INTERAM™ FIRE PROTECTION PRODUCTS

3M INTERAM™
E-50 SERIES FIRE PROTECTION MAT

1-HOUR FLEXIBLE WRAP SYSTEM
FOR ELECTRICAL RACEWAYS

Installation Booklet
Including Quality Assurance Guidelines
and Typical Drawings

Issue No. 5500-005 Date: 6-19-87

D.C.C. No._____ Date: ___ - ___ - ___

NOTE: The drawings and instructions in this package supersede all previous issues.

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By R.A. Jensen

Ck. R.G. Koza RGK

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FOR 3M INTERAM™ E-50 SERIES

1-HOUR FIRE PROTECTION SYSTEM

Issue 5500-005

I. INTRODUCTION

A. System Description

The 3M Interam™ E-50 Series, 1-hour rated Fire Protection System for Nuclear Power Plants is designed to meet the requirements of 10 CFR 50, Appendix R for electrical raceways. This E-50 Series, 1-hour system utilizes both the 3M Interam™ E-53A and E-54A Fire Protection Mats. These flexible, endothermic mats are wrapped around critical electrical raceways in multiple layer techniques. In the event of a fire, these mats release chemically bound water to provide cooling and high temperature insulation, thereby protecting critical electrical cables.

B. Installation Variations

Many methods of installing 3M materials are possible. Prints issued by 3M do not show all possible installation methods nor even necessarily the best method for installing 3M products. 3M suggests that some installer latitude is acceptable if critical installation requirements are met.

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

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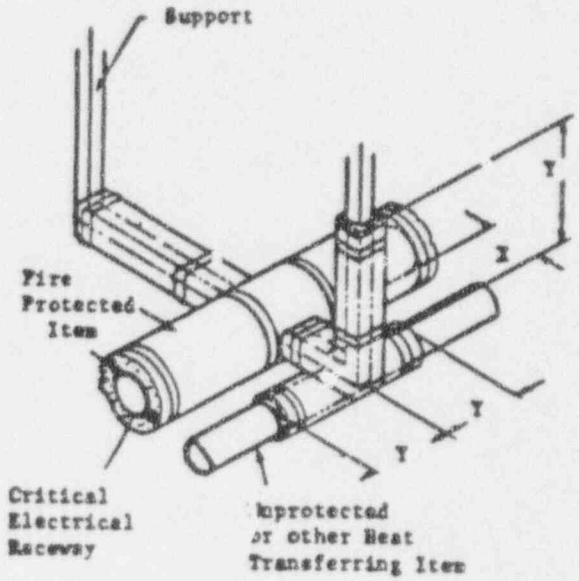
II. GENERAL INSTALLATION REQUIREMENTS

A. Layer Requirements

Items	Minimum Layers Required
1. Cable trays	
Less than 25% cable fill*	2 layers E-54A
Greater than or equal to 25% cable fill*	1 layer E-54A and 1 layer E-53A
2. Conduit: steel	3 layers of E-53A
aluminum $\geq$ 5" Ø	3 layers of E-53A
aluminum $<$ 5" Ø	1 layer E-54A & 2 layers E-53A
3. Airdrops	3 layers of E-54A
4. Junction boxes	3 layers of E-54A
5. Supports and heat transfer items	
a. Supports underneath cable tray	2 layers E-54A
b. Supports partially protected	1 layer E-54A for 12" or 2 layers E-53A for 9" or 2 layers E-54A for 6" or 2 layers E-53A and 1 layer E-54A for 5" or 3 layers E-54A for 4"

*Percent cable fill = $100 \times \frac{\text{Total sum of cross sectional area of all cables}}{\text{Cross-sectional area of useable cable tray}}$

If the final user of the 3M Interam™ E-50 Series 1-Hour Fire Protection System has determined that the strength of the bare supports holding a critical fire protected item would be sufficient if exposed to a 1-hour ASTM E-119 time-temperature fire curve, then the supports and any heat transferring items may be fire protected the distance specified in 5500-QA-2, II.A.5.B. The distance is measured before any fire protection material is installed. The distance is measured along the conductive heat transfer path of the support, as well as any heat transferring item that is mechanically attached to the support within the specified distance.



$X + Y = Z$

Z = Total length of protection required

c. Supports Fully protected - 1 layer E-54A the entire length and baseplate.

If the above criteria for the high temperature strength of bare supports is not met, or as an alternative to the above partial length protection, the entire length of the support and the baseplate must be fire protected with one layer of E-54A. Also, any heat transferring item that physically contacts the support must be fire protected with one layer of E-54A a minimum of 12" from the point of contact along the heat transfer path.

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6. Non-Critical Interference Items Near a Critical Fire Protected Item

Whenever non-critical interference items such as supports, conduits, cable trays, junction boxes, heating ducts, or fittings are close to an item that requires fire protection, the following requirements apply:

Distance Between Interference Item and Critical Fire Protected Item	Additional Fire Protection Required on Interference Item	Fire Protection Technique on Critical Item
No gap mechanical contact	Partial fire protection per section (E) above.	Butt all layers up to interference item.
No mechanical contact but gap less than .4"	Partial fire protection per section (E) above.	If possible, wrap one layer of E-50 Series between critical item and non-critical interference item. Butt all other layers up to interference item.
Gap $\geq$ .4"	No fire protection required if non-critical interference item is less than 5" wide within fire protective envelope of critical item. All gaps between interference item and E-50 Series Mat must be filled with CP 25N/S Caulk after the last layer.	Wrap as many layers of E-50 Series Mat as possible between critical item and non-critical interference item. Butt all other layers up to the interference item.

7. Heating, Ventilation, and Air Conditioning (HVAC) Ducts

Fire protection requirements for HVAC ducts may vary considerably depending on type of usage, air flow rates, fire dampers, and location. One conservative approach to fire protecting HVAC ducts would be to fire protect them as if they were lightly loaded cable trays and use two layers of E-54A.

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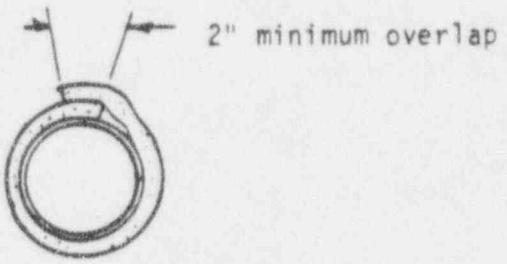
B. Seam Requirements

1. Conduits, Airdrops, Supports, and Heat Transfer Items

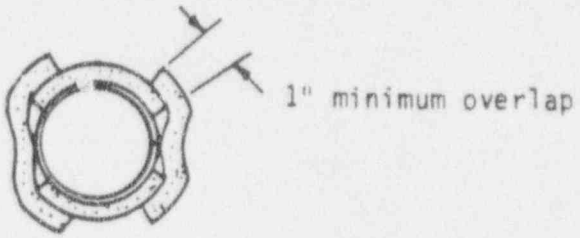
a. Whenever a mat wrap-around technique is used, all seam overlaps of the same layer of mat wrapped around an item and back onto itself must be a minimum of 2".



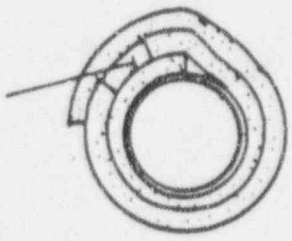
b. On elbows, at least two options exist for wrapping:

(1) Wrap-around technique using short, mitred sections around the curve of the elbow; or

(2) Multiple piece per layer technique (e.g. top, bottom, sides). With this technique, a minimum of 1" overlap is required.



c. When a given layer has an overlapped seam onto the same or adjoining piece of the same layer, the next layer may be started anywhere.



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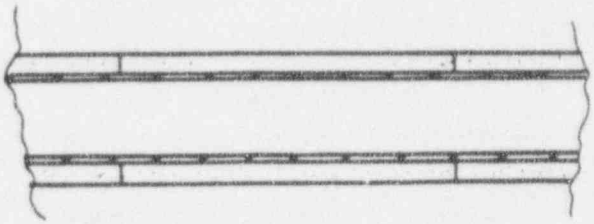
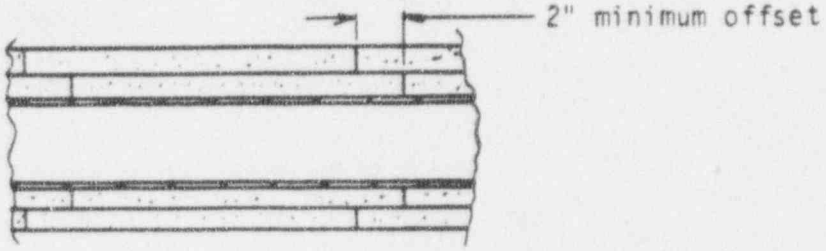
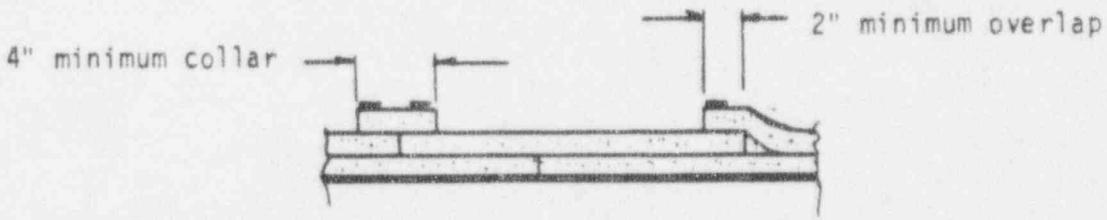
d. All adjoining pieces of the same layer of mat may be butted together without an overlap onto the adjoining pieces.



e. The stagger or offset of the seams of a given layer to the seams of the next layer must be a minimum of 2".



f. A minimum 4"-wide strip of E-50 Series Mat must cover all last layer circumferential seams. The mat used for this collar strip should be the same mat as the last full layer of mat. This strip must be secured with at least two stainless steel bands such that the banding centerline is within 2" of the edges of the collar strip. As an alternative, a minimum of 2" overlap of adjoining pieces may be used to cover the last layer seams.



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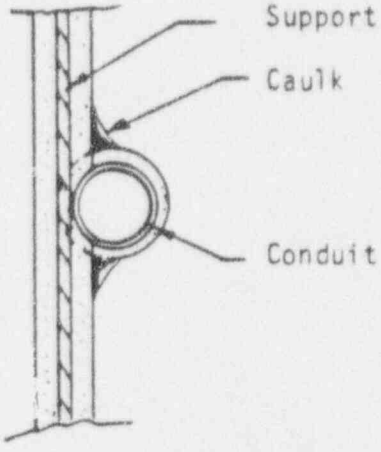
g. Direct line seams to the protected item may be used if necessary at interfaces, terminations, or sharp discontinuities. However, these direct line seams must be caulked and taped after the final layer.

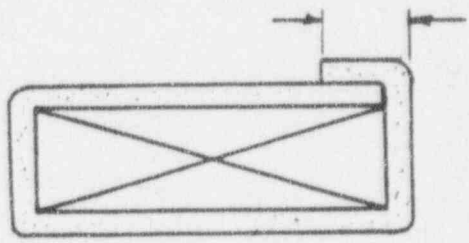


2. Cable Trays, Junction Boxes, and Buss Ducts

a. Before any fire protection mat is applied to an open top cable tray greater than 12" wide, some type of strapping must be applied around or across the cable tray at a maximum spacing of 12" on center and underneath all seams within 2" of both sides of butt joined seams. This strapping is used to minimize sagging of the fire protection mat. Any strapping system with a minimum tensile strength of 500 pounds may be used. Some options are:

- Minimum two wraps of 3/4" or wider 3M Filament Tape #898
- Most 1/2" or wider polyester or nylong strapping
- Metal strapping or bridging with precautionary note about future pulling of cables.

b. Whenever a mat wrap-around technique is used, all seam overlaps of the same layer of mat wrapped around an item and back onto itself must be a minimum of 2".



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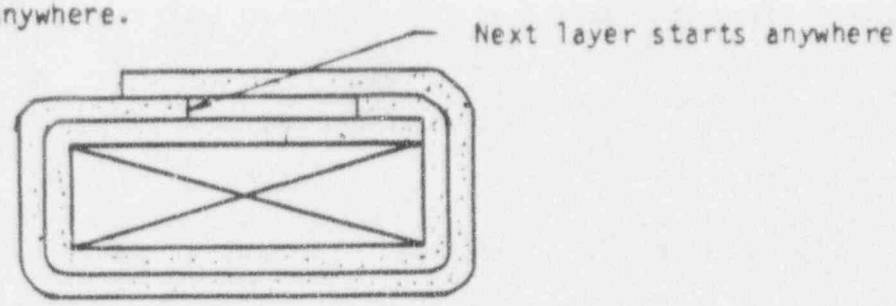
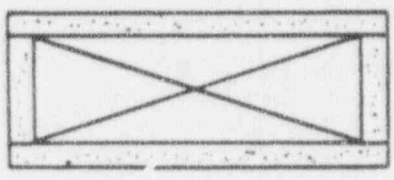
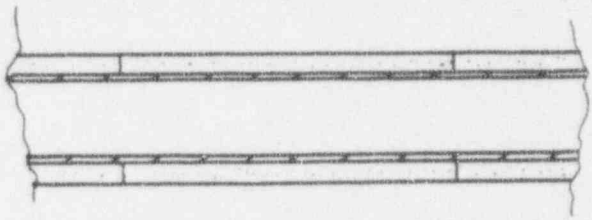
c. When a given layer has an overlapped seam onto the same or adjoining piece of the same layer, the next layer may be started anywhere.



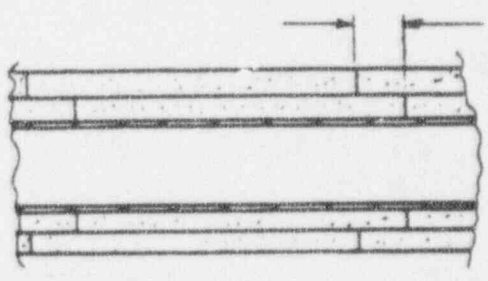
d. An alternative to the wrap-around technique is the four-piece-per-layer, box-type technique whereby adjoining pieces of the same layer are effectively butted together at right angles.



e. All adjoining pieces of the same layer of mat may be butted together without an overlap to the adjoining pieces.



f. The stagger or offset of the seams of a given layer to the seams of the next layer must be a minimum of 2".



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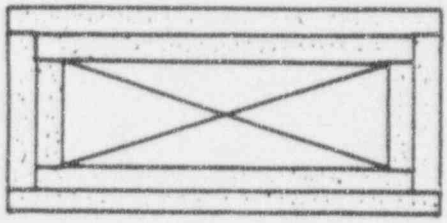
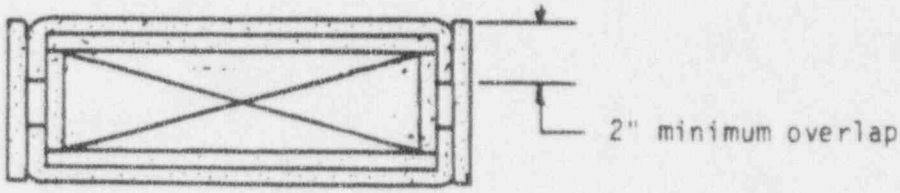
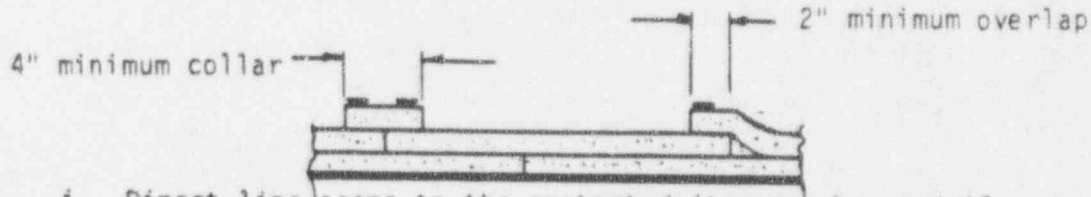
Exception: At interfaces, corners, or curves where pieces of a given layer are butted together, the stagger or offset of the seams of a given layer to the seams of the next layer may be as little as the thickness of the mat.



g. If the box technique is used, a 2" minimum overlap is required around corners on the last layer.



h. A minimum 4" wide strip of E-50 Series mat must cover all last layer seams. The mat used for this collar strip should be the same mat type as the last full layer of mat. This strip must be secured with at least two stainless steel bands such that the banding centerline is within 2" of the edges of the collar strip. As an alternative, a minimum of 2" overlap of adjoining pieces may be used to cover the last layer seams.



i. Direct line seams to the protected item may be used if necessary at interfaces, terminations, or sharp discontinuities. However, these direct line seams must be caulked and taped after the final layer.

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C. REPAIR REQUIREMENTS

1. Damage to foil only may be repaired by applying foil tape over damaged area.

2. Dents or impressions do not require repair.

3. Holes, cuts, or tears in the E-50 Series Mats:

   a. When no foil or mat have been removed, cover with foil tape.

   b. Gaps up to 1/8", cover with foil tape.

   c. Gaps 1/8" to 1/4", fill gap with CP 25N/S Caulk and cover with foil tape.

   d. Gaps larger than 1/4" on the inner layers

      1. An E-50 Series Mat insert may be cut out and placed into the gap. (The insert must not be installed with a gap greater than 1/8" remaining.) Apply foil tape over the insert; or

      2. The damaged or improperly cut mat may be removed and replaced by an undamaged piece.

   e. Gaps larger than 1/4" on the final layer

      1. An E-50 Series Mat patch may be installed over the gap such that a minimum of 2" overlap occurs on all sides. Stainless steel banding must be used with the centerline within 2" from the edge of at least two sides of the patch, or

      2. Where additional weight or ampacity are not a concern, the damaged E-50 Series layer may be covered by an additional E-50 Series layer; or

      3. The E-50 Series piece with the gap may be removed and replaced by an undamaged or better fitting E-50 Series piece.

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D. CAULKING REQUIREMENTS

1. Fire Barrier CP 25N/S Caulk should be used whenever a fire protected electrical raceway penetrates through a concrete surface.

   a. If the CS-195 "collar only" technique is used, the following two caulk points are required:

      1. Between the concrete and E-50 Series mat before any mat collars are installed; and

      2. Between the concrete and mat collars before the CS-195 collar is installed.

   b. If the CS-195 "collar-and-plate" technique is used, the following three caulk points are required:

      1. Between the concrete and E-50 Series mat before any CS-195 is installed;

      2. Between the CS-195 collar and the CS-195, plate after they are installed; and

      3. In any gaps between the edges of the CS-195 plate and concrete.

2. Fire Barrier CP 25N/S Caulk should be used whenever a support or heat transferring item is fire protected.

   a. Caulk is required at the butt joined interface of the last layer of the support or heat transferring item to the last layer of the fire protected item. A bead of caulk at least 1/4" in diameter should be applied around the entire circumference of the interface.

   b. Caulk is required at the end of the Fire Protection System on the support or heat transferring item. The caulk should be used around the support or heat transferring item and within any gaps between layers at this termination of the Fire Protection System. If the support or heat transferring item is an open channel of any type, the open channel should be stuffed with at least 4" of ceramic fiber insulation or E-50 Series mat and caulked.

3. Fire Barrier CP 25N/S Caulk should be used to fill any gaps between the E-50 Series mat and concrete or to fill gaps between layers of E-50 Series mat whenever the E-50 Series is attached directly to concrete.

E. RESTRAINING REQUIREMENTS

1. Stainless Steel Banding Restraining System

a. 1/2" wide minimum x .020" thick minimum 300-Series stainless steel banding must be applied after the last layer of the system. Either crimp-type seals or fold-over, wing-type seals may be used.

b. Two bands are required for each minimum 4" wide E-50 Series mat collar put over the last mat layer seams. The centerline of the bands must be within 2" from the edge on both sides of the mat collar.

c. Bands must also be placed such that the band centerlines are within 2" from the end of all system terminations.

d. Throughout the entire sytstem, band spacing must be 8" or less from centerline to centerline.

e. The bands must be tightened to the point where they do not move freely, but not tight enough to cut the aluminum foil.

f. If the banding is to be anchored to concrete, a minimum of 5/8" wide x .020" thick series stainless steel bands should be used to accommodate a 1/4" diameter hole for the concrete anchor.

g. An alternative to stainless steel banding is welded stainless steel mesh wire cloth covering the entire system. A minimum of 2 mesh x 2 mesh (nominal 1/2" square openings) should be used with a wire diameter of .040" or larger. Concrete anchor spacing must be 8" or less.

F. Interam™ CS-195 Composite Sheet

1. CS-195 sheet must be used whenever a critical electrical raceway (conduit, cable tray, buss duct, or cable airdrop bundle) penetrates through a concrete slab (floor, ceiling, or wall). The CS-195 sheet is required only on the side of the concrete slab where the critical electrical raceway must be fire protected.

2. The CS-195 sheet, when used as a plate anchored against concrete, must be installed with the sheet metal side away from the concrete.

3. The CS-195 sheet, when used as a collar bent around the E-50 Series mat, must be installed with the sheet metal side away from the mat.

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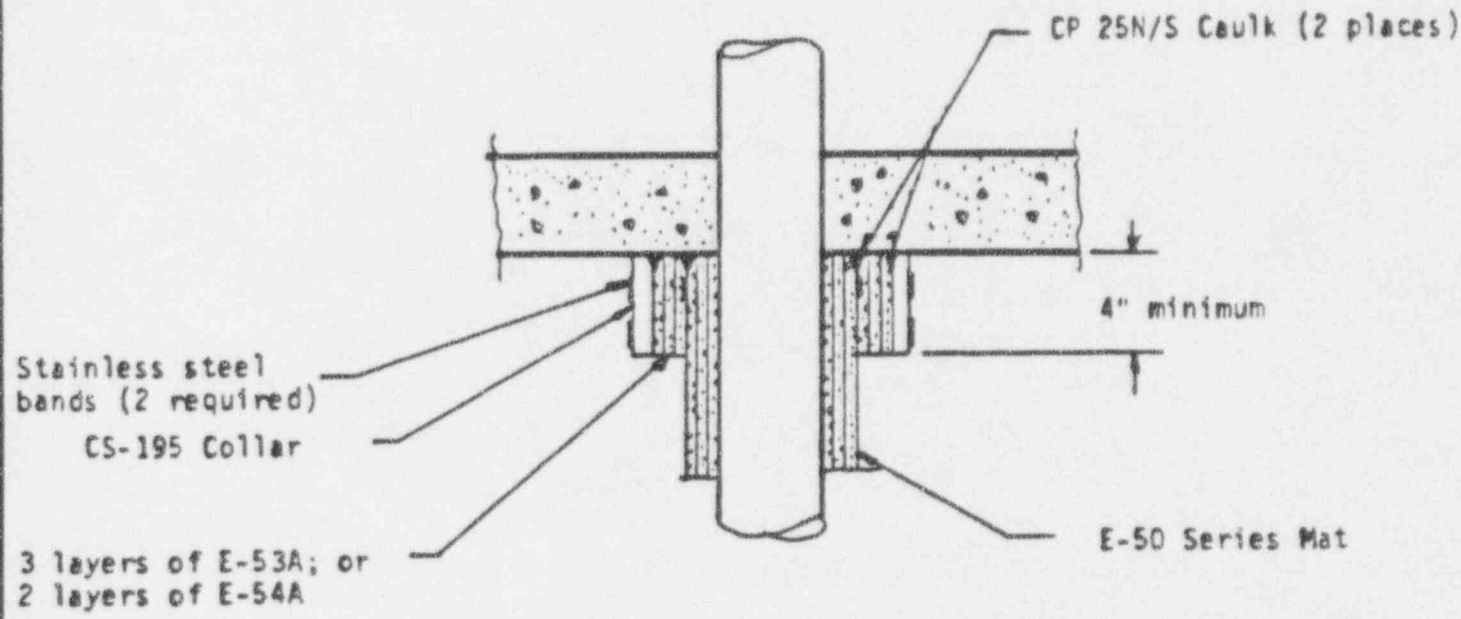
4. The requirements when using "Collar Only" option at electrical raceway - through concrete interface are:



a. Caulk is required at the following two locations:

   1. Between the concrete and mat before the 4" minimum width mat collars are installed; and

   2. Between the concrete and mat before the 4" minimum width CS-195 collar is installed.

b. E-50 Series mat collars, at least 4" wide, are butted up to the concrete such that the overall thickness of the collars against the concrete is at least .8".

c. CS-195 collar is required over the E-50 Series mat collars. No overlap of the CS-195 collar is required. Butt joined ends are acceptable. Any gaps between ends or sections of CS-195 sheet between 1/8" and 1/2" must be caulked with at least 1/4" thickness of CP 25N/S greater than 1/2", replaced the CS-195 sheet with a better fitting piece. Two stainless steel bands are required to secure this CS-195 collar.

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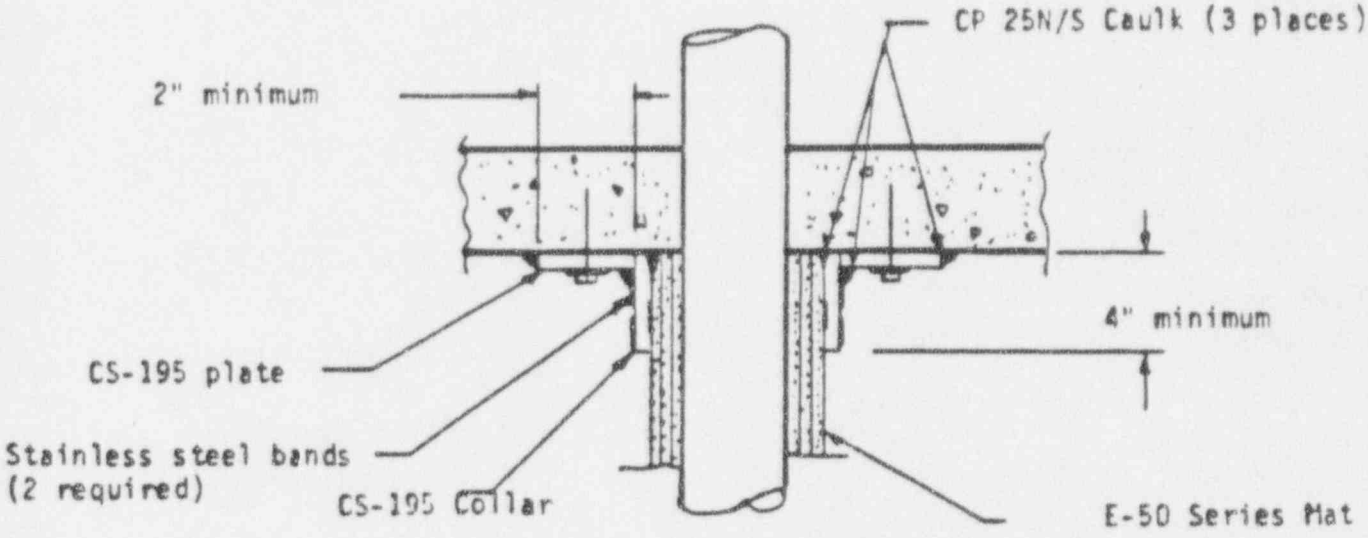
5. The requirements when using "Collar and Plates" option at electrical raceway-through-concrete interface are:



a. The CS-195 collar used around the E-50 Series mat must be at least 4" wide. Two stainless bands are required to secure this CS-195 collar.

b. The CS-195 plate must cover the concrete by at least 2".

c. A minimum of 1-1/4" diameter washer is required on all concrete anchors.

d. Concrete anchors must penetrate the concrete by at least 1".

e. Maximum concrete anchor spacing is 8". Also, concrete anchors are required within 2" of all corners and within 2" of both sides of all seams.

f. Any gaps between sheets or sections of CS-195 sheet between 1/8" and 1/2" must be caulked with at least 1/4" thickness of CP 25N/S Caulk and covered with T-49 aluminum foil tape. For gaps greater than 1/2", replace the CS-195 sheet with a better fitting piece.

g. The CS-195 sheet may be cut, when necessary, to fit around interferring items. However, all gaps must be properly caulked.

K1-1-2A

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INTERAM™
E-50 Series
1-Hour System

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G. SUMMARY OF DIMENSIONAL REQUIREMENTS

Stainless steel banding width	1/2" minimum
Concrete anchor penetration into concrete	1" minimum
Washer diameter on concrete anchor	1-1/4" minimum
Wrap-around overlaps, same layer	2" minimum
Seam offsets between layers	2" minimum
Last layer overlaps on all seams	2" minimum or 4" collar
Mat flare to concrete	2" minimum
CS-195 on concrete	2" minimum
Anchor spacing	8" maximum
Band spacing	8" maximum
Tape or plastic strapping on open top cable tray	12" maximum

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III. 3M MATERIALS LIST

A. Interam™ E-50 Series Fire Protection Mats

1. Interam™ E-53A Mat

   a. Nominally .3" thick
   b. Green in color with shiny aluminum foil on one side and nylon scrim on the other side.
   c. 3M part No. 98-0400-0551-8 (49" wide x 16' long roll)
   d. 3M part No. 98-0400-0702-7 (24.5" wide x 25' long roll)

2. Interam™ E-54A Mat

   a. Nominally .4" thick
   b. Blue in color with shiny aluminum foil on one side and nylon scrim on the other side.
   c. 3M part No. 98-0400-0557-5 (49" wide x 16' long roll)
   d. 3M part No. 98-0400-0698-7 (24.5" wide x 20' long roll)

3. The mat must be installed with the aluminum foil side away from the fire protected item.

4. All layers must be marked with the layer number as they are installed.

B. Interam™ CS-195 Fire Protection Composite Sheet

1. Nominally 1/4" thick
2. Reddish brown in color with sheet metal on one side and aluminum foil on the other side.
3. 3M part No. 80-6101-1650-3 (36" x 36")
4. 3M part No. 80-6101-1651-1 (36" x 24")
5. 3M part No. 80-6101-1873-1 (41" x 36")
6. This composite sheet must be installed with the sheet metal side away from the concrete if installed on concrete or away from the Interam™ E-50 Series mat if installed around the mat.

C. Fire Barrier CP 25N/S No Sag Caulk

1. This caulk is generally applied in a nominal 1/4" bead or 1/4" thick configuration. It is used as a sealant to repair damaged areas or to fill gaps in the fire protection.
2. 3M part No. 98-0400-0714-2 (10.5 oz. cartridge)
3. 3M part No. 98-0400-0715-9 (1-gallon)
4. 3M part No. 98-0400-0716-7 (5-gallon)

D. Interam™ T-49 Fire Protection Tape

1. Supplied in rolls 4" wide x 180' long x .005" thick

2. 3M part No. 98-0400-0172-3

3. This aluminum foil tape must be applied to all seams on all mat layers.

E. 3M Scotch® Brand Tape #898

1. Supplied in rolls 3/4" wide x 180' long x .006" thick

2. 3M part No. 70-0028-2311-3

3. This tape is used simply as an installation aid to temporarily hold mat pieces in position and to prevent sagging of the first layer of mat on an open top cable tray. It is not considered a critical part of the Fire Protection System.

4. 3M Scotch® Brand H-131 One-Hand Filament Tape Applicator (3M part No. 70-9501-3101-4) is a useful tool to use when applying this filament tape.

F. All other materials that are used for assembly may be purchased independent of 3M.

G. All materials must be visually examined upon receipt for damage during shipment and storage.

IV. RESTRAINING MATERIALS AND INSTALLATION TOOLS

A. Restraining Materials (Non-3M Products)

Reference Name	Description
Banding	1/2" wide minimum x .020" thick minimum series 300 stainless steel banding. One possible supplier is: Childers Products Company 23350 Mercantile Road Beachwood, Ohio 44122 216/464-8020
Banding Seals	Either crimp-style or fold-over wing tab seals made out of stainless steel. Also available from Childers Product Company.
Concrete Anchors	Approved concrete anchors without any lead or combustible component; e.g., 1/4" diameter Tapcon fasteners made by Rawlplug Company, Inc. (call 1-800-243-8160 for local distributors). Fasteners should penetrate into concrete at least 1".
Fender Washers	1-1/4" minimum diameter x 1/4" hole washer used underneath the head of all concrete anchors.
Mesh Wire Cloth	Welded stainless steel mesh wire cloth. A minimum of 2 mesh x 2 mesh (nominal 1/2" square openings) or finer should be used with a wire diameter of .040" or larger. This mesh wire cloth is an alternative to stainless steel bands. One possible supplier is: Wire Cloth Manufacturers 4 Emery Avenue Randolph, New Jersey 07868 201/328-1000

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QA GUIDELINES
INTERAM™
E-50 Series
1-Hour System

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B. USEFUL INSTALLATION TOOLS

Name	Description and/or Use
Razor knife	Hand-held utility or razor knife used to cut the E-50 Series mat; large scissors or snips may also be used.
Electric scissors	Optional electric scissor-blade shears used to cut straight and curved pieces of E-50 Series mat, e.g. Model K-280 scissor shears from: Kett Tool Company 5053 Madison Road Cincinnati, Ohio 45227 513/271-0333
Rubber roller	2" wide x 1-1/2" diameter or similar hand-held rubber roller used to insure good adhesion of aluminum foil tape; a plastic pliable straightedge may also be used.
Straightedge	4' plasterboard T-square or similar straightedge used to assist with straight uts of the E-50 Series Mat.
Marking Pen	Used to identify the layer number of installed mat.
Tape Measure	Used to properly size the pieces of E-50 Series Mat
Electric hand drill with carbide bit	Used to drill holes through the CS-195 Composite sheet and into concrete.
Electric hand jig saw or sabre saw with metal cutting blade	Used to cut the CS-195 Composite Sheet, other tools such as band saws, hack saws, bench shears, etc., may also be used.
Driver for concrete anchors	If Tapcon fastners made by Rawlplug are used, the Rawlplug Con Drive 2000 installation tool is helpful for drilling and tightening of the Tapcon fastners.
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.
Caulking gun	Used to dispense the 3M Interam' CP 25N/S Caulk. The 1/10 gallon (10.5 oz) size caulk tube is used.

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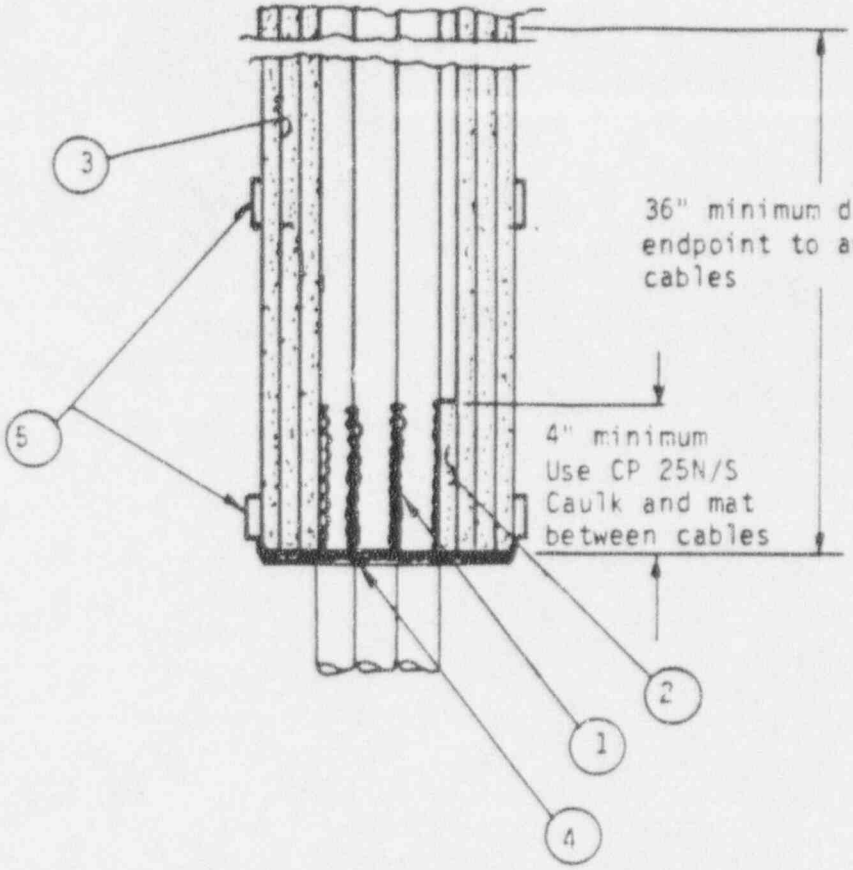
INTERAM™
E-50 SERIES
1-HOUR SYSTEM



1. Separate the cables in the bundle and caulk with CP 25N/S a minimum of 4" from the end of the firestop.

2. Fill large gaps in the cable bundle with 4" minimum lengths of E-54A mat.

3. Wrap the airdrop with three layers of E-54A following the 5500-QA Guidelines.

4. Apply CP 25N/S Caulk at the end of the firestop. Cover the endpoint and the caulk with T-49 Tape.

5. Band the firestop with stainless steel bands within 2" minimum from the endpoints. Other bands should be 8" minimum on center from the endpoint band.

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AIRDROP FIRESTOP

INTERAM™
E-50 SERIES
1-HOUR SYSTEM

Ceramic Materials Department/3M

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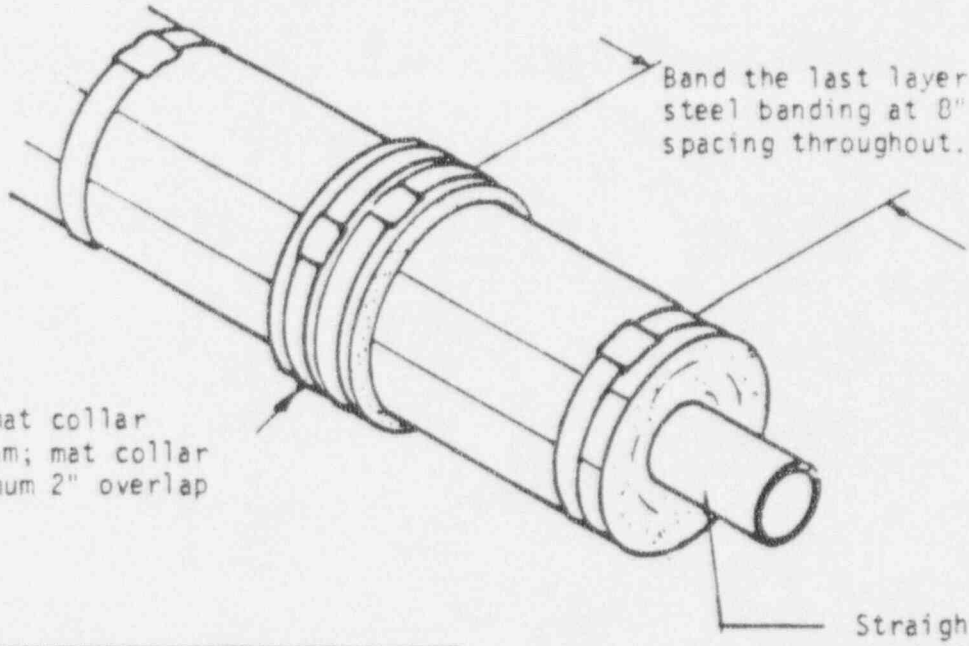
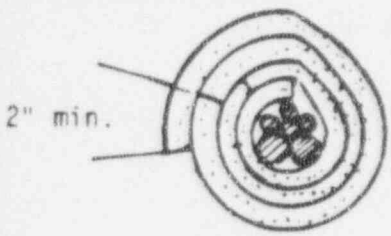
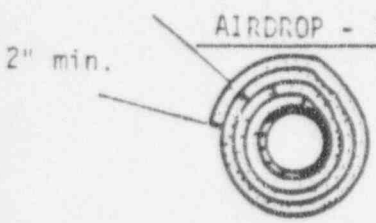


LAYER REQUIREMENTS



AIRDROP - 3 LAYERS E-54A



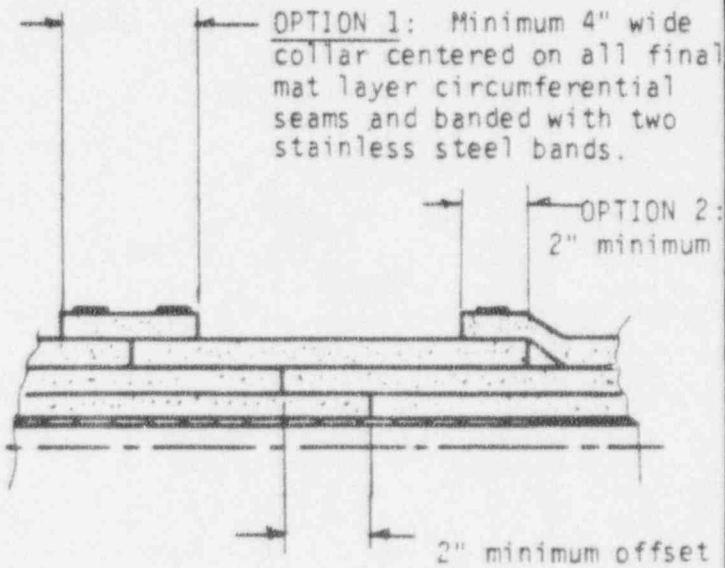
CONDUIT

Steel conduit - Use 3 layers E-53A

Aluminum conduit $\geq$ 5" - Use 3 layers E-53A

Aluminum conduit $<$ 5" - Use 1 layer E-54A and 2 layers E-53A

LAYER OVERLAPS AND OFFSETS



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BY T. A. Jensen		APP'D R. G. Koza RGK	

CONDUIT OR AIRDROP
STRAIGHT RUN

INTERAM™
E-50 SERIES
1-Hour System

Ceramic Materials Department/3M

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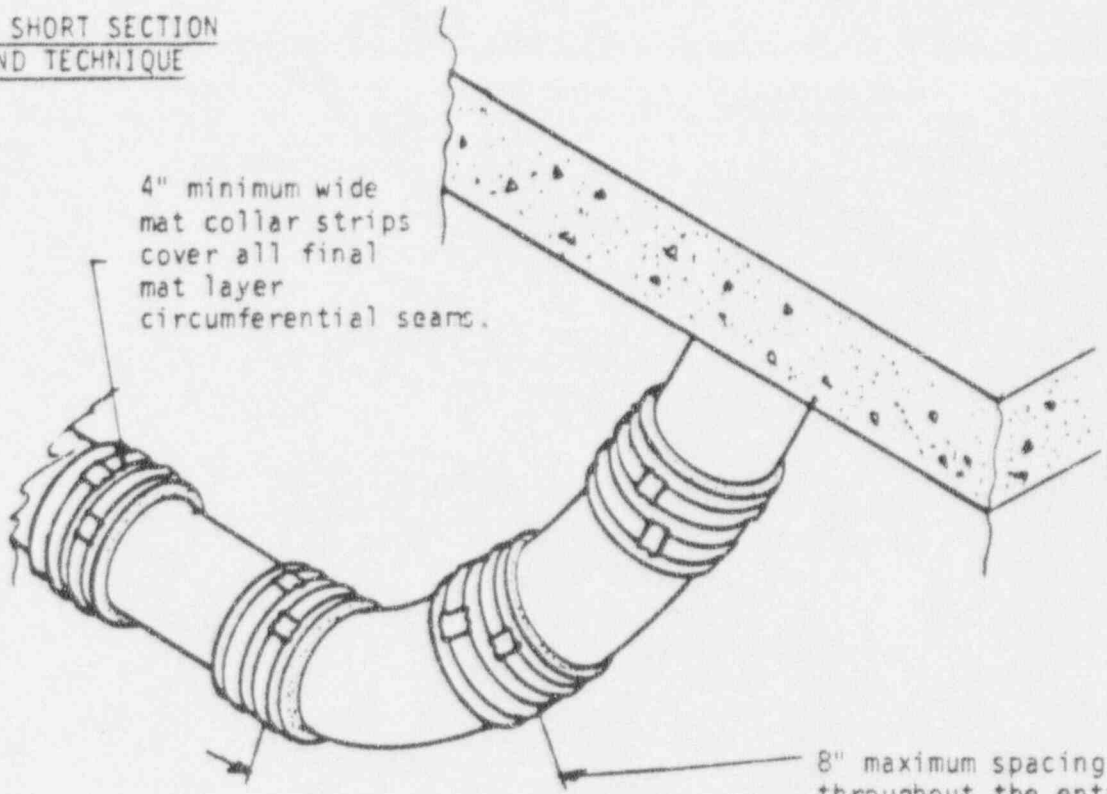
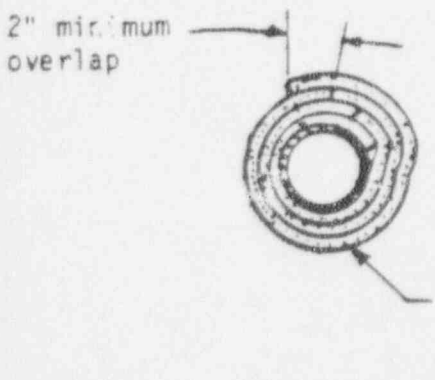
5500-C1

OPTION 1:

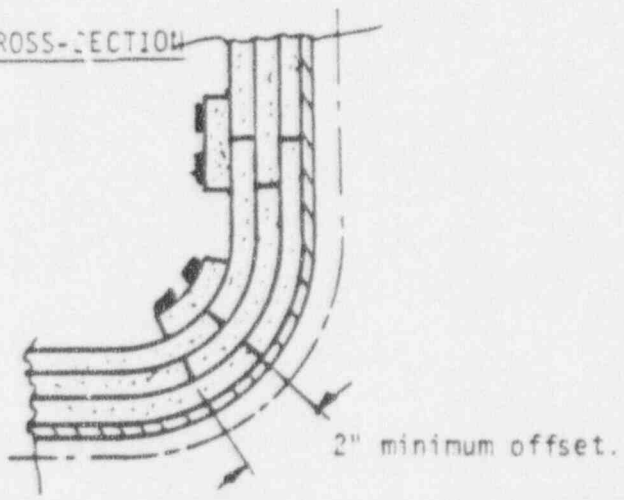
CONDUIT ELBOW SHORT SECTION
WRAP-AROUND TECHNIQUE



CROSS SECTION MAT
OVERLAP VIEW



ELBOW CROSS-SECTION



NOTE: Use short sections of mat around the curve of the elbow with a 2" minimum overlap. The sections are butted togehter with a 2" minimum offset of butt seam between layers.

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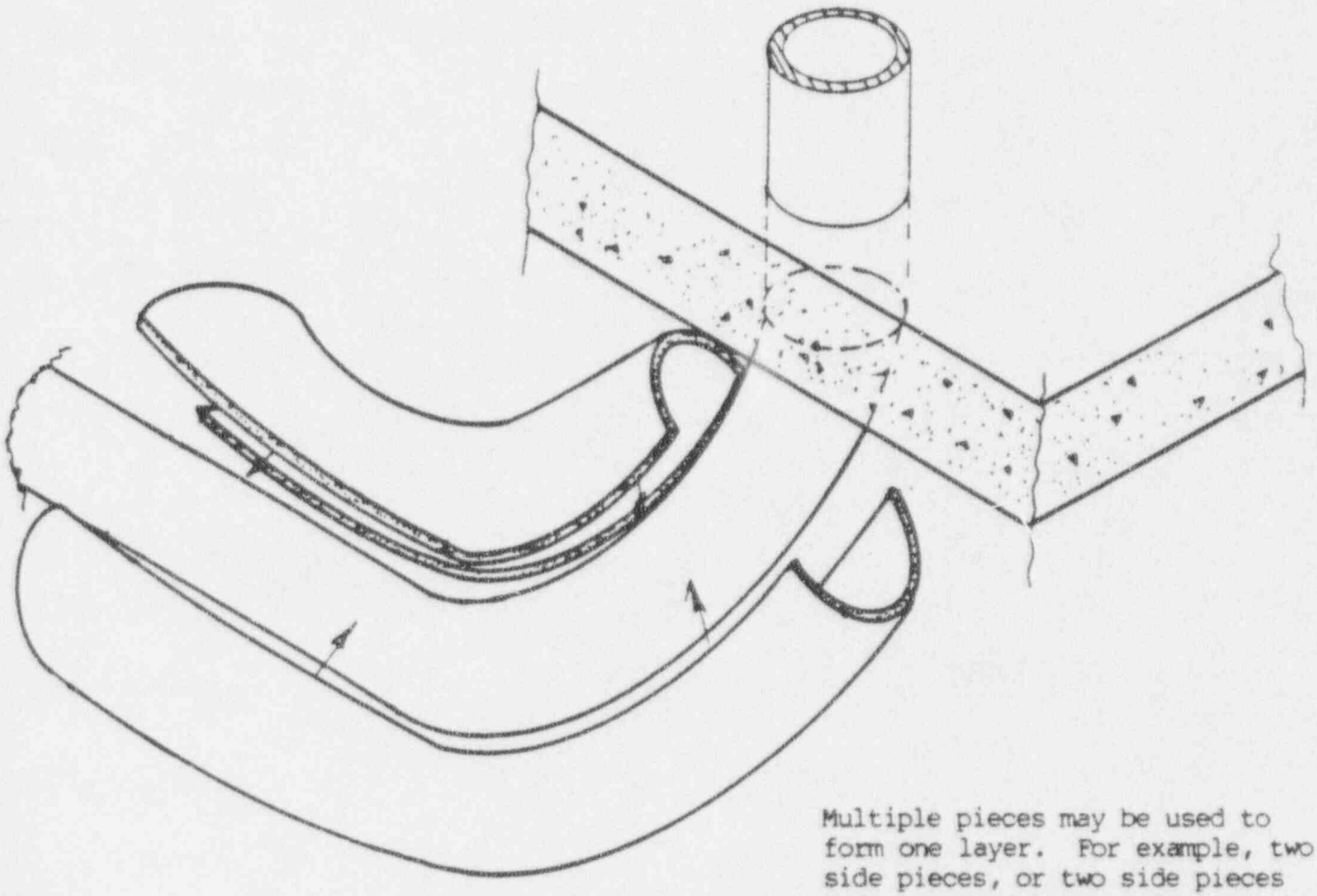
CONDUIT OR AIRDROP ELBOW

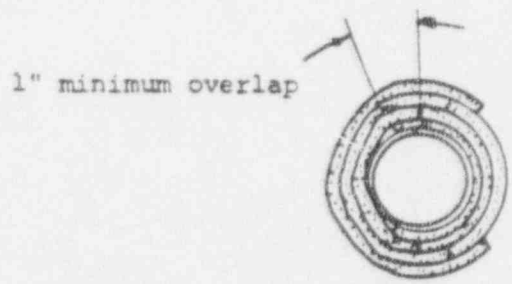
INTERAM™
E-50 Series
1-Hour System

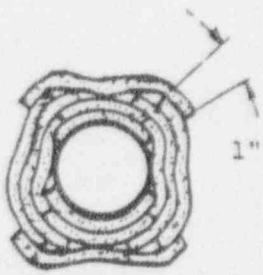
OPTION 2:

CONDUIT OR AIRDROP ELBOW
"J" WRAP TECHNIQUE



Multiple pieces may be used to form one layer. For example, two side pieces, or two side pieces and a top and bottom piece may be used. However, a 1" minimum overlap is required at the longitudinal seams of pieces of the same layer.





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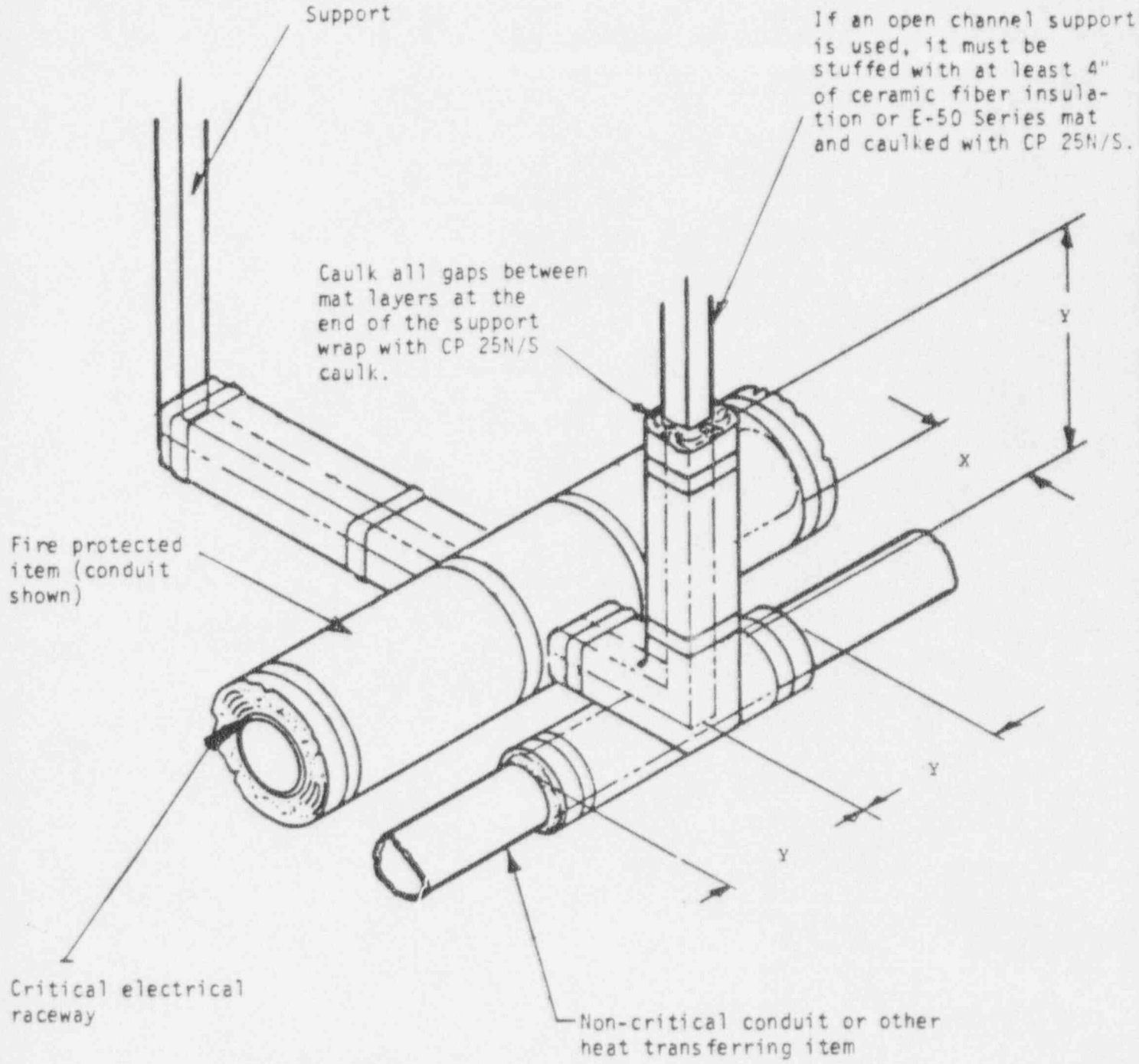
CONDUIT OR AIRDROP ELBOW

INTERAM™
E-50 Series
1-Hour System



$X + Y = Z$

Z = Total length of protection required per 5500-QA-2.

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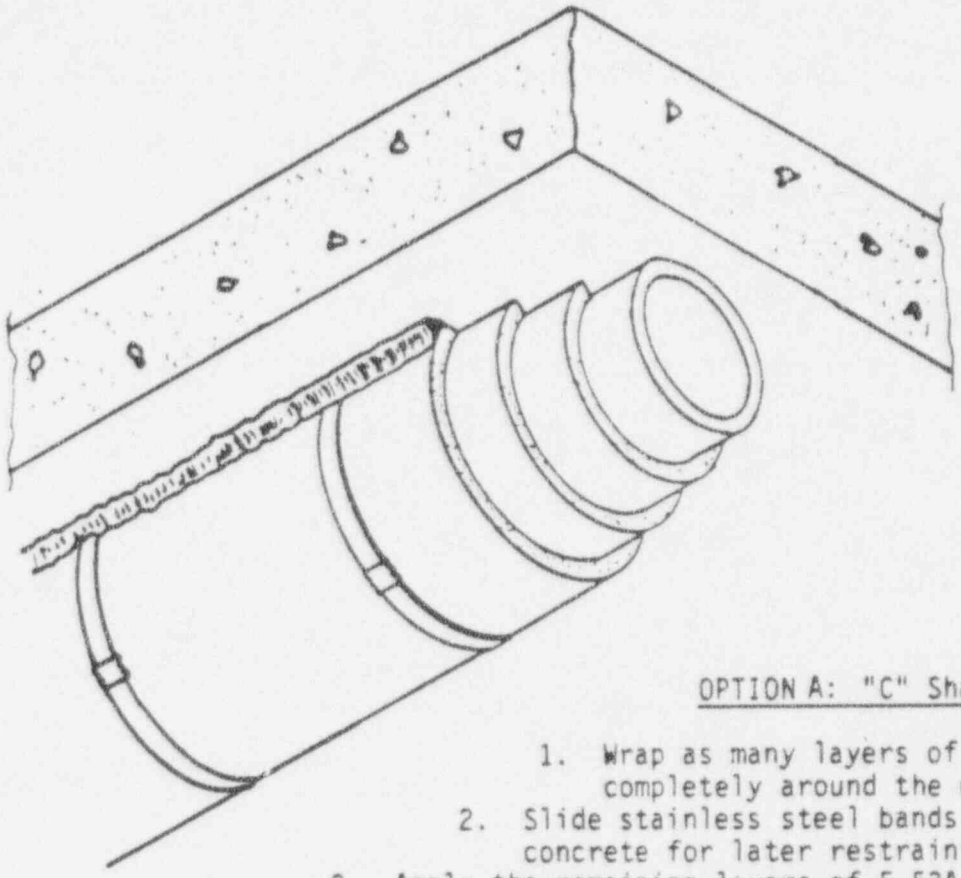
5500-C5

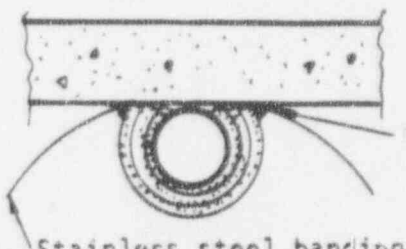
PARTIAL WRAP ON SUPPORTS AND HEAT TRANSFERRING ITEMS

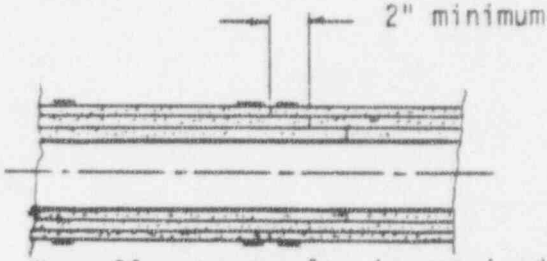
INTERAM™ E-50 Series 1-Hour System



OPTION A: "C" Shaped Wrap

1. Wrap as many layers of E-53A Mat as possible completely around the conduit per 5500-C1.
2. Slide stainless steel bands between the conduit and concrete for later restraining of the mat.
3. Apply the remaining layers of E-53A Mat (3 total required) so that the edges of the mat contacts the concrete.
4. Tighten and seal the stainless steel bands so that banding is 8" maximum spacing throughout the system and within 2" of all seams and terminations.
5. Apply CP 25N/S Caulk between the mat and concrete.





NOTE: No collar or overlap is required on the last layer seam. This applies ONLY when the conduit is against concrete.

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APP R.G. Koza

CONDUIT NEAR SLAP

INTERAM™
E-50 SERIES
1-HOUR SYSTEM

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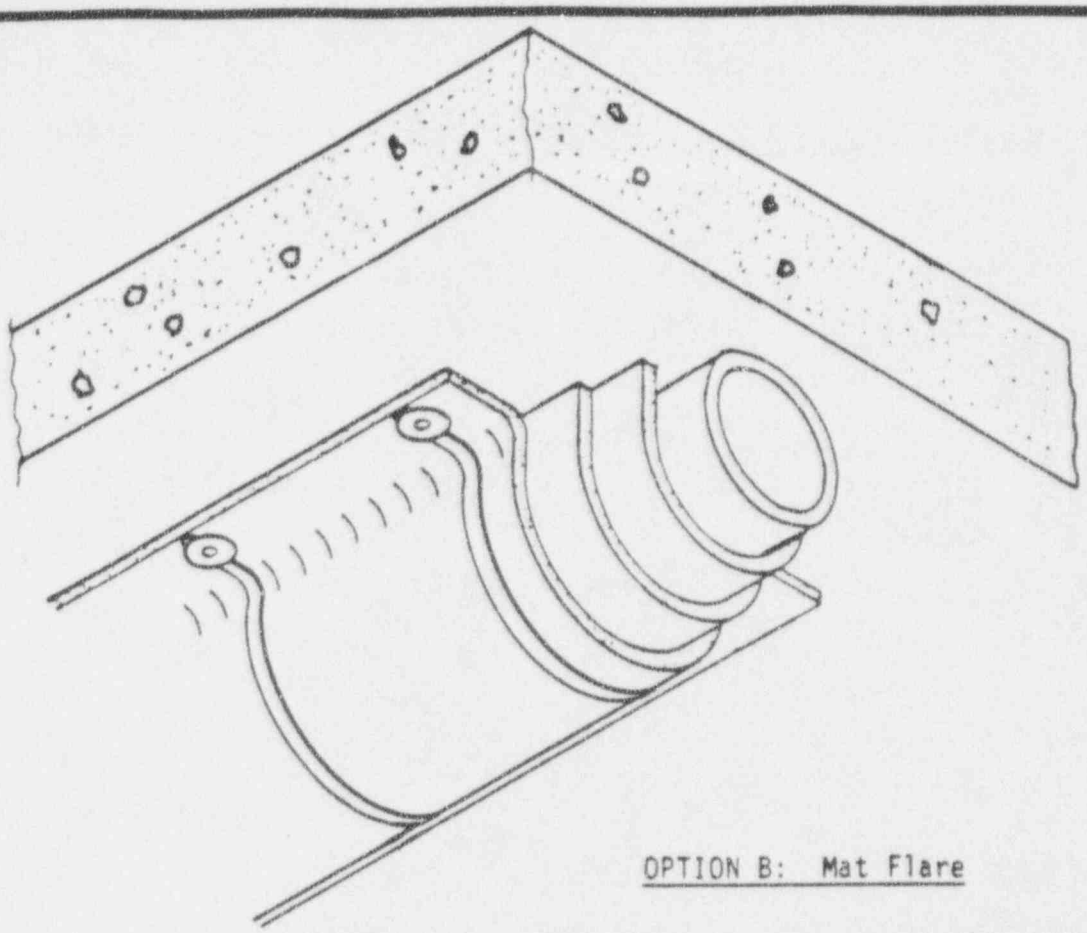
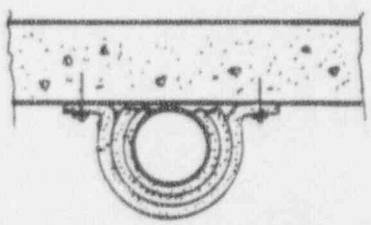
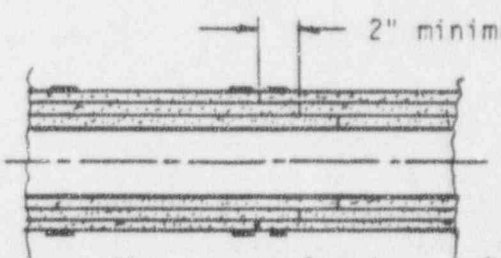


OPTION B: Mat Flare

1. Wrap as many layers of E-53A mat as possible completely aroud the conduit per 5500-C1.
2. Apply the remaining inner layer(s) of E-53A Mat so that the edges of the mat contacts the concrete.
3. Flare out the third (and final) layer of E-53A so that it extends a minimum of 2" onto the concrete.
4. Install concrete anchors, washers, and stainless steel banding at 8" maximum spacing throughout the system and within 2" of all seams and terminations. An alternative to banding is stainless steel welded wire mesh fully covering the E-53A Mat.
5. Fill any gaps between the mat and concrete with CP 25N/S Caulk.



Cross-sectional View



NOTE: No collar or overlap is required on the last layer seam. This applies ONLY when the conduit is against the concrete.

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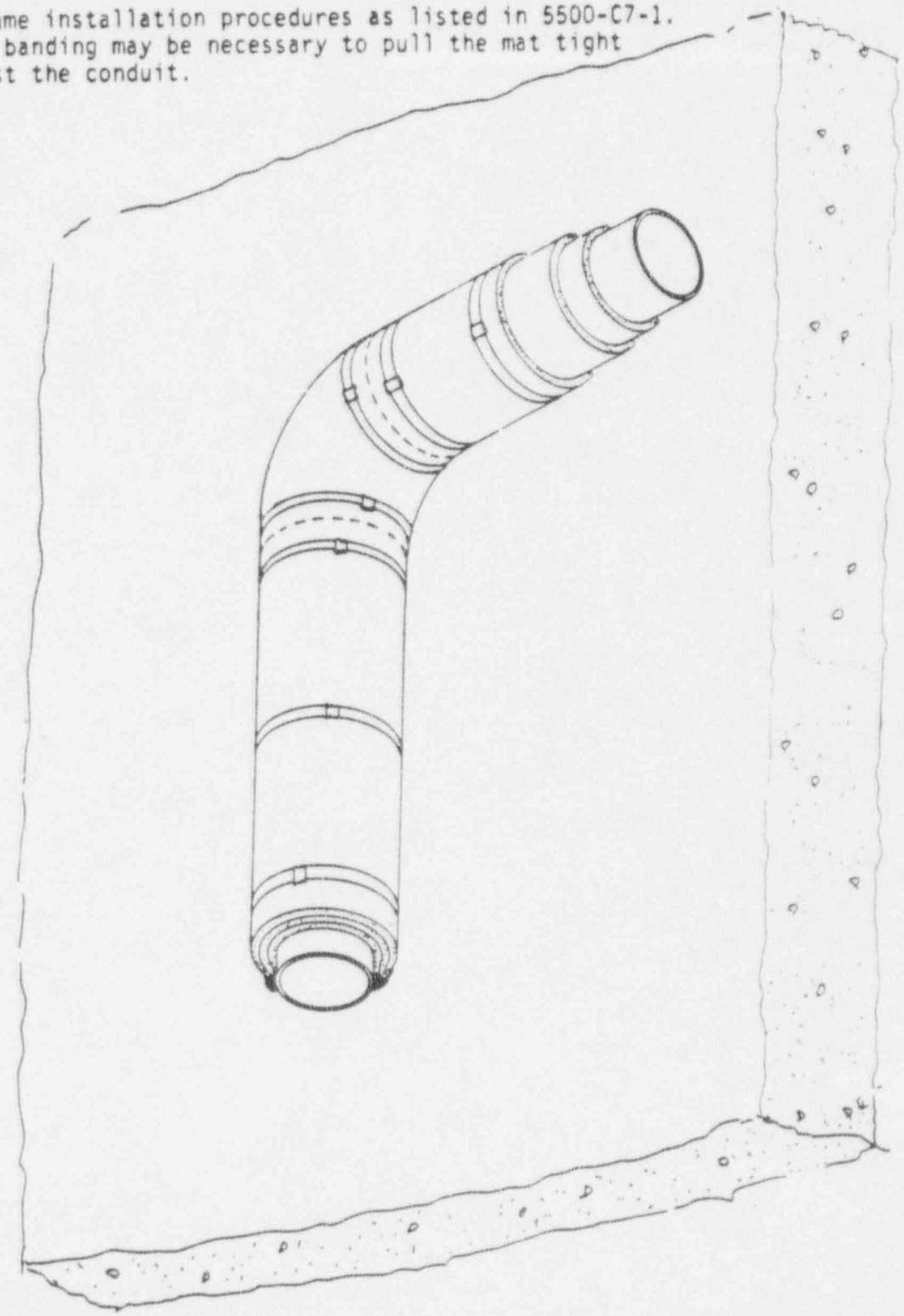
CONDUIT NEAR SLAB

INTERAM™
E-50 SERIES
1-HOUR SYSTEM

OPTION A: "C" Shaped Wrap for conduit elbow near slab

Use same installation procedures as listed in 5500-C7-1. Extra banding may be necessary to pull the mat tight against the conduit.



All statements, technical information and recommendations contained herein are based on tests we believe to be reliable. However, since the conditions of use and application are beyond our control, 3M shall not be liable for any damage, direct or consequential, resulting from the use of the material or design. 3M's only warranty shall be to replace any of our products found to be defective.

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CONDUIT NEAR SLAB
INTERAM™
E-50 SERIES
1-HOUR SYSTEM

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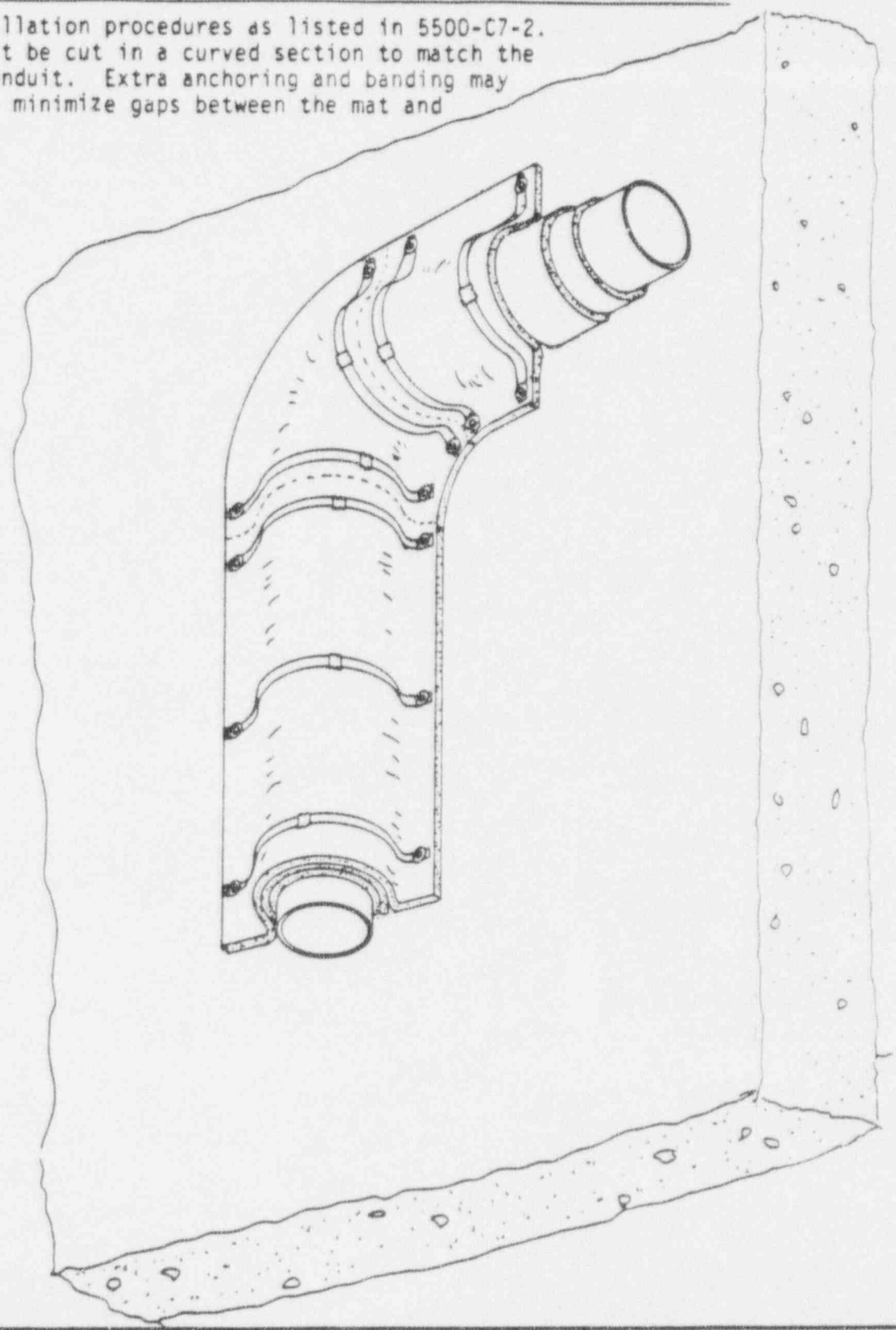
5500-C7-3

OPTION B: Mat flare technique for conduit elbow near a concrete slab.

Use same installation procedures as listed in 5500-C7-2. Last layer must be cut in a curved section to match the bend in the conduit. Extra anchoring and banding may be required to minimize gaps between the mat and concrete.



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CONDUIT NEAR SLAB
INTERAM™
E-50 Series
1-Hour System

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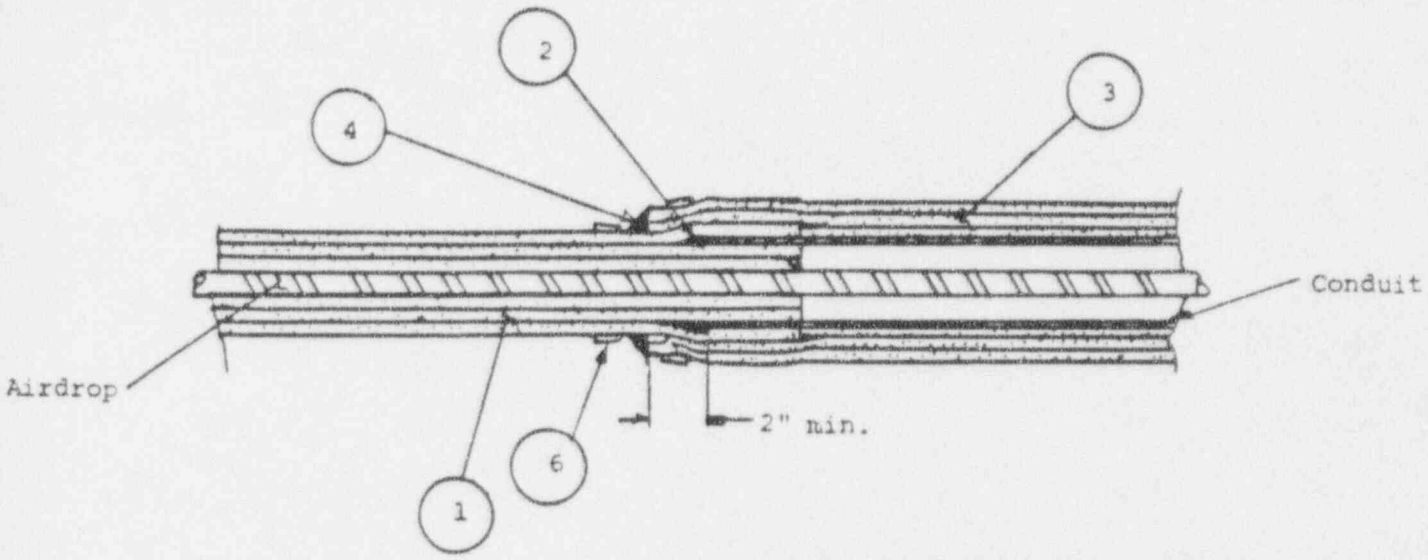
CONDUIT TO AIRDROP INTERFACE
CROSS-SECTIONAL VIEW

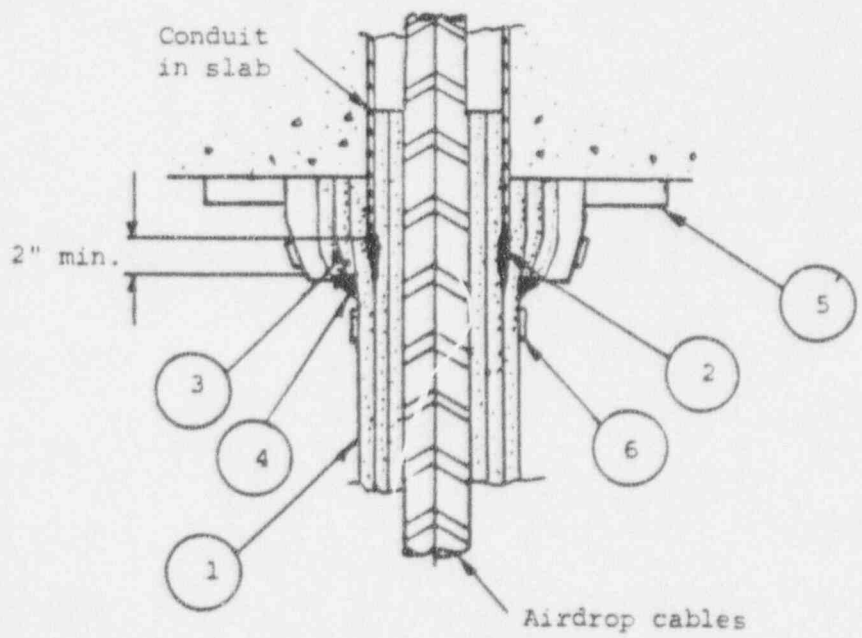
(See 5500-C8-2 for details)



5 CS-195 collar and plate not required with this interface.

CONDUIT IN SLAB TO AIRDROP INTERFACE
CROSS-SECTIONAL VIEW

(See 5500-C8-2 for details)



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	NOT TO SCALE	BY R.D.Kaya		
	BY K.A.Jensen	APP'D R.R.Licht		
Ceramic Materials Department/3M	5500-C8-1			

CONDUIT TO AIRDROP INTERFACE

INTERAM™ E-50 Series 1-Hour System

INSTRUCTIONS FOR CONDUIT TO AIRDROP INTERFACE INSTALLATION

NOTE: The layer requirements per 5500-QA-2 on the airdrop and conduit must always be maintained. In almost all cases that would require three layers of E-54A mat on the airdrop and three layers of E-50 mat on the conduit.

1. Wrap the cable airdrop bundle with three layers of E-54A mat. The mat may be butted up to the end of the conduit. However, it is preferred to extend the wrap on the airdrop a short distance into the conduit to help secure the loose cables and center the cables within the conduit.

   a. If the airdrop with three layers of E-54A is larger than the conduit outside diamter, the outer layers of fire protection on the airdrop could extend onto the conduit.

   b. If the airdrop with three layers of E-54A is smaller than the conduit outside diameter, 2" minimum wide collars should be applied to the fire protected airdrop to bring the diameter up to the size of the conduit outside diameter.

2. Caulk all gaps between the conduit and mat and at the termination of the conduit with CP 25N/S Caulk.

3. Wrap the conduit with three layers of E-50 Series mat, overlapping the fire protection onto the airdrop cable by a minimum of 2".

4. Caulk any gaps between the mat layers at the end of the conduit's fire protection.

5. Install CS-195 using "collar only" or "collar-and-plate technique per 5500-E3.

6. Restrain with stainless steel banding at 8" maximum spacing throughout the system an within 2" of all seams and terminations.

KJ:20.2

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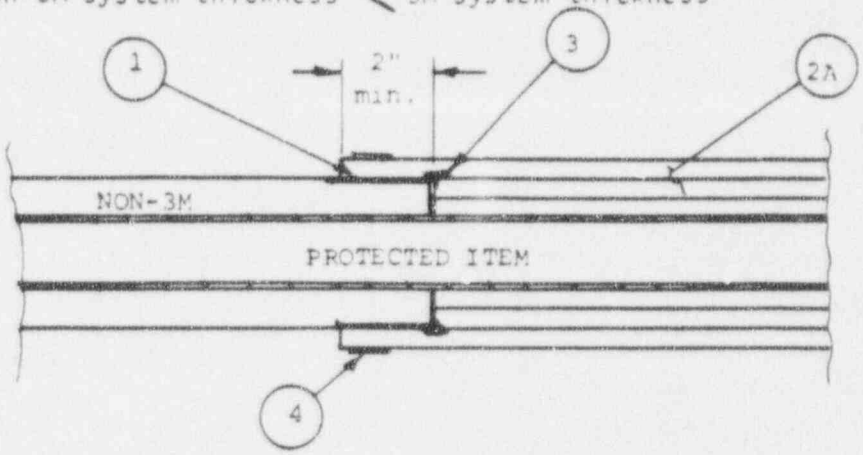
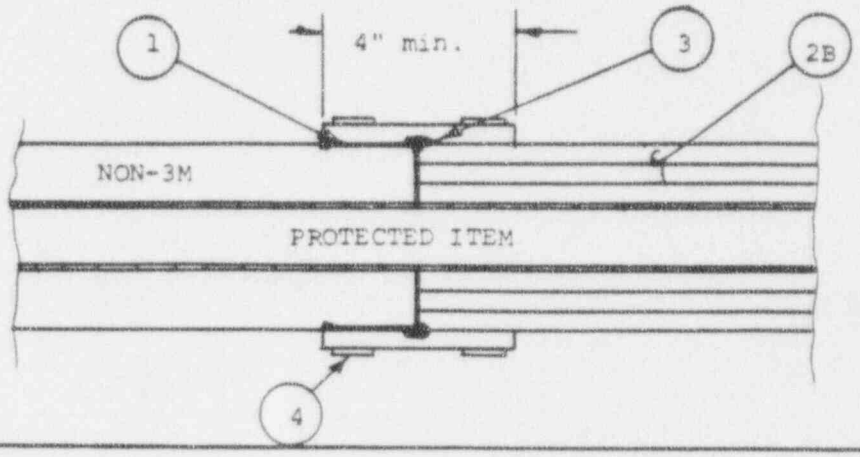
CONDUIT TO AIRDROP INTERFACE

INTERAM™ E-50 Series 1-Hour System

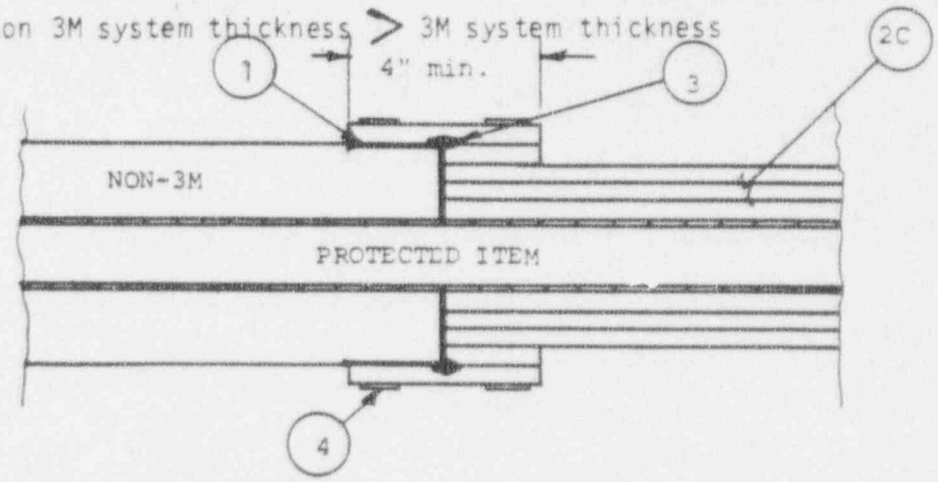
Case A: Non-3M system thickness < 3M system thickness



Case B: Non-3M system ≅ 3M system thickness



Case C: Non 3M system thickness > 3M system thickness



See 5500-E1-2 for instructions.

KJ:21.1

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2	6/10/87		

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3M to NON-3M INTERFACE

INTERAM™
E-50 Series
1-Hour System

Ceramic Materials Department/3M

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5500-E1-1

INSTRUCTIONS: (Numbers below refer to labels on previous page.)

(1.) Apply T-49 tape to non-3M fire protection system a minimum of 2" from the end of the non-3M system. Also apply T-49 tape at the end of the non-3M system.

2. Apply the 3M fire protection system with a butt joint to the non-3M system. The layer and material requirements for the 3M system are listed in 5500-QA guidelines for different items.

(2A.) If the 3M system is thicker than the non-3M system, overlap the 3M system a minimum of 2" onto the non-3M system for the outer layers.

(2B.) If the two fire protection systems are approximately the same thickness, use a minimum 4" wide collar of the E-50 Series mat centered over the seam between the two systems. The E-50 Series mat collar should be the same type as used on the last layer of the 3M system.

(2C.) If the 3M system is thinner than the non-3M system, build up the thickness of the 3M system with 2" wide minimum collars of E-50 Series mat until the thickness of the two systems are approximately equal. Apply a 4" wide minimum collar of E-50 Series mat centered over the seam between the two systems. The E-50 Series mat collar should be the same type as used on the last layer of the 3M system.

(3.) CP 25N/S Caulk is applied at joint interface.

(4.) Stainless steel banding is required on the last layer of the 3M system. Bands must be placed within 2" of the system's termination. On collars, a minimum of two bands are required with the centerline of the band within 2" of the edge of the collar.

Important notes: *These installation details assume that the non-3M system is a fully qualified, 1-hour rated fire protection system.

* If the non-3M fire protection system is a nominal 2" thick ceramic fiber blanket system, steps (#1) and (3) may be eliminated. Also, on a conduit, the 3M system should be extended a minimum of 6" beyond the point where cable temperatures must be kept below 325°F after a 1-hour fire test. In other words, the 3M to ceramic fiber blanket interface should be shifted a minimum of 6" toward the ceramic fiber blanket system.

KJ:21.2

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3	6-19-87		

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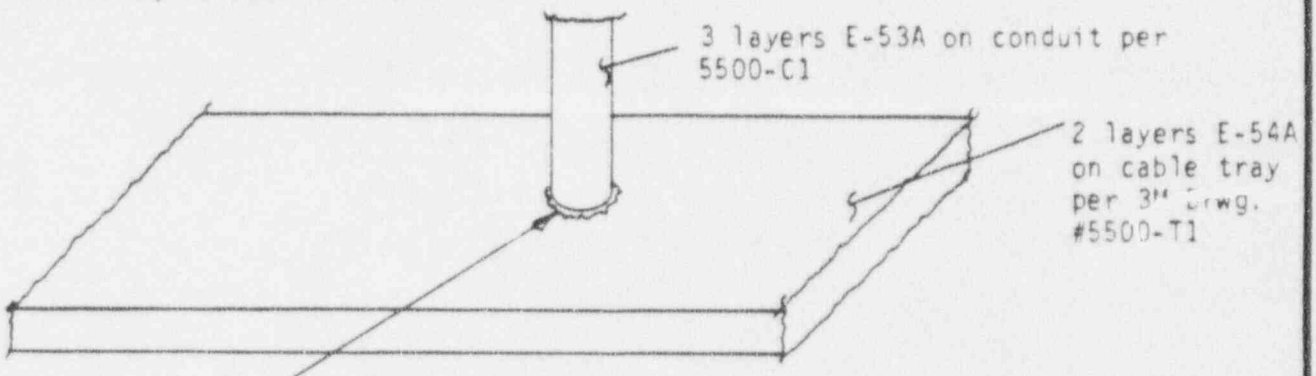
3M to NON-3M INTERFACE

INTERAM™
E-50 Series
1-Hour System

Ceramic Materials Department/3M

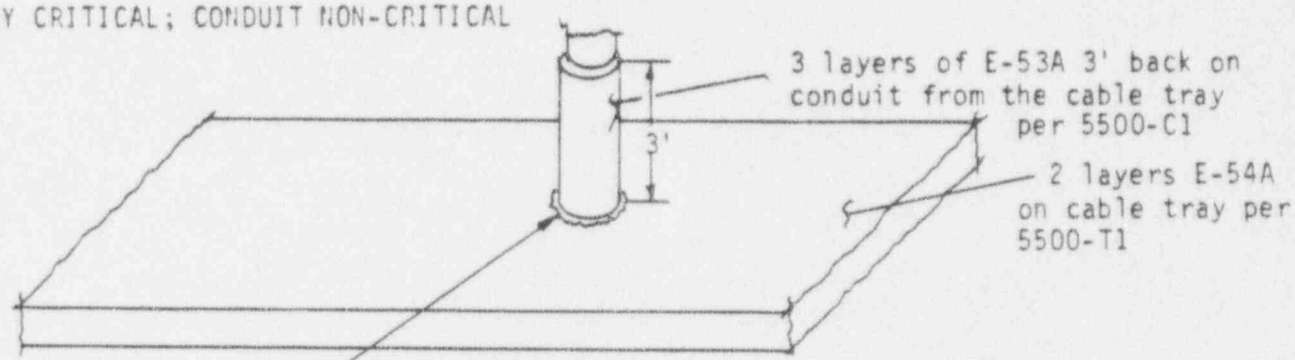
5500-E1-2

CABLE TRAY CRITICAL; CONDUIT CRITICAL



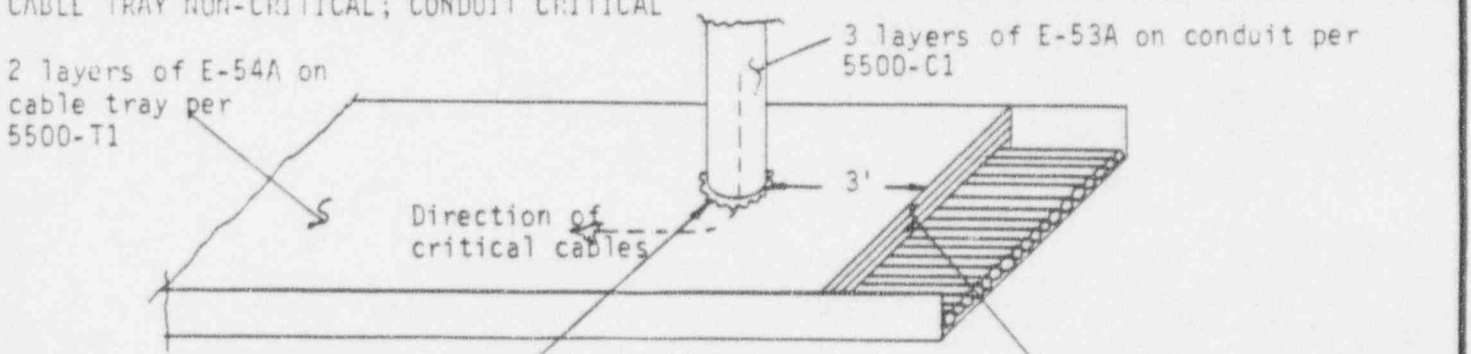
Butt joined, direct line seams are acceptable provided the last layer is caulked with CP 25N/S and taped per 5500-QA-9.

CABLE TRAY CRITICAL; CONDUIT NON-CRITICAL



Butt joined, direct line seams are acceptable provided the last layer is caulked with CP 25N/S and taped per 5500-QA-9.

CABLE TRAY NON-CRITICAL; CONDUIT CRITICAL



Butt joined, direct line seams are acceptable provided the last layer is caulked with CP 25N/S and taped per 5500-QA-9.

4" wide strips of E-54A and CP 25N/S Caulk to form fire stop per 5500-T7

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5500-E2

CABLE TRAY AND CONDUIT, CRITICAL AND NON-CRITICAL INTERFACE COMBINATIONS

3M INTERAM™ E-50 SERIES 1 HOUR RATED SYSTEM

General installation requirements for the interface of an electrical raceway going through a concrete slab are listed in the QA installation guidelines (5500-QA-12) under "CS-195 Composite Sheet". An electrical raceway may be either a conduit, cable tray, buss duct, or airdrop cable bundle. A concrete slab may be either a floor, ceiling, or wall.

Numerous possibilities exist for the penetration details of an electrical raceway through a concrete slab. Listed below are configurations covered in the attached five drawings.

Configuration		Reference Print
Case I:	Electrical raceway grouted into concrete	5500-E3-2
Case II:	Small air gap between electrical raceway and concrete	5500-E3-3
Case III:	Large air gap between electrical raceway and concrete	5500-E3-4
Case IV:	Small penetration seal between electrical raceway and concrete	5500-E3-5
Case V:	Large penetration seal between electrical raceway and concrete	5500-E3-6

Two options exist for sealing the 3M Interam™ E-50 Series mat to either the concrete or penetration seal:

1) "CS-195 collar only" technique; extra collar strip wraps of E-50 Series are required; no anchoring to concrete is required.

2) "CS-195 collar and plate" technique, anchoring of the CS-195 plate to concrete is required.

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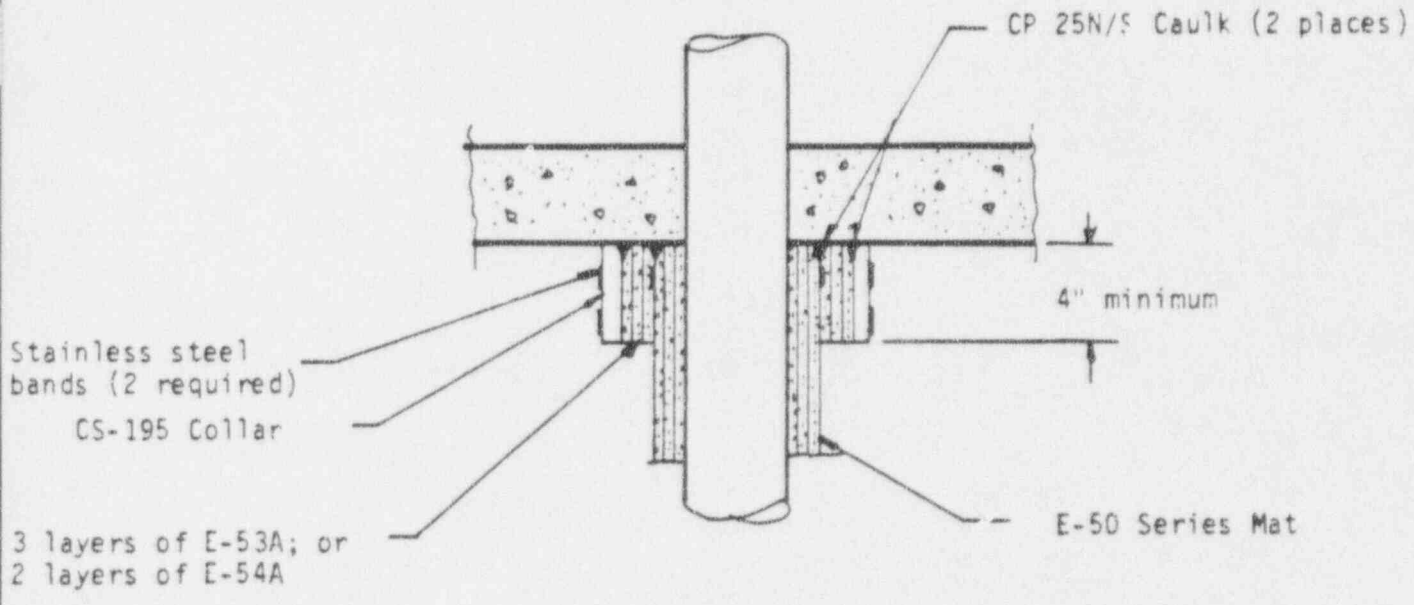
5500-E3-1

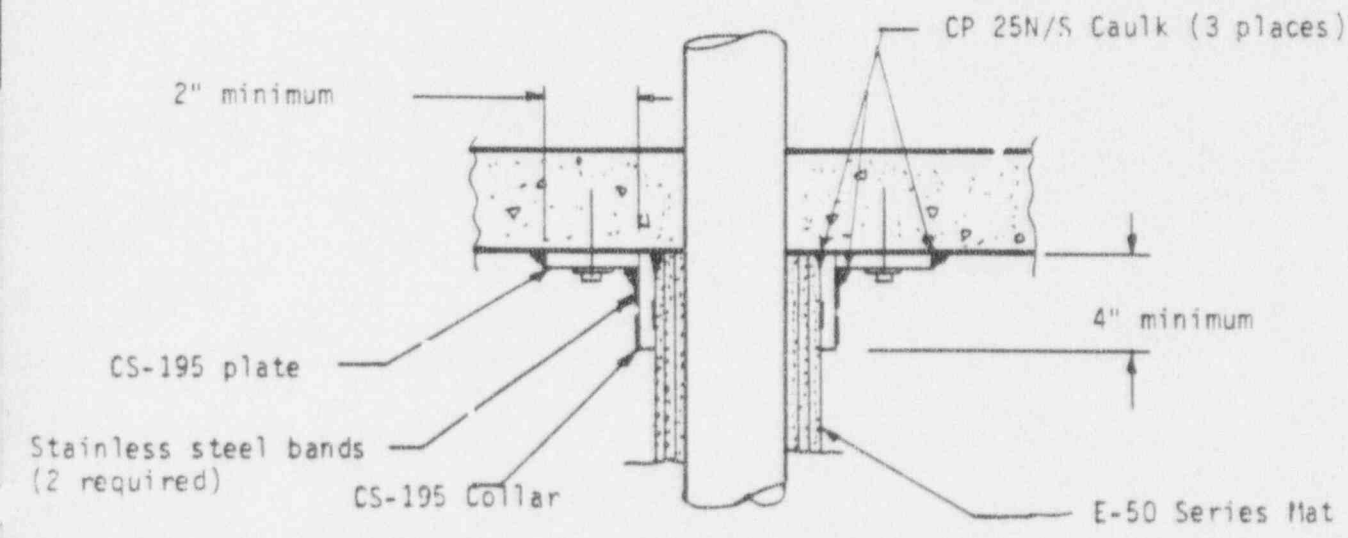
ELECTRICAL RACEWAY THROUGH CONCRETE INTERFACE INTERAM™ E-50 SERIES 1-HOUR SYSTEM

CASE I: Electrical raceway grouted into concrete

NOTE: Either of these options would also apply to a junction box mounted against concrete.



OPTION A: CS-195 collar only; no concrete anchors required



OPTION B: CS-195 collar-and-plate; concrete anchors required.

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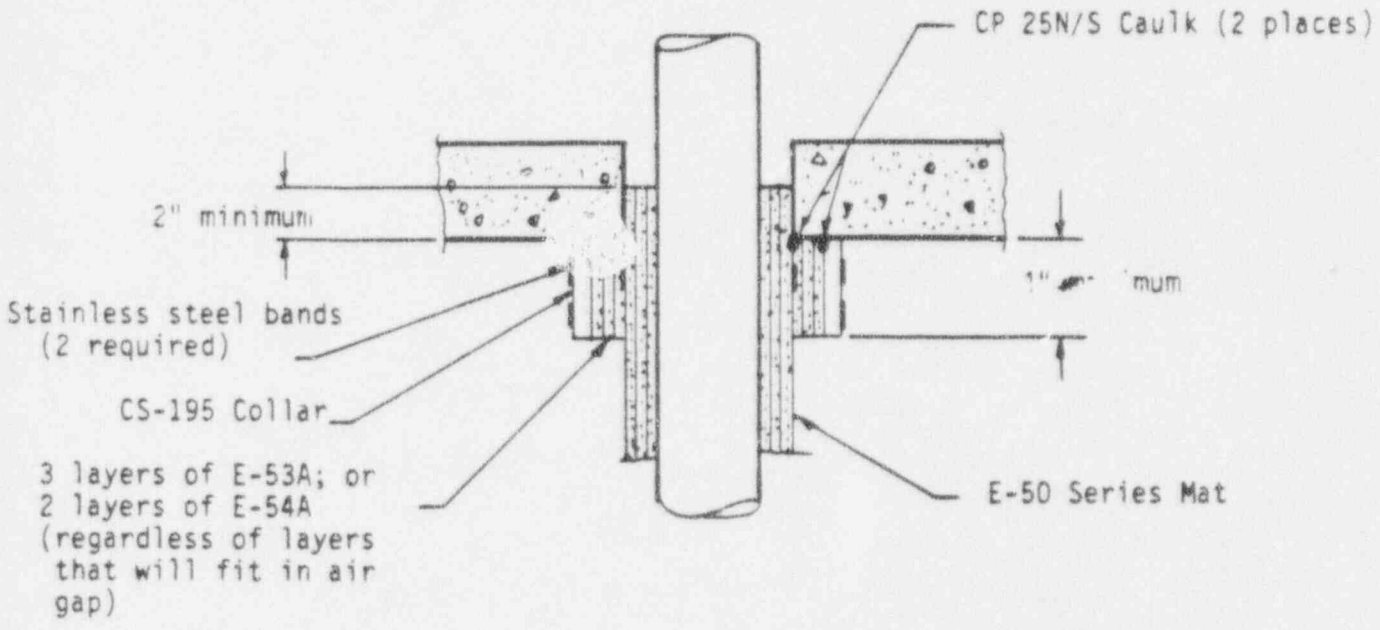
5500-E3-2

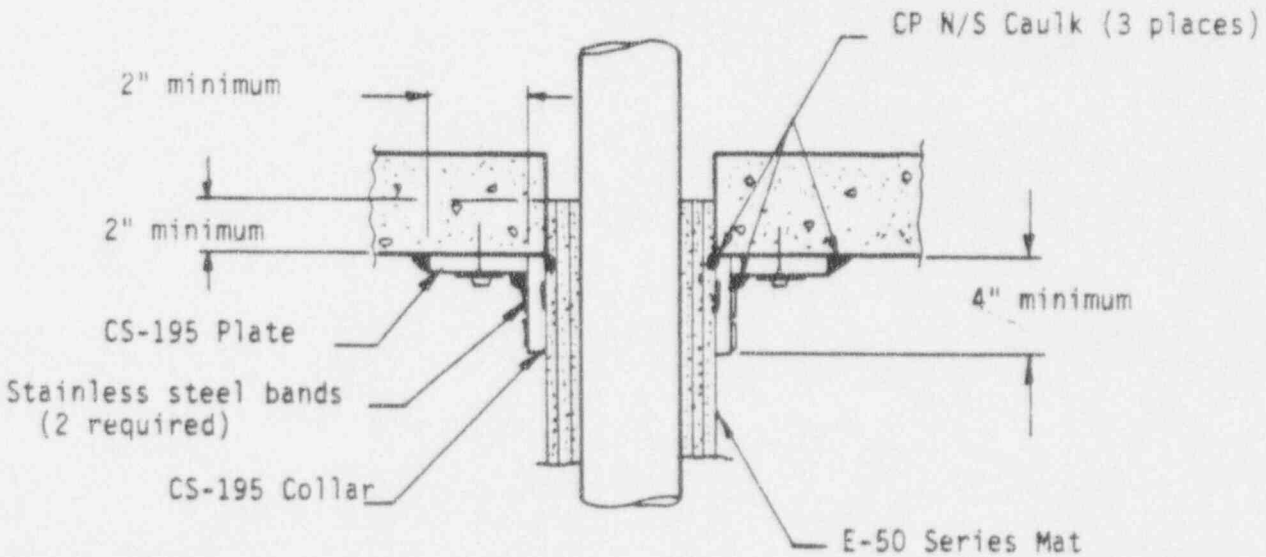
ELECTRICAL RACEWAY THROUGH CONCRETE INTERFACE

INTERAM™ E-50 Series 1-Hour System

CASE II: Small air gap between electrical raceway and concrete



OPTION A: CS-195 collar only; no concrete anchors required



OPTION B: CS-195 collar and plate; concrete anchors required.

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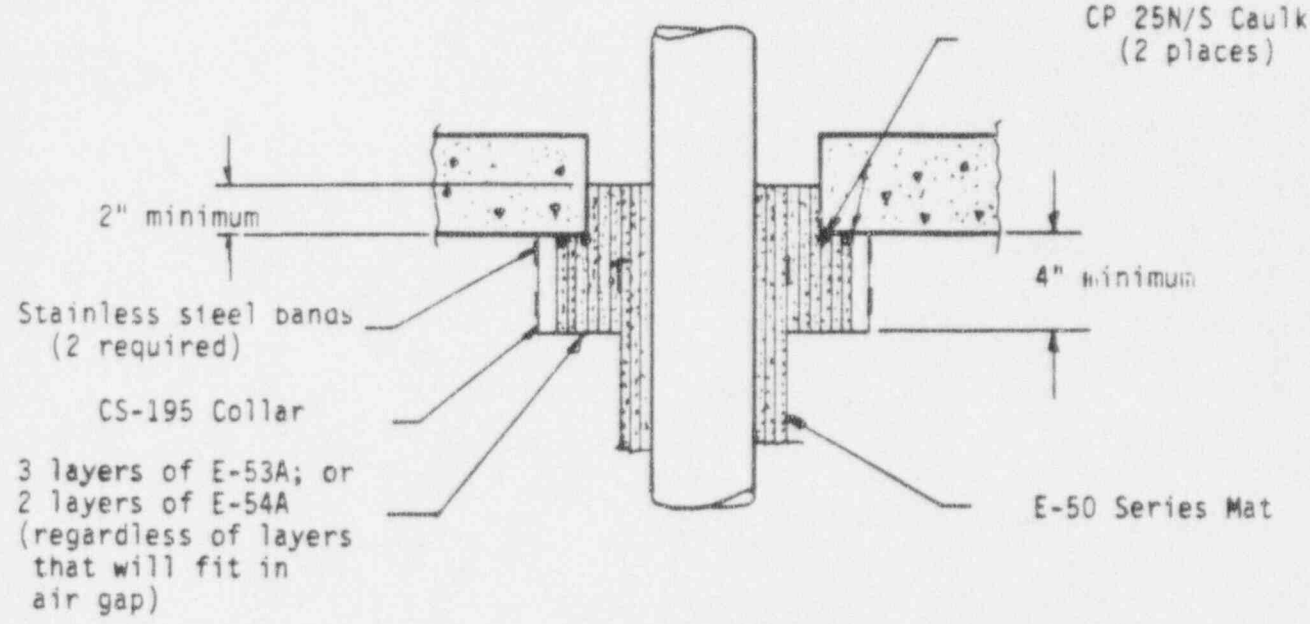
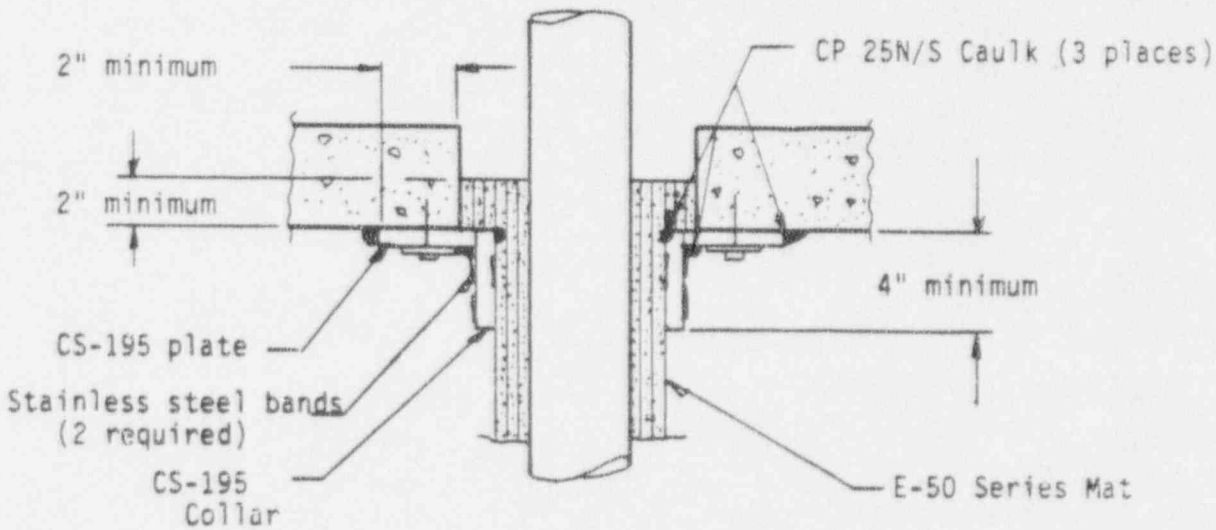
5500-E3-3

CONDUIT NEAR SLAB
INTERAM™
E-50 Series
1-Hour System

CASE III: Large air gap between electrical raceway and concrete



OPTION A: CS-195 collar only; no concrete anchors required.



OPTION B: CS-195 collar and plate; concrete anchors required.

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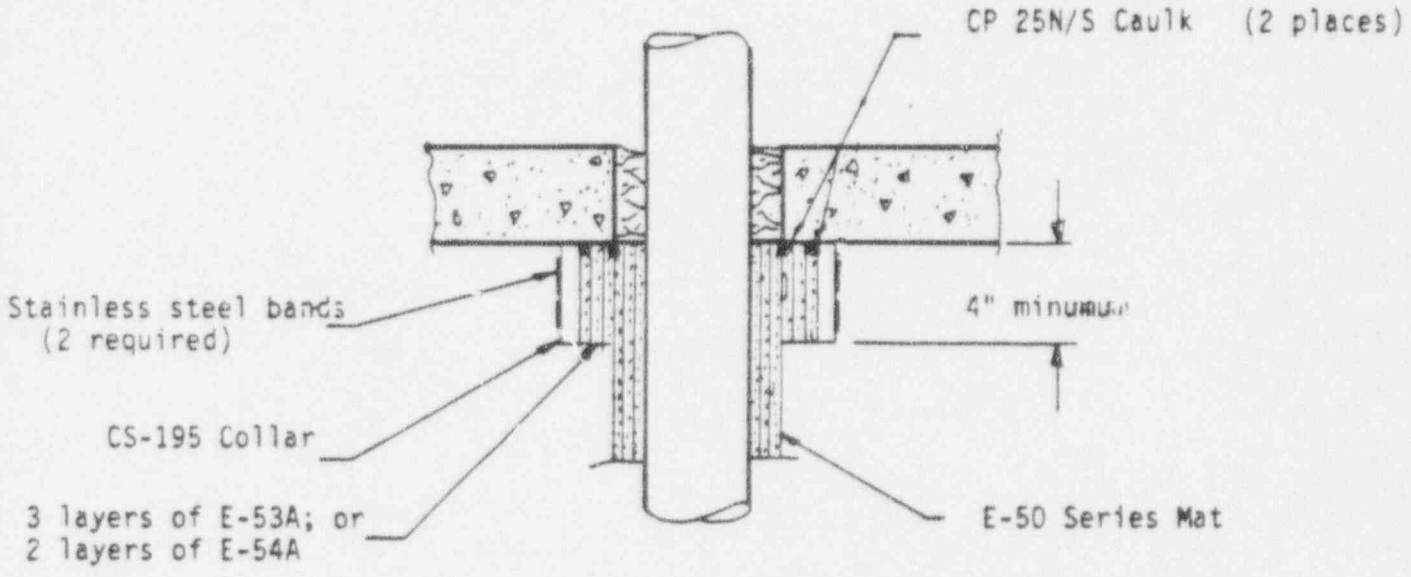
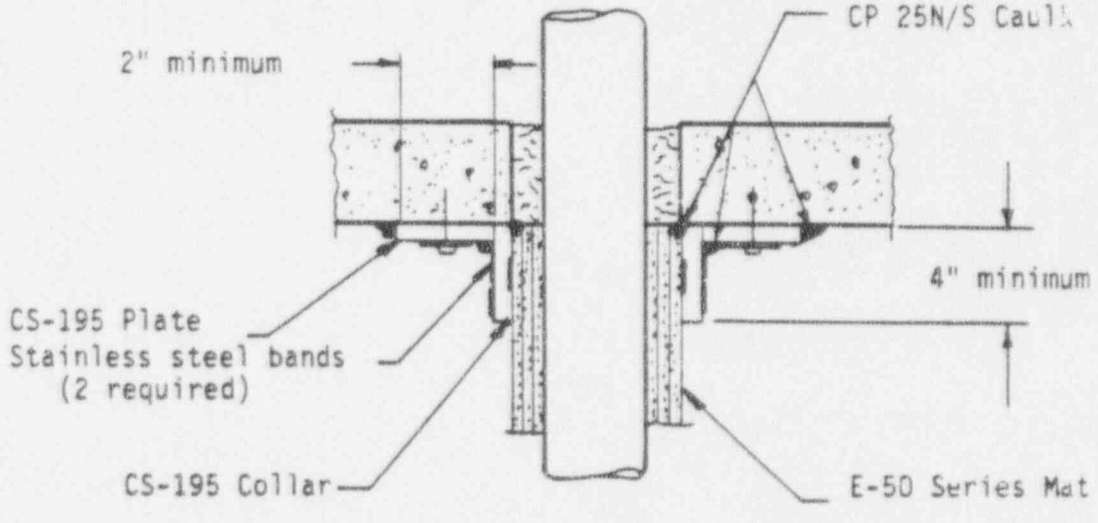
5500-E3-4

ELECTRICAL RACEWAY THROUGH CONCRETE INTERFACE
INTERAM™
E-50 Series
1-Hour System

CASE IV: Small penetration seal between electrical raceway concrete



OPTION A: CS-195 collar only; no concrete anchors required.



OPTION B: CS-195 collar and plate; concrete anchors required.

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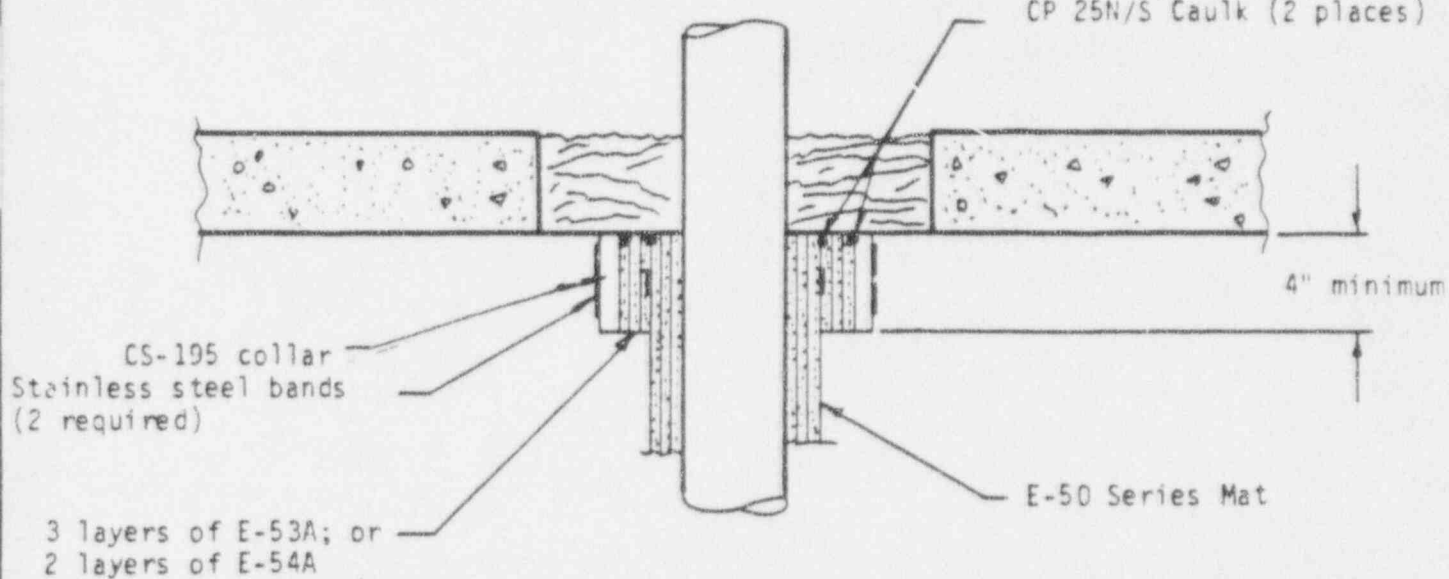
CONDUIT NEAR SLAB
INTERAM™
E-50 Series
1-Hour System

Ceramic Materials Department/3M

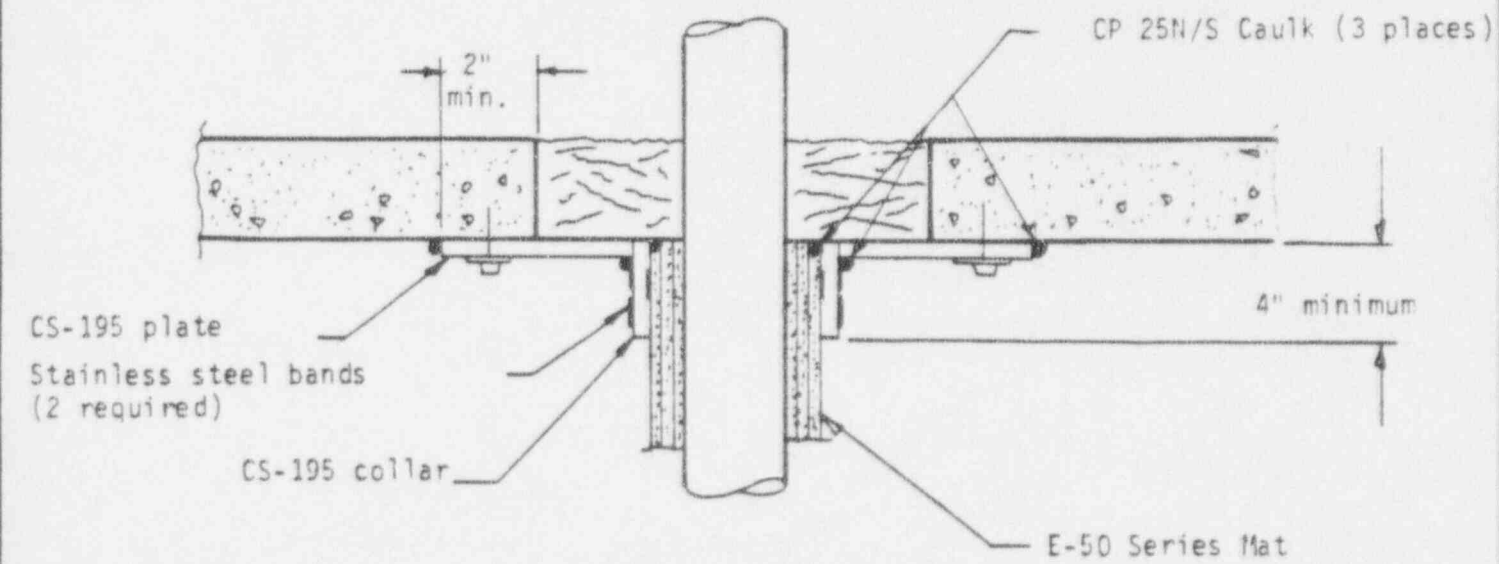
5500-E3-5

CASE V: Large penetration seal between electrical raceway and concrete

OPTION A: CS-195 collar only; no concrete anchors required.



IMPORTANT NOTE: This interface detail may be used only if the final user can assure that (1) the penetration seal is a fire rated, 1-hour minimum, penetration seal, and that (2) the temperature 2" into the penetration seal after one hour exposure to an ASTM E-119 fire temperature curve would be less than 400°F.



OPTION B: CS-195 collar-and-plate; concrete anchors required.

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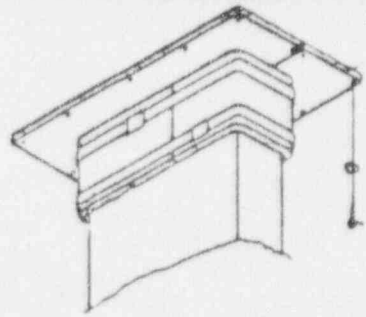
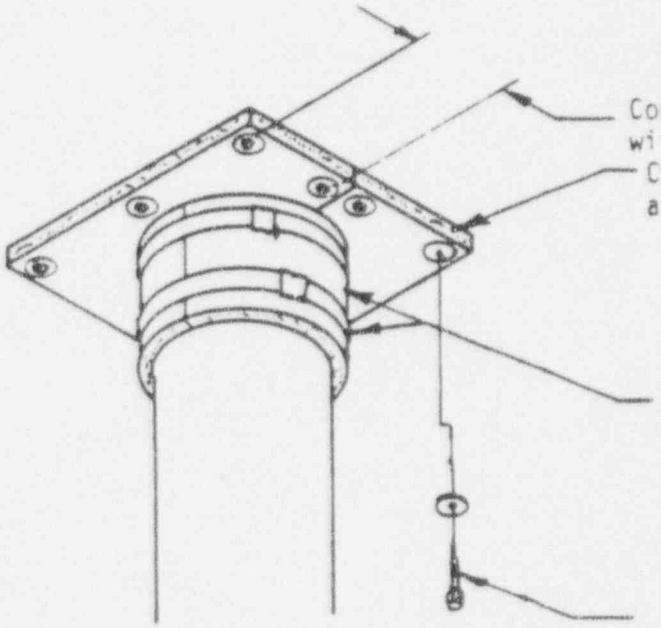
5500-E3-6

ELECTRICAL RACEWAY THROUGH CONCRETE INTERFACE

INTERAM™ E-50 Series 1-Hour System





Concrete anchor spacing at 8" maximum and within 2" of edges at corners and seams.

CS-195 sheet plate cut to fit tightly around CS-195 collar.

CS-195 collar cut to fit around wrapped electrical raceway. Collar is secured with 2 stainless steel bands.

Concrete anchor with 1-1/4" minimum diameter washer.

COLLAR VARIATIONS

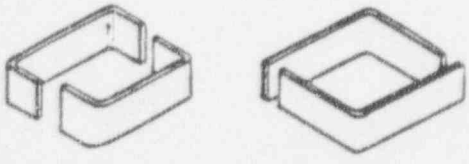
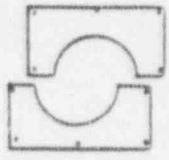
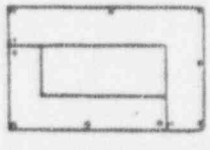
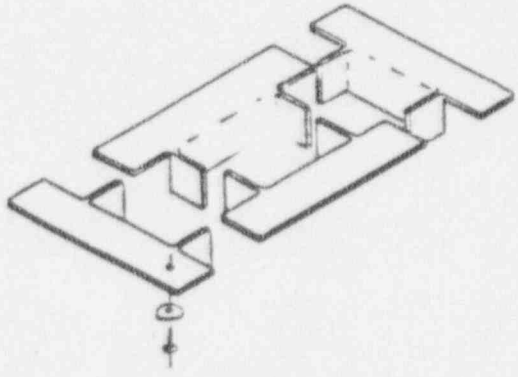


PLATE VARIATIONS





COMBINED COLLAR AND PLATE



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1	6-19-87		

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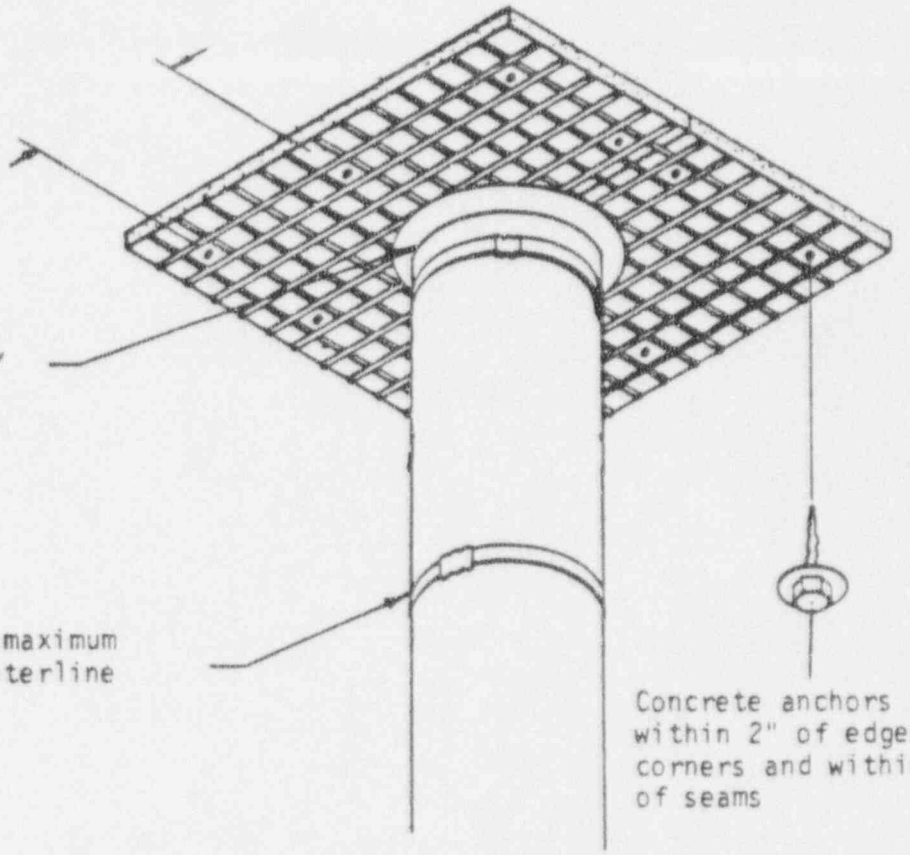
5500-E3-7

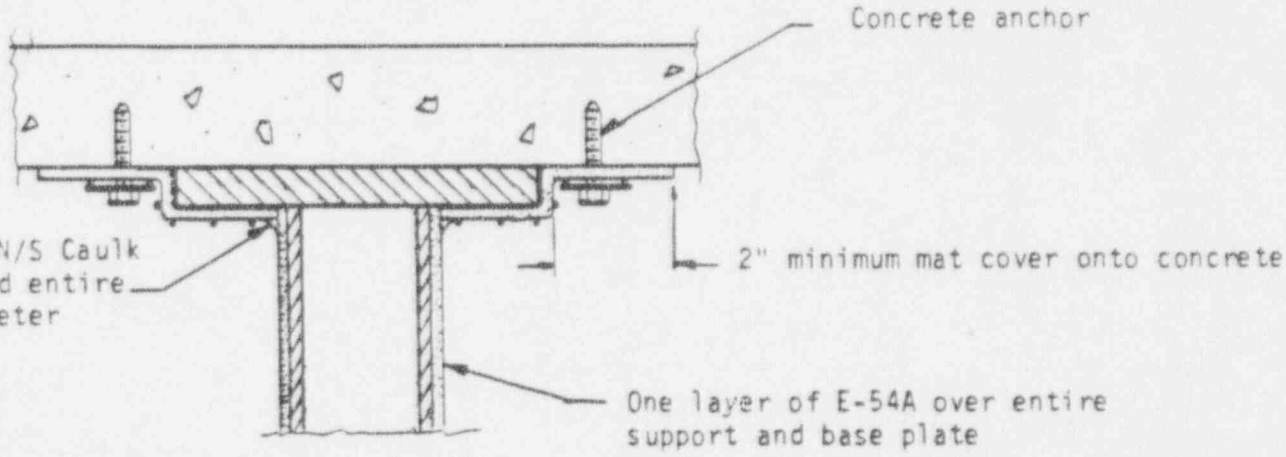
ELECTRICAL RACEWAY THROUGH CONCRETE INTERFACE

INTERAM™ E-50 SERIES

1 Hour System



SUPPORT AND BASE PLATE (CROSS-SECTIONAL VIEW)



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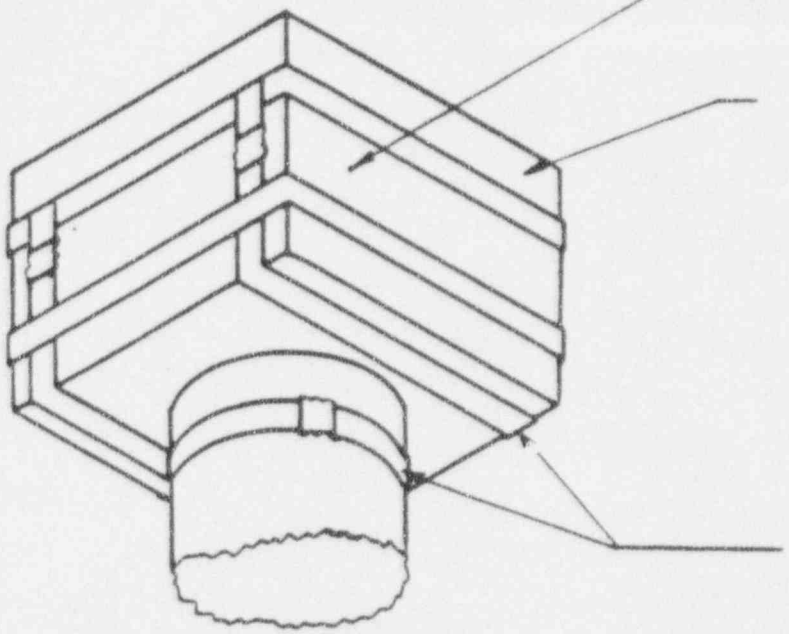
HANGER SUPPORT WITH BASE PLATE

INTERAM™ E-50 SERIES 1-HOUR SYSTEM

Ceramic Materials Department/3M

5500-H1

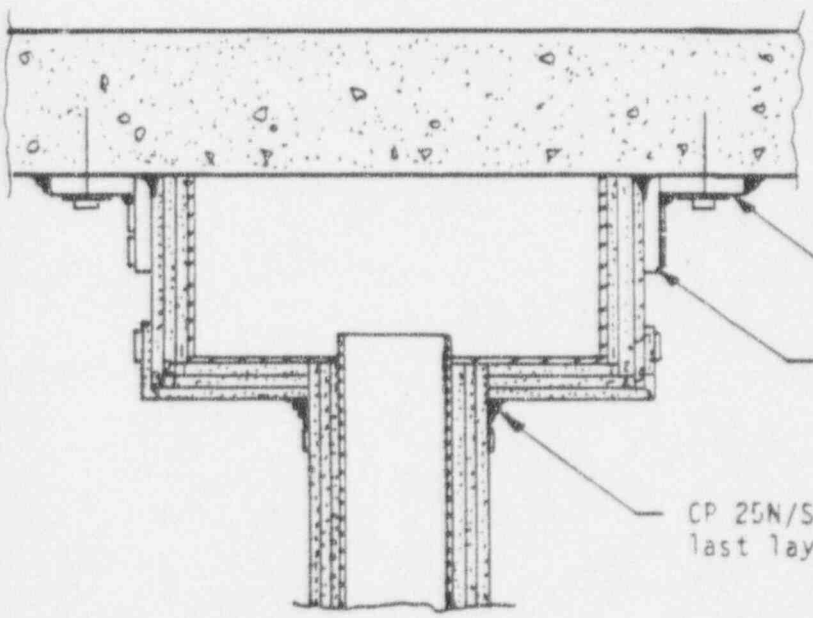


Three layers of E-54A cut to fit. Butt seams on inner layers. A 2" minimum overlap is required on all last layer seams.

Install CS-195 "collar only" or CS-195 "collar-and-plate" after final mat layer is installed. See 5500-E3-2 for installation details.

Stainless steel banding on last layer spaced at every 8" maximum throughout and within 2" from both sides of mat seams.

JUNCTION BOX AGAINST CONCRETE
(shown without CS-195)



JUNCTION BOX AGAINST CONCRETE
(cross-sectional view;
collar-and-plate technique shown)

CS-195 Plate

CS-195 Collar

CP 25N/S Caulk and T-40 Tape required after the last layer on all straight line seams

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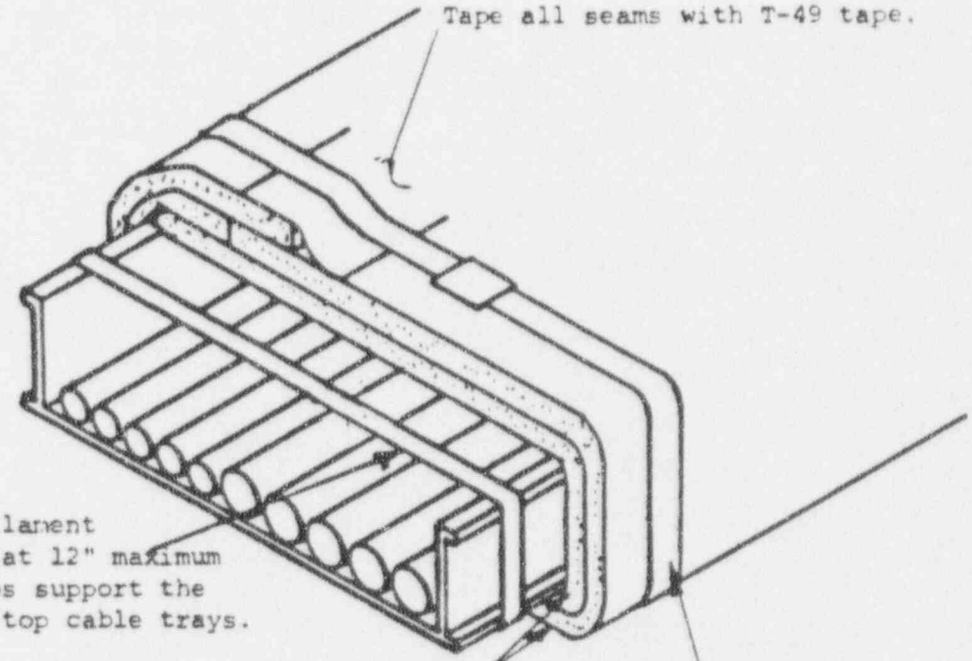
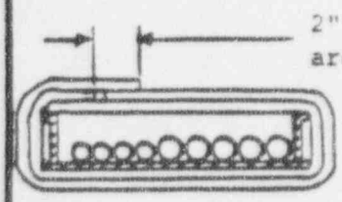
5500-J1

JUNCTION BOX

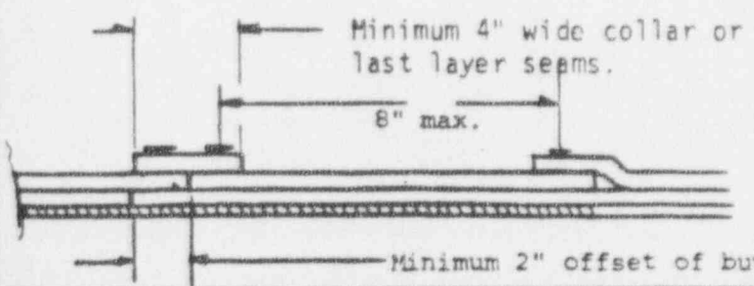
INTERAM™
E-50 SERIES
1-HOUR SYSTEM



SEAMING



NOTE: Be sure to place stainless steel banding within 2" of each exposed E-54A mat edge.



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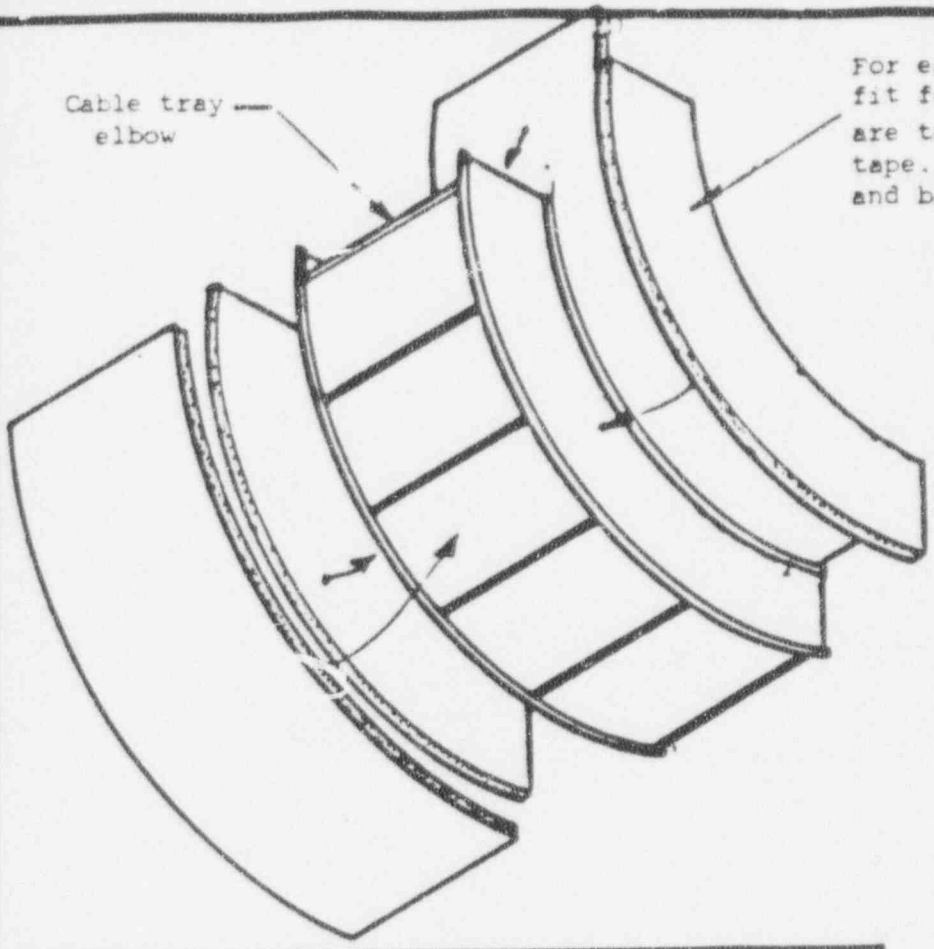
5500-T1

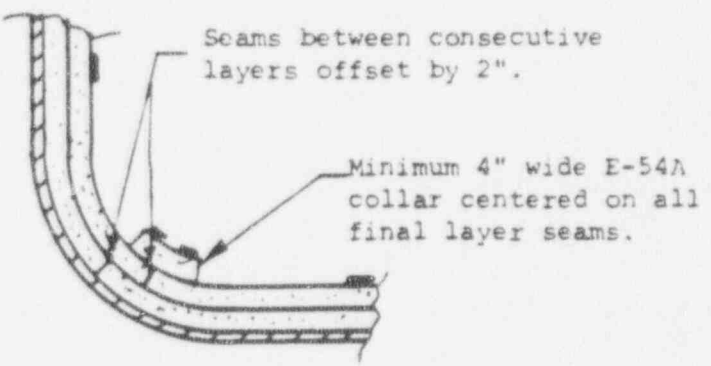
CABLE TRAY
STRAIGHT RUN

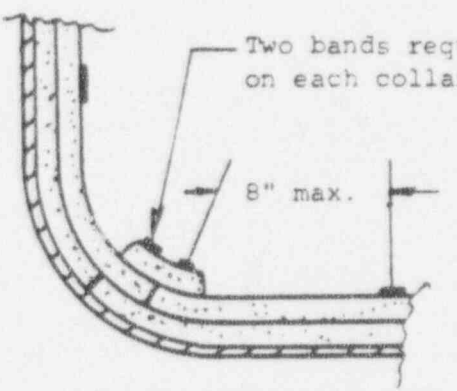
INTERAM™
E-50 Series
1-Hour System

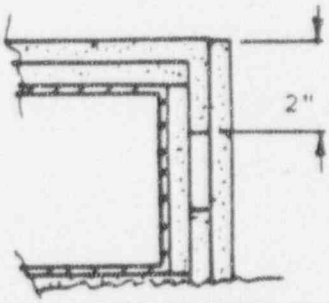


For each layer of mat wrap, cut to fit four pieces of mat. All seams are taped with T-49 aluminum foil tape. See details below for seaming and banding.

SEAMING:







CABLE TRAY EDGE CROSS-SECTION

KJ:15

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable. However, since the conditions of use and application are beyond our control, 3M shall not be liable for any damage, direct or consequential, resulting from the use of this material or design. 3M's only warranty shall be to replace any of our products found to be defective.

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2	9-30-86		

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APP R.R.Licht

5500-T2

CABLE TRAY ELBOW

INTERAM™
E-50 Series
1-Hour System

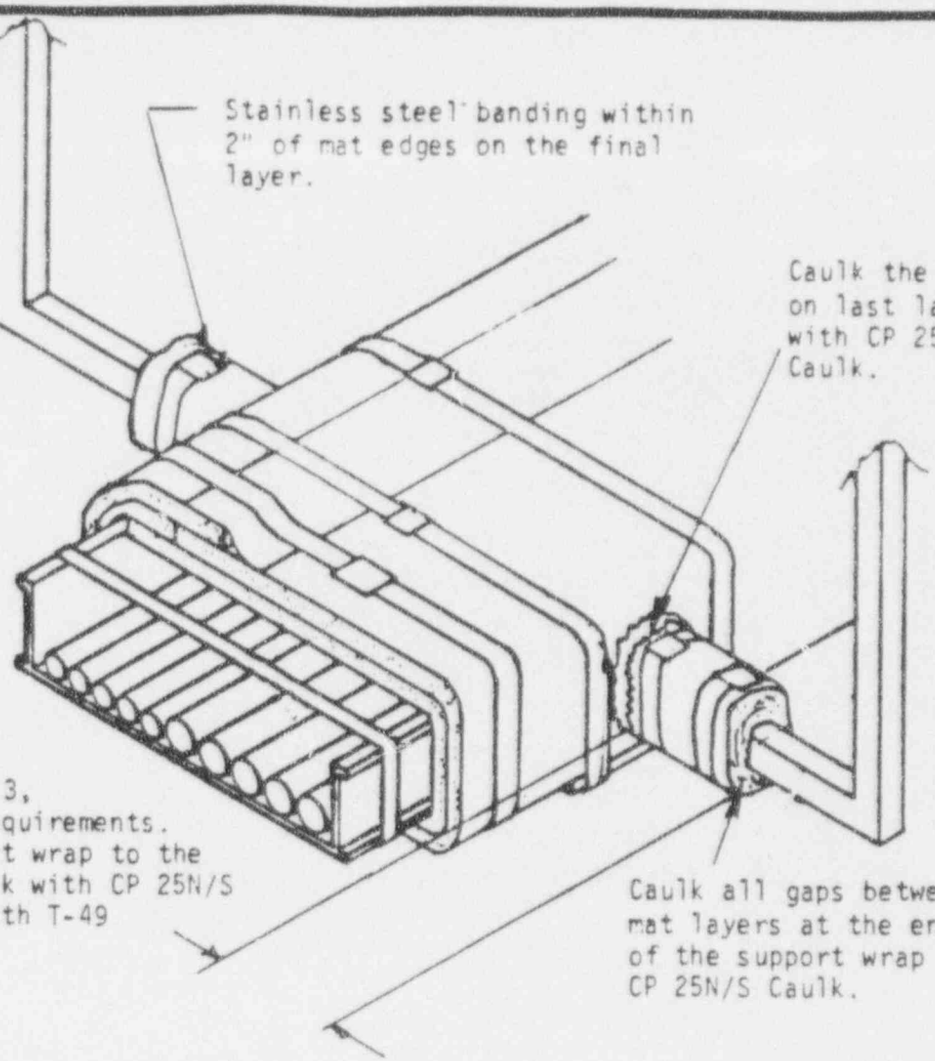
Ceramic Materials Department/3M

3M

If an open channel support is used, it must be stuffed with at least 4" of ceramic fiber insulation or E-50 Series mat and caulked with CP 25N/S.

Stainless steel banding within 2" of mat edges on the final layer.

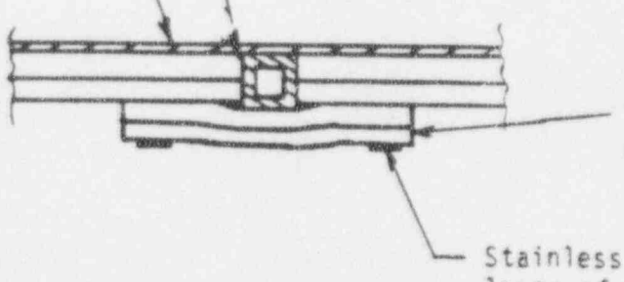
Caulk the seams on last layer with CP 25N/S Caulk.



See 5500-QA, Pages 2 and 3, for layer and distance requirements. Butt layers of the support wrap to the wrapped cable tray. Caulk with CP 25N/S Caulk. Tape all seams with T-49 aluminum tape.

Caulk all gaps between mat layers at the end of the support wrap with CP 25N/S Caulk.

CROSS-SECTIONAL VIEW
Cable Tray/Support



Two layers E-50 Series mat 5500-QA-2 on the cable tray support.

Stainless steel banding on the last layer of the support wrap.

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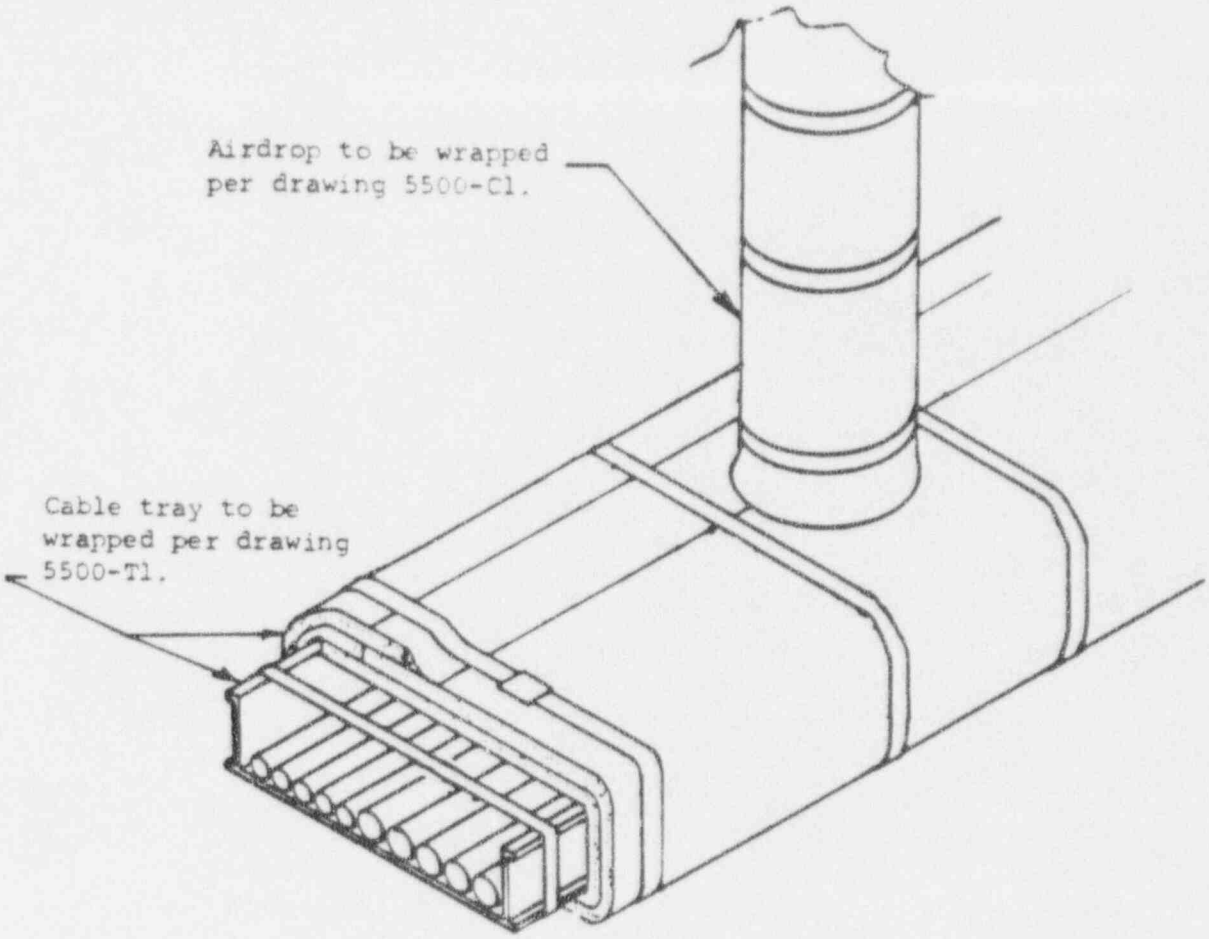
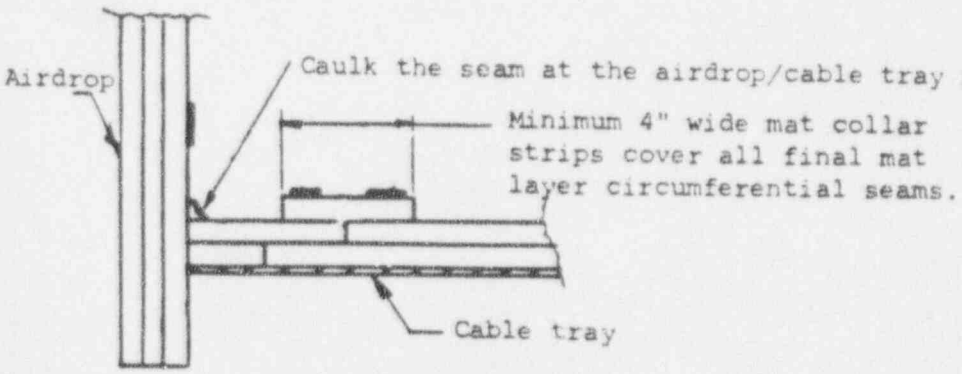
5500-T3

CABLE TRAY SUPPORT INTERFACE

INTERAM™
E-50 Series
1-Hour System





Band the airdrop and the cable tray after the last layer is completely installed.

Tape all seams with T-49 aluminum tape.

ISSUE	DATE	REV.	CH.
2	9-30-86		

NOT TO SCALE

DR K.A.Jensen

CH R.Y.Hoza

APP R.R.Licht

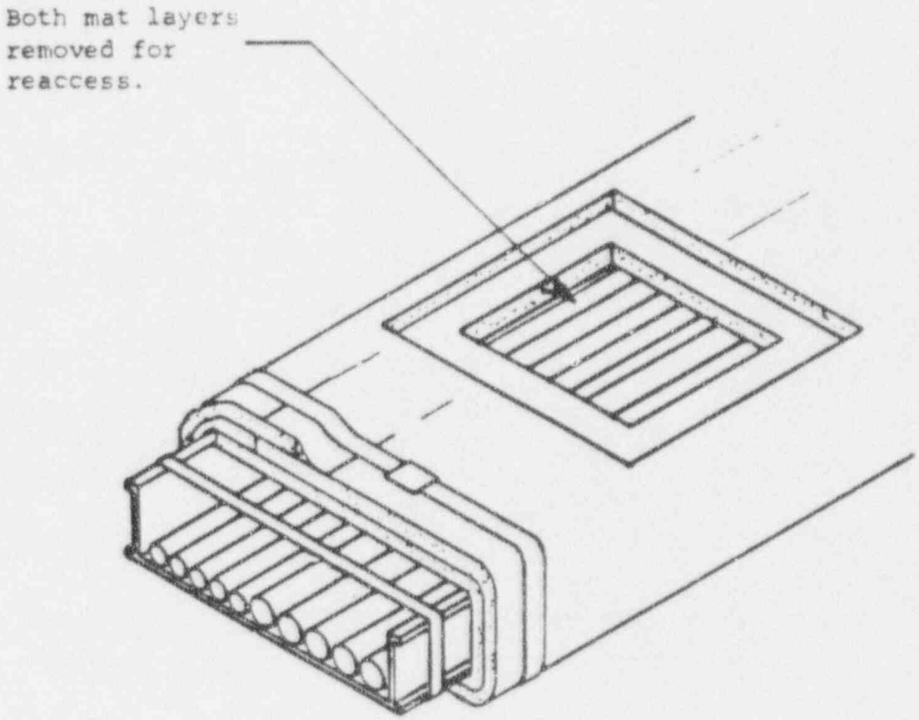
Ceramic Materials Department/3M

3M

5500-T5

CABLE TRAY TO AIRDROP INTERFACE

INTERAM™
E-50 Series
1-Hour System



1. Determine the size of repair or opening desired on inner layer.
2. Outer layer cut-out must be a minimum 4" larger in all directions to maintain a 2" minimum overlap.
3. Cut through one layer only of the mat. Remove and save cut-out mat.
4. On the innermost layer, cut into the mat without cutting entirely through it. This is done for safety reasons to insure that cable insulation is not damaged.
5. Remove the foil from the E-54A mat. Use a blunt non-conductive instrument to pierce the mat and remove the mat and scrim.
6. The system is now open for reaccess/repair.

ISSUE	DATE	REV.	CH.
3	9-30-86		

NOT TO SCALE

DR K.A.Jensen

APP R.R.Licht

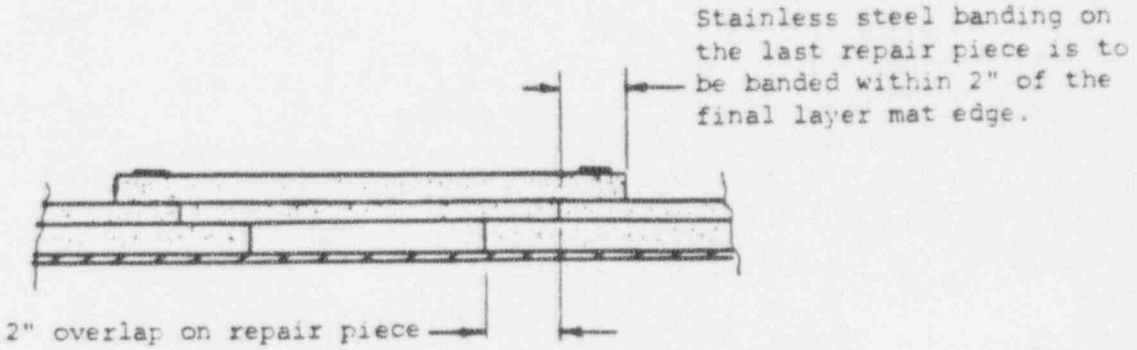
Ceramic Materials Department/3M

3M

5500-T6-1

CABLE TRAY
REACCESS AND REPAIR

INTERAM™ E-50 Series
1-Hour System



RESEALING THE MAT SYSTEM

1. Replace previously removed top section, being careful to observe 2" overlap requirements.

2. Tape all seams with T-49 aluminum foil tape to ensure a good bond. Rub the tape down with a small rubber roller.

3. Cut a new final mat layer that must be large enough to fit over the repair area with a 2" minimum overlap.

4. Tape all seams with aluminum foil tape.

5. Band the last layer with stainless steel banding. The bands must be placed within 2" of edge of mat. Band spacing must be maintained to 8" maximum spacing for the rest of the system.

ISSUE	DATE	REV.	CH.
3	9-30-86		

NOT TO SCALE

DR K.A.Jensen

CH R. McKaya

APP R.R.Licht

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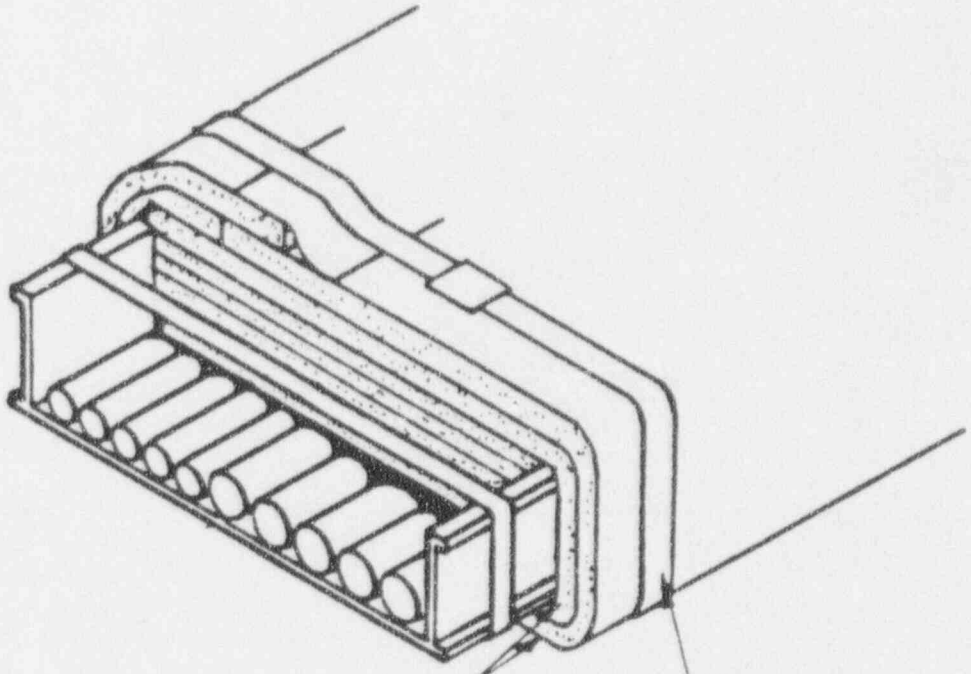
3M

5500-T6-2

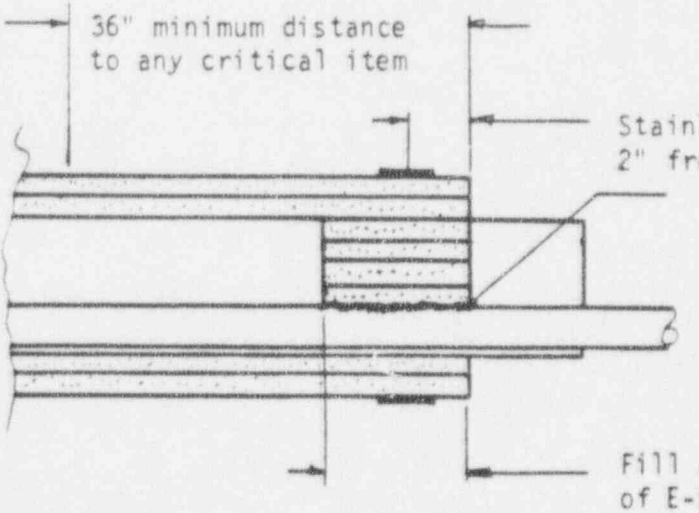
CABLE TRAY
REACCESS AND REPAIR

INTERAM™ E-50 Series
1-Hour System



Cable tray with layers of E-50 Series mat wrapped per drawing 5500-T1.

Stainless steel banding



ISSUE	DATE	REV.	CH.
3	6-19-87		

NOT TO SCALE

DR RJW 6-25-87

DR K.A. Jensen

APP R.G. Koza

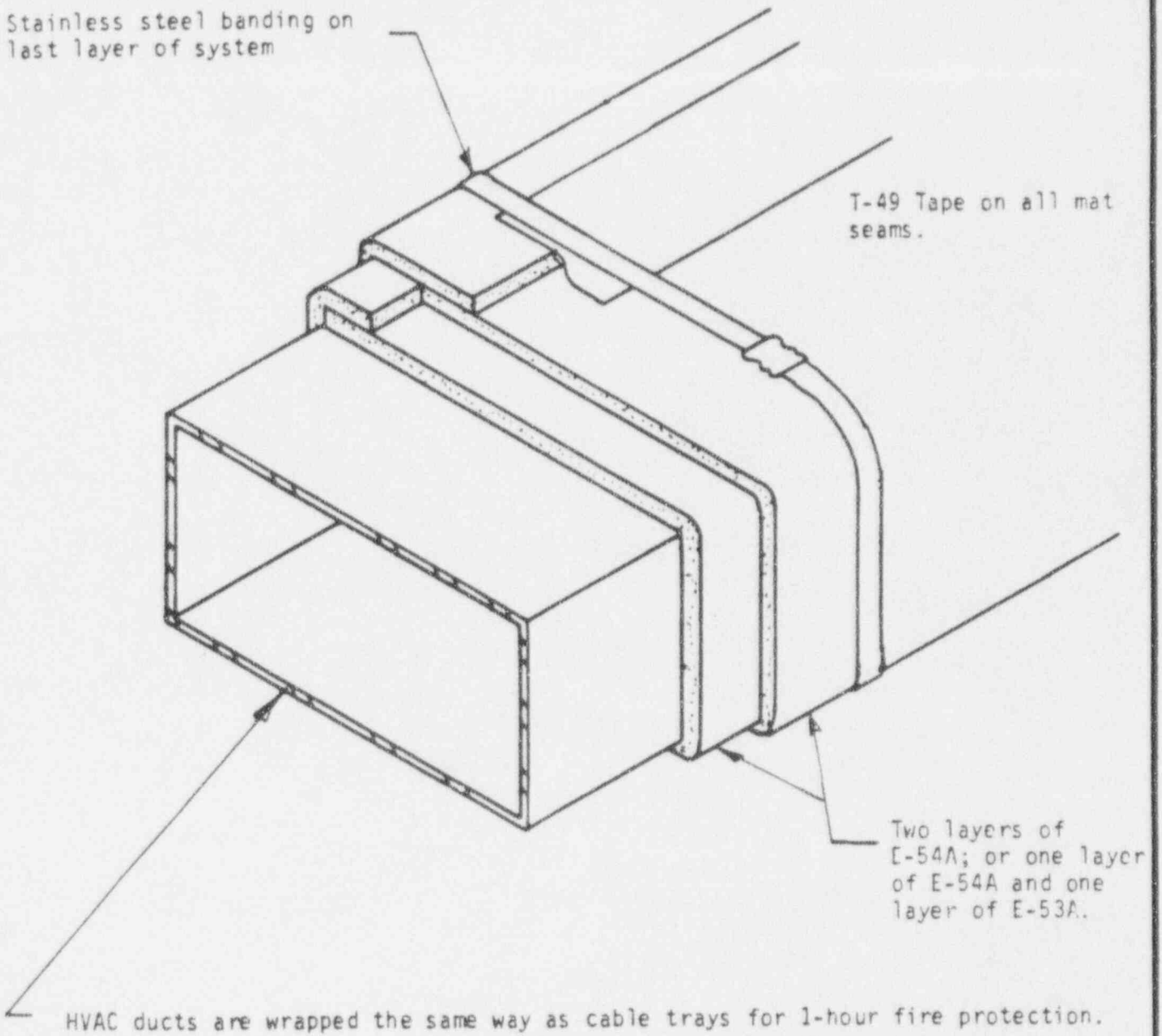
Ceramic Materials Department/3M

3M

5500-T7

CABLE TRAY FIRESTOP

INTERAM™
E-50 Series
1-Hour System



ISSUE	DATE	REV.	CH.
2	6-19-87		

KEY TO SCALE	CK RJ 6-25-87
BY K.A. Jensen	APP R.G. Koza RGK

Ceramic Materials Department/3M

5500-T8

HVAC DUCT

INTERAM™
E-50 Series
1-Hour System