

# Xalon RF Shielded Foil Panels (Aluminum)

## Installation Instructions 2020



The general procedure for installing Xalon materials starts with preparing the interior surfaces. Clean all surfaces, so they are free of dust and debris. Next, cover corners and edges followed by ceiling, floors and walls. If you are converting an existing room to an RF shielded room, each penetration (light switch, outlet, and telephone jack, HVAC duct, etc.) may require special attention. This will depend on the shielding performance desired. In most cases this means terminating the metallic wires in the outlet box, adding in EMI filters and surface mount conduit. After treating all penetrations, install the ceiling, walls and floor shielding. Then install any shielded doors, HVAC ducts, pipe penetrations and EMI filters. Test the room and repair any tears or leaks. The order on installation can vary depending on the project. Finally, apply the finish surface treatments.

***The suggested list of tools needed is as follows:***

Razor Knife or Scissors	Metal Shears or Nippers
Plastic Automotive Body Putty Squeegee	Gloves
Measuring Tape	Thin Butyl, nitrile or neoprene Gloves
Battery Powered Palm Sander	Framing Square
Xalon Foil Panels	Dust mask
Xalon Seaming Tape	Microfiber Towels
Xalon RF Shielding Panels	Ladder or Scaffolding

**General Instructions & Precautions:**

When installing Xalon Foil panels, wear gloves to protect hands from contact with the sharp edges of the foil and protect the foil from contamination from sweat and oils from the hands. The recommended gloves are butyl, nitrile or neoprene gloves with cotton inspection gloves over the top. The wearer will be more comfortable if another pair of cotton gloves is worn underneath the plastic gloves. In enclosed areas an evaluation should be made to determine if additional respiratory protection or engineering controls are needed. Xalon RF panels may be cut using standard cutting tools such as a razor knife and metal straight edge or a good pair of scissors. Xalon FP20 will require metal shears, nippers or saw to cut. Eye protection and gloves should be worn while cutting the foil.



## Cautions:

**For commercial construction (typical), make sure every metal stud (that makes up the RF shield room perimeter and ceiling, if required) is electrically connected to the building electrical ground or earth ground.**

Use electrically conductive screws. Avoid epoxy coated screws. Typical types are zinc coated or plated, steel, carbon steel or galvanized steel with self-drilling tip. Approved steel screw coatings are: zinc plated, nickel plated, galvanized, or black phosphate. Electrically conductive stainless steel screws are also acceptable in dry environment only, but not recommended. **Clear zinc coated steel, self-drilling, Scavenger Head Phillips screws are recommended. An example is Grabber (grabberman.com) Item Number 15SZ**

**Concrete Warning - Since aluminum is subject to attack by alkaline(s) it should NOT be allowed to come in direct contact with concrete or mortar. If aluminum in contact with concrete (or even other metals, like brass) and is subject to wetting (as would happen outdoors), the aluminum should be insulated from the concrete, mortar, or metal by adding a barrier like: plastic sheet, asphalt, sealer or paint, 6 mil plastic sheeting or a neoprene adhesive.**

## Installation Considerations

The principal method of installing **Xalon Foil Panels** on walls and ceiling are with zinc coated steel self-drilling screws or adhesive. For floors the Xalon FP20 panel installation, use a neoprene based contact adhesive. Ceilings can be shielded with **Xalon Foil Panels** or Xalon drop-in RF shielded ceiling panels for suspended ceilings.

All metals used in a shielded enclosure must be galvanically compatible or a difference of electrical potential could develop which can cause corrosion. The plates used for penetrations should be made from materials that are galvanically compatible with aluminum. Galvanized steel or zinc plated steel flashing is also permitted.

**1) Drywall or Class A Plywood:** The Xalon Foil Panels must be attached (adhesive or screws) to the interior of the Class A fire rated, first layer of sheetrock (typical) or Class A fire rated plywood (typical in areas that will have penetrations) Examples are a door, a window, an EMI filters, air vents and pipe penetrations. A safe way to go is to use Class A plywood for the entire first layer, instead of drywall.

**2) Use of Adhesive: (Recommended for applying to CMU, Concrete or any rough textured surface)**

Seal any masonry product first, then apply the adhesive to the surface via roller, brush or spray. Let dry until tacky. Apply the same adhesive to the **Xalon Foil Panels** with a roller, brush or spray. Follow adhesive manufacturer's application instructions. Apply the Xalon foil panels to the surface. See installation instructions below.

- ✓ Good ventilation should be available when using solvent-based adhesives. Wearing of respiratory masks is recommended. Please refer to the Material Safety Sheet for the adhesive, for any other precautions.
- ✓ **See concrete warning above.**

**3) Use of Staples or Nails: (Not Recommended)**

Do not use staples or nails to install the Xalon Foil Panels.

**4) Do not glue or screw the Xalon Foil Panels directly to the metal wall studs.** There must be a support layer installed to the metal wall studs first.

**5) Existing Room Surface Preparation (remodel)**

Remove all loose and peeling paint, patch holes and cracks. Allow new stucco, plaster and masonry to completely cure, until it is dry, then seal. Check all metal wall studs for electric continuity to ground with ohmmeter.

### Corner Installation

After the metal wall studs are checked for electric continuity and the first layer of drywall or Class A plywood (recommended) has been installed. Then install all the inside and outside corner flashing, the wall to wall, wall to ceiling and wall to floor flashing.

We recommend Class A fire rated plywood be installed, directly to the metal wall studs, instead of first layer of drywall, over the entire interior room, but at a minimum in areas that will have doors, windows, EMI filters, pipe penetrations, air vents, etc. installed. This will support the weight of the attached items and will not crush (like drywall) when clamped or screwed down.

If you have any door openings, window openings or large air vent openings, you should also install flashing now. Flashings are typically attached with the same screws you use to install the **Xalon Foil Panels**.

For quicker installation and better coverage over uneven areas, galvanized steel or aluminum flashing is recommended for corners and edges. (Highly recommended, see below, sold by others)

#### Premade corner flashings (26 to 28 gauge Galvanized Steel):

<https://flashingkings.com/> (Sold on amazon.com)

#### Premade L-Shaped Flashings (26 to 28 gauge Galvanized Steel or ≥ 0.010" Aluminum):

<https://www.gibraltarbldgproducts.com/> (Sold at Home Depot)

<https://tamcometalroof.com/metal-products/angle-flashing/> (Aluminum & Galvanized Steel)

[https://www.h-b.com/index.php?main\\_page=product\\_info&products\\_id=166](https://www.h-b.com/index.php?main_page=product_info&products_id=166) (Stainless Steel)

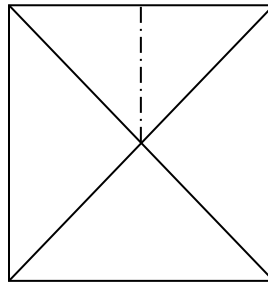


**If you are installing Xalon X25 or X250 Panels.** The standard is, the 2mil aluminum side faces towards the outside of the room and the 5mil aluminum side faces towards the inside of the room.

**For an inside corner**, using a straight edge and utility knife, you can score through the 2mil side and the core, leaving the 5mil side intact, then just bend the panel and install in to the corner.

**For an outside corner**, using a straight edge and utility knife, you can score through the 5mil side and the core, leaving the 2mil side intact, then just bend the panel and install on to the corner. Then using the 4" wide, 5mil (XALON ST4 Seaming Tape) tape around the corner.

**Another Option is to fold your own flashing out of foil seaming tape (Not Recommended).** The three-way corners should be installed in the upper four corners of the room first. The installation is accomplished by cutting the **Xalon Seaming Tape** into a 6 inch square, creasing the material into four quarters, and then folding the material back onto itself into a three-way corner. To insure a good bond, apply the adhesive to the mounting surface and the back of the **Xalon Foil Panels** using a paint roller. Place the foil into the room corner and roll with the rubber roller until smooth. Be sure to fit the foil flush on all sides since most corners are not square. The 6" wide ST-6 tape is good for this.

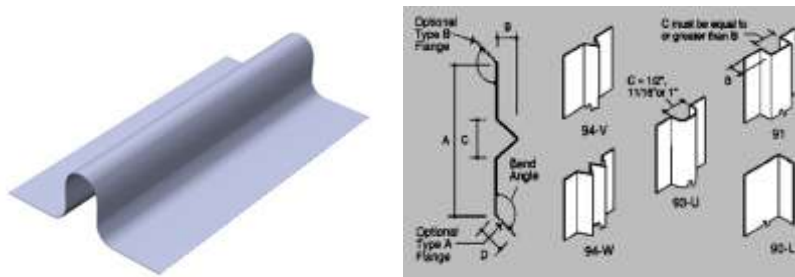


Treat outside and irregular corners the same way. Fold a 6 inch square piece of aluminum foil into quarters, then unfold and place over the corner. Insure that there are no tears or gaps inside the corner. Where these join the floor and ceiling, make sure material overlaps on all sides by at least three inches (8 cm) for the two-way corner, cut the material 12 inches (30 cm) wide and the full length of the wall, from 3-way corner to 3-way corner with a 3 inch (8 cm) overlap at each corner. Fold the material 90 degrees and install as described above.

Install your eight corners first, then cover all of the perimeter corners with 6" wide ST-6 foil tape. Wall to wall, wall to ceiling and wall to floor corners are easily accomplished with 6" wide foil tape with PSA. This will make the ceiling, floor and wall panels much easier to install.

**Shielding Over Expansion Joints**

**Xalon Foil Panels** are flexible, but not designed to bridge across expansion joints and will fail, over time. In most cases the expansion joints must be bridged with an aluminum flashing that is designed to handle the expansion and contraction. This typically occurs in prefabricated concrete panels and between wall and ceiling joints. There are different many different ways and designs to accomplish this, below are a few examples



Heckmann Building Products



## Ceiling Installation

For RF shielded ceilings that have non RF shielded suspended or drop ceilings, cover the ceiling with the Xalon Foil Panel shielding, in the same way you would install the walls (see below).

For RF shielded suspended or drop ceilings, see our separate installation sheet (Installation of Xalon RF Shielded Ceiling Panels.pdf)

## Wall Installation

**Double check that all the metal wall studs are electrically connected to a good ground.**

Install the first layer of drywall or recommended Class A plywood to the metal wall studs.

Install the galvanized steel or aluminum corner and L shaped flashing around the perimeter and the openings of the room. If you are installing Xalon X25 or X250 Panels, see the corner installation above.

You can install the Xalon panels either vertically or horizontally. Horizontally is recommended.

### Install the **Xalon Foil Panels**

For horizontal panel installation (recommended). Typically 15 screws for full 4" H x 8' W panel on 16" OC studs  
One in the center area of the panel,

One in each metal stud about 1/2" off the panel edge, at the top and bottom of the panel,

One in the metal stud about 1/2" off the panel edge, at the sides of the panel, halfway between the top and bottom screws.

For vertical panel installation. Typically 15 screws for full 8" H x 4' W panel on 16" OC studs

One in the center area of the panel,

One in each metal stud about 1/2" off the panel edge, at the top and bottom of the panel,

Three in the metal stud about 1/2" off the panel edge, at the sides of the panel, equally spaced between the top and bottom screws.

Making sure the screws drill in to the metal wall stud. If you miss the stud, remove the screw and put a 2" x 2" minimum patch of 5mil EC PSA aluminum seaming tape (the same tape you will seam tape the panels with is fine).

Check, using an ohmmeter the electrical continuity between the Xalon foil panel and your ground (typically an exposed metal wall stud). If the panel has a good ground, you can go on to the next one. If the panel does not show a good ground add more screws to the panel until a good ground is achieved. Zero ohms is not required, but should be less than 10 ohms.

## Cutting a Xalon RF Foil Panel

All Xalon RF foil wall panels can be cut with a razor/utility knife and straight edge. The 0.020" (20mil) FP20 floor panels can be cut with manual, pneumatic or electric metal shears.

The Xalon X25, X250 and FR20 panels can just be cut to the size you need, no further action required.

The Xalon X5000 panels can be cut to size, using a utility knife and straight edge. But then, you must seal the cut edge with Xalon ST-3 or ST-4 seaming tape.

**Applying the EMI Foil Seaming Tape (To Interior Side of Xalon Panel Only- This is Typical)**

Scotch Brite and Clean the already applied Xalon foil panels, about 2 to 3 inches on both sides of the seam, Scotch Brite first and then wipe the seam clean with a clean microfiber cloth or towel, before applying the foil seaming tape. This removes any oxidation, dust, oil or dirt that may cause the foil tape not to stick properly.

A faster way is to use a battery powered palm sander (picture below) with 5" round sanding disc, with 220 grit sandpaper instead of the Scotch Brite above.

Use an automotive body putty squeegee (picture below) to press and smooth the seaming tape out as you go.

Don't forget to sand, clean and tape the stand alone screw heads, typically in the middle of the Xalon foil panels.



Scotch Brite or sand, wipe down with microfiber towel and seam tape one seam at a time, i.e. do not clean all the seams in the room and come back and tape. Sand, Clean and Tape as you go.

**Caution - Seam taping inside corners** When you seam tape the inside corners with the foil seaming tape, the foil tape most likely have a radius curve in the corner(s). The solution is to have the edge(s) beveled on the layer of drywall being installed on top of the foil panel, in the corner(s), so not to rip out the foil seaming tape seam.



**4" Electrically Conductive Foil Tape**

Recommended method is to butt joint the **Xalon Foil Panels** and tape the seams with ST-4 aluminum foil tape with electrically conductive PSA. A minimum 2" seam overlap on both sides or 4" wide tape is recommended.



**Applying the EMI Foil Seaming Tape (To Exterior Side of Xalon Panel - This is for Increased SE Performance)**

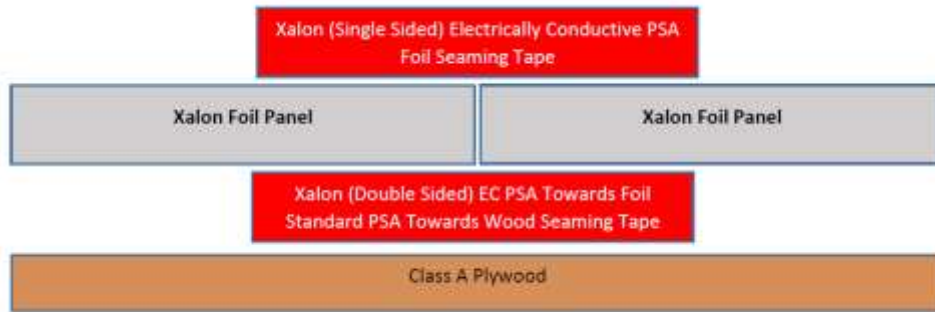
Essentially, you are seam taping the exterior of the Xalon foil panels for added shielding effectiveness performance.

Install your outer layer of Class A plywood. Then install your premade corner(s), window(s) and door(s) flashing.

You will need to locate all your panel seams and mark them on the plywood, then using the Xalon ST-6x180-2s tape for X5000 panels or Xalon ST-6x180-2s-2m tape, for X25 or X250 panels, apply the standard PSA side to the plywood, centering the tape on the panel seams. The standard PSA and electrically conductive PSA sides will be marked.

When you are ready to install a panel, pull the release paper off the seaming tape and install the panel as described above.

Then just follow the instructions above to seam tape the interior side of the Xalon foil panel - Applying the EMI Foil Seaming Tape (To Interior Side of Xalon Panel Only- This is Typical).



**4" Electrically Conductive Foil Tape (Inner Tape)**  
**6" Double Sided Foil tape (Outer Tape)**

Recommended method is to apply the ST-6-2s double sided aluminum foil tape to the plywood, then butt joint the **Xalon Foil Panels** and then tape the inner seams with ST-4 aluminum foil tape.

**Mounted In the Wall Electrical Components**

If you want your electrical conduit, light switches and electric outlets mounted in the wall, you will have to install Z-channel or hat channel on top of the Xalon foil panels, after they have been fully seam taped. The channels are usually installed horizontally, with the screws taped over with ST-4 tape. Then run your conduit, add insulation as desired and then the inner drywall finish layer. You can also install a double wall or false wall, to accomplish the same effect.

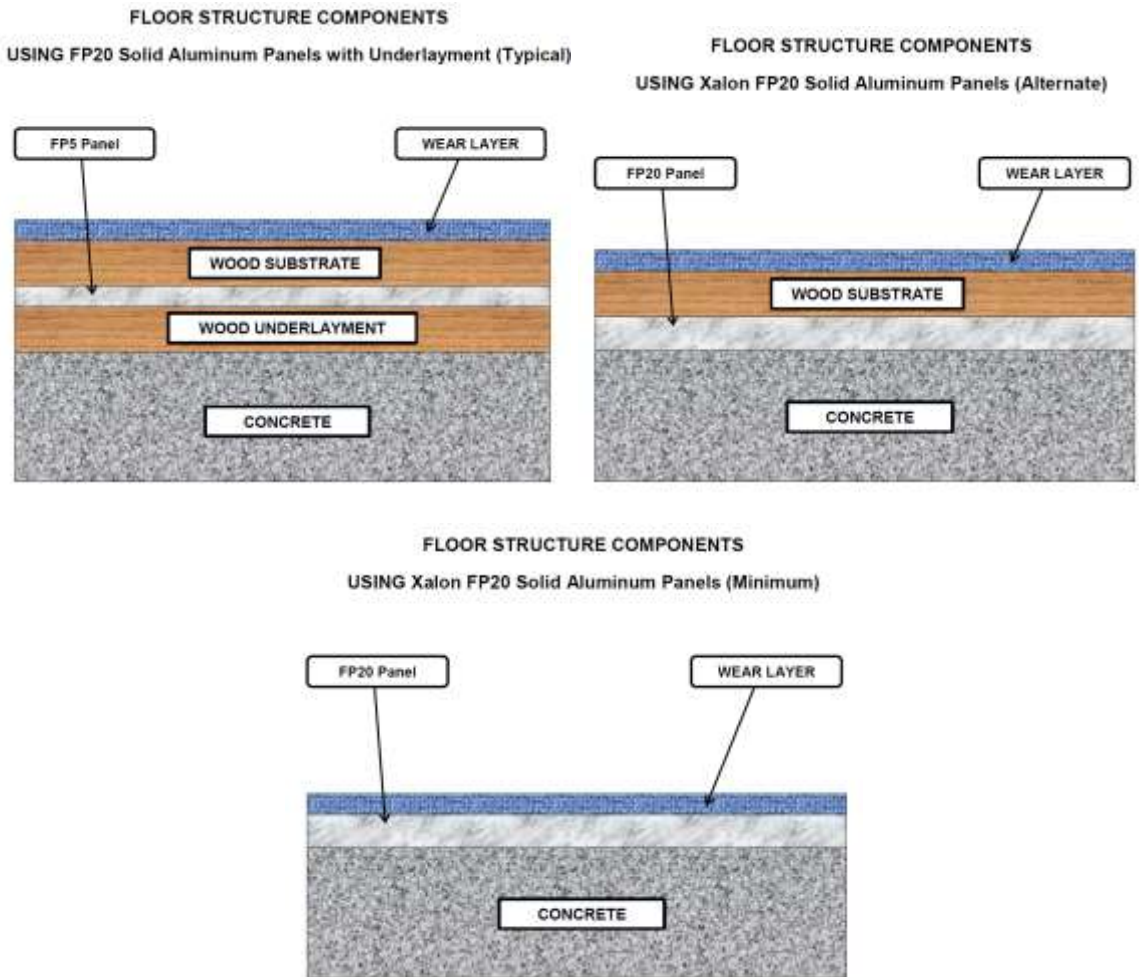


**For Unshielded Partition Walls Located Inside the Perimeter Shield**

Please contact Xalon Sales or RA Mayes Sales, for your application.

**Floor Installation**

- 1) Best Method - For FP20, 4' x 8', solid aluminum panels, glue down a wood underlayment on top of the concrete first. Then glue down the FP20 panels. Then seam tape the FP20 panels with ST-4 or ST-t-cu seaming tape. Then glue a wood substrate (hardboard or plywood) on top of the FP20 panels. Finally, apply the final floor treatment.
- 2) Alternate Method – For Xalon FP20 4' x 8' solid aluminum panels, glue the panels directly to **sealed** concrete. Then seam tape the FP20 panels with ST-4 or ST-t-cu seaming tape. Then glue a wood substrate (hardboard or plywood) on top of the FP20 panels. Finally, apply the final floor treatment.
- 3) Minimal Method – For Xalon FP20 4' x 8' solid aluminum panels, glue the panels directly to **sealed** concrete. Then seam tape the FP20 panels with ST-4 or ST-t-cu seaming tape. Then glue the final floor treatment. This is typically peel and stick carpet tile, vinyl tile or ESD tile.





**Installation of Penetrations and Doors**

We recommend Class A fire rated plywood be installed, directly to the metal wall studs, instead of first layer of drywall, in areas that will have doors, windows, EMI filters, pipe penetrations, air vents, etc. installed. This will support the weight of the attached items and will not crush (like drywall) when clamped or screwed down.

Install your penetrations, after installing the premade flashing and the Xalon RF shielded foil panels over the entire interior surfaces of the room.

It is essential that the aluminum foil panels and/or tape is under the penetration flange, nut or washer, to insure a good electrical bond, then apply Xalon seaming tape over the flange or washer and at least two inches on the wall around the penetration flange.

**RF Shielded Door Installation**

The RF shielded door is the most important of the penetrations in a shielded enclosure. It is generally the weakest link in the system and the most difficult to maintain due to its high usage. We recommend the SRG ULTRA-RF/A doors for new and retrofit applications. These doors meet most of the typical Tempest SCIF requirements and are STC 50 (or NIC 50) rated acoustic performance, also they have a rated ballistic option. RCM type, 100dB to 40GHz doors are also available. Shielding Resources Group, Inc. (SRG) is a Certified Installer for Kaba Mas LLC & Lockmasters Inc. products. See SRG Door Installation Manual.



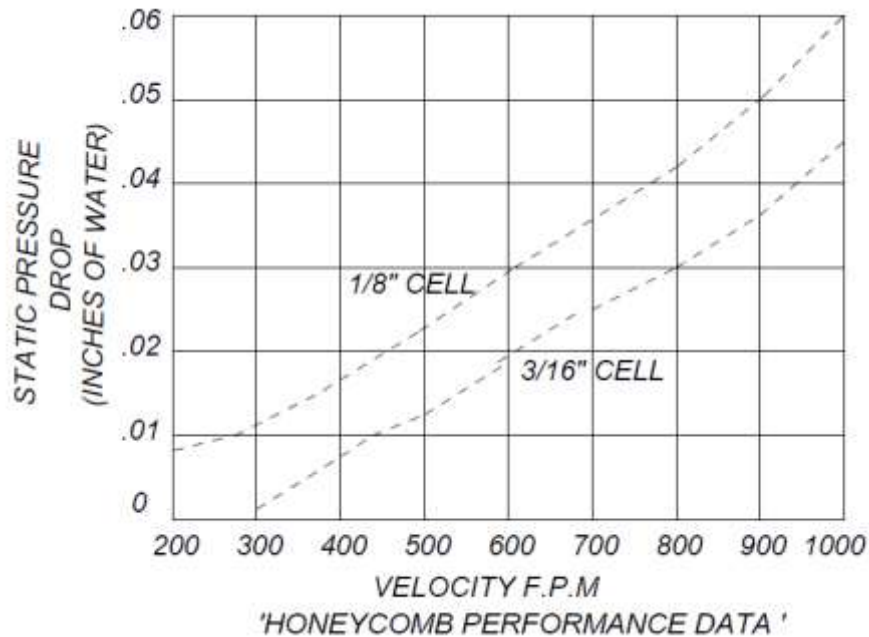
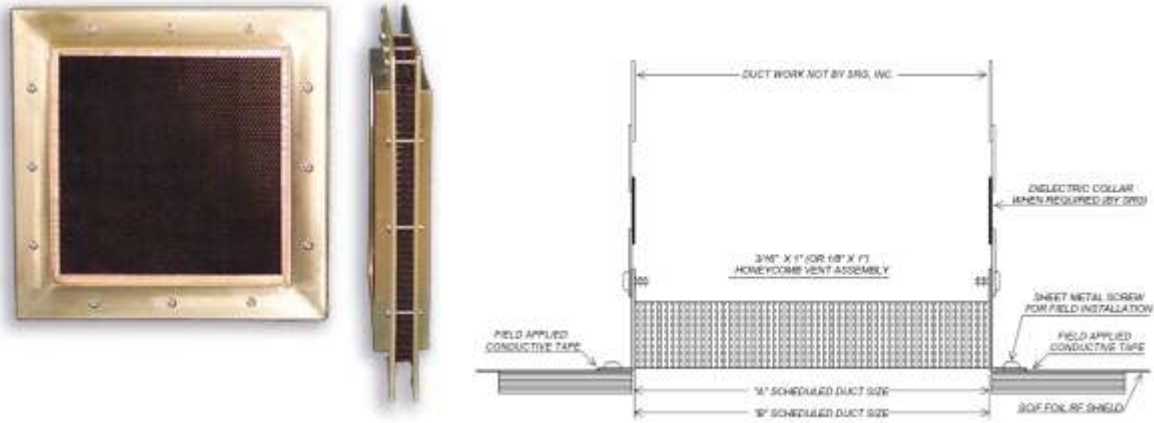
**SRG ULTRA-RF/A Shielding Effectiveness Performance**

The ULTRA-RF/A (Standard Version) provides the following performance levels when tested in accordance with IEEE 299, NSA 94-106 and NACSIM 5204:

Magnetic Field		Electric Field		Plane wave		Microwave	
10 KHz	30 dB	10 KHz	100 dB	50 MHz	100 dB	2 GHz	70 dB
100 KHz	50 dB	100 KHz	100 dB	100 MHz	80 dB	4 GHz	65 dB
1 MHz	60 dB	1 MHz	100 dB	400 MHz	80 dB	8 GHz	60 dB
10 MHz	75 dB	10 MHz	100 dB	1000 MHz	75 dB	10 GHz	60 dB
30 MHz	90 dB	30 MHz	100 dB	12 GHz	55 dB	18 GHz	40 dB

**HVAC Vent Installation**

All HVAC (Heating, Ventilating and Air Conditioning) piping requires special treatment when penetrating a shielded surface. For high performance applications, each entrance is equipped with shielded vents consisting of honeycomb material mounted in a frame set in the wall or ceiling of the enclosure. The 2" to 3" wide sheet metal frame provides good electrical contact between the Xalon foil panel shielding material and the vent. After they are installed, seam tape over the air vent flange with ST-4 tape. Static pressure drop data, due to the honeycomb in the vent is below.



**Electromagnetic Interference (EMI) Filter Installations to eliminate Conducted Emissions**

**DO NOT PUNCH ANY HOLES THROUGH THE WALLS!** Distribution of power and signal cables around the room is usually accomplished using a product similar to Wiremold 6000 wire duct around the lower edge of the room. The power distribution is entirely INSIDE the room. If retrofitting an existing room with existing wall outlets and switches, remove the plugs, and cover the opening with a flat metal plate or heavy foil before installing the Xalon Foil Panels.

**All metallic wiring entering the RF shielded space must be EMI filtered**, including AC power, DC power, telephones, Ethernet, thermostats, fire sprinkler controls, computer lines, fire alarms, and intercoms. The key to a proper installation for these devices is to be sure that the filter impedance properties are matched to the device being filtered. If the proper filter is not selected then the system in most cases will not function properly. It is best to discuss specific applications with an EMI filter specialist (call or email us).

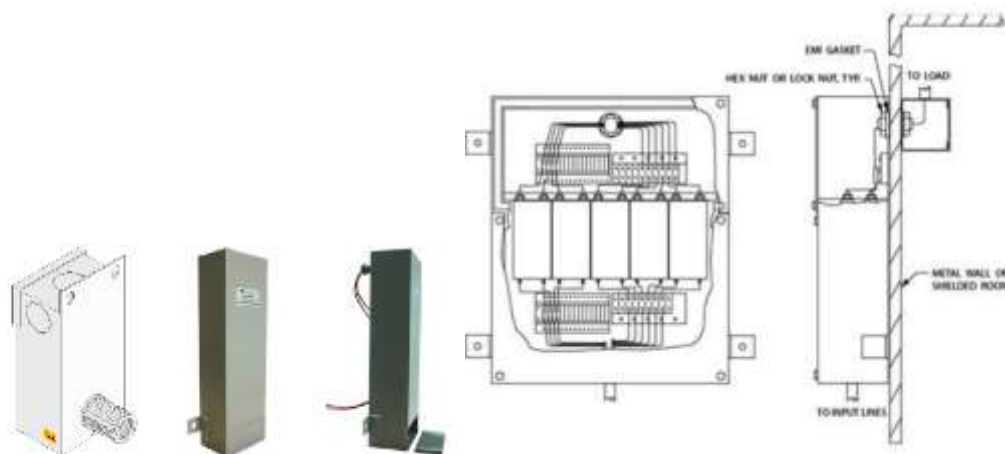
**If you do not put EMI filters on all metallic wires entering the RF shielded enclosure, it is just like having a bidirectional antenna installed in the wall, that will bring conducted signal in and conduct signal out, leaving your RF shielding useless. You must have EMI filters installed to eliminate the conducted emissions, coming and going into the RF shielded area.**

For new construction and for rooms with many (more than 6) electrical outlets, the most cost effective method is often single entrance filtering. The advantage of single entrance filtering is that only one power-line filter is required. The disadvantage is that the power must then be run to each outlet within the shield, usually in conduit. It is recommended the conduit be installed AFTER the final room finishes are installed and installed using pressure sensitive adhesive. If screws are used, be careful to maintain a metal-to-metal seal is made between the screw and the RF shielding.

Install all of the electrical system components in accordance with National Electrical Safety Code. The shielded enclosure (power line filters) should have its own dedicated circuit if possible. Match the wiring, circuit breakers, and other electrical components to the amperage rating of the filters.

Run conduit and wiring from the circuit panel directly to the filter. The EMI power filter is treated just like an electrical panel, so for EMI filters serving between 120 volts and 250 volts, the regulations require a minimum of three feet of clearance. The width of the working space in front shall be 30 inches minimum or width of the equipment.

If you are using Z-channel or hat channel on top of the Xalon foil panels your electrician can install all of the distribution boxes, conduit, wiring, switches, lighting, etc. All of the electrical components are standard commercial items.



### Pipe Penetrations

The pipe penetration consists of a metal pipe that is silver soldered or welded onto the plate. The pipe is sized to provide waveguide beyond cut-off operation at the highest operating frequency. Commonly used for air lines, water lines, fiber-optic lines and exhaust lines. No metallic wires are allowed to go through the pipe penetrations,



RF Waveguide Pipe Penetrations

### RF Shielded Windows

In retrofit applications, remove the old window and use its rough opening to size the new RF shielded window. In new construction, the window is roughed in on all four sides. Install your premade flashing or wide seaming tape, like the ST-6 over and into the rough opening, then install your Xalon foil panels, taping all the seams and finally install the window from the inside. Screw the inside window flange through the **Xalon Foil Panels** around the perimeter of the window opening using the mounting screws to bring pressure on the shield. Then place a second layer of ST-4 or ST-6 around the flange to assure a good RF seal.

### Light Switches

All electrical penetrations from outside the shielded enclosure must be shielded and EMI filtered. Either surface mount them or install Z-channel or false wall, where you can run your conduit and install your outlet and switch boxes. Then use standard commercial electrical components on both inside and outside the RF shielded area.

**Removable RF Shielded Panels**

Use removable panels for mounting groups of connectors used for instrumentation. The panels require special care since the connection between the frame and the shielding can be strained with multiple removals of the panel. The size of the panel is based upon the number of connectors that need to be mounted in the shielded wall for fiber optics, data lines, coaxial connectors, etc.



**RF Shielded Ceiling Inspection Hatches**

The ceiling inspection hatches are installed, just like a window or door, see above. Make your ceiling has framing around the entire opening.



**Shielding Repairs**

Repairing **Xalon Foil Panels** is a matter of providing adequate contact between the repair and the original material. Remove the finish and/or drywall to expose the Xalon foil panel inner aluminum foil layer for a distance of 3 inches (8 cm.) around the damaged area. Then use Xalon seaming tape to patch over the damaged foil, insuring that there is sufficient contact between the original shielding material and the new patch to provide electrical conductivity. Then patch in your drywall and refinish.





## GROUNDING SHIELDED ROOMS LINED WITH FOIL

There are different methods to grounding shielded rooms, lined with foil or built as a structure. The following method is the most appropriate and works effectively in grounding a foiled lined room.

EMI Foil lined RF shielding uses a multipoint grounding system. A single point ground does not work with EMI foil systems, due to the resistance in the electrically conductive adhesive on the seeming tape.

Make sure the metal wall studs are tied to earth or electric ground, per code.

After the first layer of sheetrock or class A plywood and the foil shielding is installed, use electrically conductive sheetrock screws (Avoid epoxy coated screws). Typical types are steel, carbon steel or galvanized steel with self-drilling tip. Approved screw coatings are: no coating, black phosphate or zinc. Electrically conductive stainless steel screws are also acceptable) to install the second layer (inner layer) of sheetrock. The screws will electrically bond every foil panel to ground, effectively grounding the complete foil RF shield.

EMI foil shielding of the floor can be problematic, due to lack of metal studs in the floor (typically concrete). Continuous copper foil strips may be required to bring the grounding out onto the floor before foil or panels are installed. Depending on the shielding effectiveness required, this may or may not be required.

Since aluminum is subject to attack by alkaline(s) it should not be allowed to come in contact with wet concrete or mortar. If aluminum in contact with concrete (or even other metals) is subject to wetting (as would happen outdoors), the aluminum should be insulated from the concrete, mortar, or metal by adding a barrier like: asphalts, several coats of paint or sealer, 6 mil plastic sheeting or a neoprene adhesive.

Please contact us for the best and most economical solution.

### Disclaimer

"The information in this installation guide is to our knowledge true and accurate, but all instructions, recommendation or suggests are made without any guarantee. Since the conditions of use of the product are beyond our control, we disclaim any liability for any loss or damage suffered from use of the product, or the instructions, recommendations or suggestions contained herein. Furthermore, no liability is accepted if use of any product in accordance with these instructions, recommendations or suggestions infringes any patent." The information in this Technical Data Sheet, although believed to be accurate, is not to be taken as a warranty

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