



10/5/91

APPENDIX III
TO THERMAL SCIENCE, INC.'S RESPONSE TO THE
UNITED STATES NUCLEAR REGULATORY COMMISSION'S
LETTER DATED 10 SEPTEMBER 1991

Enclosure 37

TSI Technical Note 20684-BV

THERMO-LAG 330 Fire Barrier System Installation Procedures Manual

Nuclear Plant Applications Prepared For Stone & Webster Engineering

Corporation, Beaver Valley Nuclear Power Plant

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THERMO-LAG 330 FIRE BARRIER SYSTEM
INSTALLATION PROCEDURES MANUAL
NUCLEAR PLANT APPLICATIONS

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BEAVER VALLEY NUCLEAR POWER PLANT

TSI TECHNICAL NOTE 20684-BV

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THERMO-LAG 330 FIRE BARRIER SYSTEM
INSTALLATION PROCEDURES MANUAL
NUCLEAR PLANT APPLICATIONS

SECTION I
GENERAL DESCRIPTION

SECTION I

GENERAL DESCRIPTION

1.0 INTRODUCTION

This section describes the THERMO-LAG 330 Fire Barrier System and its material components. The System is comprised of THERMO-LAG Stress Skin Type 330-69 and THERMO-LAG 330-1 Subliming Material. The System may be installed as Prefabricated Panels, Preshaped Conduit Sections, THERMO-LAG 330-660 Flexi-Blanket or by trowel methods. It is used in nuclear power plants to protect cable trays, conduit, cable drops (cables in free space), junction boxes and structural supports and hangers. THERMO-LAG 330-660 Flexi-Blanket is used in the protection of flex conduit and cable drops.

2.0 FIRE BARRIER DESIGNS

The designs of the THERMO-LAG 330 Fire Barrier System have applications in nuclear power generating installations. The designs are:

- A. Prefabricated Panel Design
- B. Preshaped Conduit Section Design
- C. Flexi-Blanket Design

Each of these basic designs have been approved for installation in nuclear plant facilities by the American Nuclear Insurers and are installed in a number of plants accepted for operational licensing by the Nuclear Regulatory Commission.

The material components of A and B are identical. Each of the two (2) designs are comprised of THERMO-LAG Stress Skin Type 330-69 and THERMO-LAG 330-1 Subliming Material. The designs are either prefabricated or preformed at the factory.

The material components of (C) Design is a subliming high temperature, heat blocking, flexible thermal barrier reinforced on both sides with a low density fiberglass cloth, further implemented by a heat blocking thermal catalyzer. This design is prefabricated or preformed at the factory.

2.1 Prefabricated Panel Design

The Prefabricated Panel Design is fabricated and installed at the jobsite from THERMO-LAG 330-1 Prefabricated Panels. This installation involves cutting the number of sections required to form the Fire Barrier from the THERMO-LAG Prefabricated Panels and then mounting the sections on the entity to be protected using .020 minimum x .500 minimum stainless steel banding. The assembly is completed by filling in the scored areas and joints with THERMO-LAG 330-1 Subliming Material-Trowel Grade. The Prefabricated Panel Design lends itself to installations in the nuclear power generating industry and is used to protect cable trays, cable drops (cables in free space), conduit, junction boxes, structural supports and hangers. This design is preferred over alternative spray application designs in most nuclear power plant installations because it eliminates the overspray protection requirements of the direct spray-on method.

2.2 Preshaped Conduit Section Design

The Preshaped Conduit Section Design is shipped to the jobsite ready for installation. Installation involves mounting the preshaped conduit sections on the conduit or cable drops to form cylindrical sections around the conduit or cable drop, and then fastening the sections together with .020 minimum x .500 minimum stainless steel banding material. The precoating of the sections prior to installation and the filling in of gaps or openings at the edges or joints of the assembled sections is accomplished using THERMO-LAG 330-1 Subliming Material-Trowel Grade, as required.

The Preshaped Conduit Section Design is used in the nuclear power generating industry to protect conduit, cable drops and instrumentation tubing. As with the Prefabricated Panel Design, this design is also preferred over alternative spray application designs in most nuclear power plant installations because it eliminates the overspray protection requirements of direct spray-on methods.

2.3 Flexi-Blanket Design

The THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier is a subliming, high temperature, heat blocking, flexible thermal barrier. It is reinforced on both sides with a low density fiberglass cloth, further implemented by a heat blocking thermal catalyzer.

The one hour fire rated design of the THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier System is comprised of two (2) each 0.250 inch nominal thickness layers. The three hour fire rated design of the THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier is comprised of five (5) each 0.250 inch nominal thickness layers. THERMO-LAG Fire Retardant Adhesive is used to seal the overlap seams of the Flexi-Blanket layers and THERMO-LAG 330-660 Bulk Grade Material is used to fill all joints and openings.

3.0 MATERIAL COMPONENTS

The material components which are utilized in the various designs of the THERMO-LAG 330 Fire Barrier System are as follows:

3.1 THERMO-LAG Stress Skin Type 330-69

This material provides the strong mechanical base for the THERMO-LAG 330-1 Subliming Material. It is comprised of a pretreated open weave, self stiffened, steel mesh and is used to provide an enclosure over cable trays, conduits and other items.

3.2 THERMO-LAG 330-1 Subliming Material

This material provides the level of fire resistance specified for the installation. It is a water based, subliming, thermally activated fire resistive material which volatilizes at fixed temperatures, exhibits a volume increase through the formation of a multi-cellular matrix, and blocks heat to protect the substrate material to which it is applied.

This material can be supplied in a sprayable grade (THERMO-LAG 330-1 Subliming Material - Spray Grade) for direct spray-on applications, or in a trowel grade consistency (THERMO-LAG 330-1 Subliming Material - Trowel Grade) which is suitable for troweling or caulking type applications. It is further used in the fabrication of Prefabricated Panels and Preshaped or Preformed Sections.

3.3 THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier

This is a subliming, high temperature, heat blocking, flexible, thermal barrier. It is reinforced on both sides with a low density, fiberglass cloth, further implemented by a heat blocking thermal catalyzer. This material is applied in the required thickness to provide the specified level of fire resistance.

3.4 Banding

The banding material for attaching the THERMO-LAG 330 Fire Barrier System, as tested is .020 minimum x .500 minimum stainless steel banding.

A required on site quality control procedure is shown in Section III.

Primary Raceway Supports and All Penetrations Into The THERMO-LAG
330 Fire Barrier System

- A. Structural steel supports forming a part or supporting the THERMO-LAG 330 fire barrier system, structures and components contained therein which are important to safe shutdown should be protected to provide fire resistance equivalent to that required by the barrier.

- B. To prevent heat transfer into the fire barrier system all penetrations (i.e. secondary supports, electrical or seismic) into the fire barrier system, should be fire protected to the same level of fire resistance as the raceway for a distance of at least 18 in. minimum as measured from the outer surface of the fire barrier; covering all continuous paths. (A fire test report regarding the eighteen inch (18") minimum fire protection requirement is presented in TSI's Technical Note 84-12-181).

TSI TECHNICAL NOTE 20684-BV

THERMO-LAG 330 FIRE BARRIER SYSTEM

INSTALLATION PROCEDURES MANUAL

NUCLEAR PLANT APPLICATIONS

SECTION II

INSTALLATION PROCEDURES

SECTION II

INSTALLATION PROCEDURES

This section sets forth the sequential steps involved in the installation of the THERMO-LAG 330 Fire Barrier System to cable trays, conduit, cable drops, junction boxes, structural supports and hangers.

1.0 PRE-APPLICATION PRACTICES

1.1 Qualification of Contractor

The application shall be performed by a qualified contractor who has had prior training in applying the materials and who has the equipment required to perform the application.

1.2 Safety Precautions

On site safety standards to apply - reference Thermal Science, Inc. Material Safety Data Sheets.

1.3 Delivery

The THERMO-LAG 330 Fire Barrier System materials shall be delivered to the jobsite on pallets or in original containers which show the product name, color, name of the manufacturer, and in case of bulk material, the expiration date.

1.4 Storage

The THERMO-LAG 330 Fire Barrier System materials shall be stored off the ground when not in use in totally enclosed and weather protected areas provided for this purpose.

The Prefabricated Panels, Preshaped Conduit Sections and Flexi-Blanket do not require any temperature protection. THERMO-LAG 330-1 Trowel Grade and 330-660 Bulk Grade shall be protected against freezing and from temperatures above 100F.

2.0 PREFABRICATED PANEL READY ACCESS DESIGNS FOR CABLE TRAYS

Installation of the Prefabricated Panel Ready Access Design to cable trays involves cutting the number of sections required to form the Fire Barrier from one or three hour fire rated THERMO-LAG Prefabricated Panels, and then mounting the sections on the cable tray to be protected using .020 minimum x .500 minimum stainless steel bending or other approved fasteners. The sequential steps involved in installing this fire barrier design onto the cable trays are described in the following paragraphs.

2.1 Installation of the One Hour Ready Access Fire Barrier Design

- 2.1.1 Cut a piece of material large enough to form the bottom section from a one hour rated Prefabricated Panel. The width of the bottom section shall be equal to the sum of the base and both flanges plus both sides of the cable tray. The length of the bottom section shall not exceed 6.5 feet since longer sections are unwieldy and more difficult to install.
- 2.1.2 Form a rectangular shaped bottom section by making two 90 degree bends which provide for the side panels.
- 2.1.3 Cut a piece of material large enough to form the top section from a one hour rated Prefabricated Panel. The width of the top section shall be equal to the base plus both flanges of the cable tray, plus the thickness of each of the two sides of the bottom rectangular section.

- 2.1.4 Mount the rectangular shaped bottom section on the cable tray using .020 minimum x .500 minimum stainless steel banding as shown in Figure 1. Use a minimum of two (2) bands per section.
- 2.1.5 Attach the flat top section to the installed bottom section using .020 minimum x .500 minimum stainless steel banding as shown in Figure 2. The required maximum spacing between the banding should not exceed 12 inches.
- 2.1.6 Attach additional top and bottom sections to previously installed sections by butt joining them together at their ends.
- 2.1.7 Complete the installation by filling in the edges and joints with THERMO-LAG 330-1 Subliming Material - Trowel Grade.

2.2 Installation of the Three Hour Ready Access Fire Barrier Design

- 2.2.1 Using three hour fire rated Prefabricated Panels, form and mount a three hour ready access Fire Barrier onto the cable trays following the procedures previously described in Steps 2.1.1 through 2.1.7.

3.0 PREFABRICATED PANEL DESIGN FOR JUNCTION BOXES

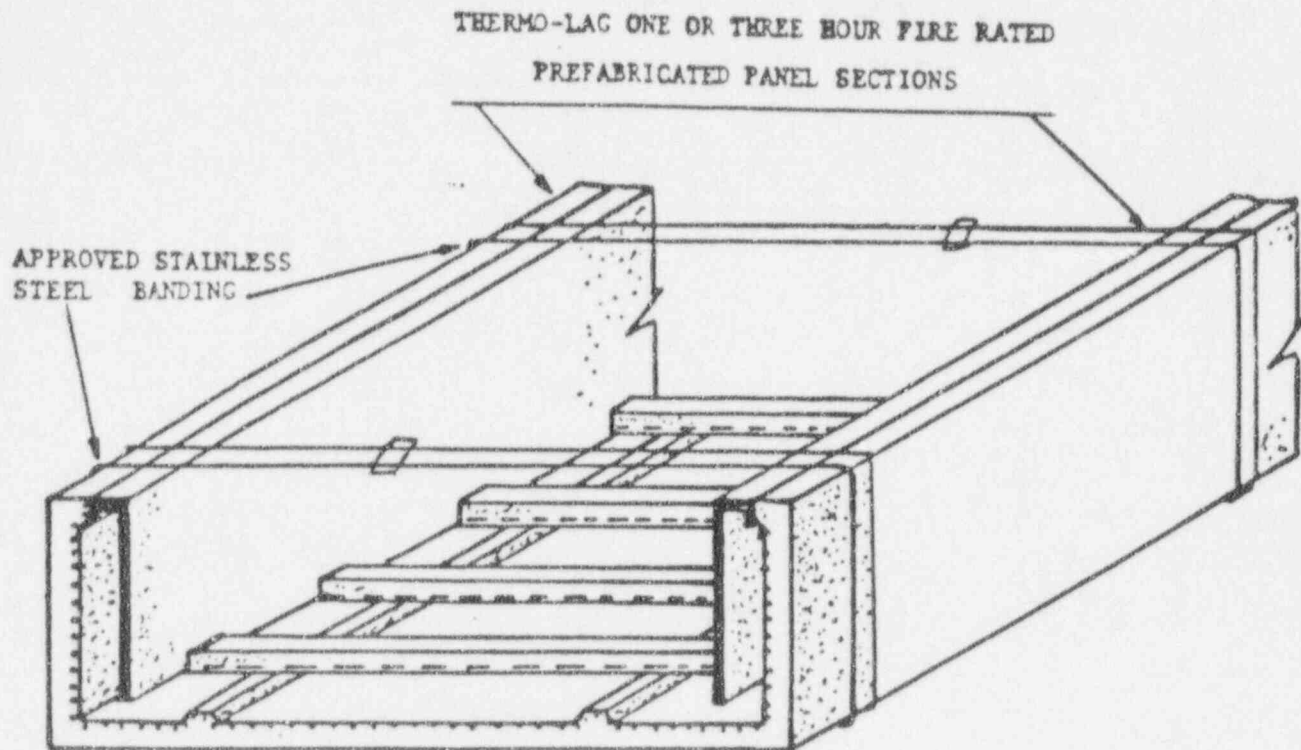
Installation of the Prefabricated Panel Design on a junction box involves cutting sections of one or three hour fire rated THERMO-LAG Prefabricated Panel large enough to provide a rectangular shape around the junction box and then mounting the sections onto the junction box, using .020 minimum x .500 minimum stainless steel banding. The sequential steps involved in installing the fire barrier design are described in the following paragraphs.

3.1 Installation of One Hour Fire Barrier Design

FOR A SURFACE MOUNTED JUNCTION BOX

- 3.1.1 Cut individual sections from a one hour fire rated Prefabricated Panel large enough to form the top, front and bottom panels and when necessary top and bottom flanges of the fire barrier assembly Ref. Figure 3.

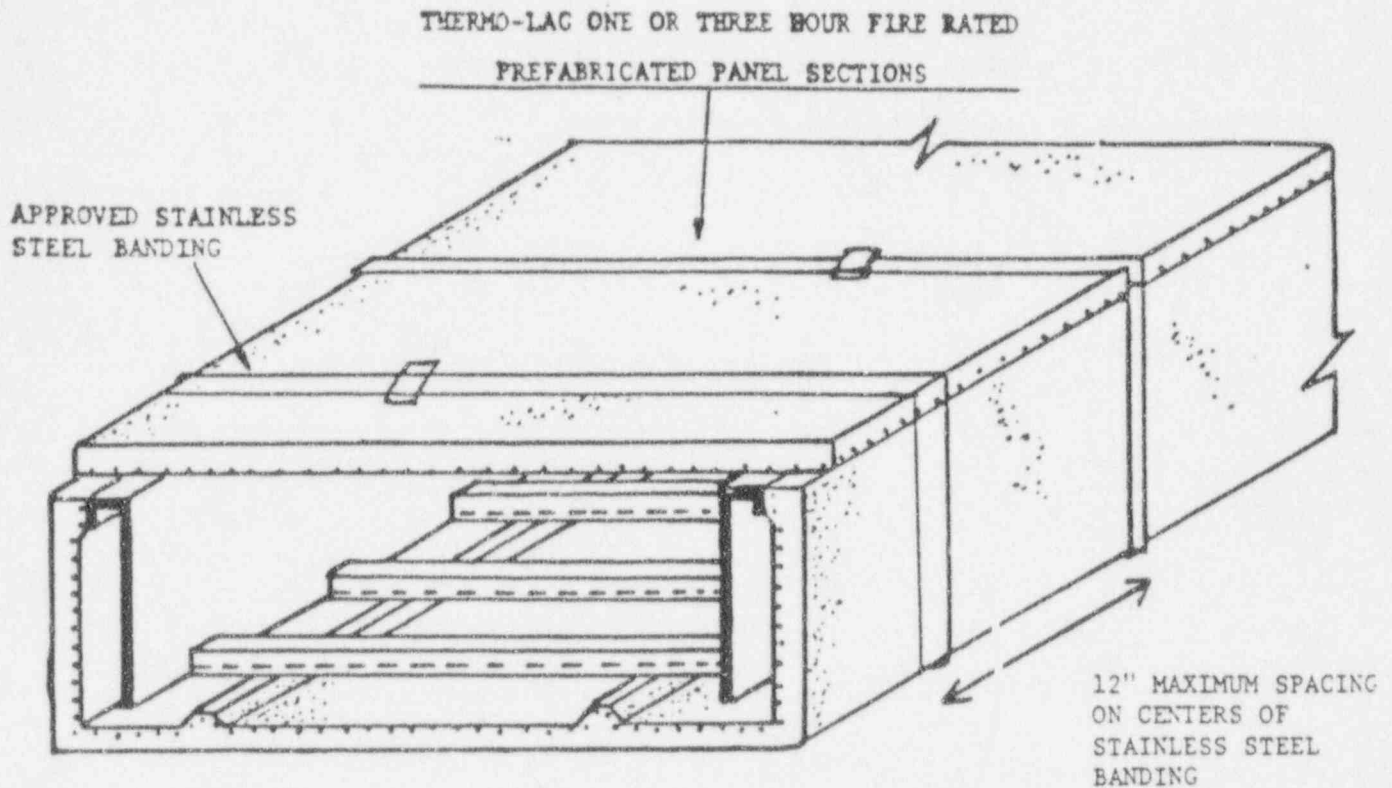
THERMO-LAG 330 FIRE BARRIER SYSTEM
 PREFABRICATED PANEL READY ACCESS DESIGN FOR CABLE TRAYS
 LADDER TRAY - BOTTOM SECTION DETAILS



"TYPICAL" INSTALLATION DETAILS

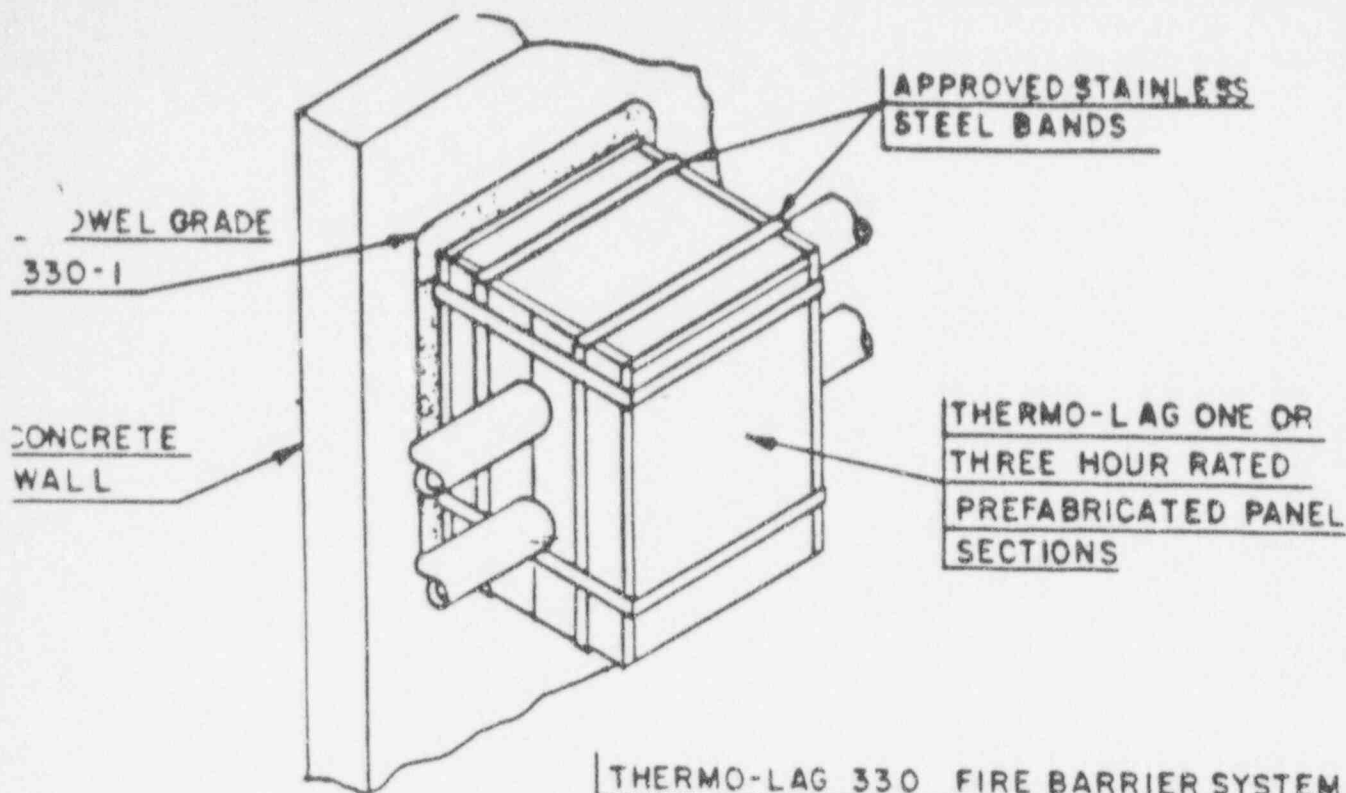
TSI, INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
NO. 512 NONE	APPROVED BY: <i>[Signature]</i>	DESIGNED BY: J. DUMPLIS
DATE: 2-6-84.	DRAWN BY:	
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL READY ACCESS DESIGN FOR CABLE TRAYS (1 HOUR OR 3 HOUR) LADDER TRAY - BOTTOM SECTION DETAILS		
		FIGURE 1

THERMO-LAG 330 FIRE BARRIER SYSTEM
 PREFABRICATED PANEL READY ACCESS DESIGN FOR CABLE TRAYS
 LADDER TRAY FIRE BARRIER ASSEMBLY

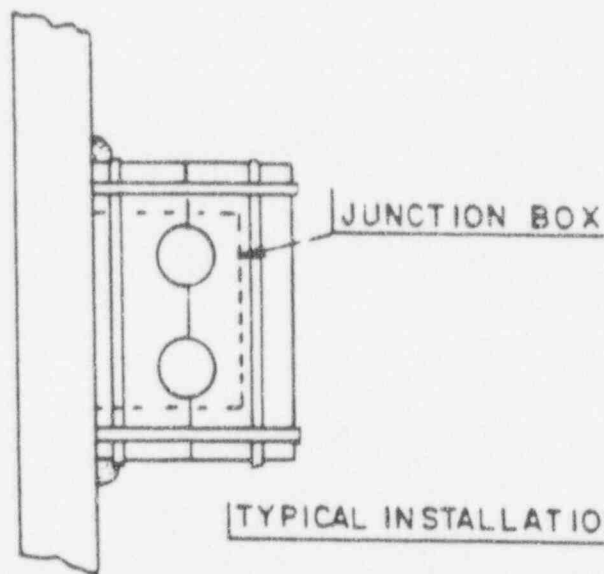


"TYPICAL" INSTALLATION DETAILS

TSI, INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	DRAWN BY: <i>[Signature]</i>	CHECKED BY: J. DUMPS
DATE: 2-7-84.	2-5	
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL READY ACCESS DESIGN FOR CABLE TRAYS (1 HOUR OR 3 HOUR) LADDER TRAY FIRE BARRIER ASSEMBLY		
		FIGURE 2



THERMO-LAG 330 FIRE BARRIER SYSTEM
PREFABRICATED PANEL DESIGN FOR JUNCTION
BOXES. JUNCTION BOX IS SURFACE MOUNTED

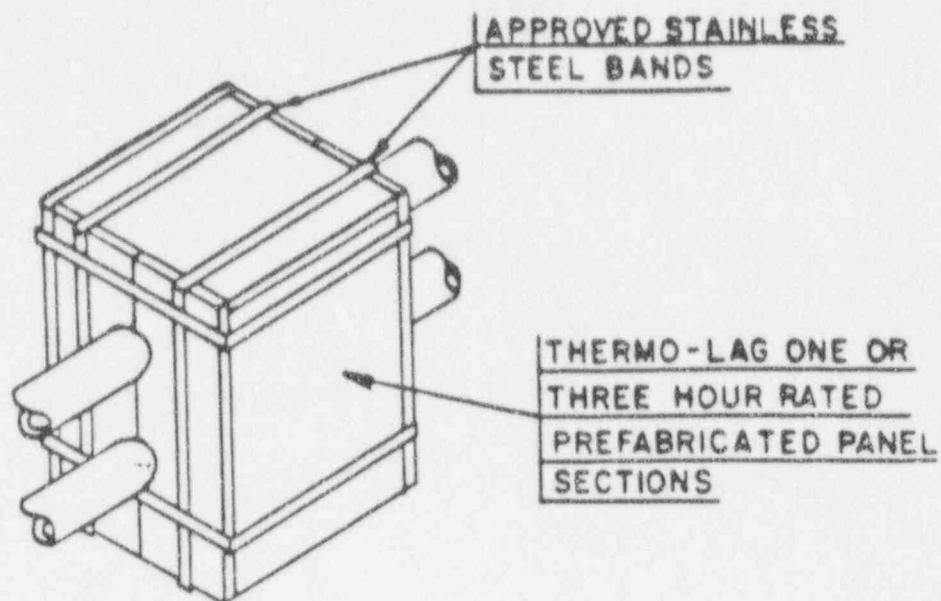


TST 2200 CASSENS DRIVE ST LOUIS, MISSOURI 63026		
SCALE NONE	APPROVED BY	DATE 8-1 DUNE 15
DATE 10-7-85		REVISION
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL DESIGN FOR SURFACE MOUNTED JUNCTION BOX (1 HOUR OR 3 HOUR)		
		FIGURE 3

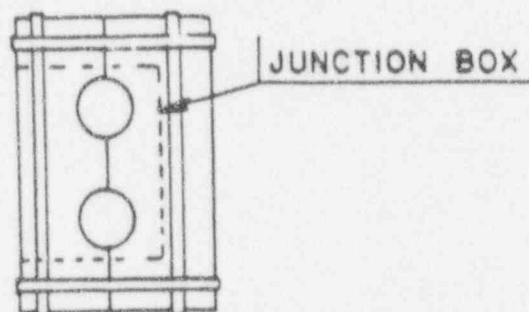
- 3.1.2 When attached to wall score the Prefabricated Panel section to shape the top, front and bottom panels and two flanges of the fire barrier enclosure
- 3.1.3 When attached to wall form the top, front and bottom panels and top and bottom flanges by making 90 degree bends
- 3.1.4 Cut two sections from a one hour fire rated Prefabricated Panel for the side panels of the fire barrier enclosure. Cut holes for conduit penetrations in the top, front and bottom panels as required and then cut the panel or panels into two pieces to facilitate installation around the conduit. Mount the side panels on the installed top, front and bottom section enclosure using the .020 minimum x .500 minimum stainless steel banding
- 3.1.5 When stainless steel banding can be used around junction box wall in all directions flanges attached to the wall need not be used. Complete the installation by filling all edges and joints with THERMO-LAG 330-1 Subliming Material - Trowel Grade

FOR A JUNCTION BOX NOT SURFACE MOUNTED

- 3.1.6 Cut individual sections from a one hour fire rated Prefabricated Panel large enough to form the top, front and bottom panels of the fire barrier assembly. The width of the section shall be equal to the width of the junction box plus an additional 1/4 inch to provide for sufficient clearance when installed. The length shall be equal to the sum of the top, front and bottom of the junction box plus an additional 1/2 inch to provide sufficient clearance when installed. Ref. Figure 4
- 3.1.7 Cut another section from a one hour fire rated Prefabricated Panel large enough to form the side and back of the fire barrier assembly. Cut holes for conduit penetrations in the side and back panels as required and then cut the panel or panels into two pieces to facilitate installation around the conduit.



THERMO-LAG 330 FIRE BARRIER SYSTEM
PREFABRICATED PANEL DESIGN FOR JUNCTION
BOXES. JUNCTION BOX NOT SURFACE MOUNTED



TYPICAL INSTALLATION DETAILS

TST <small>TST, INC.</small>		2200 CASSENS DRIVE	
		ST. LOUIS, MISSOURI 63026	
SCALE NONE	APPROVED BY	DRAWN BY DUNEIS	
DATE 10-7-85		REVISED	
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL DESIGN FOR JUNCTION BOXES WHICH ARE NOT SURFACE MOUNTED			
			FIGURE 4

3.1.8 Mount the fire barrier sections on the junction box and fasten the two sections together using .020 minimum x .500 minimum stainless steel banding.

3.1.9 Complete the installation by filling all edges and joints with THERMO-LAG 330-1 Subliming Material - Trowel Grade.

3.2 Installation of Three Hour Fire Barrier Design

3.2.1 Using a three hour fire rated Prefabricated Panel, form and mount a three hour fire barrier enclosure on the junction box following the procedures previously described in Steps 3.1.1 through 3.1.6 for surface mounted Junction Box or in steps 3.1.7 through 3.1.9 for a Junction Box not surfaced mounted.

4.0 PRESHAPED CONDUIT SECTION DESIGN FOR CONDUIT

Installation of the THERMO-LAG Preshaped Conduit Section Design on conduit, involves mounting two of the semi-circular preshaped conduit sections at a time, and fastening them together using .020 minimum x .500 minimum stainless steel banding. The sequential steps involved in installing this fire barrier design are described in the following paragraphs.

4.1 Installation of One Hour Fire Barrier Design

4.1.1 Precast the edges on one of the one hour fire rated THERMO-LAG Preshaped Conduit sections with a one quarter to a one half inch bead of THERMO-LAG 330-1 Subliming Material - Trowel Grade.

- 4.1.2 Mount the coated section and one other one hour fire rated section on the conduit with the edges flush with each other to form a cylindrical section around the conduit. Fasten the two sections together using .020 minimum X .500 minimum stainless steel banding installed at 12 inch intervals, maximum, as shown in Figure 5.
- 4.1.3 Apply a one quarter to one half inch bead of THERMO-LAG 330-1 Subliming Material - Trowel Grade to the end of the installed section, and attach the next section making sure that the ends are butted and flush.

AS AN OPTION

- 4.1.4 Assemble two one hour Preshaped Conduit Sections on the conduit without preapplication of the THERMO-LAG 330-1 Subliming Material - Trowel Grade to the edges and end joints. After installation, fill in all gaps or openings at the edges or joints with THERMO-LAG 330-1 Subliming Material - Trowel Grade.

4.2 Installation of Three Hour Fire Barrier Design

- 4.2.1 Using the three hour fire rated THERMO-LAG Preshaped Conduit Sections, install a three hour fire barrier on the conduit following the procedures previously described in Steps 4.1.1 through 4.1.3.

AS AN OPTION

- 4.2.2 Using the three hour fire rated Preshaped Conduit Section, install a three hour fire barrier on conduit following the procedure described in Step 4.1.4.

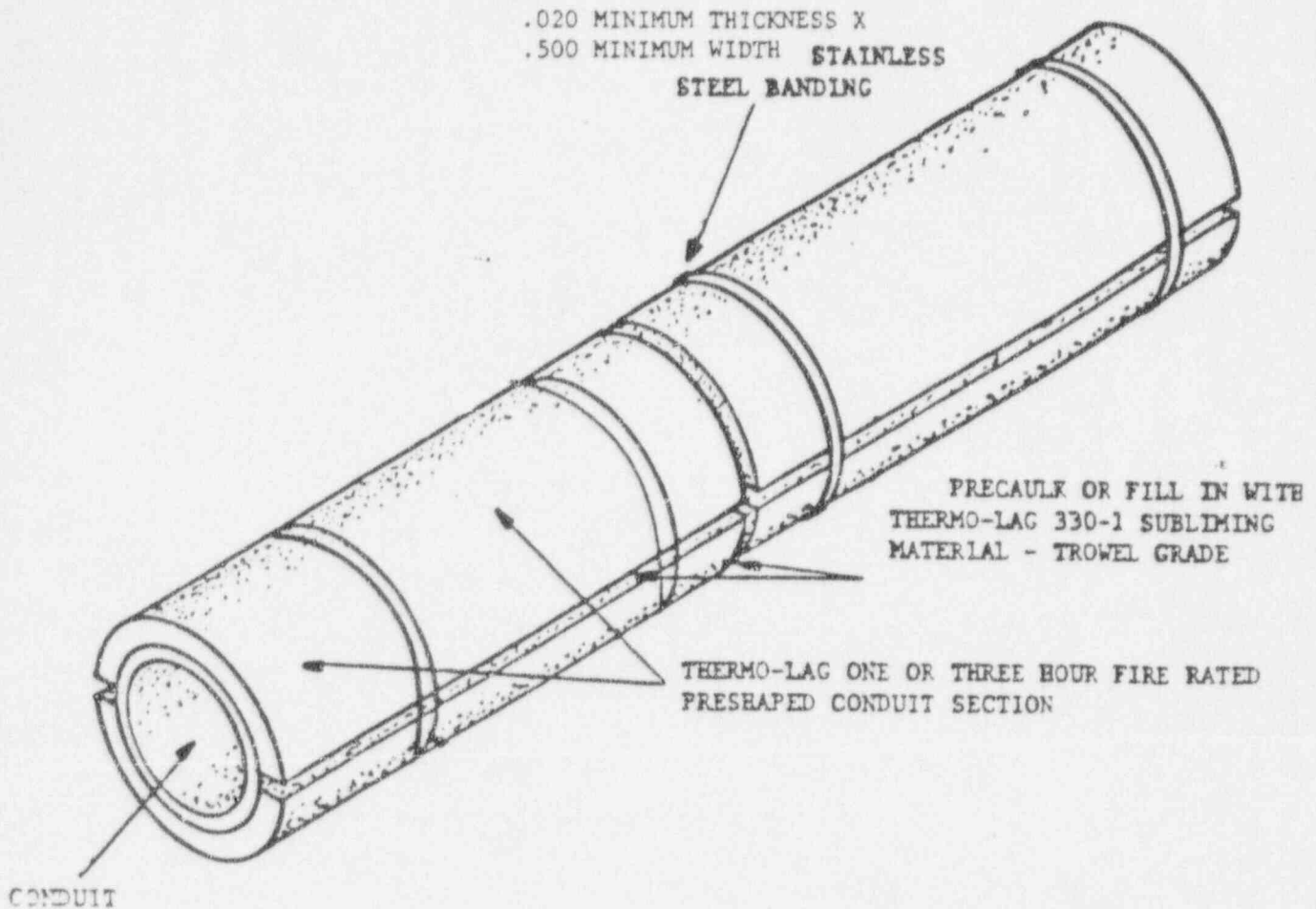
5.0 PREFABRICATED PANEL DESIGN FOR TWO OR MORE CONDUITS

Installation of the Prefabricated Panel Design on two (2) or more conduits involved cutting and forming box sections from one hour or three hour fire rated THERMO-LAG Prefabricated Panels, and then mounting the sections on the conduits to be protected, using .020 minimum x .500 minimum stainless steel banding or other approved fasteners. The sequential steps involved in installing this fire barrier design are described in the following paragraphs.

5.1 Installation of One Hour Fire Barrier Design

- 5.1.1 Cut two equal sections from a one hour fire rated Prefabricated Panel which are large enough to enclose the conduits. The width of each section shall be equal to two times the outer diameter of the conduits. The length shall not exceed 6.5 feet since longer sections are unwieldy and more difficult to install.
- 5.1.2 Form the two sided bottom fire barrier section, with the Stress Skin side facing inward, by making a 90 degree bend at the middle of the first section.
- 5.1.3 Form the two sided top fire barrier section, with the Stress Skin side facing inward, by making a 90 degree bend at the middle of the first section.
- 5.1.4 Mount the top and bottom fire barrier sections on the conduits to form a box design and then fasten the two sections together, using .020 minimum x .500 minimum stainless steel banding as shown in Figure 6.
- 5.1.5 Attach additional top and bottom fire barrier sections to previously installed sections by butt joining them together at their ends.
- 5.1.6 Complete the installation by filling in the edges and joints with THERMO-LAG 330-1 Subliming Material - Trowel Grade.

THERMO-LAG 330 FIRE BARRIER SYSTEM
PRESHAPED CONDUIT SECTION DESIGN
FOR CONDUIT

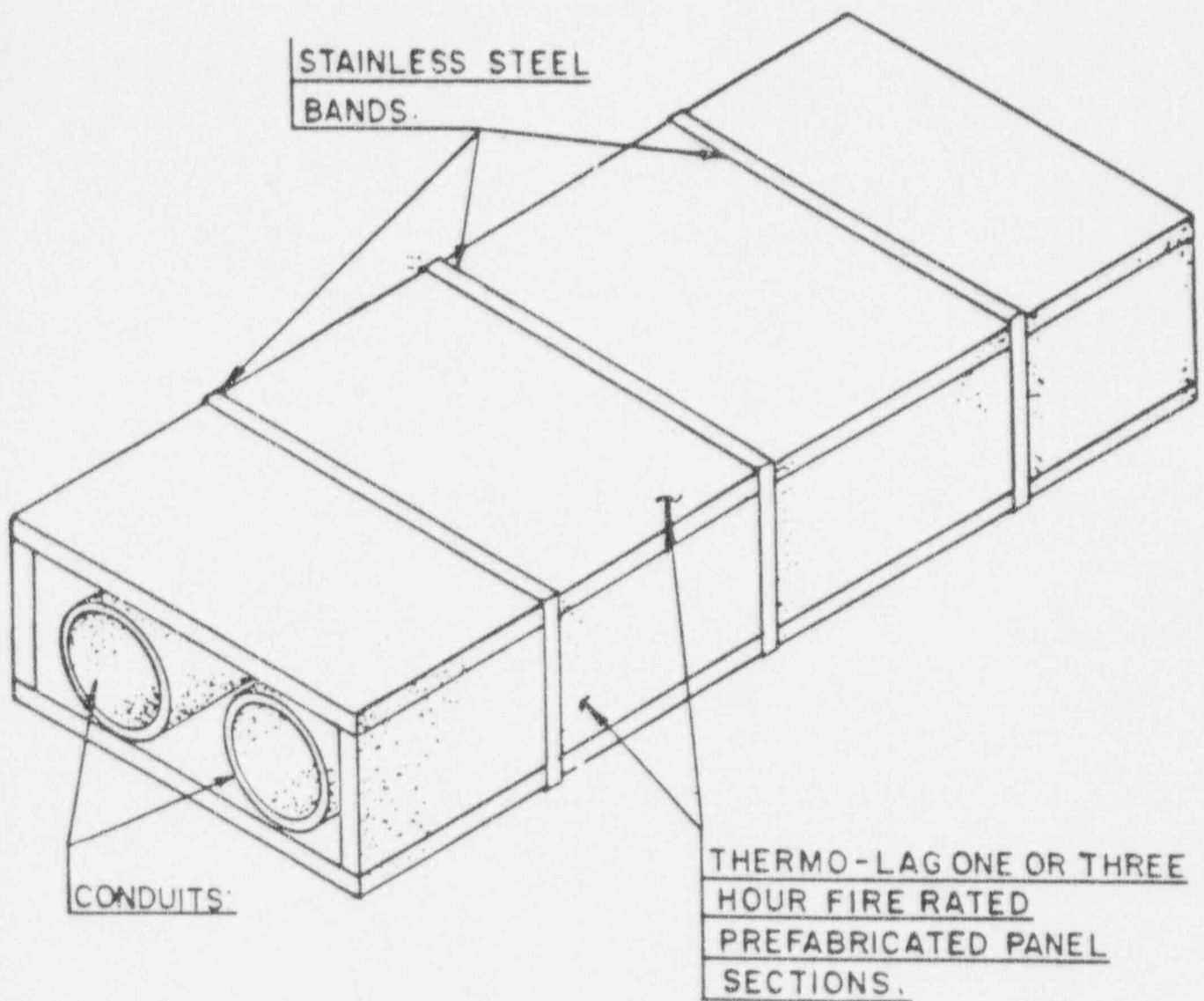


"TYPICAL" INSTALLATION DETAILS

2-11

TST, INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	APPROVED BY: <i>[Signature]</i>	DESIGNED BY: J. DUNN
DATE: 2-7-84	CHECKED:	
THERMO-LAG 330 FIRE BARRIER SYSTEM PRESHAPED CONDUIT DESIGN FOR CONDUITS (1 HOUR OR 3 HOUR)		
FIGURE 5		REVISIONS:

THERMO-LAG 330 FIRE BARRIER SYSTEM
PREFABRICATED PANEL DESIGN FOR CONDUITS



TST TST, INC.		2200 CASSENS DRIVE ST. LOUIS, MISSOURI 63026	
SCALE NONE	APPROVED BY	DRAWN BY DUMFRIES	
DATE 10-7-85		REVISED	
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL DESIGN FOR 2 OR MORE CONDUITS (1 HOUR OR 3 HOUR)			
			DRAWING NUMBER FIGURE 6

5.2 Installation of Three Hour Ready Access Fire Barrier Design

- 5.2.1 Using three hour fire rated Prefabricated Panels, form and mount a three hour fire barrier on conduits following the procedure previously described in Steps 5.1.1 through 5.1.6

6.0 INTERFACES

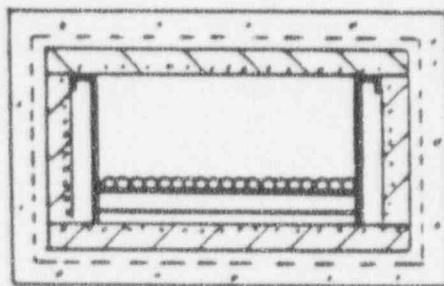
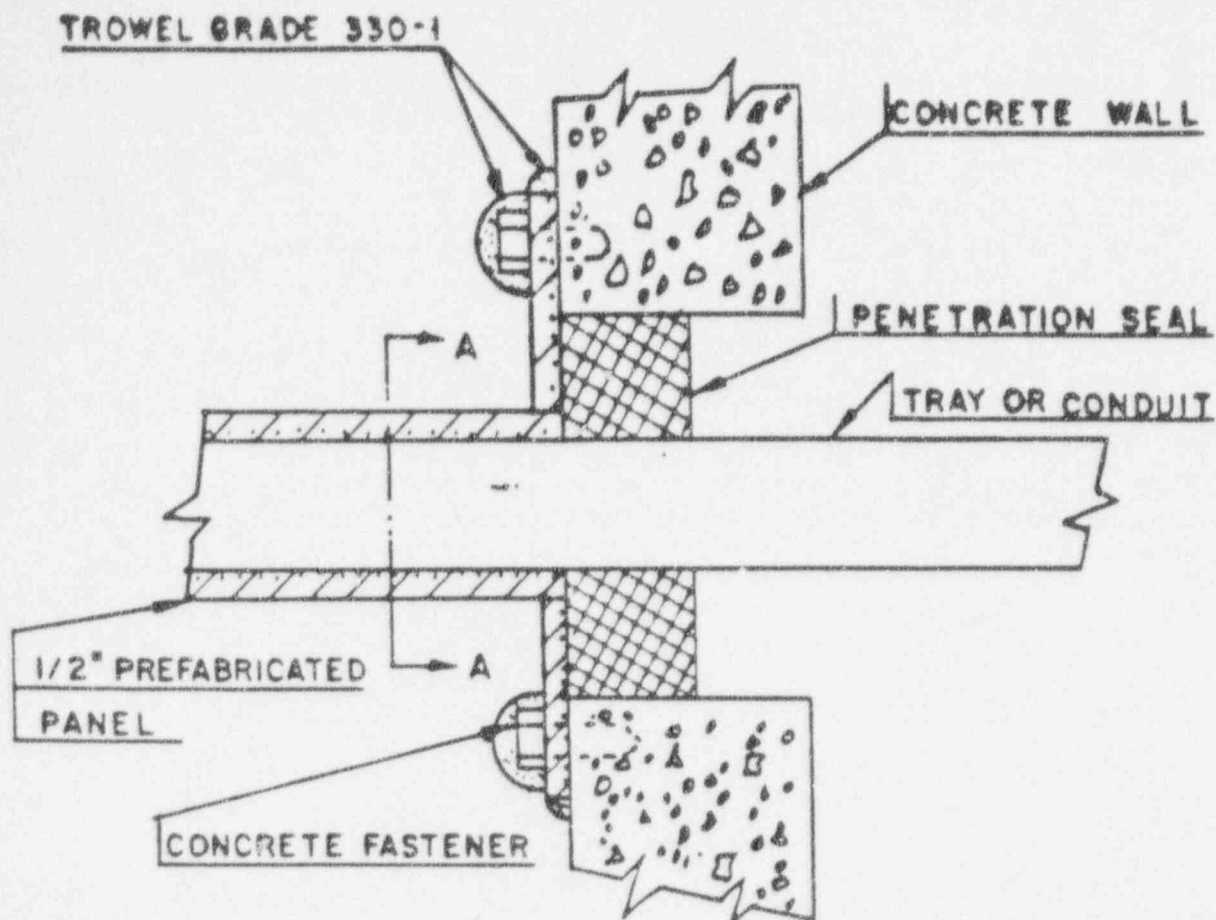
Installation of cable tray and conduit interfaces with penetration seals, walls, ceilings, and other raceways is accomplished using either Prefabricated Panel or direct trowel on methods. Typical installations using these methods are briefly described and illustrated in the following paragraphs.

6.1 Installation of One or Three Hour Interfaces Between a Cable Tray or Conduit and a Penetration Seal

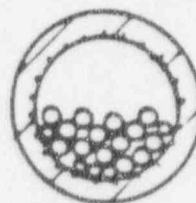
- 6.1.1 Cut and form a box shaped and flanged section from a one or three hour rated Prefabricated Panel as is shown in Figures 7 and 8. The minimum height of the flange shall be sufficient to cover the wall opening and accomodate approved concrete fasteners.
- 6.1.2 Mount the four sided and flanged section, installed at 12 inch intervals maximum, and two per flange minimum, on the cable tray or conduit using approved concrete fasteners to fasten the section to the concrete wall. The concrete fasteners shall be site approved anchors of 1/4 inch diameter. All concrete anchors must conform to field construction procedures FCP-103 for installation. FCP should be reviewed to ensure that material will not be damaged. Use .020 minimum x .500 minimum stainless steel banding installed at 12 inch maximum intervals to secure the four sided section.

6.2 Installation of One or Three Hour Self Supporting Interface Between Conduit and a Wall or Ceiling

- 6.2.1 Cut and form a three sided and flanged section from a one or three hour rated prefabricated panel as shown in Figures 9 and 10. The minimum height of the flange shall be sufficient to provide for the concrete fasteners.

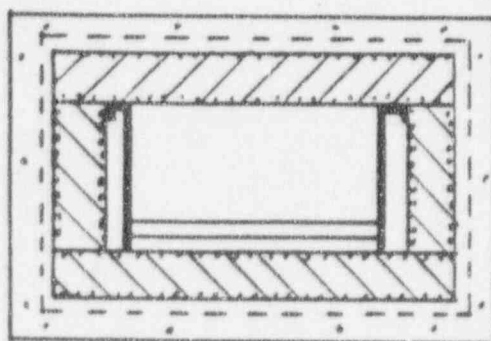
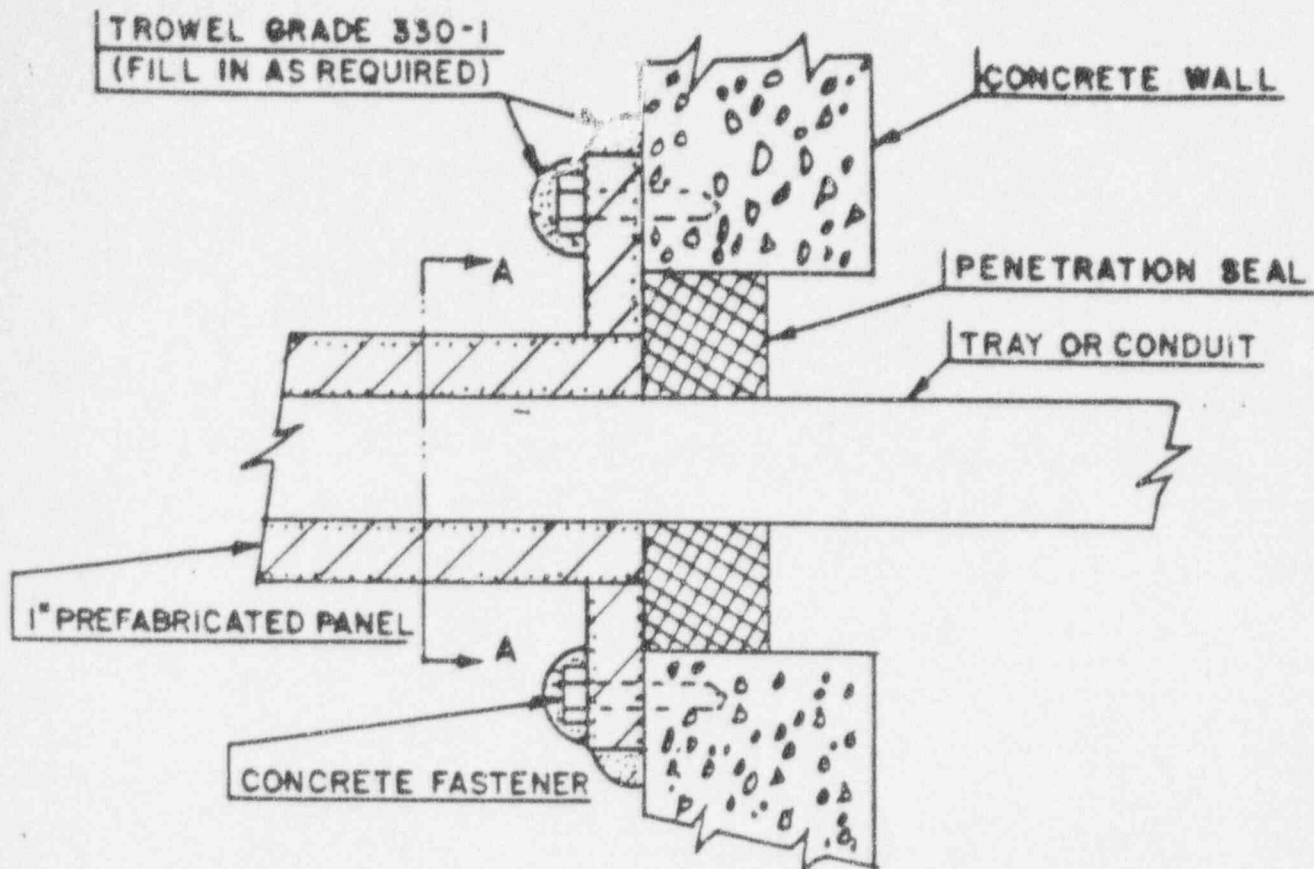


TRAY
SECTION A - A

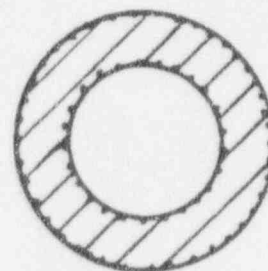


CONDUIT
SECTION A - A

TST TST, INC.		2200 CASSENS DRIVE	
		ST LOUIS, MISSOURI 63026	
SCALE NONE	APPROVED BY	DRAWN BY DUMFRIES	
DATE 10-7-85		REVISION	
THERMO-LAC 330-1 FIRE BARRIER MATERIAL-1 HOUR 2-15 1/2" MINIMUM PREFABRICATED PANEL-TYPICAL FACEWAY INTERFACING WITH PENETRATION SEAL			
			FIGURE 7

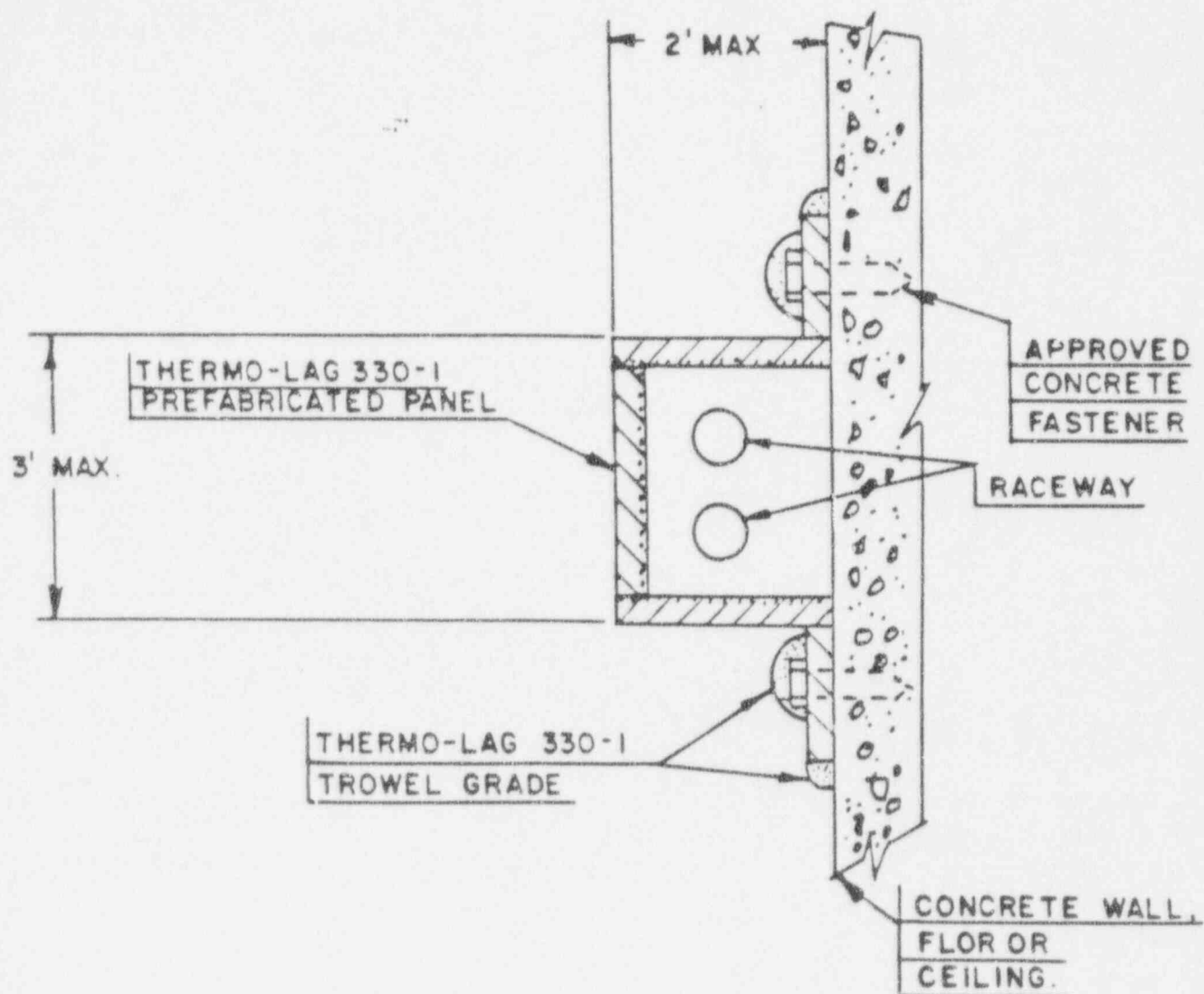


TRAY
SECTION A-A

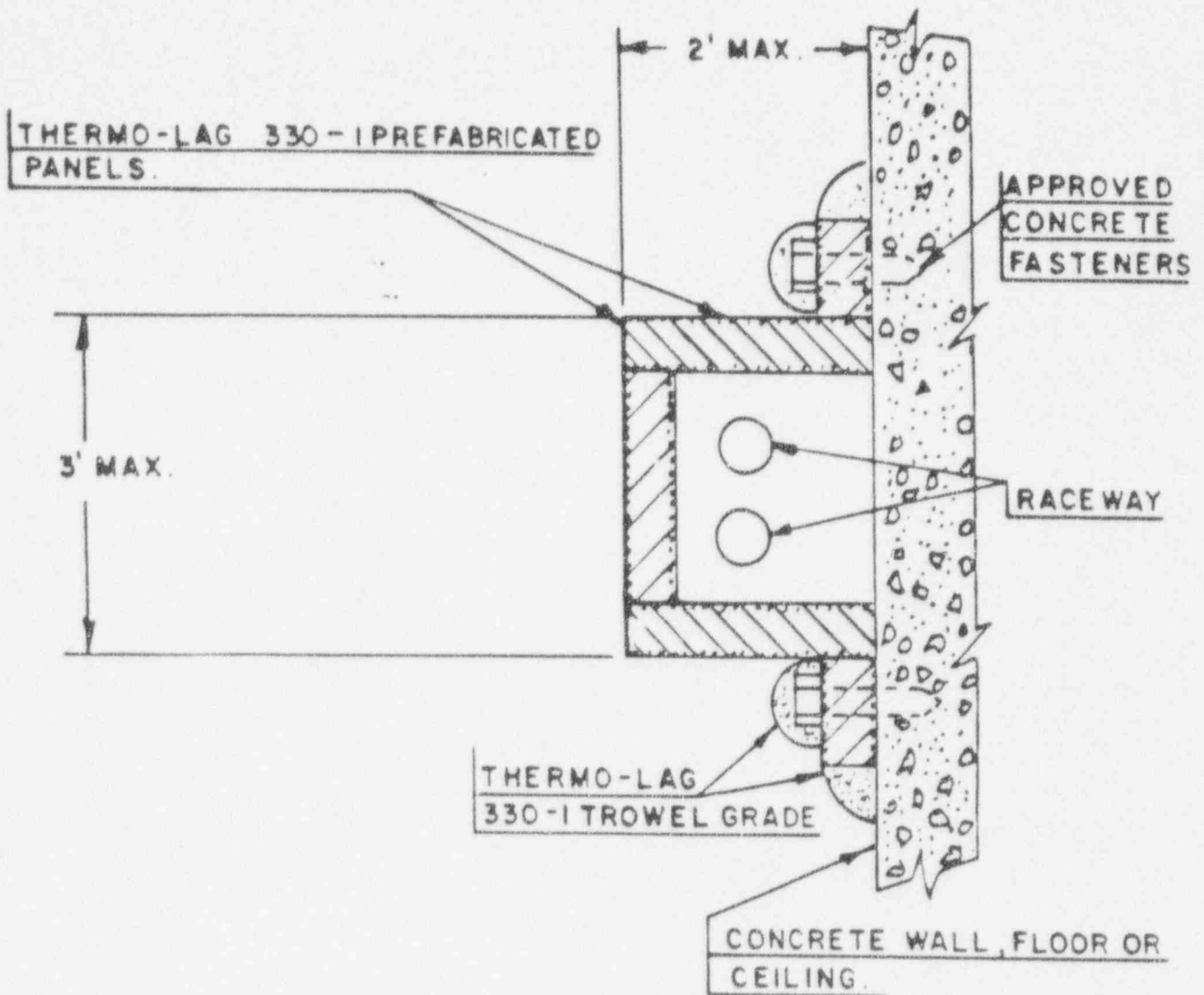


CONDUIT
SECTION A-A

TST		2200 CASSENS DRIVE	
TST, INC.		ST. LOUIS, MISSOURI 63026	
SCALE NONE	APPROVED BY	DRAWN BY DUFF-15	
DATE 10-7-85		REVISED	
THERMO-LAG 330-1 FIRE BARRIER MATERIAL-3 HOUR			
1" MINIMUM PREFABRICATED PANEL-TYPICAL RACEWAY			
INTERFACING WITH PENETRATION SEAL			FIGURE 8



TST <small>TRUSTEES</small>		2200 CASSENS DRIVE	
		ST LOUIS, MISSOURI 63026	
SCALE NONE	APPROVED BY	DRAWN BY DUBOIS	
DATE 10-7-85		REVISIT	
THERMO-LAG 330-1 FIRE BARRIER MATERIAL-1 HOUR			
1" MINIMUM PREFABRICATED PANEL-SELF SUPPORTING			
SYSTEM FOR CONDUITS			
			FIGURE 9



2-18

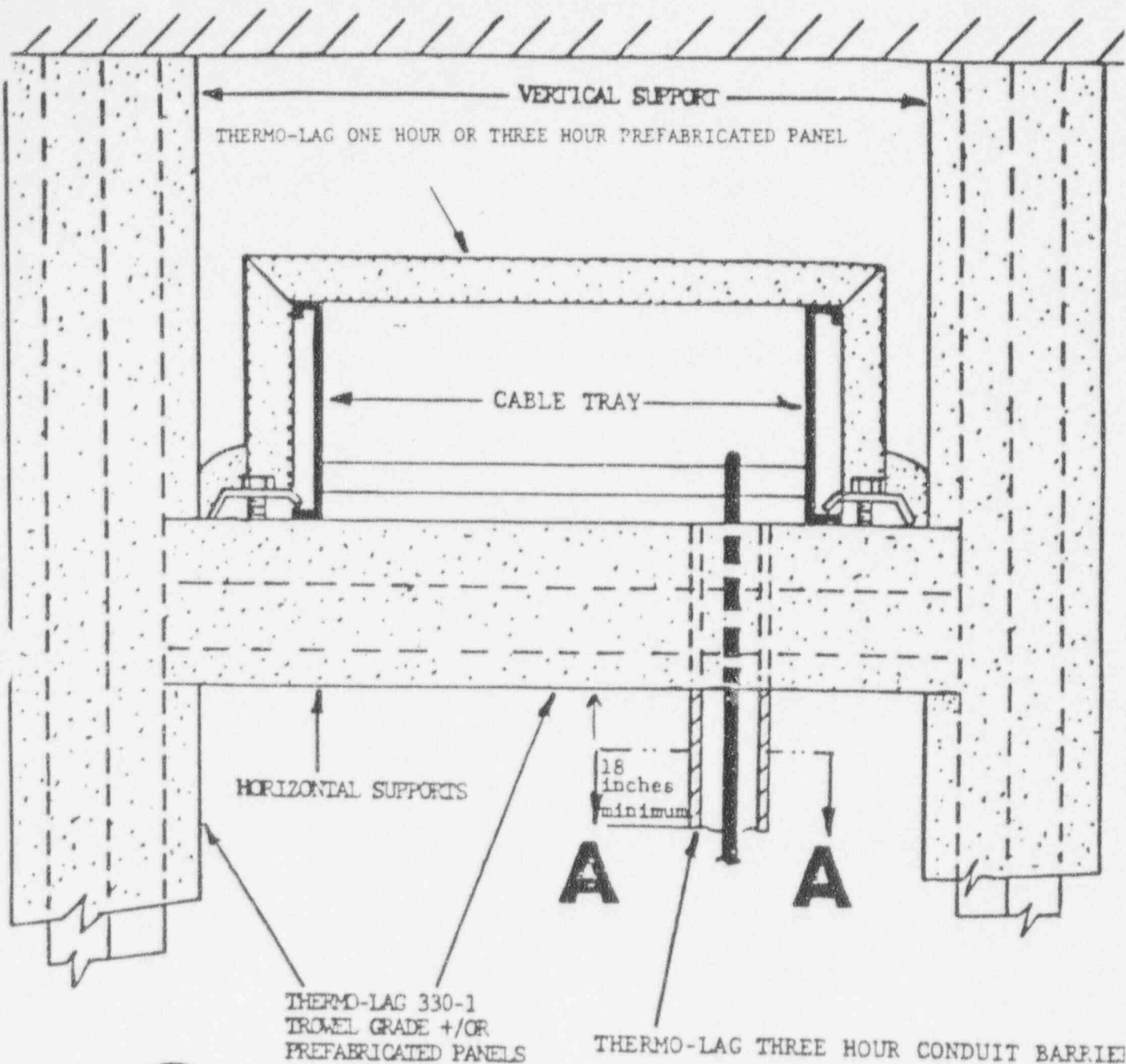
TSI 2200 CASSENS DRIVE ST LOUIS, MISSOURI 63026	
SCALE NONE DATE 10-7-85	APPROVED BY DRAWN BY DAVIS REVISED
THERMO-LAG 330-1 FIRE BARRIER MATERIAL- 3 HOUR 1" MINIMUM PREFABRICATED PANEL SELF-SUPPORTING... SYSTEM FOR CONDUITS	
FIGURE 10	

- 6.2.2 Mount the three sided end flanged section on the conduit using approved concrete fasteners to secure the section to the wall or ceiling. The fasteners should be installed at 12 inch maximum intervals with a minimum of 2 fasteners per flange. The concrete fasteners shall be site approved anchors of 1/4 inch diameter. All concrete anchors must conform to field construction procedures FCP-103 for installation. FCP should be reviewed to ensure that material will not be damaged.
- 6.2.3 Apply a coating of THERMO-LAG 330-1 Subliming Material - Trowel Grade in a nominal dry film thickness of 1/2" - 0 + 1/8" for one hour protection and 1" - 0 + 1/4" for three hour protection to the edges and joints of the installed section using a trowel or stiff bristle brush to fill in any gaps or holes.
- 6.3 Installation of One or Three Hour Interface Between a Cable Tray, a Rigid Conduit, Flex Conduit or Cable Drop
- 6.3.1 Install a one hour or three hour fire rated Prefabricated Panel Ready Access Design on the cable tray following the instructions given in Section 2.0 Ref. Figure 11.
- 6.3.2 Install a one hour or three hour fire rated Preshaped Conduit section on a conduit penetrating a cable tray fire barrier for a minimum distance of eighteen inches from the point of penetration in accordance with Section I, 4.0.B, page 1-5.

7.0 REPAIR PROCEDURES

The repair of a damaged section in a THERMO-LAG 330 Fire Barrier is easily accomplished by cutting out and removing the damaged material and then filling in the cut out section with new material.

The first step in this procedure is to remove the damaged and loose material using a knife and scraper. Care should be exercised that the damaged material is cut back until sound adhering material is reached.



SECTION **A-A**

2-20

TST		3260 BRANNON AVENUE, ST LOUIS	
MISSOURI 63104		MISSOURI 63104	
WALL NONE	DATE 3-19-84	DESIGNED BY <i>R. A. Lohman</i>	CHECKED BY <i>D. J. DUBOIS</i>
THERMO-LAG 330-1 FIRE BARRIER MATERIAL-1 HOUR		MINIMUM PREFABRICATED PANEL OR 3 HOUR 1"	
MINIMUM PREFABRICATED PANEL-TYPICAL		CABLE TRAY AND SUPPORT	
		FIGURE 11	

The next step is to undercut the edges around the cut out section to form a beveled edge. All foreign matter is then removed from the exposed substrate surface in the cut out section.

Finally, the THERMO-LAG 330 Subliming Material is troweled into the cut out section. If necessary, several coats can be applied to achieve the desired film thickness. Care should be taken to allow for shrinkage of the repair patch by building up a slight dome shape on the surface of the patch. If the damage to the THERMO-LAG 330 Fire Barrier is significant, replace the entire damaged section with a new section using the related instructions outlined in this manual.

8.0 CABLE REPLACEMENT PROCEDURES

The replacement of a cable in a THERMO-LAG 330 Fire Barrier is accomplished by removing sections of the fire barrier, replacing the cable, and then reinstalling the sections.

The first step in this procedure is to remove the required number of fire barrier sections by cutting away the material at the edges and the butt flanges.

Next, the .020 minimum x .500 minimum stainless steel banding are cut and the fire barrier section removed from the cable raceway.

After the defective cable has been replaced, the fire barrier sections are reinstalled using .020 minimum x .500 minimum stainless steel banding in accordance with the related instructions outlined in this manual. A coating of THERMO-LAG 330-1 Subliming Material - Trowel Grade is then applied in the specified wet thickness to the edges and joints of the reinstalled sections using a trowel or stiff bristle brush to fill in any uncoated areas.

9.0 POST APPLICATION PRACTICES

A clean and orderly condition shall be maintained in the installation area. Following the application, all debris and equipment shall be removed and the area left in a condition acceptable to the owner.

TSI TECHNICAL NOTE 20684-BV

THERMO-LAG 330 FIRE BARRIER SYSTEM

INSTALLATION PROCEDURES MANUAL

NUCLEAR PLANT APPLICATIONS

SECTION III

TECHNICAL DOCUMENTATION

REQUIRED ON SITE QUALITY

CONTROL PROCEDURE

The following is a required quality control procedure to be followed on site in the installation of the THERMO-LAG 330 Fire Barrier System.

RECEIVING PROCEDURES

1. Prefabricated Panels and Preshaped Conduit Sections
 - a. Make a visual inspection for damage.
2. THERMO-LAG 330-1 Subliming Compound
 - a. Make a visual inspection for damage.
 - b. Read temperature recorder strip chart to verify that temperature limitations were not exceeded.

INSTALLATION PROCEDURES

1. Insure that the proper one hour or three hour fire barrier design has been installed.
2. Check to see that the protected entity is completely enveloped.
Note: A concrete surface, such as a wall, ceiling or floor, can be a part of the envelope.
3. Check to see that the primary structural support of the protected entity is coated with the designated thickness to the point of attachment.
4. Insure that all seams and joints are filled and sealed with THERMO-LAG 330-1 Trowel Grade in order to prevent flame penetration into the envelope system.

5. Check to see that all fasteners, such as bonding, nuts and bolts, and concrete fasteners are of the proper type and spacing.
6. Insure that all penetrations into the envelope are protected for a minimum of 18 inches from the envelope with the same fire rating as envelope

INSTALLATION PROCEDURES FOR
ONE AND THREE HOUR FIRE RATED DESIGNS OF THE
THERMO-LAG 330-660 FLEXI-BLANKET THERMAL BARRIER SYSTEM FOR
FLEX CONDUIT AND CABLE DROPS

1.0 INTRODUCTION

This procedure sets forth the sequential steps involved in installing the one or three hour fire rated designs of the THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier on flex conduit and cable drops.

The THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier is a subliming, high temperature, heat blocking, flexible thermal barrier. It is reinforced on both sides with a low density fiberglass cloth, further implemented by a heat blocking thermal catalyzer.

The one hour fire rated design of the THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier System is comprised of two (2) each 0.250 inch nominal thickness layers. The three hour fire rated design of the THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier is comprised of five (5) each 0.250 inch nominal thickness layers. THERMO-LAG Fire Retardant Adhesive is used to seal the overlap seams of the Flexi-Blanket layers and THERMO-LAG 330-660 Bulk Grade Material is used to fill all joints and openings.

2.0 INSTALLATION PROCEDURES

2.1 One Hour Fire Rated Design

Installation of the one hour fire rated design of the THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier System on flex conduit and cable drops is accomplished by using a blanket. The steps involved in installing each of these two systems are set forth in the following paragraphs.

2.1.1 Blanket Wrap Installation

- 2.1.1.1 Cut the first blanket wrap layer from a sheet of THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier material in the width required to overlap the diameter of the flex conduit and cable drops by at least two (2) inches. The length of the first layer shall be sufficient to enclose the total or a portion of the total length of the flex conduit or cable drops.
- 2.1.1.2 Wrap the first layer of the Flexi-Blanket material around the flex conduit or cable drops taking care to overlap the material by at least two (2) inches.
- 2.1.1.3 Secure the first layer of the Flexi-Blanket material to the flex conduit or cable drops using .020 minimum x .500 minimum stainless steel banding material installed at twelve (12) inch intervals.
- 2.1.1.4 Cut and install additional first layers of Flexi-Blanket material in the same manner as described in Steps 2.1.1.1 through 2.1.1.3, taking care to butt join the first layer pieces.
- 2.1.1.5 Cut the second blanket wrap layer from a sheet of THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier material in the width required to overlap the installed first layer by at least two (2) inches. The length of the second layer shall be at least four (4) inches less than the first layer to provide for an adequate overlap when installing an additional second layer over the first layer.
- 2.1.1.6 Wrap the second layer of the Flexi-Blanket material around the installed first layer taking care to overlap the material by at least two (2) inches, and locate the overlap 180 degrees opposite from that of the first layer.
- 2.1.1.7 Seal the overlapped seam using THERMO-LAG Fire Retardant Adhesive.
- 2.1.1.8 Secure the second layer of the Flexi-Blanket material around the first layer using .020 minimum x .500 minimum stainless steel banding material installed at twelve (12) inch intervals.

2.1.1.9 Cut and install additional second layers of Flexi-Blanket material in the same manner as described in Steps 2.1.1.5 through 2.1.1.7, taking care to butt join the second layer pieces and to secure the butt joint using .020 minimum x .500 minimum stainless steel banding

2.1.1.10 Fill in any gaps and joints with the THERMO-LAG 330-660 Bulk Grade Material.

2.2 Three Hour Fire Rated Design

Installation of the three hour fire rated design of the THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier System on flex conduit and cable drops is accomplished by using a blanket. The steps involved in installing this system is set forth in the following paragraphs.

2.2.1 Blanket Wrap Installation

2.2.1.1 Cut the first blanket wrap layer from a sheet of THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier material in the width required to overlap the diameter of the flex conduit or cable drop by at least two (2) inches. The length of the first layer shall be sufficient to enclose the total or a portion of the total length of the flex conduit or cable drop.

2.2.1.2 Install the first blanket wrap layer of Flexi-Blanket material in the same manner as described in Steps 2.1.1.2 through 2.1.1.3 for the one hour fire rated design.

2.2.1.3 Cut the second blanket layer of Flexi-Blanket material in the width required to overlap the installed first layer by at least two (2) inches. The length of the second layer shall be at least four (4) inches less than the first layer to provide for an adequate overlap when installing an additional second layer over the first layer.

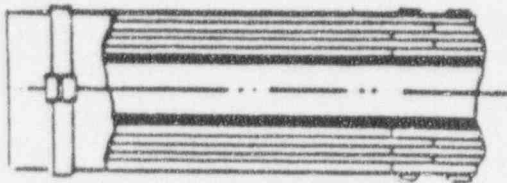
2.2.1.4 Install the second blanket wrap layer of Flexi-Blanket material in the same manner as the first layer described in Steps 2.1.1.5 through 2.1.1.8 except eliminating sealing the overlapped seams with the THERMO-LAG Fire Retardant Adhesive.

- 2.2.1.5 Install the third blanket wrap layer of Flexi-Blanket material in the same manner as the second layer described in Steps 2.1.1.5 through 2.1.1.8 except eliminating sealing the overlapped seams with the THERMO-LAG Fire Retardant Adhesive and positioning the overlap 90 degrees from that of the second layer.
- 2.2.1.6 Install the fourth blanket wrap layer of Flexi-Blanket material in the same manner as the second layer described in Steps 2.1.1.5 through 2.1.1.8 except eliminating sealing the overlapped seam with the THERMO-LAG Fire Retardant Adhesive and positioning the overlap 180 degrees from that of the third layer.
- 2.2.1.7 Install the fifth blanket wrap layer of Flexi-Blanket material in the same manner as the first layer described in Steps 2.1.1.1 through 2.1.1.3 of the one hour fire rated design except positioning the overlap 90 degrees from that of the fourth layer and sealing the overlapped seam with THERMO-LAG Fire Retardant Adhesive. Be sure that one .020 minimum x .500 minimum stainless steel banding is used to secure the installed five (5) layers at their butt joint junctions with adjoining layers.
- 2.2.1.8 Fill in any gaps and joints with the THERMO-LAG 330-660 Grade Material.

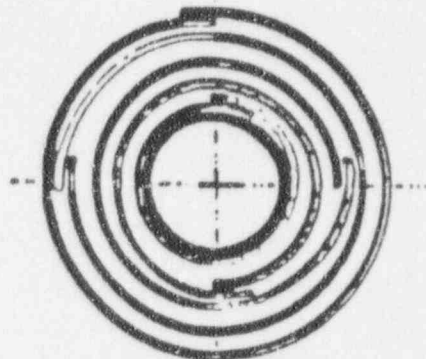
3.0 SCHEMATICS

A schematic for the one and three hour fire rated designs of the THERMO-LAG 330-660 Flexi-Blanket Thermal Barrier installed on flex conduit and cable drops is shown on the following page. Ref. Figure 12.

CONDUIT OR FLEX CONDUIT.



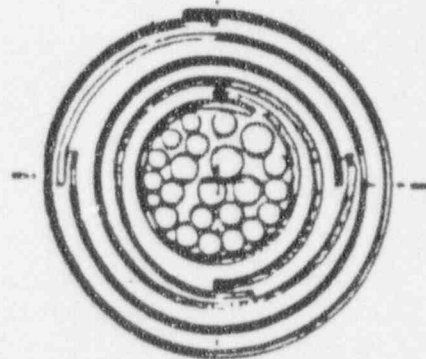
BLANKET WRAP



AIR DROP CABLES



BLANKET WRAP



UNISTRUT.

(CONCEPTUAL)

TST		2200 CESSAN DRIVE FENTON, MISSOURI 63026	
SCALE NONE	DESIGNED BY	DATE 4-19-85	
THERMO-LAG 330-660 FLEXI BLANKET THERMAL BARRIER		(1 HOUR AND 3 HOUR FIRE RATED DESIGNS)	
FIGURE 12			