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Endothermic Mat Installation Guide

Structural Steel Application Guide

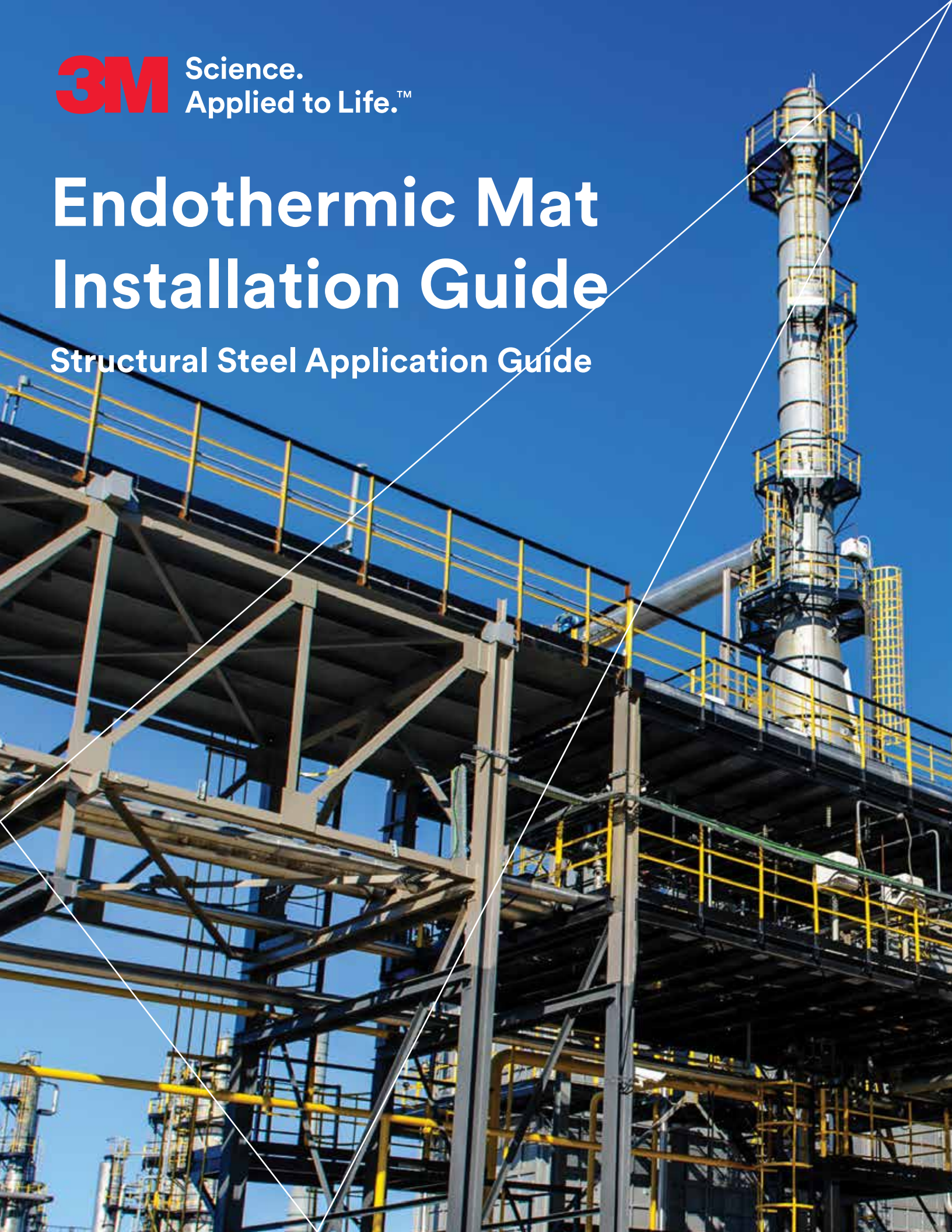


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Section 1

Wrapping procedure for straight beam configuration

- 1 Measure beam perimeter with measuring tape to determine length of first cut (*Figure 1*). Add extra length minimum 100 mm (4 in) to the perimeter length in order to accommodate for overlap and corner bending (*Figure 2*).

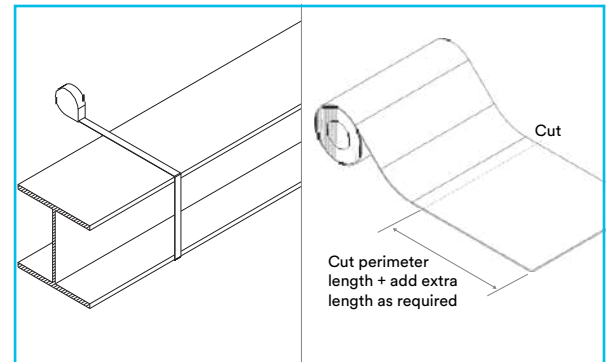


Figure 1

Figure 2

- 2 Cut Endothermic Mat 5A-4 (E-Mat) to length using bladed edge. Align E-Mat to the steel with foil side facing outward (white side should be in contact with steel). The edge of E-Mat can be held temporarily in place by filament tape or by another worker. Wrap E-Mat around the steel then overlap itself by a minimum of 50 mm (2 in) (*Figure 3*). Additional overlap is acceptable but not required. E-Mat should be tight to the steel, free of slack.

Note: Filament tape is for temporary hold only and therefore the amount of tape and spacing to be used is at the installer's discretion. Suggested amount is a minimum of four strips of tape per section of E-Mat to ensure movement does not occur.

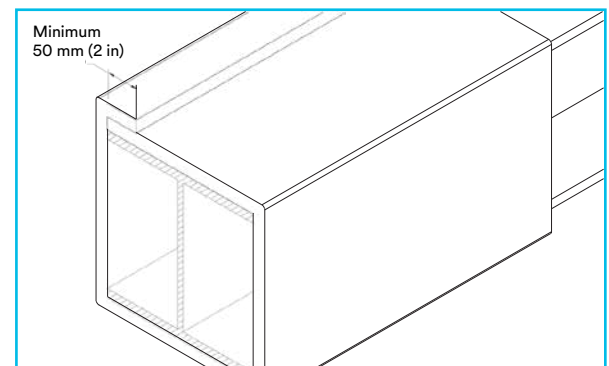


Figure 3

- 3 Tape the overlap seam (longitudinal overlap) with 3M™ Aluminum Foil Tape 437 100 mm (4 in). Centre of the tape to be approximately over the seam. Smooth the tape with a hard roller or straight edge applying enough pressure to ensure adequate adhesion of the tape to the E-Mat and to remove any air gaps (*Figure 4*).

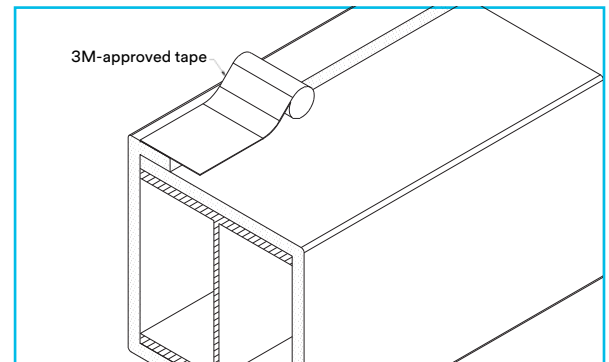


Figure 4

- 4** Repeat steps one through three for the next section of wrap. The next section of E-Mat should be tightly abutted to the first section eliminating all gaps when possible. If a gap of more than 3 mm (1/8 in) remains in the perimeter joint between sections of E-Mat, the gap is to be filled to the full depth of the E-Mat with 3M™ Fire Barrier Water Tight Sealant 3000 WT. (Figure 5)

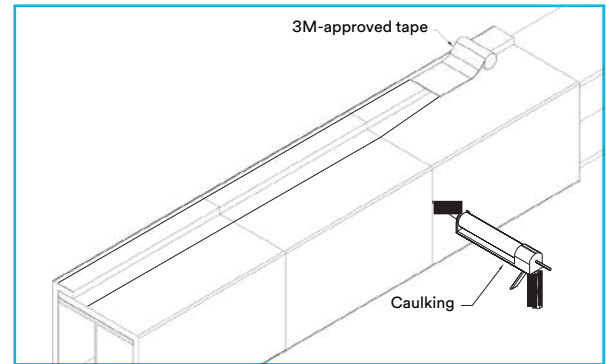


Figure 5

- 5** The butt seam where the two pieces meet (perimeter joint) is to be covered with 3M™ Aluminum Foil Tape 437 100 mm (4 in). Tape and mark the location of the joints on the tape using a soft-tipped marker to establish a reference point. The reference points are used to ensure the 50 mm (2 in) staggering of joints. The second layer should be positioned down the longitudinal run so no two joints align (Figure 6). Smooth the tape with a hard roller or straight edge applying pressure to ensure adequate adhesion of the tape to the E-Mat and to remove any air gaps.

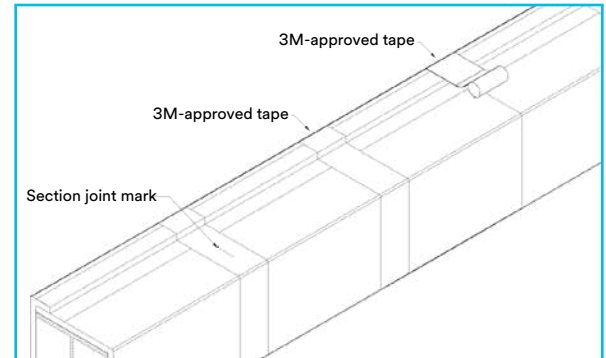


Figure 6

- 6** Measure the perimeter of the first layer and add additional length to accommodate for overlap and corner bending. Stagger the overlap joints by minimum of 50 mm (2 in) away from the overlap joint as required in the previous layer (Figure 7). Repeat steps 2 through 5.

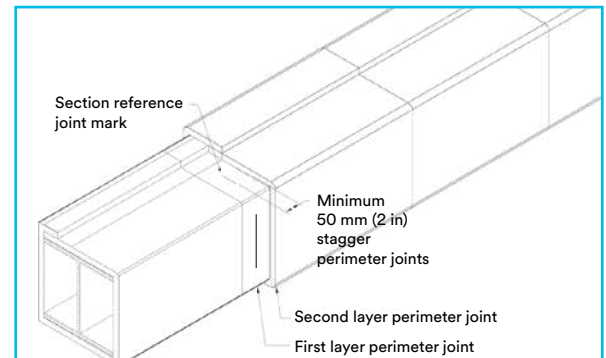


Figure 7

- 7** Once the final layer of E-Mat is in place, secure with 13 mm (1/2 in) wide, 0.508 mm (0.020 in) thick stainless steel banding to be applied over the outside of the wrap. Position banding within 50 mm (2 in) from the edge of a wrap section and spaced maximum 267 mm (10.5 in) on centre.

- 8** If applicable, install minimum 26 gauge 304 stainless steel cladding over the final layer when jet-fire exposure is required per ISO 22899. Where the cladding abuts another an overlap pieces of cladding by a of minimum 76 mm (3 in) and hold in place with 13 mm (1/2 in) wide, 0.508 mm (0.020 in) thick minimum Type 304 stainless steel banding. This is an optional step if following UL 1709.

Section 2

Wrapping procedure for outside corner

- 1 Begin applying E-Mat to the horizontal beam that terminates at the column flange (*Figure 1*). Make cut outs and slits from the E-Mat and wrap in and around the perimeter of the beam. Ensure the extended tabs of E-Mat are tightly abutted to the adjacent horizontal beam's web. Secure E-Mat in place with 3M™ 898 Filament Tape. Filament tape is for temporary hold only and therefore the amount of tape and spacing to be used is at the installer's discretion.

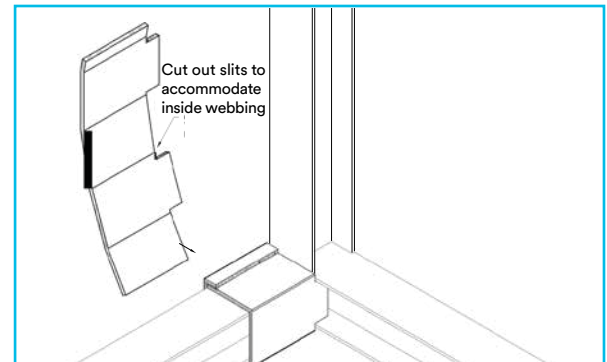


Figure 1

- 2 For the beam that interfaces with the web of the column, a similar procedure should be implemented. Make cut outs and slits from the E-Mat and wrap in and around the perimeter of the beam, with the cut-out tabs abutting tightly to the web of the column (*Figure 2*). This section of E-Mat should be tightly abutted to the first section eliminating all possible gaps. If a gap of more than 3 mm ($\frac{1}{8}$ in) remains in the perimeter joint between sections of E-Mat, the gap is to be filled to the full depth of the E-Mat with 3M™ Fire Barrier Water Tight Sealant 3000 WT.

Note: Before applying E-Mat to the next beam, make sure the bottom horizontal joint beams are properly fireproofed with E-Mat.

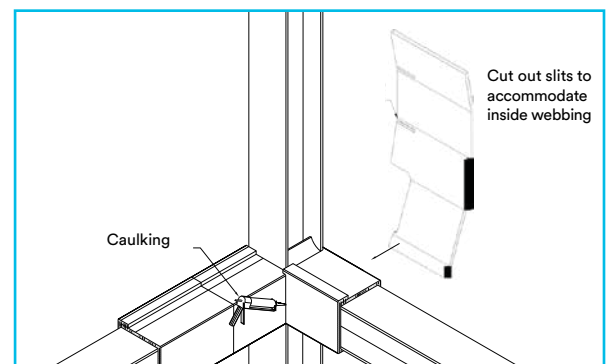


Figure 2

- 3 Once both beams are wrapped butting up to the column, begin wrapping the column. Make two cut-outs in the E-Mat to accommodate the beams. (*Figure 3*), the cut-outs should allow for a thin strip of E-Mat to overlap the interior seam between beams. Secure the E-Mat in place with filament tape. Note that the filament tape is for temporary hold only and therefore the amount of tape and spacing to be used is at the installer's discretion. Sections of E-Mat should be tightly abutted to each other (space between the two sections should be zero inches where possible). If a gap greater than 3 mm ($\frac{1}{8}$ in) exists, caulk the gap to the full depth of the wrap with 3M™ Fire Barrier Water Tight Sealant 3000 WT.

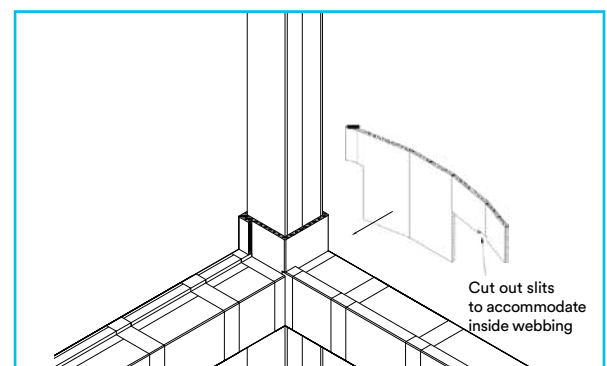


Figure 3

- 4** Tape the E-Mat overlap and perimeter seams with 3M™ Aluminum Foil Tape 437 100 mm (4 in). Centre of tape to be approximately centred over the seam. The inside corner seam should also be taped. Apply pressure on the tape to remove air gaps and secure to E-Mat. Smooth the tape with a hard roller or straight edge applying enough pressure to ensure adequate adhesion of the tape to the E-Mat and to remove any air gaps (*Figure 4*).

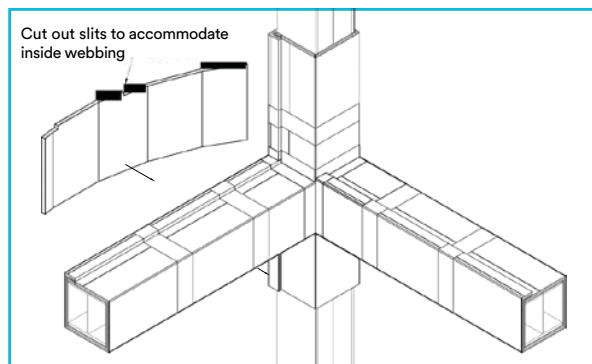


Figure 4

- 5** Repeat Steps 1 through 4 with additional layers as per listing/design requirements. The final layer where the E-Mat interfaces between the column and beams should be caulked by 3M™ Fire Barrier Water Tight Sealant 3000 WT caulking to prevent moisture from penetrating the joint.

- 6** Once the last layer of E-Mat is in place, secure the E-Mat with 13 mm (1/2 inch) wide, 0.508 mm (0.020 inches) thick stainless steel bonding to be applied over the outside of the wrap.

- 7** Where applicable install minimum 26 gauge Type 304 stainless steel cladding over the final layer per ISO 22899 jet fire exposure listings. Where the cladding abuts another piece of cladding an overlap of minimum 76 mm (3 in) is required to be held in place with 13 mm (1/2 in) wide, 0.508 mm (0.020 in) thick 304 stainless steel banding. This is an optional step if following UL 1709.



Section 3

Wrapping procedure for 45° diagonal intersection

- 1 Start with the continuous run of beam (horizontal beam). Measure beam perimeter to determine length of the cut. Add additional length to accommodate for overlap and corner bending. Cut E-Mat and place it on the horizontal beam. Align the E-Mat flush with the top flange of the horizontal beam, and mark the outline of the intersecting beams' top and bottom flange and web. Cut and remove section of E-Mat between mark-ups. Apply E-Mat to the horizontal beam (*Figure 1*), maneuvering the cut-outs around the intersecting beam.

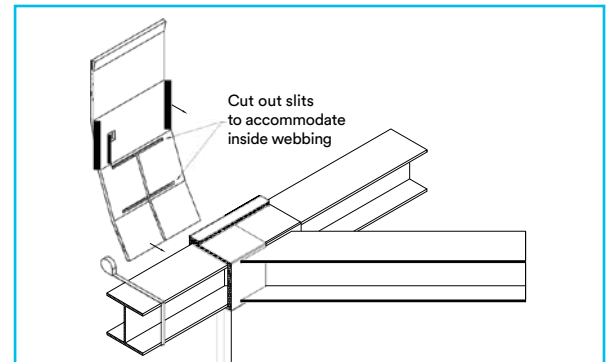


Figure 1

- 2 Secure E-Mat in place with filament tape. Note that the filament tape is for temporary hold only and therefore the amount of tape and spacing to be used is at the installer's discretion. Ensure E-Mat is covering the entire perimeter of beam. If there is a gap between the diagonal member and horizontal beam, E-Mat should cover the gap (*Figure 2*). If a gap of more than 3 mm (1/8 in) remains between installed sections of E-Mat, the gap is to be filled to the full depth of the E-Mat with the 3M™ Fire Barrier Water Tight Sealant 3000 WT. The perimeter and overlap seams of E-Mat are to be covered with 3M™ Aluminum Foil Tape 437 100mm (4 in).

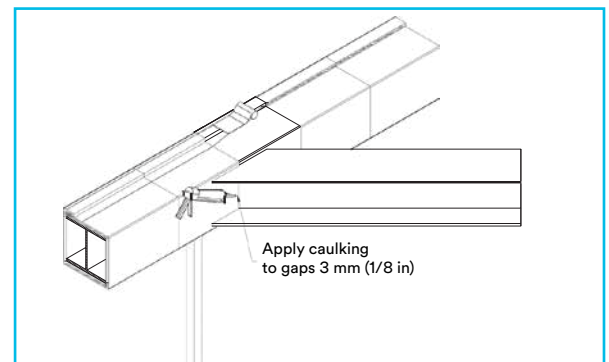


Figure 2

- 3 After fireproofing the horizontal beam, the diagonal member can be fireproofed. Wrap E-Mat around the steel then overlap onto itself (longitudinal overlap). There should be extra E-Mat on the wide-angled side of joint to lay over existing E-Mat on the horizontal beam (*Figure 3*). E-Mat should be tight and free of slack to the diagonal member steel and horizontal beam's E-Mat. Edge of E-Mat can be held in place by filament tape or by another worker. Note that the filament tape is for temporary hold only and therefore the amount of tape and spacing to be used is at the installer's discretion. If a gap of more than 3 mm ($\frac{1}{8}$ in) remains in the perimeter joint between sections of E-Mat, the gap is to be filled to the full depth of the E-Mat with the 3M™ Fire Barrier Water Tight Sealant 3000 WT.

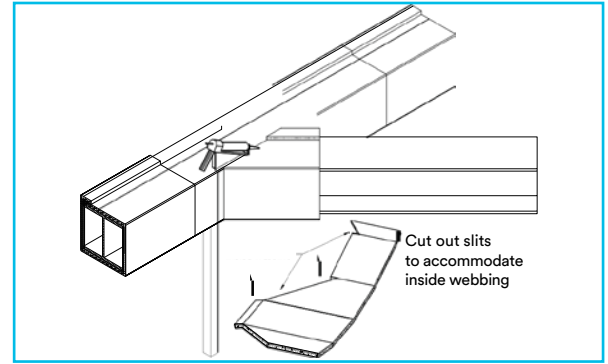


Figure 3

- 4 Repeat Steps 1 through 3 for second layer as per specification. Once the last layer of E-Mat is in place, secure the E-Mat with 13 mm ($\frac{1}{2}$ in) wide, 0.508 mm (0.020 in) thick type 304 stainless steel banding. This is an optional step if following UL 1709.

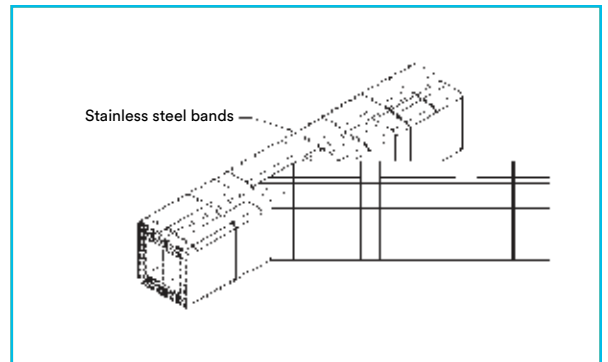


Figure 4



Section 4

Installation procedure for termination (end cap)

- 1 Ensure that the final section of the first layer of E-Mat wrapped on the beam extends beyond the beam termination sufficient that all required layers of the end cap will fit inside the end piece. Measure the inside perimeter of the first layer of E-Mat (installed on the beam). Cut out a piece of E-Mat to fit securely inside the first layer of installed E-Mat (*Figure 1*).

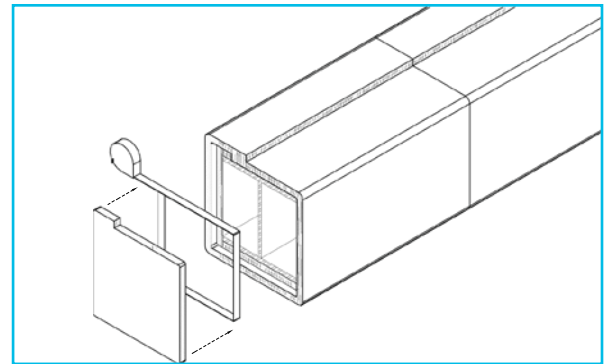


Figure 1

- 2 Place the cutout inside the first layer of E-Mat at the end of the beam with the foil facing away from the beam. Secure E-Mat in place with filament tape. Note that the filament tape is for temporary hold only and therefore the amount of tape and spacing to be used is at the installer's discretion. Repeat with additional sections of cutout to meet the specified number of layers. The butt seam where the wrapped section of E-Mat meets the end cap pieces is to be covered with 3M™ Aluminum Foil Tape 437 100mm (4in). (*Figure 2*).

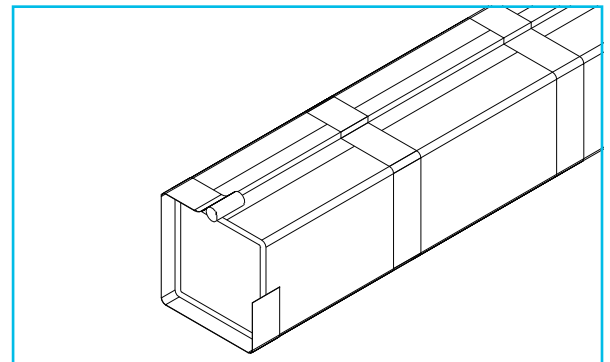


Figure 2

- 3 Repeat these steps for all subsequent layers as per listing/design. A new stainless steel band is to be installed at the termination after the final end cap layer has been installed.
- 4 Install minimum 26 gauge type 304 stainless steel cladding over the final layer where ISO 22899 jet fire exposure is required. Where the cladding abuts another piece of cladding an overlap of minimum 76 mm (3 in) is required to be held in place with 13 mm (½ in) wide, 0.508 mm (0.020 in) thick 304 stainless steel banding.

Section 5



Wrapping procedure around protruding penetrating items

- 1 Measure the total length of splice plate. Cut and slit E-Mat to the length of the penetrating item. The E-Mat is to be applied around the penetrating item. In this example, we are showing installation around a splice plate (protruding item). Measure the total length of the splice plate, cut and slit E-Mat to this length and apply accordingly (*Figure 1*).

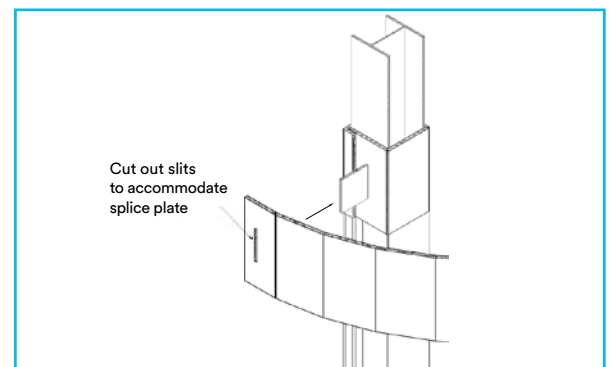


Figure 1

- 2 3M™ Fire Barrier Water Tight Sealant 3000 WT caulking to be applied around the penetrating item to provide an environmental seal to the E-Mat. This is to be completed after each layer of applied E-Mat. Implement wrapping procedure outlined in Chapter 1 to complete E-Mat installation. Repeat the same procedure for all subsequent layers to achieve desired protection as per listing/design.

- 3 Install minimum 26 gauge type 304 stainless steel cladding over the final layer where ISO 22899 jet fire exposure is required. Where the cladding abuts another piece of cladding an overlap of minimum 76 mm (3 in) is required to be held in place with 13 mm (½ in) wide, 0.508 mm (0.020 in) thick 304 stainless steel banding. This is an optional step if following UL 1709.

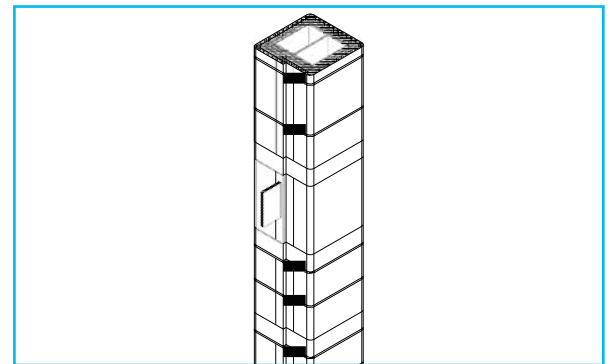


Figure 2

Section 6

Three-sided application

- 1 Flashing for three-sided application will consist of minimum type 304 stainless steel minimum 0.4826 mm (0.019 in) thick (Figure 1–Figure 3). The inner E-Mat securement flashing is installed using rivets to the top flange of the beam. Securement of the exterior flashing will consist of two 180° bends creating a 100 mm (4 in) pocket for main cladding interface and a 90° bend matching the contour of the beam and a 100 mm (4 in) pocket for thinner flashing to be secured. Inner E-Mat securement flashing will consist of 1–90° bend and will be hemmed into the stainless flashing. (Figure 3)

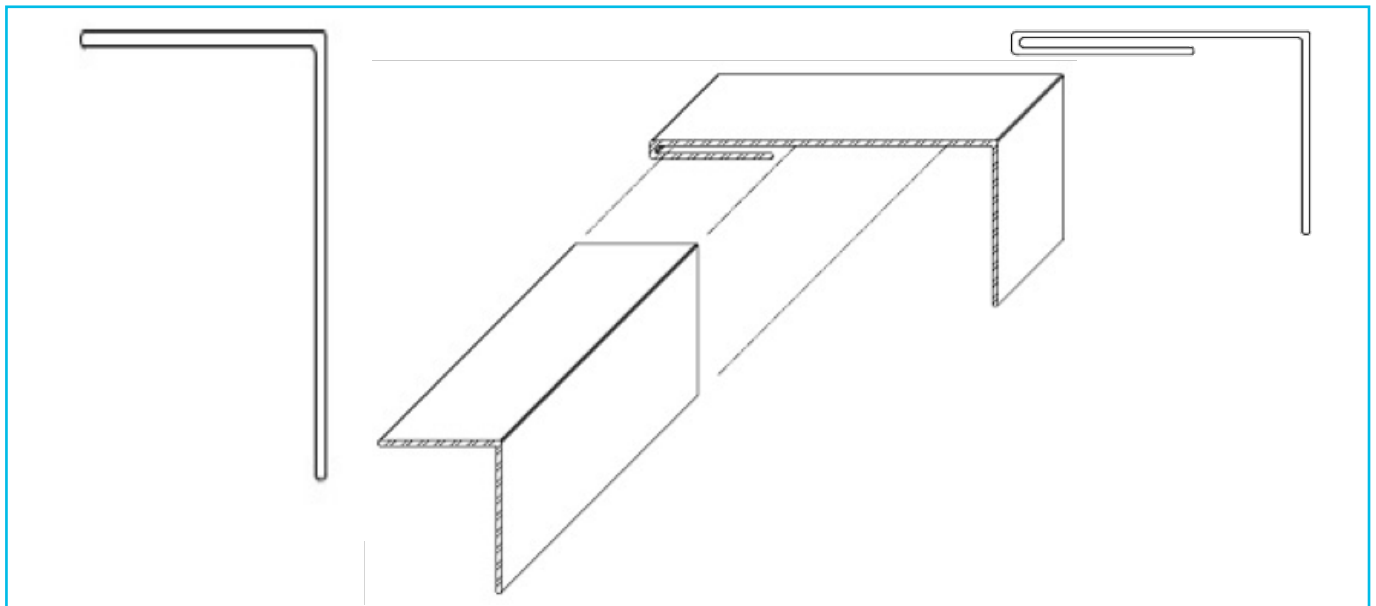


Figure 1

Figure 3

Figure 2

- 2 Apply a 50 mm (½ in) diameter bead of 3M™ Fire Barrier Water Tight Sealant 3000 WT caulking along the length of the flashing.
- 3 Flashing will be installed on the flange lip and secured utilizing a power actuated tool and fastener on no greater than 610 mm (24 in) on centre.

4 First layer of the E-Mat will be cut to length and attached to the galvanized aluminum flashing utilizing 38 mm (1.5 in) Number 14 self-tapping screws with a 30 mm (1.25 in) fender washer. Material will be secured to the flashing 75 mm (3 in) in from each edge of the material and then again in the centre of the material. No greater than 265 mm (10.5 in) on centre.

5 Second layer of the E-Mat will be cut to length and attached to the galvanized aluminum flashing utilizing 38 mm (1.5 in) # 14 Self tapping screws with a 30 mm (1.25 inches) fender washer. Material will be secured to the flashing 75 mm (3 inches) in from each edge of the material and then again in the centre of the material. No greater than 265 mm (10.5 in) on centre. (Figure 4). The butt seam where the two pieces meet on the final layer (perimeter joint) is to be covered with 3M™ Aluminum Foil Tape 437 100 mm (4 in).

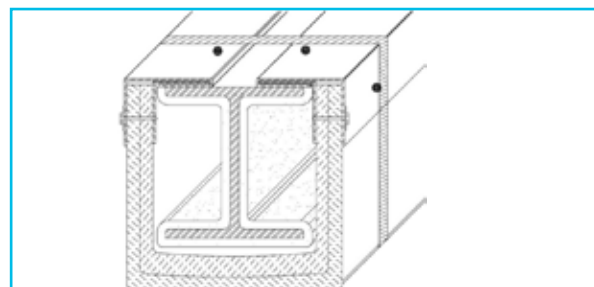


Figure 4

6 Install minimum 26 gauge type 304 stainless steel cladding over the final layer where ISO 22899 jet fire exposure is required. Where the cladding abuts another piece of cladding an overlap of minimum 76 mm (3 in) is required to be held in place with 13 mm (½ in) wide, 0.508 mm (0.020 in) thick 304 stainless steel banding. This is an optional step if following UL 1709.

Appendix

Example of application listing (ISO 22899-01 test)

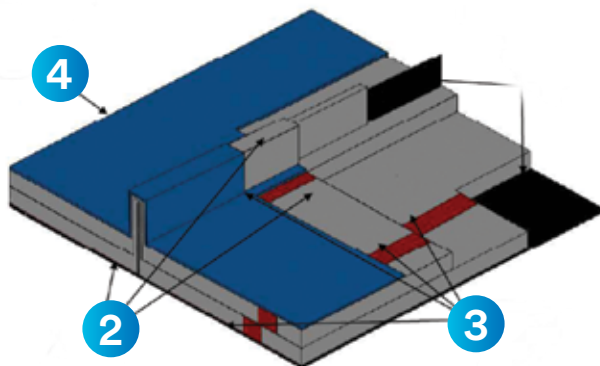
Division 07—Thermal and Moisture Protection | 07 80 00 Fire and Smoke Protection | 07 81 00 Applied Fireproofing

3M Company

Design Number 3MU/AF 120-02
Applied Fireproofing Jet Fire
3M™ Interam™ E-5 and E-5A-4 Series
Endothermic Mat—2 layers
ISO 22899-1:2007(E)

Passive Fire Protection Materials
 Temperatures During Jet Fire Exposure

Temperature Rise	Time (minutes)
11°C	15
62°C	30
105°C	45
167°C	60
306°C	90
423°C	120



Example of application listing (ISO 22899-01 test) continued

Division 07—Thermal and Moisture Protection | 07 80 00 Fire and Smoke Protection | 07 81 00 Applied Fireproofing

- 1. STRUCTURAL STEELWORK:** Use structural steel having a minimum thickness of 20 +/- 0.25 mm (0.79 +/- 0.01 in.).
- 2. STEEL PANEL:** A steel panel constructed of 10 mm (0.39) thick steel complying with ISO 630:1995, Grade Fe 430 representing steelwork with no corners or edge features.
- 3. CERTIFIED MANUFACTURER:** 3M Company
CERTIFIED PRODUCT: Applied Fireproofing
MODEL: 3M™ Interam™ E-5 and E-5A-4 Series Endothermic Mat
ENDOTHERMIC MAT: Install two layers of foil faced flexible mat tightly over the steel panel (Item 1). Install first layer with continuous vertical sections of Endothermic Mat with vertical joints fit tightly together and foil facing away from the steel panel. Adhere first layer to the steel panel (Item 1) using 3M Hi-Strength 90 Adhesive applied to the steel and the back of the first layer being applied. Use rollers over the entire layer to ensure complete adhesion is achieved. Tape all joints of first layer with Aluminium Tape (Item 6) and use rollers over tape to ensure complete adhesion. Install the additional layer with joints offset min. 50 mm (2 in) from joints of the previous layer. Adhere the additional layer to the previous layer of Endothermic Mat using 3M Hi-Strength 90 Adhesive applied to the face of the previous layer. Use rollers over the entire layer to ensure complete adhesion is achieved. Tape all joints of the additional layer with Aluminium Tape (Item 6).
- 4. STEEL SHEATHING:** Install 1 layer of 26 A T-304 stainless steel sheeting over the Endothermic Mat (Item 2) in continuous vertical sheets. Install steel sheathing with minimum 76 mm (3 in) overlap at joints to create a stepped surface installation. Adhere each piece of Steel Sheathing to the final layer of Endothermic Mat (Item 2) using 3M Hi-Strength 90 Adhesive applied to the edges of the back of the Steel Sheathing face of the corresponding locations on the final layer of Endothermic Mat (Item 2).
- 5. PINS (Not Shown):** Install nominal 35 mm (1-³/₈ in) long, 12 GA (2.70 mm [0.106 in] thick) stainless steel cup head pins with a minimum 38 mm (1-¹/₂ in) washer. Install pins by pre-drilling holes through the Steel Sheathing (Item 4) and the Endothermic Mat (Item 2) with a 11 mm (⁷/₁₆ in) drill bit and welding the pins to the Structural Steelwork (Item 1). Pins shall be spaced both vertically and horizontally 305 mm (12 in) on centre and centred over the overlap of each joint in the Steel Sheathing (Item 7).

Date issued: January 3, 2017

Project No: G102714655

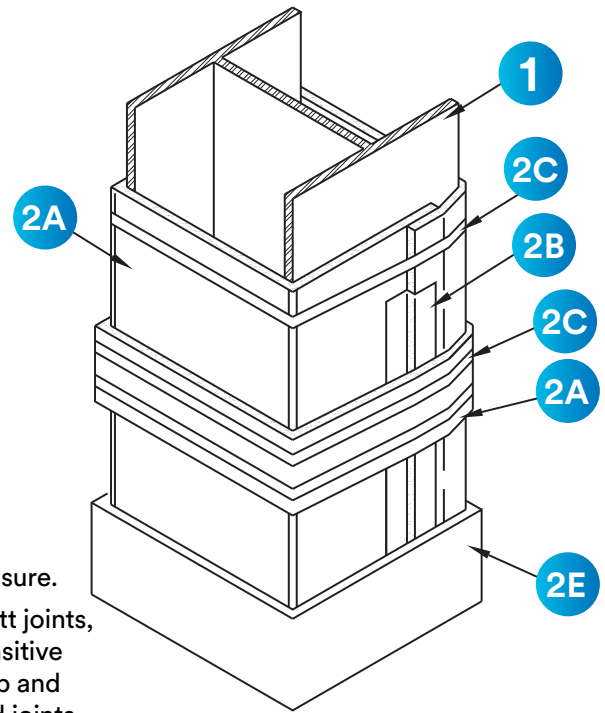
Example of application listing (UL System XR202)

System No. XR202 | October 15, 2014 | Ratings—¹/₂, ³/₄, 1-¹/₂, 2, 3 and 4 Hr.

- 1. Steel Column** — Min size of column W10×49.
- 2. Mat Materials*** — The column protection assembly consists of endothermic mat, aluminum foil tape, and aluminum cladding. The details of the column assembly are summarized below:

A. Mat Materials* — Endothermic Mat — Flexible mat supplied in rolls. Each layer of foil-faced mat installed by cutting to size and tightly wrapping around the column and itself such that a min 50 mm (2 in) overlap is present along the vertical seam. Seams to be located on the column flange. Sections are temporarily held in place with several strips of 3M Type 898 filament tape (approx. 609.6 mm [24 in] long). Adjacent sections of material on the same layer abut one another forming the circumferential edge seam. Successive layers of mat installed in same manner with butted end seams offset a min 50 mm (2 in) from butted end seams of preceding layer. For single layer construction only, a 100 mm (4 in) wide endothermic mat collar is wrapped around each taped circumferential butt joint with a 50 mm (2 in) overlap on itself. Circumferential edges of collar are sealed with foil tape. Stainless steel bands are applied as described under Item 2C. All seams in each layer of mat to be sealed with foil tape (Item 2B) prior to installation of subsequent layer of mat or collars. The hourly rating of the column assembly is dependent upon the number of endothermic mat layers as shown in the table on the next page.

Min Layers of Endothermic Mat Material	Hr Fire Rating
1	1/2
1	3/4
2	1
2	1-1/2
3	2
3	3
4	4



3M Company – Type E-5A-3, E-5A-4, E-53A, E-53C, E-54A or E-54C.

3M Company 3M Fire Protection Products – Interam™ Types E-54A, E-5A-4 or E-54C. Additionally evaluated for acid and solvent spray exposure.

B. Aluminum Foil Tape* — (Shown at vertical seam but not shown at butt joints, collars or cladding for clarity) Nom 101.6 mm (4 in) wide pressure-sensitive aluminum foil tape supplied in rolls. Used to secure the vertical overlap and circumferential butt joint seams of the endothermic mat (Item 2A) and joints in the aluminum cladding (Item 2E).

3M Company 3M Fire Protection Products — Type 425.

C. Steel Banding Straps — Min 13 mm (1/2 in) wide by 0.508 mm (0.020 in) thick stainless steel banding straps used in conjunction with No. 26 gauge galv steel wing-type crimp clips. Steel banding straps installed at the centre and 50 mm (2 in) from end of mat sections. Steel banding straps applied approx. 25.4 mm (1 in) from edges of collars. Steel banding straps installed at the centre and 25.4 mm (1 in) from top and 38.1 mm (1-1/2 in) from bottom of cladding sections.

D. Fill, Void or Cavity Material — Caulk* — (Not Shown) Thick bead of caulk to be applied as a gasket between the endothermic mat (Item 2A) and the floor or ceiling surface. The bead of caulk applied around entire perimeter of endothermic mat at interface of floor or ceiling surface prior to and after each layer of mat material and after installation of the cladding.

3M Company 3M Fire Protection Products — Type CP 25WB+, or FB 3000 WT.

E. Aluminum Cladding Jacket — Optional. After installation of the mats, collars, foil tape and steel banding straps, aluminum corner cladding pieces with nominal 304.8 mm (12 in) wide legs, 914.4 (36 in) long and min No. 27 gauge 0.3556 mm (0.014 in) thick installed and overlapped on each other to cover column and form outer jacket. Adjacent lengths of cladding to overlap the preceding length a min of 50 mm (2 in) Cladding jacket secured in place with steel banding straps as noted under Item 2C. All seams of cladding material to be sealed with foil tape after banding has been installed.

F. Stainless Steel Cladding Jacket — Optional. (Alternate to Aluminum Cladding Jacket, Item E) – After installation of the mats, nominal 914.4 mm (36 in) wide by minimum 0.2286 mm (0.009 in) thick stainless steel jacket wrapped around endothermic mat and lapping itself approximately 152.4 mm (6 in) Adjoining lengths of stainless steel jacket to overlap a minimum of 101.6 mm (4 in) Stainless steel jacket secured in place with steel banding straps (item 2C) spaced max. 304.8 (12 in) OC and max. 25.4 mm (1 in) from all seams.

G. Insulation Jacketing Tape* — Optional. (Alternate to Aluminum Cladding Jacket, Item E) – After installation of the mats, nominal 584.2 mm (23 in) wide by minimum 0.1778 mm (0.007 in) thick multilayered laminate coated with an aggressive cold weather acrylic pressure sensitive adhesive wrapped around endothermic mat and lapping itself approximately 76.2 mm (3 in). Adjoining lengths of insulation jacketing tape to overlap approximately 76.2 mm (3 in). Insulation jacketing tape secured in place by self-adhesive bond to the endothermic mat. See Tape, General Use (BVYS).

3M Company 3M Fire Protection Products — VentureClad® 1577CW, 1577CW-E, or 1579CW

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

Please contact your 3M representative for details regarding applicable listings.

Warranty; Limited Remedy: This product will be free from defects in material and manufacture for a period of ninety (90) days from the date of purchase. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user's method of application. If this product is proven defective within the warranty period stated above, your exclusive remedy and 3M's sole obligation shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product.

Limited Liability: Except where prohibited by law, 3M will not be liable for any direct, indirect, special, incidental or consequential loss or damage arising from this 3M product, regardless of the legal theory asserted.



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