



# Interam™ Systems

## Installation Manual



### **3M Specialty Materials**

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- A. ASTM E 119-95a
- B. ASTM E 1725-95
- C. Omega Point Laboratories:  
Hydrogen Fire Exposure Test
- D. ISO 834-1975

## E. Noncombustibility

## F. Seismic

## 2. Approvals

- A. Omega Point
- B. Underwriter's Laboratory
- C. DNV

Table 1 – Test Results Reference Chart

Item/size	Layers	Other info.	Fire rating or other	Test Standard	Report No.	Date	Approval/system
Beam/Column W10x49	3 E-5A3		3 hours	ASTM E119 (UL 263)	UL File R10125-6	4/15/87	UL Design X204
Beam/Column W10x49	2 E-5A3		2 hours	ASTM E119 (UL 263)	UL File R10125-6	4/15/87	UL Design X204
Beam/Column W10x49	3 E-5A3		3 hours	ASTM E119 (UL 263)	UL File R10125-4	10/13/86	UL Design X203
Beam/Column W10x49	2 E-5A3		2 hours	ASTM E119 (UL 263)	UL File R10125-4	10/13/86	UL Design X203
Beam/Column W10x49	1 E-5A3		1 hour	ASTM E119 (UL 263)	UL File R10125-4	10/13/86	UL Design X203
Beam/Column W10x49	3 E-5A3		2 hours	UL 1709	UL File R10125-5	10/13/86	UL Design X201
Beam/Column W10x49	2 E-5A3		1.5 hours	UL 1709	UL File R10125-5	10/13/86	UL Design X201
Beams/columns	4 E-5A4		See tables	ASTM E-1529	Omega Proj. 9006-98944	3/19/96	DNV HOU-96-007
	1 E-5A4		See tables	ASTM E-1529	Omega Proj. 9006-98944	3/19/96	DNV HOU-96-007
Pipe – 10" dia.	2 E-5A4	60 mm foamglas	400° C. at 182 min.	ISO 834 hydrocarbon	SINTEF 250000.10\93.278 (test 2)	12/20/93	H90
	2 E-5A4	40 mm foamglas	400° C. at 161 min.	ISO 834 hydrocarbon	SINTEF 250000.10\93.278 (test 2)	12/20/93	
Pipe - 6" dia.	1 E-54C	35 mm foamglas	160° C. at 30 min.	Jet Fire	SINTEF 250030.10\94.299	9/26/94	
Pipe – 6" dia.	2 E-54C	60 mm foamglas	198° C. at 120 min.	Jet Fire	SINTEF 251694	12/1/93	
Bulkhead	3 E-5A4	4.76 mm steel	165 min. (A150)	ISO 834	Omega Point 9006-101062	3/5/97	
Cable Tray 24" x 4"	10 E-50A	minimal fill	3 hours	UL 1724 HIFT	UL File R10125-3	12/17/84	UL Systems 7 & 8
Cable Tray 12" x 4"	5 E-50D		3 hours	ASTM E-119	TCT #414186-331	Apr-86	
Conduit - 5" dia.	5 E-50D		3 hours	ASTM E-119	TCT #414186-331	Apr-86	
Airdrop	5 E-50D		3 hours	ASTM E-119	TCT #414186-331	Apr-86	
Cable Tray 18" x 6"	2 E-5A4		1 hour	ASTM E-119	TCT #414187-751	Jun-87	
Conduit - 2.5" dia.	5 E-50D	Interface to TSI	3 hours	ASTM E-119	TCT #414186-1119	Oct-86	
Conduit – 5" dia.	5 E-50A		1 hour	ASTM E-119	SwRI 01-7912(2)	Jun-85	

Item/size	Layers	Other info.	Fire rating or other	Test Standard	Report No.	Date	Approval/system
Conduit - 2" dia.	6 E-50A		1 hour	ASTM E-119	SwRI 01-7912(2)	Jun-85	
Cable Tray - 24" x 4"	4 E-50 A		1 hour	ASTM E-119	SwRI 01-7912(2)	Jun-85	
Conduit - 5" dia.	3 E-5A3		1 hour	ASTM E-119	TCT #414186-969	Sep-86	
Airdrop	3 E-5A4		1 hour	ASTM E-119	TCT #414186-969	Sep-86	
Cable Tray - 12" x 4"	2 E-5A4		1 hour	ASTM E-119	TCT #414186-969	Sep-86	
Junction Box	3 E-5A4		1 hour	ASTM E-119	TCT #414186-969	Sep-86	
Pipe - 10" dia."	1 E-5A4	50 mm foamglas	95 min. to 400° C.	ASTM 1529	Omega Point 9006-99430	3/15/96	
Pipe - 10" dia.	2 E-5A4	50 mm foamglas	145 min. to 400° C.	ASTM 1529	Omega Point 9006-99430	3/15/96	
Pipe - 10" dia.	1 E-5A4	38 mm foamglas	84 min. to 400° C.	ASTM 1529	Omega Point 9006-99430	3/15/96	
Cable Tray - 12" x 4"	1 E-5A4		13 min.	ASTM 1529	Omega Point 9006-99733	3/19/96	
Cable Tray - 12" x 4"	2 E-5A4		28 min.	ASTM 1529	Omega Point 9006-99733	3/19/96	
Cable Tray - 12" x 4"	4 E-5A4		78 min.	ASTM 1529	Omega Point 9006-99733	3/19/96	
Cable Tray - 24" x 4"	2 E-5A4		28 min.	ASTM 1529	Omega Point 9006-99733	3/19/96	
Beam W14x238	1 E-5A4		passed	4.2 psi (0.29 bar) blast	WBE Proj. No. 807-001	Sep-96	
Beam W14x238	1 E-5A4		passed	4.8 psi (0.33 bar) blast	WBE Proj. No. 807-001	Sep-96	
Pipe - 6" dia.	2 E-5A4	60 mm foamglas	passed	0.57 bars (ave.) blast	CMR-93-F25044 (test 3)	Dec-94	
Conduit - 2" dia.	2 E-5A4	50 mm foamglas	17 dB reduction ave.	500-2000 Hz	Sinus 123800-1.RO1 (System 5)	12/23/93	
Cable Tray - 24" x 6"	5 E-50D		passed 2x SSE	IEEE 344	SwRI 1208-001	Jul-86	
Conduit - 2" dia.	5 E-50D		passed 2x SSE	IEEE 344	SwRI 1208-001	Jul-86	
Cable Tray - 24" x 6"	4 E-50A		passed 2x SSE	IEEE 344	SwRI 8554	Jul-85	
Conduit - 2" dia.	4 E-50A		passed 2x SSE	IEEE 344	SwRI 8554	Jul-85	
	1 E-5A3	Smoke Density	1.07 Dm ave. (non-flaming)	ASTM E662	Omega Point 15352-100517	10/10/96	
	1 E-5A3	Smoke Density	17.77 Dm ave. (Flaming)	ASTM E662	Omega Point 15352-100517	10/10/96	
	1 E-5A3	Toxic Gas	"0 ppm of CO, HF, HCl, NOx, "	BSS 7239	Omega Point 15352-100519	10/10/96	
	1 E-5A3	Toxic Gas	"0 ppm SO2, HCN"	BSS 7239	Omega Point 15352-100519	10/10/96	
	1 E-5A3	Flammability	0 ave. Flame Spread	ASTM E162	Omega Point 15352-100518	10/10/96	

## Global Job Reference List

### USA – Interam E-mat Fire Barrier System installations:

Over 2/3 of the Nuclear Power plants in the US use Interam E-Mat. E-mat Electrical Circuit Protection systems are NRC certified.

#### Petrochemical Installations:

Mobil Chem	Houston	Cover old concrete on structural steel and cabletrays
Shell Oil	Odessa, TX	Cable trays
Mobil Oil	Beaumont, TX	Vessel legs, structural steel, and cable trays
Arco Chemical	Beaver Valley, PA	Over existing fire proofing on structural steel
Kerr-McGee	Wyneewood, TX	Cable tray and tower skirt
LTV Steel	East Chicago	Tray fire break
Monsanto	Muscatine, IA	Tower skirt
SOHIO	Lima and Toledo, OH	Structural steel
US Steel	Gary, IN	Tray fire breaks

#### Petrochemical OUS:

- Troll Platform (Norway) – 1996 - \$130,000 – E-5A-4 Mat, FireDam 150 – structural steel protection
- Trinidad & Tobago Methanol (Trinidad) - \$450,000 – E-5A-4 Mat, FireDam 150 - cable tray protection
- Polycastle Platform (France) – 1995 - \$60,000 – E-5A-4 Mat, FireDam 150 – cable tray protection

#### Nuclear Power Plants OUS (Electrical Circuit Protection):

- Furnas (Brazil) - \$150,000 – E-mats, FireDam 150, T-49 Tape, CS-195+
- TEPKO (Tokyo) - \$300,000 – E-mats, FireDam 150, T-49 Tape, CS-195+
- Almaraz (Spain) - \$500,000 – E-mats, FireDam 150, T-49 Tape, CS-195+

# 3M™ Interam™ Systems Products

This Section describes the products needed for installing mechanically attached Interam systems tested according to ASTM E 119 and ASTM E 1725.

- A. 3M™ Interam™ Systems E-Mat 4
  - 1. 98-0400-5365-8 supplied in rolls nominally 24.5 in. (62 cm) wide by 20 ft. (6,09 m) long by 0.40 in. (10 mm) thick.
  - 2. E-Mat has aluminum foil on one side and a nylon scrim on the other. Mat is installed with the aluminum foil away from the protected item.
- B. 3M™ Interam™ FireDam™ 150 Caulk
  - 1. 98-0400-0626-8 supplied in a 10½ fl. oz. (310 mL) cartridge or 3M part no. 98-0400-2340-3 supplied in a 5 gallon (18,9 L) pail.
  - 2. Off-white in color
  - 3. Endothermic water-based caulk used to fill seams and voids at interfaces.
- C. 3M™ Interam™ Systems Sealing Tape
  - 1. 7.5 cm, 10 cm and 65 cm wide by 10 m long.
  - 2. A weather resistant tape backed with an aggressive modified bitumen adhesive.
  - 3. Used to joint E-Mat to conduit, cable trays or steel and to cover E-Mat seams. The tape described in Paragraph D can be used as an alternate.
  - 4. Used also for environmental protection of E-Mat. Stainless steel sheet metal can be used as an alternate.
- D. 3M™ Interam™ Systems T-49 Aluminum Foil Tape
  - 1. 98-0400-0172-3 supplied in rolls nominally 4 (10 cm) wide by 180 ft. (54.8 m) by 0.003 in. (0,07 mm) aluminum foil.
  - 2. Foil tape is used to seal all E-Mat seams.
  - 3. One roll of T-49 tape per five rolls of E-Mat (overlap wrap method). One roll of T-49 tape per ten rolls of E-Mat (continuous wrap method).
- E. Scotch™ Tape 898
  - 1. 3M part no. 70-0028-2311-3 is 0.75 in. (19 mm) wide by 180 ft. (54,8 m) long filament tape.
  - 2. The filament tape is used as an installation aid to temporarily hold mat pieces in place. It is not a mandatory part of the Fire Protection System. Other installation aids such as duct tape can be used instead.
- F. All other materials that are used for assembly may be purchased independent of 3M.
- G. Stainless steel banding: length of bands equal length of outer mat layer, plus 4 in. (10 cm) 1½ bands per lineal foot of protected item. Waste and cost of clips not included. ½ in. (13 mm) wide by 0.020 in. (0,5 mm) banding minimum size.

# 3M™ Interam™ Systems

## General Installation Tools, Techniques and Quality Assurance

This Section describes general tools and procedures for installing mechanically attached 3M Interam E-Mat Systems tested according to ASTM E 119 and ASTM E 1725.

This document is intended to supply the installer and the quality inspector with a tool for evaluating the acceptability of design variations

### 1.01 System Design Requirements

3M Interam E-Mat 4 is used in fireproofing for electrical systems, structural steel, gas pipe, vessel skirts and bulkheads.

When installing 3M Interam E-Mat Systems, the following critical system design requirements must be considered:

- A. Material selection
- B. Preparation Prior to Installing 3M Interam Fire Protection Systems
- C. Proper Number of Layers
- D. General Installation Guidelines
- E. Proper Repair of Any Gaps or Cuts in the Systems
- F. Proper Caulking of the Systems
- G. Proper System Restraints
- H. Environmental Protection
- I. Suggested Inspection Points

Many installations for 3M Interam E-Mat 4 are possible. The drawings in this guide, illustrating installation requirements, show 3M recommendations and installers evaluation. Installer must determine suitability of a particular detail for the intended specific installation based on regulatory requirements, 3M recommendations, and their own evaluation

of actual field conditions. The following are some considerations:

- The required number of 3M mat layers to be applied (using the proper mat type)
- The seams between mat pieces properly covered
- The interfaces (areas which require special cutting and fitting) to be properly covered.
- The heat transfer paths of items entering the system to be properly covered
- Mechanically restraining the system to stay in place during a fire event

### 2.01 Useful Installation Tools

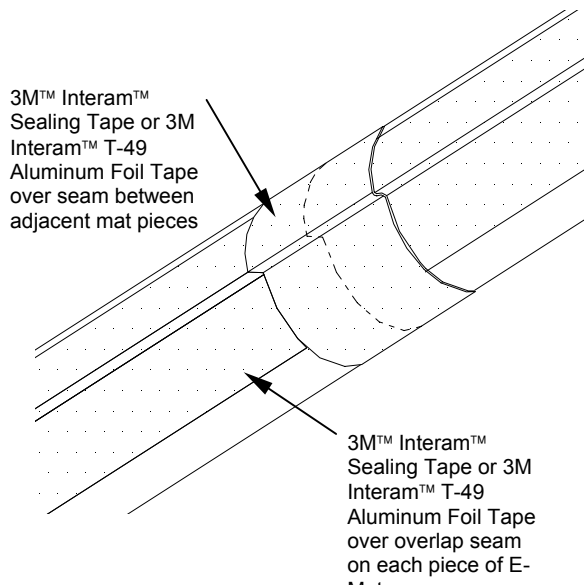
- A. Razor knife: To cut the E-Mat; electric scissors or snips may also be used.
- B. Rubber roller: A hand-held rubber roller can be used to insure good adhesion of the tape(s). A plastic squeegee will work well as an alternative.
- C. Straight edge: A “T”-square or metal straight edge can be used to assist with straight cuts of the E-Mat.
- D. Marking pen: Used to identify the layer number of installed mat.
- E. Tape measure: Used to measure the length and width of E-Mat pieces.
- F. Banding equipment: Band tensioners are available from most banding suppliers. If crimp-type seals are used to hold the bands, a crimping tool is also required.
- G. Caulking gun: Used to dispense the 3M FireDam 150 Caulk. Must fit a 10.5 oz (310 mL) cartridge.

### 3.01 Layer Requirements

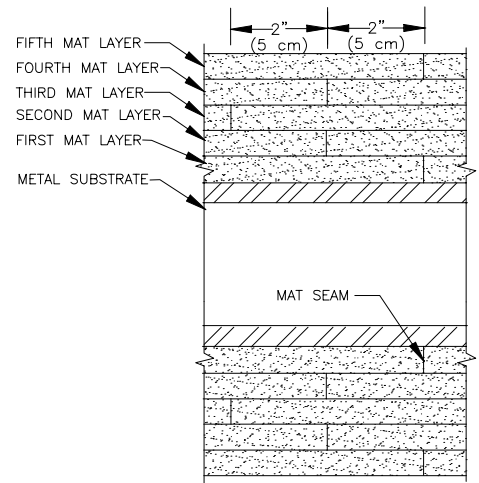
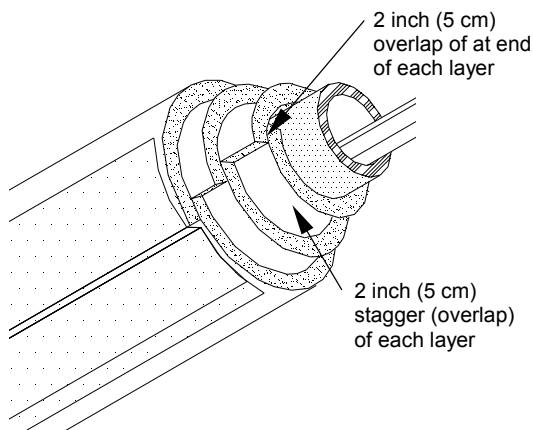
- A. See Tables included in individual installation sections for information on required layers. Installing additional layers of mat will provide additional thermal protection but weight and ampacity derating will be increased.

### 3.02 Mat Seam Requirements

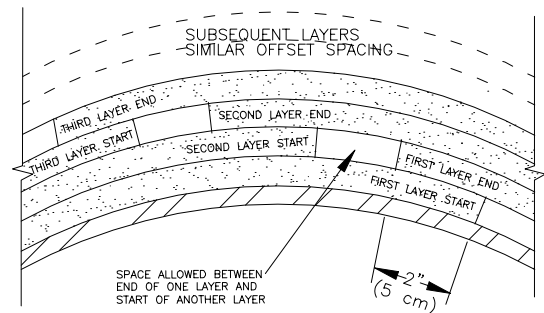
- A. Mat Layer Seams: The seams of every mat layer must be covered with the 3M Interam Sealing Tape or 3M Interam T-49 Aluminum Foil Tape. The 3M T-49 Tape must cover all repairs and all exposed edges of the mat layers.



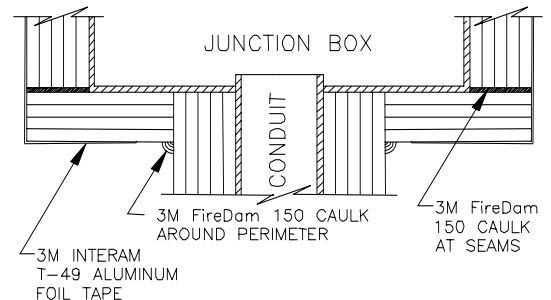
- B. Whenever a mat wrap-around technique is used, all seam overlaps must be a minimum of 2" (5 cm) per layer.
- C. Open spaces are allowable between mat layers in the fire protection envelope.



- D. The offset of the seams between successive layers must be a minimum of 2" (5 cm).

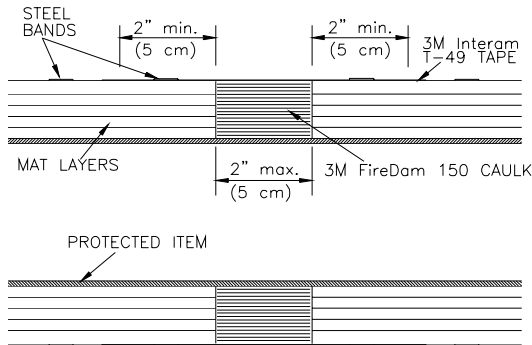


- E. On junction boxes and cable tray elbows, an alternative to the wrap-around technique is the four-piece-per-layer, box-type technique whereby adjoining pieces of the same layer are butted together at the corners. When the box technique is used, a 2" (5 cm) minimum overlap is required around corners on the last





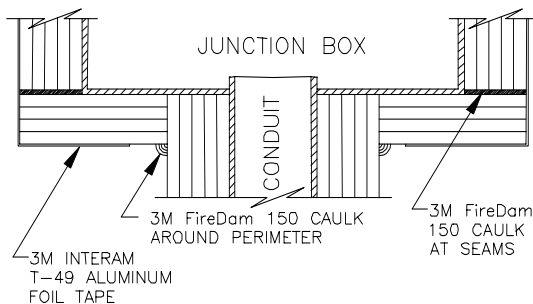
- F. An option to the seam offset is using 3M FireDam 150 Caulk and 3M Interam T-49 Aluminum Foil Tape to fill and cover a direct line seam. The 3M FireDam 150 Caulk may be applied to open seams as large as 2" (5 cm)



- H. Direct line seams to the protected item will occur at interfaces, terminations, and sharp discontinuities. These direct line seams must be caulked and taped after the final layer.
- G. Before mat is applied to cable trays greater than 12" wide (30,5 cm), strapping should be used to minimize sagging of the fire protection mat. Strapping can be filament tape, plastic bands, or duct tape. Recommended spacing is every 8" (20 cm).

### 3.04 Interface Requirements

- A. Interfaces are areas in the fire protection systems that are caused by an interference in the item to be fire protected. Because the mats cannot be stretched around interferences, they must be cut to fit.
- B. Mat seams at interfaces can be handled by several different methods as long as the



general guidelines for mat overlaps and restraining banding are followed.

- C. 3M FireDam 150 Caulk must be applied to gaps in the mat system to provide the appropriate amount of fire protection.
- D. 3M Sealing Tape or 3M T-49 Aluminum Foil Tape is used to cover seams which are cut into the mat pieces.

### 3.05 Heat Transfer Requirements

When possible, conduits, junction boxes and cables trays should be temporarily disconnected from their mounting brackets to allow uninterrupted installation of the E-Mat. After the mat is in place, the protected items must then be reattached to their brackets.

If it is not possible to disconnect conduits, junction boxes and cables trays from their mounting brackets, special considerations are to be used to prevent excessive heat transfer into the E-Mat system.

Due to the factor of safety built into this system, any metal item 1/8" (3 mm) or less in diameter will not add a significant amount of heat into the system. For items larger than 1/8" (3mm) in diameter, follow the steps described below.

- A. The 12" (30,5 cm) Rule: Cover any metallic item which contacts the critical item with one layer of E-Mat for a minimum of 12" (30,5 cm) starting from the point of contact.

- B. If the metallic item is an open channel, stuff it with with at least 4" (10 cm) of ceramic fiber insulation or E-Mat (at the mat termination) and then cover with caulk.
- C. If desired, the entire length of the metallic item may be fully fire protected with one layer of E-Mat. Also, any additional metallic item that physically contacts the primary metallic item must be fire protected with one layer of E-Mat a minimum of 12" (30,5 cm) from the point of contact.
- D. All metallic objects which do not contact critical raceways, but interfere with the fire protective envelope, must be protected as follows:
  1. When one or more layers of mat can be placed between the critical raceway and the metallic item, the metallic item does not need to be fire protected. Merely cut and fit mat layers around the item, caulk the seam and cover with Sealing or T-49 foil tape. This applies only if the interference is less than 5" (12,7 cm) wide within the fire protection system.
  2. When no mat layers can be placed between the critical raceway and the interfering item, cover the interfering item with one layer of E-Mat for a 12" (30,5 cm) minimum distance.

### 3.06 Caulking The System

- A. **Caulking Seams and Joints:** Whenever the 3M E-Mat system is applied with staggered seams, caulking is not needed. In continuous wrap methods however (as described in sec. 3.02.F, 3M FireDam 150 Caulk shall be used to fill the seams between adjacent mat pieces. Bands on mat pieces must be tensioned first and then all gaps must be filled using 3M FireDam 150 Caulk. The caulk must be applied at least ¼" (6 mm) wide up to a maximum of 2" (5 cm.) wide in the seams between mat pieces.
- B. **Caulking Terminations:** 3M FireDam 150 Caulk is required at the end of the Fire Protection System. The caulk shall be used to fill any gaps between layers at the termination of the Fire Protection System. If the termination is an open channel of any type, the

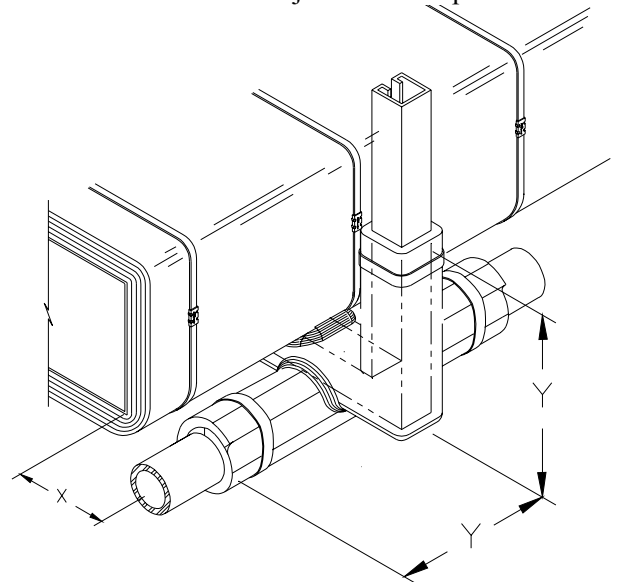
open channel shall be stuffed with at least a 4" (10 cm) depth of ceramic fiber insulation or E-Mat and covered with caulk.

- C. **Caulking interferences:** 3M FireDam 150 Caulk is required at the interface of the last layer of the interfering item to the last layer of the fire protected item. A bead of caulk at least ¼" (6 mm) in diameter shall be applied around the entire circumference of the interface.
- D. **Substrate Sealing With Caulk:** 3M FireDam 150 Caulk shall be used to fill any gaps between the E-Mat and concrete whenever the E-Mat is attached directly to concrete.

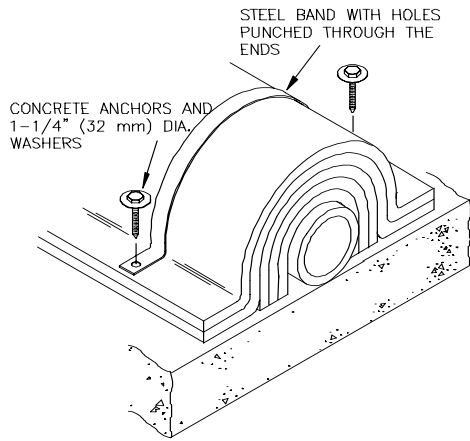
### 3.07 System Restraints

Stainless steel bands are required to mechanically restrain the fire protection after the final layer has been installed. Bands must be tightened to the point where they do not move freely but not tight enough to cut the aluminum foil surface of the E-Mat.

- A. **Band Specification:** ½" (13 mm) wide minimum by 0.020" (0,5 mm) thick minimum 300 Series stainless steel banding must be applied around the last layer of the system. Either crimp-type banding seals or fold-over wing-type seals may be used to secure the bands.
- B. **Band Spacing**
  1. A band is required on each side of the butt seam between adjacent E-Mat pieces on



the last layer of the system. The bands are



to be placed within 2" (50 mm) of the butt seam.

2. Bands must be placed within 2" (5 cm) from the end of all system terminations.
3. The bands are to be placed at a 12" (30,5 cm) maximum spacing throughout the system.
4. When attaching E-Mat to concrete, steel bands cannot be placed around the perimeter for proper restraint. Therefore, holes in the bands are to be punched and concrete anchors are then placed through the holes with minimum 1/4" (32 mm) diameter washers and secured into the concrete.

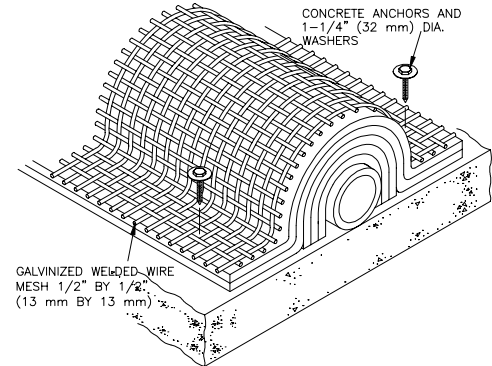
#### C. Hardware Cloth

1. 1/2" by 1/2" (13 mm by 13 mm) galvanized welded wire mesh: Wherever bands cannot be applied to meet the above spacing requirements, welded wire mesh should be used. The welded wire mesh is to be cut to fit over the area which needs restraint. The edges of the screen are then mechanically secured with ring clips or other mechanical fasteners.
2. The mesh wire diameter should be a minimum of 0.060" (1.5 mm) and concrete anchor spacing must be 12" (30,5 cm) or less.
3. Concrete Fasteners: The 3M system can include a concrete wall, floor or ceiling as one or more sides of the fire protective system. In these cases, the 3M system is terminated and overlapped onto the

concrete surface by a 2" (5 cm) minimum.

#### D. Three-Sided Restraints

1. When the E-Mat is to be installed against a concrete surface, concrete anchors are to be at a maximum of 6" (15 cm).



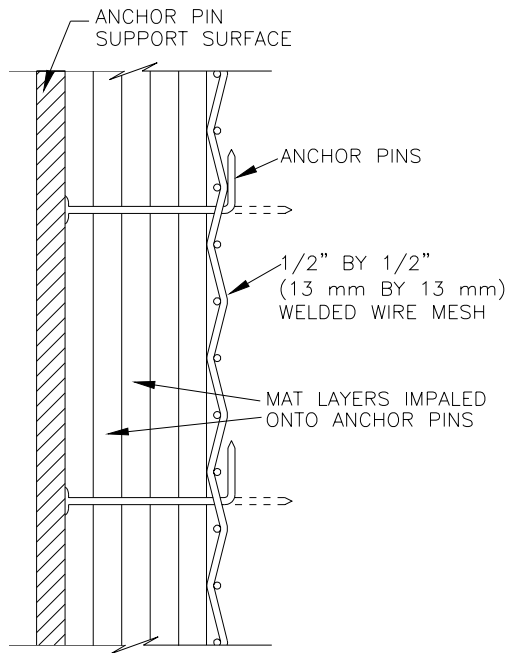
2. Penetration into the concrete of at least 1" (25 mm) is required.
3. Minimum 1/4" (32 mm) diameter washers are to be used with each concrete anchor.

#### E. Anchor Pins:

Due to the weight, sagging in the mat may occur when large unsupported spans are to be fire protected.

1. To minimize the sagging, anchor pins can be used. The anchor pins are to be attached to the item needing protection at a 12" (30,5 cm) maximum spacing and within 2" (5 cm) of mat edges.
2. The mat layers and an outer layer of the 1/2" by 1/2" (13 mm by 13 mm) welded wire screen are to be impaled over the pins. Then the pins are to be bent over the welded wire mesh to hold the mat and mesh into place.
3. The anchor pins are to be 1/8" (3 mm) diameter or less. The length of the anchor pins are to be sized so that at least 3/4" (19 mm) of the pins are exposed after impaling through the mat layers. See example on

the following page.



ANCHOR PIN DETAIL

### 3.08 System Repair

Repairs made to the outermost layer must be mechanically restrained as described in section 3.07.

Below describes damage severity and the required repair:

- A. Dents do not require repair
- B. If the foil is damaged, repair by applying sealing tape or foil tape over the damaged area.
- C. Holes, cuts, or tears in the E-Mat
  1. When no foil or mat has been removed, cover with sealing tape or foil tape.
  2. Gaps up to 1/8" (3 mm) - cover with sealing tape or foil tape.
  3. Gaps 1/8" (3 mm) to 2" (5 cm) - fill gap with 3M FireDam 150 Caulk and cover with sealing tape or foil tape.

4. Gaps larger than 2" (5 cm).
  - a. On inner layers of the E-Mat system, cut a mat insert to fill the gap and cover with sealing tape or foil tape.
  - b. On the final mat layer cut out a mat insert to fill the gap. Caulk the gaps with 3M FireDam 150 Caulk and cover caulk with sealing tape or foil tape. One or more stainless steel bands are required to restrain the patch. Band spacing on the patch must meet banding requirements in 3.07.B.

### 3.09 Environmental Protection

- A. Where corrosion is a concern, the item to be fire protected should be coated with a corrosion inhibitor before the E-Mat system is installed.
- B. If the installation is outdoors, the outermost layer of the fire protection system should be fully covered with 3M Interam Sealing Tape or stainless steel jacketing. Please contact 3M for details regarding the Sealing Tape installation requirements.

### 3.10 Suggested Inspection Points

- A. Before start of installation.
- B. After the addition of each layer.
- C. After all caulking is completed.
- D. After entire restraining system is installed.

# 1.1a Conduit or Cable Bundle Straight Section “Continuous” Wrap Method 1 Hour Fire Rating

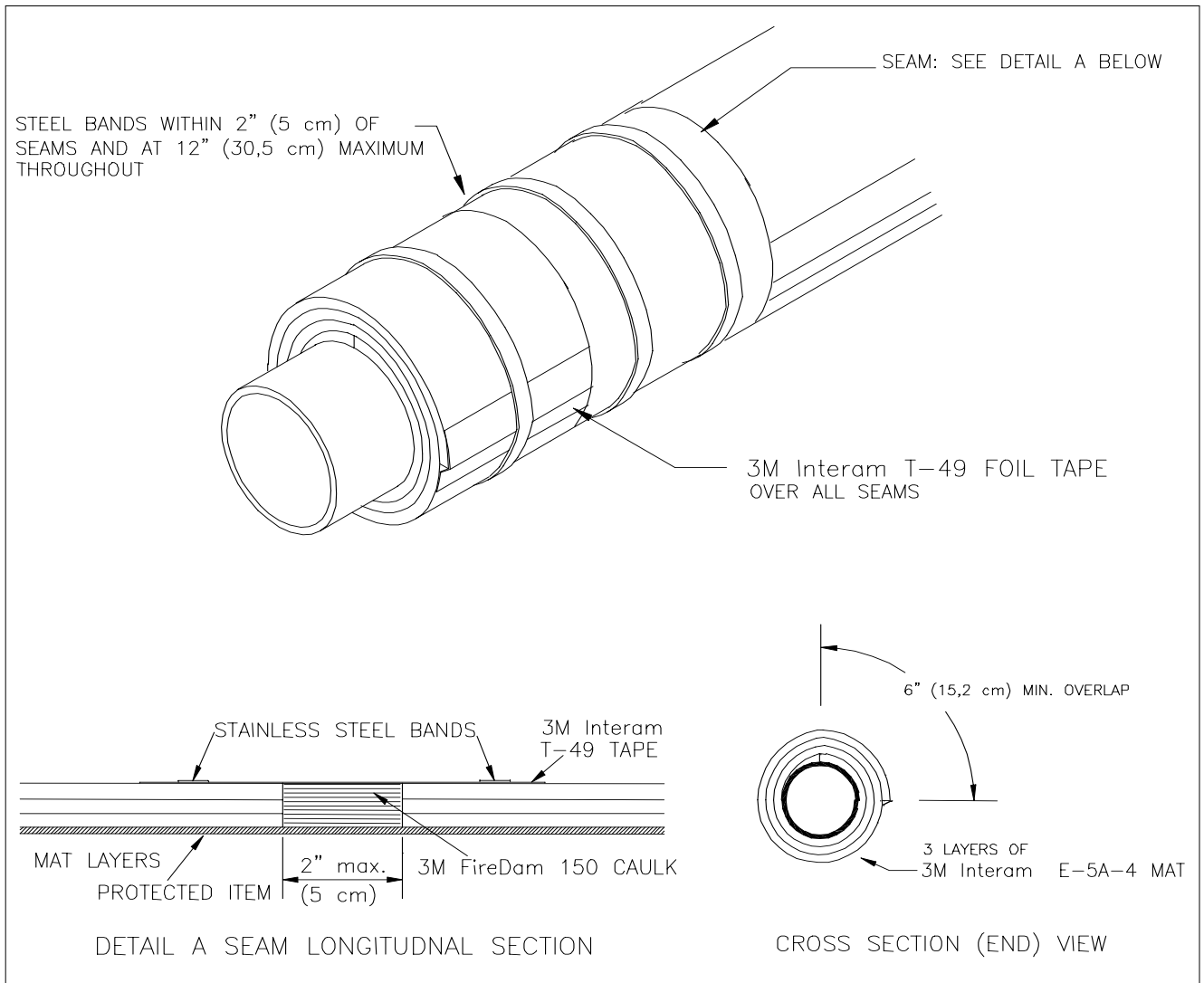
## System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-969, Date: September 1986, 3M Fire Test: #87-76  
Date: June 1987
- B. Electrical Raceway Configuration:
  - 1. Conduit or cable bundle - straight run
  - 2. Size/material: 2 in. (5 cm) and greater
- C. 3M™ Interam™ System Description:
  - 1. Hourly Rating: 1 hour
  - 2. Mat Thickness on Conduit or Cable Bundle: 1.2 in. (30 mm) thick (3 layers of E-Mat 4)
  - 3. Mat Seams: Butt seams between adjacent sections
  - 4. Layer Technique: Continuous wrap around conduit or cable bundle with 6 in. (15,2 cm) overlap of final wrap past the start point

- 5. Taping: Cover all seams with 3M™ Interam™ Sealing Tape or 3M™ Interam™ T-49 Aluminum Foil Tape
- 6. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge and seam.

## Application Details

- A. Apply 3 layers of E-Mat 4 to the conduit or cable bundle
- B. There must be a 6 in. (15,2 cm) minimum mat overlap on the final layer around the conduit or cable bundle. Seams of adjacent mat sections are butted together. Seams must be filled with 3M™ FireDam™ 150 Caulk – up to 2” (5 cm.) wide.
- C. Tape all mat seams with 3M Interam™ Sealing Tape or 3M Interam™ T-49 Aluminum Foil Tape
- D. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the conduit (cable bundle). Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge and seam.



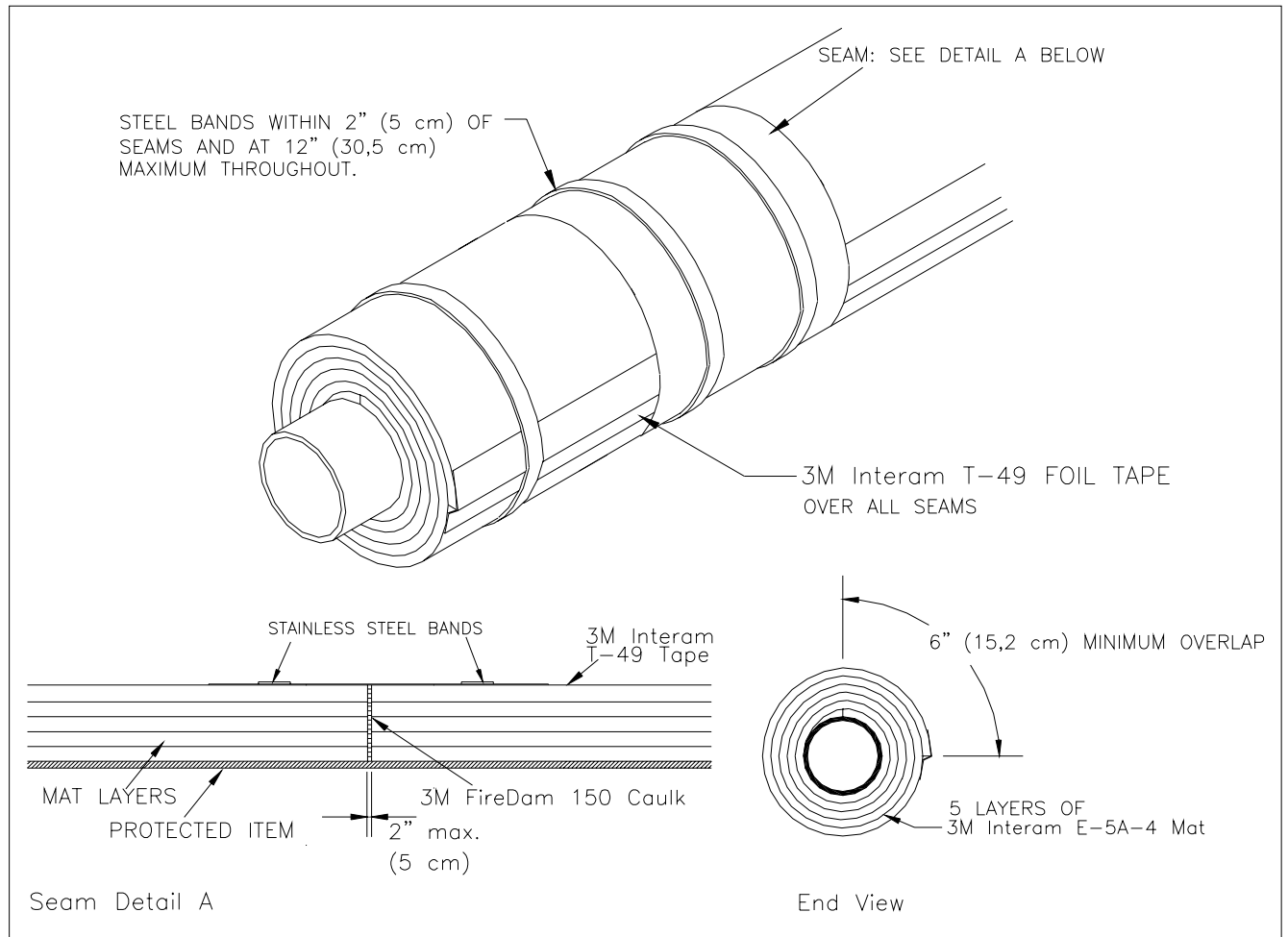
# 1.1b Conduit or Cable Bundle Straight Section “Continuous” Wrap Method 3 Hour Fire Rating

## System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-331, Date: March 1986 (Revised April 1986), 3M Fire Test: #87-82, Date: July 1987
- B. Electrical Raceway Configuration:
  - 1. Conduit or cable bundle - straight run
  - 2. Size/Material: 2 in.(5 cm) and greater
- C. 3M System Description:
  - 1. Hourly Rating: 3 hour
  - 2. Mat Thickness on Conduit or cable bundle: 2 in. (5 cm) thick - 5 layers of E-Mat 4
  - 3. Mat Seams: Butt seams between adjacent sections
  - 4. Layer Technique: Continuous wrap around conduit or cable bundle with 6 in. (15,2 cm) overlap of final layer past the start point
  - 5. Taping: All seams with 3M™ Interam™ Sealing Tape or 3M™ Interam™ T-49 Aluminum Foil Tape
  - 6. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge and seam.

## Application Details

- A. Apply 5 layers of E-5A-4 mat 2 in. (5 cm) to the conduit or cable bundle.
- B. There must be a 6 in. (15,2 cm) minimum mat overlap on the final layer around the conduit or cable bundle. Seams of adjacent mat sections are butted together. Seams must be filled with 3M™ Interam™ FireDam™ 150 Caulk up to 2” 95cm.) wide.
- C. Tape all mat seams with 3M Interam™ Sealing Tape or 3M Interam™ T-49 Aluminum Foil Tape
- D. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the conduit or cable bundle. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge and seam.



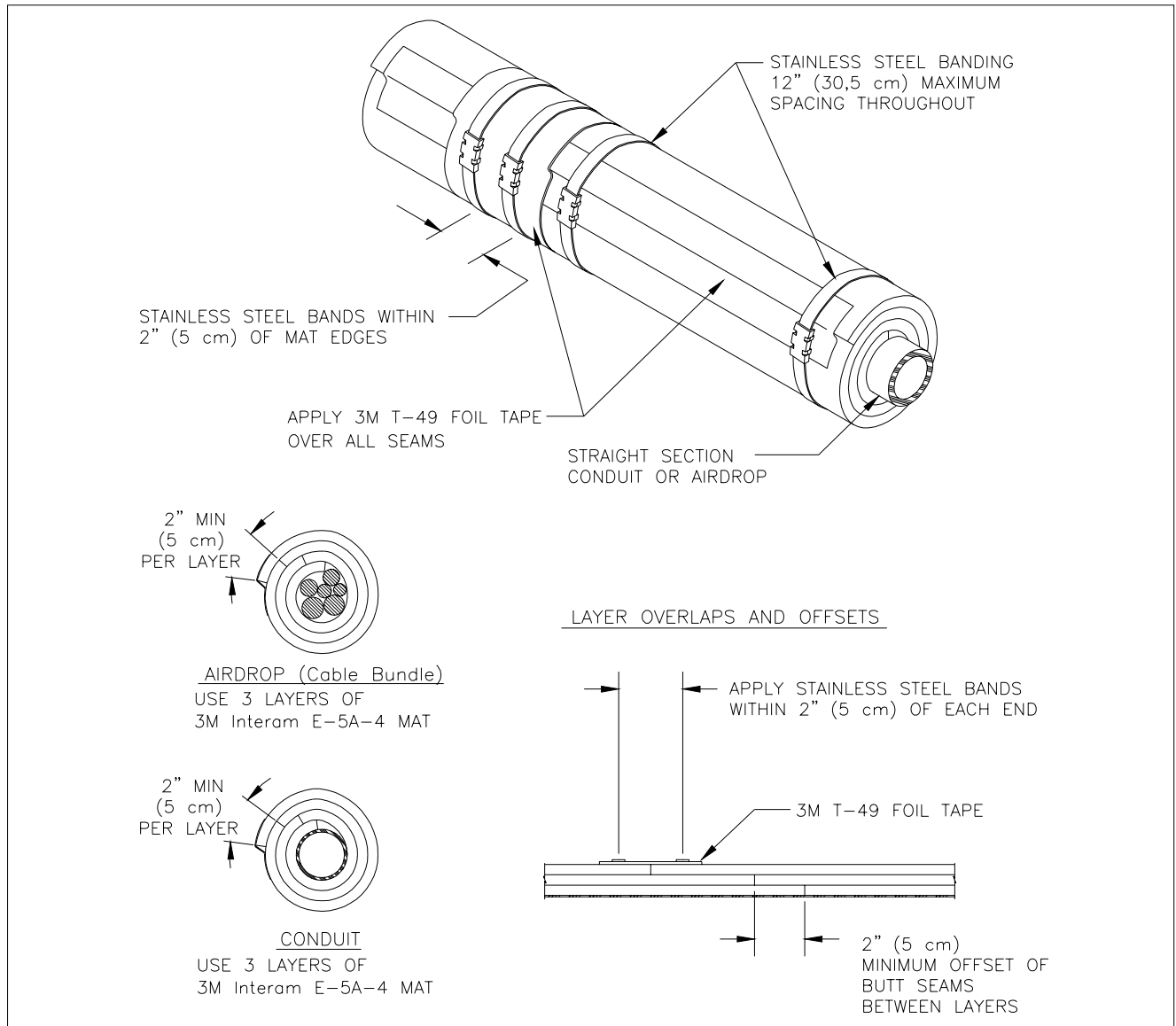
# 1.2a Conduit or Airdrop (Cable Bundle) Straight Section "Offset" Method 1 Hour Fire Rating

## System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-969, Date: September 1986, 3M Fire Test: #87-76  
Date: June 1987
- B. Electrical Raceway Configuration:
  - 1. Conduit or airdrops/straight run
  - 2. Size/material: 2 in. (5 cm) and greater
- C. 3M System Description:
  - 1. Hourly Rating: 1 hour
  - 2. Mat Thickness on Conduit or airdrop (cable bundle): 1.2 in. (30 mm) thick (3 layers of E-5A-4 mat)
  - 4. Mat Seams: 2 in. (5 cm) offset between layers
  - 5. Layer Technique: 2 in. (5 cm) overlap per layer around conduit or airdrop
  - 6. Taping: All seams with 3M™ Interam™ Sealing Tape or 3M™ Interam™ T-49 Aluminum Foil Tape
  - 7. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.

## Application Details

- A. Apply 3 layers of E-5A-4 mat [1.2 in. (30 mm)] to the conduit or airdrop (cable bundle). The application details below are the same for both the conduit or airdrop (cable bundle).
- B. There must be a 2 in. (5 cm) minimum mat overlap per layer around the conduit or airdrop (cable bundle). There must also be a 2 in. (5 cm) seam offset between the mat layers along the length of the conduit or airdrop (cable bundle).
- C. Tape all mat seams on all layers with Sealing Tape or T-49 Aluminum Foil Tape.
- D. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the conduit or airdrop (cable bundle). Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.



## 1.2b Conduit or Airdrop (Cable Bundle) Straight Section “Offset” Method 3 Hour Fire Rating

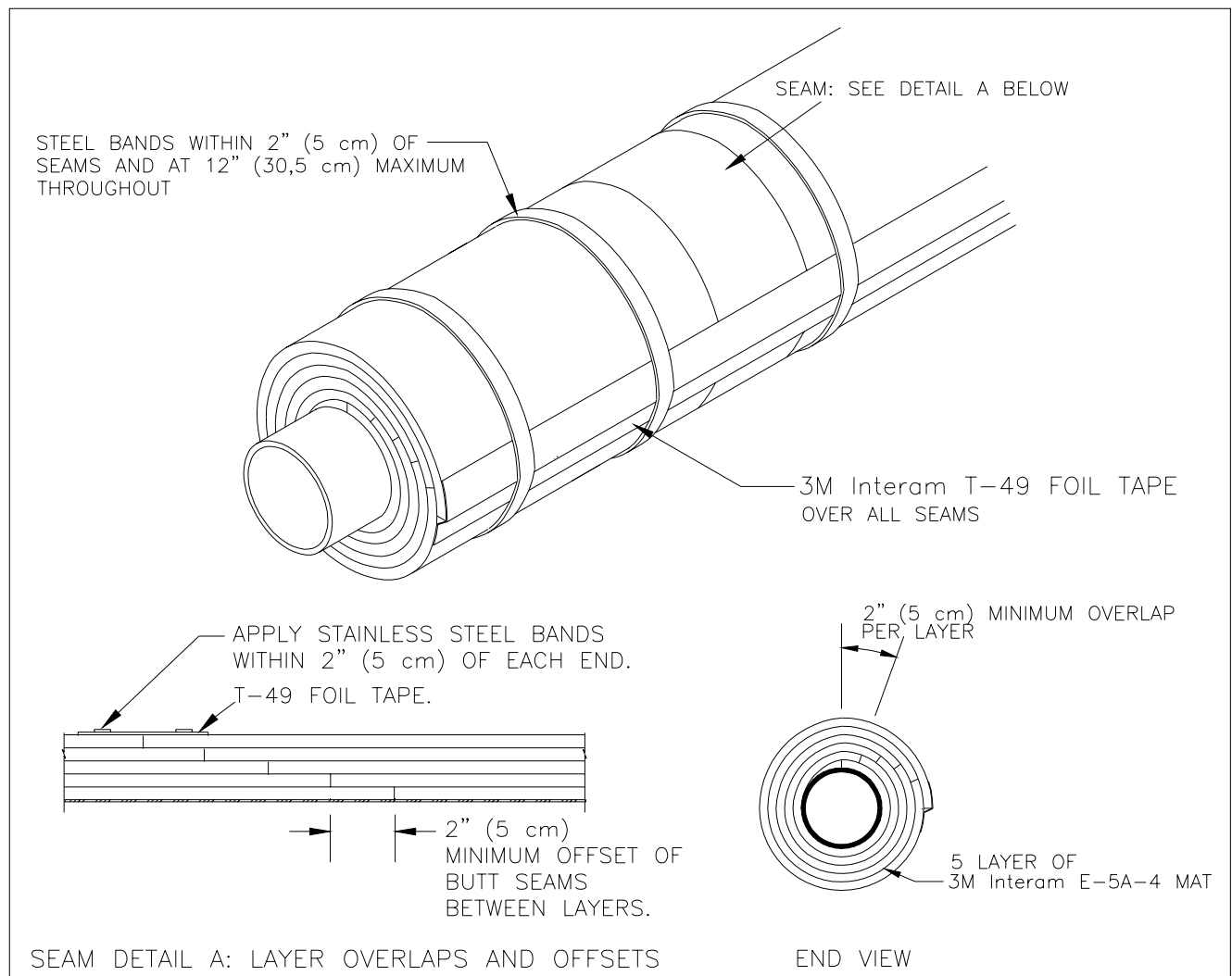
### System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-331, Date: March 1986, 3M Fire Test: #87-82.
- B. Electrical Raceway Configuration:
  1. Conduit or airdrops/straight run
  2. Size/Material: 2 in. (5 cm) and greater
- C. 3M System Description:
  1. Hourly Rating: 3 hour
  2. Mat Thickness on Conduit or Airdrop (Cable Bundle): 2 in. (5 cm) thick (5 layers of E-5A-4 mat)
  4. Mat Seams: 2 in. (5 cm) offset between layers
  5. Layer Technique: 2 in. (5 cm) overlap per layer around conduit or airdrop
  6. Taping: All seams with 3M™ Interam™ Sealing Tape or 3M™ Interam™ T-49 Aluminum Foil Tape
  7. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge

### Application Details

- A. Apply 5 layers of E-5A-4 mat 2 in. (5 cm) to the conduit or airdrop (cable bundle). The application details below are the same for both the conduit or airdrop (cable bundle).
- B. There must be a 2 in. (5 cm) minimum mat overlap per layer around the conduit or airdrop (cable bundle). There must also be a 2 in. (5 cm) seam offset between the mat layers and the length of the conduit or airdrop (cable bundle).
- C. Tape all mat seams on all layers with Sealing Tape or T-49 Aluminum Foil Tape.
- D. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the conduit or airdrop (cable bundle). Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge

*Note: ASTM E 119 Standard is represented in the drawing below. ASTM E 1725 may require additional layers.*



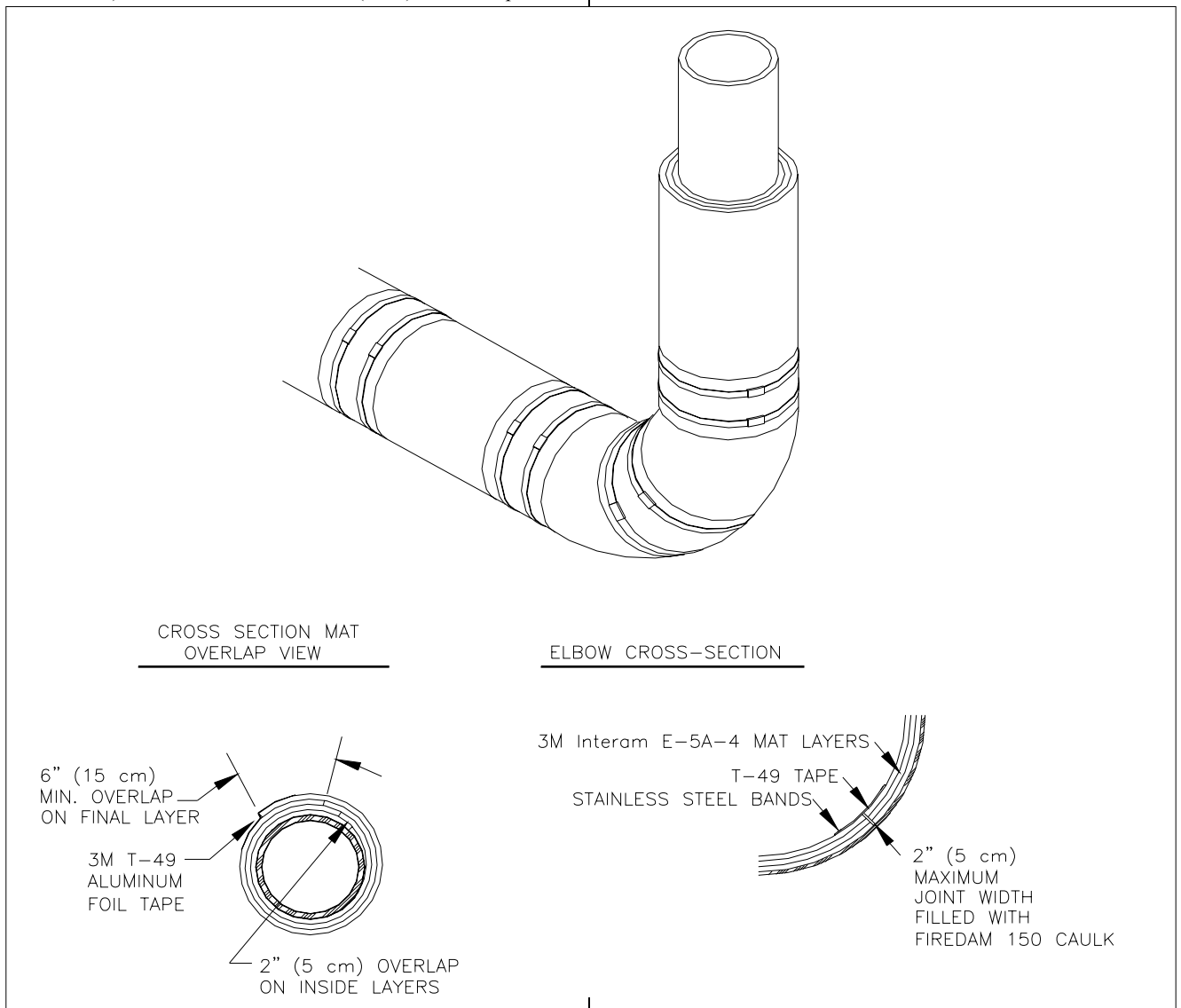


# 1.3a Conduit or Airdrop (Cable Bundle) Elbow 1 Hour Fire Rating

mat edge

## System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-969, Date: September 1986, 3M Fire Test: #87-57 Date: May 1987
- B. Electrical Raceway Configuration:
  - a. Conduit or airdrop (cable bundle)/elbow
  - b. Size/material: 2 in. (5 cm) and greater
- C. 3M System Description:
  - 1. Hourly Rating: 1 hour
  - 2. Mat Thickness on conduit or airdrop (cable bundle): 1.2 in. (30 mm) thick (3 layers of E-5A-4 mat)
  - 3. Mat Seams: butt seam at adjacent sections
  - 4. Layer Technique: Continuous wrap around conduit or airdrop with 6 in. (15,2 cm) overlap of final layer past the start point.
  - 5. Joint Sealant: 3M™ Interam™ FireDam™ 150 Caulk
  - 6. Taping: All seams with 3M™ Interam 3M™ Sealing Tape or Interam T-49 Aluminum Foil Tape
  - 7. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed



**Application Details**

- A. Apply 3 layers of E-5A-4 mat 1.2 in. (30 mm) to conduit or airdrop (cable bundle) elbow. The application details below are the same for both conduit or airdrop (cable bundle) elbow.
- B. Cut narrow sections of mat of sufficient length to wrap required number of layers and overlap around conduit or airdrop (cable bundle) in one continuous piece. Sections of mat should be butted together at inner radius and have a gap no greater than 2 in. (5 cm) at outer radius. Secure each mat section in place using filament tape.
- C. Apply FireDam 150 caulk to all gaps between sections and at butt joints. Fill to depth of all mat layers.
- D. Tape all mat seams and joints with Sealing Tape or T-49 Aluminum Foil Tape.
- E. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the elbow. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.

# 1.3b Conduit or Airdrop (Cable Bundle) Elbow 3 Hour Fire Rating

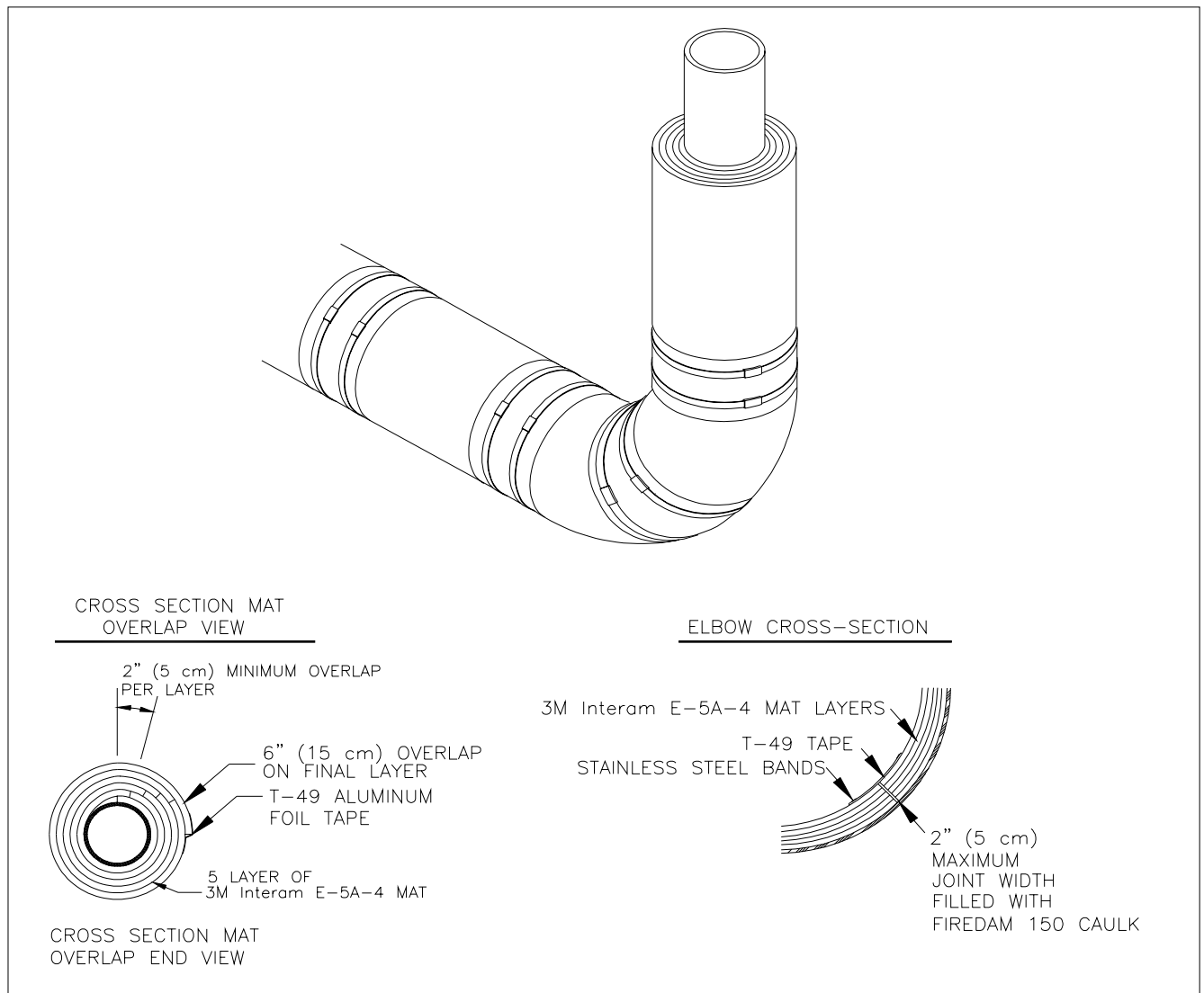
## System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-331 - Date: March 1986 (Revised April 1986), 3M Fire Test: #87-82 - Date: July 1987
- B. Electrical Raceway Configuration:
  - a. Conduit or airdrop (cable bundle)/elbow
  - b. Size/Material: 2 in. (5 cm) and greater
- C. 3M System Description:
  - 1. Hourly Rating: 3 hour
  - 2. Mat Thickness on conduit or airdrop (cable bundle): 2 in. (5 cm) thick (5 layers of E-5A-4 mat)
  - 3. Mat Seams: butt seam at adjacent sections
  - 4. Layer Technique: Continuous wrap around conduit or airdrop (cable bundle) with 10 in. (20 cm) overlap of final layer past the start point.
  - 5. Joint Sealant: 3M™ Interam™ FireDam™ 150 Caulk
  - 6. Taping: All seams with 3M™ Interam™ T-49 Aluminum Foil Tape
  - 7. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.

## Application Details

- A. Apply 5 layers of E-5A-4 mat 2 in. (5 cm) to the conduit or airdrop (cable bundle) elbow. The application details below are the same for both conduit or airdrop (cable bundle) elbow.
- B. Cut narrow sections of mat of sufficient length to provide the required number of layers and overlap around conduit or airdrop (cable bundle) in one continuous piece. If necessary, these sections may be spliced together using tape. Adjacent sections of mat should be butted together at the inner radius and have a gap no greater than 2 in. (5 cm) at the outer radius. Temporarily secure each mat section in place using filament tape.
- C. Apply FireDam 150 caulk to all gaps between mat. Fill to depth of all mat layers.
- D. Tape all mat seams and joints with sealant with Sealing Tape or T-49 Aluminum Foil Tape.
- E. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the elbow. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.

*Note: ASTM E 119 Standard is represented in the drawing below. ASTM E 1725 may require additional layers.*



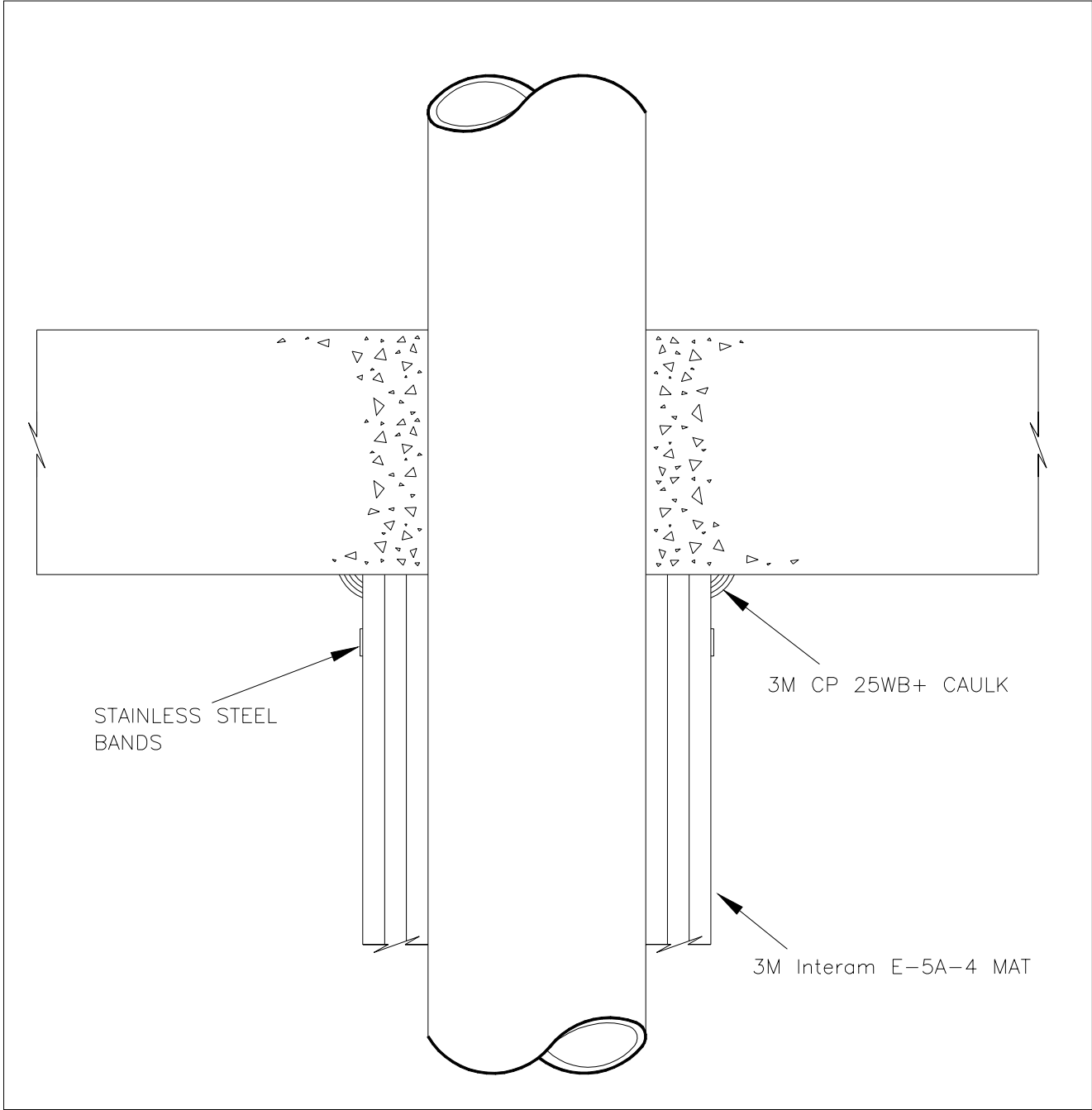
# 1.4a Electrical Raceway Closed Penetration Firestop 1 Hour Fire Rating

### System Details

- A. Qualification Fire Test(s): 3M Fire Test #92-167
- B. Electrical Raceway Configuration: Electrical Raceway - grouted concrete interface
- C. 3M System Description:
  - 1. Hourly Rating: 1 Hour
  - 2. Caulking: 3M™ Fire Barrier CP 25WB+ Caulk at interface points.
  - 4. Restraining System: stainless steel bands within 2 in. (5 cm) of E-5A-4 mat termination.

### Application Details

- A. Wrap the electrical raceway with required layers. Butt all layers to the concrete.
- B. Seal the mat to the concrete with CP 25WB+ Caulk.



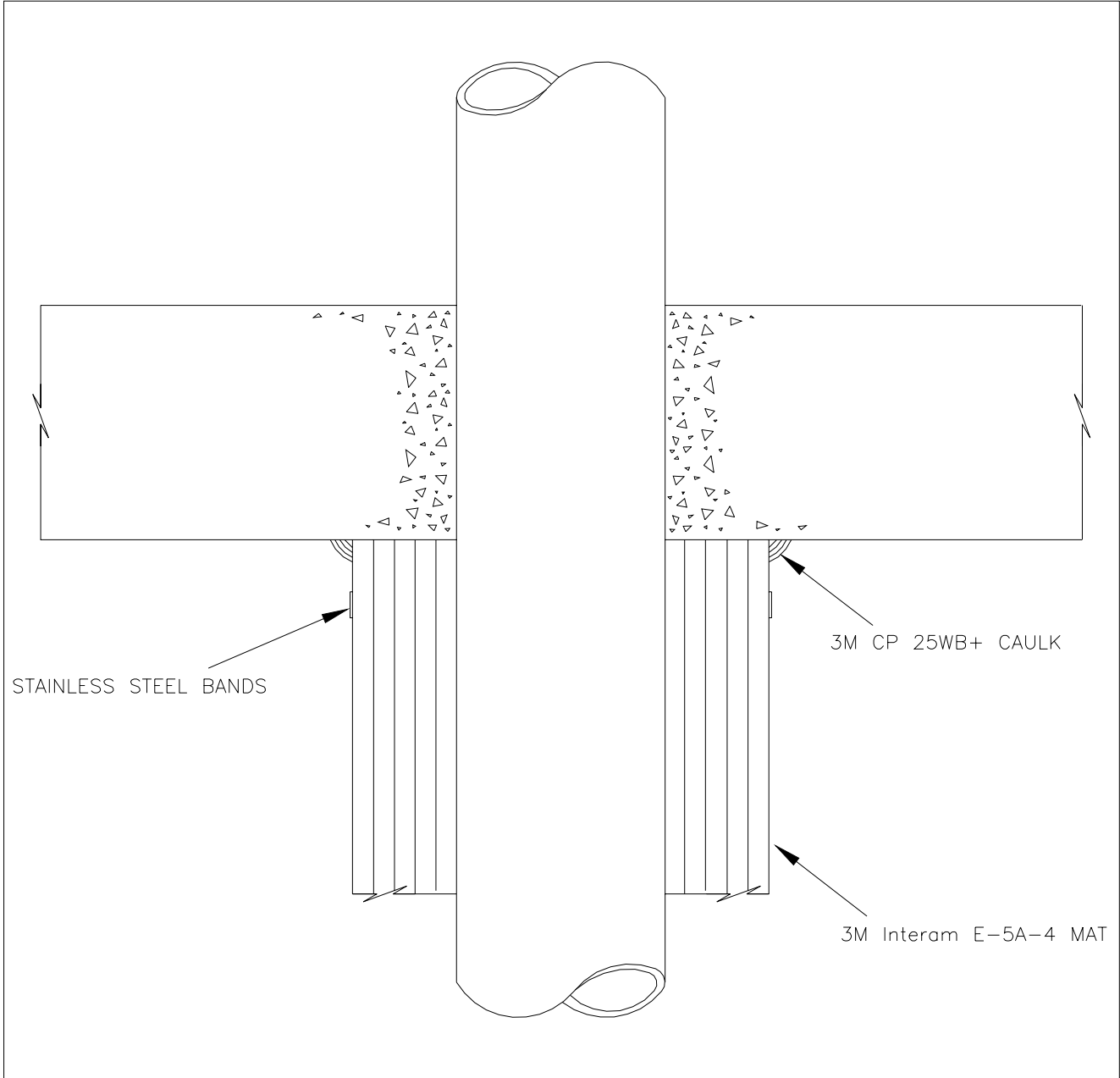
# 1.4b Electrical Raceway Closed Penetration Firestop 3 Hour Fire Rating

### System Details

- A. Qualification Fire Test(s): 3M Fire Test #92-167
- B. Electrical Raceway Configuration: Electrical Raceway - grouted concrete interface
- C. 3M System Description:
  - 1. Hourly Rating: 3 Hour
  - 2. Caulking: 3M™ Fire Barrier CP 25WB+ Caulk at interface points
  - 3. Restraining System. Stainless steel within 2 in. (5 cm) of E-5A-4 mat termination.

### Application Details

- A. Wrap the electrical raceway with required layers. Butt all layers to the concrete.
- B. Seal the mat to the concrete with CP 25WB+ Caulk.



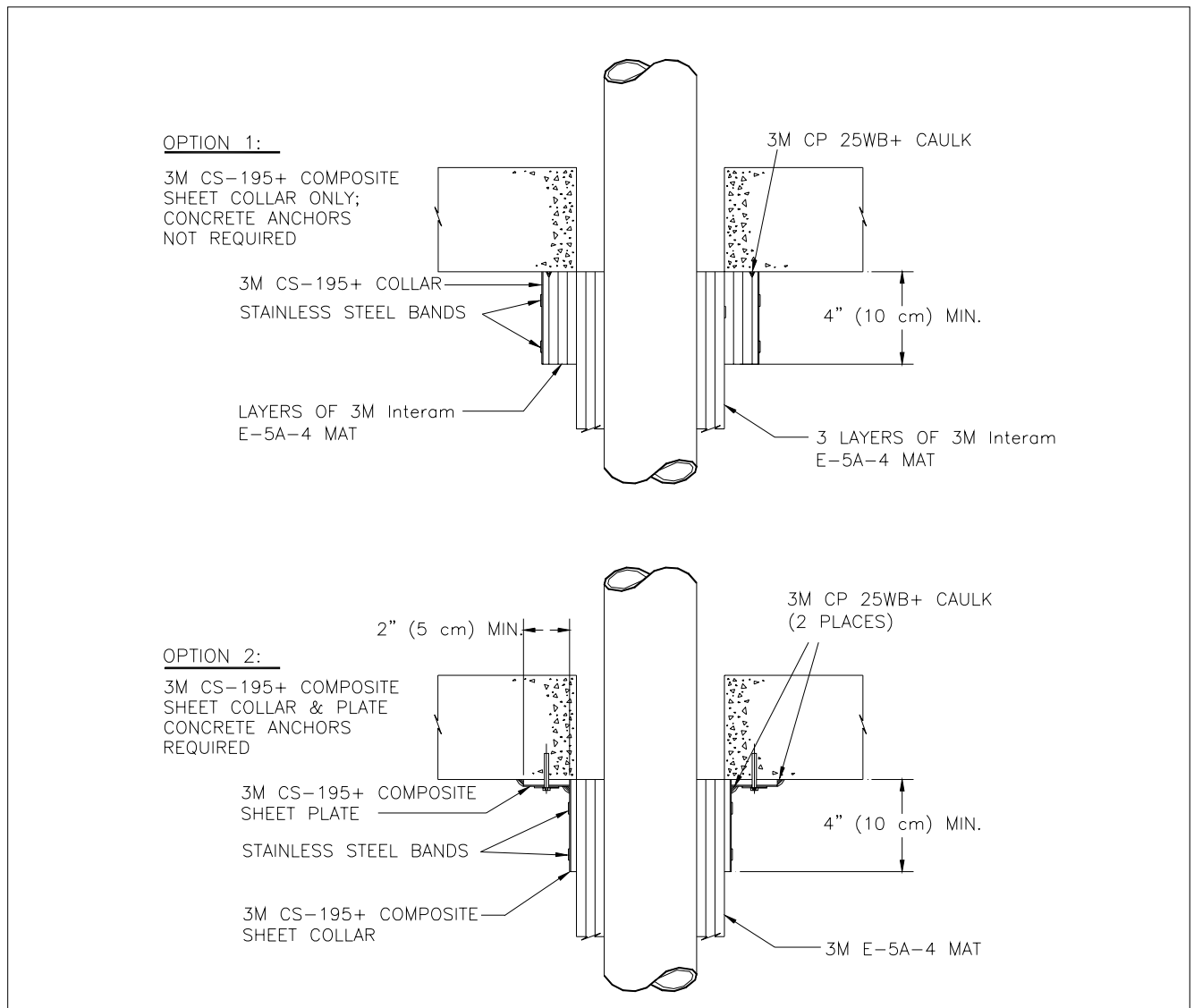
# 1.5a Electrical Raceway Open Penetration Firestop 1 Hour Fire Rating

## System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-331 Date: March 1986 (Revised April 1986)
- B. Electrical Raceway Configuration: Through penetration opening or fire rated interface
- C. 3M System Description:
  - 1. Hourly Rating: 1 Hour
  - 2. Option 1 – E-Mat Collars
    - Collars: layers of 4 in. (10 cm) wide E-Mat 4 mat collars at concrete interface and one 4 in. (10 cm) wide 3M™ Fire Barrier CS-195+ Composite Sheet collar.
    - 2 stainless steel bands.
  - Option 2 – CS-195+ Collar and Plate
    - Collar: One 4 in. (10 cm) 3M™ Fire Barrier CS-195+ Composite Sheet collar
    - Plate: One CS-195+ Composite Sheet at concrete interface anchored using concrete
    - 2 stainless steel bands
  - 3. Caulking: 3M™ Fire Barrier CP 25WB+ Caulk at interface points

## Application Details

- A. Wrap the electrical raceway with required number of layers. Butt all layers to the concrete.
- B. Option 1 – E-Mat Collars
  - Butt layers of 4 in. (10 cm) wide E-5A-4 mat up to the concrete at the raceway/concrete interface. Apply the appropriate number of layers required to cover annular space and overlap onto concrete. Caulk interface between mat and concrete with CP 25WB+ Caulk. Install a 4 in. (10 cm) wide collar of CS-195+ Composite Sheet over the mat collars. Secure collar using 2 stainless steel bands within 1 in. (2,54 cm) of collar edges.
- C. Option 2 – CS-195+ Collar and Plate
  - Cut a CS-195+ Composite Sheet collar 4 in. (10 cm) wide to fit around the wrapped electrical raceway. Butt the collar to the concrete and secure with 2 stainless steel bands. Cut a CS-195+ Composite Sheet plate to fit tightly around the collar. The plate must be large enough to cover the opening and overlap onto the concrete of 2 in. (5 cm) minimum in all directions. Secure the plate using concrete anchors with 1½ in. (32 mm) minimum diameter washers spaced at 6 in. (15 cm) maximum on centers and within 2 in. (5 cm) of edges at corner and seams.
- D. Apply CP 25WB+ Caulk between the collar and plate. Apply caulk along the exposed edge of the plate.



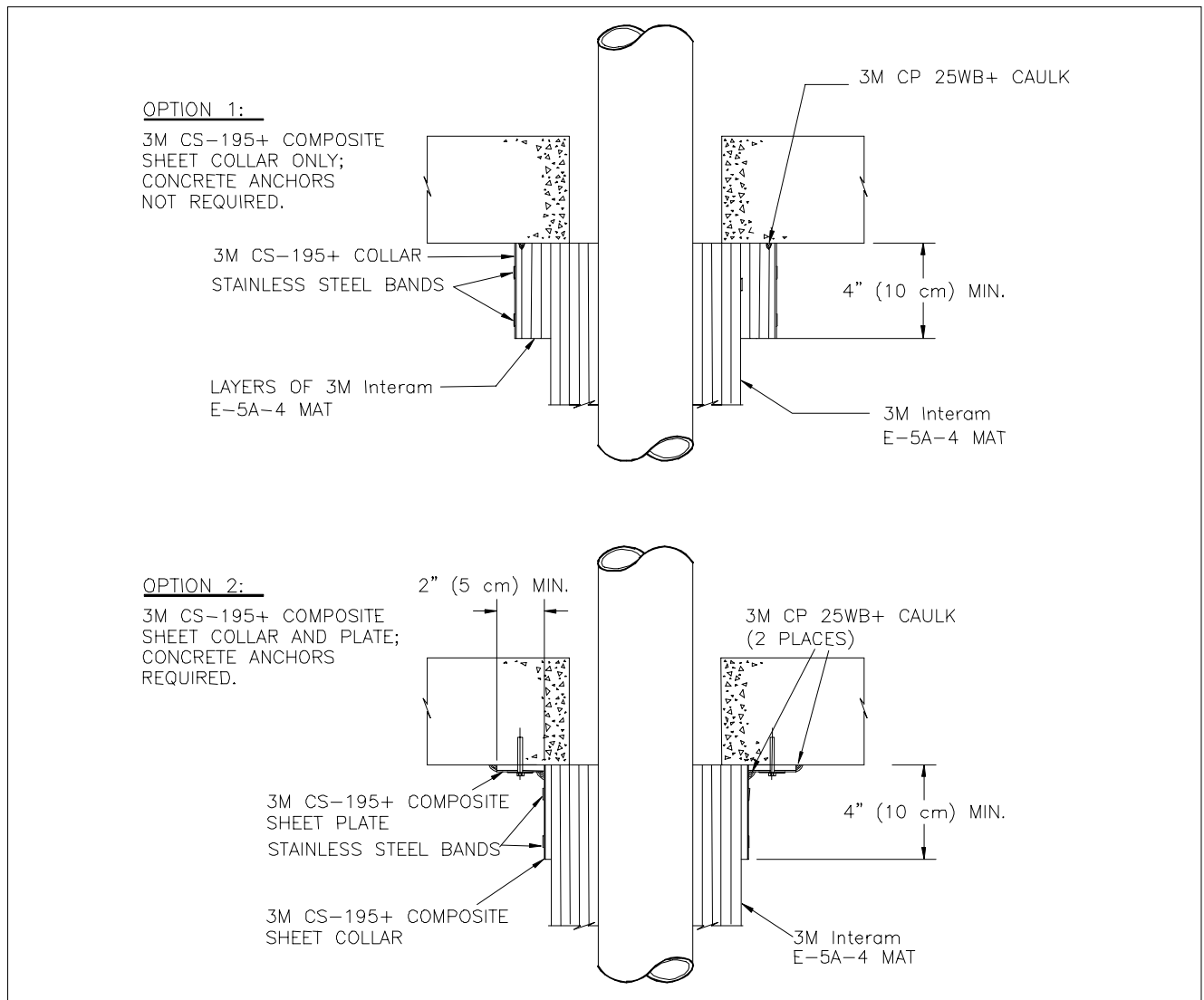
# 1.5b Electrical Raceway Open Penetration Firestop 3 Hour Fire Rating

## System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-331 Date: March 1986 (Revised April 1986)
- B. Electrical Raceway Configuration: Through penetration opening or fire rated interface
- C. 3M System Description:
  - 1. Hourly Rating: 3 Hour
  - 2. Option 1 – E-Mat Collars
    - Collars: layers of 4 in. (10 cm) wide E-Mat 4 collars at concrete interface and one 4 in. (10 cm) wide 3M™ Fire Barrier CS-195+ Composite Sheet collar.
    - 2 stainless steel bands.
  - Option 2 – CS-195+ Collar and Plate
    - Collar: One 4 in. (10 cm) 3M™ Fire Barrier CS-195+ Composite Sheet collar
    - Plate: One CS-195+ Composite Sheet at concrete interface anchored using concrete
    - 2 stainless steel bands
  - 3. Caulking: 3M™ Fire Barrier CP 25WB+ Caulk at interface points

## Application Details

- A. Wrap the electrical raceway with required number of layers. Butt all layers to the concrete.
- B. Option 1 – E-Mat Collars
  - Butt layers of 4 in. (10 cm) wide E-5A-4 mat up to the concrete at the raceway/concrete interface. Apply the appropriate number of layers required to cover annular space and overlap onto concrete. Caulk interface between mat and concrete with CP 25WB+ Caulk. Install a 4 in. (10 cm) wide collar of CS-195+ Composite Sheet over the mat collars. Secure collar using 2 stainless steel bands within 1 in. (2,54 cm) of collar edges.
- C. Option 2 – CS-195+ Collar and Plate
  - Cut a CS-195+ Composite Sheet collar 4 in. (10 cm) wide to fit around the wrapped electrical raceway. Butt the collar to the concrete and secure with 2 stainless steel bands. Cut a CS-195+ Composite Sheet plate to fit tightly around the collar. The plate must be large enough to cover the opening and overlap onto the concrete of 2 in. (5 cm) minimum in all directions. Secure the plate using concrete anchors with 1¼ in. (32 mm) minimum diameter washers spaced at 6 in. (15 cm) maximum on centers and within 2 in. (5 cm) of edges at corner and seams.
- D. Apply CP 25WB+ Caulk between the collar and plate. Apply caulk along the exposed edge of the plate.



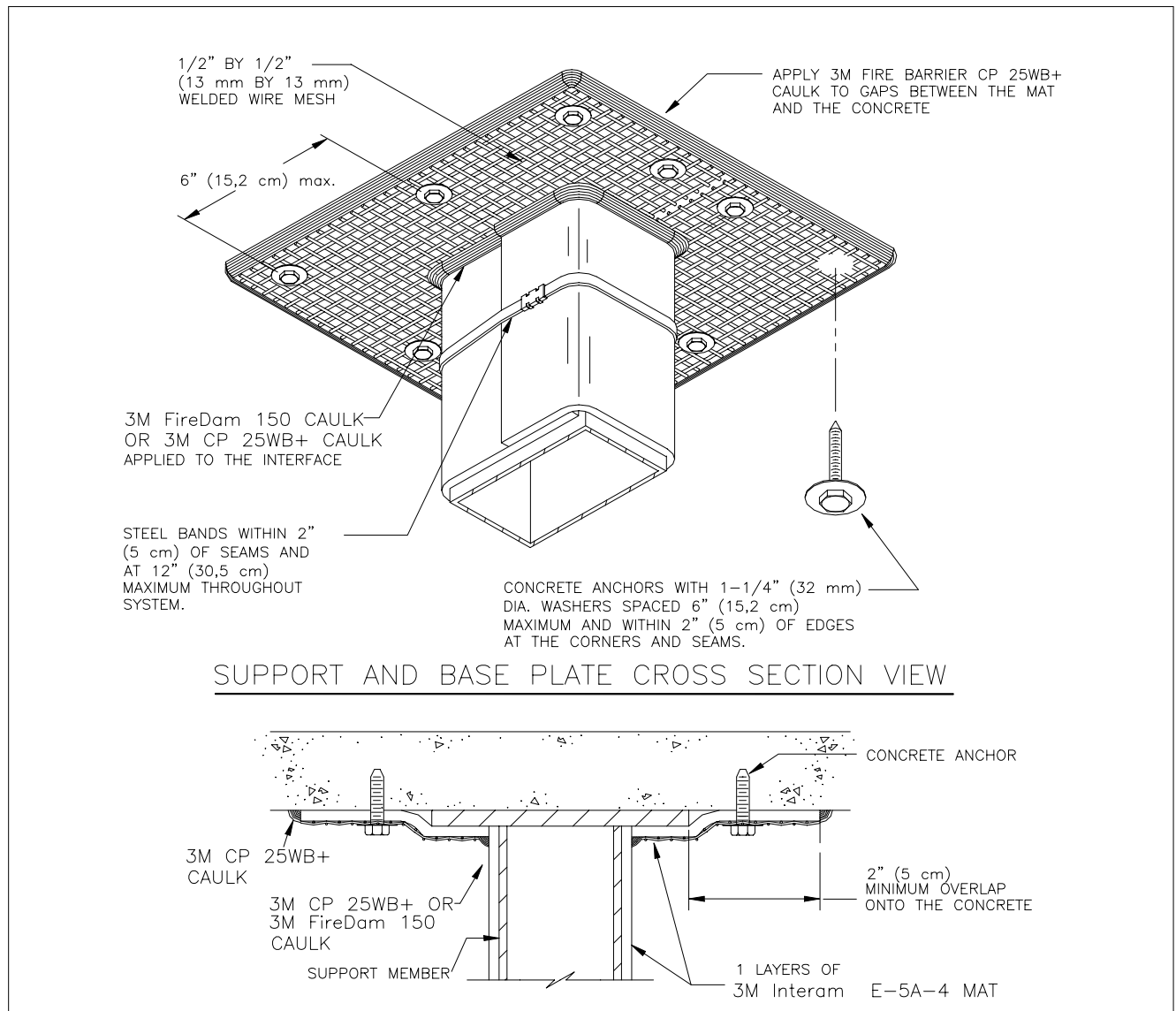
## 2.1a Fully Covered Support Member with Baseplate 1 Hour Fire Rating

### System Details

- A. Qualification Fire Test(s): Southwest Research Institute (SWRI): #0179129[1], Date: February 1985 Revised: June 1985
- B. Electrical Raceway Configuration:
- Support members and baseplates
  - Size/material: Unistrut P1000 series
- C. 3M System Description:
- Hourly Rating: 1 Hour
  - Mat Thickness (Layers): 0.40 in. (10 mm) E-Mat 4 (1 layer)
  - Caulking: 3M™ Fire Barrier CP 25WB+ Caulk or 3M™ Interam™ FireDam™ 150 Caulk at interface points.
  - Restraining System: Stainless steel banding at 12 in. (30,5 cm) maximum  
Welded wire screen (1/2 in. by 1/2 in. [13 mm by 13 mm]) Concrete anchors with washers.

### Application Details

- Wrap the support member completely to the baseplate with 1 layer of E-Mat 4. Overlap this layer with a 2 in. (5 cm) minimum onto itself, and use butt seams between adjacent sections.
- Tape all mat seams with Sealing Tape or T-49 Aluminum Foil Tape.
- Secure the mat with stainless steel banding spaced at 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each mat seam and termination.
- Caulk interface seams at concrete with CP 25WB+ Caulk and caulk the mat-to-mat interface seams with CP 25WB+ or FireDam 150 Caulk - see drawing below.
- Install 1 layer of E Mat 4 over the baseplate. Cut a piece of welded wire mesh to fit on top of the mat covering the baseplate. Cut the mat and wire mesh to fit tightly around the wrapped support member and over the baseplate. The mat and wire mesh must be large enough to cover the baseplate and overlap the concrete by a minimum of 2 in. (5 cm) in all directions. Secure the mat and screen with concrete anchors with 1¼ in. (32 mm) minimum diameter washers spaced at 6 in. (15 cm) maximum on centers and within 2 in. (5 cm) of edges at corners and seams. Apply CP 25WB+ Caulk along the exposed edges of the E Mat 4.





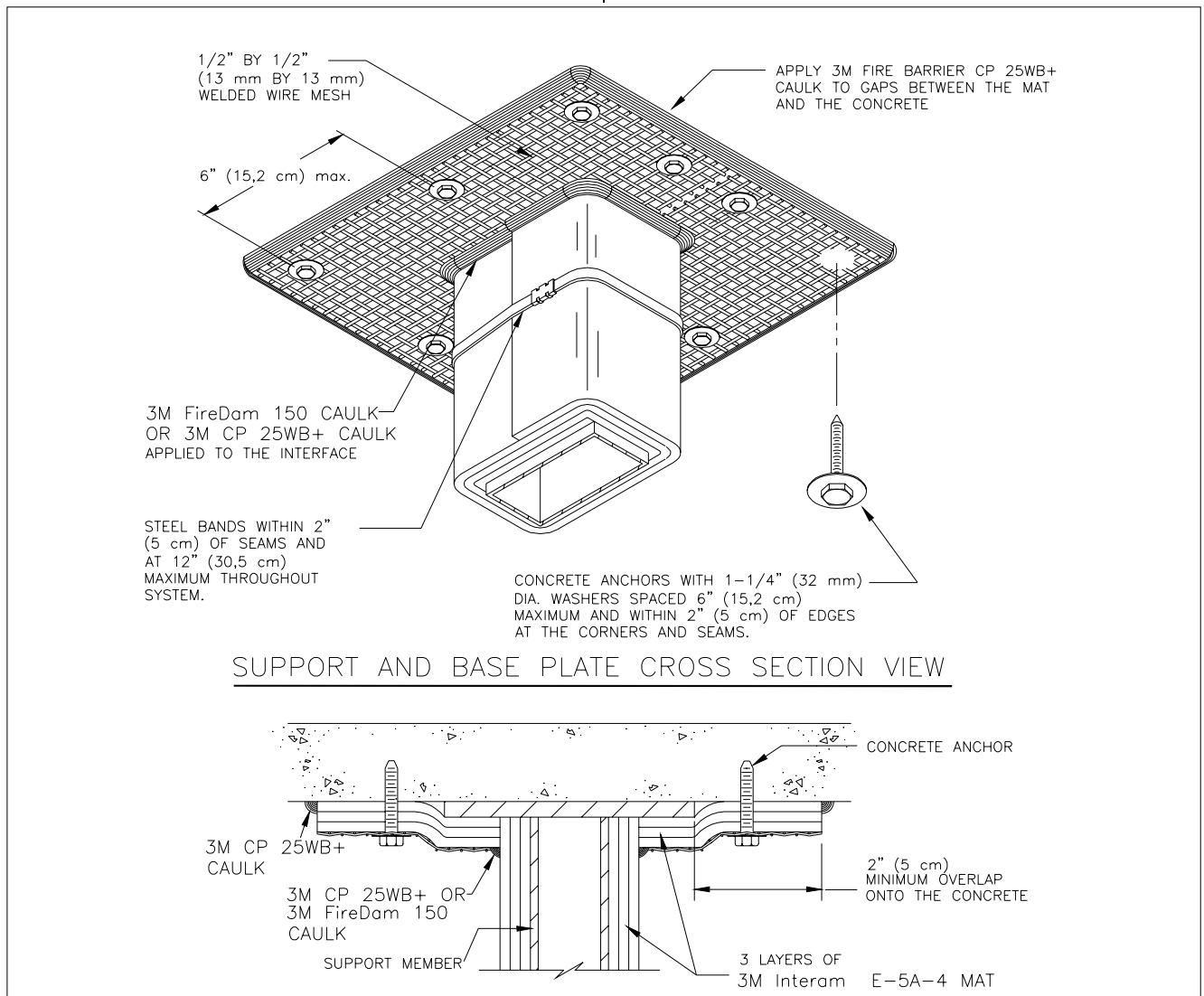
## 2.1b Fully Covered Support Member with Baseplate 3 Hour Fire Rating

### System Details

- A. Electrical Raceway Configuration:
1. Support members and baseplates
  2. Size/Material: Unistrut P1000 series
- B. 3M System Description:
1. Hourly Rating: 3 Hour
  2. Mat Thickness (Layers): 2 in. (5 cm) E Mat 4 (3 layers)
  3. Caulking: 3M™ Fire Barrier CP 25WB+ Caulk or 3M™ Interam™ FireDam™ 150 Caulk at interface points.
  4. Restraining System:  
Stainless steel banding at 12 in. (30,5 cm) maximum  
Welded wire screen (1/2 in. by 1/2 in. [13 mm by 13 mm])  
Concrete anchors with washers.

### Application Details

- Wrap the support member completely to the baseplate with 3 layers of E-Mat 4. Overlap each layer onto itself by 2 in. (5 cm) minimum, and offset seams between adjacent sections by 2" (5 cm).
- Tape all mat seams with Sealing Tape or T-49 Aluminum Foil Tape.
- Secure the final mat layer with stainless steel banding spaced at 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat seam and termination.
- Caulk interface seams at concrete with CP 25WB+ Caulk and caulk the mat-to-mat interface seams with CP 25WB+ or FireDam 150 Caulk - see drawing below.
- Install 3 layers of E Mat 4 over the baseplate. Cut a piece of welded wire mesh to fit on top of the mat covering the baseplate. Cut the mat layers and wire mesh to fit tightly around the wrapped support member and over the baseplate. The mat and wire mesh must be large enough to cover the baseplate and overlap the concrete by a minimum of 2 in. (5 cm) in all directions. Stagger the seams when applying the mat layers. Secure the mat and screen with concrete anchors with 1 1/4 in. (32 mm) minimum diameter washers spaced at 6 in. (15 cm) maximum on centers and within 2 in. (5 cm) of edges at corners and seams. Apply CP 25WB+ Caulk along the exposed edges of the E Mat 4.



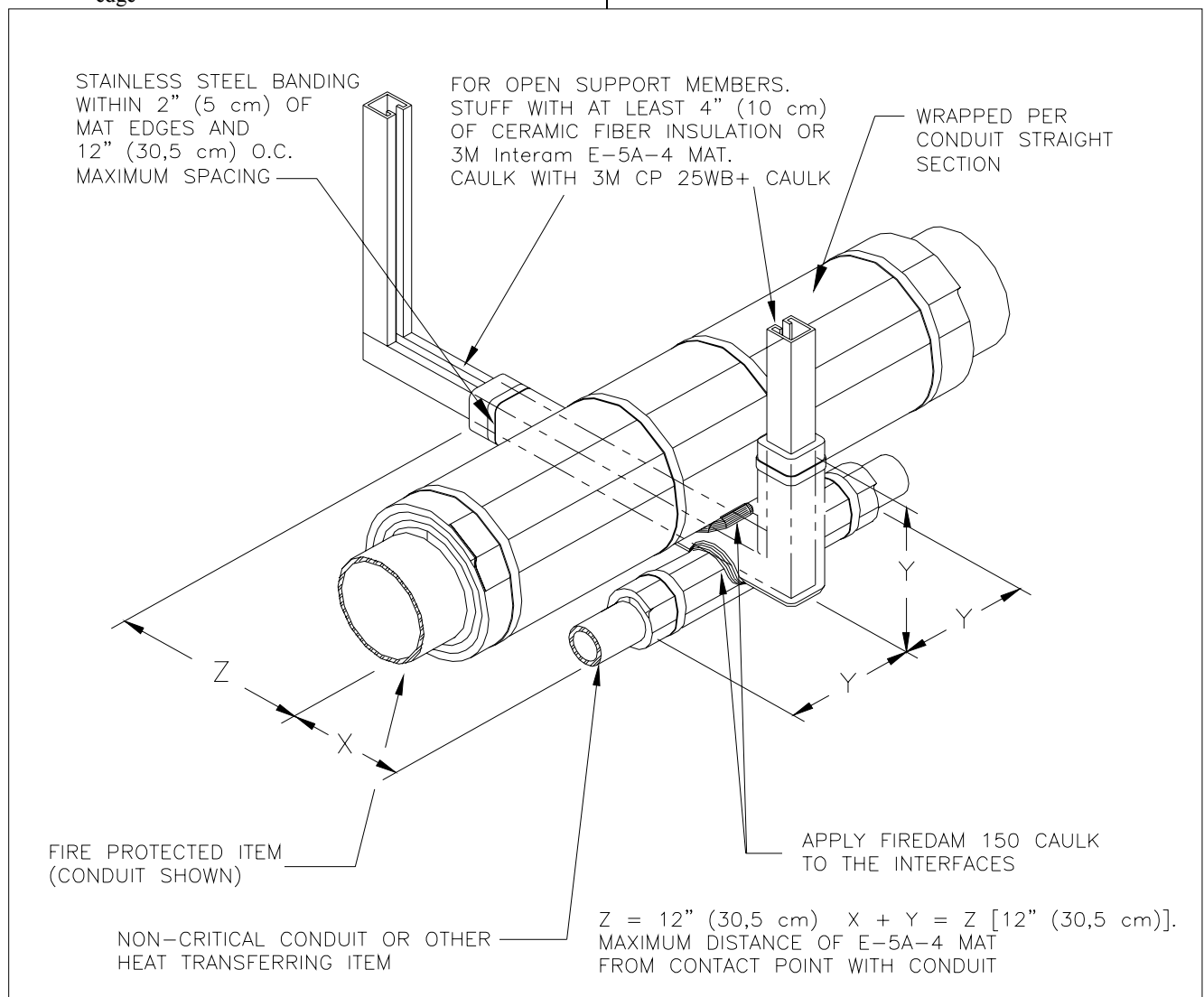
## 2.2a Partially Covered Support Members (Heat Transfer Items) 1 Hour Fire Rating

### System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-969 Date: September 1986
- B. Electrical Raceway Configuration:
1. Conduit/support member interface
  2. Size/material: Unistrut P1000 series "U" shaped steel channel
- C. 3M System Description
1. Hourly Rating: 1 Hour
  2. Mat Thickness (Layers): 0.40 in. (10 mm) thick (1 layer of E Mat 4)
  3. Mat Seams: Butted seams
  4. Layer Technique: 2 in. (5 cm) overlap around support member.
  5. Caulking: 3M™ Fire Barrier CP 25WB+ Caulk or 3M™ Interam™ FireDam™ 150 Caulk at ends of open supports and at mat seams and interfaces.
  6. Taping: all seams with 3M Sealing Tape or 3M T-49 Aluminum Foil Tape
  7. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge

### Application Details

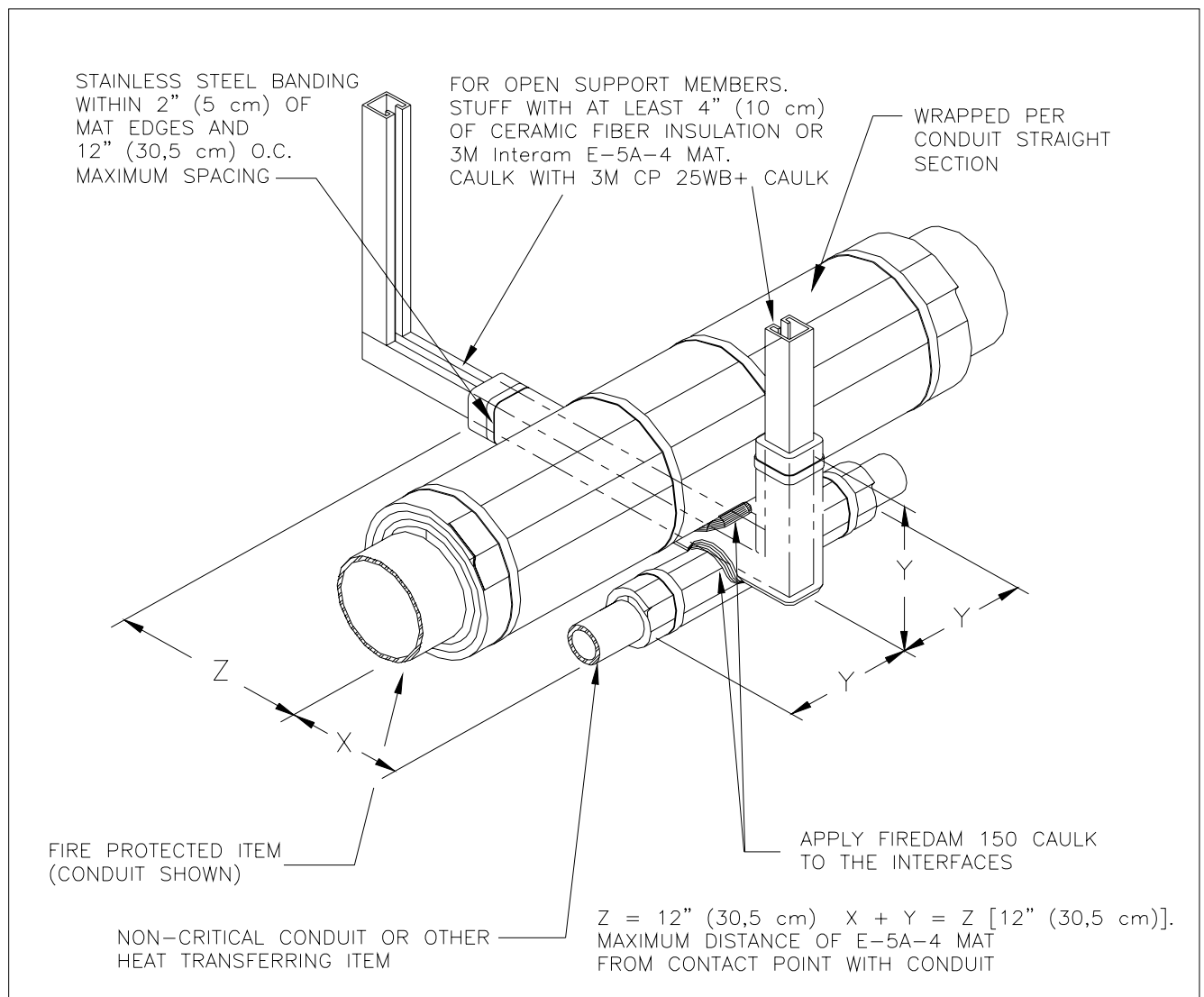
- A. Support members can be wrapped before or after the conduit or cable tray is wrapped (see conduit or cable tray sections)
- B. Apply one layer of E-5A-4 mat to the support members. The "X" + "Y" dimensions and the "Z" dimension are to be covered with E Mat a minimum distance of 12 in. (30,5 cm). Butt adjacent pieces of mat on the support member to the conduit.
- C. If an open channel support is used, it must be stuffed with at least 4 in. (10 cm) of E Mat 4. On top of the mat or ceramic fiber, seal the channels with CP 25WB+ caulk or FireDam 150 Caulk.
- D. Caulk mat interface seams and exposed mat edges with CP 25WB+ or Fire Dam 150 caulk. Tape mat seams with Sealing Tape or T-49 Aluminum Foil Tape.
- E. Restrain the mat layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.



## 2.2b Partially Covered Support Members (Heat Transfer Items) 3 Hour Fire Rating

### System Details

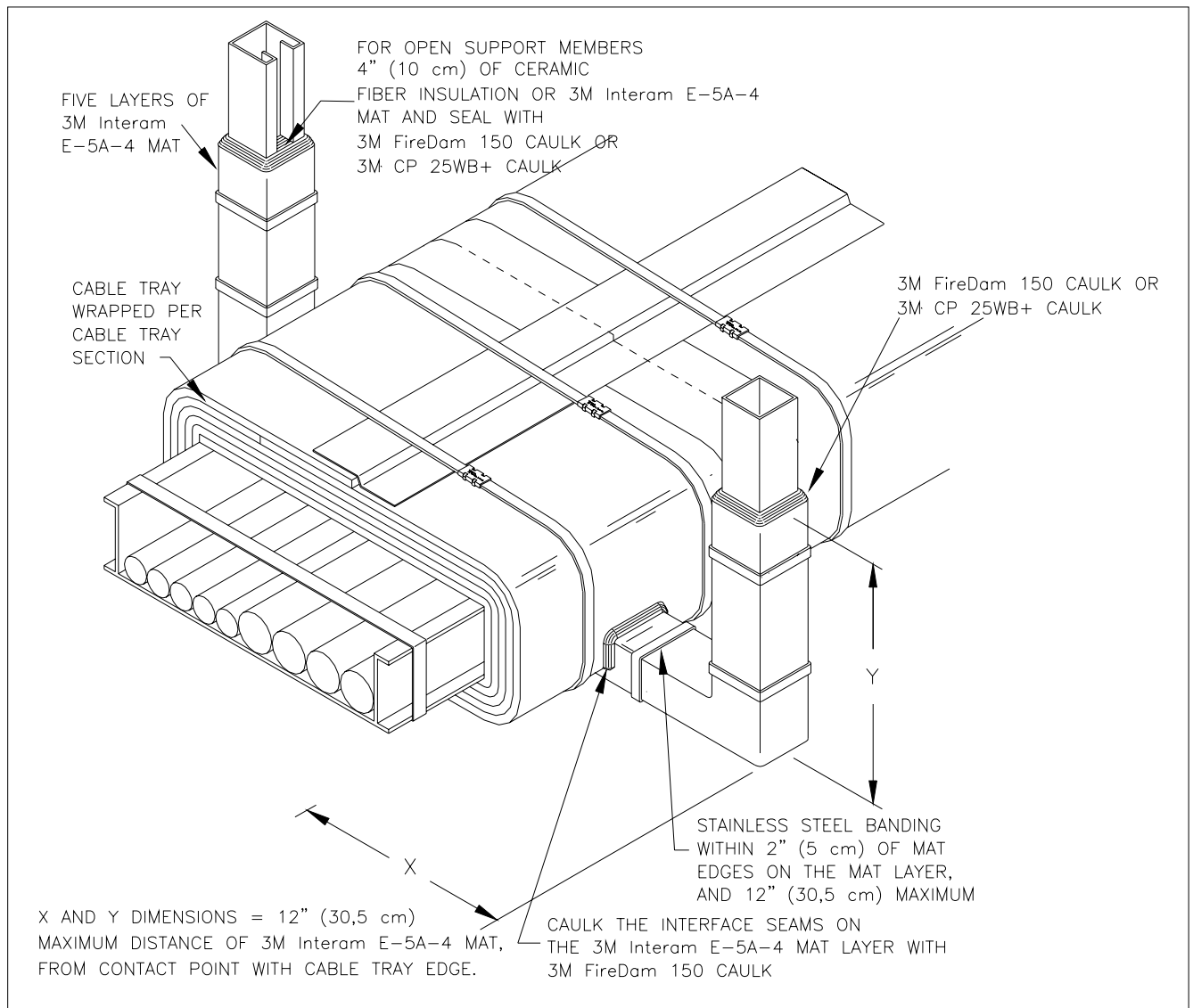
- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-331 Date: March 1986 (Revised April 1986)
- B. Electrical Raceway Configuration:
1. Cable Tray/support member interface
  2. Size/Material: Unistrut P1000 series "U" shaped steel channel
- C. 3M System Description
1. Hourly Rating: 3 Hour
  2. Mat Thickness (Layers): 1.2 in. (30 mm) thick (3 layers of E Mat 4)
  3. Mat Seams: Butted seams
  4. Layer Technique: 2 in. (5 cm) overlap per layer.
  5. Caulking: 3M™ Fire Barrier CP 25WB+ Caulk or 3M™ Interam™ FireDam™ 150 Caulk at ends of open supports and at mat seams and interfaces.
  6. Taping: all seams with 3M Sealing Tape or 3M T-49 Aluminum Foil Tape
  7. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge



7. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed E-5A-4 mat edge.

**Application Details**

- A. Support members can be wrapped before or after the conduit or cable tray is wrapped (see conduit or cable tray sections)
- B. Apply 3 layers of E-5A-4 mat to the support members. The “X” + “Y” dimensions and the “Z” dimension are to be covered with E Mat a minimum distance of 12 in. (30,5 cm). Butt adjacent pieces of mat on the support member to the conduit.
- C. If an open channel support is used, it must be stuffed with at least 4 in. (10 cm) of E Mat 4. On top of the mat or ceramic fiber, seal the channels with CP 25WB+ caulk or FireDam 150 Caulk.
- D. Caulk mat interface seams and exposed mat edges with CP 25WB+ or Fire Dam 150 caulk. Tape mat seams with Sealing Tape or T-49 Aluminum Foil Tape.
- E. Restrain the mat layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.



### 3.1a Junction Box

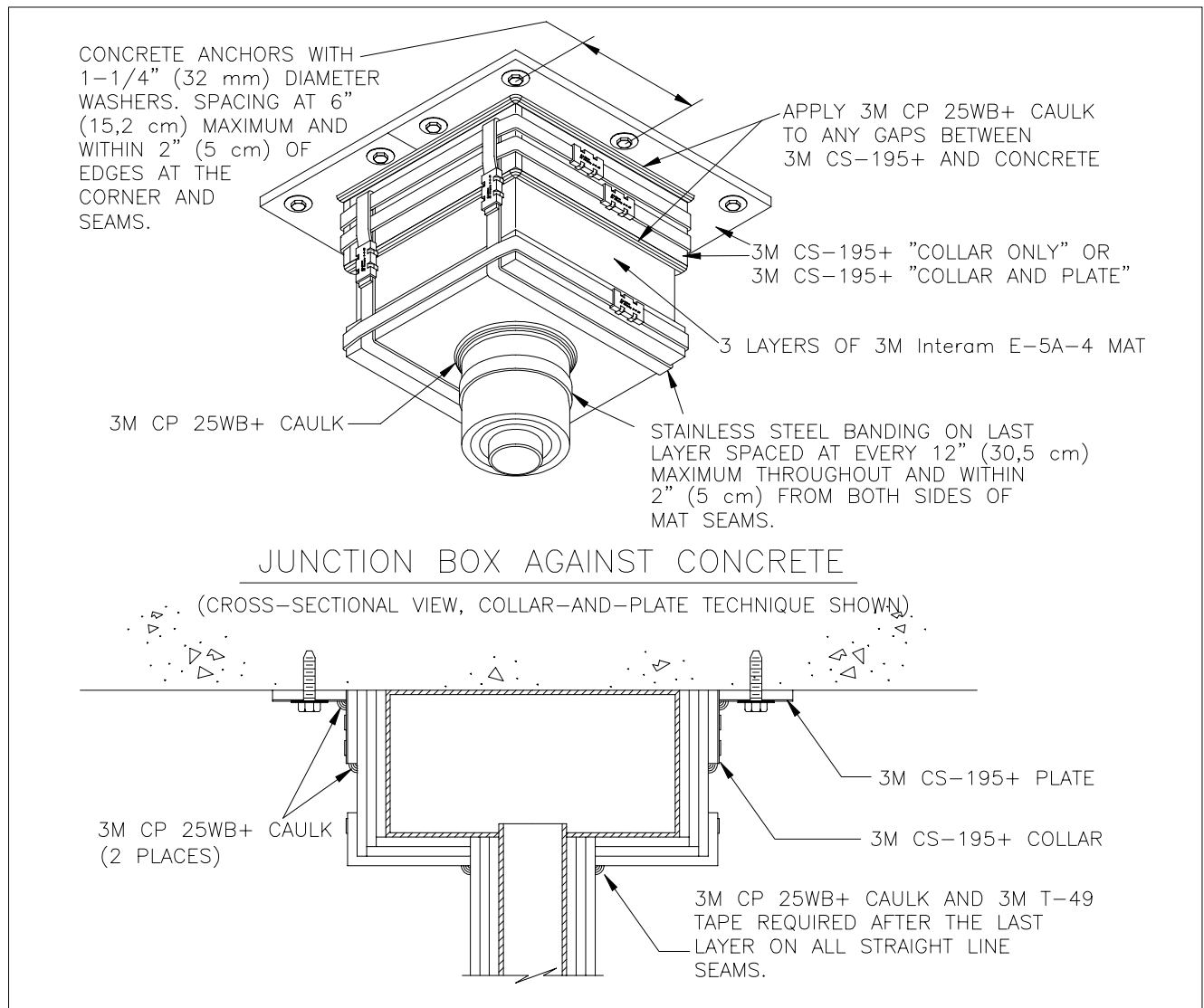
1 Hour

#### System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186 969 - Date: September 1986
- B. Electrical Raceway Configuration:
  - 1. Junction Box
  - 2. Size/material: 10 in. by 10 in. by 6 in. (25,4 cm by 25,4 cm by 15,2 cm) steel
- C. 3M System Description:
  - 1. Hourly Rating: 1 Hour
  - 2. Mat Thickness: 1.2 in. (30 mm) E Mat 4 (3 layers), with 4 in. (10 cm) wide 3M™ Fire Barrier CS-195+ Composite Sheet collar and CS-195+ Composite Sheet plate
  - 3. Caulking: 3M™ Fire Barrier CP 25WB+ Caulk at interface points
  - 4. Restraining System: For E Mat and for CS-195+ Collars, stainless steel banding is to be applied at 12 in. (30,5 cm) maximum on centers and within 2 in. (5 cm) of each seam or exposed edge. For CS-195+ Composite Sheet plates use concrete anchors spaced at 4 in. (10 cm) maximum on centers and within 2 in. (5 cm) of sheet edges.

#### Application Details

- A. Cover the junction box with 3 layers of E Mat 4. Use a box layer technique for the 2 inner layers - butt the seams on those layers. Apply the last layer with a 2 in. (5 cm) overlap.
- B. Tape all seams on all layers with 3M Sealing Tape or T-49 Aluminum Foil Tape.
- C. Secure the mat with stainless steel banding spaced at 12 in. (20,3 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.
- D. Caulk gaps at composite sheet interfaces with CP 25WB+ Caulk.
- E. Install a CS-195+ Composite Sheet "collar and plate" after the final mat layer is installed. Cut the CS-195+ Composite Sheet collar 4 in. wide (10 cm) to fit around the wrapped electrical raceway. Butt the collar to the concrete and secure with 2 stainless steel bands. Cut a CS-195+ Composite Sheet plate to fit tightly around the CS-195+ Composite Sheet collar and over the concrete. The plate must be large enough to overlap the concrete by a minimum of 2 in. (5 cm) in all directions. Secure the plate with concrete anchors with 1/4 in. (32 mm) minimum diameter washers spaced at 6 in. (15,2 cm) maximum on centers and within 2 in. (5 cm) of edges at corners and seams. Apply CP 25WB+ Caulk between the CS-195+ collar and along the exposed edge of the CS-195+ plate.



### 3.1b Junction Box

3 Hour

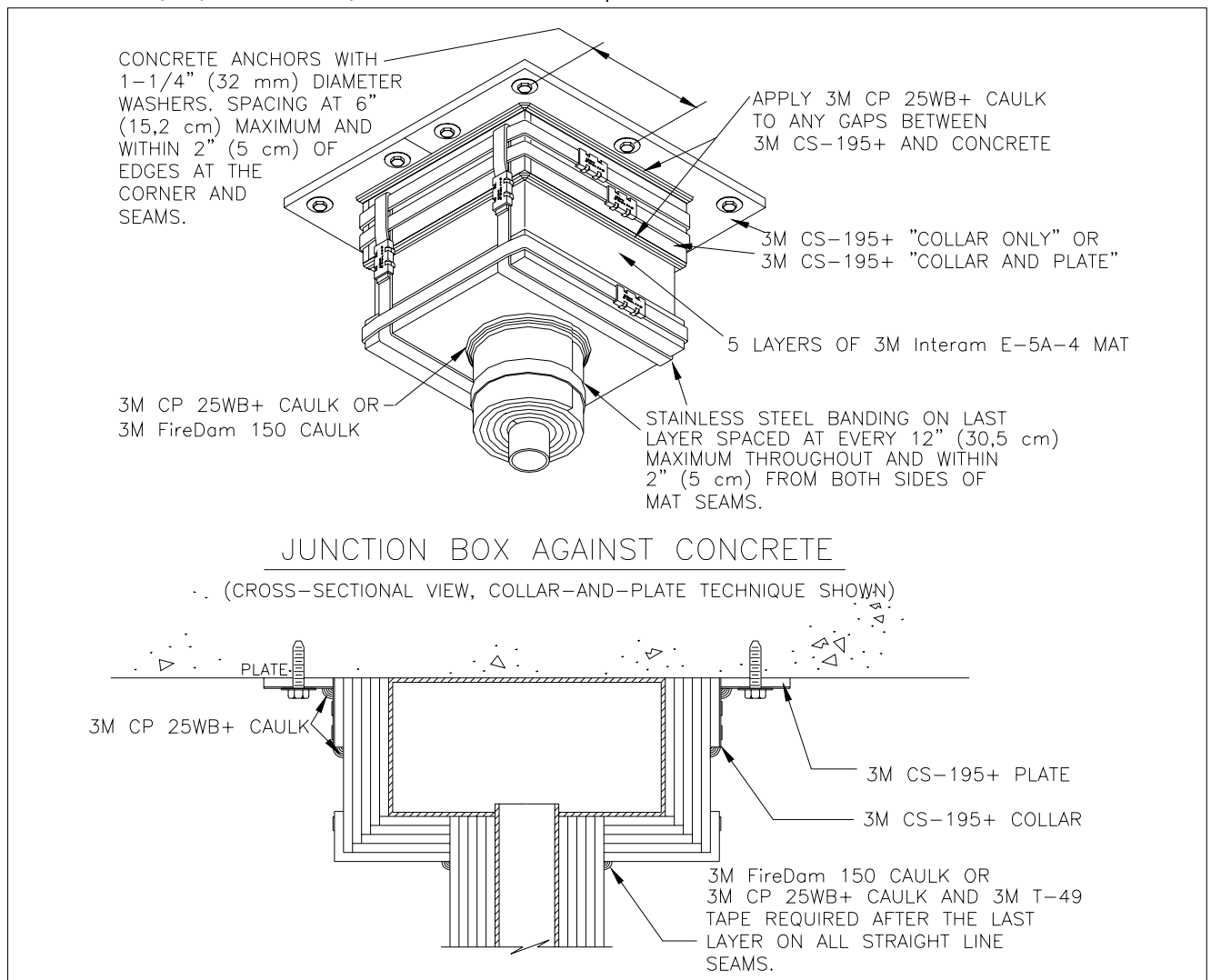
#### System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186 331 - Date: March 1986 (Revised April 1986)
- B. Electrical Raceway Configuration:
  - 1. Junction Box
  - 2. Size/Material: 10 in. by 10 in. by 6 in. (25,4 cm by 25,4 cm by 15,2 cm) steel
- C. 3M System Description:
  - 1. Hourly Rating: 3 Hour
  - 2. Mat Thickness: 2 in. (5 cm) E-5A-4 mat (5 layers) with 4 in. (103mm) wide 3M™ Fire Barrier CS-195+ Composite Sheet collar and CS-195+ Composite Sheet plate
  - 3. Caulking: 3M™ Fire Barrier CP 25WB+ Caulk or 3M™ Interam™ FireDam™ 150 Caulk at interface points.
  - 4. Restraining System: For E Mat and for CS-195+ Collars, stainless steel banding is to be applied at 12 in. (30,5 cm) maximum on centers and within 2 in. (5 cm) of each seam or exposed edge. For CS-195+ Composite Sheet plates use concrete anchors spaced at 4 in. (10 cm) maximum on centers and within 2 in. (5 cm) of sheet edges.

Note: ASTM E 119 Standard is represented in the drawing below. ASTM E 1725 may require additional layers.

#### Application Details

- A. Wrap the junction box with 5 layers of E-5A-4 mat. Use a box layer technique for the 4 inner layers - butt the seams on those layers. Apply the last layer with a 2 in. (5 cm) overlap.
- B. Tape all seams on all layers with 3M Sealing Tape or T-49 Aluminum Foil Tape.
- C. Secure the mat with stainless steel banding spaced at 12 in. (20,3 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.
- D. Caulk gaps at composite sheet interfaces with CP 25WB+ Caulk.
- E. Install a CS-195+ Composite Sheet "collar and plate" after the final mat layer is installed. Cut the CS-195+ Composite Sheet collar 4 in. wide (10 cm) to fit around the wrapped electrical raceway. Butt the collar to the concrete and secure with 2 stainless steel bands. Cut a CS-195+ Composite Sheet plate to fit tightly around the CS-195+ Composite Sheet collar and over the concrete. The plate must be large enough to overlap the concrete by a minimum of 2 in. (5 cm) in all directions. Secure the plate with concrete anchors with 1¼ in. (32 mm) minimum diameter washers spaced at 6 in. (15,2 cm) maximum on centers and within 2 in. (5 cm) of edges at corners and seams. Apply CP 25WB+ Caulk between the CS-195+ collar and along the exposed edge of the CS-195+ plate.



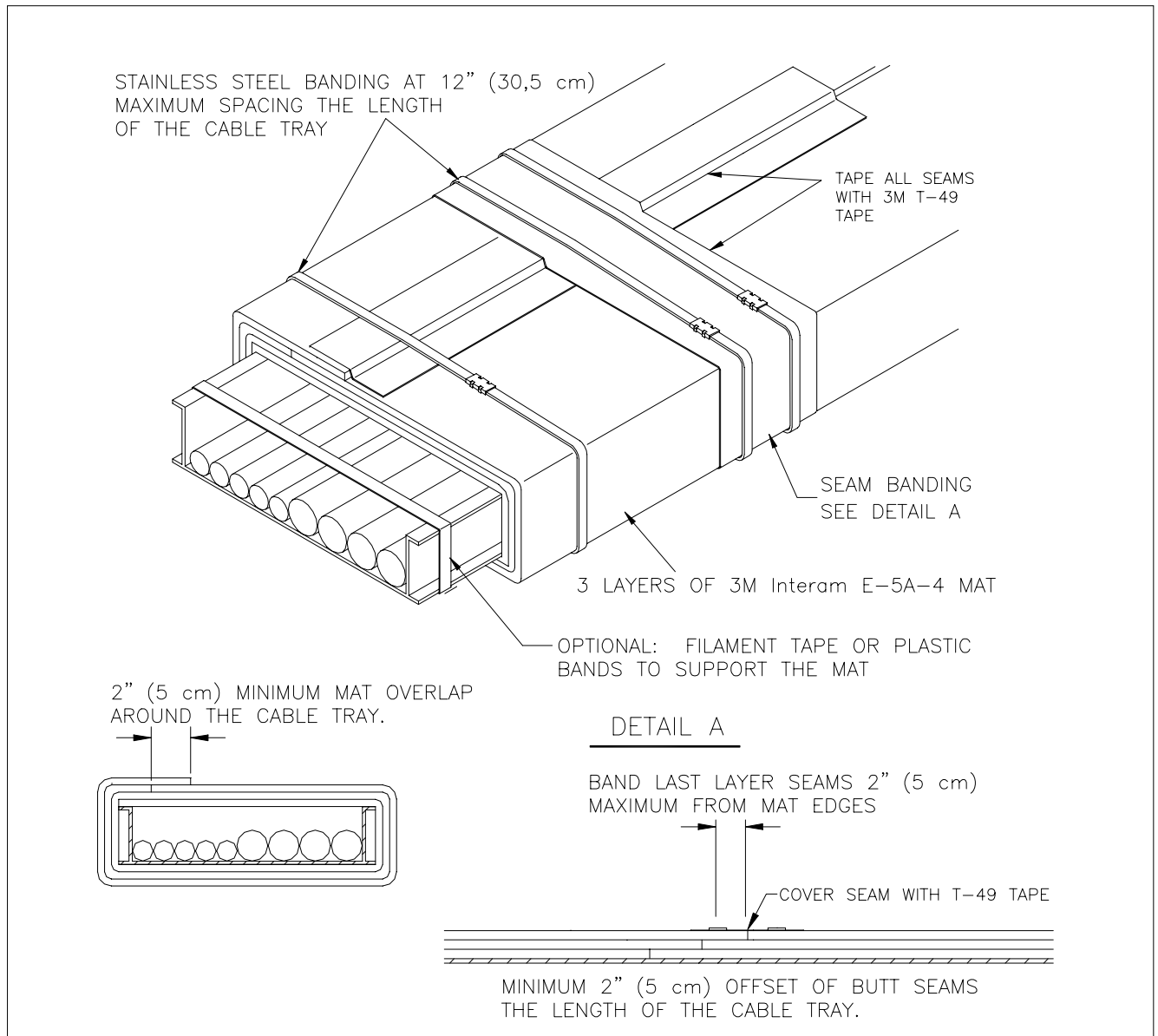
## 4.1a Cable Tray Straight Section 1 Hour Fire Rating

### System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414187-751 - Date: June 1987 3M Fire Test: #87-40 Date: April 1987
- B. Electrical Raceway Configuration:
  1. Cable tray/straight run
  2. Size/material: 4 in. by 24 in. (10 cm x 61 cm) ladder back or closed cable tray
- C. 3M System Description
  1. Hourly Rating: 1 Hour
  2. Mat Thickness on Cable Tray (Layers): 0.8 in. (30 mm) thick (2 layers of E Mat 4)
  3. Mat Seams: 2 in. (5 cm) offset between layers
  4. Layer Technique: 2 in. (5 cm) overlap per layer around cable tray
  5. Tape: 3M™ Interam Sealing Tape or 3M™ Interam T-49 Aluminum Foil Tape
  6. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.

### Application Details

- A. Optional: Filament tape or non-conductive (plastic for example) banding can be put around the cable tray at 8-12 in. (20-30 cm) spacing prior to mat installation to minimize sagging of the mat on open top cable trays.
- B. Apply 2 layers of E Mat to the cable tray. There must be a 2 in. (5 cm) minimum overlap per layer. There must also be a 2 in. (5 cm) minimum mat seam offset between adjacent mat sections along the length of the cable tray.
- C. Tape all mat seams on all layers with Sealing Tape or T-49 Aluminum Foil Tape.
- D. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the cable tray. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.



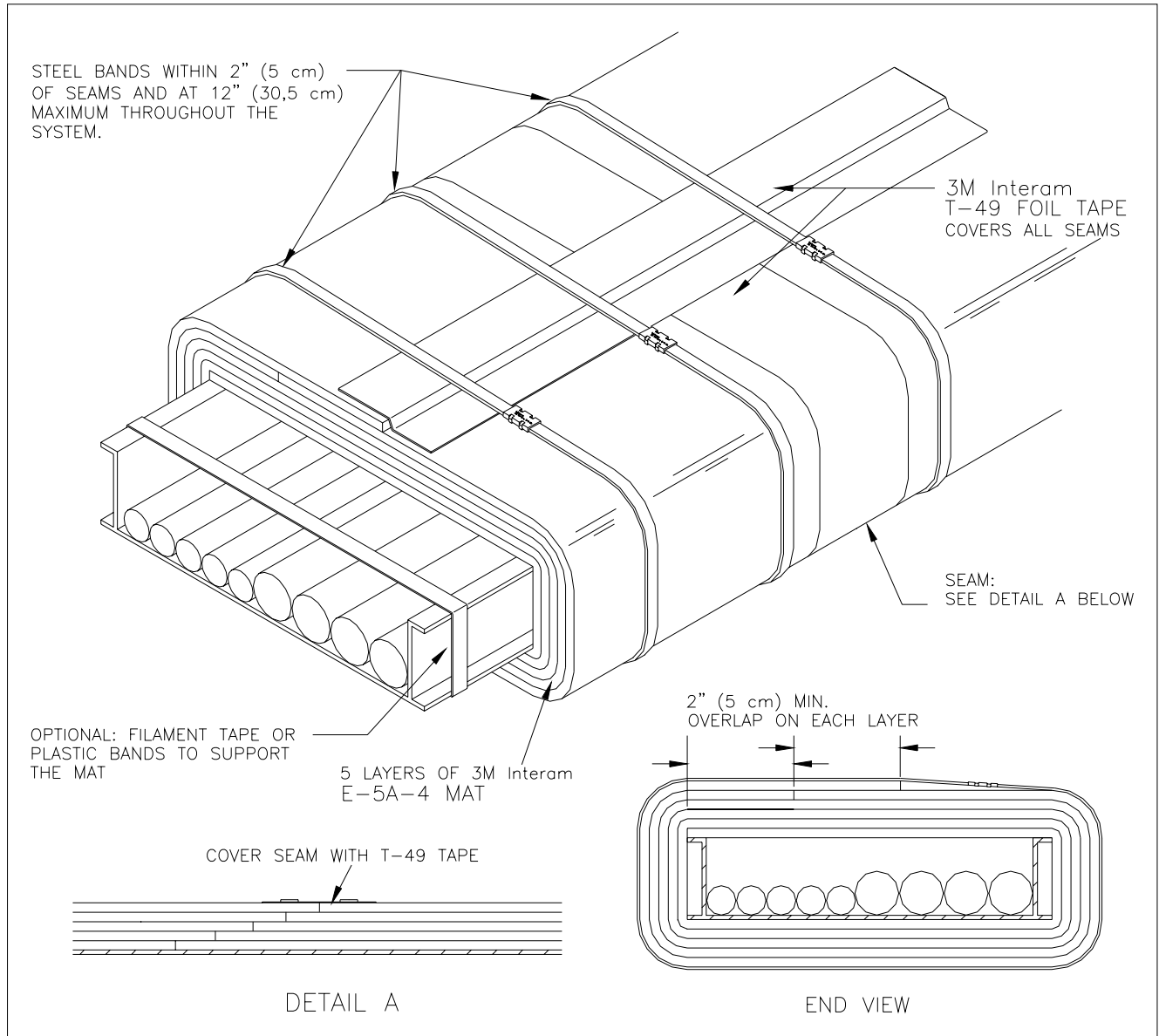
## 4.1b Cable Tray Straight Section 3 Hour Fire Rating

### System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-331 - Date: March 1986 (Revised April 1986) 3M Fire Test: #87-83 - Date: August 1987
- B. Electrical Raceway Configuration:
1. Cable tray/straight run
  2. Size/Material: 4 in. by 24 in. (10 cm by 61 cm) ladder back or closed cable tray.
- C. 3M System Description
1. Hourly Rating: 3 Hour
  2. Mat Thickness on Cable Tray (Layers): 2 in. (5 cm) thick (5 layers of E Mat 4)
  3. Mat Seams: 2 in. (5 cm) offset between layers
  4. Layer Technique: 2 in. (5 cm) overlap per layer around cable tray
  5. Tape: 3M™ Interam Sealing Tape or 3M™ Interam T-49 Aluminum Foil Tape
  6. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.

### Application Details

- A. Optional: Filament tape or non-conductive (plastic for example) banding can be put around the cable tray at 8-12 in. (20-30 cm) spacing prior to mat installation to minimize sagging of the mat on open top cable trays.
- B. Apply 2 layers of E Mat to the cable tray. There must be a 2 in. (5 cm) minimum overlap per layer. There must also be a 2 in. (5 cm) minimum mat seam offset between adjacent mat sections along the length of the cable tray.
- C. Tape all mat seams on all layers with Sealing Tape or T-49 Aluminum Foil Tape.
- D. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the cable tray. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.





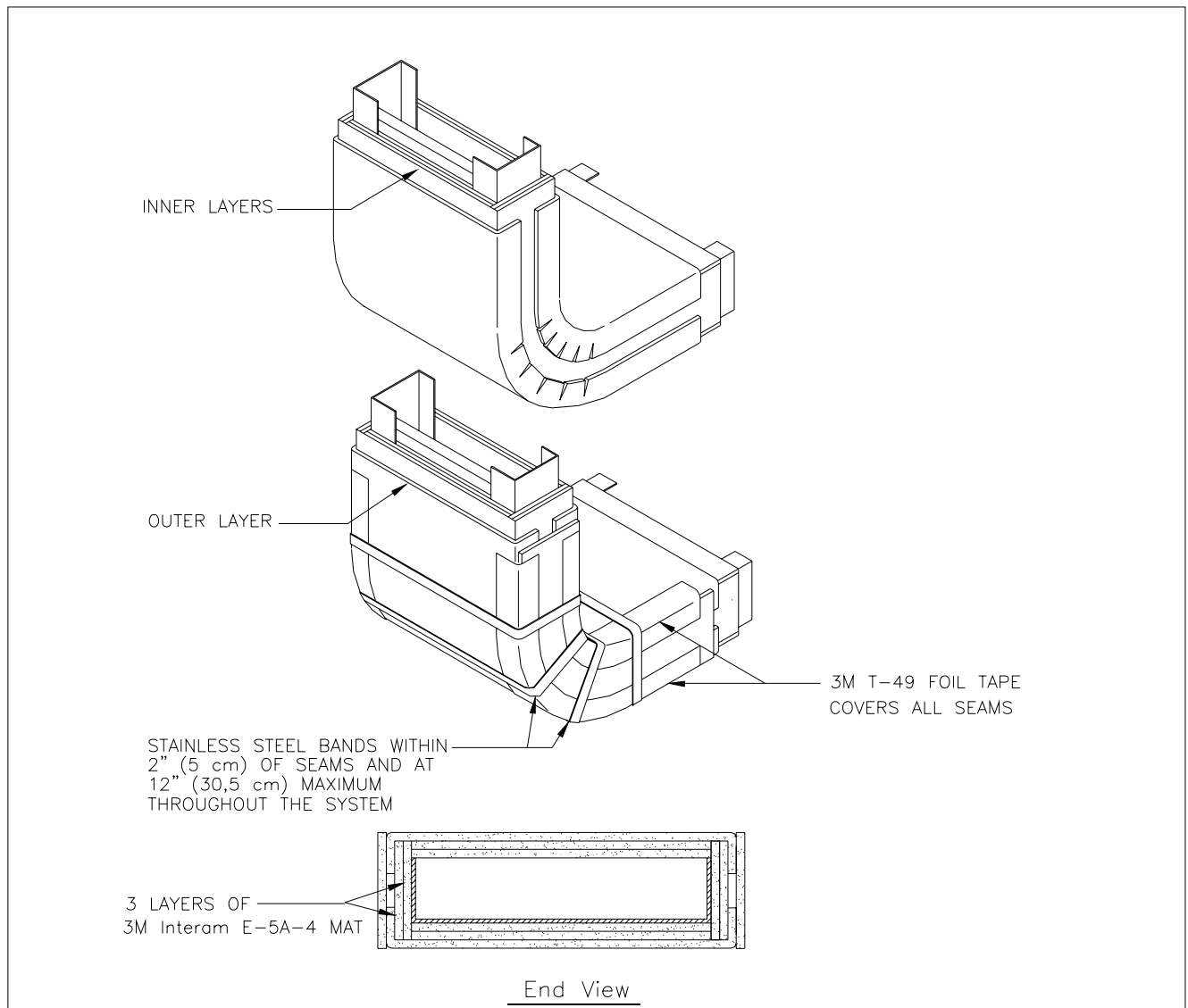
## 4.2a Cable Tray Elbow 1 Hour Fire Rating

### System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414187-751 - Date: June 1987, 3M Fire Test: #87-40 Date: April 1987
- B. Electrical Raceway Configuration:
  1. Cable tray/elbow
  2. Size/material: 4 in. by 24 in. (10 cm x 61 cm) ladder back or closed cable tray
- C. 3M System Description:
  1. Hourly Rating: 1 Hour
  2. Mat Thickness on Cable Tray (Layers): 1.2 in. (30 mm) thick (3 layers of E Mat 4)
  3. Mat Seams: 2 in. (5 cm) offset between adjacent mat sections.
  3. Layer Technique: Butted corners
  4. Caulk: FireDam 150 Caulk applied in all butt seams.
  5. Tape: 3M™ Interam Sealing Tape or 3M™ Interam T-49 Aluminum Foil Tape
  6. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.

### Application Details

- A. Optional: Filament tape or non-conductive (plastic for example) banding can be put around the cable tray at 8-12 in. (20-30 cm) spacing prior to mat installation to minimize sagging of the mat on open top cable trays.
- B. Apply 3 layers of E-5A-4 mat to the cable tray elbow. The inner two layers can be applied in four pieces (with corners butted together) cut to fit each face of the tray. The outer layer must have a 2 in. (5 cm) overlap over the inner layer corner seams. There must also be a 2 in. (5 cm) mat seam offset between the seams of the mat layers which run the length of the cable tray. Cut slits in the outer layer before installing it to prevent tearing when it is being bent around corners.
- C. Apply elbow cover pieces to tray sides.
- D. Tape all mat seams on all layers with Sealing Tape or T-49 Aluminum Foil Tape.
- E. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the cable tray. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.



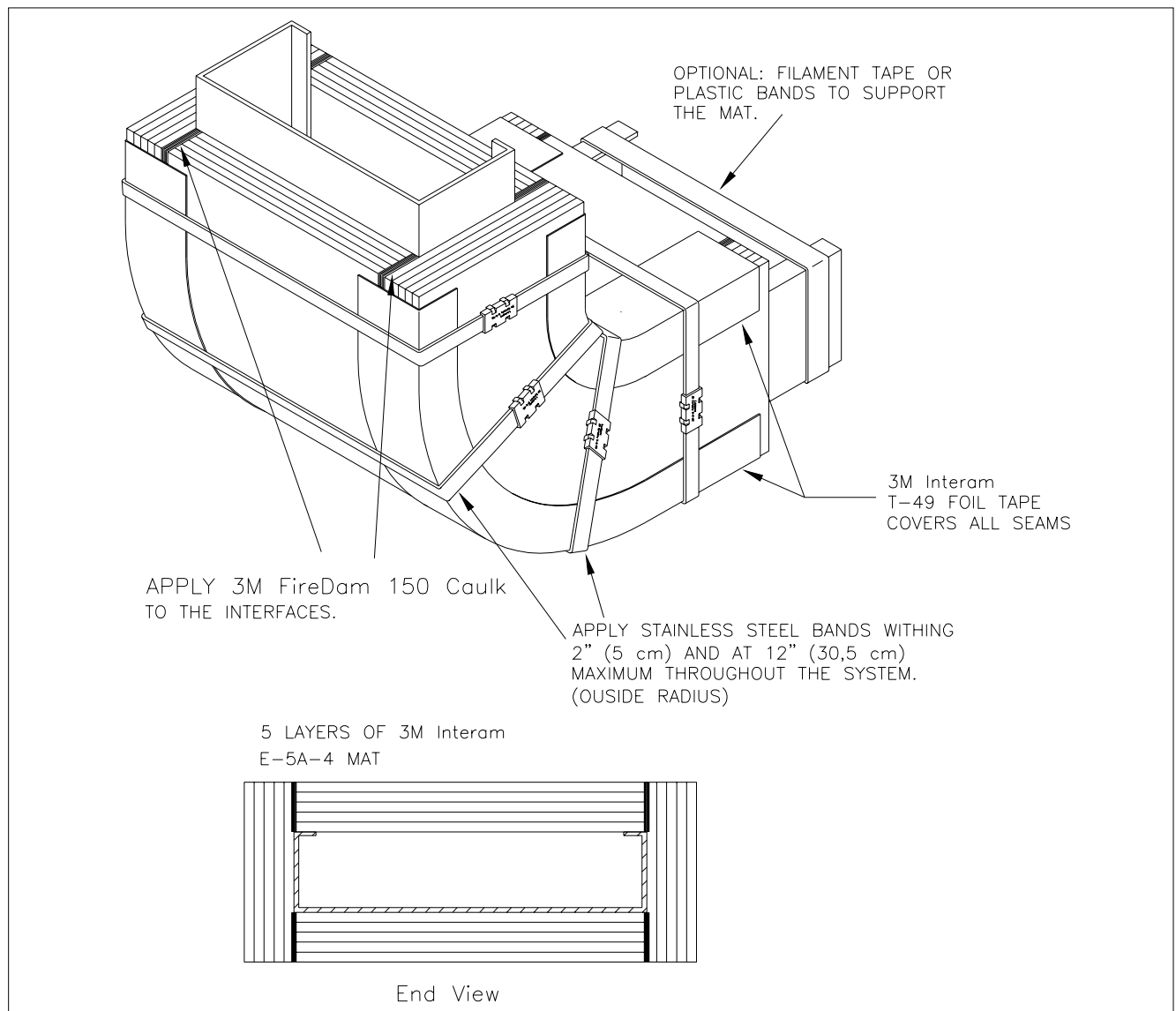
## 4.2b Cable Tray Elbow 3 Hour Fire Rating

### System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-331 - Date: March 1986, 3M Fire Test: #87-83 - Date: August 1987
- B. Electrical Raceway Configuration:
1. Cable tray/elbow
  2. Size/Material: 4 in. by 24 in. (10 cm by 61 cm) ladder back or closed cable tray
- C. 3M System Description:
1. Hourly Rating: 3 Hour
  2. Mat Thickness on Cable Tray (Layers): 2 in. (50 mm) thick (5 layers of E Mat 4)
  3. Mat Seams: 2 in. (5 cm) offset between adjacent mat sections.
  4. Layer Technique: Butted corners, and 2 in. (5 cm) overlap on final mat layer
  5. Tape: 3M™ Interam Sealing Tape or 3M™ Interam T-49 Aluminum Foil Tape
  6. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.

### Application Details

- A. Optional: Filament tape or non-conductive (plastic for example) banding can be put around the cable tray at 8-12 in. (20-30 cm) spacing prior to mat installation to minimize sagging of the mat on open top cable trays.
- B. Apply 5 layers of E-5A-4 mat to the cable tray elbow. Each layer must be applied cut to fit each face of the tray. Seams between each piece must be butted together at each corner. FireDam 150 Caulk is to be applied to fill the butt seams at each corner.
- D. Tape over the mat seams on with Sealing Tape or T-49 Aluminum Foil Tape.
- E. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the cable tray. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.



## 4.3a Cable Tray to Airdrop (Cable Bundle) Interface

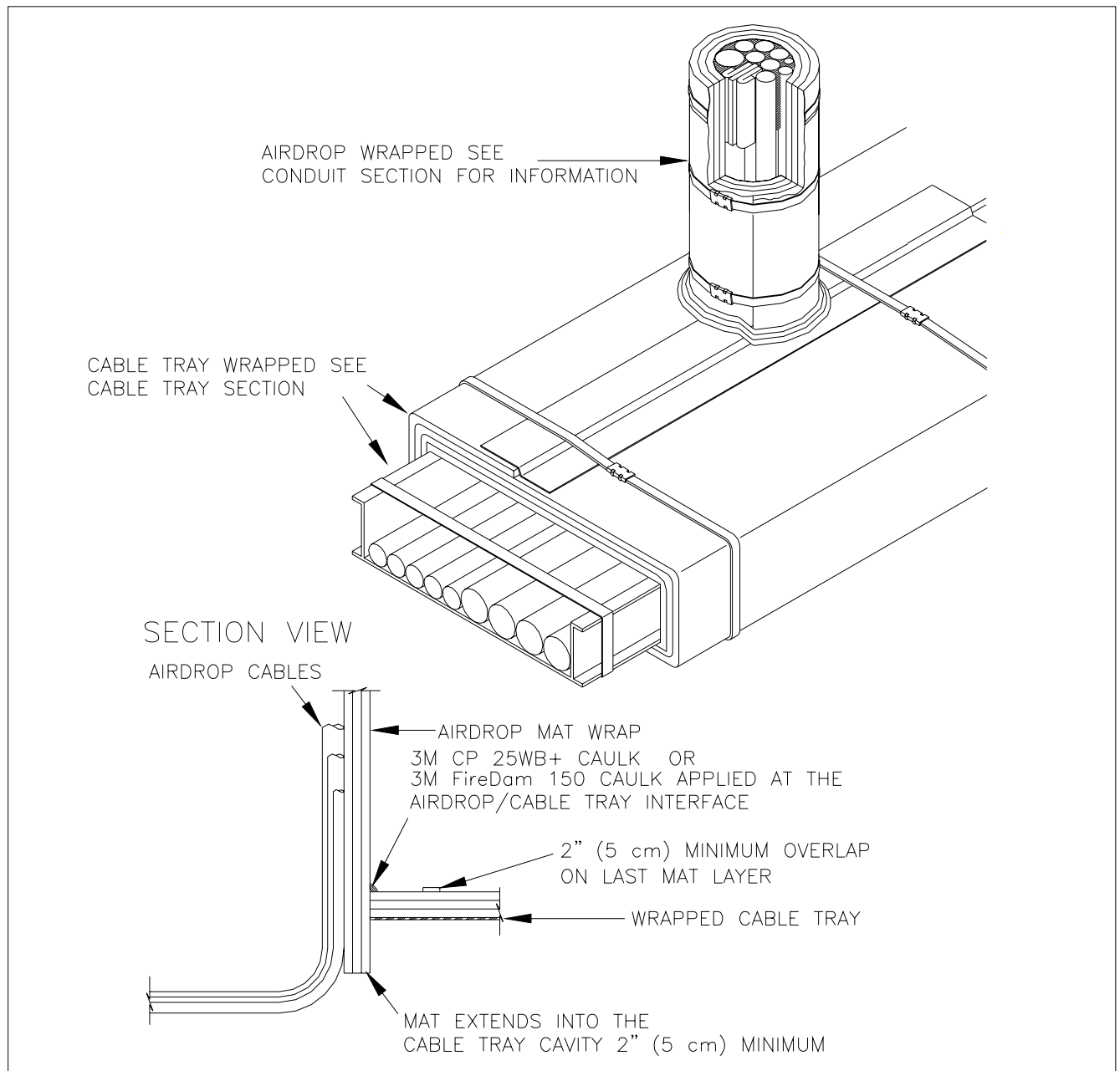
### 1 Hour Fire Rating

#### System Details

- A. Qualification Fire Test(s): SWRI 017912(2) June 1985
- B. Electrical Raceway Configuration:
  1. Cable tray/airdrop interface
  2. **Size/material:**
- C. 3M System Description
  1. Hourly Rating: 1 Hour
  2. Caulk: 3M™ FireDam 150 Caulk
  3. Tape: Tape: 3M™ Interam Sealing Tape or 3M™ Interam T-49 Aluminum Foil Tape
  4. Restraining System: Stainless steel bands 12 in. (30,5 cm) on center and within 2 in. (5 cm) of seam in final mat layer

#### Application Details

- A. Wrap the airdrop (cable bundle) first (see conduit section). When wrapping the airdrop (cable bundle), be sure to extend the E Mat into the cable tray cavity a minimum of 2 in. (5 cm).
- B. Wrap the cable tray (see cable tray straight section drawings earlier in this section).
- C. Apply 3M FireDam 150 Caulk to seal all gaps between mat pieces at airdrop/cable tray mat interface.
- D. Tape over the mat seams on with Sealing Tape or T-49 Aluminum Foil Tape.
- E. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the cable tray. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.



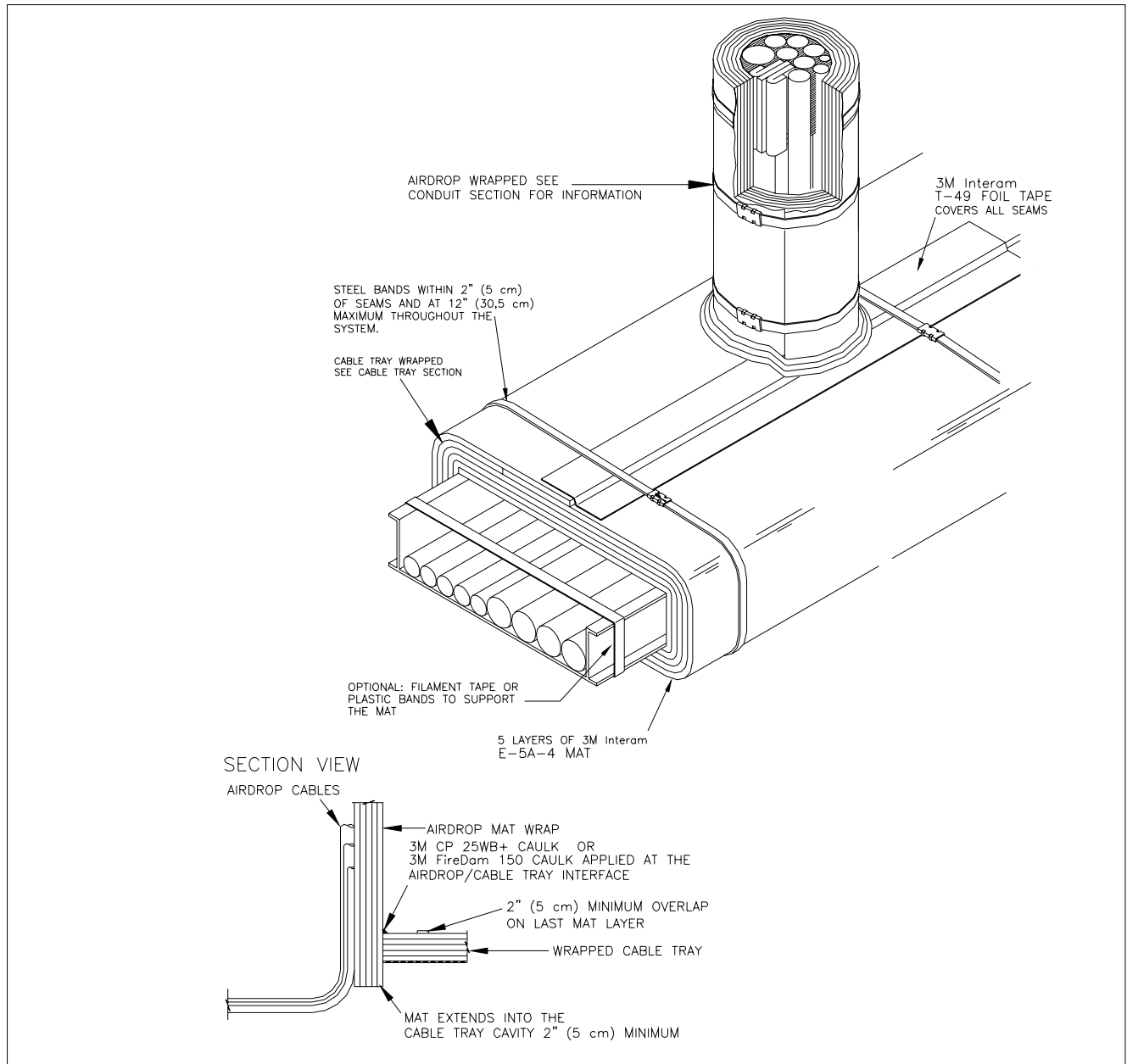
## 4.3b Cable Tray to Airdrop (Cable Bundle) Interface 3 Hour Fire Rating

### System Details

- A. Qualification Fire Test(s): Twin City Testing Corp.: #414186-331 - Date: March 1986 (Revised April 1986) 3M Fire Test: 87-83, Date: August 1987
- B. Electrical Raceway Configuration:
  1. Cable tray/airdrop interface
  2. **Size/Material:**
- C. 3M System Description
  1. Hourly Rating: 3 Hour
  2. Caulk: 3M™ FireDam 150 Caulk
  3. Tape: Tape: 3M™ Interam Sealing Tape or 3M™ Interam T-49 Aluminum Foil Tape
  4. Restraining System: Stainless steel bands 12 in. (30,5 cm) on center and within 2 in. (5 cm) of seam in final mat layer

### Application Details

- A. Wrap the airdrop (cable bundle) first (see conduit section). When wrapping the airdrop (cable bundle), be sure to extend the E Mat into the cable tray cavity a minimum of 2 in. (5 cm).
- B. Wrap the cable tray (see cable tray straight section drawings earlier in this section).
- C. Apply 3M FireDam 150 Caulk to seal all gaps between mat pieces at airdrop/cable tray mat interface.
- D. Tape over the mat seams on with Sealing Tape or T-49 Aluminum Foil Tape.
- E. Restrain the last layer with stainless steel banding spaced at 12 in. (30,5 cm) maximum spacing the length of the cable tray. Be sure to place stainless steel banding within 2 in. (5 cm) of each exposed mat edge.



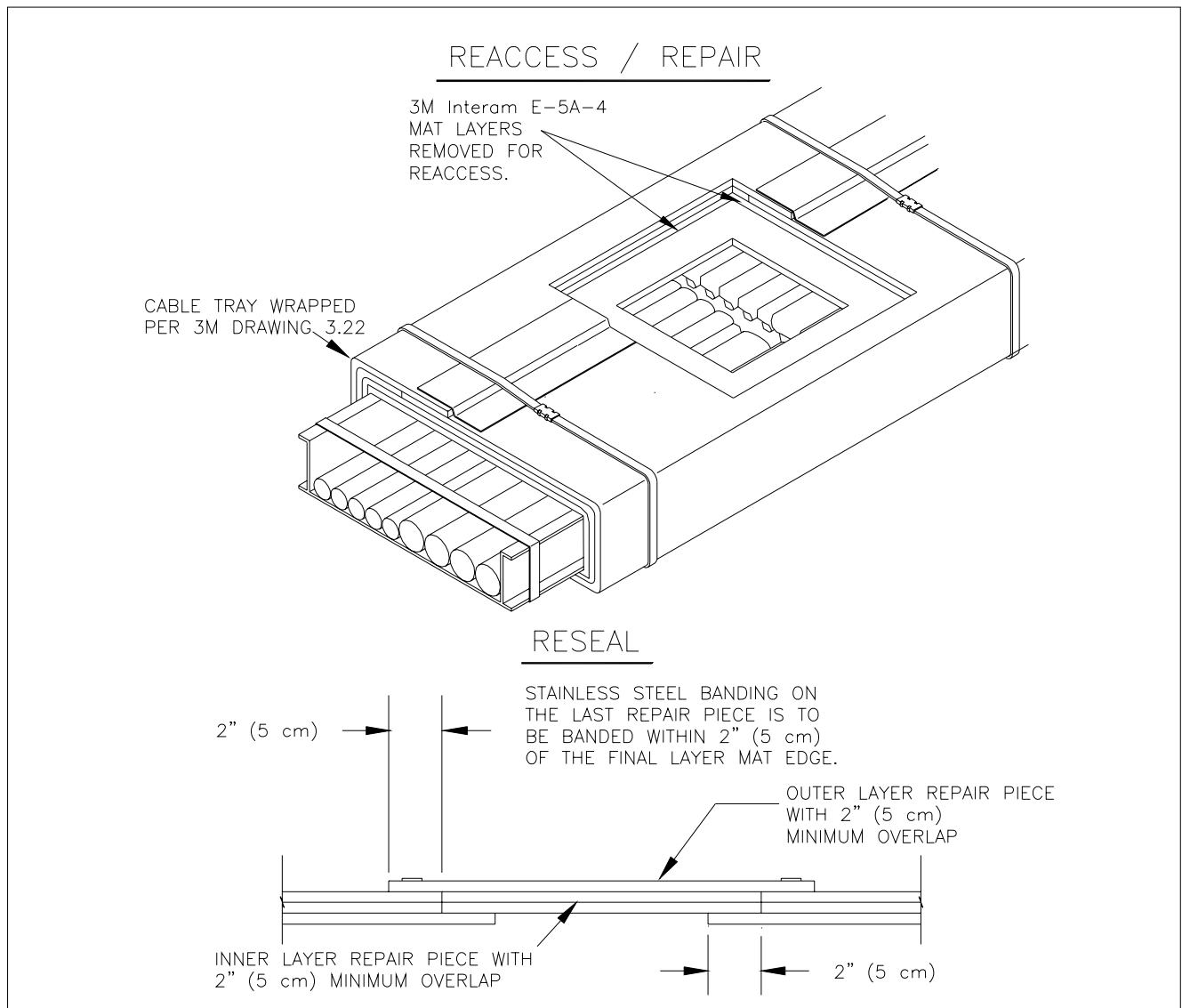
## 4.4a Cable Tray Reaccess and Repair 1 Hour Fire Rating

### System Details

- A. Electrical Raceway Configuration:
1. Cable tray/reaccess and repair
  2. Size/material: 4 in. by 24 in. (10 cm by 61 cm) ladder back or closed cable tray
- B. 3M System Description
1. Mat Thickness on Cable Tray (Layers): 0.8 in. (30 mm) thick (2 layers of E Mat 4)
  2. Layer Technique: 2 in. (5 cm) overlap
  3. Tape: 3M™ Interam Sealing Tape or 3M™ Interam T-49 Aluminum Foil Tape
  4. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.

### Application Details – Reaccess/Repair

- A. Determine a rectangular or square size of repair or opening desired.
- B. Cut outer layer to a size 4" (10 cm.) larger than the desired opening size in each direction. Remove this piece and save.
- C. Cut inner layer to the desired opening size being careful not to cut underlying cables. Discard this piece.
- D. After performing work needed inside the cable tray, place the original outer layer piece back into position. Cover the seams of that piece with 3M Sealing Tape or 3M T-49 Aluminum Foil Tape.
- E. Cut a new outer layer piece a minimum of 4 in. (10 cm) larger (total width and length) than the original outer layer piece.
- F. Place the new outer layer piece over the original piece being careful to maintain a 2" (5 cm.) overlap in each direction. Cover the seams of that piece with 3M Sealing Tape or 3M T-49 Aluminum Foil Tape.
- G. Restrain the new outer layer piece with stainless steel banding spaced at 12 in. (30,5 cm) maximum and within 2 in. (5 cm) of each exposed mat edge.



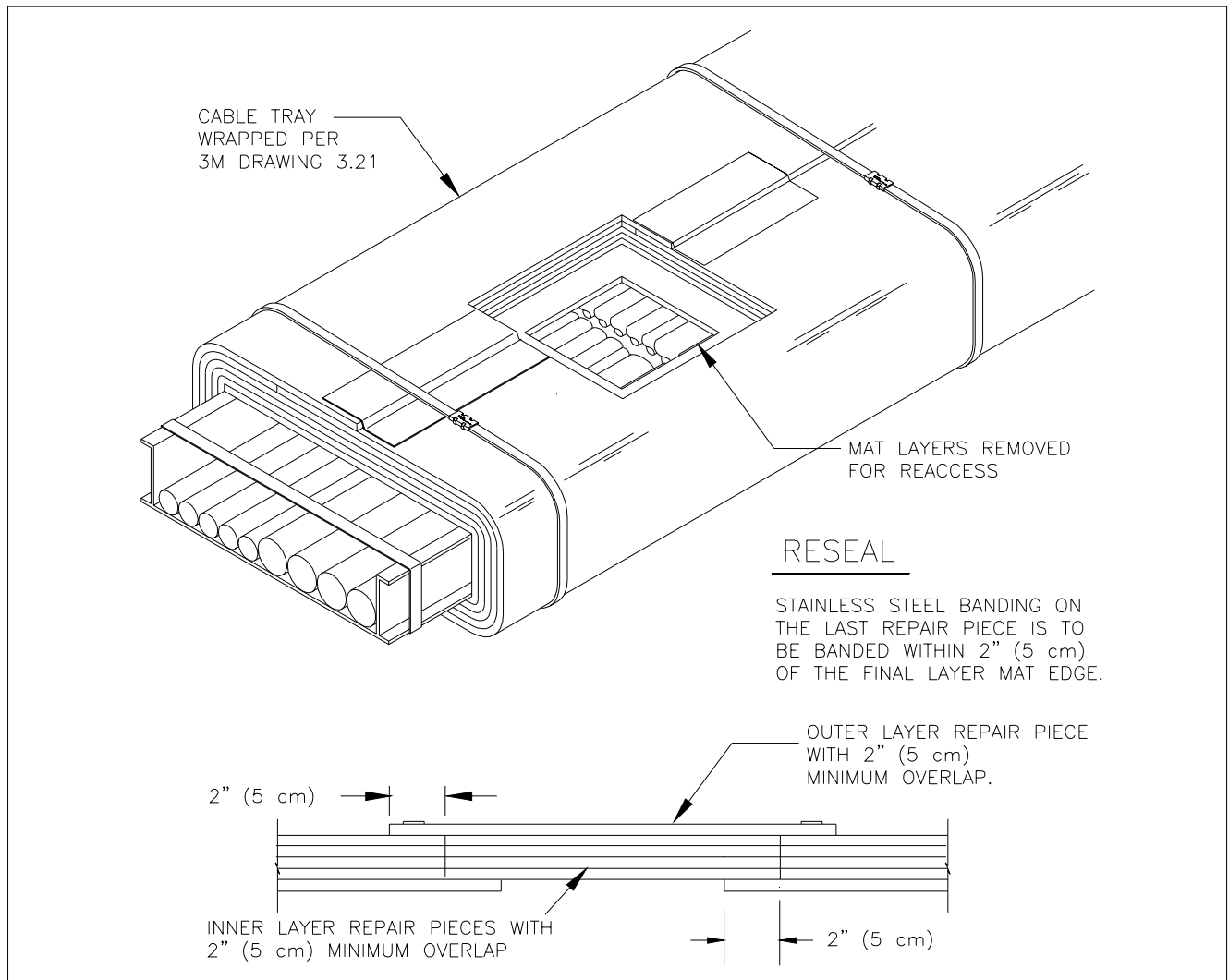
## 4.4b Cable Tray Reaccess and Repair 3 Hour Fire Rating

### System Details

- A. Electrical Raceway Configuration:
1. Cable tray/reaccess and repair
  2. Size/Material: 4 in. by 24 in. (10 cm by 61 cm) ladder back or closed - steel or aluminum
- B. 3M System Description
1. Mat Thickness on Cable Tray (Layers): 2.0 in. (50 mm) thick (5 layers of E Mat 4)
  2. Layer Technique: 2 in. (5 cm) overlap
  3. Tape: 3M™ Interam Sealing Tape or 3M™ Interam T-49 Aluminum Foil Tape
  4. Restraining System: Stainless steel bands 12 in. (30,5 cm) on centers and within 2 in. (5 cm) of each exposed mat edge.

### Application Details – Reaccess/Repair

- C. Determine a rectangular or square size of repair or opening desired.
- D. Cut out 4 layers layer to a size 4" (10 cm.) larger than the desired opening size in each direction. Remove these pieces and save.
- C. Cut inner layer to the desired opening size being careful not to cut underlying cables. Discard this piece.
- G. After performing work needed inside the cable tray, place the original outer 4 layer pieces back into position. Cover the seams of the outermost piece with 3M Sealing Tape or 3M T-49 Aluminum Foil Tape.
- H. Cut a new outer layer piece a minimum of 4 in. (10 cm) larger (total width and length) than the underlying outer layer piece.
- I. Place the new outer layer piece over the original piece being careful to maintain a 2" (5 cm.) overlap in each direction. Cover the seams of that piece with 3M Sealing Tape or 3M T-49 Aluminum Foil Tape.
- G. Restrain the new outer layer piece with stainless steel banding spaced at 12 in. (30,5 cm) maximum and within 2 in. (5 cm) of each exposed mat edge.



## 4.5 Cable Tray Horizontal Fire Break 1 Hour Fire Rating

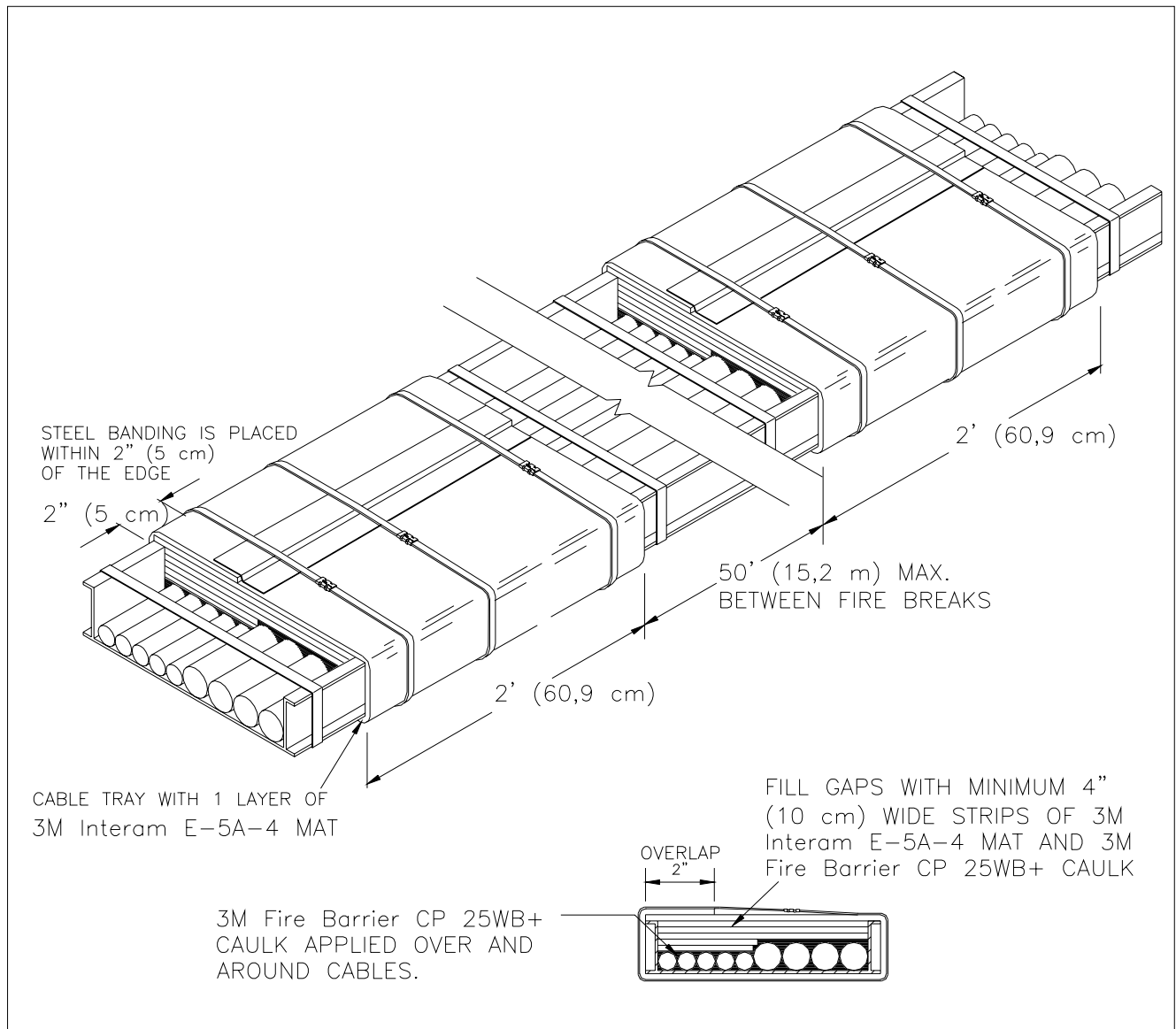
### System Details

- A. Electrical Raceway Configuration:
1. Cable Tray Fire Break
  2. Size/Material: ladder back or closed cable tray
- B. 3M System Description
1. Hourly Rating: 1 Hour - 3M™ Interam™ Systems Fire Breaks have been designed to resist flame spread for at least one hour during cable tray fires as hot as 2000°F (1100°C).
  2. Mat Thickness on Cable Tray: 0.4" (10 mm) 1 layer of E Mat 4
  3. Layer Technique: 2 in. (5 cm) overlap around cable tray
  4. Tape: 3M™ Interam™ Sealing Tape or 3M™ Interam™ T-49 Aluminum Foil Tape
  5. Caulk: 3M™ Fire Barrier CP 25 WB+ Caulk
  6. Restraining System: ½" (1 cm.) wide stainless steel bands

### Application Details

Horizontal Fire Breaks are typically installed 30 to 50 feet (14 – 32.6 m) apart along cable trays.

- Optional: Filament tape or non-conductive (plastic for example) banding can be put around the cable tray at 8-12 in. (20-30 cm) spacing prior to mat installation to minimize sagging of the mat on open top cable trays.
- One layer of 24.5" (61 cm) wide E MAT 4 is wrapped around the tray with at least a 2 in. (5 cm) seam overlap. For cable trays larger than 24" (60 cm) wide, apply a second mat section adjacent to the first with butted seams. Apply 3M Sealing Tape or T-49 Tape over the butt seam.
- Apply ½ in. (13 mm) wide by 0.020 in. (0,5 mm) thick stainless steel banding within 2 in. (5 cm) from mat ends and one entered one each mat section.
- On both ends of the fire break, stuff 4 in. (10 cm) wide mat strips to fill any large gaps. Apply CP 25WB+ caulk to fill smaller gaps (between cables for example) on each end of fire break.



## 4.6 Cable Tray Vertical Fire Break 1 Hour Fire Rating

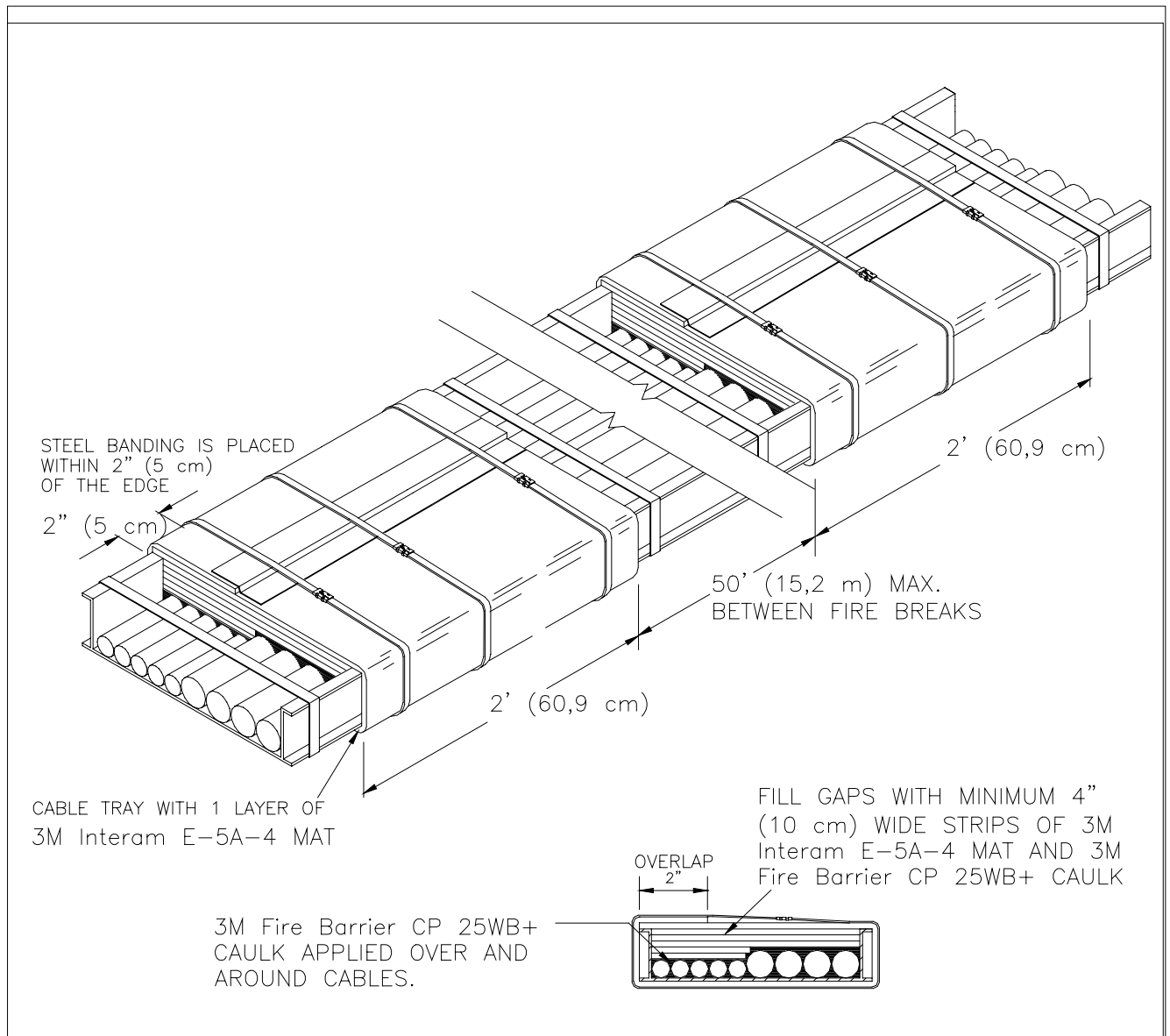
### System Details

- A. Electrical Raceway Configuration:
1. Cable Tray Fire Break
  2. Size/Material: ladder back or closed cable tray
- B. 3M System Description
1. Hourly Rating: 1 Hour - 3M™ Interam™ Systems Fire Breaks have been designed to resist flame spread for at least one hour during cable tray fires as hot as 2000°F (1100°C).
  3. Mat Thickness on Cable Tray: 0.4" (10 mm) 1 layer of E Mat 4
  3. Layer Technique: 2 in. (5 cm) overlap around cable tray
  4. Tape: 3M™ Interam™ Sealing Tape or 3M™ Interam™ T-49 Aluminum Foil Tape
  5. Caulk: 3M™ Fire Barrier CP 25 WB+ Caulk
  6. Restraining System: ½" (1 cm.) wide stainless steel bands

### Application Details

Vertical Fire Breaks are typically installed 10 to 25 feet (3 - 7.6 m) apart along cable trays.

- One layer of 24.5" (61 cm) wide E MAT 4 is wrapped around the tray with at least a 2 in. (5 cm) seam overlap. Apply a second mat section adjacent to the first with butted seams. Apply 3M Sealing Tape or T-49 Tape over the butt seam.
- Apply ½ in. (13 mm) wide by 0.020 in. (0,5 mm) thick stainless steel banding within 2 in. (5 cm) from mat ends and one entered one each mat section.
- On both ends of the fire break, stuff 4 in. (10 cm) wide mat strips to fill any large gaps. Apply CP 25WB+ caulk to fill smaller gaps (between cables for example) on each end of fire break.





# Ampacity Derating

**Table 1 - Ampacity Derating Chart**

System Materials	Conduit 1 hour	Cable Tray 1 hour	Conduit 3 hour	Cable Tray 3 hour
3M E-Mat Fire Wrap	14 to 23%	37 to 43%	20 to 30%	37 to 43%
Low Density Ceramic Fiber				
1 inch, 25 mm thick	35 to 42%	50 to 55%	35 to 42%	50 to 55%
2 inches 50 mm thick	63 to 73%	63 to 73%	63 to 73%	63 to 73%
Sheet Metal Cover Top & Bottom (16 Ga., 1.57 mm)	NA	27 to 40%	NA	27 to 40%
Subliming Board	NA	28 to 38%	NA	28 to 38%

- A. Due to the complexity of this subject, it is important to note that these values should be used for general estimates only.
- B. There are many factors (too numerous to list here), which affect the % Ampacity Derating. Among them are conductor size ambient temperature, cable grouping geometry, cable jacket thermal conductivity, emissivity and air flow are the system.
- C. The Ampacity Derating numbers in Table 2 have been determined from actual test conducted at Underwriters Laboratory (UL), Southwest Research (SwRI), and 3M laboratories, and from manufacturer's publicly available literature.

# 3M™ Interam™ Systems Electrical Estimating Guide

## Material Estimating Guide

The following pages provide information regarding material estimates for the E-Mat when applied around conduits, cable trays, and hanger support members.

In addition to these mat estimates, the following “rules of thumb” can be used to estimate the quantities of other materials to be included in the Fire Protection Systems:

- ☐ 3M FireDam 150 Caulk - one tube for every 1 to 2 rolls of mat.
- ☐ 3M T-49 Aluminum Foil Tape - 1 roll for every 3 to 5 rolls of mat.
- ☐ 898 Filament Tape - 1 roll for every 3 to 5 rolls of mat.
- ☐ 3M CP 25WB+ Caulk - 1 for every 3M CS-195+ Sheet
- ☐ Stainless Steel Bands - one 100' (30,5 m) roll for every 5 to 7 rolls of mat.
- ☐ Band Clips (Seals) - 1 box of 1000 clips for every 10 rolls of stainless steel Bands.

Note: The tables on the following pages represent the ASTM E 119 Standard. Other standards may require additional layers.

## E-Mat Layer Requirements ASTM E 119

Item	Layer of E-Mat per Rating		
	60min	120min	180min
Conduit less than 2 in. (25 mm)	4 Layers	5 Layers	6 Layers
Conduit, 2 in. (5 cm) or larger and cable bundles	3 Layers	4 Layers	5 Layers
Cable trays	2 Layers	4 Layers	5 Layers
Junction boxes	3 Layers	4 Layers	5 Layers
Support members fully covered	1 Layers	2 Layers	3 Layers
Support members and heat transfer items partially covered	1 Layers	3 Layers	5 Layers

When Layer requirement varies from those represented in the drawings follow general guidelines for overlaps, offsets, seams etc. and use number of layers indicated above.

## Installation Rate - Lineal feet (meters) per Hour by Two Workers

	1 Hour system	3 Hour System
<b>Conduit, 2 in. (5 cm) or larger</b>		
1. Straight and Easily Accessed	20 ft (6 m)/hour	8 ft. (2,5 m)/hour
2. Straight and Easily Accessed with the addition of covering support members a distance of 12" (30,5 cm)	10 ft (3 m)/hour	4 ft. (1,2 m)/hour
<b>Conduit Elbow</b>	8 ft. (2,5 m)/ hour	5 ft. (1,5 m)/hour
<b>Cable Tray (24" by 4" - 61 cm by 10 cm)</b>		
1. Straight and Easily Accessed	15 ft. (4,5 m)/hour	6 ft. (1,8 m)/hour
2. Straight and Easily Accessed with the addition of covering support members a distance of 12" (30,5 cm)	9 ft. (2,8 m)/hour	3 ft. (1 m)/hour
<b>Cable Tray Elbow</b>	5 ft. (1,5 m)/hour	2 ft. (0,6 m)/hour

Note: Installation rates will be decreased by set-up time, clean-up time, installation of scaffolding, difficult access areas, and an installer learning curve. However, the rate decrease caused by these parameters cannot be generally determined. Material Estimating Guide.

## Conduit Calculations (English Units)

### 1 Hour System Per Lineal Foot of Conduit (3 Layers E-Mat) Mat Length

Size (in.)	O.D. (in.)	Circumf (in.)	Layer 1 (in.)	Layer 2 (in.)	Layer 3 (in.)	Total Length Inches	Total Length Feet
1	1.3	4.1	8.6	11.1	13.6	33.4	2.8
1½	1.9	6.0	10.5	13.0	15.5	39.0	3.2
2	2.4	7.5	12.0	14.5	17.0	43.4	3.6
3	3.5	11.0	15.5	18.0	20.5	54.0	4.5
4	4.5	14.1	18.6	21.2	23.7	63.5	5.3
5	5.5	17.3	21.8	24.3	26.8	72.9	6.1
6	6.6	20.8	25.8	27.8	30.3	83.5	7.0
8	8.6	27.1	31.6	34.1	36.6	102.3	8.5

### 3 Hour System Per Lineal Foot of Conduit (5 Layers E-Mat) Mat Length

Size (in.)	O.D. (in.)	Circumf. (in.)	Layer 1 (in.)	Layer 2 (in.)	Layer 3 (in.)	Layer 4 (in.)	Layer 5 (in.)	Layer 6 (in.)	Total Length (5 Layers) Inches	Total Length (5 Layers) Feet
1	1.3	4.1	8.6	11.1	13.6	16.2	18.7	21.4	69.2	5.7
1½	1.9	6.0	10.5	13.0	15.5	18.0	20.5	23.3	77.5	6.5
2	2.4	7.5	12.0	14.5	17.0	19.5	22.0	24.7	85.0	7.1
3	3.5	11.0	15.5	18.0	20.5	23.0	25.6	28.3	102.6	8.6
4	4.5	14.1	18.6	21.2	23.7	26.2	28.7	31.4	118.3	9.9
5	5.5	17.3	21.8	24.3	26.8	29.3	31.8	34.7	134.0	11.2
6	6.6	20.8	25.8	27.8	30.3	32.9	35.4	38.0	151.7	12.6
8	8.6	27.1	31.6	34.1	36.6	39.1	41.6	44.4	183.1	15.3

## Hanger Support (English Units)

### 1 Hour System Per Linear Foot of Support Member

Support Size	Outside Perimeter, inches	Layer 1, inches	Total Mat, feet
.5x1.5	4	9.2	0.8
1.5x5	13	18.2	1.5
1.63x1.6	6.46	11.66	1.0
1.63x2.4	8.06	13.26	1.1
1.63x3.2	9.76	14.96	1.2
1.63x4.8	13.02	18.22	1.5
1.63x6.5	16.25	21.45	1.8
1.75x4.8	13.26	18.46	1.5
2x2	8	13.2	1.1
2x3	10	15.2	1.3
2x4	12	17.2	1.4
2x5	14	19.2	1.6
2.5x2.5	10	15.2	1.3
3x3	12	17.2	1.4
3x4	14	19.2	1.6
3x5	16	21.2	1.8
3x6	18	23.2	1.9
3x8	22	27.2	2.3
3.5x3.5	14	19.2	1.6
4x4	16	21.2	1.8
4x5	18	23.2	1.9
4x6	20	25.2	2.1
4x8	24	29.2	2.4
4x16	40	45.2	3.8
5x5	20	25.2	2.1
5x7	24	29.2	2.4
5x8	26	31.2	2.6
5.25x8	26.5	31.7	2.6
6x6	24	29.2	2.4
6x8	28	33.2	2.8
6x12	36	41.2	3.4
8x8	32	37.2	3.1
8x20	56	61.2	5.1
1 in. angle	3.42	8.62	0.7
1.5 in. angle	5.13	10.33	0.9
2 in. angle	6.84	12.04	1.0
2.5 in. angle	8.55	13.75	1.1
3 in. angle	10.26	15.46	1.3
3.5 in. angle	11.97	17.17	1.4
4 in. angle	13.68	18.88	1.6

Note: Be sure to add 5-15% for waste, error, etc.

### 3 Hour System Per Linear Foot of Support Member

Support Size	Outside Perimeter, in.	layer 1, in.	layer 2, in.	layer 3, in.	layer 4, in.	layer 5, in.	Total Mat inches	Total Mat feet
.5x1.5	4	9.2	11.7	14.2	16.7	19.2	71.0	5.9
1.5x5	13	18.2	20.7	23.2	25.7	28.2	116.0	9.7
1.63x1.6	6.46	11.66	14.16	16.66	19.16	21.66	83.3	6.9
1.63x2.4	8.06	13.26	15.76	18.26	20.76	23.26	91.3	7.6
1.63x3.2	9.76	14.96	17.46	19.96	22.46	24.96	99.8	8.3
1.63x4.8	13.02	18.22	20.72	23.22	25.72	28.22	116.1	9.7
1.63x6.5	16.25	21.45	23.95	26.45	28.95	31.45	132.3	11.0
1.75x4.8	13.26	18.46	20.96	23.46	25.96	28.46	117.3	9.8
2x2	8	13.2	15.7	18.2	20.7	23.2	91.0	7.6
2x3	10	15.2	17.7	20.2	22.7	25.2	101.0	8.4
2x4	12	17.2	19.7	22.2	24.7	27.2	111.0	9.3
2x5	14	19.2	21.7	24.2	26.7	29.2	121.0	10.1
2.5x2.5	10	15.2	17.7	20.2	22.7	25.2	101.0	8.4
3x3	12	17.2	19.7	22.2	24.7	27.2	111.0	9.3
3x4	14	19.2	21.7	24.2	26.7	29.2	121.0	10.1
3x5	16	21.2	23.7	26.2	28.7	31.2	131.0	10.9
3x6	18	23.2	25.7	28.2	30.7	33.2	141.0	11.8
3x8	22	27.2	29.7	32.2	34.7	37.2	161.0	13.4
3.5x3.5	14	19.2	21.7	24.2	26.7	29.2	121.0	10.1
4x4	16	21.2	23.7	26.2	28.7	31.2	131.0	10.9
4x5	18	23.2	25.7	28.2	30.7	33.2	141.0	11.8
4x6	20	25.2	27.7	30.2	32.7	35.2	151.0	12.6
4x8	24	29.2	31.7	34.2	36.7	39.2	171.0	14.3
4x16	40	45.2	47.7	50.2	52.7	55.2	251.0	20.9
5x5	20	25.2	27.7	30.2	32.7	35.2	151.0	12.6
5x7	24	29.2	31.7	34.2	36.7	39.2	171.0	14.3
5x8	26	31.2	33.7	36.2	38.7	41.2	181.0	15.1
5.25x8	26.5	31.7	34.2	36.7	39.2	41.7	183.5	15.3
6x6	24	29.2	31.7	34.2	36.7	39.2	171.0	14.3
6x8	28	33.2	35.7	38.2	40.7	43.2	191.0	15.9
6x12	36	41.2	43.7	46.2	48.7	51.2	231.0	19.3
8x8	32	37.2	39.7	42.2	44.7	47.2	211.0	17.6
8x20	56	61.2	63.7	66.2	68.7	71.2	331.0	27.6
1" angle	3.42	8.62	11.12	13.62	16.12	18.62	68.1	5.7
1.5" angle	5.13	10.33	12.83	15.33	17.83	20.33	76.7	6.4
2" angle	6.84	12.04	14.54	17.04	19.54	22.04	85.2	7.1
2.5" angle	8.55	13.75	16.25	18.75	21.25	23.75	93.8	7.8
3" angle	10.26	15.46	17.96	20.46	22.96	25.46	102.3	8.5
3.5" angle	11.97	17.17	19.67	22.17	24.67	27.17	110.9	9.2
4" angle	13.68	18.88	21.38	23.88	26.38	28.88	119.4	10.0

## Cable Tray Calculations (English Units)

### 1 Hour System Per Lineal Foot of Cable Tray (3 Layers E-Mat)

Cable Tray Size (in.)	Outside Perimeter (in.)	Layer 1 (in.)	Layer 2 (in.)	Layer 3 (in.)	Total Wrap Length in. (ft.)
4x12	32	37.7	40.9	44.1	122.7 (10.2)
4x18	44	50.0	53.2	56.4	159.5 (13.3)
4x24	56	62.2	65.4	68.6	196.2 (16.4)
4x30	68	74.5	77.7	80.9	233.0 (19.4)
4x36	80	86.7	89.9	93.1	269.7 (22.5)
6x6	24	29.5	32.7	35.9	98.0 (8.2)
6x12	36	41.7	44.9	48.1	134.7 (11.2)
6x18	48	54.0	57.2	60.4	171.5 (14.3)
6x24	56	62.2	65.4	68.6	196.2 (16.4)
6x30	72	78.5	81.7	84.9	245.0 (20.4)
8x12	40	45.7	48.9	52.1	146.7 (12.2)
8x18	52	58.0	61.2	64.4	183.5 (15.3)
8x24	64	70.2	73.4	76.6	220.2 (18.4)
12x12	48	53.7	56.9	60.1	170.7 (14.2)
12x18	60	66.0	69.2	72.4	207.5 (17.3)
12x24	72	78.2	81.4	84.6	244.2 (20.4)
12x30	84	90.5	93.7	96.9	281.0 (23.4)

### 3 Hour Systems Per Lineal Foot of Cable Tray (5 Layers E-Mat)

Cable Tray Size (in.)	Outside Perimeter (in.)	Layer 1 (in.)	Layer 2 (in.)	Layer 3 (in.)	Layer 4 (in.)	Layer 5 (in.)	Total Wrap Length In. (ft.)
4x12	32	37.7	40.9	44.1	47.3	50.5	220.5 (18.4)
4x18	44	50.0	53.2	65.5	59.6	62.8	290.9 (24.2)
4x24	56	62.2	65.4	78.0	71.8	75.0	352.4 (29.4)
4x30	68	74.5	77.7	90.5	84.1	87.3	413.9 (34.5)
4x36	80	86.7	89.9	103.0	96.3	99.5	475.4 (39.6)
6x6	24	29.5	32.7	44.5	39.1	42.3	187.9 (15.7)
6x12	36	41.7	44.9	57.0	51.3	54.5	249.4 (20.8)
6x18	48	54.0	57.2	69.5	63.6	66.8	310.9 (25.9)
6x24	56	62.2	65.4	78.0	71.8	75.0	352.4 (29.4)
6x30	72	78.5	81.7	94.5	88.1	91.3	433.9 (36.2)
8x12	40	45.7	48.9	61.0	55.3	58.5	269.4 (22.5)
8x18	52	58.0	61.2	73.5	67.6	70.8	330.9 (27.6)
8x24	64	70.2	73.4	86.0	79.8	83.0	392.4 (32.7)
12x12	48	53.7	56.9	69.0	63.3	66.5	309.4 (25.8)
12x18	60	66.0	69.2	81.5	75.6	78.8	370.9 (30.9)
12x24	72	78.2	81.4	94.0	87.8	91.0	432.4 (36.0)
12x30	84	90.5	93.7	106.5	100.1	103.3	493.9 (41.2)

Note: Be sure to add 5-15% for waste, error, etc.

## Cable Tray Fire Break Materials Estimating Chart

Cable Tray Size	E-Mat Sq. Ft. (Sq. m)	CP 25WB+ Cartridges	T-49 Tape Ft. (m)	898 Tape Ft. (m)	Banding Ft. (m)
<b>Horizontal</b>					
12" by 4" (30,5 cm by 10 cm)	6.31 (0,60)	2	2 (0,60)	18 (5,5)	12 (3,6)
18" by 4" (45,7 cm by 10 cm)	8.3 (0,79)	3	2 (0,60)	24 (7,4)	16 (4,8)
24" by 4" (61 cm by 10 cm)	10.4 (0,98)	3	2 (0,60)	30 (9,2)	20 (6,1)
36" by 4" (91,4 cm by 10 cm)	14.5 (1,37)	4	2 (0,60)	42 (12,9)	28 (8,5)
<b>Vertical</b>					
12" by 4" (30,5 cm by 10 cm)	6.6 (1,20)	2	4 (1,2)	36 (11,0)	24 (7,2)
18" by 4" (45,7 cm by 10 cm)	16.6 (1,58)	3	4 (1,2)	48 (14,8)	32 (9,6)
24" by 4" (61 cm by 10 cm)	20.8 (1,96)	3	4 (1,2)	60 (18,4)	40 (12,2)
36" by 4" (91,4 cm by 10 cm)	29 (2,74)	4	4 (1,2)	84 (25,8)	56 (17,0)

1. Estimate assumes a full cable tray. It does not include mat pieces used to fill fire-break ends. Add up to 10% for a nearly empty cable tray.

# 3M™ Interam™ Systems E-Mat Structural Steel Installation Guide

This Section describes procedures for installing 3M Interam E-Mat wrap systems for 1, 2, and 3 hour (ASTM E 119, UL 263) and 1.5 and 2.5 hour (ASTM E 1529, UL 1709 high intensity requirements). 3M Interam E-Mat systems can be applied to newly primed structural steel beams, columns or supports; or over old fire protection that requires upgrading.

3M Interam E-Mat Systems, properly installed, help maintain steel structural members below 1000 F (538EC) to prevent failure of supports to major equipment and vessels to prevent pipe supports from shifting/deforming and restrict addition of fuel to a fire.

## **Environmental Protection**

- A. Where corrosion is a concern, the structural member should be environmentally protected before the fire protection system is applied.
- B. If the installation is outdoors, the fire protection system should be protected with stainless steel jacketing or an approved non-metal cover.
- C. Approved non-metal covers include 3M™ Interam Systems Sealing Tape and 3M™ Scotchrap™ 52 Corrosion Protection Tape.

See Products section in this manual for more information.



## 5.1 Installation – Single-Layer “Two Inch offset Method” for Four Sided Protection

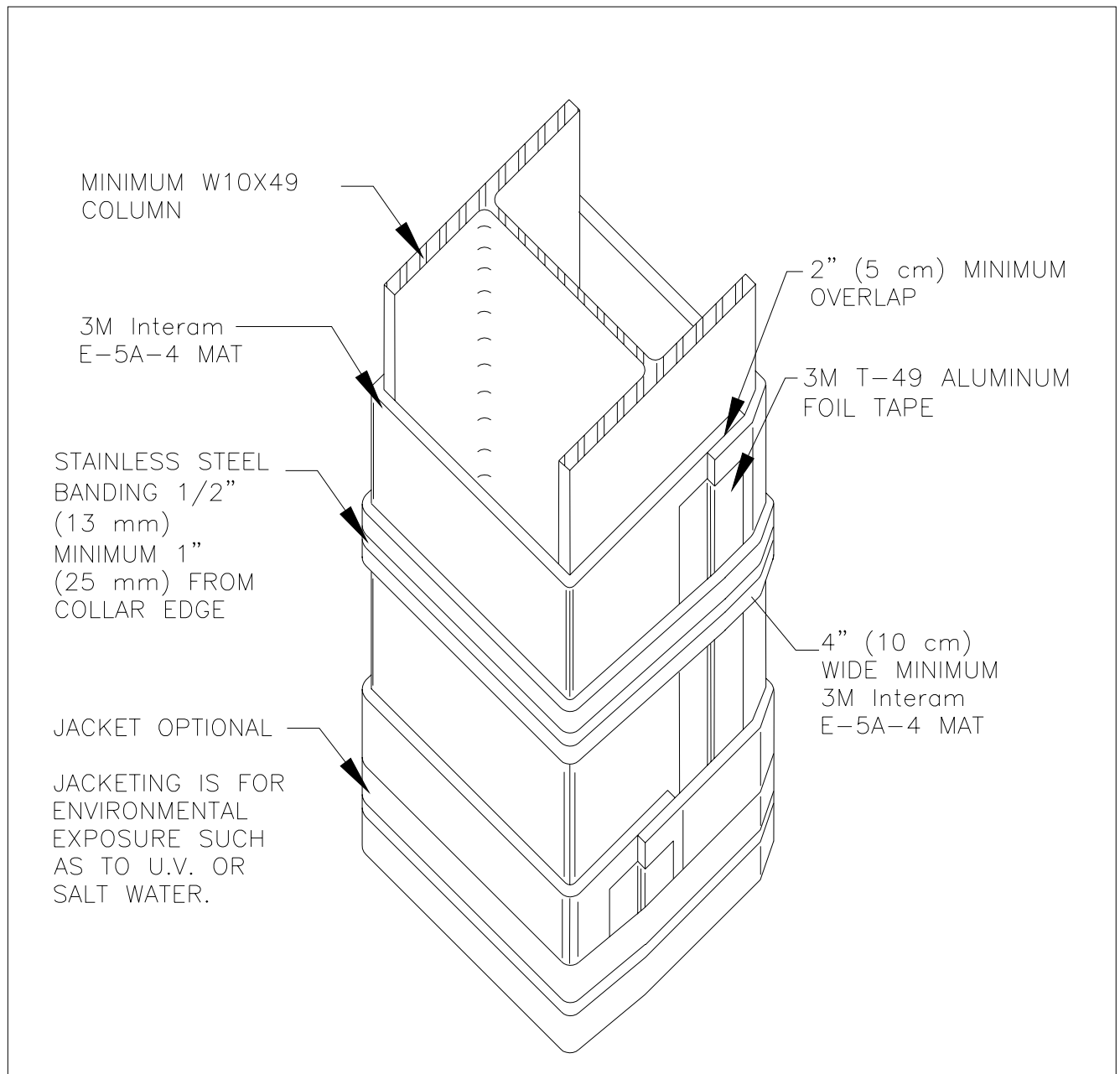
Qualification Fire Test: Omega Point Project No. 9006-98944, Mar. 19, 1986

A. The mat, once wrapped around an item, must overlap onto itself 2 in. (5 cm) minimum.

B. Adjacent mat pieces must butt together.

C. Seal seams and joints with aluminum tape and 3M™ Interam™ FireDam™ 150 caulk.

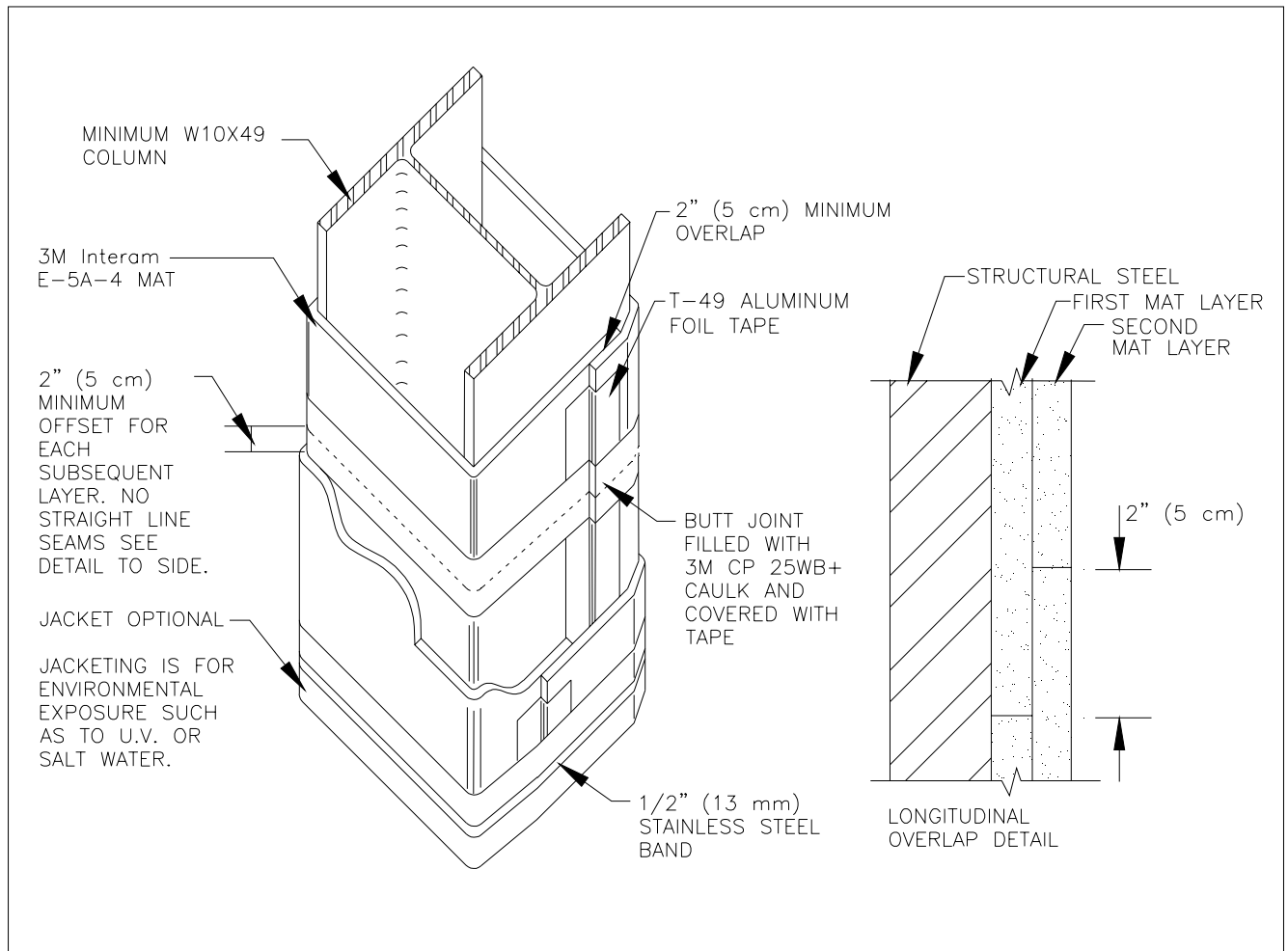
D. See Estimating Guide Table 1 for hourly fire rating applicable for single layer systems.



## 5.2 Installation – Multi-Layer “Two Inch offset Method” for Four Sided Protection

Qualification Fire Test: Omega Point Project No. 9006-98944, Mar. 19, 1986

- A. Each individual mat layer, once wrapped around an item, must overlap onto itself 2 in. (5 cm) minimum.
- B. A space may exist between the end of one layer and the beginning of another as long as required overlap is maintained for each individual layer as described in Paragraph A above.
- C. Adjacent pieces of the same layer must be butted together to the adjacent pieces. These butt joints must be caulked and a covered with T-49 tape. (See below)
- D. The offset (or stagger) of the seams of a given layer to the seams of the next layer must be a minimum of 2 in. (5 cm) (see Longitudinal Overlap Detail below).
- E. Direct line seams to the protected item may be used only if necessary at intersections, terminations, or sharp discontinuities. However, these direct line seams must be caulked with FireDam 150 Caulk and taped with T-49 tape after the final layers.
- F. Correct thickness of mat is required on all steel surfaces including beam/column intersections
- G. All seams on all layers must be covered with T-49 tape.
- H. See Estimating Guide to determined the correct number of layers for specific applications.



### 5.3 Installation – Multi-Layer “Continuous Wrap Method” for Four Sided Protection

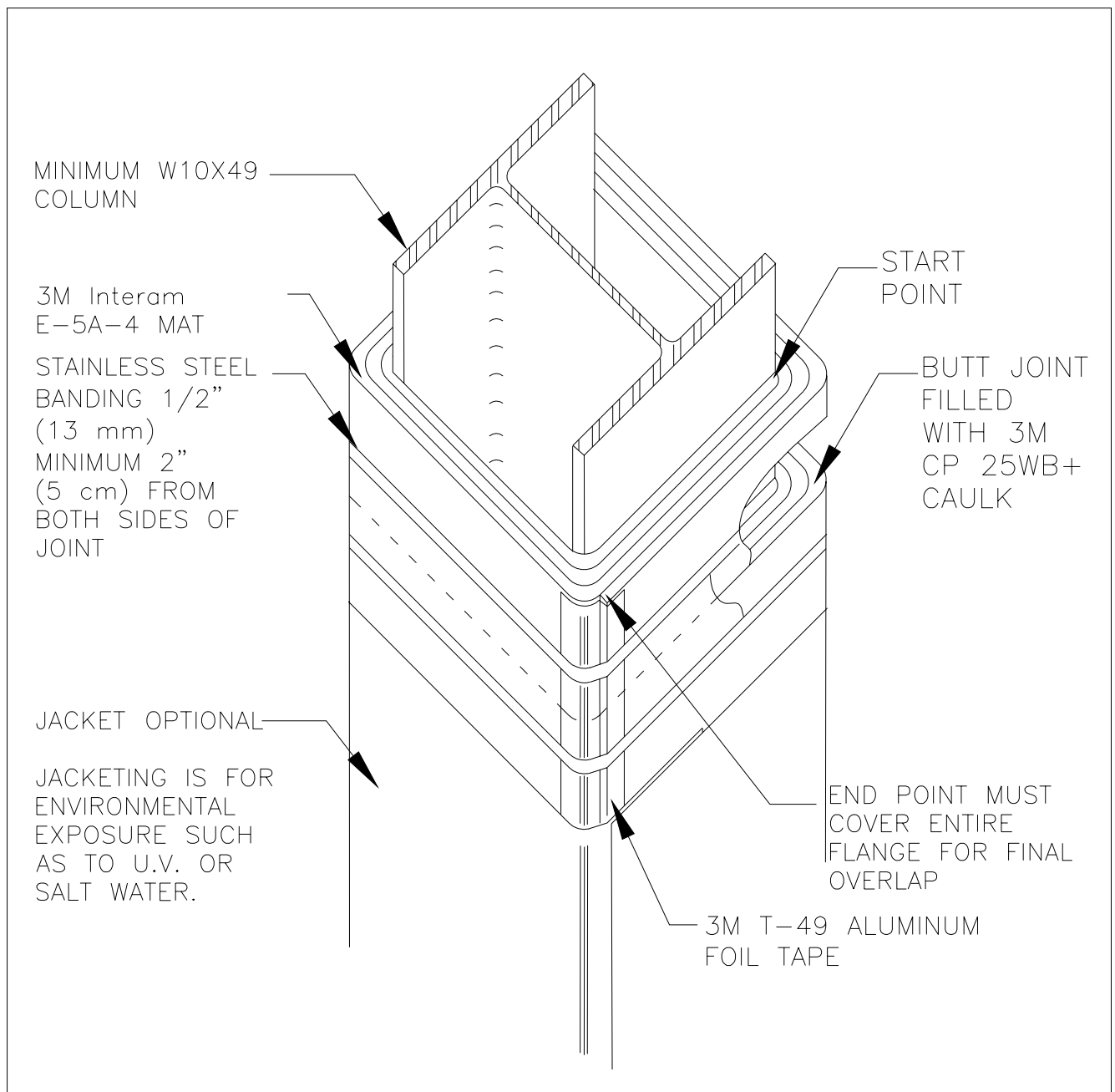
Qualification Fire Test: Omega Point Project No. 9006-98944, Mar. 19, 1986

The “Continuous Wrap Method” is a technique of applying mat in one continuous length.

- A. Install the mat as a continuous wrap. From the start point of the mat, wrap around the item until the proper number of layers have

been installed. Cut off the mat so it overlaps past the starting point and cover the entire flange face with an extra layer.

- B. Adjacent pieces are to be butted. The seams must be caulked with 3M™ Interam™ FireDam™ 150 Caulk and taped with T-49 tape after the final layers.
- C. Install stainless steel bands as shown.
- D. See Estimating Guide to determined the correct number of layers for specific applications

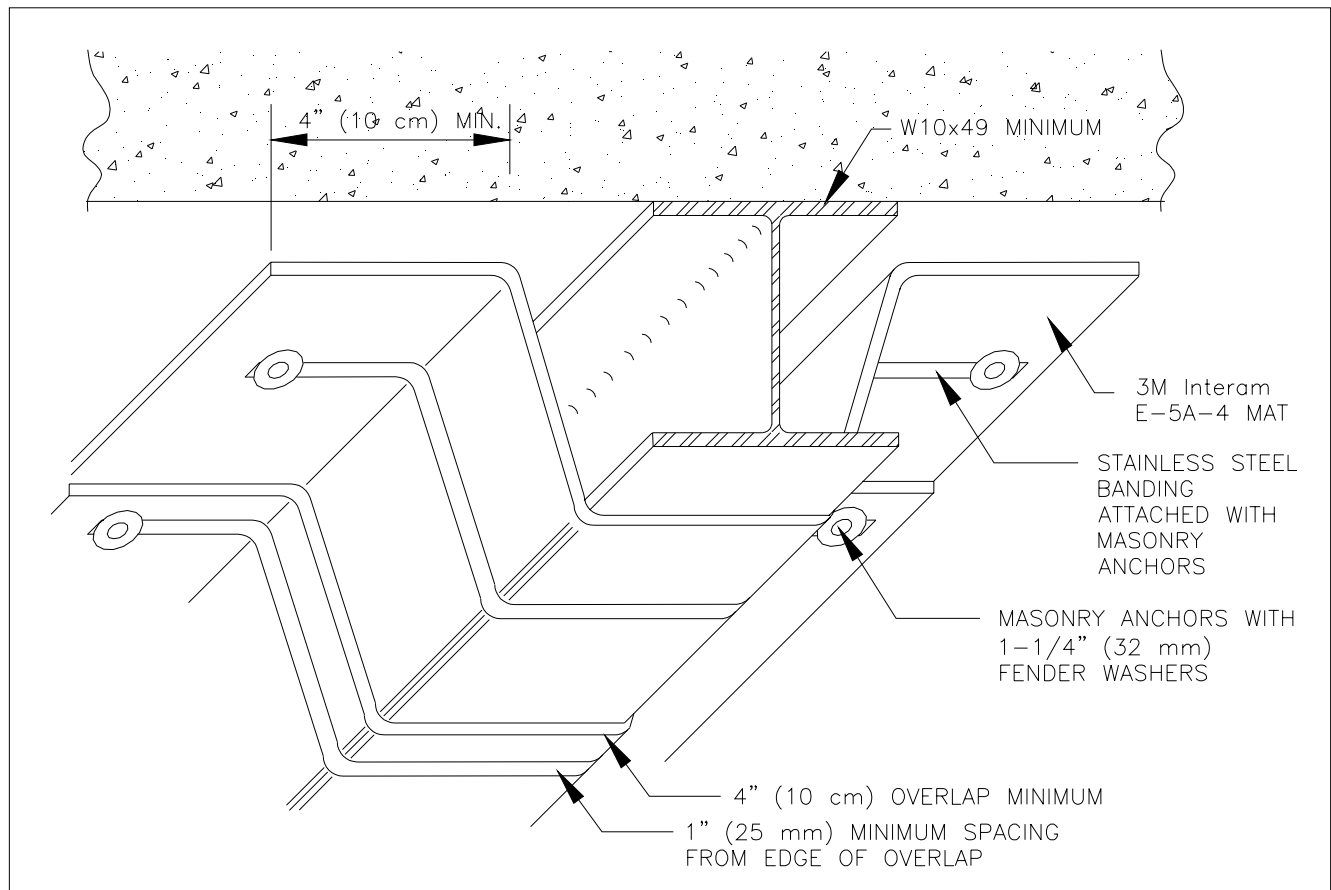


## 5.4 Installation – Three Sided Protection for Items Flush to Concrete or Steel Deck

Qualification Fire Test: Omega Point Project No. 9006-98944, Mar. 19, 1986

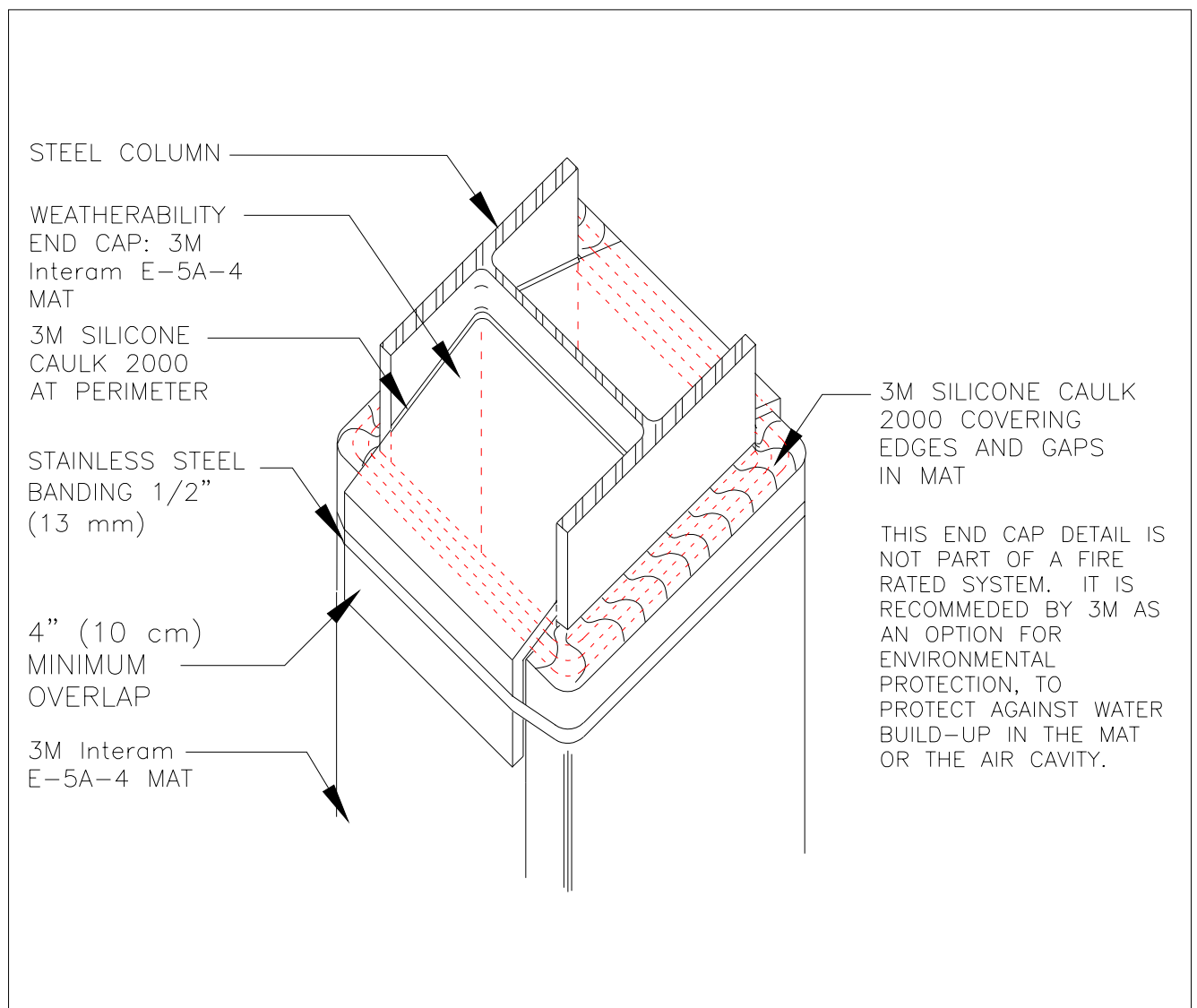
The typical method for attaching mat is by the anchor method described as follows:

- A. Install mat (only one layer required). Mat must flare out onto concrete a minimum of 4 in. (10 cm).
- B. Install stainless steel bands 12 in. (30,5 cm) O.C. maximum and restrain mat as follows.
- C. Restrain mat and bands using masonry anchors (75 lb., 34 kg pull-out strength) and 1¼ in. (32 mm) fender washers or engineering equivalent. Anchor penetration must be 1 in. (25 mm) minimum into concrete.
- D. Adjacent pieces of mat must overlap the previous mat section by 4 in. (10 cm) minimum. Bands must be installed 1 in. (25 mm) maximum from overlapping edge.

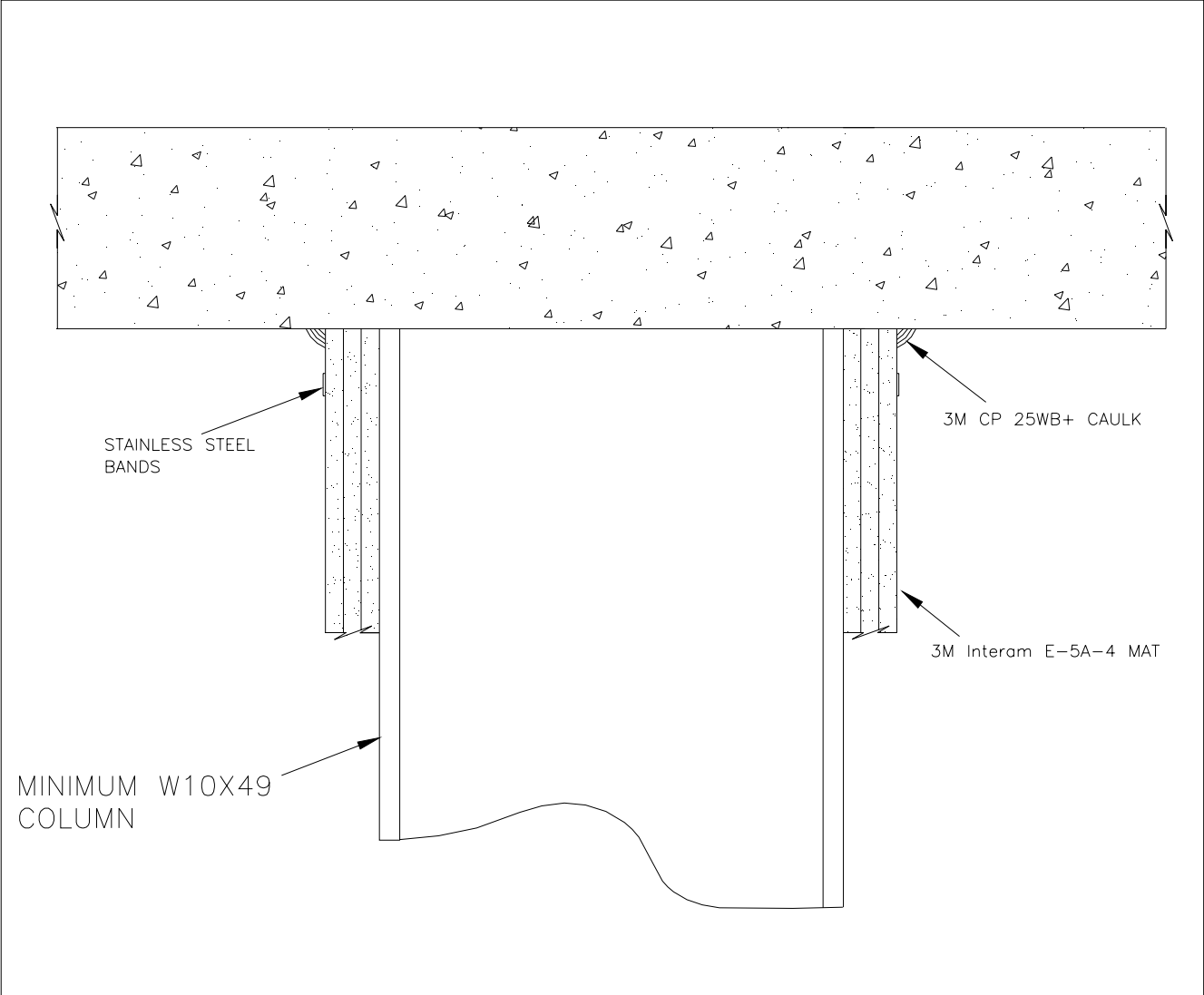


## 5.5 End Cap Termination

- A. Use E-Mat material to cut an end cap which will fit into web area at a 45 degree angle.
- B. The edge of the end cap must overlap onto system 4 in. (10 cm) minimum. And be secured with stainless steel bands
- C. Perimeter, gaps and exposed edges of mat must be caulked using 3M Silicone Caulk 2000. (See below)



# 5.6 System Termination



# Structural Steel Estimating Guide (3 Sided)

Three sided protection only requires 1 layer for all size shapes.

For three sided protection use Table 2 to find the width and depth information or measure the member.

Add width + depth x 2 + 10 inches (8 inches for overlaps plus 2 inches for radius around corners) to determine mat length needed.

# Structural Steel Estimating Guide (4 Sided)

The flow of estimating materials for 4 sided protection is:

1. Find Hp/A
  - a. If Hp/A is Known
    - 1) Refer directly to Table 1.
  - b. If Hp/A is Not Known
    - 1) Use the structural shape information in Table 2 or 3 to identify Hp/A and the perimeter information.
    - 2) It may be necessary to actually measure the member and match the size information in the table to find Hp/A.
2. Use Table 1 to find Number of Layers Required
  - a. Use the Hp/A number from Table 2 to identify the row to read from Table 1.
  - b. Round the Hp/A number up to the nearest number in Table 1.
  - c. Follow that row across to the required fire-rating column in Table 1.
  - d. The number in the box will indicate the required number of layers of E-Mat.
3. Estimate quantity of E-mat needed for the required number of layers found in Table 1 using rules below.
  - a. Two Inch Offset Method
    - Layer 1: beam perimeter (Table 2 or 3) + 5 in. (12,7 cm)
    - Layer 2: layer 1 mat length + 2 in. (5 cm)
    - Layer 3: layer 2 mat length + 2 in. (5 cm)
    - Layer 4: layer 3 mat length + 2 in. (5 cm)
    - Layer 5: layer 4 mat length + 2 in. (5 cm)
    - Layer 6: layer 5 mat length + 2 in. (5 cm)
    - Layer 7: layer 6 mat length + 2 in. (5 cm)
  - b. Continuous Wrap Method
    - Mat Length = Perimeter + Flange + Total Mat thickness
  - c. The above estimating guidelines are approximate. Actual quantity of E-Mat required will vary based on actual field conditions. Add approximately 10% for waste. Installer must use experience as skill to determine suitability of recommendations contained herein

## Example

- From Table 2: W 10X49 column Hp/A ( $m^{-1}$ ) for 4 sided protection = 162.
- Round up to 170.
- In Table 1: Follow the 170 line to the following layer requirements.
- Use rules in 3a or 3b to estimate mat length

**Table 1 -- E-5A-4 Layers Required to Provide Following Fire Ratings (To 538 C/1000 F on the Steel Surface)**

Hp/A (m <sup>-1</sup> ) <sup>1</sup> from Table 2	1 hour rating		1½ hour rating		2 hour rating		2½ hour rating		3 hour rating		4 hour rating	
	H60 <sup>2</sup>	A60 <sup>2</sup>	H90	A90	H120	A120	H150	A150	H180	A180	H240	A240
30	1	1	1	1	1	1	1	1	2	2	2	2
50	1	1	1	1	1	1	2	1	2	2	3	3
70	1	1	1	1	2	1	2	2	3	2	3	3
90	1	1	1	1	2	1	2	2	3	3	4	4
110	1	1	1	1	2	2	3	2	3	3	4	4
130	1	1	2	1	2	2	3	2	3	3	5	5
150	1	1	2	1	2	2	3	3	4	3	5	5
170	1	1	2	1	2	2	3	3	4	3	5	5
190	1	1	2	1	3	2	3	3	4	3	6	6
210	1	1	2	1	3	2	3	3	4	3	6	6
230 <sup>3</sup>	1	1	2	2	3	2	4	3	4	4	6	6
250 <sup>3</sup>	1	1	2	2	3	3	4	3	5	4	6	6
270 <sup>3</sup>	1	1	2	2	3	3	4	3	5	4	6	6
290 <sup>3</sup>	1	1	2	2	3	3	4	4	5	4	7	7
310 <sup>3</sup>	1	1	2	2	3	3	4	4	5	5	7	7

1. Hp=Perimeter of Steel Member Exposed to Flames, A=Cross-section Area of Steel Member
2. H60 = Hydrocarbon fire exposure for 60 minutes (High Intensity Fire Exposure per UL 1709), A60 = Standard fire exposure for 60 minutes (ASTM E 119)
3. Extrapolated From Test Results (Omega Point Labs, Project No. 9006-98944)



# 3M™ Interam™ Systems E-Mat Gas Pipeline Installation Guide

This Section describes procedures for installing E-Mat systems for fire protection of gas pipelines tested according to ASTM E 119, ASTM E 1529 and ISO 834 requirements.

## System Design Requirements

Pipelines that contain petroleum products (in liquid or gas forms) or steam lines often require complete enclosures which provide hot or cold insulation in combination with fire protection.

### A. Fire Ratings and Approvals

1. SINTEF
  - a. Hydrocarbon Type Fire: 1- and 2-Hour Fire Ratings for 10" (25,4 cm) diameter Steel Pipe
  - b. Jet Fire: 30-min. Fire Rating for 10" (25,4 cm) diameter Steel Pipe
3. Explosion Resistance for 10" (25,4 cm) dia. Steel Pipe
4. **Acoustic Dampening for 10" (25,4 cm) dia. Steel Pipe – XXX dB**

### B. Approvals

1. **Det Norske Veritas (DNV)**
2. **Lloyd's Registry**

**Table 1 – Layer Requirements for E Mat, ASTM E-1529 (UL1709) Hydrocarbon Exposure**

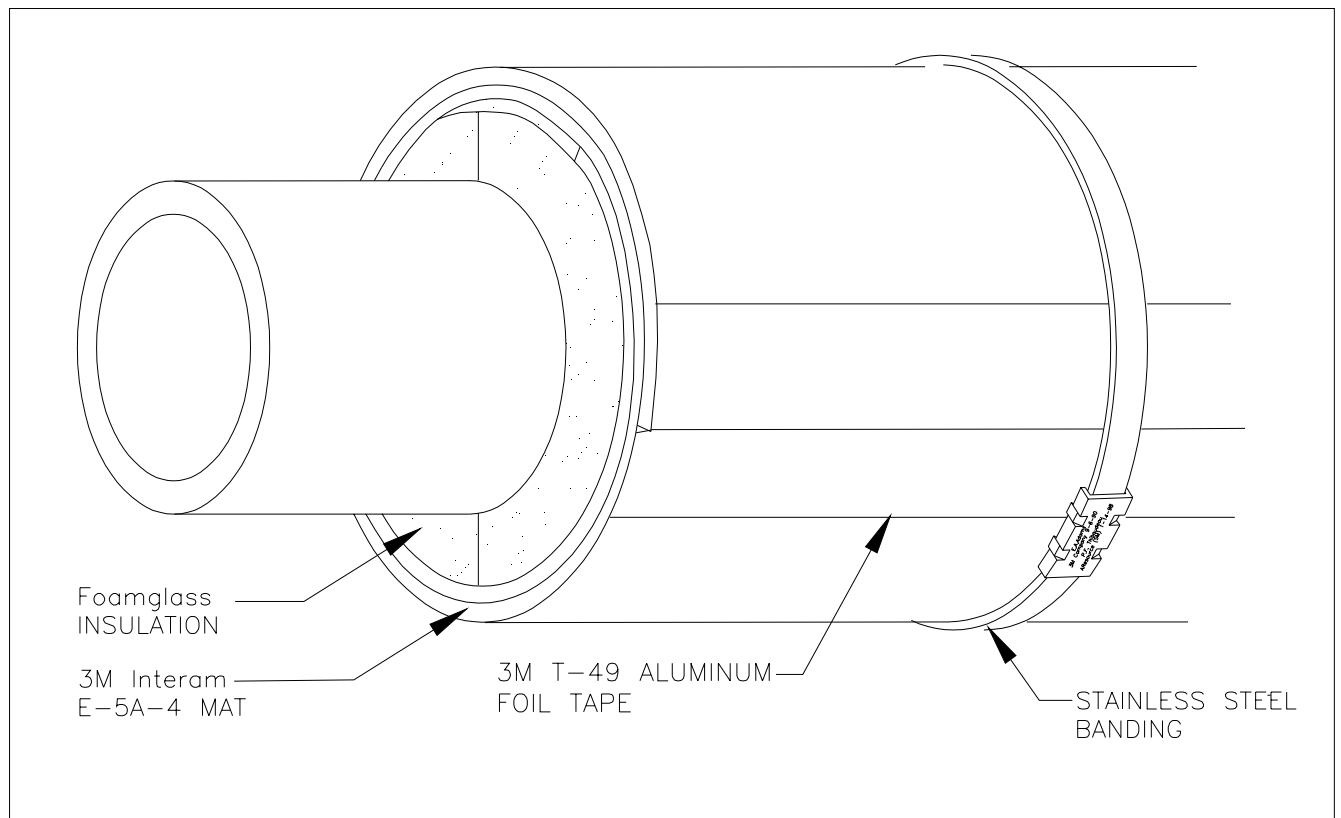
E-Mat Layers	Foamglass Thickness	Time Exposure to Temperature (Minutes)			
		392°F (200°C)	752°F (400°C)	932°F (500°C)	1112°F (600°C)
1 Layer	1½" (38 mm)	53	84	102	126
1 Layer	2" (5 cm)	62	95	114	137
2 Layers	2" (5 cm)	96	145	172	205

Foamglass is a registered trademark of Pittsburg Corning

## 6.1 Gas Pipe Detailing

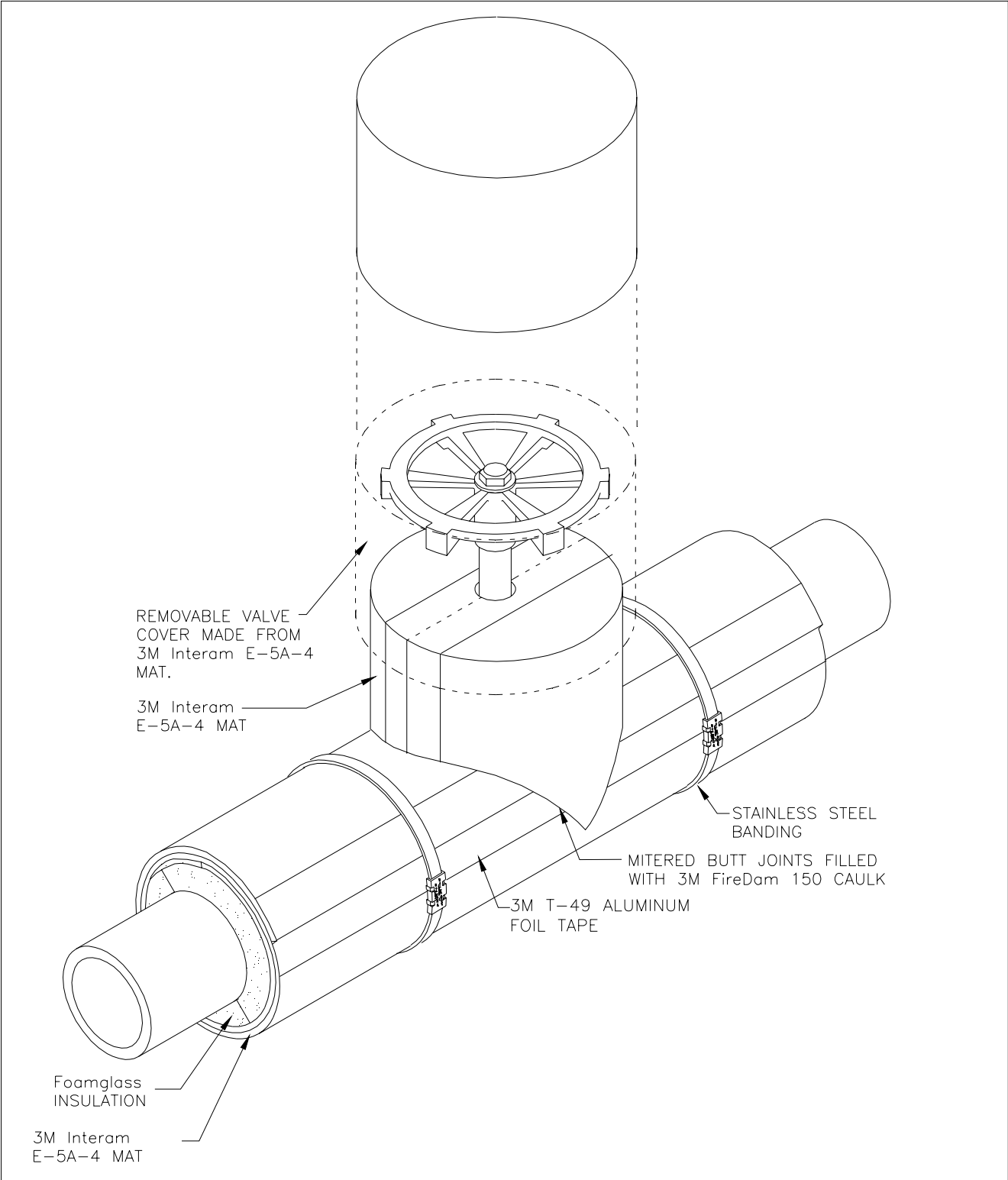
Use the “Continuous Wrap Method” in which the layers are put on in one continuous length.

- A. Prior to installing E-Mat, apply Pittsburgh Corning Foramglass in accordance with the mfr. suggestions.
- B. Apply E-Mat around the foamglass using the proper number of layers. Ends of the E-Mat and seams between adjacent sections of E-Mat are to be butted together.
- C. Apply 3M™ Interam™ FireDam™ 150 Caulk to the seams and then cover with 3M Sealing Tape.



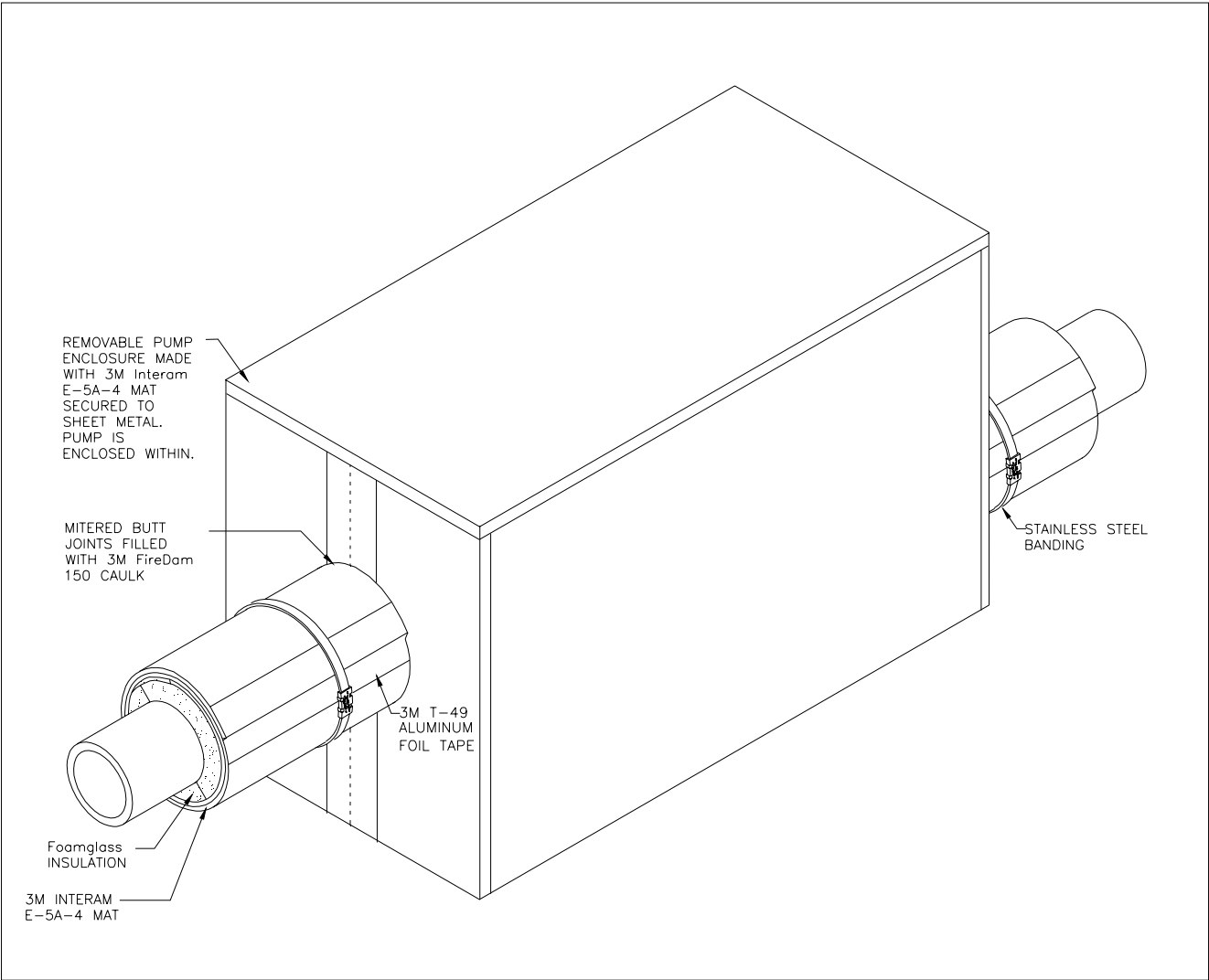
## 6.2 Removable Valve System

This diagram is meant to illustrate the concept. Actual valve cover design depends on the design of the equipment involved. E-Mat is flexible and adaptable to many types of container designs.



### 6.3 Removable Pump System

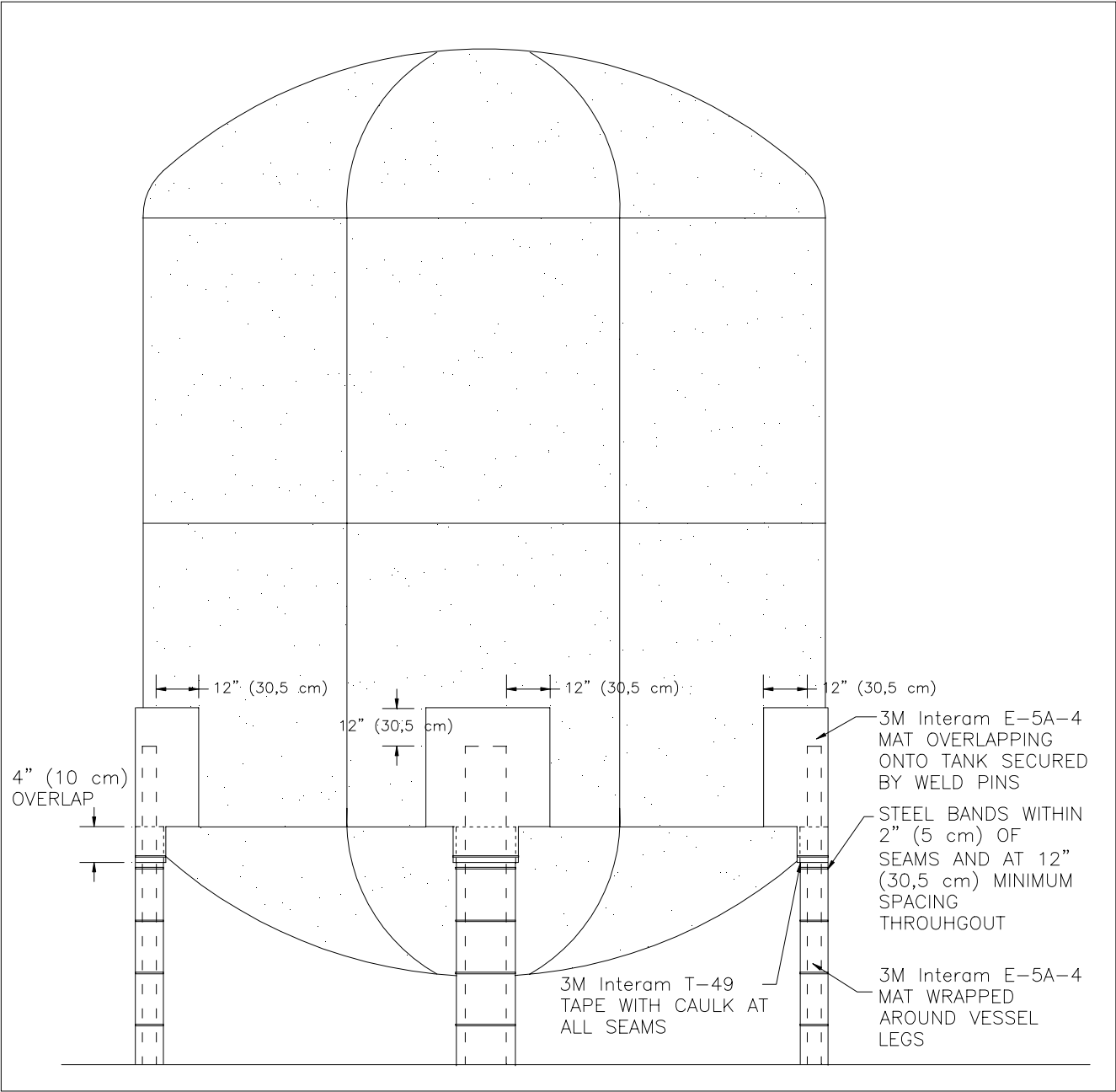
This drawing represents a concept. The box is braced with steel angle for a frame and the E-Mat is secured to sheet metal that is fastened to the frame. Ratings vary with box size and number E-Mat layers.



# 7.1 Typical Schematic for Wrapping Vessel Legs

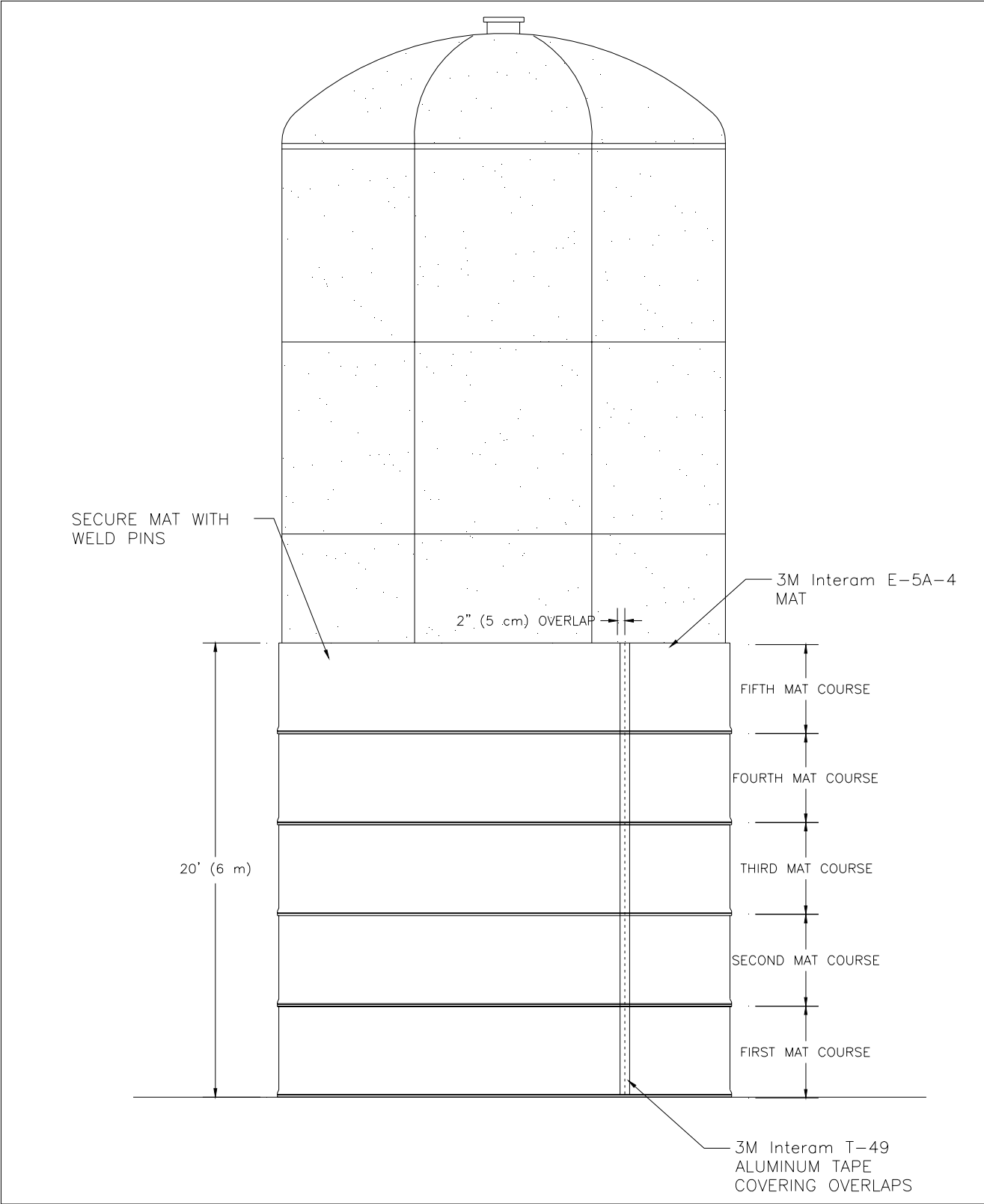
This diagram is meant to illustrate the concept. Actual system design is dictated by the design of the vessel.

For details on wrapping structural steel beams and columns, see the Structural Steel section.



# 7.2 Typical Schematic for Protecting Verticals Tanks

This diagram is meant to illustrate the concept. Actual system design is dictated by the tank design and required time ratings.



### 7.3 Typical Schematic for Protecting Horizontal Tanks

This diagram is meant to illustrate the concept. Actual system design is dictated by the tank design.

