Alfrex Plate

FABRICATION & TECHNICAL **RECOMMENDATIONS**

alfrex

Fire Resistant & Non-Combustible Cladding

CONTENTS

GENERAL

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.

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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

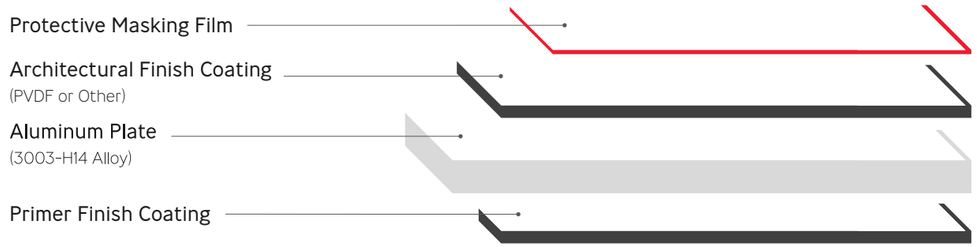
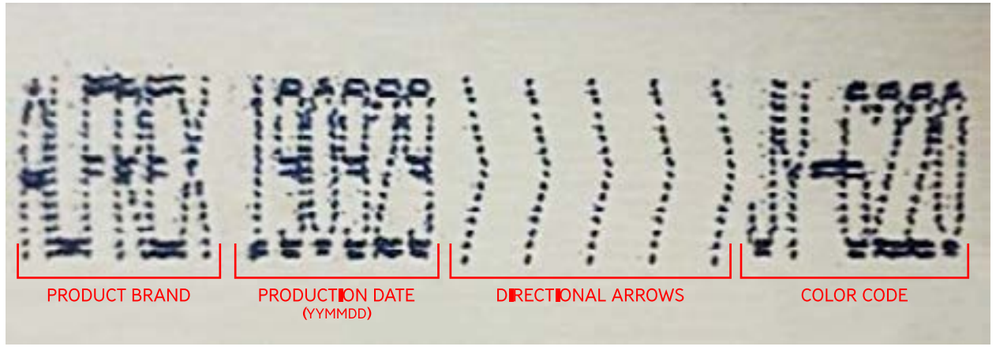


FIGURE 1.2

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.

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.

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

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

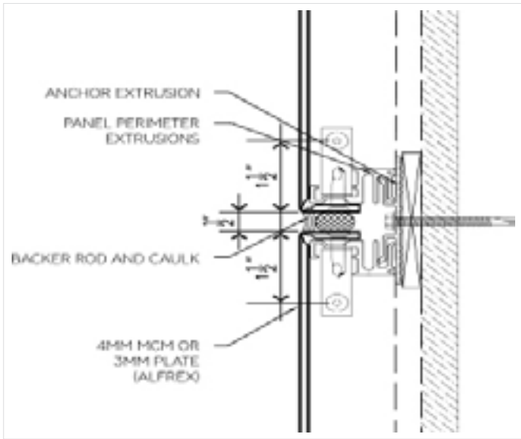
Alfrex Plate 3mm can be installed in the same manner as 4mm MCM albeit with slight modifications.

FIGURE 1.5

GENERIC RAINSCREEN SYSTEM

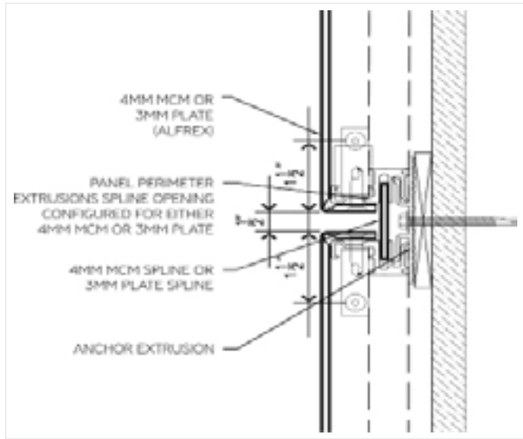
ROUTE & RETURN WET SEAL SYSTEMS

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.



FABRICATION

FABRICATOR RECOMMENDATIONS

GENERAL FABRICATION AND PROCESSING

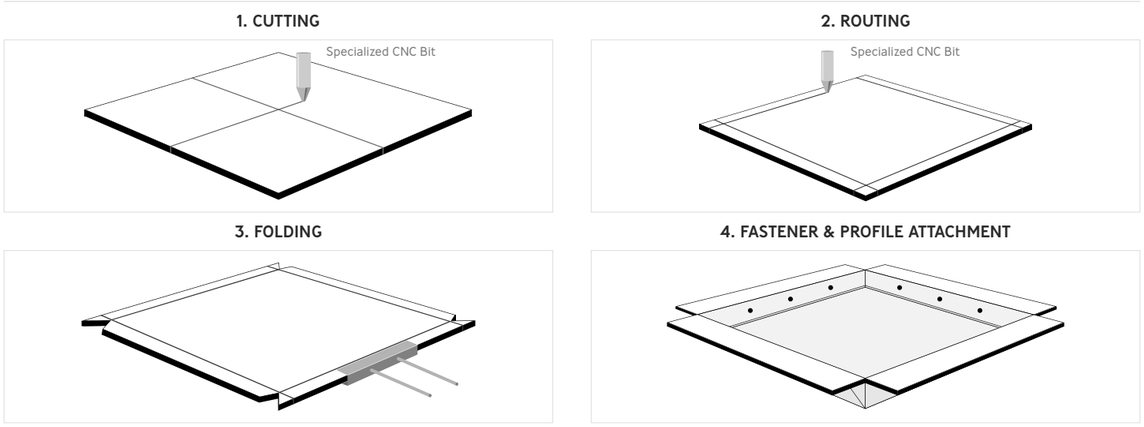
Alfrex Plate 3mm can be fabricated and processed using methods and techniques familiar to MCM fabricator with minor adaptations to processing and tooling.

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

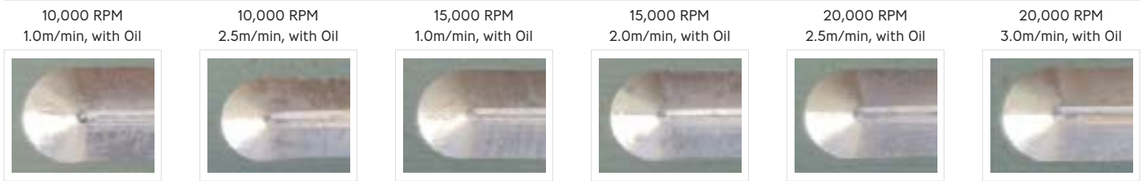
FIGURE 2.4

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

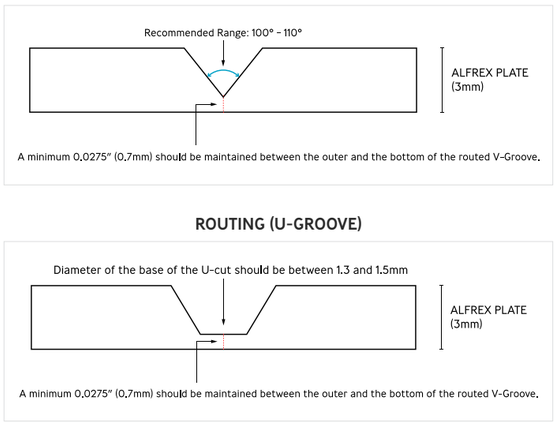
Successful results have been achieved employing rotation speeds between 15,000 - 20,000 RPM, with tool head feed rates between 40" - 118" (1,000 - 3,000mm) / minute. When routing grooves, the bottom of the groove should never reach the back of the aluminum sheet, with an ideal 0.0275" (0.7mm) of material 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.

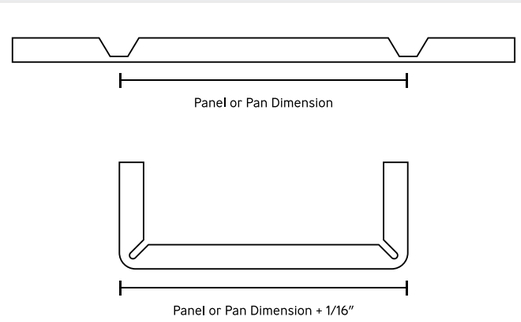
FIGURE 2.11

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.

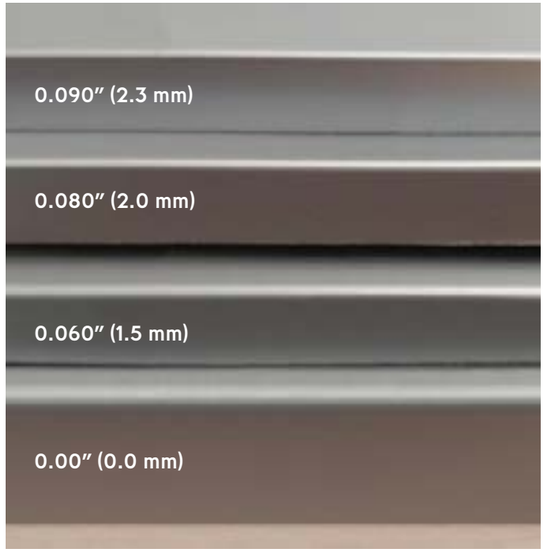


FIGURE 2.14

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.

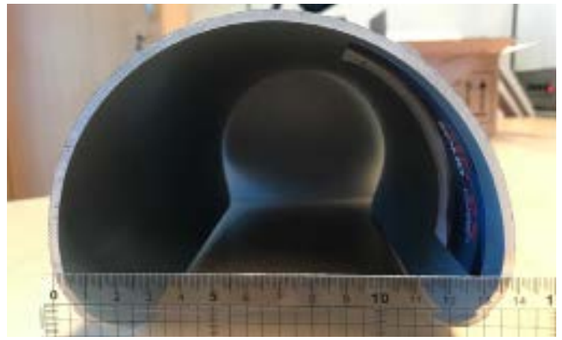
FIGURE 2.19

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

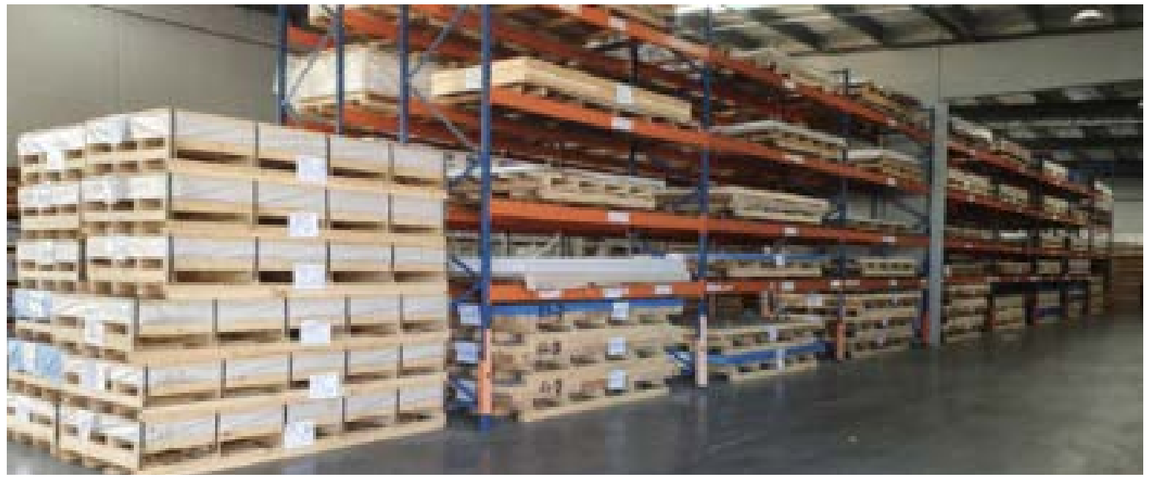


FIGURE 2.24

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.

TECHNICAL DATA

PRODUCT FABRICATION QUICK REFERENCE DATA

Alfrex FR Metal Composite Material and Alfrex Plate

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) 6mm FR : 0.008″ (0.20mm)	1/4″ (6.3mm) Power Shear with Rake Angle of 0.25″ per foot (21mm per meter) and 1° relief angle
		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

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)

PRODUCT FABRICATION QUICK REFERENCE DATA

Alfrex FR Metal Composite Material and Alfrex Plate

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)	5.5″ (140mm)
			6mm FR : 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)	0.012″ (0.3mm)
			6mm FR : 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	1.5 x Panel Thickness 0.177″ (4.5mm)
			4mm FR : 0.236″ (6mm)	
			6mm FR : 0.354″ (9mm)	
		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

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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 x 10^{-6}	in/in/°F (@ 68-212°F)
Modulus of Elasticity	ASTM E8	10.0 x 10^6	Psi
		69.0 x 10^3	Mpa
Moment of Inertia		1.37 x 10^{-4}	in^4/in
		5.7 x 10^{-3}	cm^4/m
Section Modulus		2.32 x 10^{-3}	in^3/in
		38.0 x 10^{-3}	cm^3/m
Tensile Strength	ASTM E8	20.3 x 10^3	Psi
		140.0	Mpa
Yield Strength	ASTM E8	17.4 x 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
	1,270	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 x 10^{-6}	in/in/°F (@ 68-212°F)
Modulus of Elasticity	ASTM E8	10.0 x 10^6	Psi
		69.0 x 10^3	Mpa
Moment of Inertia		4.27 x 10^{-5}	in^4/in
		1.69 x 10^{-5}	cm^4/m
Section Modulus		1.07 x 10^{-3}	in^3/in
		1.69 x 10^{-4}	cm^3/m
Tensile Strength	ASTM E8	20.3 x 10^3	Psi
		140.0	Mpa
Yield Strength	ASTM E8	17.4 x 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

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

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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.

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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.

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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.

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.

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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

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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

APPENDICES

ALFREX PLATE POST-PAINTING RECOMMENDATIONS

Alfrex Plate

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).

ALFREX PLATE 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.

PLATE BACKSIDE 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

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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.

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