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

Enclosure 35

TSI Technical Note 20684-TP
THERMO-LAG 330 Fire Barrier System Installation Procedures Manual
Nuclear Plant Applications Prepared For Bechtel Power Corporation, Turkey
Point Nuclear Power Plant
REV O March 15, 1985

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TSI TECHNICAL NOTE 20684-TP
THERMO-LAG 330 FIRE BARRIER SYSTEM
INSTALLATION PROCEDURES MANUAL
NUCLEAR PLANT APPLICATIONS

DATE OF ISSUE:

March 15, 1985

PREPARED FOR:

BECHTEL POWER CORPORATION
TURKEY POINT NUCLEAR POWER PLANT

TSI TECHNICAL NOTE 20684-TP

NOTE: All references to cable trays in the specification
No. 20684-TP should read:

Cable tray and wireway

TSI TECHNICAL NOTE 20684-TP

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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 Section, or by direct spray or trowel methods. It is used in nuclear power plants to protect cable trays, conduit, air drops (cables in free space), junction boxes and structural supports and hangers.

2.0 FIRE BARRIER DESIGNS

Four (4) basic designs of the THERMO-LAG 330 Fire Barrier System have applications in nuclear power generating installations. These four (4) designs are:

.....	Prefabricated Panel Design
.....	Preshaped Conduit Section Design
.....	Direct Spray Over Stress Skin Design
.....	Direct Spray-On Design

Each of these basic designs or combinations 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 each design are identical with the exception of the Direct Spray-On Design. Each of the first three (3) designs are comprised of THERMO-LAG Stress Skin Type 330-69 and THERMO-LAG 330-1 Subliming Material. The only difference between these three designs is that two of them are either prefabricated or preformed at the factory and the third is field sprayed at the jobsite. The Direct Spray-On Design differs from the other three designs in that it does not include the Stress Skin component.

The following paragraphs highlight the major steps involved in installing these designs. The more detailed sequential steps involved in installing these designs are described in Section II.

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 approved stainless steel tie wires or other approved fasteners. 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, air drops (cables in free space), conduit, instrumentation tubing, junction boxes, structural supports, hangers, fire walls, wireways, and other associated equipment. 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 approved stainless steel tie wires or 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 Direct Spray Over Stress Skin Design

The Direct Spray Over Stress Skin Design consists of field fabrication of a Stress Skin envelope followed by a direct spray application of the THERMO-LAG 330-1 Subliming Material - Spray Grade. The fabrication of the Stress Skin envelope involves cutting the number of sections of THERMO-LAG Stress Skin Type 330-69 required to form the Stress Skin envelope, and then mounting these sections on the entity to be protected, using approved stainless steel tie wires or other approved fastening devices. The installed sections of Stress Skin are then spray coated with the specified wet film thickness of THERMO-LAG 330-1 Subliming Material - Spray Grade. As an alternative, the fabricated sections of Stress Skin may be spray coated prior to mounting. In either case, the coating must be spray applied in accordance with instructions given in Section II.

The Direct Spray Over Stress Skin Design lends itself to installation in the nuclear power generating industry where the overspray protection requirement is not a consideration and is used to protect cable trays, conduits, cable drops, junction boxes, structural supports, hangers, and fire walls.

2.4 DIRECT SPRAY-ON DESIGN

The Direct Spray-On Design is used for coating cables installed in a cable tray. This design involves spraying the cables and the inside and outside surfaces of the cable trays with a continuous film of the THERMO-LAG 330-1 Subliming Material - Spray Grade. This material should be spray applied in accordance with the instructions given in Section II.

The Direct Spray-On Design also is used to coat conduit where overspray protection is not a consideration. This design involves spraying the conduit surface with a continuous film of the THERMO-LAG 330-1 Subliming Material - Spray Grade. The coating should be spray applied in accordance with the instruction given in Section II.

A special adaptation of the Direct Spray-On Design is the Direct Trowel-On Design used for protecting cable tray and conduit supports. This design involves an initial brush or roller application of THERMO-LAG 351 Primer over the properly prepared surface of the support, followed by the trowel application of THERMO-LAG 330-1 Subliming Material - Trowel Grade, in the dry film thickness required to provide the specified level of fire resistance.

The Direct Spray-On Design and its special adaptation are used in applications within the nuclear power industry to protect cable trays, structural supports and hangers.

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 351-2 Primer

This is a highly efficient corrosion inhibiting primer which is applied to properly prepared steel surfaces at a spread rate of circa 200 sq. ft. per gallon. This material will be applied to structural supports and hangers prior to the application of the THERMO-LAG 330-1 Subliming Material.

3.4 THERMO-LAG 350 Two Part Topcoat

This material provides excellent protection against water flow and climatic variations, chemical attack and physical abuse. It is applied at a spread rate of 50 sq. ft. per gallon.

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

SECTION II
INSTALLATION GUIDELINES

SECTION II

INSTALLATION GUIDELINES

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

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

The contractor shall follow standard industrial safety practices established for the handling of chemical coatings and shall conform to applicable OSHA and safety rules in all aspects.

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 the 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 and in weather protected areas provided for this purpose.

The Prefabricated Panels and Preshaped or Preformed Sections do not require any temperature protection. The Bulk Materials such as THERMO-LAG 330-1 Subliming Material - Spray or Trowel Grade or the THERMO-LAG 350 Series Topcoat and THERMO-LAG 351 Series Primer shall be protected against freezing and from temperatures above 100F.

2.0 PREFABRICATED PANEL READY ACCESS DESIGNS FOR CABLE TRAYS

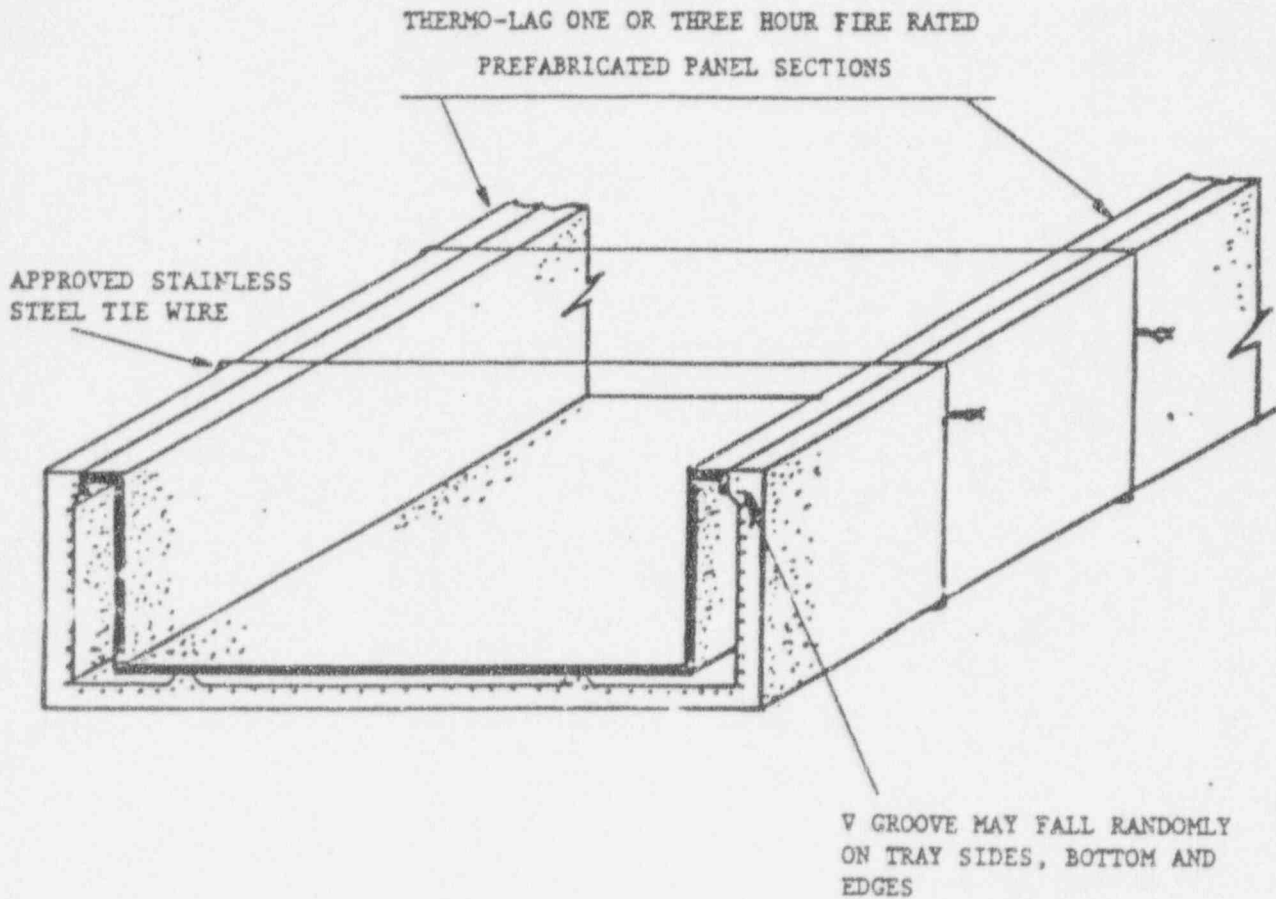
Installation of the Prefabricated Panel Ready Access Design to cable trays involves cutting the number of sections required to form the Fire Barrier from one or three hour fire rated THERMO-LAG Prefabricated Panels, and then mounting the sections on the cable tray to be protected using approved stainless steel tie wires or other approved fasteners. The 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 approved stainless steel tie wires as is shown in Figures 1, 2, and 3. The recommended maximum spacing between the tie wires should not exceed 12 inches.

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

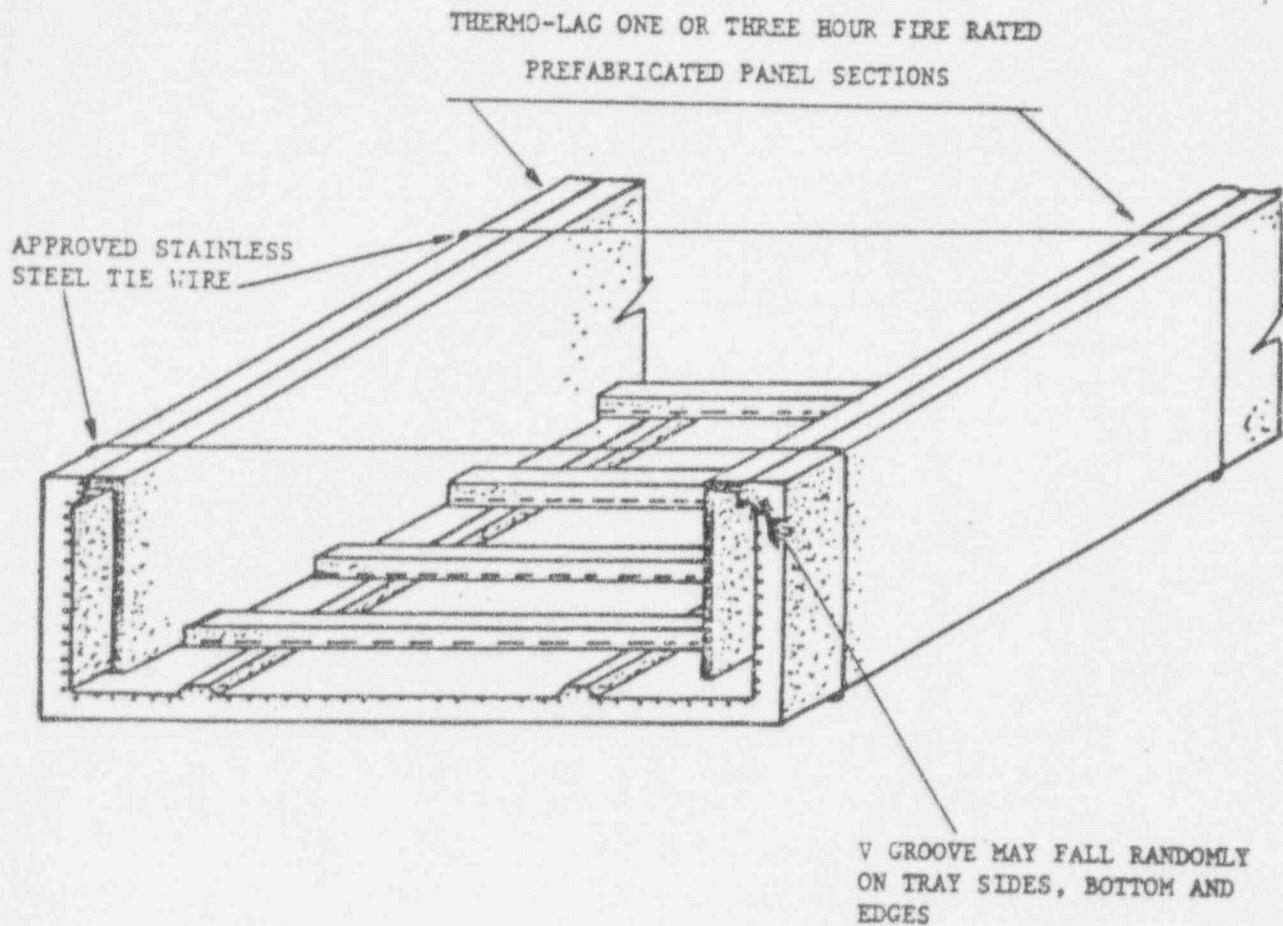
SOLID BOTTOM TRAY - BOTTOM TRAY DETAILS



"TYPICAL" INSTALLATION DETAILS

ISI, INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	APPROVED BY: <i>[Signature]</i>	DRAWN BY: J. DUMPS
DATE: 2-6-84		REVISIONS:
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL READY ACCESS DESIGN		
		FIGURE 1

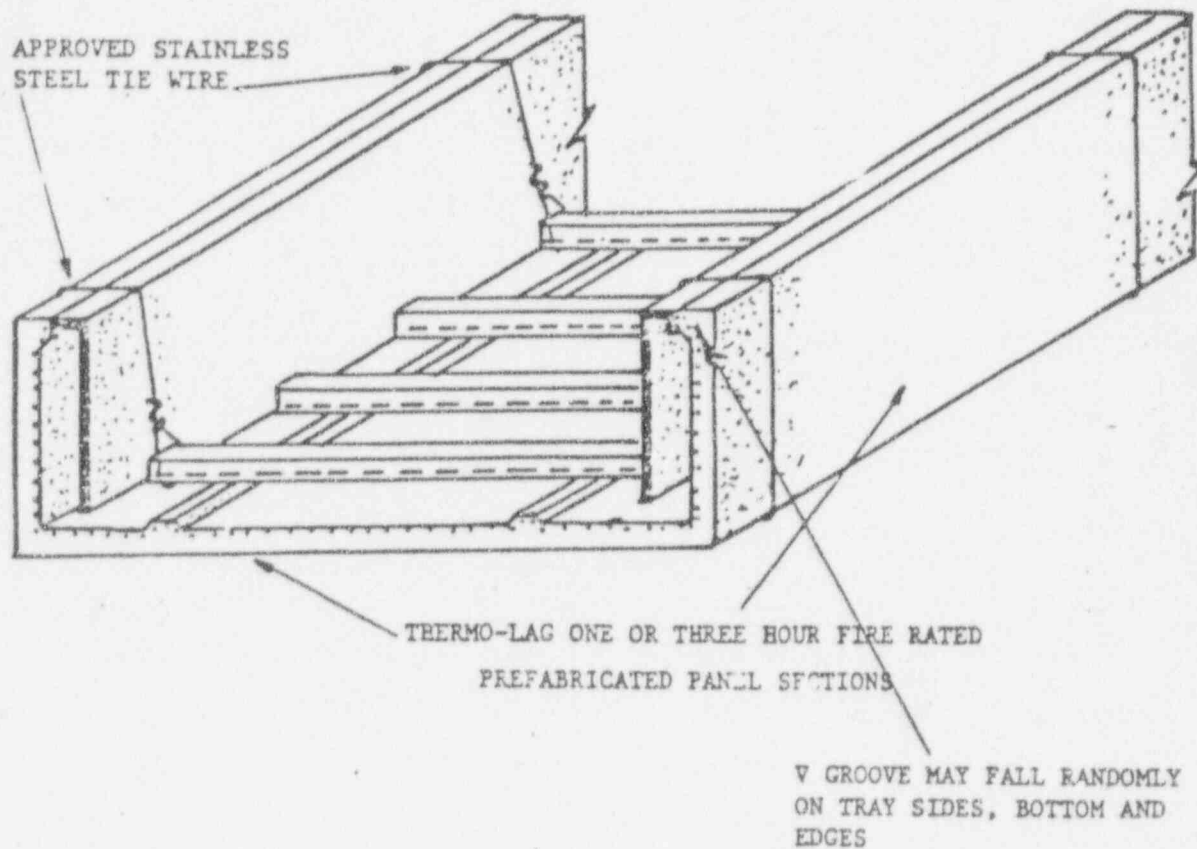
THERMO-LAG 330 FIRE BARRIER SYSTEM
 PREFABRICATED PANEL READY ACCESS DESIGN FOR CABLE TRAYS
 LADDER TRAY - BOTTOM SECTION DETAILS



"TYPICAL" INSTALLATION DETAILS

TEL, INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	APPROVED BY: <i>[Signature]</i>	DESIGNED BY: J. DUMPLIS.
DATE: 2-6-84.		REVIEWED:
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL READY ACCESS DESIGN		
		FIGURE 2

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



"TYPICAL" INSTALLATION DETAILS

TEL INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	APPROVED BY: <i>[Signature]</i>	DRAWN BY: J. DUMPS
DATE: 2-6-84.	REVIEWED:	
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL READY ACCESS DESIGN		
		DRAWING NUMBER FIGURE 3

- 2.1.5 Attach the flat top section to the installed bottom section using approved stainless steel tie wires or banding as shown in Figures 4 and 5. The recommended maximum spacing between the tie wires 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/sealing in the edges and joints with THERMO-LAG 330-1 Subliming Material - Trowel Grade.

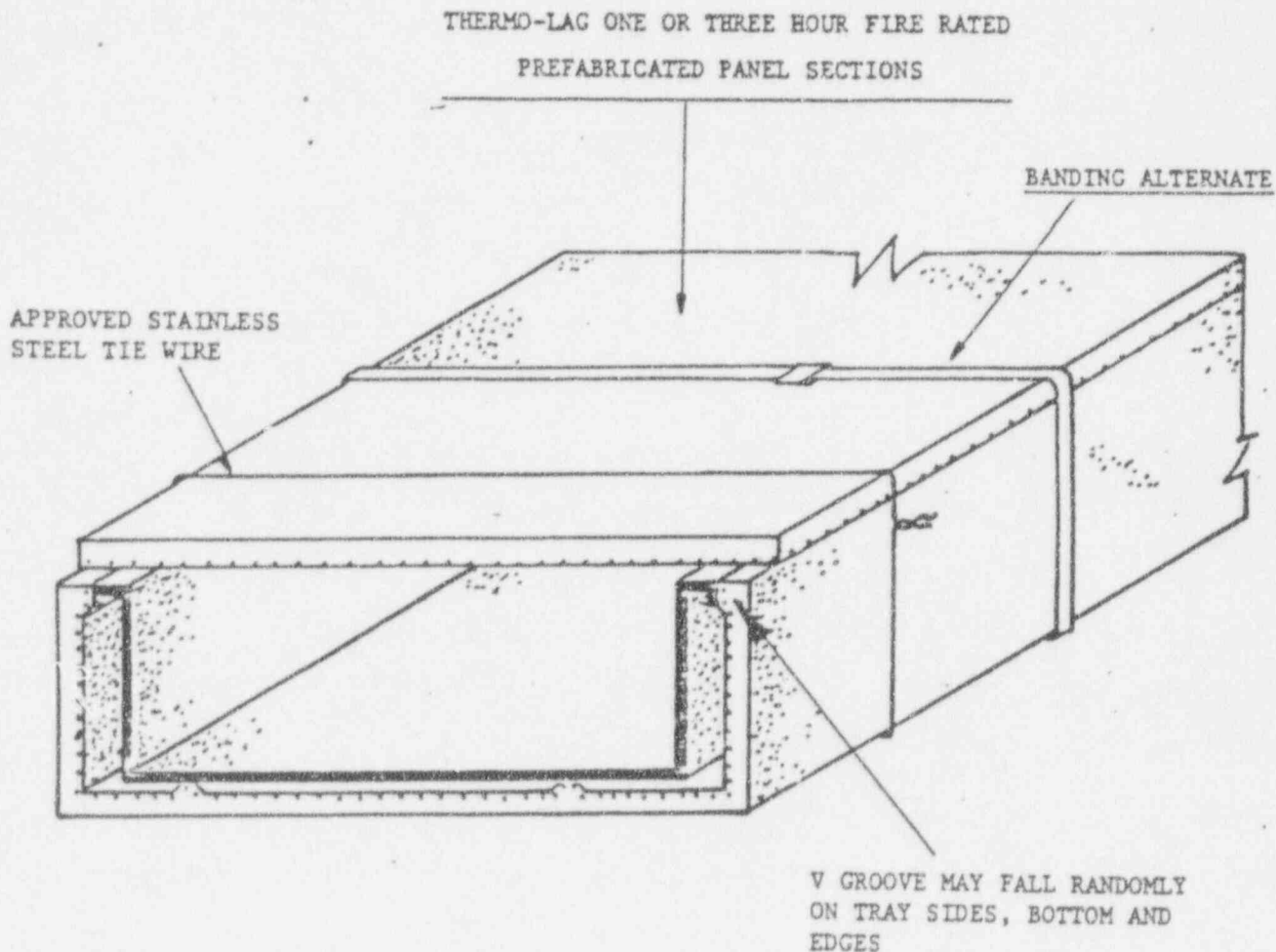
2.2 Installation of the Three Hour Ready Access Fire Barrier Design

- 2.2.1 Using three hour fire rating 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.

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- 2.2.2 Using one hour fire rated Prefabricated Panels, form and mount the first layer of the Fire Barrier on the cable tray following the procedures set out in Steps 2.1.1 through 2.1.7.
- 2.2.3 Following the procedure described in Steps 2.1.1 through 2.1.7, mount a second one hour fire rated Fire Barrier layer over the first layer previously installed in Step 2.2.2. This second layer shall be formed and mounted in such a manner that the THERMO-LAG Stress Skin Type 330-69 is on the outside.

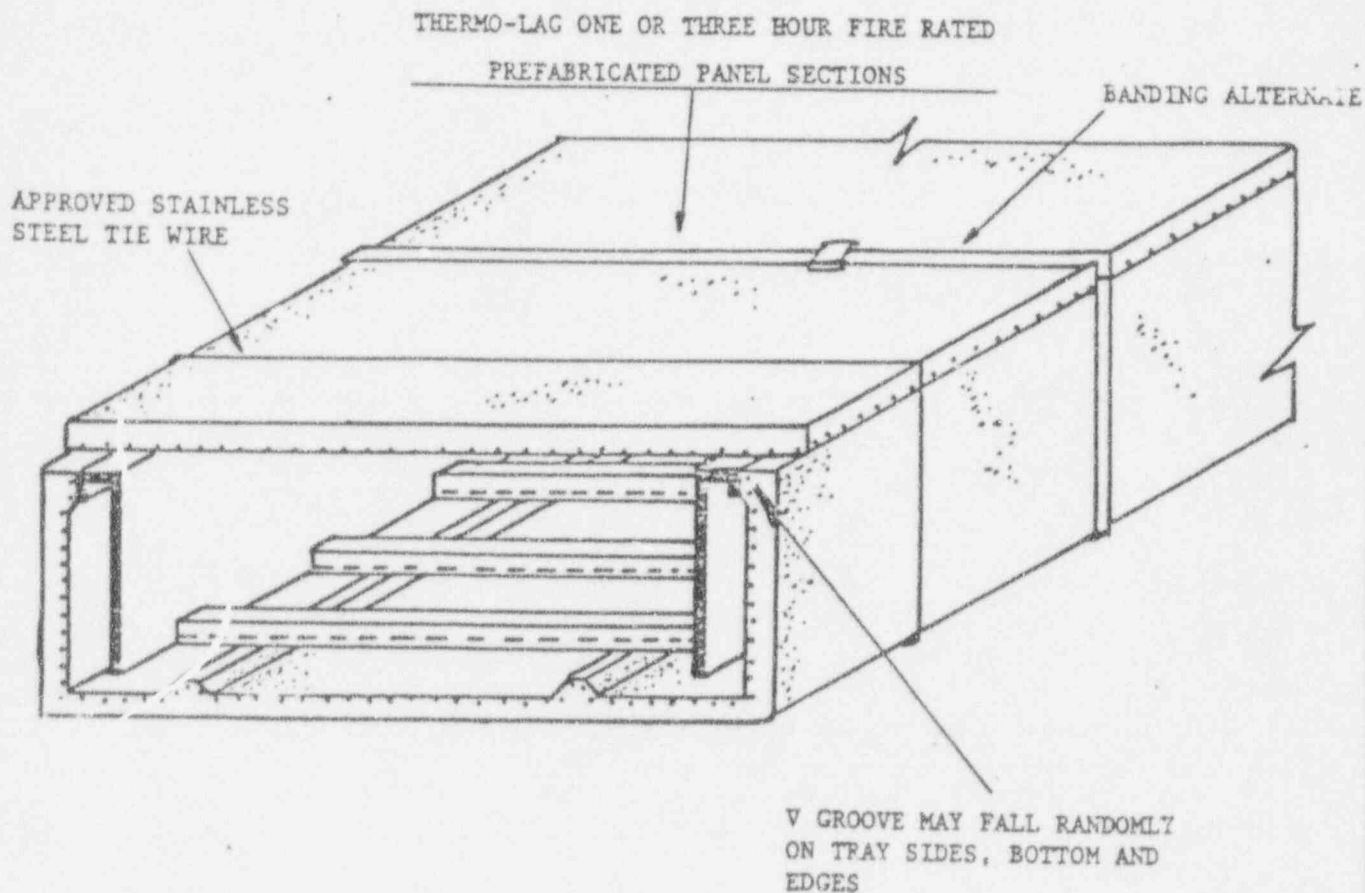
THERMO-LAG 330 FIRE BARRIER SYSTEM
 PREFABRICATED PANEL READY ACCESS DESIGN FOR CABLE TRAYS
 SOLID BOTTOM TRAY FIRE BARRIER ASSEMBLY



"TYPICAL" INSTALLATION DETAILS

ISI, INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE NONE	APPROVED BY: <i>[Signature]</i>	DRAWN BY: J. DUMPLIS
DATE: 2-7-84.	REVIEWED:	DESIGNED:
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL READY ACCESS DESIGN		
		DRAWING NUMBER FIGURE 4

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



"TYPICAL" INSTALLATION DETAILS

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DATE: 2-7-84	CHECKED:	
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL READY ACCESS DESIGN		

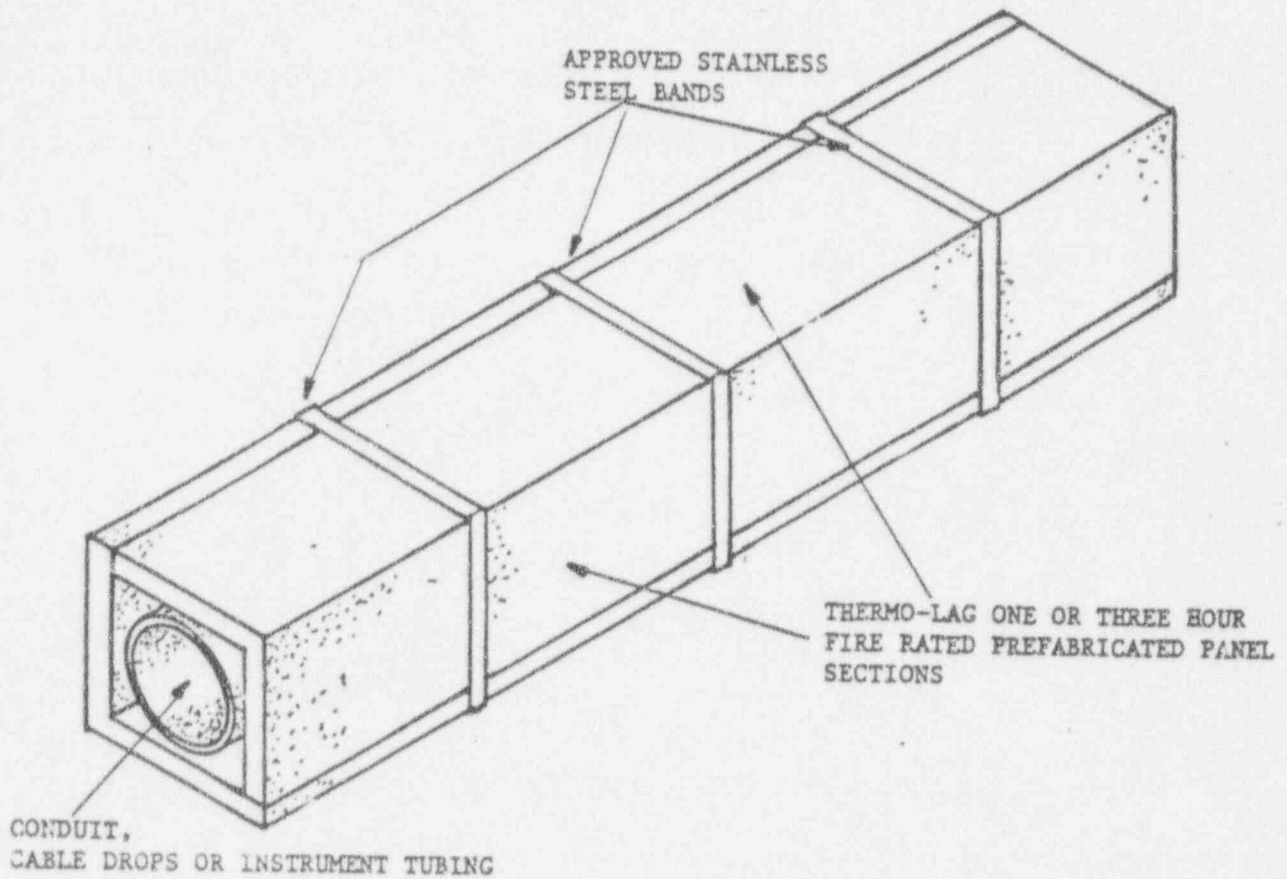
3.0 PREFABRICATED PANEL DESIGN FOR CONDUIT, CABLE DROPS AND INSTRUMENT TUBING

Installation of the Prefabricated Panel Design on conduit, cable drops and instrument tubing involves cutting and forming box sections from one hour or three hour fire rated THERMO-LAG Prefabricated Panels, and then mounting the sections on the conduit, cable drop or instrument tubing to be protected, using approved stainless steel tie wires or other approved fasteners. The sequential steps involved in installing this fire barrier design are described in the following paragraphs.

3.1 Installation of One Hour Fire Barrier Design

- 3.1.1 Cut two equal sections from a one hour fire rated Prefabricated Panel which are large enough to enclose the conduit, cable drop or instrument tube. The width of each section shall be equal to two times the outer diameter of the conduit, cable drop or instrument tubing. The length shall not exceed 6.5 feet since longer sections are unwieldly and more difficult to install.
- 3.1.2 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.
- 3.1.3 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.
- 3.1.4 Mount the top and bottom fire barrier sections on the conduit, cable drop or instrument tube to form a box design and then fasten the two sections together, using approved stainless steel bands as shown in Figure 6.
- 3.1.5 Attach additional top and bottom fire barrier sections to previously installed sections by butt joining them together at their ends.
- 3.1.6 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
 PREFABRICATED PANEL DESIGN FOR CONDUIT,
 CABLE DROPS AND INSTRUMENT TUBING



"TYPICAL" INSTALLATION DETAILS

TSL INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	APPROVED BY: <i>[Signature]</i>	SEAL BY: J. DUMPS
DATE: 2-7-84.		REVISED
THERMO-LAG 330 FIRE BARRIER SYSTEM PREFABRICATED PANEL DESIGN		
		FIGURE 6

3.2 Installation of Three Hour Ready Access Fire Barrier Design

- 3.2.1 Using three hour fire rated Prefabricated Panels, form and mount a three hour fire barrier on conduit, cable drops or instrument tubing following the procedure previously described in Steps 3.1.1 through 3.1.6.

4.0 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 Panels large enough to provide a rectangular shape around the junction box and then mounting the sections onto the junction box, using approved stainless steel bands or other approved fasteners. The sequential steps involved in installing the fire barrier design are described in the following paragraphs.

4.1 Installation of One Hour Fire Barrier Design

FOR A SURFACE MOUNTED JUNCTION BOX

- 4.1.1 Cut a section from a one hour fire rated Prefabricated Panel large enough to form the top, front and bottom panels and required top and bottom flanges of the fire barrier assembly. The width of the section shall be equal to the width of the junction box plus approximately 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 2 flanges large enough to accommodate the approved fasteners and an additional 1/2 inch to provide sufficient clearance when installed.
- 4.1.2 Score the Prefabricated Panel section to shape the top, front and bottom panels and two flanges of the fire barrier enclosure.
- 4.1.3 Form the top, front and bottom panels and top and bottom flanges by making 90 degree bends.

- 4.1.4 Mount the formed section enclosure on the wall or ceiling using approved concrete fasteners. The concrete fasteners shall be spaced at a maximum distance of 12 inches with at least two concrete fasteners being used per flange. The concrete fasteners shall be power driven and/or site approved fasteners of 1/4 inch minimum diameter, as shown in Figure 7.
- 4.1.5 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 approved stainless steel banding.
- 4.1.6 Complete the installation by filling all edges and joints with THERMO-LAC 330-1 Subliming Material - Trowel Grade.

FOR A JUNCTION BOX NOT SURFACE MOUNTED

- 4.1.7 Cut a section 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.
- 4.1.8 Score the Prefabricated Panel section to shape the top, front and bottom panels of the fire barrier enclosure.
- 4.1.9 Form the top, front and bottom panels by making 90 degree bends.
- 4.1.10 Cut another section from a one hour fire rated Prefabricated Panel large enough to form the side and back panels 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.
- 4.1.11 Score the Prefabricated Panel section to shaped the side and back panels of the fire barrier enclosure.

- 4.1.12 Form the side and back panels by making 90 degree bends.
- 4.1.13 Mount the two fire barrier sections on the junction box and fasten the two sections together using approved stainless steel banding.
- 4.1.14 Complete the installation by filling all edges and jointing with THERMO-LAG 330-1 Subliming Material - Trowel Grade.
- 4.1.15 Anchor bolts must be covered with the same thickness of the fire barrier material.

4.2 Installation of Three Hour Fire Barrier Design

- 4.2.1 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 4.1.1 through 4.1.15.

5.0 PREFABRICATED PANEL THREE HOUR FIRE WALL DESIGN

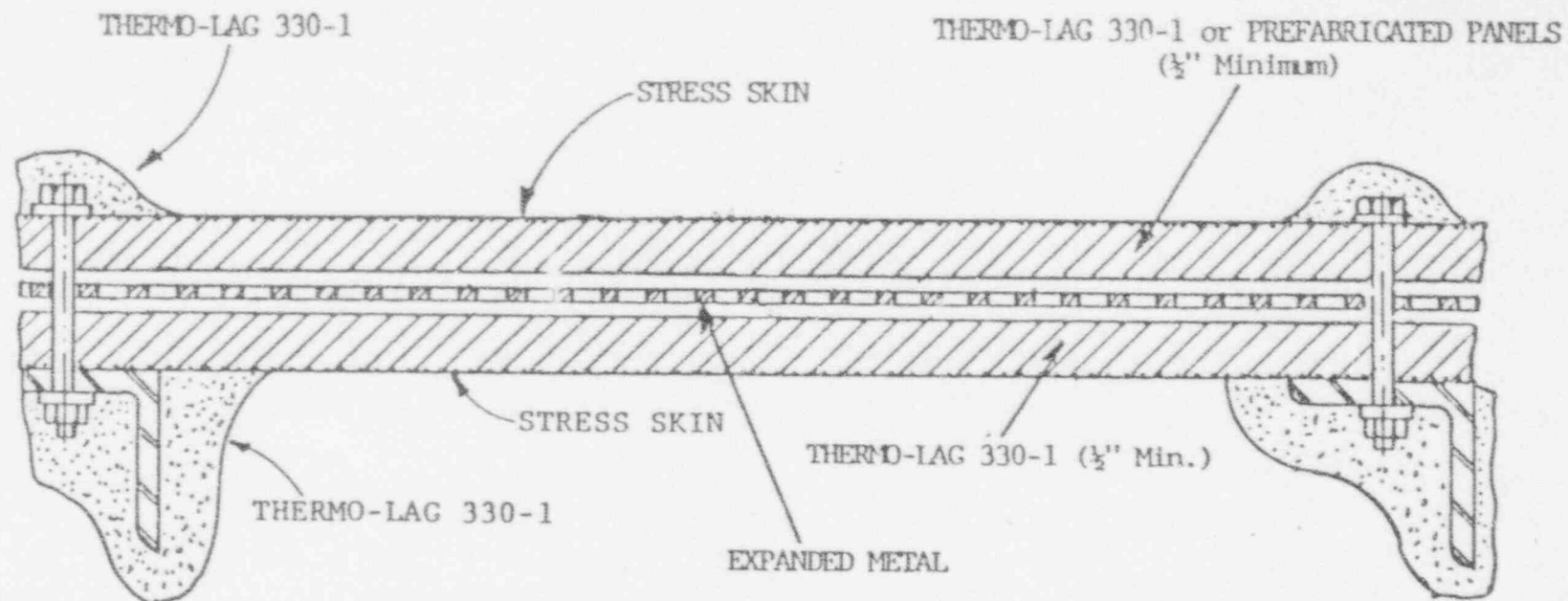
Installation of the Prefabricated Panel Design to form a fire wall involves cutting the required number of sections to form the fire wall from three hour fire rated THERMO-LAG Prefabricated Panels, and then mounting the sections on the expanded metal or other support material using approved #10 size minimum bolts, washers and nuts. The sequential steps involved in installing this fire barrier design on the fire wall support material are described in the following paragraphs.

5.1 Installation of Three Hour Fire Barrier Design

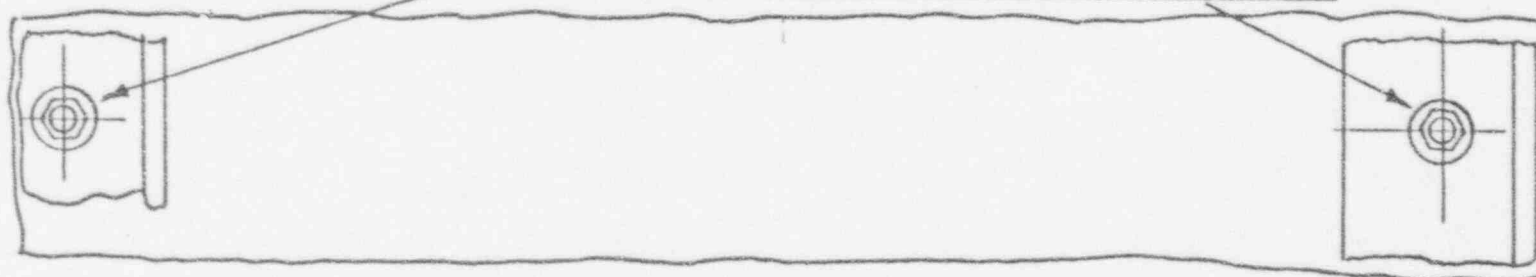
- 5.1.1 Cut two sections large enough to comprise a portion of the fire wall from one hour fire rated Prefabricated Panels.
- 5.1.2 Mount one section of the Prefabricated Panel on each side of the expanded metal or other steel support material for the fire wall with the Stress Skin side facing outward, using approved #10 or larger bolt assemblies. The holes for the #10 bolt assemblies shall be drilled on 12 inch centers with the section of the Prefabricated Panel being held in place as shown in Figure 8.
- 5.1.3 Apply sufficient amounts of THERMO-LAG 330-1 Subliming Material - Trowel Grade, over the structural steel supports and the bolt head and nut of the bolt assembly.

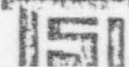
AS AN ACCEPTABLE OPTION

- 5.1.4 Cut two sections of one hour fire rated Prefabricated Panel together with an identical section of expanded metal large enough to mount on the installed rectangular steel tubing or other structural steel entities.
- 5.1.5 Mount the expanded metal section on the rectangular steel tubing or other structural steel entities using approved mechanical fasteners.



TYPICAL BOLTS, NUTS & WASHERS OR OTHER APPROVED FASTENERS



 T&E, Inc.		3260 BRANNON AVENUE, ST. LOUIS,	
		MISSOURI 63139	
SCALE: NONE	APPROVED BY:	DRAWN BY DUMPIS	
DATE: 3-19-84	<i>L. A. Johnson</i>	REVISED	
THREE HOUR FIREWALL ASSEMBLY			
			DRAWING NUMBER
			FIGURE 8

- 5.1.6 Mount one section of Prefabricated Panel on each side of the expanded metal or other steel support material for the fire wall with the Stress Skin facing outward using approved long bolts, washers or nuts.
- 5.1.7 Apply sufficient amounts of THERMO-LAG 330-1 Subliming Material - Trowel Grade over the structural steel supports and the bolt head and nut of the bolt assembly.

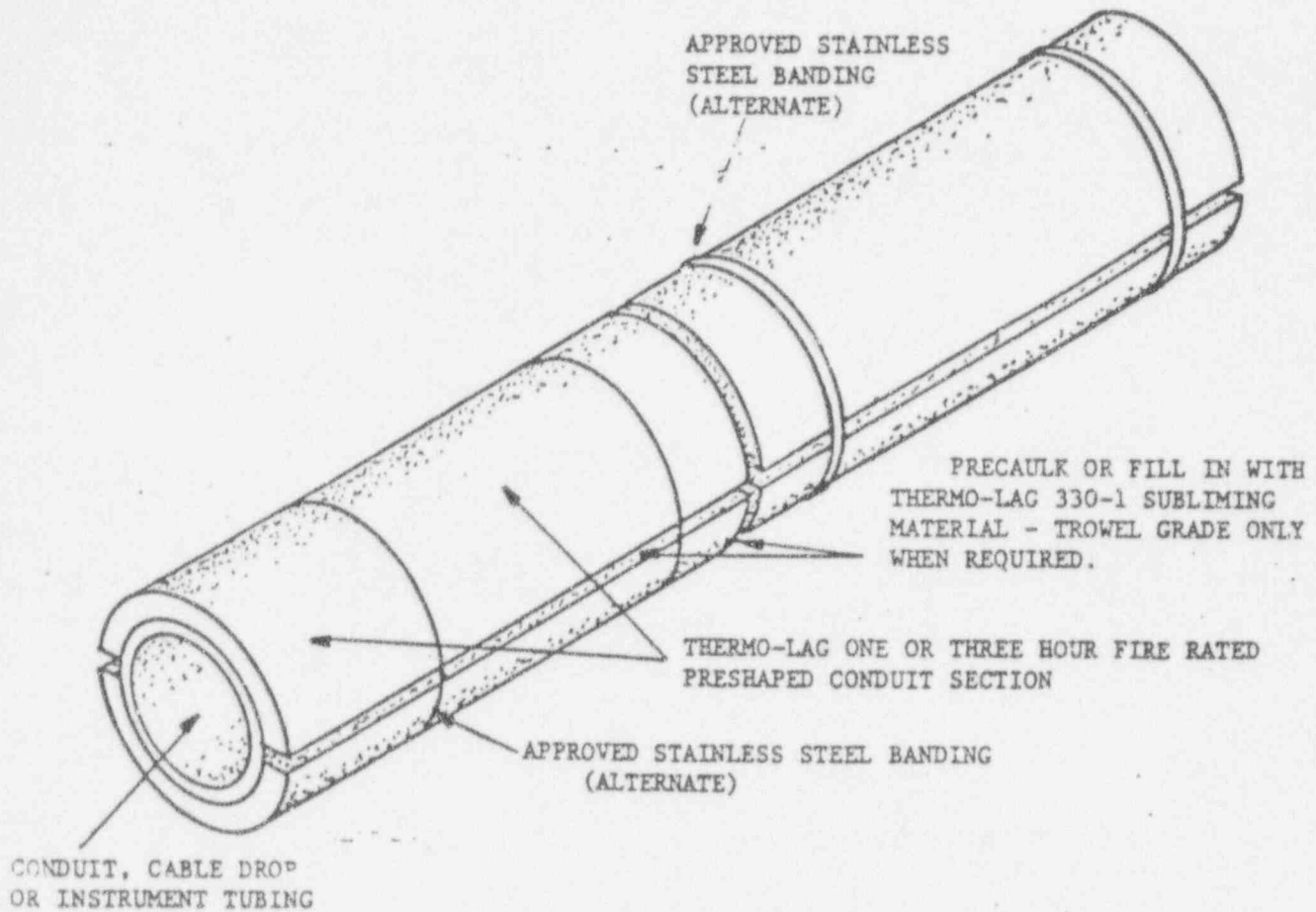
6.0 PRESHAPED CONDUIT SECTION DESIGN FOR CONDUIT, CABLE DROPS AND INSTRUMENT TUBING

Installation of the THERMO-LAG Preshaped Conduit Section Design on conduit, cable drops and instrument tubing involves mounting two of the semi-circular preshaped conduit sections at a time, and fastening them together using approved stainless steel tie wires or banding. The sequential steps involved in installing this fire barrier design are described in the following paragraphs.

6.1 Installation of One Hour Fire Barrier Design

- 6.1.1 Precoat 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.
- 6.1.2 Mount the coated section and one other one hour fire rated section on the conduit, cable drop or instrument tube with the edges flush with each other to form a cylindrical section around the conduit, cable drop or instrument tube. Fasten the two sections together using approved stainless steel tie wires or banding installed at 12 inch intervals, maximum, as shown in Figure 9.
- 6.1.3 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.

THERMO-LAG 330 FIRE BARRIER SYSTEM
 PRESHAPED CONDUIT SECTION DESIGN
 FOR CONDUIT, CABLE DROPS AND INSTRUMENT TUBING



"TYPICAL" INSTALLATION DETAILS

ISI, INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	APPROVED BY: <i>[Signature]</i>	DRAWN BY: J. DUMPS
DATE: 2-7-84		REVIEWED:
THERMO-LAG 330 FIRE BARRIER SYSTEM PRESHAPED CONDUIT DESIGN FOR CONDUIT, CABLE DROPS AND INSTRUMENT TUBING		
2-18		FIGURE 0

AS AN OPTION

- 6.1.4 Assemble two one hour Preshaped Conduit Sections on the conduit, cable drop or instrument tube 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.

6.2 Installation of Three Hour Fire Barrier Design

- 6.2.1 Using the three hour fire rated THERMO-LAG Preshaped Conduit Sections, install a three hour fire barrier on the conduit, cable drop or instrument tube following the procedures previously described in Steps 6.1.1 through 6.1.3.

AS AN OPTION

- 6.2.2 Using the three hour fire rated Preshaped Conduit Section, install a three hour fire barrier on conduit, cable drop or instrument tube following the procedure described in Step 6.1.4.

7.0

DIRECT SPRAY OVER STRESS SKIN DESIGN FOR CABLE TRAYS

Installation of the Direct Spray Over Stress Skin Design on cable trays involves fabricating and installing a protective envelope of THERMO-LAG Stress Skin Type 330-69, and then coating the Stress Skin envelope with a specified dry film thickness of the THERMO-LAG 330-1 Subliming Material - Spray Grade. The sequential steps involved in installing the fire barrier design on cable trays are described in the following paragraphs.

7.1

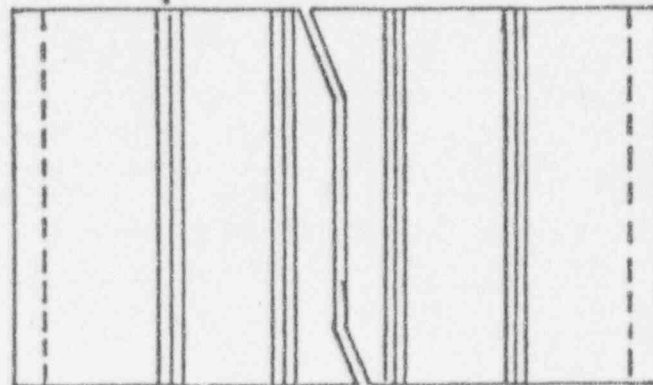
Installation of One Hour Fire Barrier Design

- 7.1.1 Cut a piece of material large enough to form the bottom section from a sheet of Stress Skin, which is normally supplied in 4 ft by 8 ft sheets. The width of the bottom section shall be equal to the sum of the base (w) and both sides (H) of the cable tray plus $3\frac{1}{2}$ inches, as shown in Figure 10. The length of the bottom piece of material shall not exceed 6.5 feet since longer sections are unwieldy and more difficult to install.
- 7.1.2 Cut a square $1\frac{1}{2}$ inch piece from each corner of the bottom section of the Stress Skin.
- 7.1.3 Form a "U" shaped section by making two 90 degree bends along the dotted lines which are located at each end of the $W + 1/2$ inch dimension line shown in Figures 10 and 11.
- 7.1.4 Form a $1\frac{1}{2}$ inch flange on each side of the bottom section by making a 90 degree bend along the dotted lines as shown in Figures 10 and 11.
- 7.1.5 Cut a piece of material large enough to form the top section from a sheet of Stress Skin, normally supplied in 4 ft by 8 ft sheets. The width of top section shall be equal to the base (W) of the cable plus $2\frac{1}{2}$ inches.
- 7.1.6 Form a $1\frac{1}{2}$ inch flange at each end of the top section by making 90 degree bends along the dotted line shown in Figures 10 and 11.

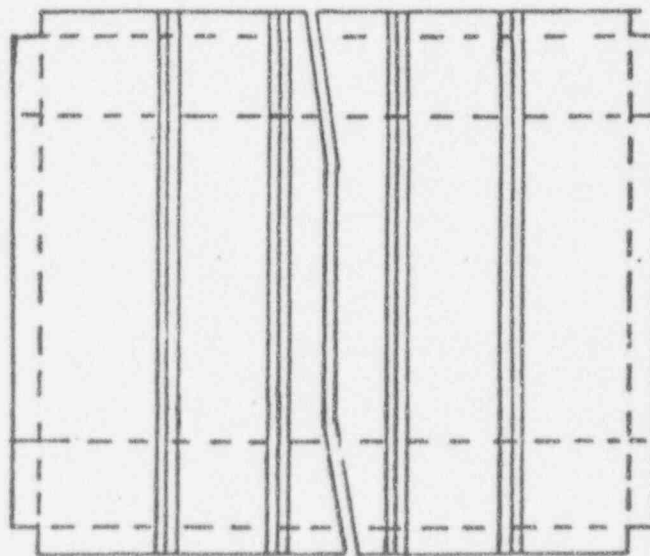
THERMO-LAG 330 FIRE BARRIER SYSTEM

STIFFENER "V" TYPE

TOP SECTION



BOTTOM SECTION

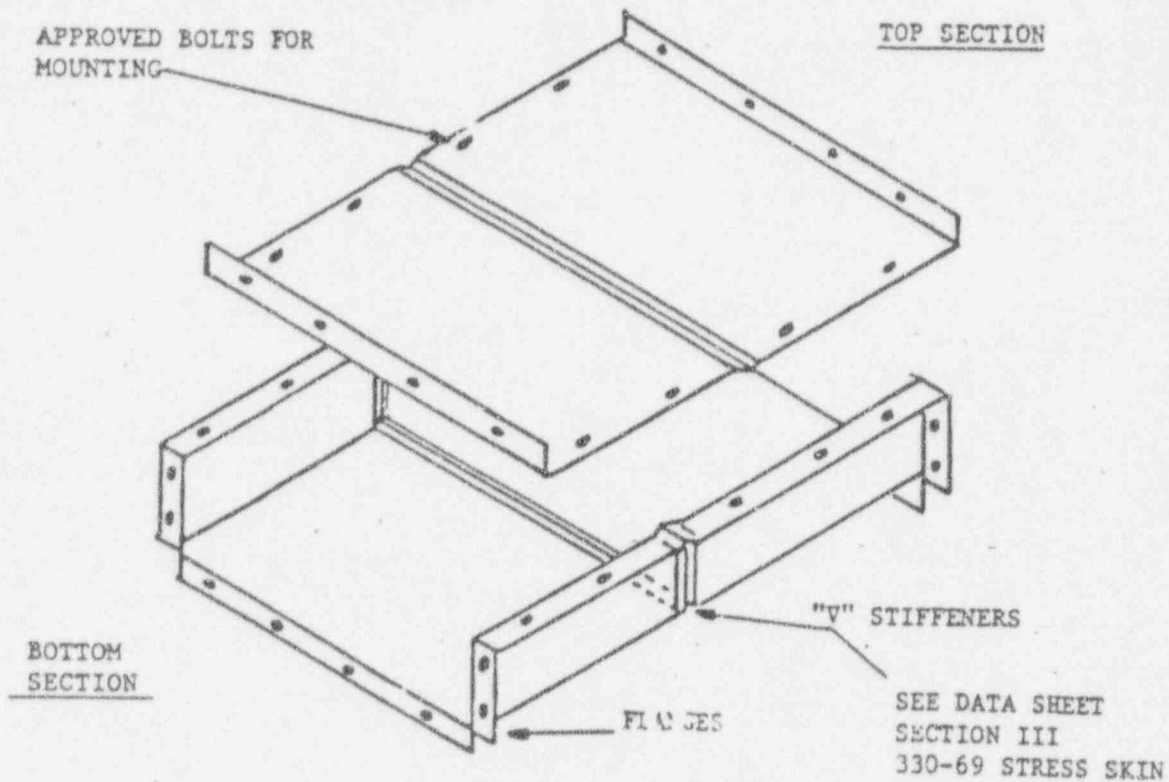


THERMO-LAG STRESS SKIN TYPE 330-69
TYPICAL LAYOUT FOR CABLE TRAY SECTIONS

"TYPICAL" INSTALLATION DETAILS


ISI, INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	APPROVED BY: <i>[Signature]</i>	DRAWN BY: J. DUMPIE
DATE: 2-7-84	REVIEWED:	THERMO-LAG STRESS SKIN TYPE 330-69 TYPICAL LAYOUT FOR CABLE TRAY SECTIONS
2-21	DRAWING NUMBER:	FIGURE 10

THERMO-LAG 330 FIRE BARRIER SYSTEM



THERMO-LAG STRESS SKIN TYPE 330-69
 INSTALLATION SCHEMATIC PRIOR TO
 THERMO-LAG 330-1 SUBLIMING MATERIAL APPLICATION

"TYPICAL" INSTALLATION DETAILS

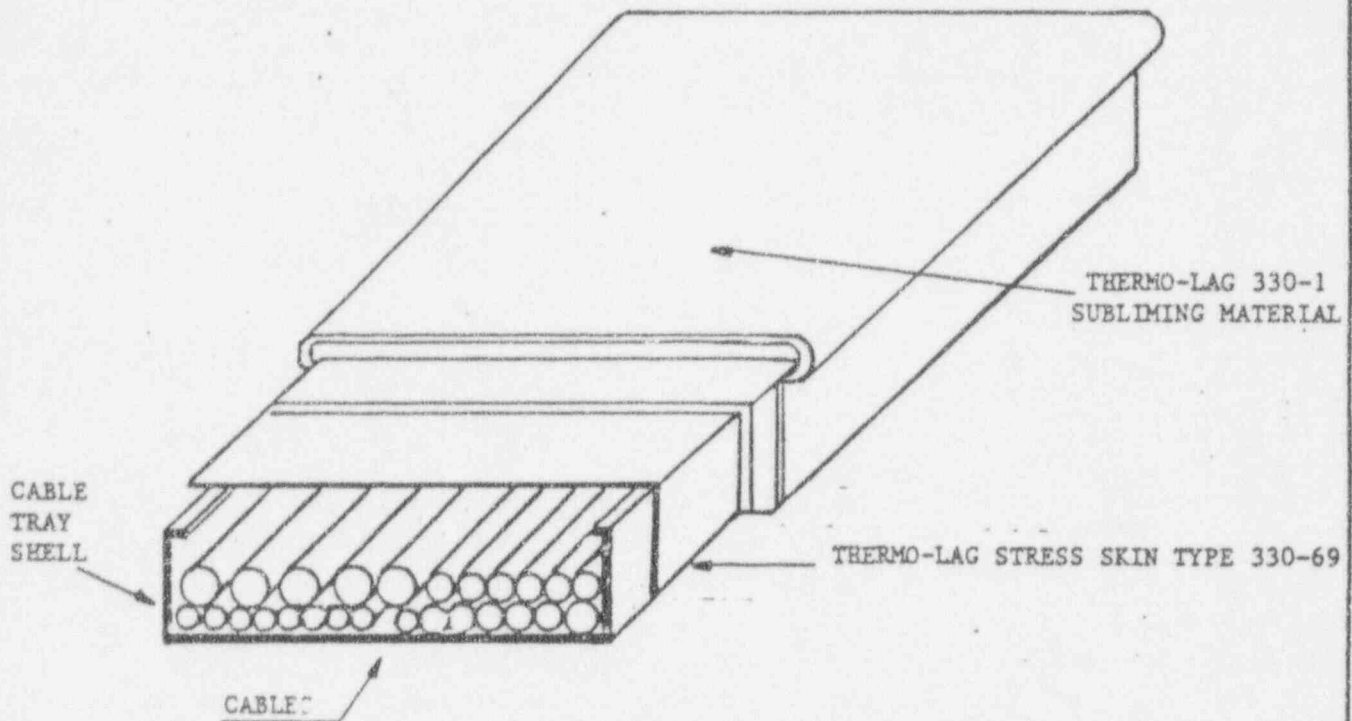
 INC. 3250 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	APPROVED BY:	DESIGNED BY: J. DUMPIE
DATE: 2-7-84.	<i>[Signature]</i>	REVIEWED
THERMO-LAG STRESS SKIN TYPE 330-69 INSTALLATION		
SCHEMATIC PRIOR TO THERMO-LAG 330-1 SUBLIMING		
MATERIAL APPLICATION		
		FIGURE 11

- 7.1.7 Mount the bottom and top sections of Stress Skin on the cable tray and fasten the two sections together at a maximum of six-inch intervals, using approved mechanical fasteners, staples or 18 ga. tie wire.
- 7.1.8 Attach additional bottom and top sections of Stress Skin to a previously installed section by fastening them together at the end flanges using approved mechanical fasteners, staples or 18 ga. tie wire.
- 7.1.9 Coat the bottom and top sections of Stress Skin with a dry film thickness of 0.625" +/- 0.125 of the THERMO-LAG 330-1 Subliming Coating - Spray Grade, as shown in Figure 12. The coating shall be applied in accordance with instructions given in Paragraph 12.0 herein.

WHEN COATING PRIOR TO MOUNTING

- 7.1.10 Coating the bottom and top sections of Stress Skin with a dry film thickness of 0.625" +/- 0.125" of the THERMO-LAG 330-1 Subliming Coating - Spray Grade, prior to mounting on the cable tray. The coating shall be applied in accordance with instructions given in Paragraph 12.0 herein.
- 7.1.11 Mount the bottom and top sections of the precoated Stress Skin on the cable tray and fasten the two sections together at a maximum of six inch intervals using approved mechanical fasteners, staples or 18 ga. tie wire.
- 7.1.12 Attach additional precoated bottom and top sections of Stress Skin to a previously installed section by fastening them together at the end flanges using approved mechanical fasteners, staples or 18 ga. tie wires.
- 7.1.13 Apply a coating of THERMO-LAG 330-1 Subliming Material - Trowel Grade in a dry film thickness of 0.625" +/- 0.125" to the edges and joints of the precoated sections of Stress Skin using a trowel or stiff bristle brush to fill in any gaps or fastening holes.

THERMO-LAG 330 FIRE BARRIER SYSTEM



CROSS SECTIONAL VIEW OF THE
THERMO-LAG 330-1 SUBLIMING COATING ENVELOPE SYSTEM
APPLIED TO A TYPICAL CABLE TRAY

"TYPICAL" INSTALLATION DETAILS

TSI, INC. 3250 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	APPROVED BY: <i>[Signature]</i>	DRAWN BY: J. DUMPIS
DATE: 2-8-84		REVIEWED:
CROSS SECTIONAL VIEW OF THE THERMO-LAG 330-1 SUBLIMING COATING ENVELOPE SYSTEM APPLIED TO A TYPICAL CABLE TRAY		
		DRAWING NUMBER: FIGURE 12

7.2 Installation of Three Hour Fire Barrier Design

- 7.2.1 Form the first layer bottom and top sections from a sheet of Stress Skin which is normally supplied in 4 ft by 8 ft sheets, following the procedures previously described in Steps 7.1.1 through 7.1.7.
- 7.2.2 Fabricate the second layer bottom section from a sheet of Stress Skin, which is normally supplied in 4 ft by 8 ft sheets. The width of the second bottom section shall be equal to the sum of the base (W) and both sides (H) of the cable tray plus $7 \frac{13}{16}$ inches.
- 7.2.3 Cut a square $2 \frac{11}{16}$ inch piece from each corner of the second bottom section of Stress Skin.
- 7.2.4 Form "U" shaped sections from the second layer bottom section by making 90 degree bends along the dotted lines which are located at each of the $W + 1 \frac{13}{16}$ inch dimension line.
- 7.2.5 Form a $2 \frac{11}{16}$ inch flange on each side of the second layer bottom section by making a 90 degree bend along the dotted lines as shown in Figure 10.
- 7.2.6 Cut a piece of material large enough to form the second layer top section from a sheet of Stress Skin, which is normally supplied in 4 ft by 8 ft sheets. The width of the second layer top section shall be equal to the base (W) of the cable tray plus $7 \frac{5}{16}$ inches.
- 7.2.7 Form a $2 \frac{11}{16}$ inch flange at each end of the second layer of Stress Skin by making 90 degree bends along the dotted lines shown in Figure 10.
- 7.2.8 Mount the first layer bottom and top sections of Stress Skin on the cable tray and fasten the two sections together at a maximum of 18 inch intervals using approved mechanical fasteners, staples or 18 ga. tie wire.

- 7.2.9 Attach additional first layer bottom and top sections of Stress Skin to a previously installed first layer section by fastening them together at the flanges using approved mechanical fasteners, staples, or 18 ga. tie wire.
- 7.2.10 Coat the first layer bottom and top section of Stress Skin a dry film thickness of 1.250" \pm 0.250" of THERMO-LAG 330-1 Subliming Coating - Spray Grade. The coating shall be applied in accordance with instructions given in Paragraph 12.0 herein.
- 7.2.11 Mount the second layer bottom and top sections of Stress Skin on the cured layer of THERMO-LAG 330-1 Subliming Material - Spray Grade, and fasten the two sections together at a maximum of 12 inch intervals, using approved mechanical fasteners, staples or 18 ga. tie wires.
- 7.2.12 Coat the second layer bottom and top sections of Stress Skin with a dry film thickness of 1.250" \pm 0.250" of THERMO-LAG 330-1 Subliming Material - Spray Grade. The coating shall be applied in accordance with instructions given in Paragraph 12.0 herein.

WHEN COATING PRIOR TO MOUNTING

- 7.2.13 Coat the first layer bottom and top sections of Stress Skin with a dry film thickness of 1.250" \pm 0.250" of THERMO-LAG 330-1 Subliming Material - Spray Grade, and place them coated side up on the floor on a flat surface. The coating shall be applied in accordance with instructions given in Paragraph 12.0 herein.
- 7.2.14 Place the second layer bottom section of Stress Skin on the cured first layer bottom section and the second layer top section of Stress Skin on the cured first layer top section.
- 7.2.15 Coat the second layer bottom and top sections of Stress Skin with a dry film coating thickness of 1.250" \pm 0.250" of THERMO-LAG 330-1 Subliming Material - Spray Grade. The coating shall be applied in accordance with instructions given in Paragraph 12.0 herein.

- 7.2.16 Mount the precoated bottom and top sections on the cable tray and fasten the two sections together at a maximum of 12 inch intervals using approved mechanical fasteners, staples or 18 ga. tie wire.
- 7.2.17 Attach additional precoated bottom and top sections to a previously installed section by fastening them together at the end flanges using approved mechanical fasteners, staples or 18 ga. tie wire.
- 7.2.18 Apply a coating of THERMO-LAG 330-1 Subliming Material - Trowel Grade in a dry film thickness of 1.250" +/- 0.250" to the edges and joints of the precoated sections using a trowel or stiff bristle brush to fill in any gaps or fastening holes.

8.0 DIRECT SPRAY OVER STRESS SKIN DESIGN FOR CONDUIT, CABLE DROPS AND INSTRUMENT TUBING

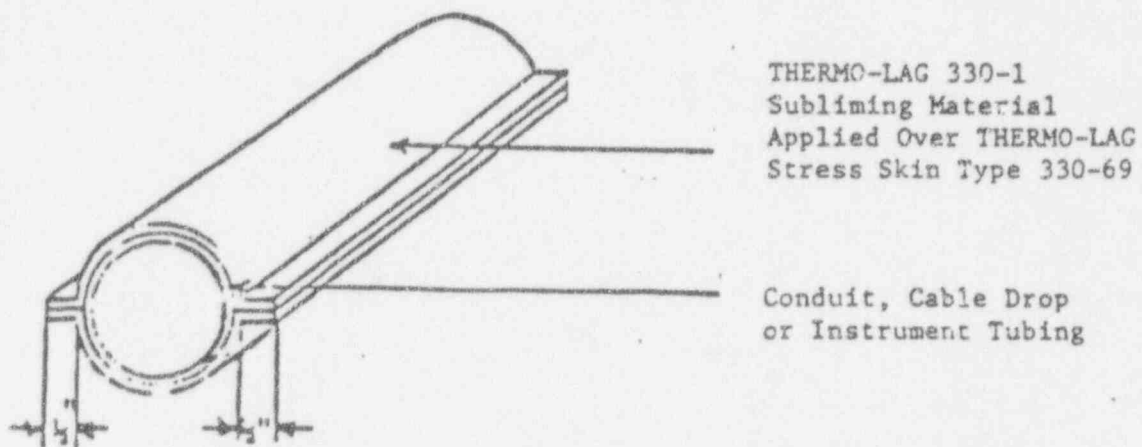
Installation of the Direct Spray over Stress Skin Design on Conduit, Cable Drops and Instrument Tubing involves fabricating and mounting two semi-circular shaped enclosures of THERMO-LAG Stress Skin Type 330-69 on the conduit, cable drop and instrument tubing, and then coating the enclosures with a specified dry film thickness of THERMO-LAG 330-1 Subliming Material - Spray Grade. The sequential steps involved in installing this fire barrier design on conduit, cable drops and instrument tubing are described in the following paragraphs.

8.1 Installation of One Hour Fire Barrier Design

- 8.1.1 Cut two equal sections large enough for enclosing the conduit from a sheet of Stress Skin, normally supplied in 4 ft by 8 ft sheets. The width of each section shall be equal to one half of the diameter of the conduit, cable drop or instrument tube plus one inch. The length shall not exceed 6.5 feet since longer sections are unwieldy and more difficult to install.
- 8.1.2 Form a semi-circular section with edge flanges from each of the two pieces by making two 90° bends at a distance of 1/2 inch from each edge of the width dimensions as is shown in Figure 13.

FIGURE 13

THERMO-LAG 330 FIRE BARRIER SYSTEM
DIRECT SPRAY OVER STRESS SKIN DESIGN
FOR CONDUIT, CABLE DROPS AND INSTRUMENT
TUBING
ONE HOUR DESIGN

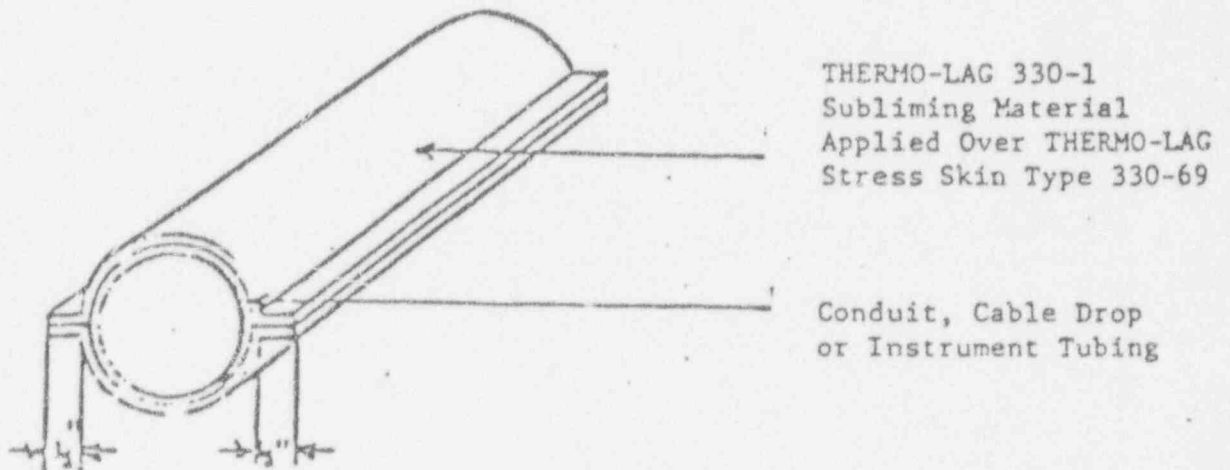


- 8.1.3 Form a 1/2 inch flange on the length edges of each of the two pieces, where required, by making a 90° bend.
- 8.1.4 Coat the bottom and top sections of Stress Skin with a dry film thickness of 0.625" +/- 0.125" of the THERMO-LAG 330-1 Subliming Material - Spray Grade prior to mounting on the conduit, cable drop or instrument tube.
- 8.1.5 Mount the two sections of the precoated Stress Skin on the conduit and fasten the two sections together at a maximum of twelve inch intervals using mechanical fasteners, staples, or 18 ga. stainless steel tie wires.
- 8.1.6 Attach additional coated top and bottom fire barrier sections to previously installed sections by butt joining them together at their ends.
- 8.1.7 Complete the installation by filling in the edges and joints with THERMO-LAG 330-1 Subliming Material - Trowel Grade. The minimum cross sectional thickness of the troweled or caulked edges and joints should be 0.5 inches.
- 8.2 Installation of Three Hour Fire Barrier Design
 - 8.2.1 Form the first layer bottom and top sections of precoated Stress Skin following the procedures previously described in Steps 8.1.1 through 8.1.4.
 - 8.2.2 Cut and form the second layer bottom and top semi-circular sections with edge flanges from a sheet of Stress Skin, allowing sufficient increase in dimensions to provide for mounting over the precoated first layer of Stress Skin.

- 8.2.3 Coat the first layer bottom and top sections of Stress Skin with a dry film thickness of 0.625" +/- 0.125" of THERMO-LAG 330-1 Subliming Material - Spray Grade, and place them coated side up on a flat surface on the floor. The coating shall be applied in accordance with instructions given in Paragraph 12.0 herein.
- 8.2.4 Place the second layer bottom section of Stress Skin on the cured first layer bottom section and the second layer top section of Stress Skin on the cured first layer top section.
- 8.2.5 Coat the second layer bottom and top sections of Stress Skin with a dry film thickness of 0.625" +/- 0.125" of THERMO-LAG 330-1 Subliming Material - Spray Grade. The material shall be applied in accordance with instructions given in Paragraph 12.0 herein.
- 8.2.6 Mount the coated bottom and top sections on the conduit, cable drop, or instrument tube and then lace the two sections together at the flanges using approved stainless steel tie wires as shown in Figure 14.
- 8.2.7 Attach additional coated top and bottom fire barrier sections to previously installed sections by butt joining them together at their ends.
- 8.2.8 Complete the installation by filling in the edges and joints with THERMO-LAG 330-1 Subliming Material - Trowel Grade. The minimum cross sectional thickness of the troweled or caulked edges and joints should be 1.0 inches.

FIGURE 14

THERMO-LAG 330 FIRE BARRIER SYSTEM
DIRECT SPRAY OVER STRESS SKIN DESIGN
FOR CONDUIT, CABLE DROPS AND
INSTRUMENT TUBING
THREE HOUR DESIGN



9.0

DIRECT SPRAY OVER EXPANDED METAL THREE HOUR FIRE WALL DESIGN

Installation of the Direct Spray over Stress Skin Three Hour Design to form a Fire Wall involves coating both sides of the expanded metal or other steel support material with THERMO-LAG 330-1 Subliming Material - Spray Grade, and then applying THERMO-LAG Stress Skin Type 330-69 to the wet surfaces on each side. The sequential steps involved in installing this fire barrier design on the fire wall support material are described in the following paragraphs.

9.1 Installation of Three Hour Fire Barrier Design

- 9.1.1 Attach the expanded metal to the structural steel framing in those cases where expanded metal is required.
- 9.1.2 Prepare the surface on both sides of the expanded metal or other steel support material for application of the THERMO-LAG 351-2 Primer by removing any dirt, scale, rust or other contaminants. Never apply the primer directly over any hard or glossy painted surfaces without roughening the surface in accordance with standard painting practices.
- 9.1.3 Apply the THERMO-LAG 351-2 Primer to both sides of the properly prepared expanded metal or other steel support material using spray equipment, brush or roller. The Primer shall be applied in accordance with instructions given in Paragraph 12.0 herein.
- 9.1.4 Coat both primed sides of the expanded metal or other steel support material with THERMO-LAG 330-1 Subliming Material - Spray Grade. The coating shall be applied in accordance with instructions given in Paragraph 12.0 herein.

Apply THERMO-LAG Stress Skin Type 330-69 to the wet surfaces on each side after the final pass and use a roller to flatten out any wrinkles and to embed the Stress Skin securely. Then apply sufficient THERMO-LAG 330-1 Subliming Material - Spray Grade, to cover the embedded THERMO-LAG Stress Skin.

OR WHEN COATING PRIOR TO MOUNTING

- 9.1.5 Cut two identical sections of THERMO-LAG Stress Skin large enough to comprise a portion of the fire wall.
- 9.1.6 Coat two sections of the THERMO-LAG Stress Skin with THERMO-LAG 330-1 Subliming Material - Spray Grade, in the required dry film coating thickness of 0.625" +/-0.125". The material shall be applied in accordance with instruction given in Paragraph 12.0 herein.
- 9.1.7 Mount the two sections of coated Stress Skin with their Stress Skin sides facing outward on the expanded metal or other steel support material using approved #10 size minimum bolts, washers and nuts. The holes, which may be counterbored as an approved option, for the approved #10 bolt assemblies are to be drilled on 12 inch centers with the two coated sections being held in place.
- 9.1.8 Apply sufficient amounts of THERMO-LAG 330-1 Subliming Material - Spray Grade, in the required dry film thickness to fill the counterbore holes.

OR AS AN ACCEPTABLE OPTION

- 9.1.9 Cut two identical sections of Stress Skin together with an identical section of expanded metal large enough to mount on the installed rectangular steel tubing or other structural steel entities.
- 9.1.10 Coating the expanded metal with a dry film thickness of 0.625" +/-0.125" of the THERMO-LAG 330-1 Subliming Material - Spray Grade. The coating shall be applied in accordance with instructions given in Paragraph 12.0 herein.

- 9.1.1 Apply one of the previously cut sections of Stress Skin to each of the two coated sections after the final pass of THERMO-LAG 330-1 Subliming Material - Spray Grade. Use a roller to flatten out any wrinkles and to embed the Stress Skin securely.
- 9.1.2 Mount the coated section on the rectangular steel tubing or other structural steel entity using approved long bolts, washers and nuts.
- 9.1.3 Apply sufficient amounts of the THERMO-LAG 330-1 Subliming Material - Spray Grade to cover the bolt heads.

10.0 DIRECT SPRAY-ON DESIGN FOR CABLES INSTALLED IN A CABLE TRAY

Application of the Direct Spray-On Design for cables installed in a cable tray involves spraying the cables and the inside and outside surfaces of the cable tray with a continuous film of the THERMO-LAG 330-1 Subliming Material - Spray Grade. The sequential steps involved in applying the fire barrier design on cables installed in a cable tray are described in the following paragraphs.

10.1 Application of One Hour Fire Barrier Design

- 10.1.1 Prepare both the cable and cable tray surfaces for application of the THERMO-LAG 330-1 Subliming Material - Spray Grade by removing any dirt, dust or other contaminants.
- 10.1.2 Spray the cables installed in the cable tray with a dry film thickness of 0.625" +/- 0.125" of THERMO-LAG 330-1 Subliming Material - Spray Grade. Using the THERMO-LAG 330-1 Subliming Material - Trowel Grade, trowel the material over all gaps remaining after the spray application. The coating shall be applied in the specified dry film thickness over the highest cable in accordance with instructions given in Paragraph 12.0 herein.

- 10.1.3 Spray the outside surfaces and remaining uncoated inside surfaces, above the coated cables, of the cable tray with the THERMO-LAG 330-1 Subliming Material - Spray Grade in the required dry film thickness of 0.625" +/- 0.125"/. The coating shall be applied in accordance with instructions given in Paragraph 12.C herein.
- 10.1.4 As an acceptable option, the applied THERMO-LAG 330-1 Subliming Material may be rolled to produce a smooth surface appearance.

11.0 INTERFACES

Installation of cable tray, conduit and instrument tubing 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.

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

- 11.1.1 Cut and form a box shaped and flanged section from a one or three hour rated Prefabricated Panel as is shown in Figures 15, 16 and 17. The minimum height of the flange shall be sufficient to cover the wall opening and accomodate approved concrete fasteners.
- 11.1.2 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 and approved stainless steel tie wires or banding installed at 12 inch maximum intervals to secure the four sided section.

OR AS AN ACCEPTABLE OPTION

- 11.1.3 Cut and form a box shaped and flanged section from a sheet of THERMO-LAG Stress Skin Type 330-69.
- 11.1.4 Mount the four sided and flanged section on the cable tray or conduit using approved fasteners to fasten the assembly together and to the concrete wall.
- 11.1.5 Apply a coating of THERMO-LAG 330-1 Subliming Material - Trowel Grade in a dry film thickness of 0.625" +/-0.125" for one hour protection and 1.250" +/-0.250" for three hour protection to the Stress Skin section using a trowel.

11.2 Installation of One or Three Hour Self Supporting Interface
Between Conduit or Instrument Tubing and a Wall or Ceiling

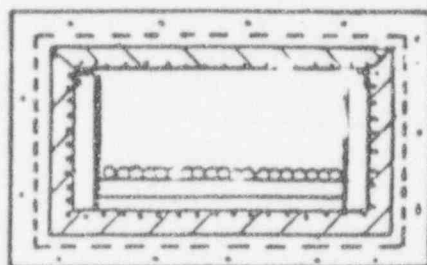
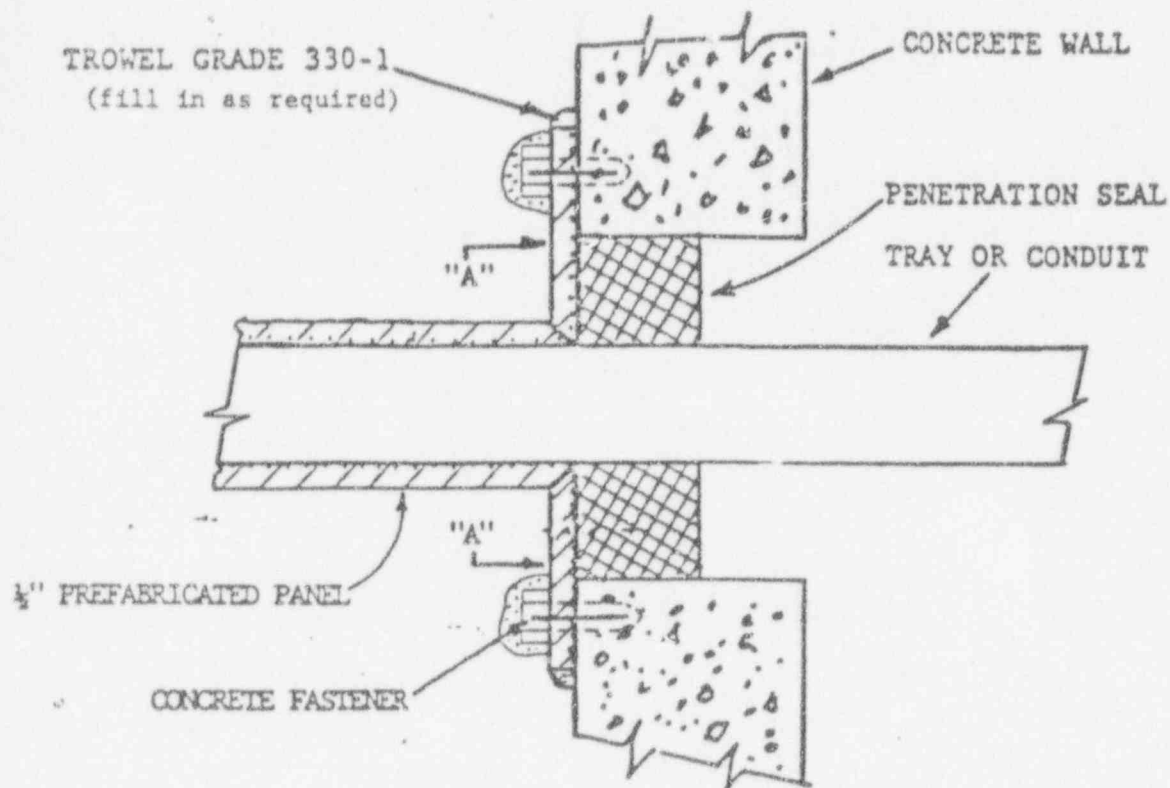
- 11.2.1 Cut and form a three sided and flanged section from a one or three hour rated prefabricated panel as shown in Figures 19 & 20. The minimum height of the flange shall be sufficient to provide for the concrete fasteners.
- 11.2.2 Mount the three sided and flanged section on the cable tray or conduit using approved concrete fasteners to secure the section to the wall or ceiling.
- 11.2.3 Apply a coating of THERMO-LAG 330-1 Subliming Material - Trowel Grade in a dry film thickness of 0.625" +/- 0.125" for one hour protection and 1.250" +/- 0.250" 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.

OR AS AN ACCEPTABLE OPTION

- 11.2.4 Cut and form a box shaped and flanged section from a sheet of THERMO-LAG Stress Skin Type 330-69.
- 11.2.4 Mount the three sided and flanged section on the cable tray or conduit using approved fasteners to secure the section to the wall or ceiling.
- 11.2.5 Apply a coating of THERMO-LAG 330-1 Subliming Material - Trowel Grade in a dry film thickness of 0.625" +/- 0.125" for one hour protection and 1.250" +/- 0.250" for three hour protection to the installed Stress Skin section using a trowel.

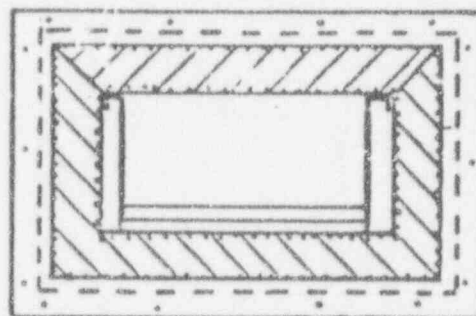
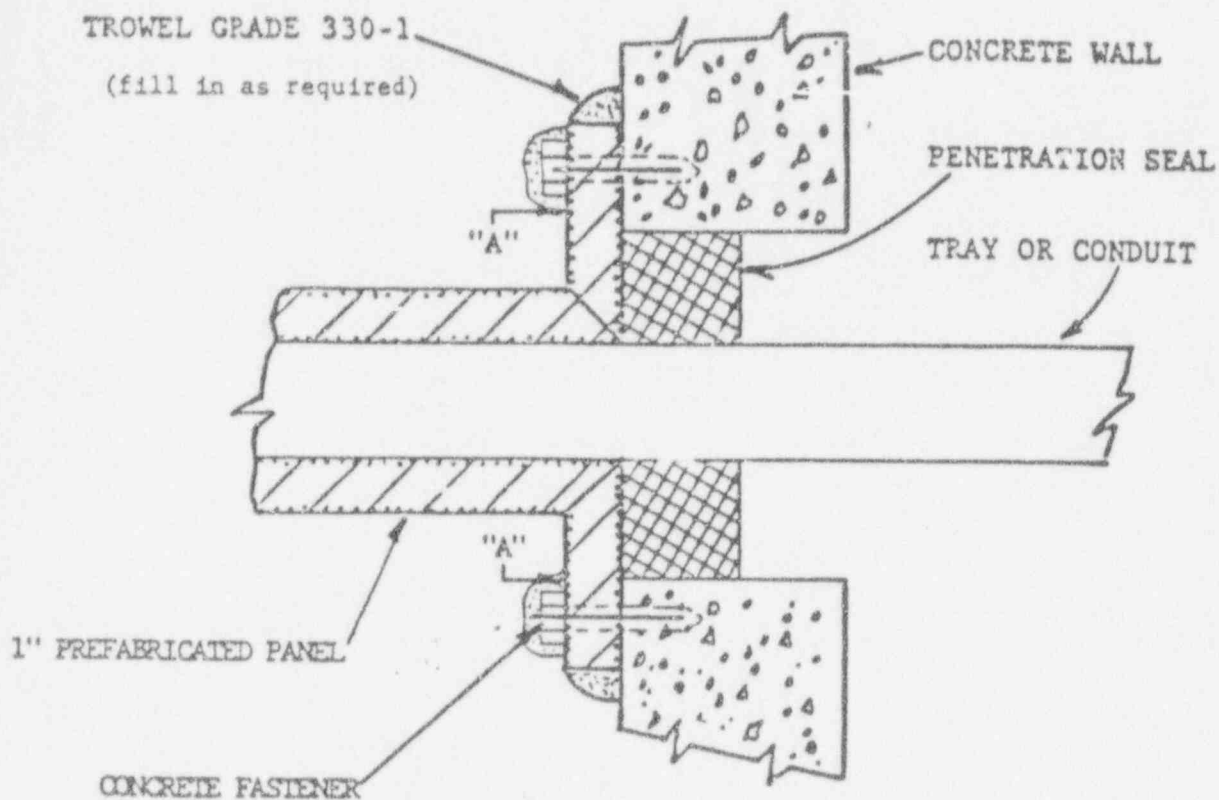
11.3 Installation of One and Three Hour Interface Between a Cable Tray
and a Conduit

- 11.3.1 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 as is shown in Figures 21.



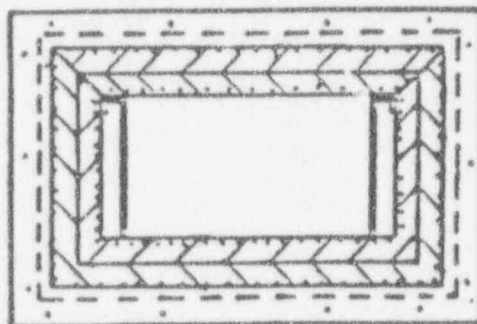
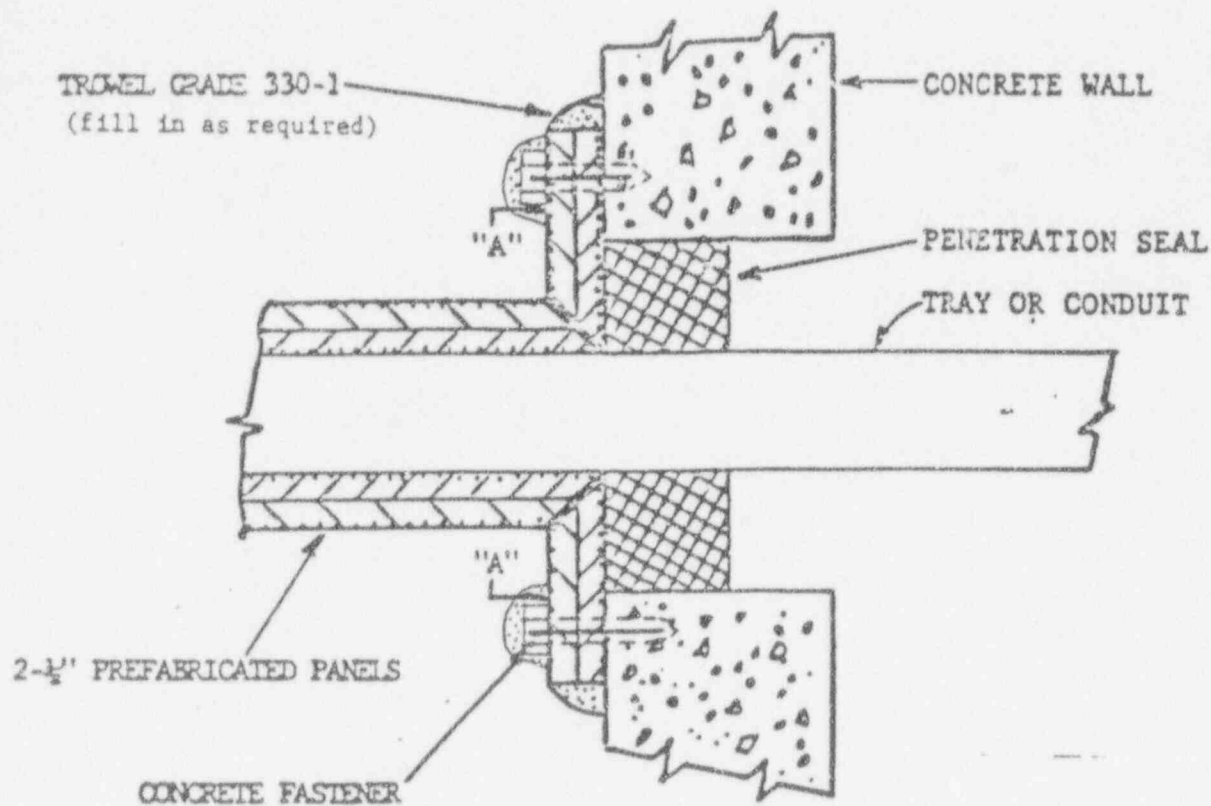
SECTION "A - A"

TEI, INC. 3260 BRANNON ST. LOUIS, MO. 63139.		
SCALE: NONE	DESIGNED BY: <i>R. A. Schmeier</i>	DRAWN BY: J. DUMPLIS
DATE: 3-19-84	CHECKED:	
TYPICAL THERMO-LAG RACEWAY INTERFACING W/ PENETRATION SEAL		
ONE HOUR 1/2" PREFAB PANEL		DRAWING NUMBER: FIGURE 15




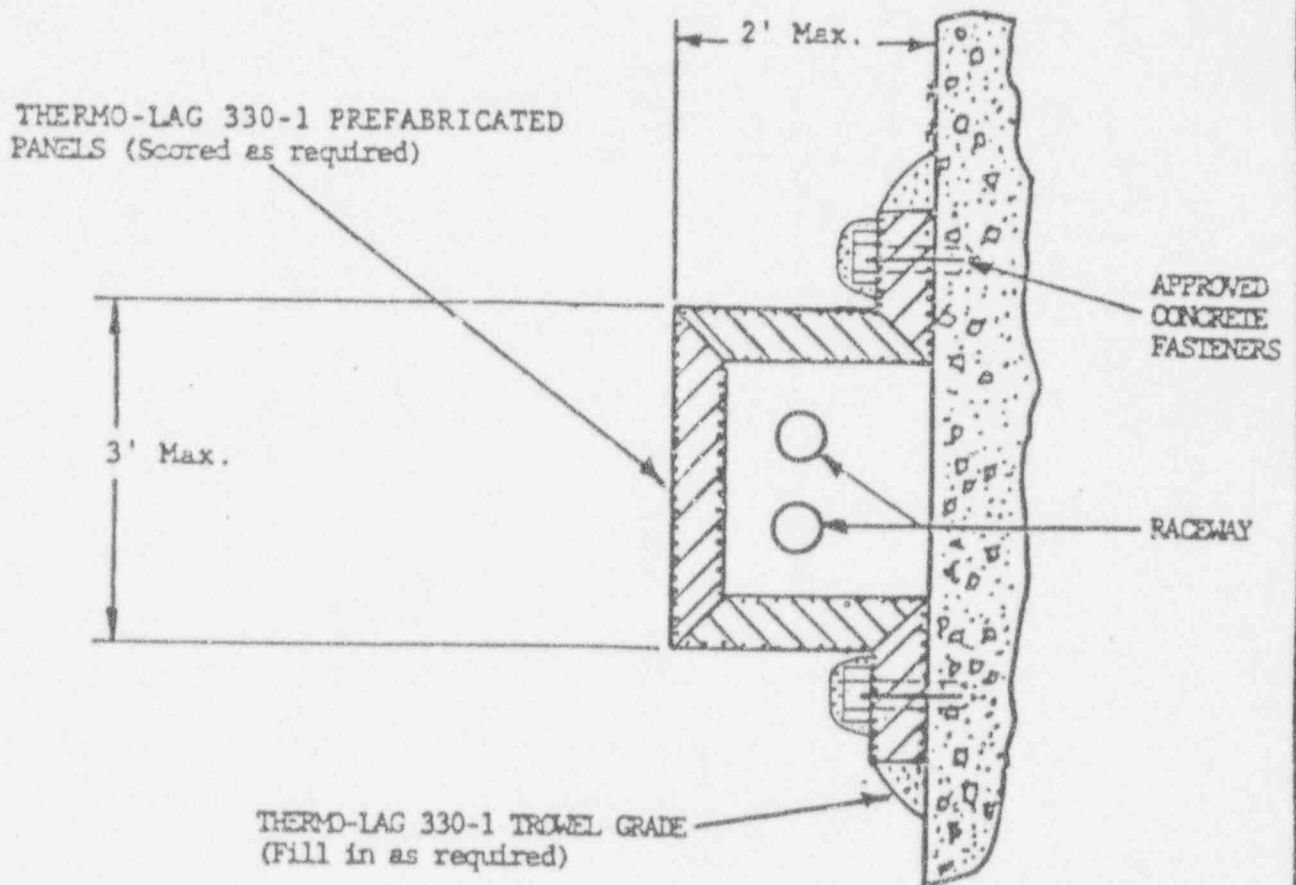
SECTION "A - A"


TEI <small>TEI, Inc.</small>		3260 BRANNON AVENUE, ST LOUIS, MISSOURI 63139	
SCALE NONE DATE 3-1984	DESIGNED BY <i>E.A. Johnson</i>		CHECKED BY DMP/JS
TYPICAL THERMO-LAG RACEWAY INTERFACING W/ PENETRATION SEAL			DRAWING NUMBER FIGURE 16
THREE HOUR - 1" PANEL			

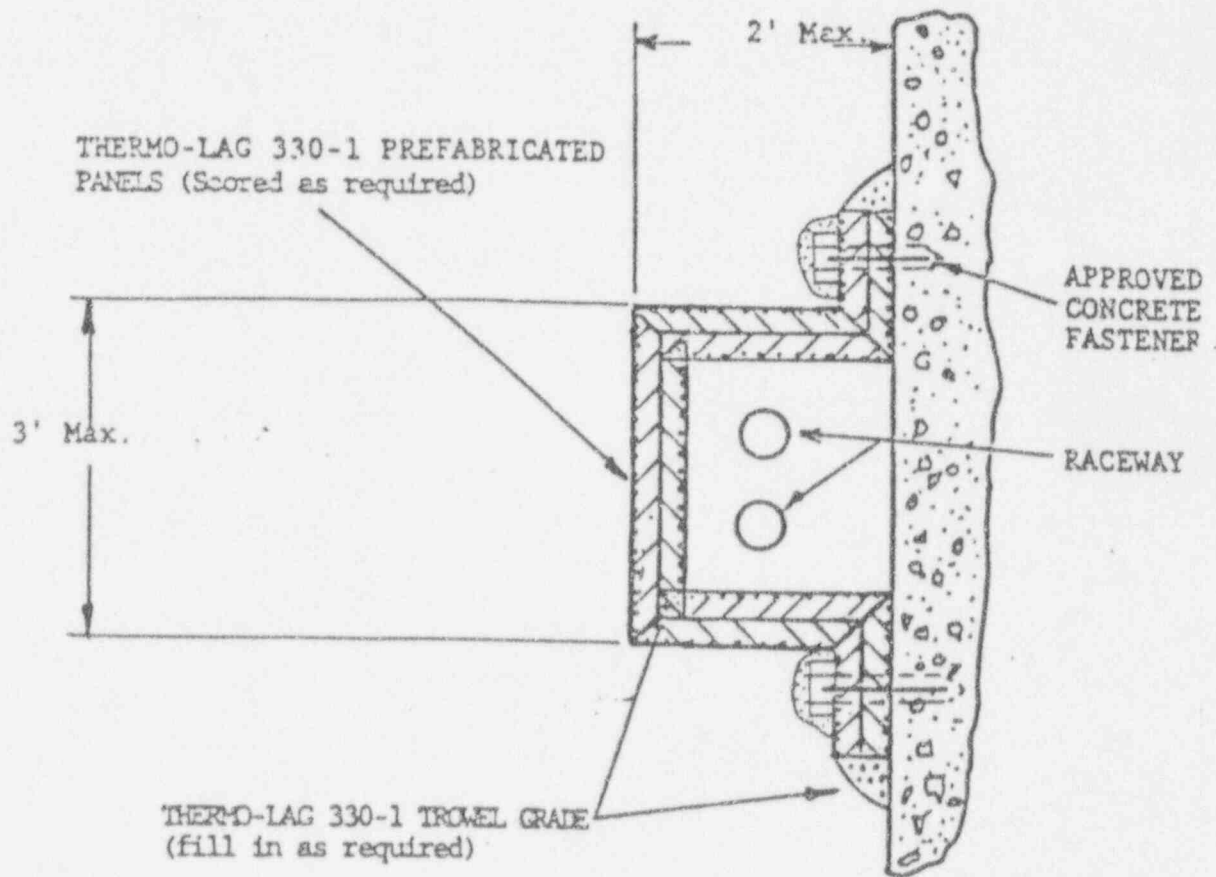



SECTION "A - A"

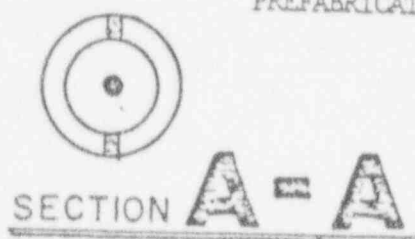
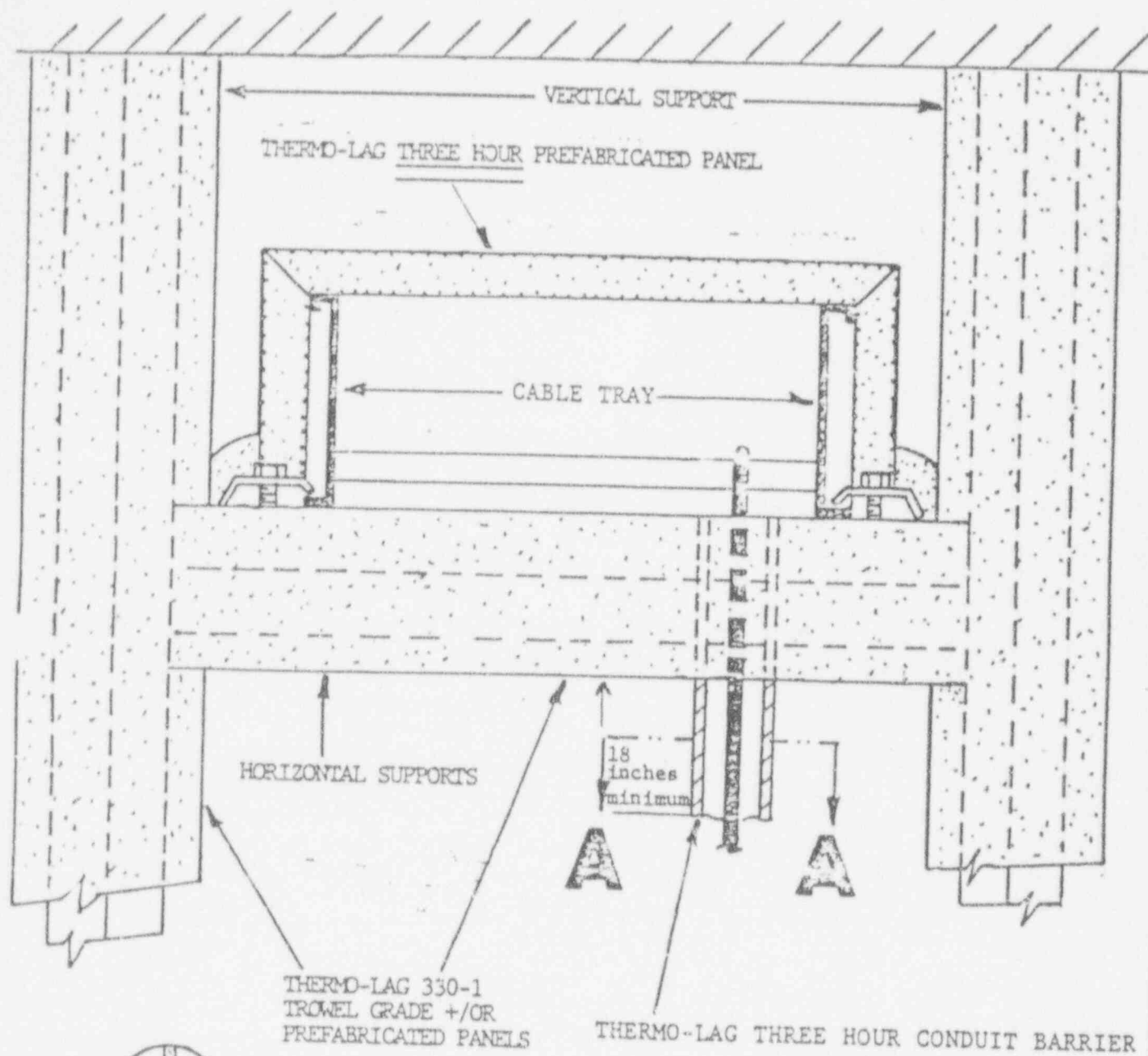
		3260 BRANNON AVENUE, ST. LOUIS, MISSOURI 63135	
SCALE	NONE	DESIGNED BY	DR. J. J. GRIFFIN
DATE	3-19-84	APPROVED BY	<i>L. A. Bolman</i>
TYPICAL THERMO-LAG RACEWAY INTERFACING W/ PENETRATION SEAL			
THREE HOUR - 2-1/2" PANELS			




 T&E, Inc.		3260 BRANNON AVENUE, ST. LOUIS,	
		MISSOURI 63139	
SCALE NONE	DATE 3-19-84	DESIGNED BY <i>R. A. Johnson</i>	DRAWN BY DMP/ES
SELF SUPPORTING THERMO-LAG SYSTEM APPLICATION FOR WALLS OR CEILING USE		THREE HOUR - 1" PANEL	
2-42		FIGURE 19	



		3260 BRANNON AVENUE, ST. LOUIS,	
		MISSOURI 63139	
SCALE	APPROVED BY	DRAWN BY D.M.P.S.	
DATE: 3-19-84	<i>L. A. Schaner</i>	CHECKED	
SELF SUPPORTING THERMO-LAG SYSTEM			
APPLICATION FOR WALLS OR CEILING USE			
THREE HOUR - 2 - 1/2" PANELS		DRAWING NUMBER	
		FIGURE 20	



		3260 BRANNON AVENUE ST. LOUIS, MISSOURI 63129	
SCALE NONE DATE 3-19-84	APPROVED BY <i>R. A. Lohman</i>		DRAWN BY DMP/IS REVISION
TYPICAL: CABLE TRAY & SUPPORT			
THREE HOUR SYSTEM			DRAWING NUMBER FIGURE 21

11.3.2 Install a one hour or three hour fire rated Preshaped Conduit section on a conduit or cable bundle penetrating a cable tray fire barrier for a minimum distance of eighteen inches from the point of penetration as is shown in Figure 21.

11.3.3 Apply a coating of THERMO-LAG 350 Primer to the horizontal structural support member and to the vertical structural supports from the horizontal support member to the ceiling, wall or floor support prior to the trowel application of one or three hour fire protection. Also apply the primer coating to a penetrating structural member for a minimum distance of 18 inches from its point of intersection with a cable tray fire barrier prior to the trowel application of one or three hour fire protection.

11.3.4 Trowel apply a coating of THERMO-LAG 330-1 Subliming Material - Trowel Grade in a dry film thickness of 0.625" +/- 0.125" for one hour fire protection and 1.250" +/- 0.25" for three hour fire protection.

12.0 COATING APPLICATION TECHNIQUES

12.1 THERMO-LAG 351 Primer Application

12.1.1 Prepare the surface of the steel entity for application of the THERMO-LAG 351 Type Primer by removing any dirt, scale, rust or other contaminants. Never apply the primer directly over any hard or glossy painted surface without roughening the surface in accordance with standard painting practices.

12.1.2 Make sure that the cleaned steel surface is compatible with the THERMO-LAG 330-1 Subliming Material by making cross hatch adhesion tests as follows:

. Cross Hatch Adhesion Test

The primer is cut over an area approximately 4" by 4" in a square matrix, each square being approximately 1/2" by 1/2". A high quality tape is applied diagonally to the square. Upon completion of the tape application, it is rubbed in firmly to assure good adhesion. With one complete jerking motion, the tape is removed. If more than 3 percent of the Primer is removed from the surface, the application is faulty. This test should be performed in areas which are deemed critical and in as many places as required by the specification. Upon completion of the Cross Hatch Adhesion Test, the test areas should be again with the THERMO-LAG 351-2 Primer by either brushing or light spray.

Always apply a barrier coat of THERMO-LAG 351 Type Primer over steel surfaces which have been previously primed with a zinc based primer. All doubtful surfaces should be removed using mechanical cleaning methods.

- 12.1.3 Apply the Primer to the properly prepared steel surface in one continuous coat using spray equipment, brush or roller. The minimum acceptable dry primer thickness should be 0.002 inches which is normally achieved by applying at a spread rate of circa 200 sq. ft. per gallon.
- 12.1.4 Measure Primer thickness using an approved magnetic direct reading gauge.
- 12.1.5 Make cross hatch adhesion tests on the primed surface to assure proper adhesion between the primer and the surface of the steel item prior to proceeding with the application of the THERMO-LAG 330-1 Subliming Material.
- 12.1.5 Coat the primed steel surface area with the THERMO-LAG 330-1 Subliming Material. The coating shall be applied in accordance with instructions given in Paragraph 12.2 or 12.3 herein.
- 12.2 THERMO-LAG 330-1 Subliming Material - Spray Application
 - 12.2.1 Apply the THERMO-LAG 330-1 Subliming Material - Spray Grade over a properly prepared surface. Make sure that the surface to be coated is clean, dry, above 40 F and free from scale, rust or other contaminants.
 - 12.2.2 Apply the material in as many passes as required to provide the required dry film build of the coating thickness, taking care to avoid slumping or sagging of the coating. Normally, a required 0.500 inch dry film coating thickness is accomplished by applying three wet coats of 0.255 inches. However, the thickness which can be safely applied in a single pass will depend on the temperature, humidity and other factors that are best determined on the jobsite.
 - 12.2.3 Apply the material in smooth even passes, taking care to keep the spray gun fan pattern at a 90 degree angle whenever possible. Reaching with a spray gun will cause the spray pattern to vary from the 90 degree angle and will result in a rougher surface than normal.

- 12.24 Take frequent wet thickness measurements during the application using a penetration measuring device to ensure that the coating is being applied uniformly and at the required wet film thickness. These wet thickness checks shall be made every five (5) square feet or every two (2) running feet of coated surface area.
(Note: When taking measurements, allow for a shrinkage rate of circa 25% between the wet and the desired dry film coating thickness.)
- 12.2.5 Remove excess build up of coating material at edges and joints by brushing or rolling the surface with a damp sponge roller or a nylon bristle brush.
- 12.2.6 Spray edges of the substrate from each side to cause the material to wrap around the edge. If the edge coating is not completely closed, use a wet roller or trowel to seal the edge surface.
- 12.2.7 Remove all runs, sags, drips or other surface imperfections before the material cures, using wet sponge rollers, brushes or hand trowels.
- 12.3 THERMO-LAG 330-1 Subliming Material Trowel Application
- 12.3.1 Trowel the material to a uniform thickness using moderate pressure and avoid overworking. The trowel should be wetted with water when a smooth finish is required.
- 12.4 Dry Film Thickness Measurements
- 12.4.1 Take dry film thickness measurements after the applied material has cured. Measurement shall be made using electrical, penetrating or magnetic measuring instruments.

13.0

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.

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 sprayed or 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.

14.0 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 stainless steel tie wires or 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 approved stainless steel tie wires or banding. 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.

15.0 POST APPLICATION PRACTICES

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

TSI TECHNICAL NOTE 20684-TP

THERMO-LAG 330 FIRE BARRIER SYSTEM

INSTALLATION PROCEDURES MANUAL

NUCLEAR PLANT APPLICATIONS

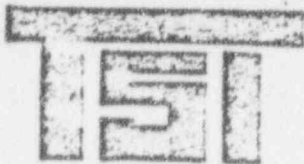
SECTION III

TECHNICAL DOCUMENTATION

SECTION III

PART I

PRODUCT DATA SHEETS



THERMO-LAG 330-1 SUBLIMING COMPOUND

DATA SHEET

PRODUCT DESCRIPTION:

THERMO-LAG 330-1 is a water based, fireproofing, thermally activated, subliming and insulative coating. When exposed to flame, the material volatilizes at fixed temperatures; exhibits a small volume increase through formation of a multi-cellular matrix; absorbs and blocks heat to protect the substrate material.

TYPE:

THERMO-LAG 330-1 Subliming Compound

COLOR:

Antique White

FINISH:

Textured

OUTSTANDING FEATURES:

Ease of Application
Excellent exterior and interior durability
No flash point or fire hazard
Chemical Resistance
No asbestos
Rugged

COMPOSITION AND PHYSICAL PROPERTIES:

SOLVENTS

Net Weight/gallon lbs/gal
Non volatile
Flash Point
Consistency
Warranted Shelf Life
Storage Conditions

WATER

10.5 ± 0.5
66 Min.
None
Semi-solid, paste-like
6 Months
Above 32°F and Below 100°F

THERMO-LAG 330-1 SUBLIMING COMPOUND

DATA SHEET CONTINUED

BASIC USE:

THERMO-LAG 330-1 is applied to cable trays, cable drop and junction box assemblies, structural steel, support structures, containment vessels, tank cars, and other similar entities.

THERMO-LAG 330-1 is applied to protect the substrate against loss of structural strength and excessive temperatures during exposure to fire. One and multiple hour fire ratings can be provided as determined by test utilizing the ASTM E-119 time - temperature environment, hydrocarbon or chemical fire environments.

THERMO-LAG 330-1 Subliming Compound has also been tested per ASTM E84 Standards by an independent testing laboratory with the following results:

Flame Spread	5
Fuel Contributed	0
Smoke Developed	15 --

COATING THICKNESS:

The coating thickness is a function of the specific weight of the steel to be protected. The heavier the steel, the thinner the coating required for a given fire endurance rating. (Specific film thicknesses are specified by the owner or his duly authorized representative.)

PACKAGED:

55 gallon drums approximately 500 net lbs. THERMO-LAG 330-1 Subliming Compound is supplied in containers bearing Underwriters Laboratories labels.

STORAGE CONDITIONS:

Store above 32°F and below 100°F.

THERMO-LAG 330-1 SUBLIMING COMPOUND

DATA SHEET CONTINUED

SURFACE PREPARATION:

1. Surface must be clean, dry and free from contaminants including oil, grease and scale prior to application.
2. THERMO-LAG 351 Primer should be used as and where required.

MIXING:

Material should be stirred to a homogeneous consistency prior to application.

TEMPERATURE/HUMIDITY:

THERMO-LAG 330-1 Subliming Compound shall be applied in conformance with good painting practices. The surface shall be dry, above 40°F and below the dew point.

METHOD OF APPLICATION:

May be applied by airless spray, air atomizing spray, brushing, rolling or caulking gun.

RECOMMENDED SPRAY EQUIPMENT:

For spray application direct from the shipping container, air-ram (45:1 & 10:1 compression ratio) extrusion pump, airless spray or air atomizing spray equipment should be used.



THERMO-LAG STRESS SKIN TYPE 330-69

DATA SHEET

PRODUCT DESCRIPTION:

THERMO-LAG Stress Skin Type 330-69 is comprised of an open weave, self stiffened steel mesh used to provide an enclosure over cables, cable trays, and cable drops and provide an easily accessible refurbishment of surfaces which possess adequate characteristics to receive the THERMO-LAG 330-1 Subliming Material System.

THERMO-LAG Stress Skin Type 330-69 is inherently resistant to differential thermal expansion, thermal stress, flutter, vibration and other type of loading - potentially resultant from earthquake conditions.

PHYSICAL PROPERTIES:

THERMO-LAG Stress Skin Type 330-69 shall be comprised of an open weave, self stiffened steel mesh to meet the following characteristics:

Strand Diameter:	0.017 Inches Minimum
Mesh Size:	56 Minimum
Weight/Sq. Yd.	1.75 Lbs. Minimum

Type "V" Stiffener dimensions:

Height:	.30 ± 0.05 Inches
Base:	.30 ± 0.05 Inches
Spacing:	6 ± 1.0 Inches

CHEMICAL PROPERTIES:

THERMO-LAG Stress Skin Type 330-69 is chemically treated to provide reliable long lasting corrosion inhibiting properties.

THERMO-LAG STRESS SKIN TYPE 330-69

DATA SHEET CONTINUED

BASIC USE:

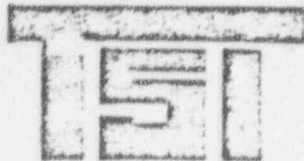
THERMO-LAG Stress Skin Type 330-69 shall be installed in such a manner as to provide a complete and continuous wrap over all areas to receive the THERMO-LAG 330-1 Subliming Material System, with the exception of junction boxes and structural support entities.

SURFACE PREPARATION:

Prior to use, the substrate should be clean, free of loose dirt, grease and other contaminants. No special surface preparation is required.

METHOD OF APPLICATION:

Best results are obtained if each individual length of each individual section does not exceed 10 feet. Each section should overlap each preceding section by at least 6 inches or fastened to the preceding and following section by a flange facsimile having a 1 inch lip, minimum. Circumferentially, two sections are preferred. The skin shall be tight and all flanges and butt joints properly fastened. The sections should be secured to each other by using approved mechanical fasteners. The maximum distance between fasteners should be 6 inches.



THERMO-LAG 351-2 PRIMER

DATA SHEET

PRODUCT DESCRIPTION:

THERMO-LAG 351-2 PRIMER IS SPECIFICALLY PROVIDED FOR USE IN CONJUNCTION WITH THERMO-LAG 330-1 SUBLIMING COATING. IT PROVIDES THE STRONG MECHANICAL BASE REQUIRED FOR FIELD APPLICATION OF THE SUBLIMING MATERIAL TO A STEEL SUBSTRATE.

COLOR: RED
FINISH: MATTE

TEMPERATURE:

THIS PRODUCT SHOULD BE APPLIED IN CONFORMANCE WITH GOOD PAINTING PRACTICES. THE SURFACE SHALL BE DRY, ABOVE 40°F AND ABOVE THE DEW POINT.

COMPOSITION AND PHYSICAL PROPERTIES:

PIGMENTS:	ANTI-CORROSION
SOLVENTS:	WATER
SOLIDS BY VOLUME:	44 ± 1%
NET WEIGHT PER GALLON:	11.5 ± 1.0 LBS.
PACKAGED:	5 GALLON PAILS
SHELF LIFE:	SIX MONTHS



THERMO-LAG 350

TWO PART SPILL RESISTANCE TOPCOAT DATA SHEET

PRODUCT DESCRIPTION:

THERMO-LAG 350 is a two part spill resistant topcoat with a formulation designed to provide chemical and corrosion resistance to protect against abrasion, moisture, corrosive fumes and chemical contact.

PHYSICAL PROPERTIES:

Color:	White
Finish:	Gloss
Solids by Volume:	34.0 \pm 1.0% Mixed
Theoretical Coverage:	50 Sq. Ft Per Gallon
Mixing Ratio By Volume:	Part A - 4 To Part B - 1
Net Weight Per Gallon:	10.93 \pm 0.20 lbs (Mixed)
Storage Temperature:	Minimum - 35°F Maximum - 120°F Protect from freezing. In cold weather, store materials inside above 60°F until use.
Shelf Life:	6 Months at recommended storage temperatures.
Flash Point:	Above 135°F
Pot Life:	10 hours at 60°F 8 hours at 77°F 4 hours at 100°F
Surface Temperature:	Minimum - 40°F Maximum - 120°F
Thinning:	Use clean water. For air spray thin up to 10%; airless spray, brush or roller, up to 5%.

THERMO-LAG 350

TWO PART SPILL RESISTANCE TOPCOAT

DATA SHEET CONTINUED

CHEMICAL RESISTANCE:

FREQUENT CONTACT

Alkali Solutions
Alcohols
Aliphatic Hydrocarbons
Aromatic Hydrocarbons
Salt Solutions

OCCASIONAL CONTACT

Fresh Water	Organic Acids
Waste Water	Mineral Acids
Mineral Oils	Oxidizing Agents
Vegetable Oils	Ketones

BASIC USE:

Especially formulated to provide compatibility when used in the THERMO-LAG 330-1 Subliming Material System. THERMO-LAG 350 Two Part Water Based Spill Resistant Topcoat provides excellent protection against water flow, climatic variations, chemical attack and physical abuse. This material has been tested in accord with ASTM E84 Standards by an independent testing laboratory with the following results:

Flame Spread:	5
Fuel Contributed:	0
Smoke Developed:	0

PACKAGED:

*5 Gallon Kits consisting of one short filled 5 gallon pail of Part A and a one gallon can of Part B.

*Partial mixes can be made provided proper ratios are maintained.

THERMO-LAG 350

TWO PART SPILL RESISTANT TOPCOAT

DATA SHEET CONTINUED

SURFACE PREPARATION:

The surface should be clean, free of loose and foreign contaminants and dry: at least 5°F above the dew point.

Spray Applications

Moisture meter readings, using a Delmhorst Moisture Meter, Model DP must be taken and readings of 20 or less must be obtained prior to the topcoat being applied.

Prefabricated Panel and Preshaped Conduit Installations

Allow 24 hours following installation before applying the topcoat.

MIXING:

Stir contents of Part A, making sure no pigment remains on the bottom of the pail. Add Part B (1 gallon container) to Part A (5 gallon pail). Mix with a power mixer until the two components are thoroughly blended. Do not use mixed material beyond pot life limits.

METHOD OF APPLICATION:

Application can be made by spray, roller or brushing. A criss/cross application technique is recommended to help achieve pin-hole free coverage.

APPLICATION EQUIPMENT:

Brush:

Use Nylon or synthetic bristle brushes.

Rollers:

Use short nap synthetic rollers for smooth surfaces.
Use long nap synthetic rollers for rough surfaces.

THERMO-LAG 350
TWO PART SPILL RESISTANT TOPCOAT
DATA SHEET CONTINUED

APPLICATION EQUIPMENT:

For Air Spray:

<u>Gun</u>	<u>Fluid Tip</u>	<u>Air Cap</u>	<u>Air Hose ID</u>	<u>Mat'l Hose ID</u>	<u>Atomizing Pressure</u>	<u>Pot Pressure</u>
DeVilbiss MBC or JGA or equal	E	2 or 78	5/16" or 3/8"	3/8" or 1/2"	75-100 psi	10-20 psi

NOTE: Low ambient temperature applications or longer hoses require higher pot pressure.

For Airless Spray:

<u>Tip Orifice</u>	<u>Atomizing Pressure</u>	<u>Material Hose ID</u>	<u>Manifold Filter</u>
0.015" to 0.019"	2700-3000 psi	1/4" or 3/8"	60 mesh

NOTE: Use appropriate tip and atomizing pressure for equipment, applicator technique and weather conditions.

DRYING TIME AT 75°F:

THERMO-LAG 350 Two Part Water Based Spill Resistant Topcoat dries to touch in approximately 1 hour; to handle in approximately 5 hours. Allow to dry for at least seven days before exposure to immersion service. Drying time will vary on ambient temperatures and relative humidity.

CLEAN UP:

Clean all equipment immediately after use with water, followed by a final washing with xylol or No. 8 Thinner.

SECTION III

PART 2

MATERIAL SAFETY DATA SHEETS

DEPARTMENT OF LABOR AND INDUSTRIES
INDUSTRIAL HYGIENE SECTION

MATERIAL SAFETY DATA SHEET



SECTION I

MANUFACTURER'S NAME TSI, Inc.		EMERGENCY TELEPHONE NO. 314 352-8422
ADDRESS (Number, Street, City, State, and ZIP Code) 3260 Brannon Avenue, St. Louis, Mo. 63139		
CHEMICAL NAME AND SYNONYMS Latex Mastic		TRADE NAME AND SYNONYMS THERMO-LAG 330-1
CHEMICAL FAMILY Fire Resistive Coating	FORMULA Company Confidential	

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
See OSHA 29CFR 1910.1000 Table Z3			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES					
OTHERS	0.7%	25ppm			
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	CIRCA	220	SPECIFIC GRAVITY (H ₂ O=1)	1.25
VAPOR PRESSURE (mm Hg.)		Water	PERCENT VOLATILE BY VOLUME (%)	41
VAPOR DENSITY (AIR=1)		Water	EVAPORATION RATE (1.0 = 1)	Water
SOLUBILITY IN WATER		Miscible		
APPEARANCE AND ODOR	White Mastic - No appreciable odor			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	None TCC	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA	N/A		N/A	
SPECIAL FIRE FIGHTING PROCEDURES Wear self contained breathing apparatus				
UNUSUAL FIRE AND EXPLOSION HAZARDS				

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form OSHA-10
OMB No. 44-11387

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing,
Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME TSI, Inc.		EMERGENCY TELEPHONE NO. 314 352-8422
ADDRESS (Number, Street, City, State, and ZIP Code) 3260 Brannon Avenue St. Louis, Missouri 63139		
CHEMICAL NAME AND SYNONYMS Modified Long Chain Polyester Primer		TRADE NAME AND SYNONYMS THERMO-LAG 351 Primer
FORMULA CONFIDENTIAL - TRADE SECRET		

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS	49	100	FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	104-380	SPECIFIC GRAVITY (H ₂ O=1)	1.4
VAPOR PRESSURE (mm Hg.)	65	PERCENT VOLATILE BY VOLUME (%)	49
VAPOR DENSITY (AIR=1)	3.2	EVAPORATION RATE (n-Butyl Acetate=1)	2.5
SOLUBILITY IN WATER	None		
APPEARANCE AND ODOR	Dark red liquid - Odor: Minimal		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (MEANSD VMD)	100°F SETA	FLAMMABLE LIMITS	Le ¹	U ²
EXTINGUISHING MEDIA	Carbon Dioxide, foam, dry chemical, water fog			
SPECIAL FIRE FIGHTING PROCEDURES				
Use self contained breathing apparatus.				
UNUSUAL FIRE AND EXPLOSION HAZARDS				
Keep away from heat, open flame and sparks.				
Do not apply to hot surfaces. DOT CATEGORY: COMBUSTIBLE LIQUID				

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1187

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing,
Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME TSI, Inc.		EMERGENCY TELEPHONE NO.
ADDRESS (Number, Street, City, State, and ZIP Code) 3260 Brannon Avenue St. Louis, Missouri 63139		
CHEMICAL NAME AND SYNONYMS Epoxy/Polyamide Topcoat		TRADE NAME AND SYNONYMS THERMO-LAG 350 Sp111
CHEMICAL FAMILY Epoxy/Polyamide	FORMULA Resistant Topcoat	

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS	25	100 PPM	BASE METAL		
CATALYST	-	-	ALLOYS		
VEHICLE	20	25PPM	METALLIC COATINGS		
SOLVENTS	55	25PPM	FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES	-	-	OTHERS		
OTHERS	-	-			
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	311°F	SPECIFIC GRAVITY (H ₂ O=1)	1.30
VAPOR PRESSURE (mm Hg.)	-	PERCENT VOLATILE BY VOLUME (%)	34%
VAPOR DENSITY (AIR=1)	-	EVAPORATION RATE (_____ = 1)	.02
SOLUBILITY IN WATER	50gm/100gm		
APPEARANCE AND ODOR	White Paintlike - Aromatic Solvent Odor		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	+135°F TCC	FLAMMABLE LIMITS	LEL	UEL
EXTINGUISHING MEDIA	CO₂ Extinguishers			
SPECIAL FIRE FIGHTING PROCEDURES				
UNUSUAL FIRE AND EXPLOSION HAZARDS				

SECTION III

PART III

RECOMMENDED ON SITE QUALITY

CONTROL PROCEDURE

RECOMMENDED ON SITE QUALITY

CONTROL PROCEDURE

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

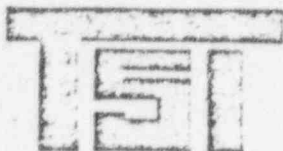
RECEIVING PROCEDURES

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.
 - c. Test as an option that:
 1. Weight per gallon is as specified in A-2 TQAPM.
 2. pH valve is as specified in A-3 TQAPM.

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 banding, tie wire, nuts and bolts, and concrete fasteners, are of 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 the envelope.



OPERATING PROCEDURES
TEST PROCEDURES

TQAPM SEC. 11.5

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Page 3

Title of Procedure:

WEIGHT PER GALLON

Purpose:

This procedure provides a method of determining, by use of a simple factor, the weight in pounds of one gallon of THERMO-LAG finished product or raw materials used in their manufacture at TSI.

Applicability:

This procedure applies to Nuclear Safety related and other programs product testing, as required by TSI, for both THERMO-LAG finished products and raw materials used in their manufacture at TSI.

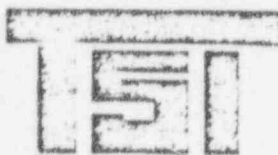
Responsibility:

The Manager of Quality Assurance shall be responsible for the testing of both THERMO-LAG finished products and raw materials used in their manufacture to insure compliance with TSI's written quality control specifications.

Procedure:

Apparatus:

The apparatus consists of a smoothly finished aluminum/stainless steel/brass or plated cup provided with a snug fitting-plug type cover having a small hole in its center. The capacity of the apparatus (filled to the top of the hole in the cover), at $23^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$, is 83.2 ± 0.1 ml. The inside of the bottom of the cup should be rounded. A convenient size for the apparatus is circa 76mm high by 38mm in diameter, the hole in the cover should be circa 1mm in diameter. The tare of the apparatus should be determined or a counterpoise weight should be provided.



OPERATING PROCEDURES
TEST PROCEDURES

TQAPM SEC. 11.5

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REVISION V

Page 4

Title of Procedure: WEIGHT PER GALLON

Procedure (continued):

1. Pour the well mixed THERMO-LAG 330-1 Subliming Material, previously brought to a temperature of approximately 77°F , into the cup until it is nearly full. Put cover on and rotate firmly into place and then wipe off the excess coating that may extrude through the hole in the cover.
2. Determine the weight of the material in the cup in grams.
3. Divide this figure by 10 to obtain the weight of the material in pounds per gallon.
4. Particular care must be taken that no air pockets are trapped in the material.



OPERATING PROCEDURES
TEST PROCEDURES

TQAPH SEC. 11.5

A-3

REVISION V

Page 5

Title of Procedure:

pH VALUE

Purpose:

This method provides a procedure for determining the hydrogen ion concentration (pH Value) of a liquid sample of THERMO-LAG finished products or raw materials used in their manufacture at TSI.

Applicability:

This procedure applies to Nuclear Safety related and other programs product testing, as required by TSI, for both THERMO-LAG finished products and raw materials used in their manufacture at TSI.

Responsibility:

The Manager of Quality Assurance shall be responsible for the testing of both THERMO-LAG finished products and raw materials used in their manufacture to insure compliance with TSI's written quality control specifications.

Procedure:

Apparatus:

- A pH meter and a combination pH electrode.
1. Adjust sample to 77 F.
 2. Calibrate pH meter and electrode against standard buffer solutions.
 3. Immerse electrode in pint sample.
 4. Take pH with meter.

SECTION III

PART 4

RECOMMENDED LIST OF INSTALLATION
TOOLS AND SPRAY EQUIPMENT

RECOMMENDED LIST OF INSTALLATION TOOLS
AND SPRAY EQUIPMENT

The following is a recommended list of typical installation tools and equipment for installation of the THERMO-LAG 330 Fire Barrier System. These parts can usually be obtained from local suppliers.

Work Tables - 7'x4'
2" Nylon Brushes
All Purpose Caulking Guns
Hand Circle Saws with carbide blades
Box Knives
1" Putty Knives
6" Putty Knives
Wire Cutters
Vice Grips
Trowels - 1" to 5"
Long Nose Pliers
Work Gloves
Dust Masks
Goggles
Protective Clothing
Organic and Particulate Matter Respirators
18 ga. Stainless Steel Tie Wire or Larger
or
Stainless Steel Banding .020 x 1/2" or Heavier

SUGGESTED COMPLEMENT OF REQUIRED SPRAY EQUIPMENT
FOR THERMO-LAG 330-1 SUBLIMING COATING APPLICATION

AIRLESS SPRAY EQUIPMENT

<u>QUANTITY</u>	<u>DESCRIPTION OF EQUIPMENT</u>
1 Each	Hydra Spray Pump 45:1
1 Each	Air Powered Ram
1 Each	Hydra Maxtic Spray Gun
1 Each	Special Dump Valve
2 Each	RAC III with 0.55 Tips
1 Each	Air Agitator
1 Each	Air Regulator Kit
1 Each	Air Regulator Only with Gauge
1 Each	Air Line Filter
1 Each	Air Line Lubricator
5 Each	Pump Repair Parts Kits
6 Each	Extra Tips with Seals
100 Feet	1 Inch I.D. Hi Pressure Fluid Hose
75 Feet	1/2 Inch I.D. Hi Pressure Fluid Hose
25 Feet	3/8 Inch I.D. Hi Pressure Fluid Hose

AIRLESS SPRAY EQUIPMENT

<u>QUANTITY</u>	<u>DESCRIPTION OF EQUIPMENT</u>
1 Each	10:1 President Spray Pump
1 Each	Air Powered Ram
1 Each	Heavy Mastic Spray Gun
1 Each	Special Dump Valve
2 Each	1/4 Inch or 1/4 Inch "E" Spray Tip
1 Each	Air Agitator
1 Each	Air Regulator Kit
1 Each	Air Regulator Only with Gauge
1 Each	Air Line Lubricator
1 Each	Air Line Filter
5 Each	Pump Repair Parts Kits
75 Feet	1/2 Inch I.D. Hi Pressure Fluid Hose
25 Feet	3/8 Inch I.D. Hi Pressure Fluid Hose