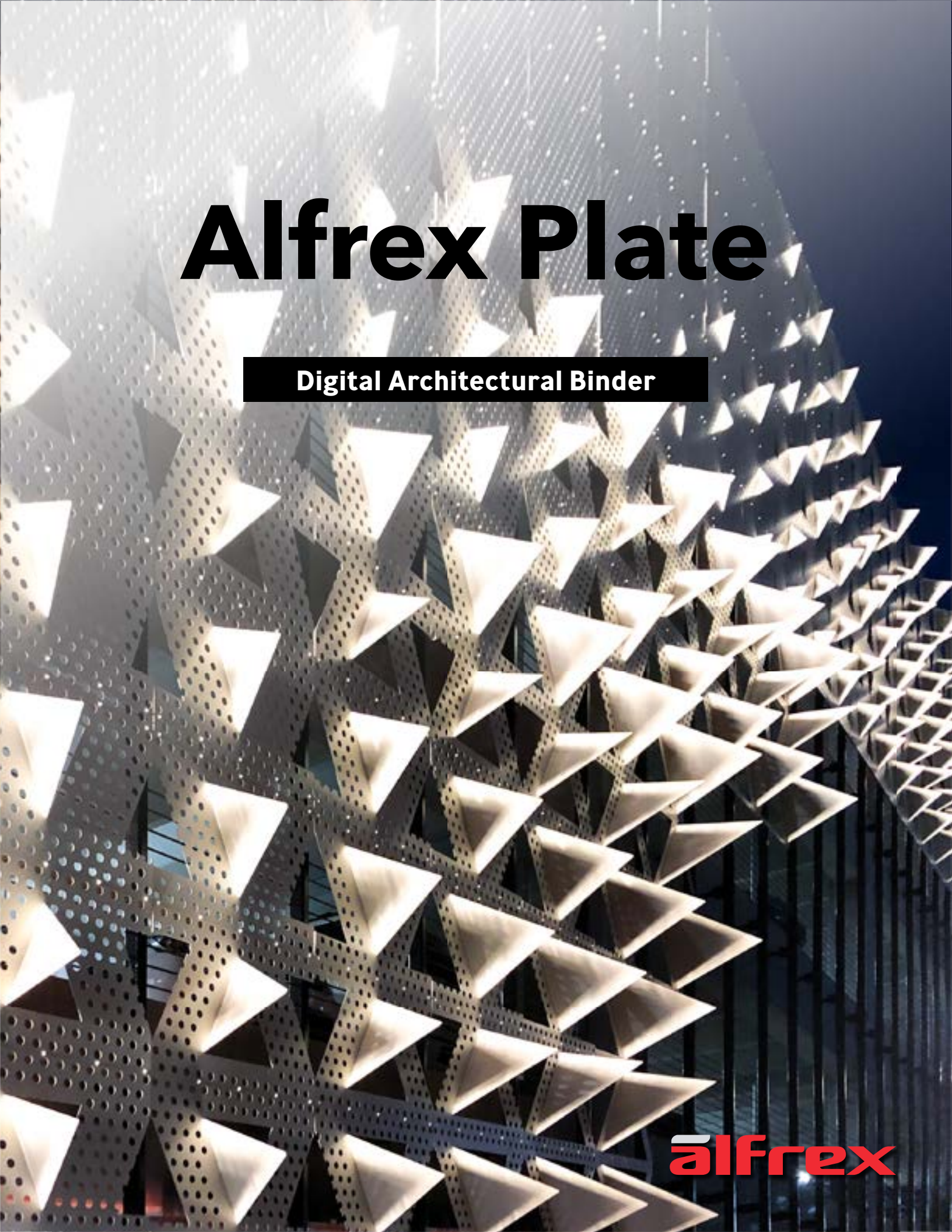


Alfrex Plate

Digital Architectural Binder

alfrex

ALFREX OVERVIEW

Alfrex, Inc. is specialized in fire-resistant and non-combustible architectural metal wall cladding for the North American market. Its foundation as a manufacturer dates back to 2000 for fire-resistant compounds, coatings, and bonding materials; and back to 2008 as a global manufacturer of fire-resistant MCM. Its company history and highlights include:

2000 Parent company Unience, Ltd. founded manufacturing fire-resistant compounds

2008 Alfrex FR Metal Composite Material launched with 2 manufacturing lines

2016 Alfrex USA commercial offices opened

2017 Alfrex Canada commercial offices opened

2019 Alfrex Plate - coil coated architectural aluminum plate added to portfolio

2020 New FR-core only MCM manufacturing plate and global headquarters inaugurated in Buford, Georgia USA

2020 All required product testing and certifications for the USA and Canada completed for Alfrex FR MCM and Alfrex Plate

2021 Alfrex launches Flat Sheet and Trim Profiles Program

PRODUCTS

Alfrex FR MCM - Metal Composite Material Wall Panels

Alfrex Plate Pre-Finished Architectural Wall Panels

Matching Flat Sheet and Trim Profiles

PRODUCT OVERVIEW

Alfrex FR MCM *Metal Composite Material Wall Panels*

Alfrex FR is a continuous process manufactured metal composite material (MCM) consisting of an extruded fire-resistant core permanently bonded to pre-finished aluminum skins on each side. It is fully tested and compliant with building codes in both the USA and Canada - holding key certifications such as ICC ES Evaluation Report ESR-4566, ICC AC25, NPFA 285, CAN S134, Florida Product Approval for High Velocity Hurricane Zones, and many others.

Alfrex Plate *Pre-Finished Architectural Wall Panels*

Alfrex Plate is a 100% solid aluminum, non-combustible wall cladding panel with a standard nominal thickness of 0.125" (3mm) by a maximum 62" width - allowing it to be fabricated and installed with the same methods and system assemblies utilized with MCM. Like MCM, it is pre-finished via coil coating lines - providing better color consistency and economics versus the post-painting of individual plate panels.

Matching Flat Sheet and Trim Profiles

Alfrex stocks tension leveled 0.040" (1mm) aluminum flat sheet in all MCM standard colors to address the challenge of coordinating color match between metal wall cladding products and sheet metal for trim and accessories. Matching flat sheet can also be made-to-order in 5 standard profiles commonly used for flashing applications.

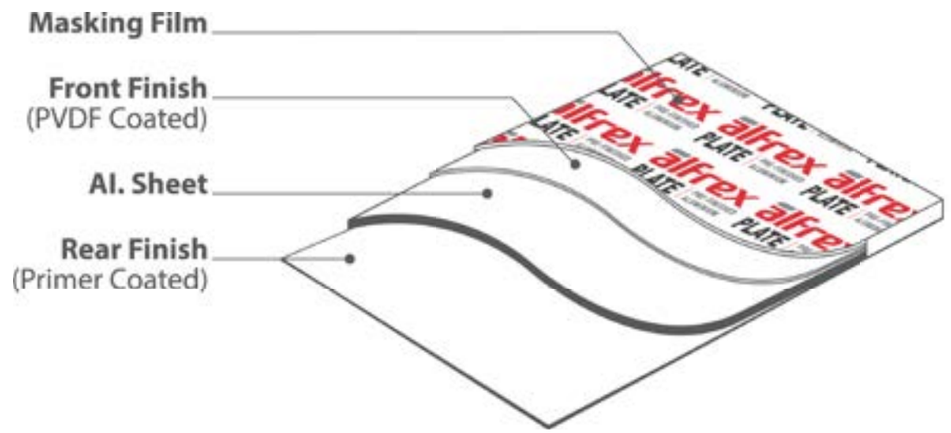
CONTENTS

ALFREX PLATE PRODUCT GUIDE

INTRODUCTION

ALFREX PLATE is a 100% solid aluminum, non-combustible wall cladding panel. With a standard thickness of 3mm (nominal 0.I25" / I/8") by a maximum 62" width, it is also available in 0.100" (2.5mm), 0.080" (2mm), 0.060" (1.5mm) thicknesses, as well as custom widths. It is pre-finished by coil coating lines specialized in handling heavier gauge solid aluminum coil, tension leveled, and cut to length per the requirements of each project.
Its 70% PVDF Kynar resin paint system ensures color consistency and outstanding UV protection, and can be coated in coordination with Alfrex FR ACM standard or custom colors.
The backside is primer coated to minimize oxidization and enable post-paint spray coating for small lot custom colors, where air dry or baked finishes are desired.

ALFREX PLATE COMPOSITION



FEATURES

Non-Combustibility

Alfrex Plate is non-combustible 100% solid aluminum, 3003-H14 alloy. For applications where meeting local building codes or satisfying owner preference is mandated, a non-combustible metal wall cladding option may be desired. Alfrex Plate fits this requirement and much more.

Coil Coated Aluminum Plate

Architectural quality coil coated finishes are rarely available on plate thickness greater than 0.080". With Alfrex 3mm Plate, "Coil Coated" is the standard. Projects requiring a non-combustible solution with greater panel spans can count on Alfrex 3mm Plate, coil coated with the same wide range of finishes and exterior coating performance warranties as Alfrex FR MCM.

Custom Colors

Alfrex provides custom matching to transform your imagination into reality using the color or finish of your choice. Simply send us a color sample, coating manufacturer paint code, Pantone number, or PMS number and we will quickly turn around an accurate match that meets your project requirements.

Small Lot Custom Colors

Alfrex stocks 3mm thick aluminum plate in 62" wide x 165" and 196" long sheets with a primed back side. This enables the post-painting of sheets in either air dry or baked on spray finishes, eliminating the need for customers to source sheets from multiple sources. This capability also provides a more economical solution for small, custom color requirements where coil coating minimums cannot be met.

Cut to Length for the Project

Alfrex Plate is tension leveled and cut to length per the requirements of each individual project. With a minimum quantity of 20 sheets per length, customers can take off and optimize Alfrex Plate in the same manner as Alfrex FR MCM - reducing scrap and processing costs.

Compatibility and Formability

Alfrex Plate can be fabricated using proven methods such as: cutting, routing, shearing, bending, folding, and roll forming. It can be folded to a 2T bend naturally, and to 90 degrees when routed from the back side. This enables closer compatibility between Alfrex Plate and popular MCM installation systems with only slight modifications.

REFERENCE DATA

STANDARD SIZES

PROPERTY	3mm Plate		0.080" Plate		UNITS
Thicknesses *(nominal)*	0.125		0.080		in
	3		2		mm
Widths **41.3in (1,050mm) width is available upon request.*	62.0	49.2	60.0	50.0	in
	I,575	I,250	I,524	I.270	mm
Lengths	Max 196				in
	Max 4,978				mm

TOLERANCES

PROPERTY	3mm Plate	UNITS
Width	+ / - 0.080	in
	2.0	mm
Length	+ / - 0.157	in
	4.0	mm
Thickness	+ / - 0.004	in
	0.1	mm

TECHNICAL PROPERTIES

PROPERTY	STANDARD	3mm Plate	UNITS
Aluminum Plate Alloy	-	3003-H14	
Panel Weight	-	1.66	lb/ft^2
		8.10	kg/m^2
Specific Gravity *(Product)*	-	2.72	g/cc
Coefficient of Expansion	-	12.9×10^{-6}	in/in/°F (@ 68-212°F)
Modulus of Elasticity	ASTM E8	10×10^{6}	Psi
		69.0×10^{3}	Mpa
Moment of Inertia	-	1.37×10^{-4}	in^4/in
		5.7×10^{-3}	cm^4/m
Section Modulus	-	2.32×10^{-3}	in^3/in
		38.0×10^{-3}	cm^3/m
Tensile Strength	ASTM E8	20.3×10^{3}	Psi
		140.0	Mpa
Yield Strength	ASTM E8	17.4×10^{3}	Psi
		120.0	Mpa
Elongation	ASTM E8	25	%
Thermal Conductivity	C518	193	W/(m•K)

FIRE PERFORMANCE

TEST	RESULT
ASTM E136	Non-Combustible
CAN/ULC-S135	Passed
CAN/ULC-S114-2018	Passed
FM 4473 "Modified" Impact Resistance	Passed

ALFREX PLATE EXECUTIVE SUMMARY

ALFREX PLATE EXECUTIVE SUMMARY

Pre-Finished 3mm & 2mm Solid Aluminum Plate

Fire Resistant & Non-Combustible Cladding

ALFREX PLATE

- Non-Combustible
- 100% 3003-H14 aluminum
- Pre-Finished Kynar PVDF Finishes
- Coil coated for consistency
- 20 Year Finish Warranty
- Identical pricing for standard or custom color production orders subject to minimums
- Primer coated backside for post-painting small customs
- Printed production marking on backside for traceability
- 5 Colors in 3mm Plate Finished Goods

FABRICATION

- Cutting & Routing
  - Specialized CC router bits
  - Laser cutting
  - Shear press
  - Saw cuts
- Bending & Folding
  - Brake press
  - Route & return
- Perforation
  - Turret punch press recommended
  - Perforated area ‹ 30% of total surface area
  - Minimum distance between perforated holes
    - 1.5x thickness of panel
    - 3mm Plate: 0.180in (4.5mm)
    - 2mm Plate: 0.120in (3mm)

INSTALLATION SYSTEMS

- With slight adaptations, compatible with MCM systems
- Consult Alfrex for fabricators by region with tested installation systems for aluminum plate

STANDARD COLOR FINISHED GOODS

- 3mm Plate: 62in x 165in and I96in
- Classic White *(match to MCM & 0.040in flat sheet)*
- Bone White *(match to MCM & 0.040in flat sheet)*
- Black *(match to MCM & 0.040in flat sheet)*
- Monument Gray
- Pure Silver Mica

DIMENSIONS

- 2mm Plate: 0.080in x 60in & 50in wide
- 3mm Plate: 0.I25in (nominal) x 62in & 49.2in wide
- Standard length: 165in
- Max length: 196in
- 20 Panel minimum per length
- Tension leveling and cut to length line

APPLICATIONS

- Non-combustible wall cladding
- Single skin aluminum plate
- Smaller sized panel modules
- High traffic areas
- Perforated panels
- Municipal building code compliance i.e: Toronto, New York City

PRODUCT CERTIFICATIONS

ALFREX PLATE - FIRE PERFORMANCE	
ASTM E136	Passed: Non-Combustible
CAN/ULC S114-2018	Passed
CAN/ULC S135	Passed
FM 4473 “Modified” Impact Resistance	Passed

LEED CERTIFICATION RECYCLED CONTENT MR CREDIT 4 - 91.05%
LEED v3 : 2 Points
LEED v4 : 1 Point

ALFREX PLATE - BUILDING CODE
Florida Product Approval with HVHZ - FL39304

PRODUCTION ORDER MINIMUMS

	Economic Order Point	Premium Priced Production Order	Specialty Finishes (Wood, Metal Series)
3mm (0.120in)	8,000 sf	I,000 sf	22,000 sf
2mm (0.080in)	6,000 sf	I,000 sf	22,000 sf

Alfrex, Inc. • 943 Gainesville Hwy. Bldg 100-4000, Buford GA 30518 • 470.589.7449 • alfrex@alfrexusa.com • www.alfrexusa.com

ALFREX PLATE SPECIFICATION COMPLIANCE CHECKLIST

SPECIFICATION COMPLIANCE CHECKLIST

Section 07 42 13 - Metal Plate Wall Panels

alfrex
Fire Resistant & Non-Combustible Cladding

PART 1: GENERAL

ASTM E330 Structural Performance

Perimeter Framing Deflection ≤ L/175
Panel Deflection ≤ L/60

Panel Deflection - Compliant
+100 psf / -90 psf, 20.0 psf water penetration per ASTM E330

		Deflection (in)		Permanent Set (in)	
		Measured	Allowed Per TAS 202 (L/333)	Measured	Allowed Per TAS 202 (L/720)
Design Pressure	+ 100.0/psf	0.10	0.36	0.02	0.17
	- 90.0/psf	0.20	0.36	‹ 0.01	0.17
Test Pressure	+ 150.0/psf	0.16	N/A	0.03	0.17
	- 135.0/psf	0.30	N/A	0.03	0.17

Perimeter Framing Deflection - Compliant

		Deflection (in)		Permanent Set (in)	
		Measured	Allowed Per TAS 202 (L/1707)	Measured	Allowed Per TAS 202 (L/3899)
Design Pressure	+ 100.0/psf	0.01	0.07	‹ 0.01	0.03
	- 90.0/psf	0.03	0.07	‹ 0.01	0.03
Test Pressure	+ 150.0/psf	0.01	N/A	0.01	0.03
	- 135.0/psf	0.03	N/A	0.01	0.03

ASTM E283, Air Leakage

< 0.06 cfm per sf at 1.57 psf

0.02 cfm/ft² (0.10 L/s/m²) at 1.57 psf (25 mph)	Compliant
0.04 cfm/ft² (0.20 L/s/m²) at 6.27 psf (50 mph)	Compliant

ASTM E331, Water Penetration

No water infiltration at 6.24 psf (0.299 kPa)

No water infiltration at 20 psf (0.96 kPa)	Compliant

Fire Performance

Compliant with regulatory fire code testing

ASTM E136: Standard Test Method for Behavior of Materials in a Vertical Tub Furnace at 750°C

CAN / ULC-S114-2018: Standard Method of Test for Determining Non-Combustibility in Building Materials

CAN / ULC-S135: Standard Test Method for the Determination of Combustibility Parameters of Building Materials

Quality Assurance

Product Certifications & Test Report Compliance

Florida Product Approval HVHZ - FL Building Commission No. FL39304	
FM 4473 "Modified" Impact Resistance Testing Results	Pass
Aluminum Ingot Country of Origin	Australia
Aluminum Ingot, Rolled Aluminum Coil, Coil Coated Plate	
» ISO 14001 Environmental Management System	
» ISO 9001 Quality Management System	

Warranty

Finish Warranty	20 Years
Perforated Product Finish Warranty	10 Years

PART 2: PRODUCT

Metal Plate Wall Panels

100% Solid Aluminum Plate Panels used for exterior wall cladding, parapets, fascia and soffits as the siding component of a rainscreen system that also includes a ventilated drainage plane and a vapor-permeable air barrier provided under separate sections and trade contracts.

Aluminum Alloy

Alloy	3003-H14

SPECIFICATION COMPLIANCE CHECKLIST

Section 07 42 13 - Metal Plate Wall Panels

Fire Resistant & Non-Combustible Cladding

PART 2: PRODUCT (con't)

Panel Dimensions

Standard Widths	62in (1575mm)
	49.2in (1250mm)
Custom Width Range	31.5in (800mm) min - 62in (1575mm) max
Lengths	Made to order 48in min - 196in max

Thicknesses

3mm	0.125inches nominal
2.5mm	0.100inches nominal
2mm	0.080inches nominal
1.5mm	0.063inches nominal

Finishes

AAMA 2605 Compliant Coil Coated
70% KYNAR® 500 based Polyvinylidene Fluoride (PVDF) finishes

PROPERTY	STANDARD	COIL COATED ALUMINUM
Color Uniformity	ASTM D2244	Max. 2 Delta E
Color Retention - Fade	ASTM D2244	≤ 5 Delta E units
Chalk Rating	ASTM D4214	≤ 8 units
Specular Gloss	ASTM D523	± 5 units
Dry Film Hardness	ASTM D3363	F - 2H
Dry Adhesion	ASTM D3359	No coating removal
Abrasion Resistance	ASTM D968	Abrasion Coefficient Value ≥ 40
Reverse Impact	ASTM D2794	No coating removal
Muriatic Acid Resistance (10% HCl, 15 min)	ASTM D1308	No blistering or visual change
Nitric Acid Resistance (HNO_3, 30 min)	ASTM D1308	≤ 5 Delta E
Alkali Mortar Resistance (10%, 25% NaOH, 60 min)	ASTM D1308	No removal No loss of adhesion or visual change
Flexibility	ASTM D4145	2T - no pick off
Humidity Resistance	ASTM D714	4000 hour exposure Less than "few" blisters Size No. 8
	ASTM D2247	
Cyclic Corrosion	ASTM B117	2000 hour exposure Min rating of 7 scribe or cut edge
	AAMA 2605-13	Min. blister rating of 8

Panel Weight

3mm	1.66 lb/ft² (8.10 kg/m²)
2.5mm	1.33 lb/ft² (6.75 kg/m²)
2mm	1.11 lb/ft² (5.40 kg/m²)
1.5mm	0.83 lb/ft² (4.05 kg/m²)

Fire Performance

Intertek Cerified Test	Results
ASTM E136	Pass - meets standard for non-combustibility
CAN/ULC S114-2018	Pass - meets the specified performance req.
CAN/ULC S135	Pass - no deviations to the ULC S135 standard

Technical Properties Data Sheet

Alfrex Plate 3mm	View
Alfrex Plate 2mm	View

Related Materials

Matching trim and accessories formed from sheet metal to match MCM panel finish.

Alfrex stocks 0.040" x 48" x 120" flat sheet in 40 colors that match Alfrex FR MCM standard colors, 4 of which match stocked Alfrex Plate colors.

ALFREX COLOR OFFERING

FINISHES STANDARD STOCKING 3mm

3mm Plate Finished Goods Sheets In-Stock

0.080" Plate by Production Order Only

Production Orders for Custom Lengths

- I,000 sf Production Order Minimum
- Subject to premium pricing and longer lead times.

2 COAT SOLIDS ▪ 20 Year Finish Warranty ▪

Classic White
JY-5195

Bone White
JY-5165

Monument
JY-6190

Black
JY-6220

2 COAT MICAS ▪ 20 Year Finish Warranty ▪

Pure Silver
JY-1220

PRE-FORMULATED NORTH AMERICAN FINISHES

Production Order Only - No Finished Goods

3mm Plate I I,000 sf Production Order Minimum

0.080in Plate I I,000 sf Production Order Minimum

Matching Finished Goods I Alfrex FR MCM & 0.040in Flat Sheet

Wood and Metal Series I Consult about availability and minimums for each finish

2 COAT SOLIDS ▪ 20 Year Finish Warranty ▪

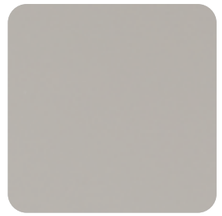
Matching 0.040" Flat Sheet in Inventory

Classic White
JY-5195

Bone White
JY-5165

Ascot White
JY-5110

Oyster
JY-5125



Dove Gray
JY-6120

Fashion Gray
JY-6130

Dark Gray
JY-6140

Slate Gray
JY-6145

Charcoal
JY-6150

Castle Gray
JY-6160

Sea Wolf
JY-6175

Bronze
JY-6180

Black
JY-6220

Midnight Black
JY-6230

FINISHES PRE-FORMULATED NORTH AMERICAN

VIVID SOLIDS*

* 20 Year Limited Finish Warranty - *consult for specific details*

Matching 0.040" Flat Sheet in Inventory

Signal Blue
JY-7110 | 2 Coat Solid

Harmony Blue
JY-7115 | 2 Coat Solid

Vibrant Red
JY-7120 | 3 Coat Solid

2 COAT MICAS

▪ 20 Year Finish Warranty ▪

Matching 0.040" Flat Sheet in Inventory

Anodic Clear Mica
JY-2510

Silversmith
JY-2515

Exotic Silver Mica
JY-2520

Gray Silver Mica
JY-2530

MZG Gray Mica
JY-2535

Pewter Mica
JY-2540

Champagne Mica
JY-2550

Driftwood Mica
JY-2555

Medium Bronze Mica
JY-2560

Copper Penny Mica
JY-2570

3 COAT METALLICS

▪ 20 Year Finish Warranty ▪

Matching 0.040" Flat Sheet in Inventory

Bright Silver Metallic
JY-3510

Champagne Metallic
JY-3520

Graphite Metallic
JY-3530

PEX Pewter Metallic
JY-3540

JLR Gray Metallic
JY-3550

METAL SERIES

▪ 20 Year Finish Warranty ▪

Matching 0.040" Flat Sheet in Inventory

Faux Zinc Graphite
JY-M110

Faux Zinc
JY-M120

Faux Zinc Lite
JY-M130

Tile Corten
JY-M140

WOOD SERIES

▪ 20 Year Finish Warranty ▪

Matching 0.040" Flat Sheet in Inventory

Teak
JY-W120

Golden Oak
JY-W140

Dark Walnut
JY-W150

ALFREX PLATE SPECIFICATION 07 42 13 METAL PLATE WALL PANELS

SECTION 07 42 13
METAL PLATE WALL PANELS

PART 1: GENERAL

1.01 SCOPE

A. Section Includes
   1. Metal Plate Wall Panels.
   2. Panel systems requirements of aluminum plate panels including exterior and interior installation assemblies, components, and accessories.

B. Related Sections: Section(s) related to this section include:
   1. Division 05 Metal Framing Sections
   2. Division 07 Air and Vapor Barrier
   3. Division 07 Flashing and Trim Sections
   4. Division 07 Joint Treatment Section
   5. Division 08 Aluminum Windows Section
   6. Division 08 Glass and Glazing Section
   7. Division 08 Curtain Wall Sections

1.02 QUALITY ASSURANCE

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed have either been identified by the International Building Code (IBC), local building code, or specific requirement for this building construction type.

B. Aluminum Association (AA)
   1. Aluminum Design Manual
   2. AA-M12C22A41: Anodized - Clear Coating
   3. AA-M12C22A44: Anodized - Color Coating

C. American Society for Testing and Materials (ASTM) International
   1. ASTM B209-10 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   2. ASTM E283 Test Method for Determining Rate of Airflow through Exterior Windows, Curtain Walls and Doors under Specified Pressure Differences Across the Specimen.
   3. ASTM E330 Standard Test Method for Water Penetration of Exterior Windows, Curtain Wall, and Doors by Uniform Static Air Pressure Difference.
   4. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Wall, and Doors by Uniform Static Air Pressure Difference.

D. American Architectural Manufacturers Associations (AAMA)
   1. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
   2. AAMA 509 Voluntary Test and Classification Method of Drained and Back Ventilated Rain Screen Wall Cladding Systems.
   3. AAMA 611-14 Voluntary Specification for Anodized Architectural Aluminum.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Provide installed metal plate panel system designed to withstand specified loads while maintaining allowable deflection and thermal movement performance as defined by the Manufacturer.

B. Deflection and Thermal Movement: Provide installed metal plate panel systems that have been designed to resist to wind loading, acting inward and outward.
   1. Perimeter Framing Deflection: Deflection of panel perimeter framing member shall not exceed L/175 normal to plane of the wall where L is the unsupported span of the perimeter framing member.

2. Panel Deflection: Deflection of the panel face shall not exceed L/60 at design load where L is the unsupported span of the panel.
3. Anchor Deflection: At connection points of framing members to anchors, anchor deflection in any direction shall not exceed 0.0625in (1.6mm).
4. Thermal Movements: Allow for free and noiseless horizontal and vertical thermal movement due to expansion and contraction of component parts over a temperature range of -20°F (-29°C) to +180°F (82.2°C) at the material surface.
    a. Buckling,opening of joints, undue stress on fasteners, failure of sealants, or any other detrimental effects of thermal movement will not be permitted.
    b. Fabrication, assembly and erection procedures shall take into account the ambient temperature range at the time of the respective operation.

C. System Requirements
1. Structural: Provide systems that have been tested in accordance with ASTM E330 at a design pressure of [specify design pressure in psf (kPa)] and have been certified to be without permanent deformation or failures of structural members.
2. Drained and Back Ventilated Rainscreen System
    a. Tested to AAMA 5209 Standard
        1) ASTM E283 Air Leakage: The air flow measurement across the metal plate panel rainscreen system (excluding jamb conditions) is measured to determine the V-axis classification on chart 1b from AAMA 509.
        2) ASTM E331 and AAMA 501.1 - Water Infiltration Measurement: At pressures of 6.24psf (300Pa) and 12.0psf (575Pa) for ASTM E331 and AAMA 501.1, the average water from the four (4) tests is collected, measured, and averaged to determine the W-axis classification.
            a) The system will be classified when the V-axis classification number is greater than or equal to the W-axis, classification number as presented on the AAMA 509 Chart 1a or 1b. (i.e. V2/W2 is acceptable, V1/W2 is not acceptable)
        3) ASTM E330: The metal plate panel rainscreen system should be engineered to meet the project design loads. The metal plate panel system must meet or exceed the following criteria when tested to a minimum pressure of 30.0psf (1436Pa) with system joinery closed (taped or sealed) in order to produce prescribed static loads of the test.
            a) Deflections should not exceed limitations defined within the section on Deflection and Thermal Movement.
3. Pressure Equalized Rainscreen System
    a. Tested to AAMA 508
        1) AAMA 508 (modified ASTM E1233) Pressure Cycle Testing must yield results as follows:
            a) The lag between the cavity and the cyclic wind pressure shall not exceed 0.08 seconds.
            b) The maximum differential between the cavity and the cyclic wind pressure shall not exceed 50% that of the maximum test pressure.
        2) ASTM E331 Static Water Penetration: The metal plate panel rainscreen system must be tested under a static pressure at 12.0psf (575Pa) minimum over a 15 minute time period and yield results as follows:
            a) All water that penetrates the exterior rainscreen cladding including condensation must be controlled and drained to the exterior.
            b) Any droplets water that contacts the air/water barrier cannot exceed 5% of the air/water barrier surface.
            c) Water will not produce any continuous stream of water on the air/water barrier.
        3) AAMA 501.1 Dynamic Water Infiltration: The metal plate panel rainscreen system must be tested to a wall pressure equivalent 12.0psf (575PA) over a 15 minute time period and yield results as follows:
            a) All water that penetrates the exterior rainscreen cladding including condensation must be controlled and drained to the exterior.
            b) Any droplets water that contacts the air/water barrier cannot exceed 5% of the air/water barrier surface.
            c) Water will not produce any continuous stream of water on the air/water barrier.
        4) ASTM E330 The metal plate panel rainscreen system should be engineered to meet the project design loads. The metal plate panel rainscreen system must meet or exceed the following criteria when tested to a minimum pressure of 30.0psf (1436Pa) with system joinery closed (taped or sealed) in order to produce prescribed static loads of the test. The wall air and water barrier should not be submitted to loads during the test.
            a) Deflections do not exceed limitations defined within the section on Deflection and Thermal Movement.

1.04 SUBMITTALS
A. Submit in accordance with Conditions of the Contract and Division 01 Submittal Procedures Section.
B. Submit product data, including manufacturer's brochures and Spec-Data Sheets.
C. Shop Drawings: Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.
D. Samples: Submit selection and verification samples for finishes, colors, and textures.
    1. Selected Samples: Manufacturer's color charts of chips illustrating full range of colors, finishes and patterns available for composite metals panels with factory applied finishes.
    2. Verification Samples:
        a. Panel System Assembly: Two samples of each assembly 12in x 12in (304mm x 304mm)
        b. Two samples of each color in coil coated, or draw down samples on aluminum substrate, not less than 3in x 4in (76mm x 102mm).
E. Quality Assurance Submittals (Submit the following):
    1. Product Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties, or a third-party listing documenting compliance to a comparable code section.
    2. Product Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
    3. Product Literature
    4. Metal plate panel rainscreen system fabricator's field reports.
F. Closeout Submittals (Submit the following):
    1. Warranty: Warranty documents specified.

1.05 QUALITY ASSURANCE
A. Metal Plate Panel Rainscreen System Fabricator Qualifications
    1. Metal plate panel rainscreen system fabricator will have at least (3) years of continuous documented experience fabricating either MCM or the solid metal plate panel material type specified.
    2. Metal plate panel rainscreen system fabricator will have been in business under its present name for at least five (5) years prior to the start of this project.
    3. Metal plate panel rainscreen system fabricator will be capable or providing field service representation during construction.

4. Metal plate panel rainscreen system fabricator will not have filed for protection from creditors under state or federal insolvency or debtor relief statues or codes

B. Metal Plate Panel Rainscreen System Installer Qualifications
   1. Metal plate panel rainscreen system installer will have been in business under its present name for at least five (5) years prior to the start of this project and have experience with similar sized projects in either MCM or solid metal plate.
   2. Metal plate panel rainscreen system installer will be capable of providing field service representation during construction.
   3. Metal plate panel rainscreen system installer must be an approved installer by the metal plate panel system fabricator for the installation of their metal plate panel system and have undergone proper training for the specified system.

C. Mock-Up
   1. At location on building and to extent directed by Architect, install areas of specified wall panels, support framing, flashing, trim and accessories to show:
      a. Substrate preparation
      b. Support framing, furring, and flashing
      c. Clearances and gaps between members
      d. Fastening methods
      e. Trim details
      f. Joint protection
      g. Workmanship
   2. Prepare mock-up for Architect's approval before start of wall panel work. Prepare additional mock-ups, if required by Architect, until approved.
   3. Maintain approved mock-up during construction to establish required standard of workmanship and basis of comparison for installation of wall panel work. Approved mock-up may remain as part of finished work.
   4. For custom colors, primer coated metal plate wall panels may be provided for application of a representative spray-coat match to the specified coil coated finish, for evaluation of color appearance only. Color match approvals must be made with paint vendor draw-down matches as described in section 1.04:D:2:b

D. Installation Documents On-Site
   1. Maintain copies of installation instructions, approved submittals and other execution related documents on-site; make available as need to confirm proper installation.

E. [____]

1.06 DELIVERY, STORAGE & HANDLING

A. Adhere to manufacturer's ordering instructions and lead time requirements to avoid delays.
B. Deliver materials to fabricator in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Protect finish of panels by applying heavy-duty removable plastic film during production.
D. After fabrication, package composite wall panels for protection against transportation damage.
E. Store material in accordance with manufacturer's guidelines.
   1. Exercise care unloading, storing and installing panels to prevent bending, warping, twisting and surface damage to the factory applied finish.
   2. Store materials protected from exposure to harmful weather conditions.
   3. Protect panels from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
   4. Slope panels to ensure positive drainage of any accumulated water.
   5. Avoid contact with any other materials that might cause staining, denting or other surface damage to the factory applied finish.

1.07 WARRANTY

A. Manufacturer's Warranties: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.
B. Warranty Periods:
   1. Panel Integrity: 5 Years commencing on Date of Substantial Completion.
   2. Painted Finish: 20 Years commencing on Date of Substantial Completion.
   3. Anodized Finish: 5 Years commencing on Date of Substantial Completion.

PART 2: PRODUCTS

2.01 METAL PLATE WALL PANELS

A. Solid Aluminum Plate Wall Panel Provider
   1. Alfrex, Inc. 943 Gainesville Hwy. Bldg 100-4000, Buford, GA 30518
      Phone - (470) 589-7449
      Website - http://alfrexusa.com
      Email - alfrex@alfrexusa.com

2.02 BASIS OF DESIGN

A. Alfrex Plate - non-combustible solid aluminum plate wall panels
B. Description: 100% Solid Aluminum Plate Panels used for exterior wall cladding, parapets, fascia and soffits as the siding component of a rainscreen system that also includes a ventilated drainage plane and a vapor-permeable air barrier provided under separate sections and trade contracts.
C. Thickness:
   1. 3mm (0.125in nominal)
   2. 2.5mm (0.100in nominal)
   3. 2mm (0.080in nominal)
   4. 1.5mm (0.063in nominal)
D. Aluminum Alloy: 3003-H14
E. Alfrex Plate Weight:
   1. 3mm: 1.66lb/ft^2 (8.10kg/m^2)
   2. 2.5mm: 1.33lb/ft^2 (6.75kg/m^2)
   3. 2mm: 1.11lb/ft^2 (5.40kg/m^2)
   4. 1.5mm: 0.83lb/ft^2 (4.05kg/m^2)
F. Finishes
   1. Coil coated KYNAR® 500 or HYLAR® 5000 based Polyvinylidene Fluoride (PVDF) or Fluoro Ethylene - Alkyl Vinyl Ether (FEVE) resin in conformance with the following general requirements of AAMA 2605.
      a. Color: (Select on of the following)
         1) Standard color as selected by the owner / architect / engineer from manufacturer's standard, color selection.
            a) 2 Coat Solid
            b) 2 Coat Mica
            c) 3 Coat Metallic
            d) [____]

2) Custom color to be matched by the panel supplier
   a) 2 Coat Solid
   b) 2 Coat Mica
   c) 3 Coat Metallic
   d) [____]

b. Dry Film Thickness:
   1) 2 Coat: 1.0mil (±0.2mil)
   2) 3 Coat: 1.0mil (±0.2mil) + 0.50mil (±0.05mil)

c. Hardness: ASTM D3383; HB minimum using Eagle Turquoise Pencil

d. Impact Resistance
   1) Test method: ASTM D2794; Gardner Variable Impact Tester with 5/8” mandrel
   2) Coating shall withstand reverse impact of 1.5in/lbs per mil substrate thickness
   3) Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.

e. Adhesion:
   1) Test Method: ASTM D3359: Coating shall not pick-off when subjected to an 11in x 11in x 1/16in grid and taped with #600 Scotch Tape.

f. Humidity Resistance:
   1) Test Method: ASTM D2247
   2) No formation of blisters when subject to condensing water fog at 100% relative humidity and 100°F for 4000 hours.

g. Salt Spray Resistance:
   1) Test Method: ASTM B117; Expose coating system to 4000 hours, using 5% NaCl solution.
   2) Corrosion creepage from scribe line: 1/16” max.
   3) Minimum blister rating of 8 within the test specimen field.

h. Weather Exposure:
   1) Outdoor:
      a) 10 Year exposure at 45° angle facing south Florida exposure.
      b) Maximum color change of 5 Delta E units as calculated in accordance with ASTM D2244
      c) Minimum chalk rating of 8 in accordance with ASTM D4214
      d) No checking, crazing, adhesion loss

i. Chemical Resistance:
   1) ASTM D1308 utilizing 10% Muriatic Acid for an exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye.
   2) ASTM D1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by they unaided eye.
   3) AAMA 2605 utilizing 70% reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D2244.

2.03 ALTERNATES

A. Base Bid/Contract Manufacturer: [Specify base bid/contract manufacturer].
   1. Product: [Specify product base bid/contract brand/trade name with product attributes and characteristics].

B. Alternate No. [Specify #]: [Specify alternate manufacturer].
   1. Product: [Specify product alternate brand/trade name with product attributes and characteristics].

C. Alternate No. [Specify #]: [Specify alternate manufacturer].
   1. Product: [Specify product alternate brand/trade name with product attributes and characteristics].

2.04 PRODUCT PERFORMANCE

A. Production Tolerances:
   1. Width: ± 2.0mm
   2. Length: ± 2.0mm
   3. Thickness: ± 0.001in (0.1mm)
   4. Bow: Maximum 0.5% length or width

2.05 FABRICATION

A. General: Shop fabricate to sizes and joint configurations indicated on drawings.
   1. Fabricate panels too dimensions indicated on drawings.
   2. Formed metal plate panel lines, breaks and angles to be sharp and true, with surfaces that are free from warp or buckle.

B. Fabrication Tolerances: Shop-fabricate panels to sizes and joint configurations indicated on drawings.
   1. Width: ± 0.079in [± 2.0mm] @ 70°F (21°C)
   2. Length: ± 0.079in [± 2.0mm] @ 70°F (21°C)
   3. Squareness: ± 0.079in [± 2.0mm] @ 70°F (21°C)

PART 3: EXECUTION

3.01 METAL PLANT FABRICATOR AND INSTALLER INSTRUCTIONS

A. Compliance: Comply with provide product data, including product technical bulletins, product catalog installation instructions and product carton instructions.

3.02 EXAMINATION AND PREPARATION

A. Verify that conditions of substrates previously installed under other sections or divisions are acceptable for metal plate panel rainscreen system installation. Documentation should be provided indicating any conditions detrimental to the performance or installation of the metal plate wall panel rainscreen system.
   1. Notify [Architect] of unacceptable conditions once discovered.
   2. Proceed with preparation and installation only after unacceptable conditions have been corrected.

B. Field Measurements
   1. If required per project conditions, field measurements of the site condition are to be taken prior to beginning fabrication work and notification of any material modifications and resulting schedule adjustment shall be formally documented.
   2. Field measurements are to be made once all substrate and adjacent materials are installed, verifying the locations of wall framing members and wall opening dimensions before commencement of installation. Indicate measurements on the “As Build Shop Drawings”.

C. Project Schedule: Provisions in the project schedule must accommodate the time interval between field measurements and fabrication/installation.

D. Miscellaneous Framing: Install miscellaneous rainscreen system support member and anchorage according to metal plate panel rainscreen system written instructions and drawings supplied by the metal plate panel rainscreen system Fabricator.

3.03 INSTALLATION

A. General:
   1. Install panels plumb, level and true in compliance with fabricator’s recommendations.
   2. Anchor panels securely in place in accordance with fabricator;s approved shop drawings.
   3. Comply with fabricator’s instructions for installation of concealed fasteners and with provisions of Section 07 90 00 for installation of joint sealers.

4. Installation Tolerances: Maximum deviation from horizontal and vertical alignment of installed panels: 0.25in in 20ft (6.4mm in 6.1m), noncumulative.
5. Separate contact of dissimilar metals with bituminous paint, approved plastic shims, or other approved methods as defined within the Aluminum Design Manual (ASD). Use gasketed or approved coated fasteners where needed to eliminate the possibility of corrosive of electrolytic action between metals.

B. Related Products
1. General: Refer to other related sections in Related Sections paragraph specified herein for related materials, including cold-form metal framing, flashing and trim, joint sealants, aluminum windows, glass and glazing and curtain walls.

3.04 FIELD QUALITY REQUIREMENTS

A. Field Quality Control: Comply with panel system fabricator's recommendations and guidelines for field forming of panels.
B. Field Quality Control: When required by contract, mock-up shall be constructed and tested at the expense of the Architect/Owner/General Contractor.
C. Testing Agency: If required, the Owner shall engage a qualified testing agency top perform tests and inspections.
D. Fabricator's Field Services: Upon Owner's request, provide fabricator's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with fabricator's instructions.

3.05 ADJUSTING AND CLEANING

A. Adjusting
1. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement are the responsibility of the General Contractor.
2. Removal of panels damaged by other trades is the responsibility of the General Contractor.
3. Repair components of the metal plate panel rainscreen system that present with minor damage provided said repairs are not visibly apparent at a distance of 10ft (3m) from the surface at a 90° angle per AAMA 2605.
4. Remove and replace components of the metal plate panel rainscreen system damage beyond repair.
5. Remove protective film immediately after installation of metal plate panels and immediately prior to completion of the metal plate panel rainscreen system work. Protective film intentionally left in plate after panel installation on any elevation at the direction of the General Contractor, is the responsibility of the General Contractor.
6. Any additional protection, after installation, is the responsibility of the General Contractor.
7. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.
8. Promptly remove from the job site any damaged metal plate panels, protective film, and other debris attributable to metal plate panel rainscreen system and installation, and legally dispose of said materials.

B. Cleaning
1. After metal plate panel rainscreen system installation remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

3.06 PROTECTION

A. Protect installed products from damage during subsequent construction work until final inspection and acceptance by Owner
B. [____]

END OF SECTION

ALFREX PLATE TECHNICAL DATA

TECHNICAL DATA SHEET

Alfrex Plate 3mm (0.125in)

Fire Resistant & Non-Combustible Cladding

COMPOSITION

PROPERTY	3mm Plate	UNITS
Aluminum Plate Alloy	3003-H14	

STANDARD SIZES

PROPERTY	3mm Plate		UNITS
Standard Thickness (nominal)	0.125		in
	3.0		mm
Other Available Thicknesses (nominal)	0.080		in
	2.0		mm
Standard Widths	49.2	62	in
	1,250	1,575	mm
Custom Width Range	31.5 - 62.0		in
	800 - 1600		mm
Standard Length	165		in
	4191		mm

PRODUCTION TOLERANCES

PROPERTY	3mm Plate	UNITS
Width	+ / - 0.080	in
	2.0	mm
Length	+ / - 0.157	in
	4.0	mm
Thickness	+ / - 0.004	in
	0.10	mm

ASTM B209 COMPLIANCE : 3003-H14

CHEMICAL COMPOSITION

ELEMENT	STANDARD	RESULTS
Aluminum	Remainder	97.75%
Copper	0.05 - 0.2%	0.17%
Iron	0.0 - 0.7%	0.56%
Manganese	1.0 - 1.5%	1.19%
Silicon	0.0 - 0.6%	0.18%
Zinc	0.0 - 0.1%	0.00%
Other Elements	0.0 - 0.15%	0.15%

MECHANICAL PROPERTY LIMITS

PROPERTY	STANDARD	RESULTS
Tensile (ksi)	20 min - 26 max	21.4
Yield Strength (ksi)	17 minimum	18.5
Elongation	2% minimum	25%

FINISH WARRANTIES

See warranty tables and sample warranties for conditions and exclusions

PVDF Coil Coated Finish	Alfrex Plate	20 Years
PVDF Coil Coated Finish (Perforated Panel)	Alfrex Plate	10 Years

Alfrex, Inc. endeavors to provide accurate and current technical information but cannot warrant or make any representations as to the accuracy or completeness of the information contained herein. All data is intended for informational purposes only and subject to change without notice. Please consult a licensed structural engineer for evaluations of structural soundness, specification, or final design.

TECHNICAL PROPERTIES

PROPERTY		3mm Plate	UNITS
Panel Weight		1.66	lb/ft^2
		8.10	kg/m^2
Specific Gravity *(Product)*		2.72	g/cc
Coefficient of Expansion		12.9×10^{-6}	in/in/°F (@ 68-212°F)
Modulus of Elasticity	ASTM E8	10.0×10^{6}	Psi
		69.0×10^{3}	Mpa
Moment of Inertia		1.37×10^{-4}	in^4/in
		5.7×10^{-3}	cm^4/m
Section Modulus		2.32×10^{-3}	in^3/in
		38.0×10^{-3}	cm^3/m
Tensile Strength	ASTM E8	20.3×10^{3}	Psi
		140.0	Mpa
Yield Strength	ASTM E8	17.4×10^{3}	Psi
		120.0	Mpa
Elongation	ASTM E8	25.0	%
Thermal Conductivity	C518	193.0	W/(m•K)

ARCHITECTURAL COATING PROPERTIES

70% Kynar 500 / Hylar 5000 PVDF Resin Coatings
AAMA 2605-13 Standard Compliance

PROPERTY	STANDARD	REQUIREMENT	RESULTS
Dry Film Thickness	ASTM D7091	≥ 23 microns	Pass - 32 microns
Color Uniformity	ASTM D2244	Max. 2 Delta E	Pass - < 2 units
Color Retention - Fade	ASTM D2244	Delta E ≤ 5 units	Pass - < 5 units
Chalk Rating	ASTM D4214	≤ 8 units	Pass - < 8 units
Specular Gloss	ASTM D523	± 5 units	Pass
Dry Film Hardness	ASTM D3363	F - 2H	Pass - 3H
Dry Adhesion	ASTM D3359	No coating removal	Pass - no removal
Abrasion Resistance	ASTM D968	Abrasion Coefficient Value ≥ 40	Pass - 51
Reverse Impact	ASTM D2794	No coating removal	Pass - no removal
Muriatic Acid Resistance *(10% HCl, 15 mins)*	ASTM D1308	No blistering or visual change	Pass - no blistering or visual changes
Nitric Acid Resistance *(HNO_3, 30 mins)*	ASTM D1308	≤ 5 Delta E	Pass - 0.2
Alkali Mortar Resistance *(10%, 25% NaOH, 60 mins)*	ASTM D1308	No removal. No loss of adhesion or visual change	Pass - no adhesion loss
Flexibility	ASTM D4145	2T - no pick off	Pass - no pick off
Humidity Resistance	ASTM D714	4000 hour exposure	Pass - No #8 blisters
	ASTM D2247	Less than "few" blisters Size No. 8	
Cyclic Corrosion	ASTM B117	2000 hour exposure	Pass - 10 rating
	AAMA 2605-13	Min. rating of 7 scribe or cut edge Min. blister rating of 8	

FIRE PERFORMANCE FOR NON-COMBUSTIBILITY

TEST	STANDARD	RESULTS
ASTM E136	Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C Temperature rise < 30°C No sustained flames after 30 sec of test	Pass - meets standard
CAN / ULC-S114-2018	Standard Method of Test for Determining Non-Combustibility in Building Materials Max loss of mass ≤ 20%, mean of max temperature rise ≤ 36°C	Pass - meets the specified performance requirements
CAN / ULC-S135	Standard Test Method for the Determination of Combustibility Parameters of Building Materials Total heat release ≤ 3 MJ/m^2, total smoke extinction area ≤ 1.0 m^2	Pass - no deviations to the ULC S135 standard

TECHNICAL DATA SHEET

Alfrex Plate 2mm (0.080in)

Fire Resistant & Non-Combustible Cladding

COMPOSITION

PROPERTY	0.080" / 2mm Plate	UNITS
Aluminum Plate Alloy	3003-H14	

STANDARD SIZES

PROPERTY	0.080" / 2mm Plate		UNITS
Standard Thickness *(nominal)*	0.080		in
	2.0		mm
Other Available Thicknesses *(nominal)*	0.098		in
	2.5		mm
Standard Widths	50.0	60.0	in
	I,270	1,524	mm
Custom Width Range	31.5 - 62.0		in
	800 - 1600		mm
Standard Length	120		in
	3050		mm

PRODUCTION TOLERANCES

PROPERTY	0.080" / 2mm Plate	UNITS
Width	+ / - 0.080	in
	2.0	mm
Length	+ / - 0.157	in
	4.0	mm
Thickness	+ / - 0.004	in
	0.10	mm

ASTM B209 COMPLIANCE : 3003-H14

CHEMICAL COMPOSITION

ELEMENT	STANDARD	RESULTS
Aluminum	Remainder	97.75%
Copper	0.05 - 0.2%	0.17%
Iron	0.0 - 0.7%	0.56%
Manganese	1.0 - 1.5%	1.19%
Silicon	0.0 - 0.6%	0.18%
Zinc	0.0 - 0.1%	0.00%
Other Elements	0.0 - 0.15%	0.15%

MECHANICAL PROPERTY LIMITS

PROPERTY	STANDARD	RESULTS
Tensile (ksi)	20 min - 26 max	21.4
Yield Strength (ksi)	17 minimum	18.5
Elongation	2% minimum	25%

FINISH WARRANTIES

See warranty tables and sample warranties for conditions and exclusions

PVDF Coil Coated Finish	Alfrex Plate	20 Years
PVDF Coil Coated Finish (Perforated Panel)	Alfrex Plate	10 Years

Alfrex, Inc. endeavors to provide accurate and current technical information but cannot warrant or make any representations as to the accuracy or completeness of the information contained herein. All data is intended for informational purposes only and subject to change without notice. Please consult a licensed structural engineer for evaluations of structural soundness, specification, or final design.

TECHNICAL PROPERTIES

PROPERTY		0.080" / 2mm Plate	UNITS
Panel Weight		1.11	lb/ft^2
		5.40	kg/m^2
Specific Gravity *(Product)*		2.72	g/cc
Coefficient of Expansion		12.9×10^{-6}	in/in/°F (@ 68-212°F)
Modulus of Elasticity	ASTM E8	10.0×10^{6}	Psi
		69.0×10^{3}	Mpa
Moment of Inertia		4.27×10^{-5}	in^4/in
		1.69×10^{-5}	cm^4/m
Section Modulus		1.07×10^{-3}	in^3/in
		1.69×10^{-4}	cm^3/m
Tensile Strength	ASTM E8	20.3×10^{3}	Psi
		140.0	Mpa
Yield Strength	ASTM E8	17.4×10^{3}	Psi
		120.0	Mpa
Elongation	ASTM E8	25.0	%
Thermal Conductivity	C518	193.0	W/(m•K)

ARCHITECTURAL COATING PROPERTIES

70% Kynar 500 / Hylar 5000 PVDF Resin Coatings
AAMA 2605-13 Standard Compliance

PROPERTY	STANDARD	REQUIREMENT	RESULTS
Dry Film Thickness	ASTM D7091	≥ 23 microns	Pass - 32 microns
Color Uniformity	ASTM D2244	Max. 2 Delta E	Pass - < 2 units
Color Retention - Fade	ASTM D2244	Delta E ≤ 5 units	Pass - < 5 units
Chalk Rating	ASTM D4214	≤ 8 units	Pass - < 8 units
Specular Gloss	ASTM D523	± 5 units	Pass
Dry Film Hardness	ASTM D3363	F - 2H	Pass - 3H
Dry Adhesion	ASTM D3359	No coating removal	Pass - no removal
Abrasion Resistance	ASTM D968	Abrasion Coefficient Value ≥ 40	Pass - 51
Reverse Impact	ASTM D2794	No coating removal	Pass - no removal
Muriatic Acid Resistance *(10% HCl, 15 mins)*	ASTM D1308	No blistering or visual change	Pass - no blistering or visual changes
Nitric Acid Resistance *(HNO_3, 30 mins)*	ASTM D1308	≤ 5 Delta E	Pass - 0.2
Alkali Mortar Resistance *(10%, 25% NaOH, 60 mins)*	ASTM D1308	No removal. No loss of adhesion or visual change	Pass - no adhesion loss
Flexibility	ASTM D4145	2T - no pick off	Pass - no pick off
Humidity Resistance	ASTM D714	4000 hour exposure	Pass - No #8 blisters
	ASTM D2247	Less than "few" blisters Size No. 8	
Cyclic Corrosion	ASTM B117	2000 hour exposure	Pass - 10 rating
	AAMA 2605-13	Min. rating of 7 scribe or cut edge Min. blister rating of 8	

FIRE PERFORMANCE FOR NON-COMBUSTIBILITY

TEST	STANDARD	RESULTS
ASTM E136	Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C Temperature rise <30°C No sustained flames after 30 sec of test	Pass - meets standard
CAN / ULC-S114-2018*	Standard Method of Test for Determining Non-Combustibility in Building Materials Max loss of mass ≤ 20%, mean of max temperature rise ≤ 36°C	Pass - meets the specified performance requirements
CAN / ULC-S135*	Standard Test Method for the Determination of Combustibility Parameters of Building Materials Total heat release ≤ 3 MJ/m^2, total smoke extinction area ≤ 1.0 m^2	Pass - no deviations to the ULC S135 standard

** Test Conducted on 3mm Plate*

STRUCTURAL PERFORMANCE TESTING SUMMARY DATA

Alfrex Plate 3mm

Fire Resistant & Non-Combustible Cladding

Wall Panel Assembly	Alfrex Plate 3mm with ACCU-TRAC AP DS Pressure Equalized Rainscreen System Courtesy of Altech Panel Systems	
Testing Protocols	Florida Building Code / Miami-Dade County Requirements TAS 201-94: Large Missile Impact Test, Level D, Wind Zone 4 TAS 202-94: Uniform Static Air Pressure TAS 203-94: Cyclic Pressure Loading	ASTM Standards Equivalents ASTM E283 ASTM E330 ASTM E331 ASTM E1996 ASTM E1886
Florida Product Approval	FL39304	
Panel Size Referenced	120 in wide x 60 in high	
Engineering Evaluation Report Download	Report No.: 514846	

ASTM E330 - Structural Performance

Panel Deflection

Deflection Criteria	Deflection Inches
L/360	0.33
TAS 202 L/333	0.36
L/240	0.50
L/180	0.67
L/90	1.33
L/60	2.00

		Deflection (in)		Permanent Set (in)	
		Measured	Allowed Per TAS 202 (L/250)	Measured	Allowed Per TAS 202 (L/720)
Design Pressure	+ 100.0 / psf	0.10	0.36	0.02	0.17
	- 90.0 / psf	0.20	0.36	‹ 0.01	0.17
Test Pressure	+ 150.0 / psf	0.16	N/A	0.03	0.17
	- 135.0 / psf	0.30	N/A	0.03	0.17

Perimeter Framing Deflection

Deflection Criteria	Deflection Inches
TAS 202 L/1707	0.07
L/720	0.17
L/360	0.33
L/240	0.50
L/175	0.69

		Deflection (in)		Permanent Set (in)	
		Measured	Allowed Per TAS 202 (L/1333)	Measured	Allowed Per TAS 202 (L/3899)
Design Pressure	+ 100.0 / psf	0.01	0.07	‹ 0.01	0.03
	- 90.0 / psf	0.03	0.07	‹ 0.01	0.03
Test Pressure	+ 150.0 / psf	0.01	N/A	0.01	0.03
	- 135.0 / psf	0.03	N/A	0.01	0.03

ASTM 283 - Air Infiltration

	Results	Allowed per TAS 202
Air Leakage: 1.57 psf (25 mph)	0.02 cfm / ft² (0.10 L/s/m²)	0.06 cfm / ft² (0.30 L/s/m²)
Air Leakage: 6.27 psf (50 mph)	0.04 cfm / ft² (0.20 L/s/m²)	0.06 cfm / ft² (0.30 L/s/m²)

ASTM E331 - Water Penetration

	Results	Allowed per TAS 202
20 psf: 15% of Positive Design Pressure at 960 Pa	Pass	No Leakage

FLORIDA PRODUCT APPROVAL COMPLIANCE SUMMARY

Alfrex Plate 3mm

Fire Resistant & Non-Combustible Cladding

Florida Product Approval No.		**Florida Building Commission No. FL39304**
System		Accu-Trac AP DS Pressure Equalized Rainscreen *by Altech Panel Systems*
Joint Condition		Rainscreen Spline
HVHZ High Velocity Hurricane Zone		Approved
Design Pressure Rating		+ 100 / - 90 psf*
Wall Design Allowable Pressure		± 150 psf
Max Panel Size		60″ x 120″
ASTM E283 *Air Infiltration*	**1.57 psf (25 mph)**	Pass
	6.27 psf (50 mph)	Pass
ASTM E330 *Structural Performance*		+100 psf, -90 psf, 20.0 psf Water penetration
ASTM E331 *Water Penetration*		20 psf
TAS 201 - ASTM E1996 & E1886 *Impact Testing*		Large Missile Impact Test, Level D, Wind Zone 4. No signs of penetration, rupture, or opening. Meets requirements of section 1626 of the Florida Building Code, Building.
TAS 202 *Uniform Static Pressure*		No signs of penetration, rupture, or opening. Meets requirements of section 1620 of the Florida Building Code, Building.
TAS 203 *Cyclic Wind Pressure Loading*		No signs of penetration, rupture, or opening. Meets requirements of section 1625 of the Florida Building Code, Building.
Testing Protocols		Florida Building Code Miami - Dade County ASTM Standards
Testing Documents		Florida Building Commission No. FL39304
Evaluation Report		-
Notes		* Stiffeners required 4″ O.C.

LEED CERTIFICATION

Alfrex Plate 3mm / 2mm / Imm

Fire Resistant & Non-Combustible Cladding

LEED is a world-renowned green building rating system that serves as an important tool in the building and construction industry. LEED certifications signify that buildings minimize their lifestyle impact on the environment through the compounded benefits of product selection, construction practices, performance, and recycling. The tables that follow summarize the direct and indirect benefits of Alfrex FR Metal Composite Material wall panels. Alfrex FR MCM can contribute to LEED® points under both versions 3 and 4 under the following areas:

MATERIALS & RESOURCES : Recycled Content MR Credit 4

Calculation	100% Post-Consumer Recycled Content + 50% Pre-Consumer Content
LEED v3	Use of recycled content constitutes at least 10% of the total value of materials in the project. 1 Point is awarded for 10%; 2 points are awarded for 20%.
LEED v4	Use of recycled content constitutes at least 25% of the total value of permanently installed materials in the project. 1 Point is awarded.

PRODUCT	THICKNESS	WEIGHT	POST-CONSUMER RECYCLED %	PRE-CONSUMER RECYCLED %	LEED CONTRIBUTION
Alfrex Plate	3mm	1.66 lbs/SF	90.55%	1%	91.05%
Alfrex Plate	0.080" / 2mm	1.11 lbs/SF	90.55%	1%	91.05%
Alfrex Plate	0.040" / Imm	0.56 lbs/SF	90.55%	1%	91.05%

MATERIALS & RESOURCES : Regional Materials MR Credit 5

It is not possible to identify nor quantify a contribution to the Regional Materials MR Credit 5.

MATERIAL SAFETY DATA SHEET

Alfrex Plate

Fire Resistant & Non-Combustible Cladding

SECTION 1: PRODUCT IDENTIFICATION

A.	Product Name	Alfrex Plate
B.	Recommended Use	Building Wall Cladding Material
C.	Restriction on Use	None
D.	Manufacturer/Importer/Distributor	**Alfrex, Inc.** 943 Gainesville Hwy. Bldg. 100-4000 Buford, GA 30518 USA +1.470.589.7449
E.	Emergency Phone Number	Chemtrec 1-800-424-9300
F.	Website	www.alfrexusa.com
G.	Initial Release Date	19-April-2019
H.	Revision Date	01-July-2020
I.	Version Number	2.0

SECTION 2: HAZARD IDENTIFICATION

A. Classification

Alfrex Plate is defined under OSHA Hazard Communications standard 29 CFR 1910.1200 as an "article". As such, it is a manufactured item other than a fluid or particle, formed to a specific design during manufacture with end functions dependent in whole or in part upon its' shape or design use during end use, and which under normal conditions of use does not release, or otherwise result in exposure to hazardous chemicals, nor pose a physical hazard or health risk to employees. Unless indicated otherwise, all classification information contained in this document regarding potential health, fire, or explosion hazards is in reference to hazardous elements that may be released during processing the product including, but not limited to, dust, fumes, chips, and fines.

Specific target organ toxicity (repeated exposure): Category 2

Chronic aquatic environment hazard: Category 1

B. GHS Label Elements Symbols

C. Signal Word Hazard Statement

Warning

H302	Harmful if swallowed.
H360	May damage fertility or the unborn child.
H373	May cause damage to organs.
H411	Toxic to aquatic life with long lasting effects.

D. Precautionary Statement

- Prevention	P201	Obtain special instructions before use.
	P202	DO not handle until all safety precautions have been read and understood.
	P210	Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking.
	P222	Do not allow contact with air.
	P231 + P232	Handle under inert gas. Protect from moisture.
	P240	Ground/bond container and receiving equipment.
	P241	Use explosion-proof electrical/ventilating/lighting/... /equipment.
	P260	Do not breathe dust/fume/gas/mist/vapors/spray.
	P264	Wash... Thoroughly after handling.
	P270	Do not eat, drink, or smoke when using this product.
	P271	Use only outdoors or in a well-ventilated area.
	P273	Avoid release to the environment.
	P280	Wear protective gloves/protective clothing/eye protection/face protection.
- Response	P308 + P313	IF exposed or concerned: Get medical advice/attention.
	P312	Call a POISON CENTER/doctor/... /if you feel unwell.
	P314	Get medical advice/attention if you feel unwell.
	P321	Specific treatment.
	P330	Rinse mouth.
	P335 + P334	Brush off loose particles from skin. Immerse in cool water/wrap in wet bandages.
	P370 + P378	In case of fire: Use... To extinguish.
	P391	Collect spillage.
- Storage	P402	Store in a dry place.
	P407	Maintain air gap between stacks/pallets.
- Disposal	P501	Dispose of contents/container in accordance with local regulation.

E. Hazards Not Otherwise Classified (NEPA)

Copper	
Health	2
Fire	Not Available
Reactivity	0
Manganese	
Health	0
Fire	Not Available
Reactivity	1
Silicon	
Health	Not Available
Fire	2
Reactivity	Not Available

Aluminum	
Health	0
Fire	Not Available
Reactivity	1
Iron	
Health	2
Fire	Not Available
Reactivity	Not Available
Zinc	
Health	0
Fire	Not Available
Reactivity	1

MATERIAL SAFETY DATA SHEET

Alfrex Plate

Fire Resistant & Non-Combustible Cladding

SECTION 3: COMPOSITE/INFORMATION ON INGREDIENTS

Components	CAS Number	Percentages %
Aluminum	7429-90-5	97.49 max
Copper	7440-50-8	0.20 max
Manganese	7439-96-5	1.50 max
Iron	7439-89-6	0.70 max
Silicon	7440-21-3	0.60 max
Zinc	7440-66-6	0.10 max
Others	-	0.06 max

This product is a solidified product, which is not exposed to chemicals contained in the product. However, it may be partially exposed in the molten condition such as cutting or melting.

SECTION 4: FIRST-AID MEASURES

A. Eye Contact	Dust from processing. Rinse eyes with water or saline solution for at least 15 minutes. Seek medical attention from a physician.
B. Skin Contact	Dust from processing. Wash skin with soap and water for at least 20 minutes while removing contaminated clothing and shoes. Seek medical attention from a physician. In the case of burns, immediately cool the affected area for as long as possible by cold water, and do not remove any clothing adhering to the skin.
C. Inhalation	Dust form processing. Move to fresh air. Seek medical attention from a physician.
D. Ingestion	Not inspected due to composition and form of product. If dust or fines are ingested, rinse mouth with water in case of more ingestion of dust or fines. Seek medical attention from a physician.
E. Most Important Symptoms & Effects	Prolonged exposure to dust and fumes may aggravate pre-existing chronic conditions of the skin or respiratory system.
F. Indication if Immediate Medical Attention and Special Treatment Needed.	Notify medical personnel of any situation and avoid overexposure to irritants.

SECTION 5: FIRE FIGHTING MEASURES

A. Suitable Extinguishing Media	Use Class D extinguishing agents on fines or molten metal. Do not use halogenated extinguishing agents on small chips, fines, or dust.
B. Specific Hazards	Dust from Processing. Wash skin with soap and water for at least 20 minutes while removing contaminated clothing and shoes. Seek medical attention from a physician. When burned, dust may emit corrosive or toxic smoke, fumes, or vapors may be emitted. Substances are not easily ignited; they may be burned via direct flame application. Substances may be explosively decomposed in case of fire or over-heating.

Alfrex, Inc. • 943 Gainesville Hwy. Bldg 100-4000, Buford GA 30518 • 470.589.7449 • alfrex@alfrexusa.com • www.alfrexusa.com

C.	Hazardous Combustion	Dust or fines dispersed in the air can be explosive. Even minor dust clouds are potentially dangerous. Chips, dust or fines in contact with water can generate flammable/explosive hydrogen gas. Hydrogen gas in a confined space or poorly ventilated space could present an explosion hazard. Fines and dust in contact with certain metal oxides (i.e. rust). Thermite reactions can be initiated easily by weak ignition sources. Molten metal in contact with water/moisture or other metal oxides. Moisture entrapped by molten metal can be explosive. Contact of molten aluminum with other metal oxides can initiate a thermite reaction.
D.	Special PPE and Precautions for Firefighters	NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

SECTION 6: ACCIDENTAL RELEASE MEASURES

A.	Personal & Environmental Precautions	Avoid contact with sharp edges or heated metal. Wear protective gloves. No special environmental precautions are required.
B.	Method and Materials for Containment and Cleaning	Clean releases or dust by sweeping the area and depositing in a closed container. Take measures to block dust from reaching surface water or grassy areas.

SECTION 7: HANDLING AND STORAGE

A.	Precautions for Safe Handling	Avoid generating dust. Avoid contact with sharp edges or heated metal. There is no visual difference between hot and cold aluminum. Local ventilation and vacuum systems must be designed to handle explosive dusts. Dry vacuums and electrostatic precipitators must not be used, unless specifically approved for use with flammable/explosive dusts. Dust collection systems must be dedicated to aluminum dust only and should be clearly labeled as such. Do not co-mingle fines of aluminum with fines of iron, iron oxide (rust) or other metal oxides. Avoid all ignition sources and maintain good housekeeping practices. Do not use compressed air to remove material from floors and other surfaces.
B.	Conditions for Safe Storage	No special storage precautions noted.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

A.	OSHA Permissible Exposure Limit	Aluminum	15mg/m^3 (Total), 10mg/m^3 (Respirable)
		Manganese	5mg/m^3 (Respirable Fume)
B.	Appropriate Engineering Controls	A system of local and/or general exhaust is recommended to keep employee exposures below the Exposure Limits. If engineering controls fail to mitigate exposure to limits listed, use NIOSH approved respiratory protection.	

MATERIAL SAFETY DATA SHEET

Alfrex Plate

Fire Resistant & Non-Combustible Cladding

C.	Individual Protection Measures (PPE)		
	- Eye & Face Protection	Wear primary eye protection such as tight-fitting safety goggles with a secondary protection face shield.	
	- Respiratory Protection	Use an approved respirator designed for the specific hazards where concentrations exceed exposure limits.	
	- Skin & Body Protection	Wear cut resistant gloves and avoid contact with sharp edged objects and materials.	
	- Thermal Protection	When handling heated materials, wear gloves and proper clothing to cover exposed areas and protect against thermal burns.	

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

A.	Appearance	Solid, Various Colors	
B.	Odor	Odorless	
C.	Odor Threshold	Not Applicable	
D.	pH	Not Applicable	
E.	Melting Point / Freezing Point	Aluminum	482°C - 660°C (900°F - 1221°F)
F.	Flash Point	Not Applicable	
G.	Evaporation Rate	Not Applicable	
H.	Flammability (Solid, Gas)	Not Applicable	
I.	Upper / Lower Flammability or Explosive Limits	Not Applicable	
J.	Solubility	Insoluble	
K.	Vapor Density	Not Applicable	
L.	Specific Gravity	2.7g/cm^3	
M.	Partition Coefficient: n-Octanol/water	Not Applicable	
N.	Auto Ignition Temperature	590°C (1,094°F)	
O.	Decomposition Temperature	Not Applicable	
P.	Viscosity	Not Applicable	
Q.	Molecular Weight	Not Applicable	

SECTION 10: STABILITY AND REACTIVITY

A.	Chemical Stability	Stable under recommended storage and handling conditions.
B.	Possibility of Hazardous Reactivity and Conditions to Avoid	Dust formation. Heat, flames and sparks. Protect from water. Aluminum fines are attached by strong acids and alkalis and by some halogenated organic compounds especially at elevated temperatures. Operations generating aluminum fines may produce hydrogen gas when exposed to moisture. Hydrogen gas is highly flammable and can accumulate in poorly ventilated areas. Liberates flammable hydrogen gas on contact with water, alcohols, acidic or basic materials, and metals or metallic compounds.

Alfrex, Inc. • 943 Gainesville Hwy. Bldg 100-4000, Buford GA 30518 • 470.589.7449 • alfrex@alfrexusa.com • www.alfrexusa.com

C. Incompatible Materials	Acids. Alkalis. Water. Halogenated compounds. Metal oxides. Iron powder and water: may cause an explosive reaction forming hydrogen gas when heated above 800°C (1470°F).
D. Hazardous Decomposition Products	Nickel oxides. Cadmium compounds. Fumes of aluminum or aluminum oxide. Welding of aluminum alloys may generate carbon monoxide, carbon dioxide, ozone, and nitrogen oxides. Lead oxides. Lead and chromium compounds.

SECTION 11: TOXICOLOGICAL INFORMATION

A. Acute Toxicity

Copper	LD50 481mg/kg Rat (OECD TG 401, GLP)
Aluminum	LD50 › 15900mg/kg Rat (OECD TG 401)
Manganese	LD50 › 2000mg/kg Rat (OECD TG 420, GLP)
Iron	LD50 98.6mg/kg Rat (OECD TG 401, male)
Silicon	LD50 3160mg/kg Rat
Zinc	LD50 › 2000mg/kg Rat (OECD TG 420, GLP)

B. Carcinogenicity	Not classified as a carcinogen. Trace elements used in the paint coatings for this product may be known cancer causing agents.
C. Inhalation	Airborne particles of aluminum and/or product materials may irritate the eyes and respiratory tract.
D. Skin Corrosion Property/Stimulativeness	The product is not known to cause human skin or respiratory sensitization. Contact with dust can cause mechanical irritation or drying of the skin.
E. Ingestion	Not Applicable
F. Germ Cell Mutagenicity	Aluminum - The in-vitro DNA damage test shows that the negative similar substance of $AlCl_3$ obtained from Sigma when there is no metabolic activity. The chromosome abnormality test by using the myelocyte for the mammal shows that the negative similar substance or $AlCl_3$ obtained from Sigma OECD TG 475 when there is no metabolic activity.
G. Reproductive Toxicity	Product not classified and dust from processing does not present any reproductive hazards. Elevated temperature processing with manganese compounds, such as welding, can present reproductive hazards for males.

MATERIAL SAFETY DATA SHEET

Alfrex Plate

Fire Resistant & Non-Combustible Cladding

H. Specific Organ Toxicity	Single Exposure, Product - the classification criteria are not met. For dusts, may cause damage to organs (kidneys, respiratory system). Repeated Exposure - May cause damage to organs through prolonged exposure (respiratory system). May cause allergic reactions in very susceptible persons, cause chronic effects, cause skin irritation and/or dermatitis and sensitization of susceptible persons. May cause adverse effects on the bone marrow and blood-forming system. May cause adverse liver effects. Elevated temperature processing such as welding and plasma arc cutting may release hazardous fumes. Overexposure to metal fumes may cause pulmonary edema (fluid in the lungs) and methemoglobinemia. May also cause pulmonary fibrosis and lung cancer. Lead compounds may be absorbed by ingestion, by inhalation and through the skin. Lead may damage kidney function, the blood forming system and the reproductive system. Inorganic lead compounds can cause developmental damage.
I. Eyes Critical Damage/Stimulativeness	Dust particles, chips or fines contact with the eyes can lead to mechanical irritation.

SECTION 12: ECOLOGICAL INFORMATION

A. Ecotoxicity (Fish)

Not expected to be harmful to aquatic organisms.

Copper	LC50 0.286mg/L 96hr Oncorhynchus mykiss (LC50 = 0.28640% sewage treatment plant effluent, 0.164 river water mg/L 96hr)
Manganese	LC50 › 3.6mg/L 96hr Oncorhynchus mykiss (OECD TG 203, GLP)
Zinc	LC50 0.439mg/L 96hr others (test specie: Cottus bairdii)

B. Persistence and Degradability	The product contains inorganic compounds which are not biodegradable.
C. Bio-accumulative Potential	The product is not bioaccumulative.
D. Soil Mobility	Not considered mobile

E. Other Adverse Effects

Copper	Fish	Oncorhynchus mykiss: NOEC = 11.4µg/L 45d
	Crustacean	Ceriodaphnia sp.: NOEC = 122µg/L mortality, 31.6µg/L reproduction OECD TG 21
	Algae	Chlamydomonas reinhardtii: NOEC = 22µg/L growth rate 10d OECD TG 201
Aluminum	Crustacean	Daphnia magna: NOEC = 0.076mg/L reproduction, 0.137µg/L immobilization 21d OECD TG 211, GLP
Manganese	Fish	Oncorhynchus mykiss: NOEC = 0.77mg/L 100d
	Crustacean	Ceriodaphnia dubia: NOEC = 1.7mg/L 8d OECD TG 211, GLP
	Algae	Ditylum brightwellii: EC50 = 1.5mg/L 5d
Zinc	Fish	Cottus bairdii: NOEC = 0.169 - 0.172mg/L 30d
	Crustacean	Daphnia magna: NOEC = 0.048 - 0.156mg/L 21d
	Bird	Ceramium tenuicore: NOEC = 7.2 - 18µg/L 7d

Alfrex, Inc. • 943 Gainesville Hwy. Bldg 100-4000, Buford GA 30518 • 470.589.7449 • alfrex@alfrexusa.com • www.alfrexusa.com

SECTION 13: DISPOSAL INFORMATION

Disposal must be in accordance with current applicable laws and regulations and material characteristics at time of disposal. Recover and reclaim or recycle, if practical. Aluminum in the form of particle may be reactive. Its hazardous characteristics, including fire and explosion, should be determined prior to disposal.

SECTION 14: TRANSPORTATION

A.	UN Number	Product: Does not require regulation
B.	UN Proper Shipping Name	Product: Does not require regulation
C.	Transport Hazard Class	Product: Does not require regulation
D.	Packing Group	Product: Does not require regulation
E.	Environmental Hazards	Product: Does not require regulation

SECTION 15: REGULATORY INFORMATION

OSHA: NOT classified as hazardous under the criteria in 29 CFR 1910.1200, Hazard Communication.

U.S. SARA REPORTING REQUIREMENTS: The product components are not subject to the reporting requirements of Sections 302, and 304 of Title III of the Superfund Amendments and Reauthorization Act.
Section 313 (TRI) reporting: Aluminum (CAS 7429-90-5) › 80% by weight, Manganese (CAS 7439-96-5) ‹ 4% by weight.

U.S. TSCA INVENTORY STATUS: The components of this product are listed in the TSCA Inventory.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): There may be elements present in the dust generated from the processing of this product, trace amounts, that are on the California Proposition 65 list. Warning! This product contains chemicals known to the State of California to cause cancer.

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory, or are exempted from listing.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: Not Applicable.

SECTION 16: OTHER INFORMATION

The information contained herein is believed to be accurate. It is not intended to constitute performance information related to this product. ALFREX, INC. MAKES NO WARRANTY OF ANY KIND, EXPRESS OR APPLIED, CONCERNING THE ACCURACY OF COMPLETENESS OF THE INFORMATION AND DATA HEREIN. THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE SPECIFICALLY EXCLUDED. ALFREX, INC. has no responsibility or liability for any damage or injury resulting from abnormal use or from any failure to adhere to recommended procedures. Alfrex, Inc. will not be responsible for claims relating to any parties' use of or reliance on information and data contained herein regardless of whether it is claimed that the information is inaccurate, incomplete, or otherwise misleading.

Initial Release	14-April-2019
Revision Date	01-July-2020
Revision Number	2.0

ALFREX PLATE FABRICATION RECOMMENDATIONS

INTRODUCTION

Alfrex Plate is a 100% solid aluminum architectural sheet pre-finished on a high-quality coil coating line specifically designed for heavier metal gauges. It features a KYNAR® / PVDF fluoropolymer-based paint system that offers a wide range of colors and finishes with the consistency and economics of coil coating. More importantly though, with minor adaptations, it enables the use of many of the same fabrication techniques and installation systems used with Alfrex FR Metal Composite Sheets (MCM).

The Alfrex Plate Fabrication and Technical Recommendations Manual has been developed specifically for fabricators experienced in fabricating MCM sheets who need additional information when adapting to fabricate 3mm thick Alfrex aluminum plate. It also serves to highlight important differences and considerations between both product lines which affect commercial project development, purchasing, and other business processes. Though 0.080" (2mm) thick Alfrex Plate is mentioned, it is not covered by this manual in detail.

This manual is not a "how-to", nor does it represent a guarantee of any kind. Rather, it is a collection of recommendations and information from others who have successfully adapted to the fabrication of aluminum plate while achieving processing speeds and efficiencies close to that of MCM sheets.

Alfrex strongly recommends that each fabricator utilize their expertise and know-how to find their "sweet spot" for processing aluminum plate. Differences in machinery, tooling, and other factors inherent to each individual company create variability and issues that can only be resolved through fabrication testing and process refinement. This critical step must be taken before producing materials for commercial projects.

THE PRODUCT DATA AND INFORMATION CONTAINED IN THIS FABRICATION AND TECHNICAL RECOMMENDATIONS MANUAL ARE FOR REFERENCE ONLY AND MAY BE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT PRIOR NOTICE FROM THE MANUFACTURER.

ALFREX, INC. MAKES NO EXPRESS WARRANTIES AND DISCLAIMS ANY IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, WITH RESPECT TO ANY OF THE PRODUCTS, PRODUCT DATA, RECOMMENDATIONS, AND SUGGESTIONS CONTAINED HEREIN.

IN NO EVENT SHALL ALFREX, INC. BE LIABLE FOR LABOR COSTS, DIRECT, INDIRECT, INCIDENTAL, PUNITIVE, SPECIAL, OR CONSEQUENTIAL DAMAGES RELATED TO OR RESULTING FROM SAID RECOMMENDATIONS AND PRODUCT DATA REGARDLESS OF WHETHER SUCH LIABILITY IS BASED UPON BREACH OF CONTRACT, BREACH OF EXPRESS OR IMPLIED WARRANTY, NEGLIGENCE, OR TORT.

ALL SALES OF ALFREX PRODUCTS ARE SUBJECT TO ITS GENERAL TERMS AND CONDITIONS WHICH MAY BE FOUND AT www.alfrexusa.com IN THE DOWNLOADS SECTION.

PRODUCT OVERNIEW

Product	Alfrex Plate pre-finished 100% solid aluminum, non-combustible architectural wall sheet
Standard Thickness	3.0mm (0.120")
Standard Width	62" (1,575mm), 49.2" (1,500mm)
Weight	

	lbs/sf	kg/sqm
3mm Plate	1.66	8.11
0.080" (2mm) Plate	1.11	5.40
4mm FR MCM	1.51	7.37

Aluminum Alloy	3003-H14 alloy sourced from Alcoa Australia
Rolling & Coating	Rolled and Coil Coated exclusively at a state-of-the-art facility in South Korea
Pre-treatments	Chromate based
Top Side Coating	PPG Fluoropolymer Duranar, 70% KYNAR® resin paint system. AAMA 2605 compliant
Bottom Side Coating	Post-paintable epoxy primer protective coating
Coating Manufacturer	PPG Industries Korea, Inc
Tension Leveling	Performed in line before cut-to-length process
Protective Film	100-micron thick protective masking film
Cut-to-Length	In-line shear, max 196", 20 sheets per length minimum
Sheet Identification	Batch identification code and directional arrows laser jet ink printed 0.39" (10mm) in height onto the backside of each sheet (Figure 1.2)
Technical Data	Consult the Technical Data Sheet of this document for Technical Properties, Production Tolerances, and Coating Performance Data etc

FIGURE 1.1

ALFREX PLATE COMPOSITION

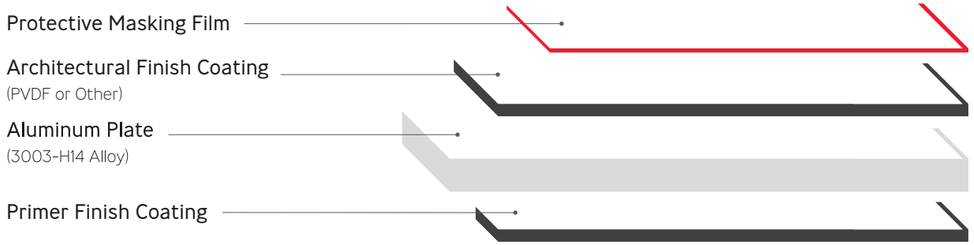
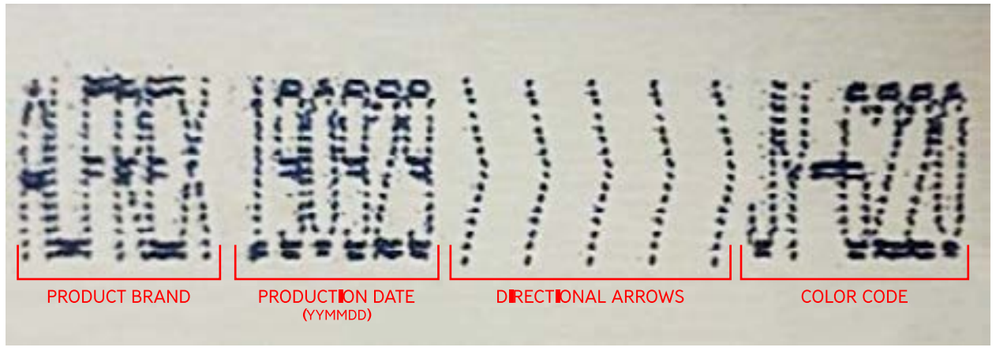


FIGURE 1.2

SHEET IDENTIFICATION

Format	Product Brand + Production Date (YYMMDD) + Directional Arrows + Color Code
Example	Alfrex + Produced in 2019 on the 29th of September + ››››› + Color Code JY-6220



CONSIDERATIONS FOR AN MCM FABRICATOR

PAINT FINISHES AND BUSINESS PROCESSES

Coating Aluminum for Plate vs. Aluminum for MCM

Alfrex 3mm Plate is pre-finished via continuous process offset roll coating on a high-quality coil coating line specialized in heavier metal gauges. Though the coating process for Alfrex Plate and Alfrex MCM are the same, there are four major differences that MCM fabricators need to keep in mind when pursuing projects with pre-finished Alfrex Plate since they drive the considerations detailed in this section.

FIGURE 1.3

THE 4 KEY DIFFERENCES COATING ALUMINUM FOR ALFREX PLATE VS ALUMINUM FOR MCM

1. 3mm thick aluminum cannot be coated on the same coil coating line used for coating 0.020" (0.5mm) thick aluminum for MCM
2. Paint formulations and primers will differ between thicker and thinner gauge aluminum due to differences in substrate temperature profiles, curing oven types, line speeds, quenching, and other coil coating process specifics.
3. Paint formulations often differ slightly between different coating lines, even when coating the same color.
4. Paint formulations may differ between PPG North America and PPG Korea due to raw material supply chain sources used.

All Colors Have to be Matched Specifically for Aluminum for Plate

Any color finish, be it a standard or custom, PPG or Sherwin Williams, Akzo Nobel or Beckers, spray applied or coil coated, will have to be matched and specially formulated for the production of Alfrex Plate due to the 4 key differences detailed in Figure 1.3.

Color Matches for Alfrex Plate May Differ Slightly

Achieving a near perfect color match for a substrate different than the control sample can sometimes be flawless, while at other times a challenge due the 4 differences previously noted. These are the same challenges encountered when matching a steel roofing color for aluminum, or a metallic spray coating for a coil coated version.

When matching an existing MCM color from any manufacturer, the match for Alfrex Plate may differ slightly. Variations may be more noticeable for mica and metallic finishes due to light reflectivity and metallic flop. Even when matching a preformulated PPG North America color at PPG Korea, slight color differences may exist due to the combination of differences in pigments and resins used at each location, compounded by the adaptation in color formulation required for the thicker aluminum plate substrate.

For planning purposes, it must be assumed that when installing Alfrex Plate next to other products on the same plane and elevation, there may be a slight difference when compared to the product to which it was matched. It is important to communicate these expectations up front when starting the color matching process and when presenting color matches for approval.

Minimum Order Quantities

Pre-finished aluminum coil for the manufacture of MCM standard color sheets is typically ordered in larger quantities and held in inventory until needed. Custom color coils for MCM are ordered in specific quantities required for the production of that specific color.

Alfrex Plate is made-to-order in a singular production run regardless of the color, or its classification as standard or custom. Minimum production order quantities for Alfrex Plate are listed in Figure 1.4. Quantities less than the minimum production quantity are available and priced at a premium to account for increased scrap and other factors. It is the standard practice at Alfrex to price material at an all-inclusive unit price per square foot or square meter, with no hidden fees or set-up charges. Please contact your local Alfrex sales representative for pricing.

Available Color Finishes

Please consult the Alfrex Plate color offering chart for a list of our standard stocking and preformulated colors including Solid, Mica, and Metallic finishes. Please consult for specific specialty finish availability.

FIGURE 1.4

ALFREX PLATE PRODUCTION ORDER MINIMUMS

	Alfrex Plate 2mm (0.080")	Alfrex Plate 3mm
Minimum production order	10,000 sf	15,500 sf
Premium Priced Production Order	≤ 3,000 sf ≤ 9,999 sf	≥ 4,000 sf ≥ 15,499 sf

Color Matching and Production Lead Times

Please allow ample lead time for both color matching and ordering of materials. Alfrex will communicate production lead times as accurately as possible based on a variety of factors. Lead times can vary from 10 weeks to 20 weeks and should always be confirmed in advance of purchase order placement.

Price Sensitivity of 100% Solid Plate vs MCM

Prices for aluminum plate are much more sensitive to raw material price fluctuations than MCM due to the much higher percentage of aluminum in the product. For this reason, it is recommended that fabricators accommodate for potential price escalations in their business endeavors and consult periodically with Alfrex to confirm pricing.

MANAGING COLOR PRODUCTION LOTS

It is recommended that orders for singular projects be made at one time, in full, so that all sheets are coil coated and manufactured from one production lot regardless if they are solid, mica, or metallic colors. Alfrex Plate is made-to-order with each production run subject to the coil coater's allowable color tolerance of 1.2 Delta-E between production lots.

Some color measurement device manufacturers state that an untrained human eye does not readily pick up differences in color less than values of 3 Delta-E or less. However, architects and those in the coatings, metal wall sheet, and metal roofing industries are readily able to perceive color differences down to a value of 1 Delta-E. With mica and metallic finishes any differences may be more pronounced.

Even when ordering standard color Alfrex Plate sheets from inventory, it is important to indicate if the sheets will be used with those from a previous order so that the production lots can be checked. In cases where sheets from different batches must be purchased, the same precautions taken with mica and metal finished MCM must be taken. (*i.e. avoiding the side by side installation of sheets from different production lots on the same plane.*)

Extra care must be taken in the planning stages to order sufficient quantities for the project and account for unforeseen scrap, potential expansion in scope, or other situations.

ADAPTING FABRICATION PROCESSES

Many MCM fabricators have successfully incorporated the fabrication of pre-finished aluminum plate using adapted techniques and tooling, and even achieved processing speeds and efficiencies close to those of MCM sheets. For the MCM fabricator new to 3mm pre-finished plate, it is critical that one utilize their expertise and know-how to find your "sweet spot" for processing aluminum plate.

Differences in machinery, tooling, and other factors inherent to each individual company create variability and issues that can only be resolved through planned and thorough fabrication testing, equipment modifications, and process refinement. Alfrex highly recommends that this critical step be taken before taking on commercial projects. There will be a learning curve, and our intention with this manual is to provide information to assist in that process. This subject is covered in greater depth in the Fabrication Section of this manual in the sub-section, "Establish Your Best Practices and Production Parameters."

ADAPTING MCM INSTALLATION SYSTEMS FOR ALFREX PLATE

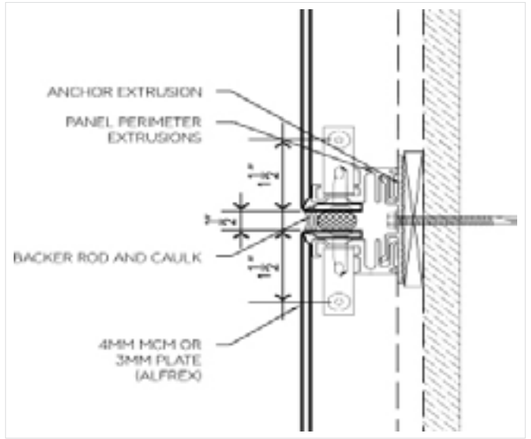
Alfrex Plate 3mm can be installed in the same manner as 4mm MCM albeit with slight modifications.

FIGURE 1.5

GENERIC RAINSCREEN SYSTEM

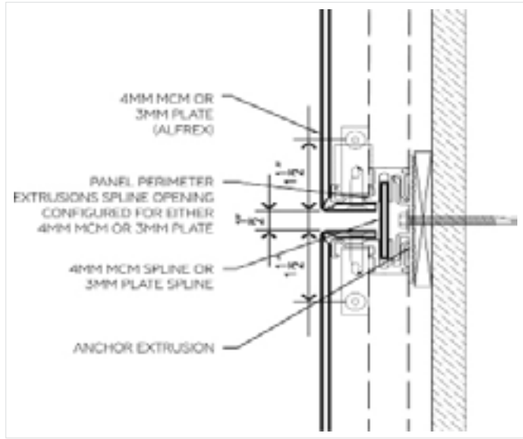
ROUTE & RETURN WET SEAL SYSTEMS

The only adaptations needed for transitioning from 4mm MCM to 3mm Plate is accommodating for the 0.040" (1mm) difference in the sheet material thickness via standard industry practices. The figure below shows a simplified generic system horizontal detail with where either 4mm MCM or 3mm Plate can be used with no adaptations to the extrusions.



RAINSCREEN INSTALLATION SYSTEMS

For rainscreen systems, extrusions will need to be adapted to accommodate for the thinner spline in the joint as well as any other particularities dependent upon the system design and manufacturer. The figure below shows a simplified generic system horizontal detail highlighting how the only adaption required is configuring the Panel Perimeter Extrusion to accept either a 4mm ACM or 3mm Plate spline.



FABRICATOR RECOMMENDATIONS

GENERAL FABRICATION AND PROCESSING

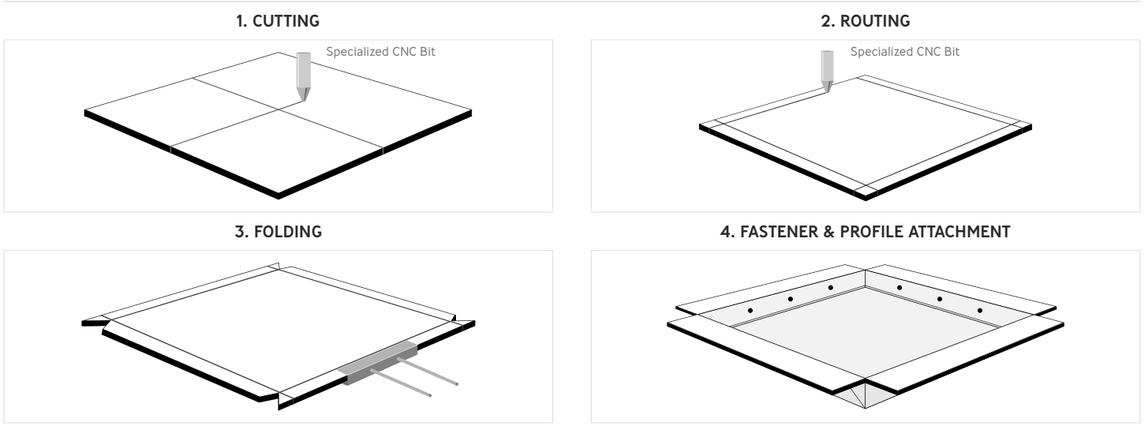
Alfrex Plate 3mm can be fabricated and processed using methods and techniques familiar to MCM fabricator with minor adaptations to processing and tooling.

FIGURE 2.1

GENERAL FABRICATION AND PROCESSING

FIGURE 2.2

GENERAL PROCESSING STEPS



ESTABLISH YOUR BEST PRACTICES AND PRODUCTION PARAMETERS

As mentioned before, each MCM fabricator new to 3mm pre-finished plate must conduct tests to determine their "sweet spot" for production parameters and setups to successfully fabricate 3mm thick aluminum plate. Please refer to the document "Product Fabrication Quick Reference Data" in the Technical Data section for side by side comparisons of Alfrex Plate 3mm vs Alfrex FR MCM with respect to the most commonly used fabrication parameters and machinery settings. The reference data will serve as an excellent starting point for determining what works best for your setup.

Perform Tests to Determine Ideal RPM, Feed Rates, and Cooling Lubricant Application

In order to find the optimum cutting and routing conditions for Alfrex Plate, it is recommended that a series of tests be conducted on the same sheet at varying RPM and feed rates until ideal production parameters and results are achieved. Optimum production parameters will vary according to the machinery and other factors. Successful fabricators of plate recommend that the use of a cooling lubricant for routing is a "must", and not an option. Of typical note is that during fabrication tests, the cleanliness of routed cuts is typically determined by the amount of coolant used during the fabrication. Ideal routes should contain no burrs in the channel if done correctly.

The importance of conducting tests can be seen in Figure 2.4-5 showing excerpts from fabrication tests used to achieve commercial levels of production.

FIGURE 2.3

EXAMPLE OF A CLEANLY ROUTED V-GROOVE CHANNEL

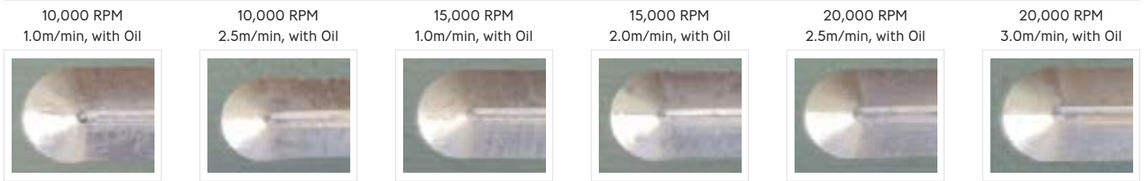
FIGURE 2.4

EXAMPLE OF ALFREX PLATE FABRICATION TESTS 1

- 10,000 RPM › 3.28 Ft / min. (with oil)
- 10,000 RPM › 8.20 Ft / min. (with oil)
- 15,000 RPM › 3.28 Ft / min. (with oil)
- 15,000 RPM › 6.56 Ft / min. (with oil)
- 20,000 RPM › 3.28 Ft/min. (with oil)
- 20,000 RPM › 6.56 Ft/min. (with oil)
- 20,000 RPM › 8.20 Ft/min. (with oil)
- 20,000 RPM › 9.84 Ft/min. (with oil)

FIGURE 2.5

EXAMPLE OF ALFREX PLATE FABRICATION TESTS 2



CNC MACHINE SETUP TIPS

Cooling Lubricant Application
A coolant mister delivery and applicator system will need to be set up for proper use. CNC machinery manufacturers or certain coolant manufacturers like UNIST, Inc. should be contacted for specific equipment recommendations.

FIGURE 2.7

CNC TOOL HEAD COVER CASE

Floating CNC Tool Head
Use of floating CNC tool heads is a common practice that can accommodate for slight bowing across sections of sheets. Rotation speeds for floating heads have worked successfully at 18,000 RPM however, the ideal "sweet spot" for each machine should be determined through trial and error.

Vacuum System Performance & Efficiency Improvements
Investing in a more powerful vacuum system can be an effective improvement to a CNC table's performance with Alfrex Plate 3mm. However, other methods may increase the effectiveness of the system.

FIGURE 2.6

ROUTING WITH COOLING LUBRICANT APPLICATION

Tool Head Cover Case
The installation of a casing around the tool head and applicator nozzles to create a "vacuum cage" will assist in controlling the spray of the coolant, removal of aluminum particulate and cooling lubricant, and help prevent excess buildup of aluminum burrs on the bed of the CNC and sheet.

Lifted Sheet Edges on the CNC Table
Alfrex Plate 3mm is tension leveled for flatness. Nevertheless, MCM fabricators have to, on occasion, deal with minor shape issues with MCM and Plate sheet. This can occur when sheets are cut into smaller shapes, releasing stresses from tension leveling, and resulting in a slight lifting of the sheet at the edges of the length dimension. With incremental improvements to the CNC vacuum system and in other areas, sheets can be firmly adhered to the table for successful cutting and routing operations.

FIGURE 2.8

ATEMAG SOFTOUCH FLOATING HEAD

COOLING LUBRICANTS

It is highly recommended that lubrication be used in a continuously applied method to enable optimal results while avoiding increased heat buildup on the sheet and damage through to the finished surface. Successful fabricators of plate recommend that the use of a cooling lubricant for routing is a "must", and not an option. Either ethanol or cutting oil-based products are suitable. The following have already been successfully used by fabricators and are available in North America.

UNIST Coolube® 2210 AL
UNIST Coolube® 2210
Tectyl Super Green 100A
Castrol Hysol® X

The determination of which cooling lubricant, applicator system, and methodology to use should be determined through direct contact with product and machinery manufacturers. Some CNC machinery manufacturers and coolant manufacturers like UNIST, Inc. sell applicator systems and can make specific recommendations.

CUTTING

Alfrex recommends that cutting of Alfrex 3mm Plate be performed either with shear presses, CNC equipment, or other high-quality machinery such as water jets. The use of hand tools or other machinery that may create excessive buildup of heat or unclean cuts is discouraged. Recommendations for rotation speeds, feed rates, and other information shown should be used as a starting point for determining your ideal parameters for cutting.

Shearing
Cutting Alfrex Plate to size on shear presses is an effective method for making larger cuts. Fabrication testing should be conducted first to make any necessary adjustments in order to achieve optimal results without excessive edge bending or damage to the coated surface. Successful shearing has been done on a 1.4" (6.3 mm) Power Shear, with a Rake Angle of 0.25" per foot (21 mm per meter), and a 1 degree relief angle.

Non-Router Cutting
When shear presses or CNC tables cannot be used, successful cutting of Alfrex 3mm Plate has been achieved with 9" diameter (229 mm), carbide tipped, 68 tooth aluminum cutting blades with a 1" arbor. A maximum 3,200 RPM and feed rate of 40" - 80" (1,000-2,032 mm) / minute is recommended as a starting point. Application of blade wax or a cooling lubricant is recommended to prevent overheating and gumming of aluminum fines on the cutting blade.

Cutting with CNC Routers
Cutting with CNC routers utilizes the same bits as for routing MCM however, rotation speeds and feed rates will have to be modified. Successful cutting on CNC routers has been accomplished with Belin 108° folding bits at approximately 16,000 RPM with feed rates between 40" - 80" (1,000 - 2,032 mm) / minute. Cutting can also be accomplished using the (PCD) twisted helical end mill bits mentioned in the next section. As with all operations, it is critical to conduct tests to determine which parameters are ideal for the tooling and machinery utilized.

ROUTING

Alfrex Plate 3mm is a product that can be easily routed in both V-Groove and U-Groove configurations using an industrial or commercial grade router with poly-crystalline diamond (PCD) twisted helical end bits at 90° or 110°. The diameter of the end-mill tool should be between 0.315" to 0.47" (8 mm to 12 mm). Belin 108° carbide folding bits have also been used successfully at rotations speeds of 16,000 RPM and feed rates between 40" - 80" (1,000 - 2,032 mm) / minute. Please consult Alfrex for more details on custom designed router bits that have been used in Australia and other markets.

Routing Groove Channel Depth

The recommended routed groove channel depth for Alfrex Plate 3mm sheets is 0.090" (2.3mm), which not only ensures a crisp radius edge like 4mm MCM, but also ensures strength in the plate substrate at the folded edge.

Rotation and Feed Rates

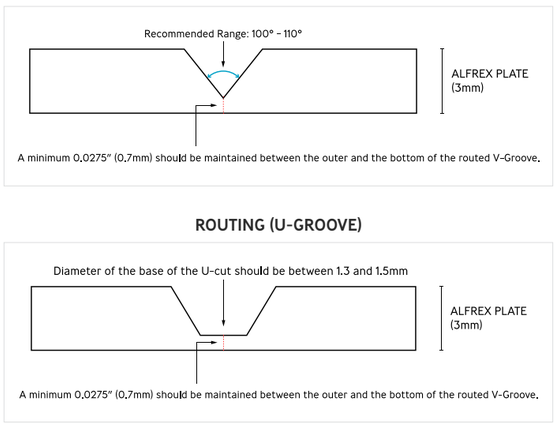
Successful results have been achieved employing rotation speeds between 15,000 - 20,000 RPM, with tool head feed rates between 40" - 118" (1,000 - 3,000mm) / minute. When routing grooves, the bottom of the groove should never reach the back of the aluminum sheet, with an ideal 0.0275" (0.7mm) of material left intact. Caution must be taken when securing sheets before routing operations begin to avoid any potential surface damage to the product.
It is recommended that fabricators conducting initial tests with Alfrex Plate 3mm begin with a minimum feed rate of 8.2 linear feet (2.5 meters) per minute, and gradually increase speeds after acceptable results are achieved. These recommendations are starting points and it must be emphasized that a misted cooling lubricant be used in order to obtain acceptable results.

FIGURE 2.9

PCD HELICAL END MILL ROUTER BIT

FIGURE 2.10

ROUTING GROOVE CHANNEL DEPTH



BENDING AND FORMING

Alfrex Plate 3mm can be bent and formed in the same way as MCM with minor differences and limitations.

Route & Return Leg Edge Radius

Traditional post-painted aluminum plate with formed return legs has a rounded radius since the sheet back side is not routed. Alfrex Plate 3mm, when routed and folded, will hold an identical edge radius as 4mm MCM 0.080" (2mm), since they both leave nearly identical amounts of material between the finished side and the bottom of the routed groove.

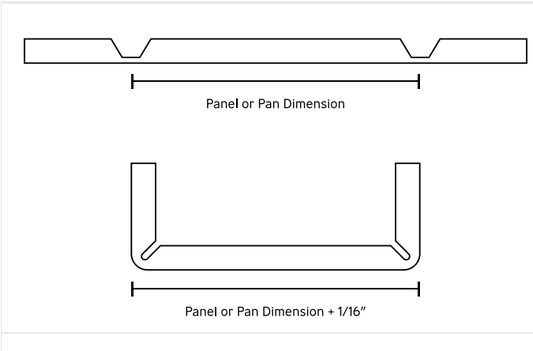
FIGURE 2.11

COMPARISON OF ALFREX PLATE 3mm RETURN EDGE vs ALFREX FR MCM 4mm

As with 4mm MCM, the edge radius created by 3mm Plate at the bent edges will increase the sheet face between 0.03125" to 0.0625" (0.79mm to 1.59mm) when routed to the recommended channel depth. It is important to conduct trials before commercial production to verify the actual range and make any necessary adjustments in fabrication or layout dimensions.

FIGURE 2.12

INCREASE IN SHEET FACE WITH BEND EDGE RADIUS



Bent Edge Radius Appearance and Router Depth

The bent edge radius of Alfrex Plate changes depending on the type of routing (V-Groove vs U-Groove), as well as the routed channel depth. The following examples show how the depth of the routed groove channel affects the appearance of the bent edge.

FIGURE 2.13

BEND EDGE RADIUS PROGRESSION

Four Alfrex Plate 3mm Sheets were fabricated with a bent return leg to demonstrate how the appearance and edge radius changes with the depth of the routed groove.

The bottom sheet is unrouted, and displays the rounded edge associated with traditional post-painted plate.

The top sheet has been routed at the recommended depth and has an equal appearance to fabricated MCM sheets.

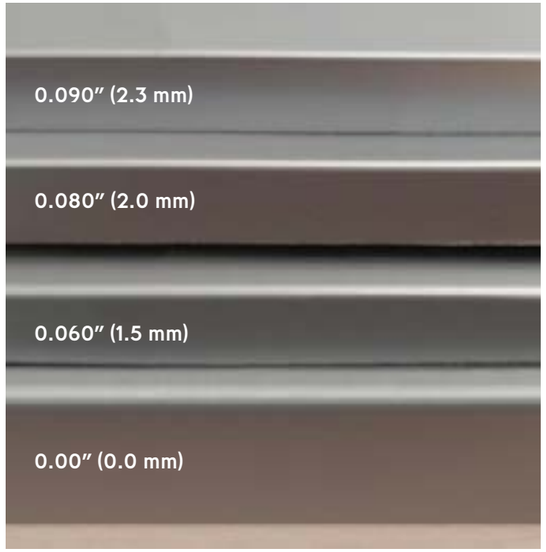


FIGURE 2.14

U-GROOVE BULLNOSE EDGE

Rounded edges can be achieved by design with the correct U-Groove router bits.

FIGURE 2.15

V-GROOVE WITH PARALLEL CHANNELS

With a 100% solid aluminum structure, tighter specialty bends like this example can be achieved with Alfrex 3mm Plate without losing strength or consistency in the fold.

The minimum distance between center points of parallel routes is 0.236″ (6mm) for Alfrex Plate 3mm vs 1.0″ (25mm) for MCM.

FIGURE 2.16

TIGHT FOLDED CORNERS 1

When fabricated correctly and prepared for installation, the radius edges and corner conditions of Alfrex Plate cassette modules appear as tight and crisp as MCM sheets.

FIGURE 2.17

TIGHT FOLDED CORNERS 2

Roll Forming

Alfrex Plate 3mm may be roll formed using the same processes as those used for MCM however, the minimum bend radius without routing is larger than that of 4mm FR MCM.

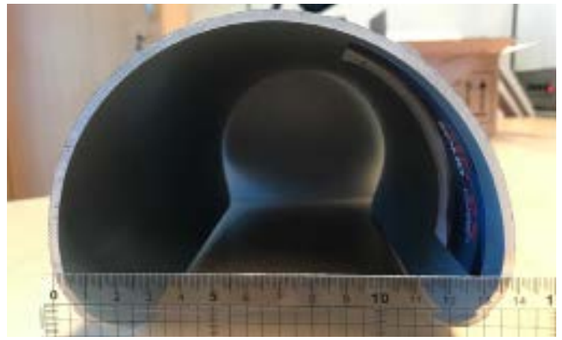
FIGURE 2.19

MINIMUM BEND RADIUS COMPARISON (UNROUTED SHEET)

Alfrex Plate 3mm	5.5" (140mm)
MCM 4mm FR	4.0" (102mm)
MCM 6mm FR	5.5" (140mm)

FIGURE 2.18

MINIMUM BEND RADIUS (UNROUTED SHEET)



PERFORATION AND FACE FASTENING

Perforation and Open Areas with Exposed Edges

Alfrex Plate may be perforated or fabricated with exposed areas on the sheet for design purposes however, special care and precautions must be followed in order to ensure proper performance of the coating finish when unfinished edges are exposed to the environment. Perforated and Exposed Edge applications refer to fabricated sheet edges and open areas located on the sheet surface are visibly exposed to open atmospheres, and do not serve as a terminated edge of the sheet.

All perforation and related operations should be carried out using turret press, punch press, tooled break press, tri-axis water jet processing machines. Laser Jet or CNC fabrication of the sheet are not recommended as they can cause heat damage to the top paint layer, leaving exposed aluminum vulnerable to oxidization.

The total perforated or open area of any individual sheet should not exceed 30% of total area of the sheet. The minimum distance between each perforated hole or open area is 1.5 x the thickness of the sheet, equating to 0.177" (4.5mm) for 3mm thick Alfrex Plate. All perforated and other open areas with exposed edges must be located greater than or equal to 1.25" (32mm) from the terminating edge of the sheet.

It is important to note that when perforating or cutting open areas into sheets, the rigidity of the sheet will naturally decrease. It is not uncommon for Plate, like MCM, to bow after perforation due to the release of internal stresses in the sheet. For this reason, it is recommended that route and return installation solutions are utilized where sheets are formed into sheet modules (cassettes) like MCM.

FIGURE 2.21

PERFORATED PLATE

Face Fastened Sheet Applications

Some requirements dictate the face fastening of Alfrex Plate sheets. In these applications it is critical that the following measures be taken in order to prevent bimetallic or galvanic corrosion between Alfrex Plate sheets and attachment materials:

1. Only stainless-steel screws may be used.
2. Spacers must be installed between Alfrex Plate and z-girts or hat channels.

Where perforated Alfrex Plate sheets are to be face fastened, extra measures should be taken to stiffen sheets to ensure that they meet the flatness criteria of the design.

Limited Finish Warranty for Perforated and Face Fastened Sheets

In cases where Alfrex Plate will be fabricated with perforations and open areas with exposed edges, or face fastened, a maximum 10-year limited paint finish warranty is available depending on the paint finish used. Conditions and limitations of the finish warranty for all perforated and exposed edge applications are listed in the Alfrex Plate Perforated Limited 10 Year Finish Warranty. Important highlights include:

1. The maximum finish warranty for Alfrex Plate sheets with perforations or exposed edge conditions is 10 Years regardless of the paint system used.
2. All perforated and exposed edge conditions, fabrication processes, and equipment to be used for perforation and exposed edge area fabrication should be approved in advance by Alfrex in order to avoid nullification of the finish warranty.
3. Warranties will be issued only for installations located greater than or equal to 1mile (1.6km) from any coastline, saltwater, or brackish saltwater.
4. All perforated and exposed edge applications exposed to salt spray or within 1.5miles (2.4km) of salt-water or industrial atmospheres, as well as areas unwashed by rain exposure, must be maintained by washing with fresh tap water once every 6 months and documentation of this maintenance provided upon request.

PROTECTIVE FILM AND INSTALLATION DIRECTION

Alfrex Plate is protected with the same type of protective film used on Alfrex FR MCM and most other brands. It protects the pre-finished surface of the product from dirt, scratches and tool marks that may potentially arise during the fabrication, handling, storage and transport of the product. The protective film is not intended to protect against corrosion, humidity or contact with any chemical products. It should be removed with 45 days following completion of fabrication and installation.

FIGURE 2.22

ALFREX PLATE PROTECTIVE FILM

The protective film for Alfrex Plate is printed with directional arrows to assist in properly orienting sheets during fabrication and installation. As with MCM, it is an absolute requirement that arrows be installed in the same direction when Alfrex Plate is pre-finished in directional finishes such as mica, metallic, metal series, wood series, and other specialty pattern finishes.

STORAGE AND HANDLING

Alfrex Plate sheets are cut to length and packaged in cushioned, reinforced skids to prevent excessive sagging of the skid when lifting and moving via fork trucks. Pallets of Alfrex Plate should always be stored horizontally on flat surfaces that prevent sagging or shifting. Do not stack pallets higher than six skids high. Storage should be in a cool, dry area with stable temperatures to prevent formation of condensation. Sheets should not be stored where they can be exposed to moisture which may cause permanent surface damage.

Care should be taken when handling individual sheets during fabrication. When lifted from each end, individual sheets will sag in the center as they are moved. Sagging should be minimized by having additional support in the center. Care must be taken to lift sheets high enough so that the sagging center sheet edge does not damage the surface of the sheet directly underneath as it is moved.

Alfrex Plate sheets may be temporarily staged in “A-frame” racks commonly used with MCM sheets. It is not recommended that Alfrex Plate sheets be transferred to other pallets not supplied by Alfrex as they may sag excessively - inducing permanent set in the solid aluminum plate sheets which will manifest in sheet bowing when placed on CNC tables.

FIGURE 2.23

ALFREX PLATE 3mm SHEET STORAGE

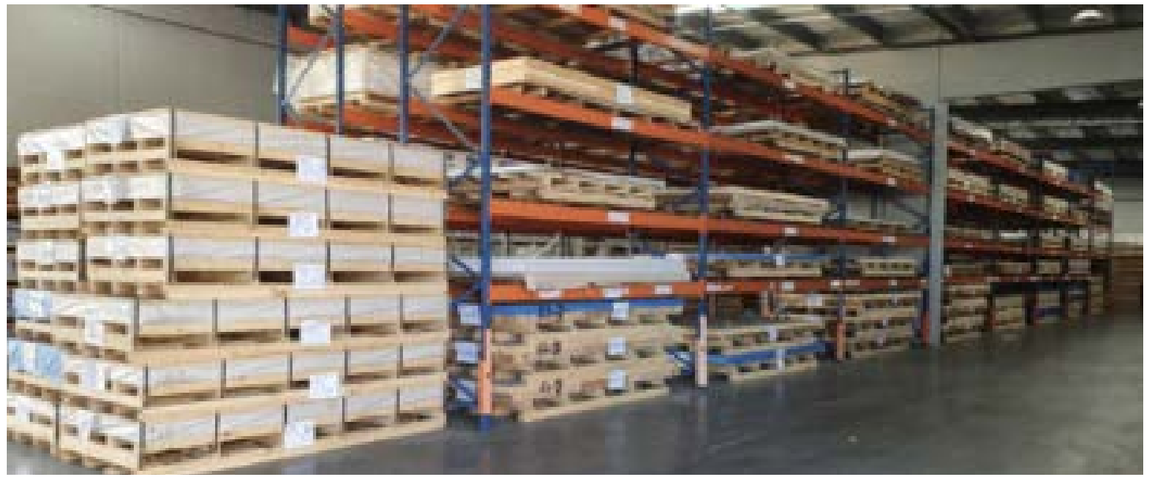


FIGURE 2.24

ALFREX PRODUCT WEIGHT AND PACKAGING LIMITS

	Unit Weight	Typical Sheet Size	Sheet Weight	Max Sheets per Skid *4100 lb (1860 kg)*
Alfrex Plate 3mm	1.66 lbs/sf (8.10 kg/m^2)	62″ x 196″ (1575 mm x 4978 mm)	140 lbs (63.5 kg)	23 sheets
Alfrex 4mm FR	1.51 lbs/sf (7.37 kg/m^2)	62″ x 196″ (1575 mm x 4978 mm)	127 lbs (53.5 kg)	25 sheets
Alfrex 6mm FR	2.13 lbs/sf (10.40 kg/m^2)	62″ x 196″ (1575 mm x 4978 mm)	118 lbs (81.5 kg)	16 sheets

CLEANING AND MAINTENANCE

Alfrex recommends that installed panels be cleaned on a regular basis in order to maintain their aesthetic appearance and to prevent the accumulation of dirt and particulate present in the local environment. The frequency and degree of cleaning is dependent upon several factor including the building location proximity to bodies of fresh water on the ocean, local climate, pollution levels, proximity to heavy industry, and overall air quality. A general practice is to clean panels at the same time a building’s windows are cleaned. For detailed information, please consult the Alfrex Cleaning and Maintenance Recommendations document in the Appendices of this manual.

TOUCH UP PAINTING

Crosslink Paints of Dallas, Texas manufactures touch up paint and applicator products specifically for the metal wall sheet and roofing industry in a number of paint systems including air-dry PVDF / KYNAR® resin paint. They should be contacted directly for purchase of their products which include touch up pens, liquid bottle & brush kits, aerosol spray cans, and paint cans of matched finishes.

CROSSLINK PAINTS
Phone: 972-364-7839
Email: Sales@crosslinkpaints.com
Website: https://www.crosslinkpaints.com

POST-PAINTING

Alfrex Plate is a coil coated metal wall cladding sheet top side coated with a 70% PVDF / KYNAR® resin finish, and bottom side coated with an epoxy finish which can be post-painted utilizing both air dry and baked-on finishes. Post-painting should only be performed by experienced applicators in the proper preparation of architectural wall sheets and application of coating systems for exterior applications.

Alfrex does not offer finish warranties for post-painted finishes. All warranties must be provided by the finish applicator directly to the warrantee. For detailed information, please consult the Alfrex Post-Painting Recommendations document in the Appendices of this manual.

PRODUCT FABRICATION QUICK REFERENCE DATA

Alfrex FR Metal Composite Material and Alfrex Plate

alfrex
Fire Resistant & Non-Combustible Cladding

SECTION	SUB-SECTION	DESCRIPTION	ALFREX FR MCM	ALFREX PLATE 3mm
CUTTING	Circular Saw Vertical Panel Saw	Blade Type	Carbide tipped blades suitable for aluminum	Carbide tipped blades suitable for aluminum
		Blade Diameter	80″ (200mm) / 10″ (250mm) / 12″ (300mm) / 14″ (350mm)	9″ (229mm) with 1″ arbor
		Blade Teeth	60 tooth or greater, extra fine	68 tooth or greater, extra fine
		Max Cutting Speed	5,500 RPM	3,200 RPM
		Feed Rate	‹ 16″ (405mm) per second	40″ - 80″ (1000-2032mm) / minute
	Shear Press	Clearance	4mm FR : 0.002″ (0.05mm)	1/4″ (6.3mm) Power Shear with Rake Angle of 0.25″ per foot (21mm per meter) and 1° relief angle
			6mm FR : 0.008″ (0.20mm)	
		Rake Angle	4mm FR : 1° 30′	
			6mm FR : 2° 30′	
CUTTING & ROUTING	Routing Saw Blade	Blade Type	Carbide tipped blades suitable for aluminum	See Circular Saw / Vertical Panel Saw Information Lubrication May be Required
		Teeth	8 teeth for grooving	
		Estimated Lifespan	-	
		Blade Diameter	12″, (-305mm)	
		Blade Tip Width V-Groove	0.063″ - 0.080″ (1.6mm - 2mm)	
		Blade Tip Width U-Groove	0.551″ (14mm)	
		Blade Tip Angle	95° or 110°	
		Recommended Route Depth	0.122″ (3.1mm)	
		Route Depth from Outer Skin Side	0.035″ (0.9mm)	
		Rotation Speed	3,000 - 5,000 RPM	
		Feed Rate	‹192″ (4876mm) / min	
		Bit Lubrication	Not Required	

PRODUCT FABRICATION QUICK REFERENCE DATA

Alfrex FR Metal Composite Material and Alfrex Plate

alfrex
Fire Resistant & Non-Combustible Cladding

SECTION	SUB-SECTION	DESCRIPTION	ALFREX FR MCM	ALFREX PLATE 3mm
CUTTING & ROUTING	V-Groove Router Bit	Router Bit Type	Carbide Router Bits	Poly-Crystalline Diamond (PCD) Helical End Mill Bits
				Belin Carbide Router Bit
		Teeth	2 to 4 Teeth	Not Applicable
		Estimated Lifespan	-	54,000 - 64,500sqft (5,000 and 6,000sqm)
		Router Bit Diameter	-	›0.315″ ‹0.47″ (›8mm ‹12mm)
		Router Bit Tip Diameter	0.063″ - 0.080″ (1.6mm - 2mm)	0.0480″ - 0.0591″ (1.22mm - 1.50mm)
		Bit Angle	95° or 110°	95° or 110°
				108°
		Recommended Router Depth	0.122″ (3.1mm)	0.090″ (2.3mm)
		Route Depth from Outer Skin Side	0.035″ (0.9mm)	0.0275″ (0.7mm)
		Double Parallel Routes - minimum distance centerpoint to centerpoint	1.0″ (25mm)	0.236″ (6mm)
		Rotation Speed	20,000 - 30,000 RPM	15,000 - 20,000 RPM
				16,000 RPM
		Feed Rate	120″ - 192″ (3,100 - 4876mm) / min	40″ - 118″ (1,000 - 3,000mm) / minute
				40″ - 80″ (1000 - 2032mm) / minute
		Bit Lubrication	Not Required	Ethanol or cutting oil based applied continuously to the router bit tip.
	U-Groove Router Bit	Router Bit Type	Carbide Router Bits	Please refer to above V-Groove Router Bit Information
		Teeth	2 to 4 Teeth	
		Router Bit Tip Diameter	0.551″ (14mm)	
		Bit Angle	95° or 110°	
		Recommended Router Depth	0.098″ (2.5mm)	
		Route Depth from Outer Skin Side	0.060″ (1.5mm)	
		Rotation Speed	20,000 - 30,000 RPM	
		Feed Rate	120″ - 192″ (3100 - 4876mm) / min	
		Bit Lubrication	Not Required	
FOLDING		Routed Panel Minimum Bend Radius	0.080″ (2mm)	0.080″ (2mm)
		Non-Routed Minimum Bend Radius	Not Applicable	3mm Plate: 0.30″ (7.5mm)

Alfrex, Inc. • 943 Gainesville Hwy. Bldg 100-4000, Buford GA 30518 • 470.589.7449 • alfrex@alfrexusa.com • www.alfrexusa.com

PRODUCT FABRICATION QUICK REFERENCE DATA

Alfrex FR Metal Composite Material and Alfrex Plate

alfrex
Fire Resistant & Non-Combustible Cladding

SECTION	SUB-SECTION	DESCRIPTION	ALFREX FR MCM	ALFREX PLATE 3mm
CURVING	**Press Break Pyramid Roller**	Minimum Bend Radius (No Routing)	4mm FR : 4.0″ (102mm) 6mm FR : 5.5″ (140mm)	5.5″ (140mm)
DRILLING		Drill Bit Type	High speed steel, twist drill bits	High speed steel, twist drill bits
		Tip Angle	100° to 140° or a counter-bore grind with a centering tip	100° to 140° or a counter-bore grind with a centering tip
		Rotation Speed	165-980 RPM	165-980 RPM
PUNCHING		Punch Die Clearance	4mm FR : 0.008″ (0.2mm) 6mm FR : 0.012″ (0.3mm)	0.012″ (0.3mm)
PERFORATING		General	Only with approved machinery and methods	Only with approved machinery and methods
		Panel Reaction	MCM Panels can bow slightly after perforation	Better solution for perforated panel applications
		Total Perforated Area	Less than or equal to 45% of total panel surface area	Less than or equal to 30% of total panel surface area
		Distance between Perforations (Edge to Edge)	1.5 x Panel Thickness 4mm FR : 0.236″ (6mm) 6mm FR : 0.354″ (9mm)	1.5 x Panel Thickness 0.177″ (4.5mm)
		Minimum Distance from Perimeter Edge	1.25″ (32mm)	1.25″ (32mm)
		Maximum Finish Warranty	Not Available	10 Years maximum with perforated panels
		Recommended Machinery / Process	Turrent punch press only	Turret punch press, punch press, tooled brake press, pre-approved water jet
		Non-Recommended Methods	Operations which can cause heat damage to the top paint layer, leaving exposed aluminum vulnerable to oxidation. Consult Alfrex for more specifics.	Operations which can cause heat damage to the top paint layer, leaving exposed aluminum vulnerable to oxidation. Consult Alfrex for more specifics.
JOINING, FASTENING, RIVETING			Only utilize Aluminum, Stainless Steel or steel materials coated or plated with zinc or aluminum. Do NOT use materials which will result in electrolysis including iron, uncoated steel, copper, brass, or bronze.	Only utilize Aluminum, Stainless Steel, or steel materials coated or plated with zinc or aluminum. Do NOT use materials which will result in electrolysis including iron, uncoated steel, copper, brass, or bronze. Only utilize aluminum rivets suitable for use with structural loads and high external temperatures.
WELDING			Not recommended as it will damage the panel and void all warranties	Not recommended for coil coated plate as it will damage the paint coating and void the finish warranty

POST-PAINTING RECOMMENDATIONS

Alfrex Plate

alfrex
Fire Resistant & Non-Combustible Cladding

Alfrex Plate is a coil coated metal wall cladding sheet top side coated with a 70% pvdf / kynar resin finish. For situations requiring smaller quantities of a custom color, post-paining may be the only economically viable option. Post-painting should only be done by experience applicators with experience in proper preparation of architectural wall panels and application of coating systems for exterior applications.

General Recommendations

- It is important to confirm with Alfrex in advance if sheets are to be post-painted and properly identify the type of coatings present. Alfrex Plate is bottom side coated with an epoxy finish which can be post-painted utilizing both air dry and baked-on finishes. The backside epoxy coating must be properly prepared before post-painting to ensure proper finish adhesion and long-term performance.
- Before painting, it is highly recommended that spot testing be done on small sample sheet, or in a small inconspicuous area to confirm if the preparation procedures and paint application achieve the desired color and adhesion levels required for long term exterior exposure.
- The epoxy coating must be lightly abraded utilizing fine grade sandpaper or similar products. Special care must be taken to abrade the surface uniformly across the entire panel substrate without significantly decreasing its dry film thickness.
- After abrasion, the sheet surface should be thoroughly wiped clean to remove dust and other surface contaminants. Utilize soft cloth and epoxy resin compatible, solvent based cleaners. Surfaces must be properly prepared before post-painting and should be degreased, clean, dry, and free of dust, dirt, oils, or any other surface contaminants.
- Only use cleaning solvents, primer coatings, and finish coatings approved by the post-painter.
- Though the abraded epoxy primer can serve as a post-paint primer, it is recommended that the sheet surface be primer coated again. This is especially important for exterior applications where longer term UV performance, film integrity, and coating warranties extended by the post-painter are required.
- Alfrex Plate may be coated with air-dry and baked-on finishes. Both should be spray applied by an experienced professional applicator.
- It is recommended that the finish applicator be informed in advance of material, process, and compatibility concerns.
- For the post-painting of Alfrex FR MCM, please consult the recommendations for that specific product since only air-dry finishes may be used with heat limitations that should not exceed 140 °F (60 °C).

POST-PAINTING RECOMMENDATIONS

Alfrex Plate

Fire Resistant & Non-Combustible Cladding

Exclusions

1. For any post-painted Alfrex Plate or Alfrex MCM product, all finish warranties for the top side coating are null and void. All other warranties, representations or guarantees, express or implied, written or oral, by operation of law or otherwise, including without limitation, the implied warranties of merchantability and fitness for a particular purpose are excluded.
2. Alfrex does not offer finish warranties for post-painted finishes. All warranties must be provided by the finish applicator directly to the warrantee.
3. All sales of Alfrex products are subject to its General Terms and Conditions which may be found at www.alfrexusa.com in the downloads section.

EPOXY COATING PROPERTIES	
PROPERTY	RESULT
Color	Light Gray
Particle Size	Max 25µm
Gloss at 60 °	30 ± 5
Viscosity (sec)	100 ± 20 (F.C#4/25°C)
Density	1.3 ± 0.05
NVM (%)	62 ± 3
MEK Rubbing	Min 50
Flexibility	2T
Pencil Hardness	2H
Acid Resistance	No Blisters
Alkali Resistance	No Blisters
Boiling Water Resistance	No Blisters
S.S.T 200hrs	Plain Surface : No Blisters
	Cross Hatch Surface : Max 2mm

ALFREX PLATE CERTIFICATIONS & COMPLIANCE REPORTS

SOUTHWEST RESEARCH INSTITUTE®

6220 CULEBRA RD. 78238-5166 • P.O. DRAWER 28510 78228-0510 • SAN ANTONIO, TEXAS, USA • (210) 684-5111 • WWW.SWRI.ORG
CHEMISTRY AND CHEMICAL ENGINEERING DIVISION
FIRE TECHNOLOGY DEPARTMENT
WWW.FIRE.SWRI.ORG
FAX (210) 522-3377

FIRE PERFORMANCE EVALUATION TESTED IN ACCORDANCE WITH ASTM E 136-11, *STANDARD TEST METHOD FOR BEHAVIOR OF MATERIALS IN A VERTICAL TUBE FURNACE AT 750 °C*

MATERIAL ID AND TRADE NAME: ***3003***

FINAL REPORT
Consisting of 5 Pages

SwRI® Project No. 01.16052.01.620a
Test Dates: March 18 and 24, 2011
Report Date: April 14, 2011

Prepared for:

The Aluminum Association, Inc.
1525 Wilson Blvd., Suite 600
Arlington, VA 22209

Prepared by: Cory Harper, Technician
CH

Submitted by:

Christina Gomez
Research Engineer
Material Flammability Section

Approved by:

Matthew S. Blais, Ph.D.
Director
Fire Technology Department

HOUSTON, TEXAS (713) 977-1377 • WASHINGTON, DC (301) 881-0226

1.0 INTRODUCTION

This report describes a small-scale fire test conducted on a material identified as *3003* in accordance with ASTM E 136-11, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C*, for The Aluminum Association, Inc., located in Arlington, Virginia. Testing was conducted March 18 and 24, 2011, at the Fire Technology Department of Southwest Research Institute (SwRI), located in San Antonio, Texas.

This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

The results presented in this report apply specifically to the specimens tested, in the manner tested, and not to the entire production of these or similar materials, nor to the performance when used in combination with other materials.

2.0 DESCRIPTION OF TEST APPARATUS AND PROCEDURE

The ASTM E 136-11 hot-air ignition furnace consists primarily of an electrical heating unit and specimen holder. The furnace tube is a vertical tube, with an inside diameter of 100 ± 5 mm and a length of 230 ± 20 mm, made of ceramic that will withstand at least 750 °C. The inner ceramic tube, with an inside diameter of 75 ± 5 mm, a length of 230 ± 20 mm, and a thickness of approximately 3 mm, is placed inside the furnace tube and positioned 20 ± 2 mm above the furnace floor on spacer blocks. The test apparatus is shown in Figure 1.

The air temperature inside the furnace is stabilized to 750 °C prior to testing. Sheathed thermocouples are used to measure the temperature of the furnace air (T_f), specimen surface (T_s), and specimen interior (T_c). The duration of flaming is recorded during the test, and specimen mass loss is determined based on weight measurements before and after testing. ASTM E 136-11 requires that a series of four tests be conducted for each sample.

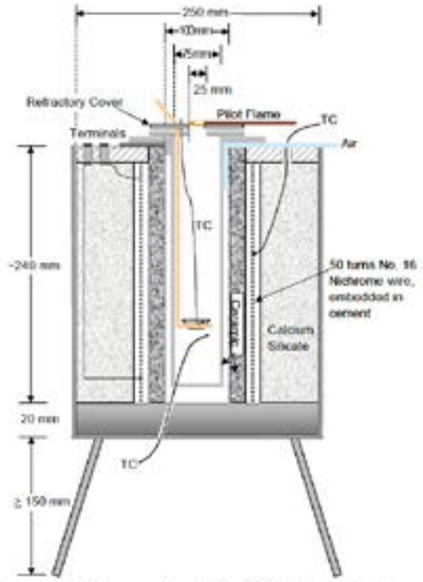


Figure 1. Schematic of SwRI's Hot-Air Furnace.

A material passes if at least three of the four specimens tested meet the following criteria (The three specimens do not need to meet the same condition.):

1. When the weight loss is 50% or less:
    a. The surface and interior thermocouples cannot have a temperature rise of more than 30 °C from the stabilized temperature measured by the interior thermocouple before testing.
    b. No sustained flaming after the first 30 s of the test.
2. When the weight loss is 50% or more:
    a. The surface and interior thermocouples cannot exhibit any temperature rise from the stabilized temperature measured by the interior thermocouple before testing.
    b. No flaming at any time during the test.

3.0 DESCRIPTION OF TEST SPECIMENS

The Aluminum Association, Inc., provided six specimens of the material, identified as *3003*. The samples measured approximately 38 × 38 × 51 mm and were received by SwRI on February 28, 2011. A description of the material provided by the client can be found in Table 1. The samples were placed in a controlled environment maintained at 23 °C ± 2 °C (73 °F ± 5 °F) and 50% ± 5% relative humidity on March 5, 2011. Prior to testing, the specimens were placed in an oven at 60 °C for 24 hr, then placed in a desiccator to cool at room temperature. Due to the nature of the material, at the 750° C heat exposure from this test, the solid block changed phase to a liquid pool. To

avoid furnace damage from molten material, the specimens were slightly trimmed and placed in an open-top vessel as described in section 6.2.1 of the ASTM E136-11 standard.

Table 1. Test Sample Description Provided by the Client.

Material ID	Description of Material	Composition	Nominal Thickness	Nominal Density	Color
3003	3003 Test Block	Nominal w/o – 1.25 Mn – 0.12 Cu – Al Balance	2.0 in. (50.9 mm*)	0.099 lbs/in.^{3} (2730 kg/m^3*)	Aluminum (silver like) (Silver*)

* Measured by SwRI personnel.

4.0 TEST RESULTS

Testing was conducted on March 18 and 24, 2011. During testing, flaming was not observed in any of the four test runs. Tabular test data and graphs of the measured temperatures plotted with respect to time are presented on page 5.

5.0 CONCLUSIONS

The material identified as *3003* **meets** the performance criteria presented in ASTM E 136-11.

SOUTHWEST RESEARCH INSTITUTE

ASTM E 136 TEST DATA SHEET

Client:	The Aluminum Association, Inc.	*Receipt Date:*	February 28, 2011
Operator:	Z. Holt	*Date Prepared by SwRI:*	Prepared on test date
Test Date(s):	March 18 and 24, 2011	*Color:*	Silver
Material ID:*	3003	*Original Thickness:*	50 mm
Trade Name:*	3003	*Test Sample Thickness:*	50 mm
Description:*	3003 Test Block	*Average Sample Mass:*	195.43 g

** Information/instructions provided by the Client*

RESULTS

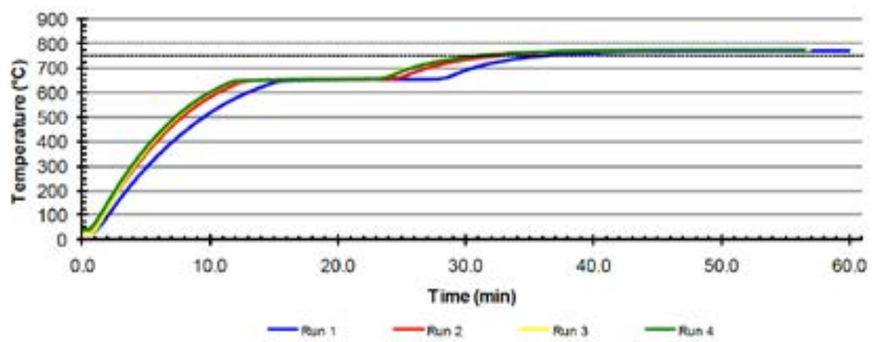
Run	Initial Mass (g)	Final Mass (g)	Percent Mass Loss	Specimen Center Stabilized (°C)	Maximum (°C)	ΔT (°C)	Criteria* ΔT< 30 °C	Specimen Surface Stabilized (°C)	Maximum (°C)	ΔT (°C)	Criteria* ΔT< 30 °C
1	184.61	184.55	0%	751	770	19	Pass	751	774	23	Pass
2	198.93	198.79	0%	752	777	26	Pass	752	777	25	Pass
3	199.45	199.35	0%	750	775	25	Pass	750	773	23	Pass
4	198.73	198.70	0%	752	776	24	Pass	752	774	22	Pass

*Criteria for when percent mass loss < 50%

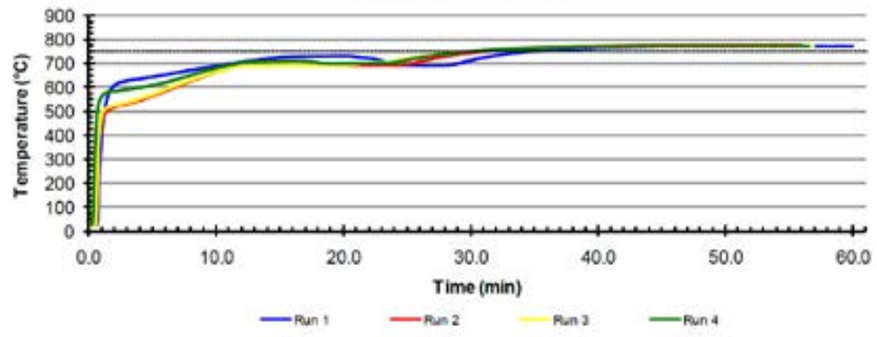
TEST OBSERVATIONS

	Insertion Time (s)	Ignition Time (mm:ss)	Flameout (mm:ss)	Duration of flaming (mm:ss)	Criteria: No flaming after first 30 s	Observed Smoke (mm:ss)	Observed Soot (mm:ss)	Total Test Time (s)
1	46	N/A	N/A	0:00	Pass	None	None	3354
2	40	N/A	N/A	0:00	Pass	None	None	3314
3	39	N/A	N/A	0:00	Pass	None	None	3373
4	32	N/A	N/A	0:00	Pass	None	None	3358

Center Temperature Graph



Surface Temperature Graph



intertek
Total Quality. Assured.

ALFREX, LLC
LETTER REPORT

SCOPE OF WORK
CAN/ULC-S114-2018; STANDARD METHOD OF TEST FOR DETERMINING NON-COMBUSTIBILITY IN BUILDING MATERIALS ON ALFREX PLATE.

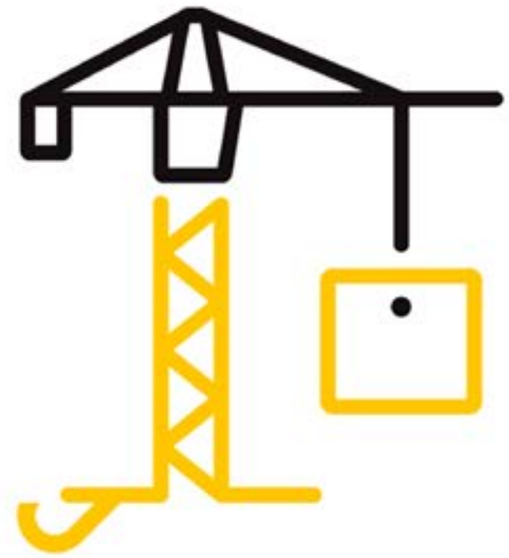
REPORT NUMBER
104403237MID-001A

TEST DATE(S)
08/25/20

ISSUE DATE **[REVISED DATE]**
09/14/20 NA

PAGES
4

DOCUMENT CONTROL NUMBER
GFT-OP-10a (21-June-2019)



intertek
Total Quality. Assured.

8431 Murphy Drive
Middleton, WI 53562
Telephone: 608-836-4400
Facsimile: 608-831-9279
www.intertek.com/building

LETTER REPORT FOR ALFREX LLC
Report No.: 104375589MID-001A
Date: 08/13/20

REPORT ISSUED TO

ALFREX, LLC
943 Gainesville Hwy.
Building 100-4000
Buford, GA 30518

Subject: Summary letter report for full report 104403237MID-001 on Alfex Plate.

Dear Julia Jun,

This letter report summarizes the results of our evaluation of Alfrex Plate to the requirements contained in the following standards:

The specimens were evaluated in accordance with the following:
ULC-S114:2018, *Standard Method of Test for Determining Non-Combustibility in Building Materials*

SUMMARY

Intertek Building & Construction (B&C) was contracted by Alfrex, LLC to perform testing in accordance with ULC S114, *Standard Method of Test for Determining Non-Combustibility in Building Materials,* on their Alfrex Plate. Results obtained are tested values and were secured by using the designated test method. Testing was conducted at Intertek test facility in Middleton, WI.

Intertek B&C will service this report for the entire test record retention period. The test record retention period ends four years after the test date. Test records, such as detailed drawings, datasheets, representative samples of test specimens (where required by Certification or Accreditation bodies), or other pertinent project documentation, will be retained for the entire test record retention period.

SECTION 1
TESTING

Client provided 68 squares of Alfrex Plate described by the client as Aluminum Plate. The provided squares were metallic/aluminum in color without an outside surface layer measuring approximately 38 mm by 38 mm by 3.02 mm thick. Seventeen squares were stacked by Intertek to generate specimens approximately 50 mm in height.

intertek
Total Quality. Assured.

8431 Murphy Drive
Middleton, WI 53562
Telephone: 608-836-4400
Facsimile: 608-831-9279
www.intertek.com/building

LETTER REPORT FOR ALFREX LLC
Report No.: 104375589MID-001A
Date: 08/13/20

SECTION 2
CONCLUSION

The maximum loss of mass of any specimen did not exceed 20%. The mean of the maximum temperature rise of the specimens did not exceed 36°C. There was no flaming from the test specimens during the last 14min and 30s of the test.

Alfrex Plate met the specified performance requirements.

There were no deviations to the ULC S114 standard.

For INTERTEK B&C:

COMPLETED BY:	Joel Zumwalt	**REVIEWED BY:**	Sandy Osborne
TITLE:	Lab Technician III	**TITLE:**	Lab Technician I
SIGNATURE:		**SIGNATURE:**	
DATE:	09/14/20	**DATE:**	09/14/20

Please note: this Letter Report does not represent authorization for the use of any Intertek certification marks.

SECTION 3
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	09/14/2020	3	

intertek
Total Quality. Assured.

ALFREX, LLC
LETTER REPORT

SCOPE OF WORK
ULC-S135:2004-(REAFFIRMED 2016), *STANDARD TEST METHOD FOR THE DETERMINATION OF COMBUSTIBILITY PARAMETERS OF BUILDING MATERIALS USING AN OXYGEN CONSUMPTION CALORIMETER (CONE CALORIMETER)* ON ALFREX PLATE

REPORT NUMBER
104375589MID-001A

TEST DATE(S)
08/13/20

ISSUE DATE **[REVISED DATE]**
09/01/20 NA

PAGES
4

DOCUMENT CONTROL NUMBER
GFT-OP-10a (21-June-2019)

intertek
Total Quality. Assured.

8431 Murphy Drive
Middleton, WI 53562
Telephone: 608-836-4400
Facsimile: 608-831-9279
www.intertek.com/building

LETTER REPORT FOR ALFREX LLC
Report No.: 104375589MID-001A
Date: 08/13/20

REPORT ISSUED TO

ALFREX, LLC
943 Gainesville Hwy.
Building 100-4000
Buford, GA 30518

Subject: Summary letter report for full report 104375589MID-001 on Alfex Plate.

Dear Julia Jun,

This letter report summarizes the results of our evaluation of Alfrex Plate to the requirements contained in the following standards:

The specimens were evaluated in accordance with the following:
ULC-S135:2004-(REAFFIRMED 2016), *Standard Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter)*; Underwriters Laboratories of Canada.

National Building Code Canada 2015 Volume 1 Noncombustible Material Section 3.3.5.1:

1) Except as permitted by Sentences (2) to (4) and Articles 3.1.5.2. to 3.1.5.24., 3.1.13.4. and 3.2.2.16., a *building* or part of a *building* required to be of *noncombustible construction* shall be constructed with *noncombustible* materials. (See also Subsection 3.1.13. for the requirements regarding the *flame-spread rating* of interior finishes.)

2) Notwithstanding the definition of *noncombustible* materials stated in Article 1.4.1.2. of Division A, a material is permitted to be used in *noncombustible construction* provided that, when tested in accordance with ULC-S135, "Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter)," at a heat flux of 50 kW/m²,
a) its average total heat release is not more than 3 MJ/m²,
b) its average total smoke extinction area is not more than 1.0 m², and
c) the test duration is extended beyond the time stipulated in the referenced standard until it is clear that there is no further release of heat or smoke.

3) If a material referred to in Sentence (2) consists of a number of discrete layers and testing reveals that the surface layer or layers protect the underlying layers such that complete combustion of the underlying layers does not occur, the test shall be repeated by removing the outer layers sequentially until all layers have been exposed during testing, or until complete combustion has occurred.

4) The acceptance criteria for a material tested in accordance with Sentence (3) shall be based on the cumulative emissions from all layers, which must not exceed the criteria stated in Clauses (2)(a) and (b).

intertek
Total Quality. Assured.

8431 Murphy Drive
Middleton, WI 53562
Telephone: 608-836-4400
Facsimile: 608-831-9279
www.intertek.com/building

LETTER REPORT FOR ALFREX LLC
Report No.: 104375589MID-001A
Date: 08/13/20

SUMMARY

Intertek Building & Construction (B&C) was contracted by Alfrex, LLC to perform testing in accordance with ULC S135, *Standard Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter),* on their Alfrex Plate. Results obtained are tested values and were secured by using the designated test method. Testing was conducted at Intertek test facility in Middleton, WI.

Intertek B&C will service this report for the entire test record retention period. The test record retention period ends four years after the test date. Test records, such as detailed drawings, datasheets, representative samples of test specimens (where required by Certification or Accreditation bodies), or other pertinent project documentation, will be retained for the entire test record retention period.

SECTION 1
TESTING

The pre-painted aluminium panels with black on one surface and gray on the other surface were cut to 100 x 100 mm by the client. The black surface was the exposed surface that was tested. Specimens were conditioned to moisture equilibrium (constant mass) at an ambient temperature of 23 ± 3°C and a relative humidity of 50 ± 5%. The cone calorimeter test was run as written in ULC S135 section 8 – Procedure. The cone calorimeter calculations were performed as written in ULC S135 section 10 – Calculations.

SECTION 2
CONCLUSION

The black pained surface of the material passed the National Building Code Canada 2015 Volume 1 for noncombustible material section 3.3.5.1. The materials' total heat release was not more than 3 MJ/m^2, with an average value of 0.7 MJ/m^2. The materials' average total smoke extinction area was not more than 1.0 m^2, with an average value of 0.3 m^2.

There were no deviations to the ULC S135 standard.

For INTERTEK B&C:

COMPLETED BY:	Bryan Bowman	**REVIEWED BY:**	Mark Crawford
TITLE:	Chemist	**TITLE:**	Engineering Team Lead
SIGNATURE:		**SIGNATURE:**	
DATE:	09/01/20	**DATE:**	09/01/20

Please note: this Letter Report does not represent authorization for the use of any Intertek certification marks.

intertek
Total Quality. Assured.

8431 Murphy Drive
Middleton, WI 53562
Telephone: 608-836-4400
Facsimile: 608-831-9279
www.intertek.com/building

LETTER REPORT FOR ALFREX LLC
Report No.: 104375589MID-001A
Date: 08/13/20

SECTION 3
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	09/01/2020	4	

ALFREX PLATE WARRANTIES

GENERAL PAINT FINISH WARRANTY (SAMPLE)

Alfrex FR Aluminum Composite Material and Alfrex Plate

alfrex
Fire Resistant & Non-Combustible Cladding

This Sample Limited Warranty ("Limited Warranty") is a facsimile of the Limited Warranty to be provided by Alfrex® Inc. ("Company") to the property owner ("Owner") which will relate to the ("Products") installed at the ("Property") at the ("Property Address") identified therein. The sample version of a Limited Warranty for a specific product and finish combination may be provided upon request.

Property Name		Property Owner			
Property Address					
City		State or Province		Zip Code	
Date of Substantial Completion		Warranty Commencement Date			
Issuance Date					
Customer Name					
Customer Address					
City		State or Province		Zip Code	
Product(s)	☐ Alfrex FR ACM		☐ Alfrex Plate		
Finish(es)	☐ 2 Coat Solid	☐ 2 Coat Mica	☐ 3 Coat Solid	☐ 3 Coat Metallic	
	Other				
Additional Descriptions					

Warranty Number _____

The "Company" will provide warranty coverage subject to the definitions, terms, conditions, limitations, and remedies stated therein. All of the following conditions and additional conditions constitute material terms of the limited warranty and failure to satisfy any one or more are of the conditions and additional conditions by owner or their agents or representatives shall render the limited warranty null and void and release Alfrex, Inc. from its obligations thereunder.

I. Company will warrant that the painted finish on the Product(s) listed therein will retain their Film integrity, Color and Chalk, as defined in a number of years after the installation of the coil coated ACM or PLATE consistent with the tables attached to the specific warranty and per the location and environmental conditions detailed therein.
2. The Warranty period starts on the Warranty Commencement Date as written in the issued Warranty and will be determined as either the date of substantial completion (default), or 6 months from the date of shipment as defined by the commercial invoice date.
3. Film Integrity shall be defined as the absence of peeling, checking, chipping or cracking, except for such crazing or slight cracking as may occur on tightly roll formed edges or brake bends at the time of forming the pre-painted sheet.
4. Color Change shall be defined as freedom from fade or change as warranted in ΔE units calculated in accordance with ASTM D2244-02, paragraph 6.2.2 CIE L*a*b*, I00 Observer, specular included. Color Change is measured on an exposed painted surface that has been cleaned of surface soils and chalk and then compared to corresponding values measured on the original or unexposed coated surface.
5. Chalk or Oxidation shall be defined as a numerical rating as warranted when measured in accordance with the standard procedures specified in ASTM D42I4-98.
6. Non-uniform color changes that result from unequal exposure to sunlight and/or the elements are not covered by the Limited Warranty.

7. Applications exposed to salt spray, or located within paint finish warranty specific distances of salt-water or industrial atmospheres, must be maintained by washing with fresh tap water (in accordance with AAMA 610.1-1979) at least annually and documentation of the maintenance provided upon request (Copy of 610.1 provided on request). It is acknowledged that fading or color changes may not be uniform if the surfaces are not equally exposed to the sun and elements.
8. The Limited Warranty will not extend to, or cover: (a) damage to the Product occasioned by improper storage of the coated metal prior to installation or moisture or other contamination detrimental to the Product because of improper packaging, handling, shipping, processing and/ or installation; or (b) damage to the Product which suffers from improper forming, fabrication, cut edge exposure, corrosion of the substrate or any other condition between the substrate and coating which causes coating degradation or delamination; or (c) Forming Product at temperatures below an ambient temperature of 60°F (16°C) which may adversely affect the appearance and performance of the finish coating; (d) any external contaminant or condition which causes coating degradation or delamination; (f) other exclusions included in the Limited Warranty for a specific paint finish – provided upon request.
9. The Limited Warranty will not extend to, or cover any failure caused by perforation processes which (a) may cause potential heat damage to the top paint layer, (b) leave exposed aluminum vulnerable to oxidation, paint degradation, or delamination, (c) are not specifically approved by Alfrex prior to issuance of the warranty.
10. The Limited Warranty will not cover damage or failure of Product which damage or failure is attributable to acts of God, falling objects, external forces, explosions, fire, terrorism, or other such similar or dissimilar occurrences.
11. Owner's sole and exclusive remedy, and Alfrex, Inc.'s liability under the Limited Warranty will be limited, at Alfrex, Inc.'s option, to recoating or replacing the coil coated Product claimed to be defective. Under no circumstances will Alfrex, Inc. be held liable for any incidental, special, punitive or consequential damages.
12. Alfrex, Inc. shall be given a reasonable opportunity to inspect the Product claimed to be defective. If after inspection of the product, Alfrex, Inc. determines that the claimed defect is covered by the warranty, Alfrex, Inc. as its sole option, shall refinish, repair, or replace, the defective Product without charge to the owner.
13. Alfrex, Inc. must approve any recoating of the metal substrate through submission of three (3) estimates that each includes the name of the coating products to be used, labor and material costs as well as any other costs associated with the work for refinishing or replacing the metal substrate. Alfrex, Inc. reserves the right to approve or negotiate the contract for such recoating or replacement work if the initial estimate is unacceptable to Alfrex, Inc.
14. All warranty work will be performed by Alfrex, Inc. or by a company, customer, contractor, applicator, or distributor selected by Alfrex, Inc. At no time does this warranty confer upon the claiming party or any other party the right to proceed with repair, replacement or restoration without written notice and agreement by a duly authorized officer of Alfrex, Inc. Any such work undertaken by the claiming party or any other party shall be for the claiming party's own account and shall result in this warranty becoming null and void. As color variances may occur between replacement or refinished product in comparison with the originally installed product due to normal weathering and aging of the originally installed product, this condition will not be indicative of a defect in either the replacement product or the originally installed product.
15. The warranty for any refinished or replaced metal substrate shall be only for the remainder of the original warranty period applicable to the original coated metal substrate.
16. In no event will the original applicable warranty period set forth in the warranty table be extended by a warranty claim.
17. In the event of any subsequent failure of any recoated or replaced coil coated Product, the Owner shall first make any claims against the supplier of those replacement materials.
18. The applicable warranty period shall be limited to, and shall in no event extend beyond, the warranty period as set forth in the warranty table for the specific finish and product.
19. The Limited Warranty is given solely to the Owner and is non-transferable and non-assignable.
20. All claims must be submitted in writing to Alfrex, Inc. in 943 Gainesville Hwy. Bldg. 100-4000, Buford, GA 30518. All claims must be accompanied by this certificate, fully completed and signed by the customer that furnished the product to the owner. In order to qualify for warranty coverage, all claims must be submitted within thirty days from the date the damage is first discovered or could have been discovered. No claims can be submitted 30 days after expiration of the warranty period.
21. In no event does Alfrex, Inc. cover the cost of labor or sundry materials required to remove and/or replace any defective product.
22. Alfrex, Inc. reserves the right to discontinue or modify its products lines and coating colors. If the original product or coating color is no longer available, Alfrex, Inc. agrees to use commercially reasonable efforts to substitute a comparable product.
23. The warranty is subject to, enforced by, and construed according to the laws of the State of Georgia. Any legal action to enforce or construe any

GENERAL PAINT FINISH WARRANTY (SAMPLE)

Alfrex FR Aluminum Composite Material and Alfrex Plate

Fire Resistant & Non-Combustible Cladding

portion of this warranty shall be brought in a Court of Company's choice in Georgia.

24. Any attempt to construe the warranty, be it by law or other legal means, that ultimately leads to any court of competent jurisdiction stating any provision herein as invalid or unenforceable the remainder of the provisions following shall come into effect. These provisions shall come into effect as though the prior provisions had not been contained herein.
25. The United Nations Convention on Contracts for the International Sale of Goods is expressly disclaimed and does not apply to the sale of Seller products. Any and all disputes between the parties that may arise pursuant to the order will be heard and determined before an appropriate arbitrator, federal or state court located in Atlanta, Georgia. The owner hereto acknowledges such court has the jurisdiction to interpret and enforce the provisions herein and/ or an arbitrator's judgment, and the owner and the Customer waives any and all objections that they may have as to personal jurisdiction or venue in any of the above courts.
26. Company has the right to termination of the warranty at any time if a (30) day notice is given to the Customer prior to Rights accruing to Customer are not lost prior to termination.
27. All information hereto shall be adhered to by both parties and shall not extend beyond the directives made therein. No modification shall be made without the understanding, consent, and signing by both Customer and Company of a contract explicitly stating this or any warranty's subsequent modification.
28. EXCEPT AS SET FORTH HEREIN, ALFREX, INC. MAKES NO OTHER EXPRESS WARRANTIES AND DISCLAIMS ANY IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, WITH RESPECT TO ANY OF THE PRODUCTS.
29. IT IS UNDERSTOOD AND AGREED THAT THE REMEDIES PROVIDED FOR HEREIN FOR THE FINISH OF THE PRODUCT DESCRIBED ARE EXCLUSIVE WHETHER FOR BREACH OF EXPRESS WARRANTIES OR OTHERWISE AND SHALL CONSTITUTE THE OWNER'S EXCLUSIVE REMEDY AND ALFREX, INC.'S EXCLUSIVE LIABILITY. IN NO EVENT SHALL ALFREX, INC. BE LIABLE FOR LABOR COSTS, DIRECT, INDIRECT, INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES FOR ANY BREACH OF ANY EXPRESS OR IMPLIED WARRANTIES IN CONNECTION WITH THE PRODUCT.
30. THE WARRANTY IS THE ONLY EXPRESS WARRANTY EXTENDED BY ALFREX, INC. IN CONNECTION WITH THE PRODUCT, OTHER THAN ALFREX, INC.'S STANDARD COATING WARRANTY, IF ANY, AND THE LIMITED WARRANTY SET OUT IN ALFREX, INC.'S SALES TERMS AND CONDITIONS, FOR THE PRODUCT, AND IT EXCLUDES ALL OTHER WARRANTIES, REPRESENTATIONS OR GUARANTEES, EXPRESS OR IMPLIED, WRITTEN OR ORAL, BY OPERATION OF LAW OR OTHERWISE, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. ALFREX, INC.'S AGGREGATE TOTAL CUMULATIVE LIABLITY UNDER THE WARRANTY IS LIMITED TO THE DOLLAR AMOUNT OF THE PURCHASE PRICE.
31. Owner is solely responsible for proper selection and installation of Alfrex, Inc.'s products. Owner agrees that it will use Alfrex, Inc. products only for their intended uses and according to the specifications and limitations established by Alfrex, Inc. from time to time. Owner shall indemnify, defend and hold Alfrex, Inc. harmless from and against any and all damages arising out of or relating to improper product selection, application, use, misuse, neglect, abuse of products or improper installation or incorporation of products.

Accepted By:

Alfrex, Inc.
943 Gainesville Hwy.
Building 100-4000
Buford, GA 30518
Phone: 470.589.7449

Authorized By _____

Authorized Signature _____

Date _____

GENERAL PAINT FINISH WARRANTY (SAMPLE)

Alfrex FR Aluminum Composite Material and Alfrex Plate

Fire Resistant & Non-Combustible Cladding

WARRANTY TABLES

WARRANTY	ALFREX FR MCM	ALFREX PLATE	TYPE
2 Coat Solid/ 2 Coat Mica	30 Years	20 Years	Finish
3 Coat Metallic	30 Years	20 Years	Finish
3 Coat Vivid Solid	20 Years	20 Years	Finish
Design Series - Wood & Metal	20 Years	20 Years	Finish
Hairline Aluminum	10 Years	N/A	Finish
Mirror	10 Years	N/A	Finish
Highly Durable Polyester 3-Coat	20 Years	N/A	Finish
Highly Durable Polyester	10 Years	N/A	Finish
Perforation	N/A	10 Years	Finish
Bond Integrity	10 Years	N/A	Product

ALFREX PLATE PROJECT REFERENCES

799 BROADWAY

Location	New York, USA
Finish(es)	Bone White, Sunstorm Moondust, Driftwood
Architect / Specifier	Perkins + Will
Installer / Contractor	Island Exterior Fabricators
Size	98,000 sqft

PIAZZA TERMINAL

Location	Pennsylvania, USA
Finish(es)	Custom Tile Corten
Architect / Specifier	BKV Group
Installer / Contractor	Architectural Metal Designs, Inc.
Size	80,000 sqft

GATEWAY CENTER

Location	New Jersey, USA
Finish(es)	Custom Black Corten
Architect / Specifier	Gensler
Installer / Contractor	Bamco, Inc.
Size	22,100 sqft

2 PENN PLAZA RENOVATION

Location	New York, USA
Finish(es)	Custom Black Anodized (BLKADZ), Classic White
Architect / Specifier	Charles Luckman Associates
Installer / Contractor	Bamco, Inc. / IDA Exterior Systems
Size	145,000 sqft

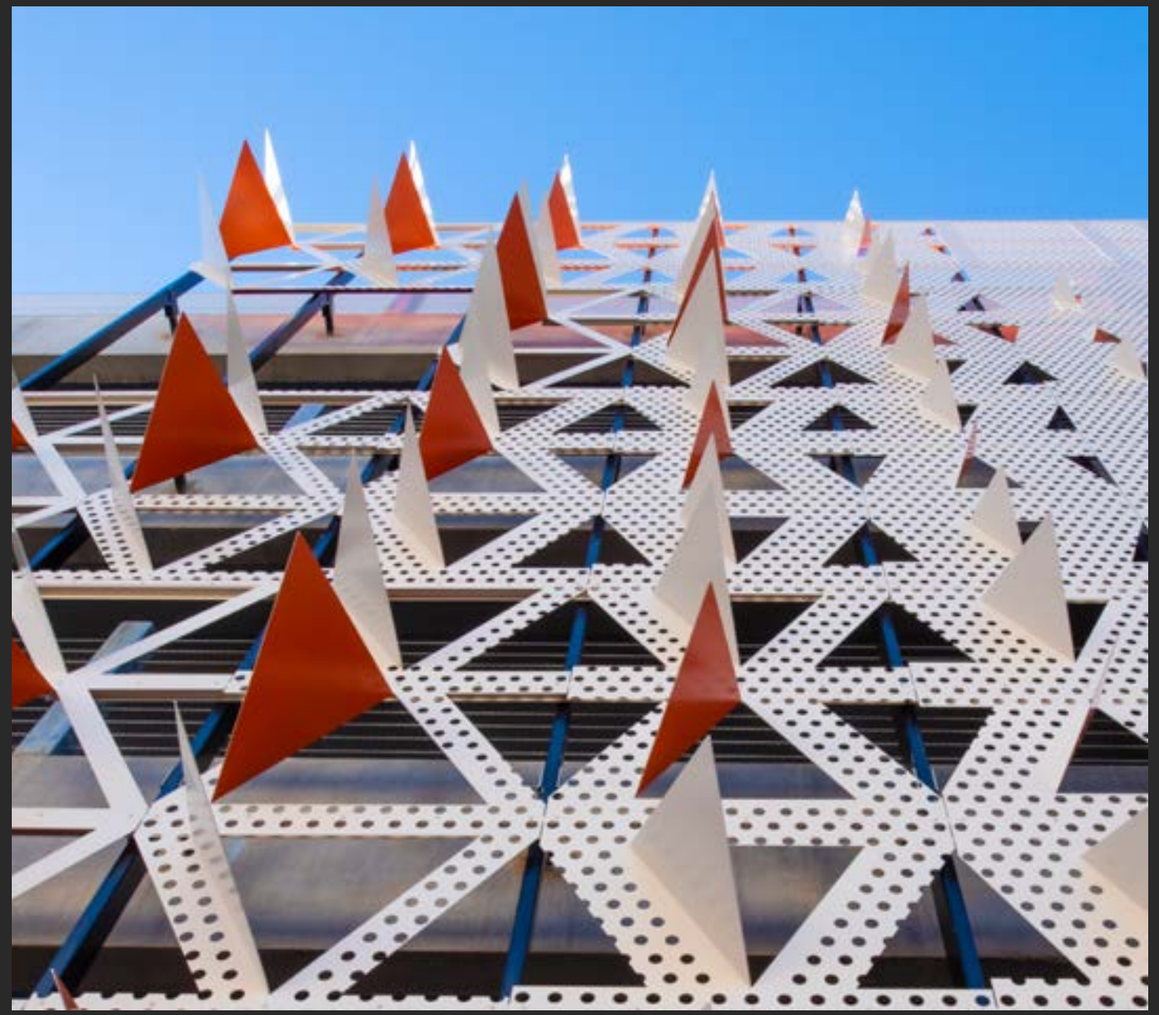
100 QUEENS QUAY

Location	Ontario, Canada
Finish(es)	Dusty Charcoal
Architect / Specifier	B+H Architects
Installer / Contractor	Riverside Group LTD
Size	63,500 sqft

THE ONE

Location	Ontario, Canada
Finish(es)	Crystal Silver
Architect / Specifier	Foster and Partners Core Architects
Installer / Contractor	Riverside Group LTD
Size	237,000 sqft

THE WORKS



Location	Georgia, USA
Finish(es)	Pacer White & Hearty Orange (Double-Sided)
Architect / Specifier	Smith Dalia Architects
Installer / Contractor	The Miller Clapperton Partnership, Inc. / Dakota Contrators, LLC
Size	l6,800 sqft

T3 WEST MIDTOWN BUILDING

Location	Georgia, USA
Finish(es)	Custom Black
Architect / Specifier	Hartshorne Plunkard Architecture
Installer / Contractor	Peachtree Protective Covers
Size	35,300 sqft

KENNESAW STATE UNIVERSITY ACADEMIC LEARNING CENTER

Location	Georgia, USA
Finish(es)	Monument, Pure Silver / Dove Gray, Bone White
Architect / Specifier	HOK
Installer / Contractor	Altech (SECO Architectural Systems)
Size	5,150 sqft

WATERSTONE OF WESTCHESTER

Location	New York, USA
Finish(es)	Bone White
Architect / Specifier	National Development
Installer / Contractor	Fantin Supply
Size	2,350 sqft

UC DAVIS HEALTH PARKING

Location	California, USA
Finish(es)	Bone White (Double-Sided)
Architect / Specifier	Dreyfuss + Blackford
Installer / Contractor	Clark Pacific
Size	15,600 sqft

NEW VALLEY HOSPITAL

Location	New Jersey, USA
Finish(es)	Custom Silver Smith, Custom Regal White
Architect / Specifier	HDR
Installer / Contractor	EDA Contractors
Size	36,000 sqft

5 RIVER PARK COBBLE HILL

Location	New York, USA
Finish(es)	Sunstorm Fawn Mica
Architect / Specifier	Romnes Architecture PIlc
Installer / Contractor	Island Exterior
Size	41,500 sqft

400 SUMMER

Location	Massachusetts, USA
Finish(es)	Sunstorm Graphite Gray
Architect / Specifier	Morris Adjmi Architects
Installer / Contractor	Island Exterior
Size	44,000 sqft

UPMC MERCY
VISION AND REHABILITATION HOSPITAL

Location	Pennsylvania, USA
Finish(es)	Custom Silversmith
Architect / Specifier	HOK
Installer / Contractor	East Coast Metal Systems
Size	69,000 sqft

WALMART HQ

Location	Arkansas, USA
Finish(es)	Silver Shadow, Custom Pewter
Architect / Specifier	Gensler
Installer / Contractor	Island Exterior
Size	159,000 sqft

NORTHEASTERN UNIVERSITY

Location	Massachusetts, USA
Finish(es)	Umbra Gray UC I30669
Architect / Specifier	Payette
Installer / Contractor	Suffolk Construction
Size	122,300 sqft

MERCEDES BENZ AUTOHAUS

Location	Queensland, Australia
Finish(es)	Black, White, Anthracite, Silver Metallic
Architect / Specifier	Cottee Parker
Installer / Contractor	A-Clad
Size	86,200 sqft

BMW SHOWROOM

Location	Victoria, Australia
Finish(es)	Pure Silver
Architect / Specifier	-
Installer / Contractor	Cladding Systems
Size	22,500 sqft

CALVARY ADELAIDE HOSPITAL

Location	South Australia, Australia
Finish(es)	Charcoal, White
Architect / Specifier	Silver Thomas Hanley (STH)
Installer / Contractor	Asurco
Size	22,400 sqft

CASEY HOSPITAL

Location	Victoria, Australia
Finish(es)	Pure Silver
Architect / Specifier	Silver Thomas Hanley (STH)
Installer / Contractor	Asurco
Size	54,000 sqft

MANTRA EPPING HOTEL

Location	Victoria, Australia
Finish(es)	Black
Architect / Specifier	-
Installer / Contractor	-
Size	6,500 sqft

ICCONS DANDENONG SOUTH

Location	Victoria, Australia
Finish(es)	Monument, Red
Architect / Specifier	RPC Architects
Installer / Contractor	Alclad Architectural
Size	-

SWINBURNE UNIVERSITY OF TECHNOLOGY

Location	Victoria, Australia
Finish(es)	Red
Architect / Specifier	Design Worldwide Partnership
Installer / Contractor	A Class Cladding
Size	-

MELBOURNE GIRL'S COLLEGE

Location	Victoria, Australia
Finish(es)	Pure Silver
Architect / Specifier	-
Installer / Contractor	Askin
Size	-

PROJECT REFERENCES

Alfrex Plate

alfrex
Fire Resistant & Non-Combustible Cladding

NORTH AMERICAN PROJECTS

PROJECT NAME	LOCATION	ARCHITECT
Waterstone at White Plain IndependentW Living Facility	New York	Elkus Manfredi Architects
WEXFORD DREXEL ACADEMIC TOWER	Pennsylvania	Ballinger
799 Broadway	New York	Perkins + Will
801 Church	Tennessee	Goettsch Partners
Piazza Terminal	Pennsylvania	BKV Group
100 Queen's Quay	Ontario	B+H Architects
5 River Park Cobble Hill	New York	ROMINES ARCHITECTURE PLLC
540 Fulton Street	New York	Marvel Architects
55 Mercer	Ontario	IBI Group
Concord Galleria	British Columbia	GBL Architects, IBI Group
Darthmouth Hitchcock Medical Center (DHMC)	New Hampshire	HDR
Herbert Hoover HS	West Virginia	Williamson Shriver Architects Inc
MSG Sphere	Nevada	Populous
One Time Square	New York	SLCE Architects, LLP
The New Valley Hospital	New Jersey	HDR
The One	Ontario	Foster and Partners Core Architects
The Works	Georgia	Smith Dalia Architects
UPMC Mercy Vision and Rehabilitation Hospital	Pennsylvania	HOK
Walmart Headquarters	Arkansas	Gensler
Kennesaw State University Academic Learning Center	Georgia	HOK
Northeastern University EXP Research Center	Massachusetts	Payette
The Dorian Hotel	Alberta	Gibbs Gage Architects
Aequitas Community Justice Campus	Indiana	CSO Architects, Inc.
ALFIE Dentistry	Ontario	Vanessa Fong Architect
Brock University	Ontario	TBA
Desa Glass	Alberta	TBA
Guillevin International	Alberta	TBA

PROJECT REFERENCES

Alfrex Plate

alfrex
Fire Resistant & Non-Combustible Cladding

PROJECT NAME	LOCATION	ARCHITECT
MNP Tower	Alberta	Kohn Pedersen Fox
Nancy Greene Way Residence	British Columbia	M Plus Architecture
Red Stone Strip Mall	Alberta	TBA
Sidaway	British Columbia	TBA
Steel Craft Expansion	Alberta	Hodgson Schilf Evans Architects Inc.
TD Chinook	Alberta	TBA
The Intersection - Adidas Village	Oregon	Hacker Architects
Vanderbilt Grad Housing	Tennessee	Valerio Dewalt Train
Vegreville	Alberta	TBA

GLOBAL PROJECTS

LOCATION	PROJECT NAME	SIZE (SQFT)	ARCHITECTURAL FIRM
Victoria, Australia	**Melbourne International Airport T2**	150,694	N/A - Retrofit Application
Queensland, Australia	**333 Ann Street**	89,964	N/A - Retrofit Application
Queensland, Australia	**Mercedes-Benz Autohaus**	86,111	Cottee Parker
Victoria, Australia	**Deakin Uni**	75,347	N/A - Retrofit Application
Victoria, Australia	**Plummer Street Apartments**	67,392	Elenberg Fraser
Victoria, Australia	**Casey Hospital**	53,819	N/A - Retrofit Application
Victoria, Australia	**Upwey High School**	49,600	N/A - Retrofit Application
Victoria, Australia	**Midtown**	30,677	Fender Katsalidis
Queensland, Australia	**119 Charlotte Street**	29,471	N/A - Retrofit Application
Victoria, Australia	**Shepparton Hospital**	26,995	N/A - Retrofit Application
Victoria Australia	**Crowne Plaza Hotel**	24,046	BPSM Architects
Victoria, Australia	**BMW Showroom**	22,475	N/A - Retrofit Application
South Australia, Australia	**Calvary Hospital**	22,356	Silver Thomas Hanley
Victoria, Australia	**Vibe Hotel**	12,916	Caydon

ALFREX PLATE HARNESSES CONTRASTS IN COLOR, SHAPE, AND LIGHTON THE WORKS PROJECT

Project Name	The Works Parking Garage
Location	Atlanta, Georgia USA
Developer	Selig Developments, a subsidiary of Selig Enterprises, Inc.
Architect	Smith Dalia Architects - Atlanta, GA
General Contractor	Dakota Contractors, LLC
Fabricator	MillerClapperton Inc.
Installer	MillerClapperton Inc.
Alfrex Product	Alfrex Plate - 3mm Pre-finished Solid Aluminum Plate
Product Finish	(Double Sided Finish) PVDF Custom White over PVDF Custom Orange

Anchoring this transformation is The Works, an expansive 80-acre mixed use development blending office space, residential living, retail, and dining - while preserving the district's historical industrial character. Guided by the vision of Selig Developments and designed by Smith Dalia Architects, the completion of Phase One showcases a parking garage remarkable for its unique design and complexity. Canvassing the garage is 13,025 square feet of 3mm thick Alfrex Pre-Finished Solid Aluminum Plate from Alfrex, LLC of Buford, Georgia USA. Fabricated and installed by MillerClapperton Inc. of Austell, Georgia, the façade is intricately designed to harness contrasts in color, shape, depth, and light to create stunning views both day and night.

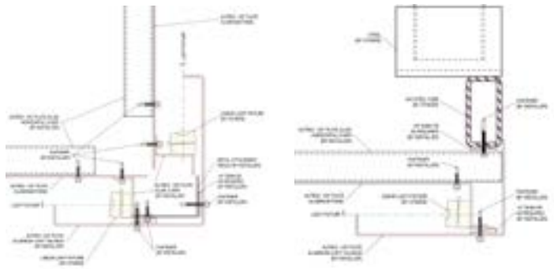
The Challenge
MillerClapperton recognized early on that this complex project would require custom solutions on all facets of execution from product choice, engineering, fabrication, and installation. Façade panel design called for a product that could be perforated in large areas, folded into geometrical shapes, coated orange and white on opposite sides, and capable of sustaining structural loads. This semi-transparent façade assembly then had to be attached to existing blue colored vertical steel beams in a manner that did not interfere with the architect's design vision. A significant research effort was undertaken to develop a simplified sub-structure for wall panel installation that would create an interplay between the exterior façade without distracting from the design in an array of lighting conditions.

Product Choice – Alfrex Plate
Alfrex Pre-Finished Solid Aluminum Plate in a 1/8" thickness was chosen due to its ability to meet the diverse aesthetical, structural, and economical requirements. Alfrex Plate is coil coated on a high-speed paint line designed specifically for heavier gauge metals. As such, it was very efficient to manufacture sheets double coated with a custom white paired opposite a custom orange. This enabled sheets to be custom fabricated, folded, and oriented to create color contrasts using the same panel without welding or additional field painting. Further savings were realized through scrap reduction as Alfrex Plate sheets were manufactured in a custom width and provided in numerous custom lengths via its integrated coil coating, tension leveling, and cut-to-length process.

CASE STUDY

Sheet Fabrication and Engineering
For the large number of perforated panels, custom tooling was developed to punch press perforated sheets of Alfrex Plate with 1.5" diameter openings. Sheets were then cut to size and back routed to enable folding into 3-dimensional geometrical shapes. As a prefinished product, Alfrex Plate was able to be cut, routed, and formed much like MCM panels without additional steps or danger of paint finish crazing. For panel installation though, a wall façade with large perforated areas and openings presented both an engineering and aesthetical challenge requiring a unique solution.
To achieve this dual requirement, custom 1.5" Z-Girts were fabricated from Alfrex 3mm Plate and attached horizontally to the garage's vertical beams. This provided not only a structurally sound means for installation, but also an aesthetical solution by capitalizing on the double side coated Alfrex Plate sheets to integrate seamlessly into the façade's color and design scheme.

Custom Light Valences
Considerable effort was put into the design and integration of custom light valences manufactured from Alfrex Plate. The light valences are effortlessly integrated into the façade design and accentuate nighttime views of the building.



The Result
The Parking Garage at The Works stands out as an interconnected part of a broad development project thanks to its unique design and choice of materials. "I'm thrilled with the outcome of the project – the rigorous design process with the client, design team, and fabrication team paid dividends in the cohesive manner that everything that came together", said Nicole Seekely, the Project Architect. "The color of the panels provides an added level of artistic expression to the façade, particularly on a sunny day when the light casts shadows on the panels." The flexibility of pre-finished Alfrex solid aluminum plate enabled fabrication and installation much like MCM metal composite material, cutting down on waste, fabrication time, and an efficient means of color coating.

Alfrex specializes in fire-resistant and non-combustible architectural metal wall cladding with a portfolio including Alfrex Pre-Finished Solid Aluminum Plate, Alfrex FR Metal Composite Material, and Matching 0.040" flat sheet. Its parent company, Unience, Co Ltd., began operation in 2000 as a manufacturer of specialty fire-resistant coatings, bonding materials, and pelletized mineral filled FR core compound for globally recognized MCM manufacturers. In 2008, Unience launched Alfrex in South Korea with a multi-line MCM production facility dedicated to the exclusive production of FR core MCM utilizing in-house, fire-resistant core technology. Today, both Unience and Alfrex are headquartered in Buford, Georgia USA, with a new state of the art FR core MCM production plant complimented by a commercial branch in Toronto, Ontario Canada.

ALFREX PLATE INSTALLATION DETAILS

THE ARCHITECTURAL DETAILS CONTAINED ARE PROVIDED FOR CONCEPTUAL PURPOSES ONLY. ALFREX ONLY MANUFACTURES MCM PANELS. PANEL SYSTEMS AND ASSEMBLY DESIGN, FABRICATION, AND INSTALLATION ARE PROVIDED BY QUALIFIED FABRICATORS AND INSTALLERS. ALFREX, LLC DOES NOT MAKE ANY WARRANTIES, EXPRESS OR IMPLIED INCLUDING MERCHANTABILITY AND FITNESS FOR PURPOSE. PLEASE CONSULT ALFREX, LLC FOR RECOMMENDATIONS OF TESTED SYSTEMS AVAILABLE IN THE MARKET.

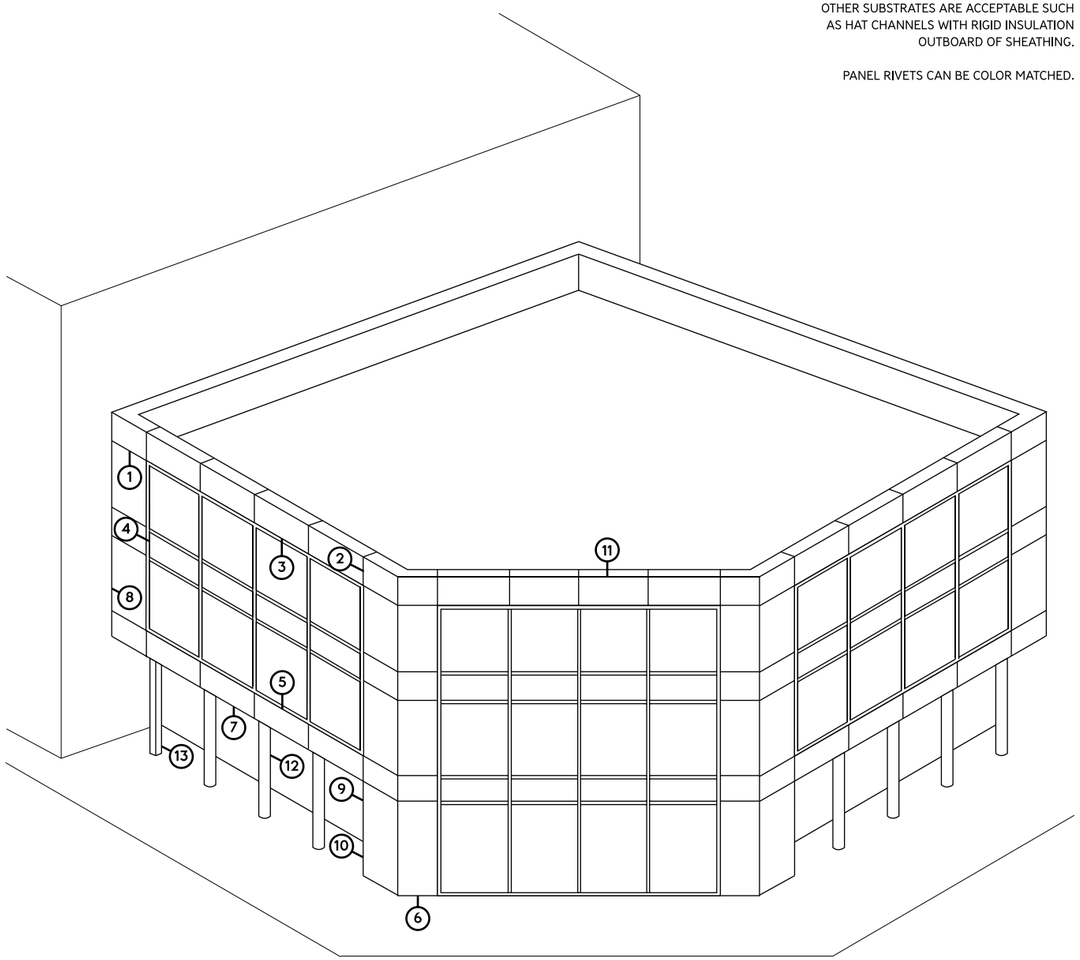
ARCH / FABRICATOR NOTES:

MAX PANEL SIZE IS 60" IN EITHER DIRECTION.

MICA / METALLIC FINISHES ARE DIRECTIONAL FINISHES AND MUST BE INSTALLED IN THE SAME DIRECTION FOR CONSISTENT COLOR.

DETAILS SHOWN ARE IN A RAINSCREEN APPLICATION ON EXTERIOR GWB SHEATHING WITH COMMERCIAL TYVEK (OR SIMILAR). OTHER SUBSTRATES ARE ACCEPTABLE SUCH AS HAT CHANNELS WITH RIGID INSULATION OUTBOARD OF SHEATHING.

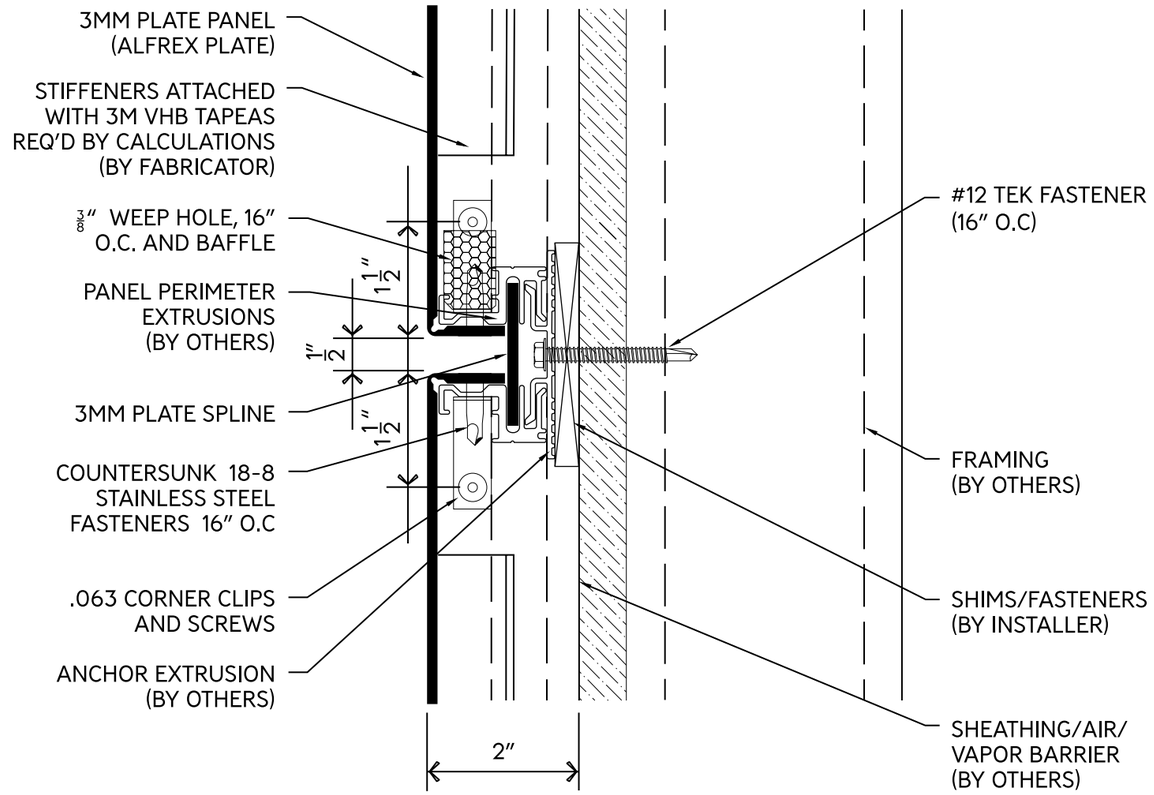
PANEL RIVETS CAN BE COLOR MATCHED.



alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com

GENERIC RAINSCREEN SYSTEM APPLICATION

PAGE
KEY
May 2021

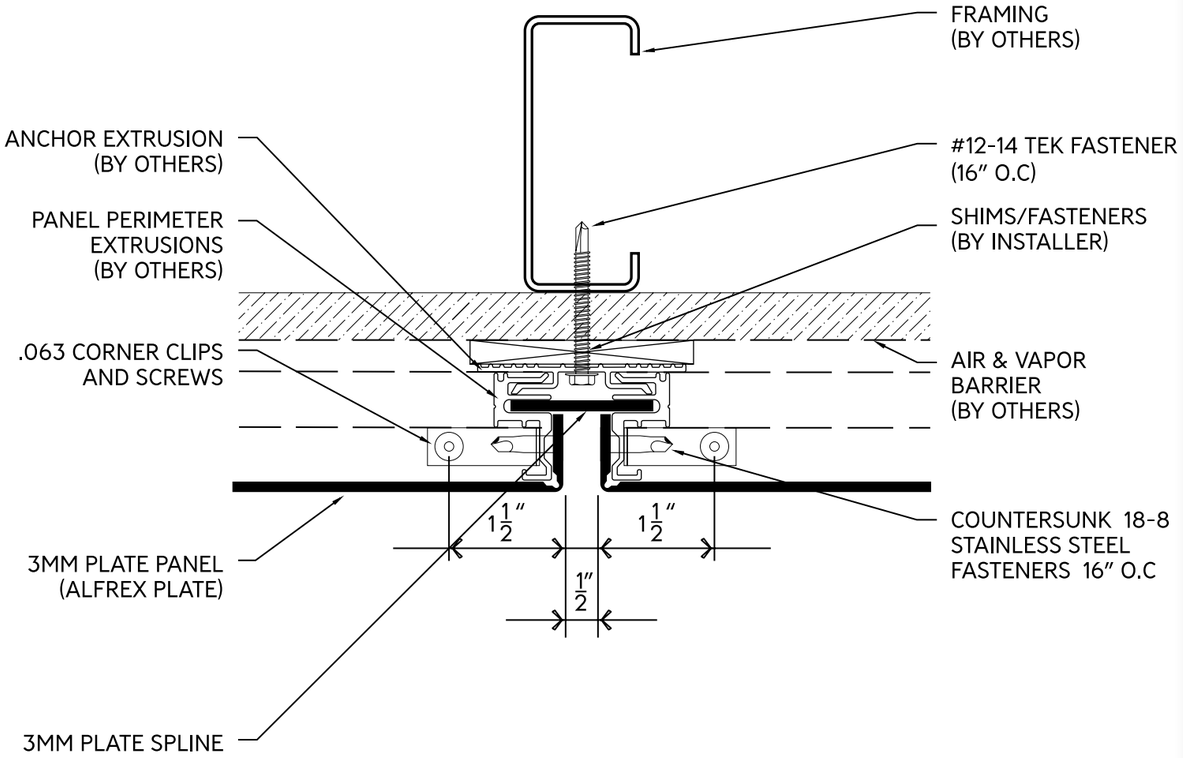


1/AL HORIZONTAL JOINT

alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com

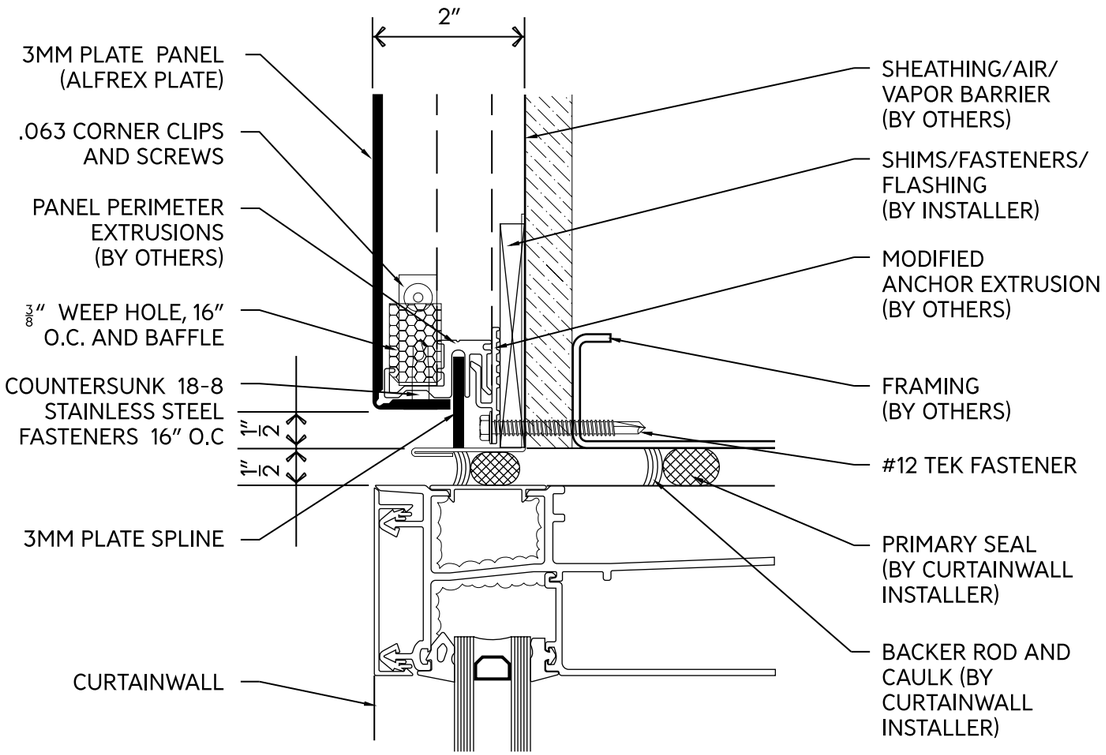
GENERIC RAINSCREEN SYSTEM APPLICATION

PAGE
1
May 2021



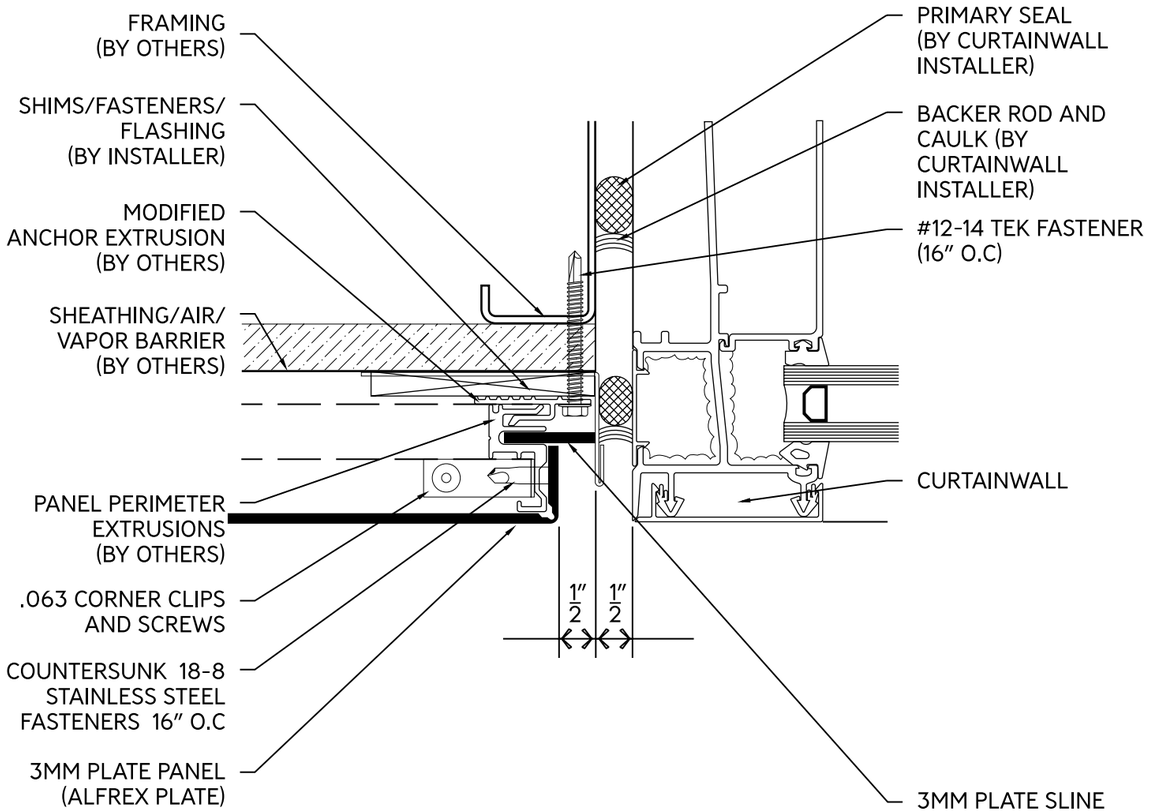
2 AL VERTICAL JOINT

alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com



3 AL HEAD

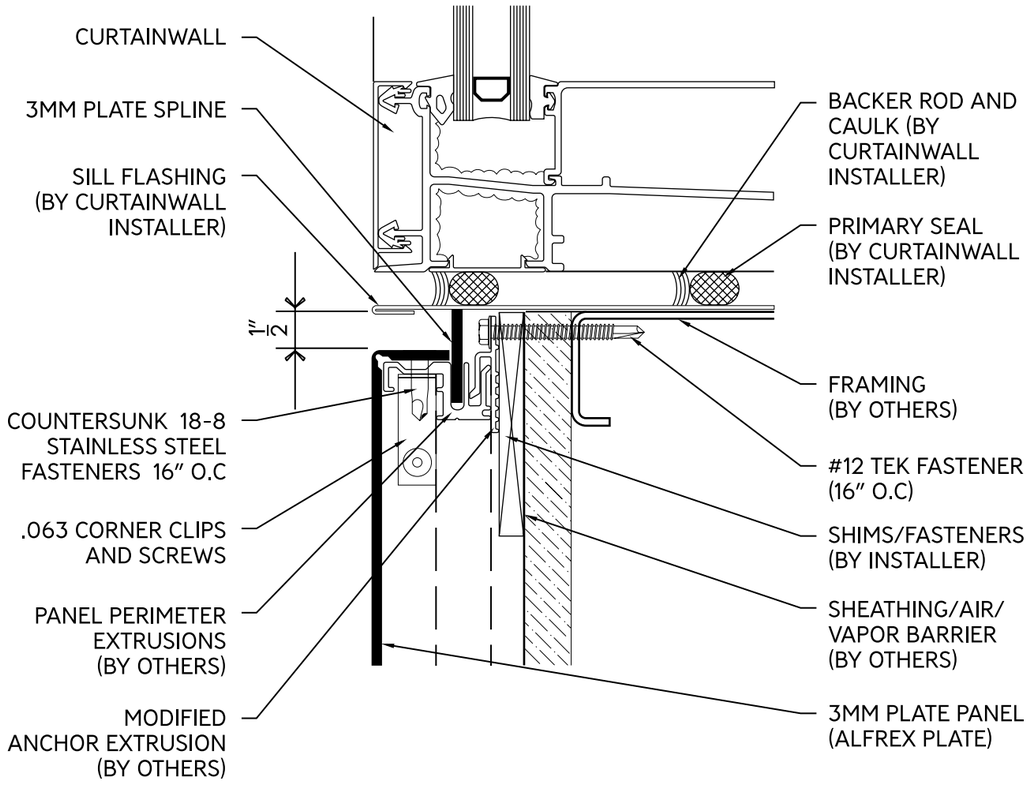
alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com



4/AL JAMB

alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com

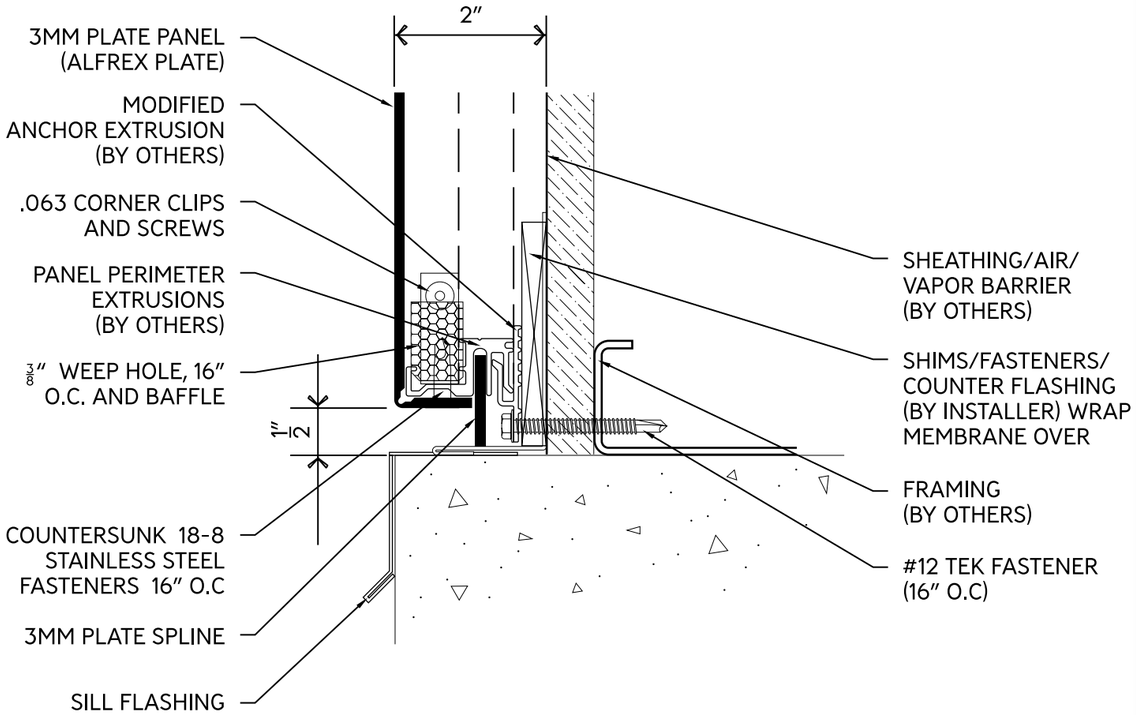
GENERIC RAINSCREEN SYSTEM APPLICATION



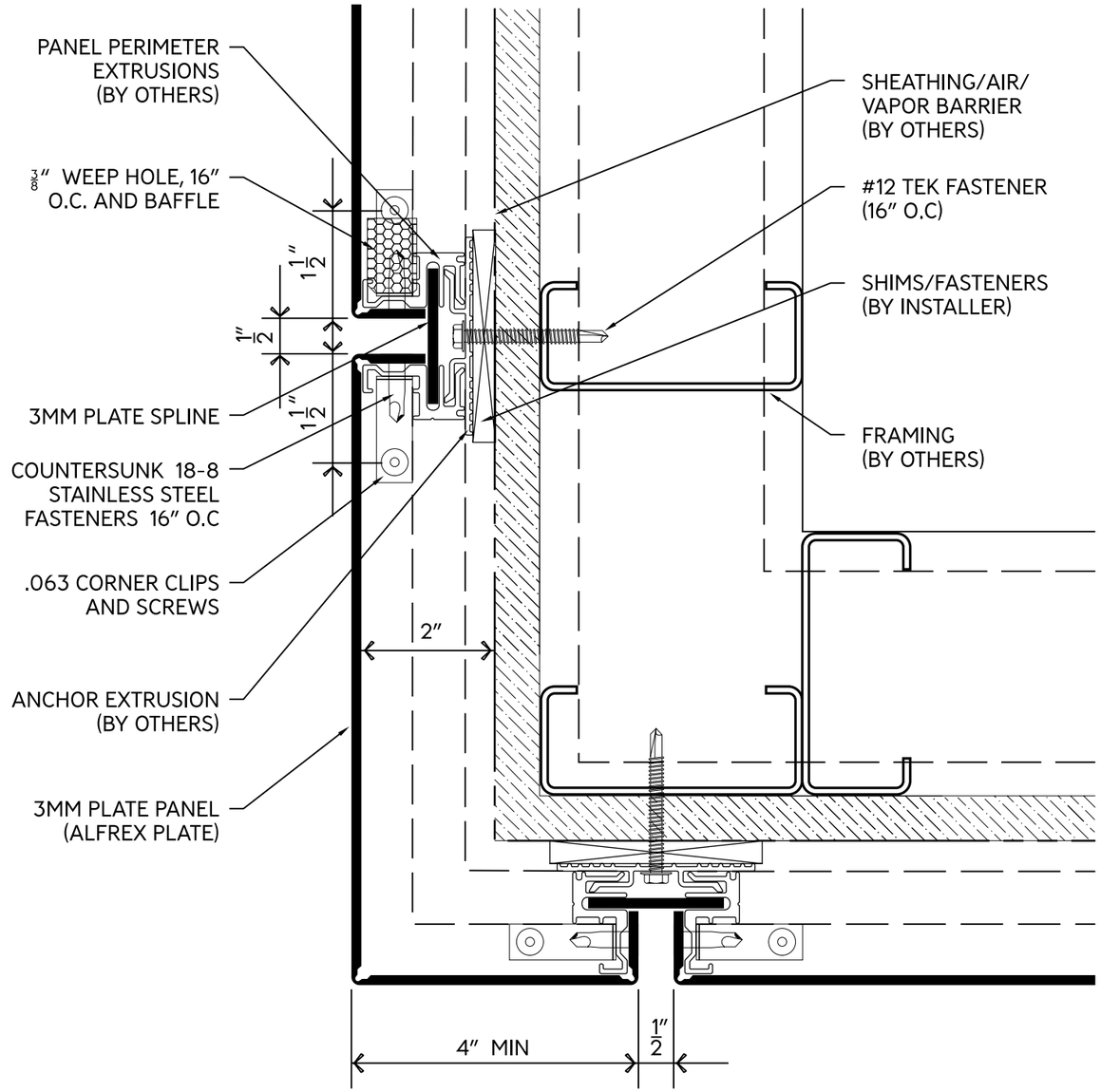
5/AL SILL

alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com

GENERIC RAINSCREEN SYSTEM APPLICATION



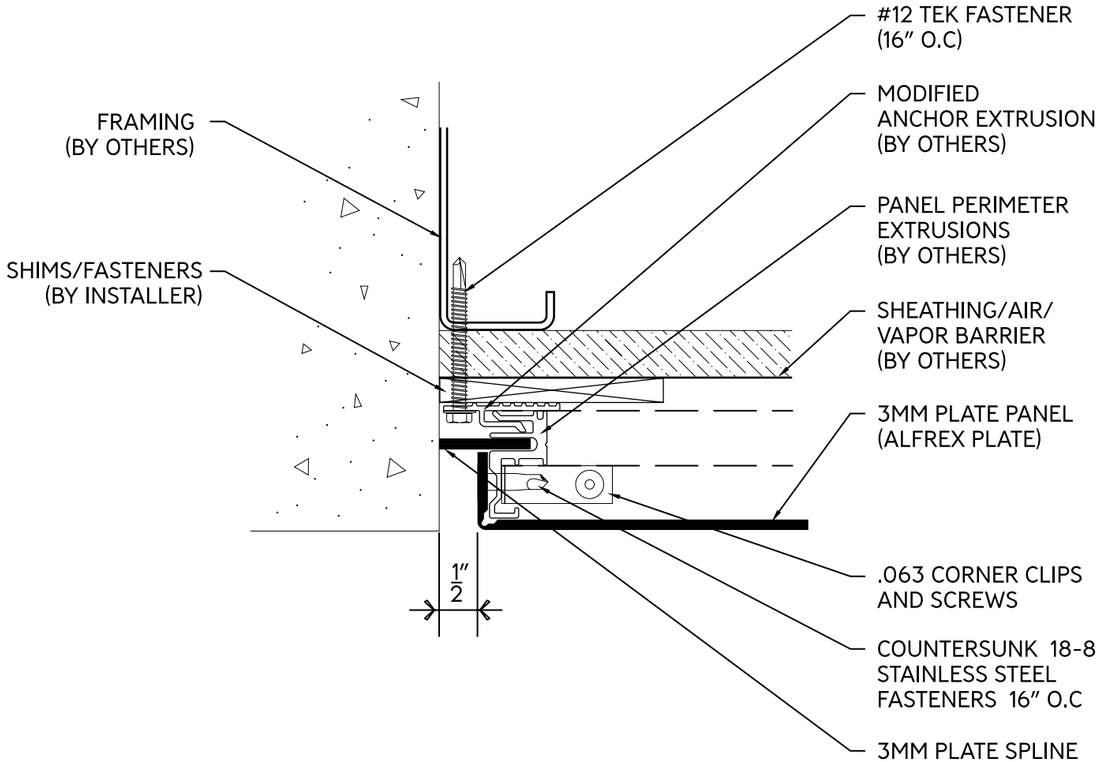
6 AL BASE CONDITION



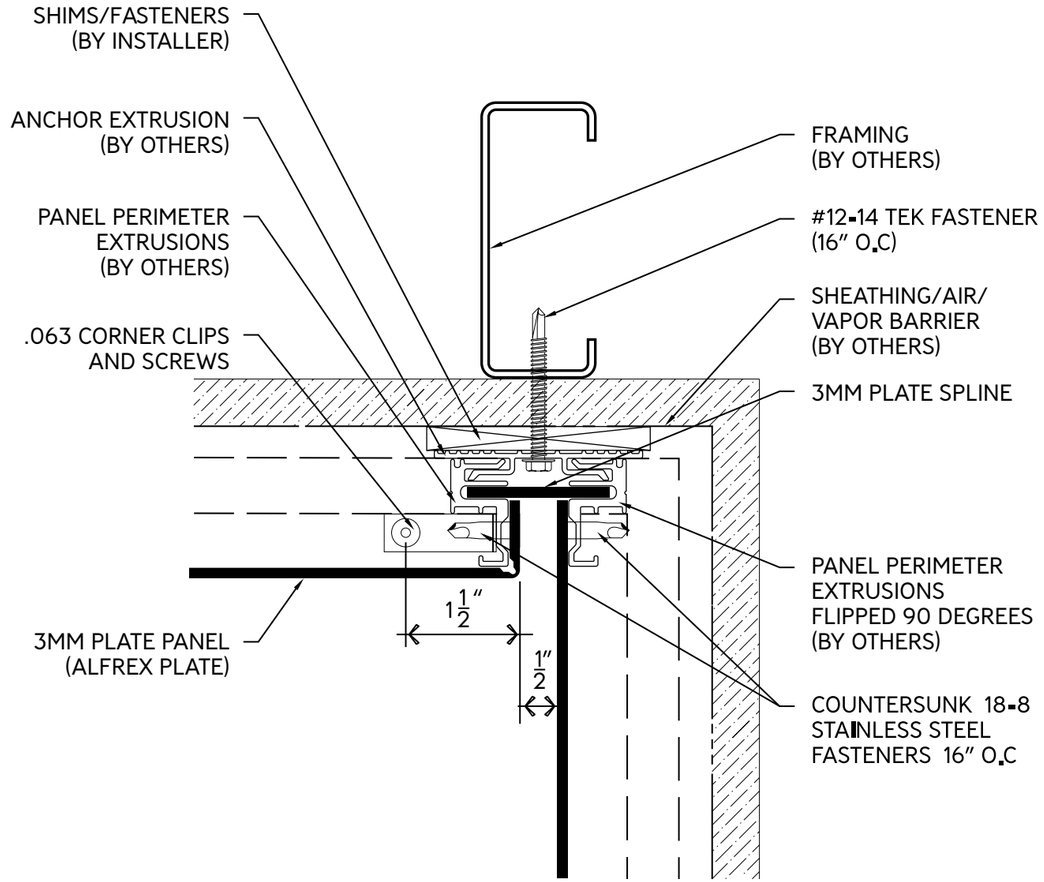
7 AL SOFFIT

alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com

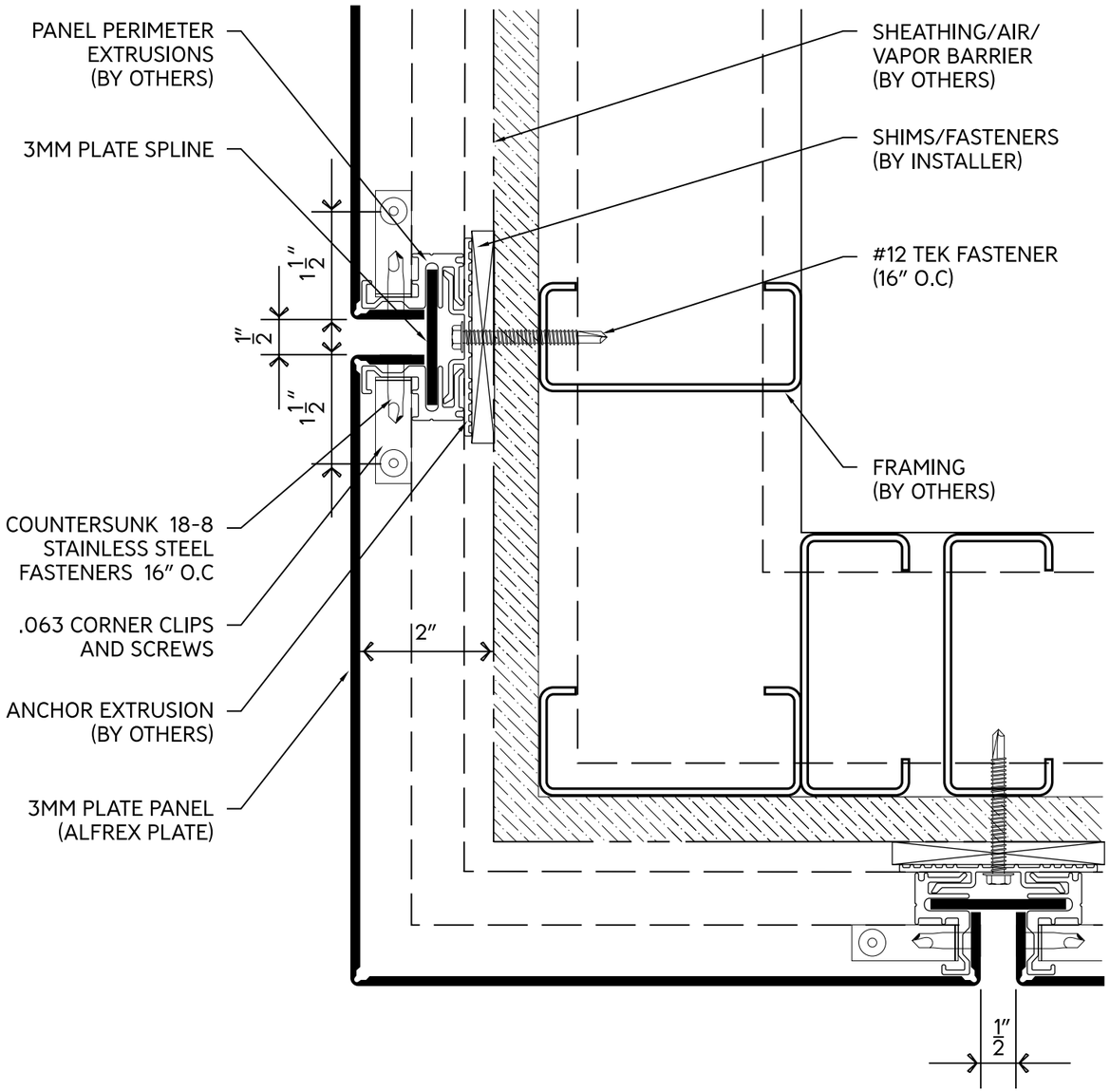
alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com



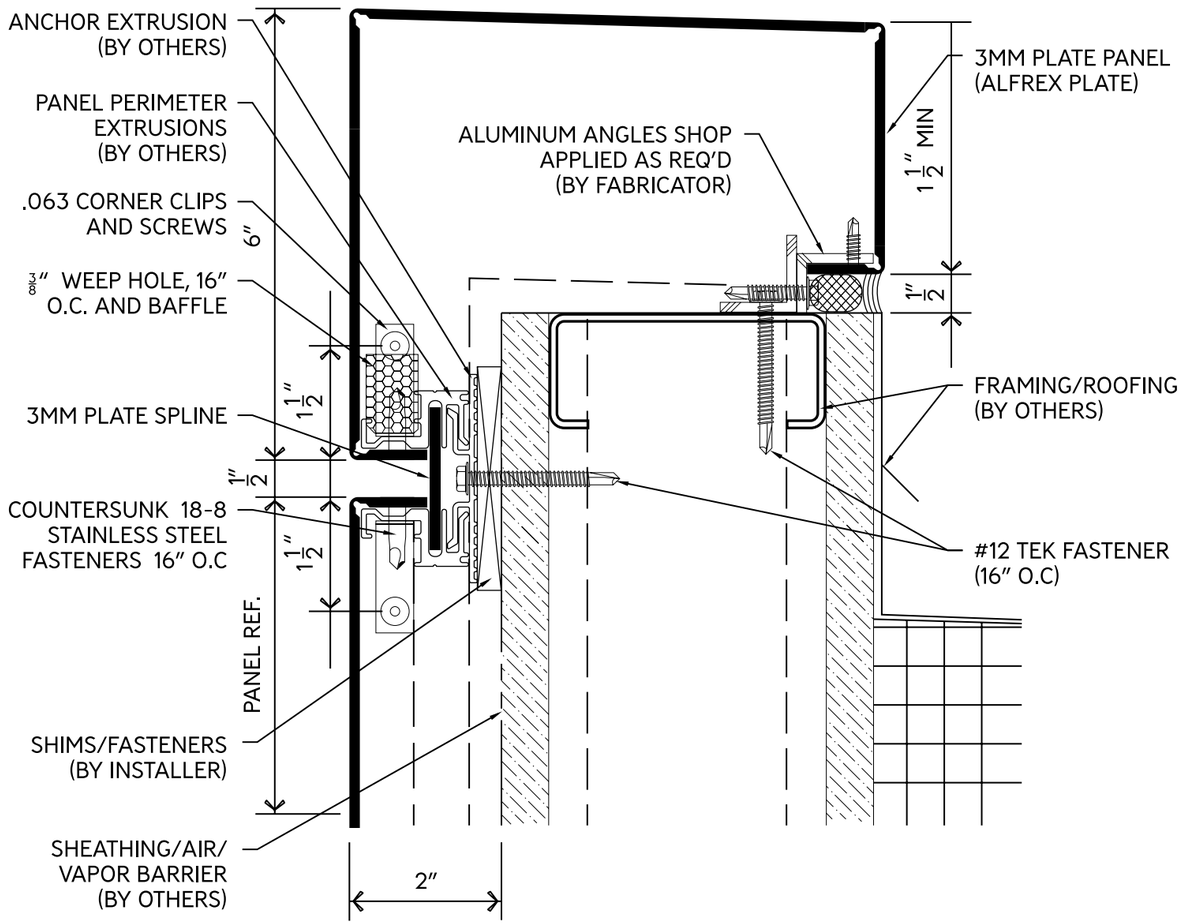
8 AL TERMINATION



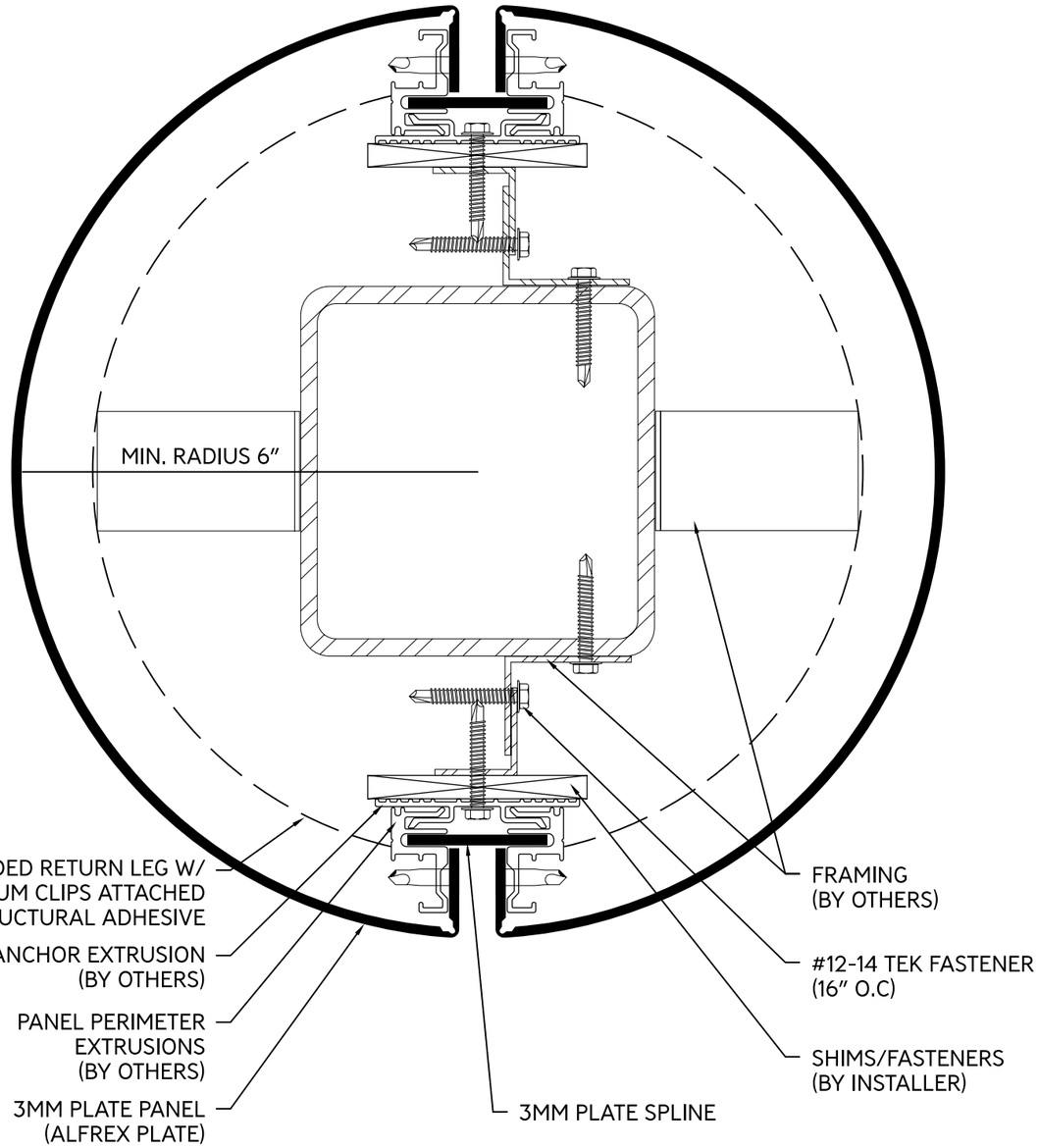
9 AL INSIDE CORNER



10 AL OUTSIDE CORNER



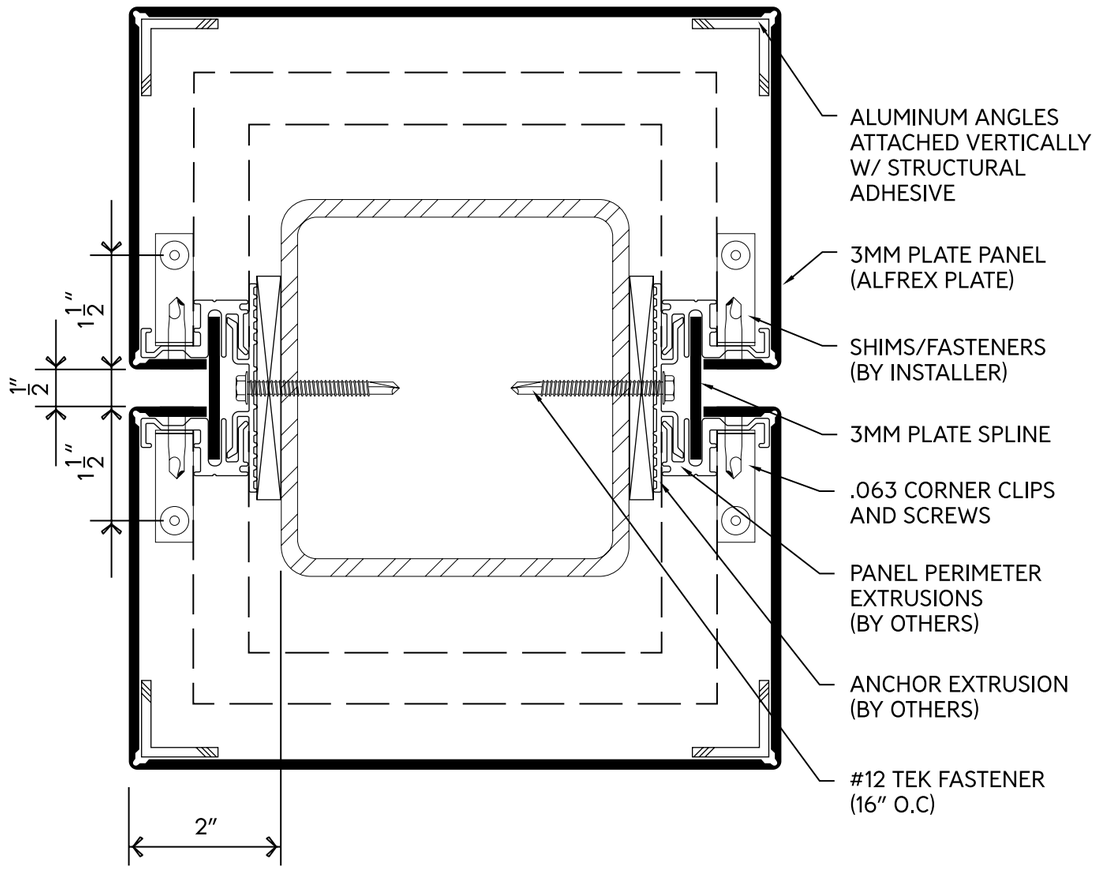
11 AL PARAPET OPTION 2



12 AL ROUND COLUMN COVER

alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com

GENERIC RAINSCREEN SYSTEM APPLICATION

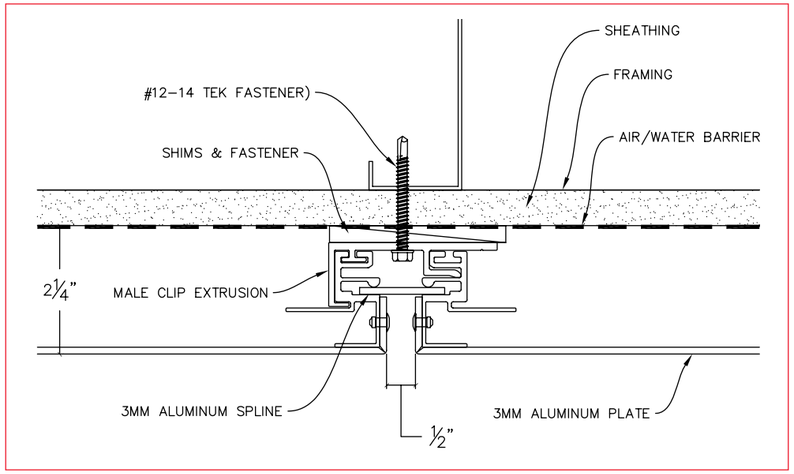


13 AL SQUARE COLUMN COVER

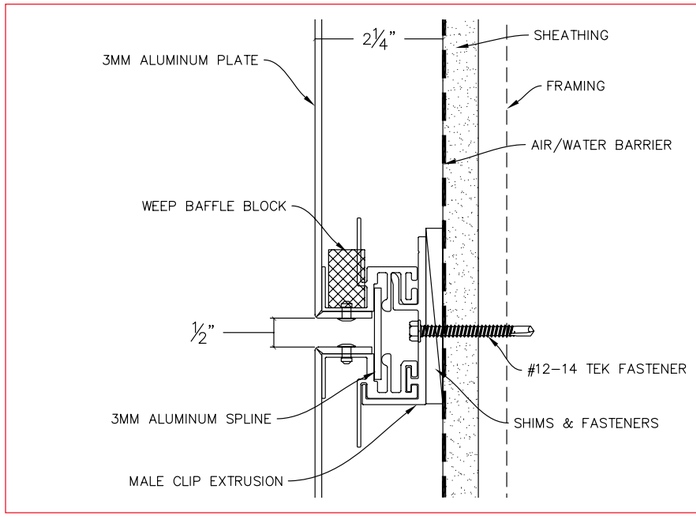
alfrex
943 Gainesville Hwy. Bldg 100-4000 Buford, GA 30518
470.589.7449 alfrex@alfrexusa.com

GENERIC RAINSCREEN SYSTEM APPLICATION

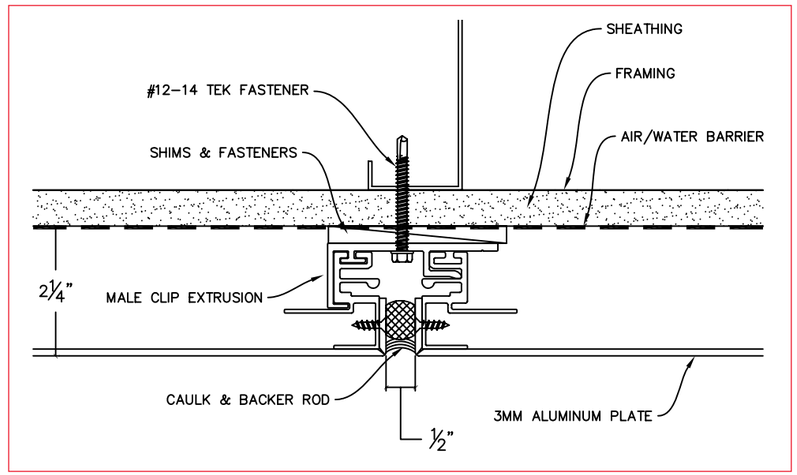
ACCU-TRAC® 3mm DS
Pressure Equalized Rainscreen System
Typical Vertical Joint



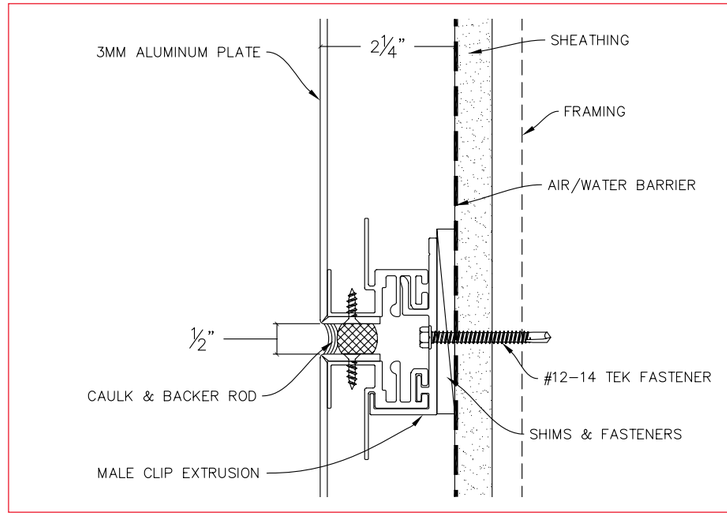
ACCU-TRAC® 3mm DS
Pressure Equalized Rainscreen System
Typical Horizontal Joint



ACCU-TRAC® 3mm ES
Route & Return Exposed Sealant System
Typical Vertical Joint



ACCU-TRAC® 3mm ES
Route & Return Exposed Sealant System
Typical Horizontal Joint



ALFREX PLATE SUPPORT DOCUMENTATION

CLEANING AND MAINTENANCE RECOMMENDATIONS

Alfrex Products

Fire Resistant & Non-Combustible Cladding

Alfrex, Inc. (Alfrex) Alfrex FR aluminum composite and Alfrex Plate panels are manufactured utilizing aluminum coils painted on continuous process coil coating lines. The high-quality architectural coatings used contain combinations of UV resistant resins, organic pigments, inorganic pigments, and protective clear coats engineered for long term exterior exposure in the elements and minimal maintenance.

Alfrex recommends that panels be cleaned on a regular basis in order to maintain their aesthetic appearance and to prevent the accumulation of dirt and particulate present in the local environment. The frequency and degree of cleaning is dependent upon several factor including the building location, proximity to bodies of fresh water or the ocean, local climate, pollution levels, proximity to heavy industry, and overall air quality. A general practice is to clean panels at the same time a building's windows are cleaned.

General Recommendations

- Always avoid the use of abrasive materials that pose a potential to scratch or degrade the painted surface of panels including, but not limited to, steel wool, wire brushes, metal scrapers, abrasive sponges, powder abrasives, and chemical abrasives.
- Commence cleaning at the bottom of building walls and progress upwards, working in the opposite direction of window cleaning, which traditionally progresses from top to bottom.
- To avoid streaking, cleaning should be done either on a cloudy day, or when areas of the building to be cleaned are shaded from direct sunlight.
- Regardless of the cleaning method used, the methods and materials should be first tested on either a product sample, or on a small, inconspicuous section of the building.
- Always start with a freshwater rinse and progress to the other cleaning methods from mildest to strongest as needed.
- It is recommended that more frequent cleaning intervals utilizing freshwater and mild detergents be employed as opposed to less frequent intervals which may require the use of harsher chemicals, solvents, and mild abrasive methods.
- NEVER use Acetone or Paint Removers on any painted product surface.
- Utilize personal protection equipment and proper safety precautions when handling solvents and other chemical agents to prevent chemical irritation or burns to the eyes, skin, or lungs.
- Follow closely cleaning product or chemical manufacturer recommendations regarding the mixing of certain chemicals in order to avoid the production of toxic gases or explosive chemical reactions.
- Only apply cleaning solutions, chemicals, or solvent solutions in conditions where panels can be rinsed with freshwater before the cleaning solution can dry. NEVER allow cleaning solutions to dry on the panels.

Freshwater Rinse

- Frequent freshwater rinsing of panel surfaces is ideal for the removal of water-soluble dirt, residues, and other organic material deposits. Mechanical pressure washers should not be used as this may damage panels, coated surfaces, or components critical for the function of the panel assembly.
- Annual freshwater rinses may be mandatory as stipulated in finish warranties under certain environmental conditions, such as proximity to salt-water and ocean mist. Please consult warranties for specific details.
- If surface contaminants or stains persist after freshwater rinsing, then the utilization of mild detergents is recommended.

Mild Detergent Cleaning

- For more persistent areas requiring deeper cleaning, Alfrex recommends that a 5% mild detergent solution diluted with freshwater be used and applied directly to the area using non-abrasive cloth, sponges, or soft bristle brushes.
- Mild detergents may be classified as those used in residential applications, commonly under popular brand names, which do not pose risks of irritation when coming in direct contact with exposed skin.

Intense Cleaning

- More intense cleaning methods may be required when mild detergent solutions are not successful in the removal of stubborn stains, or areas where non water-soluble contaminants such as paint, oils, tar, dirt, graffiti, silicone, or other sealing compounds are present.
- Alfrex recommends that a solution of Mirachem® 500 diluted to a 10% to 30% concentration be used before other common solvents or chemicals. Follow the manufacturer guidelines as well as the same processes detailed above in the general recommendations, always followed by a freshwater rinse.
- Solvents that may be used include alcohol solvents (ethanol, isopropyl alcohol, methanol), petroleum solvents (Turpentine, mineral spirits), aromatic solvents (xylene, toluene), ketones (MEK, MIBK), and esters (ethyl acetate, lacquer thinner). NEVER use acetones or paint removers.

STORAGE AND HANDLING RECOMMENDATIONS

Alfrex FR MCM - Alfrex Plate - Alfrex 0.040" Matching Flat Sheet

Fire Resistant & Non-Combustible Cladding

- Alfrex FR MCM, Alfrex Plate, and Alfrex 0.040" Matching Flat Sheet are cut to length and packaged in cushioned, reinforced pallets (skids) to prevent excessive sagging of the skid when lifting and moving via fork trucks.

- Pallets of Alfrex product should always be stored horizontally on flat surfaces that prevent sagging or shifting. Do not stack skids of MCM or Plate product higher than six skids high. Care should be taken not to stack multiple skids of heavier material on top of pallets containing only 0.040" flat sheet.

- Storage should be in a cool, dry area with stable temperatures to prevent formation of condensation. Sheets should not be stored where they can be exposed to moisture which may cause permanent surface damage. Situations where sheets may be subjected to standing water conditions should be avoided.

- Care should be taken when handling individual sheets during sheet fabrication. When lifted from each end, individual sheets will sag in the center as they are moved. Sagging should be minimized by having additional support in the center. Care must be taken to lift sheets high enough so that the sagging center sheet edge does not damage the surface of the sheet directly underneath as it is moved.

- Sheets of Alfrex product may be temporarily staged in "A-frame" racks commonly used with MCM and Plate sheets. It is not recommended that Alfrex product be transferred to other pallets not-supplied by Alfrex as they may sag excessively - inducing permanent set in the solid aluminum plate sheets which will manifest in sheet bowing when placed on CNC tables.

PERFORATED AND EXPOSED EDGE RECOMMENDATIONS

Alfrex Plate

Fire Resistant & Non-Combustible Cladding

Alfrex Plate may be perforated, or face fastened for design purposes however, special care and precautions must be followed in order to ensure proper performance of the coating finish when unfinished edges are exposed to the environment.

Definition

Perforated and Exposed Edge applications refer to fabricated sheet edges and open areas located on the panel surface, are visibly exposed to open atmospheres, and do not serve as a terminating edge of the sheet.

Perforation and Open Areas with Exposed Edges

- All perforation and related operations should be carried out using turret press, punch press, tooled break press, tri-axis water jet processing machines. Laser Jet or CNC fabrication of the sheet are not recommended as they can cause heat damage to the top paint layer, leaving exposed aluminum vulnerable to oxidization.
- The total perforated or open area of any individual sheet should not exceed 30% of total area of the sheet.
- The minimum distance between each perforated hole or open area is 1.5 x the thickness of the sheet, equating to 0.177" (4.5mm) for 3mm thick Alfrex Plate, and 0.120" (3mm) for 2mm thick Alfrex Plate.
- All perforated and other open areas with exposed edges must be located greater than or equal to 1.25" (32 mm) from the terminating edge of the sheet.

Face Fastened Panel Installation

- The following measures should be taken in order to prevent any bimetallic or galvanic corrosion between Alfrex Plate panels and the face fixing method:
- Only stainless-steel screws should be used.
- Spacers must be installed between Alfrex Plate and z-girts or hat channels.

Limited Finish Warranty

In cases where Alfrex Plate will be fabricated with perforations and open areas with exposed edges, a maximum 10-year limited paint finish warranty is available depending on the paint finish used. Conditions and limitations of the finish warranty for all perforated and exposed edge applications are listed in the Alfrex Plate Perforated Limited 10 Year Finish Warranty. Important highlights include:

1. The maximum finish warranty for face fastened Alfrex Plate sheet is 10 years regardless of the paint system used.
2. All perforated and exposed edge condition, fabrication processes, and equipment to be used for perforation and exposed edge area fabrication should be approved in advance by Alfrex in order to avoid nullification of the finish warranty.
3. Warranties will be issued only for installations located greater than or equal to 1 mile (1.6 km) from any coastline, saltwater, or brackish saltwater.
4. All perforated and exposed edge applications exposed to salt spray or within 1.5 miles (2.4 km) of salt-water or industrial atmospheres, as well as areas unwashed by rain exposure, must be maintained by washing with fresh tap water once every 6 months and documentation of this maintenance provided upon request.

alfrex

Fire Resistant & Non-Combustible Cladding

Alfrex, Inc.
943 Gainesville Hwy Bldg. 100, Suite 4000
Buford, GA, 30518
470.589.7449
alfrex@alfrexusa.com
www.alfrexusa.com