January 28, 1993

Docket Nos. 50-390
and 50-391

APPLICANT Tennessee Valley Authority (TVA)

FACILITY: Watts Bar Nuclear Plant, Units 1 and 2

SUBJECT: MEETING SUMMARY - MEETING TO DISCUSS RESULTS OF THERMO-LAG FIRE RETARDANT MATERIAL TESTS (TAC M63648)

REFERENCE: Meeting notice by P. S. Tam, January 12, 1993

On January 25, 1993, NRC and TVA representatives met at NRC headquarters in Rockville, Maryland, to discuss results obtained by TVA on Thermo-Lag fire retardant materials. Enclosure 1 is the list of meeting attendees.

TVA's test results, obtained from tests done on December 21 and 22, 1992, and January 7, 1993, are summarized in the slides used in the meeting (Enclosure 2). The staff asked questions during TVA's presentation but did not arrive at any conclusion regarding TVA's Thermo-Lag testing.

Original signed by

Peter S. Tam, Senior Project Manager
Project Directorate II-4
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Participant list
2. Slides provided by TVA

cc w/enclosures:
See next page

OFFICE	PDII-4/LA	SPLB/SC	PDII-4/PM	PDII-4/D
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DATE	1/28/93	1/28/93	1/28/93	1/28/93

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ENCLOSURE 1

LIST OF PARTICIPANTS

MEETING TO DISCUSS THERMO-LAG TEST RESULTS AT WATTS BAR

January 25, 1993

Name	Affiliation
J. Allen	TVA Corporate Engineering
R. Architzel	NRC/NRR/Plant Systems Branch
K. W. Brown	TVA Corporate Engineering
M. Callahan	NRC Congressional Affairs
F. Hebdon	NRC/NRR/Project Directorate II-4
R. Huston	TVA Rockville Office
R. Jenkins	NRC/NRR/Electrical Engineering Branch
B. Keeling	NRC Congressional Affairs
P. Madden	NRC/NRR/Plant Systems Branch
J. Matlock	TVA Watts Bar Site Licensing
T. Meisenheimer	Bechtel SERCH
J. J. Pierce	TVA Watts Bar
J. J. Raleigh	STS, Inc.
M. Salley	TVA Corporate Engineering
P. Tam	NRC/NRR/Project Directorate II-4
S. West	NRC/NRR

NRC/TVA THERMO-LAG MEETING
JANUARY 25, 1993 - ROCKVILLE, MD

- INTRODUCTION - JOHN E. ALLEN

- FIRE TESTING - MARK H. SALLEY

- ELECTRICAL TESTING - KENT W. BROWN

Enclosure 2

INTRODUCTION

TVA/WBN THERMO-LAG TEST PROGRAM

1. RESULTS

2. REVISIONS TO ORIGINAL PLAN

3. TEXAS UTILITIES TESTING

4. SCHEDULE

RESULTS OF FIRE TESTS
TVA–WBN CONDUIT TESTS

TESTS COMPLETED

- DECEMBER 21, 1992
- DECEMBER 22, 1992
- JANUARY 7, 1993

ACCEPTABLE FIRE TESTS

- NOMINAL 1/2" THERMO-LAG ON 5" STEEL CONDUIT (ΔT ave.= 190°F) EXTERNAL
- NOMINAL 1/2" + 1/4" THERMO-LAG ON 2" AIR DROP CABLE (ΔT ave.= 147°F) INTERNAL

CONDITIONALLY ACCEPTABLE FIRE TESTS

- NOMINAL 1/2" + 1/4" THERMO-LAG ON 1" STEEL CONDUIT (ΔT ave.= 153°F) INTERNAL

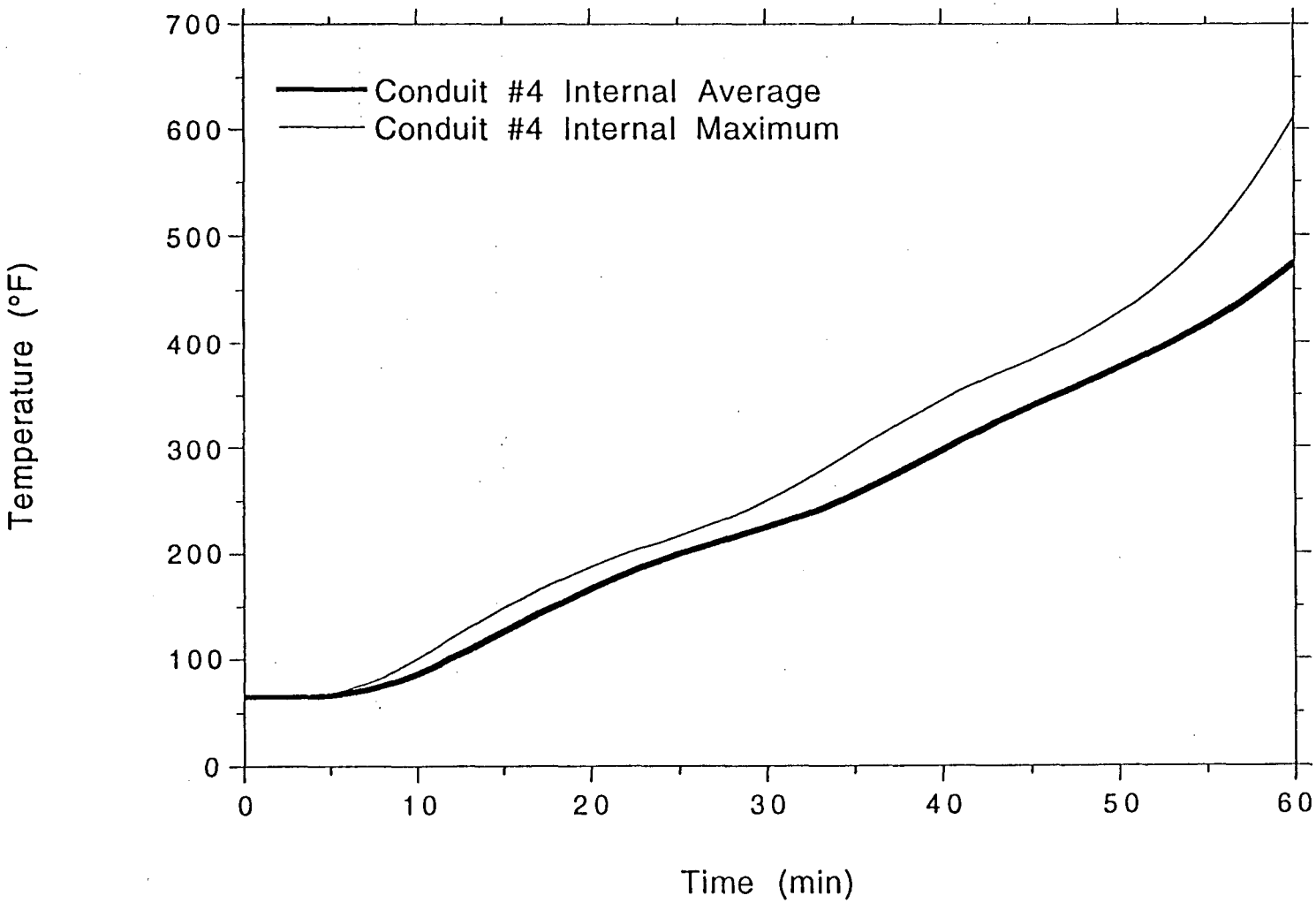
RESULTS OF FIRE TESTS
(CONTINUED)

LESSONS LEARNED

- FIBERGLASS JACKET VS. TEFLON JACKET THERMOCOUPLES
- NOMINAL 1/2" THERMO-LAG ON 1" STEEL CONDUIT EXCEEDS EXTERNAL TEMPERATURE ($\Delta T > 250^\circ F$) @ 40 MINUTES
- NOMINAL 1/2" THERMO-LAG ON 2" AIR DROPS EXCEEDS EXTERNAL TEMPERATURE ($\Delta T > 250^\circ F$) @ 42 MINUTES
- BETTER MECHANICAL PERFORMANCE WITH ADDITIONAL EXTERIOR WIRE MESH (STRESS SKIN)
- MINIMAL THERMAL PERFORMANCE IMPROVEMENTS WITH EXTERIOR WIRE MESH (STRESS SKIN)
- IMPROVED INSTALLATION METHODS
- IMPROVED TEMPERATURE PROFILE / OPTIMIZED THERMO-LAG ABLATION WITH NOMINAL 1/4" UPGRADES

NOMINAL 1/2" THERMO-LAG INSTALLED ON A 1" STEEL CONDUIT

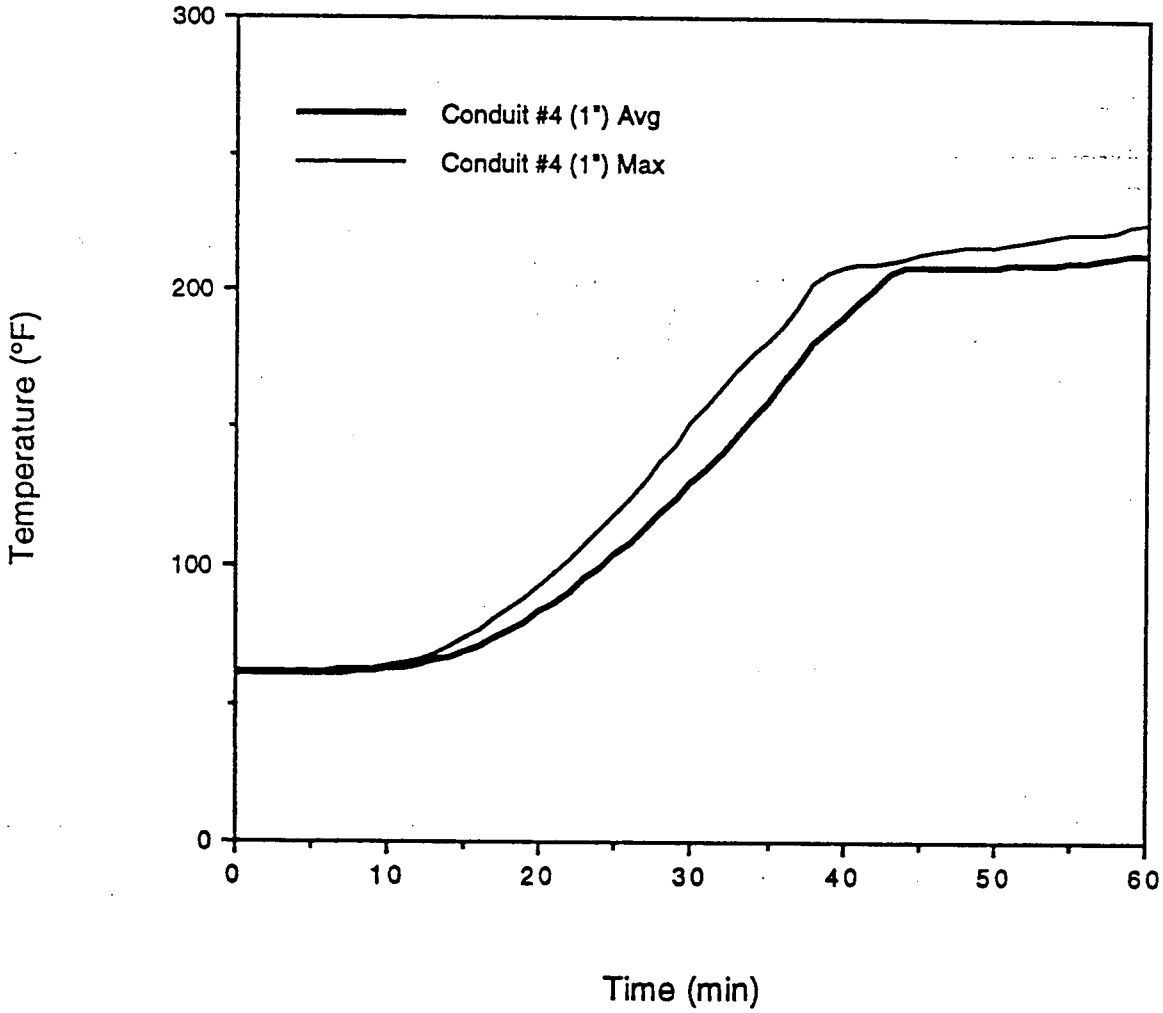
Project No. 11210-94554
Tennessee Valley Authority
Conduit #4 Internal Temperatures



OMEGA POINT LABORATORIES

NOMINAL 1/2" THERMO-LAG PLUS NOMINAL 1/4" THERMO-LAG UPGRADE INSTALLED ON A 1" STEEL CONDUIT

Data from "Project No. 94554A
Tennessee Valley Authority
Conduit #4 (1"ø) Temperatures



OMEGA POINT LABORATORIES

CABLE TRAY SYSTEMS

- DECEMBER 7 - 9, 1992 TVA REVIEWED TEXAS UTILITES (TU) CABLE TRAY FIRE TESTS

TESTS REVIEWED:

- TU-13-1 12" X 4" STRAIGHT TRAY
- TU-12-1 30" X 4" STRAIGHT TRAY
- TU-12-2 24" X 4" W / TEE
- TU-14-1 30" X 4" W / TEE

RESULTS

- TU TEST RESULTS DEMONSTRATED Δ T MEASURED ON CABLE TRAY SIDE RAILS < 250°F
- WBN TRAY SIZES ARE 18" & 24" AND ARE BOUNDED BY THE TU TESTS
- TVA WILL NOT BE PERFORMING FIRE TESTS ON CABLE TRAYS
- TVA WILL BE USING TU DESIGN, TEST REPORTS AND INSTALLATION PROCEDURES AT WBN

FUTURE TVA–WBN FIRE TESTS

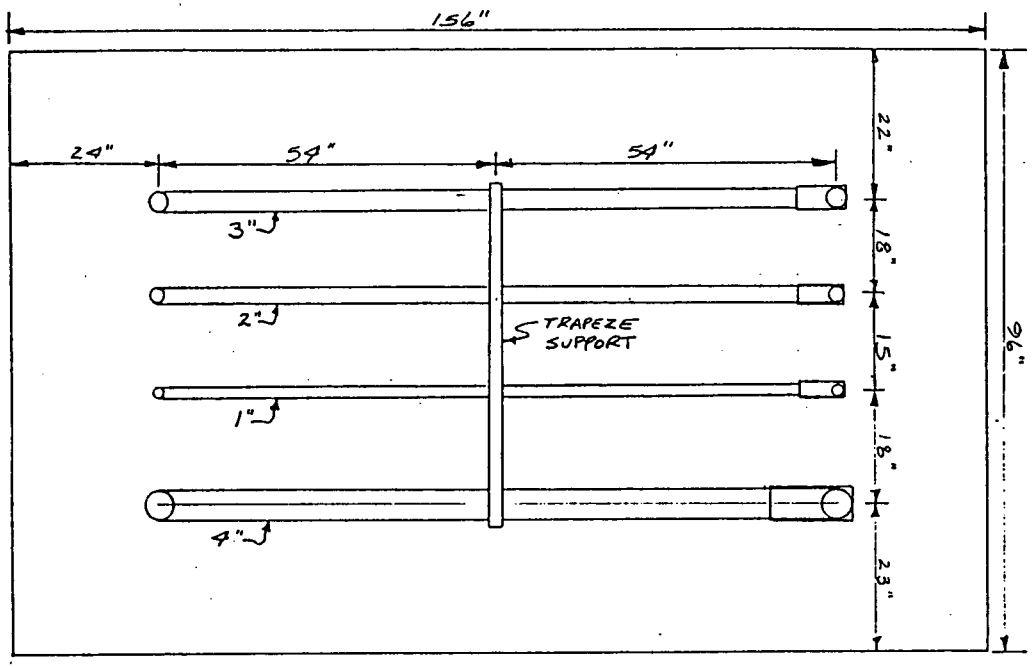
- CONDUIT TESTING (2 TEST DECKS)
  - DIFFERENT SIZES STEEL CONDUIT (6 CONDUITS)
  - ALUMINUM CONDUIT (1 CONDUIT)
  - SUPPORTS (2 SIZES TUBE STEEL)

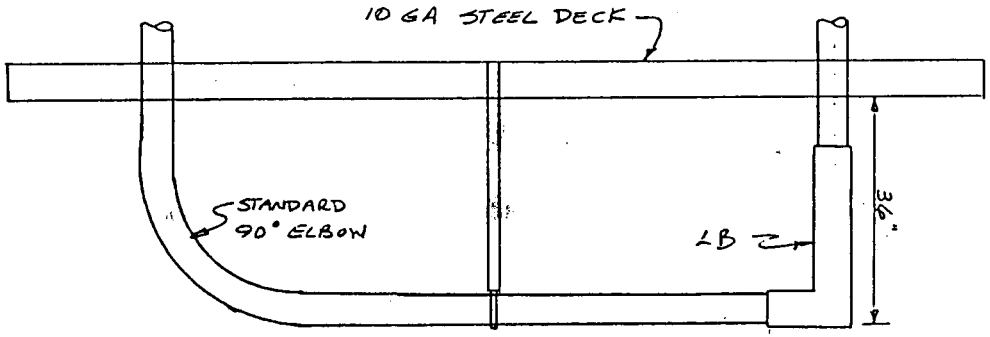
- JUNCTION BOX / MISCELLANEOUS TESTING (3 TEST DECKS)
  - DIFFERENT SIZE JUNCTION BOXES (6 BOXES)
  - CONDUITS AGAINST CONCRETE

SCHEDULE

- START THERMO-LAG INSTALLATION: FEBRUARY 3, 1993
- ESTIMATED COMPLETION: FEBRUARY 20, 1993
- CONDUIT FIRE TESTS: MARCH 18,19, 1993
- JUNCTION BOX / MISC. FIRE TESTS: MARCH 24 - 26, 1993
- ISSUE DESIGN STANDARD & DRAWINGS: MID-JUNE, 1993

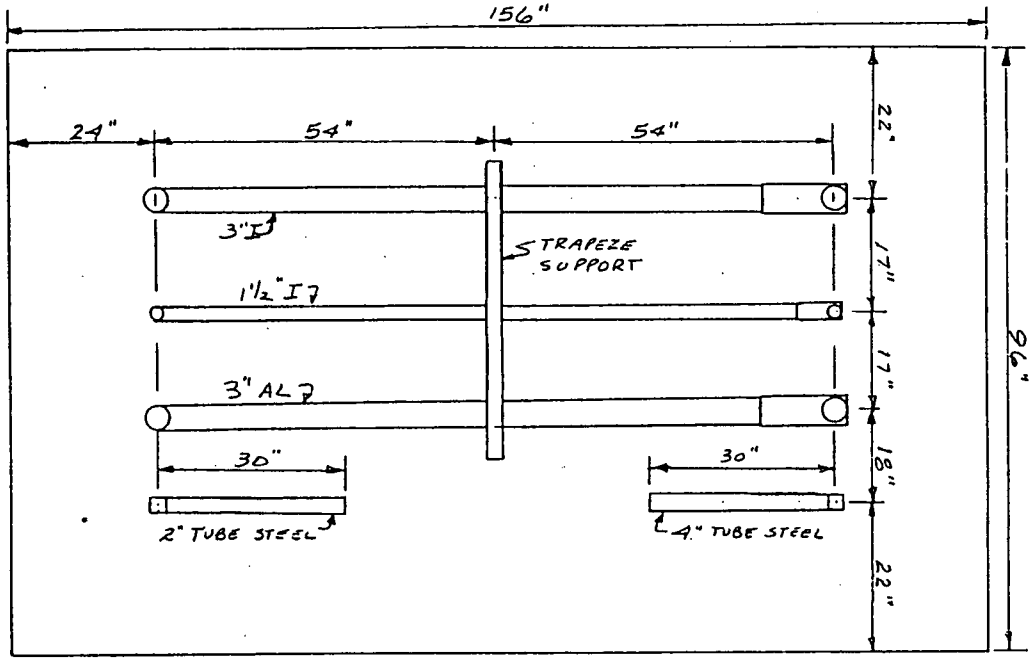
FIRE TEST DECK-4
CONDUITS

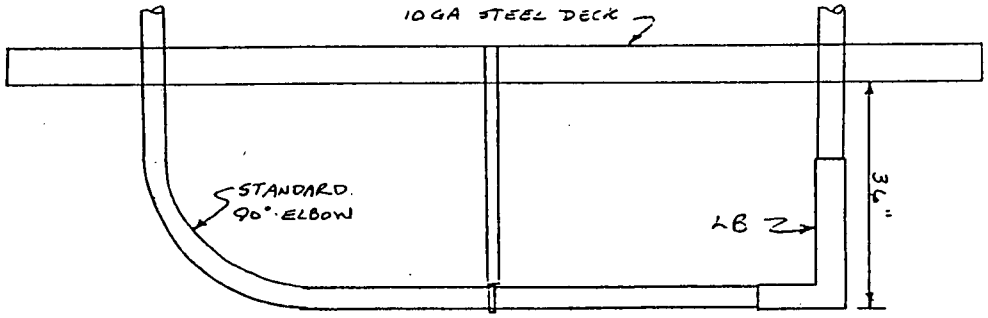




FIRE TEST DECK–5

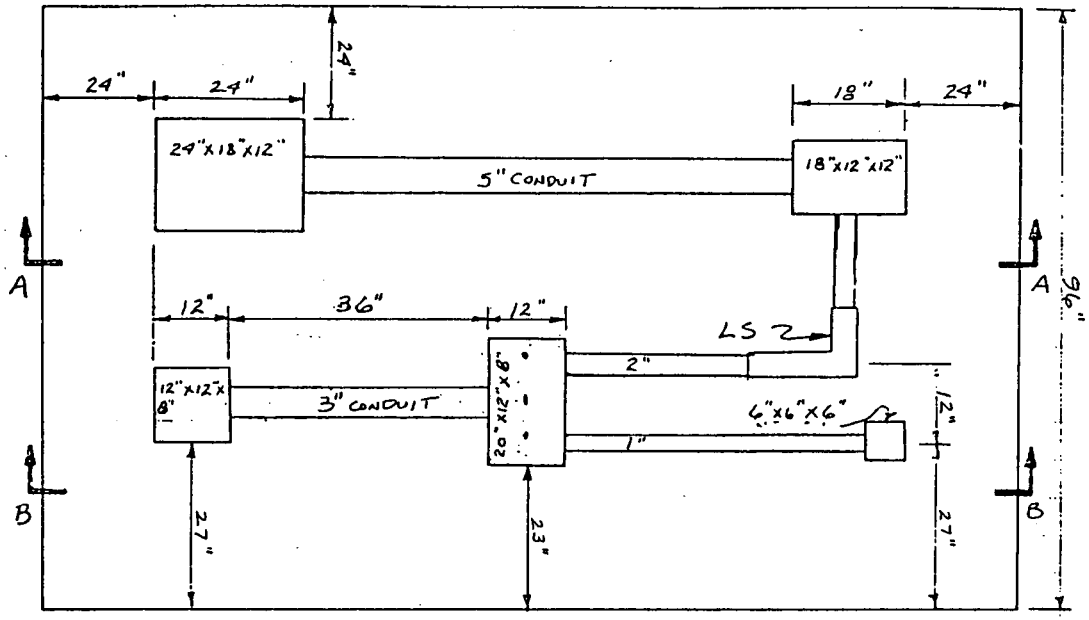
CONDUITS



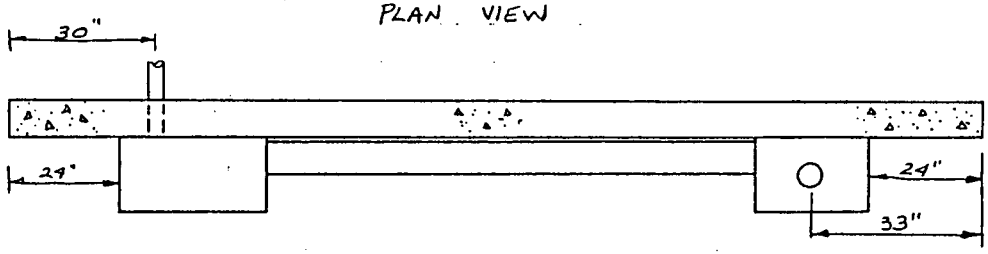


FIRE TEST DECK-6/7

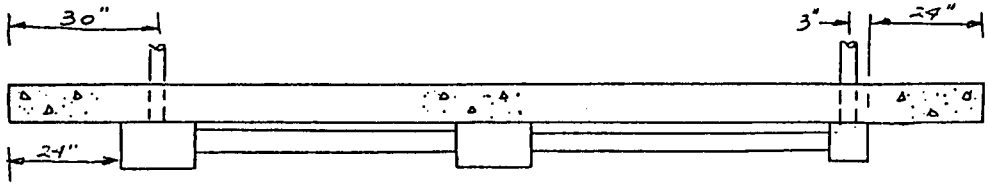
JUNCTION BOXES/MISC.



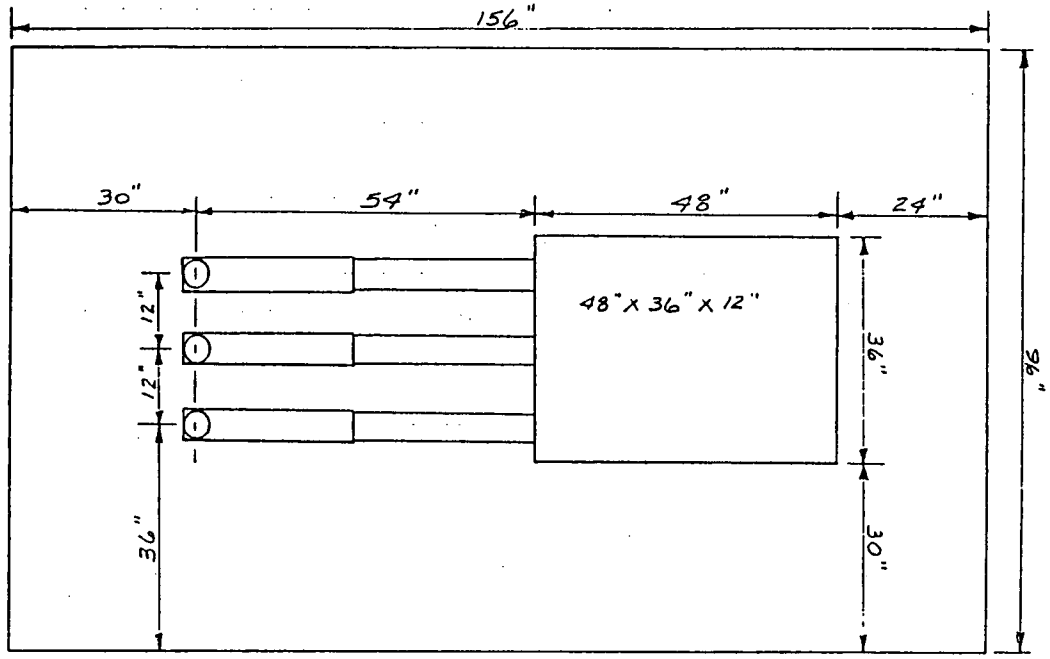
PLAN VIEW

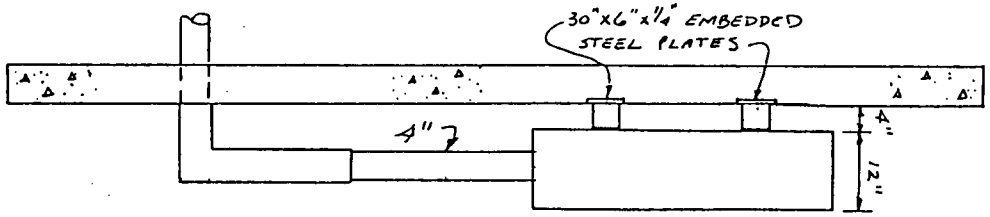


A - A



FIRE TEST DECK–8
JUNCTION BOXES/MISC.



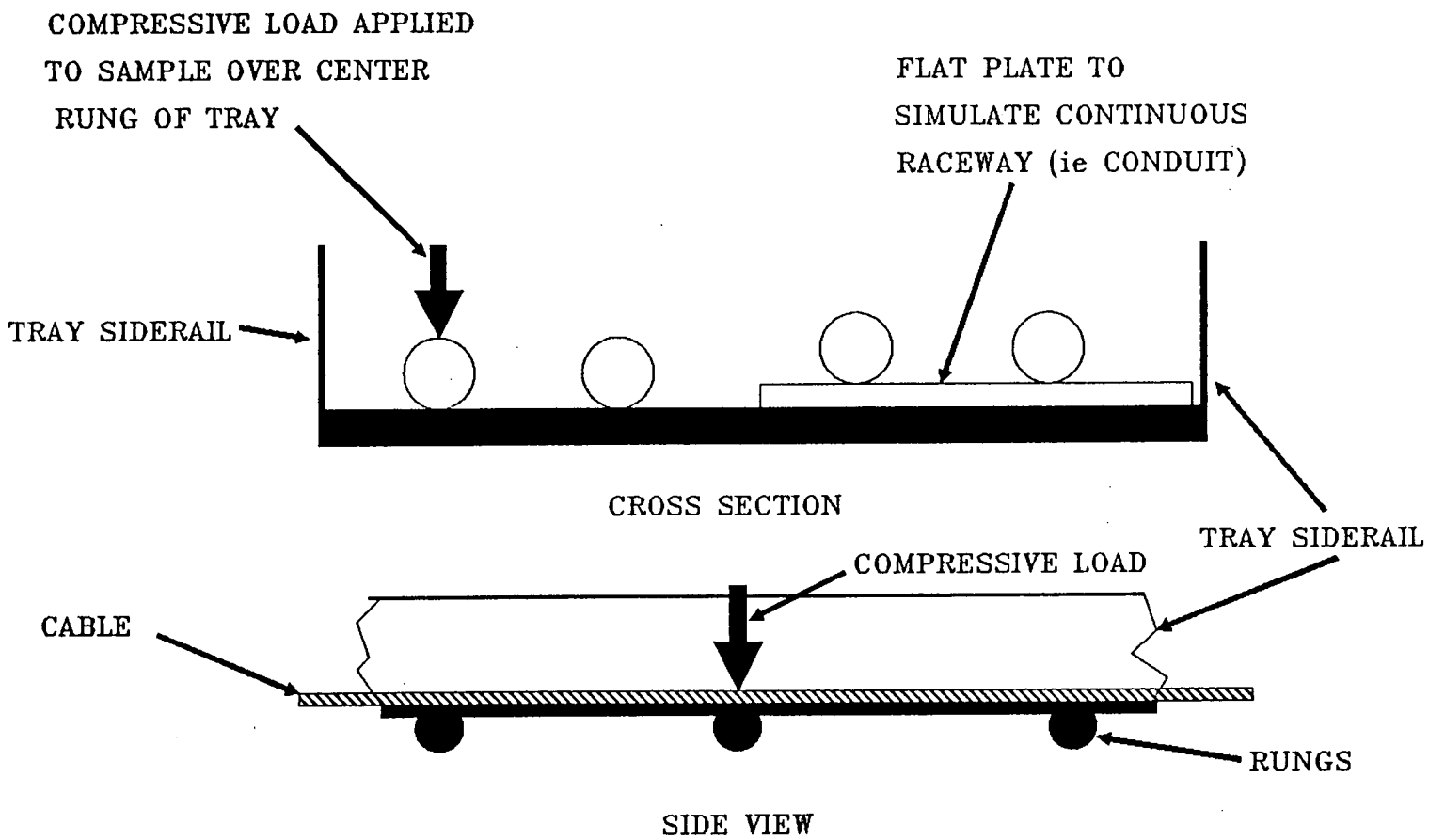


THERMO-LAG
OVERVIEW OF ORIGINAL TEST PLAN

- COMPRESSIVE LOAD TESTS (PER UL 1724 APPENDIX B)
  - TRAY
  - CONDUIT
  - W/ ENHANCED ACCEPTANCE CRITERIA

- AMPACITY TESTS (PER IEEE P-848 R11)
  - TRAY
  - CONDUIT (1" AND 4")
  - AIR DROP

THERMO-LAG
UL 1724 COMPRESSIVE LOAD TEST



THERMO-LAG
REVISED COMPRESSIVE LOAD PROGRAM

- TRAY
  - NOT REQ'D (ΔT UNDER 250F)

- CONDUIT
  - ON HOLD PENDING ADDITIONAL FIRE TESTS W/TEFLON INSULATED THERMOCOUPLES ON COLD SIDE

THERMO-LAG
REVISED AMPACITY PROGRAM

- TRAY
  - JOINT EFFORT WITH TU

- CONDUIT 1" AND 4"
  - BASELINE
  - 0.5" THERMO-LAG
  - 0.5" THERMO-LAG W/ 0.25" UPGRADE
  - 0.25" THERMO-LAG W/ 0.25" UPGRADE

- AIR DROP
  - SPECIAL TESTS NOT REQ'D
  - CONDUIT DERATING USED

THERMO-LAG
AMPACITY CHANGES AND SCHEDULE

- TRAY
  - TU TEST PLAN UNDER REVIEW
  - TEST EARLY FEBRUARY 1993 AT OMEGA POINT

- CONDUIT
  - IN-HOUSE TEST
  - 3-1/C 750s IN LIEU OF 1-3/C 750
  - 20' TEST SECTION (STD IS 12')
  - MATERIALS - JANUARY 28, 1993
  - INSTALL THERMO-LAG - FEBRUARY 2, 1993
  - FINALIZE TEST PROCEDURE - FEBRUARY 5, 1993
  - FINALIZE LAB SET-UP - MARCH 4, 1993
  - COMPLETE THERMO-LAG CURE - MARCH 4, 1993
  - FINISH TESTS - MARCH 12, 1993
  - ISSUE REPORT FOR INTERNAL REVIEW - APRIL 1, 1993