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Railings
Specification 8856-E-61
Revision 1

TECHNICAL SPECIFICATION
FOR
ELECTRICAL RACEWAY
FIRE INSULATION BARRIER
MATERIALS
FOR THE
SUSQUEHANNA STEAM ELECTRIC STATION
UNITS 1 AND 2
OF THE
PENNSYLVANIA POWER & LIGHT COMPANY

ALLENTOWN, PENNSYLVANIA


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RECEIVED
JOB 8856
SUSQUEHANNA PROJECT

OCT 5 1981

ADDENDUM NO. _____
F.C.R. No. E 6347
F.C.N. No. _____

P-156/3-1

△							n/a		
△	9/25/81	Incorp. PLB-13563, FCR-E-5486 added new materials DCR-403	<i>U/S</i>	<i>U/S</i>	<i>U/S</i>	<i>U/S</i>	n/a	<i>EP/18</i>	
△	10-4-81	ISSUED FOR CONSTRUCTION	<i>U/S</i>	<i>U/S</i>	<i>U/S</i>	<i>U/S</i>	n/a	<i>EP/18</i>	
No.	DATE	REVISIONS	BY	CHK	DESIGN SUPV	ENGR	PROJ ENGR	APPV	
SCALE NONE		DESIGNED <i>W. Hopstock</i>		DRAWN <i>NA</i>		CHIEF ENGR			
		SUSQUEHANNA STEAM ELECTRIC STATION UNITS 1 & 2 PENNSYLVANIA POWER & LIGHT COMPANY				JOB No. 8856			
								SPEC/DES GUIDE NO.	REV.
								8856-E-61	.1

8856-S-13 (8/73)

SHEET 1 OF 10

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INDEX TO
TECHNICAL SPECIFICATION FOR ELECTRICAL RACEWAY
FIRE INSULATION BARRIER
MATERIALS

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- 4.0 CODES AND STANDARDS
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TECHNICAL SPECIFICATION
FOR
ELECTRICAL RACEWAY
FIRE INSULATION BARRIER
MATERIALS

1.0 SCOPE

- 1.1 This specification describes the requirements for raceway insulation materials for the Susquehanna Nuclear Power Station Unit 1 and Unit 2 in accordance with the performance, design and test criteria requirements described herein.
- 1.2 It is not the intent to specify herein all details of design and construction. It shall be the responsibility of the Seller to insure that the materials have been designed and fabricated in compliance with this specification and with all documents referred to herein as well as in accordance with good engineering practice.
- 1.3 In the event of an apparent conflict between requirements of the specification and those of the Purchase Documents, or any of the attached specifications, the Seller must bring the conflict to Buyer's attention for resolution.
- 1.4 All materials shall be suitable for the specified service and shall be subject to the approval of the Buyer. Substitutions for articles or materials shall not be made without the specific written consent of the Buyer.
- 1.5 The Seller shall have full responsibility for compliance with the requirements of these specifications.
- 1.6 Fire stops, in walls and floors at cable tray and conduit penetrations, are not part of this specification.

2.0 WORK INCLUDED

Furnish all the necessary insulating materials, installation details, tools, equipment and services required for insulation of electrical raceway for the following:

1. Fire breaks
2. Exposure fire barriers
3. Separation barriers as described in this specification.

3.0 WORK NOT INCLUDED

- 3.1 The Buyer shall install all materials specified.
- 3.2 Unloading and storage of all materials specified.

4.0 CODES AND STANDARDS

4.1 The materials specified herein shall conform in all respects with applicable federal, state, and local laws, and regulations of U.S. Department of Labor Occupational Safety & Health Administration, The Commonwealth of Pennsylvania, and other local regulatory bodies having jurisdiction over such materials, in effect at the time of award.

4.1.1 In the event of any conflict of codes or standards, the following priority sequence shall be followed:

4.1.1.1 Nuclear Regulatory Commission Reg. Guides and American Nuclear Insurers (ANI).

4.1.1.2 U. S. Dept of Labor-Occupational Safety and Health Standards.

4.1.1.3 Commonwealth of Pennsylvania Regulations.

4.1.1.4 Bechtel Specification

Seller shall contact the Buyer for resolution of all conflicts.

Note:

Latest issue of specifications, standards and codes means the issue (including latest addenda) in force at the date of purchase order. Adoption of any case rulings or interpretations or any subsequent addenda issues shall be subject to Buyer's approval prior to their use.



5.0 CONDITIONS OF SERVICE (outside containment only)

5.1 Normal Environment:

Ambient Temperature. 40° to 105°F with occasional increases to 120°F.

5.2 Environmental Radiation:

Shall be capable of continuous operation under the conditions stated above and shall be able to withstand an integrated radiation dose of 5.3×10^6 rads gamma radiation over a 40-year period without failure. Radiation damage shall be construed to mean a detrimental change in the functional properties of the material or devices. Any exceptions must be approved by the Buyer.

6.0 DESIGN AND CONSTRUCTION

6.1 Fire Break Design

6.1.1 The purpose of Fire Breaks is to stop upward propagation of fire in vertical and horizontal covered cable trays.



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6.1.2 Fire Breaks shall be installed in vertical cable trays every 15 ft. and [REDACTED] covered tray.

6.1.3 Fire Breaks shall be made from a Insulation Blanket and mastic coating, or an approved equal, see Sect. 6.7.

6.2 Fire Break Construction (Typical For Insulation Blanket Material Only)

6.2.1 Fire Breaks shall completely encapsulate the cable tray for six to eight inches (nominal Min. Dimension).

6.2.2 If the cable tray is not covered and is not completely filled with cables, Insulation Blanket, the same width as the cable tray shall be inserted over the cables in sufficient layers to bring the outer surface of the Insulation Blanket even with the top of the tray sides.

6.2.3 One layer of Insulation Blanket will then be wrapped completely around the cable tray, with a minimum of 3 inches of overlap of adjacent blankets and blanket ends. The blanket shall be secured with stainless steel straps on 12 inch centers.

6.2.4 The open ends of the Fire Break shall be packed with Bulk Insulation Fiber and sprayed with Mastic Coating to a 1/2 inch wet thickness so as to completely seal the cable tray/cable/Insulation Blanket interface.

6.3 Exposure Fire Barrier Design

6.3.1 Exposure Fire Barriers shall be installed on electrical cable trays, conduits and junction/terminal boxes at locations specified per Fire Protection Review drawings (10 CFR 50 Append. R).

6.3.2 Exposure Fire Barriers shall be made by encasing the cable trays, conduits and junction/terminal boxes in one hour rated barrier system consisting of Insulation Blanket, or an approved equal, see sect. 6.7.

6.3.3 The purpose of Exposure Fire Barriers is to prevent damage, during a 1 hour complete engulfment fire, to electrical cables serving one division of equipment required for safe shutdown of the plant.

6.4 Exposure Fire Barrier Construction (Typical For Insulation Blanket Material Only)

6.4.1 Exposure Fire Barriers shall completely encapsulate the indicated cable tray or conduit for the entire length specified.

6.4.2 If the cable tray is not covered and is not completely filled with cables, Insulation Blanket, the same width as the cable tray, shall be inserted over the cables in sufficient layers to bring the outer surface of the Insulation Blanket even with the top of the tray sides.

- 6.4.3 The interior layer of the Insulation Blanket shall wrap completely around the perimeter of the cable tray with the ends of the blanket overlapping a minimum of 3 inches. Adjacent blankets shall be placed tightly together so as to prevent any gaps in the butt joints between blankets. This layer shall be held in place by High Performance Filament Tape spaced not more than 14 inches apart and not less than 4 inches from butt joints.
- 6.4.4 The exterior layer of Insulation Blanket shall wrap completely around the perimeter of the interior layer and must also have a minimum 3 inch overlap. The overlap of the exterior layer shall be offset from the overlap of the interior layer but still remain on the top of the tray. The exterior layer blankets shall be installed such that the butt joints between adjacent exterior blankets are offset at least 12 inches from the butt joints between interior blankets.
- 6.4.5 The exterior blankets shall be secured in place by stainless steel straps installed not more than 14 inches apart and not less than 4 inches from exterior butt joints. The tensioning of the straps shall be sufficient to hold the blanket snugly in place without causing any sufficient cutting of, or damage to, the blanket material.
- 6.4.6 A protective outer wrap of Aluminized Zetex is to be secured independently of the Kaowool blanket with Polyken 237 tape. This outer wrap shall be installed over the stainless steel straps. The blanket shall have a minimum 3 inch overlap. The overlaps in the outer wrap shall be offset from the overlaps in the previous layer but still remain on top of the tray. A single layer of Polyken 237 tape will be made over all joints (The above is typical for all barriers constructed with Insulation Blanket Material Kaowool)
- 6.4.7 Where adjoining cable tray or conduit or tray support members attached to, or come into contact with, the tray to be protected, the attaching or contacting member shall also be wrapped with two layers of Insulation Blanket as necessary to ensure complete coverage of the protected tray. No gaps or openings shall be allowed.
- 6.4.8 Conduits mounted on exposed unistrut shall be insulated in the same manner as cable trays, except that no filler blanket is required.
- 6.4.9 Conduits mounted on embedded unistrut, flush to a wall, shall be covered with two layers of Insulation Blanket. The blanket shall extend a minimum of two inches onto the surface of the wall. The edges of the blanket shall be secured to the wall by steel strips and concrete expansion anchors or an approved equivalent fastening method.

6.4.10 Exposed, non-supported cable transitions (air-lined) from conduit to tray or from tray to tray shall be wrapped in two layers of Blanket. Each layer shall wrap around the cables with an end overlap of not less than 3 inches. The blankets shall be secured by tying with Woven Tape at 14 inch maximum intervals.

6.4.11 At locations where the protected tray or conduit penetrates a fire barrier in a ceiling, floor or wall, both the interior and exterior layers of Insulation Blanket shall be cut and installed such that the blankets will fit snug against the firestop. The juncture will then be sealed with mastic coating. The mastic will be sprayed or troweled completely around the Insulation Blanket to not less than 1/4 inch thickness, and shall extend not less than 8 inches onto the exterior of the blanket and the surface of the fire barrier and ceiling, floor or wall.

6.5 Separation Barrier Design

6.5.1 The purpose of Separation Barriers is to reduce the exposure Class IE electrical cables serving redundant systems to damage from fire in a proximate raceway.

6.5.2 Separation Barriers shall be made by either/or the following methods per drawing E-49 (Reg. Guide 1.75)

- Installation of galvanized steel covers and/or bottoms on trays
- Installation of Insulation Blanket material or an approved equal, see Sect. 6.7, for conduit and tray.
- Installation of rigid board between redundant raceway. (Sect 6.7)

6.6 Separation Barrier Construction (Typical For Insulation Blanket Material Only)

6.6.1 Separation Barriers shall be applied to the indicated cable trays or conduit for the entire length where minimum separation can not be maintained.

6.6.2 In open cable trays, one layer of Insulation Blanket shall be laid on top of the cables. The blanket shall be tucked around the cables at the edge of the tray where possible. In vertical or inclined tray sections, Woven Tape shall be used to tie the blanket to the tray at 14 inch maximum intervals.

6.6.2.1 Cable tray and conduit shall be wrapped completely around the perimeter with one layer of Insulation Blanket. End joints and joints between adjacent blanket will be secured in place with stainless steel straps installed at each overlapped butt joint and at 14 inch maximum intervals along the blanket.

6.6.2.2 Where adjoining cable tray or conduit or tray support members attach to, or come into contact with, the tray or conduit to be protected, the attaching or contacting member shall also be wrapped with one layer of Insulation Blanket.

6.6.2.3 Exposed, non-supported cable transition (air-lined) from conduit to tray or from tray to tray shall be wrapped with one layer of Insulation Blanket.



6.7 Blanket Insulation/Barrier Board, Banding, Tape and Mastic Materials
(Fire Breaks, Separation Barriers and Exposure Barriers)

6.7.1 Insulation/Blanket consisting of interlaced ceramic/glass fibers, one inch thick, 8 lb. per cu. ft., width and lengths are required, Babcock and Wilcox, Kaowool or approved equal.

6.7.2 Formed barrier board consisting ceramic fibers and binders, thickness and size as required, Babcock and Wilcox, Kaowool M Board or approved equal. (Junction/Terminal box covers.)

6.7.3 Protective outer wrap joint tape, Polyken 237, 2" wide, 2 mils thick, mfg. by Kendall Corp., Polyken Div. or an approved equal.

6.7.4 Aluminized protective outer wrap consisting of glass cloth, Babcock and Wilcox, Zetex Style 800, or approved equal.

6.7.5 High Performance Filament Tape for securing Insulation blanket on electrical cable tray and conduit shall be 1 inch wide, 3M Company Tape Number 89 or approved equal.

6.7.6 Woven Tape for securing Insulation blanket in electrical cable tray shall be a refractory silica product, 1 inch wide by 0.125 inch nominal thickness with selvaged edges, Haveg Industries, Inc. Siltemp Code Number WT65-1 or approved

6.7.7 Mastic Coating for fire protection applications shall be Intumastic 285, manufactured by Carbolite Fire Proofing Products Division, or an approved equal.

6.7.8 Galvanized steel strips and concrete expansion anchors, or approved equivalent fastening method, for attached Insulation blanket to walls.





- 6.7.10 Straps for securing Insulation blanket on electrical cable tray and conduit shall be 3/4 inch width by .020 inch thick Type 304 stainless steel.
- 6.7.10 Bolts, nuts, washers and other fasteners shall be electro-galvanized or cadmium plated.
- 6.7.11 "Approved equal" barrier system, subliming compound, Thermo-lag 330-1, water based spray coating, mfg. by TSI, Inc. consisting of Thermo-lag 351 primer and Thermo-lag 350-2000 top coat for use on raceway and junction/terminal boxes.
- 6.7.12 "Approved equal" Fire Barrier System, Intumescent laminated wrap material, mfg. by Quelcor, Inc. Quelpyre two-step system for use on conduit only.

7.0 INSPECTION AND TESTS

General

The Seller shall conduct and be responsible for the tests called for in the applicable codes and standards, and shall furnish verification of all test data.

8.0 DELIVERY AND DRAWING

8.1 Seller shall be guided by the following schedules:

- 8.1.1 All material is required at the jobsite as stated in the Purchase Order.
- 8.1.2 The number of drawings to be furnished is listed in the "Drawings and Data Requirements". Form G-321-C and 8856-QA-1.

9.0 SHIPPING

9.1 All material shall be arranged and fabricated to provide convenient shipping packages. Each shipping package and all parts contained therein shall be properly protected against weather and mechanical damage during transit and storage.

10.0 PRODUCT ASSURANCE REQUIREMENTS

10.1 This specification covers items and services that have safety related functions in a nuclear power plant. The Seller shall meet the specific requirements defined herein. These requirements shall be implemented by the Seller for the items and services covered by the technical specification. The requirements specified herein do not delete or revise other requirements of the procurement document.

11.0 WARRANTIES

The Seller shall warrant that the material furnished under this specification and requisition will be suitable for the required service specified herein and will conform to all applicable codes and regulations.

If the material furnished by the Seller fails to meet the requirements of this Specification and Requisition, the Seller shall bear all expenses necessary to meet the requirements.

The Seller shall state his standard warranty included with his proposal.

The Seller shall also state the additional cost, if any, of extending the warranty for a period of one (1) year from initial commercial operation. Initial commercial operation is as defined by Specification 8856-G-1.

AREA TURNOVER OR S/U No. - N/A
DCR - N/A

9

FIELD CHANGE REQUEST

1. PAGE 1 OF 2
'Q'-Listed:
 YES NO

2. No. E-6347
3. DATE 12 10 81
MO DAY YR

PROJECT NO. 8856 F 15350

4. REF. DWG. OR SPEC. Specification-E-61 REV. 1 5. TITLE Electrical Raceway Fire Insulation Barrier Materials

6. DESIGN ORIGIN: ENGRG VENDOR (IDENTIFY) NAME SFHD

7. EXISTING CONDITION: Specification-E-61 does not specifically address inspection of Thermo-Lag 330-1 Subliming Compound Barrier System

8. CHANGE REQUEST / SKETCH - Add and/or revise the following paragraphs to read as follows:

6.7.11 "Approved Equal" barrier system, subliming compound, Thermo-Lag 330-1, water based spray coating, mfg. by TSI, Inc. consisting of Thermo-Lag 351 Primer, or Thermo-Lag Stress Skin Type 330-69 and Thermo-Lag 351 Primer, plus Thermo-Lag 330-1 Subliming Compound, for use on raceway and junction/terminal boxes.

7.0. Inspection and Tests

7.1 Each shipment of material shall be accompanied by a certificate of conformance by the manufacturer that the material is as specified on the purchase order.

7.2 Quality Control inspections shall verify that the following parameters are met.

7.2.1 Surface temperature of the substrate to receive Thermo-Lag 330-1 Subliming Compound shall be 40°F or higher prior to application of Thermo-Lag 330-1 Subliming Compound.

7.2.2 Thermo-Lag Stress Skin Type 330-69 shall be

- a.) secure with the raceway
- b.) the stress skin primer intact
- c.) free of foreign substances prior to application of

Thermo-Lag 330-1 Subliming Compound.

7.2.3 The final dry film thickness of Thermo-Lag 330-1 Subliming Compound shall be between One Half Inch and One Inch. The surface of the subliming compound

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DEC 23 1981
RECORDED FOR FILE

10. REVIEWED BY: Paul S. Huff Date 12-10-81
CIVIL _____
ELECT. _____
MECH. _____
WELDING _____
PIPING _____
INSTRUMENTATION _____

9. PREPARED BY: BILL HUFFMAN
11. APPROVAL OF FIELD DISPOSITION: W.D. Diggins Date 12/10/81
Project Field Engineer Date

12. PROJECT ENG'R'G APPROVAL: YES NO PROJ. ENGR.: E.B. Powell Date: 12-15-81
DESIGN CHANGE REQ'D: YES NO REMARKS: PP 2A/FIA (SEE RE Comment)

Handwritten scribbles or marks in the top right corner.



AREA TO BE REMOVED OR S/U No. N/A FIELD CHANGE REQUEST **F 15350** PAGE 2 OF 2 No. E-6347

PROJECT NO. 8856 'Q'-Listed: YES NO 12/10 DATE 12 10 81

4. REF. DWG. OR SPEC. Specification-E-61 REV. 1 5. TITLE Electrical Raceway Fire Insulation Barrier Materials

6. DESIGN ORIGIN: ENGRG VENDOR (IDENTIFY) NAME SFH

7. EXISTING CONDITION: See Page 1

8. CHANGE REQUEST / SKETCH

~~shall be free of textural irregularities (blisters, spalling, fissures, separations).~~

7.2.4 The repair of any surface textural irregularities shall have all damaged and loose material removed back to sound adhering material. A knife or scrapper is acceptable. The edge should be undercut to form a beveled edge as in plaster repair. All foreign matter should be removed from the substrate using a wire brush. Thermo-Lag 330-1 Subliming Compound shall be added to achieve the required dry film thickness.

7.3 Commercial quality measuring devices are acceptable for quality checks above.

7.2.3 The final dry film thickness of Thermo-Lag 330-1 Subliming Compound shall be one-half inch (1/2 inch) min. and three-fourth (3/4 inch) max. The surface of the substrate shall be free of textural irregularities (blisters, spalling, fissures, separations).

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RE Comment.

DEC 21 1981 BY RESIDENT ENGINEERING: SFHO CONTACT B. HOPSTOCK

10. REVIEWED BY:

CIVIL	<u>[Signature]</u>	Date	<u>12-10-81</u>
ELECT.			
MECH.			
WELDING			
PIPING			
INSTRUMENTATION			

9. PREPARED BY: BILL HUFFMAN

11. APPROVAL OF FIELD DISPOSITION:

[Signature] 12/10/81
Project Field Engineer Date

12. PROJECT ENGR'G APPROVAL: YES NO PROJ. ENGR.: _____ Date: _____

DESIGN CHANGE REQ'D: YES NO REMARKS: RETRACT

SPECIAL DETAILED INSTRUCTIONS

IN ACCORDANCE WITH F.I.H. G-6.6.0

FOR INSPECTION ACTIVITY NOT COVERED BY A MASTER INSPECTION PLAN

To Q.C.E.

Date _____

Subject INSTALLATION OF Thermo-Lag-330-1 Subliming Compound.

Project 8856

Report # _____
Week _____ Day _____

Item to Inspect INSTALLATION OF The Thermo-Lag-330-1 Subliming Compound Barrier SYSTEM AS PER SPEC-E-61, FCR-E-6347, FP-E-12.

Located at Various Areas in The Reactor Building And Control Building.

Type of Inspection Visual, Dimensional, And Temperature Checks.

Reference Criterias SPEC-E-61, FCR-E-6347, FP-E-12.

Inspection equip. to use Flashlight, Tape measure, Machinest Scale, And Calibrated Thermometer.

1. Record inspection results on QC-G1-1 as satisfactory or unsatisfactory.
2. Record action taken if unsatisfactory.
3. Submit Field Inspection Report # QC-G1-1 to Discipline Lead for review & signature.
4. Record all pertinent information need^d so that report will be clear and concise.
5. Other _____

Acase
Lead Discipline Q.C.E.



FIELD INSPECTION REPORT-#

3. RECORD CONTROL

CONTROL NO. _____

FILE NO. _____

1. PROJECT NO. 8856 2. DATE _____ PAGE 1 OF _____

4. ITEM INSPECTED Installation of The Thermo-Lag-330-1 Subliming Compound Barrier System As Per Spec-E-61, FCR-E-6347, FP-E-12.

5. LOCATION Various Areas in The Reactor Building And Control Building.

6. TYPE OF INSPECTION Visual And Dimensional Checks, Temperature Checks

STANDARD / CODE / PROCEDURE / DRAWING / SPECIFICATION Spec-E-61, FCR-E-6347, FP-E-12

8. INSPECTION EQUIPMENT USED Flashlight, Tape Measure, Machinest Scale, And Calibrated Thermometer.

9. RESULTS OF INSPECTION: SATISFACTORY UNSATISFACTORY

10. ACTION TAKEN IF UNSATISFACTORY _____

Reviewed BY- _____

Reviewed BY & Approved BY- _____

Distribution:
White - QC Files
Canary - Originator

11. ENGINEER _____



CONTINUATION SHEET-#

3. RECORD CONTROL

CONTROL NO. _____

FILE NO. _____

1. PROJECT NO. 8856

2. DATE _____

4. PAGE _____ OF _____

5. BLOCK CONT'D

6. FORM NO.

7. REPORT NAME

QC--

8. Continuation of Block-#9 - Results of Inspection:

	SAT.	UNSAT.
①- Proper Installation of Thermo-Lag TYPE 330-69 Stress SKIN or Thermo-Lag 351 Primer.		
②- Proper Temperature of Stress SKIN Before Application of Thermo-Lag 330-1 Subliming material.		
③- Proper Dry Film Thickness.		
④- Inspection for Blemishes.		
⑤- Proper Methods and Inspection for Repair Work.		

Continuation of Block-#10 - Action Taken if Unsatisfactory:

Distribution:
White - QC Files
Canary - Originator

9. ENGINEER _____