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FIRE ENDURANCE TEST OF A THERMO-LAG® 330-1 FIRE PROTECTIVE ENVELOPE (3 in., 2 in., 1 in., & 4 in. Conduit Configurations)

Project No. 11210-94943a

FIRE ENDURANCE TEST TO QUALIFY A PROTECTIVE ENVELOPE FOR CLASS 1E ELECTRICAL CIRCUITS

April 25, 1993

APPROVED
This approval does not relieve the Contractor from any part of his responsibility for the correctness of design, details and dimensions.
Date JUN 30 1993
TENNESSEE VALLEY AUTHORITY
Watts Bar Engineering Manager

Prepared For:

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OMEGA POINT LABORATORIES

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ABSTRACT

Four conduit configurations of various diameters (1 in., 2in., 3. in. and 4 in.), clad with a nominal thickness of either 3/8 in. or 5/8 in. Thermo-Lag® 330-1 and various upgrades as described herein, were evaluated in accordance with the Tennessee Valley Authority TEST PLAN RD 328886, based essentially on the requirements of Underwriters Laboratories, Inc. (UL) Subject 1724, "Outline of Investigation for Fire Tests for Electric Circuit Protective Systems," Issue Number 2, dated August 1991, as interpreted by the TVA Position on Fire Testing Criteria (see Appendix B). All four conduit configurations were found to meet the requirements of those documents for a fire resistance period of 60 minutes.

The details, procedures and observations reported herein are correct and true within the limits of sound engineering practice. All specimens and test sample assemblies were produced, installed and tested under the surveillance of either Tennessee Valley Authority's or the testing laboratory's in-house Quality Assurance Program. This report describes the analysis of a distinct assembly and includes descriptions of the test procedure followed, the assembly tested, and all results obtained. All test data are on file and remain available for review by authorized persons.

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INTRODUCTION

The protection of vital electrical circuits from the effects of an external fire exposure is of primary concern in the design and construction of an electrical power generating plant. Typical "fire protective envelopes" are designed to protect the contents of an electrical raceway for fire exposure periods of one to three hours, during which time the electrical circuitry must remain functional.

The external fire exposure selected to evaluate protective envelope systems is that described in the ASTM E119-88 Fire Tests of Building Construction and Materials (E119 Time-Temperature Curve, described later in this document).

Typical fire test programs involve the selection and construction of a specific electrical raceway system, instrumentation for thermal and circuit integrity measurements, followed by the application of the protective envelope system by qualified personnel.

This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment that takes into account all the factors that are pertinent to an assessment of the fire hazard of a particular end use.

OBJECTIVE

The objective of this project was to evaluate a specific assembly for use as a 1-hour fire-protective envelope for redundant electrical systems. The entire program was carried out in accordance with the Tennessee Valley Authority (TVA), TEST PLAN, RD 328886, *One Hour Fire Endurance Tests of Articles Protected with the TSI Thermo-Lag® 330 Fire Barrier System*, which may be found in Appendix B of this document. For reasons of clarity and to reduce redundancy, many items discussed in the Test Plan have not been duplicated elsewhere in this document.

TEST PROCEDURE

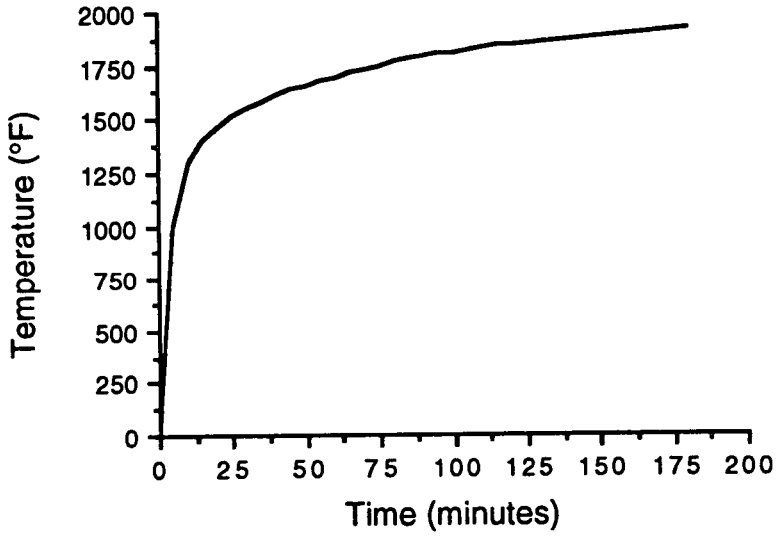
This entire test program was performed in accordance with Tennessee Valley Authority TEST PLAN, RD 328886, which has been included in Appendix B. Many of the specific details of this project will be found in that document.

FIRE TEST FURNACE

The test furnace is designed to allow the specimen to be uniformly exposed to the specified time-temperature conditions. It is fitted with symmetrically located natural gas burners designed to allow an even heat flux distribution across the surface of a test specimen.

The temperature within the furnace is determined to be the mathematical average of thermocouples located symmetrically within the furnace and positioned 12 in. away from representative parts and locations of the test specimen. The exact positioning of the thermocouples is such that the average fire exposure across the entire test specimen can be determined. The materials used in the construction of these thermocouples are those suggested in the E119 test standard. During the performance of a fire exposure test, the furnace temperatures are monitored at least every 15 seconds and displayed for the furnace operator to allow control along the specified temperature curve. All data is printed to paper every 30 seconds and saved to magnetic disk every minute.

The fire exposure is controlled to conform with the standard time-temperature curve shown in Figure 1, as determined by the table below:



Temperature (°F)	Time (min)
1000	5
1300	10
1462	20
1550	30
1700	60
1792	90
1850	120
1888	150
1925	180

Figure 1

The test furnace used consists of a large horizontal exposure chamber, with an internal dimension of 12 ft long and 7 ft wide. The furnace is equipped with diffuse-flame natural gas burners symmetrically located across the floor of the furnace and controlled by individual gas flow valves, with the overall gas flow to

the furnace being controlled by a single overall gas control valve. Capable of a maximum heat output of 5 million Btu/hour, these burners are arranged well below the exposed face of the specimen to ensure an even temperature at the surface of the specimen. Windows are located on two sides of the furnace to allow observation of the specimen during fire exposure. The depth of the furnace is variable, being increased to the desired amount by the addition of concrete blocks around the perimeter ledge. These blocks are lined with ceramic fiber blanket to minimize the heat loss from the furnace and to decrease the time required for the furnace walls to heat up. For these tests, the walls are built up from their normal height of 40 in. to a total height of slightly over 79 in. from the furnace floor to the top of the ledge.

The fire test is controlled according to the standard time/temperature cure, as indicated by the average temperature obtained from the readings of the furnace interior thermocouples symmetrically located across the specimen, 12 in. away. The thermocouples are enclosed in protection tubes of such material and dimensions that the time constant of the thermocouple assembly lies between 5.0 and 7.2 minutes, as required by the E 119 standard. The furnace temperature during a test is controlled such that the area under the time/temperature curve is within 10% of the corresponding area under the standard time/temperature curve for the one hour test period.

The furnace pressure is controlled to be as nearly neutral with respect to the surrounding laboratory atmosphere as possible, measured at the vertical mid-height of the test specimen. Adjusting the neutral plane at that position results in a nominal +0.015 in. WC pressure at the top of the specimen (under surface of the deck) and –0.015 in. WC pressure at the bottom of the specimen.

THERMOCOUPLES

Temperatures on the interior of the fire protected systems were measured with Type K, 24 gauge, Chromel-Alumel electrically welded thermocouples formed from Chromel and Alumel wires of "special limits of error (±1.1°C)," and covered with Teflon® PFA insulation. The Teflon® insulation material begins to break down at temperatures above 500°F. Temperature readings above 500°F can not be guaranteed as accurate as the thermocouple conductors may no longer be adequately separated.

DATA ACQUISITION SYSTEM

The outputs of the test article thermocouples and furnace probes are monitored by a data acquisition system consisting of a John Fluke Mfg. Co., Model HELIOS 2289A Computer Front End, a John Fluke Mfg. Co., Model HELIOS 2281A Extender Chassis (in the case of the 200 channel capacity unit), and an Apple

Computer Co., Macintosh Classic microcomputer. The Computer Front End is connected to the RS422 Serial Interface Port of the Macintosh and the Extender Chassis is serially connected to the Computer Front End. The computer is programmed in Microsoft BASIC to command the HELIOS units to sample the data input lines, receive and convert the data into a digital format, and to manipulate the raw data into usable units for display on screen and paper and for saving to floppy disk.

Two data acquisition units are used for the majority of tests due to the large number of data channels. One data acquisition unit is configured for monitoring 200 data input channels and is used to sample all (or most) of the test article thermocouples. A second data acquisition unit is configured for monitoring 100 data input channels and is used to sample the ambient laboratory temperature, furnace temperature probes and, if necessary, the remaining test article thermocouple inputs.

HOSE STREAM TEST

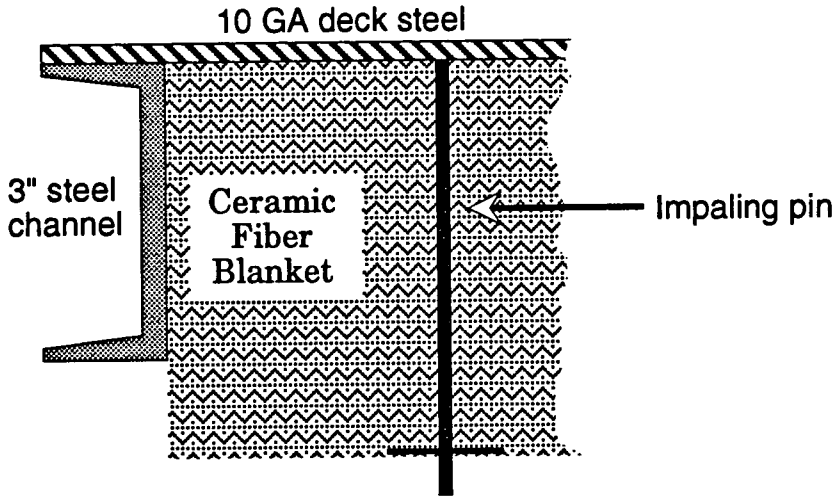
According to the Test Plan, following the fire exposure test, the test specimen is removed from the test furnace, lifted approximately 6 ft. from the ground (as measured from the lowermost part of the specimen), slowly turned (nominally 6 to 8 revolutions per minute) and exposed to the impact, erosion, and cooling effects of a hose stream directed perpendicularly at the exposed surface of the test specimen as outlined in the standard. The stream is delivered, for a minimum period of 5 minutes, through a 1-1/2 in. fog nozzle with an adjustable stream, with a nozzle pressure of 75 psi, a spray angle of 30° and with the tip of the nozzle a distance of 5 ft. from the exposed face. The nozzle is to flow a minimum of 75 gpm during the hose stream test. It is recognized that, with a three-dimensional object, not all surfaces can be attacked by the hose stream test. For this reason, the specimen is lifted high enough to allow the stream to play against the sides, inside and outside vertical surfaces and the underside of the item, resulting in little, if any, direct force being applied to the inside top surface of the specimen.

TEST ASSEMBLY

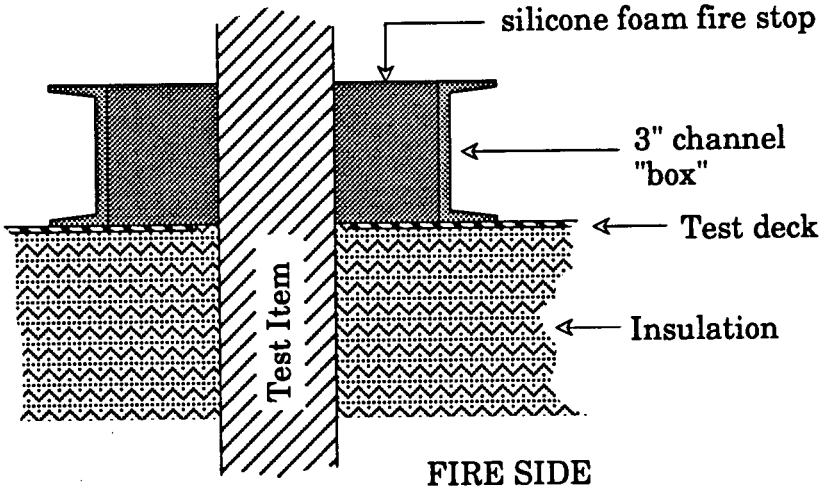
TEST DECK

The test deck consisted of a perimeter of 3 in. structural steel channel, welded together into an 8 ft by 13 ft rectangle, with the points outward. Over the top of this framework a layer of 10 GA steel sheet was welded to form a continuous, smooth top. Pipe sockets (4 in. ø, sch. 40 steel pipe) were then welded onto each corner, so that 3 in. diameter (ø) steel pipe legs could be attached to hold the assembly at a comfortable working level. Holes were then cut into the deck steel at the

appropriate locations to allow the test item to be installed through the deck assembly. Structural elements were typically attached to the test item above the deck level, to rigidly fix the item to the deck. Following the installation of the test item, the deck was reinforced with steel channel positioned so as to minimize any warping, bending or sagging during the fire test (the size of the channel being selected after consideration of the amount of stiffness required for that particular assembly), and then insulated on the underside with two 2 in. thick layers of 6 pcf ceramic fiber blanket, held in place with impaling pins, spaced a maximum of 12 in. o.c. The figure below illustrates a cross-sectional view of one edge of a typical deck assembly, showing the structural steel, the decking and the insulation.



Following complete installation of the test item, the underside of the deck was insulated as previously described, with the ceramic blanket being pushed into direct contact with the test item. A "box" around the penetration point in the deck steel was formed of 3 in. steel channel on edge and the enclosed area completely filled to a nominal depth of 3 in. with silicone foam fire seal.



CROSS-SECTION VIEW OF POINT OF PENETRATION OF THE DECK BY A TEST ITEM

This method of sealing around the point where a test item penetrates the test deck has proven very effective at withstanding the 60 minute fire exposure. Since the penetration seal is considered a part of the support system, and is not in itself being evaluated by this test method, the important aspect of the seal is that it be "typical" of a field installation and withstand the fire exposure test. The silicone foam system used in this design does not unduly act as a heat sink, nor does it offer significant physical support to the penetrating item. Its purpose is to seal the gap without affecting the evaluation of the protective envelope system.

TEST ITEMS (GENERAL)

As with conduit and junction box materials installed at Watts Bar Nuclear Power Plant (WBNPP), the materials used in the test were subjected to on-site commercial grade dedication programs prior to acceptance and subsequent installation. The conduits and junction boxes used in the test were provided by various vendors, and were similar in design and representative of those installed at WBNPP.

Thermo-Lag® 330-1 Materials

Thermo-Lag® materials were supplied by WBNPP and are representative of materials to be installed in the plant. Each Thermo-Lag® 330-1 V-ribbed panel is 5/8 in. ±1/8 in. thick (or 3/8 in. ±1/8 in.) x 48 in. wide x 78 in. long, with stress skin monolithically adhered to the panel on one face. The stress skin is installed

adjacent to the surface of the protected device. Other materials supplied by WBNPP were 330 Pre-Formed Conduit Sections (nominal 5/8 in. thick, 3 ft. long and 3/8 in. thick, 3 ft. long). All Thermo-Lag® panels were measured, saw cut and installed onto the respective test assembly by Tennessee Valley Authority craft personnel (insulators) using approved WBNPP drawings, procedures and specifications. The phases of installation and inspection were under direct supervision of TVA engineers.

Other Materials

Materials used in conjunction with Thermo-Lag® components, but furnished by other vendors to TVA as commercial grade products included: 16 GA stainless steel tie wire, stainless steel stress skin (type 304, plain weave, 8x8 square wire cloth, 0.017 in. diameter), stainless steel wire mesh (type 304, 60 density mesh, 0.011 diameter).

TEST ITEM (CONDUITS)

This assembly consisted of four conduit loop configurations (1 in., 2 in., 3 in. and 4 in.). Conduits used in these assemblies were standard weight rigid galvanized steel conduit procured from Summers Electric, San Antonio, Texas. Other materials received from Summers Electric included: 1 in., 2 in., 3 in. and 4 in. malleable LB condulet bodies, 1 in., 2 in., 3 in. and 4 in. rigid galvanized steel short radius 90° elbows, 1 in., 2 in., 3 in. and 4 in. galvanized couplings and bare #8 AWG stranded copper wire for thermocouple placement. Each conduit loop extended down through the deck, into a 90° condulet elbow (long side vertical), through a horizontal run, into a 90° standard conduit bend and back up through the deck. All of the conduit configurations extended three feet above the surface of the deck.

CONDUIT SUPPORTS

A single trapeze type UniStrut® hanger was fabricated to support the horizontal section of the four conduit loop configurations. The hanger consisted of two P2546 unistrut vertical sections with a 2 in. wide, 6-1/4 in. long plate factory welded to the top and a P1001 horizontal section secured to the vertical sections with angle brackets and spring nut hardware. The hanger was 34-1/2 in. high to place the bottom of the 1 in. ø conduit 36 in. below the deck insulation. The completed hanger was 66 in. wide. The hanger was situated at the centerline of the horizontal conduit runs. The plates on top of the hangers were insulated from the steel deck by 4 in. of Calcium Silicate Board (Promat, Inc.: Promat-L Cladding, two 2 in. thick layers) attached to the steel decking with 1/2 in. diameter threaded rods. The conduits were attached to the bottom of the unistrut hangers with conduit straps and spring nut hardware.

THERMOCOUPLE PLACEMENT

In order to monitor temperatures in the interior of the raceways, a single bare #8 AWG stranded copper wire was instrumented with thermocouples and pulled through each conduit configuration. A 24 gauge, Type K, Chromel-Alumel electrically-welded thermocouple (Special Limits of Error: ±1.1°C, purchased with lot traceability and calibration certifications) was positioned nominally every 6 in. along the length of wires pulled into each conduit. The thermocouples were attached to the bare #8 AWG stranded copper wire by placing the thermojunction in direct contact with the top surface of the wire and crimping the junction to the copper wire with a copper Buchanan 2011S open end splice cap fastened in place with a Buchanan C-24 "pres-SURE" tool.

In order to get a realistic measurement of the temperatures at the conduit steel, similar thermocouples were positioned nominally every 6 in. along the bottom surface of each conduit, being held in position by clamping under the head of a #8 x 32 x 1/4 in. long stainless steel round-head machine screw in a drilled and threaded hole at each location. The thermocouple leads were taped securely to the conduits at points away from the thermojunction by wrapping the tape completely around the conduit and thermocouple lead.

THERMO-LAG® INSTALLATION HIGHLIGHTS

Thermo-Lag® materials were installed in accordance with Tennessee Valley Authority design drawings and procedures. Short abstracts of the installation are included herein to clarify specific details. Drawings of the installed Thermo-Lag® on the test assembly are shown in Appendix H.

Thermo-Lag® 330-1 V-Ribbed Panel (5/8 in. ± 1/8 in. thickness)

These panels were used to construct the LB box design and support steel protective envelopes.

Thermo-Lag® 330-1 V-Ribbed Panel (3/8 in. ± 1/8 in. thickness)

These panels were used to construct the overlay for the LB box design protective envelopes.

Thermo-Lag® 330-1 Subliming Trowel Grade Material

This material was used to pre-caulk all joints, seams and interior surfaces of the V-ribbed panels and -pre-shaped sections.

Thermo-Lag® 330-1 Pre-Shaped Conduit Sections (5/8 in. ± 1/8 in. thickness)

This material was used to construct the protective envelope for the 4 in. conduit and the first layer of the protective envelopes for the 1 in. conduit.

Thermo-Lag® 330-1 Pre-Shaped Conduit Sections (3/8 in. ± 1/8 in. thickness)

This material was used to construct the second layer of the protective envelope for the 1 in. conduit and both the first and second layer of the protective envelope for the 2 in. and 3 in. conduits.

Application Methods

The LB boxes for each conduit run were formed from a single piece of Thermo-Lag® 330, V-ribbed, nominal 5/8 in. thick panels with the V-ribs hammered flat. The panel for each LB box (sized as required for each condulet) was made by scoring to the internal stress skin such that the panel could be folded, along the scored lines, into a box configuration. The boxes were pre-buttered with Thermo-Lag® 330-1 Trowel Grade material and were secured with stainless steel tie wire until dry. Trowel grade material was also applied to the condulet to help hold the box in place. In the case of each LB box, the joint formed by the stress skin overlap on the bottom of the LB box was stitched closed though the stress skin using stainless steel tie wire. The stress skin flap along the vertical closure seam was folded over and covered with trowel grade material (no stitching was used on this joint). Stainless steel tie wire was used to hold the box in place. All joints and seams were filled in with Thermo-Lag® 330-1 Trowel Grade material.

The box enclosure for the support member was cut from Thermo-Lag® 330, V-ribbed, nominal 5/8 in. thick panels with the V-ribs hammered flat. The two side pieces were notched to fit around the tops of the horizontal conduit runs. All pieces were pre-buttered with Thermo-Lag® 330-1 Trowel Grade material and held in place with stainless steel tie wire until dry. All joints and seams were filled in with Thermo-Lag® 330-1 Trowel Grade material.

The conduits were enclosed with Thermo-Lag® 330-1 Pre-Shaped sections (nominal 5/8 in. thick for the 4 in. and 1 in. conduits and nominal 3/8 in. thick for the 3 in. and 2 in. conduits). Straight pre-shaped conduit sections were scored down to the internal stress skin in several places (to easier facilitate bending) and were bent to conform to the curvature of the 90° standard conduit bends. Despite the scored lines, the internal stress skin was torn in places during the forming procedure. These tears were covered with additional stress skin allowing a 1 in. to 2 in. overlap. The bent pre-shaped sections were pre-buttered with Thermo-Lag® 330-1 Trowel Grade material and held in place with stainless steel tie wire

until dry. The scored lines and all seams and joints were filled in with Thermo-Lag® 330-1 Trowel Grade material.

The specimen were allowed to dry overnight. The tie wire was removed and all of the configurations were gone over with a rasp to smooth out the rough spots. A thin layer of Thermo-Lag® 330-1 Trowel Grade material was applied to all the configurations to fill in the low spots. The specimen was again allowed to dry overnight.

Upgrade Techniques

After the assembly was dry, the LB boxes on the 1 in., 2 in. and 3 in. conduits were covered with an additional layer of Thermo-Lag® 330, V-ribbed, nominal 3/8 in. thick panels with the V-ribs hammered flat. The overlay was installed in the same manner as the first layer. The 1 in., 2 in. and 3 in. conduit were then covered with an overlay consisting of Thermo-Lag® 330 pre-shaped conduit sections, nominal 3/8 in. thick. All interior surfaces of the panel pieces and pre-shaped conduit sections were pre-buttered with Thermo-Lag® 330-1 Trowel Grade material tamped solid with a hammer and temporarily held in place with stainless steel tie wire until dry. Stainless steel wire mesh was wrapped, in a single layer, over the material in the radial bend area of all four conduits. The mesh was covered with a thin layer (approximately 1/8 in. thick) of Thermo-Lag® 330-1 Trowel Grade material. Once dry, the temporary ties were removed and the configurations were gone over with a rasp to smooth out the rough spots. A thin layer of Thermo-Lag® 330-1 Trowel Grade material was applied to all the configurations to fill in the low spots. The specimen was again allowed to dry overnight. Stainless steel tie wire was then applied with a maximum spacing of 6 in. on the straight conduit sections, 4 in. maximum on the curved conduit sections and as possible on the LB boxes and support member.

The entire test assembly was allowed to cure for a minimum of thirty days before testing. Temperature/humidity data for this period may be found in Appendix F.

TEST RESULTS

The completed test specimen was placed on the Laboratory's horizontal fire test furnace and the thermocouples connected to the data acquisition system and their outputs verified. The test was conducted on March 31, 1993, by Herbert W. Stansberry II, project manager, with the following persons present:

Gerry Wiseman	-	USNRC
J.J. Pierce	-	T.V.A.
Mark Salley	-	T.V.A.

Jim Krieg	-	T.V.A.
Deggary N. Priest	-	Omega Point Laboratories, Inc.
Kerry Hitchcock	-	Omega Point Laboratories, Inc.
Connie Humphrey	-	Omega Point Laboratories, Inc.
Richard Beasley	-	Omega Point Laboratories, Inc.
Laudencio Castanon	-	Omega Point Laboratories, Inc.
Randy Henry	-	Alamo Crane Co.

The furnace was fired and the ASTM E119 standard time-temperature curve followed for a period of 60 minutes. The pressure differential between the laboratory surrounding the furnace and a point within the furnace level with the vertical midpoint of the exposed portion of the specimen was maintained at approximately 0.00 in. water column throughout the test.

The furnace was fired at 7:34 p.m. By 0:35 (min:sec) the outside surface of the test item was beginning to turn brown, and by 0:50 (min:sec) had ignited fairly uniformly across the exposed surfaces. By 1:05 (min:sec) the furnace was filled with intense smoke and heavy flaming. At 41:40 (min:sec), pieces of the outer layer of material were observed to be falling from conduit items #1 and 2. During the fire exposure, no visual openings into the raceway were observed.

In the course of the fire endurance test, one problem was encountered as discussed, in detail, below:

- Due to the time constant (5.0 - 7.2 minutes) inherent in the furnace probe thermocouples required by the test standard, the furnace operator detected an over-temperature condition (due to the combination of furnace fuel flow and burning test item) and turned the furnace fuel down. When that happened, the flaming on the surface of the Thermo-Lag® material slowly stopped, causing the furnace probes to register an under-temperature condition. Consequently, the operator increased the fuel flow to the furnace and the surface of the test item then re-ignited and filled the furnace with smoke and flames again. The furnace temperature thus "saw-toothed" its way along the E119 heating curve until the temperature was considerably above 1,000°F, at which time the previously-mentioned phenomenon ceased, and the specimen burned steadily for the remainder of the fire exposure period.

At the end of the fire exposure period, the thermocouples were disconnected, the furnace extinguished and the specimen removed from the furnace. The test specimen was elevated to a distance of approximately 6 ft. between the floor and the bottom of the test item and spun on a swivel at a rate of 6 – 8 revolutions per minute (to ensure exposure of as much of the exterior surface as possible) while being exposed to a 30° angle spray nozzle hose stream test with a minimum

pressure at the nozzle of 75 psi at a distance of 5 feet, for a 5 minute duration. The minimum flow from the nozzle was 75 gpm. The hose stream was thus positioned to attack the sides, bottom and inside vertical surfaces of the test item, with only minimal exposure to the top surface.

When the test item was removed from the furnace it was still flaming, which slowly decreased as it was positioned for the hose stream test. Prior to the hose stream test, no openings or other severe damage was noticed on the specimen. The exposed surface of the test items was covered with a layer of black ash.

Following the hose stream test, the Thermo-Lag® pieces remained firmly affixed and the stainless steel tie wire was still tightly wrapped around the assemblies. A fuller description of the condition of the protective envelope is presented later in this document.

The significant temperatures within the raceway system at the end of the fire exposure test are presented in the table below.

LOCATION	MAX. TEMPERATURE (°F)	AVG. TEMPERATURE (°F)
3 IN. Ø CONDUIT (#1)		
Conduit Steel	238	219
Bare #8 AWG Wire	224	214
2 IN. Ø CONDUIT (#2)		
Conduit Steel	246	224
Bare #8 AWG Wire	229	219
1 IN. Ø CONDUIT (#3)		
Conduit Steel	252	228
Bare #8 AWG Wire	238	223
4 IN. Ø CONDUIT (#4)		
Conduit Steel	365	276
Bare #8 AWG Wire	342	258

The average initial temperature for all thermocouples at the start of the test was 76°F, yielding an allowable temperature increase of 250°F, or 326°F actual for the average temperatures. (A 325°F increase above the 76°F initial temperature yields a maximum allowable individual temperature of 401°F, in accordance with

ASTM E119-88.) All thermocouples within each of the four conduit configurations met these criteria.

Post-Test Examination

Immediately following the hose stream test, the test item was systematically disassembled and examined for damage and general condition. A listing of those findings follows. In all cases, when describing a particular Thermo-Lag® 330-1 V-Ribbed Panel or Pre-Shaped Conduit Section, the term "panel" or "pre-shaped section" will be used.

3 IN. CONDUIT (CONDUIT #1)

LOCATION	OBSERVATION
Vertical conduit section, above condulet elbow.	3/4 in. to 1-1/2 in. char on overlay material. Grooves in char at tie wire locations. No uncharred material remaining in the overlay section. 1/4 in. to 3/8 in. uncharred material remaining against the conduit surface.
LB box, around condulet elbow.	3/4 in. to 1-1/2 in. char on overlay material. Stress skin exposed (outer layer knocked off of bottom of box). No uncharred material remaining in the overlay section. 1/4 in. to 3/8 in. uncharred material remaining against any condulet surface.
Horizontal conduit section, between condulet elbow and standard 90° bend.	3/4 in. to 1-1/4 in. char on overlay material. Grooves in char at tie wire locations. Stress skin exposed in several places along the bottom of the conduit. No uncharred material on the outer layer material. 1/4 in. to 3/8 in. uncharred material remaining against the conduit surface.
Standard 90° bend.	3/4 in. to 1-1/4 in. char on overlay material. Grooves in char at tie wire locations. No uncharred material remaining in the overlay section. 1/4 in. to 3/8 in. uncharred material remaining against the conduit surface.
Vertical conduit section, above standard 90° bend.	3/4 in. to 1-1/4 in. char on overlay material. Grooves in char at tie wire locations. No uncharred material remaining in the overlay section. 1/4 in. to 3/8 in. uncharred material remaining against the conduit surface.

2 IN. CONDUIT (CONDUIT #2)

LOCATION	OBSERVATION
Vertical conduit section, above condulet elbow.	1 in. to 1-1/2 in. char on overlay material. Grooves in char at tie wire locations. No uncharred material remaining in the overlay section. 1/4 in. to 3/8 in. uncharred material remaining against the conduit surface.
LB box, around condulet elbow.	1 in. to 1-1/2 in. char on overlay material. Stress skin exposed (outer layer knocked off of bottom of box). No uncharred material remaining in the overlay section. 1/4 in. to 3/8 in. uncharred material remaining against any condulet surface.
Horizontal conduit section, between condulet elbow and standard 90° bend.	1 in. to 1-1/2 in. char on overlay material. Grooves in char at tie wire locations. Stress skin exposed in several places along the conduit. No uncharred material on the outer layer material. 1/4 in. to 3/8 in. uncharred material remaining against the conduit surface.
Standard 90° bend.	1 in. to 1-1/2 in. char on overlay material. Grooves in char at tie wire locations. No uncharred material remaining in the overlay section. 1/4 in. to 3/8 in. uncharred material remaining against the conduit surface.
Vertical conduit section, above standard 90° bend.	1 in. to 1-1/2 in. char on overlay material. Grooves in char at tie wire locations. Stress skin exposed in several places along the conduit. No uncharred material remaining in the overlay section. 1/4 in. to 3/8 in. uncharred material remaining against the conduit surface.

1 IN. CONDUIT (CONDUIT #3)

LOCATION	OBSERVATION
Vertical conduit section, above condulet elbow.	1 in. to 1-1/2 in. char on overlay material. Grooves in char at tie wire locations. No uncharred material remaining in the overlay section. 1/2 in. uncharred material remaining against the conduit surface.
LB box, around condulet elbow.	1 in. to 1-1/2 in. char on overlay material. No uncharred material remaining in the overlay section. 1/2 in. uncharred material remaining against any condulet surface.
Horizontal conduit section, between condulet elbow and standard 90° bend.	1 in. to 1-1/2 in. char on overlay material. Grooves in char at tie wire locations. No uncharred material on the outer layer material. 1/2 in. uncharred material remaining against the conduit surface.
Standard 90° bend.	1 in. to 1-1/2 in. char on overlay material. Grooves in char at tie wire locations. No uncharred material remaining in the overlay section. 1/2 in. uncharred material remaining against the conduit surface.
Vertical conduit section, above standard 90° bend.	1 in. to 1-1/2 in. char on overlay material. Grooves in char at tie wire locations. No uncharred material remaining in the overlay section. 1/2 in. uncharred material remaining against the conduit surface.

4 IN. CONDUIT (CONDUIT #4)

LOCATION	OBSERVATION
Vertical conduit section, above condulet elbow.	1/2 in. to 1-1/4 in. char. Grooves in char at tie wire locations. 1/16 in. to 1/8 in. uncharred material remaining against the conduit surface.
LB box, around condulet elbow.	1/2 in. to 1-1/4 in. char. Grooves in char at tie wire locations. 1/16 in. to 1/8 in. uncharred material remaining against any condulet surface.
Horizontal conduit section, between condulet elbow and standard 90° bend.	1/2 in. to 1-1/4 in. char. Grooves in char at tie wire locations. 1/16 in. to 1/8 in. uncharred material remaining against the conduit surface.
Standard 90° bend.	1/2 in. to 1-1/4 in. char. Grooves in char at tie wire locations. 1/16 in. to 1/8 in. uncharred material remaining against the conduit surface.
Vertical conduit section, above standard 90° bend.	1/2 in. to 1-1/4 in. char. Grooves in char at tie wire locations. 1/16 in. uncharred material remaining against the conduit surface.

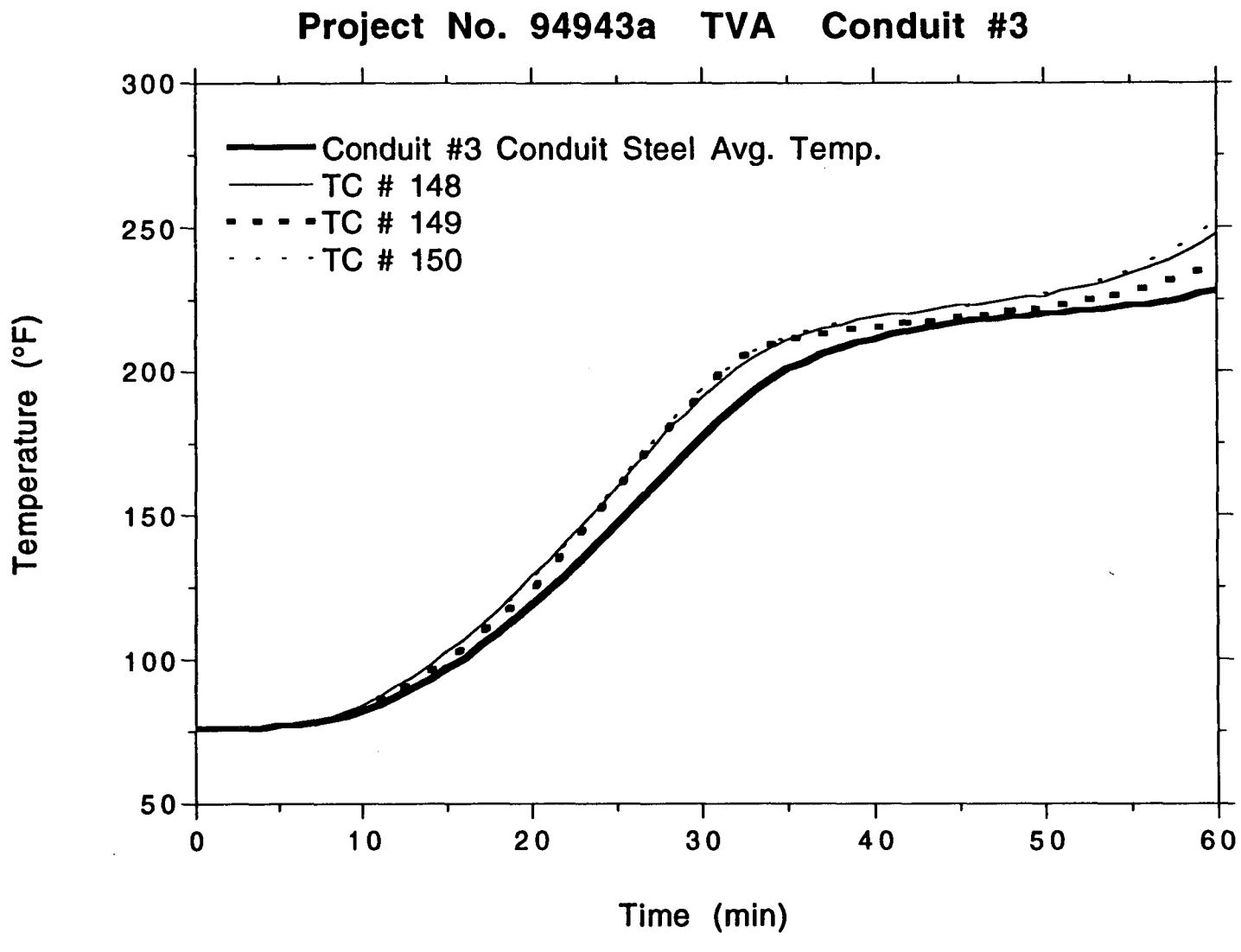
CONCLUSIONS

All four conduit configurations evaluated in this test procedure, clad with Thermo-Lag® 330-1 material and upgrades as presented herein, met the requirements of the TEST PLAN (essentially those of Underwriters Laboratories, Inc. Subject 1724, "Outline of Investigation for Fire Tests for Electric Circuit Protective Systems," Issue Number 2, dated August 1991), for a fire resistance rating of one hour.

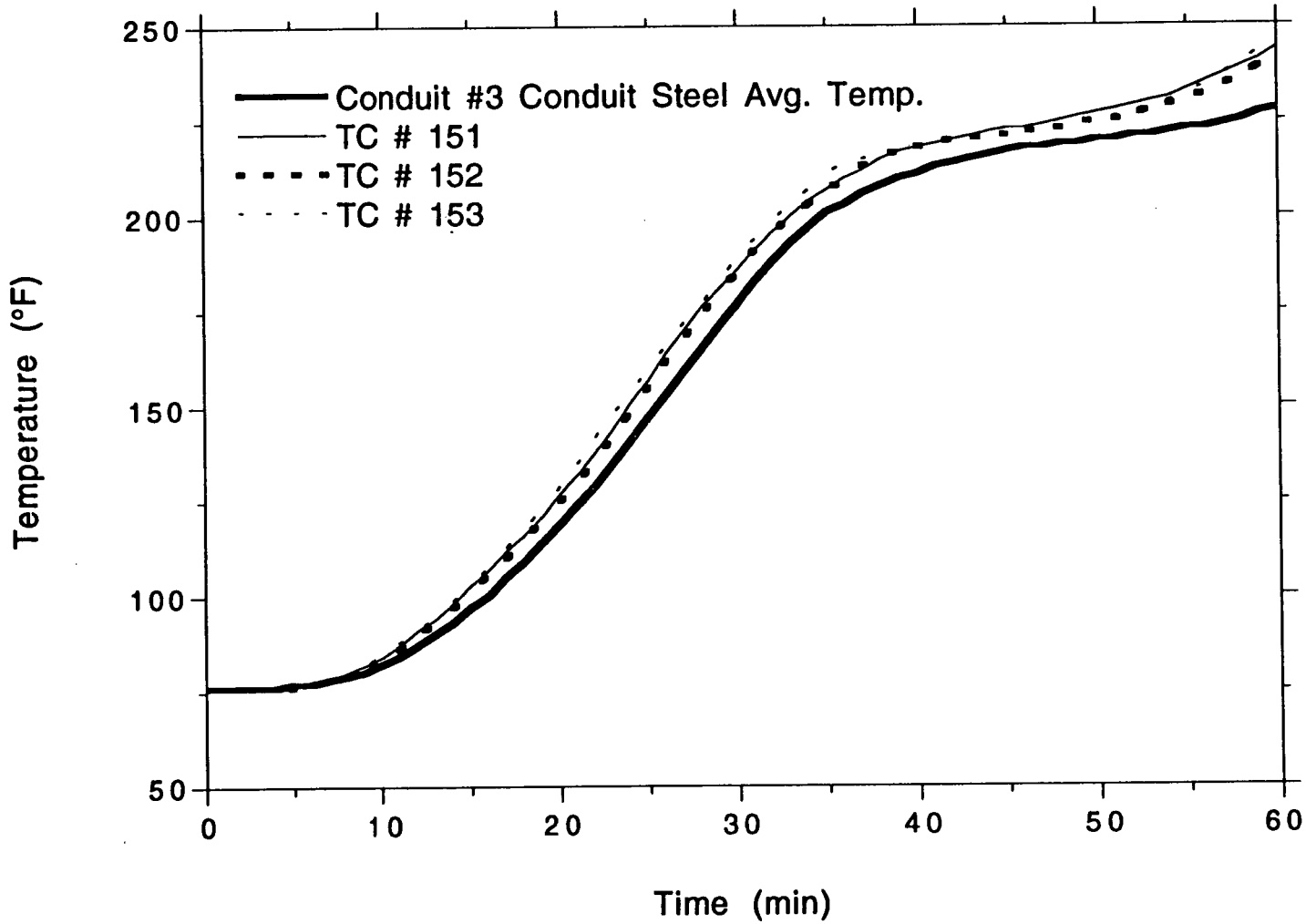
Appendix A

CONSTRUCTION DRAWINGS

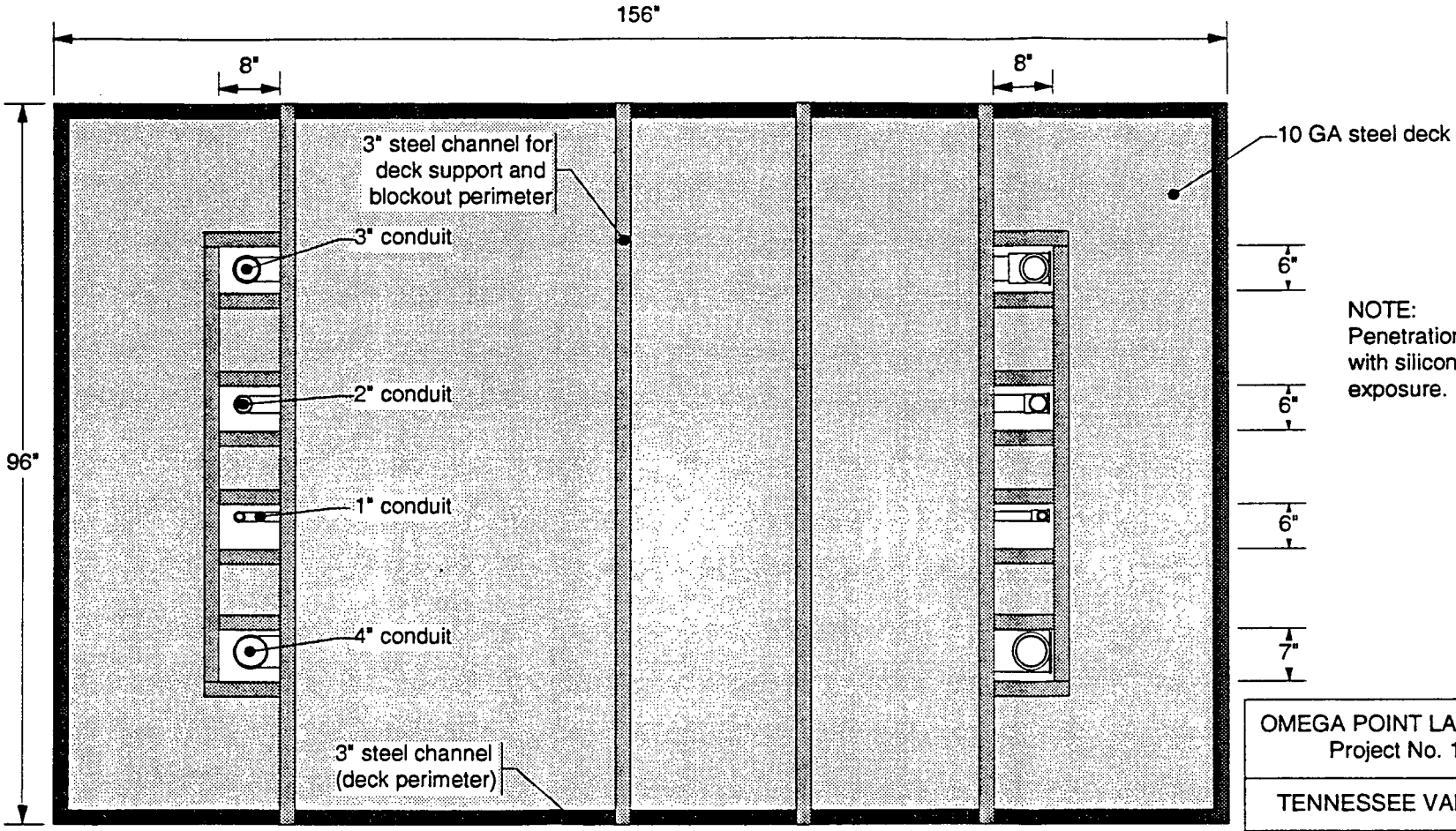
OMEGA POINT LABORATORIES


Project No. 94943a TVA Conduit #3
Conduit #3 Conduit Steel Avg. Temp.
TC # 148
TC # 149
TC # 150
Temperature (°F)
300
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

Project No. 94943a TVA Conduit #3

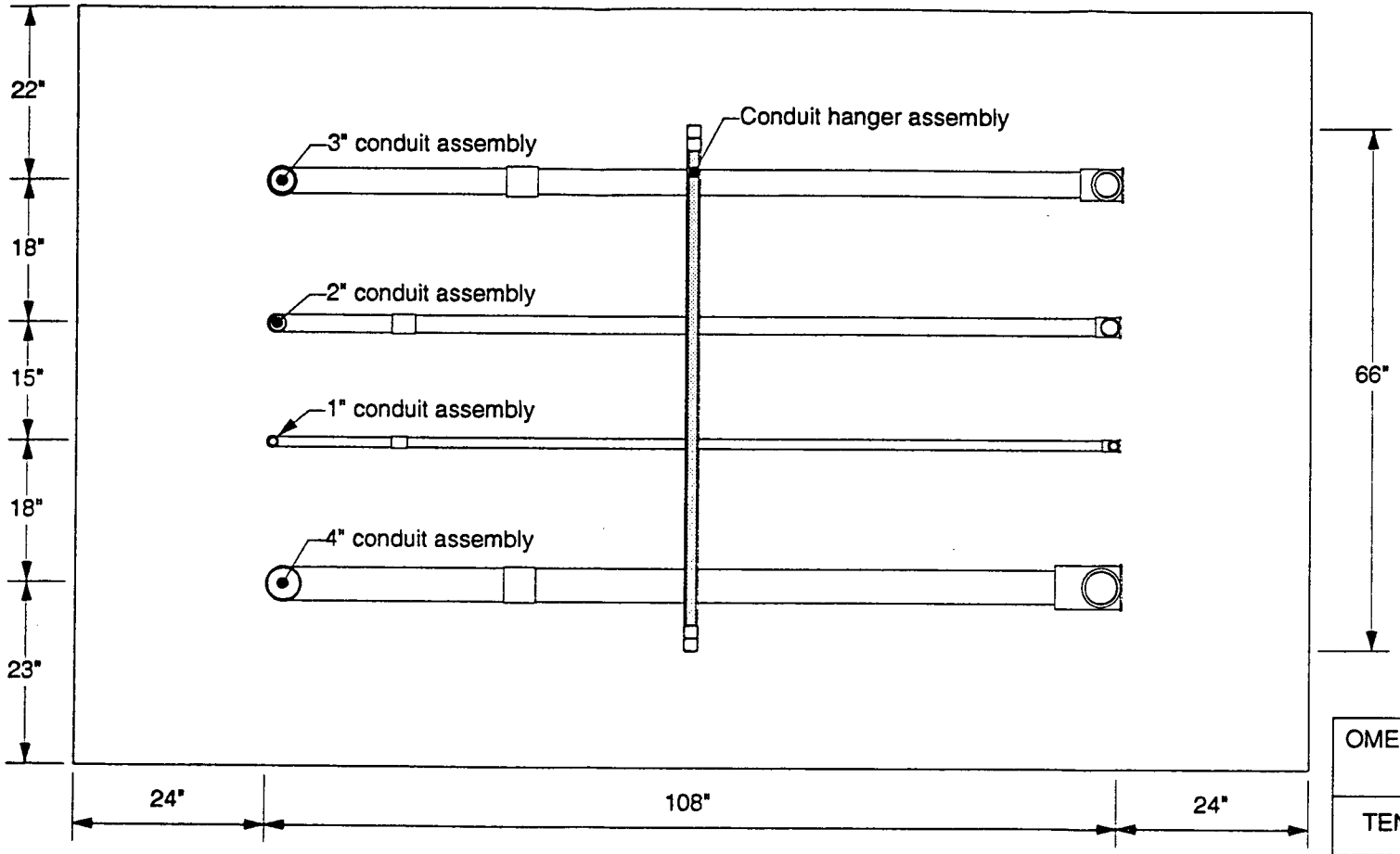


OMEGA POINT LABORATORIES

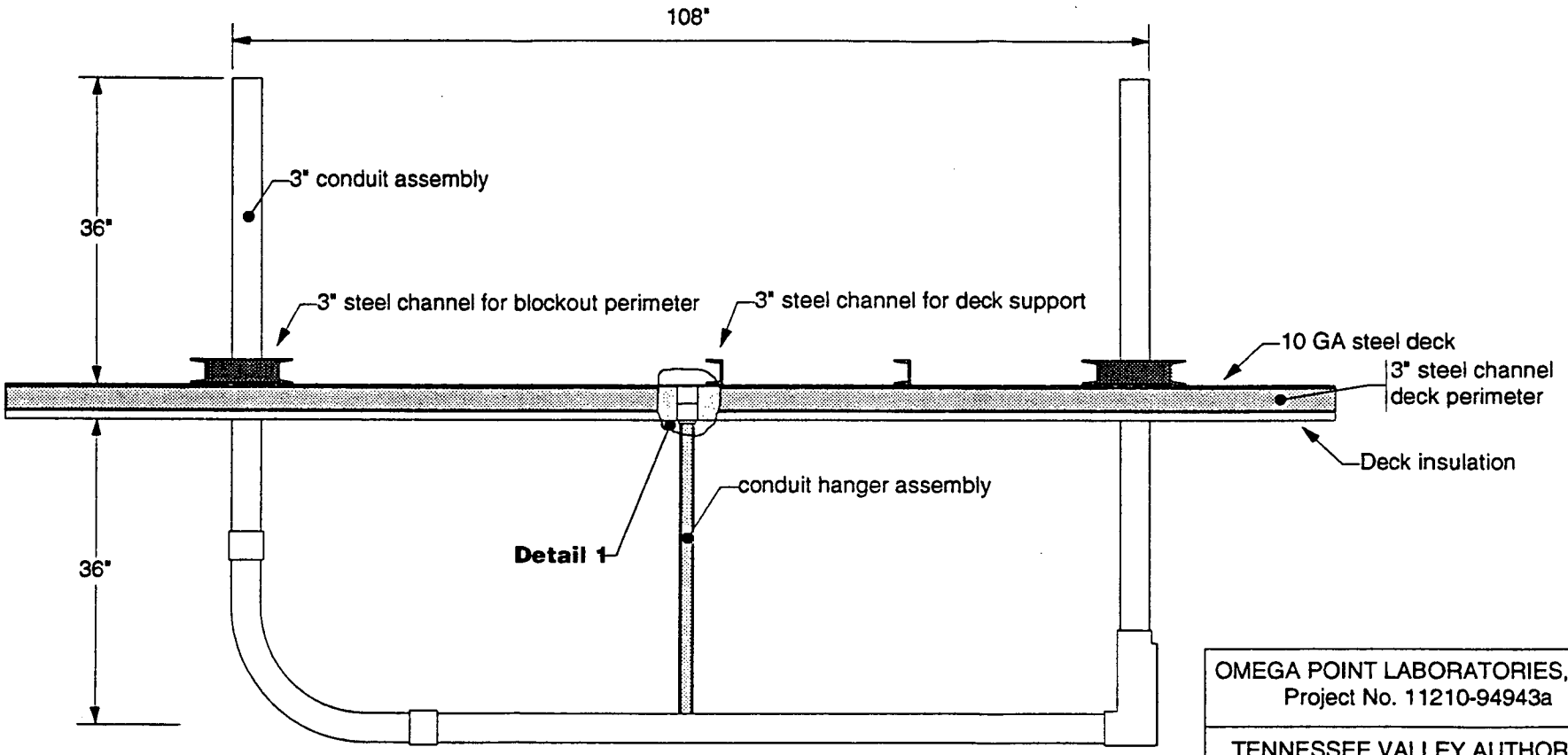


NOTE:
Penetration blockouts filled with silicone foam prior to fire exposure.

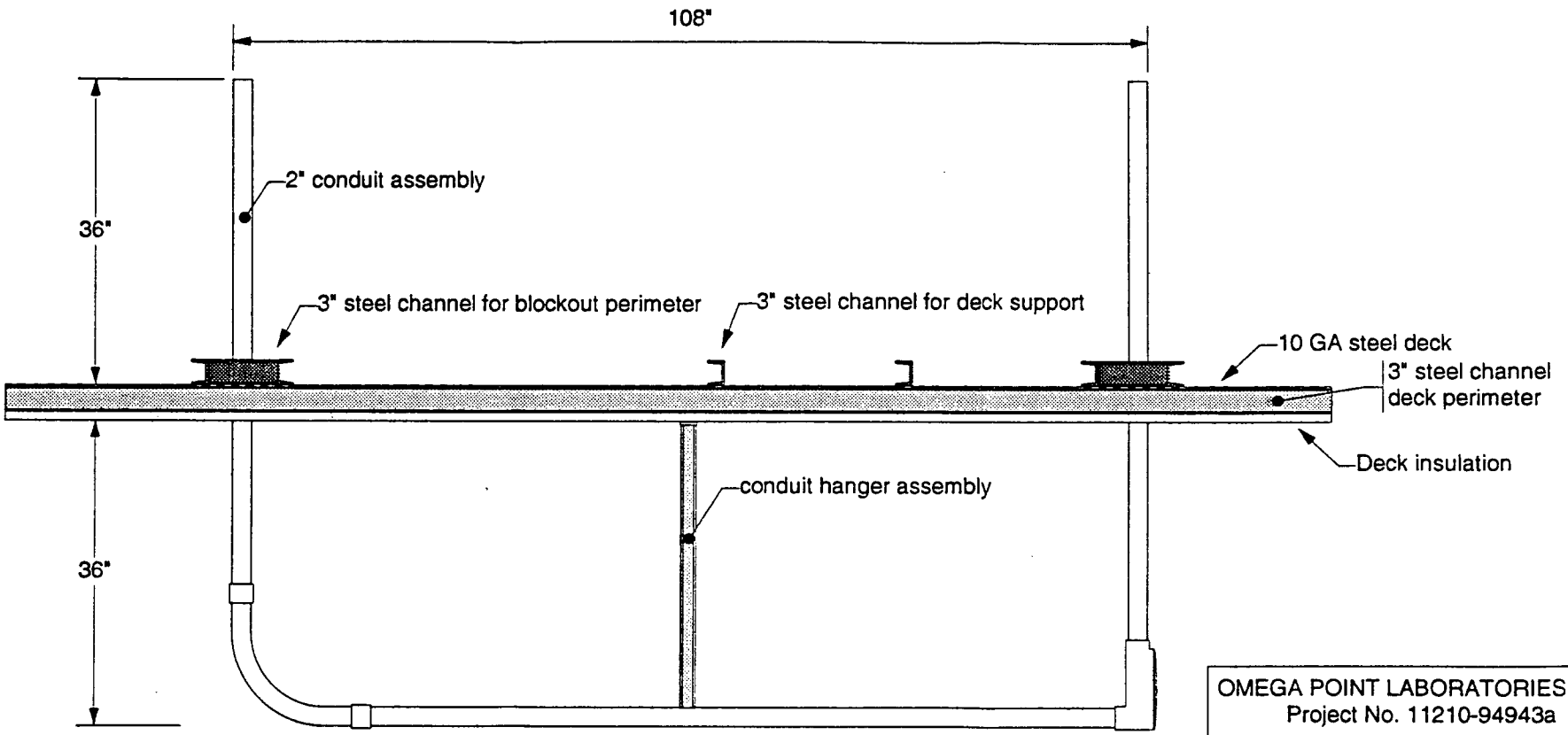
OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 1 Plan View - Above Deck



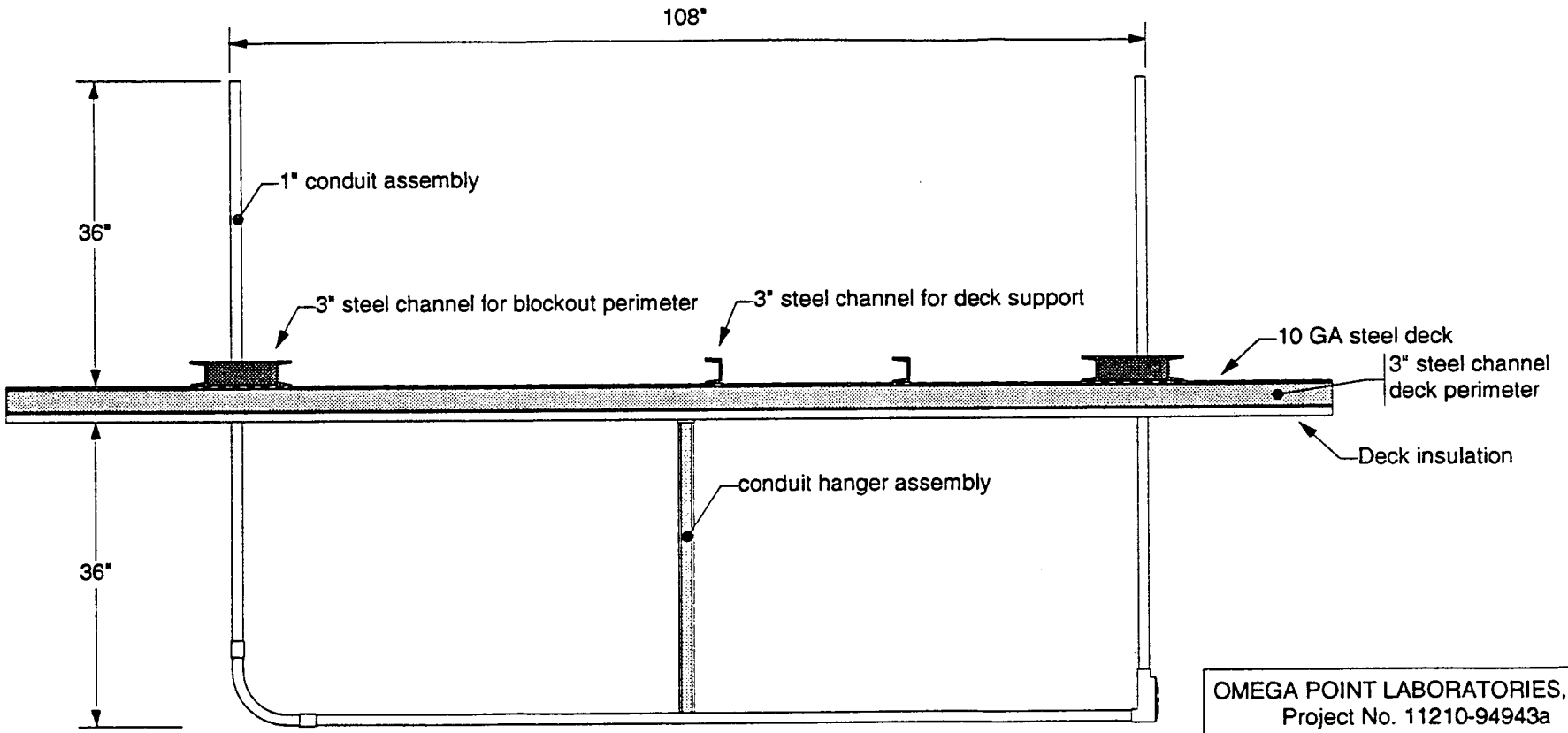
OMEGA POINT LABORATORIES, INC. Project No. 11210-93934a
TENNESSEE VALLEY AUTHORITY
Fig. 2 Plan View - Below Deck



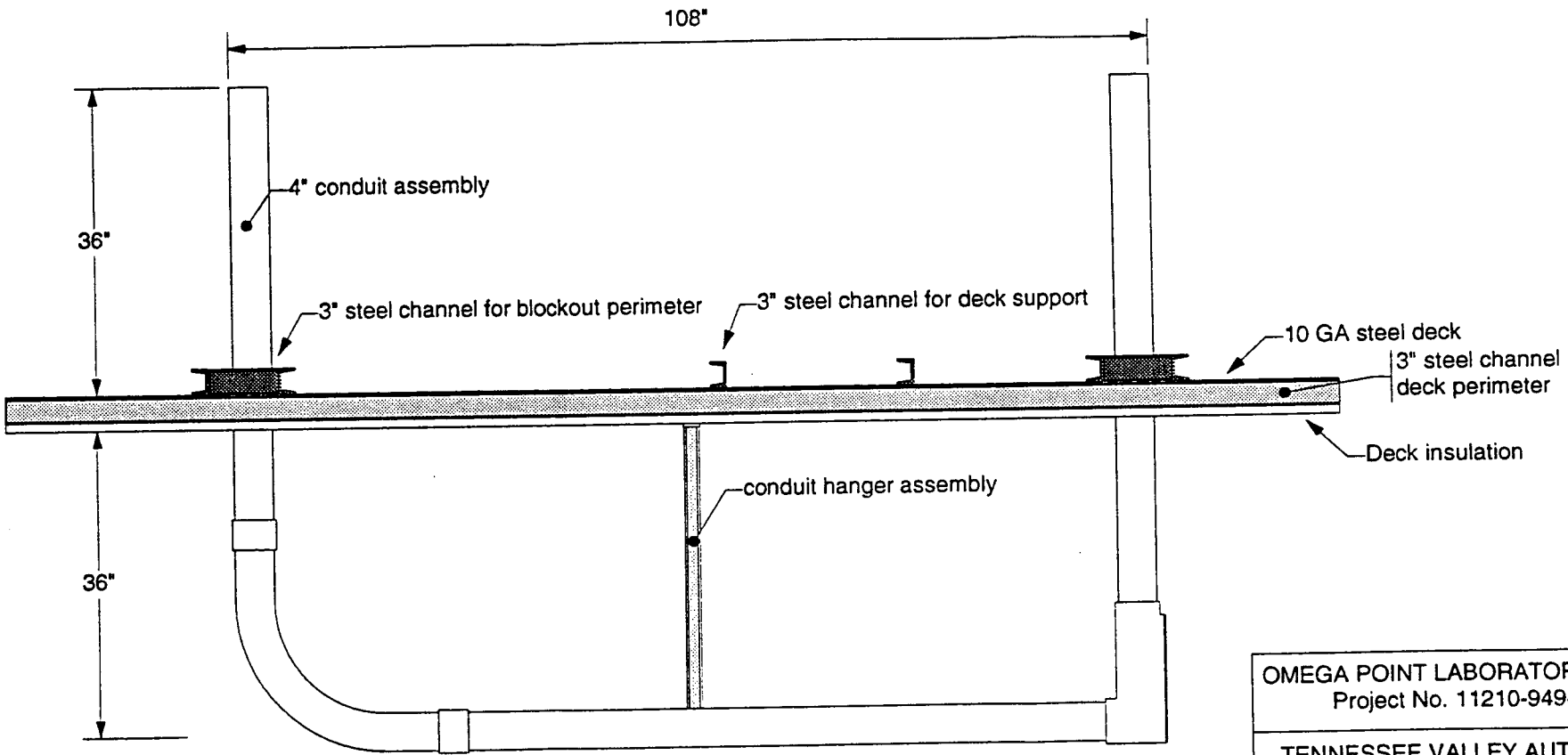
OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 3 Elevation View - 3" Conduit



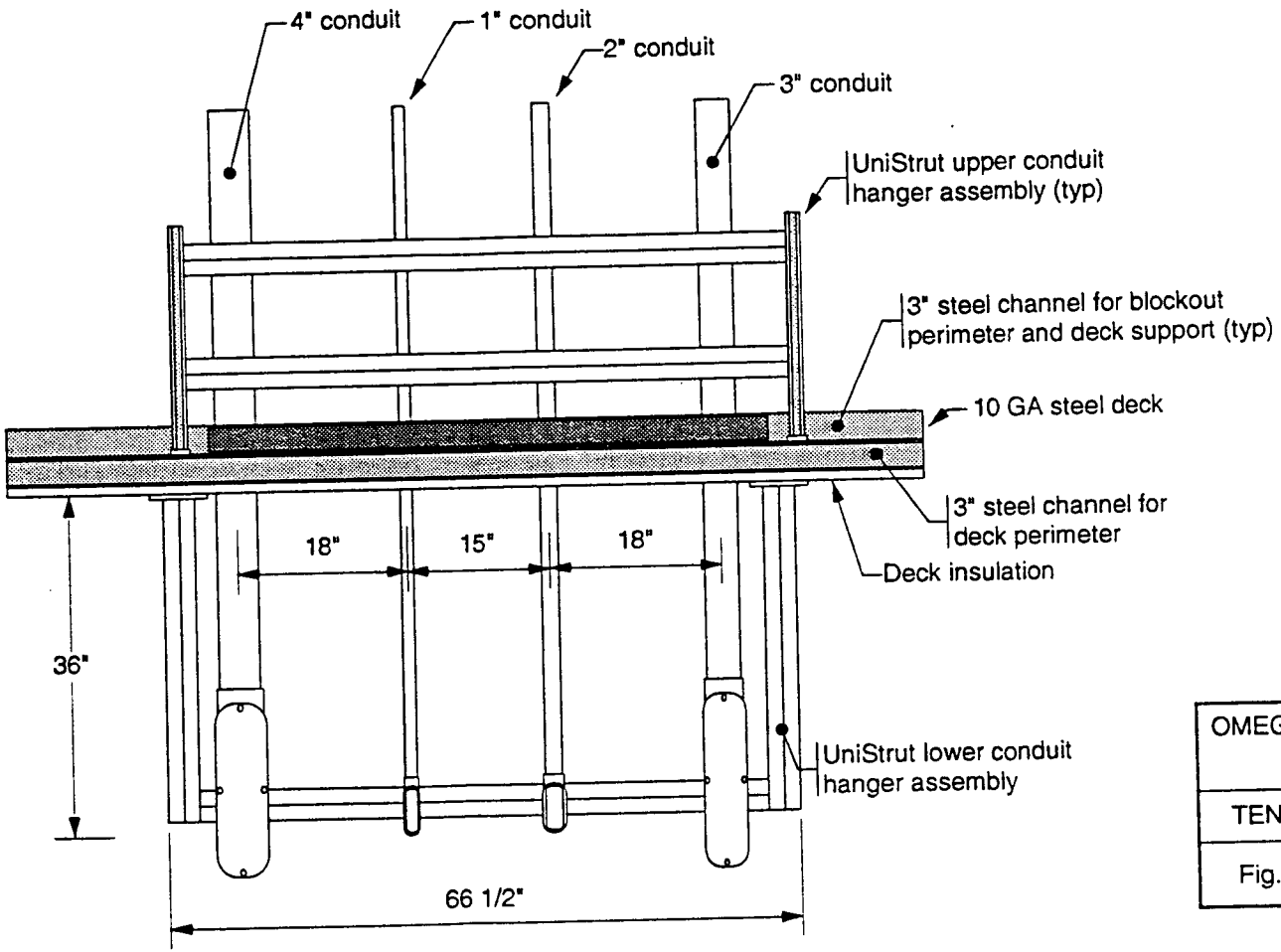
OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 4 Elevation View - 2" Conduit



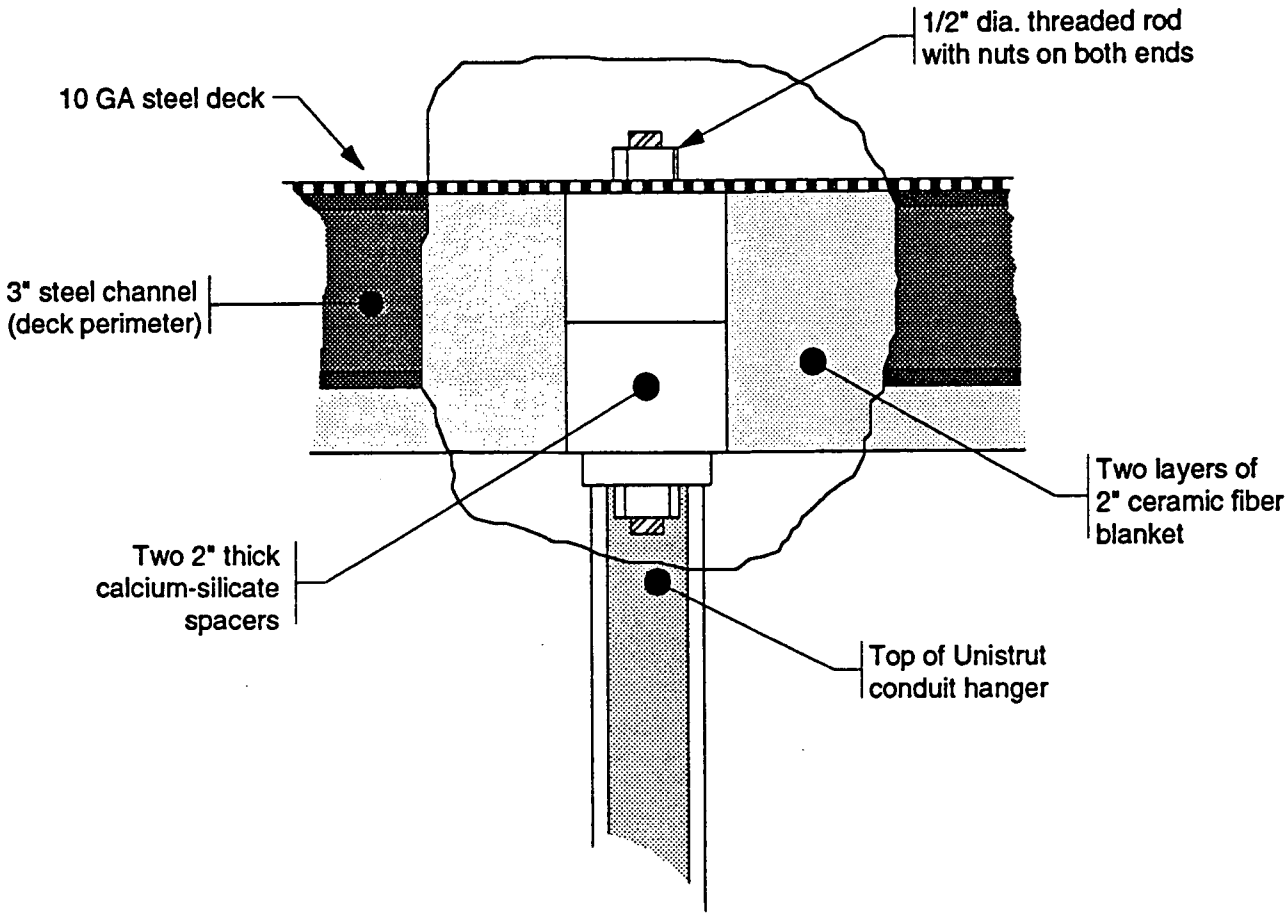
OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 5 Elevation View - 1" Conduit



OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 6 Elevation View - 4" Conduit



OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 7 Right End View - conduit LBs



DETAIL 1

OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 8 DETAIL 1 - Hanger Mounts and Insulation

Appendix B

TEST PLAN

OMEGA POINT LABORATORIES

ONE HOUR FIRE ENDURANCE TESTS OF ARTICLES PROTECTED WITH THE TSI THERMO-LAG 330 FIRE BARRIER SYSTEM

1.0 SCOPE

This test plan describes the methods and guidelines for five fire endurance tests. This test plan includes the preparation of five test decks and specimens, installation of the THERMO-LAG 330 Fire Barrier System, performance of fire endurance and hose stream tests, temperature monitoring, and all applicable documentation of these tasks and the test results. The test decks will consist of a combination of junction boxes and conduits as shown in Appendix A.

2.0 OBJECTIVE

The objective of these tests is to qualify a protective generic fire barrier system for redundant essential cables at Tennessee Valley Authority's (TVA) Watts Bar Nuclear Plant (WBN). Successful results of this test program will provide documented evidence that the fire barrier systems will satisfactorily withstand an ASTM E119-88 fire exposure for a period of one hour, followed by a hose stream test. These tests shall satisfy the requirements for fire testing the cable raceway and junction box fire barriers as detailed in Underwriters Laboratories, Inc. (UL) Subject 1724, "Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems," Issue Number 2, August 1991 except where clarified and, in the absence of other standards for these specific types of tests, standard practice shall be invoked.

3.0 ACCEPTANCE CRITERIA

3.1 The exterior surface temperature of each conduit and junction box will be recorded (cold side of the barrier). If the average temperature recorded by the exterior raceway thermocouples is less than 250°F (121°C) above their initial temperature and no individual thermocouple is in excess of 325°F (181°C) above its initial temperature, the fire barrier shall be acceptable for use with any type cable.

3.2 The thermocouples located on the bare copper cable (#8 AWG) installed inside the electrical raceway will be recorded. The highest thermocouple temperature rise above its initial temperature and the average temperature rise above their initial temperature will be recorded for each electrical raceway configuration. These results will be analyzed at a later date to determine the unique electrical applications.

3.3 A hose stream test as described in Section 8.2 will be performed at the end of the fire endurance test. The hose stream test shall not cause any openings through which the electrical raceway is visible.

4.0 REFERENCES

4.1 10CFR50, Appendix R - Fire Protection Program for Operating Nuclear Power Plants.

4.2 American Society for Testing and Materials (ASTM) E119-88 - Standard Test Methods for Fire Tests of Building Construction and Materials.

4.3 Underwriters Laboratories, Inc. (UL) Subject 1724-91 - Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems.

4.4 TVA Position on Fire Testing Criteria for Fire Barrier Systems Used to Protect Electrical Cables Required for 10CFR50 Appendix R Compliance.

5.0 RESPONSIBILITIES

5.1 TENNESSEE VALLEY AUTHORITY (TVA)

5.1.1 Establish the criteria, guidelines, drawings (draft quality), recommendations, etc., to govern the installation of the test items.

5.1.2 Establish the criteria, guidelines, drawings (draft quality), recommendations, etc., to govern the installation of the fire penetration seal systems, if any (other than deck through-penetration seals).

5.1.3 Establish the criteria, guidelines, drawings (final, report quality if needed), recommendations, hold points, etc., to govern the installation of the Thermo-Lag 330 fire barrier system materials to the test articles.

5.1.4 Provide specific installation procedures and work package documentation for each test.

5.3 LAB QUALITY ASSURANCE/QUALITY CONTROL

5.3.1 Verify the quality control documentation of the fire barrier system materials used in the test program.

5.3.2 Perform and document inspections of the fire barrier system materials at various points during the installation process.

5.3.3 Verify and document that TVA's installation procedures are used in the installation of the fire barrier system.

5.3.4 Inspect and document the construction and instrumentation of the test articles.

5.3.5 Provide written calibration documentation of all thermocouples, measurement devices and data acquisition systems used in this test program.

6.0 SPECIAL PRECAUTIONS

6.1 PRECAUTIONS FOR INSTALLATION OF THE FIRE BARRIER SYSTEM MATERIALS

6.1.1 Observe specific precautions recommended by Thermal Science, Inc. and other's material safety data sheets.

6.2 PRECAUTIONS FOR CONDUCTING THE FIRE ENDURANCE TEST

6.2.1 Proper safety precautions shall be exercised to preclude personnel from direct exposure to the flame environment, hot objects, hazardous gases, and all other related hazards.

7.0 PREREQUISITES

7.1 GENERAL TEST CONFIGURATION REQUIREMENTS

The conduit and junction box sizes and installation configurations for the five tests shall be as shown on drawings in Appendix A.

7.2 TRACEABILITY REQUIREMENTS

To ensure that the materials used in this test are representative of those in actual use or to be used at Watts Bar or other TVA facilities, all aspects of traceability as required by the Laboratory QA Program shall be applied.

5.1.5 Provide the Thermo-Lag fire barrier system materials and personnel to install the fire barrier systems.

5.1.6 Supply personnel to witness assembly and test article raceway configurations and Thermo-Lag installation at TVA's discretion.

5.2 OMEGA POINT LABORATORIES, INC. (Lab)

5.2.1 Prepare the test furnace, deck and slab assemblies and provide all required test instrumentation in accordance with its Appendix B Quality Assurance and Quality Control Programs and other applicable procedures.

5.2.2 Provide thermocouple calibration and instrumentation, storage temperature records, surface temperature probe and relative humidity instrumentation.

5.2.3 Provide, assemble, install and document the installation of all conduits, junction boxes, cable, etc. Provide computer generated drawings of conduit/junction box systems which clearly indicate critical dimensions, thermocouple locations, etc.

5.2.4 Coordinate all phases of the fire test preparation.

5.2.5 Supply QC personnel to witness and document assembly and test article raceway configurations.

5.2.6 Provide all applicable quality control documentation for the fire barrier system materials, cables and installation of the fire barrier system to each test article.

5.2.7 Observe and document the installation of the Thermo-Lag fire barrier system materials to the test articles, and attendant instrumentation on each test article.

5.2.8 Conduct the fire endurance and water hose stream tests.

5.2.9 Document the test parameters and provide a formal detailed written report of the test program and test results.

5.2.10 Notify TVA within three (3) working day of completion of test specimen.

All thermocouples used in this test program shall be teflon coated and traceable to the respective thermocouple manufacturer, with calibration certification.

7.3 DIMENSIONED DRAWINGS

All test articles shall conform to the draft dimensioned drawings (see Appendix A). Final, dimensioned drawings will be prepared by the Laboratory.

7.4 SHIPPING, RECEIVING, MATERIAL INSPECTION

Make a visual inspection of all materials for damage.

Record lot numbers and expiration dates of materials as applicable.

Thermo-Lag bulk grade materials are shipped under "protective service" with an in-transit temperature chart recorder included with each shipment in an identifiable container. That container reads "RECORDER IN HERE". The chart tape produced by this recorder shall be inspected by Laboratory personnel upon arrival of the shipment to insure that the temperature limitations of 32°F to 100°F were not exceeded.

Thermo-Lag fire barrier materials shall be stored off the ground when not in use. The materials shall be stored in a totally enclosed and weather protected area when not in use (ANSI N45.2.2, level B or better). The bulk grade (trowel grade) material shall be maintained within the temperature limitations of 32°F to 100°F.

Prior to application of the bulk grade material, check that the expiration date of the products have not passed. All bulk product expiration dates are good through the end of the expiration date month.

7.5 TEST CONFIGURATION

7.5.1 General

The test articles shall be sufficiently secured to the test deck by Laboratory personnel and sealed in accordance with instructions and drawings.

7.5.2 Conduit and Junction Box Items

Conduit and junction box test configurations for this program will consist of three concrete slabs with the following test specimen descriptions.

1. Slab 1 and 2 consists of five junction boxes attached to the concrete slab and various sizes of conduits running from one junction box to another. A two inch conduit will penetrate the slab into three of the junction boxes (see Attachment A) to allow routing of the bare #8 copper conductor through each conduit and junction box.

2. Slab 3 consist of three conduits that penetrate the concrete slab, enter LBs, exit the LBs in a horizontal plane and terminate on a large junction box.

The conduit and junction box sizes and locations are to be as shown on the drawings in Appendix A.

7.5.3 Conduit Items

Conduit test configurations for this program will consist of conduit assemblies which penetrate the steel deck and enter a standard 90° elbow, continue horizonally and enter a LB, and exit through the steel deck (see drawings in Appendix A). The conduit and LB sizes and locations are to be as shown on the drawings in Appendix A.

7.6 CABLE LOADING REQUIREMENTS

The single #8 bare copper conductor within the electrical circuit protective system is to be in accordance with section 4.4 of reference 4.3 (UL Subject 1724).

7.7 CABLE INSTALLATION

The bare copper conductor shall be instrumented as described in section 7.8 and installed along the entire length of each conduit and through the junction box being protected.

7.8 THERMOCOUPLE INSTALLATION

All thermocouples used in this test program shall be provided and installed by the Laboratory, with QC surveillance by Laboratory personnel. The thermocouple wires shall be calibrated (by Lot Number) prior to installation and/or use, and applicable quality control documentation for record purposes generated. All thermocouples will consist of Teflon coated, 24 GA, type K, Chromel-Alumel (Special Limits of Error ±1.1°C) electrically welded thermojunctions. Calibration will consist of manufacturer supplied (and audited)

certifications of calibrations at five temperatures of thermocouples taken from both ends of each purchased lot number.

The thermocouple placements and methods of attachment shall be in accordance with the requirements of sections 4.18, 19, 20 and 21 of reference 4.3 (UL Subject 1724).

7.9 INSTALLATION OF THE FIRE BARRIER SYSTEM TO THE TEST ARTICLES

Thermo-Lag 330 fire barrier system materials shall be installed by TVA crafts in accordance with applicable specifications, design drawings and procedures provided by TVA. Details of the fire barrier configurations including fasteners, orientation of structural ribs, etc., shall be documented in the final test report.

7.10 FIRE SEAL INSTALLATION

Upon completion of the fabrication and installation of the fire barrier systems to the test articles (or prior to, depending on the situation), all openings in the test articles shall be sealed by Omega Point. All openings in the test slab assemblies shall be sealed by the laboratory. All open ends of raceways which extend through the slab shall be sealed with both internal and external fire and smoke seals. Internal seals shall consist of silicone foam material, installed to a depth of nominally 6" and located at the end of the exposed raceways.

7.11 PREBURN INSPECTION

7.11.1 Prior to the commencement of the fire endurance test, a thorough check of the test assembly and associated equipment (including data recording equipment) shall be performed and documented by the Laboratory.

7.11.2 TVA shall inspect the fire barrier system for workmanship, surface defects, etc. prior to test.

7.11.3 Written approval of the construction, assembly, installation and instrumentation will be supplied by the Laboratory prior to performance of each fire exposure test (a sign-off sheet for this purpose will be supplied by the Laboratory and included in the final report).

7.11.4 Fire endurance testing of assemblies will not commence until the Thermo-Lag fire barrier materials attain a moisture meter reading that does not exceed 20 when using a meter with a scale of 0-100 such as a Delmhorst Model DP or equivalent, or until it has cured for 30 days.

8.0 PROCEDURE

8.1 FIRE ENDURANCE TEST

8.1.1 The protected test article shall be exposed to the standard time/temperature curve found in ASTM E119-88 for one hour. TVA personnel may request stopping of test if premature failure of the specimen occurs.

8.1.2 The testing organization shall adapt their testing procedures to assure the fire test complies with the requirements established in all referenced standards. Any changes, revisions, or deviations required to comply with this requirement shall be documented and properly justified and included as a part of the final test report.

8.2 WATER HOSE STREAM TEST

8.2.1 Immediately following the fire endurance test, accessible surfaces of the protected test article shall be subjected to the cooling, impact and erosion effects of a hose stream test delivered through a 1½ inch fog nozzle set at a discharge angle of 30° with a nozzle pressure of 75 psig and a minimum discharge of 75 gpm will be used. The nozzle orifice is to be a maximum of 5 feet from the edge of the tested assembly.

9.0 DATA SYSTEMS

During the fire exposure period, the thermocouples will be scanned at one minute intervals or less. Data storage for reporting purposes will be at one minute intervals (minimum); however, the furnace thermocouples should be scanned at 15 second intervals to allow close control of the furnace. A printer output of all thermocouple data should be done every 30 seconds.

10.0 FIRE TEST REPORT

10.1 The Laboratory shall submit a report on the results of the test and thermocouple data. The test report shall be prepared and submitted in accordance with the requirements of Attachment B of contract 92NNA-75726B and subsections 10.2 and 10.3.

10.2 The Laboratory will assemble the final test report, containing the collected data and required quality control documentation.

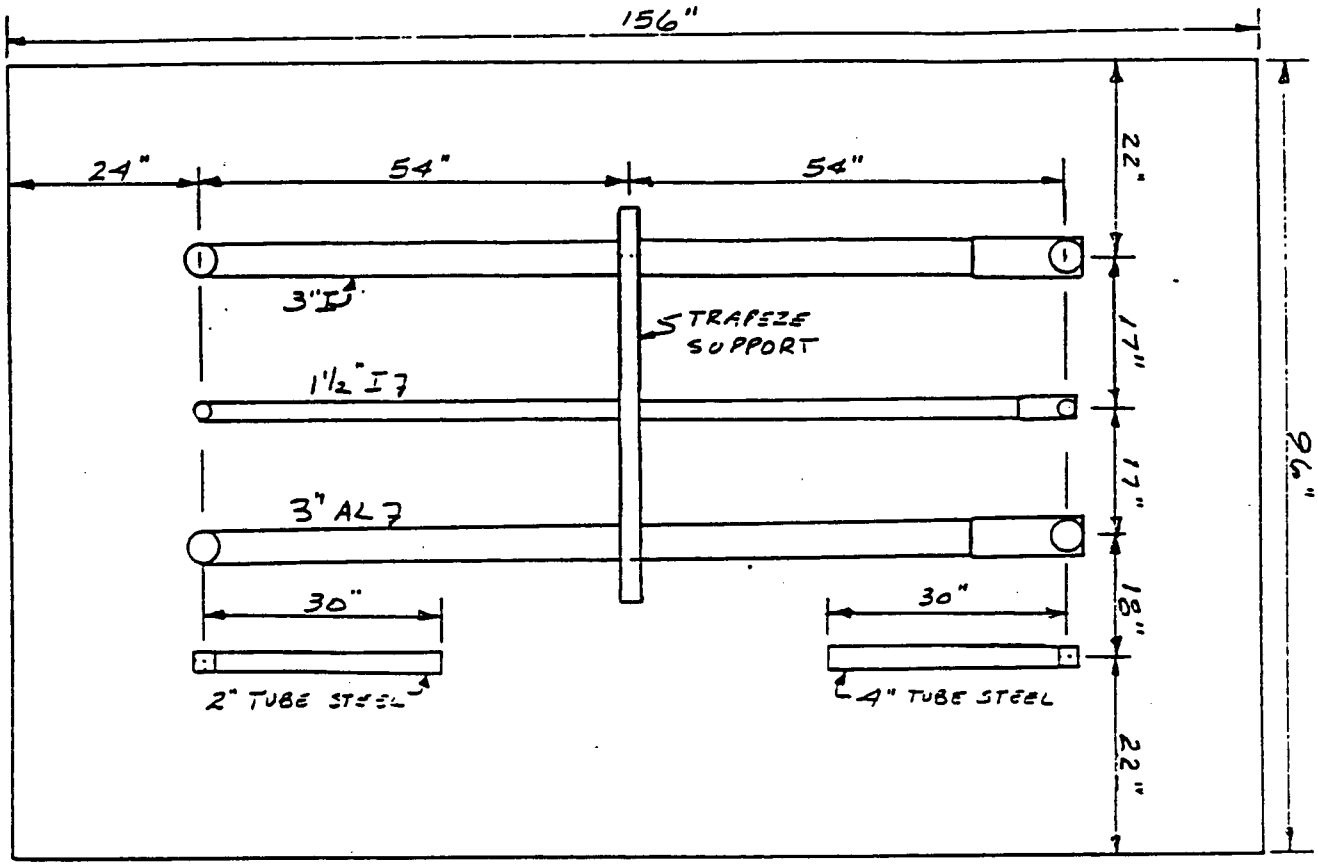
10.3 The test report shall be prepared in sufficient detail to summarize the total testing activity. The report shall include as a minimum:

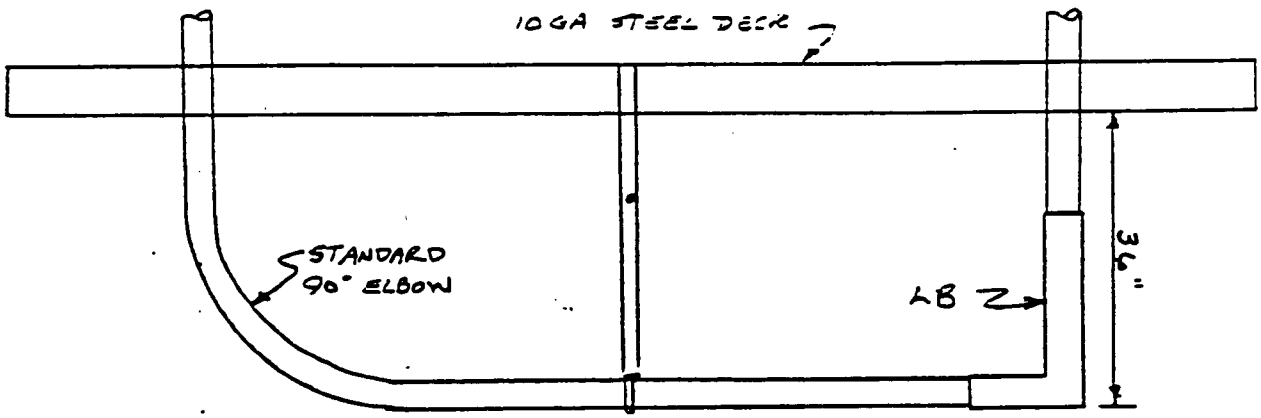
a) Date of the test
b) Location of the test
c) Description of the test furnace and test article
d) Calibration documentation of all thermocouples
e) Qualification and certification for test personnel
f) Test procedures used
g) Acceptance criteria
h) Provide quality control records for:
   * Test article construction
   * Qualification and certification for installation and inspection personnel
   * Identification and installation of fire barrier material
   * Thermocouple locations
   * Cables, sizes, type and location
i) Computer printout and graphic results of the fire endurance test
j) All raw data
k) 35mm photographic coverage of the test project and video tape documentation of the installation of the fire barrier and fire and hose stream test.
l) Provide a chronological log (Event Log) of all activities from receipt of materials through final test report
m) A copy of the test plan and fire barrier installation procedures provided by TVA

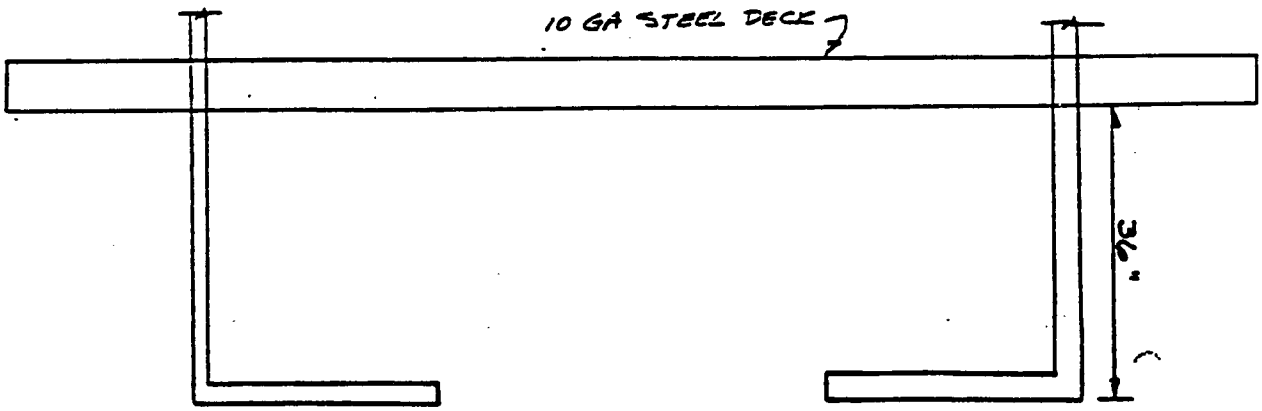
APPENDIX A

DESIGN DRAWINGS

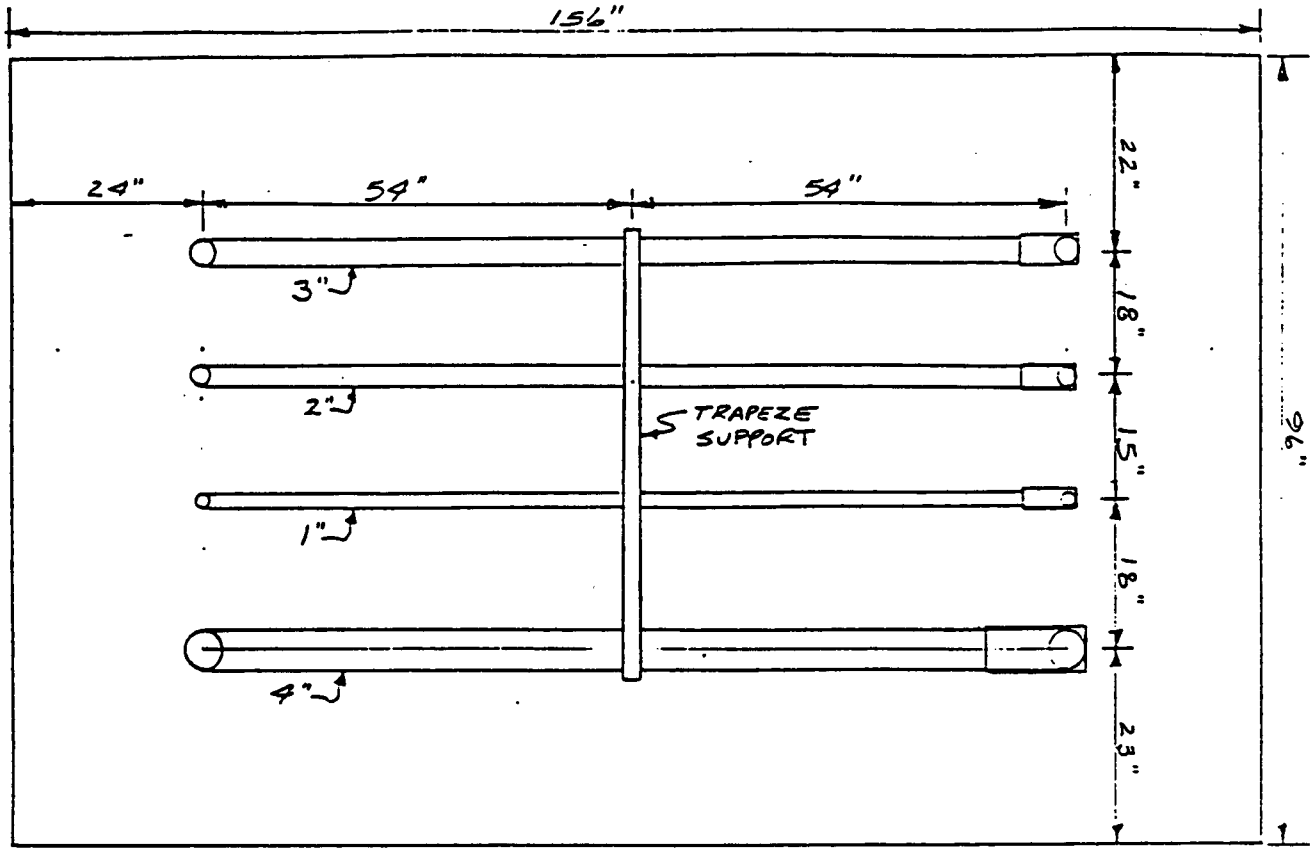
DECK 2


156"
24"
54"
54"
22"
17"
17"
18"
22"
96"
3" I
STRAPEZE SUPPORT
1½" I
3" AL
30"
30"
2" TUBE STEEL
4" TUBE STEEL


10 GA STEEL DECK
STANDARD 90° ELBOW
LB
36"


10 GA STEEL DECK
36"

DECK 1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22"
18"
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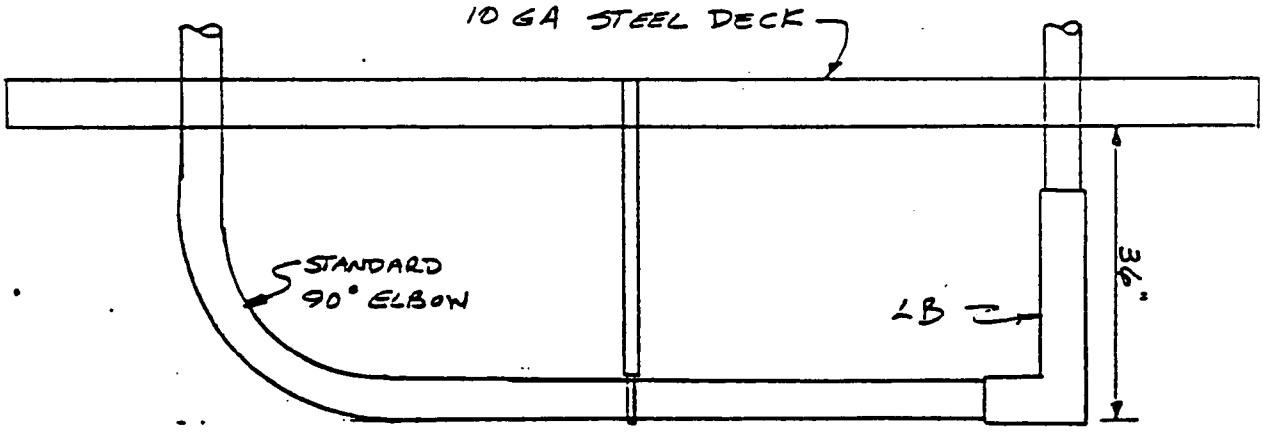
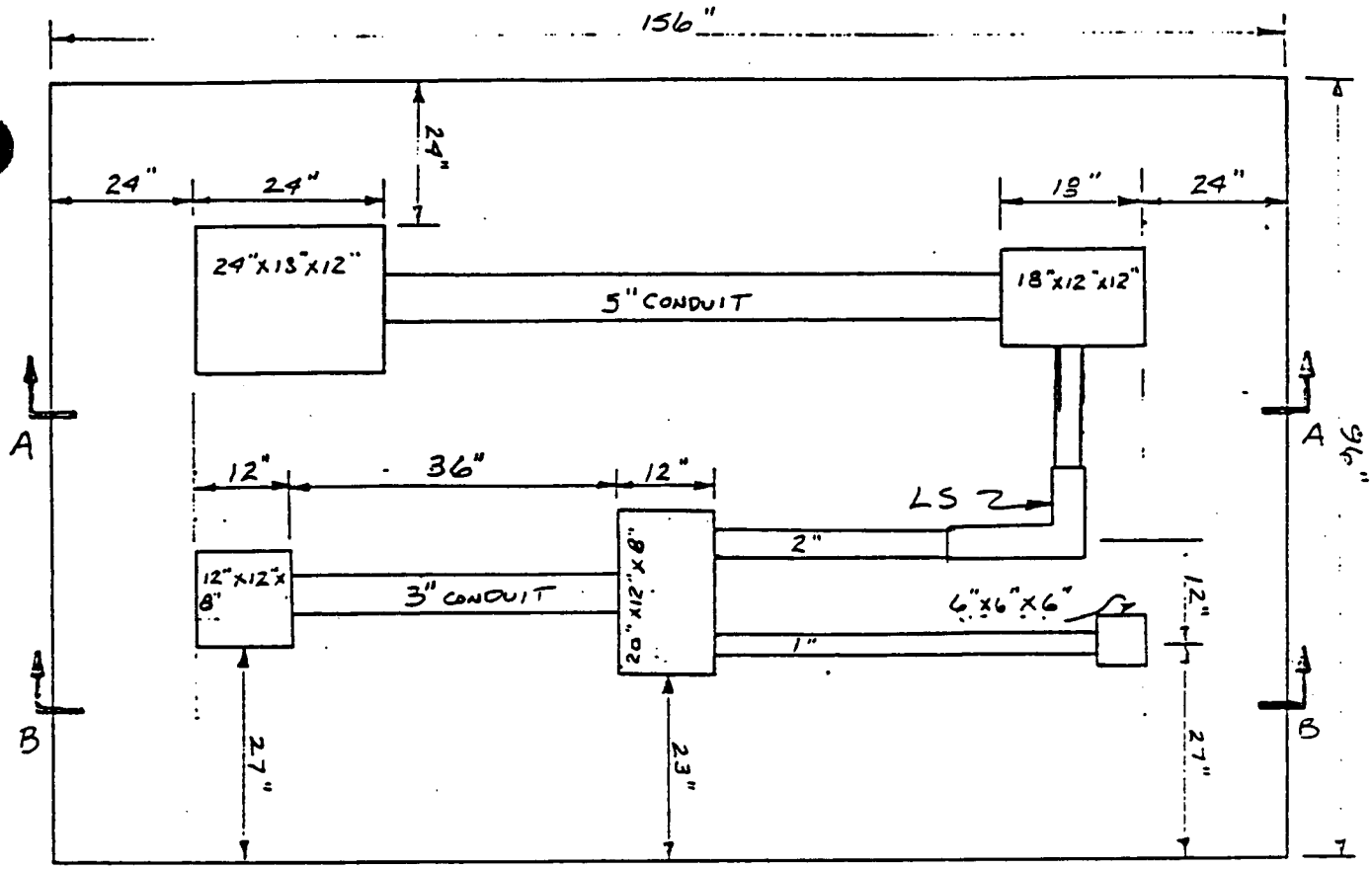
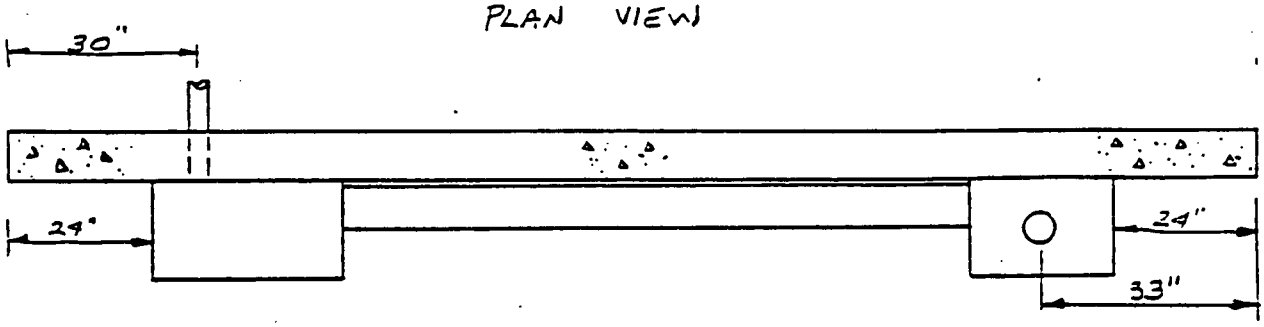
23"
96"
3"
2"
1"
4"
TRAPEZE SUPPORT

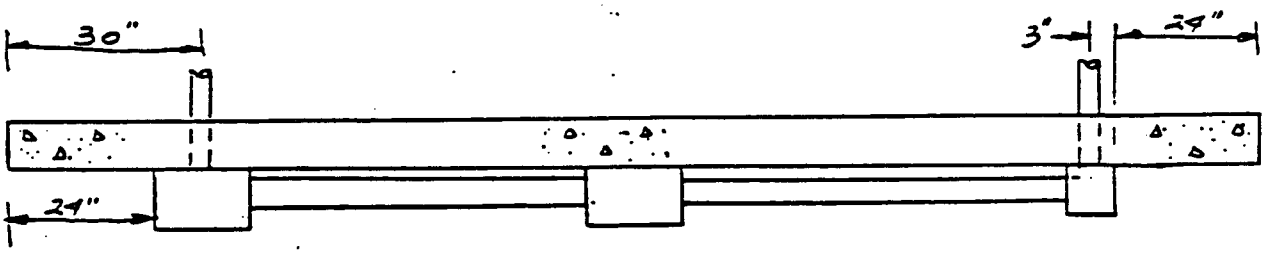

10 GA STEEL DECK
STANDARD 90° ELBOW
∠B
36"



PLAN VIEW

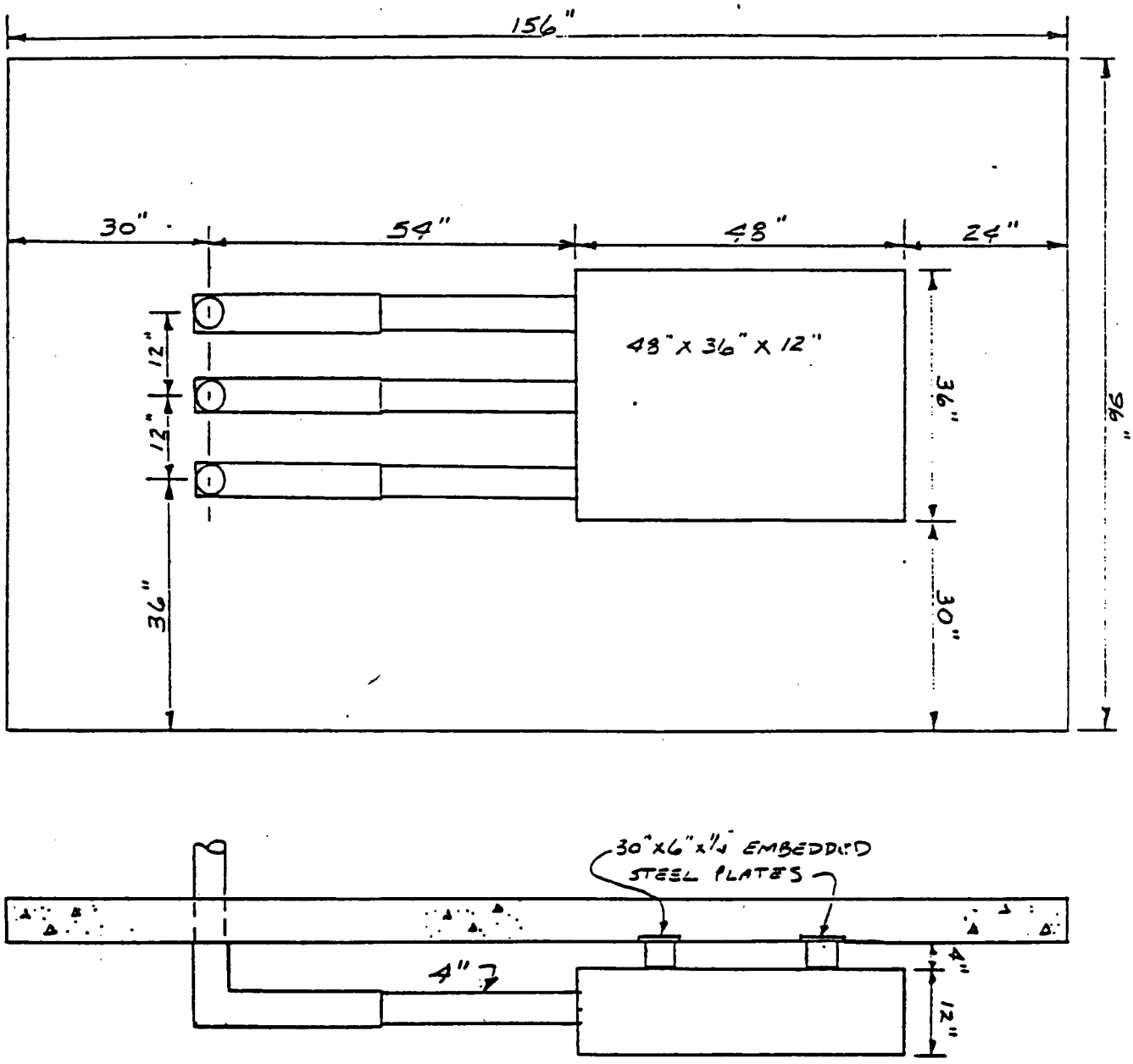


A - A



B - B

SLAB 1 AND 2


156"
30"
54"
48"
24"
48" x 36" x 12"
12"
12"
36"
36"
30"
96"
30"x6"x1/4" EMBEDDED STEEL PLATES
4"
4"
12"

SLAB 3

ATTACHMENT B

RD328886

The vendor shall provide the specified materials/services in accordance with the technical and quality assurance requirements of the established TVA IQT contract for such materials/services.

HAZARDOUS MATERIAL Documentation Required: An MSDS or PDS (of first generation quality) in compliance with 29CFR1910.1200 shall be supplied by the vendor at time of bid or quotation.

Labeling Requirements: All hazardous material shall be labeled by manufacturer in accordance with 29CFR1910.1200 to contain as a minimum the following.

1. Identity of hazardous material

2. Appropriate hazard warning (physical or health hazards)

3. Name and address of the material manufacturer

Nonconformances to the requirements of this contract shall be handled in accordance with the vendor's Quality Assurance Program. Nonconformances with a recommended disposition of "Accept as-is" or "Repair" shall be submitted to TVA for approval. Technical justification shall be provided with the nonconformance. A copy of all nonconformances relative to this contract shall accompany the shipment of this order.

Watts Bar Nuclear Plant will receive deliveries between the hours of 7:30 a.m. and 5:00 p.m. Monday thru Thursday.

Invoices shall not be paid prior to the approval or acceptance of the test reports by NE-PEG.

TVA Position on Fire Testing Criteria

OMEGA POINT LABORATORIES

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT

POSITION ON FIRE TESTING CRITERIA
FOR FIRE BARRIER SYSTEMS USED TO
PROTECT ELECTRICAL CABLING REQUIRED
FOR 10 CFR 50 APPENDIX R COMPLIANCE

Background

There is considerable discussion between the NRC, nuclear utilities and manufacturers of fire barrier systems on the appropriate test method and acceptance criteria for electrical fire barrier systems. The NRC has based its methodology and criteria on National Fire Protection Association (NFPA) 251, "Standard Method of Fire Tests of Building Construction and Materials," Chapter 7, "Tests of Nonbearing Walls and Partitions."[1] Thermal Science, Inc. (TSI), the manufacturer of Thermo-Lag, and most nuclear utilities, have based their methodology and criteria on American Nuclear Insurers (ANI) "Standard Fire Endurance Test Method to Qualify a Protective Envelope for Class 1E Electrical Circuits."[2] Other manufacturers of fire barrier systems, such as 3M and Thermal Ceramics, Inc., have typically used Underwriters Laboratory (UL) test methods and acceptance criteria such as "UL Subject 1724, "Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems."[3] The American Society for Testing and Materials (ASTM) has recognized the need to develop a unique test method and acceptance criteria for electrical fire barrier systems. They have been working for approximately the last five years on this issue but have not issued a standard.

Discussion

The Code of Federal Regulations (CFR), Title 10 Part 50 Domestic Licensing of Production and Utilization Facilities, Appendix R, Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979, paragraph III.G.2 provides the requirements for fire protection and safe shutdown capability. If redundant trains are located in the same fire area and a licensee does not provide alternative or dedicated shutdown systems for the redundant equipment in that fire area, the three acceptable methods of ensuring that one of the trains is free from fire damage are:

a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier;

b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or

c. Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.[4]

A fire wall design that has passed on appropriate test method (e.g., NFPA 251) is considered a "rated" barrier. Components which penetrate fire walls, such as mechanical and electrical penetrations, fire doors, and HVAC fire dampers, are "rated" under their own unique test method and acceptance criteria. There is presently no generally accepted test method and acceptance criteria specifically applicable to fire barrier enclosures applied to electrical cable systems. Existing methods intended for other purposes have been utilized to test such barrier systems, but none of these standards are fully appropriate to this unique application of fire barrier materials. In an attempt to define a test method for electrical circuit protection, American Nuclear Insurers (ANI) prepared "Guidelines for Fire Stop and Wrap Systems at Nuclear Facilities". However, this test method was intended to be used "for insurance purposes only".[2] The method and acceptance criteria in the ANI document are not definitive.

Position

The fire testing methodology and acceptance criteria for electrical cable systems should be unique to these systems. Underwriters Laboratory currently has an appropriate test method (Subject 1724), which addresses the uniqueness of electrical cable fire barrier systems. This test method was developed by UL specifically to address issues such as Appendix R electrical fire barrier rating requirements. The scope of the test method is:

- Measurement of temperature changes within the electrical circuit protective system caused by the heat transfer through the electrical circuit protective system to the electrical conductor or raceway, or both, during the external fire exposure test.

- Determination of the integrity of the electrical circuit protective system during the external fire exposure and water hose stream test.

- Determination of the ability of insulated electrical conductors to maintain electrical circuit integrity at the temperature conditions present within the electrical circuit protective system during the external fire exposure test and during the water hose stream test.[3]

Details such as thermocouple types and placements are discussed in this test method. The test follows the standard time-temperature curve specified in ASTM E-119, as used in other fire endurance tests (e.g., NFPA 251). The test allows the use of the actual installed cables or a No. 8 AWG (3.38mm^2) bare copper conductor to simulate the electrical circuits. With the bare conductor method the thermocouple measurements can be correlated to actual cable qualification tests as described in Appendix B of UL Subject 1724.

TVA considers that UL Subject 1724 is the most appropriate test method currently

available for determining the fire resistance rating of electrical fire barrier systems. TVA will use UL Subject 1724 with the following clarifications to perform tests of Thermo-lag 330 electrical circuit protective systems intended for use at Watts Bar:

(1) The exterior surface temperature of the electrical raceway will be recorded (cold side of the barrier). If the average temperature recorded by the exterior thermocouples is less than 250°F (121°C) above their initial temperature and no individual thermocouple is in excess of 325°F (163°C) above its initial temperature, the fire barrier will be considered acceptable for use with any type cable.[5]

(2) Section 6, Internal Fire Exposure Test, will not be used. TVA considers that this portion of the testing is not necessary, since an internally generated cable tray fire would be extremely unlikely. Circuits are protected with a fuse or breaker that will actuate prior to the jacket of a faulted cable reaching its auto-ignition temperature (for existing designs) or reaching its insulation damage temperature (for new designs) for all credible low impedance and bolted faults.[6] No other ignition sources exist within the protective barrier.

(3) Section 5, Hose Stream Test. TVA will follow the criteria for hose stream testing described in NUREG-0800 using one and one-half inch fog nozzle set at a discharge angle of 15° with a nozzle pressure of 75 psig and a minimum discharge of 75 gpm.[7] TVA considers that this would accurately represent the mechanical impact, erosion and cooling effects that would exist in TVA's nuclear power plant environment. The hose stream test shall be performed within ten minutes of the completion of the fire test. The duration and application will follow the requirements of UL 1724 Table 5.1. The nozzle will be located a maximum of ten feet measured horizontally from the outside edge of the testing assembly. Acceptance shall be based on the fire barrier system remaining intact with minimal material flaking. (The alternative test called for by the UL document, involving a one and one-eighth inch solid bore National Standard Playpipe operating at 30 psig, is not a realistic simulation of the challenge to barrier systems as installed in a nuclear power plant).

REFERENCES

(1) National Fire Protection Association (NFPA) 251, "Standard Method of Fire Tests of Building Construction and Materials", 1990 Edition.

Note: For the purposes of this paper NFPA 251 (90) is considered equivalent to ASTM E119-88 "Standard Test Method for Fire Tests of Building Construction and Materials".

(2) American Nuclear Insurers/Mutual Atomic Energy Reinsurance Pool (ANI/MAERP) RA "Guidelines for Fire Stop and Wrap Systems at Nuclear Facilities" Revision 0, November 1987.

(3) Underwriters Laboratories, Inc. (UL) Subject 1724, "Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems", Issue Number: 2, August 1991.

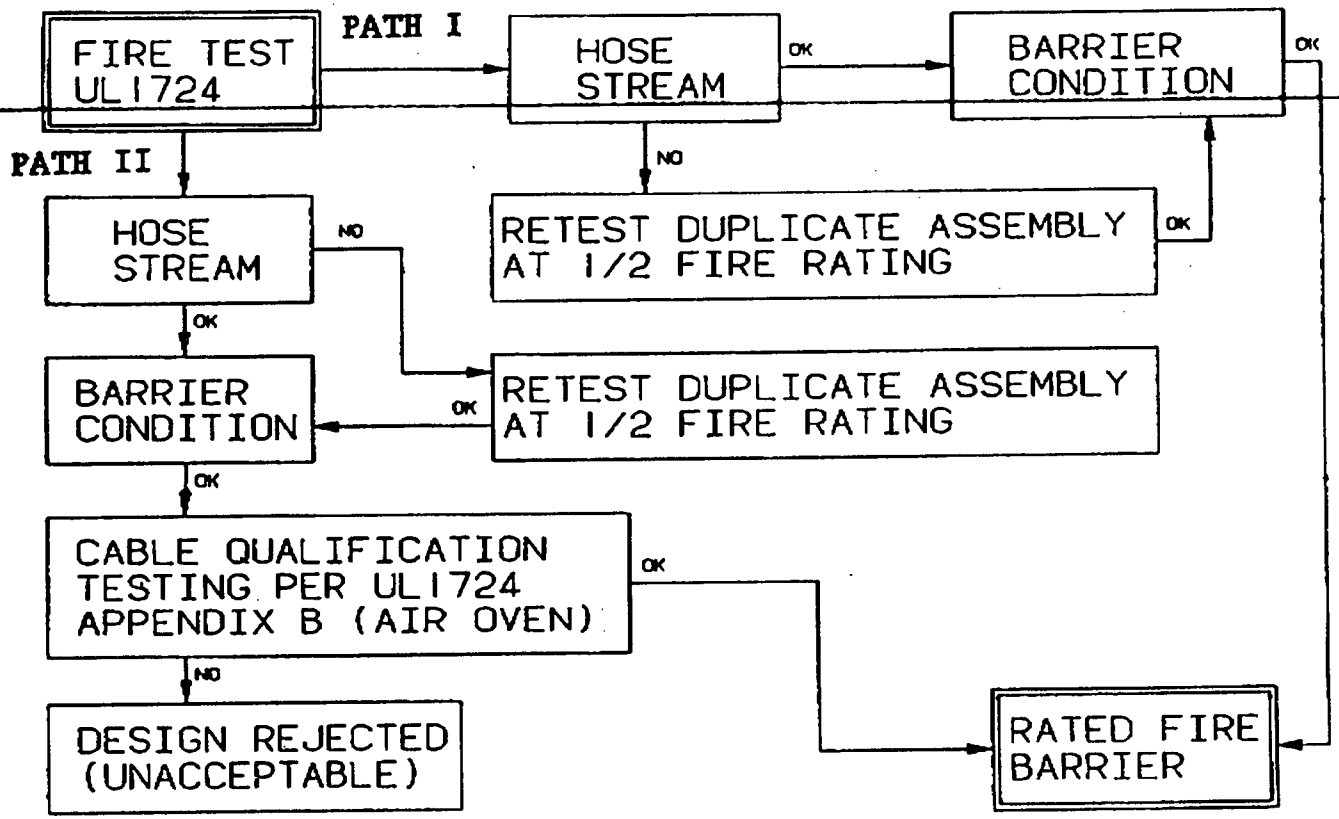
(4) Code of Federal Regulations, Title 10, Part 50, Energy, January 1, 1992.

(5) Based on a NFPA 251 (90) acceptance criteria for Nonbearing Walls and Partitions.

(6) Tennessee Valley Authority (TVA), "Watts Bar Design Criteria - WB-DC-30-13, 10 CFR 50 Appendix R Type I, II, and III Circuits". Revision 2, February 13, 1990.

(7) U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Standard Review Plan, NUREG 0800, Rev. 2, July 1981, Section 9.5.1 Fire Protection Program, page 9.5.1-29.

TVA-WBN FIRE BARRIER TESTING ACCEPTANCE CRITERIA



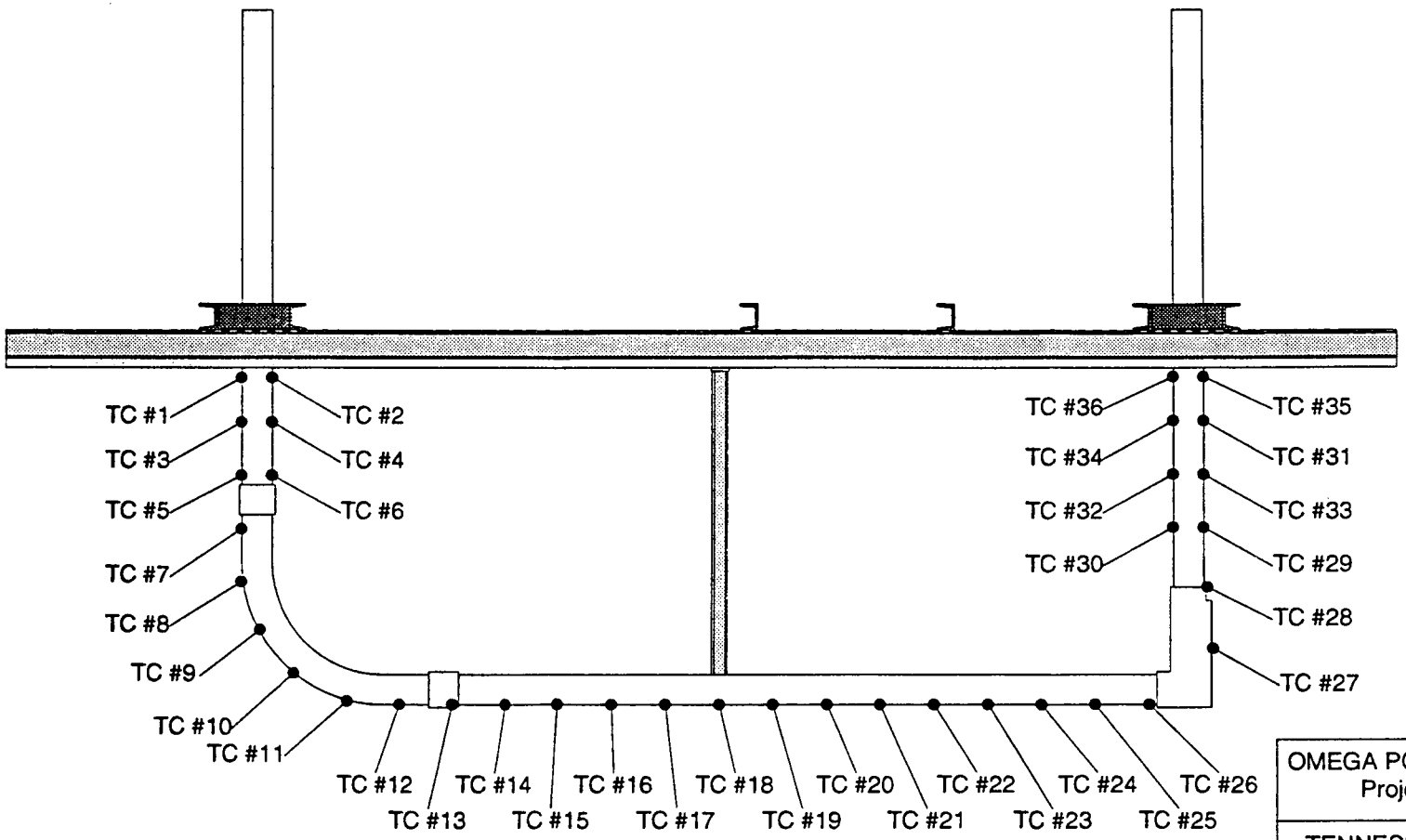
PATH I - RACEWAY $\Delta T_{avg.} \leq$ 250°F AND $\Delta T_{max.} \leq$ 325°F

PATH II - RACEWAY $\Delta T_{avg.} \geq$ 250°F OR $\Delta T_{max.} \geq$ 325°F

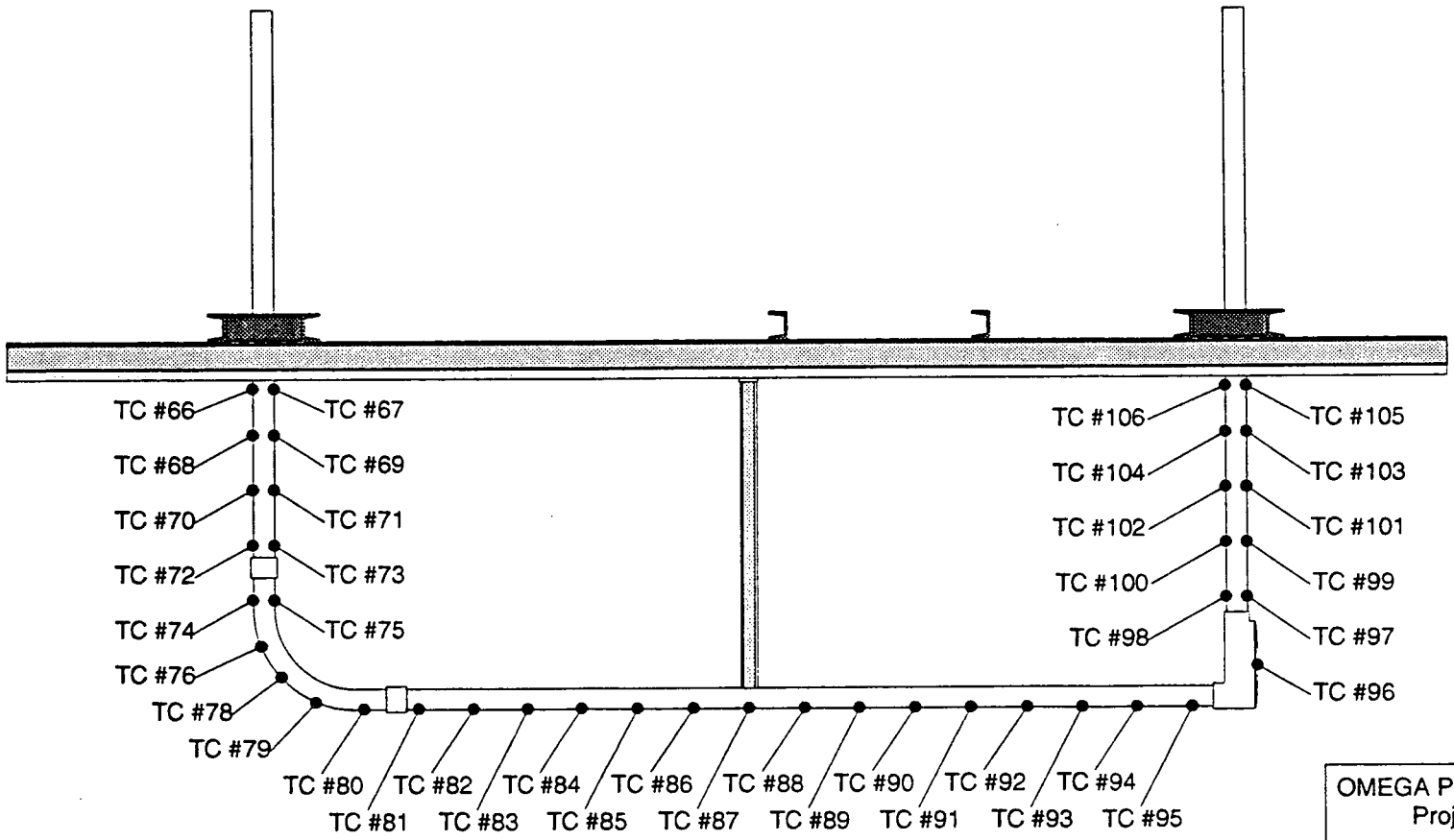
Appendix C

THERMOCOUPLE LOCATIONS

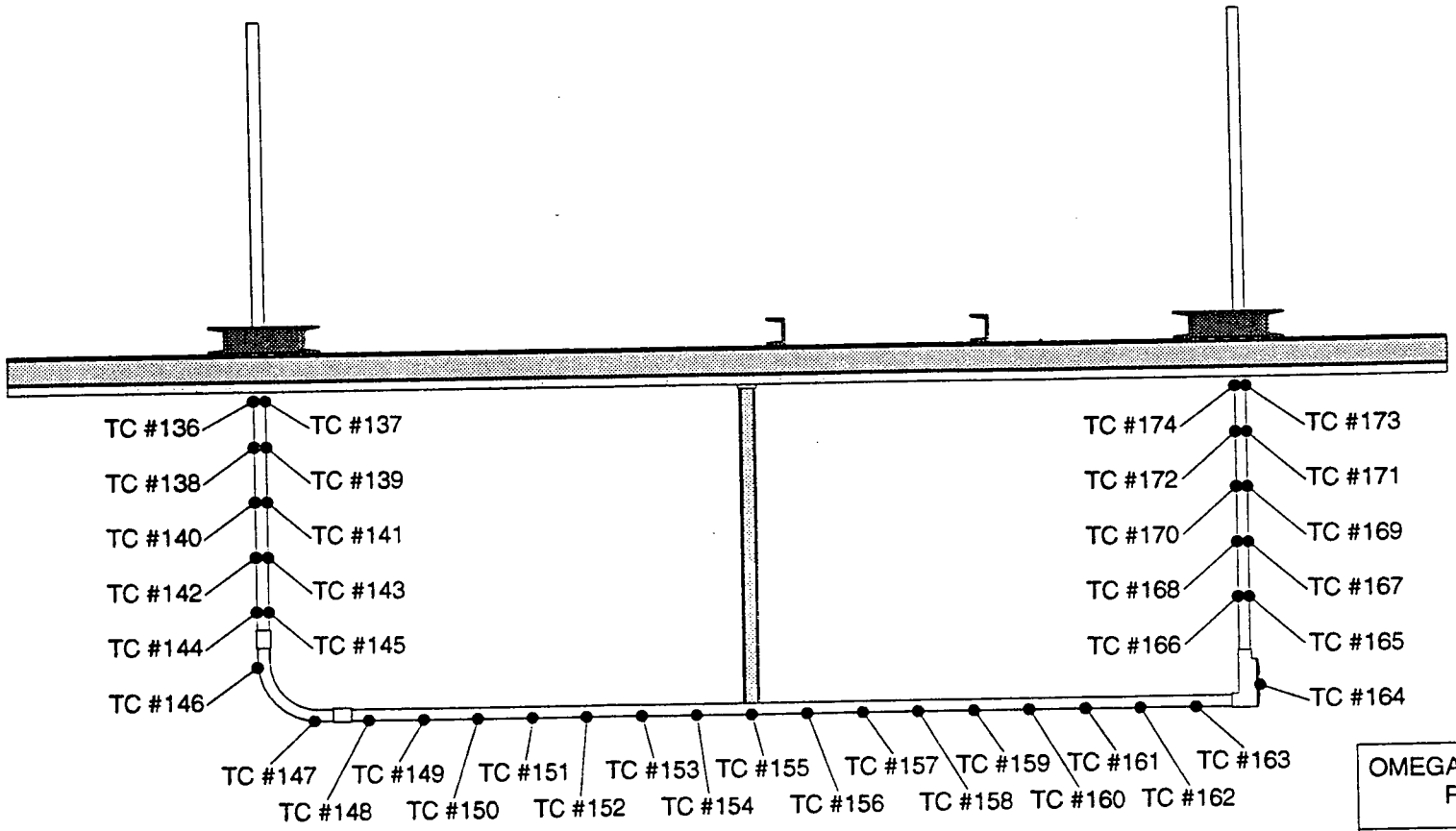
OMEGA POINT LABORATORIES



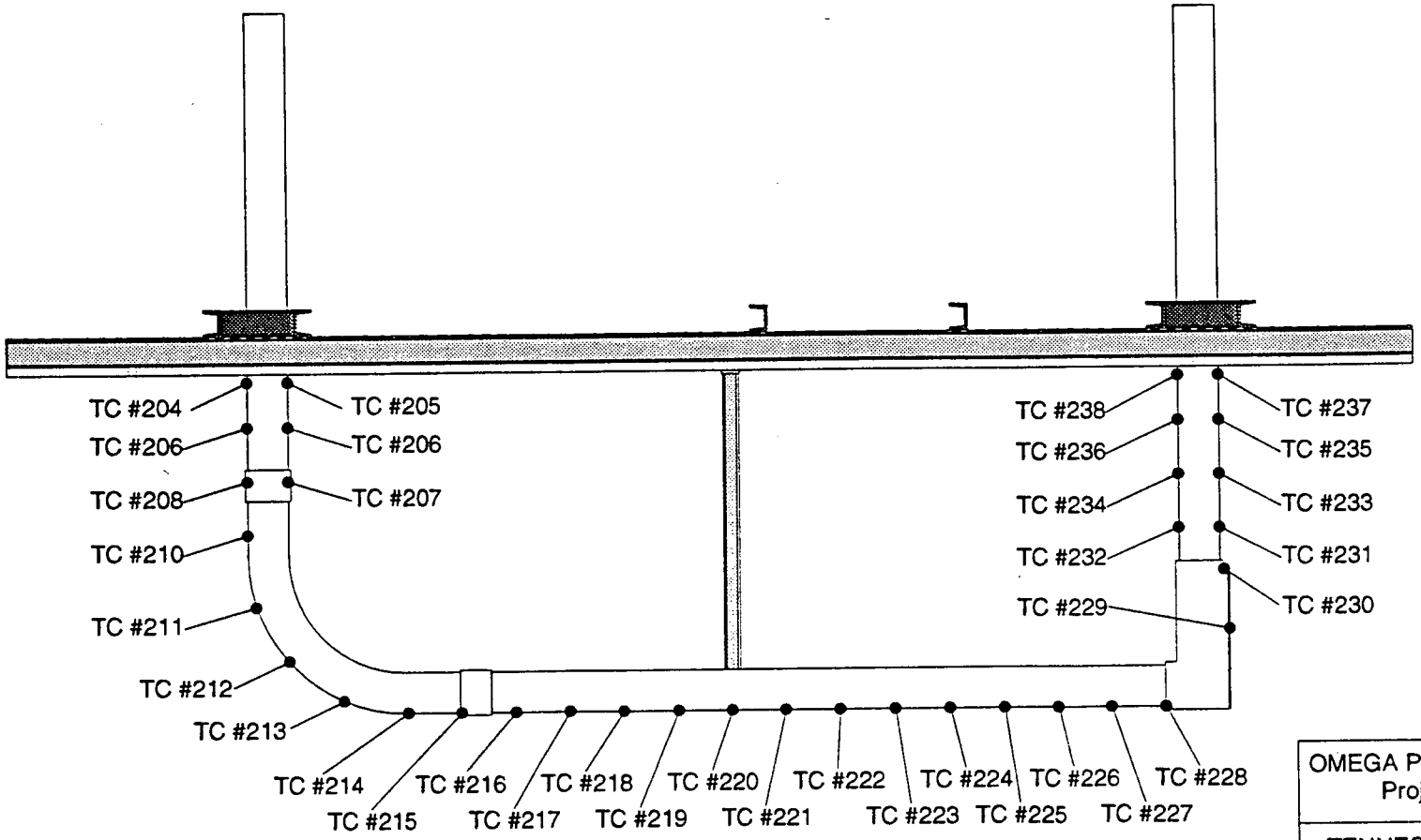
OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 9 3" Conduit - Thermocouples



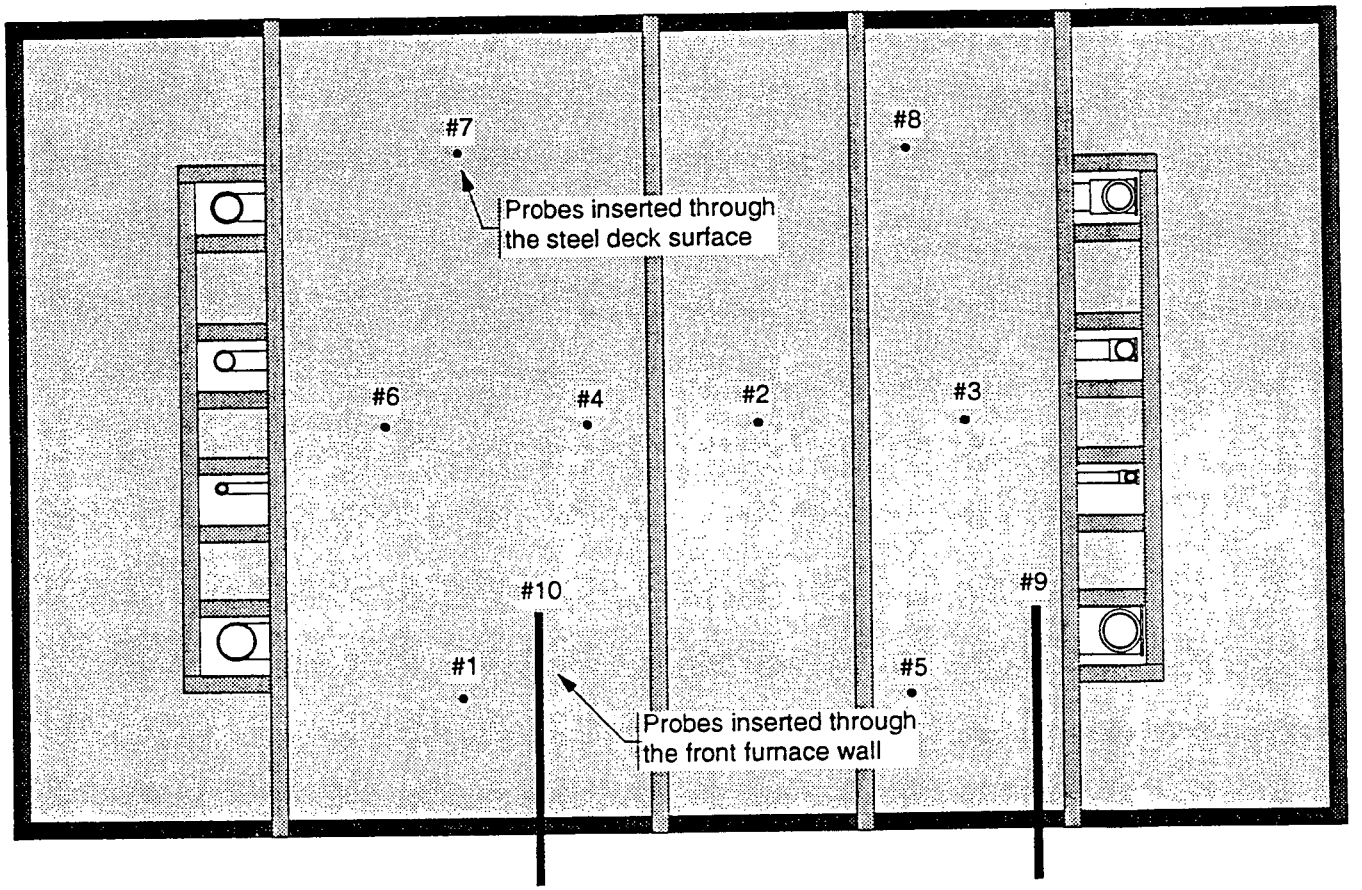
OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 10 2" Conduit - Thermocouples



OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 11 1" Conduit - Thermocouples



OMEGA POINT LABORATORIES, INC. Project No. 11210-94943a
TENNESSEE VALLEY AUTHORITY
Fig. 12 4" Conduit - Thermocouples



OMEGA POINT LABORATORIES, INC.
Project No. 11210-94943a

TENNESSEE VALLEY AUTHORITY

Fig. 13 Furnace Probe Locations

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210–94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #1 (3"Ø) CONDUIT STEEL**

TC NO.	LOCATION
1	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
2	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
3	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
4	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
5	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
6	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
7	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, near the top of the conduit elbow.
8	On the "outside" surface of the conduit system, 24" below the surface of the insulated deck, on the conduit elbow.
9	On the "outside" surface of the conduit system, 6" below the previous thermocouple, on the conduit elbow.
10	On the "outside" surface of the conduit system, 6" below the previous thermocouple, near the center of the conduit elbow.
11	On the "outside" surface of the conduit system, 6" right of the previous thermocouple, on the conduit elbow.
12	On the "outside" surface of the conduit system, 6" right of the previous thermocouple, on the conduit elbow.
13	On the "bottom" surface of the conduit system, 6" right of the previous thermocouple, near the end of the conduit elbow.
14	On the "bottom" surface of the conduit system, 24" left of the support member.
15	On the "bottom" surface of the conduit system, 18" left of the support member.
16	On the "bottom" surface of the conduit system, 12" left of the support member.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #1 (3"Ø) CONDUIT STEEL**

TC NO.	LOCATION (CONT.)
17	On the "bottom" surface of the conduit system, 6" left of the support member.
18	On the side of the conduit system, between the support strap and the conduit.
19	On the "bottom" surface of the conduit system, 6" right of the support member.
20	On the "bottom" surface of the conduit system, 12" right of the support member.
21	On the "bottom" surface of the conduit system, 18" right of the support member.
22	On the "bottom" surface of the conduit system, 24" right of the support member.
23	On the "bottom" surface of the conduit system, 30" right of the support member.
24	On the "bottom" surface of the conduit system, 36" right of the support member.
25	On the "bottom" surface of the conduit system, 42" right of the support member.
26	On the "bottom" surface of the conduit system, 48" right of the support member.
27	On the center of the condulet cover.
28	On the vertical section of the top of the LB. located on the "outside."
29	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
30	On the "inside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
31	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
32	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210–94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #1 (3"Ø)** CONDUIT STEEL

TC NO.	LOCATION (CONT.)
33	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
34	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
35	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.
36	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

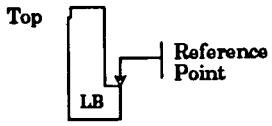
Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #1 (3"Ø) BARE #8 COPPER**

TC NO.	LOCATION
37	2" to the left of the reference point.
38	8" to the left of the reference point.
39	14" to the left of the reference point.
40	20" to the left of the reference point.
41	26" to the left of the reference point.
42	32" to the left of the reference point.
43	38" to the left of the reference point.
45	44" to the left of the reference point.
46	50" to the left of the reference point.
47	56" to the left of the reference point.
48	62" to the left of the reference point.
49	68" to the left of the reference point.
50	74" to the left of the reference point.
51	80" to the left of the reference point.
52	86" to the left of the reference point.
53	92" to the left of the reference point.
54	98" to the left of the reference point.
55	104" to the left of the reference point.
56	110" to the left of the reference point.
57	116" to the left of the reference point.
58	122" to the left of the reference point.
59	128" to the left of the reference point.
60	4" to the right (above) the reference point.
61	10" to the right (above) the reference point.
62	16" to the right (above) the reference point.
63	22" to the right (above) the reference point.
64	28" to the right (above) the reference point.
65	34" to the right (above) the reference point.



THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210–94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #2 (2"Ø) CONDUIT STEEL**

TC NO.	LOCATION
66	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
67	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
68	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
69	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
70	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
71	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
72	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, on the elbow side of the system.
73	On the "inside" surface of the conduit system, 18" below the surface of the insulated deck, on the elbow side of the system.
74	On the "outside" surface of the conduit system, 24" below the surface of the insulated deck, near top of the conduit elbow.
75	On the "inside" surface of the conduit system, 24" below the surface of the insulated deck, near top of the conduit elbow.
76	On the "inside" surface of the conduit system, 30" below the surface of the insulated deck, on the conduit elbow.
78	On the "outside" surface of the conduit system, 6" right of the previous thermocouple, on the conduit elbow.
79	On the "bottom" surface of the conduit system, 6" right of the previous thermocouple, near the end of the conduit elbow.
80	On the "bottom" surface of the conduit system, 42" left of the support member.
81	On the "bottom" surface of the conduit system, 36" left of the support member.
82	On the "bottom" surface of the conduit system, 30" left of the support member.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #2 (2"Ø) CONDUIT STEEL**

TC NO.	LOCATION (CONT.)
83	On the "bottom" surface of the conduit system, 24" left of the support member.
84	On the "bottom" surface of the conduit system, 18" left of the support member.
85	On the "bottom" surface of the conduit system, 12" left of the support member.
86	On the "bottom" surface of the conduit system, 6" left of the support member.
87	On the side of the conduit system, between the support strap and the conduit.
88	On the "bottom" surface of the conduit system, 6" right of the support member.
89	On the "bottom" surface of the conduit system, 12" right of the support member.
90	On the "bottom" surface of the conduit system, 18" right of the support member.
91	On the "bottom" surface of the conduit system, 24" right of the support member.
92	On the "bottom" surface of the conduit system, 30" right of the support member.
93	On the "bottom" surface of the conduit system, 36" right of the support member.
94	On the "bottom" surface of the conduit system, 42" right of the support member.
95	On the "bottom" surface of the conduit system, 48" right of the support member.
96	On the center of the condulet cover.
97	On the "outside" surface of the conduit system, 24" below the surface of the insulated deck, on the LB side of the system.
98	On the "inside" surface of the conduit system, 24" below the surface of the insulated deck, on the LB side of the system.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #2 (2"Ø) CONDUIT STEEL**

TC NO.	LOCATION (CONT.)
99	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
100	On the "inside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
101	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
102	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
103	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
104	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
105	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.
106	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

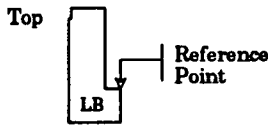
Project No: 11210–94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #2 (2"Ø) BARE #8 COPPER**

TC NO.	LOCATION
107	2" to the left of the reference point.
108	8" to the left of the reference point.
109	14" to the left of the reference point.
110	20" to the left of the reference point.
111	26" to the left of the reference point.
112	32" to the left of the reference point.
113	38" to the left of the reference point.
114	44" to the left of the reference point.
115	50" to the left of the reference point.
116	56" to the left of the reference point.
117	62" to the left of the reference point.
118	68" to the left of the reference point.
119	74" to the left of the reference point.
120	80" to the left of the reference point.
121	86" to the left of the reference point.
122	92" to the left of the reference point.
123	98" to the left of the reference point.
124	104" to the left of the reference point.
125	110" to the left of the reference point.
126	116" to the left of the reference point.
127	122" to the left of the reference point.
128	128" to the left of the reference point.
129	134" to the left of the reference point.
130	4" to the right (above) the reference point.
131	10" to the right (above) the reference point.
132	16" to the right (above) the reference point.
133	22" to the right (above) the reference point.
134	28" to the right (above) the reference point.
135	34" to the right (above) the reference point.



THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #3 (1"Ø) CONDUIT STEEL**

TC NO.	LOCATION
136	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
137	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
138	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
139	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
140	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
141	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
142	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, on the elbow side of the system.
143	On the "inside" surface of the conduit system, 18" below the surface of the insulated deck, on the elbow side of the system.
144	On the "outside" surface of the conduit system, 24" below the surface of the insulated deck, on the elbow side of the system.
145	On the "inside" surface of the conduit system, 24" below the surface of the insulated deck, on the elbow side of the system.
146	On the "outside" surface of the conduit system, on the center of the conduit elbow.
147	On the "outside" surface of the conduit system, 6" below TC #144, on the conduit elbow.
148	On the "bottom" surface of the conduit system, 42" left of the support member.
149	On the "bottom" surface of the conduit system, 36" left of the support member.
150	On the "bottom" surface of the conduit system, 30" left of the support member.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210–94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #3 (1"Ø) CONDUIT STEEL**

TC NO.	LOCATION (CONT.)
151	On the "bottom" surface of the conduit system, 24" left of the support member.
152	On the "bottom" surface of the conduit system, 18" left of the support member.
153	On the "bottom" surface of the conduit system, 12" left of the support member.
154	On the "bottom" surface of the conduit system, 6" left of the support member.
155	On the side of the conduit system, between the support strap and the conduit.
156	On the "bottom" surface of the conduit system, 6" right of the support member.
157	On the "bottom" surface of the conduit system, 12" right of the support member.
158	On the "bottom" surface of the conduit system, 18" right of the support member.
159	On the "bottom" surface of the conduit system, 24" right of the support member.
160	On the "bottom" surface of the conduit system, 30" right of the support member.
161	On the "bottom" surface of the conduit system, 36" right of the support member.
162	On the "bottom" surface of the conduit system, 42" right of the support member.
163	On the "bottom" surface of the conduit system, 48" right of the support member.
164	On the center of the condulet cover.
165	On the "outside" surface of the conduit system, 24" below the surface of the insulated deck, on the LB side of the system.
166	On the "inside" surface of the conduit system, 24" below the surface of the insulated deck, on the LB side of the system.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #3 (1"Ø) CONDUIT STEEL**

TC NO.	LOCATION (CONT.)
167	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
168	On the "inside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
169	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
170	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
171	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
172	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
173	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.
174	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

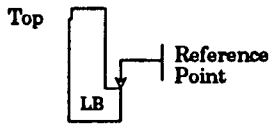
Project No: 11210–94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #3 (1"Ø) BARE #8 COPPER**

TC NO.	LOCATION
175	2" to the left of the reference point.
176	8" to the left of the reference point.
177	14" to the left of the reference point.
178	20" to the left of the reference point.
179	26" to the left of the reference point.
180	32" to the left of the reference point.
181	38" to the left of the reference point.
182	44" to the left of the reference point.
183	50" to the left of the reference point.
184	56" to the left of the reference point.
185	62" to the left of the reference point.
186	68" to the left of the reference point.
187	74" to the left of the reference point.
188	80" to the left of the reference point.
189	86" to the left of the reference point.
190	92" to the left of the reference point.
191	98" to the left of the reference point.
192	104" to the left of the reference point.
193	110" to the left of the reference point.
194	116" to the left of the reference point.
195	122" to the left of the reference point.
196	128" to the left of the reference point.
197	134" to the left of the reference point.
198	4" to the right (above) the reference point.
199	10" to the right (above) the reference point.
200	16" to the right (above) the reference point.
201	22" to the right (above) the reference point.
202	28" to the right (above) the reference point.
203	34" to the right (above) the reference point.



THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #4 (4"Ø) CONDUIT STEEL**

TC NO.	LOCATION
204	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
205	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
206	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
207	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
208	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
209	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
210	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, near the top of the conduit elbow.
211	On the "outside" surface of the conduit system, 24" below the surface of the insulated deck, on the conduit elbow.
212	On the "outside" surface of the conduit system, 6" below the previous thermocouple, on the conduit elbow.
213	On the "outside" surface of the conduit system, 6" right of the previous thermocouple, on the conduit elbow.
214	On the "outside" surface of the conduit system, 6" right of the previous thermocouple, on the conduit elbow.
215	On the "outside" surface of the conduit system, 6" right of the previous thermocouple, on the conduit elbow.
216	On the "bottom" surface of the conduit system, 24" left of the support member.
217	On the "bottom" surface of the conduit system, 18" left of the support member.
218	On the "bottom" surface of the conduit system, 12" left of the support member.
219	On the "bottom" surface of the conduit system, 6" left of the support member.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #4 (4"Ø) CONDUIT STEEL**

TC NO.	LOCATION (CONT.)
220	On the side of the conduit system, between the support strap and the conduit.
221	On the "bottom" surface of the conduit system, 6" right of the support member.
222	On the "bottom" surface of the conduit system, 12" right of the support member.
223	On the "bottom" surface of the conduit system, 18" right of the support member.
224	On the "bottom" surface of the conduit system, 24" right of the support member.
225	On the "bottom" surface of the conduit system, 30" right of the support member.
226	On the "bottom" surface of the conduit system, 36" right of the support member.
227	On the "bottom" surface of the conduit system, 42" right of the support member.
228	On the "bottom" surface of the condulet, 48" right of the support member.
229	On the center of the condulet cover.
230	On the vertical section of the top of the LB. located on the "outside."
231	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
232	On the "inside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
233	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
234	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
235	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #4 (4"Ø)** CONDUIT STEEL

TC NO.	LOCATION (CONT.)
236	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
237	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.
238	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

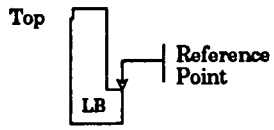
Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #4 (4"Ø) BARE #8 COPPER**

TC NO.	LOCATION
239	2" to the left of the reference point.
240	8" to the left of the reference point.
241	14" to the left of the reference point.
242	20" to the left of the reference point.
243	26" to the left of the reference point.
244	32" to the left of the reference point.
245	38" to the left of the reference point.
246	44" to the left of the reference point.
247	50" to the left of the reference point.
248	56" to the left of the reference point.
249	62" to the left of the reference point.
250	68" to the left of the reference point.
251	74" to the left of the reference point.
252	80" to the left of the reference point.
253	86" to the left of the reference point.
254	92" to the left of the reference point.
255	98" to the left of the reference point.
256	104" to the left of the reference point.
257	110" to the left of the reference point.
258	116" to the left of the reference point.
259	122" to the left of the reference point.
260	128" to the left of the reference point.
261	4" to the right (above) the reference point.
262	10" to the right (above) the reference point.
263	16" to the right (above) the reference point.
264	22" to the right (above) the reference point.
265	28" to the right (above) the reference point.
266	34" to the right (above) the reference point.

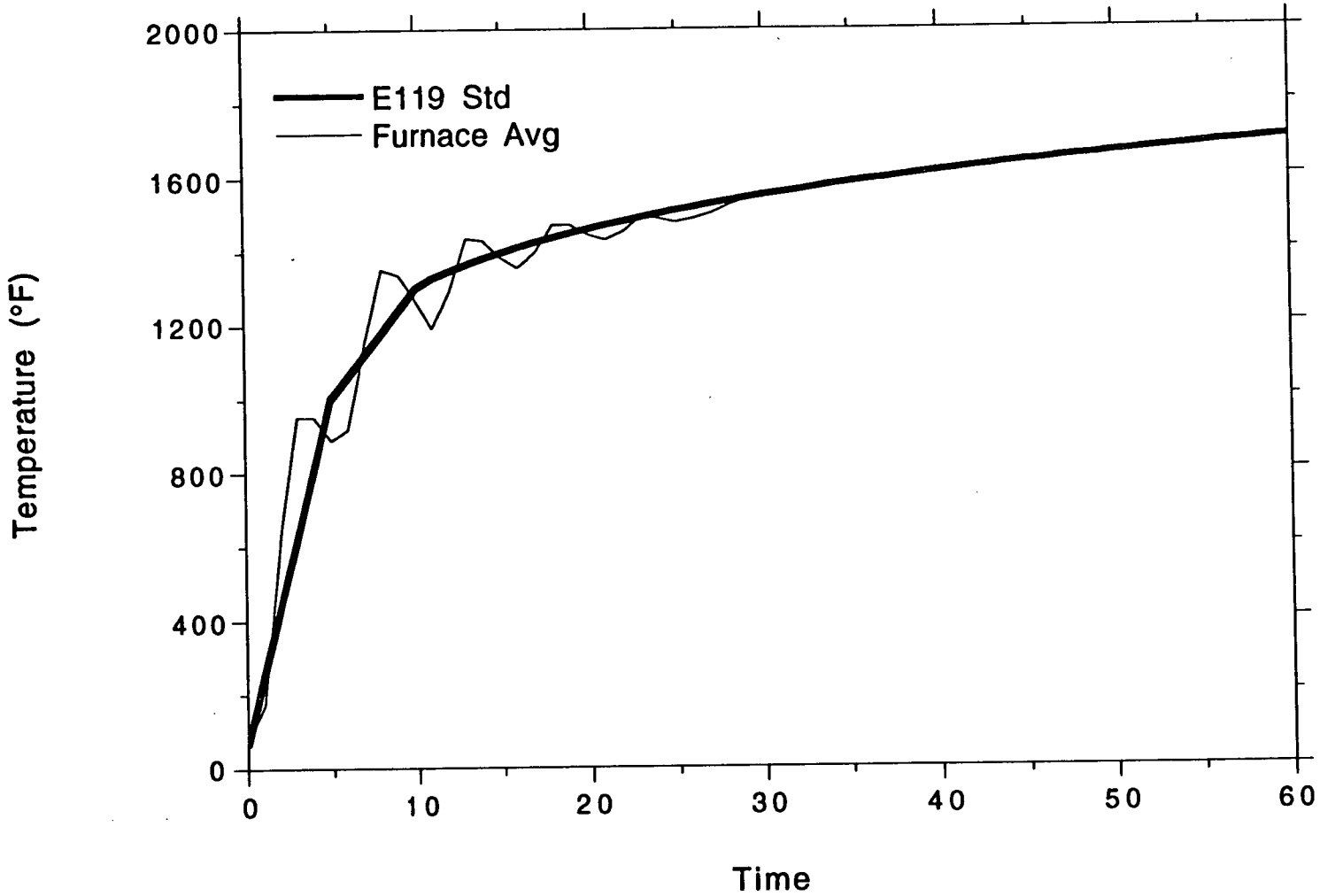


Appendix D

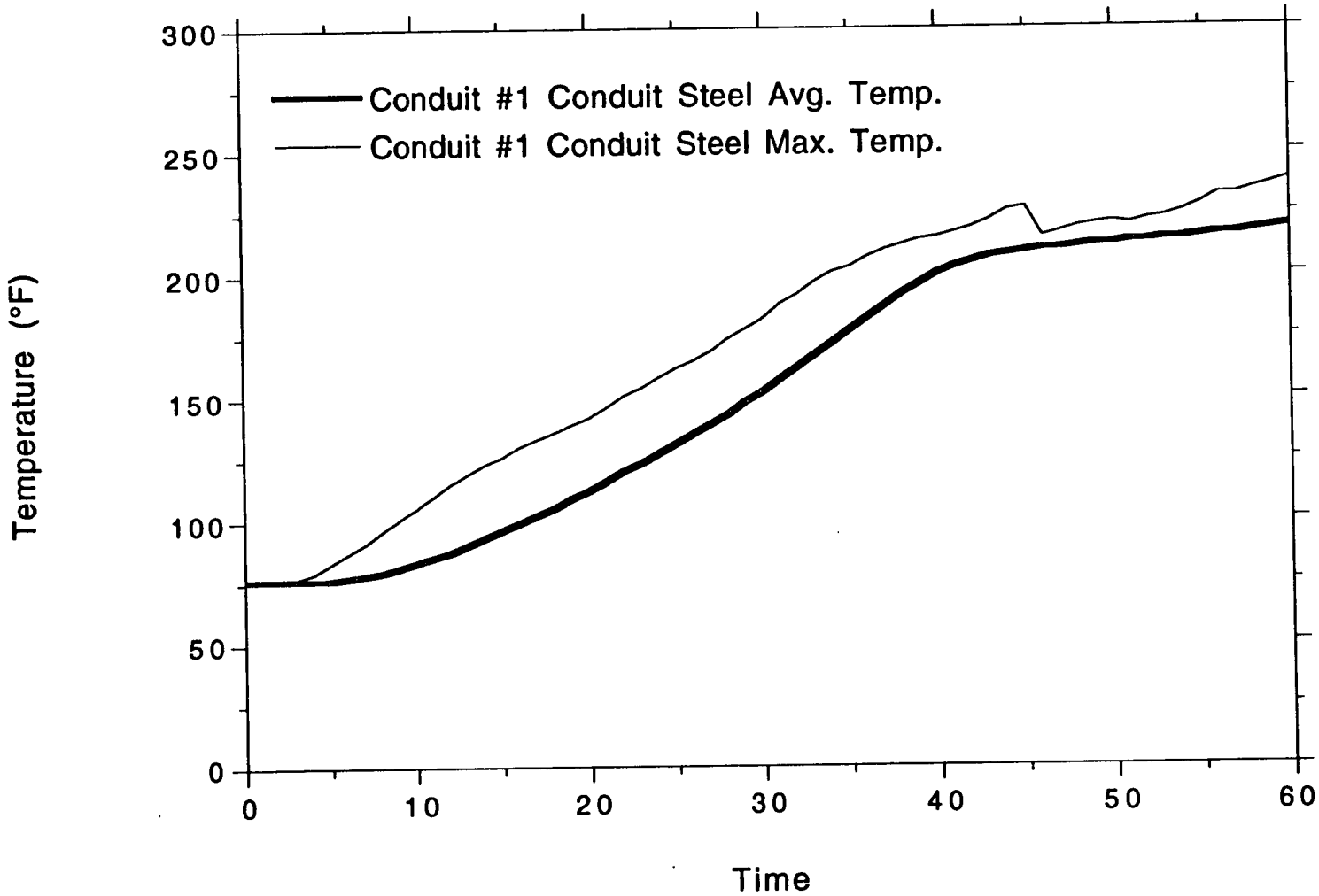
GRAPHICAL TEST DATA

OMEGA POINT LABORATORIES

Project No. 11210-94943A
Tennessee Valley Authority
Furnace Temperatures

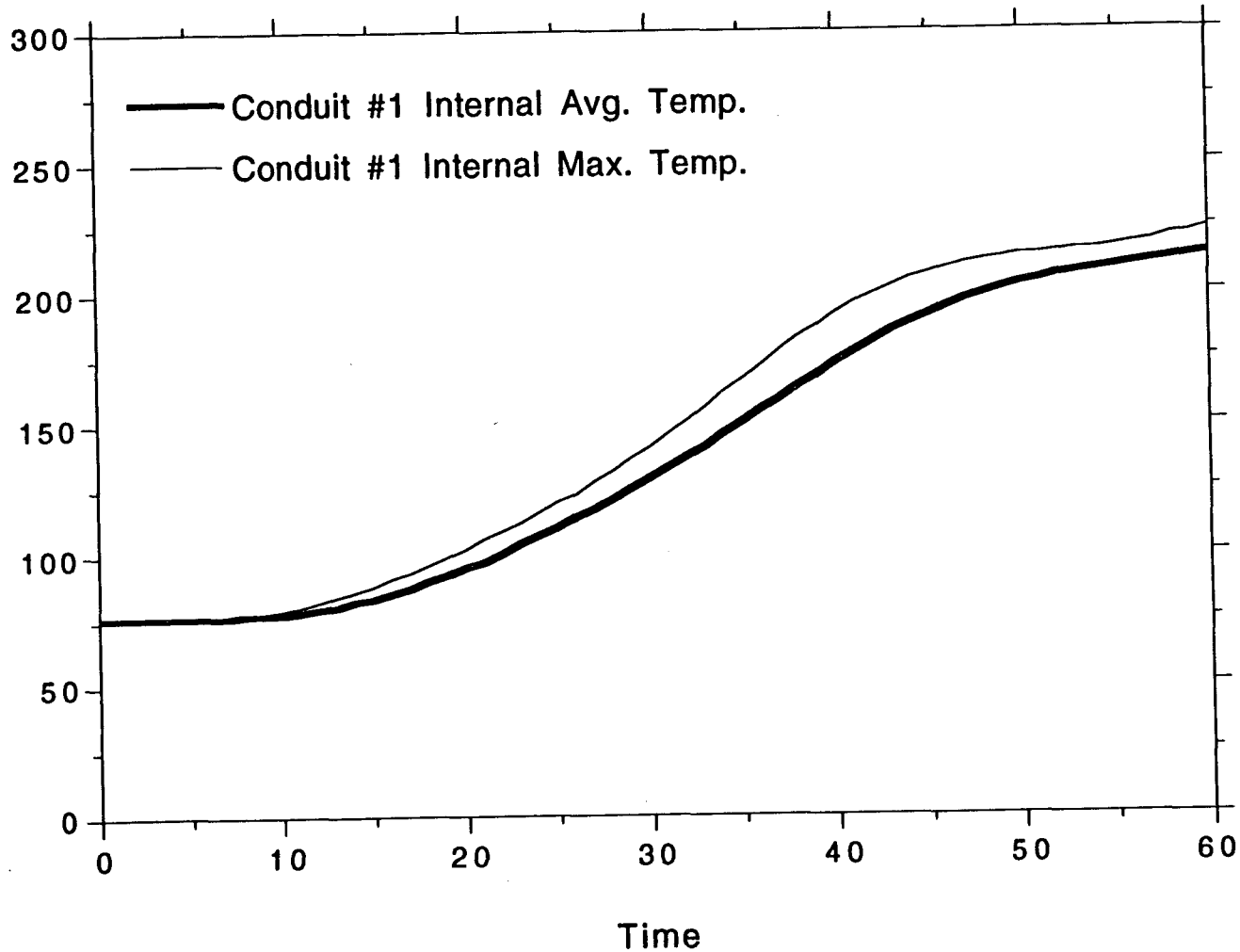


Project No. 11210-94943A
Tennessee Valley Authority
Conduit #1 (3" Steel Conduit)

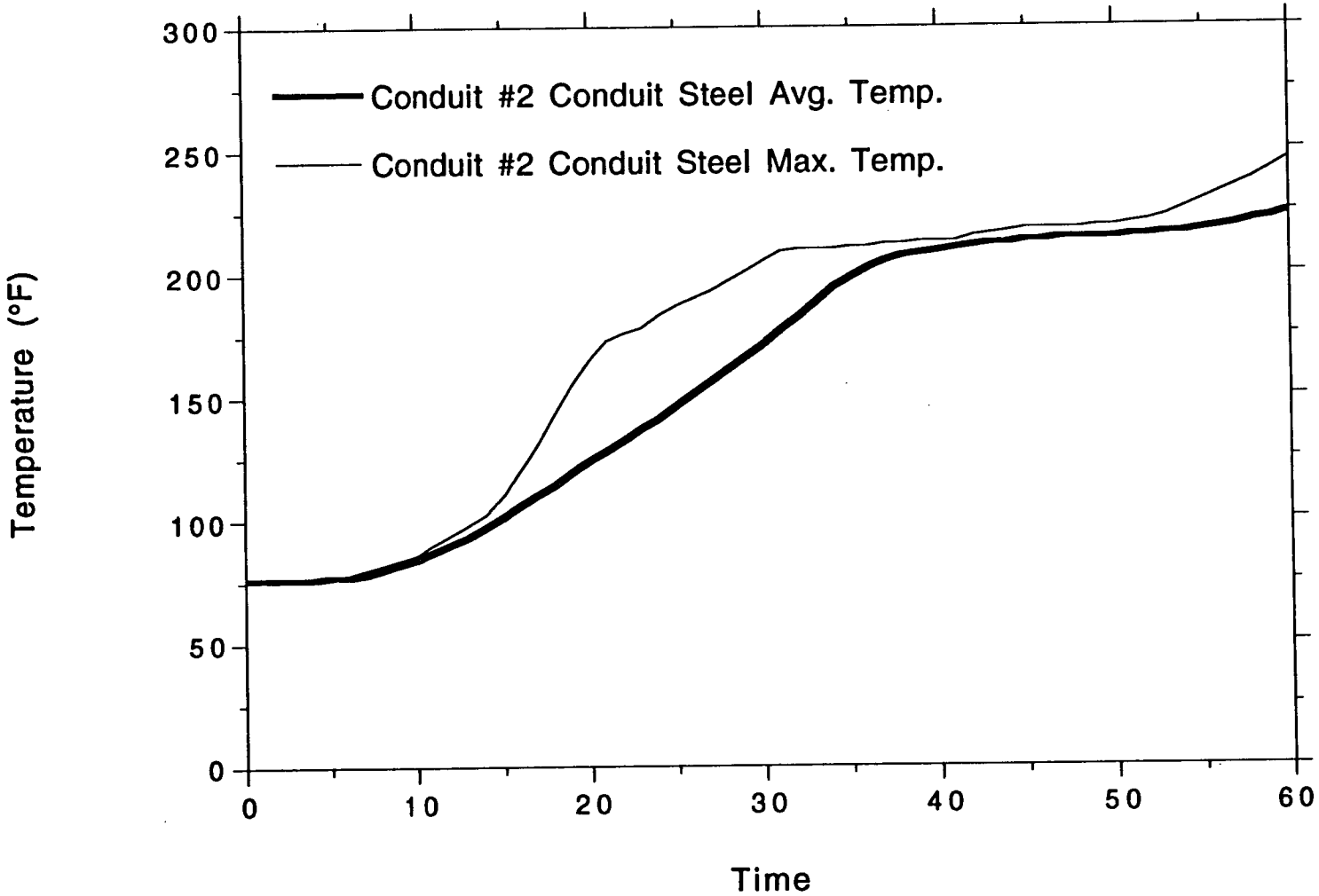


OMEGA POINT LABORATORIES

Project No. 11210-94943A
Tennessee Valley Authority
Conduit #1 (3" Steel Conduit)

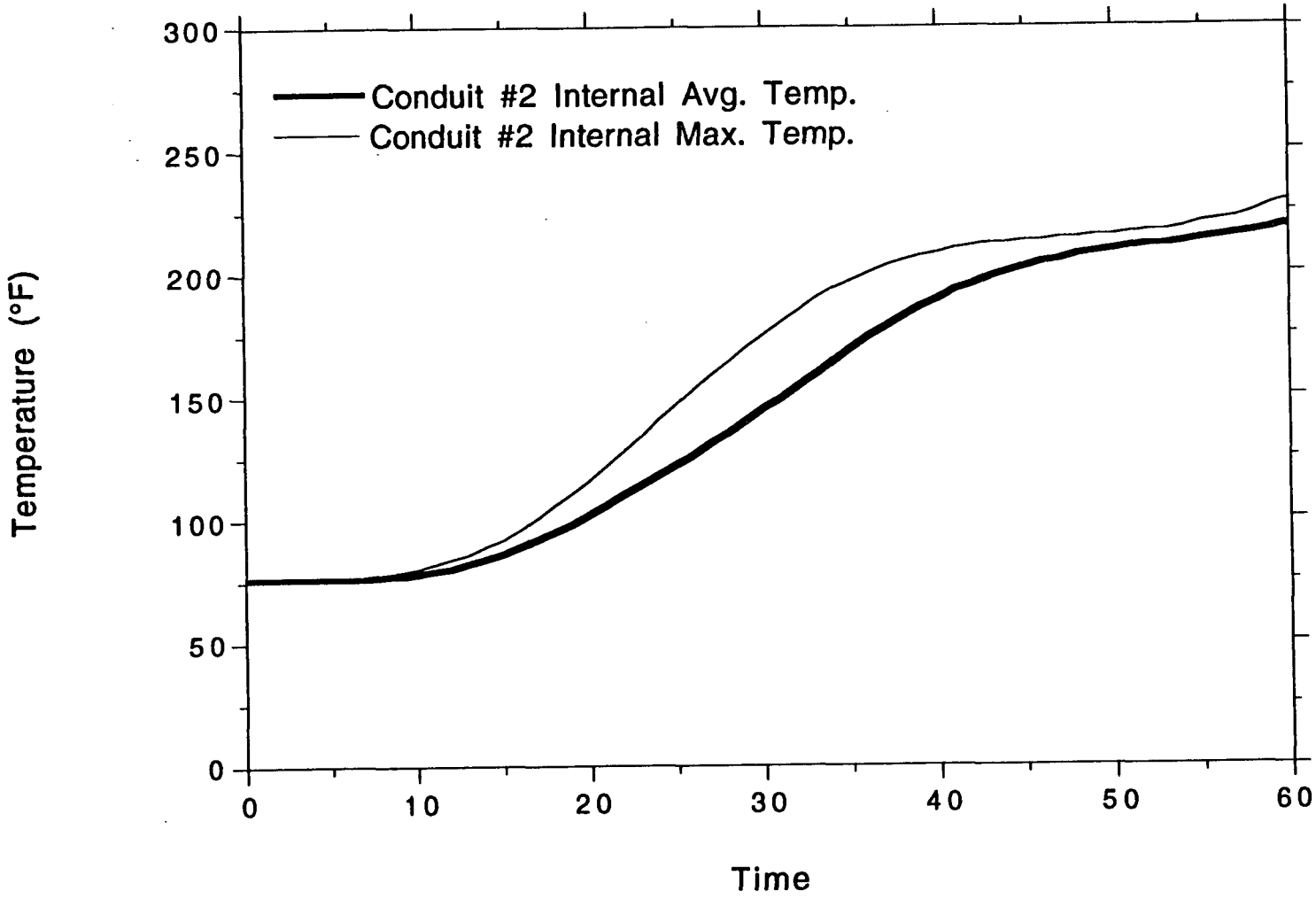


Project No. 11210-94943A
Tennessee Valley Authority
Conduit #2 (2" Steel Conduit)



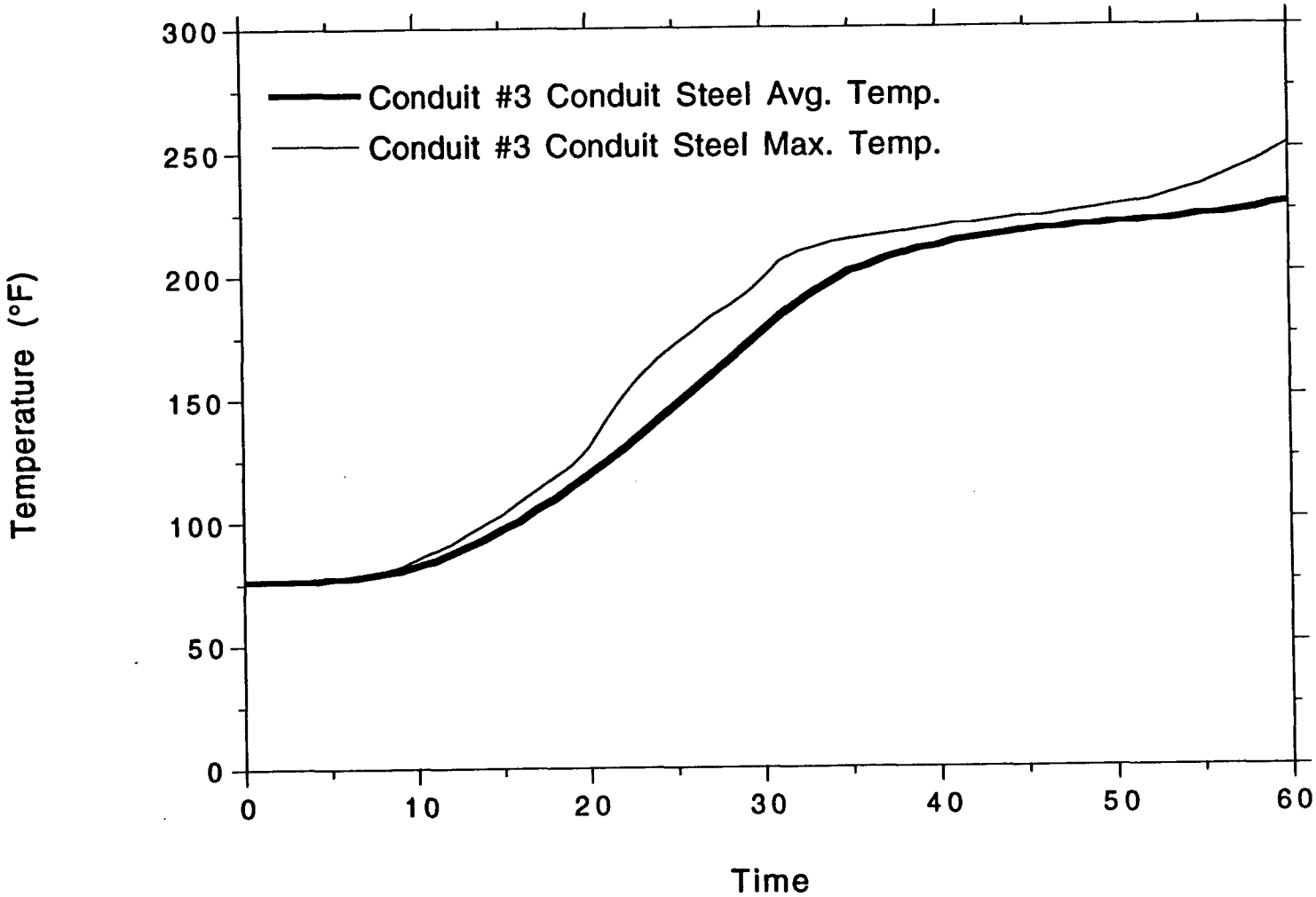
OMEGA POINT LABORATORIES

Project No. 11210-94943A
Tennessee Valley Authority
Conduit #2 (2" Steel Conduit)



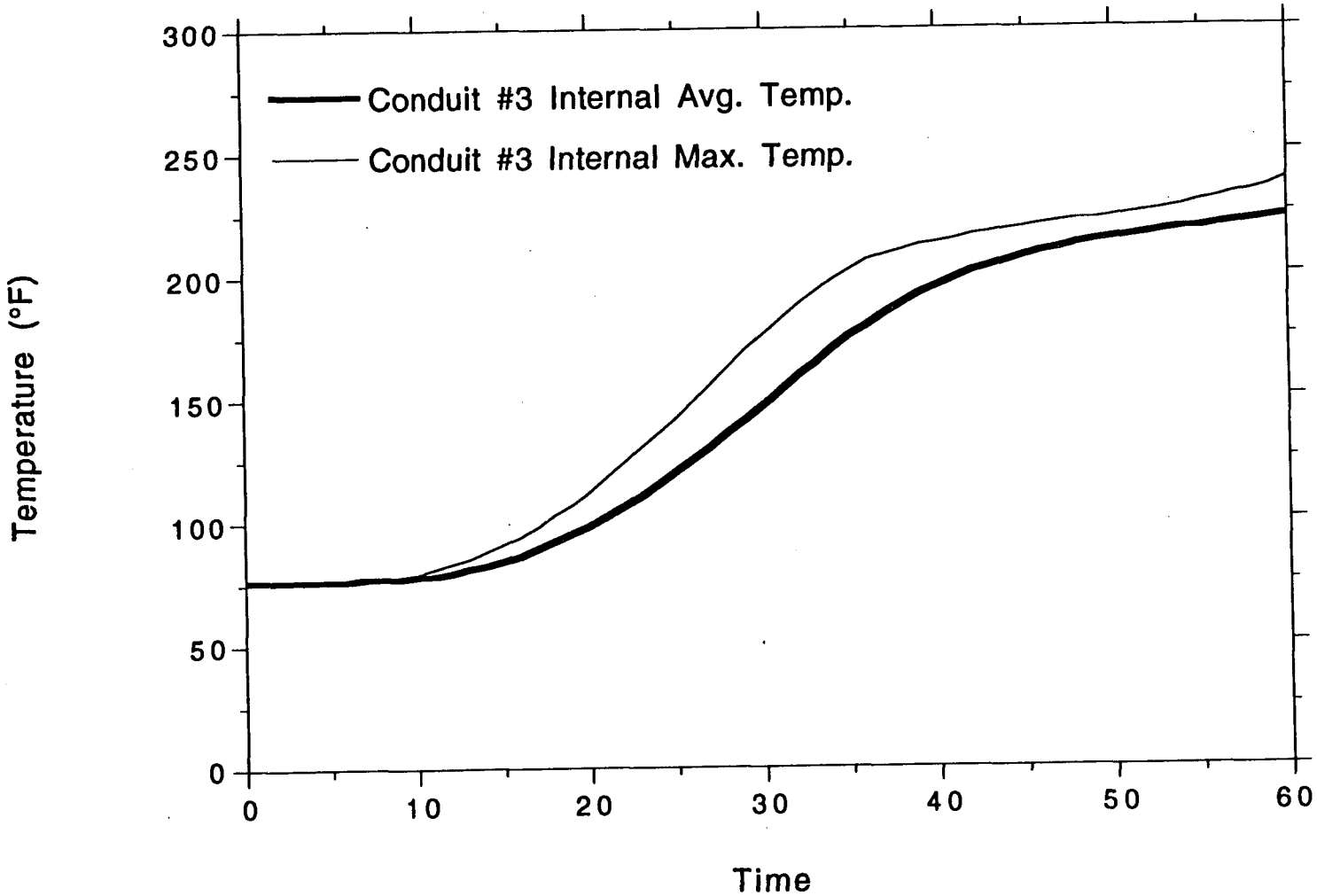
OMEGA POINT LABORATORIES

Project No. 11210-94943A
Tennessee Valley Authority
Conduit #3 (1" Steel Conduit)



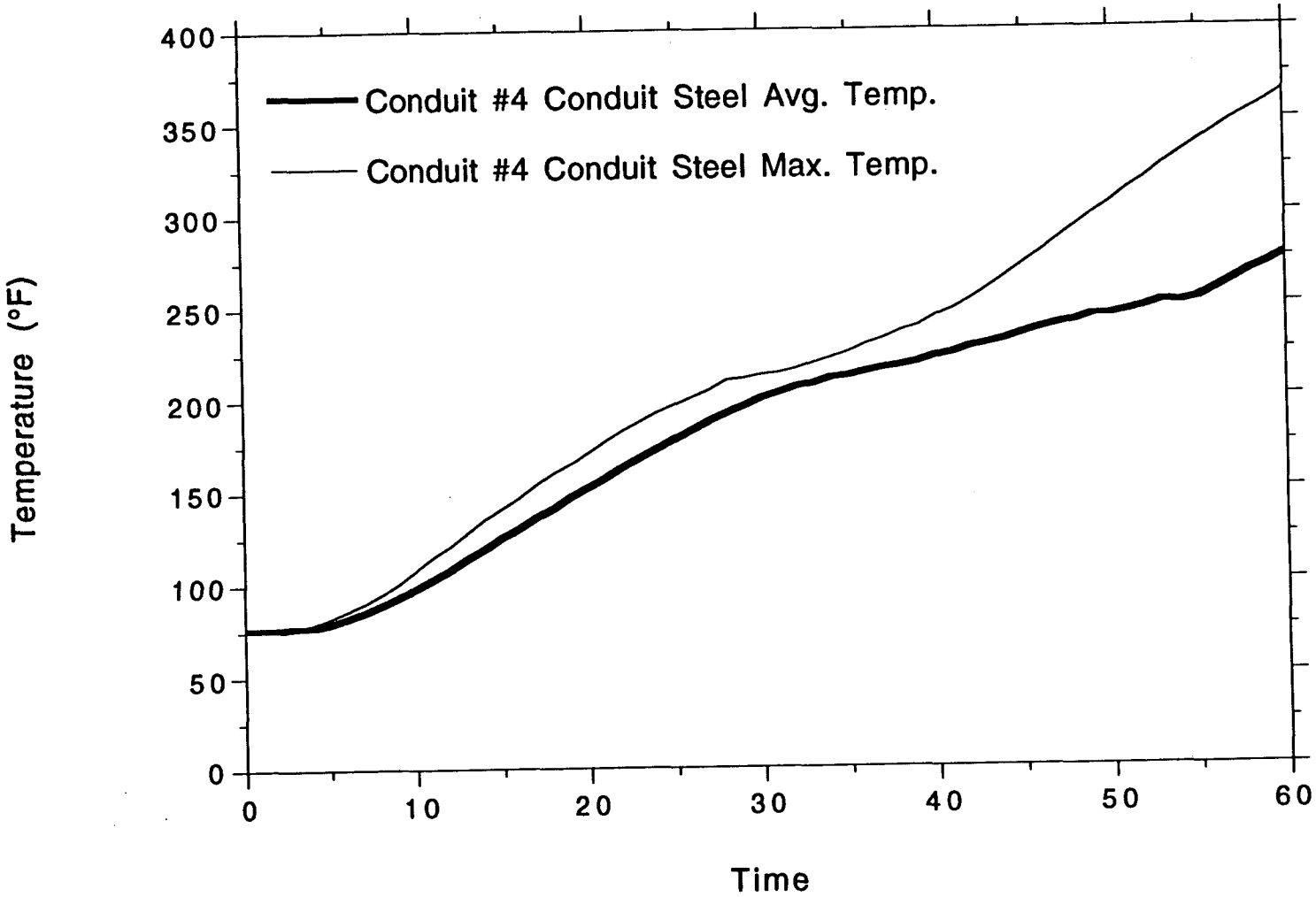
OMEGA POINT LABORATORIES

Project No. 11210-94943A
Tennessee Valley Authority
Conduit #3 (1" Steel Conduit)



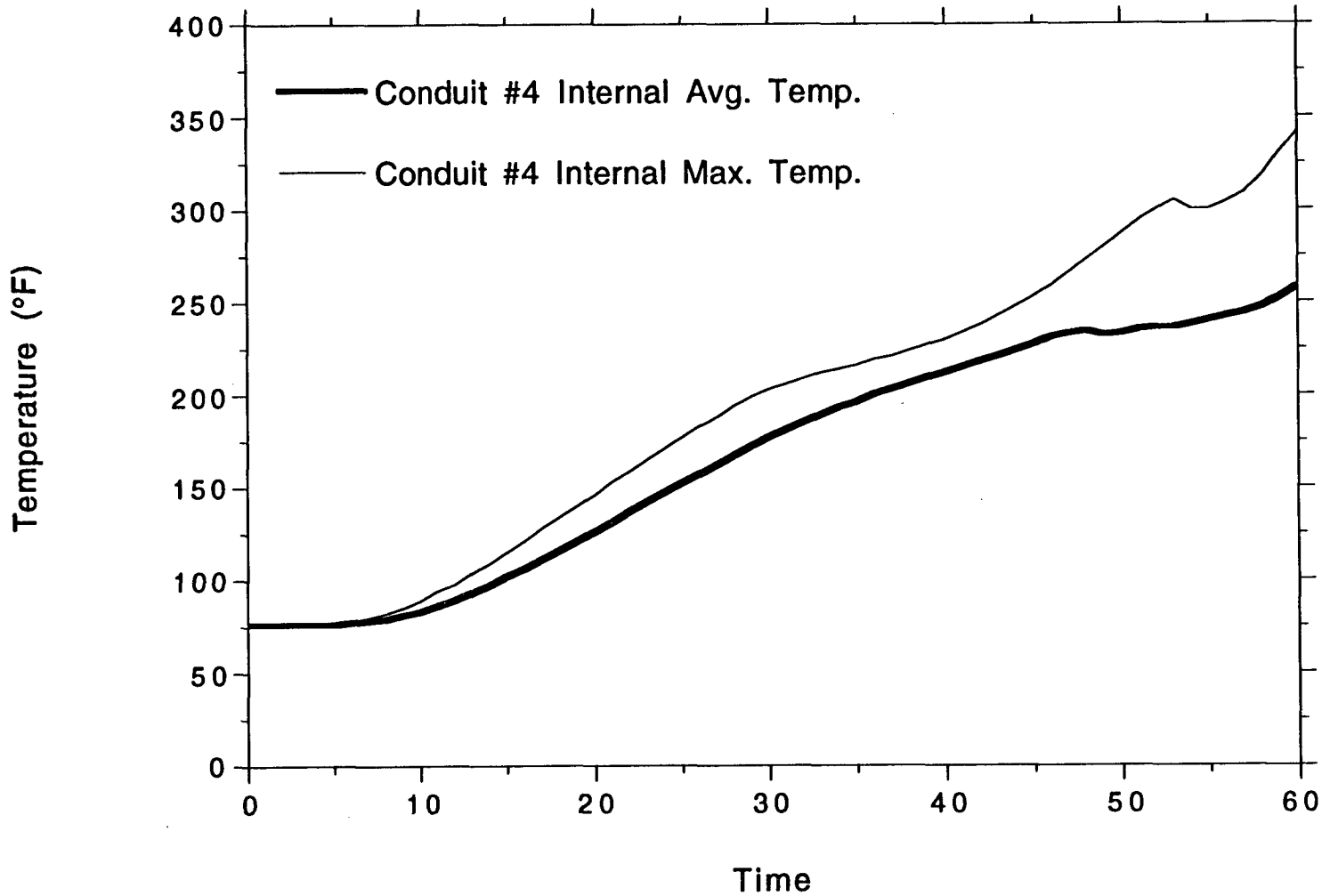
OMEGA POINT LABORATORIES

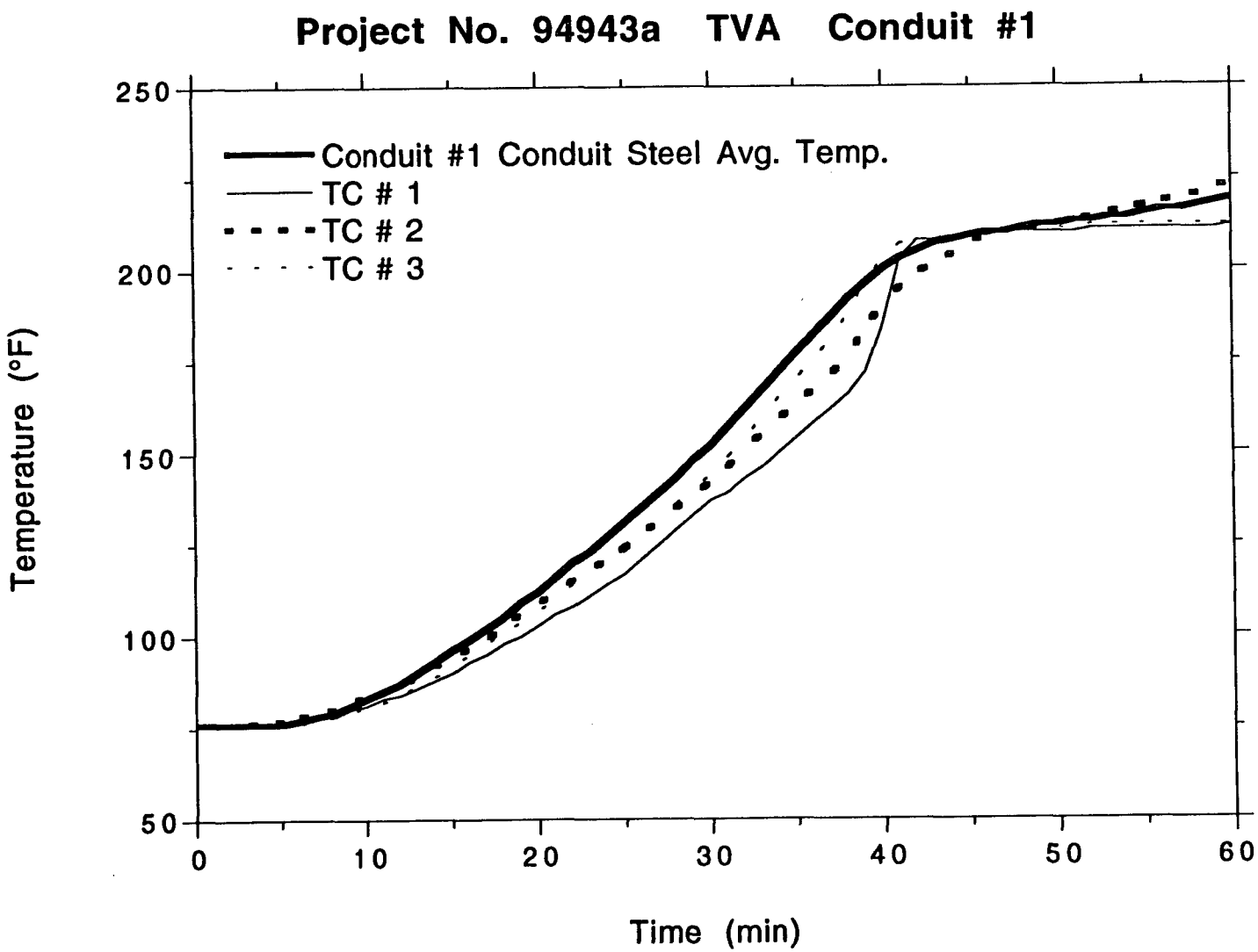
Project No. 11210-94943A
Tennessee Valley Authority
Conduit #4 (4" Steel Conduit)



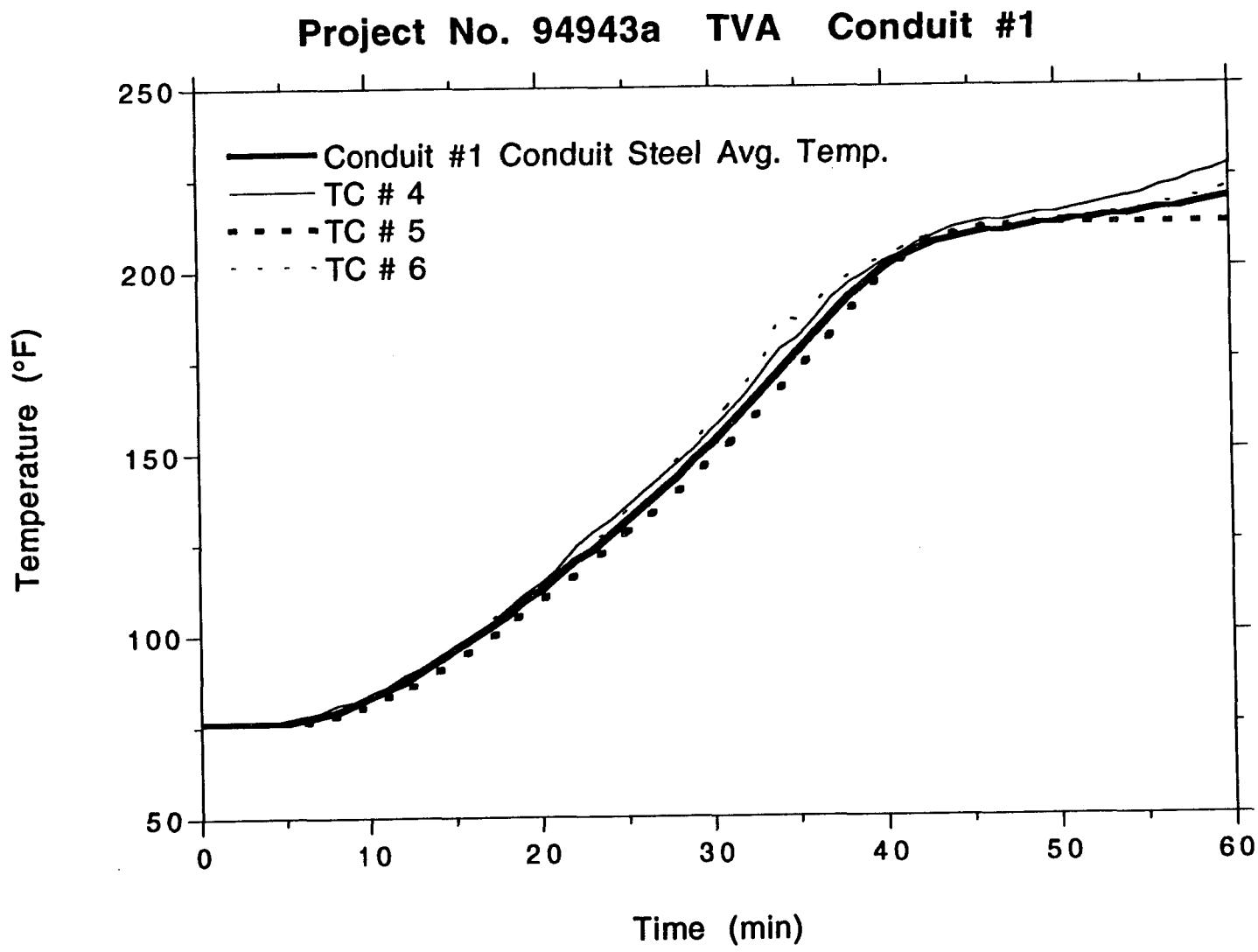
OMEGA POINT LABORATORIES

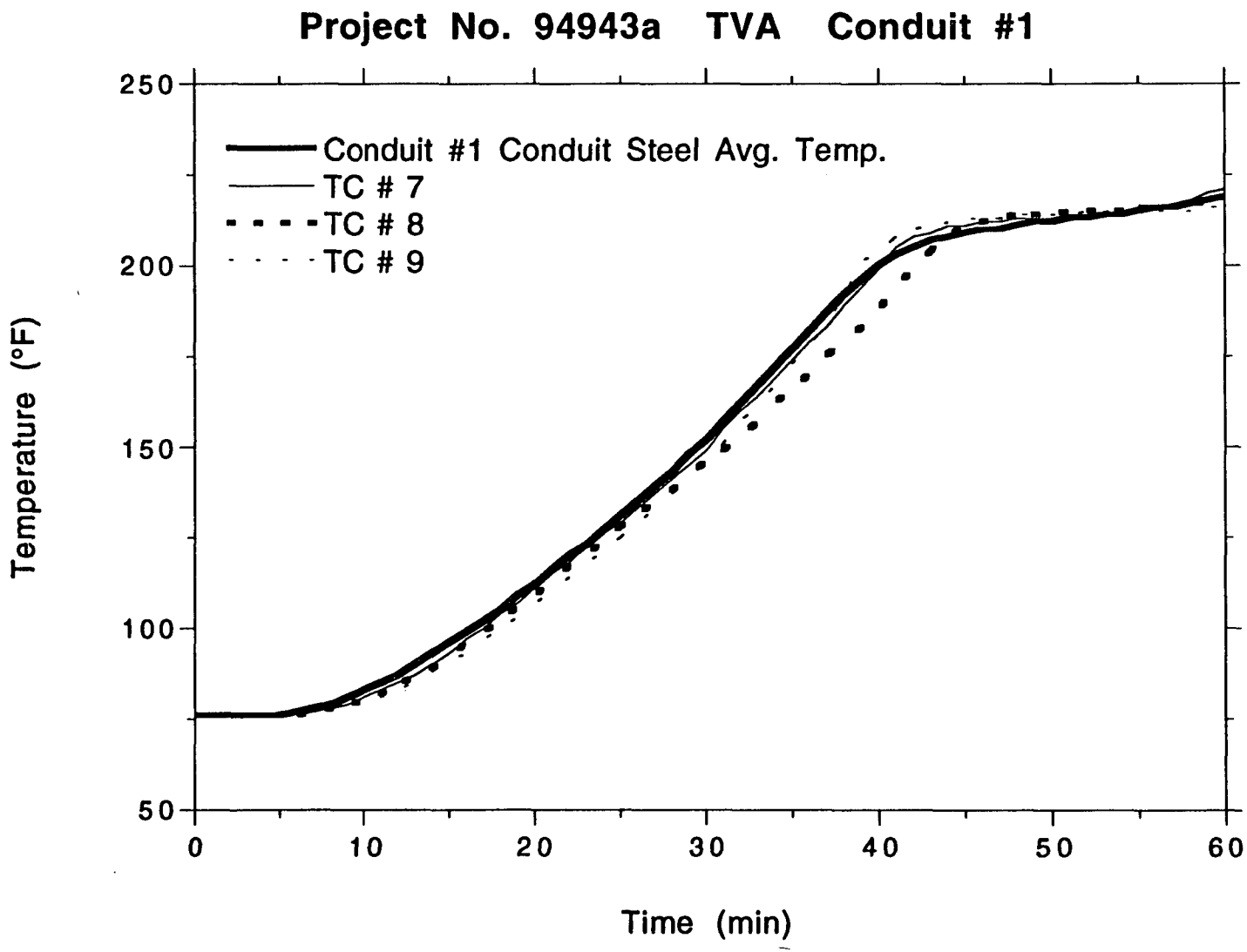
Project No. 11210-94943A
Tennessee Valley Authority
Conduit #4 (4" Steel Conduit)

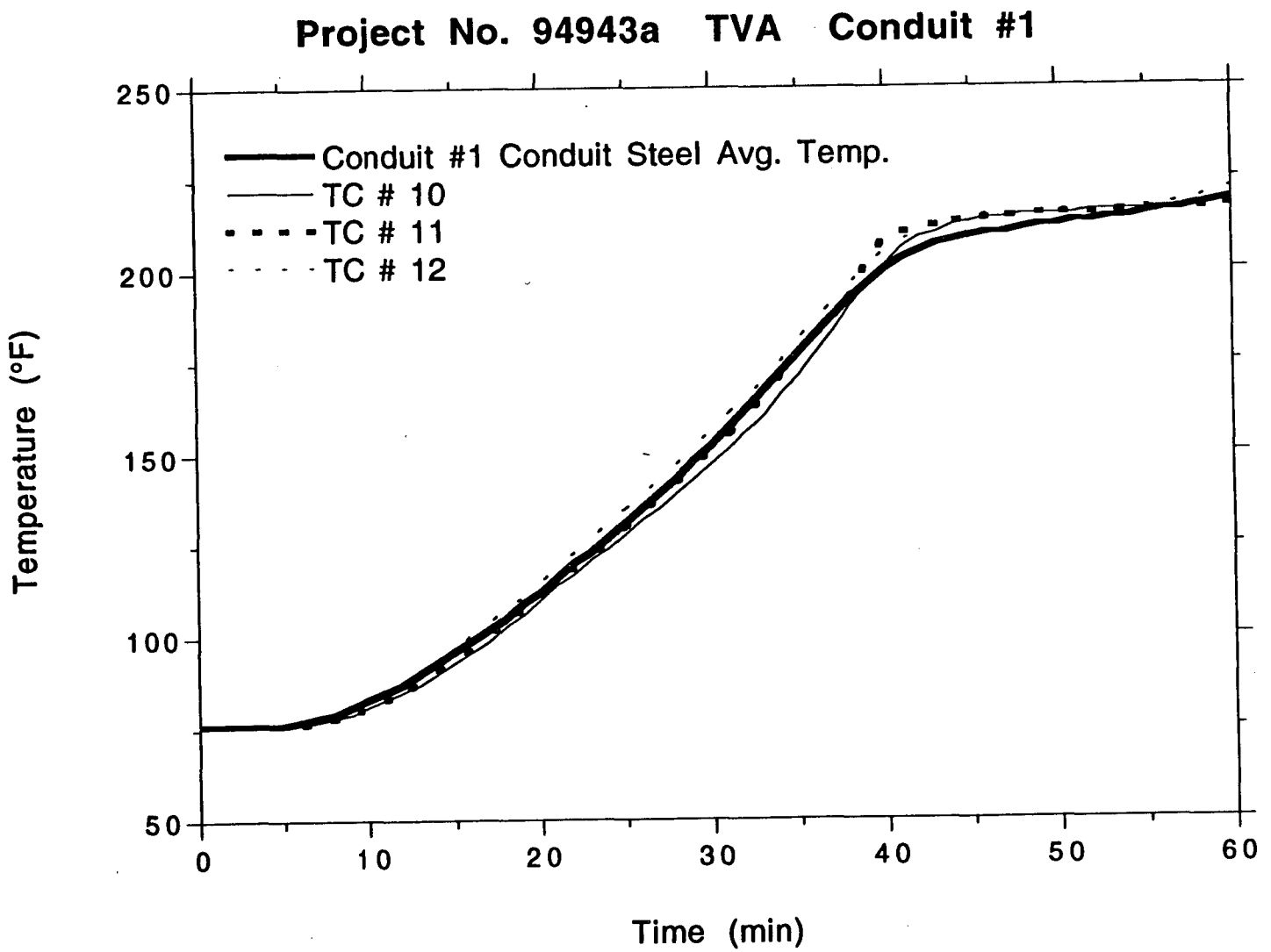




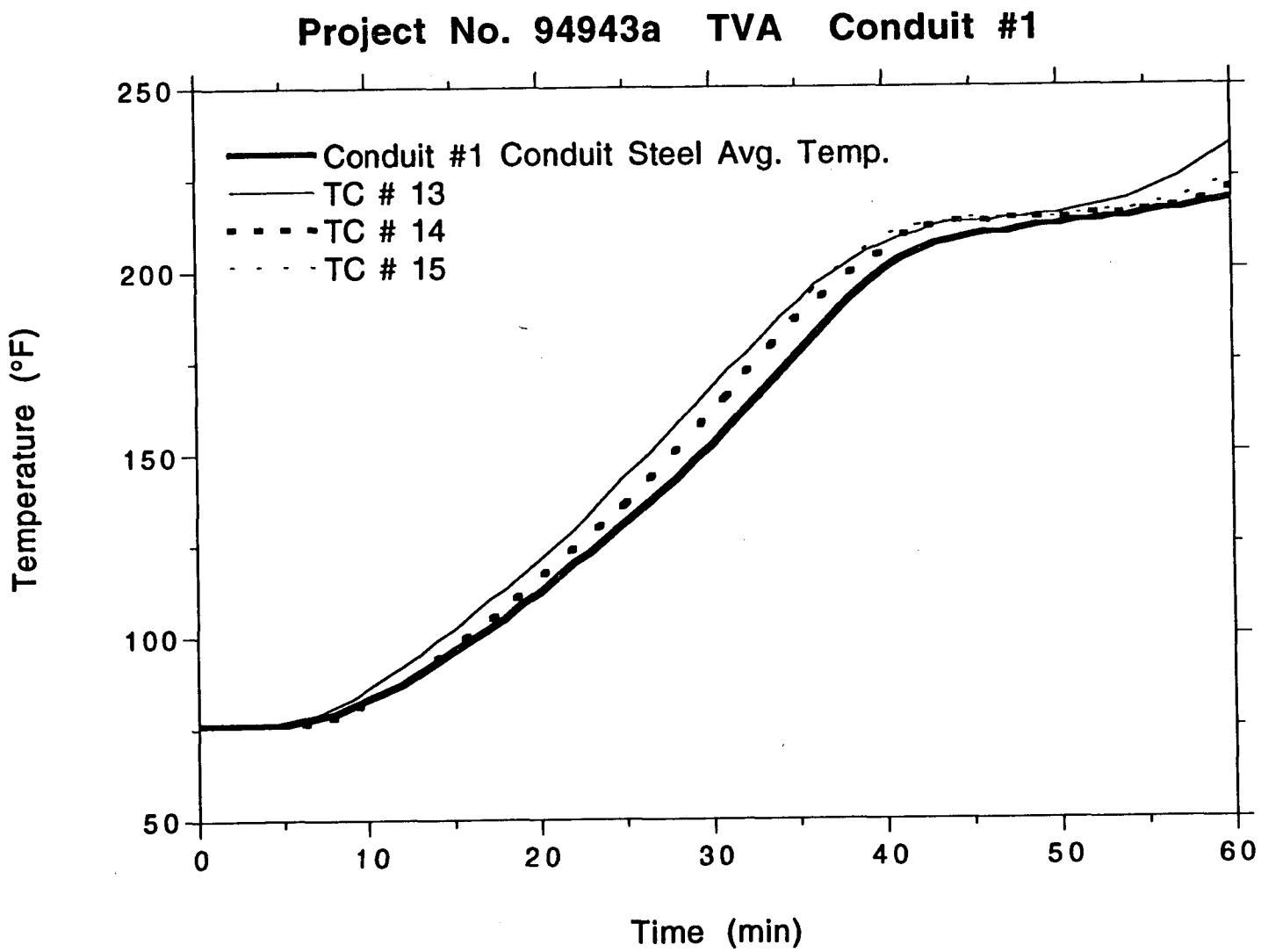
OMEGA POINT LABORATORIES


Project No. 94943a TVA Conduit #1
Conduit #1 Conduit Steel Avg. Temp.
TC # 4
TC # 5
TC # 6
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

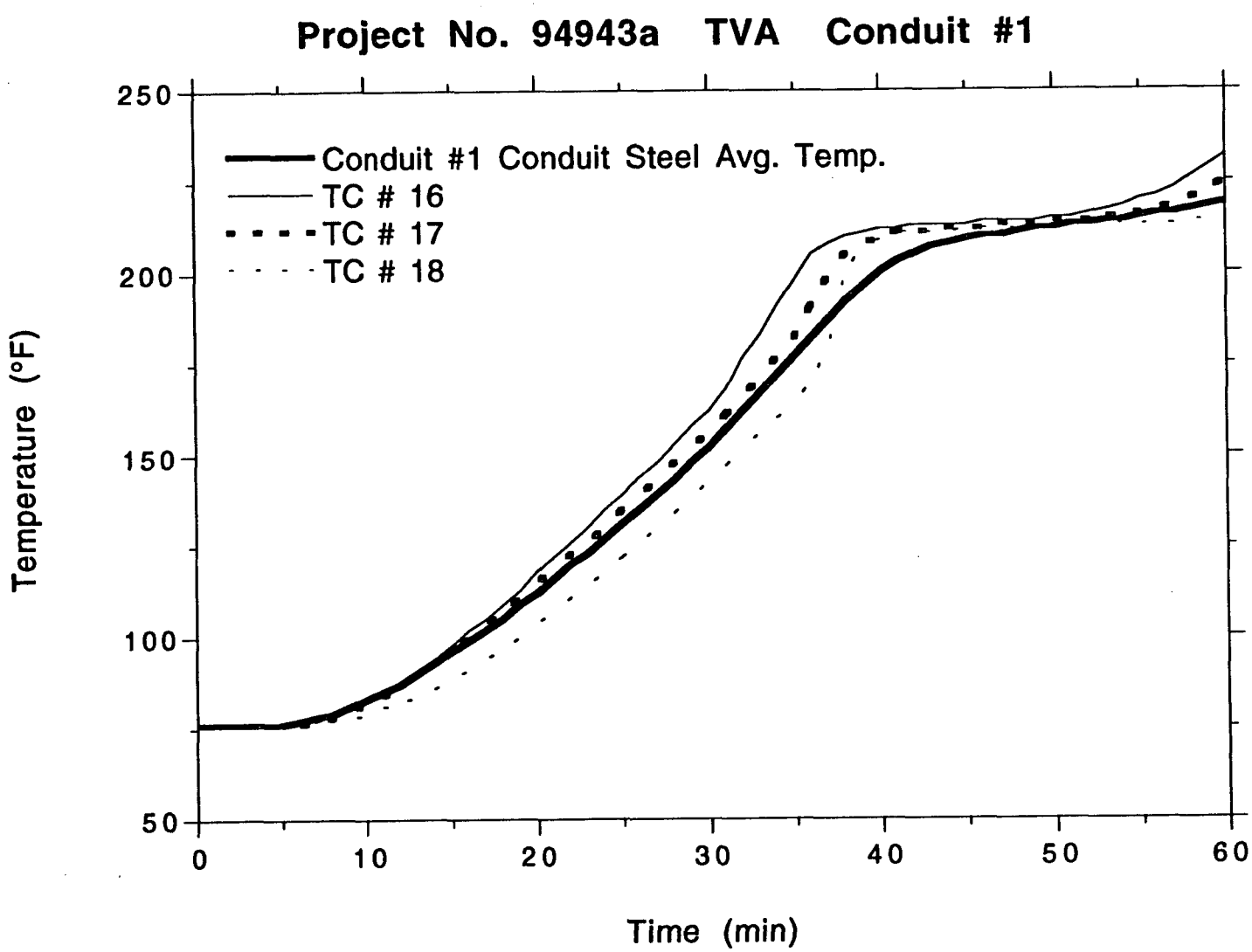

Project No. 94943a TVA Conduit #1
Conduit #1 Conduit Steel Avg. Temp.
TC # 7
TC # 8
TC # 9
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

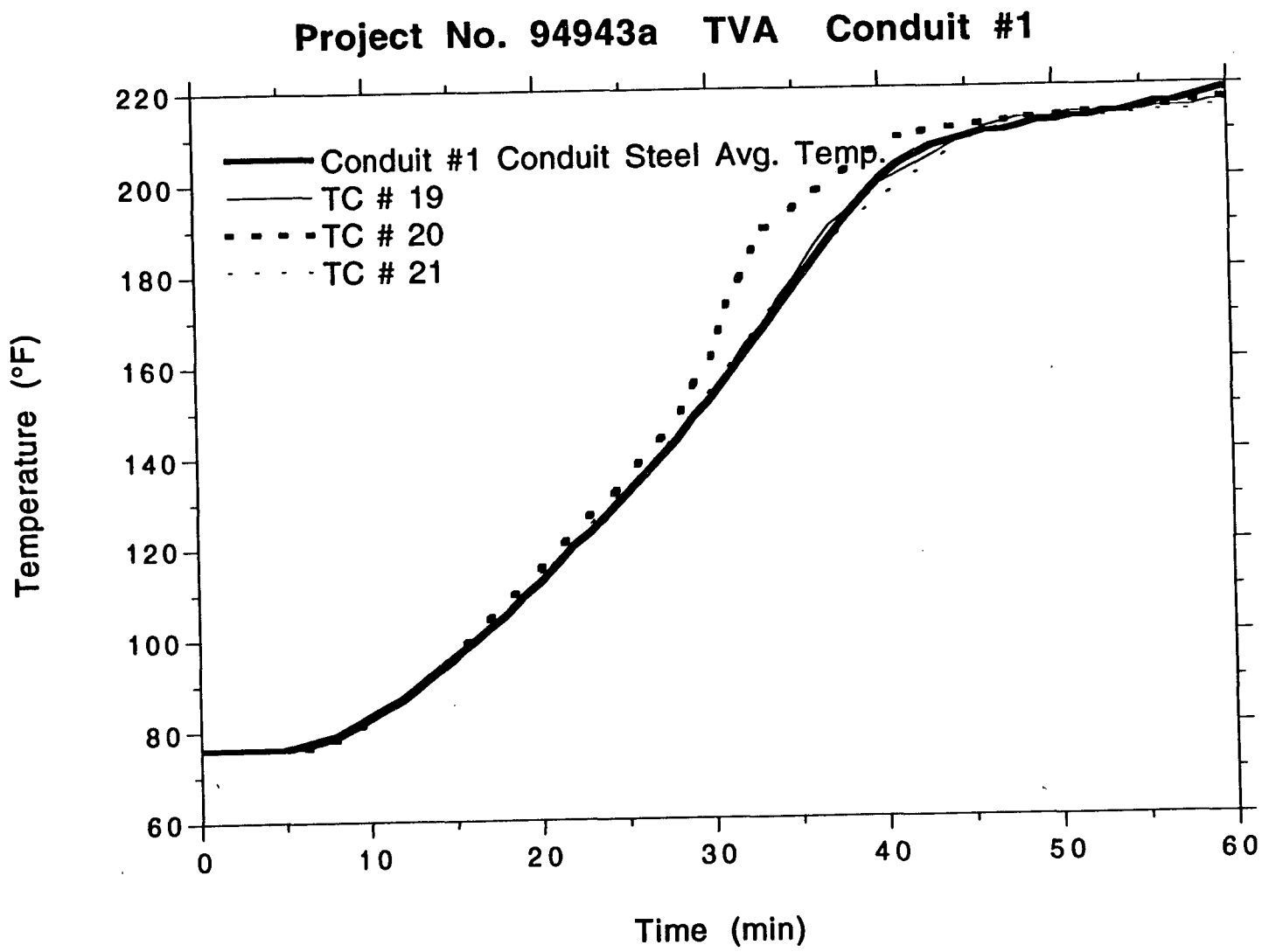


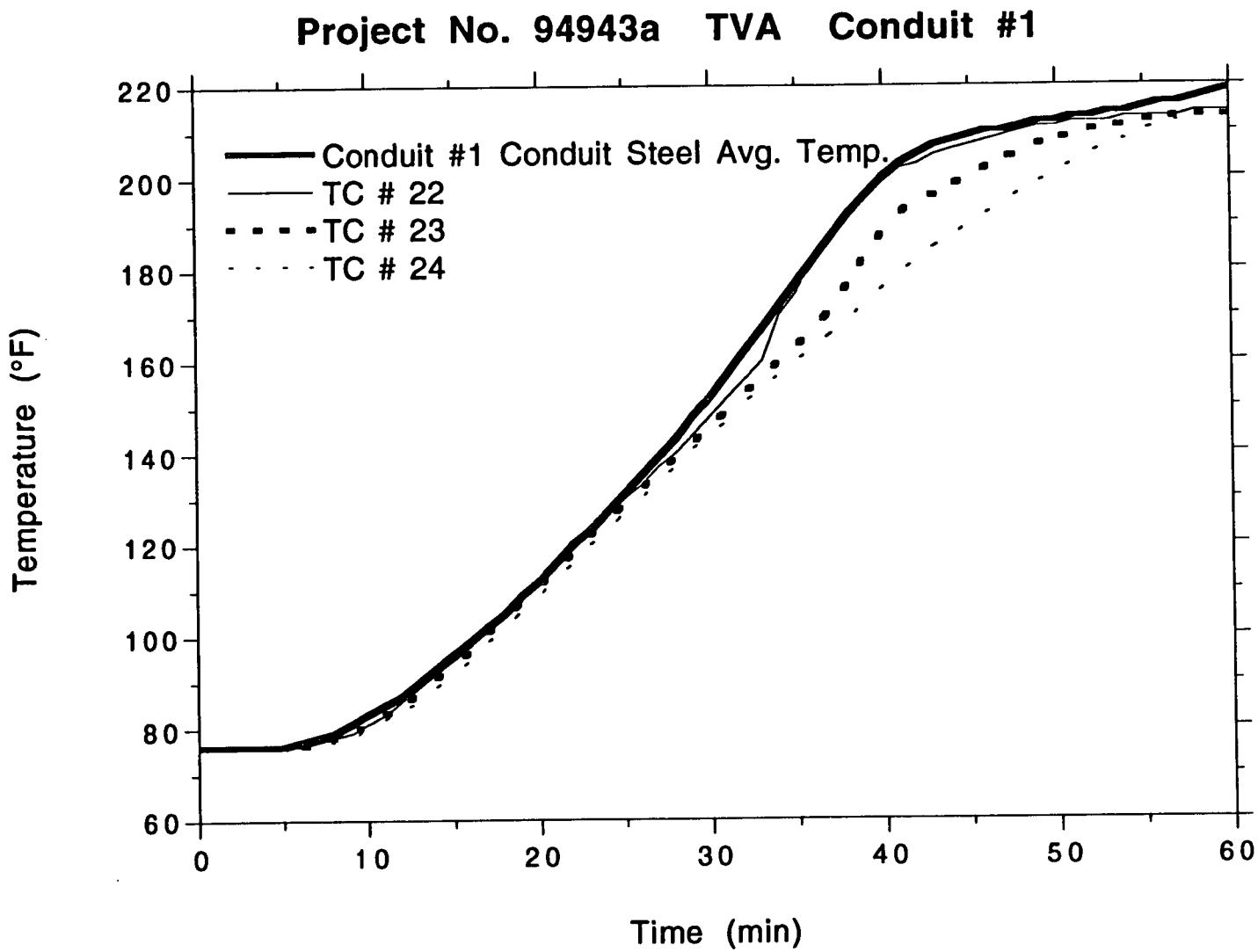
OMEGA POINT LABORATORIES

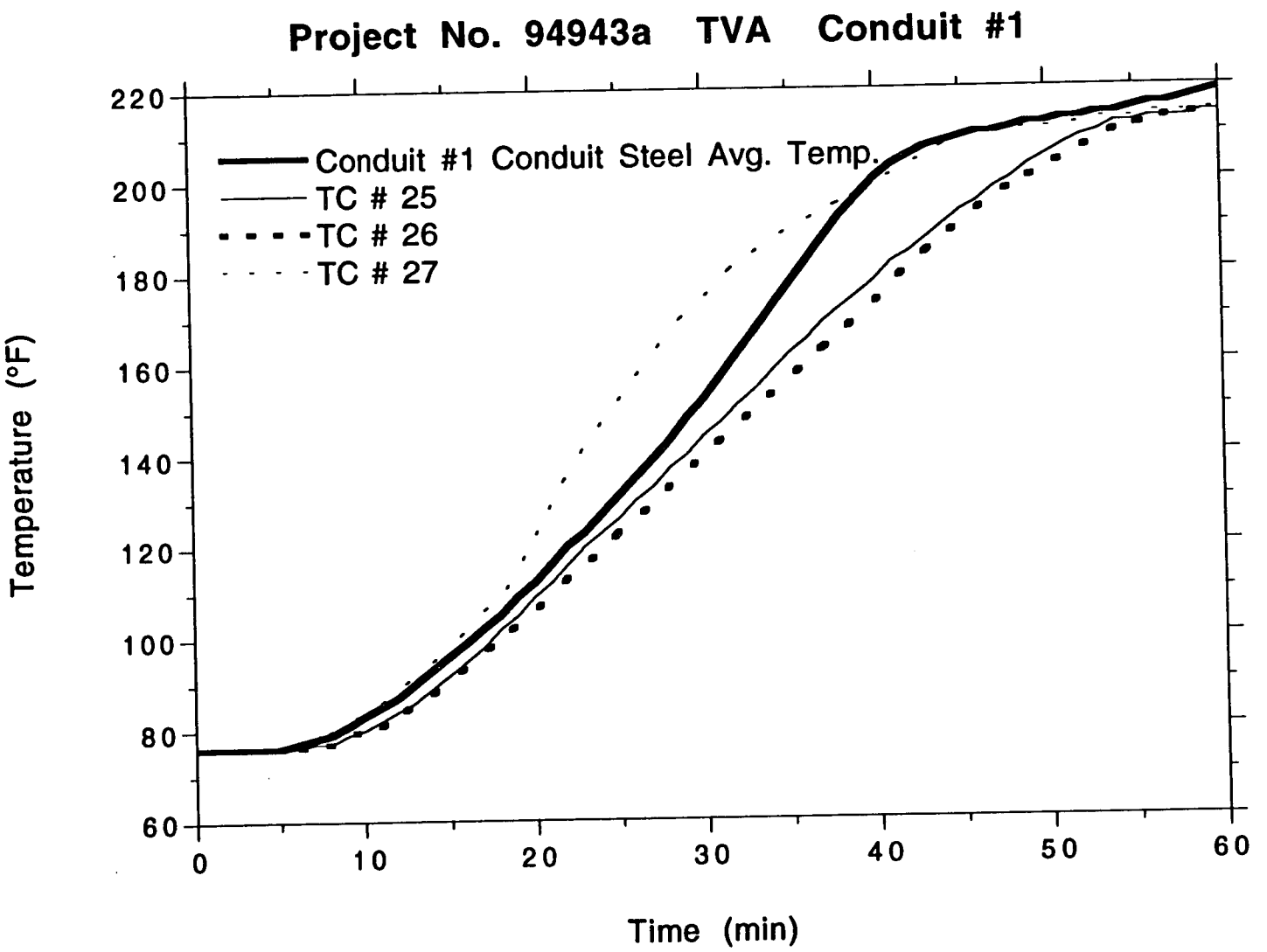


OMEGA POINT LABORATORIES

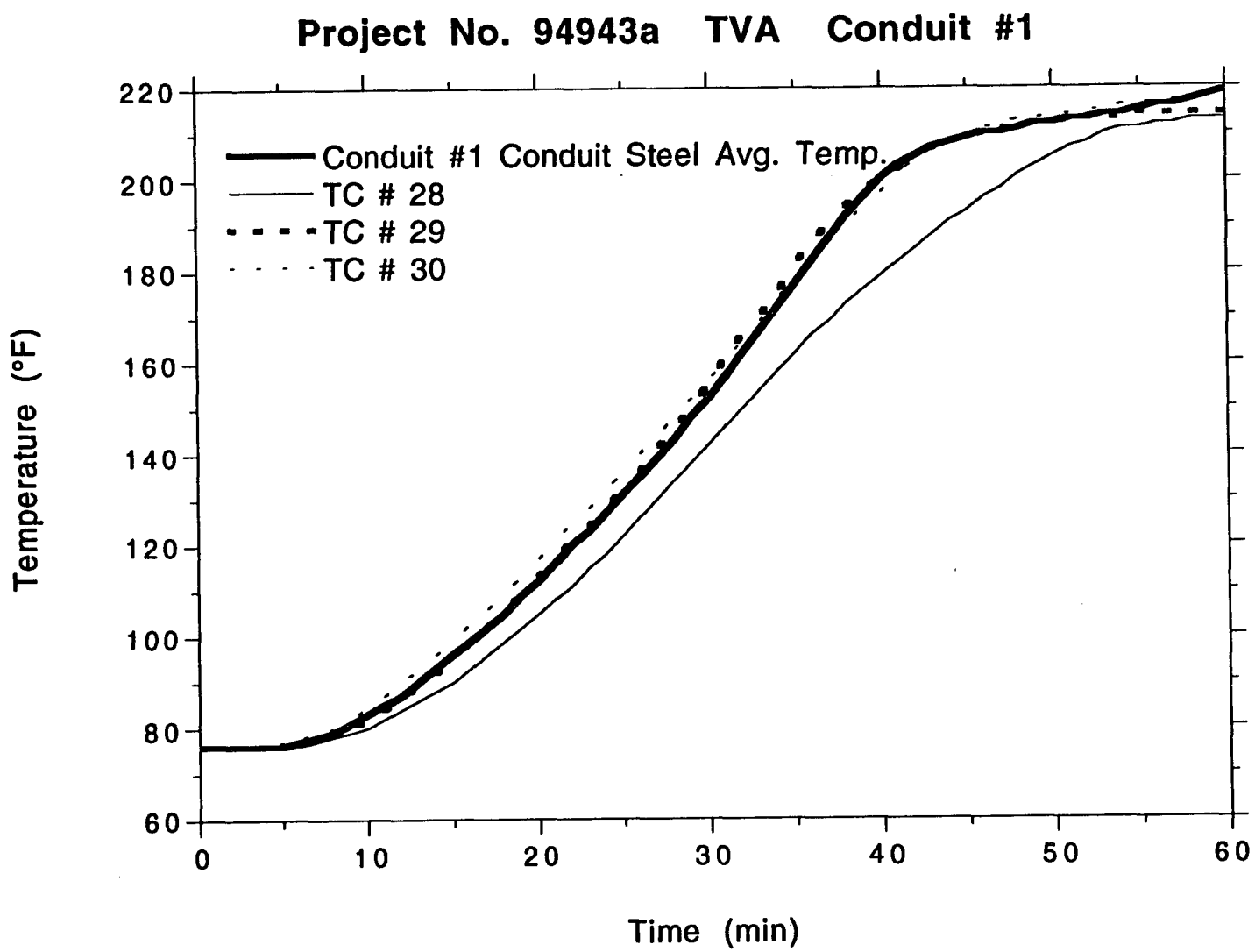

Project No. 94943a TVA Conduit #1
Conduit #1 Conduit Steel Avg. Temp.
TC # 16
TC # 17
TC # 18
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

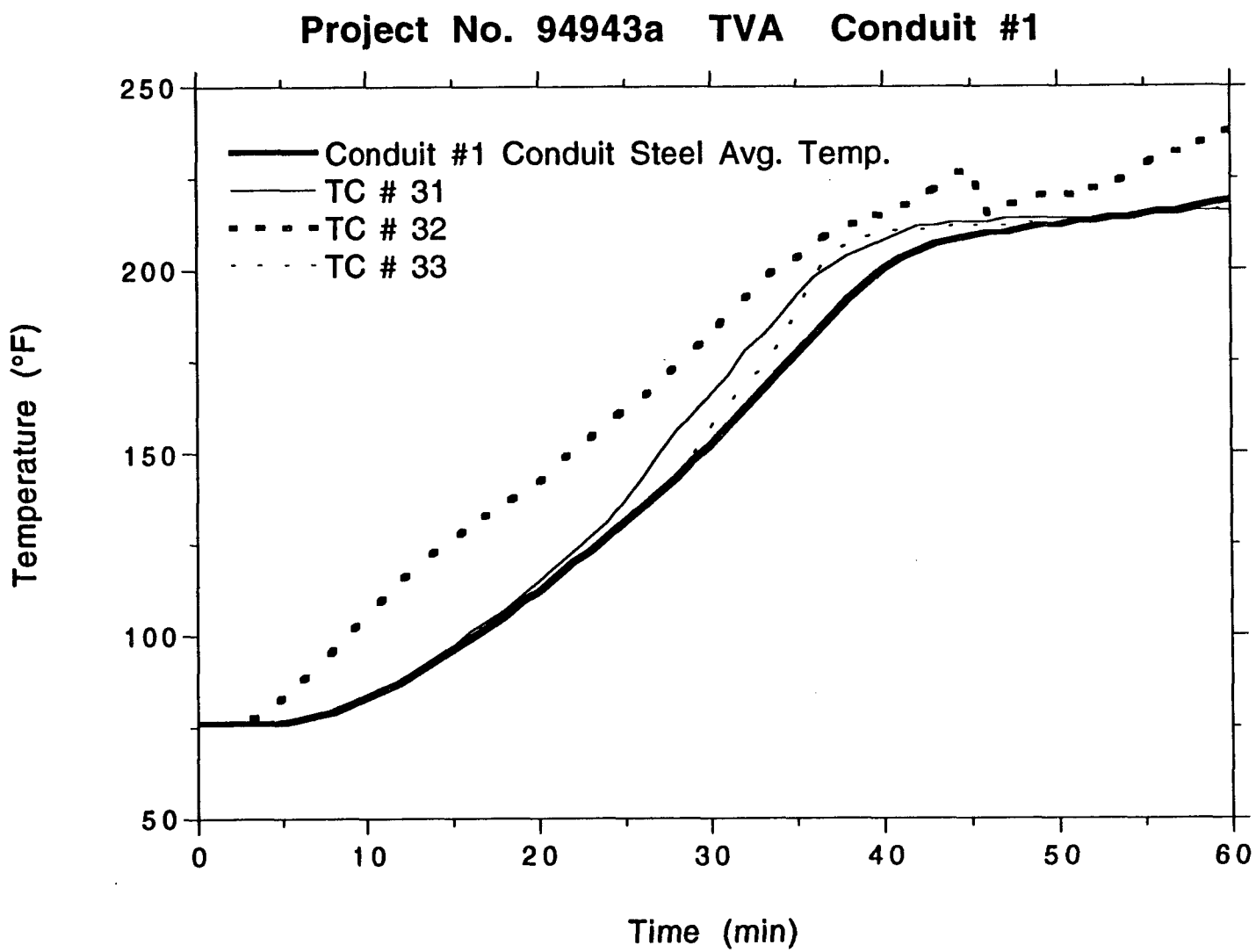

Project No. 94943a TVA Conduit #1
Conduit #1 Conduit Steel Avg. Temp.
TC # 19
TC # 20
TC # 21
Temperature (°F)
220
200
180
160
140
120
100
80
60
0
10
20
30
40
50
60
Time (min)

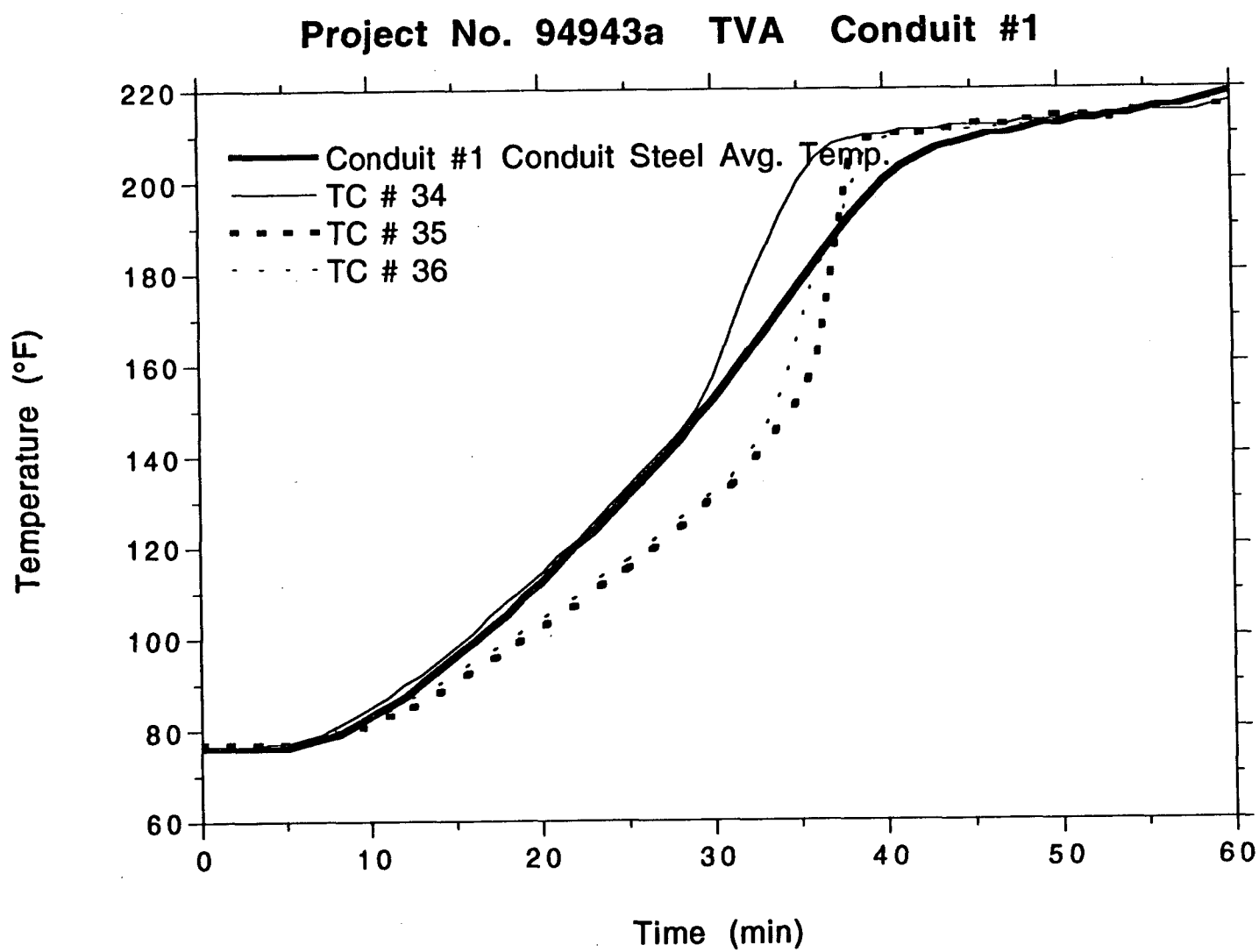

Project No. 94943a TVA Conduit #1
Conduit #1 Conduit Steel Avg. Temp.
TC # 22
TC # 23
TC # 24
Temperature (°F)
220
200
180
160
140
120
100
80
60
0
10
20
30
40
50
60
Time (min)

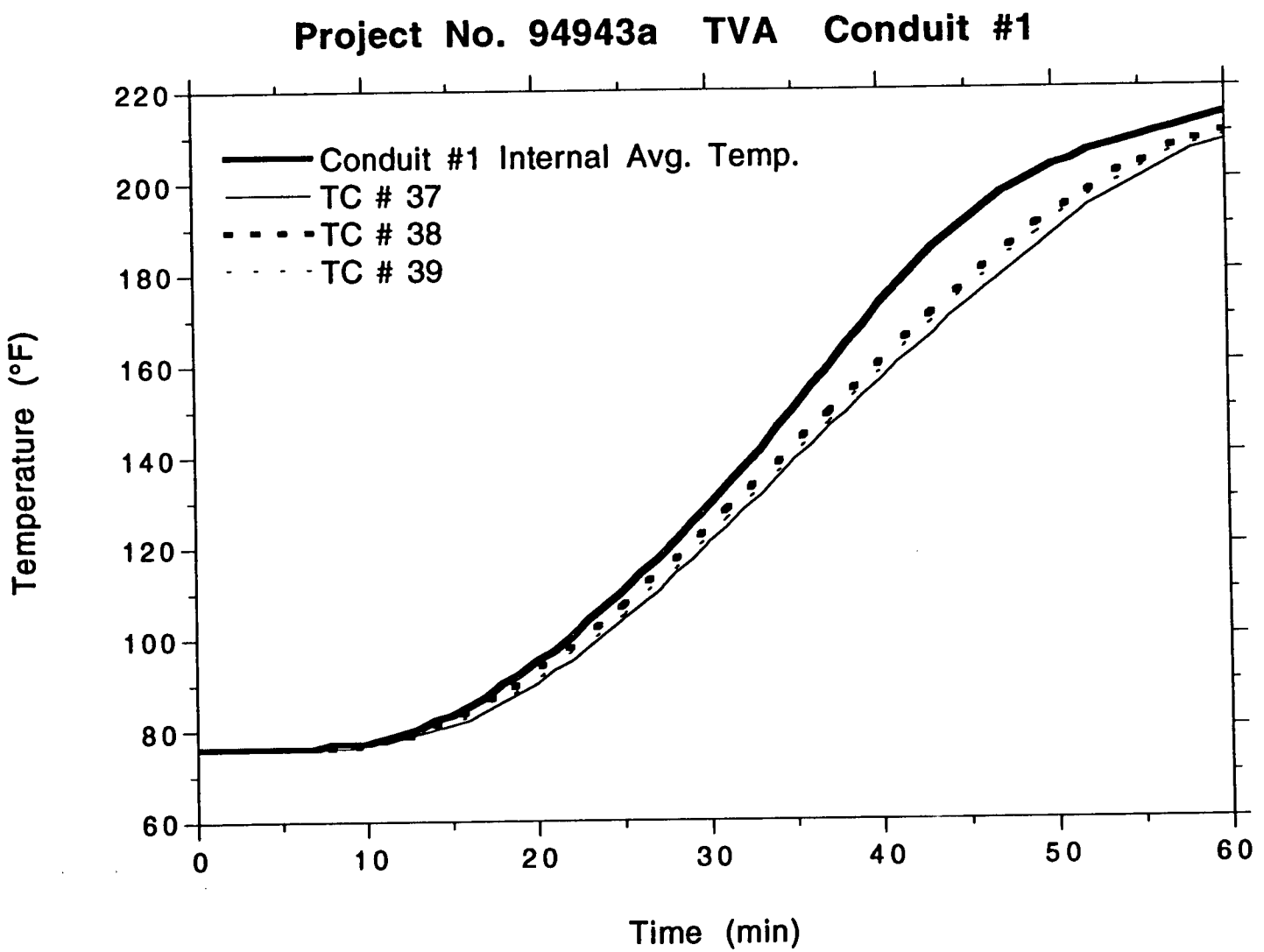


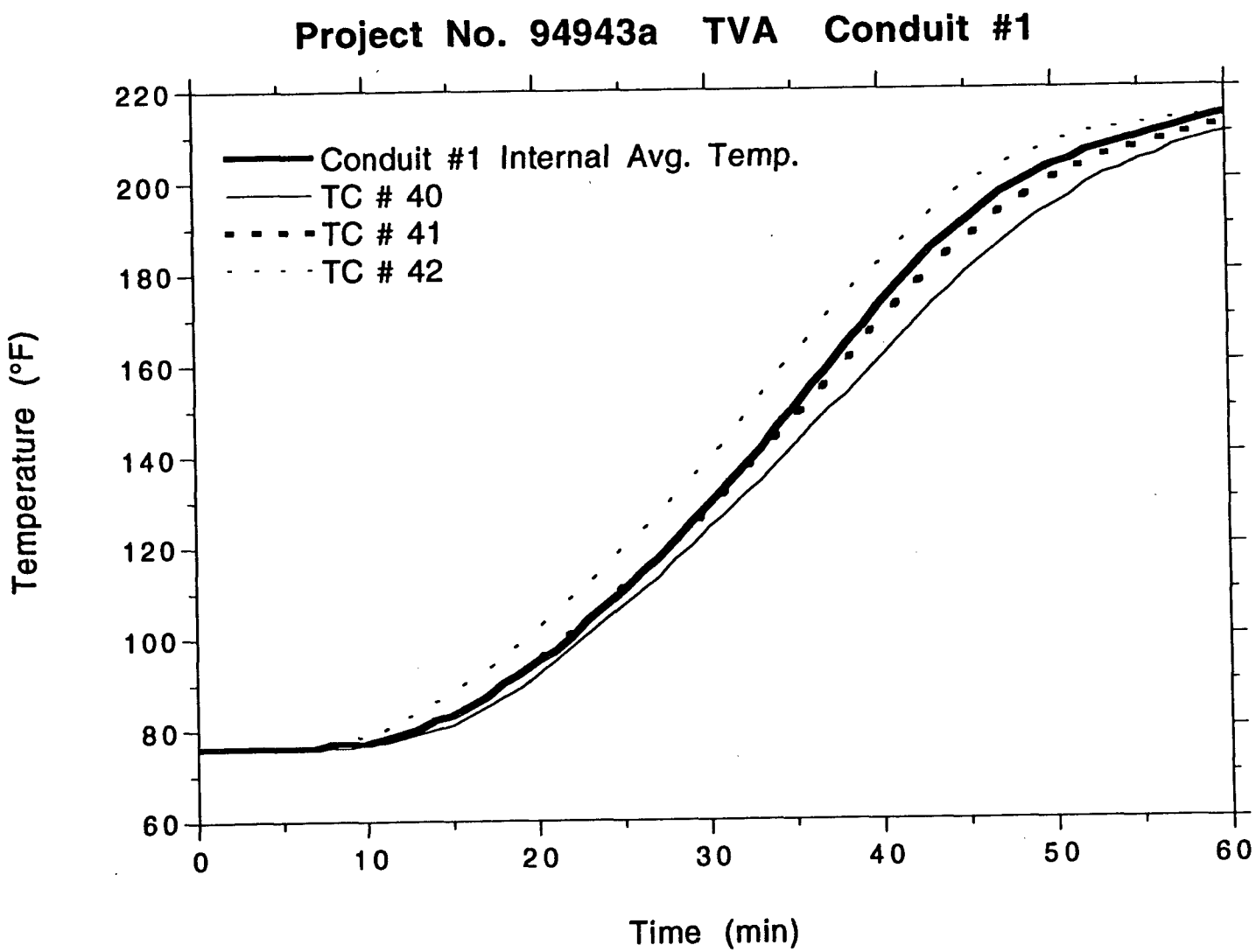
OMEGA POINT LABORATORIES

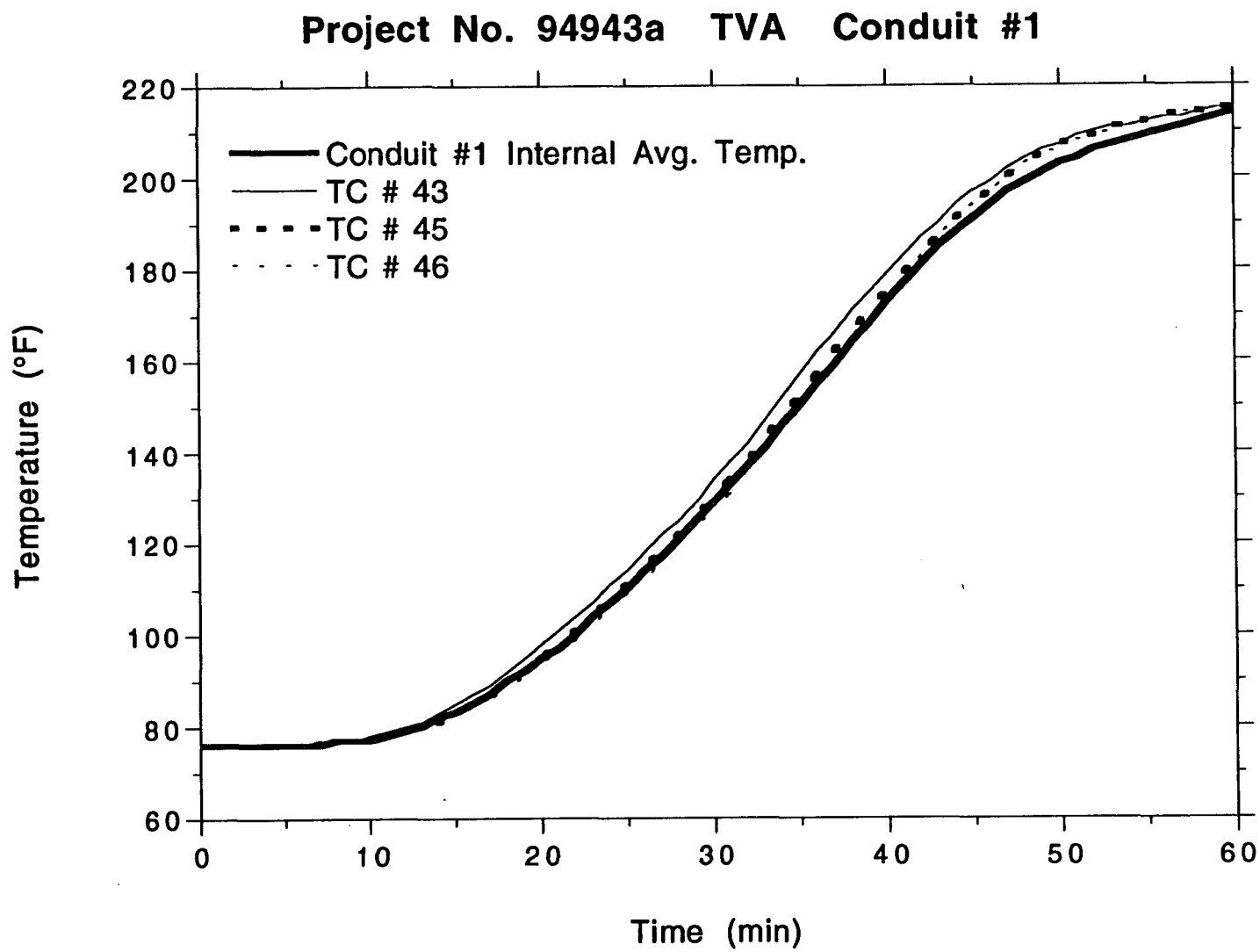

Project No. 94943a TVA Conduit #1
Conduit #1 Conduit Steel Avg. Temp.
TC # 28
TC # 29
TC # 30
Temperature (°F)
220
200
180
160
140
120
100
80
60
0
10
20
30
40
50
60
Time (min)


Project No. 94943a TVA Conduit #1
Conduit #1 Conduit Steel Avg. Temp.
TC # 31
TC # 32
TC # 33
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

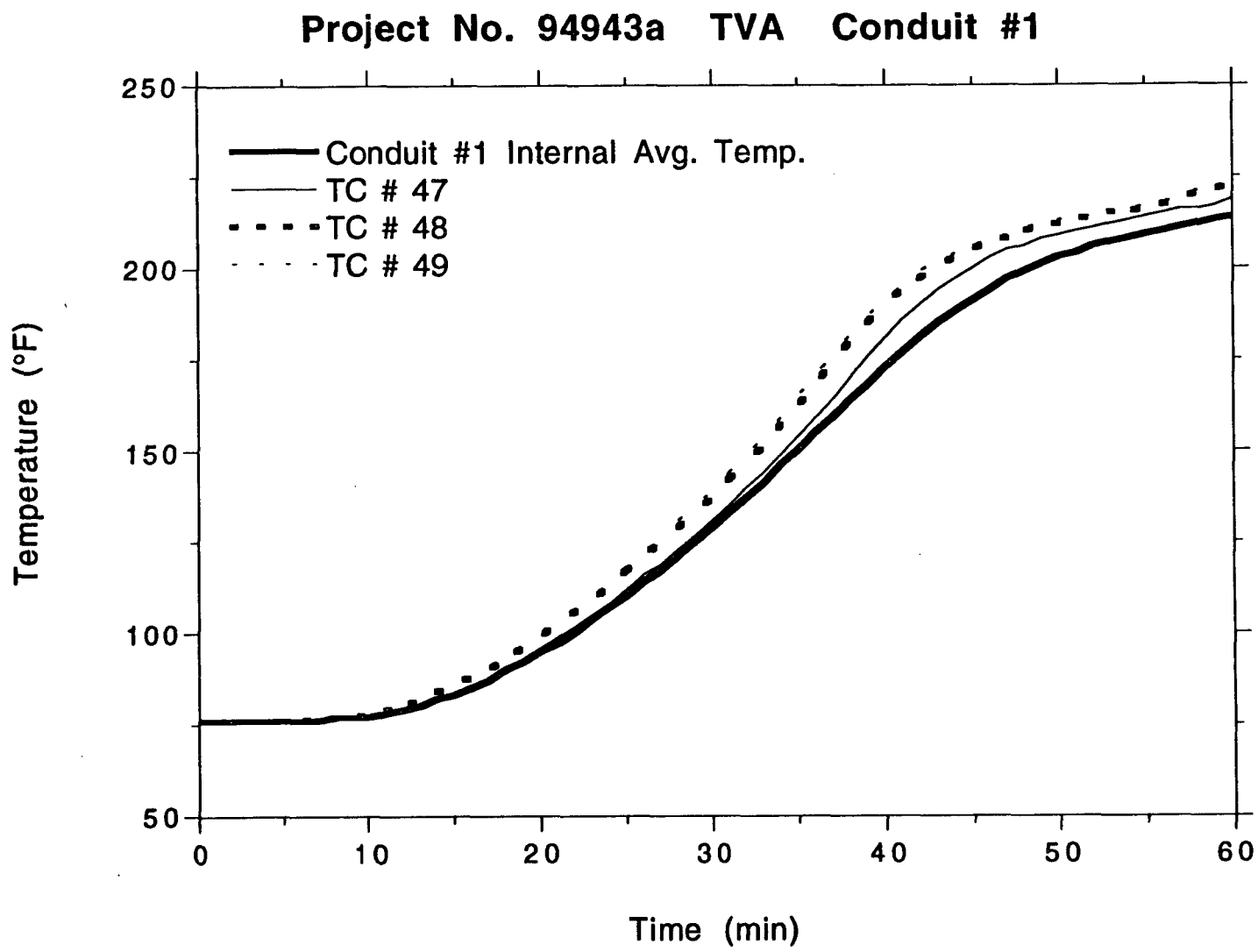

Project No. 94943a TVA Conduit #1
Conduit #1 Conduit Steel Avg. Temp.
TC # 34
TC # 35
TC # 36
Temperature (°F)
220
200
180
160
140
120
100
80
60
0
10
20
30
40
50
60
Time (min)


Project No. 94943a TVA Conduit #1
Conduit #1 Internal Avg. Temp.
TC # 37
TC # 38
TC # 39
Temperature (°F)
220
200
180
160
140
120
100
80
60
0
10
20
30
40
50
60
Time (min)

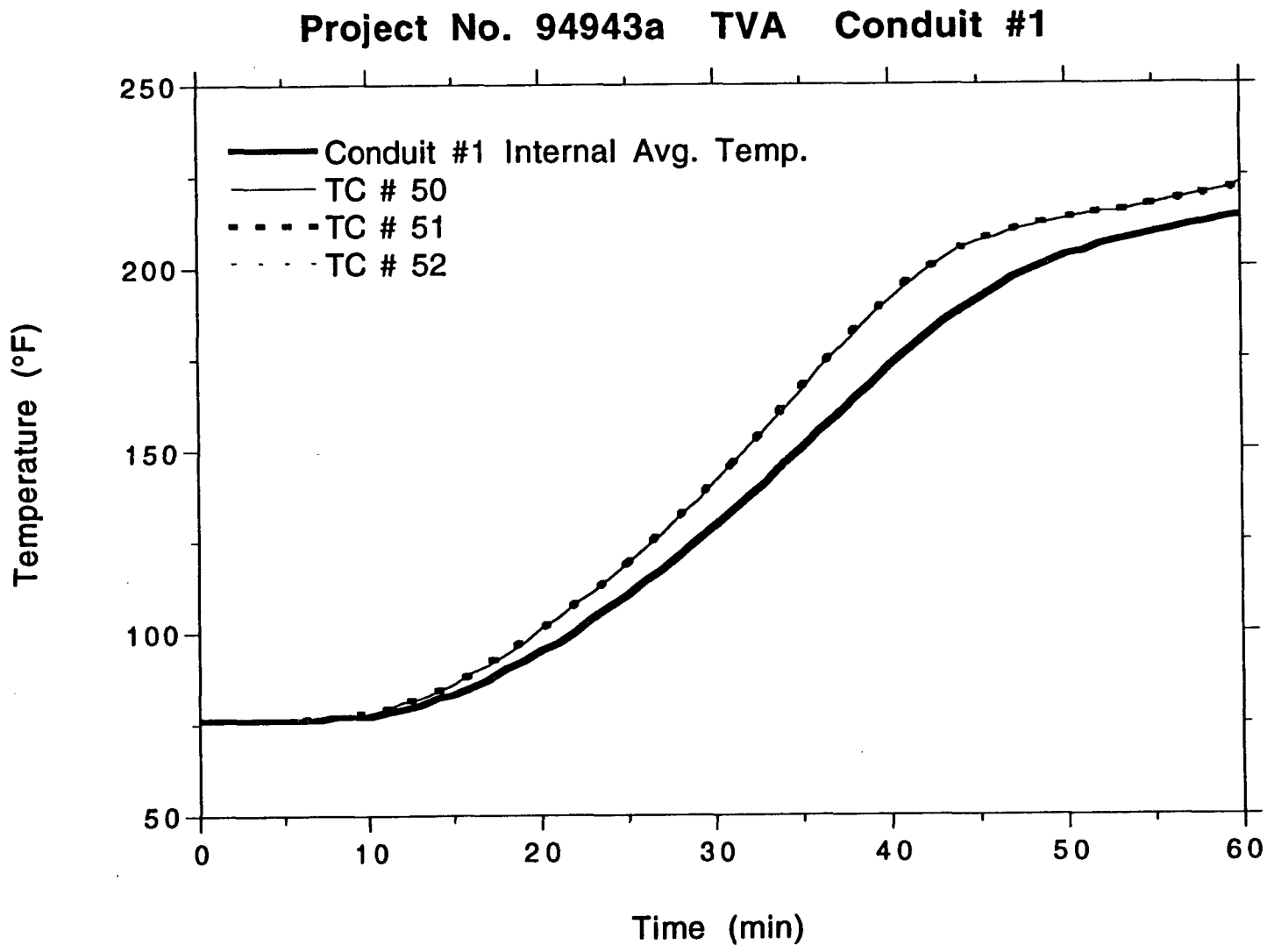

Project No. 94943a TVA Conduit #1
Conduit #1 Internal Avg. Temp.
TC # 40
TC # 41
TC # 42
Temperature (°F)
220
200
180
160
140
120
100
80
60
0
10
20
30
40
50
60
Time (min)

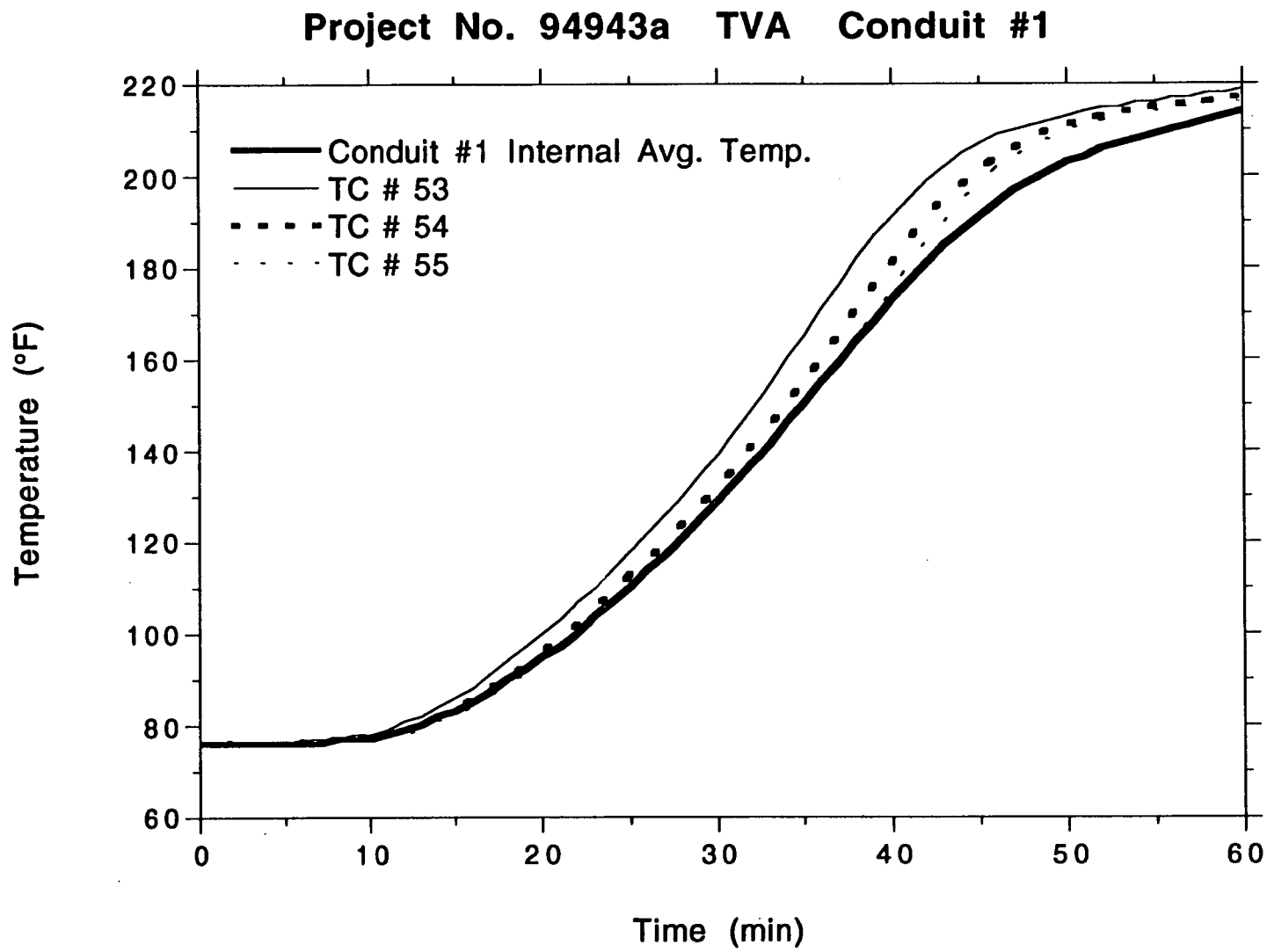


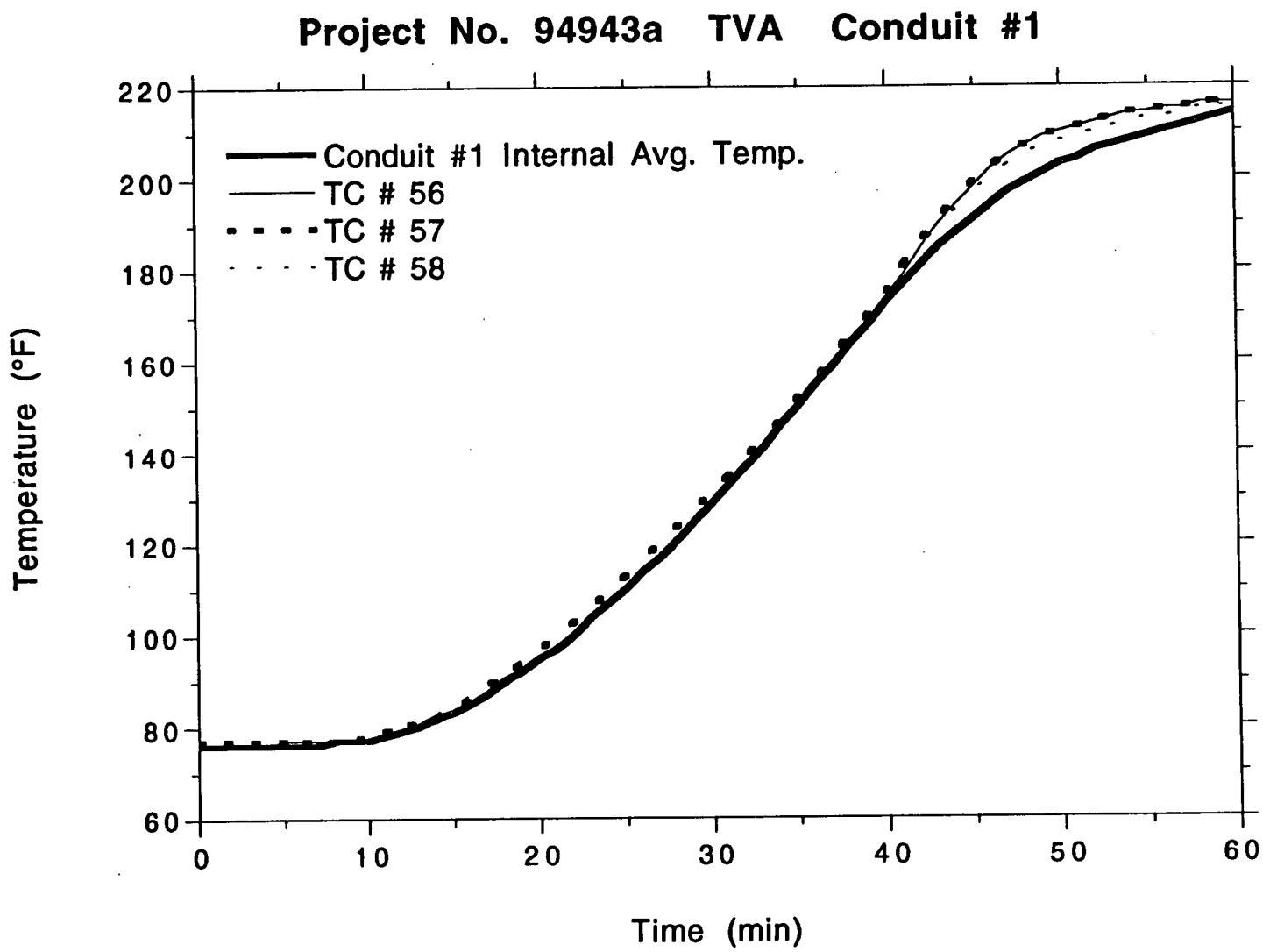
OMEGA POINT LABORATORIES

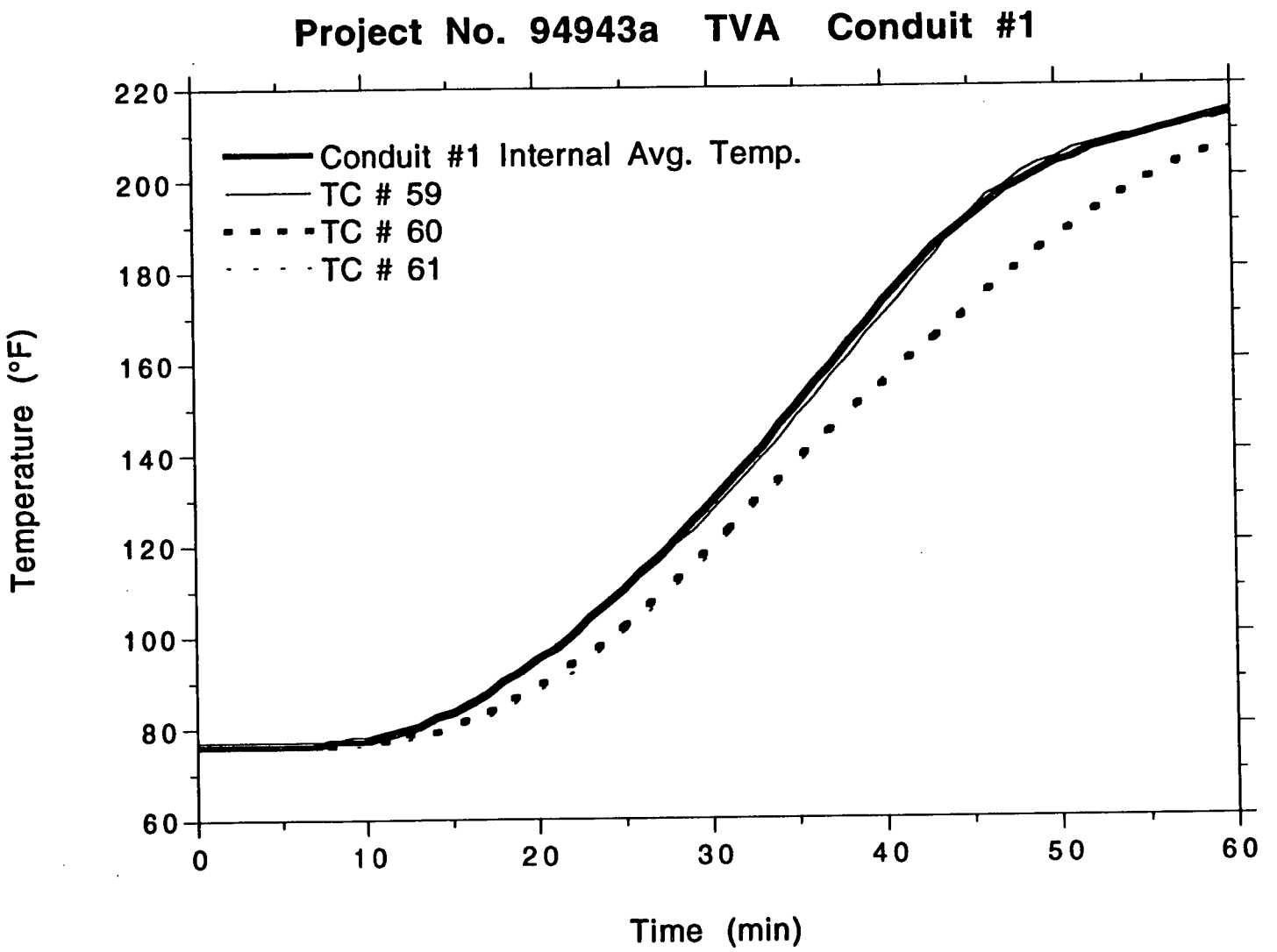


OMEGA POINT LABORATORIES

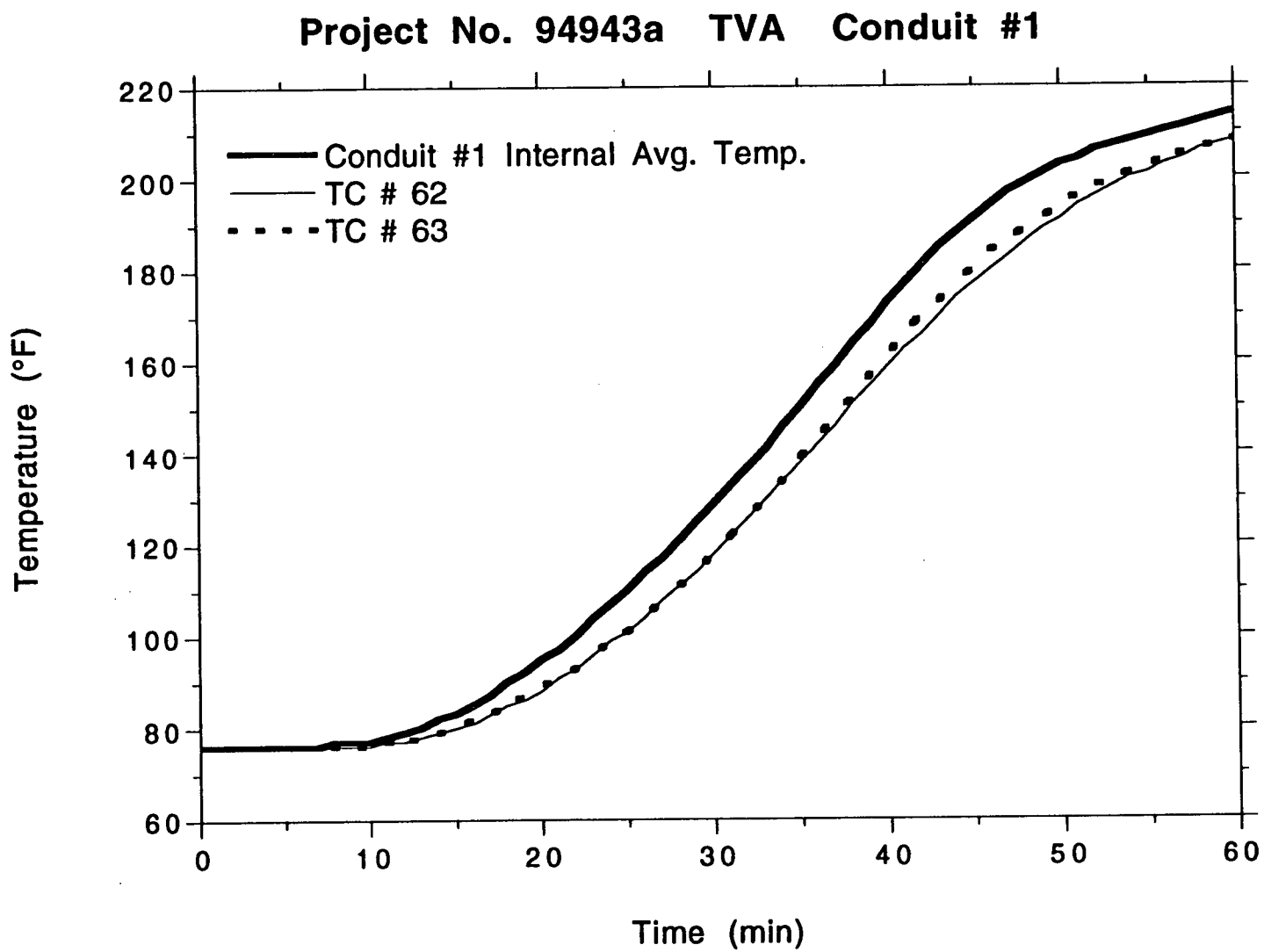

Project No. 94943a TVA Conduit #1
Conduit #1 Internal Avg. Temp.
TC # 50
TC # 51
TC # 52
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)


Project No. 94943a TVA Conduit #1
Conduit #1 Internal Avg. Temp.
TC # 53
TC # 54
TC # 55
Temperature (°F)
220
200
180
160
140
120
100
80
60
0
10
20
30
40
50
60
Time (min)

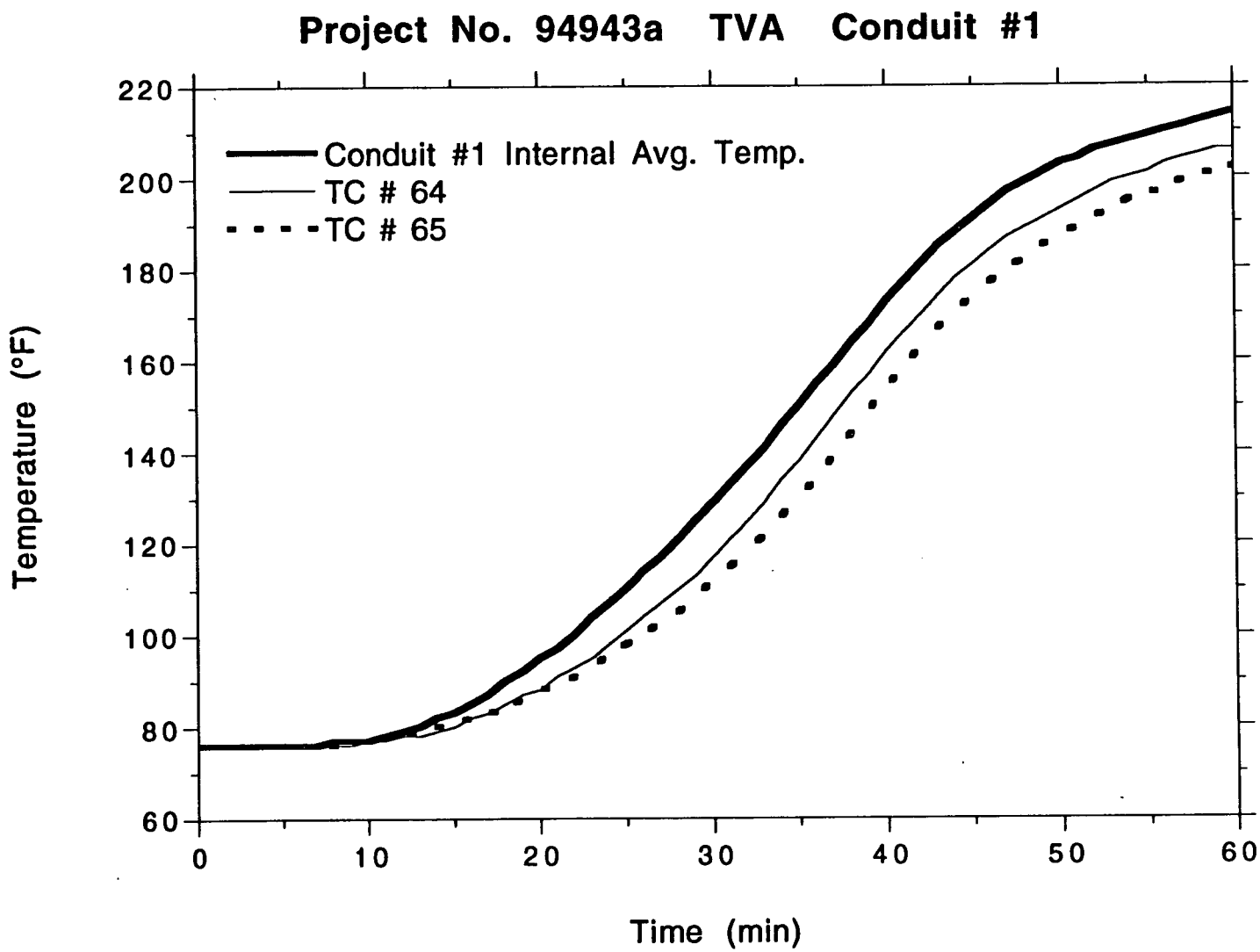

Project No. 94943a TVA Conduit #1
Conduit #1 Internal Avg. Temp.
TC # 56
TC # 57
TC # 58
Temperature (°F)
220
200
180
160
140
120
100
80
60
0
10
20
30
40
50
60
Time (min)



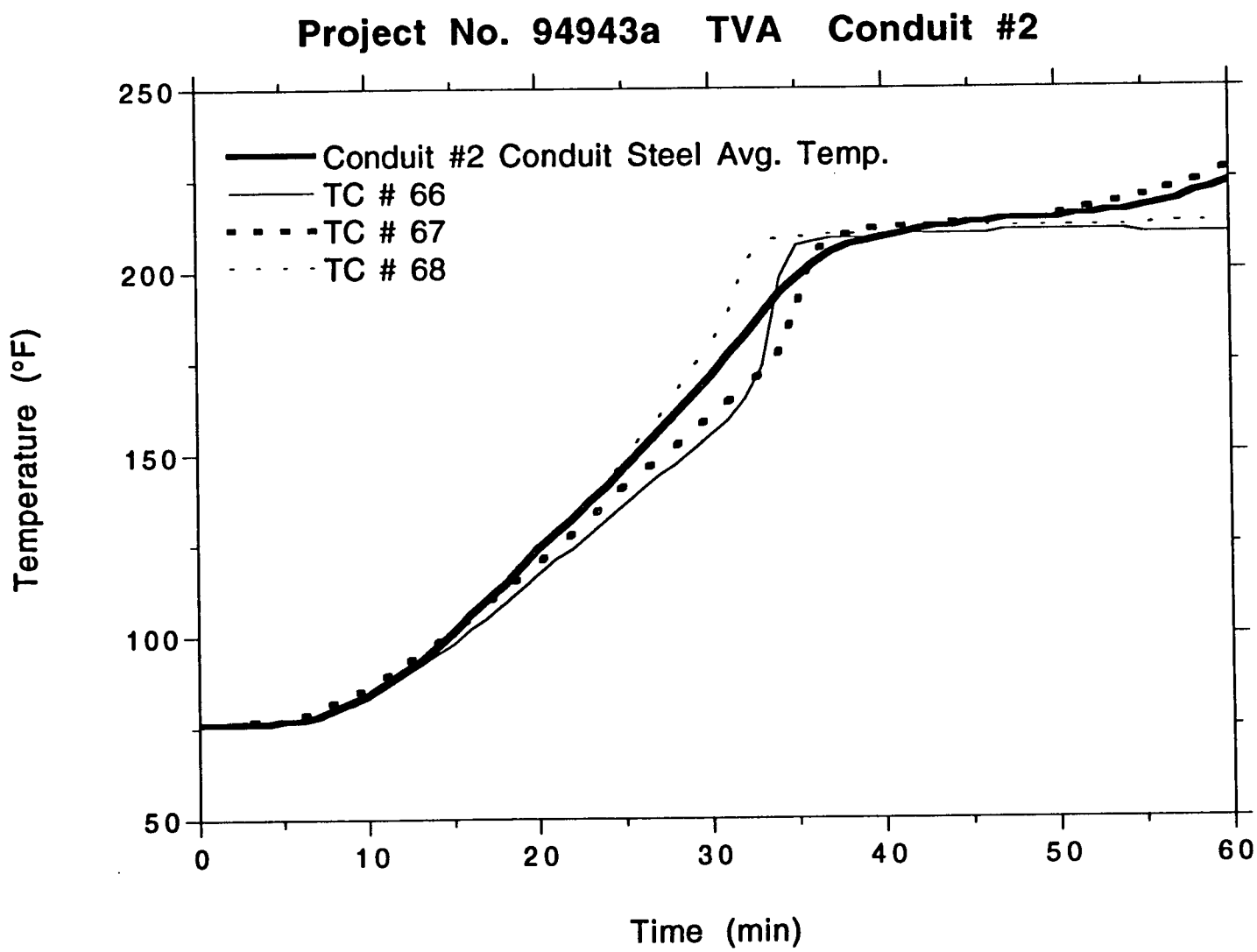
OMEGA POINT LABORATORIES



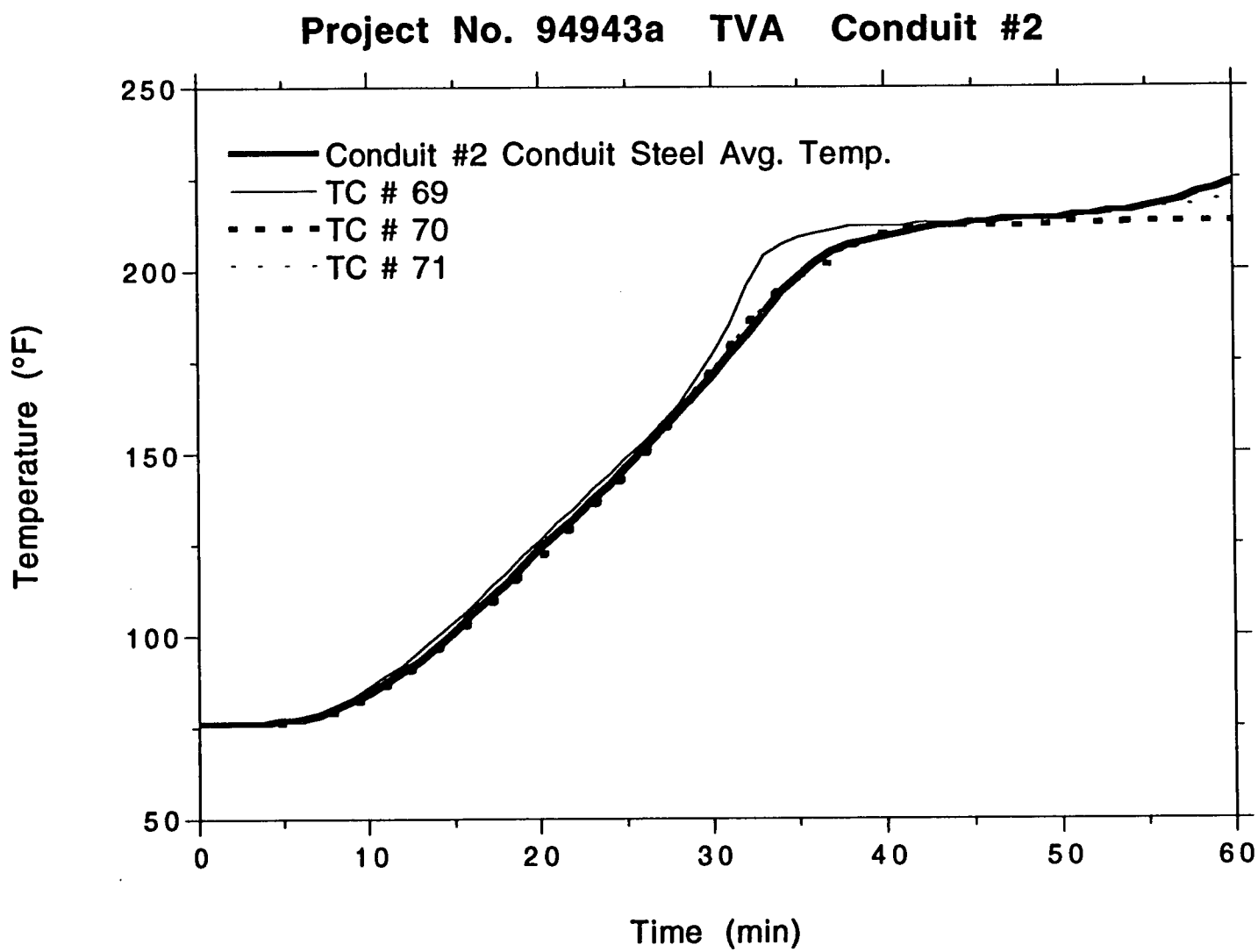
OMEGA POINT LABORATORIES

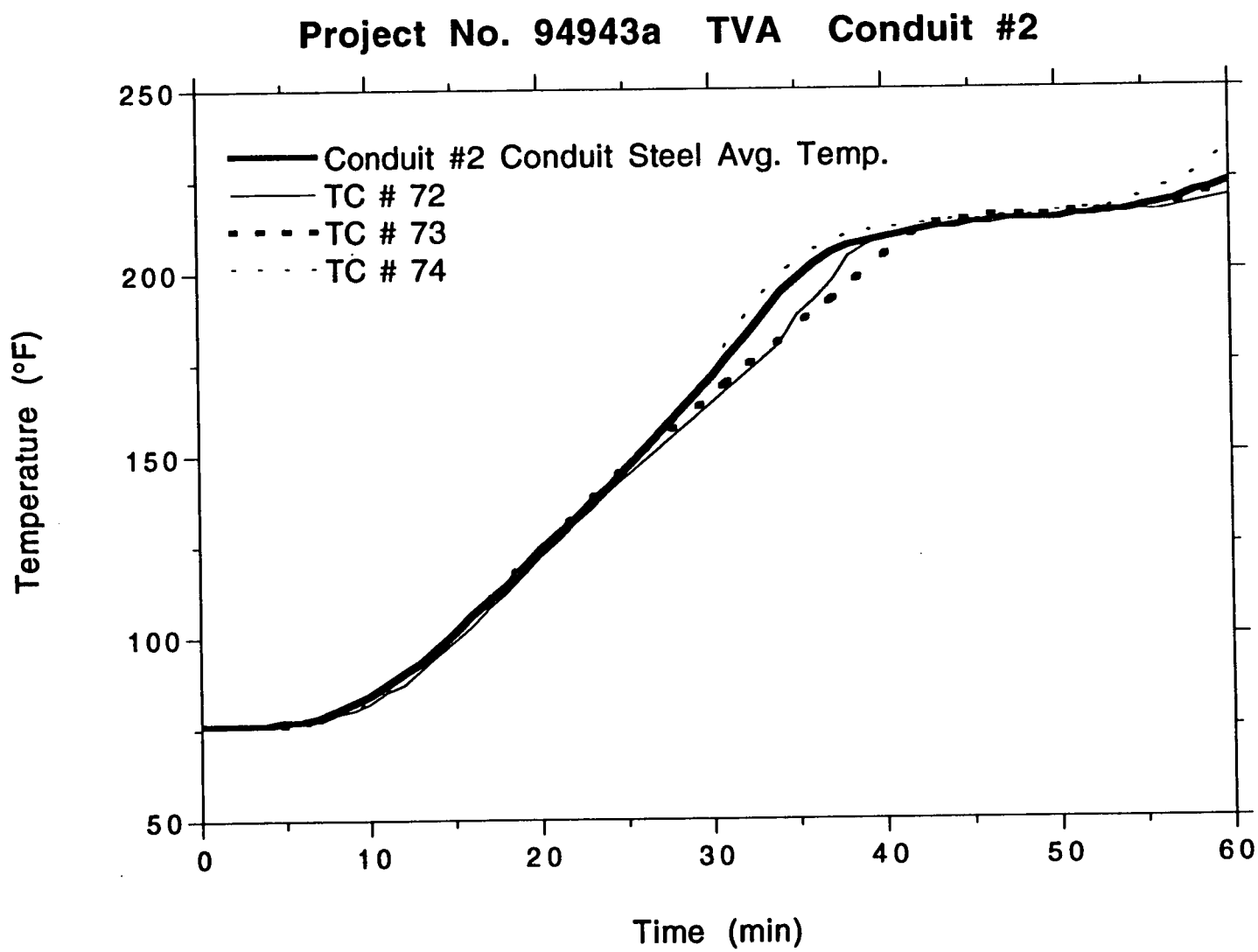


OMEGA POINT LABORATORIES

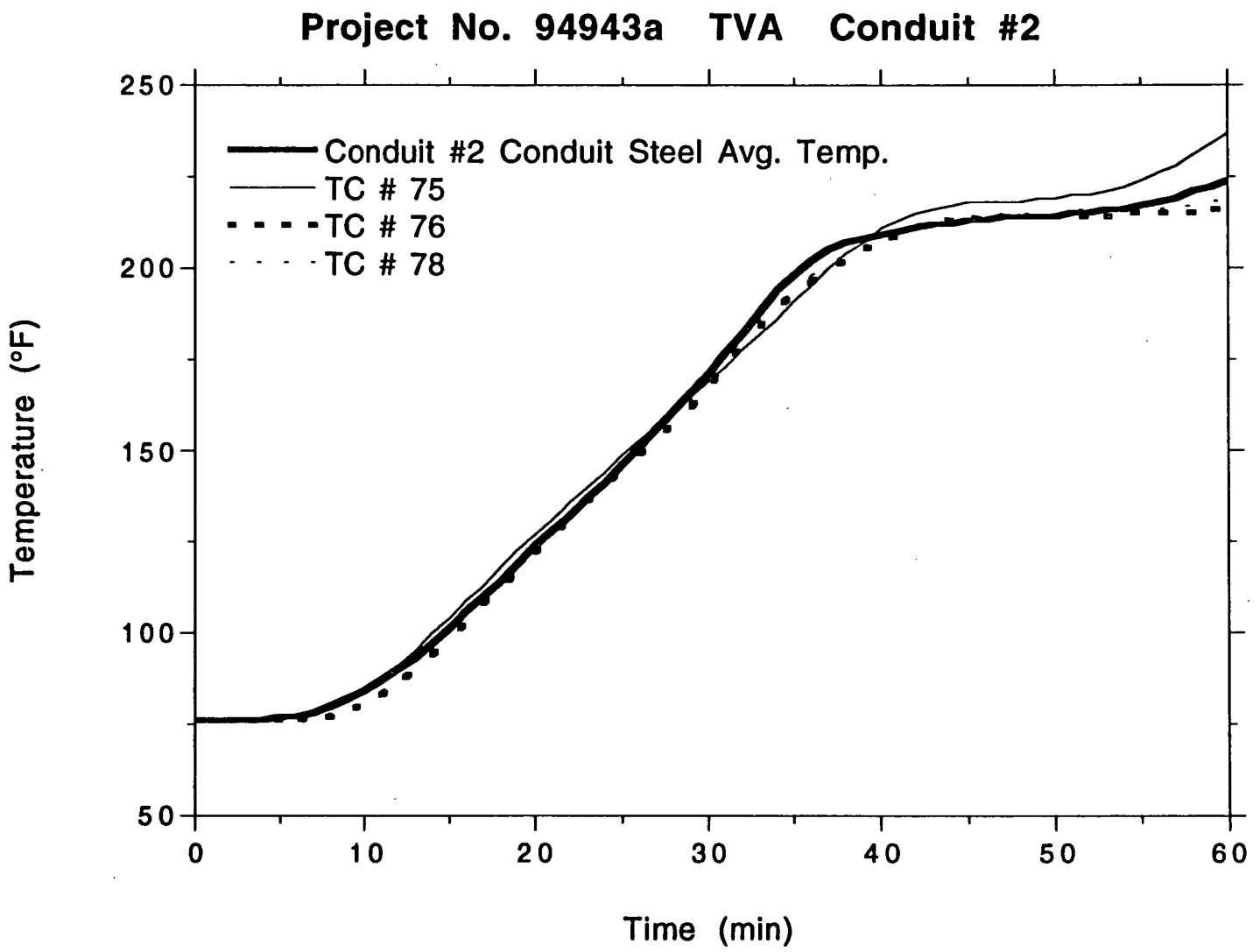


OMEGA POINT LABORATORIES

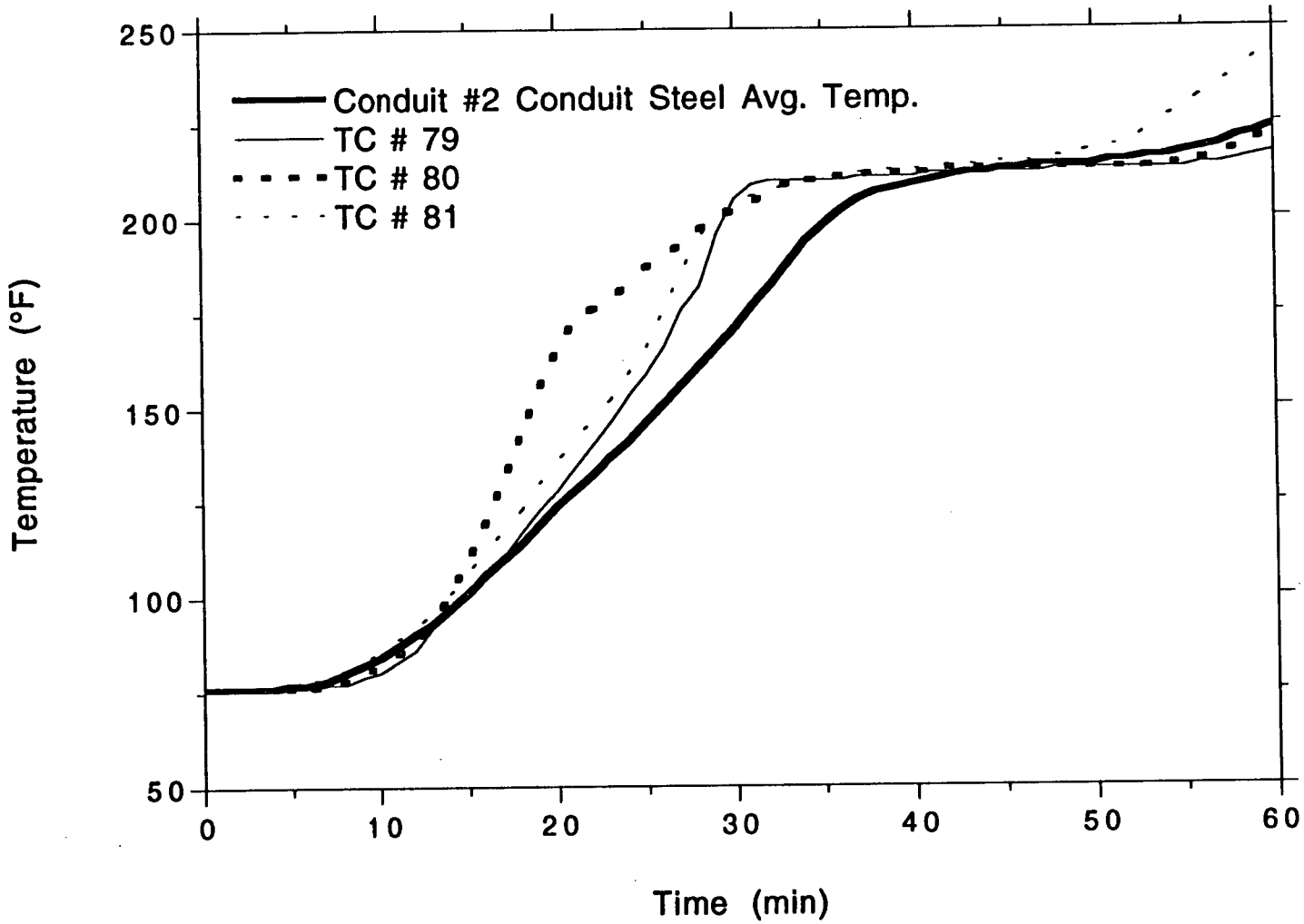

Project No. 94943a TVA Conduit #2
Conduit #2 Conduit Steel Avg. Temp.
TC # 69
TC # 70
TC # 71
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)



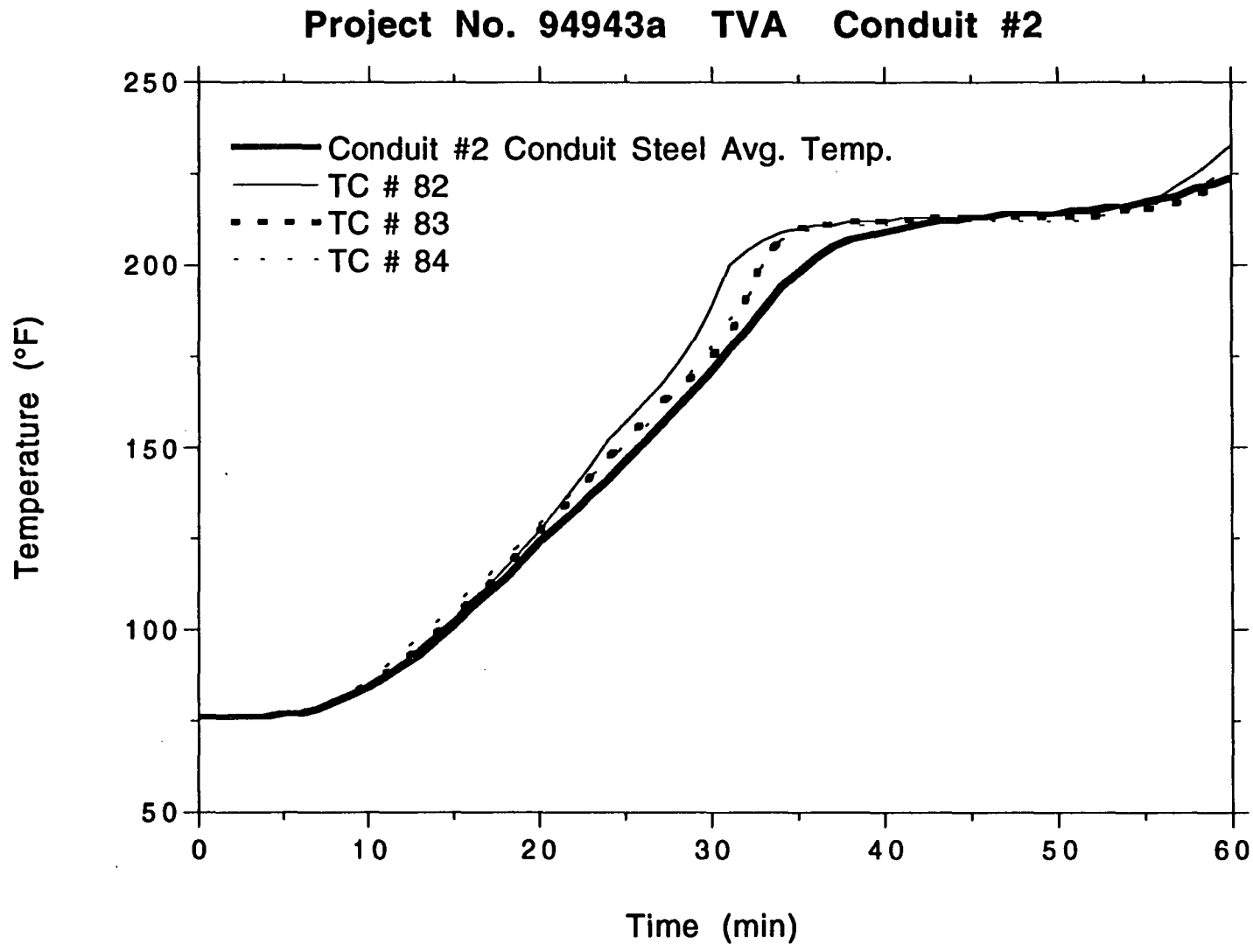
OMEGA POINT LABORATORIES


Project No. 94943a TVA Conduit #2
Conduit #2 Conduit Steel Avg. Temp.
TC # 75
TC # 76
TC # 78
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

Project No. 94943a TVA Conduit #2

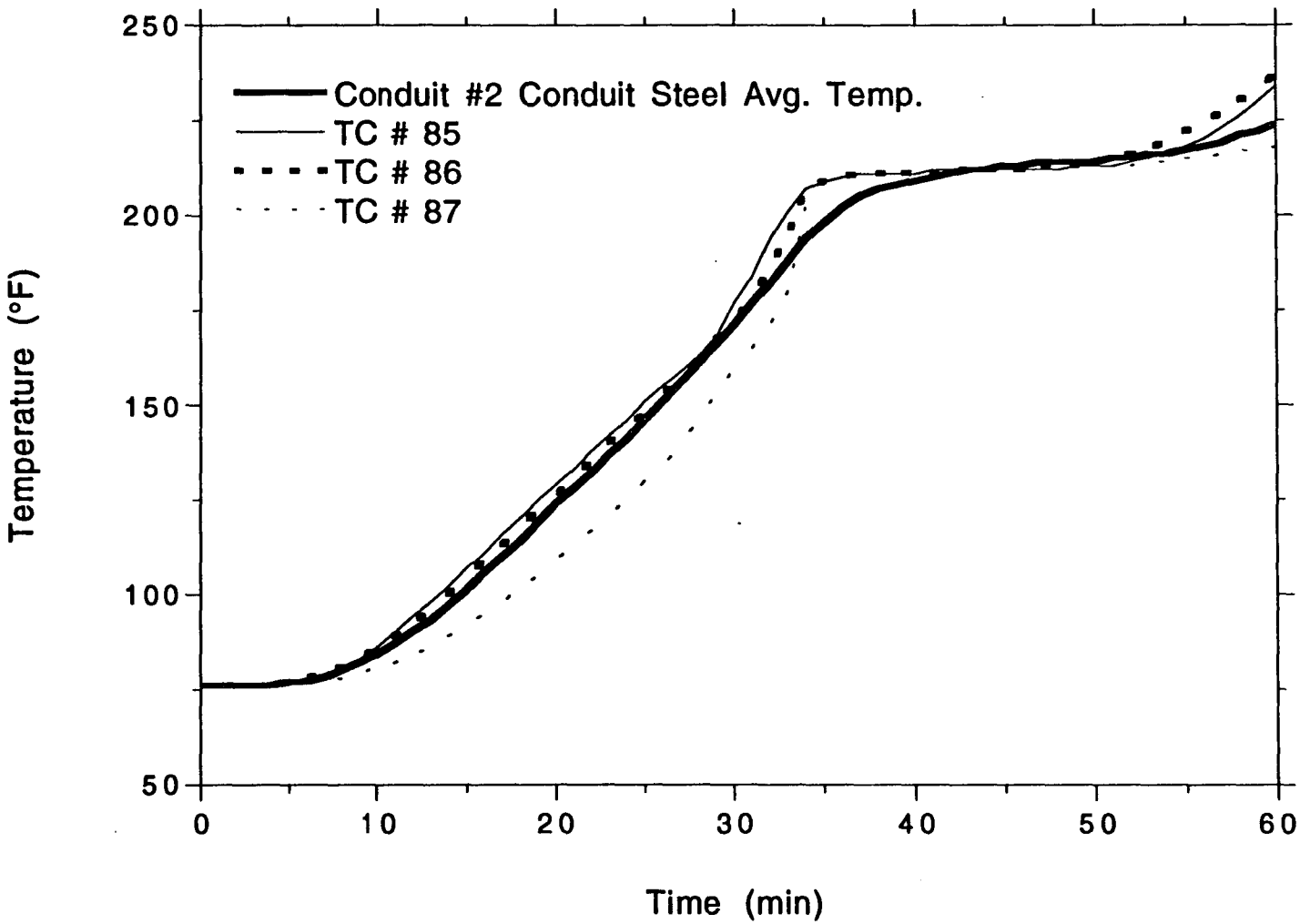


OMEGA POINT LABORATORIES



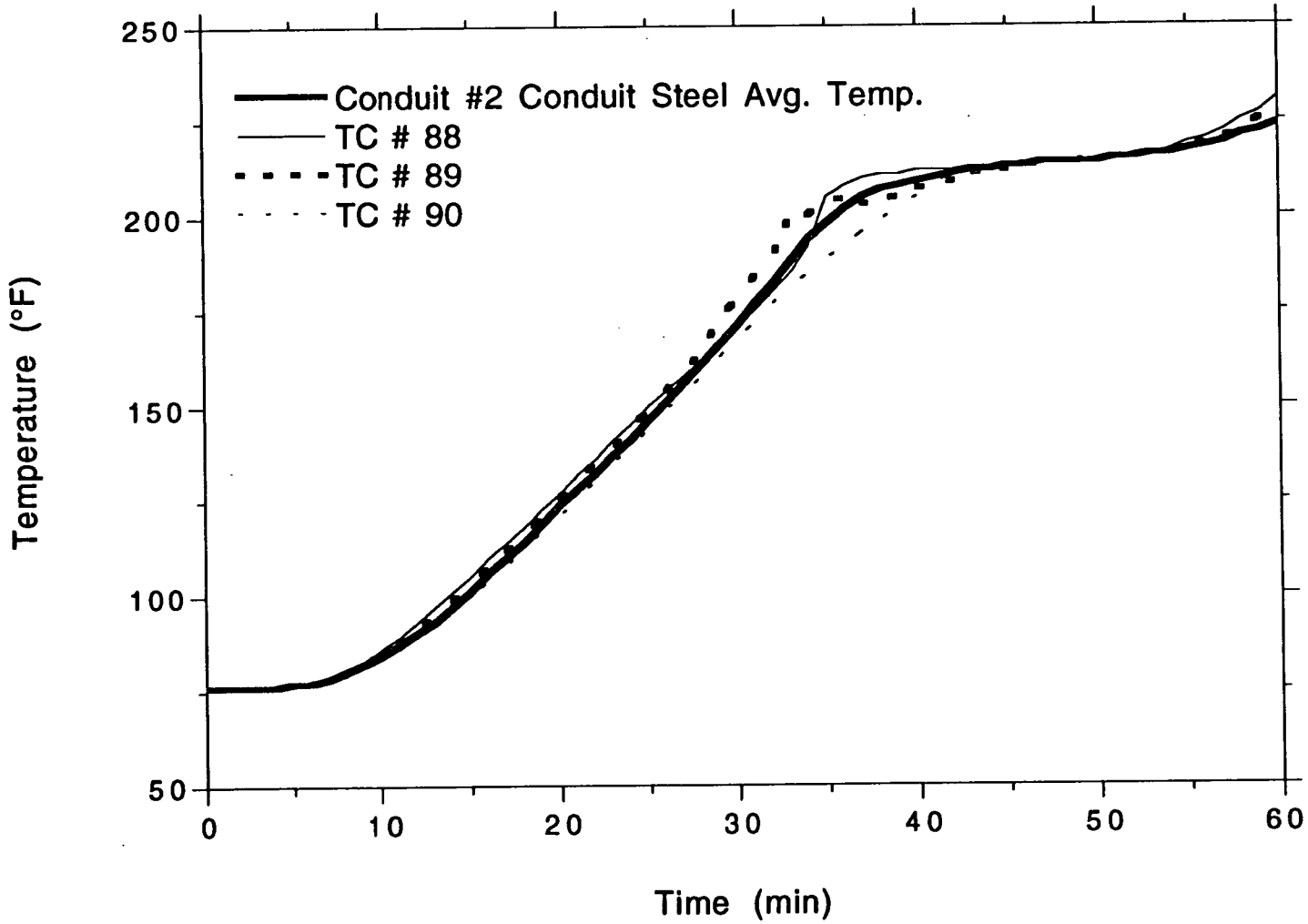
OMEGA POINT LABORATORIES

Project No. 94943a TVA Conduit #2



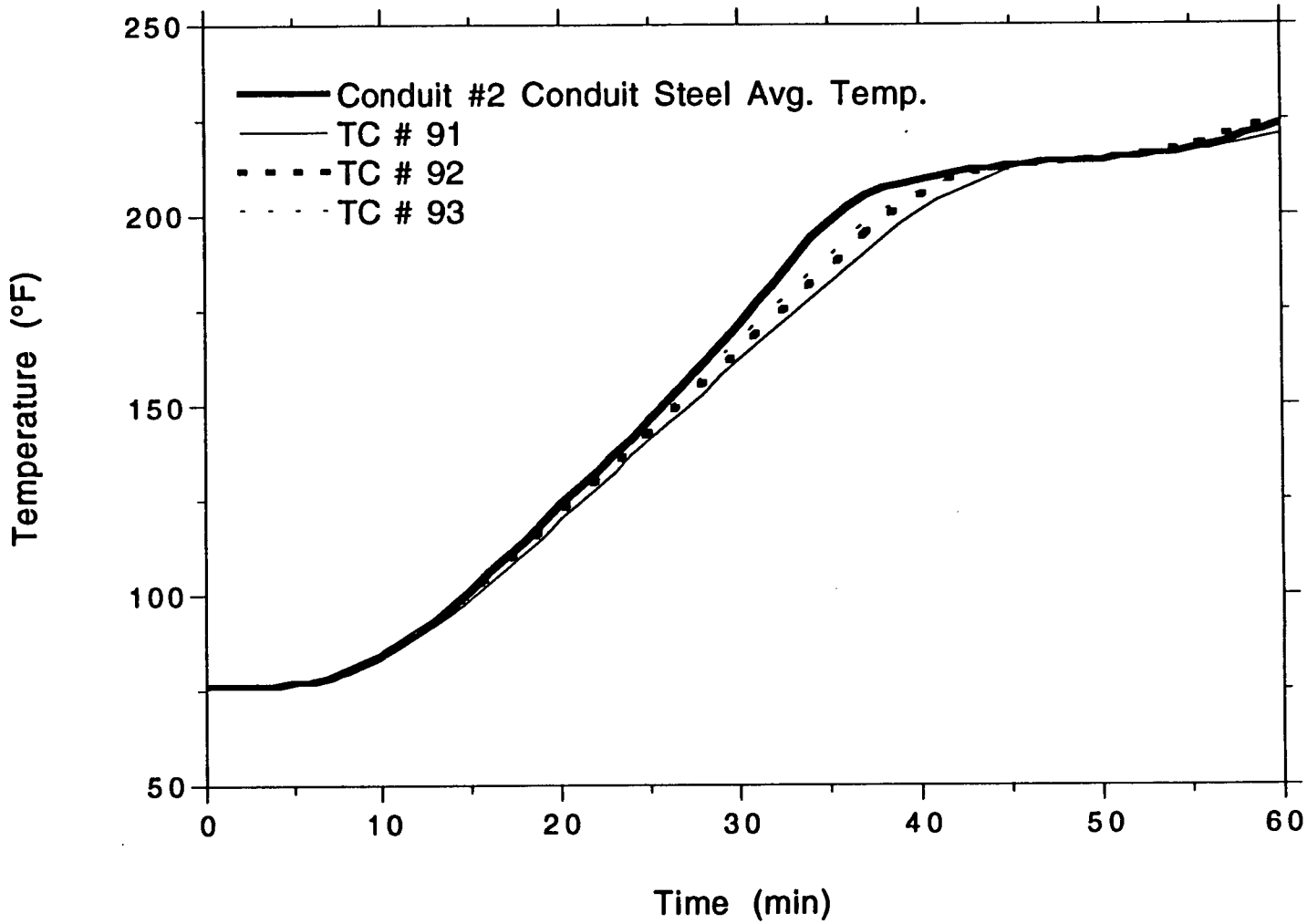
OMEGA POINT LABORATORIES

Project No. 94943a TVA Conduit #2



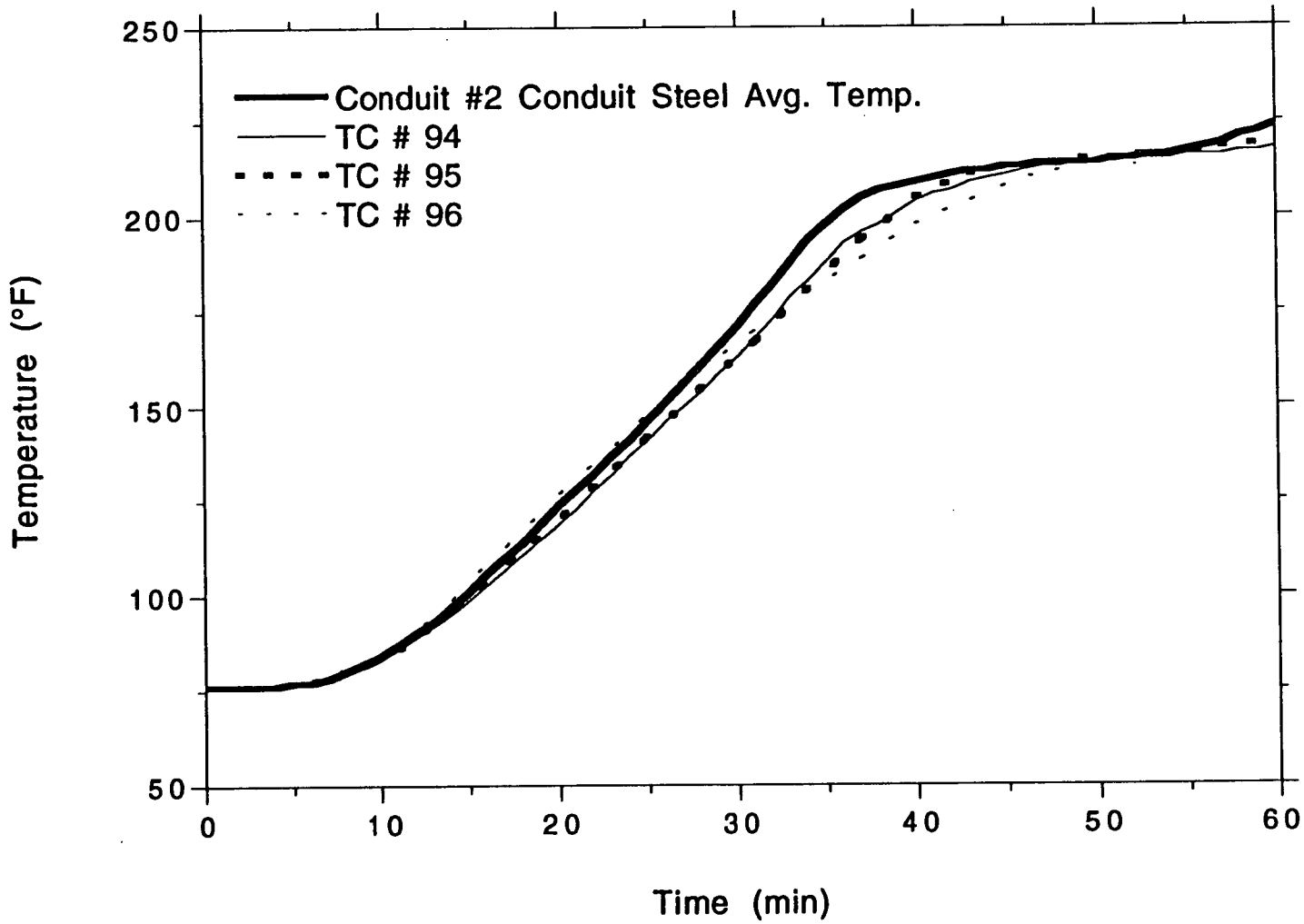
OMEGA POINT LABORATORIES

Project No. 94943a TVA Conduit #2



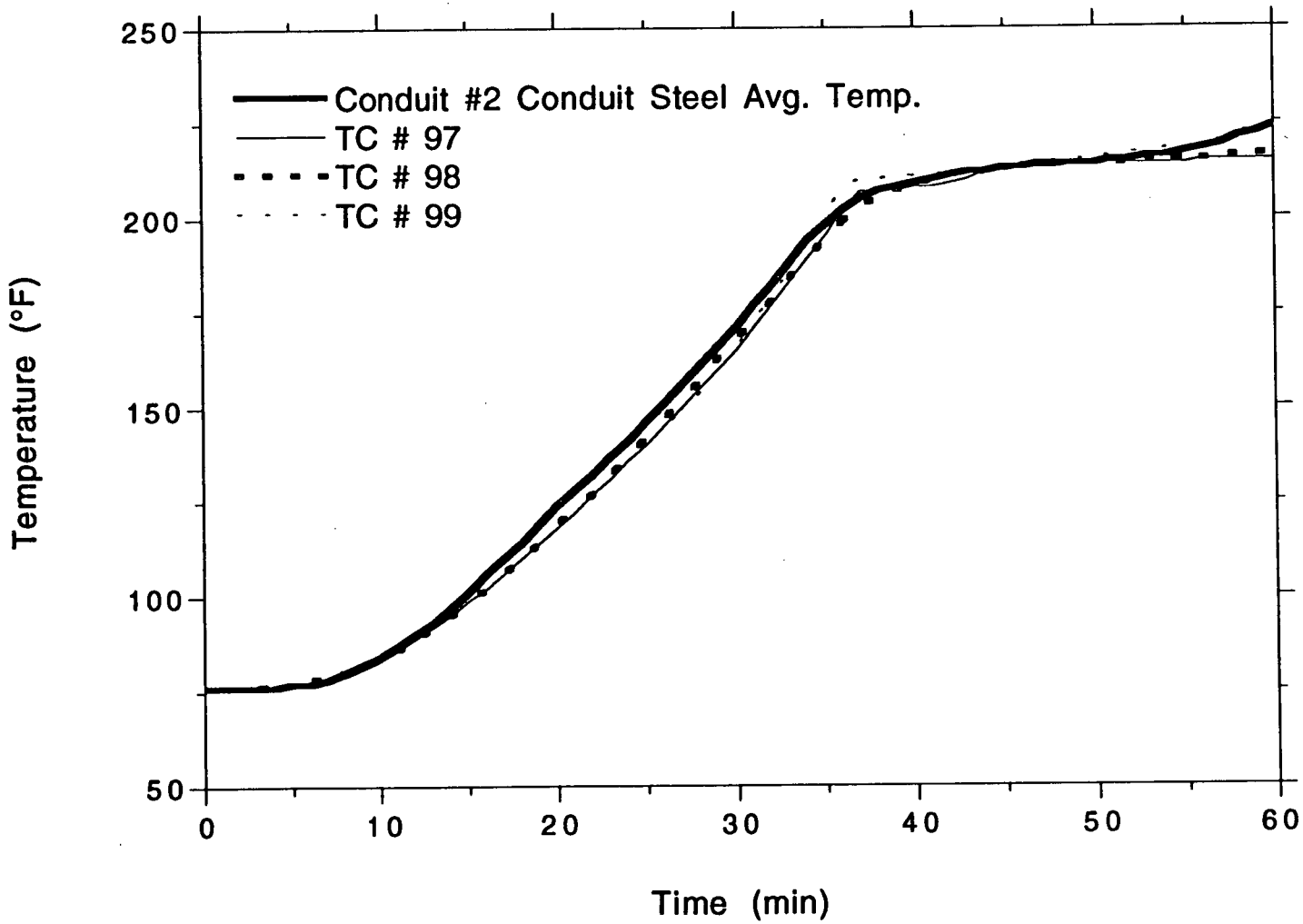
OMEGA POINT LABORATORIES

Project No. 94943a TVA Conduit #2



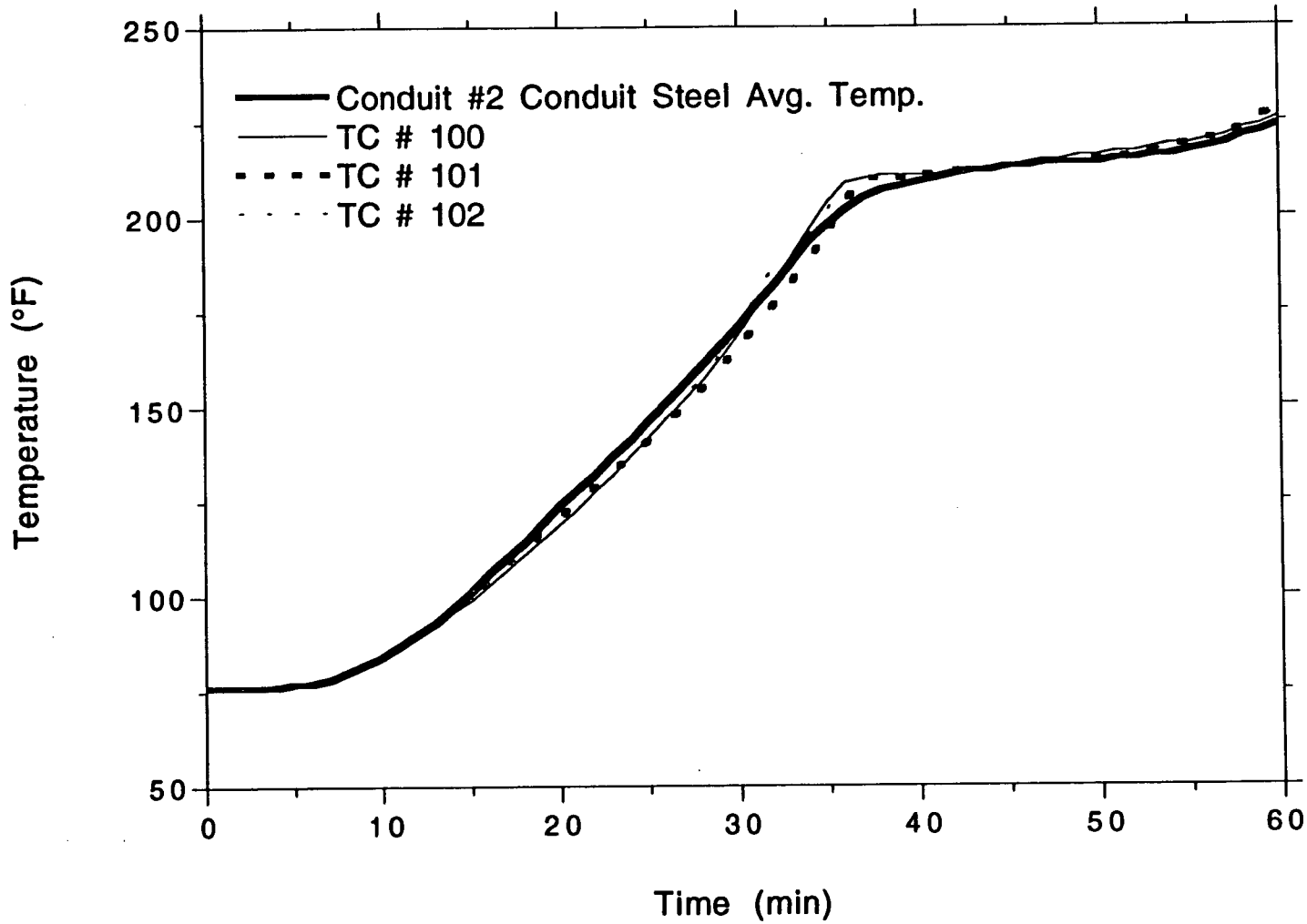
OMEGA POINT LABORATORIES

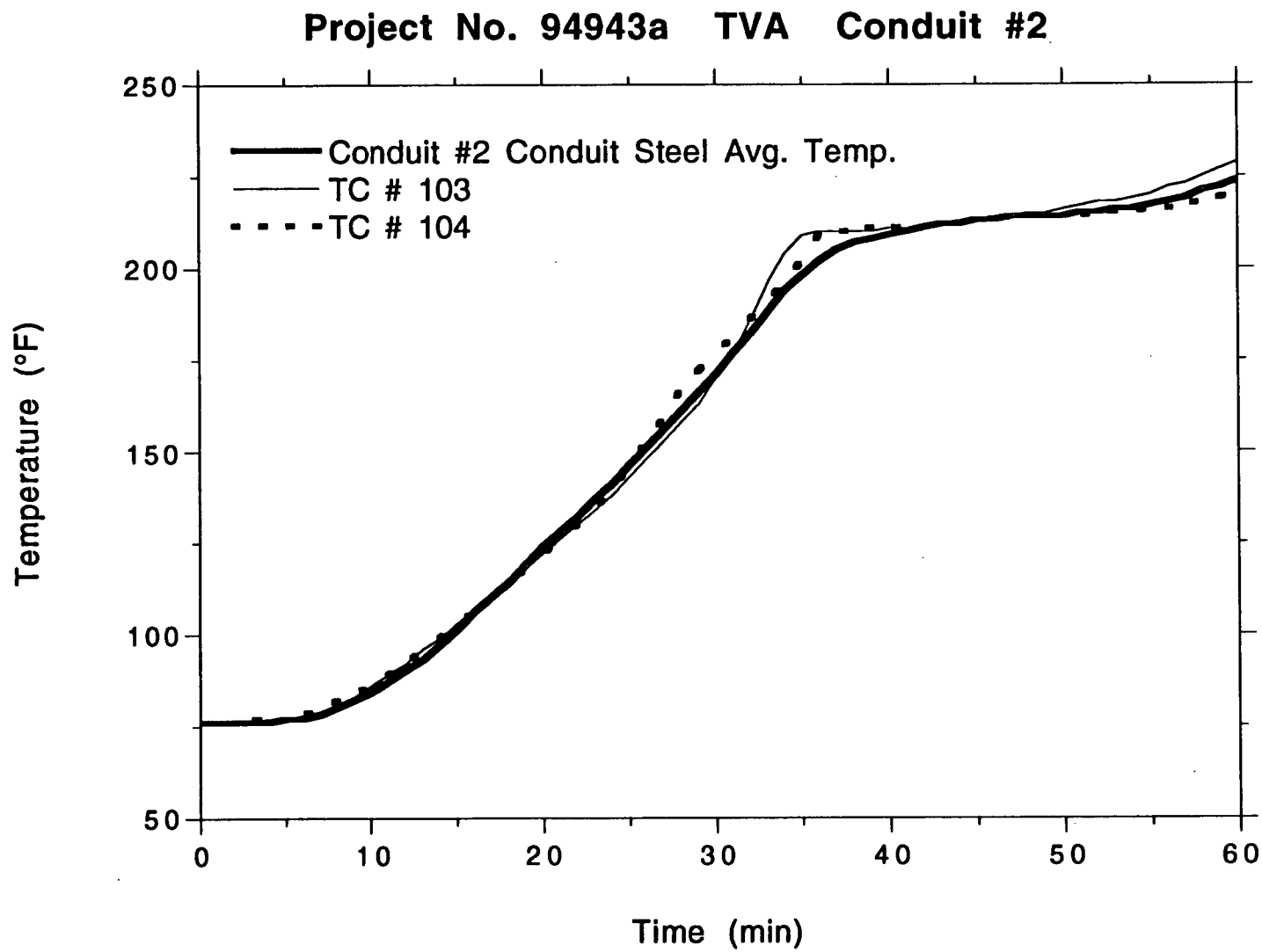
Project No. 94943a TVA Conduit #2

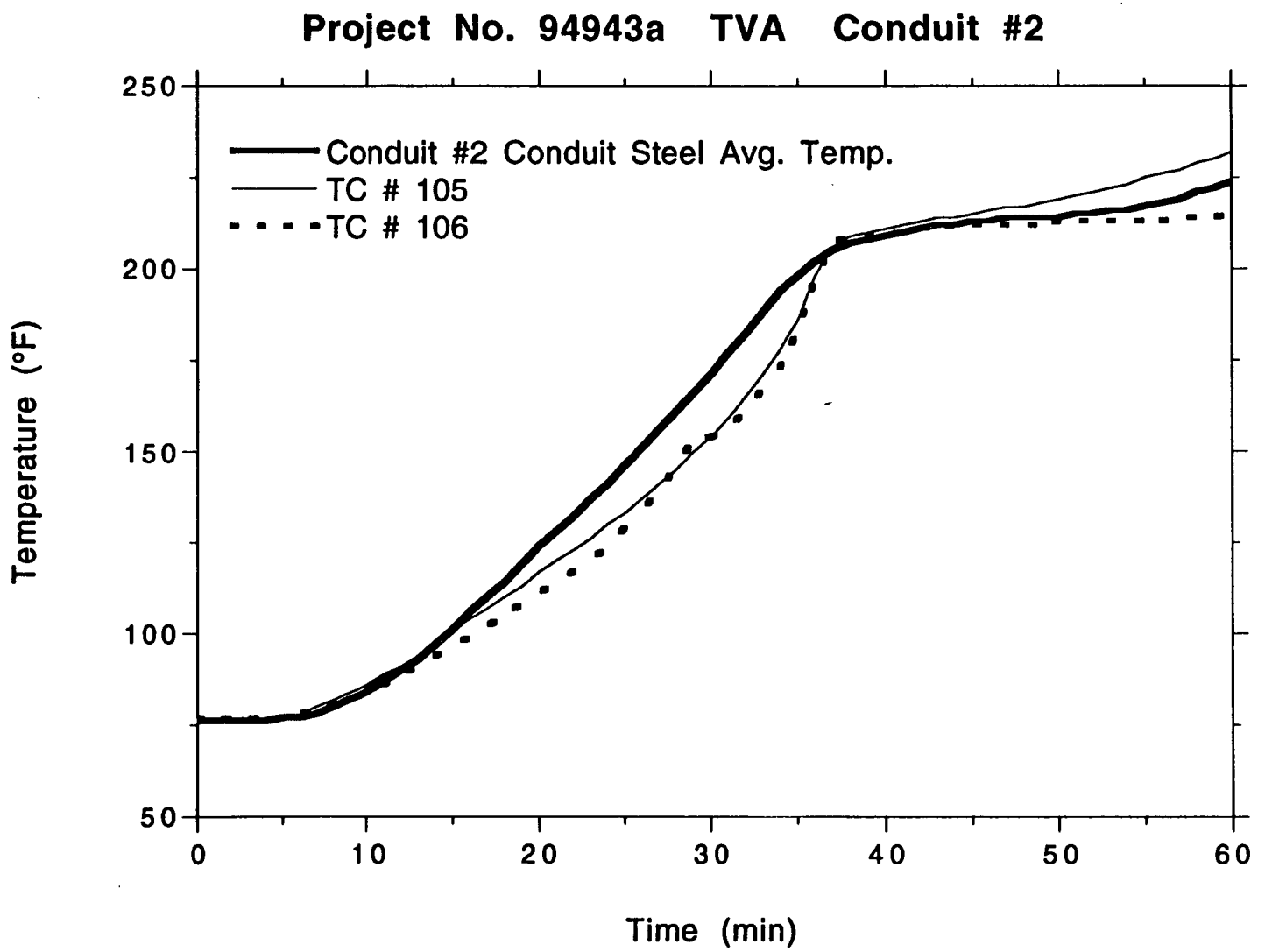


OMEGA POINT LABORATORIES

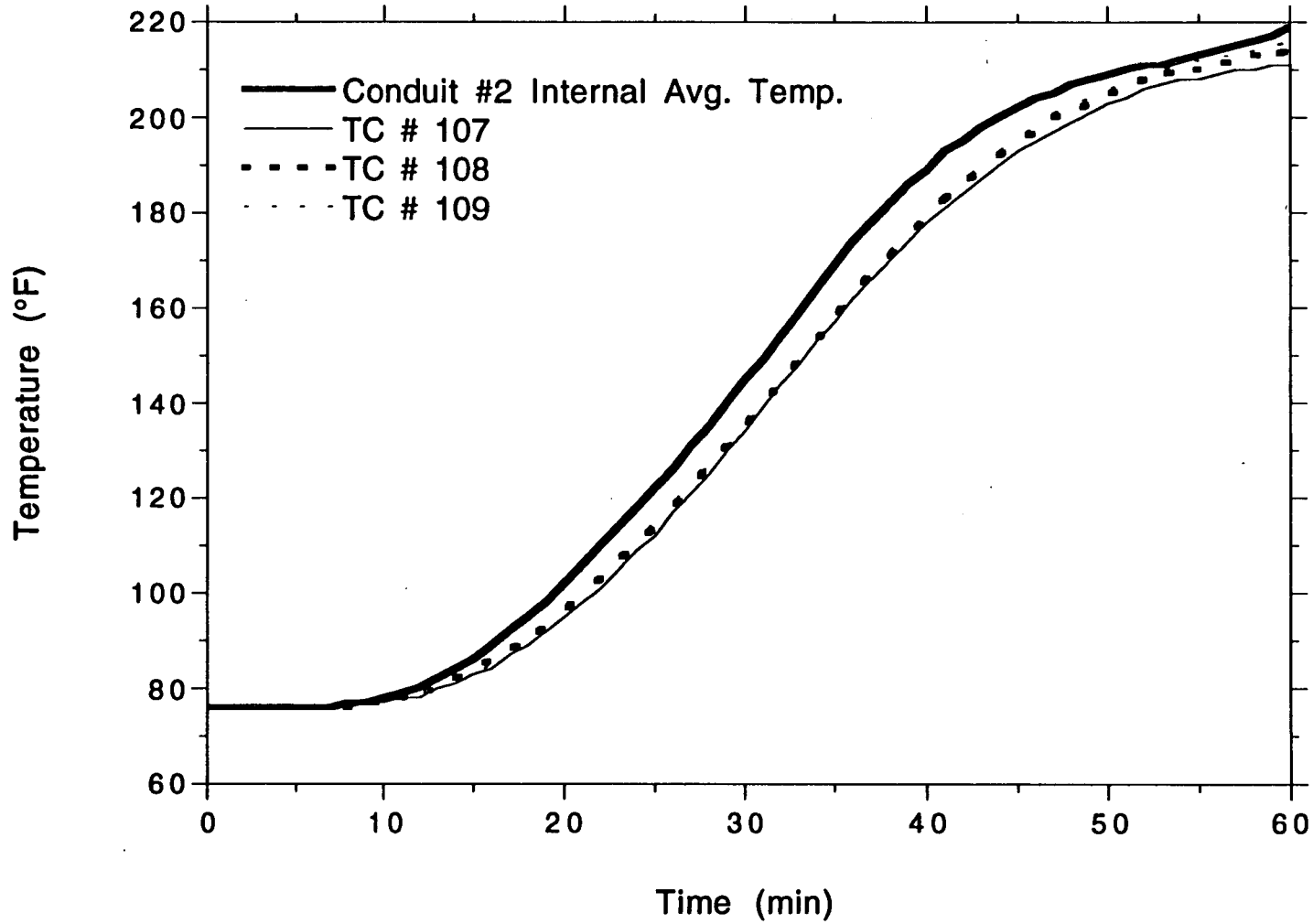
Project No. 94943a TVA Conduit #2

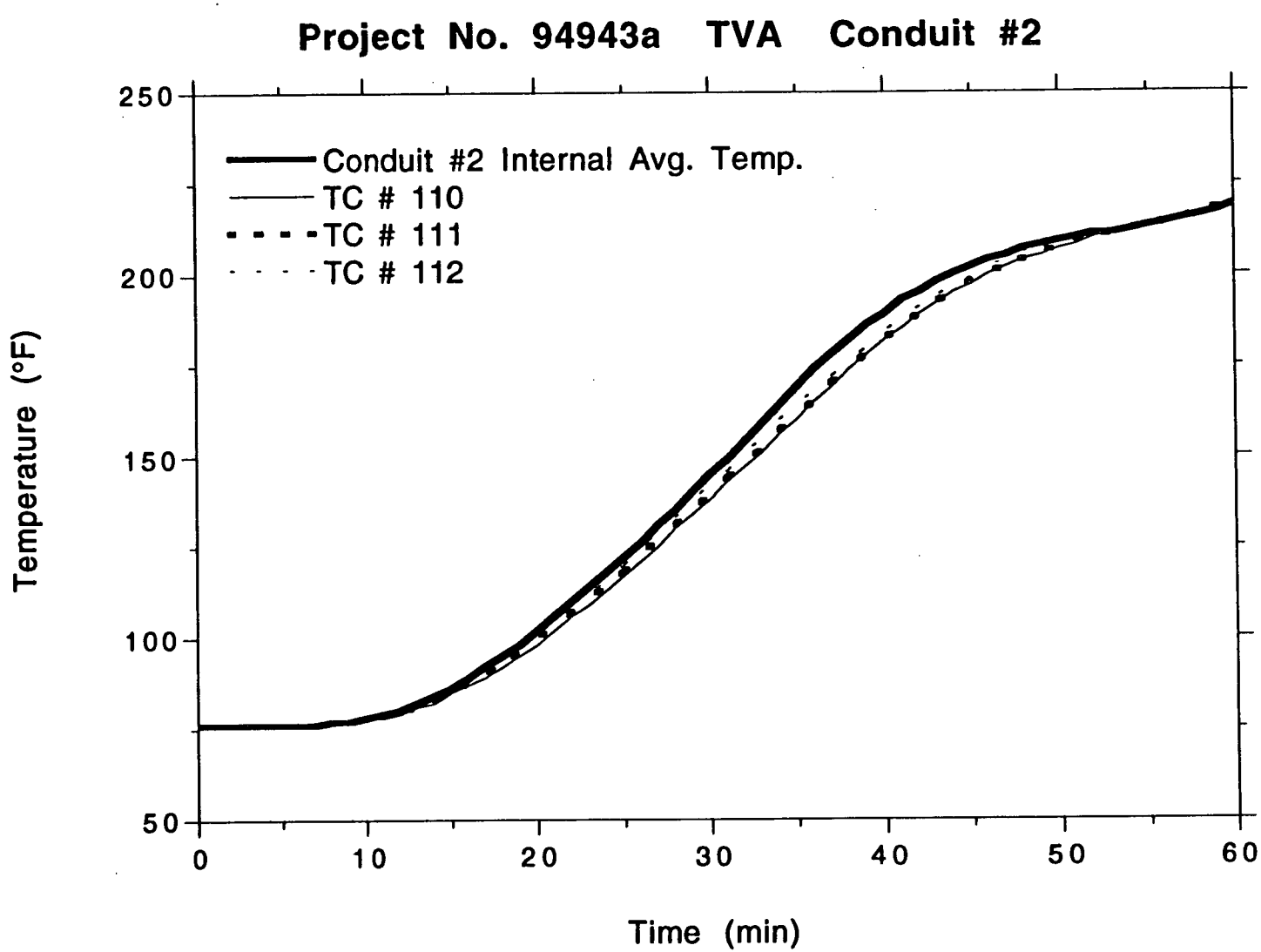



Project No. 94943a TVA Conduit #2
Conduit #2 Conduit Steel Avg. Temp.
TC # 103
TC # 104
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

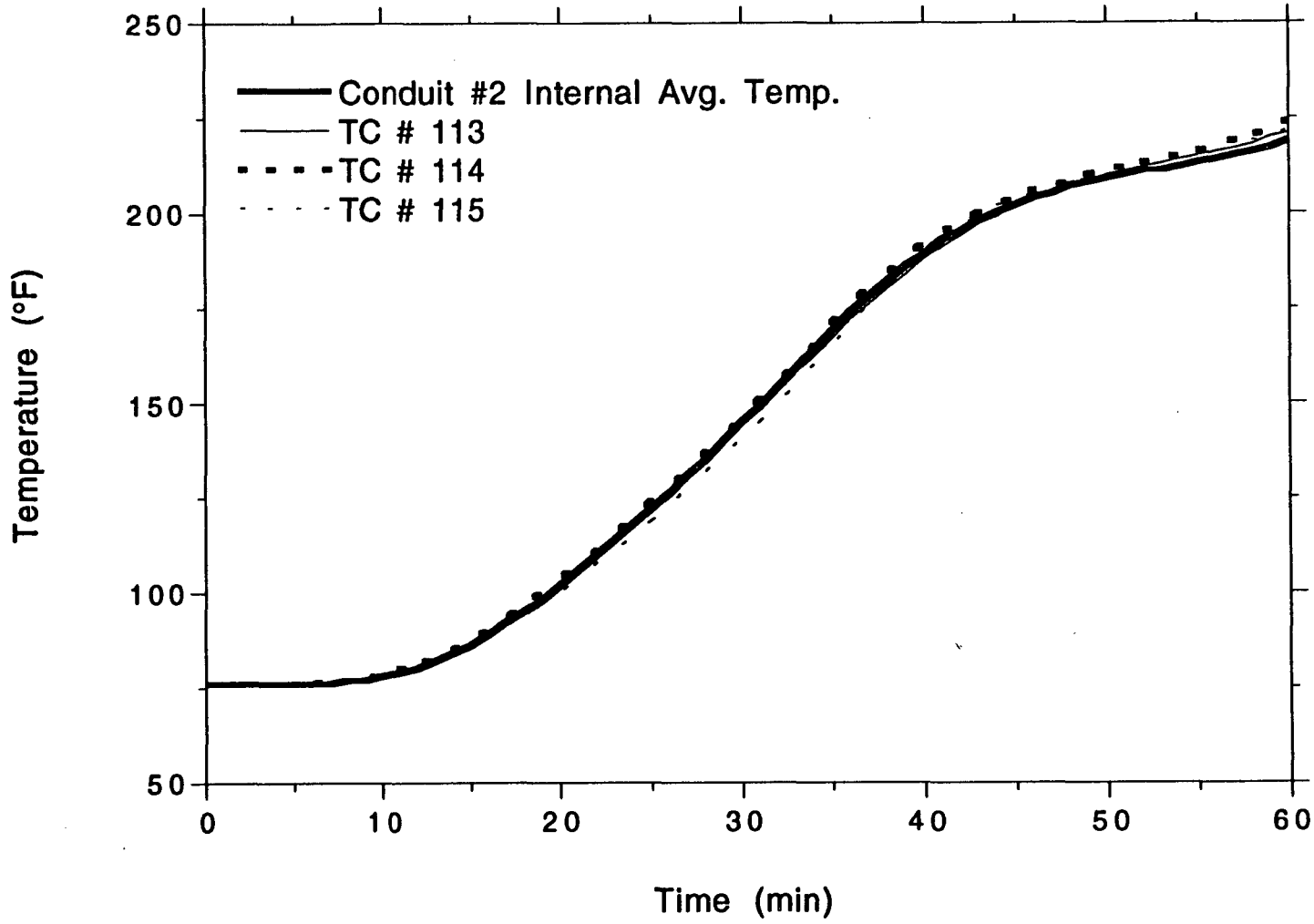

Project No. 94943a TVA Conduit #2
Conduit #2 Conduit Steel Avg. Temp.
TC # 105
TC # 106
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

Project No. 94943a TVA Conduit #2

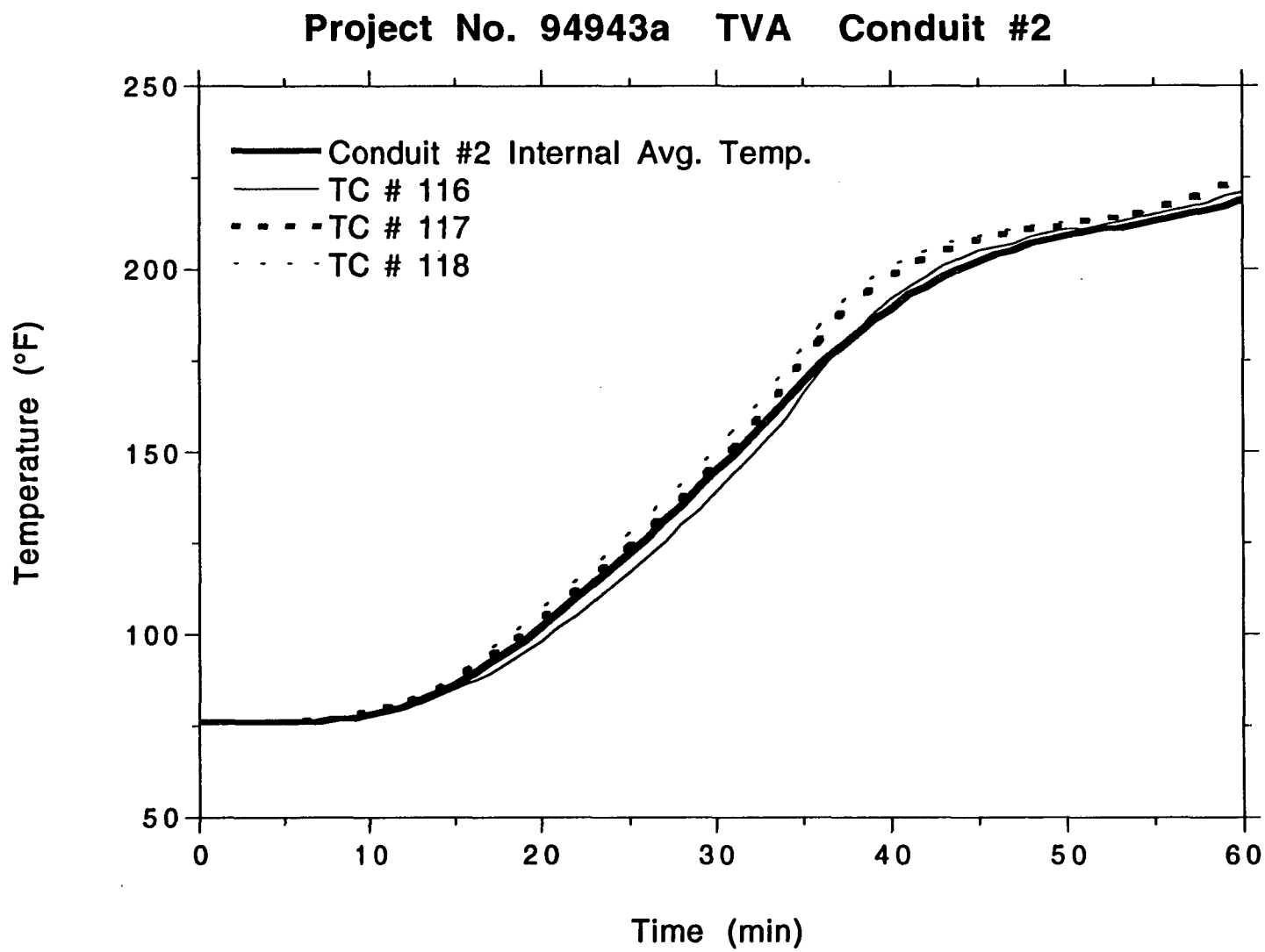



Project No. 94943a TVA Conduit #2
Conduit #2 Internal Avg. Temp.
TC # 110
TC # 111
TC # 112
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

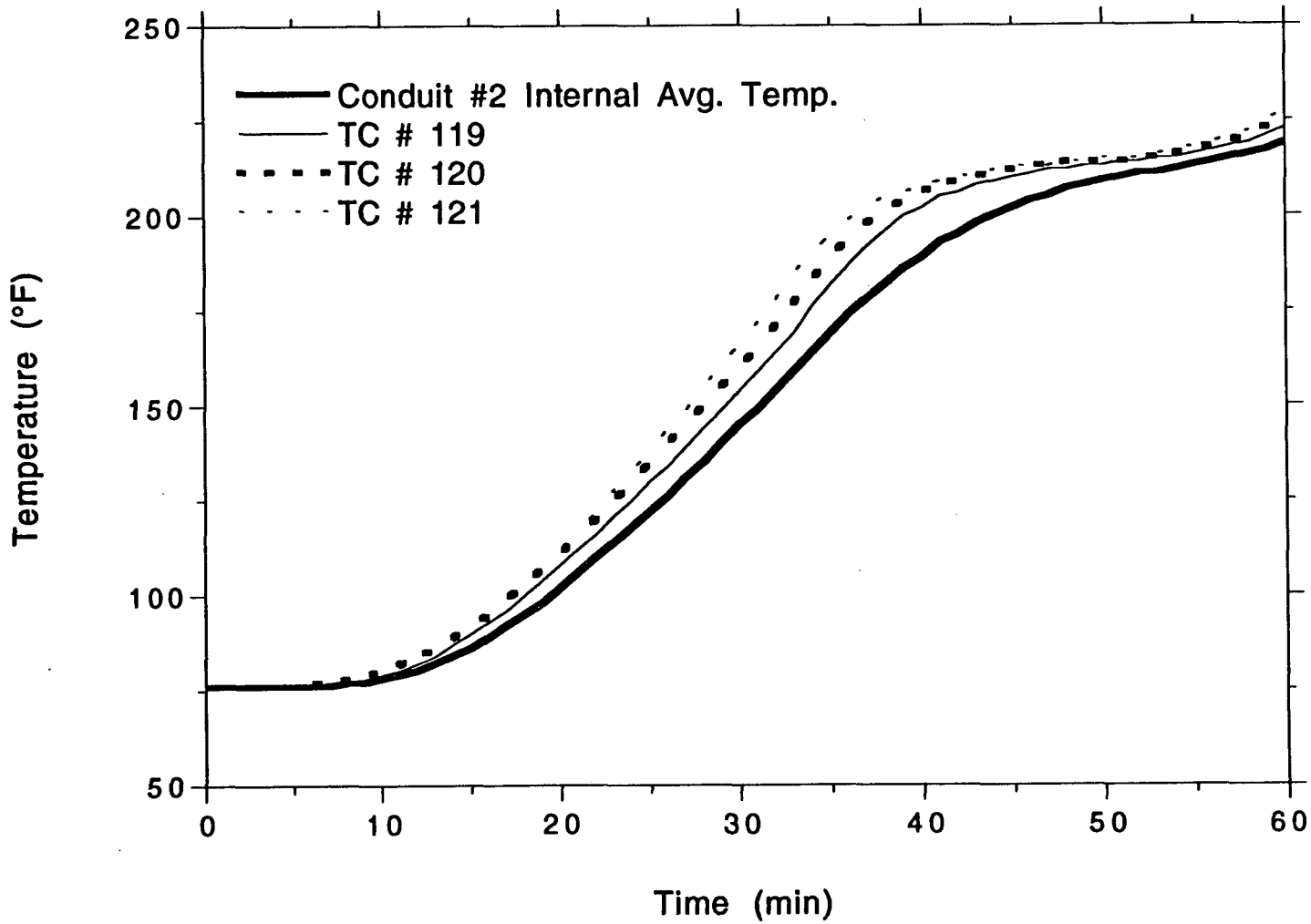
Project No. 94943a TVA Conduit #2



OMEGA POINT LABORATORIES

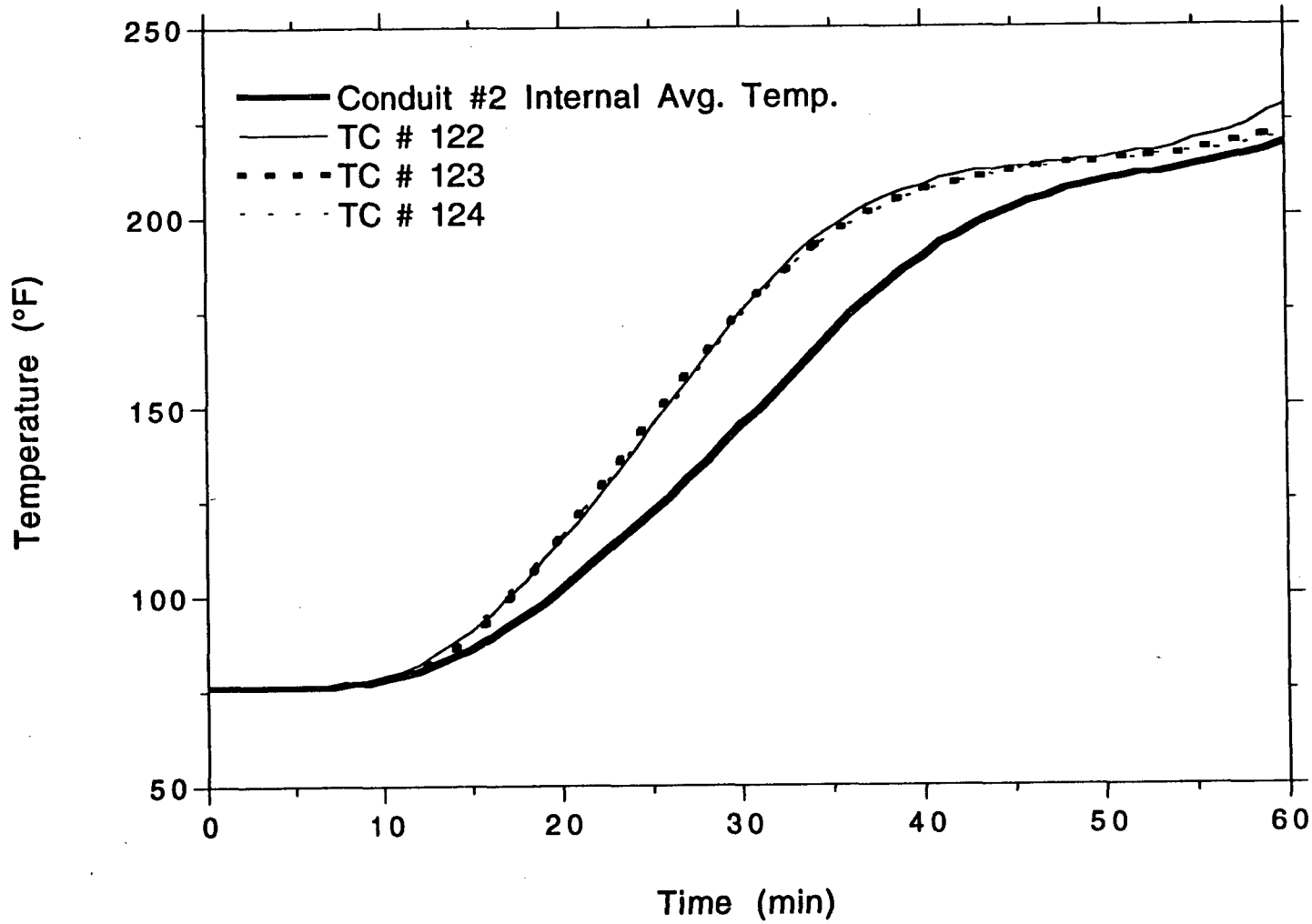

Project No. 94943a TVA Conduit #2
Conduit #2 Internal Avg. Temp.
TC # 116
TC # 117
TC # 118
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

Project No. 94943a TVA Conduit #2

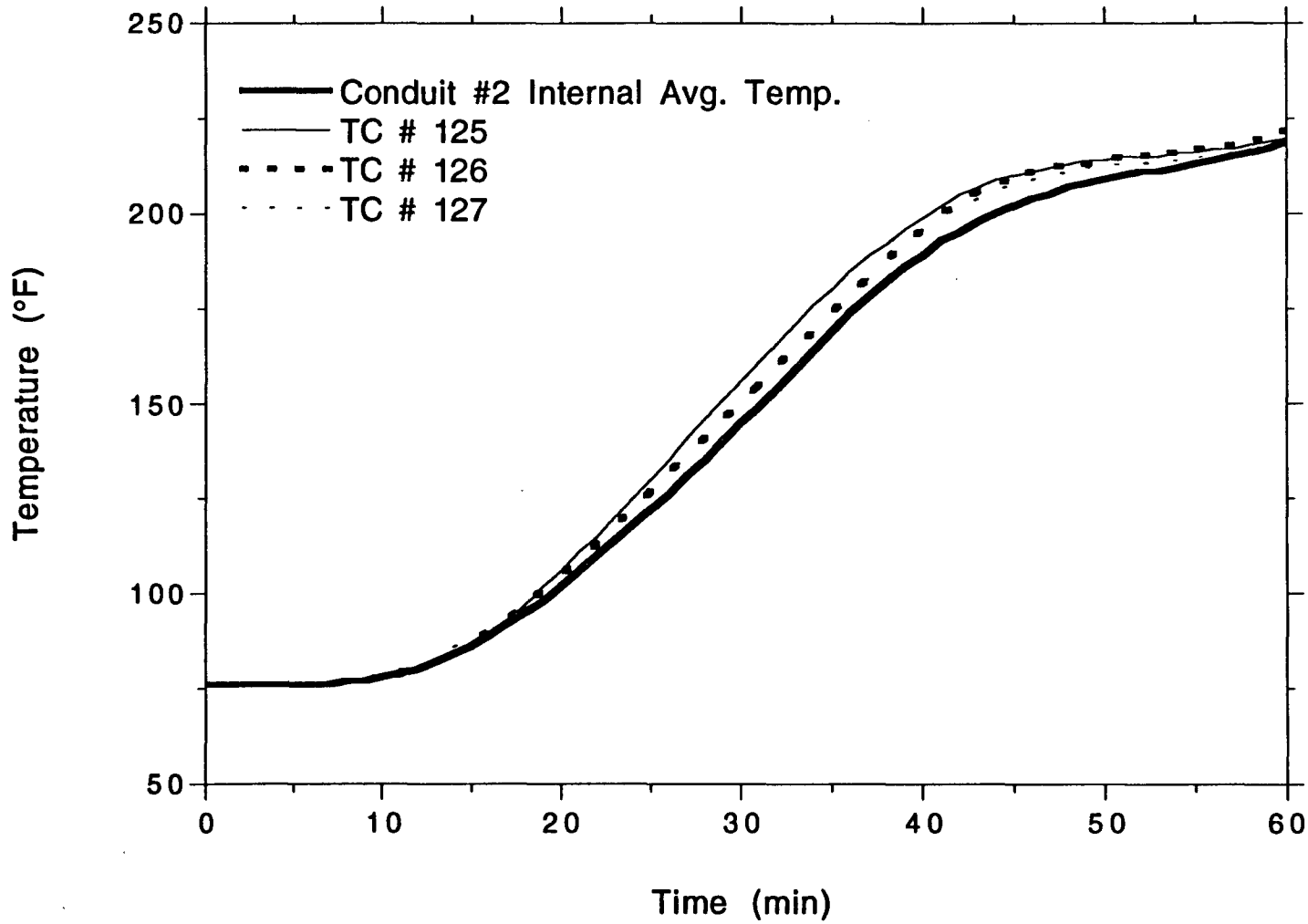


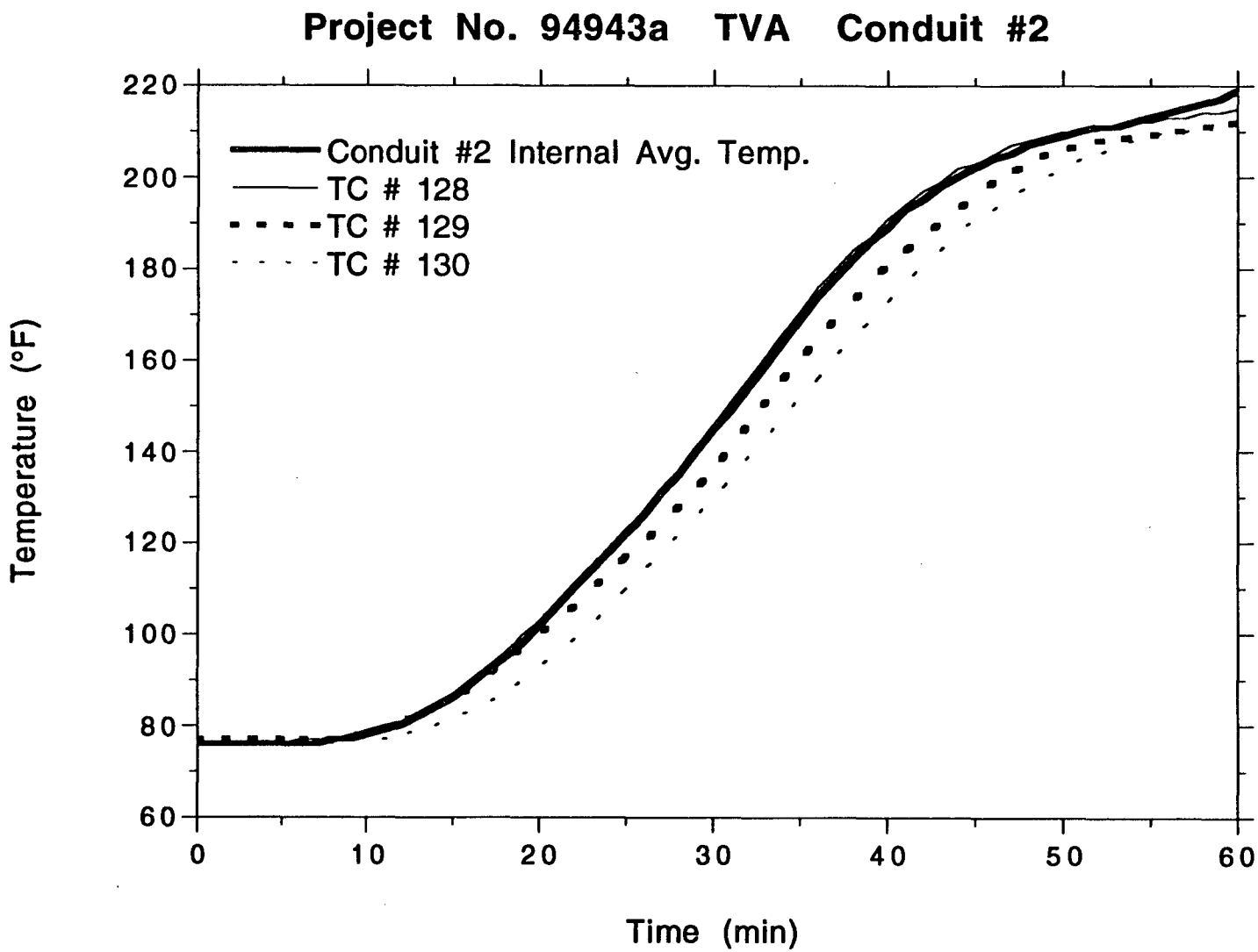
OMEGA POINT LABORATORIES

Project No. 94943a TVA Conduit #2

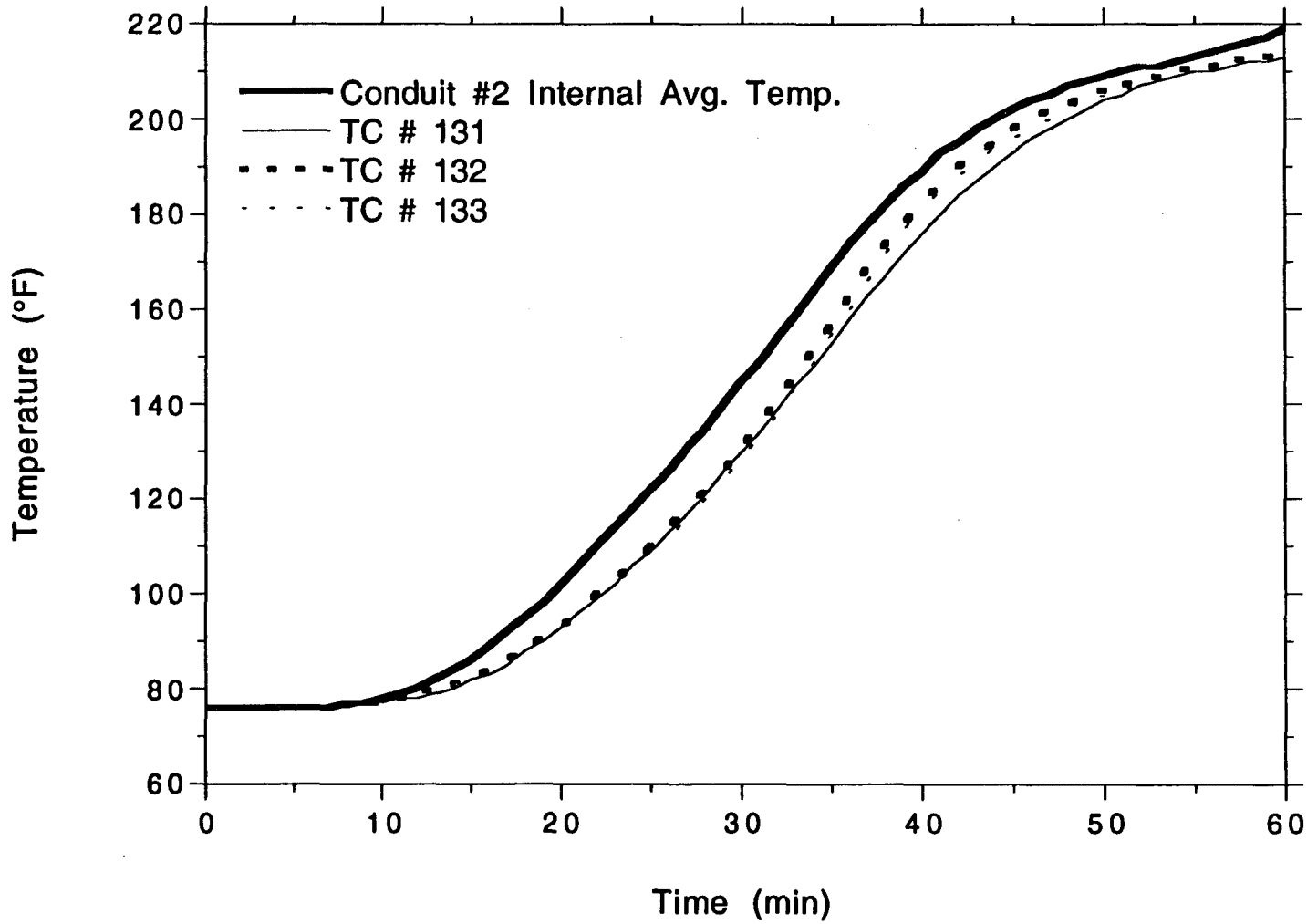


Project No. 94943a TVA Conduit #2

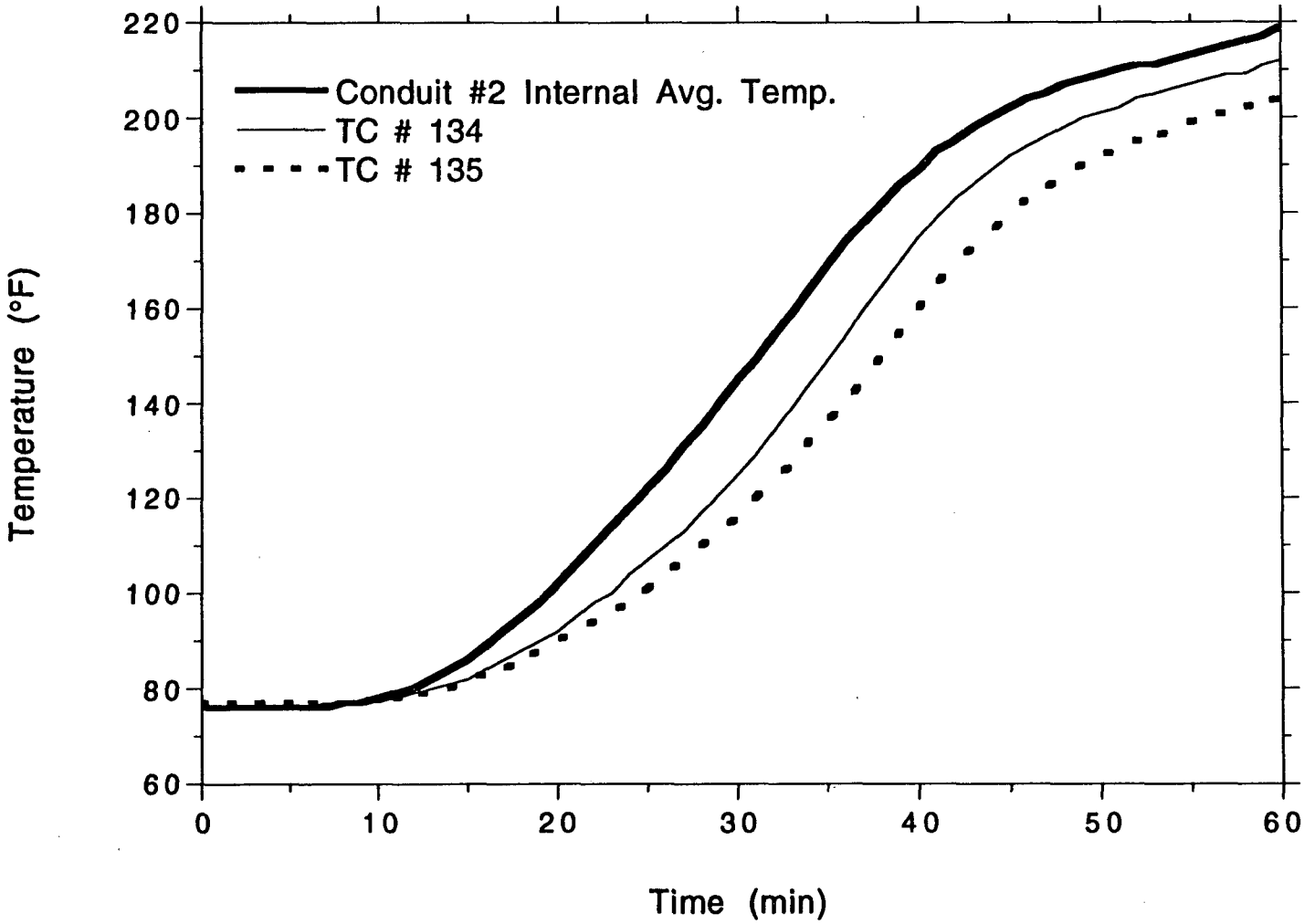


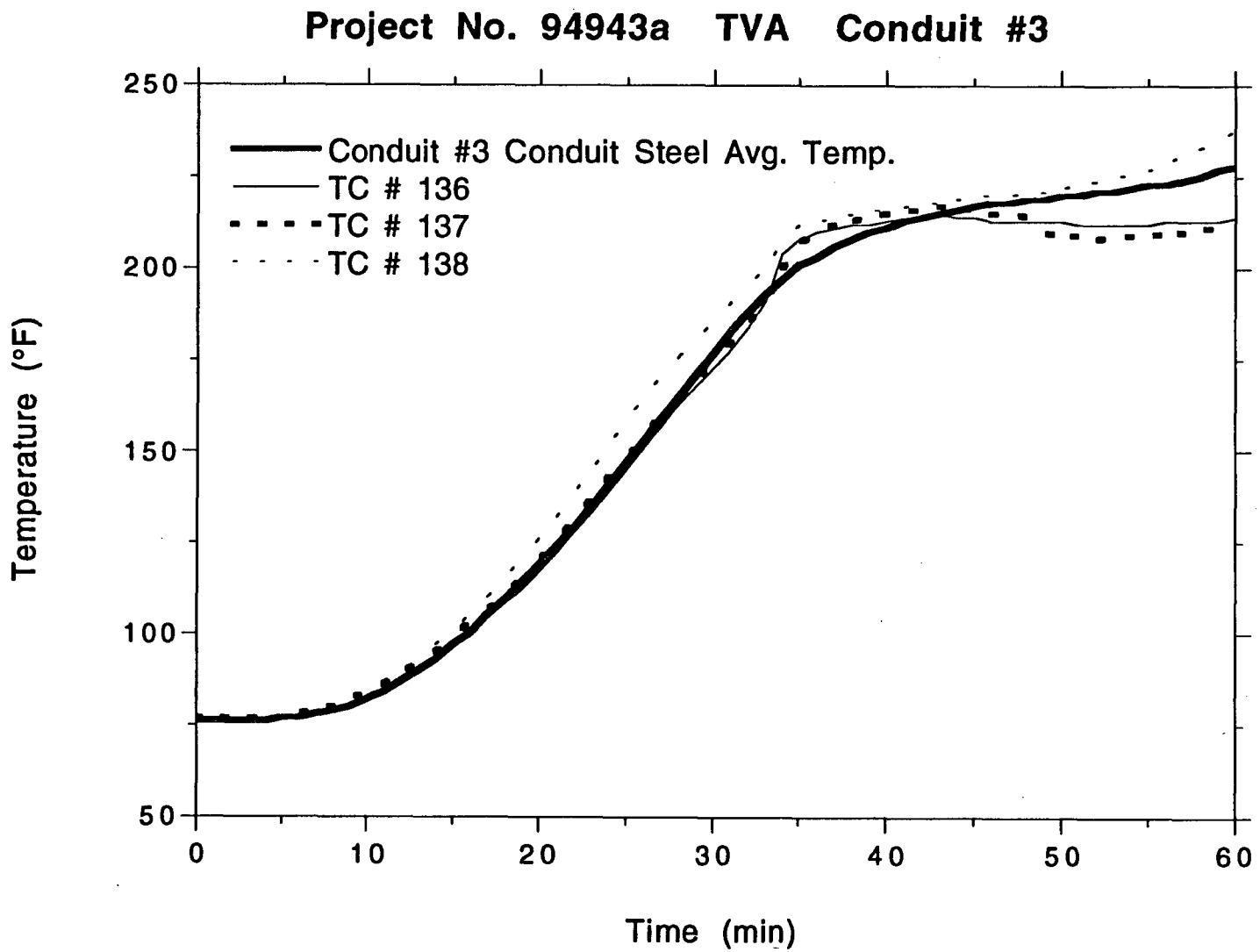

Project No. 94943a TVA Conduit #2
Conduit #2 Internal Avg. Temp.
TC # 128
TC # 129
TC # 130
Temperature (°F)
220
200
180
160
140
120
100
80
60
0
10
20
30
40
50
60
Time (min)

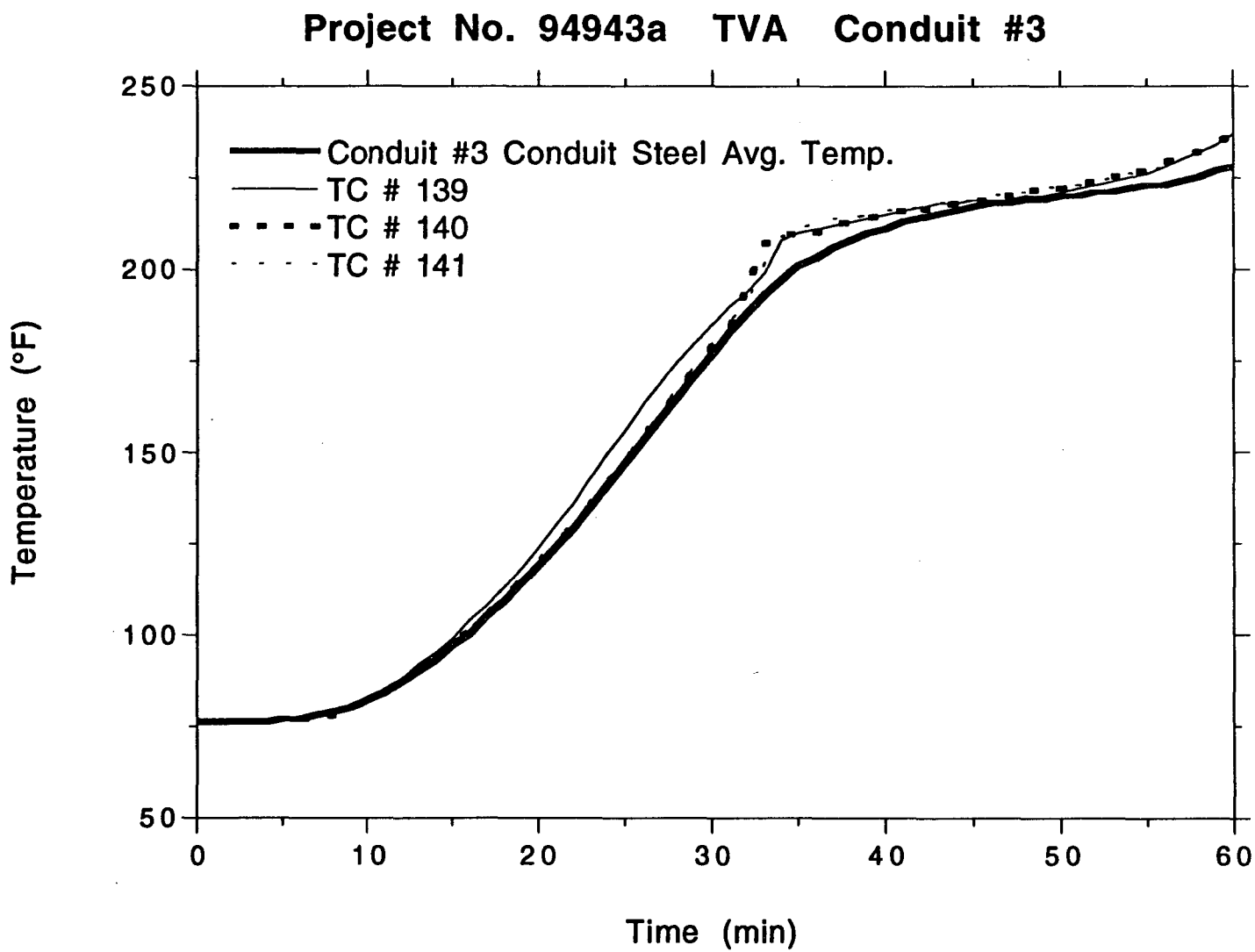
Project No. 94943a TVA Conduit #2

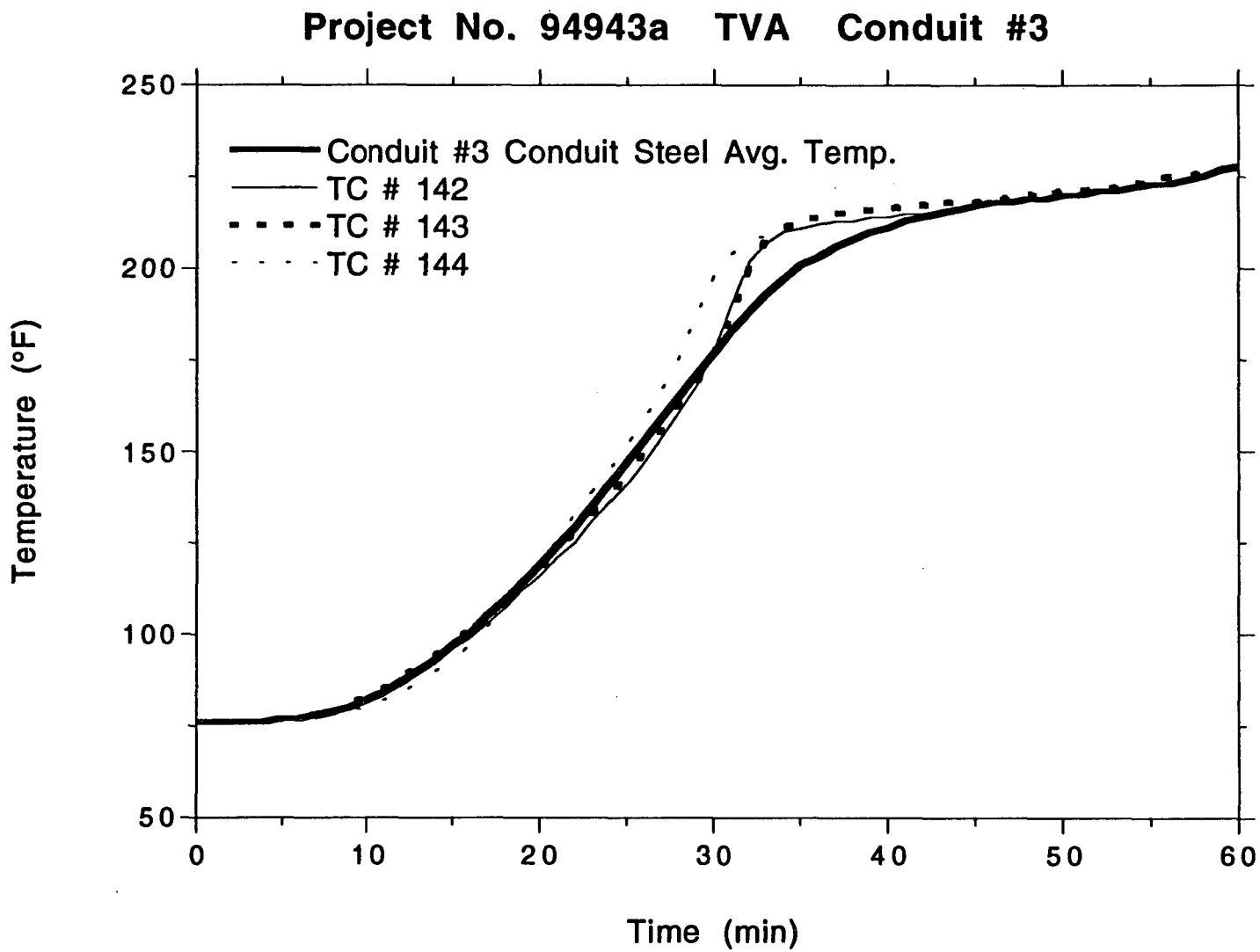


Project No. 94943a TVA Conduit #2

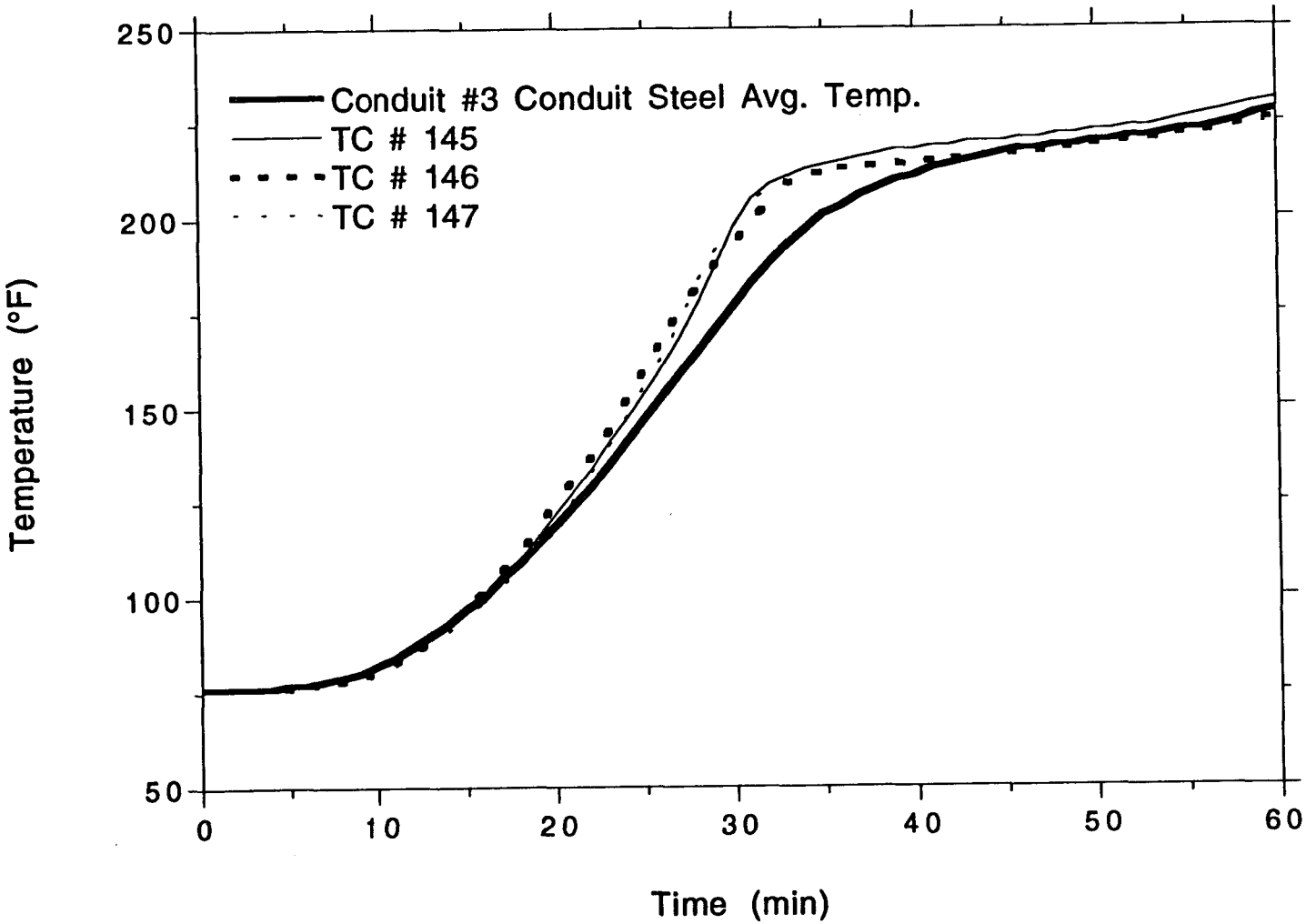



Project No. 94943a TVA Conduit #3
Conduit #3 Conduit Steel Avg. Temp.
TC # 136
TC # 137
TC # 138
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)


Project No. 94943a TVA Conduit #3
Conduit #3 Conduit Steel Avg. Temp.
TC # 139
TC # 140
TC # 141
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

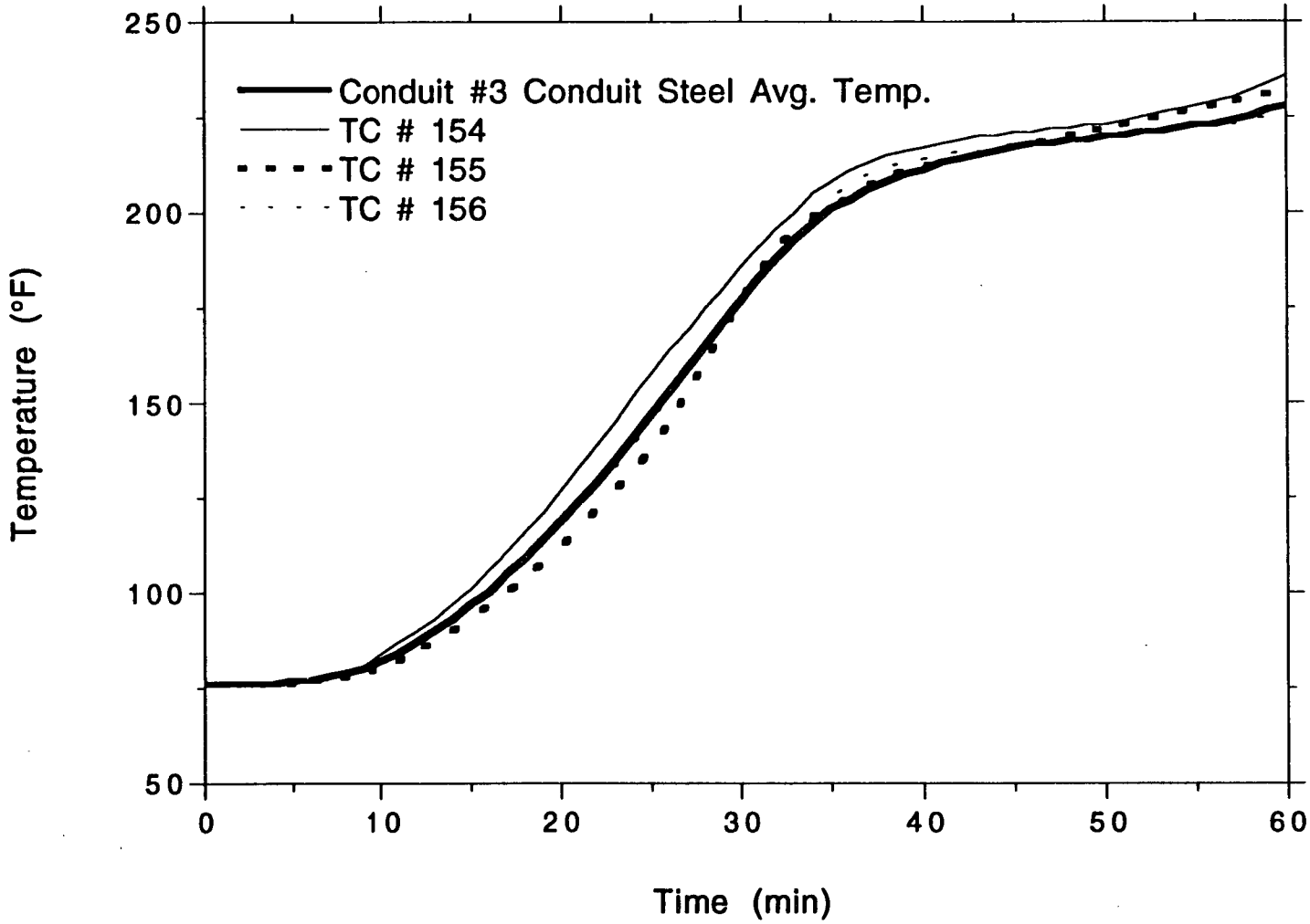

Project No. 94943a TVA Conduit #3
Conduit #3 Conduit Steel Avg. Temp.
TC # 142
TC # 143
TC # 144
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

Project No. 94943a TVA Conduit #3

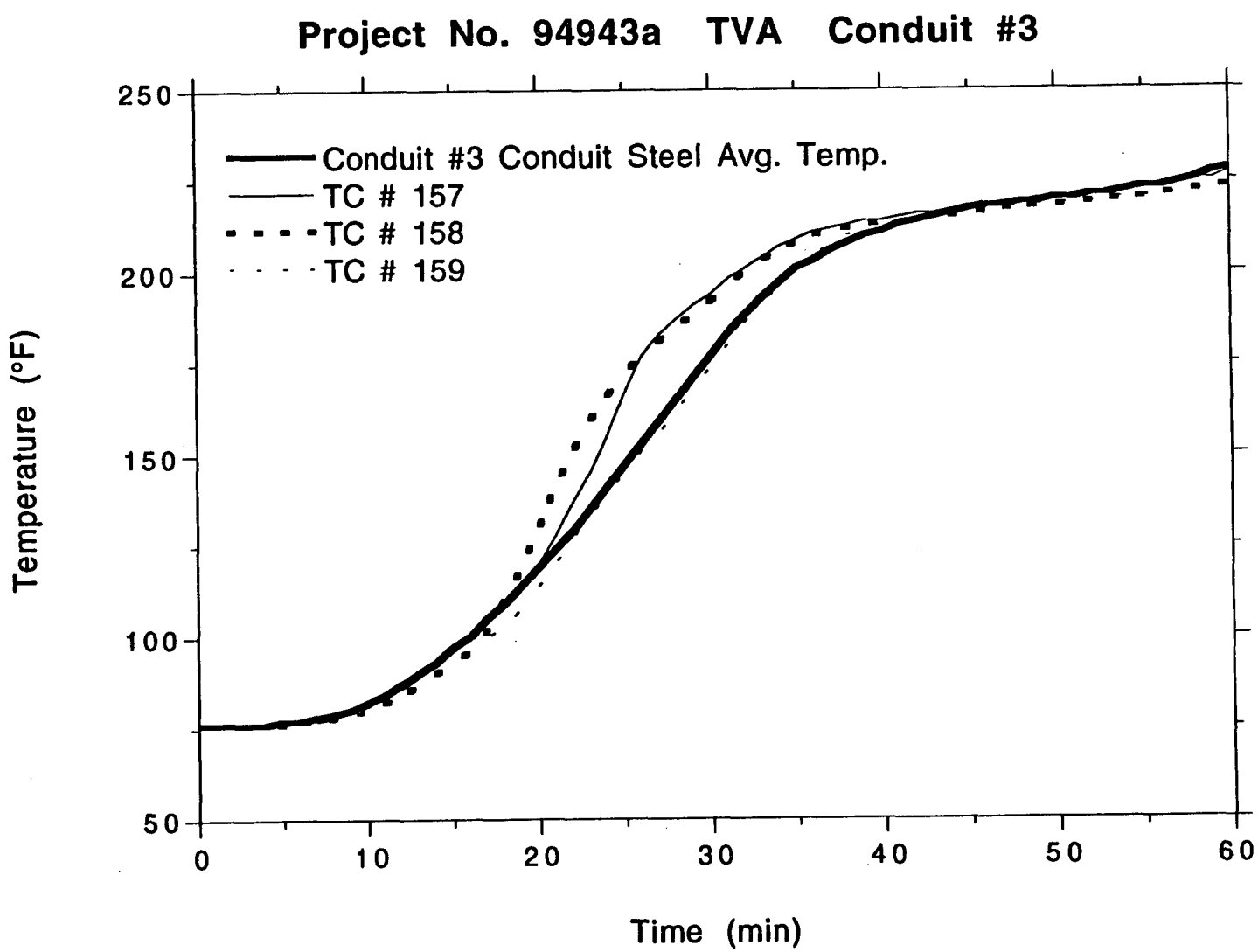


OMEGA POINT LABORATORIES

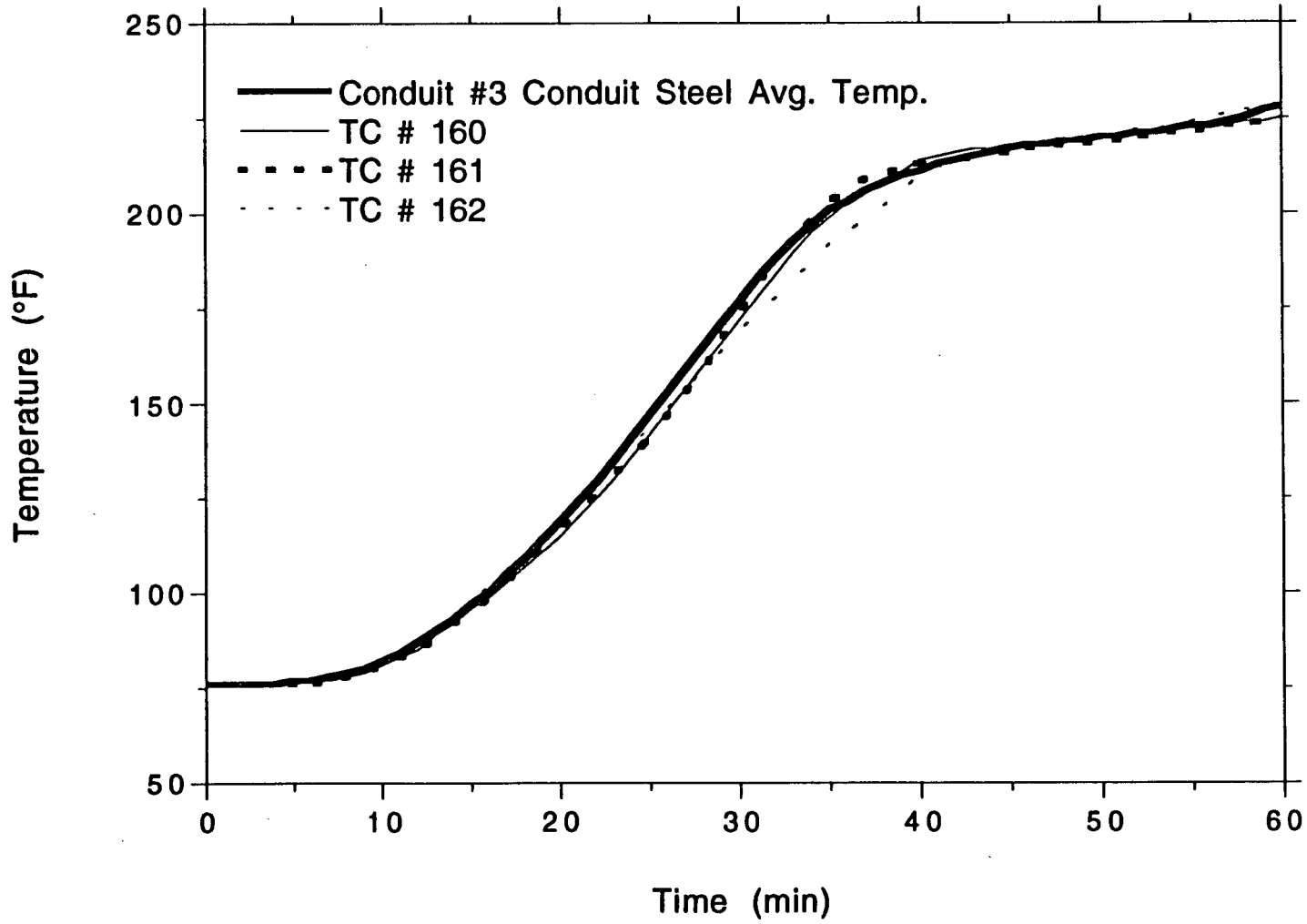
Project No. 94943a TVA Conduit #3



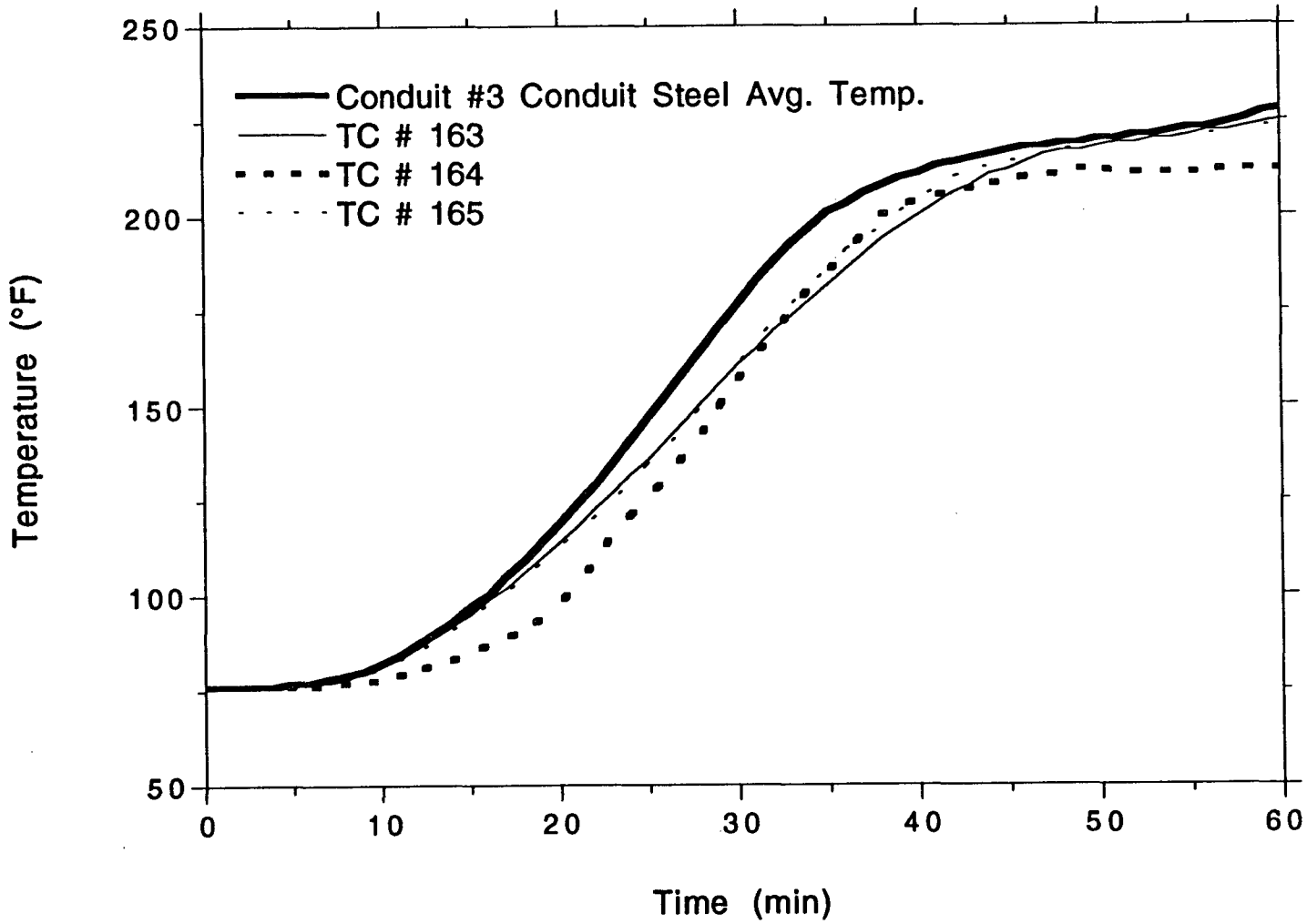
OMEGA POINT LABORATORIES


Project No. 94943a TVA Conduit #3
Conduit #3 Conduit Steel Avg. Temp.
TC # 157
TC # 158
TC # 159
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

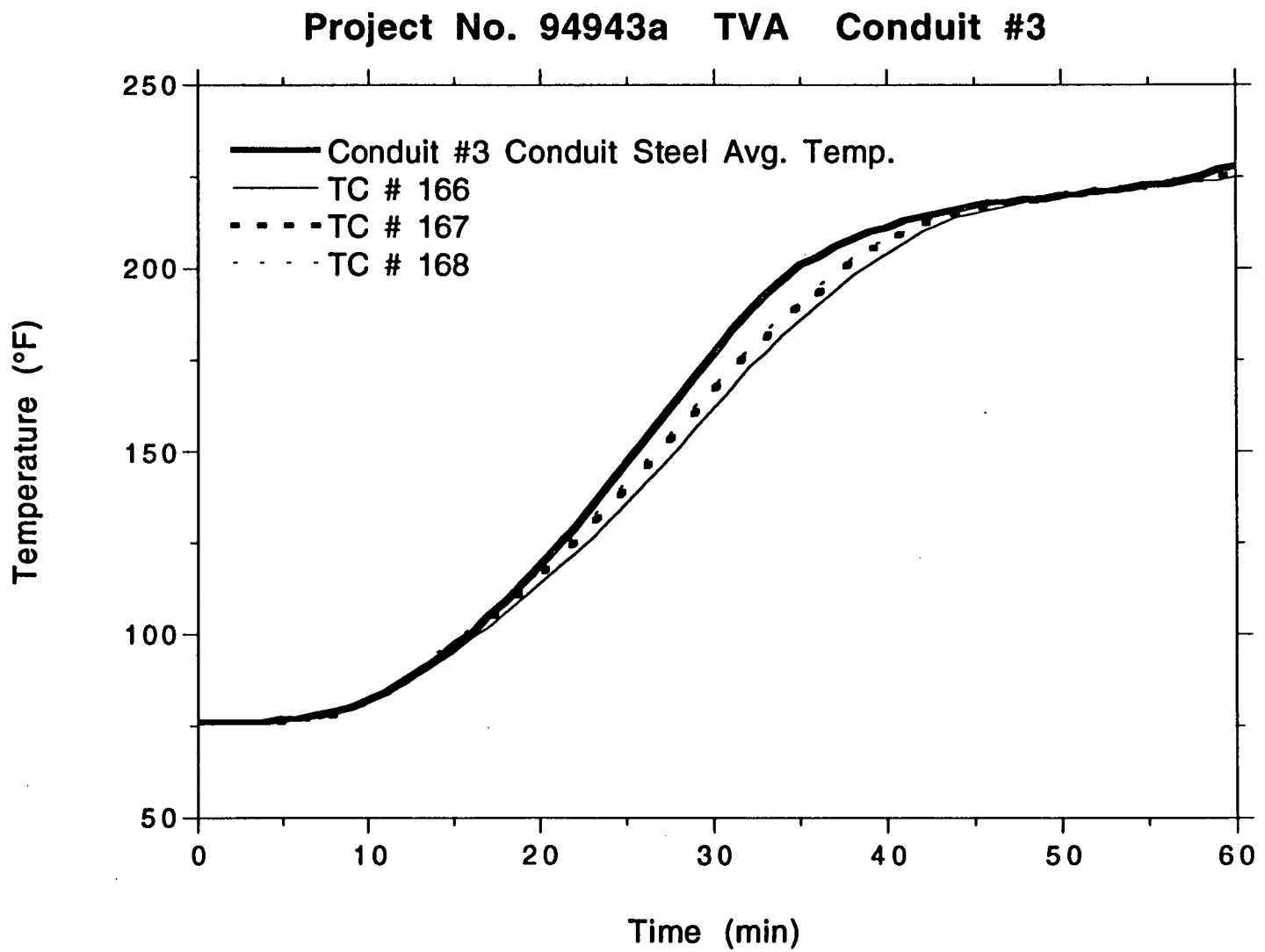
Project No. 94943a TVA Conduit #3



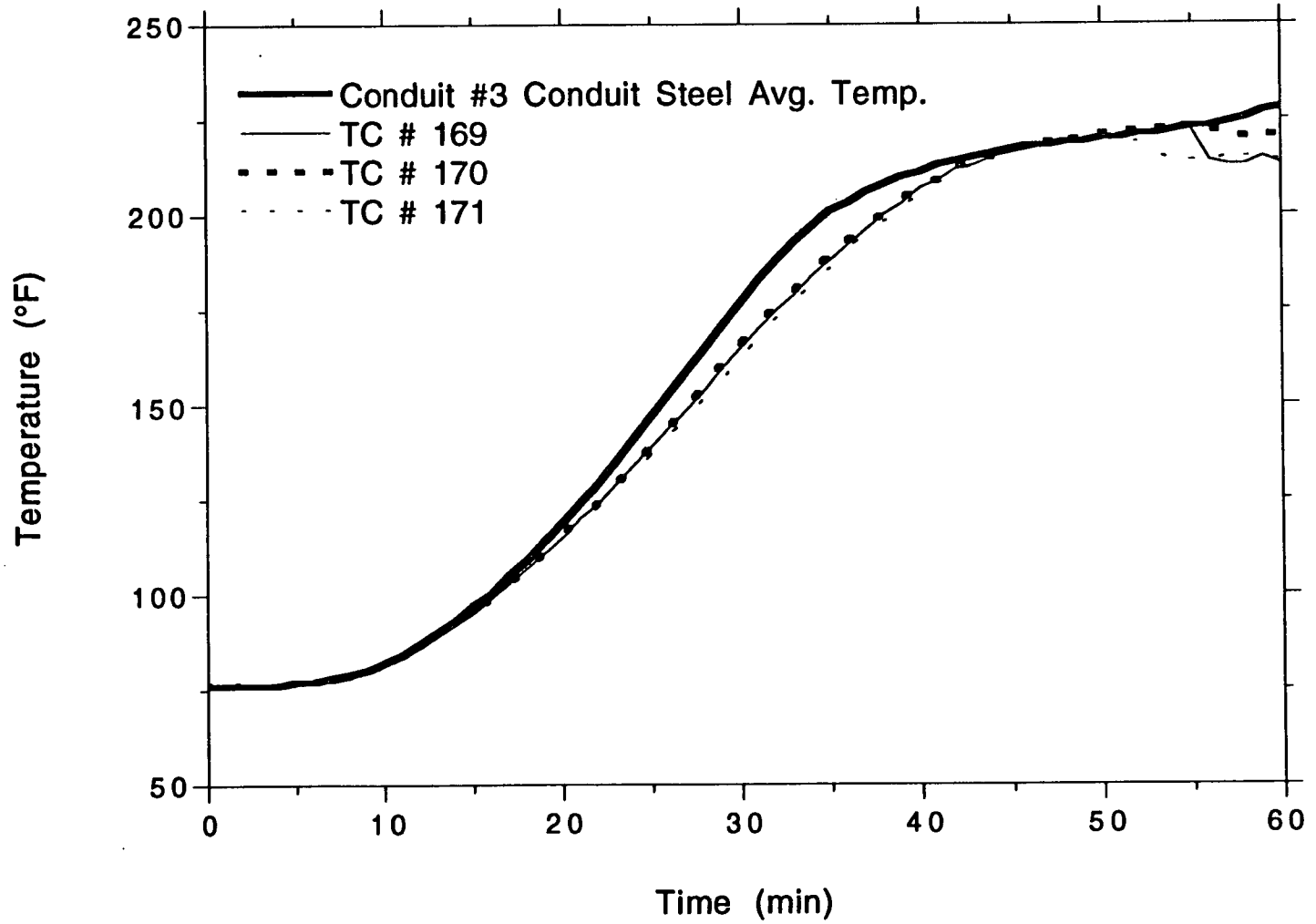
Project No. 94943a TVA Conduit #3



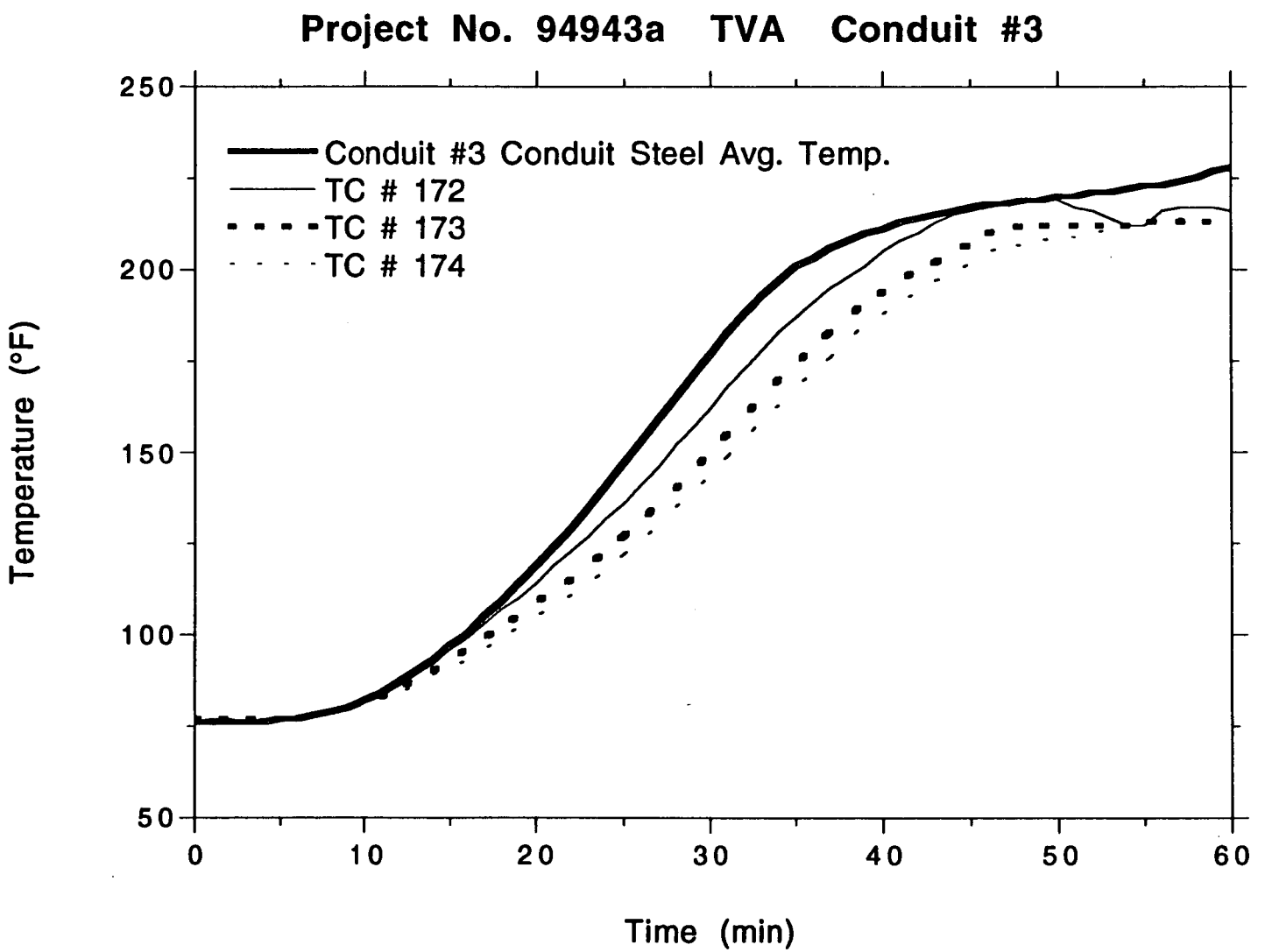
OMEGA POINT LABORATORIES

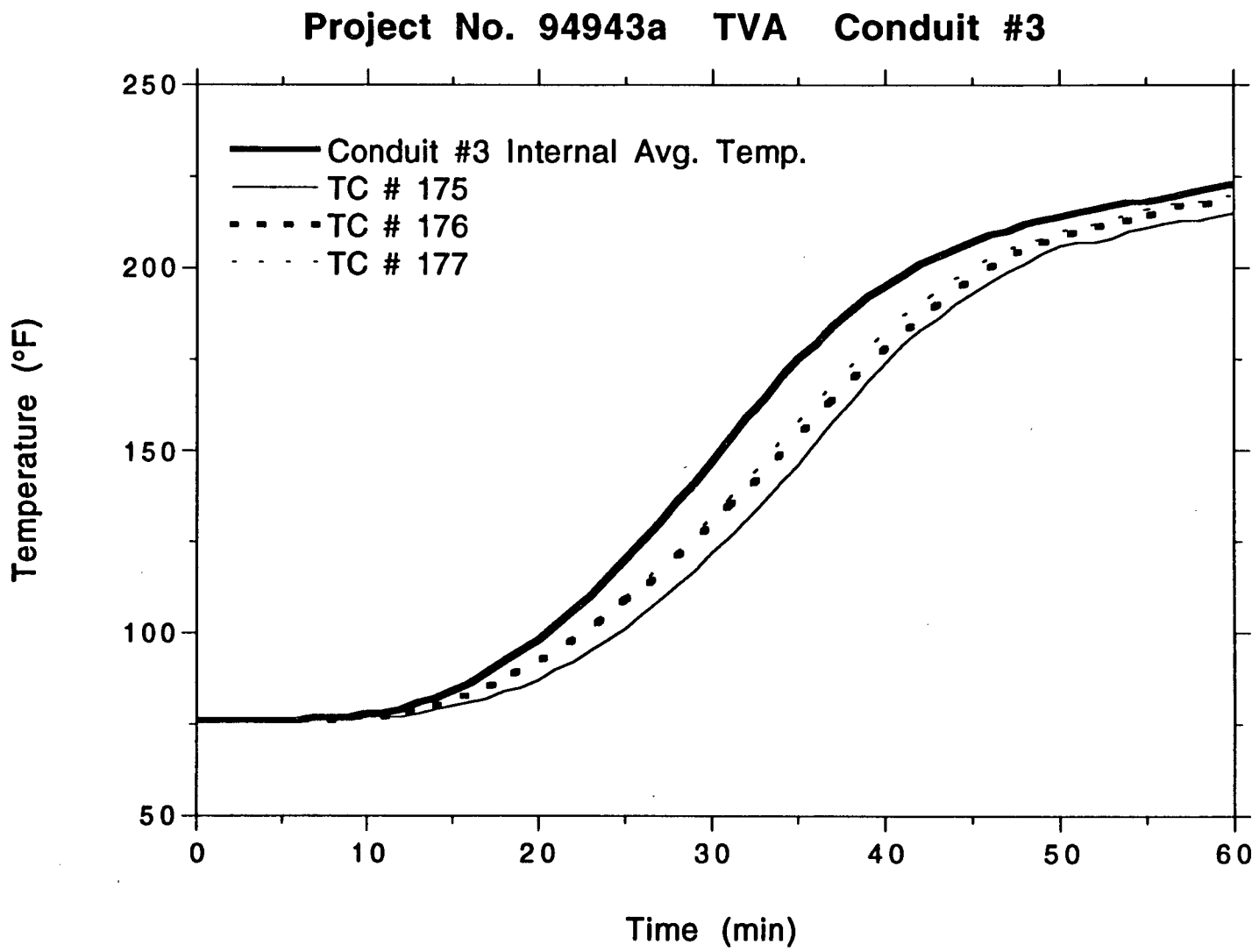

Project No. 94943a TVA Conduit #3
Conduit #3 Conduit Steel Avg. Temp.
TC # 166
TC # 167
TC # 168
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

Project No. 94943a TVA Conduit #3

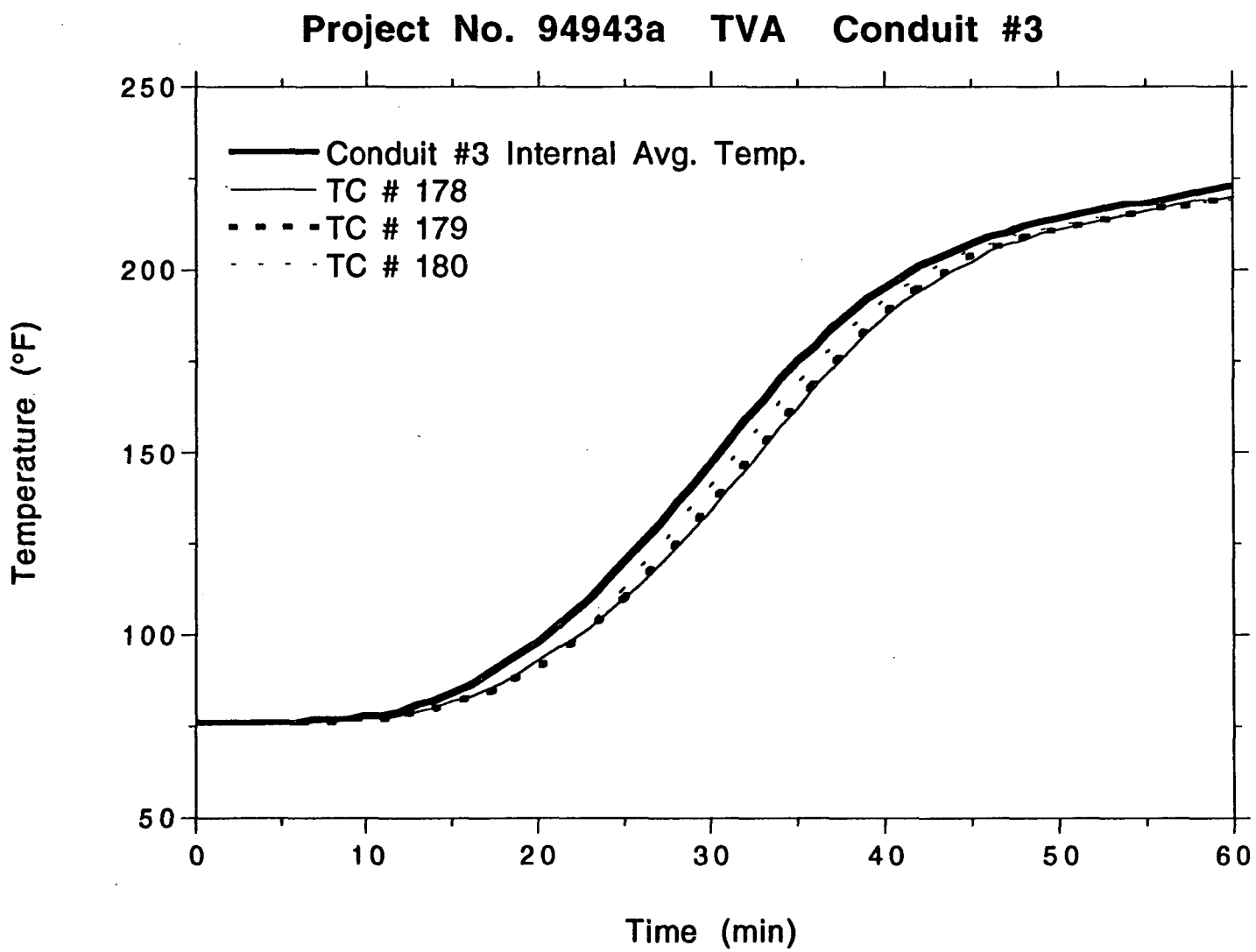


OMEGA POINT LABORATORIES

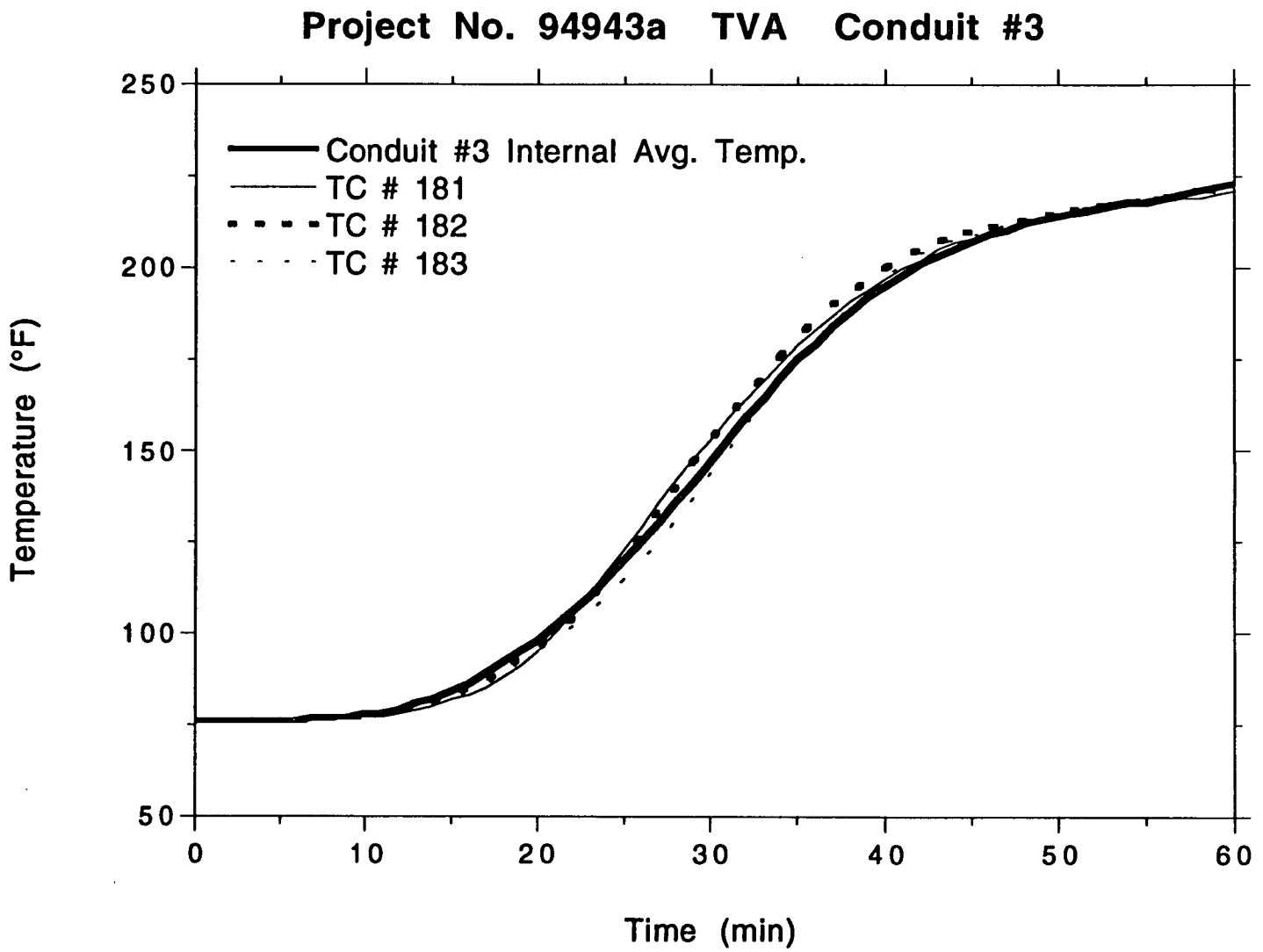

Project No. 94943a TVA Conduit #3
Conduit #3 Conduit Steel Avg. Temp.
TC # 172
TC # 173
TC # 174
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)



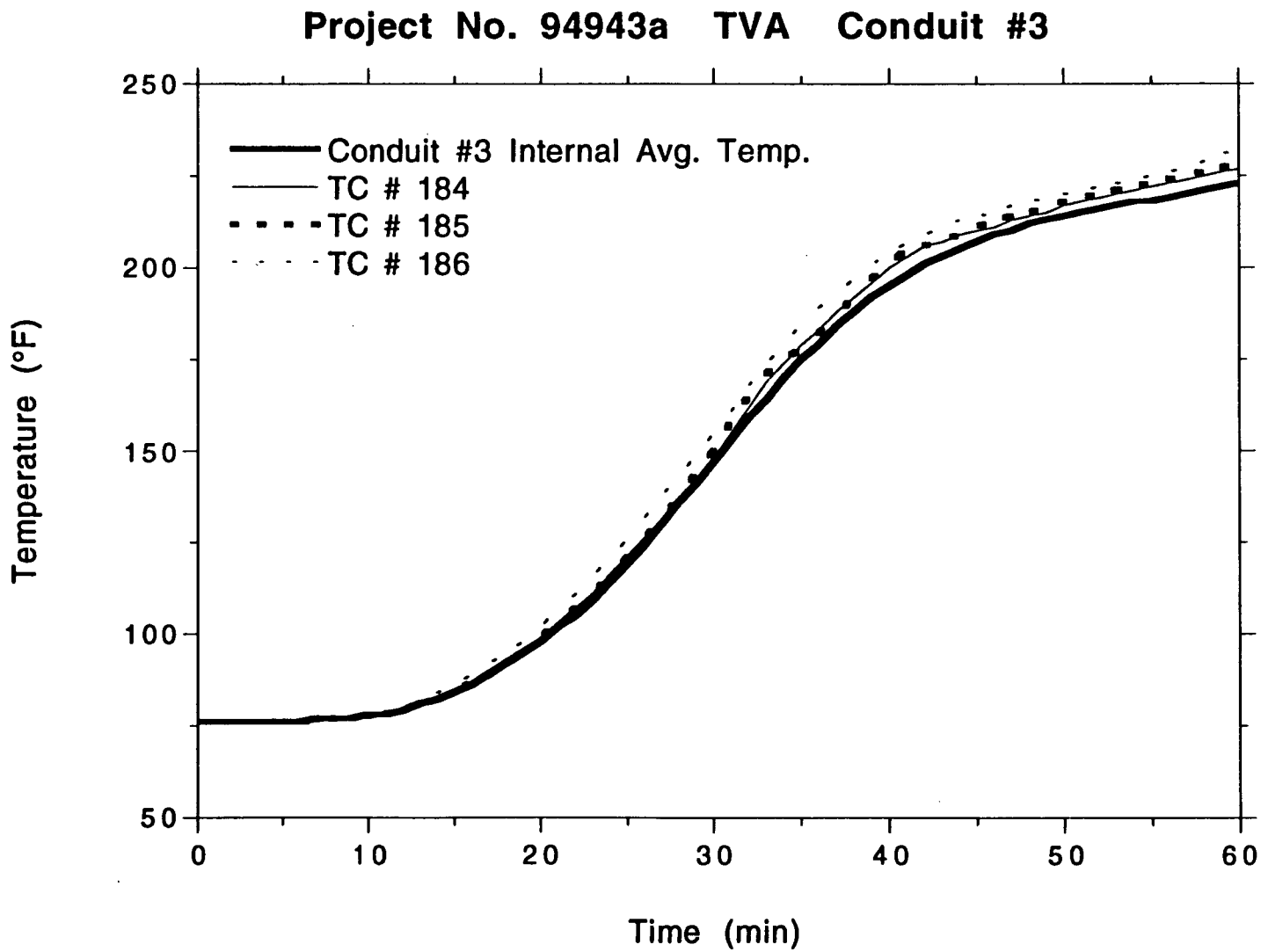
OMEGA POINT LABORATORIES



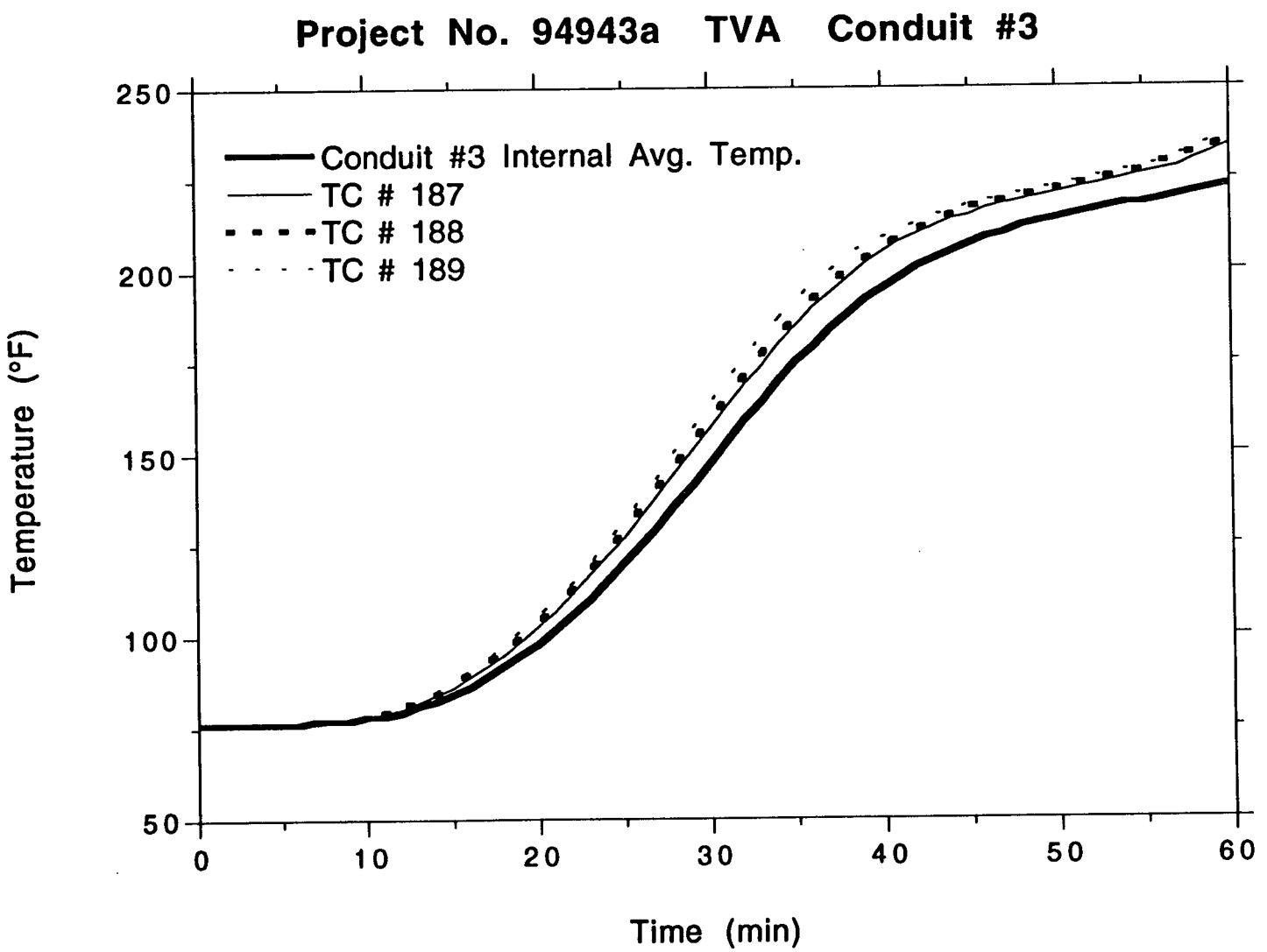
OMEGA POINT LABORATORIES



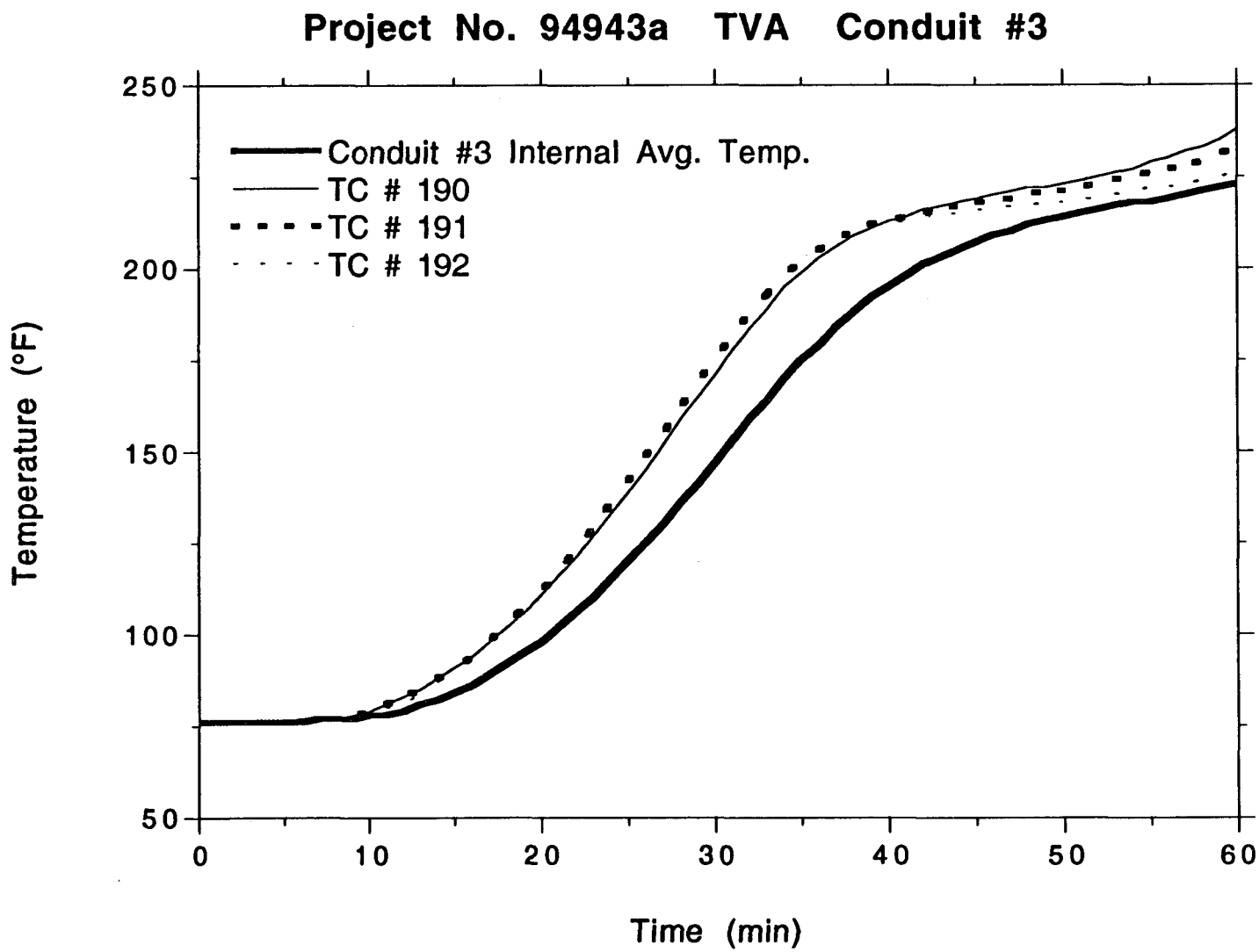
OMEGA POINT LABORATORIES

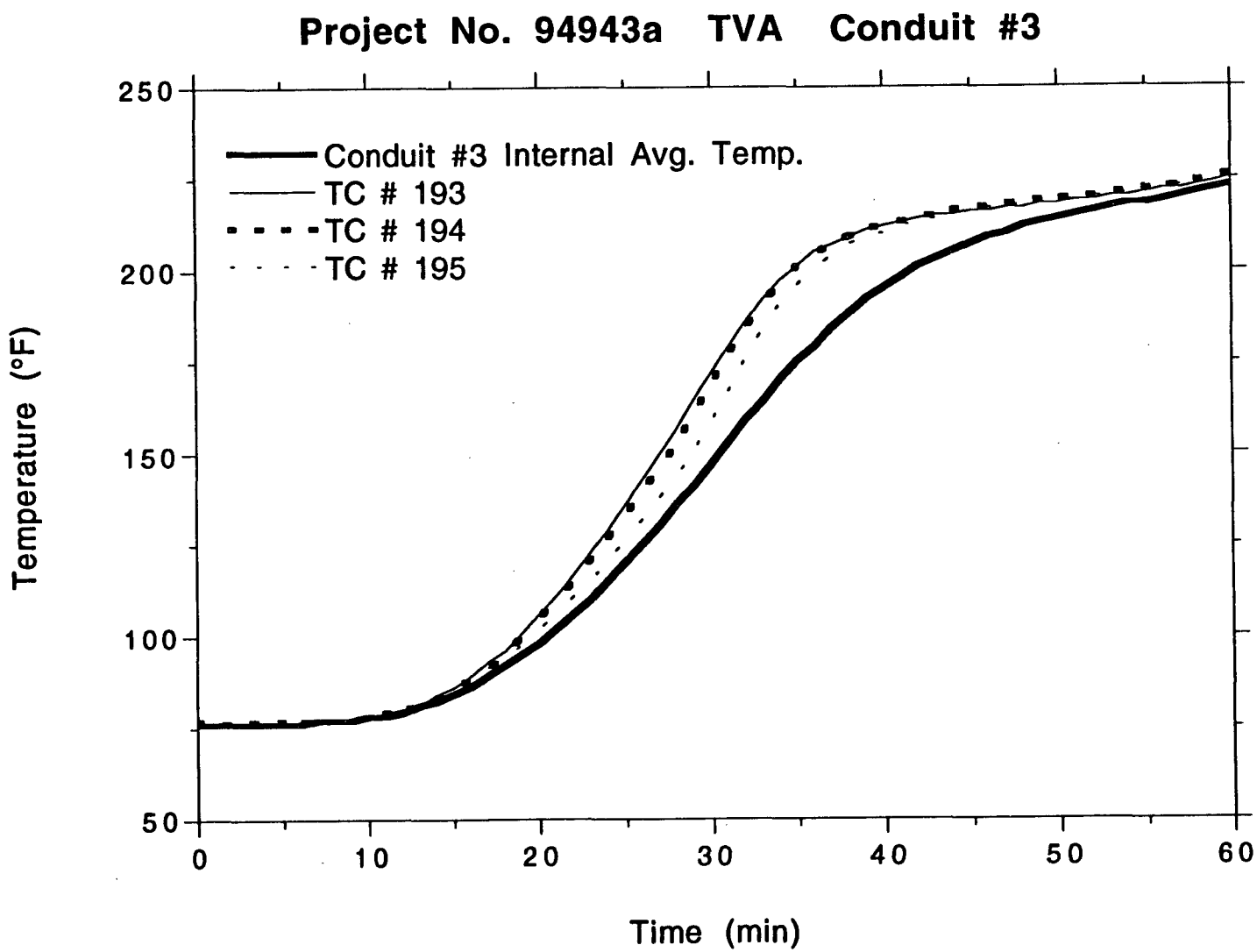


OMEGA POINT LABORATORIES



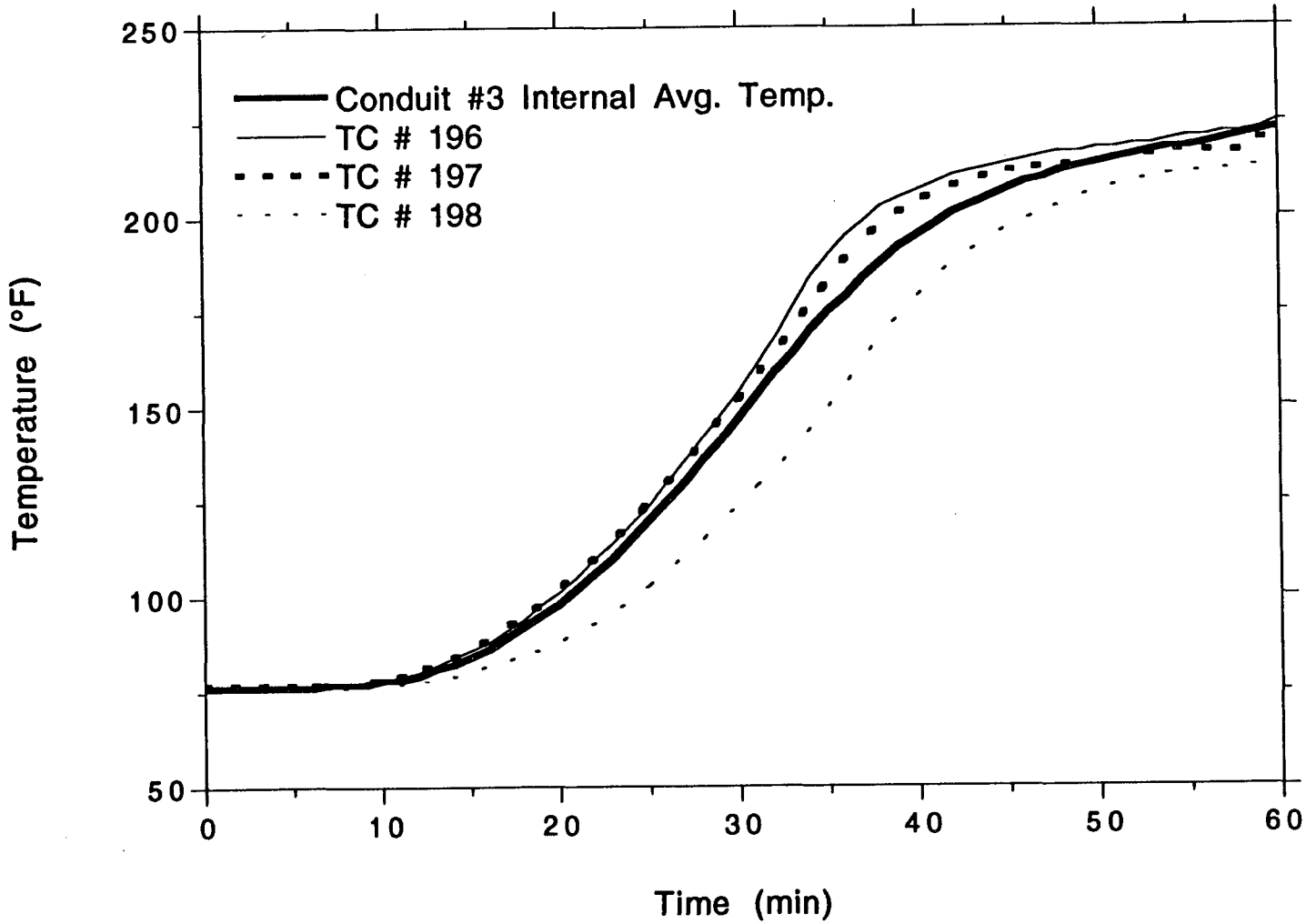
OMEGA POINT LABORATORIES


Project No. 94943a TVA Conduit #3
Conduit #3 Internal Avg. Temp.
TC # 190
TC # 191
TC # 192
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

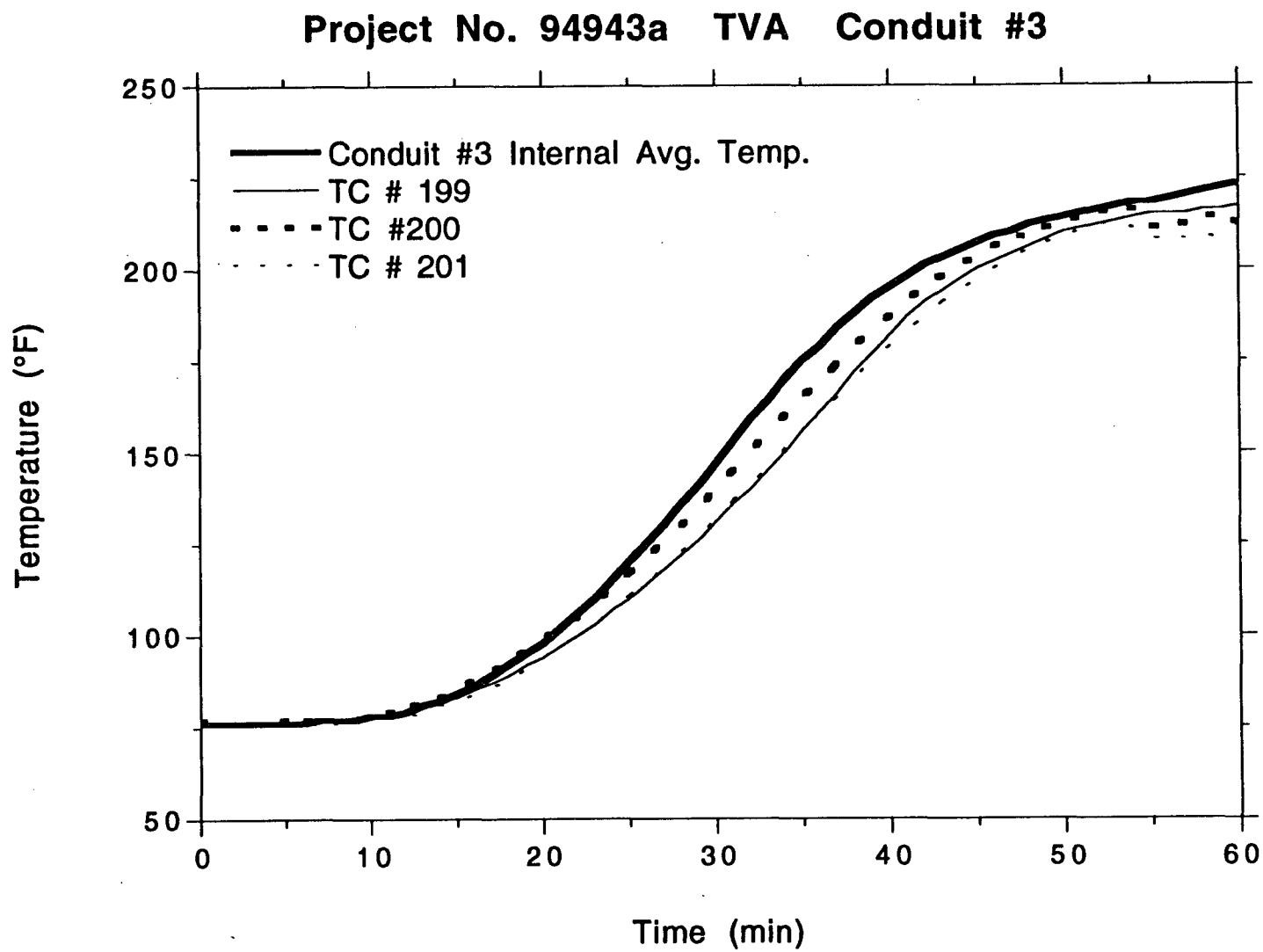


OMEGA POINT LABORATORIES

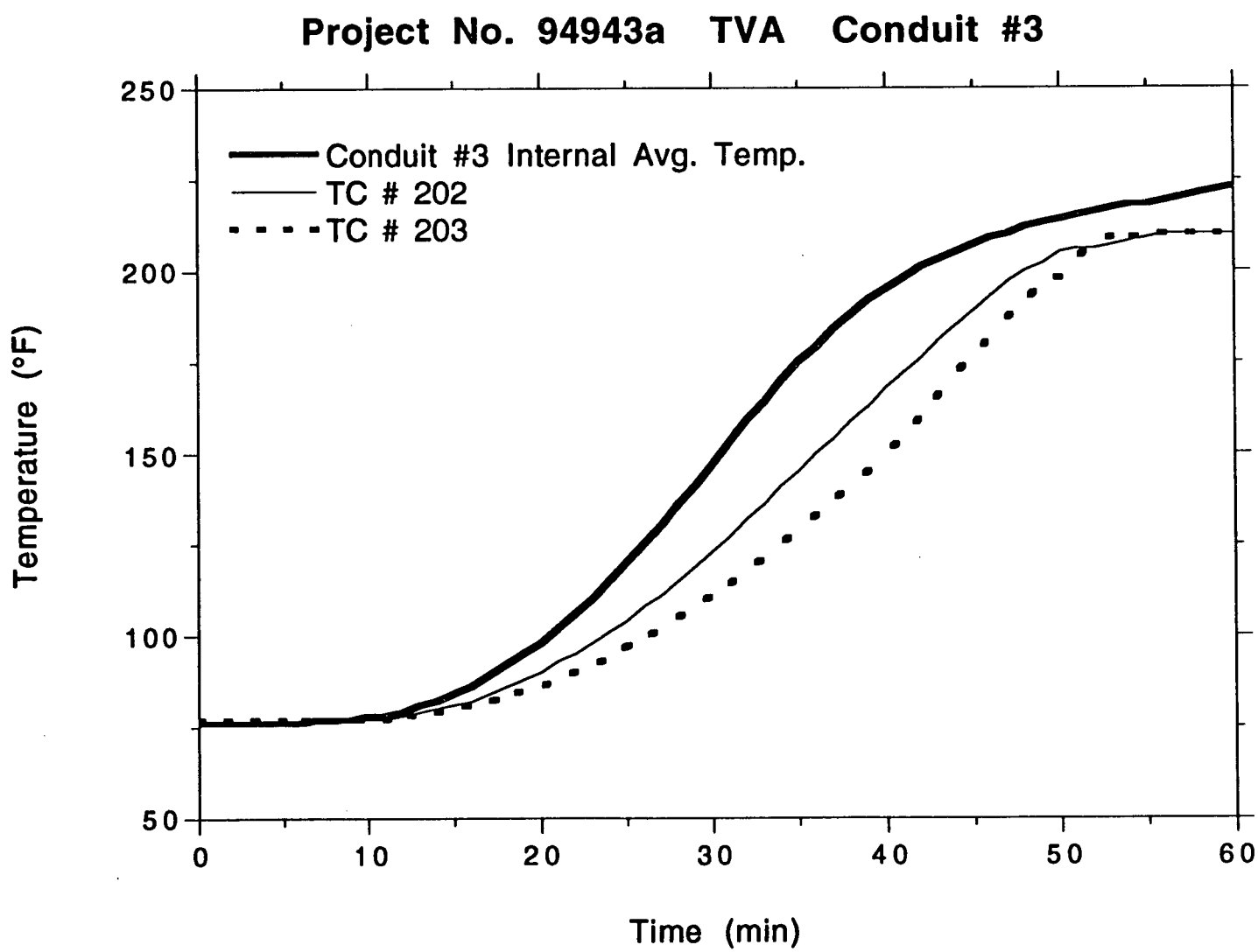
Project No. 94943a TVA Conduit #3

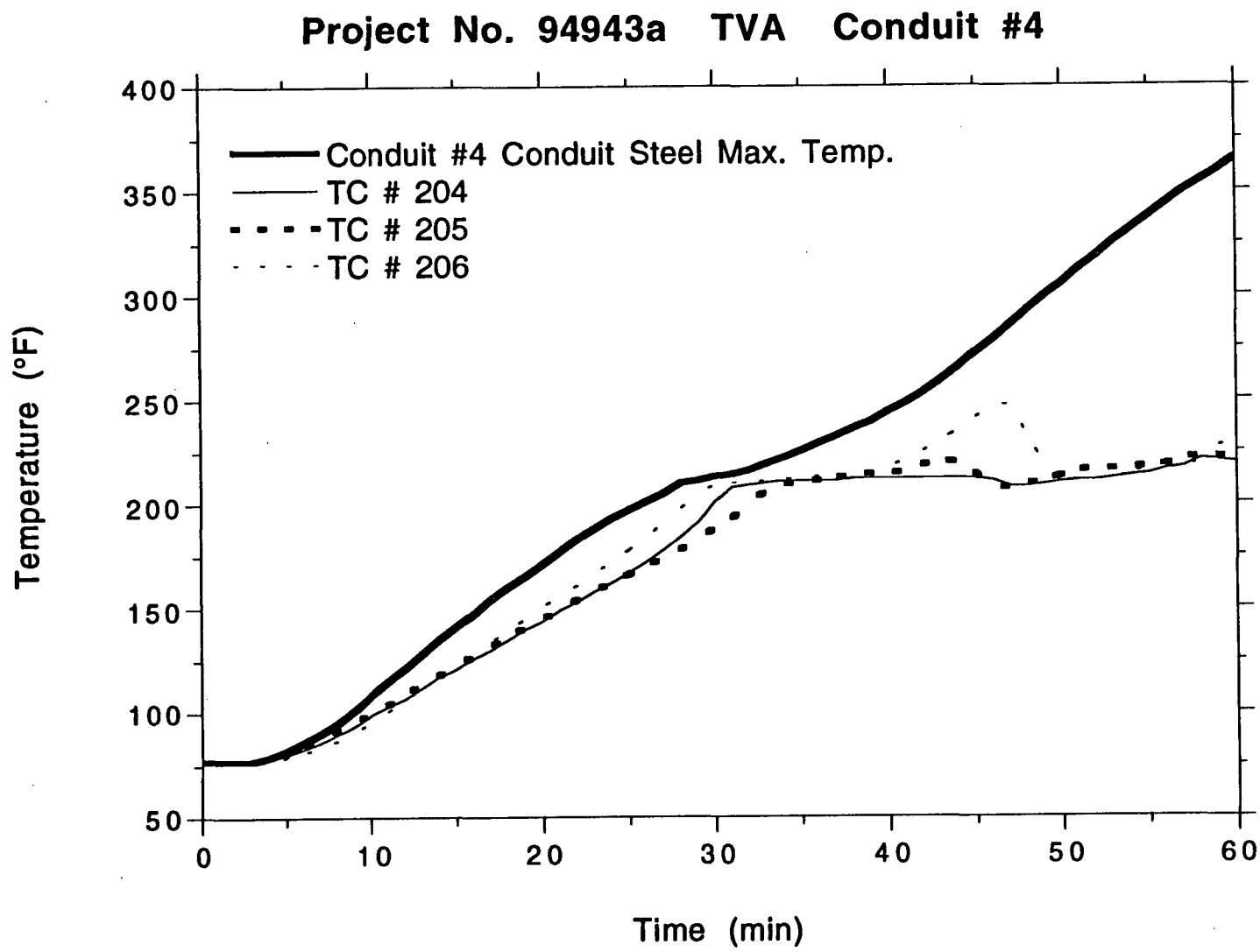


OMEGA POINT LABORATORIES

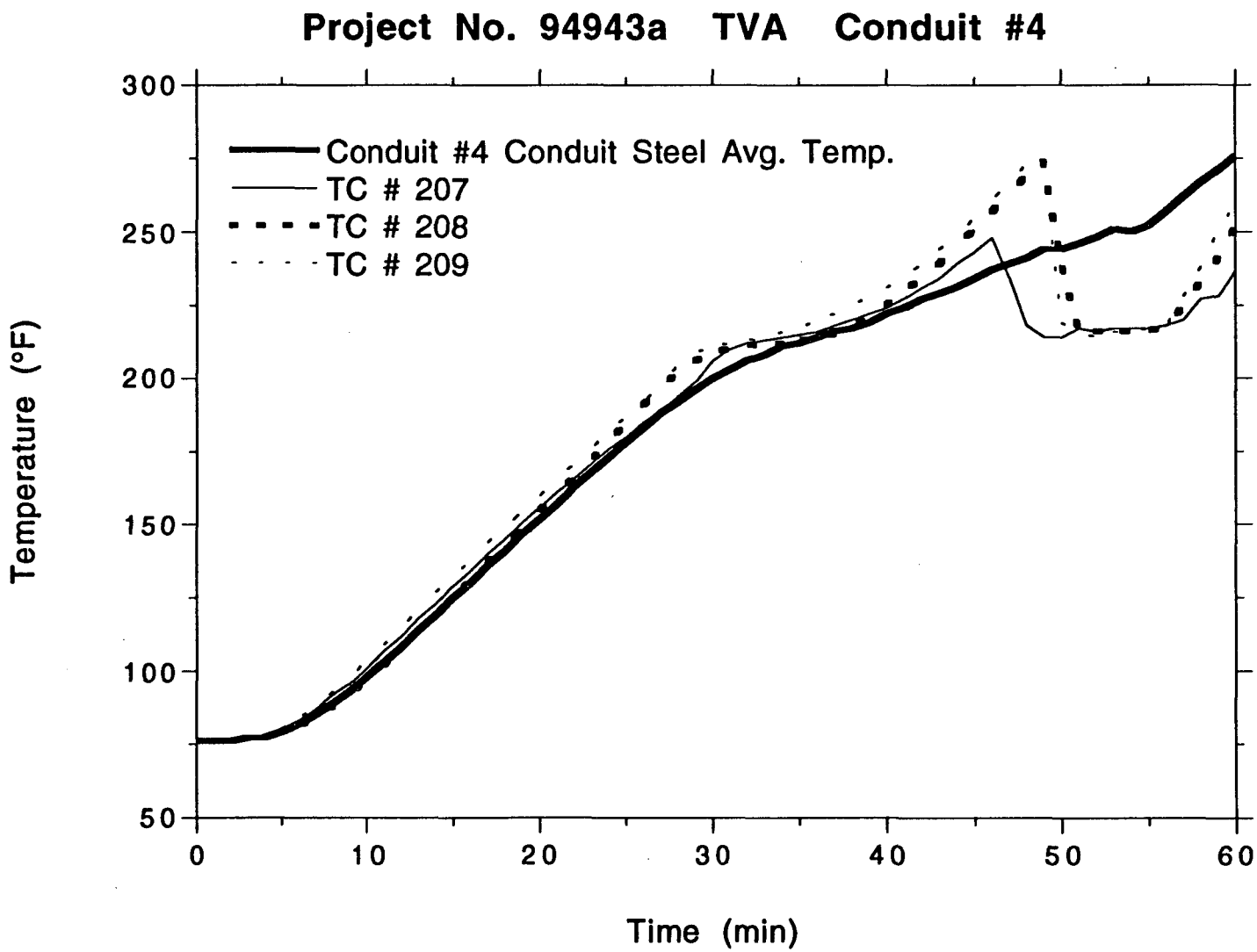


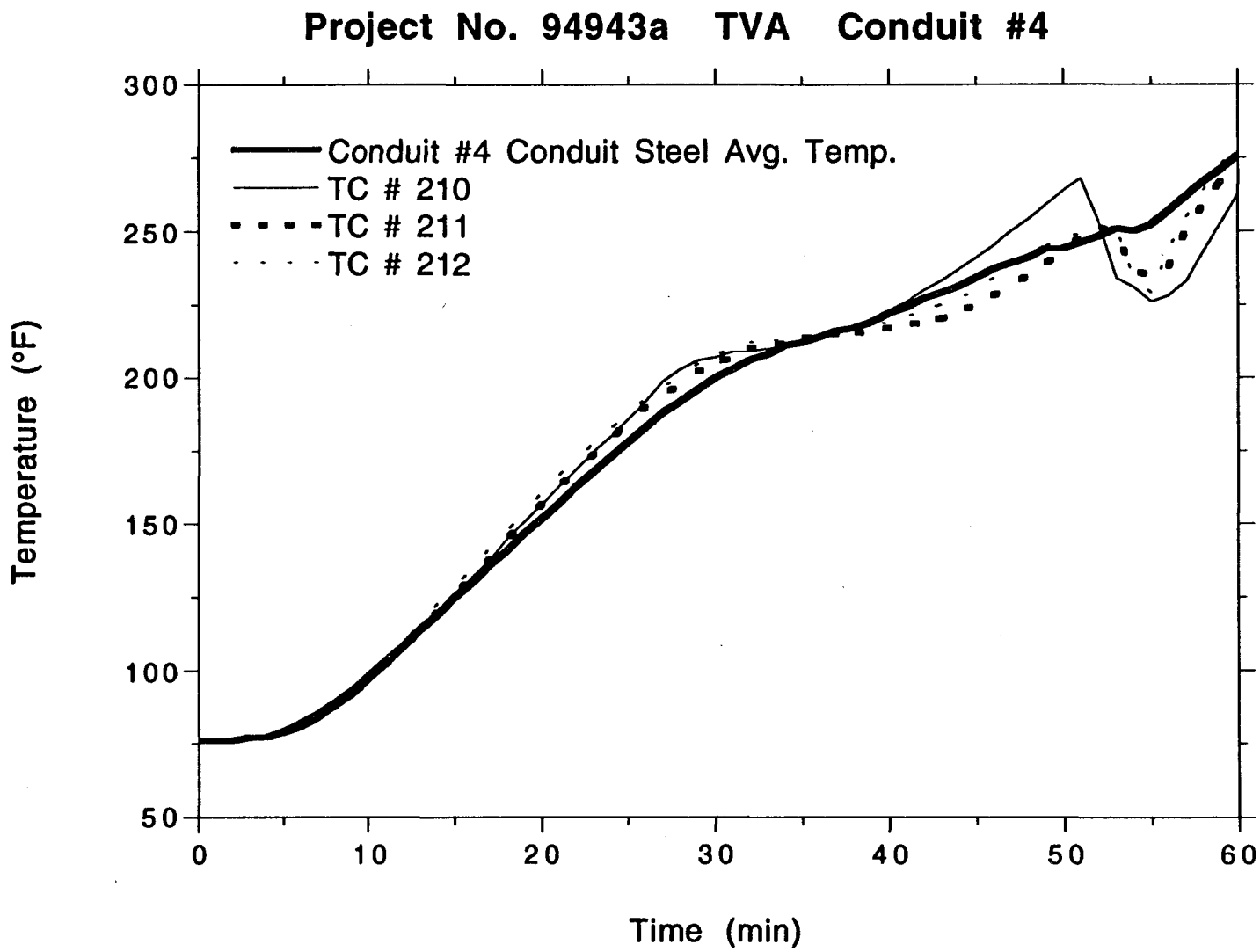
OMEGA POINT LABORATORIES

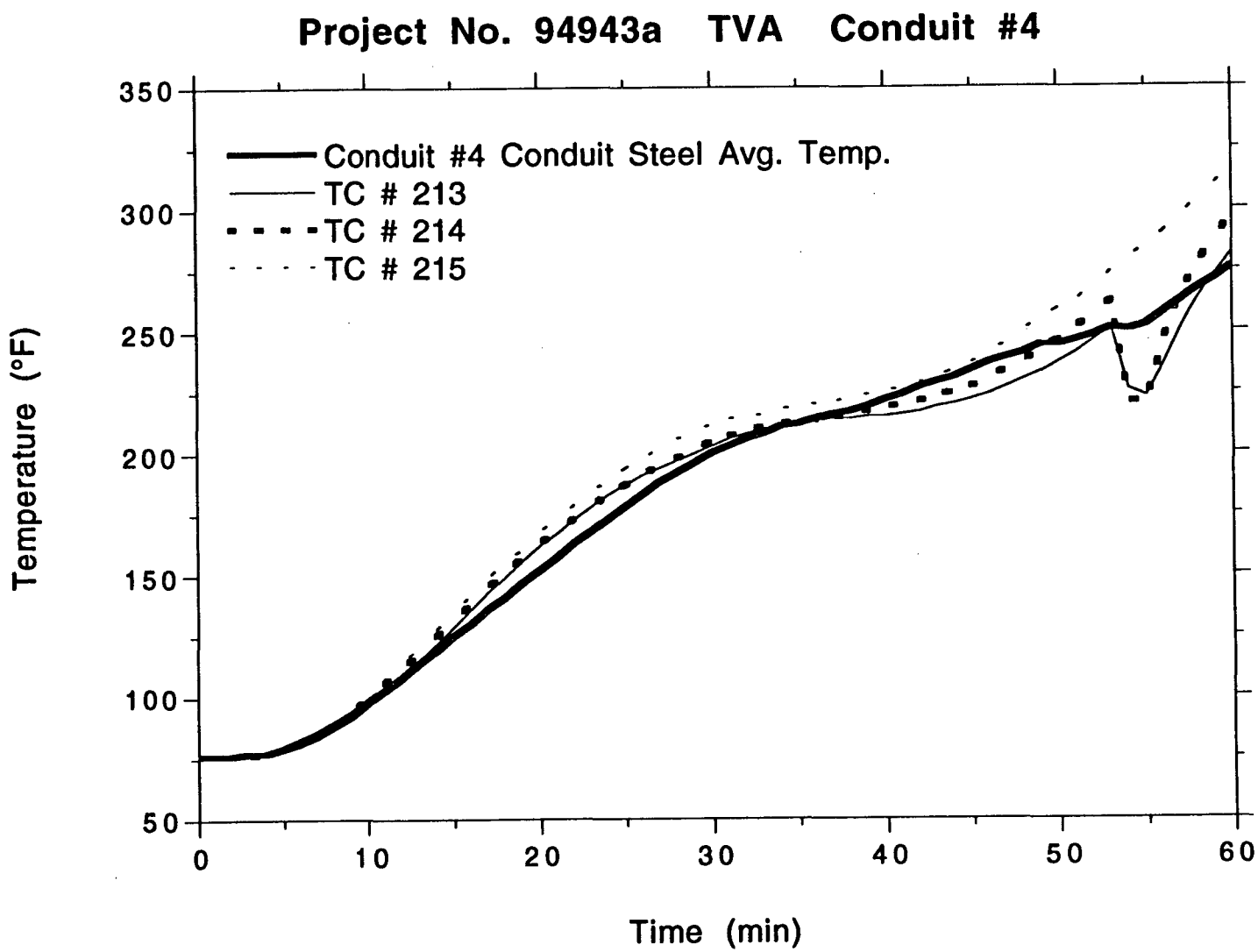

Project No. 94943a TVA Conduit #3
Conduit #3 Internal Avg. Temp.
TC # 202
TC # 203
Temperature (°F)
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)



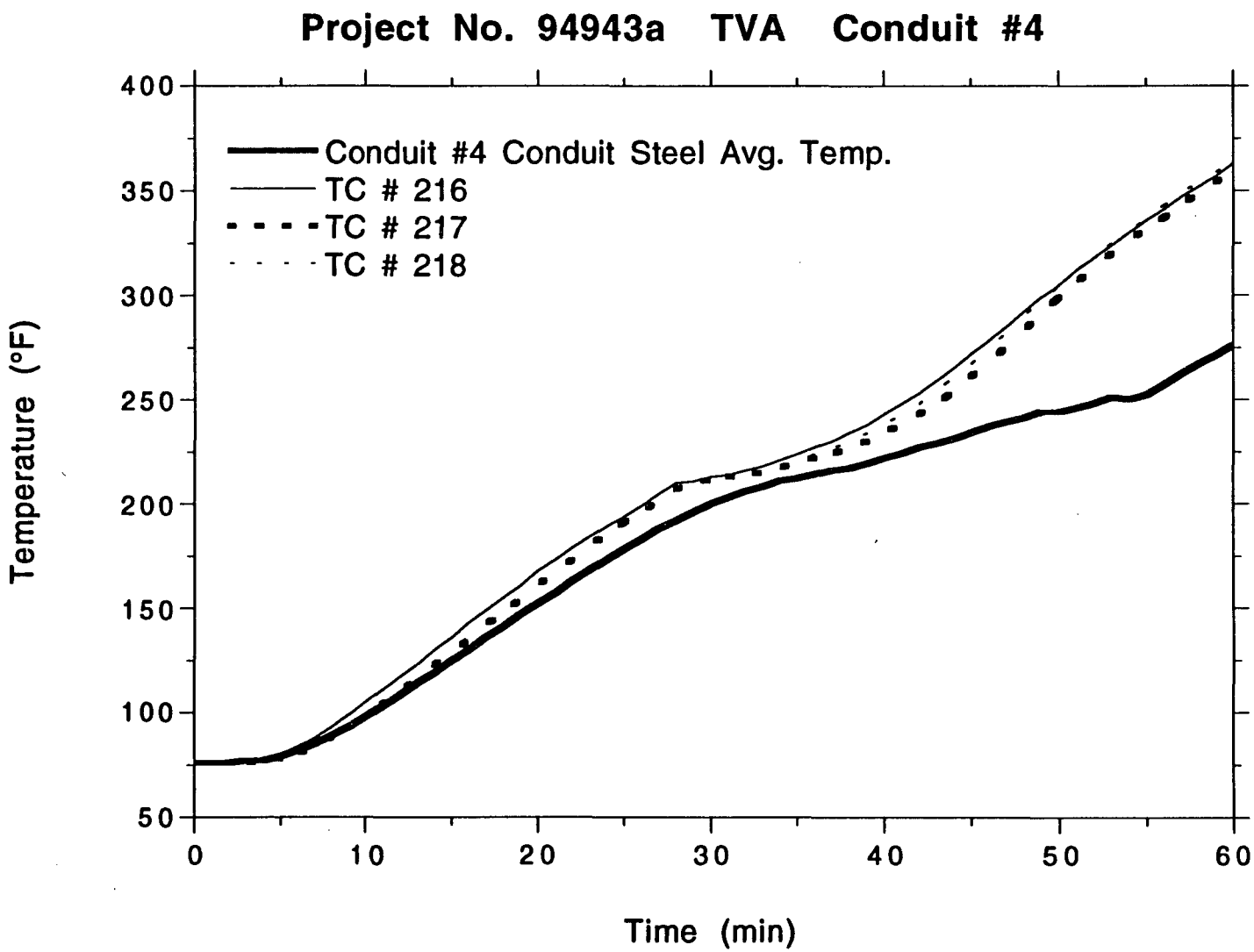
OMEGA POINT LABORATORIES


Project No. 94943a TVA Conduit #4
Conduit #4 Conduit Steel Avg. Temp.
TC # 207
TC # 208
TC # 209
Temperature (°F)
300
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)


Project No. 94943a TVA Conduit #4
Conduit #4 Conduit Steel Avg. Temp.
TC # 210
TC # 211
TC # 212
Temperature (°F)
300
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)

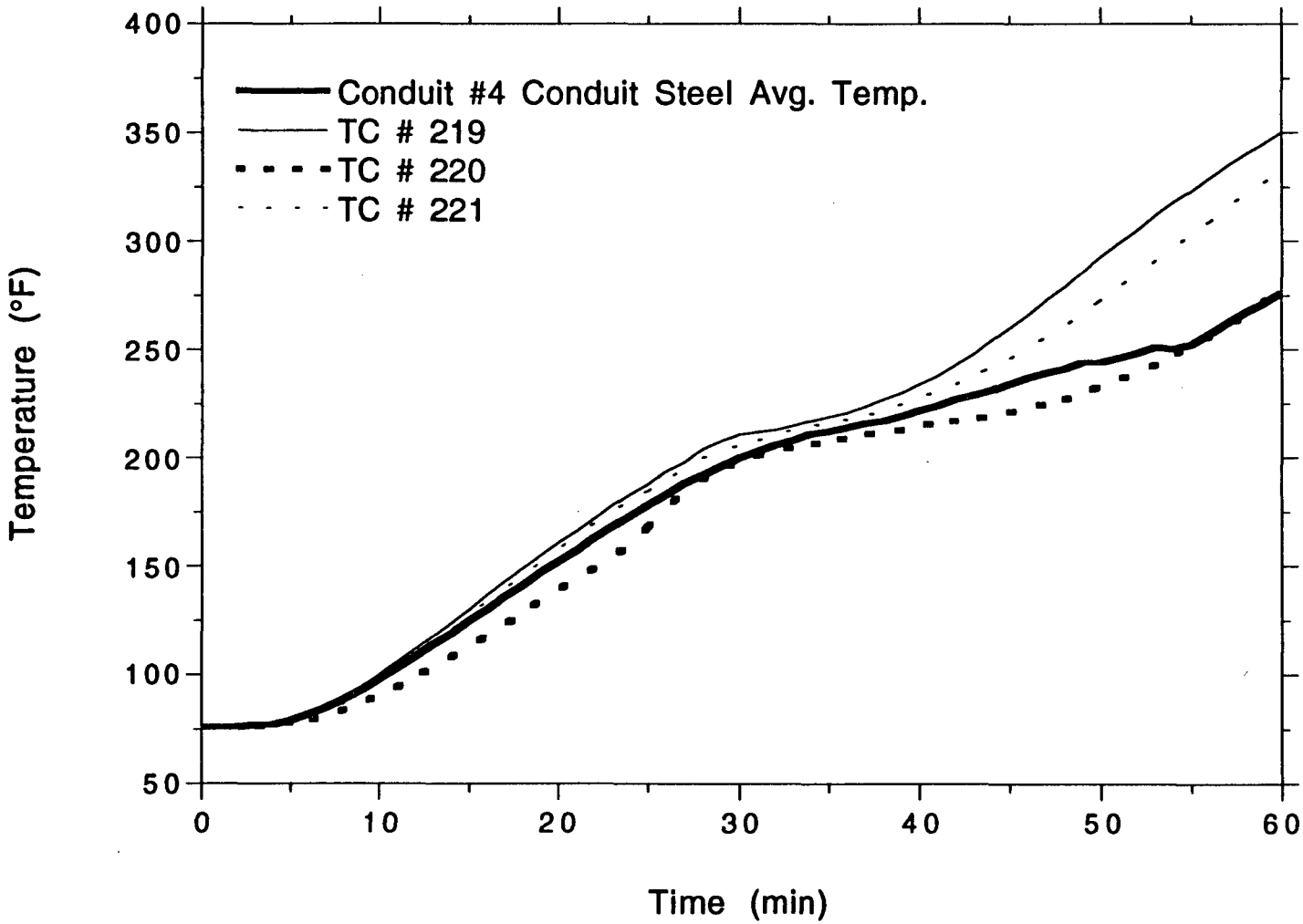


OMEGA POINT LABORATORIES

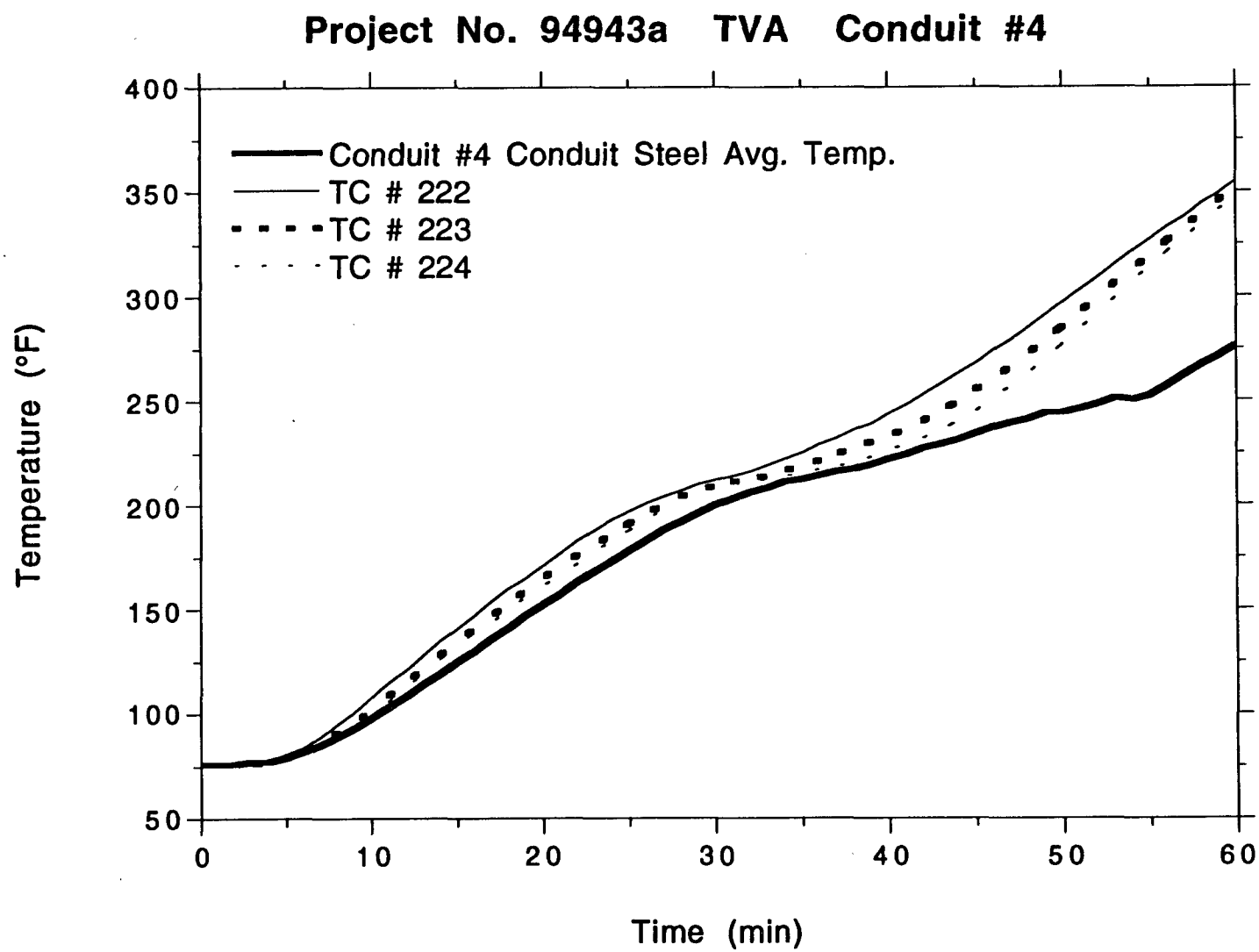


OMEGA POINT LABORATORIES

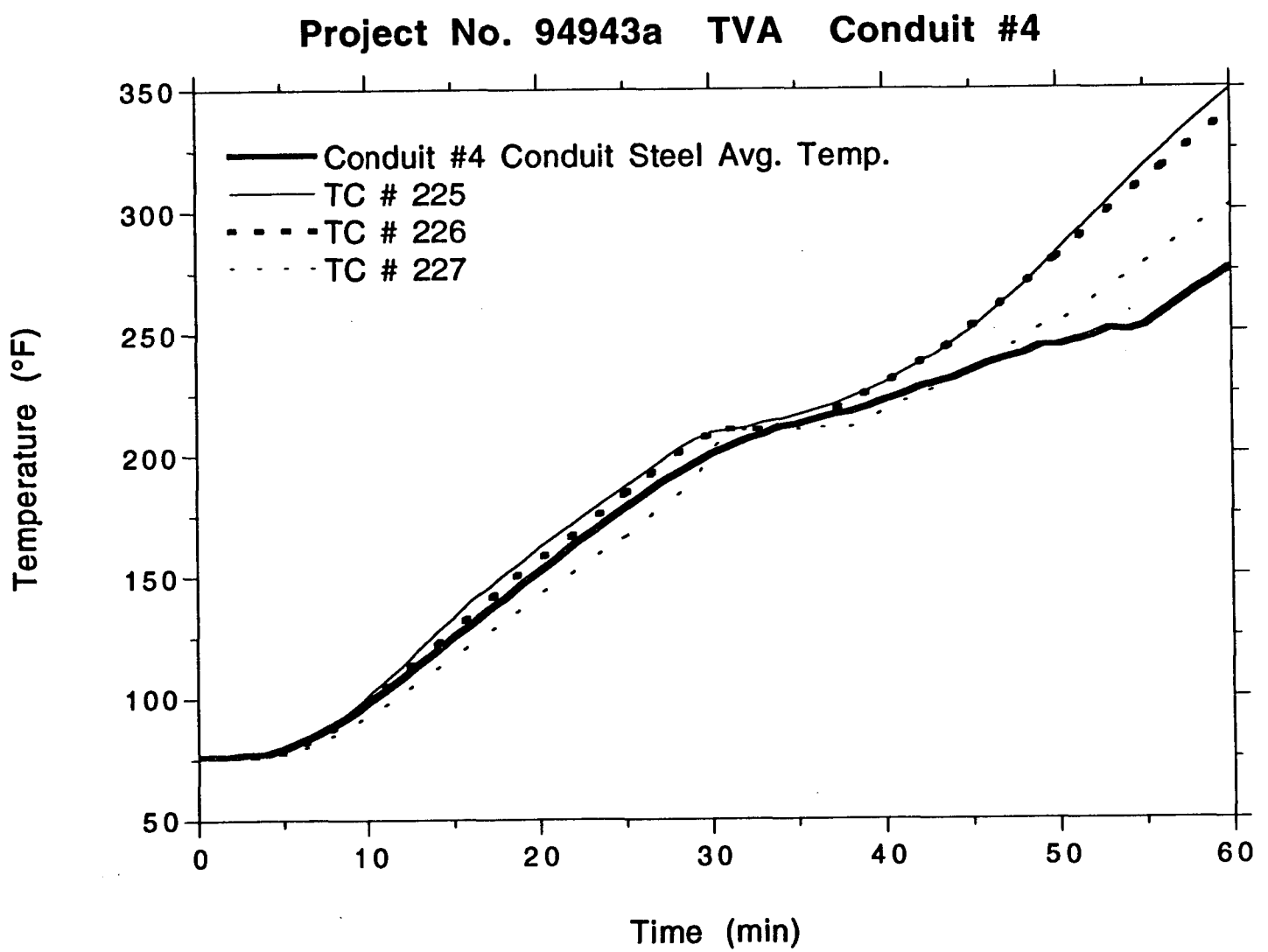
Project No. 94943a TVA Conduit #4

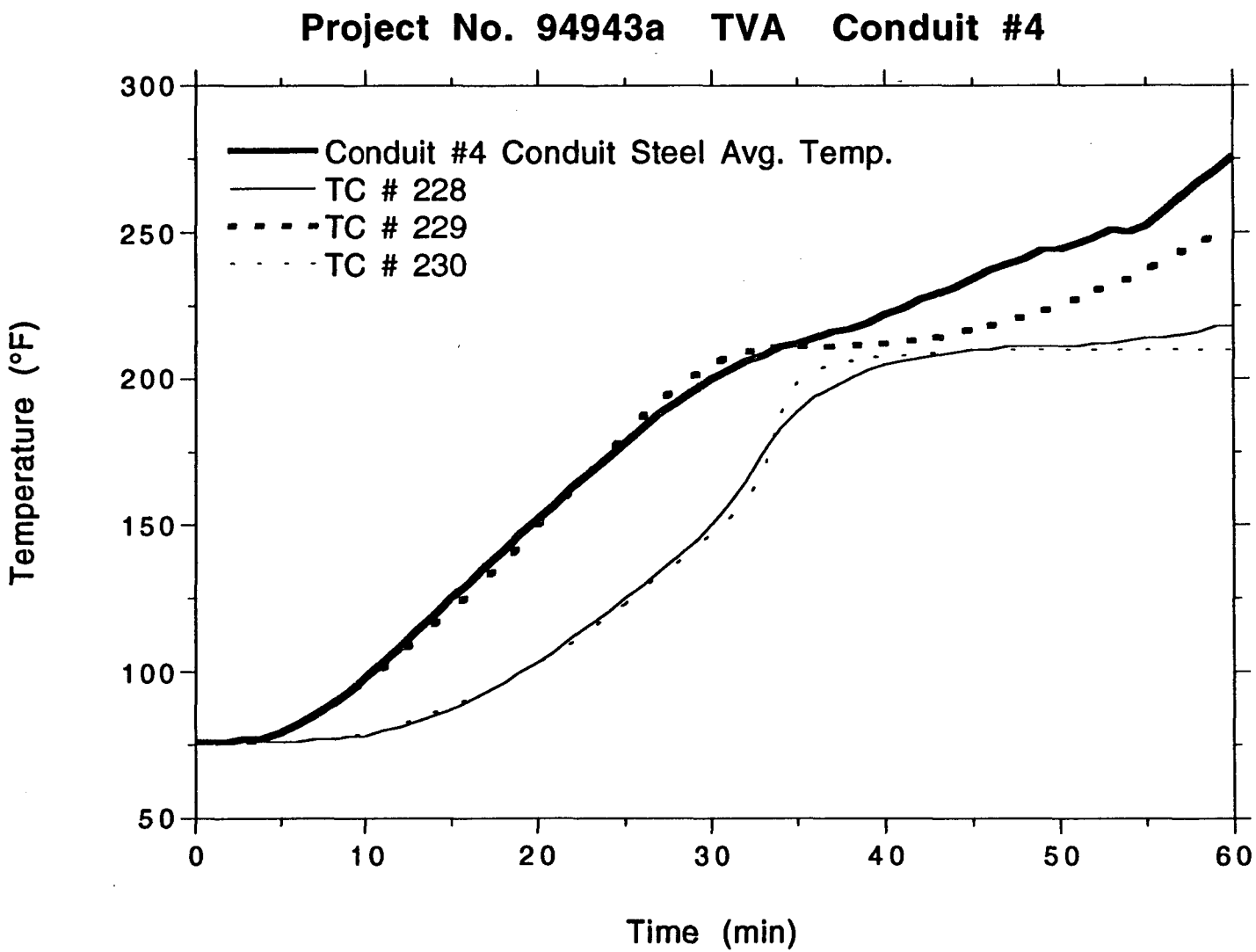


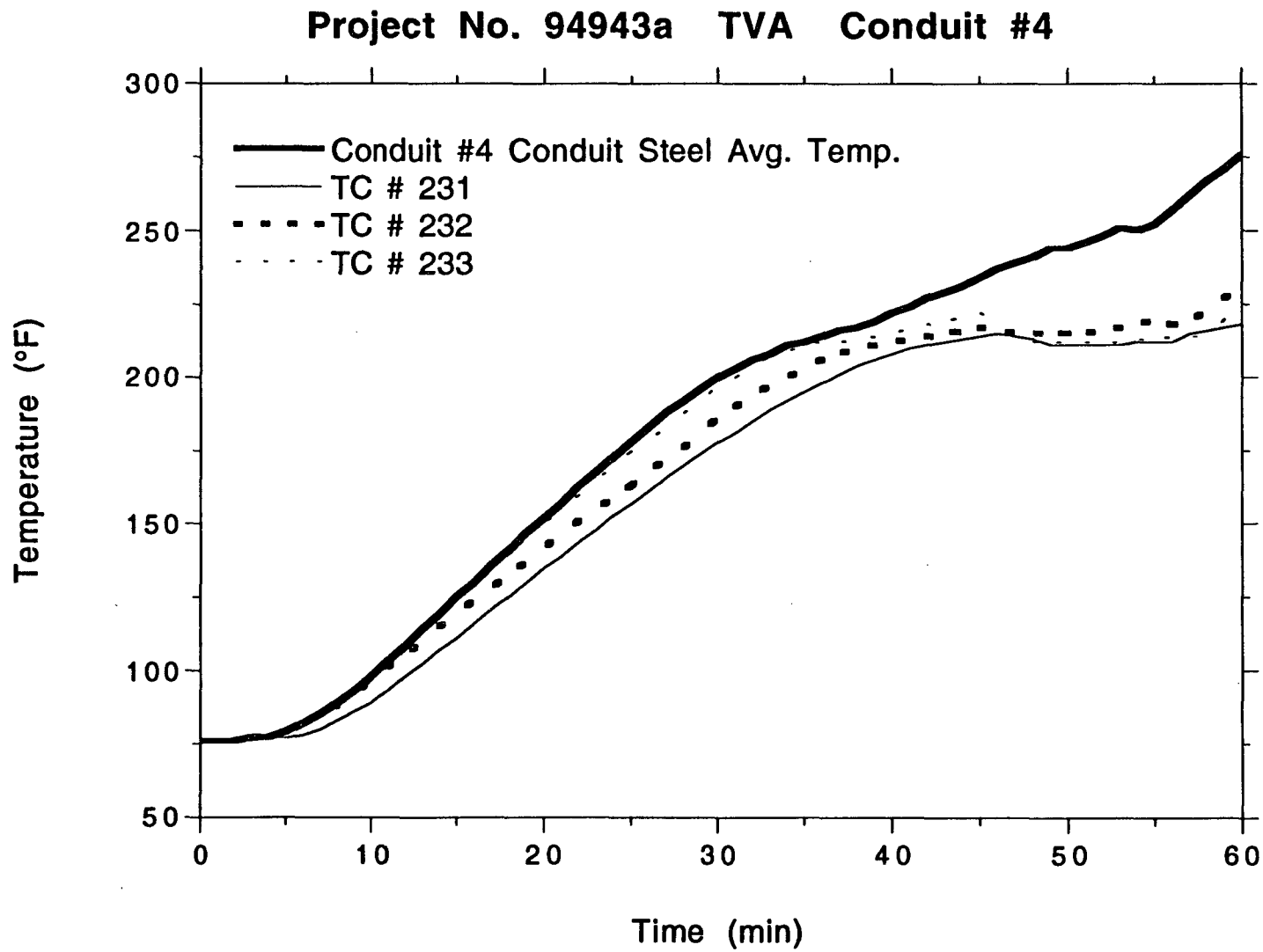
OMEGA POINT LABORATORIES



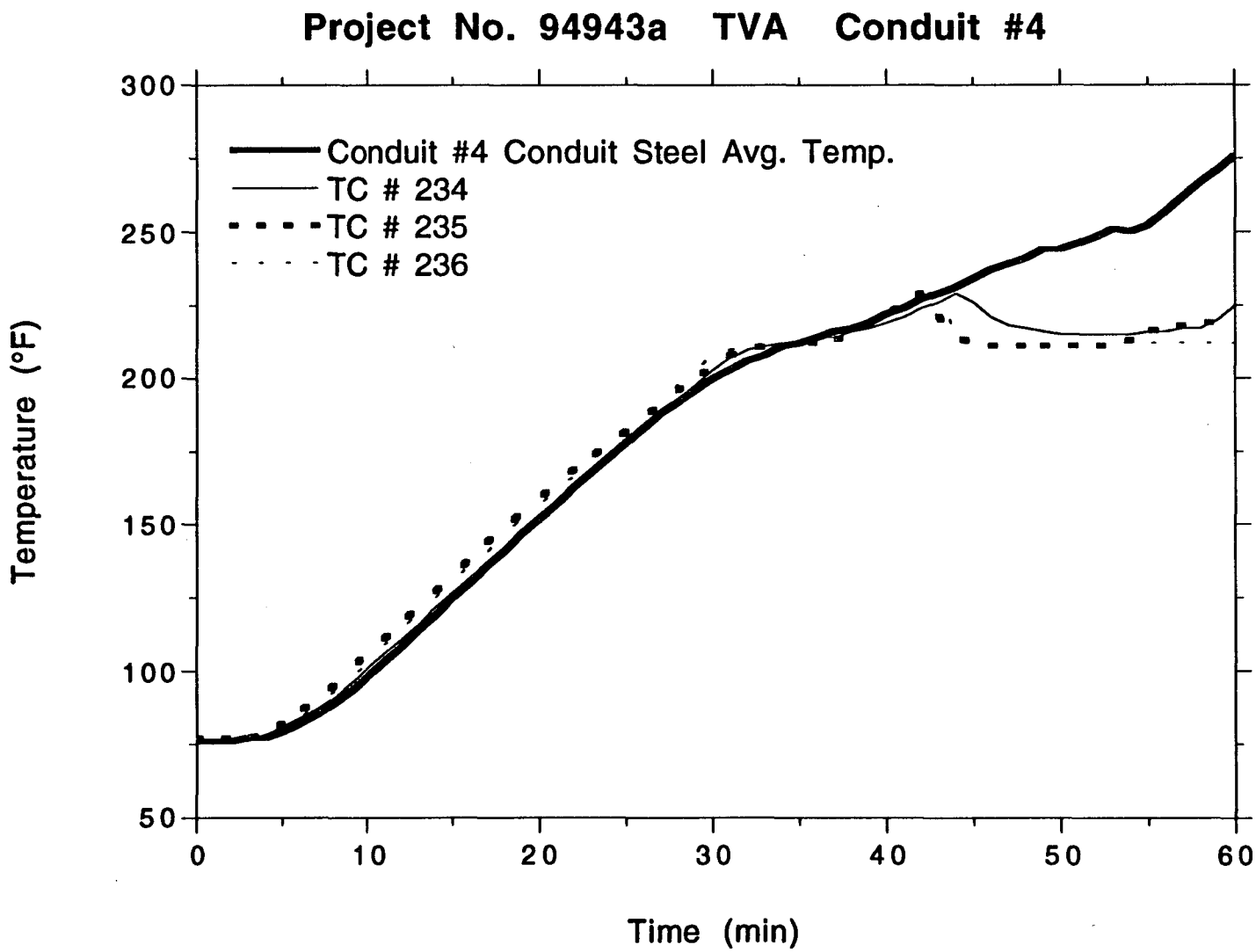
OMEGA POINT LABORATORIES

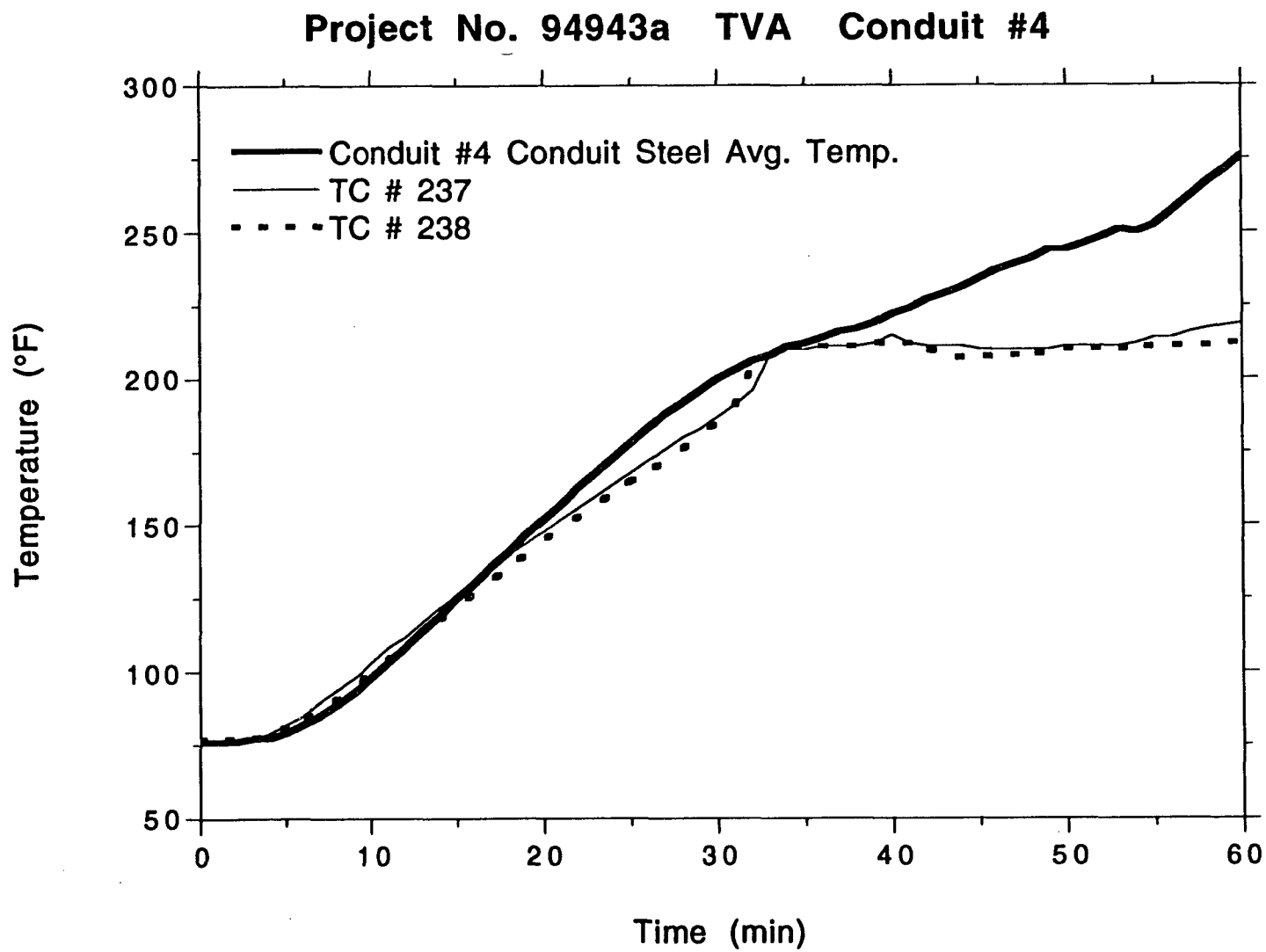

Project No. 94943a TVA Conduit #4
Conduit #4 Conduit Steel Avg. Temp.
TC # 225
TC # 226
TC # 227
Temperature (°F)
350
300
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)


Project No. 94943a TVA Conduit #4
Conduit #4 Conduit Steel Avg. Temp.
TC # 228
TC # 229
TC # 230
Temperature (°F)
300
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)



OMEGA POINT LABORATORIES


Project No. 94943a TVA Conduit #4
Conduit #4 Conduit Steel Avg. Temp.
TC # 234
TC # 235
TC # 236
Temperature (°F)
300
250
200
150
100
50
0
10
20
30
40
50
60
Time (min)



OMEGA POINT LABORATORIES

Appendix E

TABULAR TEST DATA

TVA Project No. 94943A March 31, 1993

Time (min)	E119 Std (°F)	Furnace Avg (°F)	Conduit #1 Conduit Steel Avg. Temp. (°F)	Conduit #1 Conduit Steel Max. Temp. (°F)	Conduit #1 Internal Avg. Temp. (°F)	Conduit #1 Internal Max. Temp. (°F)
0	68	75	76	77	76	77
1	254	172	76	77	76	77
2	440	633	76	77	76	77
3	627	953	76	77	76	77
4	813	952	76	79	76	77
5	1000	888	76	83	76	77
6	1060	918	77	87	76	77
7	1120	1155	78	91	76	77
8	1180	1353	79	96	77	77
9	1240	1337	81	101	77	78
10	1300	1267	83	105	77	79
11	1327	1191	85	110	78	80
12	1346	1290	87	115	79	82
13	1364	1435	90	119	80	84
14	1380	1429	93	123	82	86
15	1395	1382	96	126	83	88
16	1410	1355	99	130	85	91
17	1423	1399	102	133	87	93
18	1436	1472	105	136	90	96
19	1448	1471	109	139	92	99
20	1459	1444	112	142	95	102
21	1470	1431	116	146	97	106
22	1480	1453	120	151	100	109
23	1490	1491	123	154	104	112
24	1499	1488	127	158	107	116
25	1508	1478	131	162	110	120
26	1517	1487	135	165	114	123
27	1525	1500	139	169	117	128
28	1533	1520	143	174	121	132
29	1541	1538	148	178	125	137
30	1548	1548	152	182	129	141
31	1555	1548	157	188	133	146
32	1562	1560	162	192	137	151
33	1569	1575	167	197	141	156
34	1576	1579	172	201	146	162
35	1582	1579	177	203	150	167
36	1588	1583	182	207	155	172
37	1594	1591	187	210	159	178
38	1600	1597	192	212	164	183
39	1606	1602	196	214	168	187

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	E119 Std (°F)	Furnace Avg (°F)	Conduit #1 Conduit Steel Avg. Temp. (°F)	Conduit #1 Conduit Steel Max. Temp. (°F)	Conduit #1 Internal Avg. Temp. (°F)	Conduit #1 Internal Max. Temp. (°F)
40	1612	1606	200	215	173	192
41	1617	1614	203	217	177	196
42	1622	1622	205	219	181	199
43	1627	1629	207	222	185	202
44	1633	1635	208	226	188	205
45	1638	1638	209	227	191	207
46	1642	1642	210	215	194	209
47	1647	1645	210	217	197	211
48	1652	1649	211	219	199	212
49	1656	1653	212	220	201	213
50	1661	1656	212	221	203	214
51	1665	1661	213	220	204	214
52	1669	1666	213	222	206	215
53	1674	1670	214	223	207	216
54	1678	1675	214	225	208	216
55	1682	1677	215	228	209	217
56	1686	1680	216	232	210	218
57	1690	1685	216	232	211	219
58	1693	1692	217	234	212	221
59	1697	1700	218	236	213	222
60	1701	1706	219	238	214	224
MAX			219	238	214	224

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Conduit #2 Conduit Steel Avg. Temp. (°F)	Conduit #2 Conduit Steel Max. Temp. (°F)	Conduit #2 Internal Avg. Temp. (°F)	Conduit #2 Internal Max. Temp. (°F)	Conduit #3 Conduit Steel Avg. Temp. (°F)
0	76	77	76	77	76
1	76	77	76	77	76
2	76	77	76	77	76
3	76	77	76	77	76
4	76	77	76	77	76
5	77	78	76	77	77
6	77	78	76	77	77
7	78	80	76	77	78
8	80	82	77	78	79
9	82	84	77	79	80
10	84	86	78	80	82
11	87	90	79	82	84
12	90	94	80	84	87
13	93	98	82	86	90
14	97	102	84	89	93
15	101	110	86	92	97
16	106	120	89	96	100
17	110	131	92	101	105
18	114	143	95	106	109
19	119	155	98	111	114
20	124	165	102	116	119
21	128	173	106	122	124
22	132	176	110	128	129
23	137	178	114	134	135
24	141	183	118	141	141
25	146	187	122	147	147
26	151	190	126	153	153
27	156	193	131	159	159
28	161	197	135	164	165
29	166	201	140	170	171
30	171	205	145	175	177
31	177	209	149	180	183
32	182	210	154	185	188
33	188	210	159	190	193
34	194	210	164	194	197
35	198	211	169	197	201
36	202	211	174	200	203
37	205	212	178	203	206
38	207	212	182	205	208
39	208	213	186	207	210

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Conduit #2 Conduit Steel Avg. Temp. (°F)	Conduit #2 Conduit Steel Max. Temp. (°F)	Conduit #2 Internal Avg. Temp. (°F)	Conduit #2 Internal Max. Temp. (°F)	Conduit #3 Conduit Steel Avg. Temp. (°F)
40	209	213	189	208	211
41	210	213	193	210	213
42	211	215	195	211	214
43	212	216	198	212	215
44	212	217	200	212	216
45	213	218	202	213	217
46	213	218	204	213	218
47	214	218	205	214	218
48	214	218	207	214	219
49	214	219	208	215	219
50	214	219	209	215	220
51	215	220	210	216	220
52	215	221	211	217	221
53	216	223	211	217	221
54	216	226	212	218	222
55	217	229	213	220	223
56	218	232	214	221	223
57	219	235	215	222	224
58	221	238	216	224	225
59	222	242	217	227	227
60	224	246	219	229	228
MAX	224	246	219	229	228

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Conduit #3 Conduit Steel Max. Temp. (°F)	Conduit #3 Internal Avg. Temp. (°F)	Conduit #3 Internal Max. Temp. (°F)	Conduit #4 Conduit Steel Avg. Temp. (°F)	Conduit #4 Conduit Steel Max. Temp. (°F)
0	77	76	77	76	77
1	77	76	77	76	77
2	77	76	77	76	77
3	77	76	77	77	77
4	77	76	77	77	79
5	77	76	77	79	82
6	78	76	77	82	86
7	79	77	77	85	90
8	80	77	77	89	95
9	82	77	78	93	101
10	85	78	79	98	108
11	88	78	81	103	115
12	91	79	83	108	121
13	95	81	85	114	128
14	99	82	88	119	135
15	103	84	91	125	141
16	108	86	94	130	147
17	113	89	98	136	154
18	118	92	103	141	160
19	123	95	107	147	165
20	130	98	112	152	171
21	141	102	118	157	177
22	151	106	124	163	183
23	159	110	130	168	188
24	166	115	136	173	193
25	172	120	142	178	197
26	177	125	149	183	201
27	183	130	156	188	205
28	187	136	163	192	210
29	192	141	170	196	211
30	198	147	176	200	213
31	205	153	182	203	214
32	209	159	188	206	216
33	211	164	193	208	219
34	213	170	198	211	222
35	214	175	202	212	225
36	215	179	206	214	229
37	216	184	208	216	232
38	217	188	210	217	236
39	218	192	212	219	239

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Conduit #3 Conduit Steel Max. Temp. (°F)	Conduit #3 Internal Avg. Temp. (°F)	Conduit #3 Internal Max. Temp. (°F)	Conduit #4 Conduit Steel Avg. Temp. (°F)	Conduit #4 Conduit Steel Max. Temp. (°F)
40	219	195	213	222	244
41	220	198	214	224	248
42	220	201	216	227	253
43	221	203	217	229	259
44	222	205	218	231	265
45	223	207	219	234	272
46	223	209	220	237	278
47	224	210	221	239	285
48	225	212	222	241	292
49	226	213	222	244	299
50	227	214	223	244	305
51	228	215	224	246	312
52	229	216	225	248	318
53	231	217	226	251	325
54	233	218	227	250	331
55	235	218	229	252	337
56	238	219	230	257	343
57	241	220	232	262	349
58	244	221	233	267	354
59	248	222	235	271	359
60	252	223	238	276	365
MAX	252	223	238	276	365

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Conduit #4 Internal Avg. Temp. (°F)	Conduit #4 Internal Max. Temp. (°F)	TC # 1 (°F)	TC # 2 (°F)	TC # 3 (°F)	TC # 4 (°F)	TC # 5 (°F)	TC # 6 (°F)
0	76	77	76	76	76	76	76	76
1	76	77	76	76	76	76	76	76
2	76	77	76	76	76	76	76	76
3	76	77	76	76	76	76	76	76
4	76	77	76	77	76	76	76	76
5	76	77	77	77	76	77	76	76
6	77	78	77	78	76	78	76	77
7	78	80	78	79	77	79	77	78
8	79	82	78	80	78	81	78	80
9	81	85	80	82	79	82	79	81
10	83	89	81	84	81	84	81	83
11	86	94	83	85	82	86	83	86
12	89	98	84	87	84	89	85	88
13	93	104	86	89	87	91	87	91
14	97	109	88	92	89	94	90	94
15	102	115	90	94	92	97	93	97
16	106	121	93	97	95	100	96	100
17	111	128	95	99	98	103	99	104
18	116	134	98	103	101	107	102	107
19	121	140	100	106	104	111	106	110
20	126	146	103	109	107	114	109	114
21	131	153	106	112	110	118	113	118
22	137	159	108	115	114	124	116	121
23	142	165	111	118	117	128	120	125
24	147	171	114	121	121	131	124	129
25	152	177	117	124	125	135	128	134
26	157	183	121	128	128	139	131	139
27	162	188	125	131	132	143	135	143
28	167	194	129	135	136	147	139	148
29	172	199	133	138	140	151	143	153
30	177	203	137	142	144	156	148	158
31	181	206	139	146	149	161	152	163
32	185	209	143	151	154	166	157	169
33	189	212	146	155	160	172	162	175
34	193	214	150	159	165	178	167	187
35	196	216	154	163	170	181	172	186
36	200	219	158	167	175	186	177	190
37	203	221	162	171	181	192	182	195
38	206	224	166	176	188	196	188	198
39	209	227	172	184	196	199	194	201

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Conduit #4 Internal Avg. Temp. (°F)	Conduit #4 Internal Max. Temp. (°F)	TC # 1 (°F)	TC # 2 (°F)	TC # 3 (°F)	TC # 4 (°F)	TC # 5 (°F)	TC # 6 (°F)
40	212	230	185	190	203	202	198	203
41	215	234	203	195	207	204	202	205
42	218	238	208	199	208	207	207	208
43	221	243	208	201	208	209	208	209
44	224	248	209	204	208	211	209	210
45	227	253	209	207	209	212	210	211
46	231	259	209	209	209	213	211	212
47	233	266	210	210	210	213	211	212
48	234	273	210	211	210	214	211	213
49	232	280	210	211	211	215	212	213
50	233	287	210	212	211	215	212	213
51	235	294	210	213	211	216	212	214
52	236	300	211	214	212	217	212	214
53	236	305	211	215	212	218	212	215
54	238	300	211	216	212	219	212	215
55	240	300	211	217	212	220	212	216
56	242	304	211	218	212	222	212	217
57	244	309	211	219	212	223	212	218
58	247	318	211	220	212	225	212	219
59	252	331	211	222	212	226	212	220
60	258	342	212	223	212	228	212	222
MAX	258	342	212	223	212	228	212	222

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 7 (°F)	TC # 8 (°F)	TC # 9 (°F)	TC # 10 (°F)	TC # 11 (°F)	TC # 12 (°F)	TC # 13 (°F)	TC # 14 (°F)
0	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76
5	76	76	76	76	76	76	77	76
6	76	76	76	76	76	77	78	76
7	77	77	77	77	77	78	79	77
8	78	78	77	78	78	79	81	78
9	79	79	78	79	79	81	83	80
10	81	80	80	81	81	83	86	82
11	83	82	81	83	83	85	89	85
12	85	84	83	85	85	88	92	87
13	87	87	85	87	88	91	95	90
14	90	89	88	90	91	94	99	94
15	93	92	91	93	94	97	102	97
16	97	96	93	96	97	101	106	101
17	100	99	97	99	101	104	110	104
18	104	102	100	103	104	108	113	108
19	107	106	103	106	108	111	117	112
20	111	109	107	110	111	115	121	116
21	115	113	110	114	115	119	125	120
22	118	117	114	117	119	123	129	124
23	122	120	118	121	122	127	134	128
24	126	124	121	124	126	131	139	132
25	129	128	125	128	130	135	144	136
26	133	131	129	132	134	139	148	141
27	137	135	133	135	138	143	153	146
28	141	138	137	139	142	147	158	151
29	145	142	141	143	146	152	163	156
30	149	146	146	147	151	156	168	161
31	155	149	151	151	155	161	173	166
32	160	153	157	156	160	165	177	172
33	164	157	162	160	165	170	182	177
34	169	162	167	166	171	175	187	182
35	174	166	173	171	177	181	191	187
36	179	170	178	177	182	186	196	191
37	183	175	184	183	187	191	199	195
38	189	179	192	190	192	196	202	199
39	194	183	201	196	202	201	205	202

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 7 (°F)	TC # 8 (°F)	TC # 9 (°F)	TC # 10 (°F)	TC # 11 (°F)	TC # 12 (°F)	TC # 13 (°F)	TC # 14 (°F)
40	199	188	204	201	208	205	207	205
41	205	194	208	206	210	208	209	209
42	208	199	210	209	211	210	210	211
43	209	204	211	210	212	212	212	212
44	211	208	212	212	213	213	213	213
45	211	211	213	213	213	214	213	213
46	212	212	213	214	214	215	213	213
47	212	213	213	214	214	215	214	214
48	213	214	214	215	215	215	214	214
49	213	214	214	215	215	215	215	214
50	213	214	214	215	215	216	215	214
51	214	215	214	215	215	216	216	214
52	214	215	215	216	215	216	217	215
53	214	215	215	216	215	216	218	215
54	214	215	215	216	216	216	219	215
55	215	216	215	216	216	217	221	216
56	216	216	215	216	216	217	223	216
57	217	216	215	217	216	218	225	217
58	218	217	215	217	216	219	228	218
59	220	217	216	218	217	221	231	220
60	221	218	216	219	217	222	234	222
MAX	221	218	216	219	217	222	234	222

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 15 (°F)	TC # 16 (°F)	TC # 17 (°F)	TC # 18 (°F)	TC # 19 (°F)	TC # 20 (°F)	TC # 21 (°F)	TC # 22 (°F)
0	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76	76
6	77	77	76	76	76	76	77	76
7	77	77	77	77	77	77	77	77
8	79	79	78	77	78	78	79	78
9	80	80	80	78	80	80	80	79
10	82	83	82	79	82	82	82	81
11	85	85	84	81	84	85	85	83
12	87	88	87	82	86	87	87	86
13	91	91	90	84	89	90	90	89
14	94	94	93	86	92	93	93	92
15	97	98	97	89	95	97	96	95
16	101	102	100	91	99	100	99	98
17	105	105	104	94	102	104	103	102
18	108	109	107	97	105	108	106	105
19	112	113	111	100	109	111	110	109
20	116	118	115	104	113	115	114	112
21	120	122	119	107	116	119	117	116
22	124	126	123	111	120	123	121	119
23	128	130	126	114	124	127	125	123
24	133	135	130	118	128	130	129	126
25	137	139	135	122	132	134	132	130
26	141	144	139	126	135	139	136	133
27	146	148	143	130	139	143	140	137
28	151	153	148	134	144	147	145	140
29	156	158	152	138	148	155	149	144
30	161	162	156	143	153	161	154	148
31	166	168	161	147	158	173	159	152
32	171	177	166	152	164	180	164	156
33	177	183	171	156	168	189	169	160
34	183	191	177	160	174	190	174	170
35	189	198	182	164	179	194	179	175
36	195	205	191	170	185	197	182	183
37	199	208	199	180	190	199	186	188
38	203	210	205	200	193	202	190	192
39	206	211	208	207	197	205	193	196

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 15 (°F)	TC # 16 (°F)	TC # 17 (°F)	TC # 18 (°F)	TC # 19 (°F)	TC # 20 (°F)	TC # 21 (°F)	TC # 22 (°F)
40	209	212	209	209	199	207	196	199
41	211	212	211	211	201	209	198	202
42	212	213	211	211	203	209	201	203
43	213	213	211	211	205	211	203	205
44	213	213	212	211	207	211	206	206
45	214	213	212	212	209	211	208	207
46	214	214	212	212	211	212	210	208
47	214	214	213	212	212	212	211	209
48	214	214	213	212	213	213	211	210
49	214	214	213	212	213	213	212	211
50	214	215	214	212	213	213	212	211
51	215	215	214	212	214	214	213	212
52	215	216	214	213	214	214	213	212
53	216	217	215	213	214	214	213	212
54	216	218	215	213	214	214	213	213
55	217	220	216	213	214	215	214	213
56	218	221	217	213	215	215	214	213
57	219	223	218	213	215	215	214	213
58	221	226	220	214	215	216	214	214
59	223	229	222	214	216	216	215	214
60	225	232	225	214	216	217	215	214
MAX	225	232	225	214	216	217	215	214

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 23 (°F)	TC # 24 (°F)	TC # 25 (°F)	TC # 26 (°F)	TC # 27 (°F)	TC # 28 (°F)	TC # 29 (°F)	TC # 30 (°F)
0	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76	77
6	76	76	76	76	77	76	77	78
7	77	77	77	77	78	77	77	79
8	78	77	77	77	80	78	79	80
9	79	78	79	79	82	79	80	82
10	81	80	80	80	84	80	82	85
11	83	82	82	81	86	82	84	87
12	85	84	84	83	89	84	87	90
13	88	86	86	86	92	86	89	93
14	91	89	89	88	95	88	92	96
15	94	92	92	91	98	90	95	99
16	97	95	95	94	102	93	99	103
17	101	99	98	97	106	96	102	106
18	104	102	102	100	109	99	106	110
19	108	106	105	103	115	102	109	113
20	111	109	109	106	122	105	113	117
21	115	113	112	109	129	108	117	121
22	118	116	116	113	136	111	121	125
23	122	120	120	116	142	115	124	128
24	125	123	123	119	147	118	128	132
25	129	127	126	123	152	122	132	136
26	132	130	130	126	157	126	136	140
27	136	134	133	129	162	130	141	144
28	139	137	137	133	167	134	145	148
29	142	141	140	136	171	138	150	152
30	146	144	144	140	174	142	155	156
31	149	147	147	143	178	146	161	160
32	153	151	151	146	182	150	166	165
33	156	154	154	150	184	154	170	169
34	160	157	158	153	187	158	175	174
35	163	160	162	156	189	162	181	178
36	167	163	165	160	191	166	186	182
37	171	166	169	163	193	169	190	186
38	177	169	172	166	195	173	194	190
39	183	173	175	170	197	176	197	194

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 23 (°F)	TC # 24 (°F)	TC # 25 (°F)	TC # 26 (°F)	TC # 27 (°F)	TC # 28 (°F)	TC # 29 (°F)	TC # 30 (°F)
40	188	176	178	173	199	179	200	197
41	192	179	182	177	201	182	202	201
42	195	182	184	181	203	185	205	204
43	196	185	187	184	205	188	207	206
44	198	187	190	187	207	191	208	208
45	200	190	193	190	209	193	209	209
46	202	192	195	193	210	196	210	211
47	204	194	198	196	210	198	211	212
48	205	197	200	198	210	201	211	213
49	207	199	203	200	211	203	212	213
50	208	201	205	202	211	205	212	214
51	209	203	207	204	211	207	213	214
52	210	205	209	206	212	208	213	215
53	211	207	210	208	213	210	213	215
54	211	208	212	210	213	211	213	216
55	212	210	212	211	213	211	214	216
56	212	211	213	212	214	212	214	217
57	213	212	213	213	214	212	214	217
58	213	213	213	213	214	213	214	218
59	213	213	214	214	214	213	214	218
60	213	213	214	214	215	213	214	219
MAX	213	213	214	214	215	213	214	219

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 31 (°F)	TC # 32 (°F)	TC # 33 (°F)	TC # 34 (°F)	TC # 35 (°F)	TC # 36 (°F)	TC # 37 (°F)	TC # 38 (°F)
0	76	76	76	76	77	77	76	76
1	76	76	76	76	77	77	76	76
2	76	76	76	76	77	76	76	76
3	76	77	76	76	77	77	76	76
4	76	79	76	77	77	77	76	76
5	77	83	77	77	77	77	76	76
6	77	87	77	78	77	78	76	76
7	78	91	78	79	78	79	76	76
8	80	96	79	81	79	80	76	76
9	82	101	81	83	80	81	76	76
10	84	105	83	85	81	83	77	77
11	86	110	85	87	83	84	77	78
12	88	115	88	90	84	86	78	78
13	91	119	91	92	86	88	79	79
14	94	123	94	95	88	90	80	81
15	97	126	97	98	90	92	81	82
16	101	130	100	101	93	95	82	84
17	104	133	103	105	95	97	84	86
18	107	136	106	108	97	99	86	88
19	111	139	109	111	100	102	88	90
20	115	142	112	114	102	104	90	93
21	119	146	115	118	105	107	93	96
22	123	151	119	121	107	109	95	98
23	127	154	122	125	110	112	98	101
24	131	158	126	129	113	115	101	104
25	137	162	130	133	115	117	104	107
26	143	165	134	137	118	120	107	111
27	150	169	138	141	121	123	110	114
28	156	174	143	145	124	126	114	117
29	161	178	150	150	127	129	117	121
30	166	182	157	157	131	132	121	124
31	171	188	163	167	133	135	124	128
32	178	192	169	177	137	140	128	131
33	182	197	173	185	142	146	131	135
34	187	201	180	193	147	154	135	138
35	193	203	189	200	152	167	139	142
36	198	207	198	205	160	181	142	146
37	201	210	205	208	182	185	146	149
38	204	212	207	209	204	198	149	153
39	206	214	209	210	209	207	153	156

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 31 (°F)	TC # 32 (°F)	TC # 33 (°F)	TC # 34 (°F)	TC # 35 (°F)	TC # 36 (°F)	TC # 37 (°F)	TC # 38 (°F)
40	208	215	210	210	210	209	156	160
41	210	217	211	211	210	211	160	164
42	212	219	211	211	210	211	163	167
43	212	222	211	211	211	211	166	171
44	213	226	212	212	211	211	170	174
45	213	227	212	212	212	211	173	177
46	213	215	212	212	213	211	176	181
47	214	217	212	212	212	212	179	184
48	214	219	213	213	213	212	182	187
49	214	220	213	213	213	212	185	190
50	214	221	213	213	214	213	188	192
51	214	220	213	214	214	213	191	195
52	214	222	214	214	214	214	194	197
53	215	223	214	214	213	214	196	200
54	215	225	214	215	215	215	198	202
55	215	228	214	215	215	215	200	203
56	215	232	215	215	216	216	202	205
57	215	232	215	215	216	216	204	207
58	216	234	216	215	217	217	206	208
59	216	236	216	216	216	217	207	209
60	216	238	217	217	216	217	208	210
MAX	216	238	217	217	217	217	208	210

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 39 (°F)	TC # 40 (°F)	TC # 41 (°F)	TC # 42 (°F)	TC # 43 (°F)	TC # 45 (°F)	TC # 46 (°F)	TC # 47 (°F)
0	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76	76
6	76	76	76	76	76	76	76	76
7	76	76	76	77	77	76	76	77
8	76	76	77	77	77	77	77	77
9	76	76	77	78	77	77	77	77
10	77	77	77	79	78	77	77	78
11	77	77	78	80	79	78	78	78
12	78	78	79	82	80	79	79	79
13	79	79	80	84	81	80	80	81
14	80	80	82	86	83	81	81	82
15	81	81	83	88	85	83	83	84
16	83	83	85	91	87	85	84	86
17	84	85	87	93	89	87	86	88
18	86	87	90	96	92	90	88	90
19	89	89	92	99	95	92	91	93
20	91	92	95	102	98	95	94	96
21	94	95	98	106	101	98	96	99
22	97	98	101	109	104	101	99	102
23	99	101	104	112	107	104	102	105
24	102	104	107	116	111	108	106	108
25	105	107	111	120	114	111	109	112
26	109	110	114	123	118	115	112	116
27	112	113	117	127	122	118	116	119
28	115	117	121	131	125	122	120	123
29	119	120	124	135	129	126	124	127
30	122	124	128	139	134	130	127	131
31	126	127	132	143	138	134	131	135
32	129	131	136	148	142	138	136	140
33	133	134	140	153	147	143	140	144
34	136	138	144	158	152	148	145	149
35	140	142	148	162	157	152	149	154
36	144	146	152	166	162	157	154	159
37	147	150	156	171	166	162	159	164
38	151	153	160	175	171	166	163	170
39	155	157	165	179	175	171	168	176

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 39 (°F)	TC # 40 (°F)	TC # 41 (°F)	TC # 42 (°F)	TC # 43 (°F)	TC # 45 (°F)	TC # 46 (°F)	TC # 47 (°F)
40	158	161	169	182	179	175	173	181
41	162	165	173	186	183	179	178	186
42	166	169	177	189	187	183	183	190
43	169	173	180	193	190	187	187	194
44	173	176	184	196	194	191	191	197
45	176	180	187	199	197	194	194	200
46	179	183	190	201	199	197	197	203
47	183	186	193	203	202	200	200	205
48	185	189	195	205	204	203	203	206
49	188	192	198	206	206	205	205	208
50	191	194	200	208	207	207	206	209
51	194	196	202	209	209	208	208	210
52	196	199	203	210	210	209	209	211
53	198	201	205	211	211	211	210	212
54	200	202	206	211	211	211	211	213
55	202	204	207	212	212	212	212	214
56	204	205	208	212	213	213	213	215
57	206	207	209	213	213	214	214	216
58	207	208	210	213	214	214	214	216
59	208	209	211	214	215	215	215	217
60	209	210	212	214	215	215	216	219
MAX	209	210	212	214	215	215	216	219

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 48 (°F)	TC # 49 (°F)	TC # 50 (°F)	TC # 51 (°F)	TC # 52 (°F)	TC # 53 (°F)	TC # 54 (°F)	TC # 55 (°F)
0	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	77
3	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76	76
6	76	76	76	76	76	77	76	77
7	77	77	77	77	77	77	77	77
8	77	77	77	77	77	77	77	77
9	77	77	77	78	78	78	77	77
10	78	78	78	78	78	78	78	77
11	79	79	79	79	79	79	78	78
12	80	80	81	81	81	81	79	78
13	82	82	82	82	82	82	80	79
14	84	84	84	84	84	84	82	81
15	86	86	86	86	86	86	83	82
16	88	88	89	89	89	88	86	84
17	90	91	91	92	91	91	88	86
18	93	94	94	94	94	94	90	89
19	96	97	97	98	97	97	93	91
20	99	100	101	101	100	100	96	94
21	103	103	104	104	104	103	99	97
22	106	107	108	108	107	107	102	100
23	109	110	111	111	111	110	106	103
24	113	114	115	115	115	114	109	107
25	117	118	119	119	119	118	113	110
26	121	122	123	123	123	122	116	114
27	125	126	127	128	127	126	120	117
28	129	131	132	132	131	130	124	121
29	133	135	136	137	136	135	128	125
30	137	139	141	141	140	139	132	129
31	142	144	146	146	145	144	136	133
32	147	149	151	151	150	149	141	137
33	151	154	156	156	155	154	145	141
34	157	159	161	162	160	160	150	145
35	162	165	166	167	166	165	155	150
36	168	171	172	172	171	171	160	155
37	174	176	177	178	177	176	165	160
38	180	182	182	183	182	182	171	165
39	185	187	187	187	187	187	176	170

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 48 (°F)	TC # 49 (°F)	TC # 50 (°F)	TC # 51 (°F)	TC # 52 (°F)	TC # 53 (°F)	TC # 54 (°F)	TC # 55 (°F)
40	190	191	191	192	192	191	181	175
41	194	195	195	196	196	195	186	181
42	197	199	199	199	199	199	191	186
43	200	202	202	202	202	202	195	190
44	203	204	205	205	205	205	198	195
45	205	206	207	207	207	207	201	198
46	207	208	208	209	209	209	204	202
47	208	209	210	210	211	210	206	204
48	210	211	211	212	212	211	208	207
49	211	212	212	212	213	212	210	208
50	212	213	213	213	214	213	211	210
51	213	214	214	214	214	214	212	211
52	214	214	215	215	215	215	213	212
53	215	215	215	215	216	215	214	213
54	215	216	216	216	216	216	214	214
55	216	217	217	217	217	216	215	214
56	217	218	218	218	217	217	215	215
57	219	219	219	219	218	217	216	215
58	220	221	220	220	219	218	216	216
59	221	222	221	221	220	218	217	216
60	223	224	223	222	221	219	217	216
MAX	223	224	223	222	221	219	217	216

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 56 (°F)	TC # 57 (°F)	TC # 58 (°F)	TC # 59 (°F)	TC # 60 (°F)	TC # 61 (°F)	TC # 62 (°F)	TC # 63 (°F)
0	76	77	77	77	76	76	76	76
1	76	77	77	77	76	76	76	76
2	76	77	77	77	76	76	76	76
3	76	77	77	77	76	76	76	76
4	76	77	77	77	76	76	76	76
5	77	77	77	77	76	76	76	76
6	77	77	77	77	76	76	76	76
7	77	77	77	77	76	76	76	76
8	77	77	77	77	76	76	76	76
9	77	77	77	78	77	76	76	76
10	77	78	78	78	77	76	76	76
11	78	79	79	79	77	77	77	77
12	79	80	80	80	78	77	77	77
13	80	81	81	81	79	78	78	78
14	81	82	83	83	79	79	79	79
15	83	84	85	84	80	80	80	80
16	85	86	87	86	82	81	81	82
17	87	89	89	88	83	82	83	83
18	89	91	92	90	85	84	85	85
19	92	94	95	93	87	86	86	87
20	95	97	97	95	89	88	88	89
21	98	100	100	98	91	90	91	91
22	101	103	103	101	94	92	93	93
23	104	106	107	104	96	95	96	96
24	107	110	110	107	99	98	99	99
25	111	113	113	110	102	101	101	101
26	114	117	117	113	105	104	104	104
27	118	120	120	116	109	107	108	108
28	122	124	124	120	112	111	111	111
29	125	128	128	123	116	114	114	114
30	129	131	131	127	119	118	118	118
31	133	135	135	131	123	122	122	122
32	137	139	139	135	127	126	126	126
33	141	143	143	139	131	130	130	130
34	145	147	148	143	134	133	134	134
35	150	152	152	148	138	137	138	139
36	154	156	156	152	142	141	142	143
37	159	161	161	157	145	145	146	148
38	164	166	166	161	149	148	151	152
39	169	170	170	166	152	152	155	157

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 56 (°F)	TC # 57 (°F)	TC # 58 (°F)	TC # 59 (°F)	TC # 60 (°F)	TC # 61 (°F)	TC # 62 (°F)	TC # 63 (°F)
40	174	175	175	170	155	156	159	161
41	179	181	180	174	159	159	163	166
42	185	186	185	179	162	162	166	170
43	190	191	189	183	165	166	170	173
44	194	195	193	188	168	169	174	177
45	198	199	197	192	171	172	177	180
46	202	202	200	196	175	175	180	184
47	205	205	203	198	178	178	183	186
48	207	207	205	201	181	181	186	189
49	209	209	207	203	184	184	189	191
50	210	210	208	204	187	187	191	194
51	211	211	209	206	189	190	194	196
52	212	212	210	207	192	192	196	198
53	213	213	211	208	194	194	198	199
54	214	214	212	209	197	197	200	201
55	214	214	213	209	199	199	201	202
56	215	215	213	210	201	201	203	204
57	215	215	214	211	203	202	204	205
58	216	216	215	212	204	204	206	206
59	216	216	215	212	206	205	207	207
60	216	217	216	213	207	206	208	208
MAX	216	217	216	213	207	206	208	208

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 64 (°F)	TC # 65 (°F)	TC # 66 (°F)	TC # 67 (°F)	TC # 68 (°F)	TC # 69 (°F)	TC # 70 (°F)	TC # 71 (°F)
0	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76
2	76	76	77	76	76	76	76	76
3	76	76	77	77	76	76	76	76
4	76	76	77	77	76	76	76	76
5	76	76	77	77	77	77	76	77
6	76	76	77	78	77	78	77	77
7	76	76	79	80	78	79	78	79
8	76	76	80	82	80	81	79	80
9	76	77	81	84	82	83	81	82
10	77	77	83	86	84	86	83	85
11	77	78	86	89	87	89	86	88
12	78	78	89	92	90	92	89	91
13	78	79	92	95	94	96	92	94
14	79	80	95	98	98	100	96	98
15	80	81	98	102	102	104	100	102
16	82	82	102	105	106	108	104	106
17	83	83	105	109	111	113	108	111
18	85	84	109	113	115	117	112	115
19	87	86	113	116	120	122	117	120
20	88	88	117	120	124	126	121	124
21	91	89	121	124	129	131	126	129
22	93	91	124	128	133	135	130	133
23	95	93	128	132	138	140	135	138
24	98	96	132	137	143	144	139	142
25	101	98	136	141	148	149	144	147
26	104	100	140	145	155	153	149	152
27	107	103	144	148	160	158	155	157
28	110	105	147	152	167	163	160	162
29	113	108	151	156	174	170	166	168
30	117	112	155	160	180	177	173	173
31	121	115	159	164	188	185	179	179
32	125	118	165	168	202	196	185	185
33	129	122	174	172	208	204	190	190
34	134	126	198	178	209	207	195	194
35	138	130	207	190	209	209	198	198
36	143	134	208	205	210	210	201	201
37	148	139	209	208	210	211	202	204
38	153	144	209	210	210	212	206	206
39	157	149	209	211	210	212	209	208

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 64 (°F)	TC # 65 (°F)	TC # 66 (°F)	TC # 67 (°F)	TC # 68 (°F)	TC # 69 (°F)	TC # 70 (°F)	TC # 71 (°F)
40	162	154	210	212	210	212	210	209
41	166	158	210	212	211	212	211	211
42	170	163	210	212	211	213	212	212
43	174	167	210	212	212	213	212	213
44	178	170	210	213	212	213	212	213
45	181	174	210	213	212	213	212	213
46	184	177	210	213	212	213	212	214
47	187	180	211	214	212	213	212	214
48	189	182	211	214	212	214	212	214
49	191	185	211	214	212	214	212	214
50	193	187	211	215	212	214	213	214
51	195	189	211	216	212	215	213	215
52	197	191	211	217	212	215	213	215
53	199	193	211	218	212	216	212	215
54	200	195	211	219	212	216	213	216
55	201	196	210	220	212	217	213	216
56	203	197	210	221	213	218	213	217
57	204	199	210	223	213	220	213	217
58	205	200	210	224	213	221	213	218
59	206	201	210	226	213	223	213	219
60	206	202	210	228	213	224	213	220
MAX	206	202	211	228	213	224	213	220

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 72 (°F)	TC # 73 (°F)	TC # 74 (°F)	TC # 75 (°F)	TC # 76 (°F)	TC # 78 (°F)	TC # 79 (°F)	TC # 80 (°F)
0	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76	76
6	77	77	76	77	76	76	76	76
7	77	78	77	78	77	77	77	77
8	79	80	79	79	77	78	77	78
9	80	82	80	81	79	79	79	80
10	82	84	83	84	80	81	80	82
11	85	87	85	87	83	84	83	85
12	87	90	89	91	86	87	86	88
13	91	93	92	95	90	90	92	93
14	95	97	96	100	94	94	98	101
15	99	101	101	104	98	99	102	110
16	103	106	105	109	103	103	107	120
17	108	110	110	113	108	108	111	131
18	112	115	115	118	112	113	117	143
19	117	120	120	123	117	117	123	155
20	122	124	124	127	122	122	128	165
21	126	129	129	131	127	127	134	173
22	131	133	133	136	131	131	140	176
23	135	138	138	140	136	136	146	178
24	140	142	142	144	140	140	153	183
25	144	147	147	149	145	145	159	187
26	148	151	151	153	149	149	166	190
27	152	155	155	157	153	154	176	193
28	156	158	160	161	158	159	182	197
29	160	162	165	165	162	164	196	200
30	164	166	171	169	167	169	205	202
31	168	170	182	173	174	175	209	204
32	172	174	188	178	179	181	210	207
33	176	177	194	182	184	186	210	209
34	180	181	199	186	189	190	210	210
35	188	185	203	191	193	194	210	210
36	192	189	206	195	196	198	210	211
37	197	192	208	200	200	201	211	211
38	204	196	210	204	202	204	211	212
39	207	200	211	207	205	206	211	212

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 72 (°F)	TC # 73 (°F)	TC # 74 (°F)	TC # 75 (°F)	TC # 76 (°F)	TC # 78 (°F)	TC # 79 (°F)	TC # 80 (°F)
40	209	204	212	211	207	209	211	212
41	210	208	212	213	209	211	212	212
42	211	211	213	215	211	212	212	213
43	212	213	213	216	212	213	212	213
44	213	214	214	217	213	214	212	213
45	213	214	214	218	213	214	212	213
46	214	215	214	218	214	215	212	213
47	214	215	215	218	214	215	212	213
48	214	215	215	218	214	215	213	213
49	214	215	215	219	214	215	213	213
50	215	215	216	219	214	215	213	213
51	215	216	216	220	214	216	213	213
52	215	216	217	220	214	216	213	213
53	215	216	217	221	214	216	213	213
54	216	216	219	222	215	216	213	214
55	216	217	220	224	215	216	213	214
56	216	218	222	226	215	216	214	215
57	217	218	224	228	215	217	214	216
58	218	220	226	231	215	217	215	218
59	219	221	230	234	216	218	216	220
60	220	223	233	237	216	219	217	222
MAX	220	223	233	237	216	219	217	222

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 81 (°F)	TC # 82 (°F)	TC # 83 (°F)	TC # 84 (°F)	TC # 85 (°F)	TC # 86 (°F)	TC # 87 (°F)	TC # 88 (°F)
0	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76
4	77	76	76	77	76	76	76	76
5	77	77	77	77	77	77	77	77
6	78	77	77	78	78	78	77	77
7	79	78	78	79	79	79	77	79
8	81	80	80	81	81	81	78	81
9	83	82	82	83	83	83	79	83
10	86	85	85	86	86	86	81	86
11	89	88	88	90	90	89	82	89
12	92	91	91	94	94	92	84	93
13	96	95	95	98	98	96	86	97
14	101	99	99	102	102	100	89	101
15	107	103	103	106	107	105	92	105
16	112	108	108	111	111	109	95	110
17	118	112	112	115	116	113	98	114
18	123	117	117	120	120	118	102	118
19	130	122	122	124	125	122	105	123
20	136	127	127	129	129	126	109	127
21	141	133	132	133	133	131	113	132
22	147	139	136	138	138	135	117	136
23	152	145	142	142	142	140	121	141
24	159	152	147	146	146	144	125	145
25	166	157	152	151	151	148	130	150
26	176	162	157	155	155	153	134	154
27	186	167	162	160	159	157	140	158
28	195	173	166	166	163	162	146	162
29	201	180	170	172	168	167	153	166
30	204	189	175	178	177	172	160	171
31	206	200	180	185	184	178	165	175
32	207	204	191	190	194	186	171	180
33	209	207	202	201	201	195	180	185
34	210	209	207	207	207	207	203	192
35	211	210	210	209	209	209	209	205
36	211	211	211	210	210	210	210	208
37	212	211	211	211	211	211	211	210
38	212	212	212	211	211	211	211	211
39	213	212	212	211	211	211	211	211

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 81 (°F)	TC # 82 (°F)	TC # 83 (°F)	TC # 84 (°F)	TC # 85 (°F)	TC # 86 (°F)	TC # 87 (°F)	TC # 88 (°F)
40	213	212	212	211	211	211	212	212
41	213	213	212	211	212	211	212	212
42	214	213	213	212	212	212	212	212
43	214	213	213	212	212	212	213	213
44	214	213	213	212	212	212	213	213
45	215	213	213	212	212	212	213	213
46	215	213	213	212	212	212	213	214
47	215	214	213	212	212	213	213	214
48	216	214	213	212	212	213	213	214
49	217	214	213	212	213	213	213	214
50	218	214	213	212	213	214	213	214
51	219	214	213	212	213	215	213	215
52	219	214	213	213	214	216	213	215
53	223	215	214	214	215	217	214	216
54	226	216	215	215	217	220	214	217
55	229	218	215	216	218	222	215	219
56	232	219	216	217	220	224	215	220
57	235	222	217	219	223	227	216	222
58	238	225	219	221	226	230	217	225
59	242	229	221	224	230	233	217	227
60	246	233	224	227	234	237	218	231
MAX	246	233	224	227	234	237	218	231

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 89 (°F)	TC # 90 (°F)	TC # 91 (°F)	TC # 92 (°F)	TC # 93 (°F)	TC # 94 (°F)	TC # 95 (°F)	TC # 96 (°F)
0	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76
5	77	77	77	77	77	77	77	77
6	77	77	77	77	77	77	77	77
7	78	78	78	78	78	78	79	79
8	80	79	79	80	79	80	80	80
9	82	81	81	82	81	81	82	82
10	85	84	83	84	84	83	84	85
11	88	86	86	87	86	86	86	88
12	91	89	89	90	89	89	89	91
13	95	93	92	93	92	92	93	95
14	99	96	95	97	96	95	96	99
15	103	100	99	101	100	99	100	104
16	108	104	103	105	104	103	104	109
17	112	108	107	109	108	107	108	113
18	116	113	111	113	113	111	112	118
19	121	117	115	117	118	115	116	122
20	126	121	120	122	123	119	120	127
21	130	126	124	126	127	123	125	131
22	135	130	128	130	132	128	129	135
23	139	135	132	134	136	132	133	139
24	144	139	137	139	141	137	137	144
25	149	144	141	143	145	141	142	148
26	154	149	145	147	149	146	146	152
27	159	153	149	152	153	150	150	156
28	164	158	153	156	158	154	155	160
29	173	163	158	160	163	159	159	163
30	178	168	162	164	167	163	163	167
31	184	172	166	169	172	168	167	170
32	189	177	170	173	176	173	172	174
33	200	181	174	177	180	179	176	177
34	200	185	178	182	185	183	181	180
35	205	189	182	186	189	188	185	183
36	204	192	186	190	194	193	190	186
37	203	196	190	195	198	196	194	189
38	204	199	194	199	201	198	197	192
39	205	202	198	202	204	201	201	195

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 89 (°F)	TC # 90 (°F)	TC # 91 (°F)	TC # 92 (°F)	TC # 93 (°F)	TC # 94 (°F)	TC # 95 (°F)	TC # 96 (°F)
40	207	205	201	205	206	204	205	198
41	208	208	204	208	208	206	207	200
42	209	211	206	210	210	207	209	202
43	211	212	208	211	211	209	211	204
44	211	213	210	212	212	210	212	206
45	212	213	212	212	213	211	213	208
46	213	214	213	213	213	212	213	210
47	213	214	214	213	214	213	214	211
48	214	214	214	214	214	213	214	212
49	214	215	215	214	215	214	215	213
50	214	215	215	215	215	214	215	214
51	215	215	215	215	215	214	215	215
52	215	215	216	216	216	215	216	215
53	216	216	216	216	216	215	216	216
54	216	216	216	217	217	215	216	216
55	217	217	217	218	218	216	217	217
56	219	218	217	219	218	216	217	218
57	220	220	218	221	219	216	218	219
58	222	221	219	222	221	217	218	220
59	225	223	220	224	222	217	219	222
60	227	225	221	226	224	218	220	224
MAX	227	225	221	226	224	218	220	224

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 97 (°F)	TC # 98 (°F)	TC # 99 (°F)	TC # 100 (°F)	TC # 101 (°F)	TC # 102 (°F)	TC # 103 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	76	77	76	77	76	76	77
5	77	77	77	77	77	77	77
6	77	78	77	78	77	77	78
7	78	79	78	79	78	79	79
8	79	80	80	80	80	80	81
9	81	82	82	82	82	82	83
10	83	84	84	84	84	85	86
11	86	86	86	87	87	87	89
12	89	89	89	90	90	90	92
13	92	92	92	93	93	94	96
14	95	95	96	96	97	97	99
15	99	99	99	99	101	101	103
16	102	102	103	103	104	104	107
17	106	106	107	107	109	108	110
18	110	110	111	111	113	112	114
19	114	114	115	115	117	116	118
20	118	119	119	119	121	120	122
21	122	123	123	123	125	124	126
22	127	127	128	128	129	129	130
23	131	132	132	132	133	133	134
24	136	137	136	137	137	137	138
25	140	142	140	142	141	141	143
26	145	147	145	147	146	147	148
27	150	152	149	152	150	153	153
28	155	157	154	157	155	158	158
29	160	163	160	163	160	164	163
30	165	168	166	169	166	170	170
31	171	173	173	176	171	180	177
32	177	178	179	183	177	187	186
33	183	184	186	190	183	188	196
34	189	189	193	197	189	196	204
35	195	194	201	204	196	202	209
36	202	199	208	209	204	209	210
37	207	203	210	210	210	210	210
38	207	205	210	211	210	210	210
39	207	207	211	211	210	211	210

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 97 (°F)	TC # 98 (°F)	TC # 99 (°F)	TC # 100 (°F)	TC # 101 (°F)	TC # 102 (°F)	TC # 103 (°F)
40	208	208	211	211	211	211	211
41	208	210	211	211	211	211	211
42	209	211	212	212	212	212	211
43	210	211	212	212	212	212	212
44	212	212	213	213	212	213	213
45	212	213	213	213	213	213	213
46	213	213	214	214	213	213	214
47	213	214	214	215	214	214	214
48	213	214	215	215	214	214	215
49	214	214	215	216	214	214	215
50	214	214	216	216	215	215	216
51	214	214	216	217	215	216	217
52	214	214	217	217	216	216	218
53	214	215	217	218	217	217	218
54	214	215	218	219	218	218	219
55	214	215	218	219	219	219	220
56	215	215	219	220	220	220	222
57	215	216	220	221	221	221	223
58	215	216	222	223	223	223	225
59	215	216	223	224	226	225	227
60	215	217	225	226	228	228	229
MAX	215	217	225	226	228	228	229

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 104 (°F)	TC # 105 (°F)	TC # 106 (°F)	TC # 107 (°F)	TC # 108 (°F)	TC # 109 (°F)	TC # 110 (°F)
0	76	77	77	76	76	76	76
1	76	77	77	76	76	76	76
2	76	77	77	76	76	76	76
3	77	77	77	76	76	76	76
4	77	77	77	76	76	76	76
5	77	78	77	76	76	76	76
6	78	78	78	76	76	76	76
7	80	80	79	76	76	76	76
8	82	82	81	76	76	76	77
9	84	84	82	77	77	77	77
10	86	86	84	77	77	77	78
11	89	89	86	78	78	78	78
12	92	91	89	78	79	79	79
13	96	94	91	80	80	80	81
14	99	97	94	81	82	82	82
15	103	101	97	83	84	83	85
16	106	104	99	84	86	85	87
17	110	107	102	87	88	88	89
18	114	110	105	89	90	90	92
19	118	113	108	92	93	93	95
20	122	117	111	95	96	96	98
21	126	120	114	98	100	100	102
22	130	123	117	101	103	103	106
23	134	126	120	105	107	107	109
24	140	130	124	109	110	111	113
25	146	133	129	112	114	115	117
26	153	137	134	117	118	119	121
27	159	141	139	121	122	123	125
28	167	145	146	125	127	127	130
29	172	150	153	130	131	131	134
30	177	154	154	134	135	135	138
31	181	159	156	139	140	140	143
32	186	165	161	144	144	144	147
33	191	171	167	148	149	149	151
34	196	178	173	153	153	154	156
35	202	186	183	157	158	158	160
36	209	198	197	162	163	163	165
37	210	206	207	166	167	168	169
38	210	209	209	170	171	172	174
39	211	210	209	174	175	176	178

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 104 (°F)	TC # 105 (°F)	TC # 106 (°F)	TC # 107 (°F)	TC # 108 (°F)	TC # 109 (°F)	TC # 110 (°F)
40	211	211	210	178	179	180	182
41	211	212	210	181	183	184	185
42	211	213	211	184	186	187	189
43	212	214	211	187	189	190	192
44	212	214	212	190	192	193	195
45	213	215	212	193	195	196	197
46	213	216	212	195	197	198	200
47	214	217	212	197	200	201	202
48	214	217	212	199	201	203	204
49	214	218	212	201	203	204	205
50	214	219	213	203	205	206	207
51	214	220	213	204	206	207	208
52	215	221	213	206	208	209	210
53	215	222	213	207	209	210	211
54	215	223	213	208	210	211	212
55	216	225	213	208	210	212	213
56	216	226	213	209	211	213	214
57	217	227	214	210	212	213	215
58	218	229	214	210	213	214	216
59	219	230	214	211	213	215	218
60	221	232	215	211	214	216	219
MAX	221	232	215	211	214	216	219

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 111 (°F)	TC # 112 (°F)	TC # 113 (°F)	TC # 114 (°F)	TC # 115 (°F)	TC # 116 (°F)	TC # 117 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76
6	76	76	76	76	76	76	76
7	76	76	76	77	77	76	77
8	77	77	77	77	77	77	77
9	77	77	77	78	77	77	78
10	78	78	78	78	78	78	79
11	79	79	79	80	79	79	80
12	80	80	80	81	80	80	81
13	81	82	82	83	82	81	83
14	83	84	84	85	84	83	85
15	85	86	86	88	86	85	88
16	88	88	89	90	88	87	91
17	90	91	92	93	91	89	94
18	93	94	95	97	94	92	97
19	96	98	98	100	97	95	100
20	100	101	102	104	100	98	104
21	103	105	105	107	104	102	108
22	107	108	109	111	108	105	112
23	111	112	113	115	111	109	116
24	114	116	117	120	115	113	120
25	118	120	122	124	119	117	124
26	123	125	126	128	123	121	128
27	127	129	130	132	128	125	133
28	131	133	135	137	132	130	137
29	135	138	139	141	136	134	142
30	139	142	144	146	141	139	147
31	144	146	148	151	145	144	151
32	148	151	153	155	150	149	157
33	152	155	158	160	155	154	162
34	157	160	162	165	160	159	169
35	161	164	167	171	165	166	175
36	165	168	172	176	171	172	181
37	170	172	176	180	176	178	187
38	174	176	180	184	182	183	191
39	178	180	184	188	186	188	195

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 111 (°F)	TC # 112 (°F)	TC # 113 (°F)	TC # 114 (°F)	TC # 115 (°F)	TC # 116 (°F)	TC # 117 (°F)
40	182	184	188	192	190	192	198
41	185	188	191	195	194	195	201
42	189	191	194	197	197	198	203
43	192	194	197	200	199	201	205
44	195	197	199	202	202	203	206
45	198	199	202	204	204	205	208
46	200	202	204	206	205	206	209
47	202	204	205	207	207	207	210
48	204	206	207	208	208	209	211
49	206	207	208	210	209	210	211
50	207	209	210	211	210	211	212
51	209	210	211	212	211	211	213
52	210	211	212	213	212	212	214
53	211	212	213	214	213	213	214
54	212	213	214	215	214	214	215
55	213	214	215	216	215	215	216
56	214	215	216	217	216	216	218
57	215	216	217	219	217	217	219
58	216	217	218	220	219	218	221
59	218	218	220	222	220	220	223
60	219	220	221	224	222	221	225
MAX	219	220	221	224	222	221	225

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 118 (°F)	TC # 119 (°F)	TC # 120 (°F)	TC # 121 (°F)	TC # 122 (°F)	TC # 123 (°F)	TC # 124 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76
6	76	76	77	76	76	76	76
7	77	77	77	77	76	76	76
8	77	77	78	77	77	77	77
9	78	78	79	78	78	77	77
10	79	79	80	79	79	78	78
11	80	80	82	81	80	79	80
12	82	82	84	83	82	81	82
13	84	84	86	86	85	83	84
14	86	87	89	88	88	86	87
15	89	90	92	92	91	90	92
16	92	93	95	95	95	94	96
17	96	96	99	99	100	99	101
18	99	100	103	103	104	104	106
19	103	104	107	108	110	110	111
20	107	108	111	112	115	116	116
21	111	112	115	117	120	122	122
22	115	116	120	122	126	128	127
23	119	121	125	128	132	134	133
24	123	125	130	133	138	141	139
25	128	130	135	138	145	147	145
26	132	134	140	144	151	153	150
27	137	139	145	149	157	159	156
28	141	144	150	155	163	164	162
29	146	149	155	161	169	170	168
30	151	154	160	166	175	175	174
31	156	159	165	172	180	180	179
32	161	164	171	178	185	184	184
33	167	169	177	185	190	188	188
34	173	176	183	190	194	192	192
35	179	182	189	195	197	196	195
36	185	187	194	199	200	198	198
37	190	192	198	202	203	201	200
38	195	196	201	205	205	203	203
39	198	200	204	206	207	205	205

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 118 (°F)	TC # 119 (°F)	TC # 120 (°F)	TC # 121 (°F)	TC # 122 (°F)	TC # 123 (°F)	TC # 124 (°F)
40	201	202	206	208	208	207	206
41	203	205	208	209	210	208	208
42	205	206	209	210	211	209	209
43	207	208	210	211	212	210	210
44	208	209	211	212	212	211	211
45	209	210	212	213	213	212	212
46	210	211	213	213	213	213	213
47	211	212	213	213	214	213	213
48	212	212	214	214	214	214	214
49	212	213	214	214	215	214	214
50	213	213	214	215	215	214	215
51	213	214	214	215	216	215	215
52	214	214	215	215	217	215	215
53	214	215	215	216	217	216	216
54	215	215	216	217	218	216	216
55	216	216	217	218	220	217	217
56	217	217	218	219	221	218	217
57	218	218	219	221	222	219	218
58	220	219	221	222	224	220	219
59	222	221	223	225	227	221	220
60	224	223	225	227	229	223	221
MAX	224	223	225	227	229	223	221

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 125 (°F)	TC # 126 (°F)	TC # 127 (°F)	TC # 128 (°F)	TC # 129 (°F)	TC # 130 (°F)	TC # 131 (°F)
0	76	76	76	76	77	76	76
1	76	76	76	76	77	76	76
2	76	76	76	76	77	76	76
3	76	76	76	76	77	76	76
4	76	76	76	76	77	76	76
5	76	76	76	76	77	76	76
6	76	76	76	77	77	76	76
7	76	76	77	77	77	76	76
8	77	77	77	77	77	76	76
9	77	77	78	78	78	77	77
10	78	78	79	79	78	77	77
11	78	79	80	80	79	77	78
12	80	80	81	81	81	78	78
13	82	82	83	83	82	79	79
14	84	84	86	85	84	80	80
15	87	87	88	87	86	82	82
16	90	90	91	90	88	83	83
17	93	93	94	93	91	85	85
18	97	97	98	96	94	87	88
19	102	101	102	100	97	90	90
20	106	105	106	103	100	93	93
21	111	109	110	107	103	96	96
22	115	113	114	111	106	99	99
23	120	118	119	115	110	102	102
24	125	122	123	119	113	106	106
25	130	127	127	123	117	110	109
26	135	132	132	127	120	114	113
27	141	136	136	132	124	118	117
28	146	141	141	136	128	122	121
29	151	146	145	141	132	126	126
30	156	150	150	146	136	130	130
31	161	155	154	151	141	134	134
32	166	160	159	156	146	139	139
33	171	165	164	161	151	143	144
34	176	169	169	166	156	148	148
35	180	174	173	171	160	152	153
36	185	179	178	176	165	156	158
37	189	183	183	180	169	161	163
38	192	188	187	184	173	165	167
39	196	192	192	187	177	169	172

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 125 (°F)	TC # 126 (°F)	TC # 127 (°F)	TC # 128 (°F)	TC # 129 (°F)	TC # 130 (°F)	TC # 131 (°F)
40	199	196	196	191	181	173	176
41	202	200	199	194	184	177	180
42	205	203	202	197	187	181	184
43	207	206	204	199	190	184	187
44	209	208	206	202	193	188	190
45	210	209	208	203	196	191	193
46	211	211	209	205	199	193	196
47	212	212	210	207	201	196	198
48	213	213	211	208	203	198	200
49	214	213	212	209	205	200	202
50	214	214	213	210	206	202	204
51	215	215	213	210	207	204	205
52	215	215	213	211	208	205	207
53	215	216	214	211	208	207	208
54	216	216	214	212	209	208	209
55	216	217	215	212	209	209	210
56	217	217	215	213	210	210	210
57	217	218	216	213	210	210	211
58	218	219	217	214	211	211	212
59	219	220	218	214	211	212	212
60	220	222	219	215	212	212	213
MAX	220	222	219	215	212	212	213

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 132 (°F)	TC # 133 (°F)	TC # 134 (°F)	TC # 135 (°F)	TC # 136 (°F)	TC # 137 (°F)	TC # 138 (°F)
0	76	76	76	77	77	77	77
1	76	76	76	77	77	77	77
2	76	76	76	77	77	77	77
3	76	76	76	77	77	77	77
4	76	76	76	77	77	77	77
5	76	76	76	77	77	77	77
6	76	76	76	77	77	78	77
7	76	76	77	77	78	79	78
8	77	77	77	77	79	80	80
9	77	77	77	77	80	82	82
10	77	77	77	78	82	84	84
11	78	78	78	78	85	86	87
12	79	79	79	79	87	89	90
13	80	80	80	79	90	92	93
14	81	81	81	80	93	95	97
15	82	82	82	82	97	99	101
16	84	84	84	83	100	103	105
17	86	86	86	84	104	106	110
18	88	88	88	86	108	110	115
19	91	90	90	88	112	115	121
20	93	93	92	90	117	120	126
21	96	96	95	92	122	125	132
22	100	99	98	94	128	131	139
23	103	102	100	96	133	137	145
24	106	105	104	98	139	143	152
25	110	109	107	101	145	148	159
26	114	112	110	104	151	154	165
27	118	116	113	107	157	160	171
28	122	120	117	110	163	165	176
29	126	124	121	113	168	170	181
30	131	129	125	116	173	175	186
31	136	133	129	120	178	180	191
32	141	138	134	124	184	185	196
33	146	144	139	127	191	191	200
34	152	149	144	132	204	200	208
35	157	155	149	136	208	207	212
36	163	160	154	140	210	210	213
37	169	166	160	145	211	212	214
38	174	172	165	150	212	213	215
39	178	177	170	155	212	214	216

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 132 (°F)	TC # 133 (°F)	TC # 134 (°F)	TC # 135 (°F)	TC # 136 (°F)	TC # 137 (°F)	TC # 138 (°F)
40	183	181	175	160	213	215	216
41	186	185	179	165	214	216	217
42	190	188	183	169	214	216	218
43	193	191	186	173	215	217	218
44	195	194	189	176	214	217	219
45	198	196	192	180	214	216	220
46	200	198	194	183	213	215	220
47	202	200	196	185	213	216	220
48	203	202	198	188	213	214	221
49	205	204	200	190	213	210	221
50	206	205	201	192	213	209	222
51	207	206	202	193	212	209	223
52	208	207	204	195	212	208	224
53	209	208	205	196	212	209	225
54	210	209	206	197	212	209	226
55	211	210	207	199	212	210	227
56	211	211	208	200	213	209	229
57	212	211	209	201	213	210	231
58	213	212	209	202	213	211	233
59	213	213	211	203	213	211	235
60	214	214	212	204	214	211	238
MAX	214	214	212	204	215	217	238

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 139 (°F)	TC # 140 (°F)	TC # 141 (°F)	TC # 142 (°F)	TC # 143 (°F)	TC # 144 (°F)	TC # 145 (°F)
0	77	76	76	76	76	76	76
1	77	76	76	76	76	76	76
2	77	76	76	76	76	76	76
3	77	76	76	76	76	76	76
4	77	76	76	76	76	76	76
5	77	77	77	77	77	76	77
6	77	77	77	77	77	77	77
7	78	77	78	77	78	77	78
8	79	78	79	78	79	78	79
9	80	80	81	80	81	79	80
10	83	82	83	81	83	80	82
11	85	84	85	83	85	82	84
12	88	87	88	86	88	84	86
13	92	90	91	89	91	87	89
14	95	93	94	92	94	90	92
15	99	97	98	96	98	93	96
16	104	101	102	99	101	97	99
17	108	105	106	103	105	102	104
18	113	110	111	107	109	108	110
19	118	114	116	112	114	114	116
20	124	119	121	116	118	120	122
21	130	124	126	121	123	126	128
22	136	130	131	125	128	133	134
23	143	135	137	131	133	139	141
24	150	141	143	136	138	145	147
25	156	147	149	141	144	152	154
26	163	154	155	147	150	159	161
27	169	160	161	154	156	167	169
28	175	166	168	161	163	176	178
29	180	173	174	168	169	188	188
30	185	179	180	178	177	198	198
31	190	184	186	190	187	204	205
32	194	195	191	202	200	208	209
33	199	207	202	207	208	209	211
34	208	209	209	210	211	211	213
35	210	210	211	211	213	212	214
36	211	210	213	212	214	214	215
37	212	212	214	213	215	215	216
38	213	213	214	213	215	216	217
39	214	214	215	214	216	216	218

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 139 (°F)	TC # 140 (°F)	TC # 141 (°F)	TC # 142 (°F)	TC # 143 (°F)	TC # 144 (°F)	TC # 145 (°F)
40	215	215	216	214	216	217	218
41	216	216	217	215	217	218	219
42	217	216	217	215	217	218	219
43	218	217	218	216	218	219	220
44	218	218	219	217	218	219	220
45	219	219	219	217	218	219	220
46	219	219	220	218	219	220	221
47	219	220	221	218	219	220	221
48	220	221	221	219	220	221	222
49	220	222	222	219	220	221	222
50	221	222	223	220	221	222	223
51	222	223	223	220	221	222	223
52	223	224	224	221	222	222	224
53	224	225	225	221	222	223	224
54	225	226	226	222	223	224	225
55	226	227	227	223	224	224	226
56	228	229	228	223	225	225	227
57	230	231	230	224	225	226	228
58	232	232	232	225	226	227	229
59	234	234	234	226	227	228	230
60	237	237	236	227	228	229	231
MAX	237	237	236	227	228	229	231

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 146 (°F)	TC # 147 (°F)	TC # 148 (°F)	TC # 149 (°F)	TC # 150 (°F)	TC # 151 (°F)	TC # 152 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76
5	76	76	77	77	77	77	76
6	77	77	77	77	77	77	77
7	77	77	78	78	78	78	78
8	78	78	80	79	80	80	79
9	79	79	82	81	82	82	81
10	80	80	84	83	84	84	84
11	83	82	87	86	87	87	86
12	85	85	91	89	91	91	90
13	89	88	94	92	94	94	93
14	93	91	98	96	98	98	97
15	97	95	103	100	103	103	101
16	102	99	107	104	107	107	106
17	107	103	112	109	112	112	110
18	112	108	117	114	117	116	115
19	118	113	123	119	122	121	120
20	125	119	129	124	128	127	125
21	131	126	134	130	134	132	130
22	137	133	141	138	140	138	136
23	144	140	147	145	147	144	142
24	152	148	153	152	154	151	149
25	160	156	160	159	161	157	155
26	168	164	167	167	168	164	162
27	176	173	173	174	175	170	168
28	182	184	180	180	182	176	174
29	188	192	185	186	188	181	180
30	193	198	191	192	194	186	185
31	199	204	196	199	199	191	191
32	204	208	201	204	203	196	195
33	209	209	205	207	207	200	200
34	211	211	208	209	210	204	203
35	212	212	211	211	212	207	207
36	213	213	213	212	214	210	209
37	213	214	215	213	215	212	213
38	214	214	216	214	217	215	215
39	214	215	218	215	218	217	217

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 146 (°F)	TC # 147 (°F)	TC # 148 (°F)	TC # 149 (°F)	TC # 150 (°F)	TC # 151 (°F)	TC # 152 (°F)
40	214	215	219	215	219	218	218
41	215	215	220	216	220	219	219
42	215	216	220	217	220	220	220
43	216	216	221	217	221	221	220
44	216	217	222	218	222	222	221
45	216	217	223	219	222	223	221
46	217	217	223	219	223	223	222
47	217	218	224	220	224	224	222
48	218	218	225	221	225	225	223
49	218	218	226	221	226	226	224
50	219	219	226	222	227	227	225
51	219	219	228	223	228	228	225
52	220	220	229	224	229	229	226
53	220	220	230	225	231	230	228
54	221	221	232	226	233	231	229
55	222	221	234	228	235	233	230
56	222	222	236	229	238	235	232
57	223	223	238	231	241	237	234
58	224	223	241	233	244	239	236
59	225	224	244	235	248	241	239
60	226	225	248	237	252	244	242
MAX	226	225	248	237	252	244	242

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 153 (°F)	TC # 154 (°F)	TC # 155 (°F)	TC # 156 (°F)	TC # 157 (°F)	TC # 158 (°F)	TC # 159 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76
5	77	76	76	76	76	76	76
6	77	77	77	77	77	77	77
7	78	78	77	77	77	77	77
8	80	79	78	78	78	78	78
9	82	81	79	80	80	79	79
10	85	84	80	82	81	80	80
11	88	87	82	84	84	82	82
12	91	90	85	87	86	84	84
13	95	93	87	90	89	87	87
14	99	97	90	93	93	90	90
15	103	101	93	97	96	93	93
16	108	106	97	101	100	96	96
17	113	111	100	105	104	102	100
18	118	116	104	109	108	110	103
19	123	121	108	113	114	119	108
20	129	127	112	118	120	130	114
21	135	133	117	122	128	141	120
22	142	139	122	128	137	151	127
23	148	145	127	133	145	159	133
24	154	152	132	139	155	166	139
25	160	158	138	145	167	172	145
26	166	164	145	152	177	177	151
27	172	169	153	159	183	181	156
28	177	175	161	166	187	185	162
29	183	180	169	172	191	188	168
30	189	186	177	178	194	192	174
31	194	191	184	184	198	196	180
32	199	196	191	189	201	200	186
33	203	200	195	194	204	203	191
34	207	205	199	199	207	206	196
35	211	208	201	204	209	208	201
36	214	211	204	207	211	210	204
37	215	213	207	210	212	211	208
38	216	215	209	212	213	212	210
39	218	216	211	213	214	213	212

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 153 (°F)	TC # 154 (°F)	TC # 155 (°F)	TC # 156 (°F)	TC # 157 (°F)	TC # 158 (°F)	TC # 159 (°F)
40	218	217	212	214	214	213	213
41	219	218	213	215	215	213	214
42	220	219	214	216	216	214	215
43	221	220	215	216	216	215	215
44	221	220	216	217	217	215	216
45	222	221	217	218	218	216	216
46	222	221	218	218	218	216	217
47	223	222	219	219	219	217	217
48	223	222	220	219	219	217	218
49	224	223	221	220	220	218	218
50	225	223	222	220	220	218	218
51	226	224	223	221	220	218	219
52	227	225	224	221	221	219	219
53	229	226	225	221	221	219	220
54	230	227	226	222	222	220	220
55	232	228	227	222	223	220	220
56	234	229	228	223	223	221	221
57	237	230	229	223	224	221	221
58	240	232	230	224	225	222	222
59	243	234	231	225	225	223	222
60	247	236	232	226	227	223	223
MAX	247	236	232	226	227	223	223

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 160 (°F)	TC # 161 (°F)	TC # 162 (°F)	TC # 163 (°F)	TC # 164 (°F)	TC # 165 (°F)	TC # 166 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76
6	77	76	77	77	76	76	77
7	77	77	77	77	76	77	77
8	78	78	78	78	77	78	78
9	79	79	80	80	77	79	80
10	81	81	82	82	78	81	82
11	83	83	84	84	79	83	84
12	85	85	87	86	80	85	86
13	89	88	90	89	82	88	89
14	92	92	94	92	83	91	92
15	96	95	98	95	85	94	95
16	99	99	102	99	87	98	99
17	103	103	106	102	89	101	102
18	107	108	110	106	91	105	106
19	111	112	115	110	94	109	110
20	115	117	119	114	98	113	114
21	120	121	124	118	103	117	118
22	125	126	129	123	109	121	122
23	130	131	134	127	116	125	126
24	136	136	139	132	121	130	131
25	142	141	144	136	126	135	136
26	148	147	149	141	131	139	141
27	154	153	154	146	137	145	146
28	160	159	159	151	143	150	151
29	166	167	164	156	150	156	157
30	172	174	169	161	157	161	162
31	178	181	174	165	163	167	167
32	184	188	178	170	169	172	173
33	190	193	183	174	175	177	177
34	195	198	187	178	181	182	182
35	199	203	192	182	185	186	186
36	203	206	195	186	190	191	190
37	206	209	199	190	195	194	194
38	209	210	202	194	200	197	198
39	211	212	206	197	202	201	201

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 160 (°F)	TC # 161 (°F)	TC # 162 (°F)	TC # 163 (°F)	TC # 164 (°F)	TC # 165 (°F)	TC # 166 (°F)
40	214	213	210	200	204	204	204
41	215	213	212	203	205	207	207
42	216	214	213	206	206	210	210
43	217	215	214	208	207	212	212
44	217	215	216	211	208	213	214
45	218	216	217	212	209	214	215
46	218	217	218	214	210	215	216
47	219	217	218	216	210	216	217
48	219	218	219	217	211	217	218
49	220	218	220	217	212	218	218
50	220	219	220	218	212	218	219
51	220	219	221	219	211	219	220
52	221	220	222	219	211	219	220
53	221	220	222	220	211	220	221
54	222	221	223	220	211	220	221
55	222	221	224	221	211	221	222
56	222	222	225	222	211	221	222
57	223	223	226	222	212	222	223
58	224	223	227	223	212	223	224
59	224	224	228	224	212	223	224
60	225	225	229	225	212	224	225
MAX	225	225	229	225	212	224	225

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 167 (°F)	TC # 168 (°F)	TC # 169 (°F)	TC # 170 (°F)	TC # 171 (°F)	TC # 172 (°F)	TC # 173 (°F)
0	76	76	76	76	77	76	77
1	76	76	76	76	77	77	77
2	76	76	76	76	77	77	77
3	76	76	76	76	76	76	77
4	76	76	76	76	77	77	77
5	76	77	77	77	77	77	77
6	77	77	77	77	77	77	77
7	77	78	77	78	78	78	78
8	78	79	78	79	79	79	79
9	80	81	80	80	80	80	80
10	82	83	82	82	82	82	82
11	84	85	84	84	84	84	83
12	87	88	86	87	87	86	85
13	90	91	89	90	90	89	88
14	93	95	92	93	93	92	90
15	97	98	95	96	96	96	93
16	100	102	99	99	100	99	96
17	104	105	103	103	103	103	99
18	108	110	107	107	107	107	102
19	112	114	111	111	111	110	105
20	116	118	115	116	115	114	109
21	121	123	120	120	119	119	112
22	125	127	124	124	123	123	115
23	130	132	129	129	128	127	119
24	135	137	134	134	132	132	123
25	140	142	139	139	137	136	127
26	145	147	144	144	142	141	131
27	151	152	149	150	147	146	136
28	156	158	154	155	152	152	140
29	161	163	160	161	157	157	145
30	167	168	165	166	162	162	150
31	172	173	170	171	168	168	155
32	177	178	175	176	173	173	160
33	181	183	179	180	177	178	165
34	186	187	184	185	182	183	170
35	190	191	188	189	186	187	174
36	193	195	192	193	191	191	179
37	198	199	196	197	195	195	183
38	202	203	200	200	198	198	187
39	205	206	203	204	202	201	191

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 167 (°F)	TC # 168 (°F)	TC # 169 (°F)	TC # 170 (°F)	TC # 171 (°F)	TC # 172 (°F)	TC # 173 (°F)
40	207	208	207	207	205	205	194
41	210	210	209	209	208	208	197
42	212	213	212	212	211	210	200
43	213	214	213	214	213	213	202
44	215	216	215	215	215	215	205
45	216	217	216	217	216	216	207
46	217	218	217	218	217	217	210
47	218	219	218	219	218	218	211
48	218	219	219	219	219	219	212
49	219	220	219	220	219	219	212
50	220	221	220	221	220	219	212
51	220	221	220	221	219	217	212
52	221	222	221	222	219	216	212
53	221	222	221	222	216	214	212
54	222	223	222	223	214	212	212
55	222	223	222	223	214	212	213
56	223	224	214	222	214	216	213
57	224	225	213	221	215	217	213
58	224	225	213	220	215	217	213
59	225	226	215	220	215	217	213
60	226	227	213	221	214	216	213
MAX	226	227	222	223	220	219	213

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 174 (°F)	TC # 175 (°F)	TC # 176 (°F)	TC # 177 (°F)	TC # 178 (°F)	TC # 179 (°F)	TC # 180 (°F)
0	77	76	76	76	76	76	76
1	77	76	76	76	76	76	76
2	77	76	76	76	76	76	76
3	77	76	76	76	76	76	76
4	77	76	76	76	76	76	76
5	77	76	76	76	76	76	76
6	77	76	76	76	76	76	76
7	78	76	76	76	76	76	76
8	79	76	76	76	76	76	76
9	80	76	77	77	77	77	77
10	81	77	77	77	77	77	77
11	83	77	77	77	77	77	77
12	84	77	78	78	78	78	78
13	86	78	79	79	79	79	78
14	89	79	80	80	80	80	79
15	91	80	82	81	82	81	81
16	93	81	83	83	83	83	82
17	96	82	85	85	85	84	84
18	99	84	87	87	87	86	86
19	102	85	90	90	90	89	88
20	105	87	92	92	93	91	91
21	108	90	95	95	96	94	95
22	111	92	98	99	99	98	99
23	114	95	101	102	102	102	103
24	118	98	105	106	106	106	108
25	122	101	109	110	110	110	113
26	126	105	112	114	114	115	119
27	130	109	116	118	119	120	124
28	135	113	121	122	124	125	130
29	139	117	125	127	129	130	136
30	144	122	130	132	134	136	141
31	149	126	135	137	140	141	147
32	154	131	139	142	145	147	153
33	159	136	144	147	151	152	158
34	163	141	149	153	157	158	164
35	168	146	154	158	162	164	169
36	172	152	159	163	168	169	174
37	176	158	164	168	173	174	179
38	181	163	169	173	178	179	184
39	185	169	174	178	183	184	188

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 174 (°F)	TC # 175 (°F)	TC # 176 (°F)	TC # 177 (°F)	TC # 178 (°F)	TC # 179 (°F)	TC # 180 (°F)
40	188	174	178	183	187	188	192
41	191	179	182	187	191	192	195
42	194	183	186	190	194	195	198
43	197	186	190	194	197	198	201
44	199	190	194	197	200	201	203
45	202	193	197	200	202	204	206
46	205	196	200	203	205	206	207
47	206	199	203	205	207	207	209
48	207	201	205	207	208	209	210
49	208	204	207	208	210	210	211
50	209	206	208	210	211	211	212
51	209	207	210	211	212	212	213
52	210	207	211	212	213	213	214
53	211	208	212	213	214	214	215
54	212	210	213	215	215	215	215
55	213	211	214	216	216	216	216
56	213	212	216	217	217	217	217
57	214	213	217	218	218	217	218
58	214	213	217	218	219	218	218
59	213	214	218	219	219	219	219
60	213	215	219	220	220	219	219
MAX	214	215	219	220	220	219	219

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 181 (°F)	TC # 182 (°F)	TC # 183 (°F)	TC # 184 (°F)	TC # 185 (°F)	TC # 186 (°F)	TC # 187 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76
6	76	76	76	76	76	76	76
7	76	76	76	76	76	76	76
8	76	77	76	77	77	77	77
9	77	77	77	77	77	77	77
10	77	77	77	77	78	78	78
11	77	78	78	78	78	79	79
12	78	79	78	79	79	80	80
13	79	80	79	80	81	82	82
14	80	81	81	82	82	84	84
15	82	83	82	84	84	86	86
16	83	85	84	86	87	89	89
17	85	87	86	88	89	92	92
18	88	90	89	91	92	95	95
19	91	93	92	94	95	98	99
20	95	96	95	97	99	102	103
21	100	100	98	101	103	107	107
22	105	104	102	104	107	111	112
23	111	109	106	108	111	116	117
24	117	115	110	113	116	121	122
25	123	121	115	118	121	126	127
26	129	127	120	123	126	132	133
27	136	134	125	129	132	138	139
28	142	140	131	135	137	143	145
29	148	147	137	141	144	149	151
30	153	153	144	148	150	155	157
31	159	159	150	155	158	161	163
32	164	165	157	162	165	168	169
33	169	170	163	169	171	174	174
34	174	176	169	174	175	179	180
35	179	181	175	179	178	185	185
36	183	186	180	183	182	189	190
37	187	190	185	188	187	193	194
38	191	193	190	192	192	197	198
39	194	197	194	196	197	201	202

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 181 (°F)	TC # 182 (°F)	TC # 183 (°F)	TC # 184 (°F)	TC # 185 (°F)	TC # 186 (°F)	TC # 187 (°F)
40	197	200	198	200	201	204	205
41	200	203	201	203	205	207	208
42	202	205	204	206	206	209	210
43	205	207	206	207	207	211	212
44	207	209	208	209	209	213	214
45	208	210	209	210	211	214	215
46	210	211	210	211	213	215	217
47	211	212	212	213	214	217	218
48	212	213	213	214	215	218	219
49	213	214	214	215	216	219	220
50	214	215	215	217	218	220	221
51	214	216	216	218	219	221	222
52	215	217	217	219	220	222	223
53	216	217	218	220	221	223	224
54	217	218	219	221	222	224	225
55	217	219	219	222	223	225	226
56	218	219	220	223	224	226	227
57	219	220	221	224	225	227	228
58	219	221	222	225	226	229	230
59	220	221	222	226	227	231	232
60	221	222	223	227	229	232	234
MAX	221	222	223	227	229	232	234

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 188 (°F)	TC # 189 (°F)	TC # 190 (°F)	TC # 191 (°F)	TC # 192 (°F)	TC # 193 (°F)	TC # 194 (°F)
0	76	76	76	76	76	77	77
1	76	76	76	76	76	76	77
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	77
4	76	76	76	76	76	76	76
5	76	76	76	76	76	76	77
6	76	76	77	76	76	76	77
7	77	77	77	77	77	77	77
8	77	77	77	77	77	77	77
9	77	77	78	78	77	77	77
10	78	78	79	79	78	78	78
11	79	79	81	81	80	79	79
12	81	81	83	83	81	80	80
13	82	83	85	85	84	81	81
14	84	85	88	88	87	84	83
15	87	88	91	91	90	86	86
16	90	91	94	94	94	89	88
17	93	94	98	98	98	93	91
18	96	98	102	103	102	96	95
19	100	102	106	107	107	101	100
20	104	106	111	112	112	106	105
21	108	110	116	117	118	111	110
22	113	115	121	123	124	117	115
23	118	120	127	129	130	123	121
24	123	126	133	136	136	129	127
25	129	132	139	142	142	136	133
26	135	138	145	149	149	143	140
27	141	144	152	155	156	150	146
28	147	151	159	162	163	157	153
29	153	157	165	169	170	165	161
30	159	164	171	175	176	172	169
31	165	170	178	182	182	179	177
32	171	176	184	188	188	186	184
33	177	182	189	193	193	192	191
34	182	187	195	198	198	197	196
35	187	192	199	202	202	201	201
36	192	196	203	205	206	205	204
37	196	200	206	208	208	207	207
38	200	204	209	210	210	209	209
39	203	207	211	212	211	211	211

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 188 (°F)	TC # 189 (°F)	TC # 190 (°F)	TC # 191 (°F)	TC # 192 (°F)	TC # 193 (°F)	TC # 194 (°F)
40	206	209	213	213	212	212	212
41	209	211	214	214	213	213	213
42	211	213	216	215	214	214	214
43	213	215	217	216	215	215	215
44	215	216	218	217	215	215	216
45	217	218	219	218	216	216	217
46	218	219	220	218	216	216	217
47	219	220	221	219	217	217	218
48	220	221	222	220	217	217	218
49	221	222	222	221	218	218	219
50	222	223	223	221	218	218	219
51	223	224	224	222	219	219	220
52	224	225	225	223	219	219	220
53	225	226	226	224	220	220	221
54	226	227	227	225	221	220	221
55	227	228	229	226	222	221	222
56	229	229	230	227	222	222	222
57	230	231	232	228	223	222	223
58	232	233	233	229	224	223	224
59	233	235	235	231	225	224	225
60	236	237	238	233	226	225	226
MAX	236	237	238	233	226	225	226

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 195 (°F)	TC # 196 (°F)	TC # 197 (°F)	TC # 198 (°F)	TC # 199 (°F)	TC #200 (°F)	TC # 201 (°F)
0	77	77	77	76	76	77	76
1	77	77	77	76	76	76	76
2	77	77	77	76	76	76	76
3	77	77	77	76	76	76	76
4	77	77	77	76	76	76	76
5	77	77	77	76	76	77	76
6	77	77	77	76	76	77	76
7	77	77	77	76	77	77	76
8	77	77	77	76	77	77	76
9	77	77	78	77	77	77	77
10	78	78	78	77	78	78	77
11	79	79	79	77	78	79	78
12	80	80	81	78	79	80	78
13	81	82	82	78	80	82	79
14	83	84	84	79	82	83	81
15	85	86	86	80	83	85	82
16	88	88	89	82	85	88	84
17	91	91	92	83	87	90	86
18	94	94	95	85	89	93	88
19	98	98	98	86	92	96	91
20	102	101	102	88	94	99	94
21	106	105	106	91	97	102	97
22	111	110	110	93	100	105	100
23	115	114	115	96	103	109	103
24	121	119	119	99	107	113	107
25	126	124	125	103	110	117	111
26	132	130	130	107	114	121	114
27	138	136	135	111	118	126	119
28	144	142	141	115	122	130	123
29	151	148	147	120	126	135	127
30	159	154	152	124	131	140	132
31	167	161	158	129	136	145	137
32	176	168	164	133	140	150	141
33	184	176	170	139	145	155	146
34	191	184	177	144	150	160	151
35	196	190	183	150	156	165	156
36	200	195	189	156	161	169	161
37	204	199	194	163	166	174	165
38	207	203	198	169	172	179	170
39	209	205	201	174	177	183	175

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 195 (°F)	TC # 196 (°F)	TC # 197 (°F)	TC # 198 (°F)	TC # 199 (°F)	TC #200 (°F)	TC # 201 (°F)
40	210	207	204	179	182	187	179
41	212	209	206	184	187	191	183
42	213	211	208	188	191	195	187
43	214	212	209	191	194	198	191
44	215	213	211	194	197	201	194
45	216	214	212	197	200	203	197
46	217	215	212	199	202	206	200
47	217	216	213	201	204	208	203
48	218	217	213	203	206	209	205
49	218	217	214	205	208	211	207
50	219	218	214	207	210	212	209
51	219	218	215	208	211	214	210
52	220	219	216	209	212	215	212
53	220	219	216	210	213	216	212
54	221	220	217	211	214	216	211
55	221	221	217	211	215	211	208
56	222	221	217	212	215	211	208
57	223	222	216	212	215	212	208
58	223	222	217	213	216	214	209
59	224	223	220	213	216	214	208
60	225	225	221	214	217	212	209
MAX	225	225	221	214	217	216	212

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 202 (°F)	TC # 203 (°F)	TC # 204 (°F)	TC # 205 (°F)	TC # 206 (°F)	TC # 207 (°F)	TC # 208 (°F)
0	76	77	77	77	77	77	76
1	76	77	77	77	77	77	76
2	76	77	77	77	77	77	76
3	76	77	77	77	77	77	77
4	76	77	78	79	77	78	77
5	76	77	80	81	79	80	79
6	76	77	83	84	81	83	81
7	76	77	86	88	84	87	84
8	76	77	90	92	87	92	88
9	77	77	94	96	91	96	92
10	77	77	99	100	96	101	97
11	77	77	103	104	101	107	102
12	78	78	107	109	106	112	108
13	79	78	112	114	112	118	114
14	80	79	117	118	117	123	119
15	81	80	121	123	123	129	125
16	82	81	126	127	129	134	131
17	84	82	130	132	134	140	137
18	86	83	135	136	140	145	143
19	88	85	140	141	145	151	149
20	90	86	144	145	151	156	155
21	93	88	149	149	156	161	161
22	95	90	153	154	161	166	166
23	98	92	158	158	167	171	172
24	101	94	162	162	172	176	178
25	104	97	167	166	178	180	185
26	108	99	172	170	184	185	191
27	111	102	178	174	191	189	197
28	115	105	184	178	198	194	202
29	119	108	191	183	205	199	206
30	123	111	201	188	209	206	209
31	127	114	208	193	210	210	210
32	132	118	209	200	211	212	211
33	136	121	210	206	211	213	212
34	141	125	211	209	212	214	212
35	145	129	211	210	212	215	213
36	150	133	211	211	213	216	214
37	154	137	211	212	213	218	215
38	159	141	212	214	214	220	218
39	163	145	212	214	215	222	221

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 202 (°F)	TC # 203 (°F)	TC # 204 (°F)	TC # 205 (°F)	TC # 206 (°F)	TC # 207 (°F)	TC # 208 (°F)
40	168	150	212	213	217	224	225
41	172	154	212	216	221	227	230
42	176	160	212	218	225	231	234
43	181	166	212	221	230	234	239
44	185	172	212	219	235	239	245
45	189	176	212	214	241	243	251
46	193	182	211	207	247	248	257
47	197	187	208	207	247	234	263
48	200	191	208	209	232	218	269
49	202	197	209	210	218	214	274
50	205	198	210	213	213	214	239
51	206	203	211	215	215	217	216
52	206	208	211	217	215	216	216
53	207	209	212	216	216	217	216
54	208	209	213	216	215	217	216
55	209	209	214	218	215	217	216
56	210	210	216	218	217	218	218
57	210	210	217	221	217	220	224
58	210	210	221	222	219	227	233
59	210	210	220	222	227	228	241
60	210	210	219	222	230	237	252
MAX	210	210	221	222	247	248	274

OMEGA POINT LABORATORIES

Time (min)	TC # 209 (°F)	TC # 210 (°F)	TC # 211 (°F)	TC # 212 (°F)	TC # 213 (°F)	TC # 214 (°F)	TC # 215 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	77	77	77	77	76	76	76
4	78	77	77	77	77	77	77
5	80	78	79	79	78	79	79
6	84	80	81	82	80	81	81
7	88	83	84	85	83	85	85
8	93	87	88	89	87	89	89
9	98	91	92	94	91	94	94
10	104	96	97	99	96	100	100
11	109	101	102	104	102	106	107
12	115	107	108	110	109	112	114
13	121	114	113	116	115	118	121
14	127	120	120	123	122	125	128
15	132	126	126	129	129	132	135
16	138	132	132	135	136	138	142
17	144	138	138	142	143	145	149
18	149	145	145	148	149	151	155
19	155	151	151	154	156	157	161
20	160	157	157	161	162	163	168
21	166	163	163	167	167	168	173
22	171	169	168	172	173	173	179
23	176	175	174	178	178	178	184
24	182	180	179	183	183	183	189
25	187	186	185	188	187	187	194
26	192	192	190	193	191	191	198
27	198	199	194	197	194	195	202
28	205	203	198	201	197	198	206
29	209	206	202	205	200	201	209
30	211	207	205	208	203	205	212
31	212	209	207	210	206	207	214
32	213	209	210	212	208	209	215
33	214	210	211	213	210	211	216
34	216	211	212	213	211	212	218
35	217	212	214	214	212	213	219
36	220	213	214	215	213	213	220
37	222	216	215	216	214	214	221
38	225	218	215	217	214	216	223
39	228	220	216	218	215	217	224

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 209 (°F)	TC # 210 (°F)	TC # 211 (°F)	TC # 212 (°F)	TC # 213 (°F)	TC # 214 (°F)	TC # 215 (°F)
40	231	223	217	219	215	218	225
41	235	226	218	221	216	220	227
42	239	230	219	223	217	221	229
43	244	233	220	225	219	223	231
44	249	237	222	227	220	225	234
45	255	241	225	230	222	227	237
46	261	245	228	234	224	230	241
47	267	250	231	237	227	234	245
48	273	254	235	241	230	237	250
49	275	259	239	245	233	242	255
50	219	264	243	248	237	246	259
51	216	268	248	249	241	251	262
52	214	253	252	251	246	256	268
53	216	234	248	251	251	262	274
54	216	231	237	234	226	221	279
55	217	226	234	229	223	220	285
56	218	228	238	244	236	246	290
57	228	233	250	255	251	264	297
58	238	243	259	264	263	277	303
59	250	253	267	273	273	287	310
60	261	263	276	282	282	297	317
MAX	275	268	276	282	282	297	317

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 216 (°F)	TC # 217 (°F)	TC # 218 (°F)	TC # 219 (°F)	TC # 220 (°F)	TC # 221 (°F)	TC # 222 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	78	77	77	77	77	77	78
5	80	78	78	78	78	78	81
6	84	80	81	81	79	80	84
7	88	84	84	85	81	84	89
8	93	88	89	90	84	87	95
9	99	93	94	95	87	92	101
10	105	98	99	100	91	97	108
11	111	104	105	106	94	103	115
12	117	110	111	112	99	109	121
13	123	116	118	118	103	115	128
14	130	123	124	124	108	121	135
15	136	129	130	130	113	128	141
16	143	135	137	137	118	134	147
17	149	142	143	143	123	140	154
18	155	148	149	149	128	146	160
19	161	154	155	155	134	152	165
20	168	161	161	161	139	158	171
21	173	167	167	166	144	164	177
22	179	173	173	172	149	170	183
23	184	180	179	178	154	175	188
24	189	185	185	183	160	181	193
25	194	191	190	188	168	185	197
26	199	196	196	194	177	190	201
27	205	202	201	198	184	195	204
28	210	207	206	204	190	200	207
29	211	211	210	208	195	203	210
30	213	211	212	211	198	206	212
31	214	213	213	212	201	208	214
32	216	214	215	213	203	211	216
33	218	215	216	215	205	213	219
34	221	217	218	217	206	215	222
35	224	220	221	219	208	216	225
36	227	222	224	221	209	218	229
37	230	224	227	224	211	220	232
38	234	227	230	227	212	222	236
39	238	230	234	230	213	225	239

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 216 (°F)	TC # 217 (°F)	TC # 218 (°F)	TC # 219 (°F)	TC # 220 (°F)	TC # 221 (°F)	TC # 222 (°F)
40	243	234	238	234	215	228	244
41	248	238	243	238	216	231	248
42	253	243	248	243	217	234	253
43	259	248	254	248	218	238	258
44	265	254	261	254	219	242	263
45	272	261	267	260	221	246	268
46	278	268	275	266	223	251	274
47	285	275	282	273	225	256	279
48	292	283	290	279	227	261	285
49	299	291	297	286	230	267	291
50	305	299	305	293	233	273	297
51	312	306	312	299	236	279	303
52	318	313	318	305	239	285	309
53	324	320	325	312	243	291	315
54	330	326	331	318	247	297	321
55	336	332	337	323	252	303	327
56	341	337	343	329	256	309	333
57	347	343	349	335	261	316	338
58	352	349	354	340	266	322	344
59	357	354	359	345	272	327	349
60	363	359	365	350	277	333	355
MAX	363	359	365	350	277	333	355

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 223 (°F)	TC # 224 (°F)	TC # 225 (°F)	TC # 226 (°F)	TC # 227 (°F)	TC # 228 (°F)	TC # 229 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	77	77	77	77	77	76	77
5	79	78	79	78	77	76	79
6	82	81	82	81	79	76	82
7	86	84	86	84	82	77	85
8	91	89	90	88	85	77	89
9	96	94	95	93	89	78	93
10	102	100	101	98	93	78	97
11	109	106	107	104	97	80	101
12	115	113	113	110	102	81	106
13	122	119	120	116	107	83	111
14	128	126	127	122	112	85	116
15	135	133	133	128	117	87	121
16	141	139	140	134	122	90	126
17	147	144	145	140	127	93	132
18	153	150	151	146	132	96	137
19	159	156	156	152	137	100	143
20	165	161	162	157	143	103	150
21	170	167	167	162	147	107	156
22	176	172	172	167	152	112	162
23	181	178	177	173	157	116	168
24	186	183	182	178	162	120	174
25	191	188	187	184	166	125	181
26	196	193	192	189	172	129	187
27	200	198	197	195	178	134	192
28	204	203	202	200	183	139	197
29	207	206	206	205	189	144	201
30	209	209	209	208	202	150	204
31	211	210	210	210	209	157	208
32	212	211	211	210	210	165	209
33	214	212	213	210	210	175	210
34	216	214	214	211	210	183	211
35	219	215	216	212	210	189	211
36	221	217	218	214	211	194	211
37	224	218	220	218	211	197	211
38	227	221	223	221	211	200	211
39	230	223	226	225	213	203	212

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 223 (°F)	TC # 224 (°F)	TC # 225 (°F)	TC # 226 (°F)	TC # 227 (°F)	TC # 228 (°F)	TC # 229 (°F)
40	233	226	229	228	218	205	212
41	236	229	233	233	221	206	213
42	240	232	237	237	224	207	213
43	245	236	241	241	227	208	214
44	249	240	246	246	230	209	215
45	255	245	251	252	234	210	217
46	260	251	257	257	238	210	218
47	266	257	263	263	243	211	220
48	272	263	269	269	247	211	221
49	279	270	276	275	252	211	223
50	285	277	283	281	253	211	225
51	292	284	290	287	258	211	227
52	299	292	297	294	263	212	230
53	306	299	304	300	268	212	232
54	312	307	311	306	273	213	234
55	319	314	318	312	278	214	237
56	326	321	324	317	283	214	240
57	333	328	331	323	288	215	243
58	339	334	337	329	293	216	246
59	345	341	343	334	297	218	249
60	352	347	349	340	302	218	252
MAX	352	347	349	340	302	218	252

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 230 (°F)	TC # 231 (°F)	TC # 232 (°F)	TC # 233 (°F)	TC # 234 (°F)	TC # 235 (°F)	TC # 236 (°F)
0	76	76	76	76	76	77	76
1	76	76	76	76	76	77	76
2	76	76	76	76	76	77	76
3	76	76	77	76	77	77	77
4	76	77	78	77	78	79	78
5	76	77	79	79	81	82	81
6	76	78	82	81	84	86	84
7	77	80	85	84	87	90	89
8	77	83	88	88	91	95	93
9	78	86	92	92	96	101	98
10	79	89	97	97	101	106	103
11	80	93	101	102	106	111	109
12	82	98	105	107	111	116	114
13	84	102	110	113	116	122	120
14	86	107	115	118	122	127	125
15	88	111	119	124	127	133	131
16	91	116	124	129	132	138	136
17	93	121	128	135	137	144	141
18	96	125	133	140	142	149	147
19	100	130	137	145	148	154	152
20	103	135	142	150	153	159	157
21	106	139	146	155	158	164	162
22	110	144	151	160	162	169	167
23	114	148	155	165	167	173	172
24	119	153	159	170	172	178	177
25	123	157	163	175	177	182	182
26	128	161	168	179	182	187	187
27	133	166	172	183	188	191	192
28	137	170	176	188	193	196	198
29	142	174	181	192	198	200	203
30	147	178	186	197	203	204	208
31	152	181	190	200	207	208	210
32	158	185	194	204	210	210	211
33	168	189	197	207	211	211	212
34	188	192	200	209	212	211	212
35	199	195	203	211	213	212	213
36	203	198	206	212	214	212	214
37	205	201	208	212	214	213	215
38	206	204	210	213	216	215	217
39	207	206	211	214	217	218	220

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 230 (°F)	TC # 231 (°F)	TC # 232 (°F)	TC # 233 (°F)	TC # 234 (°F)	TC # 235 (°F)	TC # 236 (°F)
40	208	208	212	215	219	221	222
41	208	210	213	217	221	226	225
42	208	211	214	218	224	229	229
43	209	212	215	219	226	221	231
44	209	213	216	221	229	214	213
45	210	214	217	222	226	212	211
46	210	215	216	219	221	211	211
47	210	214	215	212	218	211	211
48	210	213	215	212	217	211	211
49	210	211	215	212	216	211	211
50	210	211	215	212	215	211	211
51	210	211	215	212	215	211	211
52	210	211	216	212	215	211	211
53	210	211	217	212	215	211	212
54	210	212	218	213	215	213	212
55	210	212	220	213	216	216	212
56	210	212	218	214	216	217	212
57	210	215	219	214	217	218	212
58	210	216	223	214	217	219	212
59	210	217	227	220	220	219	212
60	210	218	231	223	225	219	212
MAX	210	218	231	223	229	229	231

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 237 (°F)	TC # 238 (°F)	TC # 239 (°F)	TC # 240 (°F)	TC # 241 (°F)	TC # 242 (°F)	TC # 243 (°F)
0	77	77	76	76	76	76	76
1	77	77	76	76	76	76	76
2	77	77	76	76	76	76	76
3	77	77	76	76	76	76	76
4	79	79	76	76	76	76	76
5	82	81	76	76	77	76	76
6	85	84	76	77	78	77	76
7	90	87	76	77	80	78	77
8	94	91	77	78	82	80	78
9	98	95	77	79	84	82	80
10	103	100	78	81	87	85	82
11	108	104	79	83	91	88	85
12	112	109	80	85	95	91	88
13	117	113	82	88	99	95	91
14	122	118	84	90	103	100	96
15	126	122	86	94	107	104	100
16	131	127	88	97	112	109	105
17	135	131	91	101	117	114	110
18	140	136	94	105	122	120	115
19	144	140	97	109	127	125	121
20	148	145	100	113	132	130	126
21	152	149	104	117	138	136	132
22	156	153	108	122	143	141	137
23	160	157	111	126	148	147	143
24	164	161	115	131	154	153	149
25	168	165	120	136	159	158	154
26	172	168	124	141	164	164	160
27	176	172	129	146	169	169	165
28	180	176	133	151	175	175	171
29	183	181	138	156	180	180	176
30	187	185	143	161	185	185	182
31	191	191	148	166	189	190	187
32	196	204	154	171	192	194	191
33	208	208	160	177	196	197	195
34	210	210	166	182	199	201	199
35	210	211	171	186	203	204	202
36	211	211	176	190	206	207	206
37	211	211	182	194	209	210	209
38	211	211	186	198	212	213	211
39	212	212	190	201	216	216	214

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 237 (°F)	TC # 238 (°F)	TC # 239 (°F)	TC # 240 (°F)	TC # 241 (°F)	TC # 242 (°F)	TC # 243 (°F)
40	215	212	194	205	219	219	217
41	212	212	197	208	223	222	220
42	211	210	201	211	227	226	223
43	211	208	204	214	231	229	226
44	211	207	206	218	235	233	229
45	210	207	209	221	239	237	233
46	210	208	211	224	243	241	237
47	210	208	209	228	248	246	241
48	210	208	208	230	252	250	245
49	210	209	209	233	257	255	250
50	211	210	209	236	262	260	255
51	211	210	209	239	267	266	260
52	211	210	209	242	272	271	266
53	211	210	209	245	277	277	272
54	212	210	210	248	282	282	278
55	214	211	209	250	287	288	284
56	214	211	210	252	292	293	290
57	216	211	210	253	296	299	296
58	217	211	210	255	301	304	302
59	218	212	210	258	305	309	308
60	219	212	210	260	309	313	313
MAX	219	212	211	260	309	313	313

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 244 (°F)	TC # 245 (°F)	TC # 246 (°F)	TC # 247 (°F)	TC # 248 (°F)	TC # 249 (°F)	TC # 250 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76
6	77	77	77	77	77	77	78
7	78	78	78	78	78	78	79
8	80	80	79	80	80	79	82
9	82	83	81	82	82	82	85
10	85	86	84	85	85	85	89
11	89	89	88	89	88	88	94
12	93	94	92	93	92	92	98
13	98	98	96	97	96	97	104
14	103	103	101	102	101	102	109
15	108	109	106	107	106	107	115
16	113	114	111	112	112	113	121
17	119	120	117	118	117	118	128
18	125	126	123	123	123	124	134
19	131	132	128	129	128	130	140
20	136	137	134	135	134	136	146
21	142	143	140	140	140	142	153
22	148	149	146	146	146	148	159
23	153	155	152	152	151	154	165
24	159	161	157	157	157	160	171
25	165	166	163	163	163	166	177
26	170	172	169	169	169	172	183
27	175	177	174	174	174	178	188
28	181	182	179	180	180	183	194
29	186	187	184	185	185	189	199
30	190	192	189	190	190	194	203
31	195	196	194	194	195	198	206
32	199	200	198	198	199	202	209
33	202	204	202	202	203	206	212
34	206	207	205	205	206	209	214
35	209	210	208	208	209	212	216
36	211	213	211	210	211	214	219
37	214	216	214	213	214	217	221
38	217	219	217	215	216	220	224
39	220	223	220	218	218	223	227

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 244 (°F)	TC # 245 (°F)	TC # 246 (°F)	TC # 247 (°F)	TC # 248 (°F)	TC # 249 (°F)	TC # 250 (°F)
40	223	226	223	220	220	226	230
41	226	229	226	222	223	229	234
42	230	233	229	225	225	232	238
43	233	237	232	227	228	236	243
44	237	241	236	230	231	240	248
45	241	245	240	233	234	245	253
46	245	249	244	237	238	249	259
47	250	254	248	240	242	255	266
48	255	258	253	244	246	260	273
49	260	263	257	248	251	266	280
50	265	268	261	253	256	272	287
51	271	273	266	257	261	278	294
52	276	279	271	262	266	284	300
53	282	284	277	267	272	290	305
54	288	290	282	272	278	296	300
55	295	296	288	278	283	300	293
56	301	302	294	283	289	304	294
57	307	309	299	289	294	309	302
58	314	315	305	294	300	315	318
59	320	321	311	300	306	323	331
60	326	327	317	306	311	330	342
MAX	326	327	317	306	311	330	342

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 251 (°F)	TC # 252 (°F)	TC # 253 (°F)	TC # 254 (°F)	TC # 255 (°F)	TC # 256 (°F)	TC # 257 (°F)
0	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76
5	76	76	76	76	76	77	76
6	77	77	77	77	77	77	77
7	78	78	78	78	78	78	78
8	80	80	80	80	80	80	79
9	83	83	82	82	82	82	81
10	86	86	85	85	84	84	83
11	90	90	89	89	88	88	86
12	95	94	94	93	92	92	90
13	100	99	99	98	97	96	94
14	105	104	105	104	102	101	99
15	111	110	111	110	107	106	105
16	117	116	117	116	113	112	110
17	123	122	123	122	119	117	115
18	129	129	129	128	125	123	121
19	136	135	135	134	131	129	127
20	142	141	141	140	138	135	133
21	148	147	148	146	144	141	139
22	155	154	154	152	150	147	145
23	161	160	160	158	156	153	151
24	167	166	165	164	161	159	157
25	173	171	171	169	167	165	162
26	179	177	176	175	172	170	168
27	184	183	182	180	177	175	173
28	190	188	187	185	182	180	177
29	195	193	191	189	186	184	182
30	200	197	196	193	191	188	186
31	204	201	199	197	195	192	190
32	207	205	203	201	198	196	194
33	210	208	206	204	201	199	197
34	213	211	209	207	204	202	200
35	215	214	212	209	207	204	202
36	218	217	215	212	209	207	205
37	221	220	218	214	211	209	207
38	223	223	220	216	213	211	210
39	226	226	223	218	215	212	212

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 251 (°F)	TC # 252 (°F)	TC # 253 (°F)	TC # 254 (°F)	TC # 255 (°F)	TC # 256 (°F)	TC # 257 (°F)
40	229	229	226	220	217	214	214
41	233	233	229	222	218	216	216
42	237	237	232	225	220	217	217
43	241	241	235	227	222	219	219
44	245	245	239	230	224	221	221
45	251	250	243	233	226	223	223
46	256	255	247	236	228	225	225
47	262	260	252	239	231	227	227
48	268	266	256	243	234	228	227
49	274	272	261	206	202	202	203
50	281	259	207	205	205	206	206
51	284	246	208	208	208	208	209
52	283	211	210	210	210	210	210
53	215	212	210	211	211	211	211
54	212	212	211	211	211	211	210
55	213	213	211	211	211	211	211
56	213	213	211	211	211	211	211
57	214	213	211	211	210	211	210
58	237	213	211	211	210	210	210
59	279	244	213	211	211	211	211
60	307	280	246	212	211	211	211
MAX	307	280	261	243	234	228	227

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 258 (°F)	TC # 259 (°F)	TC # 260 (°F)	TC # 261 (°F)	TC # 262 (°F)	TC # 263 (°F)	TC # 264 (°F)
0	76	76	77	76	76	76	76
1	76	76	77	76	76	76	76
2	76	76	77	76	76	76	76
3	76	76	77	76	76	76	76
4	76	76	77	76	76	76	76
5	77	77	77	76	76	76	77
6	77	77	78	76	76	77	77
7	78	78	79	76	77	77	77
8	79	80	81	77	77	78	78
9	81	82	83	77	77	78	79
10	83	84	86	78	78	79	80
11	86	87	89	78	78	80	82
12	90	91	92	79	79	82	84
13	94	95	96	81	80	83	86
14	99	99	100	82	82	85	88
15	103	104	105	84	84	87	91
16	109	109	110	86	86	90	94
17	114	114	114	88	88	92	97
18	120	119	119	91	90	95	101
19	125	125	124	94	93	98	104
20	131	130	129	97	96	102	108
21	137	135	134	100	99	105	112
22	142	141	139	104	102	109	116
23	148	146	144	107	106	112	120
24	154	152	149	111	110	116	124
25	159	157	154	115	114	120	128
26	164	162	159	119	118	125	133
27	170	167	164	123	122	129	137
28	175	172	169	128	127	133	142
29	179	178	174	133	131	138	147
30	184	182	179	137	136	143	151
31	188	186	183	142	141	148	156
32	192	190	187	148	147	152	161
33	195	194	190	153	152	157	165
34	198	197	193	159	158	162	170
35	201	199	195	165	164	167	174
36	203	202	197	172	171	173	178
37	206	204	200	177	176	178	182
38	209	207	202	182	180	182	186
39	211	209	205	186	185	186	190

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 258 (°F)	TC # 259 (°F)	TC # 260 (°F)	TC # 261 (°F)	TC # 262 (°F)	TC # 263 (°F)	TC # 264 (°F)
40	213	212	207	191	189	190	193
41	215	215	210	194	193	193	196
42	218	217	213	198	196	197	198
43	220	220	216	201	199	199	201
44	222	223	219	203	201	202	203
45	225	226	222	205	203	204	206
46	227	229	224	207	206	207	210
47	229	230	214	207	207	208	209
48	224	202	200	208	208	208	209
49	203	203	203	208	208	209	210
50	206	207	208	209	208	209	210
51	208	210	210	209	209	209	210
52	210	210	210	209	209	208	210
53	210	210	210	209	209	208	210
54	210	210	210	209	209	209	210
55	211	210	211	209	209	209	211
56	211	210	211	209	209	209	210
57	210	210	210	209	209	209	210
58	210	210	210	209	209	209	209
59	210	210	210	209	209	209	209
60	211	210	210	209	209	209	209
MAX	229	230	224	209	209	209	211

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 265 (°F)	TC # 266 (°F)	Ambient (°F)	Furnace # 1 (°F)	Furnace # 2 (°F)	Furnace # 3 (°F)
0	76	77	75	75	76	75
1	77	77	75	179	152	132
2	77	77	75	730	587	473
3	77	77	75	1063	939	834
4	77	77	76	1040	936	876
5	77	77	75	953	867	836
6	77	77	76	990	890	852
7	77	77	75	1252	1131	1071
8	78	78	76	1443	1340	1281
9	78	78	75	1434	1328	1280
10	80	79	76	1367	1259	1222
11	81	81	75	1277	1180	1154
12	83	82	75	1360	1264	1235
13	85	84	75	1487	1427	1364
14	87	86	75	1485	1432	1374
15	90	89	75	1443	1388	1343
16	93	91	75	1405	1367	1331
17	96	94	75	1434	1418	1387
18	99	97	75	1509	1503	1456
19	103	100	75	1514	1497	1447
20	106	103	75	1485	1458	1421
21	110	107	75	1464	1463	1415
22	114	110	75	1478	1491	1448
23	118	114	75	1515	1525	1487
24	122	118	75	1518	1521	1472
25	127	121	75	1505	1518	1464
26	131	125	75	1509	1540	1479
27	135	129	75	1519	1561	1492
28	140	133	75	1538	1575	1511
29	144	137	75	1558	1584	1526
30	149	141	76	1575	1589	1533
31	153	146	76	1577	1583	1530
32	158	150	76	1588	1591	1544
33	162	154	76	1602	1611	1559
34	167	158	76	1608	1612	1561
35	171	162	76	1610	1607	1560
36	175	166	76	1612	1609	1564
37	179	170	76	1620	1617	1571
38	182	174	76	1626	1628	1575
39	186	177	76	1631	1631	1580

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	TC # 265 (°F)	TC # 266 (°F)	Ambient (°F)	Furnace # 1 (°F)	Furnace # 2 (°F)	Furnace # 3 (°F)
40	189	180	76	1634	1634	1584
41	192	184	76	1640	1643	1592
42	194	186	76	1649	1651	1600
43	196	189	76	1656	1659	1606
44	199	193	76	1662	1664	1611
45	202	196	76	1665	1669	1613
46	204	197	76	1669	1673	1617
47	204	201	76	1670	1675	1623
48	205	202	76	1674	1680	1630
49	206	201	76	1677	1683	1632
50	207	205	77	1680	1684	1633
51	207	204	77	1686	1688	1637
52	207	204	77	1689	1692	1645
53	208	205	77	1693	1699	1651
54	208	206	77	1697	1706	1659
55	209	208	77	1699	1708	1660
56	209	207	77	1702	1709	1661
57	209	208	77	1706	1714	1670
58	209	208	77	1713	1719	1679
59	209	209	77	1720	1731	1689
60	209	209	77	1726	1736	1696
MAX	209	209				

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Furnace # 4 (°F)	Furnace # 5 (°F)	Furnace # 6 (°F)	Furnace # 7 (°F)	Furnace # 8 (°F)
0	75	75	75	75	75
1	159	145	283	180	149
2	693	523	974	738	479
3	1061	859	1212	1089	828
4	1071	908	1109	1062	881
5	991	870	988	974	845
6	983	884	1041	988	862
7	1191	1092	1327	1233	1075
8	1419	1296	1510	1436	1297
9	1446	1301	1442	1415	1299
10	1374	1248	1356	1340	1244
11	1288	1177	1265	1259	1173
12	1351	1244	1405	1355	1241
13	1528	1376	1550	1520	1388
14	1551	1389	1506	1499	1399
15	1500	1357	1444	1445	1365
16	1450	1340	1406	1416	1348
17	1468	1382	1453	1455	1384
18	1529	1462	1533	1527	1454
19	1533	1461	1531	1543	1458
20	1522	1429	1502	1524	1431
21	1493	1419	1479	1499	1432
22	1498	1445	1498	1508	1461
23	1529	1496	1535	1541	1497
24	1533	1489	1535	1546	1493
25	1524	1474	1523	1533	1483
26	1529	1485	1527	1534	1494
27	1543	1500	1538	1540	1509
28	1559	1518	1558	1563	1523
29	1580	1538	1577	1585	1537
30	1590	1549	1589	1595	1546
31	1593	1551	1590	1595	1549
32	1603	1563	1603	1604	1559
33	1618	1575	1619	1620	1569
34	1621	1582	1622	1622	1575
35	1624	1582	1623	1621	1576
36	1630	1586	1626	1623	1579
37	1635	1592	1636	1632	1587
38	1639	1597	1639	1637	1591
39	1648	1603	1646	1642	1594

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Furnace # 4 (°F)	Furnace # 5 (°F)	Furnace # 6 (°F)	Furnace # 7 (°F)	Furnace # 8 (°F)
40	1654	1606	1650	1646	1597
41	1659	1613	1656	1652	1603
42	1666	1620	1666	1659	1611
43	1672	1625	1672	1666	1618
44	1676	1632	1677	1672	1627
45	1680	1635	1681	1674	1629
46	1684	1639	1682	1680	1629
47	1685	1642	1685	1682	1632
48	1689	1647	1688	1685	1637
49	1694	1652	1692	1688	1643
50	1697	1656	1695	1690	1647
51	1703	1661	1700	1695	1651
52	1707	1668	1706	1701	1656
53	1711	1673	1708	1704	1660
54	1713	1675	1711	1707	1664
55	1719	1678	1715	1708	1665
56	1723	1681	1716	1711	1668
57	1724	1684	1720	1717	1671
58	1728	1691	1726	1722	1679
59	1736	1698	1734	1731	1684
60	1742	1703	1739	1737	1689
MAX					

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Furnace # 9 (°F)	Furnace # 10 (°F)
0	75	76
1	139	199
2	423	707
3	670	972
4	715	926
5	700	853
6	750	937
7	959	1219
8	1155	1353
9	1139	1287
10	1067	1190
11	1016	1121
12	1131	1310
13	1280	1430
14	1280	1376
15	1234	1303
16	1211	1277
17	1265	1344
18	1335	1408
19	1337	1389
20	1314	1352
21	1306	1341
22	1331	1377
23	1367	1419
24	1368	1403
25	1362	1393
26	1372	1402
27	1385	1419
28	1404	1445
29	1425	1468
30	1438	1477
31	1441	1474
32	1454	1492
33	1471	1509
34	1477	1510
35	1478	1512
36	1483	1519
37	1491	1528
38	1499	1535
39	1505	1542

OMEGA POINT LABORATORIES

TVA Project No. 94943A March 31, 1993

Time (min)	Furnace # 9 (°F)	Furnace # 10 (°F)
40	1511	1549
41	1519	1558
42	1529	1568
43	1537	1577
44	1544	1583
45	1549	1586
46	1554	1591
47	1558	1595
48	1562	1597
49	1567	1602
50	1571	1603
51	1577	1609
52	1582	1615
53	1587	1620
54	1594	1626
55	1597	1628
56	1600	1631
57	1607	1638
58	1614	1645
59	1625	1656
60	1632	1662
MAX		

OMEGA POINT LABORATORIES

Appendix F

QUALITY ASSURANCE

Quality Assurance Statement

Omega Point Laboratories, Inc. is an independent, wholly owned company incorporated in the state of Texas, devoted to engineering, inspection, quality assurance and testing of building materials, products and assemblies. The company has developed and implemented a Quality Assurance Program designed to provide its clients with a planned procedure of order and document processing for inspection and testing services it provides to assure conformity to requirements, codes, standards and specifications. The Program is designed to meet the intent of ANSI 45.2 Quality Assurance Program Requirements for Nuclear Power Plants, and complies with the requirements of the ASME Code, SPPE, Military Standards and other less stringent programs. It is the Laboratory's intention to adhere strictly to this Program, to assure that the services offered to its clients remains of the highest quality and accuracy possible.

The overall responsibility of the supervision, operation and coordination of this Quality Assurance Program is that of the Quality Assurance Manager, a person not involved with the performance of the inspection or testing services, and who is under the full time employ of the Laboratory. This individual is responsible for implementing and enforcing all procedures presented in the Quality Assurance Manual and the Procedures Manual. All personnel involved with activities which fall under the scope of this Program are required to cooperate with the letter and intent of this Program.

All QA Surveillance documents remain on file at the Laboratory, and are available for inspection by authorized personnel in the performance of an on-site QA Audit. All materials, services and supplies used herein were obtained with appropriate QA Certifications of Compliance, which may be found in the following pages.

OMEGA POINT LABORATORIES

Event Log

OMEGA POINT LABORATORIES

EVENT LOG

PROJECT NO. 94943
TENNESSEE VALLEY AUTHORITY

OMEGA POINT LABORATORIES, INC.
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238
1-800-966-5253

EVENT LOG

PROJECT NO. 11210-94554
TENNESSEE VALLEY AUTHORITY

NOTE:
This Log is to be used to document the date and item for each step during the completion of the above-referenced test project. The assigned project numbers for each of the test assemblies are:

94943 A (4 conduit deck assembly)
94943 B (3 conduit deck assembly)
94943 C (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 D (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 E (4" conduit w/ large NEMA 12 JB slab assembly)

Page 1

ITEM	DATE	INITIALS
Test plan received	1/18/93	CH
Omega Point Lab technicians		
begin construction of test	1/19	CH
decks and slabs.		
Concrete poured in slabs for	1/	
tests 94943C and 94943D		
Thermocouple verification for		
assembly 94943A completed	2/2/93	CH
Slab poured for assembly E.	2/2/93	CH
Deck assembly construction	2/3/93	
began with installation of		
conduit on assembly B.		
TVA crew on site to begin	2/4/93	CH
installation of Thermo Lag		
prestraped conduit ~~over~~ CH on		
assembly 94943A.		
Installation crew:		
Dan Headrick		
Gary Headrick		
Alan White		
Larry Stames		
JJ Pierce of TVA reviewed	2/4/93	CH
installation procedures with		
TVA crew OPL QA Manager		
and Ralph Architzel with US NRC.		
4" conduit on Assembly A is	2/4/93	CH

EVENT LOG

PROJECT NO. 11210-94554
TENNESSEE VALLEY AUTHORITY

NOTE:
This Log is to be used to document the date and item for each step during the completion of the above-referenced test project. The assigned project numbers for each of the test assemblies are:

94943 A (4 conduit deck assembly)
94943 B (3 conduit deck assembly)
94943 C (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 D (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 E (4" conduit w/ large NEMA 12 JB slab assembly)

Page 2

ITEM	DATE	INITIALS
wrapped with one layer of 1/2" Thermo Lag preshaped conduit and held with stainless steel tie wire.	2/4/93	CH
Assembly 94943 B test deck has the 3 conduit pipes installed and ready for thermocouples.	2/4	CH
1" conduit on Assembly A is wrapped with the first layer of 1/2" Thermo Lag preshaped conduit sections ~~and~~ using the trowel grade Thermo Lag and held in place with stainless steel tie wire.	2/4	CH
The 3" conduit elbow is boxed in using the rigid V-groove Thermo Lag sheets.	2/5	CH
A second layer of 1/4" preshaped Thermo Lag conduit is installed over the 1" conduit.	2/5	CH
Thermocouple placement is verified by Omega Point Quality Assurance Manager on Assembly 94943 B.	2/5	CH

EVENT LOG

PROJECT NO. 11210-94554
TENNESSEE VALLEY AUTHORITY

NOTE:
This Log is to be used to document the date and item for each step during the completion of the above-referenced test project. The assigned project numbers for each of the test assemblies are:

94943 A (4 conduit deck assembly)
94943 B (3 conduit deck assembly)
94943 C (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 D (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 E (4" conduit w/ large NEMA 12 JB slab assembly)

Page 3

ITEM	DATE	INITIALS
Shipment of Thermo Lag panels and ¼" conduit sections arrive on site from T.S.I.	2/6/93	CH
Installation begins of the pre-formed conduit sections of Thermo Lag on assembly 94943B.	2/6/93	CH
3" conduit is covered with the first layer of ½" Thermo Lag preformed conduit sections using the trowel grade Thermo Lag and held with stainless steel tie wire on assembly ~~B~~ A. CH	2/6	CH
Second layer of Thermo Lag is applied to the 1" conduit sections using the ¼" upgrade material on assembly A.	2/6/93	CH
3" aluminum conduit on assembly B is covered with the ½" thick Thermo Lag preformed conduit sections.	2/7/93	CH
Square tubing sections on assembly B are wrapped with ½" Thermo Lag panel sections ~~to~~ CH within 12" of ends.	2/7/93	CH
Assembly A, 2" conduit is wrapped with ¼" thick Thermo Lag pre-	2/7/93	CH

EVENT LOG

PROJECT NO. 11210-94554
TENNESSEE VALLEY AUTHORITY

NOTE:
This Log is to be used to document the date and item for each step during the completion of the above-referenced test project. The assigned project numbers for each of the test assemblies are:

94943 A (4 conduit deck assembly)
94943 B (3 conduit deck assembly)
94943 C (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 D (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 E (4" conduit w/ large NEMA 12 JB slab assembly)

Page 4

ITEM	DATE	INITIALS
formed conduit for the second layer.	2/7/93	CH
Thermo Lag preformed conduit sections are now designated by Mark Salley of TVA to be referred to as follows:	2/8/93	CH
Thermo Lag conduit sections		
1/4" preformed now called 3/8"		
1/2" will now be 5/8"		
This is done to represent the true dimensions of the material. The tolerance on each size is plus or minus 1/8". Any material that is outside of this tolerance is rejected.	2/8/93	CH
Stress skin is applied to the 90° angles over the Thermo Lag on the 1" and 4" conduits on assembly A. The 1" conduit first layer of preformed Thermo Lag is 5/8" thick and the second layer is 3/8" thick. The 4" conduit has one layer 5/8" thick.	2/8/93	CH
Jerry Wiseman, USNRC on site.	2/8/93	CH

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94943 E (4" conduit w/ large NEMA 12 JB slab assembly)

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ITEM	DATE	INITIALS
Assembly B 3" aluminum	2/8/93	CH
conduit is covered with the		
5/8" thick preformed Thermo		
Lag conduit sections. at		
the coupling ~~the~~ trowel		
grade material covers the		
joint and is then covered		
with the 5/8" preformed		
Thermo Lag conduit which		
overlaps 2" on each side.		
Assembly B is waiting	2/9/93	CH
for material to arrive to		
continue insulating.		
Assembly A 3" conduit is	2/9/93	CH
wrapped with the second		
layer of 1/4" preformed		
Thermo Lag conduit sections.		
The material is short in the		
circumference by approxi-		
mately 1 7/8"–2". This is		
corrected by cutting a		
6" piece of ~~1/4"~~ Thermo Lag flat		
panel and stripping the		
Thermo Lag from 2" on		
both sides from the stress skin		
as shown: The 2"		

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ITEM	DATE	INITIALS
piece of Thermo Lag will fit in the void and 2" ~~wide~~ of stress skin will overlap on each side. Trowel grade Thermo Lag will bond the sections together when held with the stainless steel wire	2/9/93	CH
Assembly A support hanger is wrapped using two methods. One half uses one layer of the 5/8" Thermo Lag panel material and the other half uses two layers of the 3/8" panel material.	2/9	CH
Junction boxes and conduits are mounted on the test slab for Assembly D.	2/9	CH
Thermocouple placement is verified by Quality Assurance on assembly 94943 D for inside junction boxes and inside conduit piping.	2/9	CH
Thermo Lag conduit sections received from Watts Bar. The 3" steel conduit on Assembly B is	2/10/93	CH

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ITEM	DATE	INITIALS
wrapped with this 5/8" thick preformed Thermo Lag conduit material. Collar is installed over the connection fitting using Thermo Lag. Support hanger is wrapped with the flat panel 5/8" Thermo Lag.	2/10/93	CH
Assembly A 3" conduit 2nd layer wrap is completed using the 3/8" thick preformed Thermo Lag conduit.	2/10/93	CH
Assembly 94943D thermo-couples are pulled through the conduit and ends mounted in the junction boxes.	2/10/93	CH
Assembly 94943E junction box and conduit are installed on the concrete slab.	2/10	CH
Conduit steel TC placement on assembly 94943D is verified by OPL Quality Assurance.	2/10	CH
3" steel conduit radius is wrapped with wire mesh on Assembly B.	2/10/93	CH
Assembly A. Stress skin added to the 90° radius on the 3" steel conduit.	2/11/93	CH

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ITEM	DATE	INITIALS
assembly A and assembly B are sanded and skim coat applied.	2/11/93	CH
Thermocouples are checked by Quality Assurance and installed in the junction boxes and conduits in Assembly E.	2/11	CH
Thermo Lag installation on assembly 94943D begins.	2/11/93	CH
assembly B sanding, skim coat and polishing is completed	2/12/93	CH
Junction Box #2 on Assembly 94943D will be fitted with a removable front panel of Thermo Lag.		
Junction Box #3 on Assembly 94943D will incorporate a repair procedure on a 3½" diameter hole using a plug of flat panel Thermo Lag with 2" overlap of stress skin as illustrated on the TVA data sheet dated 2/12/93	2/12/93	CH
Thermo Lag circumferences on Assembly 94943A conduits taken by JJ Pierce and verified by OPL QA.	2/12/93	CH

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ITEM	DATE	INITIALS
Insulation of Assembly 94943E begins with wrapping the conduit JB's.	2/12/93	CH
Omega Point technicians begin installation of the junction boxes on the test slab for Assembly 94943C.	2/12/93	CH
Assembly 94943D junction boxes are dry fitted with the 5/8" "goode" panel. V ribs will be pounded flat before installation.	2/12/93	CH
Assembly E Thermo Lag insulation of the large junction box is started using the 5/8" thick V groove panels. V-grooves are pounded flat before using. A handle was mounted on this large junction box by OPC technicians and the Thermo Lag panel was cut for the handle to clear. A box was made from the Thermo Lag panel to cover which was applied first. All pieces are held using trowel grade mat'l.	2/13/93	CH

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ITEM	DATE	INITIALS
The overlapping stress skin from the side pieces of the junction box on assembly E are tied at the corners with tie wire.	2/13/93	CH
assembly 94943B dimensions of the circumference at various points are taken by J J Pierce of TVA and witnessed by Omega Point Labs QA personnel.	2/13	CH
assembly 94943D junction boxes are covered using the 5/8" Thermo Lag panels.	2/13	CH
Steve anchors are used to hold the flanges of the T.Lag boxed junction boxes to the concrete slab.	2/13	CH
All junction boxes are covered with the 5/8" Thermo Lag panel on assembly D.	2/13	CH
Junction boxes number 2 and 6 are fitted with a "removeable" Thermo Lag cover on assembly D. These two boxes use a layer of 3/8" Thermo Lag panel under the	2/13/93	CH

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ITEM	DATE	INITIALS
5/8" Thermo Lag on the front cover panel only.	2/13/93	CH
Assembly 94943C no change	2/15/93	CH
Omega Point Lab technicians and staff on Presidents Day holiday		
Assembly 94943E junction boxes flanges are fastened to the concrete slab using the 5/8" Thermo Lag panel (over the stress skin flanges) with 2¼" x ¼" sleeve anchors.	2/15	CH
Assembly 94943D small junction boxes number 1 and 4 are boxed with stress skin (over the 5/8" Thermo Lag mat'l box) and covered with the trowel grade Thermo Lag.	2/15	CH
Assembly D junction boxes # 2, 3, 5 & 6 have stress skin on edges (2" overlap) which is held in place with ½" staples.	2/15	CH
Assembly E conduits are covered with one layer of 5/8" preformed Thermo Lag using trowel grade Thermo Lag and held until set with SS tie wire	2/15/93	CH

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ITEM	DATE	INITIALS
Assembly 94943 D 5" and 3" metal conduits are wrapped with one layer of 5/8" pre-formed Thermo Lag conduit sections and trowel grade Thermo Lag.	2/15/93	CTA
Assembly 94943 D 1" metal conduit is wrapped first with the 5/8" pre formed Thermo Lag conduit sections using trowel grade material and held with stainless steel tie wire at approximately 4" spacing. This 1" conduit was then wrapped again using the 3/8" preformed Thermo Lag material with the SS wire in place over the preceeding 5/8" layer.	2/15/93	CTA
Assembly D of 2" metal conduit is wrapped using the same procedure (as the 1" conduit) except the 3/8" preformed Thermo Lag conduit sections are used for both layers.	2/15/93	CTA

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ITEM	DATE	INITIALS
Thermocouple verification on Assembly 94943C done by Omega Point Labs QA. Junction Box and conduit placement also verified by QA.	2/16/93	CTT
Assembly D conduit metal strap flanges are covered with the 5/8" Thermo Lag panels after the bolt ends are cut flush with the nut head.	2/16/93	CTT
Pat Madden with US NRC onsite to witness installation.	2/16/93	CTT
Dwayne Ezell with TVA Quality Control is on site.	2/16/93	CTT
Assembly D trowel grade Thermo Lag dried to the consistency of putty is forced between the wrapped conduit and the concrete slab on CTT ~~conduit~~ the 1", 2" & 3" conduits. After this dries, stainless steel tie wire will hold at 6" spacing.	2/16	CTT
Thermocouple placement on the steel conduit and inside the junction boxes is completed by OPL technicians and verified by OPL QA on Assembly 94943C.	2/16	CTT

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ITEM	DATE	INITIALS
Assembly D will have 4" ~~3~~ inch square sections of stress skin stapled over the bolt heads on junction boxes #2 & #6. This is followed by a skim coat of trowel grade Thermo Lag.	2/16/93	CH
Assembly 94943D 5" Thermo Lag wrapped conduit is filled in at the concrete slab with the trowel grade Thermo Lag that has been dried to a consistency of putty. This gap was from approximately 1/4" to no clearance in some areas.	2/17/93	CH
Assembly A stainless steel tie is tied on all conduits. The spacing is maximum 6" on straight conduit and 4" maximum on the radius.	2/17	CH
Assembly 94943E large junction is covered with a second layer of Thermo Lag panel. This layer uses the 3/8" material. The front panel is cut to slide over the existing bolt ends and the handles, which was previously	2/17/93	CH

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ITEM	DATE	INITIALS
wrapped with the 5/8" Thermo Lag panel. The handle does not receive a second layer. The second layer panels have 2" overlap otherwise side flanges which is stepped to the first layer.	2/17/93	CH
Two additional thermocouples are placed in each of the two junction boxes on Assembly C which were requested by Pat Madden, USNRC. These were verified by OPL QA.	2/17/93	CH
Assembly 94943 C Thermo Lag wrap is started using the 1/8" flat V-groove panel material. V-grooves are pounded flat before application. Thickness tolerance on this Thermo Lag panel is ± 1/8".	2/18/93	CH
Junction Box #2 on Assembly C is covered on the front panel only with a second layer of Thermo Lag panel. The inside layer uses 5/8" thick panel and the outer layer uses the 1/8" thick material.	2/18/93	CH

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ITEM	DATE	INITIALS
Assembly C Junction Box #1 and #3 have a fill-in piece of the 5/8" Thermo Lag to allow for the ~~top~~ hinges. This 5/8" board covers the side of the hinge only. This side, along with the other four surfaces are boxed in with the 1/8" matl.	2/18/93	CH
Corners of the boxed-in junction boxes of Assembly C are filled in with the trowel grade Thermo Lag dried to a consistency of putty.	2/18/93	CH
Thermo Lag wrap on all junction boxes is done. Stress skin reinforcement of the corners with a 2" overlap is completed on junction box number 5. This procedure will be followed on all JBs on Assembly 94943C.	2/19/93	CH
Filling the preformed Thermo Lag conduit sections around the metal conduits which are adjacent to the concrete slab is started. The Thermo Lag is shaved to fit behind the conduit	2/19	CH

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ITEM	DATE	INITIALS
Assembly C 1" and 2" conduits are wrapped with 1 1/8" thick preformed Thermo Lag conduit sections. The 3" conduit is wrapped with the 5/8" thick preformed Thermo Lag conduit and will be wrapped with a second layer of 3/8" thick material. The 5" metal conduit is wrapped with one layer only of the 5/8" thick Thermo Lag material.	2/19/93	CH
Assembly B stainless steel bands (on the 3" aluminum and steel conduits) and stainless steel wire is installed. Metal corner pieces are added to the 3" conduit LB's. This completes the assembly of 94943 B.	2/20/93	CH
Second (3/8") layer of Thermo Lag preformed conduit is installed on the 3" conduit on Assembly C. Wrapping of remaining conduits are completed on Assembly C. Stress skin	2/20	CH

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ITEM	DATE	INITIALS
is installed on the corners of the junction boxes with staples.	2/20/93	CH
Base plates are installed on both sides of the 1" and 2" conduits and held with sleeve anchors.	2/20/93	CH
Skim coat on Assembly C	2/22/93	CH
Sand and touch-up on Assembly 94943 E.	2/22	CH
Permanent tie wire is attached to Assemblies 94943 D & E.	2/23/93	CH
Assembly 94943 E is complete.	2/23	
Filling is edges on the junction boxes on Assembly 94943 C is completed.	2/23	CH
Assembly 94943 D is complete	2/23	CH
Assembly 94943 C is completed after the smoothing with abrasive pads and the permanent stainless steel tie wires are attached.	2/24	CH
All TVA extra materials are packaged by TVA technicians and shipped ~~but~~ CH back to Watts Bar Power Plant.	2/24	CH
All TVA personnel depart Omega Point Labs.	2/24/93	CH

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ITEM	DATE	INITIALS
J.J. Pierce of TVA had requested "weep holes" be drilled into the J Boxes on assemblies C, D and E. Omega Point Labs drilled these through as marked by TVA.	3/11/93	CH
Two of the designated 1/4" drill points went into the Thermo Lag layer on Assembly C. These were moved to with-in 2" and drilled again through the junction boxes. JB #2 was patched on the bottom and junction box #3 was patched on the side.	3/16/93	CH
This "patching" procedure consisted of packing trowel grade Thermo Lag of a putty consistency into the 1/4" holes by OPL technician with QA observing per instructions by J.J. Pierce.	3/16/93	CH
Assembly 94943A is mounted on the ASTM E119 furnace and 266 thermocouples are connected	3/31/93	CH

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ITEM	DATE	INITIALS
to the data acquisition equipment. Pretest checklist is performed by Omega Point Fire Technologist, Herb Stansberry.	3/31/93	CH
Temperature at the start of test is 77°F, with a 36% relative humidity level.	3/31	CH
Fire test of Assembly 94943A is started at 7:34pm On site to witness this test are: Jim Krieg TVA	3/31	CH
DJ Pierce TVA		
Mark Salley "		
Jerry Wiseman US NRC		
Greg Priest Omega Point Labs		
Herb Stansberry " " "		
Connie Humphrey " "		
Kerry Hitchcock " "		
Richard Beasley " "		
Laudencio Castanon " "		
Randy Henry Alamo Crane		
Test is completed at 8:34pm and is followed by the hose stream test using the fog nozzle with 75 psig at the nozzle, from a distance of	3/31	CH

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ITEM	DATE	INITIALS
5 feet and using a 30° angle	3/31	CH
spray. The hose stream		
test began 6 minutes		
after the end of the fire test.		
Tear down and inspection		
of tested Assembly 94943A		
followed the hose stream		
test.		
Assembly 94943B is mounted	4/1/93	CH
on the ASTM E119 test furnace		
and 227 thermocouples are		
connected to the data		
acquisition equipment. Pretest	4/1/93	CH
checklist is done by Herb		
Stansberry Fire Technologist.		
Temperature at start of test	4/1/93	CH
is 77° with a 44% relative		
humidity level.		
Fire test of Assembly 94943B	4/1/93	CH
is started at 7:39 pm and		
is witnessed by:		
Mark Salley TVA		
J.J. Pierce TVA		
Jerry Wiseman US NRC	4/1/93	JW
Ney Priest Omega Point Labs		
Herb Stansberry " "		
Connie Humphrey " "		

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ITEM	DATE	INITIALS
Cleda Patton Omega Point Lab	4/1/93	[illegible]
Kerry Hitchcock " " "		
Richard Beasley		
Laudencio Castaon		
David Lynd Alamo Crane		
Test is completed at 8:39 pm and	4/1	[illegible]
is followed by the hose stream		
test using the fog nozzle with		
75 psi at the nozzle, from a distance		
of 5 feet and using a 30° angle		
spray. The hose stream test began		
7 minutes after the end of the		
fire test. Seal down and inspection		
of tested assembly 94943B followed		
the hose stream test.	4/1	[illegible]
Assembly 94943D is mounted	4/6	[illegible]
on the ASTM E119 furnace and		
121 thermocouples are connected		
to the data acquisition equipment.		
Pretest checklist is performed	4/6	[illegible]
by Omega Point Fire Technologist,		
Herb Stansberry. Temperature		
at the start of the test is 75°F		
with a 66% relative humidity		
level.	4/6	[illegible]
Fire test of Assembly 94943D		

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ITEM	DATE	INITIALS
is started at 8:30pm. On site	4/6	[illegible]
to witness this test are:		
J.J. Pierce TVA	4/6	[illegible]
Mark Salley TVA		
John Starchl Watts Bar		
Pat Madden USNRC		
Steve Hardy Carolina Power + Light		
Deg Priest Omega Point Lab		
Connie Humphrey " " "		
Herb Stanberry " " "		
Cleda Patton " " "		
Kerry Hitchcock " " "		
Richard Beasley " " "		
David Kimmons Alamo Crane		
Test is completed at 9:30 pm and	4/6	[illegible]
is followed by the hose stream test		
using the fog nozzle with 75psi		
at the nozzle, from a distance		
of 5 feet and using a 30° angle		
spray. The hose stream test		
began 5 minutes after the end		
of the fire test. Tear down		
and inspection of the test assembly		
94943D followed the hose stream test.	4/6	[illegible]

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ITEM	DATE	INITIALS
Assembly 94943E is mounted on the E919 Test furnace and 104 thermocouples are connected to the data acquisition system equipment.	4/7/93	CH
Pretest checklist for assembly 94943E is done by Omega Point Fire Technologist Daily Hansberry and witnessed by Doug Priest President. Relative humidity at start of test is 66% and the temperature is 72°F.	4/7/93	CH
The ASTM Fire Resistance test of assembly 94943E is started at 8:27 pm.	4/7/93	CH
On hand to witness this fire test are:	4/7/93	CH
J J Pierce TVA		
Mark Salley TVA		
John Sterchi Watts Bar Power Plant		
Steve Hardy Carolina Power & Light		
Pat Madden US NRC		

EVENT LOG

PROJECT NO. 11210-94554
TENNESSEE VALLEY AUTHORITY

NOTE:
This Log is to be used to document the date and item for each step during the completion of the above-referenced test project. The assigned project numbers for each of the test assemblies are:

94943 A (4 conduit deck assembly)
94943 B (3 conduit deck assembly)
94943 C (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 D (1", 2", 3", 5" conduit w/ JBs slab assembly)
94943 E (4" conduit w/ large NEMA 12 JB slab assembly)

ITEM	DATE	INITIALS
Dee Priest Omega Point Labs	4/7/93	CH
Cynthia Humphrey " " "		
Cleda Patton " " "		
Herb Stansberry " " "		
Kenny Hitchcock " " "		
Laudencio Castanon " "		
Richard Beasley " "		
David Kimmons, Alamo Crane Service		
Test is completed at 9:27 pm and is followed by the hose stream test at 9:32 pm using the fog nozzle from a distance of 15 feet with 75 psi at the nozzle with a 30° angle spray to the test sample.	4/7/93	CH
Tear down and inspection of Assembly 94943E followed the hose stream test.		

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/24/93-01

LOT/CONTRACT NO. _____ EXPIRATION DATE _____

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER J J Pierce DATE 2/24/93

QC INSPECTOR C Humphrey DATE 2/24/93

MATERIAL CONDITION

CONDUIT N/A PANELS N/A TIE WIRE 16 GA MESH N/A

PROCEDURE _____ DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED		
FASTENER SPACING		
18" RULE ON SUPPORTS		
MESH OVERLAP		
TROWER GRADE THICKNESS		
SEAMS OFFSET	N/A	

AJD 2/24/93

REMARKS: Finished Assembly 94943C by smoothing with abrasive pads/water. Attached permanent tie wires.

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/22/93-01

LOT/CONTRACT NO. TROWEL F92-12036 EXPIRATION DATE JULY 1993

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER [signature] DATE 2/22/93

QC INSPECTOR C Humphrey DATE 2/23/93

MATERIAL CONDITION

CONDUIT N/A PANELS N/A TIE WIRE 16 GA MESH N/A

PROCEDURE _____ DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED		
FASTENER SPACING		
18" RULE ON SUPPORTS		
MESH OVERLAP		
TROWER GRADE THICKNESS		
SEAMS OFFSET	N/A	

[signature] 2/22/93

REMARKS: Skim coat of trowel put on Assembly 94943C. Filled in edge of JB (next to concrete) on Assemblies 94943C & E. Used abrasive pad & water to finish Assembly 94943D & E.

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/23/93-01

LOT/CONTRACT NO. TROWEL F92-12036 EXPIRATION DATE JULY 1993

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER [signature] DATE 2/23/93

QC INSPECTOR C Humphrey DATE 2/23/93

MATERIAL CONDITION

CONDUIT N/A PANELS N/A TIE WIRE 16GA MESH N/A

PROCEDURE _____ DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED		
FASTENER SPACING		
18" RULE ON SUPPORTS		
MESH OVERLAP		
TROWER GRADE THICKNESS		
SEAMS OFFSET	N/A	

[signature] 2/23/93

REMARKS: Attached permanent tie wire to Assemblies 94943D & E. Filling in edges of JBs on Assembly 94943C.

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/20/93-01

LOT/CONTRACT NO. 5/8" board ~~F9090~~ F9-909029 2/20/93
3/8 conduit F93-01013

TROWEL F92-10014
EXPIRATION DATE MAY 1993
TROWEL F92-12036 JULY 1993

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER J Pierce DATE 2/20/93

QC INSPECTOR C Humphrey DATE 2/20/93

MATERIAL CONDITION

CONDUIT 3/8" overlay MAX 1/2" MIN 1/4" PANELS _____ TIE WIRE 16 GA MESH 0.017 dia S.S.

PROCEDURE _____ DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2 (3" Conduit only)
JOINTS PRE-BUTTERED		YES
FASTENER SPACING		ok
18" RULE ON SUPPORTS		N/A
MESH OVERLAP		YES
TROWER GRADE THICKNESS		Skim
SEAMS OFFSET	N/A	YES

ASSEMBLY 94943C

REMARKS: Use 5/8" board to form border (base plate) on 1" and 2" conduits. Use 0.017 dia. stainless steel stress skin to cover 3" conduit and lap up the wall. Attach to wall with 5/8" board and sleeve anchors (1/4" x 2 1/4"). Assembly 94943B - Attach 1/2" stainless steel bandings & corner strips on LB's on 3" conduits. Attach 16 GA. tie wire to 3" I, 1 1/2" conduit and 2" & 4" supports. Put 0.017 dia stress skin on ~~cord~~ corners of all JBs and the LB.

2/20/93 TVA / 94943C.

(1) make putty consistency from muddy consistency

(2) put putty in middle joint of pipe insulation over 5" pipe.

(3) put collar over joint of 5" pipe insulation.

(4) apply putty in middle joint of 3" pipe insulation (upper left)

(5) install second layer (7/8") insulation over first layer insulation on 3" conduit.

(6) install insulation around conduit support on 2" pipe.

(7) install insulation around conduit support on 5" pipe

(8) install insulation around conduit support on 3" pipe

(9) attached stress skin on 4 corners of JB5 w/ staples.

(10) install base plate on both side of ~~of~~ "1" + 2" conduit w/ sleeve anchors.

(11) attach 4"x4" stress skin over nuts on JB5 front side of.

(12) attach stress skin over 3" conduit insulation w/ staple.

(13) using sleeve anchors to attach base plate over stress skin against slab on 3" conduit. apply muddy material over stress skin.

(14) attach stress skin on ~~four~~ all corners of JB~~1~~ #3. and covered w/ mud.

(15) attach 1 piece preshaped stress skin ~~over~~ all around JB #1. w/ staple & covered w/ mud.

(16) attach 1 piece preshaped stress skin all around LS w/ staple & covered w/ mud.

(17) attach 4"x4" stress skin over nuts ~~in~~ on front side of JB2 and covered w/ mud

(18) attach stress skin ~~all~~ on all corners of JB4 w/ staple and covered w/ mud.

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/19/93-01

LOT/CONTRACT NO. See Remarks

TROWEL 92-10014
EXPIRATION DATE MAY 1993

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER J P Pierce DATE 2/19/93

QC INSPECTOR C Humphrey DATE 2/19/93

MATERIAL CONDITION

CONDUIT See below PANELS 1 1/8" MAX 1 1/4" MIN 1" TIE WIRE 16 GA MESH N/A

PROCEDURE _____ DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	
FASTENER SPACING	OK	
18" RULE ON SUPPORTS	N/A	
MESH OVERLAP	YES	
TROWER GRADE THICKNESS	N/A	
SEAMS OFFSET	N/A	

REMARKS: Assembly 94243C - All the JBs & the LS are enclosed with 1 1/8" (Nominal) Thermo-Lag panels. Conduit sections 5" MAX 3/4" MIN 1/2", 3" MAX 3/4" MIN 1/2" ~~2" MAX 3/4" MIN 1/2"~~ JP 2/19/93, Lot F9-907058
1" MAX 1 1/4" MIN 1" Lot 92-10007, 3" overlay MAX 1/2" MIN 1/4"
~~2" overlay MAX 1/2" MIN 1/4"~~ JP 2/19/93 LOT # F93-01013
2" (1 1/8 Thick) Lot 92-08007 MAX 1 1/4" MIN 1"
1" & 2" conduits covered with 1 1/8" preformed conduit sections.
3" conduit covered with 5/8" + 3/8" preformed conduit sections
5" conduit covered with 5/8" preformed conduit

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/18/93-01

LOT/CONTRACT NO. F92-10039 (1 1/8" Panel) TROWEL 92-10014 EXPIRATION DATE MAY 1993

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER J. Pierce DATE 2/18/93

QC INSPECTOR C Humphrey DATE 2/18/93

MATERIAL CONDITION

CONDUIT N/A PANELS 1 1/8" MAX 1 1/4" MIN 1" TIE WIRE 16GA MESH N/A

PROCEDURE _____ DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	2/18/93	
FASTENER SPACING		
18" RULE ON SUPPORTS		
MESH OVERLAP		
TROWER GRADE THICKNESS	Skim	
SEAMS OFFSET	N/A	

REMARKS: Finish coat of trowel on Assemblies 94943D & E. Assembly 94943C - JBs enclosed with 1 1/8" board. Started cutting out JB enclosures, but none attached.

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/17/93-01

LOT/CONTRACT NO. TROWEL-92-10014 EXPIRATION DATE MAY 93

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER J Pierce DATE 2/17/93

QC INSPECTOR C Humphrey DATE 2/17/93

MATERIAL CONDITION

CONDUIT _____ PANELS _____ TIE WIRE 16GA MESH _____

PROCEDURE _____ DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	N/A	N/A
FASTENER SPACING	OK	OK
18" RULE ON SUPPORTS		
MESH OVERLAP		
TROWER GRADE THICKNESS		
SEAMS OFFSET	N/A	

REMARKS: ASSEMBLIES 94943A & B. Attached permanent tie wire to dried assemblies. Spacing of tie wires is 6" max on straight sections, 4" max on curved sections, and the spacing on the supports and LB's is as possible. TROWEL USED ON ASSEMBLIES 94943D & E.

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/16/93-01 TROWEL 92-10014

LOT/CONTRACT NO. F93-01013 (3/8 Panel) EXPIRATION DATE MAY 93

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER J Price DATE 2/16/93

QC INSPECTOR C Humphrey DATE 2/16/93

MATERIAL CONDITION

CONDUIT _____ PANELS 3/8" MAX 1/2" MIN 1/4" TIE WIRE _____ MESH _____

PROCEDURE _____ DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED		
FASTENER SPACING		
18" RULE ON SUPPORTS		
MESH OVERLAP		
TROWER GRADE THICKNESS		
SEAMS OFFSET	N/A	

REMARKS: Assembly 94943E - The 3/8" board is for the second layer on the 4'x3' JB. Second layer installed in the same manner as the first layer except the stress skin against the wall on the second layer is against the base plate and held in place by the anchor bolts. Then a layer of trowel is applied over this stress skin.

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/15/93-01

LOT/CONTRACT NO. TLOWEL 92-10014 EXPIRATION DATE MAY 93

CONDUIT ~~PANELS~~ - F9907058, F9909009

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER J. Pierce DATE 2/15/93

QC INSPECTOR Cleda Patton DATE 2/15/93

MATERIAL CONDITION

CONDUIT MAY 4" 3/4" 5" 3/4" MIN 1/2" 1/2"

PANELS _____

TIE WIRE 16GA

Stress Skin ~~MESH~~ 0.017 Stainless

PROCEDURE _____

DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	
FASTENER SPACING	OK	
18" RULE ON SUPPORTS	N/A	
MESH OVERLAP	YES (Corners of JBs)	
TROWER GRADE THICKNESS	N/A	
SEAMS OFFSET	N/A	

REMARKS: Assembly 94943D - Used Arrow T50 Staple gun and 1/2" staples to hold the external stress skin to the Thermo-Lag. The stress skin is put on the edges of the box enclosures (overlap a minimum of 2 inches). JBs 1 & 4 are covered with external stress skin cut from a single piece and then folded to fit.

SEE ATTACHED

SUBJECT ASSEMBLY 94943D PROJECT

COMPUTED BY [illegible] DATE 2/15/93 CHECKED BY Cleda Patton DATE 2/15/93

2" Conduit 1st layer conduit sections MAX 1/2" MIN 1/4"
Lot # F93-01013 & F93-01004
Second layer Lot F93-01013 max 1/2" MIN 1/4"

3" Conduit Max 3/4" MIN 1/2" Lot # F9-907027 & F9907053

5" Conduit MAX 3/4" MIN 1/2" LOT # F9 907063

1" Conduit 1st Layer Max 3/4" MIN 1/2" Lot # F9 907063
& F9908010
2nd layer max 1/2" Min 1/4" Lot F93-01013

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/13/93-01

LOT/CONTRACT NO. F92-10039 (1 1/8" Board) TROWEL 92-10014 EXPIRATION DATE MAY 1993
F9-909009 (5/8" Board)
CRAFTSMAN F9-907058 (" ") DATE

COGNIZANT ENGINEER J. Pierce DATE 2/13/93

QC INSPECTOR [signature] DATE 2/13/93

MATERIAL CONDITION

CONDUIT N/A PANELS 1 1/8" MAX 1 1/4" MIN 1" 5/8" MAX 3/4" MIN 1/2" TIE WIRE 16 GA MESH N/A

PROCEDURE DRAWING

HOLD POINTS

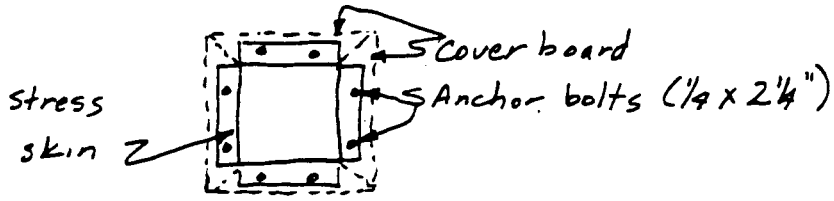
	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	
FASTENER SPACING	ok	
18" RULE ON SUPPORTS	N/A	
MESH OVERLAP	N/A	
TROWER GRADE THICKNESS	N/A	
SEAMS OFFSET	N/A	

REMARKS: One side of the 1 1/8" thick board has numerous staples (~7/8" long) that appear to have been used to hold the stress skin to the Thermo-Lag (Assembly 94943C). See Attached

SUBJECT Assembly 94943D (5/8 board) PROJECT

J.J. Price 2/13/93 Hubert W. Slaughter 2/13/93
COMPUTED BY DATE CHECKED BY DATE

The JB assemblies all have stress skin overlapped onto the concrete a minimum of 2 inches. Thermo-Lag board is cut to cover the stress skin on the condrete (see sketch)

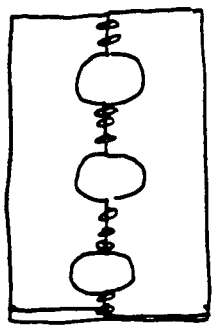


The JB enclosure is buttered on the inside and placed over the JB with the stress skin folded out. The cover board is placed up and marked for anchor bolt holes. The anchor bolt holes are drilled in the concrete. The stress skin is butter on the concrete side and the cover board is buttered and the anchor bolts are attached. The cover board is cinched up tight to the concrete with the anchor bolts. The anchor bolts and fender washers are covered with trowel grade, the edges of the JB are filled in with trowel grade and the entire assembly is allowed to dry overnight (minimum 12-hours). The anchor bolts spacing must not exceed 12 inches and each cover board piece must have a minimum of one anchor bolt. A fender washer is put between the Thermo-Lag and the nut.

SUBJECT Assembly 94943 E (5/8 board) PROJECT

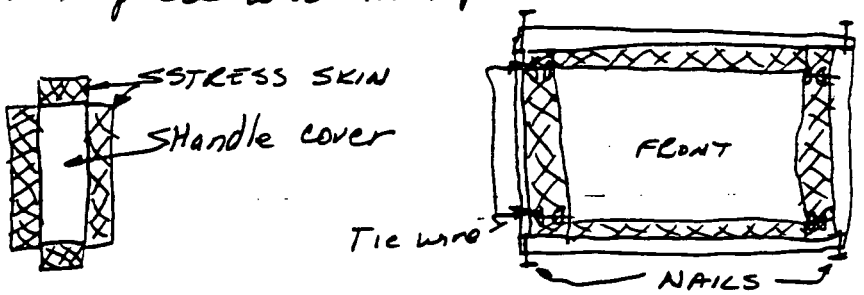
COMPUTED BY 2/13/93 DATE CHECKED BY 2/13/93 DATE

The piece of Thermo-Lag board than covers the end of the JB where the conduits enter the JB is cut down the middle and cut out to fit around the conduits. The internal



stress skin is tied together with tie wire before the trowel grade was applied.

A hole was cut out of the front piece to allow the handle to clear. A box was made to cover the handle. It was put on the handle and the front piece was then put on.



The overlapping stress skin from the side pieces are tied together ~~athe~~ at the corners with tie wire. Nails were used to temporarily hold the pieces together along the edge.

SUBJECT ASSEMBLY 94943 B - CIRCUMFERENCES PROJECT

COMPUTED BY 2/13/93 DATE CHECKED BY 2/13/93 DATE

PRE CURED DIMENSIONS

	1½"	3" I	3" AL
C_1	12 5/8	16	16
C_2	12 13/16	16	16
C_3	12 7/16	16 9/16	16 1/4
C_4	12 5/8	16 1/4	16
C_5	12 5/8	16	15 3/4
C_6	12 7/16	16	15 3/4
C_7	12 5/8	16 1/8	15 3/4
C_8	12 9/16	16 7/16	15 3/4
C_9	12 11/16	16 5/8	16
C_{10}	12 1/2	16 3/16	15 13/16
C_{11}	12 5/8	16 1/4	15 5/8
C_{12}	12 3/4	16 1/4	15 7/8
C_{13}	13 1/2	16 3/4	15 13/16
C_{14}	13 1/4	16 1/4	16
C_{15}	12 5/8	16 5/16	16
C_{16}	12 3/4	16	16 1/4

G4943 E

① insulation applied on LB#1 as 1 piece, insert small pieces into from crevice to make it solid. use tie wire to tight.

② Hollow portion of JB cover handle filled with Thermo-lag board stuck

③ Bolts fitted to JB cover to hold Thermo lag in place

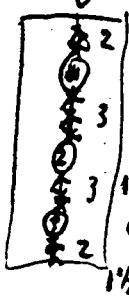
④ Large JB covered with 5 separate panels.

⑤ Panel dry fit on JB prior to installation

⑥ Panel to cover JB lid dry fit + hammered on to make indented marks for bolt locations

⑦ Hole cut in cover panel for handle cover box and panel dry fit.

⑧ Side panel pieces stitched together along seam (through internal stress skin). Joint pre battered prior to stitching.



1" above conduit#1
2½" above conduit#1
1½" above conduit#2
4" "
6" "
1½" above conduit#3
4" "
6" "
1½" below conduit#3
2½" "

⑨ side panels pre-battered + installed on JB.

⑩ top panel pre-battered + installed on JB.

⑪ Bottom panel pre-battered, installed + propped in place on JB.

⑫ JB panels temporarily held in place with nails

⑬ Stress skin flaps stitched at overlapped areas in corners of JB cover (Two places at each corner)

(14) Underside of stress skin buttered on JB cover perimeter. (Top side of stress skin also buttered)

(15) Handle perimeter pre-buttered on JB lid, interior of handle box pre-buttered, box installed over handle.

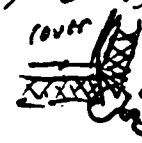
(16) JB box lid cover panel pre-buttered & installed on JB. Fender washers + nuts used to hold cover panel in place. Nails used to temporarily hold the edges of the cover in place.

(17) Tie wire installed around JB box

2/13/93

94943D

1. Junction box #5: applied side insulation pieces (2 pieces ☐) w/ tie wire around.
2. made precure measurement on 94943B.
3. Use sleeve anchors to hold border from and stress skin from junction box #1 against concrete slab.
4. Use sleeve anchors to hold flange of Thermo-lag around LB on conduit #3.
5. Interior of Box (to cover LB on conduit #3) coated with Trowel grade.
6. Opening to LB box filled with Trowel grade material
7. Flange frame material installed around LB box after pre-buttering.
8. Corners of LB box filled with Trowel grade material
9. JB #2 flange frame held in place with sleeve anchors after pre-buttering.
10. 3/8" Thermo-lag panel fit over bolts in JB lid on JB #2 prior to installing 5/8" material.
11. 5/8" material to be installed on sides of JB #2 prebuttered.
12. JB cover material pre-buttered prior to installation over bolts in JB box lid on JB #2 (excessive length of bolts cutoff).
13. stress skin flaps on JB cover pieces stitched together at corners



then perimeter of flaps wrapped with tie wire and covered with trowel grade material.
14. Interior surfaces of JB #3 cover material pre buttered prior to installation.
15. Flange frame installed with sleeve anchors after pre buttering.
16. 3/8" thick panel pre-buttered & installed on JB #4 cover.
17. 5/8" material ~~applied~~ prebuttered & installed over JB #4.

(18) Flange frame pre-butter + installed around JB#4 with sleeve anchors

(19) Joints + seams on JB#4 filled with trowel grade material

(20) All nuts + washers of flange frames around JB's covered with trowel grade material

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/12/93-01 TROWEL 92-10014

LOT/CONTRACT NO. F9908069 (F031390) F9909009 EXPIRATION DATE MAY 1993

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER J Pierce DATE 2/12/93

QC INSPECTOR C Humphrey DATE 2/12/93

MATERIAL CONDITION

CONDUIT N/A PANELS MAX 3/4" MIN 1/2" TIE WIRE 16 GA MESH N/A

PROCEDURE _____ DRAWING _____

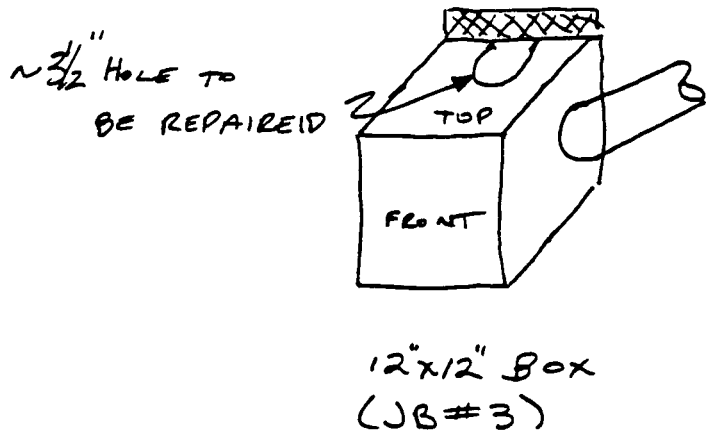
HOLD POINTS

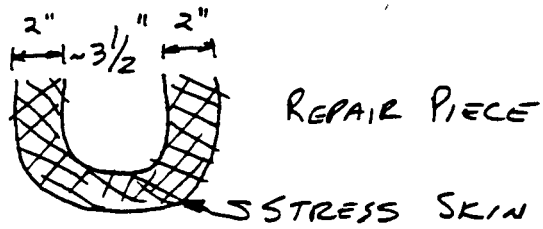
	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	
FASTENER SPACING	N/A	
18" RULE ON SUPPORTS	N/A	
MESH OVERLAP	OK	
TROWER GRADE THICKNESS	N/A	
SEAMS OFFSET	N/A	

REMARKS: On the 12x12 box (Assembly 94943D), the cut out for the conduit was on the wrong side piece. A piece was cut to fill it in and patch it and the conduit was cut out on the correct side. See attached sheets for details on JBs 2 & 3. See sheet 3 of 3 for baseplate description for Assembly 94943E.

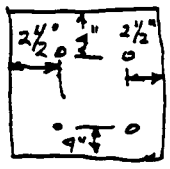
SUBJECT Slab Assembly 93943 D PROJECT

J J Pierce 2/12/93 C Humphrey 2/12/93
COMPUTED BY DATE CHECKED BY DATE

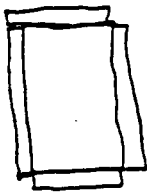




Junction Box #2 has a front piece installed to allow access without destroying the whole box enclosure. The box is a 20"x12" JB. Four all-thread (1/4"x3") were attached to the JB lid.



One piece of TL 5/8" panel was cut/scored to form the four sides. The stress skin remainded continuous around the four sides.



A piece of 3/8 panel was cut to fit inside the four side pieces and forced on the 1/4" all tread. A piece of 5/8" panel was cut to overlap the four sides and forced over the all threads.

Junction Box 5 - Sides made from 2 pieces of panel. Front made from separate piece. Front was made similar to front piece of JB 2 (see above).

SUBJECT ASSEMBLY 93943-E PROJECT

J. Pierce 2/12/93 C Humphrey 2/12/93
COMPUTED BY DATE CHECKED BY DATE

A baseplate (made from 5/8" panel) was cut to fit around the 4" conduits where they penetrate the concrete slab. The base plate is held (attached) to the concrete by 1/4" x 2 1/4" sleeve anchors (4 in each base plate). The baseplate is prebuttered on the backside (side next to concrete)

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/11/93-01

LOT/CONTRACT NO. F9908069 (4x6½ sheet) EXPIRATION DATE N/A

CRAFTSMAN _____ DATE _____

COGNIZANT ENGINEER JJ Pierce DATE 2/11/93

QC INSPECTOR C Humphrey DATE 2/11/93

MATERIAL CONDITION

CONDUIT N/A PANELS MAX 3/4" MIN 1/2" TIE WIRE N/A MESH N/A

PROCEDURE _____ DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED		
FASTENER SPACING		
18" RULE ON SUPPORTS		
MESH OVERLAP		
TROWER GRADE THICKNESS		
SEAMS OFFSET	N/A	

JJP 2/11/93

REMARKS: Measured and cut the 5/8" thick sheets to form the enclosures for the JBs on deck 9+993D

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/10/93-01

LOT/CONTRACT NO. F9907027, F9911013 F9907058, F9907053

Trowel 92-10014 EXPIRATION DATE May 93

CRAFTSMAN _____ DATE NA

COGNIZANT ENGINEER [signature] DATE 2/10/93

QC INSPECTOR C Humphrey DATE 2/10/93

5/8"
Max = 3/4"
Min = 1/2"

MATERIAL CONDITION

CONDUIT _____ PANELS Same TIE WIRE 16ga MESH 304 S.S. Knitted

PROCEDURE Installation Proc. DRAWING _____

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	YES
FASTENER SPACING	Not yet	
18" RULE ON SUPPORTS	YES	YES
MESH OVERLAP	YES	YES
TROWER GRADE THICKNESS	Skim coats	
SEAMS OFFSET	N/A	YES

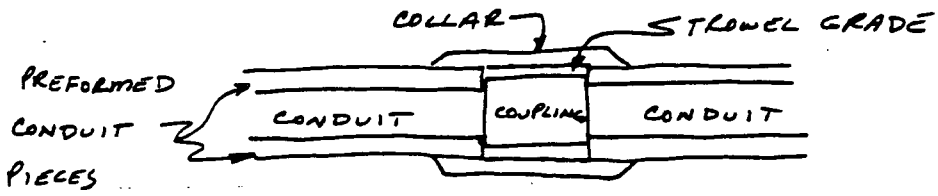
REMARKS: See Attached

SUBJECT WBN THERMO-LAG TESTING PROJECT

J. Pierce 2/10/93 C. Humphrey 2/10/93

COMPUTED BY DATE CHECKED BY DATE

The couplings on the 3-inch conduits (Deck 94943B) are a little larger (OD) than the conduits and the preformed TL sections will not fit around it. The preformed conduit sections are butted up against the coupling. A collar is made to fit over the coupling by cutting 3 pieces of the preformed sections and fitting them around the coupling. This collar overlaps the conduit sections by a couple of inches. The coupling area is filled in with trowel grade under the collar.



APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/9/93-01

LOT/CONTRACT NO. F93 0103 — Trowel 92-10014 EXPIRATION DATE May 93

CRAFTSMAN N/A DATE

COGNIZANT ENGINEER [signature] DATE 2/9/93

QC INSPECTOR C Humphrey DATE 2/9/93

MATERIAL CONDITION

CONDUIT Nom 3/8" Max = 1/2" Min = 1/4" PANELS Nom 3/8" Max = 1/2" Min = 1/4" TIE WIRE 16ga MESH N/A

PROCEDURE Installation Procedure DRAWING

HOLD POINTS

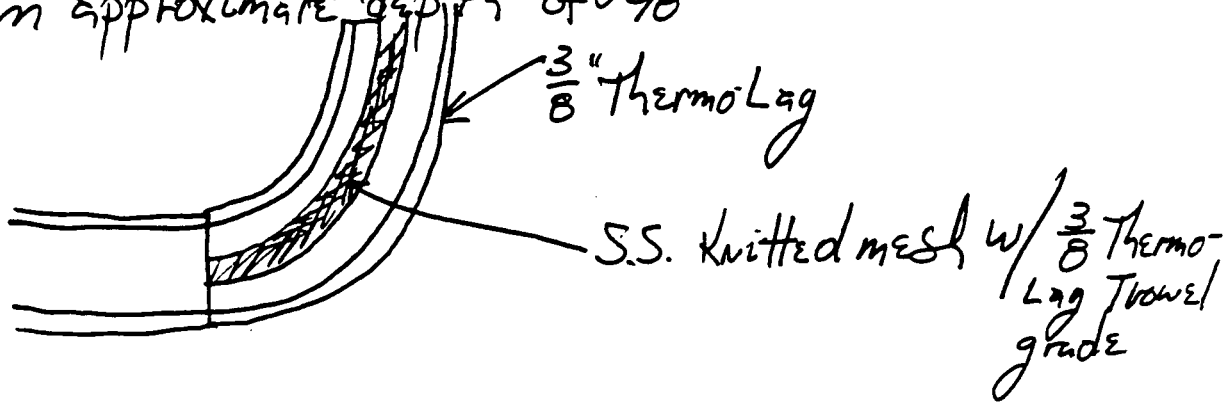
	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	YES
FASTENER SPACING	YES	temp.
18" RULE ON SUPPORTS	YES	YES
MESH OVERLAP	Not yet	→
TROWER GRADE THICKNESS	Not yet	→
SEAMS OFFSET	N/A	YES

REMARKS: Deck 94943 A - The second layer 3/8" material was applied to the 3" steel conduit. The spacer of 3/8" board material was 2" wide. It was installed as described in Inspection 2/9/93-01. The seams were offset. The filler strip was added to the top & inside of the assembly. (see attached)

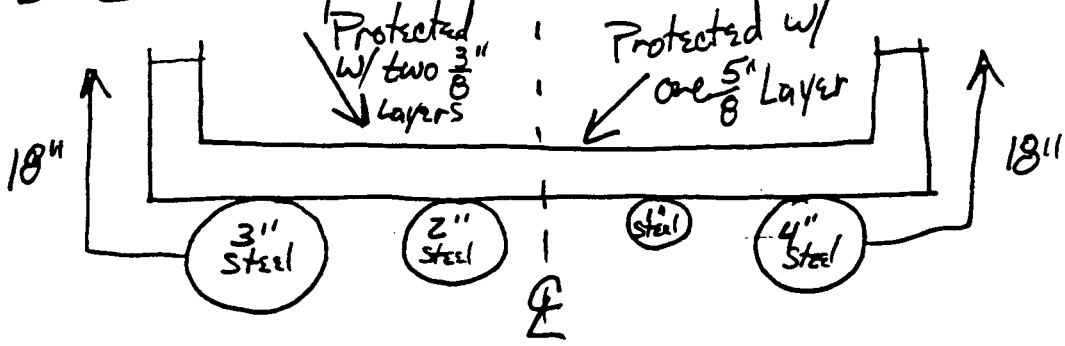
SUBJECT Thermo-Lag PROJECT WBN

COMPUTED BY [illegible] DATE 2/9/93 CHECKED BY C Humphrey DATE 2/9/93

The radius section was somewhat harder to complete. An approximate 4" wide section of Type 304 S.S. knitted mesh wire cloth, 60 density, 0.011" dia. wire was applied. The gap was then filled to an approximate depth of 3/8"



All Thermo-Lag sections were installed on Deck 94943 A. The support was completed. It is protected as follows:



DECK 94943B The 3" x 5/8" was not shipped from WBN. The shipment will arrive tomorrow. Light skim work was done on this deck.

APPENDIX A

Sheet 1 of 13

DATA SHEET

INSPECTION NO. 2/8/93-01

LOT/CONTRACT NO. F93-01013, F93-01004

Trowel 92-10014 EXPIRATION DATE May/93

CRAFTSMAN N/A DATE

COGNIZANT ENGINEER [signature] DATE 2/8/93

QC INSPECTOR [signature] DATE 2/8/93

NOM 3/8"
MAX = 1/2

MATERIAL CONDITION

CONDUIT MIN = 1/4" PANELS TIE WIRE 16ga MESH See attached

PROCEDURE Installation Procedure DRAWING

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	YES
FASTENER SPACING	OK	Not installed yet
18" RULE ON SUPPORTS	NO (94943B) YES (94943A) →	
MESH OVERLAP	See Attached →	
TROWER GRADE THICKNESS	See Attached →	
SEAMS OFFSET	N/A	YES

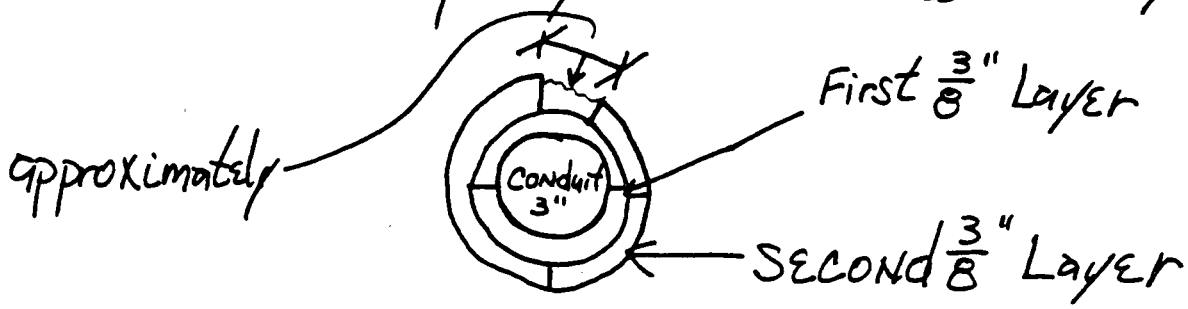
REMARKS: (See attached)

SUBJECT Thermo-Lag Testing PROJECT WBN 303

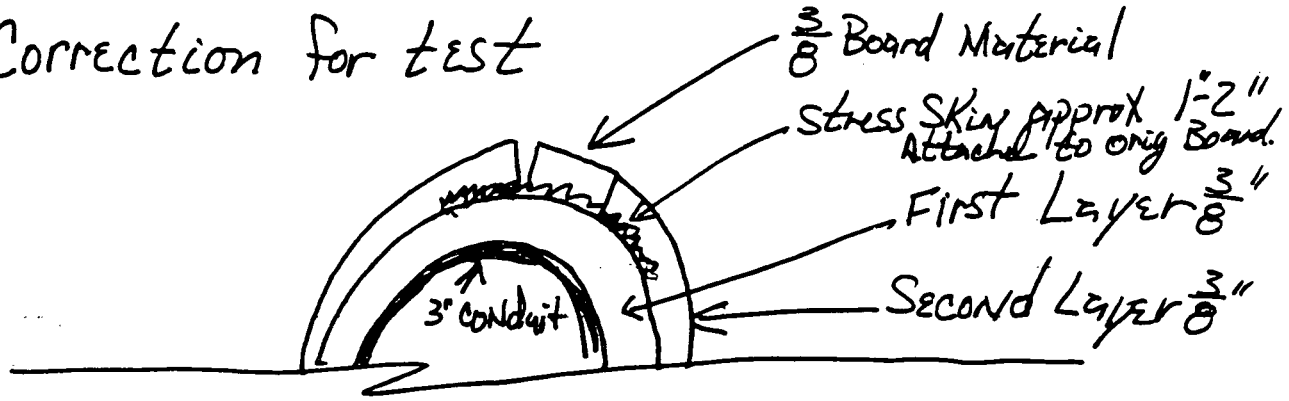
COMPUTED BY [illegible] DATE 2/8/93-01 CHECKED BY [illegible] DATE 2/8/93

DECK 94943A

Problem with the $\frac{3}{8}$"+$\frac{3}{8}$" overlay design on the 3" conduit.
First layer is installed with the $\frac{3}{8}$" overlay - Fit up is good. The SECOND layer of Thermo-Lag is too small to completely cover the first layer.



Correction for test



Applied mesh overlap to exterior of the radius 90° on 4" & 1" steel conduits - begin final skimcoats on both. (>$\frac{1}{16}$")

TVA 489H (EN DES-2-78) TENNESSEE VALLEY AUTHORITY SHEET ___ OF ___

304

SUBJECT Thermo-Lag Testing PROJECT

COMPUTED BY [signature] DATE 2/8/93-01 CHECKED BY [signature] DATE 2/8/93

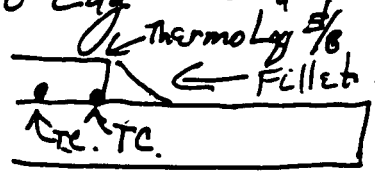
DECK 94943B

3" AL conduit for SQN. This assembly was protected with Thermo-Lag "as installed" at SQN. (The WBN procedures were not used) Major differences are LB box is from separate sections, Radius 90° is cut from separate pieces. The assembly was completed, temporary tie wires removed & assembly Rasped down

1½" steel conduit the second layer was installed. Tie wires were left on first layer max 6" space.

8 more semi circular sections are needed to finish the 3" Steel conduit. Called WBN, they will overnight from WBN warehouse.

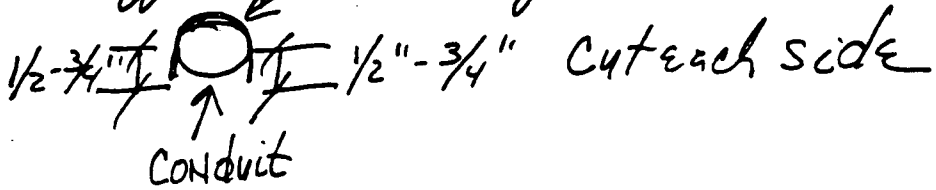
Work on skimming joints on supports. Note: The first thermo couple is right off the edge of the Thermo-Lag - Will probably lose this one during test.



SUBJECT Thermo-Lag Testing PROJECT WBN

COMPUTED BY [signature] DATE 2/7/93-01 CHECKED BY [signature] DATE 2/7/93

1) There is a problem with the $\frac{3}{8}'' + \frac{3}{8}''$ overlay design. The 3/8" that was to be used as the first layer on the $1\frac{1}{2}''$ conduit is too large. It fit well on the 2" conduit as the first layer was used. For the $1\frac{1}{2}''$ conduit, first layer of 3/8" in the 3/8+3/8 design, the sides had to be trimed approximately 1/2" to 3/4" of an inch. The pieces are "egg shaped" Thermolag 3/8



After cutting both sides of each piece the overlays fit up well. There is some minor cracking during the installation. The cracks are repaired w/ Trowel grade material

This approach is conservative but time consuming. If the design proves successful in the fire test, a more accurate semi circular piece will have to be ordered for WBN installation.

2) Question: In the Overlay design, do we leave the tie wires on the first layer? In the first testing - Herb Stansberry (OPL) checked & said we removed them. However it could only make the assembly stronger if the tie wires remain. The tie wires will be left on the first layer @ 6" maximum spacing.

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/7/93-01 Trowel 92-10014

LOT/CONTRACT NO. F93-01004, F92-09015, F93-01013, F99-07077 EXPIRATION DATE May 93

CRAFTSMAN N/A DATE N/A

COGNIZANT ENGINEER [signature] DATE 2/7/93

QC INSPECTOR [signature] DATE 2/7/93

MATERIAL CONDITION

Nom 3/8 Nom 5/8

MAX = 1/2 CONDUIT MAX = 3/4 PANELS Same TIE WIRE 16ga MESH N/A

MIN = 1/2

MIN = 1/4 PROCEDURE "Installation Procedure" DRAWING

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	YES
FASTENER SPACING	OK	OK
18" RULE ON SUPPORTS	YES	YES
MESH OVERLAP	Not yet	Not yet
TROWER GRADE THICKNESS	Not yet	Not yet
SEAMS OFFSET	N/A	YES

REMARKS: - See Attached -

Worked on decks - Install second 3/8 on 94943A

Install first layer on 94943B

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/6/93-02

LOT/CONTRACT NO. F93-01004, F93-01013, F93-01012, Travel 92-10014 EXPIRATION DATE May 93

CRAFTSMAN NA DATE N/A

COGNIZANT ENGINEER [signature] DATE 2/6/93

QC INSPECTOR Cleder S. Patton DATE 2/6/93

MATERIAL CONDITION

CONDUIT Nom 7/8 MAX 1/2 MIN 1/4 PANELS MAX 1/2 MIN 1/4 TIE WIRE 16 GA MESH N/A

PROCEDURE Installation Procedure DRAWING

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	YES
FASTENER SPACING	OK	OK
18" RULE ON SUPPORTS	YES	YES
MESH OVERLAP	Not yet	Not yet
TROWER GRADE THICKNESS	Not yet	Not yet
SEAMS OFFSET	N/A	YES

REMARKS: Deck 94943A - Install 5/8+3/8 on 1" conduit. Start 3/8"+3/8" on 2" conduit

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/6/93-01

LOT/CONTRACT NO. FB-01001, FB-01013 Thru 93-10014 EXPIRATION DATE May 93

CRAFTSMAN N/A DATE N/A

COGNIZANT ENGINEER [signature] DATE 2/6/93

QC INSPECTOR Clida S Patton DATE 2/6/93

MATERIAL CONDITION

CONDUIT MAX 3/4" Nom 5/8" MIN 1/2" PANELS MAX. 3/4" MIN. 1/2" TIE WIRE 16ga MESH N/A

PROCEDURE Installation Procedure* DRAWING

* Except 3" AL.

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	
FASTENER SPACING	OK	
18" RULE ON SUPPORTS	N/A	
MESH OVERLAP	Not yet	
TROWER GRADE THICKNESS	Not yet	
SEAMS OFFSET	N/A	

REMARKS: Deck 94943B - Install 3" AL conduit as done at SQN (LB cover from separate pieces, cut & miter 90°) Install thermo-Lag on supports (one 5/8" piece). LB box covers

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/5/93-01

LOT/CONTRACT NO. 93NWA 75792B

TROWEL 92-1004
EXPIRATION DATE MAY 93

CRAFTSMAN N/A DATE N/A

COGNIZANT ENGINEER J J Price DATE 2/5/93

QC INSPECTOR C Humphrey DATE 2/5/93

MATERIAL CONDITION

CONDUIT MAX 3" 1" / 1/2" 1/2" MIN 1/4" 1/4"

PANELS MAX 3/4" MIN 1/2"

TIE WIRE 16 GA.

MESH

PROCEDURE "INSTALLATION PROCEDURE

DRAWING DETAIL B

HOLD POINTS

	LAYER 1	LAYER 2 (1" Conduit)
JOINTS PRE-BUTTERED	YES	Yes
FASTENER SPACING	OK	ok
18" RULE ON SUPPORTS		Yes
MESH OVERLAP	YES	Yes
TROWER GRADE THICKNESS	N/A	SKIM
SEAMS OFFSET	N/A	YES

REMARKS:

APPENDIX A

Sheet 1 of 2

DATA SHEET

INSPECTION NO. 2/4/93-01

LOT/CONTRACT NO. TROWEL 92-10019 F9907047, F9907063 EXPIRATION DATE MAY 93

CRAFTSMAN N/A DATE N/A

COGNIZANT ENGINEER J. Pierce DATE 2/4/93

QC INSPECTOR C. Humphrey DATE 2/4/93

MATERIAL CONDITION

CONDUIT MAX 4" 3/4" 1" 3/4" MIN 1/2" 1/2"

PANELS MAX 3/4" MIN 1/2"

TIE WIRE 16 GA.

MESH N/A

PROCEDURE "INSTALLATION PROCEDURE"

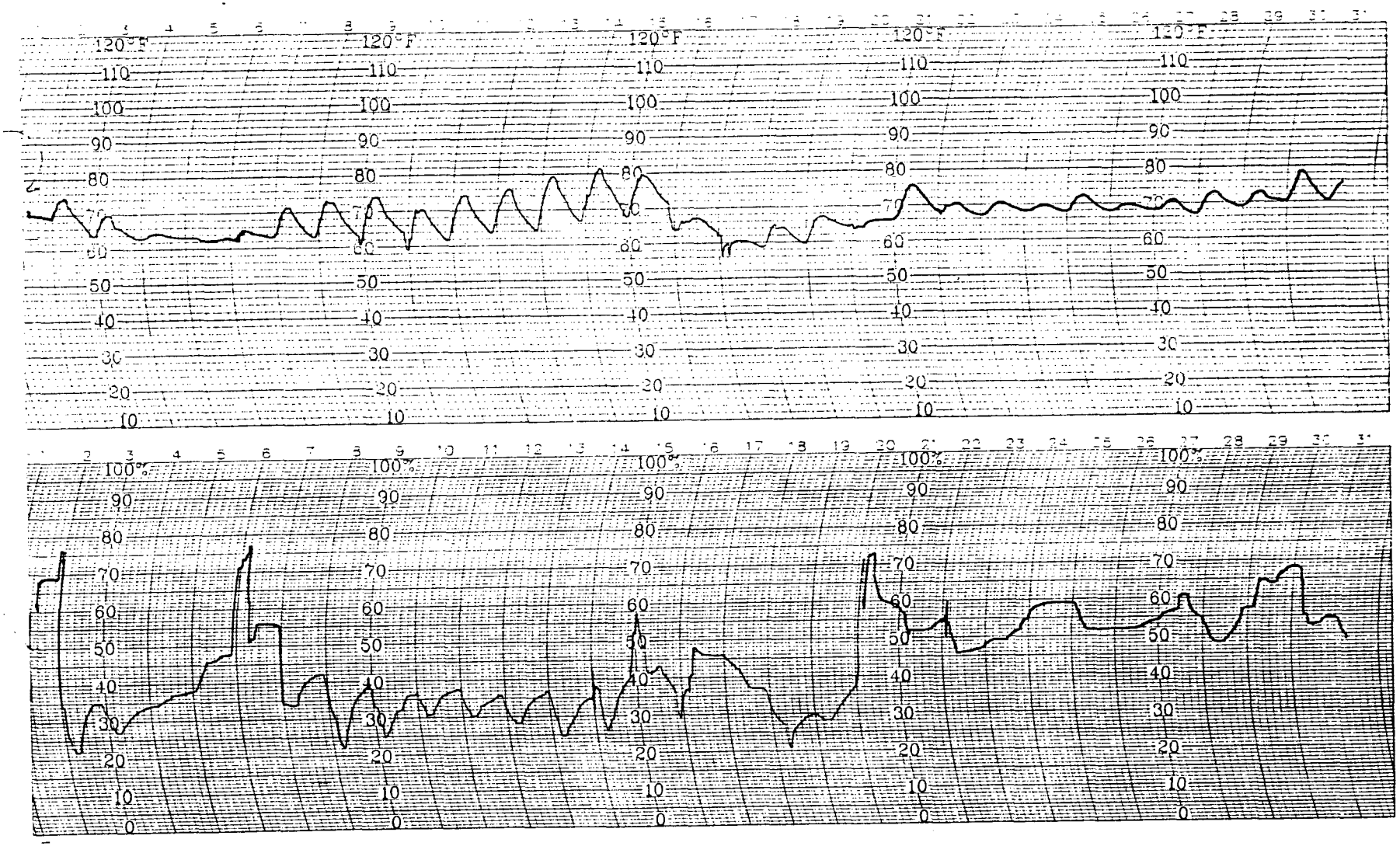
DRAWING DETAIL A & B

HOLD POINTS

	LAYER 1	LAYER 2
JOINTS PRE-BUTTERED	YES	
FASTENER SPACING	OK	
18" RULE ON SUPPORTS	Not Done	
MESH OVERLAP	YES	
TROWER GRADE THICKNESS	N/A	
SEAMS OFFSET	N/A	

REMARKS: Put LB box protection on 4" & 1" and conduit sections on 4" & 1". This is 1st layer on 1".
Contract #s 91NNB75871A, 93NNA75792B
All craftsman, OPL QC Manager, & NRR Section Chief were given an brief training session on the procedure.

311



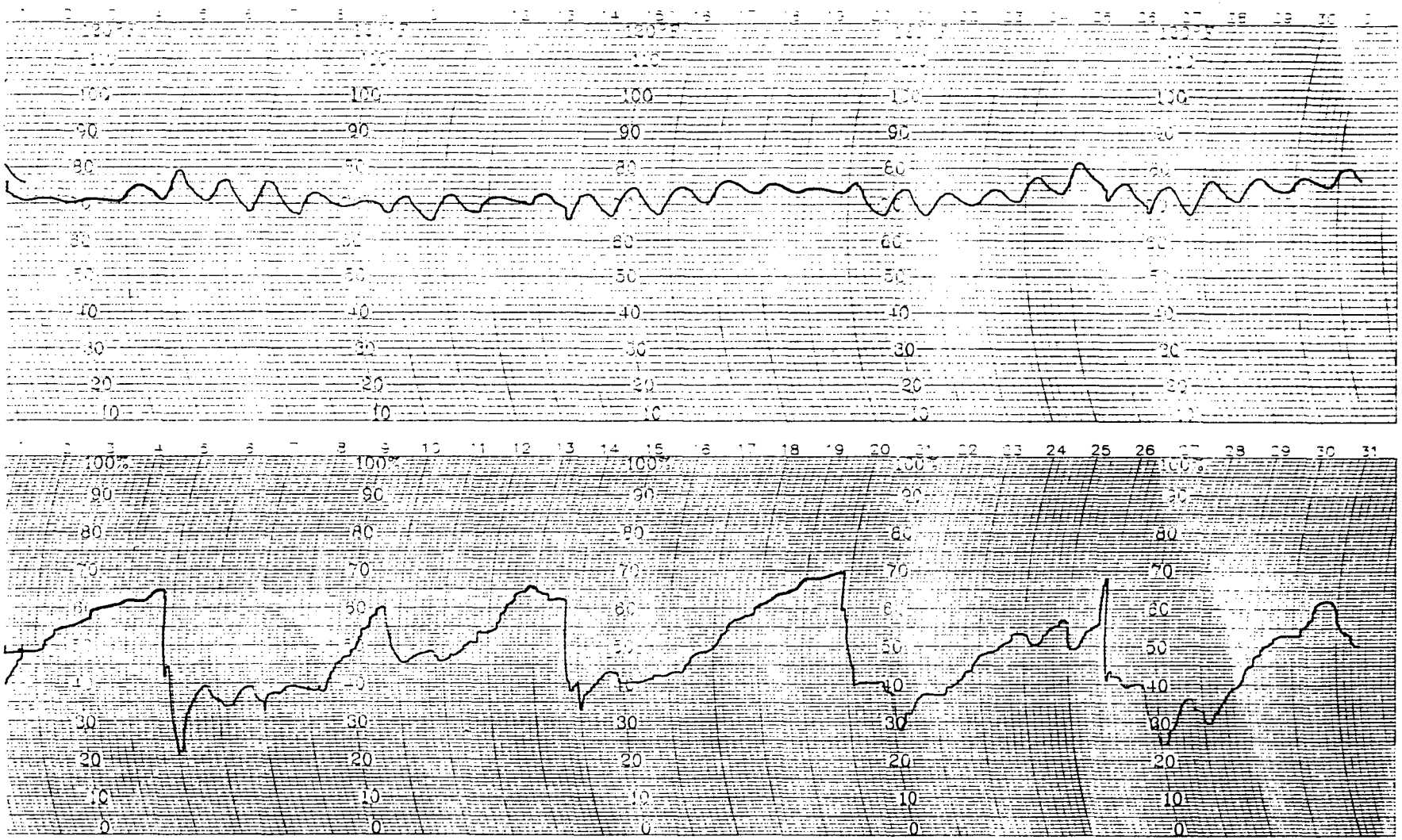
HYGROTHERMOGRAPH
31 DAY

CHART NO. 50208
ECH 271
3-15-88

P.O. BOX 410539
SACRAMENTO, CA. 95841
PHONE: (916) 923-0055

WeatherMeasure
WEATHERtronics
Division of QUALIMETRICS, Inc.

312


HYGROTHERMOGRAPH
31 DAY
CHART NO. 50208
ECN 2717
3 15 88
P.O. BOX 41039
SACRAMENTO, CA. 95841
PHONE: (916) 923-0055
Weather Measure
WEATHERtronics
Division of QUALIMETRICS, Inc.

Certifications of Calibration and Conformance

OMEGA POINT LABORATORIES

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME: TVA
CLIENT/PROJECT NUMBER: 11210-94943
RECEIVED FROM: PMC
PROJECT LOCATION: Omega Point Labs

REPORT NUMBER: 1251.11210
DATE RECEIVED: 2/3/93 and 2/4/93
DATE INSPECTED: 2/5/93
INSPECTED BY: C. Humphrey

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	QUANTITY Rec'd	QUANTITY ~~B.O.~~	I.D. NO.	CON'D MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	ACCEPTANCE Hold	ACCEPTANCE Reject	REMARKS
Teflon Coated Thermocouple Wire	1002Q	20K	22,120 Rec'd		KK-TA/TA-24	Y	Y	Good	None	X			Order received in two shipments: 11,120' rec'd 2/3/93; 11,000' rec'd 2/4/93 ~~OK~~ Lot numbers: 87520, 87531, 87532, 87552, 87553, 87554 + 87555

FORM
1/29/93

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

PURCHASE ORDER

Vendor:

Andy Garrish
PMC Corporation
57 Harvey Road

Londonderry NH 03053

PO Number: 1002-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Constance A. Humphrey
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
1/6/93	UPS Ground			

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Thermocouple Wire KK-TA/TA-24 Teflon Coated	20K	$350.00	$7,000.00
2.	Calibration Fee	1	$207.00	$207.00
	Tax & Shipping			
	"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval C Humphrey Date 1/6/93			

Special Instructions

Include Certificates of Conformance and Calibration Data

Ordered By: Constance A. Humphrey
Project #: OPL Equipment
TVA 11210-94943

Total	$7,207.00
Shipping	
Tax	
Invoice Total	$7,207.00

Rec'd 11,120' on 2/3/93 CH

Rec'd 11,000' on 2/4/93 CH

Total Rec'd 22,120'

PMC

CERTIFICATE OF CONFORMANCE

TO OMEGA POINT LABS
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO TX. 78238

DATE 1/29/93
CUSTOMER PO# 1002Q
JOB # 13932

PMC P/N	QUANTITY	CUSTOMER P/N	SPEC
KK-TA/TA-24	11,000'		

THE FOLLOWING SPOOL 87552 IS MADE UP FROM REEL # 15134 & 15135. THE REMAINING SPOOLS 87553, 87554 & 87555 ARE MADE UP FROM REEL'S 15128 & 15129.

ADDITIONAL INFORMATION (IF REQUIRED):

SPOOL #	IN ERROR 200°	IN ERROR 400°	IN ERROR 600°	IN ERROR 800°	IN ERROR 1000°
87552-INSIDE	+0.1	-0.1	-0.7	-2.1	-1.1
87552-OUTSIDE	0	-0.4	-1.7	-3.0	-1.1
87553-INSIDE	0	-0.5	-2.2	-2.8	-1.9
87554					
87555-OUTSIDE	-0.1	-0.2	-1.9	-2.1	-1.0

This is to certify the materials furnished on this shipment are in conformance with the requirements, specifications, and drawings of the above referenced customer purchase order. Inspection and test records are on file and available for customer review.

William P. Stockwell
Quality Assurance Inspector

Thomas M. Coffey
Quality Assurance Manager

57 HARVEY ROAD
LONDONDERRY, NH
03053
(603) 432-WIRE
FAX (603) 432-0435

PMC

CERTIFICATE OF CONFORMANCE

TO OMEGA POINT LABS
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX. 78238

DATE 1/28/93
CUSTOMER PO# 1002Q
JOB # 13932

PMC P/N	QUANTITY	CUSTOMER P/N	SPEC
KK-TA-TA-24	11,120'		

THE FOLLOWING SPOOLS 87530, 87531 and 87532 ARE MANUFACTURED FROM REEL# 15134 AND 15135

ADDITIONAL INFORMATION (IF REQUIRED):

SPOOL#	IN ERROR 200°	IN ERROR 400°	IN ERROR 600°	IN ERROR 800°	IN ERROR 1000°
87520	+0.4	-0.2	-1.3	-2.5	+1.5
87531					
87532	+0.7	0	-1.0	-2.2	-1.1

This is to certify the materials furnished on this shipment are in conformance with the requirements, specifications, and drawings of the above referenced customer purchase order. Inspection and test records are on file and available for customer review.

Quality Assurance Inspector

Quality Assurance Manager

57 HARVEY ROAD
LONDONDERRY, NH
03053
(603) 432-WIRE
FAX (603) 432-0435

These reels were used for spool # 87552

HAI-KP™
NON-MAGNETIC
THERMOCOUPLE GRADE

SIZE 0201 GROSS 26.84
B & S 24 TARE 1.65
HEAT# 4886 NET 25.19
COIL# 13
P.O.
RES. Ω/Ft.
SPEC.#
P/N KKP-24 15134
DATE 12/11/92

TEST TEMP	KP EMF vs. Pt-67 (MV)	Dev. from KP EMF (MV)
200°F	2.613	-.011
300°F	4.323	-.013
400°F	6.115	-.028
500°F	7.965	-.033
1000°F	17.504	-.065
1600°F	28.474	-.053
2000°F	35.334	

HARRISON ALLOYS INC.
HARRISON, N.J.
T-1

cal. KK
12/22/92

HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE

SIZE 0201 GROSS 26.92
B & S 24 TARE 1.65
HEAT# 5605 NET 25.27
COIL# 12
P.O.
RES. Ω/Ft.
SPEC.#
P/N KKN-24 15135
DATE 12/11/92

TEST TEMP.	KN EMF vs. Pt-67 (MV)	Dev. from KN EMF (MV)
200°F	-1.206	-.005
300°F	-1.770	-.019
400°F	-2.200	-.004
500°F	-2.595	+.007
1000°F	-4.747	+.016
1600°F	-7.692	+.001
2000°F	-9.521	

HARRISON ALLOYS INC.
HARRISON, N.J.
T-2

These Reels were used in the [illegible]

875555

HAI-KP™
NON-MAGNETIC
THERMOCOUPLE GRADE

SIZE 0201 GROSS 27.01
B & S 24 TARE 1.65
NET 25.36
HEAT# 4P86
COIL# 2
P.O.
RES. Ω/Ft.
SPEC.#
P/N KKP-24 15128
DATE 12/11/92

TEST TEMP.	KP EMF vs. Pt-67 (MV)	Dev. from KP EMF (MV)
200°F	2.613	-.005
300°F	4.323	-.009
400°F	6.115	-.016
500°F	7.965	-.019
1000°F	17.504	-.054
1600°F	28.474	-.024
2000°F	35.334	

HARRISON ALLOYS INC.
T-1
HARRISON, N.J.

cal. KK
12/22/92

HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE

SIZE 0201 GROSS 26.90
B & S 24 TARE 1.65
NET 25.25
HEAT# 5605
COIL# 7
P.O.
RES. Ω/Ft.
SPEC.#
P/N KKN-24 15129
DATE 12/11/92

TEST TEMP.	KN EMF vs. Pt-67 (MV)	Dev. from KN EMF (MV)
200°F	-1.206	-.004
300°F	-1.770	-.018
400°F	-2.200	-.023
500°F	-2.595	+.006
1000°F	-4.747	+.015
1600°F	-7.692	-.002
2000°F	-9.521	

HARRISON ALLOYS INC.
T-2
HARRISON, N.J.

PMC CORPORATION
57 HARVEY ROAD, LONDONDERRY, N.H. 03053 • (603) 432-WIRE
SPECIALIZING IN WIRE, CABLES & TEMPERATURE

SOLD TO

OMEGA POINT LABS
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

78238

SHIP TO

OMEGA POINT LABS
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

DATE RECEIVED	CUSTOMER NO.	E	O	T	PMC JOB NO.
1/06/93	OMEG001	60	60	60	13932

CUSTOMER P.O. NUMBER	REQUESTED SHIP	SCHEDULED SHIP	CODE
10020	1/29/93	1/29/93	1. MFT 5. METERS 2. CFT 6. FEET 3. POUNDS 7. LOT 4. EACH NET 8. OTHER

SHIP VIA	F.O.B.	TERMS
UPS	LONDONDERRY, NH	NET 15

ITEM	QUANTITY ORDERED	PART NUMBER / DESCRIPTION	QUANTITY SHIPPED
	8880.00	KK-TA/TA-24	11,000
	1.00	CALIBRATION AT 200, 400, 600, 800, 1000°F I/O W/LOT TAGS	

Thank You!

UNIT PRICES ARE BASED ON COPPER AT $ /lb., SILVER AT $ /TROY OZ. HOWEVER UNIT PRICES INVOICED WILL BE BASED ON MATERIAL COST ON DATE OF SHIPMENT.

SPECIAL INSTRUCTIONS:

DATE SHIPPED	BILL OF LADING NO.	NO. OF PACKAGES	WEIGHT	PPD.	COL.	PARTIAL	COMPLETE	PACKED BY
1/29/93		2	76#	✓		✓		JR

PACKING SLIP

PMC CORPORATION
57 HARVEY ROAD, LONDONDERRY, N.H. 03053 • (603) 432-WIRE

SPECIALIZING IN WIRE, CABLES & TEMPERATURE

SOLD TO

OMEGA POINT LABS
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

78238

SHIP TO

OMEGA POINT LABS
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

DATE RECEIVED	CUSTOMER NO.	E	O	T	PMC JOB NO.
1/06/93	OMEG001	60	60	60	13932

CUSTOMER P.O. NUMBER	REQUESTED SHIP	SCHEDULED SHIP	CODE
10020	1/29/93	1/29/93	1. MFT 5. METERS 2. CFT 6. FEET 3. POUNDS 7. LOT 4. EACH NET 8. OTHER

SHIP VIA	F.O.B.	TERMS
UPS	LONDONDERRY, NH	NET 15

ITEM	QUANTITY ORDERED	PART NUMBER / DESCRIPTION	QUANTITY SHIPPED
	20000.00	KK-TA/TA-24 ~~[illegible]~~	11,120
2	1,00	CALIBRATION AT 200,400,600,800,1000°F I/O W/LOT TABS	1/27/93
		11,120 Thank you!	

UNIT PRICES ARE BASED ON COPPER AT $ /lb., SILVER AT $ /TROY OZ. HOWEVER UNIT PRICES INVOICED WILL BE BASED ON MATERIAL COST ON DATE OF SHIPMENT.

SPECIAL INSTRUCTIONS:

DATE SHIPPED	BILL OF LADING NO.	NO. OF PACKAGES	WEIGHT	PPD	COL.	PARTIAL	COMPLETE	PACKED BY
1/28/93		2	91#	✓		✓		JR

PACKING SLIP

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

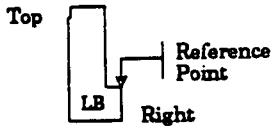
Project No: 11210–94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #2 (2"Ø) BARE #8 COPPER**

TC NO.	LOCATION
✓ 107	2" to the left of the reference point.
✓ 108	8" to the left of the reference point.
✓ 109	14" to the left of the reference point.
✓ 110	20" to the left of the reference point.
✓ 111	26" to the left of the reference point.
✓ 112	32" to the left of the reference point.
✓ 113	38" to the left of the reference point.
✓ 114	44" to the left of the reference point.
✓ 115	50" to the left of the reference point.
✓ 116	56" to the left of the reference point.
✓ 117	62" to the left of the reference point.
✓ 118	68" to the left of the reference point.
✓ 119	74" to the left of the reference point.
✓ 120	80" to the left of the reference point.
✓ 121	86" to the left of the reference point.
✓ 122	92" to the left of the reference point.
✓ 123	98" to the left of the reference point.
✓ 124	104" to the left of the reference point.
✓ 125	110" to the left of the reference point.
✓ 126	116" to the left of the reference point.
✓ 127	122" to the left of the reference point.
✓ 128	128" to the left of the reference point.
✓ 129	134" to the left of the reference point.
✓ 130	4" to the right (above) the reference point.
✓ 131	10" to the right (above) the reference point.
✓ 132	16" to the right (above) the reference point.
✓ 133	22" to the right (above) the reference point.
✓ 134	28" to the right (above) the reference point.
✓ 135	34" to the right (above) the reference point.



QUALITY VERIFIED

C Humphrey 2/1/93

Signed Date

With Exceptions as Noted.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #3 (1"Ø) CONDUIT STEEL**

TC NO.	LOCATION
136	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
137	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
138	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
139	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
140	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
141	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
142	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, on the elbow side of the system.
143	On the "inside" surface of the conduit system, 18" below the surface of the insulated deck, on the elbow side of the system.
144	On the "outside" surface of the conduit system, 24" below the surface of the insulated deck, on the elbow side of the system.
145	On the "inside" surface of the conduit system, 24" below the surface of the insulated deck, on the elbow side of the system.
146	~~On the "inside" surface of the c~~onduit system, 30" below the surface of the insulated deck, near top of the conduit elbow.
147	On the "outside" surface of the conduit system, 6" ~~right of the previous~~ thermocouple, on the conduit elbow. Below #144
148	On the "bottom" surface of the conduit system, 42" left of the support member.
149	On the "bottom" surface of the conduit system, 36" left of the support member.
150	On the "bottom" surface of the conduit system, 30" left of the support member.

QUALITY VERIFIED

C Humphrey 2/2/93

Signed Date

With Exceptions as Noted.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #2 (2"Ø) CONDUIT STEEL**

TC NO.	LOCATION (CONT.)
✓ 151	On the "bottom" surface of the conduit system, 24" left of the support member.
✓ 152	On the "bottom" surface of the conduit system, 18" left of the support member.
✓ 153	On the "bottom" surface of the conduit system, 12" left of the support member.
✓ 154	On the "bottom" surface of the conduit system, 6" left of the support member.
✓ 155	On the side of the conduit system, between the support strap and the conduit.
✓ 156	On the "bottom" surface of the conduit system, 6" right of the support member.
✓ 157	On the "bottom" surface of the conduit system, 12" right of the support member.
✓ 158	On the "bottom" surface of the conduit system, 18" right of the support member.
✓ 159	On the "bottom" surface of the conduit system, 24" right of the support member.
✓ 160	On the "bottom" surface of the conduit system, 30" right of the support member.
✓ 161	On the "bottom" surface of the conduit system, 36" right of the support member.
✓ 162	On the "bottom" surface of the conduit system, 42" right of the support member.
✓ 163	On the "bottom" surface of the conduit system, 48" right of the support member.
✓ 164	On the center of the condulet cover.
✓ 165	On the "outside" surface of the conduit system, 24" below the surface of the insulated deck, on the LB side of the system.
✓ 166	On the "inside" surface of the conduit system, 24" below the surface of the insulated deck, on the LB side of the system.

QUALITY VERIFIED

C Humphrey 2/2/93

Signed Date

With Exceptions as Noted

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: CONDUIT #2 (2"Ø) CONDUIT STEEL

TC NO.	LOCATION (CONT.)
167	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
168	On the "inside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
169	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
170	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
171	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
172	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
173	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.
174	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.

QUALITY VERIFIED

C Humphrey 2/2/93

Signed Date

With Exceptions as Noted.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

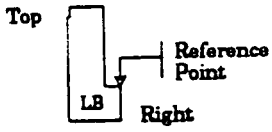
Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: CONDUIT #3 (1"Ø) BARE #8 COPPER

TC NO.	LOCATION
✓ 175	2" to the left of the reference point.
✓ 176	8" to the left of the reference point.
✓ 177	14" to the left of the reference point.
✓ 178	20" to the left of the reference point.
✓ 179	26" to the left of the reference point.
✓ 180	32" to the left of the reference point.
✓ 181	38" to the left of the reference point.
✓ 182	44" to the left of the reference point.
✓ 183	50" to the left of the reference point.
✓ 184	56" to the left of the reference point.
✓ 185	62" to the left of the reference point.
✓ 186	68" to the left of the reference point.
✓ 187	74" to the left of the reference point.
✓ 188	80" to the left of the reference point.
✓ 189	86" to the left of the reference point.
✓ 190	92" to the left of the reference point.
✓ 191	98" to the left of the reference point.
✓ 192	104" to the left of the reference point.
✓ 193	110" to the left of the reference point.
✓ 194	116" to the left of the reference point.
✓ 195	122" to the left of the reference point.
✓ 196	128" to the left of the reference point.
✓ 197	134" to the left of the reference point.
✓ 198	4" to the right (above) the reference point.
✓ 199	10" to the right (above) the reference point.
✓ 200	16" to the right (above) the reference point.
✓ 201	22" to the right (above) the reference point.
✓ 202	28" to the right (above) the reference point.
✓ 203	34" to the right (above) the reference point.



QUALITY VERIFIED

C Humphrey 2/1/93

Signed Date

With Exceptions as Noted

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210–94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #4 (4"Ø) CONDUIT STEEL**

TC NO.	LOCATION
✓ 204	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
205	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the elbow side of the system.
✓ 206	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
✓ 207	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the elbow side of the system.
✓ 208	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
✓ 209	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the elbow side of the system.
✓ 210	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, near the top of the conduit elbow.
✓ 211	On the "outside" surface of the conduit system, 24" below the surface of the insulated deck, on the conduit elbow.
✓ 212	On the "outside" surface of the conduit system, 6" below the previous thermocouple, on the conduit elbow.
✓ 213	On the "outside" surface of the conduit system, 6" right of the previous thermocouple, on the conduit elbow.
✓ 214	On the "outside" surface of the conduit system, 6" right of the previous thermocouple, on the conduit elbow.
✓ 215	On the "outside" surface of the conduit system, 6" right of the previous thermocouple, on the conduit elbow.
✓ 216	On the "bottom" surface of the conduit system, 24" left of the support member.
✓ 217	On the "bottom" surface of the conduit system, 18" left of the support member.
✓ 218	On the "bottom" surface of the conduit system, 12" left of the support member.
✓ 219	On the "bottom" surface of the conduit system, 6" left of the support member.

QUALITY VERIFIED

C Humphrey 2/2/93

Signed Date

With Exceptions as Noted

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #1 (3"Ø) CONDUIT STEEL**

TC NO.	LOCATION (CONT.)
✓ 220	On the side of the conduit system, between the support strap and the conduit.
✓ 221	On the "bottom" surface of the conduit system, 6" right of the support member.
✓ 222	On the "bottom" surface of the conduit system, 12" right of the support member.
✓ 223	On the "bottom" surface of the conduit system, 18" right of the support member.
✓ 224	On the "bottom" surface of the conduit system, 24" right of the support member.
✓ 225	On the "bottom" surface of the conduit system, 30" right of the support member.
✓ 226	On the "bottom" surface of the conduit system, 36" right of the support member.
✓ 227	On the "bottom" surface of the conduit system, 42" right of the support member.
✓ 228	On the "bottom" surface of the conduit system, 48" right of the support member. Edge of condulet cover
✓ 229	On the center of the condulet cover.
✓ 230	On the vertical section of the top of the LB. located on the "outside."
✓ 231	On the "outside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
✓ 232	On the "inside" surface of the conduit system, 18" below the surface of the insulated deck, on the LB side of the system.
✓ 233	On the "outside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
✓ 234	On the "inside" surface of the conduit system, 12" below the surface of the insulated deck, on the LB side of the system.
✓ 235	On the "outside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.

QUALITY VERIFIED

C Humphrey 3/2/93

Signed Date

With Exceptions as Noted.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: CONDUIT #1 (3"Ø) CONDUIT STEEL

TC NO.	LOCATION (CONT.)
✓ 236	On the "inside" surface of the conduit system, 6" below the surface of the insulated deck, on the LB side of the system.
✓ 237	On the "outside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.
✓ 238	On the "inside" surface of the conduit system, 1" below the surface of the insulated deck, on the LB side of the system.

QUALITY VERIFIED

C Humphrey 2/2/93

Signed Date

With Exceptions as Noted.

THERMOCOUPLE PLACEMENT

Client: Tennessee Valley Authority

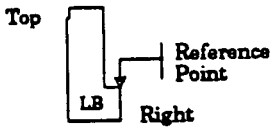
Project No: 11210-94943 Test A

Identification: One 3"ø conduit, one 2"ø conduit, one 1" ø conduit and one 4" ø conduit.

Thermocouple Lot Numbers Used: _____

ITEM INSTRUMENTED: **CONDUIT #4 (4"Ø) BARE #8 COPPER**

TC NO.	LOCATION
239	2" to the left of the reference point.
240	8" to the left of the reference point.
241	14" to the left of the reference point.
242	20" to the left of the reference point.
243	26" to the left of the reference point.
244	32" to the left of the reference point.
245	38" to the left of the reference point.
246	44" to the left of the reference point.
247	50" to the left of the reference point.
248	56" to the left of the reference point.
249	62" to the left of the reference point.
250	68" to the left of the reference point.
251	74" to the left of the reference point.
252	80" to the left of the reference point.
253	86" to the left of the reference point.
254	92" to the left of the reference point.
255	98" to the left of the reference point.
256	104" to the left of the reference point.
257	110" to the left of the reference point.
258	116" to the left of the reference point.
259	122" to the left of the reference point.
260	128" to the left of the reference point.
261	4" to the right (above) the reference point.
262	10" to the right (above) the reference point.
263	16" to the right (above) the reference point.
264	22" to the right (above) the reference point.
265	28" to the right (above) the reference point.
266	34" to the right (above) the reference point.



QUALITY VERIFIED

C Humphrey 8/2/93

Signed Date

With Exceptions as Noted.

Omega Point Laboratories, Inc.
6868 Alamo Downs Pkwy.
San Antonio, Texas 78238
800-966-5253 FAX 512-647-0615

Certificate of Calibration

Certification No.:	920012
Calibration Date:	11-18-92
Recalibration Date:	5-18-93
Manufacturer:	Omega Point Laboratories, Inc.
Model No.:	200 Channel DAU
Serial No.:	1042
Equipment Description:	200 Channel Data Acquisition System with Fluke Computer Front End and Extender Chassis
Calibration Sources:	Digicator Digital Calibrator, Model #CL-466, Serial #703297

PERFORMANCE:

Better than -0.06/+2.33 on all 200 channels

Cailibration Performed/Approved by:

Herbert W. Stansberry II
Senior Laboratory Technician

OMEGA POINT LABORATORIES

Omega Point Laboratories, Inc.

6868 Alamo Downs Pkwy.
San Antonio, Texas 78238
800-966-5253 FAX 512-647-0615

Certificate of Calibration

Certification No.:	920014
Calibration Date:	1-6-93
Recalibration Date:	7-6-93
Manufacturer:	Omega Point Laboratories, Inc.
Model No.:	100 Channel DAU
Serial No.:	1041
Equipment Description:	100 Channel Data Acquisition Unit with Fluke Computer Front End
Calibration Sources:	Digicator Digital Calibrator, Model #CL-466, Serial #703297

PERFORMANCE:

Better than +0.23/+1.24 on all 100 channels

Cailibration Performed/Approved by:

Herbert W. Stansberry II
Senior Laboratory Technician

OMEGA POINT LABORATORIES

© OOES 748

OMEGA POINT LABORATORIES
CALIBRATION DATA SHEET

DIGITAL CALIBRATOR
OMEGA ENGINEERING MODEL CL 466-L
SN# 703297

Calibration Date 4/15/93 Next Cal. Due on or before: 10/15/93

Calibration Frequency: Every six months.

Equipment to be returned to qualified facility for recalibration against suitable NBS / Mil. Std.45662 / 10 CFR 50 standards.

Sent to (for Calibration): Rothe Development
4614 Sinclair Rd.
San Antonio, TX
78222

Ship Date: 3/23/93

Return Date: 4/19/93

P.O. #: 1025Q

Attach calibration label to the Digital Calibrator and any supporting documentation ("As Returned" specifications) to this form.

LETTER TO FILE

DATE: April 22, 1993

SUBJECT: Calibration of Digital Temperature Calibrator, CL-466
Omega Point Laboratories Equipment No. 703297

The Certificate of Calibration from Rothe Development, Inc., dated April 15, 1993, noted that the Omega Point Labs Digital Calibrator (#703297) was received "OUT OF SPECS".

The attached data sheet specified that the "OUT-OF-SPECS" condition involved only the Type T readings (out of specs by two points).

Omega Point Laboratories uses ONLY the Type K thermocouples and therefore, this "OUT-OF-SPECS" condition involving the Type T thermocouple reading does not apply to any testing performed at Omega Point Laboratories.

Signed,

Constance A. Humphrey

Constance A. Humphrey
Quality Assurance Manager
Omega Point Laboratories, Inc.

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME: OPL
CLIENT/PROJECT NUMBER: OPL Equips.
RECEIVED FROM: Re The Development
PROJECT LOCATION: Omega Point Labs

REPORT NUMBER: 1276-OPL
DATE RECEIVED: 4/19/93
DATE INSPECTED: 4/22/93
INSPECTED BY: C Humphrey

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	QUANTITY Rec'd	QUANTITY B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	ACCEPTANCE Hold	ACCEPTANCE Reject	REMARKS
Digital Temp. Calibrator	1025Q	1	1	—	Model CL466 Ser. # 703297	Y	Y	Good	None	X			Calibration service of OPL Equipment

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:

Peter Stemmerman
Rothe Development
4614 Sinclair Road

San Antonio TX 78222

PO Number: 1025-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Constance A. Humphrey
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
3/23/93	Rothe Truck		4-12-93	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Calibration Services for: Digital Temperature Calibrator Model CL-466 Serial # 703297 "See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval C Humphrey Date 3/23/93	1	$152.00	$152.00
	Tax	1	$12.54	$12.54
	Rec'd 4/19/93 CH			

Special Instructions

Please include Certificate of Conformance and Calibration Data Sheets.

Ordered By: Constance A. Humphrey
Project #: OPL Equipment

Total	$164.54
Shipping	
Tax	
Invoice Total	$164.54

VENDOR PURCHASING SPECIFICATION AND

QUALITY ASSURANCE REQUIREMENTS

Vendor Rothe Development

Purchase Order No. 1025 Q

Any or all of the following Quality Assurance requirements shall be incorporated as conditions to this procurement when corresponding box is marked. Failure to comply with any requirement specified herein may result in rejection and/or return of shipment at seller's expense.

1.0 QUALITY PROGRAM

☒ Seller shall furnish all items on this Purchase Order in accordance with Quality Program approved by Buyer.

2.0 QUALITY VERIFICATION

When additional quality verification activities are required as a conditior to this procurement, invoices will not be paid until satisfactory completion of such activities. Excessive rejection rates may result in removal from buyer's Approved Vendors List.

☒ Receiving Inspection - Buyer shall inspect items upon receipt to verify compliance with purchase order requirements. Rejected items shall be returned at seller's expense.

☐ Independent Laboratory Tests - Samples of materials furnished shall be tested independently for conformance to specification requirements proir to final acceptance. Rejected materials shall be returned at seller's expense.

☒ Document Review - Final acceptance shall be based on satisfactory review of required certifications and other supporting documents.

3.0 CERTIFICATIONS

When certifications are required as a condition to this procurement, the seller shall furnish one reproducible copy either with or prior to each shipment. Shipments will not be accepted and invoices will not be paid until certifications are in buyer's possession.

VENDOR Rothe Development
PURCHASE ORDER NO. 1025 Q

☒ Certificate of Compliance/Conformance Required - Certification that materials and/or services comply with purchase order requirements. Certification shall reference purchase order number and traceability numbers (when applicable).

☐ Certified Test Report Required - Certification that material complies with applicable material specification(s) and the purchase order. Include actual results of required tests.

☒ Certificate of Calibration Required - Certification shall be traceable to National Bureau of Standards. (Renamed NIST, Nat. Institute of Science & Technology)

4.0 AUDITS/RIGHT OF ACCESS

☒ The buyer reserves the right to audit your facility to verify compliance with purchase order, code and specification requirements with minimum of ten (10) days notice.

☐ Shipments shall only originate from facilities approved by the buyer.

☒ Buyer reserves the right to inspect any or all work included in this order at seller's facility with as early notice as practicable.

5.0 IDENTIFICATION

☒ Seller shall identify each item with a unique traceability number by physical marking or tagging. Traceability numbers shall be traceable to certifications and packing lists.

☐ Seller shall identify each container with a unique identification number. The identification number shall be traceable to certifications and packing lists.

6.0 10 CFR, PART 21

☐ The material, equipment and/or services to be furnished under the provisions of this purchase order are involved in the testing of basic components of a Nuclear Regulatory Commission (NCR) licensed facility. Accordingly, the seller is subject to the provisions of 10 CFR, Part 21 (Reporting of Defects and Non-compliance)

PURCHASING SPECIFICATIONS
PAGE 3 OF 3

VENDOR Rothe Development
PURCHASE ORDER NO. 1025 Q

7.0 PACKING/SHIPPING

☐ All materials shall be packaged in air tight, moisture free containers and shall be free from all foreign substances such as dirt, oil, grease or other deleterious material.

☒ All materials and equipment shall be suitably crated, boxed or otherwise prepared for shipment to prevent damage during handling and shipping. Wherever practical, equipment shall be palletized for ease of unloading and storage at destination. each container shall be clearly marked with buyer's purchase order number.

QUALITY ASSURANCE APPROVAL C Humphrey DATE 3/23/93

FORM
3/93

EQUIPMENT DELIVERY RECEIPT

340

Rothe Development, Inc.
Metrology Services Division
[illegible] Sinclair Rd.
[illegible] Antonio, TX 78222-2099
(512)648-3131

Date: 04/16/93
Control: 556

Company: Omega Point Laboratories
Contact: Ms. Connie Humphrey
Address: 6868 Alamo Downs Parkway
City: San Antonio, TX 78238
Phone: 647-5253

Item	W.O. #	Customer P.O.	Mfgr.	Model	Serial No.	Description
1	37147	1025-Q	Omega	CL-466-L-1	703297	Digital Temp Calibrator

[illegible]ived by:

Date:

RDI 3003

Rothe Development, Inc.

4614 SINCLAIR RD. SAN ANTONIO, TEXAS 78222-2099
512-648-3131 FAX: 512-648-4091

METROLOGY SERVICES DIVISION
PRECISION MEASUREMENT EQUIPMENT LABORATORY
TRACEABLE TO NIST

341

CHARGE # 107 CONTROL # 556 - 2477

WORK ORDER # 37147

CUSTOMER

RECEIVED FROM Omega Point Laboratories
DATE 03/25/93
ADDRESS 6868 Alamo Downs Parkway
San Antonio, TX 78238
PHONE# 647-5253
CONTACT (NAME) Ms. Connie Humphrey
FAX# 647-0615
PURCHASE ORDER # 1025-Q
CUSTOMER COMMENTS TAXABLE 8.25%

ITEM

MFG Omega
MODEL CL-466-L-1
SERIAL # 703297
TYPE Digital Temp Calibrator
ACCES. RCVD. Probe, Power Cord

- [ ] REPAIR
- [ ] OPERATIONAL CHECK
- [x] CALIBRATION

CALIBRATION DATE 15Apr93
DATE DUE 15Oct93

CALIBRATION INTERVAL 6 MO.

- [ ] RECEIVED IN SPECS.
- [ ] RECEIVED INOPERATIVE
- [x] RECEIVED OUT OF SPECS.

CKT REF #	QTY.	MFG PART #	DESCRIPTION	COST

ROTHE TECH.	OUR P.O. #
WW	
REPAIR LABOR HRS.	SERVICE CODE
	K

PARTS TOTAL	
REPAIR LABOR	
SHIPPING	
TEAR DOWN CHARGE	
CALIBRATION	150.[illegible]
TAX	12.[illegible]
TOTAL	161.[illegible]

TR #'s 20, 30, 150

COMMENTS CAL DATA PROVIDED

WORK PERFORMED: Only type T thermal couple @ two points was out of specs. 100°F read 99.2, + 300°F read 299.3°F only allowed ± .6°F. Adjusted & Cal'd

TE. 24 °F

R.H. 30 %

RDI 2002

SHIP VIA: _____ DATE: _____ RECEIVED BY: _____

Rothe Development Inc.

Metrology Services Division

4614 SINCLAIR RD., SAN ANTONIO, TEXAS 78222 210-648-3131 FAX 210-648-4091

Certificate of Calibration

29755

CAL DATE: 04/15/93

DUE DATE: 10/15/93

ISSUED TO: Omega Point Laboratories
6868 Alamo Downs Parkway
San Antonio, TX 78238
647-5253

CONTROL: 556 - 8477

PROCEDURE/TOL: MFG SPECS
WORK ORDER #: 37147
CUSTOMER PO #: 1025-Q

MFG: Omega

MODEL: CL-466-L-1

SERIAL #: 703297

TYPE: Digital Temp Calibrator

RECEIVED IN-SPECS ☐
OUT-OF-SPECS ☒

All Calibration measurements performed at ROTHE DEVELOPMENT INC. METROLOGY SERVICES meet the requirements of MIL-STD-45662A, and are traceable to the National Institute of Standards and Technology through Primary NIST Calibration or Secondary Calibration performed by other Metrological facilities. Ambient conditions: Temperature 74oF, Relative Humidity 30%

Test Report Number and Calibration Standards Used

Ref #	Model #	Mfgr	Serial #	Description	Cal Date	Int	Cal Due
TR 20	5700A	FLUKE	4605002	CALIBRATOR	02/11/93	3	05/11/93
TR 30	3458A	HP	2823A01926	DMM	03/10/93	3	06/10/93
TR 150	TRC-III	OMEGA	41007	ICE POINT REFERENCE	11/02/92	12	11/02/93

Test Report Numbers

DCV FLUKE CERT# DH70
ACV FLUKE CERT# DP30
NIST TEST# 250839
NIST TEST# 248798
Hz HMVB Transmission

INSPECTED BY Peter J Klemmer

COMMENTS:

CAL DATA PROVIDED

RDI 1001

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA : OMEGA CL-466

WORK ORDER # 37147

CUSTOMER Omega Point Labs.

SERIAL 703297

DATE 15April93

TECH # 11

RECEIVED IN SPECS _____ RECEIVED OUT OF SPECS ✓

RECEIVED INOPERATIVE _____

TYPE J	DEG F	INCOMING	OUTGOING	TOL
-5.760	-200	-200.3	-199.8	+/- .6
-3.492	-100	-100.2	-100.0	+/- .6
0.000	32	31.8	32.0	+/- .6
1.942	100	99.7	100.0	+/- .6
7.947	300	299.6	299.9	+/- .6
14.108	500	499.6	499.9	+/- .6
21.785	750	749.7	749.9	+/- .6
29.515	1000	999.6	999.9	+/- .6
37.688	1250	1249.8	1249.9	+/- .6
46.503	1500	1500.0	1500.1	+/- .6
53.525	1700	1700.0	1700.1	+/- .6

	DEG C	INCOMING	OUTGOING	TOL
-4.632	-100	-99.9	-99.8	+/- .5
0.000	0	-.1	.0	+/- .5
5.268	100	99.9	100.0	+/- .5
16.325	300	299.8	299.9	+/- .5
33.096	600	599.8	599.9	+/- .5
51.875	900	899.9	900.0	+/- .5

TYPE K	DEG F	INCOMING	OUTGOING	TOL
-2.699	-100	-100.6	-99.9	+/- 1.2
0.000	32	31.6	32.0	+/- .8
1.520	100	99.4	100.0	+/- .8
6.092	300	299.4	299.9	+/- .8
10.560	500	499.3	499.8	+/- .8
16.349	750	749.3	749.8	+/- .8
22.251	1000	999.2	999.7	+/- .8
28.148	1250	1249.3	1249.7	+/- .8
33.913	1500	1499.4	1499.9	+/- .8
39.485	1750	1749.4	1750.0	+/- .8
44.856	2000	1999.5	2000.0	+/- .8
49.996	2250	2249.6	2250.1	+/- .8
54.845	2500	2499.6	2500.2	+/- .8

TYPE K	DEG C	INCOMING	OUTGOING	TOL
-3.553	-100	-99.7	-99.6	+/- .8
0.000	0	-.2	.0	+/- .5
4.095	100	99.7	100.0	+/- .5
12.207	300	299.6	299.9	+/- .5
20.640	500	499.5	499.8	+/- .5
31.214	750	749.6	749.8	+/- .5
41.269	1000	999.6	999.9	+/- .5
50.633	1250	1249.7	1250.0	+/- .5
54.125	1350	1349.7	1350.1	+/- .5

TYPE T	DEG F	INCOMING	OUTGOING	TOL
-5.341	-300	-301.5	-299.7	+/- 1.5
-4.149	-200	-201.2	-199.9	+/- 1.5
-2.581	-100	-101.0	-99.8	+/- 1.5
0.000	32	31.5	32.1	+/- .6
1.518	100	* 99.2	100.0	+/- .6
6.647	300	* 299.3	300.0	+/- .6
12.572	500	499.4	500.1	+/- .6
19.095	700	699.5	700.1	+/- .6

	DEG C	INCOMING	OUTGOING	TOL
-5.439	-190	-191.0	-189.7	+/- 1.0
-3.378	-100	-100.6	-99.8	+/- 1.0
0.000	0	-.4	.0	+/- .4
4.277	100	99.6	100.0	+/- .4
9.286	200	199.7	200.0	+/- .4
14.860	300	299.7	300.1	+/- .4
20.252	390	389.7	390.0	+/- .4

TYPE E	DEG F	INCOMING	OUTGOING	TOL
-8.404	-300	-300.1	-299.6	+/- .7
-6.471	-200	-200.4	-199.9	+/- .7
-3.976	-100	-100.4	-100.0	+/- .7
0.000	32	31.7	32.0	+/- .7
2.281	100	99.5	99.9	+/- .7
9.708	300	299.3	299.7	+/- .7
17.942	500	499.4	499.8	+/- .7
28.854	750	749.5	749.9	+/- .7
40.056	1000	999.4	999.8	+/- .7
51.246	1250	1249.6	1250.0	+/- .7
62.240	1500	1499.5	1500.0	+/- .7
75.024	1800	1799.6	1800.1	+/- .7

	DEG C	INCOMING	OUTGOING	TOL
-5.237	-100	-99.8	-99.8	+/- .4
0.000	0	-.1	.0	+/- .4
6.317	100	99.8	100.0	+/- .4
21.033	300	299.7	299.9	+/- .4
36.999	500	499.6	499.8	+/- .4
53.110	700	699.7	700.0	+/- .4
68.783	900	899.7	900.0	+/- .4
76.358	1000	999.7	1000.0	+/- .4

MV INPUT	INCOMING	OUTGOING	TOL
-10	-9.99	-9.99	.01% OF RDG+/-2CT
0	-.01	-.00	
10	9.98	9.98	
30	29.98	29.98	
50	49.98	49.98	
75	74.99	74.99	
100	100.01	100.01	

MA INPUT	INCOMING	OUTGOING	TOL
0	-.001	-.000	.01% OF RDG+/-2CT
5	4.998	4.998	
10	9.998	9.999	
15	14.999	15.000	
20	20.003	20.003	

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME Omega Point Lab
CLIENT/PROJECT NUMBER OPL Equipment
RECEIVED FROM Metroplex Metrology Lab
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1272 . OPL
DATE RECEIVED 3-17-93
DATE INSPECTED 3-18-93
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	QUANTITY Rec'd	QUANTITY B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	ACCEPTANCE Hold	ACCEPTANCE Reject	REMARKS
Pressure Gauge	1023Q				SN# 92LE004	Y	Y	Good	None	X			Calibration only
0-100 PSI													
Pressure Gauge													
0-60 PSI					SN# 92LE001								
Tape Measure 25'					SN# 89LE002								
Dial Caliper 6"					SN# Q623532								
Troemner Metric													
Weights Class P					SN# 88LE003								

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:

Metroplex Metrology Lab
2312 Municipal Parkway

Bedford TX 76021

PO Number: 1023-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Constance A. Humphrey
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
3/1/93	UPS		3/19/93	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Pressure Gauge 0-100 psi -Serial #92 LE 004	1		$0.00
2.	Pressure Gauge 0-60 psi -Serial #92 LE 001	1		$0.00
3.	25' Tape Measure Serial #89LE002	1	$25.00	$25.00
4.	6" Dial Caliper Serial #Q623532	1	$10.50	$10.50
5.	Troemner Metric Weights Class P Serial #88 LE 003	1	$127.50	$127.50

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Humphrey
Date 3/1/93

Special Instructions

Please include Calibration Data and Certificates of Conformance.

Please return calibrated items no later than 3/19/93.

Ordered By: Constance A. Humphrey
Project #: OPL Equipment

Total	$163.00
Shipping	
Tax	
Invoice Total	$163.00

INVOICE

No. 3849348

METROPLEX METROLOGY LABORATORY

PHONE Metro (817) 267-4999
FAX (817) 540-1410

2312 MUNICIPAL PARKWAY

PLEASE REMIT TO P.O. BOX 210249
BEDFORD, TEXAS 76095-7249

BEDFORD, TEXAS 76021

Refer to above number in correspondence regarding this charge.

SOLD TO: Omega Point Lab.
6868 Alamo Dams Parkway
San Antonio, TX 78238

SHIP TO: Same
210-647-3[illegible]

VIA: UPS | CUSTOMER P/O NO.: 1025-[illegible] | TERMS: *NET 30* | F.O.B. BEDFORD, TEXAS

Item No.	Qty.	DESCRIPTION	Unit Price	Amount
1	1	McDaniel 0-100 Liquid Filled PSI Gage, S/N 92LE004 Cal. & Cert.		
2	1	McDaniel 0-60 Liquid Filled PSI Gage, S/N 92LE001 Cal. & Cert.		
3	1	Stanley Powerlock II 25' Steel Tape, S/N 89LE002 Cal. & Cert.		
[illegible]	1	Troemner 17 Piece Weight Set, S/N 88LE003 Cal. & Cert. (17)		

IF YOUR REMITTANCE IS POSTMARKED BY 3/27/93,
YOU MAY DEDUCT $4.25 FROM THE INVOICE AMOUNT.
OUR TERMS ARE NET 30 DAYS FROM THE DATE OF THIS INVOICE.

Parts	Tools	Calibration Certification	Repairs	Shipping & Handling	Tax	TOTAL
		212.50		8.63	18.24	239.37

Please Pay ▲

rb Cust# 10441

Masters at Repairs and Calibration of Precision Measuring Instruments

PACKING SLIP

INVOICE

No. 38388 19

METROPLEX METROLOGY LABORATORY

PHONE Metro (817) 267-4999
FAX (817) 540-1410

2312 MUNICIPAL PARKWAY

PLEASE REMIT TO P.O. BOX 210249
BEDFORD, TEXAS 76095-7249

BEDFORD, TEXAS 76021

Refer to above number in correspondence regarding this charge.

SOLD TO: Omega Point Lab.
6868 Alamo Downs Parkway
San Antonio, TX 78238

SHIP TO: Same
210-647-[illegible]

VIA: UPS CUSTOMER P/O NO.: 10230 TERMS: *NET 30* F.O.B. BEDFORD, TEXAS

Item No.	Qty.	DESCRIPTION	Unit Price	Amount
1	1	Fowler 6" Dial Caliper, S/N Q623532 Cal. & Cert.		

IF YOUR REMITTANCE IS POSTMARKED BY 3/21/93,
YOU MAY DEDUCT $ .21 FROM THE INVOICE AMOUNT.
OUR TERMS ARE NET 30 DAYS FROM THE DATE OF THIS INVOICE.

Parts	Tools	Calibration Certification	Repairs	Shipping & Handling	Tax	TOTAL
		10.50			.87	[illegible]

Please Pay ▲

Ab Cust# 10441

Masters at Repairs and Calibration of Precision Measuring Instruments

PACKING SLIP

TEST № 413541

METROPLEX METROLOGY LABORATORY
INCORPORATED
P.O. BOX 210249
BEDFORD, TEXAS 76095-7249
2312 MUNICIPAL PARKWAY
BEDFORD, TEXAS 76021-4642
METRO (817) 267-4999

Certificate of Calibration

We certify the accuracy of this McDaniel 0 to 100 Liquid Filled PSI Gage, Mod.# None, S/N 92LE004, subdivided in 1 lb. increments, property of Omega Point Lab., 6868 Alamo Downs Parkway, San Antonio, Texas. The accuracy of this instrument has been determined from **Reference Standards** which have been calibrated from **Master Standards** which were certified by **The National Institute of Standards and Technology.**

The accuracy of this psi gage meets all the requirements of **Federal Specifications GGG-G-76E, GG-G-66-B** and **Instrument Calibration Procedure (I.C.P.) No. D25A.** The calibration certification of this instrument is in compliance with **MIL-STD-45662A.** This instrument has been calibrated in an upright position at 72°F 45%RH. **NIST Test #737/229495. Expires: 10-2-93.**

Received Condition: In Tolerance

LABORATORY WEIGHT PRESSURE	DISPLAYED INDICATED PRESSURE OF PSI GAGE	DEVIATION OF PSI GAGE	LIMITS OF UNCERTAINTY
10	10	0	0
20	20	0	0
30	30	0	0
40	40.2	+.2	.1%
50	50.2	+.2	.1%
60	60.2	+.2	.1%
70	70.2	+.2	.1%
80	80	0	0
90	90	0	0
100	100	0	0

Chief Metrologist

Floyd A. Passmore

Floyd Passmore
Date Cal: 3-8-93
Date Due: 3-8-94

TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

TEST IN COMPLIANCE WITH MIL-STD-45662A

FP/rb

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME Omega Point Labs
CLIENT/PROJECT NUMBER 11210-94943
RECEIVED FROM Summers Elect
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1257 - 11210
DATE RECEIVED 2-18-93
DATE INSPECTED 2-18-93
INSPECTED BY: C. Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	QUANTITY Rec'd	QUANTITY B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	ACCEPTANCE Hold	ACCEPTANCE Reject	REMARKS
4" mall LB Cond Body	1014Q	3	3		LB400m	Y		Good	None	X			
2" mall LB Cond Body	1014Q	2	2		LB 200 m	Y		Good	None	X			
2" neoprene gasket	1014Q	1	1		APP GK200	Y		Good	None	X			
4" Cond Body Cover	1014Q	3	3		APP IK 350-400	Y		Good	None	X			
1" steel Locknut	1014Q	8	8		BPT 103	Y		Good	None	X			
2" steel locknut	1014Q	8	8		BPT 106	Y		Good	None	X			
3" steel locknut	1014Q	8	8		BPT 108	Y		Good	None	X			
4" steel locknut	1014Q	6	6		BPT 110	Y		Good	None	X			
5" steel locknut	1014Q	8	8		BPT 111	Y		Good	None	X			
1" mall ins gd Bush	1014Q	4	4		BPT 383	Y		Good	None	X			
2" mall ins gd bush	1014Q	4	4		BPT 386	Y		Good	None	X			
3" mall ins gd bush	1014Q	2	2		BPT 388	Y		Good	None	X			
4" mall bushing	1014Q	3	3		OZG IBC 400	Y		Good	None	X			
3" mall bushing	1014Q	2	2		OZG IBC 300	Y		Good	None	X			
5" mall bushing	1014Q	4	4		OZG IBC 500	Y		Good	None	X			
5" 1050 Plastic Bush	1014Q	4	4		BPT 331	Y		Good	None	X			

FORM
1/29/93

Page 1 of 2

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME Omega Point Labs
CLIENT/PROJECT NUMBER 11210-94943
RECEIVED FROM Summing Elect
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1257 / 11210 cont
DATE RECEIVED 2-18-93
DATE INSPECTED 2-18-93
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO. OR ORDER NO.	QUANTITY			I.D. NO.	CNTRL MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
2" gal Conduit	1014Q	10'	10'		GAL200	Y		Good	None	X			
1" gal Conduit	1014Q	10'	10'		GAL100	Y		Good	None	X			

FORM
1/4/89

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Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

PURCHASE ORDER

Vendor:

Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1014-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
2/4/93				

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	LB 400-M Catalog pg. A-18 4" Form 35 Malleabel Iron Unilet Conduit Outlet Body	3		$0.00
2.	LB 200-M Catalog pg. A-18 2" Form 35 Malleabel Iron Unilet Conduit Outlet Body	1		$0.00
3.	GK 200-N Catalog pg. A-18 2" Solid Gasket Neoprene	1		$0.00
4.	GK 400-N Catalog pg. A-18 4" Solid Gasket Neoprene	3		$0.00
5.	BPT 103 Catalog pg. X-17 1" Locknuts	8		$0.00
6.	BPT 106 Catalog pg. X-17 2" Locknuts	8		$0.00
7.	BPT 108 Catalog pg. X-17 3" Locknuts	8		$0.00
8.	Bpt 110 Catalog pg. X-17 4" Locknuts	6		$0.00

Special Instructions

Ordered By: Kerry Hitchcock
Project #: 11210-94943

Total	$0.00
Shipping	
Tax	
Invoice Total	$0.00

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:
Summers Elect
2400 Brockton
San Antonio, TX 78217

PO Number: 1014 Q con't

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:
Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:
Kerry Hitchcock
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
2/4/93				

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
9. ✓	BPT 111 5" Locknuts. 5" Steel Locknut Pg X-17	8		
10. ✓	BPT 383 1" Insulating Grey Bushing	4		
11. ✓	BPT 386 2" " " Pg X-16	4		
12. ✓	BPT 388 3" " "	4		
13.	BPT 390 4" " " "	3		
14. ✓	BPT 391 5" " " "	4		
15. ✓	Gal 200 2" Galvanized Rigid Conduit.	1 @ 10'	X-16	
16. ✓	Gal 100 1" Galvanized Rigid Conduit.	1 @ 10'		

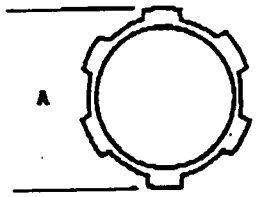
Special Instructions

Order By: Kerry Hitchcock
Project #: 11210-94943

TOTAL

Rigid Conduit And IMC

Conduit Locknuts



Application

Use to fasten threaded conduit to unthreaded opening in a box or enclosure

Sizes

3/8" thru 4": steel
1/2" thru 4": zinc die cast
5" and 6": malleable iron

Material

100 thru 110: steel
101-DC thru 110-DC: zinc
111 and 112: malleable iron

Standard Finish

100 thru 112: zinc electro-plate
101-DC thru 110-DC: chromate conversion coating

Dimensions

Refer to dimension chart

Certifications

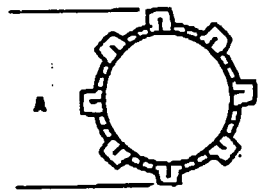
(UL) 101-DC thru 106-DC, File No. E9391
Federal specification W-F-408D

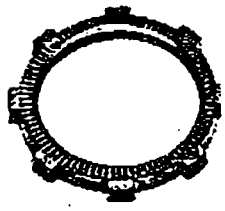
Steel

Catalog Number	Size	Amount Unit	Amount Std. Pkg.	Weight Per C	Dimensions A	Dimensions Thickn
100	3/8"	200	2000	1.0	1	1/8
101	1/2"	100	1000	1.1	1 1/8	1/8
102	3/4"	100	1000	1.7	1 3/8	3/16
103	1"	100	500	3.2	1 3/4	1/8
104	1 1/4"	Bulk	100	4.1	2 1/8	1/8
105	1 1/2"	Bulk	100	5.0	2 1/16	1/8
106	2"	Bulk	50	7.0	2 15/16	1/8
107	2 1/2"	Bulk	25	13.2	3 9/16	3/16
108	3"	Bulk	25	18.4	4 3/16	3/16
109	3 1/2"	Bulk	25	21.8	4 3/4	3/16
110	4"	Bulk	25	24.8	5 3/8	3/16

Malleable Iron

Catalog Number	Size	Amount Unit	Amount Std. Pkg.	Weight Per C	Dimensions A	Dimensions Thickn
111	5"	Bulk	10	56.0	6 3/4	7/8
112	6"	Bulk	10	68.0	7 13/16	7/8





Zinc Die Cast

Catalog Number	Size	Amount Unit	Amount Std. Pkg.	Weight Per C	Dimensions A	Dimensions Thickn
101-DC	1/2"	100	1000	1.2	1 1/8	1/8
102-DC	3/4"	100	1000	1.9	1 7/16	3/16
103-DC	1"	100	500	3.0	1 11/16	3/16
104-DC	1 1/4"	Bulk	100	4.1	2 1/16	1/8
105-DC	1 1/2"	Bulk	100	5.8	2 7/16	1/8
106-DC	2"	Bulk	50	8.4	2 15/16	1/8
107-DC	2 1/2"	Bulk	25	13.2	3 1/2	3/16
108-DC	3"	Bulk	25	18.4	4 1/8	3/16
109-DC	3 1/2"	Bulk	25	21.8	4 13/16	3/16
110-DC	4"	Bulk	25	24.8	5 1/8	3/16

BRIDGEPORT
Bridgeport Fittings, Inc.
705 Lindship Boulevard, Stratford, CT 06497
203/377-6944 Fax. 203/381-3488

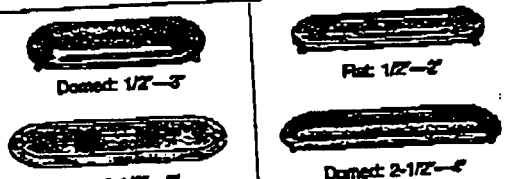
A-8

Covers and Gaskets for Form 35® Unilet® Conduit Outlet Bodies.

Covers Furnished with Stainless Steel Fastening Screws.

NOTE: Refer to page 26 for Wiring Capacity Tables.

Metal Covers



Size	Blank Stamped Steel	Blank Cast Malleable
1/2	K50	K50-CM
3/4	K75	K75-CM
1	K100	K100-CM
1-1/4	K125 & 150	K125 & 150-CM
1-1/2	K125 & 150	K125 & 150-CM
2	K200	K200-CM
2-1/2	K250 & 300	K250 & 300-CM
3	K250 & 300	K250 & 300-CM
3-1/2	K350 & 400	K350 & 400-CM
4	K350 & 400	K350 & 400-CM
5	K500	—
6	K600	—

Gaskets—Solid

Size	Neoprene	Composition Fiber
1/2	GK50-N	GK50-V
3/4	GK75-N	GK75-V
1	GK100-N	GK100-V
1-1/4	GK125-150-N	GK125-150-V
1-1/2	GK125-150-N	GK125-150-V
2	GK200-N	GK200-V
2-1/2	GK250-300-N	GK250-300-V
3	GK250-300-N	GK250-300-V
3-1/2	GK350-N	GK350-V
4	GK400-N	GK400-V
Not perforated		
5	GK500-SN	
6	GK600-SN	

Composition Covers

Blank

1-Wire

2-Wire

3-Wire

Form 35 Size	Hole Size	Cat. No.
1/2	(Drill as required)	KB50
3/4		KB75
1		KB100

Form 35 Size	Hole Size	Cat. No.
1/2	13/32	K1W50
3/4	7/16	K1W75

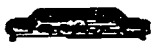
Form 35 Size	Hole Size	Cat. No.
1/2	3/8	K2W50
3/4	3/8	K2W75
1	19/32	K2W100

Form 35 Size	Hole Size
1/2	5/16
3/4	3/8
1	19/32

Wiring Device Covers

Lamp Receptacle with 1-1/2" Shade Holder Groove. Porcelain, 600 Watt, 600 Volt Rating

Size	Cat. No.
1/2	KLR50
3/4	KLR75



Device Cover for Interchangeable (Despard) Wiring Devices, Cast Aluminum with Mounting Strap

Size	Cat. No.
1/2	KWD50-A

Switch/Co... changeable ... vices, Cast ... Gasket and ... Strap

Size
3/4

A

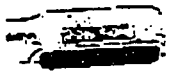
Form 35® Malleable Iron Unilet® Conduit Outlet Bodies.

Threaded Type for use with Rigid Metal Conduit and IMC;
Compression Type for use with Threadless Rigid Metal Conduit.

NOTE: Refer to page 26 for Wiring Capacity Tables.

Threaded Type

Body Style and Catalog Numbers (Patented Roller Feature Listings in Bold Type)

Hub Size	C	E	LB	LL	LR
					
1/2	C50-M	E50-M	LB50-M	LL50-M	LR50-M
3/4	C75-M	E75-M	LB75-M	LL75-M	LR75-M
1	C100-M	E100-M	LB100-M	LL100-M	LR100-M
1-1/4	C125-M	—	LB125-M	LL125-M	LR125-M
1-1/2	C150-M	—	LB150-M	LL150-M	LR150-M
2	C200-M	—	LB200-M	LL200-M	LR200-M
2-1/2	C250-M	—	LB250-M	LL250-M	LR250-M
3	C300-M	—	LB300-M	LL300-M	LR300-M
3-1/2	C350-M	—	LB350-M	LL350-M	LR350-M
4	C400-M	—	LB400-M	LL400-M	LR400-M
5	—	—	LB500-M	—	—
6	—	—	LB600-M	—	—

Hub Size	LRL*	T	TA	TB	X
1/2	LRL50-M	T50-M	TA50-M	TB50-M	X50-M
3/4	LRL75-M	T75-M	TA75-M	TB75-M	X75-M
1	LRL100-M	T100-M	TA100-M	TB100-M	X100-M
1-1/4	LRL125-M	T125-M	—	TB125-M	X125-M
1-1/2	LRL150-M	T150-M	—	TB150-M	X150-M
2	LRL200-M	T200-M	—	TB200-M	X200-M
2-1/2	—	T250-M	—	—	—
3	—	T300-M	—	—	—
3-1/2	—	T350-M	—	—	—
4	—	T400-M	—	—	—

*LRL Unilets have double opening and are furnished with one steel cover, assembled.

Compression Type— For use with Threadless Rigid Metal Conduit

Hub Size	LB	LRL*	T
1/2	LB50N-M	LRL50N-M	T50N-M
3/4	LB75N-M	LRL75N-M	T75N-M
1	LB100N-M	LRL100N-M	T100N-M

Back Style for Form 35 Unilet conduit body sizes (inches)

Unilet Body	Flat Back	Round Back
C, LB	1/2 thru 2	2-1/2 and up
E	1/2 thru 1	2-1/2 and up
LL, LR, T	1/2 thru 2	1/2, 3/4, 1, 2
TB	1-1/4, 1-1/2	1-1/4 and up
X	1/2 thru 1	

All TA Unilets are round back design. All Compression Type are flat-back design.

Refer to Pricing Index for price, weight, and standard package

Appleton ELECTRIC COMPANY

1701 W. Wellington Ave.
Chicago, Illinois 60657

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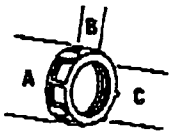
Rigid Conduit And IMC

Bushings



Application

Used with locknut to terminate threaded rigid and IMC to box

Rounded surface of bushing prevents damage to wire insulation

Sizes

½" thru 6": malleable iron
½" thru 6": aluminum
½" thru 4": zinc die cast
½" thru 6": plastic

Material

201 thru 212: malleable iron
201-AL thru 212-AL: aluminum
201-DC thru 210-DC: zinc die cast
321 thru 332: plastic rated 105°C

Standard Finish

201 thru 212: zinc electro-plate
201-AL thru 212-AL: plain finish
201-DC thru 210-DC: chromate conversion coating
321 thru 332: plain finish

Dimensions

Refer to dimension chart

Certifications

UL 201 thru 212, 201-DC thru 210-DC, 321 thru 332. File No. E9391
Federal specification W-F-4080: 201 thru 212, 201-DC thru 210-DC, 321 thru 332
CSA File No. LR39354
201-DC thru 210-DC, 321 thru 330

Malleable Iron

Catalog Number	Size	Amount Unit	Amount Std. Pkg.	Weight Per C	Nominal Dimensions A	B	C
201	½"	100	1000	2.8	1 1/16	3/8	5/8
202	¾"	100	1000	4.8	1 1/4	7/16	13/16
203	1"	50	500	6.5	1 1/2	9/16	1 1/16
204	1¼"	Bulk	100	8.7	1 7/8	3/4	1 3/8
205	1½"	Bulk	100	12.9	2 3/16	11/16	1 1/2
206	2"	Bulk	50	18.0	2 5/8	13/16	2 1/8
207	2½"	Bulk	25	32.8	3 1/8	13/16	2 9/16
208	3"	Bulk	25	40.8	3 3/4	1	3
209	3½"	Bulk	25	67.2	4 3/16	1	3 1/2
210	4"	Bulk	20	92.0	4 7/8	1	3 15/16
211	5"	Bulk	5	132.0	6 1/8	1 1/8	4 15/16
212	6"	Bulk	5	186.0	7 3/16	1 1/8	6

Aluminum

201-AL	½"	100	1000	1.0	1 1/16	3/8	5/8
202-AL	¾"	100	1000	1.6	1 1/4	7/16	13/16
203-AL	1"	50	500	2.6	1 1/2	9/16	1 1/16
204-AL	1¼"	Bulk	100	3.2	1 7/8	3/4	1 3/8
205-AL	1½"	Bulk	100	4.7	2 3/16	11/16	1 1/2
206-AL	2"	Bulk	50	6.8	2 5/8	13/16	2 1/8
207-AL	2½"	Bulk	25	12.4	3 1/8	13/16	2 7/16
208-AL	3"	Bulk	25	15.2	3 3/4	1	3
209-AL	3½"	Bulk	25	25.2	4 3/16	1	3 1/2
210-AL	4"	Bulk	20	32.5	4 7/8	1	3 15/16
211-AL	5"	Bulk	5	60.0	6 1/8	1 1/8	4 15/16
212-AL	6"	Bulk	5	80.0	7 3/16	1 1/8	6

Zinc Die Cast

201-DC	½"	100	1000	2.7	1 1/16	3/8	5/8
202-DC	¾"	100	1000	4.3	1 3/16	7/16	13/16
203-DC	1"	50	500	6.5	1 9/16	1/2	1 1/16
204-DC	1¼"	Bulk	100	8.3	1 7/8	1/2	1 3/8
205-DC	1½"	Bulk	100	11.5	2 1/8	9/16	1 5/8
206-DC	2"	Bulk	50	17.2	2 5/8	13/16	2 1/16
207-DC	2½"	Bulk	25	32.0	3 3/16	13/16	2 9/16
208-DC	3"	Bulk	25	39.8	3 13/16	13/16	3
209-DC	3½"	Bulk	25	40.0	4 5/8	13/16	3 9/16
210-DC	4"	Bulk	20	48.5	4 13/16	13/16	4 1/16

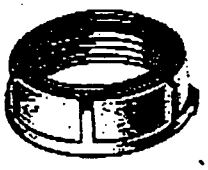
Plastic

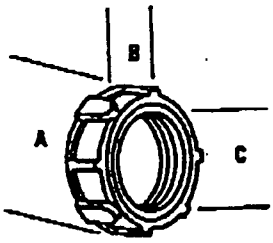
321	½"	100	1000	.5	1	3/8	5/8
322	¾"	100	1000	.8	1 1/4	7/16	13/16
323	1"	50	500	1.2	1 9/16	1/2	1
324	1¼"	Bulk	100	1.4	1 13/16	1/2	13/16
325	1½"	Bulk	100	1.8	2 1/16	1/2	1 9/16
326	2"	Bulk	50	3.0	2 11/16	1/2	2
327	2½"	Bulk	25	4.4	3 1/8	5/8	2 1/8
328	3"	Bulk	25	6.4	3 13/16	3/4	2 13/16
329	3½"	Bulk	25	7.2	4 3/16	3/4	3 3/8
330	4"	Bulk	20	7.5	4 13/16	3/4	3 13/16
331	5"	Bulk	5	28.0	6 3/16	1	4 3/8
332	6"	Bulk	5	34.0	7 3/8	1	5 13/16

BRIDGEPORT
Bridgeport Fittings, Inc.
705 Lordship Boulevard, Stratford, CT 06497
203/377-5944 Fax: 203/381-3488

Rigid Conduit And IMC

Insulated Bushings





Malleable Iron

Catalog Number	Size	Amount Unit	Amount Std. Pkg.	Weight Per C	Dimensions A	Dimensions B	Dimensions C
361	½"	100	1000	2.5	1 1/16	3/8	5/8
362	¾"	100	1000	4.7	1 1/4	7/16	13/16
363	1"	50	500	6.8	1 1/2	9/16	1
364	1¼"	Bulk	100	9.0	1 7/8	¾	1 15/16
365	1½"	Bulk	100	12.6	2 3/16	13/16	1 9/16
366	2"	Bulk	50	17.6	2 5/8	15/16	2
367	2½"	Bulk	25	35.2	3 1/8	15/16	2 5/16
368	3"	Bulk	25	42.4	3 3/4	1	2 7/8
369	3½"	Bulk	25	69.2	4 3/16	1	3 3/8
370	4"	Bulk	20	93.5	4 7/8	1	3 7/8
371	5"	Bulk	5	152.0	6 1/8	1 1/8	4 13/16
372	6"	Bulk	5	190.0	7 3/16	1 1/8	5 13/16

Aluminum

Catalog Number	Size	Amount Unit	Amount Std. Pkg.	Weight Per C	Dimensions A	Dimensions B	Dimensions C
361-AL	½"	100	1000	1.0	1 1/16	3/8	5/8
362-AL	¾"	100	1000	1.7	1 1/4	7/16	13/16
363-AL	1"	50	500	2.7	1 1/2	9/16	1
364-AL	1¼"	Bulk	100	3.0	1 7/8	¾	1 15/16
365-AL	1½"	Bulk	100	5.0	2 3/16	13/16	1 9/16
366-AL	2"	Bulk	50	7.4	2 5/8	15/16	2
367-AL	2½"	Bulk	25	13.2	3 1/8	15/16	2 5/16
368-AL	3"	Bulk	25	16.0	3 3/4	1	2 7/8
369-AL	3½"	Bulk	25	26.4	4 3/16	1	3 3/8
370-AL	4"	Bulk	20	35.5	4 7/8	1	3 7/8
371-AL	5"	Bulk	5	60.0	6 1/8	1 1/8	4 13/16
372-AL	6"	Bulk	5	80.0	7 3/16	1 1/8	5 13/16

Zinc Die Cast

Catalog Number	Size	Amount Unit	Amount Std. Pkg.	Weight Per C	Dimensions A	Dimensions B	Dimensions C
361-DC	½"	100	1000	2.7	1 1/16	3/8	5/8
362-DC	¾"	100	1000	4.2	1 5/16	7/16	13/16
363-DC	1"	50	500	6.4	1 5/16	½	1
364-DC	1¼"	Bulk	100	8.7	1 7/8	½	1 15/16
365-DC	1½"	Bulk	100	11.3	2 1/8	9/16	1 9/16
366-DC	2"	Bulk	50	17.4	2 5/8	11/16	2
367-DC	2½"	Bulk	25	30.8	3 1/8	13/16	2 5/16
368-DC	3"	Bulk	25	38.0	3 13/16	13/16	2 7/8
369-DC	3½"	Bulk	25	44.8	4 5/16	13/16	3 3/8
370-DC	4"	Bulk	20	51.5	4 13/16	13/16	3 7/8

Application

Used with locknut to terminate threaded rigid and IMC to box

Plastic metaliner prevents damage to wire insulation

Sizes

½" thru 6": malleable iron

½" thru 6": aluminum

½" thru 4": zinc die cast

Material

361 thru 372: malleable iron with plastic metaliner rated at 105°C

361-AL thru 372-AL: aluminum with plastic metaliner rated at 105°C

361-DC thru 370-DC: zinc die cast with plastic metaliner rated at 105°C

Standard Finish

361 thru 372: zinc electro-plate

361-AL thru 372-AL: plain finish

361-DC thru 370-DC: chromate conversion coating

Dimensions

Refer to dimension chart

Certifications

UL 361-DC thru 370-DC, File No. E9391

Federal specification W-F-408D:

361-DC thru 370-DC

CSA File No. LR39354

361-DC thru 370-DC

BRIDGEPORT
Bridgeport Fittings, Inc.
705 Lordship Boulevard, Stratford, CT 06497
203/377-5644 Fax: 203/381-3488

RIGID

Galvanized Rigid Conduit

Catalog Number	Size	Weight Per 100'	Standard Package	Price Per 100
Gal 050	1/2	79	100	118.68
Gal 075	3/4	105	50	147.02
Gal 100	1	153	50	213.06
Gal 125	1-1/4	201	10	271.26
Gal 150	1-1/2	249	10	339.76
Gal 200	2	332	10	441.22
Gal 250	2-1/2	527	10	756.90
Gal 300	3	683	10	937.56
Gal 350	3-1/2	831	10	1152.58
Gal 400	4	972	10	1362.96

Intermediate Metal Conduit

Catalog Number Type and Size	Weight Per 100'	Standard Package	Price Per 100
IMC 050	60	100	92.14
IMC 075	82	50	106.38
IMC 100	116	50	157.90
IMC 125	150	10	201.78
IMC 150	182	10	235.70
IMC 200	242	10	322.10
IMC 250	401	10	650.46
IMC 300	493	10	838.28
IMC 350	573	10	979.20
IMC 400	638	10	1157.64

Galvanized Conduit 90° Ells

ELL (ELB)

Catalog Number Type and Size	Lbs. 100	Carton Quantity	Price Per 100
ELL 050GAL90	78	50	927.08
ELL 075GAL90	111	50	1120.72
ELL 100GAL90	191	20	1656.08
ELL 125GAL90	312	20	2394.80
ELL 150GAL90	424	10	2859.82
ELL 200GAL90	658	10	4207.38
ELL 250GAL90	1177	1	6939.88
ELL 300GAL90	1850	1	10374.86
ELL 350GAL90	2578	1	17971.32
ELL 400GAL90	3216	1	208.46/EA

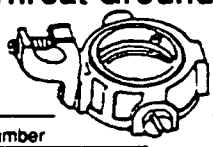
Galvanized Conduit Couplings

Catalog Number	Size	Lbs. 100	Carton Quantity	Price Per Full Carton or More
CPL050	1/2	13	100	276.86
CPL075	3/4	21	50	339.58
CPL100	1	31	30	479.02
CPL125	1-1/4	39	25	599.02
CPL150	1-1/2	56	25	756.28
CPL200	2	73	20	999.62
CPL250	2-1/2	190	25	2215.86
CPL300	3	238	20	3026.20
CPL350	3-1/2	358	18	4044.48
CPL400	4	318	12	4075.02

Plastic Insulated Bushings

Catalog Number Bridgeport	Appleton	Size	Carton Quantity	Price Per 100
321	BBU50	1/2"	100	23.00
322	BBU75	3/4"	100	35.50
323	BBU100	1"	50	67.00
324	BBU125	1-1/4"	25	90.90
325	BBU150	1-1/2"	25	116.20
326	BBU200	2"	25	213.20
327	BBU250	2-1/2"	10	430.00
328	BBU300	3"	10	480.80
329	BBU350	3-1/2"	5	590.70
330	BBU400	4"	1	720.20

Insulated Throat Grounding Bushings



Catalog Number Bridgeport	Gedney	Union	Size	Price Per 100
381	BLG0504	96-12	1/2"	640.20
382	BLG0704	96-34	3/4"	791.00
383	BLG1104	96-1	1"	951.50
384	BLG1204	96-114	1-1/4"	840.40
385	BLG1504	96-112	1-1/2"	880.90
386	BLG2004	96-2	2"	1151.10
387	BLG2604	96-212	2-1/2"	1860.20
388	BLG3104	96-3	3"	2650.00
389	BLG3604	96-312	3-1/2"	3301.00
390	BLG4104	96-4	4"	4200.00

Appleton

Catalog Number	Size	Carton Quantity	Price Per 100
GIB50L	1/2	50	550.00
GIB75L	3/4	50	704.00
GIB100L	1	25	782.00
GIB125L	1-1/4	25	1084.00
GIB150L	1-1/2	25	1184.00
GIB200L	2	10	1578.00
GIB250L	2-1/2	5	2806.00
GIB300L	3	5	3670.00
GIB350L	3-1/2	5	4520.00
GIB400L	4	2	5566.00

Male Insulating Bushings - No Locknuts

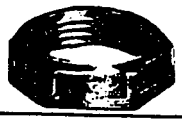
Union

Catalog Number	Size	Carton Quantity	Price Per 100
1-12	1/2"	50	168.00
1-34	3/4"	50	203.40
1-1	1"	20	263.20
1-114	1-1/4"	10	309.60
1-112	1-1/2"	5	406.60
1-2	2"	4	491.20
1-212	2-1/2"	4	829.60
1-3	3"	4	1228.60
1-312	3-1/2"	4	1337.20
1-4	4"	4	1919.00

RIGID

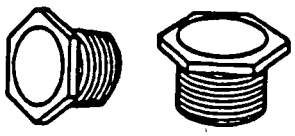
Bakelite Insulated Bushings

Gedney



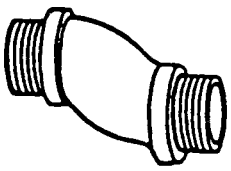
Catalog Number	Size	Carton Quantity	Price Per 100
A50	1/2"	100	64.00
A75	3/4"	100	76.00
A100	1"	50	114.00
A125	1-1/4"	25	224.00
A150	1-1/2"	25	282.00
A200	2"	20	380.00
A250	2-1/2"	20	818.00
A300	3"	10	864.00
A350	3-1/2"	10	1106.00
A400	4"	10	1334.00
A500	5"	5	2836.00
A600	6"	5	5476.00

Chase Nipples



Catalog Number Appleton	Bridgeport	Size	Carton Quantity	Price Per 100
CN50	1102	1/2"	100	80.00
CN75	1103	3/4"	100	110.00
CN100	1104	1"	25	225.00
CN125	1105	1-1/4"	25	387.00
CN150	1106	1-1/2"	10	500.00
CN200	1107	2"	5	768.00
CN250	1108	2-1/2"	5	1892.00
CN300	1109	3"	2	2778.00
CN350	1110	3-1/2"	2	5778.00
CN400	1111	4"	2	9546.00

Offset Nipple

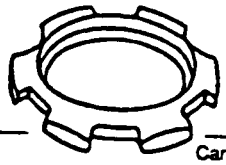


OFN50

Catalog Number Bridgeport	Appleton	Size	Carton Quantity	Price Per 100
Malleable Iron				
1520	OFN50	050	25	501.30
1521	OFN75	075	25	519.50
1523	OFN100	100	10	1330.20
1524	OFN125	125	5	1499.00
1525	OFN150	150	5	2351.20
[illegible] Fitting				
[illegible]	—	050	20	192.40
52[illegible]	—	075	10	252.00
522DC	—	100	5	301.80
523DC	—	125	10	478.40
524DC	—	150	10	589.00
525DC	—	200	5	868.20

Conduit and Fixture Locknuts

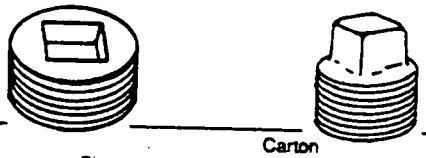
Appleton



Catalog Number	Size	Carton Quantity	Price Per 100
BL38	3/8"	100	39.88
BL50	1/2"	100	24.50
BL75	3/4"	100	43.00
BL100	1"	50	68.00
BL125	1-1/4"	50	94.00
BL150	1-1/2"	50	154.00
BL200	2"	50	224.00
BL250	2-1/2"	10	625.00
BL300	3"	5	800.00
BL350	3-1/2"	5	1353.00
BL400	4"	5	1687.00

Threaded Close-Up Plugs

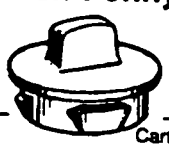
Appleton



Catalog Number	Size	Carton Quantity	Price Each
Screwdriver Slot			
PLG50R	1/2"	100	2.20
PLG75R	3/4"	100	2.66
Recessed			
PLG100R	1"	50	3.10
PLG125	1-1/4"	25	3.54
PLG150	1-1/2"	25	5.26
PLG200	2"	10	9.10
PLG250	2-1/2"	5	15.80
PLG300	3"	2	23.22
Square Head			
PLG50S	1/2"	100	2.20
PLG75S	3/4"	100	2.66
PLG100S	1"	50	3.10
PLG125S	1-1/4"	25	4.24
PLG150S	1-1/2"	25	5.80
PLG200S	2"	10	10.04
PLG250S	2-1/2"	5	15.80
PLG300S	3"	2	23.22
PLG350S	3-1/2"	2	31.22
PLG400S	4"	1	39.00

Plastic Push-Penny Plugs

T&B



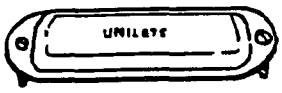
Catalog Number	Size	Carton Quantity	Price Per 100
Plastic Push-Penny Plugs			
1470	1/2"	100	42.00
1471	3/4"	100	46.00
1472	1"	50	63.00
1473	1-1/4"	50	98.00
1474	1-1/2"	25	186.00
1475	2"	25	254.00

Form 35 Malleable Iron Unilet Conduit Outlet Bodies *(continued)*

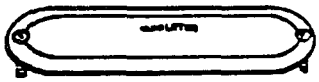
Type LB		
LB300-M	3	178.50
LB350-M	3-1/2	292.20
LB400-M	4	329.76
LB500-M	5	855.26
LB600-M	6	1379.16
Type LL		
LL50-M	1/2	9.56
LL75-M	3/4	11.46
LL100-M	1	17.24
LL125-M	1-1/4	29.80
LL150-M	1-1/2	35.38
LL200-M	2	58.32
LL250-M	2-1/2	133.90
LL300-M	3	178.50
LL350-M	3-1/2	292.20
LL400-M	4	356.32
Type LR		
LR50-M	1/2	9.56
LR75-M	3/4	11.46
LR100-M	1	17.24
LR125-M	1-1/4	29.80
LR150-M	1-1/2	35.38
LR200-M	2	58.32
LR250-M	2-1/2	144.70
LR300-M	3	178.50
LR350-M	3-1/2	292.20
LR400-M	4	329.76
Type LRL		
LRL50-M	1/2	13.06
LRL75-M	3/4	15.90
LRL100-M	1	21.02
LRL125-M	1-1/4	44.34
LRL150-M	1-1/2	60.80
LRL200-M	2	87.54
Type T		
T50-M	1/2	11.96
T75-M	3/4	14.36
T100-M	1	21.52
T125-M	1-1/4	31.56
T150-M	1-1/2	42.08
T200-M	2	65.02
T250-M	2-1/2	140.78
T300-M	3	185.18
T350-M	3-1/2	344.04
T400-M	4	385.52
Type TA		
TA50-M	1/2	19.86
TA75-M	3/4	25.56
TA100-M	1	33.52
Type TB		
TB50-M	1/2	12.90
TB75-M	3/4	15.78
TB100-M	1	22.46
TB125-M	1-1/4	33.96
TB150-M	1-1/2	44.46
TB200-M	2	69.78
Type X		
X50-M	1/2	17.42
X75-M	3/4	18.64
X100-M	1	30.88
X125-M	1-1/4	40.14
X150-M	1-1/2	51.74
X200-M	2	106.46

Covers and Gaskets for Form 35 Unilet Conduit Outlet Bodies

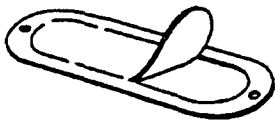
Covers Furnished with Stainless Steel Fastening Screws



Domed Cover



Flat Cover



Neoprene Gasket
Tear out inner perforated section to convert to "open type" gasket.

Composite Fiber Gaskets

Catalog Number	Size	Price Each
Metal Covers - Blank Stamped Steel		
K50	1/2	2.88
K75	3/4	3.50
K100	1	4.80
K125	1-1/4	5.74
K150	1-1/2	5.74
K200	2	10.18
K250	2-1/2	15.94
K300	3	15.94
K350	3-1/2	18.78
K400	4	18.78
K500	5	73.26
K600	6	144.00
Metal Covers - Blank Cast Malleable		
K50-CM	1/2	4.44
K75-CM	3/4	6.44
K100-CM	1	8.60
K125 & 150CM	1-1/4, 1-1/2	13.64
K200-CM	2	16.88
K250-CM	2-1/2	19.76
K300-CM	3	19.76
K350-CM	3-1/2	35.26
K400-CM	4	35.26
Solid Gaskets - Neoprene		
GK50-N	1/2	2.88
GK75-N	3/4	2.88
GK100-N	1	3.82
GK125-N	1-1/4	4.80
GK150-N	1-1/2	4.80
GK200-N	2	5.74
GK250-N	2-1/2	10.54
GK300-N	3	10.54
GK350-N	3-1/2	11.96
GK400-N	4	11.96
Solid Gaskets - Neoprene Not Perforated		
GK500-SN	5	36.00
GK600-SN	6	56.84
Solid Gaskets - Composition Fiber		
GK50-V	1/2	3.40
GK75-V	3/4	3.40
GK100-V	1	3.82
GK125-V	1-1/4	5.68
GK150-V	1-1/2	5.68
GK200-V	2	6.80
GK250-V	2-1/2	9.56
GK300-V	3	9.56
GK350-V	3-1/2	11.94
GK400-V	4	11.94

SUMMERS ELECTRIC

CONTROL

A division of SUMMERS GROUP

PACKING SLIP 363

PACKING SLIP NUMBER	PAGE
081529302	1

04-FEB-1993, 13:57

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
2400 BROCKTON

SAN ANTONIO, TX 78217

CUSTOMER ORDER NUMBER	JOB NAME	CONTACT	TYPE
PO-1014Q/KERRY		KERRY	WC

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
04-FEB-1993	04-FEB-1993	Will Call	PC	778	000	10th, Net 20th

LINE	QTY. ORD.	QTY. B.O.	QTY. SHP.	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
001	10	0	10	GAL 200 2-IN GALV CONDUIT	08-F-3 00106		132.20	C	[illegible]
002	10	0	10	GAL 100 1-IN GALV CONDUIT	08-F-2 00103		92.80	C	[illegible]
003	1	0	1	APP LB200M 2-IN MALL LB COND BODY	29-B-2 47705		28.00	E	[illegible]
004	1	0	1	APP K200 2-IN STL COND BODY COVER	29-A-1 47140		5.09	E	5.
005	1	0	1	APP GK200N 2-IN NEOPRENE GASKET	29-A-2 43410		2.87	E	2.
006	8	0	8	BPT 103 1-IN STEEL LOCKNUT	12-B-4 00103		28.95	C	[illegible]
007	8	0	8	BPT 106 2-IN STEEL LOCKNUT	12-B-4 00106		45.00	C	[illegible]
008	8	0	8	BPT 108 3-IN STEEL LOCKNUT	12-B-4 00108		95.00	C	[illegible]
009	6	0	6	BPT 110 4-IN STEEL LOCKNUT	12-B-4 00110		175.00	C	[illegible]

SUB TOTAL	:	88.4
FREIGHT	:	.0
TAX	:	7.3
TOTAL	:	95.8

FORM #0101-2250 (9-9

PICKED BY | CHECKED BY | DATE | CUSTOMER SIGNATURE

SUMMERS ELECTRIC

CONTROL

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PACKING SLIP 364

PACKING SLIP NUMBER	PAGE
081530901	1

04-FEB-1993, 14:02

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
1014Q/KERRY			WC

ORDERED		SHIP VIA	FRT	SLS	TAX	TERMS
04-FEB-1993	04-FEB-1993	Will Call	PC	232	000	10th, Net 20th

LINE	QTY ORD	QTY BO	QTY SHP	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
001	4	0	4	BPT 383 1-IN MALL INS GRD BUSH	12-B-1 00383		475.35	C	1[illegible]
002	4	0	4	BPT 386 2-IN MALL INS GRD BUSH	12-B-1 00386		575.55	C	2[illegible]
003	2	0	2	BPT 388 3-IN MALL INS GRD BUSH	12-B-1 00388		1,590.00	C	3[illegible]
004	3	3	0	BPT 390 4-IN MALL INS GRD BUSH	12-B-1 00390		2,520.00	C	
005	4	4	0	BPT 391 5-IN MALL INS GRD BUSH	00391	Y	4,017.98	C	

SUB TOTAL	:	73[illegible]
FREIGHT	:	[illegible]
TAX	:	6[illegible]
TOTAL	:	79[illegible]

FORM #0101-2250 (9-92

PICKED BY | CHECKED BY 232 | DATE | CUSTOMER SIGNATURE

SUMMERS ELECTRIC

CUSTOMER

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PACKING SLIP

365

PACKING SLIP NUMBER	PAGE
081582301	1

09-FEB-1993, 12:00

M: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO	JOB NAME	CONTACT	TYPE
PO-10140	F		DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
08-FEB-1993	08-FEB-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	QTY ORD	QTY SHP	QTY B/O	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
002	4	0		0ZG IBC500 5" MALL BUSHING		Y	45.00	E	13[illegible]
00[illegible]	2	0		2 0ZG IBC300 3" MALL BUSHING		Y	14.00	E	2[illegible]
004	3	0		3 0ZG IBC400 4" MALL BUSHING		Y	20.00	E	6[illegible]

Freight, if applicable, to be billed later

SUB TOTAL	:	268.[illegible]
FREIGHT	:	[illegible]
TAX	:	22.[illegible]
TOTAL	:	290.[illegible]

Richard Bussell

FORM #0101-2250 (9-92

PICKED BY: ED | CHECKED BY: | DATE: | CUSTOMER SIGNATURE:

SUMMERS ELECTRIC

CUSTOMER

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PACKING SLIP

366

PACKING SLIP	PAGE
[illegible]	

[illegible]-FEB-1993 [illegible]

FROM: 501 W. BEACH STREET
FORT WORTH, TX 76111

SOLD TO: 08640300
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	SALES
C-10140 KERRY		KERRY	DEL

ORDER DATE	SHIP DATE	SHIPPING VIA	[illegible]	[illegible]	[illegible]	TERMS
5-FEB-1993	05-FEB-1993	United Parcel Service	PC	778	[illegible]	10th Net 31th

LINE	QTY ORD	QTY B.O.	QTY SHP	PART NUMBER / DESCRIPTION	[illegible]	UNIT PRICE	U/M	EXTENDED PRICE
01	3	0	3	APP K050X400 ✓ 4-IN COND BODY COVER	[illegible]	[illegible]	E	[illegible]
						SUB TOTAL		
						FREIGHT		
						TAX		
						TOTAL		

FORM #0101-2231 (12-90

PICKED BY [illegible] CHECKED BY [illegible] DATE 2/8 CUSTOMER SIGNATURE

SUMMERS ELECTRIC

CUSTOMER

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PACKING SLIP 367

PACKING SLIP NUMBER	PAGE
400126601	

05-FEB-1993, 15:0

FROM: 4102 East Hwy 332
Freeport, TX 77541

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO: OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

B-Bxs

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-1014Q/KERRY		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
05-FEB-1993	05-FEB-1993	Best Way	PC	778	000	10th, Net 20th

LINE	QTY ORD.	QTY B.O.	QTY SHIP	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
001	3	0	3	APP LB400-M 4-IN MALL LB COND BODY	47760		164.88	E	49[illegible]
							SUB TOTAL	:	49[illegible]
							FREIGHT	:	
							TAX	:	4[illegible]
							TOTAL	:	50[illegible]

FORM # 0101-2247 (9

PICKED [illegible] CHECKED BY DATE 2/6/93 CUSTOMER SIGNATURE

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP

368

PACKING SLIP NUMBER	PAGE
181603501	1

05-FEB-1993 15:07

FROM: 3910 S. INDUSTRIAL DRIVE
AUSTIN, TX 78744

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-10140/KERRY		KERRY	DEL

ORDER DATE	SHIP DATE	SHIPPING VIA	FOB	TERMS	TAX	TERMS
05-FEB-1993	05-FEB-1993	United Parcel Servic	PC	778	000	10th. Net 20th

LINE	QTY ORD	QTY B/O	QTY SHP	PART NUMBER / DESCRIPTION	BIN LOC / UPC	NSP	UNIT PRICE	UOM	EXTENDED PRICE
001	8	0	8	BPT 111 5-IN STEEL LOCKNUT	00111		1.000.00	C	[illegible]
00[illegible]	4	0	4	BPT 331 5-IN 105D PLSTC BUSH	00331		671.85	C	[illegible]
							SUB TOTAL	:	105.[illegible]
							FREIGHT	:	[illegible]
							TAX	:	3.[illegible]
							TOTAL	:	115.[illegible]

1 UPS 0956559 62
Shipout
2-5-93 973-05

8 lbs. 2.68

FORM #0101-2250 (9-92)

PICKED BY: GMR CHECKED BY: DATE: CUSTOMER SIGNATURE:

SUMMERS ELECTRIC

CONTROL

A division of SUMMERS GROUP

SLIP 369

PACKING SLIP NUMBER	PAGE
081530902	1

25-FEB-1993, 11:18

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

DD

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

		CONTACT	TYPE
10140/KERRY			WC

ORD			FRE	SLS	TAX	TERMS
04-FEB-1993	04-FEB-1993	Will Call	PC	232	000	10th, Net 20th

LINE	ORDERED	SHIPPED	PART NUMBER / DESCRIPTION	BIN LOC	UPC	MST	UNIT PRICE	UM	EXTENDED PRICE
005	4	0	4 BPT 391 5-IN MALL INS GRD BUSH		00391	Y	4,017.98	C	160.7

Freight, if applicable, to be billed later

SUB TOTAL	:	160.7
FREIGHT	:	.0
TAX	:	13.2
TOTAL	:	173.9

FORM 60169-2288

PICKED BY Rick CHECKED BY 232 DATE CUSTOMER SIGNATURE Kerry Hilliard

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME Omega Point Labs
CLIENT/PROJECT NUMBER 11210-94943
RECEIVED FROM Summers Elect
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1258 . 11210
DATE RECEIVED 2-18-93
DATE INSPECTED 2-18-93
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
4" galv Cond	1015Q	10'	10'		GAL400	Y	Y	Good	None	X			
Sleeve anchor w/acorn nuts	1015Q	100	100		SCR SAA1/ 4X2-1/4	Y	Y	Good	None	X			
open end wire conn	1015Q	1000	1000		BUC2006S	Y	Y	Good	None	X			

FORM
1/29/93

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

PURCHASE ORDER

Vendor:

Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1015-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
2/4/93				

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1. ✓	SAA 1/4"x 2 1/4" Catalog pg. S-5 1/4" x 2 1/4" Sleeve Anchors, Acorn Nut (100 ct.)	1		$0.00
2. ✓	Gal 400 Catalog pg. X-16 10' of 4" Galvanized Rigid Conduit	1		$0.00
3.	2006S Catalog pg. B-8 Crimp Type Connector Splice Caps Open End (100 ct.)	10		$0.00

Special Instructions

Ordered By: Kerry Hitchcock
Project #: 11210-94943

Total	$0.00
Shipping	
Tax	
Invoice Total	$0.00

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:

Summers Elect
Brockton
S.A. Tex.

PO Number: 1015 Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
2/4/93				

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	SAA 1/4 x 2 1/4 ← (~~catalog #~~) Pg 1/4" x 2 1/4" Sleeve Anchors, Acorn Nut Catalog Pg. S-5	1 Box of 100		
2.	Gal. 400 ← (Catalog #) Pg X-16 4" Galvanized Rigid Conduit	1 @ 10'		
3.	2006S ← (Catalog #) Crimp Type Connector Splice Caps - Open End. Pg B-8	10 Boxes @ 100 each Box.		

Special Instructions

Order By: Kerry

Project #: TVA 11210-94943
Decks C, D, E

TOTAL

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 373

PACKING SLIP NUMBER	PAGE
081536301	1

04-FEB-1993, 15:55

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-10150/KERRY		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
04-FEB-1993	04-FEB-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	QTY ORD.	QTY B.O.	QTY SHP.	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
001	10	0	10	GAL 400 4-IN GALV CONDUIT	08-F-6 00110		563.24	C	5[illegible]

SUB TOTAL	:	5[illegible]
FREIGHT	:	[illegible]
TAX	:	[illegible]
TOTAL	:	6[illegible]

#116

FORM #0101-2250 (9

PICKED [illegible] CHECKED [illegible] DATE [illegible] CUSTOMER SIGNATURE Kerry [illegible]

02/10/93 18:14 ☎5128240419 SUMMERS ELEC 002

SUMMERS ELECTRIC

ORIGINAL

A division of SUMMERS ELECTRIC

PACKING SLIP

PACKING SLIP NUMBER	PAGE
081538102	1

10-FEB-1993 16:39

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
5968 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO: OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

CUSTOMER NUMBER	PURCHASE ORDER NUMBER	CONTACT	TYPE
0-10150/KEERY		KERRY	DEL

ORDERED BY	ORDER DATE	SHIP VIA	FOB	BLS	TAX	TERMS
4-FEB-1993	04-FEB-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	ORDERED	BACK ORDER	QTY SHIP	PART NUMBER / DESCRIPTION	BIN LOC / UPC	INST	UNIT PRICE	UM	EXTENDED PRIC
02	100	0	100	SCR SAA1/4X2-1/4 SLEEVE ANCHOR W/ACORN	COUNTER NU		31.52	C	31.5

SUB-TOTAL	31.5
FREIGHT	.0
TAX	2.6
TOTAL	34.1

FORM 40101-2250 B

PICKED BY: CHECKED BY: DATE: CUSTOMER SIGNATURE:

02/10/93 18:13 ☎5128240419 SUMMERS ELEC 001

SUMMERS ELECTRIC

ORIGINAL

PACKING SLIP

PACKING SLIP NUMBER: 081538101

PAGE: 1

04-FEB-1993 17:03

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643600
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT
SAN ANTONIO, TX 78238

SHIP TO: OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER		CONTACT	
0-10159/KEERY		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA		TAX1	TAX2	TERMS
4-FEB-1993	04-FEB-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	QTY ORD	QTY BKO	QTY SHP	PART NUMBER / DESCRIPTION	UPC	UNIT PRICE	UM	EXTENDED PRICE
01	1000	0	1000	BUC 2006S OPEN-END WIRE CONN	18-H-3 45005	5.26	C	52.6

SUB TOTAL	:	52.6
FREIGHT	:	.0
TAX	:	4.3
TOTAL	:	56.9

FORM #0101-225

PICKED BY ED FEB 10 '93 17:11

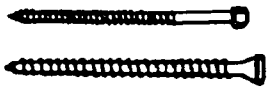
CHECKED BY NL

DATE

CUSTOMER SIGNATURE Amy L. Decker

5128240419 PAGE.001

Concrete Screws
Hex Head

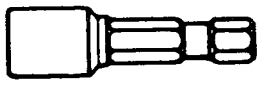


Catalog Number	Description	Quantity	Price
SCH3/16x1-1/4	3/16 x 1-1/4	100	32.89
SHC3/16x1-3/4	3/16 x 1-3/4	100	38.09
SCH3/16x2-1/4	3/16 x 2-1/4	100	47.14
SHC3/16x3-1/4	3/16 x 3-1/4	100	64.91
SHC1/4x1-1/4	1/4 x 1-1/4	100	40.57
SCH1/4x1-3/4	1/4 x 1-3/4	100	47.06
SCH1/4x2-1/4	1/4 x 2-1/4	100	58.49
SCH1/4x2-3/4	1/4 x 2-3/4	100	66.06
SCH1/4x3-3/4	1/4 x 3-3/4	100	86.00
SCH1/4x4	1/4 x 4	100	90.00

Wood Screws, Phillips Flat Head

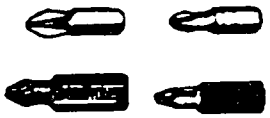
Catalog Number	Description	Quantity	Price
Zinc Plated Wood Screw, Phillips Flat Head			
PFW6x1/2	6 x 1/2	100	1.49
PFW8x3/4	8 x 3/4	100	2.49
PFW10x3/4	10 x 3/4	100	4.20
Brass Wood Screw, Phillips Flat Head			
PFWB6x1	6 x 1	100	16.66

Magnetic Chuck



Catalog Number	Description	Quantity	Price
CHUCK1/4	1/4-1 - 3/4" Long	1	7.06
CHUCK5/16	3/8-1 - 3/4" Long	1	7.37
CHUCK3/8	5/16-1 - 3/4" Long	1	9.37

Bit Tips
Phillips

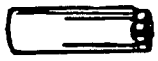


Catalog Number	Description	Quantity	Price
PBT2	No. 2 - 1" Long	5	71.43
PBT3	No. 3 - 1" Long	5	71.23
Magnetic Bit Tip Holder			
MAGBITHLD		1	10.23

Carbide Masonry Bit

Catalog Number	Quantity	Price
MB1/4 x 4	1	3.57

Anchors



Drop In Anchors

Machine Screw Anchors

Nail Drive Anchors

Plastic Conical Anchor

Sleeve Anchor

Wedge Anchor

Catalog Number	Description	Quantity	Price
Drop-In Anchors			
DA1/4x1	1/4x1	100	65.57
DA1/2x2	1/2x2	50	157.86
DA3/8x1-1/2	3/8x1-1/2	100	94.20
E-Z Anchors			
E-ZANCHORS		50	57.09
Hollow Wall Anchors			
HWA1/8S	1/8 S	100	35.71
HWA3/16S	3/16 S	50	82.57
HWA1/4S	1/4 S	50	97.43
HWA1/8L	1/8L	100	42.54
Hollow Wall Drive Anchors, Combo Phillips & Slotted Head			
HWDA1/8LD	1/8 LD	100	47.57
HWDA1/8SD	1/8 SD	100	42.00
Machine Screw Anchors			
MSA6-32	6-32	100	28.00
MSA8-32	8-32	100	28.63
MSA10-24	10-24	100	32.17
MSA1/4-20	1/4-20	100	44.57
MSA5/16-18	5/16-18	50	77.71
MSA3/8-16	3/8-16	50	112.00
MSA1/2-13	1/2-13	50	165.94
Nail Drive Anchors, Truss Head			
NDAT1/4x3/4	3/4	100	20.17
NDAT1/4x1	1	100	23.80
NDAT1/4x1-1/4	1-1/4	100	28.63
NDAT1/4x1-1/2	1-1/2	100	32.37
PE Plastic Yellow Conical Anchors			
PAPE1/4x1-1/4	1/4 x 1-1/4	100	6.17
Plastic Conical Anchors			
PA8-10x7/8	8-10x7/8	1	4.86
PA10-12x1	10-12x1	1	5.06
PA14-16x1-3/8	14-16 x 1-3/8	1	6.49
Plastic Toggle Anchor			
PTATB	TB	100	26.43
PTATC	TC	100	31.11
Nylon Nail Anchors, Mushroom Head			
PNAM1/4x3	1/4 x 3	100	39.77
Nylon Nail Anchors, Round Head			
PNAR1/4x1	1/4 x 1"	100	14.66
PNAR1/4x1-1/2	1/4 x 1-1/2"	100	18.00
Sleeve Anchors, Acorn Nut			
SAA1/4x1-3/8	1/4 x 1-3/8	100	35.86
SAA1/4x2-1/4	1/4 x 2-1/4	100	42.06
Sleeve Anchors, Hex Nut			
SAH3/8x1-7/8	3/8 x 1-7/8	50	64.94
SAH3/8x3	3/8 x 3	50	84.94

RIGID

Galvanized Rigid Conduit

Catalog Number	Size	Weight Per 100'	Standard Package	Price Per 100
Gal 050	1/2	79	100	118.68
Gal 075	3/4	105	50	147.02
Gal 100	1	153	50	213.06
Gal 125	1-1/4	201	10	271.26
Gal 150	1-1/2	249	10	339.76
Gal 200	2	332	10	441.22
Gal 250	2-1/2	527	10	756.90
Gal 300	3	683	10	937.56
Gal 350	3-1/2	831	10	1152.58
Gal 400	4	972	10	1362.96

Intermediate Metal Conduit

Catalog Number Type and Size	Weight Per 100'	Standard Package	Price Per 100
IMC 050	60	100	92.14
IMC 075	82	50	106.38
IMC 100	116	50	157.90
IMC 125	150	10	201.78
IMC 150	182	10	235.70
IMC 200	242	10	322.10
IMC 250	401	10	650.46
IMC 300	493	10	838.28
IMC 350	573	10	979.20
IMC 400	638	10	1157.64

Galvanized Conduit 90° Ells

ELL (ELS)

Catalog Number Type and Size	Lbs. 100	Carton Quantity	Price Per 100
ELL 050GAL90	78	50	927.08
ELL 075GAL90	111	50	1120.72
ELL 100GAL90	191	20	1656.08
ELL 125GAL90	312	20	2394.80
ELL 150GAL90	424	10	2859.82
ELL 200GAL90	658	10	4207.38
ELL 250GAL90	1177	1	6939.88
ELL 300GAL90	1850	1	10374.86
ELL 350GAL90	2578	1	17971.32
ELL 400GAL90	3216	1	208.46/EA

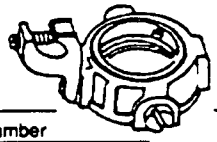
Galvanized Conduit Couplings

Catalog Number	Size	Lbs. 100	Carton Quantity	Price Per Full Carton or More
CPL050	1/2	13	100	276.86
CPL075	3/4	21	50	339.58
CPL100	1	31	30	479.02
CPL125	1-1/4	39	25	599.02
CPL150	1-1/2	56	25	756.28
CPL200	2	73	20	999.62
CPL250	2-1/2	190	25	2215.86
CPL300	3	238	20	3026.20
CPL350	3-1/2	356	18	4044.48
CPL400	4	318	12	4075.02

Plastic Insulated Bushings

Catalog Number Bridgeport	Appleton	Size	Carton Quantity	Price Per 100
321	BBU50	1/2"	100	23.00
322	BBU75	3/4"	100	35.50
323	BBU100	1"	50	67.00
324	BBU125	1-1/4"	25	90.90
325	BBU150	1-1/2"	25	116.20
326	BBU200	2"	25	213.20
327	BBU250	2-1/2"	10	430.00
328	BBU300	3"	10	480.80
329	BBU350	3-1/2"	5	590.70
330	BBU400	4"	1	720.20

Insulated Throat Grounding Bushings



Catalog Number Bridgeport	Gedney	Union	Size	Price Per 100
381	BLG0504	96-12	1/2"	640.20
382	BLG0704	96-34	3/4"	791.00
383	BLG1104	96-1	1"	951.50
384	BLG1204	96-114	1-1/4"	840.40
385	BLG1504	96-112	1-1/2"	880.90
386	BLG2004	96-2	2"	1151.10
387	BLG2604	96-212	2-1/2"	1860.20
388	BLG3104	96-3	3"	2650.00
389	BLG3604	96-312	3-1/2"	3301.00
390	BLG4104	96-4	4"	4200.00

Appleton

Catalog Number	Size	Carton Quantity	Price Per 100
GIB50L	1/2	50	550.00
GIB75L	3/4	50	704.00
GIB100L	1	25	782.00
GIB125L	1-1/4	25	1084.00
GIB150L	1-1/2	25	1184.00
GIB200L	2	10	1578.00
GIB250L	2-1/2	5	2806.00
GIB300L	3	5	3670.00
GIB350L	3-1/2	5	4520.00
GIB400L	4	2	5566.00

Male Insulating Bushings - No Locknuts

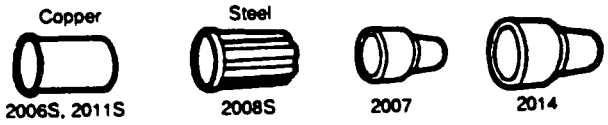
Union

Catalog Number	Size	Carton Quantity	Price Per 100
1-12	1/2"	50	168.00
1-34	3/4"	50	203.40
1-1	1"	20	263.20
1-114	1-1/4"	10	309.60
1-112	1-1/2"	5	406.60
1-2	2"	4	491.20
1-212	2-1/2"	4	829.60
1-3	3"	4	1228.60
1-312	3-1/2"	4	1337.20
1-4	4"	4	1919.00

Pre-Insulated Splice Caps

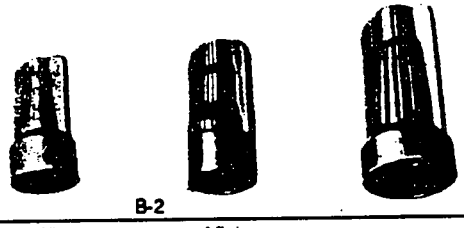
Catalog Number	Description	Carton Quantity	Price Per 100
2002	Splice Connector	50	22.72

Splice Caps and Insulators



Catalog Number	Wire Range	Minimum Quantity	Unit	Price
Crimp Type Connector Splice Caps - Open End				
2006S	2#18 - 2#12	100	C	8.52
2006SB	Bulk	10M	M	76.12
2008S	2#18 - 2#12	100	C	8.78
2011S	4#12 or 2#10	50	C	22.56
Snap-On Insulators For:				
2007	2006S, 2008S	100	C	16.62
2007B	Bulk	10M	M	145.18
2014	2011S	50	C	34.68

B-Cap Wire Connectors



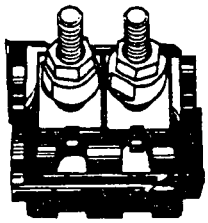
Catalog Number	Wire Range	Minimum Quantity	Unit	Price
B-Caps Packaged in Cartons				
B1 - 1	24 - 12 Yellow	100	C	12.44
B2 - 1	22 - 8 Red	100	C	16.70
B4 - 1	12 - 6 Blue/G	50	C	37.96
B-Caps Packed Bags Inside Bucket				
B1 - 25	24 - 12 Yellow	2500	M	116.80
B2 - 25	22 - 8 Red	2500	M	153.00
B-Caps Packed In Bags				
B1B	24 - 18 Yellow	500	M	101.54
B2B	22 - 18 Red	500	M	133.34
B4B	22 - 6 Blue/G	250	M	304.80

Non-Metallic Cable Connectors

Compare the ease of the "Nifty 1050" with screw-type connectors. With the "Nifty 1050" there are no screws, lock nuts, or clamps to handle or work loose. Every installation is tight, vibration-proof, and rust-proof.

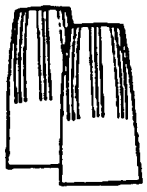
Catalog Number	Description	Price Per 100
NM Cable Connector - One Piece		
1050	Plier Crimp Type	34.80

B-Tap Cable Connectors



Catalog Number	Wire Range	Price Each
BTC3/0-12	3/0 - 12	13.86
BTC350-10	350 - 10	48.00
BTC350-2/0	350 - 2/0	64.28
BTC4/0-6	4/0 - 6	24.42
BTC500-4	500 - 4	69.94

N-Cap Wire Connectors



Catalog Number	Color	Wire Range	Price Each
N1-1	Grey	22 - 14	6.98
N2-1	Blue	22 - 14	7.78
N3-1	Orange	22 - 14	9.18
N4-1	Yellow	18 - 12	10.58
N6-1	Red	18 - 10	15.58
N8-1	Grey	18 - 8	30.98
N1-B	Grey	22 - 14	55.90
N2-B	Blue	22 - 14	65.90
N3-B	Orange	22 - 14	81.90
N4-B	Yellow	18 - 12	91.90
N6-B	Red	18 - 10	127.90

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME Omega Point Labs
CLIENT/PROJECT NUMBER 11210-94943
RECEIVED FROM Summers Elect
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1259 . 11210
DATE RECEIVED 2-18-93
DATE INSPECTED 2-18-93
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	QUANTITY Rec'd	QUANTITY B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	ACCEPTANCE Hold	ACCEPTANCE Reject	REMARKS
Kindorf Channel w/ holes	1016Q	20'	20'		KIN B907	Y		Good	None	X			
2" stl Cond body cover		2	2		APP K200	Y		Good	None	X			
2" neoprene gasket		2	2		APPGK200N	Y		Good	None	X			

FORM
1/29/93

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

PURCHASE ORDER

Vendor:

Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1016-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
2/9/93	UPS			

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1. ✓	B 907-10 Catalog pg. K-2 Kindorf Channel 10' of 1 1/2" x 3/4" x 14 ga.	2		$0.00
2.	LL 200-M Catalog pg. A-17 Form 35 Malleabel Iron Unilet Conduit Outlet Bodies	2		$0.00
3. ✓	APP GK200N Catalog pg. A-18 2" Neoprene Gasket	2		$0.00
4. ✓	APP K200 Catalog pg. A-18 Metal Covers Blank Cast Malleable	2		$0.00

Special Instructions

Ordered By: Kerry Hitchcock
Project #: 11210-94943

Total	$0.00
Shipping	
Tax	
Invoice Total	$0.00

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:
Summers Elect
Brockton.

PO Number: 1016 Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 6868 Alamo Downs Parkway San Antonio, TX 78238	Omega Point Laboratories, Inc. 6868 Alamo Downs Parkway San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
2-9-93	ups			

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	B 907-10 Kindorf Channel 1½" x ¾" x 14 ga. Pg K-2	2 @ 10' each		
2.	LL 200-m Pg A-17 Form 35 Malleable Iron Unilet Conduit Outlet Bodies.	2		
3.	~~GK 200 N~~ APP GK200N 2" Neoprene Gasket Pg A-18	2		
4. ✓	~~K200 CM~~ APP K200 Metal Covers Blank Cast Malleable Pg A-18	2		

Special Instructions

Order By: Kerry

Project #: TVA. 11210-94543

TOTAL

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 382

PACKING SLIP NUMBER	PAGE
081586502	1

09-FEB-1993, 08:53

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO: OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO	JOB NAME	CONTACT	TYPE
PO-10160/KERRY		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
09-FEB-1993	09-FEB-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	QTY ORD	QTY B/O	QTY SHIP	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
002	2	0	2	APP GK200N 2-IN NEOPRENE GASKET	29-A-2 43410		2.87	E	5

SUB TOTAL	:	5
FREIGHT	:	
TAX	:	
TOTAL	:	5

FORM #0101-2250 (9-9

PICKED | CHECKED | DATE | CUSTOMER SIGNATURE

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP

383

PACKING SLIP NUMBER	PAGE
091586501	1

09-FEB-1993, 08:4[illegible]

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO: OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-10160/KERRY		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
09-FEB-1993	09-FEB-1993	Our Truck	PC	770	000	10th, Net 20th

LINE	QTY ORD	QTY B/O	QTY SHIP	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	INST	UNIT PRICE	UM	EXTENDED PRICE
001	20	0	20	KIN B907-10 B906 CHNL W/HOLES	09-P 75558		99.00	C	19[illegible]

SUB TOTAL	:	19[illegible]
FREIGHT	:	
TAX	:	[illegible]
TOTAL	:	21[illegible]

FORM #0101-2250 (9-92)

PICKED [illegible] CHECKED [illegible] DATE CUSTOMER SIGNATURE Richard Beasley

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP

384

PACKING SLIP NUMBER	PAGE
[illegible]	

FROM:
1101 ST. EMANUAL
HOUSTON, TX 77002

03-FEB-1993, 08:50

SOLD TO:
08643800
OMEGA POINT LABORATORIES
6868.ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78228

SHIP TO:
OMEGA POINT LABORATORIES
6858 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78228

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
[illegible]-1016D/KERRY		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
[illegible]-FEB-1993	03-FEB-1993	UPS Red	[illegible]	[illegible]	[illegible]	10th net [illegible]

LINE	QTY. ORD.	QTY. B.O.V.	QTY. SHIP	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
001	2	0	2	APP K200 2-IN STL COND BODY COVER 47140			5.10	E	

MUST SEND UPS RED FOR SURE TODAY

SUB TOTAL	:
FREIGHT	:
TAX	:
TOTAL	:

FORM #0101-2235 (12

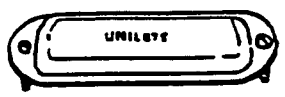
PICKED [illegible] CHECKED [illegible] DATE 2/1/93 CUSTOMER SIGNATURE

Form 35 Malleable Iron Unilet Conduit Outlet Bodies *(continued)*

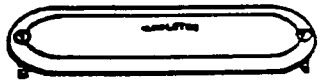
Type LB		
LB300-M	3	178.50
LB350-M	3-1/2	292.20
LB400-M	4	329.76
LB500-M	5	855.28
LB600-M	6	1379.16
Type LL		
LL50-M	1/2	9.56
LL75-M	3/4	11.46
LL100-M	1	17.24
LL125-M	1-1/4	29.80
LL150-M	1-1/2	35.38
LL200-M	2	58.32
LL250-M	2-1/2	133.90
LL300-M	3	178.50
LL350-M	3-1/2	292.20
LL400-M	4	356.32
Type LR		
LR50-M	1/2	9.56
LR75-M	3/4	11.46
LR100-M	1	17.24
LR125-M	1-1/4	29.80
LR150-M	1-1/2	35.38
LR200-M	2	58.32
LR250-M	2-1/2	144.70
LR300-M	3	178.50
LR350-M	3-1/2	292.20
LR400-M	4	329.76
Type LRL		
LRL50-M	1/2	13.06
LRL75-M	3/4	15.90
LRL100-M	1	21.02
LRL125-M	1-1/4	44.34
LRL150-M	1-1/2	60.80
LRL200-M	2	87.54
Type T		
T50-M	1/2	11.96
T75-M	3/4	14.36
T100-M	1	21.52
T125-M	1-1/4	31.56
T150-M	1-1/2	42.08
T200-M	2	65.02
T250-M	2-1/2	140.78
T300-M	3	185.18
T350-M	3-1/2	344.04
T400-M	4	385.52
Type TA		
TA50-M	1/2	19.86
TA75-M	3/4	25.56
TA100-M	1	33.52
Type TB		
TB50-M	1/2	12.90
TB75-M	3/4	15.78
TB100-M	1	22.46
TB125-M	1-1/4	33.96
TB150-M	1-1/2	44.46
TB200-M	2	69.78
Type X		
X50-M	1/2	17.42
X75-M	3/4	18.84
X100-M	1	30.88
X125-M	1-1/4	40.14
X150-M	1-1/2	51.74
X200-M	2	108.46

Covers and Gaskets for Form 35 Unilet Conduit Outlet Bodies

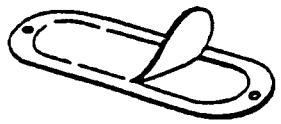
Covers Furnished with Stainless Steel Fastening Screws



Domed Cover



Flat Cover



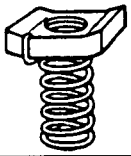
Neoprene Gasket
Tear out inner perforated section to convert to "open type" gasket.

Composite Fiber Gaskets

Catalog Number	Size	Price Each
Metal Covers - Blank Stamped Steel		
K50	1/2	2.98
K75	3/4	3.50
K100	1	4.30
K125	1-1/4	5.74
K150	1-1/2	5.74
K200	2	*0.13
K250	2-1/2	*5.94
K300	3	*5.94
K350	3-1/2	*8.73
K400	4	*8.73
K500	5	*73.26
K600	6	*44.30
Metal Covers - Blank Cast Malleable		
K50-CM	1/2	4.44
K75-CM	3/4	6.44
K100-CM	1	8.60
K125 & 150CM	1-1/4, 1-1/2	*13.64
K200-CM	2	*6.88
K250-CM	2-1/2	*9.76
K300-CM	3	*9.76
K350-CM	3-1/2	35.26
K400-CM	4	35.26
Solid Gaskets - Neoprene		
GK50-N	1/2	2.98
GK75-N	3/4	2.88
GK100-N	1	3.82
GK125-N	1-1/4	4.80
GK150-N	1-1/2	4.80
GK200-N	2	5.74
GK250-N	2-1/2	*0.54
GK300-N	3	*0.54
GK350-N	3-1/2	*1.96
GK400-N	4	*1.96
Solid Gaskets - Neoprene Not Perforated		
GK500-SN	5	36.00
GK600-SN	6	56.84
Solid Gaskets - Composition Fiber		
GK50-V	1/2	3.40
GK75-V	3/4	3.40
GK100-V	1	3.82
GK125-V	1-1/4	5.68
GK150-V	1-1/2	5.68
GK200-V	2	6.80
GK250-V	2-1/2	9.56
GK300-V	3	9.56
GK350-V	3-1/2	11.94
GK400-V	4	11.94

Steel Nut

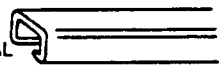
B910

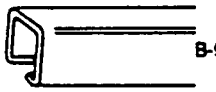

B911

Catalog Number	Thread Size	Price Per 100
Without Springs - For All Channels		
B910-1/4	1/4	120.60
B910-5/16	5/16	136.00
B910-3/8	3/8	132.60
B910-1/2	1/2	135.70
Without Springs - For All Channels and Spot-Type Concrete Inserts		
B914-1/4	1/4	118.00
B914-3/8	3/8	124.20
B914-1/2	1/2	131.40
B914-3/4	3/4	202.40
With Springs - For 1-1/2" Deep Channel		
B911-1/4	1/4	139.50
B911-5/16	5/16	185.40
B911-3/8	3/8	162.50
B911-1/2	1/2	162.80
With Springs - For 3/4" Deep Channels		
B912-1/4	1/4	150.60
B912-5/16	5/16	185.40
B912-3/8	3/8	165.90
B912-1/2	1/2	193.00

Channels

B-906
B-906-AL

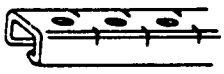


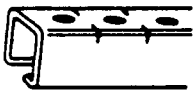


B-900 (12 ga.)
B-900-M (14 ga.)
B-900-AL

17/32" dia. bolt holes on 1-1/2"

B-907

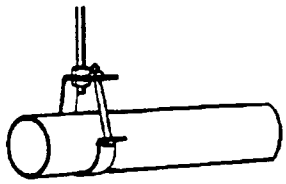




B-905 (12 ga.)
B-905-M (14 ga.)

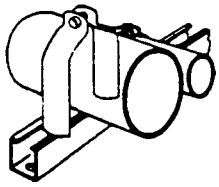
Catalog Number	Dimensions	Price Per 100 Feet
Solid Base		
B900-10	1-1/2" x 1-1/2" x 12 ga.	533.10
B900-20	1-1/2" x 1-1/2" x 12 ga.	500.20
B906-10	1-1/2" x 3/4" x 14 ga.	325.40
B906-20	1-1/2" x 3/4" x 14 ga.	325.40
17/32"Diameter Bolt Holes On 1 1/2" Centers, 3/4" From End		
B905-10	1-1/2" x 1-1/2" x 12 ga.	581.80
B905-20	1-1/2" x 1-1/2" x 12 ga.	581.80
B907-10	1-1/2" x 3/4" x 14 ga.	377.50
B907-20	1-1/2" x 3/4" x 14 ga.	377.50

Lay-In Pipe Hanger



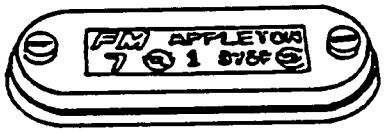
Catalog Number	Size	Hanger Rod Size	Price Per 100
C149-1/2	1/2	1/4	302.80
C149-3/4	3/4	1/4	326.60
C149-1	1	1/4	401.60
C149-1-1/4	1-1/4	1/4	466.80
C149-1-1/2	1-1/2	1/4	543.60
C149-2	2	1/4	553.90
C149-2-1/2	2-1/2	3/8	721.40
C149-3	3	3/8	720.00
C149-3-1/2	3-1/2	3/8	876.00
C149-4	4	3/8	1648.10
C149-5	5	3/8	2003.20

Single Bolt Channel Pipe Straps

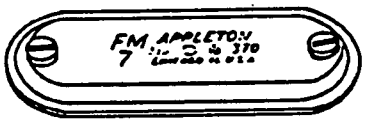


Catalog Number	Size	Steel Thickness	Price Per 100
Galv-Krom Straps			
C105-3/8	038	14 ga.	165.20
C105-1/2	050	14 ga.	146.50
C105-3/4	075	14 ga.	163.70
C105-1	100	14 ga.	177.50
C105-1-1/4	125	14 ga.	203.70
C105-1-1/2	150	12 ga.	225.30
C105-2	200	12 ga.	244.60
C105-2-1/2	250	12 ga.	309.30
C105-3	300	12 ga.	334.30
C105-3-1/2	350	1/8	418.30
C105-4	400	1/8	460.00
C105-5	500	1/8	656.00
C105-6	600	1/8	834.40
EMT Straps			
C106-1/2	050	14ga	146.30
C106-3/4	075	14ga	164.60
C106-1	100	14ga	179.30
C106-1-1/4	125	14ga	196.00
C106-1-1/2	150	14ga	218.80
C106-2	200	14ga	233.50

FM7 Blank Covers and Gaskets



Cast Grayloy-Iron Cover



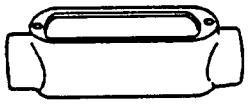
Stamped Steel Cover

Solid Gasket

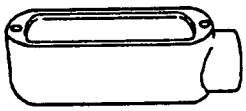
Catalog Number	Body Size	Price Each
Cast Grayloy-Iron Cover		
170F	1/2	4.46
270F	3/4	5.42
370F	1	8.60
470F	1-1/4	11.46
570F	1-1/2	11.46
670F	2	16.88
870F	2-1/2	19.76
870F	3	19.76
970F	3-1/2	29.58
970F	4	29.58
Cast Grayloy-Iron Cover with Gasket		
170FG	1/2	8.64
270FG	3/4	9.86
370FG	1	14.78
470FG	1-1/4	19.32
570FG	1-1/2	19.32
670FG	2	26.90
870FG	2-1/2	34.86
870FG	3	34.86
970FG	3-1/2	49.64
970FG	4	49.64
Stamped Steel Cover		
170	1/2	2.90
270	3/4	3.50
370	1	4.80
470	1-1/4	5.76
570	1-1/2	5.76
670	2	10.18
870	2-1/2	15.94
870	3	15.94
970	3-1/2	18.78
970	4	18.78
Solid Gasket		
GASK571	1/2	2.88
GASK572	3/4	2.88
GASK573	1	3.82
GASK574	1-1/4	4.80
GASK575	1-1/2	4.80
GASK576	2	5.74
GASK578	2-1/2	9.56
GASK578	3	9.56
GASK579	3-1/2	12.08
GASK579	4	12.08

Form 35 Malleable Iron Unilet Conduit Outlet Bodies

Threaded Type for use with Rigid Metal Conduit and IMC



Type C



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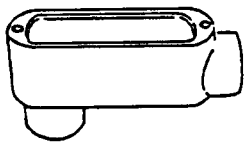

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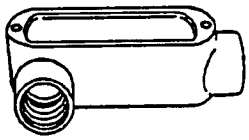

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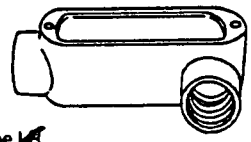

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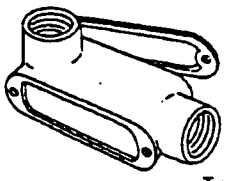

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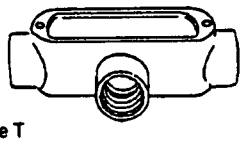

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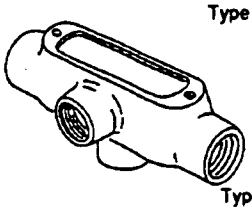
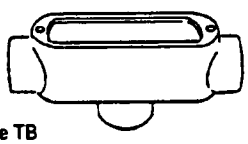
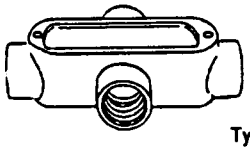


Type TA



Type TB



Type X

Catalog Number	Hub Size	Price Each
Type C		
C50-M	1/2	9.56
C75-M	3/4	11.46
C100-M	1	17.20
C125-M	1-1/4	29.80
C150-M	1-1/2	38.86
C200-M	2	64.06
C250-M	2-1/2	133.90
C300-M	3	178.50
C350-M	3-1/2	292.20
C400-M	4	329.76
Type E		
E50-M	1/2	12.10
E75-M	3/4	18.96
E100-M	1	20.88
Type LB		
LB50-M	1/2	9.56
LB75-M	3/4	11.46
LB100-M	1	17.20
LB125-M	1-1/4	29.80
LB150-M	1-1/2	38.86
LB200-M	2	64.04
LB250-M	2-1/2	133.90

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME Omega Point Labs
CLIENT/PROJECT NUMBER TVA
RECEIVED FROM Summers Electric
PROJECT LOCATION OPL

REPORT NUMBER 1213 / OPL
DATE RECEIVED 10/13/92 + 10/20/92
DATE INSPECTED 10/13/92 + 10/20/92
INSPECTED BY: C. Patton

ITEM DESCRIPTION	P.O. NO. OR ORDER NO.	QUANTITY			I.D. NO.	CNTRL MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Conduit, Coupling & Wire	9247Q					Y	Y	Good	None	X			received all fittings + conduit

FORM
1/4/89

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:

Pete
Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 9247Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
10/8/92				

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	5" MALL LB COND BODY	6		$0.00
2.	1" MALL LB COND BODY	6		$0.00
3.	5" SHORT RADIUS 90° ELBOW	6		$0.00
4.	1" SHORT RADIUS 90° ELBOW	6		$0.00
5.	2" SHORT RADIUS 90° ELBOW	6		$0.00
6.	5" RIGID CONDUIT	90'		$0.00
7.	1" RIGID CONDUIT	120'		$0.00
8.	2" RIGID CONDUIT	60'		$0.00
9.	5" COUPLING-GALV	6		$0.00
10.	1" COUPLING-GALV	6		$0.00
11.	2" COUPLING-GALV	6		$0.00
12.	#8 COPPER BARE WIRE *	500'		$0.00
	"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."			
	QA Approval C Patton			
	Date 10/8/92			

Special Instructions

INCLUDE CERTIFICATES OF COMPLIANCE

Order By: KERRY HITCHCOCK

Project #: TVA

TOTAL $0.00

ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

SLIP 330

PACKING SLIP NUMBER	PAGE
16470[illegible]501	

20-OCT-1992. 09:19

FROM:
2400 BROCKTON
SAN ANTONIO. TX 78217

SOLD TO:
08642800
OMEGA POINT LABORATORIES
8868 ALAMO DOWNS PARKWAY

SAN ANTONIO. TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
8868 ALAMO DOWNS PARKWAY

SAN ANTONIO. TX 78238

CUSTOMER	NAME	CONTACT	TYPE
[illegible]		KEVIN	[illegible]

ORDER DATE	[illegible]	[illegible]	SLSM	TAX	[illegible]
[illegible]	20-OCT-1992	[illegible]	[illegible]	[illegible]	Not [illegible]

LINE	[illegible]	[illegible]	PART NUMBER	[illegible]	BIN LOC	[illegible]	EXTENDED PRICE
			DESCRIPTION		UPC		
20	0	30	GFL 100 1-IN GALV CONDUIT		09-F-2 00133		

PICKED BY [illegible] CHECKED BY [illegible] DATE CUSTOMER SIGNATURE [signature]

FORM #0101-2250 (9-9

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 391

PACKING SLIP NUMBER	PAGE
325715301	1

10-FEB-1993, 10:48

.OM: 8860 SCRANTON
HOUSTON, TX 77075

SOLD TO:
08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
1016Q PO-KERRY		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
10-FEB-1993	10-FEB-1993	Our Truck	PC	778	000	10th. Net 20th

LINE	QTY ORD	QTY BO	QTY SHP	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
001	2	0	2	APP LL200-M 2-IN MALL LL COND BODY	48050		32.34	E	64
				NEED TO SEND UPS RED TODAY PLEASE					
							SUB TOTAL	:	64
							FREIGHT	:	
							TAX	:	5
							TOTAL	:	70

FORM # 0101-2247 (9-

PICKER CHECKED DATE CUSTOMER

ELECTRIC

CUSTOMER

SLIP 392

SLIP NUMBER	PAGE
15[illegible]	1

FROM:
2400 BRUCKTON
SAN ANTONIO, TX 78217

19-OCT-1992, 11:36

SOLD TO:
02642800
OMEGA POINT LABORATORIES
6822 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78228

SHIP TO:
OMEGA POINT LABORATORIES
6822 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78228

CUSTOMER PO	CONTACT	
--28/W KERRY HITCH		DEL

ORDER DATE						
-OCT-1992	08-OCT-1992	Our Truck	PC	778	000	Intn. Net 20th

LINE	QTY. ORD		DESCRIPTION			EXTENDED PRICE
	0		SHAP 4200-EN		Y	2

Freight, if applicable, to be billed later

FORM 89101-2234 (12-9

PICKED BY [illegible] CHECKED BY [illegible] DATE CUSTOMER SIGNATURE [illegible]

ELECTRIC

CUSTOMER

A division of SUPPLIERS GROUP

SLIP 393

PACKING SLIP NUMBER	PAGE
164540700	

FROM:
2400 BRUCKTON
SAN ANTONIO, TX 78217

16-OCT-1992, 10:32

SOLD TO:
08643800
OMEGA POINT LABORATORIES
8868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
8868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER			
1224 W KERRY HITCH			DEL
ORDER DATE			
08-OCT-1992	Own Truck	PP	120.000 10th Net 30th

LINE	QTY. ORD.	QTY. SHIP.	DESCRIPTION	UNIT PRICE	EXTENDED PRICE
	500	0	500 13" BARE B E'X		

Freight, if applicable, to be billed later

PICKED BY Rick CHECKED BY Rick DATE

CUSTOMER SIGNATURE Kerry Hitchcock

FORM 60101-2234 (12-

ELECTRIC

CUSTOMER

A division of

PACKING SLIP 334

PACKING SLIP NUMBER	PAGE
[illegible]	

FROM:
2400 BRUCKTON
SAN ANTONIO, TX [illegible]

10-OCT-1992 14:[illegible]

SOLD TO:
[illegible]
OMEGA POINT LABORATORIES
8828 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX [illegible]

SHIP TO:
OMEGA POINT LABORATORIES
8828 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX [illegible]

CUSTOMER PO NUMBER					
[illegible]					

ORDER DATE	SHIP DATE							
[illegible]	08-OCT-1992	[illegible]						

LINE	QTY. ORD.	QTY. BO	QTY. SHP	DESCRIPTION	BIN LOC	UNIT PRICE	EXTENDED PRICE
				APP [illegible] 1-IN SMALL LB COND BODY		4/[illegible]	
				APP [illegible]			
				APP [illegible]			
				KIT [illegible] 1-IN VEU BRACKET	29-[illegible]	4[illegible]	
				APP LB100-M 1-IN SMALL LB COND BODY	29-B-2	4/600	
				APP K100 1-IN STL COND BODY COVER	29-B-1	4/[illegible]	
				GAL 100 1-IN GALV CONDUIT	08-F-1	[illegible]	
				GAL 100 1-IN GALV CONDUIT	08-F-1	0010[illegible]	
				UPL 100 GALV UPLB	30-C-4	00[illegible]	
				UPL 200 GALV UPLB	30-C-4	00[illegible]	
				[illegible] 1-IN GALV CONDUIT		00[illegible]	

FORM #0101-2234 (1[illegible]

PICKED BY [illegible] CHECKED BY [illegible] DATE CUSTOMER SIGNATURE [illegible]

ELECTRIC

CUSTOMER

A division of

SLIP 395

PACKING SLIP NUMBER	PAGE
[illegible]	

FROM:
2400 BROCKTON
SAN ANTONIO, TX 78217

[illegible]

SOLD TO:
08643600
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78228

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78228

8HF
SEP 30
1930
43

CUSTOMER PURCHASE ORDER NUMBER			CARRIER	TERMS
[illegible] W/KERRY HITCH				

ORDER DATE	SHIPPED DATE	SHIPPED VIA					Net Date
[illegible]	06-OCT-1992	OUR TRUCK					

LINE	ORD.	SHIP.	BACK ORD.	QTY. SHIP.	PRODUCT NUMBER / DESCRIPTION	UNIT PRICE		EXTENDED PRICE
[illegible]	6	0		6	ELB 100 GAL 90 ELBLW	[illegible]		[illegible]
[illegible]	6	0		6	ELB 200 GAL 90 ELBLW	[illegible]		[illegible]
[illegible]	6	0		6	CPL 300 GALV CPLG	[illegible]	Y	[illegible]
[illegible]	500	500		0	CUP BARE E STR			[illegible]
[illegible]	6	0		6	ELB 500 GAL 90 24" HDG ELBOW 24"RAD		Y	[illegible]

Freight, if applicable, to be billed later

12/1/92

PICKED BY [illegible] CHECKED BY [illegible] DATE CUSTOMER SIGNATURE [illegible]

FORM #0101-2234 (12-9

GOLD S[illegible]R DELIVERY, INC.

DELIVERY TICKET
0176496

2100 DENTON DR., SUITE #104
AUSTIN, TEXAS 78758
(512) 339-7122

2401 BROCKTON
SAN ANTONIO, TEXAS 78217
(512) 822-4653

DATE 10-12-92

DELIVERY CHARGES: ☑ PREPAID ☐ COLLECT ☐ BILL TO

BUS/AIRLINE CHARGES: ☐ PREPAID ☐ COLLECT

C.O.D.

TYPE OF DELIVERY: ☐ GOLD RUSH ☑ 1hr. ☐ 2hr. ☐ 4hr.

SHIPPER'S NO.	[illegible]	CONSIGNEE'S NO.
SHIPPER	[illegible]	CONSIGNEE: OMEGA JOINT LABS
ADDRESS	[illegible]	ADDRESS: (x 6) [illegible] DOWN
CITY	SAN ANTONIO, TX [illegible]	CITY: SAT
ATTENTION OR RM. NO.		ATTENTION OR RM. NO.

NO. PCS.	DESCRIPTION AND MARKS	WEIGHT
1	[illegible]	1130
2	[illegible]	

BILL TO

NOT RESPONSIBLE FOR CLAIMS AFTER 48 HOURS
NOT RESPONSIBLE FOR CONCEALED DAMAGE
DUE AND PAYABLE IN AUSTIN, TRAVIS COUNTY.

$50 Declared Value
Unless specified here

C.O.D. AMOUNT $

DRIVER [illegible] UNIT # 111

DRIVER UNIT #

RECEIVED (IN GOOD CONDITION)
BY [illegible]

TOTAL →

SUMMERS ELECTRIC

October 15, 1992

CERTIFICATION OF COMPLIANCE

Omega point Labs
6868 Alamo Downs Pkarway
San Antonio, Texas 78238
Attn: Kerry

Customer Order No. 9247Q

Materials: Misc. electrical conduit and fittings.

Item No.	Qty Ordered	Description
1.	6	5" Mall LB Cond Body
2.	6	1" Mall LB Cond Body
3.	6	5" Short Radius 90 Elbow
4.	6	1" Short Radius 90 Elbow
5.	6	2" Short Radius 90 Elbow
6.	90'	5" Rigid Conduit
7.	120'	1" Rigid Conduit
[illegible]	60'	2" Rigid Conduit
[illegible]	6	5" Coupling - Galv
10.	6	1" Coupling - Galv
11.	6	2" Coupling - Galv
12.	500'	#8 Copper Bare Wire

This is to certify that the materials shipped to fill the above order has been manufactured in accordance with standard manufacturing procedures and specifiction for this product.

SUMMERS ELECTRIC
Pete Hernandez
Pete Hernandez

2400 BROCKTON
SAN ANTONIO, TEXAS 78217

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME: TVA
CLIENT/PROJECT NUMBER: 11210-94943
RECEIVED FROM: Summers Electric
PROJECT LOCATION: Omega Point Labs

REPORT NUMBER: 1250-11210
DATE RECEIVED: 2/2/93
DATE INSPECTED: 2/2/93
INSPECTED BY: C Humphrey

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	QUANTITY Rec'd	QUANTITY B.O.	I.D. NO.	CON'D MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	ACCEPTANCE Hold	ACCEPTANCE Reject	REMARKS
Steel 4" conduit	1006Q	20'	20'	—	GAL 400	Y	Y	N/A	NONE	X			Catalog items. Received in various shipments from Summers Electric. CA
3" steel cond.	"	40'	40'	—	GAL 300	Y	Y	N/A	"	X			
2" steel cond.	"	20'	20'	—	GAL 200	Y	Y	N/A	"	X			
1½" steel cond.	"	20'	20'	—	GAL 150	Y	Y	N/A	"	X			
1" steel cond.	"	20'	20'	—	GAL 100	Y	Y	N/A	"	X			
3" Alum. cond.	"	20'	20'	—	ALC 300	Y	Y	N/A	"	X			
4" steel LB	"	1	1	—	APP LB 400M	Y	Y	Good	"	X			
3" steel LB	"	2	2	—	APP LB 300M	Y	Y	"	"	X			
2" steel LB	"	1	1	—	APP LB 200 M	Y	Y	"	"	X			
1½" steel LB	"	1	1	—	APP LB 150 M	Y	Y	"	"	X			
1" steel LB	"	1	1	—	APP LB 100M	Y	Y	"	"	X			
4" Neoprene Gasket	"	1	1	—	GK 400	Y	Y	"	"	X			
3" "	"	3	3	—	APP GK 300	Y	Y	"	"	X			
2" "	"	1	1	—	APP GK 200	Y	Y	"	"	X			
1½" "	"	1	1	—	APP GK 150	Y	Y	"	"	X			
1" "	"	1	1	—	APP GK 100	Y	Y	"	"	X			

FORM
1/29/93

398

Page 1 of 2

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME: TVA
CLIENT/PROJECT NUMBER: 11210-94943
RECEIVED FROM: Summers Elect.
PROJECT LOCATION: Omega Point Labs

REPORT NUMBER: 1250.11210
DATE RECEIVED: 2/2/93
DATE INSPECTED: 2/2/93
INSPECTED BY: C Humphrey

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	QUANTITY Rec'd	QUANTITY B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	ACCEPTANCE Hold	ACCEPTANCE Reject	REMARKS
4" steel LB cover	10060	1	1	–	APP K-400	Y	Y	Good	None	X			
3" steel LB cover	"	2	2	–	APP K-300	Y	Y	"	"	X			
2" steel LB cover	"	1	1	–	APP K-200	Y	Y	"	"	X			
1½" steel LB cover	"	1	1	–	APP K-150	Y	Y	"	"	X			
1" steel LB cover	"	1	1	–	APP K-100	Y	Y	"	"	X			
3" Aluminum LB	"	1	1	–	ELB 300 ALU 90	Y	Y	"	"	X			
3" Aluminum LB cover	"	1	1	–	K300-A	Y	Y	"	"	X			
4" steel conduit 90° radius	"	1	1	–	ELB 400 GAL 90	Y	Y	N/A	"	X			
3" "	"	2	2	–	ELB 300 GAL 90	Y	Y	N/A	"	X			
2" "	"	1	1	–	ELB 200 GAL 90	Y	Y	N/A	"	X			
1½" "	"	1	1	–	ELB 150 GAL 90	Y	Y	N/A	"	X			
1" "	"	1	1	–	ELB 100 GAL 90	Y	Y	N/A	"	X			
3" Aluminum conduit 90° radius	"	1	1	–	ELB 300 ALU 90	Y	Y	N/A	"	X			
Bare Copper Wire	"	500'	500'	–	COP BARE 8 STR	Y	Y	Good	"	X			

See page 1

FORM 1/29/93

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

PURCHASE ORDER

Vendor:

Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1006-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
1/18/93	Truck-Central		1/18/93	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	4" steel conduit 10' length	2		$0.00
2.	3" steel conduit 10' length	4		$0.00
3.	2" steel conduit 10' length	2		$0.00
4.	1-1/2" steel conduit 10' length	2		$0.00
5.	1" steel conduit 10' length	2		$0.00
6.	3" aluminum conduit 10' length	2		$0.00
7.	4" steel LB w/ gasket & cover	1		$0.00
8.	3" steel LB w/ gasket & cover	2		$0.00
9.	2" steel LB w/ gasket & cover	1		$0.00
10.	1-1/2" steel LB w/ gasket & cover	1		$0.00
11.	1" steel LB w/ gasket & cover	1		$0.00
12.	3" aluminum LB w/ gasket & cover	1		$0.00
	Continued on second page			

Special Instructions

Please include the material certificate of conformance

Page 1 of 2

Ordered By: Kerry Hitchcock
Project #: TVA

Total	$0.00
Shipping	
Tax	
Invoice Total	$0.00

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:

Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1006-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
1/19/93	Truck-Central		1-18-93	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
13.	4" steel conduit 90° radius	1		$0.00
14.	3" steel conduit 90° radius	2		$0.00
15.	2" steel conduit 90° radius	1		$0.00
16.	1-1/2" steel conduit 90° radius	1		$0.00
17.	1" steel conduit 90° radius	1		$0.00
18.	3" aluminum conduit 90° radius	1		$0.00
19.	bare copper - 500' length	1		$0.00
	order total	1	$505.05	$505.05

Special Instructions

Page 2 of 2

Ordered By: Kerry Hitchcock
Project #: TVA

Total	$505.05
Shipping	
Tax	$41.69
Invoice Total	$546.74

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 402

PACKING SLIP NUMBER	PAGE
081231401	

18-JAN-1993, 12:25

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-1006-Q/CARRIE			DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
18-JAN-1993	18-JAN-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	QTY. ORD.	QTY. B.O.	QTY. SHP.	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
002	40	0	40	GAL 300 3-IN GALV CONDUIT	08-F-5 00108		3[illegible]4.71	C	[illegible]
[illegible]	20	0	20	GAL 200 2-IN GALV CONDUIT	08-F-3 00106		192.18	C	[illegible]
004	20	0	20	GAL 150 1-1/2 GALV CONDUIT	08-F-3 00105		140.53	C	[illegible]
005	20	0	20	GAL 100 1-IN GALV CONDUIT	08-F-2 00103		92.80	C	[illegible]
006	2	0	2	Rec'd need 1 APP LB200M 2-IN MALL LB COND BODY	29-B-2 47705		28.00	E	[illegible]
007	2	0	2	Rec'd need 1 APP K200-CM 2-IN MALL COND BODY CVR	29-B-1 47155		8.44	E	[illegible]
008	2	0	2	Rec need 1 APP GK200N 2-IN NEOPRENE GASKET	43410		2.87	E	[illegible]
009	1	0	1	APP LB150M 1-1/2 MALL LB COND BODY	29-B-2 47680		18.00	E	18.
010	1	0	1	APP K125&150 1-1/2 COND BODY COVER	29-A-1 47085		2.87	E	2.
01[illegible]	1	0	1	APP GK125-150N 1-1/4&1-1/2 NEO GSKT	29-B-3 43340		2.40	E	2.
012	1	0	1	APP LB100M 1-IN MALL LB COND BODY	29-B-2 47630		8.60	E	8.

PICKED [illegible] CHECKED [illegible] DATE CUSTOMER SIGNATURE [illegible]

FORM #0101-2250 (9-9

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 403

PACKING SLIP NUMBER	PAGE
081231401	2

18-JAN-1993, 12:23

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-1006-Q/CARRIE			DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
18-JAN-1993	18-JAN-1993	Our Truck	PC	778	000	10th.- Net 20th

LINE	QTY. ORD.	QTY. B.O.	QTY. SHP.	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
013	1	0	1	APP K100 1-IN STL COND BODY COVER	29-A-1 47060		2.40	E	2.
014	1	0	1	APP GK100N 1-IN NEOPRENE GASKET	43310		1.91	E	1.
015	1	0	1	APP LB300-A 3-IN AL LB COND BODY	47735		50.00	E	50.
016	1	0	1	APP K250&300A 3-IN COND BODY COVER	47170		9.48	E	9.
017	1	0	1	APP GK250-300N 2-1/2&3 NEO GSKT	43440		5.27	E	5.
018	1	0	1	ELB 400 GAL 90 4" ELBOW	31-C-3 00170		3,500.00	C	35.
019	2	0	2	ELB 300 GAL 90 3" ELBOW	31-B-3 00168		1,700.00	C	34.
020	1	0	1	ELB 200 GAL 90 2" ELBOW	31-A-3 00166		738.33	C	7.
021	1	0	1	ELB 150 GAL 90 1½" 1-1/2 90D GALV ELBOW	00165		468.43	C	4.
0	1	0	1	ELB 100 GAL 90 1" ELBOW	31-A-3 00163		291.00	C	2.

#116 #116

FORM #0101-2250 (9-92)

PICKED [ ] CHECKED [ ] DATE [ ] CUSTOMER SIGNATURE [ ]

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 404

PACKING SLIP NUMBER	PAGE
081231401	3

18-JAN-1993, 12:25

DM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-1006-Q/CARRIE			DEL

ORDER DATE	SHIPPED DATE	SHIP VIA	FRT	SLS	TAX	TERMS
18-JAN-1993	18-JAN-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	QTY ORD	QTY B.O.	QTY SHIP	PART NUMBER / DESCRIPTION	BIN LOC / UPC	INST	UNIT PRICE	UM	EXTENDED PRICE
023	20	20	0	GAL 400 B/O 4-IN GALV CONDUIT	08-F-6 00110		530.11	C	
0	2	2	0	APP LB300-M B/O 3-IN MALL LB COND BODY	47740	Y	86.00	E	
026	2	2	0	APP K250-300	29-A-1		7.11	E	
027	2	0	2	APP GK250-300N 2-1/2&3 NEO GSKT	43440		5.27	E	10.

SUB TOTAL	:	505.
FREIGHT	:	.
TAX	:	41.
TOTAL	:	546.

Rck #116
Rck #116
#116

FORM #0101-2250 (9-

PICKED [ ] CHECKED BY [ ] DATE [ ] CUSTOMER SIGNATURE [ ]

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 405

PACKING SLIP NUMBER	PAGE
3477036-02	1

18-JAN-1993, 12:38

FROM: 1101 ST. EMANUAL
HOUSTON, TX 77002

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-1006-G/CARRIE		CARRIE	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
13-JAN-1993	18-JAN-1993	Best Way UPS	PC	778	000	10th. Net 20th

LINE	QTY ORD	QTY BO	QTY SH	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
002	1	0	1	APP LB400-M 4-IN MALL LB COND BODY 47760			188.13	E	188
				PLEASE SEND OUT TODAY IF POSSIBLE ON FRT TRUCK					
							SUB TOTAL	:	188
							FREIGHT	:	
							TAX	:	12
							TOTAL	:	200

FORM # 0101-2247

PICKED CHECKED DATE 1-18-93 CUSTOMER SIGNATURE

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKIN SLIP

406

PACKING SLIP NUMBER	PAGE
34770[illegible]601	

15-JAN-1993, 12[illegible]

FROM: 1101 ST. EMANUAL
HOUSTON, TX 77002

SOLD TO: 08642800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO: OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

W/ 34770 3602

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-1006-D/CARRIE		CARRIE	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
18-JAN-1993	18-JAN-1993	~~[illegible]~~ Tex Pack	PC	776	000	10th. Net 20th

LINE	QTY ORD	QTY B.O.	QTY SHIP	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
001	20	0	20	ALC 300 1-IN ALUM CONDUIT	01108		15.00	C	

PLEASE SEND OUT TODAY IF POSSIBLE ON FRT TRUCK

SUB TOTAL	:
FREIGHT	:
TAX	:
TOTAL	:

FORM # 0101/2247 (9-

PICKED | CHECKED | DATE 1-18-93 | CUSTOMER SIGNATURE

SPINDLETOP ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP

407

PACKING SLIP NUMBER	PAGE
762308601	-

18-JAN-1993, 12:13

9 7-53-120

FROM: 3025 MILAM
BEAUMONT, TX 77701

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

PO-1006-0/CARRIE		CARRIE	DEL

ORDER						
18-JAN-1993	18-JAN-1993	United Parcel Servic	PC	778	000	10th, Net 20th

LINE	ORDERED	SHIPPED	B/O	PART NUMBER / DESCRIPTION		UNIT PRICE		EXTENDED PRICE
001	1	0	1	ELB 300 ALU 90 ELBOW	01168	4,842.11	D	[illegible]

PLEASE SEND OUT TODAY IF POSSIBLE. THANKS

SUB TOTAL	:	[illegible]
FREIGHT	:	
TAX	:	[illegible]
TOTAL	:	[illegible]

UPS (1) 2.91

FORM #0101-2261 (9-

PICKED [illegible] CHECKED [illegible] DATE 1-18-93 CUSTOMER SIGNATURE

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 408

PACKING SLIP NUMBER	PAGE
081231402	1

20-JAN-1993, 11:24

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-1006-Q/CARRIE			DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
18-JAN-1993	18-JAN-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	QTY ORD.	QTY BACK	QTY SHP	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
026	500	0	500	CDP BARE 8 STR		Y	130.00	M	65

Freight, if applicable, to be billed later

SUB TOTAL	:	65
FREIGHT	:	
TAX	:	5
TOTAL	:	70.

#116

#116

PICKED CHECKED DATE CUSTOMER SIGNATURE

FORM #0101-2250 (9-92

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 409

PACKING SLIP NUMBER	PAGE
081231403	1

20-JAN-1993, 11:27

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
PO-1006-Q/CARRIE			DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
18-JAN-1993	18-JAN-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	QTY ORD	QTY B.O.	QTY SHIP	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
024	2	0	2	APP LB300-M 3-IN MALL LB COND BODY	47740	Y	86.00	E	171

Freight, if applicable, to be billed later

SUB TOTAL	:	171
FREIGHT	:	
TAX	:	14
TOTAL	:	185

FORM #0101-2250 (9-

CHECKED BY CHECKED BY DATE CUSTOMER SIGNATURE

SPINDLETOP ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 110

762308602 | 1

FROM: 3025 MILAM
BEAUMONT, TX 77701

18-JAN-1993, 12:31

9

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

1006-Q/CARRIE		DARRIE	DEL

ORDER DATE						
JAN-1993	18-JAN-1993	United Parcel Servic	PC	778	000	10th, Net 20th

LINE	QTY. ORD.	QTY. B.O.	QTY. SHIP.	PART NUMBER / DESCRIPTION				
2	0		2	APP K250&300 3-IN COND BODY COVER	47165	7.97	E	15.94

PLEASE SEND OUT TODAY IF POSSIBLE THANKS

SUB TOTAL	:	15.94
FREIGHT	:	.00
TAX	:	1.32
TOTAL	:	17.26

UPS

2.51

FORM #0101-2261 (9

PICKED BY JRW CHECKED BY JRW DATE 1-18-93 CUSTOMER SIGNATURE

SUMMERS ELECTRIC

ORIGINAL INVOICE

A division of SUMMERS GROUP

INVOICE 411

FROM:
SUMMERS ELECTRIC
2400 BROCKTON
P.O.BOX 17747
SAN ANTONIO, TX 78217

INVOICE DATE	INVOICE NO.	PAGE
23-JAN-1993	031231405	1

INVOICE TO:
08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO TX 78238

CUSTOMER P.O.	JOB NAME	CONTACT	ORDER DATE	SHIP VIA	SLSMN	FBT.
3-1006-3-CARRIE			13-JAN-1993	Our Truck	226	PC

LINE NO.	QTY. ORD.	QTY. B.O.	QTY. SHIPPED	PART NUMBER / DESCRIPTION	UPC	PRICE	UM	EXTENDED PRICE
20	20	0	20	GAL 400 4-IN GALV CONDUIT	00110	530.11	C	106.02

POSTED

DO NOT RETURN GOODS WITHOUT PERMISSION

- RETURN OF GOODS MUST BE ACCOMPANIED BY INVOICE NUMBER

SUB TOTAL	106.0
FREIGHT TOTAL	.0
SALES TAX	8.7

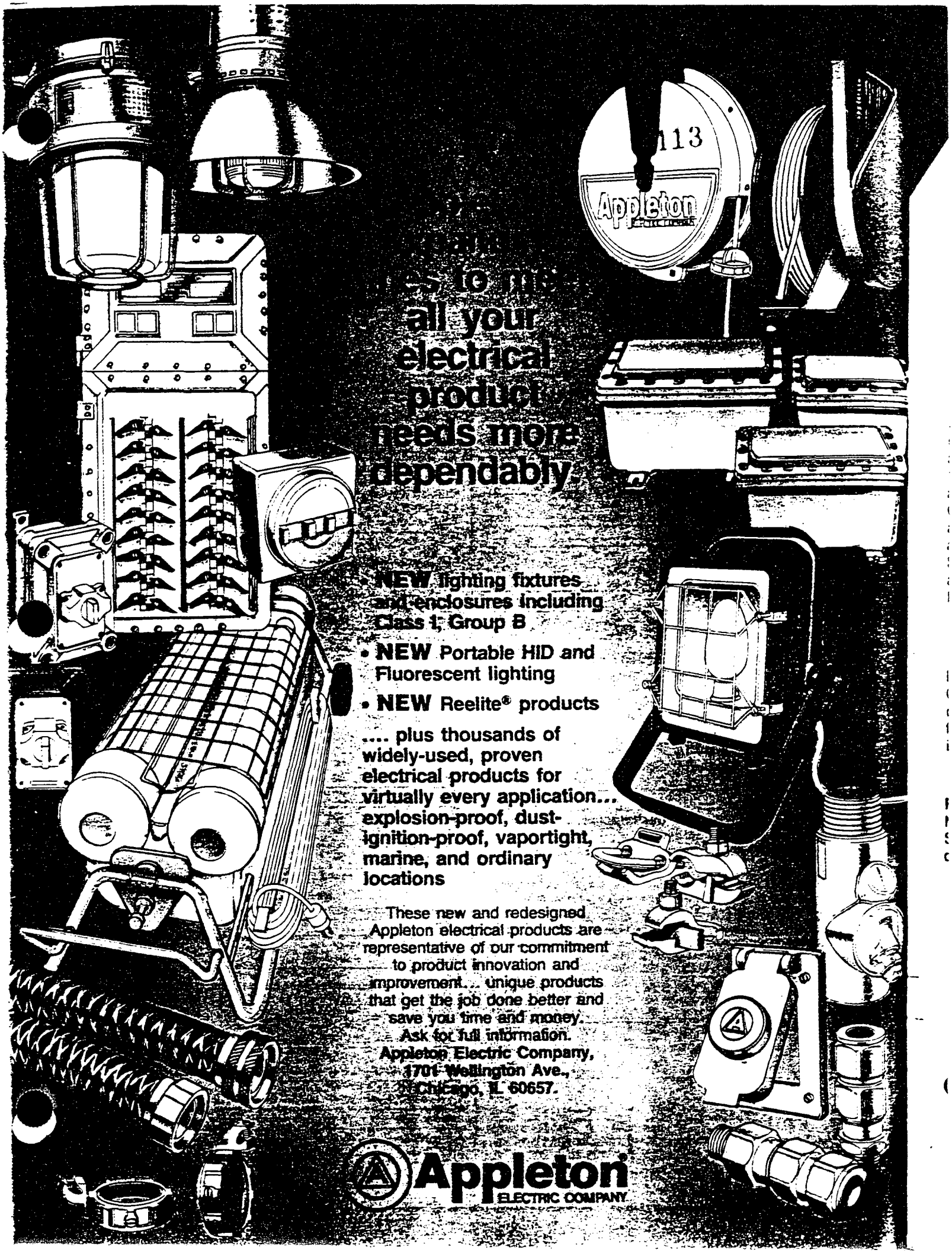
10th, Net 20th	10-MAR-1993	1.06	20-MAR-1993

412

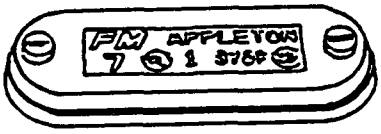
1993 Electrical Supply Catalog

SUMMERS ELECTRIC

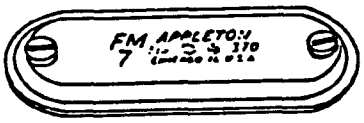
A division of Summers Group


113
Appleton
all your
electrical
product
needs more
dependably
• NEW lighting fixtures and enclosures including Class 1, Group B
• NEW Portable HID and Fluorescent lighting
• NEW Reelite® products
.... plus thousands of widely-used, proven electrical products for virtually every application... explosion-proof, dust-ignition-proof, vaportight, marine, and ordinary locations
These new and redesigned Appleton electrical products are representative of our commitment to product innovation and improvement... unique products that get the job done better and save you time and money.
Ask for full information.
Appleton Electric Company,
1701 Wellington Ave.,
Chicago, IL 60657.
Appleton
ELECTRIC COMPANY

FM7 Blank Covers and Gaskets



Cast Grayloy-Iron Cover



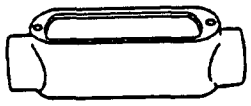
Stamped Steel Cover

Solid Gasket

Catalog Number	Body Size	Price Each
Cast Grayloy-Iron Cover		
170F	1/2	4.46
270F	3/4	5.42
370F	1	8.60
470F	1-1/4	11.46
570F	1-1/2	11.46
670F	2	16.88
870F	2-1/2	19.76
870F	3	19.76
970F	3-1/2	29.58
970F	4	29.58
Cast Grayloy-Iron Cover with Gasket		
170FG	1/2	8.64
270FG	3/4	9.86
370FG	1	14.78
470FG	1-1/4	19.32
570FG	1-1/2	19.32
670FG	2	26.90
870FG	2-1/2	34.86
870FG	3	34.86
970FG	3-1/2	49.64
970FG	4	49.64
Stamped Steel Cover		
170	1/2	2.90
270	3/4	3.50
370	1	4.80
470	1-1/4	5.76
570	1-1/2	5.76
670	2	10.18
870	2-1/2	15.94
870	3	15.94
970	3-1/2	18.78
970	4	18.78
Solid Gasket		
GASK571	1/2	2.88
GASK572	3/4	2.88
GASK573	1	3.82
GASK574	1-1/4	4.80
GASK575	1-1/2	4.80
GASK576	2	5.74
GASK578	2-1/2	9.56
GASK578	3	9.56
GASK579	3-1/2	12.08
GASK579	4	12.08

Form 35 Malleable Iron Unilet Conduit Outlet Bodies

Threaded Type for use with Rigid Metal Conduit and IMC



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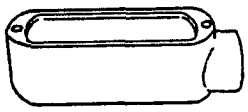

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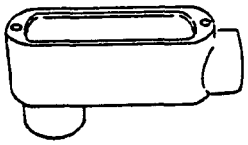
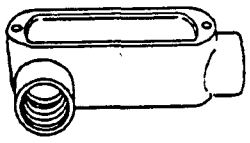
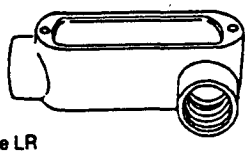


Type LB



Type LL



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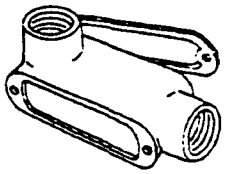

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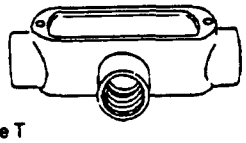

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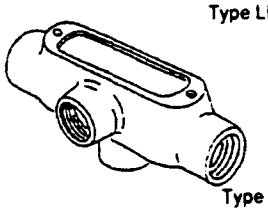

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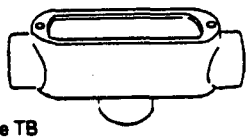
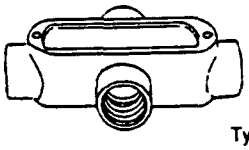


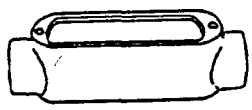
Type TB



Type X

Catalog Number	Hub Size	Price Each
Type C		
C50-M	1/2	9.56
C75-M	3/4	11.46
C100-M	1	17.20
C125-M	1-1/4	29.80
C150-M	1-1/2	38.86
C200-M	2	64.06
C250-M	2-1/2	133.90
C300-M	3	178.50
C350-M	3-1/2	292.20
C400-M	4	329.76
Type E		
E50-M	1/2	12.10
E75-M	3/4	18.96
E100-M	1	20.88
Type LB		
LB50-M	1/2	9.56
LB75-M	3/4	11.46
LB100-M	1	17.20
LB125-M	1-1/4	29.80
LB150-M	1-1/2	38.86
LB200-M	2	64.04
LB250-M	2-1/2	133.90

Aluminum Conduit Outlet Bodies



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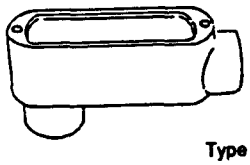

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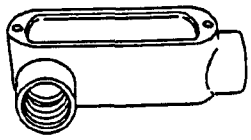

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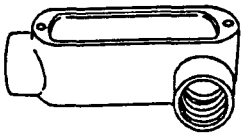

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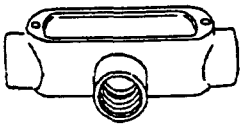

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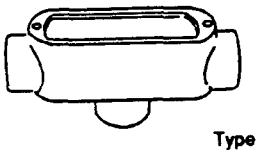
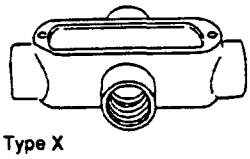


Type TB



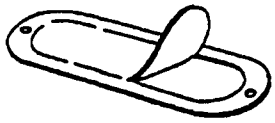
Type X

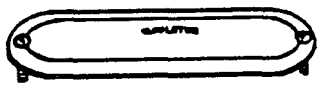
Catalog Number	Hub Size	Price Each
Type C		
C50A	1/2"	10.22
C75A	3/4"	11.60
C100A	1"	17.42
C125A	1-1/4"	26.32
C150A	1-1/2"	34.22
C200A	2"	57.06
C250A	2-1/2"	115.58
C300A	3"	153.48
Type LB		
LB50-A	1/2"	9.52
LB75-A	3/4"	11.62
LB100-A	1"	15.78
LB125-A	1-1/4"	26.38
LB150-A	1-1/2"	34.32
LB200-A	2"	57.04
LB250-A	2-1/2"	134.52
LB300-A	3"	178.08
LB350-A	3-1/2"	272.06
LB400-A	4"	278.82
Type LL		
LL50-A	1/2"	9.56
LL75-A	3/4"	11.62
LL100-A	1"	17.24
LL125-A	1-1/4"	28.42
LL150-A	1-1/2"	31.06
LL200-A	2"	61.40
LL250-A	2-1/2"	124.64
LL300-A	3"	164.98
LL350-A	3-1/2"	293.10
LL400-A	4"	331.54

Aluminum Conduit Outlet Bodies *(cont.)*

Catalog Number	Hub Size	Price Each
Type LR		
LR50-A	1/2"	10.54
LR75-A	3/4"	11.62
LR100-A	1"	17.22
LR125-A	1-1/4"	26.24
LR150-A	1-1/2"	34.32
LR200-A	2"	56.82
LR250-A	2-1/2"	124.64
LR300-A	3"	178.30
LR350-A	3-1/2"	293.10
LR400-A	4"	331.54
Type T		
T50A	1/2"	11.60
T75A	3/4"	14.78
T100A	1"	20.26
T125A	1-1/4"	32.20
T150A	1-1/2"	43.12
T200A	2"	61.14
T300A	3"	182.02
Type TB		
TB50A	1/2"	19.82
TB100A	1"	28.50
Type X		
X50A	1/2"	15.36
X75A	3/4"	19.46
X100A	1"	28.98

Blank Covers





Catalog Number	Body Size	Price Each
Sheet Aluminum furnished with Stainless Screws		
K50-A	1/2"	2.60
K75-A	3/4"	3.70
K100-A	1"	4.76
K125-A	1-1/4"	6.26
K150-A	1-1/2"	6.26
K200-A	2"	9.56
K250-A	2-1/2"	18.96
K300-A	3"	18.96
K350-A	3-1/2"	22.36
K400-A	4"	22.36

Aluminum Threaded Entrance Elbows

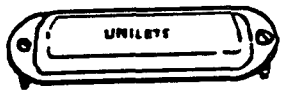
Catalog Number	Size	Price Each
SLAY-50A	1/2"	729.78
SLAY-75A	3/4"	875.74
SLAY-100A	1"	1434.18
SLAY-125A	1-1/4"	2175.14
SLAY-150A	1-1/2"	4967.24
SLAY-200A	2"	7539.74

Form 35 Malleable Iron Unilet Conduit Outlet Bodies *(continued)*

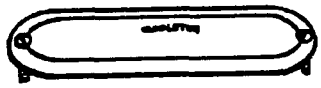
Type LB		
LB300-M	3	178.50
LB350-M	3-1/2	292.20
LB400-M	4	329.76
LB500-M	5	855.26
LB600-M	6	1379.16
Type LL		
LL50-M	1/2	9.56
LL75-M	3/4	11.46
LL100-M	1	17.24
LL125-M	1-1/4	29.80
LL150-M	1-1/2	35.38
LL200-M	2	58.32
LL250-M	2-1/2	133.90
LL300-M	3	178.50
LL350-M	3-1/2	292.20
LL400-M	4	356.32
Type LR		
LR50-M	1/2	9.56
LR75-M	3/4	11.46
LR100-M	1	17.24
LR125-M	1-1/4	29.80
LR150-M	1-1/2	35.38
LR200-M	2	58.32
LR250-M	2-1/2	144.70
LR300-M	3	178.50
LR350-M	3-1/2	292.20
LR400-M	4	329.76
Type LRL		
LRL50-M	1/2	13.06
LRL75-M	3/4	15.90
LRL100-M	1	21.02
LRL125-M	1-1/4	44.34
LRL150-M	1-1/2	60.80
LRL200-M	2	87.54
Type T		
T50-M	1/2	11.96
T75-M	3/4	14.36
T100-M	1	21.52
T125-M	1-1/4	31.56
T150-M	1-1/2	42.08
T200-M	2	65.02
T250-M	2-1/2	140.78
T300-M	3	185.18
T350-M	3-1/2	344.04
T400-M	4	385.52
Type TA		
TA50-M	1/2	19.86
TA75-M	3/4	25.56
TA100-M	1	33.52
Type TB		
TB50-M	1/2	12.90
TB75-M	3/4	15.78
TB100-M	1	22.46
TB125-M	1-1/4	33.96
TB150-M	1-1/2	44.46
TB200-M	2	69.78
Type X		
X50-M	1/2	17.42
X75-M	3/4	18.64
X100-M	1	30.68
X125-M	1-1/4	40.14
X150-M	1-1/2	51.74
X200-M	2	106.46

Covers and Gaskets for Form 35 Unilet Conduit Outlet Bodies

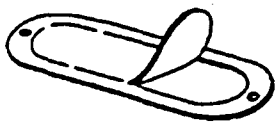
Covers Furnished with Stainless Steel Fastening Screws



Domed Cover



Flat Cover



Neoprene Gasket
Tear out inner perforated section to convert to "open type" gasket.

Composite Fiber Gaskets

Catalog Number	Size	Price Each
Metal Covers - Blank Stamped Steel		
K50	1/2	2.88
K75	3/4	3.50
K100	1	4.80
K125	1-1/4	5.74
K150	1-1/2	5.74
K200	2	10.18
K250	2-1/2	15.94
K300	3	15.94
K350	3-1/2	18.78
K400	4	18.78
K500	5	73.26
K600	6	144.00
Metal Covers - Blank Cast Malleable		
K50-CM	1/2	4.44
K75-CM	3/4	6.44
K100-CM	1	8.60
K125 & 150CM	1-1/4, 1-1/2	13.64
K200-CM	2	16.88
K250-CM	2-1/2	19.76
K300-CM	3	19.76
K350-CM	3-1/2	35.26
K400-CM	4	35.26
Solid Gaskets - Neoprene		
GK50-N	1/2	2.88
GK75-N	3/4	2.88
GK100-N	1	3.82
GK125-N	1-1/4	4.80
GK150-N	1-1/2	4.80
GK200-N	2	5.74
GK250-N	2-1/2	10.54
GK300-N	3	10.54
GK350-N	3-1/2	11.96
GK400-N	4	11.96
Solid Gaskets - Neoprene Not Perforated		
GK500-SN	5	36.00
GK600-SN	6	56.84
Solid Gaskets - Composition Fiber		
GK50-V	1/2	3.40
GK75-V	3/4	3.40
GK100-V	1	3.82
GK125-V	1-1/4	5.68
GK150-V	1-1/2	5.68
GK200-V	2	6.80
GK250-V	2-1/2	9.56
GK300-V	3	9.56
GK350-V	3-1/2	11.94
GK400-V	4	11.94

RIGID

Galvanized Rigid Conduit

Catalog Number	Size	Weight Per 100'	Standard Package	Price Per 100
Gal 050	1/2	79	100	118.68
Gal 075	3/4	105	50	147.02
Gal 100	1	153	50	213.06
Gal 125	1-1/4	201	10	271.26
Gal 150	1-1/2	249	10	339.76
Gal 200	2	332	10	441.22
Gal 250	2-1/2	527	10	756.90
Gal 300	3	683	10	937.56
Gal 350	3-1/2	831	10	1152.58
Gal 400	4	972	10	1362.96

Intermediate Metal Conduit

Catalog Number Type and Size	Weight Per 100'	Standard Package	Price Per 100
IMC 050	60	100	92.14
IMC 075	82	50	106.38
IMC 100	116	50	157.90
IMC 125	150	10	201.78
IMC 150	182	10	235.70
IMC 200	242	10	322.10
IMC 250	401	10	650.46
IMC 300	493	10	838.28
IMC 350	573	10	979.20
IMC 400	638	10	1157.64

Galvanized Conduit 90° Ells

Ell - (ELB)

Catalog Number Type and Size	Lbs. 100	Carton Quantity	Price Per 100
ELL 050GAL90	78	50	927.08
ELL 075GAL90	111	50	1120.72
ELL 100GAL90	191	20	1656.08
ELL 125GAL90	312	20	2394.80
ELL 150GAL90	424	10	2859.82
ELL 200GAL90	658	10	4207.38
ELL 250GAL90	1177	1	6939.88
ELL 300GAL90	1850	1	10374.86
ELL 350GAL90	2578	1	17971.32
ELL 400GAL90	3216	1	208.46/EA

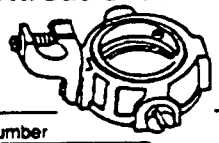
Galvanized Conduit Couplings

Catalog Number	Size	Lbs. 100	Carton Quantity	Price Per Full Carton or More
CPL050	1/2	13	100	276.66
CPL075	3/4	21	50	339.58
CPL100	1	31	30	479.02
CPL125	1-1/4	39	25	599.02
CPL150	1-1/2	56	25	756.28
CPL200	2	73	20	999.62
CPL250	2-1/2	190	25	2215.86
CPL300	3	238	20	3026.20
CPL350	3-1/2	356	18	4044.48
CPL400	4	318	12	4075.02

Plastic Insulated Bushings

Catalog Number Bridgeport	Appleton	Size	Carton Quantity	Price Per 100
321	BBU50	1/2"	100	23.00
322	BBU75	3/4"	100	35.50
323	BBU100	1"	50	67.00
324	BBU125	1-1/4"	25	90.90
325	BBU150	1-1/2"	25	116.20
326	BBU200	2"	25	213.20
327	BBU250	2-1/2"	10	430.00
328	BBU300	3"	10	480.80
329	BBU350	3-1/2"	5	590.70
330	BBU400	4"	1	720.20

Insulated Throat Grounding Bushings



Catalog Number Bridgeport	Gedney	Union	Size	Price Per 100
381	BLG0504	96-12	1/2"	640.20
382	BLG0704	96-34	3/4"	791.00
383	BLG1104	96-1	1"	951.50
384	BLG1204	96-114	1-1/4"	840.40
385	BLG1504	96-112	1-1/2"	880.90
386	BLG2004	96-2	2"	1151.10
387	BLG2604	96-212	2-1/2"	1860.20
388	BLG3104	96-3	3"	2650.00
389	BLG3604	96-312	3-1/2"	3301.00
390	BLG4104	96-4	4"	4200.00

Appleton

Catalog Number	Size	Carton Quantity	Price Per 100
GIB50L	1/2	50	550.00
GIB75L	3/4	50	704.00
GIB100L	1	25	782.00
GIB125L	1-1/4	25	1084.00
GIB150L	1-1/2	25	1184.00
GIB200L	2	10	1578.00
GIB250L	2-1/2	5	2806.00
GIB300L	3	5	3670.00
GIB350L	3-1/2	5	4520.00
GIB400L	4	2	5566.00

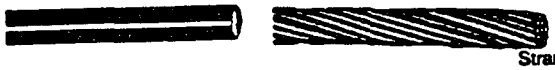
Male Insulating Bushings - No Locknuts

Union

Catalog Number	Size	Carton Quantity	Price Per 100
1-12	1/2"	50	168.00
1-34	3/4"	50	203.40
1-1	1"	20	263.20
1-114	1-1/4"	10	309.60
1-112	1-1/2"	5	406.60
1-2	2"	4	491.20
1-212	2-1/2"	4	829.60
1-3	3"	4	1228.60
1-312	3-1/2"	4	1337.20
1-4	4"	4	1919.00

Prices Subject to Change Without Notice

Soft Drawn Bare Copper



Solid — Stranded

Catalog Number	Size	Feet Per Spool	Price Per 1000'
Solid - 25# Non-Returnable Spools			
BARE14SOL	14	2000	80.16
BARE12SOL	12	1250	114.96
BARE10SOL	10	800	184.44
BARE8SOL	8	500	343.18
BARE6SOL	6	315	459.26
BARE4SOL	4	198	702.26
Stranded on 25# Spools (7 Strand)			
BARE8STR	8	500	343.76
BARE6STR	6	315	482.68
BARE4STR	4	198	751.30
BARE2STR	2	125	1182.54
Large Sizes Stocked on Master Reels			
BARE20STR2/0 Cut to Length			2275.26
BARE40STR4/0 Cut to Length			3650.66

BX Armored Cable

BX HCF Health Care Tray Cable — BX Armored Ground Wire

Catalog Number	Size	Feet Coil	Price Per 1000'
Solid BX Cable			
BX102	10/2	250	991.20
BX103	10/3	250	1296.42
BX104	10/4	150	1944.66
BX122	12/2	250	574.48
BX123	12/3	250	840.28
BX124	12/4	200	1178.12
BX142	14/2	250	550.46
BX143	14/3	250	723.66
Stranded BX Cable			
BX63	6/3	100	3448.58
BX83STR	8/3	150	2308.20
BX HCF Cable with Green Ground			
BXHCF122WG	12/2WG	250	751.12
BXHCF123WG	12/3WG	250	1107.80
Bare Armored Ground Wire			
BX 61BARE	6/1	250'	934.60
BX 81BARE	8/1	250'	737.40

Machine Tool Wire

MTW - 600 Volt

Catalog Number	O.D. Inches	Price 1000'
Machine Tool Wire - 2/64ths Insulation		
MTW18**	.113	319.78
MTW16**	.125	415.30
MTW14**	.139	553.14
MTW12**	.158	792.04

**Substitute 2 Digit Color Code

BE - BLUE	BK - BLACK	BN - BROWN	
GN - GREEN	PE - PURPLE	PK - PINK	
RD - RED	WE - WHITE	YW - YELLOW	OE - ORANGE

Non-Metallic Sheath Cable

Copper Romex

Catalog Number	Description	Length	Packaging	Price 1000'
Without Ground Wire				
NMB10/3	Plain	250	Carton	869.04
NMB10/3	Plain	1000	Reel	869.04
NMB63	Plain	125	Coil	2561.64
NMB63	Plain	1000	Reel	2561.64
NMB83	Plain	125	Coil	1724.58
NMB83	Plain	1000	Reel	1724.58
With Full Size Bare Ground Wire - Carton & Reel				
NMB10/2	With Ground	250	Carton	636.00
NMB10/2	With Ground	1000	Reel	636.00
NMB10/3	With Ground	250	Carton	926.16
NMB10/3	With Ground	1000	Reel	926.16
NMB12/2	With Ground	250	Carton	366.40
NMB12/2	With Ground	1000	Reel	366.40
NMB12/3	With Ground	250	Carton	603.14
NMB12/3	With Ground	1000	Reel	603.14
NMB14/2	With Ground	250	Carton	249.94
NMB14/2	With Ground	1000	Reel	249.94
NMB14/3	With Ground	250	Carton	436.04
NMB14/3	With Ground	1000	Reel	436.04
Reel Charge Above Sizes				
With Full Size Bare Ground Wire - Coil & Reel				
NMB2/3	With Ground	125	Coil	6116.32
NMB2/3	With Ground	1000	Reel	6116.32
NMB4/3	With Ground	125	Coil	4181.32
NMB4/3	With Ground	1000	Reel	4181.32
NMB6/2	With Ground	125	Coil	1950.22
NMB6/2	With Ground	500	Reel	1950.22
NMB6/3	With Ground	125	Coil	2784.58
NMB6/3	With Ground	1000	Reel	2784.58
NMB8/2	With Ground	125	Coil	1350.56
NMB8/2	With Ground	500	Reel	1350.56
NMB8/3	With Ground	125	Coil	2009.06
NMB8/3	With Ground	1000	Reel	2009.06

Type S

Rubber Jacket - 600 Volt

Catalog Number	Size*	Cord Diameter	Price Per 1000'
S103	10/3	.687	6646.96
S104	10/4	.742	7723.86
S123	12/3	.632	5276.04
S124	12/4	.662	6093.82
S142	14/2	.527	3300.50
S143	14/3	.557	3984.14
S144	14/4	.602	4974.66
S163	16/3	.425	2389.02
S164	16/4	.480	3309.70

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME: TVA
CLIENT/PROJECT NUMBER: 11210-94943
RECEIVED FROM: Summers Electric
PROJECT LOCATION: Omega Point Labs

REPORT NUMBER: 1249-11210
DATE RECEIVED: 1/29/93
DATE INSPECTED: 1/29/93
INSPECTED BY: C Humphrey

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	QUANTITY Rec'd	QUANTITY B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	ACCEPTANCE Hold	ACCEPTANCE Reject	REMARKS
NEMA TYPE 12 JUNCTION BOX	1009Q	2	2	—	12HX12WX8D	Y	Y	Good	None	X			Catalog items. Copy of catalog description included
" "	"	2	2	—	6HX6WX6D	Y	Y	"	"	X			
" "	"	1	1	—	48HX36WX12D	Y	Y	"	"	X			
" "	"	2	2	—	24HX18WX12D	Y	Y	"	"	X			
" "	"	2	2	—	18HX12WX12D	Y	Y	"	"	X			
" "	"	2	2	—	20HX12WX8D	Y	Y	"	"	X			

FORM
12/20/91

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:

Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1009-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
1/21/93	truck			

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
	NEMA type 12 JIC Continuous Hinge Clamp Cover Enclosures: H x W x D			
1.	12 x 12 x 8	2	$63.31	$126.62
2.	6 x 6 x 6	2	$32.76	$65.52
	NEMA Type 12 Wall Mount Enclosures: H x W x D			
3.	48 x 36 x 12	1	$392.47	$392.47
4.	24 x 18 x 12	2	$199.60	$399.20
5.	18 x 12 x 12	2	$172.12	$344.24
6.	20 x 12 x 8	2	$142.47	$284.94

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Humphrey
Date 1/21/93

Rec'd 1/29/93 CA

Special Instructions

Please include all material data.

Ordered By: Kerry Hitchcock
Project #: 11210-94943
TVA

Total	$1,612.99
Shipping	
Tax	$133.07
Invoice Total	$1,746.06

SUMMERS ELECTRIC

CUSTOMER

A division of SUMMERS GROUP

PACKING SLIP 421

PACKING SLIP NUMBER	PAGE
081317101	1

29-JAN-1993, 09:47

M: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY
ATTN: ACCOUNTS PAYABLE DEPT.
SAN ANTONIO, TX 78238

SHIP TO:
OMEGA POINT LABORATORIES
6868 ALAMO DOWNS PARKWAY

SAN ANTONIO, TX 78238

CUSTOMER ORDER NUMBER	JOB NAME	CONTACT	TYPE
PO-10090/CARRIE		CARRIE	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
21-JAN-1993	21-JAN-1993	Our Truck	PC	778	000	10th, Net 20th

LINE	QTY ORD.	QTY B.O.	QTY SHP.	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
001	2	0	2	CAW 12HX12WX8D NEMA12	ok	Y	63.31	E	126.
00[illegible]	2	0	2	CAW 6HX6WX6D NEMA12	ok	Y	32.76	E	65.
003	1	0	1	CAW 48HX36WX12D NEMA-12	ok	Y	392.47	E	392.
004	2	0	2	CAW 24HX18WX12D NEMA-12	ok	Y	199.60	E	399.
005	2	0	2	CAW 18HX12WX12D NEMA-12	ok	Y	172.12	E	344.
006	2	0	2	CAW 20HX12WX8D NEMA-12	ok	Y	142.47	E	284.

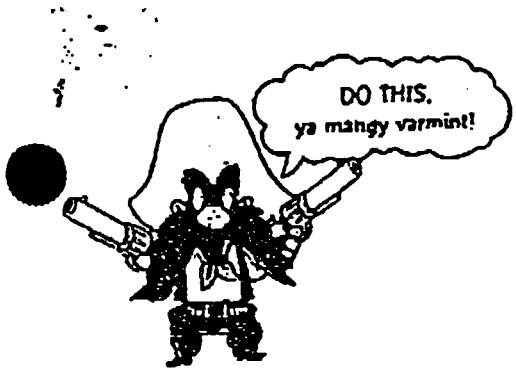
Freight, if applicable, to be billed later

SUB TOTAL	:	1,612.
FREIGHT	:	
TAX	:	133.
TOTAL	:	1,746.

Richard L Beasley

FORM #0101-2250 (9-92)

PICKED BY | CHECKED BY | DATE | CUSTOMER SIGNATURE



SUMMERS ELECTRIC

FAX 824-0419

Date: _____ Number of pages to follow: 2

To: Carrie

From: Pete

Maybe this will make it easier to under stand

will take 3-4 days to Complete order

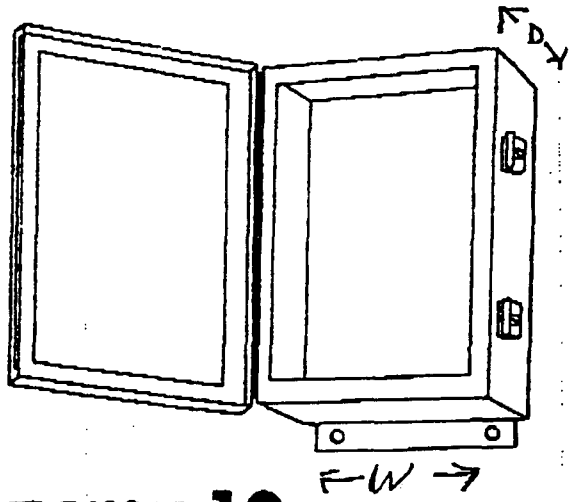
Pete

Here are your prices

2400 BROCKTON
SAN ANTONIO, TEXAS 78217
(512) 824-1451

H W D
12 x 12 x 8 (2) 63 3/E
~~20 x 12 x 8~~
6 x 6 x 6 (2) 32 76/E H

Manufacturer of
Electrical Enclosures
& Wireway
10000 W. Commerce
San Antonio, Texas 78227
(512) 673-3580
FAX 673-3583



standard sizes

Width	Height	Depth	List
4	4	3	29.88
4	6	3	34.34
6	8	3½	41.95
4	4	4	31.26
4	6	4	36.34
6	6	4	40.04
8	8	4	48.20
8	10	4	52.82
6	12	4	51.28
10	12	5	67.45
6	8	6	49.13
8	10	6	59.44
10	10	6	68.90
12	12	6	78.39
12	14	6	85.16
10	16	6	83.62
14	16	6	100.25
10	12	8	79.93
12	14	8	94.95
14	16	8	111.50
14	16	10	122.74

** list price is for 14ga. steel, painted*

nema 12

Nema Type 12 JIC Continuous Hinge, Clamp Cover Enclosures

Application

E.P.I. NEMA Type 12 JIC continuous clamp cover enclosures are designed to house electrical controls, terminals, and instruments. They provide protection from dust, dirt, oil and water.

Construction

Made from 14, 12 or 10 gauge steel. All seams are continuously welded. There are no holes or knockouts. External screw clamps are provided for securing the gasketed cover. The screw clamps are quick and easy to operate and have no loose parts. A continuous hinge is provided. External mounting feet are furnished for mounting.

Accessories

Panels must be ordered separately, as they are not furnished with the enclosures. Provisions for padlocking and other type hardware can be provided if specified.

Finish

The standard finish is ASA-61, Light-dove gray inside and out. Additional finished can be provided.

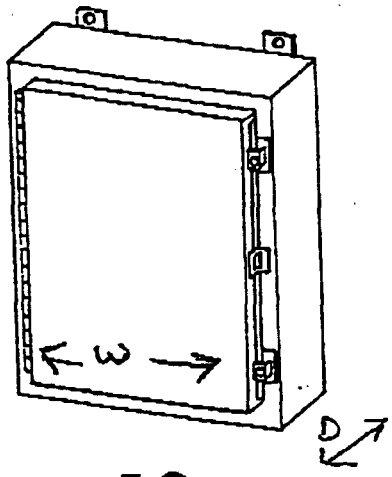
Industry Standard

Meet various National Electrical Manufacturers Association (NEMA) and Joint Industrial Council (JIC) standards as indicated. JIC EGP—1-1967.

12

H W D
48 X 36 X 12 (1) 392.47
24 X 18 X 12 (2) 198.60
18 X 12 X 12 (2) 172.12
20 X 12 X 8 (2) 142.47

Manufacturer of
Electrical Enclosures
& Wireway
10000 W. Commerce
San Antonio, Texas 78227
(512) 673-3580
FAX 673-3583



nema 12

standard sizes

W	H	D	List
12	16	6	190.89
12	20	6	202.91
12	24	6	214.96
16	16	6	205.61
16	20	6	220.40
16	24	6	235.16
16	30	6	257.16
20	16	6	220.40
20	20	6	237.64
20	24	6	255.13
20	30	6	281.12
24	12	6	214.96
24	20	6	255.13
24	24	6	275.33
24	30	6	305.40
24	36	6	335.54
30	36	6	377.54
12	16	8	200.27
12	20	8	213.69
12	24	8	227.02
16	16	8	216.35
16	20	8	232.45
16	24	8	248.42
20	20	8	251.17
20	24	8	269.83
20	30	8	298.08
24	20	8	269.83
24	24	8	291.32
24	30	8	323.47
24	36	8	355.56
24	42	8	387.79
24	48	8	419.87
30	24	8	323.47
30	30	8	361.68
30	36	8	399.87
30	42	8	437.95
30	48	8	476.15
36	30	8	399.87
36	36	8	444.03
36	42	8	488.14
36	48	8	532.38
36	60	8	621.06

W	H	D	List
12	16	10	209.57
12	24	10	239.10
16	20	10	244.44
20	20	10	264.62
20	24	10	284.68
20	30	10	314.78
24	24	10	307.49
24	30	10	341.53
24	36	10	375.74
30	36	10	421.92
30	42	10	462.18
30	48	10	502.30
36	42	10	513.96
36	48	10	560.56
36	60	10	653.25
16	20	12	258.17
20	24	12	299.40
24	24	12	323.47
24	30	12	359.74
24	36	12	395.91
30	30	12	401.85
30	36	12	444.00
30	42	12	486.20
30	72	12	697.18
36	36	12	492.32
36	42	12	540.47
36	48	12	588.70 →
36	60	12	685.10
36	72	12	782.17
24	24	16	355.56
24	30	16	395.74
30	36	16	489.24
30	72	16	765.49
36	42	16	592.86
36	48	16	644.95
36	60	16	749.41
24	30	20	432.04
30	36	20	532.66
30	72	20	833.82
36	48	20	701.49
36	60	20	814.07

Nema Type 12 Wall Mount Enclosures

Application

E.P.I. Type 12 enclosures are designed to house electrical controls, terminals, and instruments. They provide protection from dust, dirt, oil, and water.

Construction

Made from 14, 12, or 10 gauge steel. All seams are continuously welded. There are no holes or knockouts. The neoprene door gasket is attached with oil-resistant adhesive. The door clamps are quick and easy to operate, and have no loose parts. A hasp and staple are provided for padlocking. Body stiffeners and door stiffeners are provided in larger enclosures for extra rigidity. External feet are furnished for mounting. Collar studs are provided for optional mounting panel, otherwise not installed.

Accessories

Panels must be ordered separately, as they are not furnished with the enclosures. Floor stand kits in 6-inch, 12-inch, 18-inch, and 24-inch heights are available for factory installation on all single door NEMA 12 enclosures. Drip shield kits protect the door and the door hardware from dripping water and settling dust.

Finish

The standard finish is ASA-61, light-dove gray, inside and out. Panels are same.

Industry Standard

Conforms to the National Electrical Manufacturers Association (NEMA) standard for Type 12 (Industrial Use) enclosures. JIC

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME TVA
CLIENT/PROJECT NUMBER 11210-94943
RECEIVED FROM Toltec Steel
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1245.11210
DATE RECEIVED 1/19/93
DATE INSPECTED 1/19/93
INSPECTED BY: C Humphrey

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	CONTRLD MATERIAL Y/N	DATE CERT. REC'D	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
4" Steel tubing	1008@	20	20	—	4X06X20	Y	1/14/93	n/a	none	X			
2" Steel tubing	"	24	24	—	2X06X24	Y	1/19	n/a	"	X			

FORM
12/20/91

425

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:

Toltec Steel Products, Inc
5390 Dietrich Road

San Antonio TX 78219

PO Number: 1008-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
1/18/93	truck			

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	steel tubing 4 x 4 x 250 x 20	1	$104.00	$104.00
2.	steel tubing 2 x 2 x 250 x 24	1	$61.68	$61.68
3.	Material certification on items 1 & 2			
4.	angle iron 1-1/4 x 1-1/4 x 3/16 x 20	1	$65.71	$65.71
	"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval C Humphrey Date 1/18/93 Rec'd 1/19/93			

Special Instructions

Material certificate of conformance required on steel tubing.

Ordered By: Kerry Hitchcock
Project #: TVA
11210-94943

Total	$231.39
Shipping	
Tax	$19.09
Invoice Total	$250.48

* * * * * * * * * * * * * * * *
* S A L E S O R D E R 21519 *
* * * * * * * * * * * * * * * *

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH
SAN ANTONIO, TX 78219

DELIVERY PICKING TICKET

BILL TO: 000477
OMEGA POINT LABORATORIES

6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TEXAS 78238

SHIP TO:
OMEGA POINT LABORATORIES

6868 ALAMO DOWNS PARKWAY
SAN ANTONIO, TEXAS 782380000

PURCHASE ORDER: KERRY
PLACED BY:
SHIP VIA:
COMMENTS:

TELEPHONE #: (512) 647-5253

ORDER DATE: 1/19/93
SALESMAN: CASEY HARMS

REQUEST DATE: 1/18/93

	ORDER QTY	SHIP QTY	COD PART NUMBER	DESCRIPTION	WEIGHT	UNIT COST	EXTEND COST
01	8	8	ANG 1-1/4XC02	1-1/4 X 1-1/4 X 3/16 X 20	237	27.75	65.71
02	1	1	TUB 4XC06X20	4 X 4 X 250 X 20	244	520.00	104.00
03	1	1	TUB 2XC06X24	2 X 2 X 250 X 24	130	257.00	61.68
04	0	0		TUBING MUST BE VERY	0	.00	.00
05	0	0		CLEAN W/ MTR'S	0	.00	.00

TOTAL WEIGHT: 611 LBS

RECEIVED BY: Kerry Stilwell

NET BEFORE TAX 231.39
TAX..... 19.09
GRAND TOTAL... 250.48

UNION ST [redacted] MFG. CO., LTD.

MILL TEST CERTIFICATE

MESSRS.
UNION STE... AMERICA INC.
GLENPOINTE CENTRE WEST 4TH FLR
500 FRANK W. BURR BLVD TEANECK
N.J. 07666

PAGE [redacted]
M/O NO : 92J004
INVOICE NO : D29210201
DATE : 1992.10.22

COMMODITY : R.R.W. STRRI ASTM A500 GRADE B SQUARE TUBING.
L/C NO : NYIS-10842
P/O NO : HTN-3282/#H4228 LPT-2317
MADE IN KOREA

SPECIFICATION : BLACK PLAIN END, LIGHTLY OILED

LIFT NO	TYPE	SIZE	NET WT KGS/ LBS	PCS	HYDRAULIC TEST KG/CMxCM	BENDING	FLATTENING	DRIFT	RADIUS OF CORNER (mm)	STRAIGHTNESS	SQUARENESS	TWIST (mm/m)	ZINC TEST UNIFORM (g/m²)	DIMENSION	NDT	HEAT NO.	TENSILE TEST T.S. KG/MMxMM	Y.P	EL. (%)	CHEMICAL COM. (%) C (×100)	Si	Mn	P (×1000)	S
040001 -0009	BPE	3"X3"X0.180"X40' (76.2 MM X 76.2 MM X 4.57MM)	12960 28571	108					90	G	G	G	G		G		48.2	37.0	31.0	16	TR	67	14	9
050001 -0010	BPE	3"X3"X0.250"X40' (76.2 MM X 76.2 MM X 6.35MM)	19152 42222	120					127	G	G	G	G		G		48.7	37.7	30.0	14	1	67	16	8
060001 -0003	BPE	4"X4"X0.180"X40' (101.6 MM X 101.6 MM X 4.57MM)	7891 17396	48					90	G	G	G	G		G		48.3	37.0	33.0	15	TR	68	15	8
07[redacted] -0[redacted]	[redacted]	[redacted] 6.35MM)	18581 40963	84					127	G	G	G	G		G		48.8	38.4	32.0	14	TR	66	15	8
																	---> LAST ITEM <---							
		T O T A L	58584 129152	360																				

NOTE : G(GOOD) T(TIMES)
FLATTENING TEST(H=2/3D)

REMARKS :

SURVEYOR

We hereby certify that the material herein has been made and tested in accordance with the above specification and the results of all test are acceptable

MANAGER OF Q.A SECTION

Grinnell COMPANY

ED TUBE AND CONDUIT
y Pipe Division
ice Box 11010
Texas 77575
409/336-5651

CUSTOMER: Toltec

CUSTOMER P.O.#:

ATC P.O.#: BOL#

Specification:

ASTM A500

1250" X 5.41#
TRUCT. TBG.

MILL TEST REPORT

ALLIED TUBE AND CONDUIT certifies that the following material has been tested for tensile properties and chemical analysis in accordance with the stated specifications. We also certify that this information is correct as contained in the records of the corporation.

Lab Manager/Metallurgist

5/15/91

LOT#	SAMPLE#	HYDROTEST PRESSURE	TENSILE PROPERTIES (PSI) Y.S.	UTS	EL%	ELEMENTS:	C	Mn	P	S	Si	Al	Mo	Ni	Cr	Cu	V	Cb
						LADLE:												
A	91-830		60,200	61,700	25.0	CHECK #1	.14	.40	.004	.015								
						CHECK #2	.13	.39	.003	.012								
						LADLE												
A	91-831		62,600	66,500	30.0	CHECK #1	.14	.42	.011	.004								
						CHECK #2	.14	.42	.011	.004								
						LADLE												
C	91-835		59,500	62,500	34.0	CHECK #1	.11	.40	.004	.013								
						CHECK #2	.10	.41	.003	.011								
						LADLE												
						CHECK #1												
						CHECK #2												

CHEMICAL ANALYSIS (%)

U. S. SALES COMPANY, INC.

CONTRACTORS SPECIALTIES
"SINCE 1948"
318 W. MELROSE PLACE
SAN ANTONIO, TEXAS 78212

PHONE 829-7044

Sold To: Omega Point Labs

Date: 1/2/93

Invoice: 6473

YOUR ORDER NO.	JOB NAME	Terms: 2% – 10 days, Net 30 days
1007-Q		

QUANTITY	DESCRIPTION				AMOUNT
3	P-2558-40	Mega Demo Cabinet			
4	P-2558-30				
3	P-2558-20				
3	P-2558-15				
3	P-2558-10				

TAX

TOTAL

Received By

☐ Tax Exempt

U. S. SALES CO.

CONTRACTORS SPECIALTIES
PHONE 344-1341
162 GLENCOE DR.
SAN ANTONIO, TEXAS 78212
SINCE 1948

February 16,1993

CERTIFICATE OF COMPLIANCE

Omega Point Labs
6868 Alamo Downs Parkway
San Antonio, Texas 78238
Attn: Kerry

This is to certify that the materials shipped to fill the order below has been manufactured in accordance with standard manufacturing procedures and specifications for this product

Material 6 P-2558-40 4" Hold Down Clamps
2 P-2558-30 3" Hold Down Clamps

U. S. Sales Company

Johnny Boyd

Johnny Boyd, President

U. S. SALES COMPANY, INC.

CONTRACTORS SPECIALTIES
"SINCE 1948"
318 W. MELROSE PLACE
SAN ANTONIO, TEXAS 78212

PHONE 829-7044

Sold To: Omega Power Lamb

Date: 1/2/[illegible]

Invoice: 6473

YOUR ORDER NO.	JOB NAME	Terms: 2% – 10 days, Net 30 days
1007-G		

QUANTITY	DESCRIPTION	LIST	UNIT	DISCOUNT	AMOUNT
3	P-2558-40 [illegible]				
4	P-2558-30				
3	P-2558-20				
3	P-2558-15				
3	P-2558-10				

TAX

TOTAL

Received By C Humphrey

☐ Tax Exempt

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME: TVA
CLIENT/PROJECT NUMBER: 11210-94943
RECEIVED FROM: U S Sales
PROJECT LOCATION: Omega Point Labs

REPORT NUMBER: 1247-11210
DATE RECEIVED: 1/21/93
DATE INSPECTED: 1/21/93
INSPECTED BY: C Humphrey

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	QUANTITY Rec'd	QUANTITY B.O.	I.D. NO.	CONTRLD MATERIAL Y/N	DATE CERT. REC'D	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	ACCEPTANCE Hold	ACCEPTANCE Reject	REMARKS
Hold Down Clamp	10010	3	3	—	P2558-40	Y	1/21	Good	None	X			
" " "	"	9	9	—	P2558-30	Y	1/21	"	"	X			
" " "	"	3	3	—	P2558-20	Y	1/21	"	"	X			
" " "	"	3	3	—	P2558-15	Y	1/21	"	"	X			
" " "	"	3	3	—	P2558-10	Y	1/21	"	"	X			

FORM
12/20/91

PURCHASE ORDER

Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway, San Antonio TX 78238
(512) 647-5253 FAX: (512) 647-0615

Vendor:

U.S. Sales
318 Melrose Place

San Antonio TX 78212

PO Number: 1007-Q

Invoice, correspondence, all shipping papers, and packages must reference P.O. number.

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Order Date	Ship Via	F.O.B.	Date Required	Terms
1/18/93	truck			

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	P-2558-40 hold down clamp	3	$6.02	$18.06
2.	P-2558-30 hold down clamp	9	$5.33	$47.97
3.	P-2558-20 hold down clamp	3	$4.18	$12.54
4.	P-2558-15 hold down clamp	3	$2.62	$7.86
5.	P-2558-10 hold down clamp	3	$2.50	$7.50
	"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval C Humphrey Date 1/18/93			
	Plus tax			

Special Instructions

Please include certificate of compliance on materials.

Ordered By: Kerry Hitchcock
Project #: 11210-94943
TVA

Total	$93.93
Shipping	
Tax	$7.13
Invoice Total	$101.06

U. S. SALES CO.

CONTRACTORS SPECIALTIES
PHONE 344-1341
162 GLENCOE DR.
SAN ANTONIO, TEXAS 78212
SINCE 1948

January 21, 1993

CERTIFICATION OF COMPLIANCE

Omega Point Labs
6868 Alamo Downs Parkway
San Antionio, Texas 78238
Attn: Kerry

Customer Order No. 1007 Q

Material	3 P-2558-40	Hold Down Clamps
	9 P-2558-30	Hold Down Clamps
	3 P-2558-20	Hold Down Clamps
	3 P-2558-15	Hold Down Clamps
	3 P-2558-10	Hold Down Clamps

This is to certify that the materials shipped to fill the above order has been manufactured in accordance with standard manufacturing procedures and specifications for this product.

U. S. SALES CO.

Johnny Boyd

Johnny Boyd, President

Omega Point Laboratories, Inc.
Personnel Certifications

OMEGA POINT LABORATORIES

STATEMENT OF PHYSICAL CONDITION
(INSPECTION, EXAMINATION AND TESTING PERSONNEL)

NAME: Deggary N. Priest HIRE DATE: March, 1985

PHYSICAL CAPABILITY OF PERFORMANCE OF ASSIGNED TASKS

"I certify that I am physically capable of performing my assigned tasks with the exceptions as listed below."

EXCEPTIONS: none

SIGNATURE: Deggary N. Priest (Applicant) DATE: 9/28/88

VISION: Natural or corrected near-distant acuity in accordance with J-1 letters on standard Jaeger's test type chart for near vision or equivalent test type.

EXAMINATION DATE October 28, 1988 EXPIRATION DATE October 28, 1989
RESULTS Passed EXAMINER C. Curtis

EXAMINATION DATE 12/5/89 EXPIRATION DATE 12/5/90
RESULTS Pass EXAMINER C. Curtis

EXAMINATION DATE 12/10/90 EXPIRATION DATE 12/10/91
RESULTS Passed EXAMINER C Curtis

EXAMINATION DATE 12/11/91 EXPIRATION DATE 12/11/92
RESULTS Pass EXAMINER C Humphrey

EXAMINATION DATE 12/6/92 EXPIRATION DATE 12/6/93
RESULTS Passed EXAMINER C Humphrey

EXAMINATION DATE EXPIRATION DATE
RESULTS EXAMINER

QUALITY ASSURANCE TRAINING RECORD

OMEGA POINT LABORATORIES

NAME Deggary N. Priest

PAGE 1 OF 1

DESCRIPTION OF TRAINING ACTIVITY	SIGNATURE	TRAINED BY	DATE
OPL QAP-005, Sec. 206(a) Energy Reorganization Act			10/28/88
10 CFR, Part 21, Reporting Defects and Noncompliances			10/28/88
10 CFR 50, App.B, Q/A Criteria Nuclear Power Plants			10/28/88
Ammended Atomic Energy Act (235)Protection Inspectors			10/28/88
ANSI N45.2 Q/A Program For Nuclear Power Plants			10/28/88
OPL Quality Assurances Procedures Manual, Rev. A			10/28/88
QAP 008 Receiving, Hndlg, Storage & Shpg Insp.Rev. A			1/20/89
QAP 009 Calibration & Certification of MTE, Rev.A			1/20/89
QAP 010 Nonconformance Reporting, Rev. A			1/20/89
OPL Quality Assurance Procedures Manual, Revision B		C Humphrey	2/06/92

OMEGA POINT LABORATORIES

CERTIFICATE OF QUALIFICATION

Deggary N. Priest has met all qualification criteria established by procedure no. QAP-006 and is hereby certified to perform Level III functions as described below and as further detailed in supporting training records.

Levels of capability include:

X Performing and recording inspection and tests in accordance with procedures.

X Planning inspections and tests, including the set-up of related equipment.

X Evaluating the validity and acceptability of inspection and testing results.

X Reporting inspection, examination and testing results.

X Supervising and training equivalent and lower personnel.

X Qualifying and certifying lower level personnel.

X Evaluating the adequacy of specific programs used to train personnel.

X Qualifying and certifying same level personnel.

The basis for this certification includes:

X Education and experience as documented.

X Management upgrade.

X Programmatic and on-the-job training as documented.

___ Proficiency testing as documented.

Period of certification:

From 3/6/92 to 3/6/93

Certified by: Constance A. Humphrey

C Humphrey — Signature

3/6/92 — date

OMEGA POINT LABORATORIES

RECEIVED
1989 JAN 17 PM 5:44
ADMISSIONS AND RECORDS
C.S.U.H.

January 12, 1989

Office of Admissions & Registration
California State University at Hayward
Hayward, CA 94542-3035

Re: Mr. Deggary N. Priest
SS No 629-56-1005

Dear Sir or Madam:

Would you kindly verify the educational records of Deggary N. Priest who attended Cal State at Hayward from Spring, 1967 through 1972?

Bachelor of Science Degree, Chemistry, 1970

VERIFIED BY: Judith L. Hirsch DATE JAN 26 1989 mk
Judith L. Hirsch, Associate Vice President
Admissions and Enrollment Services

Office of Admissions and Records
California State University
Hayward, California 94542

Master of Science Degree, Chemistry, 1972

VERIFIED BY: Judith L. Hirsch DATE JAN 26 1989 mk
Judith L. Hirsch, Associate Vice President
Admissions and Enrollment Services

If your records do not agree with this information, please correct and then verify.

If you have any questions or problems, please call Mr. Priest at 1-800-443-3072.

I am including a postage-paid envelope for your convenience in returning this form to us.

Regards,

Constance A. Curtis

Constance A. Curtis
Vice President
Omega Point Laboratories, Inc.

CAC/dbm

6868 Alamo Downs Parkway
San Antonio, Texas 78238
512 / 647-5253
TELEX: 9102400828 SWCS UQ
FAX: 512 / 647-0615

OMEGA POINT LABORATORIES®

January 20, 1989

Employment Department
Weyerhaeuser Company
P.O. Box 188
Longview, WA 98632

Re: **Deggary N. Priest**

Dear Sir or Madam:

Would you kindly send me verification of employment of Mr. Deggary N. Priest who was a Fire Technologist for the Fire Technology Center, Lab B of WeyCo from November, 1976 through July, 1979?

I am enclosing an addressed, postage-paid return envelope for your convenience.

Thank you for your consideration.

Regards,

Constance A. Curtis

Constance A. Curtis
Vice President
Omega Point laboratories, Inc.

CAC/dbm

Enclosure

1/26/89
Mr. Priest was employed by Weyerhaeuser Co. from 11-76 to 7-79.
Jan Richards
Salaried Payroll Spec.
Weyerhaeuser Co.

6868 Alamo Downs Parkway
San Antonio, Texas 78238
512 / 647-5253
TELEX: 9102400828 SWCS UQ
FAX: 512 / 647-0615

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 • 6220 CULEBRA ROAD • SAN ANTONIO, TEXAS, USA 78284 • (512) 684-5111 • TELEX 244846

1 February 1989

Ms. Constance A. Curtis
Vice President
Omega Point Laboratories, Inc.
6368 Alamo Downs Parkway
San Antonio, TX 78238

Dear Ms. Curtis:

This is to verify that Mr. Deggary N. Priest was employed as a Senior Research Scientist in the Department of Fire Technology from 7 September 1982 to 8 March 1985.

Very truly yours,

Bill E. Crumlett
Director, Personnel Department

BEC:il

QC INDOCTRINATION STATEMENT

I, Deggary N. Priest, have been indoctrinated to the technical objectives and Quality Assurance/Quality Control elements Omega Point Laboratories' Q/A Program.

I have also received indoctrination to the regulatory standards listed below:

Omega Point Labs QAP Manual, Rev. A, Sec. 005, which includes:
Sec. 206 (a) of the Energy Reorganization Act of 1974

10 CFR, Part 21 - Reporting Defects and Noncompliance

10 CFR 50, Appendix B - Quality Assurance Criteria For Nuclear Power Plants

Ammended Atomic Energy Act, Sec. 235 - Protection of Inspectors

ANSI N45.2 - Quality Assurance Program For Nuclear Power Plants

Omega Point Labs Quality Assurance Manual, Revision B

- Omega Point Labs Quality Assurance Procedures Manual, Revision B

2/6/92

Signature Date

Indoctrination By:

Constance A. Humphrey 2/6/92

Supervisor/Training Instructor Date

Name Deggary N. Priest

Title President

Company Omega Point Laboraories, Inc.

Address 6868 Alamo Downs Parkway

San Antonio, TX 78238

I hereby acknowledge receipt of the following document(s):

Omega Point Laboratories, Inc.
Quality Assurance Procedures Manual

Revision B

Controlled Copy No. 11

Signed, _____ Date 2/06/92

OMEGA POINT LABORATORIES

RELEVANT EDUCATION AND EXPERIENCE

NAME: Deggary N. Priest INITIAL HIRE DATE: March 1985

DATE OF BIRTH: 2/8/44 SSN: 555-56-1005

==========

LEVEL I

- ☐ TWO YEARS EXPERIENCE IN QUALITY RELATED ACTIVITIES.
- ☐ HIGH SCHOOL GRADUATE (OR EQUIVALENT) PLUS SIX MONTHS QUALITY RELATED EXPERIENCE.
- ☐ ASSOCIATES DEGREE IN A RELATED DISCIPLINE PLUS THREE MONTHS QUALITY RELATED EXPERIENCE.
- ☐ MANAGEMENT UPGRADE (ATTACH RECORD OF BASIS AND APPROVAL BY QUALITY ASSURANCE MANAGER).

==========

LEVEL II

- ☐ ONE YEAR SATISFACTORY PERFORMANCE IN QUALITY RELATED ACTIVITIES AS A LEVEL I OR HIGHER.
- ☐ HIGH SCHOOL GRADUATE (OR EQUIVALENT) PLUS THREE YEARS QUALITY RELATED EXPERIENCE.
- ☐ ASSOCIATES DEGREE PLUS ONE YEAR QUALITY RELATED EXPERIENCE.
- ☐ FOUR YEAR DEGREE PLUS SIX MONTHS QUALITY RELATED EXPERIENCE.
- ☐ MANAGEMENT UPGRADE (ATTACH RECORD OF BASIS AND APPROVAL BY QUALITY ASSURANCE MANAGER).

==========

LEVEL III

- ☐ SIX YEARS EXPERIENCE PERFORMING QUALITY RELATED ACTIVITIES AS A LEVEL II.
- ☐ HIGH SCHOOL GRADUATE (OR EQUIVALENT) PLUS: TEN YEARS QUALITY RELATED EXPERIENCE OR EIGHT YEARS QUALITY RELATED EXPERIENCE WITH AT LEAST TWO YEARS AS A LEVEL II AND TWO YEARS NUCLEAR RELATED.
- ☐ ASSOCIATES DEGREE PLUS SEVEN YEARS QUALITY RELATED EXPERIENCE WITH AT LEAST TWO YEARS NUCLEAR RELATED.
- ☒ FOUR YEAR DEGREE PLUS FIVE YEARS QUALITY RELATED EXPERIENCE WITH AT LEAST TWO YEARS NUCLEAR RELATED.

==========

CHECKED BY: [signature] DATE: 10/28/88

Name Deggary N. Priest

Title President

Company Omega Point Laboratories, Inc.

Address 6868 Alamo Downs Parkway

San Antonio, TX 78238

I hereby acknowledge receipt of the following document(s):

Omega Point Laboratories, Inc.
Quality Assurance Procedures Manual

Revision A

Controlled Copy No. 1

Signed Deggary N. Priest Date 1/28/89

Name Deggary N. Priest

Title President

Company Omega Point Laboratories, Inc.

Address 6868 Alamo Downs Parkway

San Antonio, TX 78238

I hereby acknowledge receipt of the following document(s):

Omega Point Laboratories, Inc.
Quality Assurance Manual

Revision A

Controlled Copy No. 1

Signed Deggary N. Priest Date 7/28/88

OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

Name Deggary N. Priest Position President
Evaluation Date January 4, 1991 Initial Hire Date April, 1985

PROFICIENCY	Does not meet Requirements	Meets Reqm't	Exceeds Reqm't
1. Demonstrates knowledge of assigned duties.			X
2. Performs duties in an efficient manner.			X
3. Completes expected amount of work.			X
4. Understands and utilizes available resources.			X
5. Meets schedules for completing assigned duties.			X
6. Performs duties without excessive supervision.			X
7. Performs in a consistent, reliable manner.			X
8. Flexible in performance of assigned tasks.		X	
9. Demonstrates sufficient communication skills.			X
10. Cooperates well with others.			X
11. Takes initiative to accomplish tasks.			X
12. No excessive absenteeism or tardiness.			X

Summary: The overall Nuclear Quality Assurance Program is running very smoothly, largely due to Deg's efforts and improved communication skills.

Evaluator Signature C Curtis Employee Signature

OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

Name Deggary Priest Position President
Evaluation Date 12/14/89 Initial Hire Date 4/85

PROFICIENCY	Does not meet Requirements	Meets Reqm't	Exceeds Reqm't
1. Demonstrates knowledge of assigned duties.	—	—	✓
2. Performs duties in an efficient manner.	—	✓	—
3. Completes expected amount of work.	—	—	✓
4. Understands and utilizes available resources.	—	✓	—
5. Meets schedules for completing assigned duties.	—	✓	—
6. Performs duties without excessive supervision.	—	—	✓
7. Performs in a consistent, reliable manner.	—	—	✓
8. Flexible in performance of assigned tasks.	—	—	✓
9. Demonstrates sufficient communication skills.	—	✓	—
10. Cooperates well with others.	—	—	✓
11. Takes initiative to accomplish tasks.	—	✓	—
12. No excessive absenteeism or tardiness.	—	—	✓

Summary: Evaluation in regards to Q/A program only.

Evaluator Signature C Curtis Employee Signature [signature]

OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

NAME : Deggary N. Priest INITIAL HIRE DATE: March, 1985

S.S.N.: 555-56-1002 EVALUATION DATE : 10/28/88

PROFICIENCY	Does Not Meet Requirements	Meets Requirements	Exceeds Requirements
1. Demonstrates knowledge of assigned duties.			X
2. Performs duties in an efficient manner.		X	
3. Completes expected amount of work.			X
4. Understands and utilizes available resources.			X
5. Meets schedules for completing assigned duties.			X
6. Performs duties without excessive supervision.			X
7. Performs in a consistent, reliable manner.			X
8. Flexible in performance of assigned tasks.		X	
9. Demonstrates sufficient communication skills.			X
10. Cooperates well with others.			X
11. Takes initiative to accomplish tasks.			X
12. No excessive absenteeism or tardiness.			X

SUMMARY/AREAS NEEDING IMPROVEMENT: _____

Evaluator Signature _____ Employee Signature _____

OMEGA POINT LABORATORIES

STATEMENT OF PHYSICAL CONDITION
(INSPECTION, EXAMINATION AND TESTING PERSONNEL)

NAME: Constance Curtis HIRE DATE: 10/86

Name Change: Constance A. Humphrey Date: 7/6/91

PHYSICAL CAPABILITY OF PERFORMANCE OF ASSIGNED TASKS

"I certify that I am physically capable of performing my assigned tasks with the exceptions as listed below."

EXCEPTIONS: None

SIGNATURE: Constance A. Curtis DATE: 11/3/88
(Applicant)

VISION: Natural or corrected near-distant acuity in accordance with J-1 letters on standard Jaeger's test type chart for near vision or equivalent test type.

EXAMINATION DATE 11/2/88 EXPIRATION DATE 11/1/88
RESULTS Passed EXAMINER [signature]

EXAMINATION DATE 12/5/89 EXPIRATION DATE 12/5/90
RESULTS Pass EXAMINER [signature]

EXAMINATION DATE 12/10/90 EXPIRATION DATE 12/9/91
RESULTS Passed EXAMINER [signature]

EXAMINATION DATE 12/11/91 EXPIRATION DATE 12/11/92
RESULTS Passed EXAMINER [signature]

EXAMINATION DATE 12/15/92 EXPIRATION DATE 12/15/93
RESULTS Passed EXAMINER [signature]

EXAMINATION DATE _____ EXPIRATION DATE _____
RESULTS _____ EXAMINER _____

RECORD OF LEAD AUDITOR QUALIFICATIONS

NAME: Constance A. Curtis TITLE: Q/A Manager DATE: 10/30/89

QUALIFICATION POINT REQUIREMENTS		CREDITS
EDUCATION	4 CREDITS MAX.	
University/Degree/Date		
EXPERIENCE	9 CREDITS MAX.	
Technical (0-5 Pts.)	OPL 10/88 to Present	1
~~Nuclear Industry (0-1 Pts.)~~	Parsons-Jurden 12/77 to 12/78	1
	Showcase Bldrs. 10/83 to 9/86	1
Quality Assurance (0-2 Pts.)	Omega Point Labs 10/86 to Present	2
Auditing (0-1 Pts.)	OPL 12/88 to Present	1
PROFESSIONAL ACCOMPLISHMENT	2 CREDITS MAX.	
Certificate/Date	Fire Tests in Bldg. Codes 4/9/87	2
MANAGEMENT	2 CREDITS MAX.	
Explain:	Has attended many QA activities and training programs. Ms. Curtis shows sound judgement, has displayed many of the leadership qualities that are required to qualify her.	2
Evaluated by: (Name & Title)	Deggary N. Priest, President	
	TOTAL CREDITS	10

AUDIT COMMUNICATION SKILLS

Evaluated by: (Name & Title) (Consultant) L. Charles Spriggs Promatec QA Program Mgr. Date 5/88

AUDIT TRAINING COURSES

Course or Topic	Date
1. Lead Auditor Training Course (General Atomics)	10/27/89
2. Quality Control Inspector (Promatec Training Course)	4/23/90

AUDIT PARTICIPATION

Location	Audit	Date
1. SwRI	Nuclear Quality Assurance Program	12/15/88
2. Promatec	Nuclear Quality Assurance Program	12/02/88
3. Rothe Dev.	Quality Assurance Program Audit	3/29/89
4. Houston Scale	Quality Assurance Program Audit	10/29/91

EXAMINATION Passed Date

AUDITOR CERTIFIED BY: Date Certified 10/30/89

(Signature & Title) L. Charles Spriggs
Promatec Lead Auditor & QA Program Director

ANNUAL EVALUATION *(Signature & Date)*				
	10/30/89	10/26/90	10/31/91	10/29/92

EVALUATION OF PERFORMANCE

Name Constance A. Curtis Position Q/A Manager

INDOCTRINATION:
Indoctrination with technical objectives: Applicable codes and standards, quality assurance program and quality control procedures and methods.

Date 1/20/89 By D. Priest Level III
Comments

ON THE JOB PARTICIPATION
First hand experience through actual performance of processes, tests, examinations and inspections.

Date 5/25/89 By L. Charles Spriggs Level III
Comments Reviewed audits performed by Ms. Curtis

PROFICIENCY TRAINING AND EXAMINATION

Date of Training 10/23-10/27/89 By William G. Hanson/General Atomics
Examination Date 10/27/89 Level III

EVALUATION OF PERFORMANCE

INITIAL Date 12/6/89 By Deg Priest Level III
Results Satisfactory performance in all areas

90 DAY Date 3/12/90 By Deg Priest Level III
Results Program is running smoothly

1 ANNUAL Date 3/20/91 By Deg Priest Level III
Results Good

2 ANNUAL Date 3/14/92 By Deg Priest Level III
Results Q/A Program is running well.

3 ANNUAL Date By Level
Results

QUALITY ASSURANCE TRAINING RECORD

OMEGA POINT LABORATORIES

NAME Constance A. (Curtis) Humphrey
(Name change 7/6/91)

PAGE 1 OF 1

DESCRIPTION OF TRAINING ACTIVITY	SIGNATURE	TRAINED BY	DATE
OPL QAP-005, Sec. 206(a) Energy Reorganization Act	C Curtis	[illegible]	10/28/88
10 CFR, Part 21, Reporting Defects and Noncompliances	C Curtis	[illegible]	10/28/88
10 CFR 50, App.B, Q/A Criteria Nuclear Power Plants	C Curtis	[illegible]	10/28/88
Ammended Atomic Energy Act (235) Protection Inspectors	C Curtis	[illegible]	10/28/88
ANSI N45.2 Q/A Program For Nuclear Power Plants	C Curtis	[illegible]	10/28/88
OPL Quality Assurances Procedures Manual, Rev. A	C Curtis	[illegible]	10/28/88
QAP 008 Receiving, Hndlg, Storage & Shpg Insp. Rev. A	C Curtis	[illegible]	1/20/89
QAP 009 Calibration & Certification of MTE, Rev. A	C Curtis	[illegible]	1/20/89
QAP 010 Nonconformance Reporting, Rev. A	C Curtis	[illegible]	1/20/89
OPL Quality Assurance Manual, Rev. B	C Curtis	[illegible]	10/01/90
OPL Quality Assurance Procedures Manual, Revision B	C Humphrey	[illegible]	2/06/92

Certificate Of Proficiency

THIS IS TO CERTIFY THAT

Constance A. Curtis

SSN: 555-68-5402

HAVING COMPLETED THE PRESCRIBED CLASSROOM AND PRACTICAL APPLICATION TRAINING AND HAVING SUCCESSFULLY DEMONSTRATED UNDERSTANDING OF AND ABILITY TO COMPLY WITH THE REQUIREMENTS OF THE PROMATEC FIRE PROTECTIVE SYSTEMS AND TO FUNCTION WITHIN THE CONFINES HEREON PRESCRIBED, IS HEREBY GRANTED THE CLASSIFICATION OF

QUALITY CONTROL INSPECTOR

for

3-6548 Silicone RTV Foam Penetration Seals

THIS CLASSIFICATION THUS CONFERRED IS IN FORCE AND WILL BE HONORED ONLY WHILE THE RECIPIENT IS EMPLOYED BY: Omega Point Laboratories
San Antonio, Texas

UNDER THE SUPERVISION OR WITH THE APPROVAL OF

B&B PROGRESSIVE MATERIALS
AND TECHNOLOGIES, INC.
HOUSTON, TEXAS

PROMATEC

Product Assurance Manager

CERTIFICATE NUMBER 100/234 DATE April 23, 1990

QC INDOCTRINATION STATEMENT

I, Constance A. Humphrey, have been indoctrinated to the technical objectives and Quality Assurance/Quality Control elements Omega Point Laboratories' Q/A Program.

I have also received indoctrination to the regulatory standards listed below:

Omega Point Labs QAP Manual, Rev. A, Sec. 005, which includes:
Sec. 206 (a) of the Energy Reorganization Act of 1974

10 CFR, Part 21 - Reporting Defects and Noncompliance

10 CFR 50, Appendix B - Quality Assurance Criteria For Nuclear Power Plants

Ammended Atomic Energy Act, Sec. 235 - Protection of Inspectors

ANSI N45.2 - Quality Assurance Program For Nuclear Power Plants

Omega Point Labs Quality Assurance Manual, Revision B

- Omega Point Labs Quality Assurance Procedures Manual, Revision B

Constance A. Humphrey 2/6/92
Signature Date

Indoctrination By:

2/6/92
Supervisor/Training Instructor Date

OMEGA POINT LABORATORIES

CERTIFICATE OF QUALIFICATION

Constance Humphrey has met all qualification criteria established by procedure no. QAP-006 and is hereby certified to perform Level III functions as described below and as further detailed in supporting training records.

Levels of capability include:

- X Performing and recording inspection and tests in accordance with procedures.
- X Planning inspections and tests, including the set-up of related equipment.
- X Evaluating the validity and acceptability of inspection and testing results.
- X Reporting inspection, examination and testing results.
- X Supervising and training equivalent and lower personnel.
- X Qualifying and certifying lower level personnel.
- X Evaluating the adequacy of specific programs used to train personnel.
- X Qualifying and certifying same level personnel.

The basis for this certification includes:

- X Education and experience as documented.
- ___ Management upgrade.
- X Programmatic and on-the-job training as documented.
- X Proficiency testing as documented.

Period of certification:

From 3/3/92 to 3/3/93

Certified by:

Signature

Deggary N. Priest

March 3, 1992
date

OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

Name Constance Curtis Position VP / QA Mgr.
Evaluation Date 12/12/89 Initial Hire Date 10/86

PROFICIENCY	Does not meet Requirements	Meets Reqm't	Exceeds Reqm't
1. Demonstrates knowledge of assigned duties.	—	✓	—
2. Performs duties in an efficient manner.	—	✓	—
3. Completes expected amount of work.	—	✓	—
4. Understands and utilizes available resources.	—	✓	—
5. Meets schedules for completing assigned duties.	—	✓	—
6. Performs duties without excessive supervision.	—	—	✓
7. Performs in a consistent, reliable manner.	—	✓	—
8. Flexible in performance of assigned tasks.	—	—	✓
9. Demonstrates sufficient communication skills.	—	—	✓
10. Cooperates well with others.	—	—	✓
11. Takes initiative to accomplish tasks.	—	—	✓
12. No excessive absenteeism or tardiness.	—	—	✓

Summary:

Evaluator Signature [signature] Employee Signature Constance Curtis

OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

NAME : Constance A. Curtis INITIAL HIRE DATE: 10/86

S.S.N.: 555-68-5402 EVALUATION DATE : 10/28/88

PROFICIENCY	Does Not Meet Requirements	Meets Requirements	Exceeds Requirements
1. Demonstrates knowledge of assigned duties.		X	
2. Performs duties in an efficient manner.		X	
3. Completes expected amount of work.		X	
4. Understands and utilizes available resources.		X	
5. Meets schedules for completing assigned duties.		X	
6. Performs duties without excessive supervision.		X	
7. Performs in a consistent, reliable manner.		X	
8. Flexible in performance of assigned tasks.		X	
9. Demonstrates sufficient communication skills.		X	
10. Cooperates well with others.		X	
11. Takes initiative to accomplish tasks.		X	
12. No excessive absenteeism or tardiness.		X	

SUMMARY/AREAS NEEDING IMPROVEMENT:

Evaluator Signature [signature] Employee Signature Curtis

GENERAL ATOMICS

October 30, 1989

Ms. Constance Curtis
Vice-President
Omega Point Laboratories, Inc.
6868 Alamo Downs Parkway
San Antonio, TX 78238

Dear Ms. Curtis:

This letter is to inform you that you have successfully completed the Lead Auditor Training Course. The passing score is 70, and your score is 86. Congratulations!

Sincerely,

William G. Hanson

William G. Hanson
Quality Assurance Records Center

PO. BOX 85608, SAN DIEGO, CA 92138-5608 (619) 455-3000

LEAD AUDITOR TRAINING COURSE

Outline

I. The Foundations of the Quality Assurance Program

- A. Relevance of QA Program Understanding to the System Auditor
- B. Quality Assurance Objectives
- C. Responsibility for Attaining Quality Objectives
- D. Assurance Functions

II. Quality Assurance Program Elements

- A. Organization for Quality Assurance
- B. Quality Assurance Program
- C. Design Control
- D. Procurement Document Control
- E. Procedures, Instructions, & Drawings
- F. Document Control
- G. Control of Purchased Items and Services
- H. Identification and Control of Materials, Parts, and Components
- I. Control of Special Processes
- J. Inspection
- K. Test Control
- L. Control of Measuring, Testing & Inspection Equipment
- M. Handling, Packaging, Shipping & Storing
- N. Inspection, Test, and Operating Status
- O. Control of Nonconforming Items, Materials
- P. Corrective Action
- Q. Quality Assurance Records
- R. QA Audit

III. System Audit Definitions and Principles

- A. Definitions
- B. Principles
- C. Types of System Audit
- D. Audit Boundaries

IV. Anatomy of the System Audit

- A. Preparation and Planning
- B. Notification of Activities to be Audited
- C. The Pre-Audit Conference
- D. Physical Conduct of the Audit
- E. Analysis of Results

IX. Writing the Audit Plan

A. Organization of the Plan
B. Review Statements of Audit Purpose and Scope for Adequacy
C. Preparation of Audit Plan Draft
D. Audit Team Conference on Completeness and Adequacy of Plan
E. Reviewing Audit Plan with Audit Management

X. Audit Conduct

A. Notification of Intent to Audit
B. Pre-Audit Conference
C. Physical Conduct of the Audit

XI. Adverse Findings and Corrective Action

A. Analysis of Results
B. Post-Audit Conference
C. Corrective Action

XII. Reporting and Follow-up

A. The Interim Report
B. The (Internal Audit) Finding Notice
C. The Audit Report
D. Corrective Action Follow-up
E. Close-Out of Findings

XIII. Audit Ethics and Psychology

A. Psychological Views of System Audit
B. Psychology of Audit Conferences
C. Handling Antagonism
D. Handling Possible Deception
E. Coping with Fear
F. Implications of Safety and Liability to System Audit
G. Audit Ethics

XIV. Management Roles of System Audit

A. A Brief Review of Communication in Large Organizations
B. Role 1: Visibility for Upper Management
C. Role 2: Requirements/Policy Clarification
D. Role 3: The Flagging Function

D. Audit Function Library
E. Audit Files
F. Accumulating Audit Cost Data
G. Maintaining Control of Follow-up Activity
H. Treatment of Forms
L Auditor Qualification/Capabilities Profile

XX. Examination

GENERAL ATOMICS

This is to certify that CONSTANCE CURTIS,
Social Security No. 555-68-5402, is awarded 3.6
Continuing Education Units (CEU's) in the Quality Assurance discipline for successful completion of the LEAD AUDITOR TRAINING course.
The course is part of the General Atomics Continuing Education Program in Quality Assurance and involved 36 contact hours of instruction.

Permanent records are kept at, and inquiries may be addressed to,

Quality Assurance Training
General Atomics
P.O. Box 86608
San Diego, CA 92138

A copy of the course outlined is attached hereto.

Certified by: Colin R. Fisher

Colin R. Fisher, Director
Quality Assurance

GENERAL ATOMICS

GENERAL ATOMICS

certifies that

CONSTANCE CURTIS

has attended and successfully completed the course

LEAD AUDITOR TRAINING

given OCTOBER 23-27, 1989 in SAN DIEGO, CALIFORNIA

DIRECTOR, QUALITY ASSURANCE

P. S. Stuart

INSTRUCTOR

ASTM

ASTM Hereby Awards This Certificate And 1.6 CEUs To: CONSTANCE CURTIS

For Successful Completion Of The Course On:

FIRE TESTS IN BUILDING CODES, PRINCIPLES & APPLICATIONS

April 7 - 9, 1987

Pamela A. White

President

Instructors

Texas Engineering Extension Service
The Texas A&M University System
Technology Resource Center

Presents this certificate to

CONSTANCE A. CURTIS

for completion of

Code Enforcement Officer Training
Module III

May 10, 1990
in cooperation with the
Code Enforcement Association of Texas

Chuck Phinney
Instructor

James R. Bradley
Director, Texas Engineering Extension Service

467

Texas Engineering Extension Service
The Texas A&M University System
Technology Resource Center

Presents this certificate to

CONSTANCE A. CURTIS

for completion of the 24-hour

Building Codes Training Program
Course III: Structural Codes

May 8, 1990

Chuck Phinney
Instructor

James R. Bradley
Director, Texas Engineering Extension Service

Texas Engineering Extension Service
The Texas A&M University System
Technology Resource Center

Presents this certificate to

CONSTANCE A. CURTIS

for completion of the 24-hour

Building Codes Training Program
Course II: Non-Structural Plan Review

April 3, 1990

Chuck Phinney
Instructor

James R. Bradley
Director, Texas Engineering Extension Service

469

Name Constance A. Curtis

Title Vice President

Company Omega Point Laboratories

Address 6868 Alamo Downs Parkway

San Antonio, TX 78238

I hereby acknowledge receipt of the following document(s):

Omega Point Laboratories, Inc.
Quality Assurance Procedures Manual

Revision A

Controlled Copy No. 2

Signed Constance A. Curtis Date 1/19/89

US·HOME® U.S. HOME CORPORATION

1800 West Loop South • Box 2863 • Houston, Texas 77252-2863 • (713) 599-2560

FRANK E. MATTHEWS
Senior Personnel Director

January 6, 1989

Ms. Constance P. Curtis
Omega Point Labs
6868 Alamo
Downs Parkway
San Antonio, Texas 78238

Dear Ms. Curtis:

Per your request, our personnel records show that you were employed with U.S. Home Corporation from 05/08/79 - 11/01/82. Your last position was as a Vice President of Construction at a salary of $38,500 per year.

Please let us know if we can be of further assistance.

Sincerely,

Frank Matthews

Frank Matthews
Senior Personnel Director

/hat

OMEGA POINT LABORATORIES

RELEVANT EDUCATION AND EXPERIENCE

NAME: Constance A. Curtis INITIAL HIRE DATE: 10/86

DATE OF BIRTH: 5/24/46 SSN: 555-68-5402

==========

LEVEL I

- [X] TWO YEARS EXPERIENCE IN QUALITY RELATED ACTIVITIES.
- [X] HIGH SCHOOL GRADUATE (OR EQUIVALENT) PLUS SIX MONTHS QUALITY RELATED EXPERIENCE.
- [ ] ASSOCIATES DEGREE IN A RELATED DISCIPLINE PLUS THREE MONTHS QUALITY RELATED EXPERIENCE.
- [ ] MANAGEMENT UPGRADE (ATTACH RECORD OF BASIS AND APPROVAL BY QUALITY ASSURANCE MANAGER).

==========

LEVEL II

- [ ] ONE YEAR SATISFACTORY PERFORMANCE IN QUALITY RELATED ACTIVITIES AS A LEVEL I OR HIGHER.
- [X] HIGH SCHOOL GRADUATE (OR EQUIVALENT) PLUS THREE YEARS QUALITY RELATED EXPERIENCE.
- [ ] ASSOCIATES DEGREE PLUS ONE YEAR QUALITY RELATED EXPERIENCE.
- [ ] FOUR YEAR DEGREE PLUS SIX MONTHS QUALITY RELATED EXPERIENCE.
- [ ] MANAGEMENT UPGRADE (ATTACH RECORD OF BASIS AND APPROVAL BY QUALITY ASSURANCE MANAGER).

==========

LEVEL III

- [ ] SIX YEARS EXPERIENCE PERFORMING QUALITY RELATED ACTIVITIES AS A LEVEL II.
- [ ] HIGH SCHOOL GRADUATE (OR EQUIVALENT) PLUS: TEN YEARS QUALITY RELATED EXPERIENCE OR EIGHT YEARS QUALITY RELATED EXPERIENCE WITH AT LEAST TWO YEARS AS A LEVEL II AND TWO YEARS NUCLEAR RELATED.
- [ ] ASSOCIATES DEGREE PLUS SEVEN YEARS QUALITY RELATED EXPERIENCE WITH AT LEAST TWO YEARS NUCLEAR RELATED.
- [ ] FOUR YEAR DEGREE PLUS FIVE YEARS QUALITY RELATED EXPERIENCE WITH AT LEAST TWO YEARS NUCLEAR RELATED.

==========

CHECKED BY: Susan M. [illegible] DATE: 10/28/88

Name Constance A. Humphrey

Title V.P. & Q/A Manager

Company Omega Point Laboratories, Inc.

Address 6868 Alamo Downs Parkway

San Antonio, TX 78238

I hereby acknowledge receipt of the following document(s):

Omega Point Laboratories, Inc.
Quality Assurance Procedures Manual

Revision B

Controlled Copy No. 15

Signed Constance A. Humphrey Date 2/06/92

STATEMENT OF PHYSICAL CONDITION
(INSPECTION, EXAMINATION AND TESTING PERSONNEL)

NAME: Kerry Hitchcock HIRE DATE: 7/88

PHYSICAL CAPABILITY OF PERFORMANCE OF ASSIGNED TASKS

"I certify that I am physically capable of performing my assigned tasks with the exceptions as listed below."

EXCEPTIONS: (none)

SIGNATURE: Kerry Hitchcock (Applicant) DATE: 11/8/88

VISION: Natural or corrected near-distant acuity in accordance with J-1 letters on standard Jaeger's test type chart for near vision or equivalent test type.

EXAMINATION DATE 11/8/88 EXPIRATION DATE 11/8/89
RESULTS Passed EXAMINER C. Curtis

EXAMINATION DATE 12/6/89 EXPIRATION DATE 12/6/90
RESULTS Passed EXAMINER C. Curtis

EXAMINATION DATE 12/4/90 EXPIRATION DATE 12/4/91
RESULTS Passed EXAMINER C Curtis

EXAMINATION DATE 11/20/91 EXPIRATION DATE 11/20/92
RESULTS Passed EXAMINER C Humphrey

EXAMINATION DATE 12/16/92 EXPIRATION DATE 12/16/93
RESULTS Passed EXAMINER C Humphrey

EXAMINATION DATE _____ EXPIRATION DATE _____
RESULTS _____ EXAMINER _____

OMEGA POINT LABORATORIES

CERTIFICATE OF QUALIFICATION

Kerry Hitchcock has met all qualification criteria established by procedure no. QAP-006 and is hereby certified to perform Level II functions as described below and as further detailed in supporting training records.

Levels of capability include:

- X Performing and recording inspection and tests in accordance with procedures.
- X Planning inspections and tests, including the set-up of related equipment.
- X Evaluating the validity and acceptability of inspection and testing results.
- _ Reporting inspection, examination and testing results.
- X Supervising and training equivalent and lower personnel.
- X Qualifying and certifying lower level personnel.
- _ Evaluating the adequacy of specific programs used to train personnel.
- X Qualifying and certifying same level personnel.

The basis for this certification includes:

- X Education and experience as documented.
- X Management upgrade.
- X Programmatic and on-the-job training as documented.
- X Proficiency testing as documented.

Period of certification:

From 8/4/92 to 8/4/93

Certified by:

C Humphreys 8/4/92

Signature date

OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

Name Kerry Hitchcock Position Foreman
Evaluation Date August 5, 1992 Initial Hire Date July 14, 1992

PROFICIENCY	Does not meet Requirements	Meets Reqm't	Exceeds Reqm't
1. Demonstrates knowledge of assigned duties.			X
2. Performs duties in an efficient manner.			X
3. Completes expected amount of work.			X
4. Understands and utilizes available resources.			X
5. Meets schedules for completing assigned duties.			X
6. Performs duties without excessive supervision.			X
7. Performs in a consistent, reliable manner.			X
8. Flexible in performance of assigned tasks.			X
9. Demonstrates sufficient communication skills.			X
10. Cooperates well with others.			X
11. Takes initiative to accomplish tasks.			X
12. No excessive absenteeism or tardiness.			X

Summary: Kerry has become an extremely valuable asset to Omega Point. He works effectively and efficiently without supervision and has proven to be a capable manager of others.

Evaluator Signature C Humphrey Employee Signature Kerry Hitchcock

Certificate Of Proficiency

THIS IS TO CERTIFY THAT

Kerry M. Hitchcock

SSN: 454-19-6265

HAVING COMPLETED THE PRESCRIBED CLASSROOM AND PRACTICAL APPLICATION TRAINING AND HAVING SUCCESSFULLY DEMONSTRATED UNDERSTANDING OF AND ABILITY TO COMPLY WITH THE REQUIREMENTS OF THE PROMATEC FIRE PROTECTIVE SYSTEMS AND TO FUNCTION WITHIN THE CONFINES HEREON PRESCRIBED, IS HEREBY GRANTED THE CLASSIFICATION OF

INSTALLER

of

3-6548 Silicone RTV Foam Penetration Seals

THIS CLASSIFICATION THUS CONFERRED IS IN FORCE AND WILL BE HONORED ONLY WHILE THE RECIPIENT IS EMPLOYED BY: Omega Point Laboratories
San Antonio, Texas

UNDER THE SUPERVISION OR WITH THE APPROVAL OF

B&B PROGRESSIVE MATERIALS
AND TECHNOLOGIES, INC.
HOUSTON, TEXAS

PROMATEC

Product Assurance Manager

CERTIFICATE NUMBER 100/235 DATE April 23, 1990

OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

Name Kerry Hitchcock Position Foreman
Evaluation Date July 29, 1991 Initial Hire Date July 14, 1988

PROFICIENCY	Does not meet Requirements	Meets Reqm't	Exceeds Reqm't
1. Demonstrates knowledge of assigned duties.			X
2. Performs duties in an efficient manner.			X
3. Completes expected amount of work.			X
4. Understands and utilizes available resources.			X
5. Meets schedules for completing assigned duties.			X
6. Performs duties without excessive supervision.			X
7. Performs in a consistent, reliable manner.			X
8. Flexible in performance of assigned tasks.			X
9. Demonstrates sufficient communication skills.			X
10. Cooperates well with others.			X
11. Takes initiative to accomplish tasks.			X
12. No excessive absenteeism or tardiness.			X

Summary: Kerry continues to excel in all areas. He has completed the many courses in welding to now be fully certified in all phases of the GAS-TUNGSTEN-ARC Welding Process.

On April 23, 1990, Kerry completed his Certificate of Proficiency as an Installer of 3-6548 RTV Foam Penetration Seals.

Evaluator Signature [signature] Employee Signature Kerry Hitchcock

TVA

Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

JAN 17 1992

Mr. Deggary N. Priest
Omega Point Laboratories
6868 Alamo Downs Parkway
San Antonio, Texas 78238

Dear Mr. Priest:

I would like to take a moment and thank you for all your efforts in preparing and conducting our Seismic Gap Fire Tests projects 1121-92348 and 1121-92349. The 'turn-around' time in preparing the project, conducting the test, and issuing the report were excellent. Your efforts allowed me to close out this item ahead of schedule. I would also like to commend Kerry Hitchcock and Richard Beasley for their ingenuity and care in constructing the test slabs.

I am very impressed with Omega Point's personal attention to detail in providing the highest quality, truly representative construction, fire test.

If you ever have the need, please feel free to use me as a reference.

Sincerely,

Mark Henry Salley
Fire Protection/Appendix R
Engineering Specialist
Corporate Engineering-Nuclear Power

OMEGA POINT LABORATORIES

RELEVANT EDUCATION AND EXPERIENCE

NAME: Kerry Hitchcock INITIAL HIRE DATE: July 14, 1988

DATE OF BIRTH: February 2, 1962 SSN: 454-19-8265

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LEVEL I

- [ ] TWO YEARS EXPERIENCE IN QUALITY RELATED ACTIVITIES.
- [x] HIGH SCHOOL GRADUATE (OR EQUIVALENT) PLUS SIX MONTHS QUALITY RELATED EXPERIENCE.
- [ ] ASSOCIATES DEGREE IN A RELATED DISCIPLINE PLUS THREE MONTHS QUALITY RELATED EXPERIENCE.
- [ ] MANAGEMENT UPGRADE (ATTACH RECORD OF BASIS AND APPROVAL BY QUALITY ASSURANCE MANAGER).

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LEVEL II

- [ ] ONE YEAR SATISFACTORY PERFORMANCE IN QUALITY RELATED ACTIVITIES AS A LEVEL I OR HIGHER.
- [ ] HIGH SCHOOL GRADUATE (OR EQUIVALENT) PLUS THREE YEARS QUALITY RELATED EXPERIENCE.
- [ ] ASSOCIATES DEGREE PLUS ONE YEAR QUALITY RELATED EXPERIENCE.
- [ ] FOUR YEAR DEGREE PLUS SIX MONTHS QUALITY RELATED EXPERIENCE.
- [ ] MANAGEMENT UPGRADE (ATTACH RECORD OF BASIS AND APPROVAL BY QUALITY ASSURANCE MANAGER).

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LEVEL III

- [ ] SIX YEARS EXPERIENCE PERFORMING QUALITY RELATED ACTIVITIES AS A LEVEL II.
- [ ] HIGH SCHOOL GRADUATE (OR EQUIVALENT) PLUS: TEN YEARS QUALITY RELATED EXPERIENCE OR EIGHT YEARS QUALITY RELATED EXPERIENCE WITH AT LEAST TWO YEARS AS A LEVEL II AND TWO YEARS NUCLEAR RELATED.
- [ ] ASSOCIATES DEGREE PLUS SEVEN YEARS QUALITY RELATED EXPERIENCE WITH AT LEAST TWO YEARS NUCLEAR RELATED.
- [ ] FOUR YEAR DEGREE PLUS FIVE YEARS QUALITY RELATED EXPERIENCE WITH AT LEAST TWO YEARS NUCLEAR RELATED.

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OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

NAME : Kerry Hitchcock INITIAL HIRE DATE: July 14, 1988

S.S.N.: 454-19-8265 EVALUATION DATE : June 5, 1989

PROFICIENCY	Does Not Meet Requirements	Meets Requirements	Exceeds Requirements
1. Demonstrates knowledge of assigned duties.			✓
2. Performs duties in an efficient manner.			✓
3. Completes expected amount of work.			✓
4. Understands and utilizes available resources.			✓
5. Meets schedules for completing assigned duties.			✓
6. Performs duties without excessive supervision.			✓
7. Performs in a consistent, reliable manner.			✓
8. Flexible in performance of assigned tasks.			✓
9. Demonstrates sufficient communication skills.			✓
10. Cooperates well with others.			✓
11. Takes initiative to accomplish tasks.			✓
12. No excessive absenteeism or tardiness.			✓

SUMMARY/AREAS NEEDING IMPROVEMENT: Kerry has been quick to learn instrumentation techniques and continues to learn the fine testing business.

Evaluator Signature [signature] Employee Signature Kerry Hitchcock

OMEGA POINT LABORATORIES

RELEVANT EDUCATION AND EXPERIENCE

Name Kerry Hitchcock Position Foreman

Date of Birth 2/2/62 SS No. 454-19-8265

LEVEL 1

___ Two years experience in Quality related activities.
_x_ High School graduate (or equivalent) plus 6 months Quality related experience.
___ Associates degree in a related discipline plus 3 months Quality related experience.
___ Management upgrade (attach record of basis and approval by Quality Assurance Manager).

LEVEL II

_x_ One year satisfactory performance in Quality related activities as a level I or higher.
___ High school graduate (or equivalent) plus 3 years Quality related experience.
___ Associates degree plus 1 year Quality related experience.
___ Four year degree plus 6 months Quality related experience.
___ Management upgrade (attach record of basis and approval by Quality Assurance Manager).

LEVEL III

___ Six years experience in quality related activities as a level II.
___ High school graduate (or equivalent) plus: ten years Quality related experience or 8 years Quality related experience with at least 2 years as a level II and 2 years Nuclear related.
___ Associate degree plus 7 years Quality related experience with at least 2 years Nuclear related.
___ Four year degree plus 5 years Quality related experience with at least 2 years Nuclear related.

CHECKED BY C Humphrey DATE 7/29/91

QC INDOCTRINATION STATEMENT

I, Kerry Hitchcock, have been indoctrinated to the technical objectives and Quality Assurance/Quality Control elements Omega Point Laboratories' Q/A Program.

I have also received indoctrination to the regulatory standards listed below:

Omega Point Labs QAP Manual, Rev. A, Sec. 005, which includes:
Sec. 206 (a) of the Energy Reorganization Act of 1974

10 CFR, Part 21 - Reporting Defects and Noncompliance

10 CFR 50, Appendix B - Quality Assurance Criteria For Nuclear Power Plants

Ammended Atomic Energy Act, Sec. 235 - Protection of Inspectors

ANSI N45.2 - Quality Assurance Program For Nuclear Power Plants

* Omega Point Labs Quality Assurance Manual, Revision B

Kerry Hitchcock 10/09/90
Signature Date

Indoctrination By:

C Curtis 10/09/90
Supervisor/Training Instructor Date

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

1F FLAT
Position

.125" .125"
Test Thickness Range

PLATE TEE JOINT
Test Diameter Design

1/16" and 1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
1/8" BARE WIRE			1/8" BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT			DC-STRAIGHT
Polarity	Polarity	Polarity	Polarity
60-115			60-115
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUIRE
Test Conducted By

McKAY-ER308 STAINLESS STEEL
Filler Metal Trade Name

Specimen#	Type	Results
1F	FILLET	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test plates were prepared, welded and tested upon an in accordance with the requirements of Texas Vocational School.

Richard J. Aguilar
By Instructor Signature

8-7-91
Date

Texas Vocational School
1915 Houston St
San Antonio, Texas 78203

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KELLY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

3G VERTICAL
Position

.125" to .250"
Test Thickness Range

PLATE
Test Diameter

1/16" Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
Y8 BARE WIRE			Y8 BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
AC			AC
Polarity	Polarity	Polarity	Polarity
60-100			60-100
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

UNIBRAZE-4043-ALUMINUM
Filler Metal Trade Name

Specimen#	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

8-6-81
Date

Texas Vocational School
1803 S. Flores St
San Antonio, Texas 78204

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GTAW TUNGSTEN ARC
Welding Process

PLATE
Type

2G HORIZONTAL
Position

.125" up to .250
Test Thickness Range

PLATE
Test Diameter

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
1/8 BARE WIRE			1/8 BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
AC			AC
Polarity	Polarity	Polarity	Polarity
60-100			60-100
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

UNIBRAZE-4043-ALUMINUM
Filler Metal Trade Name

Specimen	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

CERTIFICATION

This is to certify that the statements in this record are true and that the test plates were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Richard Aguilar
Instructor Signature

8-1-91
Date

Texas Vocational School
1015 Frio St.
San Antonio, Texas 78207

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

Kelly M. Hitchcock
Student Name

454-19-8265
Social Security Number

Progression

Richard Aguilar
Test Conducted By

Shielded Metal Arc
Welding Process

Plate
Type

4G Overhead
Position

Lincoln-5P & LH70
Filler Metal Trade Name

.375" up to .750"
Test Thickness Range

Plate
Test Diameter

Open Groove
Shape

1/16" Land
1/8" Root Gap Opening

	ROOT	HOT PASS	FILLER	CAP
Process	SMAW	SMAW	SMAW	SMAW
Filler Metal	1/8" E6010	1/8" E7018	1/8" E7018	1/8" E7018
Polarity	DC-Reverse	DC-Reverse	DC-Reverse	DC-Reverse
Amp Range	70-115	100-150	100-150	100-150

Specimen	Type	Results
1F	Face	Good
1R	Root	Good

CERTIFICATION

This is to certify that the student named above [illegible] welded and tested upon [illegible] with the requirements of [illegible]

Evaluator Signature

8-12-91
Date

Texas Vocational School
Welding Dept.
[illegible]

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-M-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

3F VERTICAL
Position

.125"
Test Thickness

.125"
Range

PLATE
Test Diameter

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
1/8" BARE WIRE			1/8" BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT			DC STRAIGHT
Polarity	Polarity	Polarity	Polarity
60-115			60-115
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

McKAY-ER308 STAINLESS STEEL
Filler Metal Trade Name

Specimen #	Type	Results
1F	FILLET	GOOD

CERTIFICATION

This is to certify that the statements in this record are correct and that the specimens were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

8-7-91
Date

Texas Vocational School
[illegible]
San Antonio, [illegible]

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TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KELLY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

3G VERTICAL
Position

.125" upto .250"
Test Thickness — Range

PLATE
Test Diameter — Pipe

1/16" Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
STAW			STAW
Process	Process	Process	Process
1/8" BARE WIRE			1/8" BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC STRAIGHT			DC STRAIGHT
Polarity	Polarity	Polarity	Polarity
60-115			60-115
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

McKAY-FORGE STAINLESS STEEL
Filler Metal Trade Name

Specimen#	Type	Results

CERTIFICATION:

This is to certify that the statements in this record are true and that the test welds were prepared, welded and tested upon me in accordance with the requirements of Texas Vocational School.

Richard J. Aguilar
Evaluator's Signature

8-8-91
Date

Texas Vocational School
1903 S. Flores St.
San Antonio, Texas 78204

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

3F VERTICAL
Position

.125"
Test Thickness

.125"
Range

PLATE TEE JOINT
Test Diameter

1/16" Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
1/8" BARE WIRE			1/8" BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
AC			AC
Polarity	Polarity	Polarity	Polarity
60-100			60-100
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

CUTBRAZE 4043 ALUMINUM
Filler Metal Trade Name

Specimen#	Type	Results
1F	FILLET	GOOD

CERTIFICATES

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Instructor's Signature

8-1-91
Date

Texas Vocational School
P.O.S. Box 34
San Antonio, Texas

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KELLY M. HITCHCOCK
Student Name

454-19-8865
Social Security Number

SHIELDED METAL ARC
Welding Process

PLATE
Type

3G VERTICAL
Position

.375" upto .750"
Test Thickness Range

PLATE OPENGROVE
Test Diameter Alloy

1/16" Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
SMAW	SMAW	SMAW	SMAW
Process	Process	Process	Process
1/8" E6010	1/8" E7018	1/8" E7018	1/8" E7018
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-REVERSE	DC-REVERSE	DC-REVERSE	DC-REVERSE
Polarity	Polarity	Polarity	Polarity
70-115	100-150	100-150	100-150
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

LINCOLN-5P & LH70
Filler Metal Trade Name

Specimen	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

CERTIFICATION:

This is to certify that the statements in this record are true and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

8-6-91
Date

Texas Vocational School
1913 S. Flores St.
San Antonio, Texas

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KELLY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

SHIELDED METAL ARC
Welding Process

PLATE
Type

4G OVERHEAD
Position

.375" 4G .750"
Test Thickness Range

PLATE BACKING
Test Diameter Backing

1/16" Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
SMAW	SMAW	SMAW	SMAW
Process	Process	Process	Process
1/8" E7018	1/8" E7018	1/8" E7018	1/8" E7018
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC REVERSE	DC REVERSE	DC REVERSE	DC REVERSE
Polarity	Polarity	Polarity	Polarity
100-150	100-150	100-150	100-150
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUIAR
Test Conducted By

LINCOLN-LH78
Filler Metal Trade Name

Specimen #	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

8-22-91
Date

Texas Vocational School
1415 Flora St
San Antonio, Texas 78204

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TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS METAL ARC
Welding Process

PLATE
Type

2G HORIZONTAL
Position

.375" 4TO.250"
Test Thickness Range

PLATE SINGLE GROOVE 1/16" Land
Test Diameter Bevel 1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GMAW	GMAW	GMAW	GMAW
Process	Process	Process	Process
.035" WIRE	.035" WIRE	.035" WIRE	.035" WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-REVERSE	DC-REVERSE	DC-REVERSE	DC-REVERSE
Polarity	Polarity	Polarity	Polarity
110-165	120-165	120-165	120-165
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

EAGLE WIRE CO.-ER70S-6
Filler Metal Trade Name CARBON

Specimen #	Type	Results
4R	ROOT	GOOD
4F	FACE	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon me in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

8-14-91
Date

Texas Vocational School
1433 Horizon
San Antonio, Texas

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KELLY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS METAL ARC
Welding Process

PLATE
Type

3G VERTICAL
Position

.375"
Test Thickness

.750"
Range

PLATE
Test Diameter

OPEN GROOVE
Pipe

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GMAW	GMAW	GMAW	GMAW
Process	Process	Process	Process
.035" WIRE	.035" WIRE	.035" WIRE	.035" WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-REVERSE	DC-REVERSE	DC-REVERSE	DC-REVERSE
Polarity	Polarity	Polarity	Polarity
110-165	120-165	120-165	120-165
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

EAGLE WIRE CO. - ER70S-6
Filler Metal Trade Name CARBON

Specimen	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

CERTIFICATION

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon me in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

8-14-91
Date

Texas Vocational School
1945 Hoefer St.
San Antonio, Texas 78201

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TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

1F FLAT
Position

.375" .375"
Test Thickness Range

PLATE TEE JOINT
Test Diameter

1/16 Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
1/8" BARE WIRE			1/8" BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT			DC-STRAIGHT
Polarity	Polarity	Polarity	Polarity
70-115			70-115
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD A. GUIGAR
Test Conducted By

McKAY-ER70S-2
Filler Metal Trade Name CARLON

Specimen#	Type	Results
1F	FILLET	GOOD

CERTIFICATION:

This is to certify that the statements in the record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Richard A. Guigar
Evaluator Signature

7-3-91
Date

Texas Vocational School
1914 S. Flores St
San Antonio, Texas 78204

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TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KELLY M. HITCHCOCK — Student Name

454-19-8265 — Social Security Number

GAS TUNGSTEN ARC — Welding Process

PLATE — Type

3F VERTICAL — Position

.375" — Test Thickness

.375" — Range

PLATE TEE JOINT — Test Diameter

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
1/8" BARE WIRE			1/8" BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT			DC-STRAIGHT
Polarity	Polarity	Polarity	Polarity
70-115			70-115
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR — Test Conducted By

MIKU-ER70S-2 — Filler Metal Trade Name CARBON

Specimen #	Type	Results
3F	FILLET	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

7-10-91 — Date

Texas Vocational School
1913 S. Flores St.
San Antonio, Texas 78204

20

496

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KELLY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

3G HORIZONTAL
Position

.375" 4/5 .250"
Test Thickness Range

PLATE
Test Diameter

OPEN BEVEL
1/16" Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW	GTAW	SMAW	SMAW
Process	Process	Process	Process
1/8" BARE WIRE	1/8" BARE WIRE	1/8" E7018	1/8" E7018
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT	DC-STRAIGHT	DC-REVERSE	DC-REVERSE
Polarity	Polarity	Polarity	Polarity
70-115	70-115	100-150	100-150
Amp Range	Amp Range	Amp Range	Amp Range

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Instructor's Signature

7-22-91
Date

Texas Vocational School
1803 Flores St
San Antonio, Texas 78204

Progression

RICHARD AGUILAR
Test Conducted By

MCKAY-ER70S-2
LINCOLN-LH70
Filler Metal Trade Name

Specimen#	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

20

497

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KELLY M. HITCHCOCK — Student Name

454-19-8265 — Social Security Number

GAS TUNGSTEN ARC — Welding Process

PLATE — Type

3G VERTICAL — Position

.375" — Test Thickness

UP TO .750" — Range

PLATE OPEN GROOVE — Test Diameter

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW	GTAW	SMAW	SMAW
Process	Process	Process	Process
1/8" BARE WIRE	1/8" BARE WIRE	1/8" E7018	1/8" E7018
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT	DC-STRAIGHT	DC-REVERSE	DC-REVERSE
Polarity	Polarity	Polarity	Polarity
70-115	70-115	100-150	100-150
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUIAR — Test Conducted By

McKAY-BE205-2
LINCOLN-LH70 — Filler Metal Trade Name

Specimen#	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon me in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

7-23-91 — Date

Texas Vocational School
1913 S. Flores St.
San Antonio, Texas

20

493

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GASTUNGSTEN ARC
Welding Process

PLATE
Type

1F FLAT
Position

.125"
Test Thickness

.125"
Range

PLATE
Test Diameter

TEE JOINT
Weldment

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			
Process	Process	Process	Process
1/8" BARE WIRE			
Filler Metal	Filler Metal	Filler Metal	Filler Metal
AC			
Polarity	Polarity	Polarity	Polarity
70-115			
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

UNIBRAZE-4045
Filler Metal Trade Name ALUMINUM

Specimen#	Type	Results
1F	FILLET	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Richard Aguilar
Evaluator's Signature

7-15-91
Date

Texas Vocational School
[illegible] Flores St
San Antonio, Texas [illegible]

20

499

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

2G HORIZONTAL
Position

.125" up to .250"
Test Thickness Range

PLATE
Test Diameter

1/16" Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
3/32 BARE WIRE			3/32 BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT			DC STRAIGHT
Polarity	Polarity	Polarity	Polarity
70-115			70-115
Amp Range	Amp Range	Amp Range	Amp Range

CERTIFICATION

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

7-7-91
Date

Texas Vocational School
[illegible]
San Antonio, Texas [illegible]

Progression

RICHARD AGUILAR
Test Conducted By

McKAY-ER308
Filler Metal Trade Name STAINLESS STEEL

Specimens	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

20

500

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-A-8265
Social Security Number

GAS METAL ARC
Welding Process

PLATE
Type

4G OVERHEAD
Position

.375" up to .750"
Test Thickness Range

PLATE OPEN GROOVE
Test Diameter Groove

1/16 Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GMAW	GMAW	GMAW	GMAW
Process	Process	Process	Process
.035" WIRE	.035" WIRE	.035" WIRE	.035" WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-REVERSE	DC-REVERSE	DC-REVERSE	DC-REVERSE
Polarity	Polarity	Polarity	Polarity
120-165	120-165	120-165	120-165
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

EAGLE WIRE CO. - ER70S-6
Filler Metal Trade Name

Specimen#	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon me in accordance with the requirements of Texas Vocational School.

Richard J. Rubio
Evaluator's Signature

7-31-91
Date

Texas Vocational School
1903 S. Flores St
San Antonio, Texas 78204

501

The Management and Faculty of

TEXAS VOCATIONAL SCHOOL

Proudly Presents This

PERFECT ATTENDANCE AWARD

to

KERRY M. HITCHCOCK

Having attended all scheduled classes

From July 1st *to* July 31st

Presented this 5th *day of* August *19* 91

M. Hedkamp
Signed for Management

Signed for Faculty

502

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK — Student Name

454-19-8265 — Social Security Number

SHIELDED METAL ARC — Welding Process

PLATE — Type

2G HORIZONTAL — Position

.375" — Test Thickness

4 TO .750" — Range

PLATE — Test Diameter

BACKING — Material

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
SMAW	SMAW	SMAW	SMAW
Process	Process	Process	Process
1/8" E7018	1/8" E7018	1/8" E7018	1/8" E7018
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-REVERSE	DC-REVERSE	DC-REVERSE	DC-REVERSE
Polarity	Polarity	Polarity	Polarity
100-150	100-150	100-150	100-150
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR — Test Conducted By

LINCOLN-CH70 — Filler Metal Trade Name

Specimen#	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

CERTIFICATION:

This is to certify that the statements in this record are true and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

8-20-91

Date

Texas Vocational School
1913 S. Flores St.
San Antonio, Texas

503

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

Kerry M. Hitchcock — Student Name

454-19-8265 — Social Security Number

GAS TUNGSTEN ARC — Welding Process

PLATE — Type

3F VERTICAL — Position

.375" — Test Thickness

.375" — Range

PLATE — Test Diameter

TEE JOINT

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
1/8" BARE WIRE			1/8" BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT			DC-STRAIGHT
Polarity	Polarity	Polarity	Polarity
70-115			70-115
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR — Test Conducted By

McKAY-ER70S-2 CARLON — Filler Metal Trade Name

Specimen	Type	Results
3F	FILLET	GOOD

CERTIFICATION

This is to certify that the statements in this record are true and correct to the best of my knowledge and belief, and that the test specimen was prepared, welded, tested and graded in accordance with the requirements of Texas Vocational School.

Richard J. Aguilar — Instructor's Signature

7-10-91 — Date

Texas Vocational School
P.O. Box [illegible]
[illegible]

504

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

1F FLAT
Position

.375" .375"
Test Thickness Range

PLATE TEE JOINT
Test Diameter Range

1/16" Land
1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
1/8" BARE WIRE			1/8" BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT			DC-STRAIGHT
Polarity	Polarity	Polarity	Polarity
70-115			70-115
Amp Range	Amp Range	Amp Range	Amp Range

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Evaluator's Signature

7-3-91
Date

Texas Vocational School
[illegible] Flores St
San Antonio, Texas [illegible]

Progression

RICHARD AGUILAR
Test Conducted By

McKAY-ER70S-2
Filler Metal Trade Name CARLON

Specimen#	Type	Results
1F	FILLET	GOOD

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GASTUNGSTEN ARC
Welding Process

PLATES
Type

1F FLAT
Position

.125"
Test Thickness

.125"
Range

PLATE
Test Diameter

TEE JOINT

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
STAW			
Process	Process	Process	Process
1/8" BRAZERODE			
Filler Metal	Filler Metal	Filler Metal	Filler Metal
AC			
Polarity	Polarity	Polarity	Polarity
70-115			
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

UNIBRAZE - 4045
Filler Metal Trade Name ALUMINUM

Specimen #	Type	Results
1F	FILLET	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the test welds were prepared, welded and tested upon are in accordance with the requirements of Texas Vocational School.

Instructor's Signature

7-15-91
Date

Texas Vocational School
[illegible]
San Antonio, Texas

TEXAS VOCATIONAL SCHOOL

WELDING DEPARTMENT

Student Test Record

KERRY M. HITCHCOCK
Student Name

454-19-8265
Social Security Number

GAS TUNGSTEN ARC
Welding Process

PLATE
Type

26 HOURS
Position

.125" up to .250"
Test Thickness Range

PLATE
Test Diameter

1/16" Land

1/8" Root Gap Opening

ROOT	HOT PASS	FILLER	CAP
GTAW			GTAW
Process	Process	Process	Process
3/32 BARE WIRE			3/32 BARE WIRE
Filler Metal	Filler Metal	Filler Metal	Filler Metal
DC-STRAIGHT			DC-STRAIGHT
Polarity	Polarity	Polarity	Polarity
70-115			70-115
Amp Range	Amp Range	Amp Range	Amp Range

Progression

RICHARD AGUILAR
Test Conducted By

McKAY ER308
Filler Metal Trade Name STAINLESS STEEL

Specimen	Type	Results
1R	ROOT	GOOD
1F	FACE	GOOD

CERTIFICATION:

This is to certify that the statements in this record are correct and that the welds were properly welded and tested upon in accordance with the requirements of Texas Vocational School.

Instructor's Signature

7-7-91
Date

Texas Vocational School
[illegible]

507

CITY OF SAN ANTONIO

JOURNEYMAN ELECTRICIAN

THIS IS TO CERTIFY THAT

KERRY M. KITCHCOCK #1596

having satisfactorily passed the required examination of Journeyman Electrician before the Examining and Supervising Board of Electricians is hereby licensed as a Journeyman Electrician within the corporate limits of the City of San Antonio, Texas.

9-30-88

Harry Katz

Chairman, Electrical Bd.

Form No. 29-113 (11-82)

QUALITY ASSURANCE TRAINING RECORD

Name Herbert W. Stansberry II

Page 1 of 1

DESCRIPTION OF TRAINING ACTIVITY	SIGNATURE	TRAINED BY	DATE
OPL QAP-005, Sec. 206(a) Energy Reorganization Act	H. Stansberry II	C Humphrey	1/16/92
10 CFR, Part 21, Reporting Defects and Noncompliances	H. Stansberry II	C Humphrey	1/16/92
10 CFR 50, App.B, Q/A Criteria for Nuclear Power Plants	H. Stansberry II	C Humphrey	1/16/92
Ammended Atomic Energy Act (235) Protection of Inspectors	H. Stansberry II	C Humphrey	1/17/92
ANSI N45.2 Q/A Program for Nuclear Power Plants	H. Stansberry II	C. Humphrey	1/08/92
OPL QualityAssurance Manual, Revision B	H. Stansberry II	C Humphrey	1/08/92
OPL Quality Assurance Procedures Manual, Revision B	H. Stansberry II	C. Humphrey	1/08/92

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OMEGA POINT LABORATORIES

CERTIFICATE OF QUALIFICATION

Herbert W. Stansberry II has met all qualification criteria established by Procedure No. QAP-006 of the Omega Point Labs Quality Assurance Procedures Manual and is hereby certified to perform Level II functions as described below and as further detailed in supporting training records.

Levels of capability include:

- ✓ Performing and recording inspection and tests in accordance with procedures.
- ✓ Planning inspections and tests, including the set-up of related equipment.
- ✓ Evaluating the validity and acceptability of inspection and testing results.
- ✓ Reporting inspection, examination and testing results.
- ___ Supervising and training equivalent and lower personnel.
- ___ Qualifying and certifying lower level personnel.
- ___ Evaluating the adequacy of specific programs used to train personnel.
- ✓ Qualifying and certifying same level personnel.

The basis for this certification includes:

- ✓ Education and experience as documented.
- ___ Management upgrade.
- ✓ Programmatic and on-the-job training as documented.
- ___ Proficiency testing as documented.

Period of certification:

From 2/3/92 to 2/3/93

Certified by:

C Humphrey — Signature

2/3/92 — date

OMEGA POINT LABORATORIES

CERTIFICATE OF QUALIFICATION

HERB STANSBERRY has met all qualification criteria established by Procedure No. QAP-006 of the Omega Point Labs Quality Assurance Procedures Manual and is hereby certified to perform Level II functions as described below and as further detailed in supporting training records.

Levels of capability include:

- ✓ Performing and recording inspection and tests in accordance with procedures.
- ✓ Planning inspections and tests, including the set-up of related equipment.
- ✓ Evaluating the validity and acceptability of inspection and testing results.
- ✓ Reporting inspection, examination and testing results.
- ___ Supervising and training equivalent and lower personnel.
- ___ Qualifying and certifying lower level personnel.
- ___ Evaluating the adequacy of specific programs used to train personnel.
- ✓ Qualifying and certifying same level personnel.

The basis for this certification includes:

- ✓ Education and experience as documented.
- ___ Management upgrade.
- ✓ Programmatic and on-the-job training as documented.
- ___ Proficiency testing as documented.

Period of certification:

From 2/3/93 to 2/3/94

Certified by:

C Humphrey — Signature

2/3/93 — date

OMEGA POINT LABORATORIES

STATEMENT OF PHYSICAL CONDITION

NAME: Herbert W. Stansberry II DATE OF HIRE: 4-30-90

PHYSICAL CAPABILITY OF PERFORMANCE OF ASSIGNED TASKS

"I certify that I am physically capable of performing my assigned tasks with the exceptions as listed below."

EXCEPTIONS: None.

Signature [signature] Date 1/16/92

VISION: Natural or corrected near-distant acuity in accordance with J-1letters on a standard Jaeger's test type chart for near vision or equivalent test type.

EXAMINATION DATE 1/16/92 EXPIRATION DATE 1/16/93
RESULTS Passed EXAMINER C Humphrey

EXAMINATION DATE 1/12/93 EXPIRATION DATE 1/12/94
RESULTS Passed EXAMINER C Humphrey

EXAMINATION DATE _____ EXPIRATION DATE _____
RESULTS _____ EXAMINER _____

EXAMINATION DATE _____ EXPIRATION DATE _____
RESULTS _____ EXAMINER _____

OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

Name Herbert W. Stansberry II
Evaluation Date 7/21/92

Position Laboratory Technician
Initial Hire Date 04/30/90

PROFICIENCY	Does not meet Requirements	Meets Reqm't	Exceeds Reqm't
1. Demonstrates knowledge of assigned duties.		X	
2. Performs duties in an efficient manner.		X	
3. Completes expected amount of work.			X
4. Understands and utilizes available resources.			X
5. Meets schedules for completing assigned duties.		X	
6. Performs duties without excessive supervision.		X	
7. Performs in a consistent, reliable manner.			X
8. Flexible in performance of assigned tasks.			X
9. Demonstrates sufficient communication skills.		X	
10. Cooperates well with others.		X	
11. Takes initiative to accomplish tasks.			X
12. No excessive absenteeism or tardiness.		X	

Summary: (6 months review)
Herb is showing an outstanding aptitude for the fire testing and quality assurance responsibilities

Evaluator Signature C Humphrey Employee Signature [illegible]

QC INDOCTRINATION STATEMENT

I, Herbert W. Stansberry II, have been indoctrinated to the technical objectives and Quality Assurance/Quality Control elements Omega Point Laboratories' Q/A Program.

I have also received indoctrination to the regulatory standards listed below:

Omega Point Labs QAP Manual, Rev. A, Sec. 005, which includes:
Sec. 206 (a) of the Energy Reorganization Act of 1974

10 CFR, Part 21 - Reporting Defects and Noncompliance

10 CFR 50, Appendix B - Q/A Criteria For Nuclear Power Plants

Ammended Atomic Energy Act, Sec. 235 - Protection of Inspectors

ANSI N45.2 - Quality Assurance Program For Nuclear Power Plants

Omega Point Labs Quality Assurance Manual, Revision B

- Omega Point Labs Quality Assurance Procedures Manual, Revision B

Herbert W. Stansberry II 1/17/92
Signature Date

Indoctrination By:

Constance A. Humphrey 1/17/92
Supervisor/Training Instructor Date

RELEVANT EDUCATION AND EXPERIENCE

Name Herbert W. Stansberry II Position Laboratory Technician

Date of Birth 06/25/71 SS No. 100-54-3072

LEVEL 1

___ Two years experience in Quality related activities.
X High School graduate (or equivalent) plus 6 months Quality related experience.
X Associates degree in a related discipline plus 3 months Quality related experience.
___ Management upgrade (attach record of basis and approval by Quality Assurance Manager).

LEVEL II

___ One year satisfactory performance in Quality related activities as a level I or higher.
___ High school graduate (or equivalent) plus 3 years Quality related experience.
X Associates degree plus 1 year Quality related experience.
___ Four year degree plus 6 months Quality related experience.
___ Management upgrade (attach record of basis and approval by Quality Assurance Manager).

LEVEL III

___ Six years experience in quality related activities as a level II.
___ High school graduate (or equivalent) plus: ten years Quality related experience or 8 years Quality related experience with at least 2 years as a level II and 2 years Nuclear related.
___ Associate degree plus 7 years Quality related experience with at least 2 years Nuclear related.
___ Four year degree plus 5 years Quality related experience with at least 2 years Nuclear related.

CHECKED BY Constance A. Humphrey DATE 1/17/92

ITT

ITT TECHNICAL INSTITUTE

BY VIRTUE OF THE APPROVAL GRANTED TO THEM
BY THE TEXAS EDUCATION AGENCY
CERTIFIES THAT

HERBERT WILLIAM STANSBERRY II

IS AWARDED THIS

ASSOCIATE OF APPLIED SCIENCE DEGREE

IN

ELECTRONICS ENGINEERING TECHNOLOGY

IN WITNESS WHEREOF WE AFFIX OUR SIGNATURES

Given at San Antonio, Texas, this 11th day of September, 1991.

Director of Education

ITT Technical Institute

Director

516

QUALITY ASSURANCE TRAINING RECORD

NAME Cleda S. Patton

DESCRIPTION OF TRAINING ACTIVITY	SIGNATURE	TRAINED BY	DATE
OPL QAP-005, Sec. 206 (a) Energy Reorganization Act	Cleda Patton	C Humphrey	7/2/92
10 CFR, Part 21, Reporting Defects and Noncompliances	Cleda Patton	C. Humphrey	7/2/92
10 CFR 50, App. B, Q/A Criteria for Nuclear Power Plants	Cleda Patton	C Humphrey	7/2/92
Ammended Atomic Energy Act (235) Protection of Inspectors	Cleda Patton	C Humphrey	7/15/92
ANSI N45.2 Q/A Program for Nuclear Power Plants	Cleda Patton	C. Humphrey	7/2/92
OPL Quality Assurance Manual, Revision B	Cleda Patton	C Humphrey	7/2/92
OPL Quality Assurance Procedures Manual, Revision B	Cleda Patton	C. Humphrey	7/15/92

QC INDOCTRINATION STATEMENT

I, Cleda S. Patton, have been indoctrinated to the technical objectives and Quality Assurance/Quality Control elements Omega Point Laboratories' Q/A Program.

I have also received indoctrination to the regulatory standards listed below:

Omega Point Labs QAP Manual, Rev. A, Sec. 005, which includes:
Sec. 206 (a) of the Energy Reorganization Act of 1974

10 CFR, Part 21 - Reporting Defects and Noncompliance

10 CFR 50, Appendix B - Q/A Criteria For Nuclear Power Plants

Ammended Atomic Energy Act, Sec. 235 - Protection of Inspectors

ANSI N45.2 - Quality Assurance Program For Nuclear Power Plants

Omega Point Labs Quality Assurance Manual, Revision B

- Omega Point Labs Quality Assurance Procedures Manual, Revision B

Cleda Patton 8/10/92
Signature Date

Indoctrination By:

Lawrence A. Humphrey 8/10/92
Supervisor/Training Instructor Date

OMEGA POINT LABORATORIES

PERFORMANCE EVALUATION

Name Cleda S. Patton
Evaluation Date 7/15/92

Position Assistant to the President
Initial Hire Date 01/02/92

PROFICIENCY	Does not meet Requirements	Meets Reqm't	Exceeds Reqm't
1. Demonstrates knowledge of assigned duties.	—	X	—
2. Performs duties in an efficient manner.	—	—	X
3. Completes expected amount of work.	—	X	—
4. Understands and utilizes available resources.	—	X	—
5. Meets schedules for completing assigned duties.	—	X	—
6. Performs duties without excessive supervision.	—	—	X
7. Performs in a consistent, reliable manner.	—	—	X
8. Flexible in performance of assigned tasks.	—	X	—
9. Demonstrates sufficient communication skills.	—	X	—
10. Cooperates well with others.	—	X	—
11. Takes initiative to accomplish tasks.	—	X	—
12. No excessive absenteeism or tardiness.	—	—	X

Summary: Cleda has shown a great deal of promise in her first six months of quality assurance training.

Evaluator Signature C Humphrey Employee Signature Cleda Patton

STATEMENT OF PHYSICAL CONDITION

NAME: Cleda S. Patton DATE OF HIRE: 01/02/92

PHYSICAL CAPABILITY OF PERFORMANCE OF ASSIGNED TASKS

"I certify that I am physically capable of performing my assigned tasks with the exceptions as listed below."

EXCEPTIONS: None

Signature Cleda Patton Date 2/11/92

VISION: Natural or corrected near-distant acuity in accordance with J-1letters on a standard Jaeger's test type chart for near vision or equivalent test type.

EXAMINATION DATE 2/11/92 EXPIRATION DATE 2/11/93
RESULTS Passed EXAMINER C Humphrey

EXAMINATION DATE 2/11/93 EXPIRATION DATE 2/11/94
RESULTS Passed EXAMINER Connie Humphrey

EXAMINATION DATE _____ EXPIRATION DATE _____
RESULTS _____ EXAMINER _____

EXAMINATION DATE _____ EXPIRATION DATE _____
RESULTS _____ EXAMINER _____

RELEVANT EDUCATION AND EXPERIENCE

Name Cleda S. Patton Position Assistant to the President

Date of Birth 08/07/50 SS No. 451-82-5042

LEVEL 1

___ Two years experience in Quality related activities.
_X_ High School graduate (or equivalent) plus 6 months Quality related experience.
___ Associates degree in a related discipline plus 3 months Quality related experience.
___ Management upgrade (attach record of basis and approval by Quality Assurance Manager).

LEVEL II

___ One year satisfactory performance in Quality related activities as a level I or higher.
___ High school graduate (or equivalent) plus 3 years Quality related experience.
___ Associates degree plus 1 year Quality related experience.
___ Four year degree plus 6 months Quality related experience.
___ Management upgrade (attach record of basis and approval by Quality Assurance Manager).

LEVEL III

___ Six years experience in quality related activities as a level II.
___ High school graduate (or equivalent) plus: ten years Quality related experience or 8 years Quality related experience with at least 2 years as a level II and 2 years Nuclear related.
___ Associate degree plus 7 years Quality related experience with at least 2 years Nuclear related.
___ Four year degree plus 5 years Quality related experience with at least 2 years Nuclear related.

CHECKED BY C Humphrey DATE July 2, 1992

OMEGA POINT LABORATORIES

CERTIFICATE OF QUALIFICATION

Cleda S. Patton has met all qualification criteria established by Procedure No. QAP-006 of the Omega Point Labs Quality Assurance Procedures Manual and is hereby certified to perform Level I functions as described below and as further detailed in supporting training records.

Levels of capability include:

X Performing and recording inspection and tests in accordance with procedures.

X Planning inspections and tests, including the set-up of related equipment.

X Evaluating the validity and acceptability of inspection and testing results.

X Reporting inspection, examination and testing results.

___ Supervising and training equivalent and lower personnel.

___ Qualifying and certifying lower level personnel.

___ Evaluating the adequacy of specific programs used to train personnel.

___ Qualifying and certifying same level personnel.

The basis for this certification includes:

X Education and experience as documented.

___ Management upgrade.

___ Programmatic and on-the-job training as documented.

___ Proficiency testing as documented.

Period of certification:

From 7/15/92 to 7/15/93

Certified by:

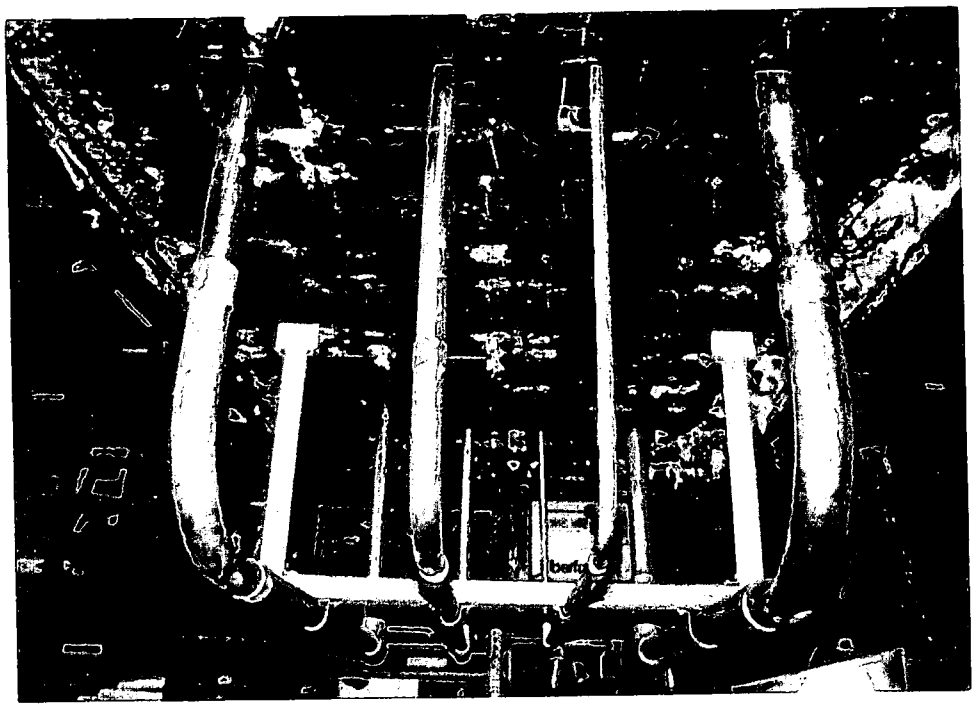
C Humphrey
Signature

7/15/92
date

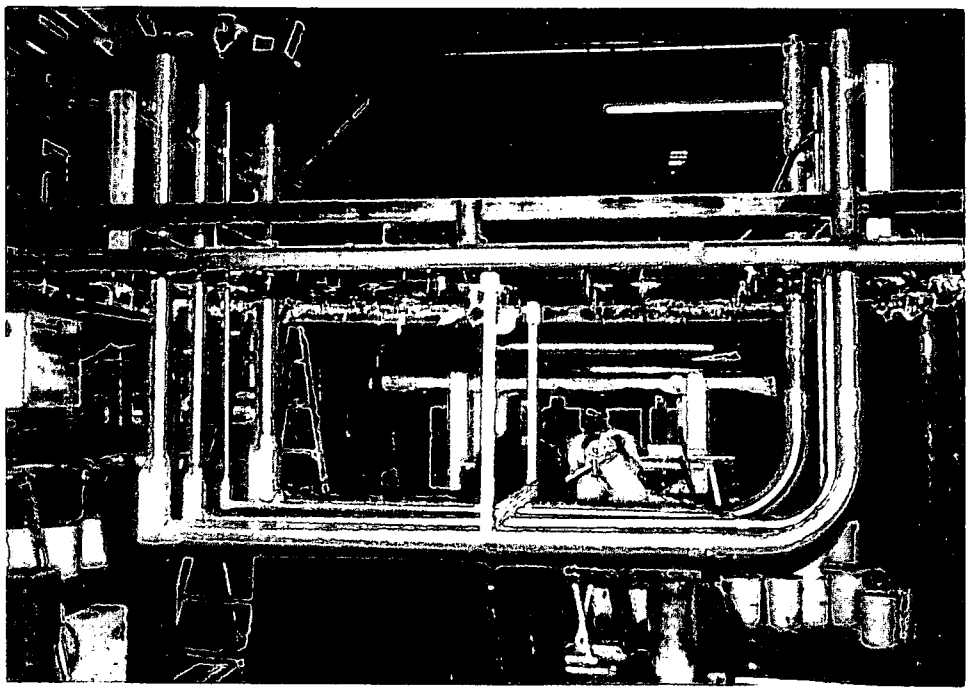
Appendix G

PHOTOGRAPHS

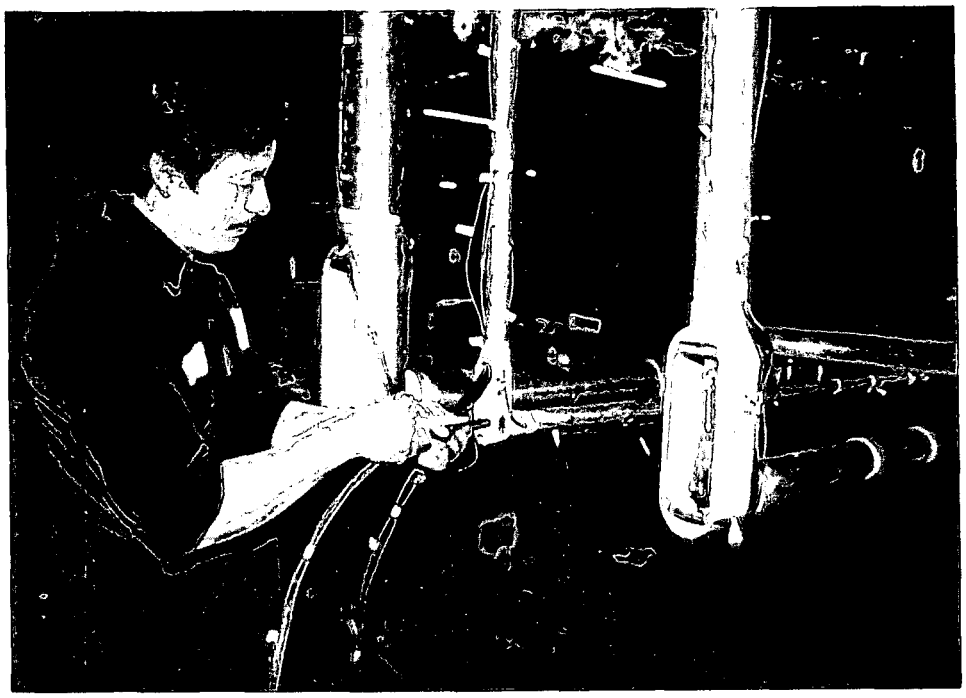
OMEGA POINT LABORATORIES



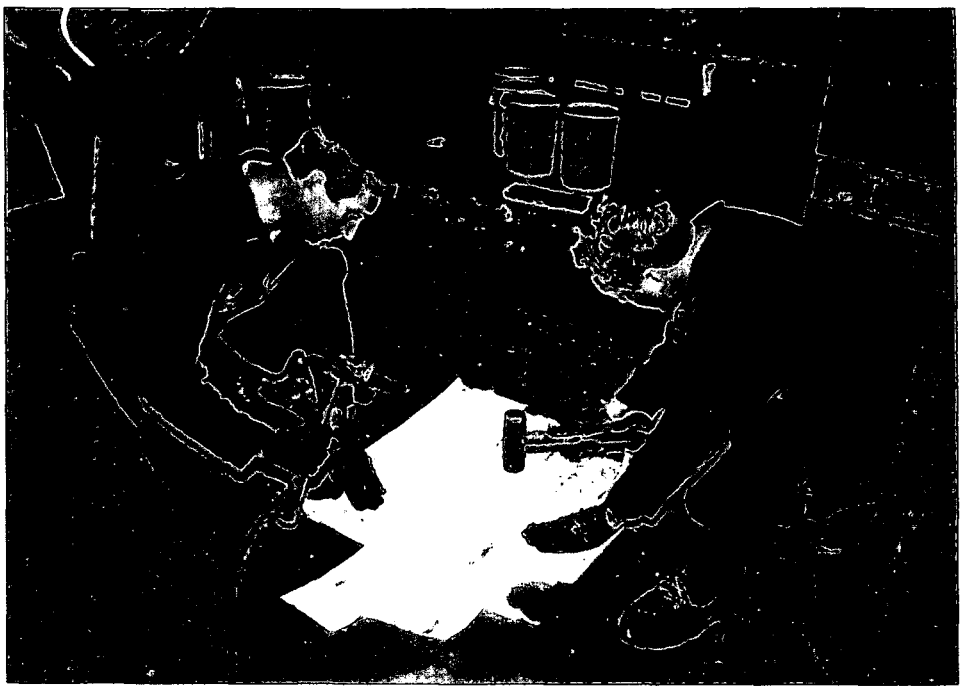
End view of conduits installed onto test deck.



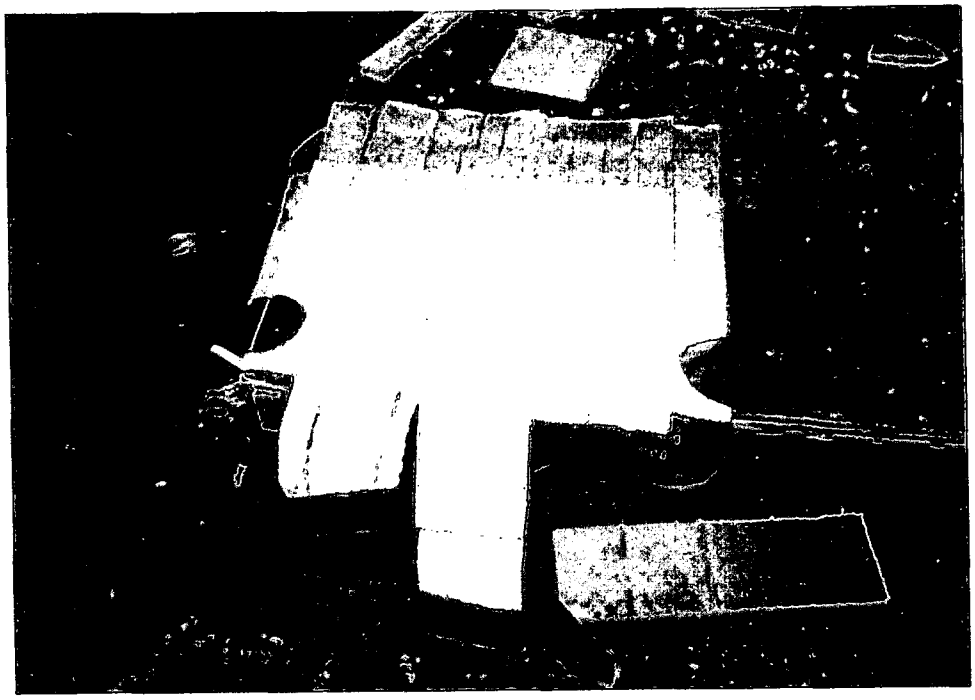
View of conduit installed onto test deck.



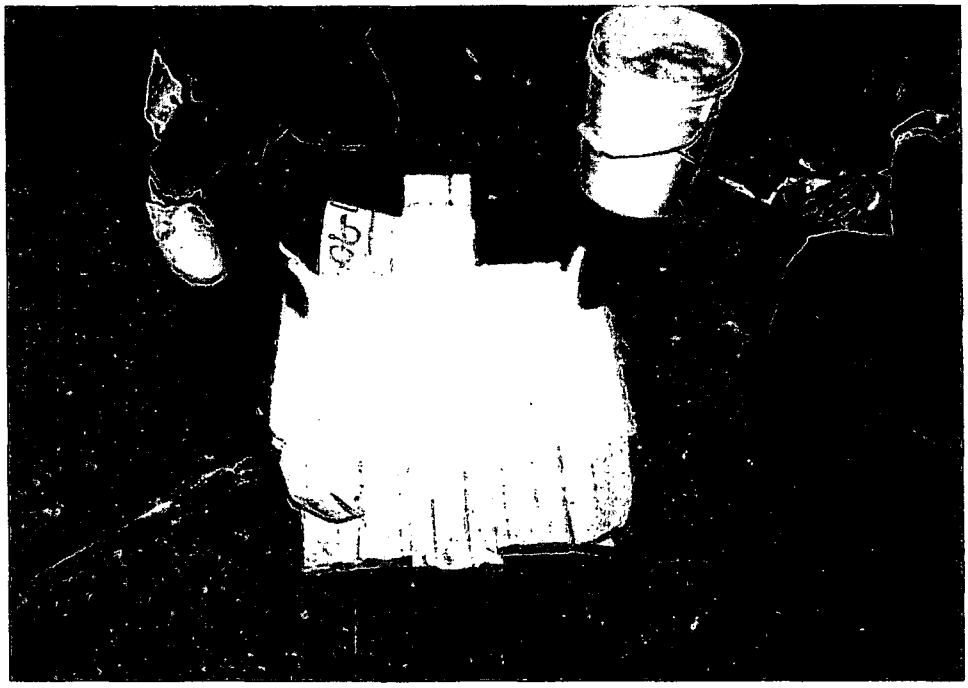
Thermocoupled #8 AWG wire pulled through conduit assemblies.



V-ribs hammered flat on panel to be installed over 4 in. condulet.

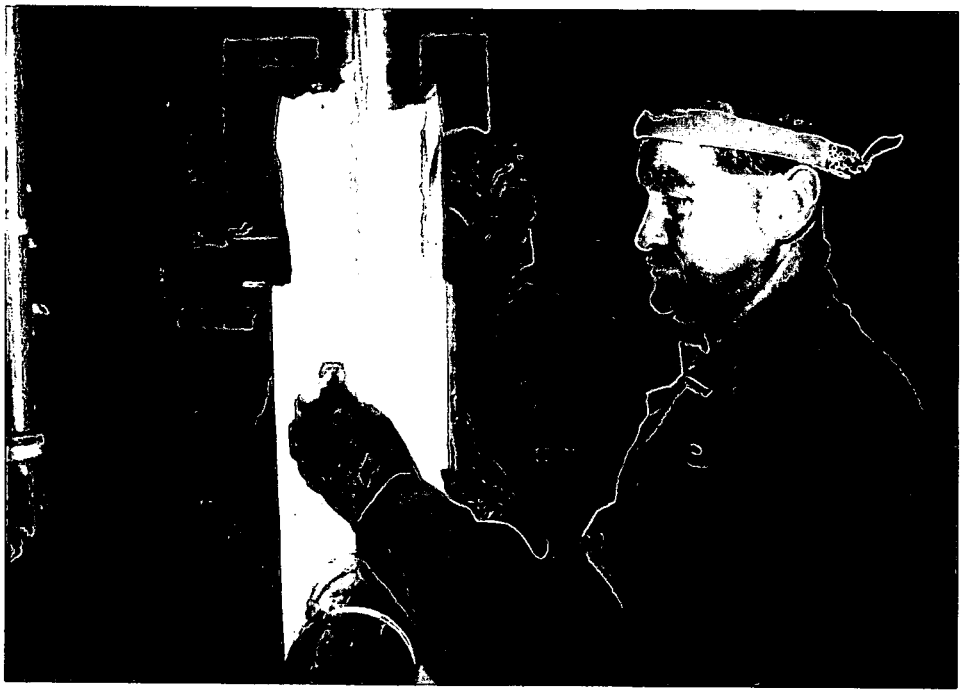


View of panel to be installed around 4 in. condulet.



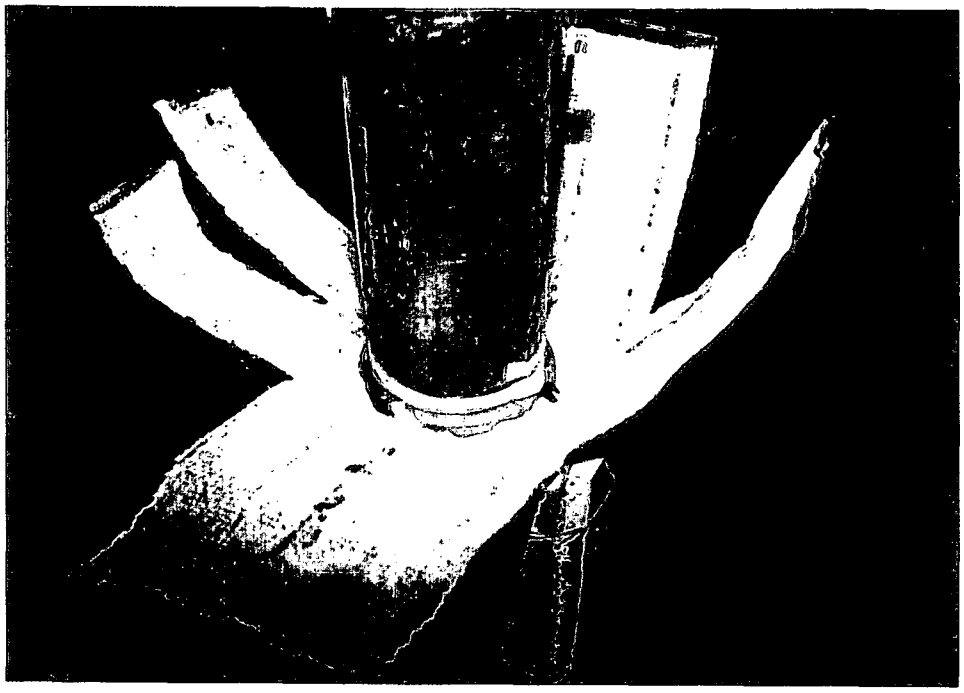
Inside of panel "buttered" prior to installation over 4 in. condulet.

Panel installed over 4 in. condulet.

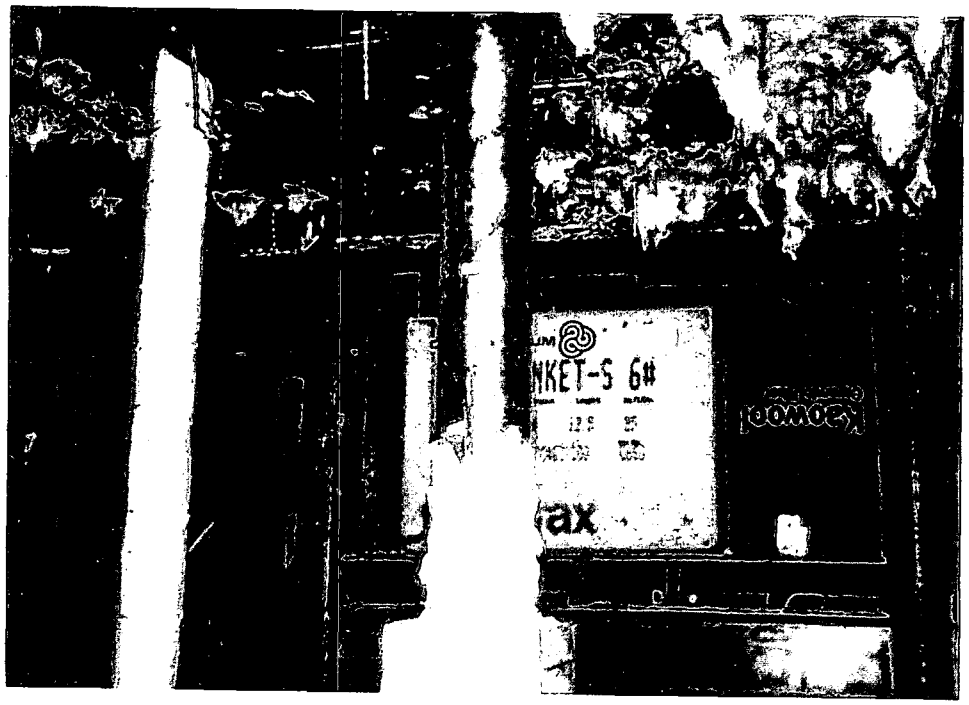


Stress skin overlapped at vertical joint.

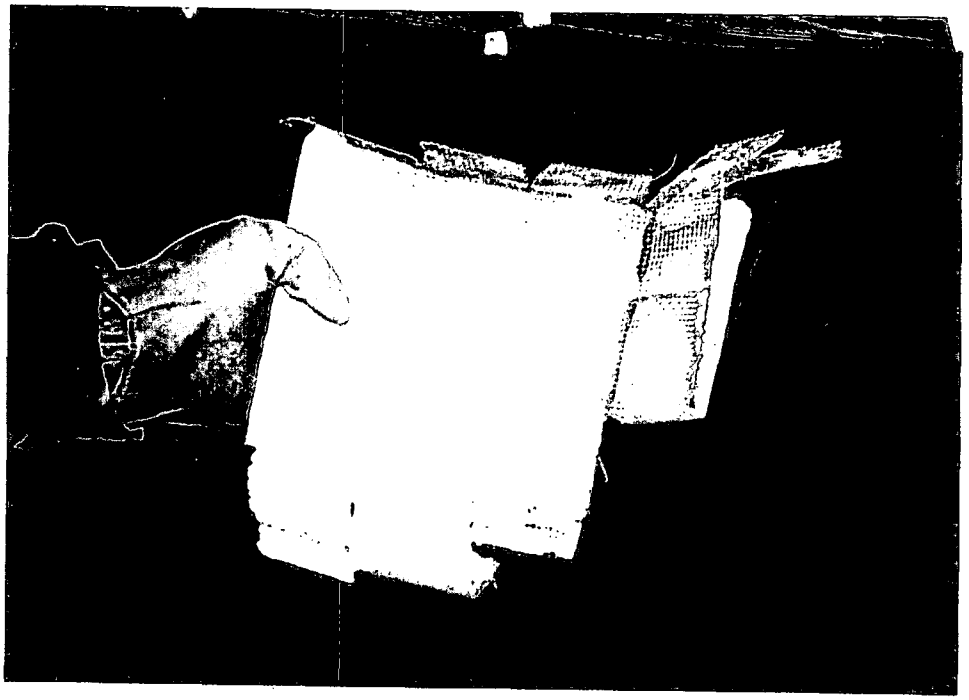
Panel temporarily held in place with tie wire.



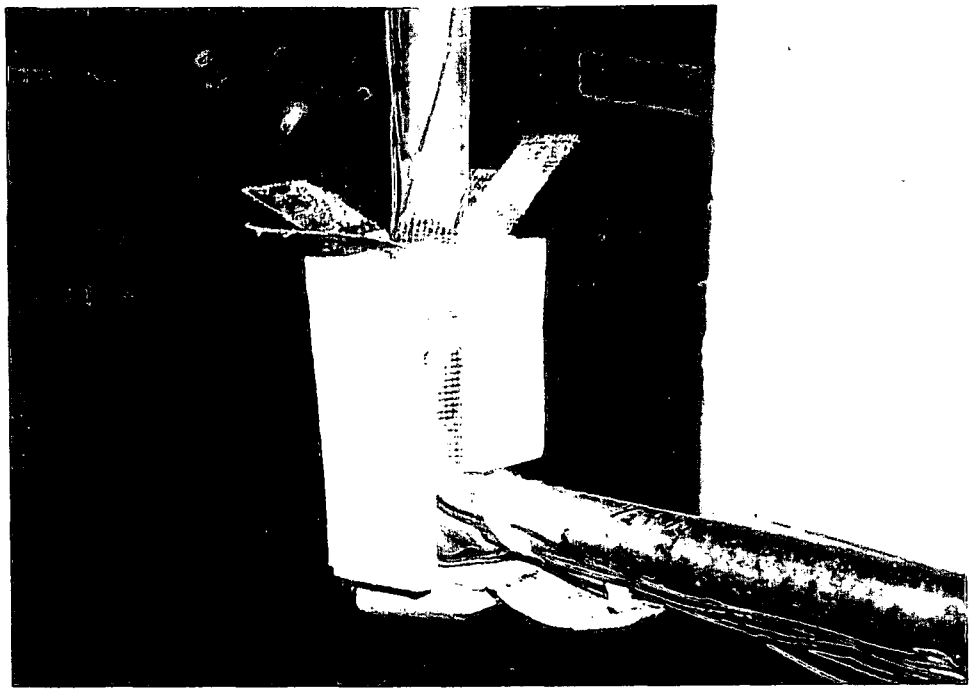
Openings around top of box filled with trowel grade.



Stress skin held to conduit over condulet box with tie wire.



View of material to be fit around the 1 in. condulet.



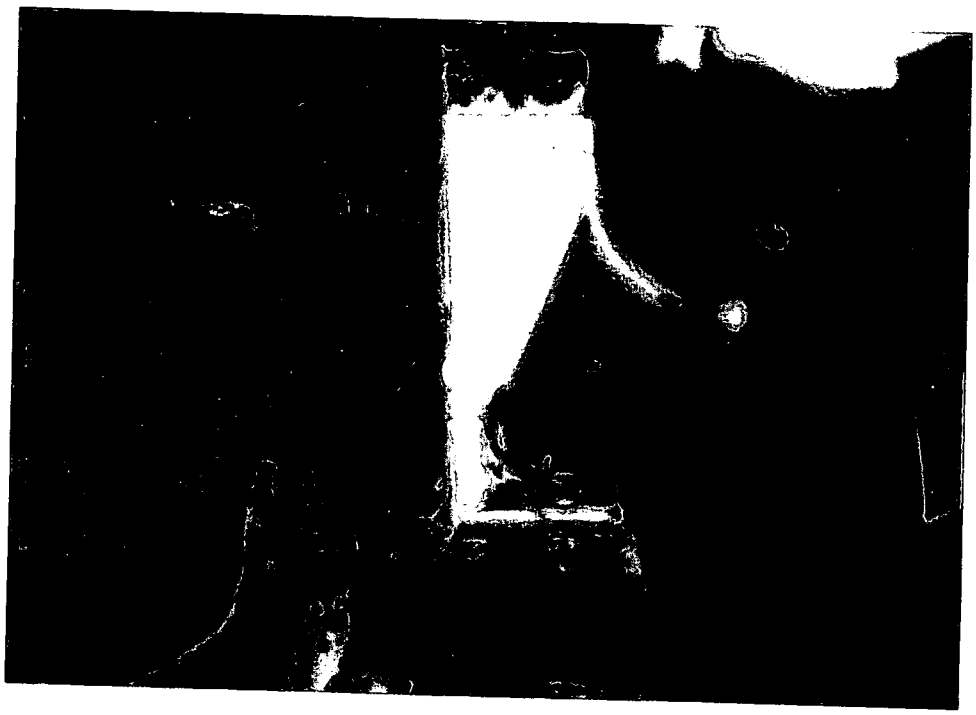
Material installed onto 1 in. condulet.

Material held in place with stainless steel tie wire.

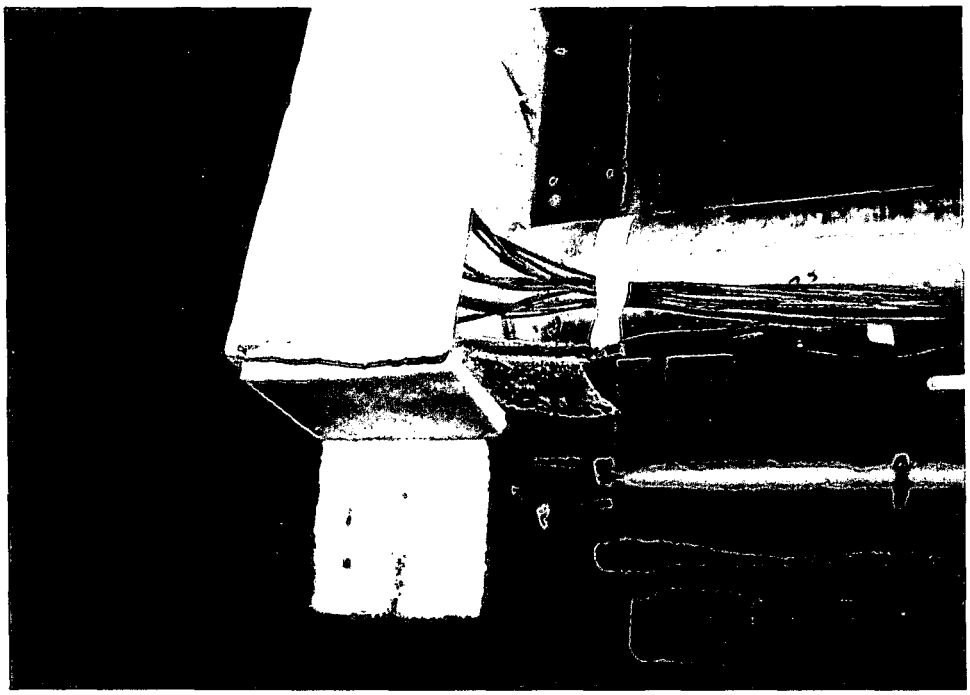
Opening around top of condulet box filled with trowel grade.

View of completed 1 in. condulet box.

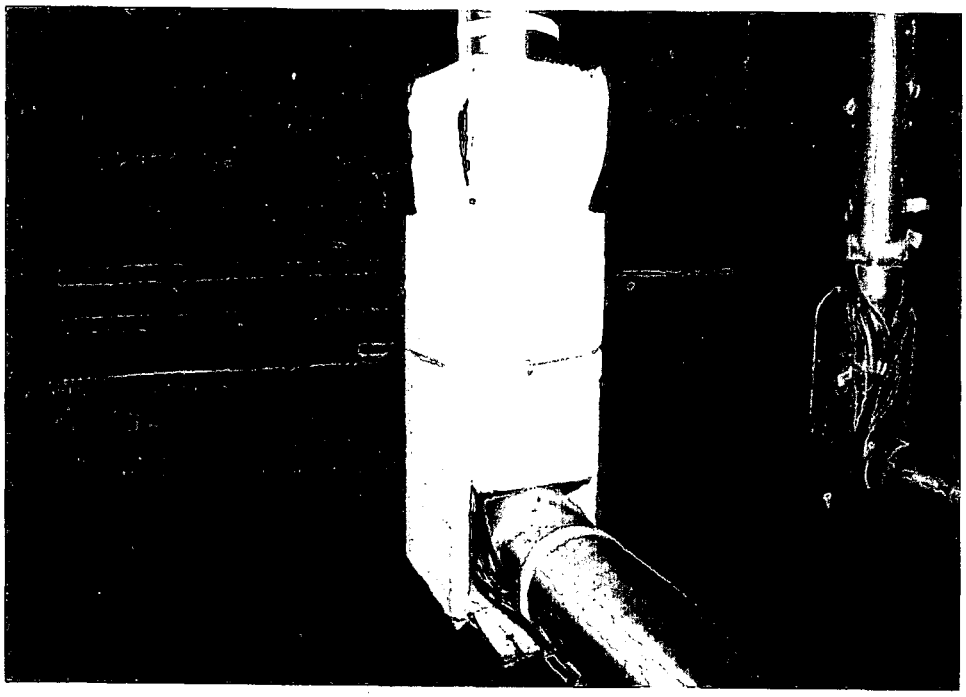
Material installed around 3 in. condulet.



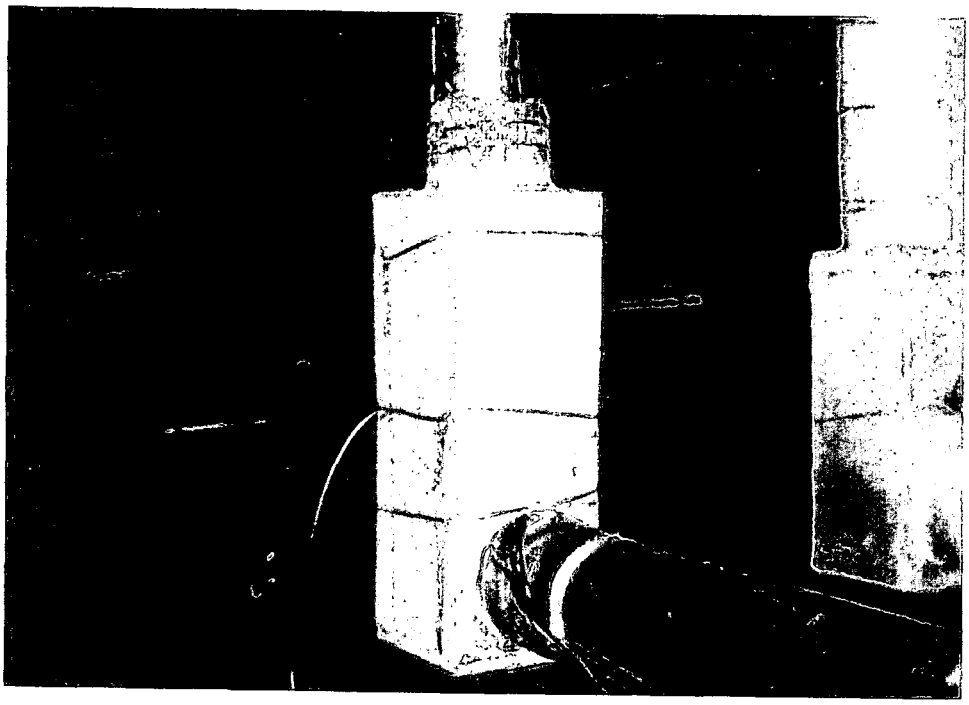
Bottom of condulet box fit into position.



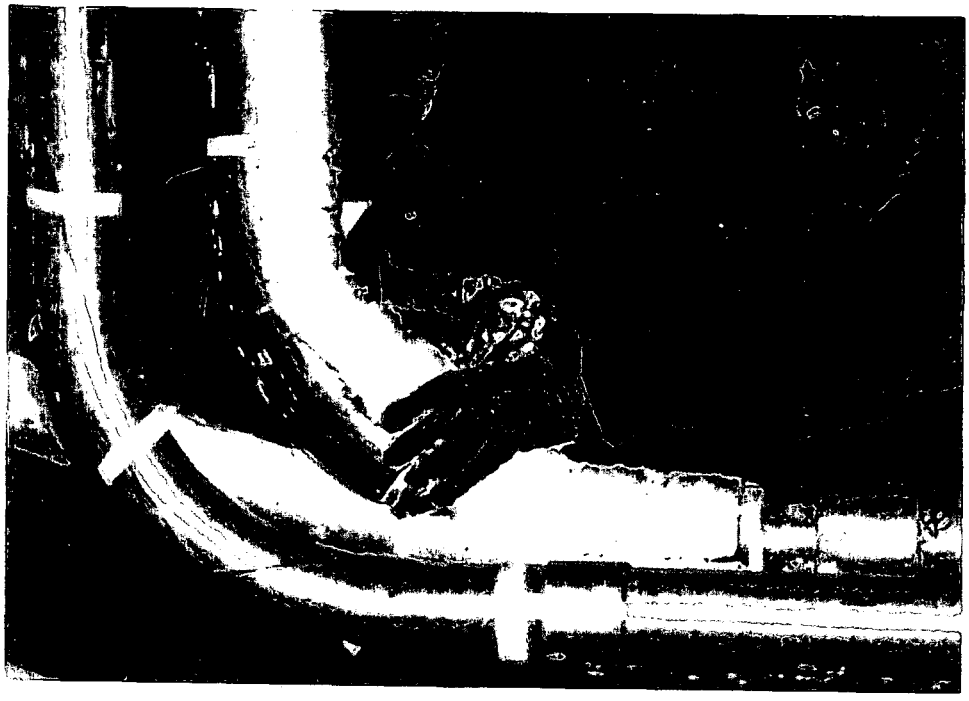
View of bottom of condulet box on 3 in. conduit.



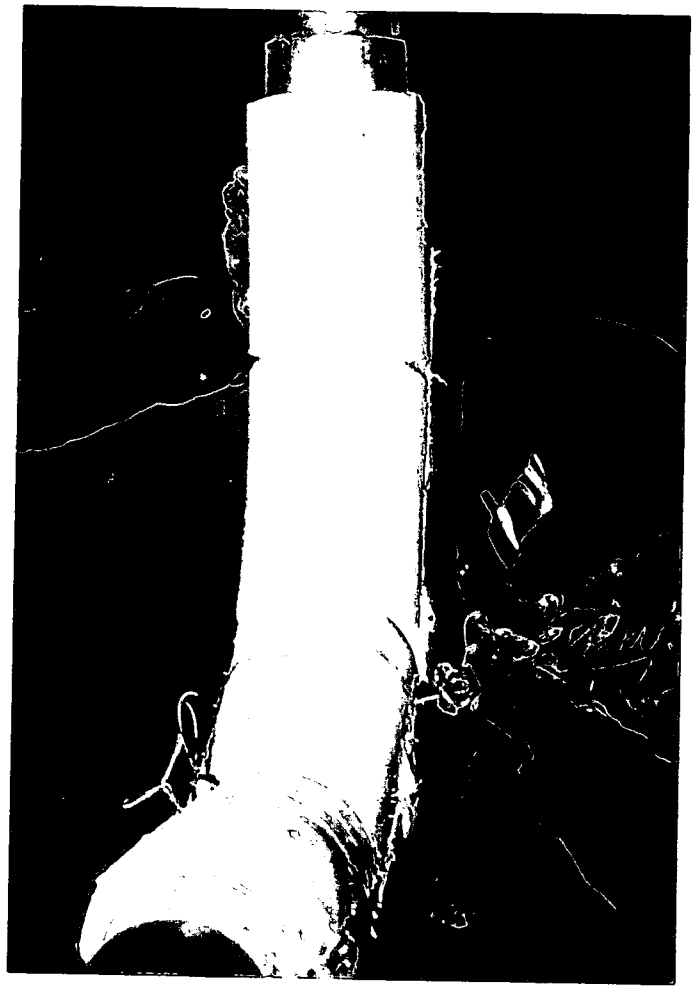
View of material installed around 3 in. condulet.



Condulet box completely installed on 3 in. conduit.

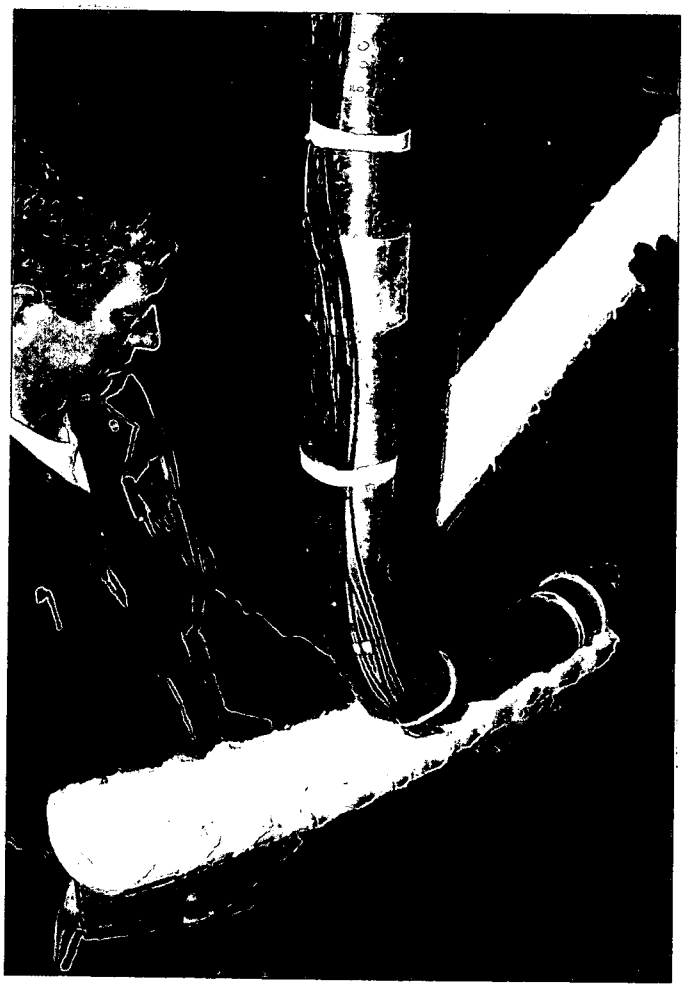


Material with mitered grooves installed onto 3 in. radial bend.



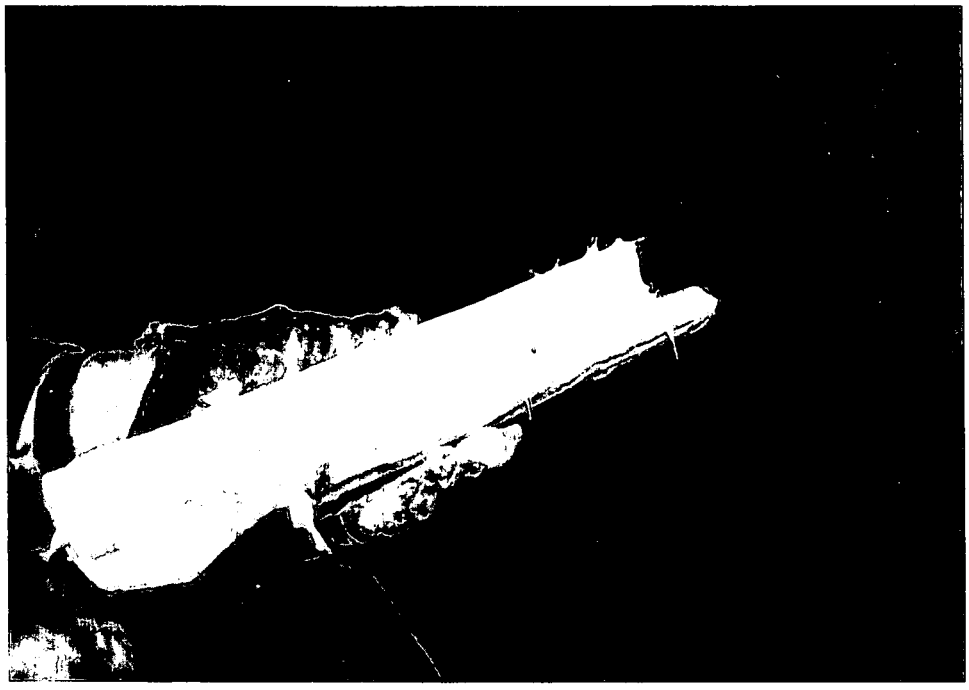
Material held in place with stainless steel tie wire.

Material installed onto 1 in. conduit radial bend.

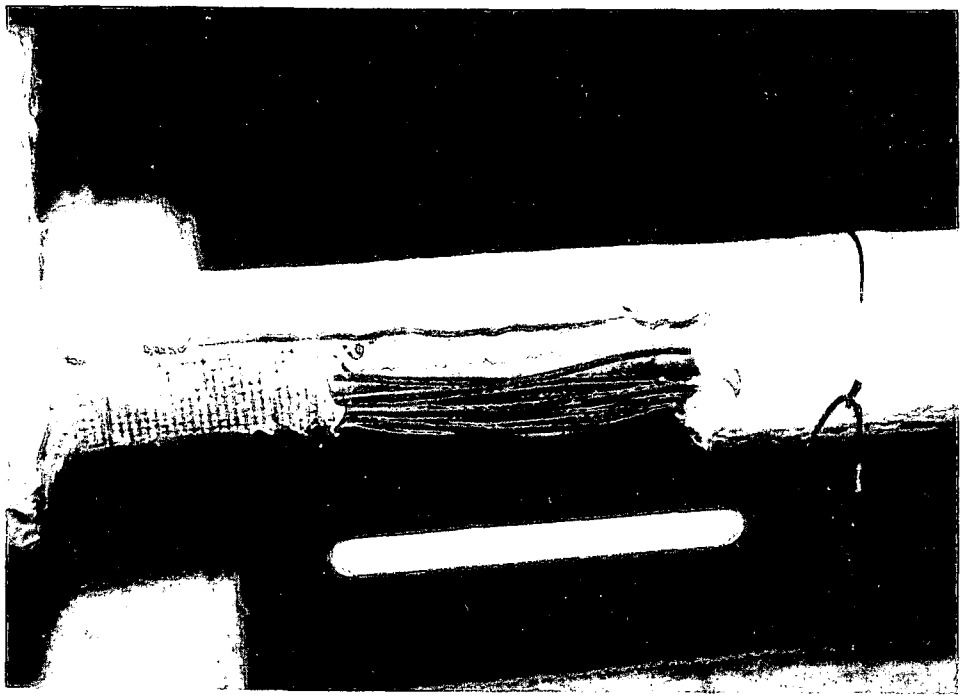


Material installed onto radial bend of 4 in. conduit.

Close view of miter grooves cut into material to be installed onto radial bends.



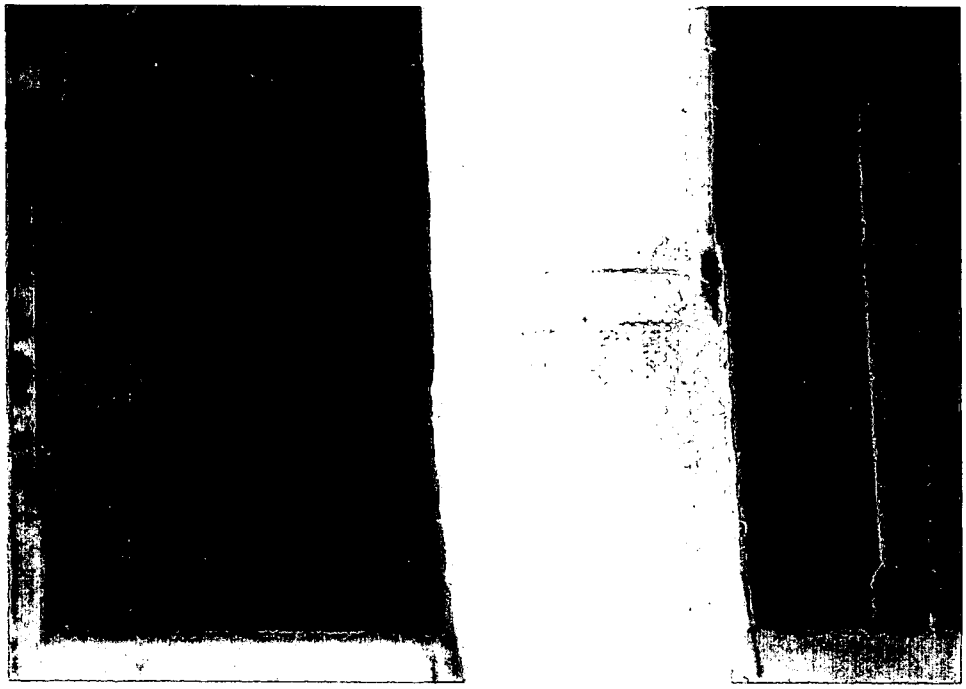
Trowel grade material applied to the inner surfaces of pre-shaped sections to be installed over straight conduit runs.



Typical joint in straight conduit run near condulet box.

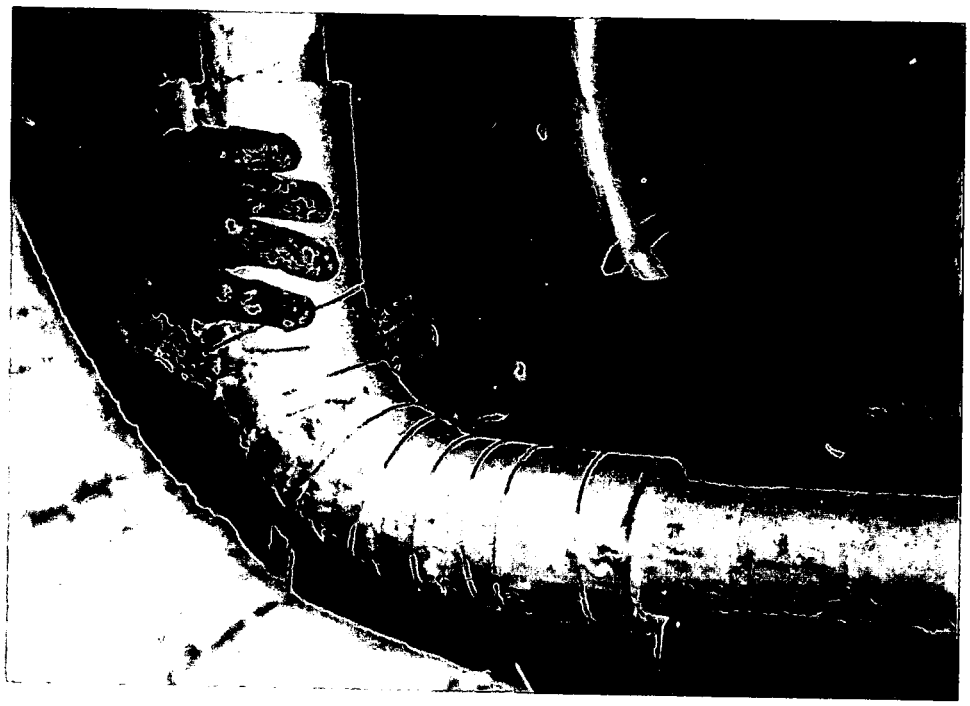
Pre-shaped sections installed onto large diameter conduit.

Stainless steel mesh installed over material on 2 in. radial bend.



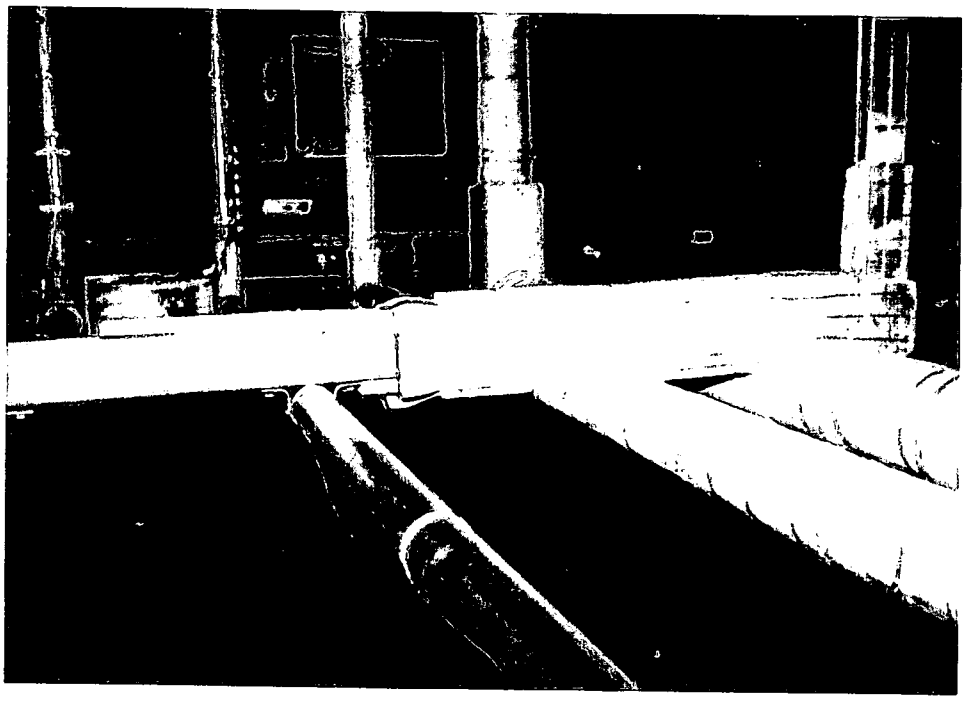
Trowel grade material applied over stainless steel mesh in radial bend area.

"Overlay" material installed and secured with stainless steel tie wire.

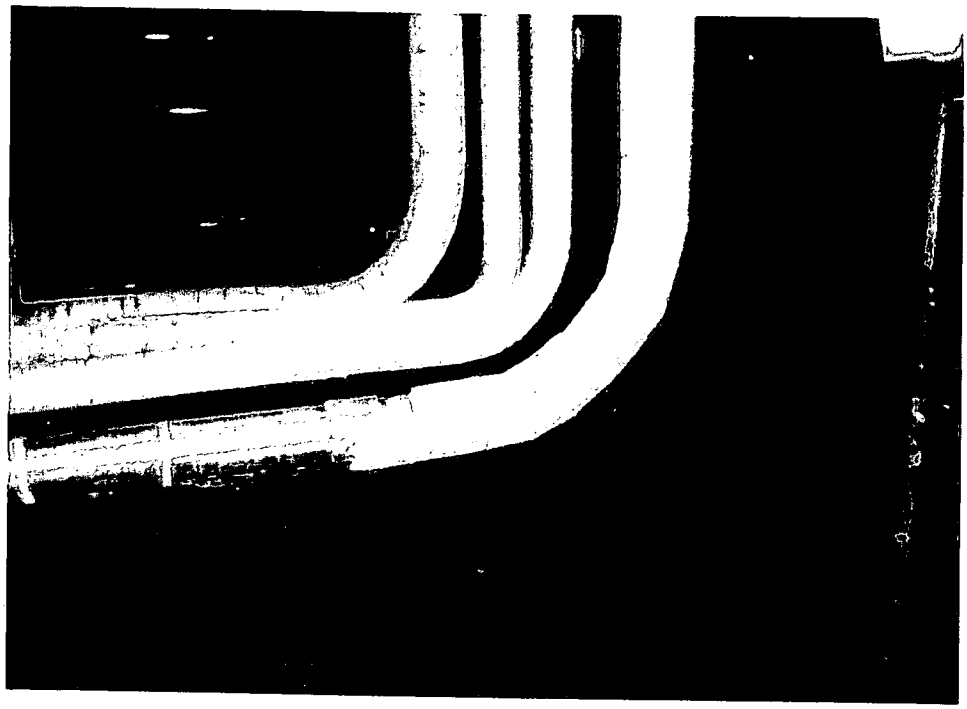


View of near complete overlay on 1 in conduit radial bend.

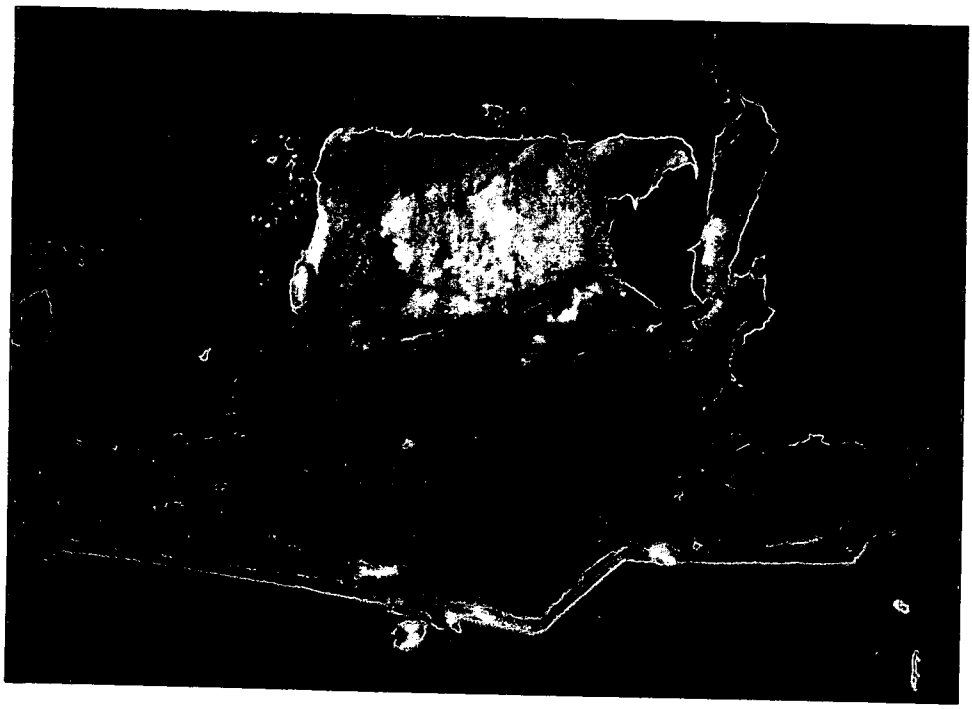
Pre-shaped conduit sections installed on vertical conduits over LB boxes.



Material applied to support member.



View of radial bends.



Trowel grade material applied to the inside of the material to be installed as an "overlay" on the 1 in. condulet box.

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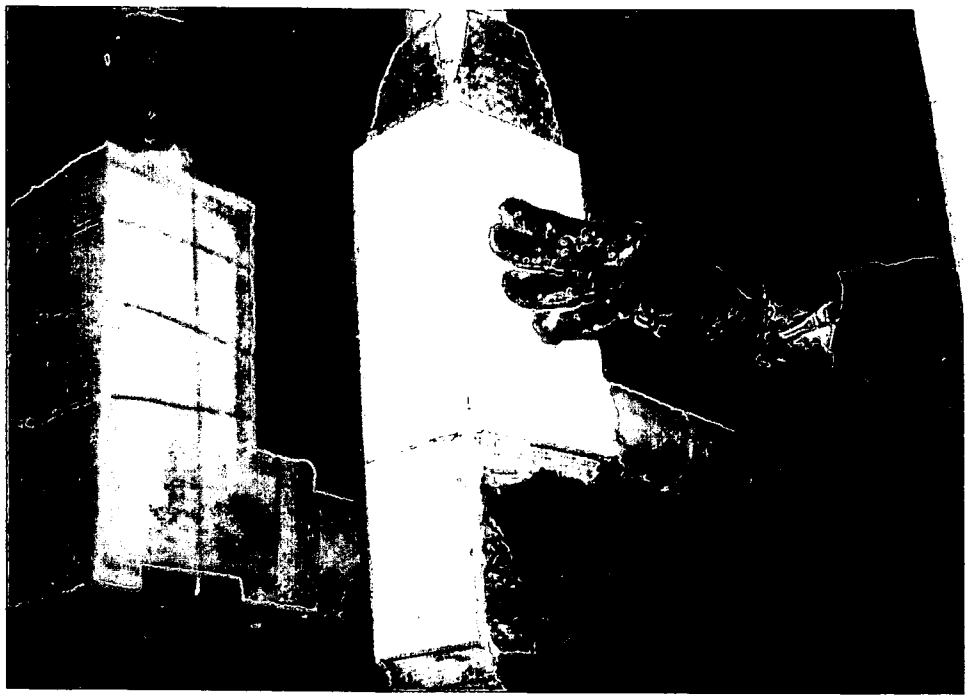
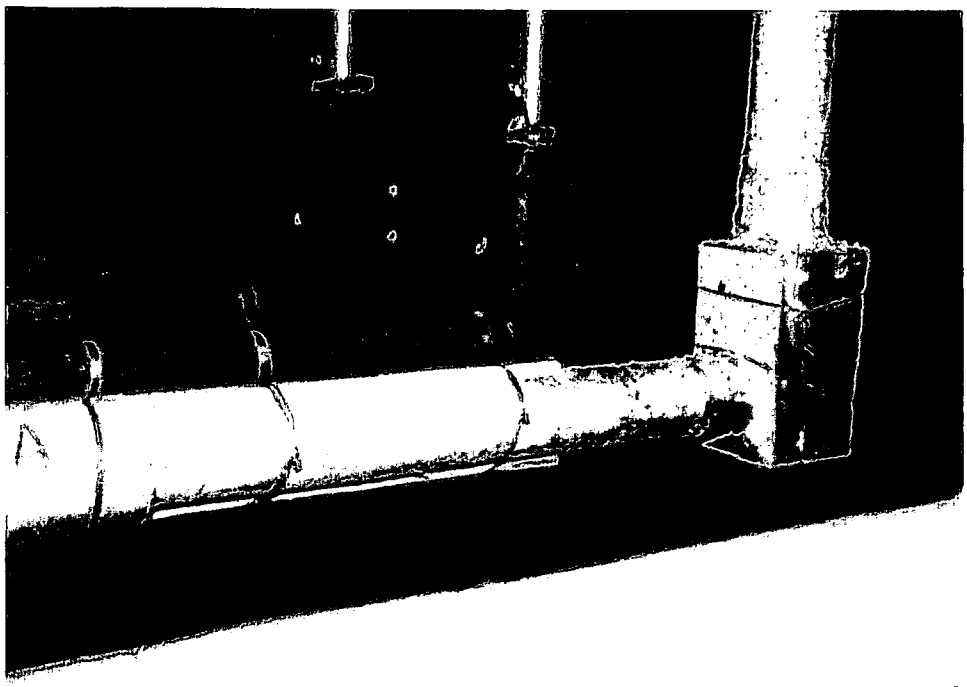


Overlay box installed over 1 in. condulet box.

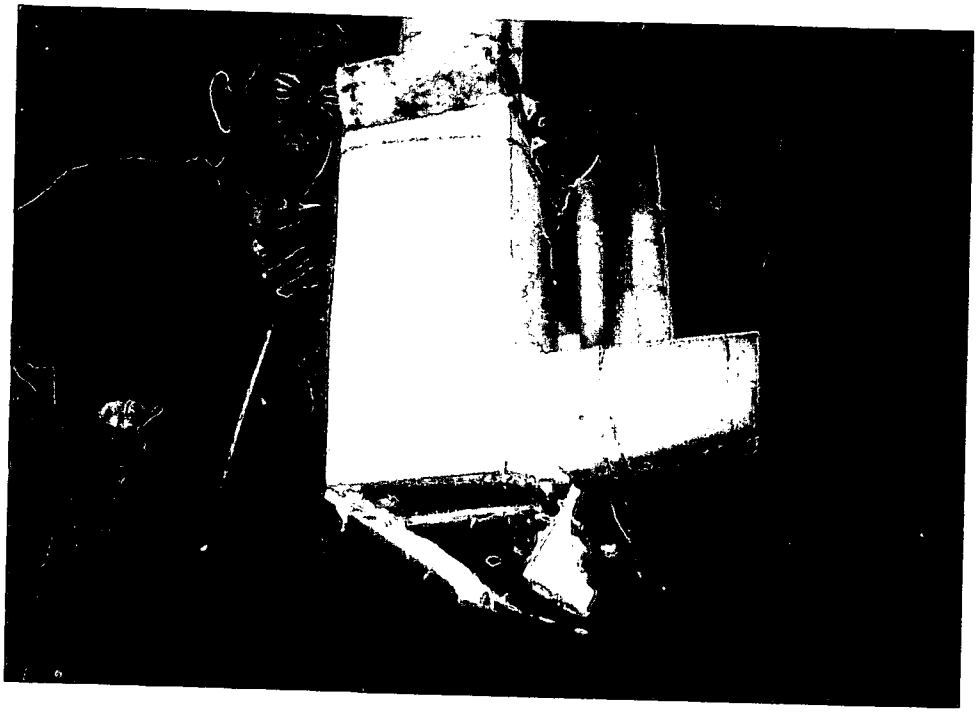


Overlay of pre-shaped sections installed onto 1 in. conduit.

View of overlay boxes installed onto 1 in. and 2 in. conduits.

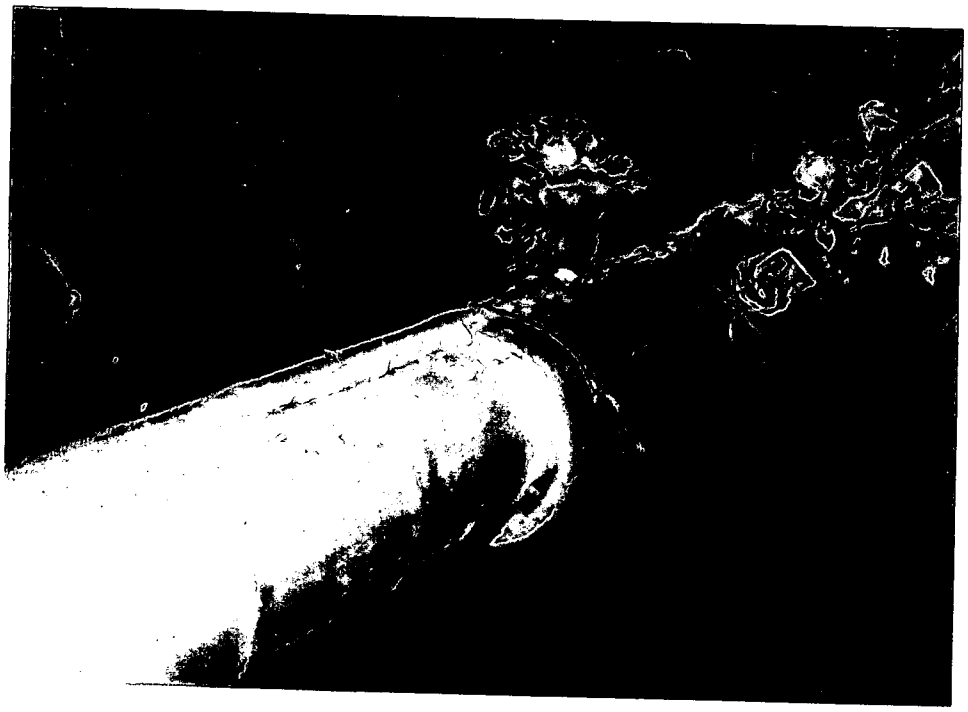
Material secured to horizontal conduit runs with stainless steel tie wire.

View of pre-shaped material joint near the LB box.



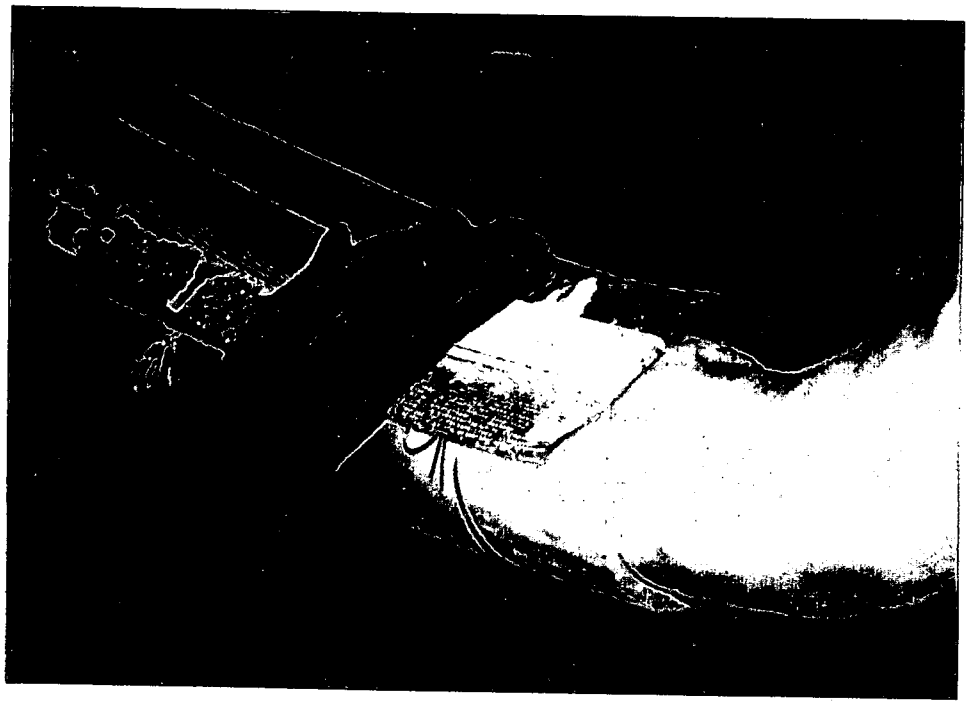
Overlay box installed over 3 in. condulet.

View of overlay box completely installed.

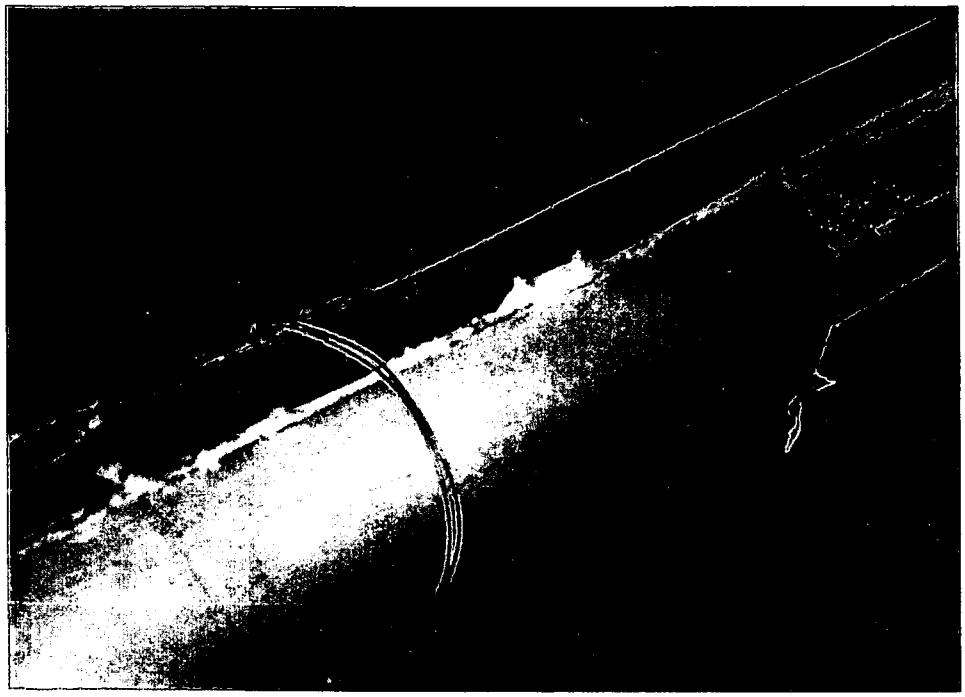


Overlay material applied and held in place with stainless steel tie wire.

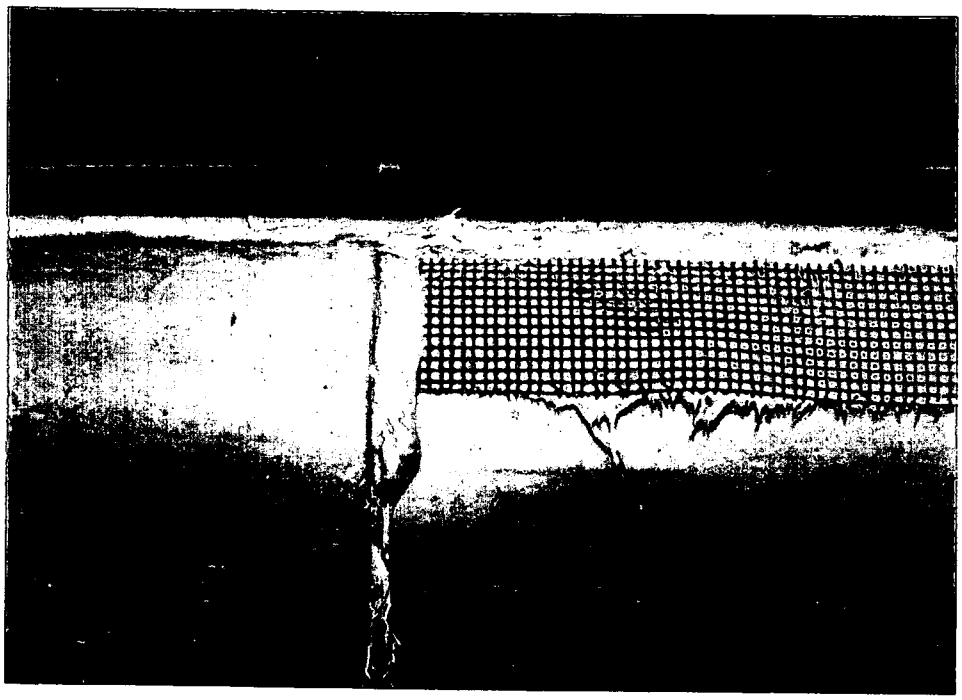
View of open area in overlay material on 3 in. conduit.



"Patch" cut to fill in open area on overlay material.



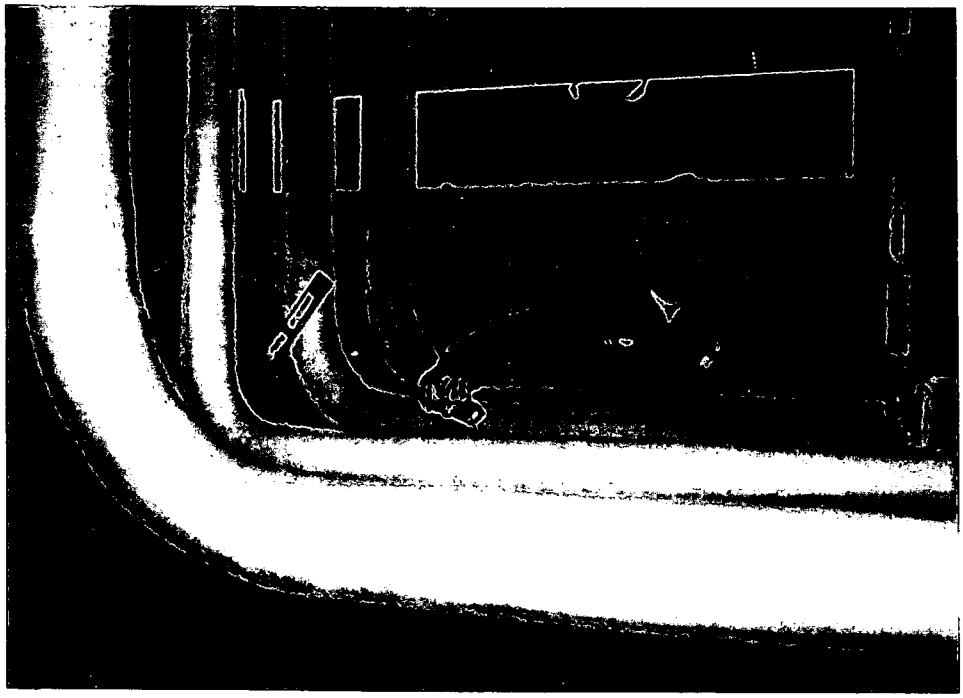
View of patch installed in overlay material.



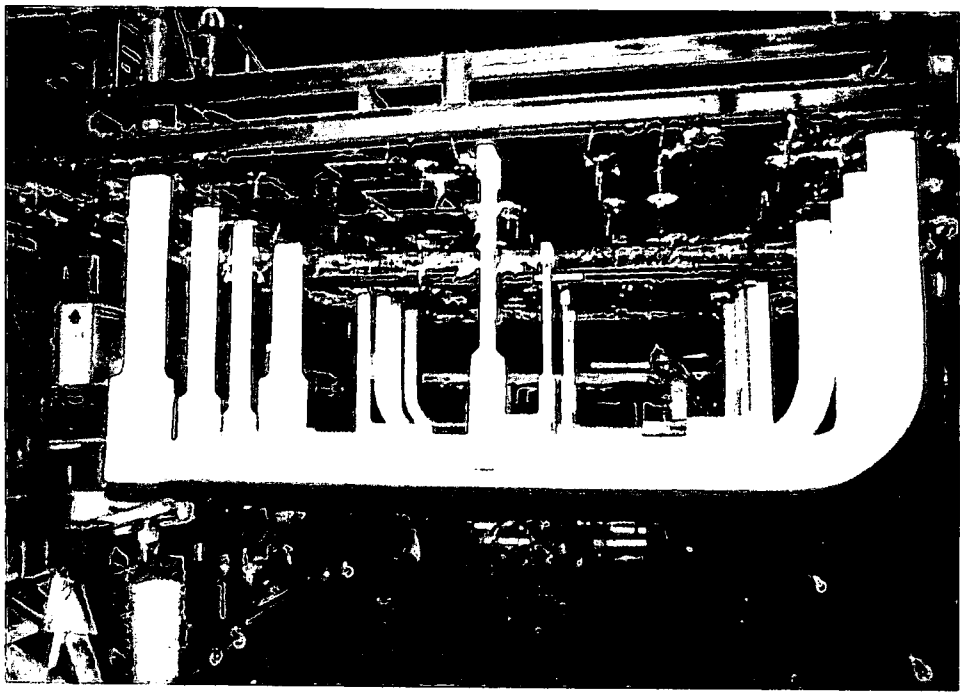
Close view of patch showing stress skin overlap.

Skim coat of trowel grade applied to all configurations.

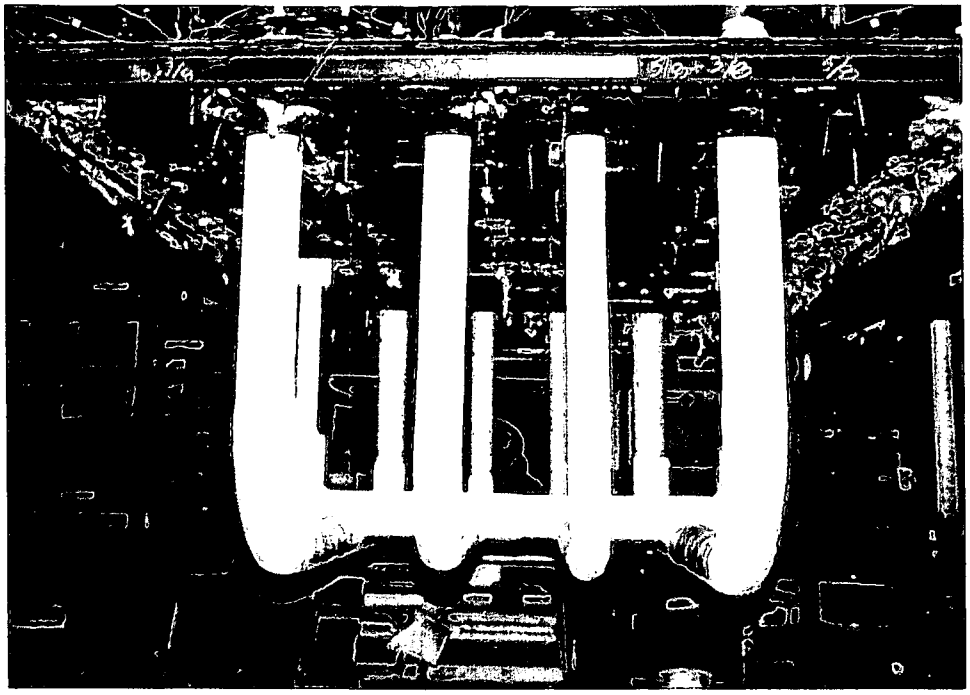
Skim coat smoothed with a wet brush.



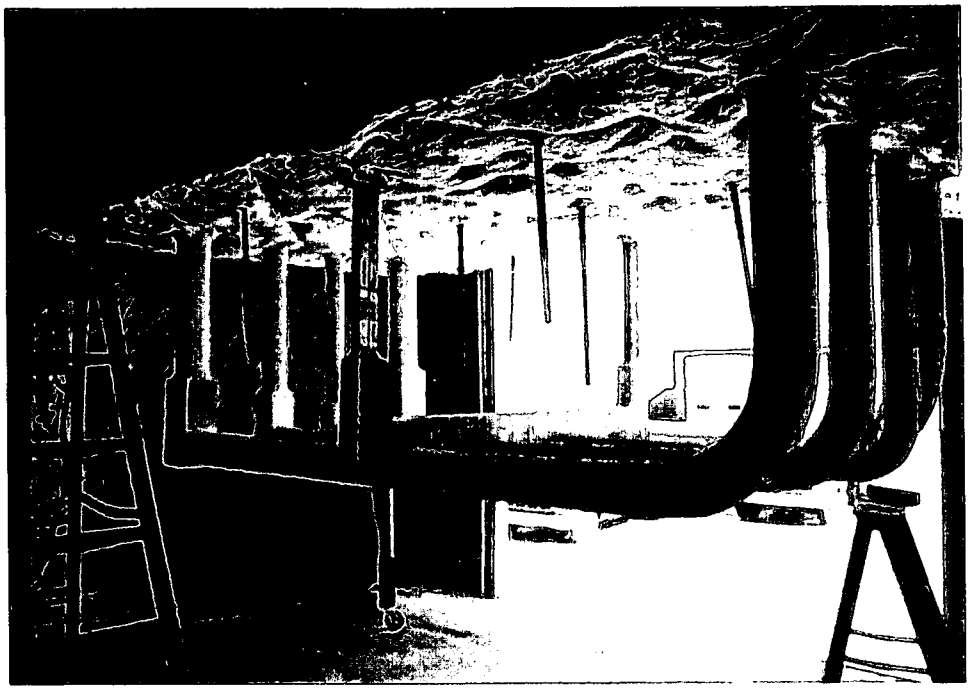
Skim coat smoothed with rasps to eliminate high spots.



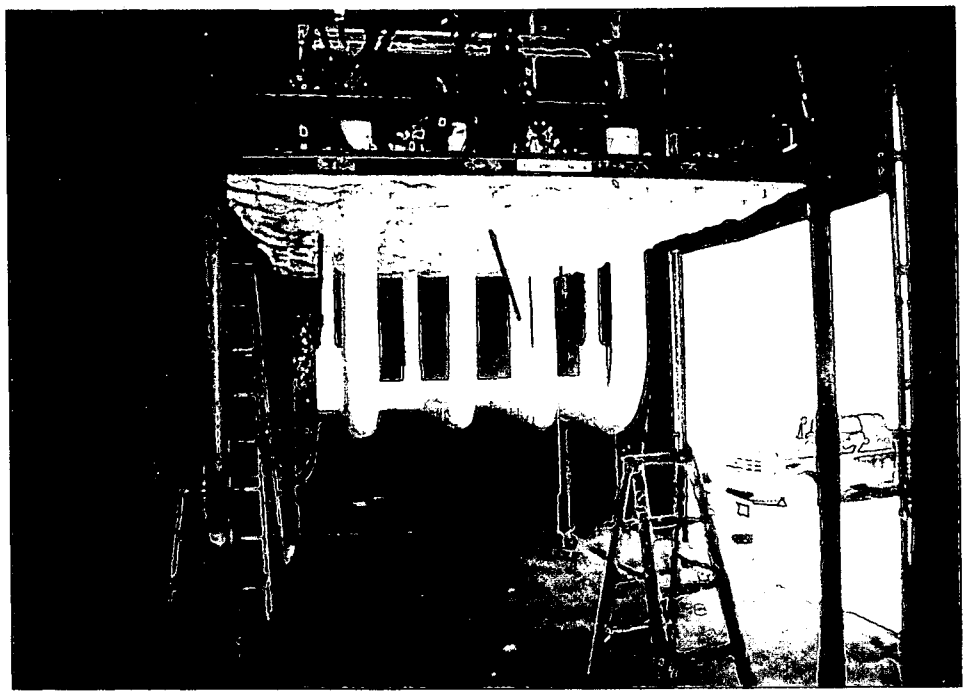
View of completed assemblies.



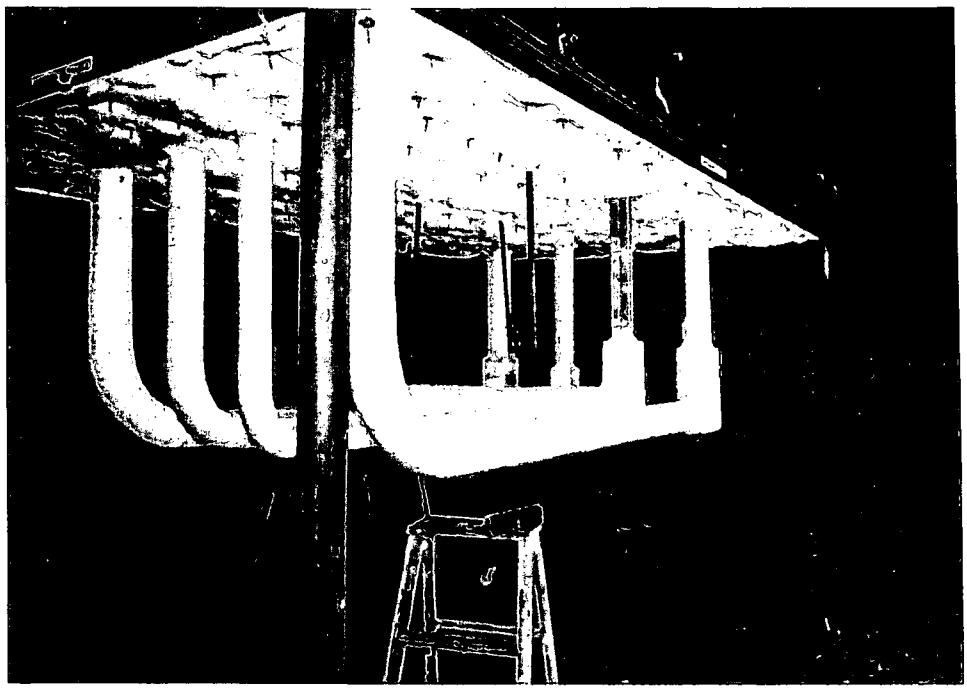
End view of completed assemblies.



Rear view of test article before test.

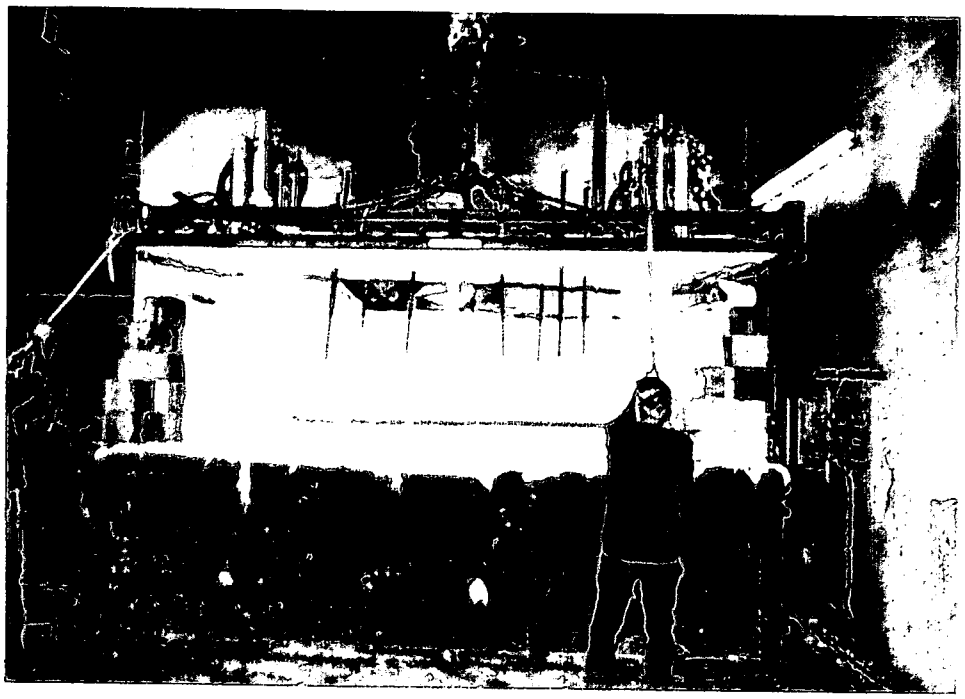


End view of radial bends before test.

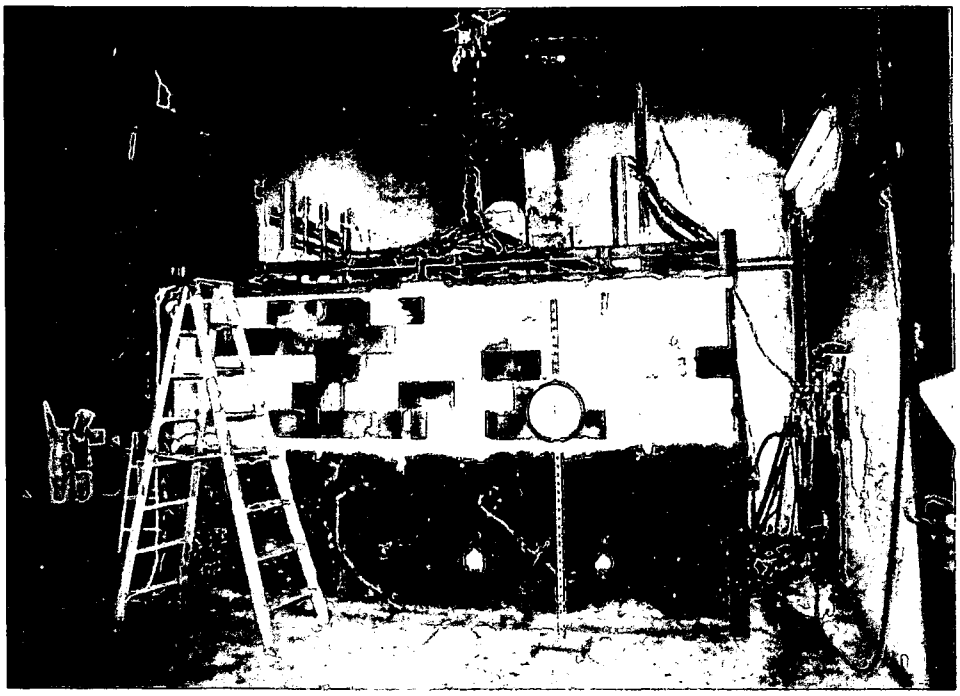


Right front view of test article before test.

View of LB boxes before test.

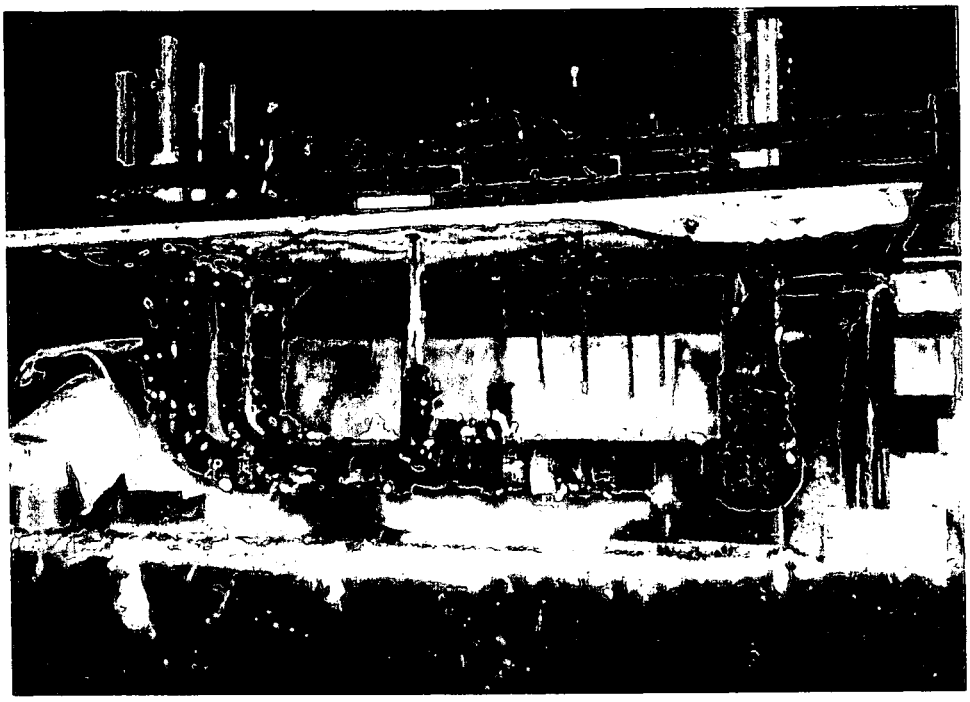


Test article being placed onto test furnace.

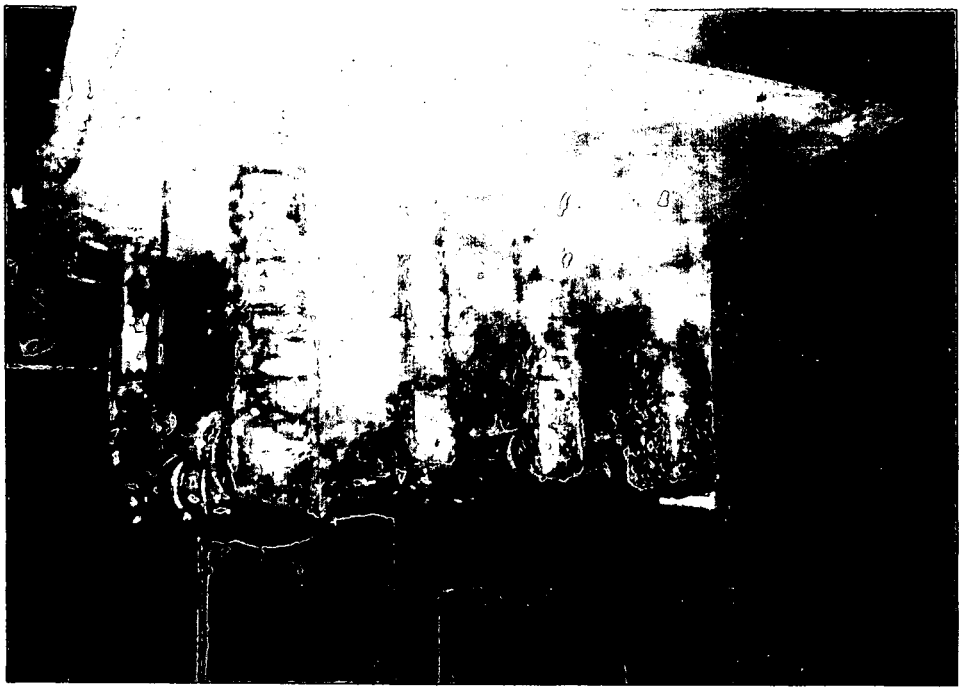


View of test furnace immediately prior to fire exposure.

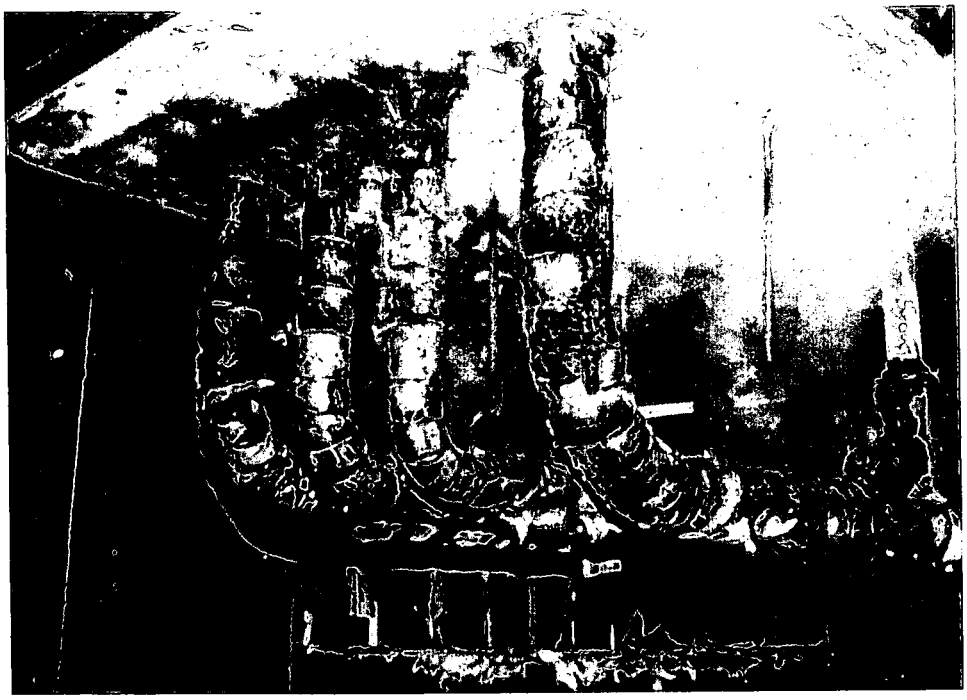
View of furnace interior during test.



Front view of test sample prior to hose stream test.

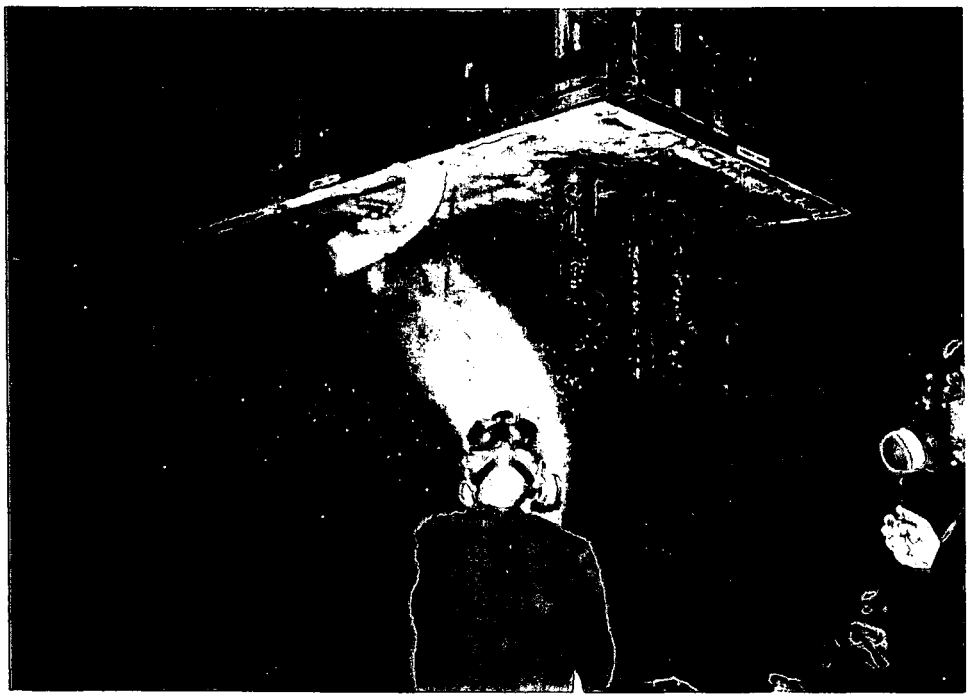


View of LB boxes after fire exposure.

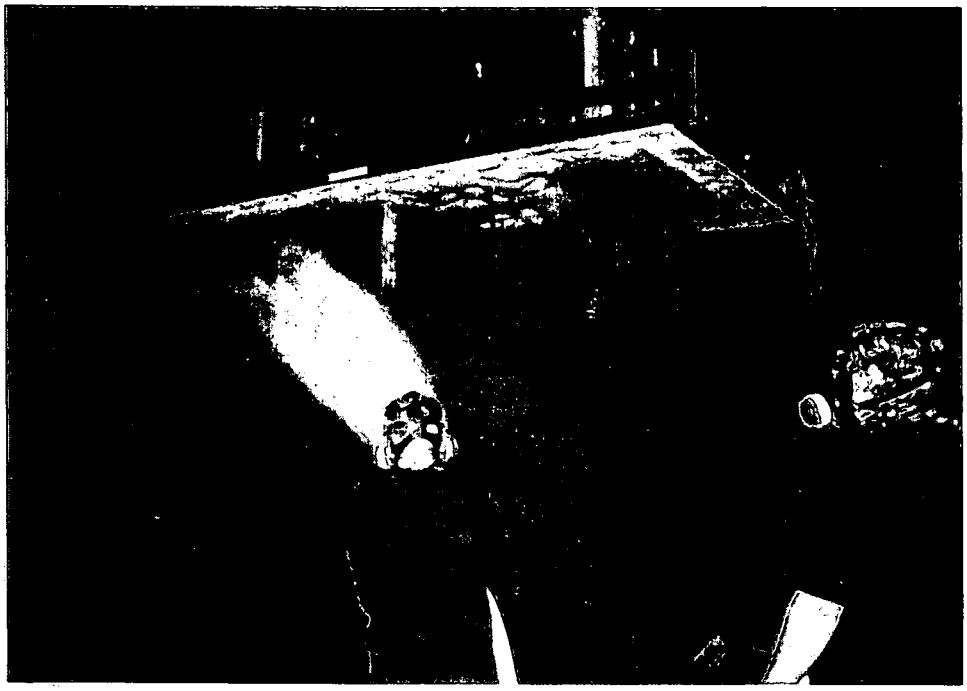


View of radial bends after fire exposure.

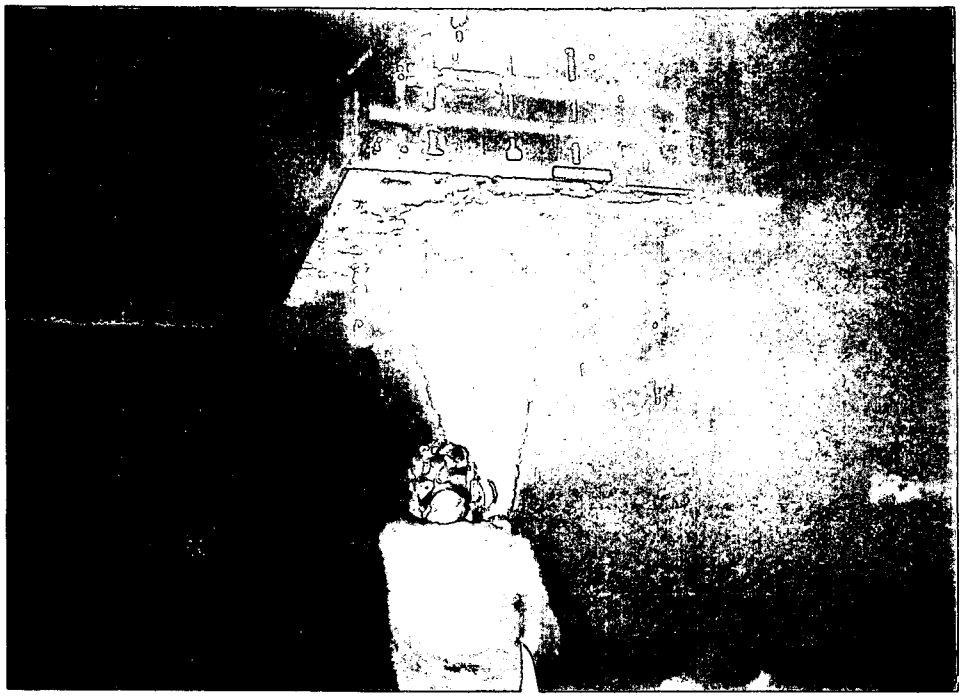
View of underside of sample after fire exposure.



Hose stream test.



Hose stream test.



Hose stream test.

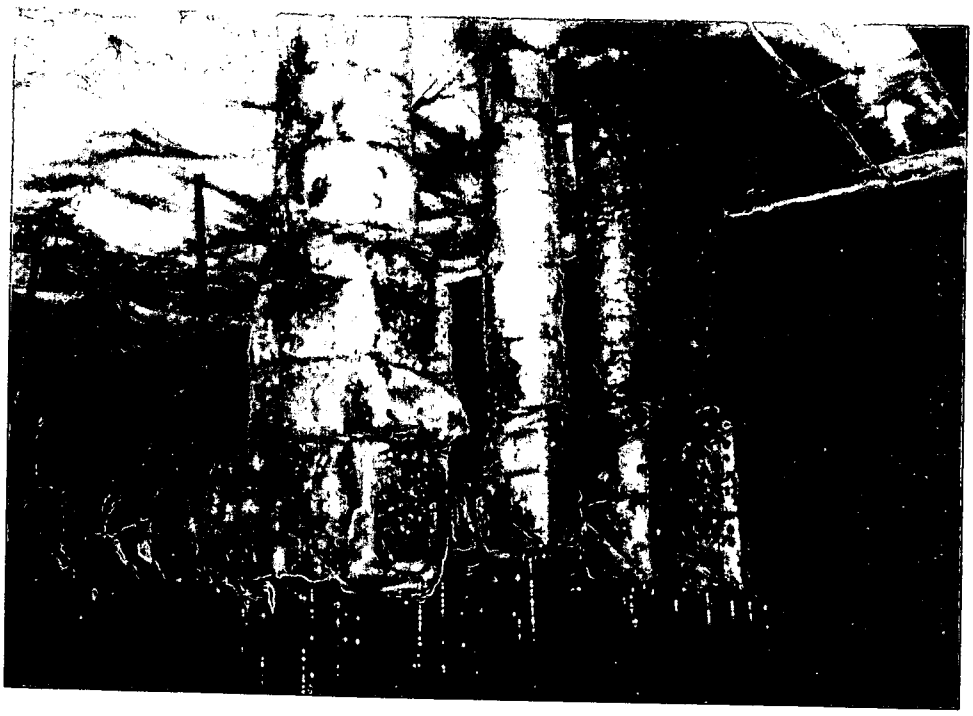
Hose stream test.

View of radial bends after hose stream test.

View of underside of LB boxes after hose stream test.

View of vertical conduit runs over LB boxes after hose stream test.

View of LB boxes after hose stream test.



View of 4 in. LB box after hose stream test.

View of 4 in. horizontal conduit and support member after hose stream test.

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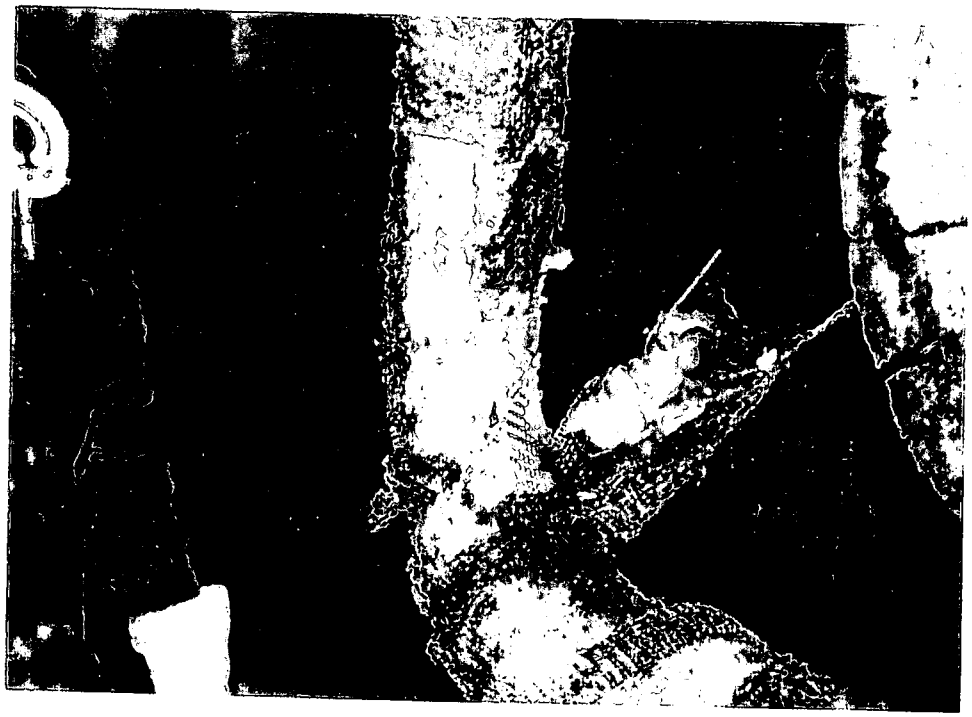
View of radial bends after hose stream test.

View of 4 in. conduit section near LB showing material dislodged by hose stream.

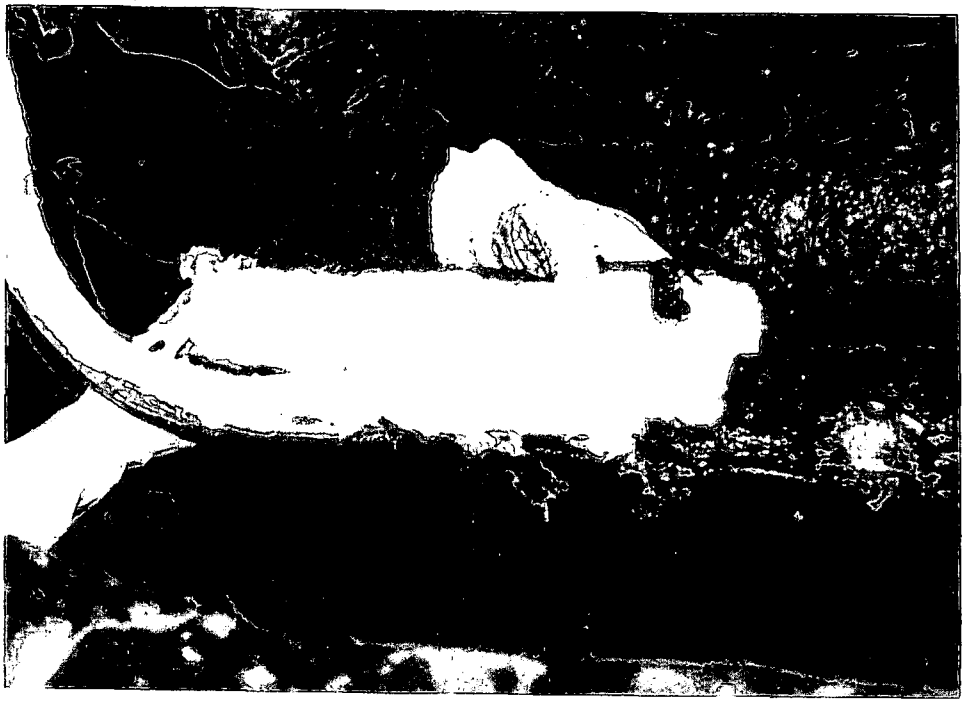


View of 1 in. radial bend with char removed.

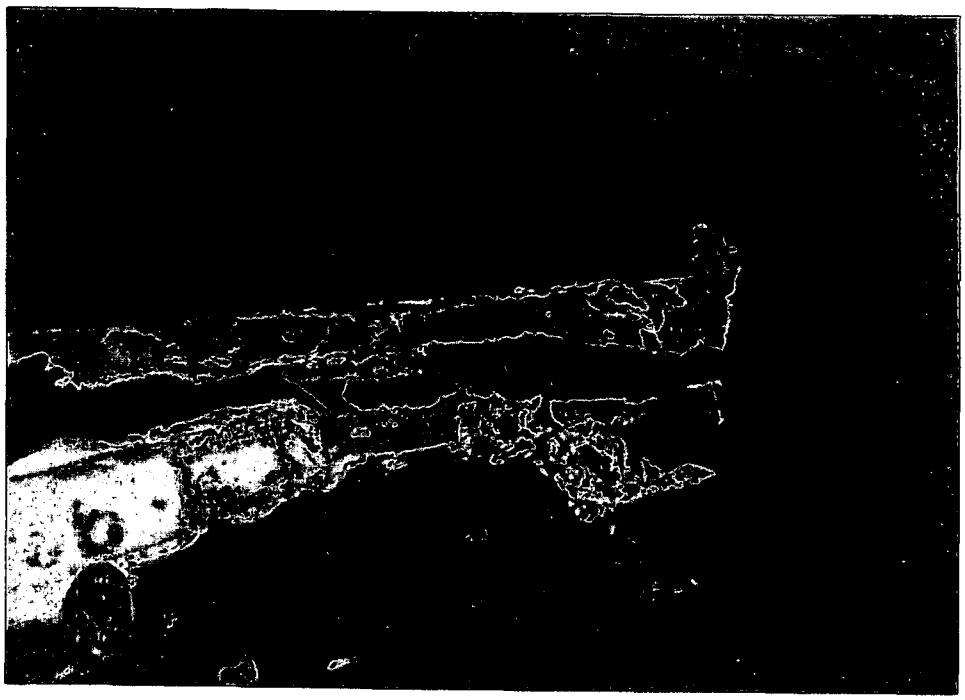
View of 1 in. radial bend and vertical conduit with overlay removed.

View of material removed from 1 in. vertical conduit above radial bend.

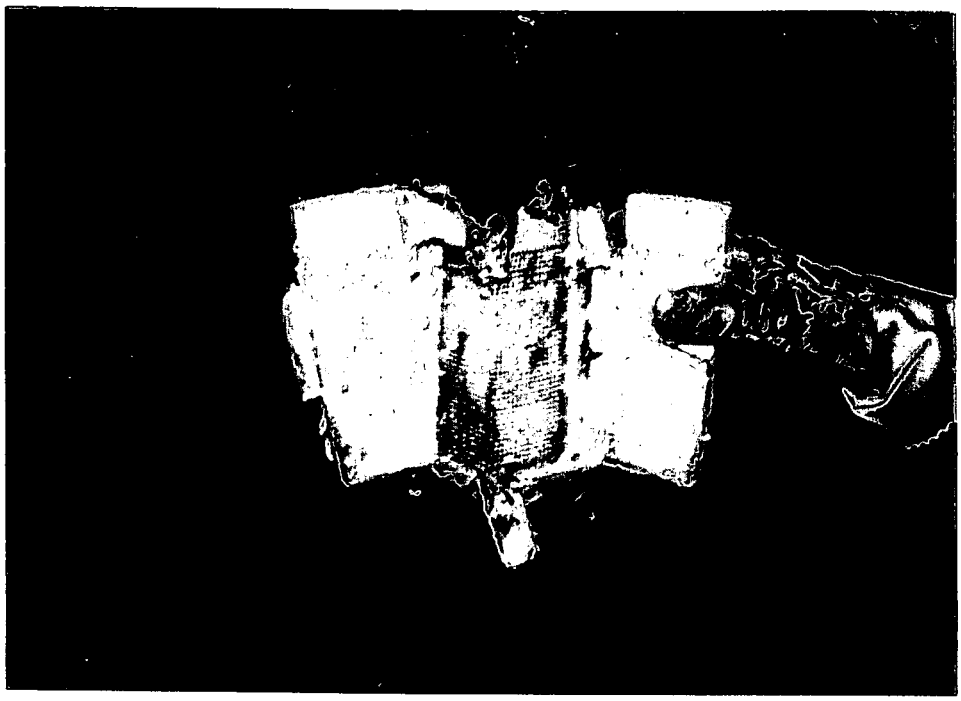
View of material removed from 1 in. radial bend.



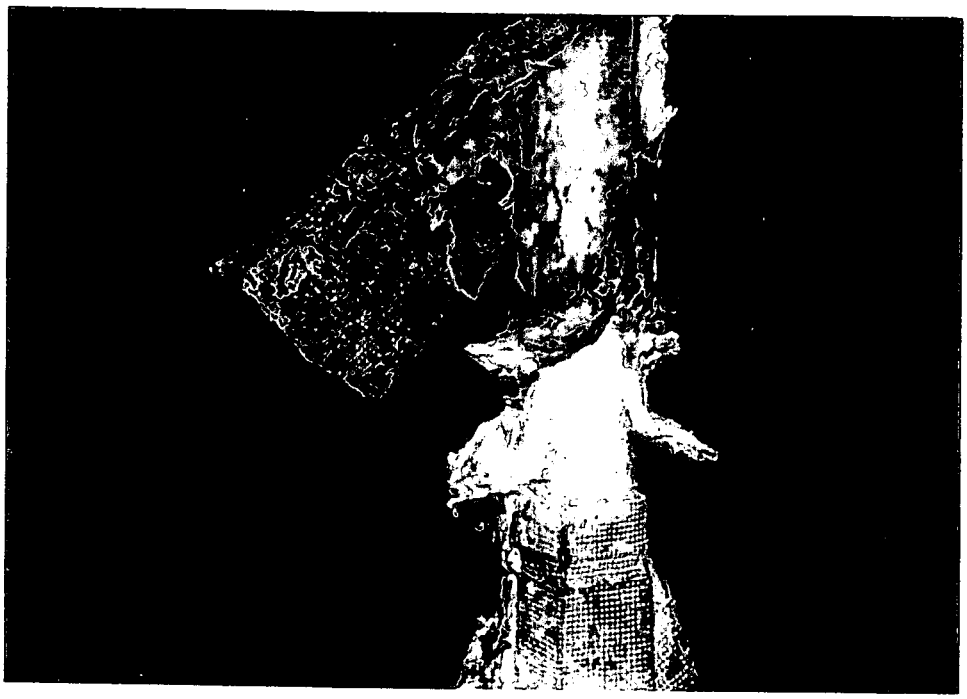
View of material removed from 1 in. horizontal conduit near radial bend.



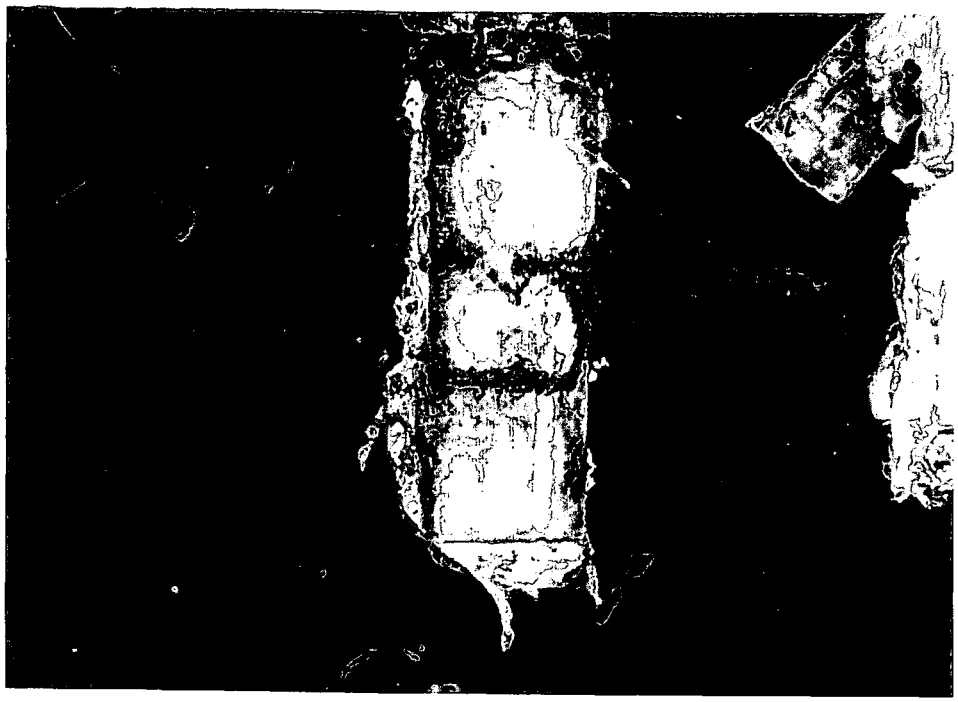
View of material removed from 1 in. horizontal conduit near LB box.



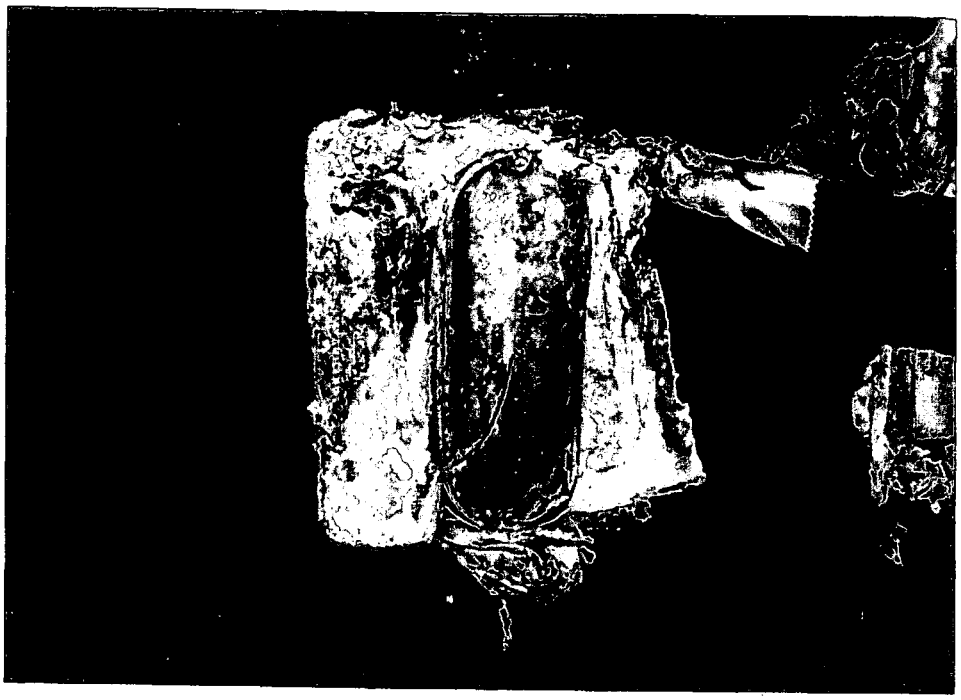
View of overlay material removed from 1 in. LB box.



View of overlay material and first layer of material on 1 in. vertical conduit over LB box.



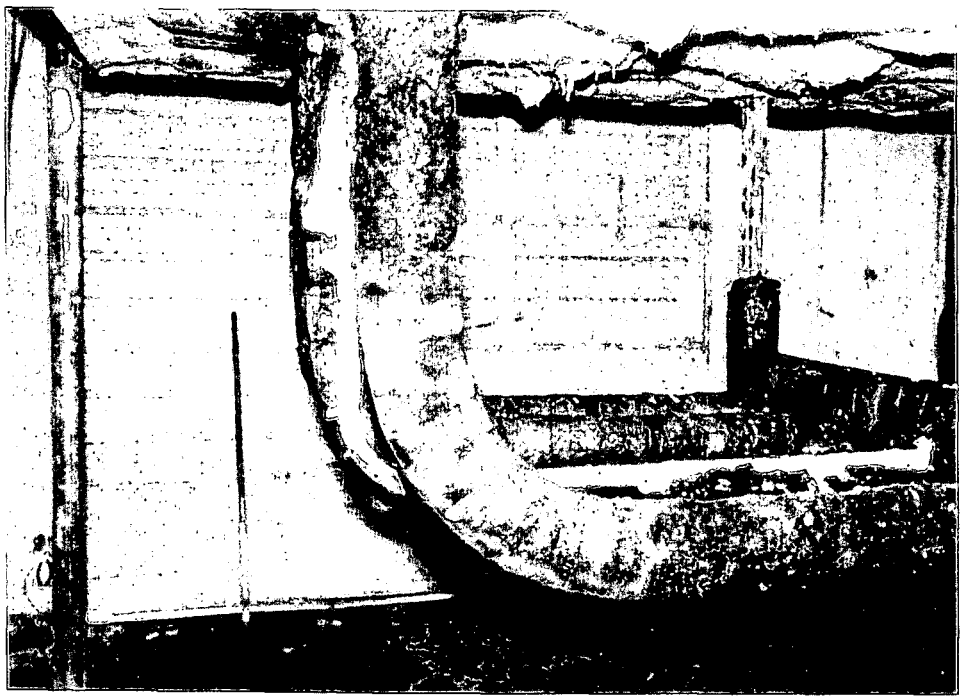
View of material on 4 in. condulet.



View of material removed from 4 in. condulet.

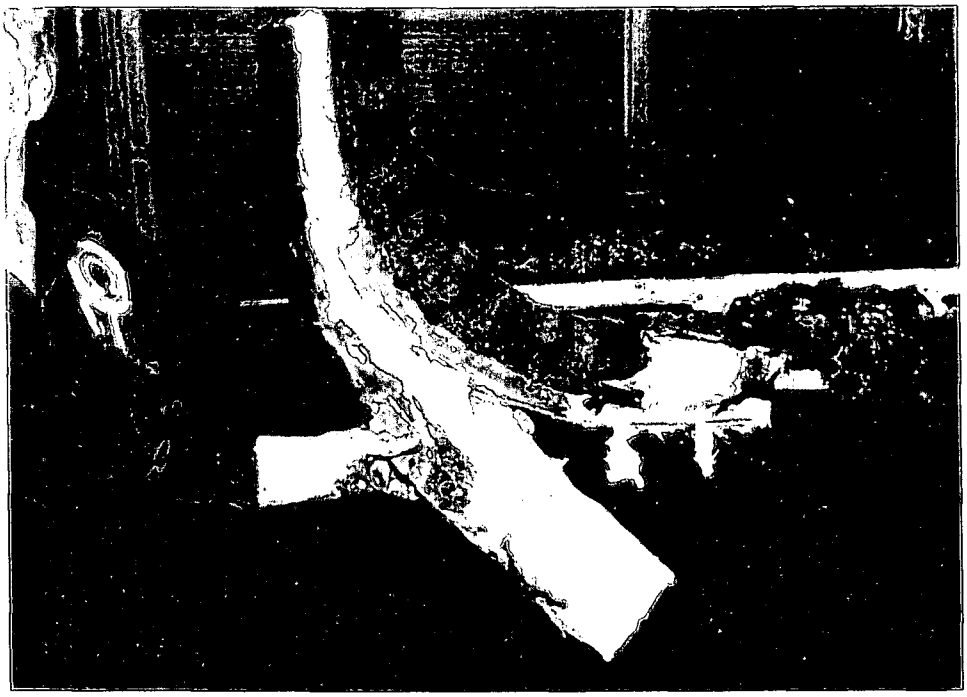
View of material removed from conduit above LB box.

View of material removed from horizontal conduit near LB box.

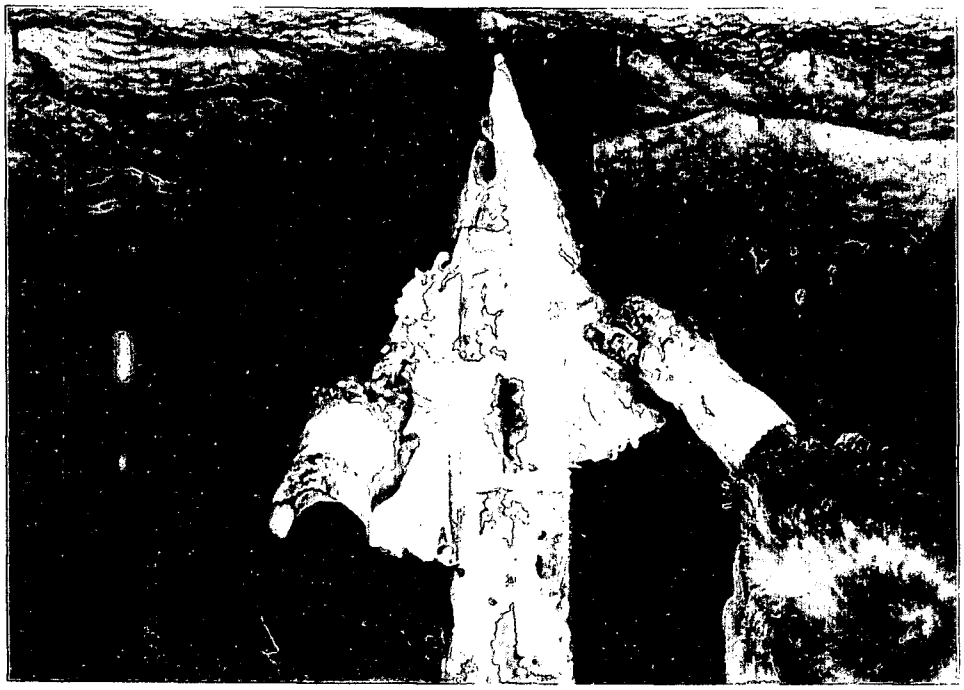


View of radial with char removed.

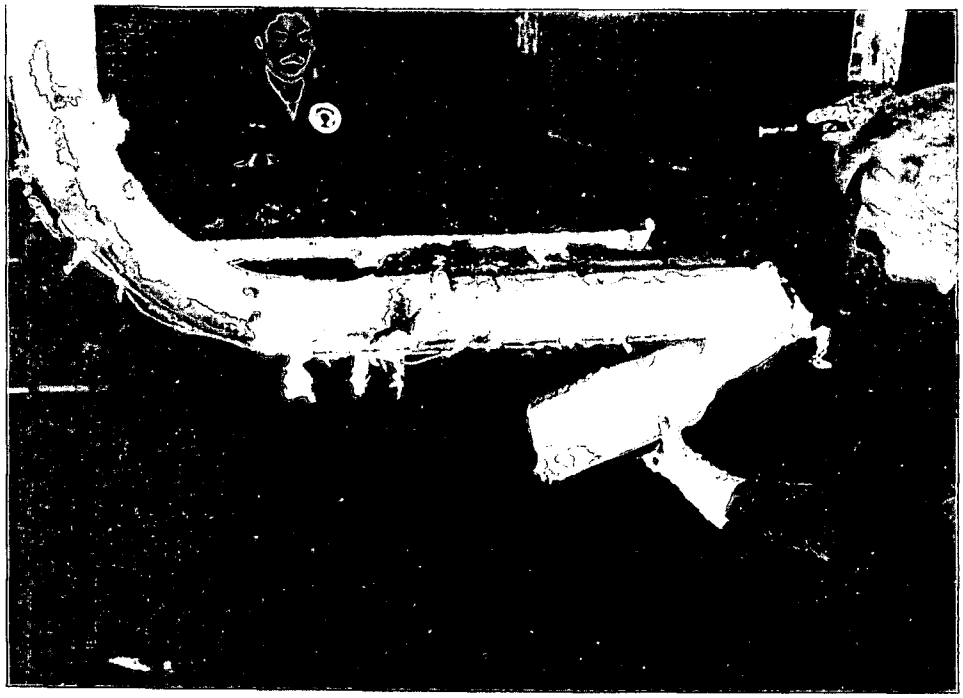
Material removed from radial bend of 4 in. conduit.



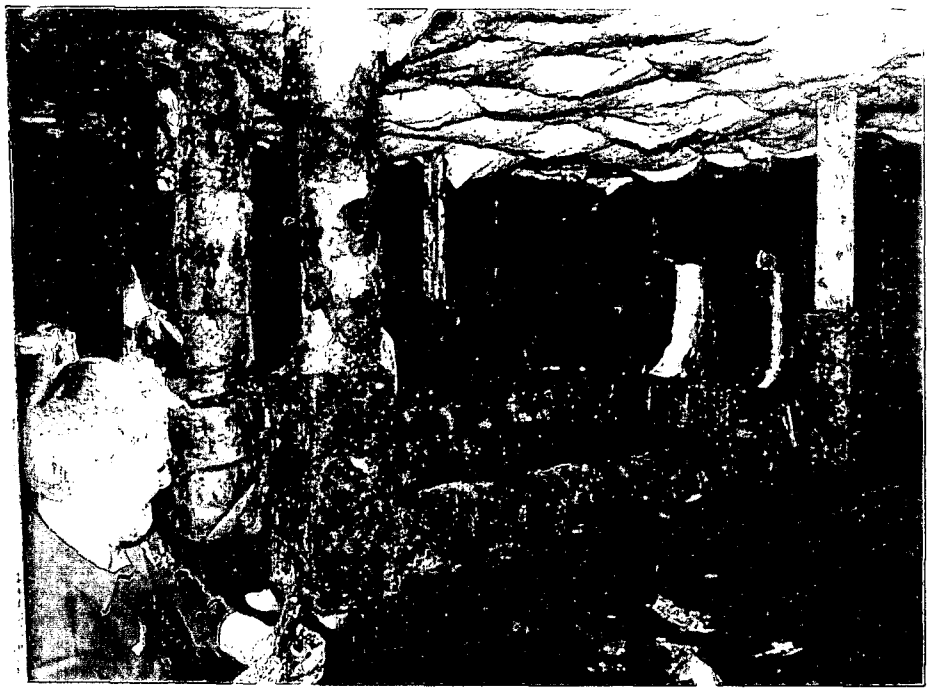
Interior view of material removed from 4 in. radial bend.



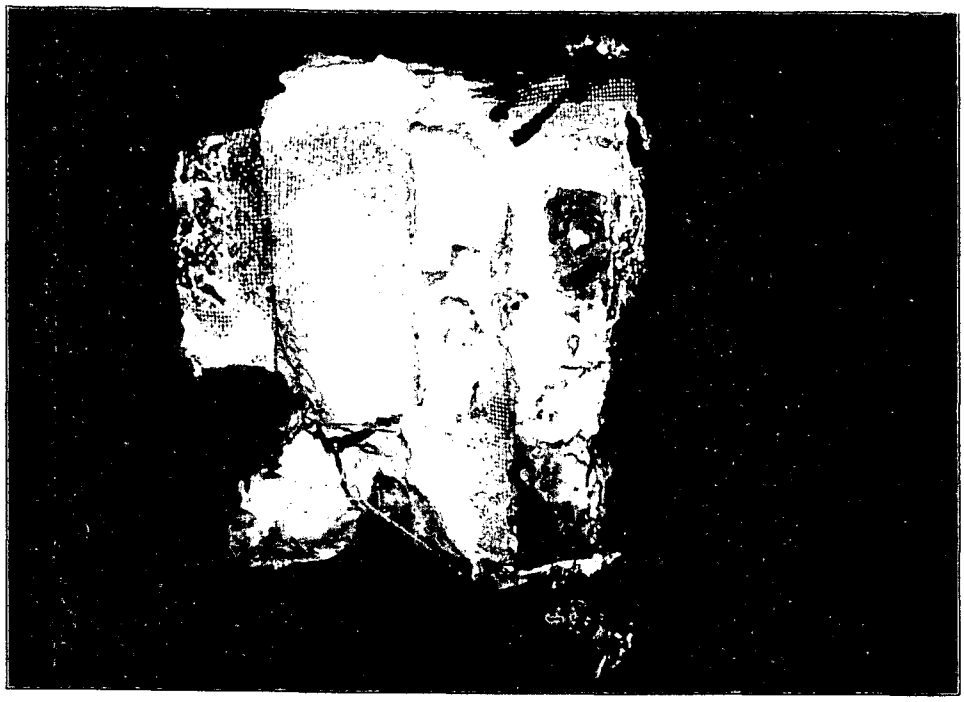
Material removed from vertical conduit above radial bend.



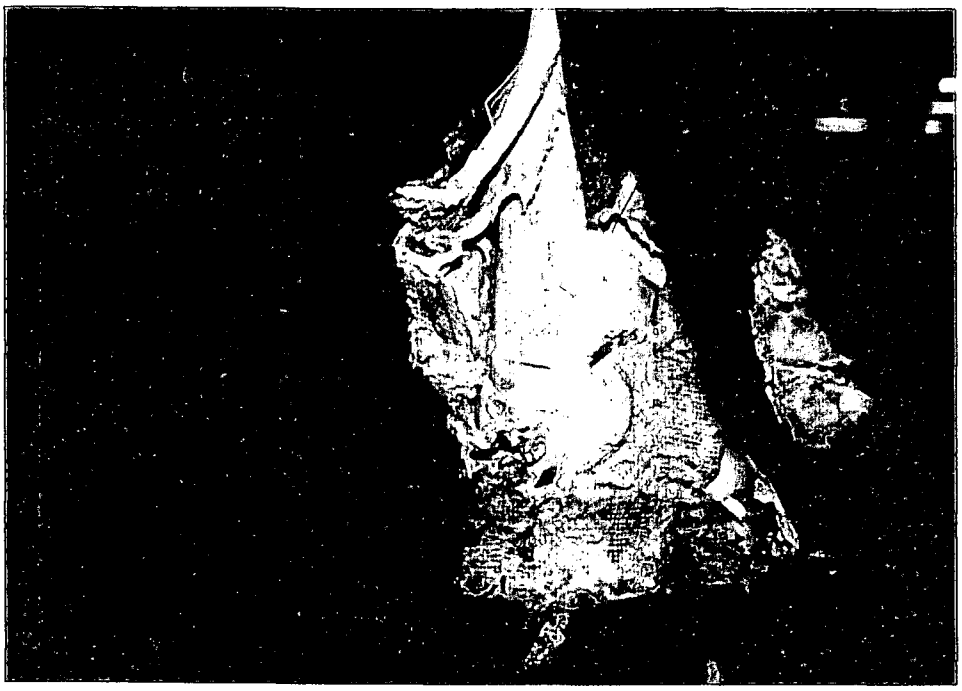
Material removed from horizontal conduit section near radial bend.



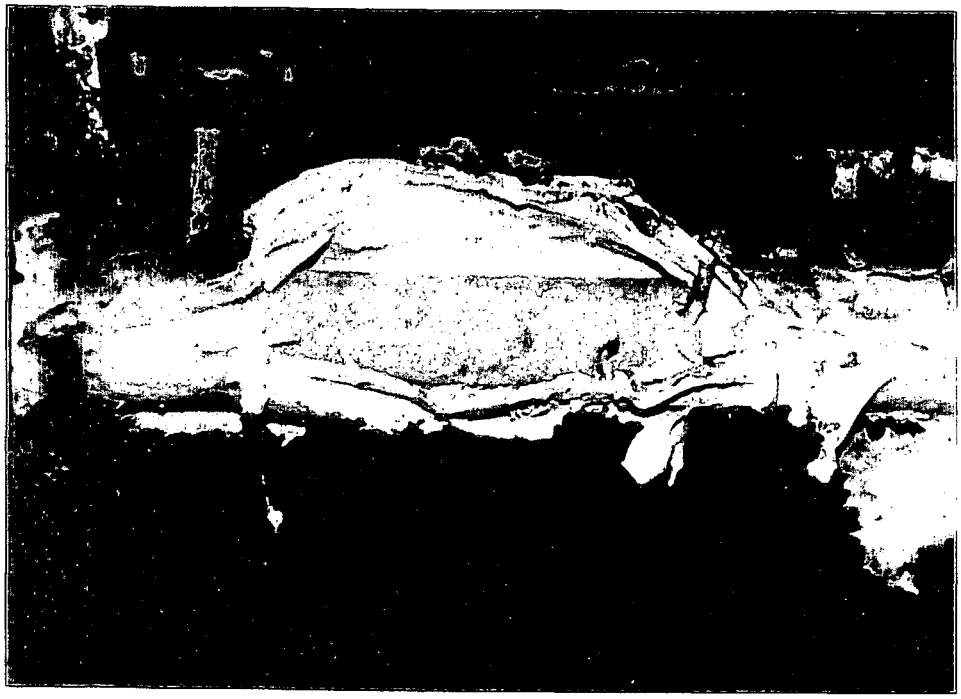
View of 3 in. conduit configuration with char removed from LB box.



Interior view of material on 3 in. condulet.

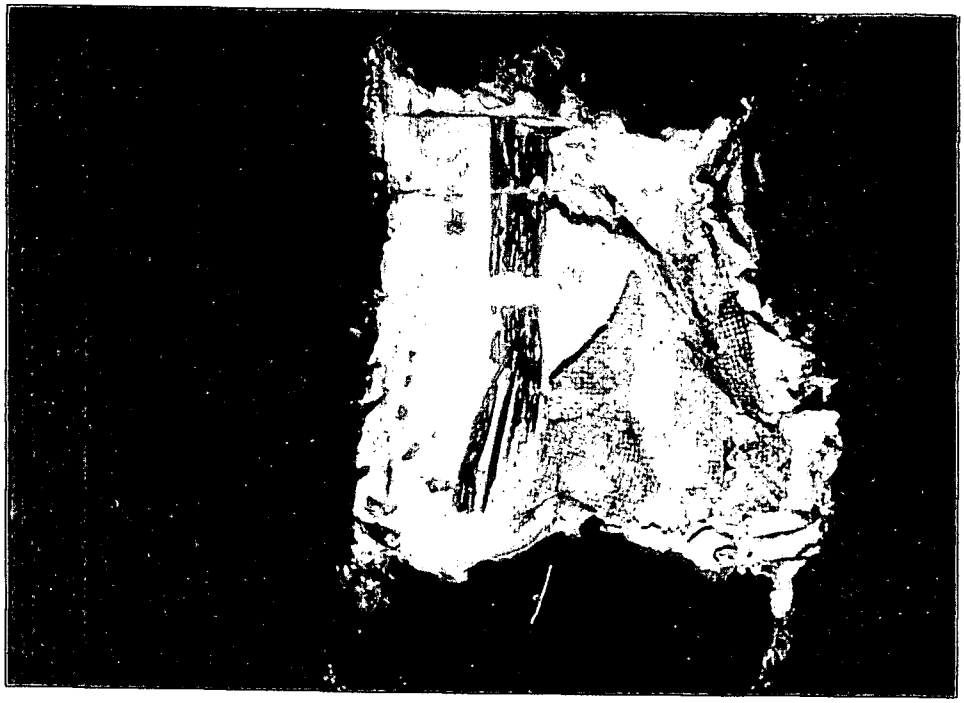


View of material on 3 in. conduit above LB box.

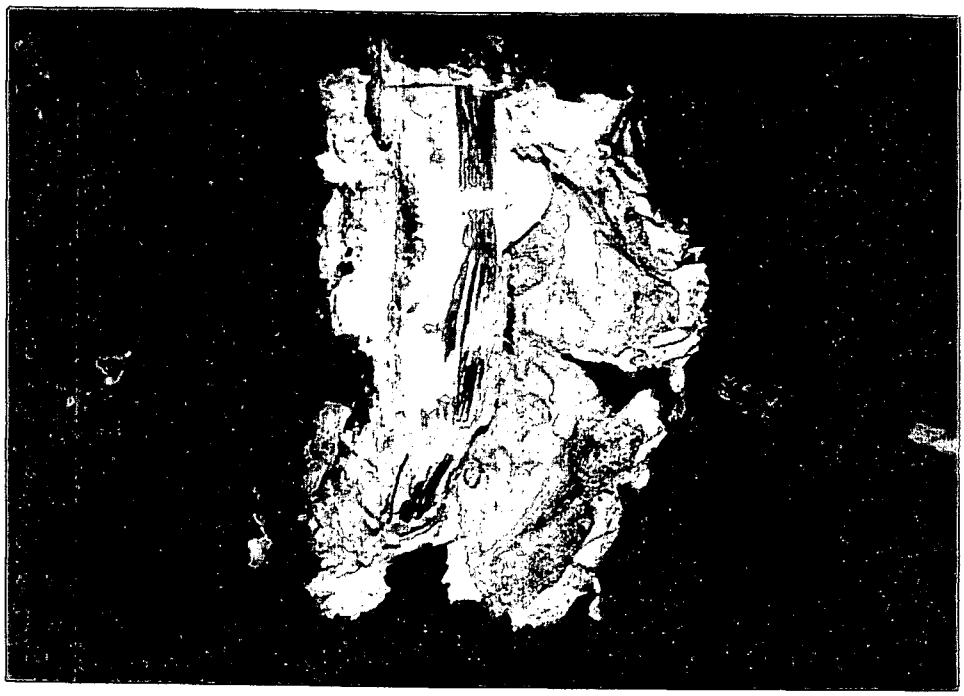


View of material removed from 3 in. horizontal conduit near LB box.

Stainless steel wrap removed from 3 in. radial bend.



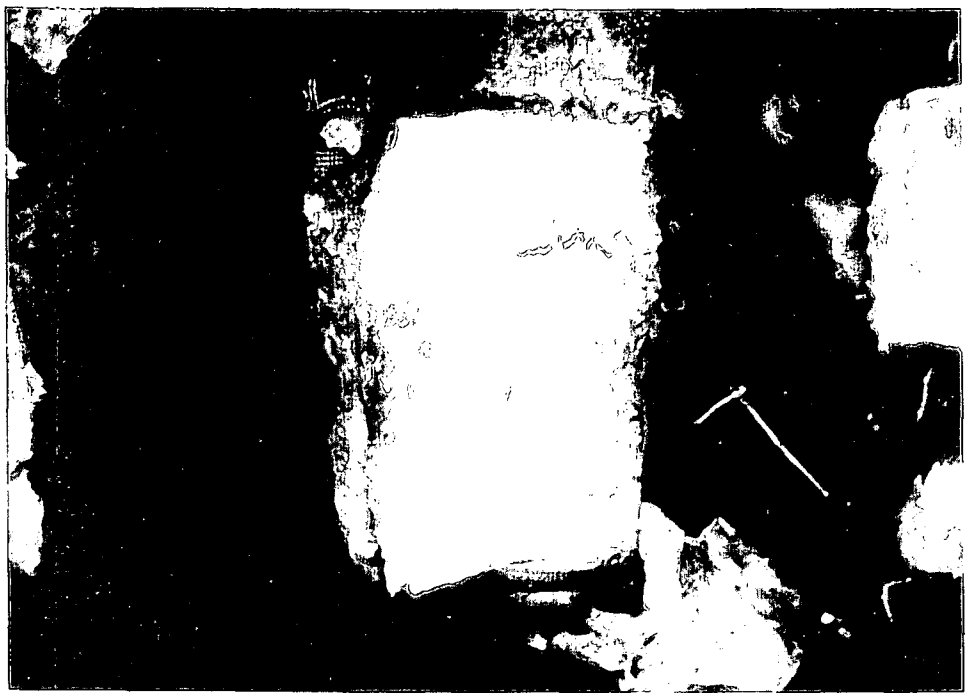
Material removed from top of radial bend on 3 in. conduit.



View of material removed from 3 in. conduit radial bend.

View of inner layer of material on 3 in. radial bend.

View of 2 in. LB box with char removed.



View of interior of LB box on 2 in. conduit.

Material removed from horizontal conduit near LB box.

Material removed from conduit above 2 in. LB box.

Material removed from 2 in. radial bend.

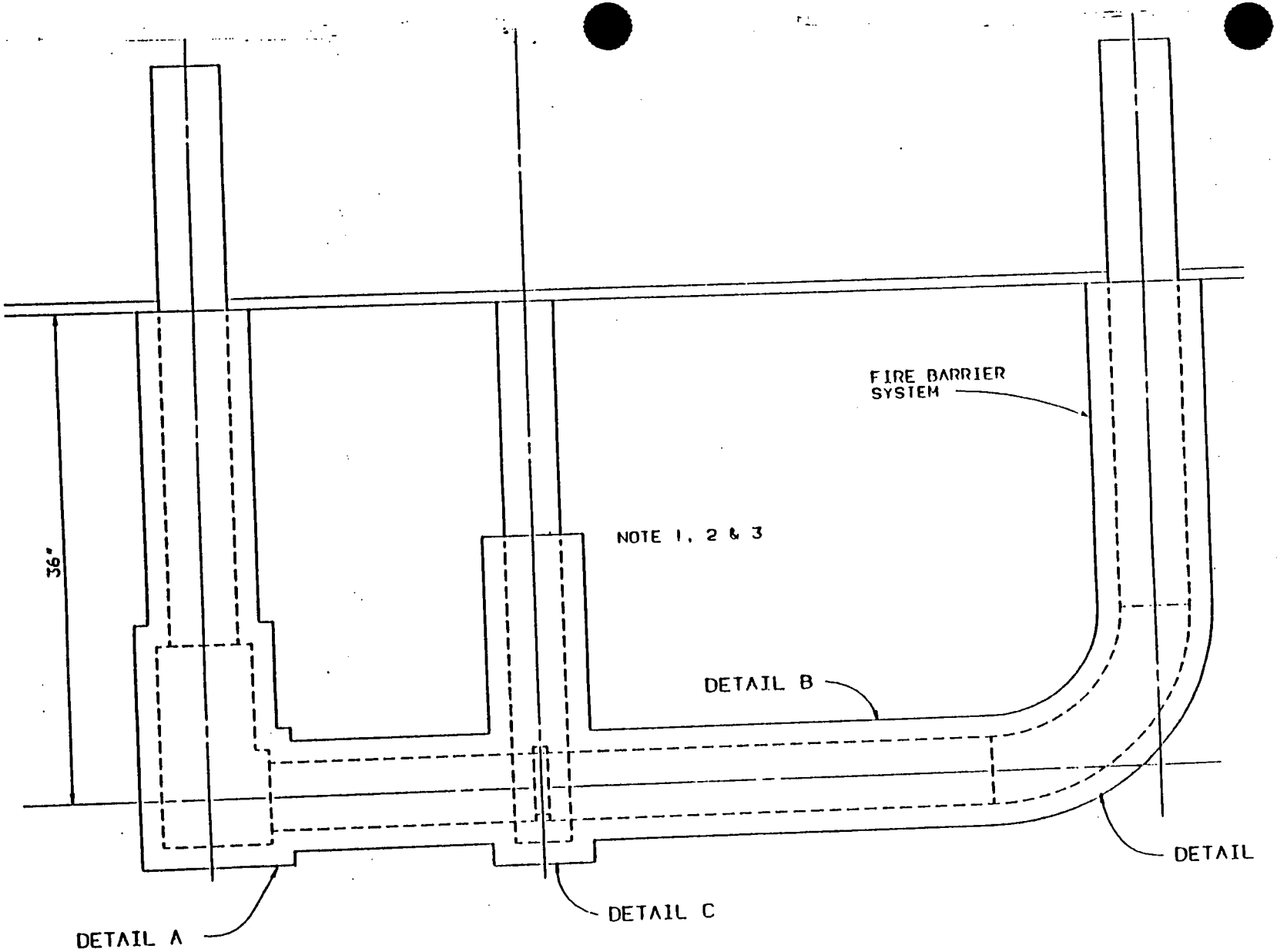
Appendix H

THERMO-LAG® INSTALLATION DETAILS

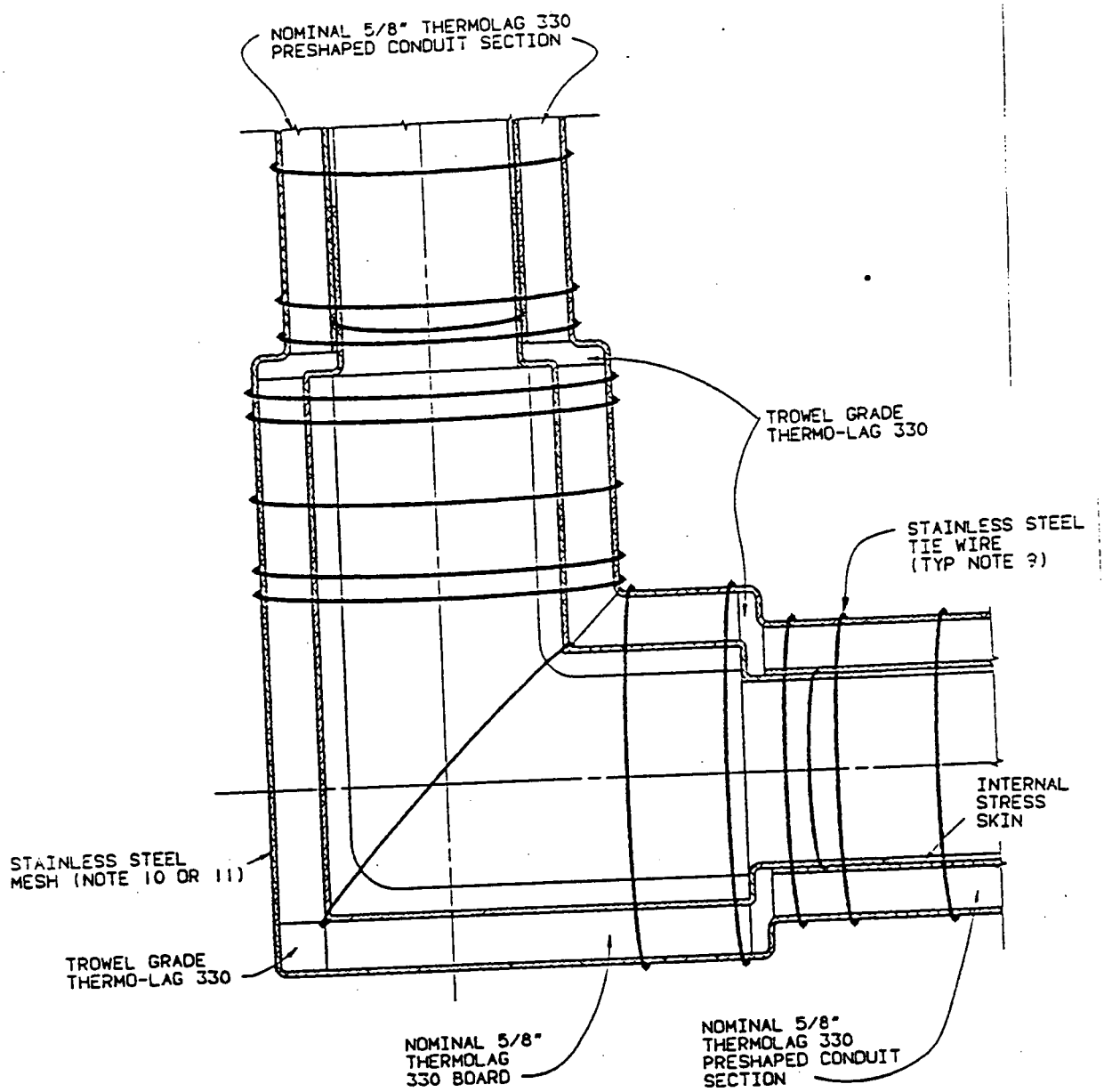
OMEGA POINT LABORATORIES

Installation Details For 4 in. Conduit Configuration

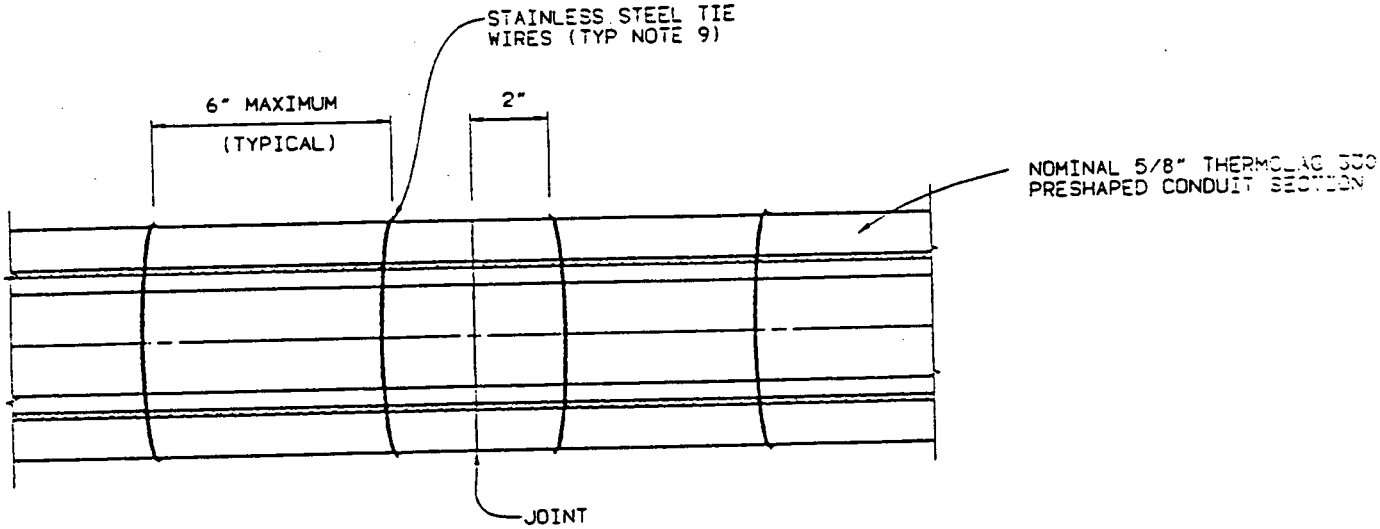
OMEGA POINT LABORATORIES


FIRE BARRIER SYSTEM
NOTE 1, 2 & 3
36"
DETAIL B
DETAIL
DETAIL C
DETAIL A

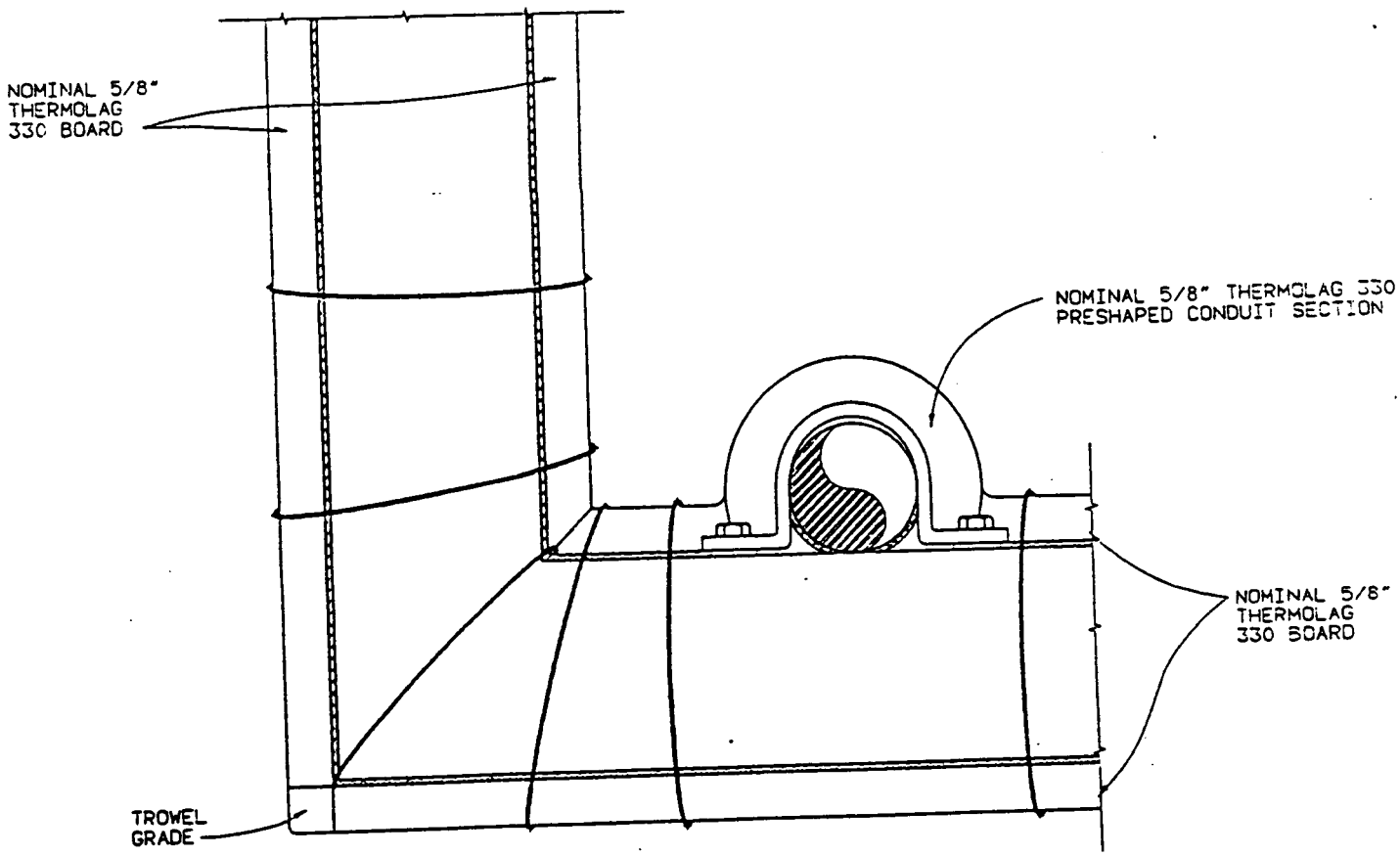
ELEVATION



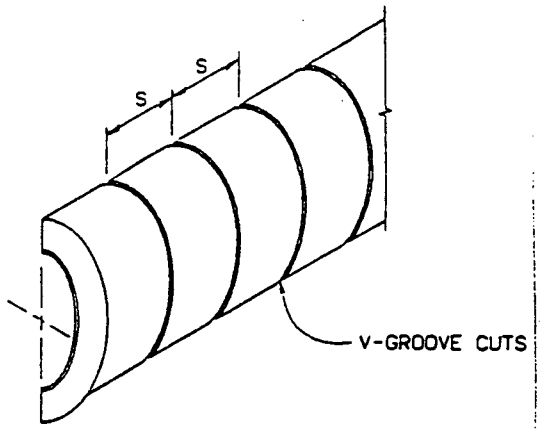
DETAIL A
LB DETAIL
NOMINAL 5/8" DESIGN
WITH MESH WRAP
NOTE 5



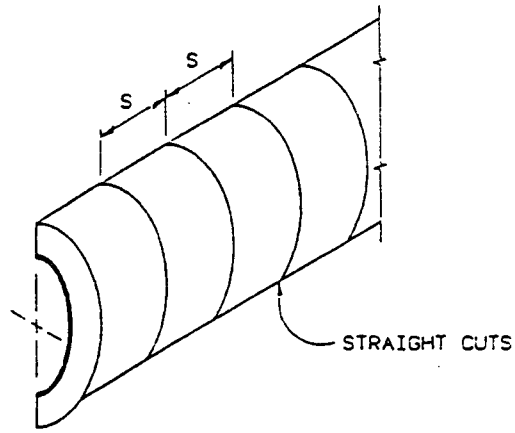
DETAIL B
STRAIGHT JOINT
NOMINAL 5/8" DESIGN



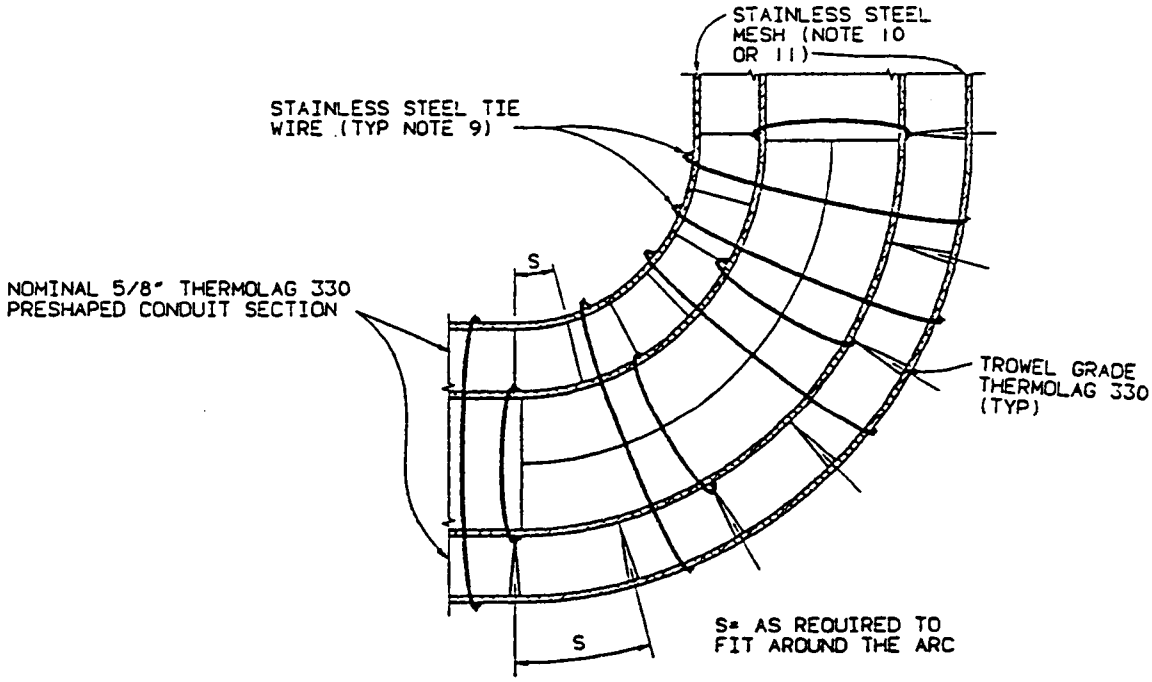
DETAIL C
SUPPORT SECTION
NOTE 6 & 7



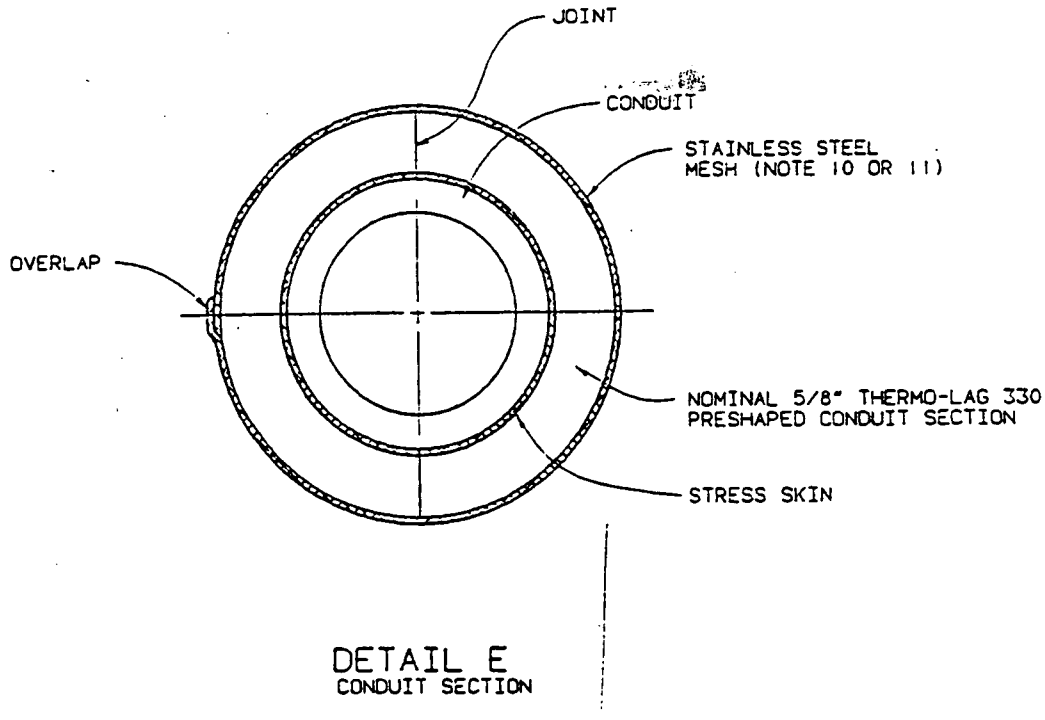
CUTS FOR INSIDE BEND
S= CUT SPACING AS REQUIRED



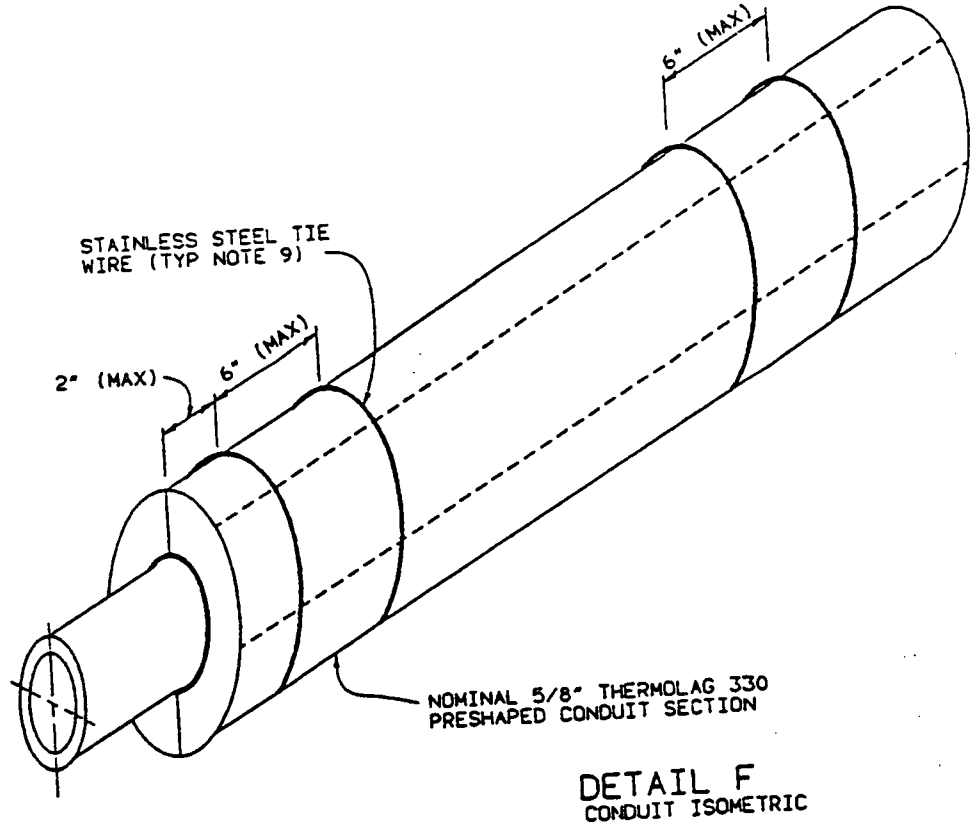
CUTS FOR OUTSIDE BEND
S= CUT SPACING AS REQUIRED



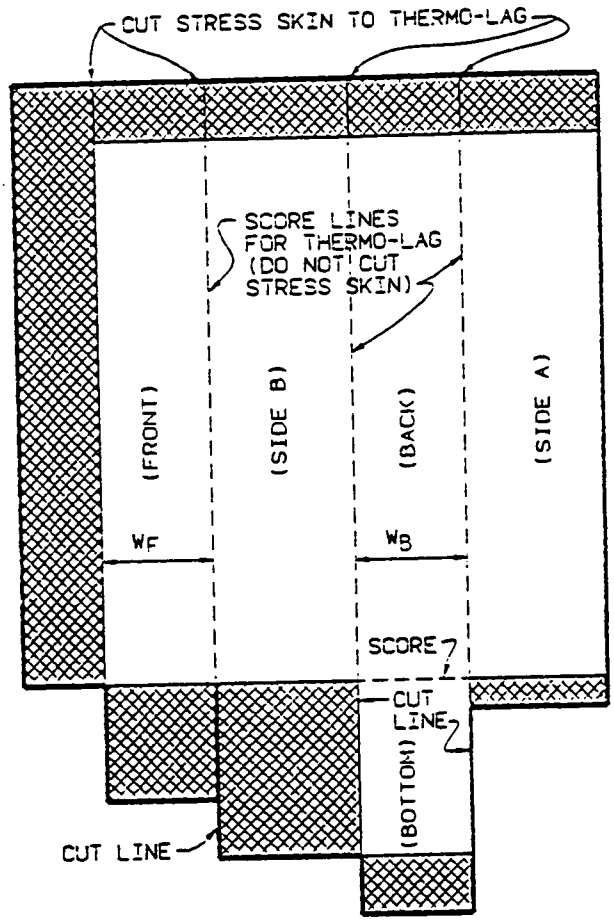
DETAIL D
RADIUS DETAIL



DETAIL E
CONDUIT SECTION



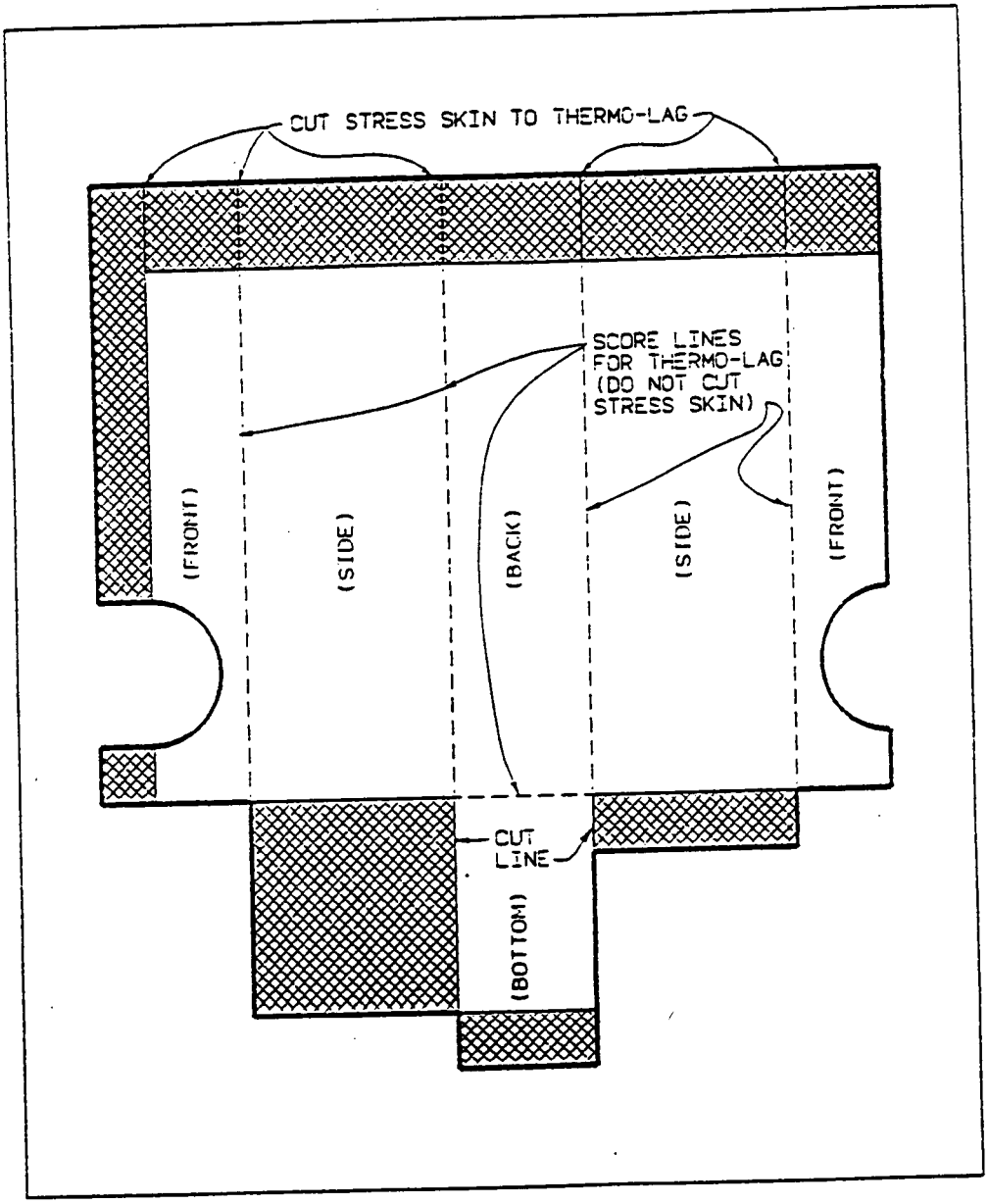
DETAIL F
CONDUIT ISOMETRIC



NOTE: MAKE EITHER FRONT(OR SIDE A) 5/8" WIDER THAN BACK(OR SIDE B) FOR OVERLAP

DETAIL G

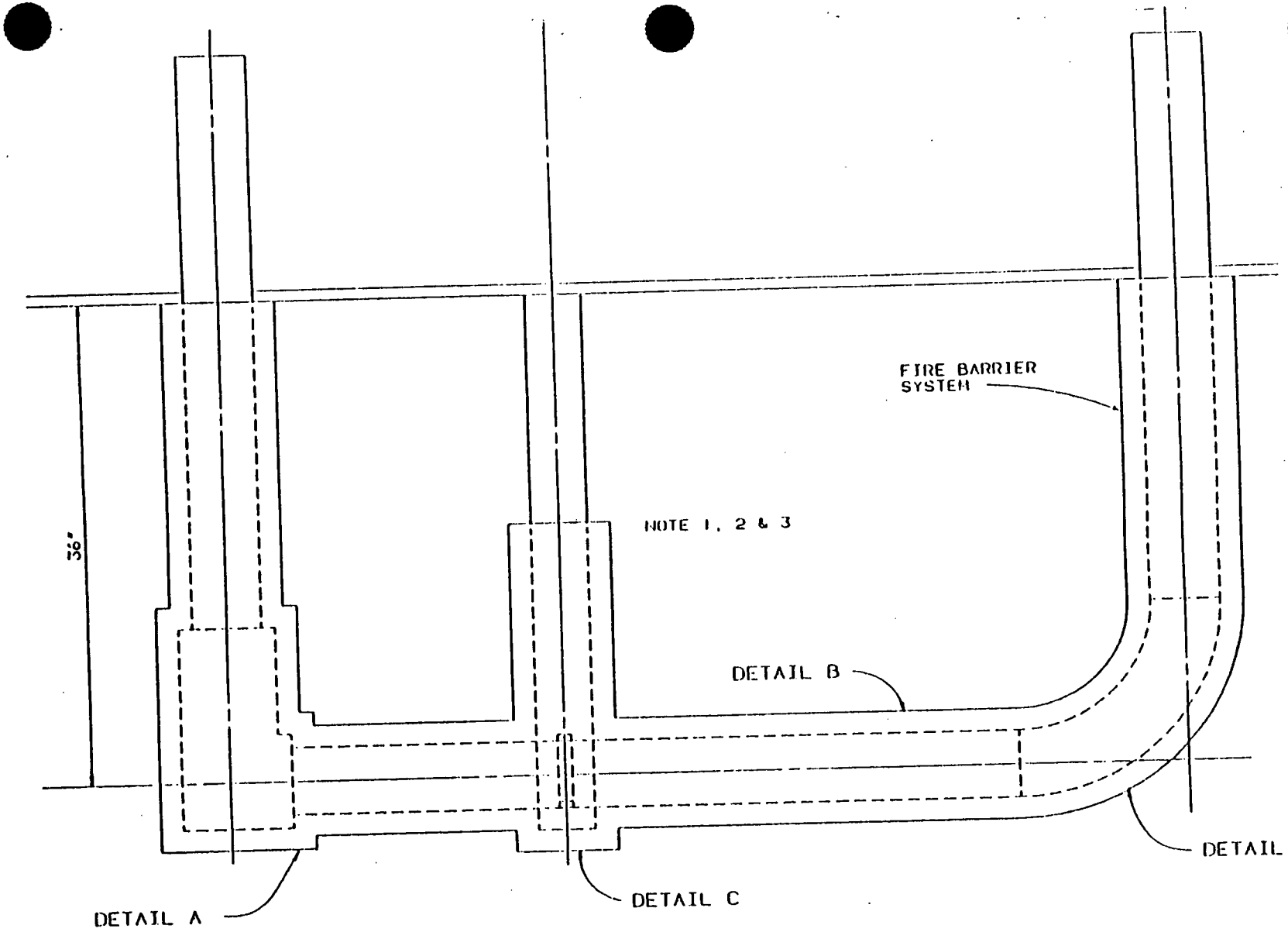
SMALL LB OR LS
(SMALLER THAN 4" CONDUITS)
NOTE 5



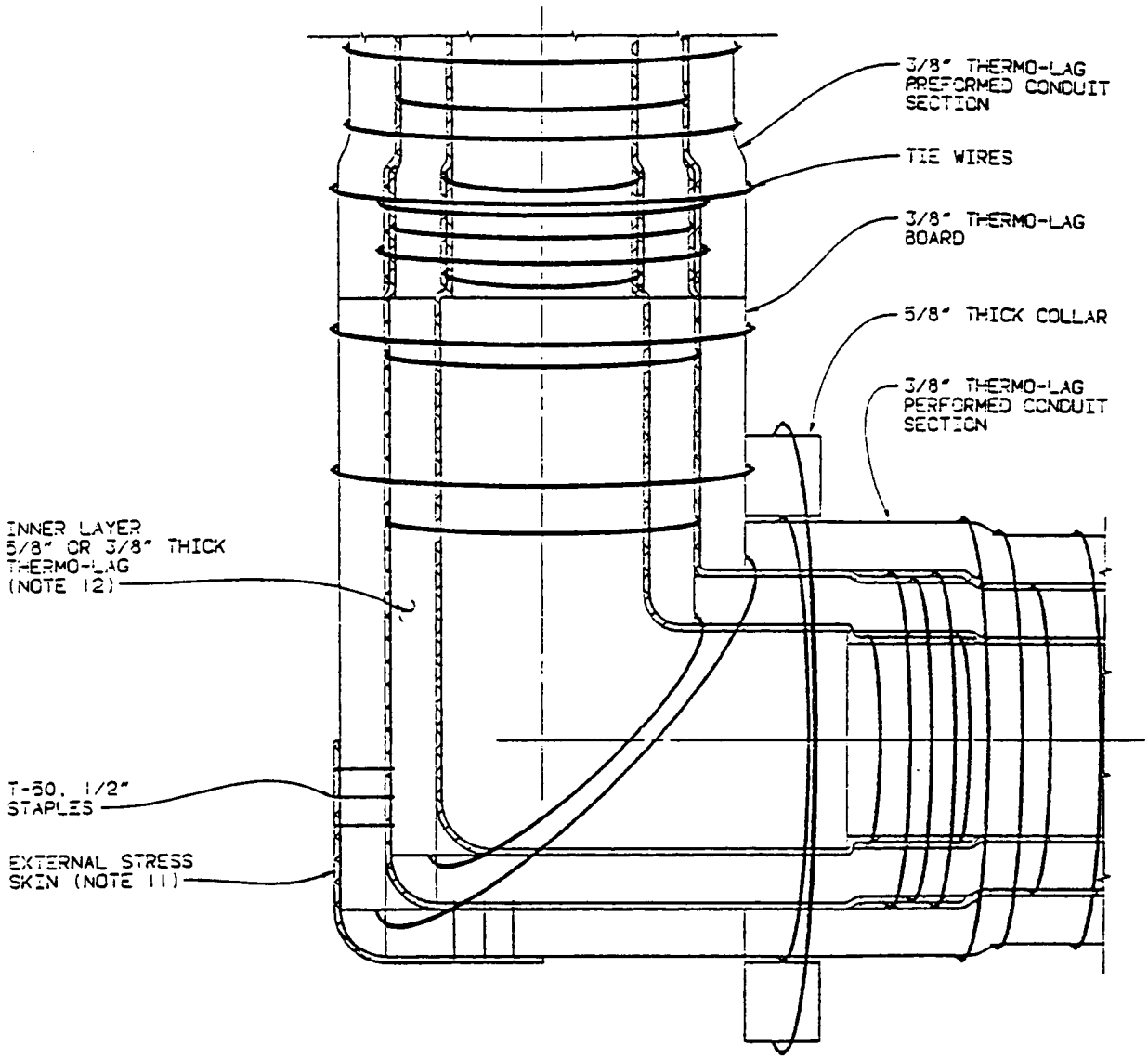
DETAIL H
LARGE LB OR LS
(FOR 4" AND LARGER CONDUITS)
NOTE 5

Installation Details For 1 in., 2 in., and 3 in. Conduit Configurations

OMEGA POINT LABORATORIES

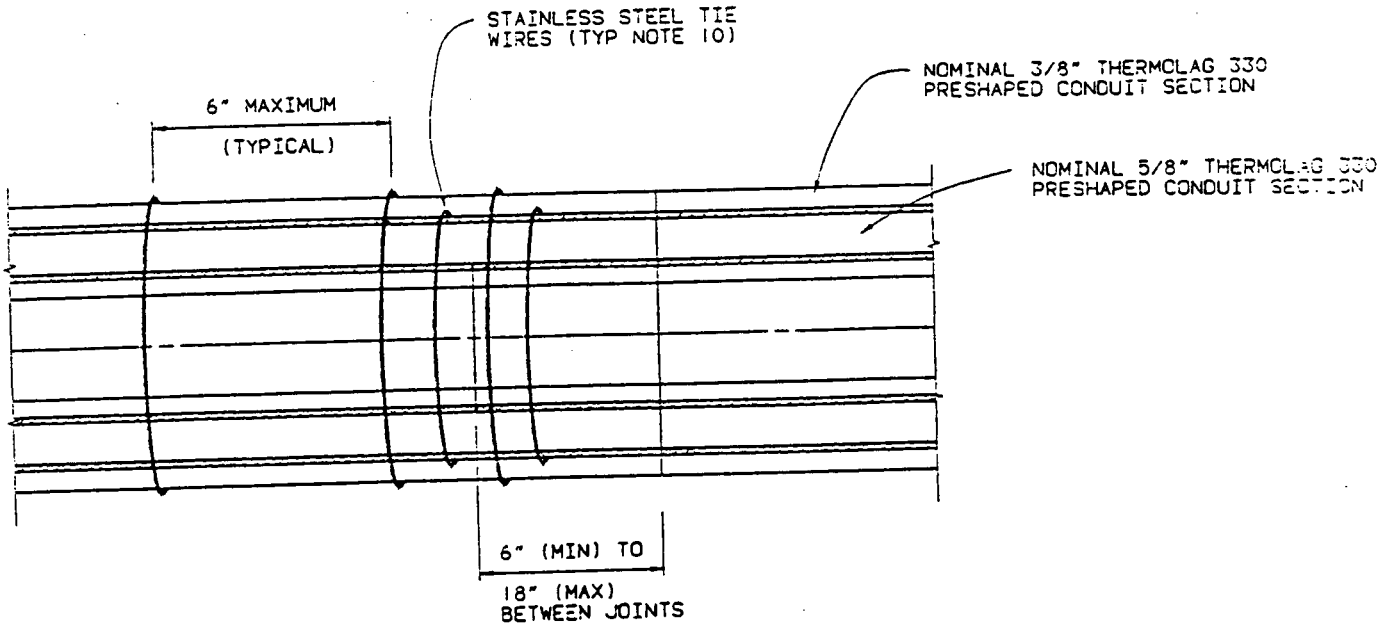

FIRE BARRIER
SYSTEM
NOTE 1, 2 & 3
36"
DETAIL B
DETAIL
DETAIL A
DETAIL C

ELEVATION

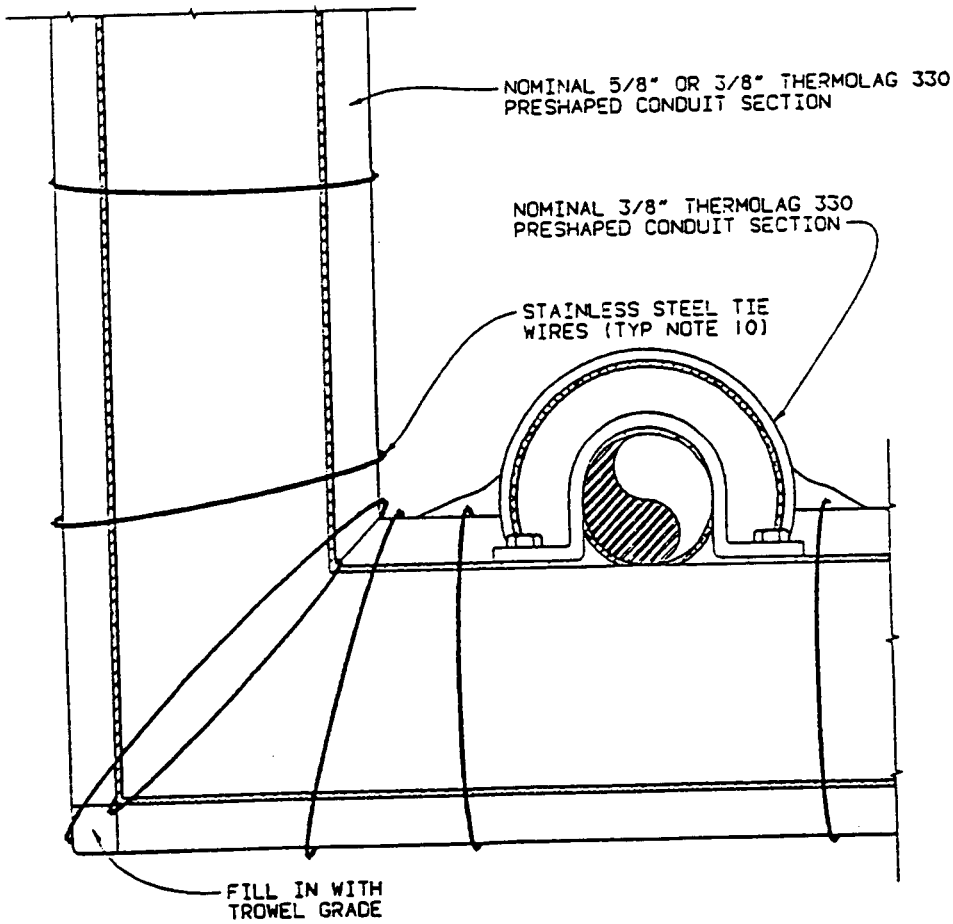


DETAIL A

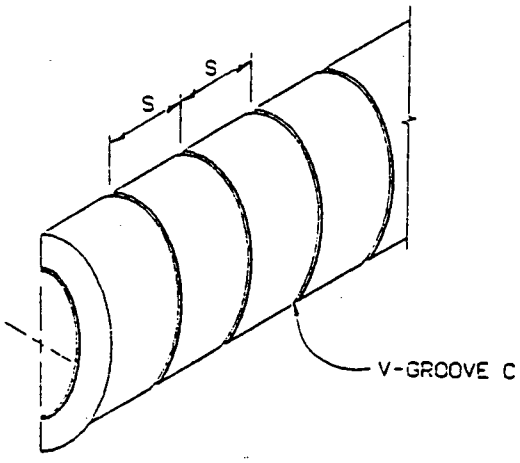
NOTE 5



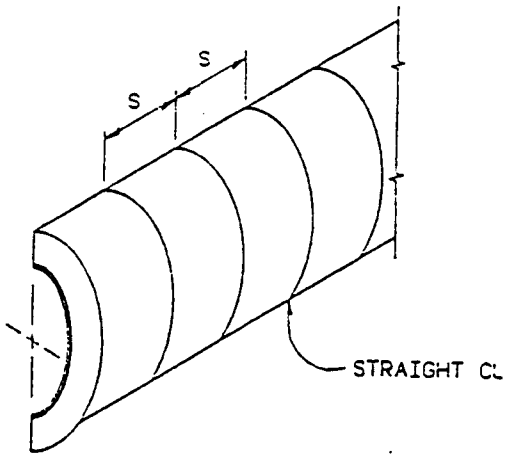
DETAIL B
STRAIGHT JOINT 3/8"
WITH PREFORMED OVERLAY
NOTE 6



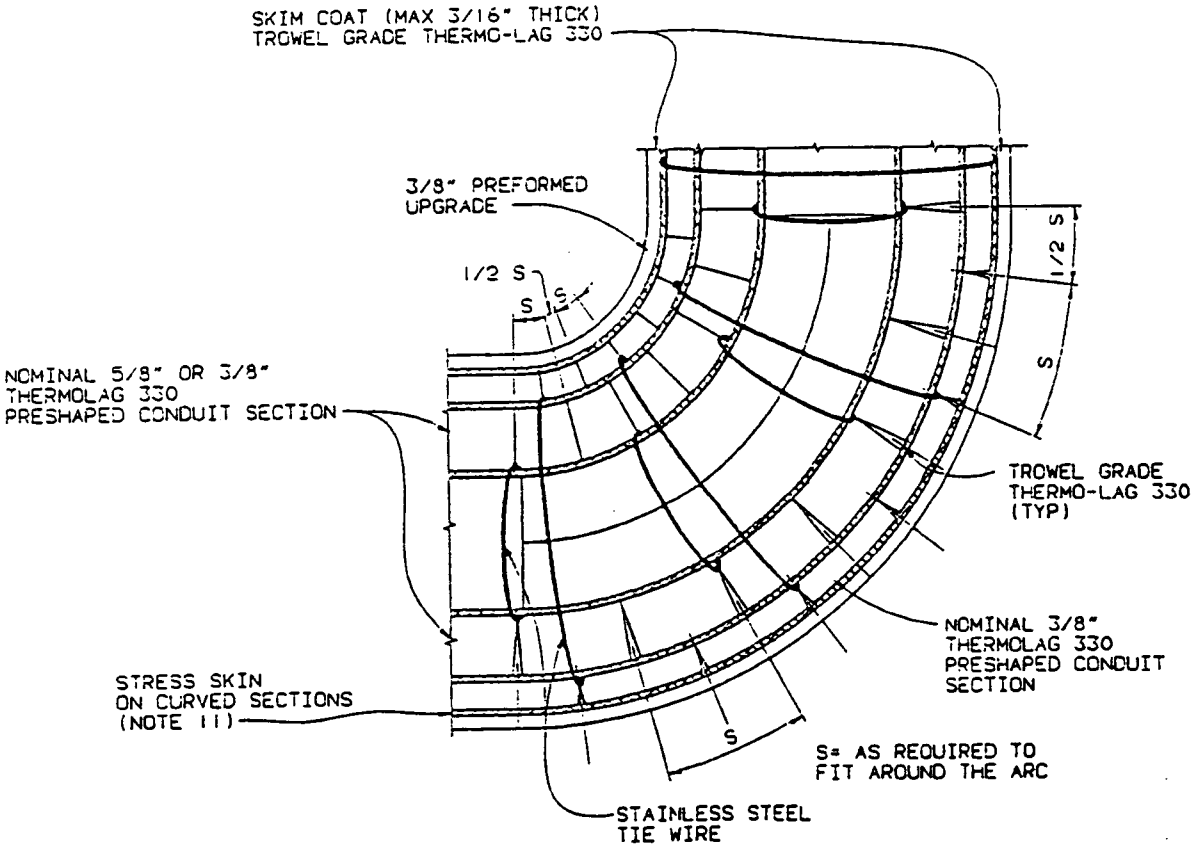
DETAIL C
SUPPORT SECTION
NOTE 7 & 8



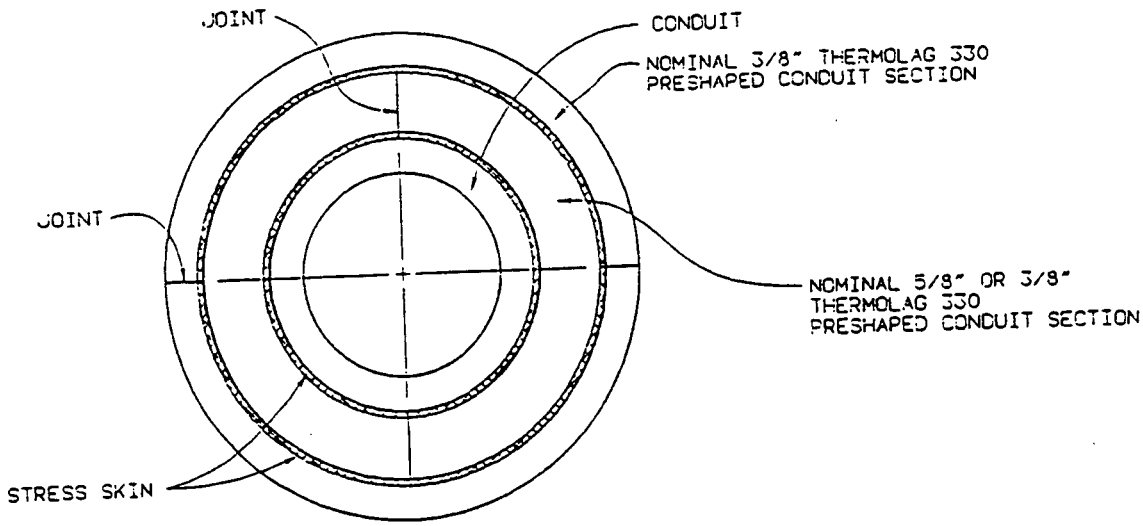
CUTS FOR INSIDE BEND
S= CUT SPACING AS REQUIRED



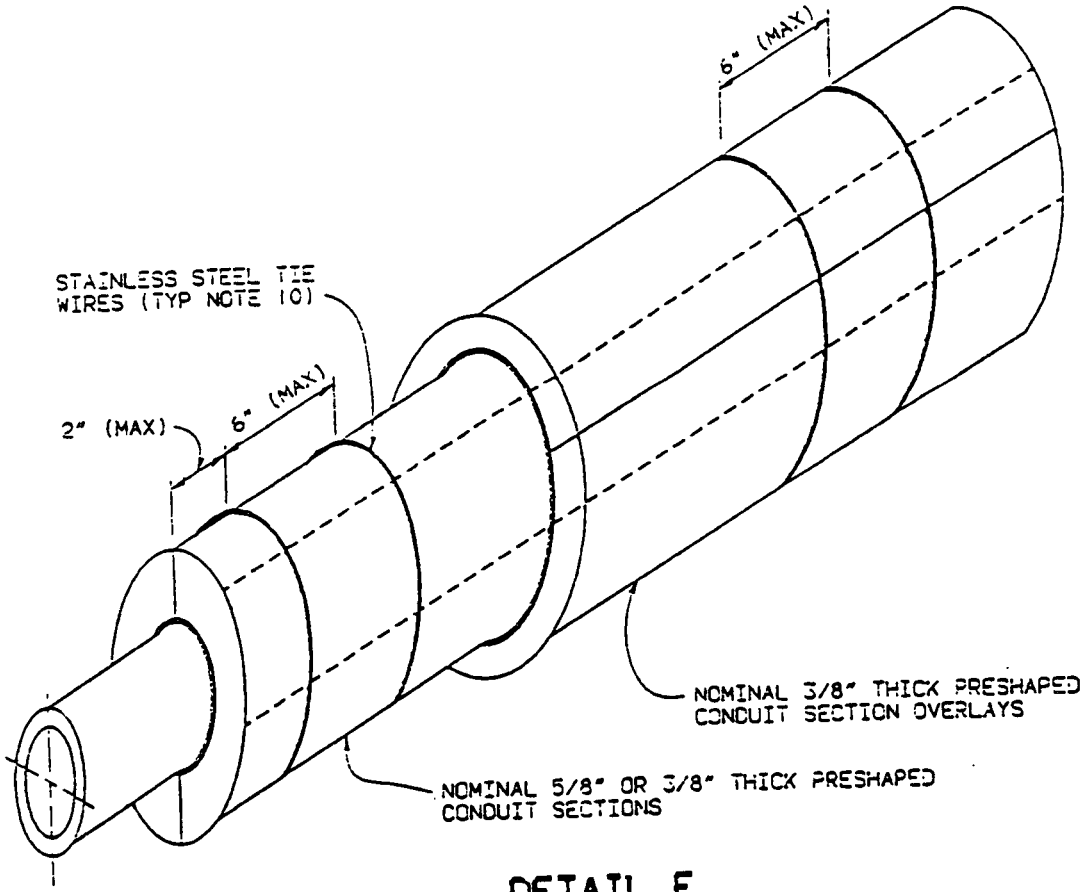
CUTS FOR OUTSIDE BEND
S= CUT SPACING AS REQUIRED



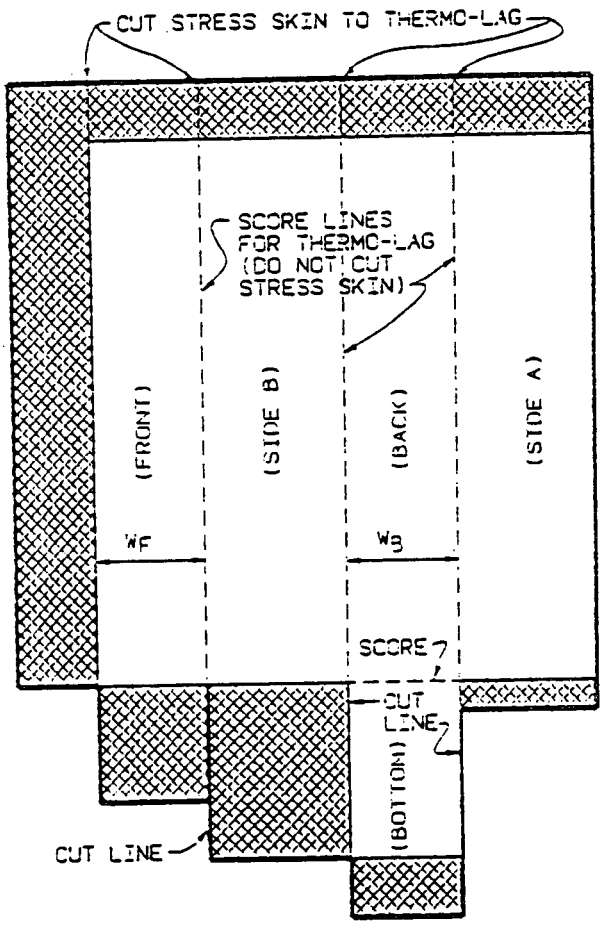
DETAIL D
RADUIS DETAIL
3/8" PREFORMED UPGRADE
NOTE 9



DETAIL E
CONDUIT SECTION
WITH 3/8" UPGRADE



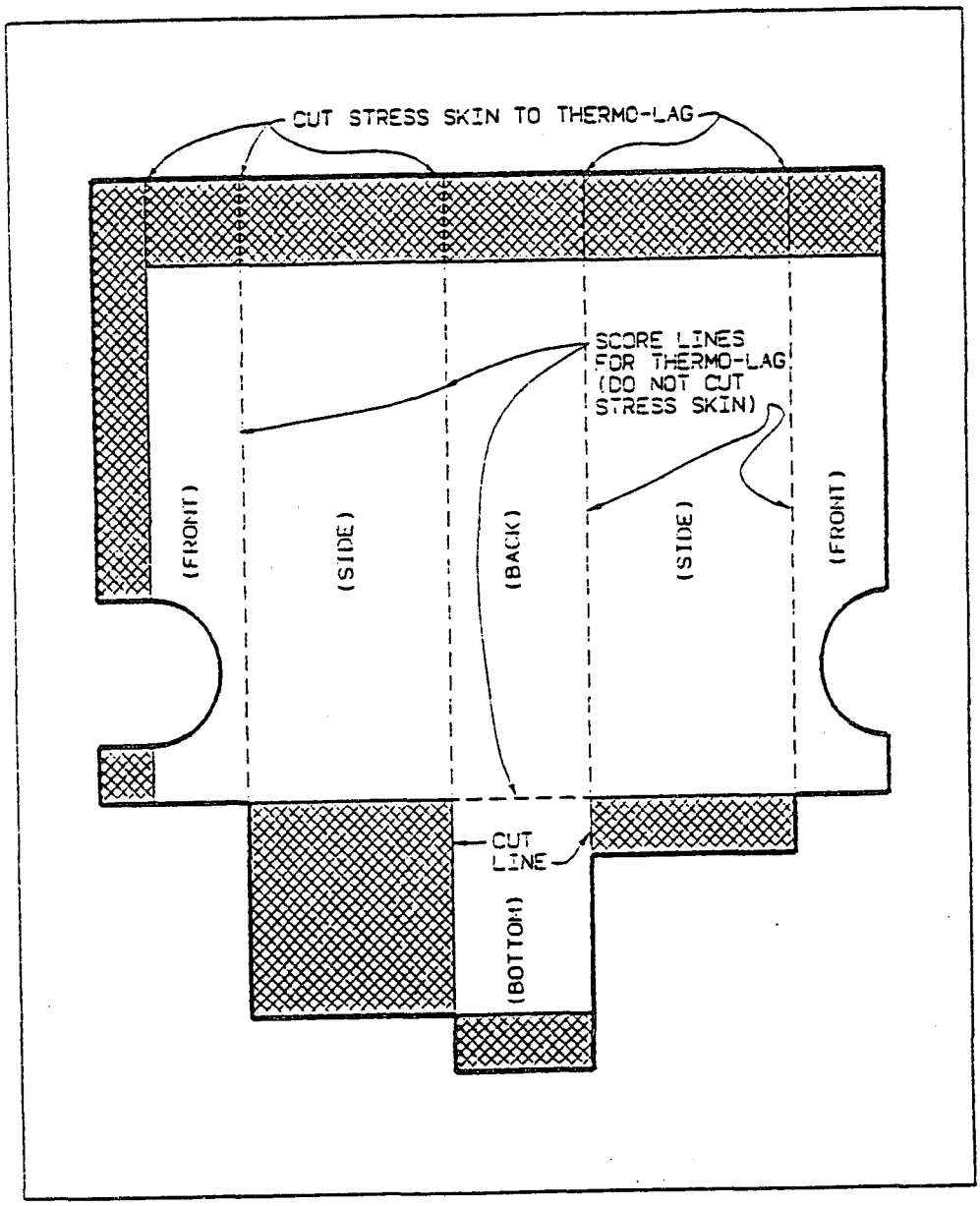
DETAIL F
CONDUIT ISOMETRIC



NOTE: MAKE EITHER FRONT(OR SIDE A) 5/8" WIDER THAN BACK(OR SIDE B) FOR OVERLAP

DETAIL G

SMALL LB OR LS
(SMALLER THAN 4" CONDUITS)
NOTE 5



DETAIL H

LARGE LB OR LS
(FOR 4" AND LARGER CONDUITS)
NOTE 5