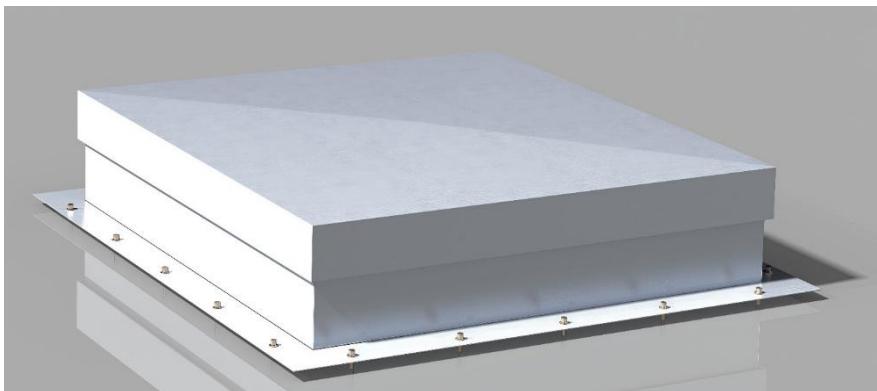




## Explosion & Blast Relief Roof Vents

### Technical Data Sheet – Installation and O & M Information



For use in applications where there is a high risk of an internal explosion, or detonation, generated from the storage of gaseous, flammable or materials containing fine particles of dust.

#### Features

- Release value to meet customer specification
- Bespoke sizes to meet customer dimensions
- FM Approved Release Bolts

#### Product Description

Our Explosion & Blast Relief Roof Vents offer a solution to protect facilities from blast events, intended to relieve blast loads and to prevent structural damage and injury to personnel.

#### Advantages

Our Roof Vents are bespoke products made with specialist materials for applications in a variety of climates and conditions.

We use FM Approved Release Bolts to provide customer confidence in our products and also for Health and Safety Executive requirements.

#### Areas of Application

- Chemical Production
- Petroleum Industry
- Paint/Varnish Manufacturers
- Energy/Mining Industry
- Co-Generating Plans
- Hydrogen Applications
- Lithium Battery Storage
- Automotive
- Grinding/Pulverizing
- Paper Process
- Hospitals (Gas/Flammable)
- Brewery Facilities
- Fossil Fuel Plants
- Food Processing
- University Laboratories
- Nuclear Power Stations



## Specification

| <b>PROFILE</b>                               |   |
|--|---|
| <input checked="" type="checkbox"/>          | Fabricated Aluminium Base and Top Assembly  |
| <input checked="" type="checkbox"/>          | Main Body 153mm high  |
| <input checked="" type="checkbox"/>          | Top Panel 62mm high   |
| <b>FINISHES</b>                              |   |
| <input checked="" type="checkbox"/>          | Mill finish Aluminium as standard   |
| <input checked="" type="checkbox"/>          | Other finishes on request   |
| <b>AVAILABLE SIZES</b>                       |   |
| <input checked="" type="checkbox"/>          | Standard size nominal 1220mm x 1220mm   |
| <input checked="" type="checkbox"/>          | Bespoke sizes made to order   |
| <input checked="" type="checkbox"/>          | Overall finished size – add 250mm in each direction to the roof aperture size cut out   |
| <b>WEIGHTS</b>                               |   |
| <input checked="" type="checkbox"/>          | Top lid assembly 9.80kg/m <sup>2</sup> meeting FM Global Approved 1-44  |
| <b>STANDARDS - REFERENCES</b>                |   |
| <input checked="" type="checkbox"/>          | FM Global Loss Prevention 1-44 Rev 2023 Venting Class of Work 4440 Vent Releasing Product   |
| <input checked="" type="checkbox"/>          | Designed with regard to NFPA 68 guidelines – design, location, installation, maintenance of Venting (Standard on Explosion Protection by Deflagration Venting) 2023   |
| <b>THERMAL PROPERTIES</b>                    |   |
| <input checked="" type="checkbox"/>          | All panels are insulated with minimum 50mm EPS70 insulation FR if required  |
| <b>EXPLOSION RELEASE VALUES</b>              |   |
| <input checked="" type="checkbox"/>          | FM Approved release bolts are manufactured in a range of values. EXA 74, EXA 76, EXA 79, EXA 84 – and the Blast Release Roof Vents use these in various combinations to provide the Blast Release value that is required in each application. |
| <b>TOP RELEASE PANEL EXPANSION ALLOWANCE</b> |   |
| <input checked="" type="checkbox"/>          | Explosion Release Assembly Units incorporate expansion and contraction mechanisms   |
| <b>FIXING HOLE POSITIONS</b>                 |   |
| <input checked="" type="checkbox"/>          | See drawing – Prepared to industry standard to accept up to 20 fixings or as detailed by client   |
| <b>RESTRAINTS</b>                            |   |
| <input checked="" type="checkbox"/>          | Restraint cables included   |



## FM Approved Blast Release Bolts

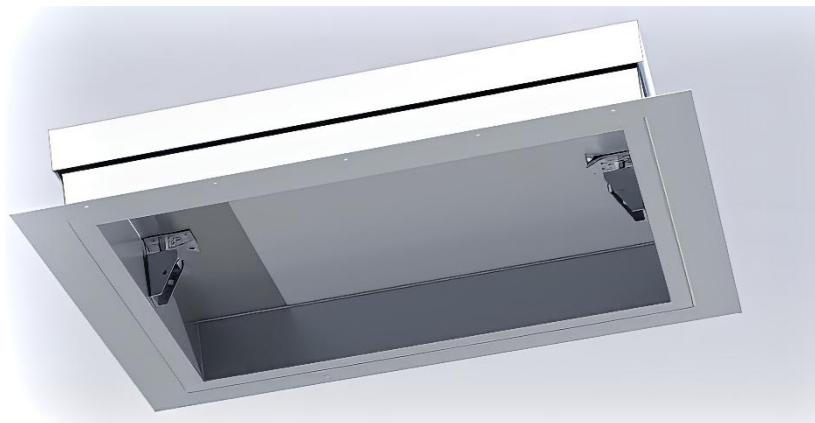
FM Global (Factory Mutual Insurance Company) has underwritten a wide range of Blast and Explosion Mitigation products. This product is constructed to those guidelines see – FM Global Property Loss Prevention Data Sheet 1-44 sub section 2.1.4 Pressure Relieving Vent Panels.

In addition, all explosion release bolts are fully FM Approved and provide a range of release values for this safety product.

Release assembly units and FM Approved Release Bolts are positioned internally and are easily accessible for maintenance or adjusting the release requirements.

All venting systems rely to the greater extent on an equal balance of pressure across its surface for optimum performance. This is important to keep in mind because not all explosions can be so predictable. Internal explosions are notoriously difficult to determine because there is a pressure wave and a gas wave that reflect internally off walls and other fitments and in doing so create elevated levels of pressure in various locations.

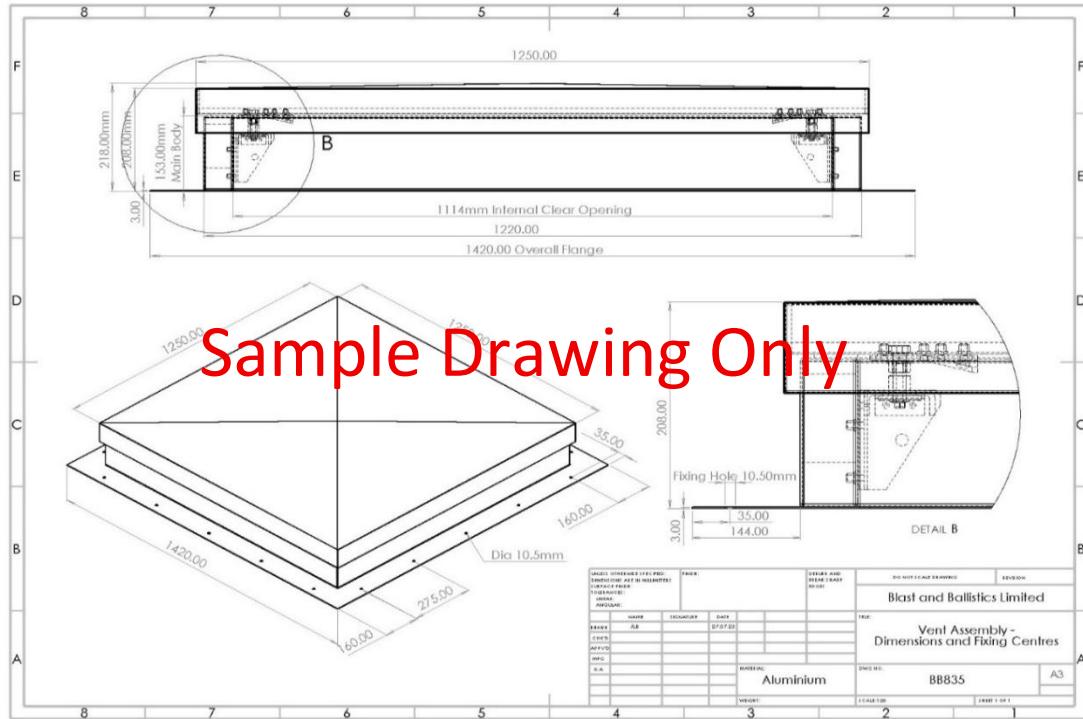
Consider more than one roof vent when undertaking an internal blast analysis. Ideally the blast would occur directly and uniformly beneath the blast vent, but in reality, this is not always the case. By incorporating more than one blast vent it will provide greater potential to offer a more uniform and even blast regime within the building.



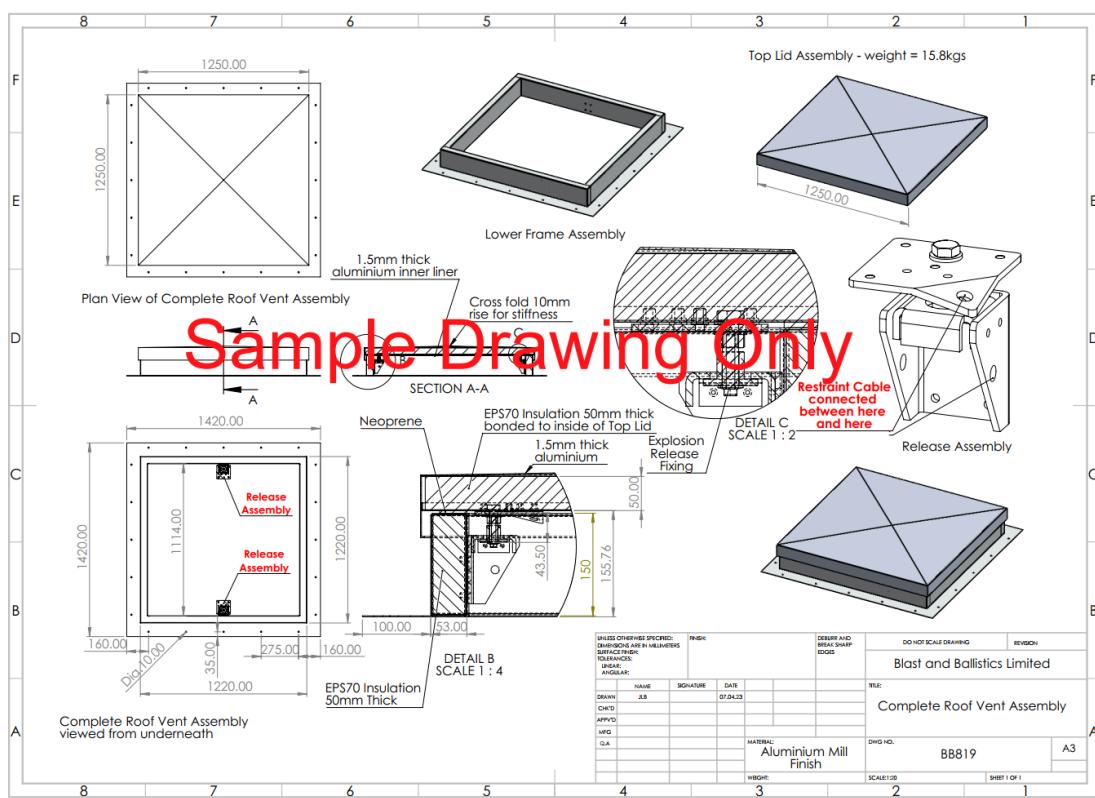
Special Sizes Available



## Sample Drawings



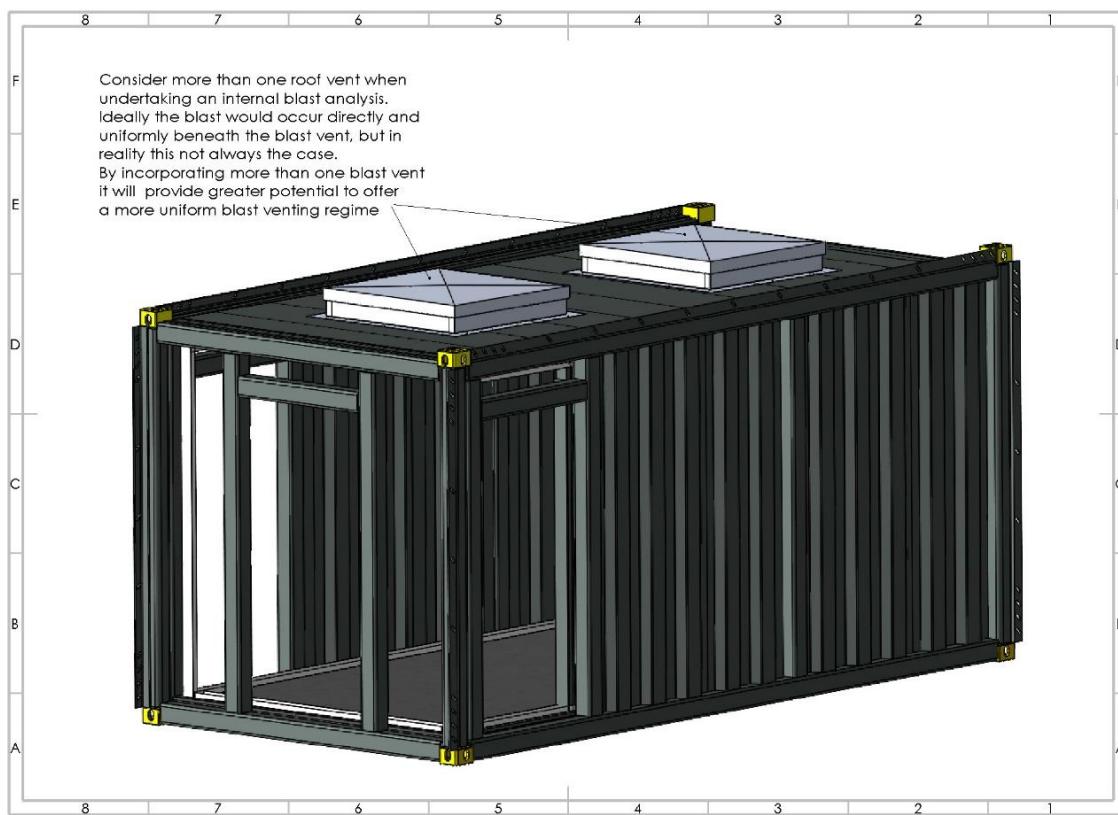
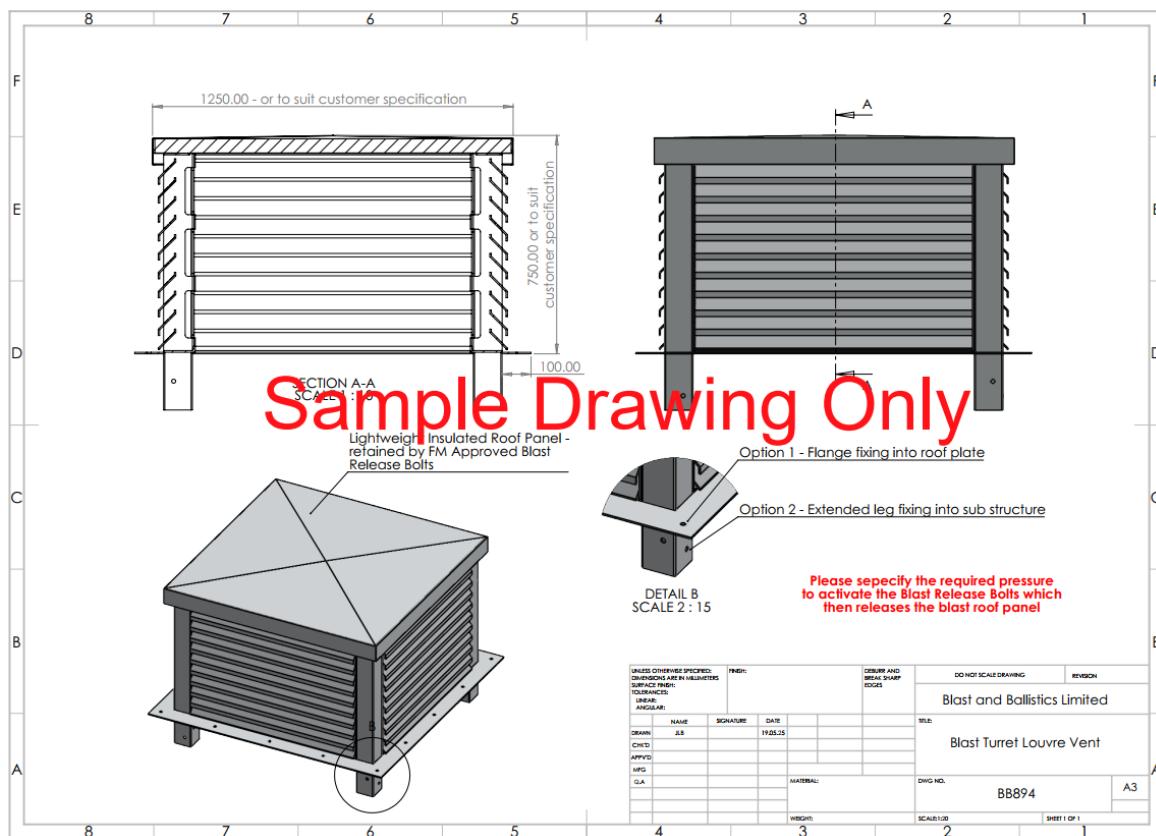
Sample Drawing Only



Sample Drawing Only



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## Release Assembly Unit

The Release Assembly Units hold the lightweight roof panel in place. The large washer that also contains the special FM Approved release bolts, is designed to move within the assembly to allow for heat expansion of the roof panel. All of these components are supplied factory assembled but note how the release washers should appear when correctly tightened or if the panel needs to be removed and replaced at some point in the future.



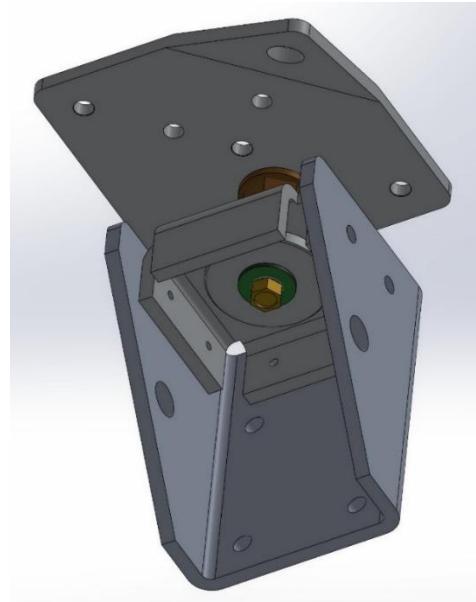
Release Bolt and Washer  
Correctly Tightened



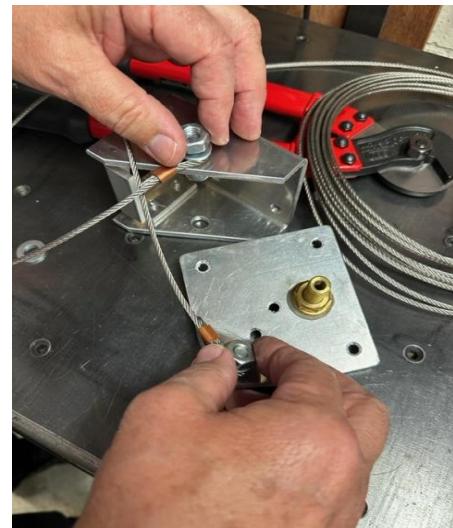
Release Bolt and Washer  
Over Tightened

The Vent Assemblies are fitted with steel cables to mitigate the potential for the lightweight roof panel to break away from the confines of the building should the unit need to be deployed following an internal blast or explosion. The restraint cables can be removed during installation and re fitted afterwards if required.

**Note:** The blast venting regime for the building will probably assume that the blast pressure will be applied onto the roof panel in a uniform manner as highlighted above. Again however this can sometimes be non-uniform and in addition, elements of any venting system can be damaged. It is very important to keep this in mind when preparing a post blast management plan where roof



Release Assembly Unit





vents are concerned and anticipate falling debris post blast from the aluminium spacer rings on the releases and any other residual debris from post blast effects, particularly with pedestrian traffic which could exacerbate potential injuries arising from the initial blast. This is very important.

## Additional Information

### Removing & Inserting the Special Release Bolts

It may be necessary to remove and replace the special release bolts that are supplied with this product. This may be because the roof panel has been removed during installation, or when doing so the bolt was overtightened and deformed prematurely (see images on page 6). Conversely, it may simply be the case that the release value of the bolts supplied may need to be changed for those offering a different release value to accommodate a change in the buildings blast regime.

### FM Approved Release Bolts

FM Approved Release Bolts are globally recognised in the industry and provide you with the certified performance and required credibility to meet international standards.

This ensures consistency in each product and reduces the risk of incorrect activation.



**Note:** The special release bolt supplied with the release washer as shown left, fits into a pre threaded hole. This is a course thread and may initially feel difficult to start. When correctly aligned however it can be easily inserted by hand.

**DO NOT FORCE THIS BOLT INTO THE PRE THREADED HOLE. Click here to see a video of this:**  
[https://www.youtube.com/shorts/q\\_ux6eO6bEl](https://www.youtube.com/shorts/q_ux6eO6bEl)



## Expansion & Contraction of the Roof Panel



Expansion Washer – This is the large washer that is fitted into the release assembly and through which the release bolt passes. When correctly tightened, the release bolt and washer should appear as in this picture (left) and the washer should be free to move around as shown in the accompanying video. **Do not over tighten the washer as it will begin to crinkle.**

When roof panels are fitted onto the roof of buildings they are immediately exposed to all elements of weather. One of these being direct sunlight. This can cause the roof panel to expand and contract and in order to mitigate applying a sideways loading on to the release fixing, this washer will move with the roof panel but still keep the release bolt aligned. **Click here to see a video of this:** [https://www.youtube.com/shorts/qPo\\_IBG30c8](https://www.youtube.com/shorts/qPo_IBG30c8)

## Understanding the Release Assembly

A short video clip showing the release assembly working can be seen by clicking on the following link. It is worthwhile looking at this and gaining an understanding of what happens during the release process.

Under blast loading this all happens in milliseconds but the link below shows the operation taking place under controlled conditions and much more slowly. Note carefully at the midpoint of the video, the green collapsible washer can be seen to deform momentarily and then the force is re applied to demonstrate the bolt head travelling through the washer and releasing the assembly.

**Click here to see a video of this happening:** <https://www.youtube.com/shorts/TNeSzGO1LTQ>



## Damage-Limiting Construction

### FM Global Property Loss Prevention Data Sheets 1-44, Extract with reference to Roof Vent Panels and FM Approved Release Fasteners

#### 2.1.3 Location

2.1.3.1 Locate rooms or buildings requiring damage-limiting construction in accordance with Section 3.1.1.

2.1.3.2 Avoid venting a single end of an elongated enclosure. Where this situation is unavoidable, follow the guidelines in Section 3.1.7.

#### 2.1.4 Pressure Relieving Vent Panels

Install at least a total area of pressure relieving vent panels that equals the minimum recommended vent area.

Do not credit roof vent panel areas subject to accumulation of snow, ponded water, dust, or debris. Where this situation is unavoidable, refer to Section 3.1.2. A maximum weight of 3lb/ft<sup>2</sup> (14.6kg/m<sup>2</sup>) is generally recommended for venting roof panels.

#### 2.1.4.1 FM Approved Products

Follow the manufacturer's instructions for the installation of FM Approved (see Appendix A for definition) explosion venting systems, including fasteners and washers.

The following recommendations apply to the installation of FM Approved explosion venting systems including fasteners and washers:

1. When FM Approved, collapsing washers are used, a 1/2in. (13mm) diameter oversized hole should be drilled in the wall panel and a slightly smaller diameter centering washer or sleeve should be installed. It is imperative that the pilot hole for the screw/bolt be centred with respect to the centering washer. Only a specifically FM Approved No.14 (1/4in., 6mm in diameter) screw/bolt should be used with this washer (see Figure 2.1.4.1-1).

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## Notes:

Vent-All FM Certified Approved Release Washers identification colours –

|        |                         |   |
|--------|-------------------------|---|
| EXA-74 | Colour Code GREEN       | Release Value Per Fastener 70# / 0.31 kN  |
| EXA-76 | Colour Code BLUE        | Release Value Per Fastener 110# / 0.49 kN |
| EXA-79 | Colour Code TAN         | Release Value Per Fastener 175# / 0.78 kN |
| EXA-84 | Colour Code LIGHT GREEN | Release Value Per Fastener 435# / 1.93 kN |

Release calculations of venting panel in this product include the weight of the roof panel e.g. –

Weight of roof panel in kN + 2 x Vent Washer in kN /vent area

The illustrated Release Washer in this Data Sheet is GREEN, release value 70lbs/0.31kN

The Release Assemblies are fitted centrally and opposing to balance the resistance of the Roof Panel

Applications that require 4 No. Release Assemblies are also paired about centre

Imbalanced blast waves can cause distortion and compromise operation. Keep Roof Panels clear of debris and snow accumulation at all times. An excessive internal explosion could compromise the restraint cables and also distort the roof panel requiring replacement before future use.

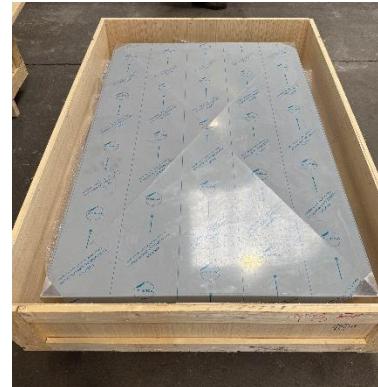
Note – As noted above, these roof vents have facility to accommodate movement within the roof panel when exposed to temperature variations. However, without maintenance/inspection, problems can occur due to inadvertent releases from wind, expansion and contraction caused by temperature changes, maintenance personnel walking on the roof, and even heavy equipment vibrations from inside the building. Snow & ice and other debris on the roof may delay or prevent release.

Any roof vent will always require maintenance/inspection. The FM Approved release bolts are a standard and universal blast release product. The FM Approved release bolt does not guarantee complete performance in all instances. Again reiterating the importance of regular maintenance and inspections.



## Installation Instructions

1. The roof vents are delivered to site in timber crates. The roof vent will have a protective wrapping for convenience when installing and should be removed when the installation is complete.
2. Carefully remove the roof vent lid and set aside. In the crate will be the lower half of the roof vent, that is the vertical sides and the flange will bolt down to the roof.
3. Position the roof vent over the pre-prepared aperture in the roof of the building.
4. When satisfied that it is in the correct position, remove the lid of the vent once again and drill the fixing holes into the roof in order to bolt the flange down.
5. Remove the flange and lower half of the assembly. Clean away all dust and debris thoroughly and then use a proprietary sealant or similar so that when the lower half of the assembly is once again repositioned and bolted down, it provides a water-tight seal.





## Final Assembly of the Roof Vent

There are two suggested methods to connect the top roof panel to the lower part of the assembly.

### Option 1

Bolt down the lower half of the assembly. Place the top roof panel on to it and then from inside the building, insert the special connecting bolts to secure the top roof vent panel.

### Option 2

After drilling all fixing holes in the roof, the top and bottom parts of the roof vent can be assembled before re-positioning and bolting down to the roof. If the roof vent assembly is fully assembled as in this option, then it must be handled very carefully when placing back into position so as not to disrupt the FM Approved Blast Release Bolts.

## Installing the FM Approved Blast Release Bolts (Applicable to both options above)



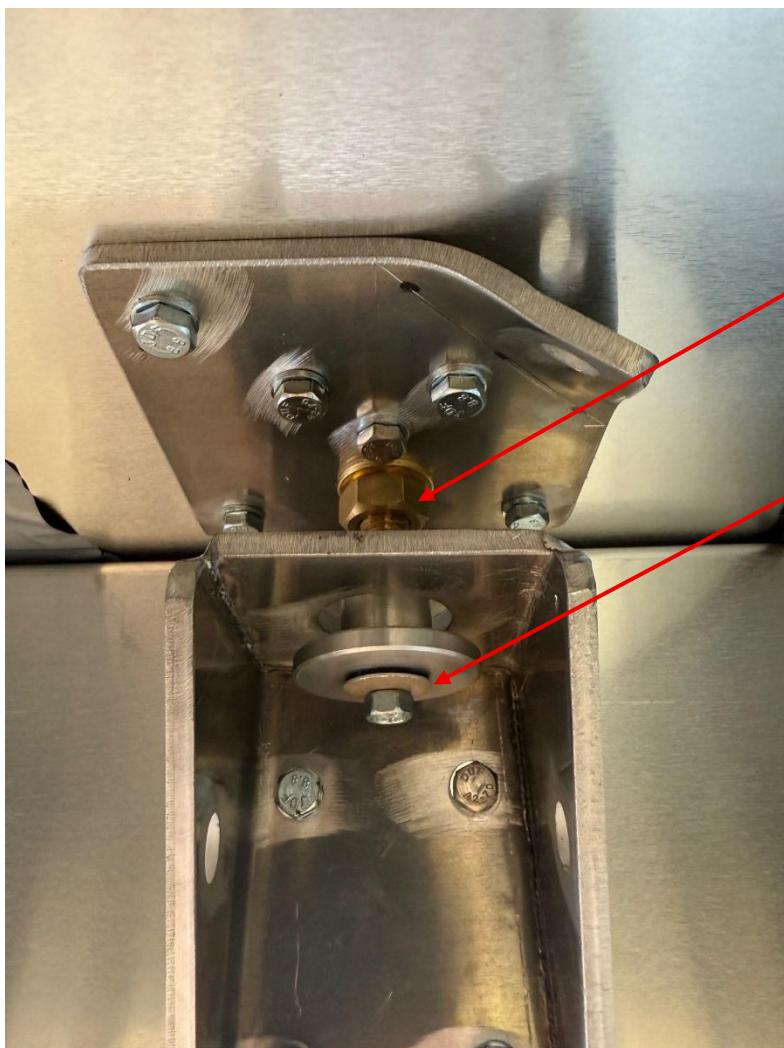
Connecting bolts on top panel of roof vent

Holes in release bolt assembly – lower half of vent



The roof vent assembly can be fitted with either two, four, six or more release bolt assemblies.

When the lid is placed onto the bottom half of the unit, ensure that the bolts as shown above fall into the holes as shown in red.



*Fully assembled blast release bolt assembly*

It is very important to assemble the release bolt, special washer and aligning bush in the correct order. Tighten the bolt with hand tools only. **DO NOT USE POWER TOOLS.**

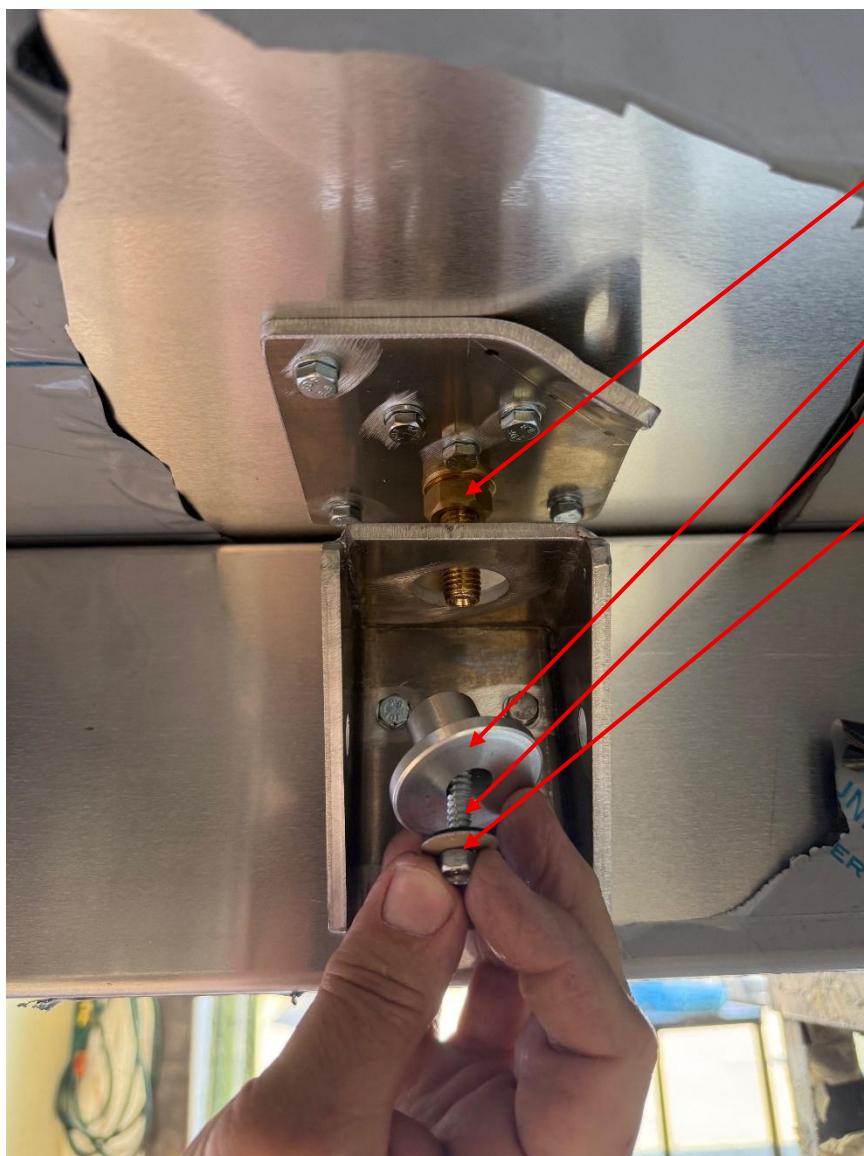


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The special FM Approved Blast Release Bolts will have been previously fitted in the factory and therefore it will insert very easily if aligned correctly. If the release bolt cannot be inserted easily, then do not attempt to force this but simply remove it and realign it carefully.

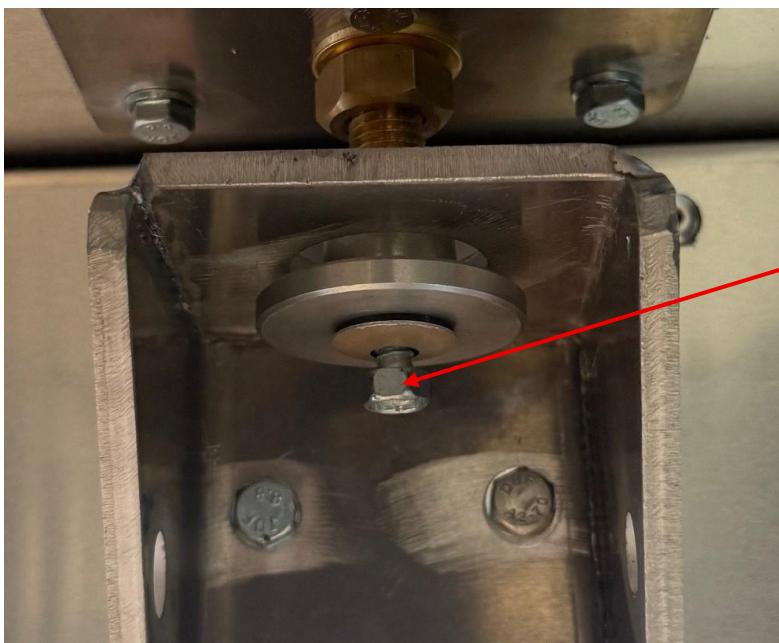
See video - <https://www.youtube.com/watch?v=t1QJKbZVuyY>

**This is very important and will compromise the operation of the blast release if not done correctly.**



Connecting bolt from roof panel  
Aligning bush  
FM Approved Fixing Bolt  
FM Approved Collapsible Release Washer

**NOTE: The FM Approved Washer is fragile and is designed to collapse under a pre-determined pressure. Do not overtighten or distort this washer**



Finally, tighten the connecting bolt  
**using hand tools only.**  
**DO NOT SQUASH THE SPECIAL**  
**RELEASE WASHER**

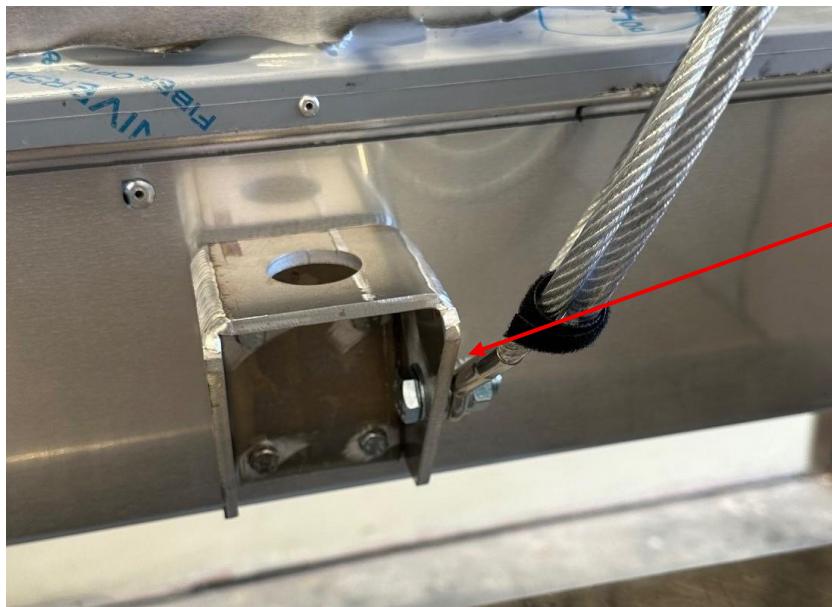
### Attaching the Restraint Cables

Along one side of the roof vent, attach the cables as shown below.





Bolt cable to top roof panel of assembly



Bolt cable to lower half of assembly



Neatly arrange the cable as shown and lightly hold in place using hook and loop tape fastener, sometimes referred to as 'Velcro'. Carefully consider how the cable is folded – ensure that it does not get caught up or trapped around any of the release components when it needs to be released.

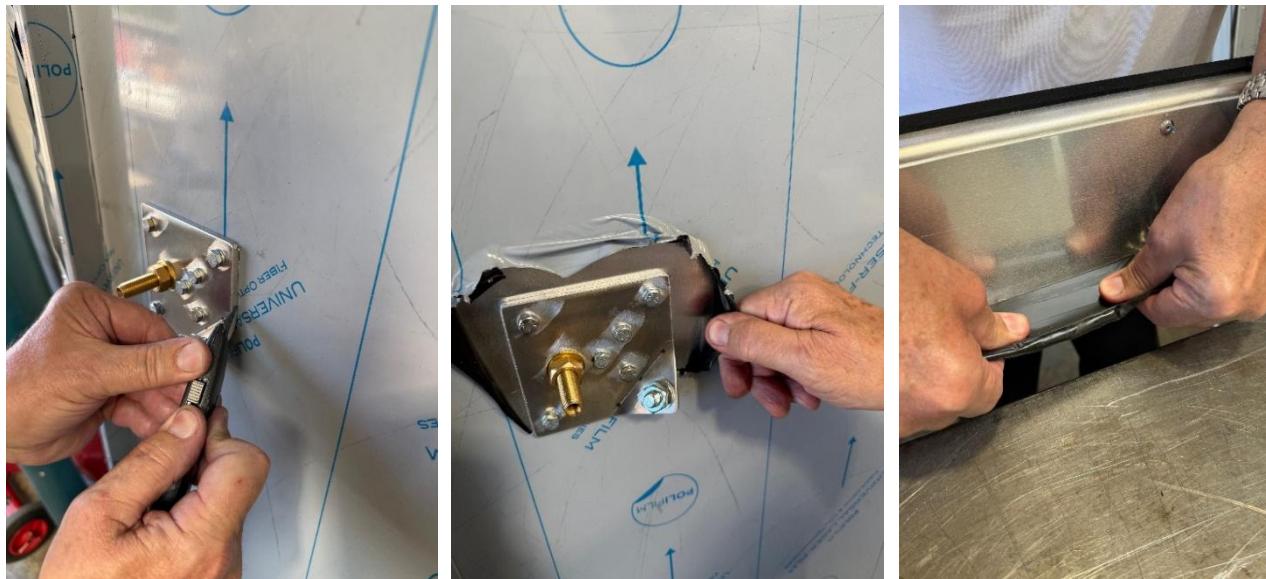
**IMPORTANT – Do not over secure the cable. It must unfurl if the lid is deployed.**



All nuts, bolts, assemblies, washers and fastener provided



Finally, remove all protective wrapping from the vent.



Always See Terms and Conditions for further information in relation to roof vents, available upon request.

#### **Addendum -**

Problems and maintenance can occur due to inadvertent releases from wind, expansion and contraction caused by temperature changes, maintenance personnel walking on the roof, and even heavy equipment vibrations from inside the building. Snow & ice and other debris on the roof may delay or prevent release. Please do not discount this warning.

#### **Maintenance –**

Check regularly as per the maintenance regime for the building and pay special attention to how external weather and climatic changes may affect the product such as strong winds, amongst other elements. There is the potential for particularly strong winds in certain locations to try and lift the roof panel and begin to deploy the special blast release bolts. Should this be the case then replace the release bolts in question as detailed above in this document. Also check the product for any damage from other trades perhaps carrying out maintenance or repairs across the building. Clean periodically with proprietary cleaners and although not covered under this product, it is worthwhile checking any sealant joints between the vents and the roof for dilapidation and reinstate if necessary. Check fixing bolts for tightness and remove any accumulating debris.