PROJECT ALL DISCIPLINE MECHANICAL
CONTRACT TV-92362V UNIT 0
DESCRIPTION FIRE ENDURANCE TESTING
DOCUMENT NO. 11960-97259

Pages: 1059

QA Record

R.92 941212 864

FIRE ENDURANCE TEST OF THERMO-LAG® 330-1 FIRE PROTECTIVE ENVELOPES (Three Four-Sided Box Enclosures Encasing Groups of Vertical Conduits and an Enclosure Encasing a 4 in. Conduit and a Junction Box)

Project No. 11960-97259
(Volume 1 of 2)

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

November 29, 1994

Prepared For:

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in cooperation with

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OMEGA POINT LABORATORIES

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ABSTRACT

A group of eight 4 in. diameter aluminum conduits arranged in two rows of four, a group of four 3 in. diameter steel conduits arranged in two rows of two, a group of four 1 in. diameter steel conduits arranged in two rows of two and a 4 in. diameter steel conduit containing a junction box (12 in. x 12 in. x 60 in.), each clad with a nominal thickness of 5/8 in. Thermo-Lag® 330-1 and various upgrades as described herein, were evaluated in accordance with the Tennessee Valley Authority TEST PLAN "One Hour Fire Endurance Tests of Conduits Protected With The TSI Thermo-Lag Fire Barrier System," Revision 1, and Supplement 1 to the U.S. Nuclear Regulatory Commission Generic Letter 86-10.

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.

Herbert W. Stansberry II
Project Manager

12/1/94
Date

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12/1/94
Date

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Date

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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, *One Hour Fire Endurance Tests of Conduits Protected with the TSI Thermo-Lag Fire Barrier System*, Revision 1 and Supplement 1 to the U.S. Nuclear Regulatory Commission Generic Letter 86-10, both of 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.

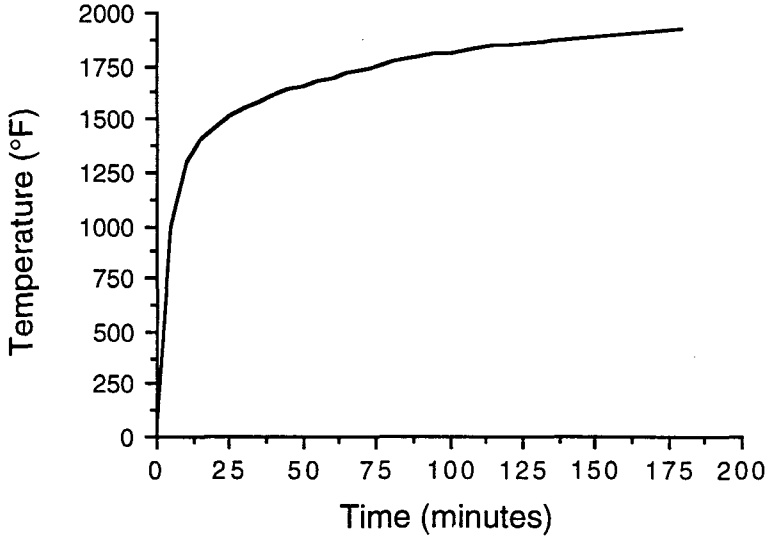
TEST PROCEDURE

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 propane 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 6 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 vertical exposure chamber, with internal dimensions of 10 ft (height) by 10 ft (width). The furnace is equipped with diffuse-

flame propane gas burners symmetrically located across the back of the furnace and controlled by individual gas flow valves, with the overall gas flow to the furnace being controlled by a single gas control valve. Capable of a maximum heat output of 5 million Btu/hour, these burners are arranged well away from 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 wall extensions (metal stud frames lined with two layers of 5/8 in, thick type X gypsum and a 2 in. thick layer of ceramic fiber blanket) or concrete walls around the perimeter face. For this tests, the walls of the furnace are extended from their normal depth of 24 in. to a total depth of 48 in. from the furnace back to the exposed face of the test deck.

The fire test is controlled according to the standard time-temperature curve, 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 the 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 since 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 total of three data acquisition systems consisting of: 1) a John Fluke Mfg. Co., Model HELIOS 2289A Computer Front End, a John Fluke Mfg. Co., Model HELIOS 2281A Extender Chassis, and an Apple Computer Co., Macintosh Classic microcomputer, yielding a channel capacity of 200 channels, 2) a John Fluke Mfg. Co., Model HELIOS 2289A Computer Front End and an Apple Computer Co., Macintosh Classic microcomputer, yielding a channel capacity of 100 channels, and 3) an IOTech TempScan 1000, six IOTech TempScan 1000 EXP10 expansion chassises, an IOTech SCSI to IEEE488 Buss Converter, and an Apple Computer Co., Macintosh Centris 650 microcomputer, yielding a channel capacity of 416 channels. The HELIOS Computer Front Ends are connected to the RS422 Serial Interface Port of the Macintosh Classic Computers and the Extender Chassis is serially connected to one HELIOS Computer Front End. The TempScan units are daisy-chained together and connected via an IEEE488 buss to the SCSI to IEEE488 converter. The converter is then connected to the Macintosh Centris 650 via the SCSI port. The computers are programmed in Microsoft BASIC to command the data acquisition 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 storage on hard disk.

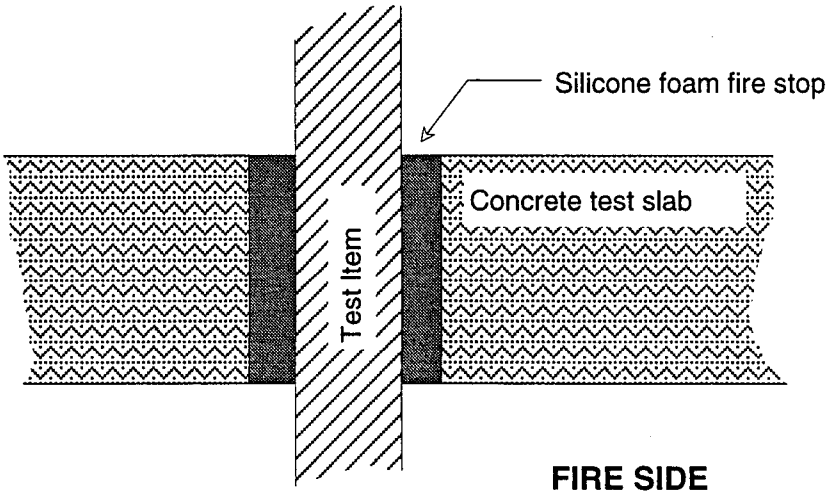
HOSE STREAM TEST

According to the Test Plan, following the fire exposure test, the test specimen is removed from the test furnace, placed in the hose stream testing area and exposed to the impact, erosion, and cooling effects of a hose stream directed perpendicular to 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 technician controlling the hose is lifted to the center of the test deck wall with a platform lift to allow the stream to play against the front, sides, and inside vertical surfaces and the underside of the item, resulting in little, if any, direct force being applied to the outside perimeter surfaces of the specimen.

TEST ASSEMBLY

TEST DECK

The test deck consisted of a perimeter of 6 in. structural steel channel, welded together into an 136 in wide by 151 in. tall rectangle, with the flanges inward. Steel rebar (#5) was welded to the interior web of the perimeter channel in a grid pattern spaced 12 in. o.c. The rebars were located 1-1/2 in. up from the bottom of the channel frame. Similar forms were constructed of 6 in. steel channel, 4 in. steel angle and #5 rebars for the deck sides walls (120 in. x 24 in.) and for the deck top and bottom (132 in. x 24 in.). Steel pipe sleeves were welded in place within the framework for the top and bottom forms to provide blockouts for conduits and thermocouple leads to pass through the finished concrete deck. Normal weight concrete was poured into the slab frames and vibrated to remove any air pockets. The assembly was allowed sufficient curing so as not to be severely damaged by the fire exposure. After curing, the deck front wall, top and bottom and both sides were assembled and welded together. Lengths of 12 in. steel channel were then welded to the sides of the slab, perpendicular to the face, to allow the deck wall to be free-standing for assembly and testing. After installation of the penetrating items, all holes through the slab were completely filled with silicone foam fire seal.



CROSS-SECTIONAL VIEW OF POINT OF PENETRATION
OF THE SLAB 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 materials installed at TVA's Nuclear Power Plants (NPP), the materials used in the test were subjected to on-site commercial grade dedication programs prior to acceptance and subsequent installation. The conduits used in the test were provided by various vendors, and were similar in design and representative of those installed in TVA's NPPs.

WEIGHT OF RACEWAY

RACEWAY	CONDUIT
4" Aluminum Conduit	3.38 lbs/lin.ft
4" Steel Conduit	9.54 lbs/lin.ft
3" Steel Conduit	6.70 lbs/lin.ft
1" Steel Conduit	1.49 lbs/lin.ft
5'x1'x1' Steel Junction Box	96.25 lbs

* Bare #8 copper conductor is considered negligible and is therefore not included

Thermo-Lag® 330-1 Materials

Thermo-Lag® 330-1 materials were supplied by Thermal Science, Inc. (TSI), St. Louis, MO. Each Thermo-Lag® 330-1 V-ribbed panel is 5/8 in. thick (nominal) x 47 in. wide x 77 in. long, with the 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 TSI were Thermo-Lag® 330-1 Pre-Formed Conduit Sections (nominal 5/8 in. thick, 3 ft. long and 3/8 in. thick, 3 ft. long). All Thermo-Lag® 330-1 panels were measured, saw cut and installed onto the respective test assembly by Tennessee Valley Authority craft personnel (insulators) using approved TVA 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® 330-1 components, but furnished by other vendors to TVA as commercial grade products included: 16 GA type 304 stainless steel annealed tie wire*, external stainless steel stress skin ASTM E-437 (type 304, plain weave and 8x8 square wire cloth, 0.017 in. wire diameter).

* All tie wire used in the TVA/TSI test program was 16 GA type 304 stainless steel annealed with the exception of a limited amount of 18 GA type 304 stainless steel annealed tie wire used to stitch the external stress skin together at overlaps. The 18 GA tie wire was used in this application due to the limited working area between the four sided box and the concrete test deck. It was decided that the 18 GA tie wire could be worked and tightened better in this application.

TEST ITEM (CONDUITS AND JUNCTION BOX)

A single 4 in. diameter steel conduit was installed just right of center in the test deck. The conduit passed through a steel pipe sleeve blockout in the concrete deck top, passed vertically through the test deck cavity and entered the top of a 12 in. wide x 12 in. deep x 60 in. high steel junction box. The conduit exited the junction box bottom and passed out of the deck cavity through a steel pipe sleeve blockout in the concrete deck bottom. The steel junction box was centered vertically on the conduit and the conduit was fastened to unistrut supports located 12 in. above and 12 in. below the junction box.

A group of eight 4 in. diameter aluminum conduits was installed on the right side of the test deck. The conduits were arranged in an array two conduits deep and four conduits wide. Each of the eight conduits passed through a steel pipe sleeve blockout in the concrete deck top, passed vertically through the test deck cavity and exited through a steel pipe sleeve blockout in the concrete deck bottom . The eight conduits had an overall exposed vertical dimension of 10 ft and were spaced 7 in. apart. All eight conduits were secured to the deck outside of the furnace chamber.

A group of four 1 in. diameter steel conduits was installed on the left side of the test deck. The conduits were arranged in an array two conduits deep and two conduits wide. Each of the four conduits passed through a steel pipe sleeve blockout in the concrete deck top, passed vertically through the test deck cavity and exited through a steel pipe sleeve blockout in the concrete deck bottom . The four conduits had an overall exposed vertical dimension of 10 ft and were spaced 4

in. apart. All four conduits were secured to the deck outside of the furnace chamber.

A group of four 3 in. diameter steel conduits was installed in the test deck, between the group of 1 in. conduits and the conduit/junction box configuration. The conduits were arranged in an array two conduits deep and two conduits wide. Each of the four conduits passed through a steel pipe sleeve blockout in the concrete deck top, passed vertically through the test deck cavity and exited through a steel pipe sleeve blockout in the concrete deck bottom . The four conduits had an overall exposed vertical dimension of 10 ft and were spaced 7 in. apart. All four conduits were secured to the deck outside of the furnace chamber.

Drawings of the test items and supports are located in Appendix A: Construction Drawings.

THERMOCOUPLE PLACEMENT

In order to monitor temperatures in the interior of the raceways, bare #8 AWG stranded copper wire was instrumented with 24 gauge, Type K, Chromel-Alumel electrically-welded thermocouples (Special Limits of Error: ±1.1°C, purchased with lot traceability and calibration certifications) placed nominally every 6 in. along the length of wire. 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. Wires instrumented as such were installed in the interior of each of the installed conduits.

In order to get a realistic measurement of the temperatures on the conduit surfaces, similar thermocouples were positioned nominally every 6 in. along the side of the conduit facing the back furnace wall, 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 run along the conduits and passed through the slab using the same blockout as the conduit. During the installation of the barrier materials, the installation of additional thermocouples was requested by a representative of the USNRC. These thermocouples were similarly affixed at 12 in. intervals to the sides of the rear conduits (facing the barrier system) in the group of 1 in. steel conduits and the group of 3 in. steel conduits.

Thermocouples were also affixed to the interior of the junction box. At least one thermojunction was placed in each square foot of area on each face of the junction boxes..

THERMO-LAG® 330-1 INSTALLATION HIGHLIGHTS

Thermo-Lag® 330-1 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® 330-1 on the test assembly are shown in Appendix G.

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

These panels were used to construct the four-sided conduit enclosures the junction box enclosure and to cover the structural support members.

Thermo-Lag® 330-1 Subliming Trowel Grade Material

This material was used to pre-butter all joints, seams and interior surfaces of the V-ribbed panels and pre-shaped sections, to fill in edges and to form the skim coat.

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

This material was used to construct a portion of the conduit protective envelopes. This materials was also used to cover the 4 in. diameter conduit attached to the junction box.

Application Methods

Three different designs were used to install the Thermo-Lag® 330-1 to the vertical conduits in the four-sided configurations.

Pre-Shaped Section/Board Method - (used on the array of eight 4 in. aluminum conduits) - For this method of installation, nominal 5/8 in. pre-shaped conduit sections (appropriate for the size of the conduits) were cut down the center to form 90° sections. The sections were pre-buttered and installed on the outside corners of the vertical conduit array. Nominal 5/8 in. board material was then cut to fit between the 90° sections, forming a box with rounded edges. Threaded steel rod fastened with fender washers and nuts was used pull the board stock panels together when the boards were wider then 36 in. All boards were pre-buttered where contact was made with conduits or pre-shaped conduit sections. Nominal 5/8 in. board material was used to form "joint backing boards" between lengths of board material. Bolts (or threaded rod), fender washers and nuts were used to hold the "joint backing boards" in place and to secure two lengths of panel together. Other attributes of the installations are:

- Tie wires were installed 6 in. o.c., maximum.

- A "Type A Base Plate" (described later in this text) was installed at the top of the enclosure, at the enclosure to concrete interface.
- A "Type B Base Plate" (described later in this text) was installed at the bottom of the enclosure, at the enclosure to concrete interface.
- The "Generic TVA Upgrade" (described later in this text) was applied to the completed assembly.

Score and Fold Method - (used on the array of four 3 in. conduits) - For this method of installation, nominal 5/8 in. board material was cut, scored and folded to form an appropriately sized box to enclose the vertical conduit array. The board material was pre-buttered on all interior surfaces that contacted the conduits. Thermo-Lag® 330-1 Trowel Grade and putty material were used to square the corners along the folds. Nominal 5/8 in. board material was used to form "joint backing boards" between lengths board material. Bolts (or threaded rod), fender washers and nuts were used to hold the "joint backing boards" in place and to secure two lengths of panel together. Other attributes of the installations are:

- Tie wires were installed 6 in. o.c., maximum.
- "Type B Base Plates" (described later in this text) were installed at the top and bottom of the enclosure, at the enclosure to concrete interface.
- The "Generic TVA Upgrade" (described later in this text) was applied to the completed assembly.

Separate Board Method - (used on the array of four 1 in. conduits) - For this method of installation, nominal 5/8 in. board material was cut to form the sides of an appropriately sized box to enclose the vertical conduit array. The cuts were made to stagger the joints around the assembly. The enclosure board material was pre-buttered on all interior surfaces that contacted the conduits, other board material. Joints were staggered in the vertical rise ("joint backing boards" were not used). Other attributes of the installations are:

- Tie wires were installed 6 in. o.c., maximum.
- "Type A Base Plates" (described later in this text) were installed at the top and bottom of the enclosure, at the enclosure to concrete interface.
- The "Generic TVA Upgrade" (described later in this text) was applied to the completed assembly.

Conduit and Junction Box - The junction box and support members were enclosed with nominal 5/8 in. board material (with V-ribs flattened) using the Score and Fold Method. All internal surfaces were pre-buttered with trowel grade material prior to installation. Thermo-Lag® 330-1 Trowel Grade and putty material were used to square the corners along the folds. The conduit was enclosed with one layer of nominal 5/8 in. pre-shaped conduit sections. All interior surfaces and joints were pre-buttered with trowel grade material.

- Tie wires were installed 6 in. o.c., maximum.
- "Type A Base Plates" (described later in this text) were installed at the top and bottom of the enclosure, at the enclosure to concrete interface.
- The "Generic TVA Upgrade" (described later in this text) was applied to the completed assembly.

Type A Base Plate - Type A Base Plates are installed after the Thermo-Lag® 330-1 material has been installed on the conduits. The base plate is pre-buttered and fastened to the concrete with concrete anchors spaced 12 in. o.c.

Type B Base Plate - Type B Base Plates are installed before the Thermo-Lag® 330-1 material has been installed on the conduits. The base plate is pre-buttered and fastened to the concrete with concrete anchors spaced 12 in. o.c.

"Generic TVA Upgrade" - A skim coat of trowel grade material was applied to the enclosure and eternal stress skin was installed in it while still wet. The external stress skin was secured to the enclosure with 1/2 in. long staples (as necessary), fender washers and nuts (where applicable). Another skim coat of trowel grade material was applied over the external stress skin and brush finished smooth. The thickness of the skim coat can be approximated as "just thick enough such that the external stress skin is not readily visible."

TEST RESULTS

After allowing the completed test specimen to cure for minimum of thirty days, the completed test specimen was placed on the Laboratory's horizontal fire test furnace. The thermocouples were then connected to the data acquisition system and their outputs verified.

The test was conducted on October 19, 1994, by Herbert W. Stansberry II, Project Manager, with the following persons present:

Jiet Singh	-	USNRC
J.J. Pierce	-	T.V.A.
Mark Salley	-	T.V.A.
Rick Woody	-	T.V.A.
Brian Gent	-	T.V.A.
Rich Lohman	-	TSI
Tim Hill	-	TSI
Deggary N. Priest	-	Omega Point Laboratories, Inc.
Kerry Hitchcock	-	Omega Point Laboratories, Inc.
Connie Humphrey	-	Omega Point Laboratories, Inc.

Cleda Patton	-	Omega Point Laboratories, Inc.
Richard Beasley	-	Omega Point Laboratories, Inc.
Laudencio Castanon	-	Omega Point Laboratories, Inc.

The furnace was fired at 12:18 p.m. 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. By 0:32 (min:sec) the outside surface of the test item was beginning to turn brown, and by 1:17 (min:sec) had ignited fairly uniformly across the exposed surfaces. By 2:14 (min:sec) the furnace was filled with intense smoke and heavy flaming. During the fire exposure, no visual openings into the raceway were observed.

At the end of the fire exposure period, the thermocouples were disconnected, the furnace extinguished and the specimen removed from the furnace. 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, the exposed surfaces of the test items were observed to be mostly covered with a layer of black ash and the external stress skin was observed to be exposed in spots where the trowel grade material had peeled away.

The test specimen was placed erect on the floor and a platform lift was positioned to place the hose stream technician at the approximate center of the test sample. The test deck was then 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.

Following the hose stream test, the Thermo-Lag® 330-1 pieces remained firmly affixed. The layer of external stress skin was exposed in spots. An in-depth 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 on the following pages. An explanation of the allowable limits is given following the table.

LOCATION	MAX. TEMP. (°F)	AVG. TEMP. (°F)
GROUP OF 1" STEEL CONDUITS		
Front Left Conduit	252	233
Front Left Conduit Bare #8	230	221
Front Right Conduit	252	232
Front Right Conduit Bare #8	227	219
Rear Left Conduit	234	224
Rear Left Conduit Bare #8	221	218
Rear Left Additional Thermocouples	220	214
Rear Right Conduit	232	223
Rear Right Conduit Bare #8	215	210
Rear Right Additional Thermocouples	216	211
GROUP OF 3" STEEL CONDUITS		
Front Left Conduit	242	230
Front Left Conduit Bare #8	216	208
Front Right Conduit	235	228
Front Right Conduit Bare #8	215	207
Rear Left Conduit	225	221
Rear Left Conduit Bare #8	211	205
Rear Left Additional Thermocouples	210	208
Rear Right Conduit	219	210
Rear Right Conduit Bare #8	211	207
Rear Right Additional Thermocouples	210	207

LOCATION (cont.)	MAX. TEMP. (°F)	AVG. TEMP. (°F)
GROUP OF 4" ALUMINUM CONDUITS		
Front Left Conduit	243	227
Front Left Conduit Bare #8	221	207
Front Left-Center Conduit	212	206
Front Left-Center Conduit Bare #8	191	182
Front Right-Center Conduit	225	208
Front Right-Center Conduit Bare #8	193	185
Front Right Conduit	224	217
Front Right Conduit Bare #8	211	200
Rear Left Conduit	228	215
Rear Left Conduit Bare #8	213	198
Rear Left-Center Conduit	208	203
Rear Left-Center Conduit Bare #8	196	190
Rear Right-Center Conduit	205	202
Rear Right-Center Conduit Bare #8	195	190
Rear Right Conduit	219	213
Rear Right Conduit Bare #8	206	199
4" STEEL CONDUIT WITH JUNCTION BOX		
Conduit Above Junction Box	299	268
Junction Box Interior	240	225
Conduit Below Junction Box	291	264
Bare #8 Within Conduit/Junction Box	260	230

The average initial temperature for all thermocouples at the start of the test was 78°F, yielding an allowable temperature increase of 250°F, or 328°F actual for the average temperatures. (A 325°F increase above the 78°F initial temperature yields a maximum allowable individual temperature of 403°F, in accordance with ASTM E119-88.) All of the thermocouples on within the multiple conduit enclosures and within the conduit/junction box configuration met the stated 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, respectively.

4 in. ALUMINUM CONDUIT ENCLOSURE

LOCATION	OBSERVATION
Front vertical section.	Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below. Approximately 1/2 in. char depth under external stress skin. Approximately 3/8 in. of uncharred material remaining in upper flat center panel (up to 1/2 in. remaining in lower front center panels). Approximately 1/4 in. of uncharred material remaining in upper pre-shaped corner sections (up to 3/8 in. remaining in lower front corner sections). Top and bottom base plates mostly consumed. Material totally intact at top and bottom of enclosure (at base plate overlaps).
Right and left vertical section.	Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below. Approximately 1/2 in. char depth under external stress skin. Approximately 3/8 in. of uncharred material remaining in upper flat panels (up to 1/2 in. remaining in lower panels). Approximately 1/4 in. of uncharred material remaining in upper pre-shaped corner sections (up to 3/8 in. remaining in lower corner sections). Top and bottom base plates mostly consumed. Material totally intact at top and bottom of enclosure (at base plate overlaps).
Rear vertical section.	Up to 1/2 in. char depth across panels, still covering external stress skin below. Approximately 1/2 in. char depth under external stress skin. Between 1/2 in. and 5/8 in. of uncharred material remaining in rear flat panels. Approximately 3/8 in. of uncharred material remaining in rear pre-shaped corner sections. Top and bottom base plates mostly consumed. Material totally intact at top and bottom of enclosure (at base plate overlaps).

3 in. STEEL CONDUIT ENCLOSURE

LOCATION	OBSERVATION
Front vertical section.	Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below. Approximately 1/2 in. char depth under external stress skin. Between 1/4 in. and 3/8 in. of uncharred material remaining in upper flat center panel (up to 3/8 in. remaining in lower front center panels). Top and bottom base plates mostly consumed. Material totally intact at top and bottom of enclosure (at base plate overlaps).
Right and left vertical section.	Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below. Approximately 1/2 in. char depth under external stress skin. Approximately 3/8 in. of uncharred material remaining in side panels. Top and bottom base plates mostly consumed. Material totally intact at top and bottom of enclosure (at base plate overlaps).
Rear vertical section.	Up to 1/2 in. char depth across panels, still covering external stress skin below. Approximately 1/2 in. char depth under external stress skin. Between 3/8 in. and 1/2 in. of uncharred material remaining in rear flat panels. Top and bottom base plates mostly consumed. Material totally intact at top and bottom of enclosure (at base plate overlaps).

1 in. STEEL CONDUIT ENCLOSURE

LOCATION	OBSERVATION
Front vertical section.	Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below. Approximately 1/2 in. char depth under external stress skin. Approximately 1/4 in. of uncharred material remaining in upper flat center panel (up to 3/8 in. remaining in lower front center panels). Top and bottom base plates mostly consumed. Material totally intact at top and bottom of enclosure (at base plate overlaps).
Right and left vertical section.	Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below. Approximately 1/2 in. char depth under external stress skin. Approximately 1/4 in. of uncharred material remaining in left flat panels (between 1/4 in. and 3/8 in. remaining in right panels). Top and bottom base plates mostly consumed. Material totally intact at top and bottom of enclosure (at base plate overlaps).
Rear vertical section.	Up to 1/2 in. char depth across panels, still covering external stress skin below. Approximately 1/2 in. char depth under external stress skin. Between 3/8 in. and 1/2 in. of uncharred material remaining in rear flat panels. Top and bottom base plates mostly consumed. Material totally intact at top and bottom of enclosure (at base plate overlaps).

4 in. STEEL CONDUIT AND JUNCTION BOX ENCLOSURE

LOCATION	OBSERVATION
Vertical section above junction box.	Approximately 1/2 in. char depth on pre-shaped section. Approximately 3/8 in. of uncharred material remaining in pre-shaped sections on conduit. Top base plate mostly consumed. Material totally intact at top of enclosure (at base plate overlap). Between 1/16 in. and 1/8 in. uncharred material intact on upper support member. Approximately 1/16 in. uncharred material intact on collar at top of junction box.
Junction box enclosure.	Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below (except on rear, which had approximately 1/2 in. char depth still covering external stress skin below. Approximately 1/2 in. char depth under external stress skin. Approximately 3/8 in. of uncharred material remaining in panels on front, rear, right and bottom of enclosure. Approximately 1/4 in. uncharred material intact on left and top panels.
Vertical section below junction box.	Approximately 1/2 in. char depth on pre-shaped section. Approximately 3/8 in. of uncharred material remaining in pre-shaped sections on conduit. Bottom base plate mostly consumed. Material totally intact at bottom of enclosure (at base plate overlap). Between 1/16 in. and 1/8 in. uncharred material intact on lower support member. Approximately 1/16 in. uncharred material intact on collar at bottom of junction box.

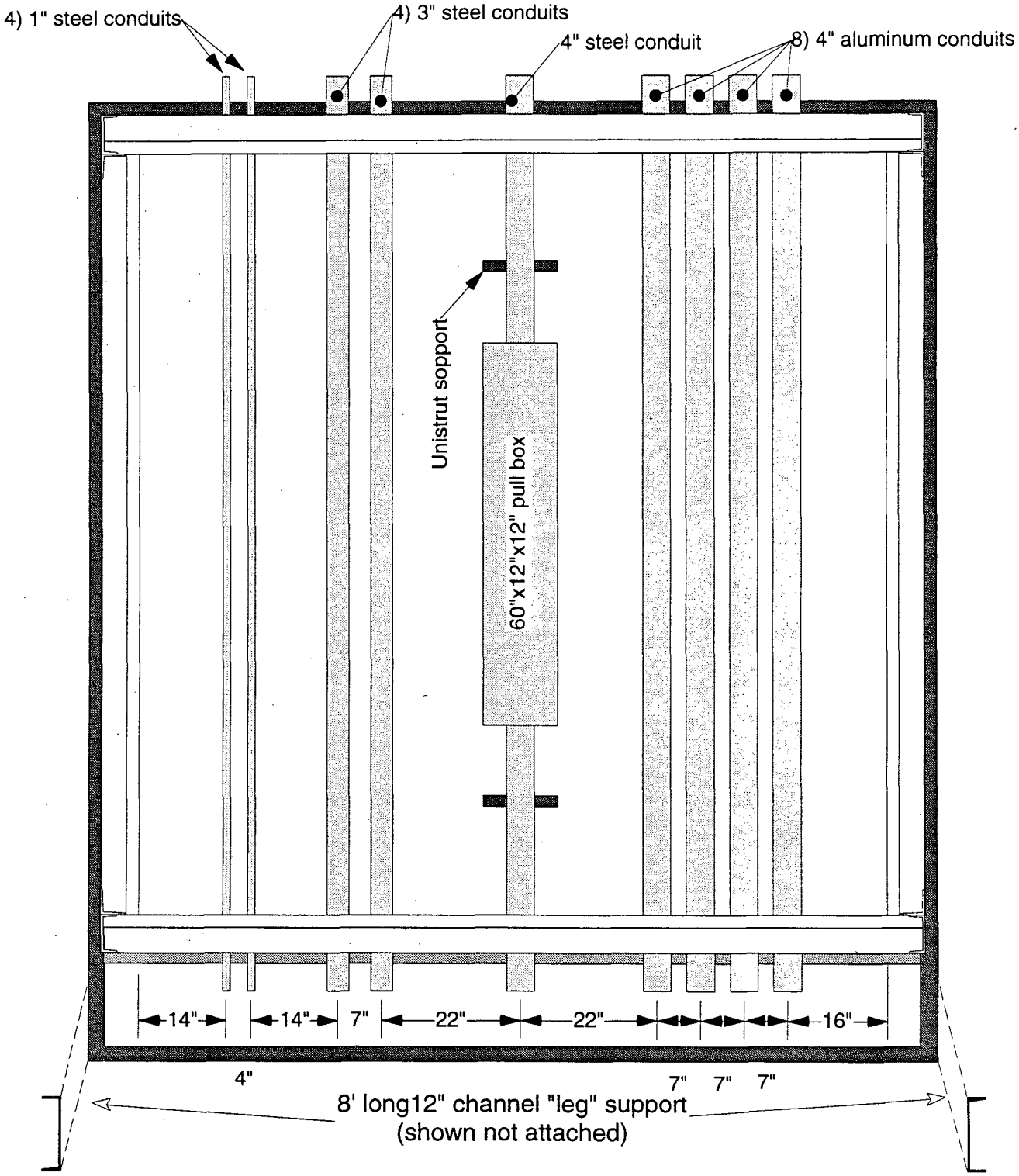
CONCLUSIONS

Each of the multiple conduit enclosures and the 4 in. conduit/junction box enclosure, clad with Thermo-Lag® 330-1 material and upgrades as presented herein, met the requirements of the TEST PLAN for a fire resistance rating of one hour.

Thermocouples were installed 6 in. o.c. along the exposed length of each of the conduits. The thermocouples were all located on the front surface of the conduits (facing the back wall of the furnace). At the request of a representative of the USNRC, additional thermocouples were installed on the outer surfaces of the rear conduits in the group of four 3 in. steel conduits and the group of four 1 in. steel conduits. These thermocouples were in intimate contact with the barrier system installed over the conduits. These additional thermocouples were also within the requirements of the TEST PLAN for a fire resistance rating of one hour. These thermocouples registered temperatures lower than those on the front surface of the rear conduits in each array (not in contact with any barrier materials).

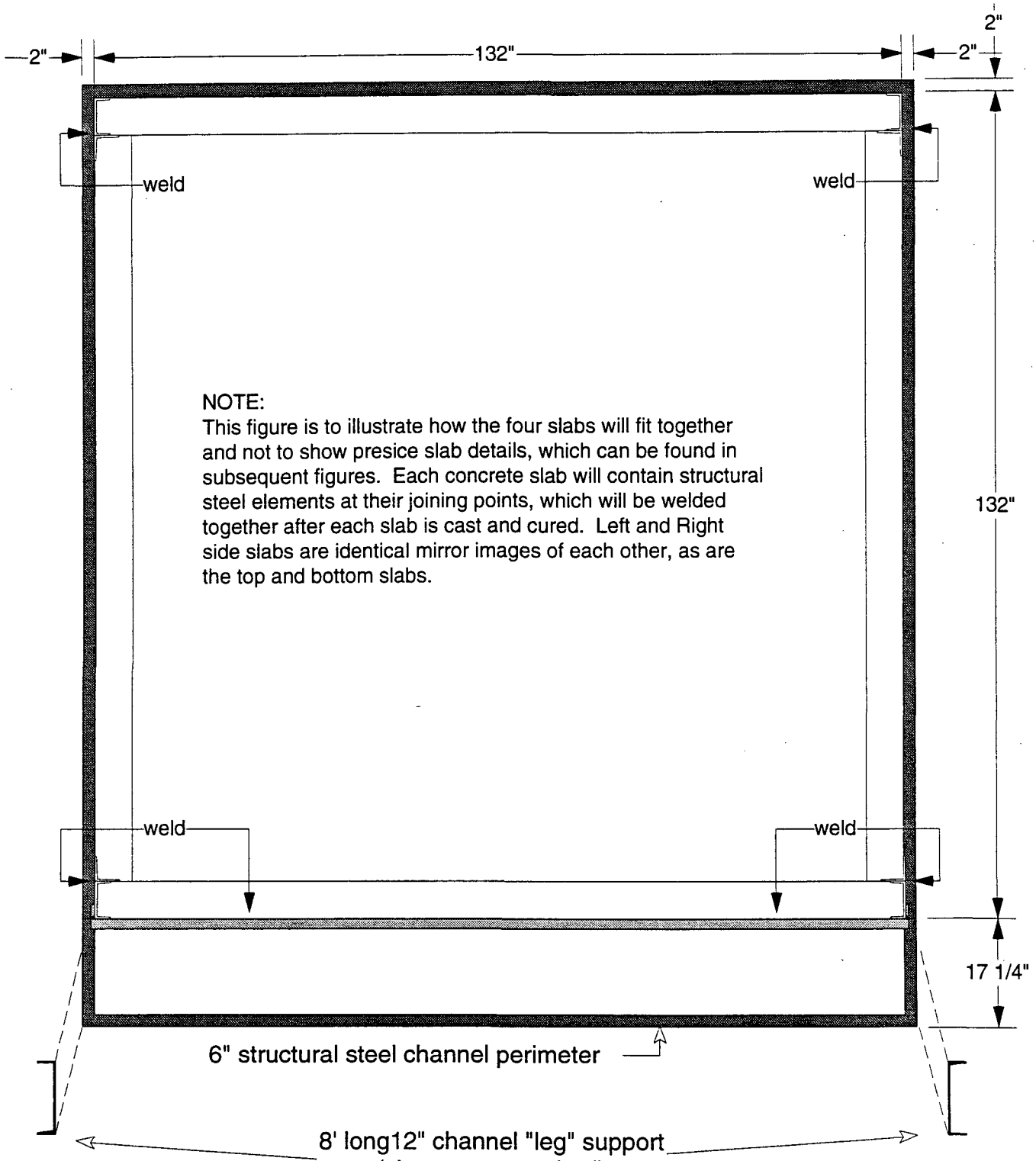
Appendix A

CONSTRUCTION DRAWINGS



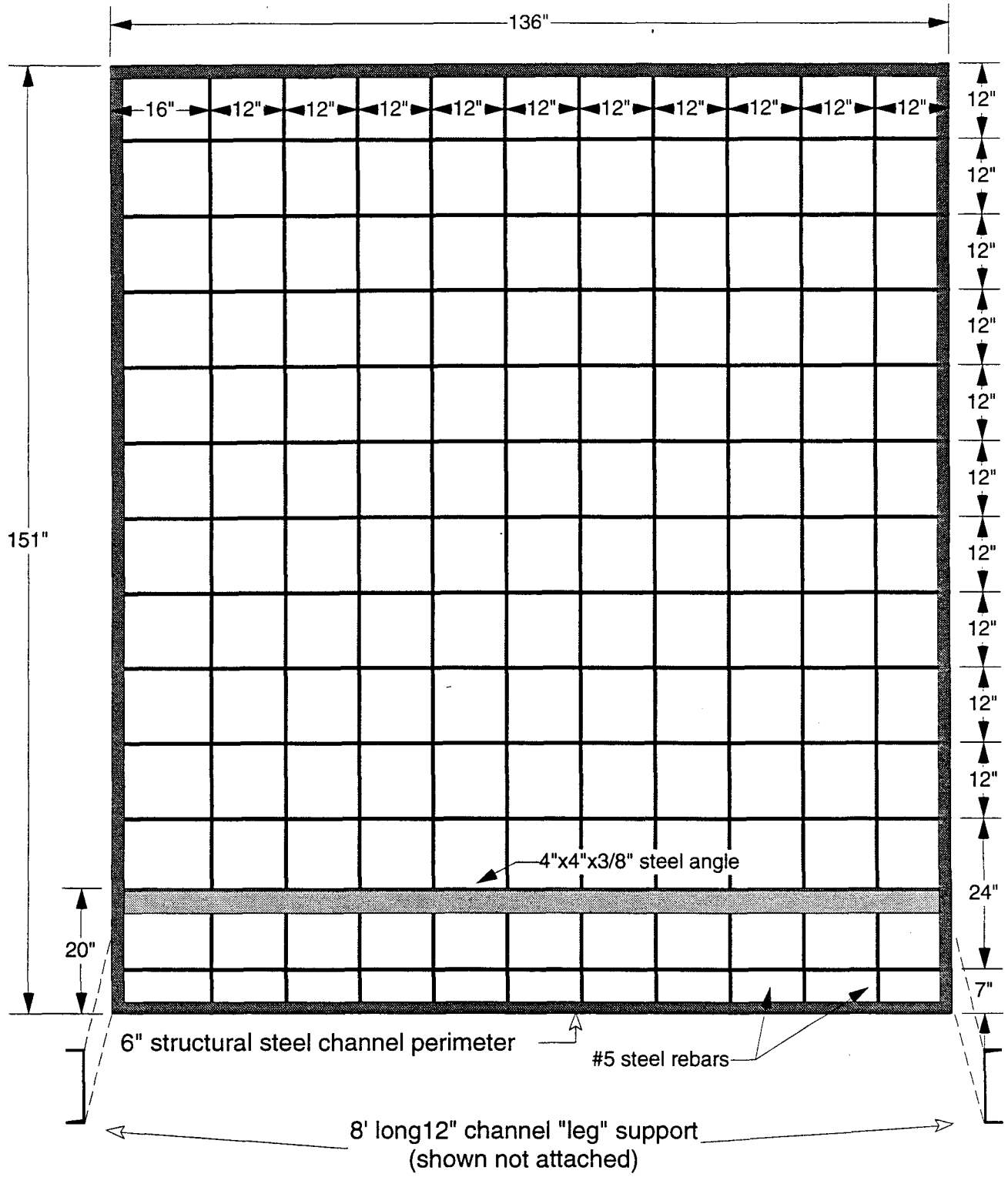
ELEVATION VIEW
from Hot Side

OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 1 Raceway Location Elevation View Test Deck #6, Rev. 1
Drawn by: [illegible] Date: 8/1/94 Appr'd by: C. Humphreys Date: 8/2/94
TVA Appr'l: J.J. Pierce Date: 8/2/94



ELEVATION VIEW
from Hot Side

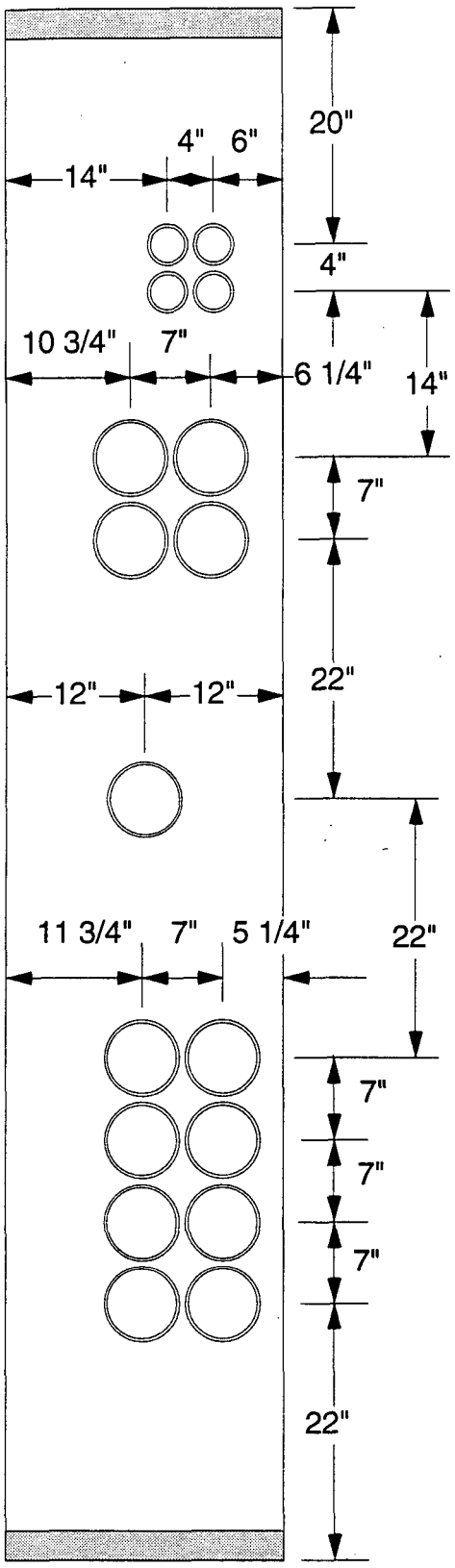
OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 2 Extension Slabs - Elevation View Test Deck #6, Rev. 1
Drawn by: ~~H Shelton~~ Date: 8/1/94 Appr'd by: C Humphrey Date: 8/2/94
TVA Appr'l: JJ Price Date: 8/2/94



NOTE:
All rebar positioned 1-1/2" to 2" from the hot side face of the slab. 4" steel angle positioned with front flat flush with hot face of slab. The darker edge of angle denotes location of flange (points toward cold face of slab).

ELEVATION VIEW from Hot Side

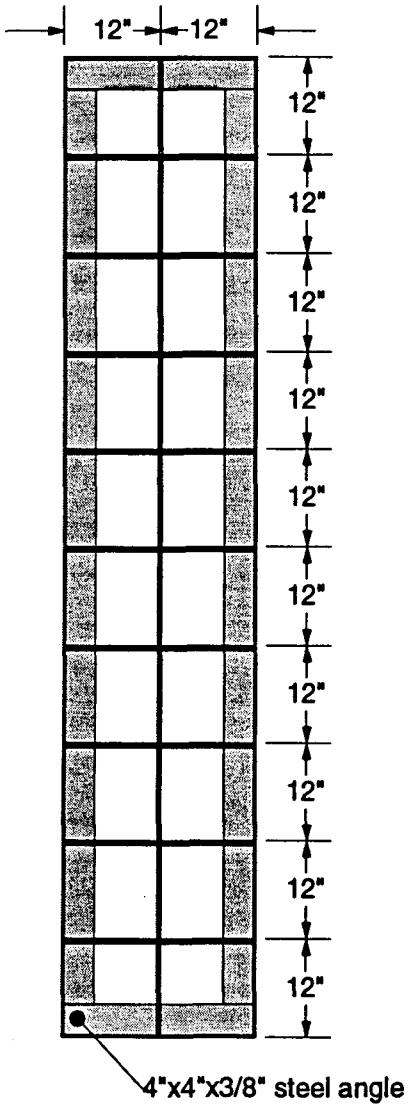
OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 3 Test Slab Reinforcement Test Deck #6, Rev. 1
Drawn by: H. Stanley II Date: 8/1/94 Appr'd by: C. Humphries Date: 8/2/94
TVA Appr'l: J. Price Date: 8/2/94



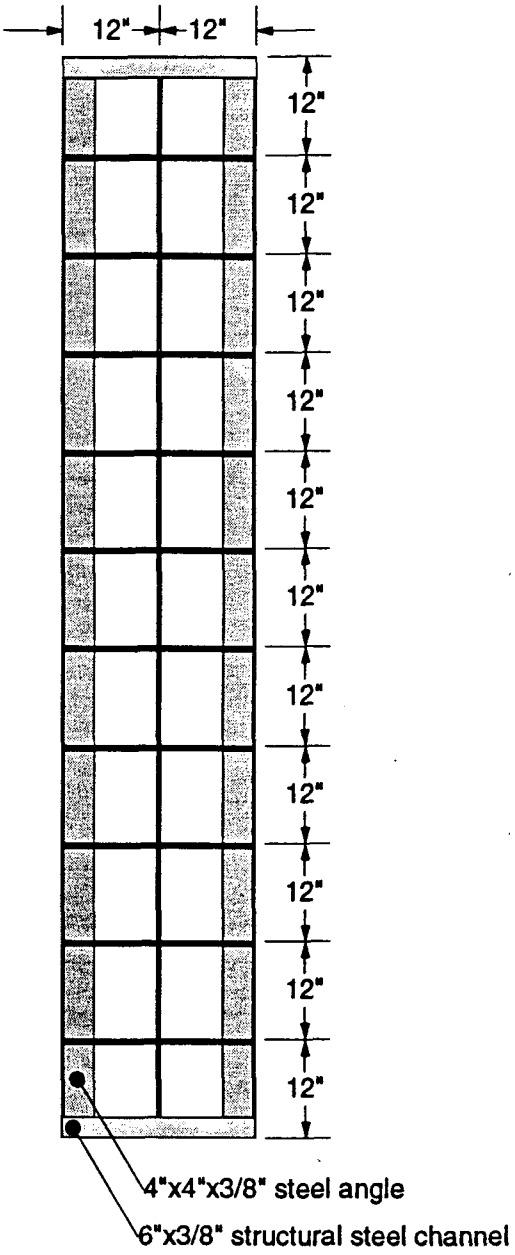
NOTE:
Slab Shown is the bottom extension, fire side. The top extension, fire side is the mirror image of this slab.

Top and Bottom Extensions (2 required)

OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 4 Slab Extension Blockouts Test Deck #6, Rev. 1
Drawn by: [illegible] Date: 8/2/94 Appr'd by: C Humphrey Date: 8/2/94
TVA Appr'l: JJ Price Date: 8/2/94



Left and Right Side Extensions (2 required)



Top and Bottom Extensions (2 required)

NOTE:
All rebar is #5, spaced 12" o.c. The rebar mat is located 1-1/2" to 2" in form the hot face of the slabs. The slabs above are viewed from the hot face (all angle flats are to be on the cold face surface.

OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 5 Slab Extension Reinforcement Test Deck #6, Rev. 1
Drawn by: [illegible] Date: 8/1/94 Appr'd by: C Humphreys Date: 8/2/94
TVA Appr'l: J.J. Price Date: 8/2/94

Appendix B

TEST PLAN

ONE HOUR FIRE ENDURANCE TESTS OF ELECTRICAL RACEWAYS PROTECTED WITH TSI THERMO-LAG FIRE BARRIER SYSTEMS

REVISION 1

PREPARED BY J.J. PIERCE

SIGNATURE J.J. Pierce

DATE 7/11/94

CHECKED BY MARK H. SALLEY

SIGNATURE

DATE 7/11/94

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

1.0 SCOPE

This test plan describes the methods and guidelines for four fire endurance tests. This test plan includes the preparation of the test decks and specimens, installation of the Thermo-Lag, performance of fire endurance and hose stream tests, temperature monitoring, and applicable documentation of these tasks and test results.

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) nuclear power plants (NPP). Successful results of this test program will provide documented evidence that the electrical raceway fire barrier systems (ERFBS) will satisfactorily withstand an ASTM E-119-88 fire exposure for a period of one hour, followed by a hose stream test. These tests shall satisfy the requirements for fire testing the ERFBS as detailed in Underwriter's Laboratories, Inc. (UL) Subject 1724, "Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems", Issue Number 2, August 1991, and NRC Generic Letter 86-10, Supplement 1, 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 electrical raceway will be recorded (cold side of the barrier). If the average temperature recorded by the exterior raceway thermocouples does not exceed 250° F (139° C) above their initial temperature and no individual thermocouple is in excess of 325° F (181° C) above its initial temperature, the ERFBS 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 ERFBS. These results will be analyzed, if required, 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. If the hose stream test does not cause any openings through which the electrical raceway is visible, the ERFBS shall be acceptable.

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 configuration 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), recommendations, hold points, etc., to govern the installation of the Thermo-Lag ERFBS to the test articles.

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

5.1.5 Provide the electrical raceway materials (e.g., cable trays, fittings, conduits, junction boxes, cables).

5.1.6 Personnel to install the fire barrier systems.

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

5.2 THERMAL SCIENCE, INC. (TSI)

5.2.1 Provide the Thermo-Lag materials (5/8" and 3/8" thick ribbed and flat board, preformed conduit sections, trowel grade material), stress skin, stainless steel tie wire and bands.

5.2.2 Make the necessary arrangements with, and provide adequate funding for Omega Point Laboratories to perform the tests.

5.3 OMEGA POINT LABORATORIES, INC. (OPL)

5.3.1 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 Program and other applicable procedures.

5.3.2 Provide thermocouple calibration and instrumentation, storage temperature records, and relative humidity instrumentation.

5.3.3 Assemble, install and document the installation of the electrical raceways (i.e., trays, conduits, cables, junction boxes, etc.). Provide computer generated drawings of the electrical raceways which clearly indicate critical dimensions, thermocouple locations, etc.

5.3.4 Coordinate all phases of the fire test preparation.

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

5.3.6 Provide all applicable quality control documentation for the ERFBS materials to the test articles and attendant instrumentation on each test article.

5.3.7 Observe and document the installation of the Thermo-Lag ERFBS materials to the test articles and attendant instrumentation on each test article.

5.3.8 Conduct the fire endurance and water hose stream tests.

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

5.3.10 Notify TVA and TSI within three (3) working days of completion of each test specimen.

5.4 OPL QUALITY ASSURANCE/QUALITY CONTROL

5.4.1 Maintain the quality control documentation of the ERFBS materials used in the test program.

5.4.2 Witness and document monitoring activities of the ERFBS installation process performed by TVA.

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

5.4.4 Provide written calibration documentation of all thermo-couples, measurement devices and data acquisition systems used in this test program.

6.0 SPECIAL PRECAUTION

6.1 PRECAUTIONS FOR INSTALLATION OF THE ERFBS

6.1.1 Observe specific precautions recommended by TSI 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 object, hazardous gases, and other related hazards.

7.0 PREREQUISITES

7.1 GENERAL TEST CONFIGURATION REQUIREMENTS

The electrical raceway installation configurations for the tests shall be shown on drawings in Appendix A.

7.2 TRACEABILITY REQUIREMENTS

To ensure that the materials used in these tests are representative of those in actual use, or to be used at TVA facilities, all aspects of traceability as required by the OPL QA Program shall be applied.

All thermocouples used in these tests shall be 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 OPL.

7.4 SHIPPING, RECEIVING, MATERIAL INSPECTIONS

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 OPL 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 limits 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 CONFIGURATIONS

7.5.1 General

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

7.5.2 Two Sided Boxed Conduits and Cable Tray Supports (Test Deck 4)

This slab will contain eight (8) 4-inch conduits arranged in two rows of four conduits each and two (2) 1-inch conduits that enter one side of the slab wall and run the entire length of the slab and exit the opposite wall. Between the two banks of conduits will be two sets of cable tray supports with a small section of tray attached (see drawing in Appendix A).

7.5.3 Three Sided Conduit Box and Large Junction Box (Test Deck 5)

This deck will be a wall test that contains five (5) 2-inch, one (1) 2½-inch, and one (1) 3-inch aluminum conduits that enter through the deck and immediately attach to LB fittings, turn and run parallel to the deck for approximately ten feet and terminate with a cap or plug on the end. Another group of conduits (two 1-inch steel) are routed in the same manner parallel to the above group. Another group of three 3-inch aluminum conduits will be mounted perpendicular to the above conduits and be approximately 3-feet long. A large junction box (60"x36"x24") will be mounted to the deck (see drawing in Appendix A).

7.5.4 Four Sided Conduit Boxes and Pull Box (Test Slab 6)

This slab will contain four configurations of conduits. One configuration will consist of eight 4-inch aluminum conduits (two rows of four) that enter through one wall of the slab and exit the opposite wall. One configuration consists of four 3-inch steel conduits (two rows of two) that enter through one wall of the slab and exit the opposite wall. One configuration consists of four 1-inch steel conduits (two rows of two) that enter through one wall of the slab and exit the opposite wall. One configuration consists of a 4-inch steel conduit entering through one wall of the slab and extending to a pull box (60"x12"x12"), exiting the pull box and exiting the opposite wall of the slab (see drawing in Appendix A).

7.5.5 Small Conduit and Large Ganged Conduits (Test Deck 7)

This deck consist of seven 4-inch steel conduits that each enter through the deck and extend down to a 90° elbow, turn horizontally for approximately eight feet and enter a LB and then exit through the deck. Two small conduits (¾" - one steel and one aluminum) enter through the deck and extend down to a 90° elbow, turn horizontally for approximately six feet and enter a LB and then exit through the deck (see drawing in Appendix A).

7.6 CABLE LOADING REQUIREMENTS

All ERFBS will contain a single #8 AWG bare copper conductor within the ERFBS and are to be in accordance with section 4.4 of reference 4.3 (UL Subject 1724). The bare copper conductor shall be instrumented along the entire length of the raceway being protected.

7.7 THERMOCOUPLE INSTALLATION

All thermocouples used in this test program shall be provided and installed by OPL, with QC surveillance by OPL personnel. The thermocouple wires shall be calibrated (by Lot Number) prior to installation and/or use, and applicable quality control documentation records generated. All thermocouples will consist of 24 GA, type K, Chromel-Alumel Teflon PFA insulation (Special Limits of Error $\pm$1.1° C) electrically welded thermojunctions. Calibration will consist of manufacturer supplied (and audited) certifications of calibrations at fire temperatures of thermocouples taken from both ends of each purchased lot number.

The thermocouples shall be placed at 6" intervals and methods of attachment shall be in accordance with the requirements of sections 4.18, 19, 20 and 21 of reference 4.3. The thermocouples shall be attached to the bare copper conductors by wire ties, or equivalent.

7.8 INSTALLATION OF THE ERFBS TO THE TEST ARTICLES

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

7.9 FIRE SEAL INSTALLATION

Upon completion of the fabrication and installation of the ERFBS to the test articles, all openings in the test articles shall be sealed by OPL. All openings in the test deck assemblies shall be sealed by OPL. All open ends of raceways (conduits, etc.) which extend through the deck shall be sealed with both internal and external fire seals. Internal seals shall consist of silicone foam material (or equal), installed to a depth of nominally 6" and located at the end of the exposed raceway.

7.10 PREBURN INSPECTION

7.10.1 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 OPL.

7.10.2 TVA shall inspect the ERFBS for workmanship, surface defects, etc. prior to test.

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

7.10.4 Fire endurance testing of assemblies will not commence until the Thermo-Lag ERFBS attains 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 30 days has elapsed since completion of the ERFBS installation.

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 OPL 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 (within 10 minutes) 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 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. The nozzle orifice is to be a maximum of 5 feet from the edge of the tested assembly. | R1

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 60 seconds. | R1

10.0 FIRE TEST REPORT

10.1 OPL 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 sections 10.2 and 10.3 following.

10.2 OPL 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:

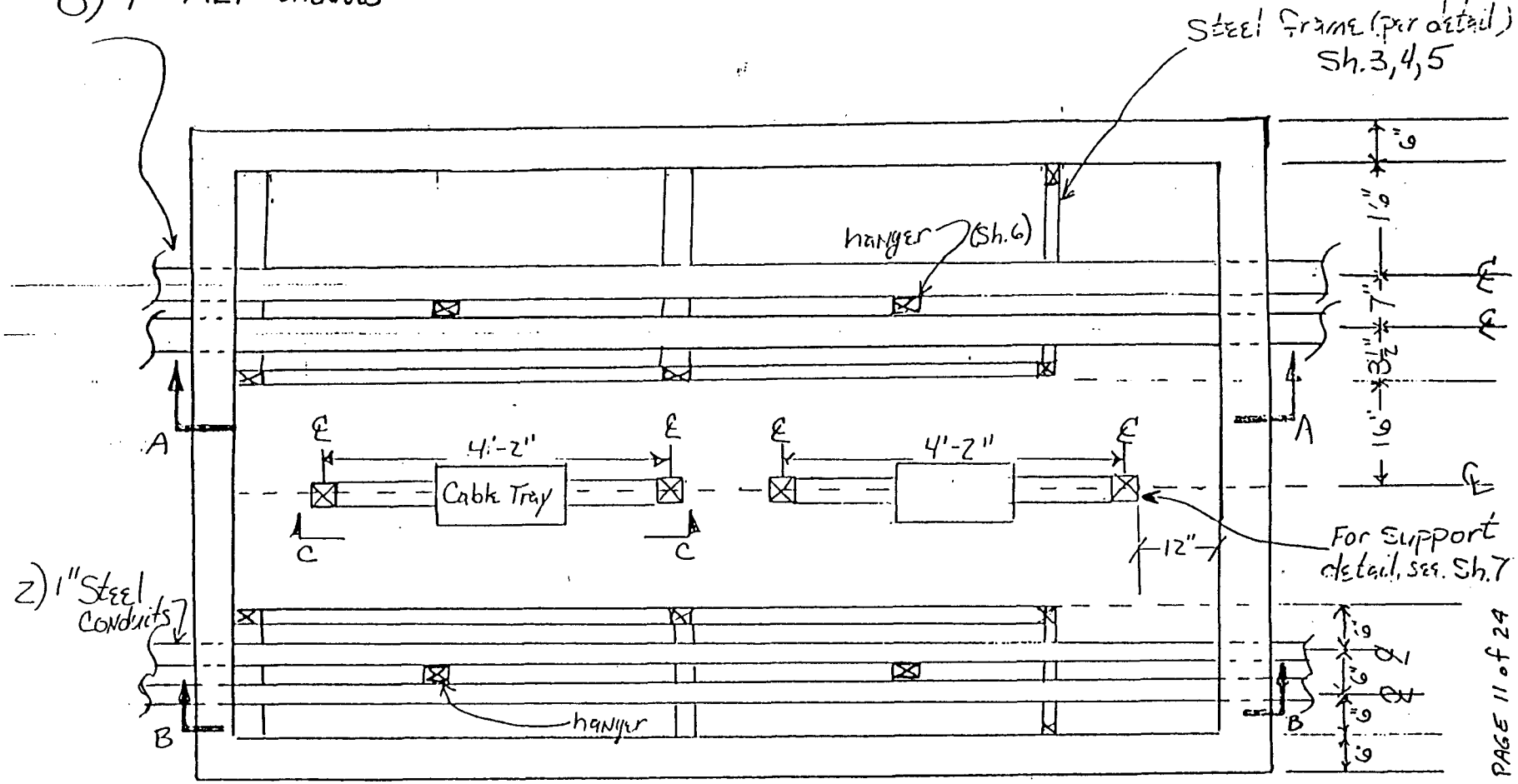
a. Date of the test
b. Location of the test
c. Description of the test furnace and test article
d. Calibration documentation of all thermocouples
e. Qualification and certification for QA personnel
f. Test procedures used
g. Acceptance criteria
h. Provide quality control records for:
   (1) Test article construction
   (2) Identification and installation of ERFBS
   (3) Thermocouple locations
   (4) Cables, sizes, type and location
   (5) Actual raceway fill densities (mass per linear foot)
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 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

10.4 OPL shall provide six copies of each test report to TVA and one copy of each test report to TSI.

APPENDIX A

DESIGN DRAWINGS

8) 4" AL. Conduits



Plan

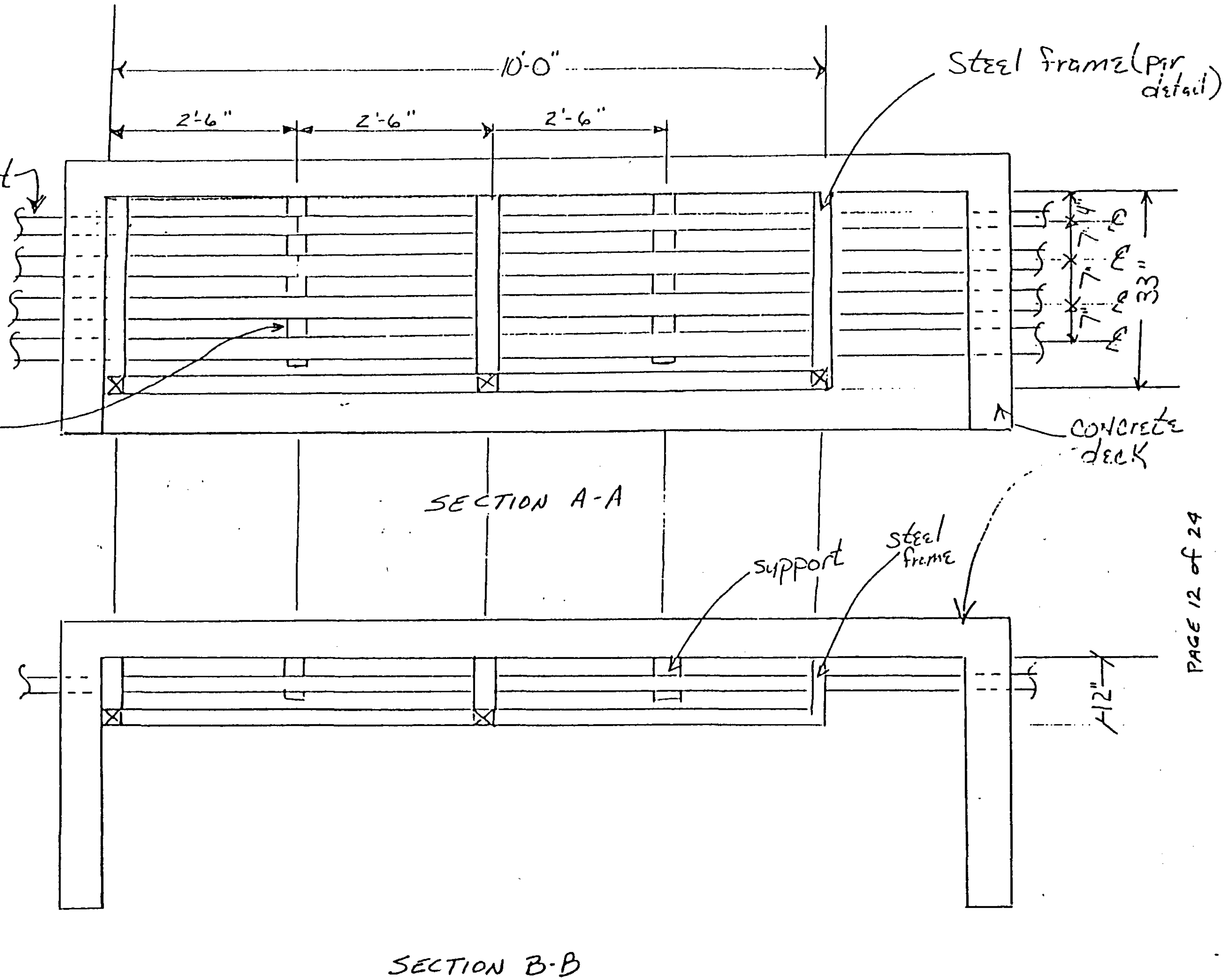
Note: Conduit hangers alternate. Conduits fastened w/ 2 hole straps on one side only. Center supports to support conduits location.

Sheet 2 of 7 — 38

2-Sided box — Test Deck #4

COMPUTED ____ DATE ____

CHECKED ____ DATE ____



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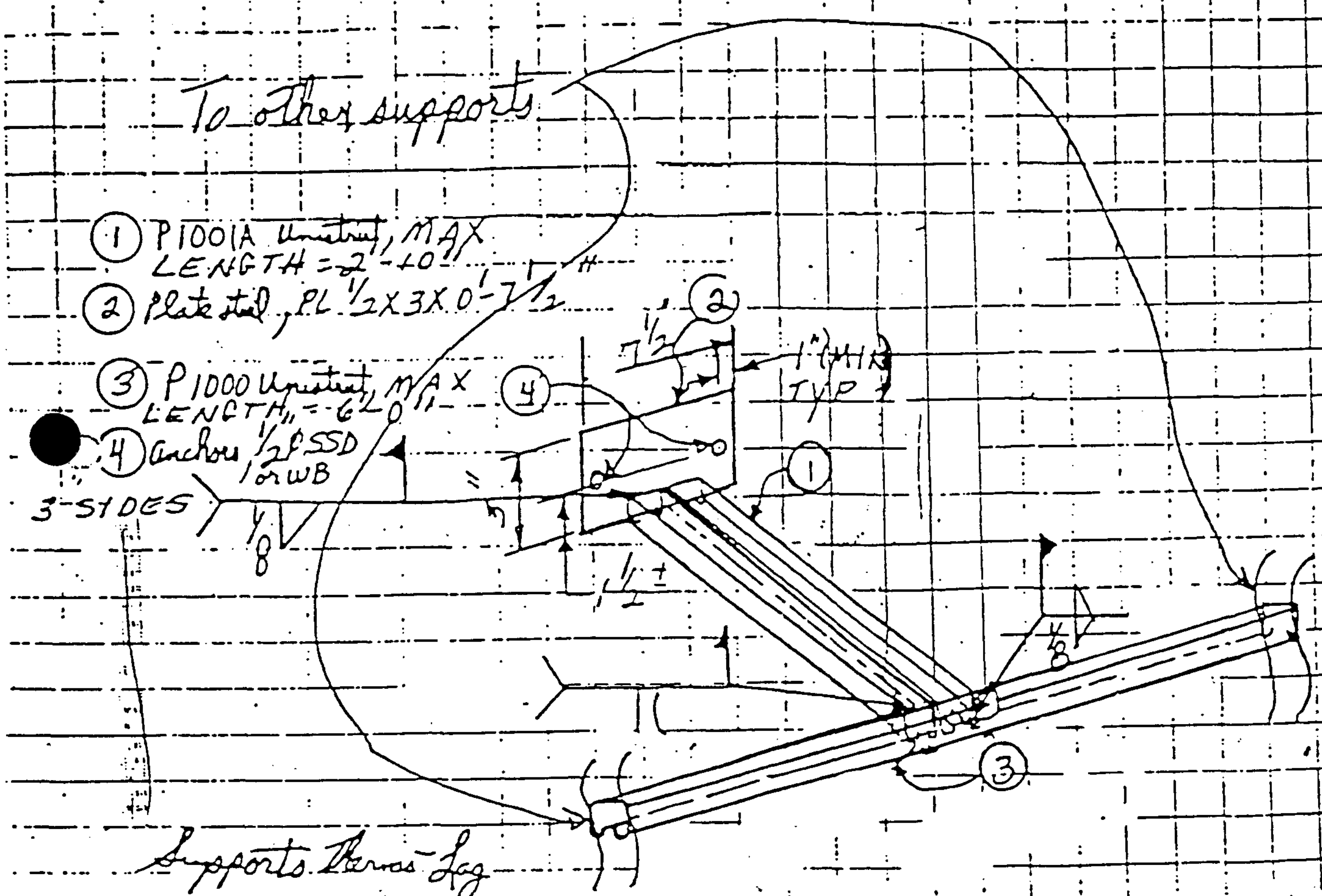
(3 of 7)



Add the above support to drawing 48N 1314-5 for the following location

1-376-1136 ≃10'-2" W of u at A1 _ Elev ≃ 761'   47A053-90 series can apply

WP 11605

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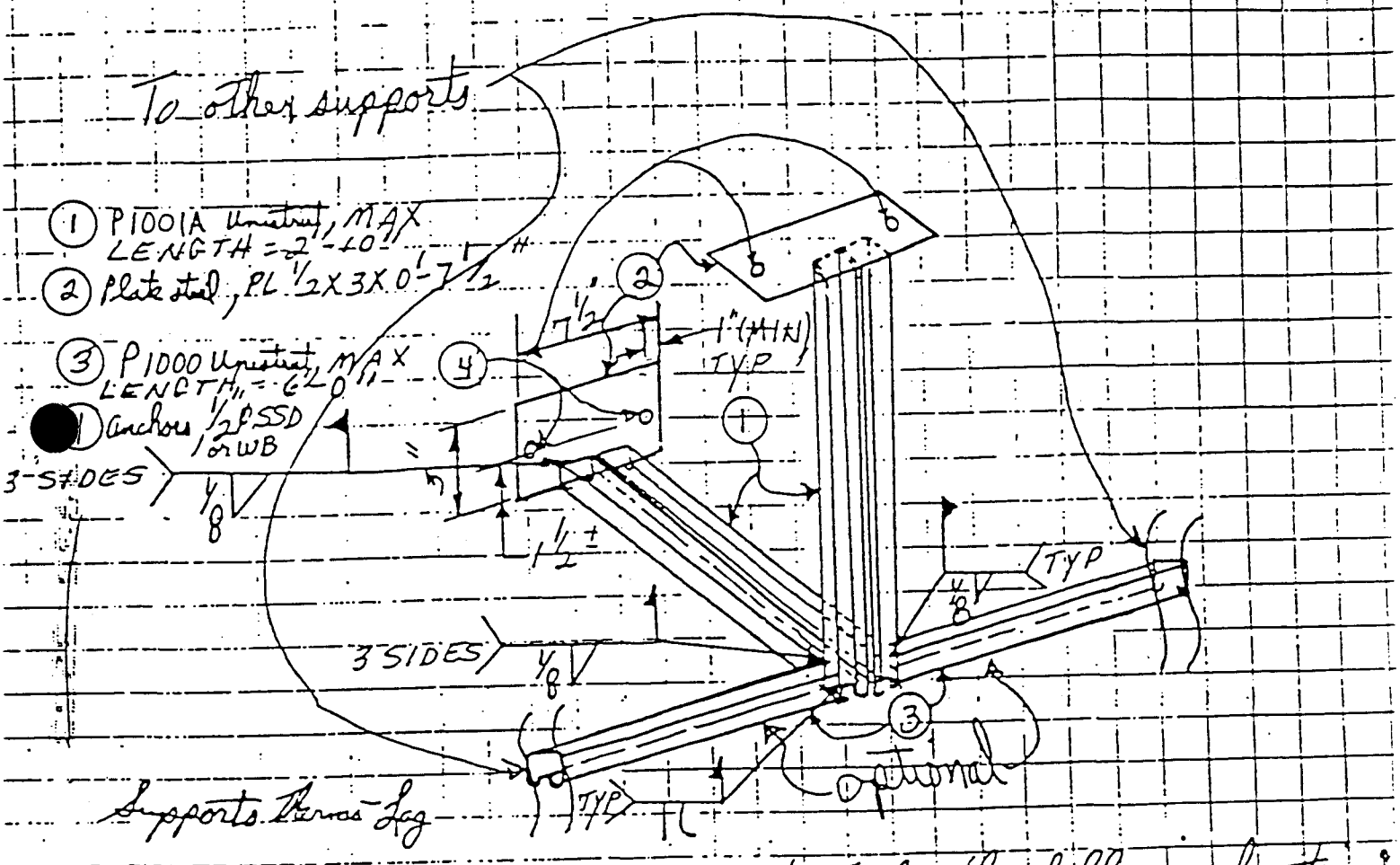
FCR-3451 R1

E4 of 7



Add the above supports to drawing 48N1314-5 for the following locations:

R2	(1) ≃ 6'7½" W of u at A1	Elev ≃ 76'	47A053-90 series can apply
	(2) ≃ 15'11" W of u at A1		
	(3) ≃ 0'8" W of t at A1		
	(4) ≃ 11'4" W of t at A1		
	(5) ≃ 17'4" W of t at A1		

WP 11605

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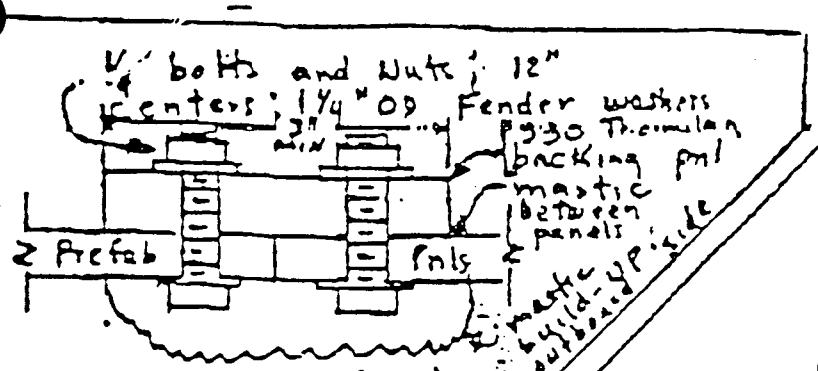
FCR-3451 R2

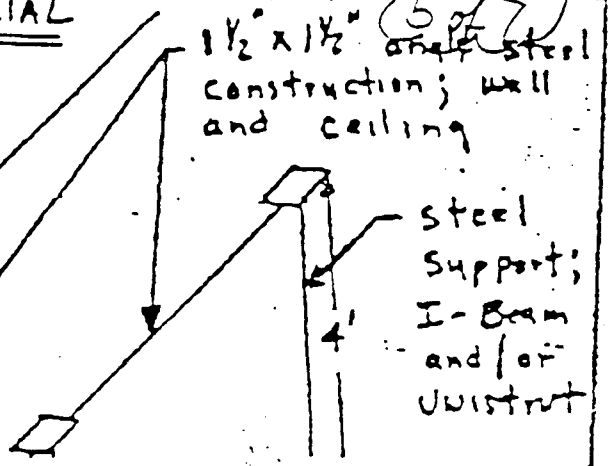
SEQUOYAH NUCLEAR PLANT

SK-DH-050286

TSI FIRE BARRIER INST - SPECIAL



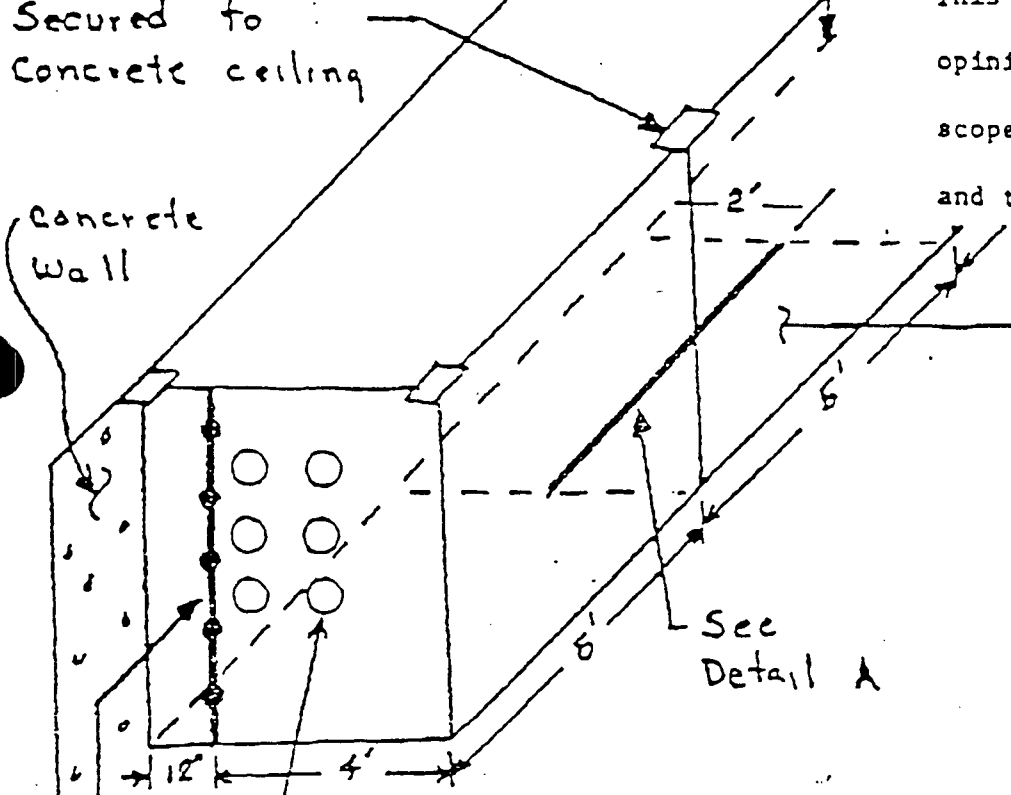
DETAIL A (ALT)



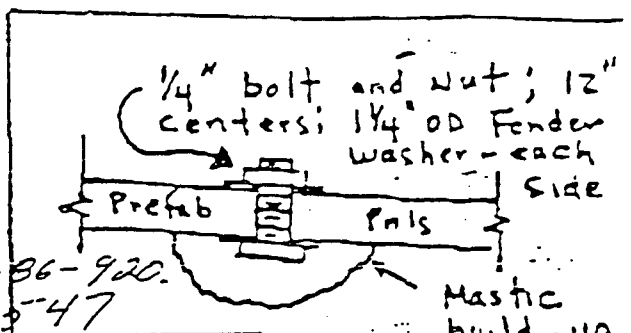
5-6-86

This application, in my opinion, is within the scope of the approved one and three hour test programs.

L. A. Johnson



Thermo-lag 330, 1 hr. fire barrier material, 1/2" thick, Prefabricated panel construction, Secured around perimeter using Nelson studs on 12" centers (dimensions approx)



Detail A

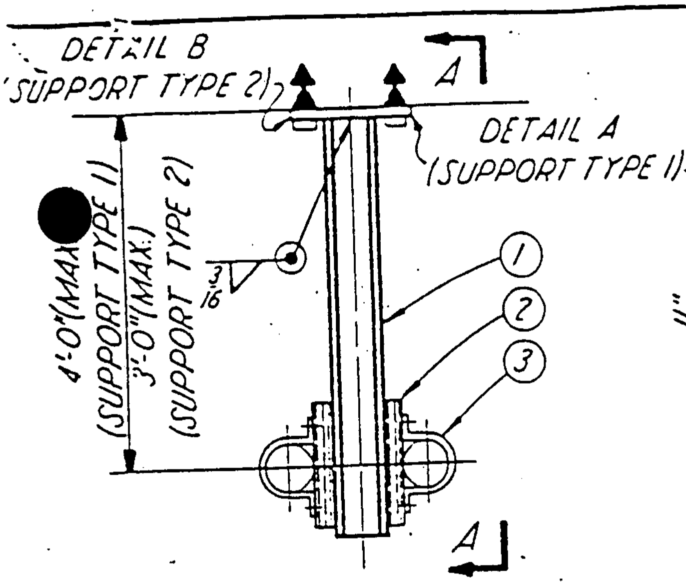
* Pnls joined with mastic

TC-86-920

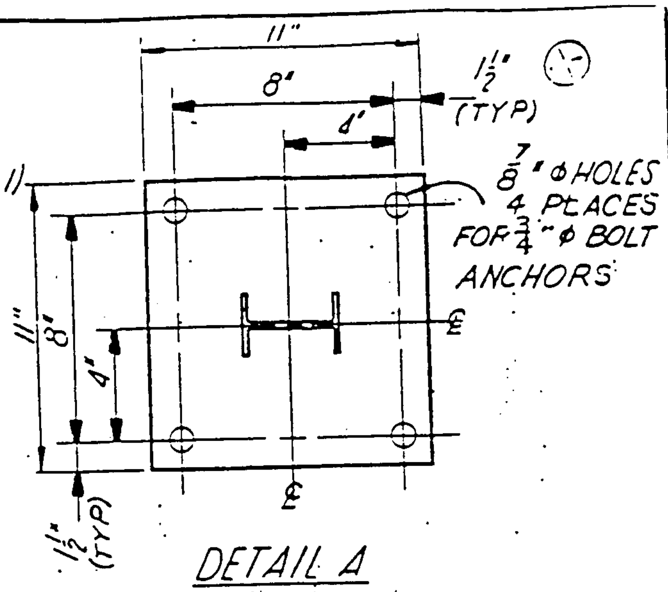
WP 113-47

PAGE X6-8 OF X6-8

NOTE: Thermo-lag Material furnished on contract 84KB5-836467



ELEVATION VIEW



DETAIL A
(SUPPORT TYPE 1)

TABLE A

SUPPORT TYPE	CONDUIT SIZE									STEEL SIZE "A"
	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	5"	
1	50	50	9	13	11	6	4	3	2	W6 X 15.5
2	30	30	7	9	9	5	3	3	2	W4 X 13

NOTES:
1. FOR GEN. NOTES & REQUIREMENTS SEE 47A056-1.
2. THE NO'S. GIVEN IN THE BLOCKS OF TABLE A ARE THE THEORETICAL NOT THE PHYSICAL LIMIT OF CONDUIT SIZES TO BE SUPPORTED. WHEN SEVERAL SIZES ARE MIXED, THE LIMITING NO. IS TO BE THAT OF THE CONDUIT SIZE W/ THE SMALLEST ALLOWABLE NO. BY ITSELF.
3. THIS SUPPORT CAN BE MOUNTED TO FLOORS, CEILING, & WALLS USING EMBED. STEEL OR THE PL W/ CONC. ANCHORS.
4. THIS SUPPORT CAN BE USED AS AN AXIAL FOR UP TO 25 FT OF CONDUIT WHEN USING OPTIONAL BRACE AS SHOWN IN SECTION A-A
5. UNISTRUT IS TO BE USED FOR THE ATTACHMENT OF CONDUIT. IT IS NOT NECESSARY FOR THE UNISTRUT TO RUN THE FULL LENGTH OF THE MAIN SUPPORT MEMBER.
6. COMPANION DWG 47A056-53A

NOTE *:
1. THIS DWG SHALL NOT BE USED AFTER NOV. 22 1985 WITHOUT PRIOR OE APPROVAL
2. THIS DWG HAS BEEN REPLACED BY 47A056-1053

NOT TO SCALE

SEISMIC CLASS I STRUCTURES

MECHANICAL
SEISMIC SUPPORT
CONDUIT

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

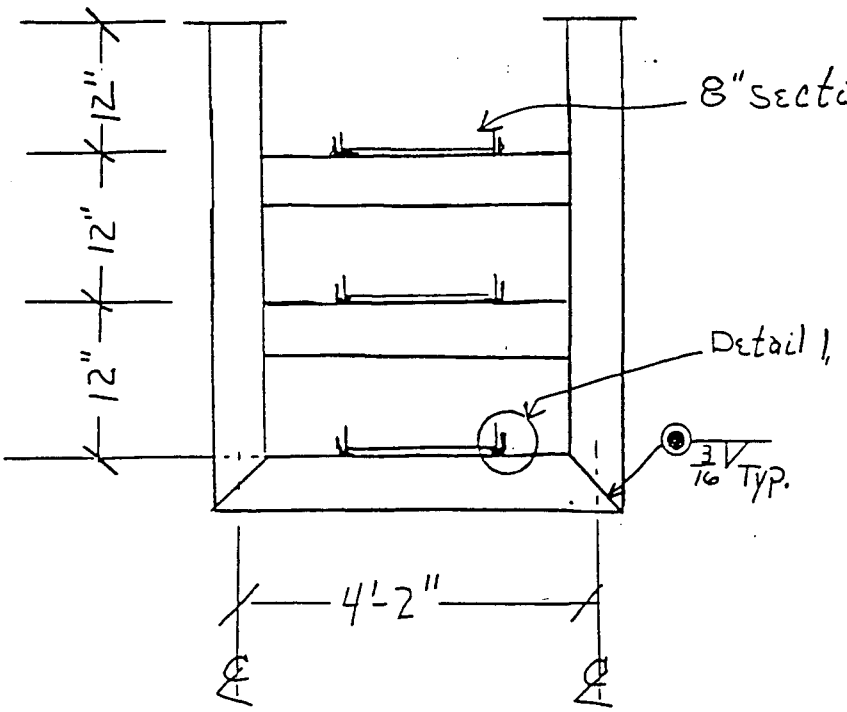
REV	ECN NO.	DATE	DSGN	DRWN	CHKD	SUPV	ENGR	INSP	SUBM	RECM	APPR	SSO
1	L6530	11-22-85										
	ADDED NOTE * FCR 3770											

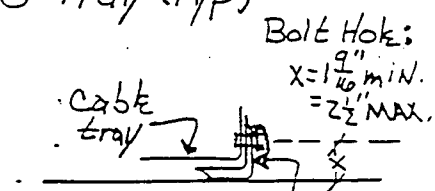
DSGN G.H. PIGG
DRWN CALVIN V. HENDERSON
CHKD W.G. MONROE
SUPV J.S. ARRINGTON
INSP
ENGINEER

SUBMITTED / RECOMMENDED / APPROVED
KNOXVILLE 10-23-75 45 M 47A056-53 R1

Test Deck #4 COMPUTED ____ DATE ____
CHECKED ____ DATE ____

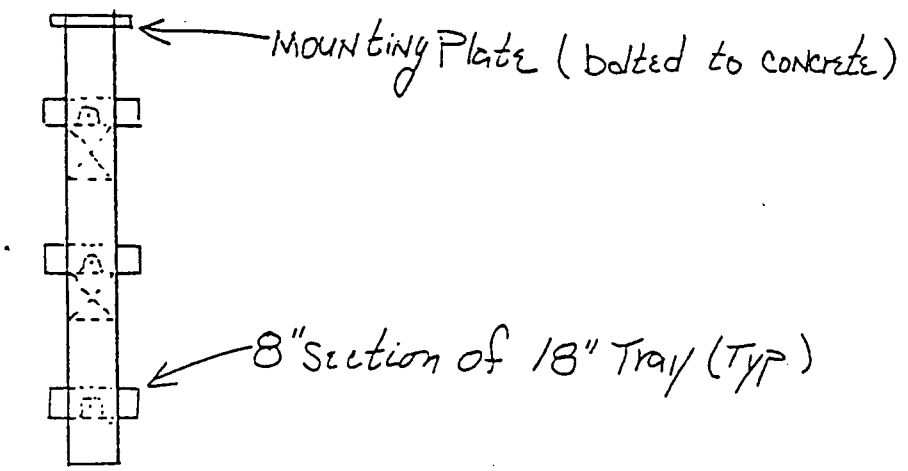
Cable Tray Support Details





Detail 1

1) Bolt = 3/8" x 1", Hole = 7/16" ϕ
Head installed inside tray.



Notes: 1) Tube Steel 6"x6"x0.5", ASTM-A500 Grade B or ASTM A501
2)
3)

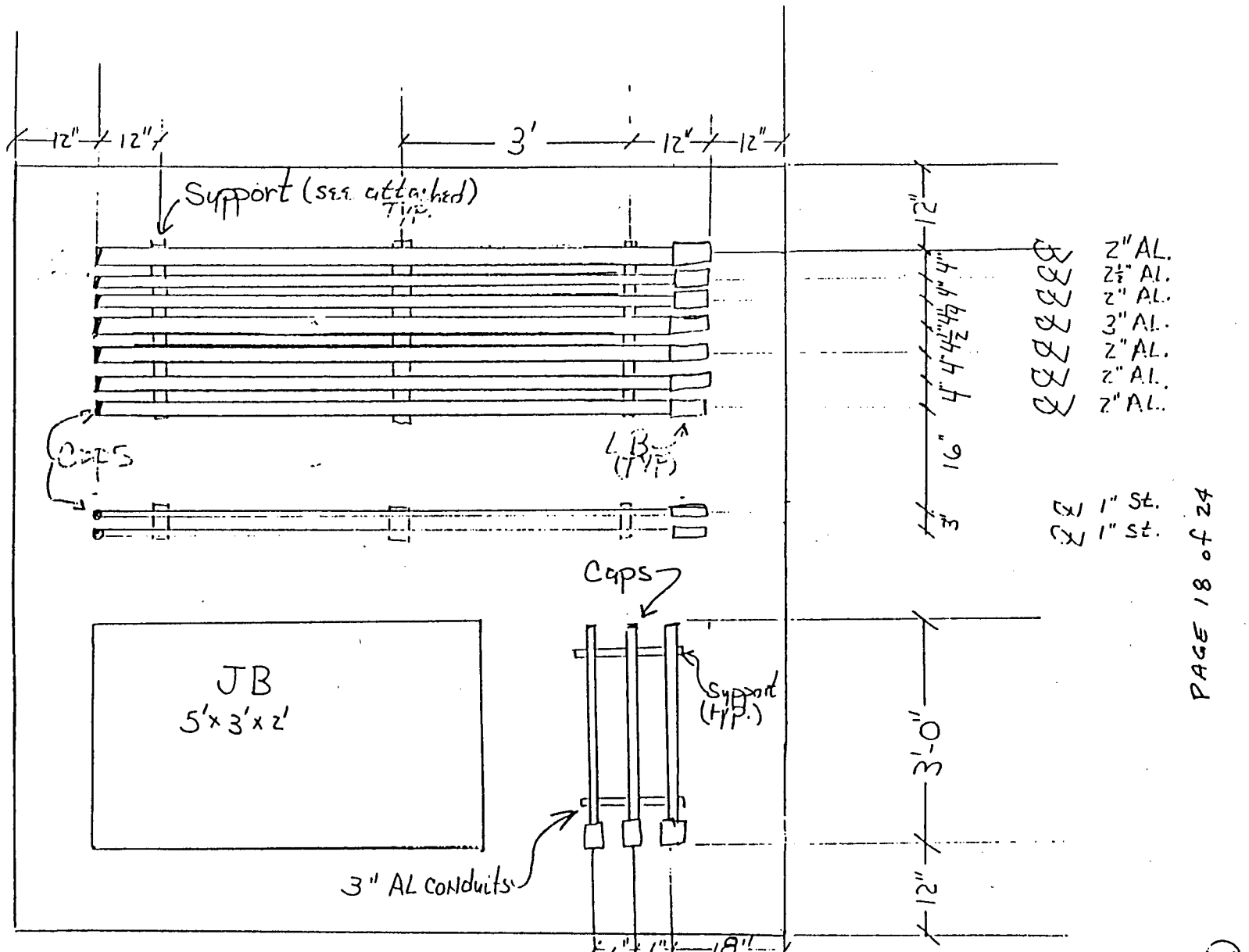
- 3 sided - Boxed Conduits
- Large JB (Wall Conduits)

SHEET 1 OF 2

COMPUTED ____ DATE ____

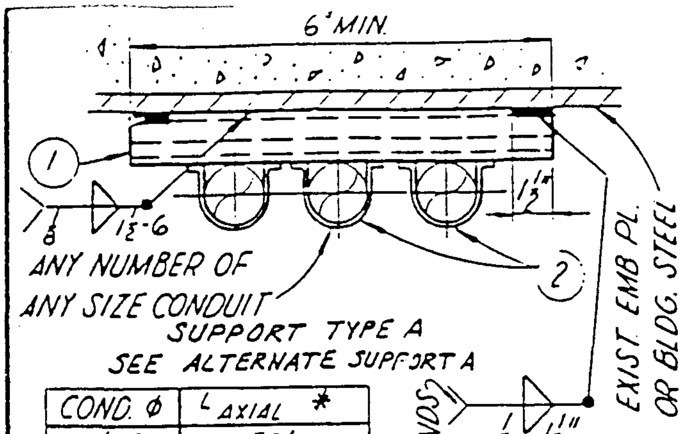
CHECKED ____ DATE ____

Test Deck #5



Note: 1) Supports per attached detail. Unistrut to be cut flush with END of 2 hole strap.
2) LB to exit through back of deck
3) Conduit ends to be Capped

PAGE 18 of 24



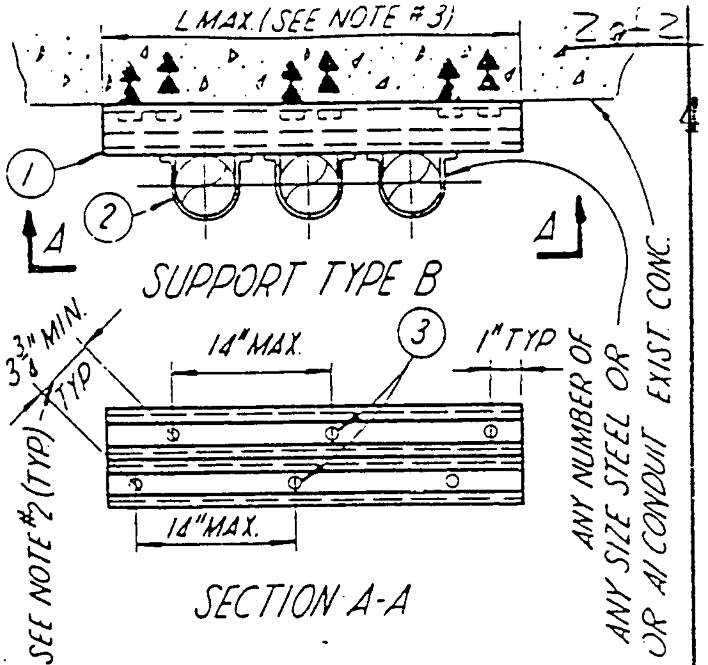


TABLE A

COND. Φ	L_{AXIAL} *
1/2"	50'
3/4"	50'
1"	40'
1 1/2"	25'
2"	25'
2 1/2"	10'
3"	10'
4"	10'
5"	10'

* L_{AXIAL} IS THE MAX LENGTH OF THE ATTACHED CONDUIT FOR WHICH THIS SUPPORT WILL PROVIDE AXIAL RESTRAINT. (SEE NOTE 6)

NOT TO SCALE

NOTE *:
1. THIS DWG SHALL NOT BE USED A... WITHOUT PRIOR OE APPROVAL
2. THIS DWG HAS BEEN REPLACED BY 47A056-1059

NOTES:
1. FOR GENERAL NOTES & SPECIFICATIONS SEE 47A056-1
2. BOLT ANCHORS MUST BE A MIN. OF 3 3/4" APART IN ACCORDANCE W/ GENERAL CONSTRUCTION SPECIFICATION G-32.
3. L MAX MAY VARY AS NEEDED AS LONG AS MAX BOLT ANCHOR SPACING OF 14" IS NOT EXCEEDED ON EITHER CHANNEL OF THE P1001A UNISTRUT.
4. CONDUITS MUST BE ATTACHED TO EITHER CHANNEL OF THE P1001A UNISTRUT BETWEEN BOLT ANCHORS SECURING THAT PARTICULAR CHANNEL.
5. THIS SUPPORT MAY BE ATTACHED TO WALLS, FLOORS, OR CEILINGS.
6. THIS COND. SUPPORT WILL PROVIDE AXIAL RESTRAINT FOR THE SIZES & LENGTHS OF CONDUIT ATTACHED TO IT AS SHOWN IN TABLE A. CONDUIT SIZES MAY BE MIXED WITH THE AXIAL SPAN FOR THE LARGEST CONDUIT BEING THE LIMITING AXIAL SPAN FOR ALL CONDUITS ATTACHED
7. BOLTING TO CONC. MAY BE COMBINED W/ WELDING TO EMBEDDED PLS. AS LONG AS THE MAX. DISTANCE BETWEEN THE ADJACENT BOLT & WELD IS NO MORE THAN 14".
8. COMPANION DWG 47A056-59A.

MK. NO	QTY.	MATL. DESCRIPTION
5	AS REQD	TS (SIZE AS REQD)
4	AS REQD	P1001 UNISTRUT (LENGTH VARIES)
3	AS REQD.	3/8" Φ BOLT ANCHOR ASSEMBLIES
2	AS REQD.	P2558 UNISTRUT PIPE STRAPS W/ NUTS, BOLTS, & FLAT WASHERS
1	1	P1001A UNISTRUT (LENGTH VARIES)

REV NO.	ECN NO.	DATE	
5	L6530	11/27/85	ADDED NOTE * PER FCR 3770
4			REVISED PER FCR 2598 R1
3	LSI	1-14-85	REV. PER SQ-FCR-1121 FOR ECN L-5198
2	SI	5-27-8	ADDED NOTE 8
1	SI	7-6-	ADDED NOTE 7 PER FCR E-696

SEISMIC CLASS I STRUCTURE
MECHANICAL
SEISMIC SUPPORT
CONDUIT

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

DSGN G.H. PIGG
DRWN C.V. HENDERSON
CHKD W.G. MONROE
SUPV J.S. ARRINGTON
INSP
ENGINEER

KNOXVILLE 45IM 47A056-59 Q

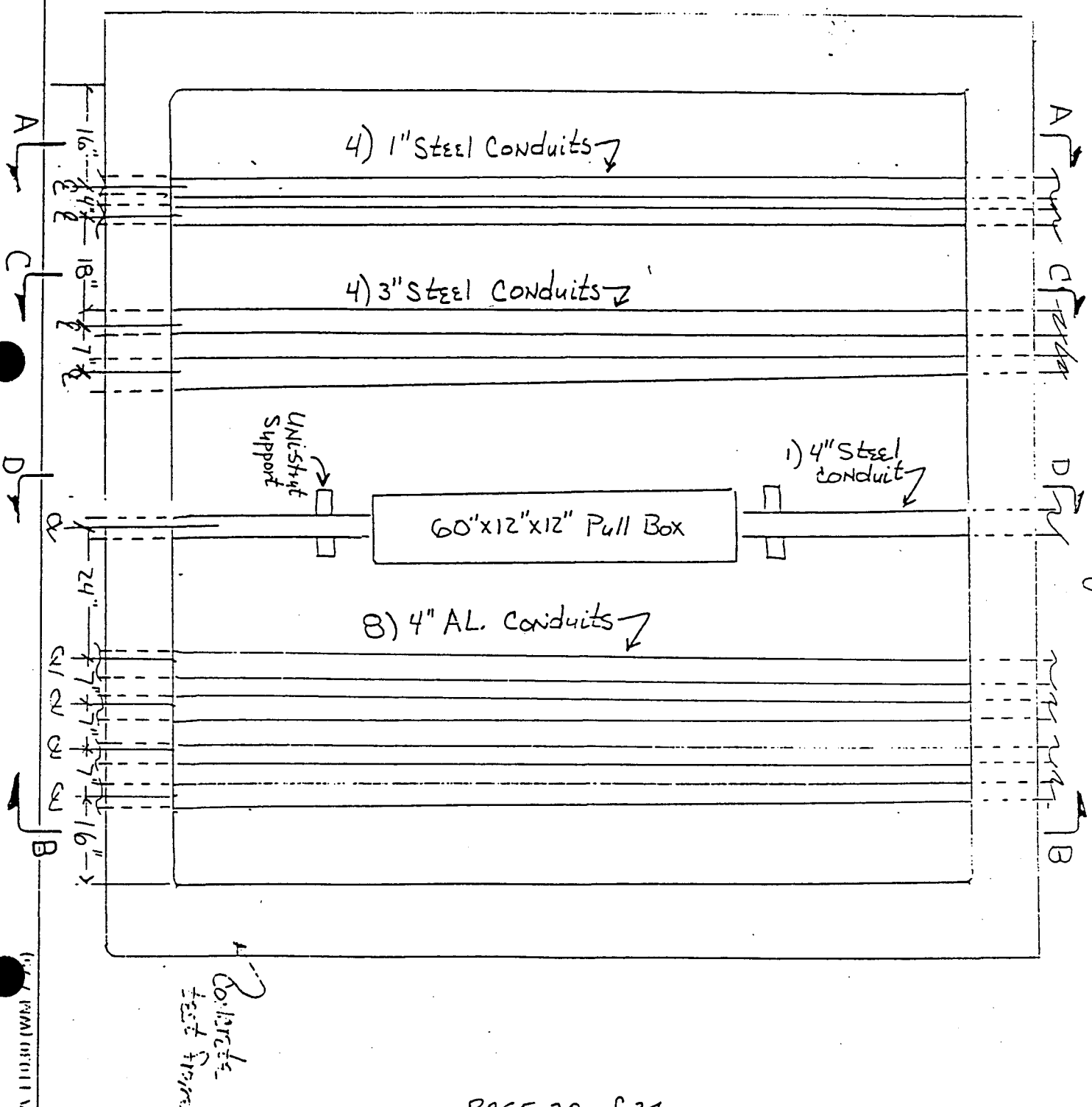
4 Sided Terminating Conduit Box SHEET 1 OF 3

Test Deck 6

Concrete Wall

COMPUTED _____ DATE _____

CHECKED _____ DATE _____



COMPUTED ______ DATE ______
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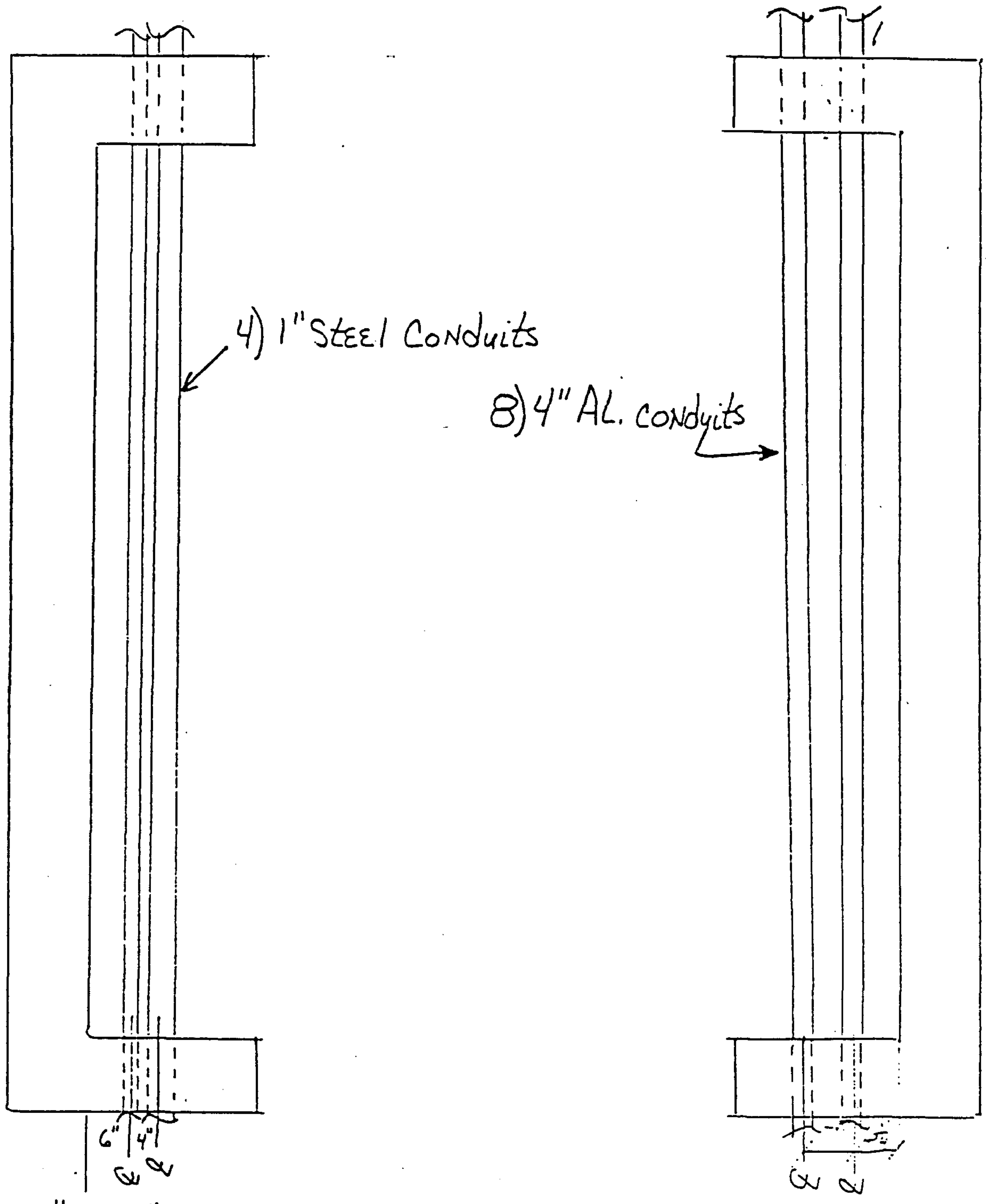
Test Deck #6

Left View

Right View



"A-A"

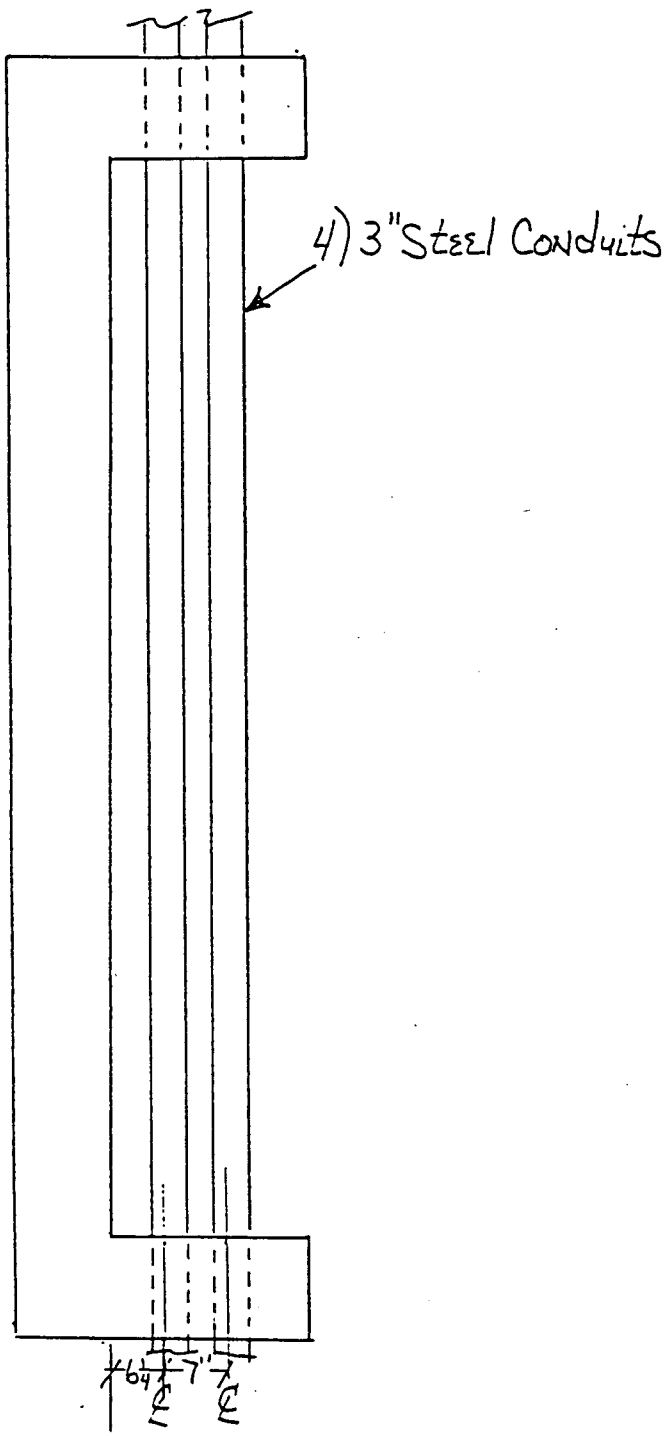
"B-B"

Note: Lab can pour concrete in place around conduits or sleeve and seal or core bore and seal around conduits.

COMPUTED _____ DATE _____
CHECKED _____ DATE _____

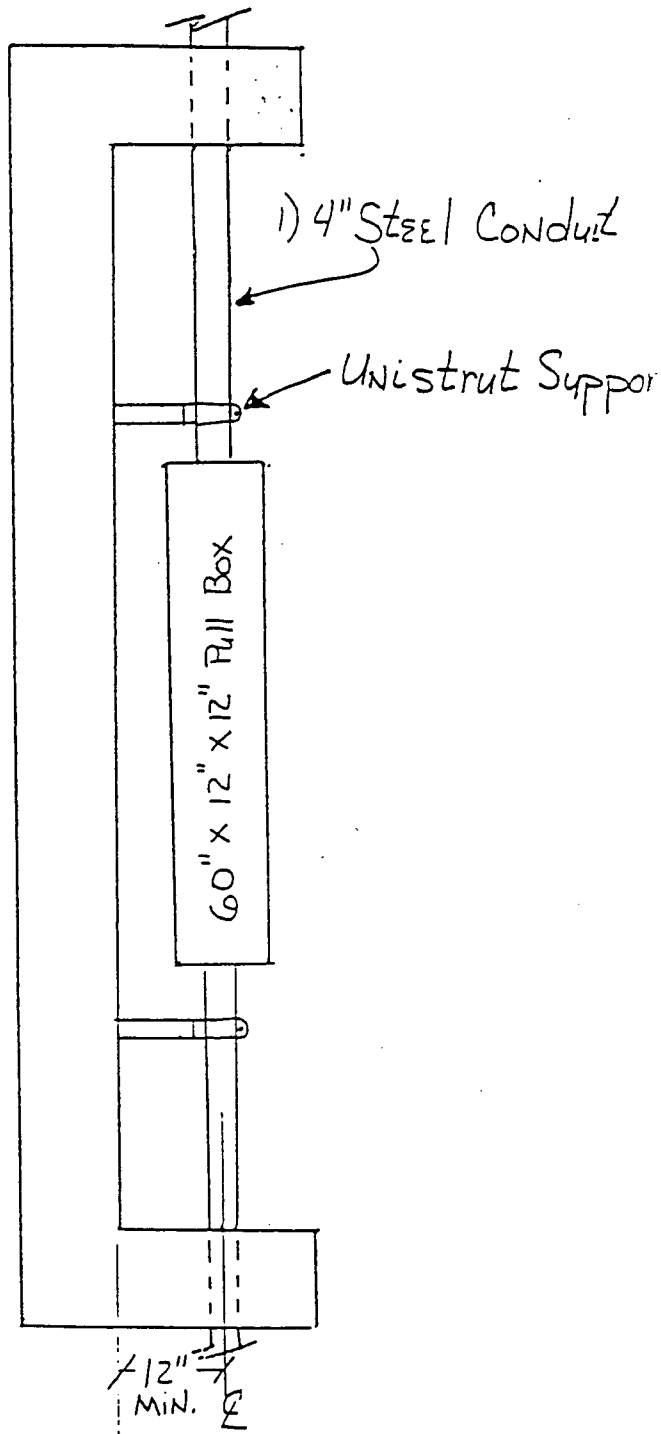
Test Deck #6

Left View



"C-C"

Left View



"D-D"

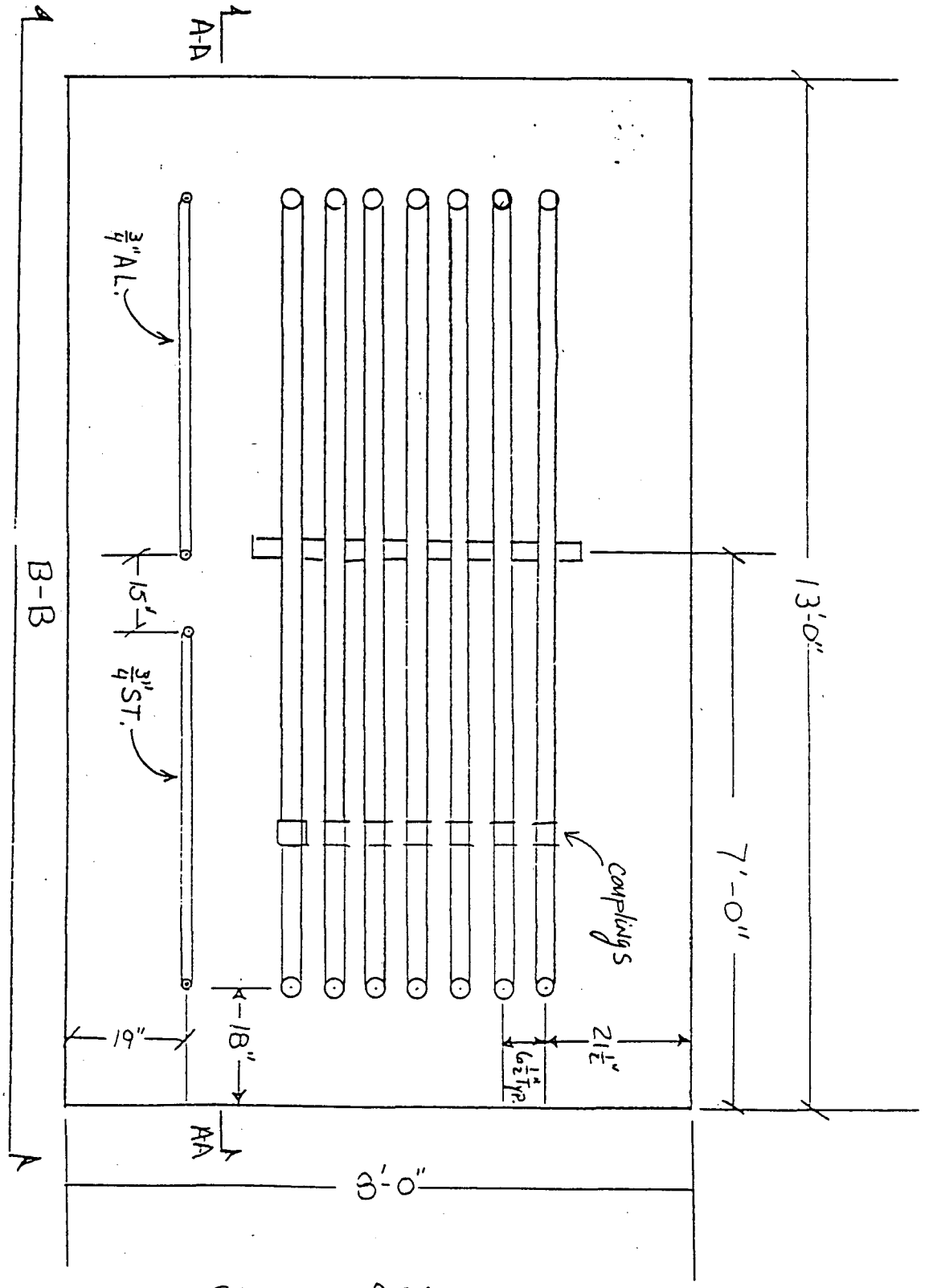
Note: 12" to ℄ is MIN. Lab may move out from wall on "D-D". Unistrut support by Lab.

Test Deck #7
Steel Deck - Horiz -

COMPUTED MKG DATE
CHECKED DATE

7) 4" Steel Conduits. Spaced 6½" on ℄

Plan view



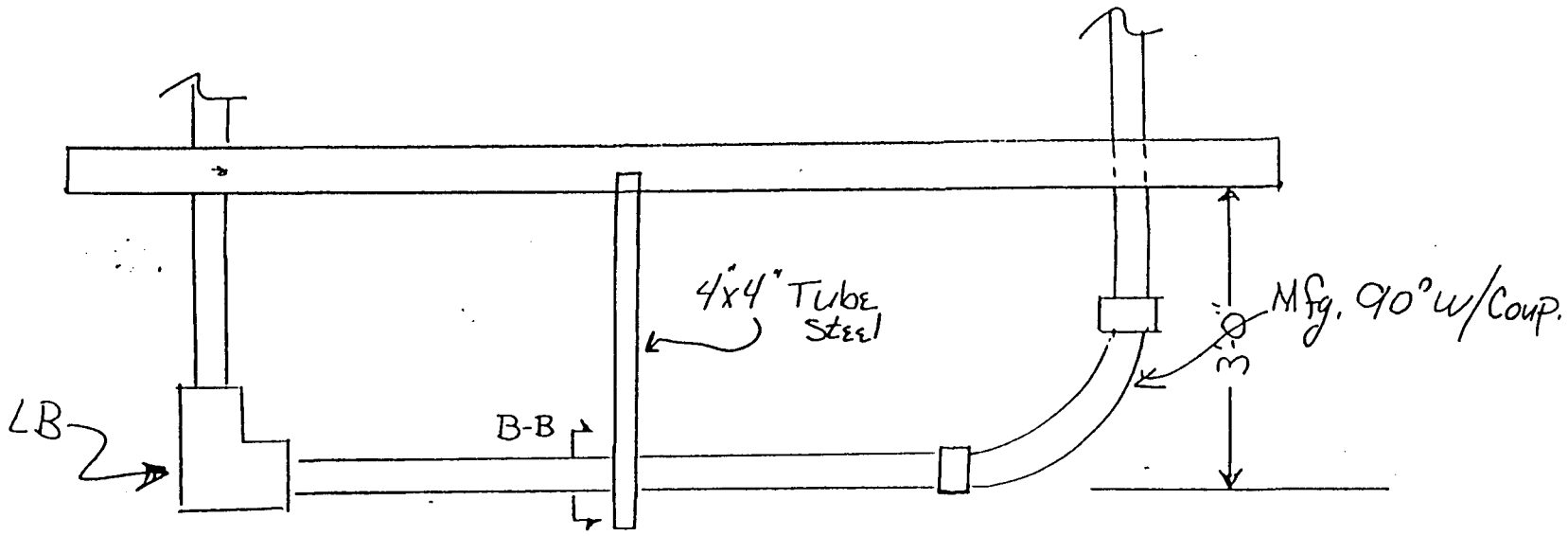
Large Ganged Conduits

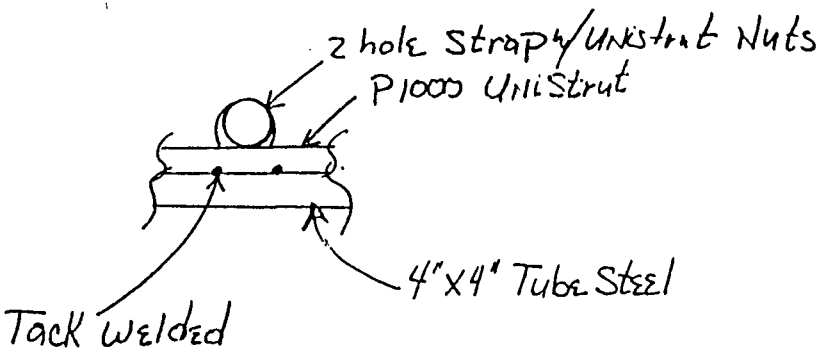
SHEET 02 OF 2 50

COMPUTED _____ DATE _____

CHECKED _____ DATE _____

Elevation A-A





Note: The two 3/4" conduits (1AL, 1ST) are the same configuration as Elevation A-A only half as Long. The conduits shall extend 3'-0" down from the test deck. No center support is required.

U.S.NRC Supplement 1 to Letter 86-10

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

March 25, 1994

TO: ALL HOLDERS OF OPERATING LICENSES OR CONSTRUCTION PERMITS FOR NUCLEAR POWER REACTORS

SUBJECT: FIRE ENDURANCE TEST ACCEPTANCE CRITERIA FOR FIRE BARRIER SYSTEMS USED TO SEPARATE REDUNDANT SAFE SHUTDOWN TRAINS WITHIN THE SAME FIRE AREA (SUPPLEMENT 1 TO GENERIC LETTER 86-10, "IMPLEMENTATION OF FIRE PROTECTION REQUIREMENTS")

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing Supplement 1 to Generic Letter (GL) 86-10, "Implementation of Fire Protection Requirements," April 24, 1986, to disseminate the review guidance contained in Enclosure 1, "Fire Endurance Test Acceptance Criteria for Fire Barriers Used to Separate Redundant Safe Shutdown Trains Within the Same Fire Area." This guidance will be used by the staff to review and evaluate the adequacy of fire endurance tests and fire barrier systems proposed by licensees or applicants in the future to satisfy existing NRC fire protection rules and regulations. This guidance refines and clarifies the fire barrier testing acceptance criteria specified by GL 86-10, for application in that specific (future review) context.

BACKGROUND

On April 24, 1986, the NRC issued GL 86-10 in order to give the industry additional guidance on implementing NRC fire protection requirements. The guidance in GL 86-10 did not change the requirement to separate one safe shutdown train from its redundant train with either a 1-hour or a 3-hour fire rated barrier. In Enclosure 2 to GL 86-10, the NRC staff responded to industry questions. Question 3.2.1 of the enclosure provided the staff position on fire endurance test acceptance criteria for fire barrier cable tray wraps. In its response, the staff stated that Chapter 7, "Tests of Nonbearing Walls and Partitions," of National Fire Protection Association (NFPA) Standard 251, "Standard Methods of Fire Tests of Building Construction," was applicable to cable-tray fire wraps.

On July 30, 1991, the NRC established a special review team to identify and evaluate technical issues related to the Thermo-Lag 330-1 fire barrier system. On August 6, 1991, the NRC issued Information Notice (IN) 91-47, "Failure of Thermo-Lag Fire Barrier Material to Pass Fire Endurance Test." This IN gave licensees information on the fire endurance test performed by Gulf States Utilities Company on a Thermo-Lag 330-1 fire barrier installed on a wide aluminum cable tray and the associated fire test failure. On December 6, 1991, the NRC issued IN 91-79, "Deficiencies in the Procedures for Installing Thermo-Lag Fire Barrier Material," which gave information on deficiencies in procedures that the Thermo-Lag vendor (Thermal Science, Incorporated) provided for constructing Thermo-Lag 330-1 fire barriers. In

response to concerns about the indeterminate qualifications of Thermo-Lag 330-1 fire barriers, on June 23, 1992, the NRC issued IN 92-46, "Thermo-Lag Fire Barrier Material Special Review Team Findings, Current Fire Endurance Tests, and Ampacity Calculation Errors." The staff found the following problems with Thermo-Lag 330-1 fire barriers: incomplete or indeterminate fire test results, questionable ampacity derating test results and a wide range of documented ampacity derating factors, some barrier installations that were not constructed in accordance with vendor-recommended installation procedures, incomplete installation procedures, and as-built fire barrier configurations that may not have been qualified by valid fire endurance tests or evaluated in accordance with the guidance of GL 86-10.

After reviewing INs 91-47 and 91-79, Texas Utilities (TU) Electric Company initiated a fire endurance test program to qualify the Thermo-Lag raceway fire barrier systems for Comanche Peak Steam Electric Station. Under this program, TU Electric performed an initial fire barrier test series during the weeks of June 15 and 22, and August 19, 1992. Notwithstanding the fire test acceptance criteria guidance specified in GL 86-10, TU Electric followed the guidance of American Nuclear Insurers (ANI) as specified in ANI Information Bulletin 5(79), "ANI/MAERP Standard Fire Endurance Test Method to Qualify a Protective Envelope for Class 1E Electrical Circuits," July 1979.

As a result of NRC interaction with TU Electric regarding its test program, the NRC concluded that there was uncertainty on the part of licensees as to whether or not the ANI test method established a level of fire barrier performance equivalent to that established by the GL 86-10 acceptance criteria. In addition, the NRC staff recognized that the 1-hour and 3-hour raceway fire barrier systems are unique and that additional guidance on the proper implementation of the GL 86-10 acceptance criteria would be useful.

AREAS OF CONCERN

The experiences with Thermo-Lag fire barrier systems at TU Electric recounted above raised the following general concerns:

(1) The fire endurance test acceptance criteria used by other fire barrier vendors, applicants, and licensees may not meet the acceptance criteria of GL 86-10, and may not fully demonstrate the fire barrier performance intended.

(2) Certain past cable functionality testing (i.e., circuit integrity monitoring) may not fully demonstrate the capability of protected circuits to function during and after a postulated fire.

FIRE ENDURANCE CAPABILITY

NRC Qualification Requirements and Guidance for Fire Barriers

Section 50.48 of 10 CFR requires that each operating nuclear power plant have a fire protection plan that satisfies General Design Criterion (GDC) 3. GDC 3 requires that structures, systems, and components important to safety be

designed and located to minimize, in a manner consistent with other safety requirements, the probability and effects of fires. Fire protection features required to satisfy GDC 3 include features to ensure that one train of those systems necessary to achieve and maintain shutdown conditions be maintained free of fire damage. One means of complying with this requirement is to separate one safe shutdown train from its redundant train with a fire-rated barrier. The level of fire resistance required of the barrier, 1-hour or 3-hours, depends on the other fire protection features in the fire area.

The NRC issued guidance on acceptable methods of satisfying the regulatory requirements of GDC 3 in Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants;" Appendix A to BTP APCSB 9.5-1; BTP Chemical Engineering Branch (CMEB) 9.5-1, "Fire Protection for Nuclear Power Plants;" and GL 86-10. In the BTPs and in GL 86-10, the staff stated that the fire resistance ratings of fire barriers should be established in accordance with NFPA Standard 251, "Standard Methods of Fire Tests of Building Construction and Materials," by subjecting a test specimen that represents the materials, workmanship, method of assembly, dimensions, and configuration for which a fire rating is desired to a "standard fire exposure.[1]"

Some licensees have used the acceptance criteria of ANI Bulletin No. 5(79), to evaluate the performance of their fire barrier systems. The ANI test methodology, which ANI issued for insurance purposes only, requires that cables within the fire barrier test specimen be monitored for circuit integrity while the test specimen is subjected to a test fire that follows the standard time-temperature curve specified in American Society of Testing and Materials (ASTM) Standard E-119, "Standard Methods of Fire Tests of Building Construction and Materials," and to a hose stream test. Under this criterion, the fire barrier system is evaluated by monitoring the capability of the cables inside the fire barrier to pass a low voltage circuit integrity test. During the fire and hose stream tests, if cable circuit integrity is maintained, the tests are considered successful. The ANI test methodology does not specify the following GL 86-10 acceptance criteria:

(1) The fire barrier design has withstood the fire endurance test without the passage of flame or the ignition of cotton waste on the unexposed side for a period of time equivalent to the fire-resistance rating required of the barrier.

(2) Analysis of temperature levels recorded on the unexposed side of the fire barrier demonstrates that the maximum temperature rise does not exceed 139 °C [250 °F] above ambient temperature.[2]

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[1] American Society for Testing and Materials Standard E-119 was adopted by NFPA as NFPA Standard 251.

[2] The 163 °C [325 °F] temperature condition was established by allowing the temperature of the unexposed side of the fire barrier to rise 139 °C [250 °F] above the assumed 24°C [75°F] ambient air temperature, as measured by the

3) The fire barrier remains intact and does not allow water to be projected beyond the unexposed surface during the hose stream test.

Enclosure 1, "Interpretations of Appendix R," to GL 86-10, provided additional guidance with respect to the term "free of fire damage" as used in Appendix R. Interpretation 3, "Fire Damage," stated: "In promulgating Appendix R, the Commission has provided methods acceptable for assuring that necessary structures, systems, and components are free from fire damage (see Section III.G.2a, b, and c), that is, the structure, system or component under consideration is capable of performing its intended function during and after the postulated fire, as needed."

The review guidance provided in Enclosure 1 (1) clarifies the applicability of the test acceptance criteria stated in GL 86-10 to raceway fire barrier systems, (2) specifies a set of fire endurance test acceptance criteria which are acceptable for demonstrating that fire barrier systems can perform the required fire-resistive function and maintain the protected safe shutdown train free of fire damage, (3) specifies acceptable options for hose stream testing, and (4) specifies acceptable criteria for functionality testing of cables when a deviation is necessary, such as when the fire barrier temperature rise criteria are exceeded or the test specimen cables sustain visible damage.

The test methods and acceptance criteria specified in Enclosure 1 are acceptable for determining the adequacy of fire barrier systems proposed by licensees or applicants in the future to satisfy NRC fire protection rules and regulations. Applicants or licensees may propose alternative test methods and acceptance criteria to demonstrate an equivalent level of protection; the staff will review such proposals on a case-by-case basis. Enclosure 2 is a summary comparison of this review guidance against the GL 86-10 acceptance criteria.

Evaluation and Application of Fire Endurance and Functionality Test Results

The fire endurance qualification test is successful for a raceway fire barrier if the following conditions are satisfied (see Enclosure 3, "Fire Barrier Testing Acceptance Criteria/Logic Diagram"):

(1) The average internal temperature of the fire barrier system, as measured on the exterior surface of the raceway or component, did not rise more than 139 °C [250 °F] above its initial temperature; and

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thermocouples within the test specimen at the onset of the fire exposure, during the fire test.

(2) When cables or components are included in the test specimen, a visual inspection of the protected cables or components revealed no signs of degraded conditions[3] from the thermal effects[4] of the fire exposure; and

(3) The fire barrier system remained intact during the fire exposure and hose stream tests without developing any openings through which the protected component, raceway, or cables are visible.

For raceway fire barrier systems, the staff adopted the hose stream testing methodology specified in NUREG-0800, "Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 9.5.1, "Guidelines for Fire Protection for Nuclear Power Plants," Revision 2, July 1981, Position 5.a. This SRP position established the acceptability of using the fog nozzle method for hose stream testing of fire barrier penetration seals. The fog nozzle hose stream test method is an acceptable option for tests of the entire raceway fire barrier system under the new staff position.

Licensees that propose to use fire endurance test results that deviate from the acceptance criteria as the bases for qualifying and installing fire barrier configurations, should request a deviation from the acceptance criteria based on a engineering evaluation acceptable to the staff, such as demonstrating cable functionality. For those licensees required to comply with Section III.G to Appendix R, the engineering evaluation justifying the deviating conditions should be submitted with the exemption request. The review guidance provided in Enclosure 1 provides specific guidance for demonstrating cable functionality, including subjecting the cables to Megger and high-potential tests. The results of these tests can be used to determine the insulation-resistance characteristics of the thermally damaged cable and to determine if the cable insulation would have been sufficient to maintain circuit functionality during and after the fire exposure.

IMPLEMENTATION

This section describes how the NRC plans to use the review guidance contained in Enclosure 1. After this supplement to GL 86-10 is issued, except in those cases in which an applicant or licensee has proposed an acceptable alternative fire endurance test method and acceptance criteria that demonstrates an equivalent level of fire protection, the NRC will use the methods and the

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[3] Examples of thermal degradation of cable jacket and insulation materials are: swollen, split, cracked, blistered, melted, or discolored jacket; exposed shield; exposed, degraded, or discolored conductor insulation; and exposed copper conductor.

[4] When the temperature criterion is exceeded or damage occurs, operability at the temperature conditions experienced during the fire test must be assessed. That is, fire endurance tests that are judged acceptable on the basis of a visual inspection of certain components or cables may not be applied to other components or cables without a specific evaluation.

criteria specified in the enclosed review guidance to (1) evaluate fire endurance testing programs proposed by licensees or applicants in the future for demonstrating compliance with pertinent NRC fire protection rules and regulations and (2) review the adequacy of the fire barrier systems proposed in the future by applicants or licensees.

ACTIONS REQUESTED

None.

REPORTING REQUIREMENTS

None.

BACKFIT DISCUSSION

The guidance transmitted by this generic letter supplement will be used by the staff for review and evaluation of the adequacy of fire barrier systems and fire endurance tests that may be proposed in the future to satisfy NRC fire protection rules and regulations. This guidance refines and clarifies the guidance specified in Generic Letter 86-10 for application in that future review context; specifically it (1) clarifies the applicability of the test acceptance criteria stated in GL 86-10 to raceway fire barrier systems, (2) specifies a set of fire endurance test acceptance criteria which are acceptable for demonstrating that fire barrier systems can serve the required fire-resistive function and maintain the protected safe shutdown train free of fire damage, (3) contains acceptable options for hose stream testing, and (4) specifies acceptable criteria for functionality testing of cables when a deviation would be necessary, such as if the fire barrier temperature rise criteria are exceeded or the cable sustains visible damage.

No generic or plant-specific backfitting is intended or approved at this time in connection with issuance of this review guidance. The staff may consider the need for further generic action in that regard, if the industry guidance currently under development for addressing the pertinent fire protection issues is substantively inconsistent with this staff review guidance; but such action would be separately justified in accordance with the criteria of 10 CFR 50.109 and existing NRC backfit procedures. Similarly, if plant-specific backfits are proposed by the NRC staff consistent with this review guidance, the proposed backfits would be justified on a case-by-case basis in accordance with the criteria of 10 CFR 50.109 and existing NRC backfit procedures.

If you have any questions about this matter, please contact one of the contacts listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

Sincerely,

Luis A. Reyes
Acting Associate Director for Projects
Office of Nuclear Reactor Regulation

Enclosures:
1. NRC Staff Review Guidance and Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used To Separate Redundant Safe Shutdown Trains Within the Same Fire Area.
2. Comparison of Staff Position on Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used To Separate Redundant Safe Shutdown Trains Within the Same Fire Area to the Acceptance Criteria of GL 86-10.
3. NRC Fire Testing Acceptance Criteria Logic Diagram.
4. List of Recently Issued Generic Letters

Technical contact: Patrick M. Madden, NRR
(301) 504-2854

Lead Project Manager: Marsha K. Gamberoni, NRR
(301) 504-3024

FIRE ENDURANCE TEST ACCEPTANCE CRITERIA FOR
FIRE BARRIER SYSTEMS USED TO SEPARATE REDUNDANT SAFE SHUTDOWN TRAINS
WITHIN THE SAME FIRE AREA

I. BACKGROUND

In 1975, the Browns Ferry Nuclear power plant experienced a serious electrical cable tray fire. This fire had a significant impact on operator response to tne event from a safety perspective. The fire caused spurious instrumentation indications and affected the control of several safety systems. As a result of this fire, the NRC issued the following fire protection guidelines and regulations concerning fire protection programs at nuclear power plants:

May 1, 1976	Branch Technical Position (APCSB) 9.5-1, "Fire Protection Program."
February 24, 1977	Appendix A to Branch Technical Position APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976."
February 19, 1981	10 CFR 50.48, "Fire Protection."
February 19, 1981	Appendix R to 10 CFR Part 50, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1979."
July 1981	NUREG-0800, Standard Review Plan (SRP), 9.5.1, "Fire Protection for Nuclear Power Plants."

In addition to the above fire protection guidance and regulations, the NRC, in an effort to clarify its fire protection requirements to the industry, issued Generic Letter (GL) 81-12, "Fire Protection Rule (45 FR 76602, November 19, 1980)," February 20, 1981; GL 83-33, "NRC Position on Certain Requirements of Appendix R to 10 CFR 50," October 19, 1983; and GL 86-10. "Implementation of Fire Protection Requirements," April 24, 1986. GL 86-10, which took precedence over previous staff guidance, provided staff interpretations to Appendix R and answers to industry questions regarding the implementation of Appendix R. The NRC, in an effort to give the licensees flexibility to make changes to its plant specific fire protection program, issued GL 88-12, "Removal of Fire Protection Requirements From Technical Specifications," August 2, 1988. Through the implementation and the adoption of a standard license condition, a licensee can make changes which do not adversely affect the ability to achieve and maintain post-fire safe shutdown to its fire protection program in accordance with 10 CFR 50.59.

The aforementioned NRC documents provided NRC staff guidance concerning fire barriers separating plant fire areas, including the fire resistance (endurance) ratings for the barriers and the qualification tests that establish their fire resistance ratings. In addition, the documents provided

guidance on combustibility of structural materials and tests for demonstrating low flame spread properties.

The following sections of this document provide the objective for providing safe shutdown related fire barriers in nuclear power plants, definition of fire protection terms related to fire barriers, and the NRC fire endurance test acceptance criteria for fire barriers used to separate safe shutdown functions within the same fire area.

II. OBJECTIVE OF FIRE BARRIERS USED TO SEPARATE SAFE SHUTDOWN FUNCTIONS WITHIN THE SAME FIRE AREA

Fire rated barriers are used in nuclear power plants to provide fire area separation between redundant safety-related components and safe shutdown functions. They provide fire resistance protection, as required by Appendix R[5], to one safe shutdown train in those fire areas which contain both trains. The objective of the safe shutdown related Appendix R fire barrier is to ensure that a safe shutdown train is conservatively protected from fire-related thermal damage. The necessity for these fire barriers has been verified by multiple probabilistic risk assessments (PRAs). These PRAs indicated that, even with fire barriers installed, fires are a major contributor to core melt probabilities.

It is the position of the NRC that fire endurance ratings of building construction and materials are demonstrated by testing fire barrier assemblies in accordance with the provisions of the applicable sections of NFPA 251, "Standard Methods of Fire Tests of Building Construction and Materials," and ASTM E-119, "Fire Test of Building Construction and Materials." Assemblies that pass specified acceptance criteria (e.g., standard time-temperature fire endurance exposure, unexposed side temperature rise, and hose stream impingement) are considered to have a specific fire resistance rating.

Enclosure 1 to GL 86-10, "Interpretations of Appendix R," provided additional guidance with respect to the term "free from fire damage." Interpretation 3, "Fire Damage," states, "In promulgating Appendix R, the Commission has provided methods acceptable for assuring that necessary structures, systems, and components are free from fire damage (see Section III.G.2a, b, and c), that is, the structure, system or component under consideration is capable of performing its intended function during and after the postulated fire, as needed."

GL 86-10, Response 3.2.1, also stated that, "The resulting 325 °F cold side temperature criterion is used for cable tray wraps because they perform a fire barrier function to preserve the cables free from fire damage. It is clear that cable that begins to degrade at 450 °F is free from fire damage at 325 °F." (Emphasis added.) In addition, the staff response stated that, "for newly identified conduit and cable trays requiring such wrapping new materials

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[5] For advanced reactor designs, redundant safe shutdown functions are required to be located in separate 3-hour fire areas.

which meet the 325 °F criterion should be used, or justification should be provided for the use of material which does not meet the 325 °F criterion. This may be based on an analysis demonstrating that the maximum recorded temperature is sufficiently below the cable insulation ignition temperature." (Emphasis added.)

The basic premise of the NRC fire resistance criteria is that fire barriers which do not exceed 163 °C [325 °F] cold side temperature[6] and pass the hose stream test provide adequate assurance that the shutdown capability is protected without further analyses. If the temperature criteria is exceeded, sufficient additional information is needed to perform an engineering evaluation to demonstrate that the shutdown capability is protected.

III. DEFINITIONS

In order to support the understanding of the technical terms used throughout this document, the following definitions are provided.

Combustible Material - Material that does not meet the definition of non-combustible.

Fire Barrier - Those components of construction (walls, floors and their supports), including beams, joists, columns, penetration seals or closures, fire doors, and fire dampers that are rated by approving laboratories in hour of resistance to fire and are used to prevent the spread of fire.

Fire Resistance Rating - The time that materials of a test assembly have withstood a standard ASTM E-119 fire exposure and have successfully met the established test acceptance criteria (fire barrier test acceptance criteria refer to Sections IV, V, and VI).

Noncombustible Material - (a) Material which, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat; (b) Material having a structural base of noncombustible material, with a surfacing not over 1/8-inch thick that has a flame spread rating of not higher than 50 when measured in accordance with ASTM E-84, "Surface Burning Characteristics of Building Materials." (There is an exception to this definition as defined by BTP Appendix A, Position D.1.d. This position allows the use of combustible interior finishes when listed by a nationally recognized test laboratory, such as Factory Mutual or Underwriters Laboratories, Incorporated, for a flame spread, smoke and fuel contribution of 25 or less in its use configuration.)

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[6] The 163 °C [325 °F] temperature condition was established by allowing the temperature of the unexposed side of the fire barrier to rise 139 °C [250 °F] above the assumed 24 °C [75 °F] ambient air temperature, as measured by t thermocouples within the test specimen at the onset of the fire exposure dur the fire test.

Raceway - Cable trays, conduits, junction boxes, and other components used to support and route cables from circuit termination to circuit termination.

Raceway Fire Barrier - Nonload bearing partition type envelope system installed around electrical components and cabling that are rated by test laboratories in hours of fire resistance and are used to maintain safe shutdown functions free of fire damage.

IV. FIRE ENDURANCE TEST ACCEPTANCE CRITERIA FOR FIRE BARRIER WALLS, FLOORS, CEILINGS, AND FREE STANDING EQUIPMENT ENCLOSURES USED TO SEPARATE SAFE SHUTDOWN FUNCTIONS WITHIN THE SAME FIRE AREA

To demonstrate the adequacy of fire barrier walls, floors, ceilings, and enclosures, barrier designs should be verified by fire endurance testing. NRC fire protection guidance refers to the guidance of NFPA 251 and ASTM E-119 as acceptable test methods for demonstrating fire endurance performance.

The fire endurance test acceptance criteria for the subject fire barriers are:

The fire barrier design has withstood the fire endurance test without the passage of flame or the ignition of cotton waste on the unexposed side for a period of time equivalent to the fire resistance rating required of the barrier;

The temperature levels recorded on the unexposed side of the fire barrier are analyzed and demonstrable that the maximum temperature does not exceed 139 °C [250 °F] above ambient; and

The fire barrier remains intact and does not allow projection of water beyond the unexposed surface during the hose stream test. (For acceptable hose stream test methods and time of application - See Section VII.)

If the above criteria are met for fire barrier walls, floors, ceilings, and free standing equipment enclosures separating safe shutdown functions within the same fire area, the barrier is acceptable.

NRC fire protection guidance also ensures that door and ventilation openings and penetrations are properly protected. The guidance requires that these openings be protected with fire doors and fire dampers which have been fire tested and listed by a nationally recognized test laboratory (e.g., Factory Mutual or Underwriters Laboratories, Incorporated). In addition, the construction and installation techniques for door and ventilation openings and other penetrations through these fire barriers should be qualified by fire endurance tests.

The guidance of NFPA 251 and ASTM E-119 should be consulted with regard to construction, materials, workmanship, and details such as dimensions of parts, and the size of the specimen(s) to be tested. In addition, NFPA 251 and ASTM E-119 should be consulted with regard to the placement of thermocouples on the specimen.

V. FIRE ENDURANCE TEST ACCEPTANCE CRITERIA FOR ELECTRICAL RACEWAY AND COMPONENT FIRE BARRIER SYSTEMS FOR SEPARATING SAFE SHUTDOWN FUNCTIONS WITHIN THE SAME FIRE AREA

The NRC provided guidance in Appendix A to Branch Technical Position 9.5-1, Position D.3.(d), for cable tray fire barriers. This fire protection guidance states that the design of fire barriers for horizontal and vertical cable trays should, as a minimum, meet the requirements of ASTM E-119, "Fire Test of Building Construction and Materials," including hose stream test. On November 19, 1980, the NRC issued Appendix R to 10 CFR Part 50. The technical basis for Section III.M, "Fire Barrier Penetration Seal Qualification," states that "Fire barriers are 'rated' for fire resistance by being exposed to a 'standard test fire.' This standard test fire is defined by the American Society of Testing and Materials in ASTM E-119." In addition, this technical basis stated that "[i]f specific plant conditions preclude the installation of a 3-hour fire barrier to separate the redundant trains, a 1-hour fire barrier and automatic fire suppression and detection system for each redundant train will be considered the equivalent of a 3-hour barrier." Appendix R to 10 CFR Part 50, Section III.G, "Fire protection of safe shutdown capability," provides what the NRC views as equivalent means for ensuring that one safe shutdown train remains free of fire damage.

In 1984 Appendix R workshops held with industry, and later in GL 86-10, the staff provided guidance related to fire barrier designs for raceways. In Enclosure 2, "Question and Answers," to this GL, Question 3.2.1., "Acceptance Criteria," the staff provided guidance on the cold side temperature for fire barrier cable tray wraps. In response to this question the staff stated that the acceptance criteria contained in Chapter 7 of NFPA 251, "Standard Methods of Fire Tests of Building Construction and Materials," pertaining to non-bearing fire barriers was applicable to cable tray fire barrier wraps. Chapter 5 of NFPA 251 explains the conduct of the fire test.

The following is the NFPA 251 acceptance criteria:

- The wall or partition withstood the fire endurance test without the passage of flame or gases hot enough to ignite cotton waste, for a period equal to that for which classification is desired;

- The wall or partition withstood the fire and hose stream tests specified in Chapter 5, without the passage of flame, gases hot enough to ignite cotton waste, or the hose stream. The assembly failed the hose stream test if an opening develops that permits the projection of water from the stream beyond the unexposed surface during the hose stream test; and

- Transmission of heat through the wall or partition during the fire endurance test did not raise the temperature on the unexposed surfaces more than 139 °C [250 °F] above their initial temperatures.

The staff considers the fire endurance qualification test for fire barrier materials applied directly to a raceway or component to be successful if the following conditions are met:

- The average unexposed side temperature of the fire barrier system, as measured on the exterior surface of the raceway or component, did not exceed 139 °C [250 °F] above its initial temperature; and

  (Staff Guidance: NFPA 251 and ASTM E-119 allow this temperature to be determined by averaging thermocouple temperature readings. For the purposes of this criterion, thermocouple averaging can be used provided similar series of thermocouples (e.g., cable tray side rail) are averaged together to determine temperature performance of the raceway fire barrier system. In addition, conditions of acceptance are placed on the temperatures measured by a single thermocouple. If any single thermocouple exceeds 30 percent of the maximum allowable temperature rise (i.e., 139 °C + 42 °C = 181 °F [250 °F + 75 °F = 325 °F]), the test exceeded the temperature criteria limit.)

- Irrespective of the unexposed side temperature rise during the fire test, if cables or components are included in the fire barrier test specimen, a visual inspection should be performed.[7] Cables should not show signs of degraded conditions[8] resulting from the thermal affects of the fire exposure; and

  (Staff Guidance: For those cases where signs of thermal degradation are present, the fire barrier did not perform its intended fire-resistive function. For those barriers which are not capable of performing their intended function, a deviation based on demonstrating that the functionality of thermally degraded cables or component was maintained and that the cables or component would have adequately performed their intended function during and after a postulated fire exposure may be granted. The attachment to this position provides a methodology for demonstrating the functionality of cables during and after a fire test exposure. The purpose of the functionality tests is to justify observed deviations in fire barrier performance. For those fire barrier test specimens that are tested without cables,

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[7] When the temperature criteria are exceeded or damage occurs, component operability at the temperatures experienced during the fire test should be assessed. Fire endurance tests that are judged acceptable on the basis of a visual inspection of specific components or cables included in the test specimen may not be applied to other components or cables without a specific evaluation.

[8] Examples of thermal cable degradation are: jacket swelling, splitting, cracking, blistered, melted, or discoloration; shield exposed; conductor insulation exposed, degraded, or discolored; bare copper conductor exposed.

an engineering analysis justifying internal fire barrier temperature conditions greater than allowed can be based on a comparison of the fire barrier internal temperature profile measured during the fire endurance test to existing cable specific performance data, such as environmental qualification (EQ) tests.)

The cable tray, raceway, or component fire barrier system remained intact during the fire exposure and water hose stream test without developing any openings through which the cable tray, raceway, or component (e.g., cables) is visible. Section VII identifies acceptable hose stream test methods.

The test specimen should be representative of the construction for which the fire rating is desired as to materials, workmanship, and details such as dimensions of parts, and should be built under representative conditions. Raceway fire barrier systems being subjected to qualification fire endurance tests should be representative of the end use. For example, if it is intended to install a cable tray fire barrier system in the plant without protecting the cable tray supports, then the test program should duplicate these field conditions. In addition, the fire test program should encompass or bound raceway sizes and the various configurations for those fire barrier systems installed in the plant. It should be noted that several test specimens will be required in order to qualify various sizes of horizontal and vertical runs of cable trays and conduits, junction boxes and pull boxes, etc. The cable tray or raceway design used for the tests should be constructed with materials and configurations representative of in plant conditions (e.g., the mass associated with typical steel conduits and cable trays, representative internal and external penetration seals). If cables are included in the raceway fire barrier test specimen, these cables should be representative of the installed plant-specific cables.

Measuring cable temperatures is not a reliable means for determining excessive temperature conditions which may occur at any point along the length of the cable during the fire test. In lieu of measuring the unexposed surface temperature of the fire barrier test specimen, methods which will measure the surface temperature of the raceway (e.g., exterior of the conduit, side rails of cable trays, bottom and top of cable tray surfaces, junction box external surfaces) can be considered as equivalent if the raceway components used to construct the fire test specimen represent plant specific components and configurations. The metal surfaces of the raceway, under fire test conditions, exhibit good thermal conductivity properties. Temperatures measured on these surfaces provide a indication of the actual temperature rise within the fire barrier system.

In 1979, American Nuclear Insurers (ANI) issued a fire endurance test method for raceway fire barrier systems for insurance purposes. This method, "Fire Endurance Protective Envelope Systems for Class 1E Electrical Circuits," specified that cable temperatures be monitored by thermocouples. Industry considers this the proper location for determining the temperature rise within the raceway fire barrier system. Since cable jackets have a low thermal

conductivity, the actual local temperatures of the cable jackets indications of barrier failure and internal fire barrier temperature rise conditions during the fire exposure are masked. Monitoring cable temperatures can give indications of low internal fire barrier temperature conditions during the fire endurance test. Using this temperature monitoring approach, cable damage can occur without indication of excessive temperatures on the cables. This, linked with no loss of circuit integrity, would give indications of a successful test. The staff considers monitoring the cable temperature as the primary means of determining cable tray or raceway fire barrier performance to be nonconservative. Therefore, the staff has incorporated the provision for a post-fire visual inspection of cables that are installed in fire barrier test specimens. As discussed above, temperatures monitored on the exterior surface of the raceway provide a more representative indication of fire barrier performance.

Fire endurance tests of raceway fire barrier systems should be without cables. This method is preferred because by excluding cables from the test specimen it eliminates bias in the test results created by the thermal mass of the cables. Without this thermal mass, the internal temperature conditions measured by the test specimen thermocouples during the fire exposure will provide a more accurate determination of fire barrier thermal performance.

Thermocouple Placement - Test Specimens Containing Cables

The following are acceptable placements of thermocouples for determining the thermal performance of raceway or cable tray fire barrier systems that contain cables during the fire exposure:

Conduits - The temperature rise on the unexposed surface of a fire barrier system installed on a conduit should be measured by placing the thermocouples every 152 mm [6 inches][9] on the exterior conduit surface underneath the fire barrier material. The thermocouples should be attached to the exterior conduit surface located opposite the test deck and closest to the furnace fire source. Thermocouples should also be placed immediately adjacent to all structural members, supports, and barrier penetrations.

Cable Trays - The temperature rise on the unexposed surface of a fire barrier system installed on a cable tray should be measured by placing the thermocouples on the exterior surface of the tray side rails between the cable tray side rail and the fire barrier material. In addition to placing thermocouples on the side rails, thermocouples should be attached to two AWG 8 stranded bare copper conductors. The first copper conductor should be installed on the bottom of the cable tray rungs along the entire length and down the longitudinal center of the cable tray run. The second conductor should be installed along the outer top

[9] For the thermocouples installed on conduits, cable tray side rails, and bare copper conductors, a ±13 mm [±½ inch] installation tolerance is acceptable.

surface of the cables closest to the top and towards the center of the fire barrier. The bare copper wire is more responsive than cable jackets to temperature rise within the fire barrier enclosure. The temperature changes measured along the bare copper conductors provide indication of joint failure or material burn through conditions. Thermocouples should be placed every 152 mm [6 inches] down the longitudinal center along the outside surface of the cable tray side rails and along the bare copper conductors. Thermocouples should also be placed immediately adjacent to all structural members, supports, and barrier penetrations.

Junction Boxes (JB) - The temperature rise on the unexposed surface of a fire barrier system installed on junction boxes should be measured by placing thermocouples on either the inside or the outside of each JB surface. Each JB surface or face should have a minimum of one thermocouple, located at its geometric center. In addition, one thermocouple should be installed for every one square foot of JB surface area. These thermocouples should be located at the geometric centers of the one square foot areas. At least one thermocouple should also be placed within 25 mm [1 inch] of each penetration connector/interface.

Airdrops - The internal airdrop temperatures should be measured by thermocouples placed every 305 mm [12 inches] on the cables routed within the air drop and by a stranded AWG 8 bare copper conductor routed inside and along the entire length of the airdrop system with thermocouples installed every 152 mm [6 inches] along the length of the copper conductor. The copper conductor should be in close proximity with the unexposed surface of the fire barrier material. Thermocouples should also be placed immediately adjacent to all supports and barrier penetrations.

With the exception of airdrops, the installation of thermocouples on cables is optional and is left to the discretion of the licensee, test sponsor, or test laboratory. Cable thermocouples are to be used for engineering purposes only. Cable thermocouples alone are not acceptable for the demonstration of fire barrier performance. However, cable thermocouples may support fire barrier deviation conditions.

Temperature conditions on the unexposed surface of the fire barrier material during the fire test will be determined by averaging the temperatures measured by the thermocouples. In determining these cable tray or raceway temperature conditions, the thermocouples measuring similar fire barrier areas of performance should be averaged together and the basis of acceptance will be based on the individual averages. The following method of averaging should be followed:

Conduits - The thermocouples applied to the outside metal surface of the conduit should be averaged together.

Cable Trays - The thermocouples on each cable tray side rail should be averaged separately. For example, thermocouples placed on one side rail

will be averaged separately from the other side rail. In addition, the temperature conditions measured by thermocouples on the two bare copper conductors should be averaged separately.

Junction Boxes - For small JBs which have only one thermocouple placed on each JB surface, the individual JB surface thermocouples should be averaged together. For larger JBs which have more that one thermocouple placed on each JB surface, the thermocouples on the individual JB surfaces should be averaged together.

Airdrops - The thermocouples placed on the outer cable(s) routed in the airdrop fire barrier should be averaged together.

The averages of any thermocouple group during the fire test should not exceed 139 °C [250 °F] above the unexposed side temperature within the fire barrier test specimen at the onset of the fire endurance test. In addition, the temperature of each individual thermocouple will be evaluated. Individual thermocouple conditions should not exceed the 139 °C [250 °F] temperature rise by more than 30 percent.

Thermocouple Placement - Test Specimens Without Cables

The following are acceptable thermocouple placements for determining the thermal performance of raceway or cable tray fire barrier systems that do not contain cables:

Conduits - The temperature rise of the unexposed surface of a fire barrier system installed on a conduit should be measured by placing thermocouples every 152 mm [6 inches] on the exterior conduit surface between the conduit and the unexposed surface of the fire barrier material. These thermocouples should be attached to the exterior conduit surface opposite of the test deck and closest to the furnace fire source. The internal raceway temperatures should be measured by a stranded AWG 8 bare copper conductor routed through the entire length of the conduit system with thermocouples installed every 152 mm [6 inches] along the length of the copper conductor. Thermocouples should also be placed immediately adjacent to all structural members, supports, and barrier penetrations.

Cable Trays - The temperature rise on the unexposed surface of a fire barrier system installed on a cable tray should be measured by placing thermocouples every 152 mm [6 inches] on the exterior surface of each tray side rails between the side rail and the fire barrier material. Internal raceway temperatures should be measured by a stranded AWG 8 bare copper conductor routed on the top of the cable tray rungs along the entire length and down the longitudinal center of the cable tray run with thermocouples installed every 152 mm [6 inches] along the length of the copper conductor. Thermocouples should be placed immediately adjacent to all structural members, supports, and barrier penetrations.

Junction Boxes - The temperature rise on the unexposed surface of a fire barrier system installed on junction boxes should be measured by placing thermocouples on either the inside or the outside of each JB surface. Each JB surface or face should have a minimum of one thermocouple, located at its geometric center. In addition, one thermocouple should be installed for every one square foot of JB surface area. These thermocouples should be located at the geometric centers of the one square foot areas. At least one thermocouple should also be placed within 25 mm [1 inch] of each penetration connector/interface.

Airdrops - The internal airdrop temperatures should be measured by a stranded AWG 8 bare copper conductor routed inside and along the entire length of the airdrop system with thermocouples installed every 152 mm [6 inches] along the length of the copper conductor. The copper conductor should be in close proximity with the unexposed surface of the fire barrier material. Thermocouples should also be placed immediately adjacent to all supports and penetrations.

Temperature conditions on the unexposed surfaces of the fire barrier material during the fire test will be determined by averaging the temperatures measured by the thermocouples installed in or on the raceway. In determining these temperature conditions, the thermocouples measuring similar areas of the fire barrier should be averaged together. Acceptance will be based on the individual averages. The following method of averaging should be followed:

Conduits - The thermocouples applied to the outside metal surface of the conduit should averaged together.

Cable Trays - The thermocouples on each cable tray side rail should be averaged separately. For example, thermocouple placed on one side rail will be averaged separately from the other side rail. In addition, the temperature conditions measured by thermocouples on the bare copper conductor should be averaged separately from the side rails.

Junction Boxes - For JBs that have only one thermocouple on each JB surface, the individual JB surface thermocouples should be averaged together. For JBs that have more that one thermocouple on each JB surface, the thermocouples on the individual JB surfaces should be averaged together.

Airdrops - The thermocouples placed on the copper conductor within the airdrop fire barrier should be averaged together.

The average of any thermocouple group should not exceed 139 °C [250 °F] above the unexposed side temperature within the fire barrier test specimen at the onset of the fire endurance test. In addition, the temperature of each individual thermocouple will be evaluated. Individual thermocouple conditions should not exceed the 139 °C [250 °F] temperature rise by more than 30 percent.

a fire barrier test specimen without cables does not meet the average or maximum single point temperature criteria, then the internal raceway temperature profile as measured by the instrumented bare copper conductors during the fire exposure can be used to assess cable functionality through air oven tests of plant specific cable types and construction.

VI. HOSE STREAM TESTS

NFPA 251 and ASTM E-119 allow flexibility in hose stream testing. The standards allow the hose stream test to be performed on a duplicate test specimen subjected to a fire endurance test for a period equal to one-half of that indicated as the fire resistance rating, but not for more than 1 hour (e.g., 30 minute fire exposure to qualify a 1-hour fire rated barrier).

For safe shutdown related fire barrier systems referenced in Section IV and duplicate electrical cable tray or raceway and component fire barrier test specimens that have been exposed to the ½-duration test fire exposure, the staff finds the hose stream application specified by the NFPA 251 acceptable. NFPA 251 requires the stream of water to be delivered through a 6.4 cm [2½-inch] hose discharging through a standard 2.9 cm [1⅛-inch] playpipe nozzle onto the test specimen after the fire exposure test. The stream is applied with the nozzle orifice positioned 6.1 meters [20 feet] away from the center of the test specimen at a pressure of 207 kPa [30 psi]. The application of the stream is to all exposed parts of the specimen for a minimum duration of 1 minute for a 1-hour barrier and 2½ minutes for a 3-hour barrier.

As an alternate for electrical raceway fire barrier test specimens, the application of the hose stream test can be performed immediately after the completion of the full fire endurance test period. If this method is used to satisfy the hose stream test criteria, the following hose stream applications are acceptable:

- The stream applied at random to all exposed surfaces of the test specimen through a 6.4 cm [2½-inch] national standard playpipe with a 2.9 cm [1⅛-inch] orifice at a pressure of 207 kPa [30 psi] at a distance of 6.1 meters [20 feet] from the specimen. (Duration of the hose stream application - 1 minute for a 1-hour barrier and 2½ minutes for a 3-hour barrier); or

- The stream applied at random to all exposed surfaces of the test specimen through a 3.8 cm [1½-inch] fog nozzle set at a discharge angle of 30 degrees with a nozzle pressure of 517 kPa [75 psi] and a minimum discharge of 284 lpm [75 gpm] with the tip of the nozzle at a maximum of 1.5 meters [5 feet] from the test specimen. (Duration of the hose stream application - 5 minutes for both 1-hour and 3-hour barriers); or

- The stream applied at random to all exposed surfaces of the test specimen through 3.8 cm [1½-inch] fog nozzle set at a discharge angle of 15 degrees with a nozzle pressure of 517 kPa [75 psi] and

a minimum discharge of 284 lpm [75 gpm] with the tip of the nozzle at a maximum of 3 meters [10 feet] from the test specimen. (Duration of the hose stream application - 5 minutes for both 1-hour and 3-hour barriers.)

VII. FIRE BARRIER COMBUSTIBILITY

The NRC's fire protection guidelines and requirements establish the need for each nuclear power plant to perform a plant-specific fire hazard analysis. The fire hazard analysis should consider the potential for in-situ and transient fire hazards and combustibles. With respect to building materials (e.g., cable insulation and jackets, plastics, thermal insulation, fire barrier materials), the combustibility, ease of ignition, and flame spread over the surface of a material should be considered by the fire hazards analysis. One method of determining combustibility is by subjecting a sample of the fire barrier material to a small scale vertical tube furnace as described by ASTM E-136. The flashover ignition temperature of the material (as determined by ASTM D-1929) and the flame spread characteristics of the material (as determined by ASTM E-84) should also be evaluated. The potential heat release of the material (as determined by ASTM D-3286 or NFPA 259), should also be factored into the fire hazards analysis.

Fire barrier materials used as radiant energy heat shields inside containment and used to achieve a combustible free zone are required to be noncombustible as defined in Section III.

VIII. REFERENCES

<u>U.S. Nuclear Regulatory Commission</u>

May 1, 1976 Branch Technical Position (APCSB) 9.5-1, "Fire Protection Program."

February 24, 1977 Appendix A to the Branch Technical Position APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976."

February 19, 1981 10 CFR 50.48, "Fire protection."

February 19, 1981 Appendix R to 10 CFR Part 50, "Fire Protection for Nuclear Power Plants."

February 20, 1981 Generic Letter 81-12, "Staff Position - Safe Shutdown Capability."

July 1981 NUREG - 0800, Standard Review Plan, 9.5.1, "Fire Protection for Nuclear Power Plants."

October 19, 1983 Generic Letter 83-33, "NRC Positions on Certain Requirements of Appendix R to 10 CFR 50."

April 24, 1986 Generic Letter 86-10, "Implementation of Fire Protection Requirements."

American Society for Testing and Materials

ASTM E-84, "Surface Burning Characteristics of Building Materials."

ASTM E-119, "Fire Test of Building Construction and Materials."

ASTM E-136, "Behavior of Materials in a Vertical Tube Furnace at 750°C."

ASTM D-1929, "Test Method for Ignition Properties of Plastics."

ASTM D-3286, "Test Method for Gross Calorific Value of Solid Fuel by the Isothermal-Jacket Bomb Calorimeter."

American Nuclear Insurers (ANI)

July 1979, ANI Information Bulletin No. 5 (79) test criteria for "Fire Endurance Protective Envelope Systems for Class 1E Electrical Circuits."

National Fire Protection Association (NFPA)

NFPA 251, "Standard Methods of Fire Tests of Building Construction and Materials."

NFPA 259, "Standard Test Method for Potential Heat of Building Materials."

ACCEPTABLE METHODS FOR DEMONSTRATING FUNCTIONALITY OF CABLES PROTECTED BY RACEWAY FIRE BARRIER SYSTEMS DURING AND AFTER FIRE ENDURANCE TEST EXPOSURE

I. INTRODUCTION

The NRC considers fire barrier systems that meet the acceptance criteria adequate under NRC fire protection regulations. The licensee, where the criteria are not met, should submit an engineering analysis to the staff that clearly demonstrates the functionality of the protected cables. This engineering analysis should consider the cable insulation type, actual voltage and current conditions, cable function, and thermal affects on the cable and its ability to function. This evaluation should also consider cable operating temperatures within the fire barrier at the onset of the fire exposure.

II. CABLE CIRCUIT INTEGRITY TESTS

In 1979, American Nuclear Insurers (ANI) issued a fire endurance test method for raceway fire barrier systems for insurance purposes. This method, "Fire Endurance Protective Envelope Systems for Class 1E Electrical Circuits," specified a circuit integrity test. The intent of this test was to identify the onset of fire damage to the cables within the raceway fire barrier test specimen during the fire endurance test period. The circuit integrity test voltage is 8 to 10 volts DC; therefore the loss of circuit integrity under these voltage conditions may occur only as a result of a dead short or open circuit.

During fire tests of raceway fire barrier systems, thermal damage to the cables has been observed. This thermal damage has led to cable jacket and insulation degradation without the loss of circuit integrity as monitored using ANI criteria. Since cable voltages used for ANI circuit integrity tests do not replicate cable operating voltages, loss of cable insulation conditions can exist during the fire test without a dead short occurring. It is expected that if the cables were at rated power and current, a fault would propagate. The use of circuit integrity monitoring during the fire endurance test is not a valid method for demonstrating that the protected shutdown circuits are capable of performing their required function during and after the test fire exposure. Therefore, circuit integrity monitoring is not required to satisfy NRC acceptance criteria for fire barrier qualification.

III. EQUIPMENT QUALIFICATION

Comparison of the fire barrier internal time-temperature profile measured during the fire endurance test to existing cable performance data, such as data from environmental qualification (EQ) tests, could be proposed to the staff as a method for demonstrating cable functionality. EQ testing is typically performed to rigorous conditions, including rated voltage and current. By correlating the EQ test time-temperature profile to the fire test time-temperature profile, the EQ test data would provide a viable mechanism to ensure cable functionality. A large body of EQ test data for many cable types

.ists today. The use of EQ data represents a cost-effective approach for addressing cable functionality for fire tests for those cases where the 163 °C [325 °F] limit is exceeded.

The staff agrees that a comparison of fire test temperature profiles to existing EQ and Loss of Cooling Accident (LOCA) test results or air oven test results is an acceptable approach to demonstrate cable functionality provided the subject analysis incorporates the anticipated temperature rise due to self heating effects of installed power cables with the fire test results.

IV. CABLE INSULATION TESTS

The two principal materials used as cable insulation and cable jackets by the nuclear industry are thermoplastics and thermosetting polymeric materials. A thermoplastic material can be softened and resoftened by heating and reheating. Conversely, thermosetting cable insulation materials cure by chemical reaction and do not soften when heated. Under excessive heating thermosetting insulation becomes stiff and brittle. Electrical faults may be caused by softening and flowing of thermoplastic insulating materials at temperatures as low as 149 °C [300 °F]. Thermosetting electrical conductor insulation materials usually retain their electrical properties under short-term exposures to temperatures as high as 260 °C [500 °F]. Insulation resistance (Megger) tests provide indications of the condition of the cable insulation resistance, whereas the high potential (Hi-Pot) test provides assurance that the cable has sufficient dielectric strength to withstand the applied rated voltage. A cable insulation failure usually results from two breakdown modes: one failure mode is excessive dielectric loss which is due to low insulation resistance, and the other failure mode is overpotential stress which is due to loss of dielectric strength of the insulation material.

If Megger tests are not performed at frequent intervals during the fire exposure, indications of insulation damage in insulation may go undetected. When removed from elevated temperatures, insulation will reset. Megger tests of insulated cables after the fire endurance test and after the cable has sufficiently cooled may not detect degradation in the insulation resistance. Therefore, wet or dry Megger of cables after a fire exposure does not provide reasonable assurance that the cables would have functioned as intended during the fire exposure.

To provide reasonable assurance that the cables would have functioned during and after the fire exposure, Megger tests need to be performed before the fire test, at multiple time intervals during the fire exposure (i.e, every 20 minutes during the 1-hour fire test and every hour during the 3-hour fire test) for instrumentation cables only, and immediately after the fire endurance test to assess the cable insulation resistance levels. This testing will assure that the cables will maintain the insulation resistance levels necessary for proper operation of instruments.

The Megger tests (pre-fire, during the fire [if performed], and immediately after the fire test conditions) should be done conductor-to-conductor for multi-conductor and conductor-to-ground for all cables. The minimum

acceptable insulation resistance (IR) value, using the test voltage values as shown in the table below, is determined by using the following expression:

$$IR\ (\text{Mega-ohms}) \geq \frac{[[K+1]\ \text{Mega-ohm}\ ]\ *\ 1000\ (\text{ft})\ ]}{\text{Length (ft)}}$$

Where K = 1 Mega-ohm/KV * Operating Voltage (expressed in KV)

In addition, to determine the insulation resistance levels required for nuclear instrumentation cables, an assessment of the minimum insulation resistance value (e.g., one mega-ohm) and its potential impact on the functionality of these cables should be evaluated. An ac or dc high potential (Hi-Pot) test for power cables greater than 1000 volts (V) should also be performed after the post-fire Megger tests to assess the dielectric strength. This test provides assurance that the cable will withstand the applied voltage during and after a fire. The high potential test should be performed for a 5 minute duration at 60 percent of either 80 V/mil ac or 240 V/mil dc (e.g., 125 mil conductor insulation thickness x 240 V/mil dc x 0.6 = 18,000 V dc).

The table below summarizes the Megger and Hi-Pot test voltages[10] which, when applied to power, control and instrumentation cables, would constitute an acceptable cable functionality test.

TYPE	OPERATING VOLTAGE	MEGGER TEST VOLTAGE	HIGH POTENTIAL TEST VOLTAGE
Power	≥ 1000 V ac	2500 V dc	60% x 80 V/mil (ac) 60% x 240 V/mil (dc)
Power	< 1000 V ac	1500 V dc*	None
Instrument and Control	≤ 250 V dc ≤ 120 V ac	500 V dc	None

* A Megger test voltage of 1000 V dc is acceptable provided a Hi-Pot test is performed after the Megger test for power cables rated at less than 1000 V ac.

The electrical cable functionality tests recommended above are one acceptable method. Alternate methods to assess degradation of cable functionality will be evaluated by the staff for acceptability on a case-by-case basis. The above table summarizing the Megger and Hi-Pot test voltages are "typical" and the applicant can follow the applicable industry standards and manufacturer's recommendations for the specific cable application in the performance of the insulation resistance and Hi-Pot tests.

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[10] The review guidance for Megger and Hi-Pot test voltages was derived fror IEEE 383-1974, IEEE 422-1986 and IEEE 690-1984.

V. AIR OVEN TESTS

Air oven tests can be used to evaluate the functionality of cables for those cable tray or raceway fire barrier test specimens tested without cables. This testing method consists of exposing insulated wires and cables at rated voltage to elevated temperatures in a circulating air oven. The temperature profile for regulating the temperature in the air oven during this test is the temperature measured by the AWG 8 bare copper conductor during the fire exposure of those cable tray or raceway test specimen which were tested without cables.

The staff finds the test method described by UL Subject 1724, "Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems", Issue Number 2, August 1991, Appendix B, "Qualification Test for Circuit Integrity of Insulated Electrical Wires and Cables in Electrical Circuit Protection Systems", with the following modifications, acceptable:

1. During the air oven test the cables are to be energized at rated voltage. The cables are to be monitored for conductor-to-conductor faults in multi-conductor cables and conductor-to-ground faults in all conductors.

2. The cables being evaluated should be subjected to the Megger and high potential tests, recommended above in Section IV, "Cable Insulation Tests."

3. The impact force test, which simulates the force of impact imposed on the raceway by the solid stream test, described in UL 1724, Appendix B, paragraph B3.16, is not required to be performed.

VI. CABLE THERMAL EXPOSURE THRESHOLD

The following analysis, which is based on determining whether a specific insulation material will maintain electrical integrity and operability within a raceway fire barrier system during and after an external fire exposure, is an acceptable method for evaluating cable functionality. In order to determine cable functionality, it is necessary to consider the operating cable temperatures within the fire barrier system at the onset of the fire exposure and the thermal exposure threshold (TET) temperature of the cable. For example, if the TET of a specific thermoplastic cable insulation (Brand X) is 149 °C [300 °F] and the normal operating temperature within the fire barrier system is 66 °C [150 °F], then the maximum temperature rise within the fire barrier system should not exceed 83 °C [150 °F] during exposure to an external fire of a duration equal to the required fire resistance rating of the barrier. For this example the TET limit for Brand X cable is 83 °C [150 °F] above the cable operating temperatures within the fire barrier system at the onset of the external fire exposure. The cable TET limits in conjunction with a post test visual cable inspection and the Hi-Pot test described above should readily demonstrate the functionality of the cable circuit during and after a fire.

The normal cable operating temperature can be determined by loading cable specimens installed within a thermal barrier system in the test configuration with rated voltage and current. The TET temperature limits for most cable insulation may be obtained from the manufacturer's published data which is given as the short-circuit rating limit. With the known TET and normal operating temperature for each thermal barrier system configuration, the maximum temperature rise limit within a fire barrier system may then be determined.

COMPARISON OF FIRE ENDURANCE TEST CRITERIA
FOR FIRE BARRIER SYSTEMS USED TO SEPARATE
SAFE SHUTDOWN FUNCTIONS WITHIN THE SAME FIRE AREA

GL 86-10, SUPP. 1	GL 86-10	RATIONALE FOR CLARIFICATION
Temperature, as measured on the external surface of the Raceway, should not exceed 163 °C [325 °F] (Note 1). This temperature is determined by averaging temperature readings of similar series of thermocouple (e.g., cable tray side rail) (Note 2).	Temperature, as measured on the unexposed side of the fire barrier material, should not exceed 163 °C [325 °F].	Temperature - Difficult to measure a uniform temperature on the fire barrier material surface. Raceway temps provide good indication of internal temp-rise and potential barrier failure locations during the test.
Barrier Condition - Fire barrier should remain intact. No visible signs of component, raceway or cables after fire and hose stream test.	Barrier Condition - The barrier should have withstood the fire and hose stream test without the passage of flame or hot gasses hot enough to ignite cotton waste.	Barrier Condition - Cotton waste has not been used in raceway fire barrier testing as an indicator of barrier failure. Visual inspection process provides a better indication of barrier condition after the fire and hose stream test.
Hose Stream Test - solid stream test as specified in NFPA 251 on second test specimen after being subjected to a fire exposure of 1/2 duration (Note 4) or a fog stream after the full fire exposure.	Hose Stream Test - solid stream test as specified in NFPA 251.	Hose Stream Test - To reflect alternative methods found acceptable (Note 3). The use of a fog nozzle for the hose stream at the end of a full duration of the fire test provides a good method for testing erosion and cooling effects.

GL 86-10, SUPP. 1	GL 86-10	RATIONALE FOR CLARIFICATION
Cable condition - When cables are included in the test specimen, post-fire condition must be visually inspected. Cables should show no signs of degraded conditions resulting from the thermal affects of the fire exposure.	Cable condition - No consideration given to determining the material condition of the cable.	Cable condition - The objective of these fire barriers is to assure that thermal damage to protected safe shutdown cables or components does not occur.

GUIDANCE FOR ENGINEERING EVALUATIONS JUSTIFYING DEVIATIONS FROM THE FIRE BARRIER ACCEPTANCE CRITERIA

Functionality should be demonstrated if any of the preceding criteria are exceeded (Note 5). .ethods when cables are excluded from test specimen: Comparison of internal temp. profiles to EQ and LOCA test data. Air oven test of cables at rated voltage with Megger and Hi-Pot tests (Note 6) Method when cables are in test specimen include megger and Hi-Pot testing (Note 7) Demonstration of functionality should also consider operating temperature of the cables inside the fire arrier at the onset of ıe fire exposure.	Functionality - No guidance provided. Up to licensees to demonstrate by engineering analysis. Analysis kept on file for NRC review. Engineering analysis generally based on internal temperature below the ignition temperature. No consideration given cable operating temperatures within the barrier at the onset of the fire exposure.	Functionality is considered to be a deviation from the acceptance criteria and must be justified on a case-by-case basis which includes an assessment of cable jacket material.

Note 1: The 163 °C [325 °F] temperature condition was established by allowing the internal temperature on the raceway surface to rise a maximum of 139 °C [250 °F] above the initial temperature of the test specimen (assumed to be 24 °C [75 °F]).

Note 2: NFPA 251/ASTM-E119 allows the temperature condition to be determined by averaging the thermocouple readings. The conditions of acceptance are also placed on the temperature conditions measured by a single thermocouple. Under these conditions of acceptance, if any single thermocouple exceeds 30 percent above the maximum allowable temperature rise (i.e., max. allowable 139 °C + 42 °C = 181 °C [250 °F + 75 °F = 325 °F]) the test is considered to have exceeded the criteria temperature limit.

Note 3: SRP 9.5.1 recognizes the use of a fog stream as an alternative hose stream testing method for qualifying fire barrier penetration seals.

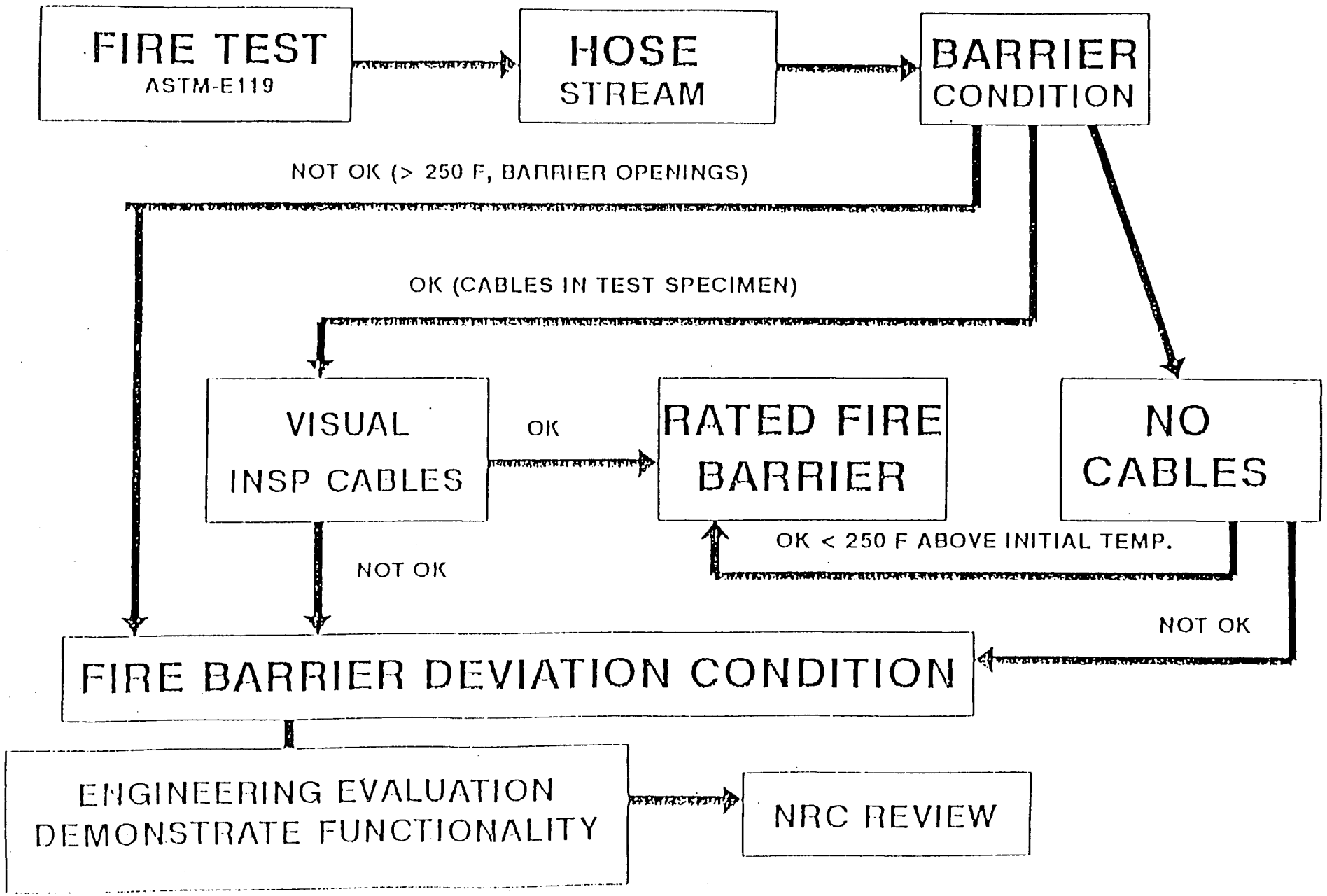
Note 4: This hose stream test method provides assurance that the cable tray or raceway fire barrier system has sufficient structural integrity to resist minor fire related barrier breaches caused by falling objects.

Note 5: A fire barrier system that does not meet the acceptance criteria is not considered a rated fire barrier. For those conditions (e.g., high raceway temperature, barrier openings, water projection, cable damage) which deviate from the acceptance criteria, an engineering analysis which clearly demonstrates the functionality of the protected components or cables should be submitted to the staff for review. The purpose of the recommended functionality tests is to justify observed deviations in fire barrier performance. Engineering analyses justifying these deviations should not rely substantially upon the equipment (e.g., cable) qualification as the basis for acceptance. Deviations will be evaluated by the staff on a case-by-case basis.

Note 6: For fire barrier systems tested without cables, plant-specific cable types should be subjected to air oven tests when the fire barrier temperature rise criteria are exceeded. These cables will be exposed to a temperature profile as determined by the internal raceway thermocouples during the fire test. Cables will be tested at rated voltage. Megger and Hi-Pot testing should be performed in a consistent manner to those tests performed for cables included in a fire barrier test specimen and subjected to the fire endurance test.

Note 7: Megger tests of cables included in the fire test specimen should be performed before, during (instrumentation cables only) and immediately after the fire exposure and subjecting power cables which have voltage ratings $\geq$ 1000 volts ac to a Hi-Pot test (60 percent) immediately after the fire exposure.

LOGIC DIAGRAM



TVA Position on Fire Testing Criteria

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.

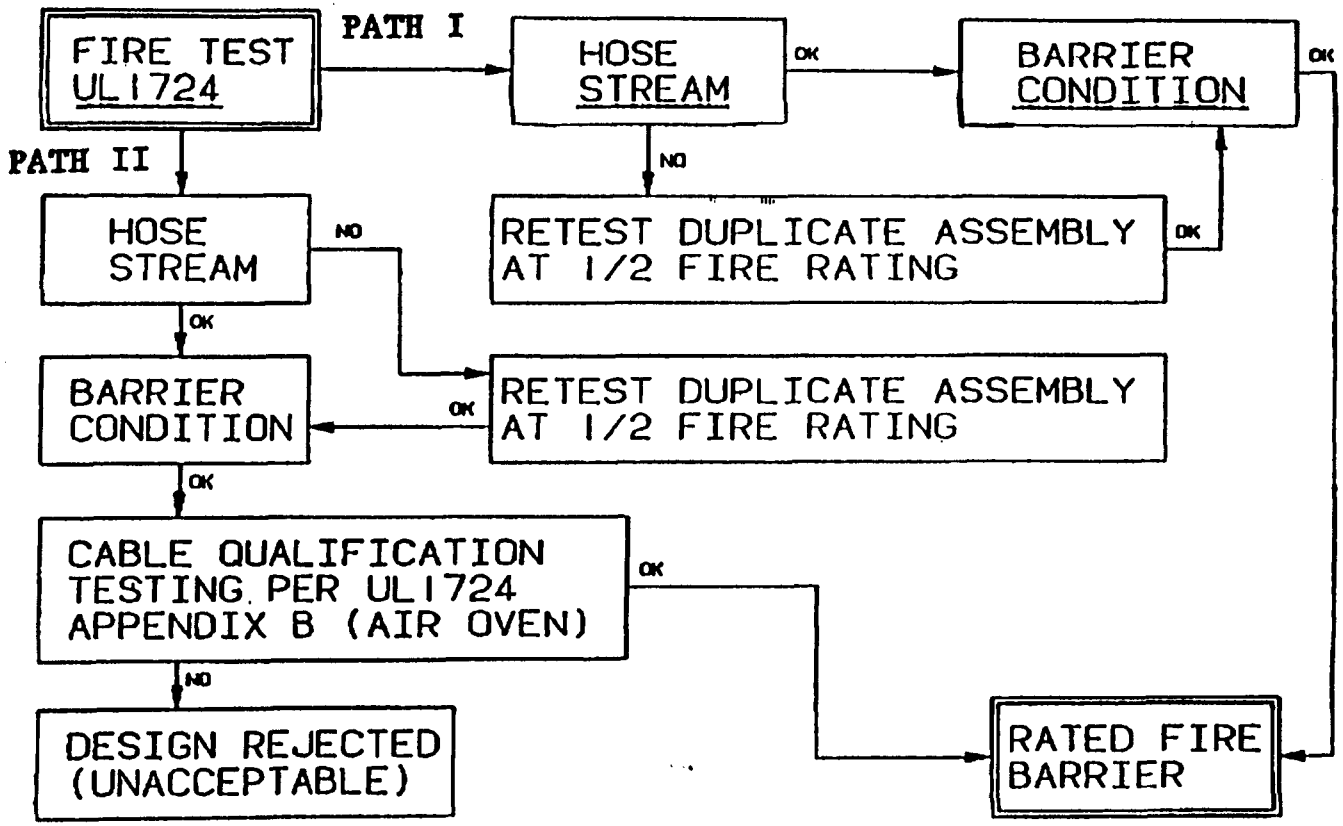
(4) Code of Federal Regulations, Title 10, Part 50, Energy, January 1, 1992.

(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

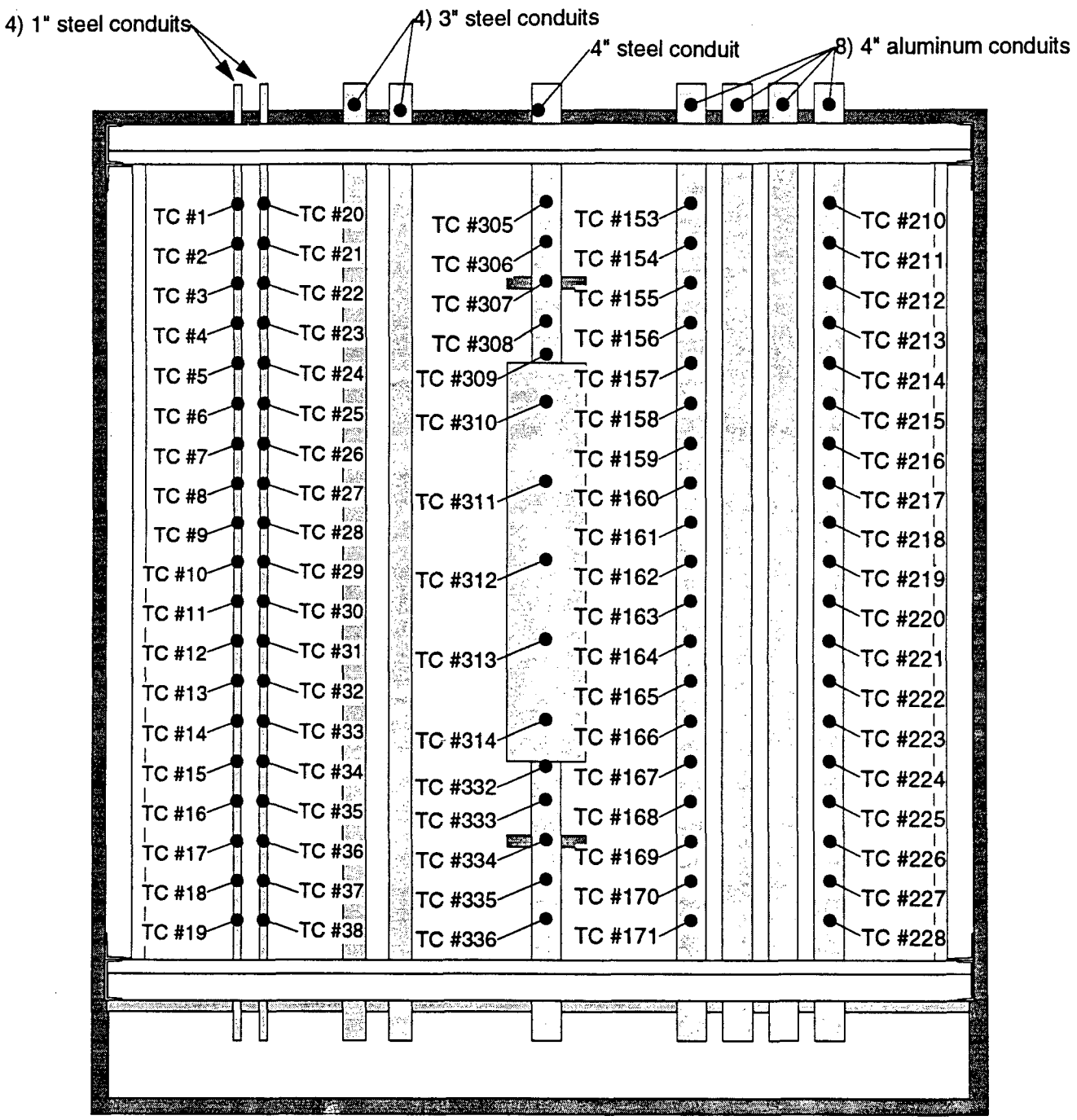


PATH I - RACEWAY $\Delta T_{avg.} \leq$ 250°F AND $\Delta T_{max.} \leq$ 325°F

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

Appendix C

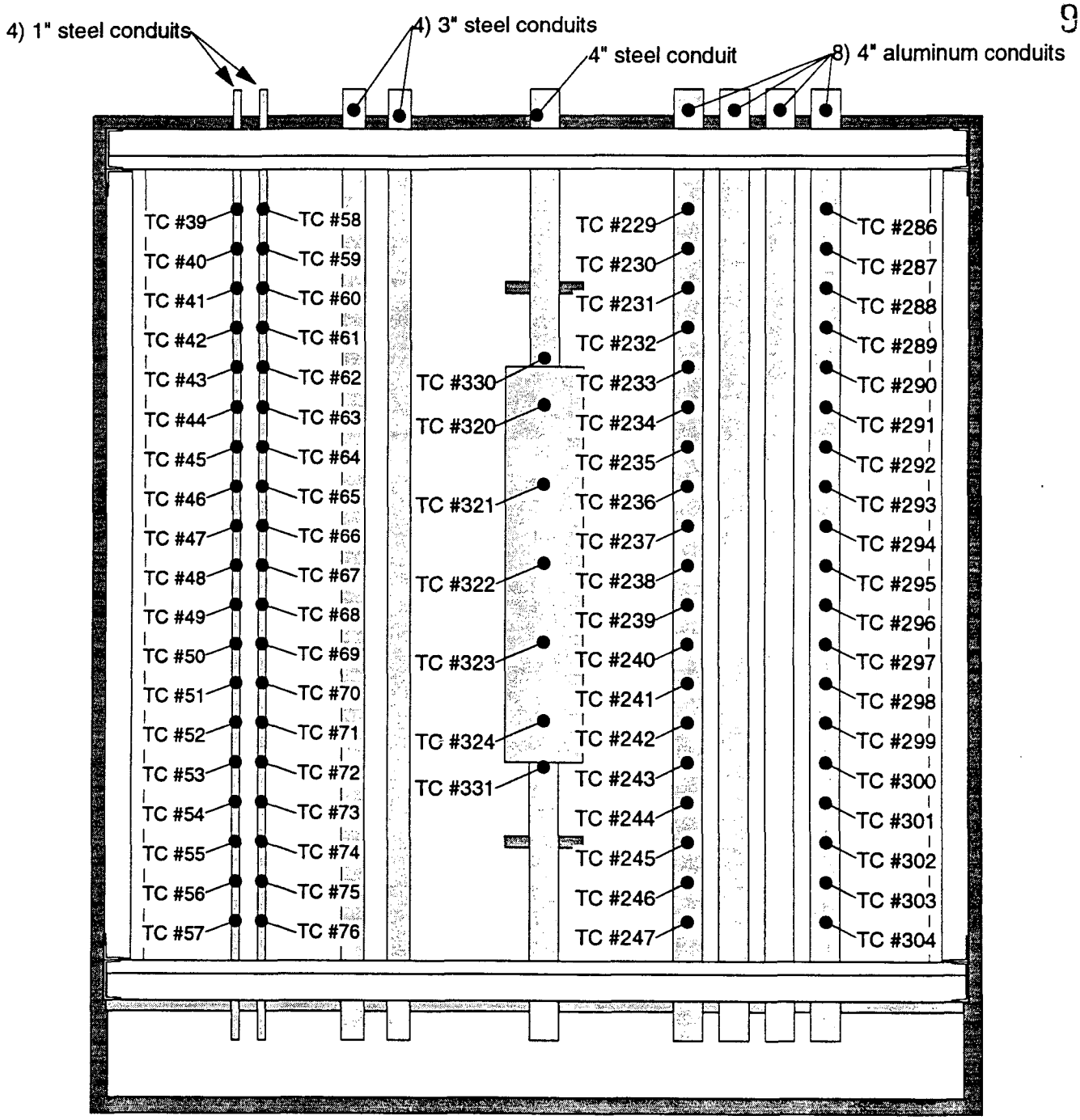
THERMOCOUPLE LOCATIONS



ELEVATION VIEW
from Hot Side

NOTE:
Thermocouples shown on 1" steel conduits and on 4" aluminum conduits are on fireside surface of the row of conduits closest to the fireside. Thermocouples shown on the 4" steel conduit and on the attached junction box are on the fireside (front) surfaces of each.

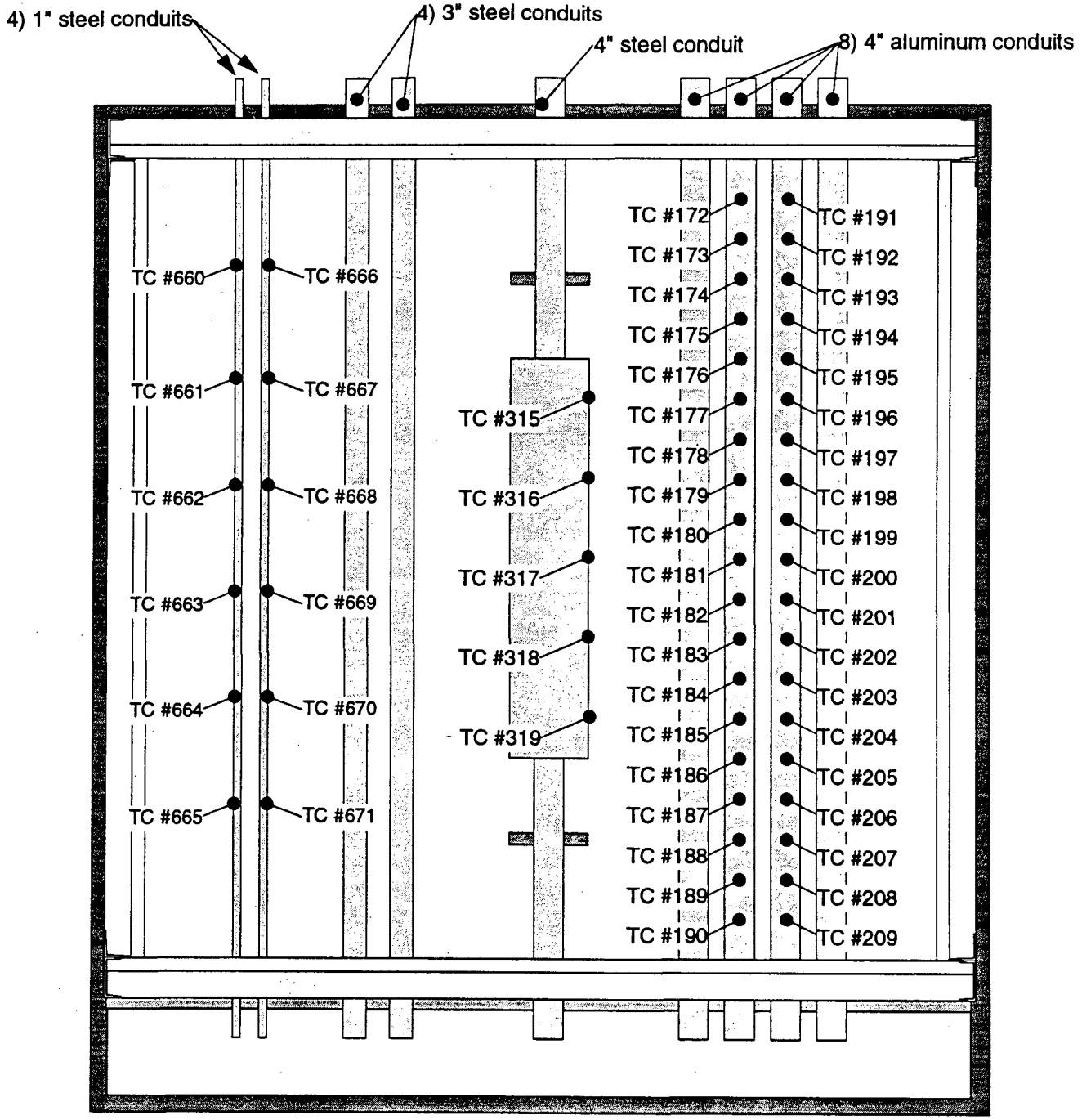
OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 6 Thermocouple Locations, Test Deck #6, Rev. 1
Drawn by: H Stanford Date: 9/1/94 Appr'd by: C Humphrey Date: 9/1/94



ELEVATION VIEW
from Hot Side

NOTE:
Thermocouples shown on 1" steel conduits and on 4" aluminum conduits are on fireside surface of the row of conduits closest to the slab wall (coldside) .
Thermocouples shown on the junction box attached to the 4" steel conduit are on the coldside (rear) surface of the JB. Thermocouple #330 is on the top surface of the JB and #331 is on the bottom surface.

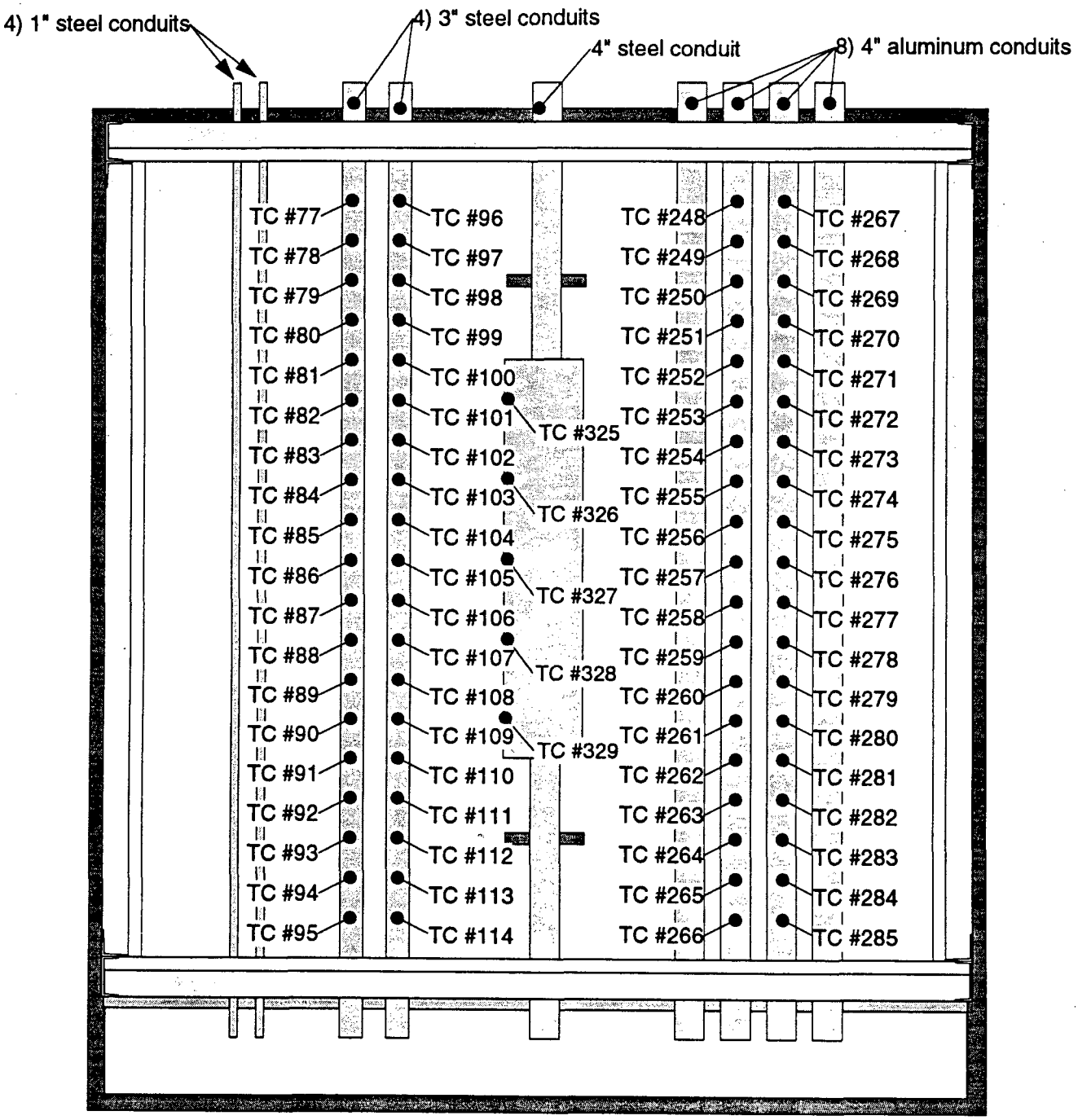
OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 7 Thermocouple Locations, Test Deck #6, Rev. 1
Drawn by: [signature] Date: 9/1/94 Appr'd by: C. Humphrey Date: 9/1/94



ELEVATION VIEW
from Hot Side

NOTE:
Thermocouples shown on 1" steel conduits are on the outer surfaces of the rear row of conduits. Thermocouples on the 4" aluminum conduits are on fireside surface of the row of conduits closest to the furnace (fireside) . Thermocouples shown on the junction box attached to the 4" steel conduit are on the right side surface of the JB.

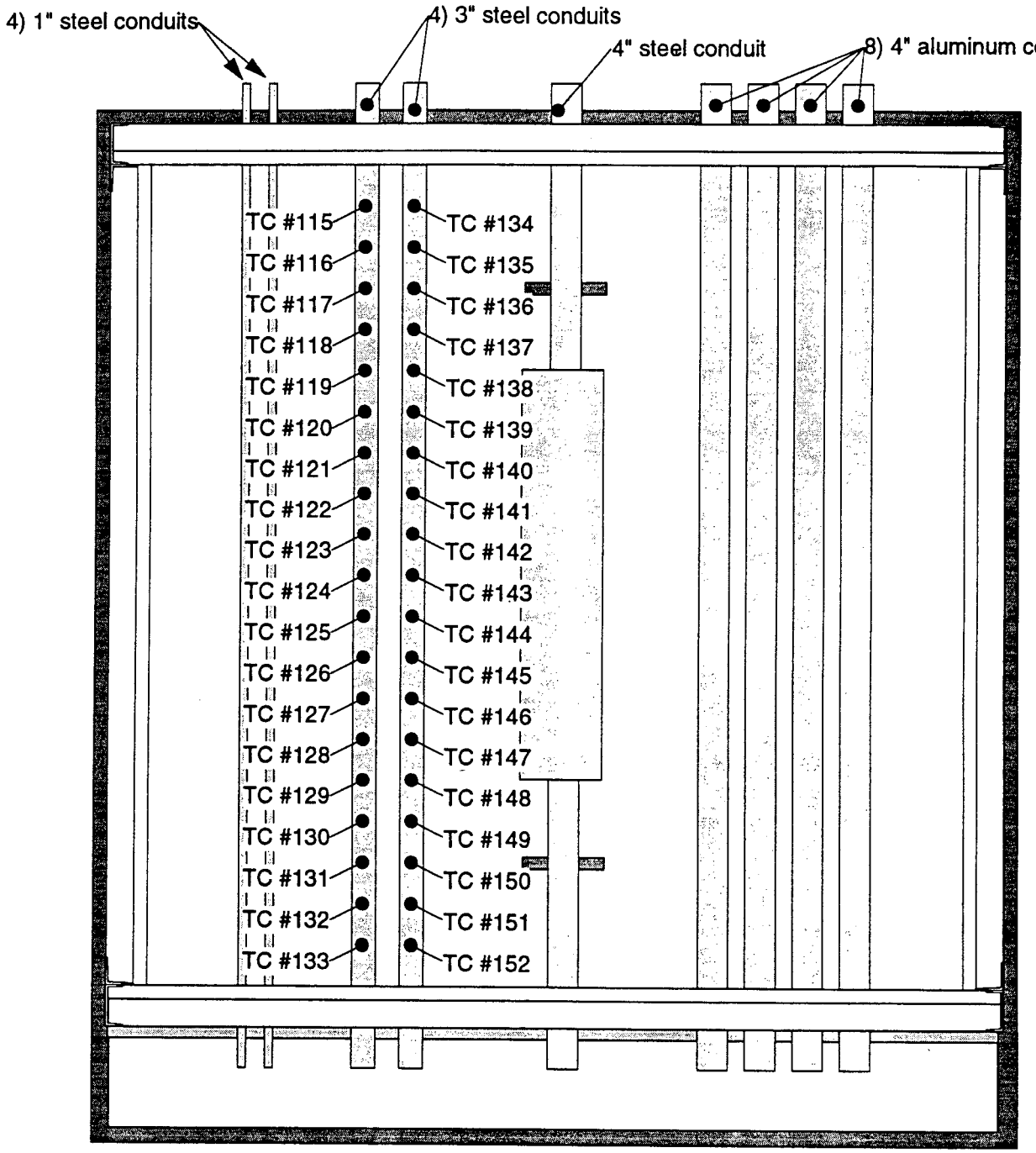
OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 8 Thermocouple Locations, Test Deck #6, Rev. 1
Drawn by: H. Stanley II Date: 4/1/94 Appr'd by: C Humphrey Date: 4/1/94



ELEVATION VIEW
from Hot Side

NOTE:
Thermocouples shown on 3" steel conduits are on the fireside surface of the row of conduits closest to the furnace. Thermocouples on the 4" aluminum conduits are on fireside surface of the row of conduits closest to the wall (coldside) . Thermocouples shown on the junction box attached to the 4" steel conduit are on the left side surface of the JB.

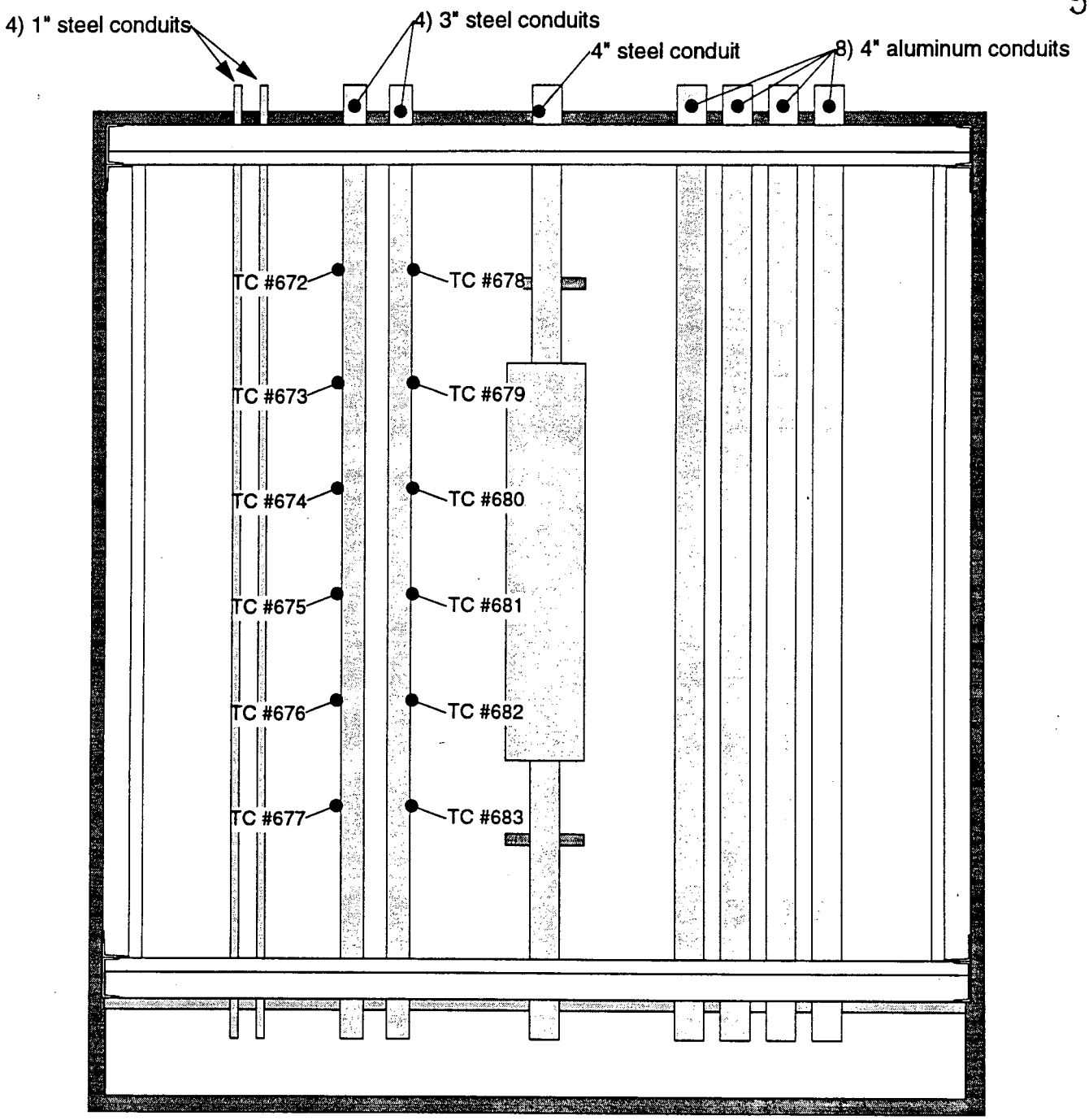
OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 9 Thermocouple Locations, Test Deck #6, Rev. 1
Drawn by: H Stanley III Date: 9/1/94 Appr'd by: C. Humphrey Date: 9/1/94



ELEVATION VIEW
from Hot Side

NOTE:
Thermocouples shown on 3" steel conduits are on the fireside surface of the row of conduits closest to the wall (coldside).

OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig.10 Thermocouple Locations, Test Deck #6, Rev. 1
Drawn by: H Stanley Date: 9/1/94 Appr'd by: C Humphrey Date: 9/1/94



ELEVATION VIEW
from Hot Side

NOTE:
Thermocouples shown on 3" steel conduits are on the outer surfaces of the rear row of conduits.

OMEGA POINT LABORATORIES, INC. Project No. 11960-97259
TVA / TSI
Fig. 11 Thermocouple Locations, Test Deck #6, Rev. 1
Drawn by: [signature] Date: 9/1/94 Appr'd by: C Humphrey Date: 9/1/94

THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

NOTE:
This Log is to be used to document the precise location of the thermocouples located on each test item. The back of this sheet may be used for any necessary drawings or schematics.

Project #: 97259

Test Deck #: 6

Item: Steel Conduit Surface

Front Left 1" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E1	On fireside surface of the conduit, 6" below top of slab.
E2	On fireside surface of the conduit, 6" below previous thermocouple.
E3	On fireside surface of the conduit, 6" below previous thermocouple.
E4	On fireside surface of the conduit, 6" below previous thermocouple.
E5	On fireside surface of the conduit, 6" below previous thermocouple.
E6	On fireside surface of the conduit, 6" below previous thermocouple.
E7	On fireside surface of the conduit, 6" below previous thermocouple.
E8	On fireside surface of the conduit, 6" below previous thermocouple.
E9	On fireside surface of the conduit, 6" below previous thermocouple.
E10	On fireside surface of the conduit, 6" below previous thermocouple.
E11	On fireside surface of the conduit, 6" below previous thermocouple.
E12	On fireside surface of the conduit, 6" below previous thermocouple.
E13	On fireside surface of the conduit, 6" below previous thermocouple.
E14	On fireside surface of the conduit, 6" below previous thermocouple.
E15	On fireside surface of the conduit, 6" below previous thermocouple.
E16	On fireside surface of the conduit, 6" below previous thermocouple.
E17	On fireside surface of the conduit, 6" below previous thermocouple.
E18	On fireside surface of the conduit, 6" below previous thermocouple.
E19	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

PLEASE USE THE BACK OF THIS SHEET FOR DRAWINGS, IF NECESSARY

THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

NOTE:
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Project #: 97259

Test Deck #: 6

Item: Steel Conduit Surface

Front Right 1" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E20	On fireside surface of the conduit, 6" below top of slab.
E21	On fireside surface of the conduit, 6" below previous thermocouple.
E22	On fireside surface of the conduit, 6" below previous thermocouple.
E23	On fireside surface of the conduit, 6" below previous thermocouple.
E24	On fireside surface of the conduit, 6" below previous thermocouple.
E25	On fireside surface of the conduit, 6" below previous thermocouple.
E26	On fireside surface of the conduit, 6" below previous thermocouple.
E27	On fireside surface of the conduit, 6" below previous thermocouple.
E28	On fireside surface of the conduit, 6" below previous thermocouple.
E29	On fireside surface of the conduit, 6" below previous thermocouple.
E30	On fireside surface of the conduit, 6" below previous thermocouple.
E31	On fireside surface of the conduit, 6" below previous thermocouple.
E32	On fireside surface of the conduit, 6" below previous thermocouple.
E33	On fireside surface of the conduit, 6" below previous thermocouple.
E34	On fireside surface of the conduit, 6" below previous thermocouple.
E35	On fireside surface of the conduit, 6" below previous thermocouple.
E36	On fireside surface of the conduit, 6" below previous thermocouple.
E37	On fireside surface of the conduit, 6" below previous thermocouple.
E38	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Steel Conduit Surface

Rear Left 1" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E39	On fireside surface of the conduit, 6" below top of slab.
E40	On fireside surface of the conduit, 6" below previous thermocouple.
E41	On fireside surface of the conduit, 6" below previous thermocouple.
E42	On fireside surface of the conduit, 6" below previous thermocouple.
E43	On fireside surface of the conduit, 6" below previous thermocouple.
E44	On fireside surface of the conduit, 6" below previous thermocouple.
E45	On fireside surface of the conduit, 6" below previous thermocouple.
E46	On fireside surface of the conduit, 6" below previous thermocouple.
E47	On fireside surface of the conduit, 6" below previous thermocouple.
E48	On fireside surface of the conduit, 6" below previous thermocouple.
E49	On fireside surface of the conduit, 6" below previous thermocouple.
E50	On fireside surface of the conduit, 6" below previous thermocouple.
E51	On fireside surface of the conduit, 6" below previous thermocouple.
E52	On fireside surface of the conduit, 6" below previous thermocouple.
E53	On fireside surface of the conduit, 6" below previous thermocouple.
E54	On fireside surface of the conduit, 6" below previous thermocouple.
E55	On fireside surface of the conduit, 6" below previous thermocouple.
E56	On fireside surface of the conduit, 6" below previous thermocouple.
E57	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Steel Conduit Surface

Rear Right 1" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E58	On fireside surface of the conduit, 6" below top of slab.
E59	On fireside surface of the conduit, 6" below previous thermocouple.
E60	On fireside surface of the conduit, 6" below previous thermocouple.
E61	On fireside surface of the conduit, 6" below previous thermocouple.
E62	On fireside surface of the conduit, 6" below previous thermocouple.
E63	On fireside surface of the conduit, 6" below previous thermocouple.
E64	On fireside surface of the conduit, 6" below previous thermocouple.
E65	On fireside surface of the conduit, 6" below previous thermocouple.
E66	On fireside surface of the conduit, 6" below previous thermocouple.
E67	On fireside surface of the conduit, 6" below previous thermocouple.
E68	On fireside surface of the conduit, 6" below previous thermocouple.
E69	On fireside surface of the conduit, 6" below previous thermocouple.
E70	On fireside surface of the conduit, 6" below previous thermocouple.
E71	On fireside surface of the conduit, 6" below previous thermocouple.
E72	On fireside surface of the conduit, 6" below previous thermocouple.
E73	On fireside surface of the conduit, 6" below previous thermocouple.
E74	On fireside surface of the conduit, 6" below previous thermocouple.
E75	On fireside surface of the conduit, 6" below previous thermocouple.
E76	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Steel Conduit Surface

Front Left 3" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E77	On fireside surface of the conduit, 6" below top of slab.
E78	On fireside surface of the conduit, 6" below previous thermocouple.
E79	On fireside surface of the conduit, 6" below previous thermocouple.
E80	On fireside surface of the conduit, 6" below previous thermocouple.
E81	On fireside surface of the conduit, 6" below previous thermocouple.
E82	On fireside surface of the conduit, 6" below previous thermocouple.
E83	On fireside surface of the conduit, 6" below previous thermocouple.
E84	On fireside surface of the conduit, 6" below previous thermocouple.
E85	On fireside surface of the conduit, 6" below previous thermocouple.
E86	On fireside surface of the conduit, 6" below previous thermocouple.
E87	On fireside surface of the conduit, 6" below previous thermocouple.
E88	On fireside surface of the conduit, 6" below previous thermocouple.
E89	On fireside surface of the conduit, 6" below previous thermocouple.
E90	On fireside surface of the conduit, 6" below previous thermocouple.
E91	On fireside surface of the conduit, 6" below previous thermocouple.
E92	On fireside surface of the conduit, 6" below previous thermocouple.
E93	On fireside surface of the conduit, 6" below previous thermocouple.
E94	On fireside surface of the conduit, 6" below previous thermocouple.
E95	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Steel Conduit Surface

Front Right 3" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E96	On fireside surface of the conduit, 6" below top of slab.
E97	On fireside surface of the conduit, 6" below previous thermocouple.
E98	On fireside surface of the conduit, 6" below previous thermocouple.
E99	On fireside surface of the conduit, 6" below previous thermocouple.
E100	On fireside surface of the conduit, 6" below previous thermocouple.
E101	On fireside surface of the conduit, 6" below previous thermocouple.
E102	On fireside surface of the conduit, 6" below previous thermocouple.
E103	On fireside surface of the conduit, 6" below previous thermocouple.
E104	On fireside surface of the conduit, 6" below previous thermocouple.
E105	On fireside surface of the conduit, 6" below previous thermocouple.
E106	On fireside surface of the conduit, 6" below previous thermocouple.
E107	On fireside surface of the conduit, 6" below previous thermocouple.
E108	On fireside surface of the conduit, 6" below previous thermocouple.
E109	On fireside surface of the conduit, 6" below previous thermocouple.
E110	On fireside surface of the conduit, 6" below previous thermocouple.
E111	On fireside surface of the conduit, 6" below previous thermocouple.
E112	On fireside surface of the conduit, 6" below previous thermocouple.
E113	On fireside surface of the conduit, 6" below previous thermocouple.
E114	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

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Project #: 97259

Test Deck #: 6

Item: Steel Conduit Surface

Rear Left 3" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E115	On fireside surface of the conduit, 6" below top of slab.
E116	On fireside surface of the conduit, 6" below previous thermocouple.
E117	On fireside surface of the conduit, 6" below previous thermocouple.
E118	On fireside surface of the conduit, 6" below previous thermocouple.
E119	On fireside surface of the conduit, 6" below previous thermocouple.
E120	On fireside surface of the conduit, 6" below previous thermocouple.
E121	On fireside surface of the conduit, 6" below previous thermocouple.
E122	On fireside surface of the conduit, 6" below previous thermocouple.
E123	On fireside surface of the conduit, 6" below previous thermocouple.
E124	On fireside surface of the conduit, 6" below previous thermocouple.
E125	On fireside surface of the conduit, 6" below previous thermocouple.
E126	On fireside surface of the conduit, 6" below previous thermocouple.
E127	On fireside surface of the conduit, 6" below previous thermocouple.
E128	On fireside surface of the conduit, 6" below previous thermocouple.
E129	On fireside surface of the conduit, 6" below previous thermocouple.
E130	On fireside surface of the conduit, 6" below previous thermocouple.
E131	On fireside surface of the conduit, 6" below previous thermocouple.
E132	On fireside surface of the conduit, 6" below previous thermocouple.
E133	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Test Deck #: 6

Item: Steel Conduit Surface

Rear Right 3" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E134	On fireside surface of the conduit, 6" below top of slab.
E135	On fireside surface of the conduit, 6" below previous thermocouple.
E136	On fireside surface of the conduit, 6" below previous thermocouple.
E137	On fireside surface of the conduit, 6" below previous thermocouple.
E138	On fireside surface of the conduit, 6" below previous thermocouple.
E139	On fireside surface of the conduit, 6" below previous thermocouple.
E140	On fireside surface of the conduit, 6" below previous thermocouple.
E141	On fireside surface of the conduit, 6" below previous thermocouple.
E142	On fireside surface of the conduit, 6" below previous thermocouple.
E143	On fireside surface of the conduit, 6" below previous thermocouple.
E144	On fireside surface of the conduit, 6" below previous thermocouple.
E145	On fireside surface of the conduit, 6" below previous thermocouple.
E146	On fireside surface of the conduit, 6" below previous thermocouple.
E147	On fireside surface of the conduit, 6" below previous thermocouple.
E148	On fireside surface of the conduit, 6" below previous thermocouple.
E149	On fireside surface of the conduit, 6" below previous thermocouple.
E150	On fireside surface of the conduit, 6" below previous thermocouple.
E151	On fireside surface of the conduit, 6" below previous thermocouple.
E152	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Aluminum Conduit Surface

Front Left 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E153	On fireside surface of the conduit, 6" below top of slab.
E154	On fireside surface of the conduit, 6" below previous thermocouple.
E155	On fireside surface of the conduit, 6" below previous thermocouple.
E156	On fireside surface of the conduit, 6" below previous thermocouple.
E157	On fireside surface of the conduit, 6" below previous thermocouple.
E158	On fireside surface of the conduit, 6" below previous thermocouple.
E159	On fireside surface of the conduit, 6" below previous thermocouple.
E160	On fireside surface of the conduit, 6" below previous thermocouple.
E161	On fireside surface of the conduit, 6" below previous thermocouple.
E162	On fireside surface of the conduit, 6" below previous thermocouple.
E163	On fireside surface of the conduit, 6" below previous thermocouple.
E164	On fireside surface of the conduit, 6" below previous thermocouple.
E165	On fireside surface of the conduit, 6" below previous thermocouple.
E166	On fireside surface of the conduit, 6" below previous thermocouple.
E167	On fireside surface of the conduit, 6" below previous thermocouple.
E168	On fireside surface of the conduit, 6" below previous thermocouple.
E169	On fireside surface of the conduit, 6" below previous thermocouple.
E170	On fireside surface of the conduit, 6" below previous thermocouple.
E171	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Aluminum Conduit Surface

Front Left -Center 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E172	On fireside surface of the conduit, 6" below top of slab.
E173	On fireside surface of the conduit, 6" below previous thermocouple.
E174	On fireside surface of the conduit, 6" below previous thermocouple.
E175	On fireside surface of the conduit, 6" below previous thermocouple.
E176	On fireside surface of the conduit, 6" below previous thermocouple.
E177	On fireside surface of the conduit, 6" below previous thermocouple.
E178	On fireside surface of the conduit, 6" below previous thermocouple.
E179	On fireside surface of the conduit, 6" below previous thermocouple.
E180	On fireside surface of the conduit, 6" below previous thermocouple.
E181	On fireside surface of the conduit, 6" below previous thermocouple.
E182	On fireside surface of the conduit, 6" below previous thermocouple.
E183	On fireside surface of the conduit, 6" below previous thermocouple.
E184	On fireside surface of the conduit, 6" below previous thermocouple.
E185	On fireside surface of the conduit, 6" below previous thermocouple.
E186	On fireside surface of the conduit, 6" below previous thermocouple.
E187	On fireside surface of the conduit, 6" below previous thermocouple.
E188	On fireside surface of the conduit, 6" below previous thermocouple.
E189	On fireside surface of the conduit, 6" below previous thermocouple.
E190	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Test Deck #: 6

Item: Aluminum Conduit Surface

Front Right -Center 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E191	On fireside surface of the conduit, 6" below top of slab.
E192	On fireside surface of the conduit, 6" below previous thermocouple.
E193	On fireside surface of the conduit, 6" below previous thermocouple.
E194	On fireside surface of the conduit, 6" below previous thermocouple.
E195	On fireside surface of the conduit, 6" below previous thermocouple.
E196	On fireside surface of the conduit, 6" below previous thermocouple.
E197	On fireside surface of the conduit, 6" below previous thermocouple.
E198	On fireside surface of the conduit, 6" below previous thermocouple.
E199	On fireside surface of the conduit, 6" below previous thermocouple.
E200	On fireside surface of the conduit, 6" below previous thermocouple.
E201	On fireside surface of the conduit, 6" below previous thermocouple.
E202	On fireside surface of the conduit, 6" below previous thermocouple.
E203	On fireside surface of the conduit, 6" below previous thermocouple.
E204	On fireside surface of the conduit, 6" below previous thermocouple.
E205	On fireside surface of the conduit, 6" below previous thermocouple.
E206	On fireside surface of the conduit, 6" below previous thermocouple.
E207	On fireside surface of the conduit, 6" below previous thermocouple.
E208	On fireside surface of the conduit, 6" below previous thermocouple.
E209	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Aluminum Conduit Surface

Front Right 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E210	On fireside surface of the conduit, 6" below top of slab.
E211	On fireside surface of the conduit, 6" below previous thermocouple.
E212	On fireside surface of the conduit, 6" below previous thermocouple.
E213	On fireside surface of the conduit, 6" below previous thermocouple.
E214	On fireside surface of the conduit, 6" below previous thermocouple.
E215	On fireside surface of the conduit, 6" below previous thermocouple.
E216	On fireside surface of the conduit, 6" below previous thermocouple.
E217	On fireside surface of the conduit, 6" below previous thermocouple.
E218	On fireside surface of the conduit, 6" below previous thermocouple.
E219	On fireside surface of the conduit, 6" below previous thermocouple.
E220	On fireside surface of the conduit, 6" below previous thermocouple.
E221	On fireside surface of the conduit, 6" below previous thermocouple.
E222	On fireside surface of the conduit, 6" below previous thermocouple.
E223	On fireside surface of the conduit, 6" below previous thermocouple.
E224	On fireside surface of the conduit, 6" below previous thermocouple.
E225	On fireside surface of the conduit, 6" below previous thermocouple.
E226	On fireside surface of the conduit, 6" below previous thermocouple.
E227	On fireside surface of the conduit, 6" below previous thermocouple.
E228	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

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Project #: 97259

Test Deck #: 6

Item: Aluminum Conduit Surface

Rear Left 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E229	On fireside surface of the conduit, 6" below top of slab.
E230	On fireside surface of the conduit, 6" below previous thermocouple.
E231	On fireside surface of the conduit, 6" below previous thermocouple.
E232	On fireside surface of the conduit, 6" below previous thermocouple.
E233	On fireside surface of the conduit, 6" below previous thermocouple.
E234	On fireside surface of the conduit, 6" below previous thermocouple.
E235	On fireside surface of the conduit, 6" below previous thermocouple.
E236	On fireside surface of the conduit, 6" below previous thermocouple.
E237	On fireside surface of the conduit, 6" below previous thermocouple.
E238	On fireside surface of the conduit, 6" below previous thermocouple.
E239	On fireside surface of the conduit, 6" below previous thermocouple.
E240	On fireside surface of the conduit, 6" below previous thermocouple.
E241	On fireside surface of the conduit, 6" below previous thermocouple.
E242	On fireside surface of the conduit, 6" below previous thermocouple.
E243	On fireside surface of the conduit, 6" below previous thermocouple.
E244	On fireside surface of the conduit, 6" below previous thermocouple.
E245	On fireside surface of the conduit, 6" below previous thermocouple.
E246	On fireside surface of the conduit, 6" below previous thermocouple.
E247	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Aluminum Conduit Surface

Rear Left-Center 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E248	On fireside surface of the conduit, 6" below top of slab.
E249	On fireside surface of the conduit, 6" below previous thermocouple.
E250	On fireside surface of the conduit, 6" below previous thermocouple.
E251	On fireside surface of the conduit, 6" below previous thermocouple.
E252	On fireside surface of the conduit, 6" below previous thermocouple.
E253	On fireside surface of the conduit, 6" below previous thermocouple.
E254	On fireside surface of the conduit, 6" below previous thermocouple.
E255	On fireside surface of the conduit, 6" below previous thermocouple.
E256	On fireside surface of the conduit, 6" below previous thermocouple.
E257	On fireside surface of the conduit, 6" below previous thermocouple.
E258	On fireside surface of the conduit, 6" below previous thermocouple.
E259	On fireside surface of the conduit, 6" below previous thermocouple.
E260	On fireside surface of the conduit, 6" below previous thermocouple.
E261	On fireside surface of the conduit, 6" below previous thermocouple.
E262	On fireside surface of the conduit, 6" below previous thermocouple.
E263	On fireside surface of the conduit, 6" below previous thermocouple.
E264	On fireside surface of the conduit, 6" below previous thermocouple.
E265	On fireside surface of the conduit, 6" below previous thermocouple.
E266	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Aluminum Conduit Surface

Rear Right-Center 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E267	On fireside surface of the conduit, 6" below top of slab.
E268	On fireside surface of the conduit, 6" below previous thermocouple.
E269	On fireside surface of the conduit, 6" below previous thermocouple.
E270	On fireside surface of the conduit, 6" below previous thermocouple.
E271	On fireside surface of the conduit, 6" below previous thermocouple.
E272	On fireside surface of the conduit, 6" below previous thermocouple.
E273	On fireside surface of the conduit, 6" below previous thermocouple.
E274	On fireside surface of the conduit, 6" below previous thermocouple.
E275	On fireside surface of the conduit, 6" below previous thermocouple.
E276	On fireside surface of the conduit, 6" below previous thermocouple.
E277	On fireside surface of the conduit, 6" below previous thermocouple.
E278	On fireside surface of the conduit, 6" below previous thermocouple.
E279	On fireside surface of the conduit, 6" below previous thermocouple.
E280	On fireside surface of the conduit, 6" below previous thermocouple.
E281	On fireside surface of the conduit, 6" below previous thermocouple.
E282	On fireside surface of the conduit, 6" below previous thermocouple.
E283	On fireside surface of the conduit, 6" below previous thermocouple.
E284	On fireside surface of the conduit, 6" below previous thermocouple.
E285	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

PLEASE USE THE BACK OF THIS SHEET FOR DRAWINGS, IF NECESSARY

THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

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Project #: 97259

Test Deck #: 6

Item: Aluminum Conduit Surface

Rear Right 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
E286	On fireside surface of the conduit, 6" below top of slab.
E287	On fireside surface of the conduit, 6" below previous thermocouple.
E288	On fireside surface of the conduit, 6" below previous thermocouple.
E289	On fireside surface of the conduit, 6" below previous thermocouple.
E290	On fireside surface of the conduit, 6" below previous thermocouple.
E291	On fireside surface of the conduit, 6" below previous thermocouple.
E292	On fireside surface of the conduit, 6" below previous thermocouple.
E293	On fireside surface of the conduit, 6" below previous thermocouple.
E294	On fireside surface of the conduit, 6" below previous thermocouple.
E295	On fireside surface of the conduit, 6" below previous thermocouple.
E296	On fireside surface of the conduit, 6" below previous thermocouple.
E297	On fireside surface of the conduit, 6" below previous thermocouple.
E298	On fireside surface of the conduit, 6" below previous thermocouple.
E299	On fireside surface of the conduit, 6" below previous thermocouple.
E300	On fireside surface of the conduit, 6" below previous thermocouple.
E301	On fireside surface of the conduit, 6" below previous thermocouple.
E302	On fireside surface of the conduit, 6" below previous thermocouple.
E303	On fireside surface of the conduit, 6" below previous thermocouple.
~~E303~~	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: 4" Steel Conduit Surface Conduit w/Junction Box (viewed from fireside)

TC Number	Description of exact physical location
E305	On fireside surface of the conduit, 6" below top of slab.
E306	On fireside surface of the conduit, 6" below previous thermocouple.
E307	On fireside surface of the conduit, 6" below previous thermocouple.
E308	On fireside surface of the conduit, 6" below previous thermocouple.
E309	On fireside surface of the conduit, 6" below previous thermocouple, 1" above top of junction box.
E310	On fireside surface of junction box(cover), 6" below top of box.
E311	On fireside surface of the junction box (cover), 6" below previous thermocouple.
E312	On fireside surface of the junction box (cover), 6" below previous thermocouple.
E313	On fireside surface of the junction box (cover), 6" below previous thermocouple.
E314	On fireside surface of the junction box (cover), 6" below previous thermocouple.
E315	On right side surface of the junction box , 6" below top of box.
E316	On right side surface of the junction box , 6" below previous thermocouple.
E317	On right side surface of the junction box , 6" below previous thermocouple.
E318	On right side surface of the junction box , 6" below previous thermocouple.
E319	On right side surface of the junction box , 6" below previous thermocouple.
E320	On coldside surface of the junction box , 6" below top of box.
E321	On coldside surface of the junction box, 6" below previous thermocouple.
E322	On coldside surface of the junction box, 6" below previous thermocouple.
E323	On coldside surface of the junction box, 6" below previous thermocouple.
E324	On left side surface of the junction box, 6" below previous thermocouple.
E325	On left side surface of the junction box, 6" below top of box.
E326	On left side surface of the junction box, 6" below previous thermocouple.
E327	On left side surface of the junction box, 6" below previous thermocouple.
E328	On left side surface of the junction box, 6" below previous thermocouple.
E329	On left side surface of the junction box, 6" below previous thermocouple.
E330	On top surface of junction box, 1" from conduit toward coldside of sample.
E331	On bottom surface of junction box, 1" from conduit toward fireside of sample.
E332	On fireside surface of the conduit, 1" below bottom of junction box.
E333	On fireside surface of the conduit, 6" below previous thermocouple.
E334	On fireside surface of the conduit, 6" below previous thermocouple.
E335	On fireside surface of the conduit, 6" below previous thermocouple.
E336	On fireside surface of the conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Steel Conduit

Front Left 1" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C337	On bare #8 wire in conduit, 6" below top of slab.
C338	On bare #8 wire in conduit, 6" below previous thermocouple.
C339	On bare #8 wire in conduit, 6" below previous thermocouple.
C340	On bare #8 wire in conduit, 6" below previous thermocouple.
C341	On bare #8 wire in conduit, 6" below previous thermocouple.
C342	On bare #8 wire in conduit, 6" below previous thermocouple.
C343	On bare #8 wire in conduit, 6" below previous thermocouple.
C344	On bare #8 wire in conduit, 6" below previous thermocouple.
C345	On bare #8 wire in conduit, 6" below previous thermocouple.
C346	On bare #8 wire in conduit, 6" below previous thermocouple.
C347	On bare #8 wire in conduit, 6" below previous thermocouple.
C348	On bare #8 wire in conduit, 6" below previous thermocouple.
C349	On bare #8 wire in conduit, 6" below previous thermocouple.
C350	On bare #8 wire in conduit, 6" below previous thermocouple.
C351	On bare #8 wire in conduit, 6" below previous thermocouple.
C352	On bare #8 wire in conduit, 6" below previous thermocouple.
C353	On bare #8 wire in conduit, 6" below previous thermocouple.
C354	On bare #8 wire in conduit, 6" below previous thermocouple.
C355	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Steel Conduit

Front Right 1" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C356	On bare #8 wire in conduit, 6" below top of slab.
C357	On bare #8 wire in conduit, 6" below previous thermocouple.
C358	On bare #8 wire in conduit, 6" below previous thermocouple.
C359	On bare #8 wire in conduit, 6" below previous thermocouple.
C360	On bare #8 wire in conduit, 6" below previous thermocouple.
C361	On bare #8 wire in conduit, 6" below previous thermocouple.
C362	On bare #8 wire in conduit, 6" below previous thermocouple.
C363	On bare #8 wire in conduit, 6" below previous thermocouple.
C364	On bare #8 wire in conduit, 6" below previous thermocouple.
C365	On bare #8 wire in conduit, 6" below previous thermocouple.
C366	On bare #8 wire in conduit, 6" below previous thermocouple.
C367	On bare #8 wire in conduit, 6" below previous thermocouple.
C368	On bare #8 wire in conduit, 6" below previous thermocouple.
C369	On bare #8 wire in conduit, 6" below previous thermocouple.
C370	On bare #8 wire in conduit, 6" below previous thermocouple.
C371	On bare #8 wire in conduit, 6" below previous thermocouple.
C372	On bare #8 wire in conduit, 6" below previous thermocouple.
C373	On bare #8 wire in conduit, 6" below previous thermocouple.
C374	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Steel Conduit

Rear Left 1" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C375	On bare #8 wire in conduit, 6" below top of slab.
C376	On bare #8 wire in conduit, 6" below previous thermocouple.
C377	On bare #8 wire in conduit, 6" below previous thermocouple.
C378	On bare #8 wire in conduit, 6" below previous thermocouple.
C379	On bare #8 wire in conduit, 6" below previous thermocouple.
C380	On bare #8 wire in conduit, 6" below previous thermocouple.
C381	On bare #8 wire in conduit, 6" below previous thermocouple.
C382	On bare #8 wire in conduit, 6" below previous thermocouple.
C383	On bare #8 wire in conduit, 6" below previous thermocouple.
C384	On bare #8 wire in conduit, 6" below previous thermocouple.
C385	On bare #8 wire in conduit, 6" below previous thermocouple.
C386	On bare #8 wire in conduit, 6" below previous thermocouple.
C387	On bare #8 wire in conduit, 6" below previous thermocouple.
C388	On bare #8 wire in conduit, 6" below previous thermocouple.
C389	On bare #8 wire in conduit, 6" below previous thermocouple.
C390	On bare #8 wire in conduit, 6" below previous thermocouple.
C391	On bare #8 wire in conduit, 6" below previous thermocouple.
C392	On bare #8 wire in conduit, 6" below previous thermocouple.
C393	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Steel Conduit

Rear Right 1" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C394	On bare #8 wire in conduit, 6" below top of slab.
C395	On bare #8 wire in conduit, 6" below previous thermocouple.
C396	On bare #8 wire in conduit, 6" below previous thermocouple.
C397	On bare #8 wire in conduit, 6" below previous thermocouple.
C398	On bare #8 wire in conduit, 6" below previous thermocouple.
C399	On bare #8 wire in conduit, 6" below previous thermocouple.
C400	On bare #8 wire in conduit, 6" below previous thermocouple.
C401	On bare #8 wire in conduit, 6" below previous thermocouple.
C402	On bare #8 wire in conduit, 6" below previous thermocouple.
C403	On bare #8 wire in conduit, 6" below previous thermocouple.
C404	On bare #8 wire in conduit, 6" below previous thermocouple.
C405	On bare #8 wire in conduit, 6" below previous thermocouple.
C406	On bare #8 wire in conduit, 6" below previous thermocouple.
C407	On bare #8 wire in conduit, 6" below previous thermocouple.
C408	On bare #8 wire in conduit, 6" below previous thermocouple.
C409	On bare #8 wire in conduit, 6" below previous thermocouple.
C410	On bare #8 wire in conduit, 6" below previous thermocouple.
C411	On bare #8 wire in conduit, 6" below previous thermocouple.
C412	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Steel Conduit

Front Left 3" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C413	On bare #8 wire in conduit, 6" below top of slab.
C414	On bare #8 wire in conduit, 6" below previous thermocouple.
C415	On bare #8 wire in conduit, 6" below previous thermocouple.
C416	On bare #8 wire in conduit, 6" below previous thermocouple.
C417	On bare #8 wire in conduit, 6" below previous thermocouple.
C418	On bare #8 wire in conduit, 6" below previous thermocouple.
C419	On bare #8 wire in conduit, 6" below previous thermocouple.
C420	On bare #8 wire in conduit, 6" below previous thermocouple.
C421	On bare #8 wire in conduit, 6" below previous thermocouple.
C422	On bare #8 wire in conduit, 6" below previous thermocouple.
C423	On bare #8 wire in conduit, 6" below previous thermocouple.
C424	On bare #8 wire in conduit, 6" below previous thermocouple.
C425	On bare #8 wire in conduit, 6" below previous thermocouple.
C426	On bare #8 wire in conduit, 6" below previous thermocouple.
C427	On bare #8 wire in conduit, 6" below previous thermocouple.
C428	On bare #8 wire in conduit, 6" below previous thermocouple.
C429	On bare #8 wire in conduit, 6" below previous thermocouple.
C430	On bare #8 wire in conduit, 6" below previous thermocouple.
C431	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Steel Conduit

Front Right 3" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C432	On bare #8 wire in conduit, 6" below top of slab.
C433	On bare #8 wire in conduit, 6" below previous thermocouple.
C434	On bare #8 wire in conduit, 6" below previous thermocouple.
C435	On bare #8 wire in conduit, 6" below previous thermocouple.
C436	On bare #8 wire in conduit, 6" below previous thermocouple.
C437	On bare #8 wire in conduit, 6" below previous thermocouple.
C438	On bare #8 wire in conduit, 6" below previous thermocouple.
C439	On bare #8 wire in conduit, 6" below previous thermocouple.
C440	On bare #8 wire in conduit, 6" below previous thermocouple.
C441	On bare #8 wire in conduit, 6" below previous thermocouple.
C442	On bare #8 wire in conduit, 6" below previous thermocouple.
C443	On bare #8 wire in conduit, 6" below previous thermocouple.
C444	On bare #8 wire in conduit, 6" below previous thermocouple.
C445	On bare #8 wire in conduit, 6" below previous thermocouple.
C446	On bare #8 wire in conduit, 6" below previous thermocouple.
C447	On bare #8 wire in conduit, 6" below previous thermocouple.
C448	On bare #8 wire in conduit, 6" below previous thermocouple.
C449	On bare #8 wire in conduit, 6" below previous thermocouple.
C450	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Steel Conduit
Rear Left 3" Conduit in Array
(viewed from fireside)

TC Number	Description of exact physical location
C451	On bare #8 wire in conduit, 6" below top of slab.
C452	On bare #8 wire in conduit, 6" below previous thermocouple.
C453	On bare #8 wire in conduit, 6" below previous thermocouple.
C454	On bare #8 wire in conduit, 6" below previous thermocouple.
C455	On bare #8 wire in conduit, 6" below previous thermocouple.
C456	On bare #8 wire in conduit, 6" below previous thermocouple.
C457	On bare #8 wire in conduit, 6" below previous thermocouple.
C458	On bare #8 wire in conduit, 6" below previous thermocouple.
C459	On bare #8 wire in conduit, 6" below previous thermocouple.
C460	On bare #8 wire in conduit, 6" below previous thermocouple.
C461	On bare #8 wire in conduit, 6" below previous thermocouple.
C462	On bare #8 wire in conduit, 6" below previous thermocouple.
C463	On bare #8 wire in conduit, 6" below previous thermocouple.
C464	On bare #8 wire in conduit, 6" below previous thermocouple.
C465	On bare #8 wire in conduit, 6" below previous thermocouple.
C466	On bare #8 wire in conduit, 6" below previous thermocouple.
C467	On bare #8 wire in conduit, 6" below previous thermocouple.
C468	On bare #8 wire in conduit, 6" below previous thermocouple.
C469	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Steel Conduit

Rear Right 3" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C470	On bare #8 wire in conduit, 6" below top of slab.
C471	On bare #8 wire in conduit, 6" below previous thermocouple.
C472	On bare #8 wire in conduit, 6" below previous thermocouple.
C473	On bare #8 wire in conduit, 6" below previous thermocouple.
C474	On bare #8 wire in conduit, 6" below previous thermocouple.
C475	On bare #8 wire in conduit, 6" below previous thermocouple.
C476	On bare #8 wire in conduit, 6" below previous thermocouple.
C477	On bare #8 wire in conduit, 6" below previous thermocouple.
C478	On bare #8 wire in conduit, 6" below previous thermocouple.
C479	On bare #8 wire in conduit, 6" below previous thermocouple.
C480	On bare #8 wire in conduit, 6" below previous thermocouple.
C481	On bare #8 wire in conduit, 6" below previous thermocouple.
C482	On bare #8 wire in conduit, 6" below previous thermocouple.
C483	On bare #8 wire in conduit, 6" below previous thermocouple.
C484	On bare #8 wire in conduit, 6" below previous thermocouple.
C485	On bare #8 wire in conduit, 6" below previous thermocouple.
C486	On bare #8 wire in conduit, 6" below previous thermocouple.
C487	On bare #8 wire in conduit, 6" below previous thermocouple.
C488	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in 4" Steel Conduit With Junction Box

(viewed from fireside)

TC Number	Description of exact physical location
C489	On bare #8 wire in conduit, 6" below top of slab.
C490	On bare #8 wire in conduit, 6" below previous thermocouple.
C491	On bare #8 wire in conduit, 6" below previous thermocouple.
C492	On bare #8 wire in conduit, 6" below previous thermocouple.
C493	On bare #8 wire in conduit, 6" below previous thermocouple.
C494	On bare #8 wire in conduit, 6" below previous thermocouple.
C495	On bare #8 wire in conduit, 6" below previous thermocouple.
C496	On bare #8 wire in conduit, 6" below previous thermocouple.
C497	On bare #8 wire in conduit, 6" below previous thermocouple.
C498	On bare #8 wire in conduit, 6" below previous thermocouple.
C499	On bare #8 wire in conduit, 6" below previous thermocouple.
C500	On bare #8 wire in conduit, 6" below previous thermocouple.
C501	On bare #8 wire in conduit, 6" below previous thermocouple.
C502	On bare #8 wire in conduit, 6" below previous thermocouple.
C503	On bare #8 wire in conduit, 6" below previous thermocouple.
C504	On bare #8 wire in conduit, 6" below previous thermocouple.
C505	On bare #8 wire in conduit, 6" below previous thermocouple.
C506	On bare #8 wire in conduit, 6" below previous thermocouple.
C507	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Aluminum Conduit

Front Left 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C508	On bare #8 wire in conduit, 6" below top of slab.
C509	On bare #8 wire in conduit, 6" below previous thermocouple.
C510	On bare #8 wire in conduit, 6" below previous thermocouple.
C511	On bare #8 wire in conduit, 6" below previous thermocouple.
C512	On bare #8 wire in conduit, 6" below previous thermocouple.
C513	On bare #8 wire in conduit, 6" below previous thermocouple.
C514	On bare #8 wire in conduit, 6" below previous thermocouple.
C515	On bare #8 wire in conduit, 6" below previous thermocouple.
C516	On bare #8 wire in conduit, 6" below previous thermocouple.
C517	On bare #8 wire in conduit, 6" below previous thermocouple.
C518	On bare #8 wire in conduit, 6" below previous thermocouple.
C519	On bare #8 wire in conduit, 6" below previous thermocouple.
C520	On bare #8 wire in conduit, 6" below previous thermocouple.
C521	On bare #8 wire in conduit, 6" below previous thermocouple.
C522	On bare #8 wire in conduit, 6" below previous thermocouple.
C523	On bare #8 wire in conduit, 6" below previous thermocouple.
C524	On bare #8 wire in conduit, 6" below previous thermocouple.
C525	On bare #8 wire in conduit, 6" below previous thermocouple.
C526	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

PLEASE USE THE BACK OF THIS SHEET FOR DRAWINGS, IF NECESSARY

THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

NOTE:
This Log is to be used to document the precise location of the thermocouples located on each test item. The back of this sheet may be used for any necessary drawings or schematics.

Project #: 97259

Test Deck #: 6

Item: Bare #8 in Aluminum Conduit

Front Left-Center 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C527	On bare #8 wire in conduit, 6" below top of slab.
C528	On bare #8 wire in conduit, 6" below previous thermocouple.
C529	On bare #8 wire in conduit, 6" below previous thermocouple.
C530	On bare #8 wire in conduit, 6" below previous thermocouple.
C531	On bare #8 wire in conduit, 6" below previous thermocouple.
C532	On bare #8 wire in conduit, 6" below previous thermocouple.
C533	On bare #8 wire in conduit, 6" below previous thermocouple.
C534	On bare #8 wire in conduit, 6" below previous thermocouple.
C535	On bare #8 wire in conduit, 6" below previous thermocouple.
C536	On bare #8 wire in conduit, 6" below previous thermocouple.
C537	On bare #8 wire in conduit, 6" below previous thermocouple.
C538	On bare #8 wire in conduit, 6" below previous thermocouple.
C539	On bare #8 wire in conduit, 6" below previous thermocouple.
C540	On bare #8 wire in conduit, 6" below previous thermocouple.
C541	On bare #8 wire in conduit, 6" below previous thermocouple.
C542	On bare #8 wire in conduit, 6" below previous thermocouple.
C543	On bare #8 wire in conduit, 6" below previous thermocouple.
C544	On bare #8 wire in conduit, 6" below previous thermocouple.
C545	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

NOTE:
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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Aluminum Conduit

Front Right-Center 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C546	On bare #8 wire in conduit, 6" below top of slab.
C547	On bare #8 wire in conduit, 6" below previous thermocouple.
C548	On bare #8 wire in conduit, 6" below previous thermocouple.
C549	On bare #8 wire in conduit, 6" below previous thermocouple.
C550	On bare #8 wire in conduit, 6" below previous thermocouple.
C551	On bare #8 wire in conduit, 6" below previous thermocouple.
C552	On bare #8 wire in conduit, 6" below previous thermocouple.
C553	On bare #8 wire in conduit, 6" below previous thermocouple.
C554	On bare #8 wire in conduit, 6" below previous thermocouple.
C555	On bare #8 wire in conduit, 6" below previous thermocouple.
C556	On bare #8 wire in conduit, 6" below previous thermocouple.
C557	On bare #8 wire in conduit, 6" below previous thermocouple.
C558	On bare #8 wire in conduit, 6" below previous thermocouple.
C559	On bare #8 wire in conduit, 6" below previous thermocouple.
C560	On bare #8 wire in conduit, 6" below previous thermocouple.
C561	On bare #8 wire in conduit, 6" below previous thermocouple.
C562	On bare #8 wire in conduit, 6" below previous thermocouple.
C563	On bare #8 wire in conduit, 6" below previous thermocouple.
C564	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Aluminum Conduit

Front Right 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C565	On bare #8 wire in conduit, 6" below top of slab.
C566	On bare #8 wire in conduit, 6" below previous thermocouple.
C567	On bare #8 wire in conduit, 6" below previous thermocouple.
C568	On bare #8 wire in conduit, 6" below previous thermocouple.
C569	On bare #8 wire in conduit, 6" below previous thermocouple.
C570	On bare #8 wire in conduit, 6" below previous thermocouple.
C571	On bare #8 wire in conduit, 6" below previous thermocouple.
C572	On bare #8 wire in conduit, 6" below previous thermocouple.
C573	On bare #8 wire in conduit, 6" below previous thermocouple.
C574	On bare #8 wire in conduit, 6" below previous thermocouple.
C575	On bare #8 wire in conduit, 6" below previous thermocouple.
C576	On bare #8 wire in conduit, 6" below previous thermocouple.
C577	On bare #8 wire in conduit, 6" below previous thermocouple.
C578	On bare #8 wire in conduit, 6" below previous thermocouple.
C579	On bare #8 wire in conduit, 6" below previous thermocouple.
C580	On bare #8 wire in conduit, 6" below previous thermocouple.
C581	On bare #8 wire in conduit, 6" below previous thermocouple.
C582	On bare #8 wire in conduit, 6" below previous thermocouple.
C583	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Aluminum Conduit

Rear Left 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C584	On bare #8 wire in conduit, 6" below top of slab.
C585	On bare #8 wire in conduit, 6" below previous thermocouple.
C586	On bare #8 wire in conduit, 6" below previous thermocouple.
C587	On bare #8 wire in conduit, 6" below previous thermocouple.
C588	On bare #8 wire in conduit, 6" below previous thermocouple.
C589	On bare #8 wire in conduit, 6" below previous thermocouple.
C590	On bare #8 wire in conduit, 6" below previous thermocouple.
C591	On bare #8 wire in conduit, 6" below previous thermocouple.
C592	On bare #8 wire in conduit, 6" below previous thermocouple.
C593	On bare #8 wire in conduit, 6" below previous thermocouple.
C594	On bare #8 wire in conduit, 6" below previous thermocouple.
C595	On bare #8 wire in conduit, 6" below previous thermocouple.
C596	On bare #8 wire in conduit, 6" below previous thermocouple.
C597	On bare #8 wire in conduit, 6" below previous thermocouple.
C598	On bare #8 wire in conduit, 6" below previous thermocouple.
C599	On bare #8 wire in conduit, 6" below previous thermocouple.
C600	On bare #8 wire in conduit, 6" below previous thermocouple.
C601	On bare #8 wire in conduit, 6" below previous thermocouple.
C602	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

NOTE:
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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Aluminum Conduit

Rear Left-Center 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C603	On bare #8 wire in conduit, 6" below top of slab.
C604	On bare #8 wire in conduit, 6" below previous thermocouple.
C605	On bare #8 wire in conduit, 6" below previous thermocouple.
C606	On bare #8 wire in conduit, 6" below previous thermocouple.
C607	On bare #8 wire in conduit, 6" below previous thermocouple.
C608	On bare #8 wire in conduit, 6" below previous thermocouple.
C609	On bare #8 wire in conduit, 6" below previous thermocouple.
C610	On bare #8 wire in conduit, 6" below previous thermocouple.
C611	On bare #8 wire in conduit, 6" below previous thermocouple.
C612	On bare #8 wire in conduit, 6" below previous thermocouple.
C613	On bare #8 wire in conduit, 6" below previous thermocouple.
C614	On bare #8 wire in conduit, 6" below previous thermocouple.
C615	On bare #8 wire in conduit, 6" below previous thermocouple.
C616	On bare #8 wire in conduit, 6" below previous thermocouple.
C617	On bare #8 wire in conduit, 6" below previous thermocouple.
C618	On bare #8 wire in conduit, 6" below previous thermocouple.
C619	On bare #8 wire in conduit, 6" below previous thermocouple.
C620	On bare #8 wire in conduit, 6" below previous thermocouple.
C621	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Aluminum Conduit

Rear Right-Center 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C622	On bare #8 wire in conduit, 6" below top of slab.
C623	On bare #8 wire in conduit, 6" below previous thermocouple.
C624	On bare #8 wire in conduit, 6" below previous thermocouple.
C625	On bare #8 wire in conduit, 6" below previous thermocouple.
C626	On bare #8 wire in conduit, 6" below previous thermocouple.
C627	On bare #8 wire in conduit, 6" below previous thermocouple.
C628	On bare #8 wire in conduit, 6" below previous thermocouple.
C629	On bare #8 wire in conduit, 6" below previous thermocouple.
C630	On bare #8 wire in conduit, 6" below previous thermocouple.
C631	On bare #8 wire in conduit, 6" below previous thermocouple.
C632	On bare #8 wire in conduit, 6" below previous thermocouple.
C633	On bare #8 wire in conduit, 6" below previous thermocouple.
C634	On bare #8 wire in conduit, 6" below previous thermocouple.
C635	On bare #8 wire in conduit, 6" below previous thermocouple.
C636	On bare #8 wire in conduit, 6" below previous thermocouple.
C637	On bare #8 wire in conduit, 6" below previous thermocouple.
C638	On bare #8 wire in conduit, 6" below previous thermocouple.
C639	On bare #8 wire in conduit, 6" below previous thermocouple.
C640	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

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Project #: 97259

Test Deck #: 6

Item: Bare #8 in Aluminum Conduit

Rear Right 4" Conduit in Array

(viewed from fireside)

TC Number	Description of exact physical location
C641	On bare #8 wire in conduit, 6" below top of slab.
C642	On bare #8 wire in conduit, 6" below previous thermocouple.
C643	On bare #8 wire in conduit, 6" below previous thermocouple.
C644	On bare #8 wire in conduit, 6" below previous thermocouple.
C645	On bare #8 wire in conduit, 6" below previous thermocouple.
C646	On bare #8 wire in conduit, 6" below previous thermocouple.
C647	On bare #8 wire in conduit, 6" below previous thermocouple.
C648	On bare #8 wire in conduit, 6" below previous thermocouple.
C649	On bare #8 wire in conduit, 6" below previous thermocouple.
C650	On bare #8 wire in conduit, 6" below previous thermocouple.
C651	On bare #8 wire in conduit, 6" below previous thermocouple.
C652	On bare #8 wire in conduit, 6" below previous thermocouple.
C653	On bare #8 wire in conduit, 6" below previous thermocouple.
C654	On bare #8 wire in conduit, 6" below previous thermocouple.
C655	On bare #8 wire in conduit, 6" below previous thermocouple.
C656	On bare #8 wire in conduit, 6" below previous thermocouple.
C657	On bare #8 wire in conduit, 6" below previous thermocouple.
C658	On bare #8 wire in conduit, 6" below previous thermocouple.
C659	On bare #8 wire in conduit, 6" below previous thermocouple, 6" above bottom of slab.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97259

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Project #: 97259

Test Deck #: 6

Item: Steel Conduit Surface on Rear of 1" Conduit and 3" Conduit Arrays (viewed from fireside)

TC Number	Description of exact physical location
E660	On left surface of the left 1" conduit, 12" below top of slab.
E661	On left surface of the left 1" conduit, 12" below previous thermocouple.
E662	On left surface of the left 1" conduit, 12" below previous thermocouple.
E663	On left surface of the left 1" conduit, 12" below previous thermocouple.
E664	On left surface of the left 1" conduit, 12" below previous thermocouple.
E665	On left surface of the left 1" conduit, 12" below previous thermocouple.
E666	On right surface of the right 1" conduit, 12" below top of slab.
E667	On right surface of the right 1" conduit, 12" below previous thermocouple.
E668	On right surface of the right 1" conduit, 12" below previous thermocouple.
E669	On right surface of the right 1" conduit, 12" below previous thermocouple.
E670	On right surface of the right 1" conduit, 12" below previous thermocouple.
E671	On right surface of the right 1" conduit, 12" below previous thermocouple.
E672	On left surface of the left 3" conduit, 12" below top of slab.
E673	On left surface of the left 3" conduit, 12" below previous thermocouple.
E674	On left surface of the left 3" conduit, 12" below previous thermocouple.
E675	On left surface of the left 3" conduit, 12" below previous thermocouple.
E676	On left surface of the left 3" conduit, 12" below previous thermocouple.
E677	On left surface of the left 3" conduit, 12" below previous thermocouple.
E678	On right surface of the right 3" conduit, 12" below top of slab.
E679	On right surface of the right 3" conduit, 12" below previous thermocouple.
E680	On right surface of the right 3" conduit, 12" below previous thermocouple.
E681	On right surface of the right 3" conduit, 12" below previous thermocouple.
E682	On right surface of the right 3" conduit, 12" below previous thermocouple.
E683	On right surface of the right 3" conduit, 12" below previous thermocouple.

NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (copper wire), and E (engineering TC), for instance c1, E35, etc.

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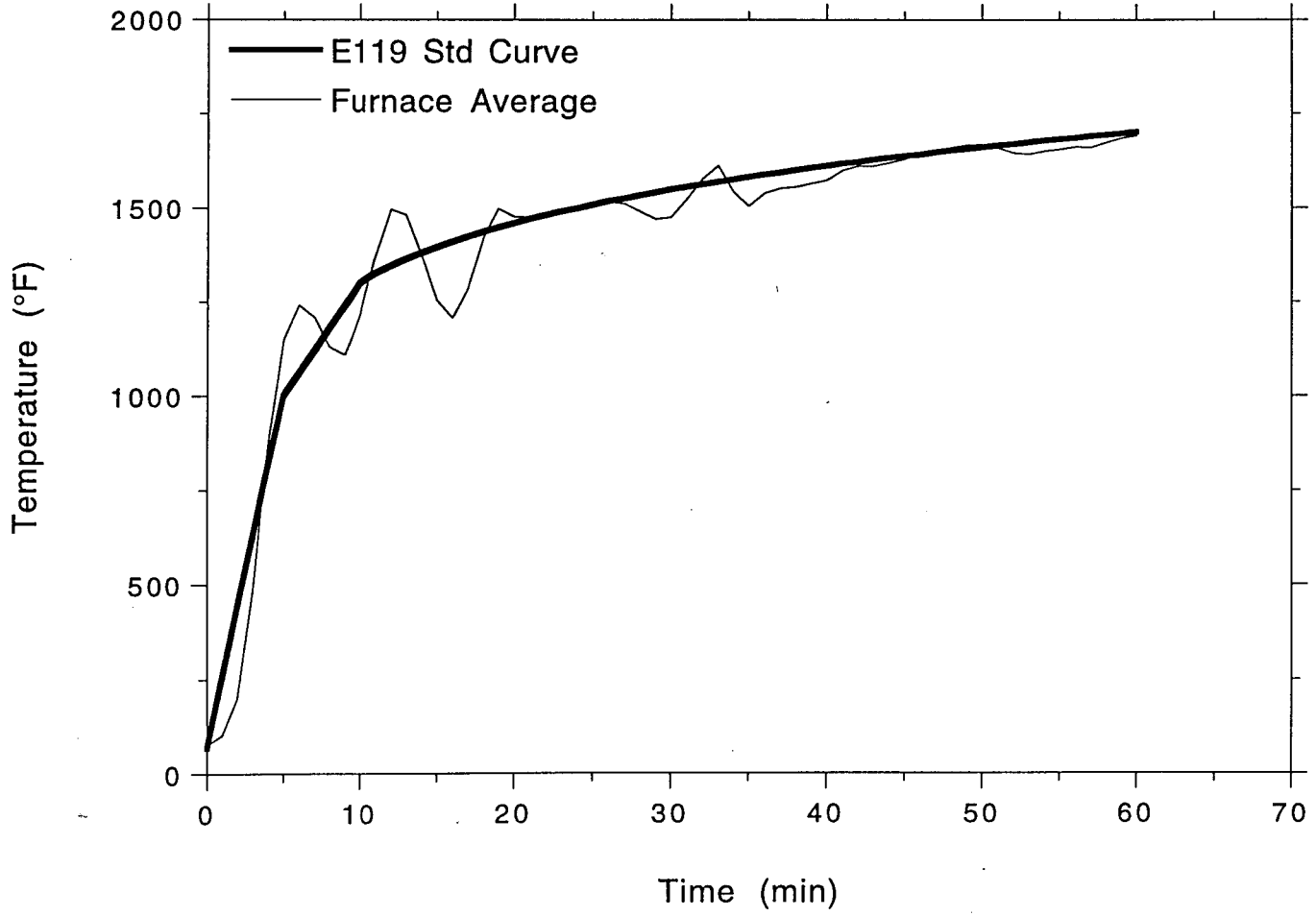
Appendix D

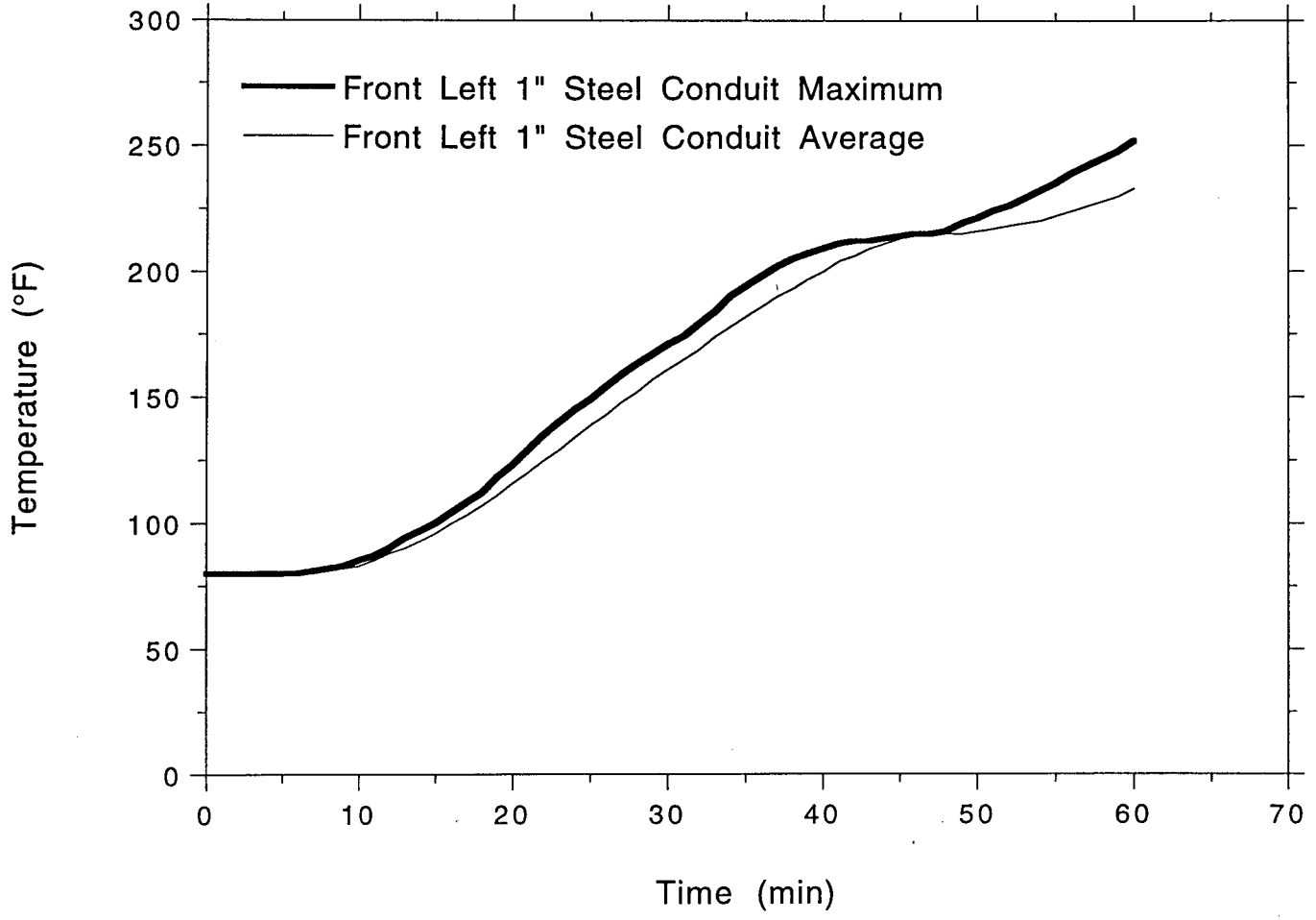
TEST DATA

TSI/TVA
Project No. 11960-97259
Furnace Temperature



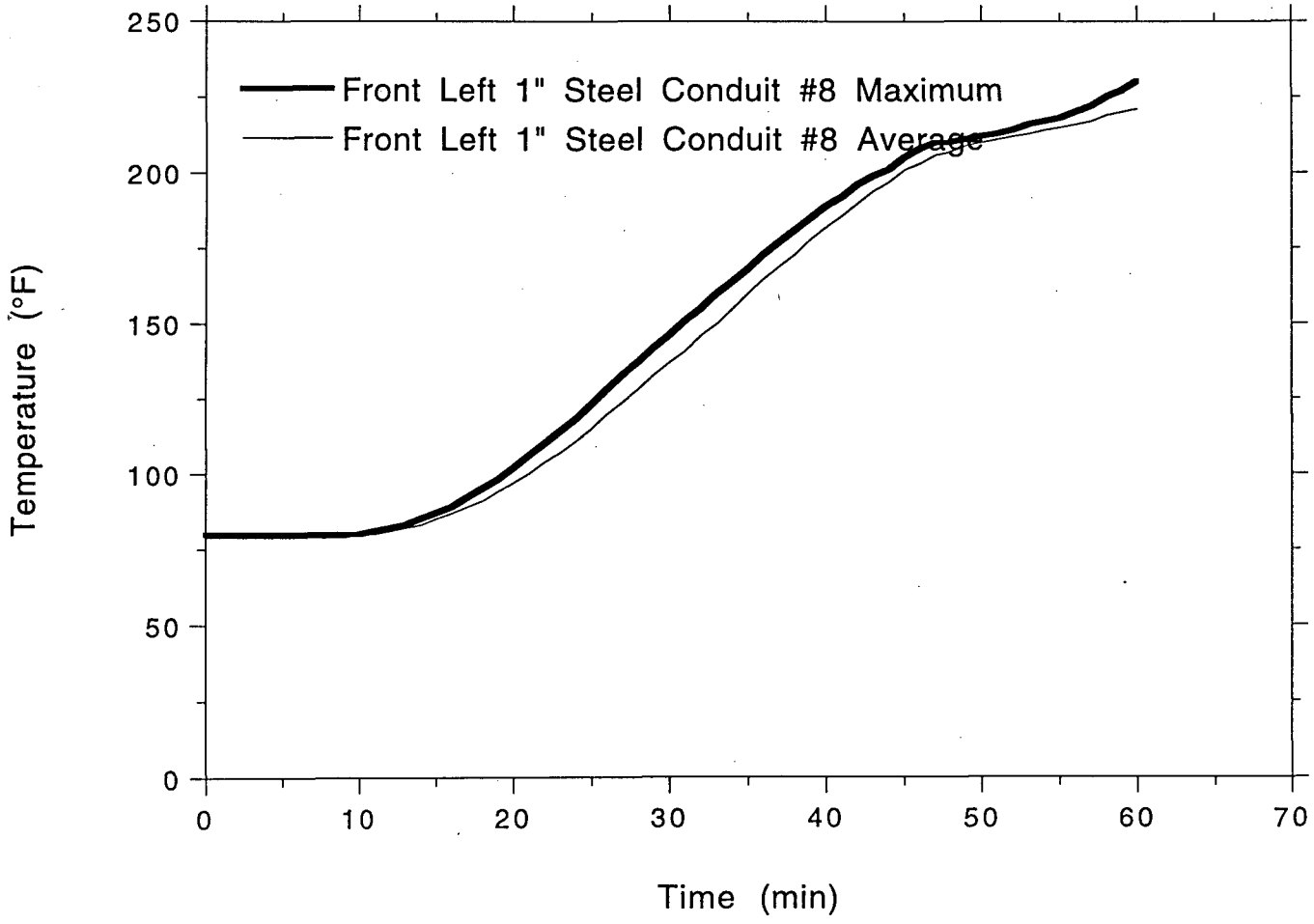
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



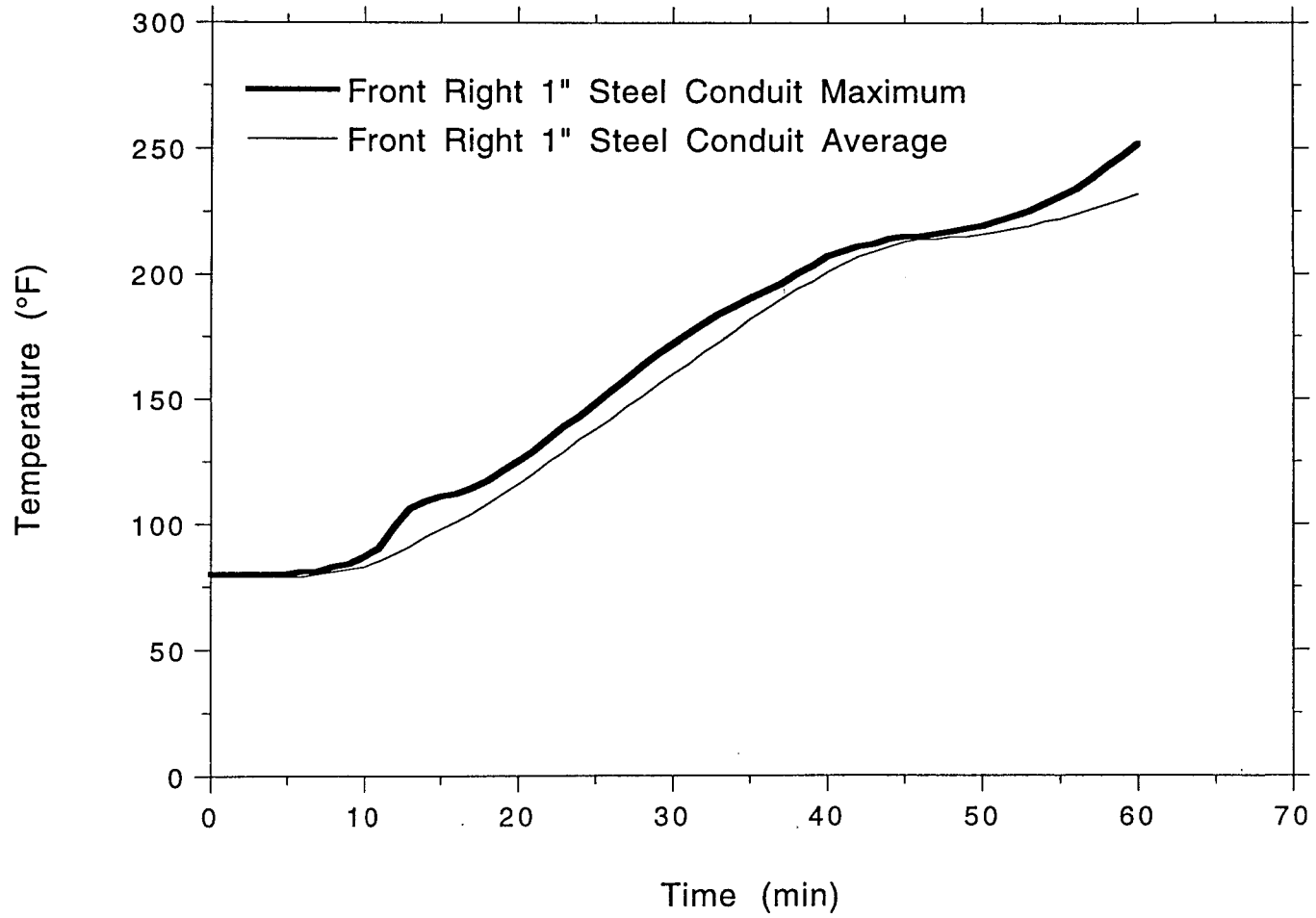
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



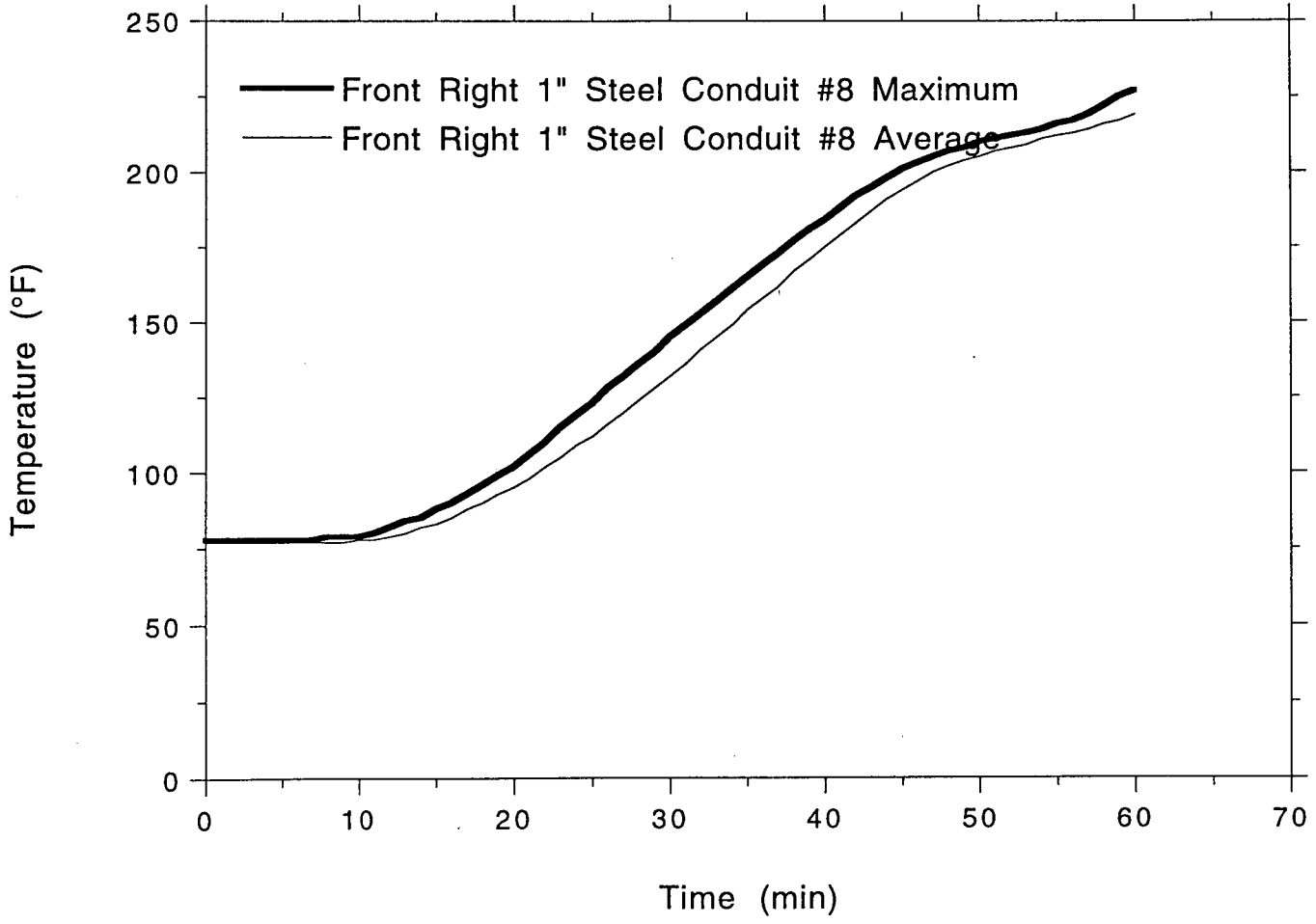
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



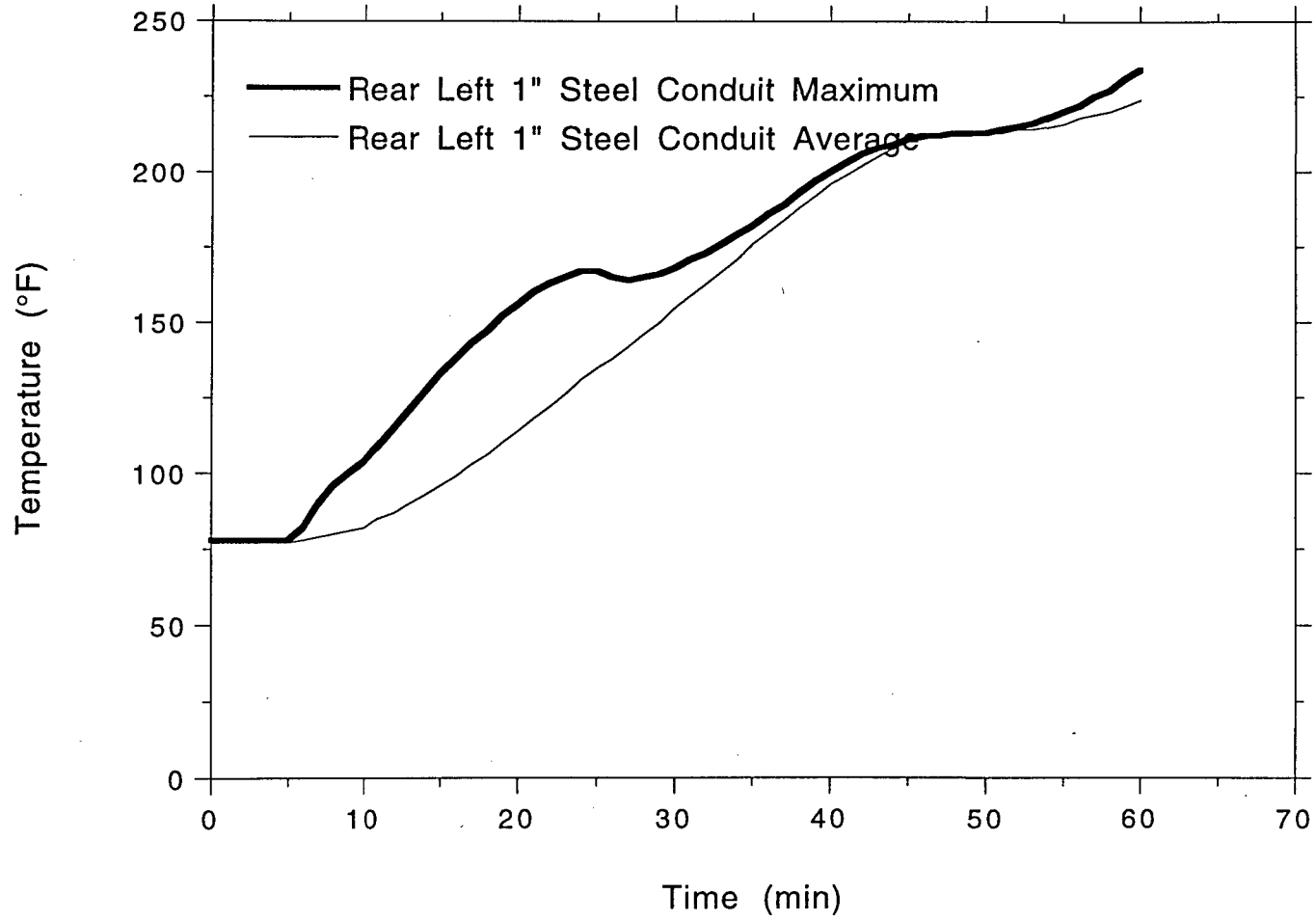
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



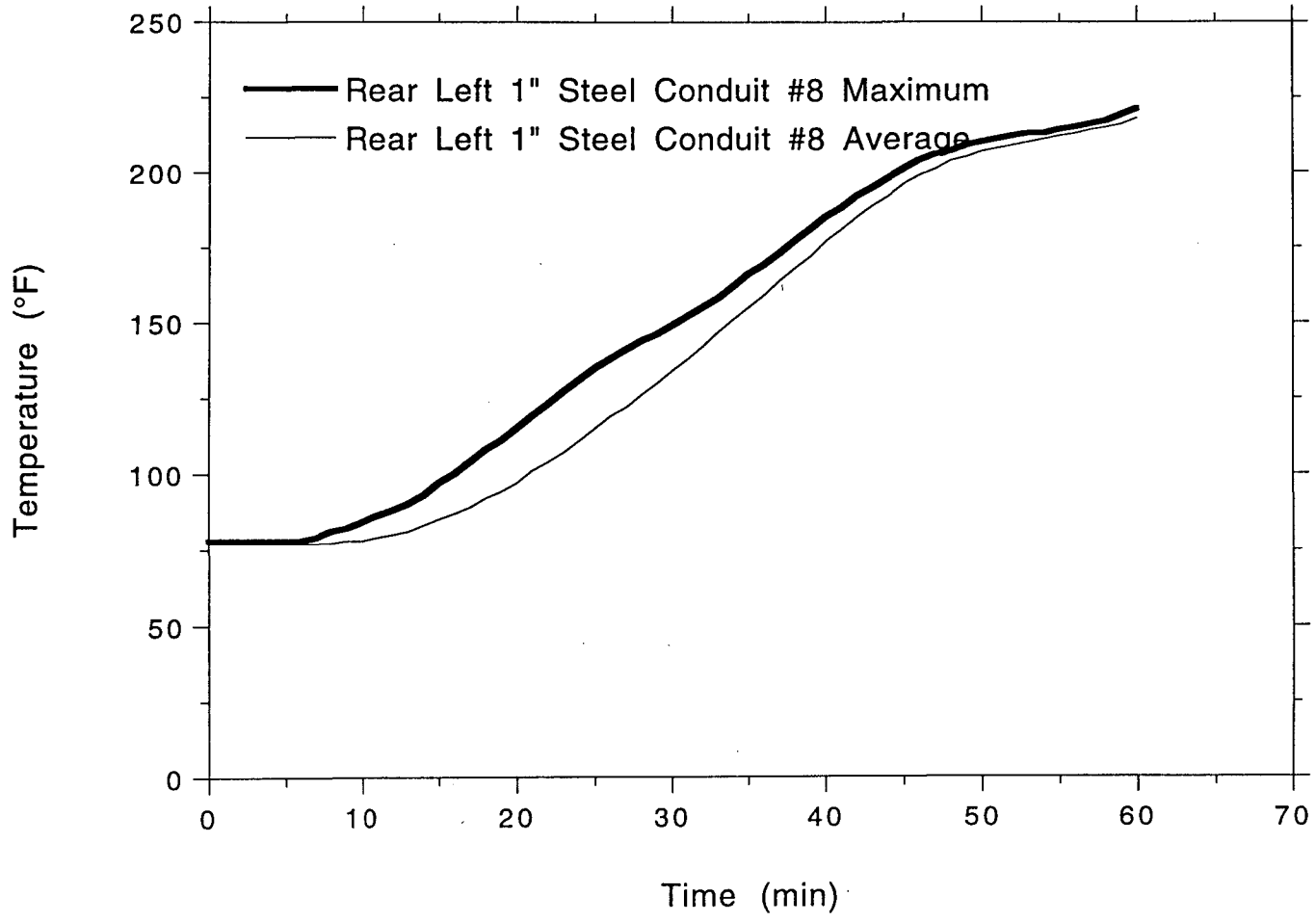
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



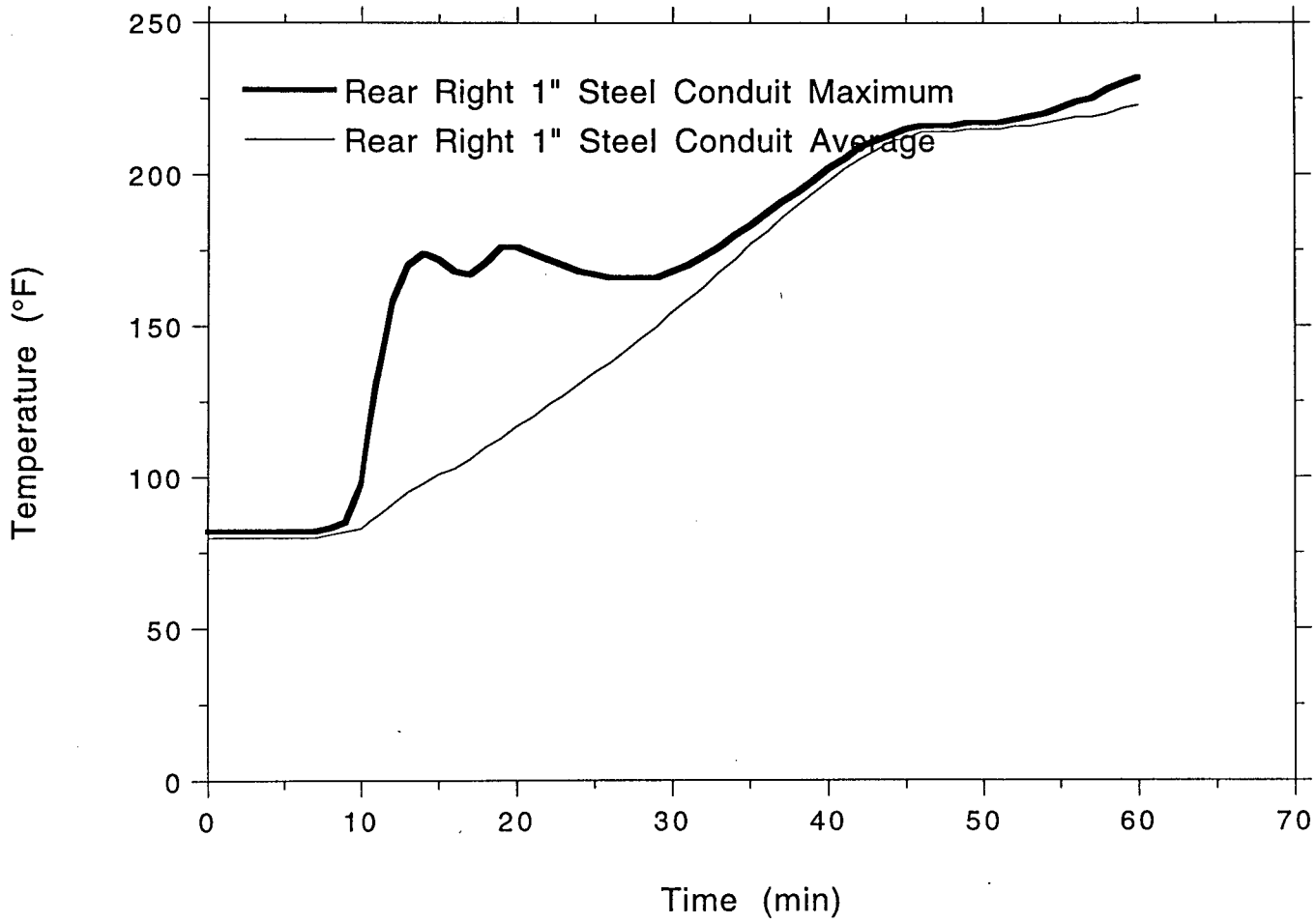
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



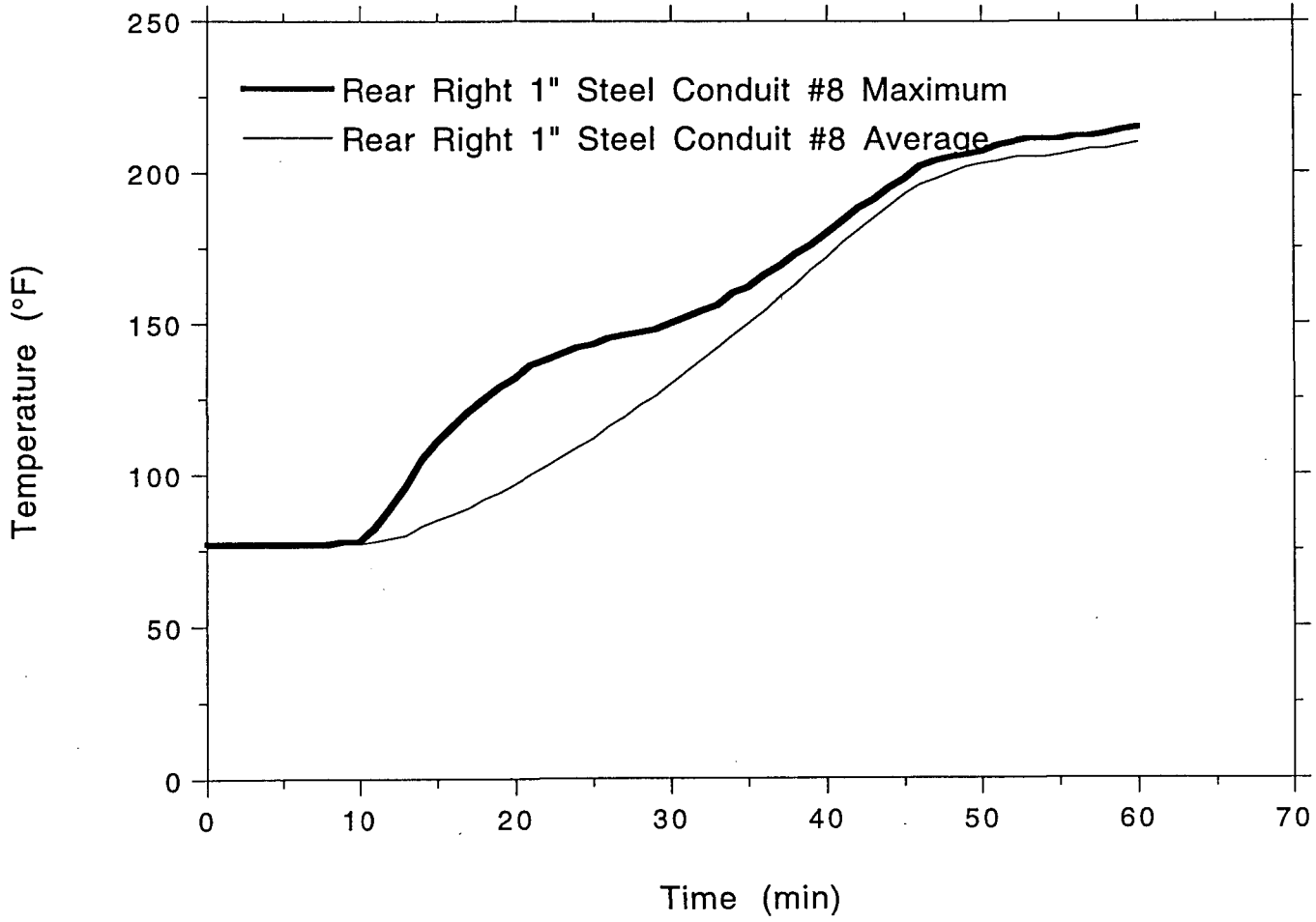
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



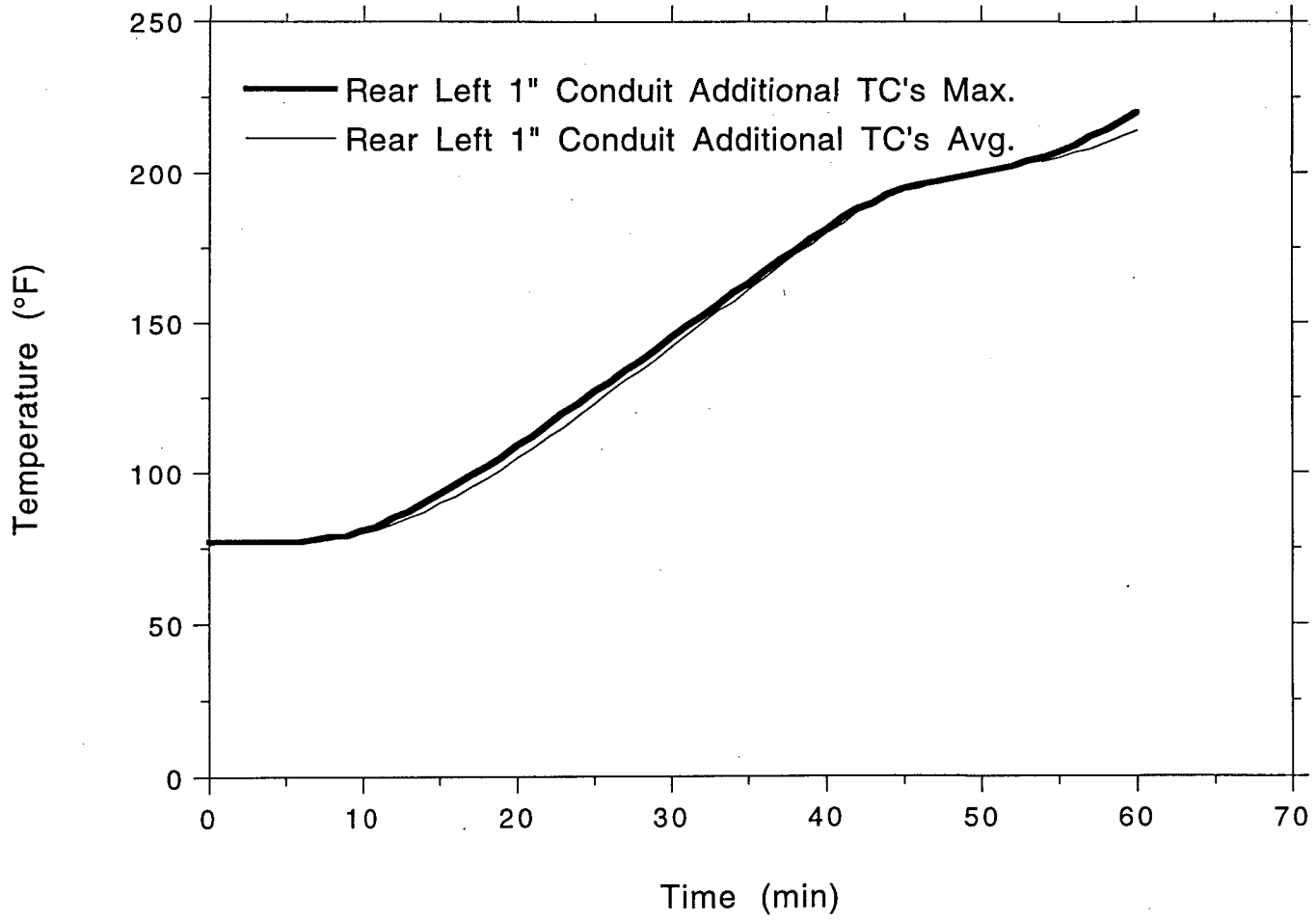
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



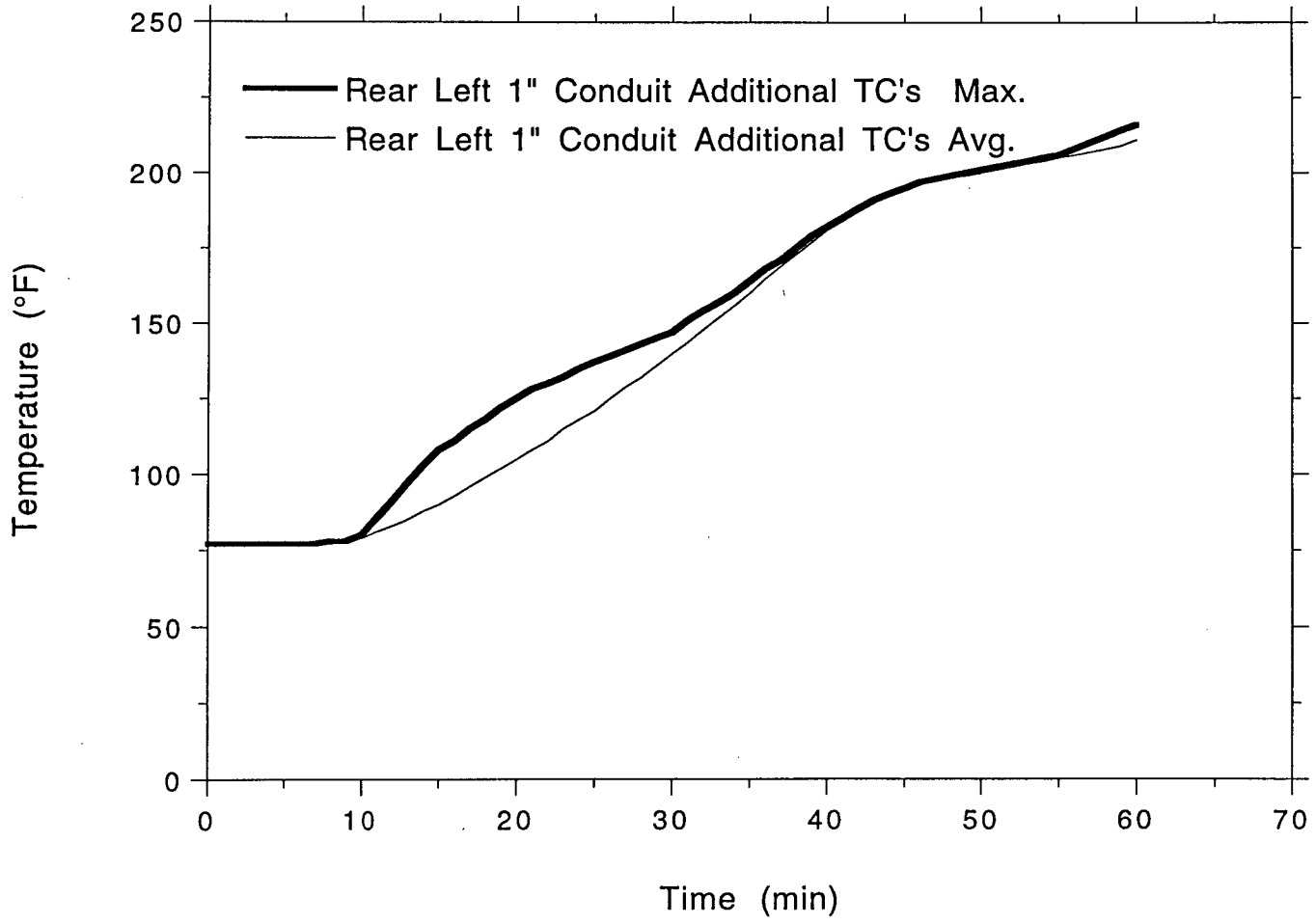
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



OMEGA POINT LABORATORIES

TSI/TVA
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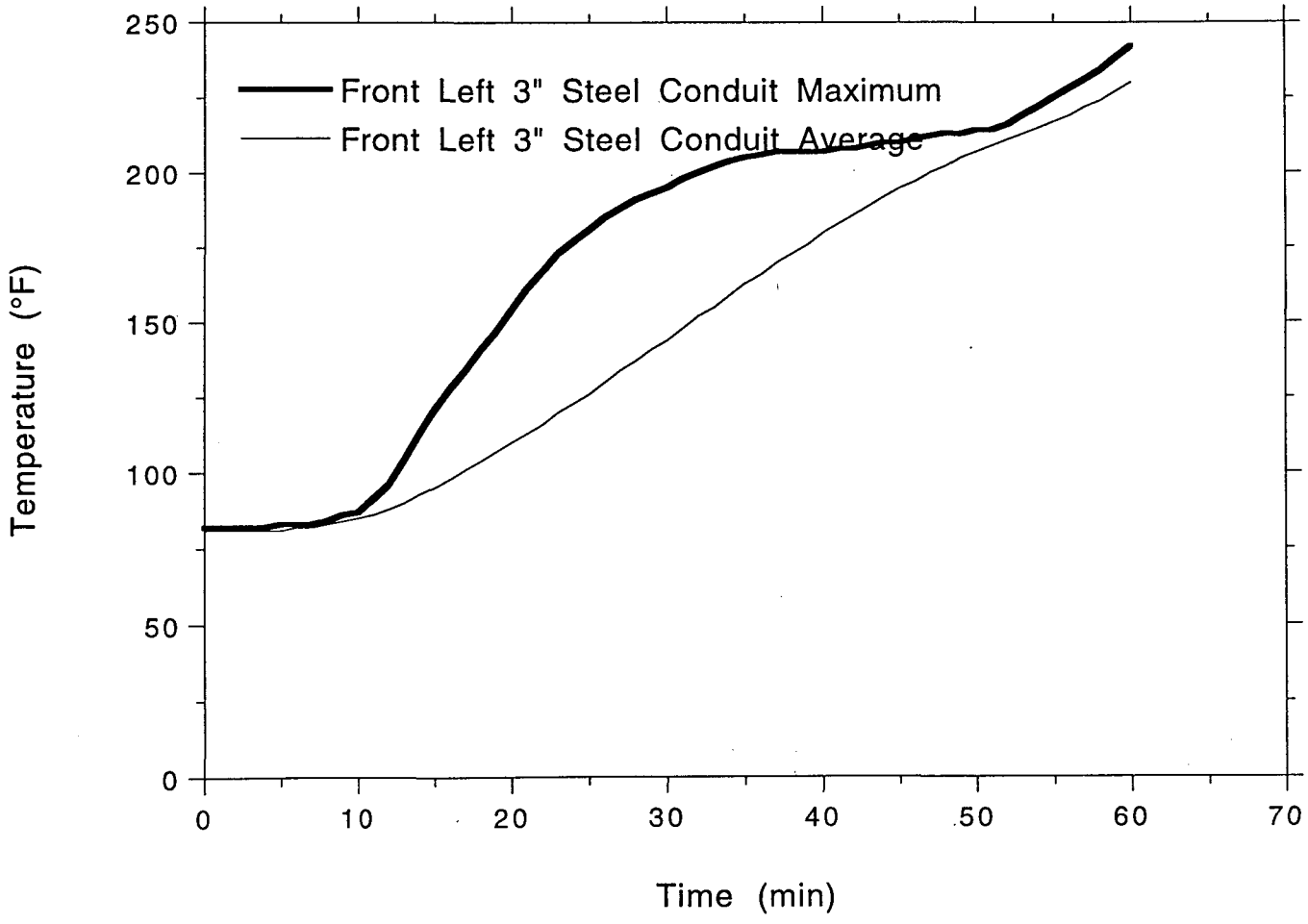
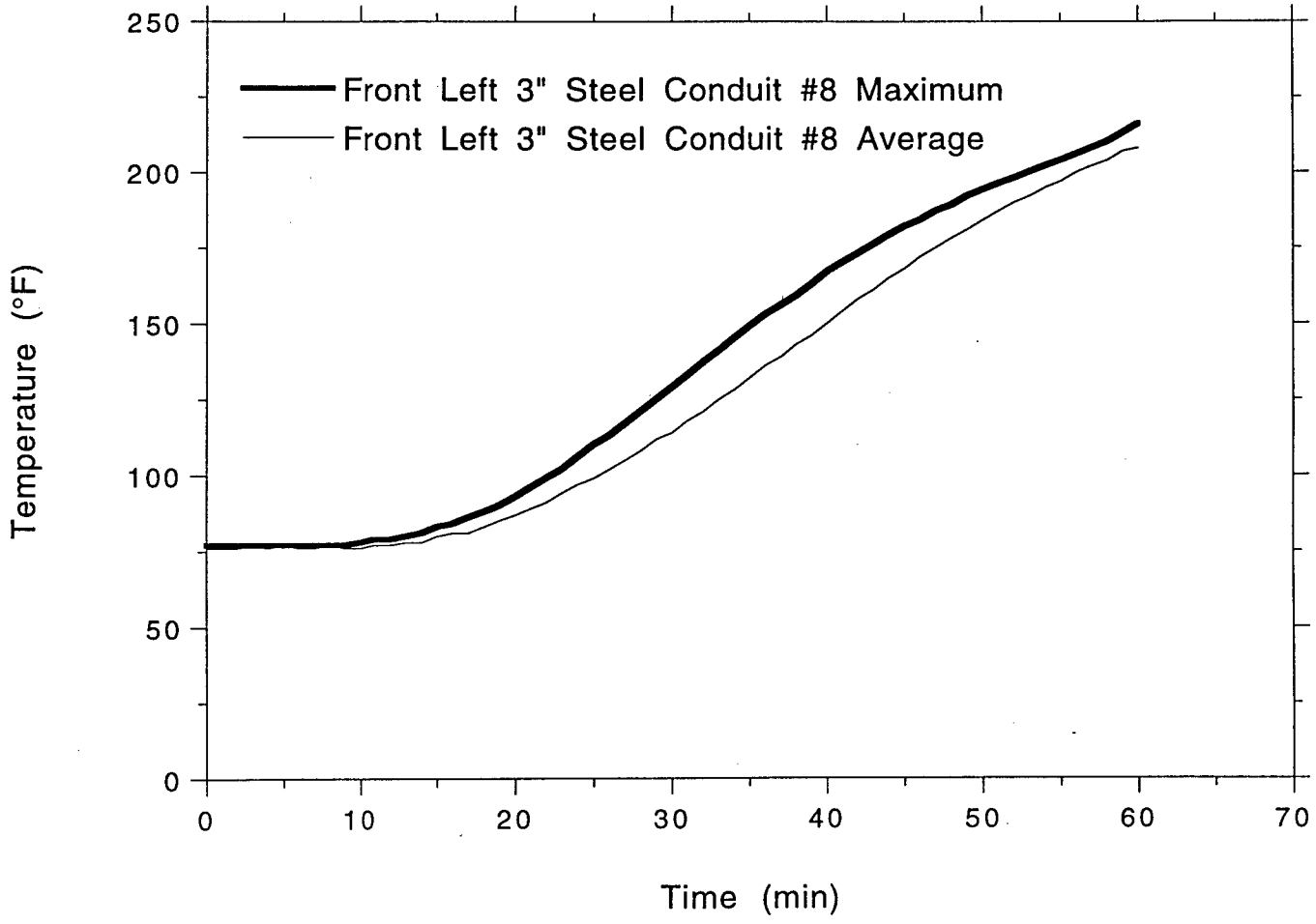
Conduit Average Temperatures



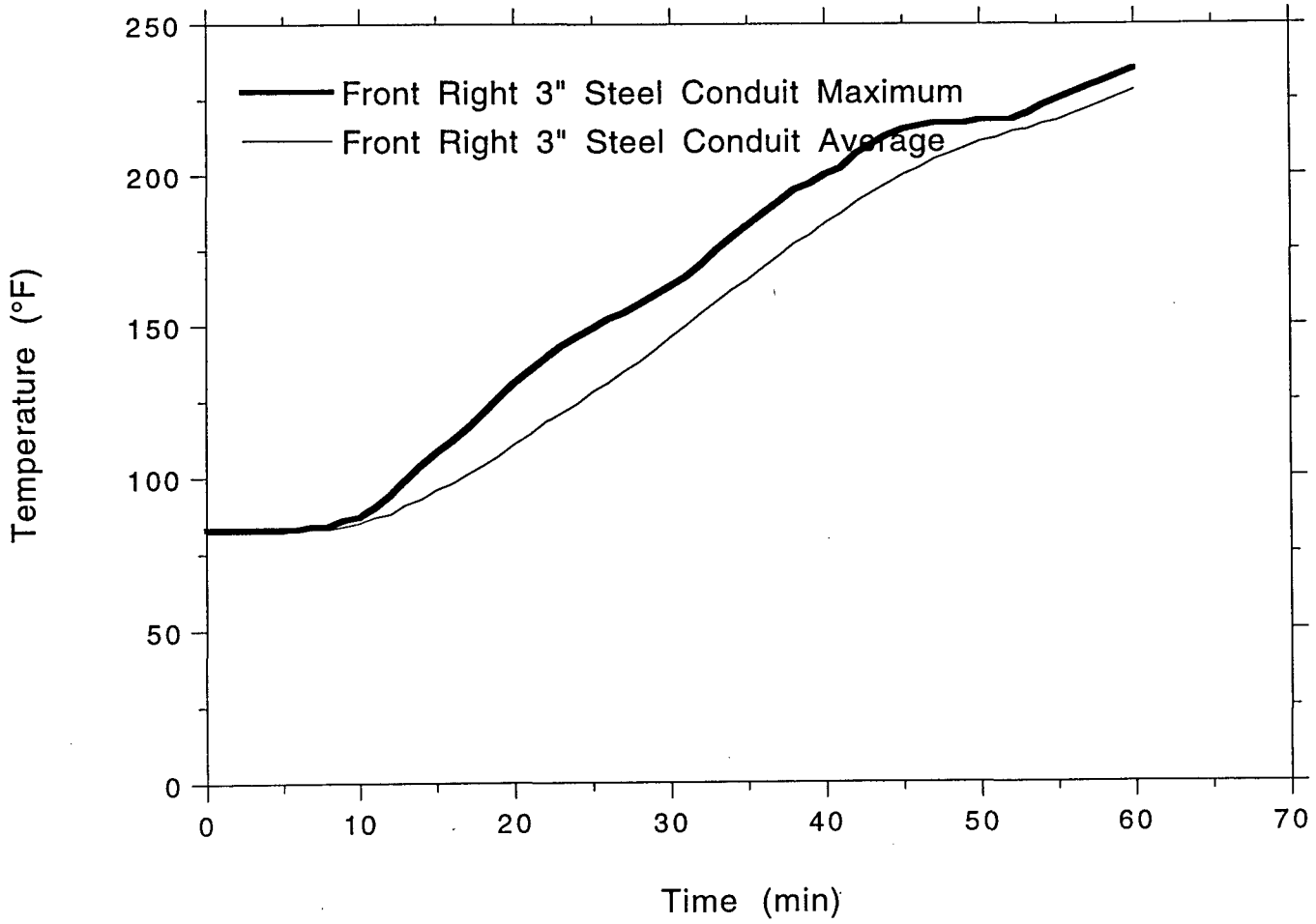
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



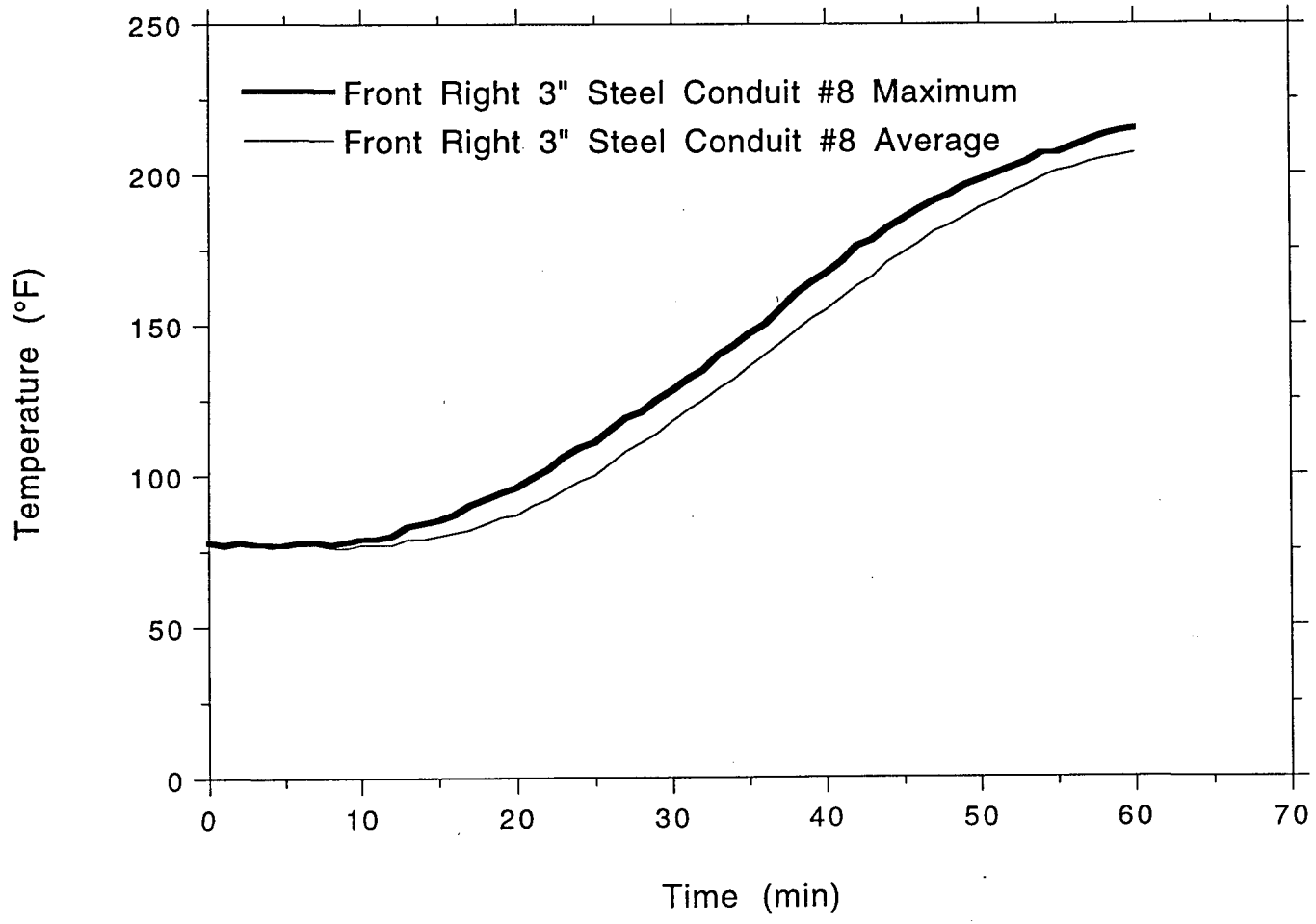
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



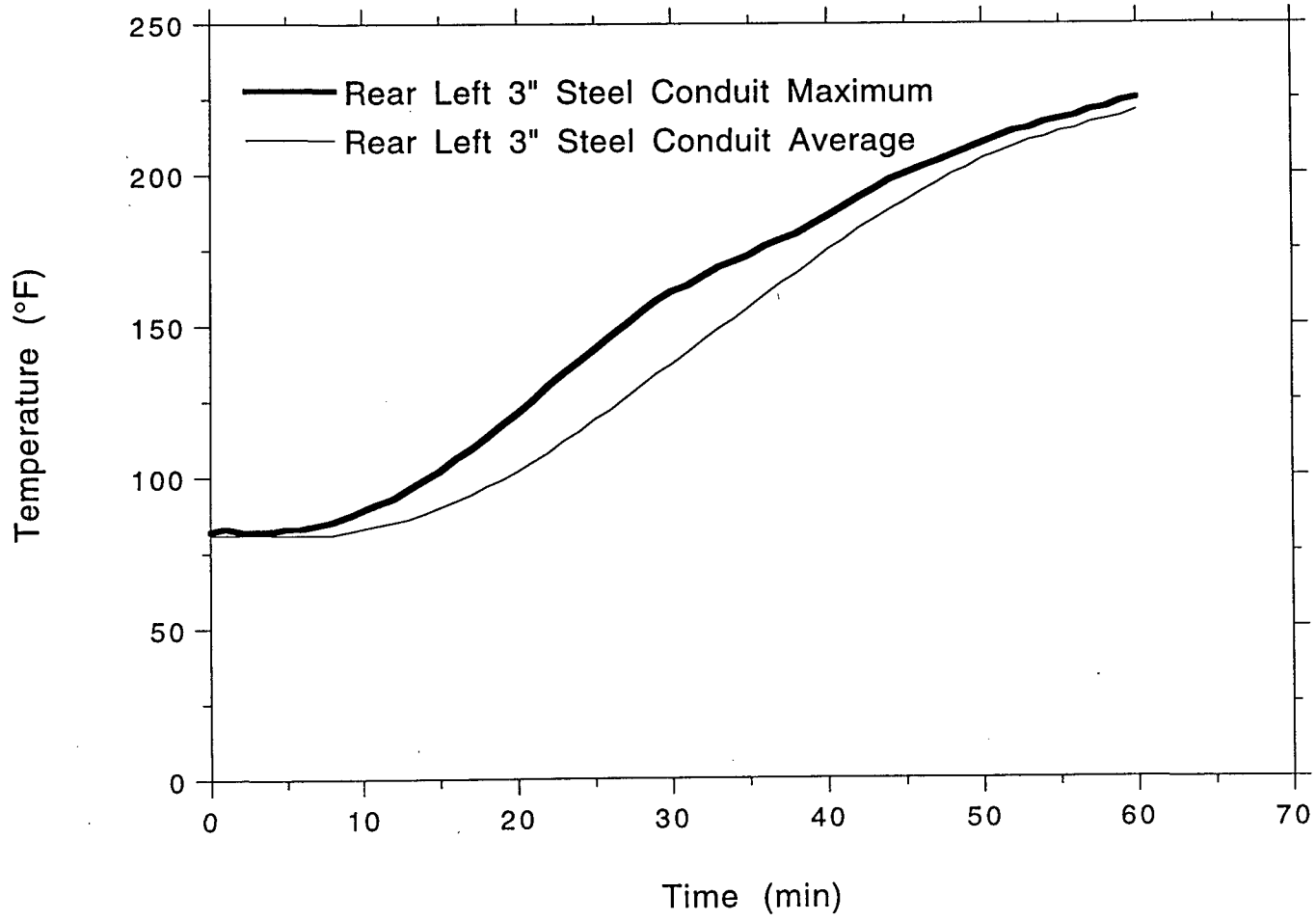
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



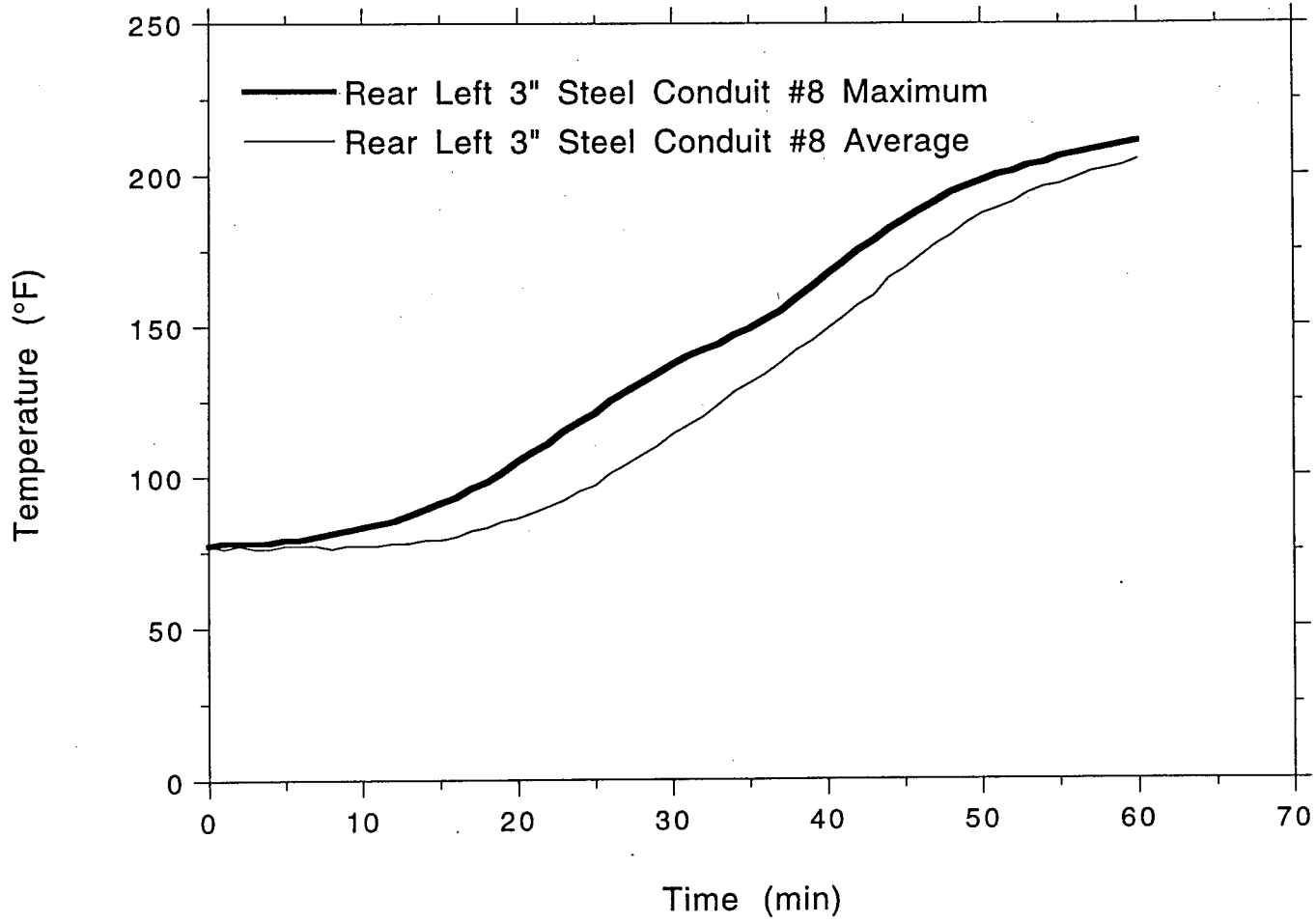
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



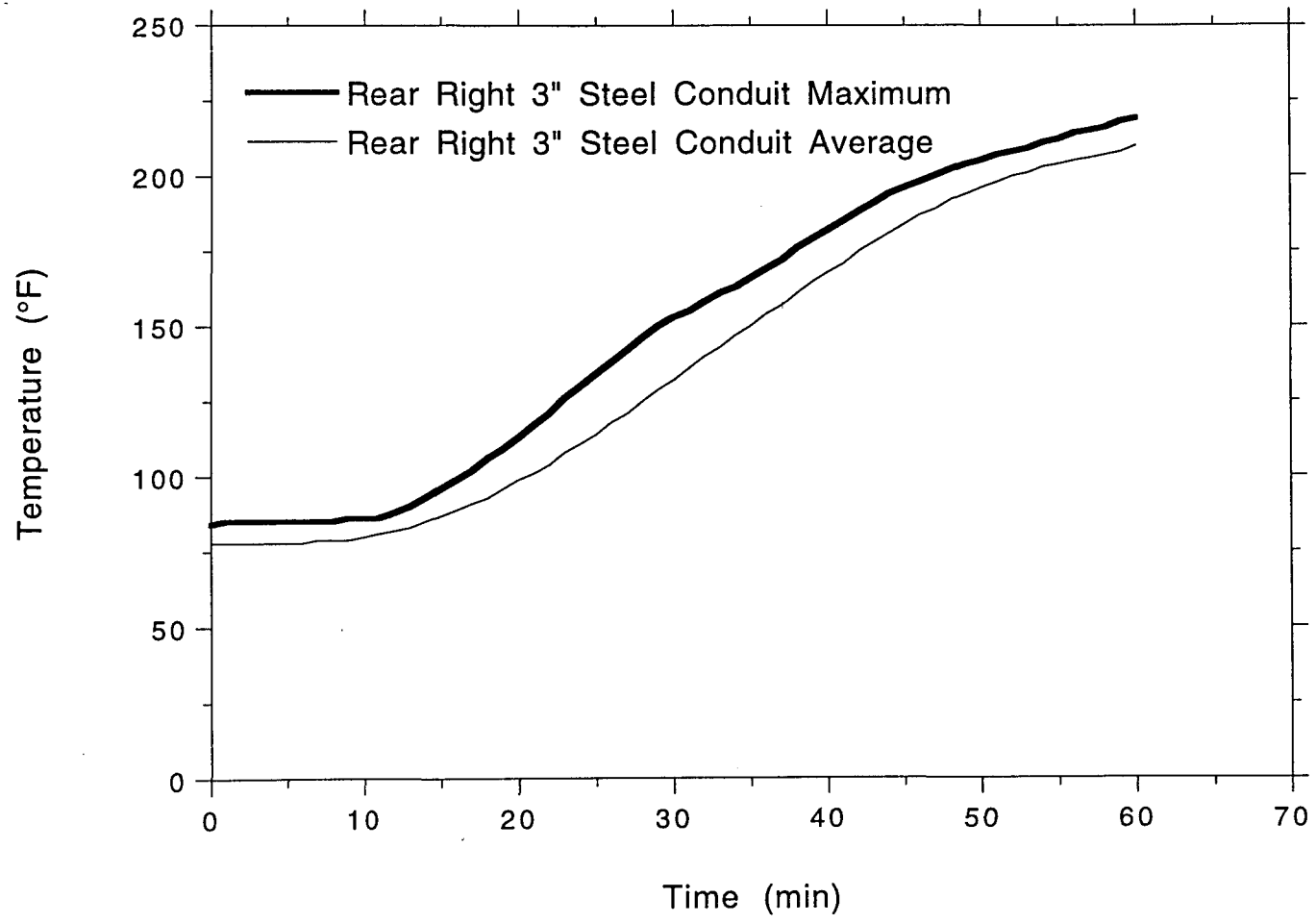
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



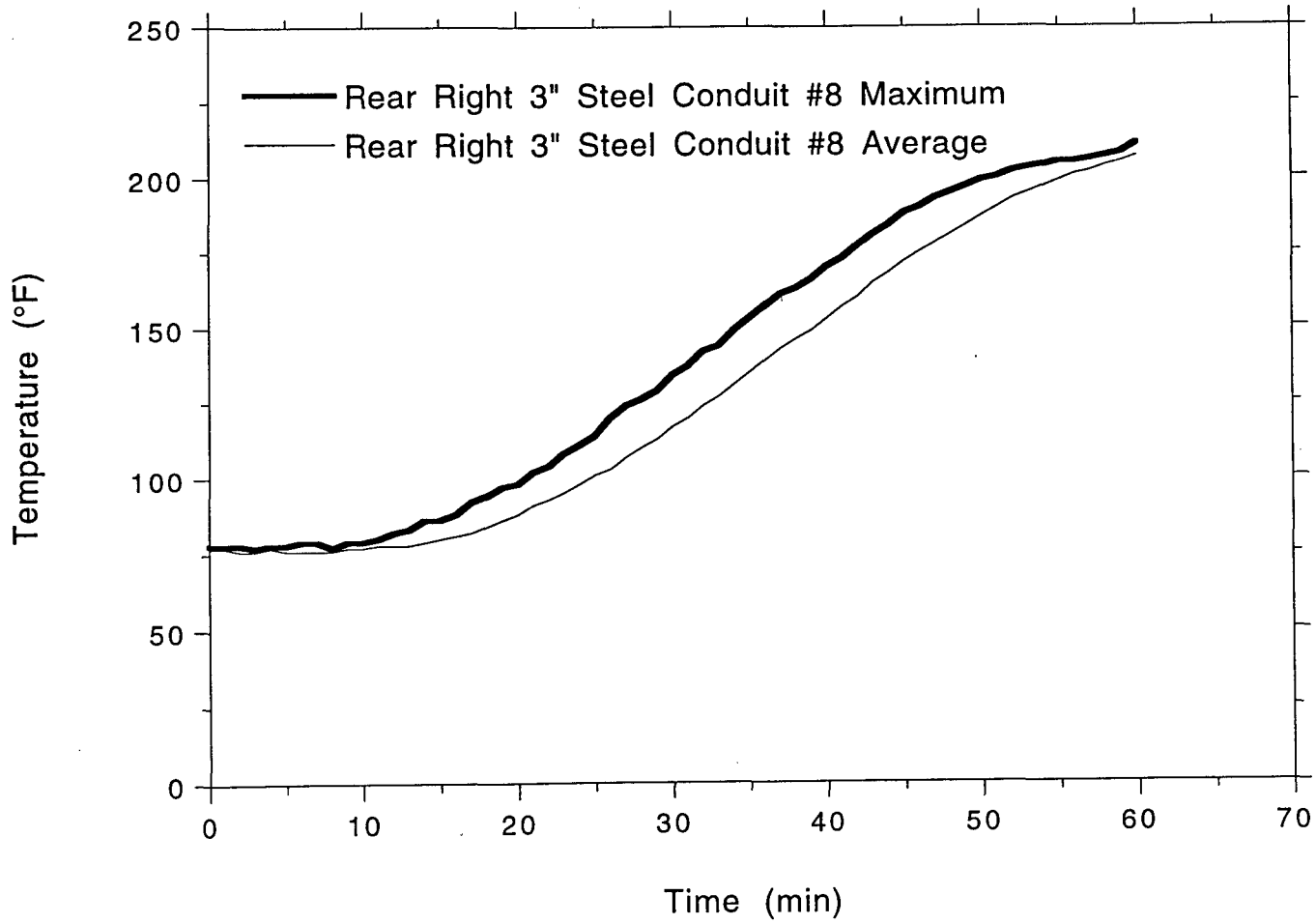
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



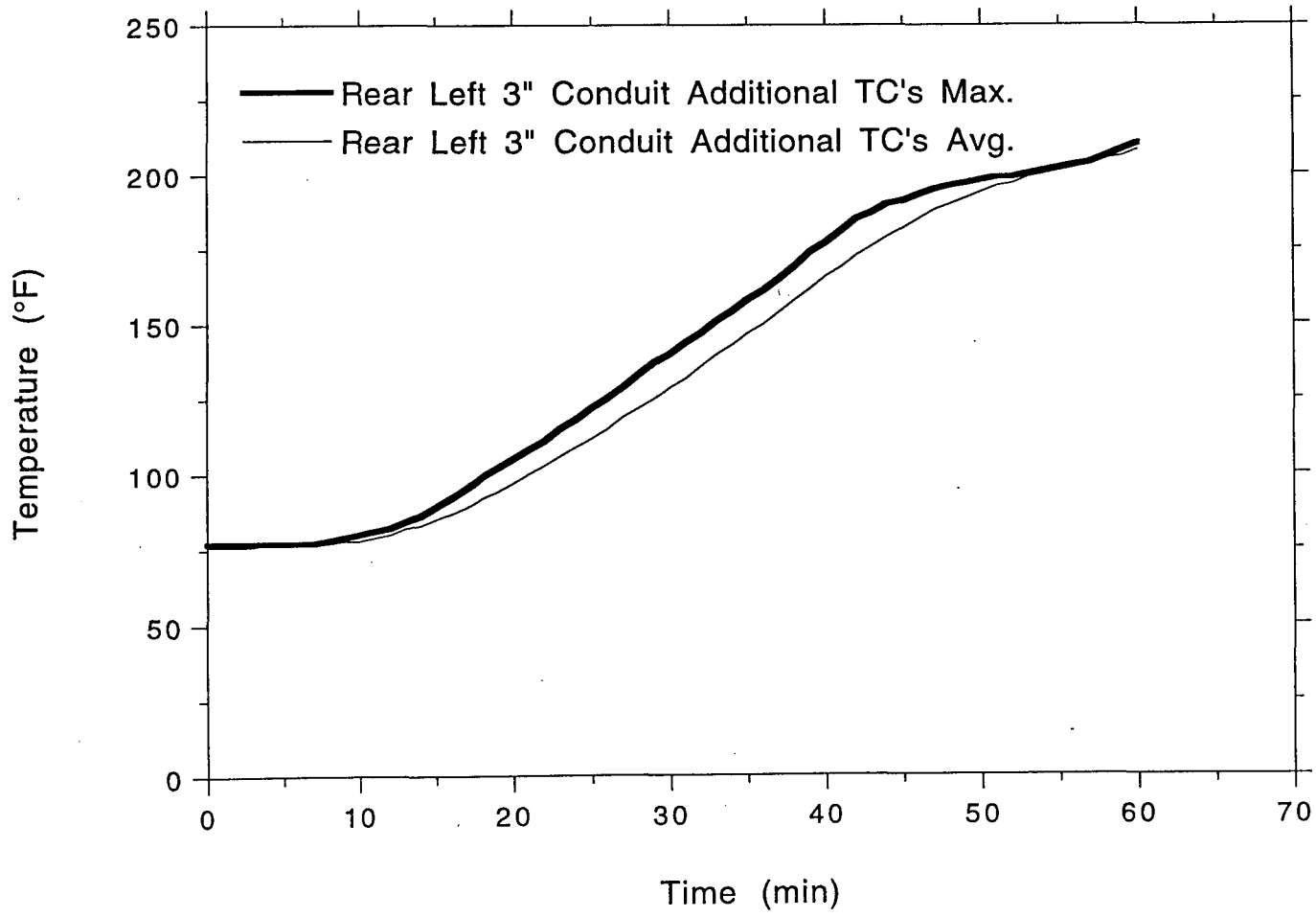
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



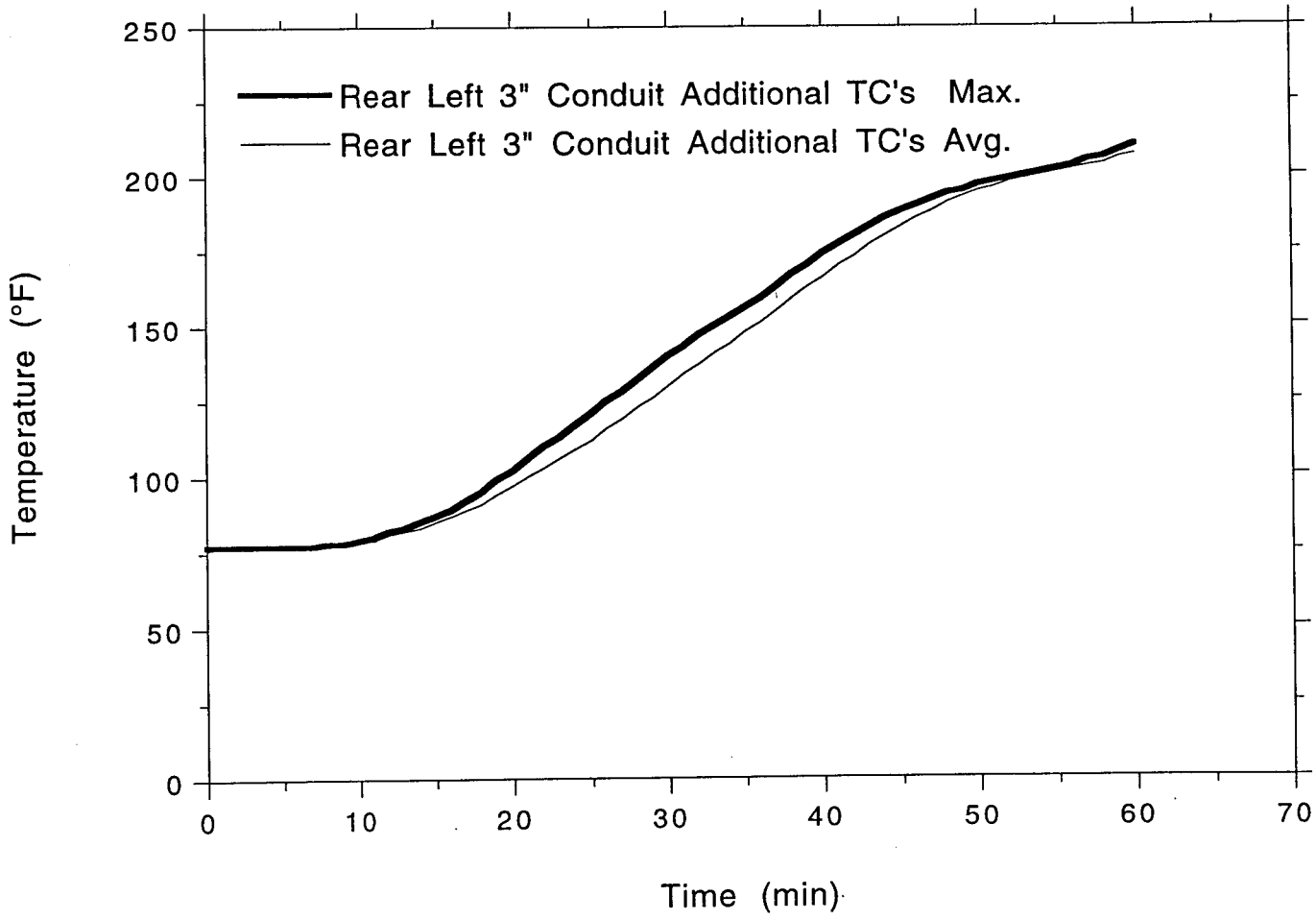
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



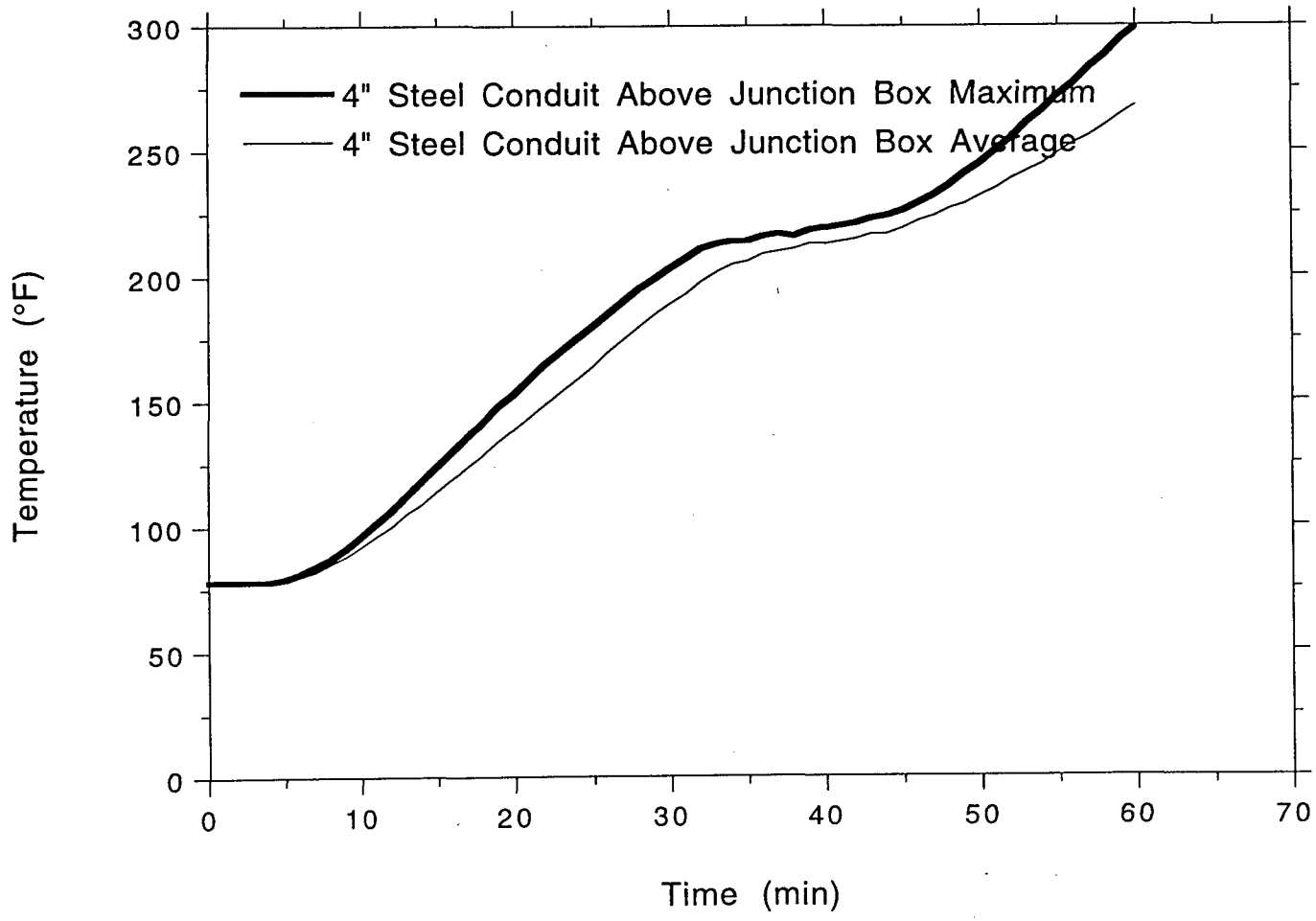
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



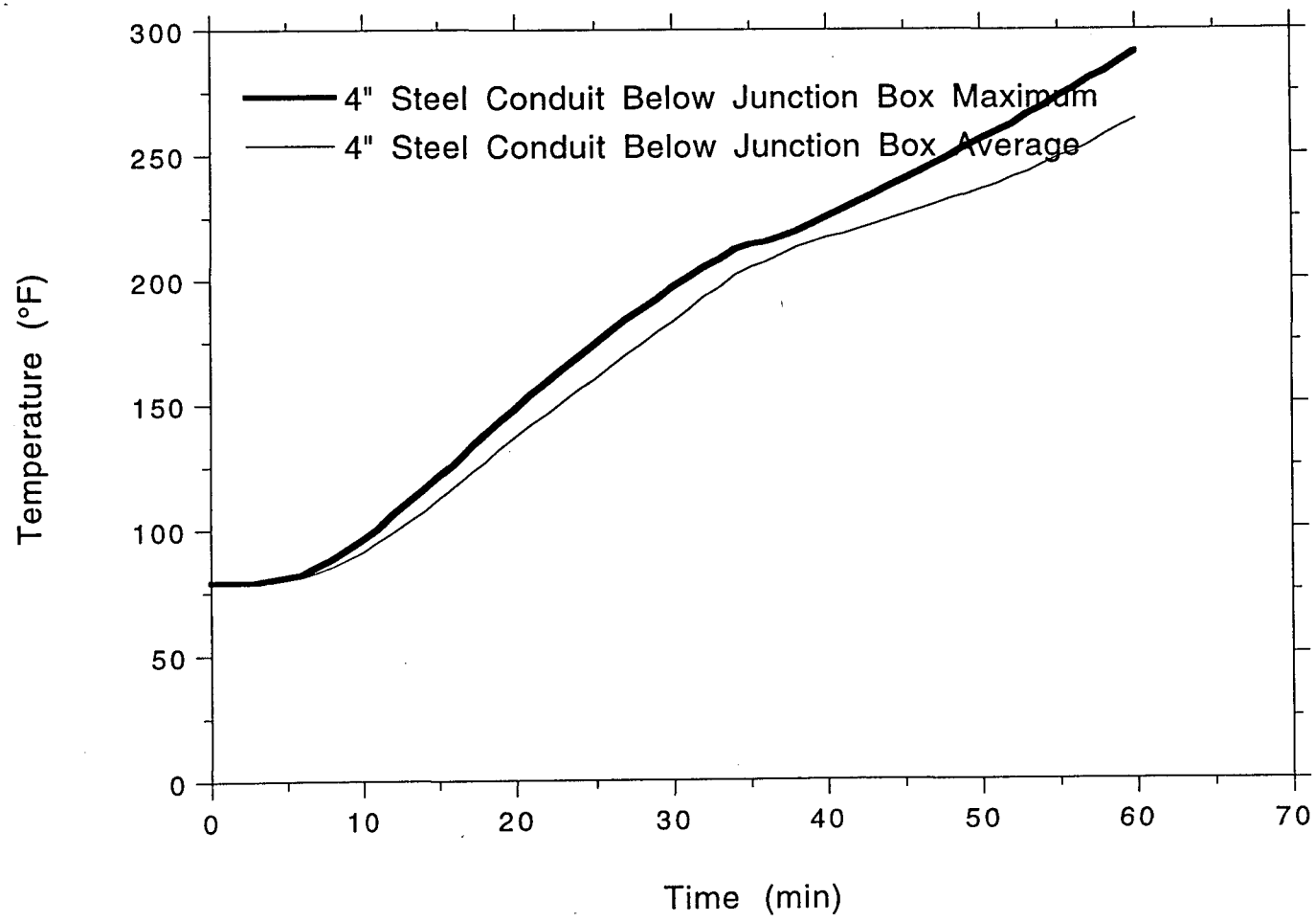
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



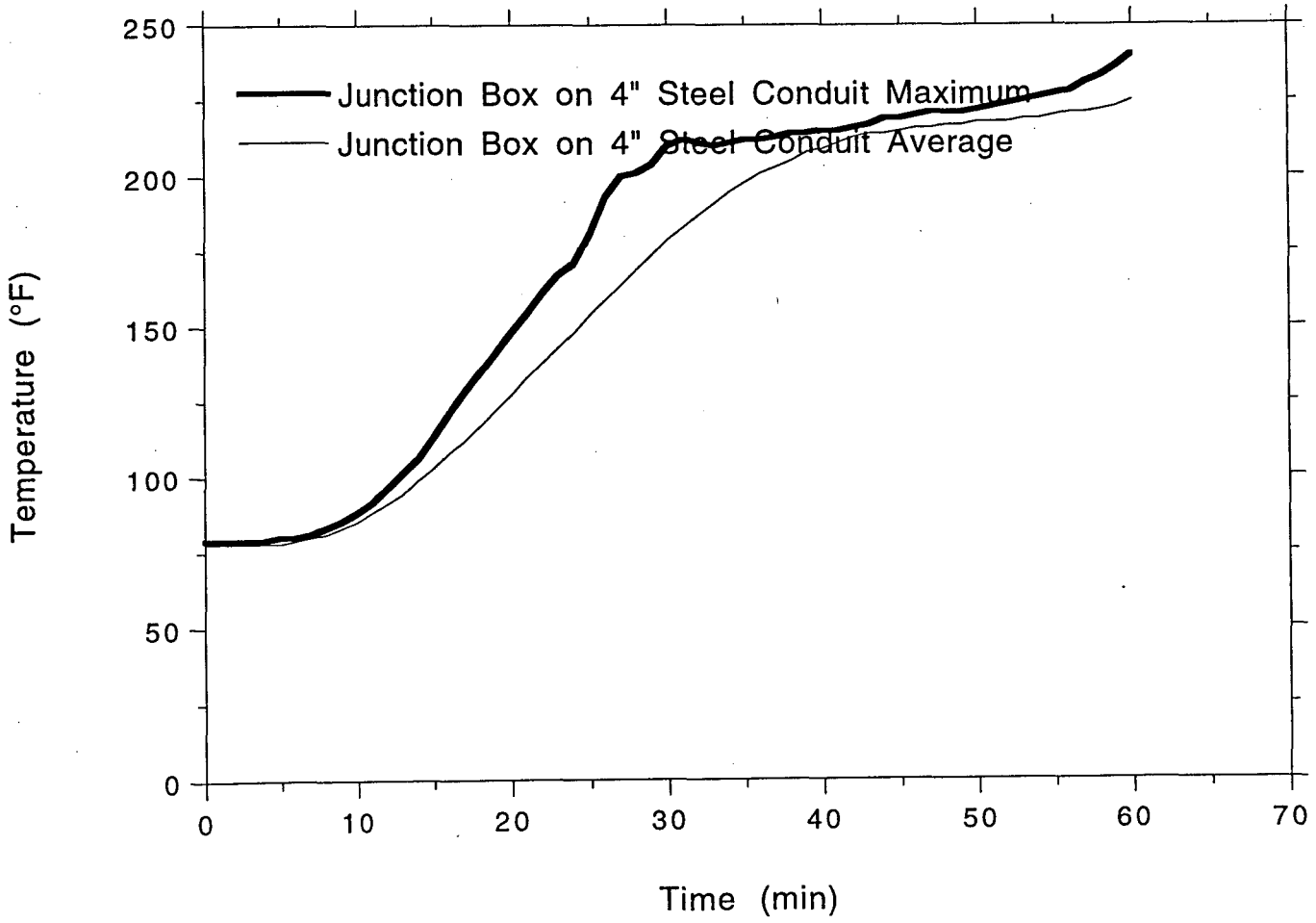
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



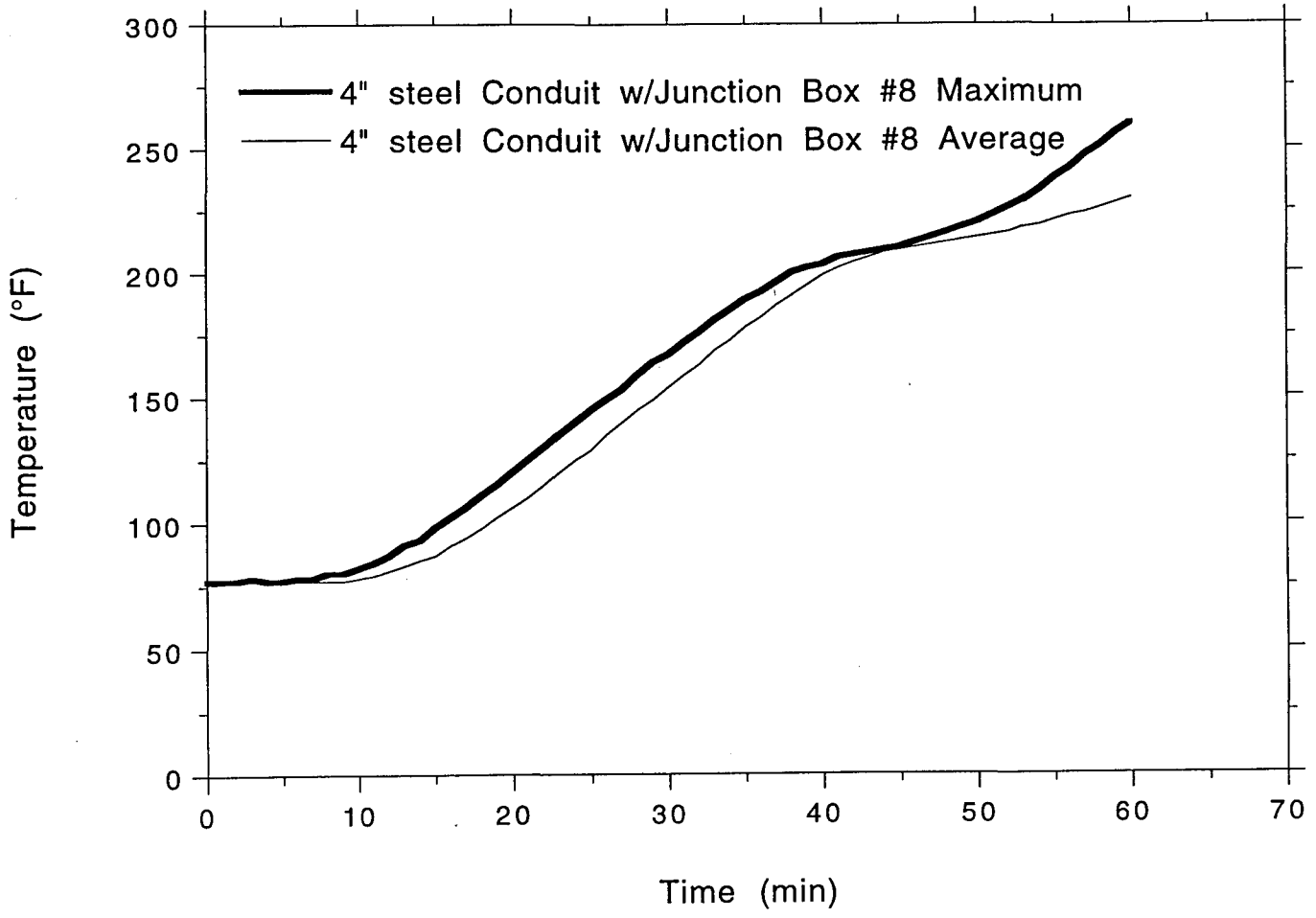
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



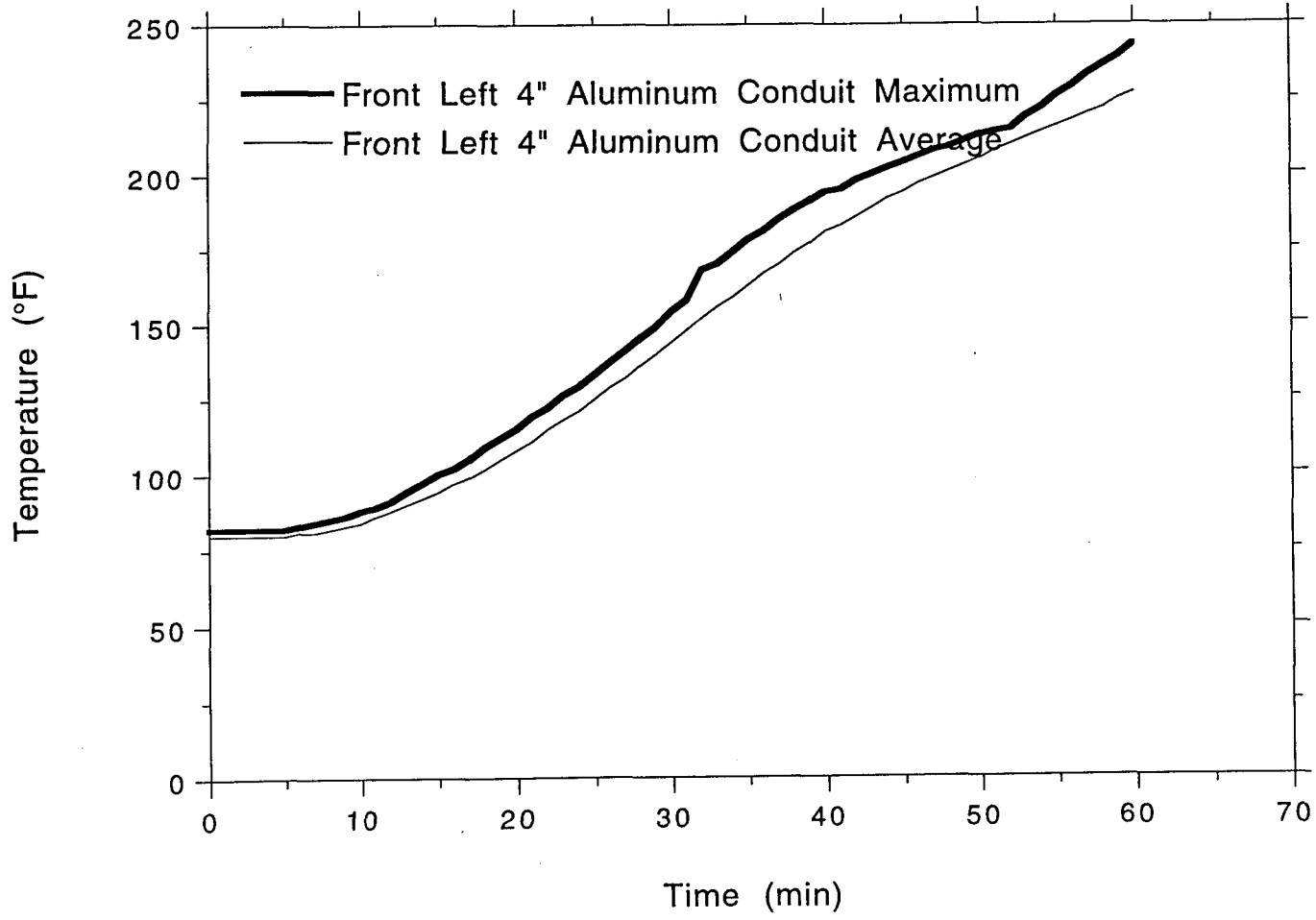
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



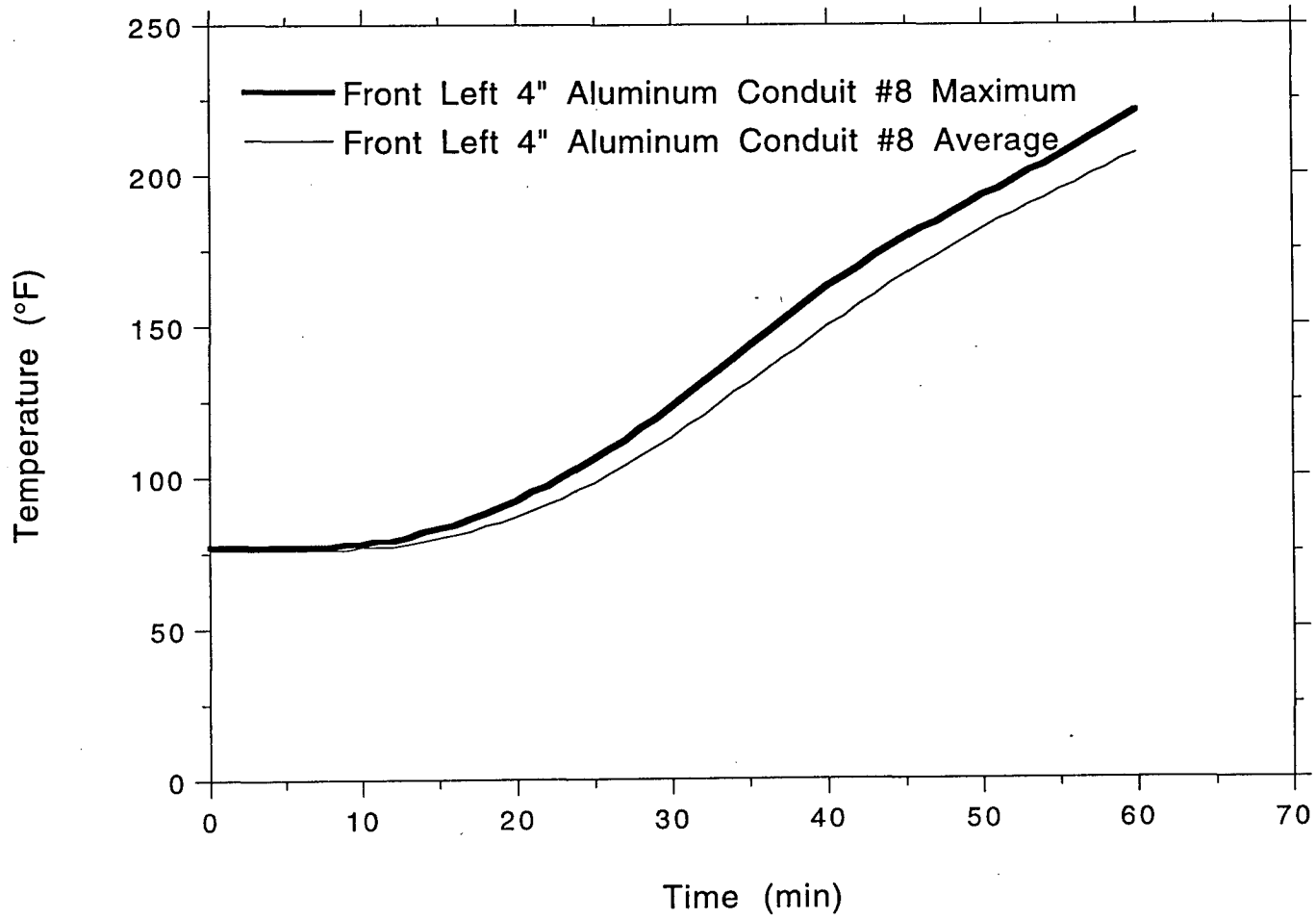
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



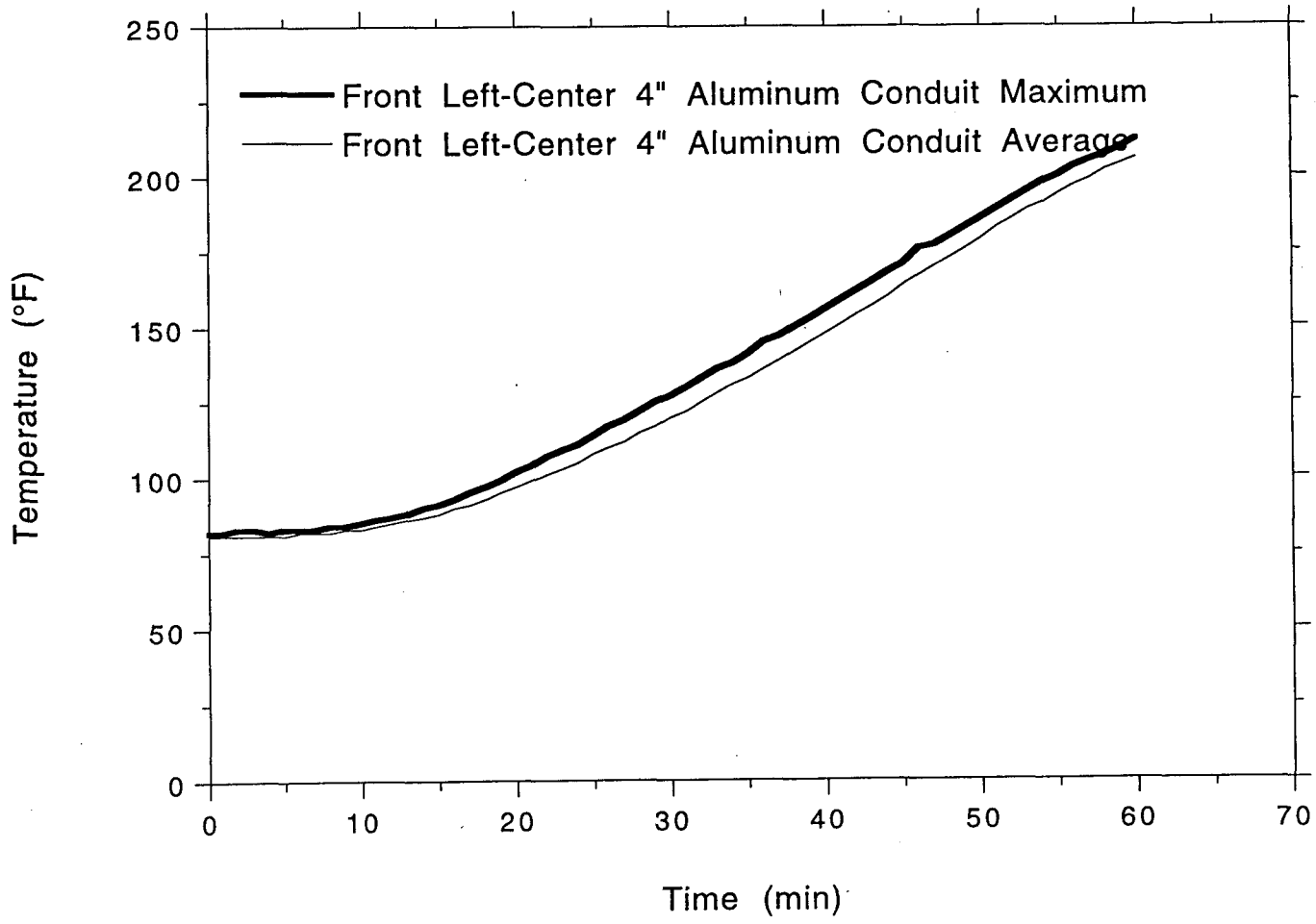
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



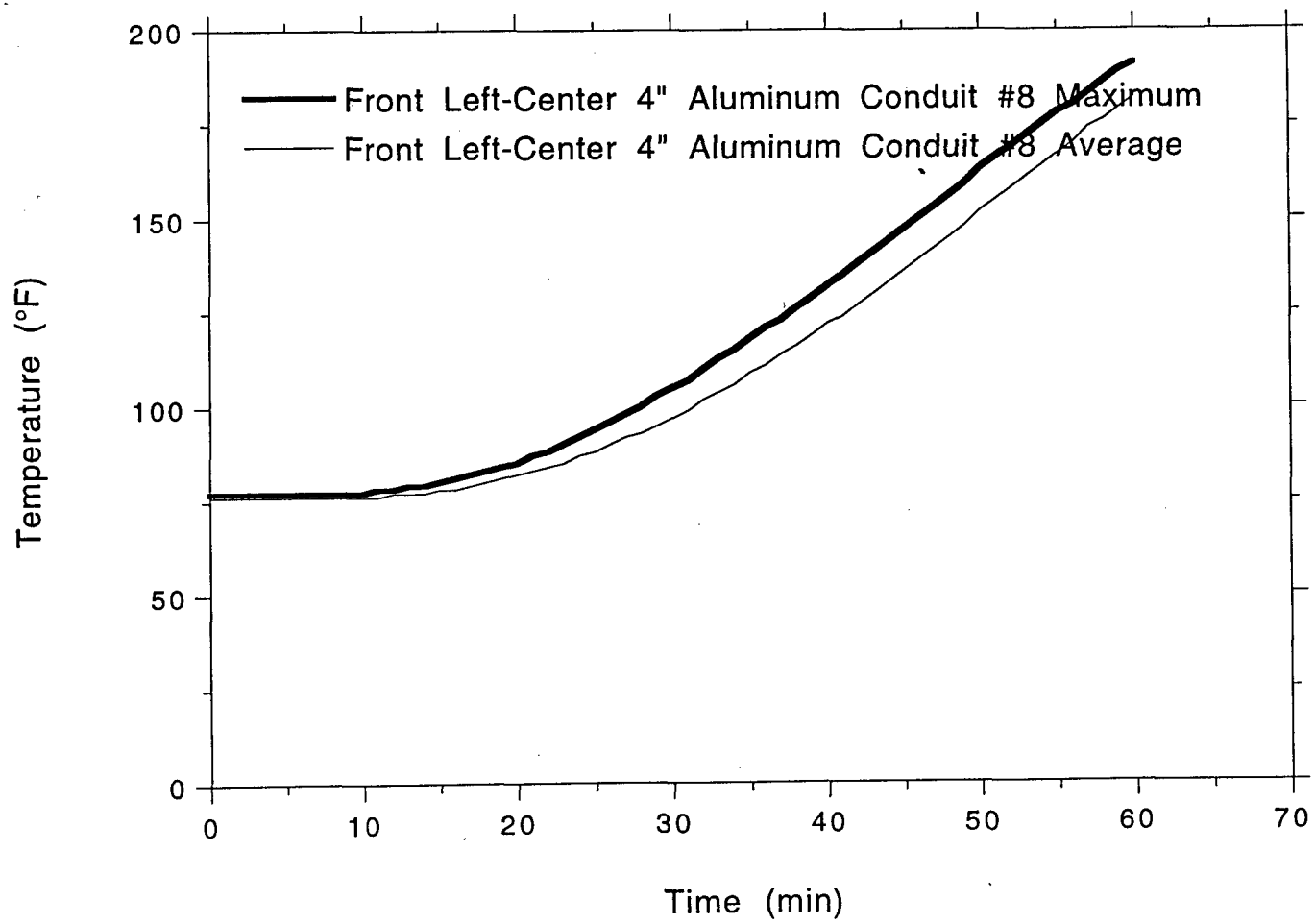
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



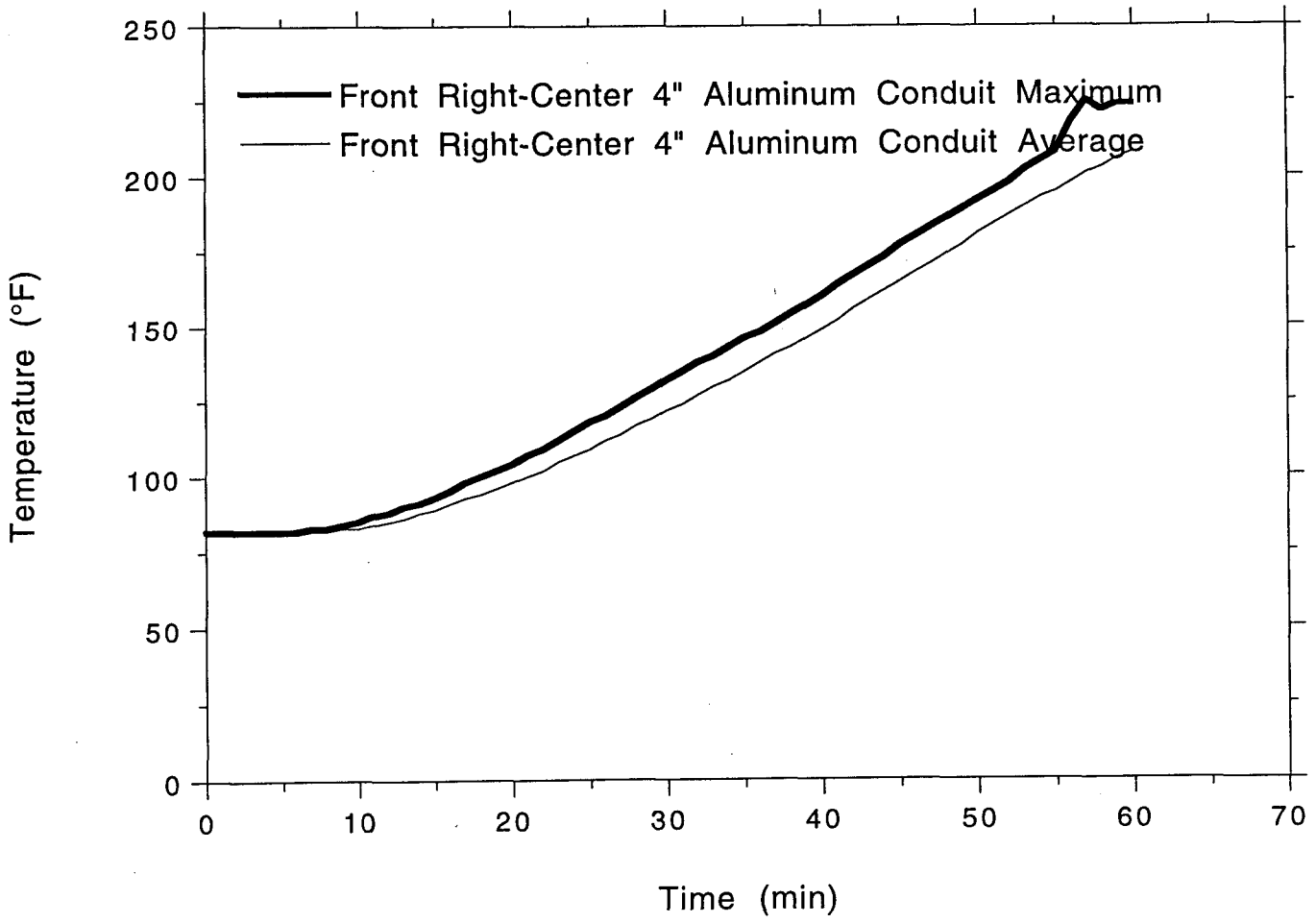
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



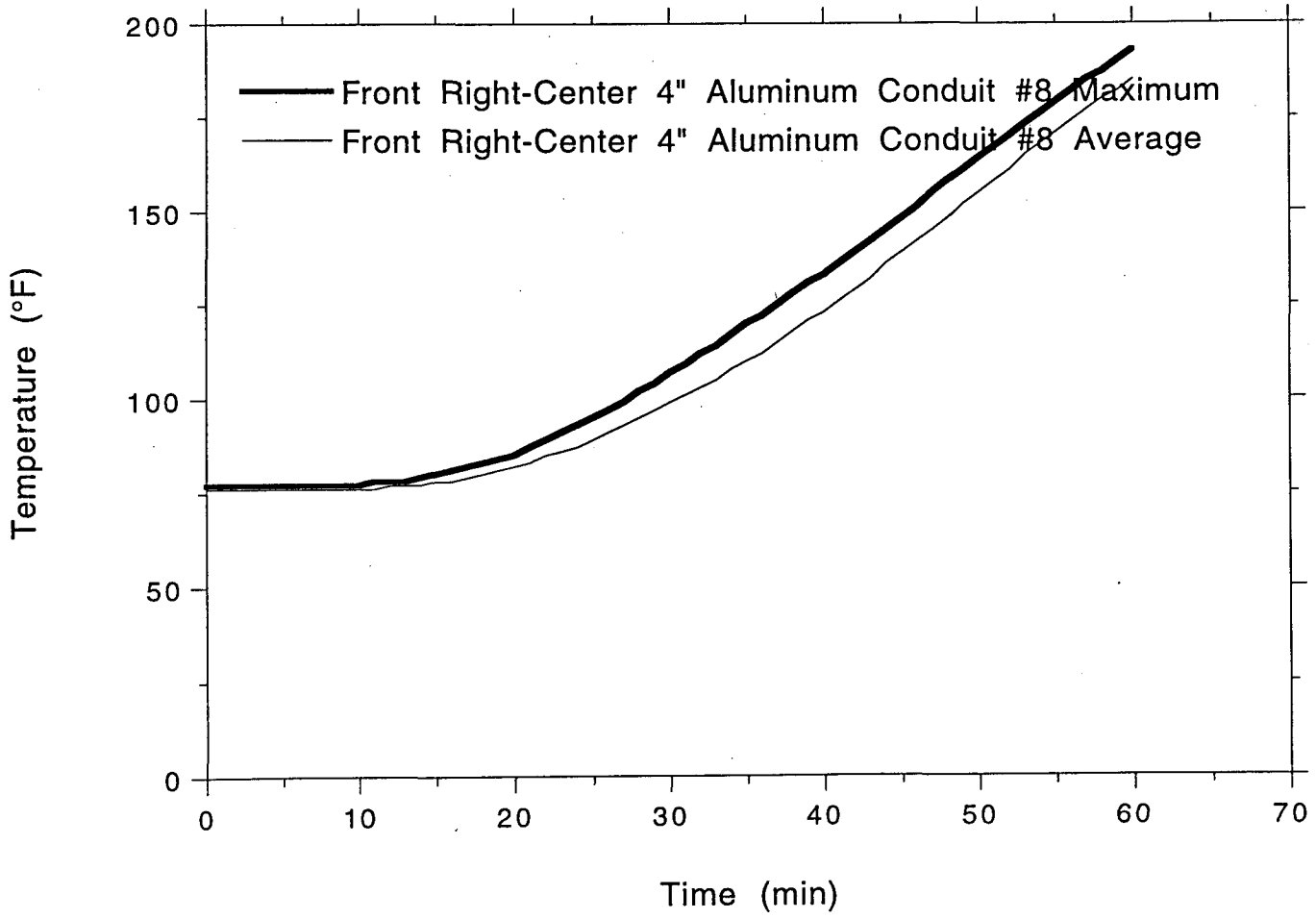
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



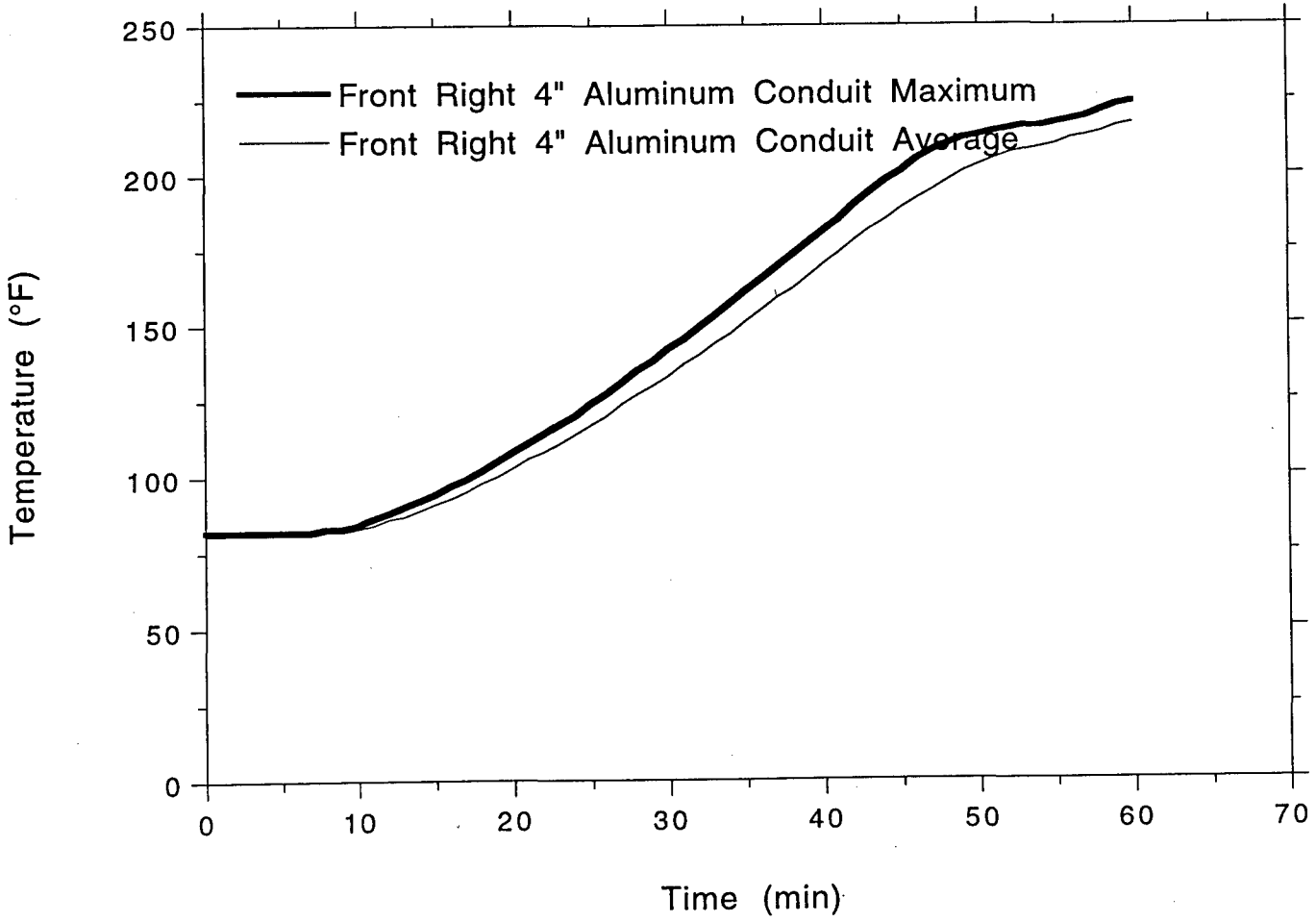
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures

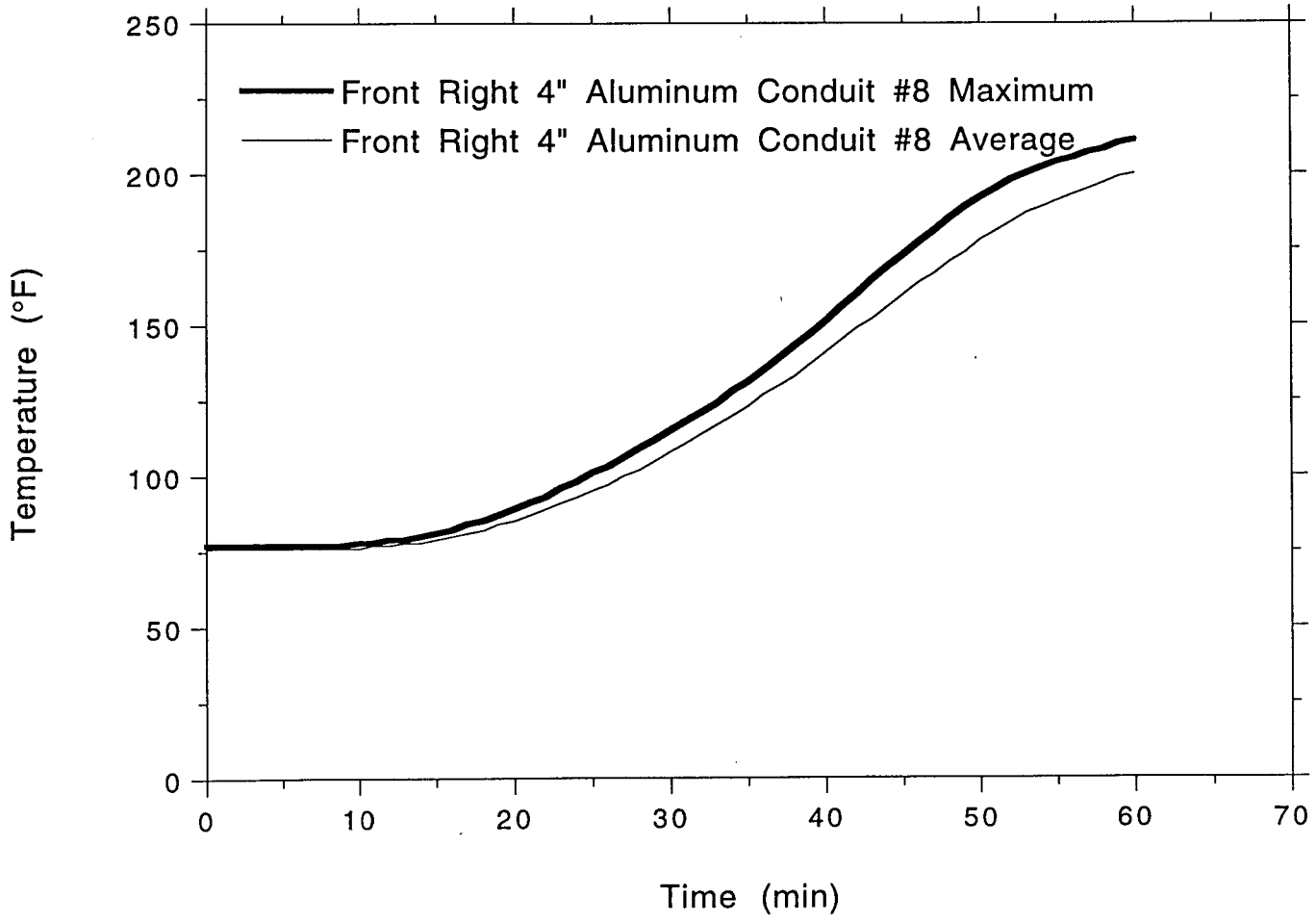


OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures

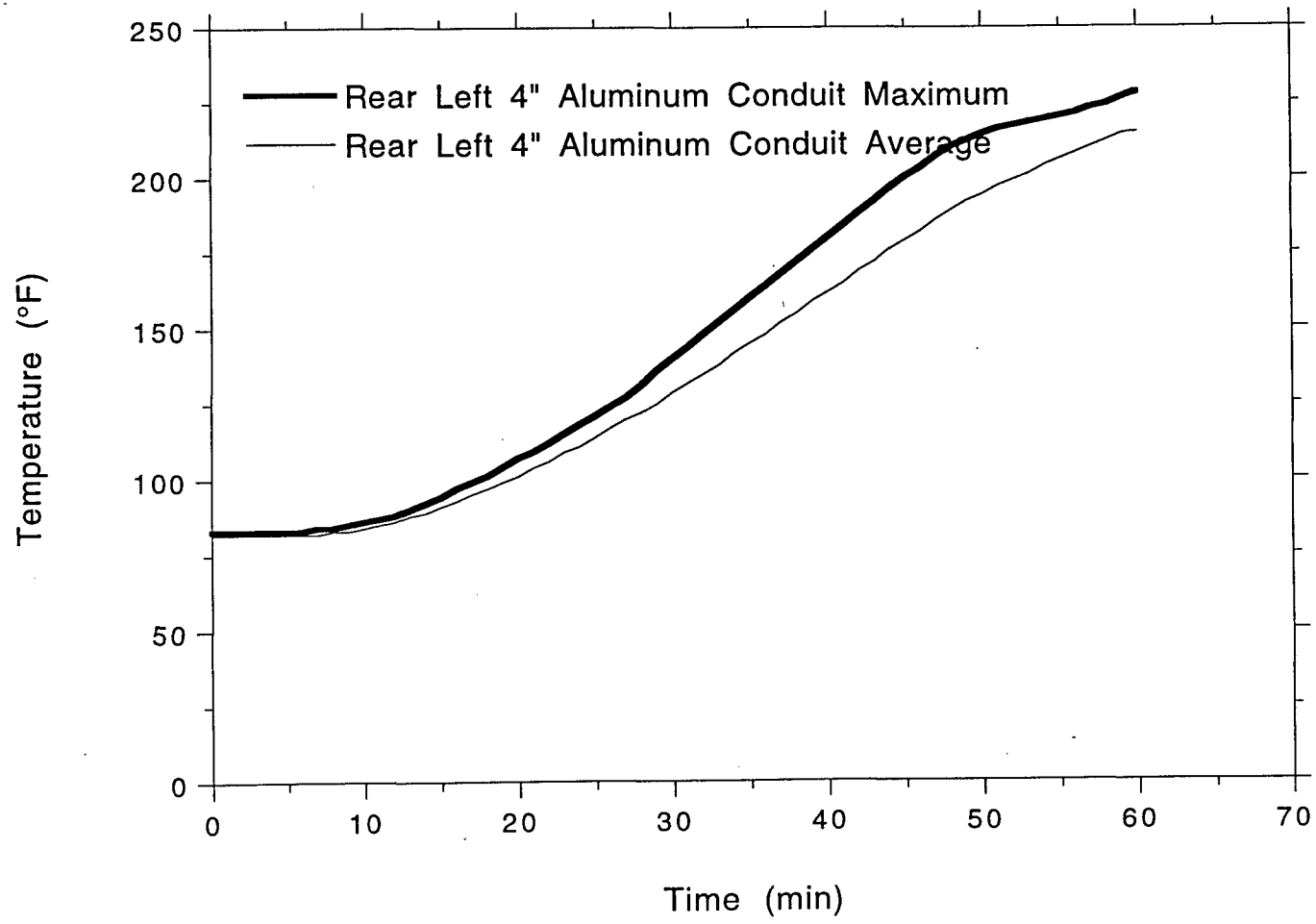


TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



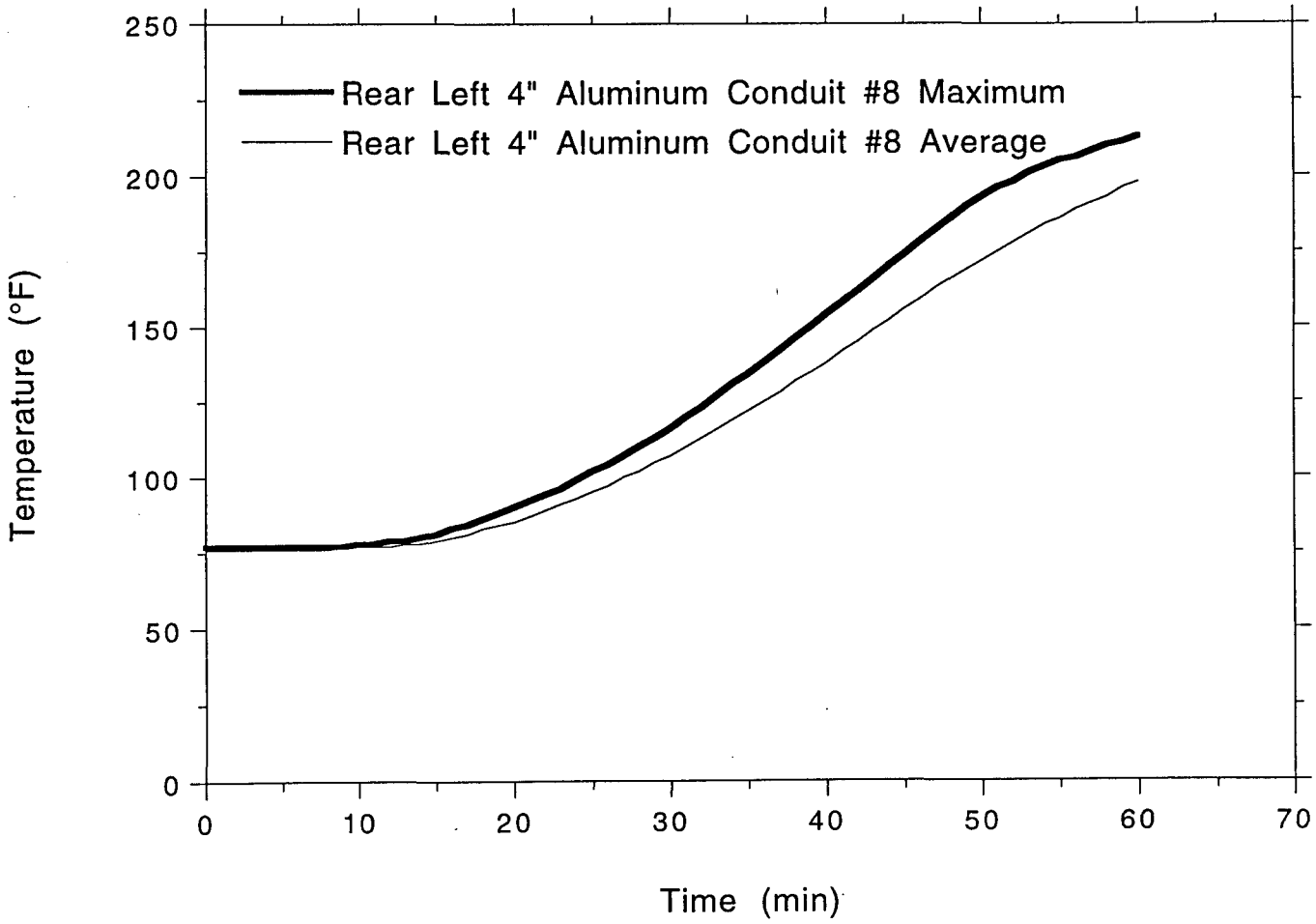
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



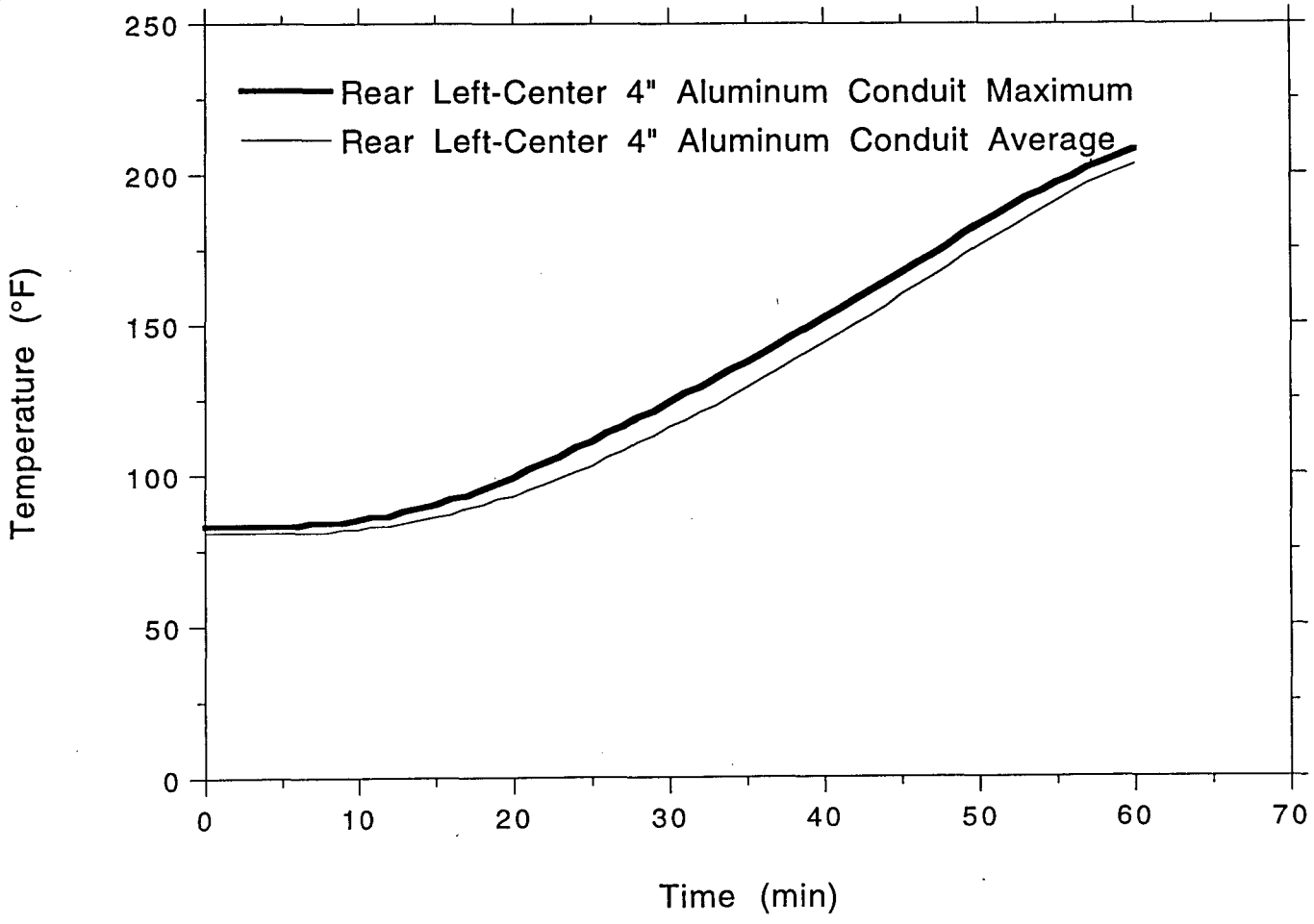
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



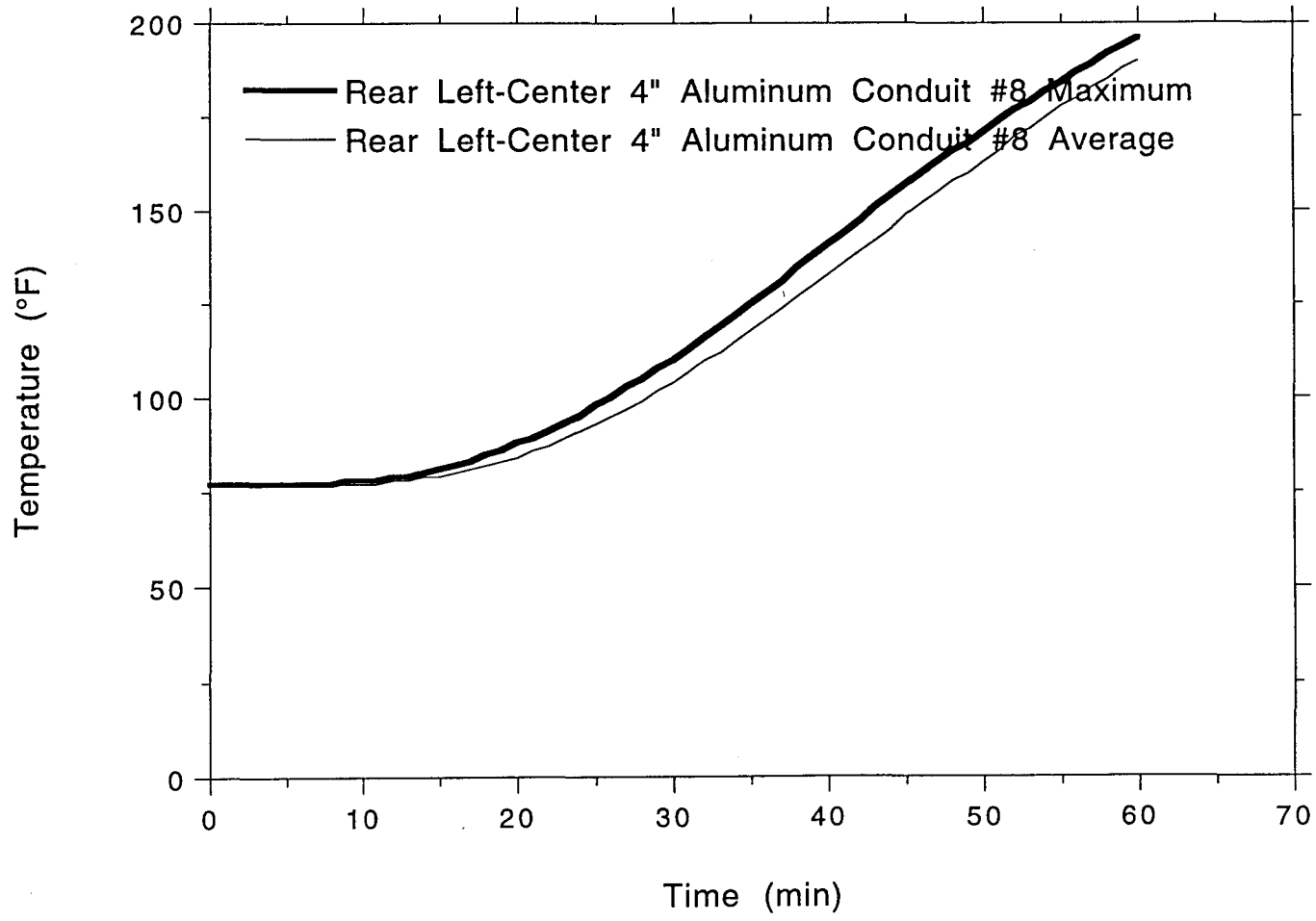
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



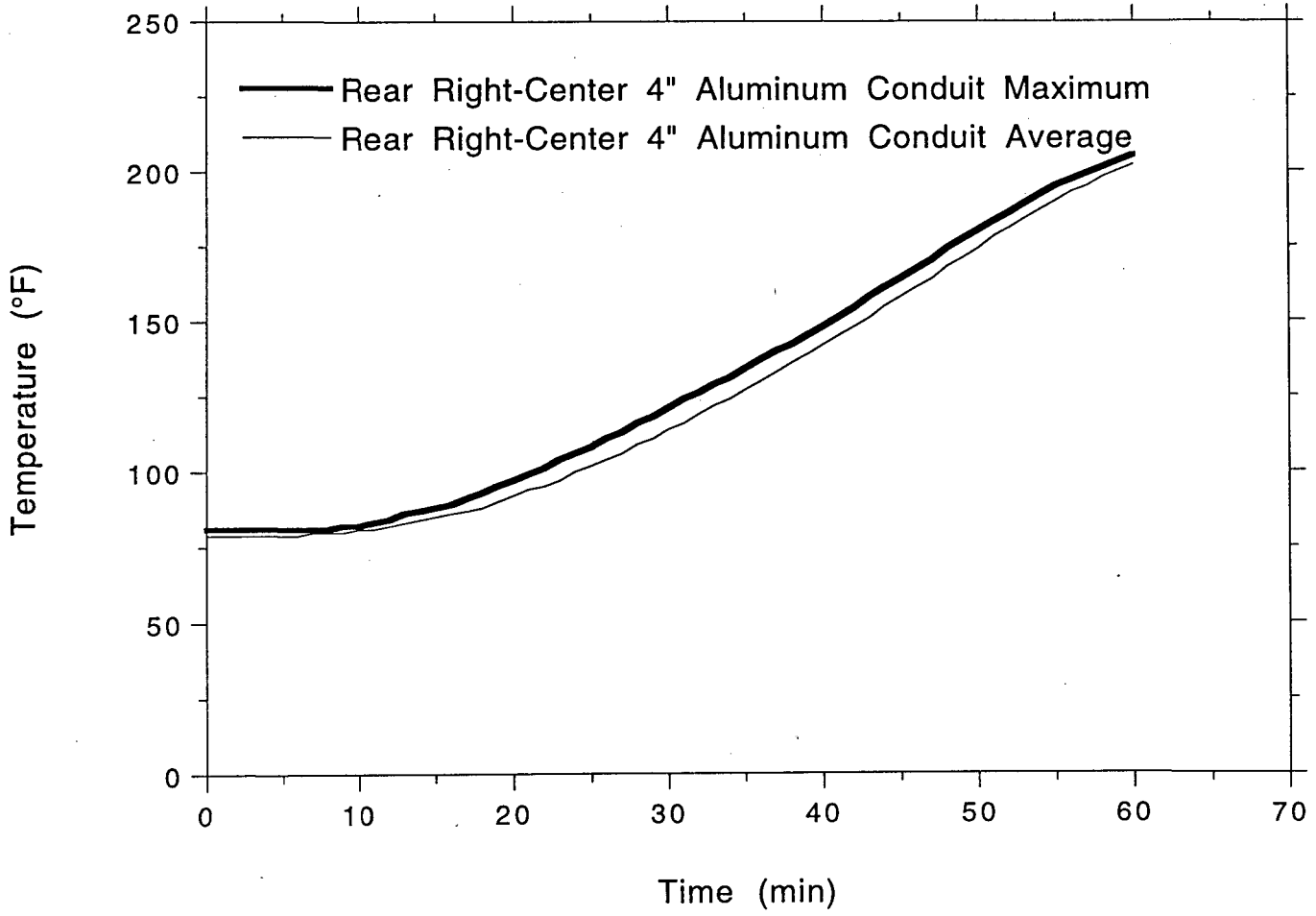
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



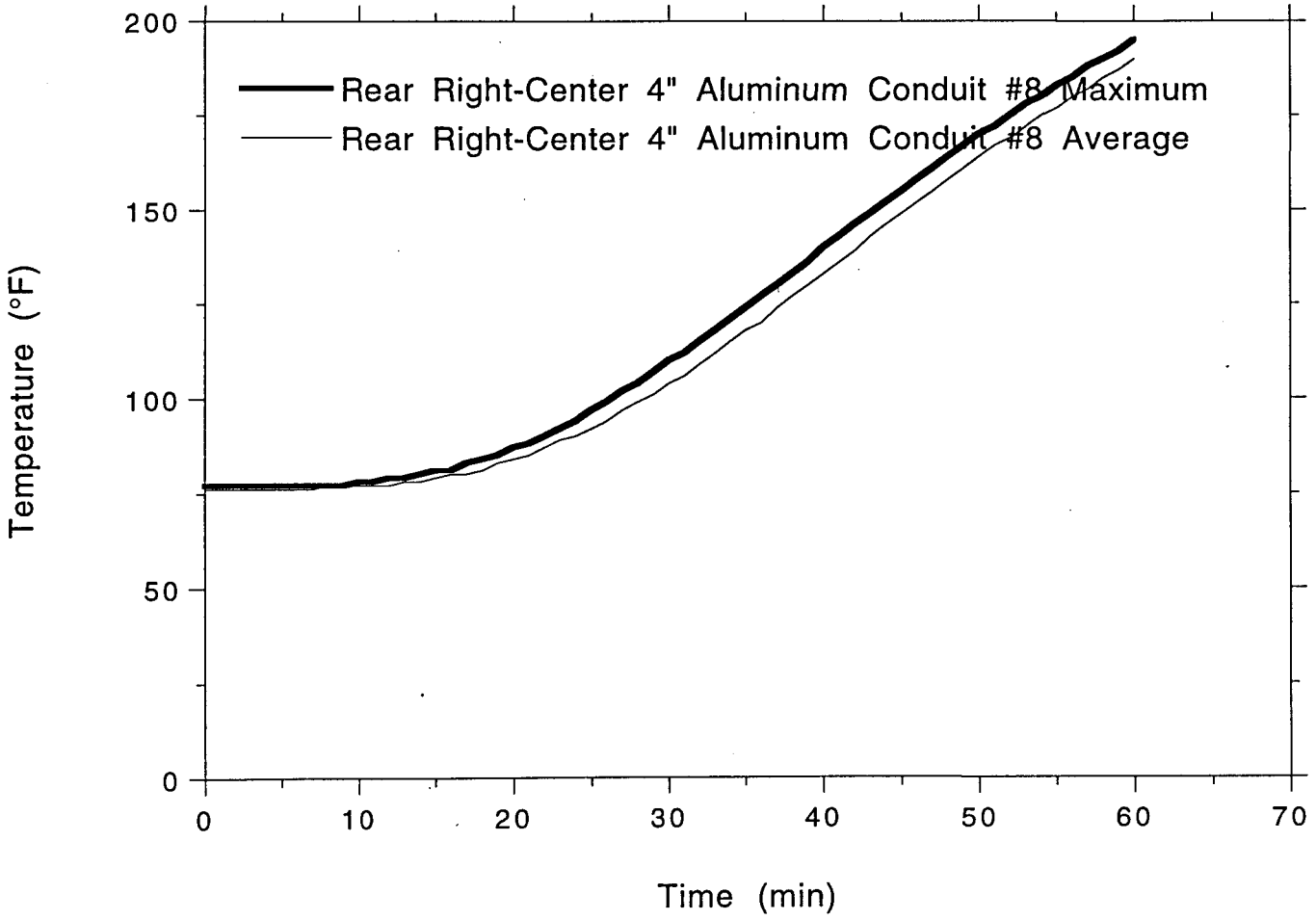
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



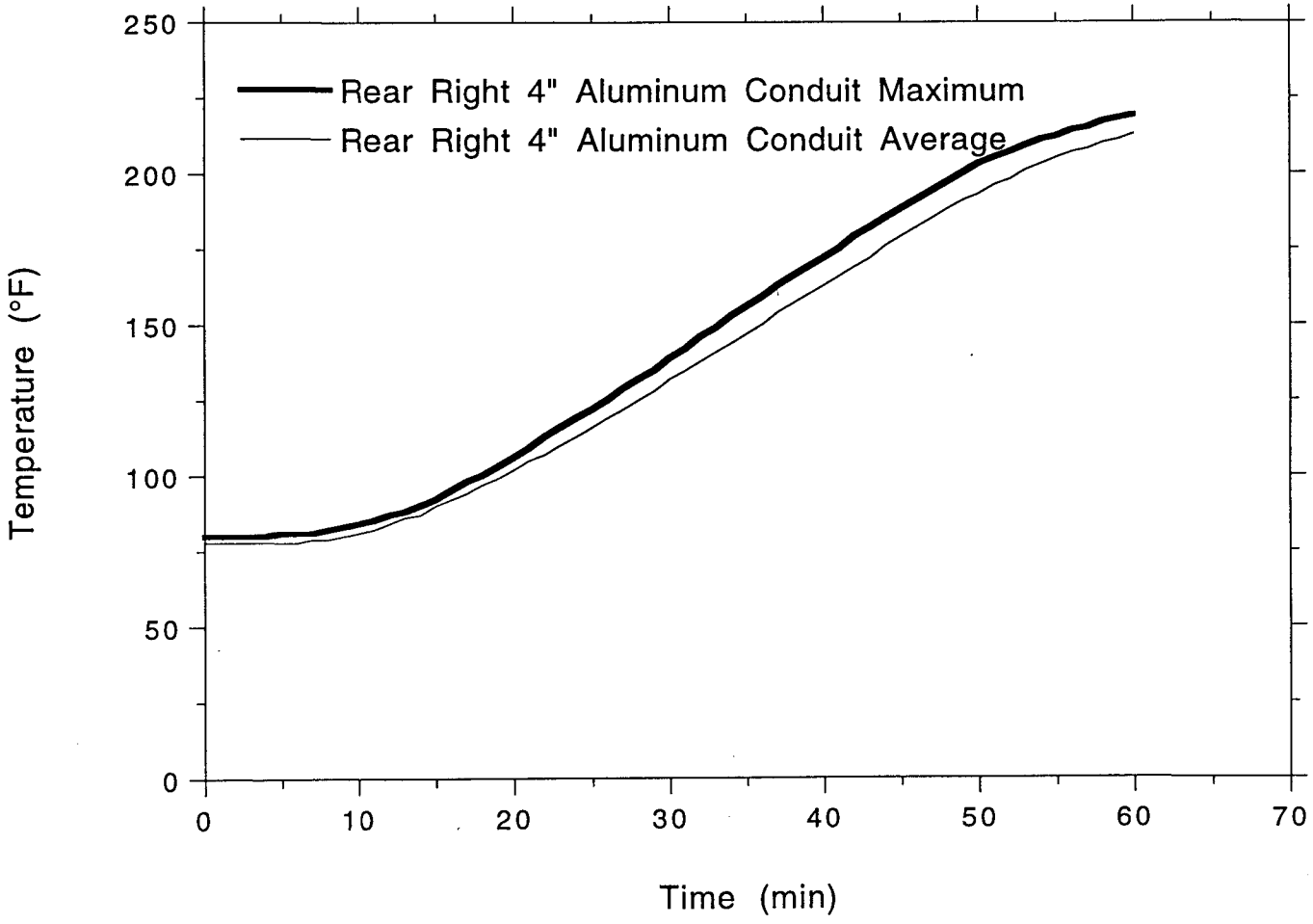
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



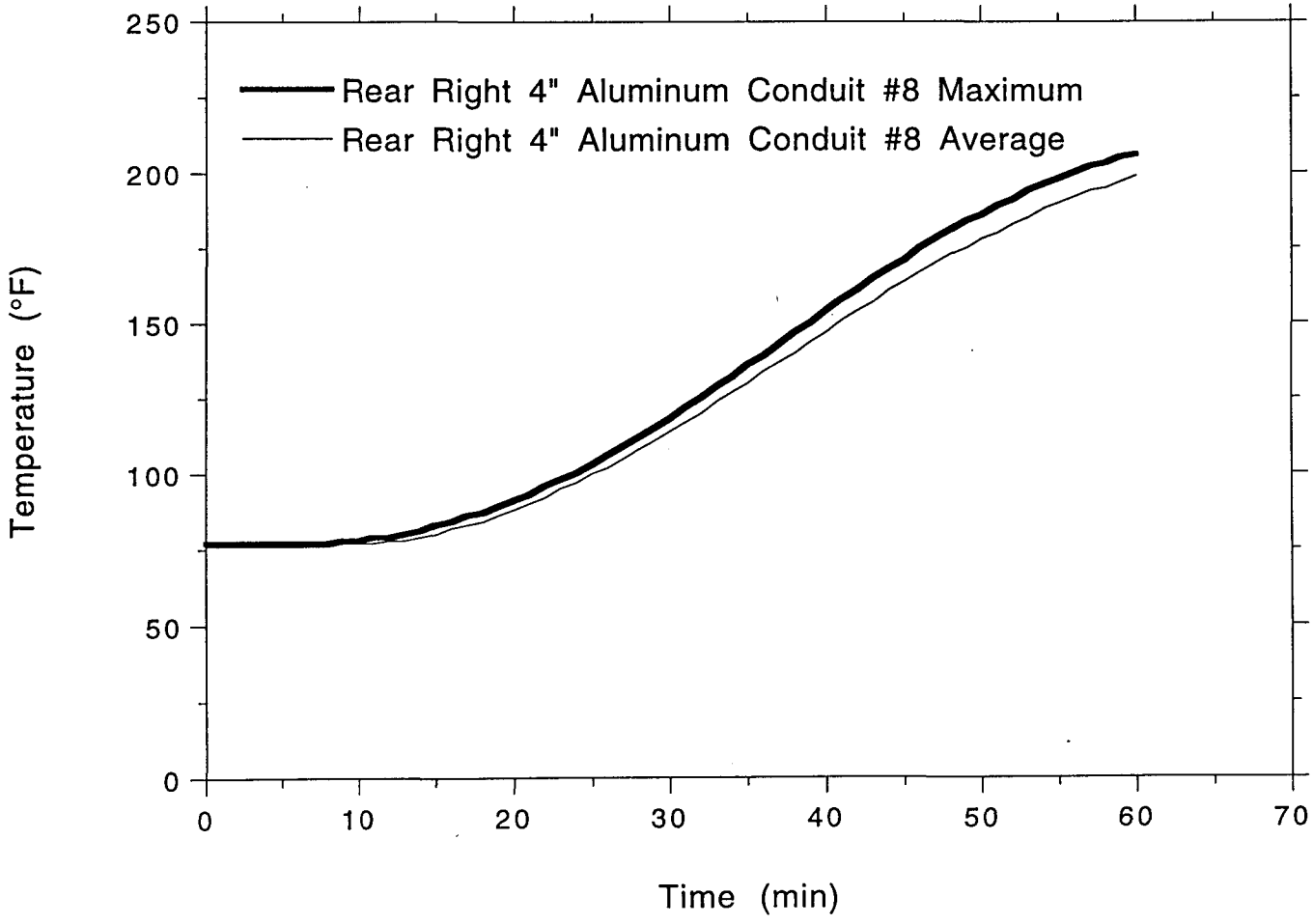
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



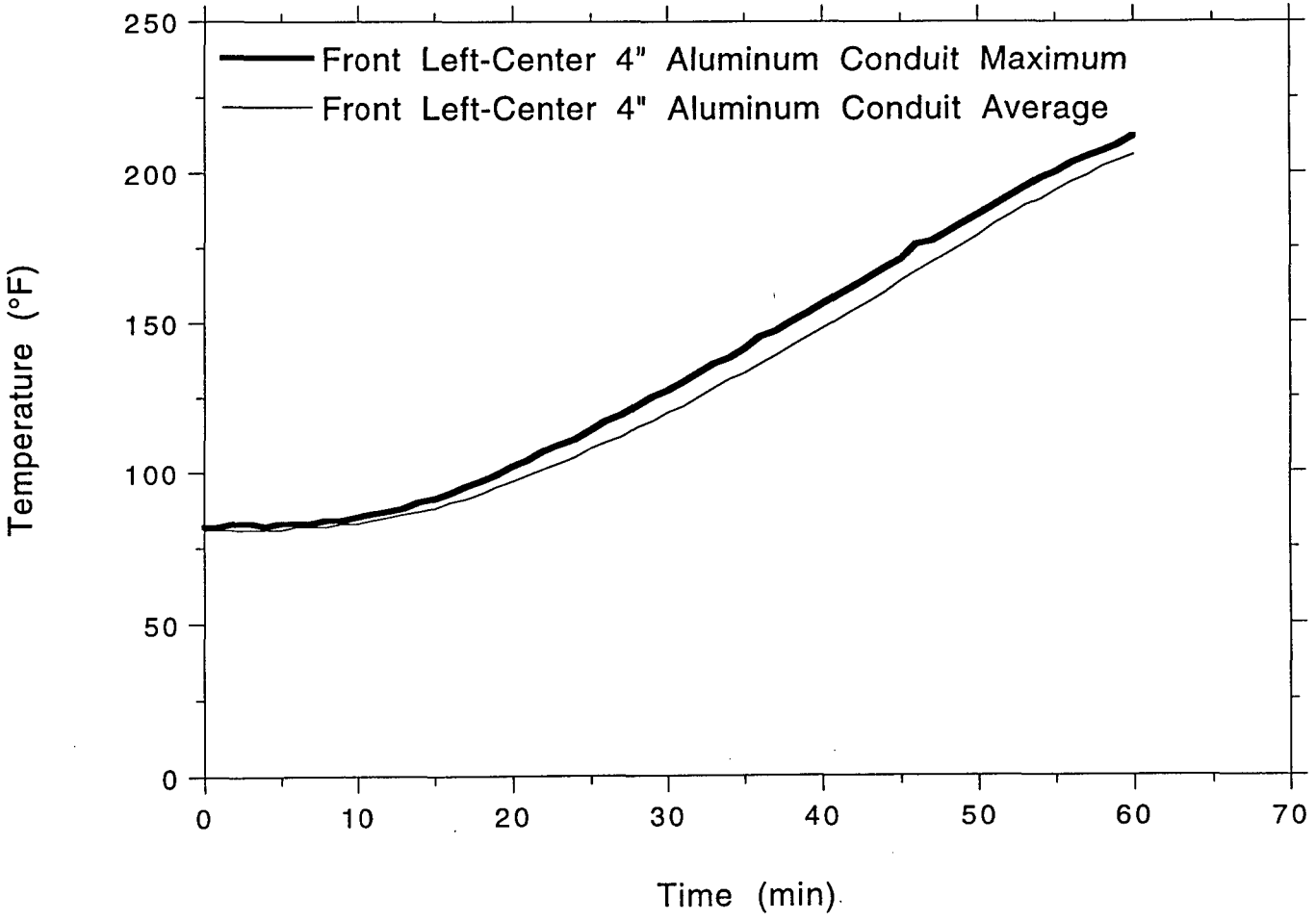
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



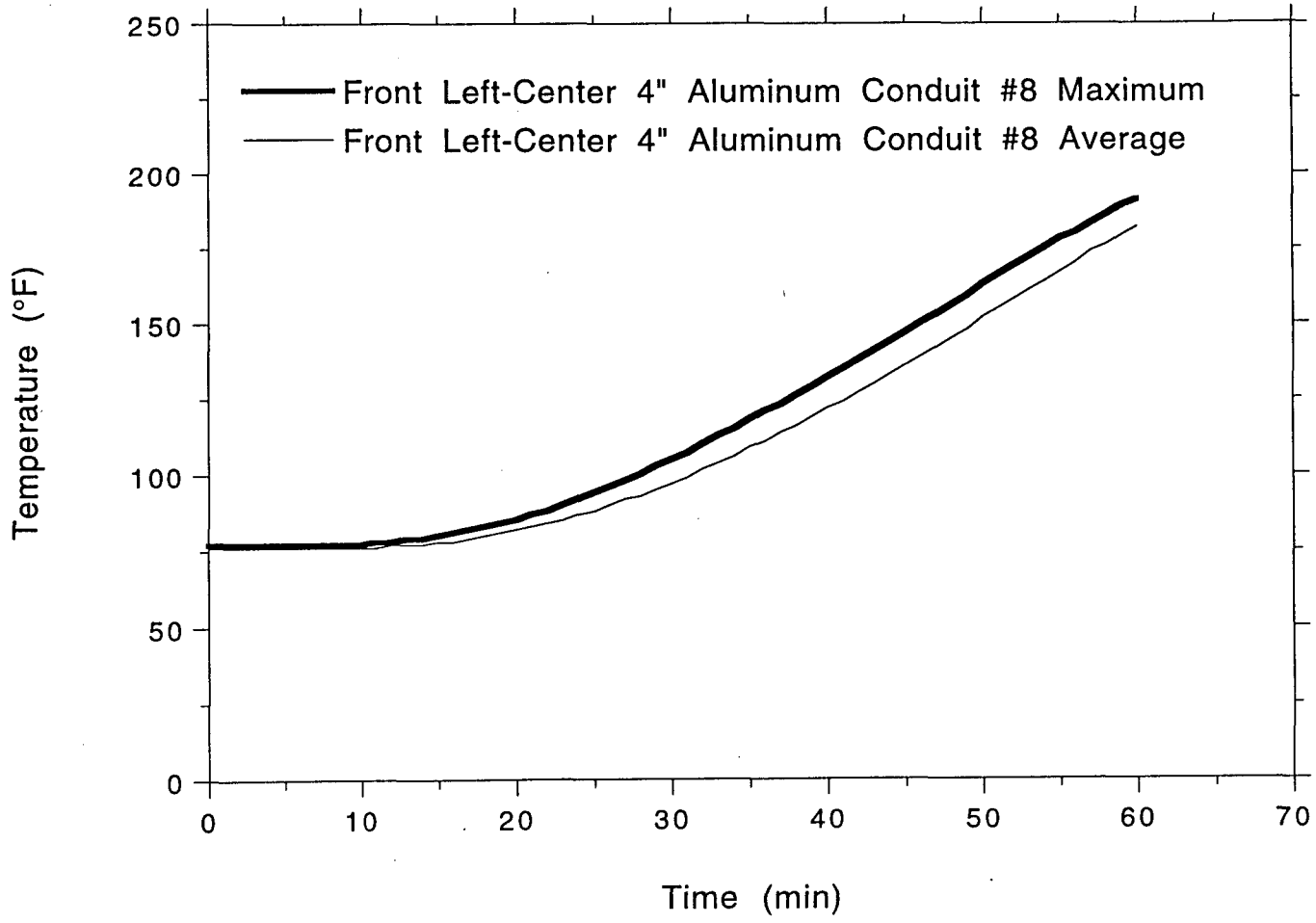
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



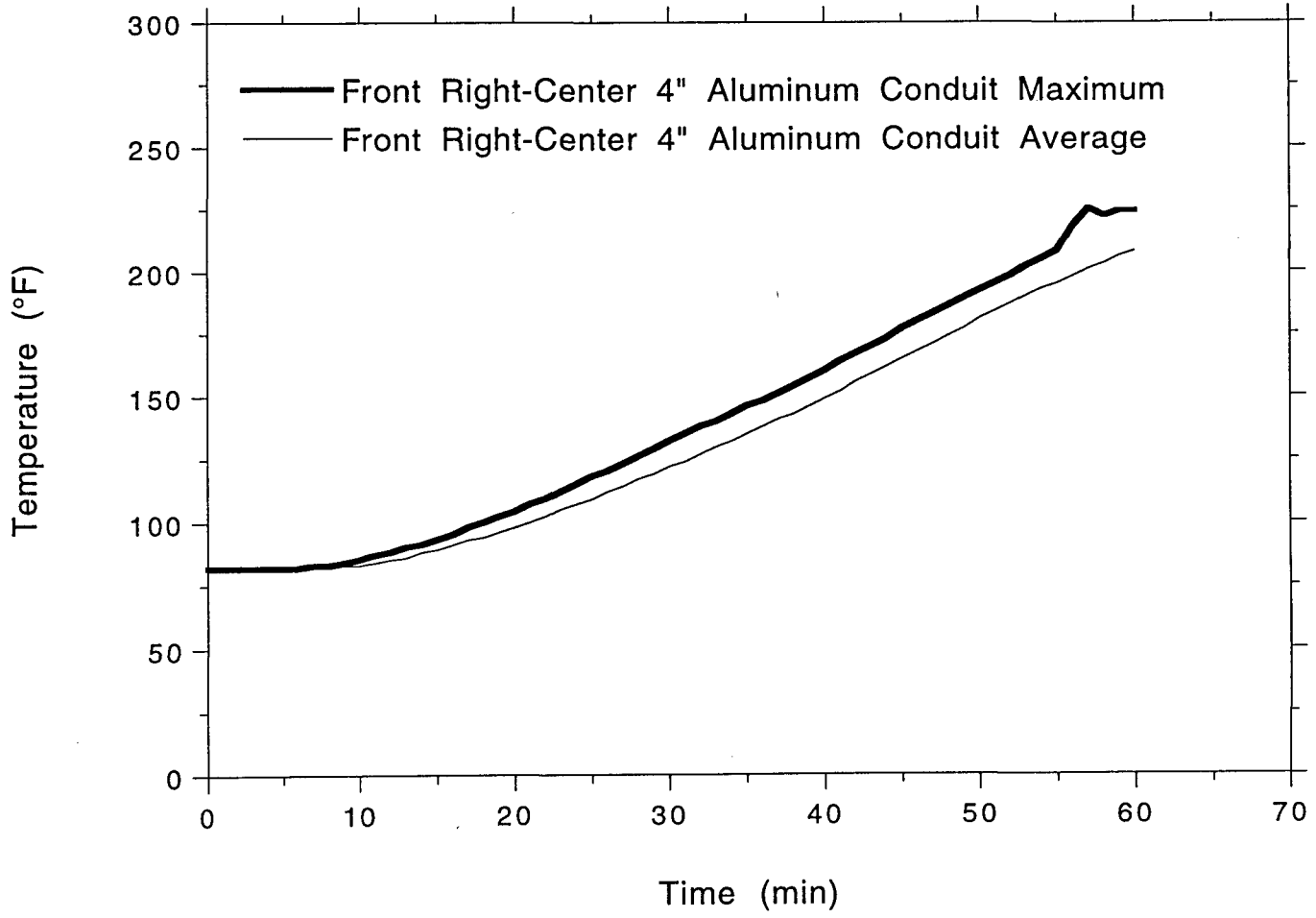
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



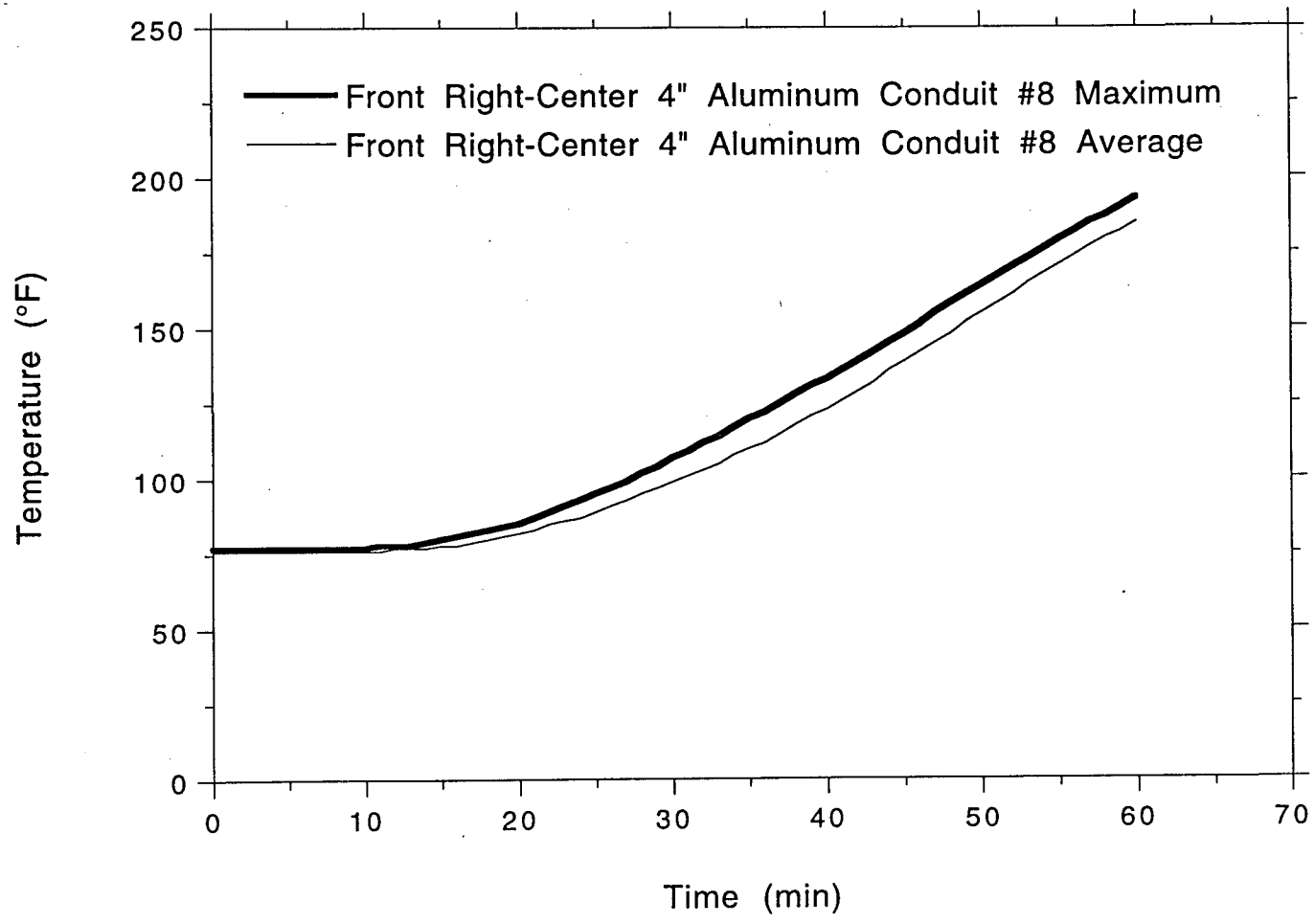
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



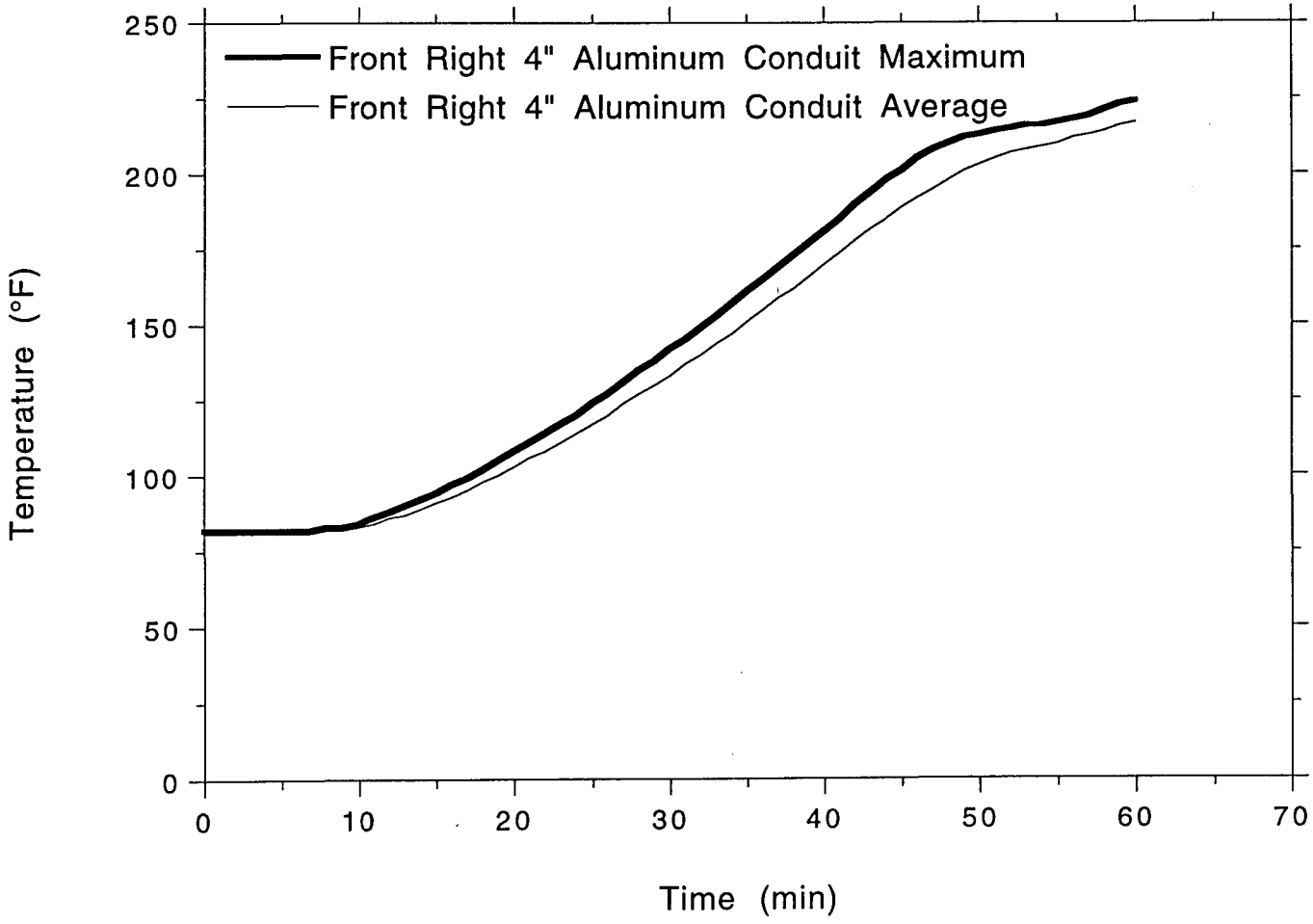
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



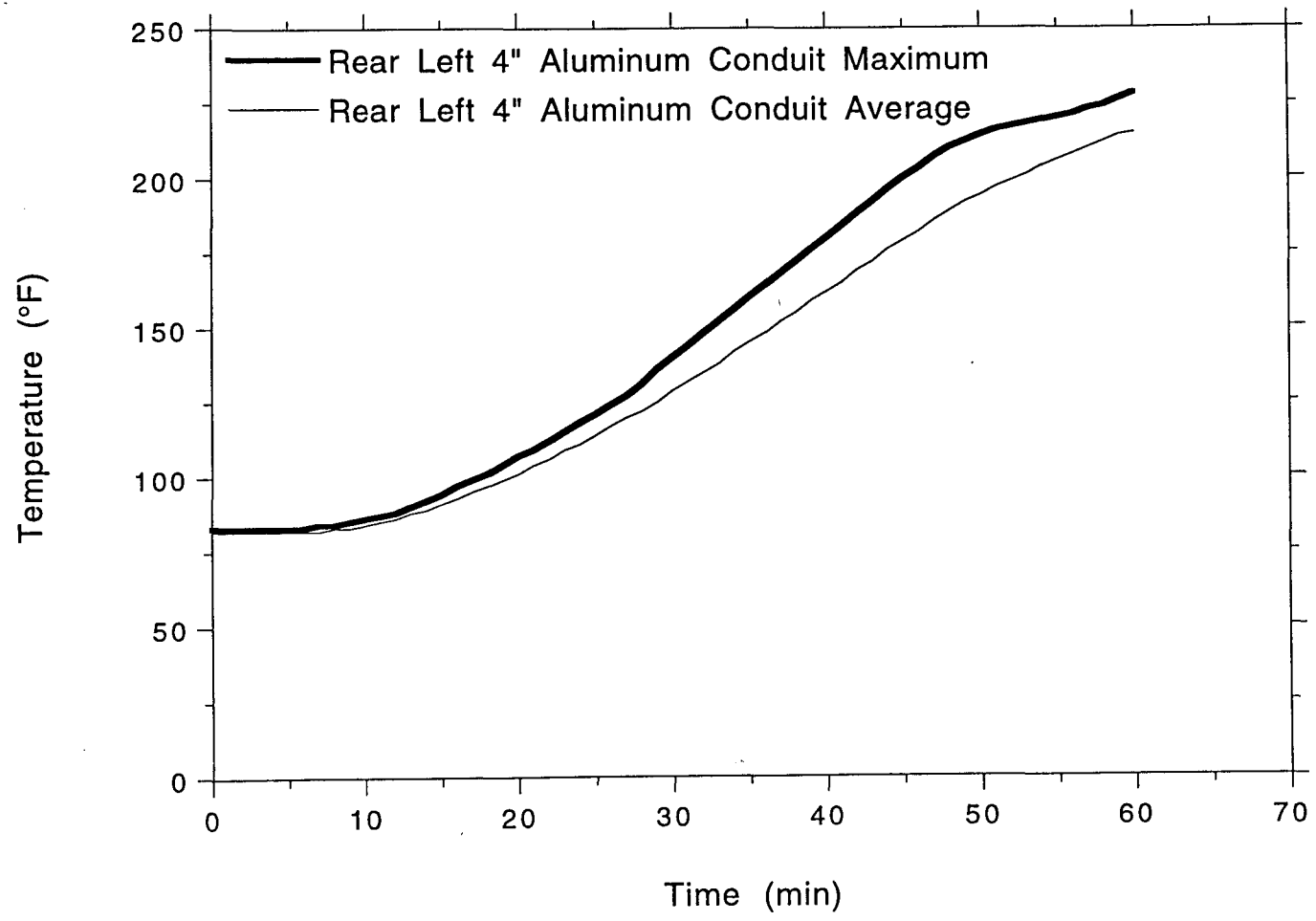
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



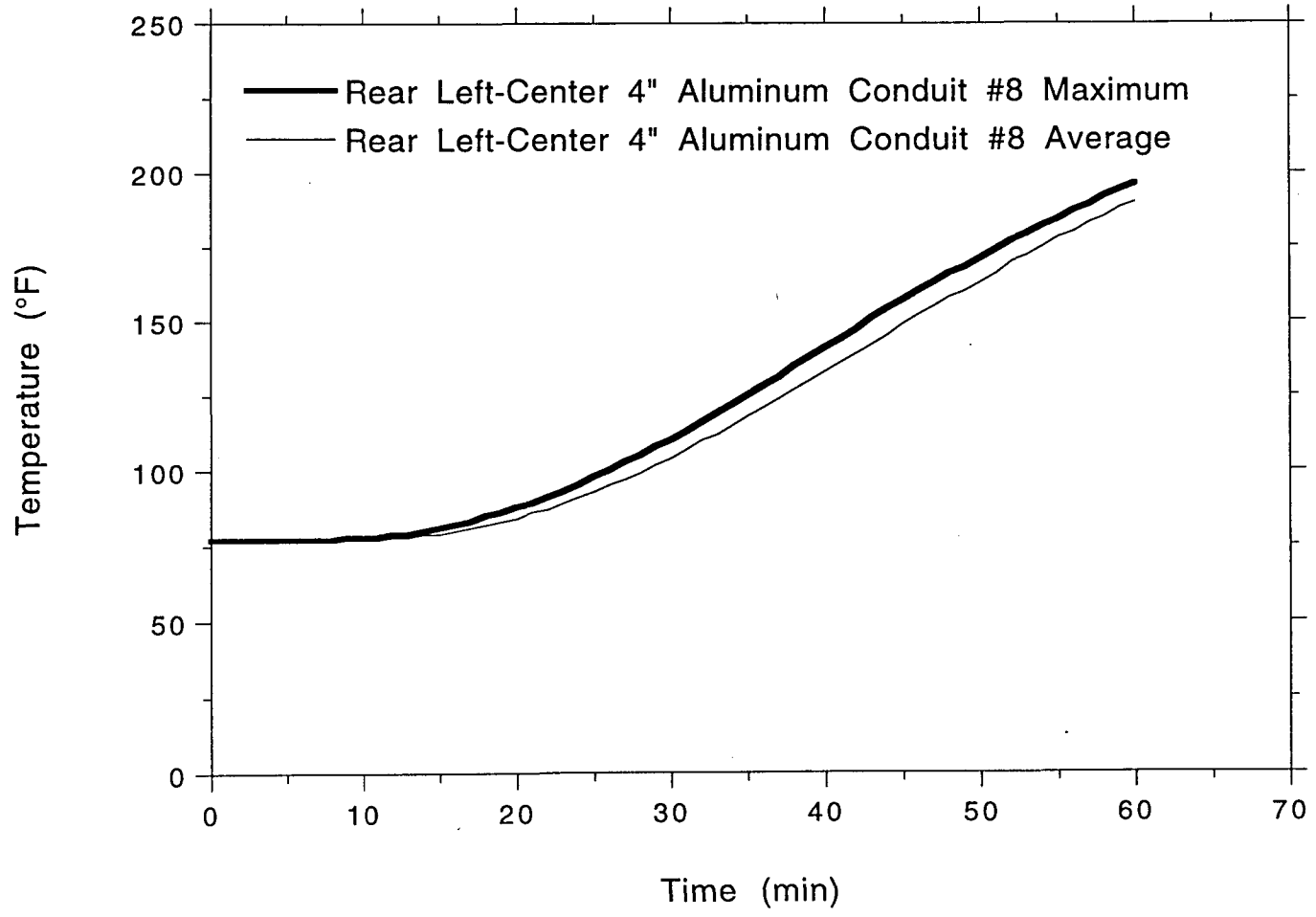
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



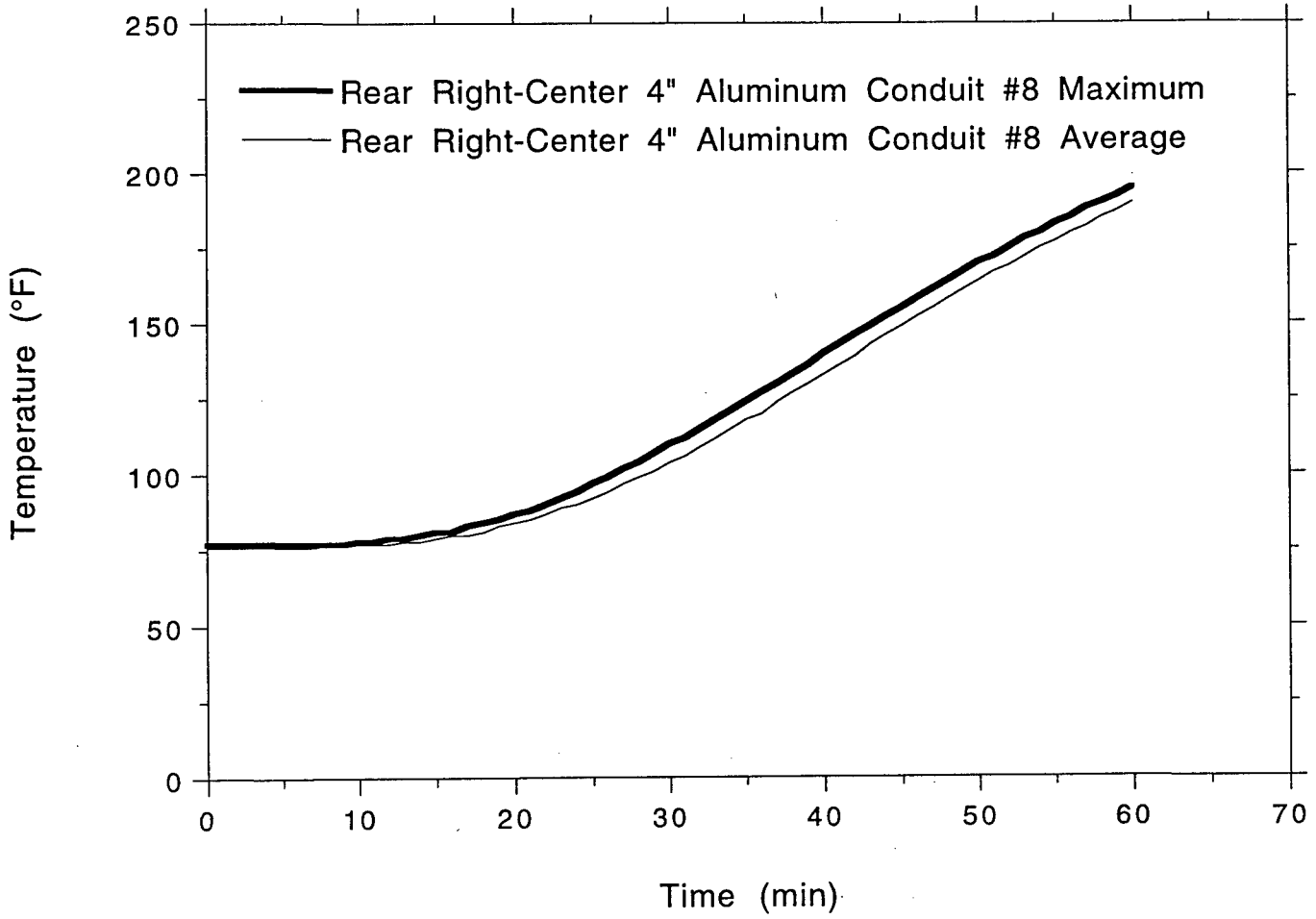
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



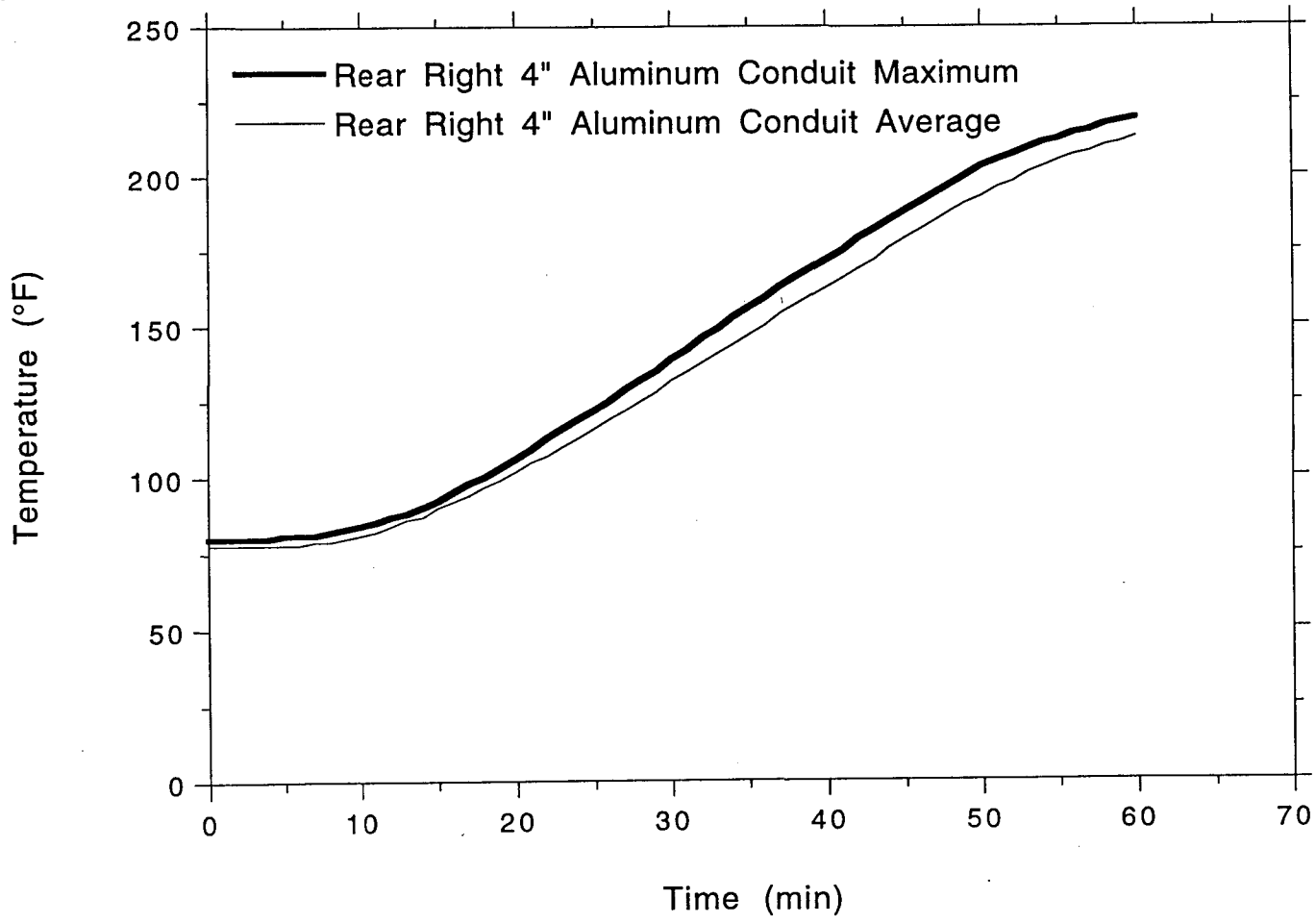
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



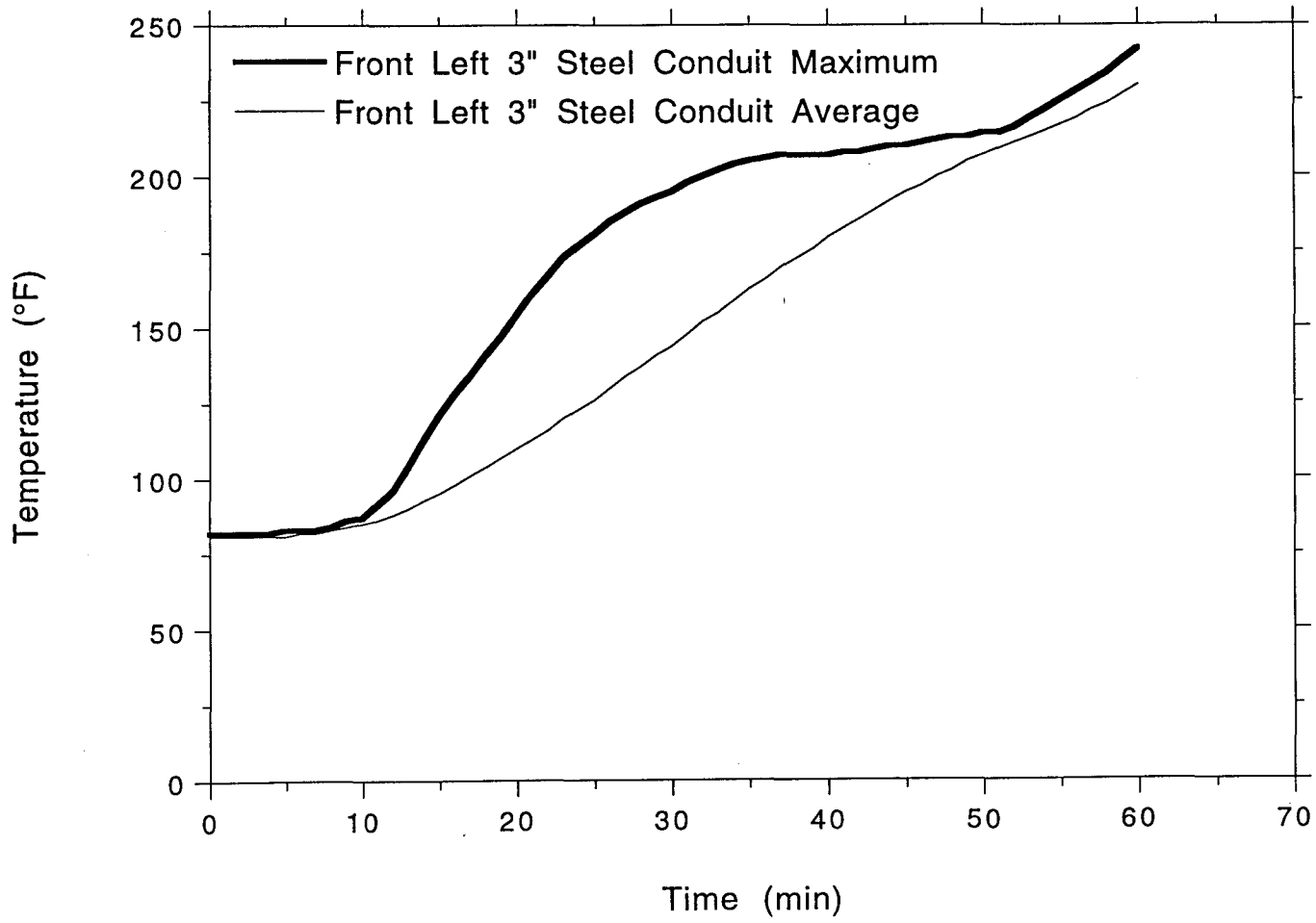
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



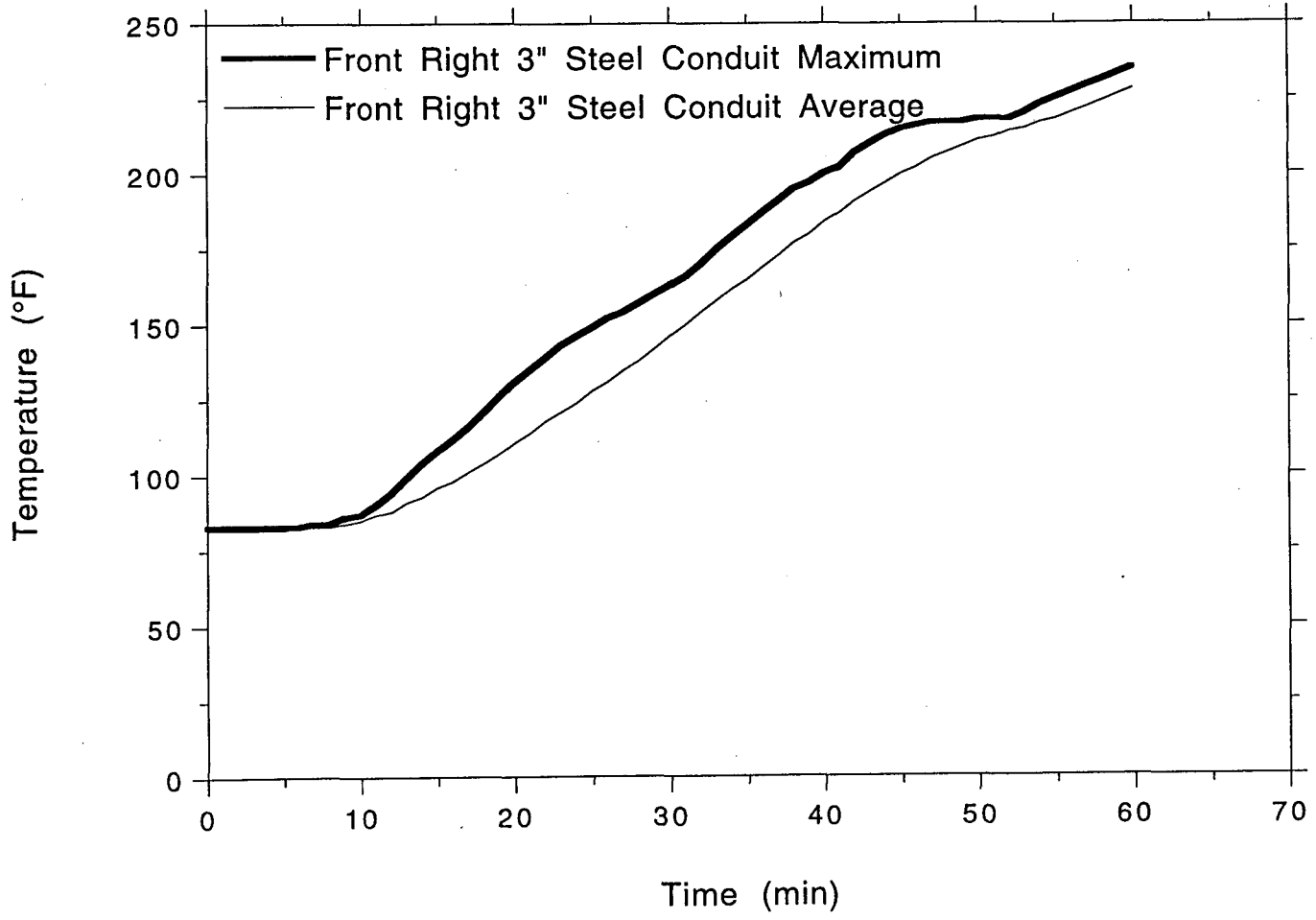
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



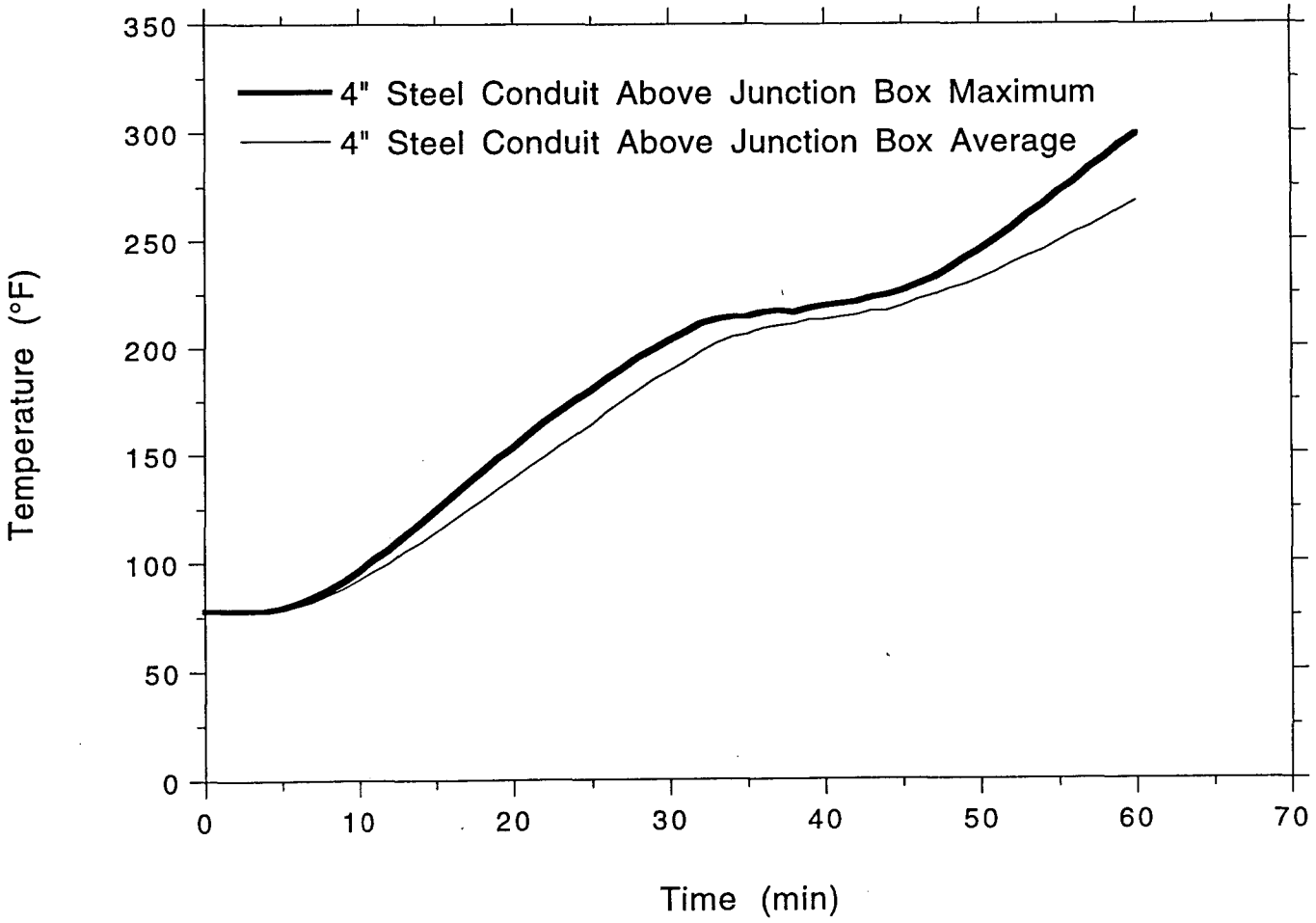
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



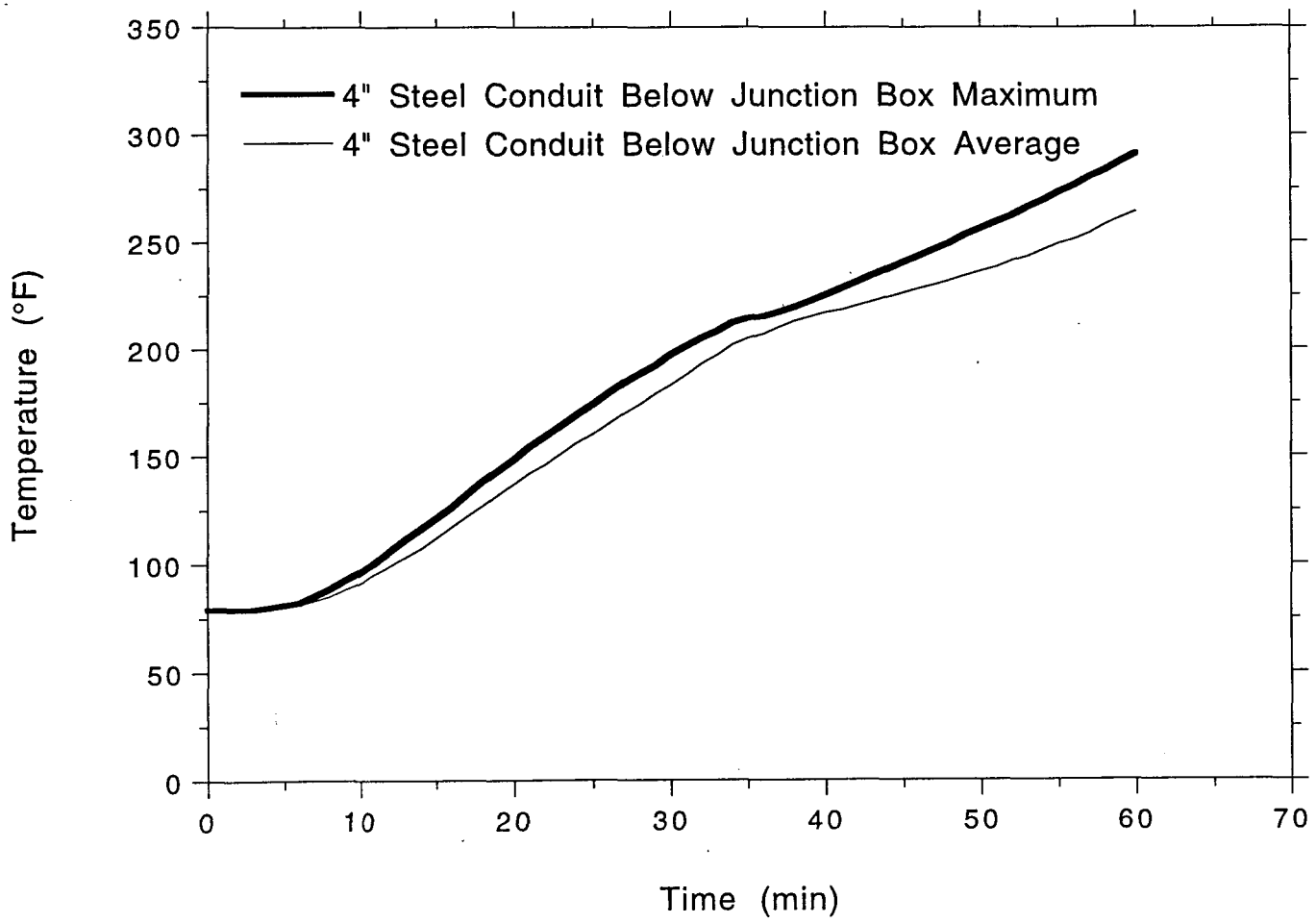
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



OMEGA POINT LABORATORIES

Project No. 15300-97590
3M Commercial Graphics

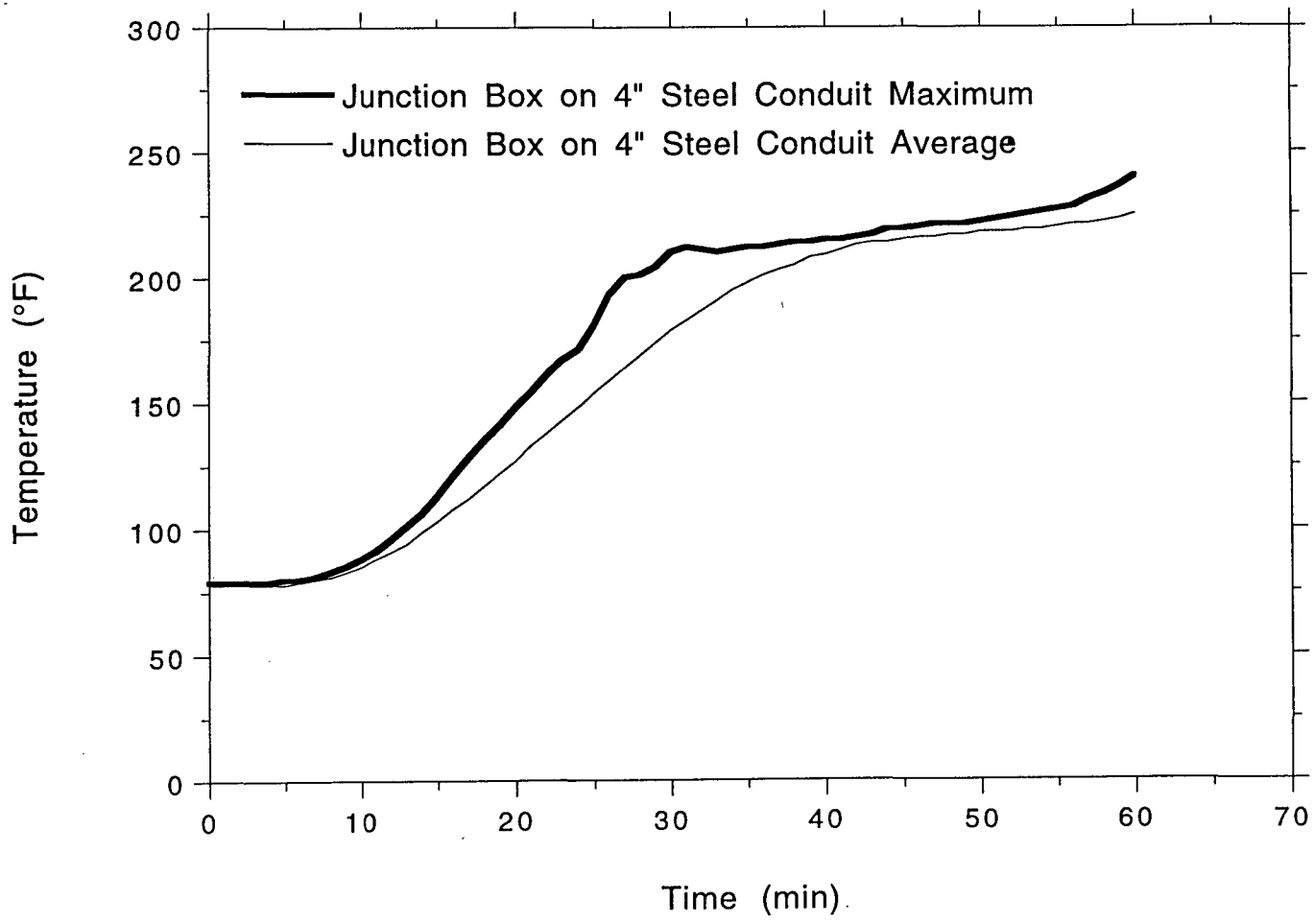
Test ID	Dm **	Dm (corr) **	tDm(min.)	t.9Dm (min.)
Flaming:				
1F	139.1	137.4	14.1	9.8
2F	139.9	138.2	13.9	10.4
3F	141.0	137.5	12.4	9.6
Ave	140 **	140 **	13.5	9.9
Non-Flaming:				
1NF	121.0	111.9	11.8	7.7
2NF	125.5	116.9	12.7	8.2
3NF	120.5	112.3	10.9	7.7
Ave	120 *	110 *	11.8	7.9

OMEGA POINT LABORATORIES

*It is recommended in the standard that the data be reported to only two significant figures, as we have done for the average values.

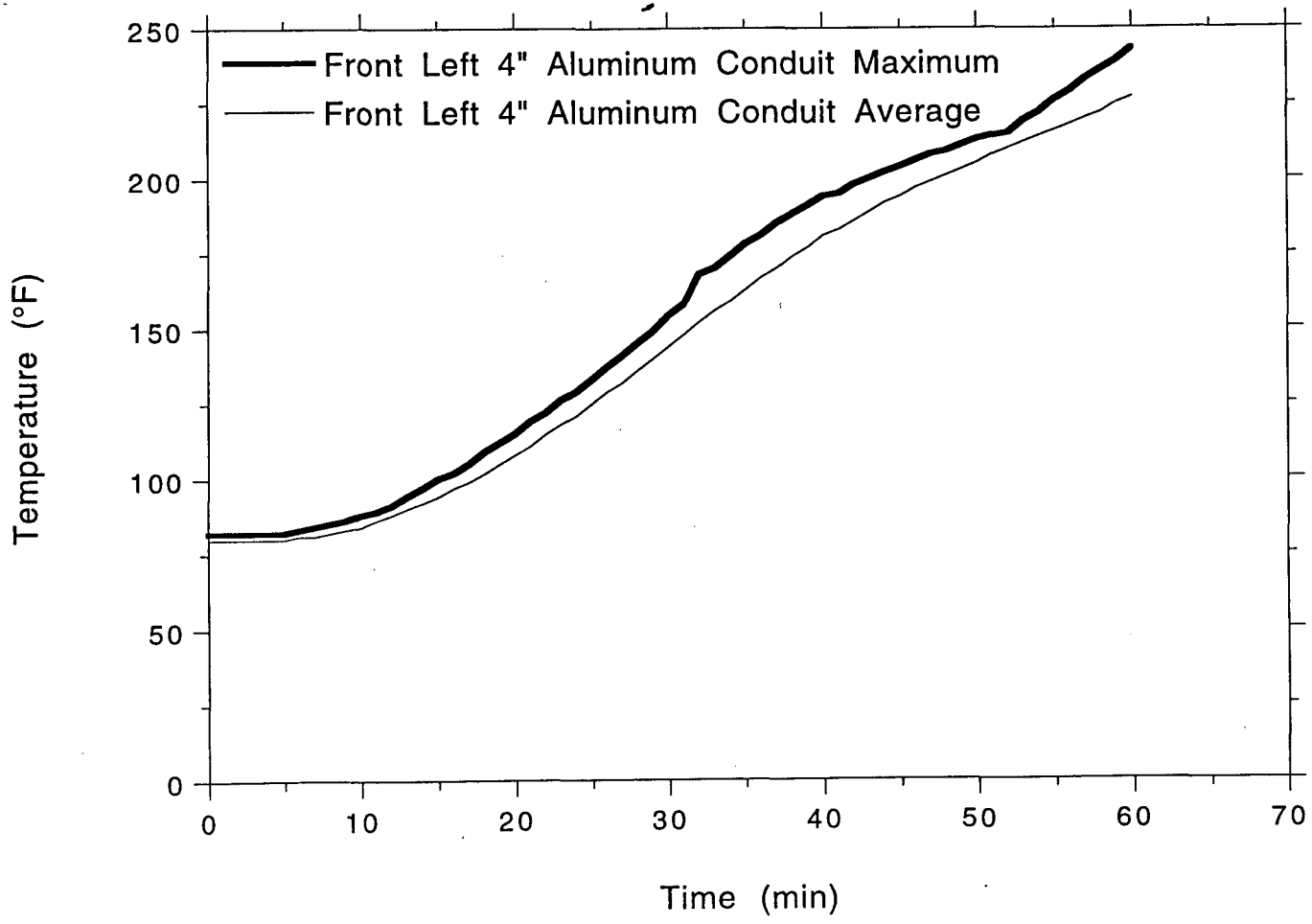
**Prior to the adoption of this test method, it was customary to report the maximum smoke accumulated as Dm(corr), and for that reason it has been included as a part of the test report. Subsequently, a statistical analysis of the round-robin data upon which the precision statement is based, showed that the Dm values were more uniform. Therefore, it is required that both Dm and Dm(corr) be reported.

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



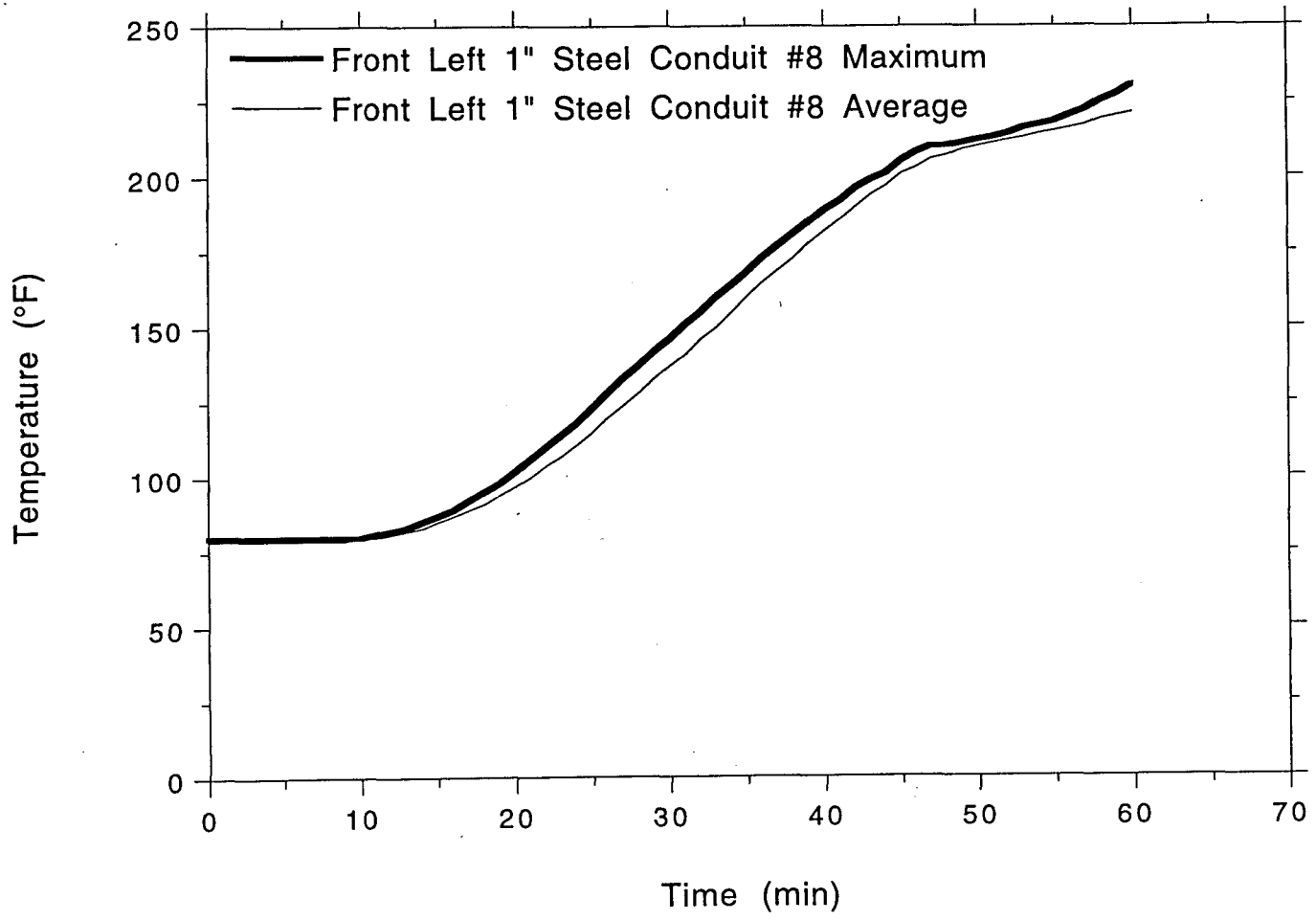
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



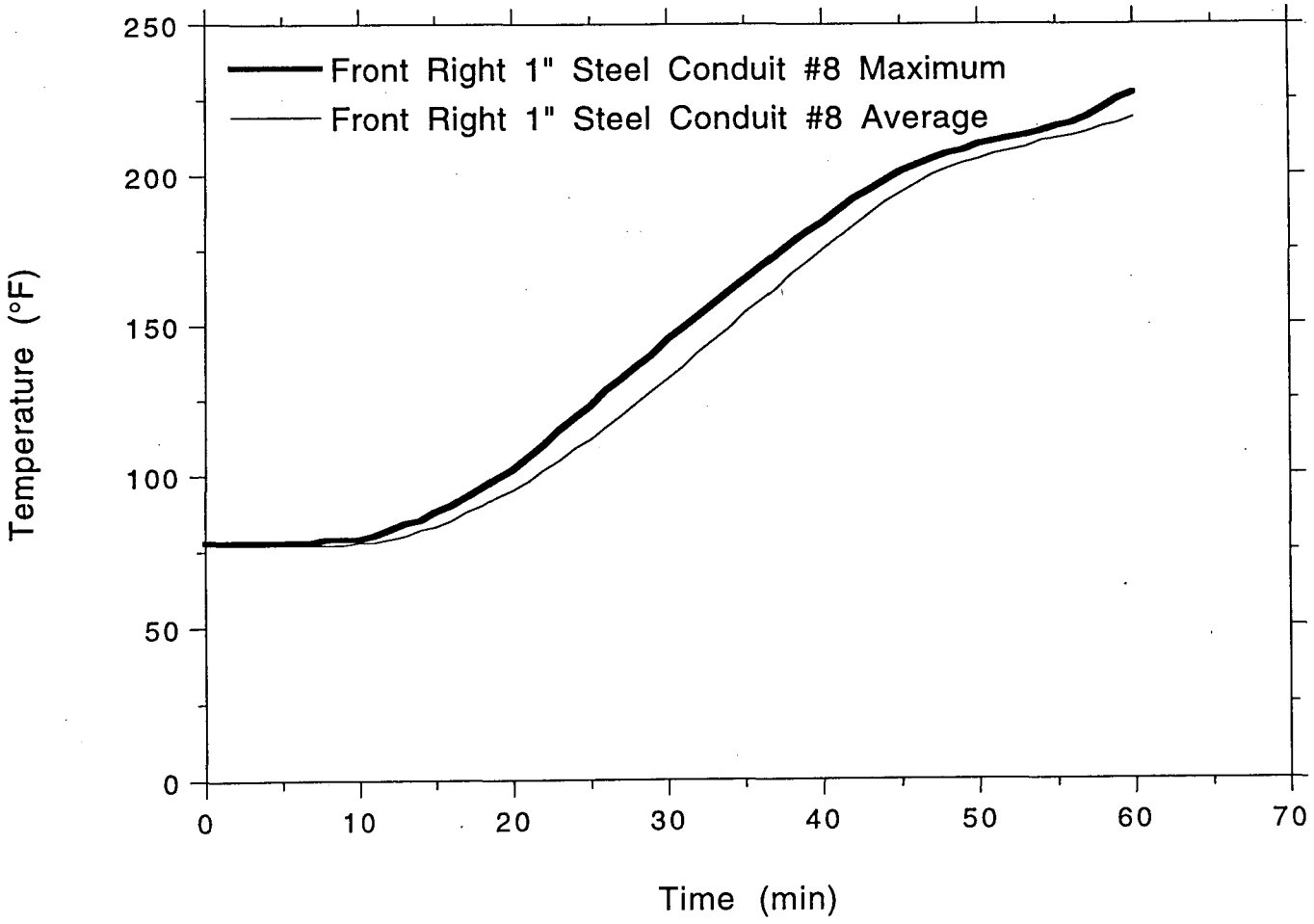
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



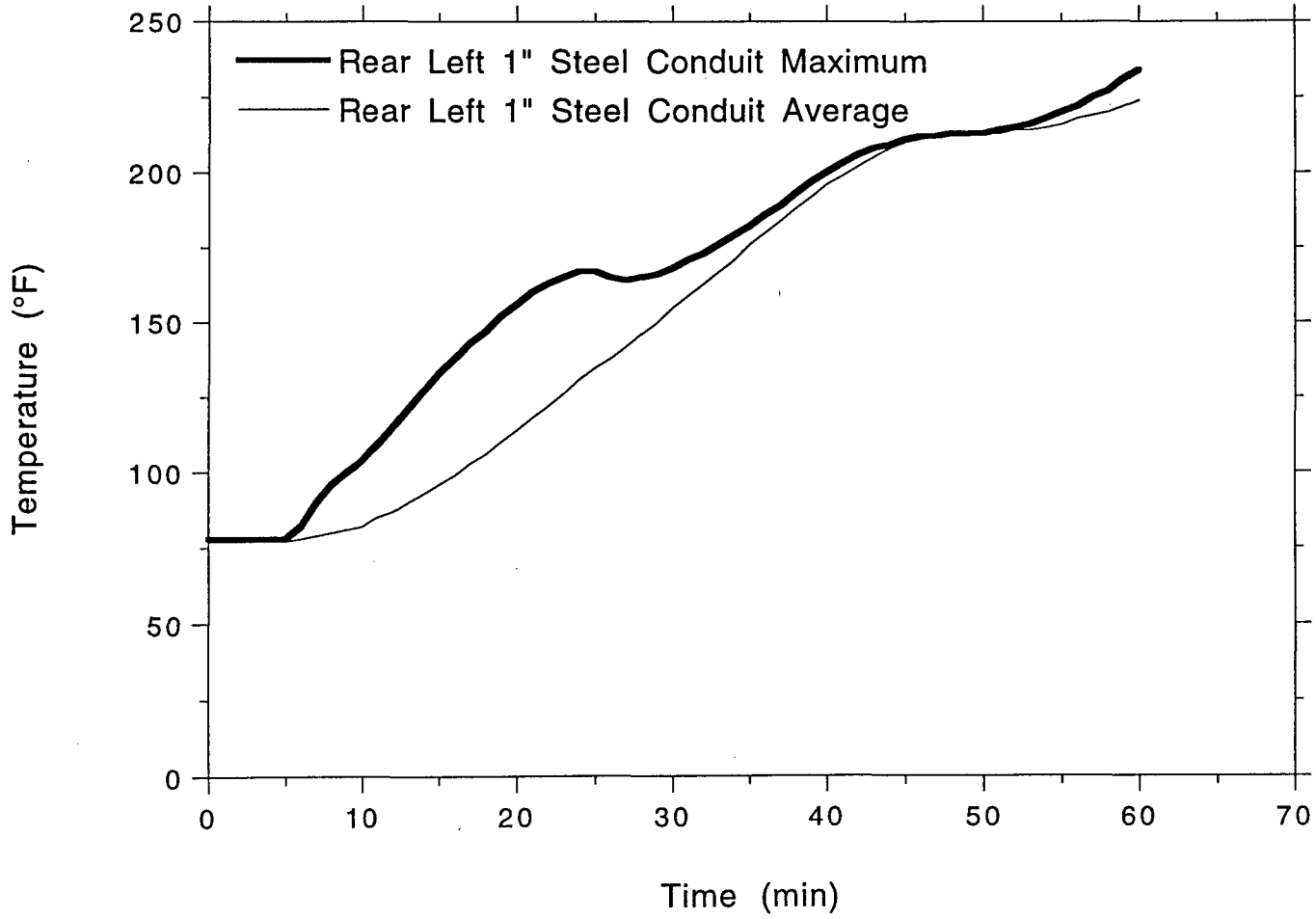
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



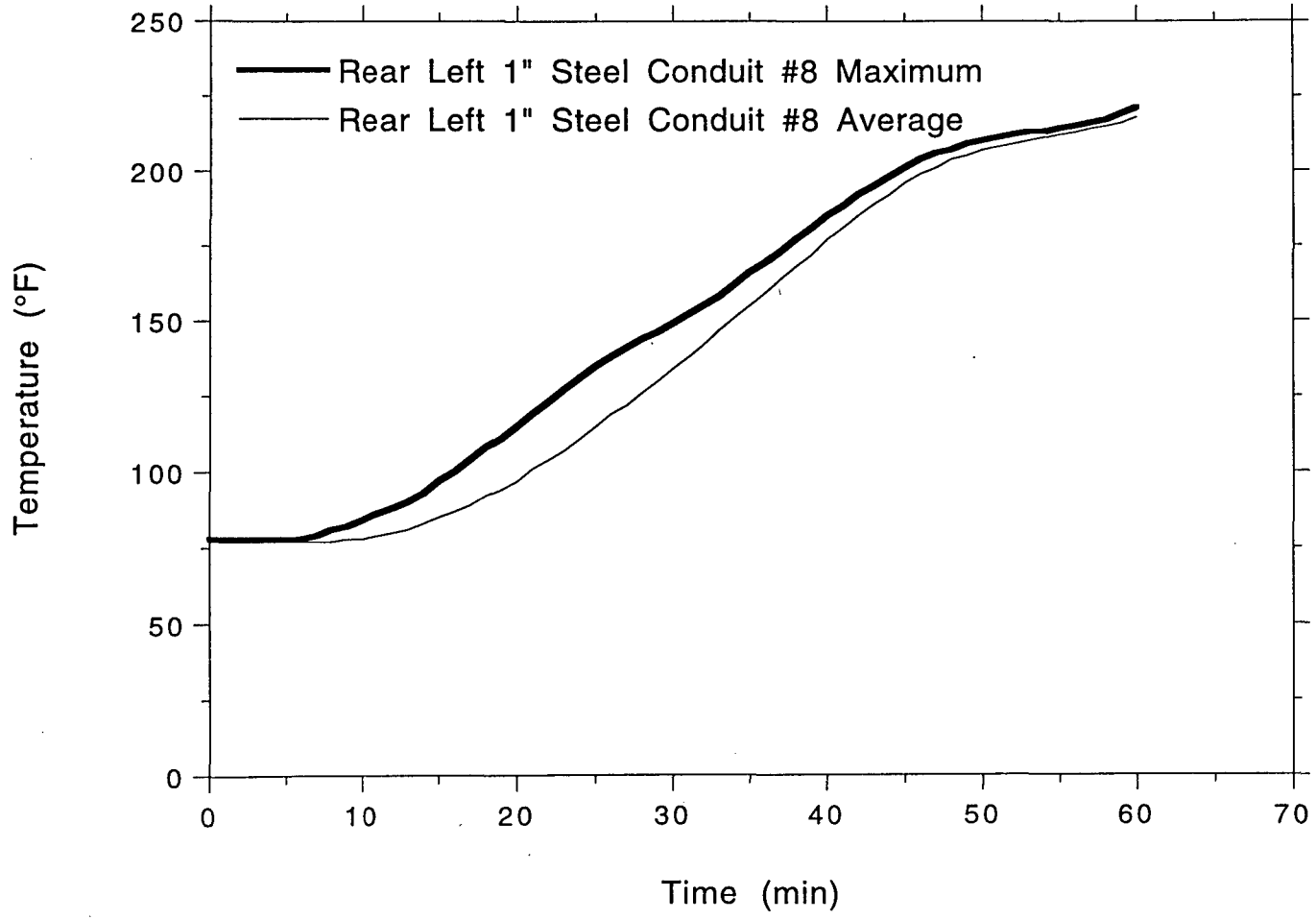
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



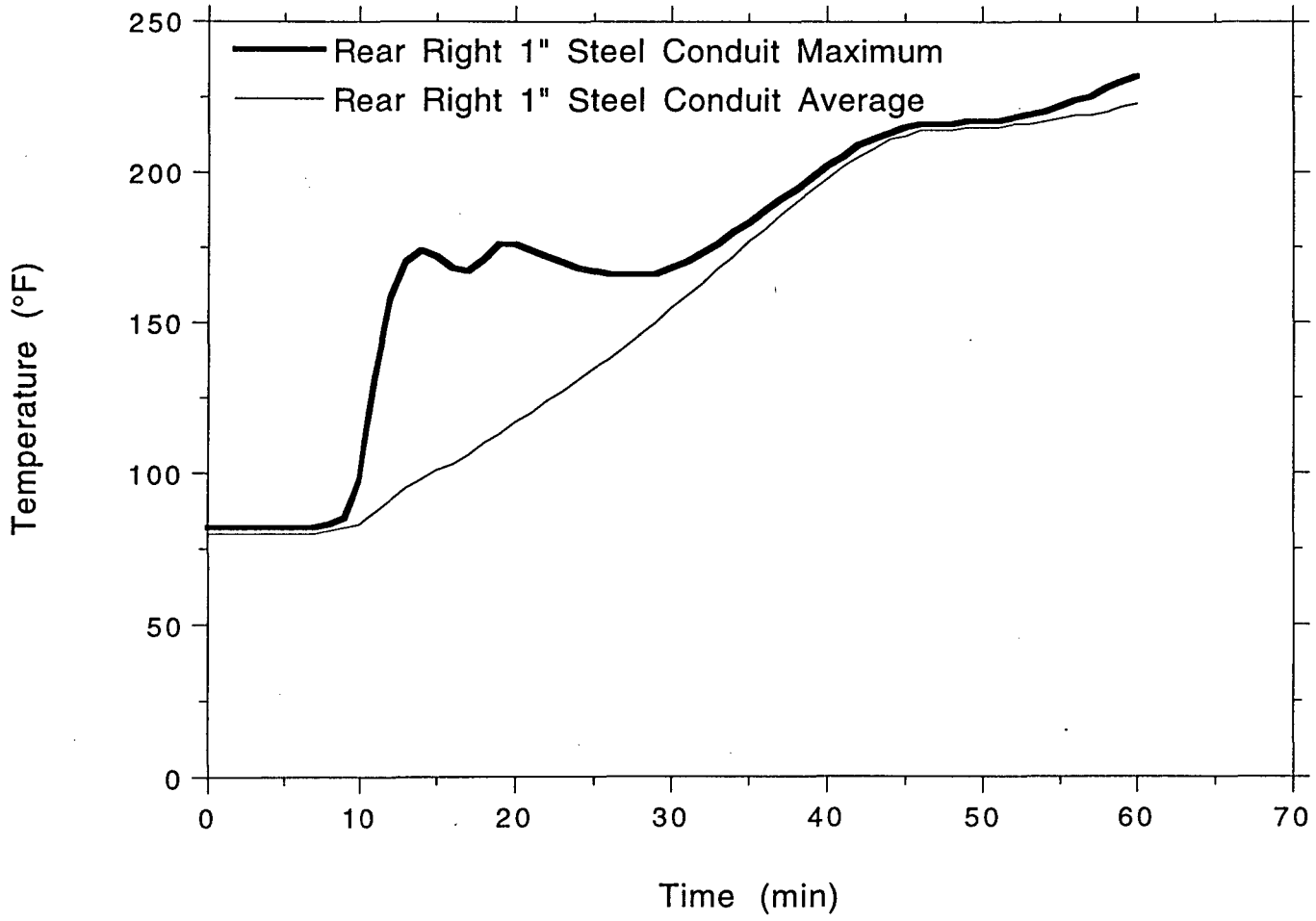
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



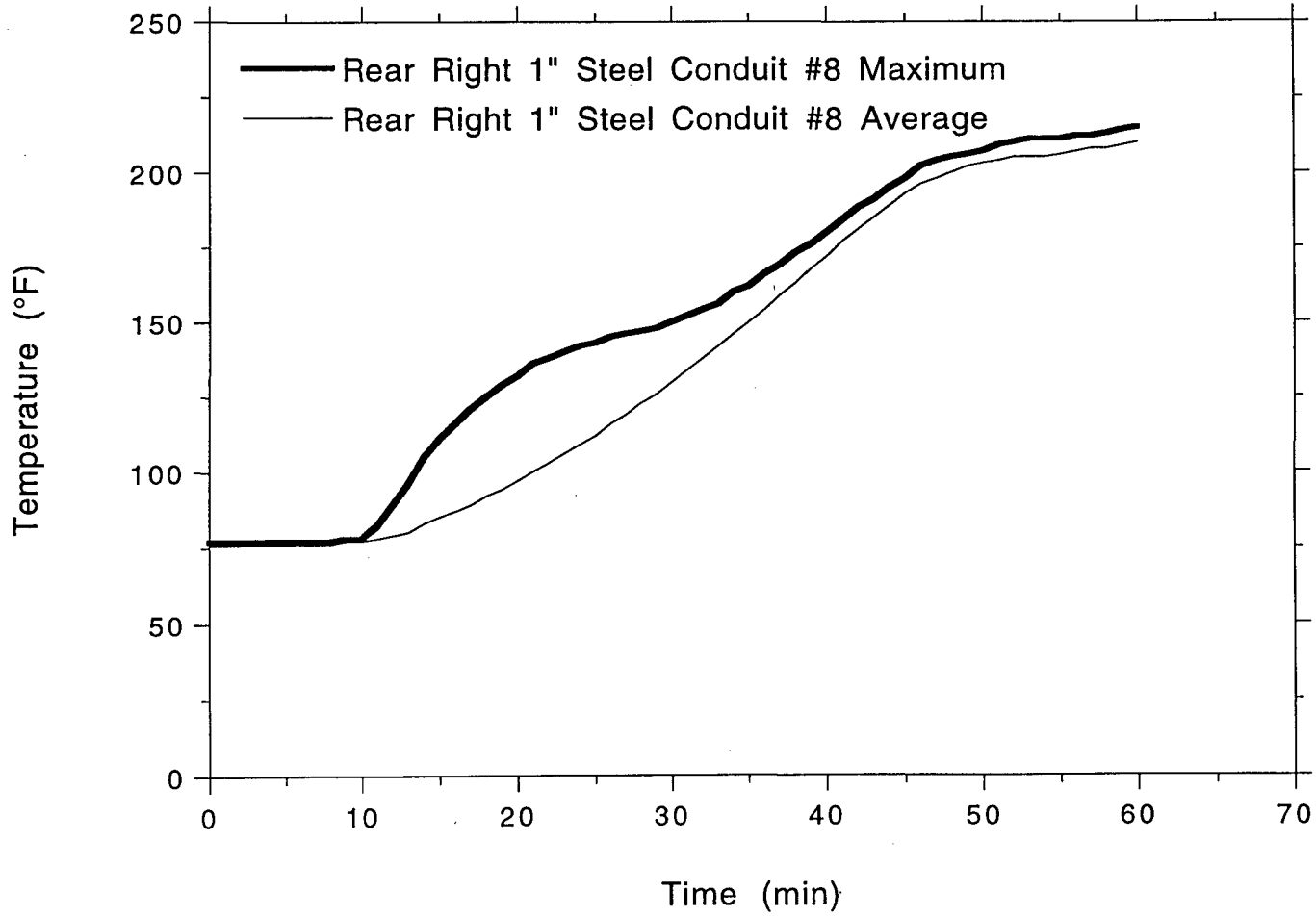
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



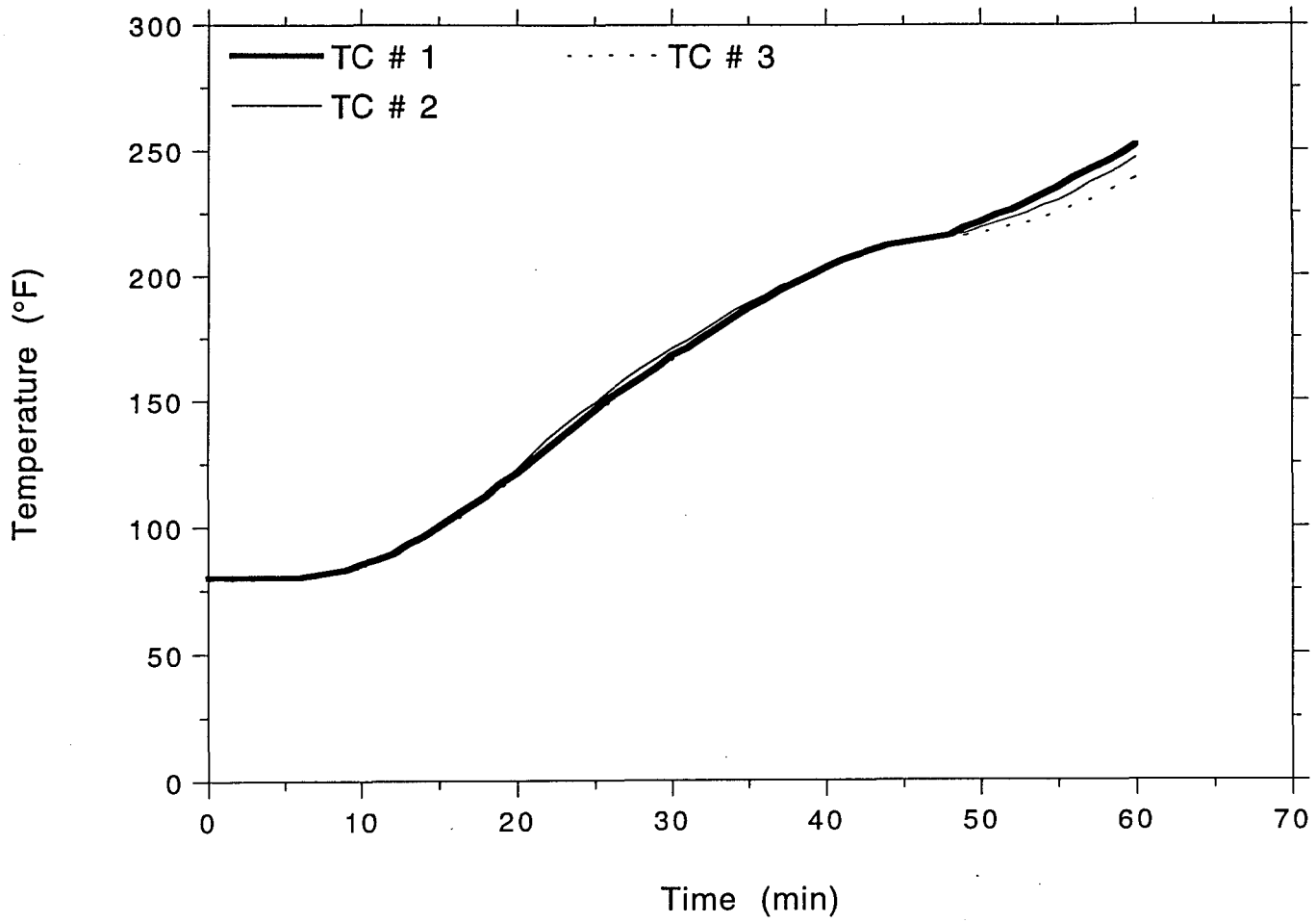
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Conduit Average Temperatures



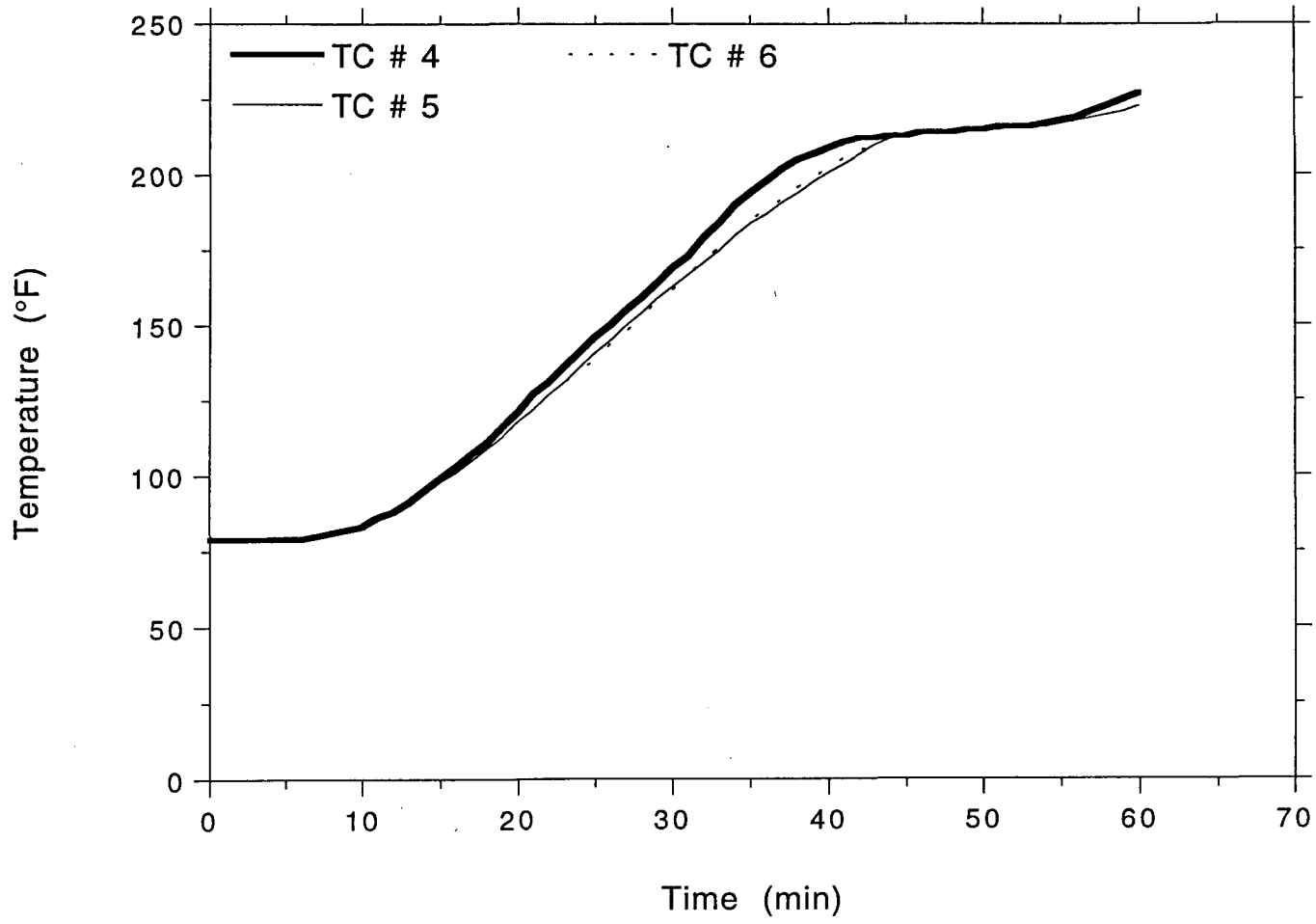
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit



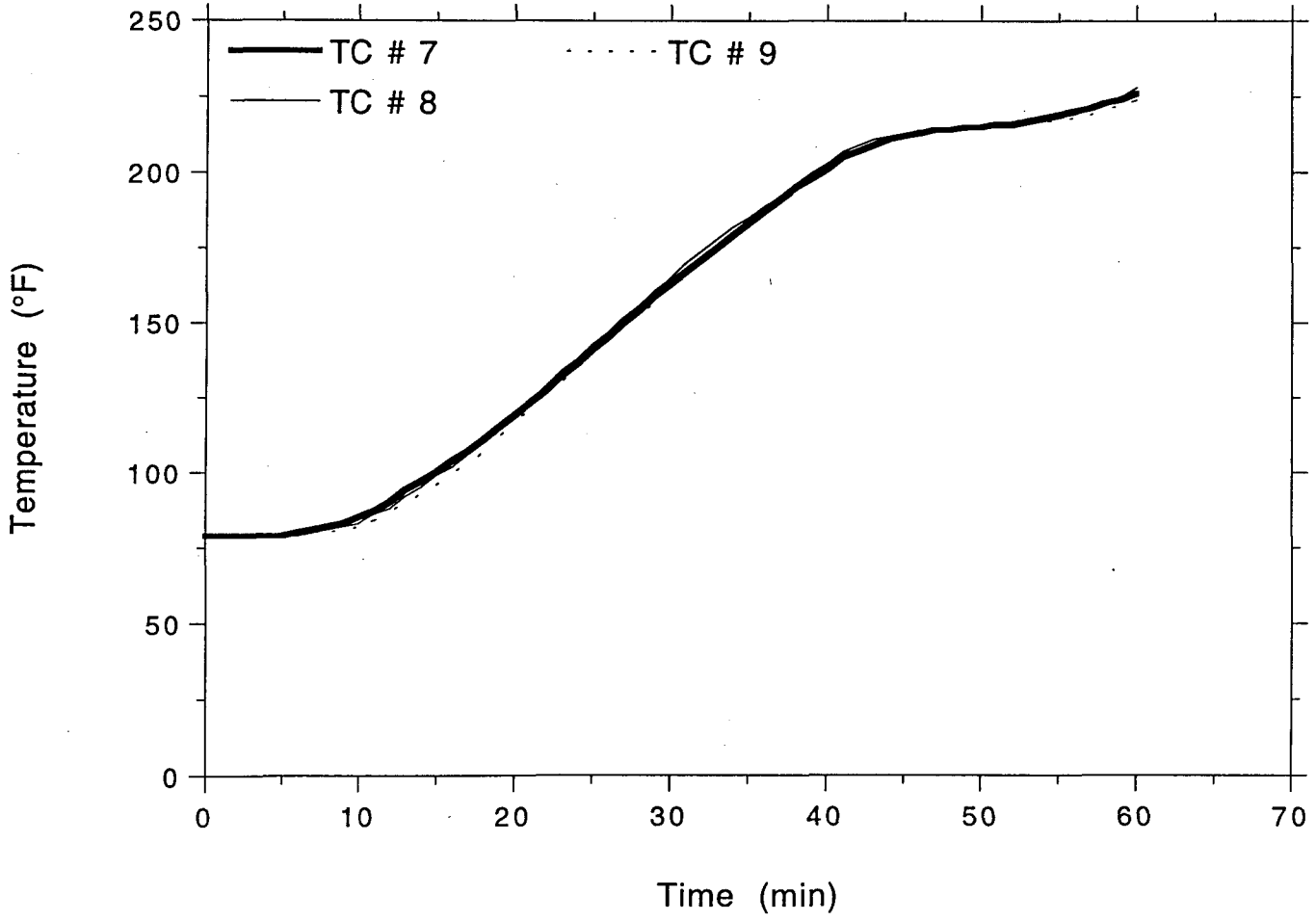
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit



OMEGA POINT LABORATORIES

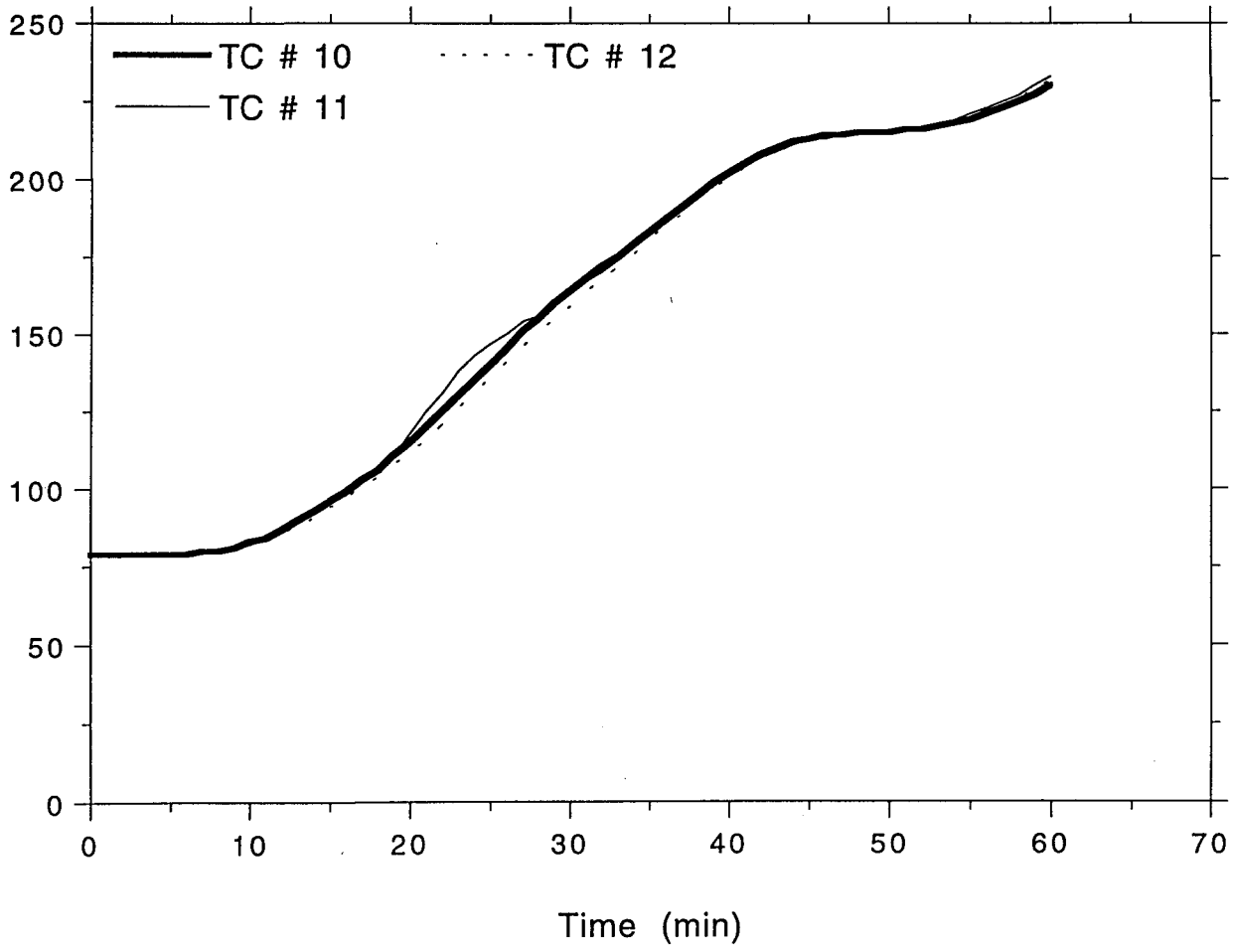
TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit



OMEGA POINT LABORATORIES

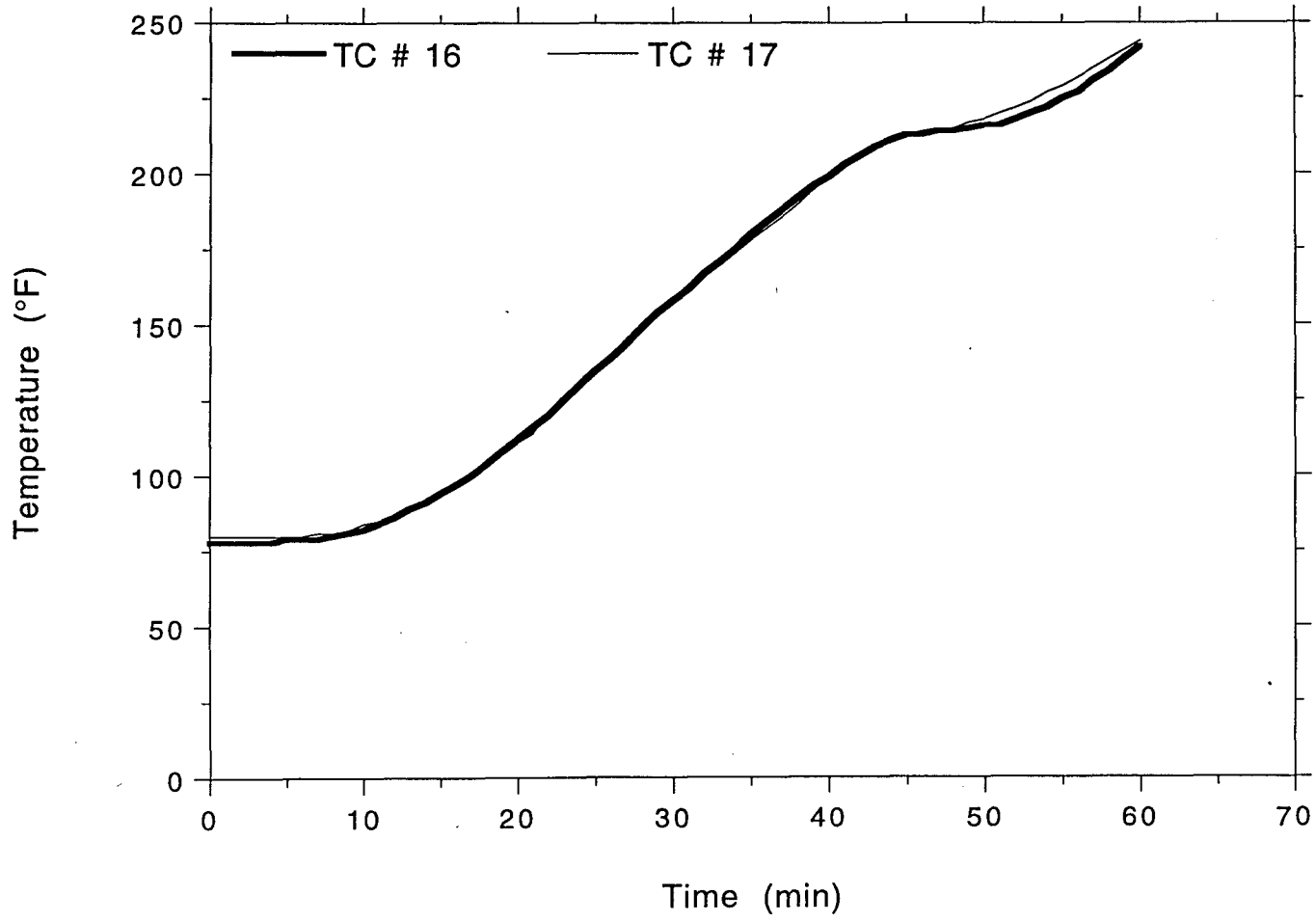
961

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit



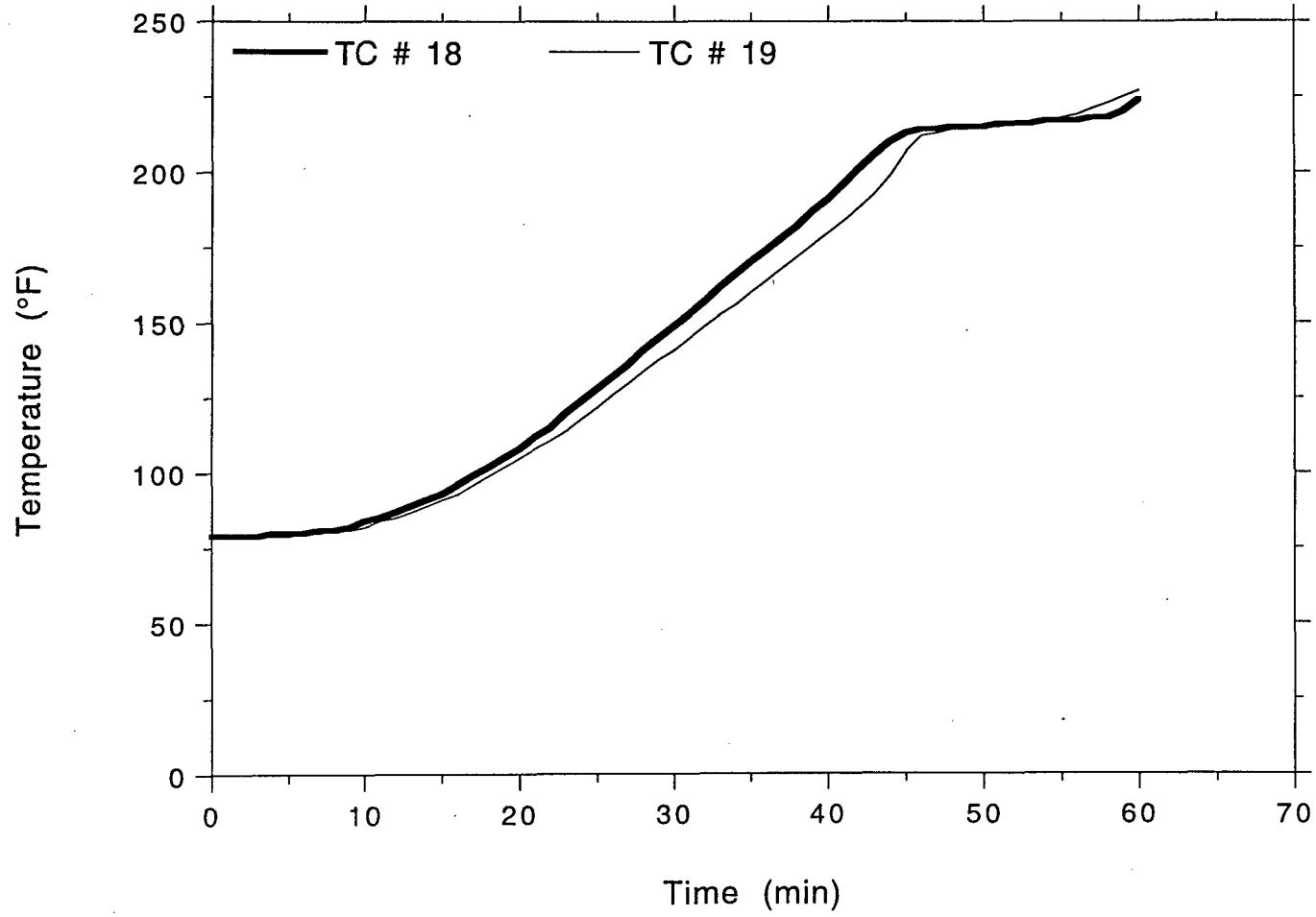
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit



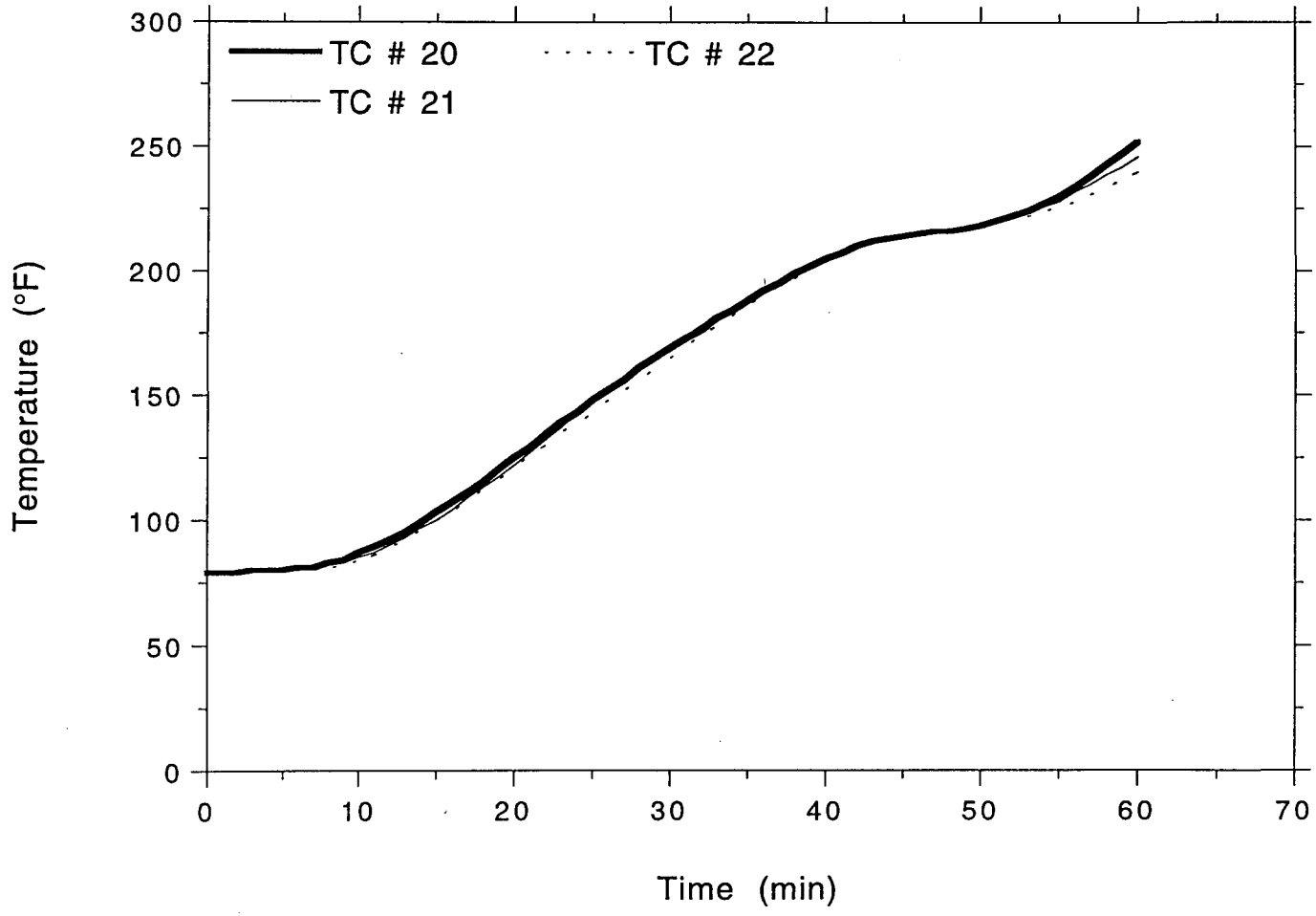
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 1" Steel Conduit



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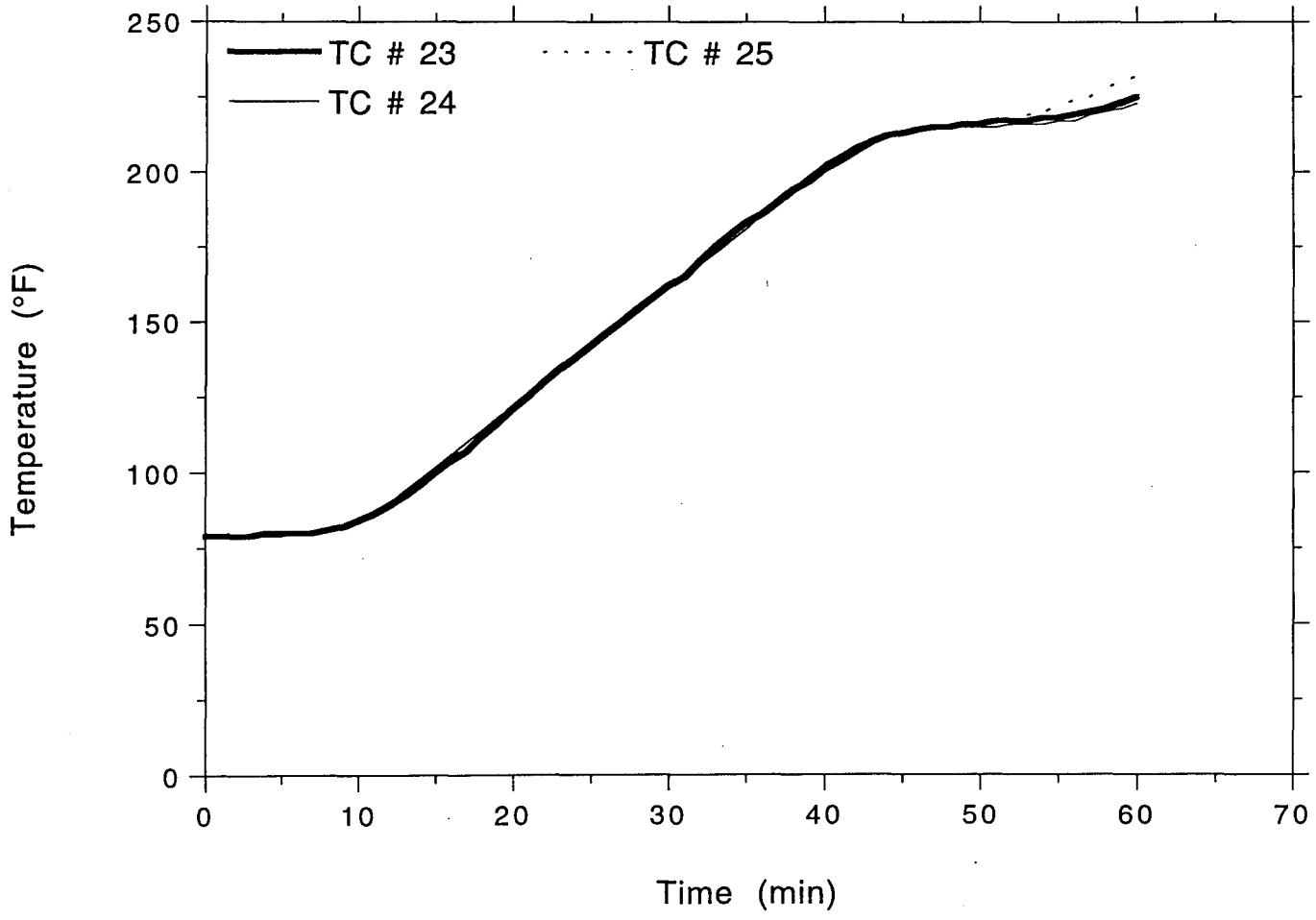

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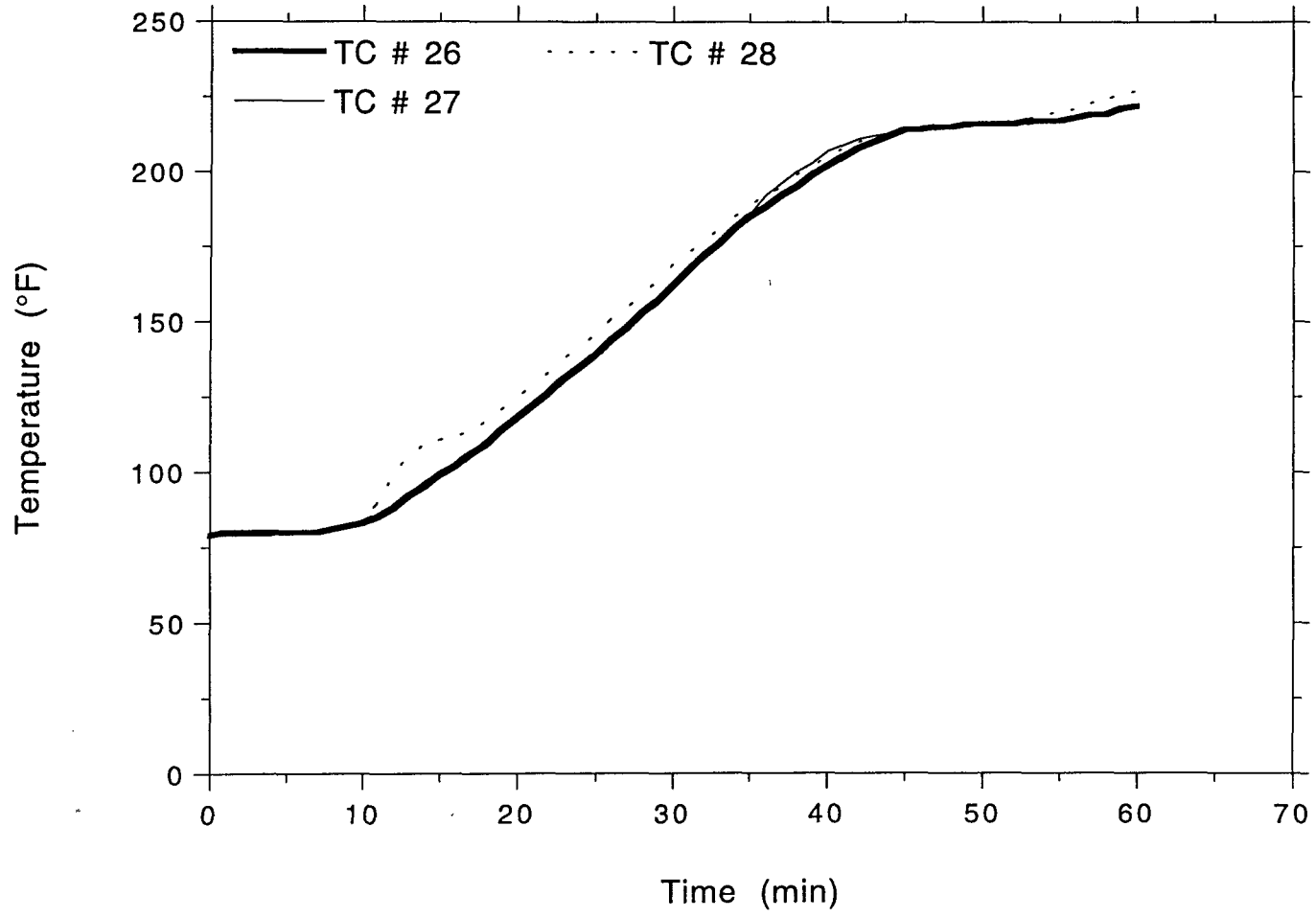

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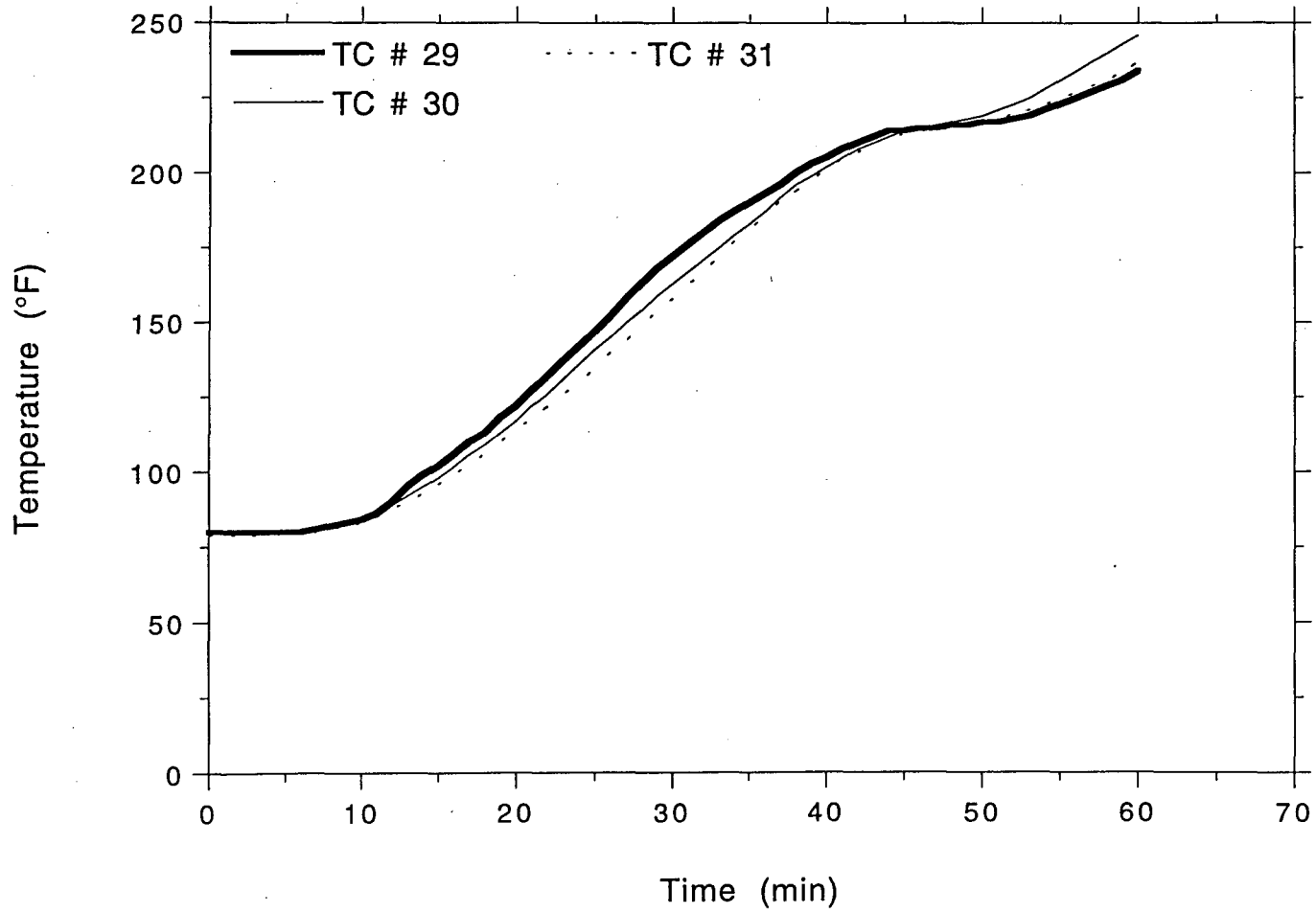

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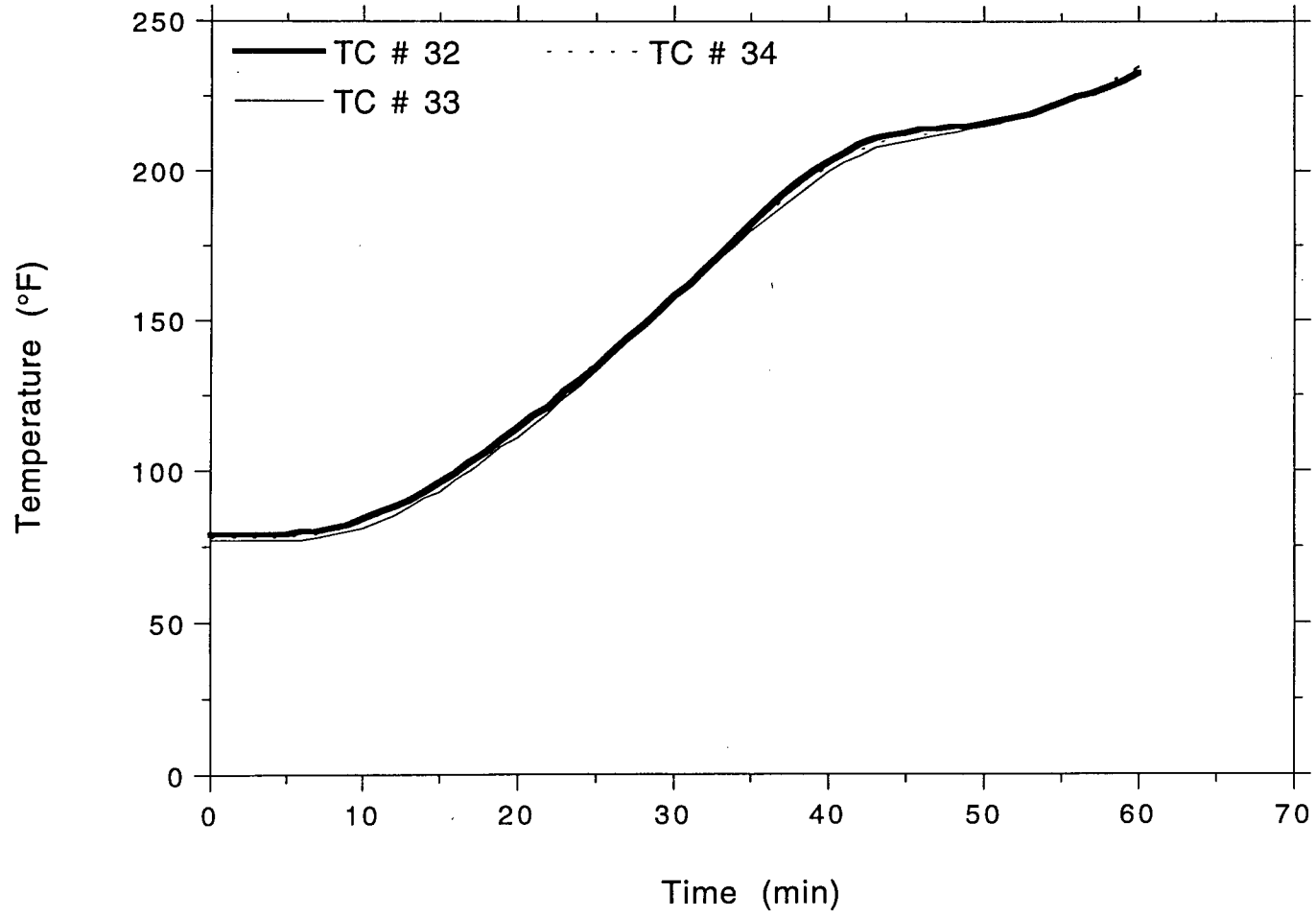

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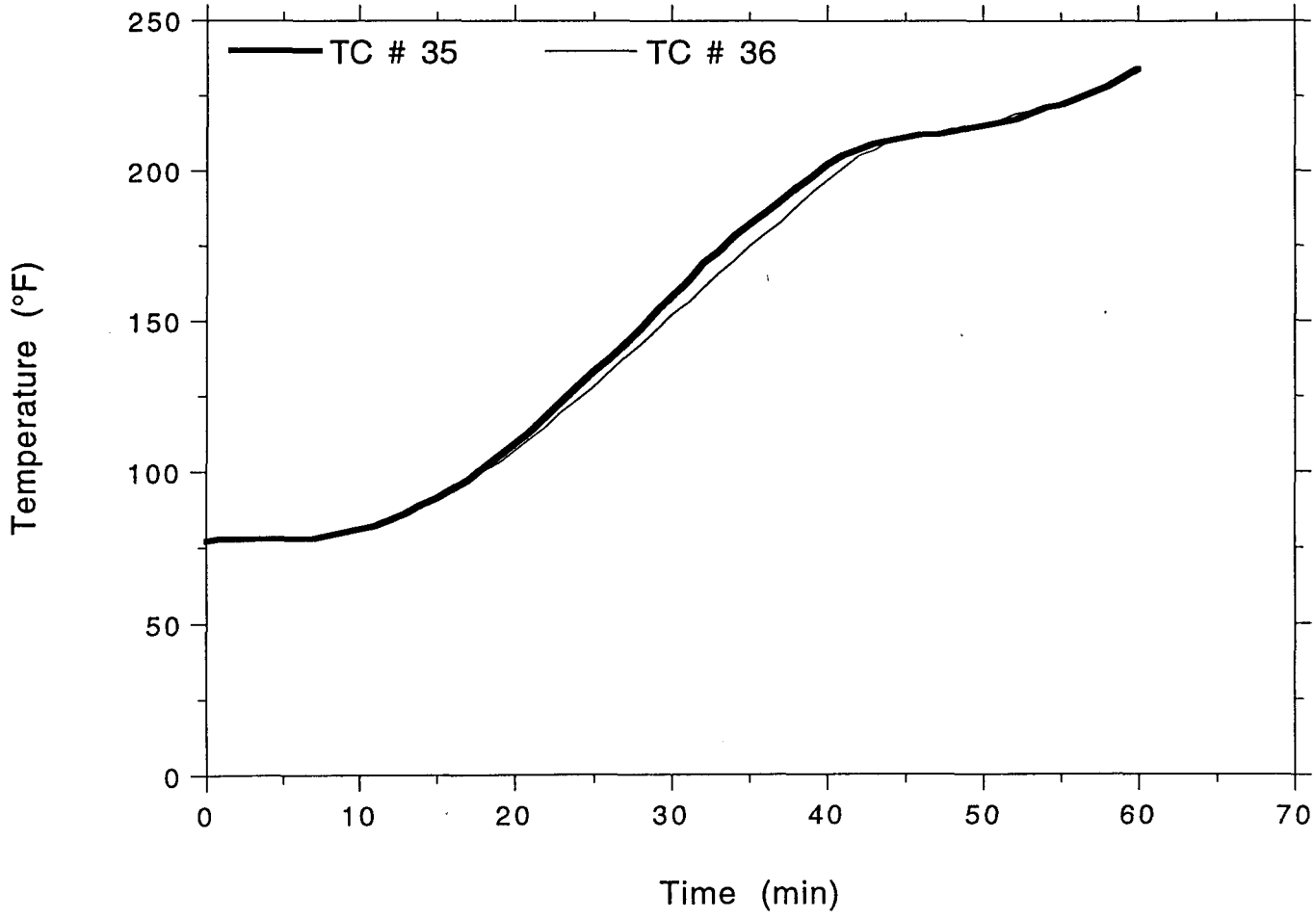

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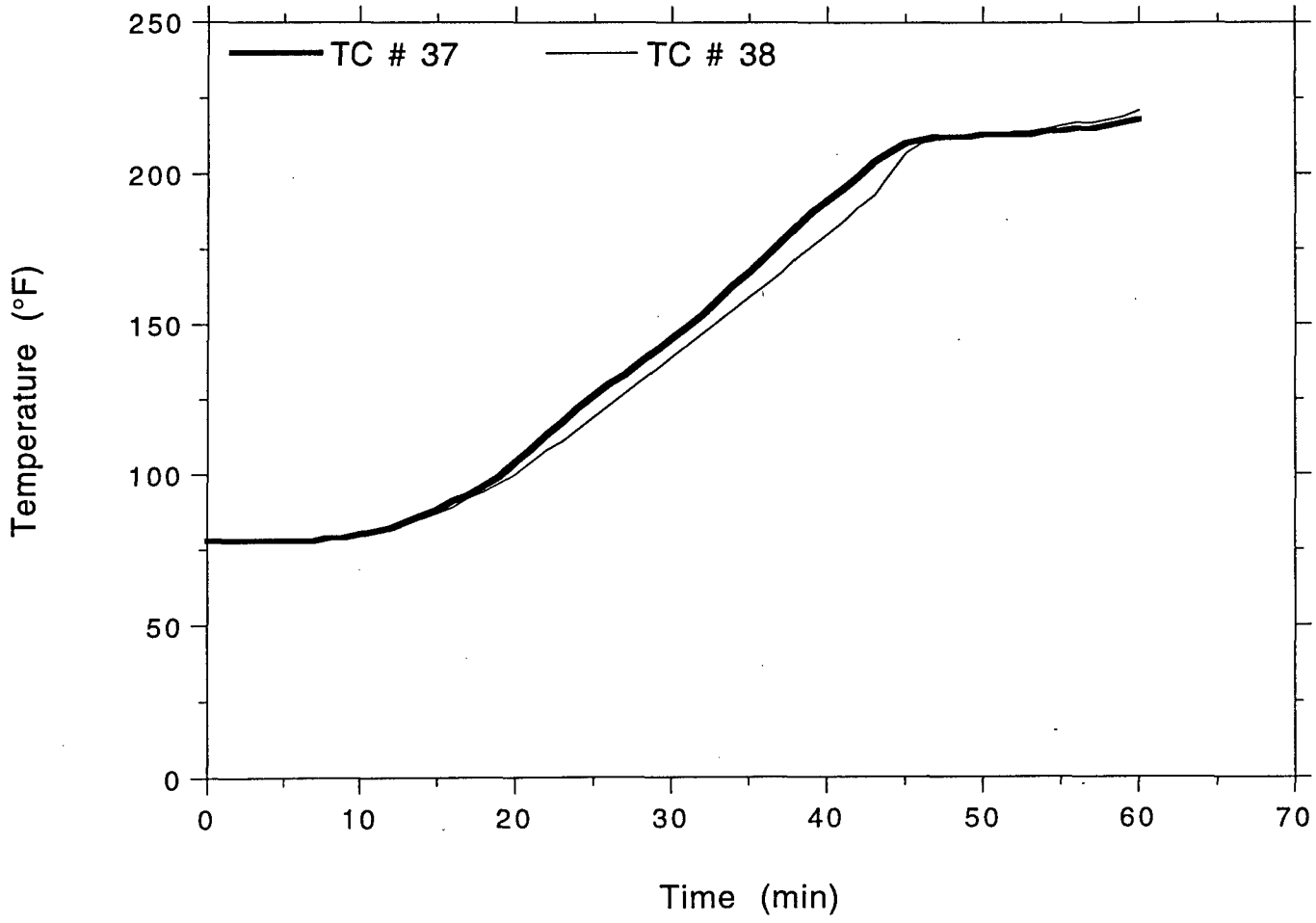

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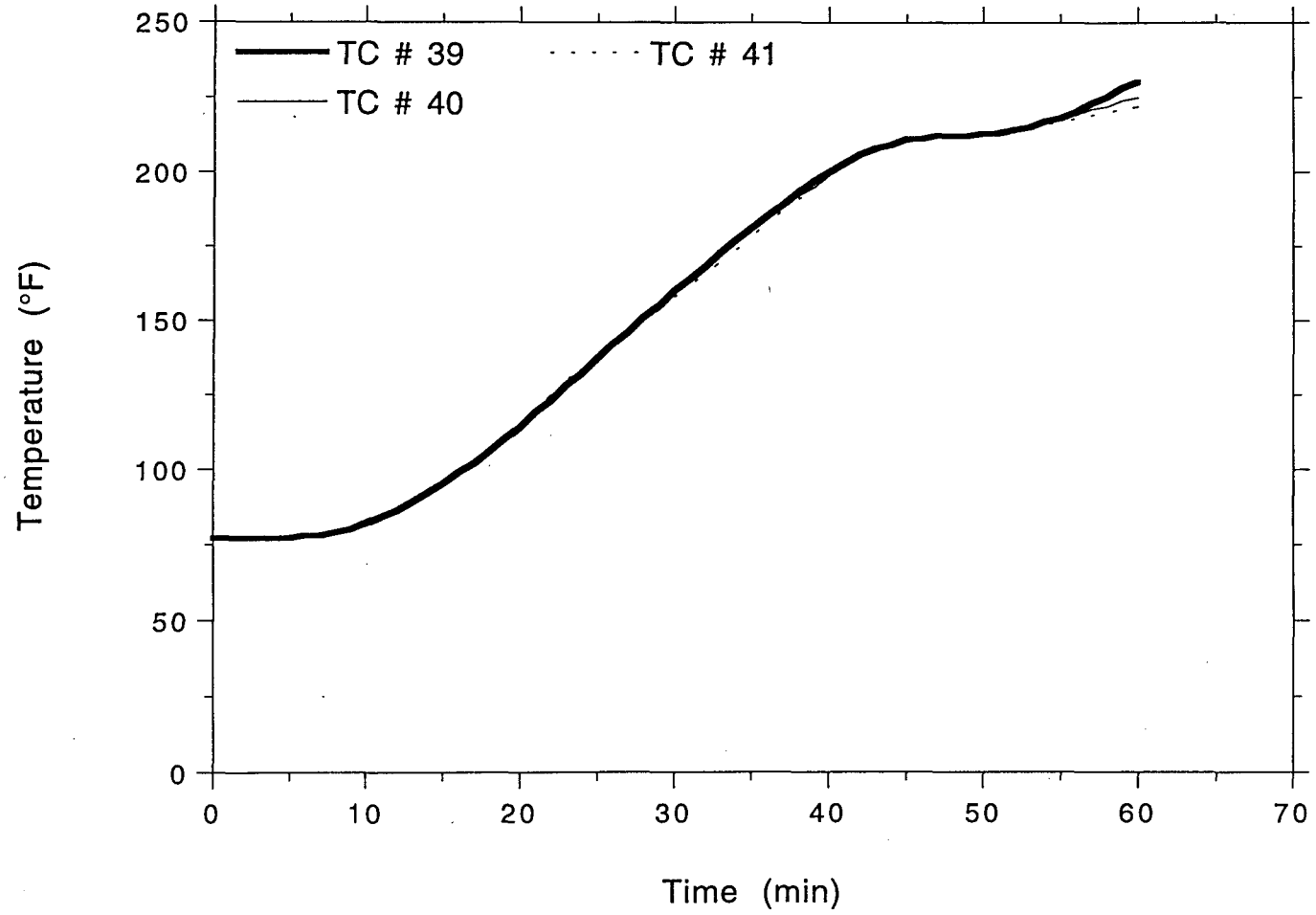

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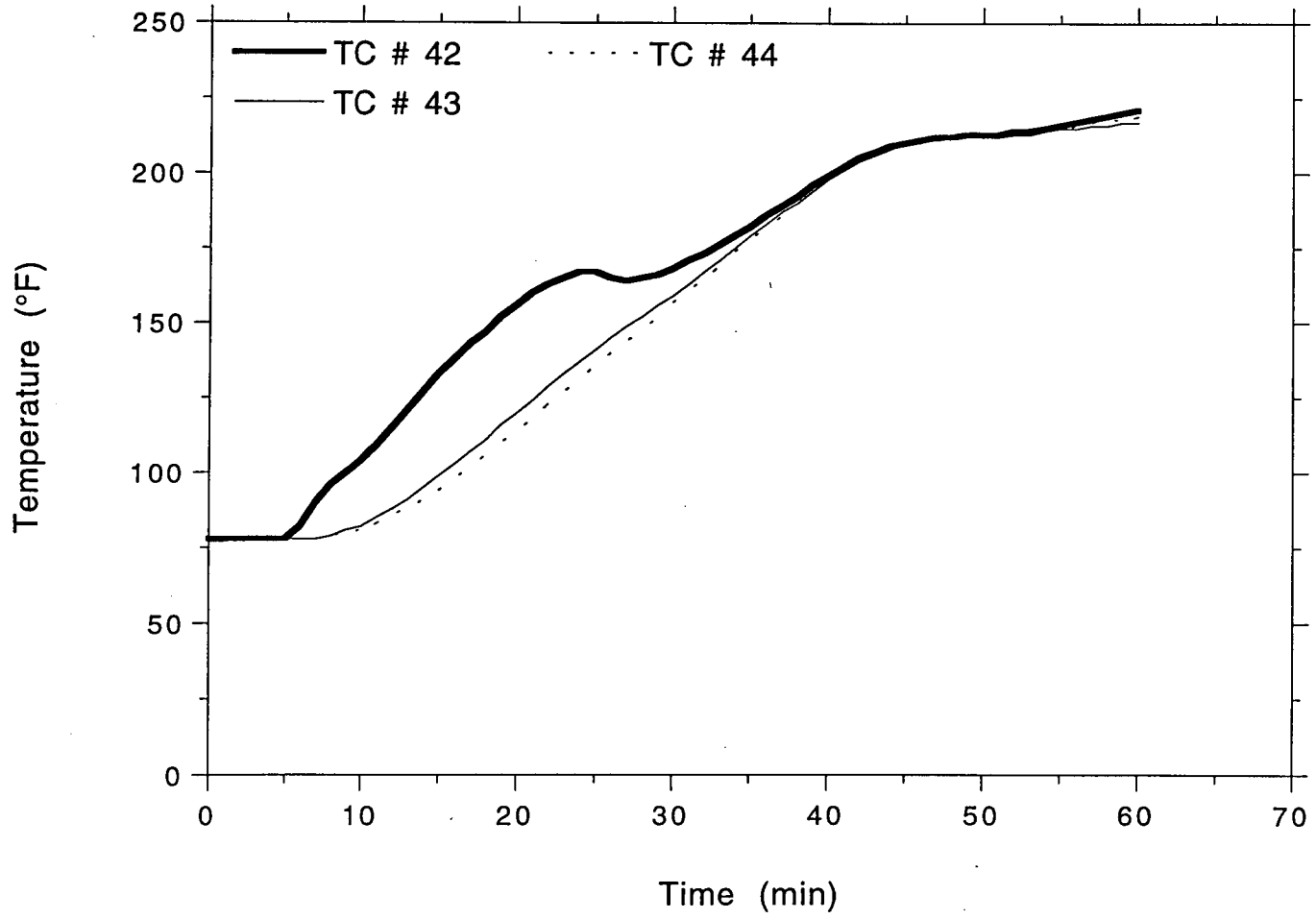

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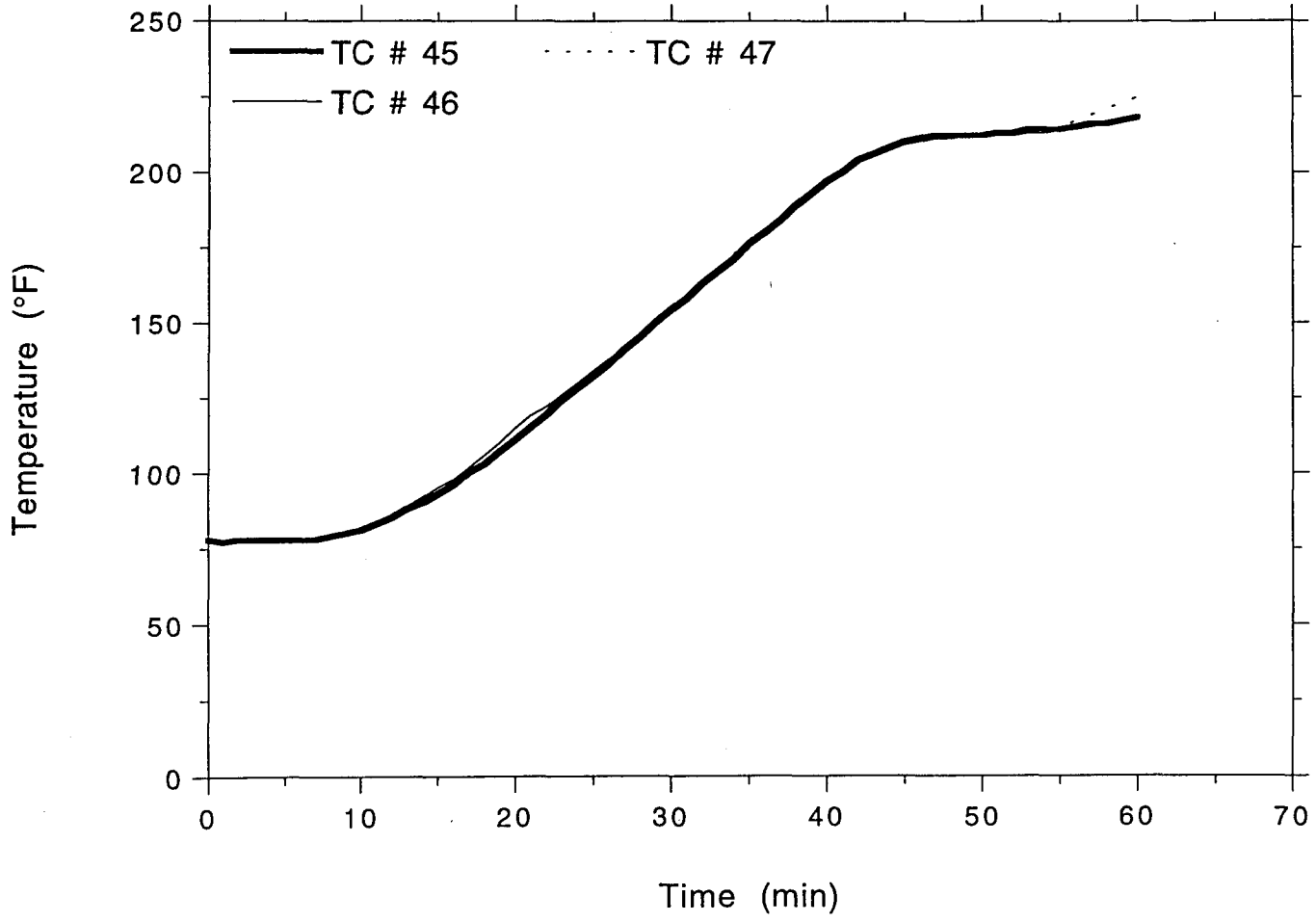

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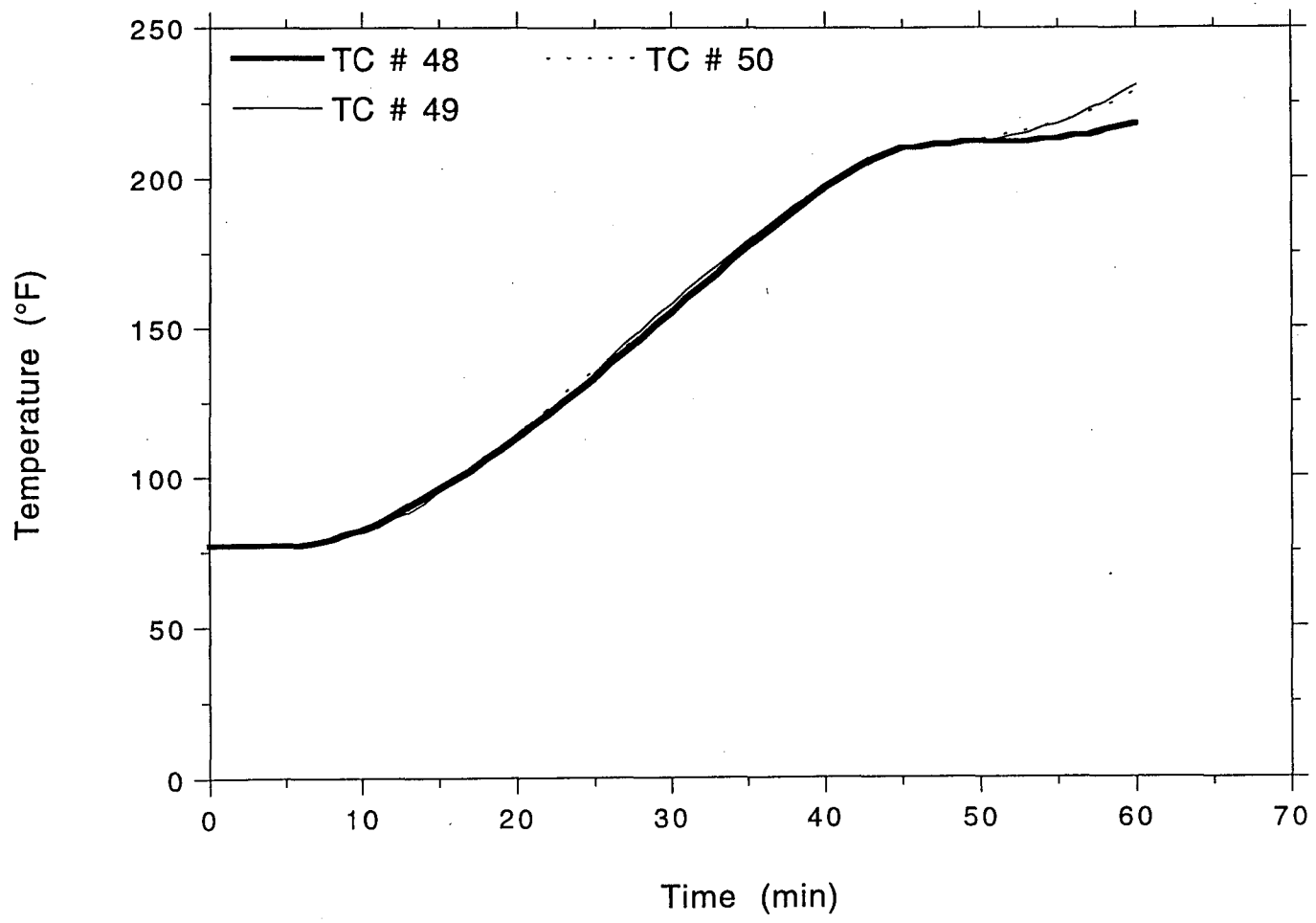

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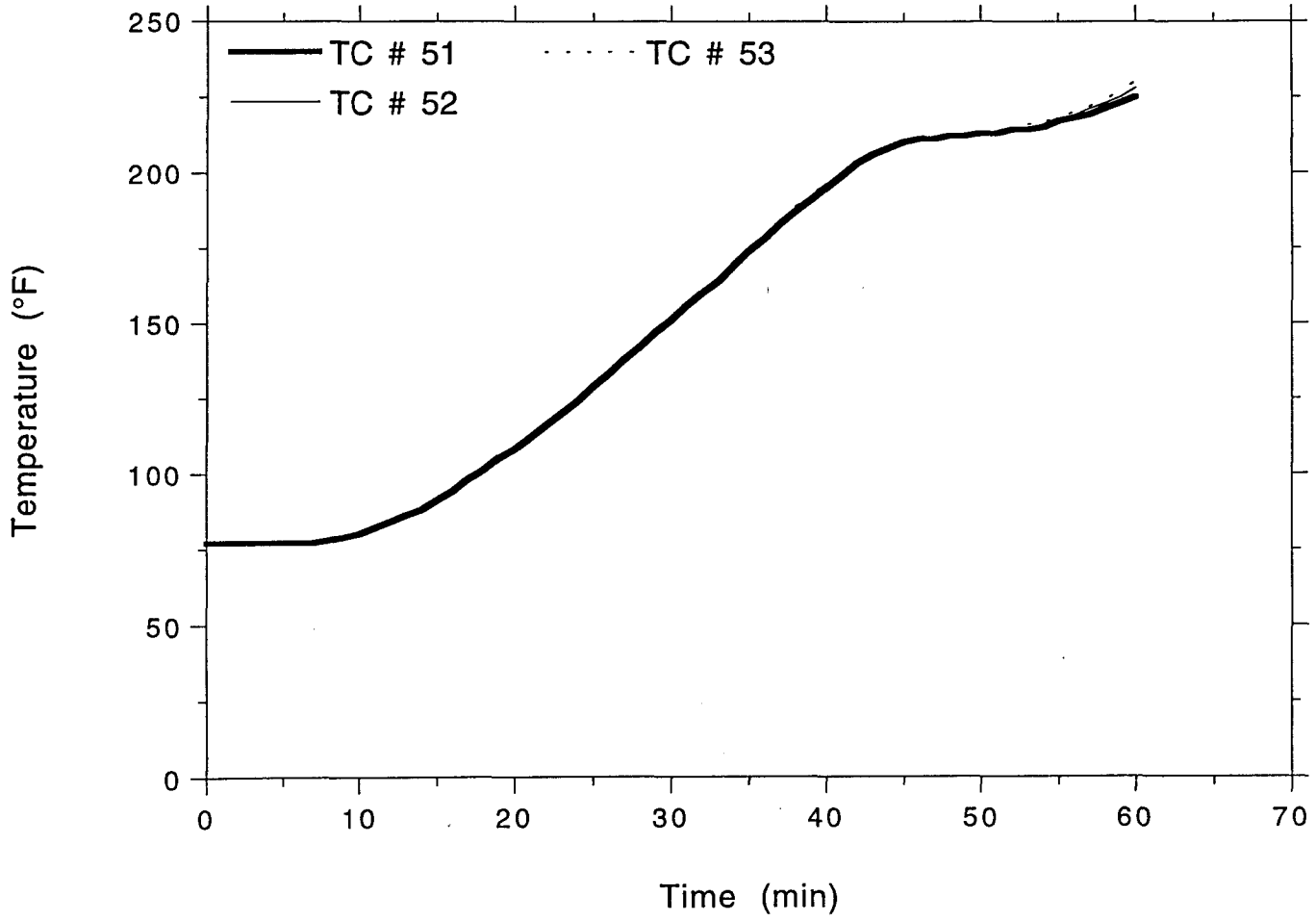

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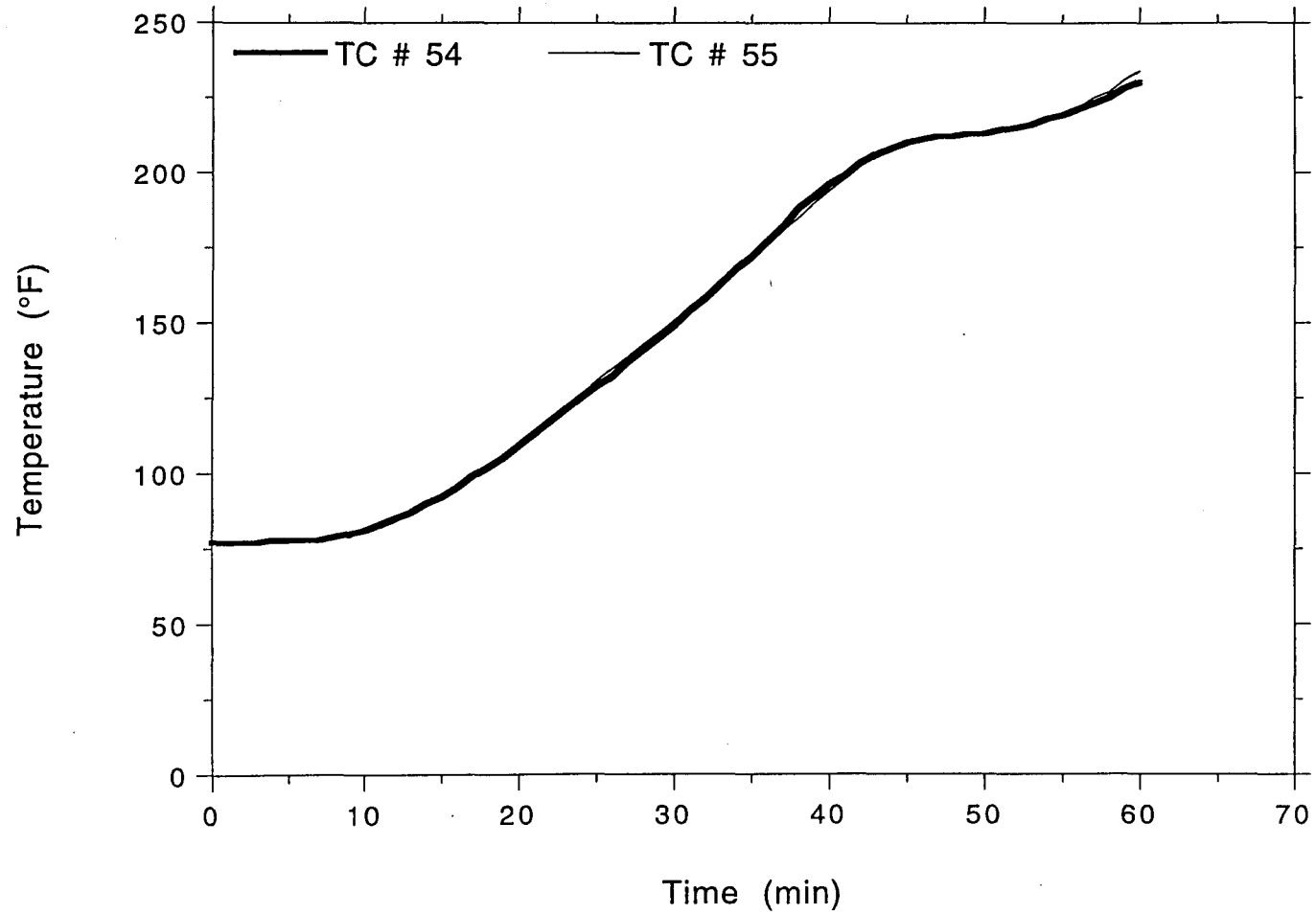

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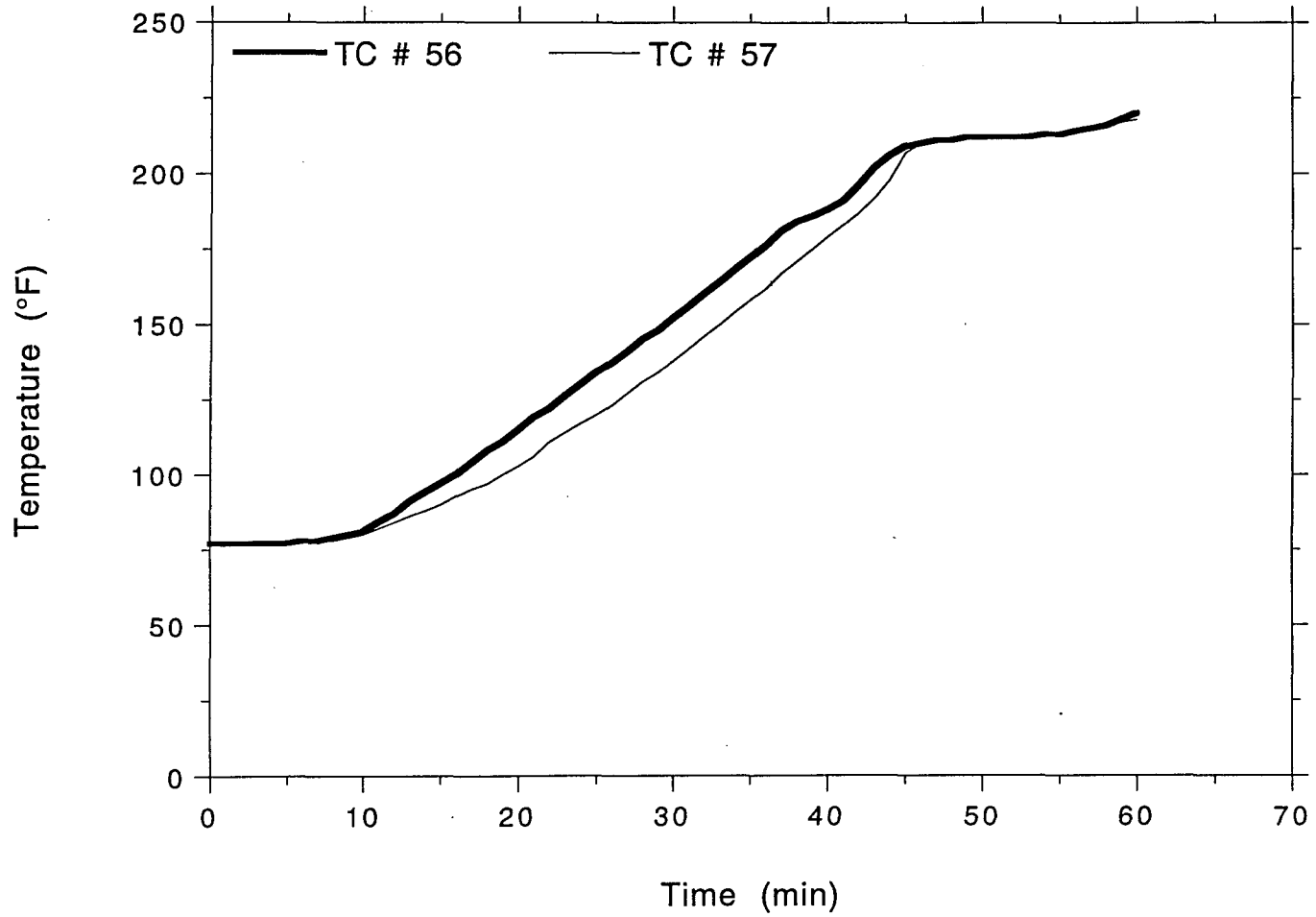
Rear Left 1" Steel Conduit



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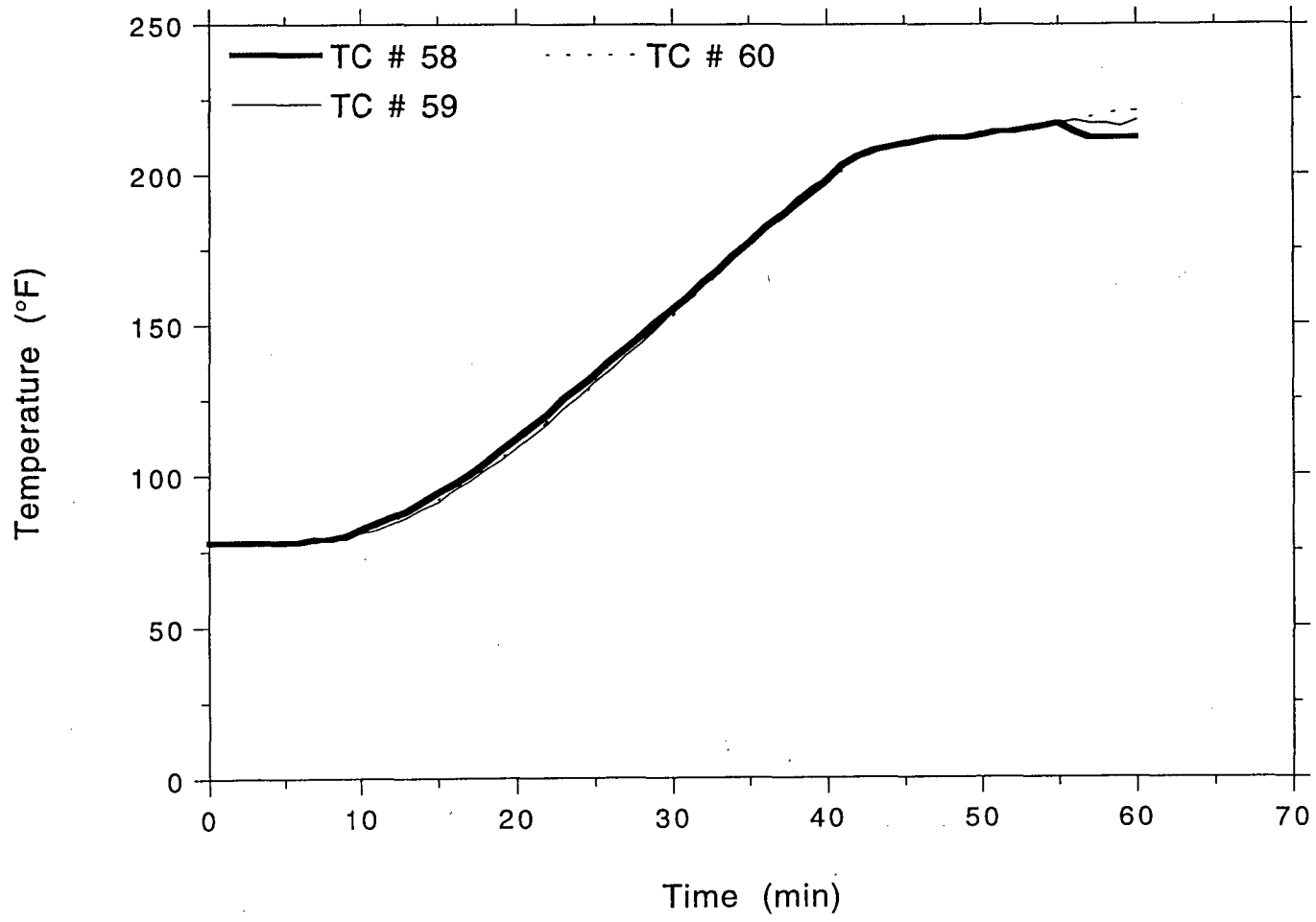

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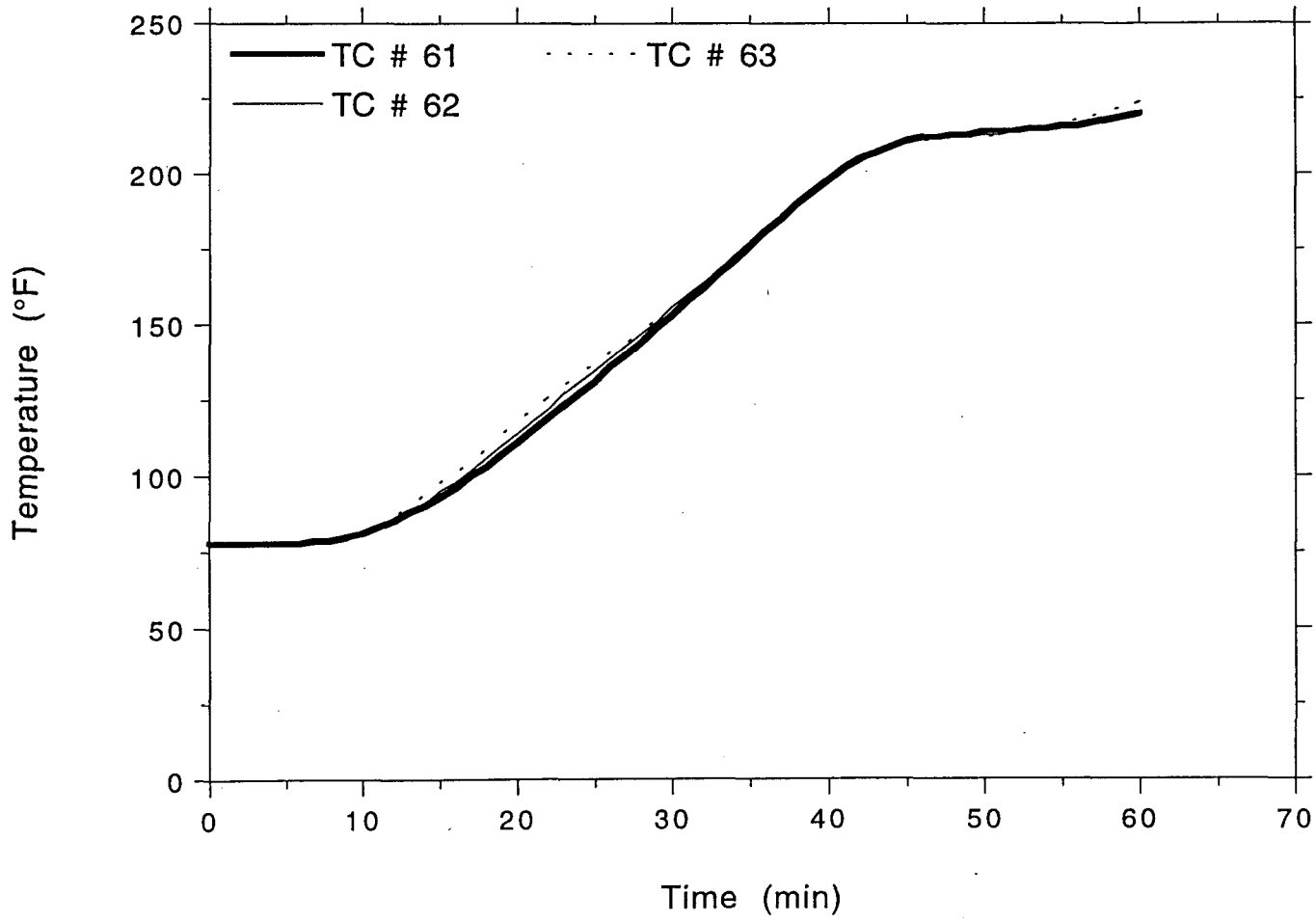

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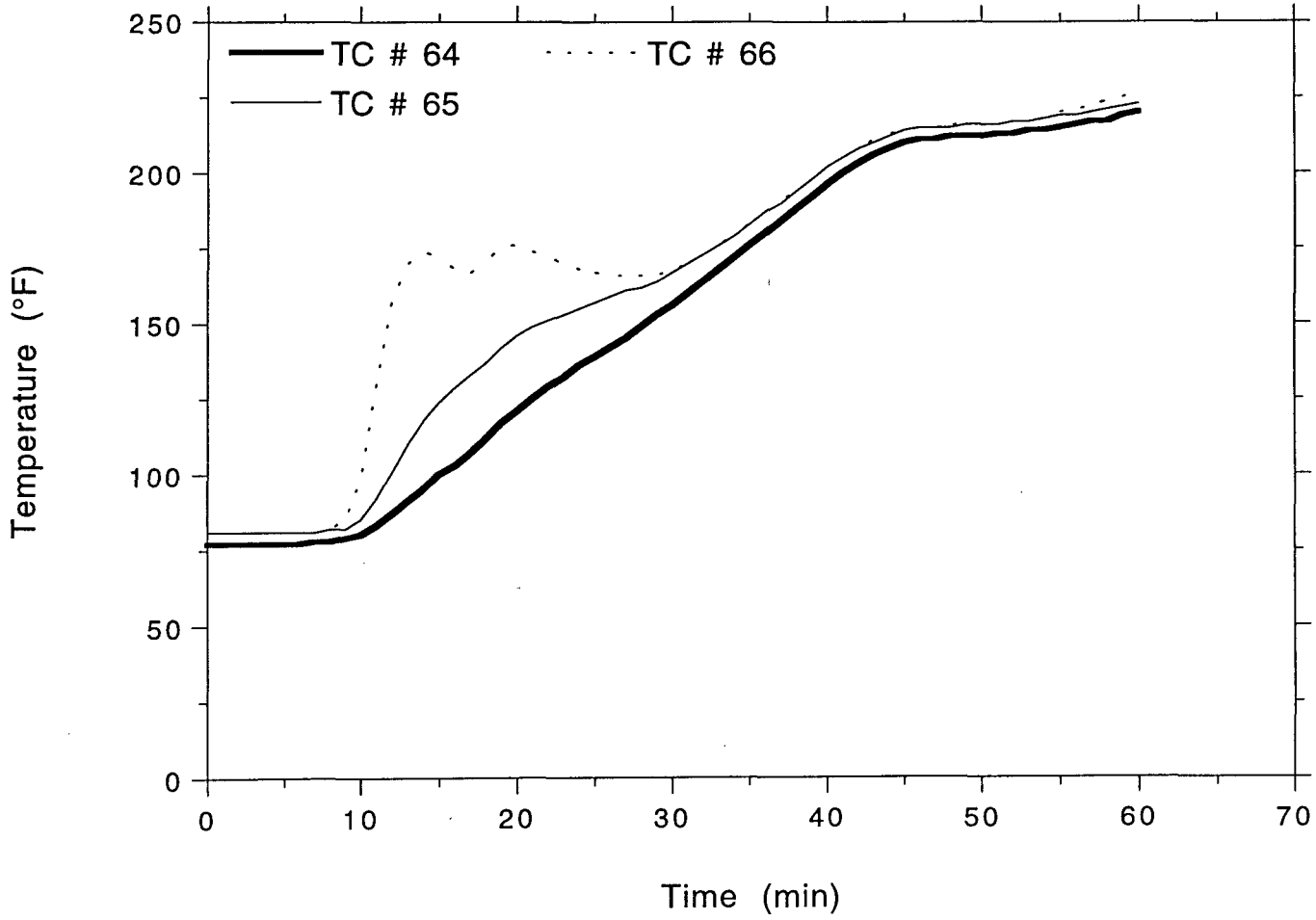

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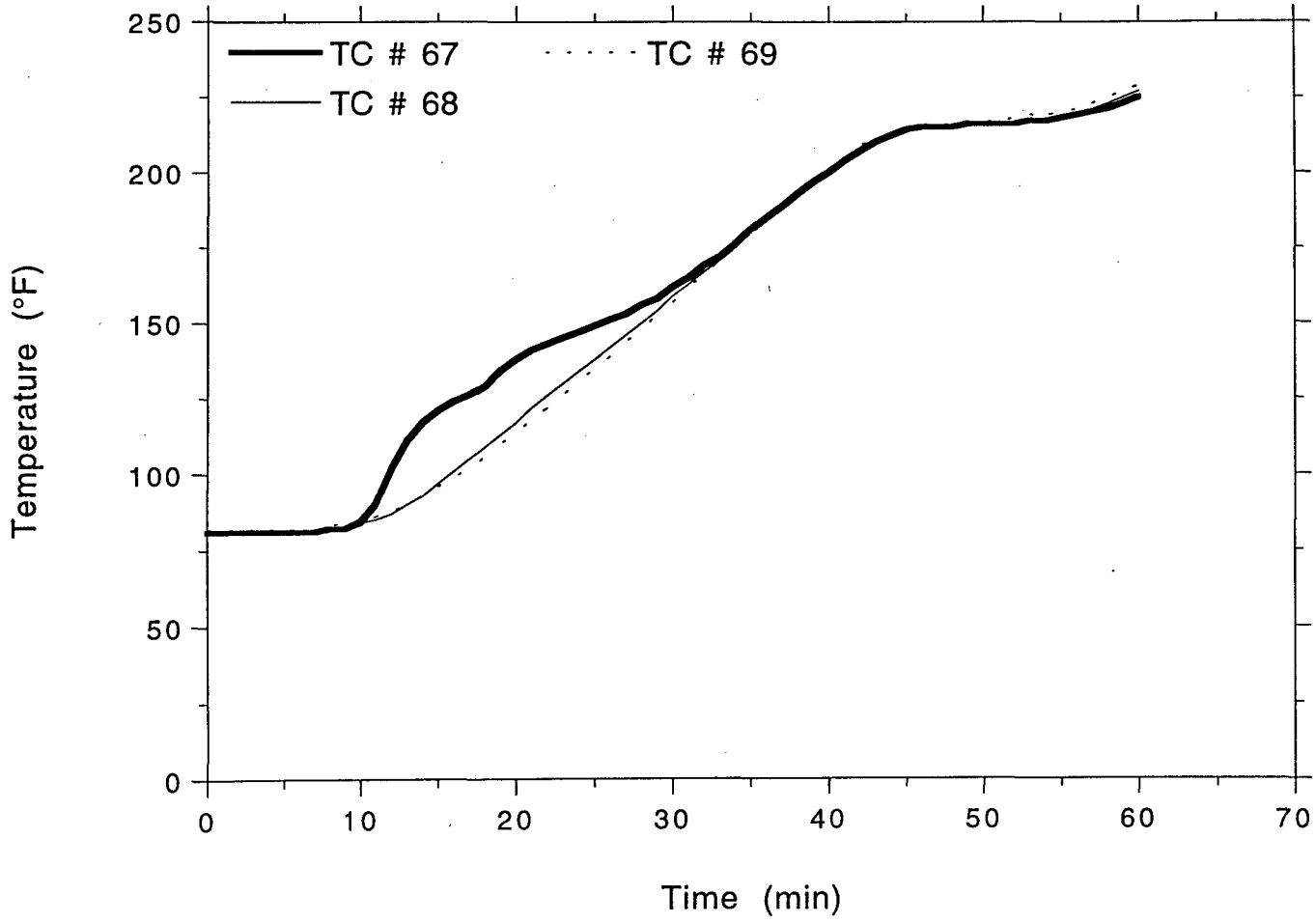

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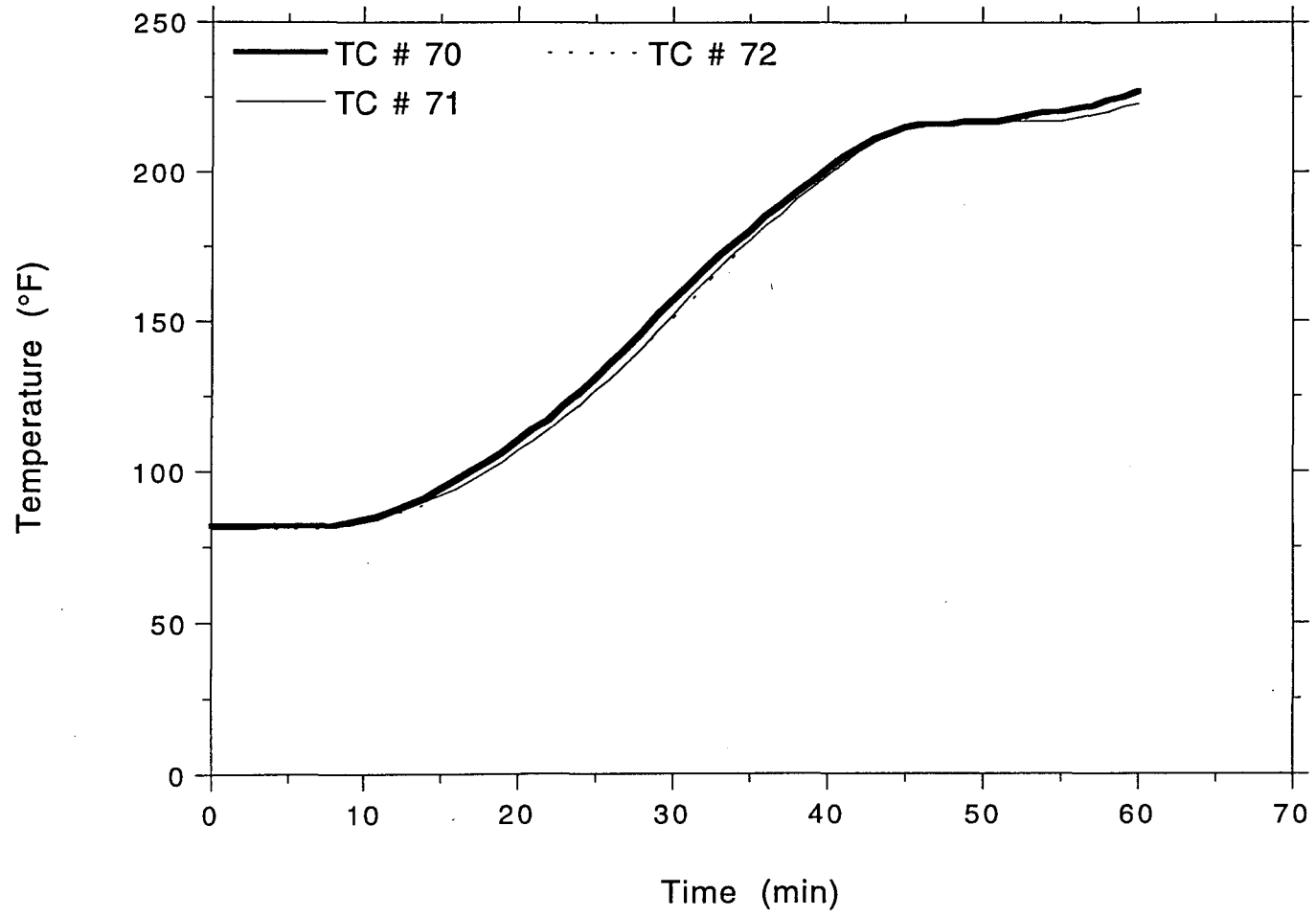

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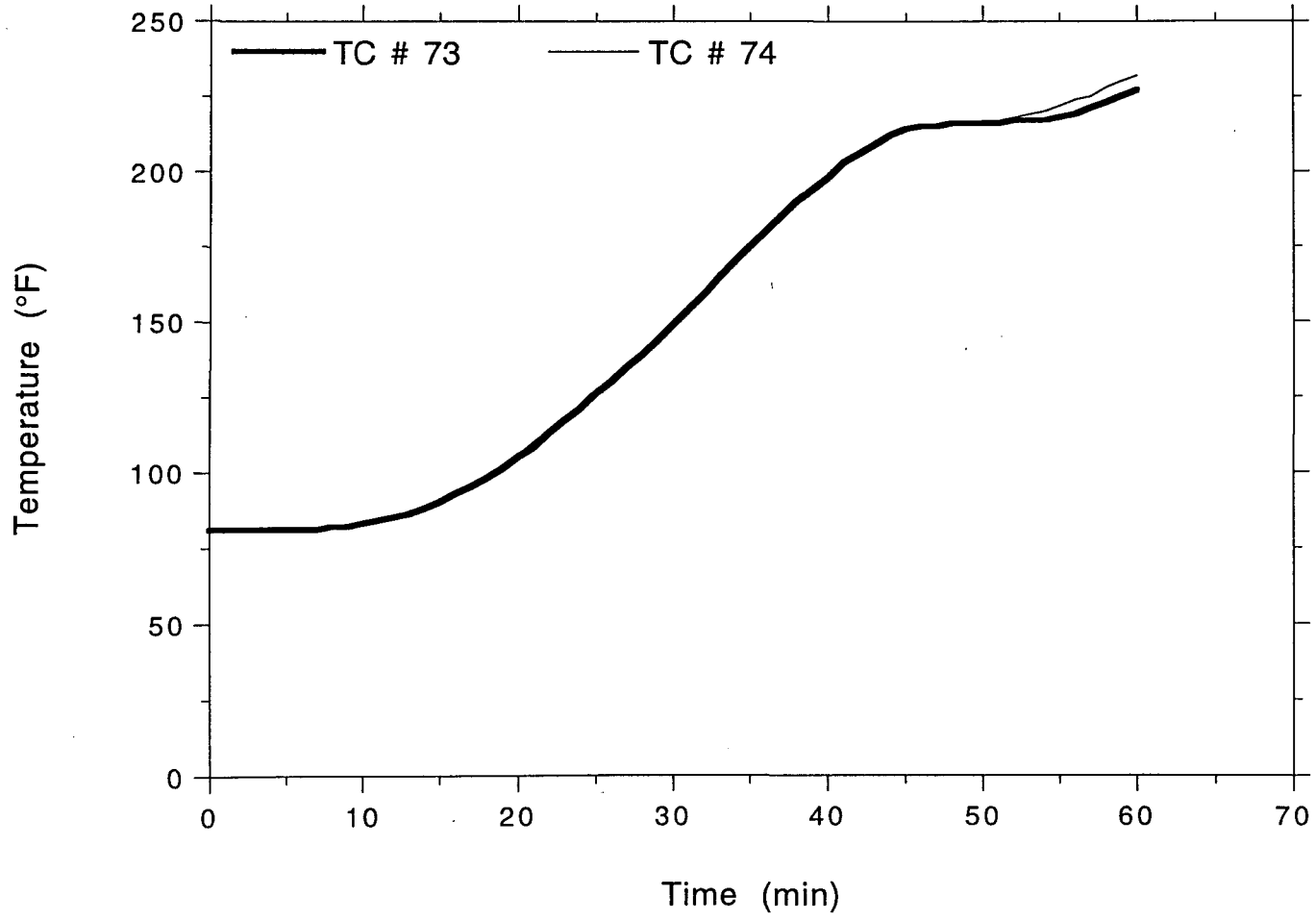

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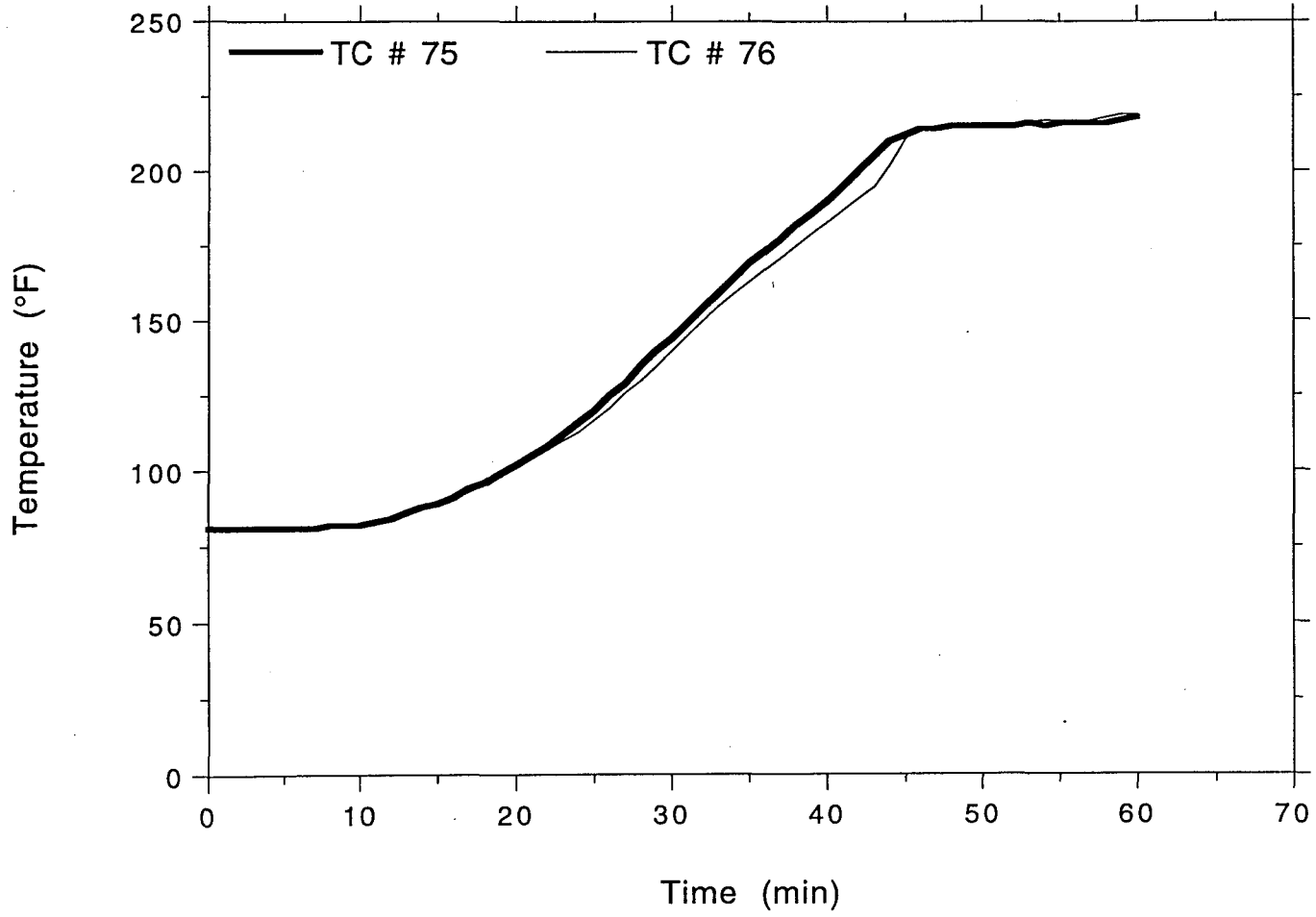
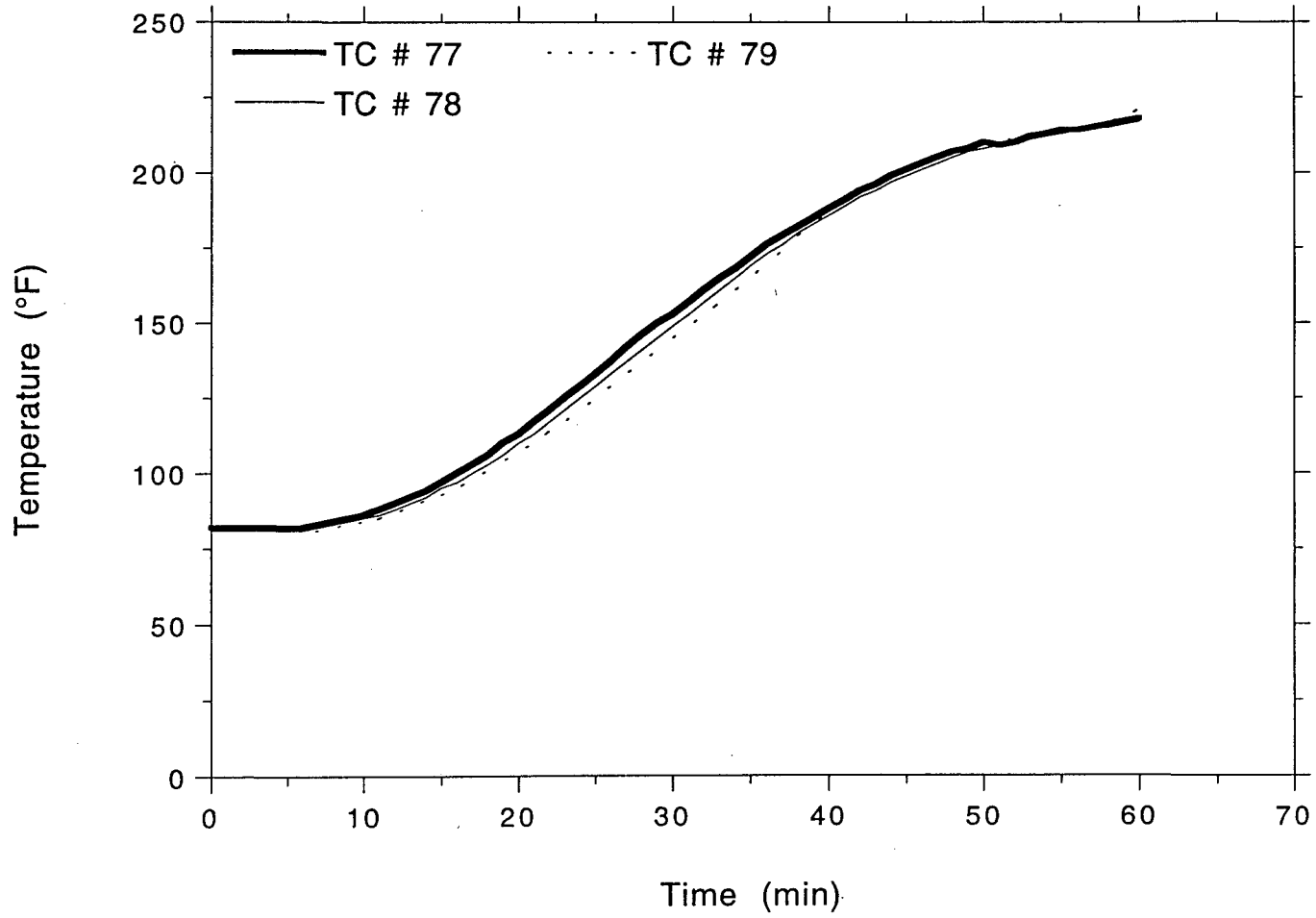
Rear Right 1" Steel Conduit



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 3" Steel Conduit



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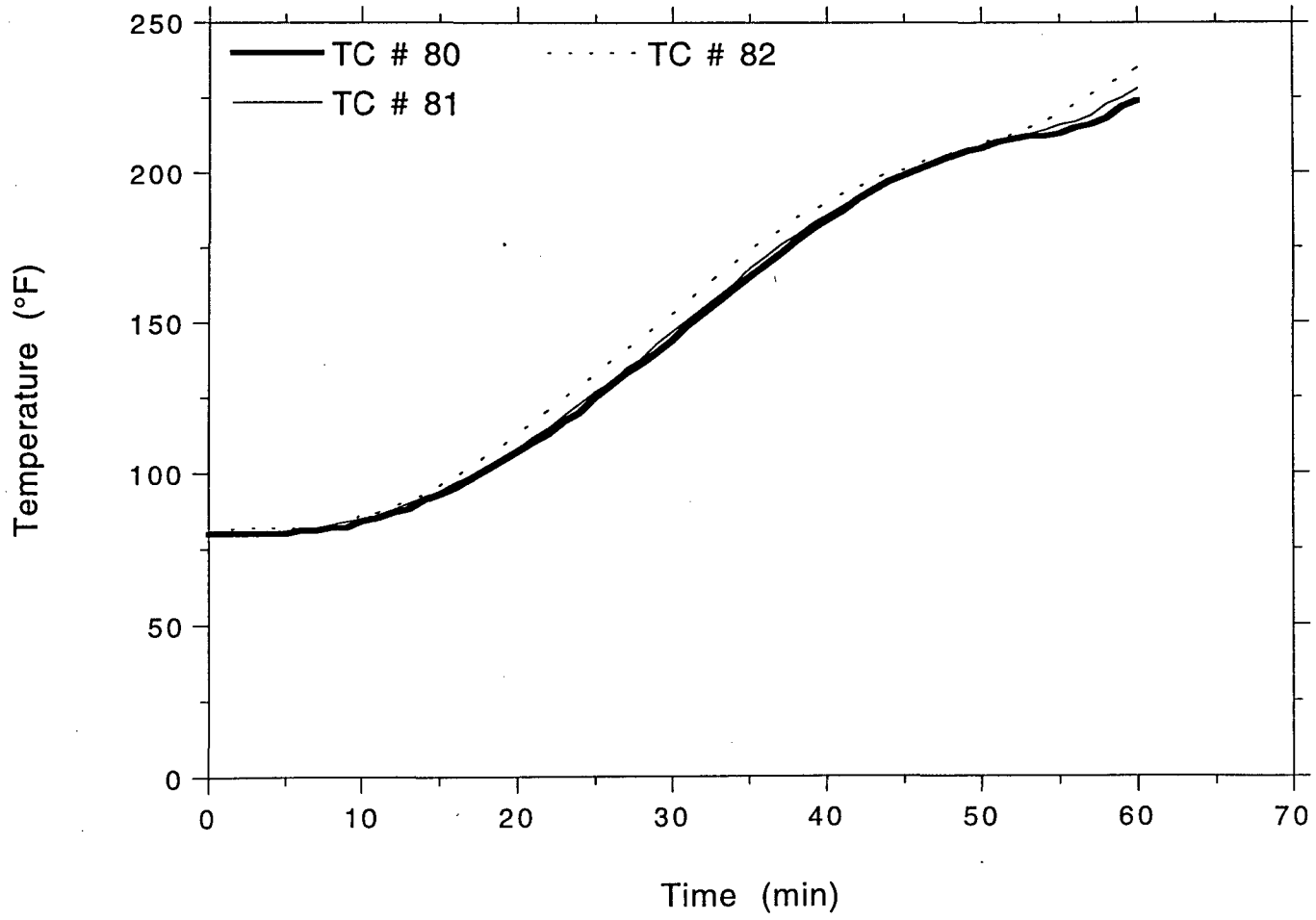

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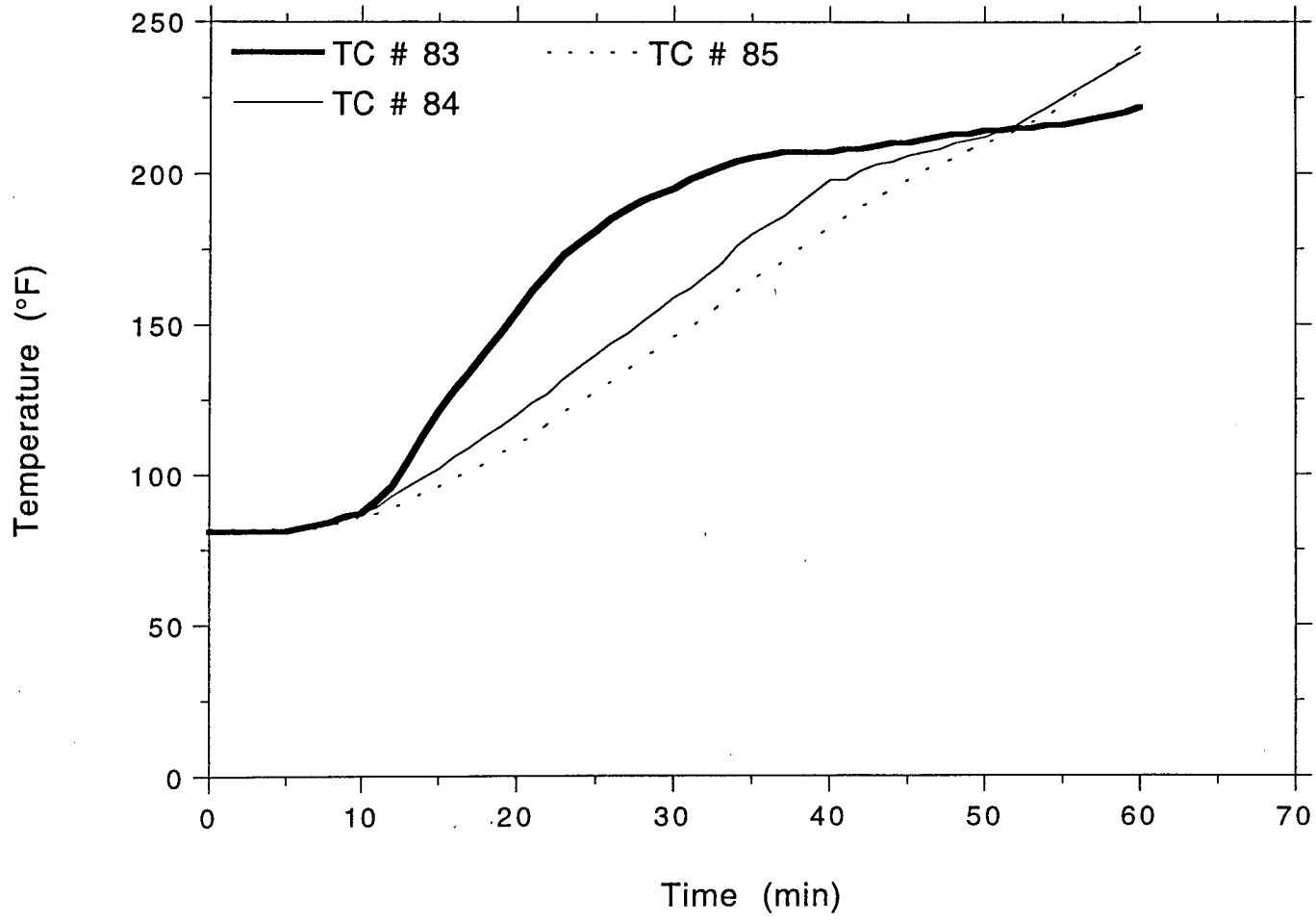

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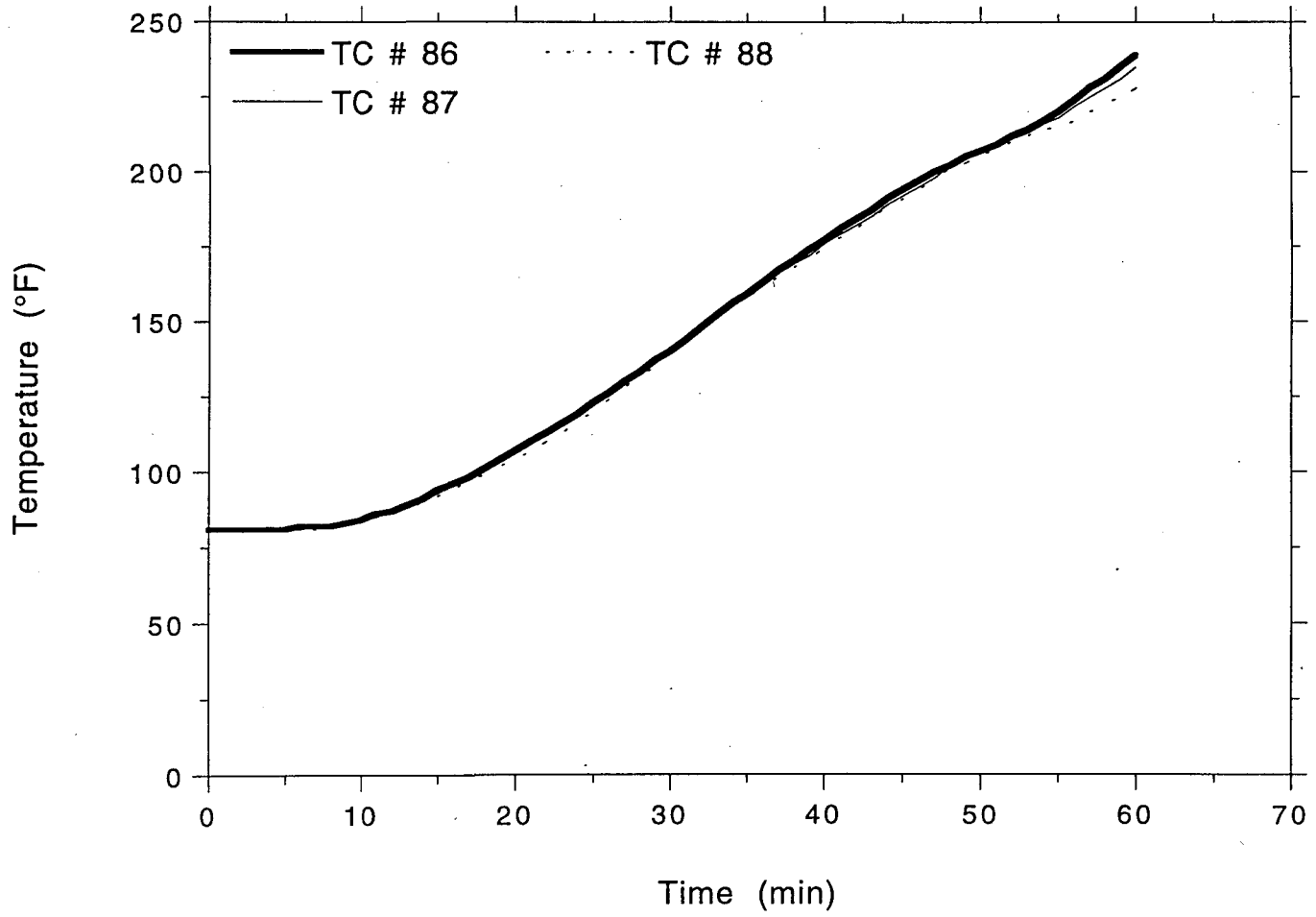

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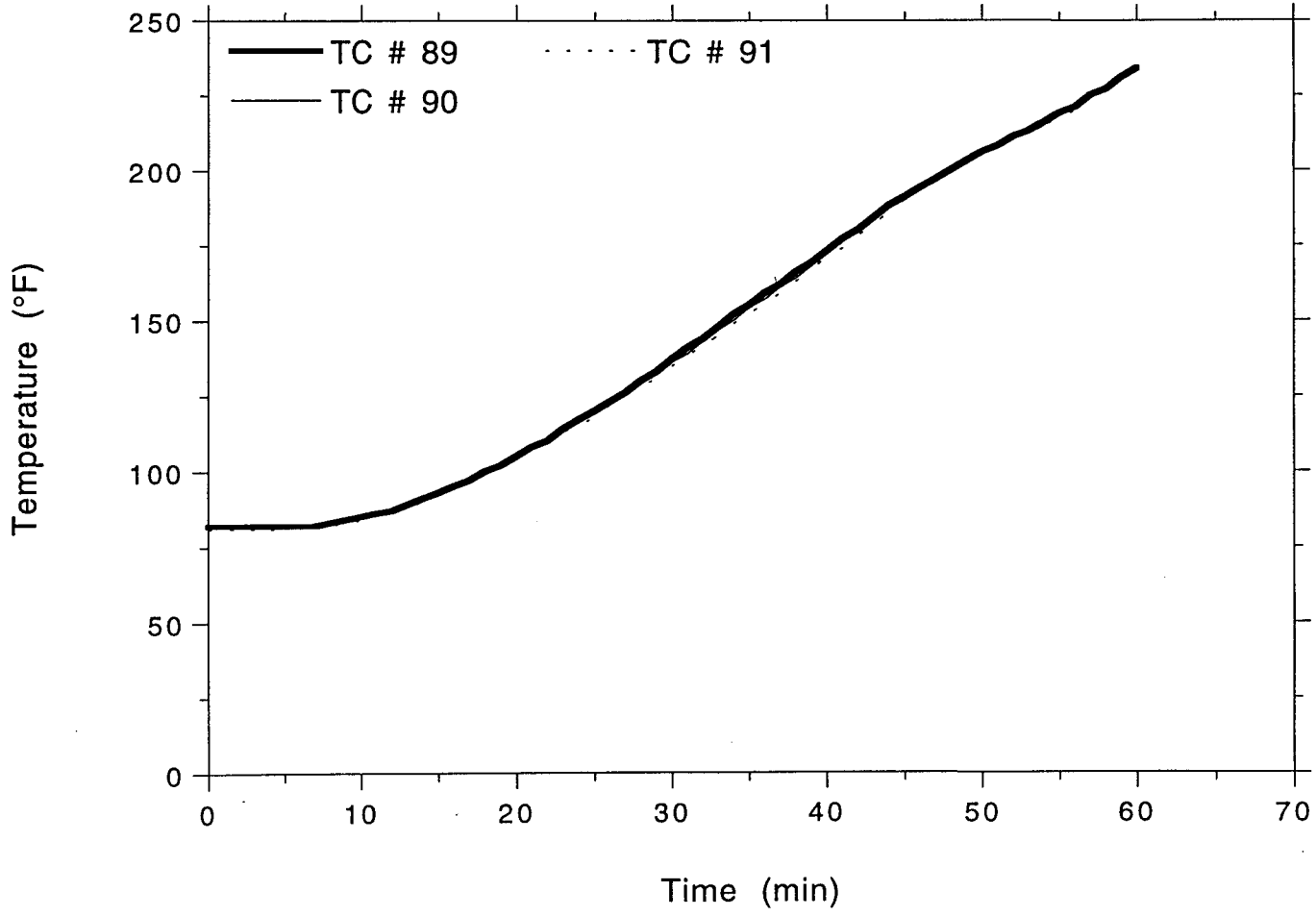

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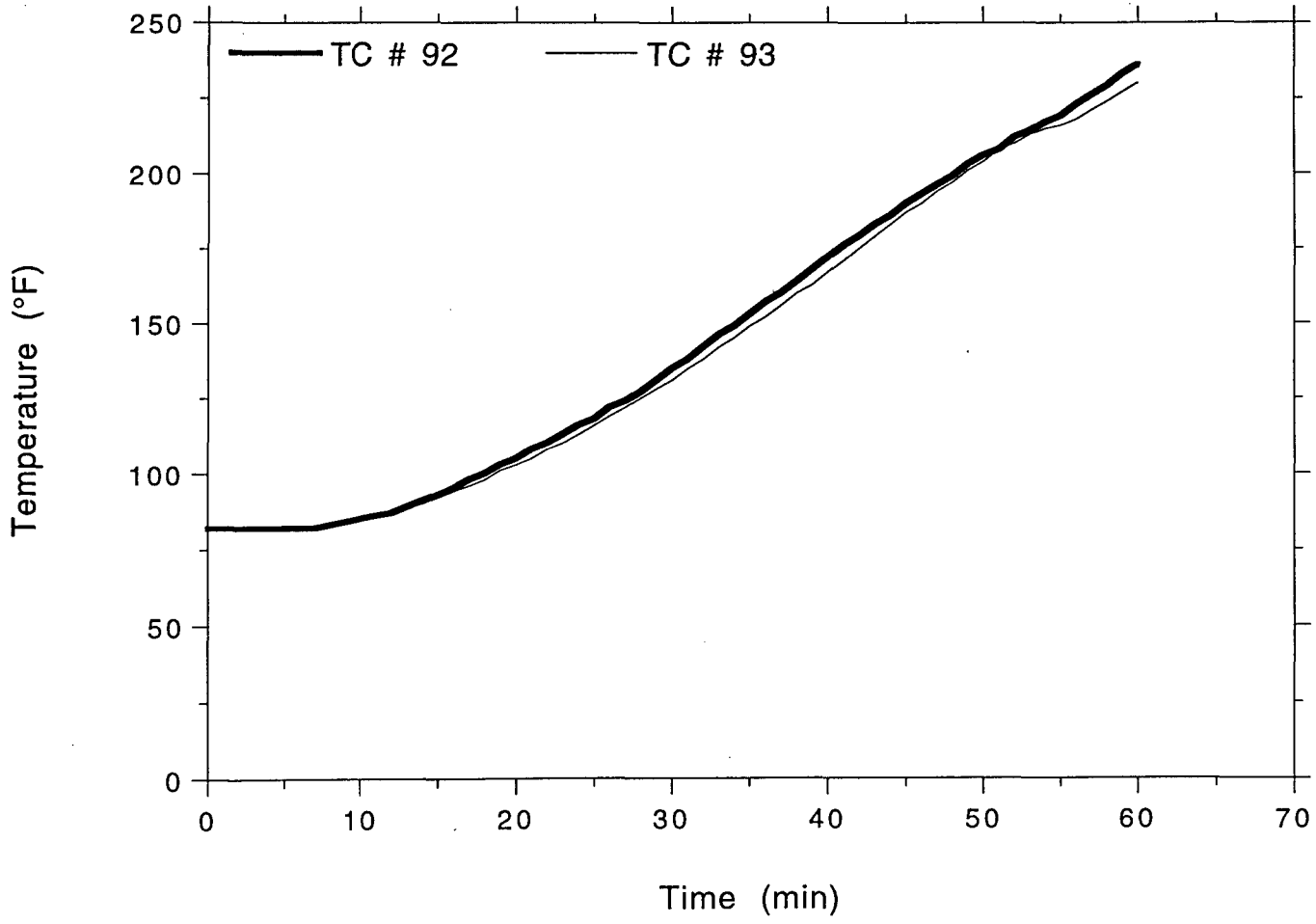

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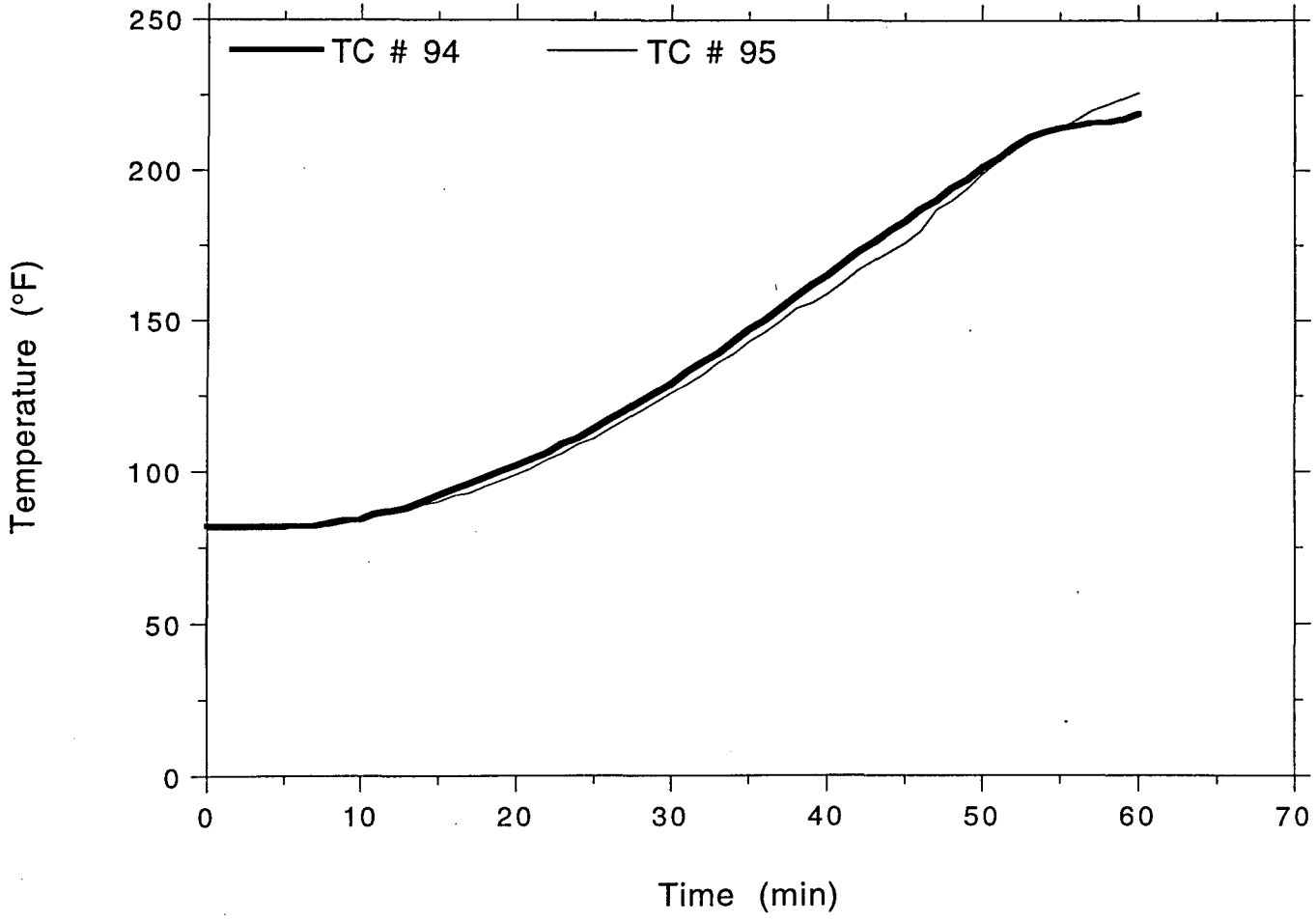

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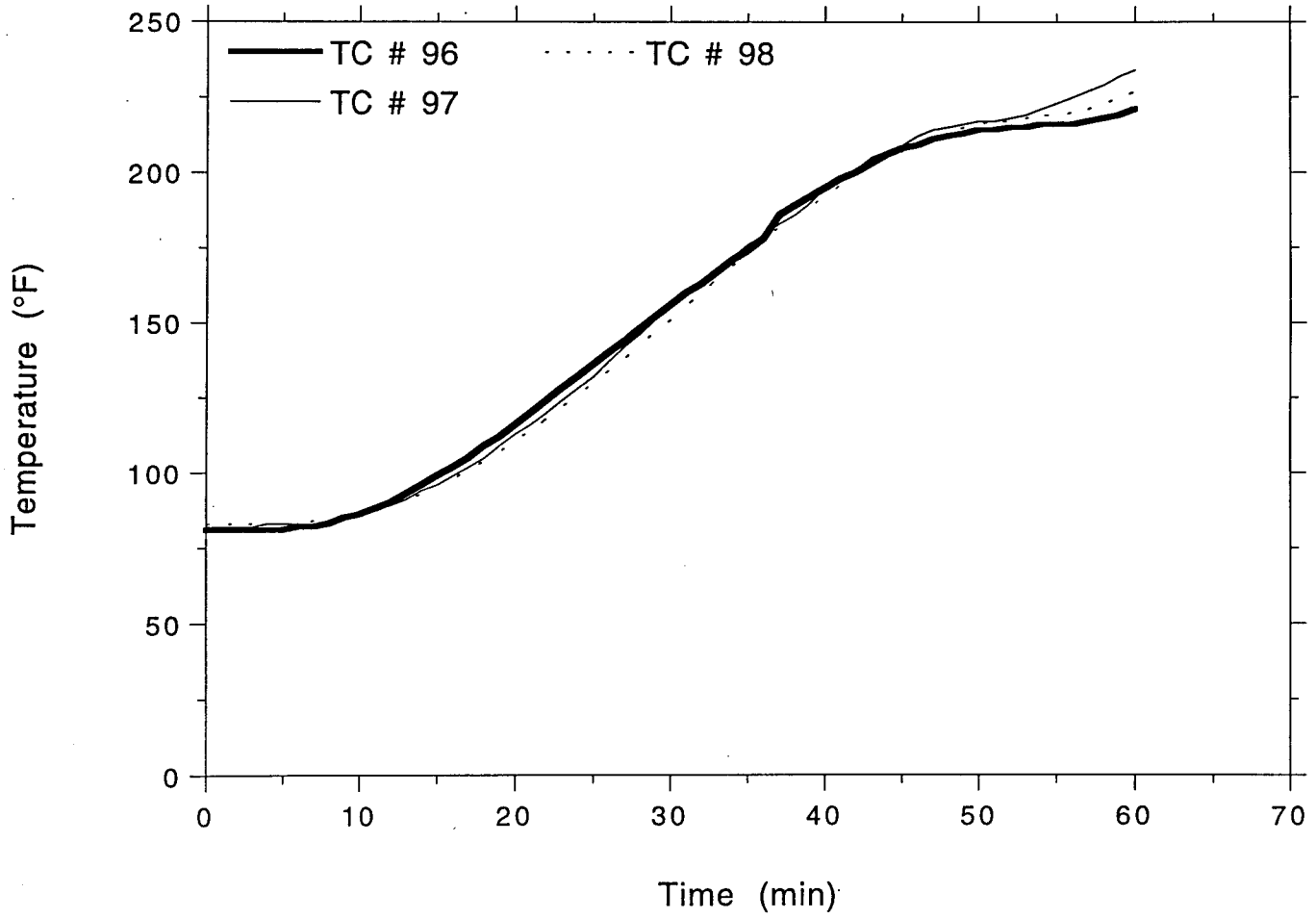

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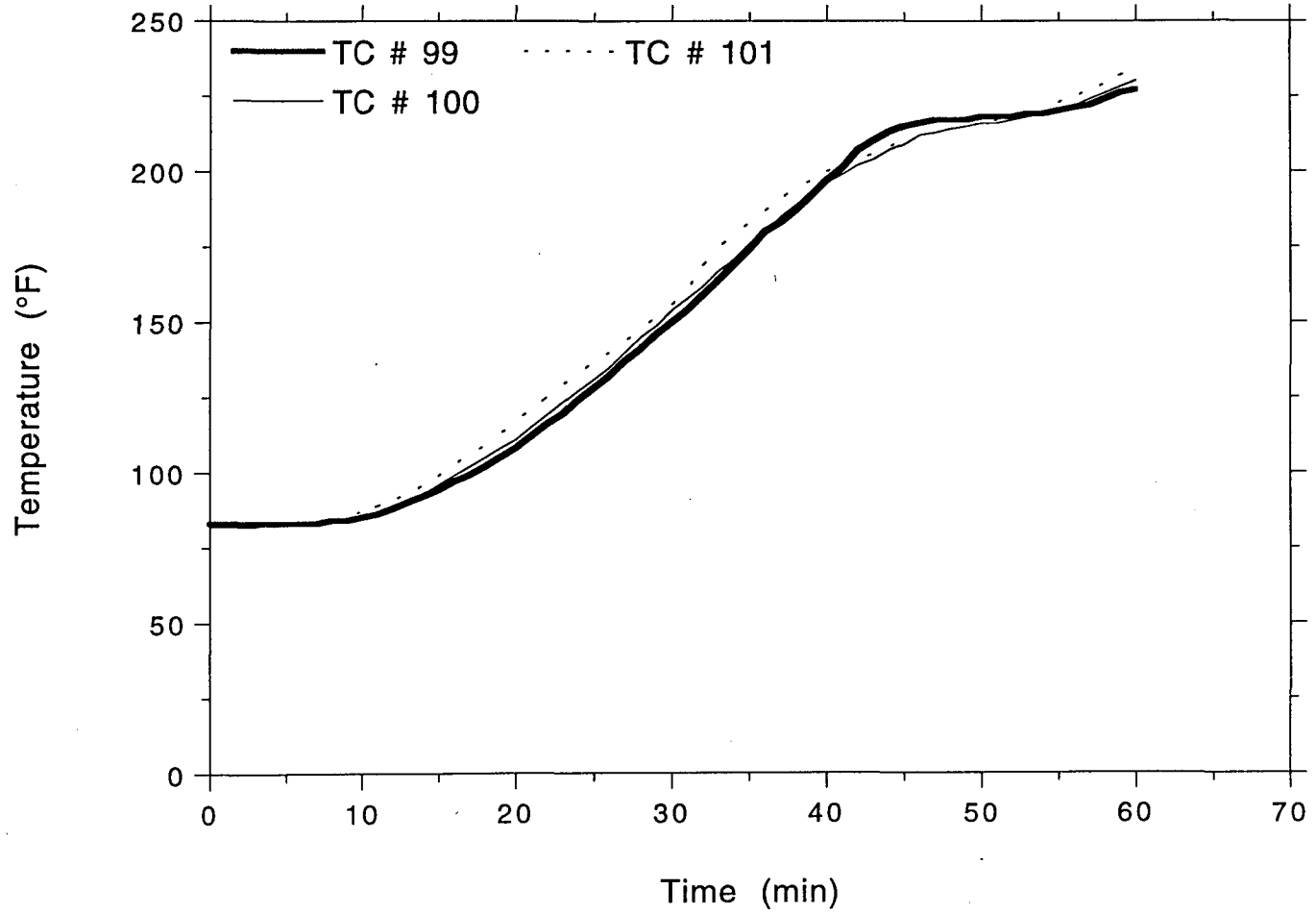

OMEGA POINT LABORATORIES

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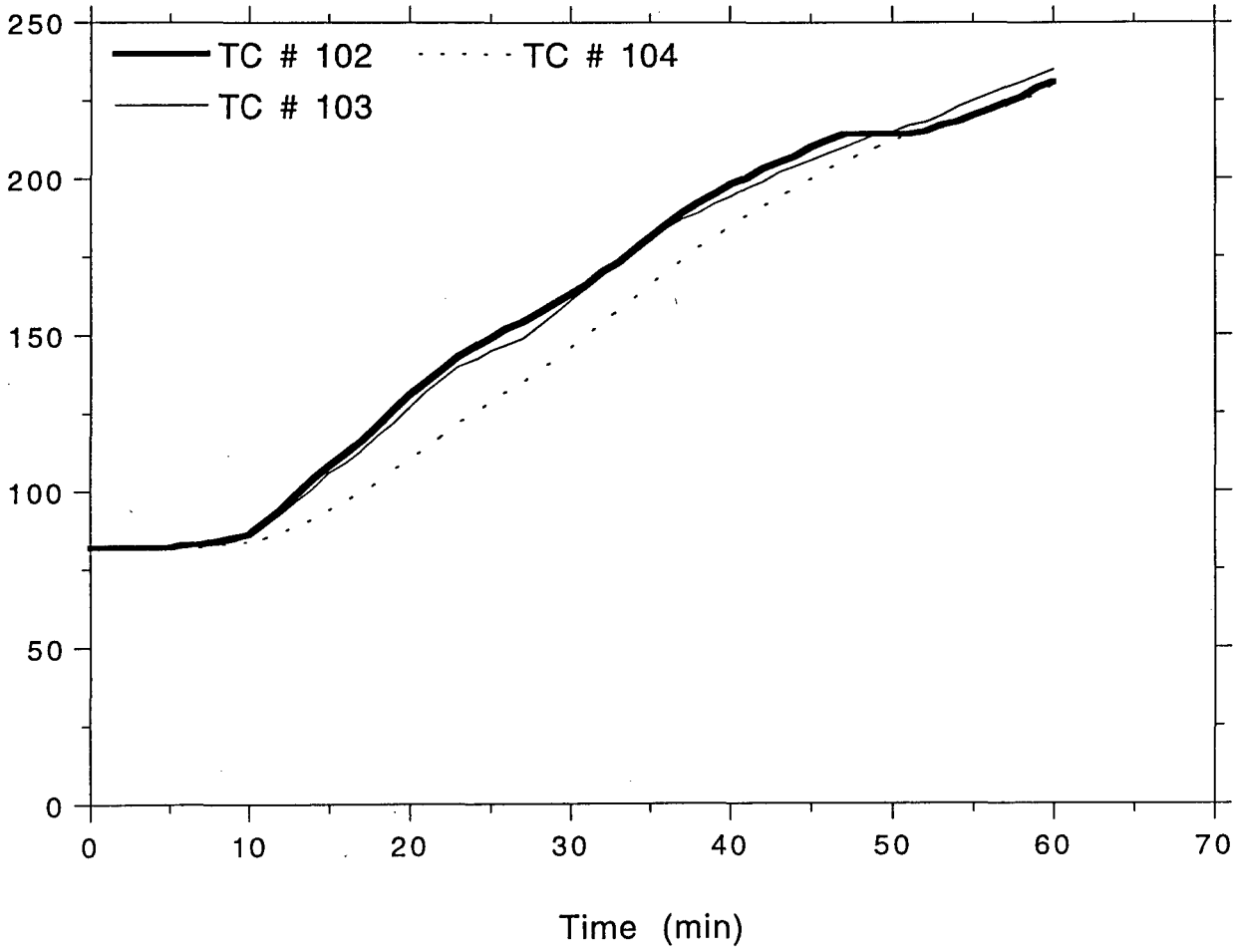
TSI/TVA
Project No. 11960-97259
Front Right 3" Steel Conduit



OMEGA POINT LABORATORIES

TSI/TVA
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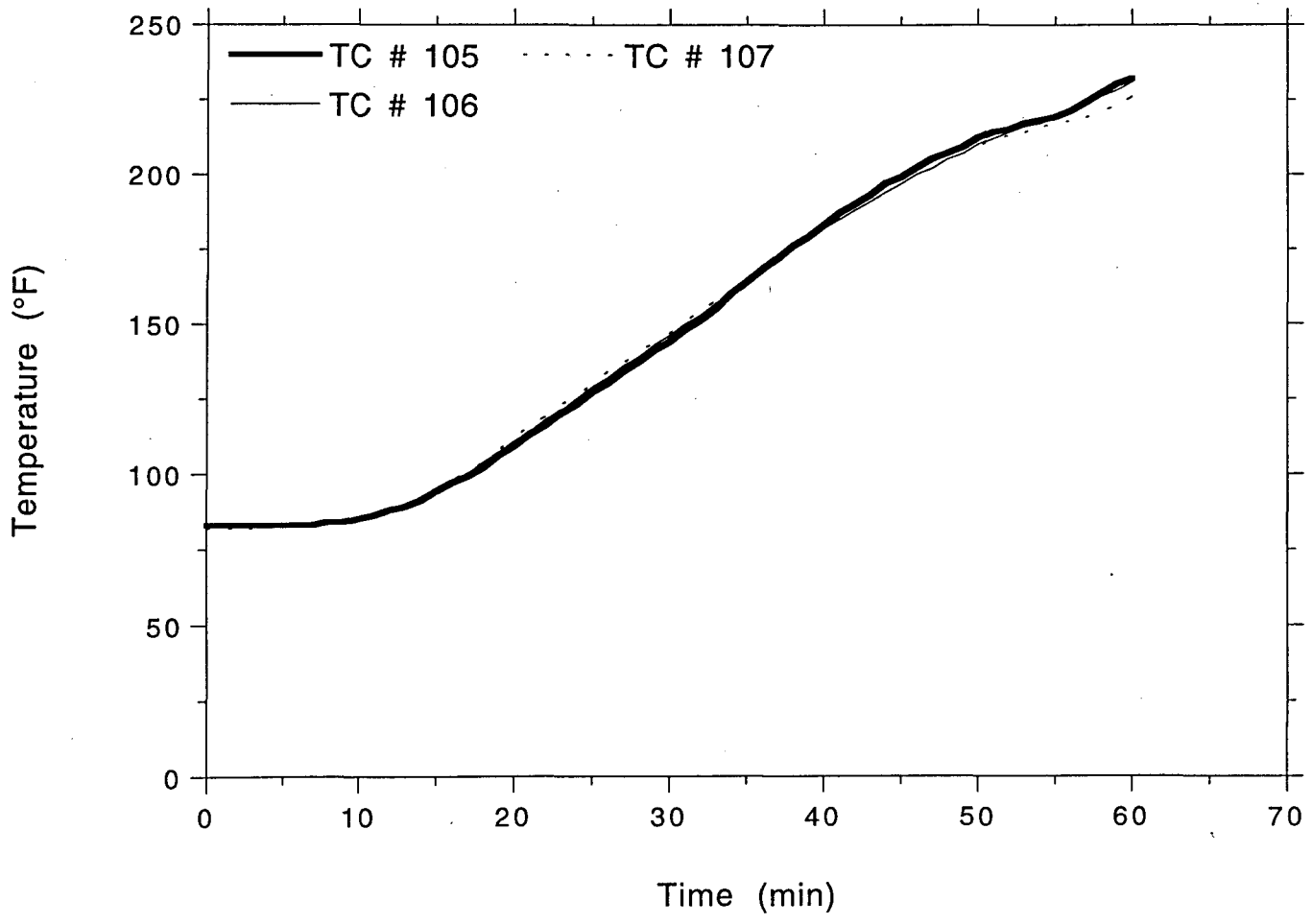
Front Right 3" Steel Conduit



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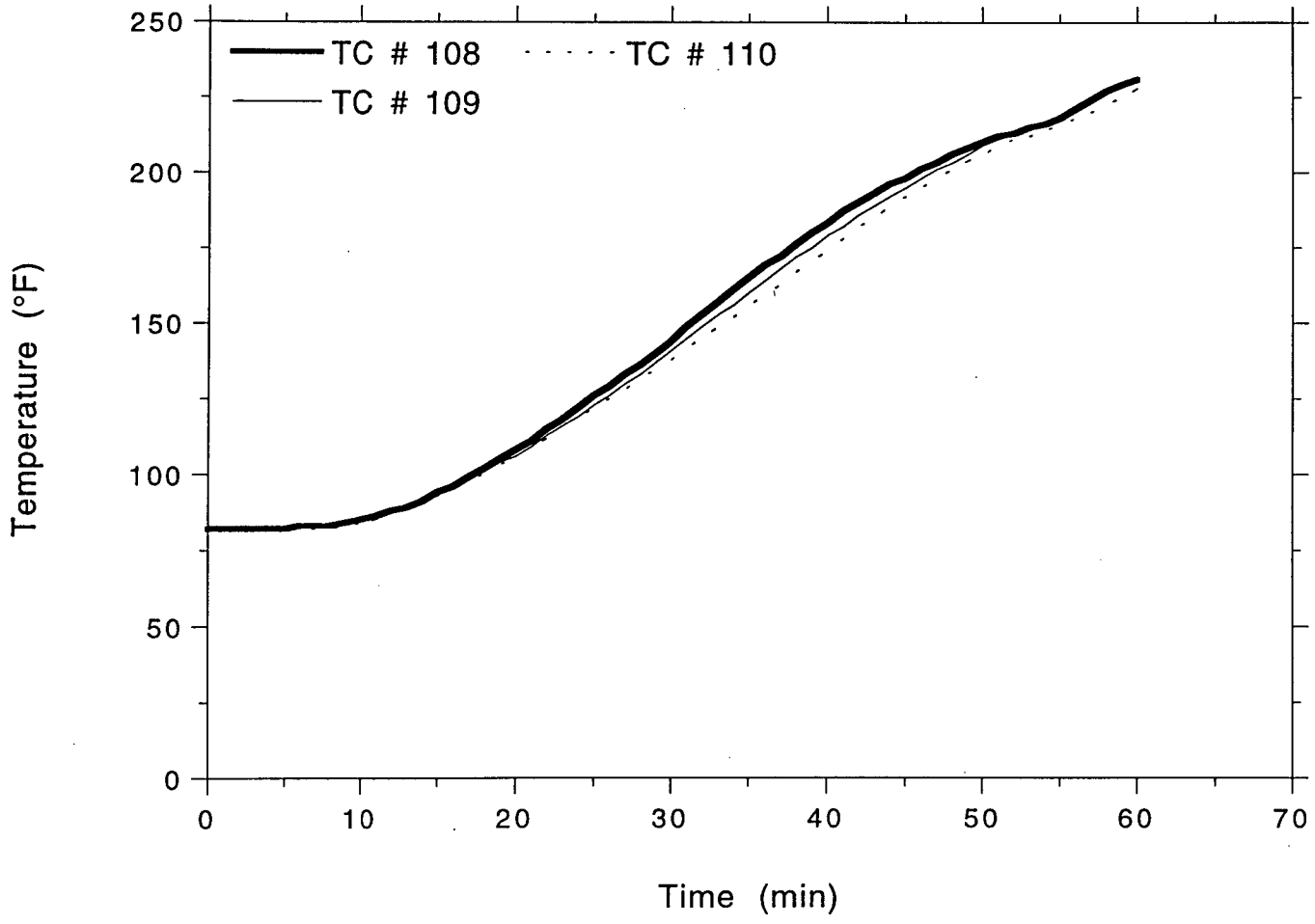

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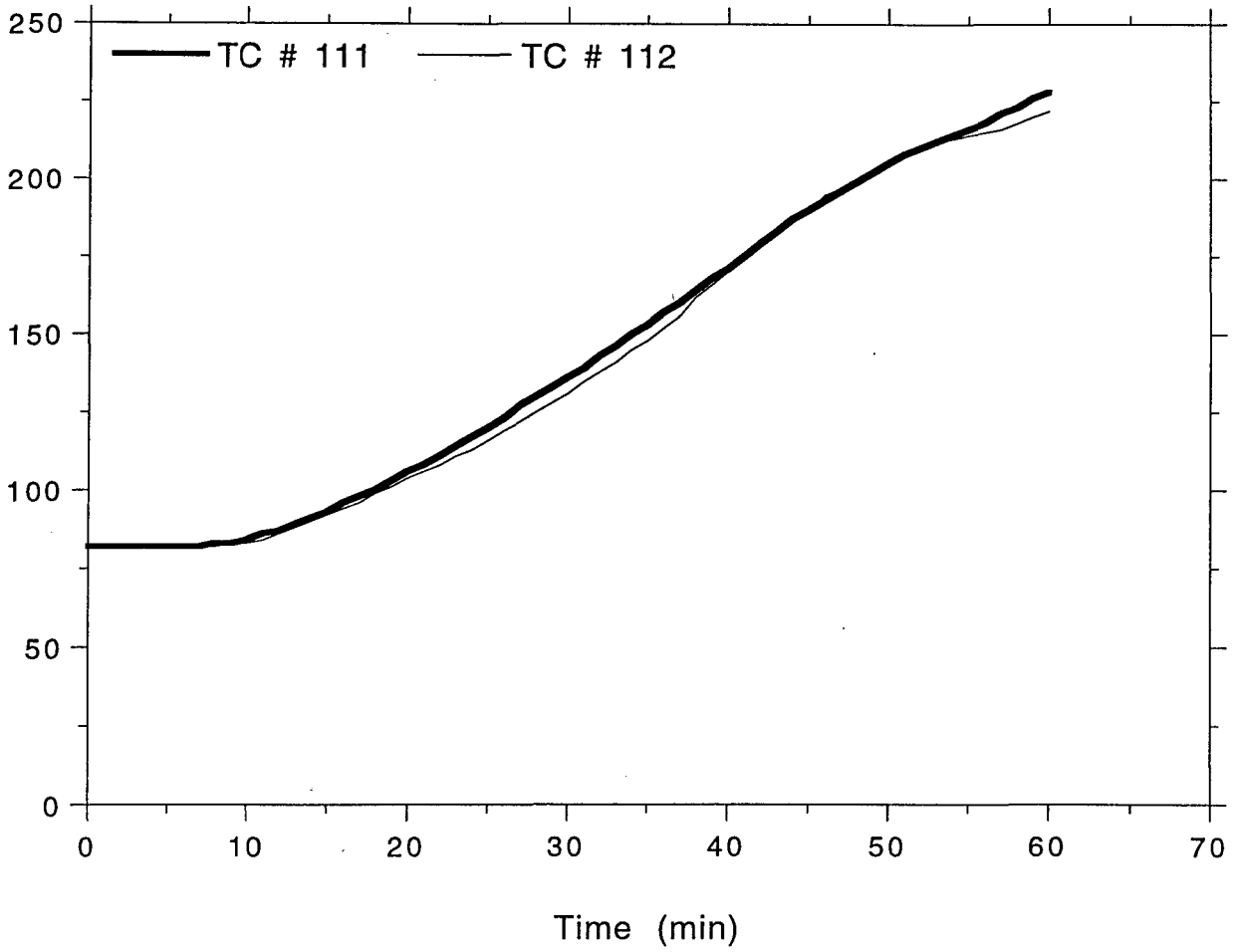

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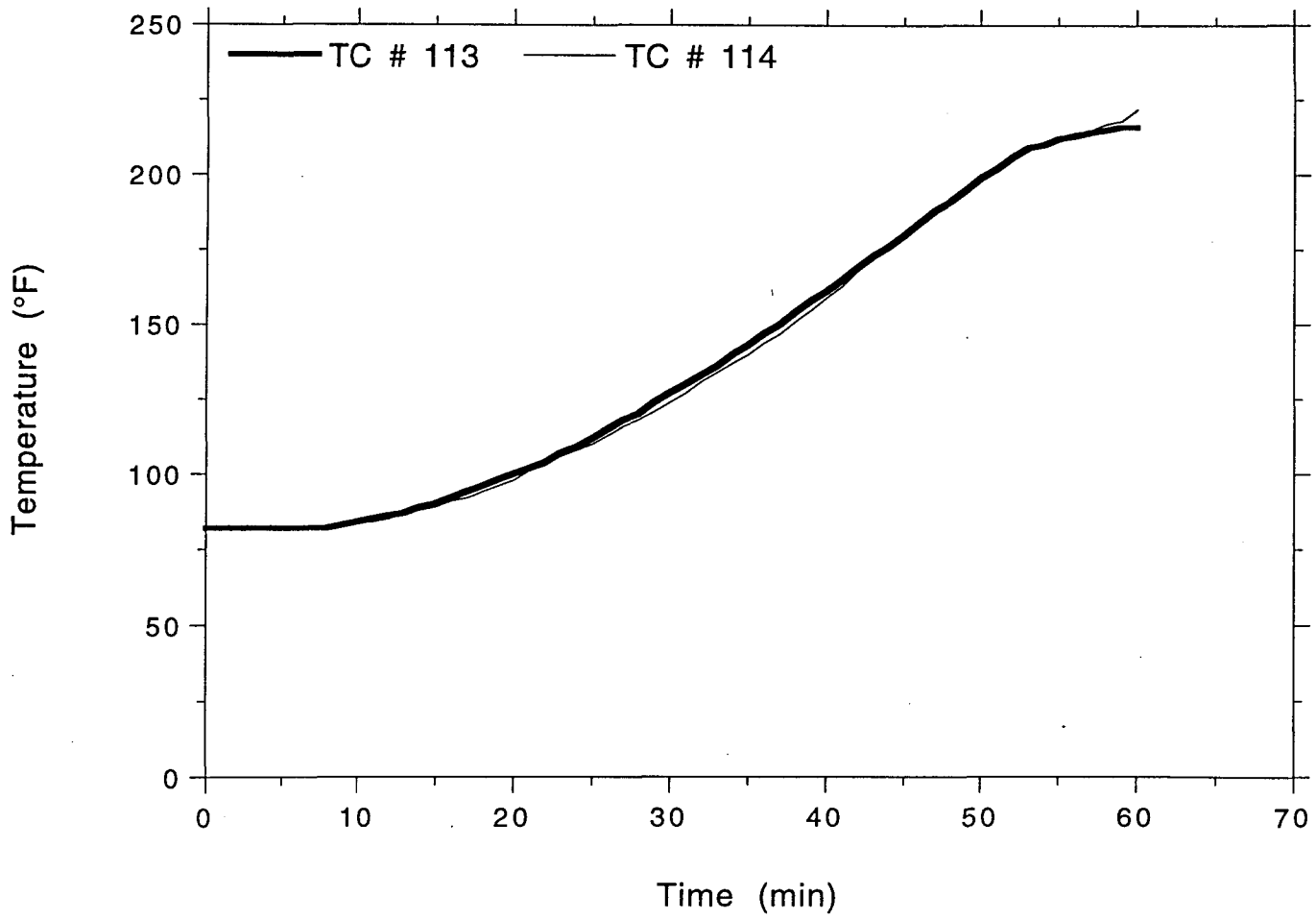

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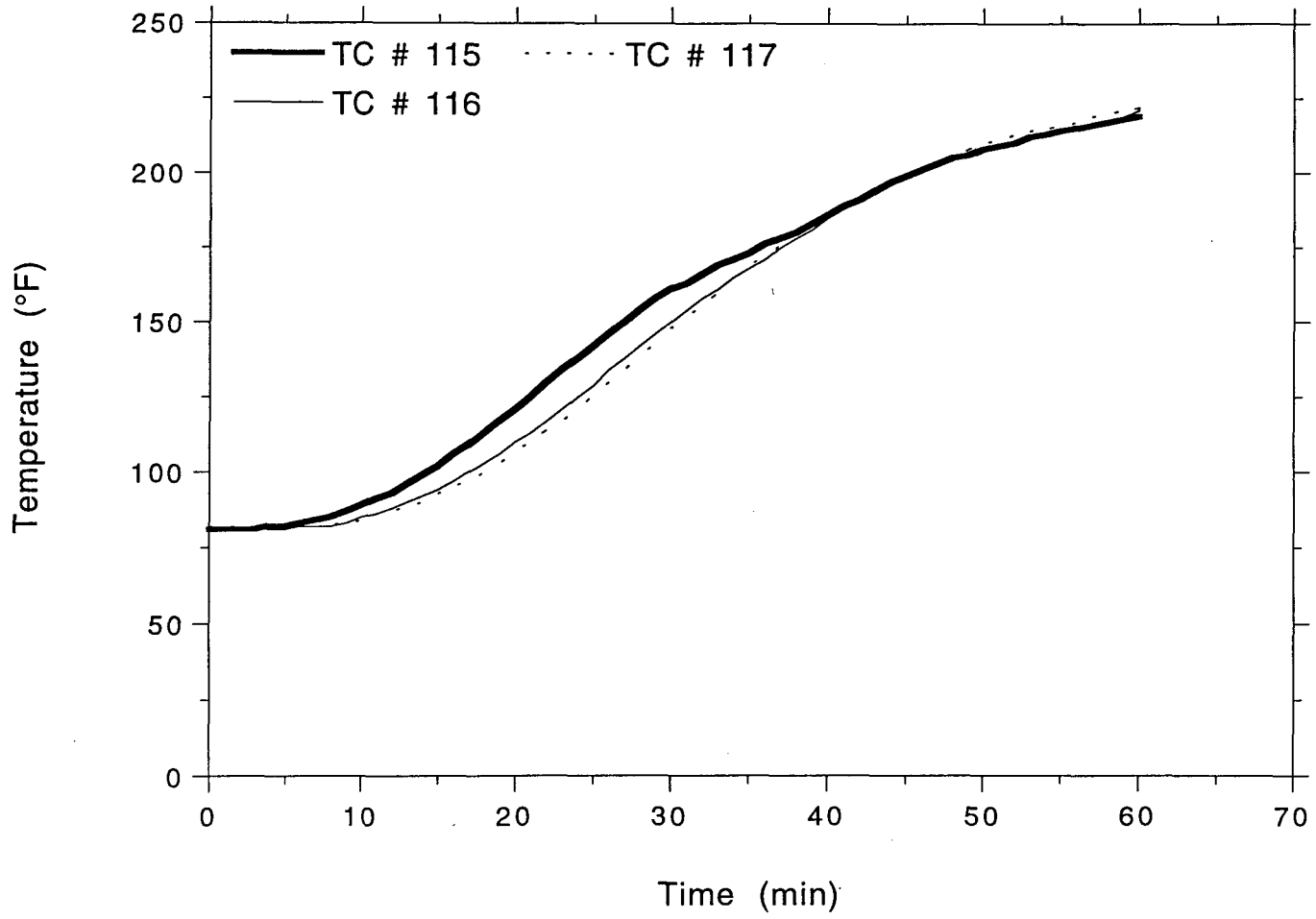

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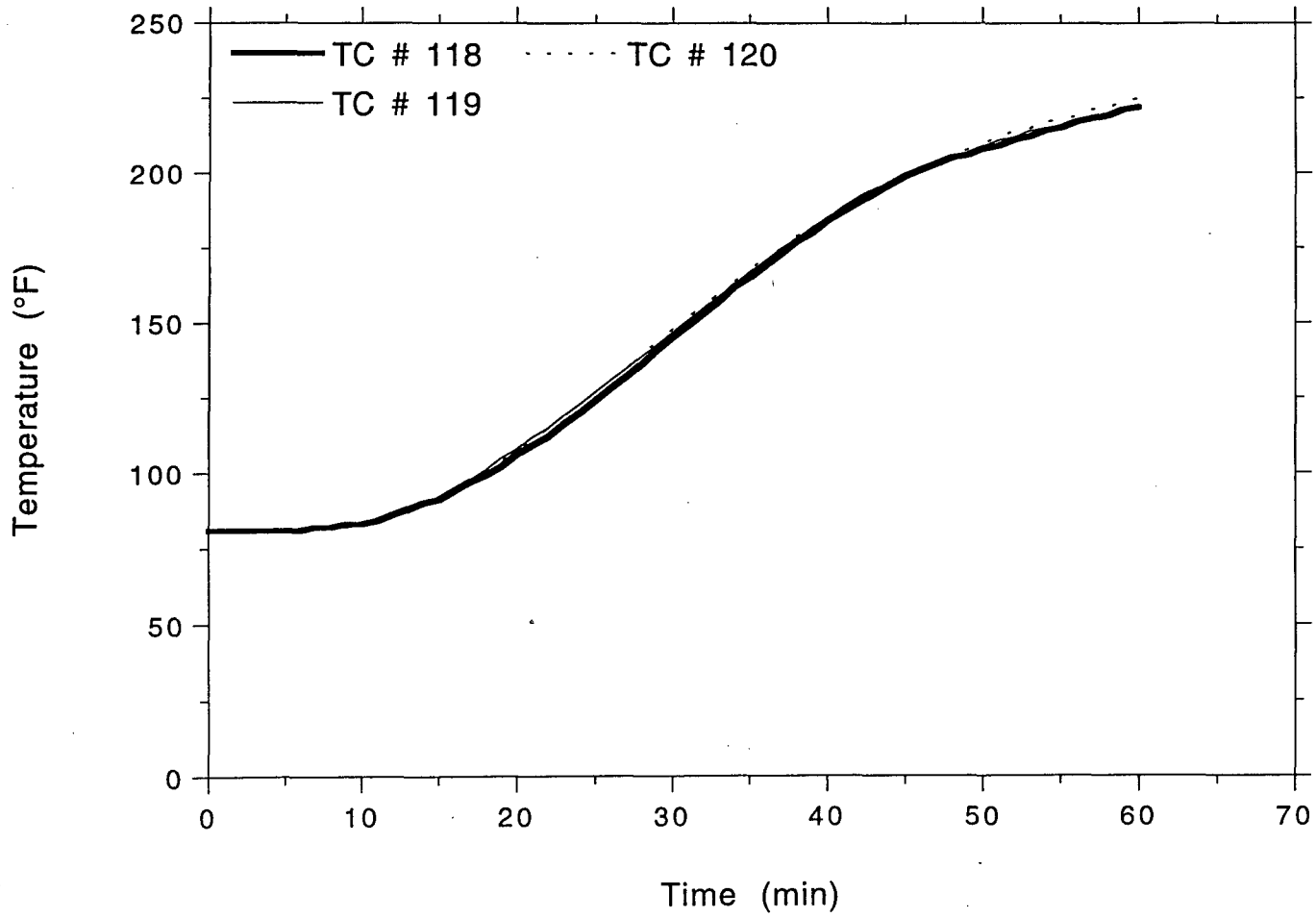

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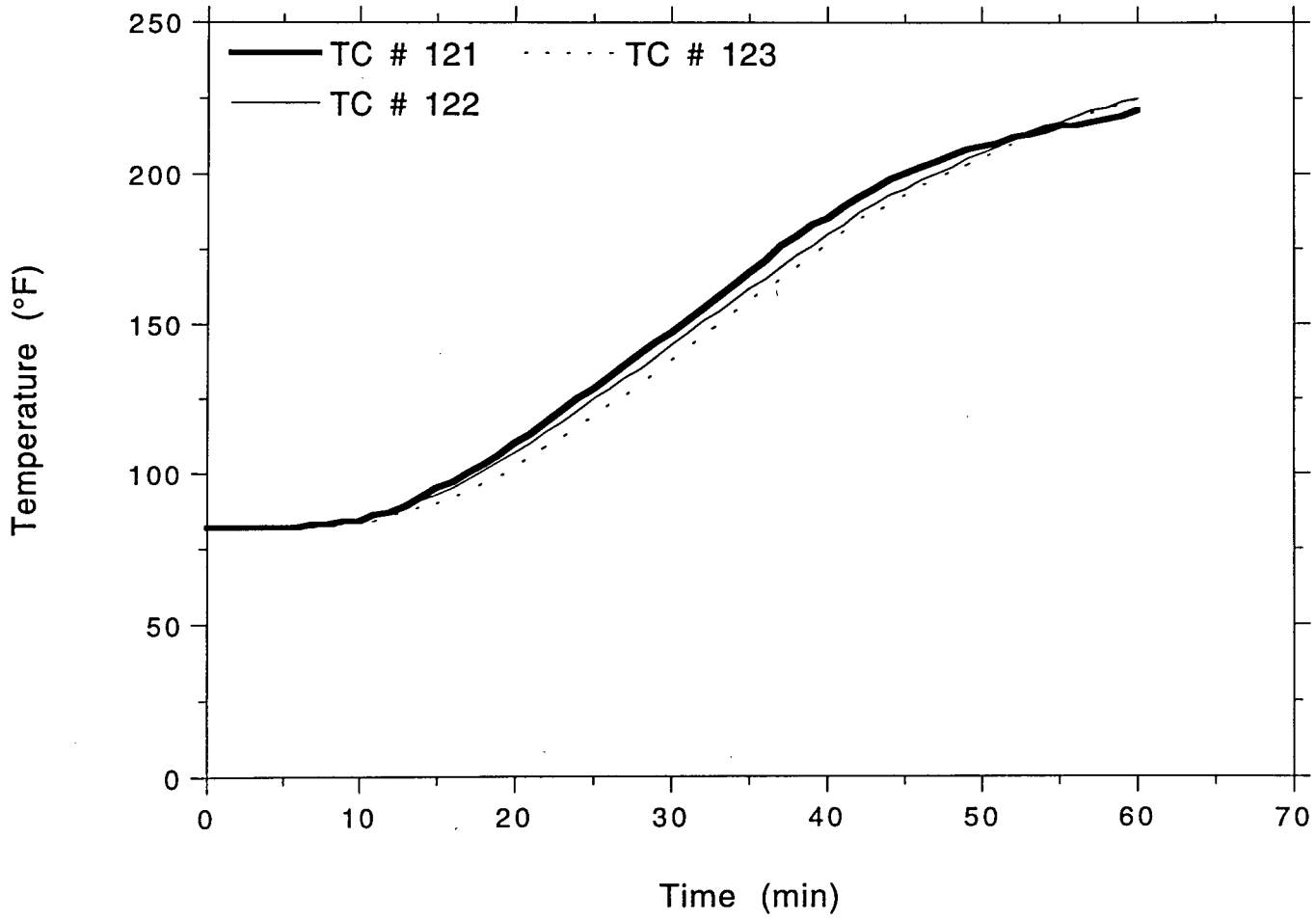

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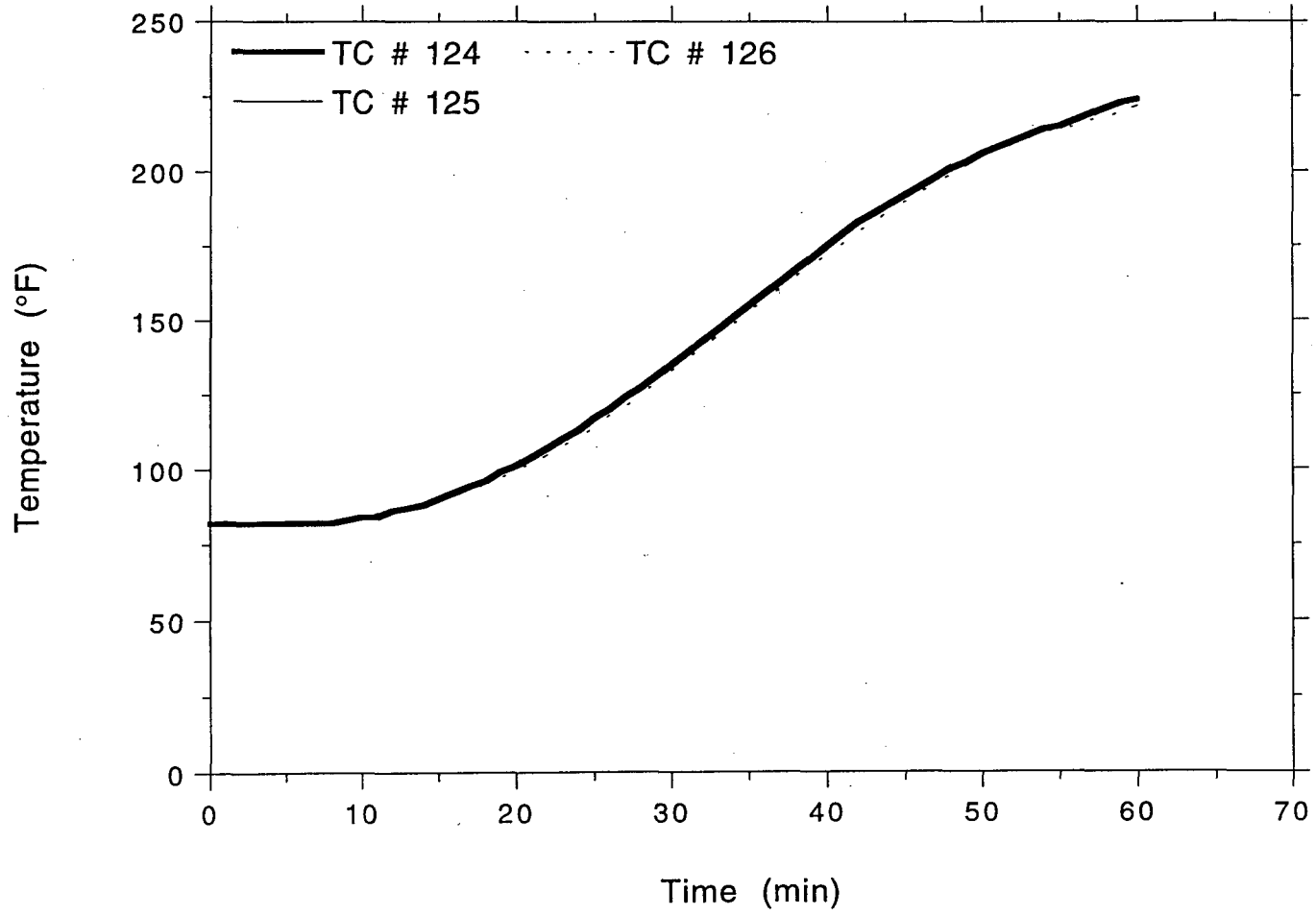

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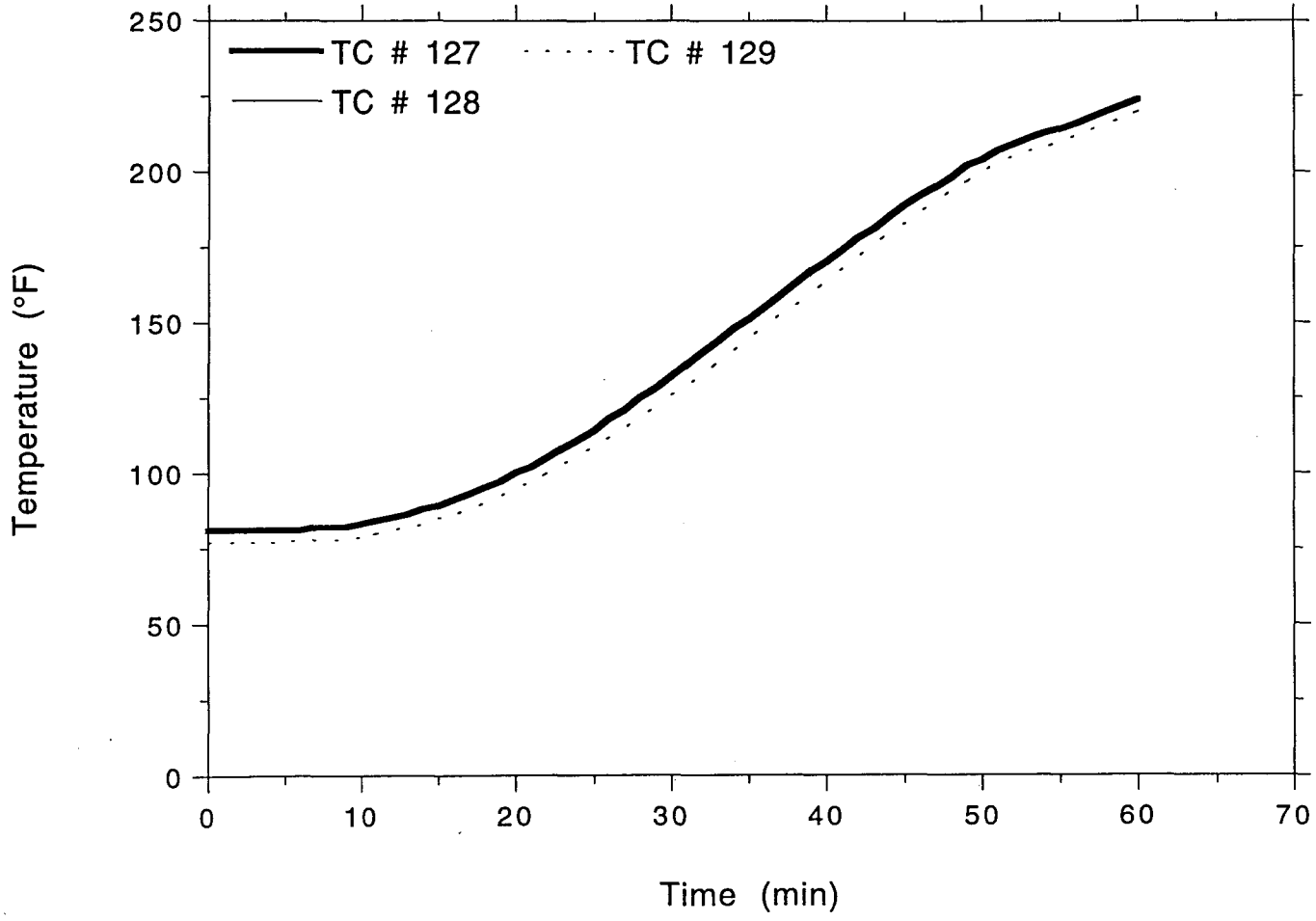

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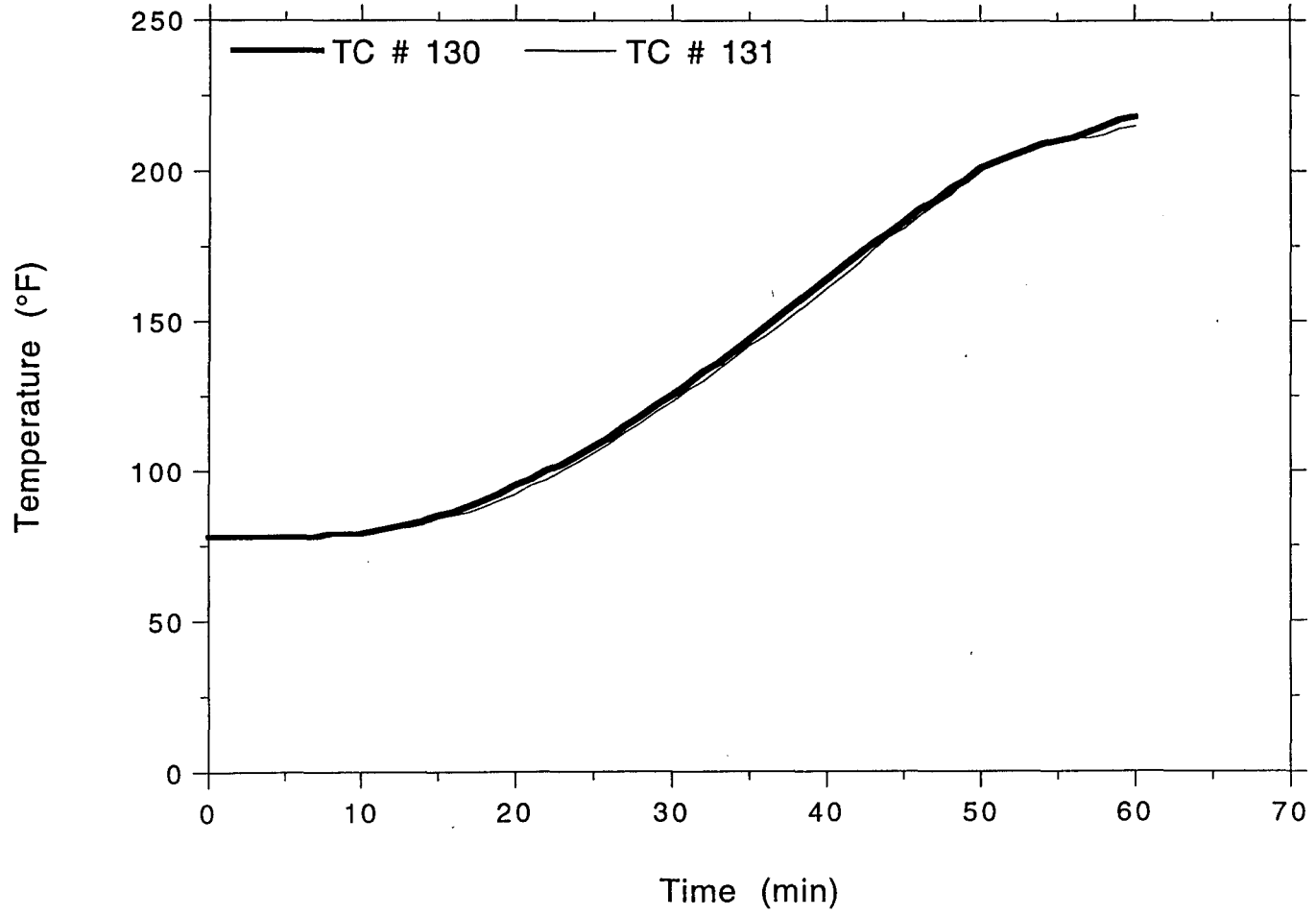

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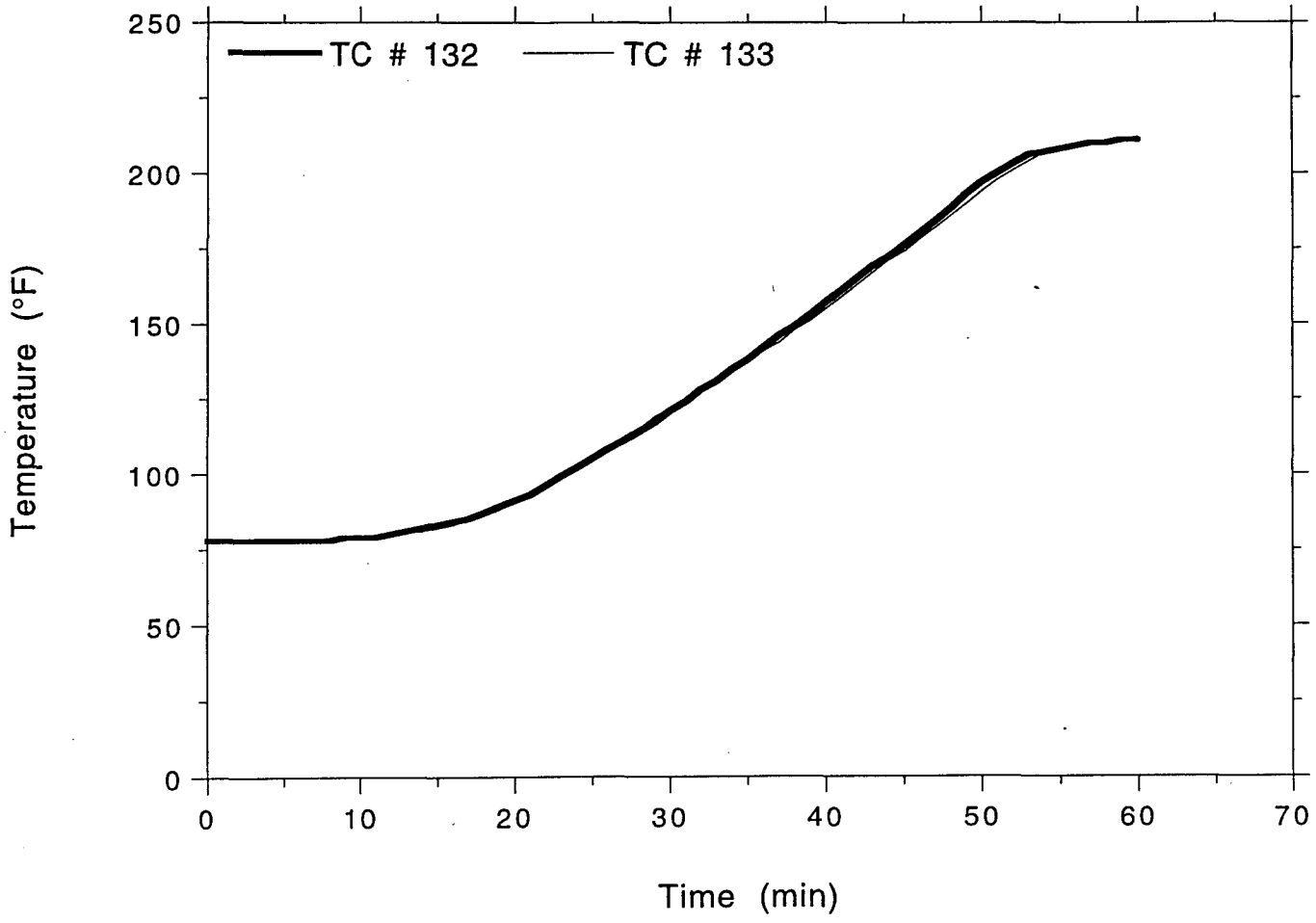

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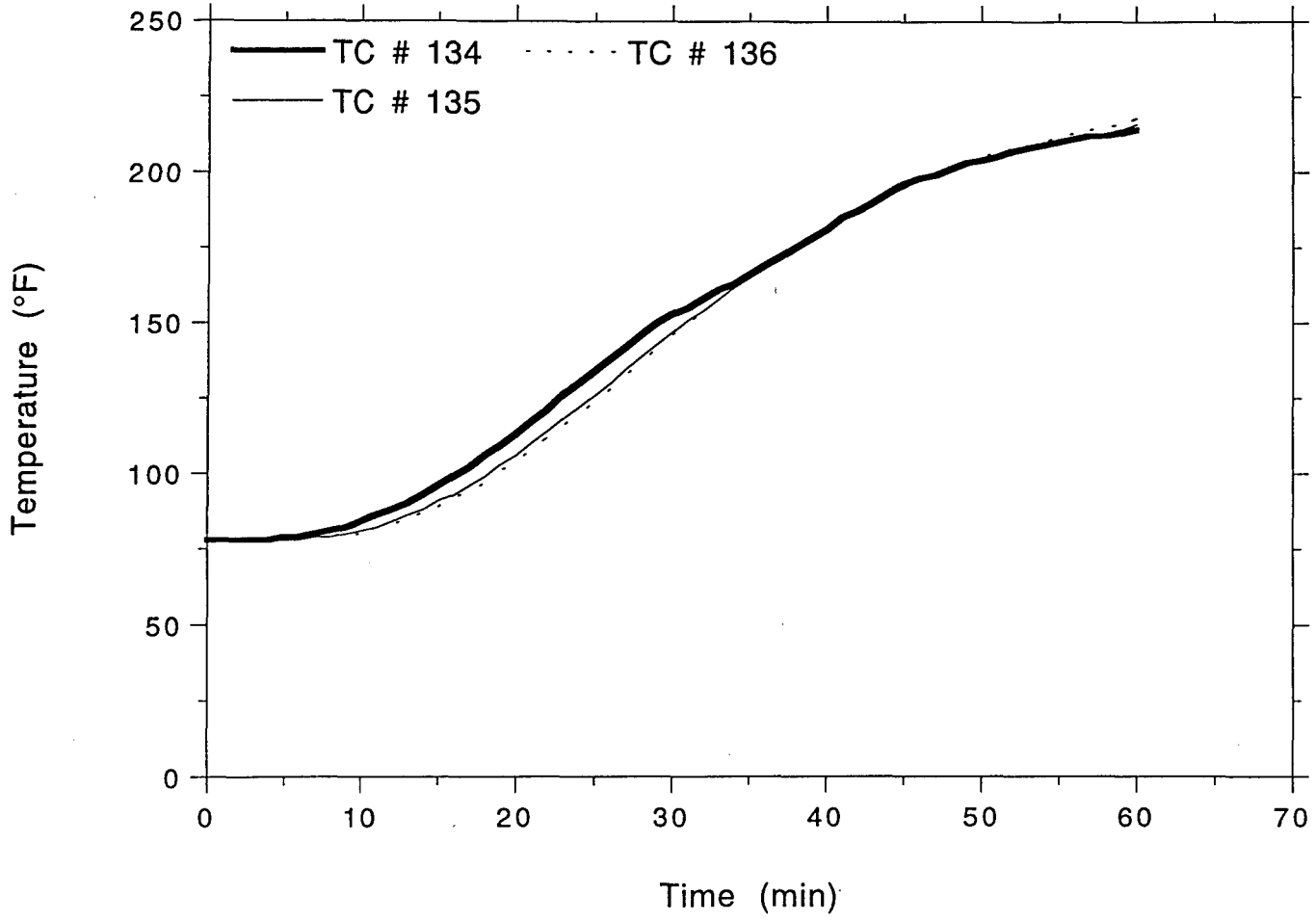

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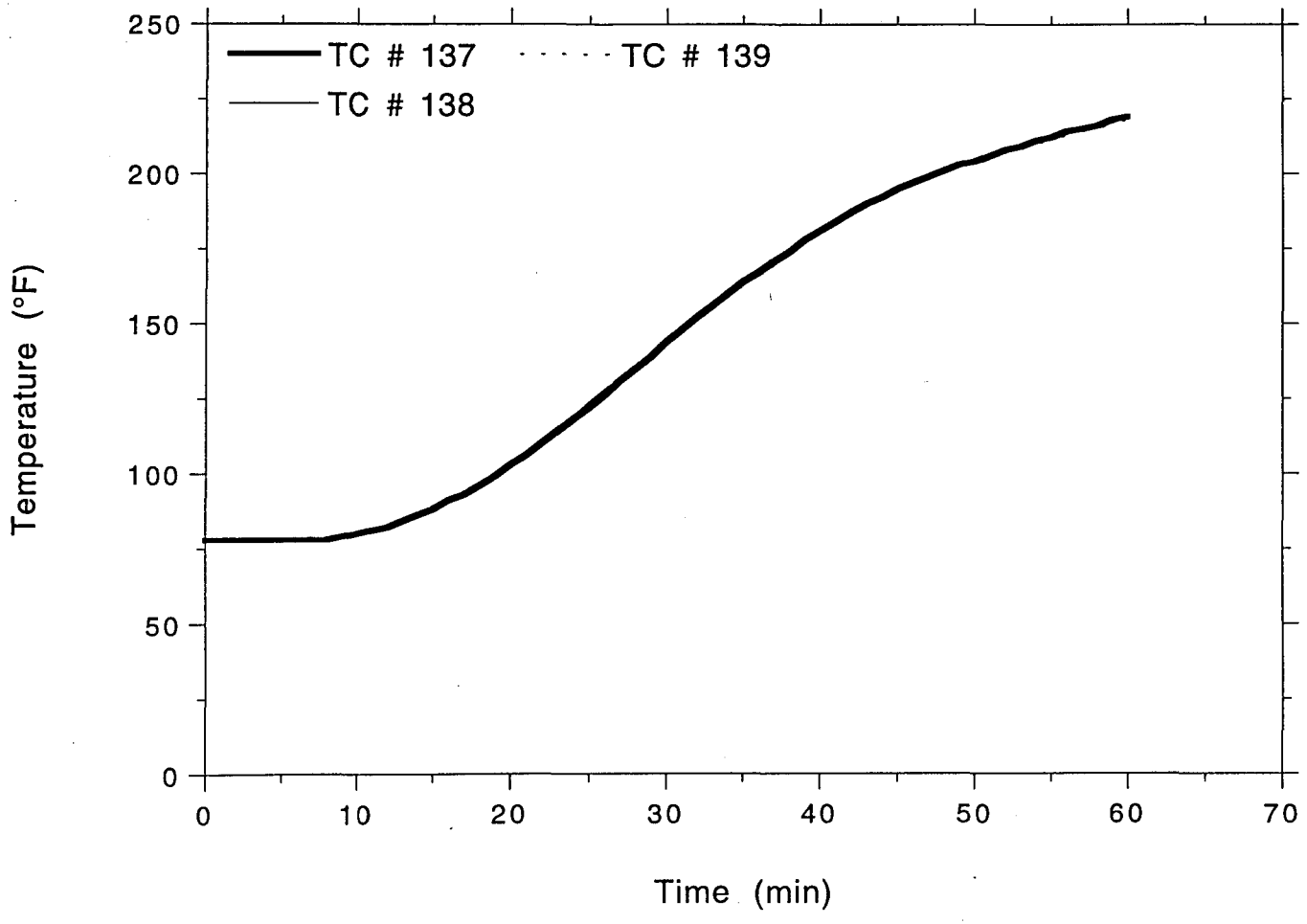

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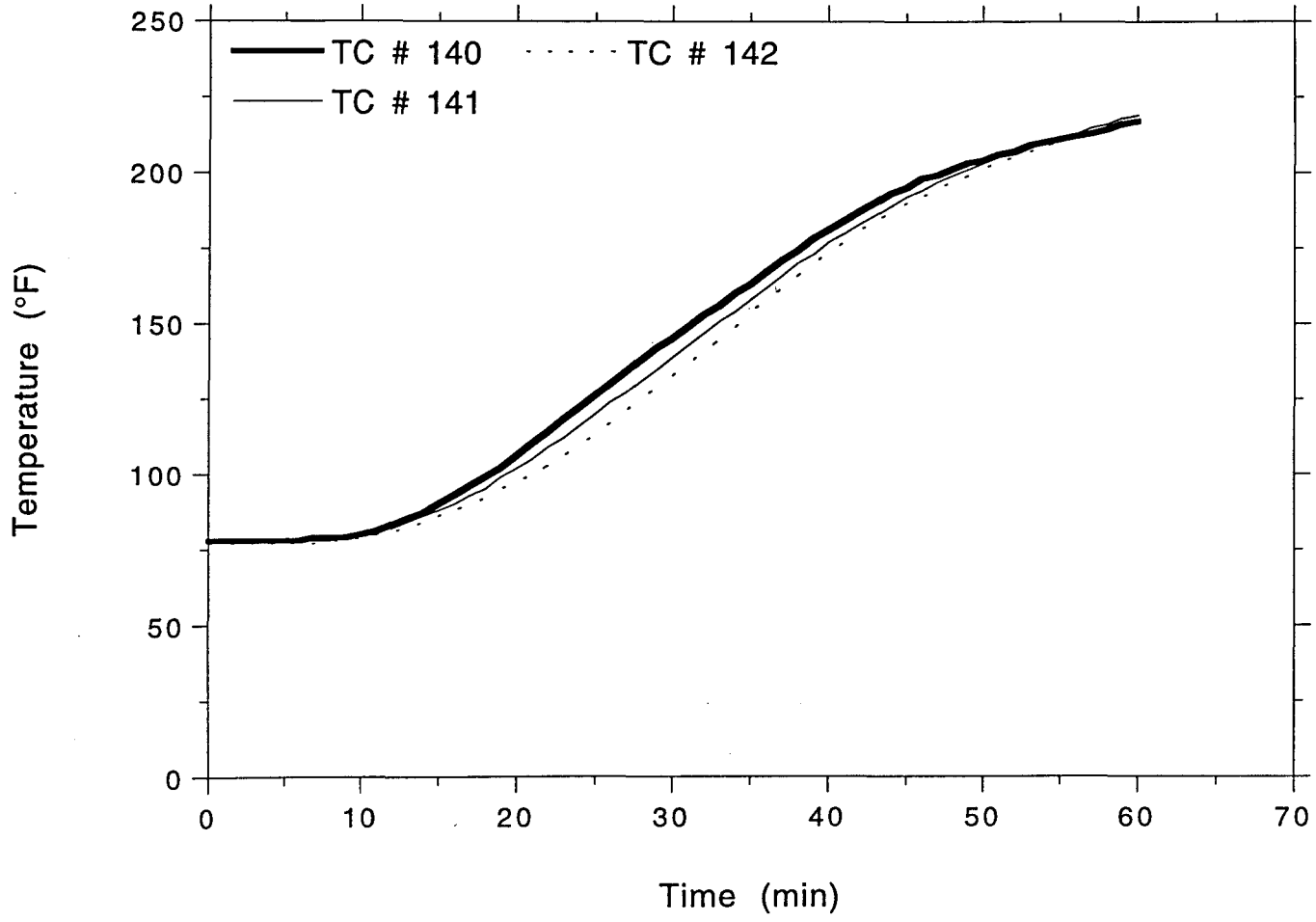
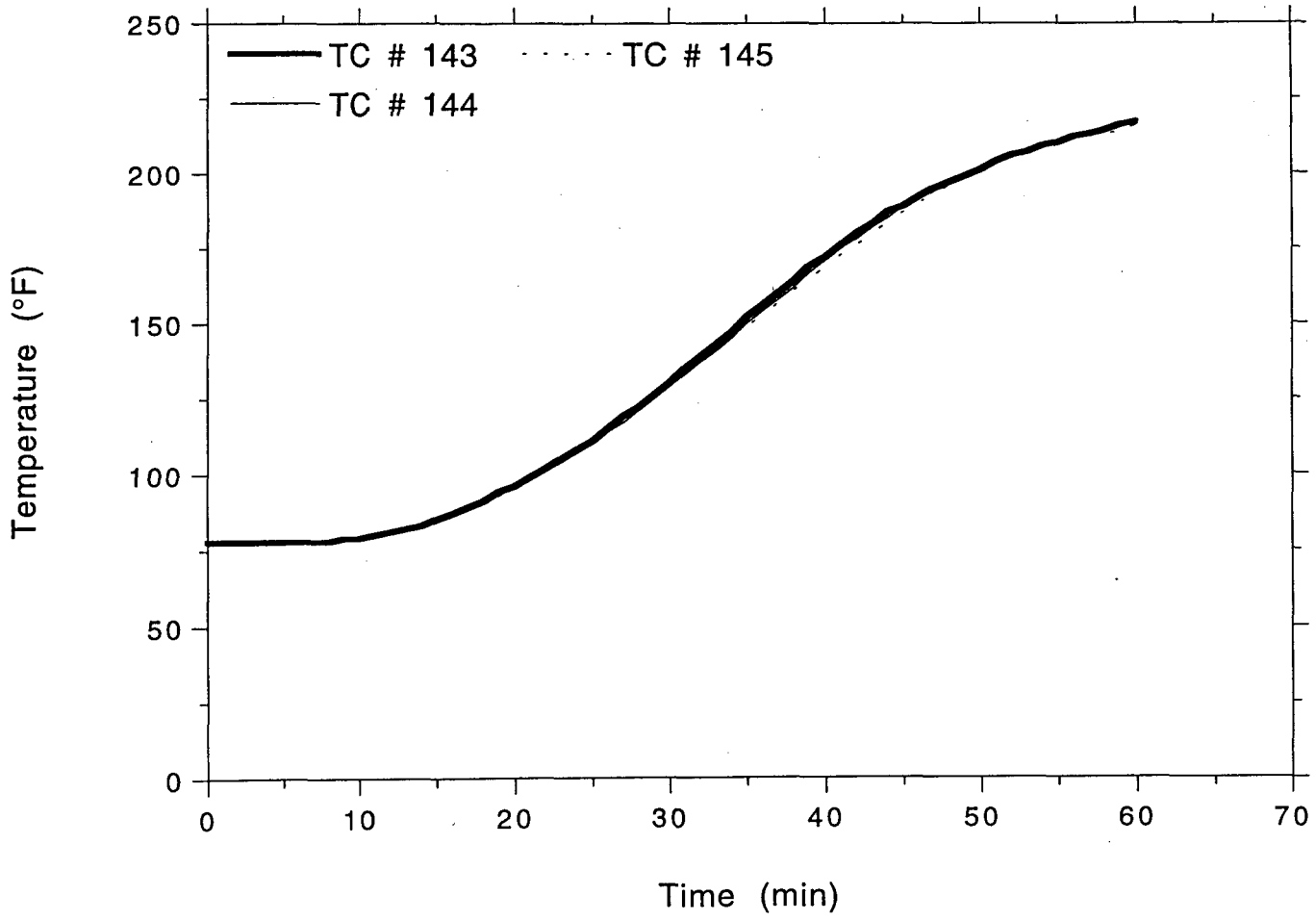
Project No. 11960-97259
Rear Right 3" Steel Conduit



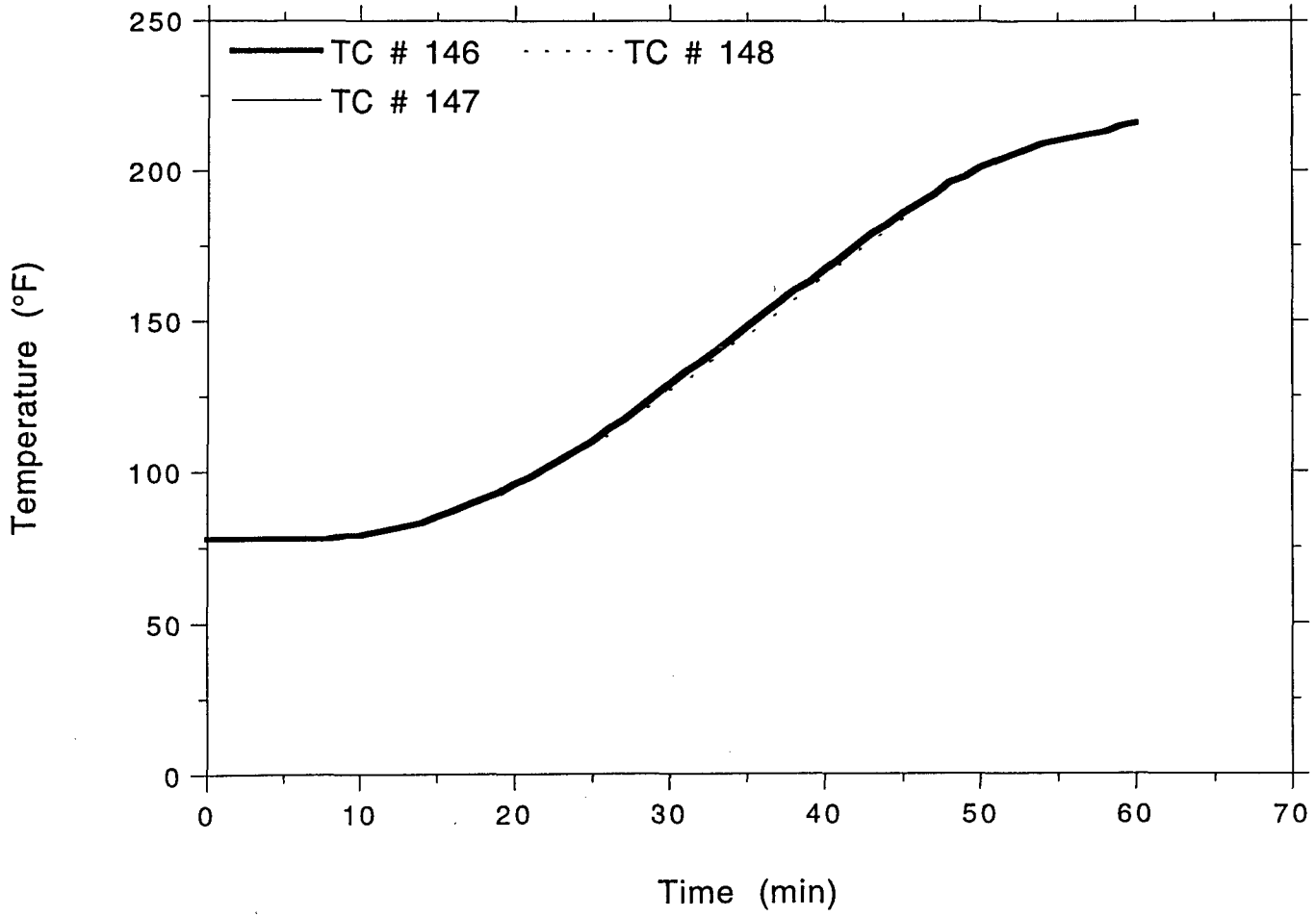
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit



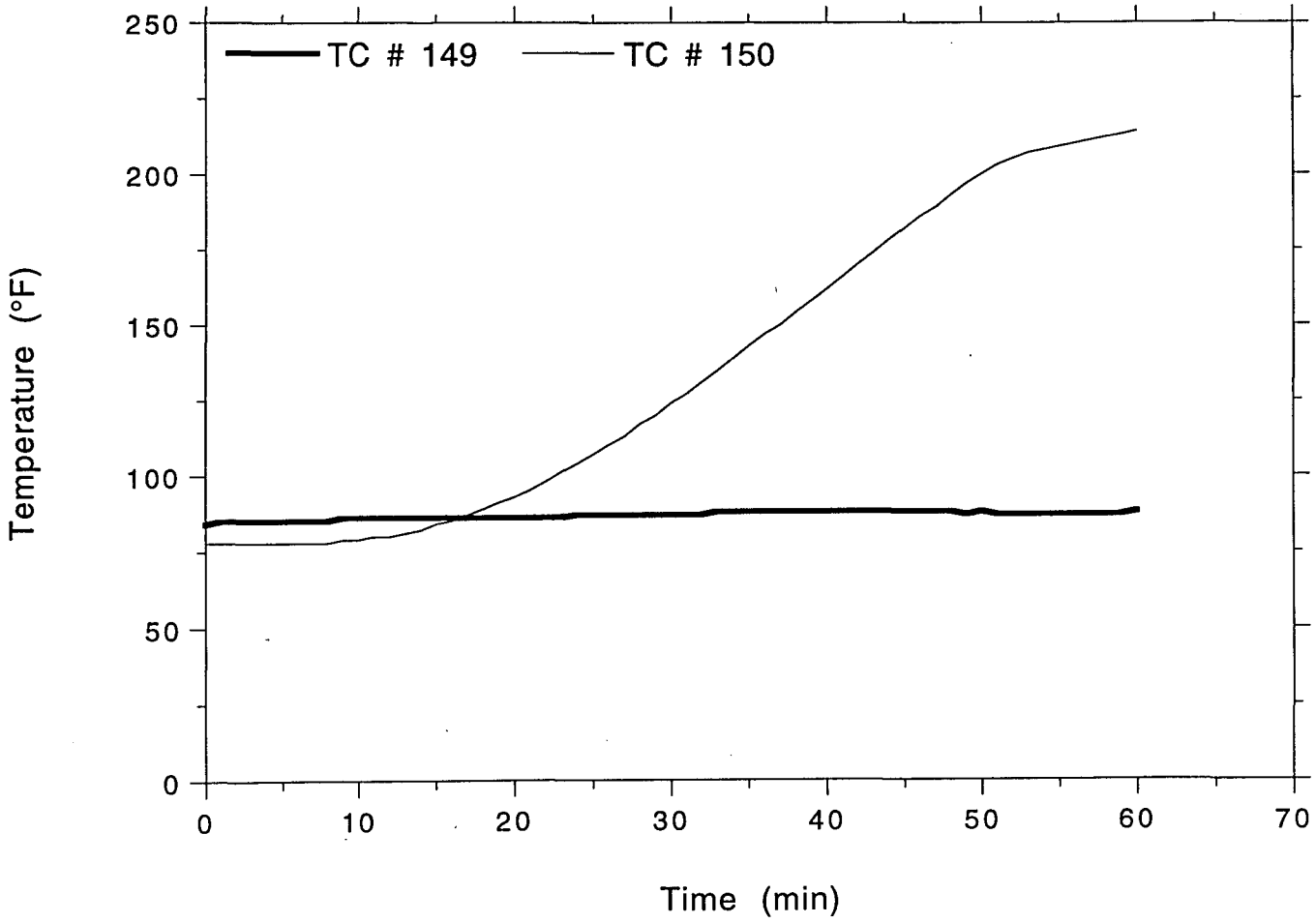
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit



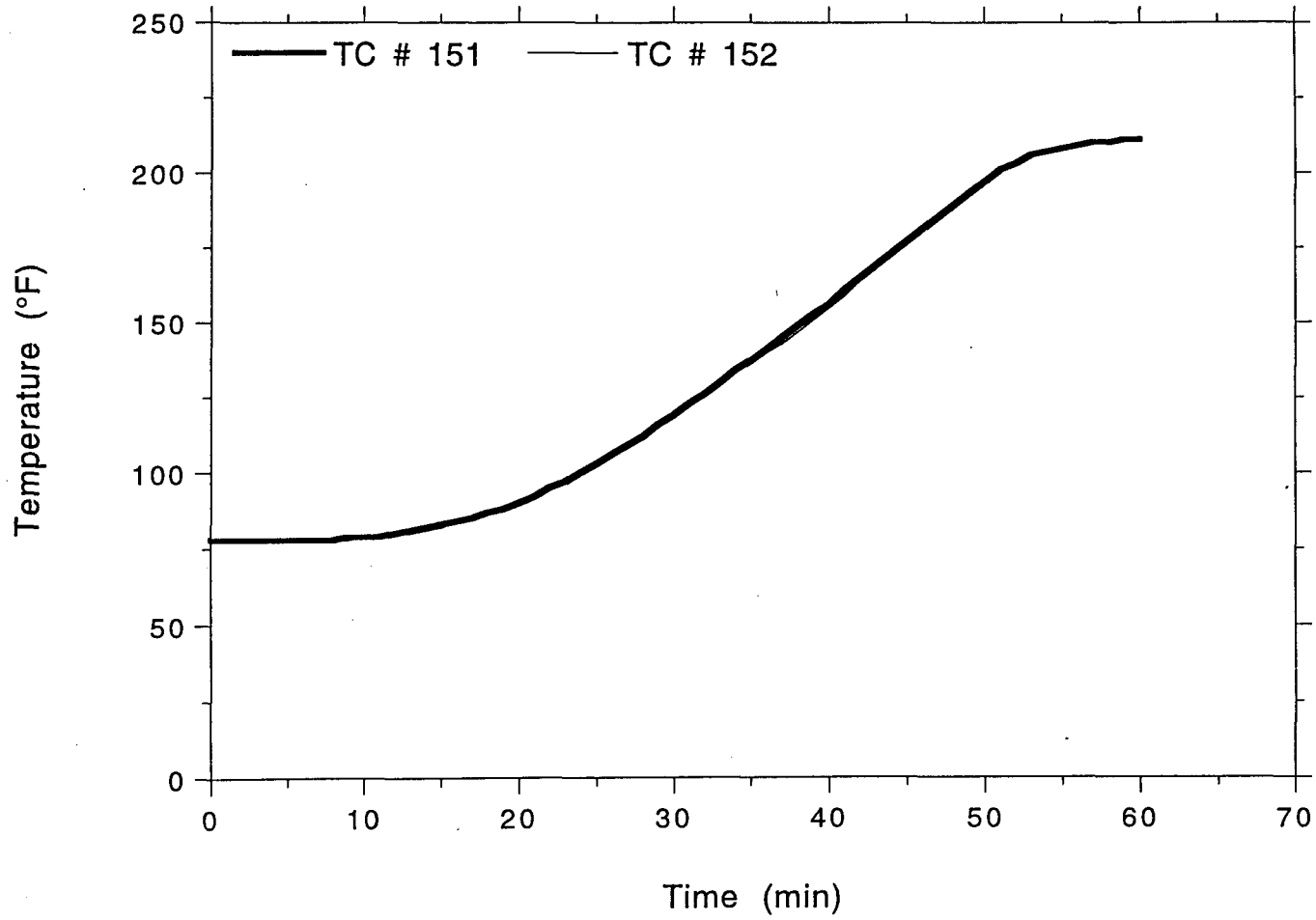
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit



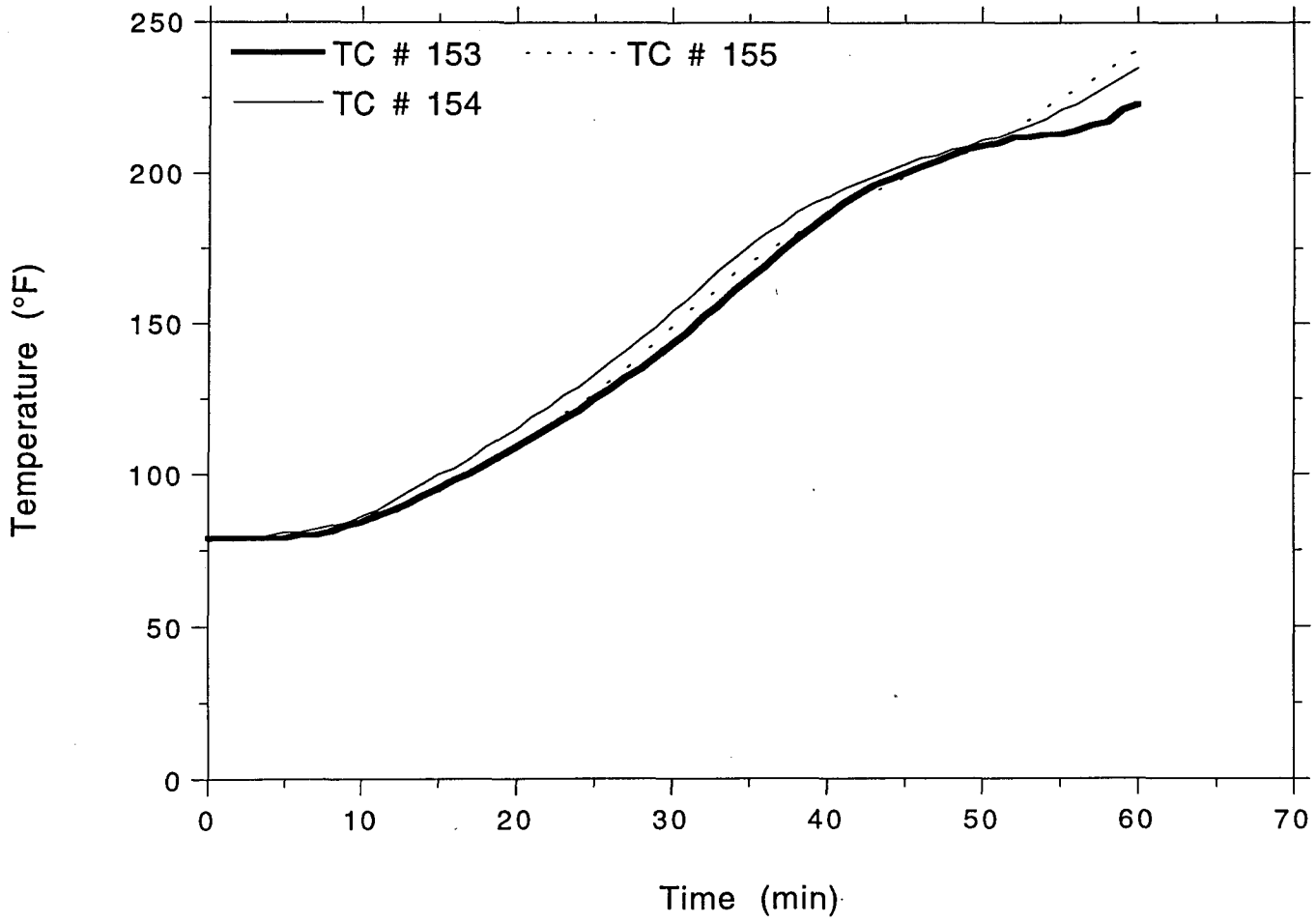
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit



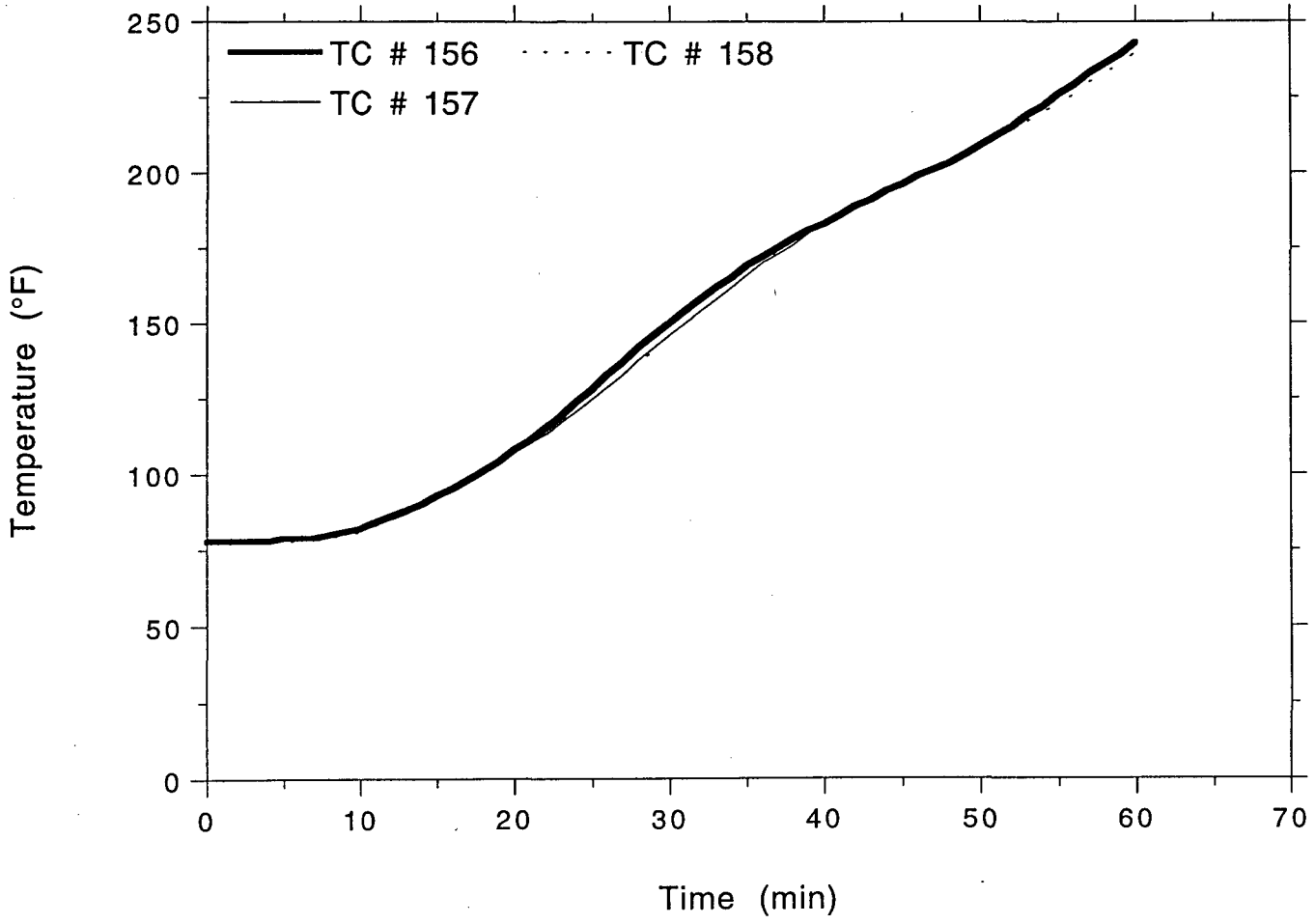
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit



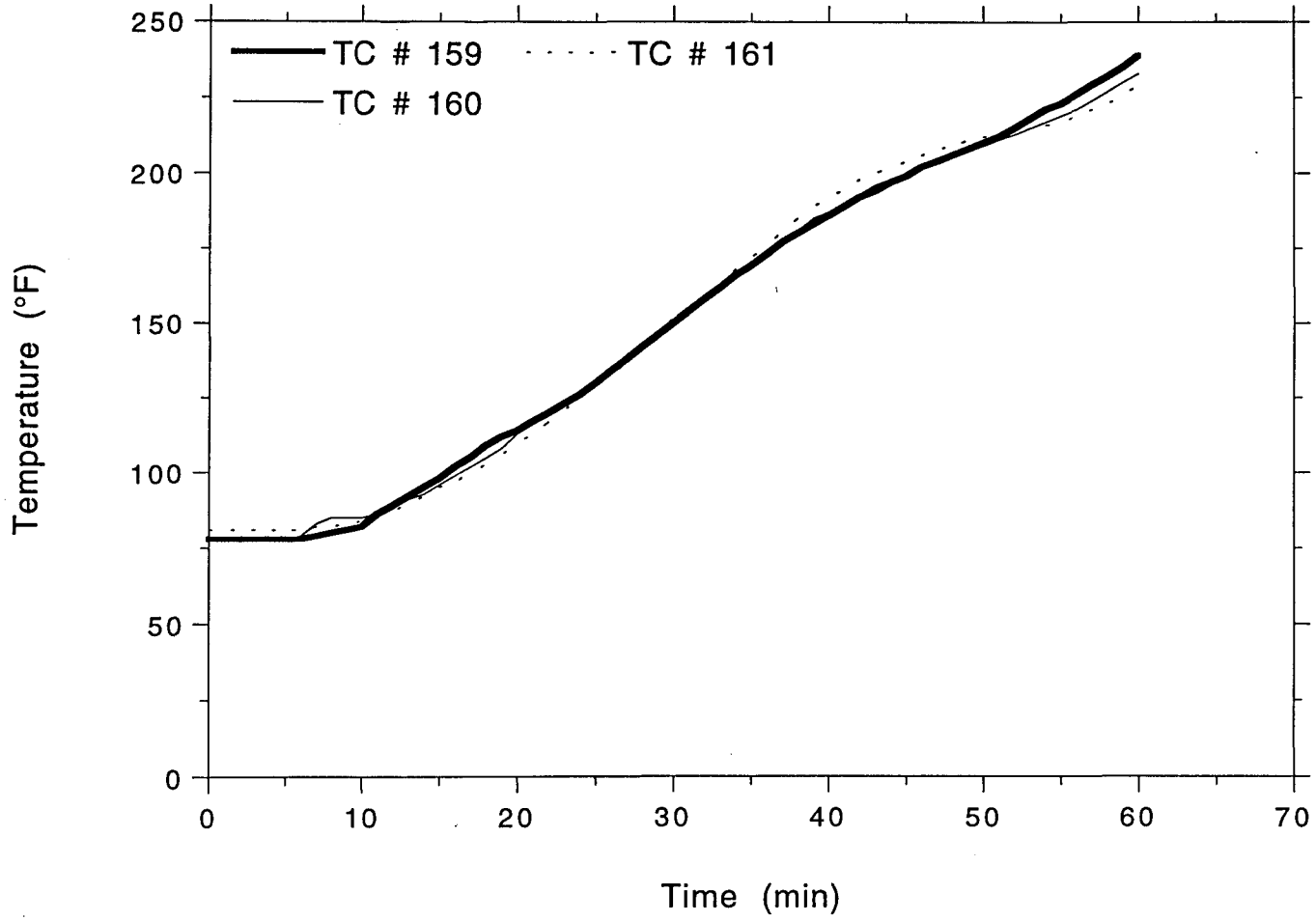
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit



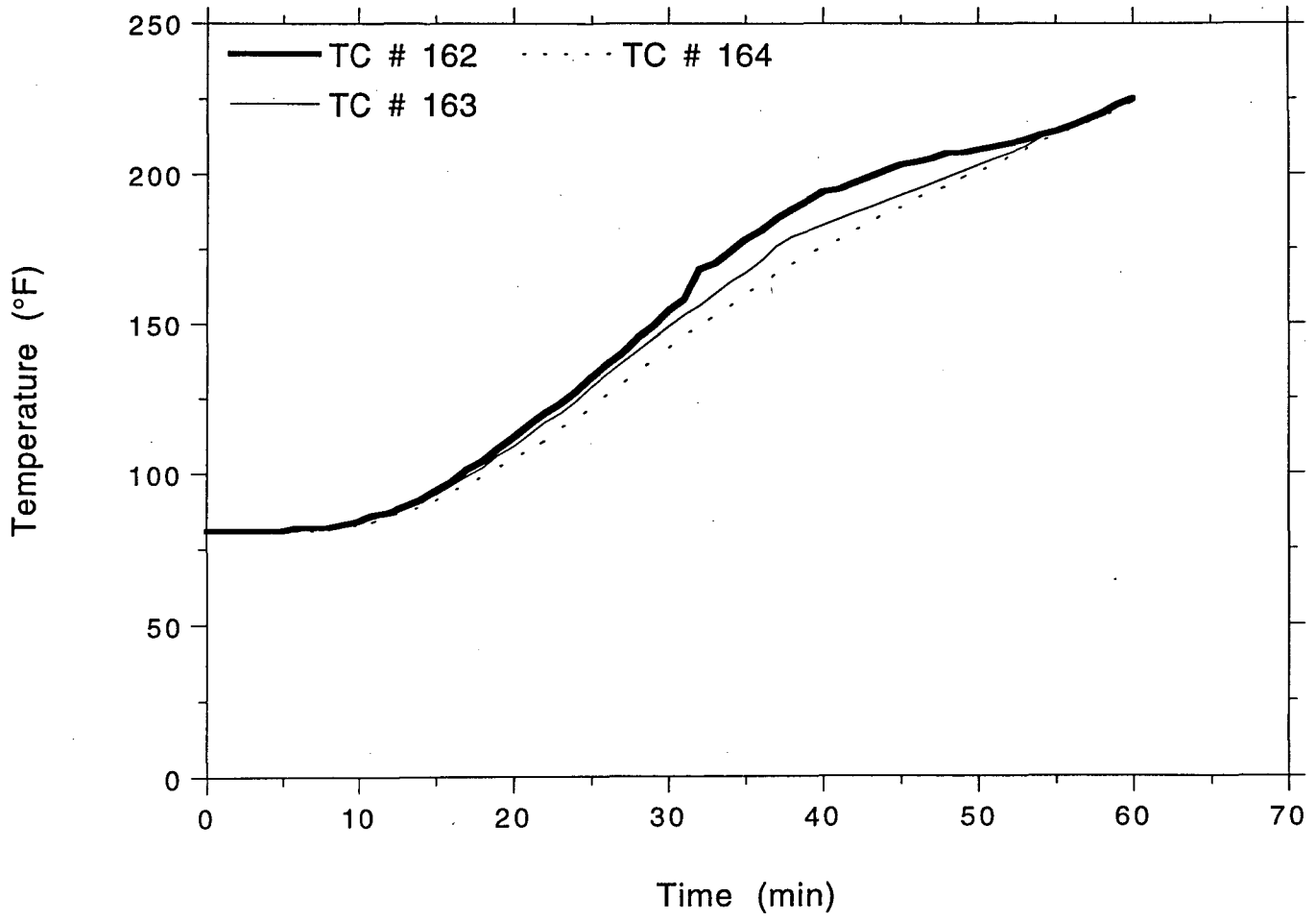
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit



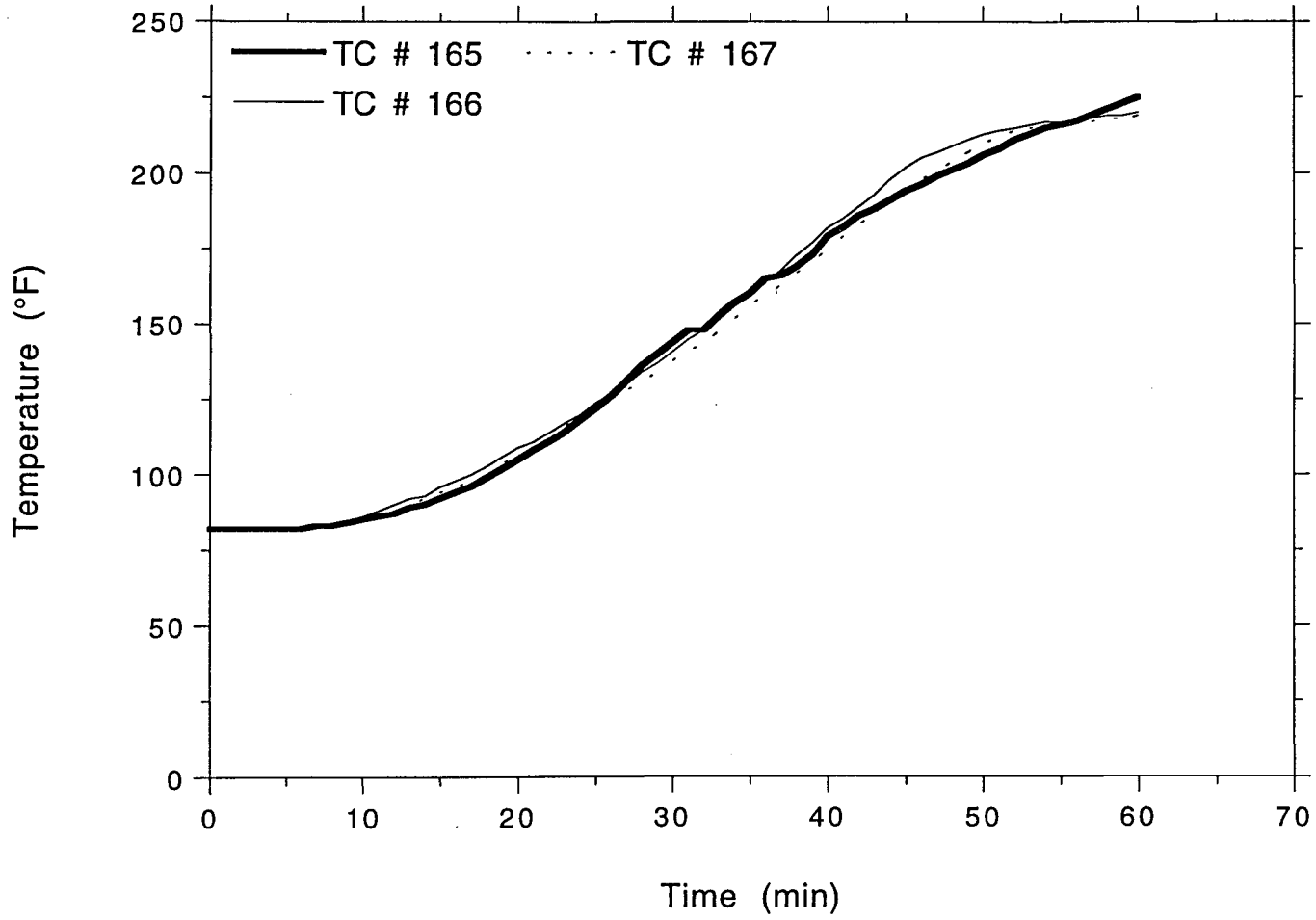
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit



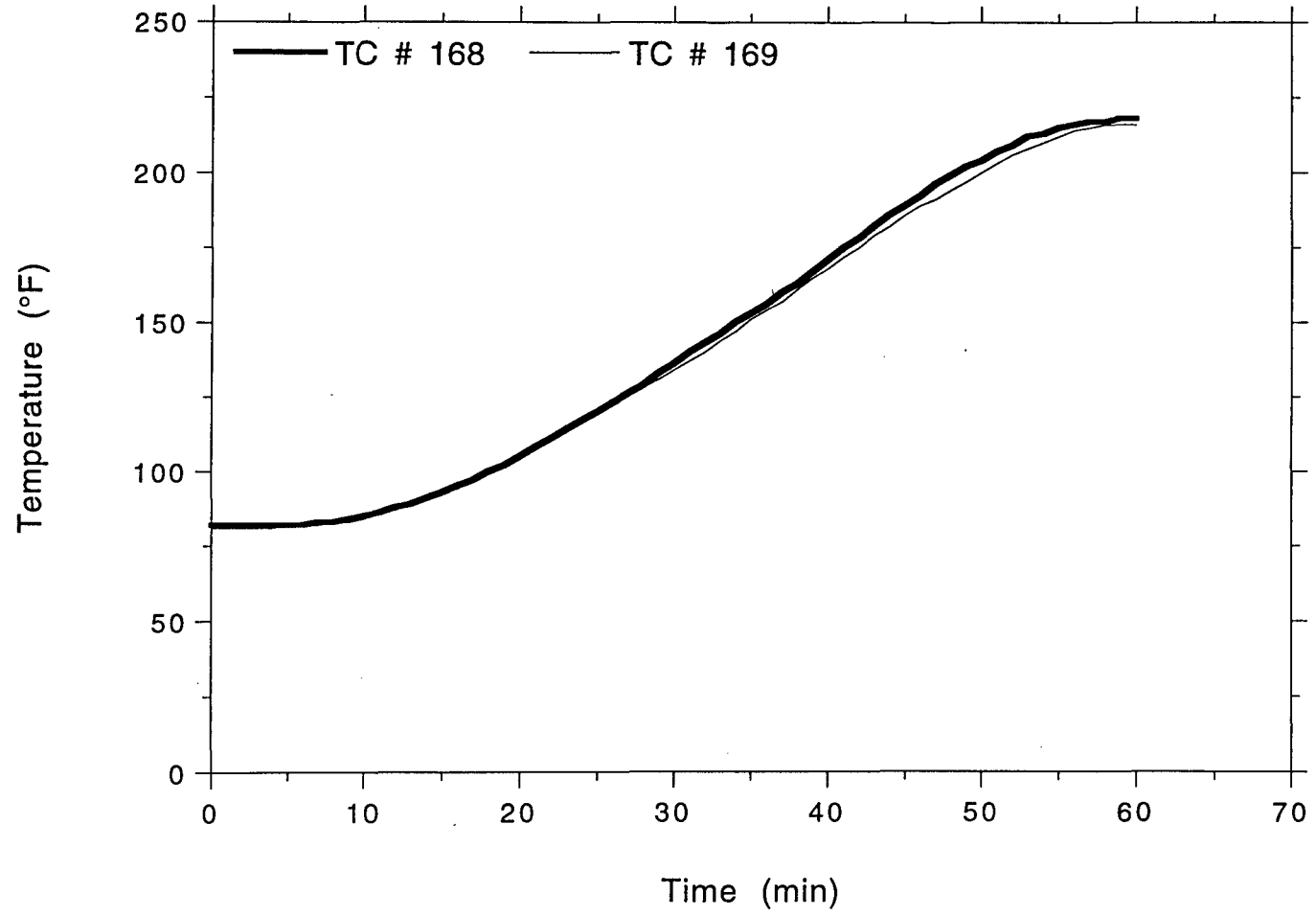
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit



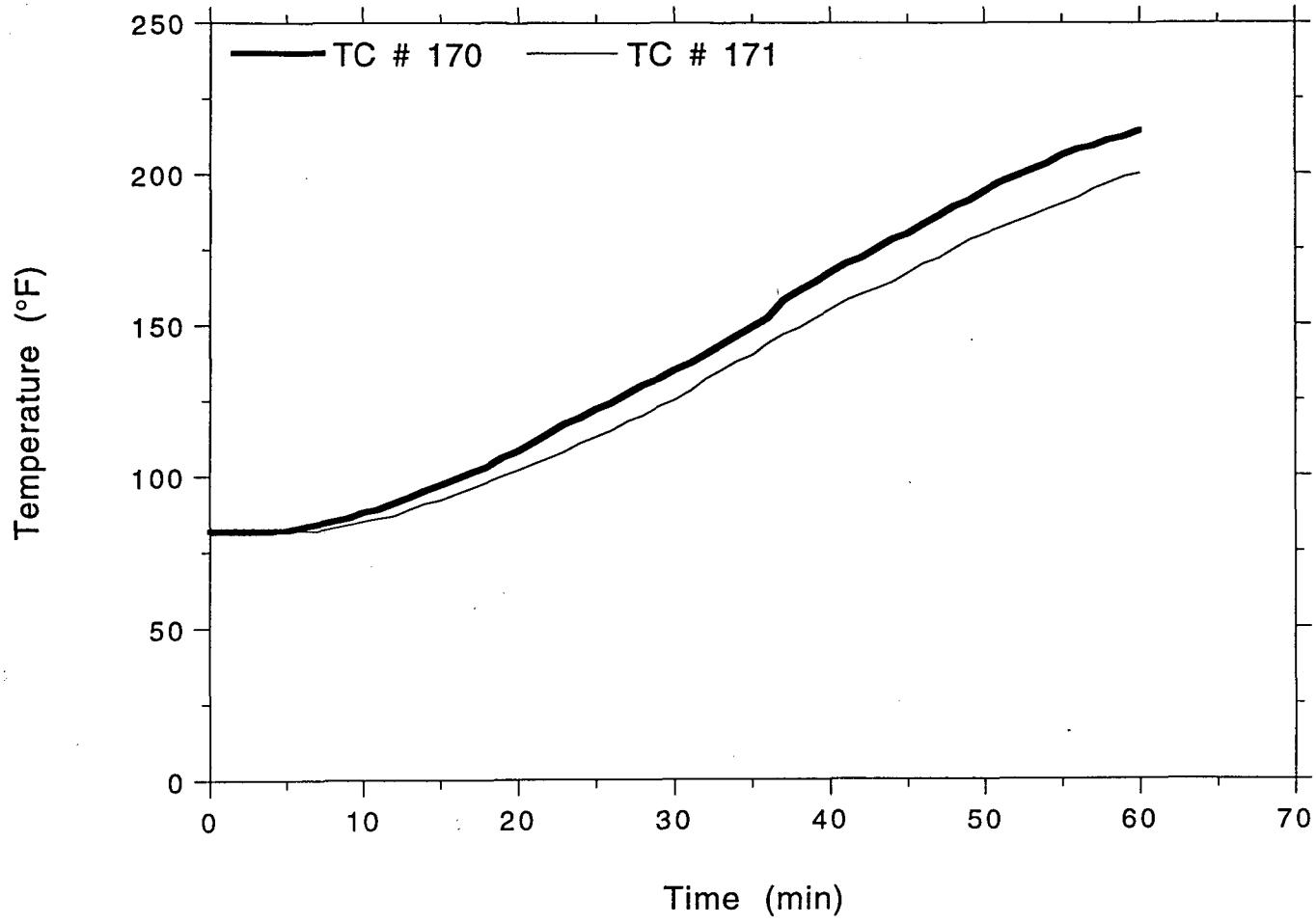
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
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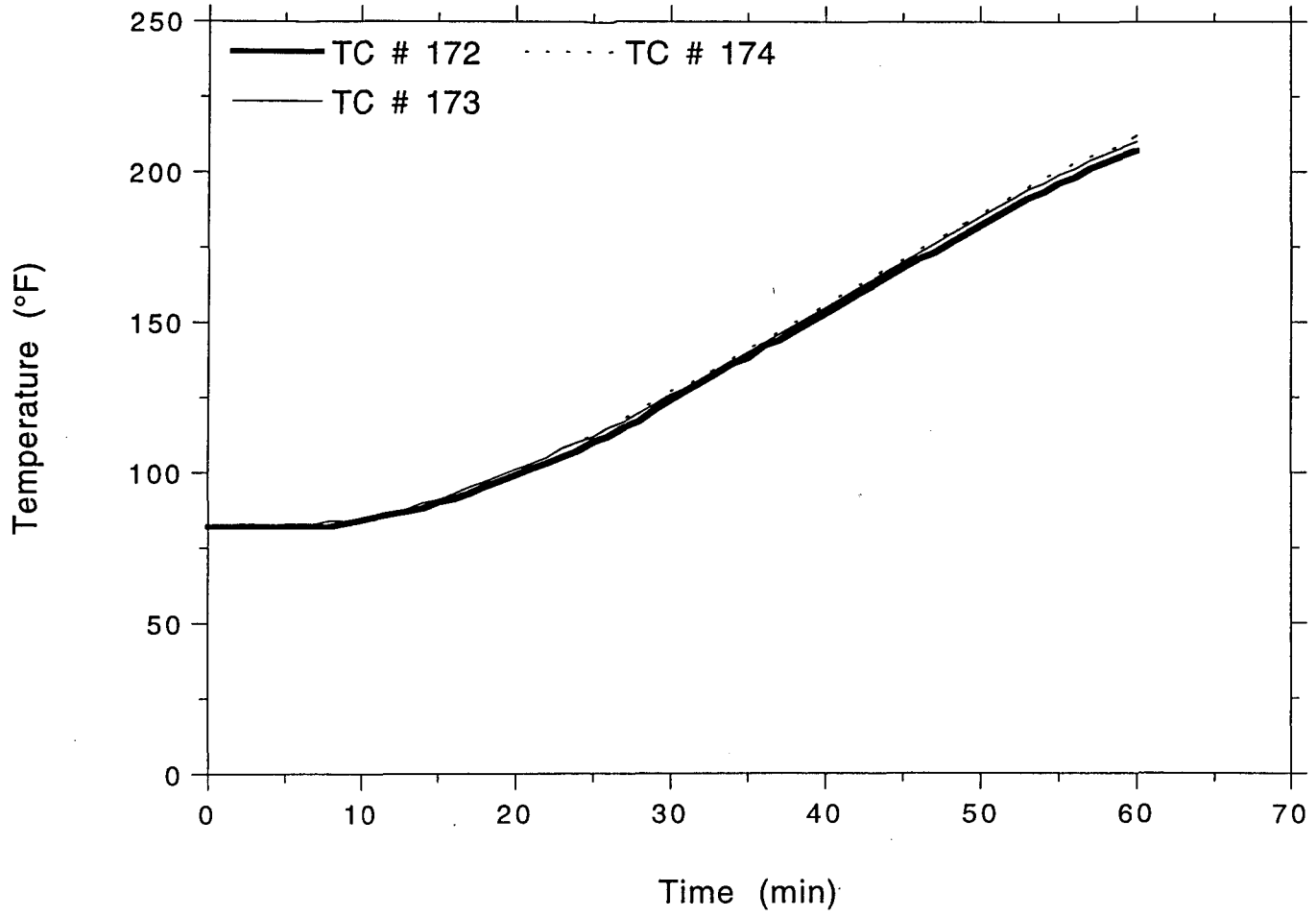
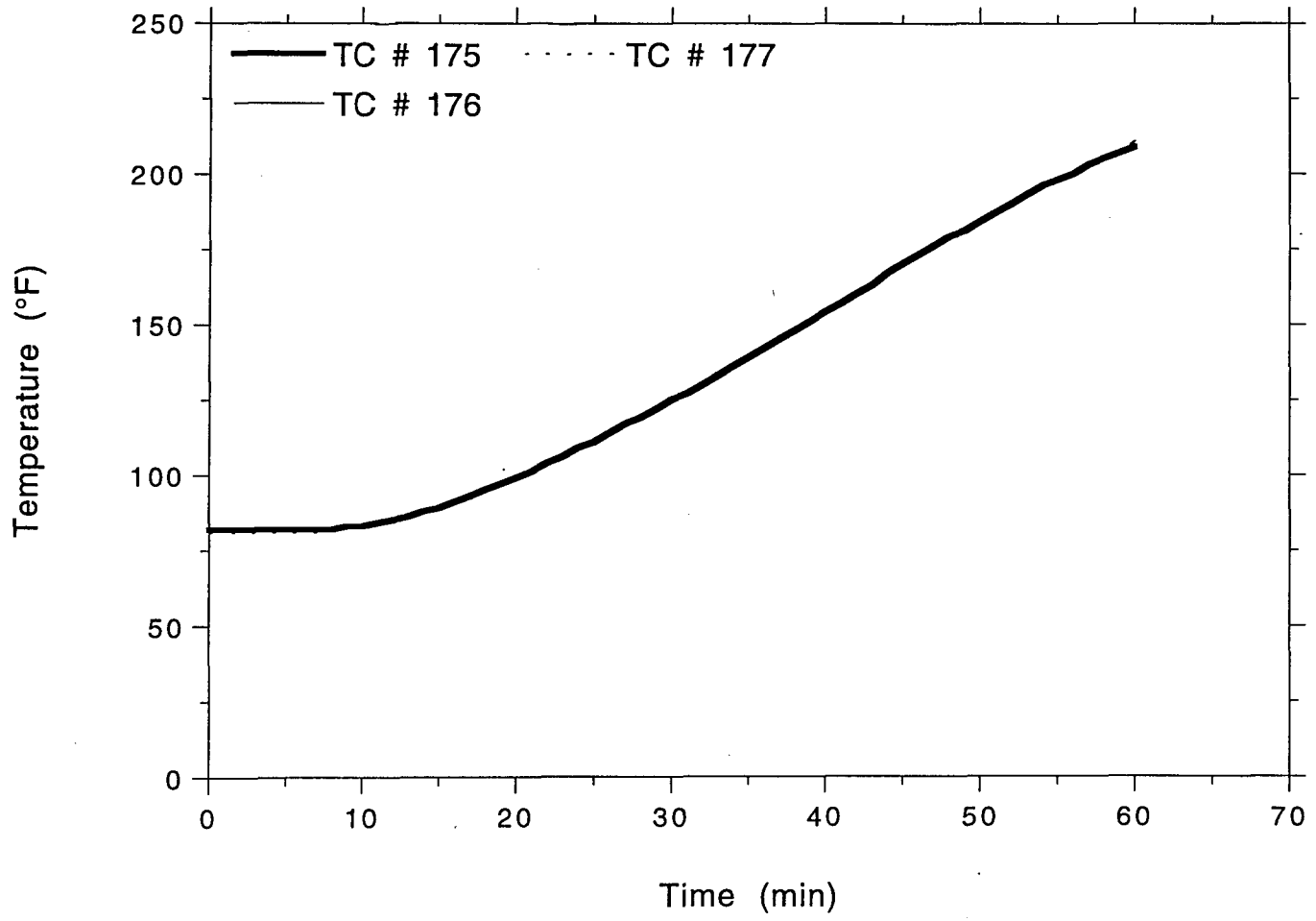
Front Left-Center 4" Al. Conduit



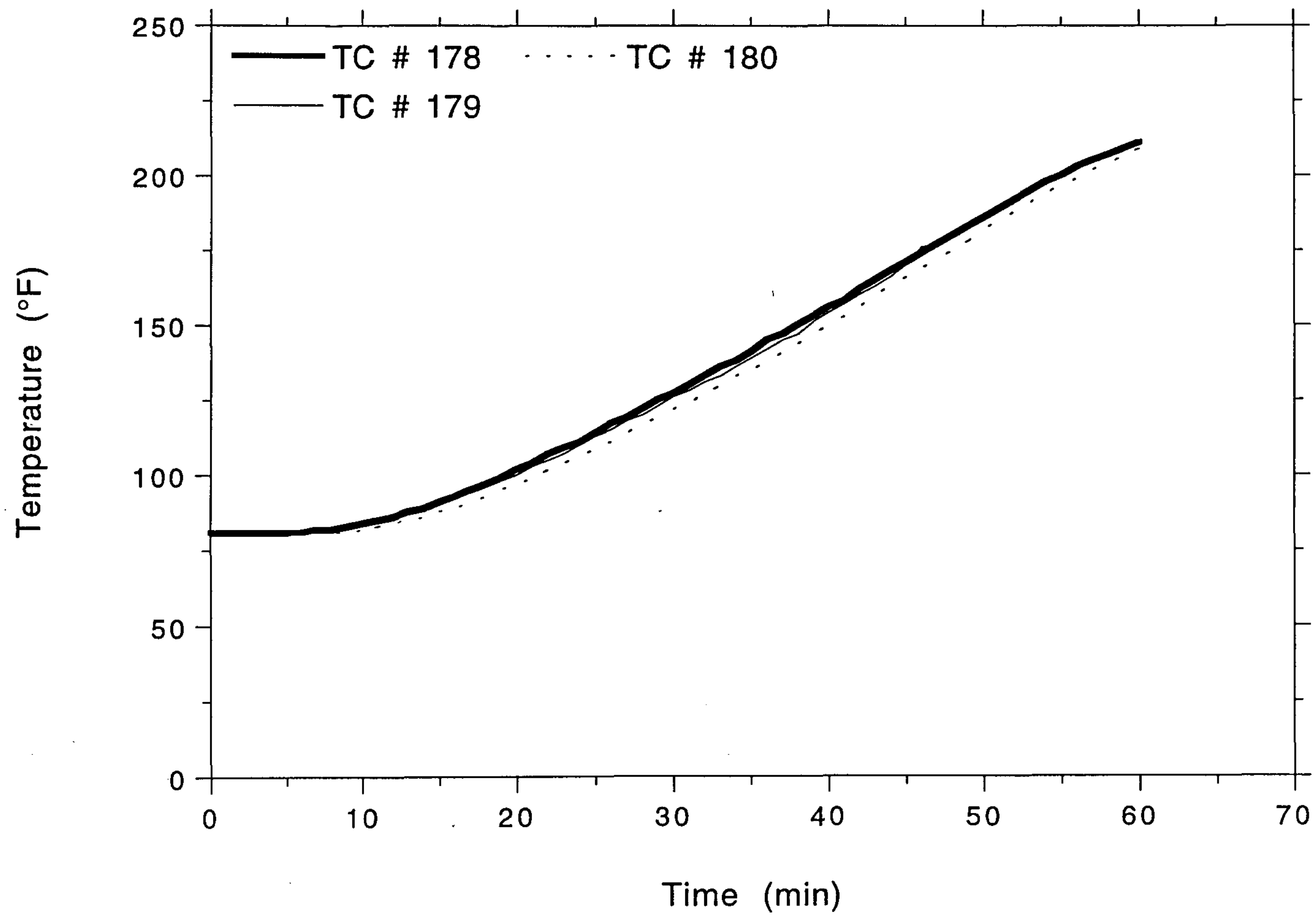
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left-Center 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left-Center 4" Al. Conduit



OMEGA POINT LABORATORIES

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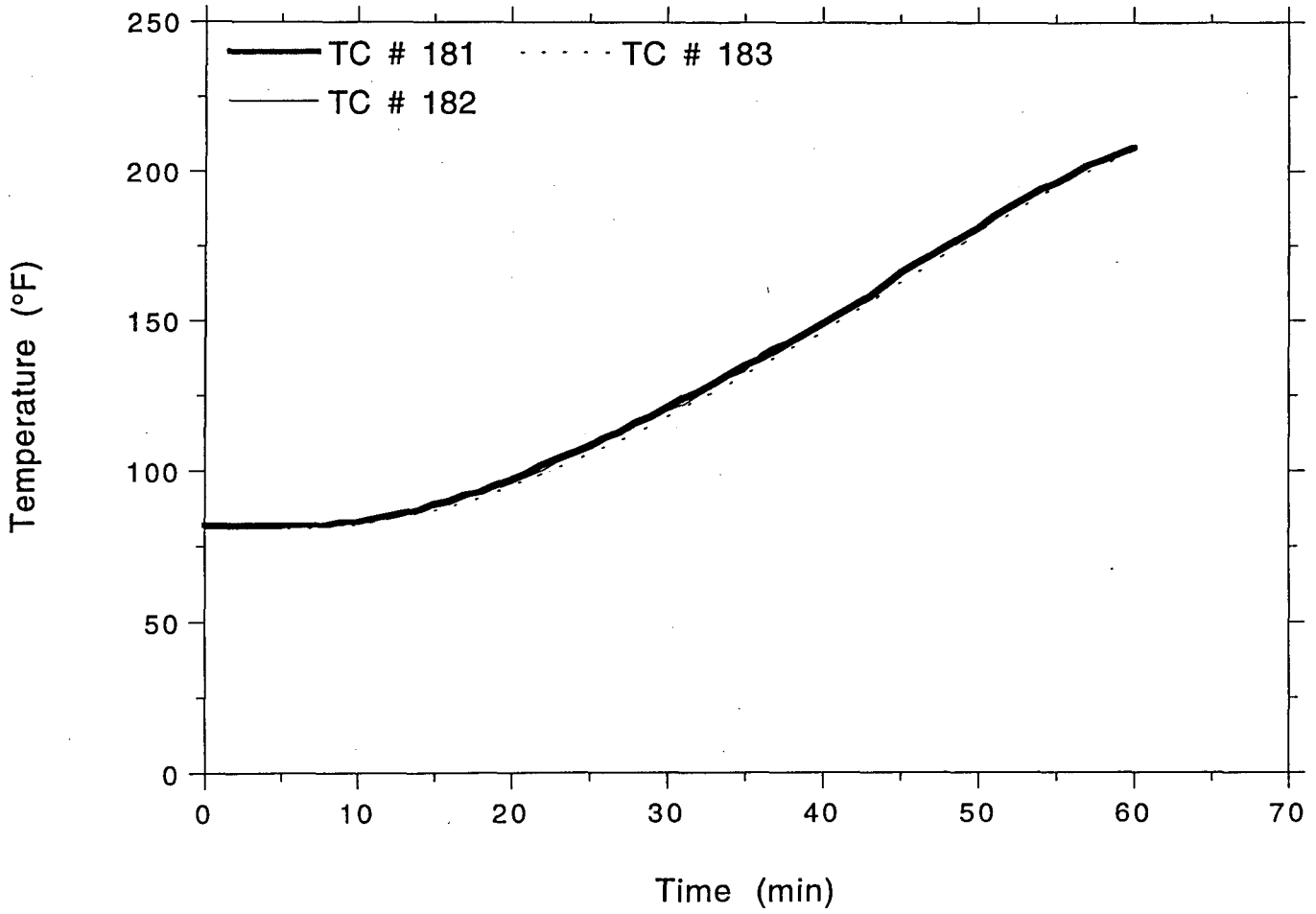
Front Left-Center 4" Al. Conduit



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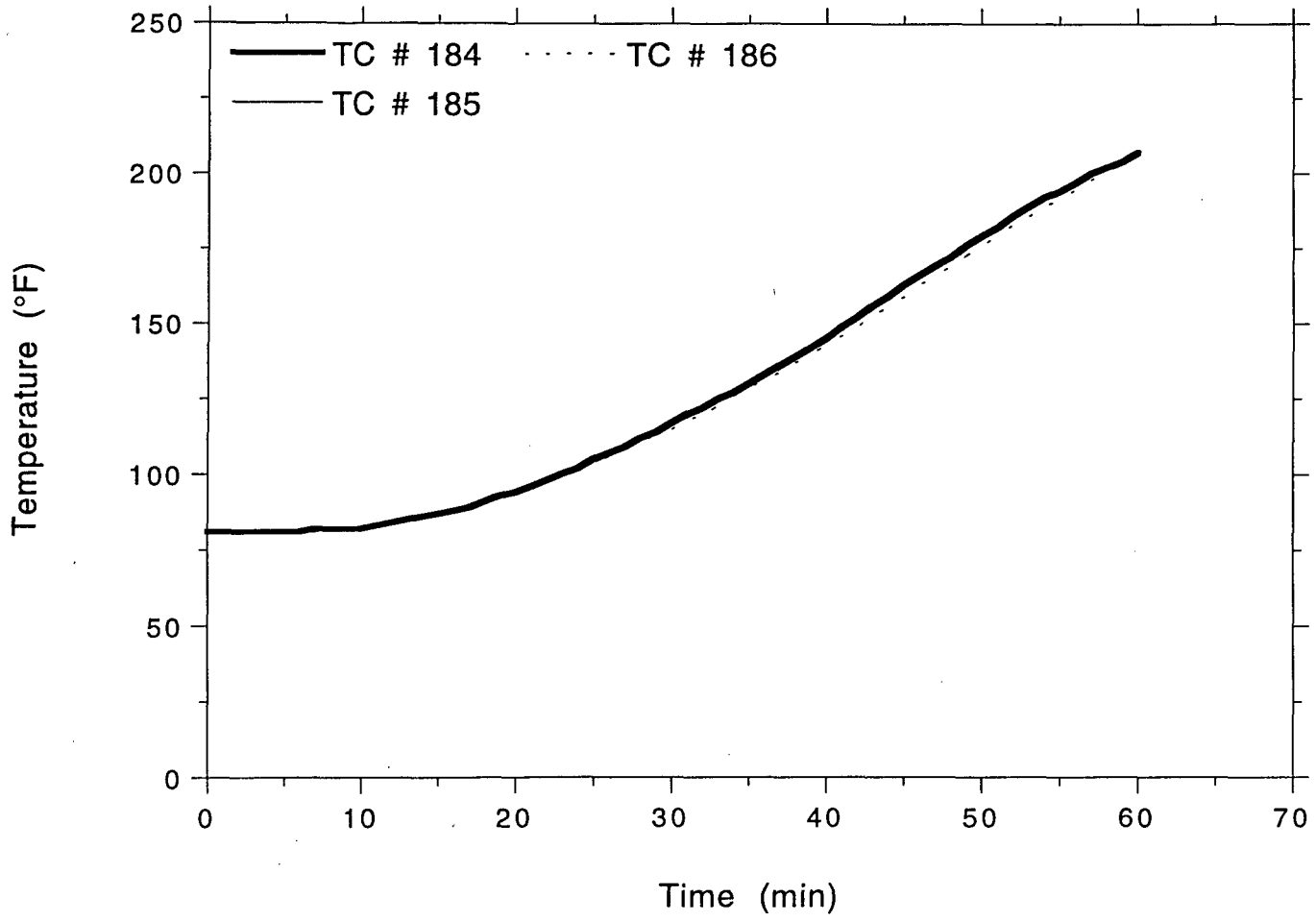

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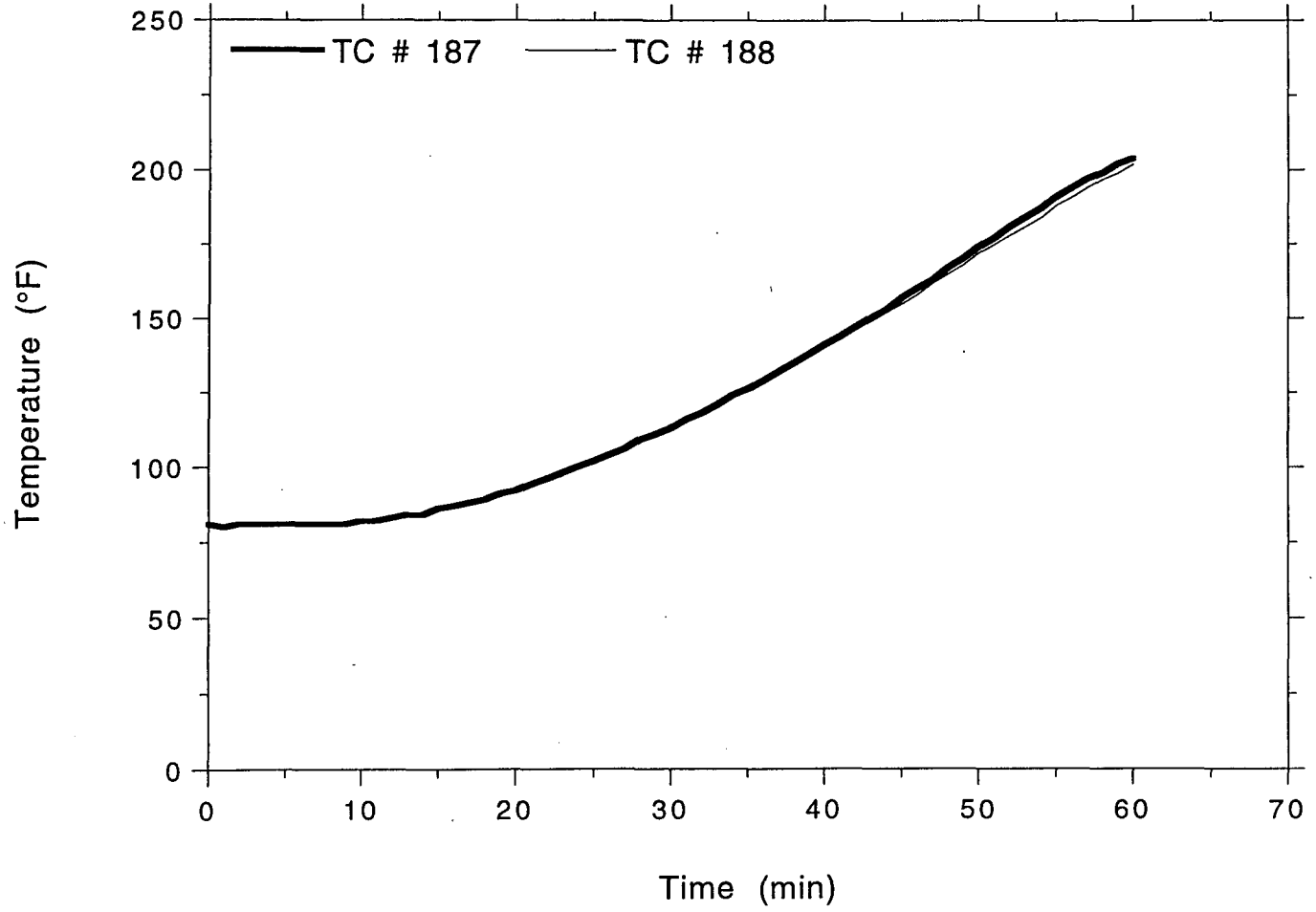

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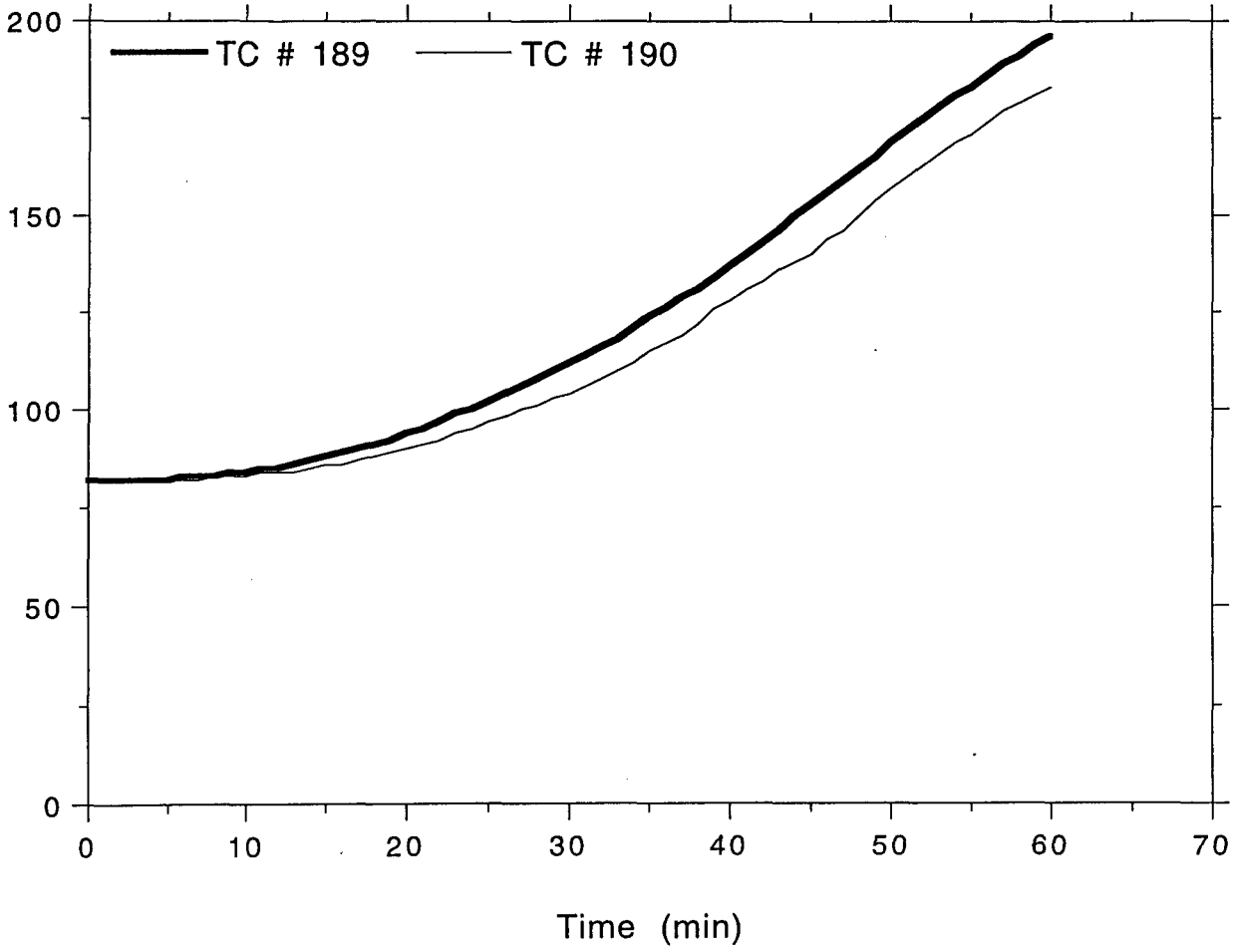

OMEGA POINT LABORATORIES

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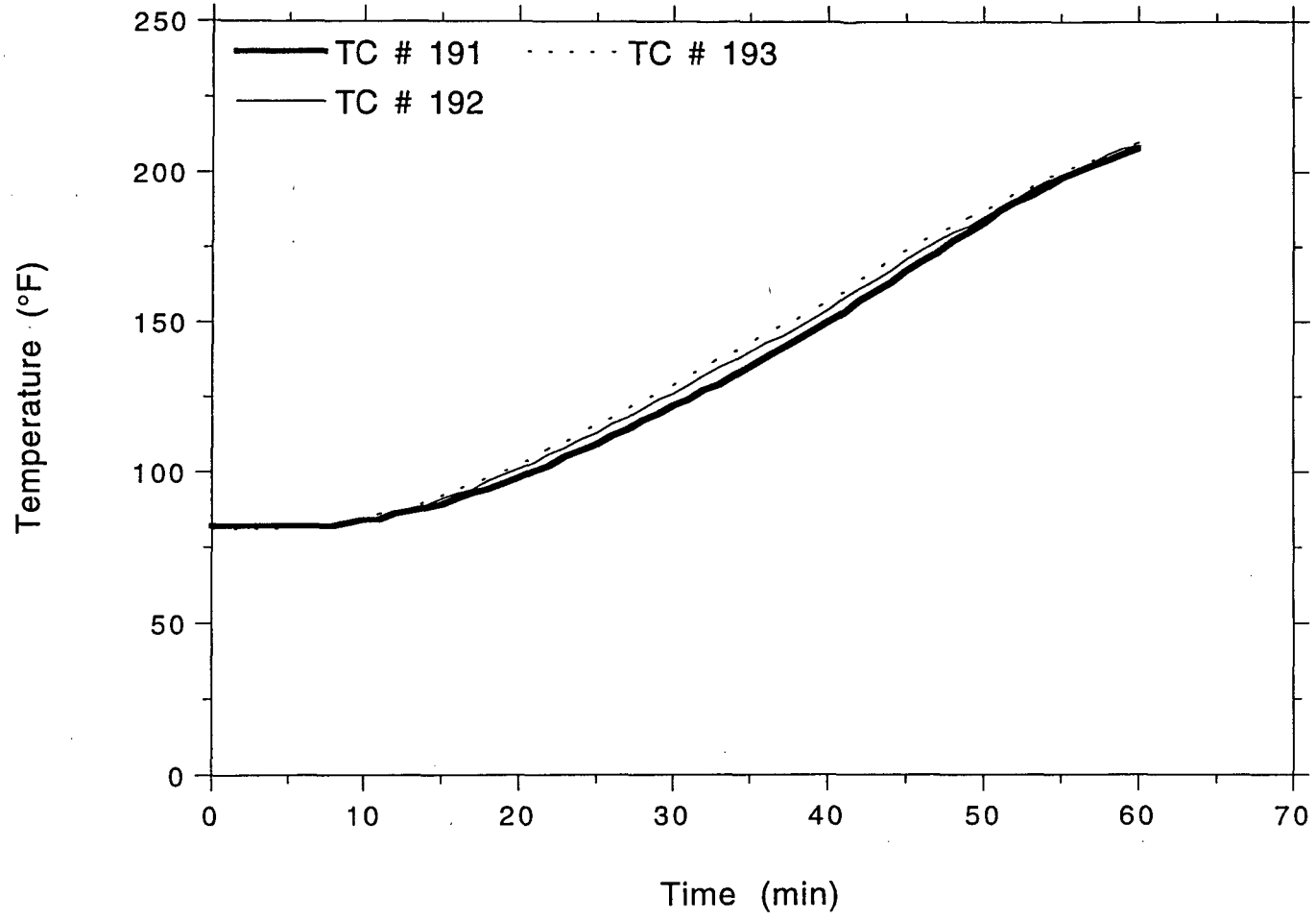

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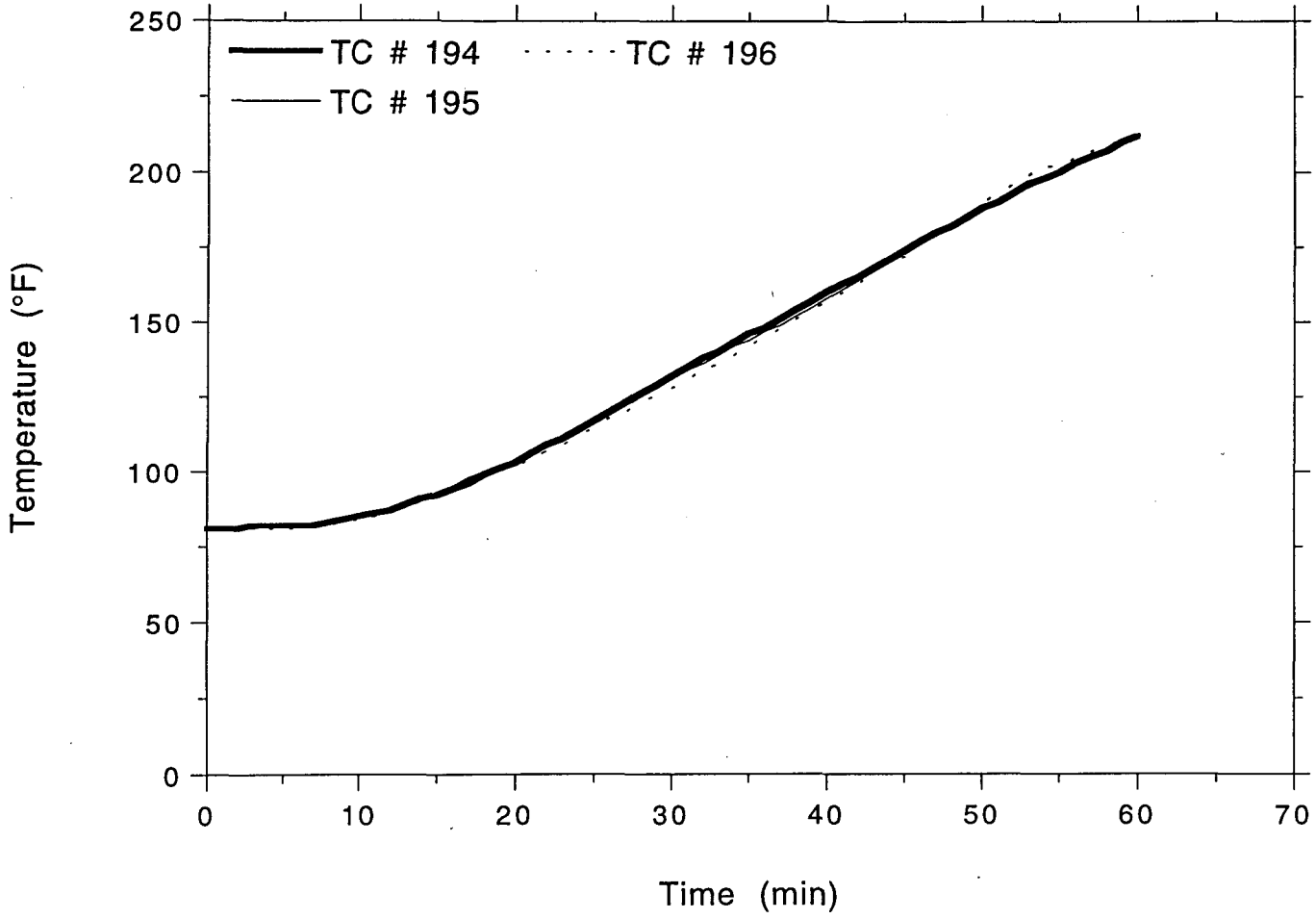

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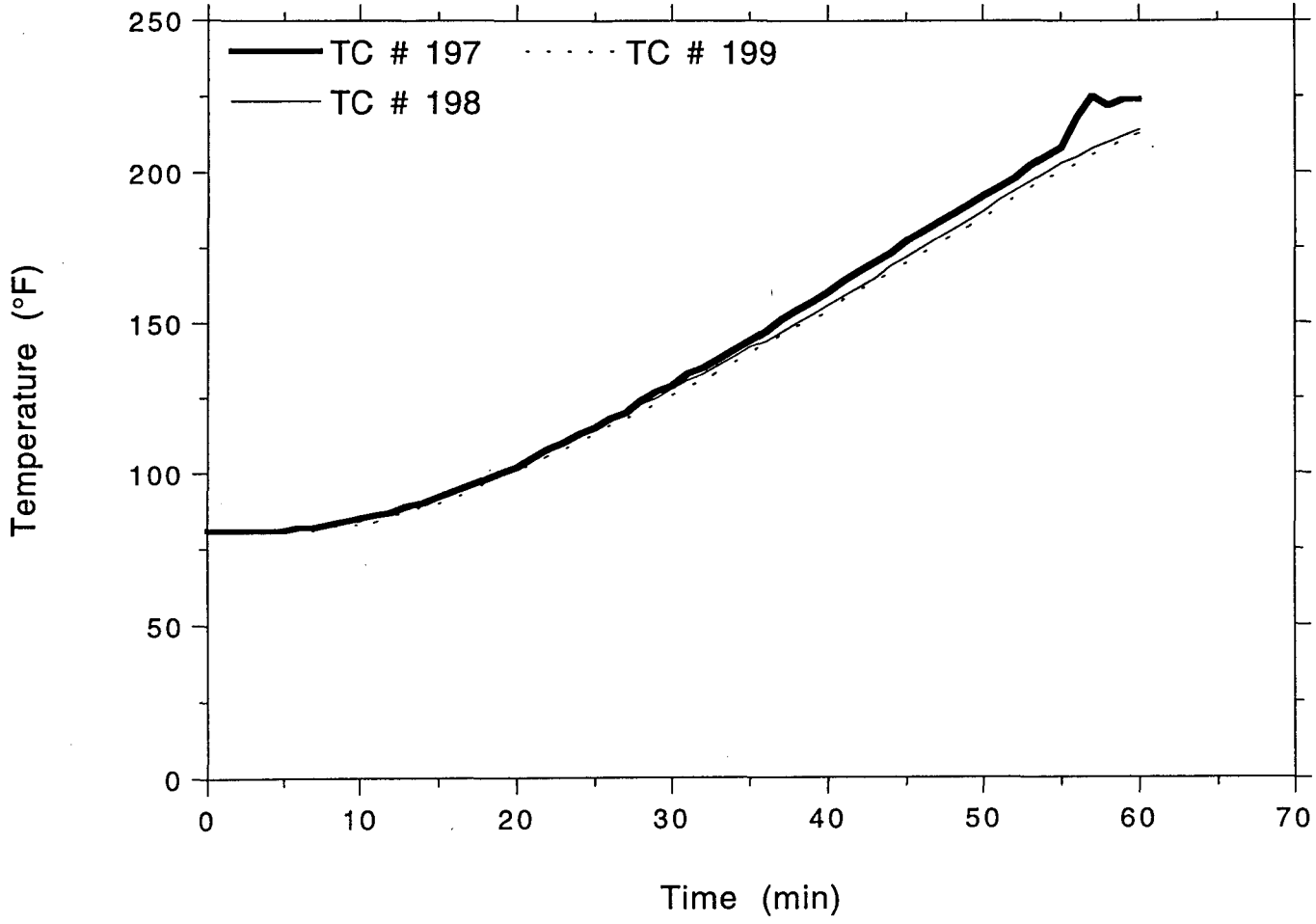

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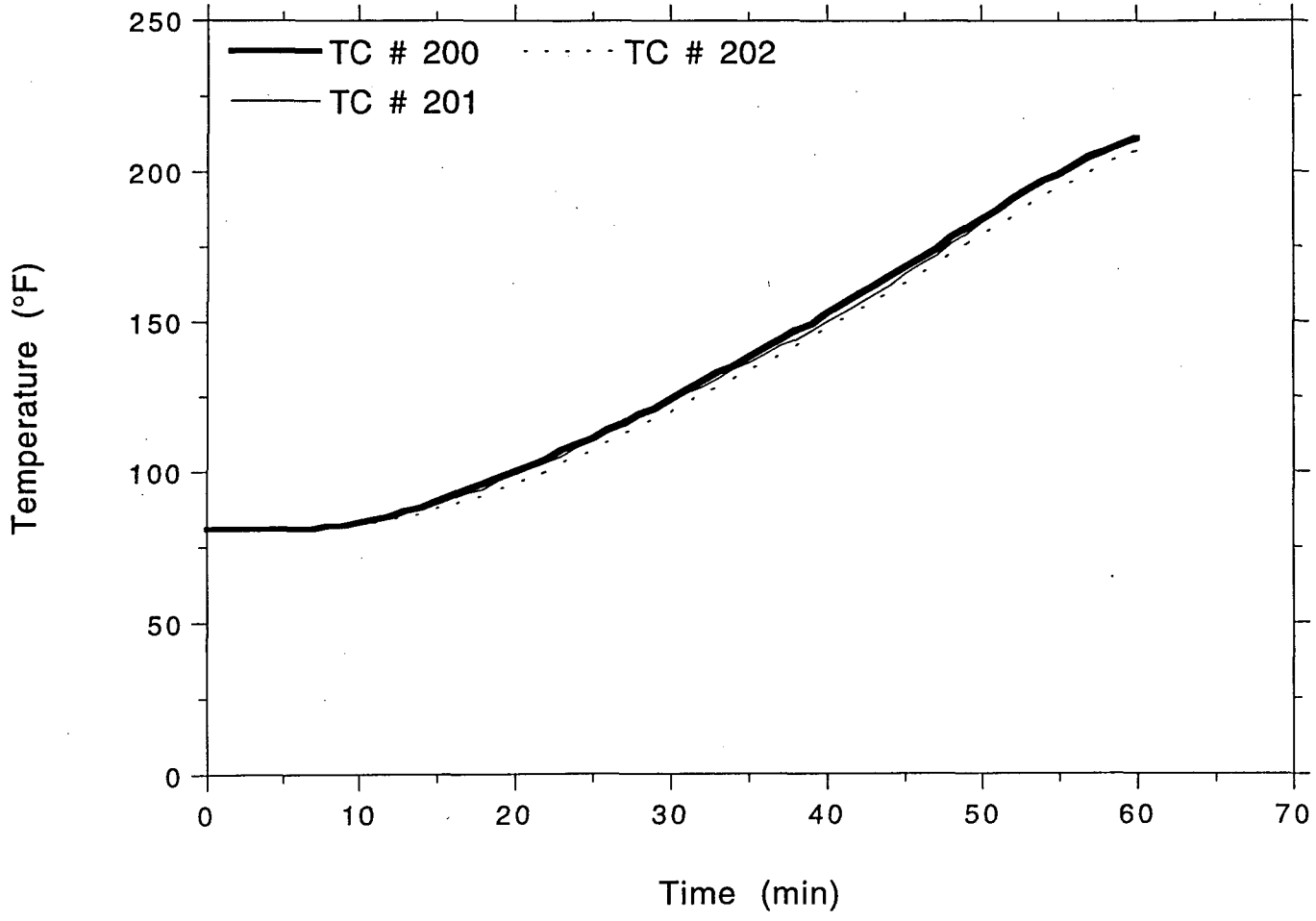

OMEGA POINT LABORATORIES

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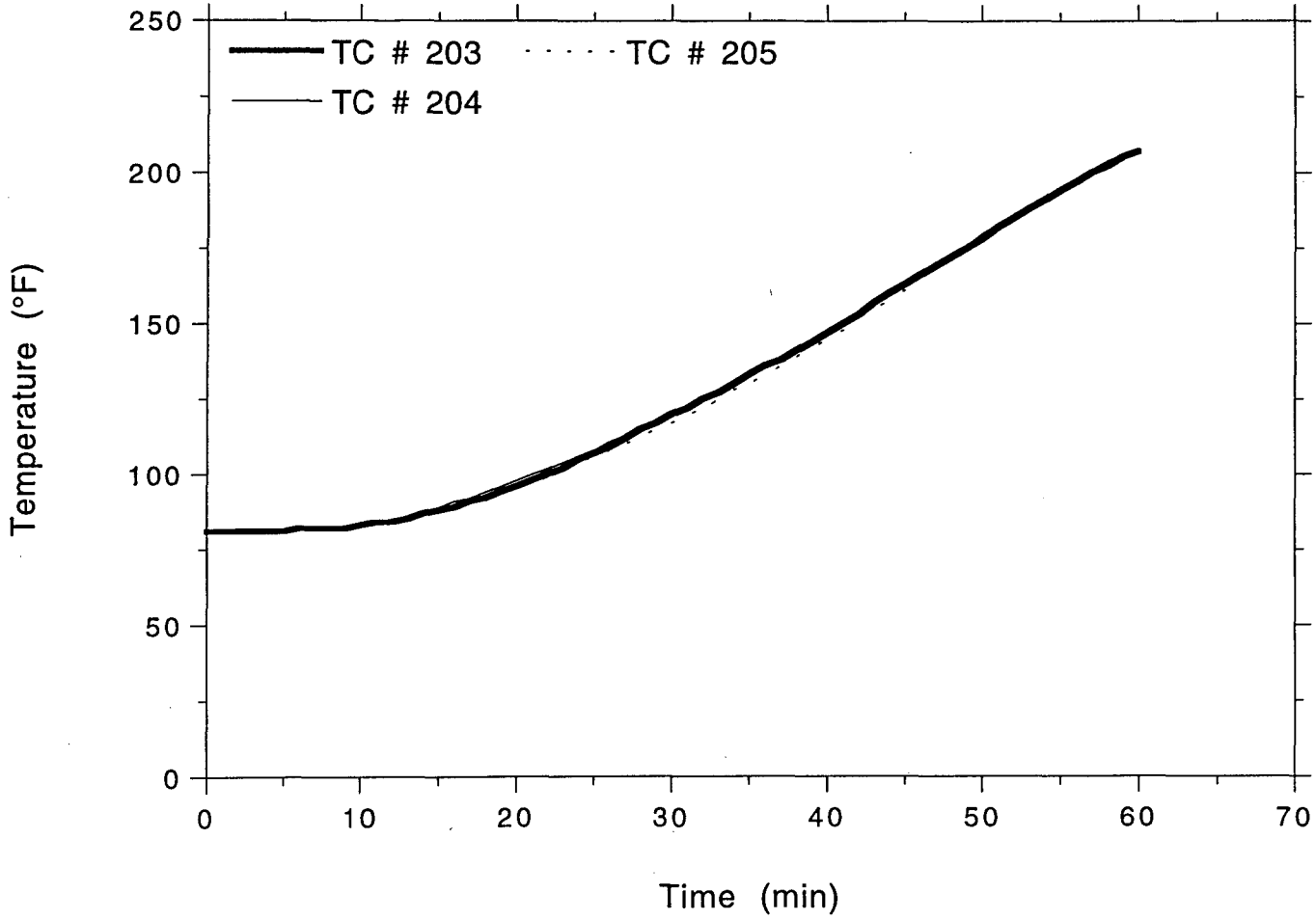

OMEGA POINT LABORATORIES

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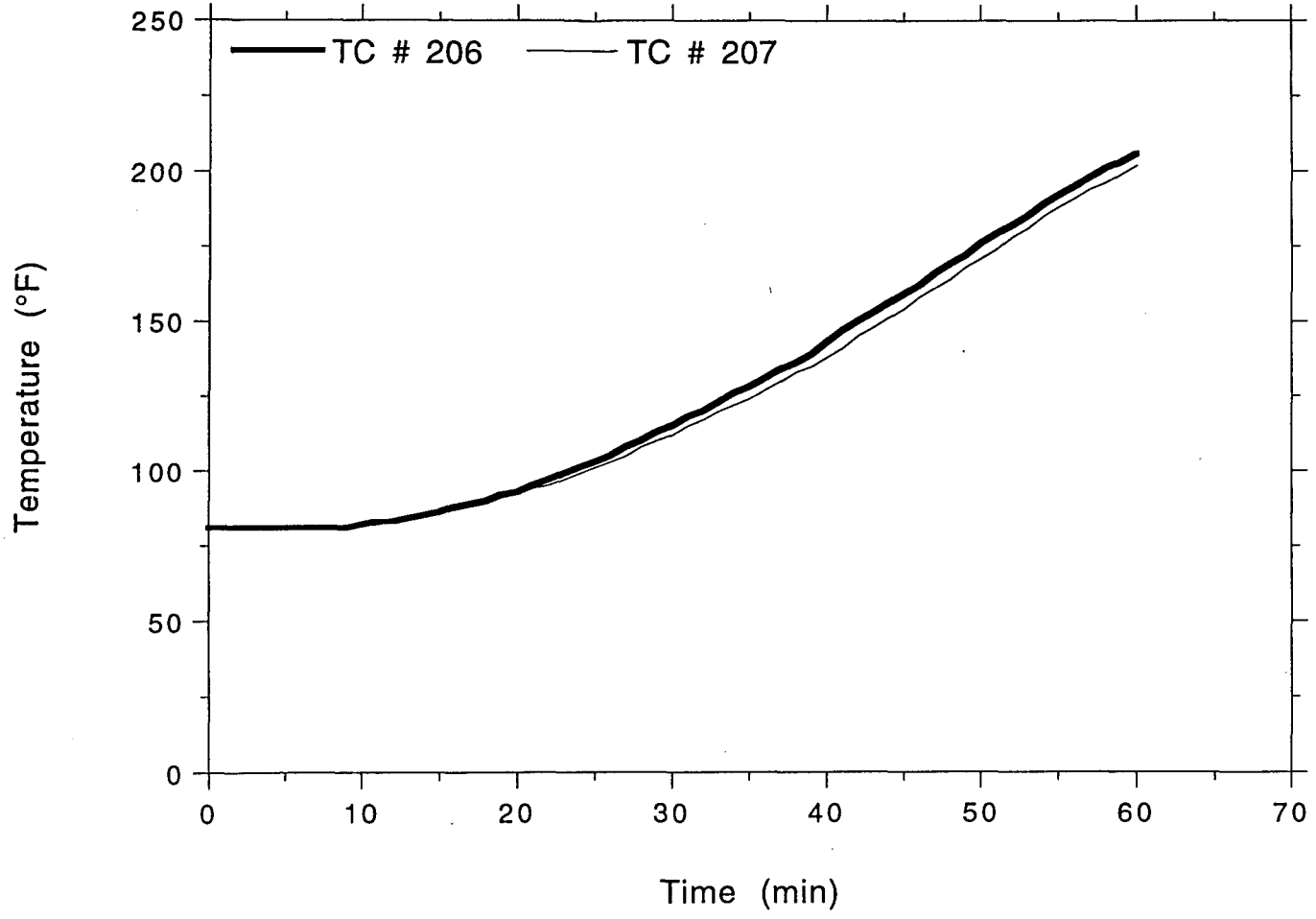
Front Right-Center 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
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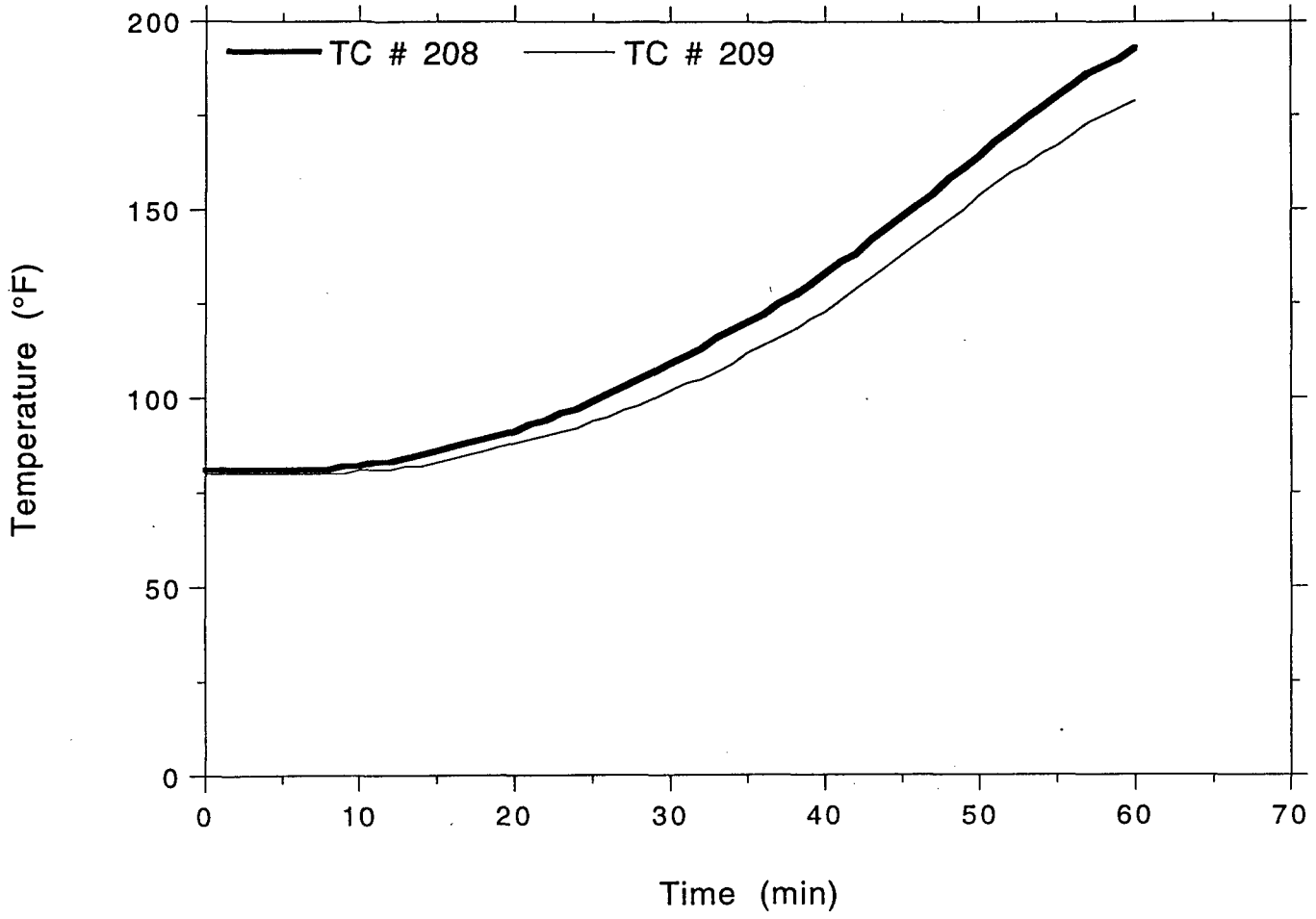
Front Right-Center 4" Al. Conduit



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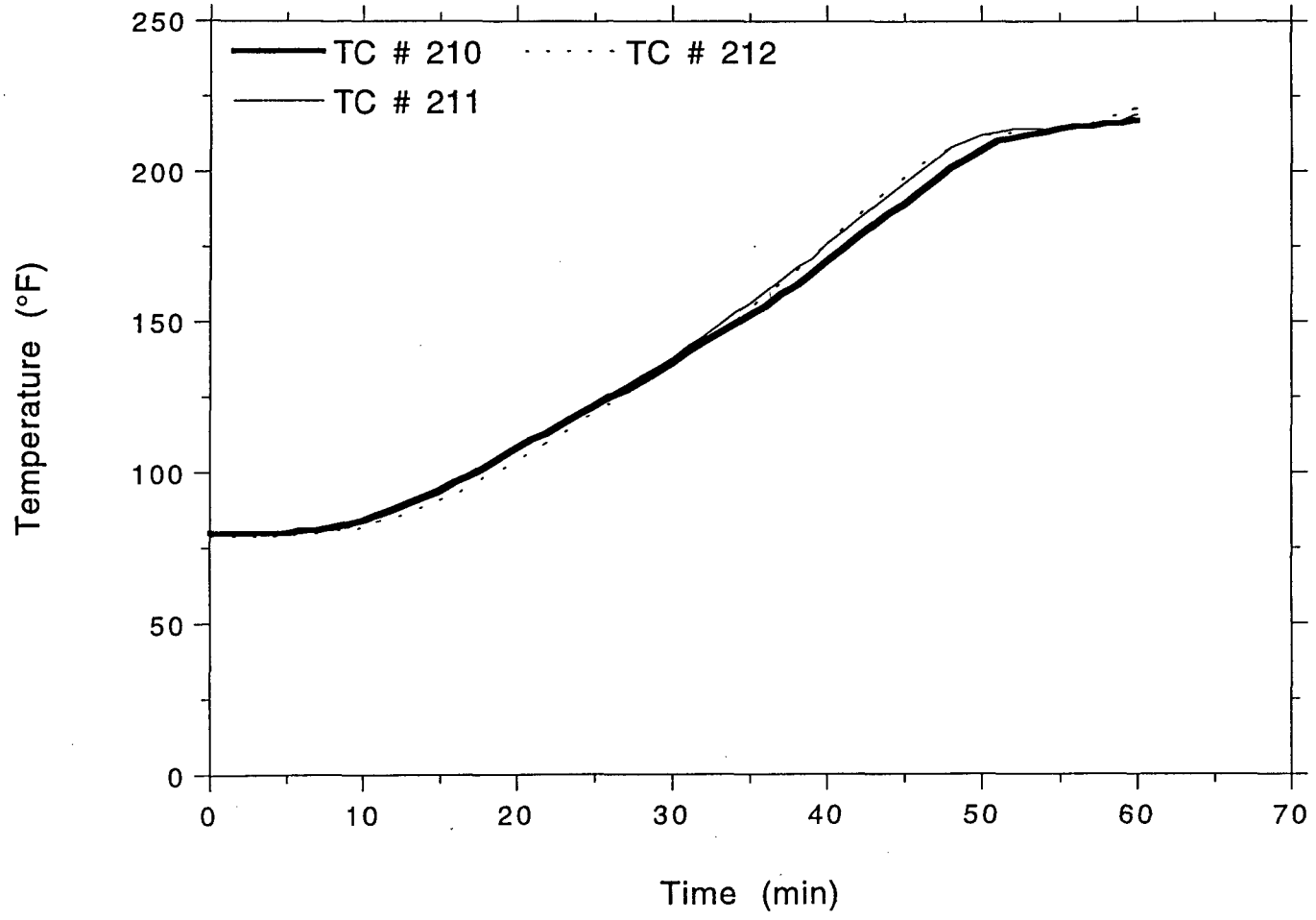
Front Right 4" Al. Conduit



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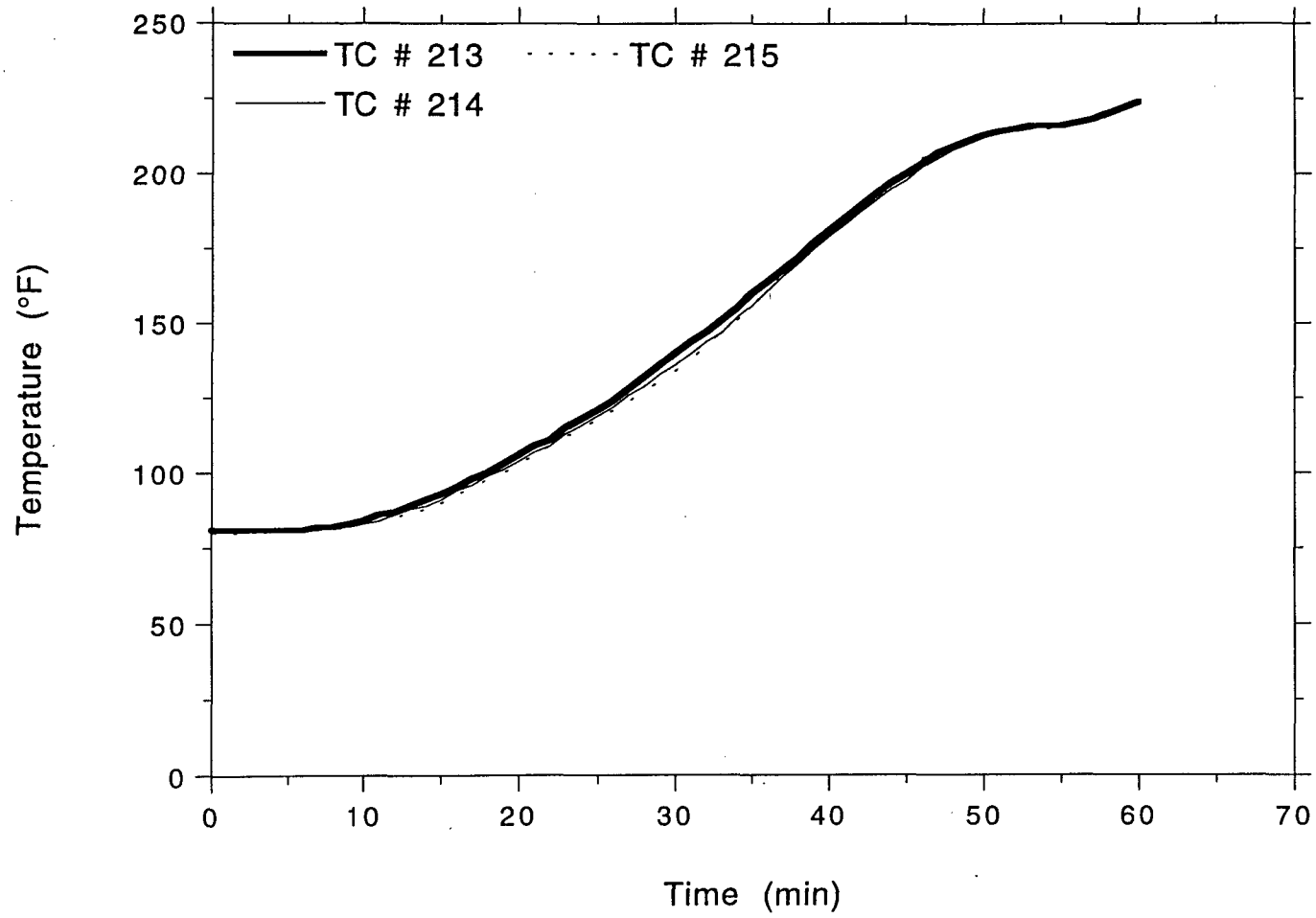

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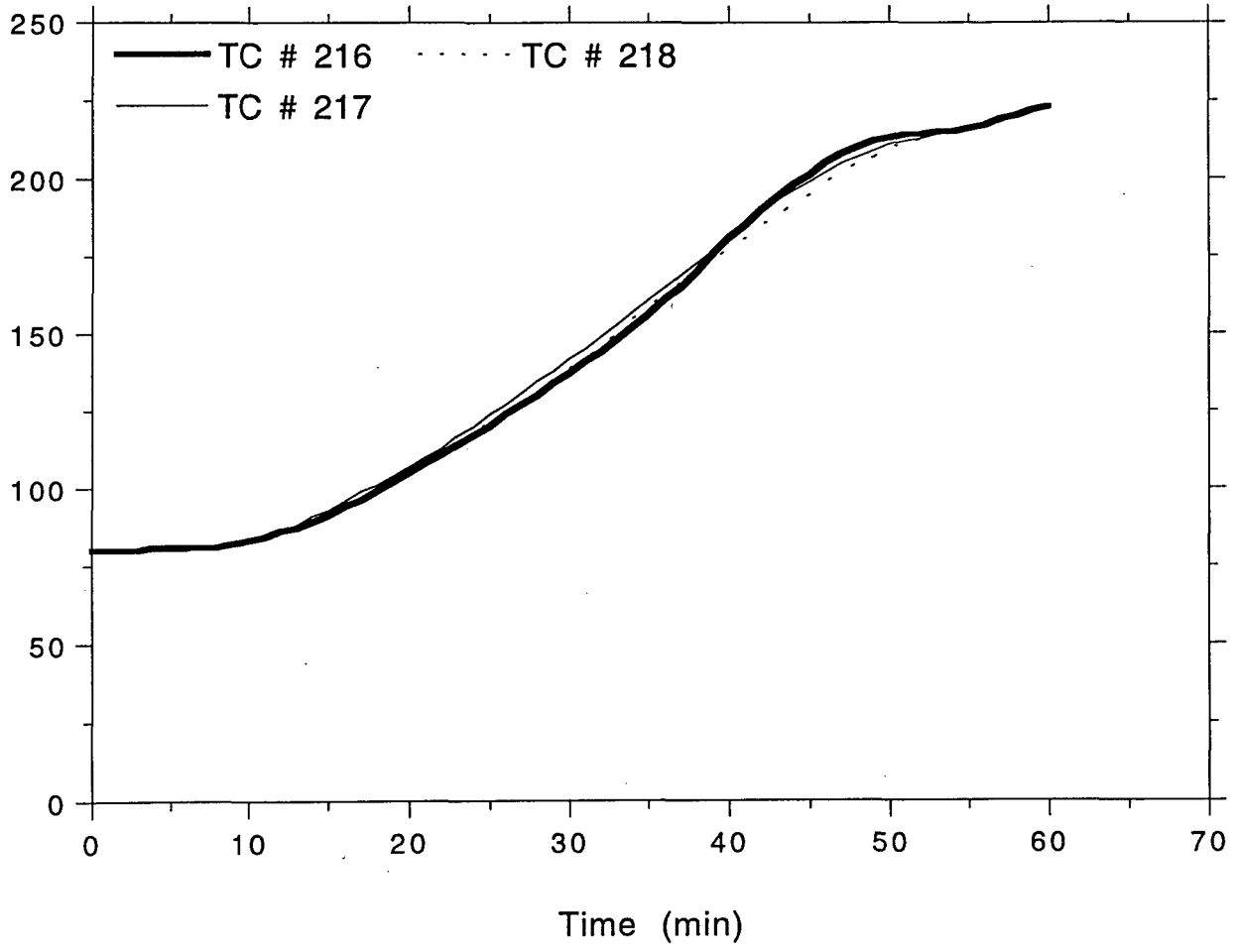

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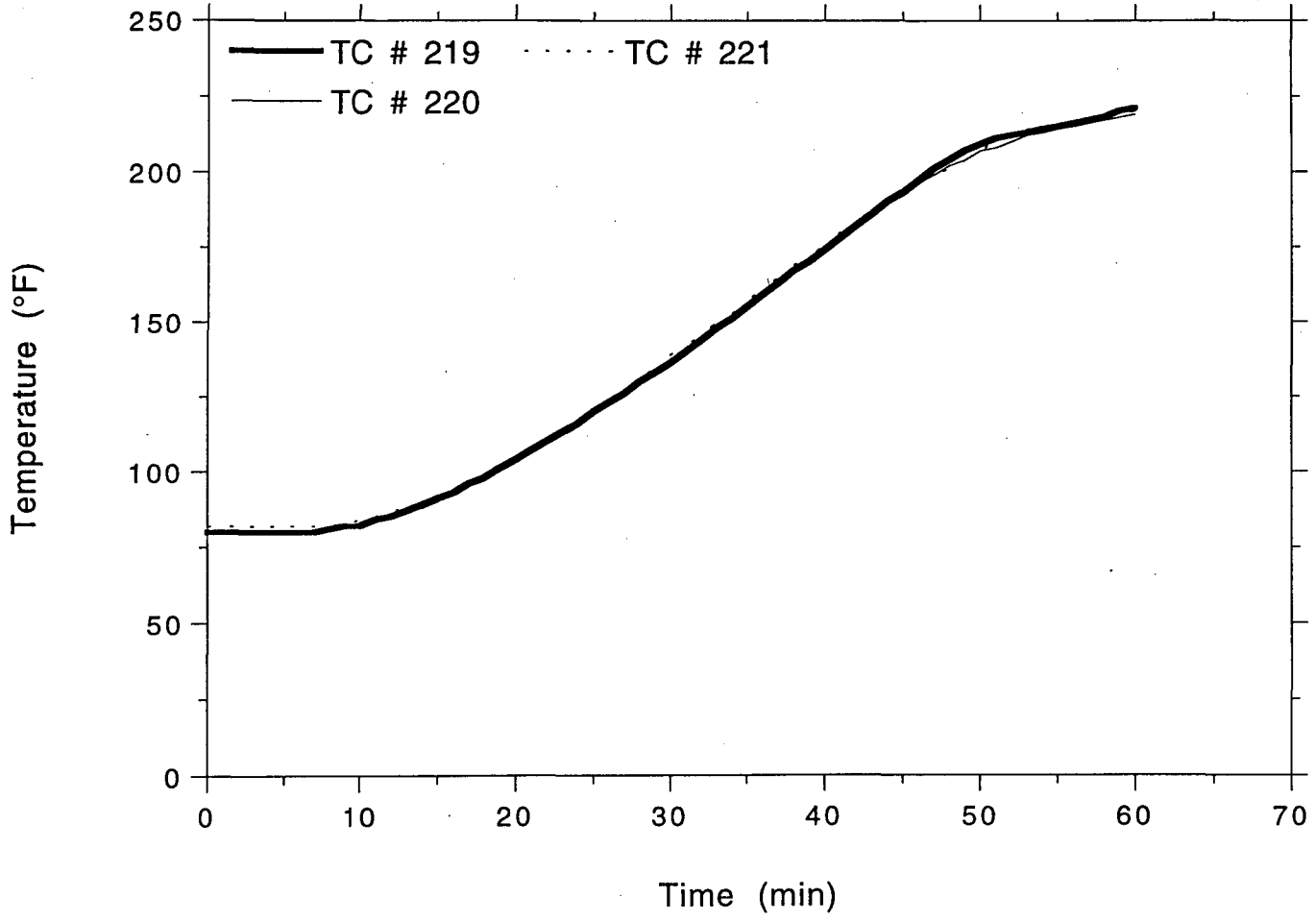
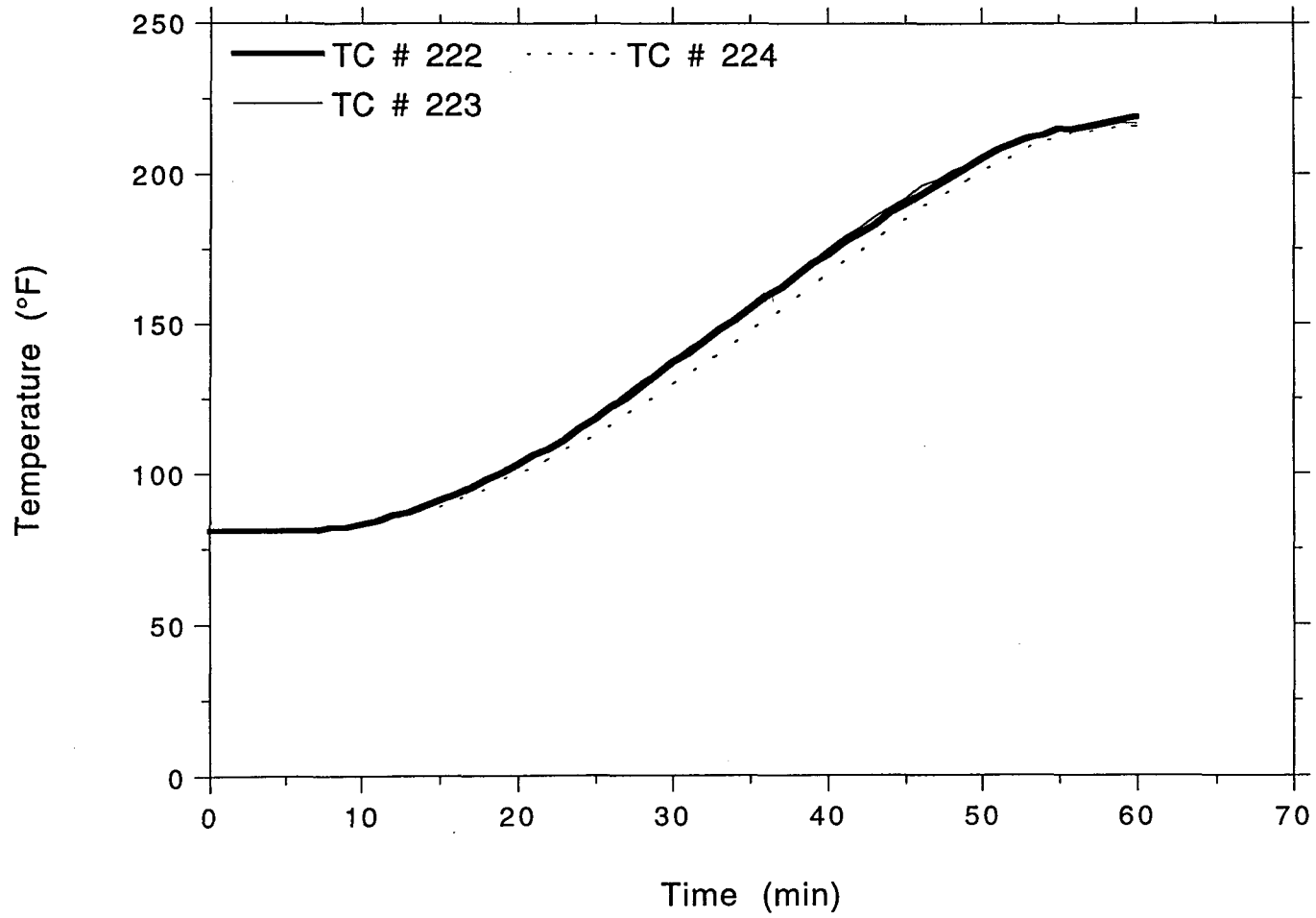


OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 4" Al. Conduit



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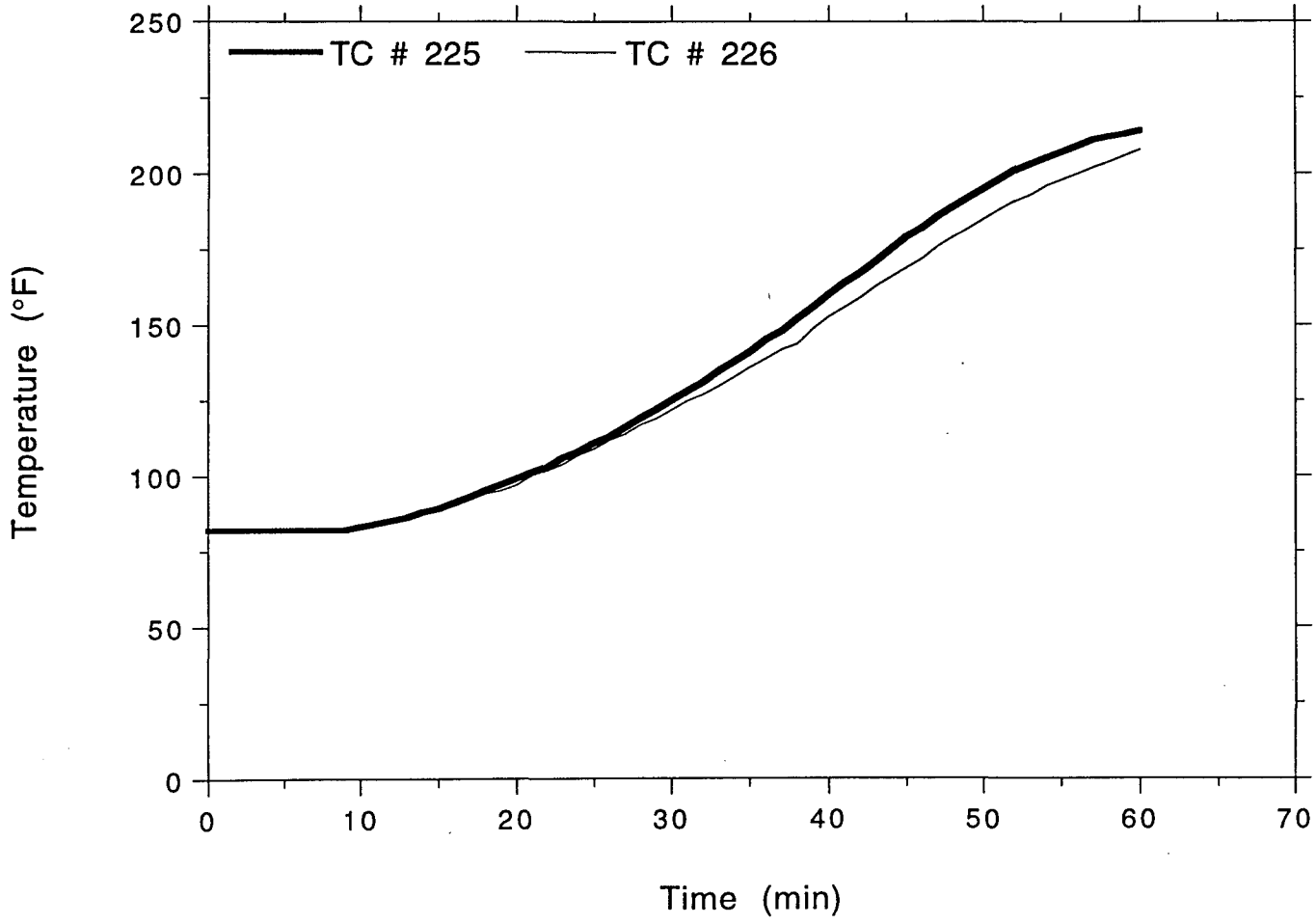

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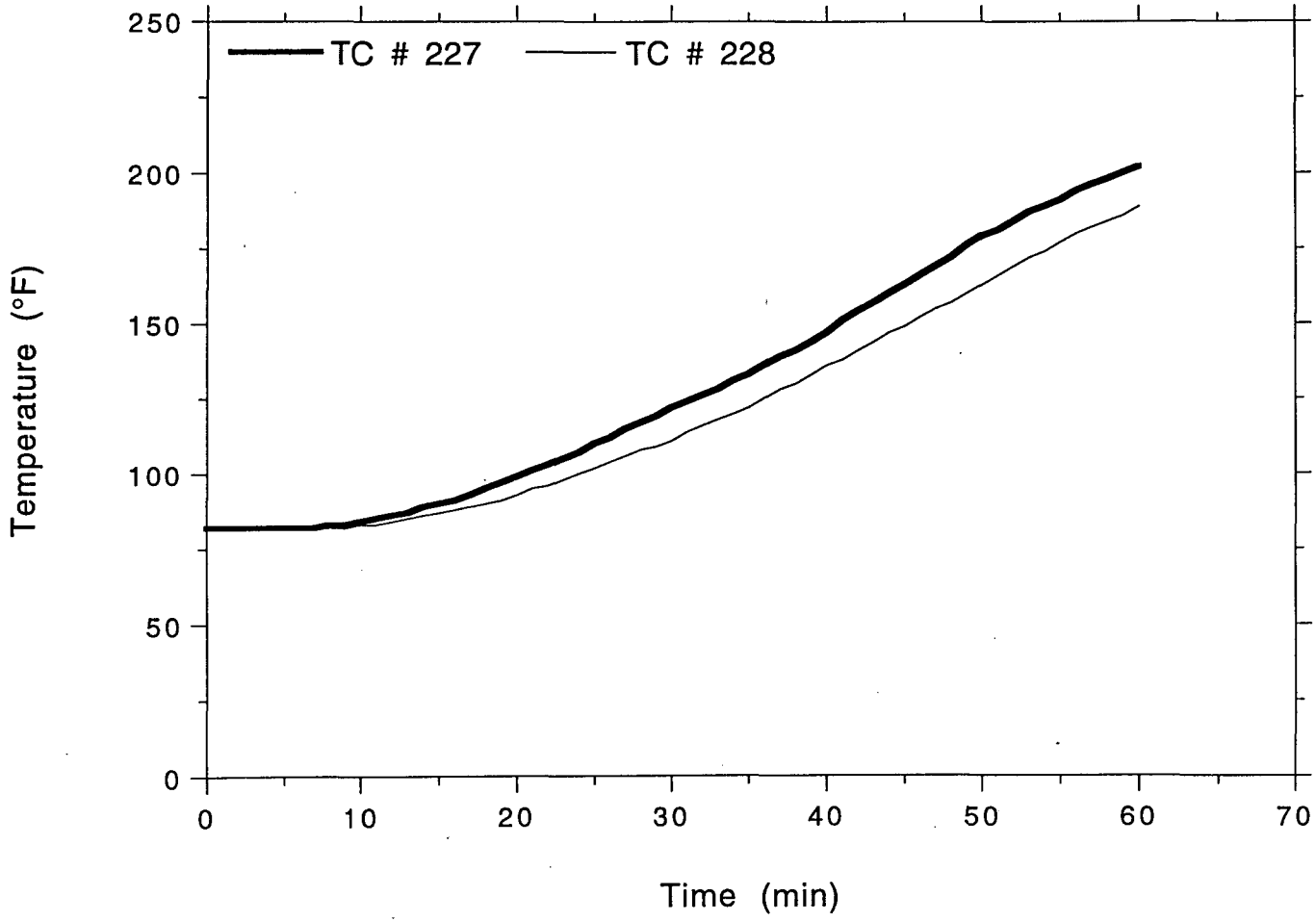

OMEGA POINT LABORATORIES

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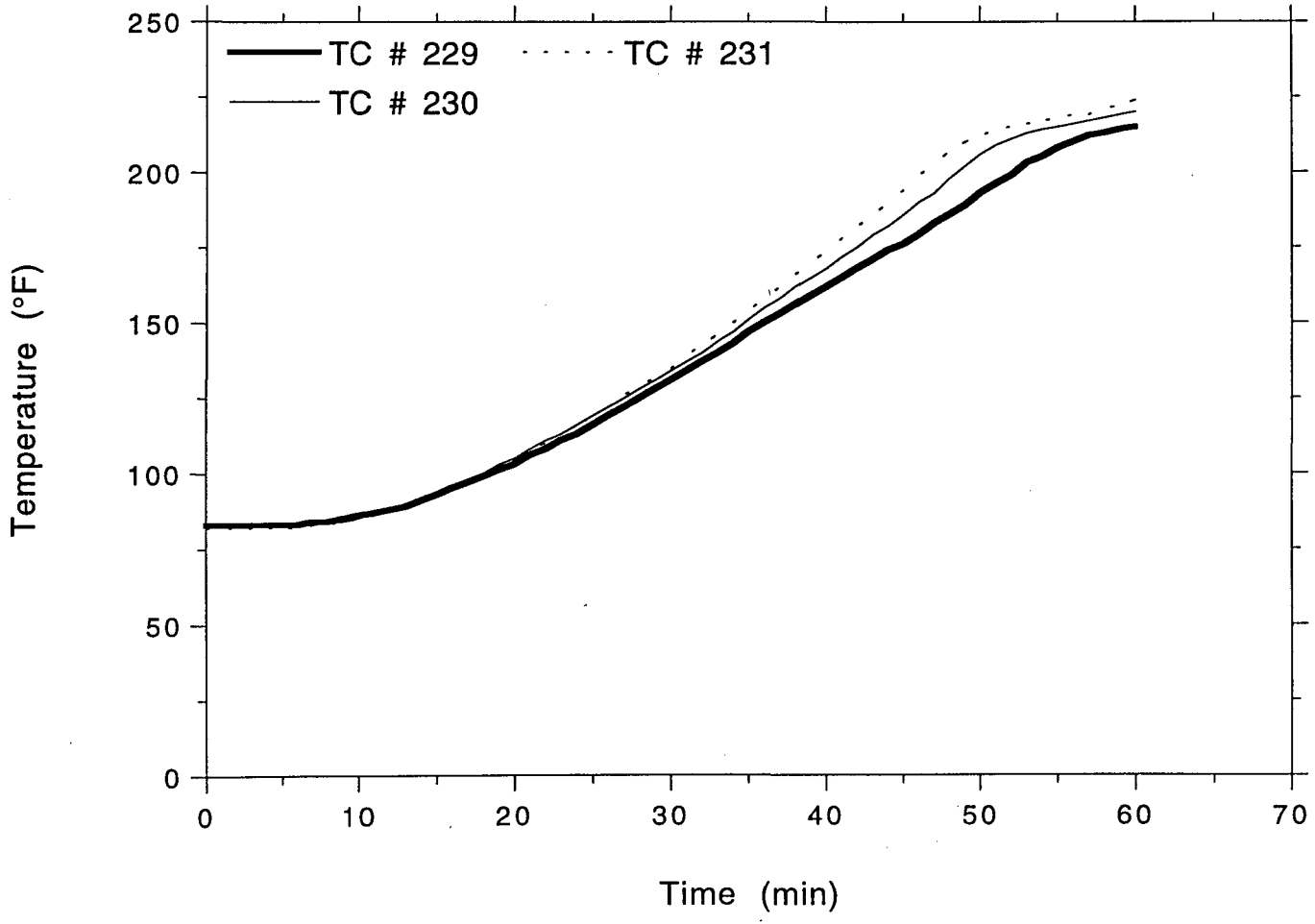
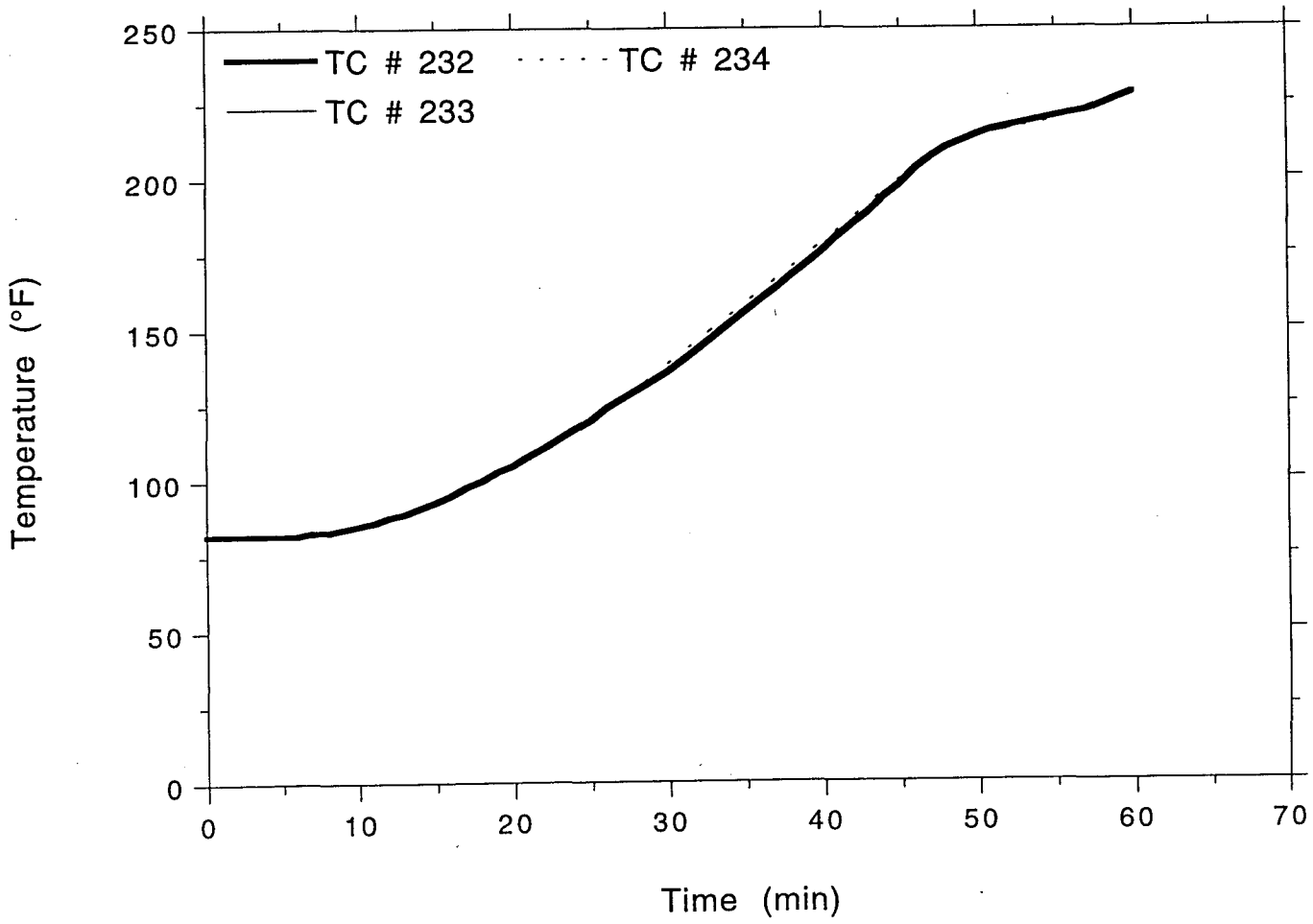
Rear Left 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
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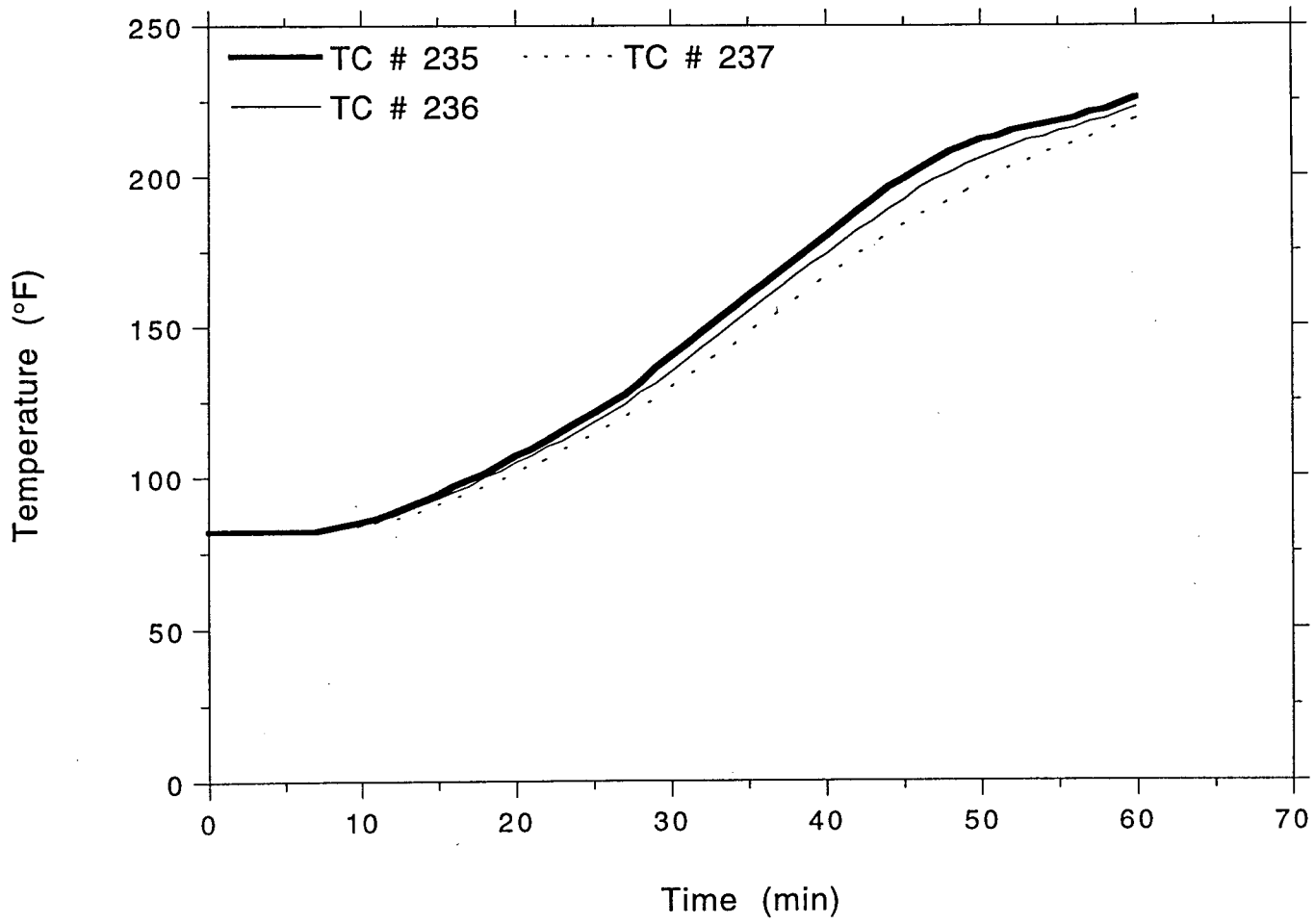
Rear Left 4" Al. Conduit



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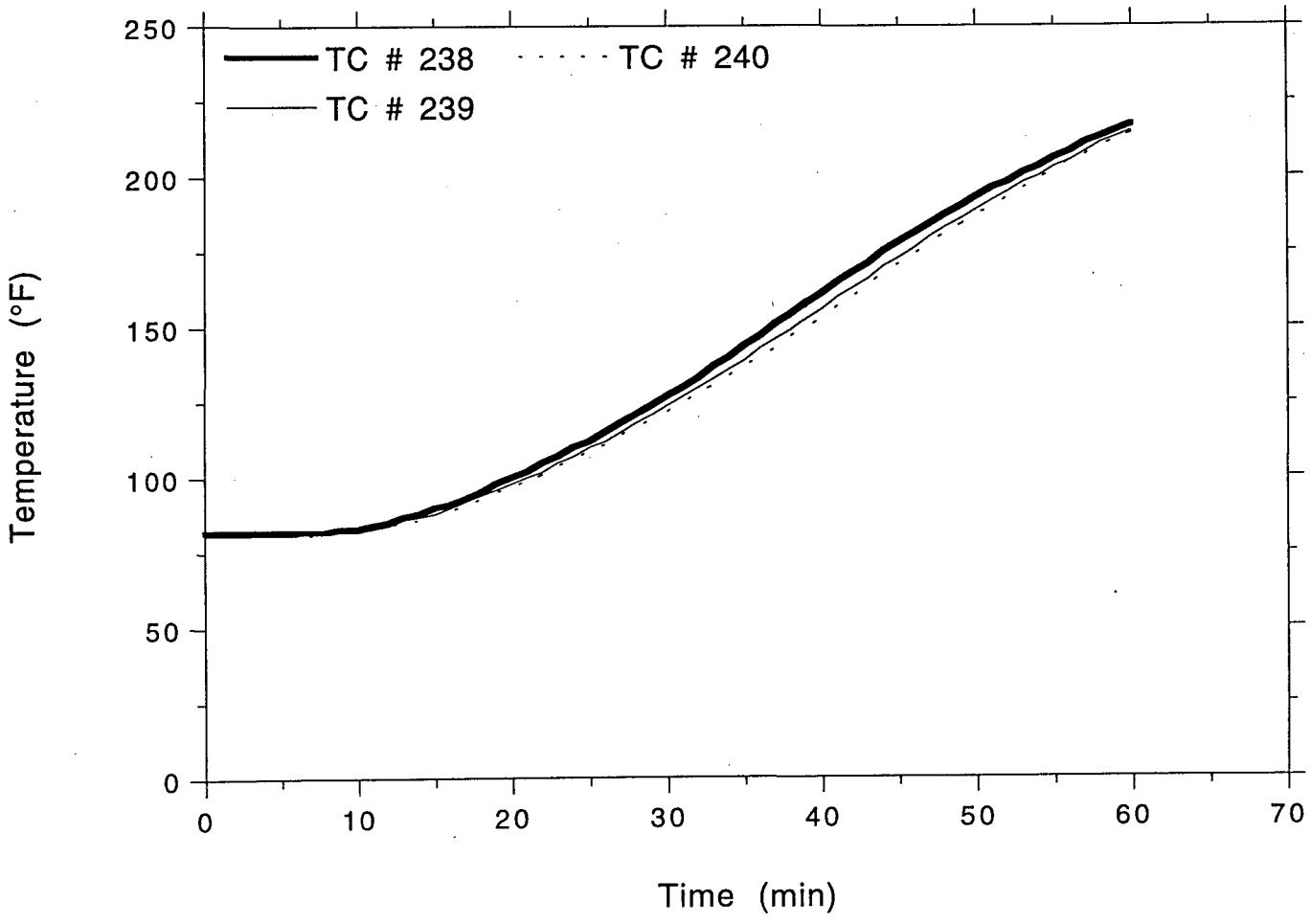

OMEGA POINT LABORATORIES

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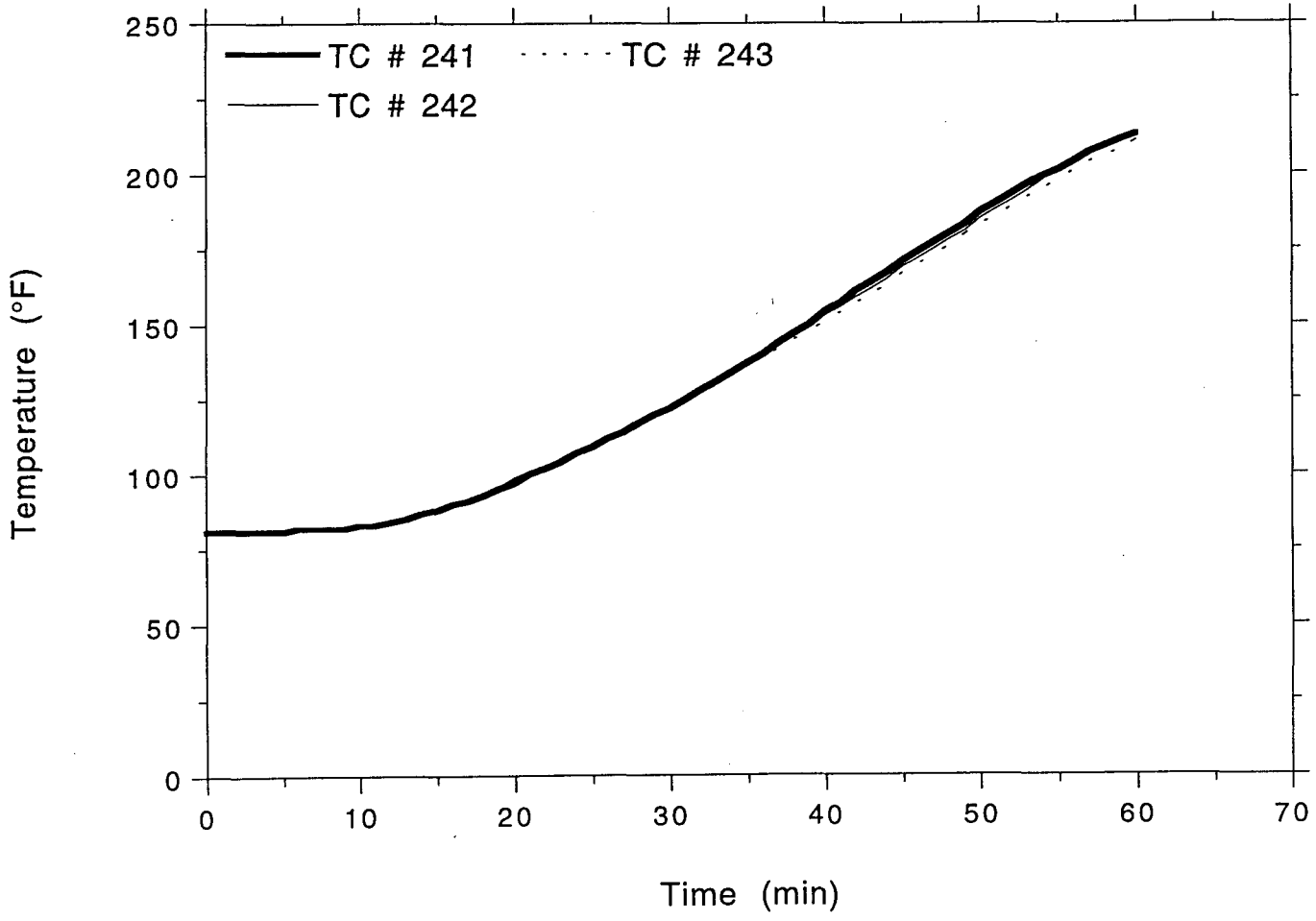

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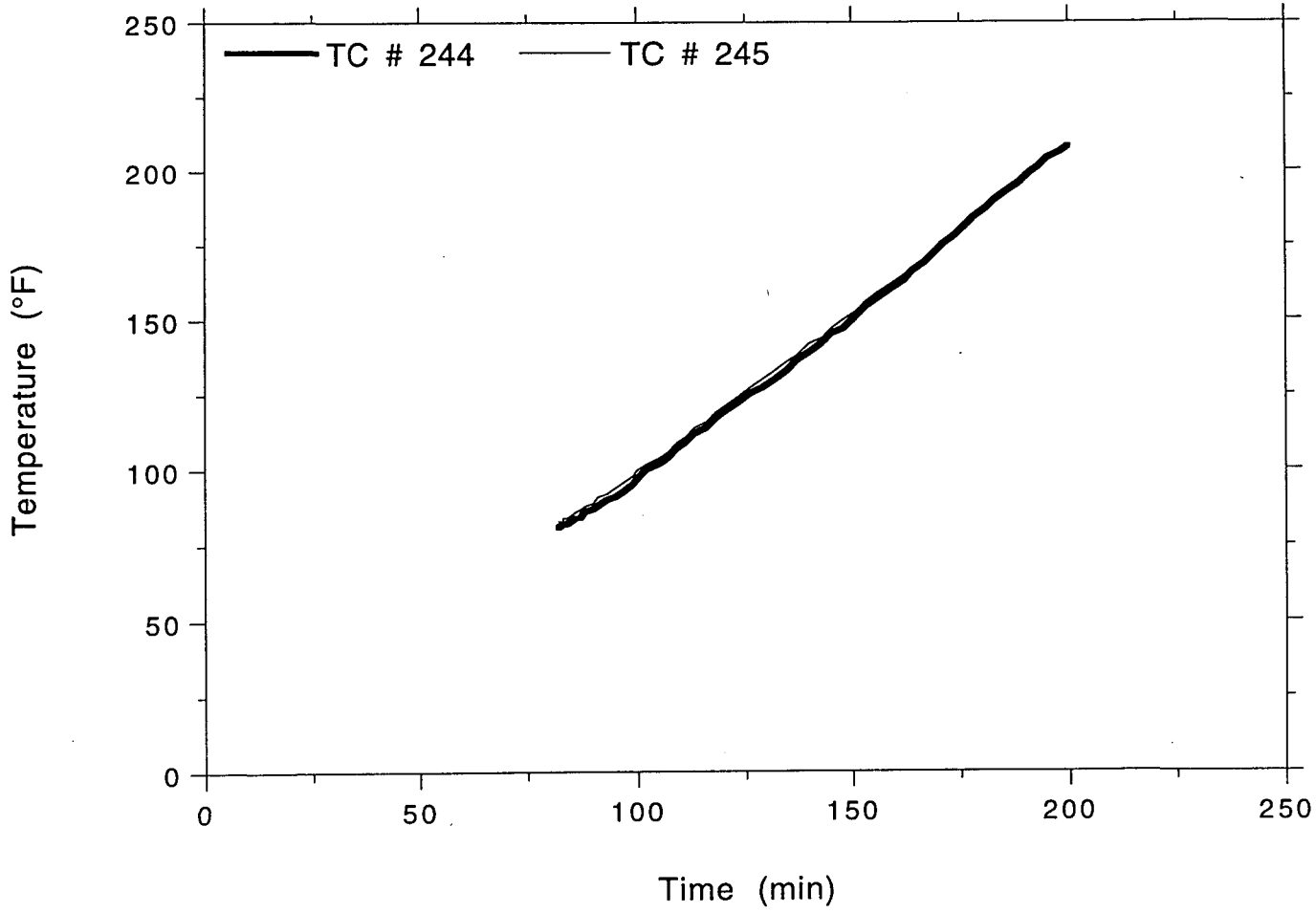

OMEGA POINT LABORATORIES

TSI/TVA
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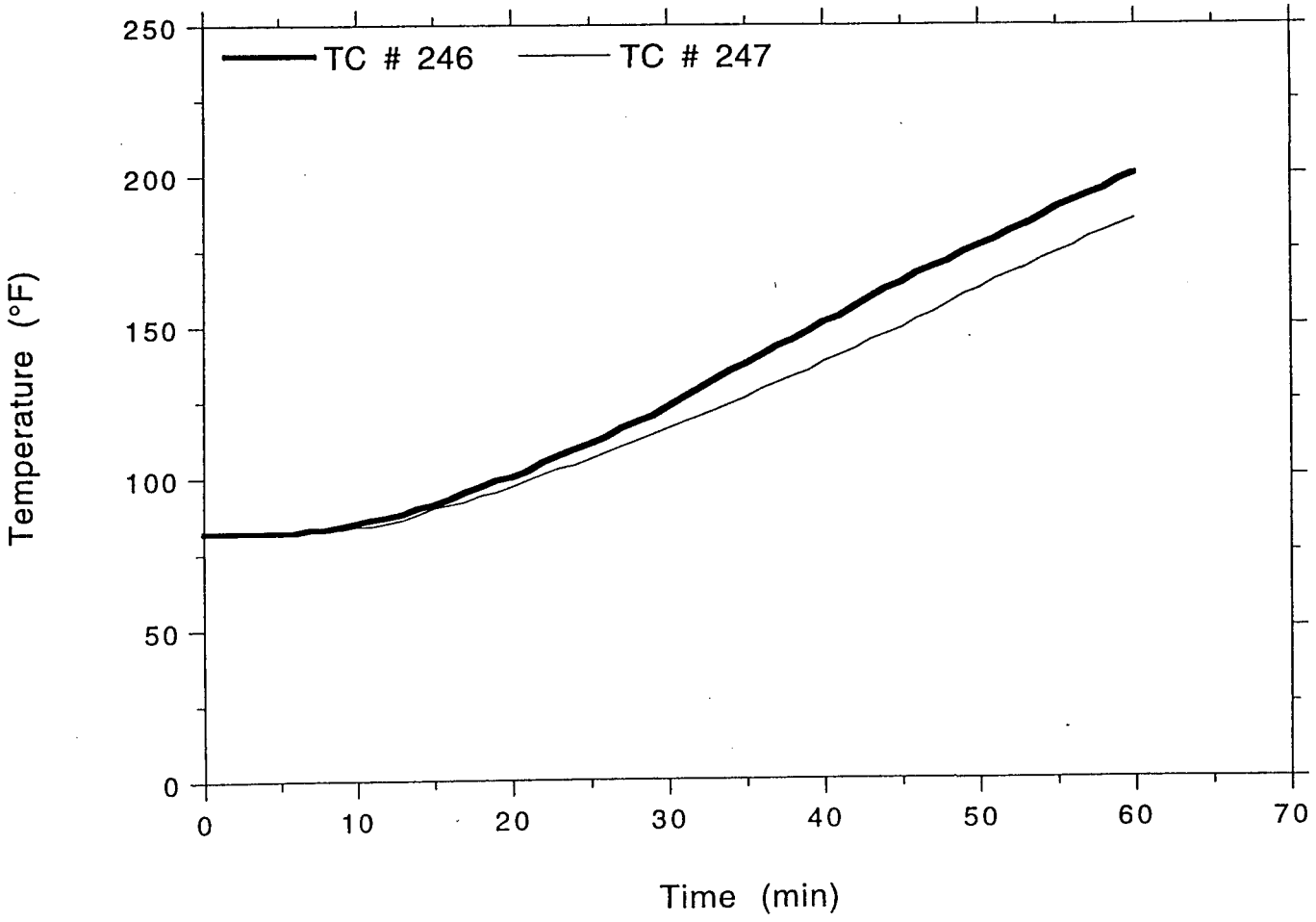
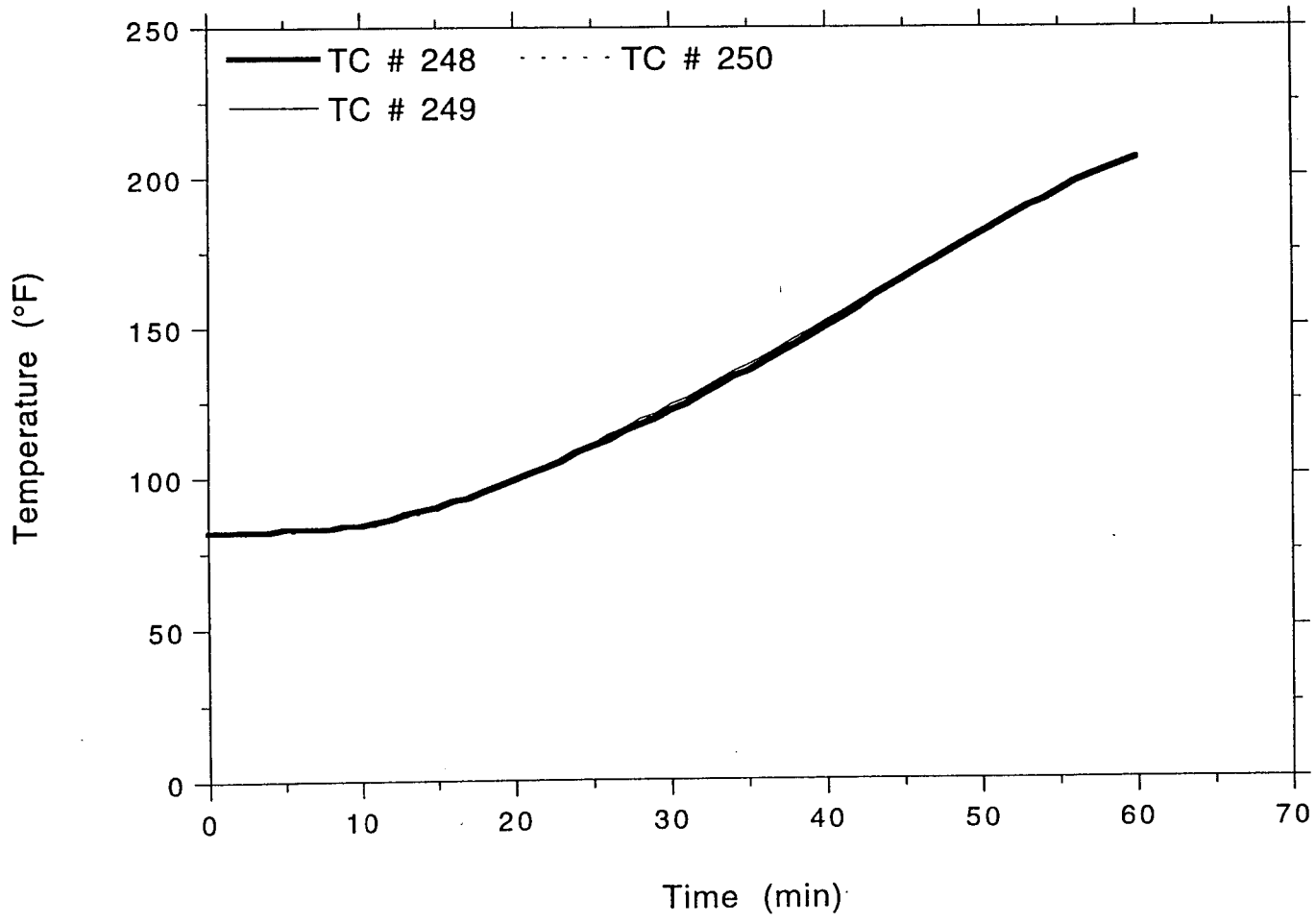
Rear Left 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left-Center 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
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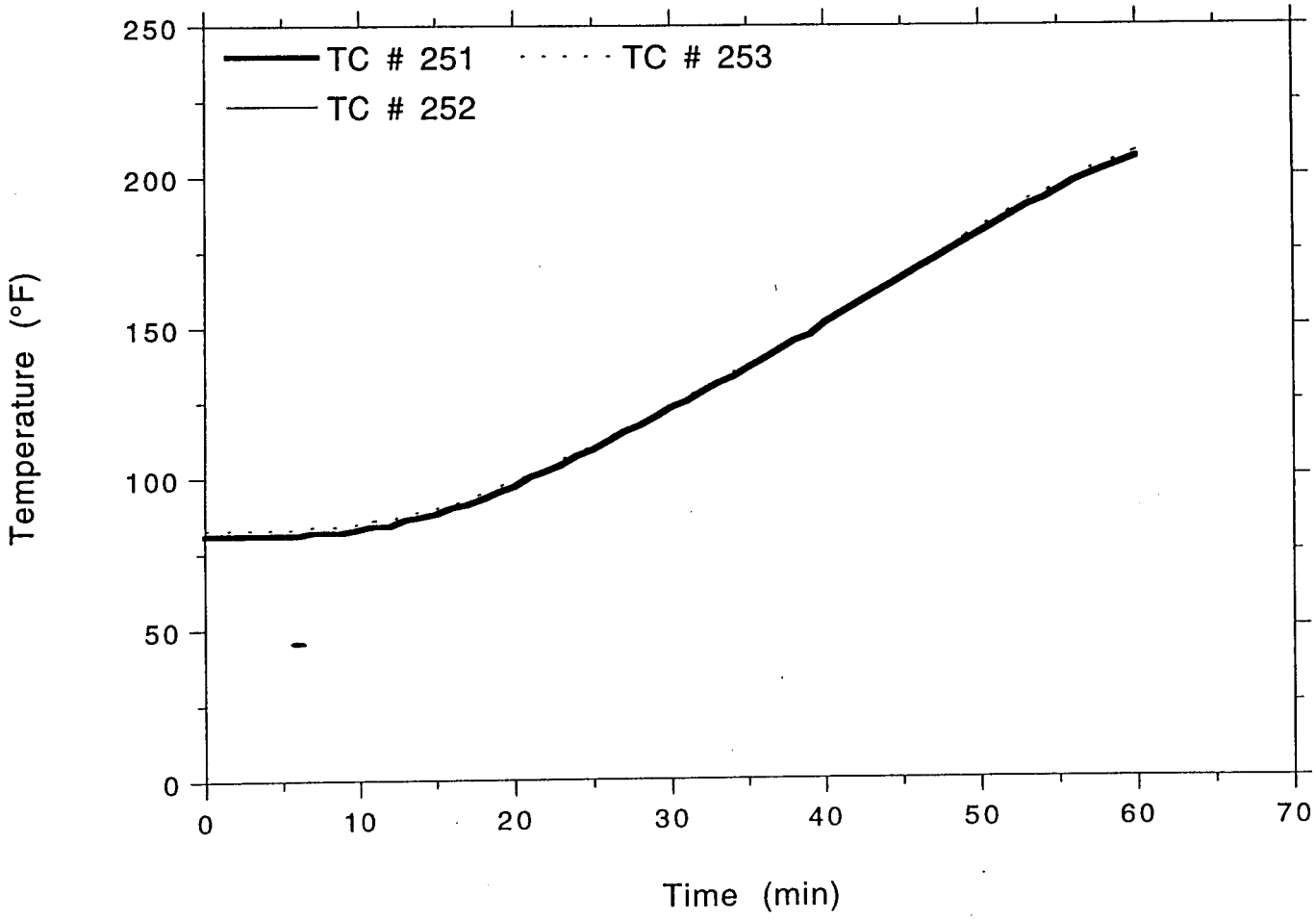
Rear Left-Center 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
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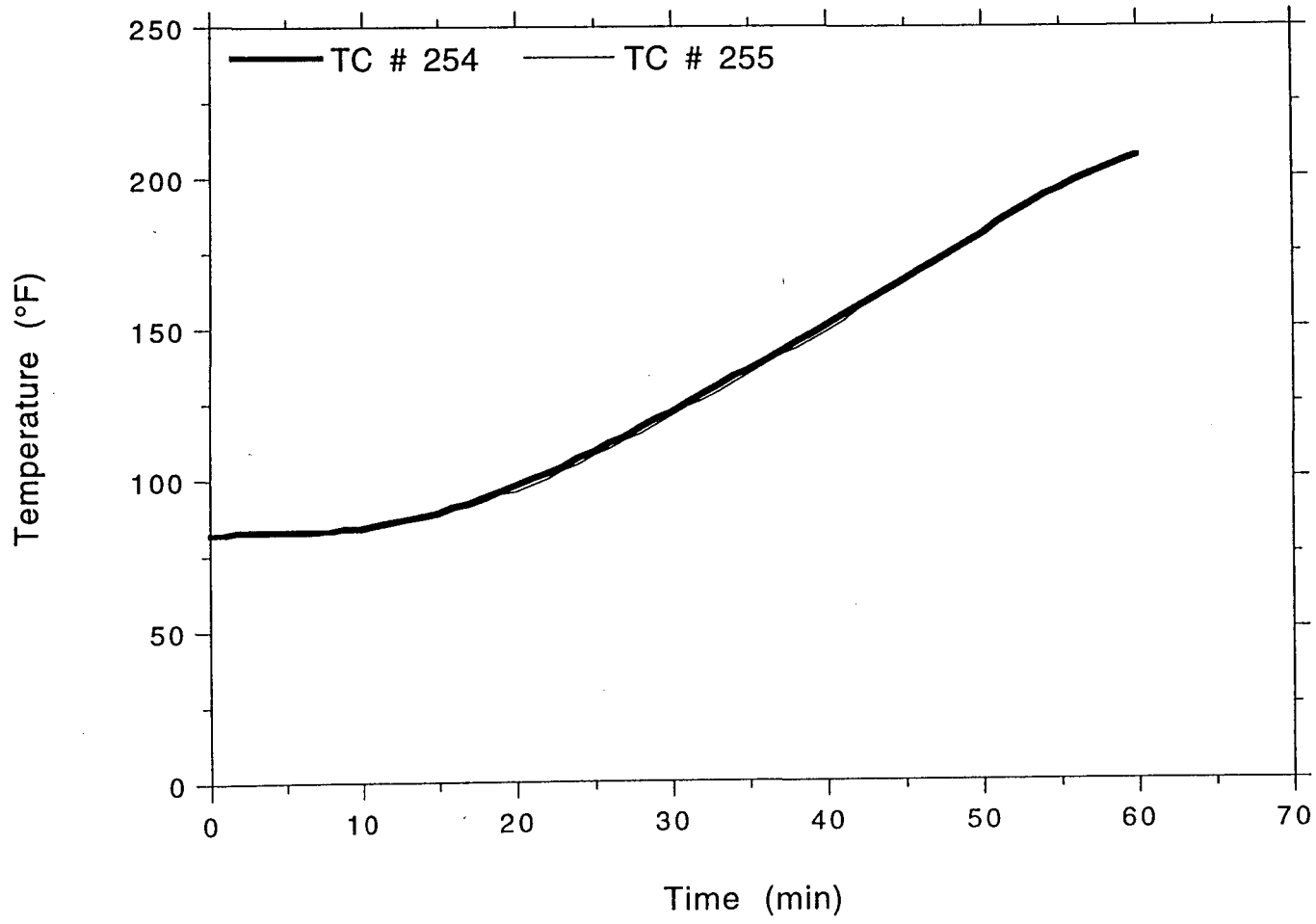
Rear Left-Center 4" Al. Conduit



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TSI/TVA
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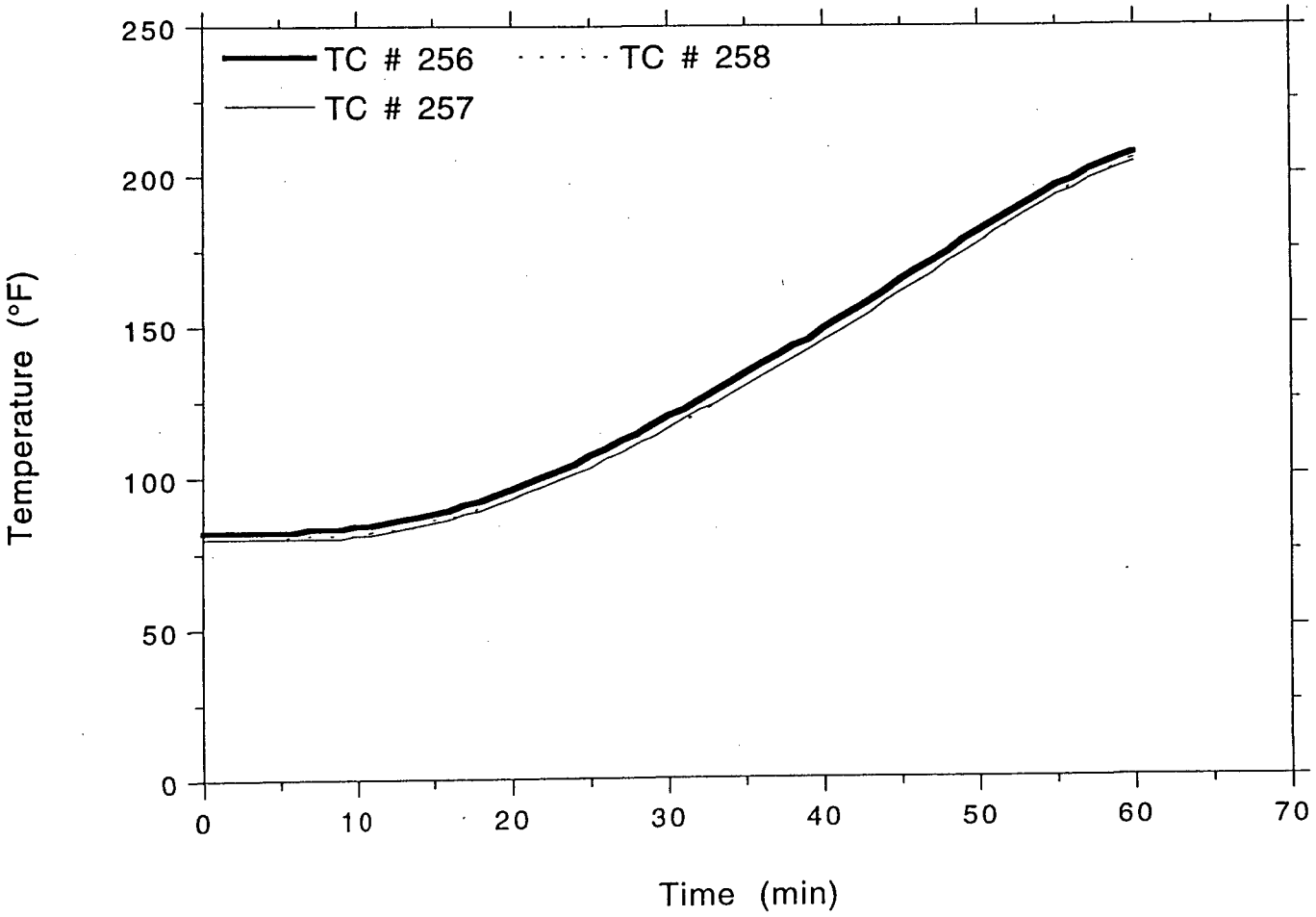
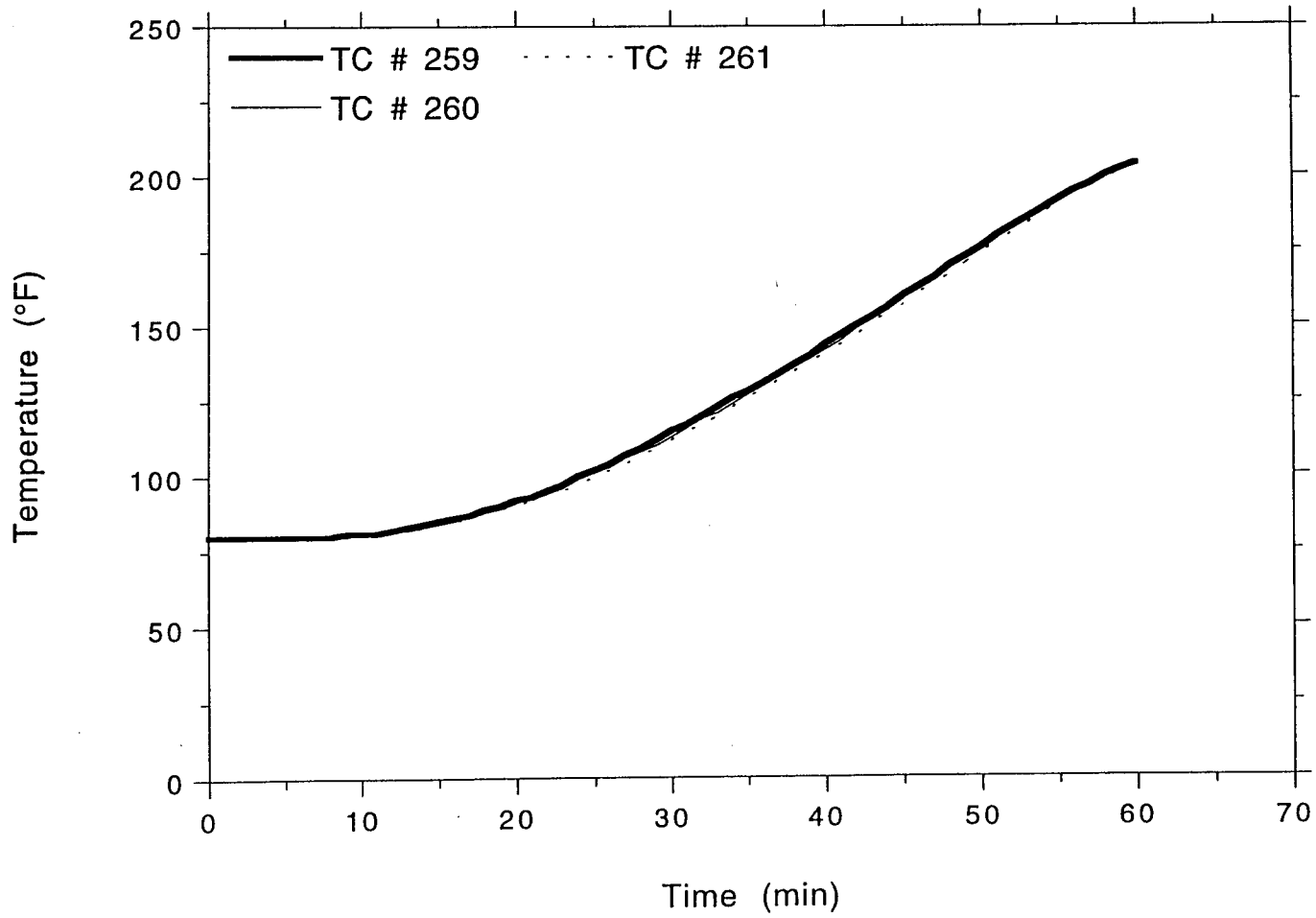
Rear Left-Center 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left-Center 4" Al. Conduit



OMEGA POINT LABORATORIES

TSI/TVA
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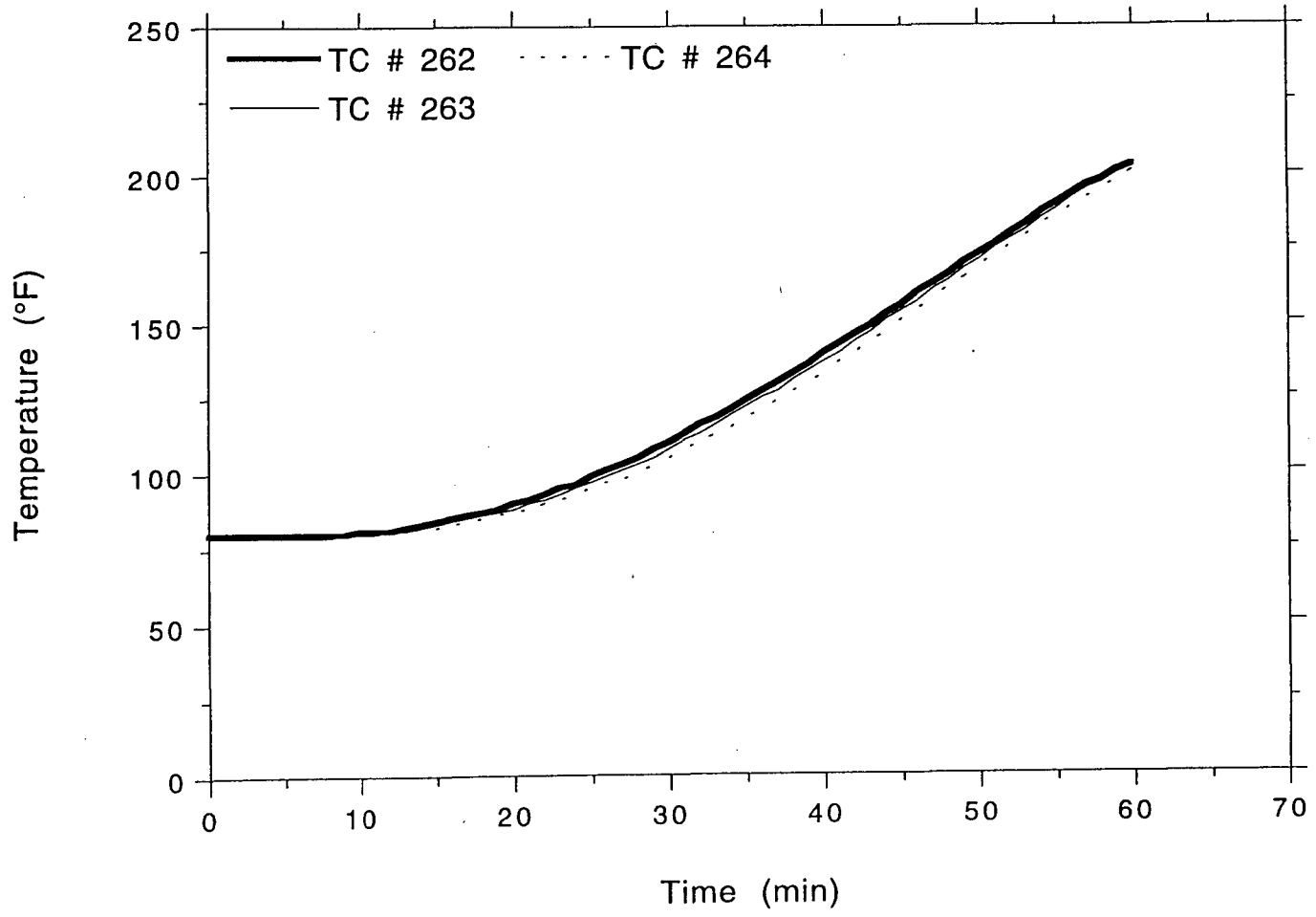
Rear Left-Center 4" Al. Conduit



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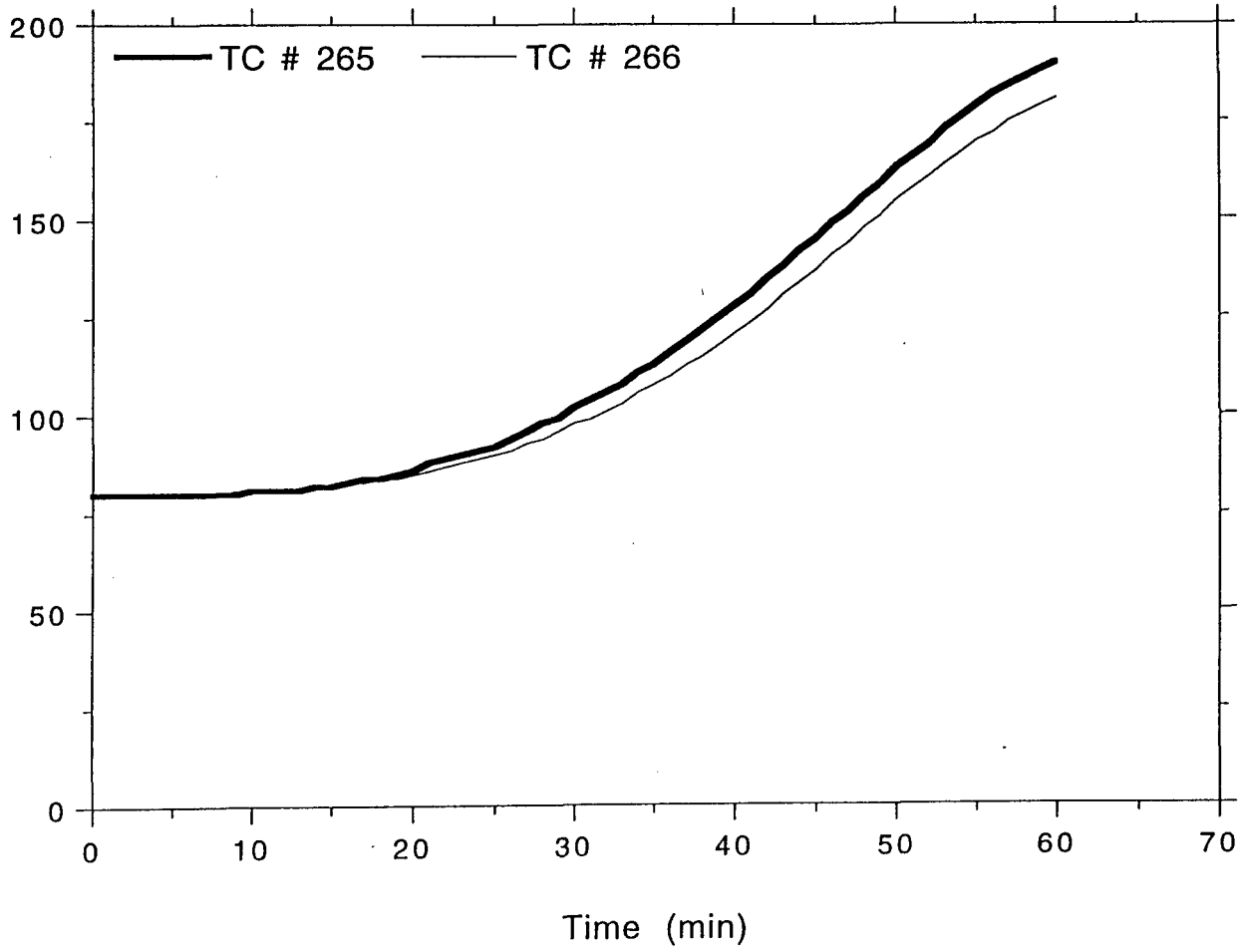

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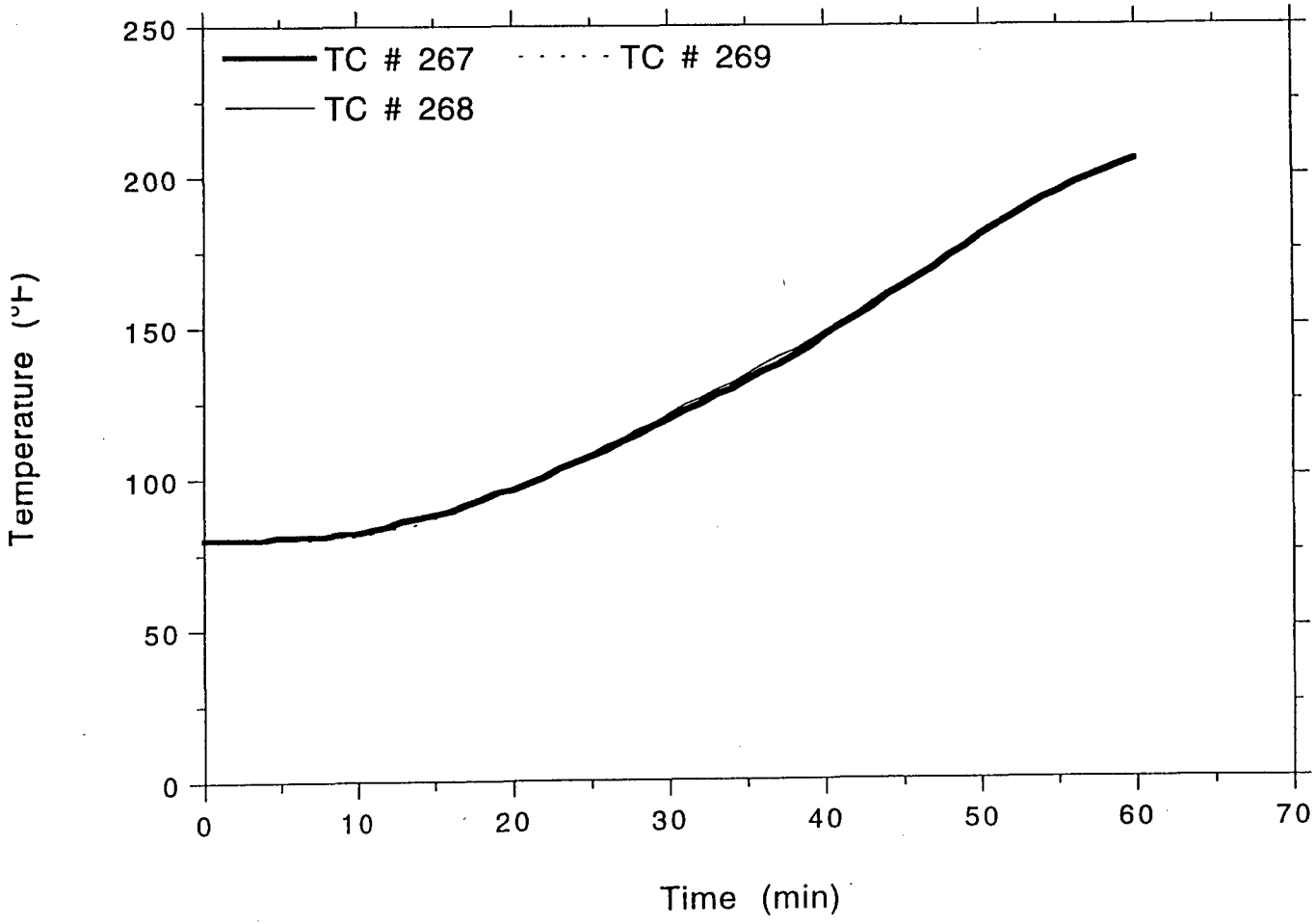

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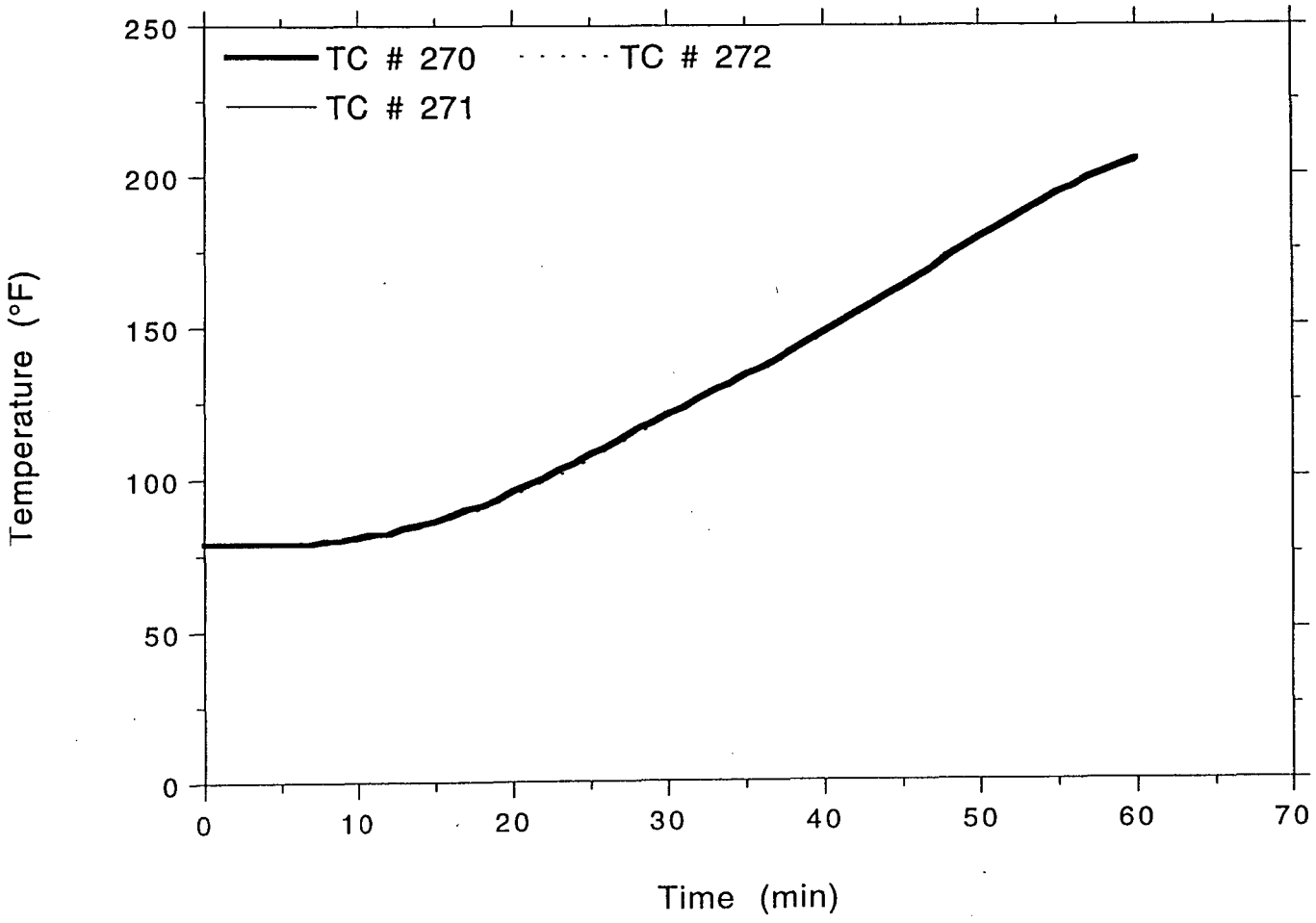
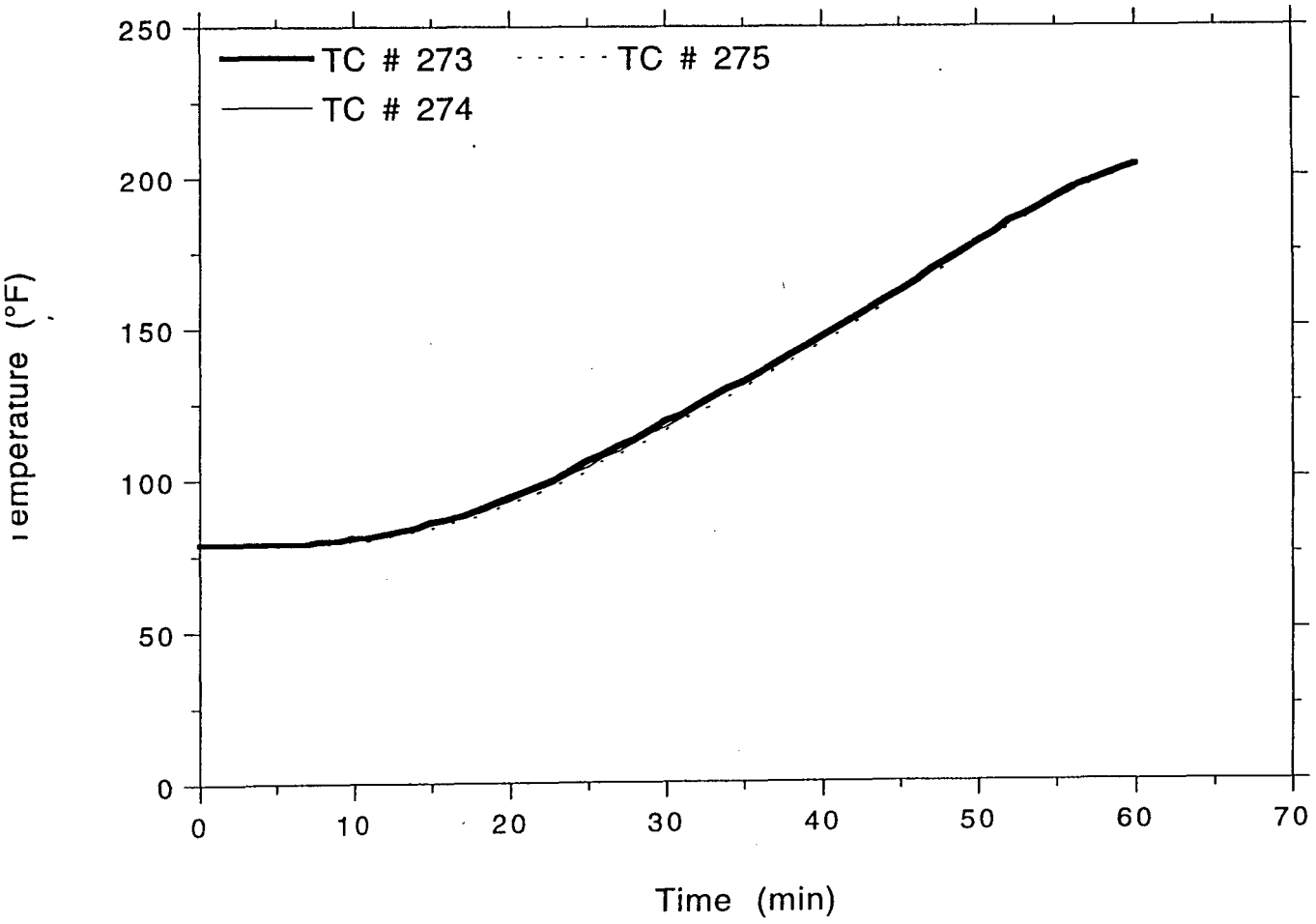
Project No. 11960-97259
Rear Right-Center 4" Al. Conduit



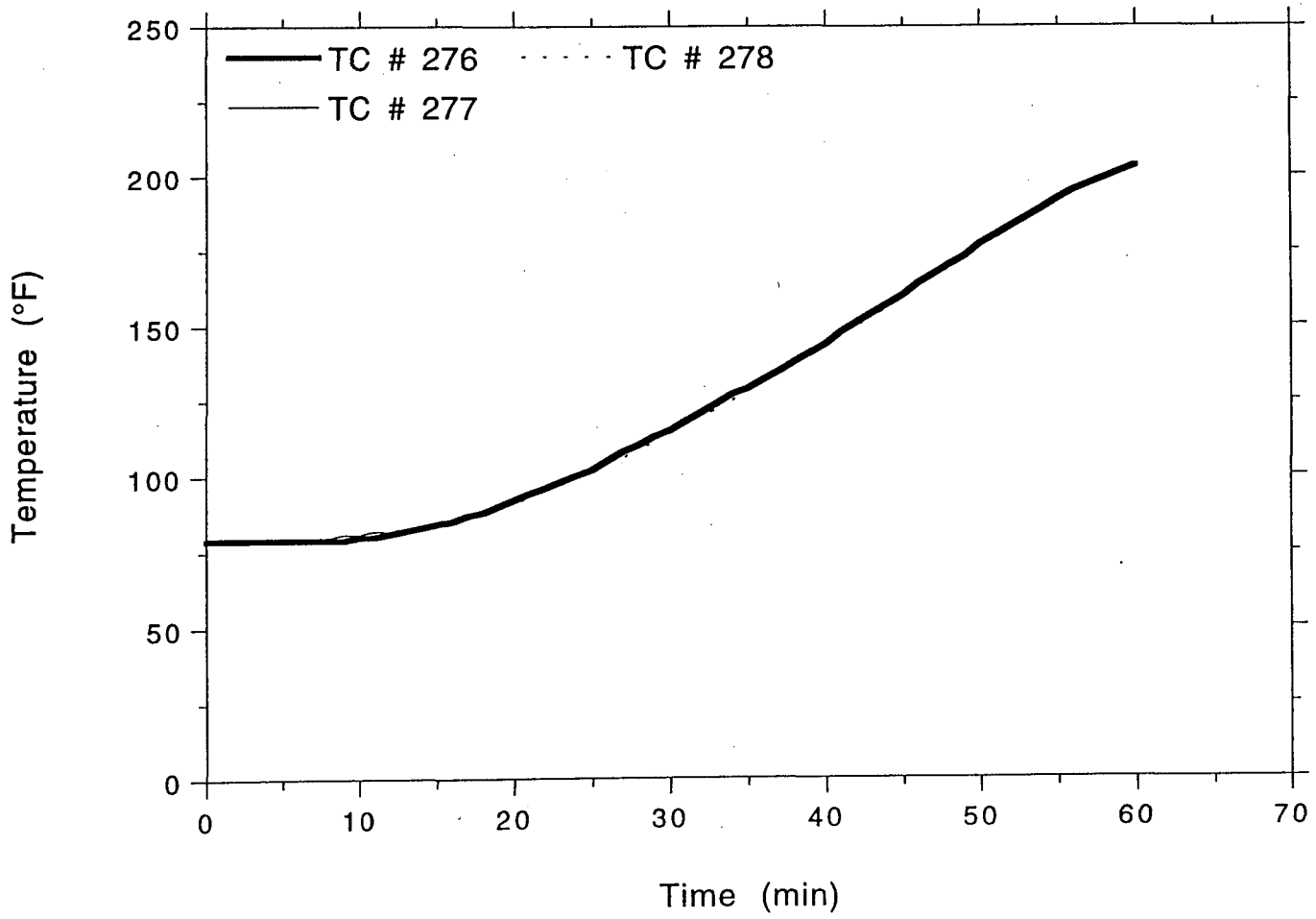
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right-Center 4" Al. Conduit



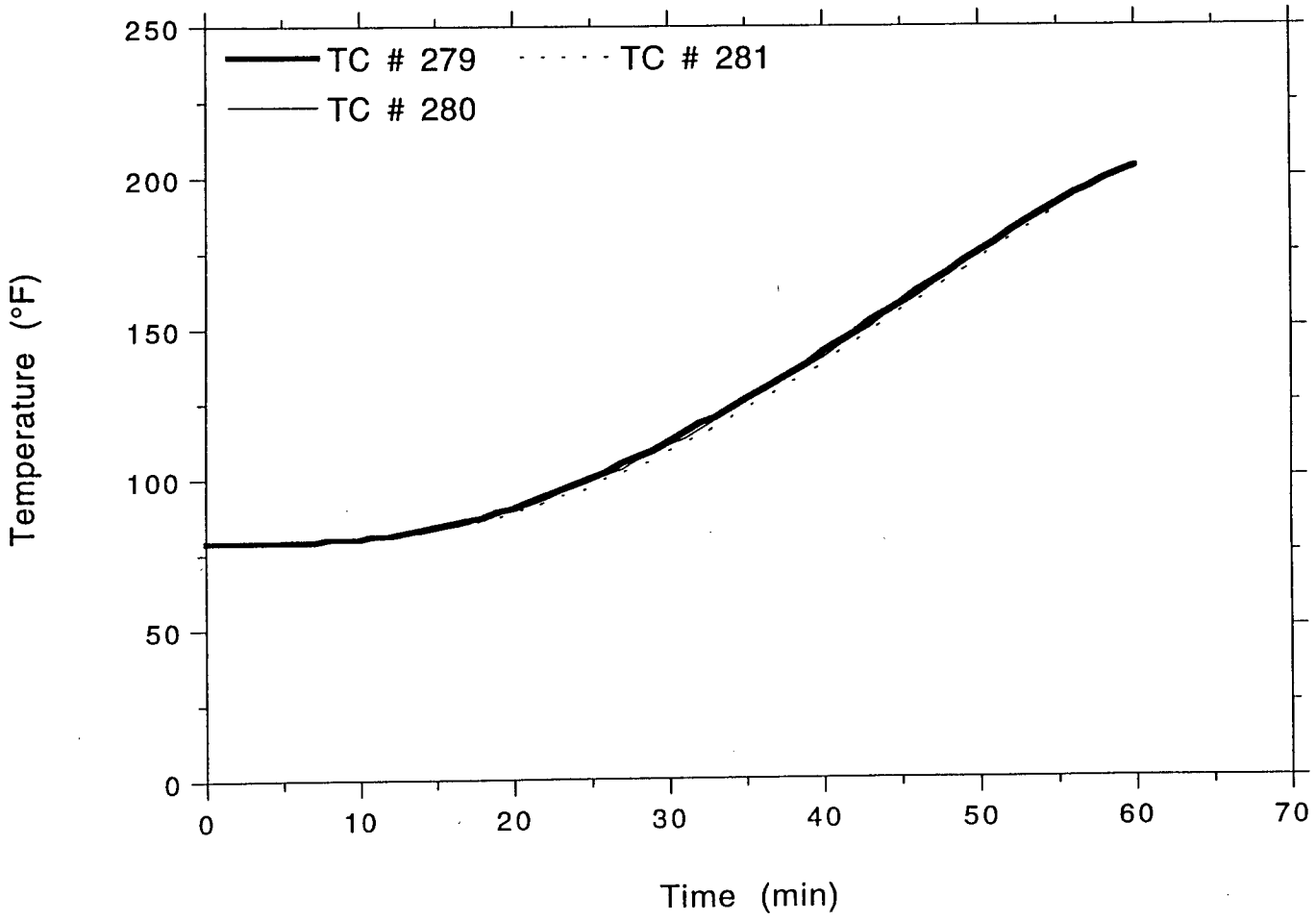
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right-Center 4" Al. Conduit



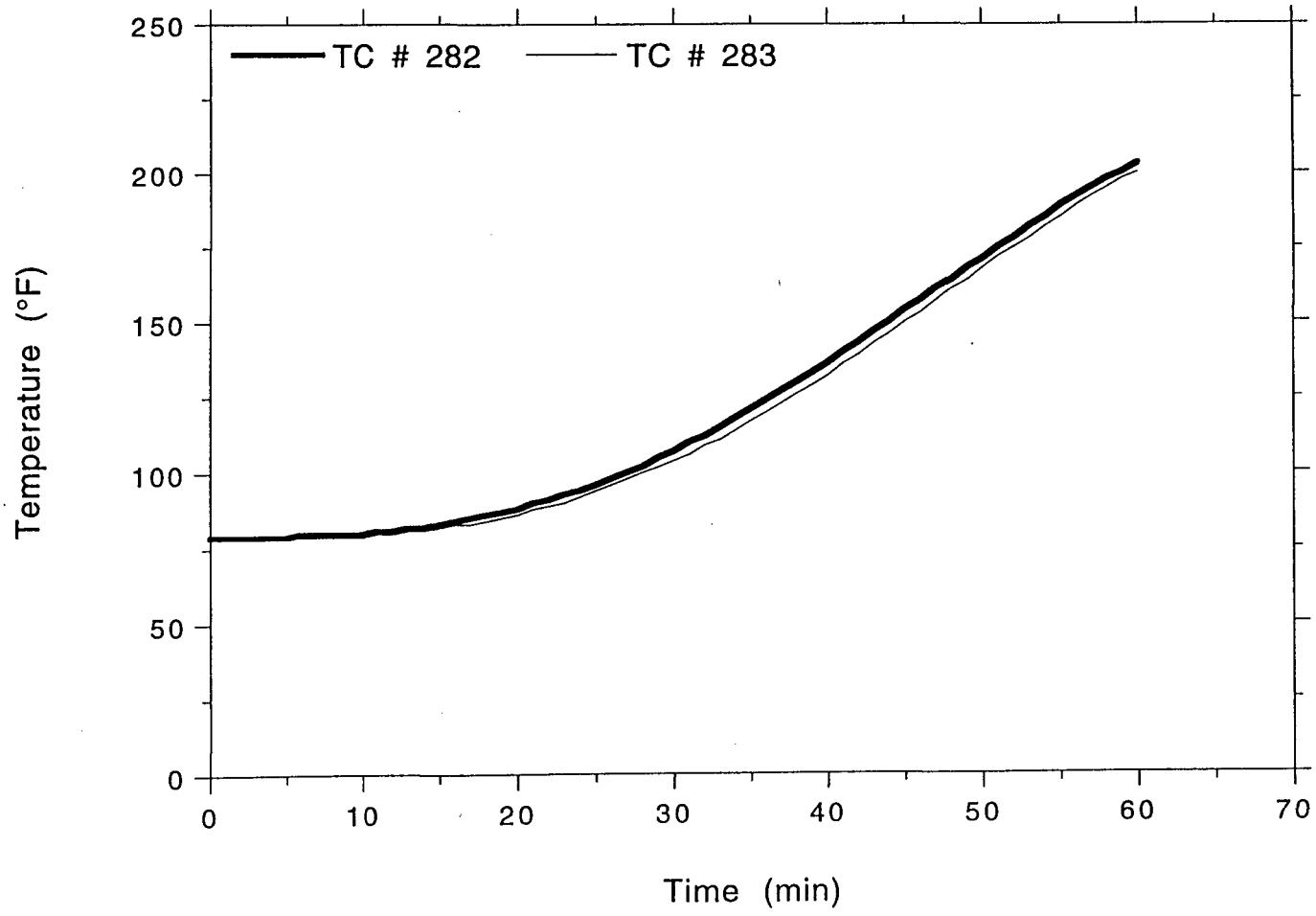
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right-Center 4" Al. Conduit



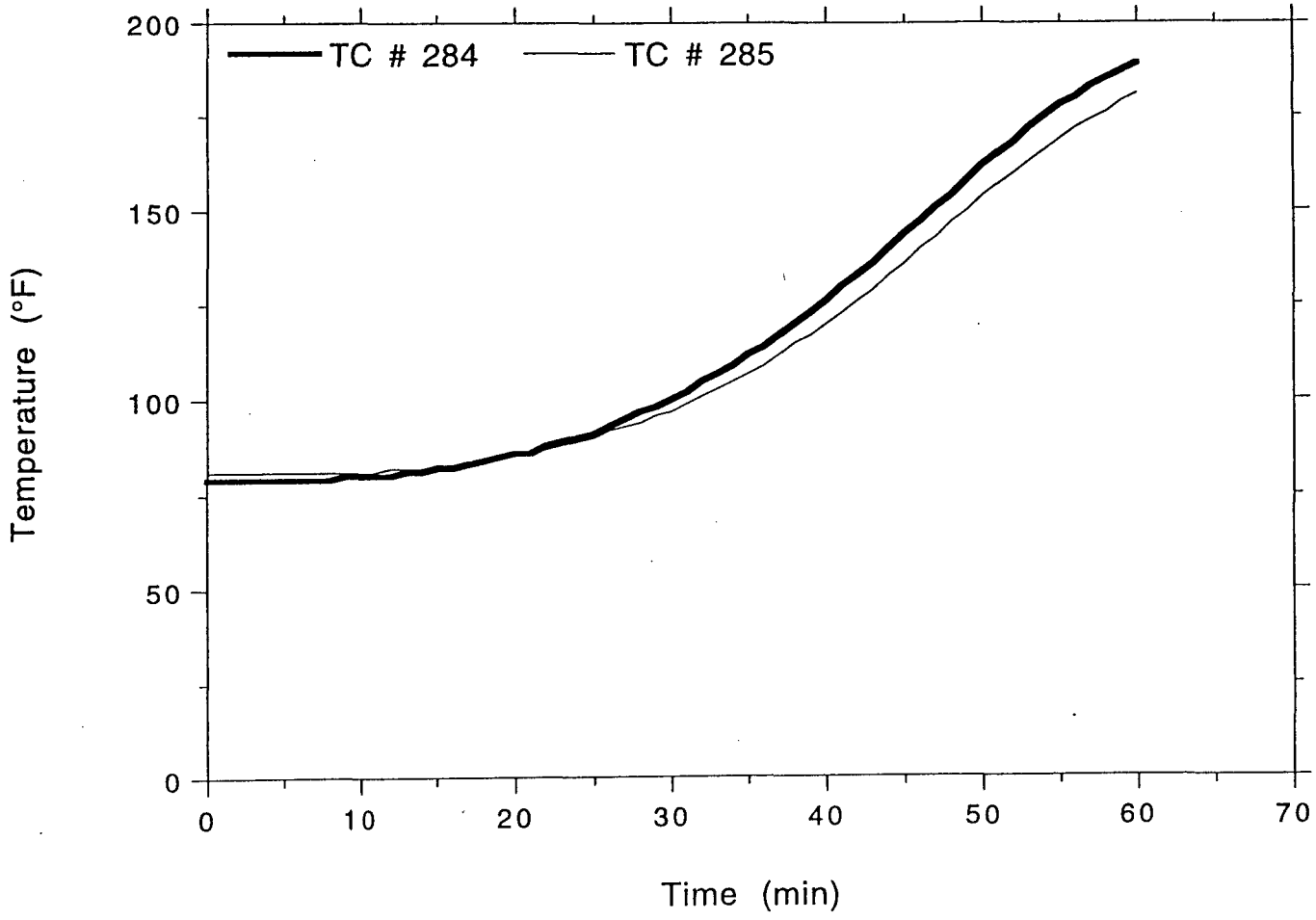
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right-Center 4" Al. Conduit



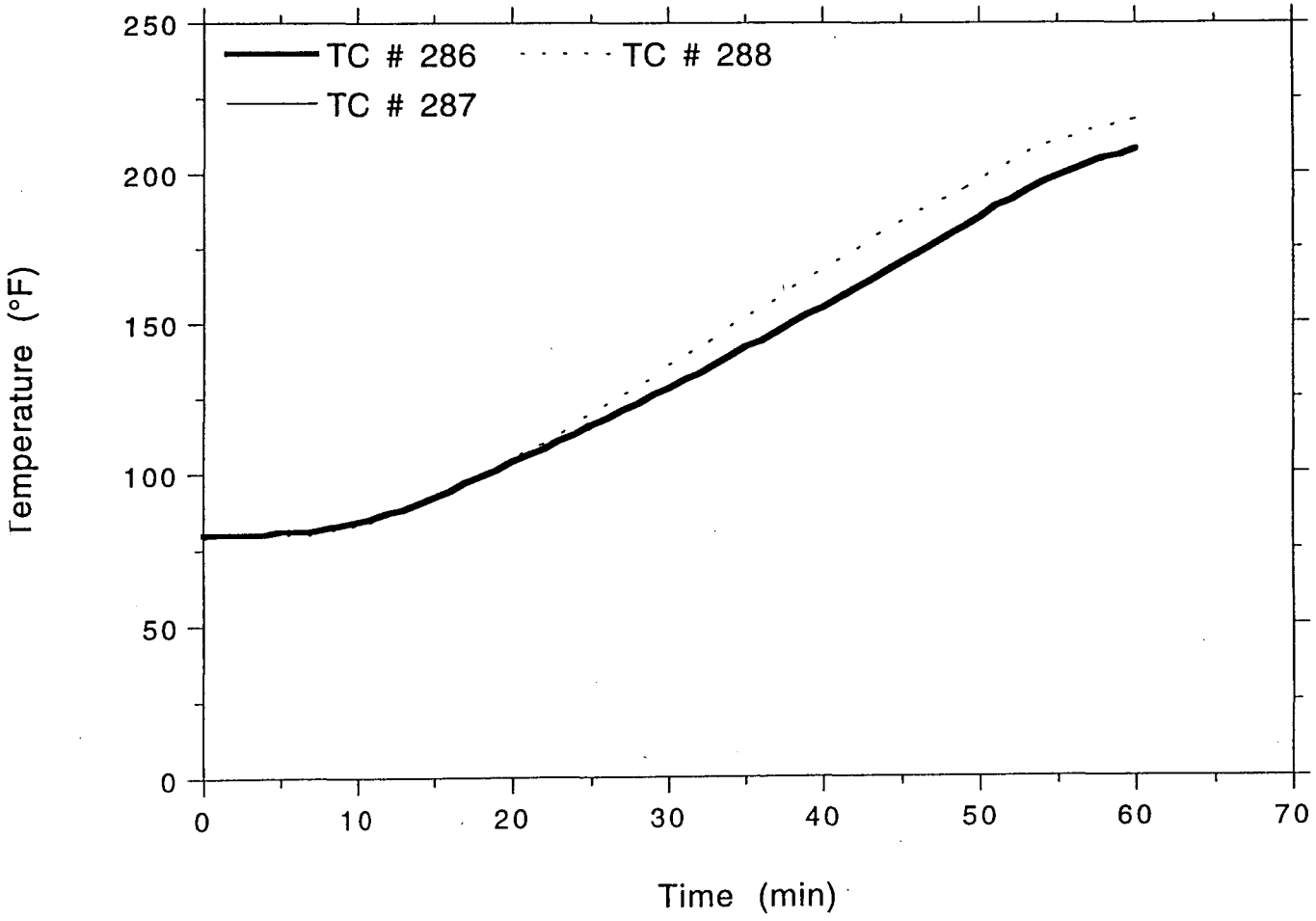
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right-Center 4" Al. Conduit



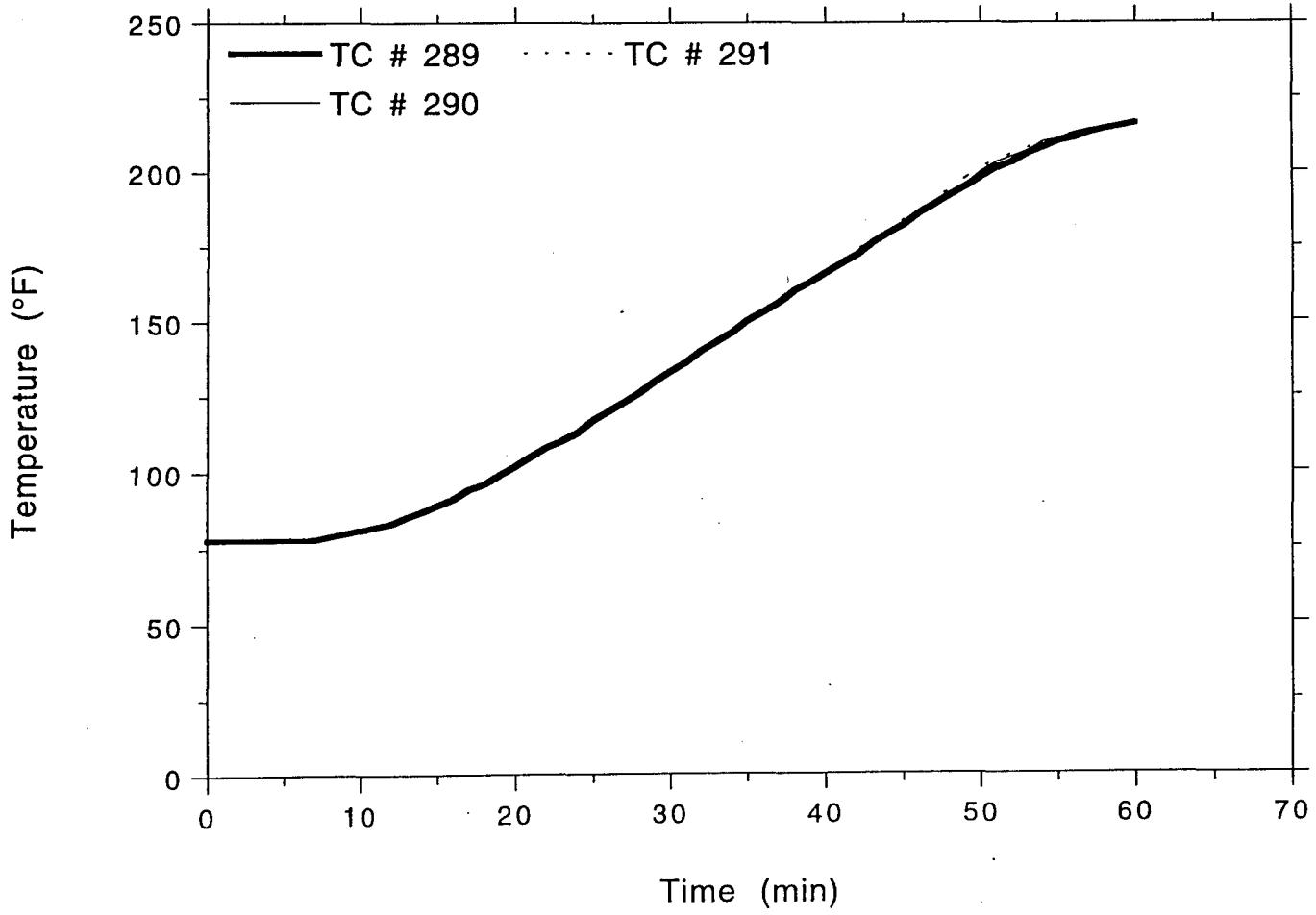
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 4" Al. Conduit



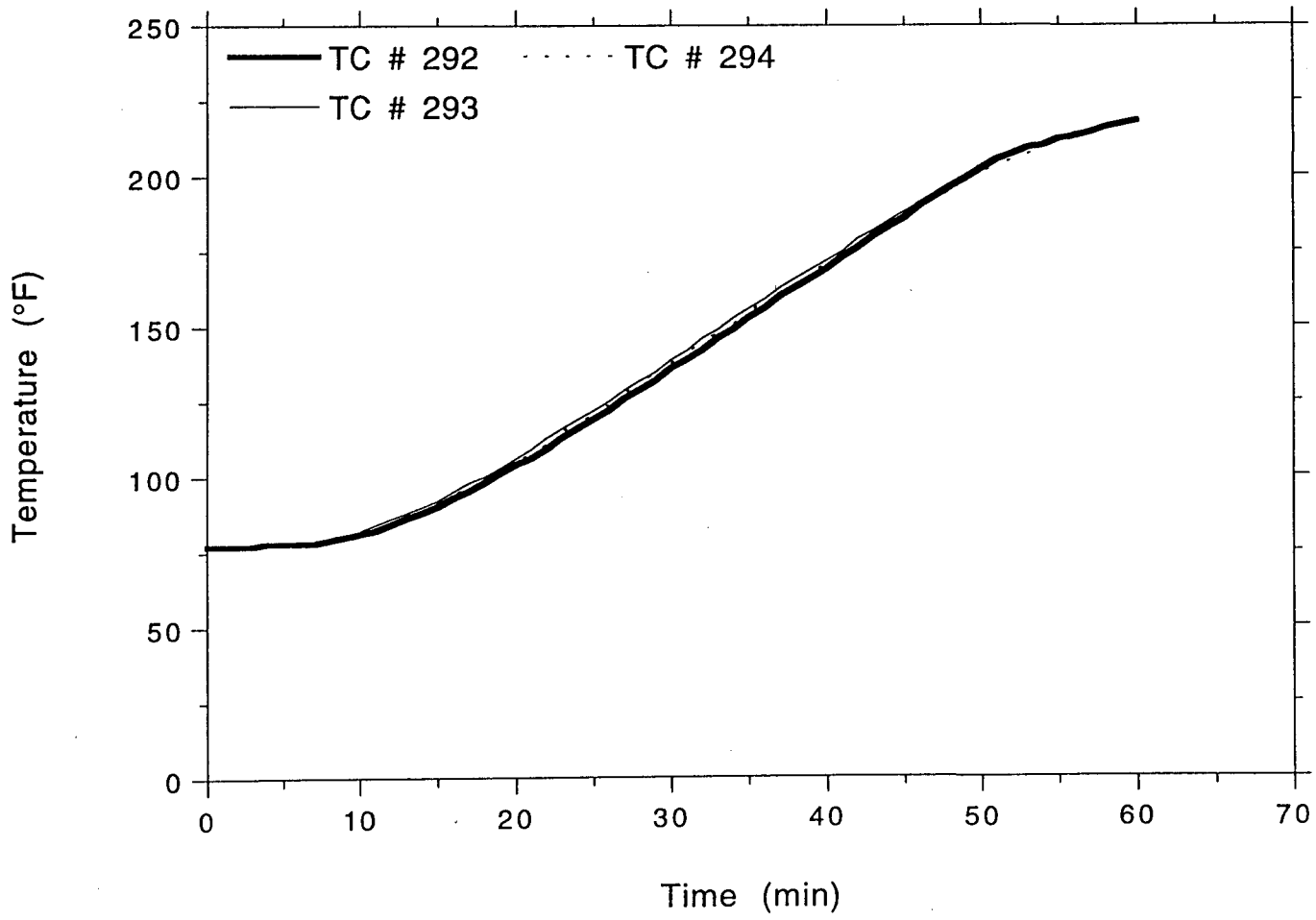
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 4" Al. Conduit



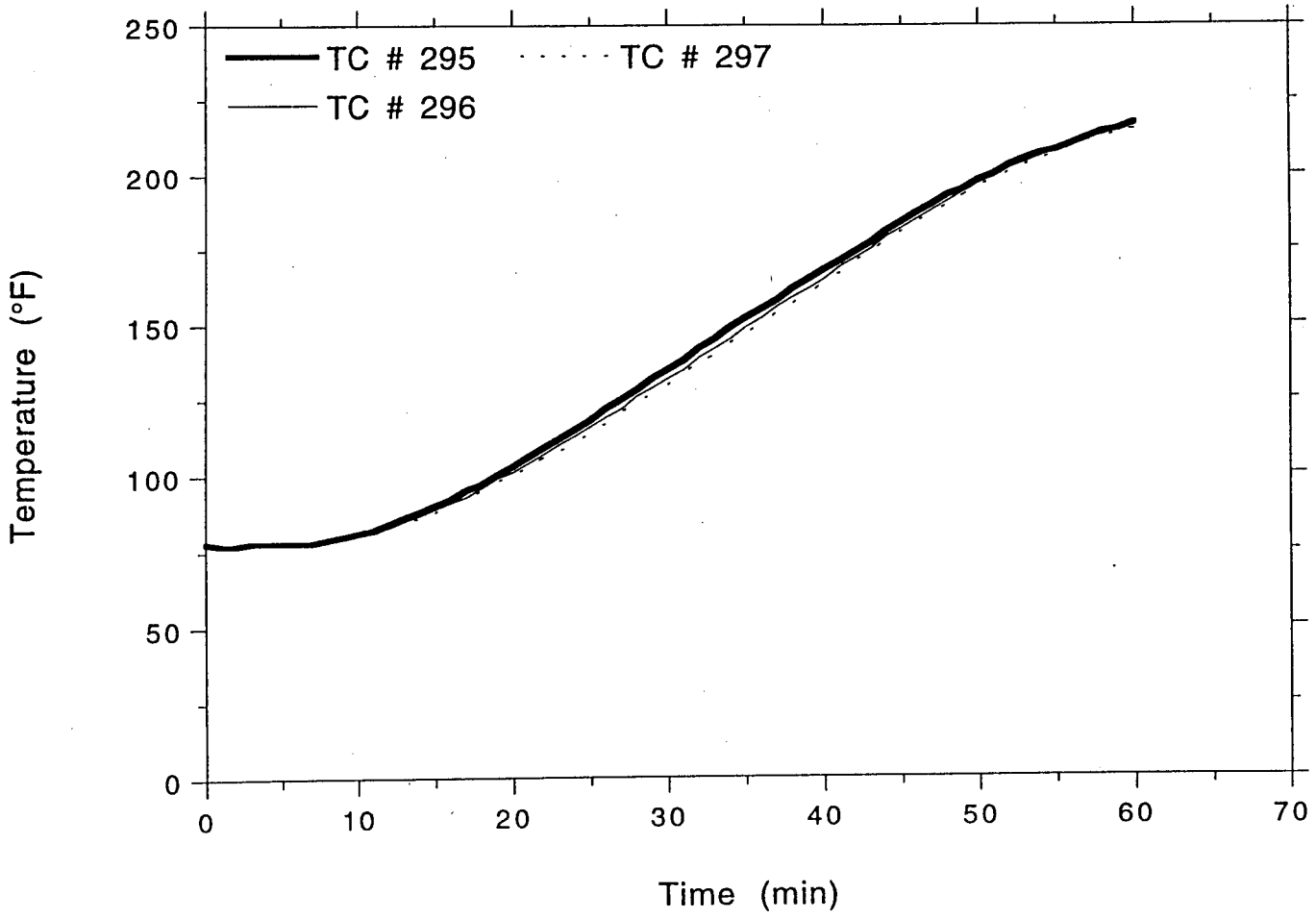
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 4" Al. Conduit



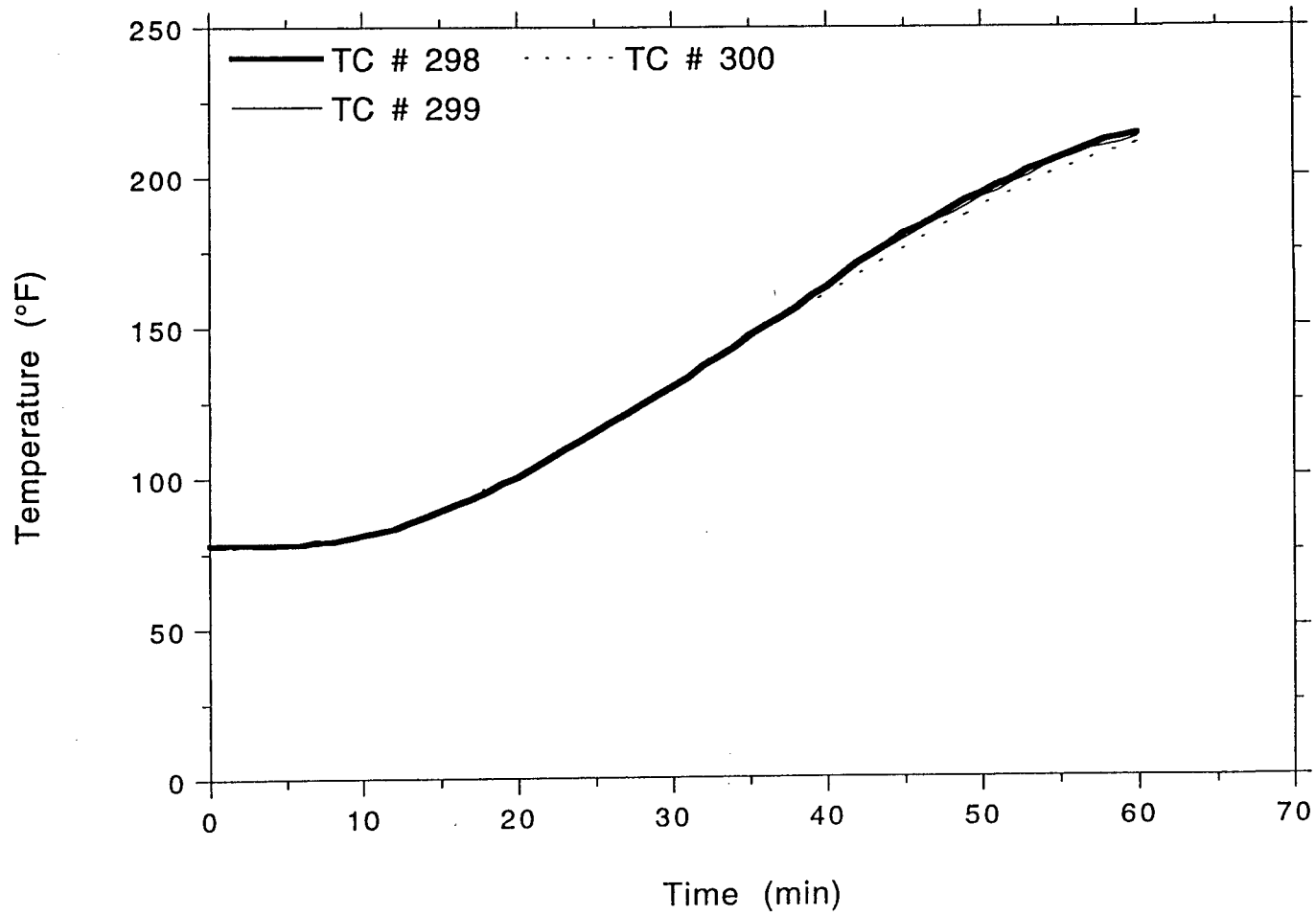
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 4" Al. Conduit



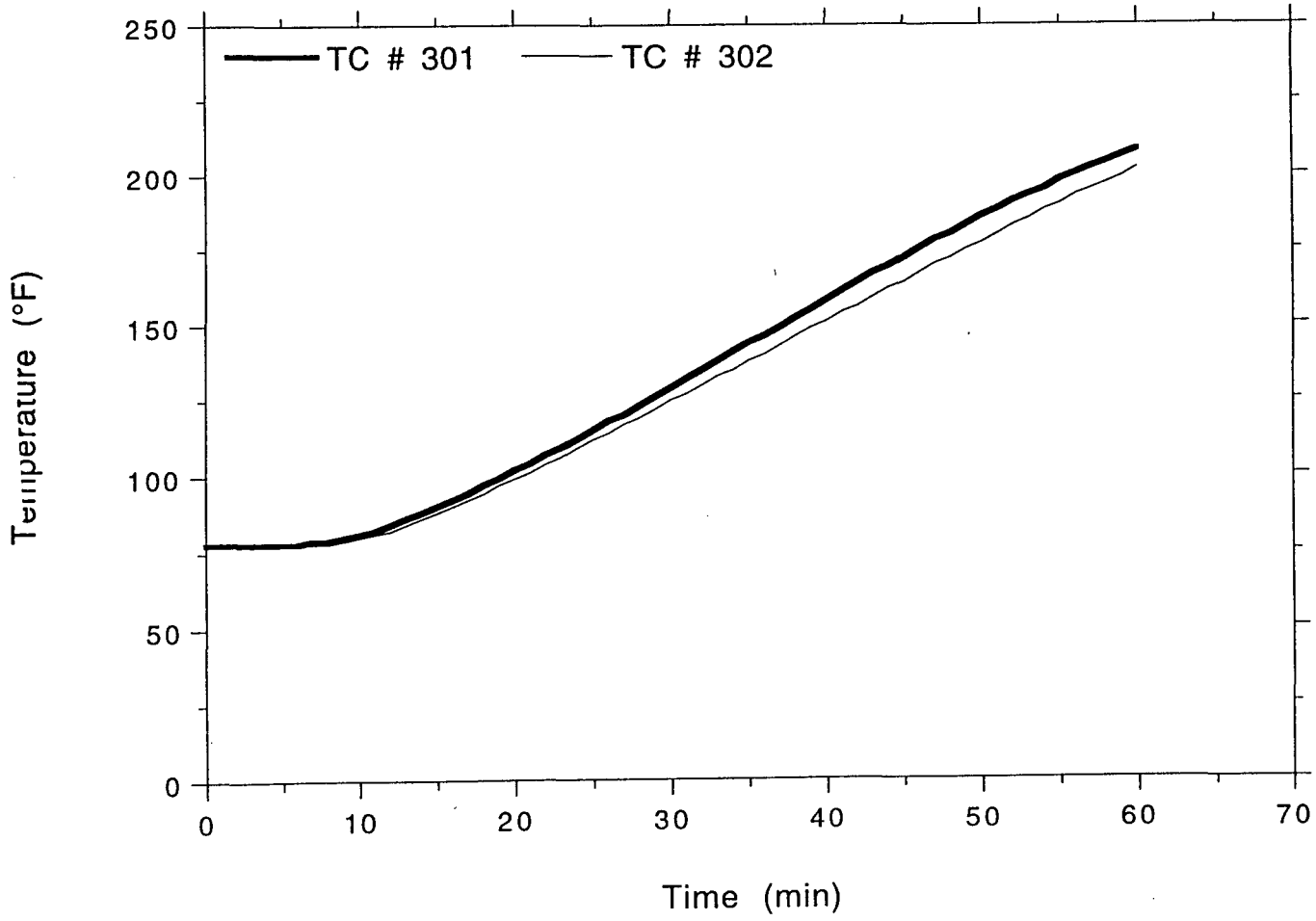
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 4" Al. Conduit



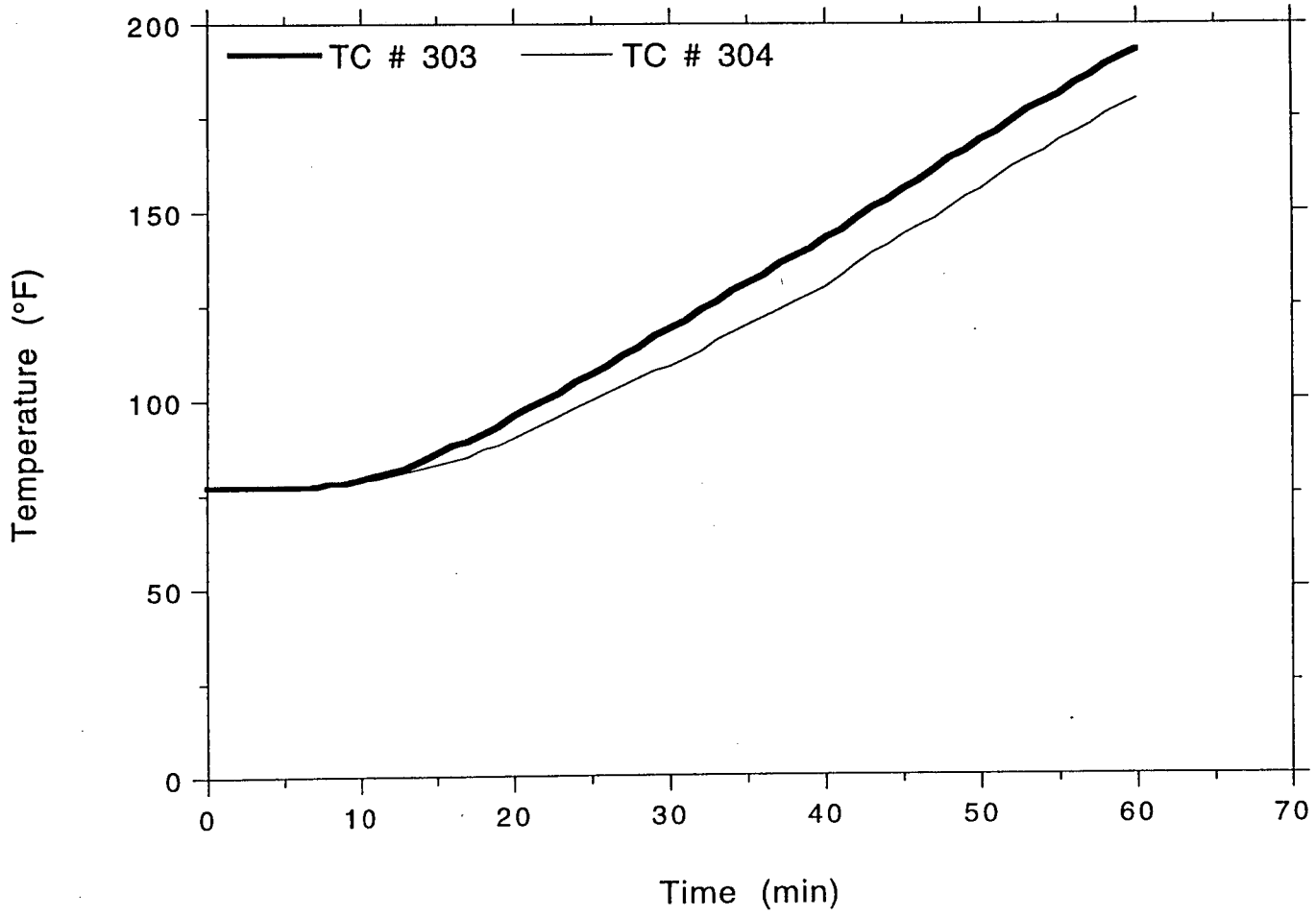
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 4" Al. Conduit



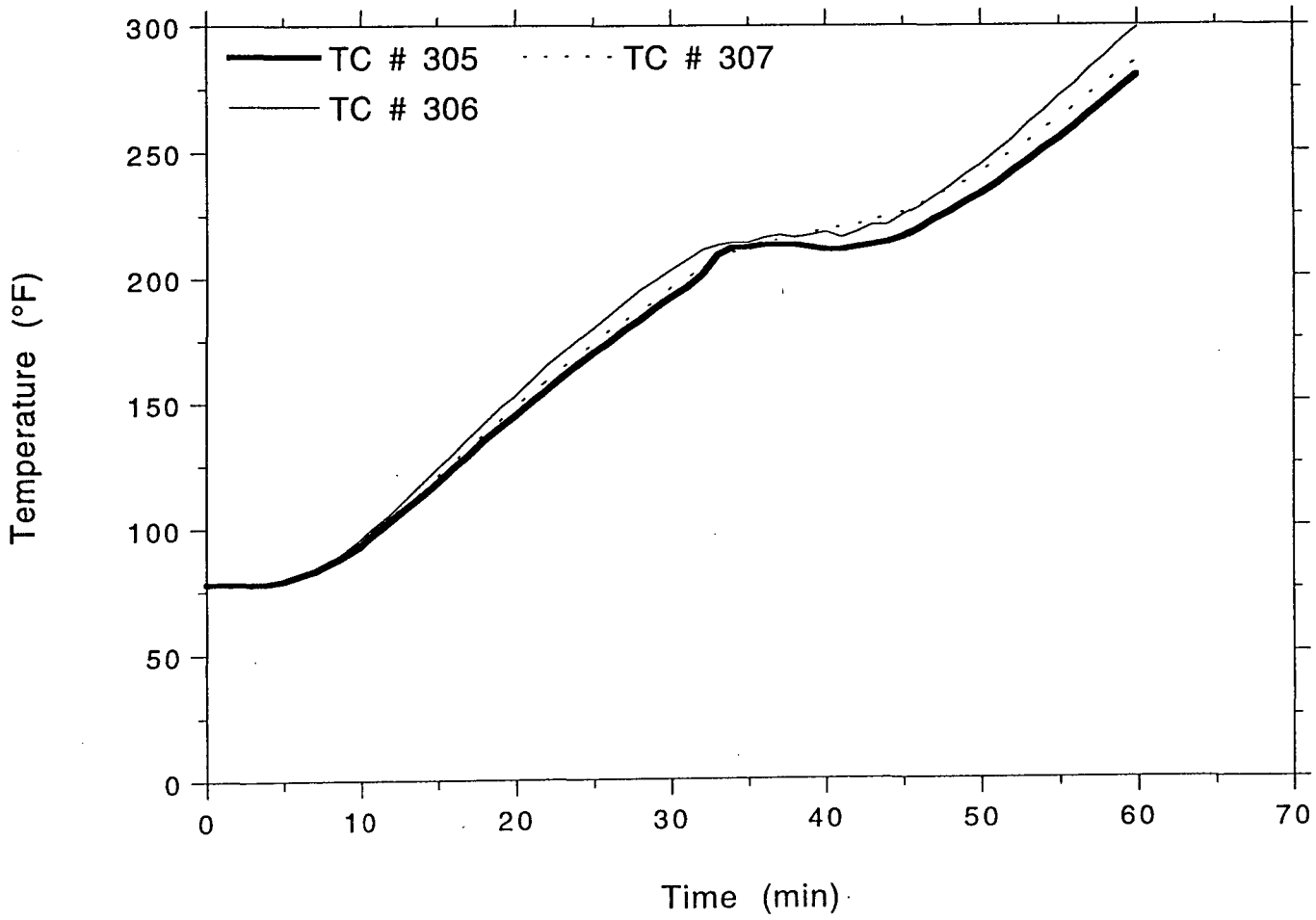
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 4" Al. Conduit



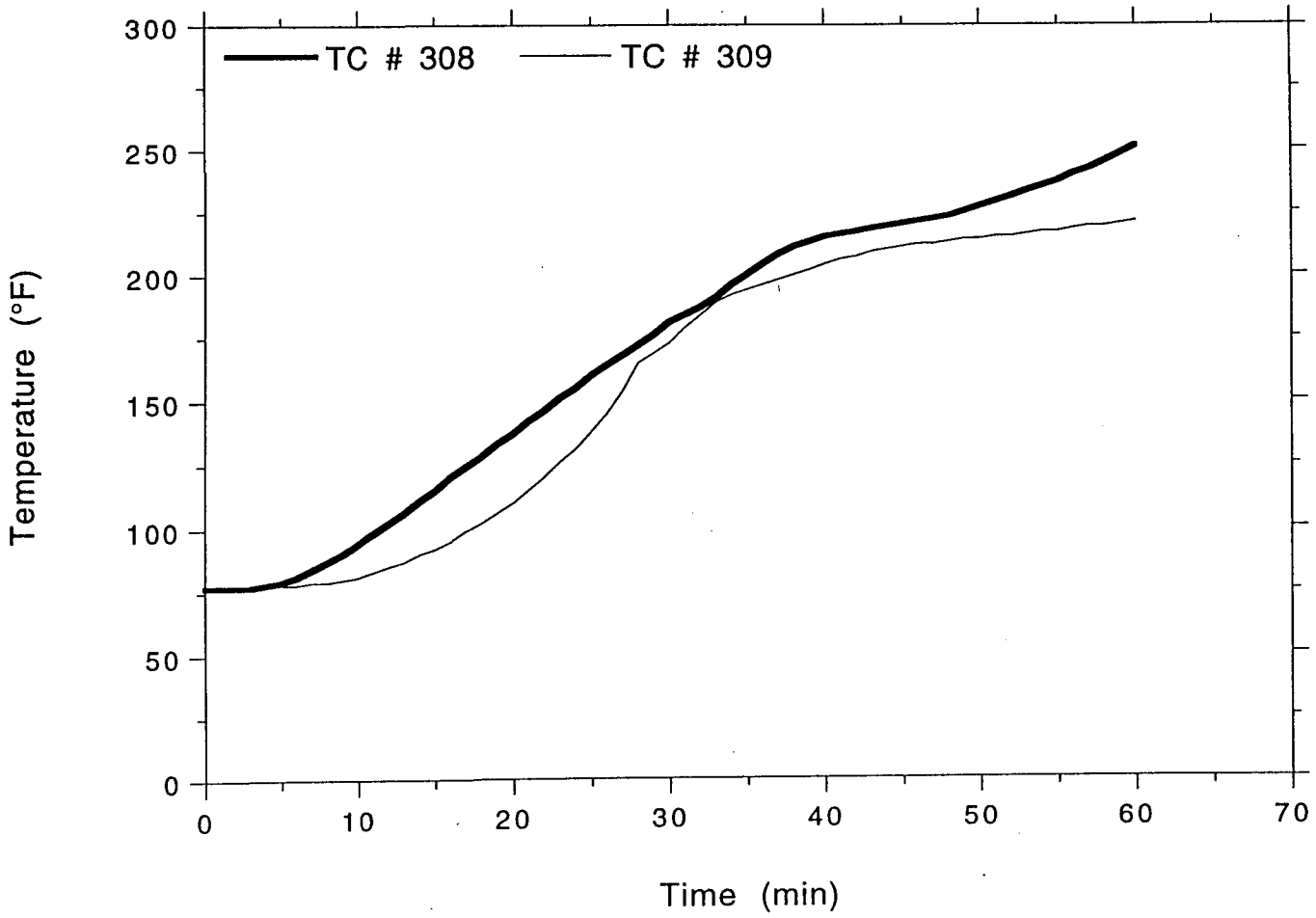
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit Above JB



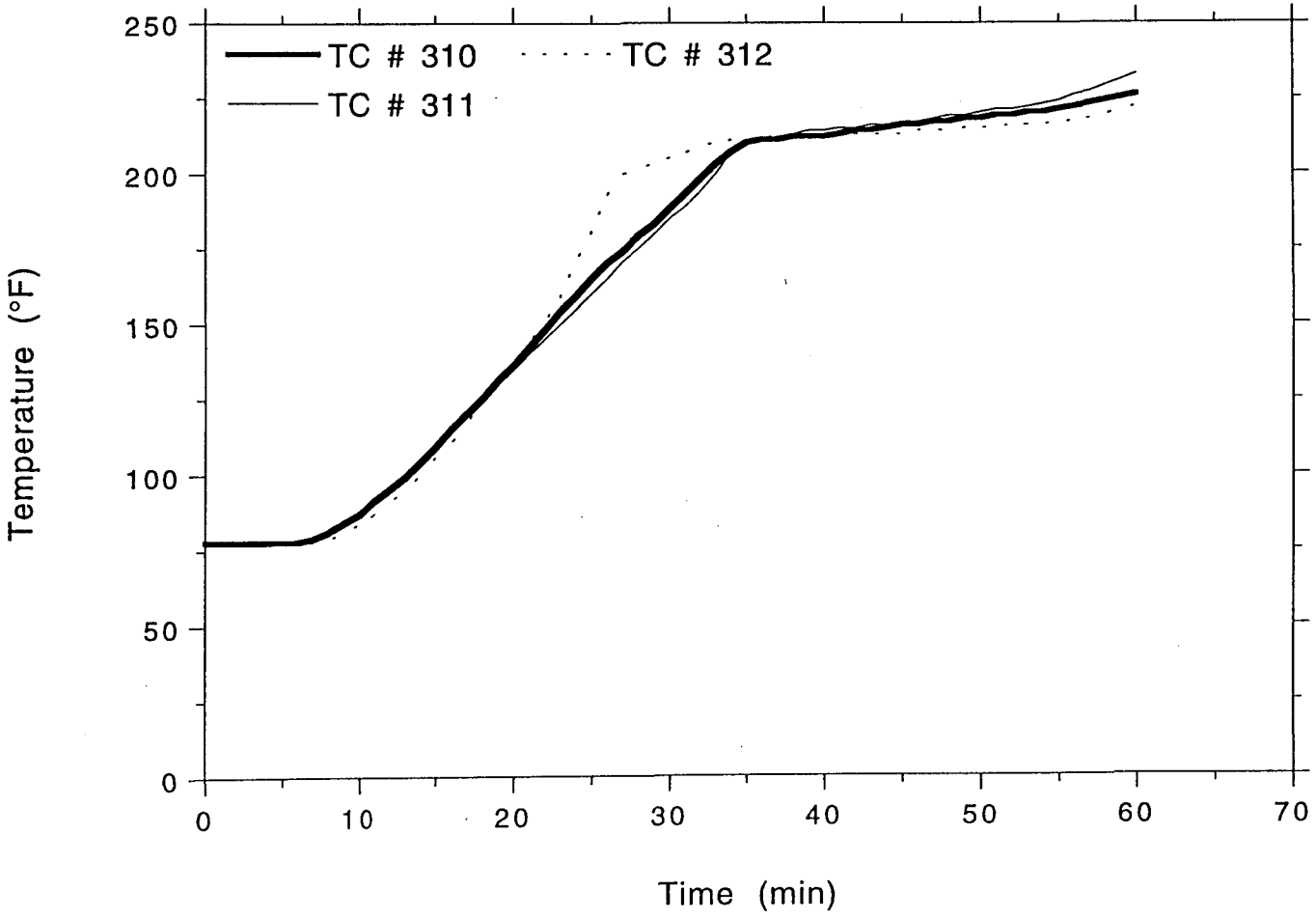
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit Above JB



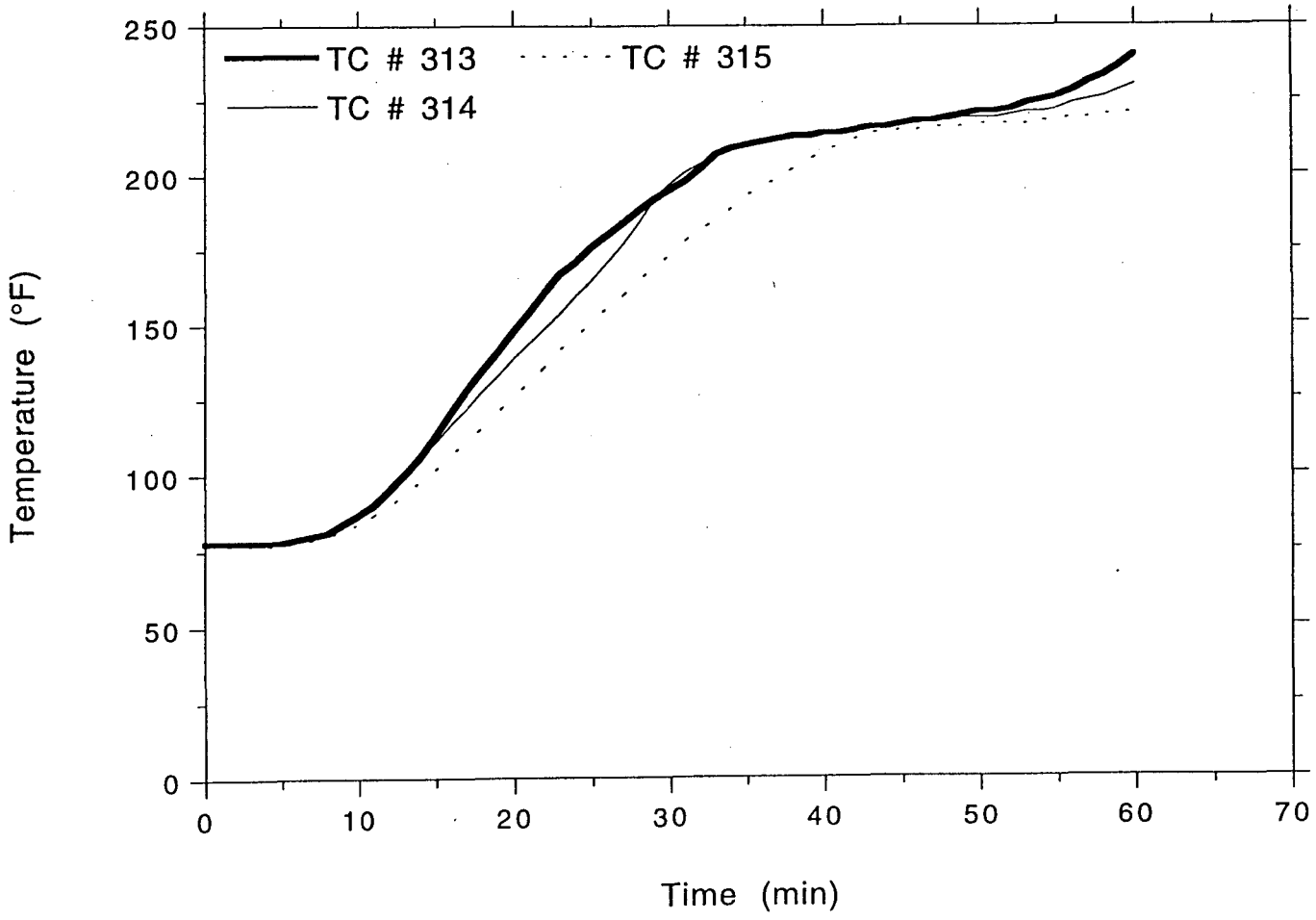
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
JB on 4" Steel Conduit



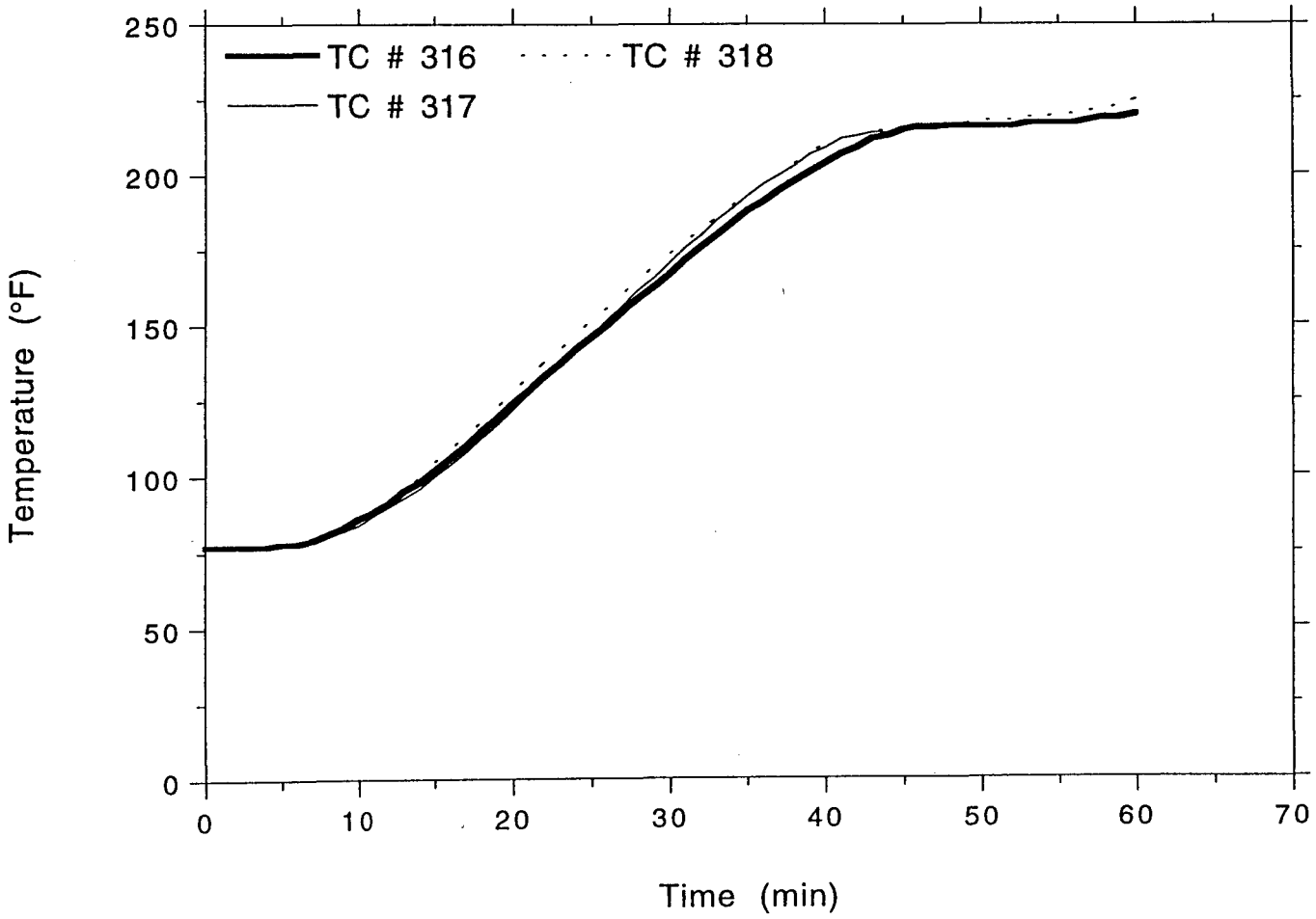
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
JB on 4" Steel Conduit



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
JB on 4" Steel Conduit



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
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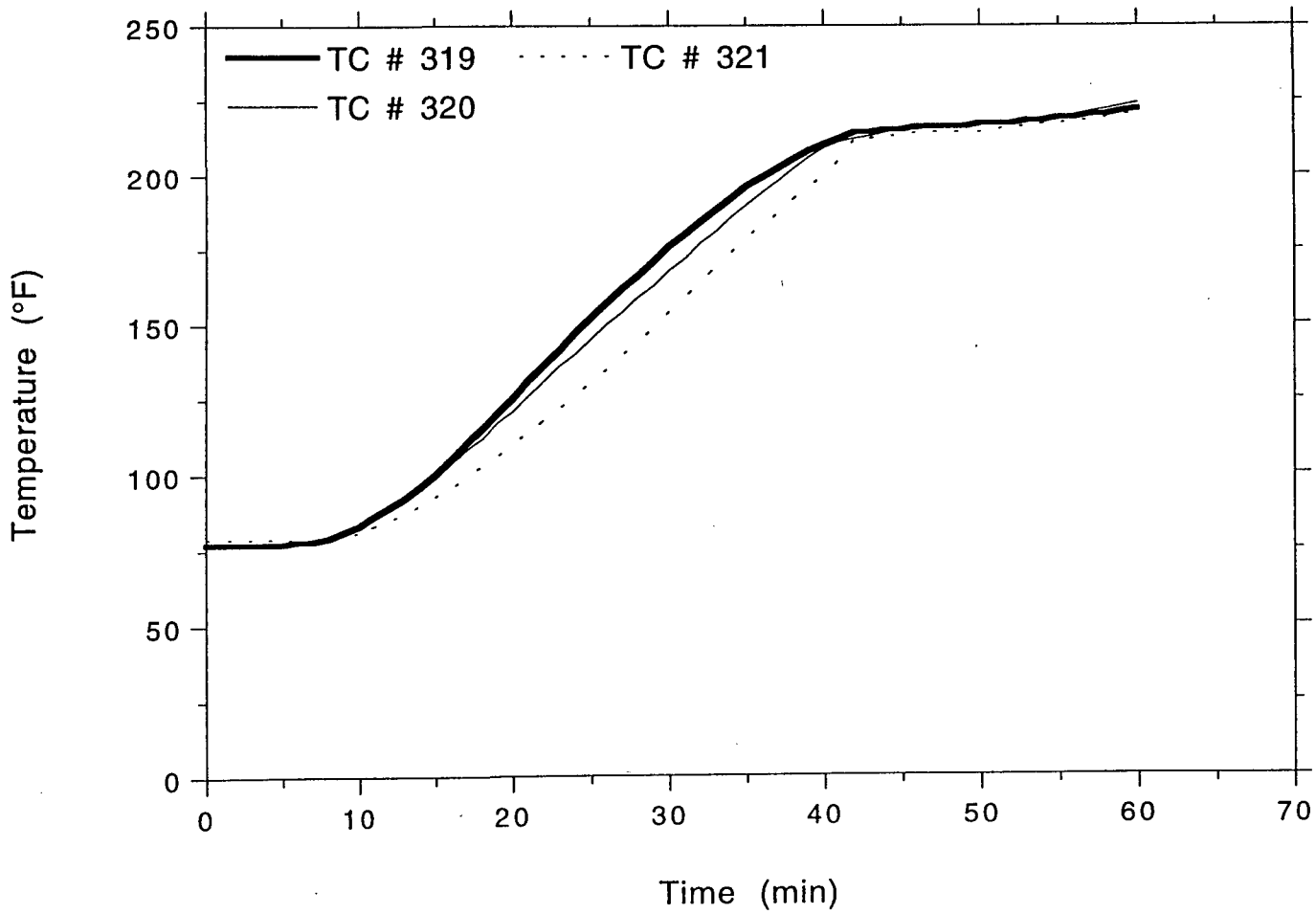
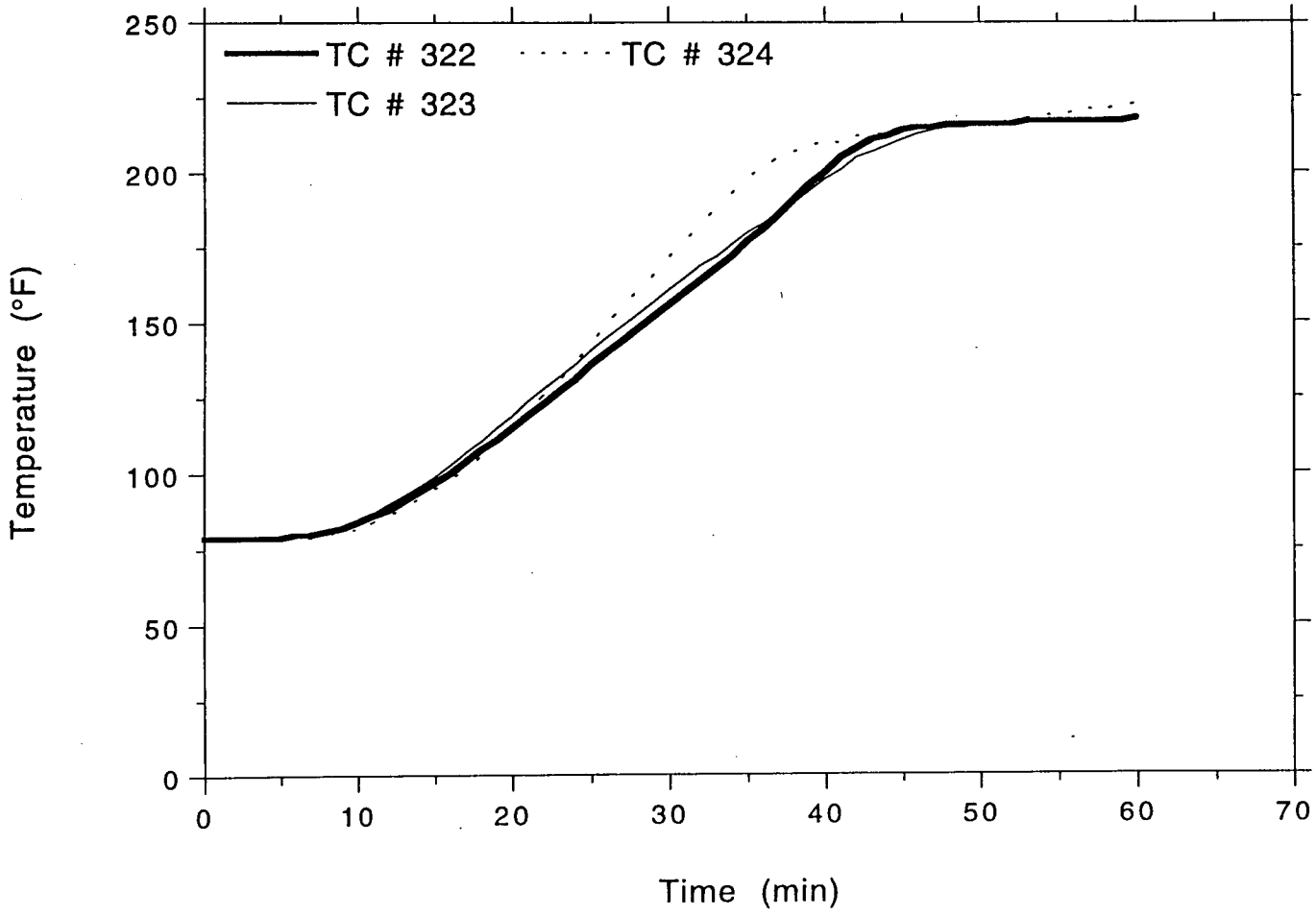


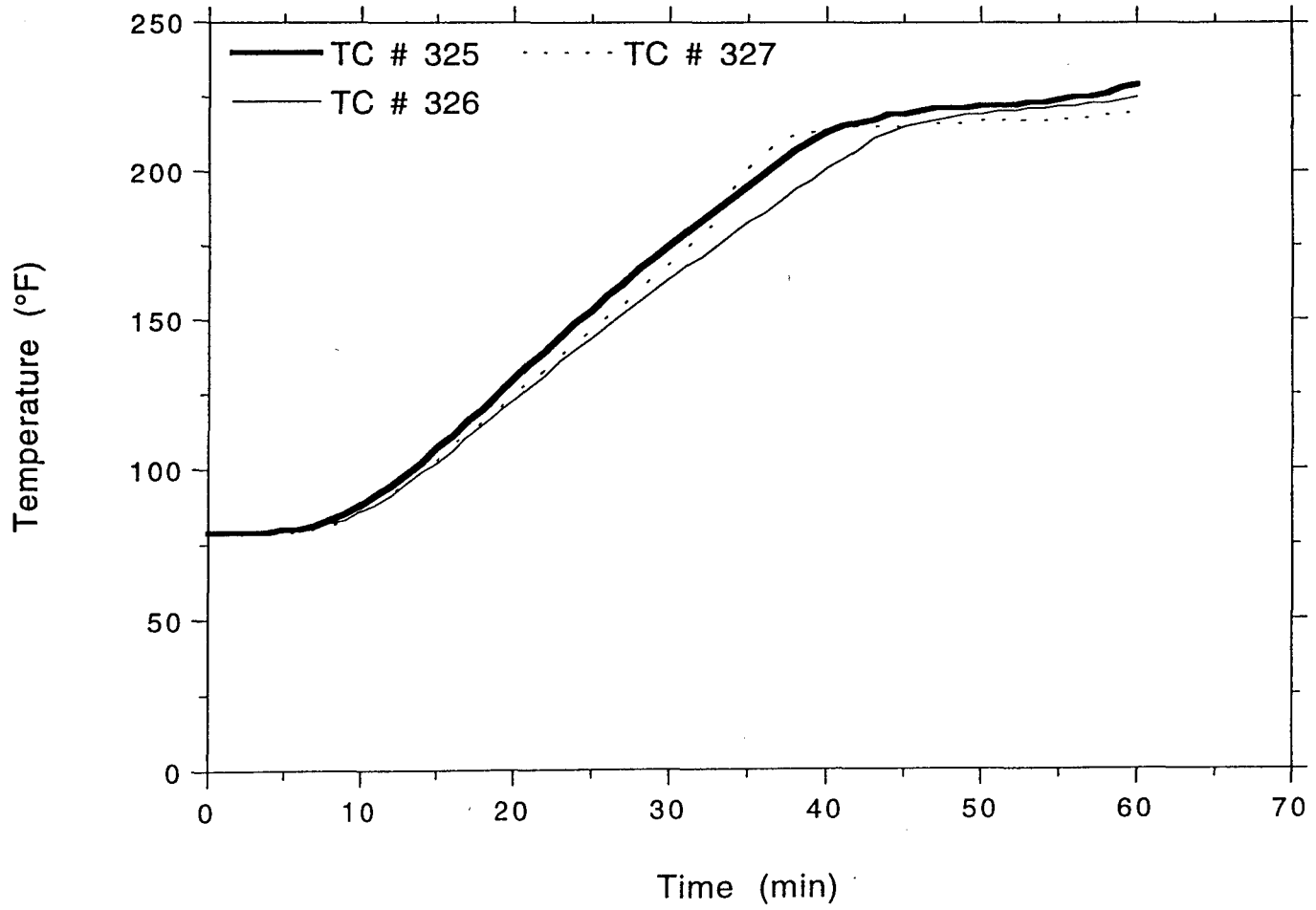
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
JB on 4" Steel Conduit



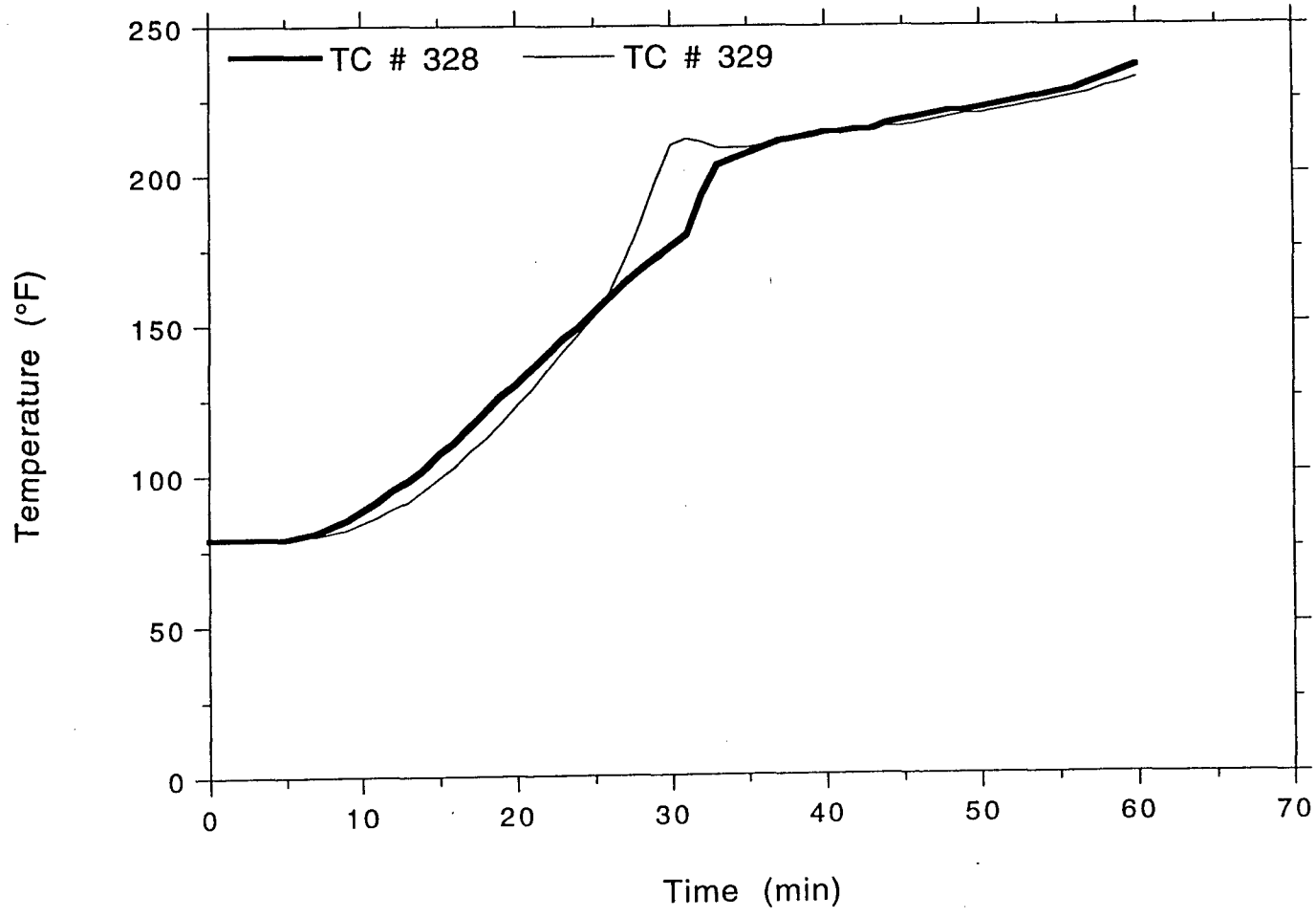
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
JB on 4" Steel Conduit

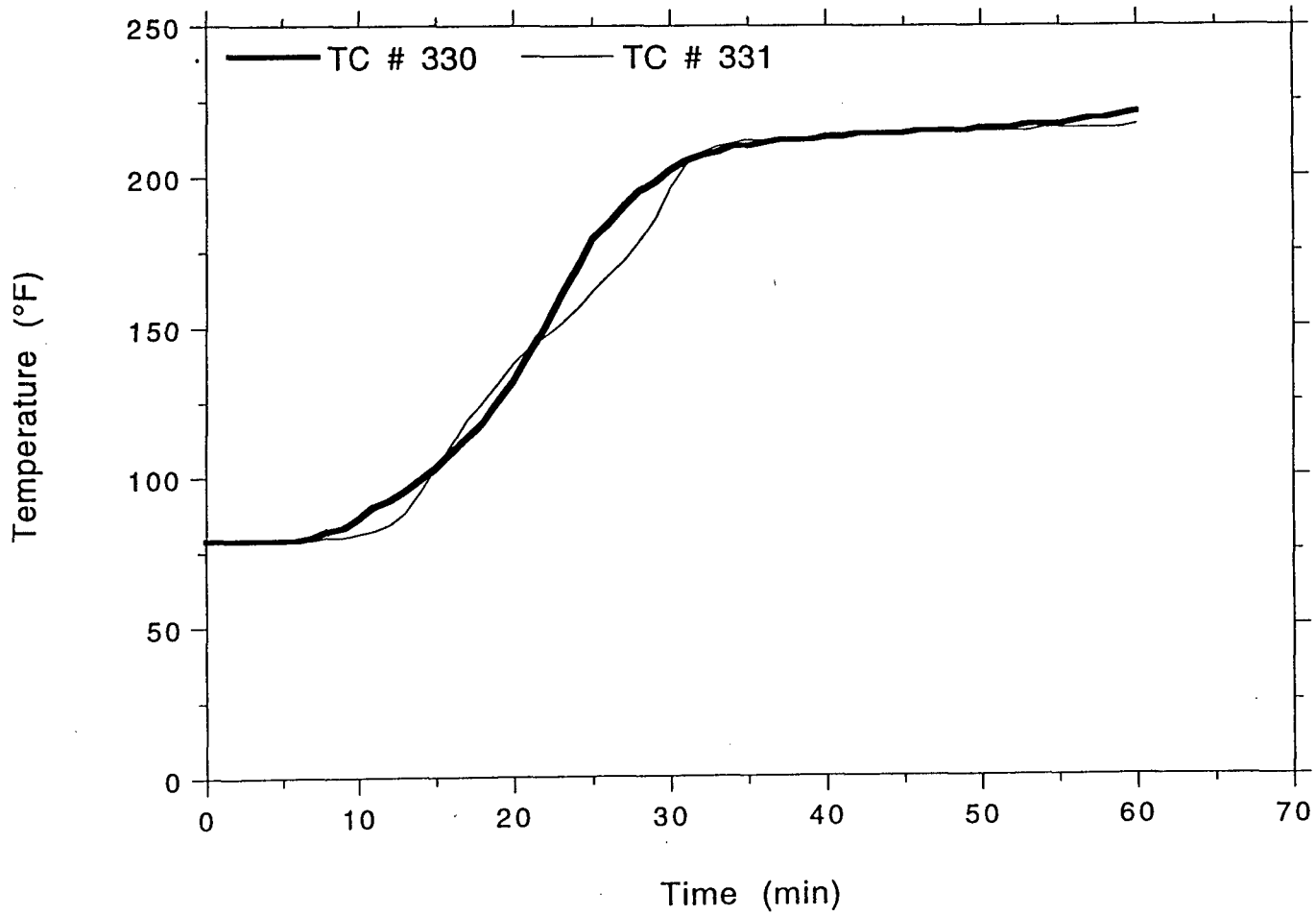


OMEGA POINT LABORATORIES

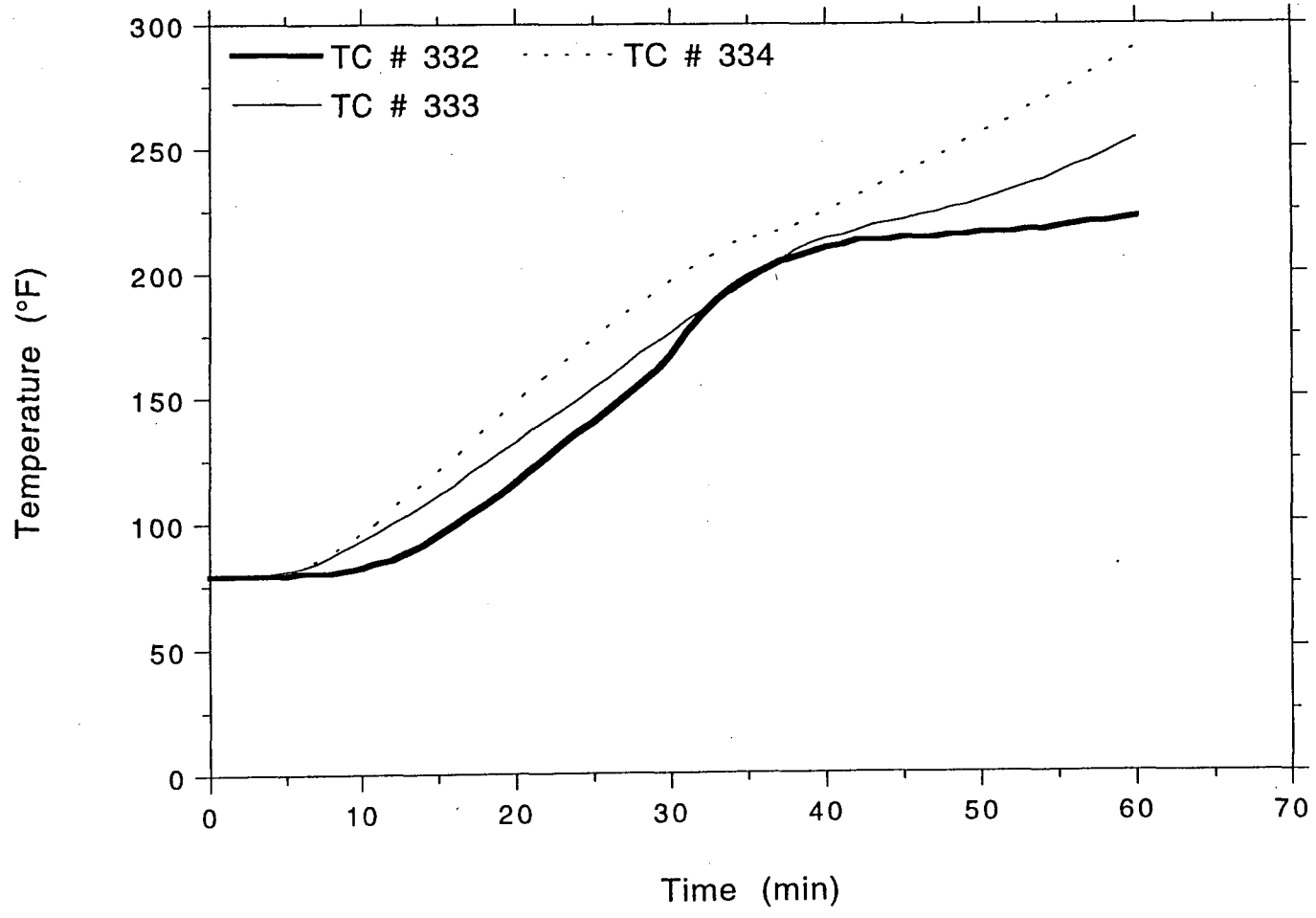
TSI/TVA
Project No. 11960-97259
JB on 4" Steel Conduit



TSI/TVA
Project No. 11960-97259
JB on 4" Steel Conduit

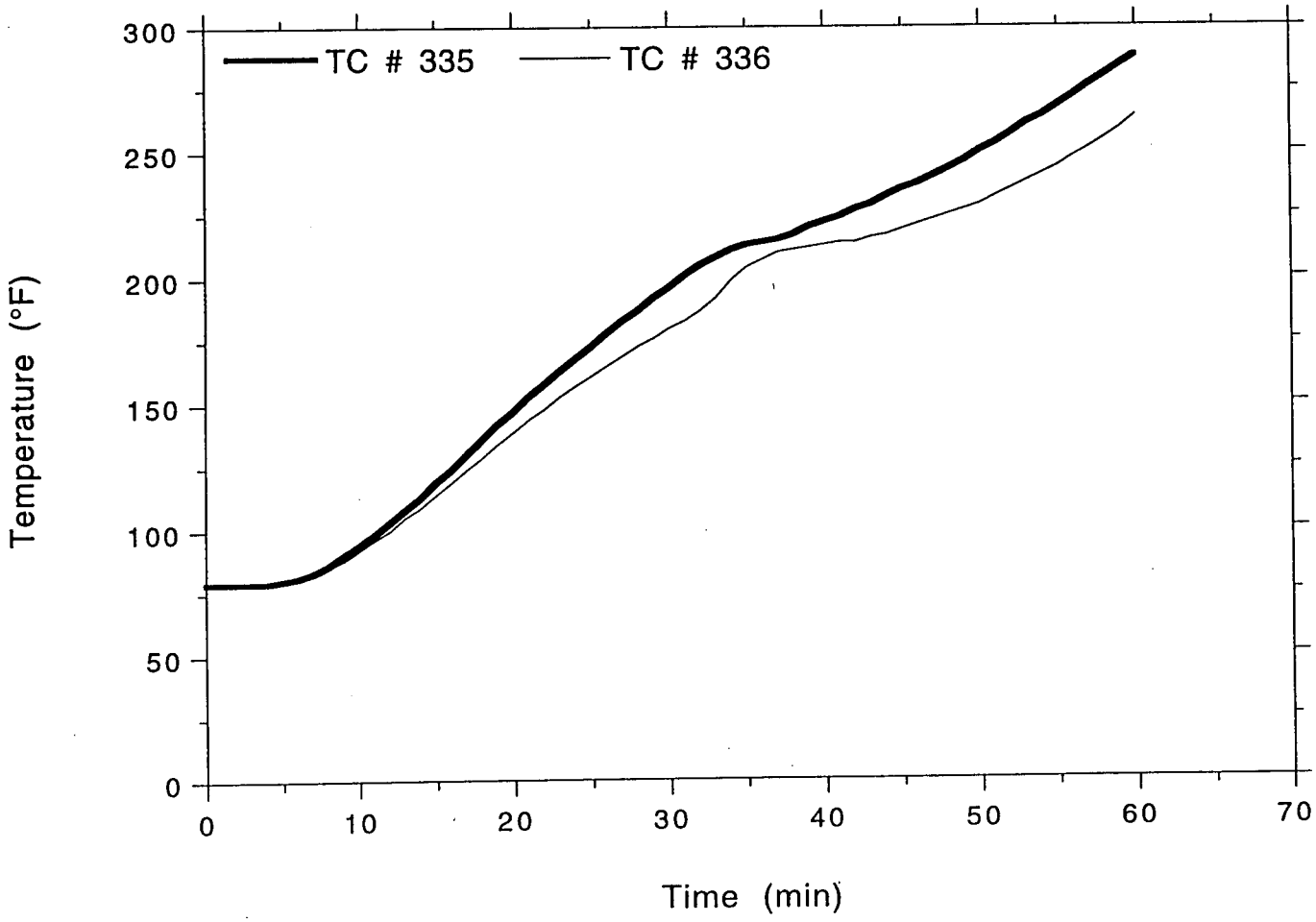


TSI/TVA
Project No. 11960-97259
4" Steel Conduit Below JB



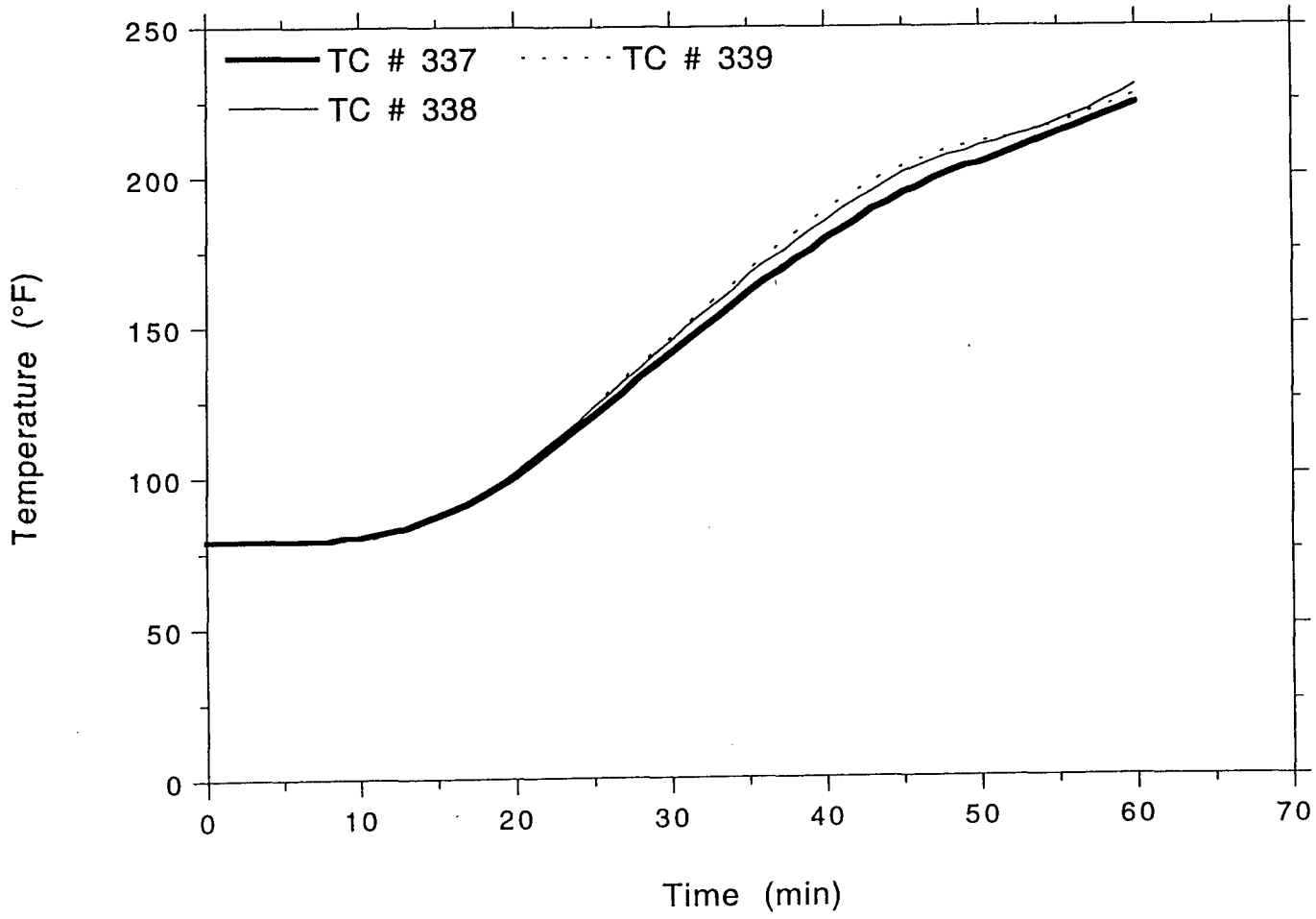
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit Below JB



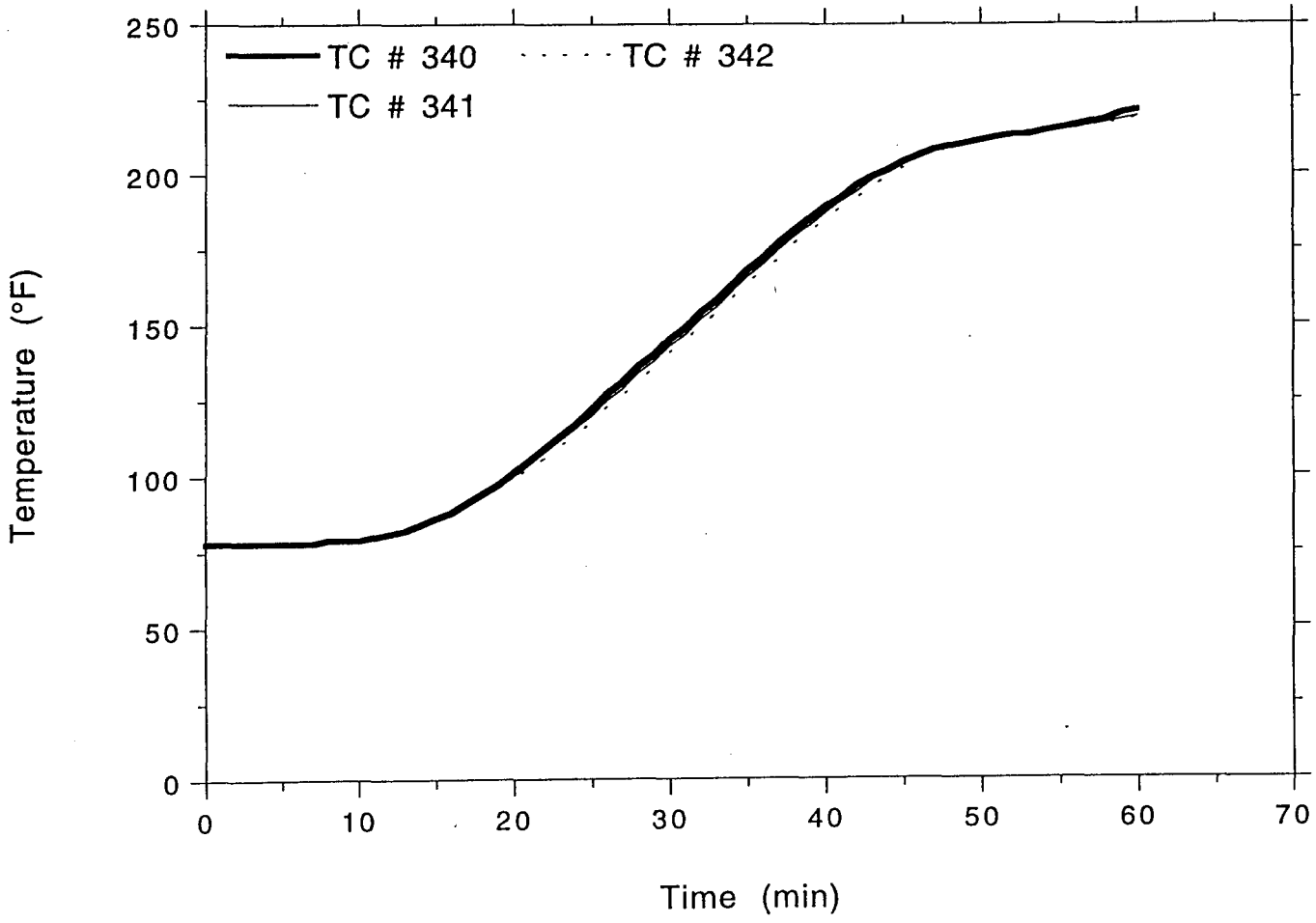
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit, #8



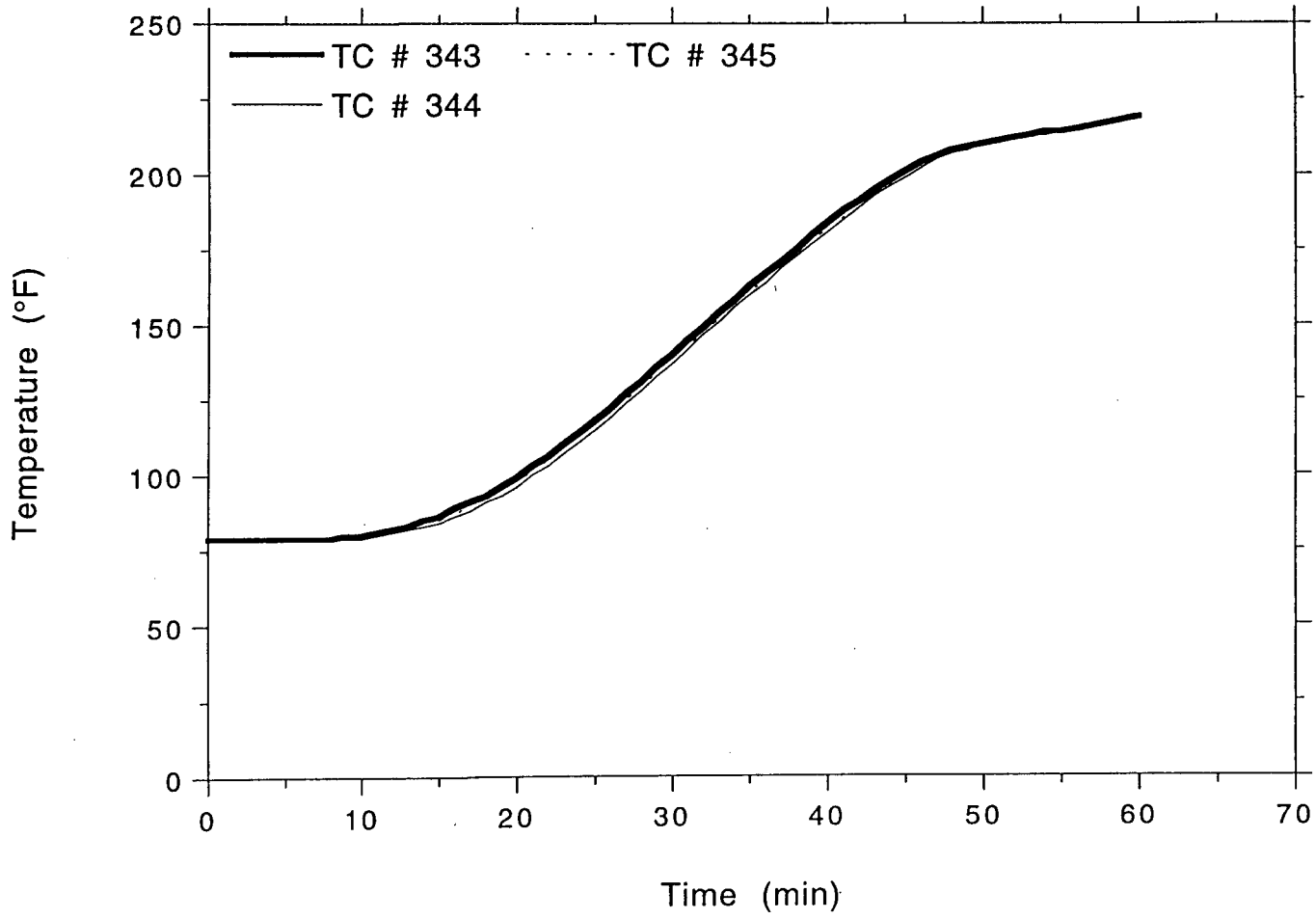
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit, #8



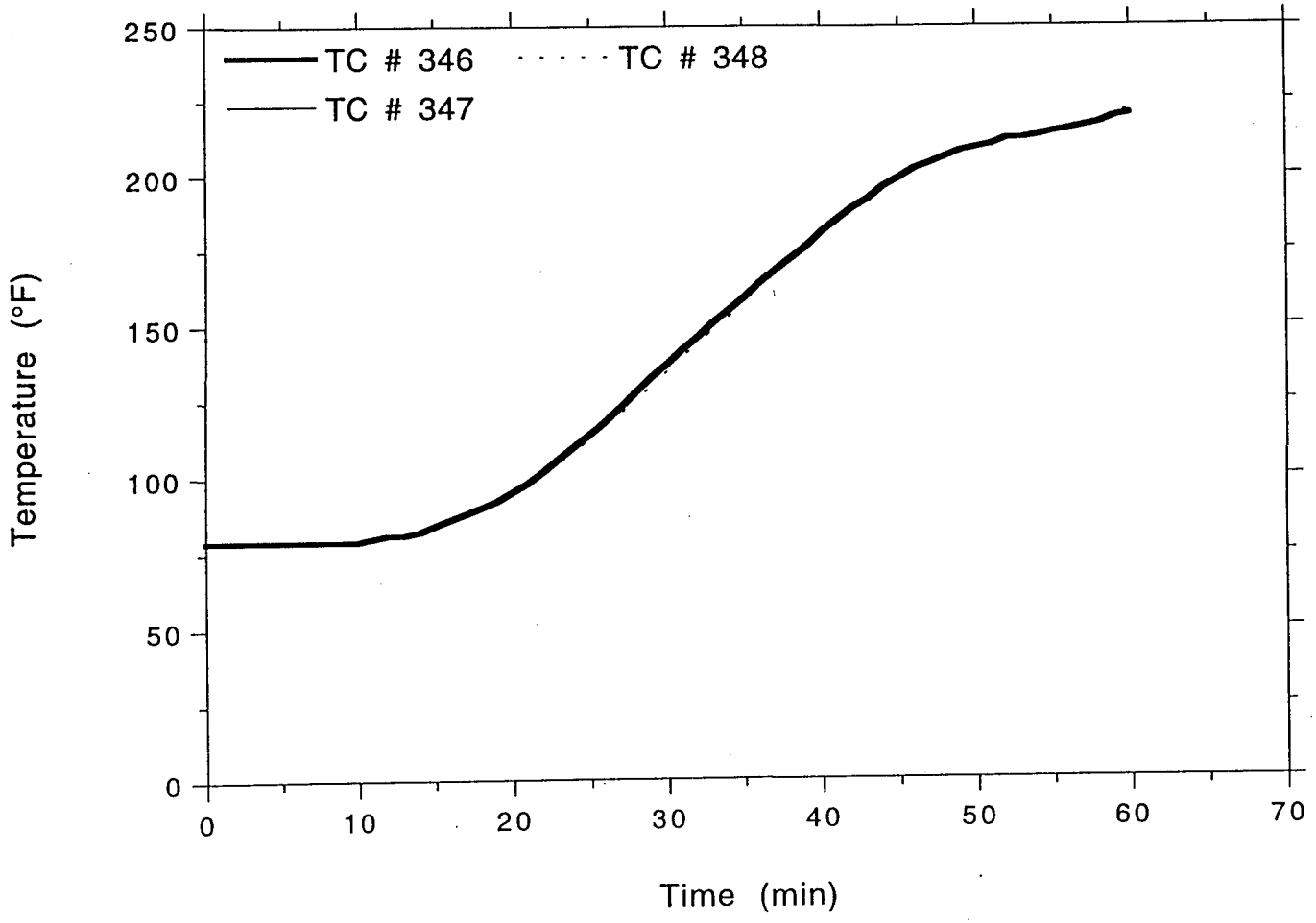
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit, #8



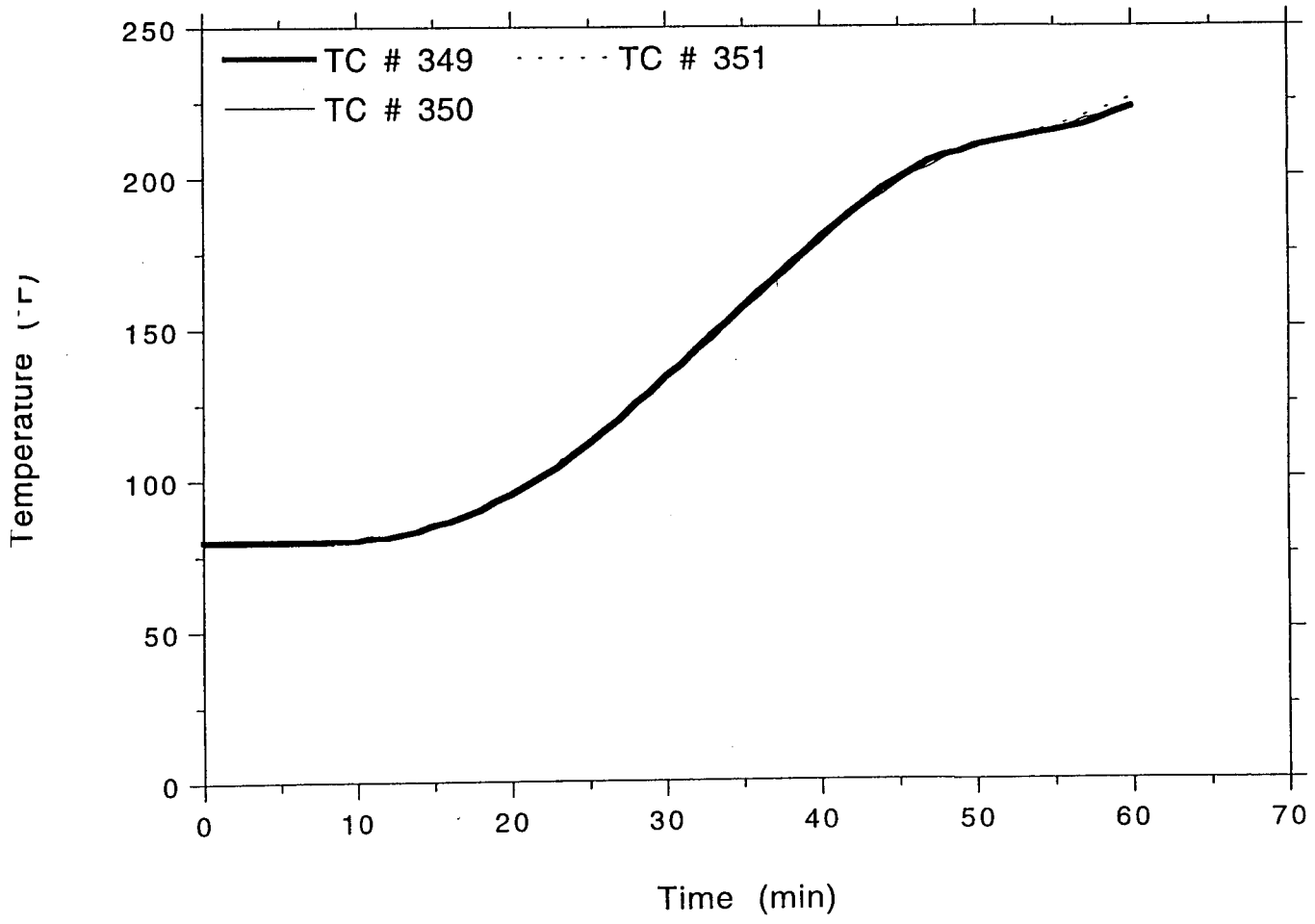
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit, #8



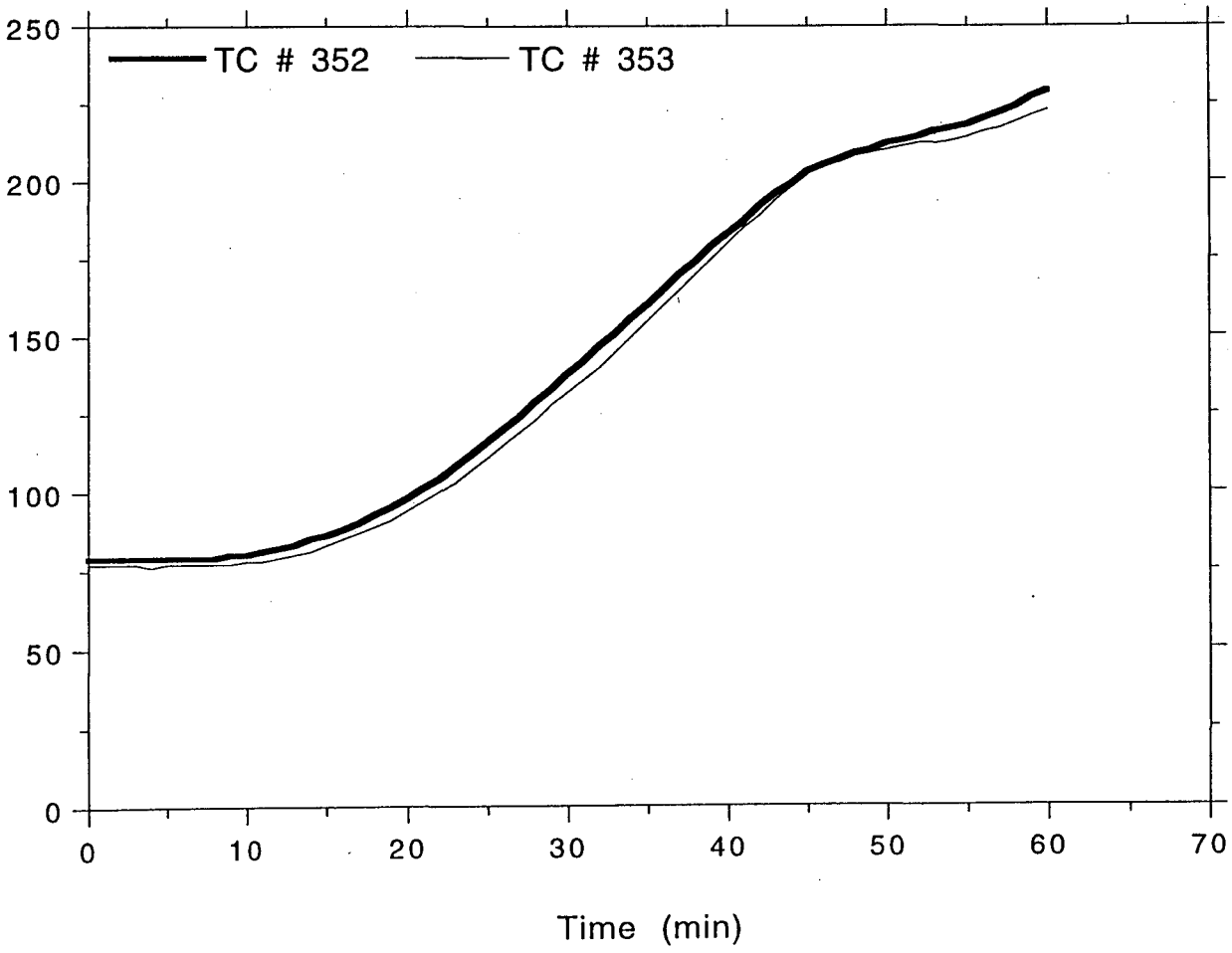
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit, #8



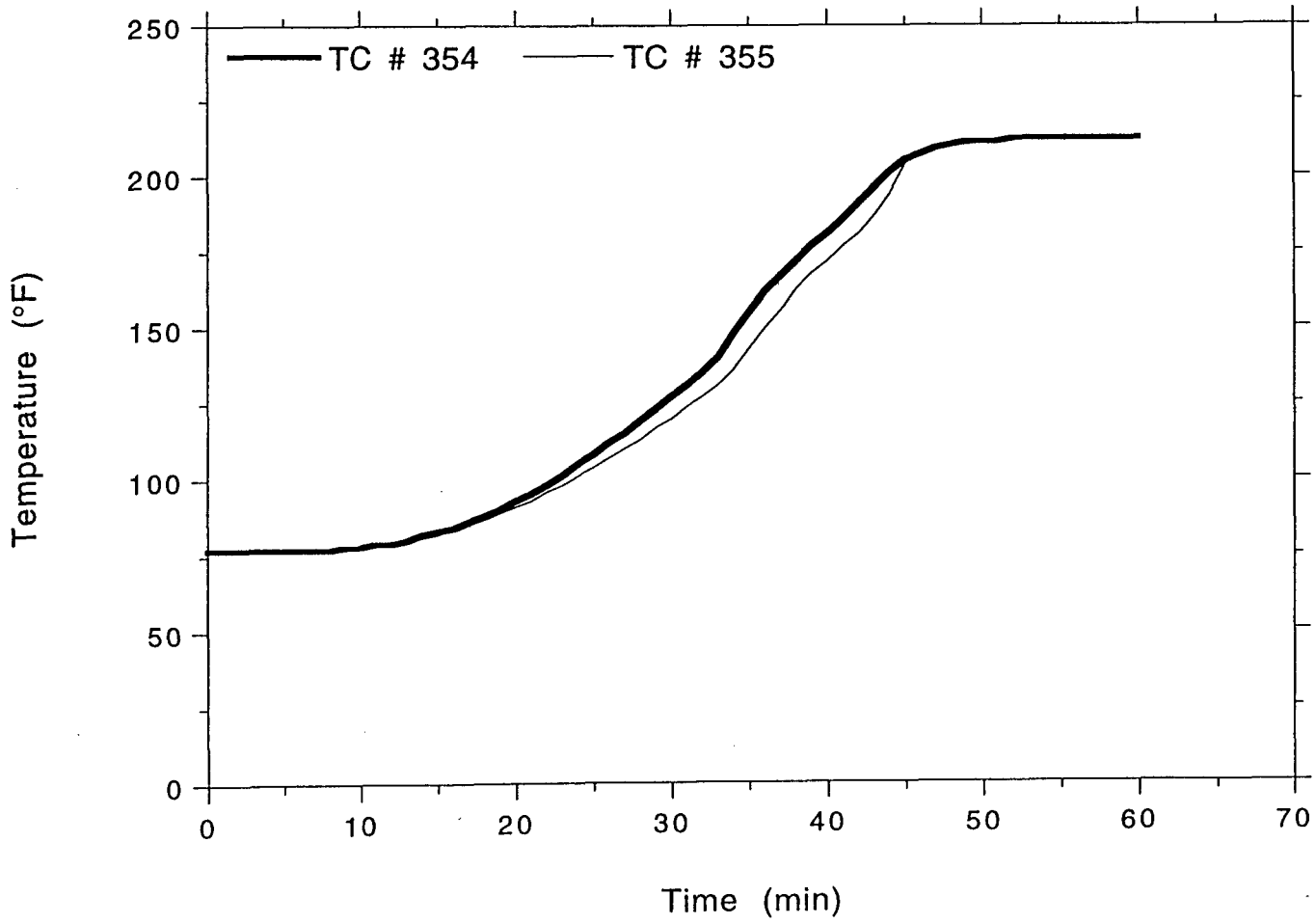
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit, #8



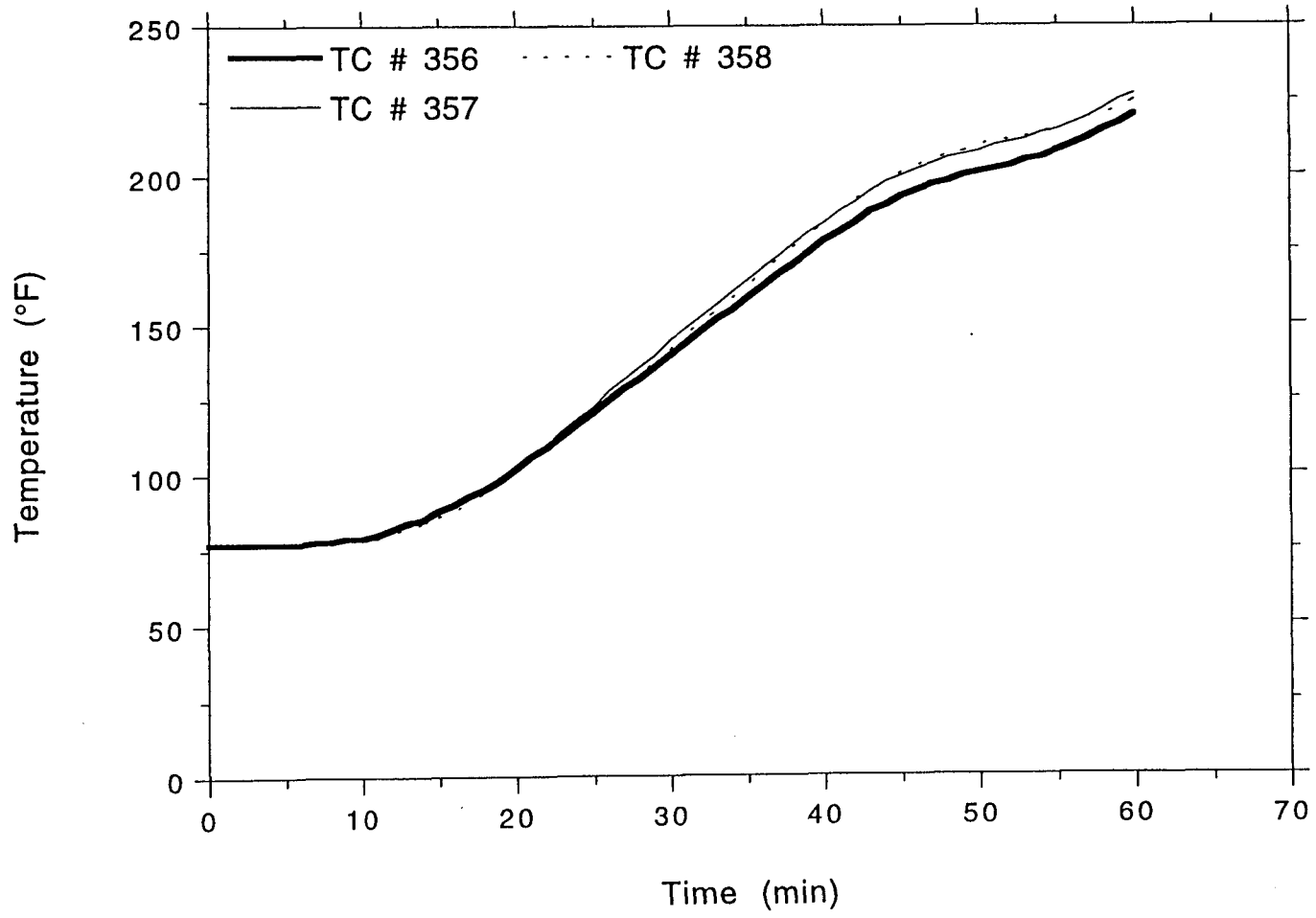
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 1" Steel Conduit, #8



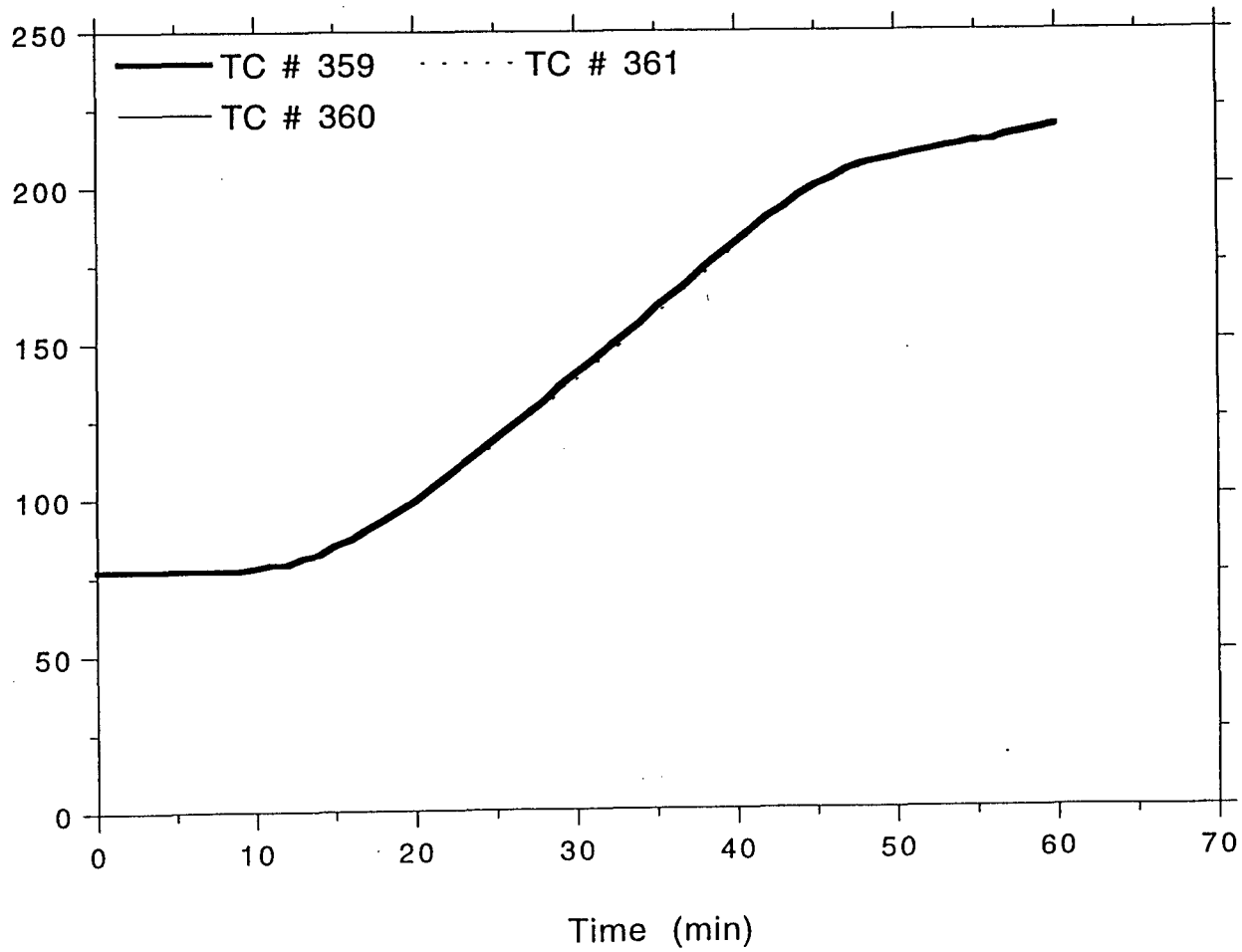
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 1" Steel Conduit, #8



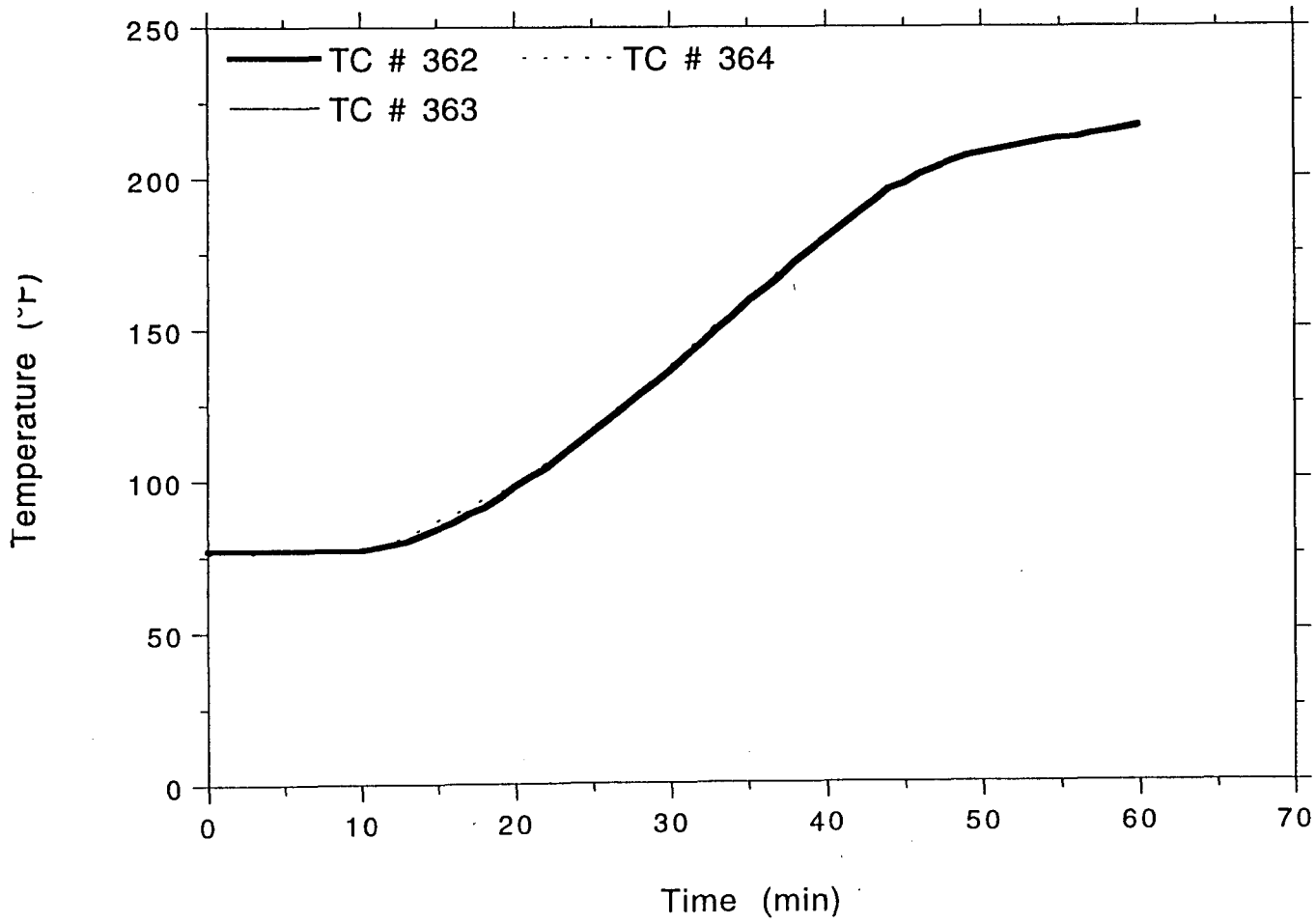
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 1" Steel Conduit, #8



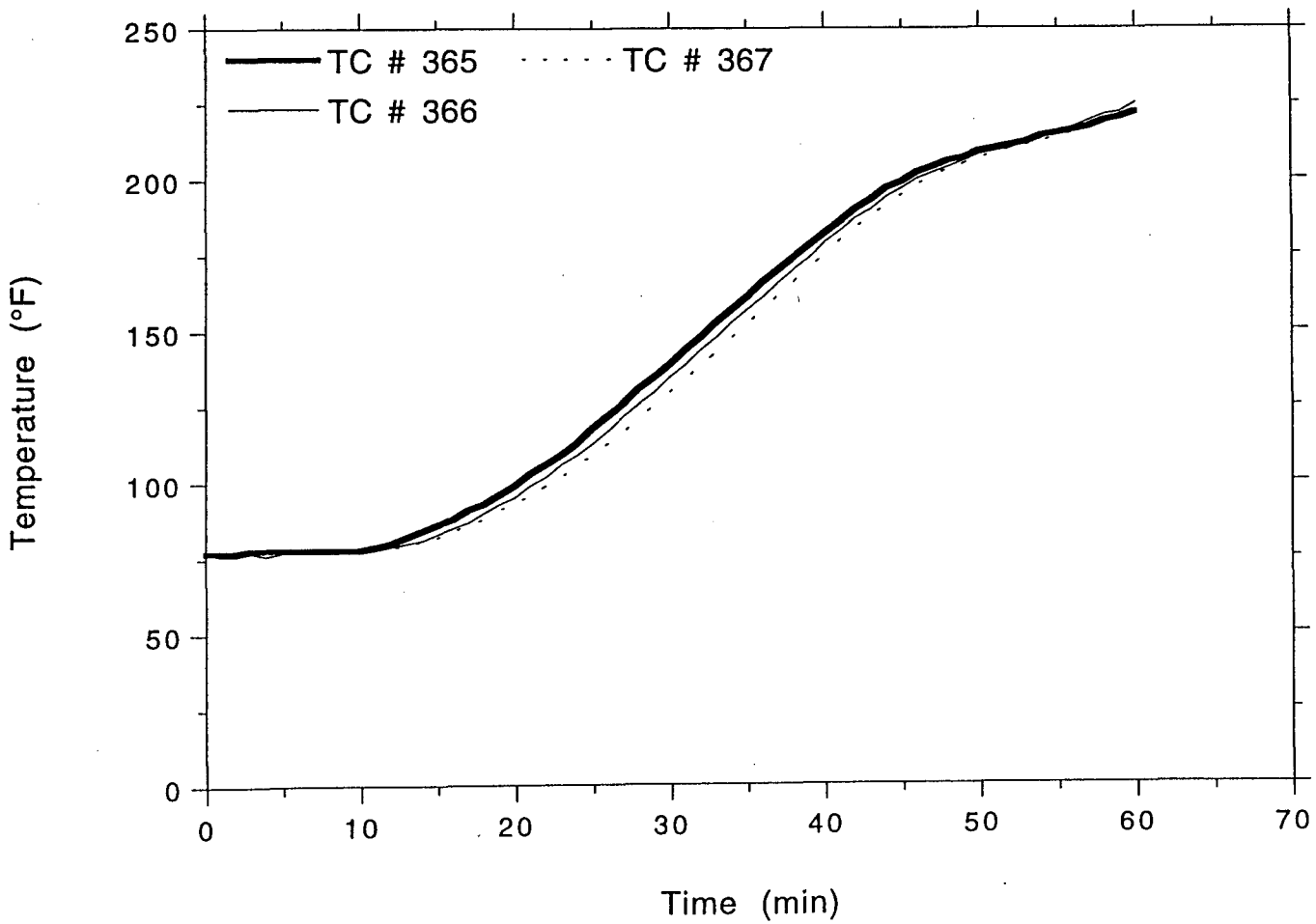
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 1" Steel Conduit, #8



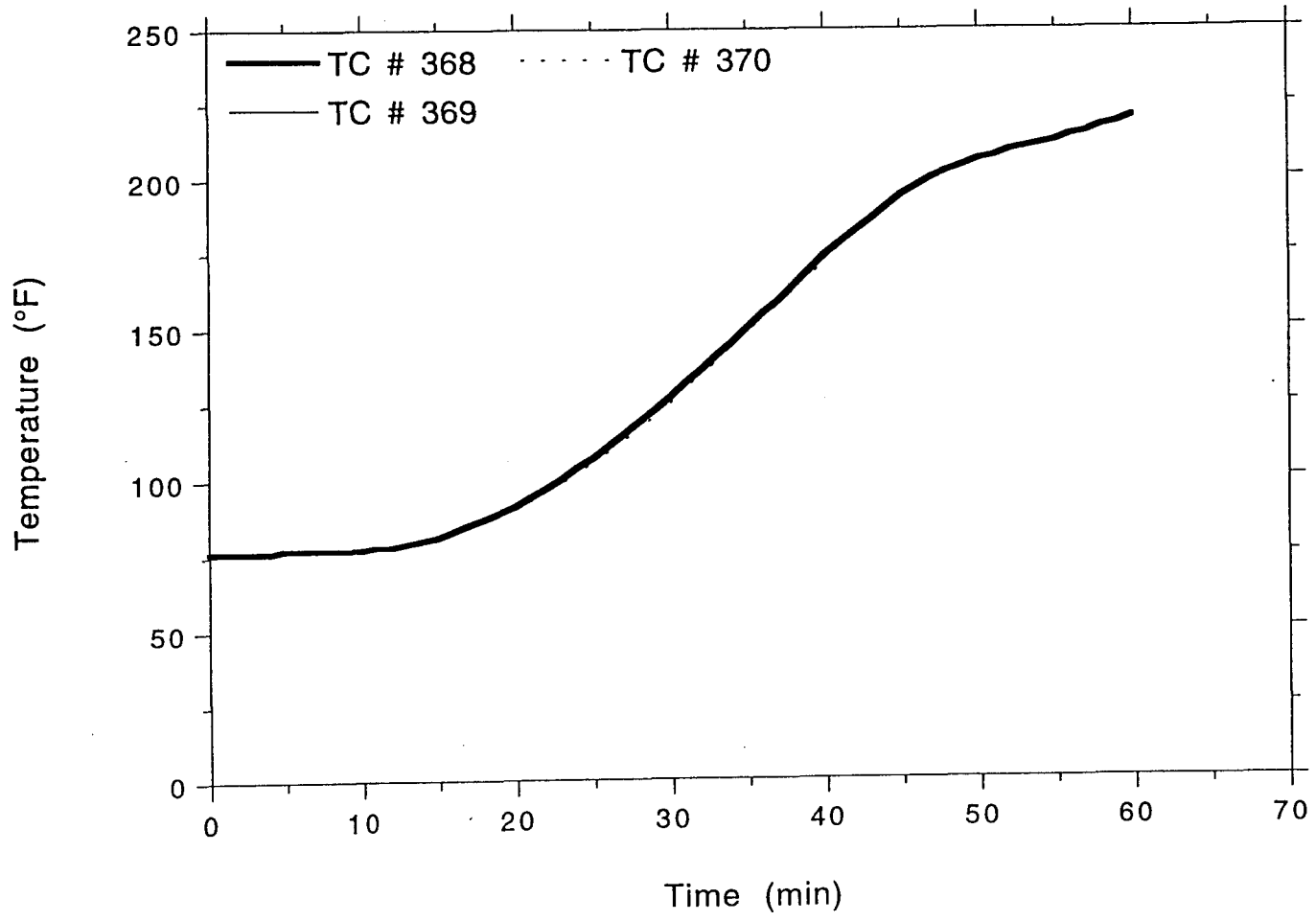
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 1" Steel Conduit, #8



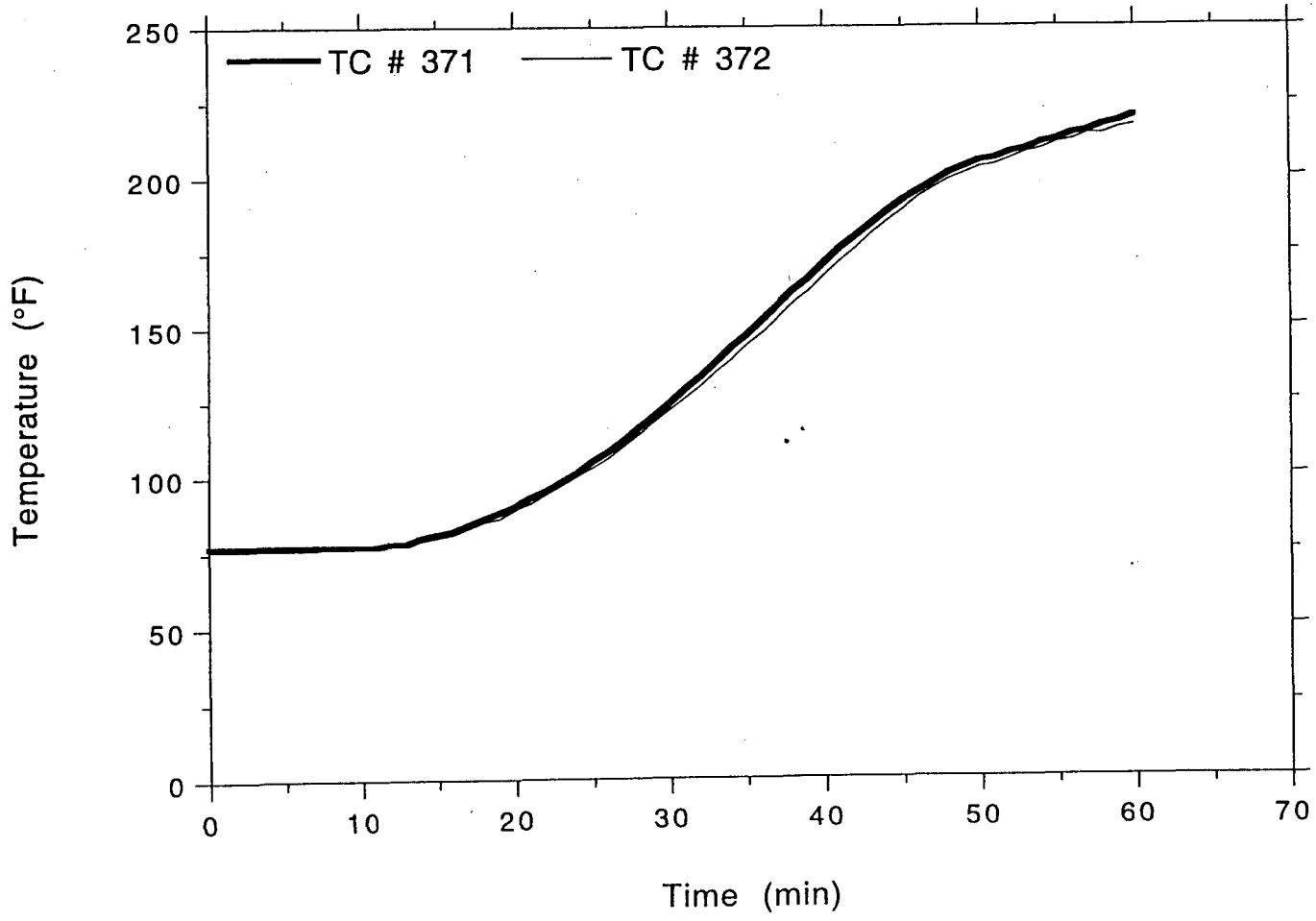
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 1" Steel Conduit, #8



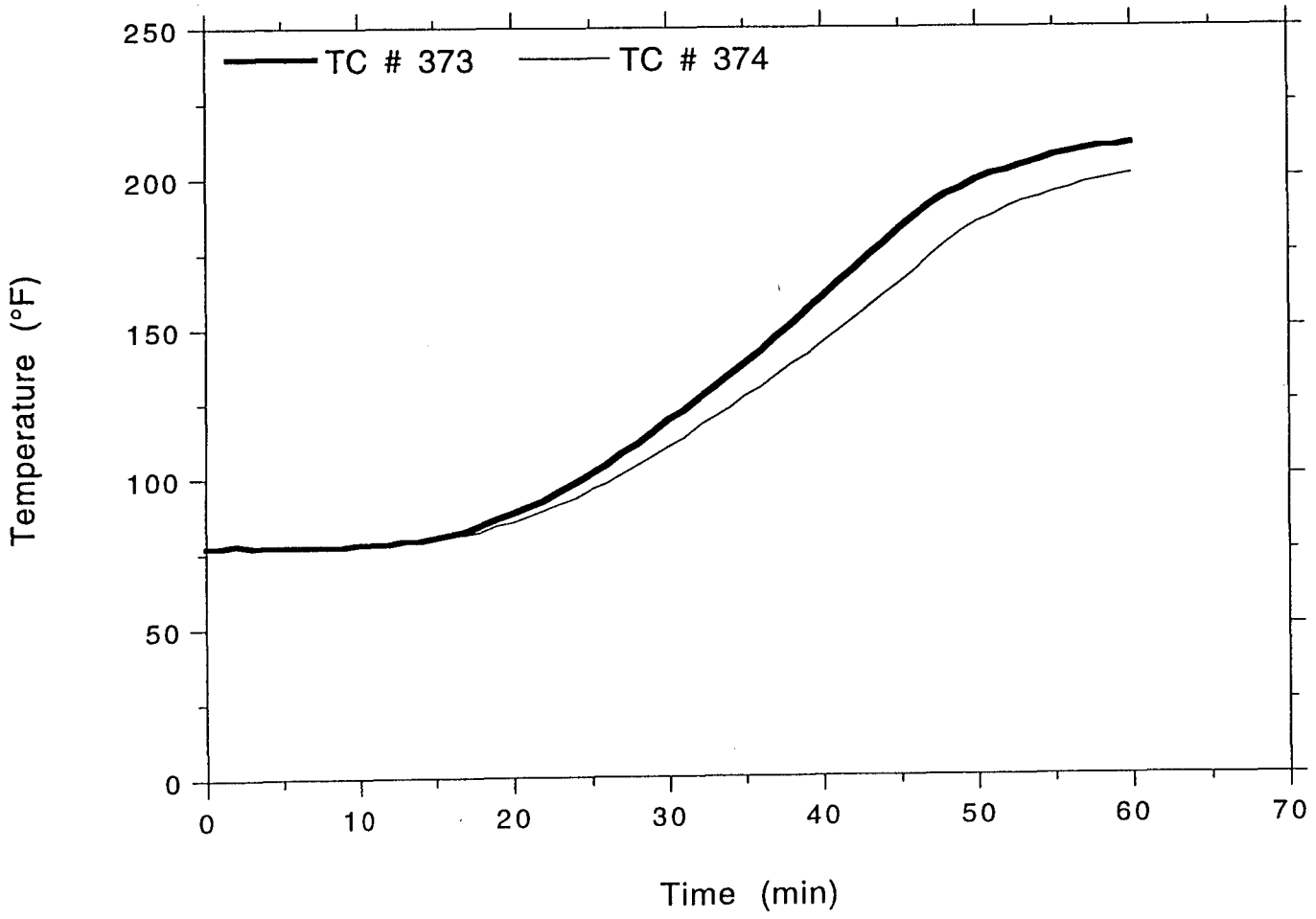
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 1" Steel Conduit, #8



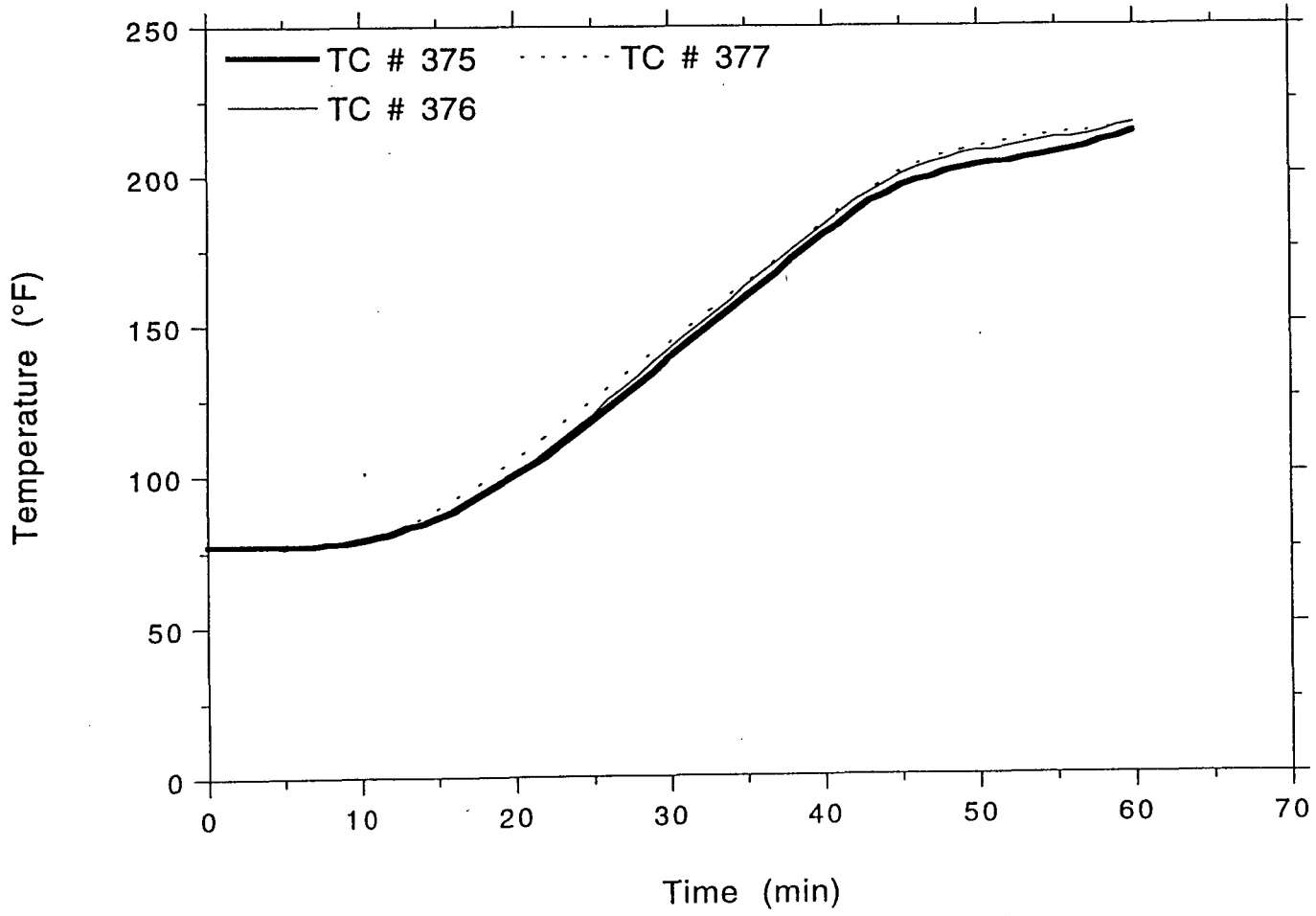
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 1" Steel Conduit, #8



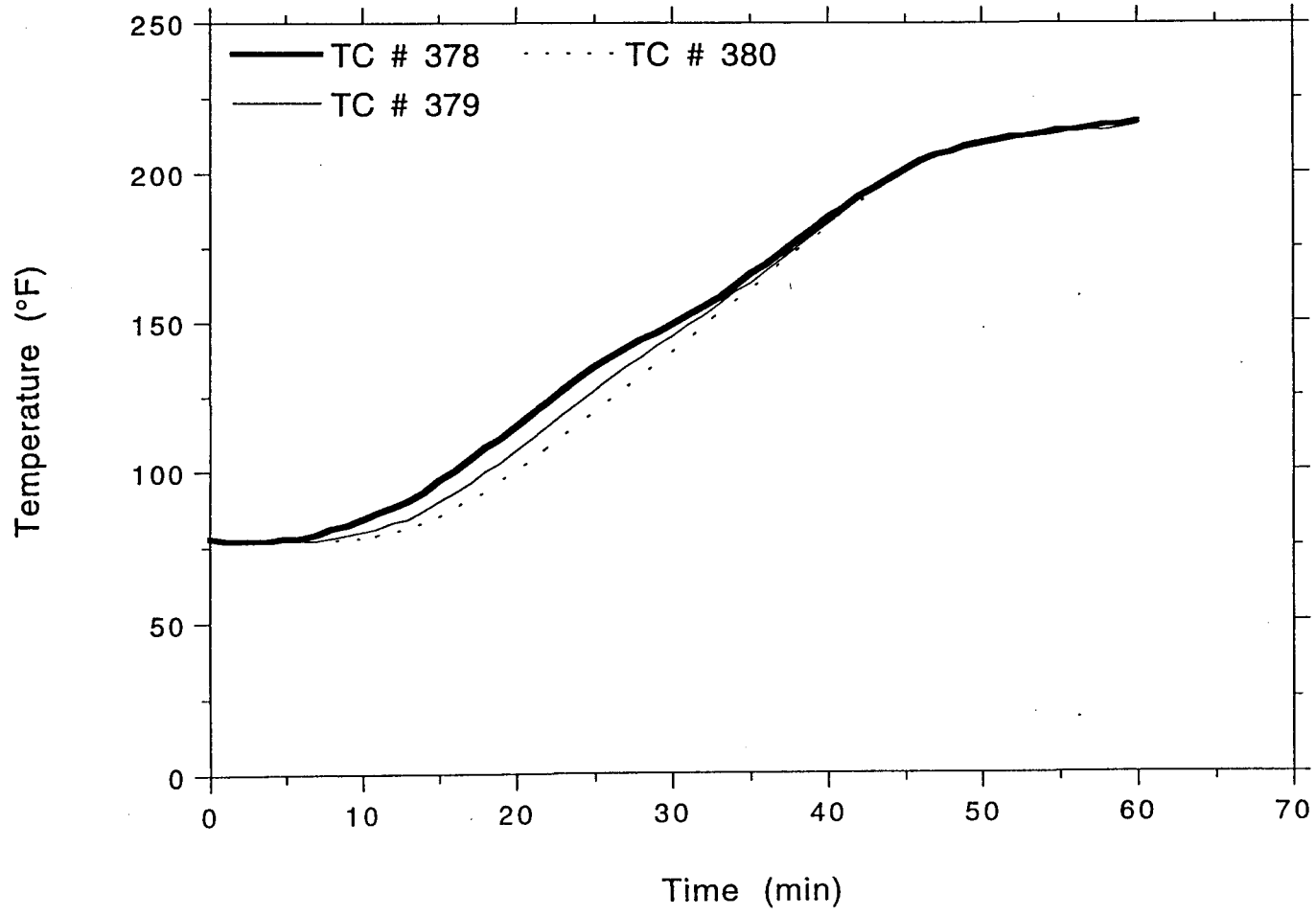
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 1" Steel Conduit, #8



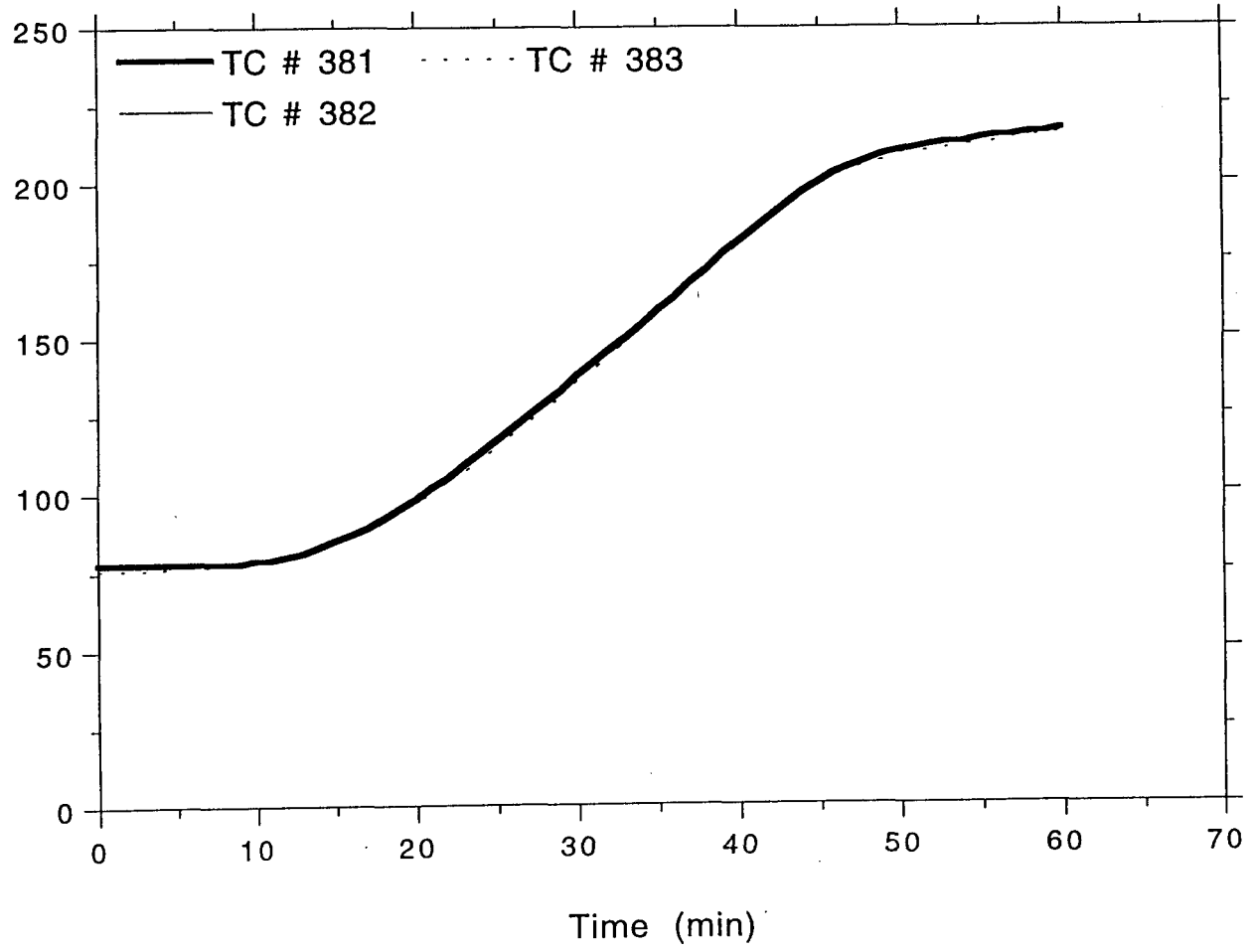
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 1" Steel Conduit, #8



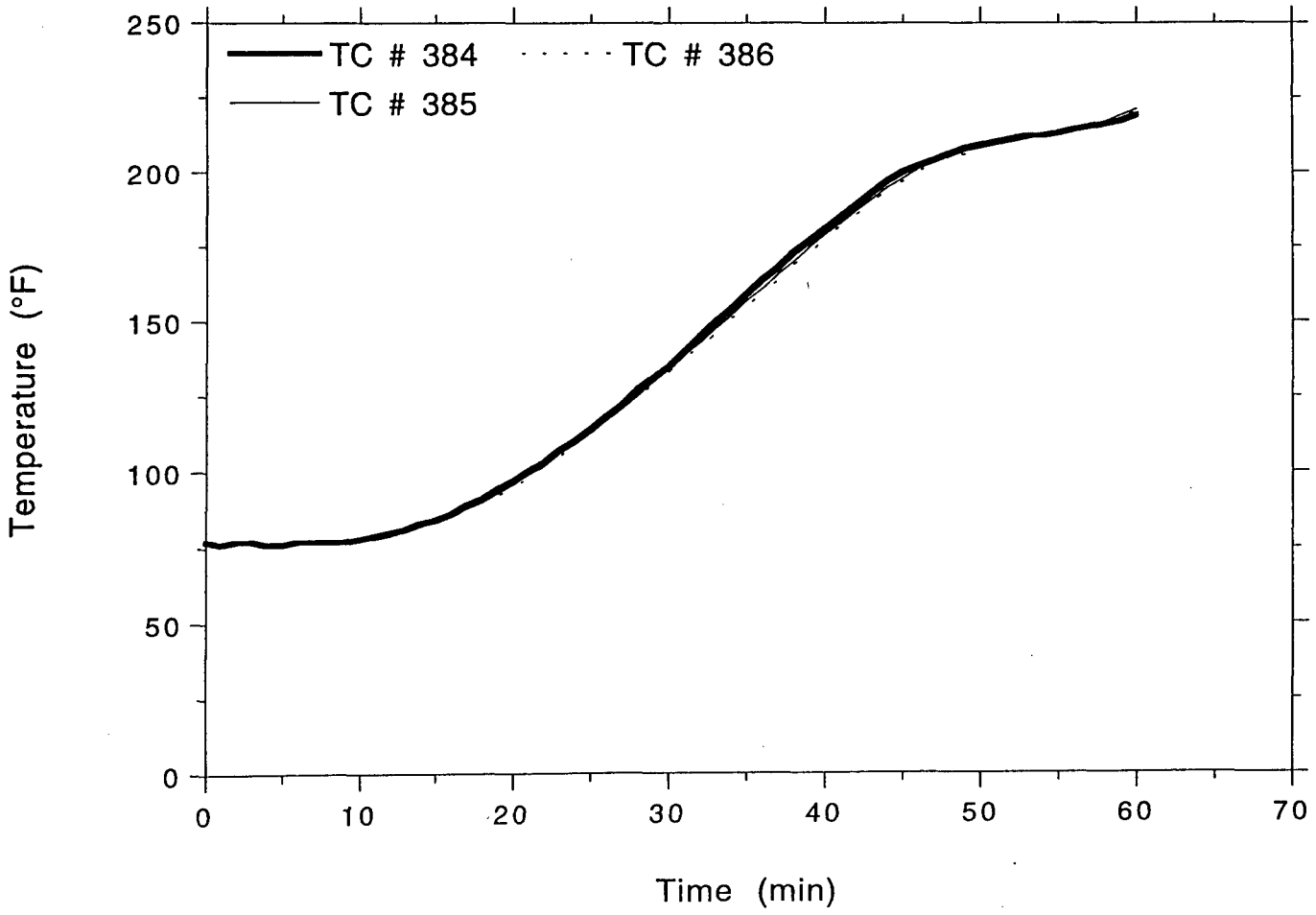
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 1" Steel Conduit, #8



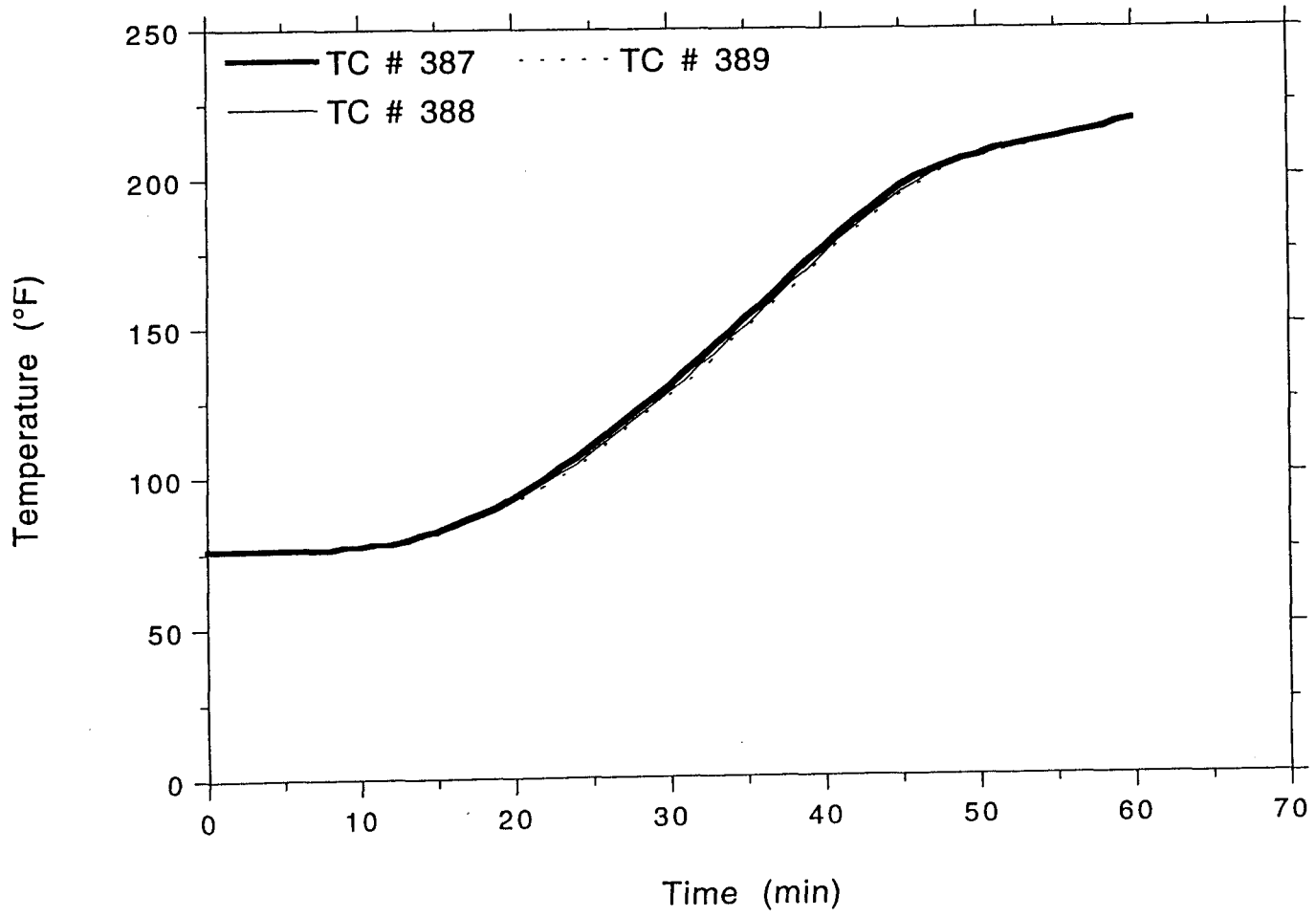
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 1" Steel Conduit, #8



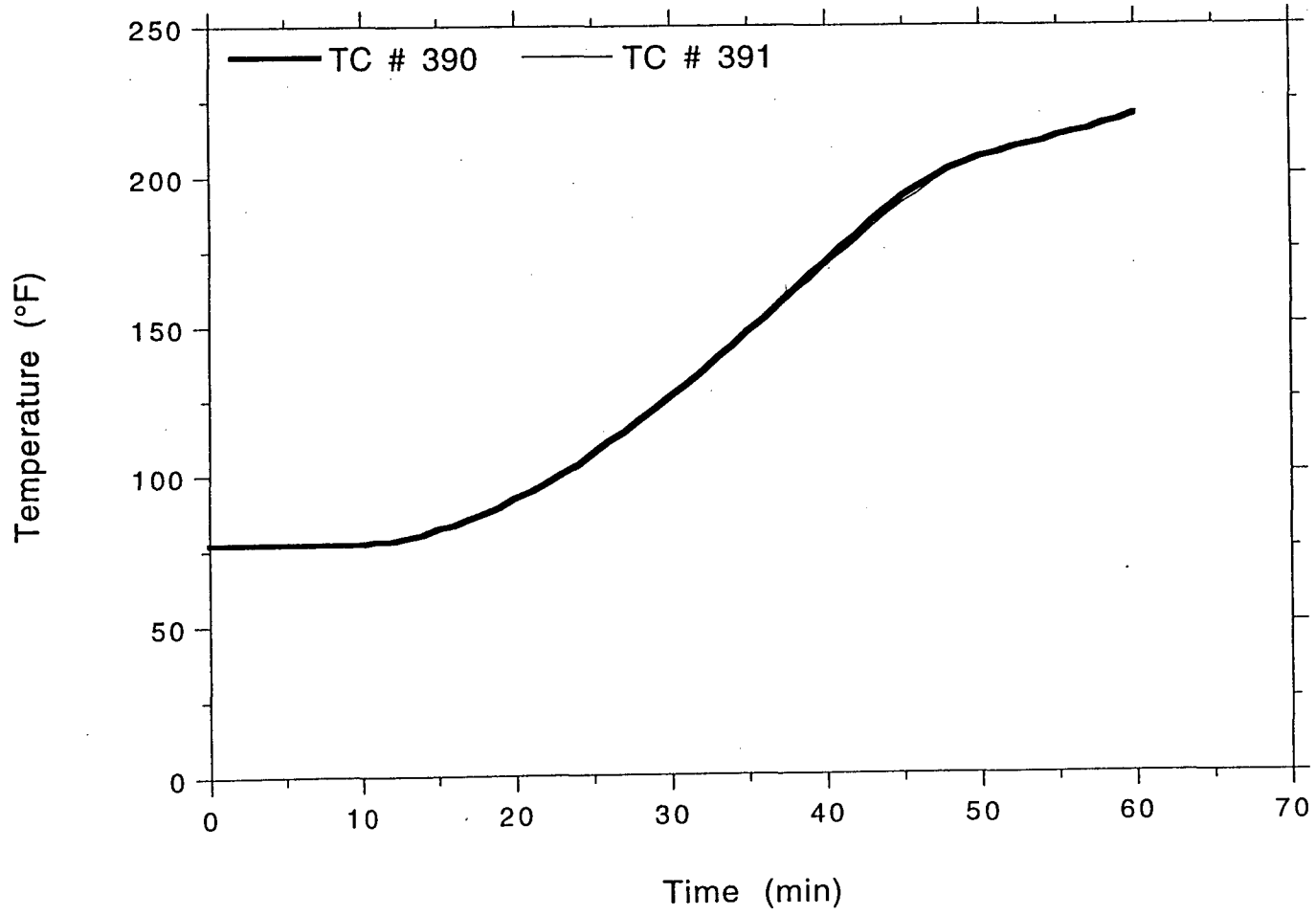
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 1" Steel Conduit, #8



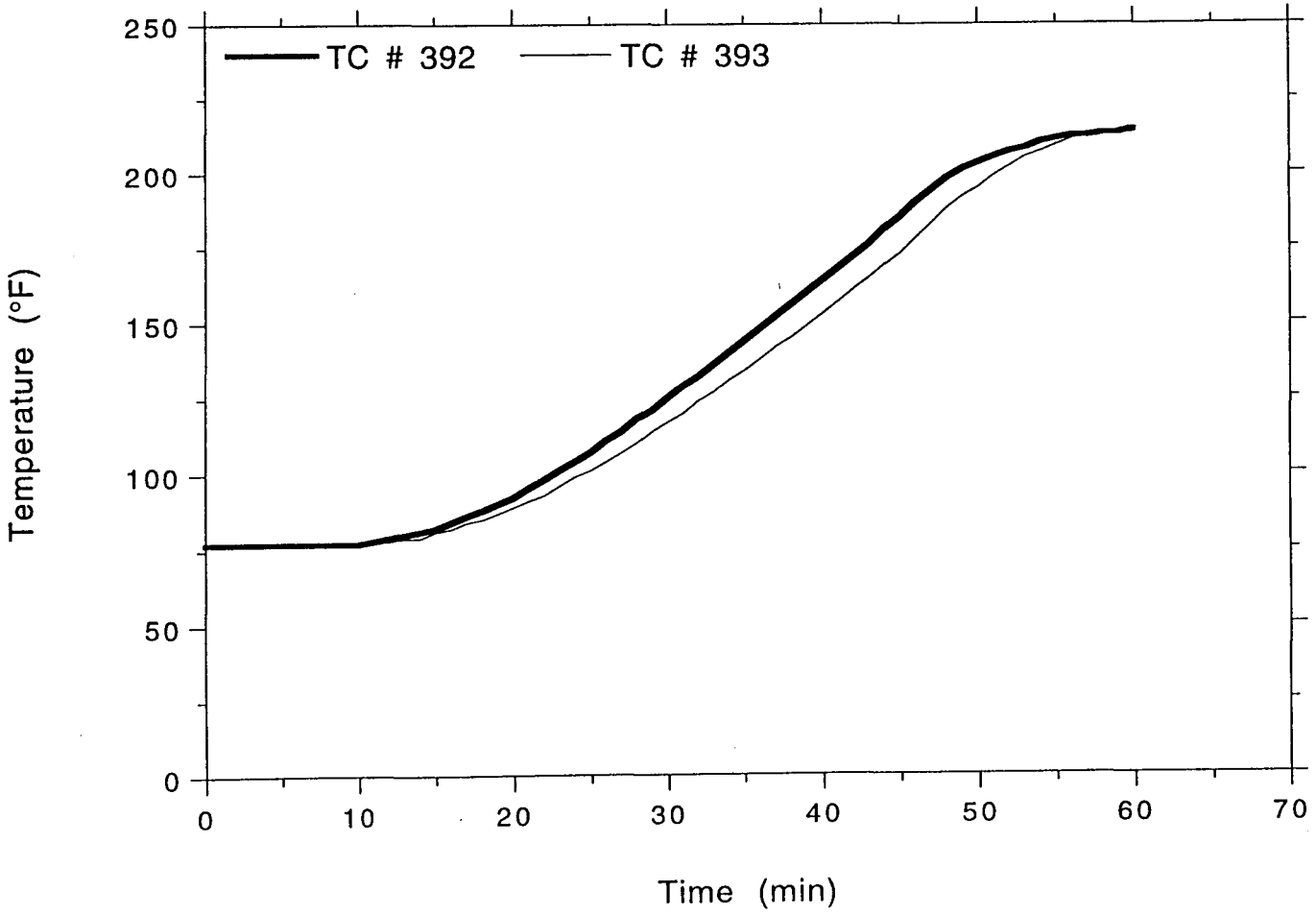
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 1" Steel Conduit, #8



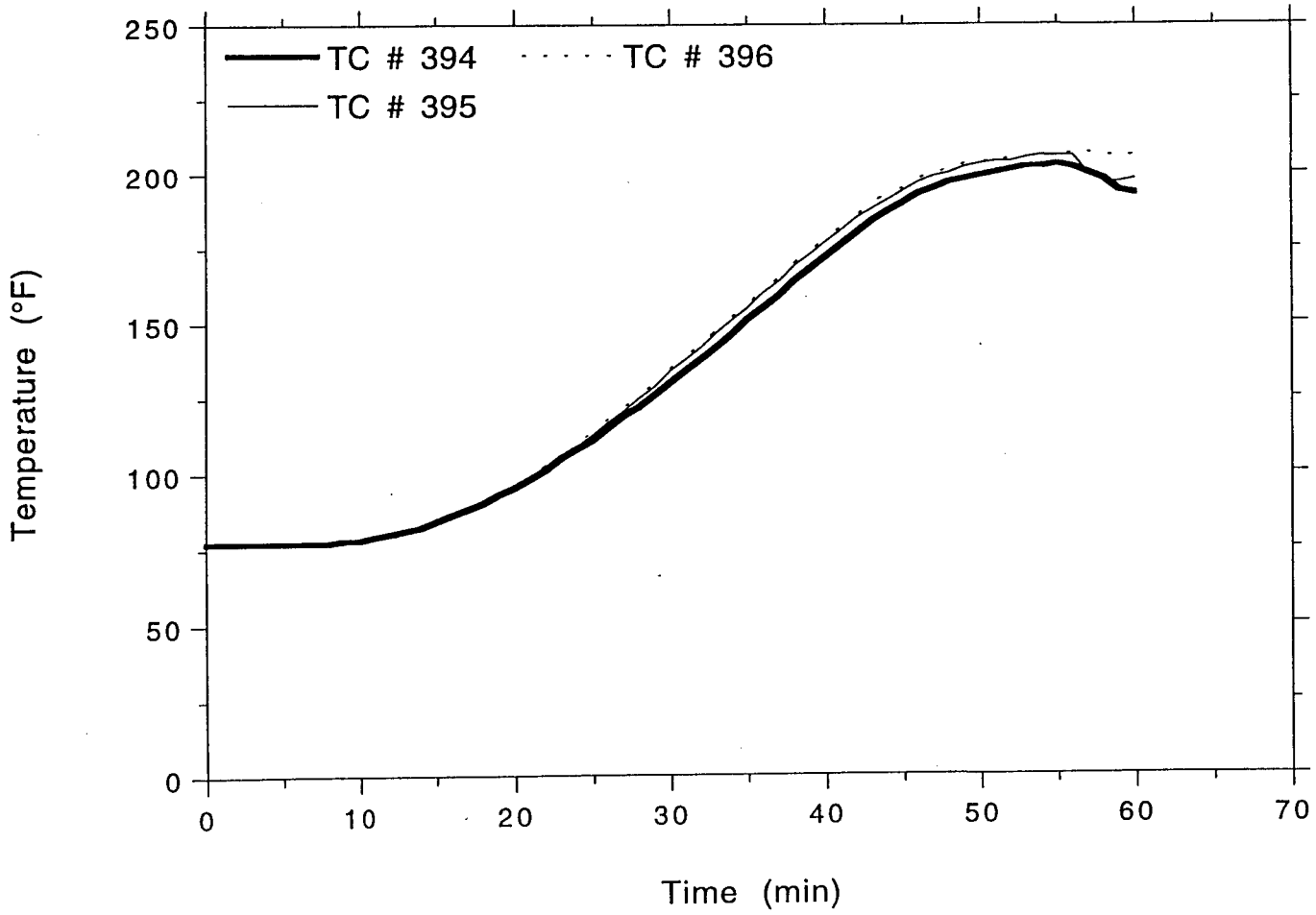
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 1" Steel Conduit, #8



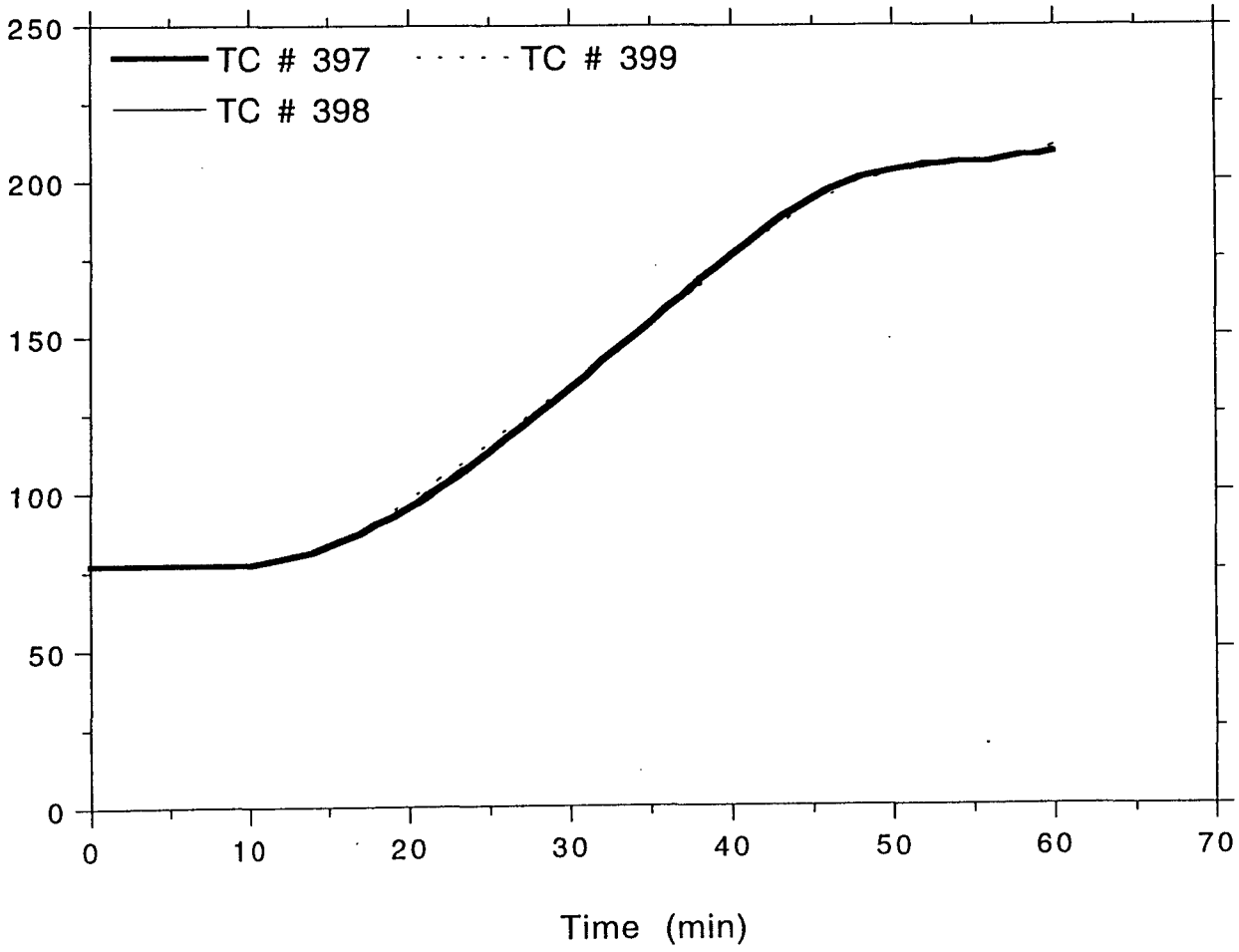
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 1" Steel Conduit, #8



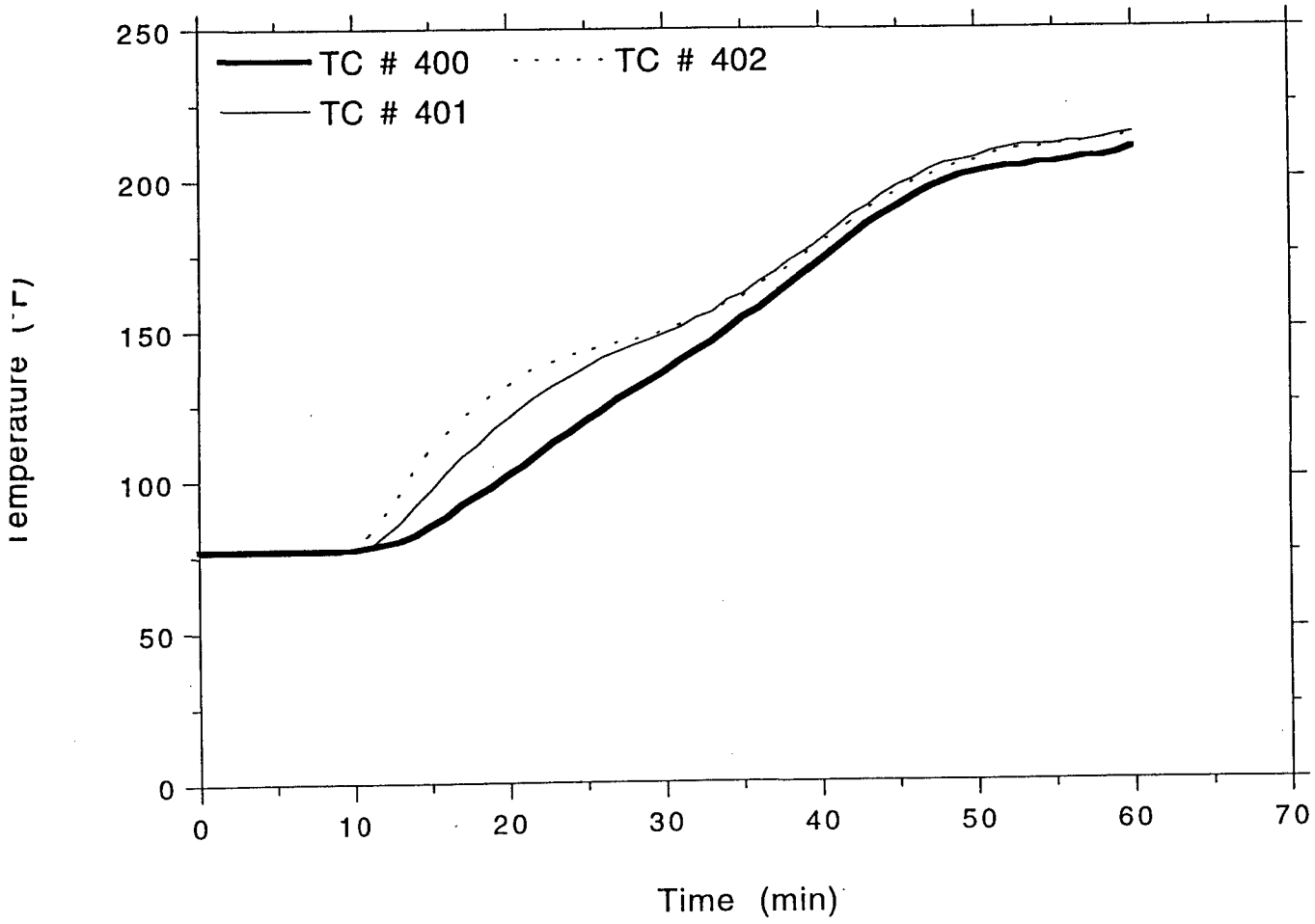
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 1" Steel Conduit, #8



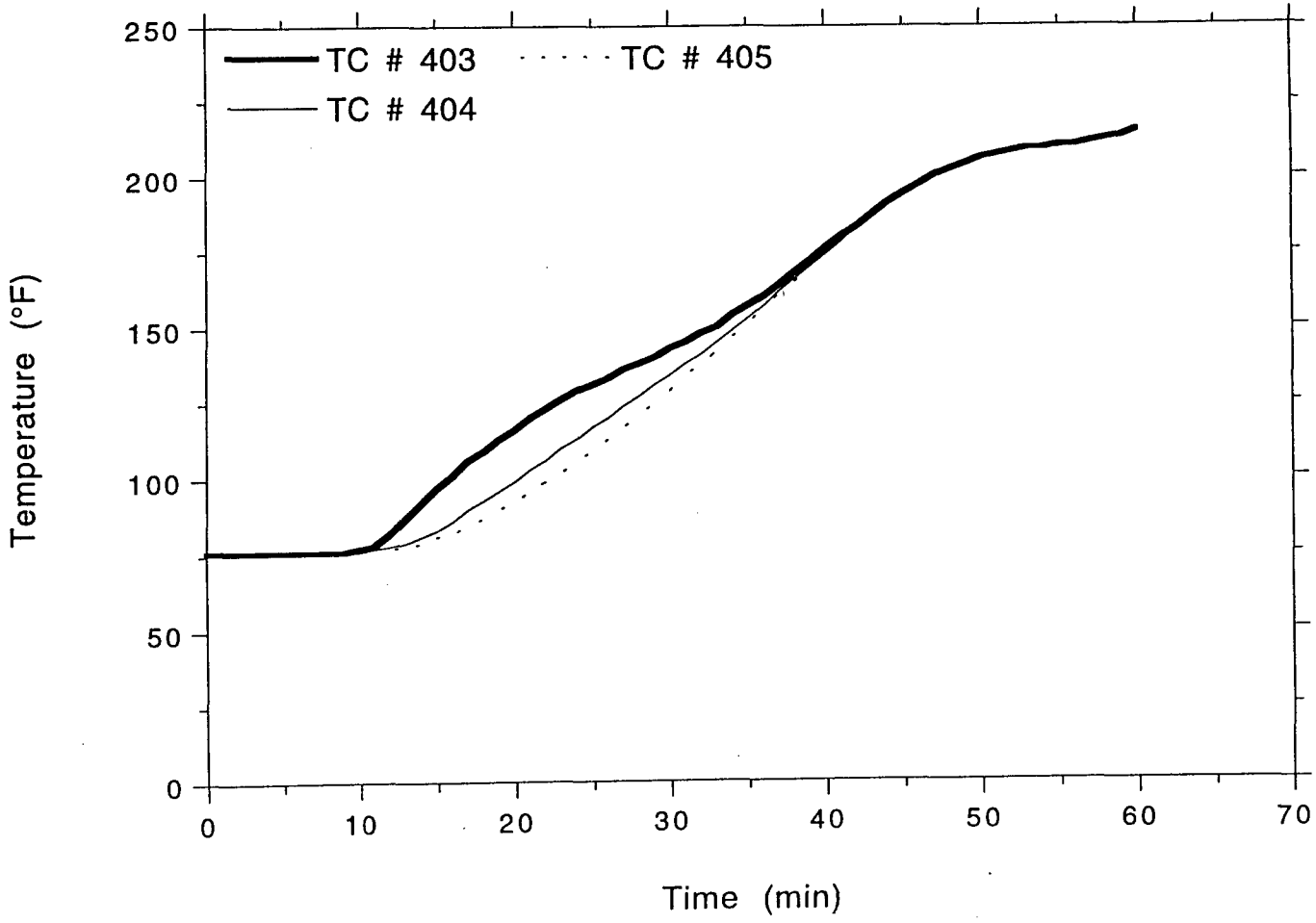
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 1" Steel Conduit, #8



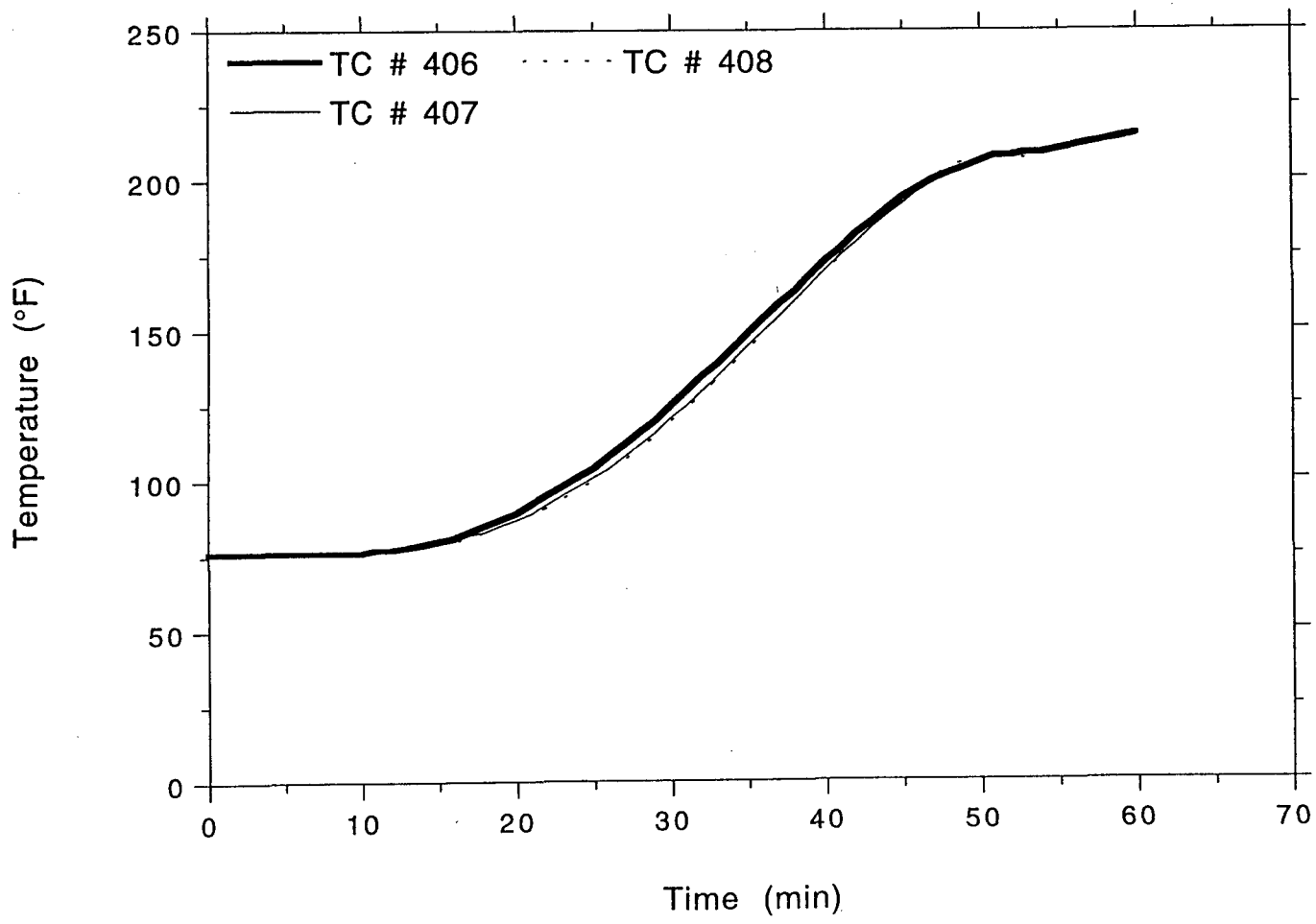
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 1" Steel Conduit, #8



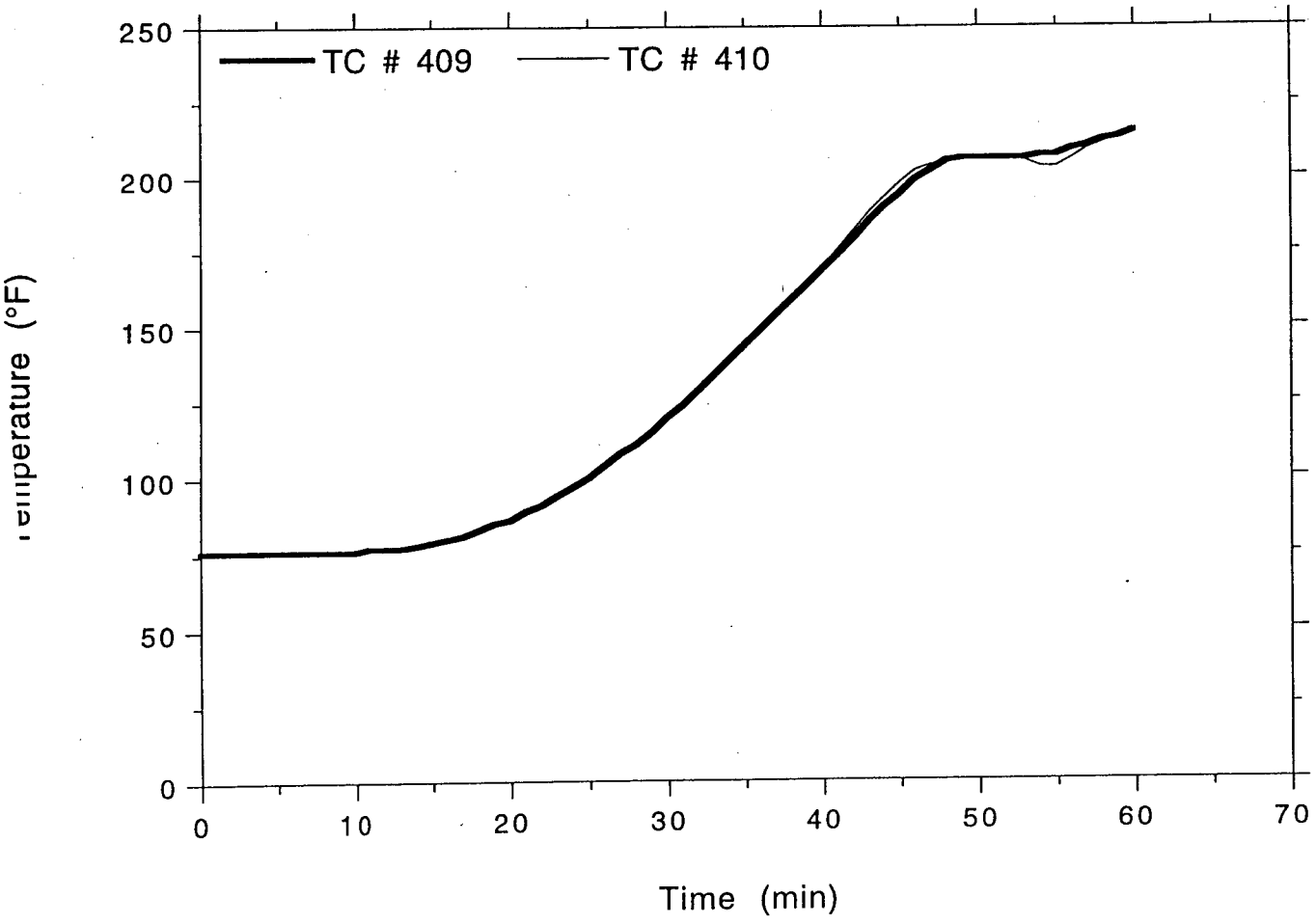
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 1" Steel Conduit, #8



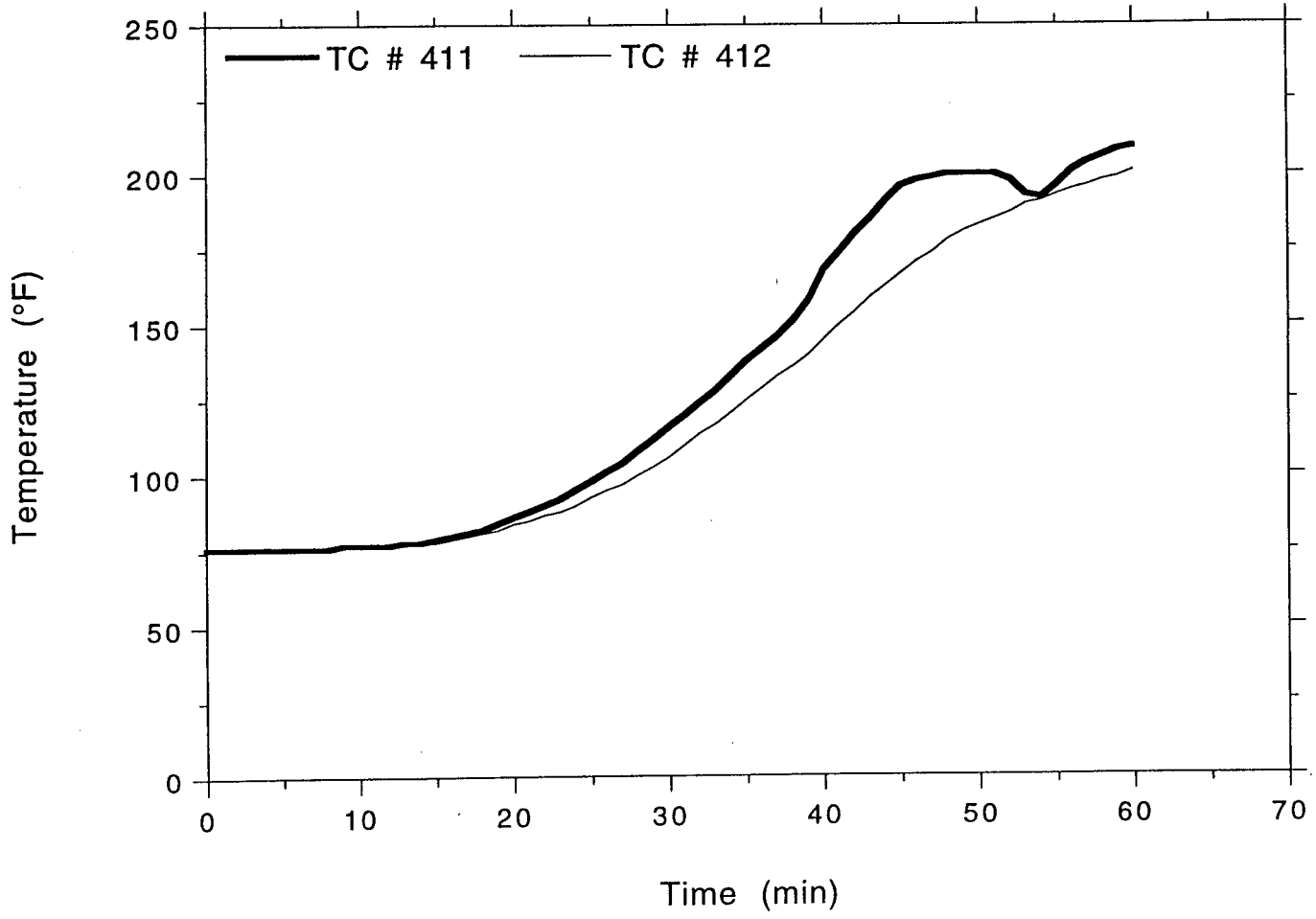
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 1" Steel Conduit, #8



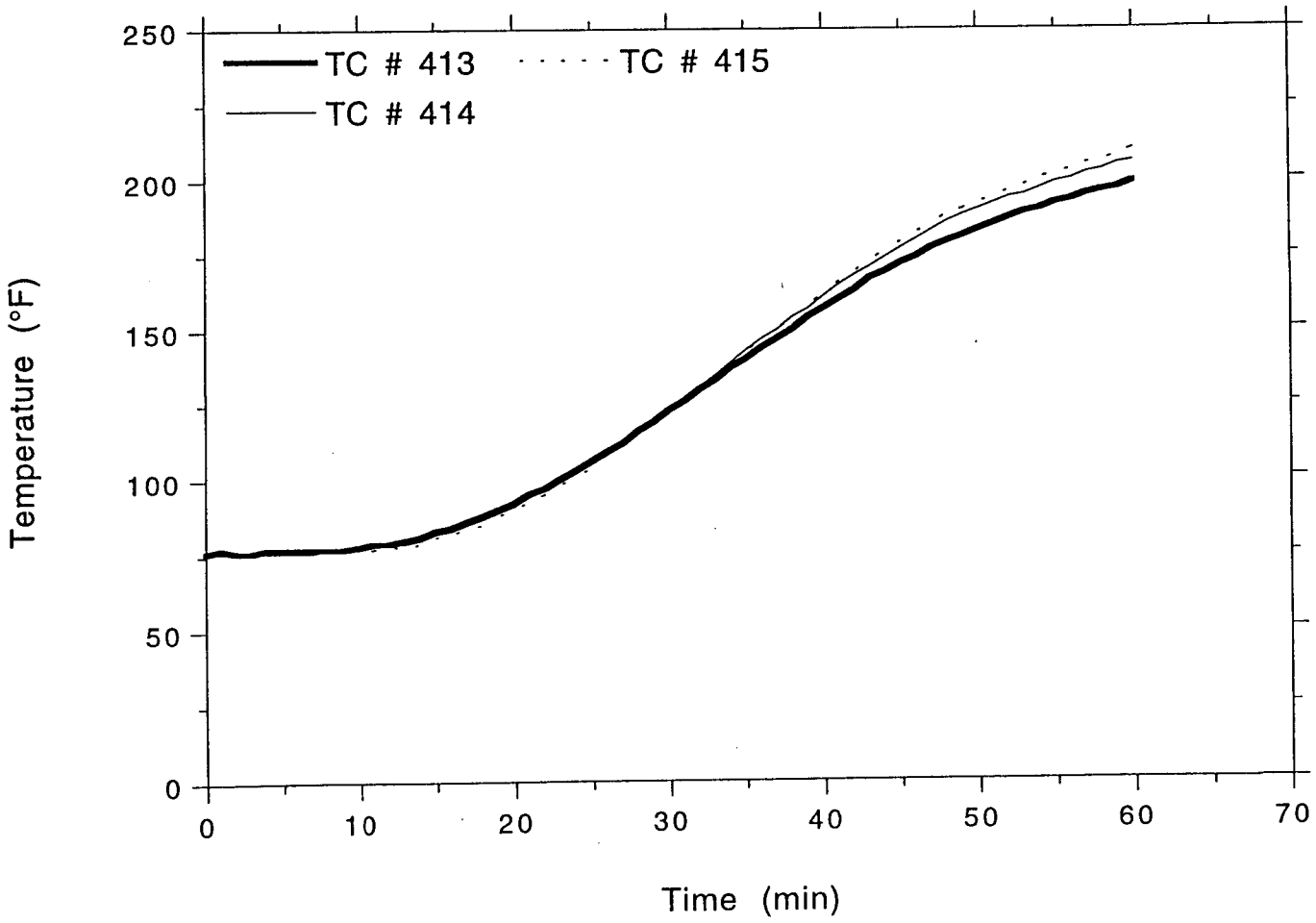
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 1" Steel Conduit, #8



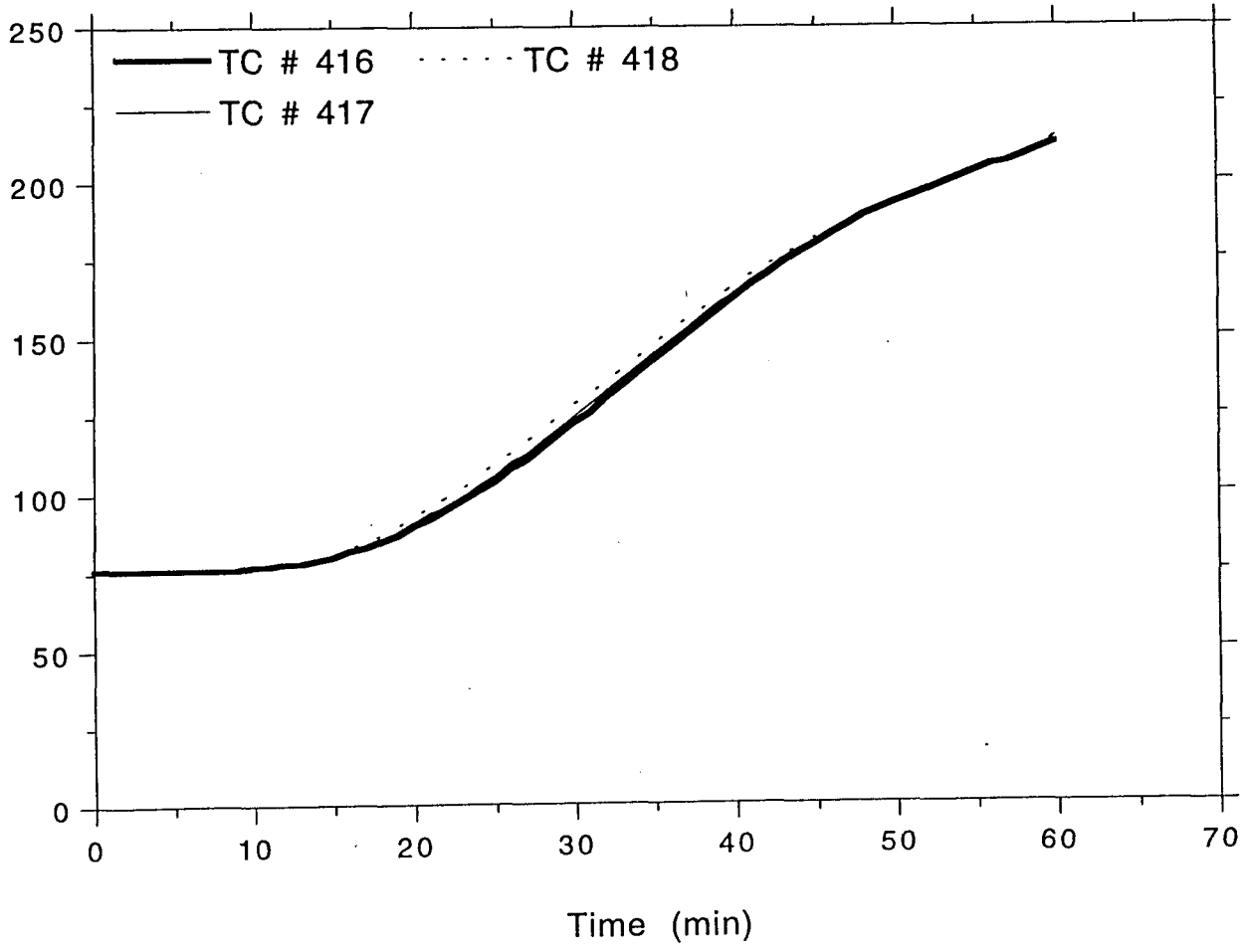
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 3" Steel Conduit, #8



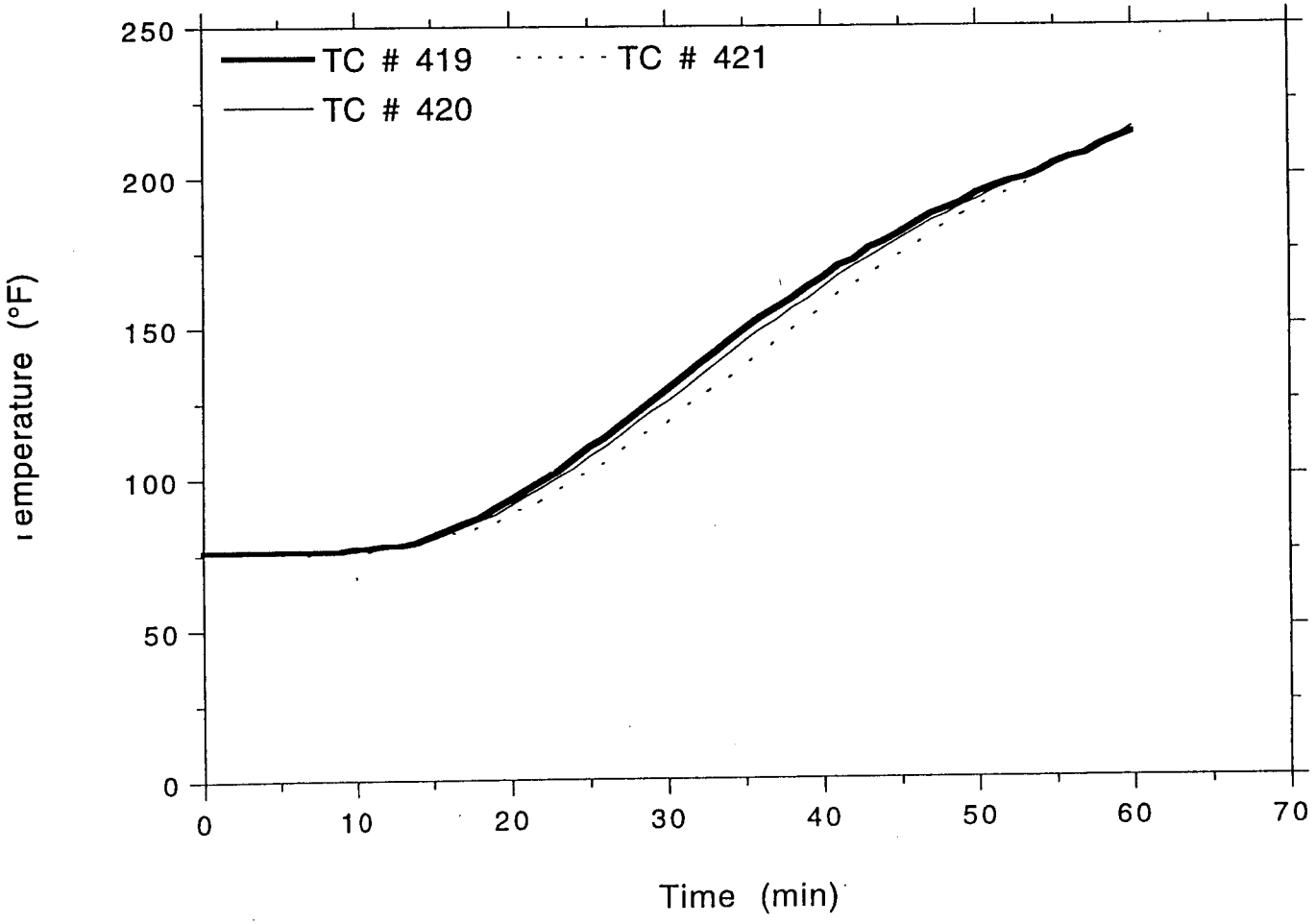
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 3" Steel Conduit, #8



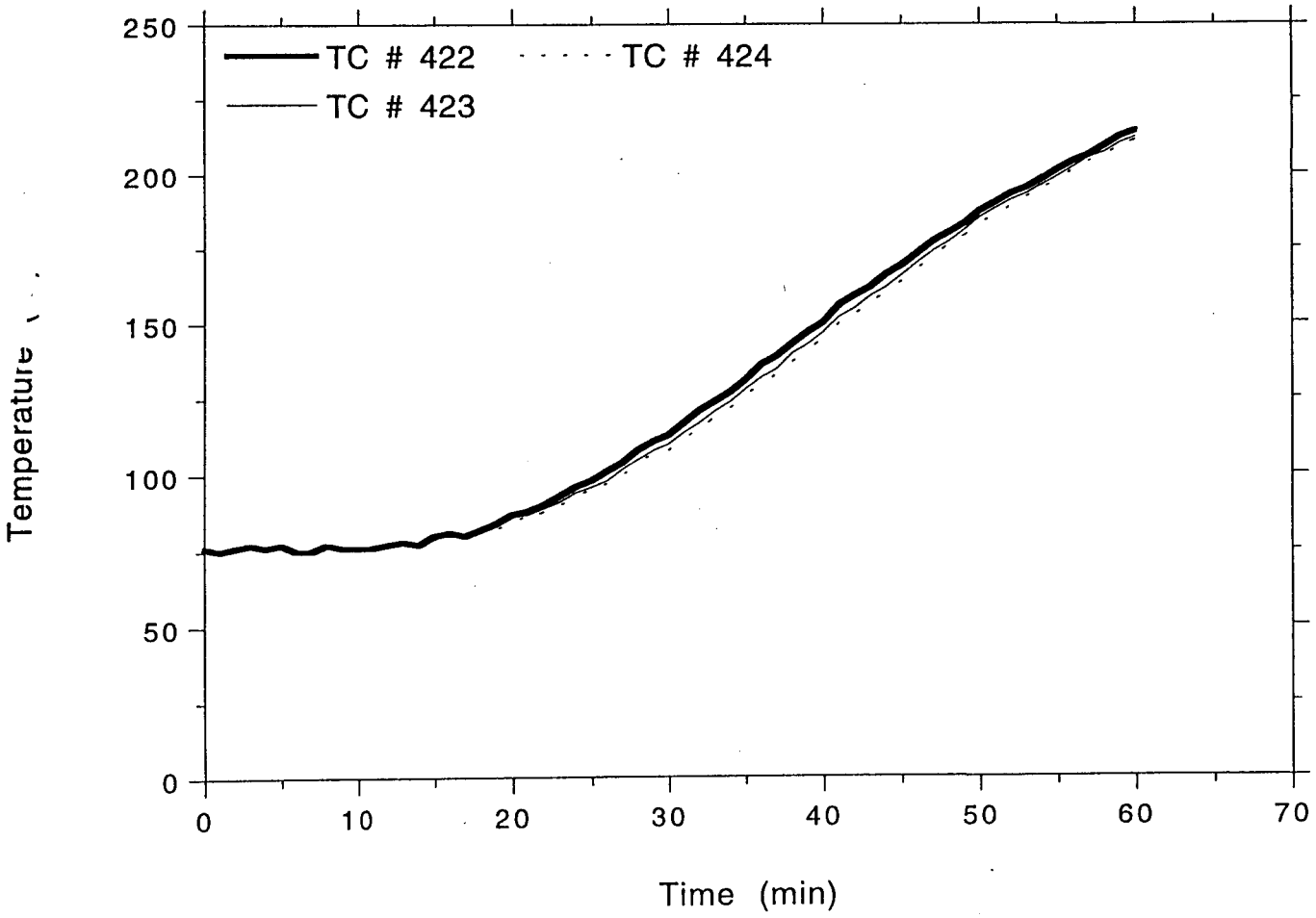
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 3" Steel Conduit, #8



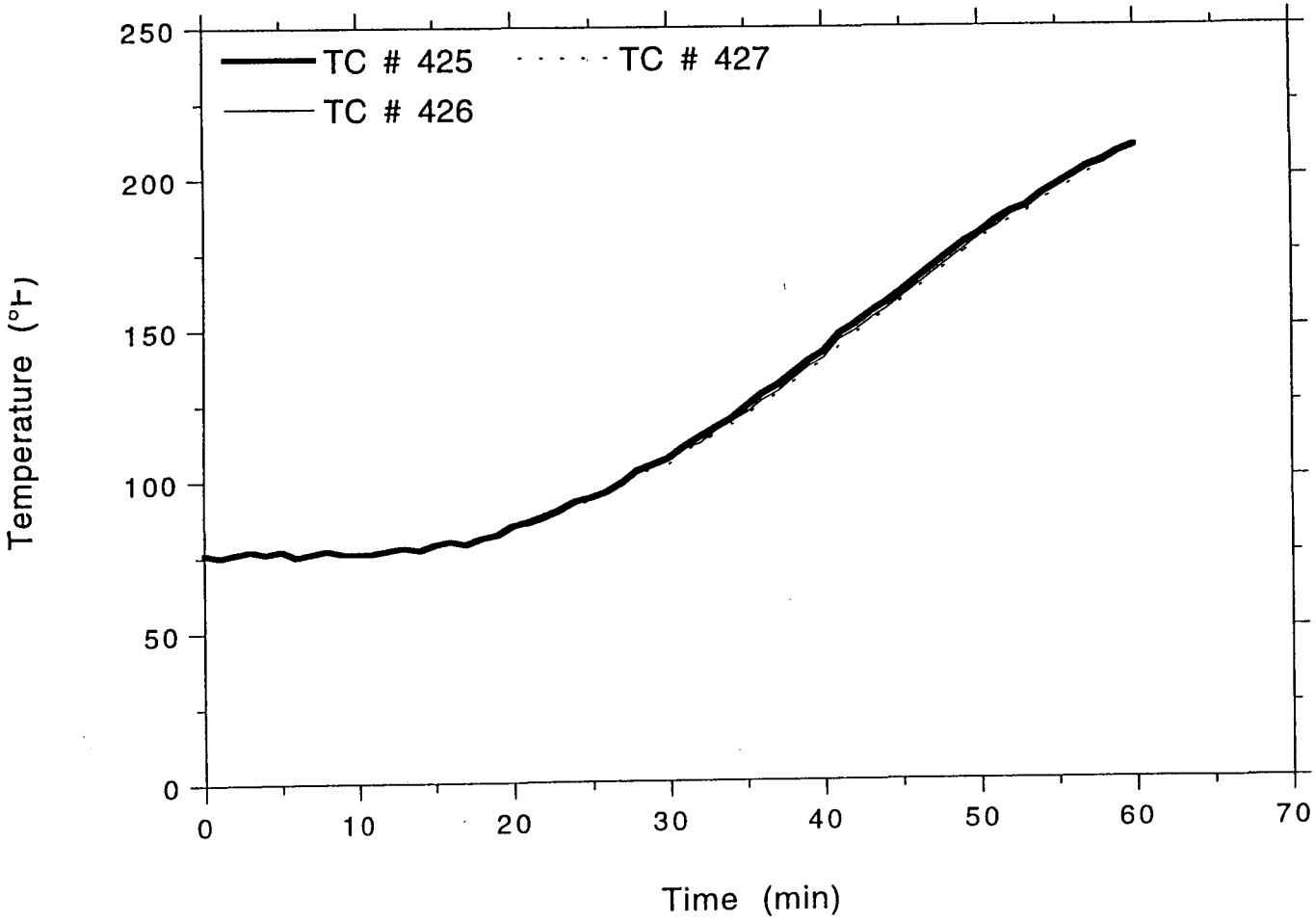
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 3" Steel Conduit, #8



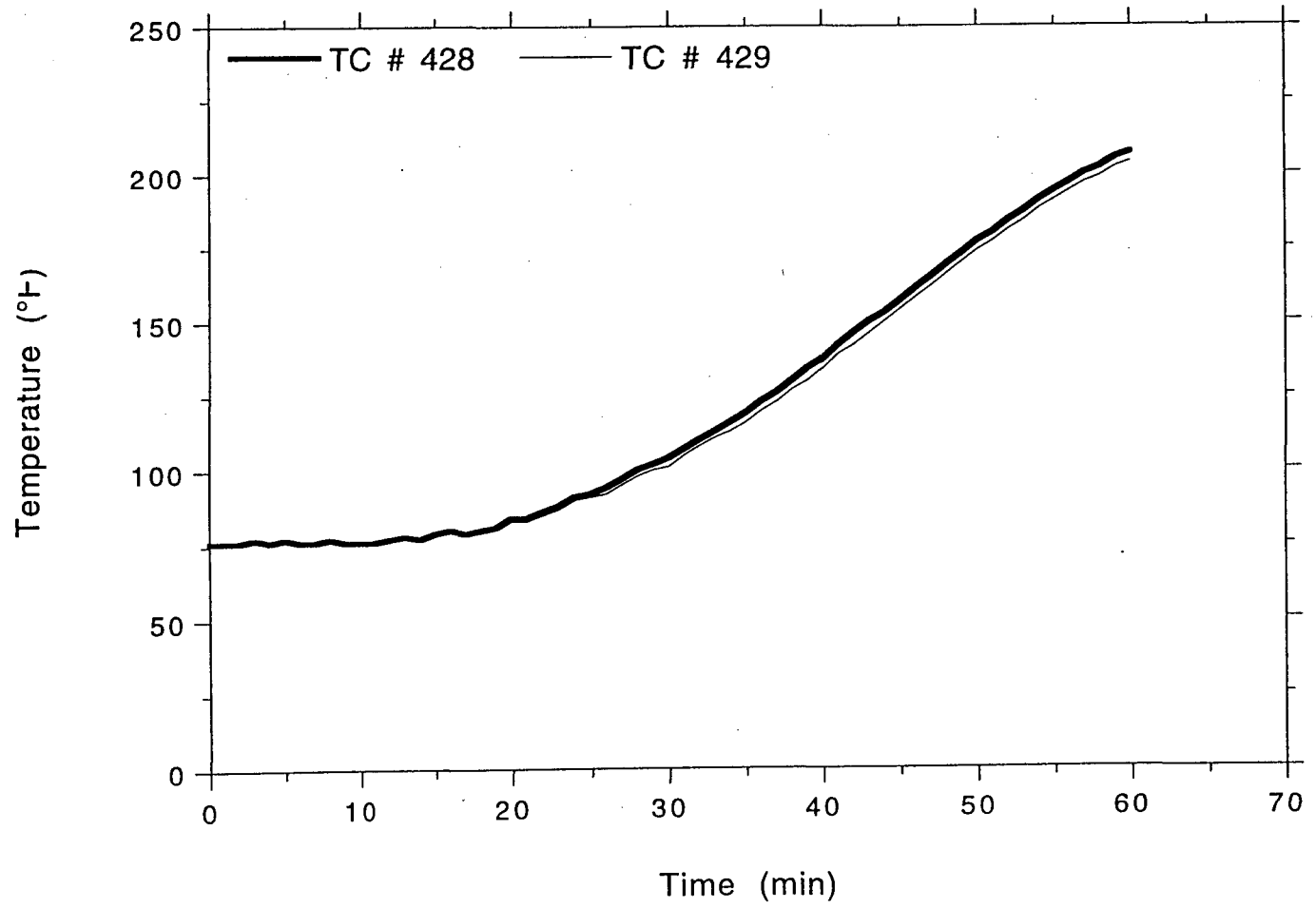
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 3" Steel Conduit, #8



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 3" Steel Conduit, #8



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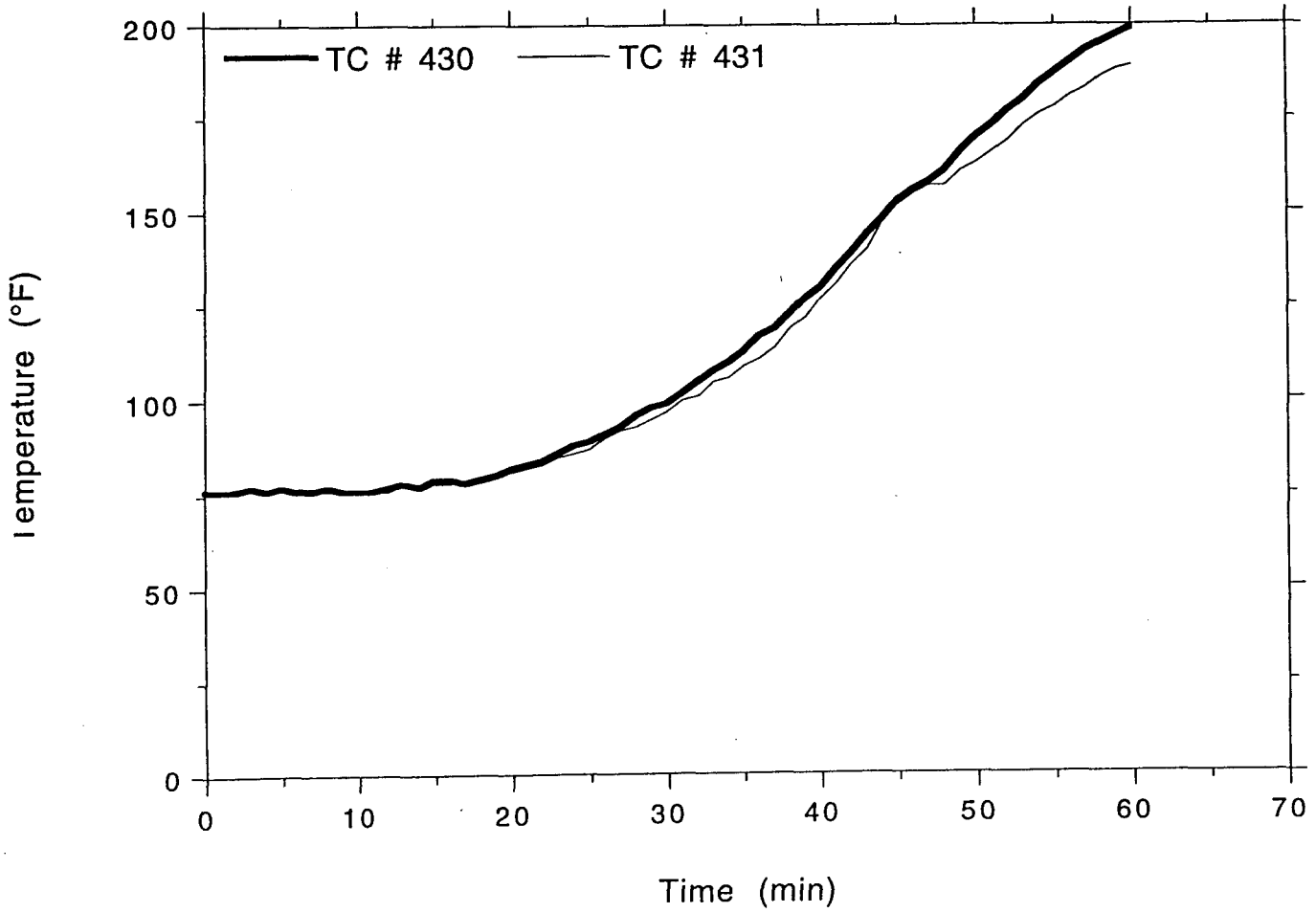
Front Left 3" Steel Conduit, #8



OMEGA POINT LABORATORIES

TSI/TVA
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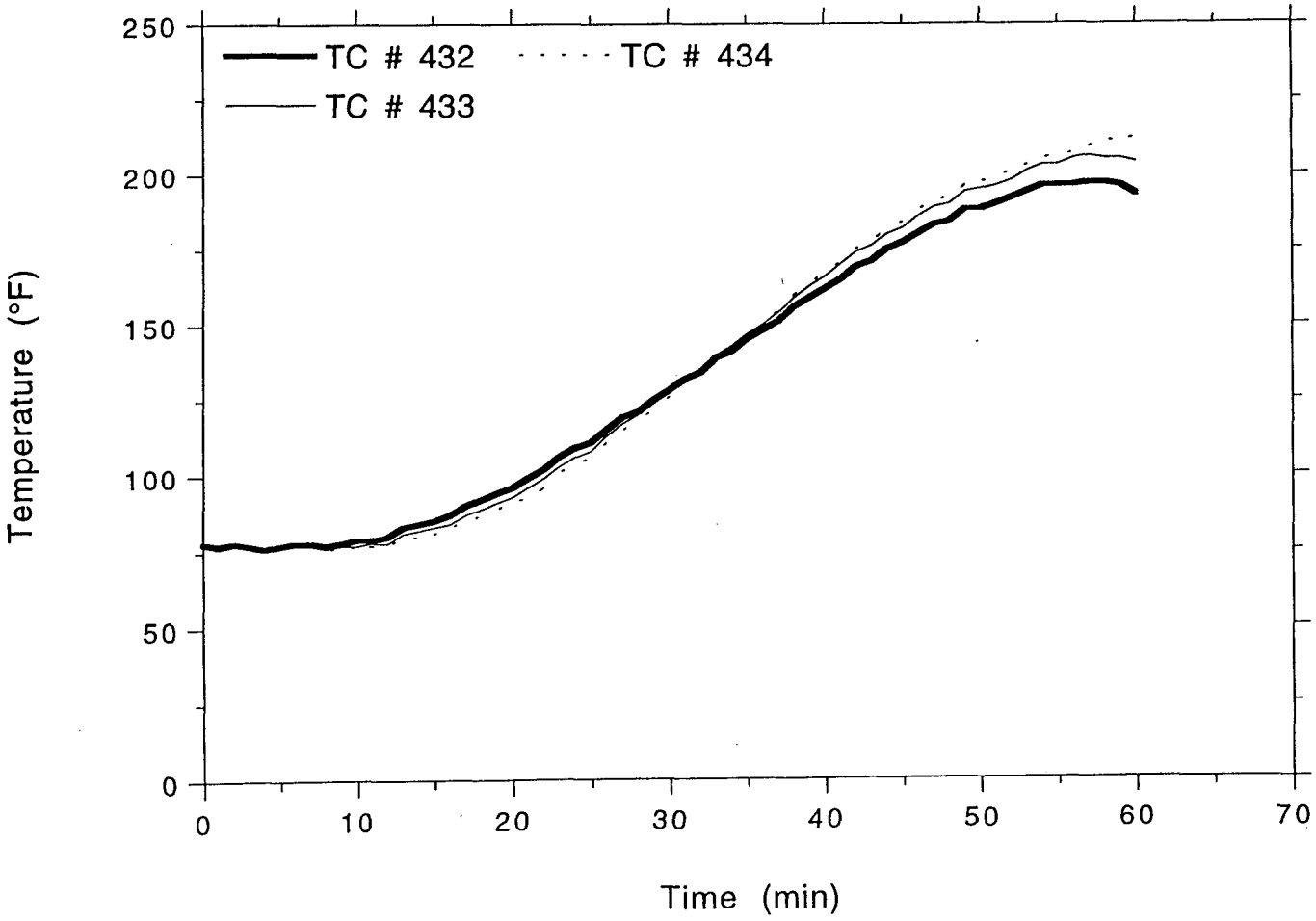
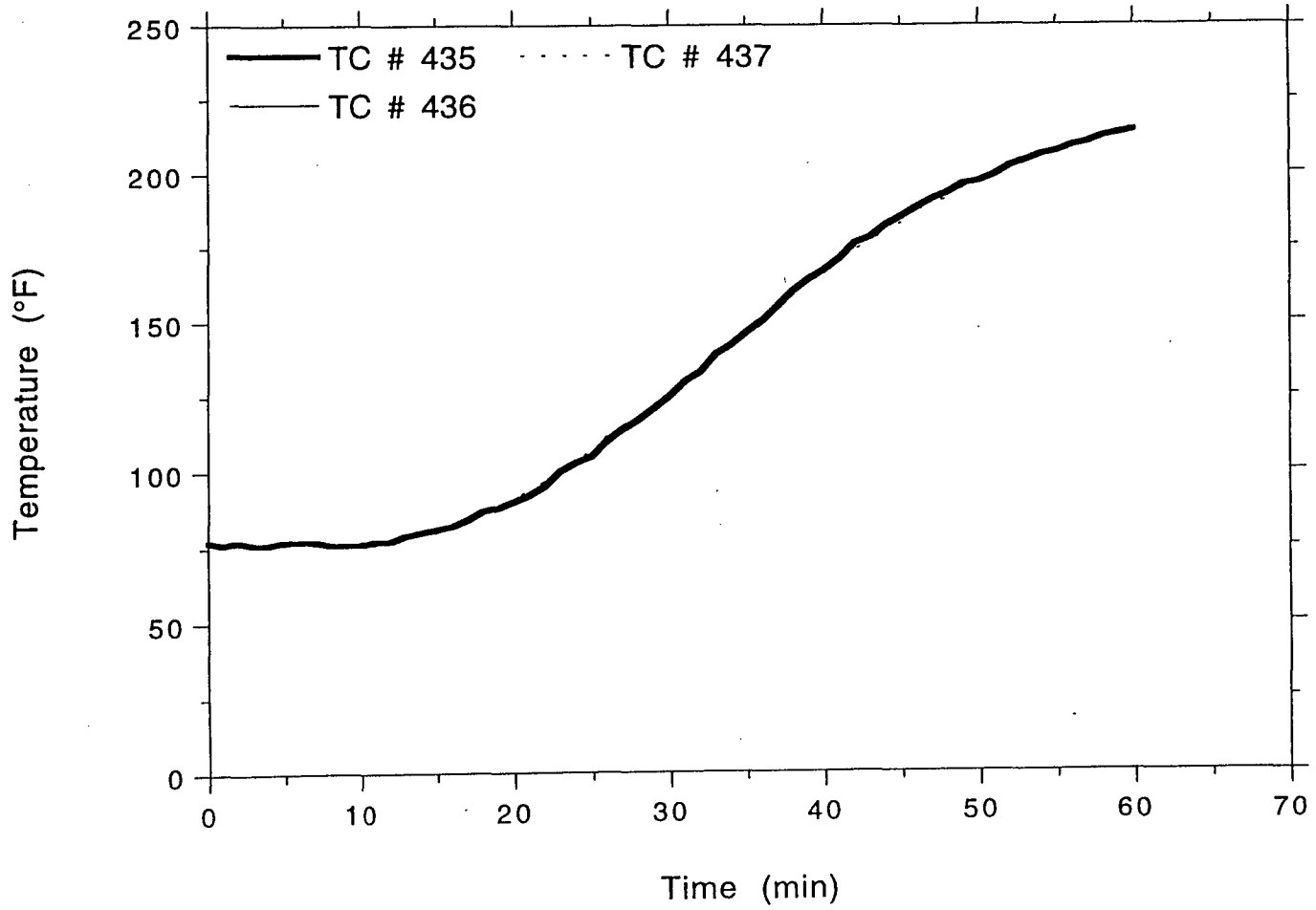
Front Right 3" Steel Conduit, #8



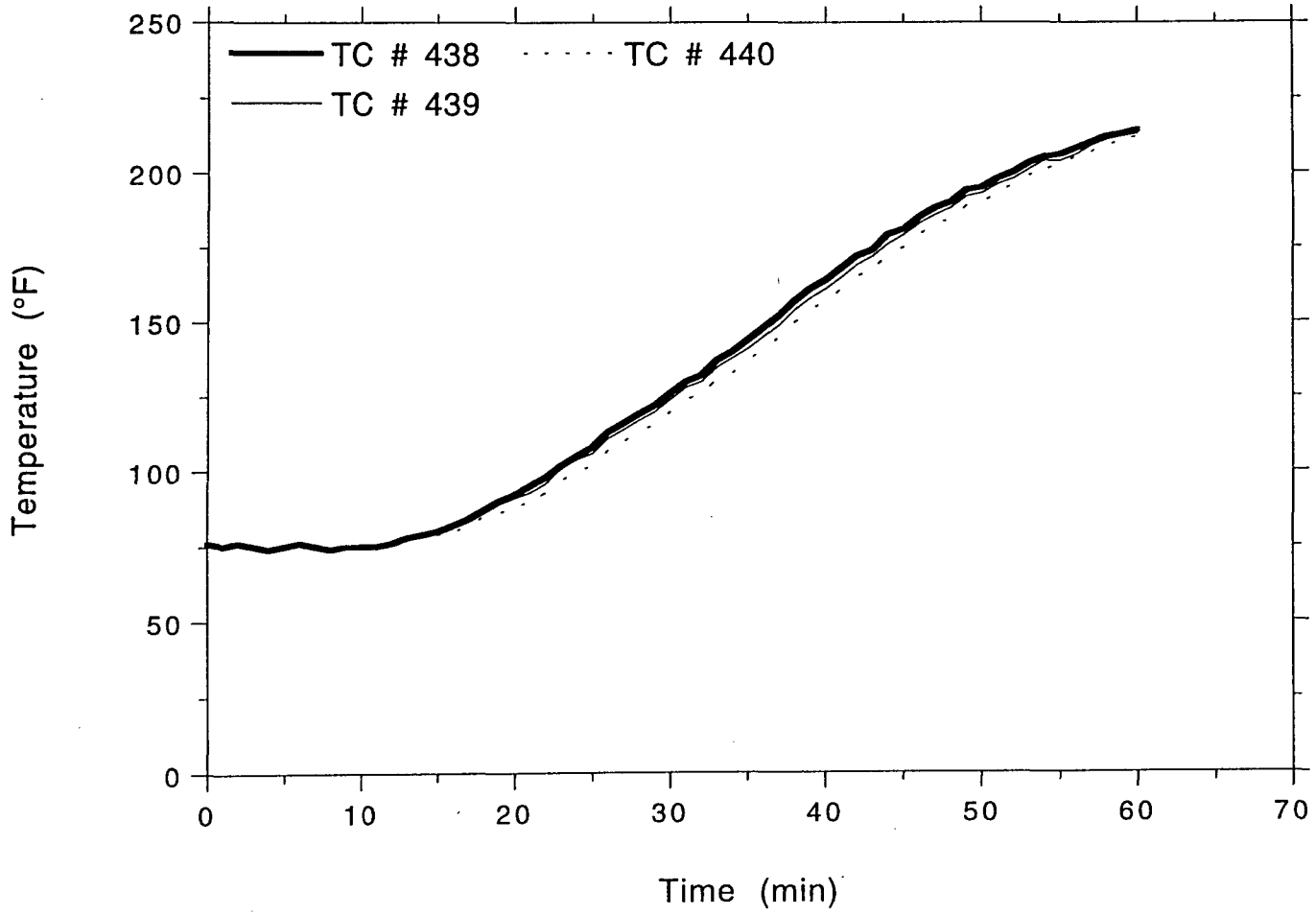
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 3" Steel Conduit, #8



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Right 3" Steel Conduit, #8



OMEGA POINT LABORATORIES

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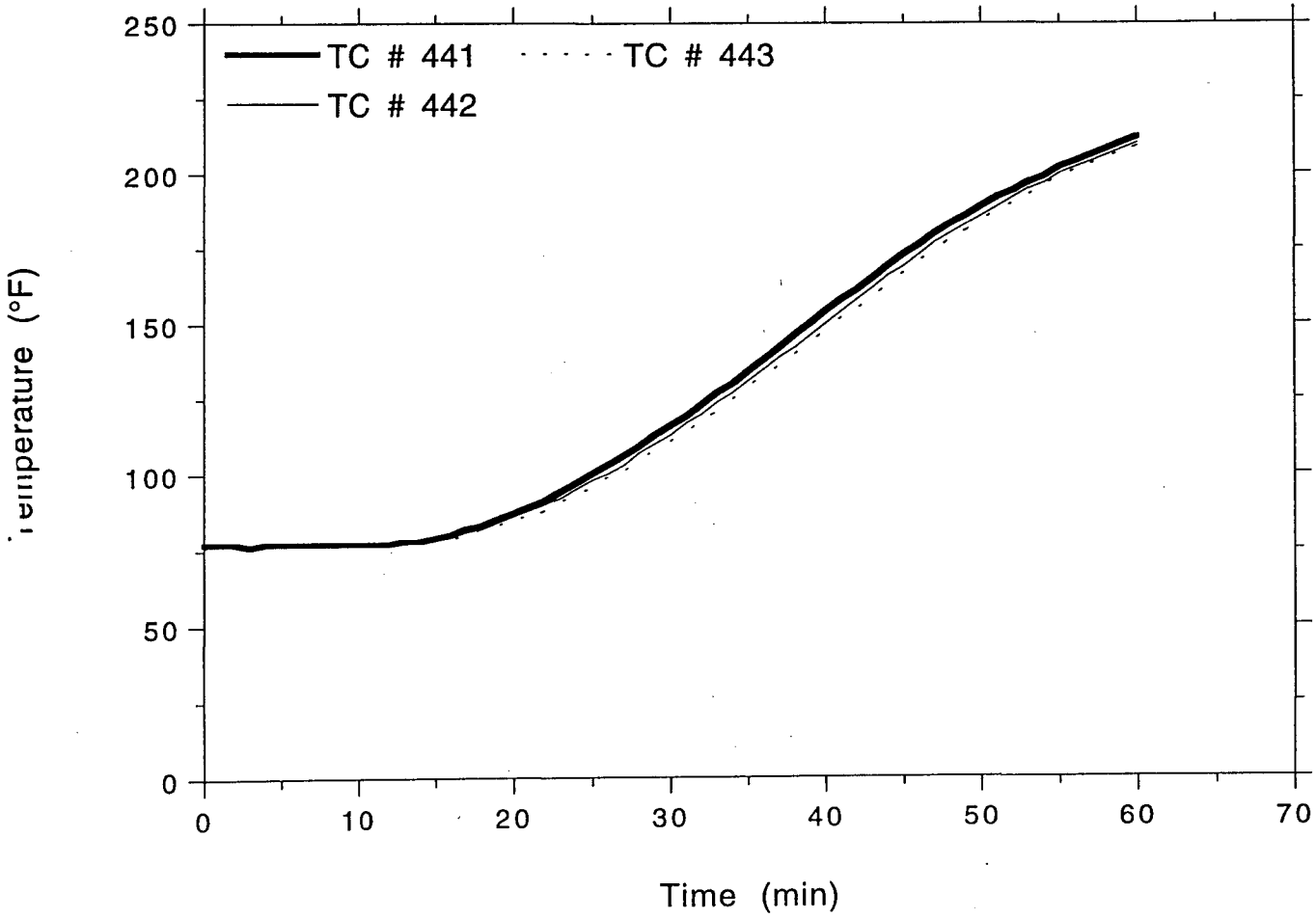

OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
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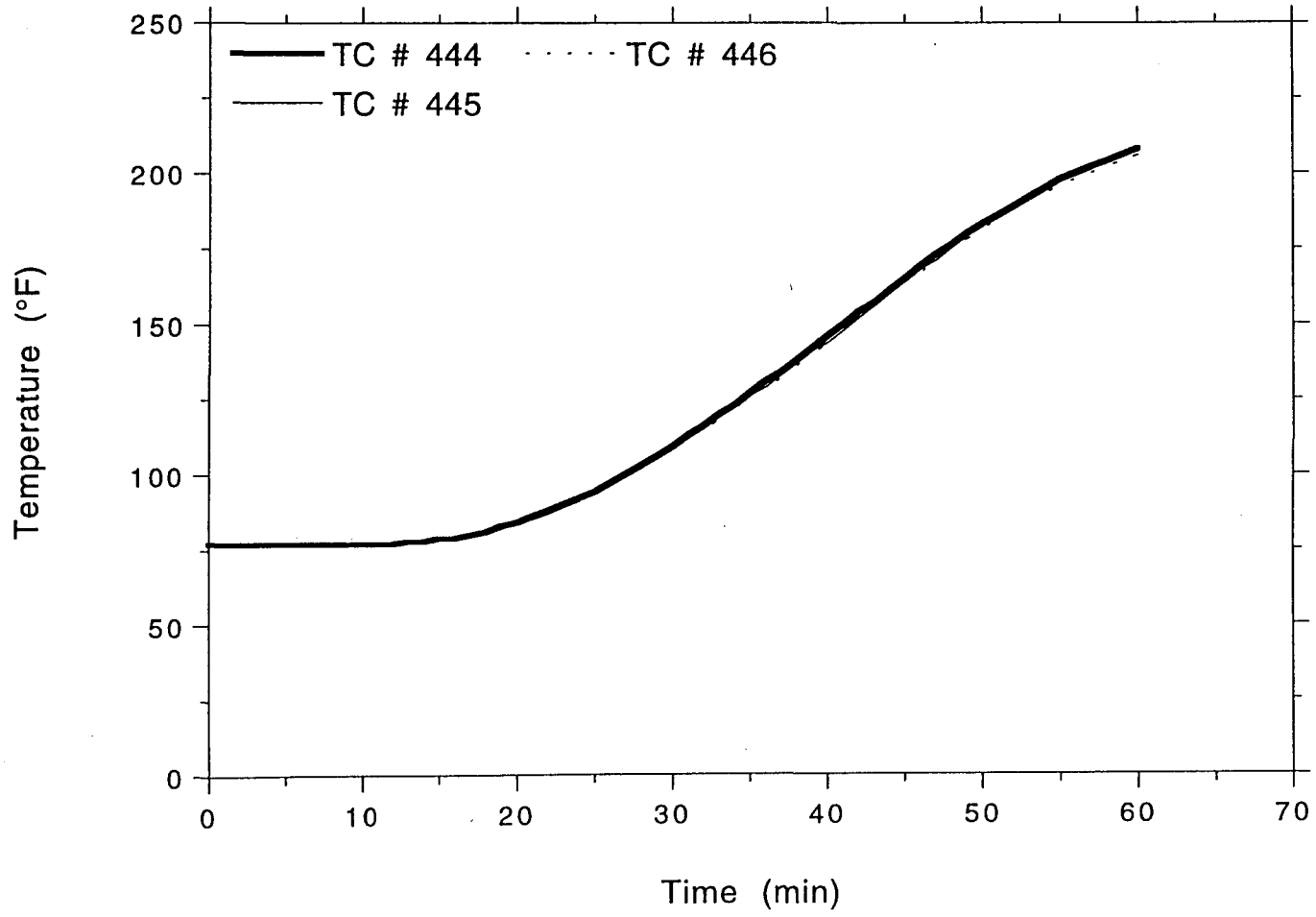

OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
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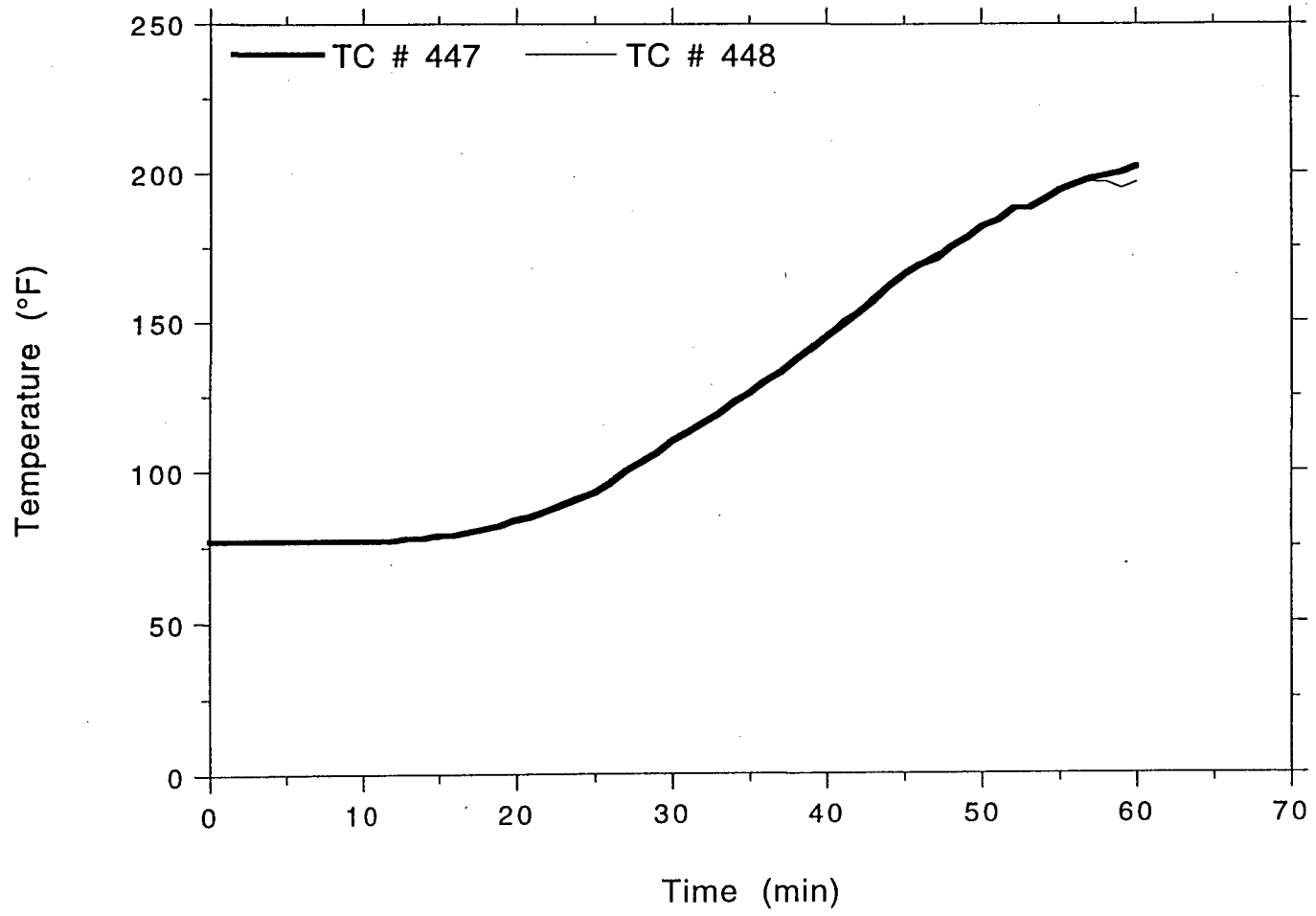

OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
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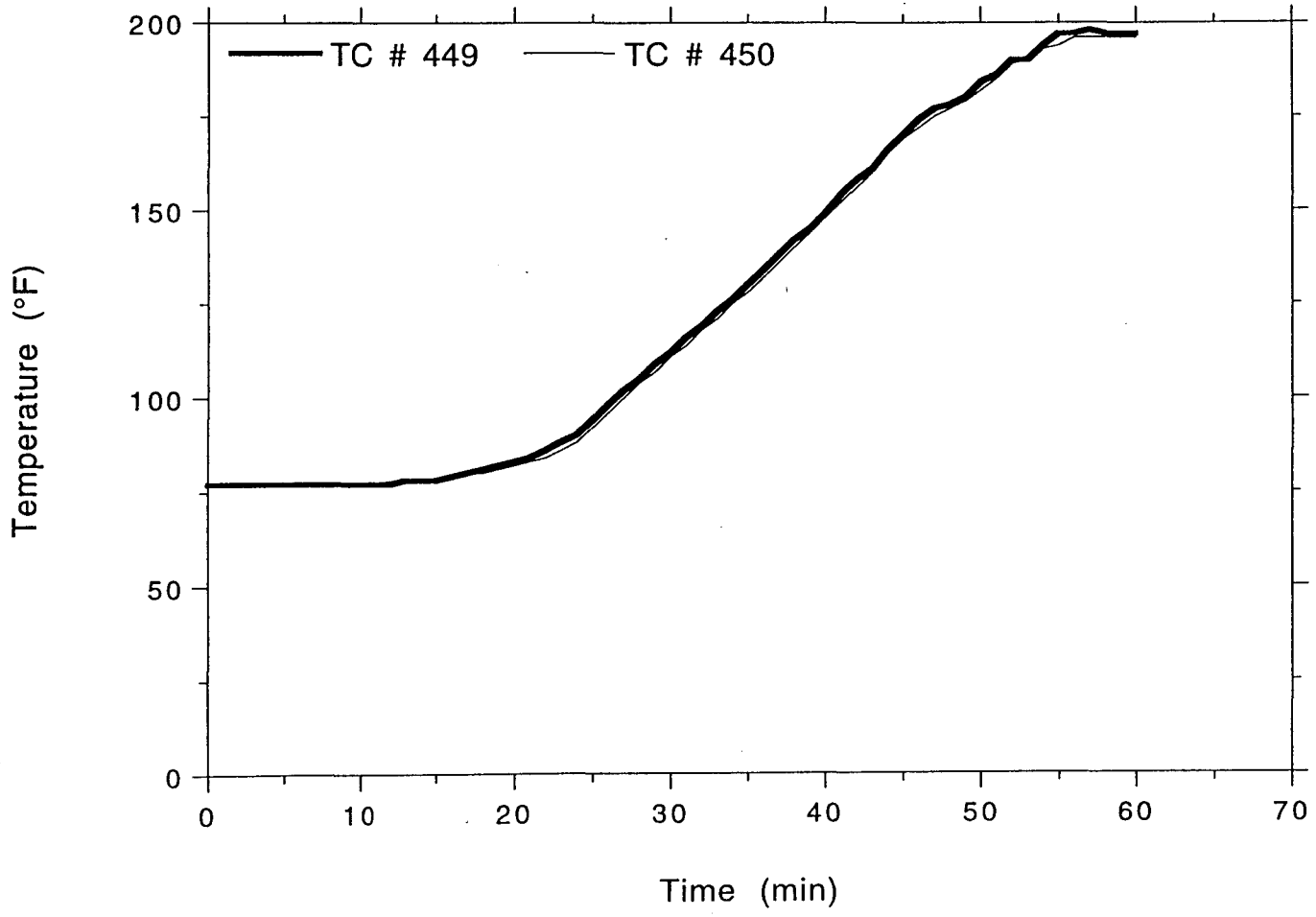
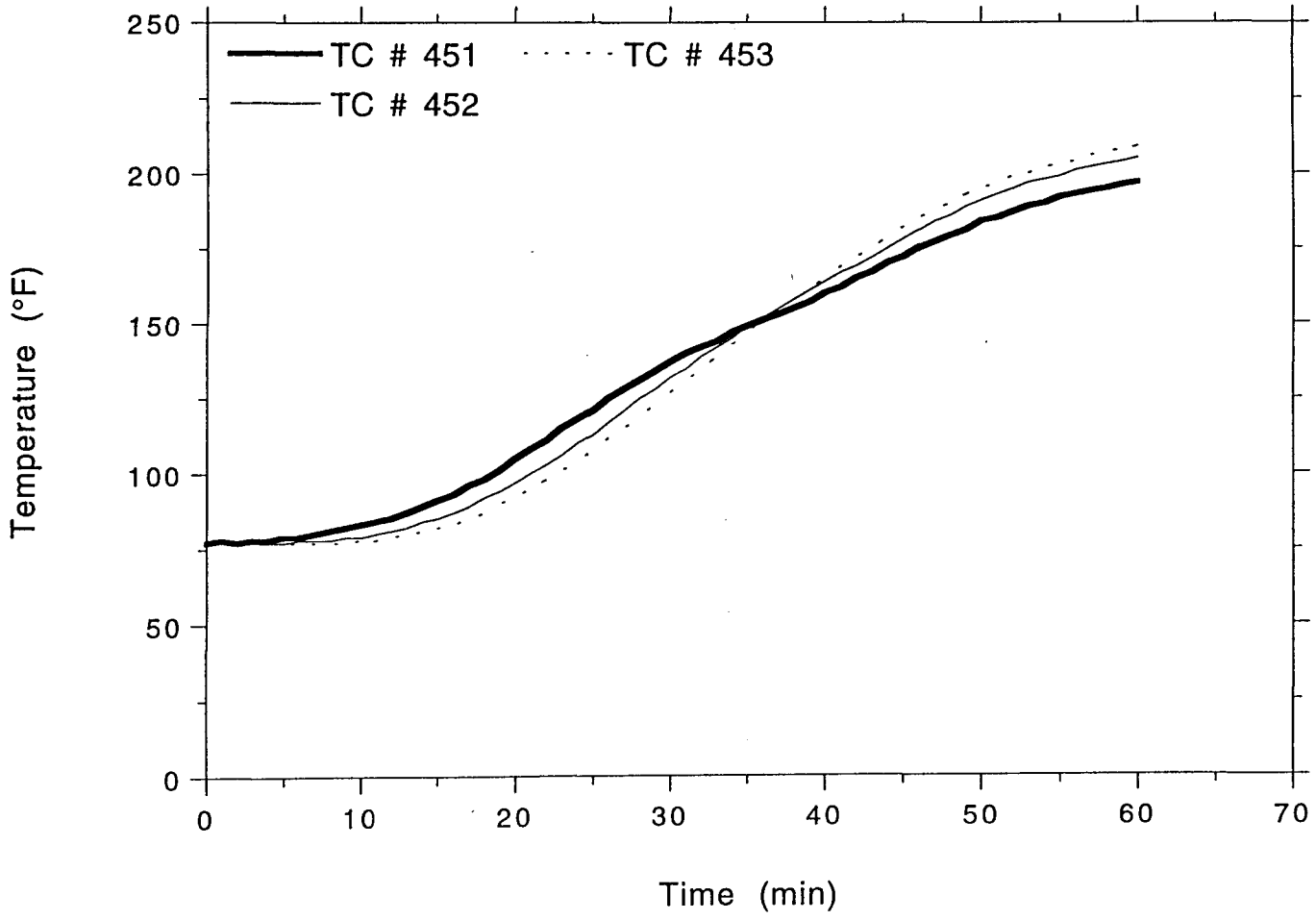


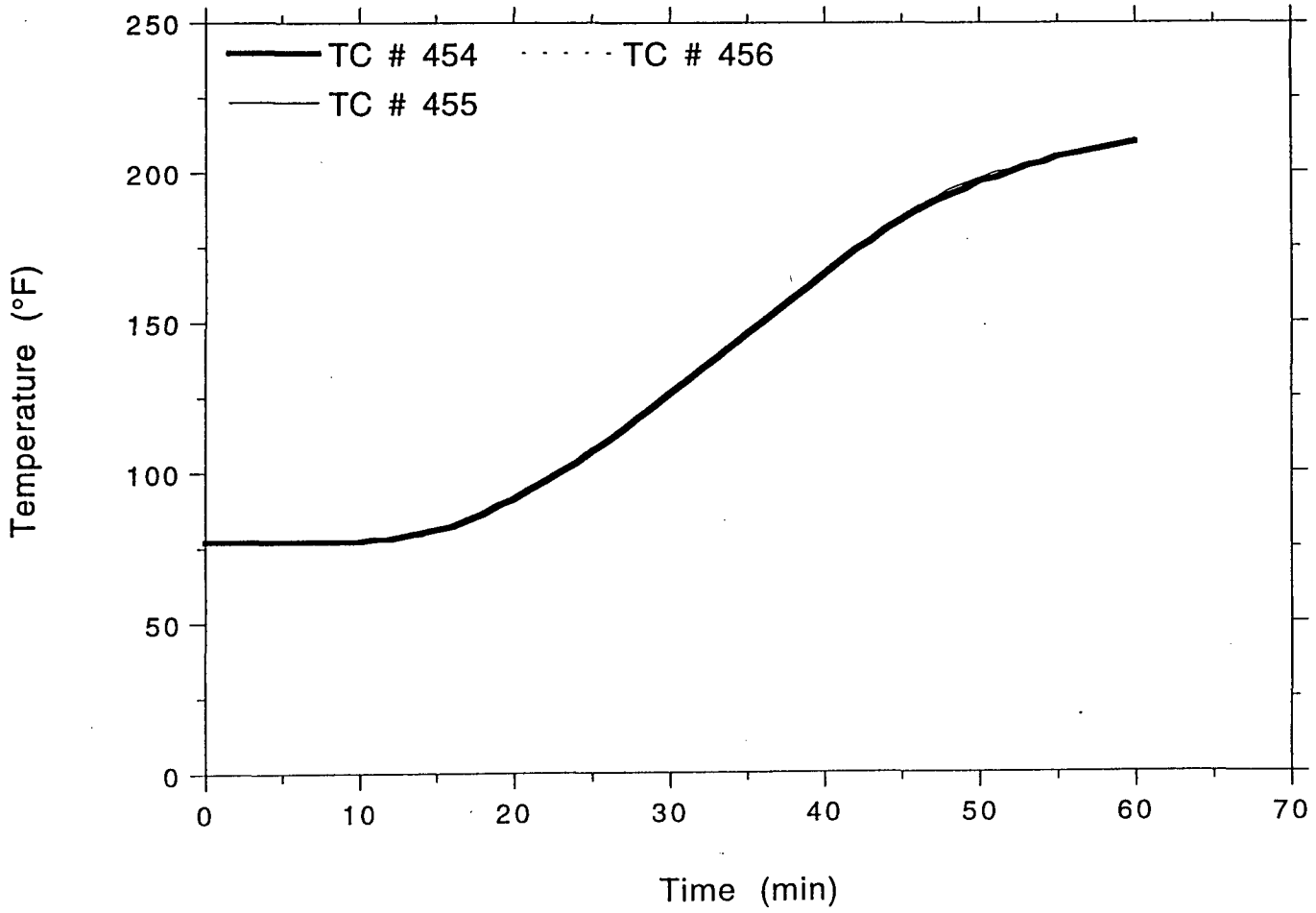
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 3" Steel Conduit, #8



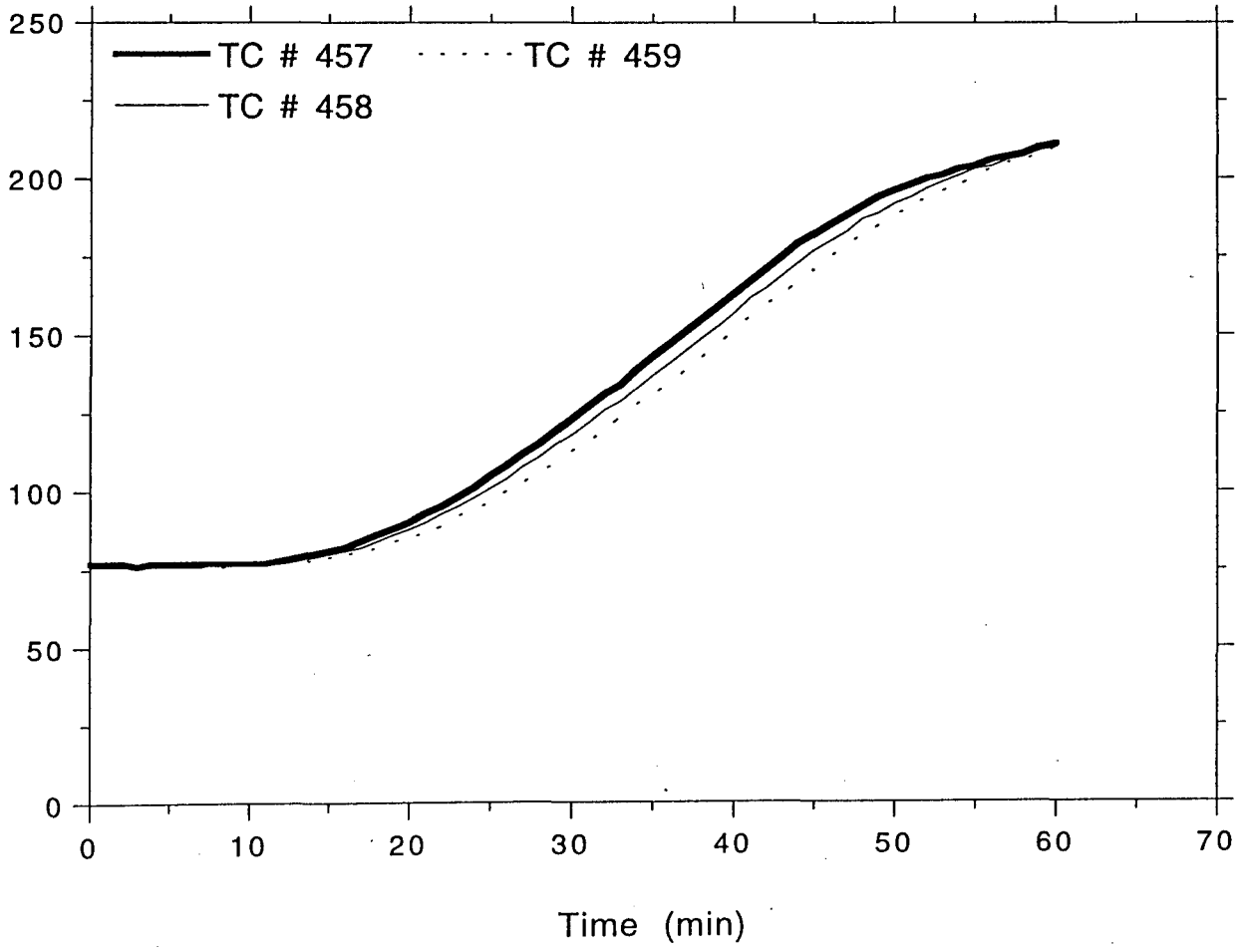
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 3" Steel Conduit, #8



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 3" Steel Conduit, #8



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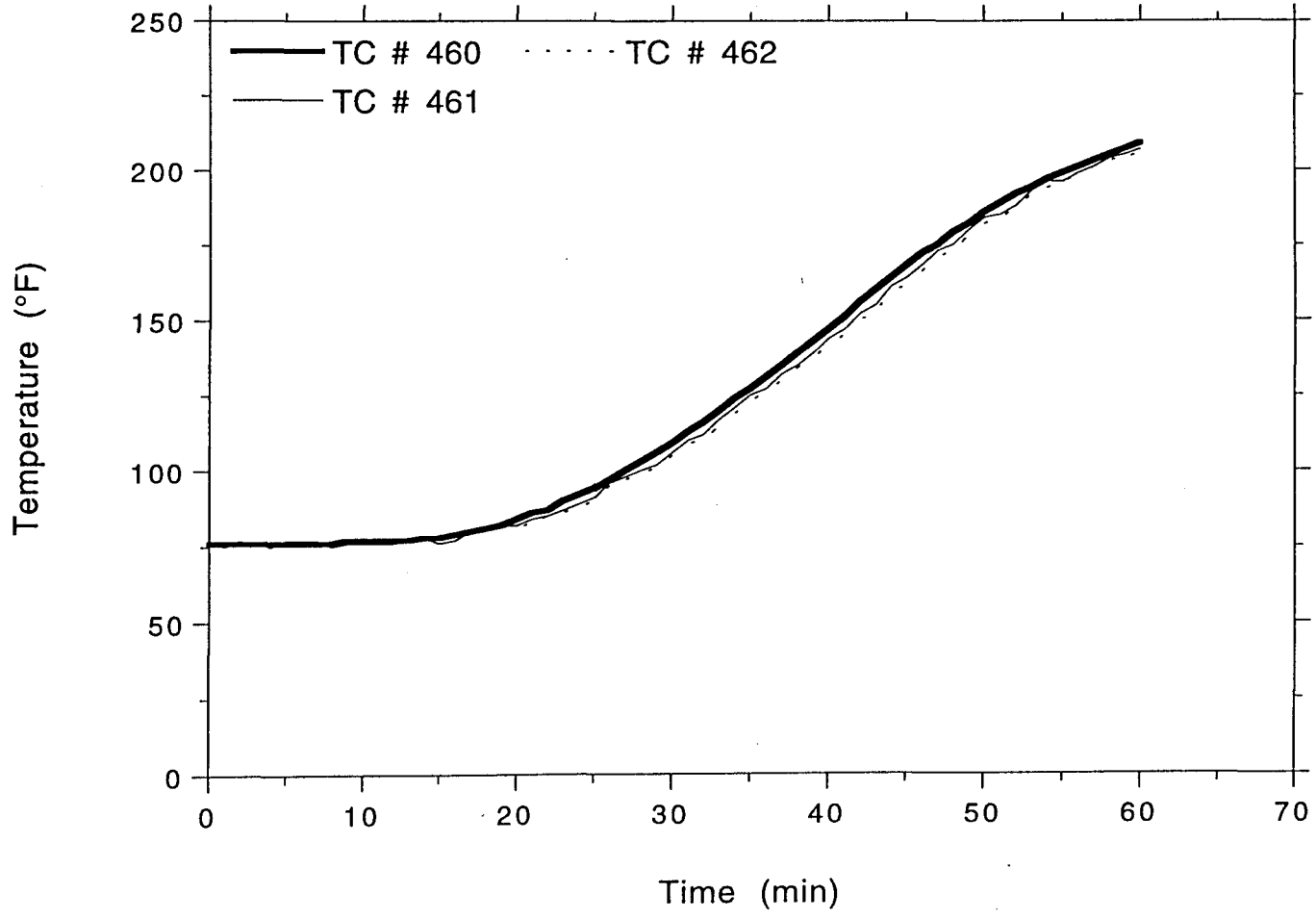
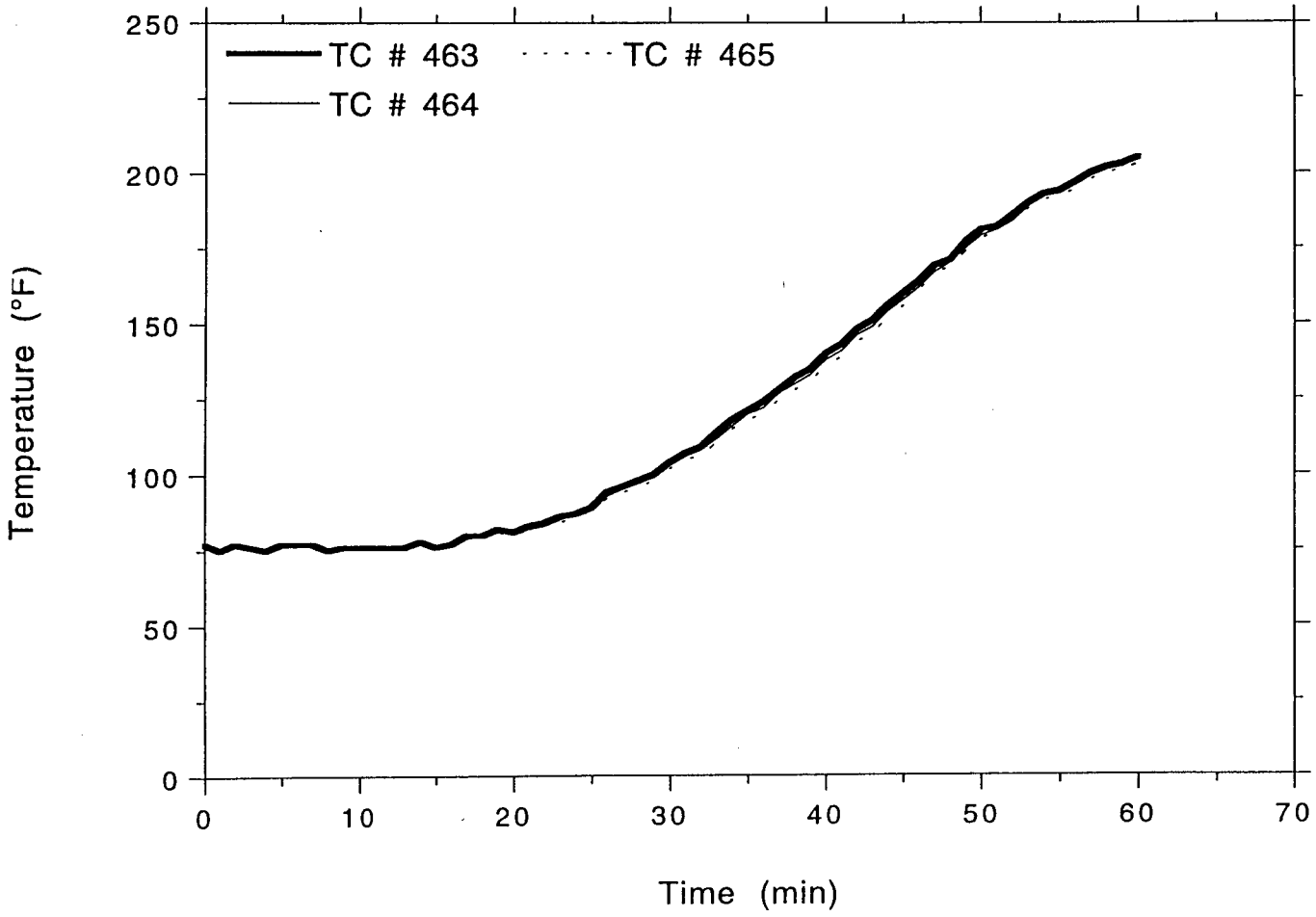
Rear Left 3" Steel Conduit, #8



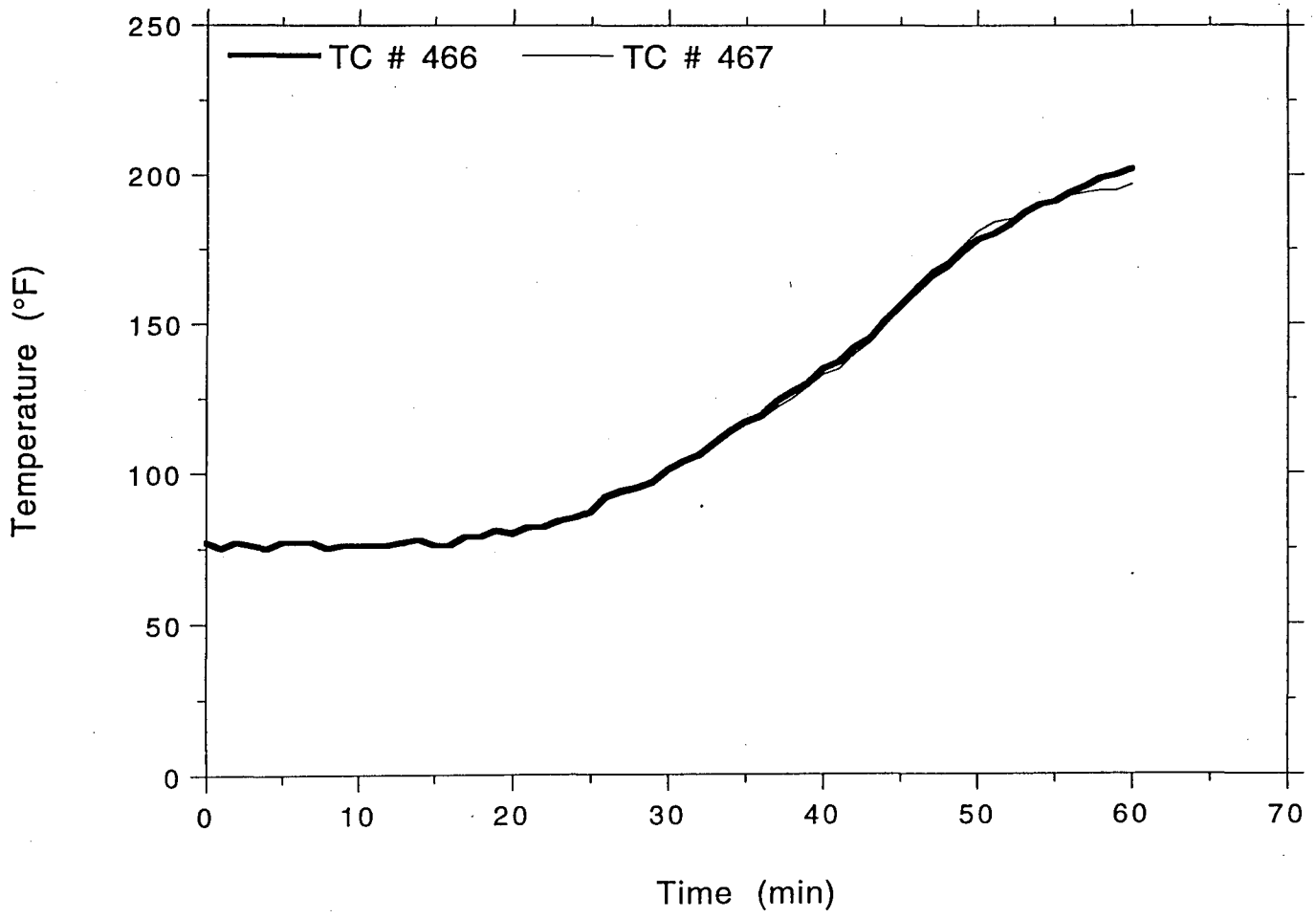
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 3" Steel Conduit, #8



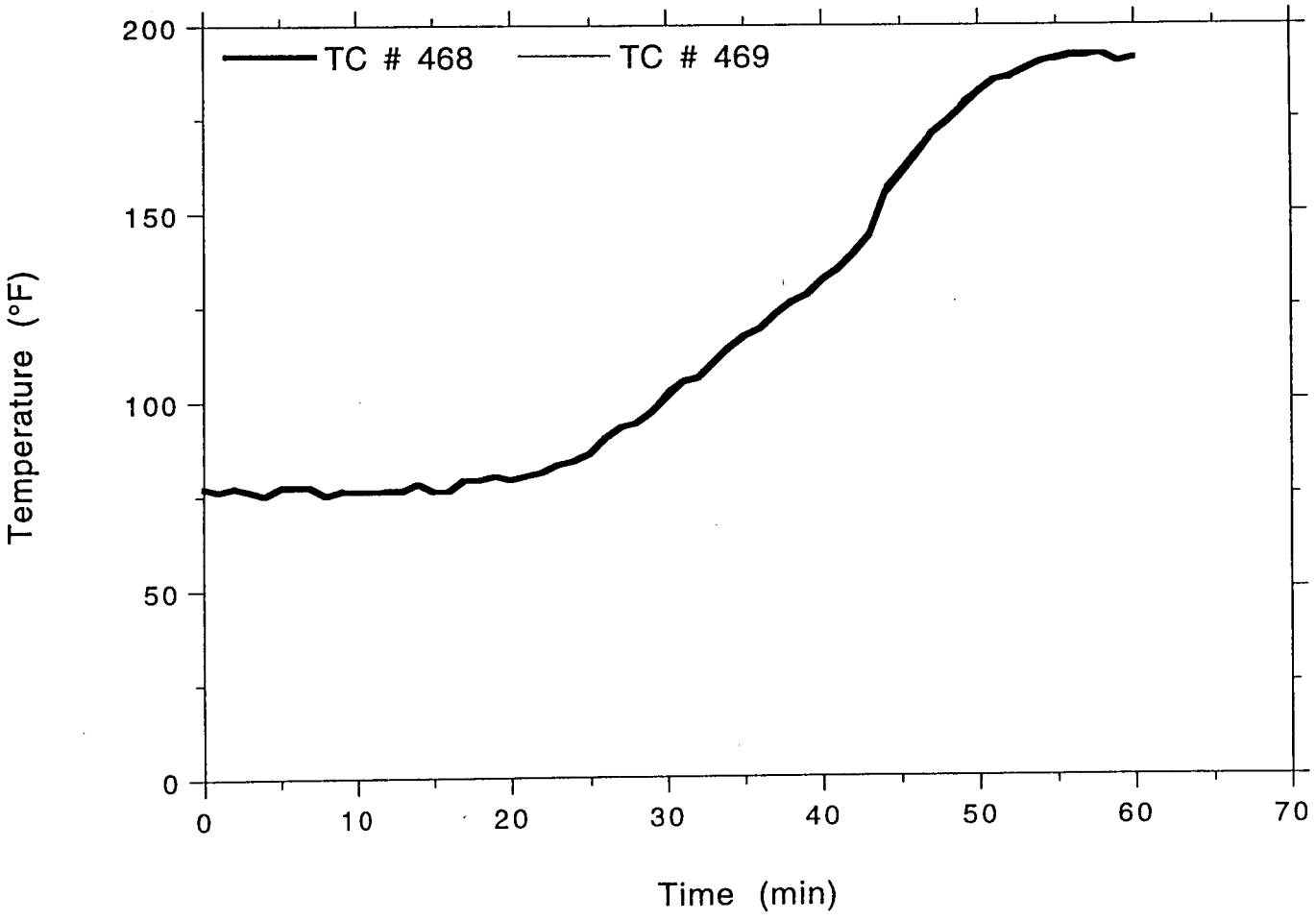
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 3" Steel Conduit, #8



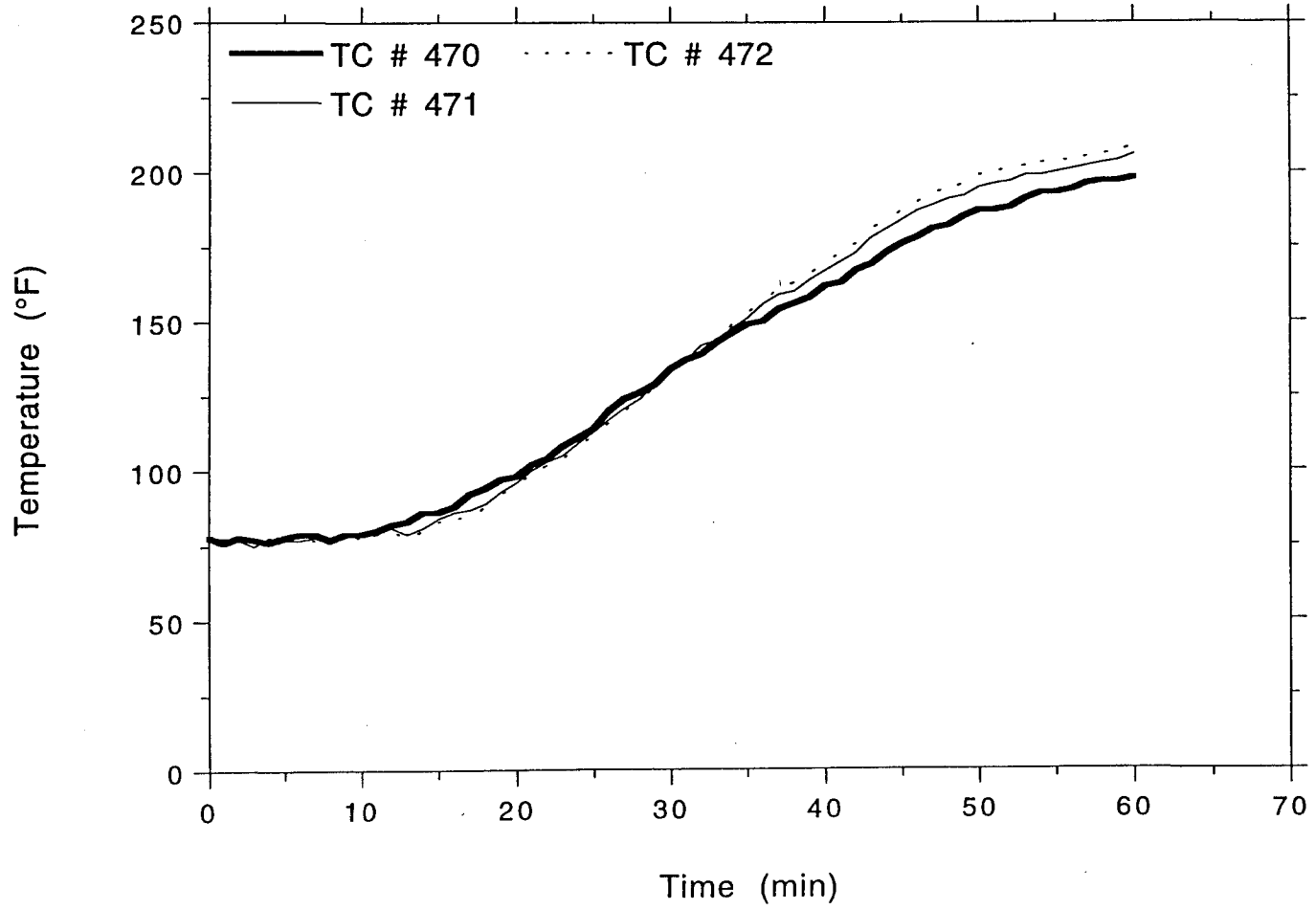
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 3" Steel Conduit, #8



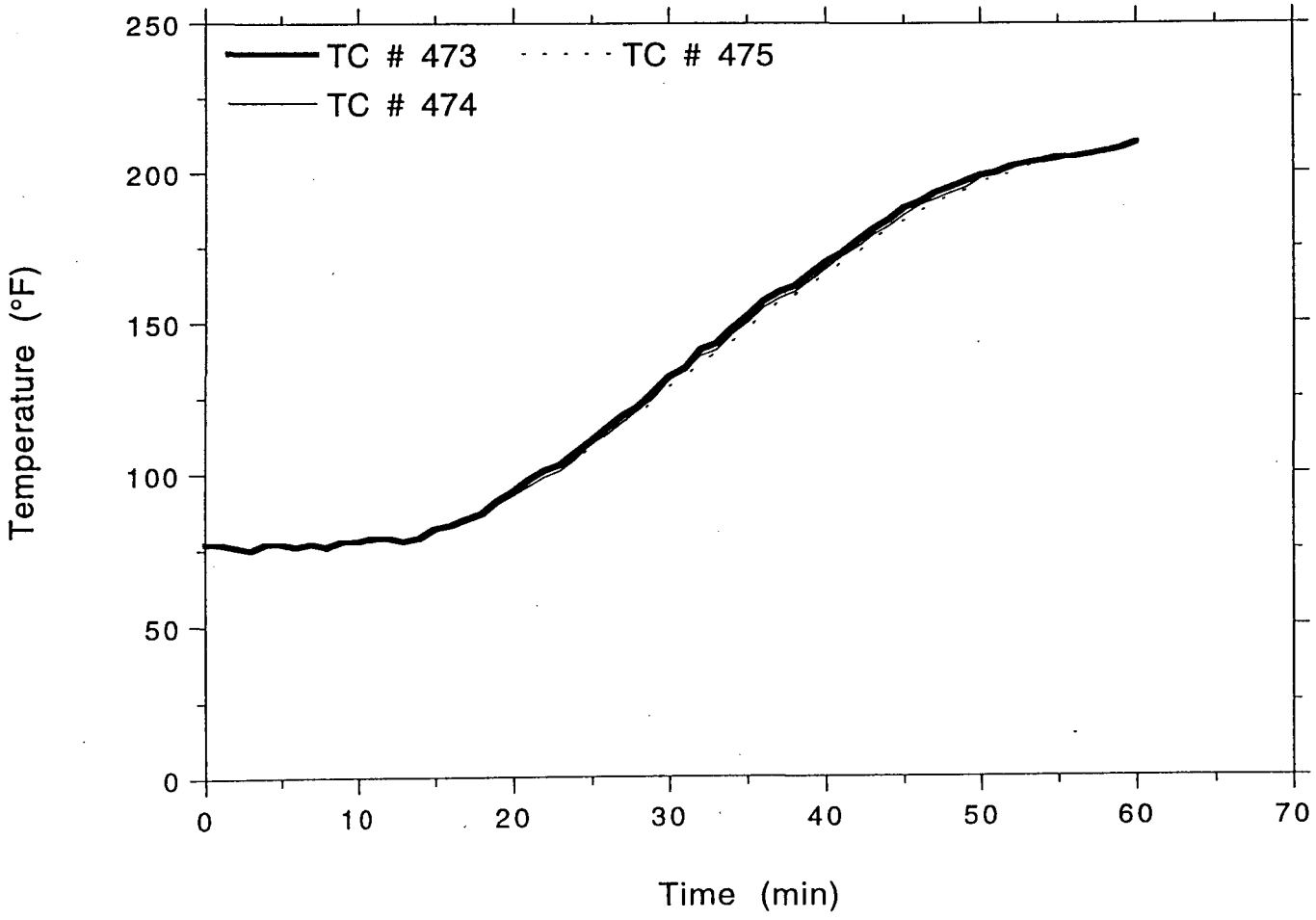
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit, #8



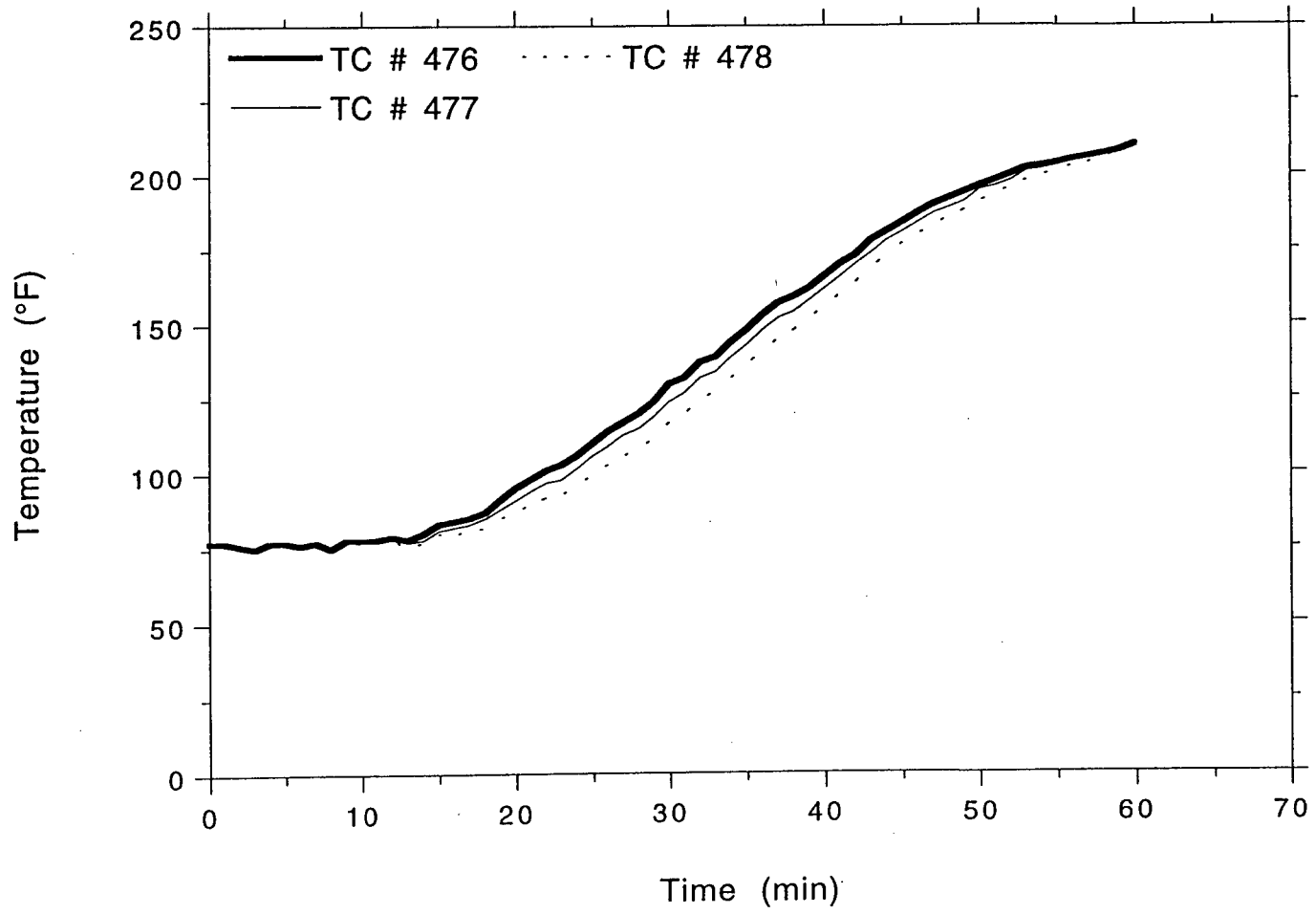
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit, #8



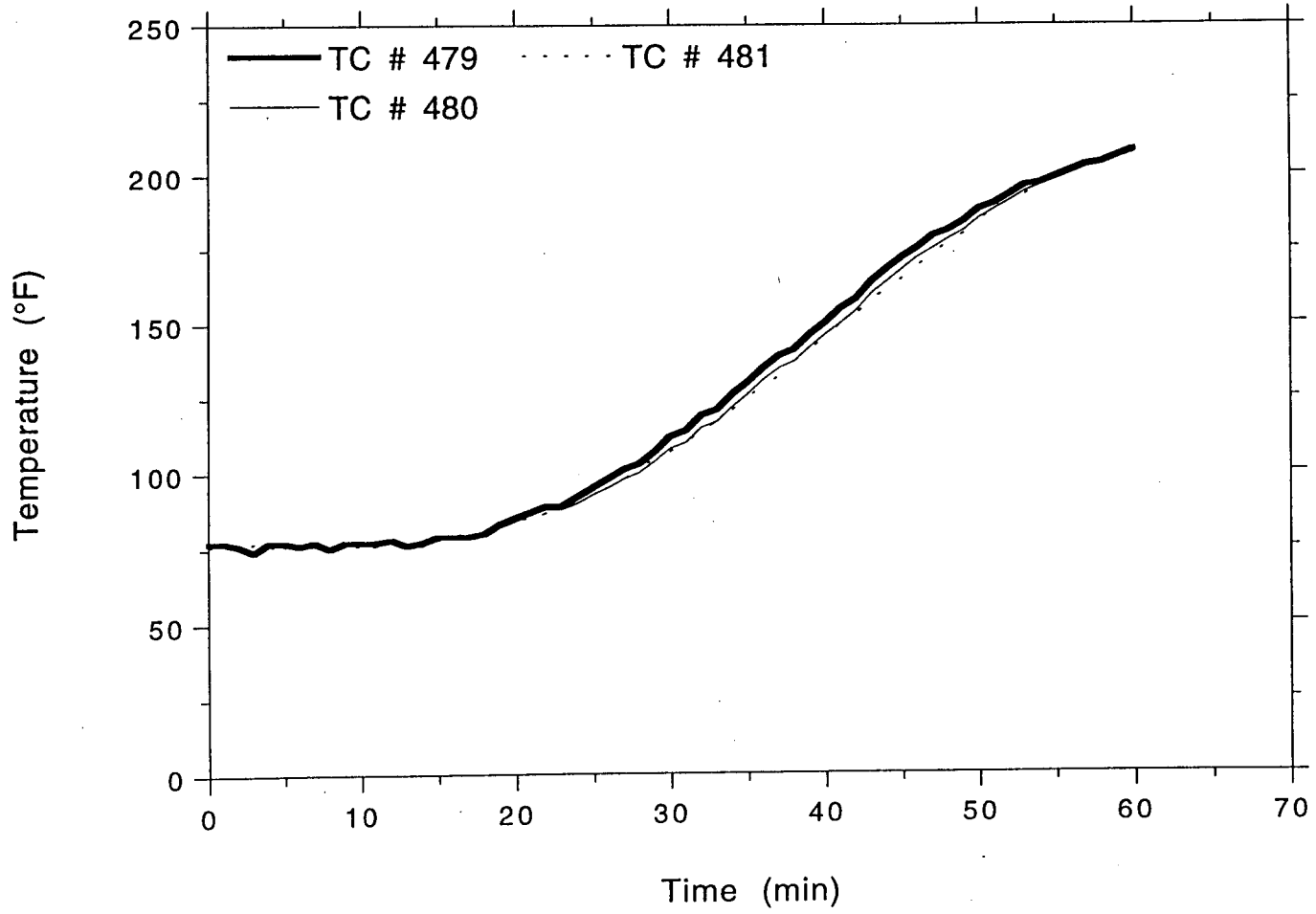
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit, #8

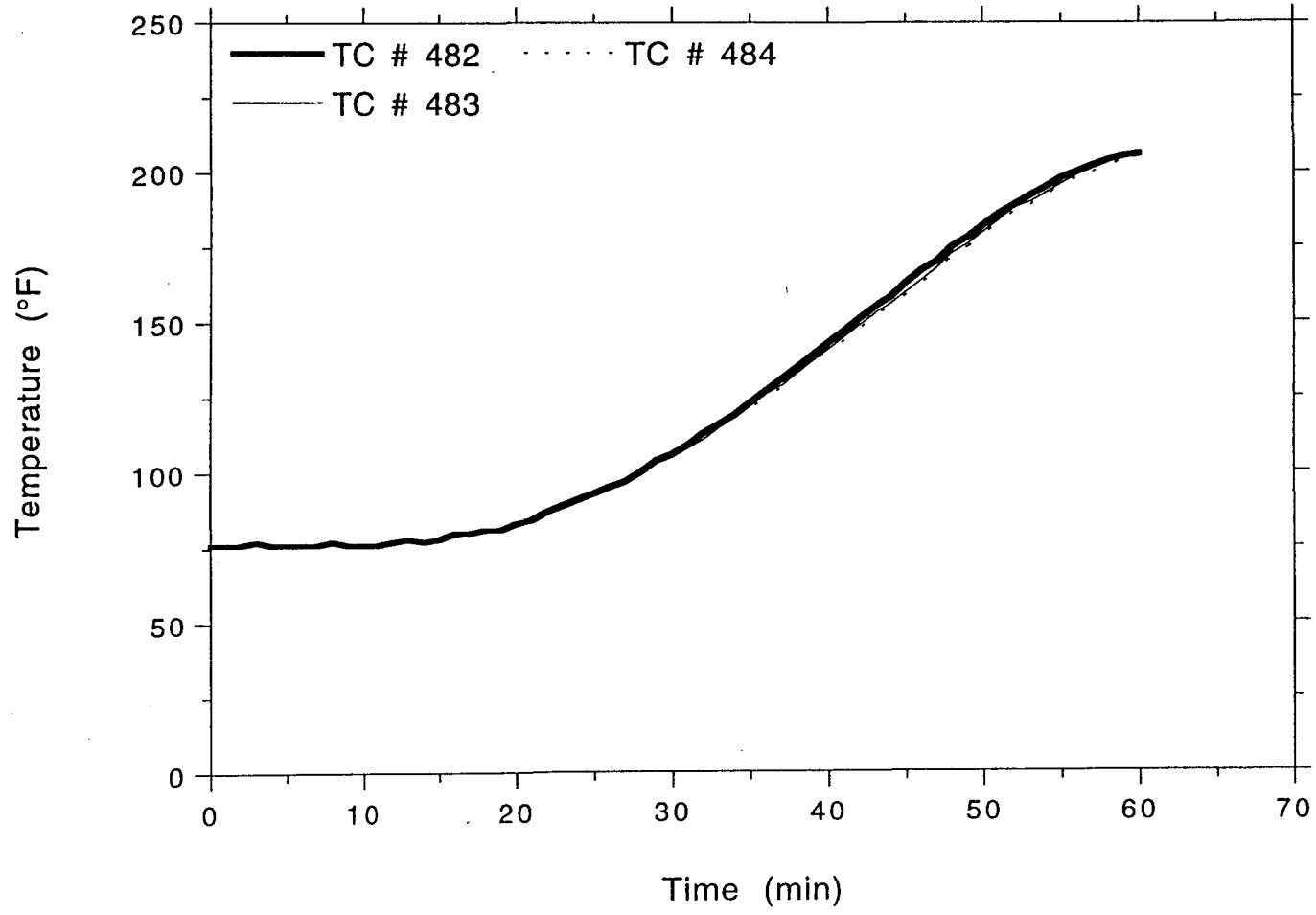


OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit, #8

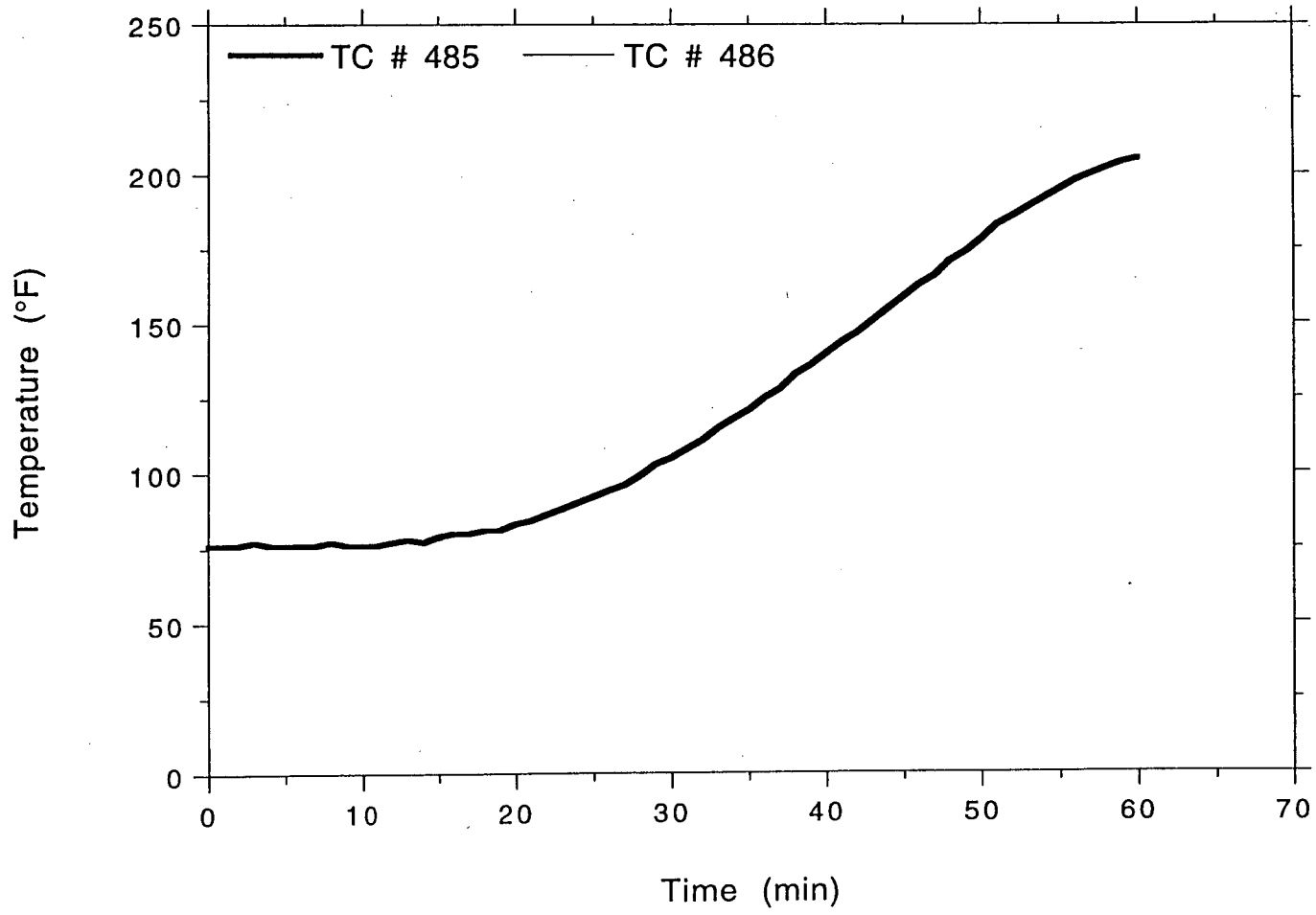


TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit, #8



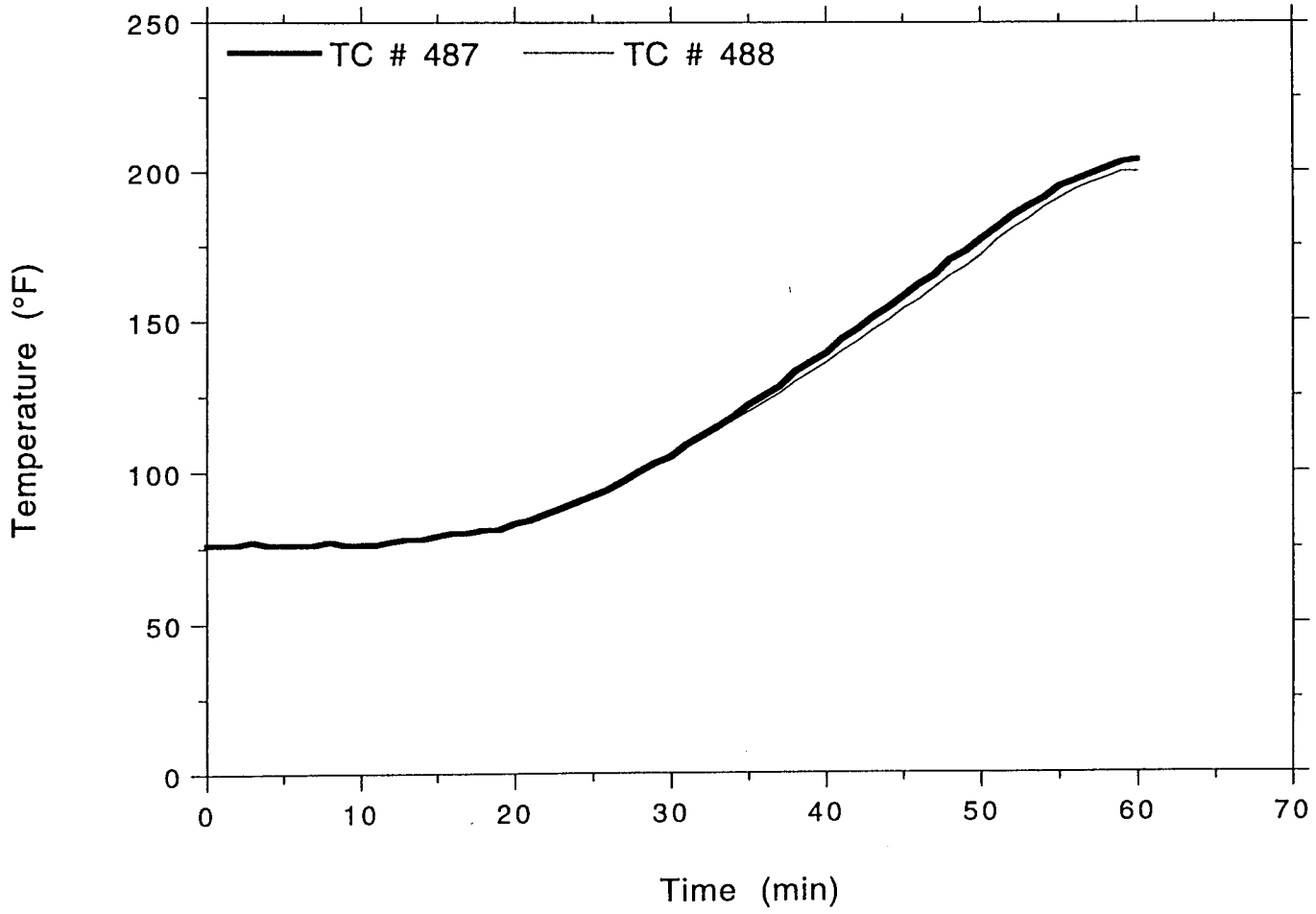
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit, #8



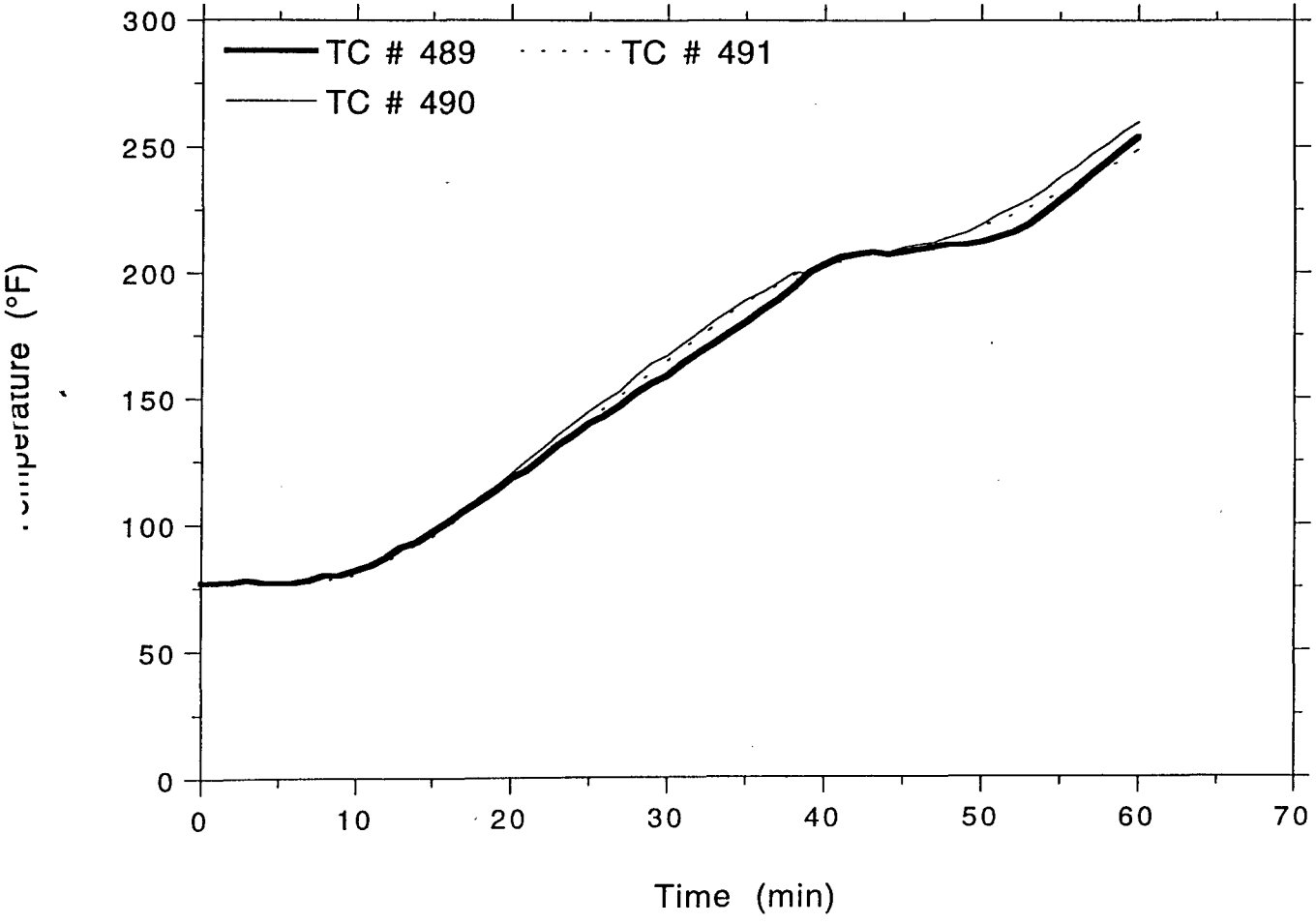
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit, #8



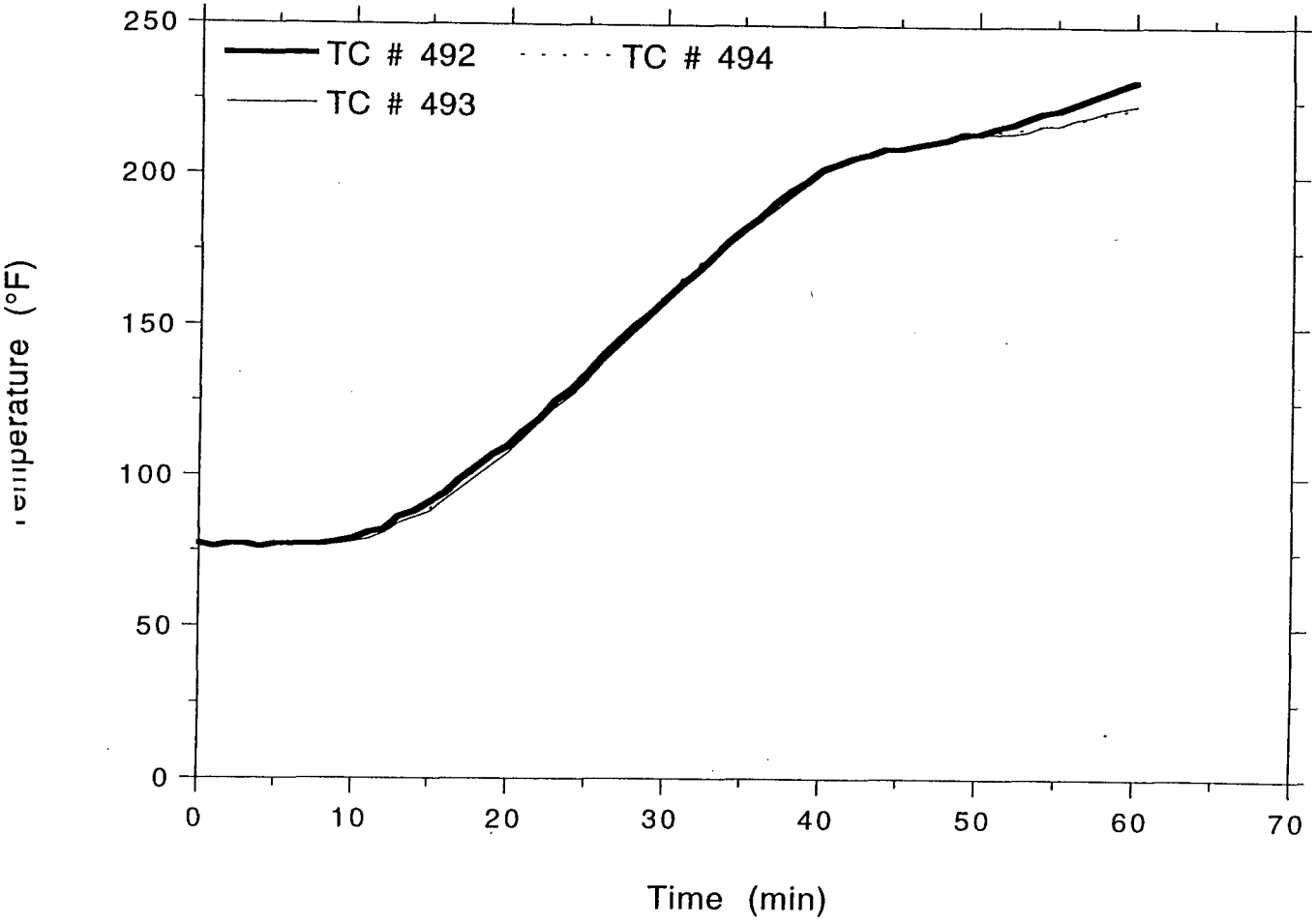
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit w/JB, #8



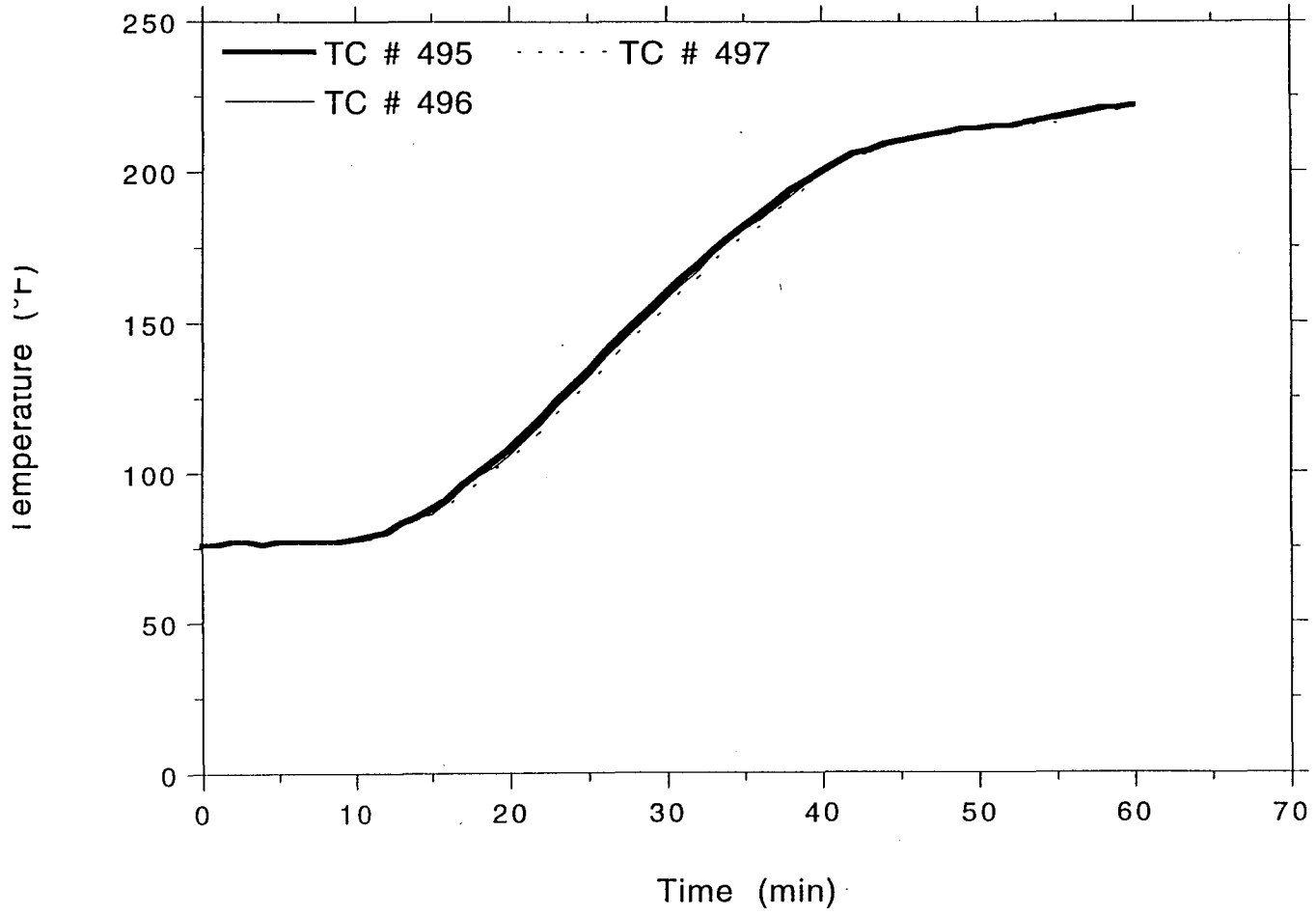
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit w/JB, #8



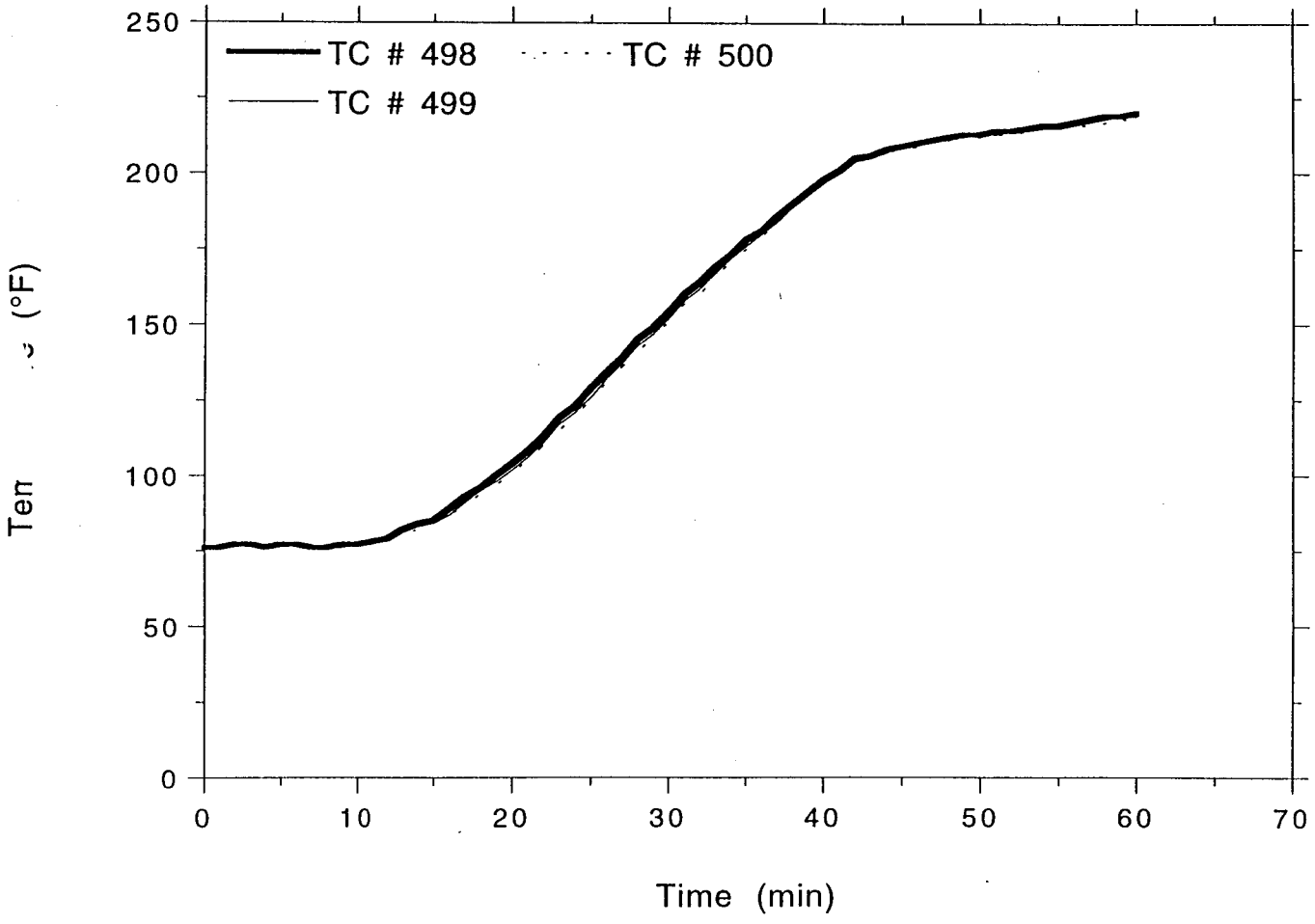
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit w/JB, #8



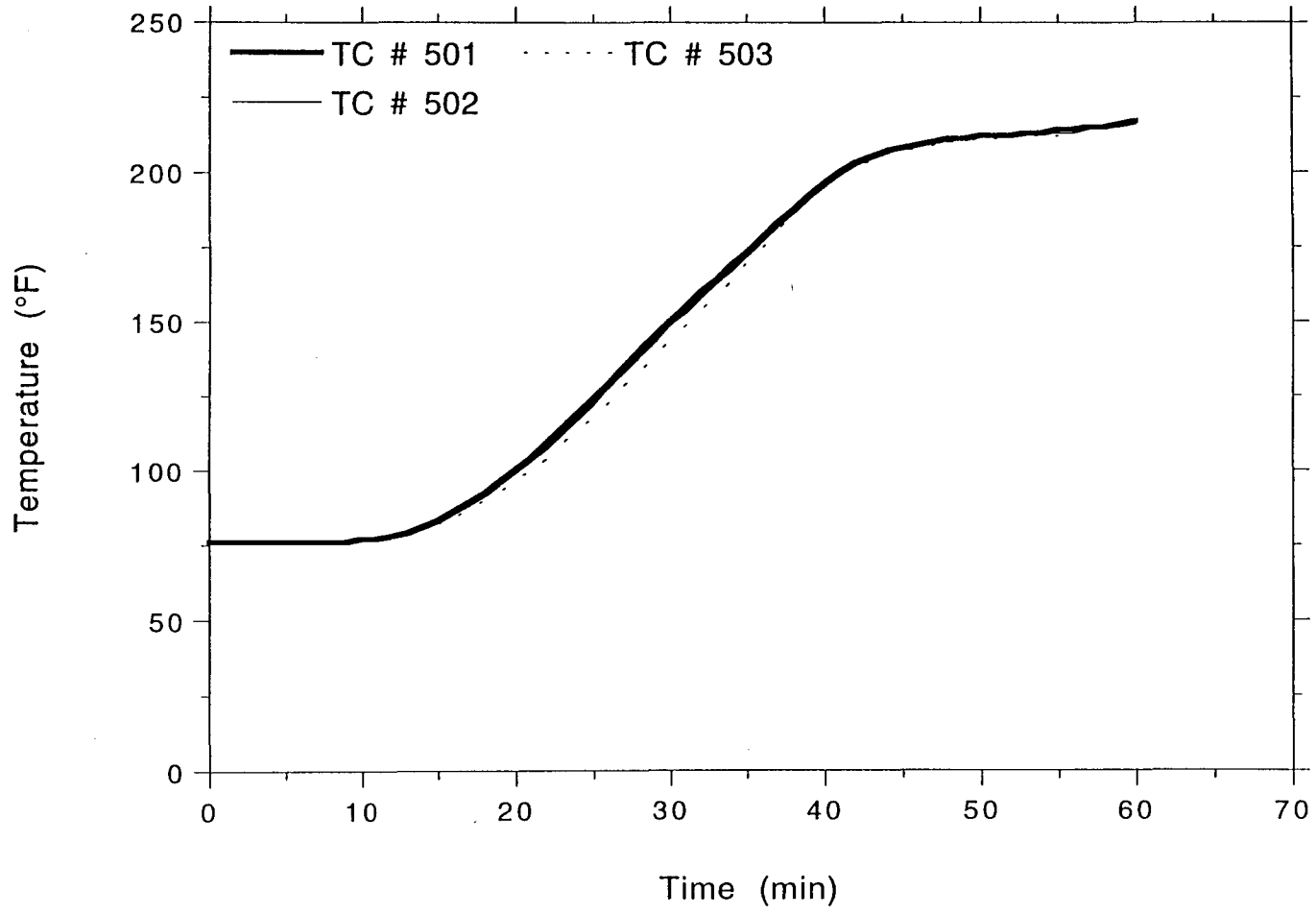
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit w/JB, #8



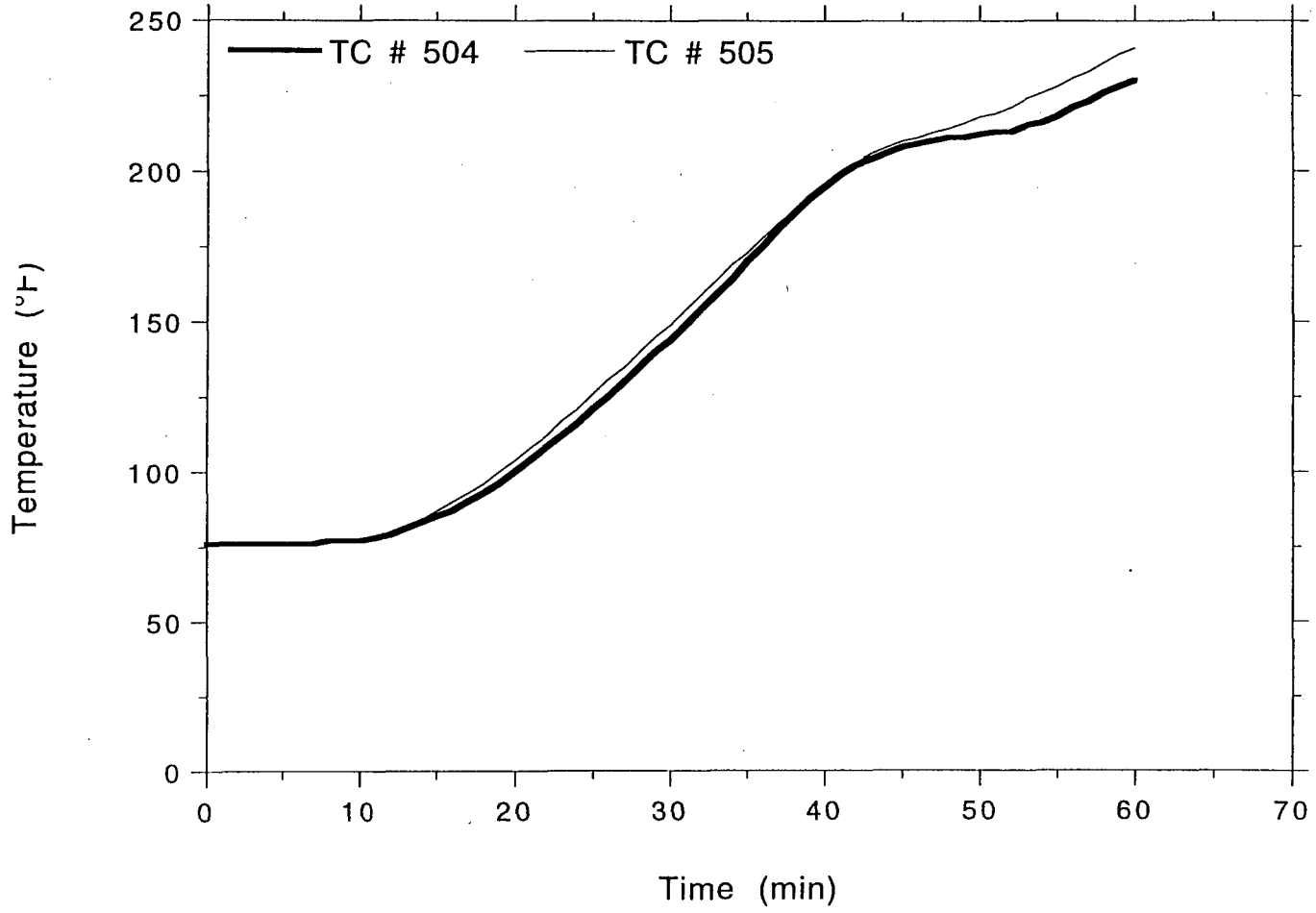
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit w/JB, #8



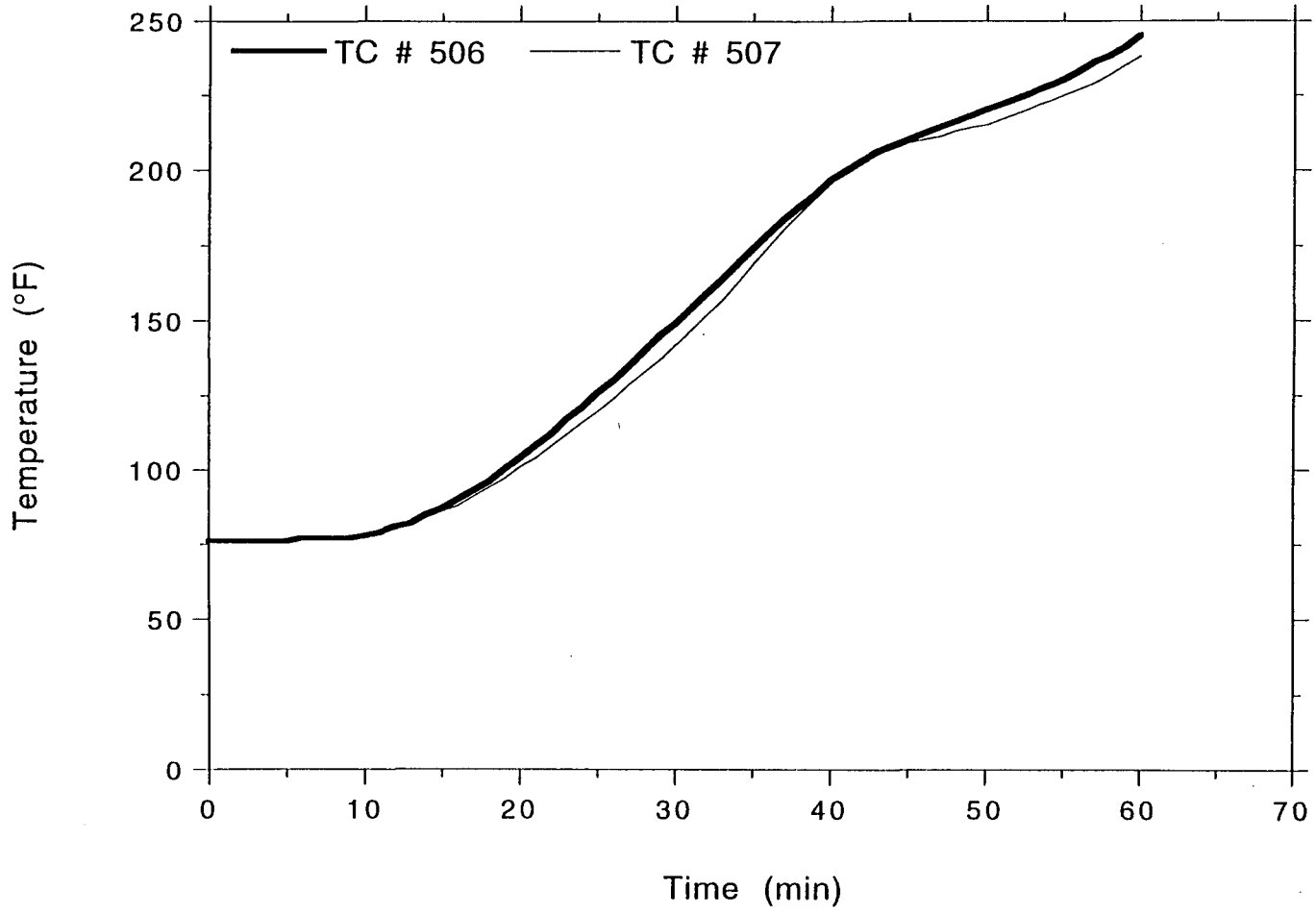
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit w/JB, #8



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
4" Steel Conduit w/JB, #8



OMEGA POINT LABORATORIES

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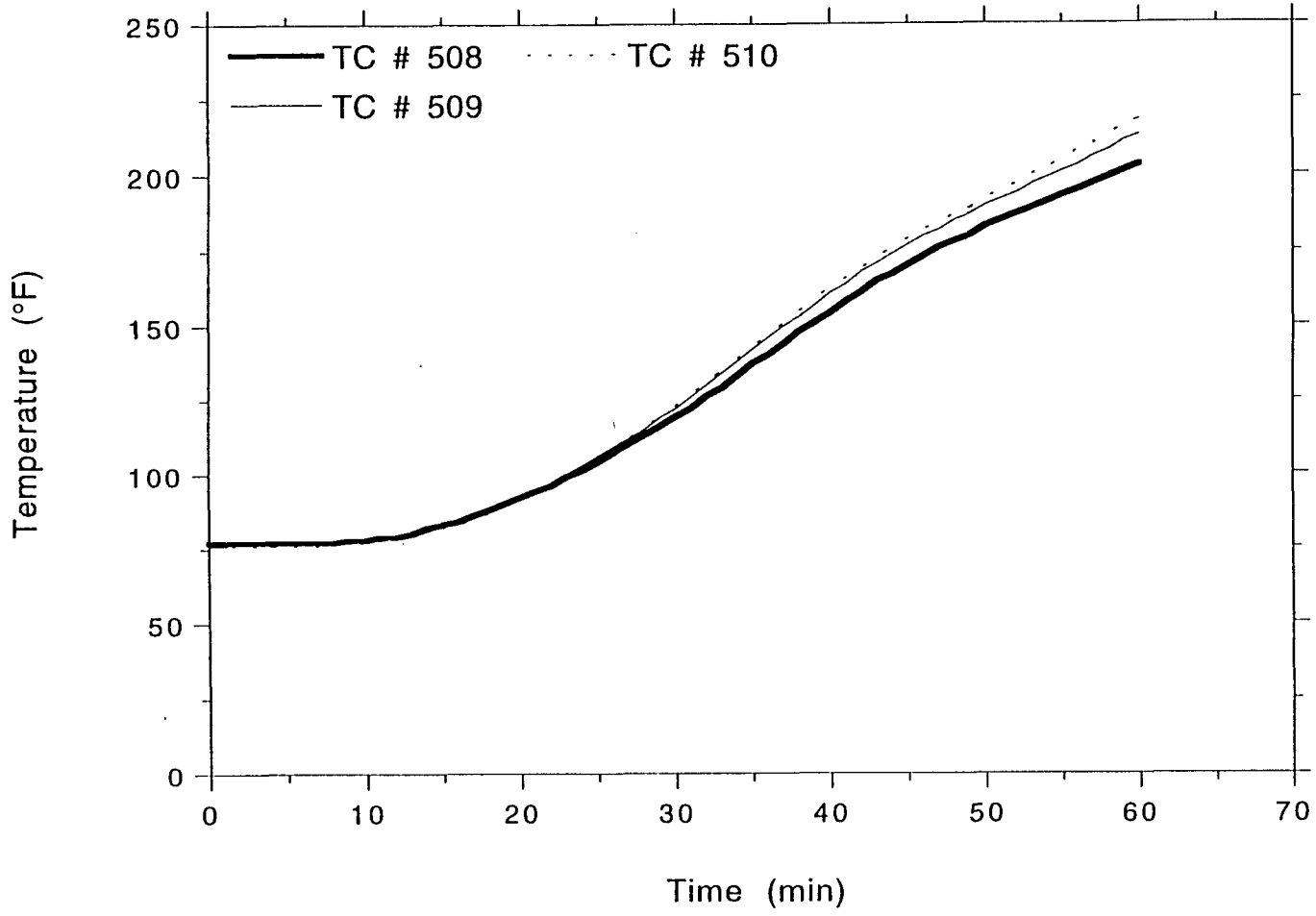
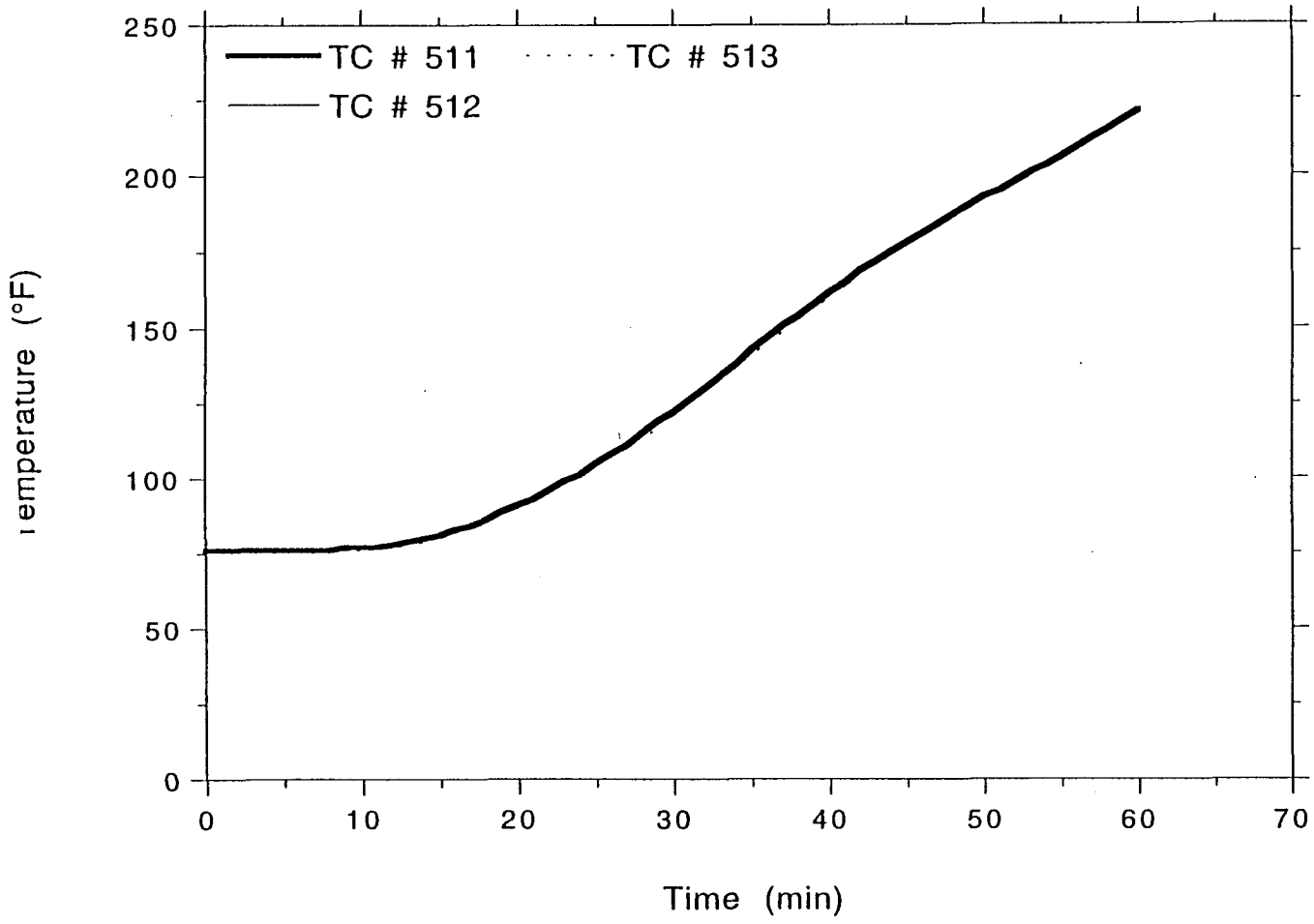
TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit, #8



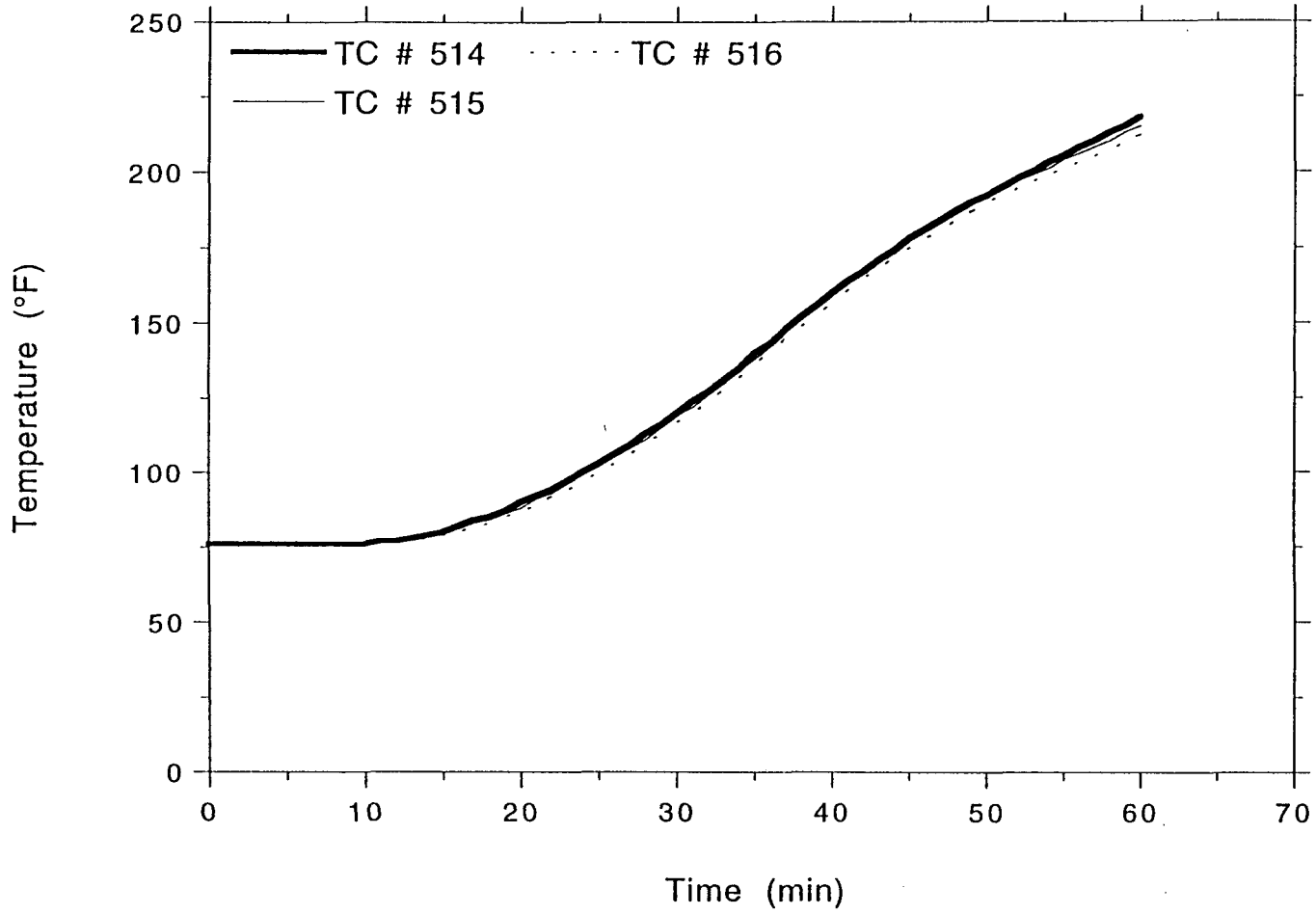
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit, #8



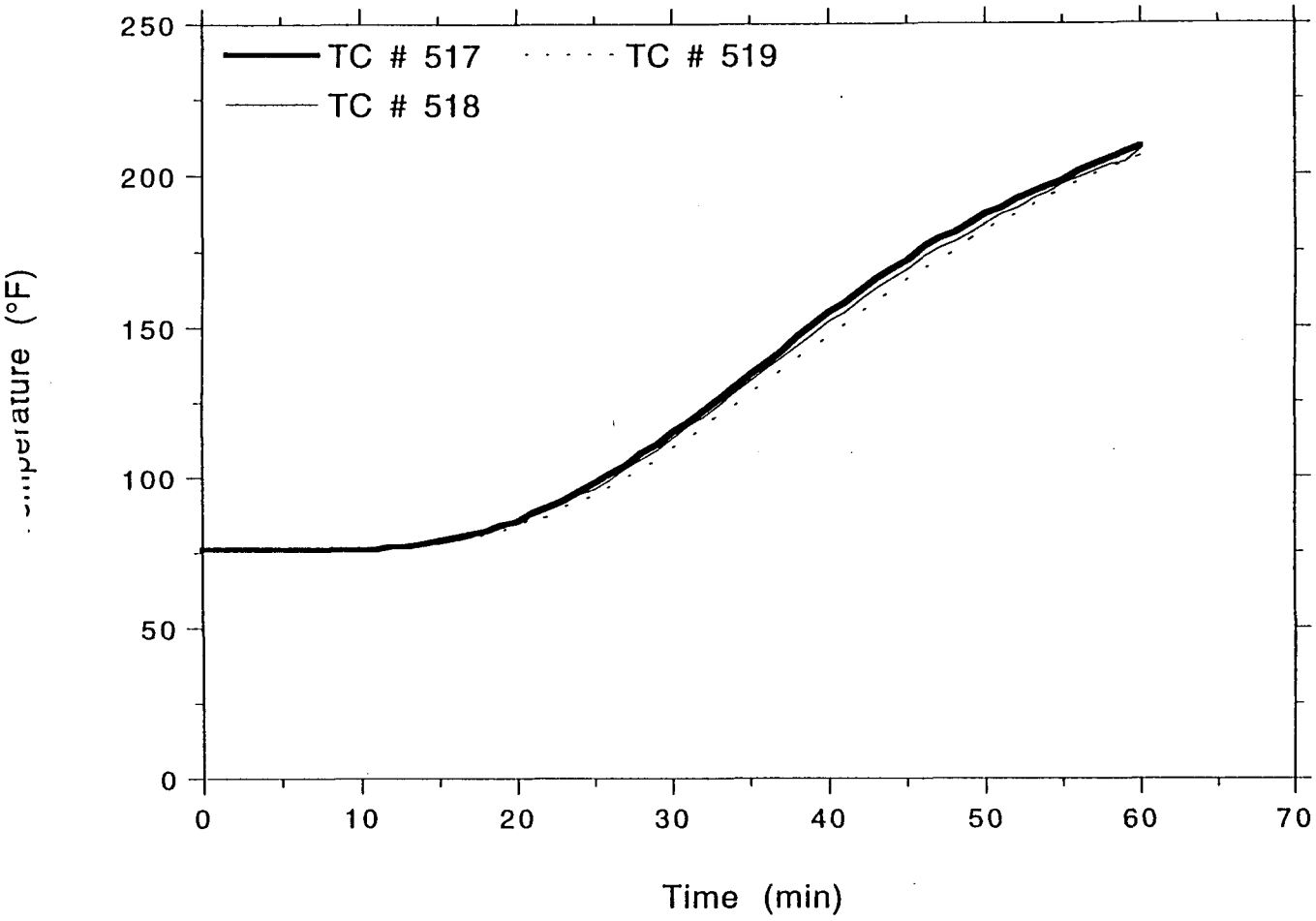
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit, #8



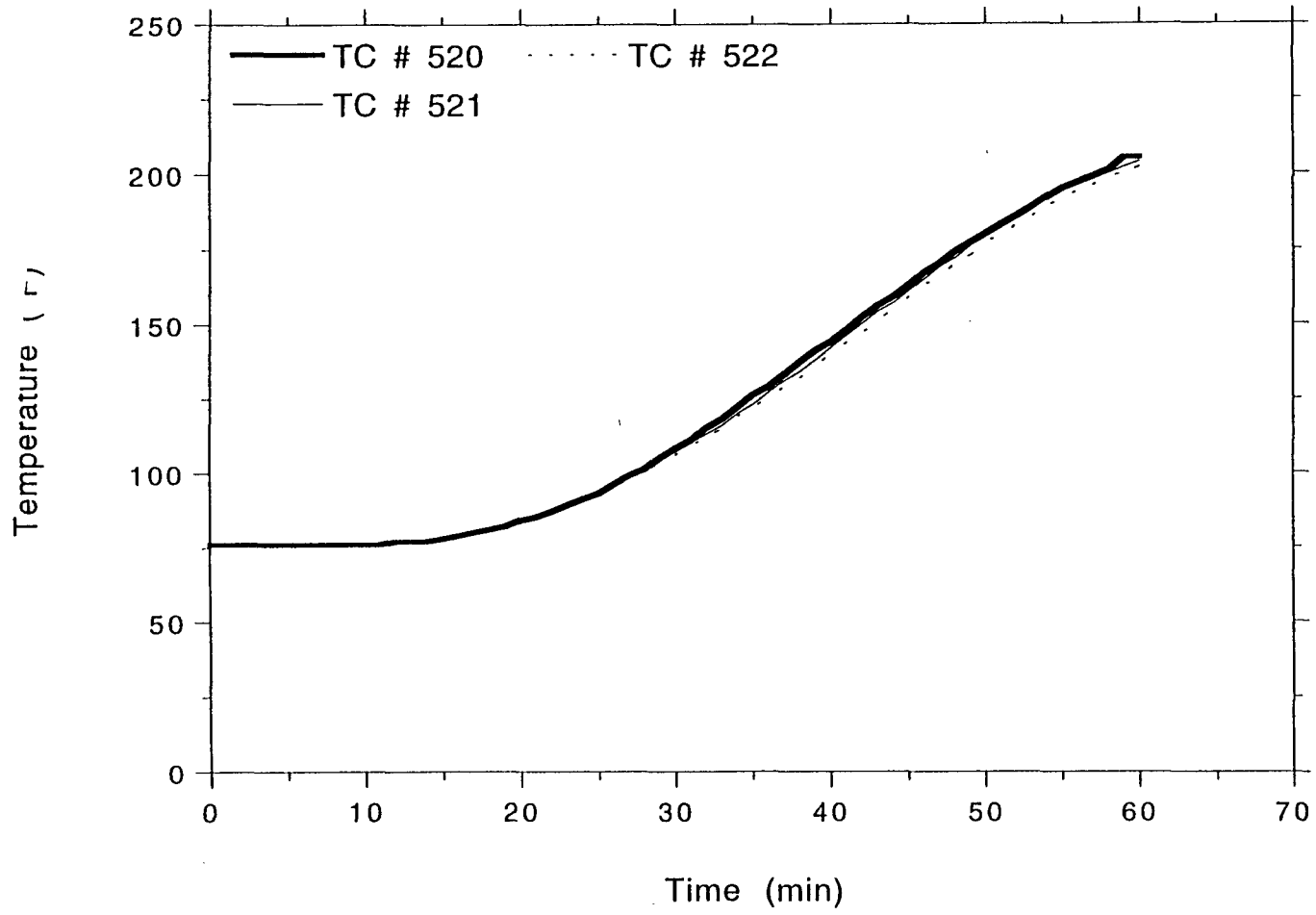
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit, #8



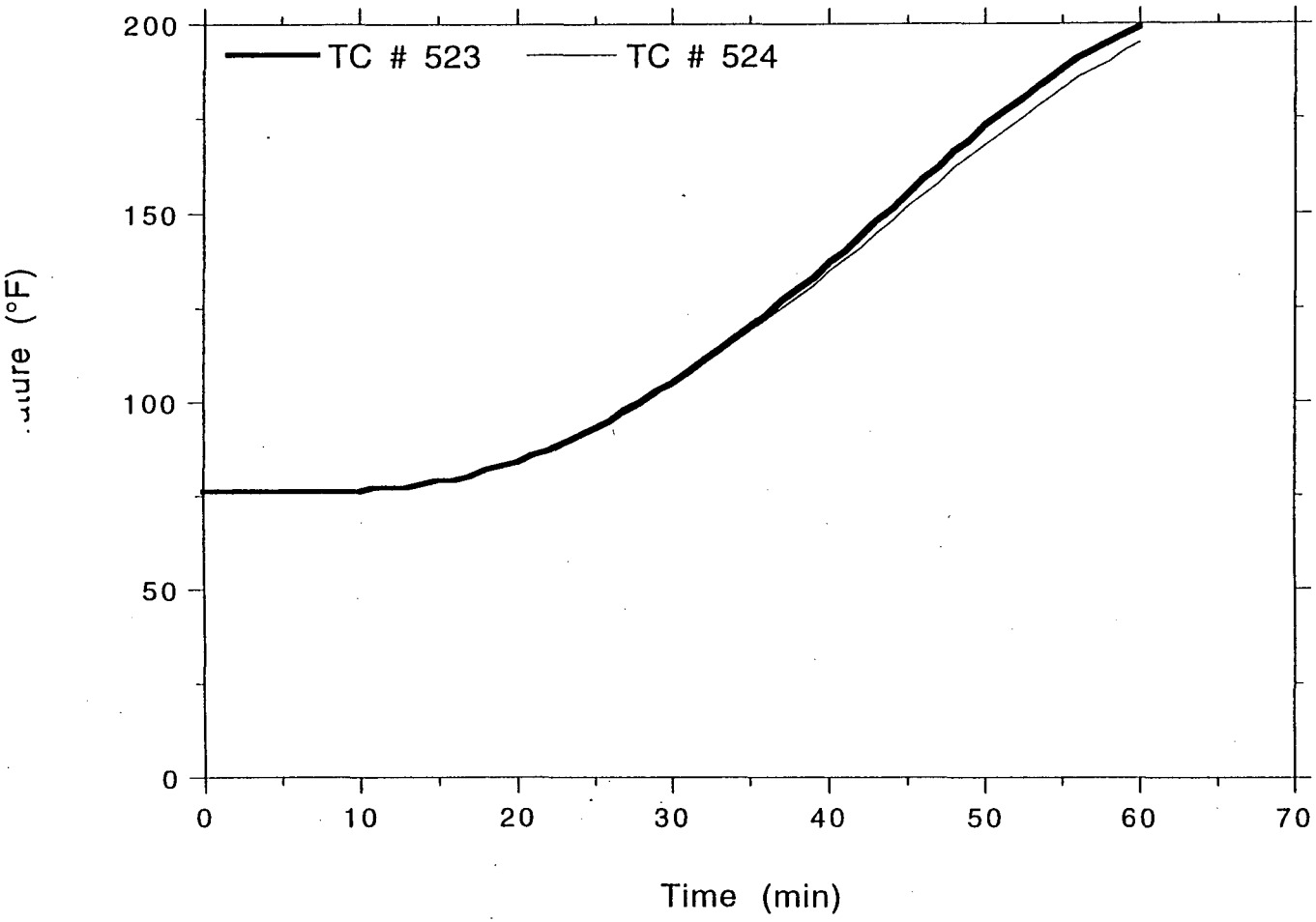
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit, #8



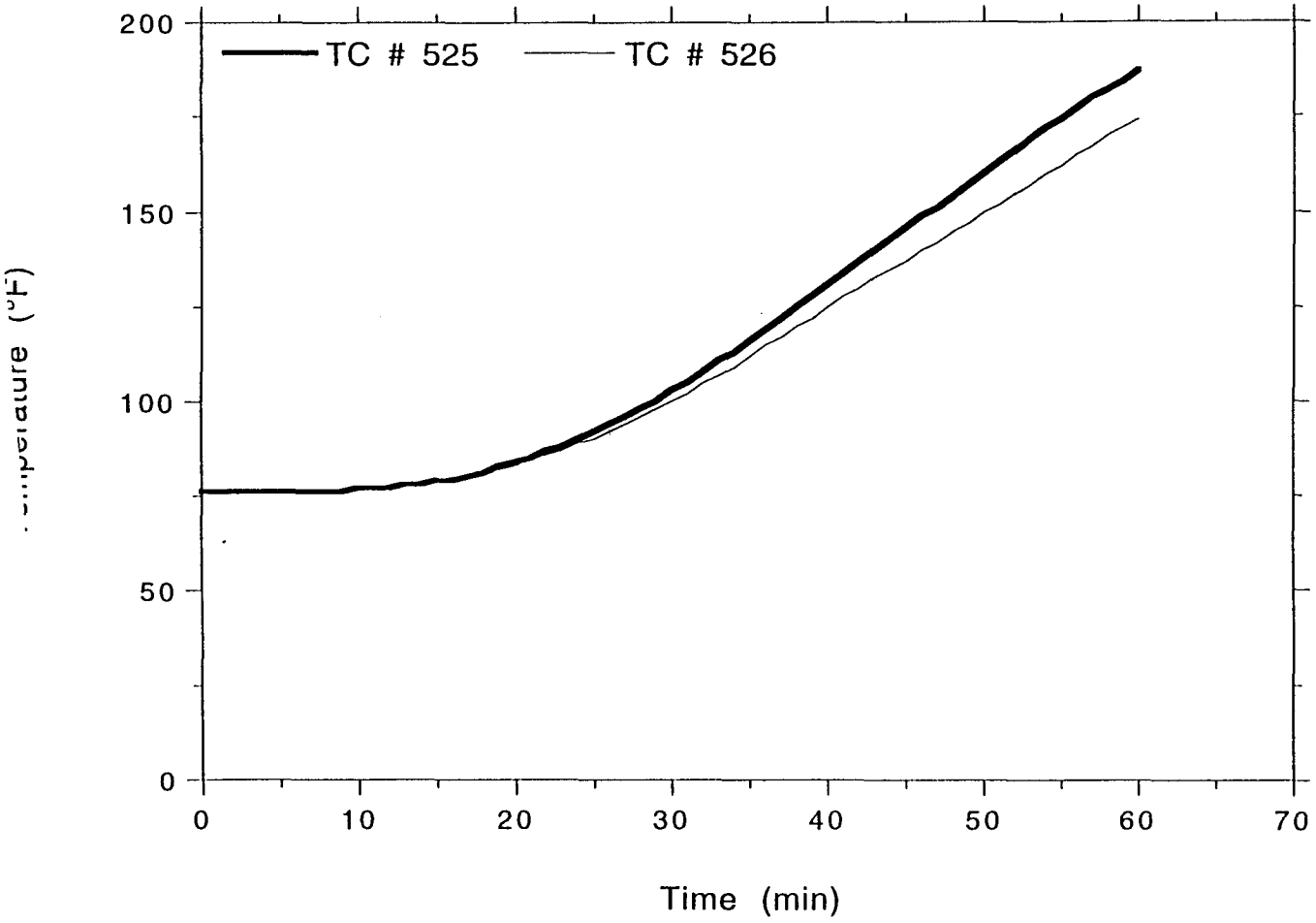
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit, #8



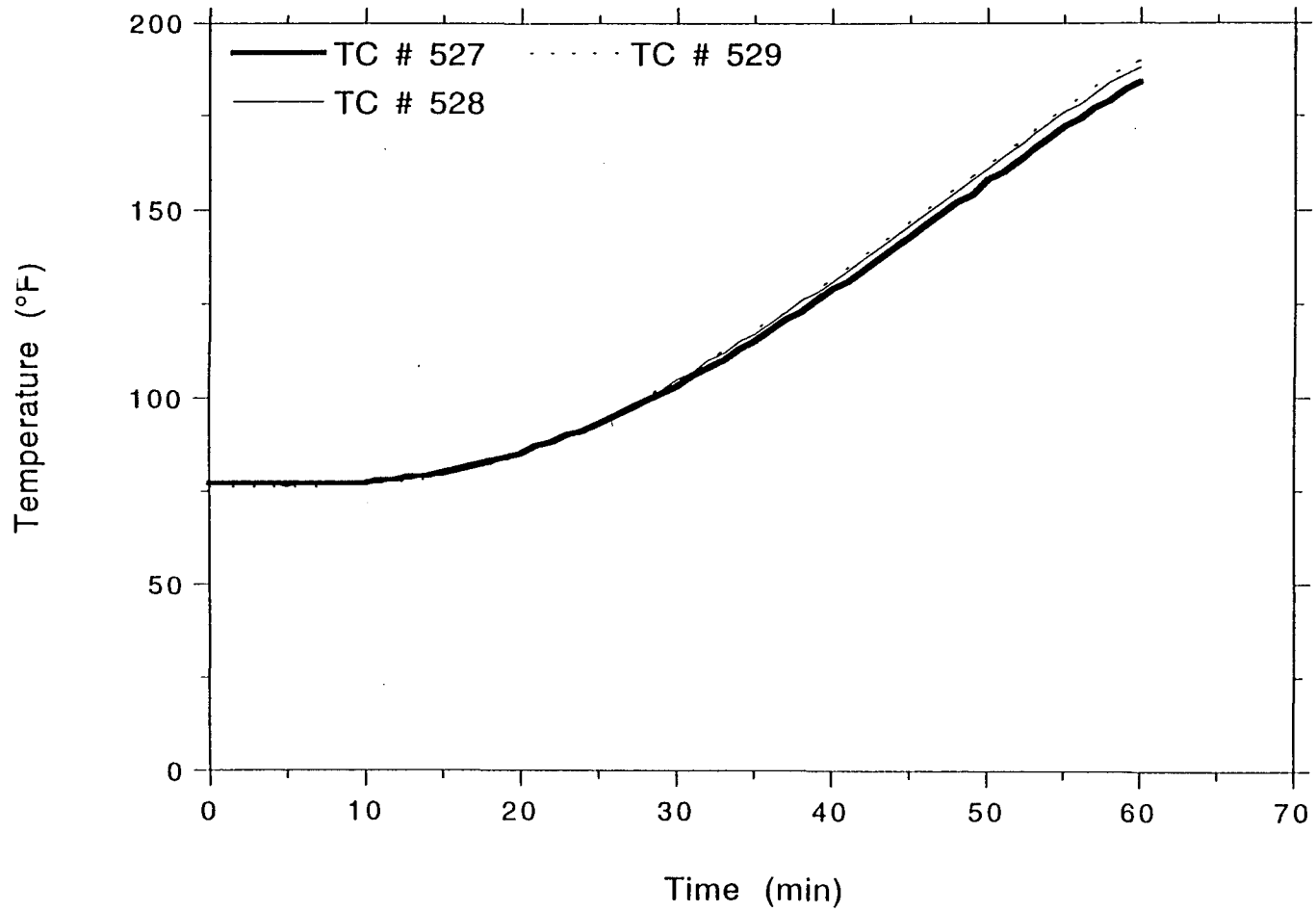
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left 4" Al. Conduit, #8



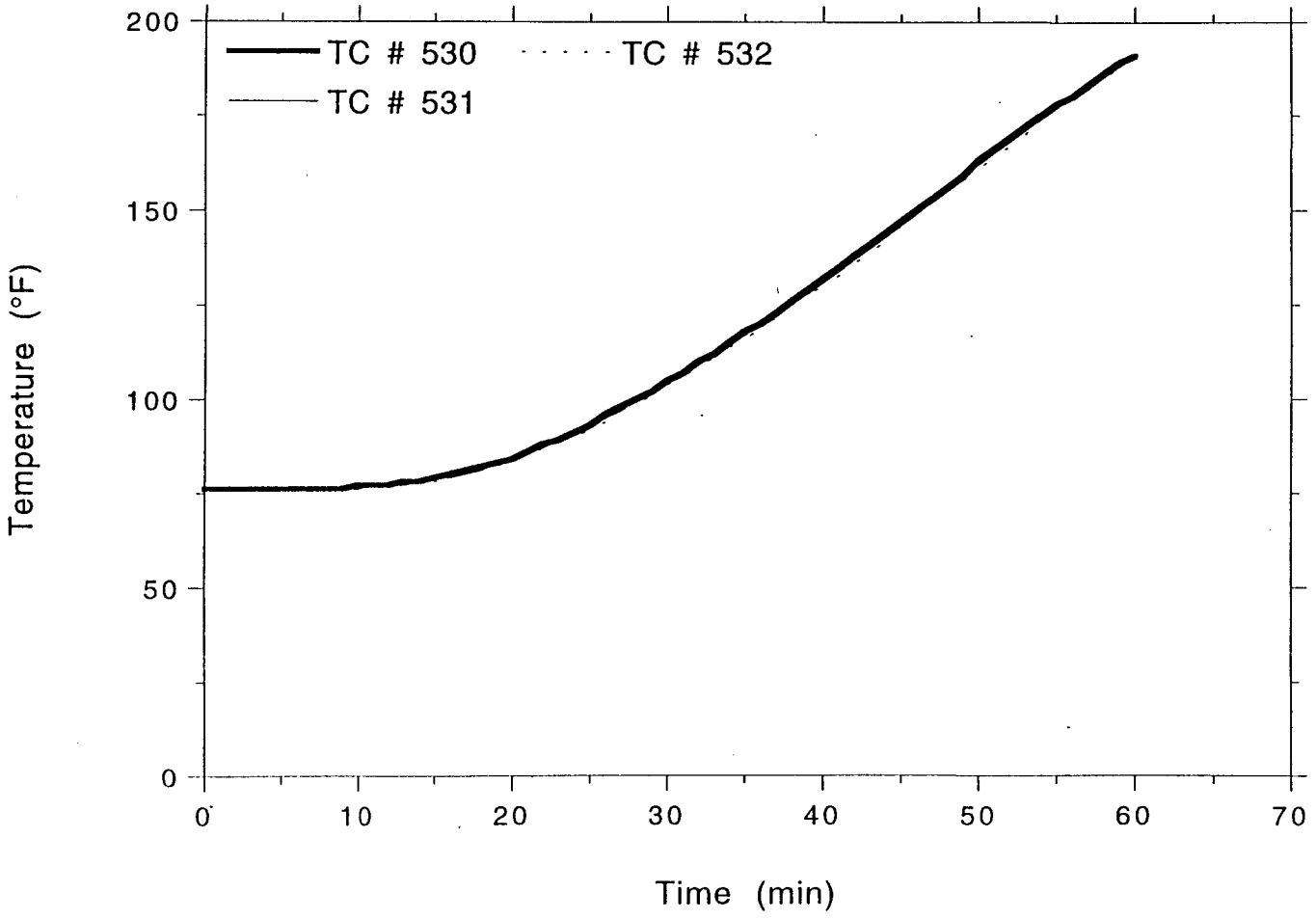
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left-Center 4" Al. Conduit, #8



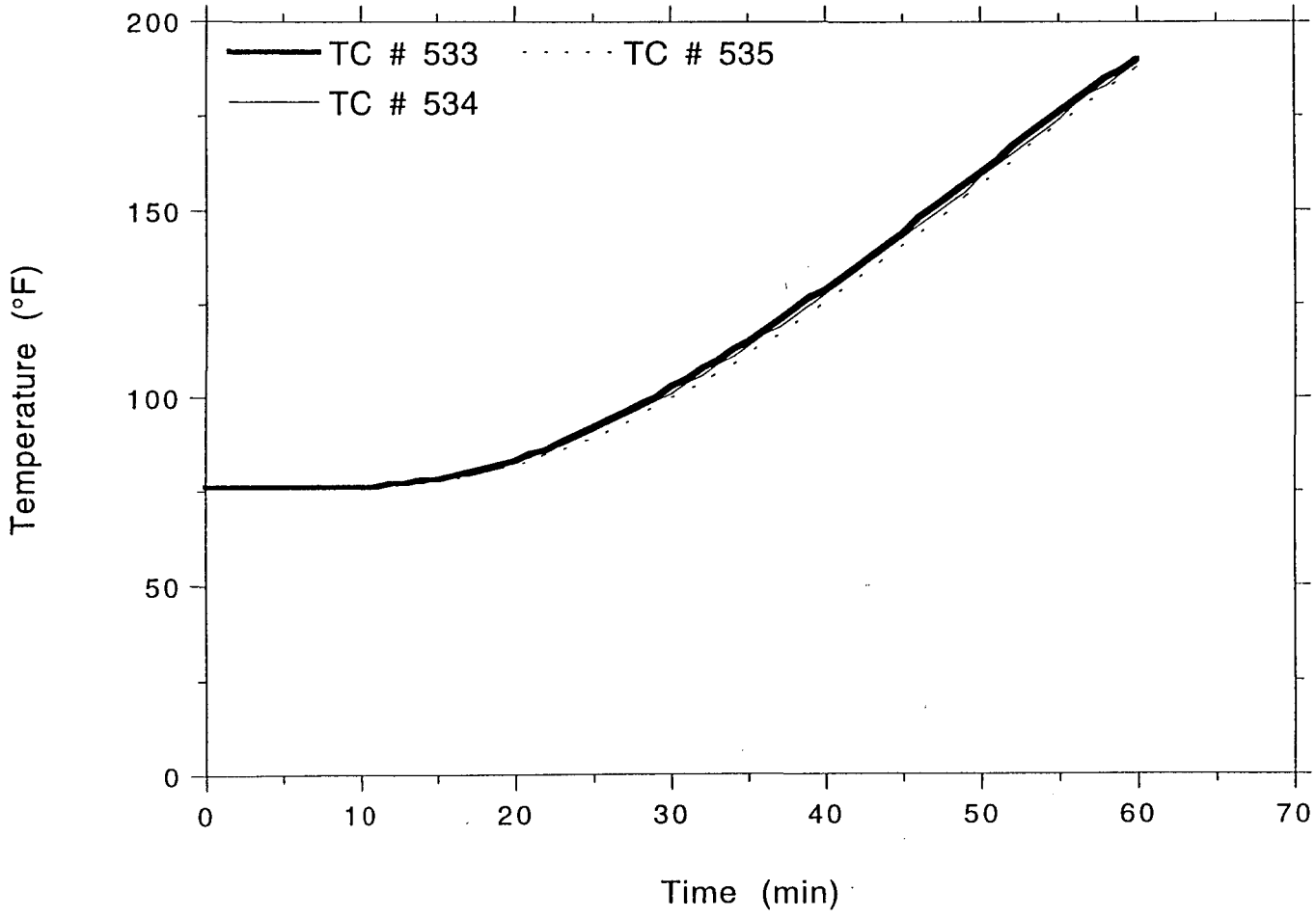
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left-Center 4" Al. Conduit, #8



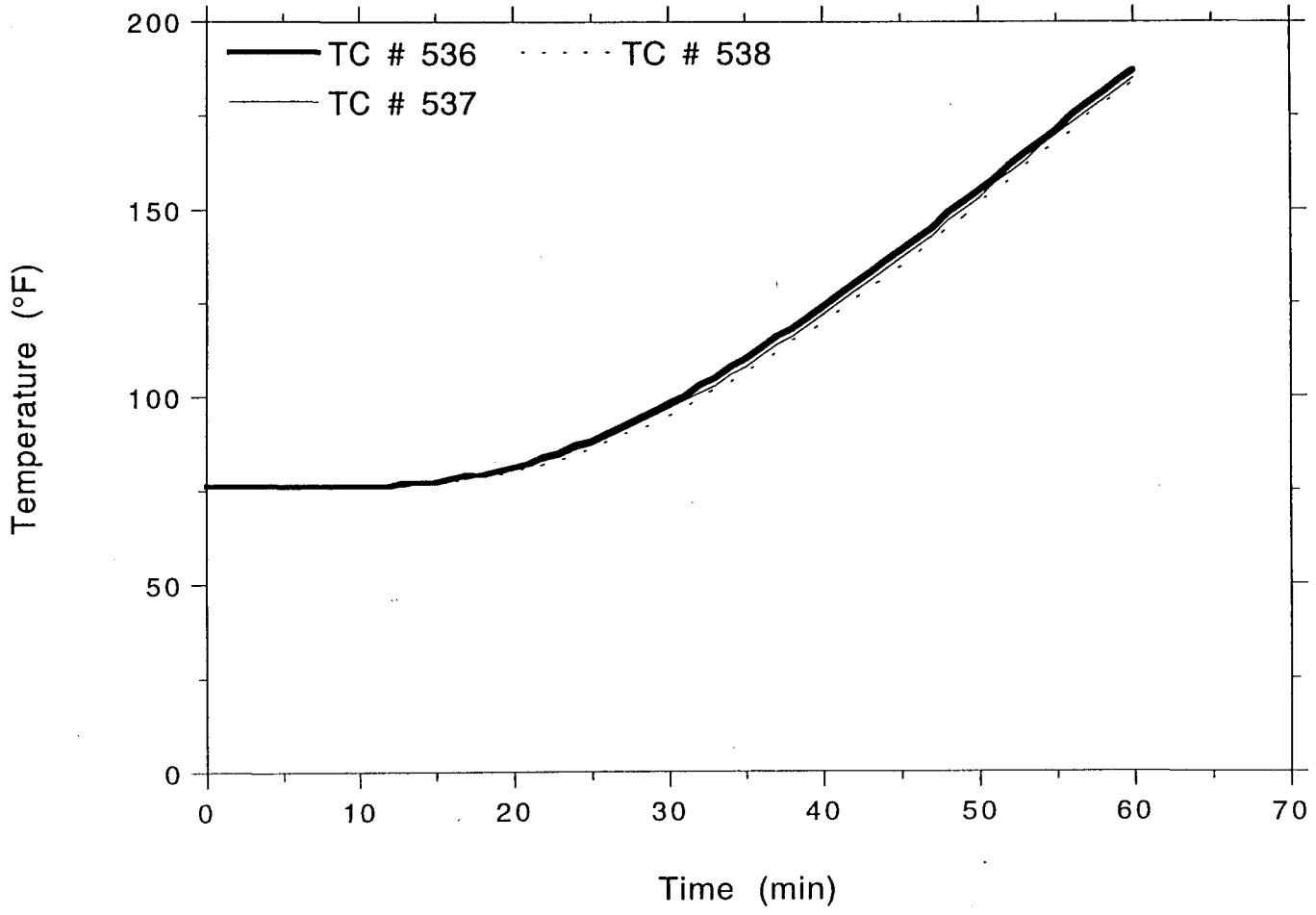
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left-Center 4" Al. Conduit, #8



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Front Left-Center 4" Al. Conduit, #8



OMEGA POINT LABORATORIES

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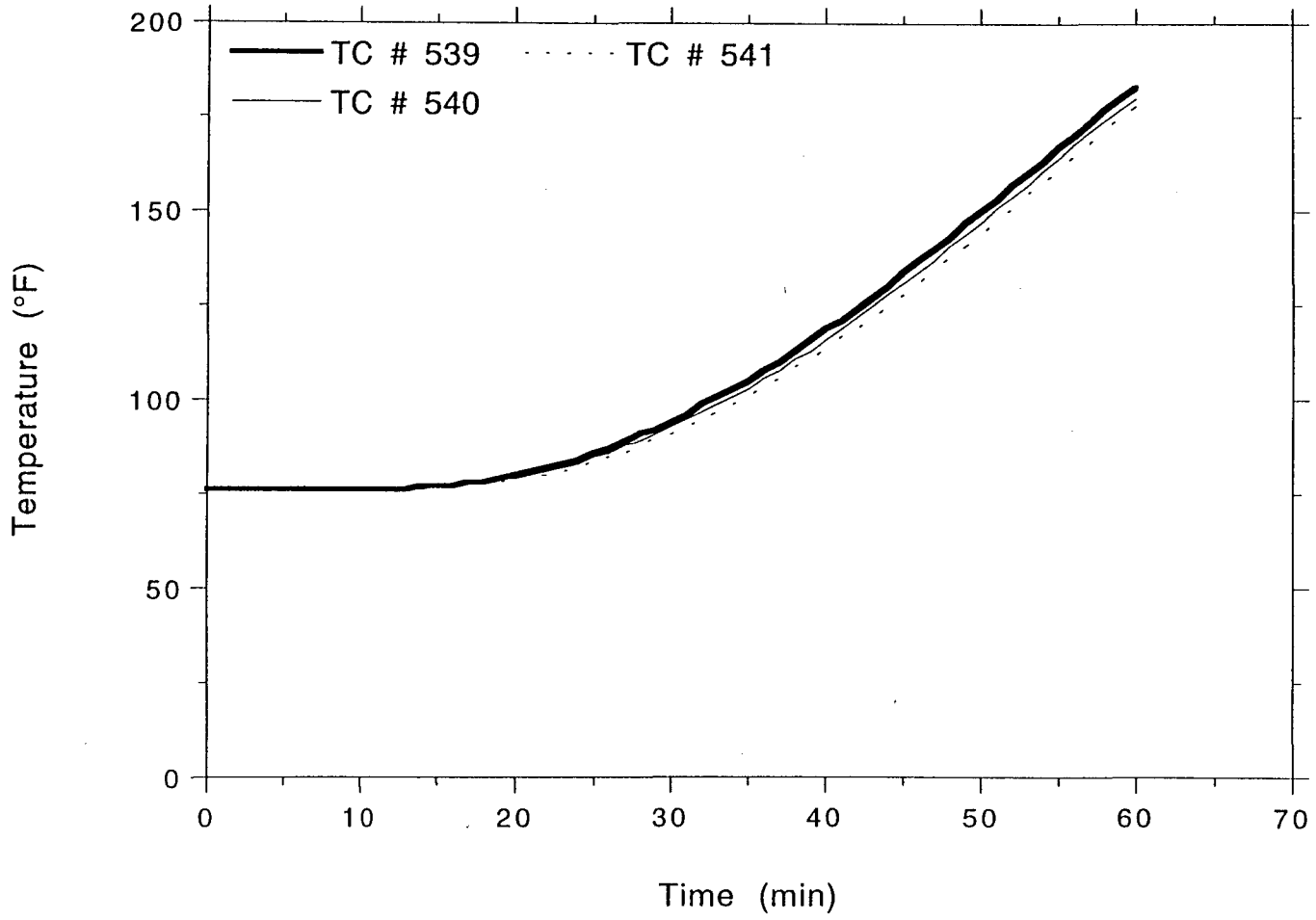
Front Left-Center 4" Al. Conduit, #8



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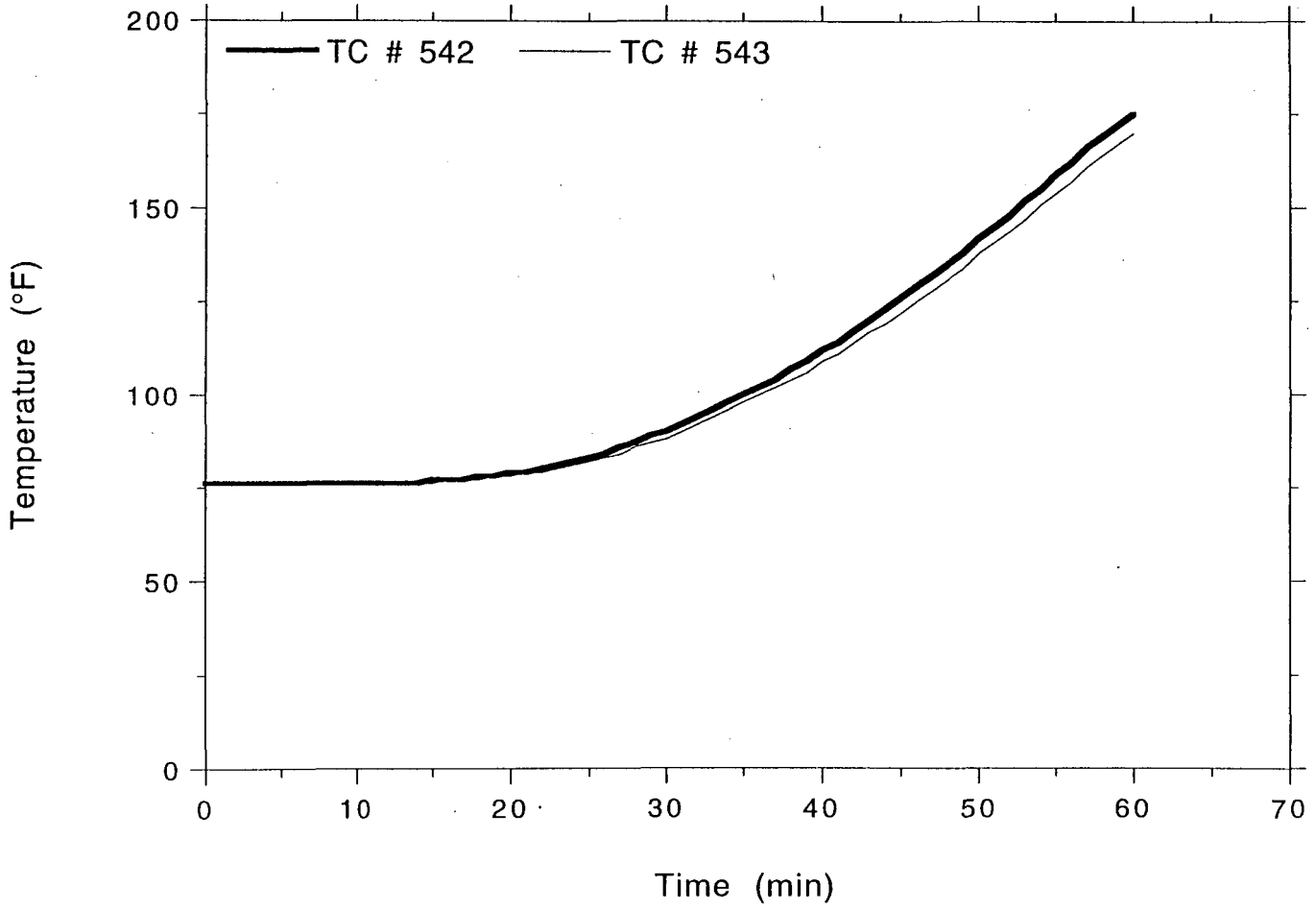
Front Left-Center 4" Al. Conduit, #8



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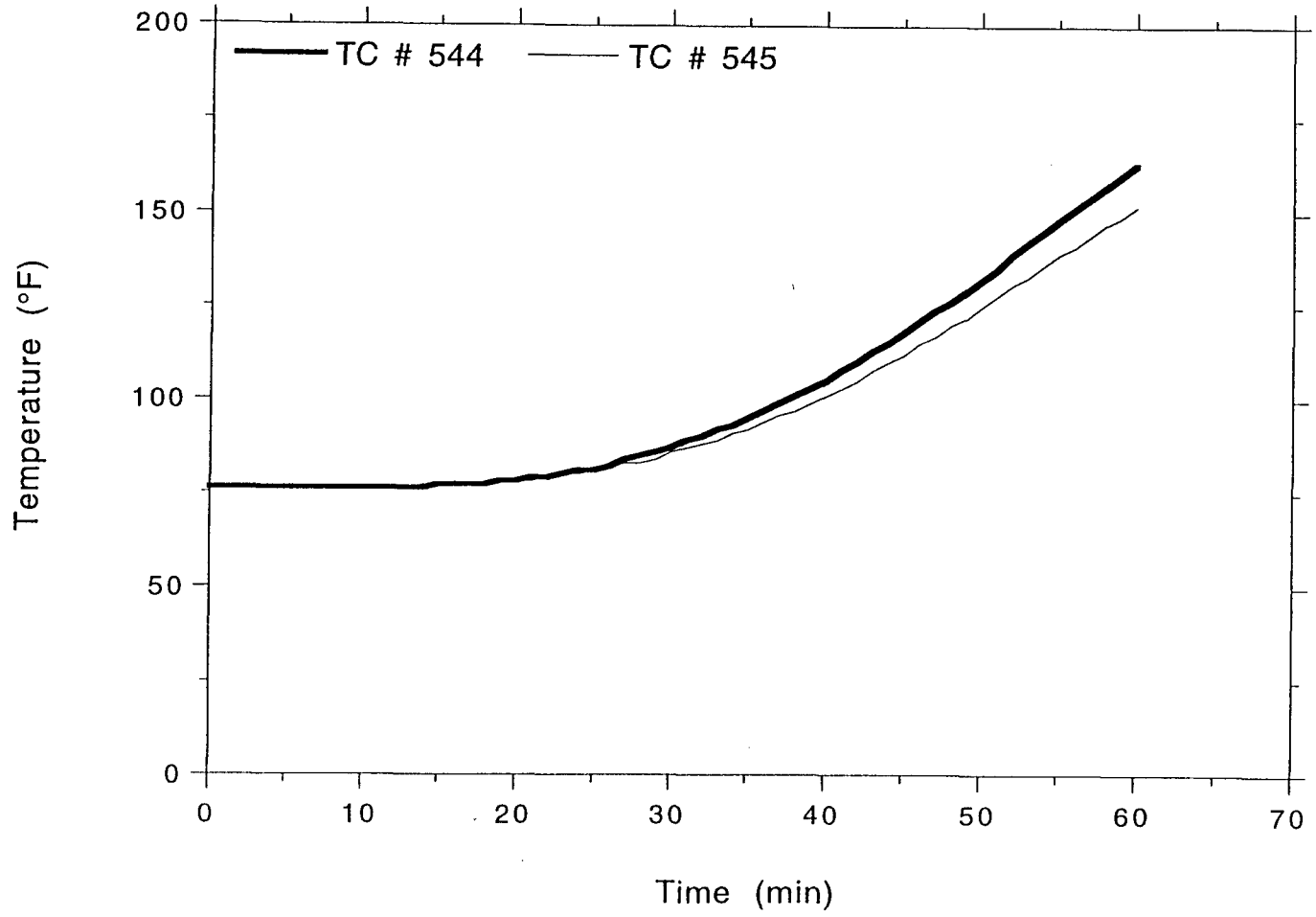

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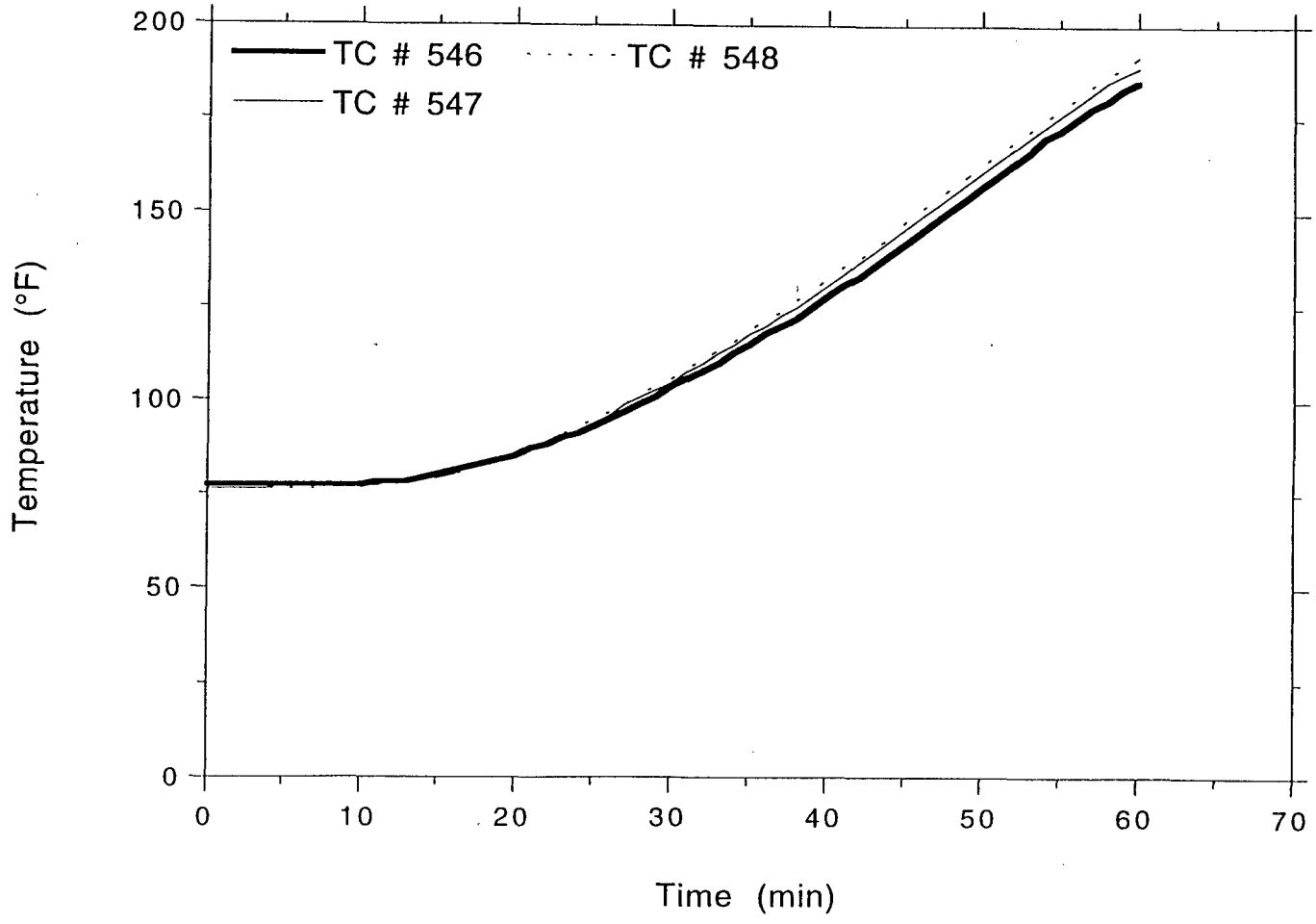

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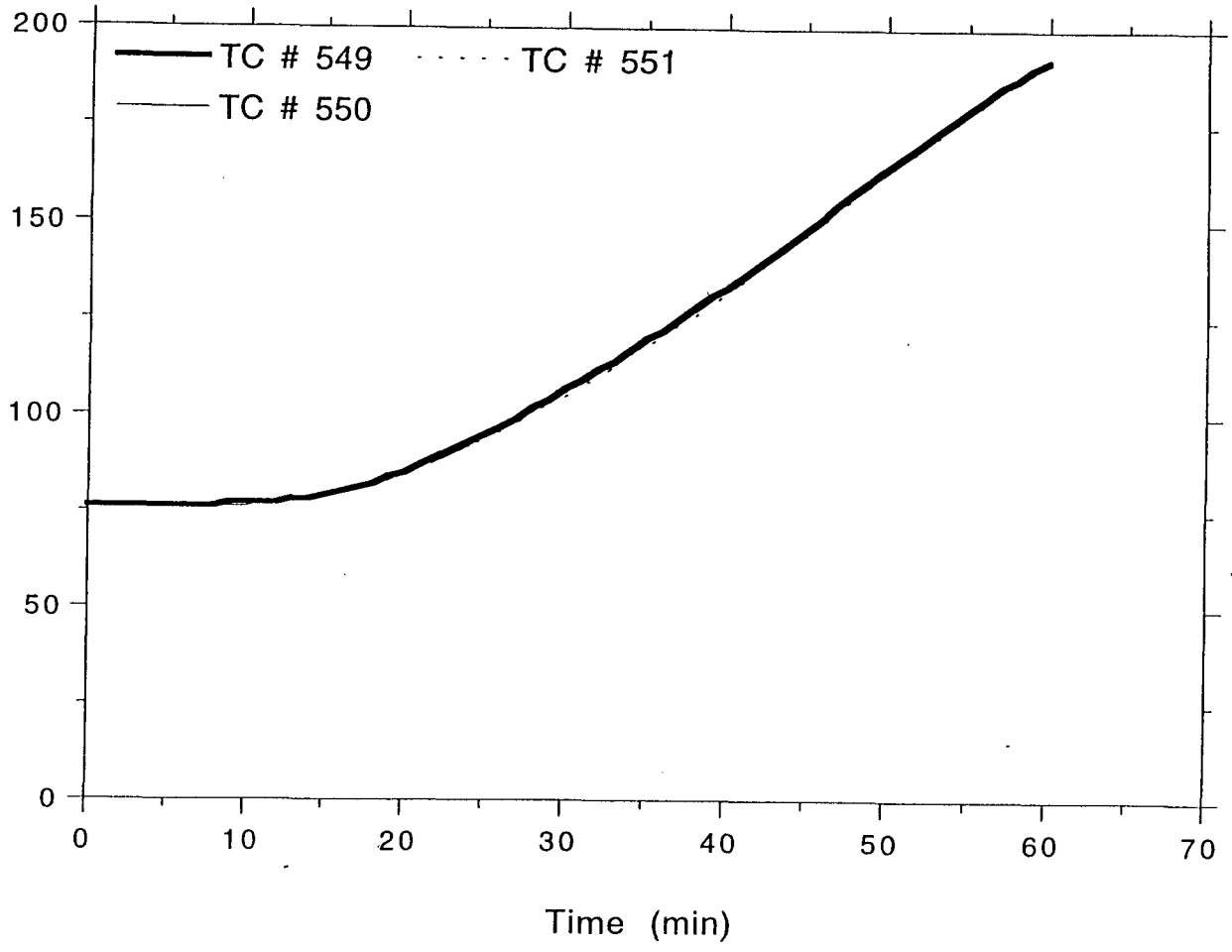

OMEGA POINT LABORATORIES

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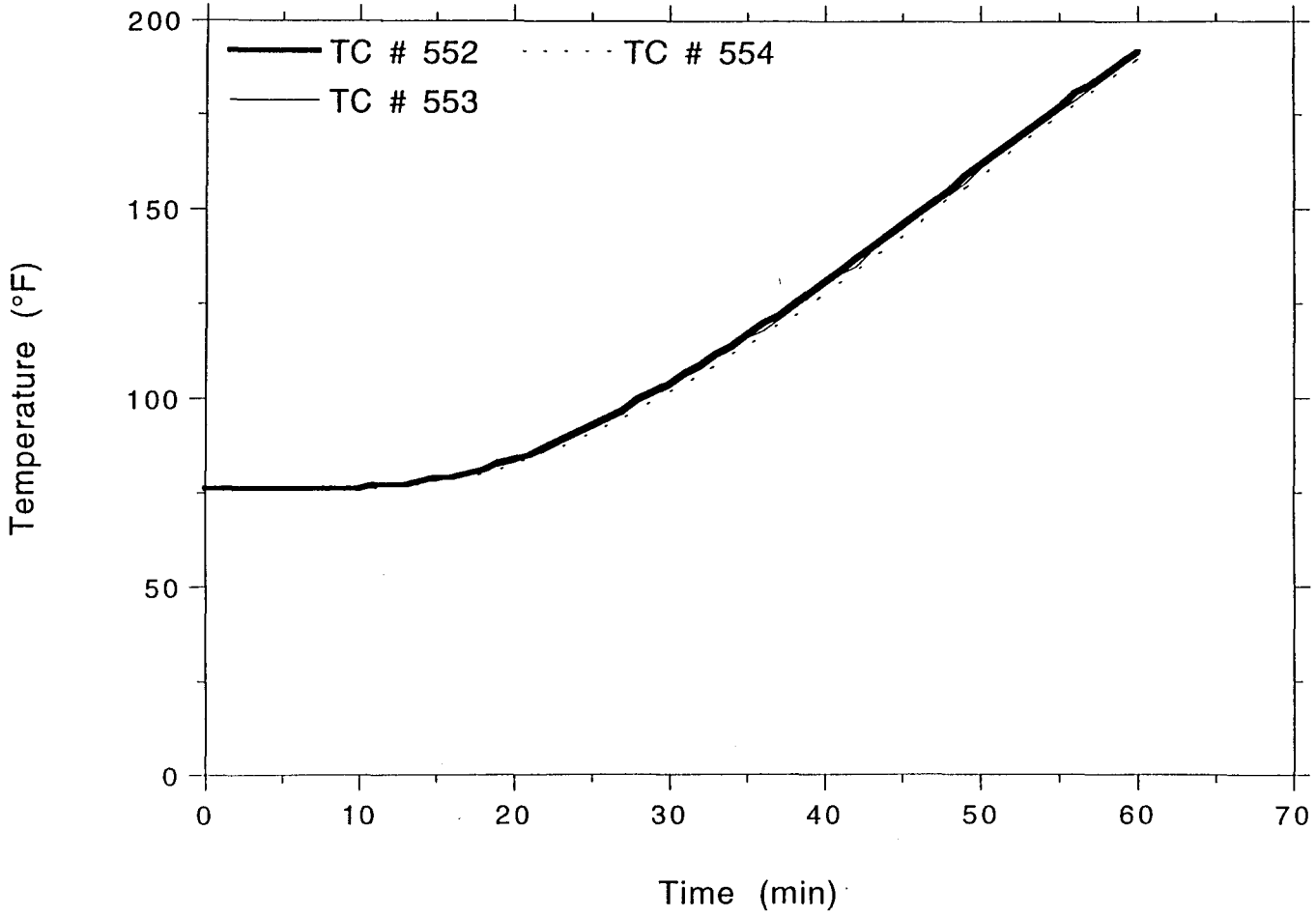

OMEGA POINT LABORATORIES

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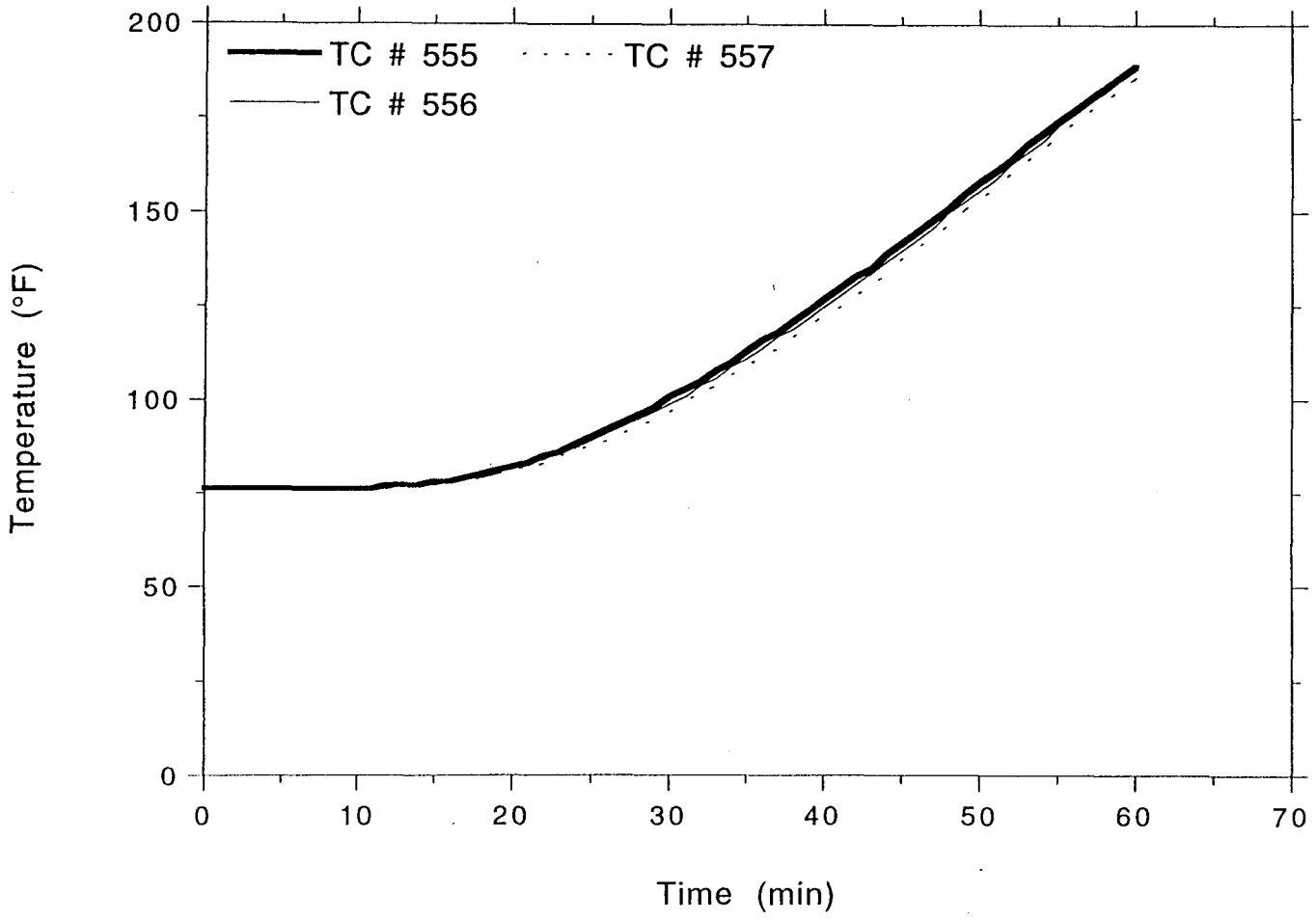

OMEGA POINT LABORATORIES

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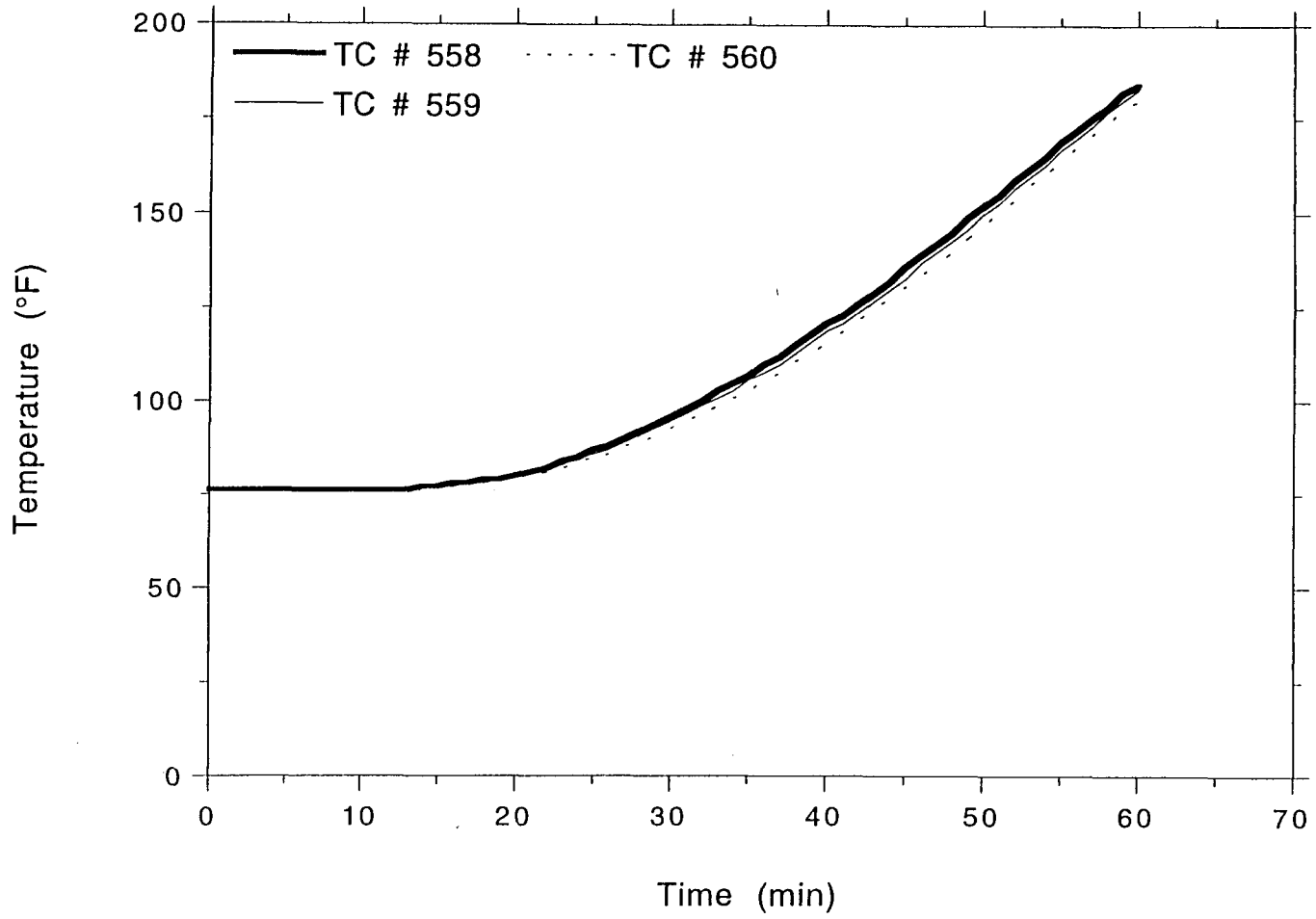

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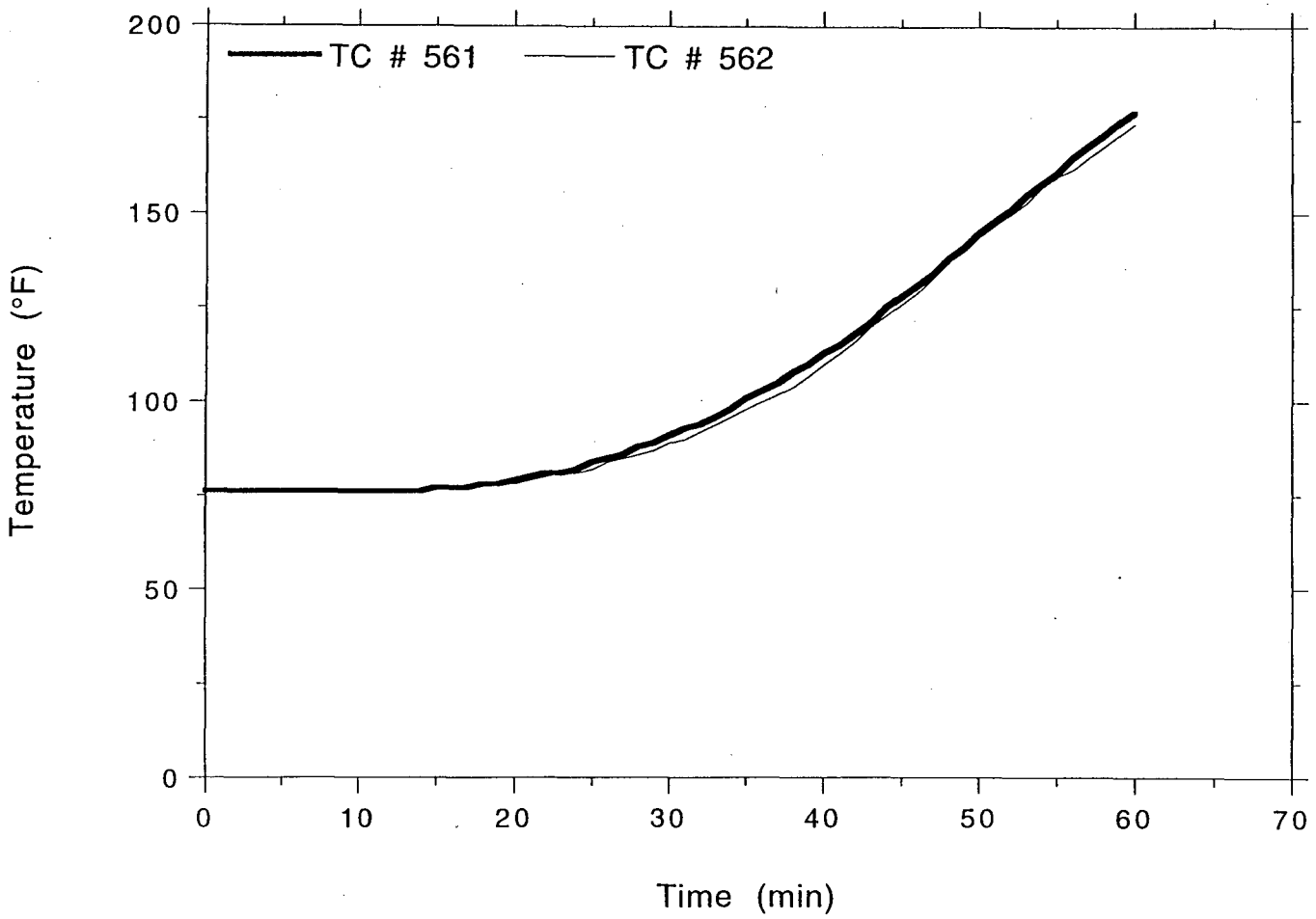

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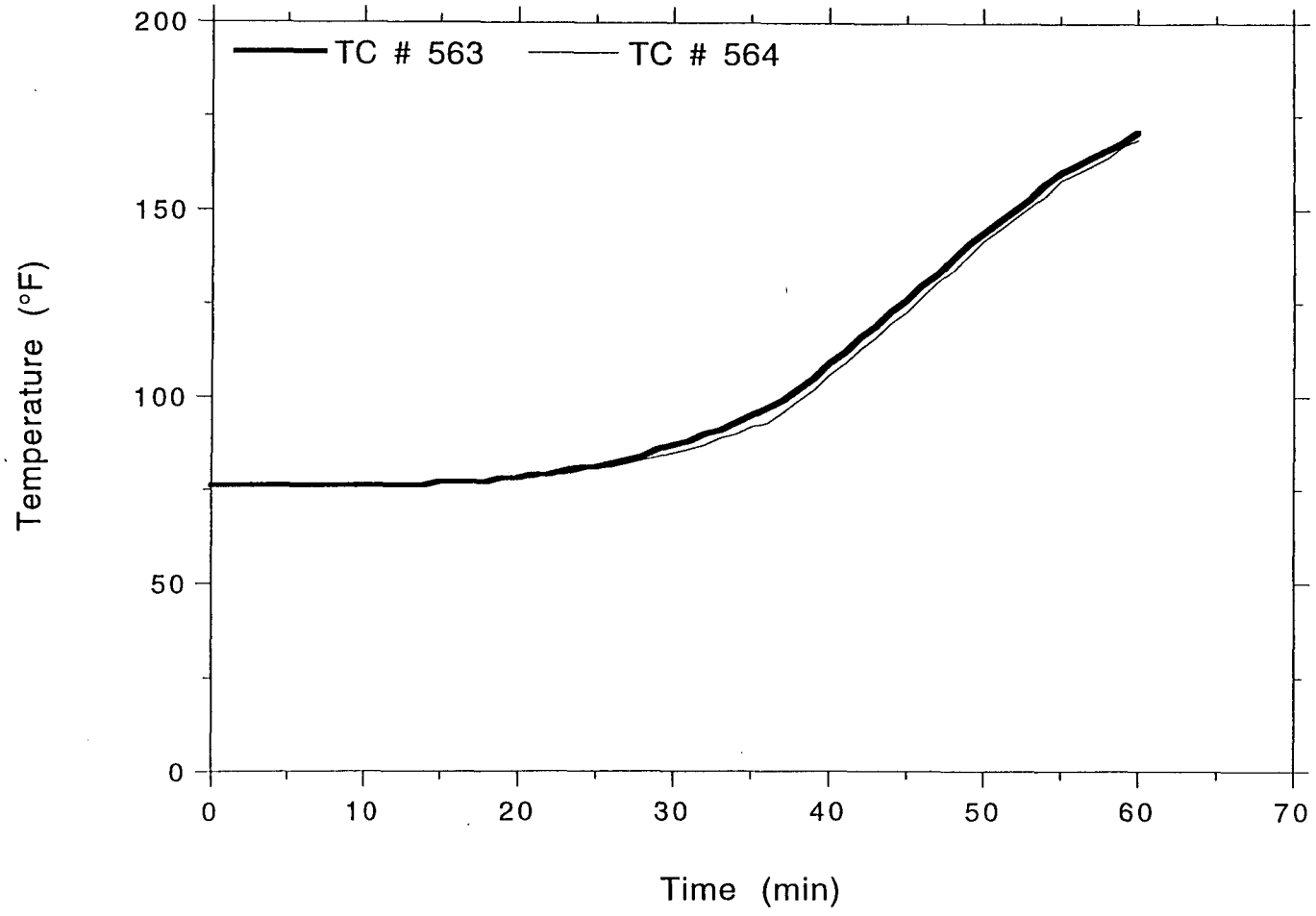

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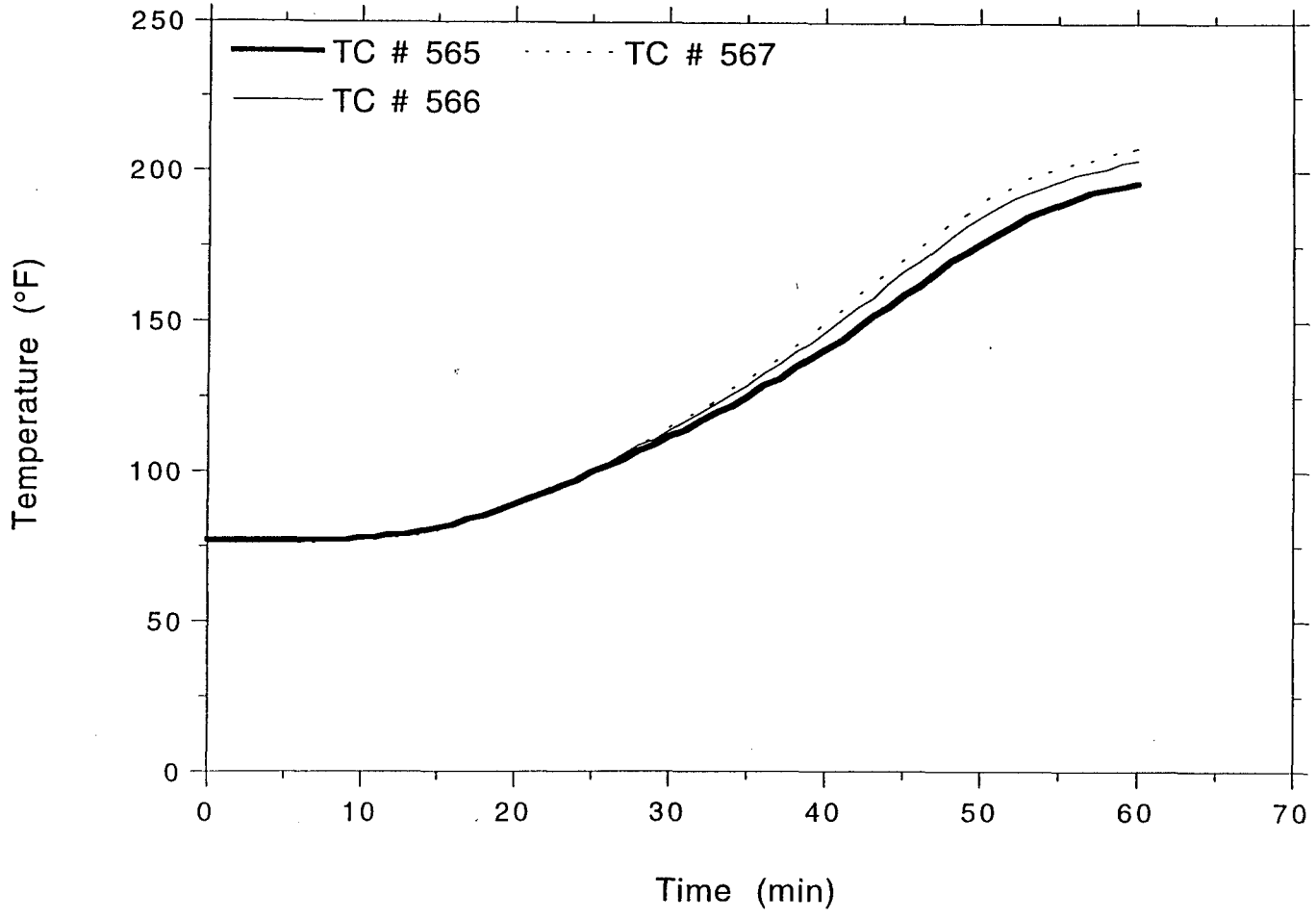

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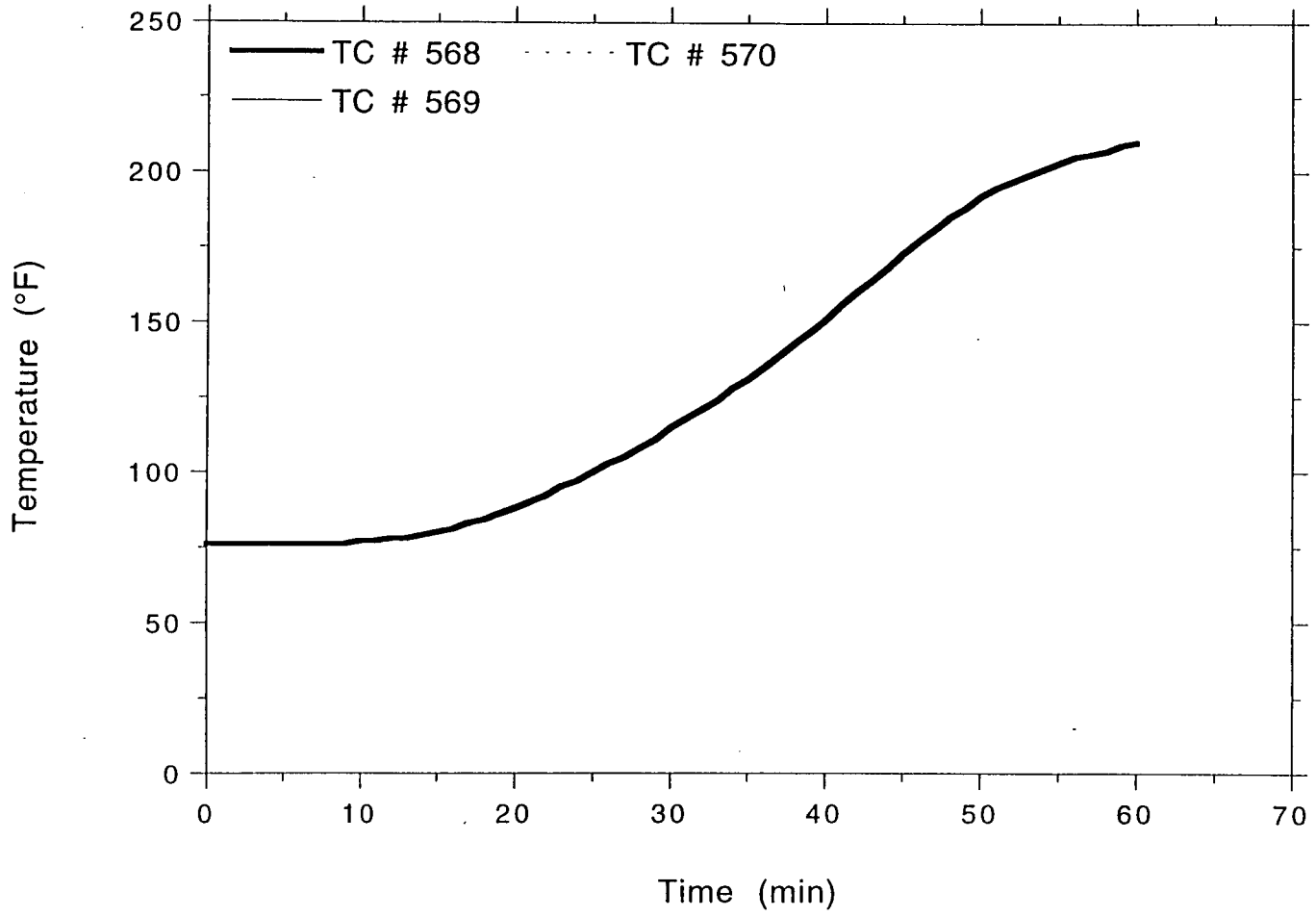

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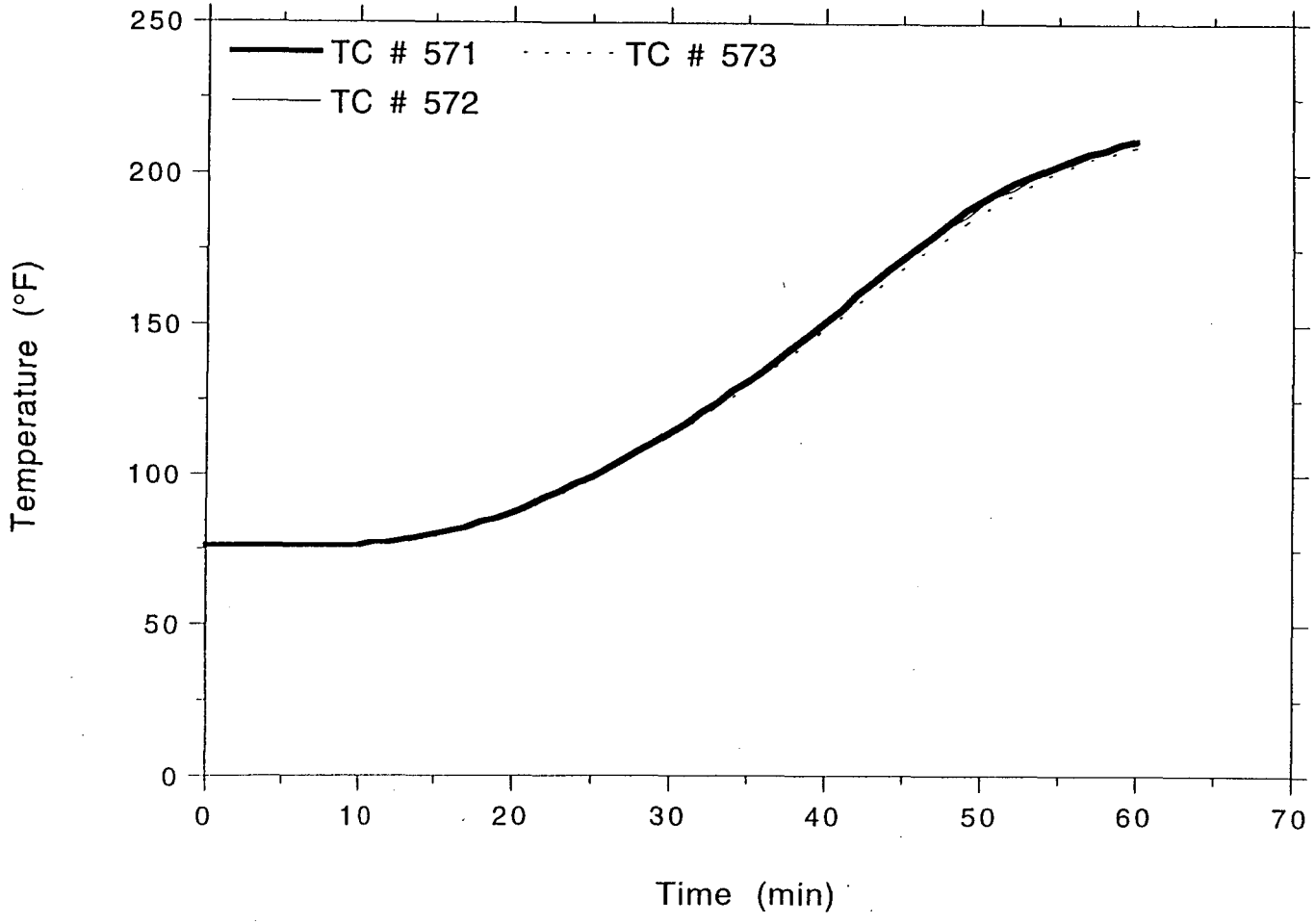

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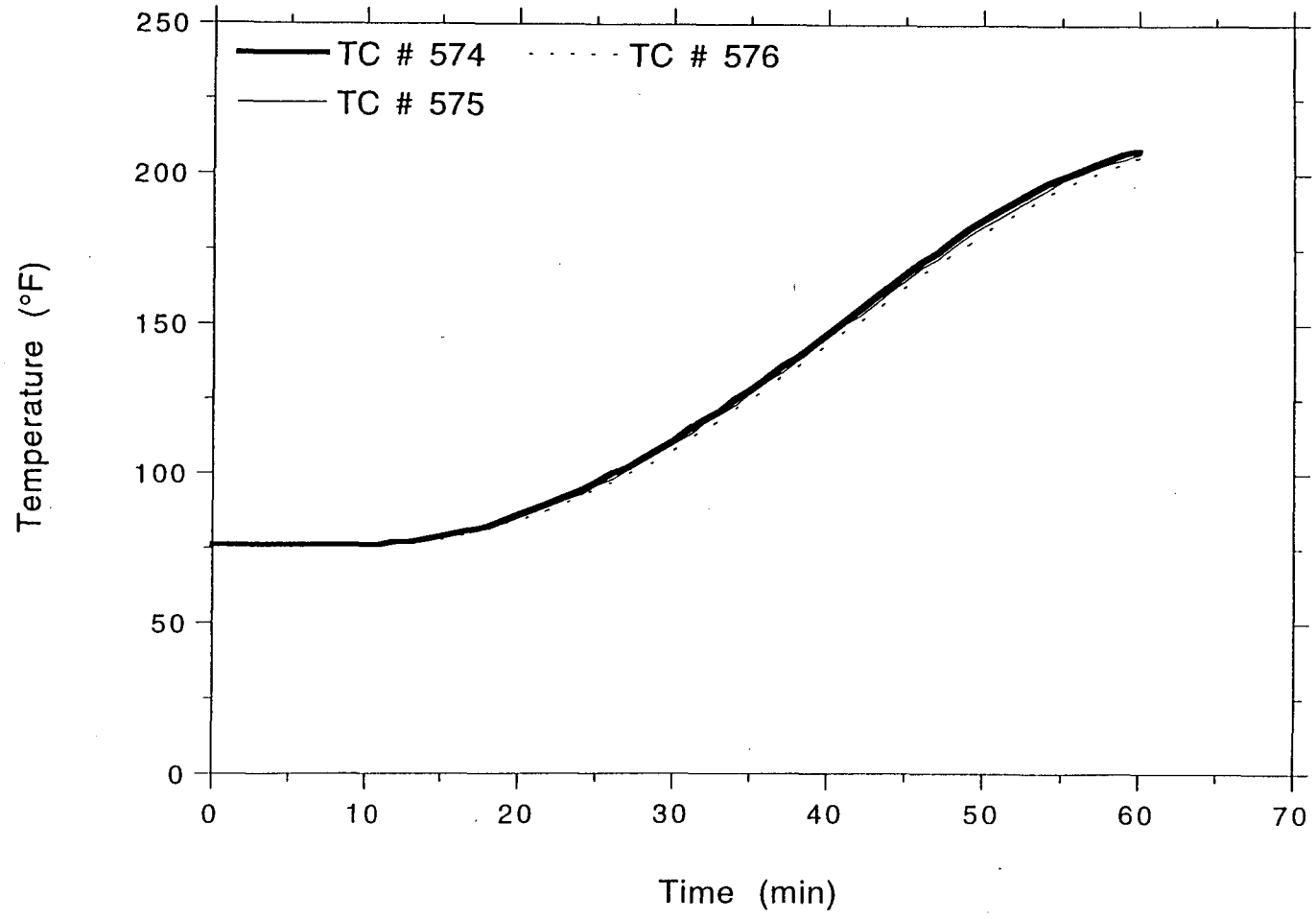

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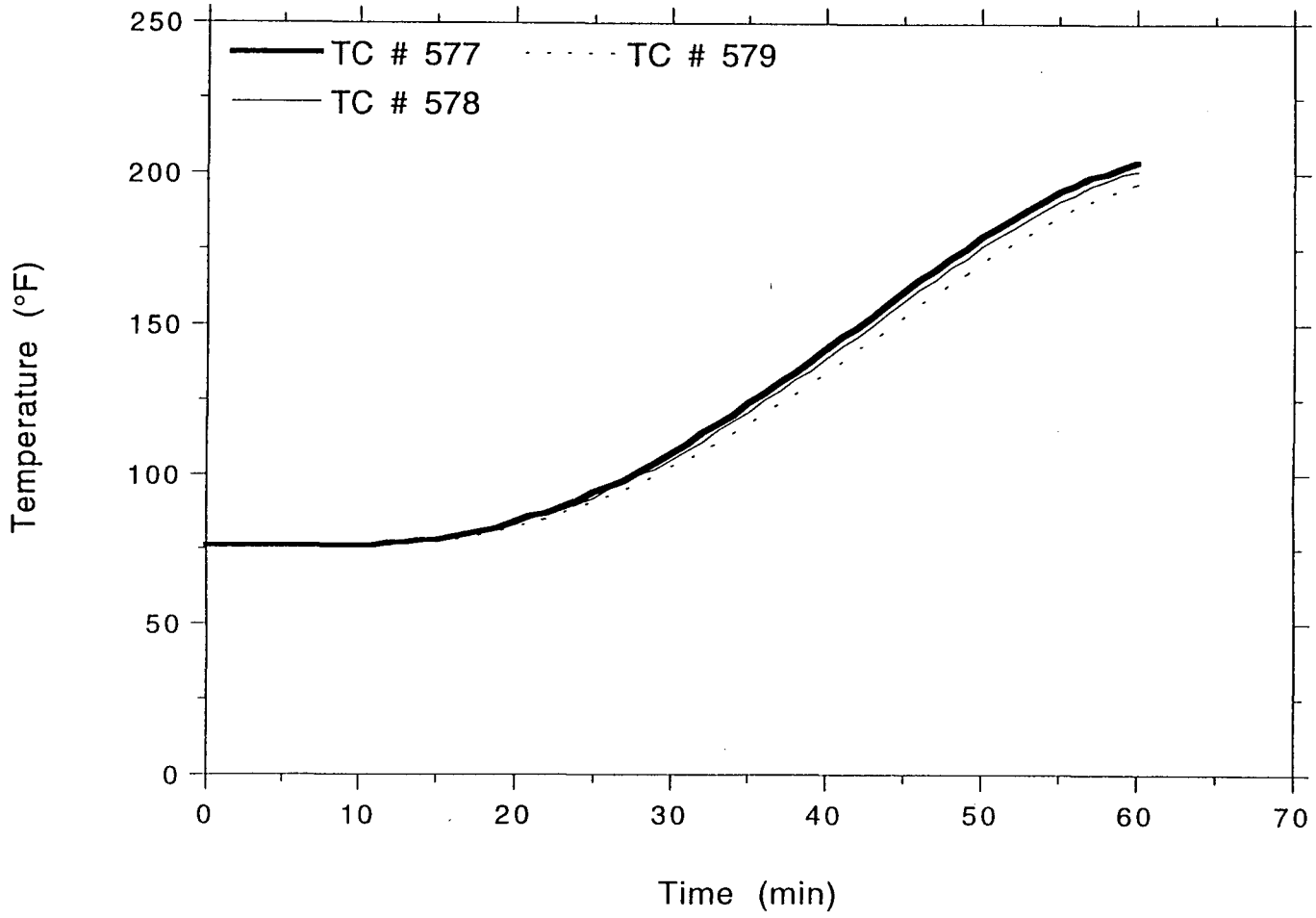

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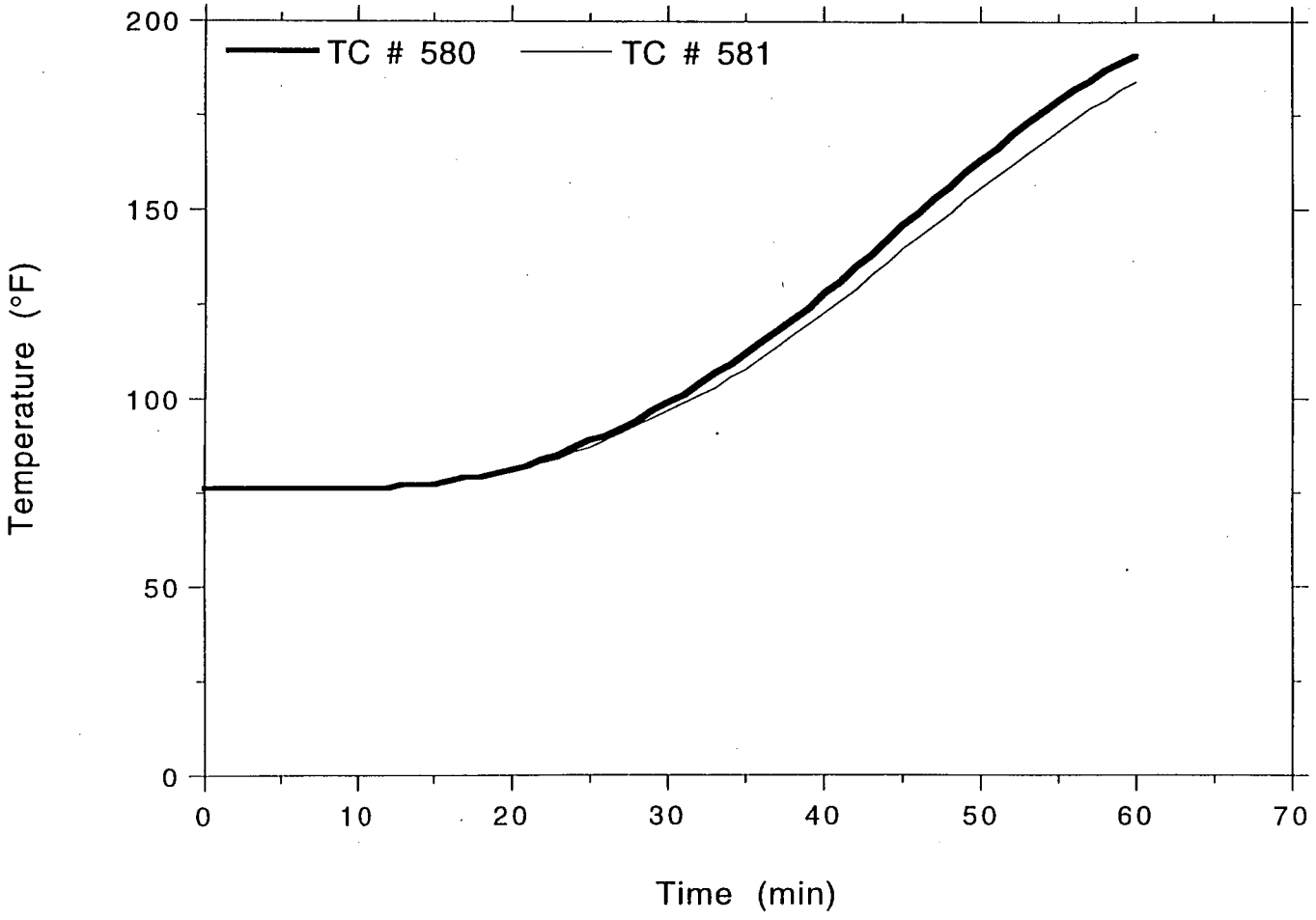

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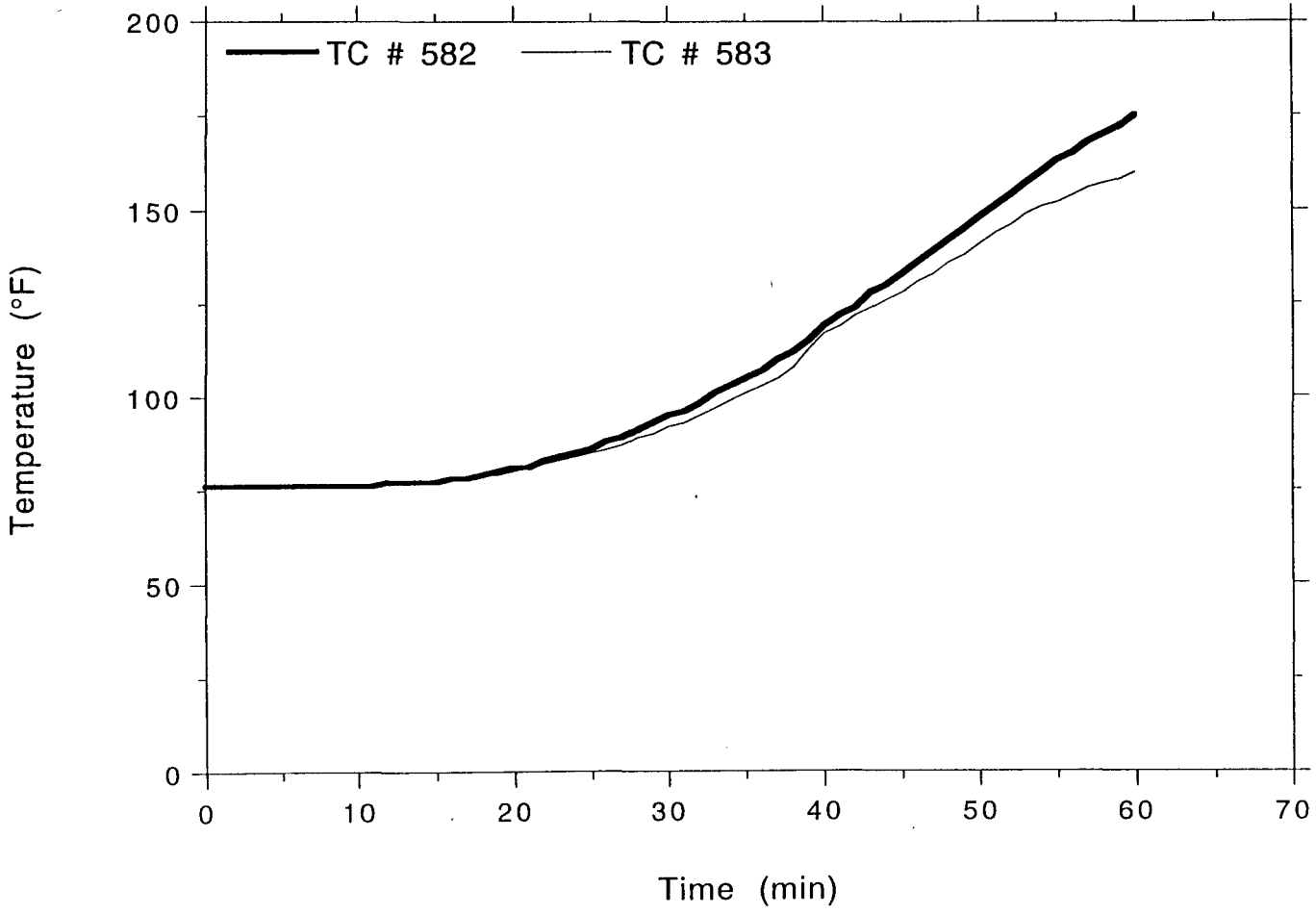

OMEGA POINT LABORATORIES

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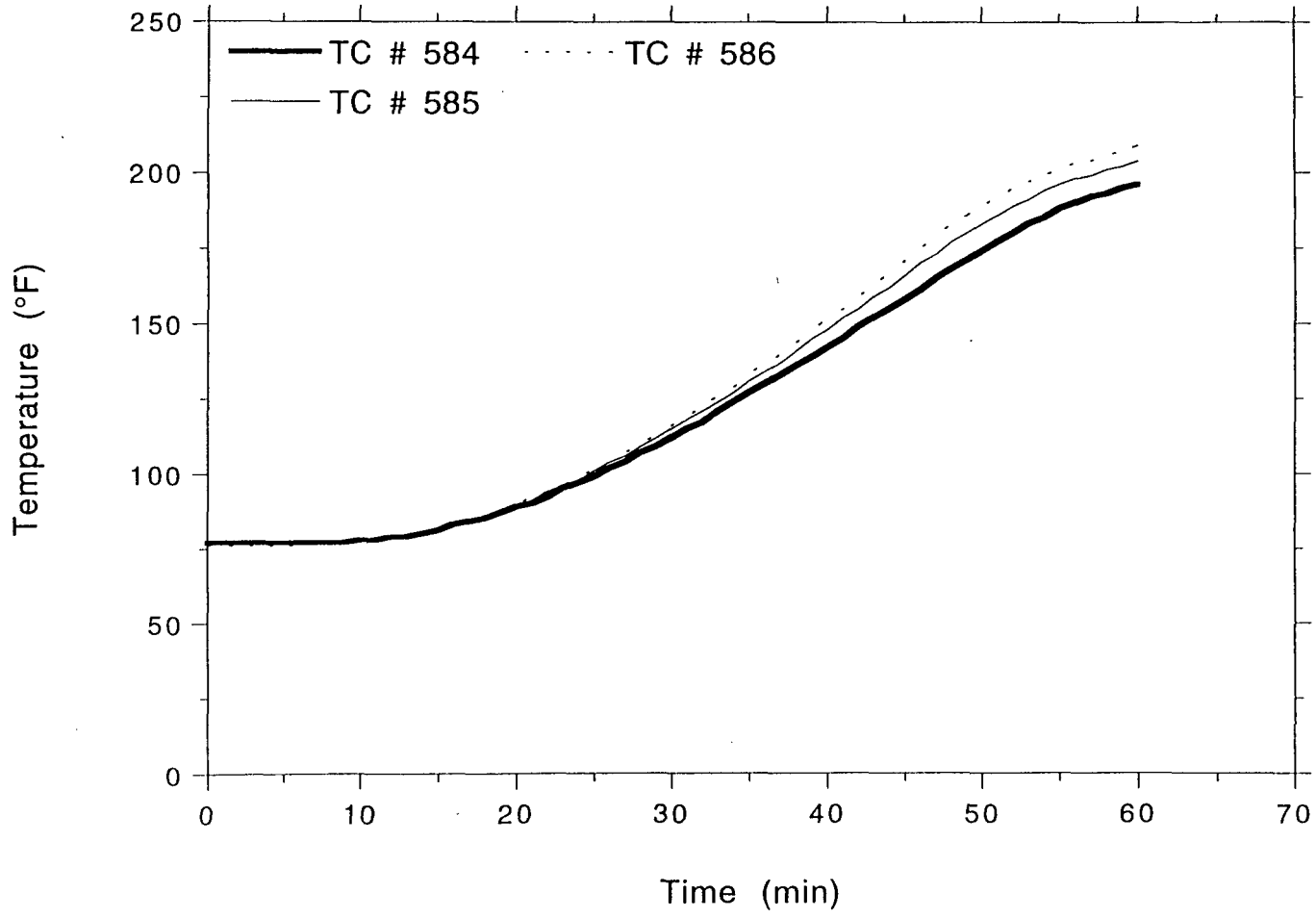
Rear Left 4" Al. Conduit, #8



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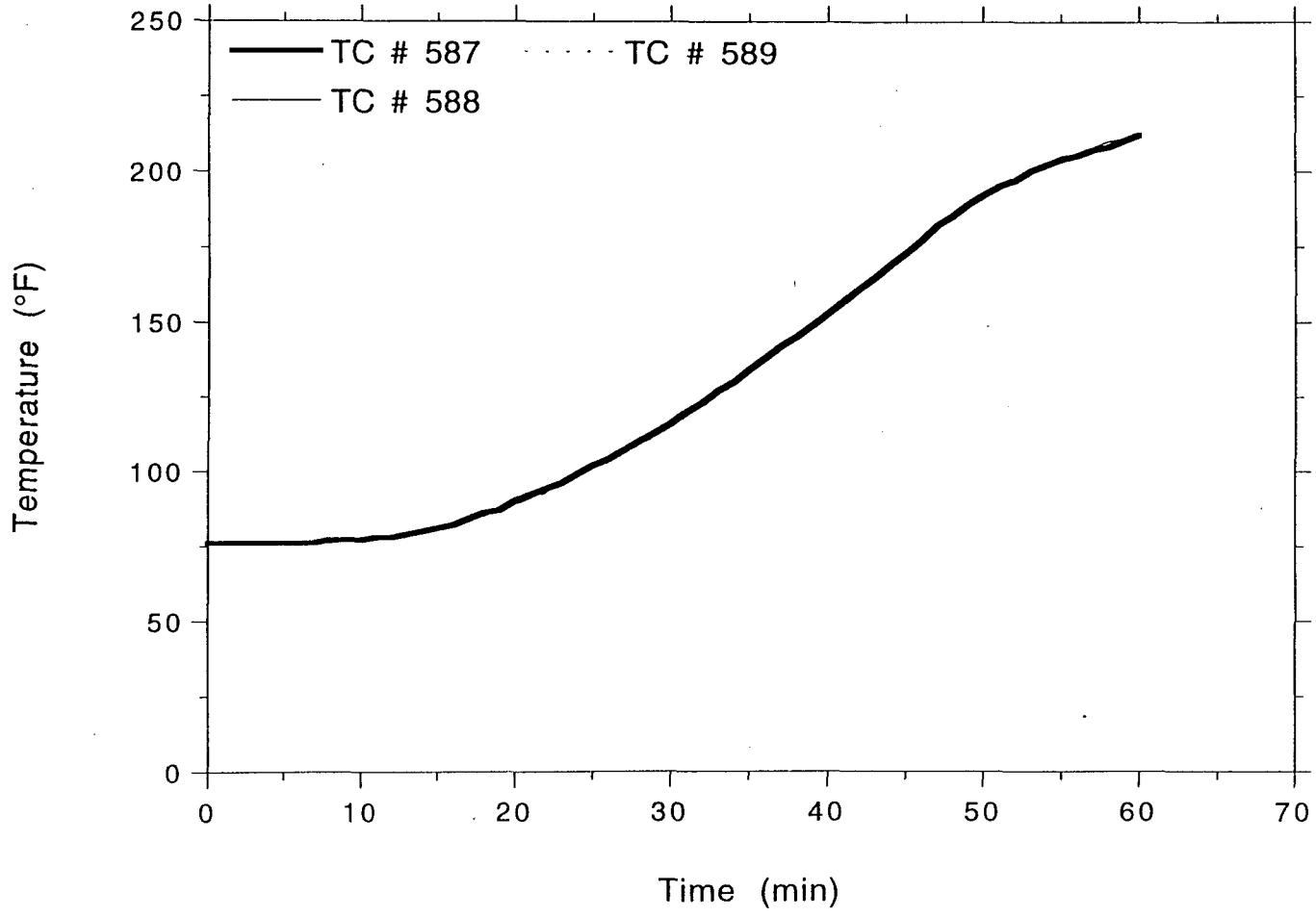
Rear Left 4" Al. Conduit, #8



OMEGA POINT LABORATORIES

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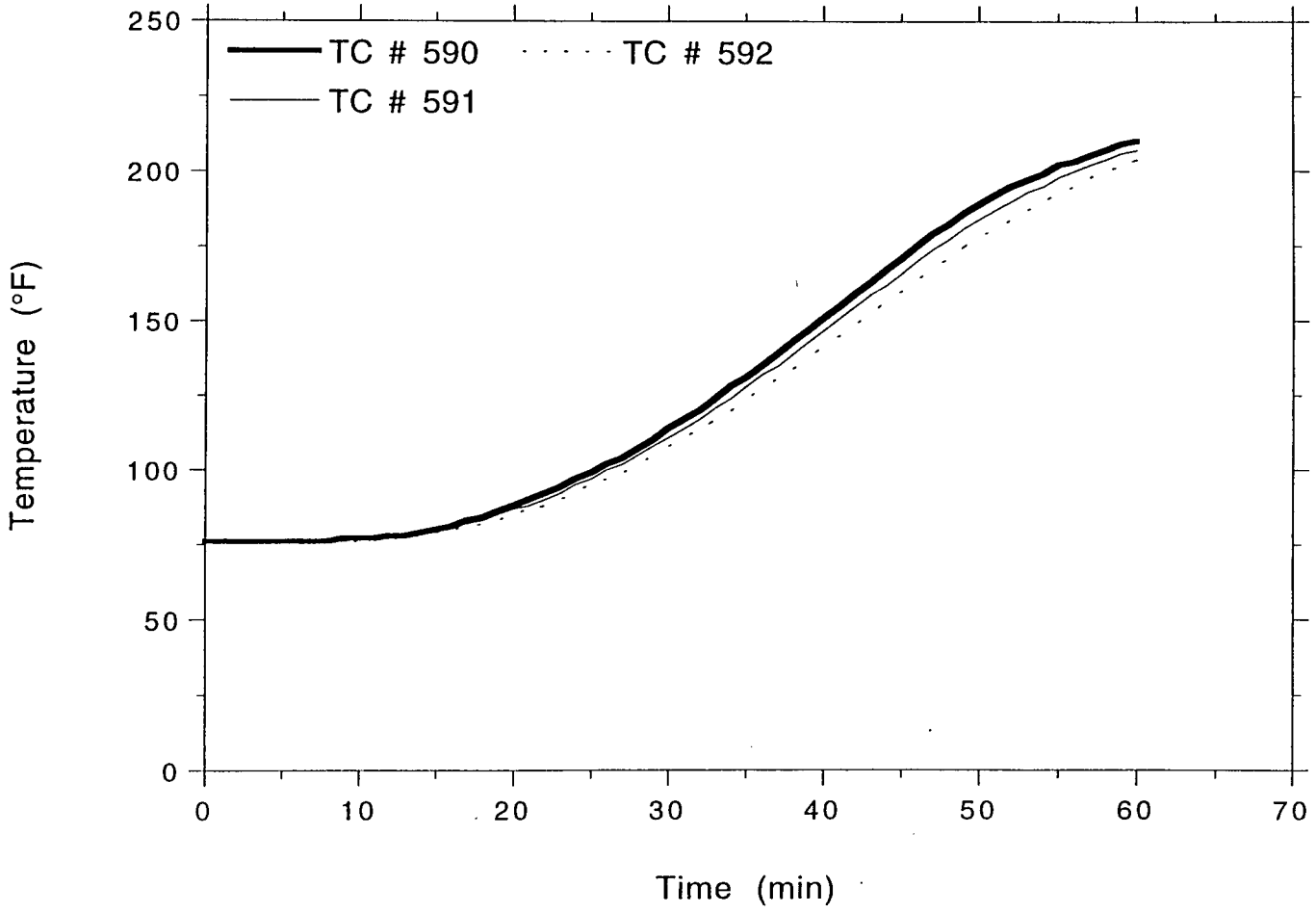
Rear Left 4" Al. Conduit, #8



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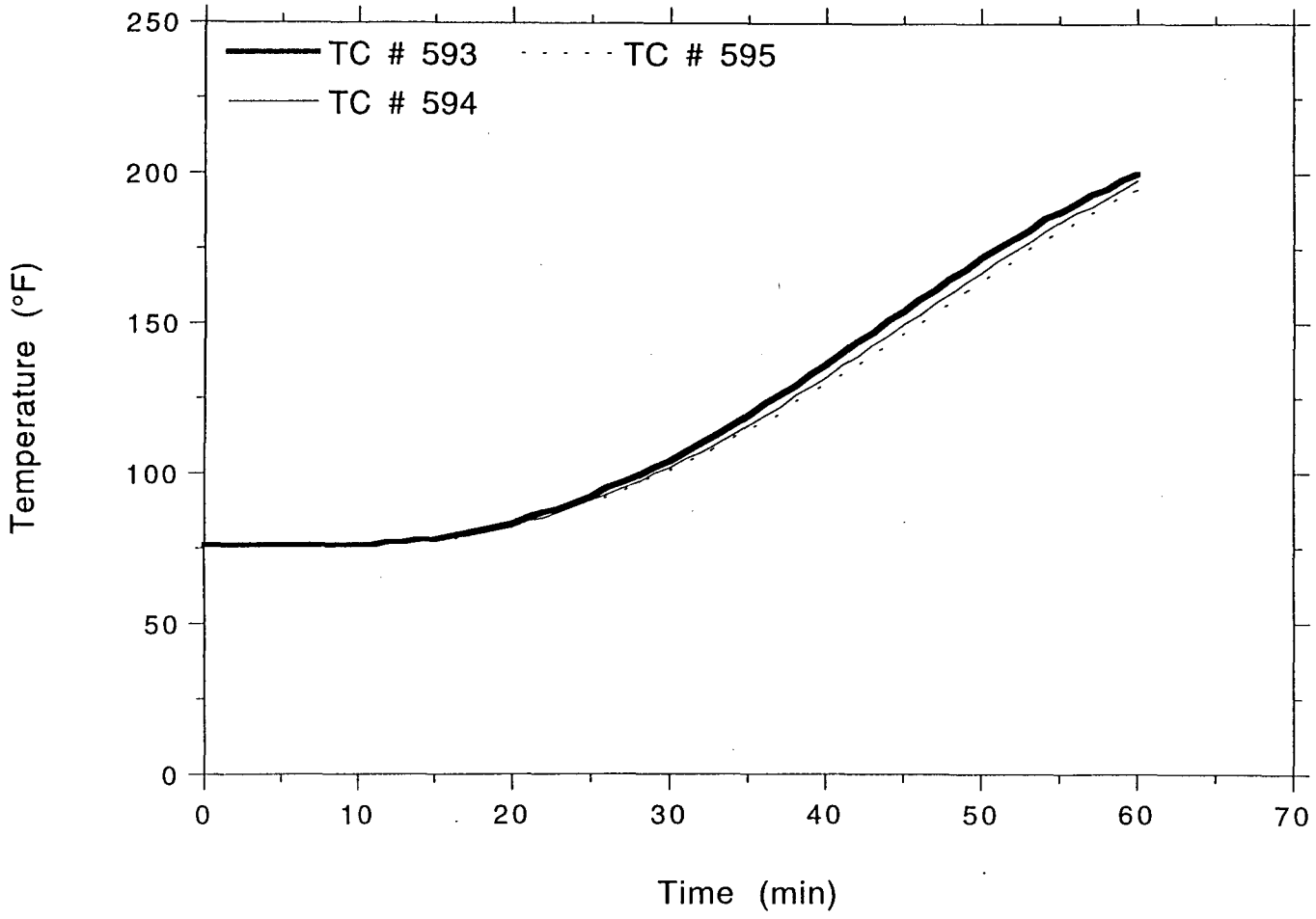

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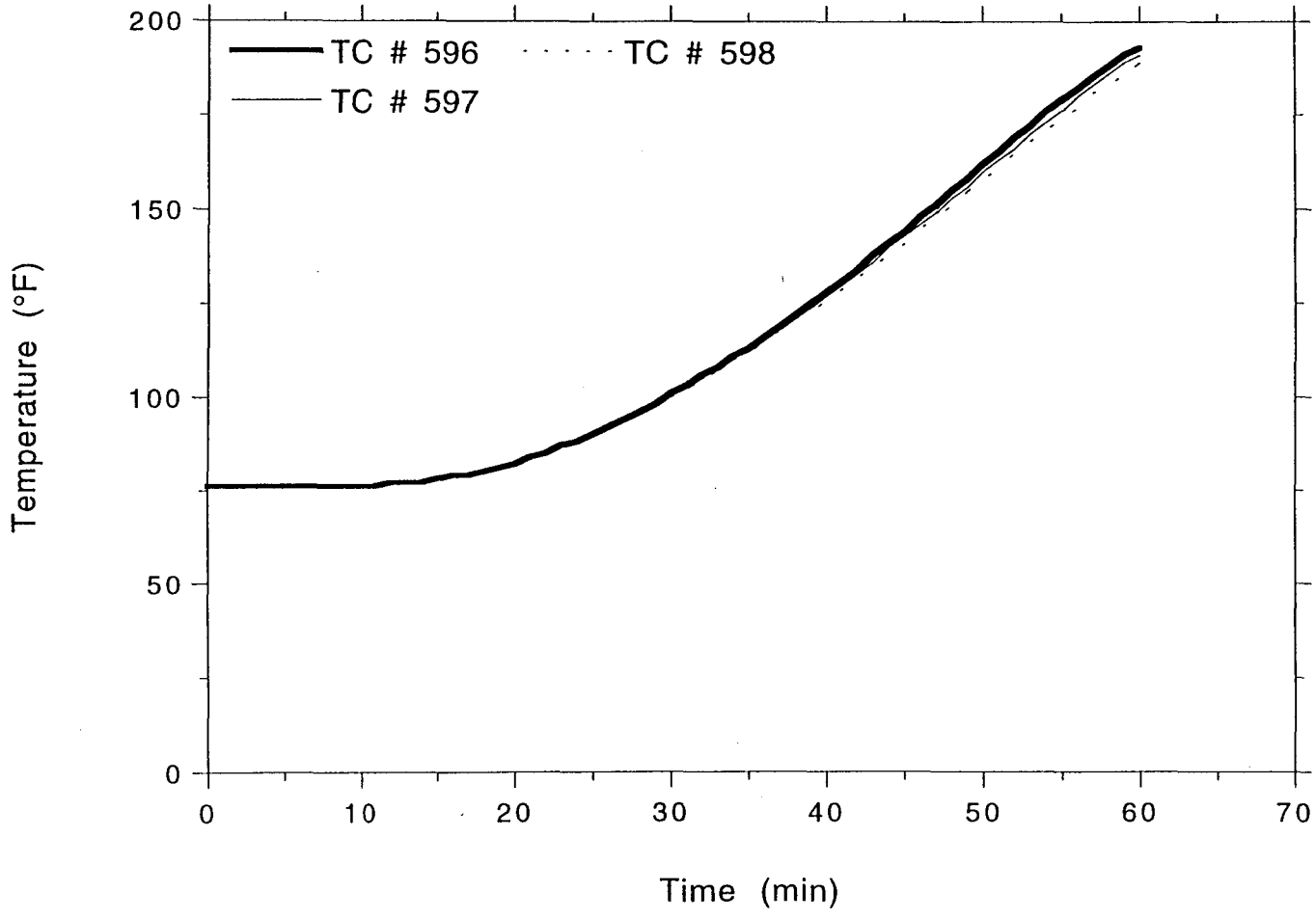

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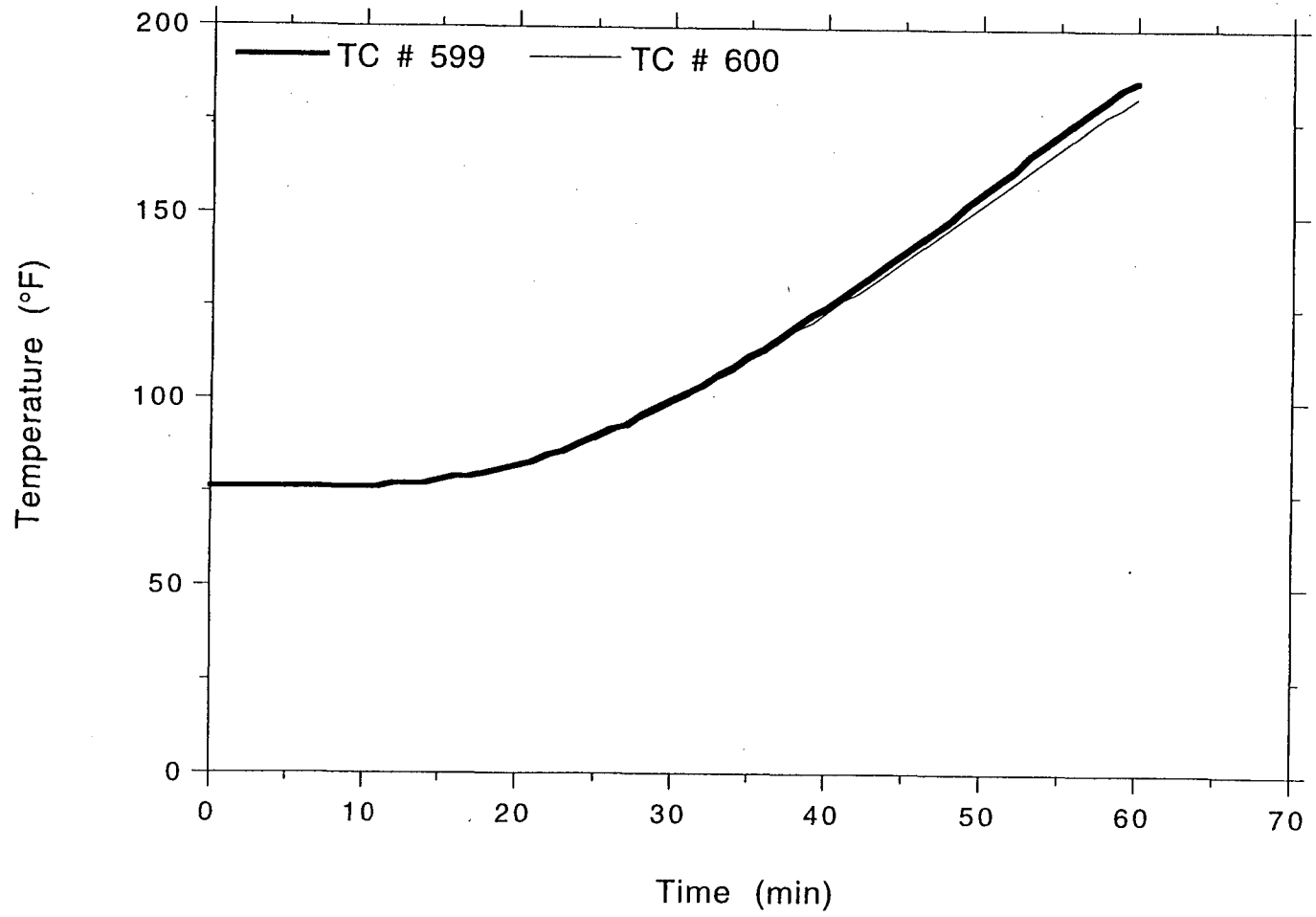

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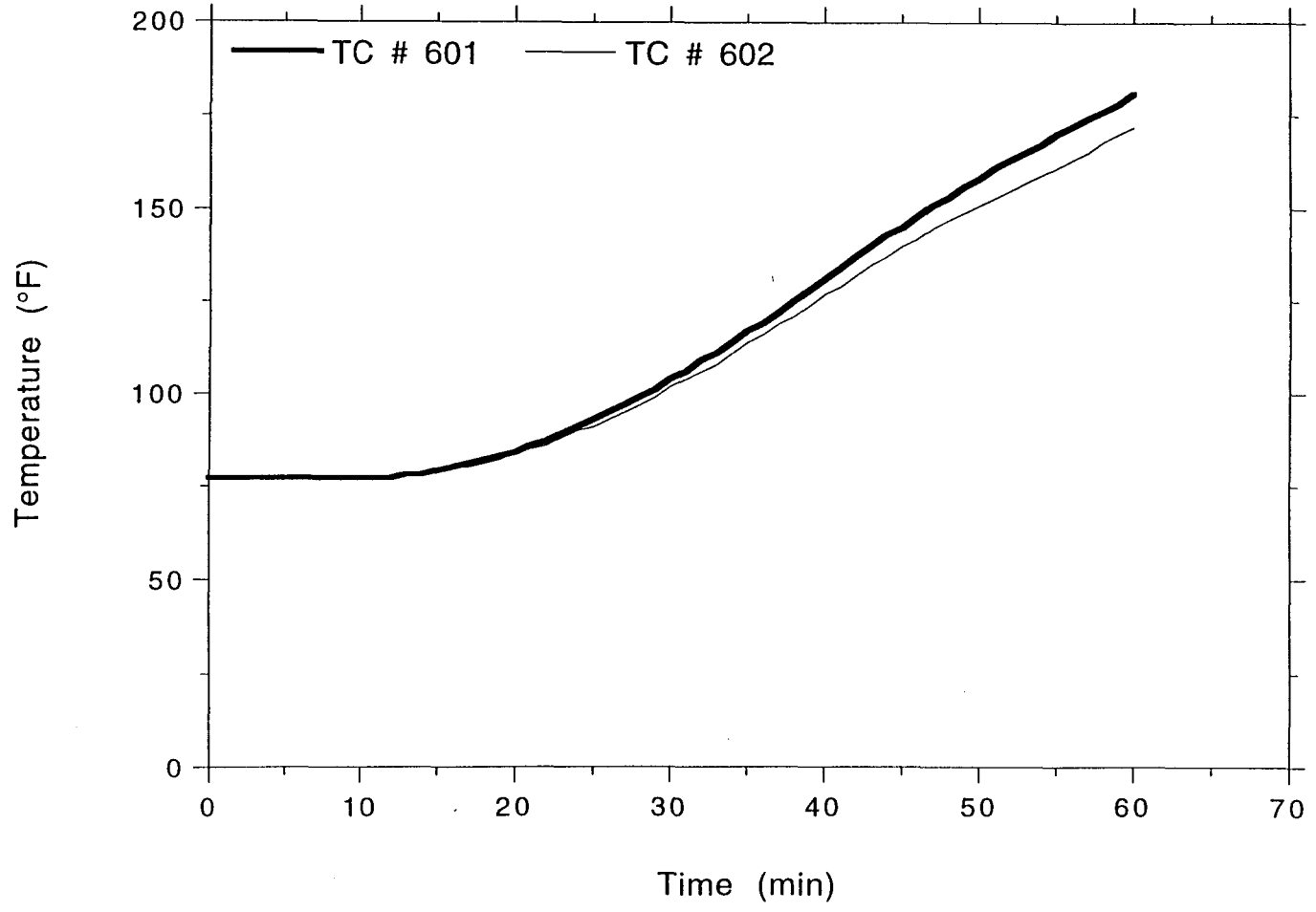

OMEGA POINT LABORATORIES

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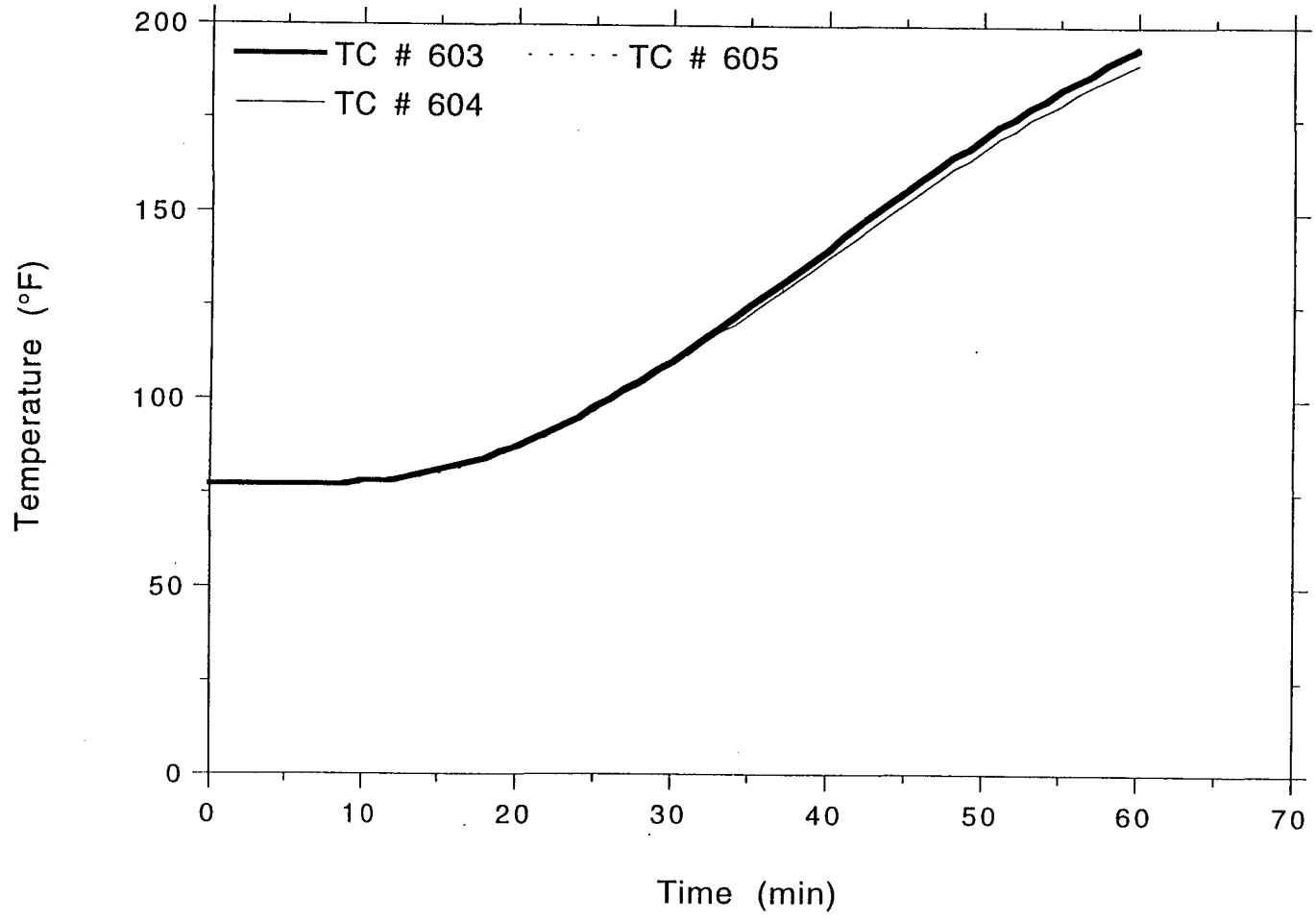
Rear Left-Center 4" Al. Conduit, #8



OMEGA POINT LABORATORIES

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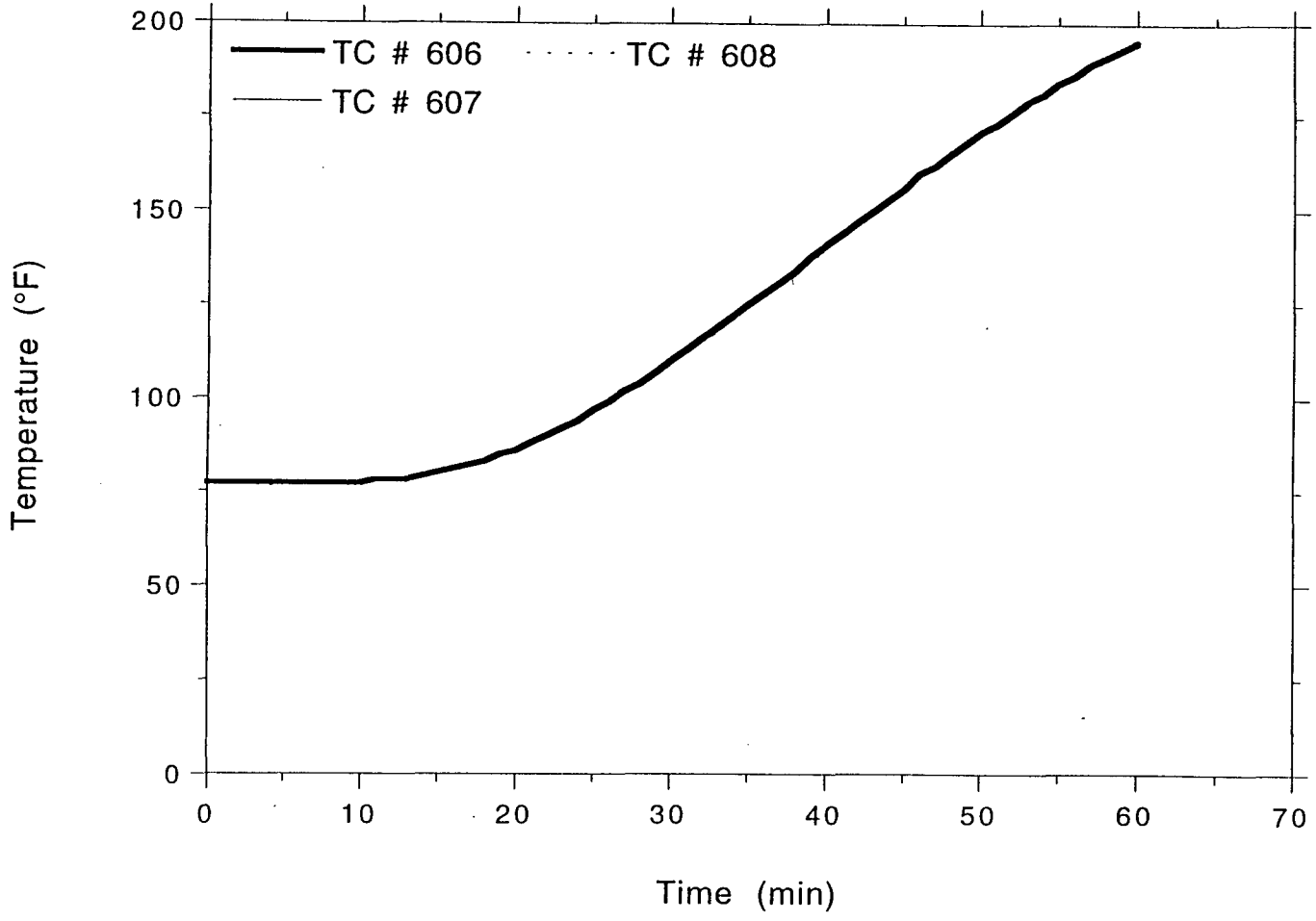

OMEGA POINT LABORATORIES

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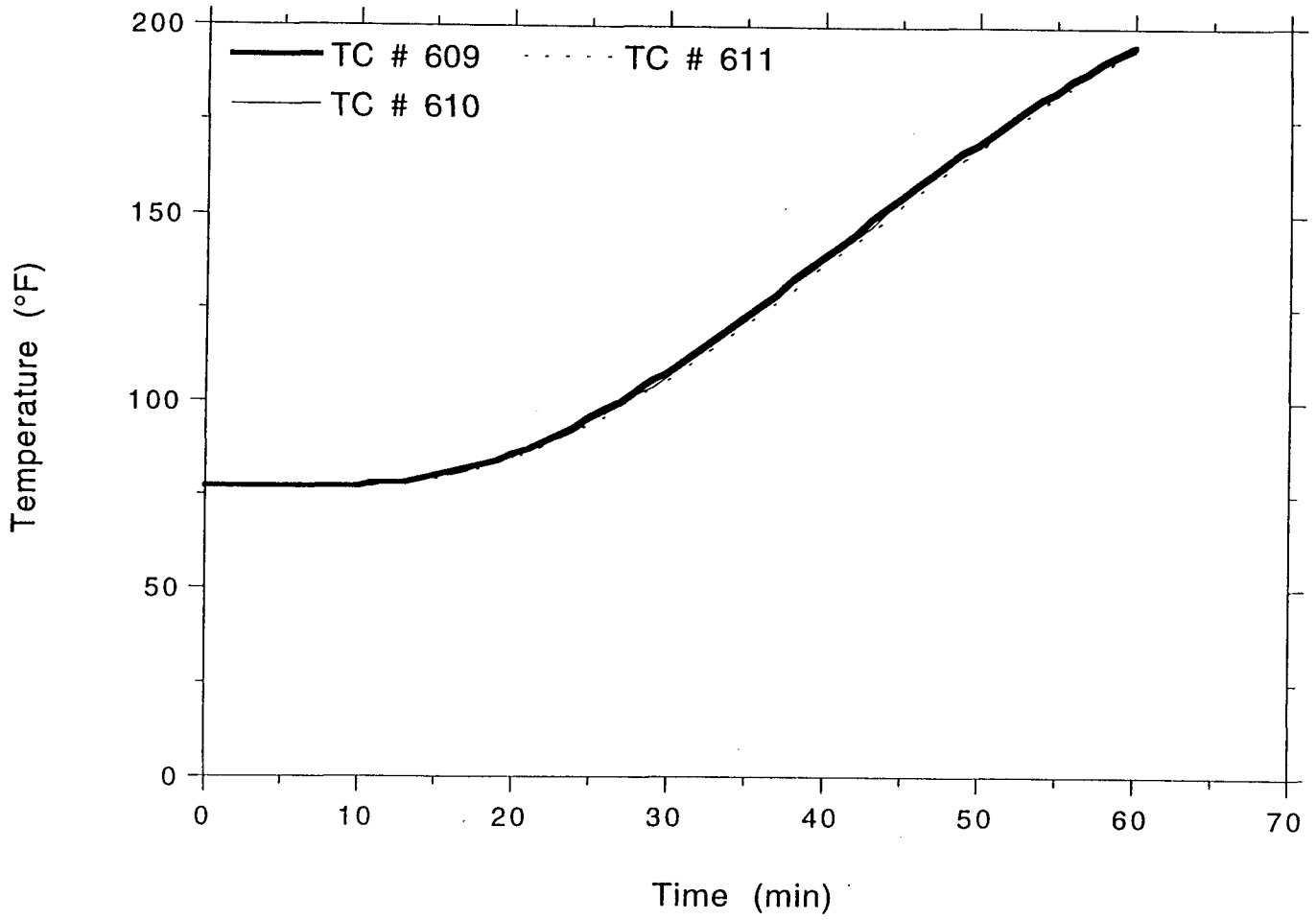

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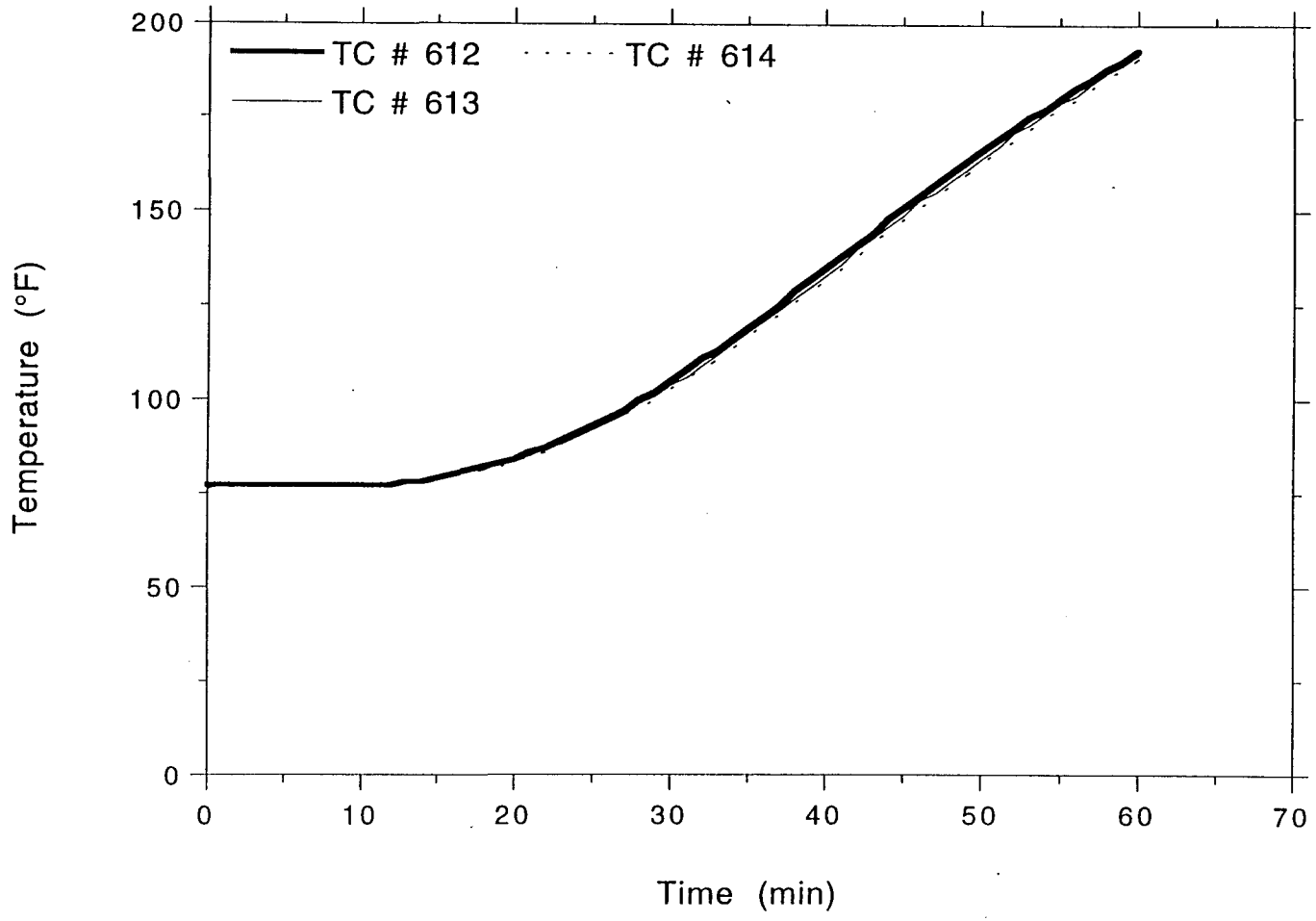

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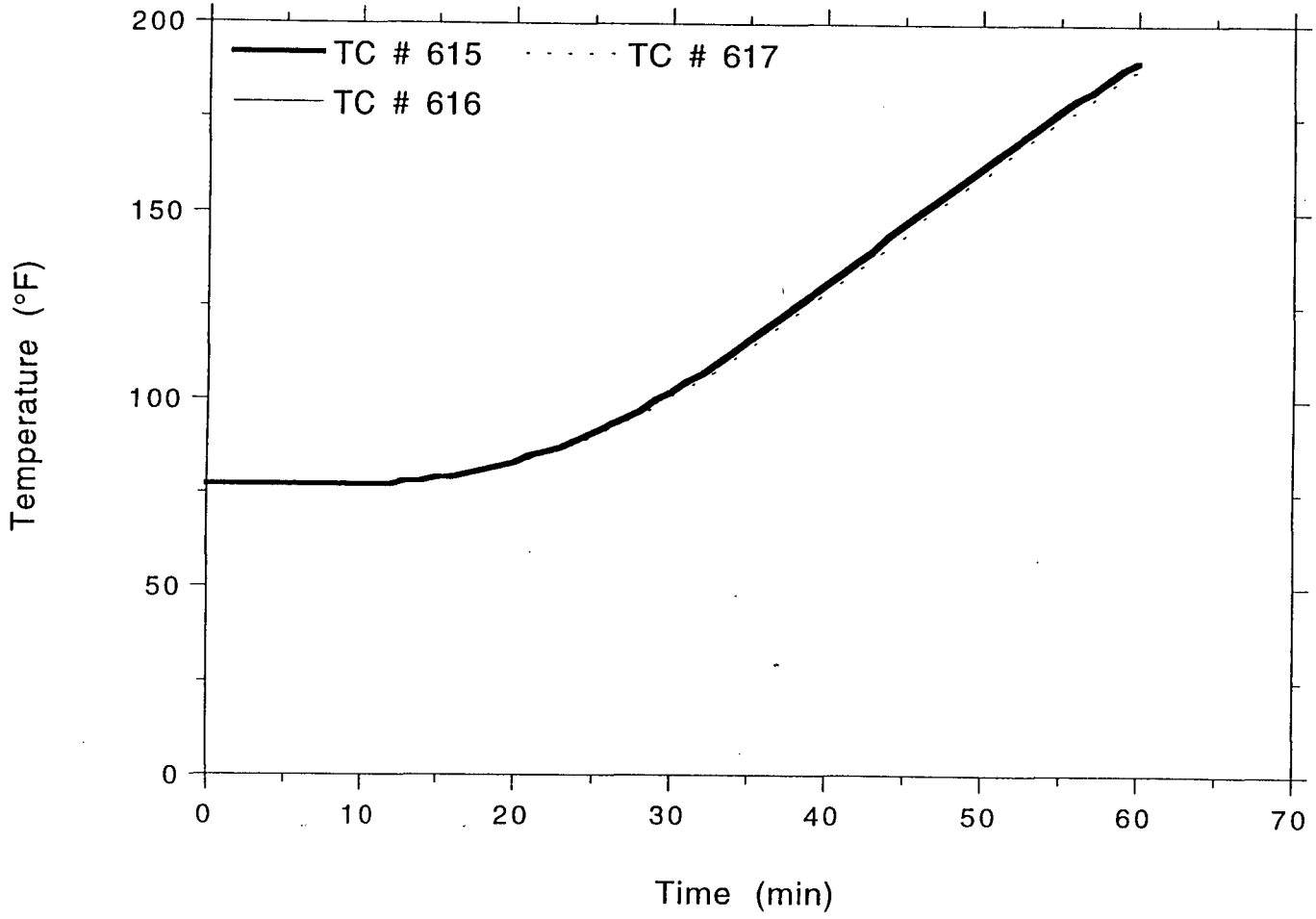

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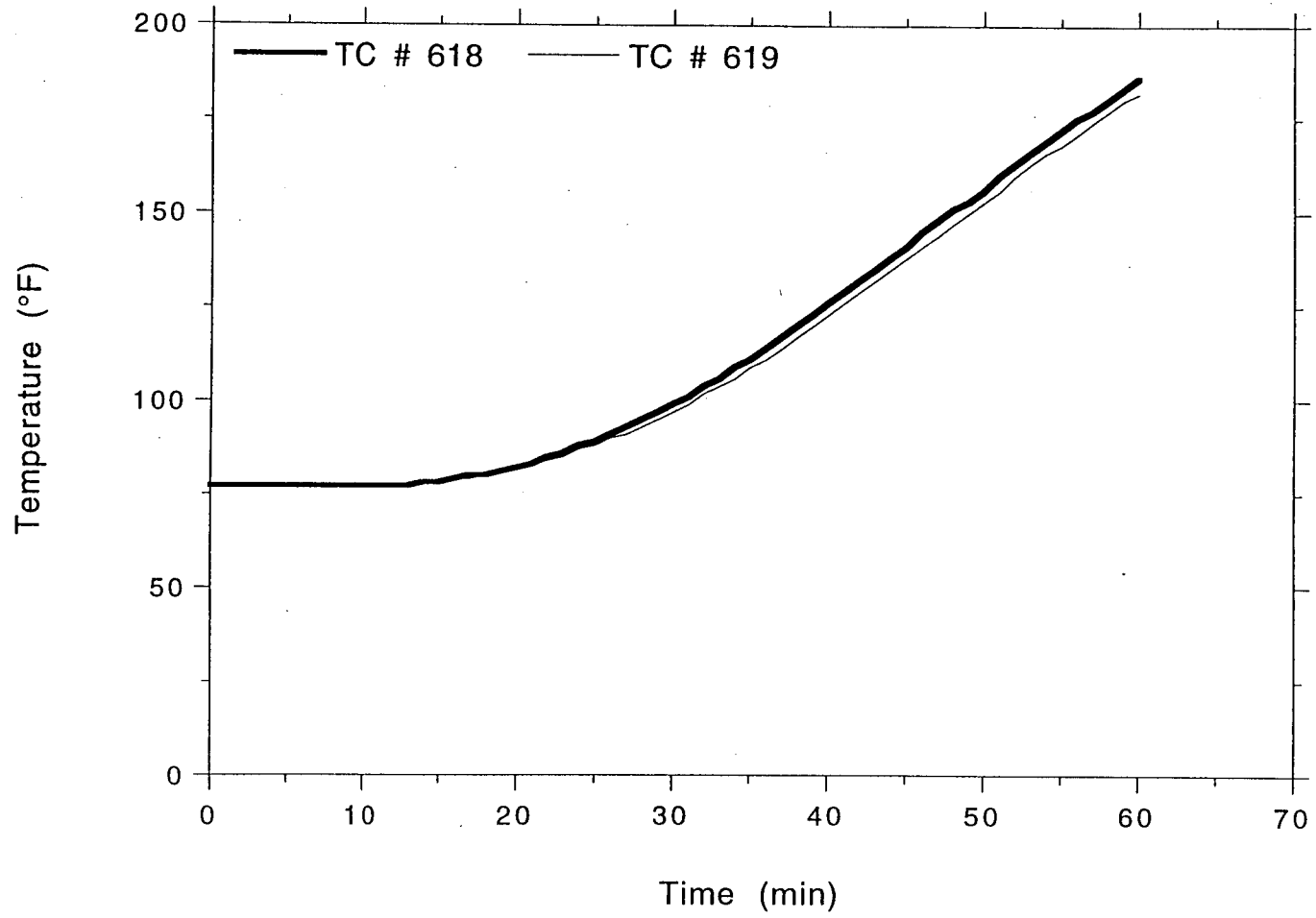

OMEGA POINT LABORATORIES

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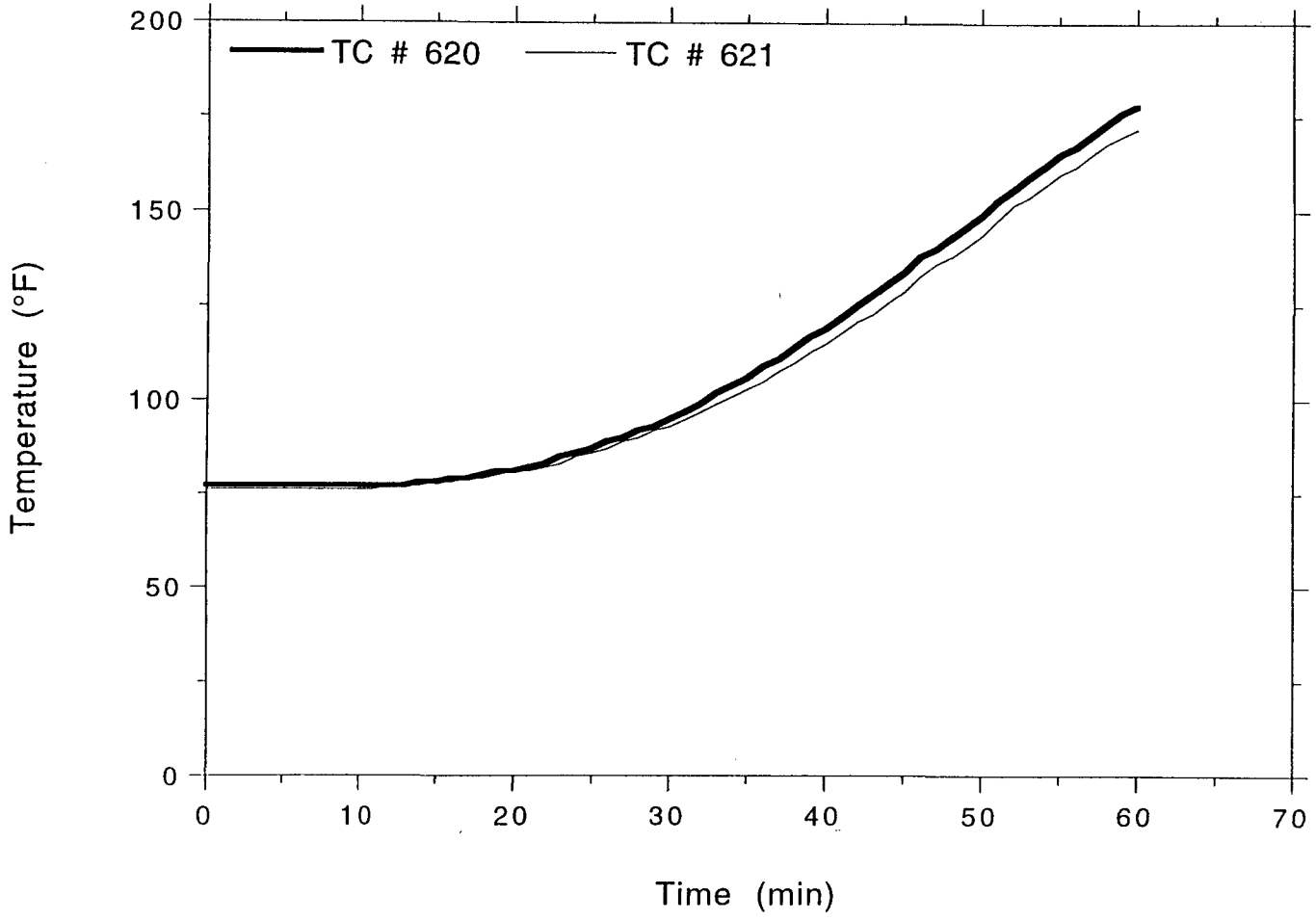

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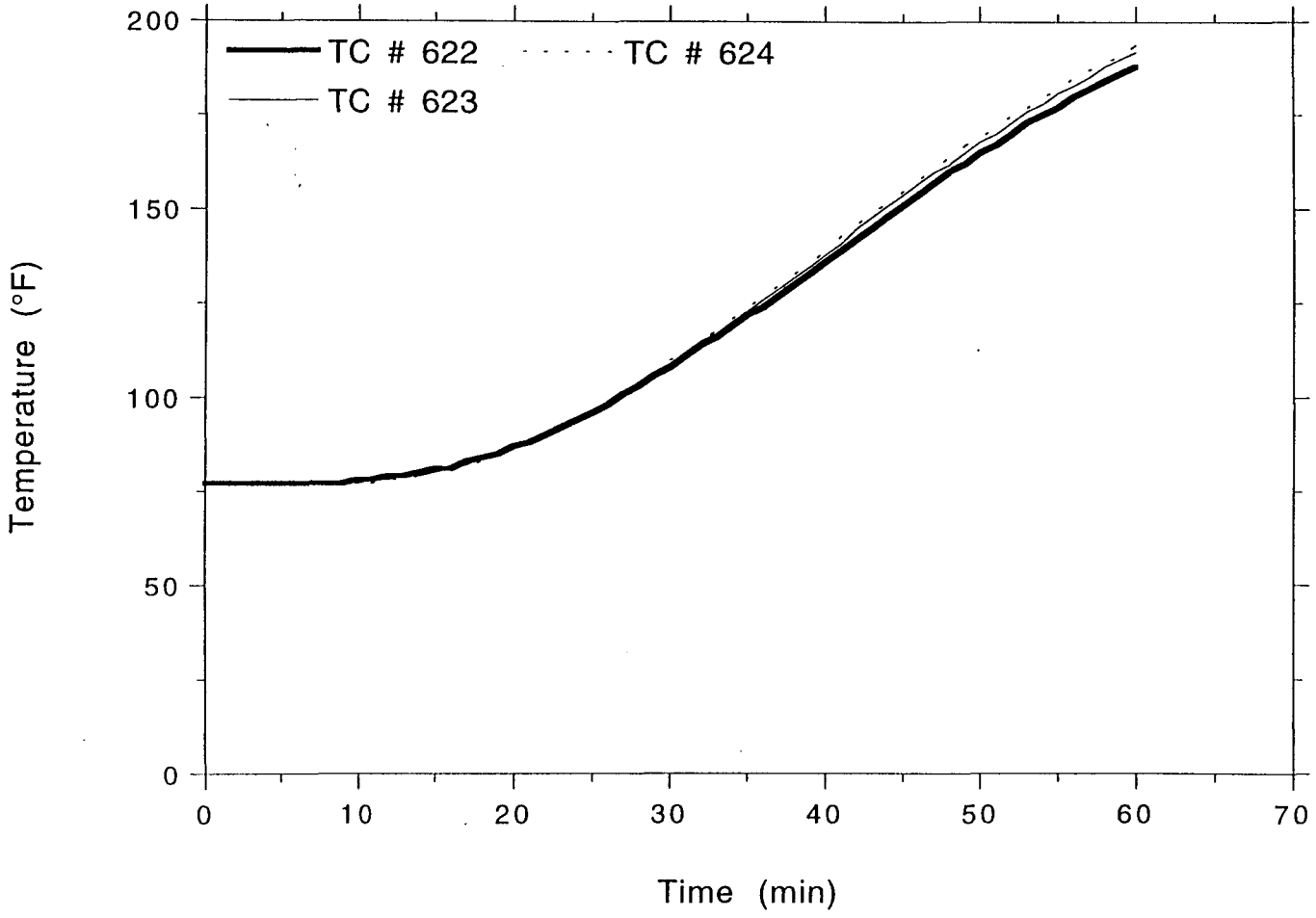

OMEGA POINT LABORATORIES

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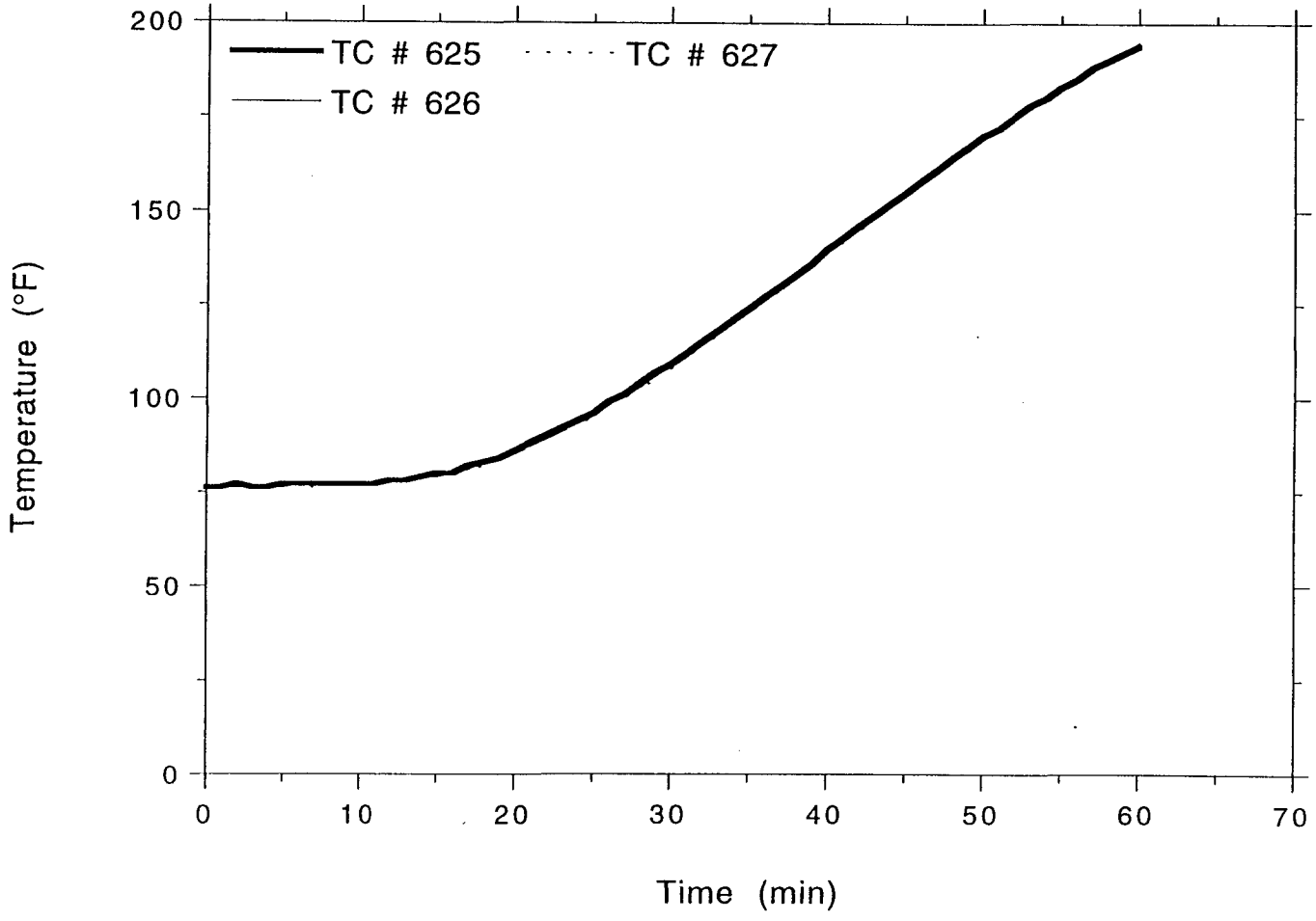

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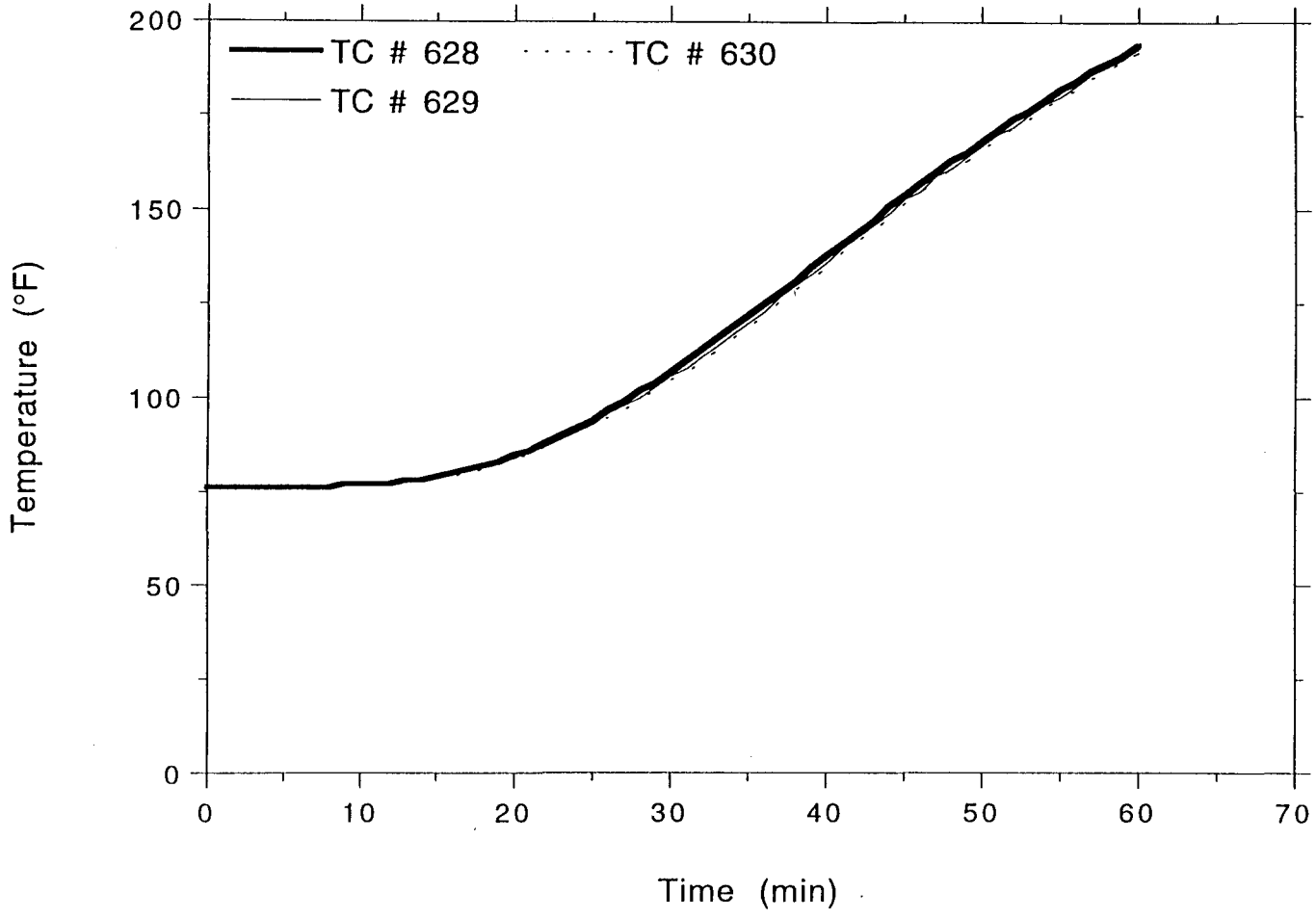

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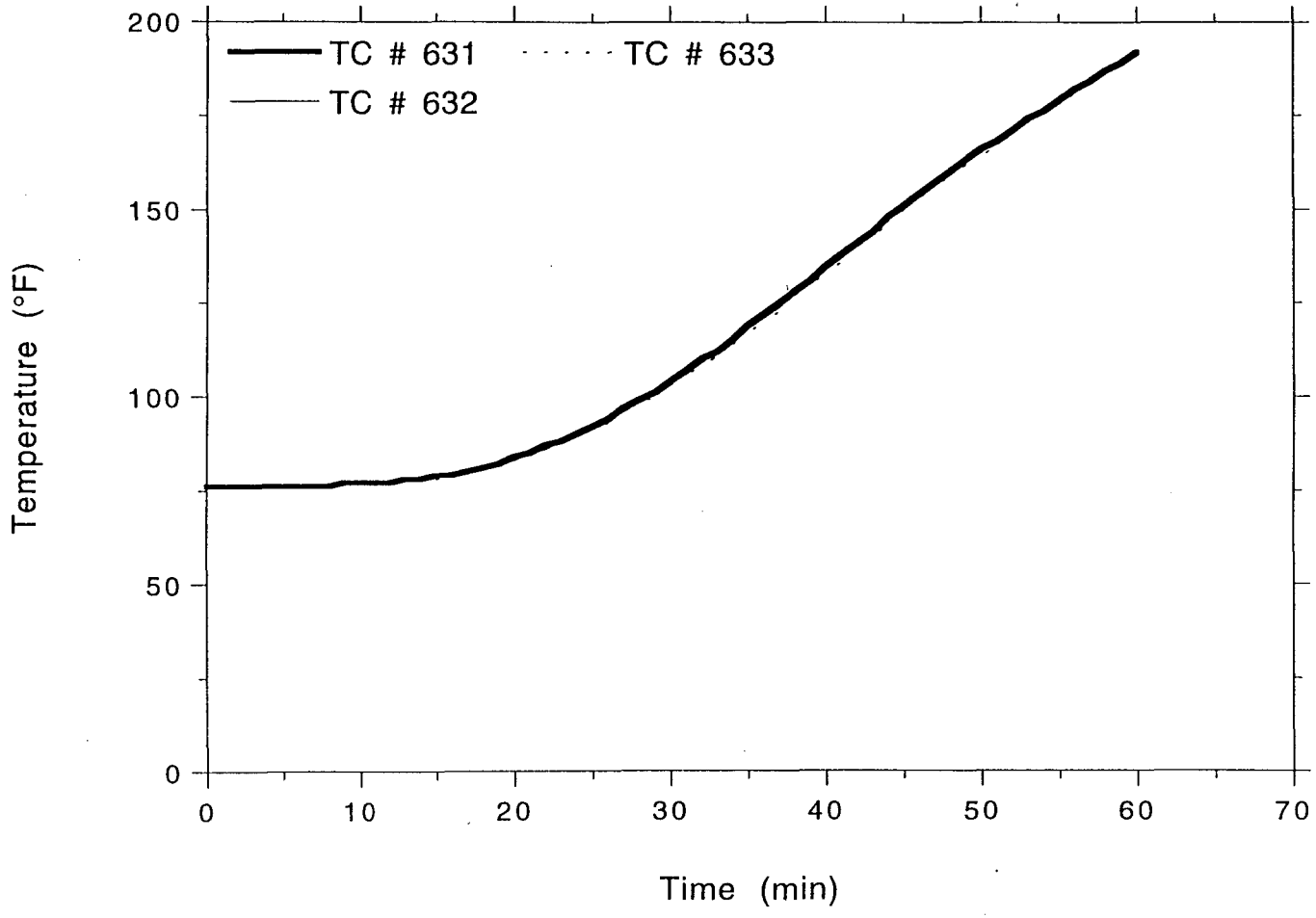

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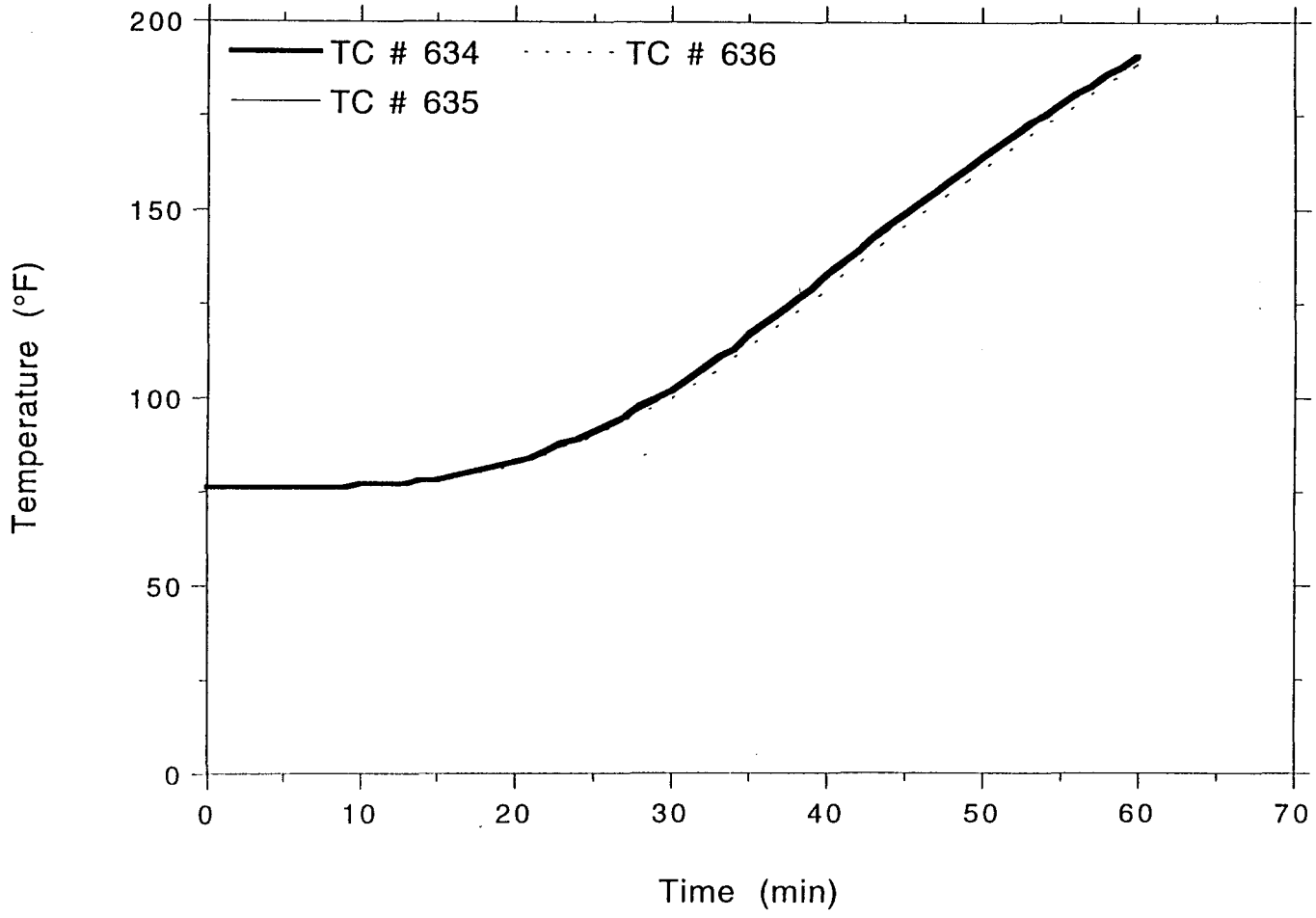

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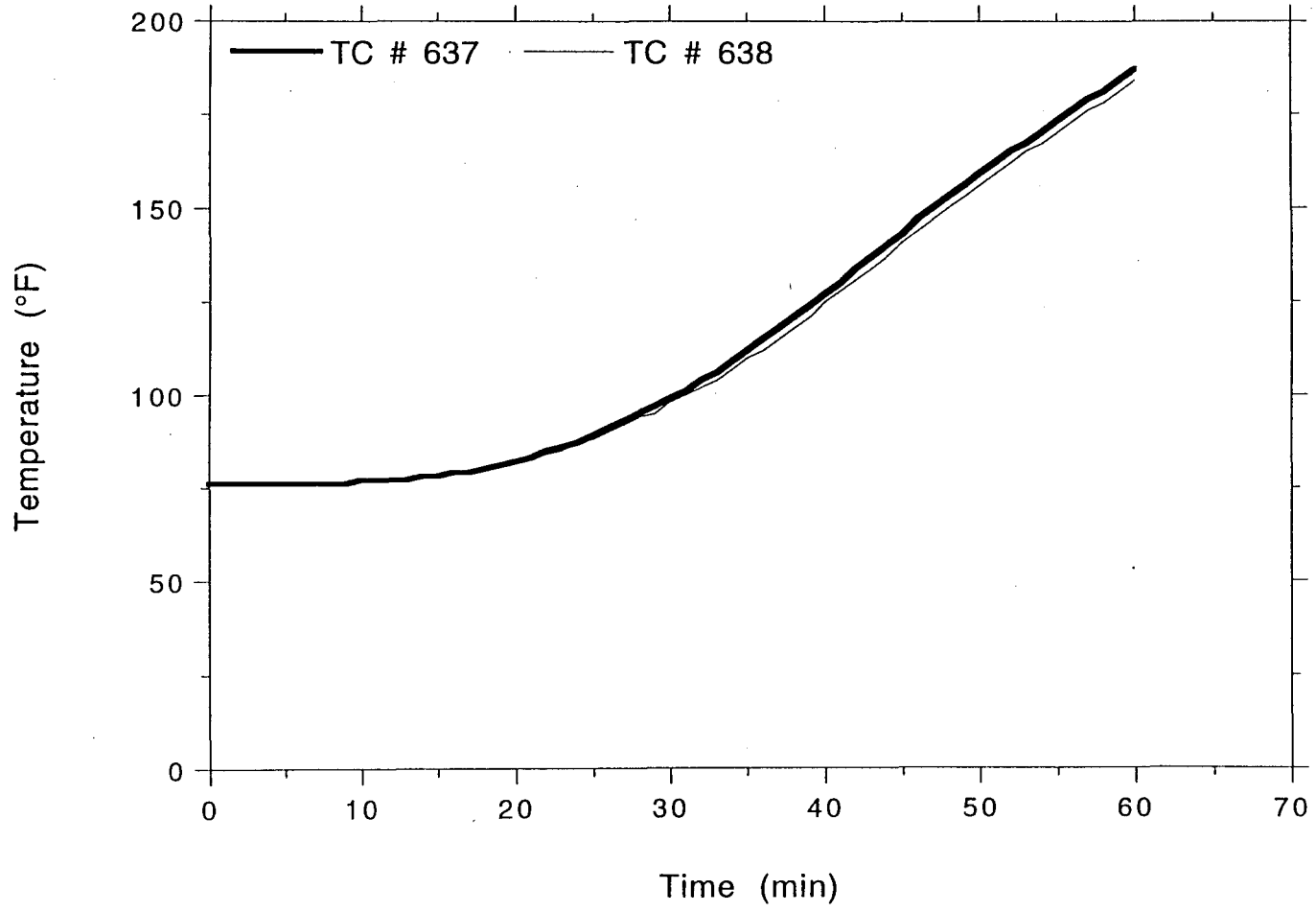

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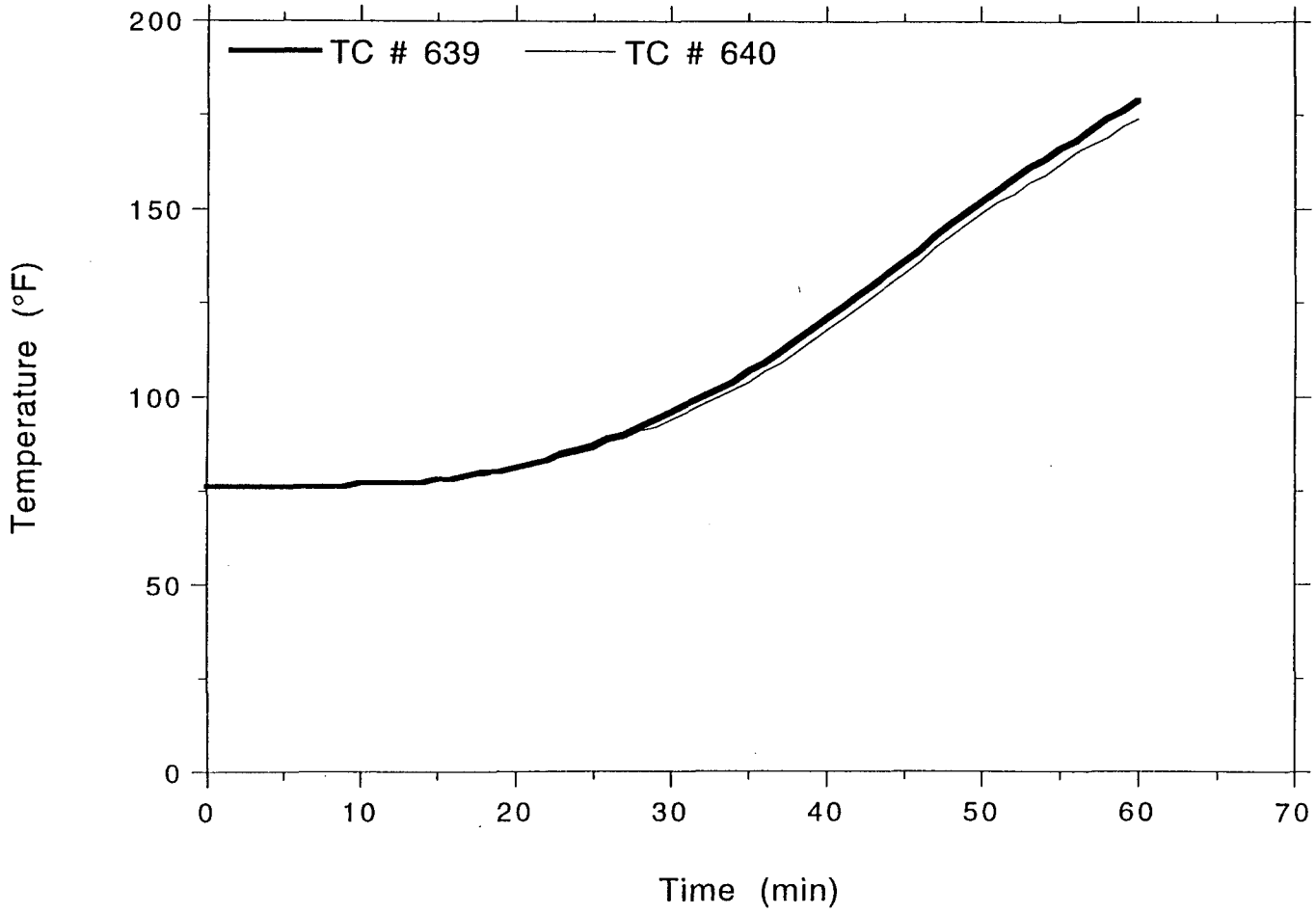

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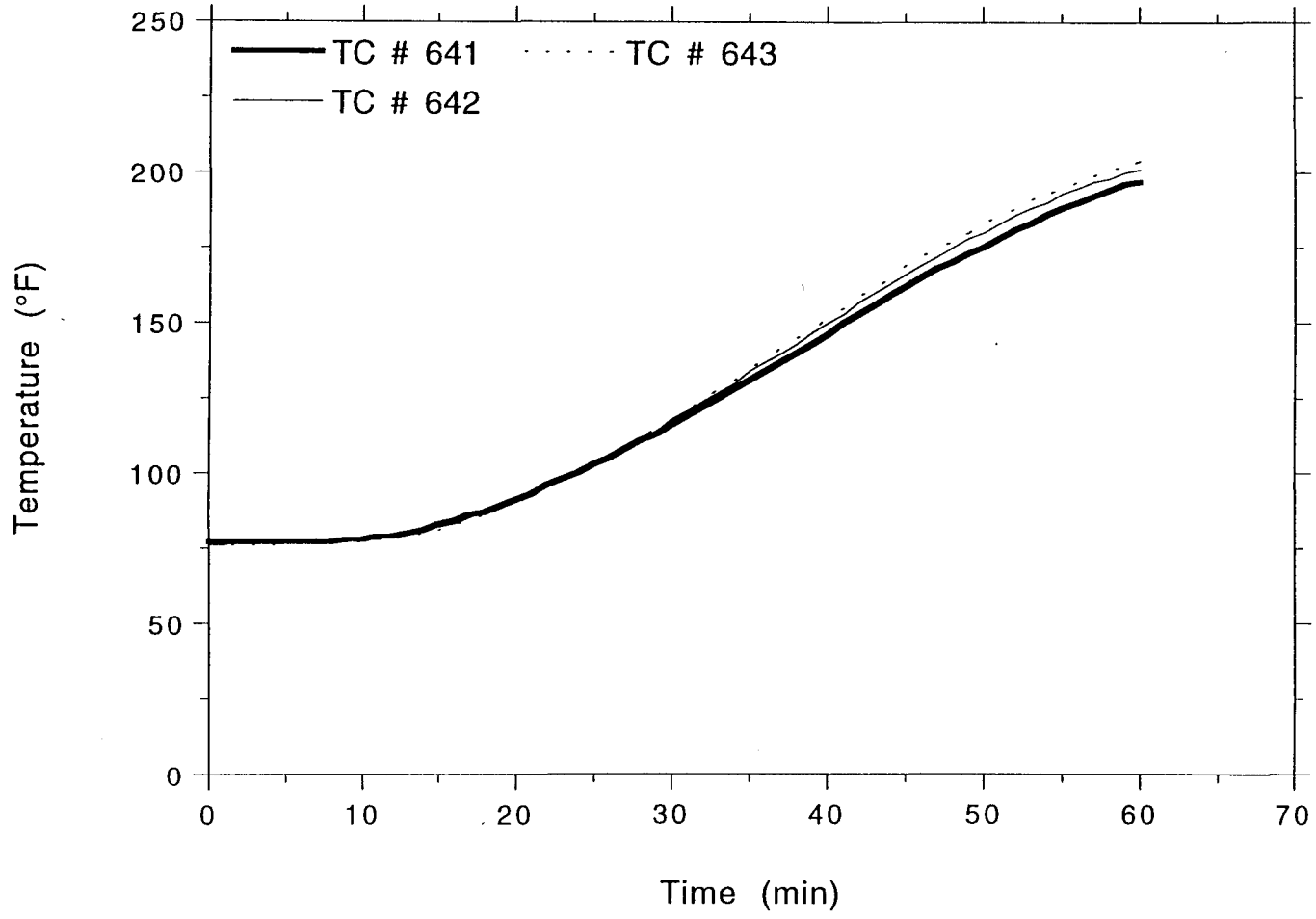

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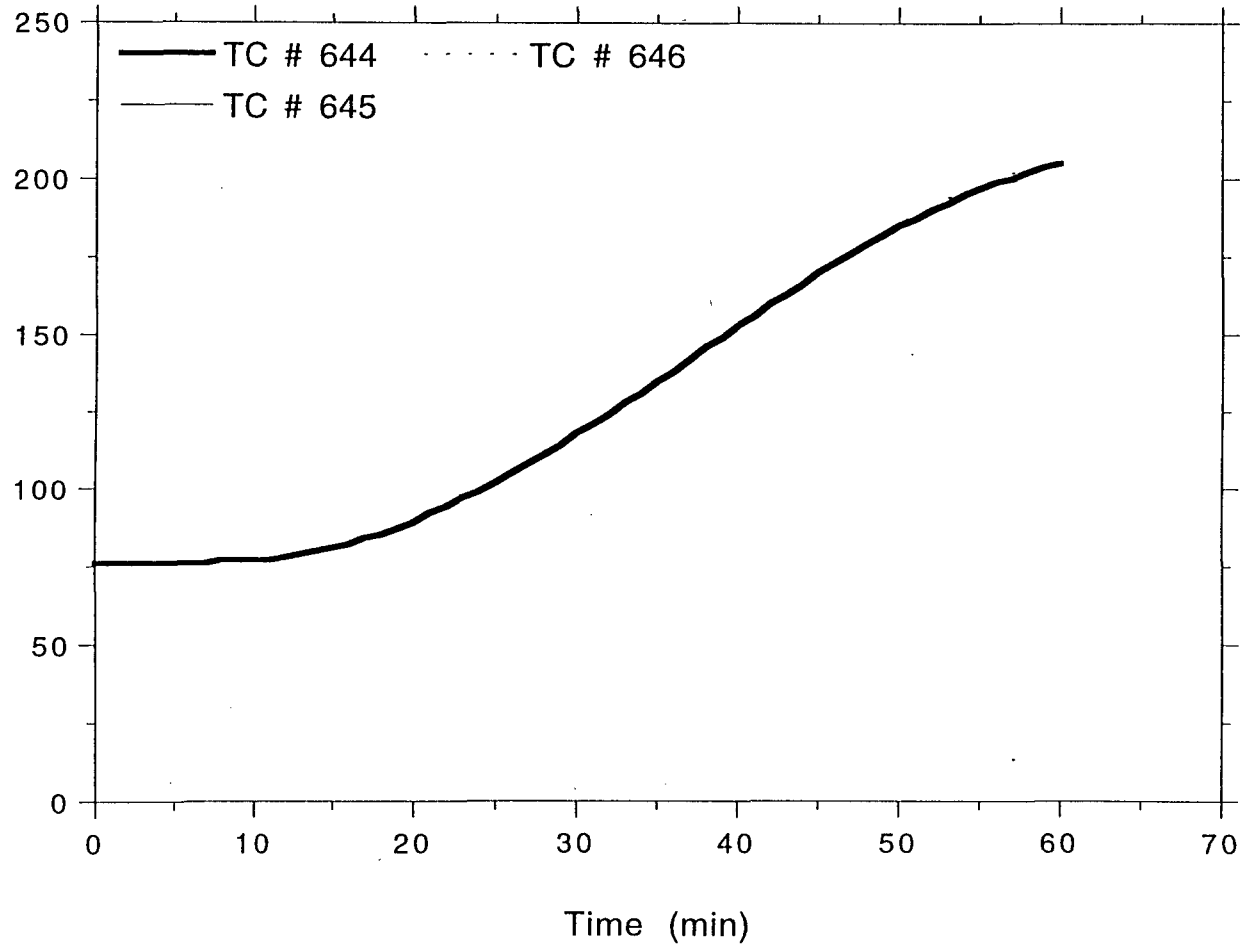

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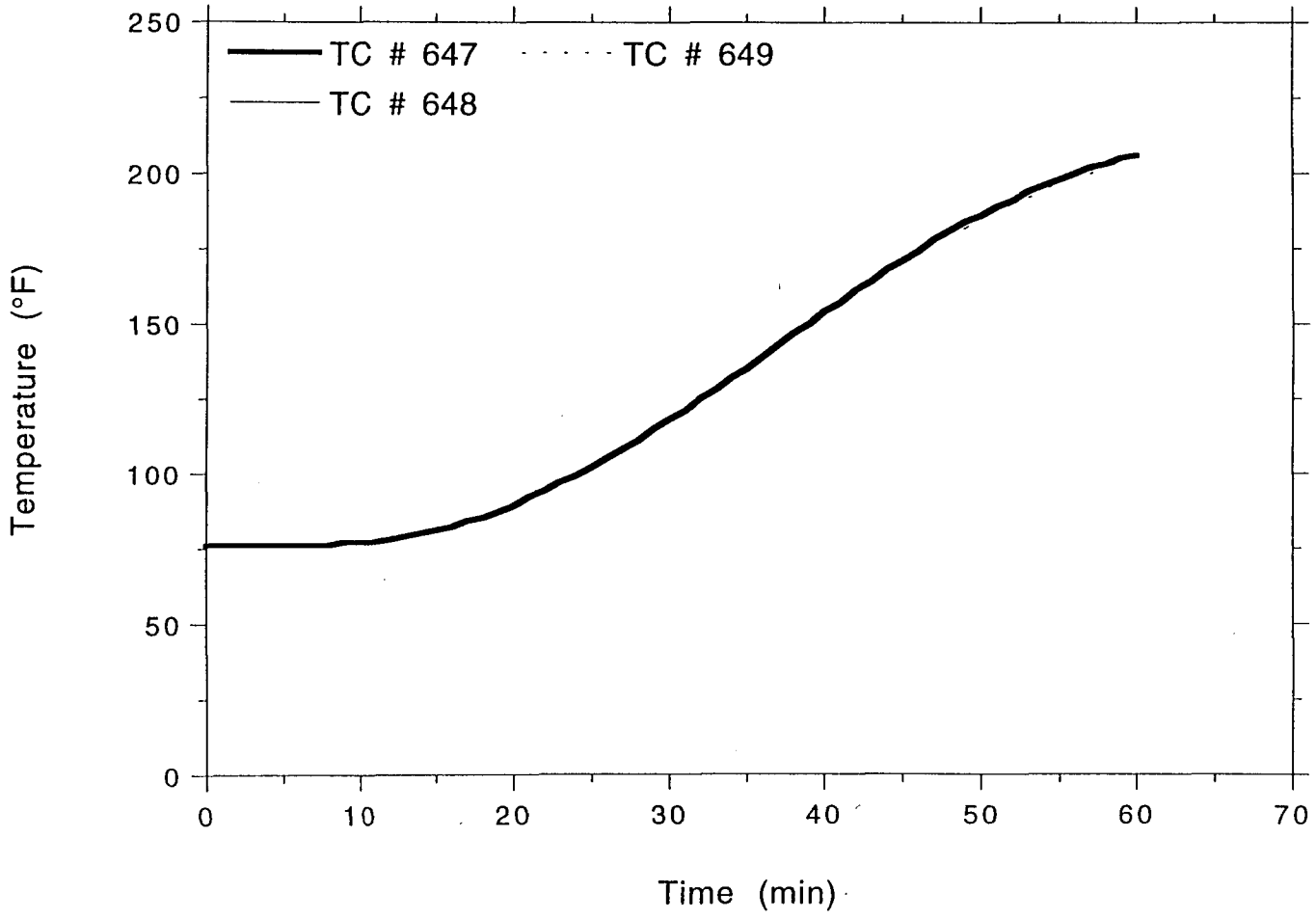

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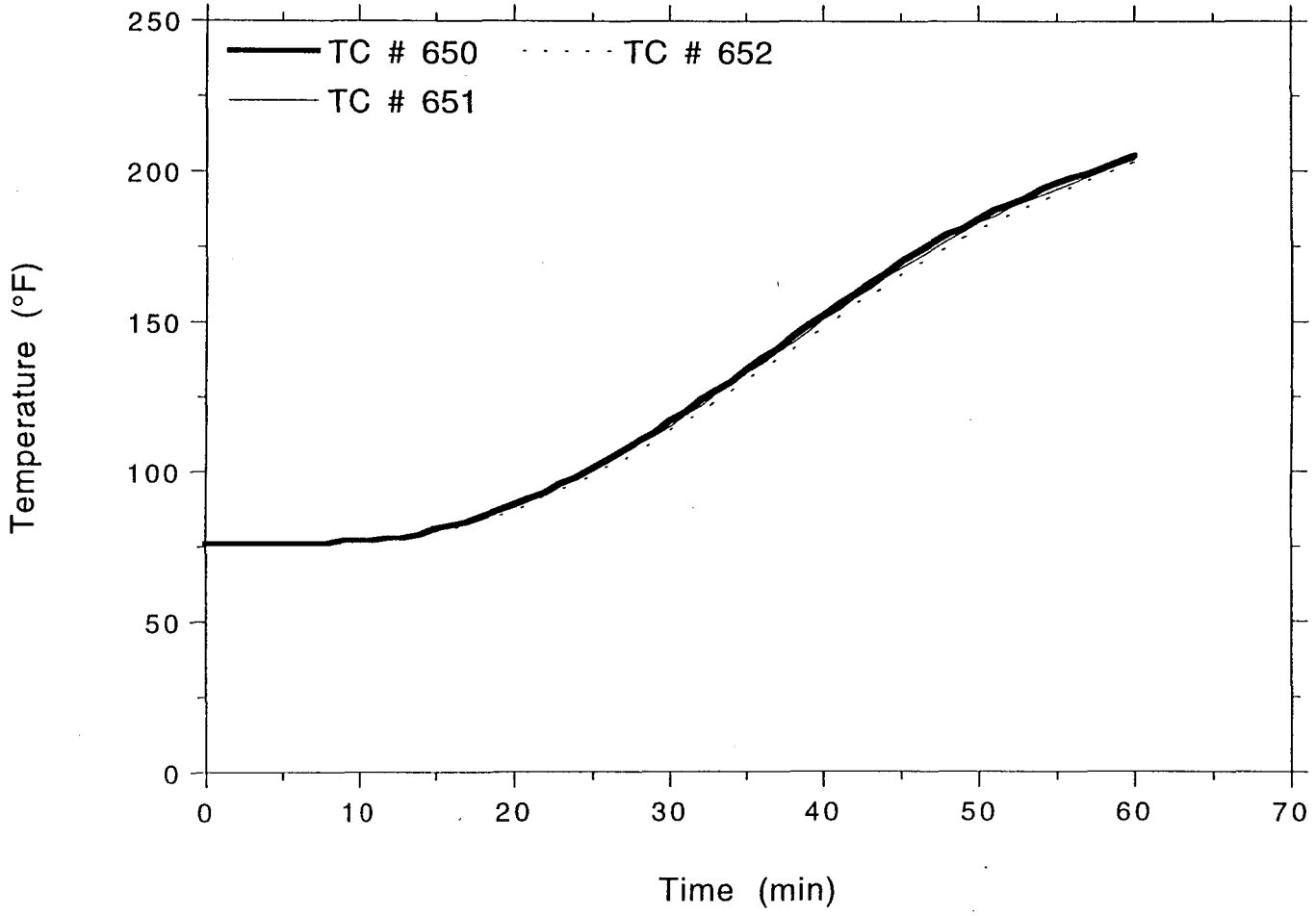

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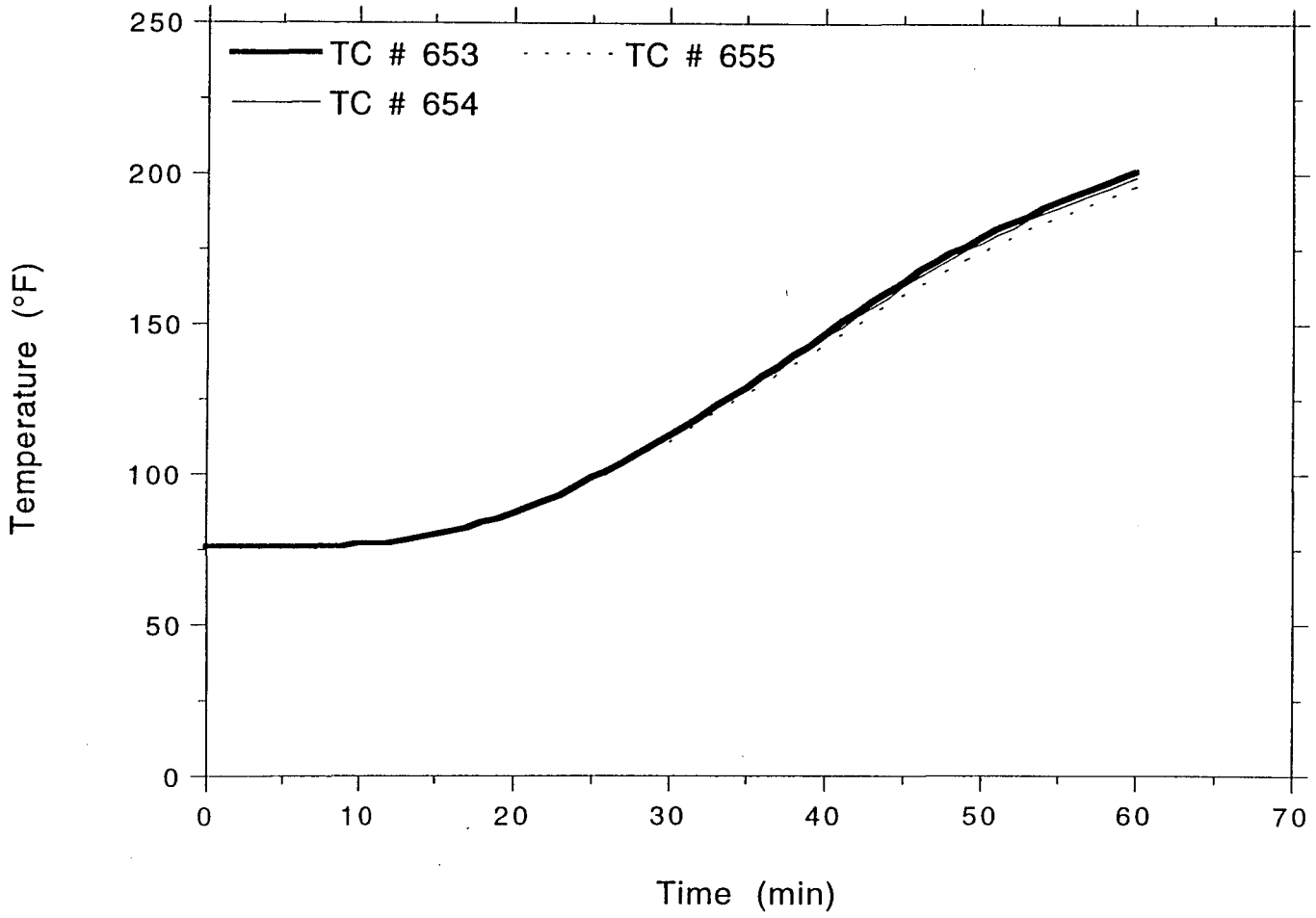

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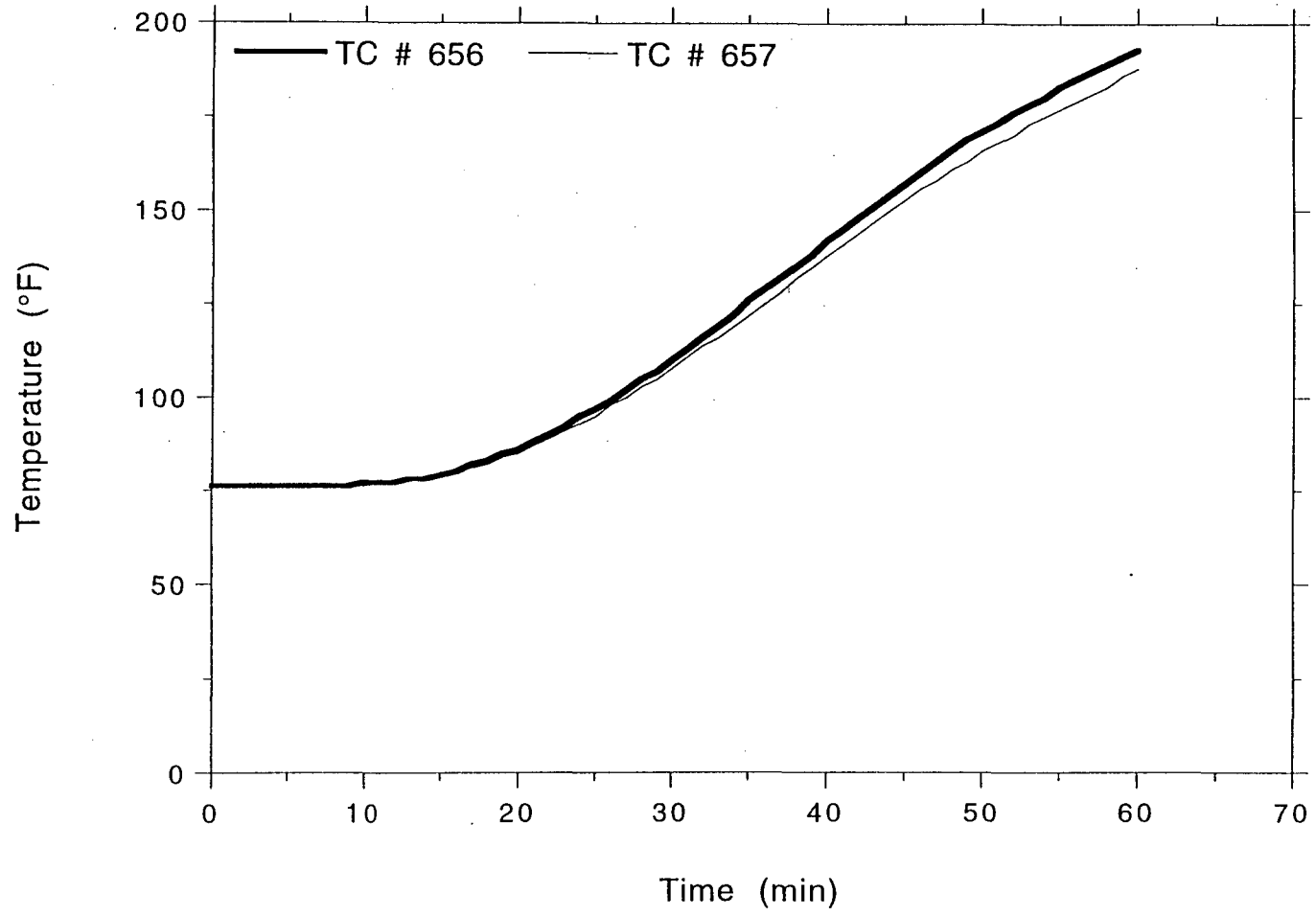
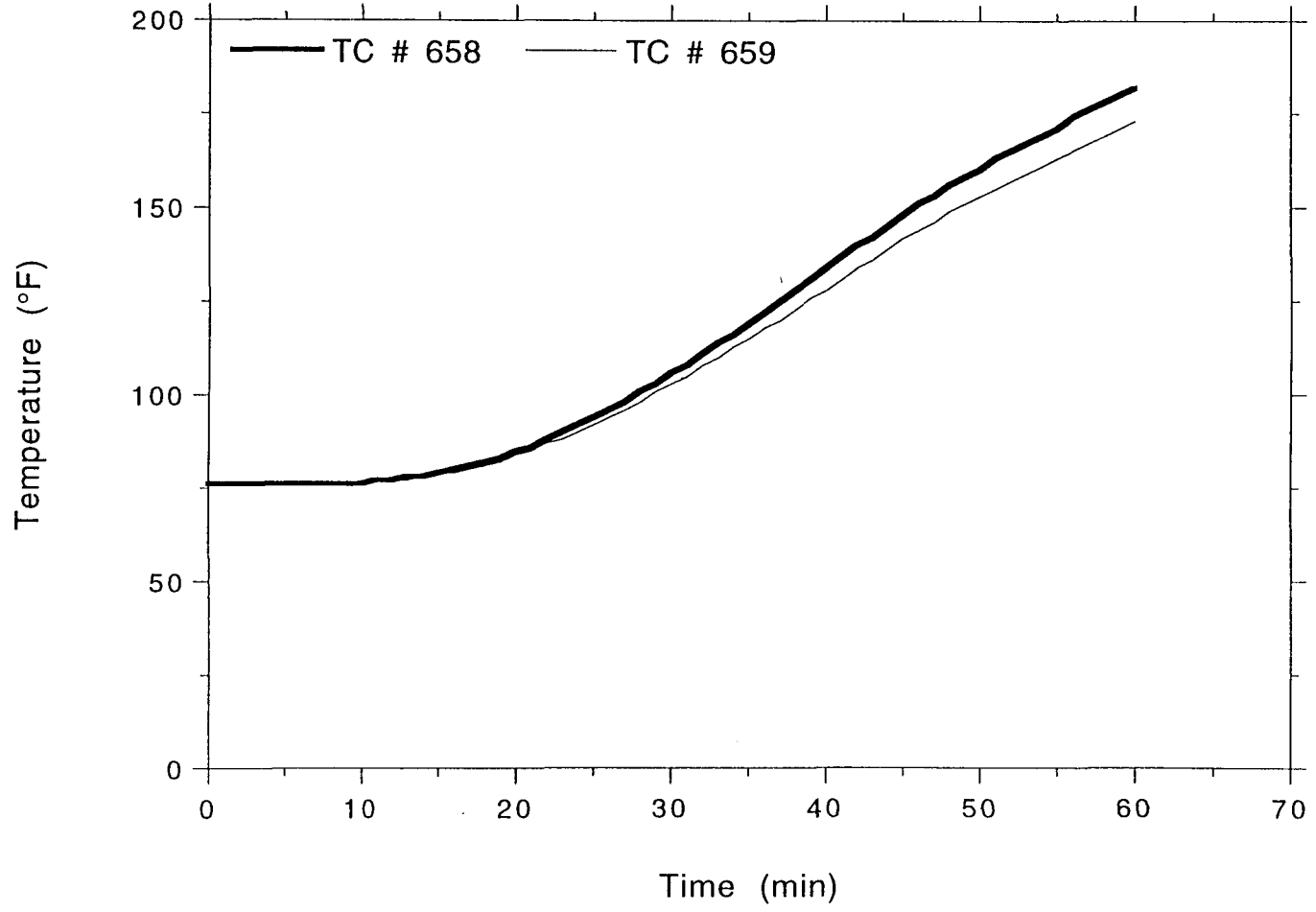
Project No. 11960-97259
Rear Right 4" Al. Conduit, #8



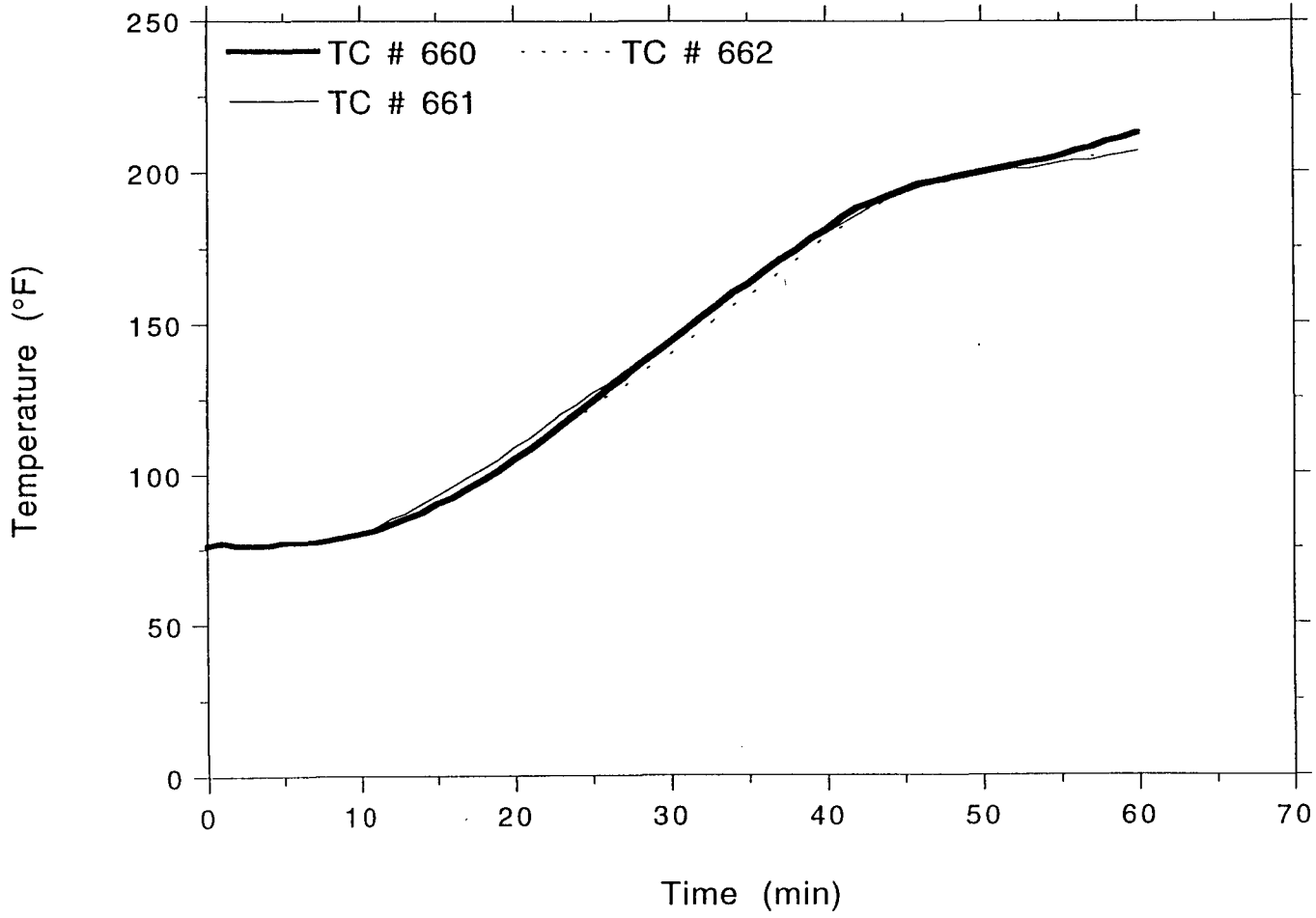
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 4" Al. Conduit, #8



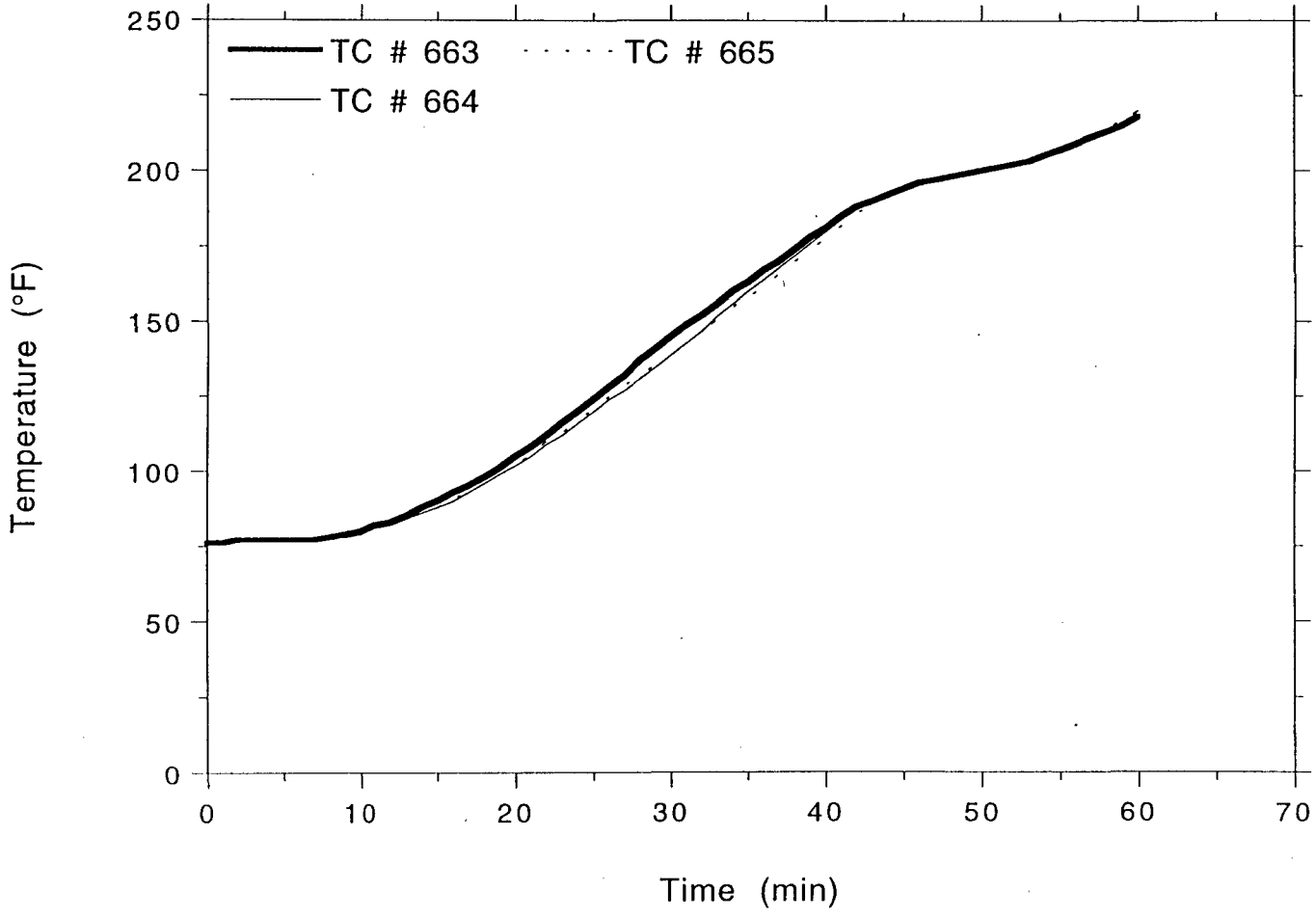
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 1" Steel Conduit, Left Side



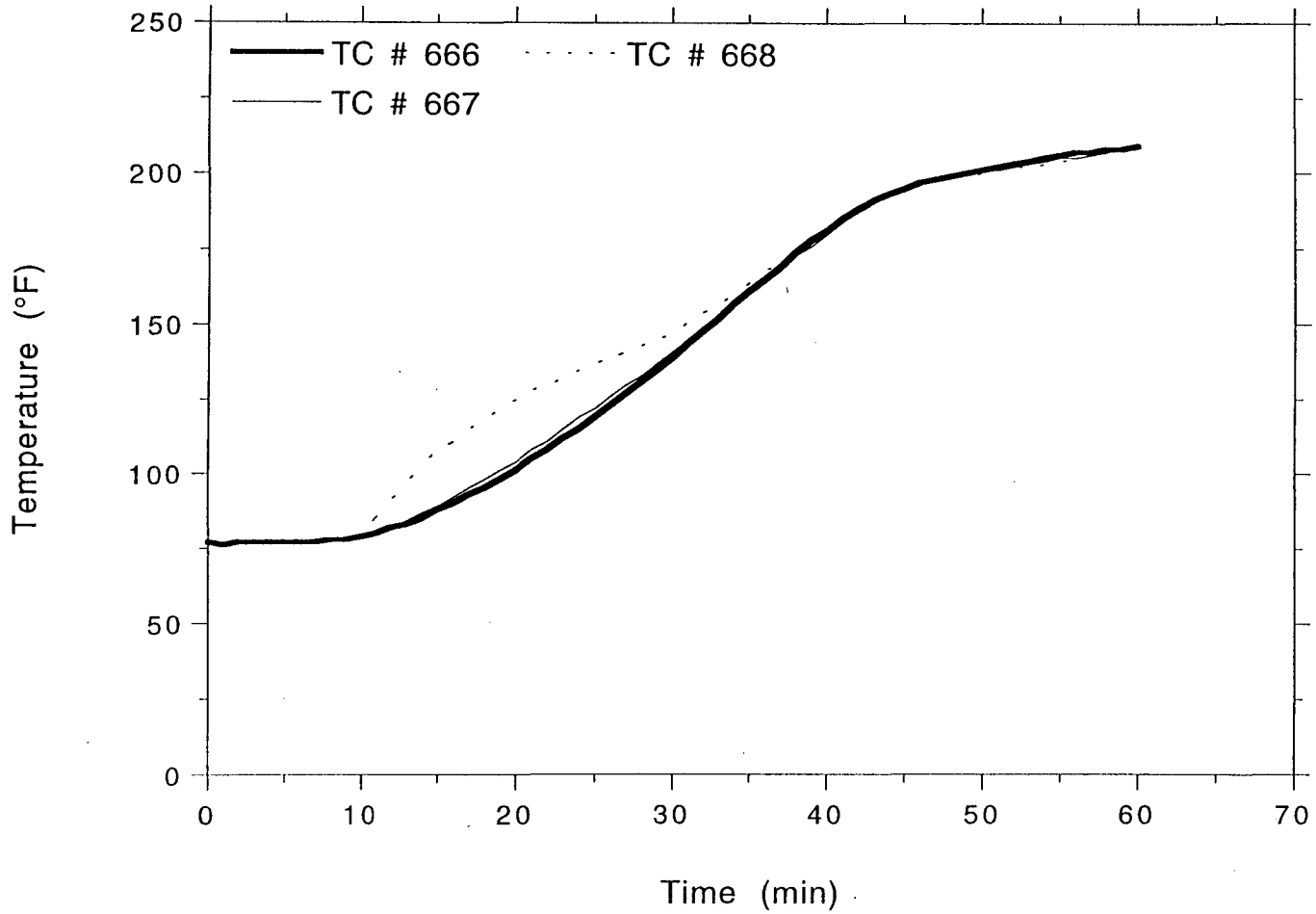
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 1" Steel Conduit, Left Side



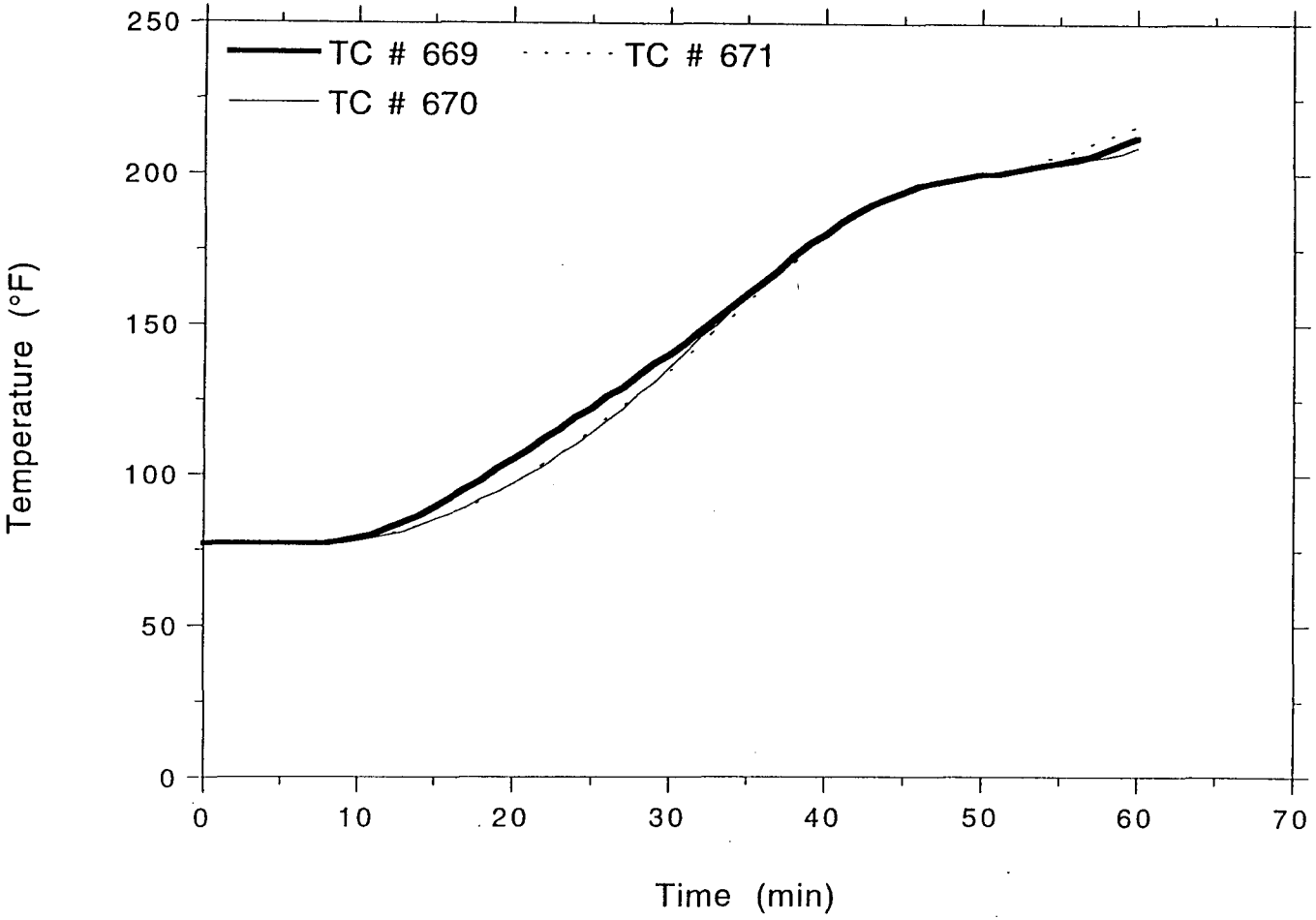
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 1" Steel Conduit, Right Side



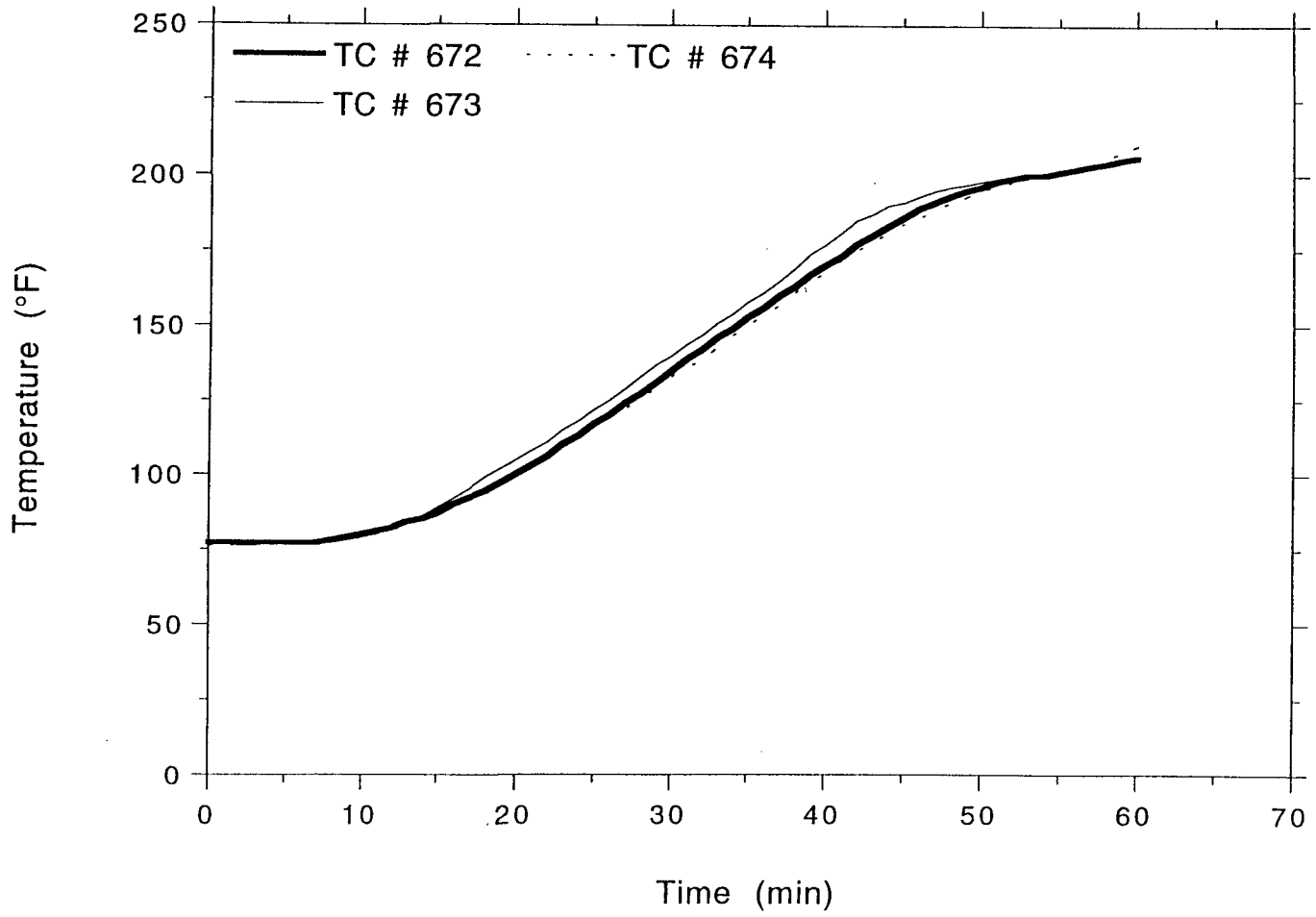
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 1" Steel Conduit, Right Side



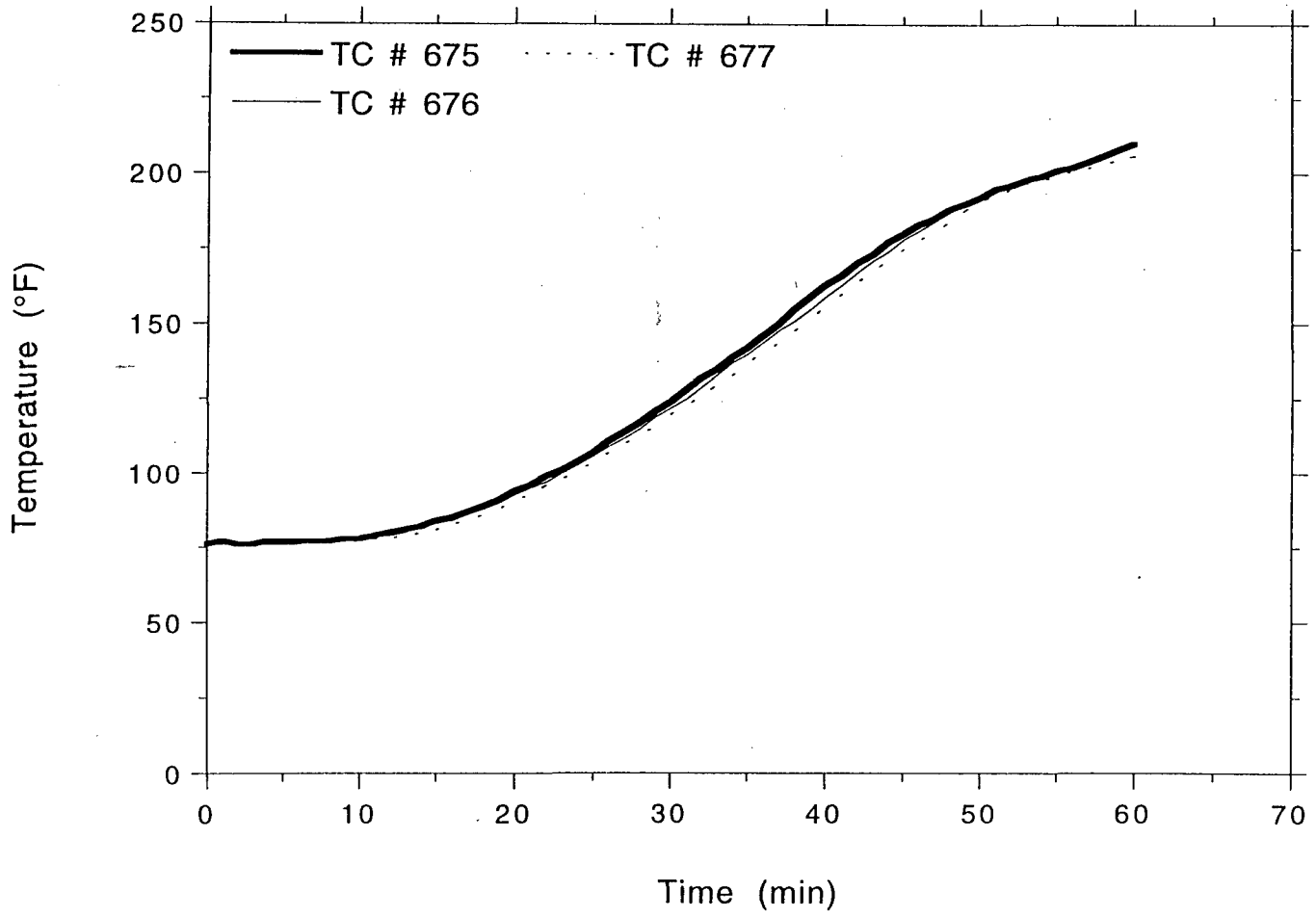
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 3" Steel Conduit, Left Side



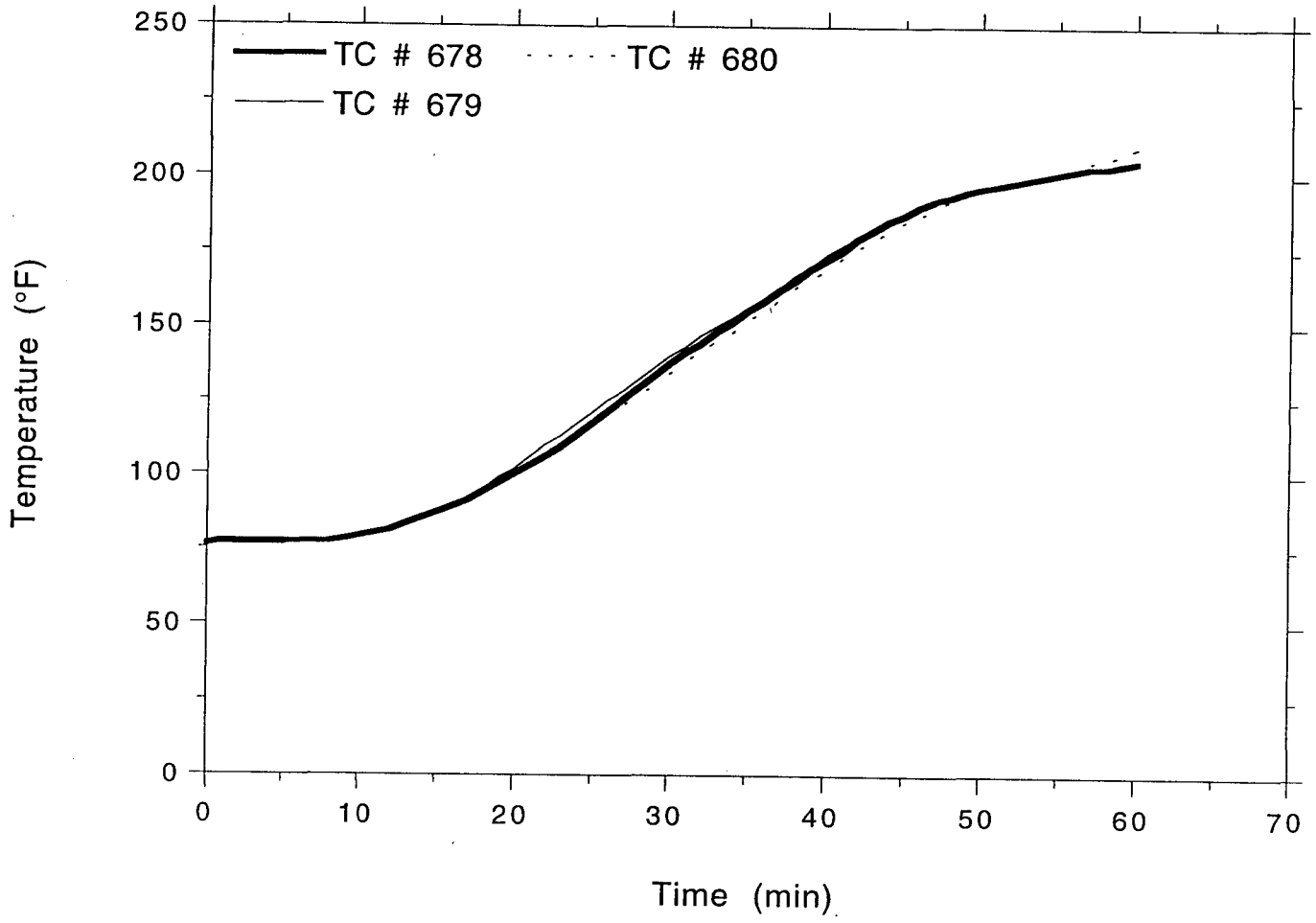
OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Left 3" Steel Conduit, Left Side



OMEGA POINT LABORATORIES

TSI/TVA
Project No. 11960-97259
Rear Right 3" Steel Conduit, Right Side



OMEGA POINT LABORATORIES

FIRE ENDURANCE TEST OF THERMO-LAG® 330-1 FIRE PROTECTIVE ENVELOPES (Three Four-Sided Box Enclosures Encasing Groups of Vertical Conduits and an Enclosure Encasing a 4 in. Conduit and a Junction Box)

Project No. 11960-97259
(Volume 2 of 2)

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

November 29, 1994

Prepared For:

Tennessee Valley Authority
P.O. Box 11127
Chattanooga, TN 37401

in cooperation with

Thermal Science, Inc.
2200 Cassens Drive
Fenton, MO 63026

OMEGA POINT LABORATORIES

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(VOLUME 2 OF 2)

Appendix D

TEST DATA (continued)

Time (min)	Front Left 1" Steel Conduit Maximum (°F)	Front Left 1" Steel Conduit Average (°F)	Front Left 1" Steel Conduit #8 Maximum (°F)	Front Left 1" Steel Conduit #8 Average (°F)
0	80	79	80	79
1	80	79	80	79
2	80	79	80	79
3	80	79	80	79
4	80	79	80	79
5	80	79	80	79
6	80	80	80	79
7	81	80	80	79
8	82	81	80	79
9	83	82	80	79
10	85	83	80	80
11	87	85	81	80
12	90	88	82	81
13	94	90	83	82
14	97	93	85	83
15	100	96	87	85
16	104	100	89	87
17	108	103	92	89
18	112	107	95	91
19	118	111	98	94
20	123	116	102	97
21	129	120	106	100
22	135	125	110	104
23	140	129	114	107
24	145	134	118	111
25	149	139	123	115
26	154	143	128	120
27	159	148	133	124
28	163	152	137	128
29	167	157	142	133
30	171	161	146	137
31	174	165	151	141
32	179	169	155	146
33	184	174	160	150
34	190	178	164	155
35	194	182	168	160
36	198	186	173	165
37	202	190	177	169
38	205	193	181	173

Time (min)	Front Left 1" Steel Conduit Maximum (°F)	Front Left 1" Steel Conduit Average (°F)	Front Left 1" Steel Conduit #8 Maximum (°F)	Front Left 1" Steel Conduit #8 Average (°F)
39	207	197	185	178
40	209	200	189	182
41	211	204	192	186
42	212	206	196	190
43	212	209	199	194
44	213	211	201	197
45	214	213	205	201
46	215	214	208	203
47	215	214	210	206
48	216	215	210	207
49	219	215	211	209
50	221	216	212	210
51	224	217	213	211
52	226	218	214	212
53	229	219	216	213
54	232	220	217	214
55	235	222	218	215
56	239	224	220	216
57	242	226	222	217
58	245	228	225	219
59	248	230	227	220
60	252	233	230	221
Max Temp:	252	233	230	221
Max Allowed:	405	329	405	329

Time (min)	Front Right 1" Steel Conduit Maximum (°F)	Front Right 1" Steel Conduit Average (°F)	Front Right 1" Steel Conduit #8 Maximum (°F)	Front Right 1" Steel Conduit #8 Average (°F)
0	80	79	78	77
1	80	79	78	77
2	80	79	78	77
3	80	79	78	77
4	80	79	78	77
5	80	79	78	77
6	81	79	78	77
7	81	80	78	77
8	83	81	79	77
9	84	82	79	77
10	87	83	79	78
11	90	85	80	78
12	99	88	82	79
13	106	91	84	80
14	109	95	85	82
15	111	98	88	83
16	112	101	90	85
17	114	104	93	88
18	117	108	96	90
19	121	112	99	93
20	125	116	102	95
21	129	120	106	98
22	134	125	110	102
23	139	129	115	105
24	143	134	119	109
25	148	138	123	112
26	153	142	128	116
27	158	147	132	120
28	163	151	136	124
29	168	156	140	128
30	172	160	145	132
31	176	164	149	136
32	180	169	153	141
33	184	173	157	145
34	187	177	161	149
35	190	182	165	154
36	193	186	169	158
37	196	190	173	162
38	200	194	177	167

Time (min)	Front Right 1" Steel Conduit Maximum (°F)	Front Right 1" Steel Conduit Average (°F)	Front Right 1" Steel Conduit #8 Maximum (°F)	Front Right 1" Steel Conduit #8 Average (°F)
39	203	197	181	171
40	207	201	184	175
41	209	204	188	179
42	211	207	192	183
43	212	209	195	187
44	214	211	198	191
45	215	213	201	194
46	215	214	203	197
47	216	214	205	200
48	217	215	207	202
49	218	215	208	204
50	219	216	210	205
51	221	217	211	207
52	223	218	212	208
53	225	219	213	209
54	228	221	214	211
55	231	222	216	212
56	234	224	217	213
57	238	226	219	214
58	243	228	222	216
59	247	230	225	217
60	252	232	227	219
Max Temp:	252	232	227	219
Max Allowed:	405	329	403	327

OMEGA POINT LABORATORIES

Time (min)	Rear Left 1" Steel Conduit Maximum (°F)	Rear Left 1" Steel Conduit Average (°F)	Rear Left 1" Steel Conduit #8 Maximum (°F)	Rear Left 1" Steel Conduit #8 Average (°F)
0	78	77	78	77
1	78	77	78	77
2	78	77	78	77
3	78	77	78	77
4	78	77	78	77
5	78	77	78	77
6	82	78	78	77
7	90	79	79	77
8	96	80	81	77
9	100	81	82	78
10	104	82	84	78
11	109	85	86	79
12	115	87	88	80
13	121	90	90	81
14	127	93	93	83
15	133	96	97	85
16	138	99	100	87
17	143	103	104	89
18	147	106	108	92
19	152	110	111	94
20	156	114	115	97
21	160	118	119	101
22	163	122	123	104
23	165	126	127	107
24	167	131	131	111
25	167	135	135	115
26	165	138	138	119
27	164	142	141	122
28	165	146	144	126
29	166	150	146	130
30	168	155	149	134
31	171	159	152	138
32	173	163	155	142
33	176	167	158	147
34	179	171	162	151
35	182	176	166	155
36	186	180	169	159
37	189	184	173	164
38	193	188	177	168

Time (min)	Rear Left 1" Steel Conduit Maximum (°F)	Rear Left 1" Steel Conduit Average (°F)	Rear Left 1" Steel Conduit #8 Maximum (°F)	Rear Left 1" Steel Conduit #8 Average (°F)
39	197	192	181	172
40	200	196	185	177
41	203	199	188	181
42	206	202	192	185
43	208	205	195	189
44	209	208	198	192
45	211	210	201	196
46	212	211	204	199
47	212	212	206	201
48	213	212	207	204
49	213	212	209	205
50	213	213	210	207
51	214	213	211	208
52	215	214	212	209
53	216	214	213	210
54	218	215	213	211
55	220	216	214	212
56	222	218	215	213
57	225	219	216	214
58	227	220	217	215
59	231	222	219	216
60	234	224	221	218
Max Temp:	234	224	221	218
Max Allowed:	403	327	403	327

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	Rear Right 1" Steel Conduit Maximum (°F)	Rear Right 1" Steel Conduit Average (°F)	Rear Right 1" Steel Conduit #8 Maximum (°F)	Rear Right 1" Steel Conduit #8 Average (°F)
0	82	80	77	76
1	82	80	77	76
2	82	80	77	76
3	82	80	77	76
4	82	80	77	76
5	82	80	77	76
6	82	80	77	76
7	82	80	77	76
8	83	81	77	76
9	85	82	78	77
10	98	83	78	77
11	131	87	82	78
12	158	91	89	79
13	170	95	96	80
14	174	98	105	83
15	172	101	111	85
16	168	103	116	87
17	167	106	121	89
18	171	110	125	92
19	176	113	129	94
20	176	117	132	97
21	174	120	136	100
22	172	124	138	103
23	170	127	140	106
24	168	131	142	109
25	167	135	143	112
26	166	138	145	116
27	166	142	146	119
28	166	146	147	123
29	166	150	148	126
30	168	155	150	130
31	170	159	152	134
32	173	163	154	138
33	176	168	156	142
34	180	172	160	146
35	183	177	162	150
36	187	181	166	154
37	191	186	169	159
38	194	190	173	163

OMEGA POINT LABORATORIES

Time (min)	Rear Right 1" Steel Conduit Maximum (°F)	Rear Right 1" Steel Conduit Average (°F)	Rear Right 1" Steel Conduit #8 Maximum (°F)	Rear Right 1" Steel Conduit #8 Average (°F)
39	198	194	176	168
40	202	198	180	172
41	205	202	184	177
42	209	205	188	181
43	211	208	191	185
44	213	211	195	189
45	215	212	198	193
46	216	214	202	196
47	216	214	204	198
48	216	214	205	200
49	217	215	206	202
50	217	215	207	203
51	217	215	209	204
52	218	216	210	205
53	219	216	211	205
54	220	217	211	205
55	222	218	211	206
56	224	219	212	207
57	225	219	212	208
58	228	220	213	208
59	230	222	214	209
60	232	223	215	210
Max Temp:	232	223	215	210
Max Allowed:	407	330	402	326

Time (min)	Rear Left 1" Conduit Additional TC's Max. (°F)	Rear Left 1" Conduit Additional TC's Avg. (°F)	Rear Right 1" Conduit Additional TC's Max. (°F)
0	77	76	77
1	77	77	77
2	77	77	77
3	77	77	77
4	77	77	77
5	77	77	77
6	77	77	77
7	78	77	77
8	79	78	78
9	79	79	78
10	81	80	80
11	82	81	85
12	85	83	91
13	87	85	97
14	90	87	103
15	93	90	108
16	96	92	111
17	99	95	115
18	102	98	118
19	105	101	122
20	109	105	125
21	112	108	128
22	116	112	130
23	120	115	132
24	123	119	135
25	127	123	137
26	130	127	139
27	134	131	141
28	137	134	143
29	141	138	145
30	145	142	147
31	149	146	151
32	152	150	154
33	156	154	157
34	160	157	160
35	163	161	164
36	167	165	168
37	171	169	171
38	174	173	175

Time (min)	Rear Left 1" Conduit Additional TC's Max. (°F)	Rear Left 1" Conduit Additional TC's Avg. (°F)	Rear Right 1" Conduit Additional TC's Max. (°F)
39	178	176	179
40	181	180	182
41	185	183	185
42	188	187	188
43	190	189	191
44	193	192	193
45	195	194	195
46	196	195	197
47	197	197	198
48	198	198	199
49	199	199	200
50	200	200	201
51	201	201	202
52	202	202	203
53	204	203	204
54	205	204	205
55	207	205	206
56	209	207	208
57	212	208	210
58	214	210	212
59	217	212	214
60	220	214	216
Max Temp:	220	214	216
Max Allowed:	402	326	402

Time (min)	Rear Right 1" Conduit Additional TC's Avg. (°F)	Front Left 3" Steel Conduit Maximum (°F)	Front Left 3" Steel Conduit Average (°F)	Front Left 3" Steel Conduit #8 Maximum (°F)
0	77	82	81	77
1	77	82	81	77
2	77	82	81	77
3	77	82	81	77
4	77	82	81	77
5	77	83	81	77
6	77	83	82	77
7	77	83	82	77
8	77	84	83	77
9	78	86	84	77
10	79	87	85	78
11	81	91	86	79
12	83	96	88	79
13	85	104	90	80
14	88	113	93	81
15	90	121	95	83
16	93	128	98	84
17	96	134	101	86
18	99	141	104	88
19	102	147	107	90
20	105	154	110	93
21	108	161	113	96
22	111	167	116	99
23	115	173	120	102
24	118	177	123	106
25	121	181	126	110
26	125	185	130	113
27	129	188	134	117
28	132	191	137	121
29	136	193	141	125
30	140	195	144	129
31	144	198	148	133
32	148	200	152	137
33	152	202	155	141
34	156	204	159	145
35	160	205	163	149
36	165	206	166	153
37	169	207	170	156
38	173	207	173	159

Time (min)	Rear Right 1" Conduit Additional TC's Avg. (°F)	Front Left 3" Steel Conduit Maximum (°F)	Front Left 3" Steel Conduit Average (°F)	Front Left 3" Steel Conduit #8 Maximum (°F)
39	177	207	176	163
40	181	207	180	167
41	184	208	183	170
42	187	208	186	173
43	190	209	189	176
44	193	210	192	179
45	195	210	195	182
46	196	211	197	184
47	198	212	200	187
48	199	213	202	189
49	199	213	205	192
50	200	214	207	194
51	201	214	209	196
52	202	216	211	198
53	203	219	213	200
54	204	222	215	202
55	205	225	217	204
56	206	228	219	206
57	207	231	222	208
58	208	234	224	210
59	209	238	227	213
60	211	242	230	216
Max Temp:	211	242	230	216
Max Allowed:	327	407	331	402

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Time (min)	Front Left 3" Steel Conduit #8 Average (°F)	Front Right 3" Steel Conduit Maximum (°F)	Front Right 3" Steel Conduit Average (°F)	Front Right 3" Steel Conduit #8 Maximum (°F)
0	76	83	82	78
1	76	83	82	77
2	76	83	82	78
3	77	83	82	77
4	76	83	82	77
5	77	83	82	77
6	76	83	83	78
7	76	84	83	78
8	77	84	83	77
9	76	86	84	78
10	76	87	85	79
11	77	90	87	79
12	77	94	88	80
13	78	99	91	83
14	78	104	93	84
15	80	108	96	85
16	81	112	98	87
17	81	116	101	90
18	83	121	104	92
19	85	126	107	94
20	87	131	111	96
21	89	135	114	99
22	91	139	118	102
23	94	143	121	106
24	97	146	124	109
25	99	149	128	111
26	102	152	131	115
27	105	154	135	119
28	108	157	138	121
29	112	160	142	125
30	114	163	146	128
31	118	166	150	132
32	121	170	154	135
33	125	175	158	140
34	128	179	162	143
35	132	183	165	147
36	136	187	169	150
37	139	191	173	155
38	143	195	177	160

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Time (min)	Front Left 3" Steel Conduit #8 Average (°F)	Front Right 3" Steel Conduit Maximum (°F)	Front Right 3" Steel Conduit Average (°F)	Front Right 3" Steel Conduit #8 Maximum (°F)
39	146	197	180	164
40	150	200	184	167
41	154	202	187	171
42	158	207	191	176
43	161	210	194	178
44	165	213	197	182
45	168	215	200	185
46	172	216	202	188
47	175	217	205	191
48	178	217	207	193
49	181	217	209	196
50	184	218	211	198
51	187	218	212	200
52	190	218	214	202
53	192	220	215	204
54	195	223	217	207
55	197	225	218	207
56	200	227	220	209
57	202	229	222	211
58	204	231	224	213
59	207	233	226	214
60	208	235	228	215
Max Temp:	208	235	228	215
Max Allowed:	326	408	332	403

OMEGA POINT LABORATORIES

Time (min)	Front Right 3" Steel Conduit #8 Average (°F)	Rear Left 3" Steel Conduit Maximum (°F)	Rear Left 3" Steel Conduit Average (°F)	Rear Left 3" Steel Conduit #8 Maximum (°F)
0	77	82	81	77
1	76	83	81	78
2	77	82	81	78
3	77	82	81	78
4	76	82	81	78
5	77	83	81	79
6	77	83	81	79
7	77	84	81	80
8	76	85	81	81
9	76	87	82	82
10	77	89	83	83
11	77	91	84	84
12	77	93	85	85
13	79	96	86	87
14	79	99	88	89
15	80	102	90	91
16	81	106	92	93
17	82	109	94	96
18	84	113	97	98
19	86	117	99	101
20	87	121	102	105
21	90	125	105	108
22	92	130	108	111
23	95	134	112	115
24	98	138	115	118
25	100	142	119	121
26	104	146	122	125
27	108	150	126	128
28	111	154	130	131
29	114	158	134	134
30	118	161	137	137
31	122	163	141	140
32	125	166	145	142
33	129	169	149	144
34	132	171	152	147
35	136	173	156	149
36	140	176	160	152
37	144	178	164	155
38	148	180	167	159

Time (min)	Front Right 3" Steel Conduit #8 Average (°F)	Rear Left 3" Steel Conduit Maximum (°F)	Rear Left 3" Steel Conduit Average (°F)	Rear Left 3" Steel Conduit #8 Maximum (°F)
39	152	183	171	163
40	155	186	175	167
41	159	189	178	171
42	163	192	182	175
43	166	195	185	178
44	171	198	188	182
45	174	200	191	185
46	177	202	194	188
47	181	204	197	191
48	183	206	200	194
49	186	208	202	196
50	189	210	205	198
51	191	212	207	200
52	194	214	209	201
53	196	215	211	203
54	199	217	212	204
55	201	218	214	206
56	202	219	215	207
57	204	221	217	208
58	205	222	218	209
59	206	224	219	210
60	207	225	221	211
Max Temp:	207	225	221	211
Max Allowed:	327	407	331	402

Time (min)	Rear Left 3" Steel Conduit #8 Average (°F)	Rear Right 3" Steel Conduit Maximum (°F)	Rear Right 3" Steel Conduit Average (°F)	Rear Right 3" Steel Conduit #8 Maximum (°F)
0	77	84	78	78
1	76	85	78	78
2	77	85	78	78
3	76	85	78	77
4	76	85	78	78
5	77	85	78	78
6	77	85	78	79
7	77	85	79	79
8	76	85	79	77
9	77	86	79	79
10	77	86	80	79
11	77	86	81	80
12	78	88	82	82
13	78	90	83	83
14	79	93	85	86
15	79	96	87	86
16	80	99	89	88
17	82	102	91	92
18	83	106	93	94
19	85	109	96	97
20	86	113	99	98
21	88	117	101	102
22	90	121	104	104
23	92	126	108	108
24	95	130	111	111
25	97	134	114	114
26	101	138	118	120
27	104	142	121	124
28	107	146	125	126
29	110	150	129	129
30	114	153	132	134
31	117	155	136	137
32	120	158	140	142
33	124	161	143	144
34	128	163	147	149
35	131	166	150	153
36	134	169	154	157
37	138	172	157	161
38	142	176	161	163

Time (min)	Rear Left 3" Steel Conduit #8 Average (°F)	Rear Right 3" Steel Conduit Maximum (°F)	Rear Right 3" Steel Conduit Average (°F)	Rear Right 3" Steel Conduit #8 Maximum (°F)
39	145	179	165	166
40	149	182	168	170
41	153	185	171	173
42	157	188	175	177
43	160	191	178	181
44	166	194	181	184
45	169	196	184	188
46	173	198	187	190
47	177	200	189	193
48	180	202	192	195
49	184	204	194	197
50	187	205	196	199
51	189	207	198	200
52	191	208	200	202
53	194	209	201	203
54	196	211	203	204
55	197	212	204	205
56	199	214	205	205
57	201	215	206	206
58	202	216	207	207
59	203	218	208	208
60	205	219	210	211
Max Temp:	205	219	210	211
Max Allowed:	327	409	328	403

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Time (min)	Rear Right 3" Steel Conduit #8 Average (°F)	Rear Left 3" Conduit Additional TC's Max. (°F)	Rear Left 3" Conduit Additional TC's Avg. (°F)
0	77	77	76
1	77	77	76
2	76	77	76
3	76	77	76
4	77	77	77
5	76	77	77
6	76	77	77
7	76	77	77
8	76	78	77
9	77	79	78
10	77	80	78
11	78	81	79
12	78	82	80
13	78	84	82
14	79	86	83
15	80	89	85
16	81	92	87
17	82	95	89
18	84	99	92
19	86	102	94
20	88	105	97
21	91	108	100
22	93	111	103
23	95	115	106
24	98	118	109
25	101	122	112
26	103	125	115
27	107	129	119
28	110	133	122
29	113	137	125
30	117	140	129
31	120	144	132
32	124	147	136
33	127	151	140
34	131	154	143
35	135	158	147
36	139	161	150
37	143	165	154
38	146	169	158

Time (min)	Rear Right 3" Steel Conduit #8 Average (°F)	Rear Left 3" Conduit Additional TC's Max. (°F)	Rear Left 3" Conduit Additional TC's Avg. (°F)
39	149	174	162
40	153	177	166
41	157	181	169
42	160	185	173
43	165	187	176
44	168	190	179
45	172	191	182
46	175	193	185
47	178	195	188
48	181	196	190
49	184	197	192
50	187	198	194
51	190	199	196
52	193	199	197
53	195	200	199
54	197	201	200
55	199	202	201
56	201	203	202
57	202	204	203
58	204	206	205
59	205	208	206
60	207	210	208
Max Temp:	207	210	208
Max Allowed:	327	402	326

Time (min)	Rear Right 3" Conduit Additional TC's Max. (°F)	Rear Right 3" Conduit Additional TC's Avg. (°F)	4" Steel Conduit Above Junction Box Maximum (°F)
0	77	76	78
1	77	77	78
2	77	77	78
3	77	77	78
4	77	77	78
5	77	77	79
6	77	77	81
7	77	77	84
8	78	77	87
9	78	78	91
10	79	79	96
11	80	79	101
12	82	81	106
13	83	82	112
14	85	83	118
15	87	85	124
16	89	87	130
17	92	89	136
18	95	91	142
19	99	94	148
20	102	97	153
21	106	100	159
22	110	103	165
23	113	106	170
24	117	109	175
25	121	112	180
26	125	116	185
27	128	119	190
28	132	123	195
29	136	126	199
30	140	130	203
31	143	134	207
32	147	137	211
33	150	141	213
34	153	144	214
35	156	148	214
36	159	151	216
37	163	155	217
38	167	159	216

Time (min)	Rear Right 3" Conduit Additional TC's Max. (°F)	Rear Right 3" Conduit Additional TC's Avg. (°F)	4" Steel Conduit Above Junction Box Maximum (°F)
39	170	163	218
40	174	166	219
41	177	170	220
42	180	173	221
43	183	177	223
44	186	180	224
45	188	183	226
46	190	186	229
47	192	188	232
48	194	191	236
49	195	193	241
50	197	195	245
51	198	196	250
52	199	198	255
53	200	199	261
54	201	200	266
55	202	201	272
56	203	202	277
57	205	203	283
58	206	204	288
59	208	206	294
60	210	207	299
Max Temp:	210	207	299
Max Allowed:	402	326	403

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Time (min)	4" Steel Conduit Above Junction Box Average (°F)	4" Steel Conduit Below Junction Box Maximum (°F)	4" Steel Conduit Below Junction Box Average (°F)
0	78	79	79
1	78	79	79
2	78	79	79
3	78	79	79
4	78	80	79
5	79	81	80
6	80	82	81
7	82	85	83
8	85	88	85
9	88	92	88
10	92	96	91
11	96	100	95
12	100	106	99
13	105	111	103
14	109	116	107
15	114	121	112
16	119	126	117
17	124	132	122
18	129	138	127
19	134	143	132
20	139	148	137
21	144	154	142
22	149	159	146
23	154	164	151
24	159	169	156
25	164	174	160
26	170	179	165
27	175	184	170
28	180	188	174
29	185	192	179
30	189	197	183
31	193	201	188
32	198	205	193
33	202	208	197
34	205	212	202
35	206	214	205
36	209	215	207
37	210	217	210
38	211	219	213

Time (min)	4" Steel Conduit Above Junction Box Average (°F)	4" Steel Conduit Below Junction Box Maximum (°F)	4" Steel Conduit Below Junction Box Average (°F)
39	213	222	215
40	213	225	217
41	214	228	218
42	215	231	220
43	217	234	222
44	217	237	224
45	219	240	226
46	222	243	228
47	224	246	230
48	227	249	232
49	229	253	234
50	232	256	236
51	235	259	238
52	239	262	241
53	242	266	243
54	245	269	246
55	249	273	249
56	253	276	251
57	256	280	254
58	260	283	258
59	264	287	261
60	268	291	264
Max Temp:	268	291	264
Max Allowed:	328	404	329

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Time (min)	Junction Box on 4" Steel Conduit Maximum (°F)	Junction Box on 4" Steel Conduit Average (°F)	4" steel Conduit w/Junction Box #8 Maximum (°F)
0	79	78	77
1	79	78	77
2	79	78	77
3	79	78	78
4	79	78	77
5	80	78	77
6	80	79	78
7	81	80	78
8	83	81	80
9	85	83	80
10	88	85	82
11	91	88	84
12	96	91	87
13	101	94	91
14	106	99	93
15	113	103	98
16	121	108	102
17	128	112	106
18	135	117	111
19	141	122	115
20	148	127	120
21	154	133	125
22	161	138	130
23	167	143	135
24	171	148	140
25	181	154	145
26	193	159	149
27	200	164	153
28	201	169	159
29	204	174	164
30	210	179	167
31	212	183	172
32	211	187	176
33	210	191	181
34	211	195	185
35	212	198	189
36	212	201	192
37	213	203	196
38	214	205	200

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Time (min)	Junction Box on 4" Steel Conduit Maximum (°F)	Junction Box on 4" Steel Conduit Average (°F)	4" steel Conduit w/Junction Box #8 Maximum (°F)
39	214	208	202
40	215	209	203
41	215	211	206
42	216	213	207
43	217	214	208
44	219	214	209
45	219	215	210
46	220	216	212
47	221	216	214
48	221	217	216
49	221	217	218
50	222	218	220
51	223	218	223
52	224	218	226
53	225	219	229
54	226	219	233
55	227	220	238
56	228	221	242
57	231	221	247
58	233	222	251
59	236	223	256
60	240	225	260
Max Temp:	240	225	260
Max Allowed:	404	328	402

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Time (min)	4" steel Conduit w/Junction Box #8 Average (°F)	Front Left 4" Aluminum Conduit Maximum (°F)	Front Left 4" Aluminum Conduit Average (°F)
0	76	82	80
1	76	82	80
2	77	82	80
3	77	82	80
4	76	82	80
5	77	82	80
6	77	83	81
7	77	84	81
8	77	85	82
9	77	86	83
10	78	88	84
11	79	89	86
12	81	91	88
13	83	94	90
14	85	97	92
15	87	100	94
16	91	102	97
17	94	105	99
18	98	109	102
19	102	112	105
20	106	115	108
21	110	119	111
22	115	122	115
23	120	126	118
24	125	129	121
25	129	133	125
26	135	137	129
27	140	141	132
28	145	145	136
29	149	149	140
30	154	154	144
31	159	158	148
32	163	168	152
33	169	170	156
34	173	174	159
35	178	178	163
36	182	181	167
37	187	185	170
38	191	188	174

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Time (min)	4" steel Conduit w/Junction Box #8 Average (°F)	Front Left 4" Aluminum Conduit Maximum (°F)	Front Left 4" Aluminum Conduit Average (°F)
39	195	191	177
40	199	194	181
41	202	195	183
42	204	198	186
43	206	200	189
44	208	202	192
45	209	204	194
46	210	206	197
47	211	208	199
48	212	209	201
49	213	211	203
50	214	213	205
51	215	214	208
52	216	215	210
53	218	219	212
54	219	222	214
55	221	226	216
56	223	229	218
57	224	233	220
58	226	236	222
59	228	239	225
60	230	243	227
Max Temp:	230	243	227
Max Allowed:	326	407	330

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Time (min)	Front Left 4" Aluminum Conduit #8 Maximum (°F)	Front Left 4" Aluminum Conduit #8 Average (°F)	Front Left-Center 4" Aluminum Conduit Maximum (°F)
0	77	76	82
1	77	76	82
2	77	76	83
3	77	76	83
4	77	76	82
5	77	76	83
6	77	76	83
7	77	76	83
8	77	76	84
9	78	76	84
10	78	77	85
11	79	77	86
12	79	77	87
13	80	78	88
14	82	79	90
15	83	80	91
16	84	81	93
17	86	82	95
18	88	84	97
19	90	85	99
20	92	87	102
21	95	89	104
22	97	91	107
23	100	93	109
24	103	96	111
25	106	98	114
26	109	101	117
27	112	104	119
28	116	107	122
29	119	110	125
30	123	113	127
31	127	117	130
32	131	120	133
33	135	124	136
34	139	128	138
35	143	131	141
36	147	135	145
37	151	139	147
38	155	142	150

Time (min)	Front Left 4" Aluminum Conduit #8 Maximum (°F)	Front Left 4" Aluminum Conduit #8 Average (°F)	Front Left-Center 4" Aluminum Conduit Maximum (°F)
39	159	146	153
40	163	150	156
41	166	153	159
42	169	157	162
43	173	160	165
44	176	164	168
45	179	167	171
46	182	170	176
47	184	173	177
48	187	176	180
49	190	179	183
50	193	182	186
51	195	185	189
52	198	187	192
53	201	190	195
54	203	192	198
55	206	195	200
56	209	197	203
57	212	200	205
58	215	202	207
59	218	205	209
60	221	207	212
Max Temp:	221	207	212
Max Allowed:	402	326	407

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Time (min)	Front Left-Center 4" Aluminum Conduit Average (°F)	Front Left-Center 4" Aluminum Conduit #8 Maximum (°F)	Front Left-Center 4" Aluminum Conduit #8 Average (°F)
0	81	77	76
1	81	77	76
2	81	77	76
3	81	77	76
4	81	77	76
5	81	77	76
6	82	77	76
7	82	77	76
8	82	77	76
9	83	77	76
10	83	77	76
11	84	78	76
12	85	78	77
13	86	79	77
14	87	79	77
15	88	80	78
16	90	81	78
17	91	82	79
18	93	83	80
19	95	84	81
20	97	85	82
21	99	87	83
22	101	88	84
23	103	90	85
24	105	92	87
25	108	94	88
26	110	96	90
27	112	98	92
28	115	100	93
29	117	103	95
30	120	105	97
31	122	107	99
32	125	110	102
33	128	113	104
34	131	115	106
35	133	118	109
36	136	121	111
37	139	123	114
38	142	126	116

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Time (min)	Front Left-Center 4" Aluminum Conduit Average (°F)	Front Left-Center 4" Aluminum Conduit #8 Maximum (°F)	Front Left-Center 4" Aluminum Conduit #8 Average (°F)
39	145	129	119
40	148	132	122
41	151	135	124
42	154	138	127
43	157	141	130
44	160	144	133
45	164	147	136
46	167	150	139
47	170	153	142
48	173	156	145
49	176	159	148
50	179	163	152
51	183	166	155
52	186	169	158
53	189	172	161
54	191	175	164
55	194	178	167
56	197	180	170
57	199	183	174
58	202	186	176
59	204	189	179
60	206	191	182
Max Temp:	206	191	182
Max Allowed:	331	402	326

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Time (min)	Front Right-Center 4" Aluminum Conduit Maximum (°F)	Front Right-Center 4" Aluminum Conduit Average (°F)	Front Right-Center 4" Aluminum Conduit #8 Maximum (°F)
0	82	81	77
1	82	81	77
2	82	81	77
3	82	81	77
4	82	81	77
5	82	81	77
6	82	81	77
7	83	82	77
8	83	82	77
9	84	83	77
10	85	83	77
11	87	84	78
12	88	85	78
13	90	86	78
14	91	88	79
15	93	89	80
16	95	91	81
17	98	93	82
18	100	94	83
19	102	96	84
20	104	98	85
21	107	100	87
22	109	102	89
23	112	105	91
24	115	107	93
25	118	109	95
26	120	112	97
27	123	114	99
28	126	117	102
29	129	119	104
30	132	122	107
31	135	124	109
32	138	127	112
33	140	130	114
34	143	132	117
35	146	135	120
36	148	138	122
37	151	141	125
38	154	143	128

Time (min)	Front Right-Center 4" Aluminum Conduit Maximum (°F)	Front Right-Center 4" Aluminum Conduit Average (°F)	Front Right-Center 4" Aluminum Conduit #8 Maximum (°F)
39	157	146	131
40	160	149	133
41	164	152	136
42	167	156	139
43	170	159	142
44	173	162	145
45	177	165	148
46	180	168	151
47	183	171	155
48	186	174	158
49	189	177	161
50	192	181	164
51	195	184	167
52	198	187	170
53	202	190	173
54	205	193	176
55	208	195	179
56	218	198	182
57	225	201	185
58	222	203	187
59	224	206	190
60	224	208	193
Max Temp:	225	208	193
Max Allowed:	407	331	402

Time (min)	Front Right-Center 4" Aluminum Conduit #8 Average (°F)	Front Right 4" Aluminum Conduit Maximum (°F)	Front Right 4" Aluminum Conduit Average (°F)
0	76	82	81
1	76	82	81
2	76	82	81
3	76	82	81
4	76	82	81
5	76	82	81
6	76	82	81
7	76	82	81
8	76	83	82
9	76	83	82
10	76	84	83
11	76	86	84
12	77	88	86
13	77	90	87
14	77	92	89
15	78	94	91
16	78	97	93
17	79	99	95
18	80	102	98
19	81	105	100
20	82	108	103
21	83	111	106
22	85	114	108
23	86	117	111
24	87	120	114
25	89	124	117
26	91	127	120
27	93	131	124
28	95	135	127
29	97	138	130
30	99	142	133
31	101	145	137
32	103	149	140
33	105	153	144
34	108	157	147
35	110	161	151
36	112	165	155
37	115	169	159
38	118	173	162

Time (min)	Front Right-Center 4" Aluminum Conduit #8 Average (°F)	Front Right 4" Aluminum Conduit Maximum (°F)	Front Right 4" Aluminum Conduit Average (°F)
39	121	177	166
40	123	181	170
41	126	185	174
42	129	190	178
43	132	194	182
44	136	198	185
45	139	201	189
46	142	205	192
47	145	208	195
48	148	210	198
49	152	212	201
50	155	213	203
51	158	214	205
52	161	215	207
53	165	216	208
54	168	216	209
55	171	217	210
56	174	218	212
57	177	219	213
58	180	221	214
59	182	223	216
60	185	224	217
Max Temp:	185	224	217
Max Allowed:	326	407	331

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Time (min)	Front Right 4" Aluminum Conduit #8 Maximum (°F)	Front Right 4" Aluminum Conduit #8 Average (°F)	Rear Left 4" Aluminum Conduit Maximum (°F)
0	77	76	83
1	77	76	83
2	77	76	83
3	77	76	83
4	77	76	83
5	77	76	83
6	77	76	83
7	77	76	84
8	77	76	84
9	77	76	85
10	78	76	86
11	78	77	87
12	79	77	88
13	79	78	90
14	80	78	92
15	81	79	94
16	82	80	97
17	84	81	99
18	85	82	101
19	87	84	104
20	89	85	107
21	91	87	109
22	93	89	112
23	96	91	115
24	98	93	118
25	101	95	121
26	103	97	124
27	106	100	127
28	109	102	131
29	112	105	136
30	115	108	140
31	118	111	144
32	121	114	148
33	124	117	152
34	128	120	156
35	131	123	160
36	135	127	164
37	139	130	168
38	143	133	172

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Time (min)	Front Right 4" Aluminum Conduit #8 Maximum (°F)	Front Right 4" Aluminum Conduit #8 Average (°F)	Rear Left 4" Aluminum Conduit Maximum (°F)
39	147	137	176
40	151	141	180
41	156	145	184
42	160	149	188
43	165	152	192
44	169	156	196
45	173	160	200
46	177	164	203
47	181	167	207
48	185	171	210
49	189	174	212
50	192	178	214
51	195	181	216
52	198	184	217
53	200	187	218
54	202	189	219
55	204	191	220
56	205	193	221
57	207	195	223
58	208	197	224
59	210	199	226
60	211	200	228
Max Temp:	211	200	228
Max Allowed:	402	326	408

Time (min)	Rear Left 4" Aluminum Conduit Average (°F)	Rear Left 4" Aluminum Conduit #8 Maximum (°F)	Rear Left 4" Aluminum Conduit #8 Average (°F)
0	82	77	76
1	82	77	76
2	82	77	76
3	82	77	76
4	82	77	76
5	82	77	76
6	82	77	76
7	82	77	76
8	83	77	76
9	83	77	77
10	84	78	77
11	85	78	77
12	86	79	77
13	88	79	78
14	89	80	78
15	91	81	79
16	93	83	80
17	95	84	81
18	97	86	83
19	99	88	84
20	101	90	85
21	104	92	87
22	106	94	89
23	109	96	91
24	111	99	93
25	114	102	95
26	117	104	97
27	120	107	100
28	122	110	102
29	125	113	105
30	129	116	107
31	132	120	110
32	135	123	113
33	138	127	116
34	142	131	119
35	145	134	122
36	148	138	125
37	152	142	128
38	155	146	132

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Time (min)	Rear Left 4" Aluminum Conduit Average (°F)	Rear Left 4" Aluminum Conduit #8 Maximum (°F)	Rear Left 4" Aluminum Conduit #8 Average (°F)
39	159	150	135
40	162	154	138
41	165	158	142
42	169	162	145
43	172	166	149
44	176	170	152
45	179	174	156
46	182	178	159
47	186	182	163
48	189	186	166
49	192	190	169
50	194	193	172
51	197	196	175
52	199	198	178
53	201	201	181
54	204	203	184
55	206	205	186
56	208	206	189
57	210	208	191
58	212	210	193
59	214	211	196
60	215	213	198
Max Temp:	215	213	198
Max Allowed:	332	402	326

Time (min)	Rear Left-Center 4" Aluminum Conduit Maximum (°F)	Rear Left-Center 4" Aluminum Conduit Average (°F)	Rear Left-Center 4" Aluminum Conduit #8 Maximum (°F)
0	83	81	77
1	83	81	77
2	83	81	77
3	83	81	77
4	83	81	77
5	83	81	77
6	83	81	77
7	84	81	77
8	84	81	77
9	84	82	78
10	85	82	78
11	86	83	78
12	86	83	79
13	88	84	79
14	89	85	80
15	90	86	81
16	92	87	82
17	93	89	83
18	95	90	85
19	97	92	86
20	99	93	88
21	102	95	89
22	104	97	91
23	106	99	93
24	109	101	95
25	111	103	98
26	114	106	100
27	116	108	103
28	119	111	105
29	121	113	108
30	124	116	110
31	127	118	113
32	129	121	116
33	132	123	119
34	135	126	122
35	137	129	125
36	140	132	128
37	143	135	131
38	146	138	135

Time (min)	Rear Left-Center 4" Aluminum Conduit Maximum (°F)	Rear Left-Center 4" Aluminum Conduit Average (°F)	Rear Left-Center 4" Aluminum Conduit #8 Maximum (°F)
39	149	141	138
40	152	144	141
41	155	147	144
42	158	150	147
43	161	153	151
44	164	156	154
45	167	160	157
46	170	163	160
47	173	166	163
48	176	169	166
49	180	173	168
50	183	176	171
51	186	179	174
52	189	182	177
53	192	185	179
54	194	188	182
55	197	191	184
56	199	194	187
57	202	197	189
58	204	199	192
59	206	201	194
60	208	203	196
Max Temp:	208	203	196
Max Allowed:	408	331	402

Time (min)	Rear Left-Center 4" Aluminum Conduit #8 Average (°F)	Rear Right-Center 4" Aluminum Conduit Maximum (°F)	Rear Right-Center 4" Aluminum Conduit Average (°F)
0	77	81	79
1	77	81	79
2	77	81	79
3	77	81	79
4	77	81	79
5	77	81	79
6	77	81	79
7	77	81	80
8	77	81	80
9	77	82	80
10	77	82	81
11	77	83	81
12	78	84	82
13	78	86	83
14	79	87	84
15	79	88	85
16	80	89	86
17	81	91	87
18	82	93	88
19	83	95	90
20	84	97	92
21	86	99	94
22	87	101	95
23	89	104	97
24	91	106	100
25	93	108	102
26	95	111	104
27	97	113	106
28	99	116	109
29	102	118	111
30	104	121	114
31	107	124	116
32	110	126	119
33	112	129	122
34	115	131	124
35	118	134	127
36	121	137	130
37	124	140	133
38	127	142	136

Time (min)	Rear Left-Center 4" Aluminum Conduit #8 Average (°F)	Rear Right-Center 4" Aluminum Conduit Maximum (°F)	Rear Right-Center 4" Aluminum Conduit Average (°F)
39	130	145	139
40	133	148	142
41	136	151	145
42	139	154	148
43	142	158	151
44	145	161	155
45	149	164	158
46	152	167	161
47	155	170	164
48	158	174	168
49	160	177	171
50	163	180	174
51	166	183	178
52	170	186	181
53	172	189	184
54	175	192	187
55	178	195	190
56	180	197	193
57	183	199	195
58	185	201	198
59	188	203	200
60	190	205	202
Max Temp:	190	205	202
Max Allowed:	327	406	329

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Time (min)	Rear Right-Center 4" Aluminum Conduit #8 Maximum (°F)	Rear Right-Center 4" Aluminum Conduit #8 Average (°F)	Rear Right 4" Aluminum Conduit Maximum (°F)
0	77	76	80
1	77	76	80
2	77	76	80
3	77	76	80
4	77	76	80
5	77	76	81
6	77	76	81
7	77	76	81
8	77	77	82
9	77	77	83
10	78	77	84
11	78	77	85
12	79	77	87
13	79	78	88
14	80	78	90
15	81	79	92
16	81	80	95
17	83	80	98
18	84	81	100
19	85	83	103
20	87	84	106
21	88	85	109
22	90	87	113
23	92	89	116
24	94	90	119
25	97	92	122
26	99	94	125
27	102	97	129
28	104	99	132
29	107	101	135
30	110	104	139
31	112	106	142
32	115	109	146
33	118	112	149
34	121	115	153
35	124	118	156
36	127	120	159
37	130	124	163
38	133	127	166

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Time (min)	Rear Right-Center 4" Aluminum Conduit #8 Maximum (°F)	Rear Right-Center 4" Aluminum Conduit #8 Average (°F)	Rear Right 4" Aluminum Conduit Maximum (°F)
39	136	130	169
40	140	133	172
41	143	136	175
42	146	139	179
43	149	143	182
44	152	146	185
45	155	149	188
46	158	152	191
47	161	155	194
48	164	158	197
49	167	161	200
50	170	164	203
51	172	167	205
52	175	169	207
53	178	172	209
54	180	175	211
55	183	177	212
56	185	180	214
57	188	182	215
58	190	185	217
59	192	187	218
60	195	190	219
Max Temp:	195	190	219
Max Allowed:	402	326	405

Time (min)	Rear Right 4" Aluminum Conduit Average (°F)	Rear Right 4" Aluminum Conduit #8 Maximum (°F)	Rear Right 4" Aluminum Conduit #8 Average (°F)
0	78	77	76
1	78	77	76
2	78	77	76
3	78	77	76
4	78	77	76
5	78	77	76
6	78	77	76
7	79	77	76
8	79	77	76
9	80	78	77
10	81	78	77
11	82	79	77
12	84	79	78
13	86	80	78
14	87	81	79
15	90	83	80
16	92	84	82
17	94	86	83
18	97	87	84
19	99	89	86
20	102	91	88
21	105	93	90
22	107	96	92
23	110	98	95
24	113	100	97
25	116	103	100
26	119	106	102
27	122	109	105
28	125	112	108
29	128	115	111
30	132	118	114
31	135	122	117
32	138	125	120
33	141	129	124
34	144	132	127
35	147	136	130
36	150	139	134
37	154	143	137
38	157	147	140

Time (min)	Rear Right 4" Aluminum Conduit Average (°F)	Rear Right 4" Aluminum Conduit #8 Maximum (°F)	Rear Right 4" Aluminum Conduit #8 Average (°F)
39	160	150	144
40	163	154	147
41	166	158	151
42	169	161	154
43	172	165	157
44	176	168	161
45	179	171	164
46	182	175	167
47	185	178	170
48	188	181	173
49	191	184	175
50	193	186	178
51	196	189	180
52	198	191	183
53	201	194	185
54	203	196	188
55	205	198	190
56	207	200	192
57	208	202	194
58	210	203	195
59	211	205	197
60	213	206	199
Max Temp:	213	206	199
Max Allowed:	328	402	326

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Time (min)	TC # 1 (°F)	TC # 2 (°F)	TC # 3 (°F)	TC # 4 (°F)	TC # 5 (°F)	TC # 6 (°F)	TC # 7 (°F)	TC # 8 (°F)	TC # 9 (°F)
0	80	80	79	79	80	79	79	79	79
1	80	80	79	79	79	79	79	79	79
2	80	80	79	79	79	79	79	79	79
3	80	80	79	79	79	79	79	79	79
4	80	80	80	79	80	79	79	79	79
5	80	80	80	79	80	79	79	79	79
6	80	80	80	79	80	80	80	79	79
7	81	81	80	80	80	80	81	80	80
8	82	82	81	81	81	81	82	81	80
9	83	83	82	82	82	82	83	82	81
10	85	85	84	83	83	84	85	83	82
11	87	87	86	86	85	86	87	86	84
12	89	90	88	88	88	89	90	88	87
13	93	93	91	91	91	92	94	92	90
14	96	96	95	95	94	95	97	95	93
15	100	100	99	99	98	99	100	99	96
16	104	104	102	103	101	102	104	102	100
17	108	108	106	107	105	105	107	106	103
18	112	112	111	111	109	109	111	111	107
19	117	118	115	116	113	113	115	115	112
20	121	123	120	121	118	118	119	119	117
21	126	129	125	127	122	122	123	124	121
22	131	135	130	131	127	127	127	129	126
23	136	140	135	136	131	131	132	134	130
24	141	145	140	141	136	135	136	138	135
25	146	149	145	146	141	139	141	143	140
26	151	154	149	150	145	144	145	147	144
27	155	159	154	155	150	148	150	152	149
28	159	163	158	159	154	153	154	156	153
29	163	167	162	164	159	158	159	161	157
30	168	171	166	169	163	162	163	165	162
31	171	174	171	173	167	167	167	170	166
32	175	178	174	179	171	172	171	174	170
33	179	182	179	184	175	176	175	178	174
34	183	186	183	190	180	180	179	182	178
35	187	189	187	194	184	185	183	185	182
36	190	192	191	198	187	189	187	189	186
37	194	196	194	202	191	192	191	192	190
38	197	198	198	205	194	196	195	196	194
39	200	201	201	207	198	199	198	200	197
40	203	203	204	209	201	203	201	203	201

OMEGA POINT LABORATORIES

Time (min)	TC # 1 (°F)	TC # 2 (°F)	TC # 3 (°F)	TC # 4 (°F)	TC # 5 (°F)	TC # 6 (°F)	TC # 7 (°F)	TC # 8 (°F)	TC # 9 (°F)
41	206	206	207	211	204	206	205	207	204
42	208	209	209	212	207	208	207	209	207
43	210	211	211	212	210	210	209	211	209
44	212	212	213	213	212	212	211	212	211
45	213	214	214	213	213	213	212	213	213
46	214	215	214	214	214	214	213	214	214
47	215	215	215	214	214	214	214	214	214
48	216	216	216	214	215	215	214	214	214
49	219	217	216	215	215	215	215	214	215
50	221	219	217	215	215	215	215	215	215
51	224	221	218	216	215	215	216	215	215
52	226	223	220	216	216	216	216	215	216
53	229	225	221	216	216	216	217	216	216
54	232	228	223	217	216	216	218	217	217
55	235	230	225	218	217	217	219	218	217
56	239	233	228	219	218	218	220	219	218
57	242	237	230	221	219	219	221	221	219
58	245	240	233	223	220	220	223	223	221
59	248	243	236	225	221	221	224	225	222
60	252	247	239	227	223	223	226	228	224
Max Temp:	252	247	239	227	223	223	226	228	224
Max Allowed:	405	405	404	404	405	404	404	404	404

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 10 (°F)	TC # 11 (°F)	TC # 12 (°F)	TC # 13 (°F)	TC # 14 (°F)	TC # 15 (°F)	TC # 16 (°F)
0	79	79	79	79	79	79	78
1	79	79	79	79	79	79	78
2	79	79	79	79	79	79	78
3	79	79	79	79	79	79	78
4	79	79	79	79	79	79	78
5	79	79	79	79	79	79	79
6	79	79	79	79	79	79	79
7	80	80	80	80	80	80	79
8	80	80	80	81	80	80	80
9	81	81	81	82	81	81	81
10	83	82	82	83	83	83	82
11	84	84	84	85	85	85	84
12	87	86	86	87	87	87	86
13	90	89	88	90	90	89	89
14	93	92	91	92	92	92	91
15	96	95	94	95	95	95	94
16	99	98	97	98	99	98	97
17	103	102	101	102	102	101	100
18	106	106	104	105	106	105	104
19	111	111	108	109	110	108	108
20	115	118	112	112	114	112	112
21	120	125	116	116	119	116	116
22	125	131	121	121	123	120	120
23	130	138	126	126	128	124	125
24	135	143	131	130	132	129	130
25	140	147	136	135	137	134	135
26	145	150	141	140	141	140	139
27	151	154	146	145	146	145	144
28	155	156	151	150	151	149	149
29	160	160	155	154	155	154	154
30	164	163	159	159	159	159	158
31	168	167	164	164	164	164	162
32	172	170	168	168	168	168	167
33	175	174	172	173	173	172	171
34	179	178	176	178	178	177	175
35	183	182	181	182	182	181	180
36	187	186	185	186	186	185	184
37	191	190	189	190	190	189	188
38	195	195	194	194	194	193	192
39	199	198	197	198	197	197	196
40	202	202	201	201	201	201	199

OMEGA POINT LABORATORIES

Time (min)	TC # 10 (°F)	TC # 11 (°F)	TC # 12 (°F)	TC # 13 (°F)	TC # 14 (°F)	TC # 15 (°F)	TC # 16 (°F)
41	205	205	204	205	204	204	203
42	208	207	207	209	207	207	206
43	210	209	209	211	210	209	209
44	212	211	211	213	212	211	211
45	213	213	213	213	213	213	213
46	214	213	214	214	214	214	213
47	214	214	214	214	214	214	214
48	215	215	215	215	215	215	214
49	215	215	215	215	215	215	215
50	215	215	216	215	216	215	216
51	216	216	216	216	217	216	216
52	216	217	217	216	219	217	218
53	217	218	218	217	220	219	220
54	218	219	219	218	222	221	222
55	219	221	221	220	225	223	225
56	221	223	222	222	227	226	227
57	223	225	224	224	230	229	231
58	225	227	226	227	233	232	234
59	227	230	229	230	237	235	238
60	230	233	232	234	240	239	242
Max Temp:	230	233	232	234	240	239	242
Max Allowed:	404	404	404	404	404	404	403

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 17 (°F)	TC # 18 (°F)	TC # 19 (°F)	TC # 20 (°F)	TC # 21 (°F)	TC # 22 (°F)	TC # 23 (°F)
0	80	79	79	79	80	80	79
1	80	79	79	79	80	80	79
2	80	79	79	79	80	80	79
3	80	79	79	80	80	80	79
4	80	80	79	80	80	80	80
5	80	80	79	80	80	80	80
6	80	80	80	81	80	80	80
7	81	81	80	81	81	81	80
8	81	81	81	83	82	81	81
9	82	82	81	84	83	82	82
10	84	84	82	87	85	84	84
11	85	85	84	89	87	86	86
12	87	87	85	92	90	89	89
13	90	89	87	95	93	92	92
14	92	91	89	99	97	96	96
15	95	93	91	103	100	100	100
16	98	96	93	107	104	103	104
17	101	99	96	111	109	108	107
18	104	102	99	115	113	112	112
19	107	105	102	120	117	116	116
20	111	108	105	125	122	121	121
21	114	112	108	129	127	126	125
22	121	115	111	134	132	130	130
23	126	120	114	139	137	135	134
24	131	124	118	143	143	139	138
25	136	128	122	148	148	143	142
26	140	132	126	152	153	148	146
27	145	136	130	156	157	152	150
28	149	141	134	161	161	156	154
29	153	145	138	165	165	161	158
30	158	149	141	169	170	165	162
31	162	153	145	173	174	170	165
32	166	157	149	176	178	174	170
33	170	162	153	181	181	178	175
34	174	166	156	184	185	182	179
35	178	170	160	188	189	186	183
36	182	174	164	192	192	190	186
37	186	178	168	195	196	194	190
38	190	182	172	199	199	197	194
39	195	187	176	202	202	201	197
40	199	191	180	205	205	204	201

OMEGA POINT LABORATORIES

Time (min)	TC # 17 (°F)	TC # 18 (°F)	TC # 19 (°F)	TC # 20 (°F)	TC # 21 (°F)	TC # 22 (°F)	TC # 23 (°F)
41	203	196	184	207	208	207	204
42	207	201	188	210	210	210	207
43	209	206	193	212	212	212	210
44	212	210	199	213	213	213	212
45	213	213	207	214	214	215	213
46	214	214	212	215	215	215	214
47	215	214	213	216	216	216	215
48	215	215	214	216	216	217	215
49	217	215	214	217	217	217	216
50	218	215	215	218	218	218	216
51	220	216	215	220	219	219	217
52	222	216	216	222	221	221	217
53	224	216	216	224	223	222	217
54	227	217	217	227	226	224	218
55	229	217	218	230	228	226	218
56	232	217	219	234	232	228	219
57	235	218	221	238	235	231	220
58	238	218	223	243	239	234	221
59	241	220	225	247	242	237	223
60	244	224	227	252	246	240	225
Max Temp:	244	224	227	252	246	240	225
Max Allowed:	405	404	404	404	405	405	404

OMEGA POINT LABORATORIES

Time (min)	TC # 24 (°F)	TC # 25 (°F)	TC # 26 (°F)	TC # 27 (°F)	TC # 28 (°F)	TC # 29 (°F)	TC # 30 (°F)
0	79	80	79	79	79	80	80
1	79	80	80	79	79	80	80
2	79	80	80	79	79	80	80
3	79	80	80	79	79	80	80
4	79	80	80	79	79	80	80
5	79	80	80	80	80	80	80
6	80	80	80	80	80	80	80
7	80	80	80	80	80	81	81
8	81	81	81	81	81	82	82
9	83	82	82	82	82	83	83
10	84	84	83	83	84	84	85
11	87	86	85	85	90	86	87
12	90	90	88	89	99	90	89
13	94	94	92	93	106	95	92
14	98	98	95	97	109	99	95
15	102	102	99	100	111	102	98
16	106	105	102	103	112	106	102
17	110	109	106	107	114	110	106
18	114	113	109	111	117	113	109
19	118	118	114	115	121	118	113
20	122	122	118	119	125	122	117
21	126	126	122	123	129	127	122
22	130	131	126	127	133	132	126
23	134	135	131	131	138	137	131
24	138	139	135	135	142	142	136
25	142	143	139	140	146	147	141
26	146	147	144	144	151	152	145
27	149	151	148	149	155	158	150
28	153	154	153	153	159	163	154
29	157	158	157	158	164	168	159
30	161	162	162	162	169	172	163
31	165	166	167	167	173	176	167
32	169	170	172	172	177	180	171
33	173	175	176	176	181	184	175
34	177	179	181	181	185	187	179
35	181	183	185	186	189	190	183
36	186	187	188	192	192	193	187
37	190	190	192	196	195	196	192
38	195	194	195	200	199	200	196
39	199	198	199	203	202	203	199
40	203	201	202	207	205	205	202

Time (min)	TC # 24 (°F)	TC # 25 (°F)	TC # 26 (°F)	TC # 27 (°F)	TC # 28 (°F)	TC # 29 (°F)	TC # 30 (°F)
41	206	205	205	209	208	208	205
42	209	207	208	211	210	210	208
43	211	210	210	212	212	212	210
44	212	212	212	213	213	214	212
45	213	214	214	214	214	214	214
46	214	214	214	214	214	215	215
47	214	215	215	215	215	215	216
48	215	216	215	215	215	216	217
49	215	216	216	215	216	216	218
50	215	216	216	216	216	217	219
51	215	217	216	216	217	217	221
52	216	218	216	216	217	218	223
53	216	219	217	216	218	219	225
54	216	220	217	217	219	221	228
55	217	222	217	217	220	223	231
56	217	224	218	218	221	225	234
57	219	225	219	219	223	227	237
58	220	228	219	220	224	229	240
59	221	230	221	221	226	231	243
60	223	232	222	222	227	234	246
Max Temp:	223	232	222	222	227	234	246
Max Allowed:	404	405	404	404	404	405	405

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 31 (°F)	TC # 32 (°F)	TC # 33 (°F)	TC # 34 (°F)	TC # 35 (°F)	TC # 36 (°F)	TC # 37 (°F)
0	79	79	77	78	77	77	78
1	79	79	77	78	78	77	78
2	79	79	77	78	78	77	78
3	79	79	77	78	78	77	78
4	80	79	77	78	78	78	78
5	80	79	77	78	78	78	78
6	80	80	77	79	78	78	78
7	80	80	78	79	78	78	78
8	81	81	79	80	79	79	79
9	82	82	80	81	80	80	79
10	83	84	81	83	81	81	80
11	85	86	83	85	82	82	81
12	88	88	85	87	84	84	82
13	90	90	88	90	86	86	84
14	93	93	91	93	89	88	86
15	96	96	93	96	91	91	88
16	99	99	97	99	94	94	91
17	103	103	100	102	97	97	93
18	106	106	104	106	101	100	96
19	110	110	108	109	105	103	99
20	114	114	111	113	109	107	104
21	118	118	115	117	113	111	108
22	122	121	119	122	118	115	113
23	126	126	124	126	123	120	117
24	130	130	128	131	128	124	122
25	135	134	133	136	133	128	126
26	140	139	138	140	137	133	130
27	144	144	143	145	142	138	133
28	149	148	148	149	147	142	137
29	154	153	153	154	153	147	141
30	158	158	157	159	158	152	145
31	163	162	162	164	163	156	149
32	167	167	166	168	169	161	153
33	172	172	171	173	173	166	158
34	177	177	175	177	178	170	163
35	181	182	180	181	182	175	167
36	186	187	184	186	186	179	172
37	191	192	188	190	190	183	177
38	194	196	192	195	194	188	182
39	198	200	196	198	198	193	187
40	201	203	200	202	202	197	191

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 31 (°F)	TC # 32 (°F)	TC # 33 (°F)	TC # 34 (°F)	TC # 35 (°F)	TC # 36 (°F)	TC # 37 (°F)
41	205	206	203	205	205	201	195
42	207	209	205	207	207	205	199
43	210	211	208	209	209	207	204
44	212	212	209	211	210	210	207
45	213	213	210	212	211	211	210
46	214	214	211	212	212	212	211
47	214	214	212	213	212	213	212
48	215	215	213	213	213	214	212
49	216	215	214	214	214	214	212
50	217	216	215	215	215	215	213
51	218	217	216	216	216	217	213
52	220	218	218	218	217	219	213
53	221	219	219	219	219	220	213
54	223	221	221	221	221	222	214
55	225	223	223	223	222	223	214
56	227	225	225	225	224	225	215
57	229	226	226	227	226	227	215
58	231	228	228	230	228	229	216
59	234	230	230	232	231	232	217
60	237	233	232	235	234	234	218
Max Temp:	237	233	232	235	234	234	218
Max Allowed:	404	404	402	403	402	402	403

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 38 (°F)	TC # 39 (°F)	TC # 40 (°F)	TC # 41 (°F)	TC # 42 (°F)	TC # 43 (°F)	TC # 44 (°F)
0	78	77	77	78	78	77	78
1	78	77	77	78	78	77	78
2	78	77	77	78	78	78	78
3	78	77	77	78	78	78	78
4	78	77	77	78	78	78	78
5	78	77	77	78	78	78	78
6	78	78	78	78	82	78	78
7	78	78	78	78	90	78	78
8	79	79	79	79	96	79	79
9	79	80	80	80	100	81	80
10	80	82	81	82	104	82	81
11	81	84	83	84	109	85	83
12	82	86	86	87	115	88	86
13	84	89	88	89	121	91	88
14	85	92	91	92	127	95	91
15	87	95	95	96	133	99	94
16	89	99	98	99	138	103	98
17	92	102	102	103	143	107	102
18	94	106	105	107	147	111	106
19	97	110	109	111	152	116	110
20	100	114	114	116	156	120	114
21	104	119	118	120	160	124	118
22	108	123	123	125	163	129	123
23	111	128	127	130	165	133	127
24	115	132	132	134	167	137	131
25	119	137	137	138	167	141	136
26	123	142	142	142	165	145	140
27	127	146	146	146	164	149	144
28	131	151	151	150	165	152	148
29	135	155	155	154	166	156	152
30	139	160	159	158	168	159	157
31	143	164	164	162	171	163	161
32	147	168	168	166	173	167	165
33	151	173	172	170	176	171	169
34	155	177	176	174	179	175	174
35	159	181	180	178	182	179	178
36	163	185	184	183	186	183	182
37	167	189	188	187	189	187	186
38	172	193	192	191	192	190	190
39	176	197	195	195	196	194	194
40	180	200	199	199	199	198	198

Time (min)	TC # 38 (°F)	TC # 39 (°F)	TC # 40 (°F)	TC # 41 (°F)	TC # 42 (°F)	TC # 43 (°F)	TC # 44 (°F)
41	184	203	202	202	202	201	201
42	189	206	205	205	205	204	204
43	193	208	207	207	207	206	207
44	200	209	209	209	209	208	209
45	207	211	210	210	210	210	210
46	210	211	211	211	211	211	211
47	211	212	212	212	212	211	212
48	212	212	212	212	212	212	212
49	212	212	213	213	213	212	213
50	213	213	213	213	213	212	213
51	213	213	214	214	213	212	213
52	214	214	215	215	214	213	214
53	214	215	216	216	214	213	214
54	215	217	217	216	215	214	214
55	216	218	218	217	216	215	215
56	217	220	219	218	217	215	216
57	217	223	221	219	218	216	217
58	218	225	222	220	219	216	218
59	219	228	224	221	220	217	218
60	221	230	225	222	221	217	219
Max Temp:	221	230	225	222	221	217	219
Max Allowed:	403	402	402	403	403	402	403

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 45 (°F)	TC # 46 (°F)	TC # 47 (°F)	TC # 48 (°F)	TC # 49 (°F)	TC # 50 (°F)	TC # 51 (°F)
0	78	77	77	77	77	77	77
1	77	77	77	77	77	77	77
2	78	77	77	77	77	77	77
3	78	77	77	77	77	77	77
4	78	77	77	77	77	77	77
5	78	77	77	77	77	77	77
6	78	77	77	77	78	78	77
7	78	78	78	78	78	78	77
8	79	79	79	79	79	79	78
9	80	81	80	81	80	81	79
10	81	82	81	82	82	82	80
11	83	84	83	84	83	85	82
12	85	86	86	87	86	88	84
13	88	89	88	90	88	90	86
14	90	92	91	93	91	93	88
15	93	95	94	96	95	96	91
16	96	98	97	99	98	99	94
17	100	102	100	102	101	102	98
18	103	106	104	106	105	106	101
19	107	110	107	109	109	110	105
20	111	115	111	113	113	114	108
21	115	119	115	117	117	119	112
22	119	122	119	121	121	123	116
23	124	126	123	125	126	128	120
24	128	130	127	129	130	132	124
25	132	134	132	133	135	136	129
26	136	138	136	138	140	140	133
27	141	142	140	142	145	144	138
28	145	146	145	146	149	148	142
29	150	151	150	151	154	152	147
30	154	155	154	155	158	156	151
31	158	159	159	160	163	161	156
32	163	163	164	164	167	165	160
33	167	167	168	168	171	169	164
34	171	171	173	173	175	173	169
35	176	176	177	177	179	177	174
36	180	180	182	181	183	181	178
37	184	184	185	185	187	186	183
38	189	188	190	189	191	190	187
39	193	192	194	193	194	193	191
40	197	196	197	197	198	197	195

OMEGA POINT LABORATORIES

Time (min)	TC # 45 (°F)	TC # 46 (°F)	TC # 47 (°F)	TC # 48 (°F)	TC # 49 (°F)	TC # 50 (°F)	TC # 51 (°F)
41	200	200	201	200	201	201	199
42	204	203	204	203	204	204	203
43	206	206	207	206	207	207	206
44	208	208	208	208	209	209	208
45	210	209	210	210	210	210	210
46	211	210	211	210	211	211	211
47	212	211	211	211	212	212	211
48	212	211	212	211	212	212	212
49	212	212	212	212	212	213	212
50	212	212	212	212	213	213	213
51	213	212	212	212	213	214	213
52	213	212	213	212	214	215	214
53	214	213	214	212	215	216	214
54	214	213	214	213	217	217	215
55	214	214	215	213	218	219	217
56	215	214	217	214	220	220	218
57	216	215	219	214	223	222	219
58	216	216	221	216	225	224	221
59	217	217	223	217	228	226	223
60	218	218	225	218	231	229	225
Max Temp:	218	218	225	218	231	229	225
Max Allowed:	403	402	402	402	402	402	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 52 (°F)	TC # 53 (°F)	TC # 54 (°F)	TC # 55 (°F)	TC # 56 (°F)	TC # 57 (°F)	TC # 58 (°F)
0	77	78	77	77	77	78	78
1	77	78	77	77	77	78	78
2	77	78	77	77	77	78	78
3	77	78	77	77	77	78	78
4	77	78	78	77	77	78	78
5	77	78	78	77	77	78	78
6	77	78	78	78	78	78	78
7	78	78	78	78	78	78	79
8	78	79	79	79	79	78	79
9	79	80	80	79	80	79	80
10	80	81	81	81	81	80	82
11	82	82	83	82	84	82	84
12	84	84	85	84	87	84	86
13	86	86	87	87	91	86	88
14	88	88	90	89	94	88	91
15	91	91	92	92	97	90	94
16	94	94	95	95	100	93	97
17	97	97	99	98	104	95	100
18	100	100	102	102	108	97	104
19	104	104	105	105	111	100	108
20	108	107	109	109	115	103	112
21	111	111	113	113	119	106	116
22	116	115	117	118	122	111	120
23	120	119	121	122	126	114	125
24	124	124	125	126	130	117	129
25	128	128	129	131	134	120	133
26	133	133	132	135	137	123	138
27	137	138	137	139	141	127	142
28	141	142	141	143	145	131	146
29	146	147	145	147	148	134	151
30	150	151	149	151	152	138	155
31	155	156	154	155	156	142	159
32	159	160	158	159	160	146	164
33	164	165	163	164	164	150	168
34	169	170	168	168	168	154	173
35	173	175	172	172	172	158	177
36	178	180	177	176	176	162	182
37	182	184	182	181	181	167	186
38	187	189	188	185	184	171	190
39	191	193	192	190	186	175	194
40	195	196	196	194	188	179	198

OMEGA POINT LABORATORIES

Time (min)	TC # 52 (°F)	TC # 53 (°F)	TC # 54 (°F)	TC # 55 (°F)	TC # 56 (°F)	TC # 57 (°F)	TC # 58 (°F)
41	199	200	199	198	191	183	203
42	203	203	203	202	196	187	206
43	206	207	206	205	202	192	208
44	208	209	208	208	206	198	209
45	210	211	210	210	209	207	210
46	211	212	211	211	210	210	211
47	211	212	212	212	211	211	212
48	212	213	212	212	211	212	212
49	212	213	213	213	212	212	212
50	212	213	213	213	212	212	213
51	213	214	214	214	212	212	214
52	214	214	215	215	212	212	214
53	214	216	216	216	212	213	215
54	215	217	218	218	213	213	216
55	217	218	219	220	213	213	217
56	219	220	221	222	214	214	214
57	221	222	223	225	215	215	212
58	223	224	225	227	216	216	212
59	225	227	228	231	218	217	212
60	228	230	230	234	220	218	212
Max Temp:	228	230	230	234	220	218	217
Max Allowed:	402	403	402	402	402	403	403

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 59 (°F)	TC # 60 (°F)	TC # 61 (°F)	TC # 62 (°F)	TC # 63 (°F)	TC # 64 (°F)	TC # 65 (°F)
0	77	78	78	77	77	77	81
1	77	78	78	77	77	77	81
2	77	78	78	77	77	77	81
3	77	78	78	77	77	77	81
4	77	78	78	77	77	77	81
5	77	78	78	77	77	77	81
6	78	78	78	77	77	77	81
7	78	78	79	78	78	78	81
8	79	79	79	78	78	78	82
9	79	80	80	79	79	79	82
10	81	81	81	81	81	80	85
11	82	83	83	83	84	83	92
12	84	85	85	85	87	87	101
13	86	87	88	88	90	91	110
14	89	90	90	91	94	95	118
15	91	92	93	95	98	100	124
16	95	95	96	98	101	103	129
17	98	99	100	102	105	107	133
18	102	102	103	106	109	112	137
19	105	106	107	110	114	117	142
20	109	109	111	114	118	121	146
21	113	113	115	118	122	125	149
22	117	118	119	122	126	129	151
23	122	122	123	127	130	132	153
24	126	126	127	131	134	136	155
25	131	130	131	135	137	139	157
26	135	135	136	139	141	142	159
27	140	140	140	143	144	145	161
28	144	144	144	147	148	149	162
29	149	149	149	151	152	153	164
30	154	153	153	156	156	156	167
31	158	158	158	160	160	160	170
32	163	162	162	164	164	164	173
33	169	167	167	168	168	168	176
34	173	172	171	173	172	172	179
35	178	176	176	177	176	176	183
36	183	181	181	181	180	180	187
37	187	185	185	185	185	184	190
38	192	190	190	190	189	188	194
39	196	194	194	193	193	192	198
40	199	198	198	197	197	196	202

OMEGA POINT LABORATORIES

Time (min)	TC # 59 (°F)	TC # 60 (°F)	TC # 61 (°F)	TC # 62 (°F)	TC # 63 (°F)	TC # 64 (°F)	TC # 65 (°F)
41	202	201	202	201	201	200	205
42	205	205	205	204	204	203	208
43	207	207	207	207	207	206	210
44	209	209	209	209	209	208	212
45	211	211	211	210	210	210	214
46	212	212	212	211	211	211	215
47	212	212	212	212	211	211	215
48	212	213	213	212	212	212	215
49	213	213	213	212	212	212	216
50	214	214	214	213	212	212	216
51	214	214	214	213	213	213	216
52	215	215	214	214	214	213	217
53	216	215	215	214	214	214	217
54	217	215	215	214	216	214	218
55	217	217	216	215	217	215	219
56	218	218	216	215	218	216	219
57	217	219	217	216	219	217	220
58	217	220	218	217	221	217	221
59	216	221	219	218	222	219	222
60	218	221	220	219	224	220	223
Max Temp:	218	221	220	219	224	220	223
Max Allowed:	402	403	403	402	402	402	406

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 66 (°F)	TC # 67 (°F)	TC # 68 (°F)	TC # 69 (°F)	TC # 70 (°F)	TC # 71 (°F)	TC # 72 (°F)
0	81	81	81	82	82	81	81
1	81	81	81	82	82	81	81
2	81	81	81	82	82	81	81
3	81	81	81	82	82	81	81
4	81	81	81	82	82	82	81
5	81	81	81	82	82	82	81
6	81	81	81	82	82	82	81
7	81	81	81	82	82	82	81
8	82	82	82	83	82	82	82
9	85	82	83	84	83	82	82
10	98	84	84	85	84	83	83
11	131	90	85	86	85	84	84
12	158	102	87	88	87	86	86
13	170	111	90	90	89	88	87
14	174	117	93	93	91	90	89
15	172	121	97	96	94	92	92
16	168	124	101	99	97	94	94
17	167	126	105	102	100	97	97
18	171	129	109	106	103	100	100
19	176	134	113	110	106	103	103
20	176	138	117	114	110	107	107
21	174	141	122	118	114	110	110
22	172	143	126	122	117	114	114
23	170	145	130	126	122	118	118
24	168	147	134	131	126	122	122
25	167	149	138	135	131	127	127
26	166	151	142	139	136	131	131
27	166	153	146	144	141	136	136
28	166	156	150	148	146	141	141
29	166	158	154	153	152	147	146
30	168	162	159	157	157	152	151
31	170	165	163	162	162	158	156
32	173	169	167	166	167	163	162
33	176	172	171	171	172	168	167
34	180	176	176	176	176	173	172
35	183	181	180	181	180	177	177
36	187	185	184	185	185	182	182
37	191	189	189	190	189	186	186
38	194	193	193	194	193	191	191
39	198	197	198	198	197	195	195
40	202	200	201	202	201	199	199

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 66 (°F)	TC # 67 (°F)	TC # 68 (°F)	TC # 69 (°F)	TC # 70 (°F)	TC # 71 (°F)	TC # 72 (°F)
41	205	204	204	205	205	203	203
42	208	207	208	209	208	207	207
43	211	210	211	211	211	210	210
44	213	212	213	213	213	213	212
45	214	214	214	215	215	214	214
46	215	215	215	216	216	215	215
47	215	215	215	216	216	216	215
48	216	215	215	216	216	216	216
49	216	216	216	217	217	216	216
50	216	216	216	217	217	216	216
51	216	216	216	217	217	216	217
52	217	216	216	218	218	217	217
53	217	217	217	219	219	217	218
54	218	217	217	219	220	217	219
55	220	218	218	220	220	217	219
56	221	219	219	221	221	218	221
57	222	220	221	223	222	219	222
58	224	221	223	225	224	220	224
59	225	223	225	227	225	222	225
60	227	225	227	229	227	223	227
Max Temp:	227	225	227	229	227	223	227
Max Allowed:	406	406	406	407	407	406	406

OMEGA POINT LABORATORIES

Time (min)	TC # 73 (°F)	TC # 74 (°F)	TC # 75 (°F)	TC # 76 (°F)	TC # 77 (°F)	TC # 78 (°F)	TC # 79 (°F)
0	81	82	81	82	82	81	81
1	81	82	81	82	82	81	81
2	81	82	81	82	82	81	81
3	81	82	81	82	82	81	81
4	81	82	81	82	82	81	81
5	81	82	81	82	82	81	81
6	81	82	81	82	82	81	81
7	81	82	81	82	83	82	81
8	82	82	82	82	84	83	82
9	82	83	82	82	85	84	83
10	83	83	82	83	86	85	84
11	84	84	83	84	88	86	85
12	85	86	84	85	90	88	87
13	86	87	86	86	92	90	89
14	88	89	88	88	94	92	91
15	90	91	89	89	97	95	93
16	93	94	91	91	100	97	95
17	95	96	94	93	103	100	98
18	98	99	96	96	106	103	101
19	101	102	99	98	110	106	104
20	105	106	102	101	113	110	107
21	108	110	105	104	117	113	110
22	113	114	108	107	121	117	114
23	117	118	112	110	125	121	117
24	121	122	116	113	129	125	121
25	126	127	120	117	133	129	125
26	130	131	125	121	137	133	129
27	135	136	129	126	142	137	133
28	139	140	135	130	146	141	137
29	144	145	140	135	150	145	141
30	149	150	144	140	153	149	145
31	154	155	149	145	157	153	149
32	159	160	154	150	161	157	153
33	165	165	159	155	165	161	157
34	170	170	164	159	168	165	161
35	175	175	169	163	172	169	165
36	180	180	173	167	176	173	170
37	185	185	177	171	179	176	174
38	190	189	182	175	182	180	179
39	194	194	186	179	185	183	183
40	198	198	190	183	188	186	187

OMEGA POINT LABORATORIES

Time (min)	TC # 73 (°F)	TC # 74 (°F)	TC # 75 (°F)	TC # 76 (°F)	TC # 77 (°F)	TC # 78 (°F)	TC # 79 (°F)
41	203	202	195	187	191	189	191
42	206	206	200	191	194	192	194
43	209	210	205	195	196	194	196
44	212	212	210	202	199	197	199
45	214	214	212	211	201	199	201
46	215	215	214	214	203	201	204
47	215	216	214	215	205	203	205
48	216	216	215	216	207	205	207
49	216	216	215	216	208	207	209
50	216	217	215	216	210	208	210
51	216	217	215	216	209	209	211
52	217	218	215	216	210	210	211
53	217	219	216	216	212	211	211
54	217	220	215	217	213	212	213
55	218	222	216	217	214	213	214
56	219	224	216	217	214	214	215
57	221	225	216	217	215	215	216
58	223	228	216	218	216	215	217
59	225	230	217	219	217	216	218
60	227	232	218	219	218	217	221
Max Temp:	227	232	218	219	218	217	221
Max Allowed:	406	407	406	407	407	406	406

OMEGA POINT LABORATORIES

Time (min)	TC # 80 (°F)	TC # 81 (°F)	TC # 82 (°F)	TC # 83 (°F)	TC # 84 (°F)	TC # 85 (°F)	TC # 86 (°F)
0	80	81	81	81	81	82	81
1	80	81	81	81	81	82	81
2	80	81	82	81	81	82	81
3	80	81	82	81	81	82	81
4	80	81	82	81	81	82	81
5	80	81	82	81	81	82	81
6	81	82	82	82	82	82	82
7	81	82	82	83	83	82	82
8	82	83	83	84	84	83	82
9	82	84	84	86	85	84	83
10	84	85	86	87	87	86	84
11	85	86	87	91	89	87	86
12	87	88	89	96	93	89	87
13	88	90	91	104	96	91	89
14	91	92	93	113	99	94	91
15	93	94	96	121	102	96	94
16	95	97	99	128	106	99	96
17	98	99	102	134	109	101	98
18	101	102	106	141	113	104	101
19	104	105	109	147	116	107	104
20	107	108	113	154	120	110	107
21	110	112	117	161	124	113	110
22	113	115	121	167	127	117	113
23	117	119	125	173	132	121	116
24	120	123	129	177	136	124	119
25	125	127	133	181	140	128	123
26	129	130	137	185	144	131	126
27	133	135	141	188	147	135	130
28	136	138	145	191	151	139	133
29	140	143	149	193	155	142	137
30	144	147	153	195	159	146	140
31	149	151	157	198	162	149	144
32	153	155	162	200	166	153	148
33	157	159	166	202	170	157	152
34	161	163	170	204	176	161	156
35	165	168	174	205	180	165	159
36	169	172	178	206	183	168	163
37	173	176	181	207	186	171	167
38	177	179	185	207	190	175	170
39	181	183	187	207	194	179	174
40	184	186	190	207	198	182	177

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 80 (°F)	TC # 81 (°F)	TC # 82 (°F)	TC # 83 (°F)	TC # 84 (°F)	TC # 85 (°F)	TC # 86 (°F)
41	187	189	193	208	198	186	181
42	191	192	195	208	201	189	184
43	194	195	198	209	203	192	187
44	197	198	200	210	204	195	191
45	199	200	201	210	206	198	194
46	201	202	203	211	207	201	197
47	203	204	205	212	208	203	200
48	205	205	206	213	210	205	202
49	207	207	208	213	211	208	205
50	208	208	210	214	212	210	207
51	210	210	211	214	214	212	209
52	211	212	213	215	216	214	212
53	212	213	215	215	219	217	214
54	212	214	217	216	222	219	217
55	213	216	220	216	225	223	220
56	215	217	223	217	228	227	224
57	216	219	226	218	231	231	228
58	218	223	229	219	234	234	231
59	222	225	232	220	237	238	235
60	224	228	235	222	240	242	239
Max Temp:	224	228	235	222	240	242	239
Max Allowed:	405	406	406	406	406	407	406

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 87 (°F)	TC # 88 (°F)	TC # 89 (°F)	TC # 90 (°F)	TC # 91 (°F)	TC # 92 (°F)	TC # 93 (°F)
0	81	81	82	82	81	82	82
1	81	81	82	82	81	82	82
2	81	81	82	82	81	82	82
3	81	81	82	82	81	82	82
4	81	81	82	82	81	82	82
5	81	81	82	82	81	82	83
6	81	81	82	82	82	82	83
7	82	81	82	82	82	82	83
8	82	82	83	83	82	83	84
9	83	83	84	84	83	84	84
10	84	84	85	85	84	85	85
11	86	85	86	86	86	86	86
12	87	86	87	87	87	87	87
13	89	88	89	89	88	89	89
14	91	90	91	91	90	91	90
15	93	92	93	93	92	93	92
16	96	94	95	95	95	95	94
17	98	97	97	97	97	98	96
18	101	99	100	100	99	100	98
19	104	102	102	102	102	103	101
20	106	104	105	105	104	105	103
21	109	107	108	108	107	108	105
22	113	110	110	111	110	110	108
23	116	113	114	114	113	113	110
24	119	117	117	116	115	116	113
25	123	120	120	120	118	118	116
26	126	124	123	123	122	122	119
27	130	128	126	126	125	124	122
28	134	132	130	129	128	127	125
29	138	135	133	133	131	131	128
30	141	139	137	136	135	135	131
31	145	143	141	139	138	138	135
32	149	147	144	143	142	142	138
33	153	151	148	147	145	146	142
34	157	155	152	150	149	149	145
35	160	158	155	154	152	153	149
36	163	161	159	157	156	157	152
37	166	165	162	161	159	160	156
38	169	168	166	164	163	164	160
39	172	171	169	168	167	168	163
40	176	175	173	172	171	172	167

OMEGA POINT LABORATORIES

Time (min)	TC # 87 (°F)	TC # 88 (°F)	TC # 89 (°F)	TC # 90 (°F)	TC # 91 (°F)	TC # 92 (°F)	TC # 93 (°F)
41	179	178	177	176	174	176	171
42	182	181	180	180	178	179	175
43	185	185	184	183	182	183	179
44	189	188	188	187	186	186	183
45	192	191	191	190	190	190	187
46	195	194	194	193	193	193	190
47	198	198	197	196	196	196	194
48	202	201	200	199	199	199	197
49	205	203	203	202	203	203	201
50	207	205	206	205	205	206	204
51	209	208	208	208	208	208	208
52	211	210	211	210	210	212	210
53	213	212	213	213	213	214	213
54	216	214	216	216	215	217	215
55	218	215	219	218	217	219	216
56	222	217	221	221	220	223	218
57	225	220	225	224	224	226	221
58	228	223	227	227	228	229	224
59	231	225	231	231	231	233	227
60	235	228	234	234	235	236	230
Max Temp:	235	228	234	234	235	236	230
Max Allowed:	406	406	407	407	406	407	407

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 94 (°F)	TC # 95 (°F)	TC # 96 (°F)	TC # 97 (°F)	TC # 98 (°F)	TC # 99 (°F)	TC # 100 (°F)
0	82	81	81	82	83	83	82
1	82	81	81	82	83	83	82
2	82	81	81	82	83	83	82
3	82	81	81	82	83	83	82
4	82	81	81	83	83	83	83
5	82	81	81	83	83	83	83
6	82	82	82	83	83	83	83
7	82	82	82	83	84	83	83
8	83	82	83	84	84	84	84
9	84	83	85	85	85	84	85
10	84	84	86	86	86	85	86
11	86	85	88	88	88	86	87
12	87	86	90	89	90	88	89
13	88	87	93	91	91	90	91
14	90	89	96	94	93	92	93
15	92	90	99	96	96	94	96
16	94	92	102	99	98	97	99
17	96	93	105	102	101	99	102
18	98	95	109	105	104	102	105
19	100	97	112	109	107	105	108
20	102	99	116	113	111	108	111
21	104	101	120	116	114	112	115
22	106	104	124	120	118	116	119
23	109	106	128	124	122	119	123
24	111	109	132	128	126	124	127
25	114	111	136	132	130	128	131
26	117	114	140	137	134	132	135
27	120	117	144	142	138	137	140
28	123	120	148	146	143	141	145
29	126	123	152	151	147	146	149
30	129	126	156	155	151	150	154
31	133	129	160	160	156	154	158
32	136	132	163	164	160	159	162
33	139	136	167	168	165	164	167
34	143	139	171	172	169	169	171
35	147	143	174	176	173	174	176
36	150	146	178	179	178	180	180
37	154	150	186	183	182	183	185
38	158	154	189	186	186	187	189
39	162	156	192	190	189	192	193
40	165	159	195	195	192	197	196

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 94 (°F)	TC # 95 (°F)	TC # 96 (°F)	TC # 97 (°F)	TC # 98 (°F)	TC # 99 (°F)	TC # 100 (°F)
41	169	163	198	198	196	201	199
42	173	167	200	201	199	207	202
43	176	170	203	205	202	210	204
44	180	173	206	207	205	213	207
45	183	176	208	209	207	215	209
46	187	180	209	212	209	216	212
47	190	187	211	214	212	217	213
48	194	190	212	215	213	217	214
49	197	194	213	216	215	217	215
50	201	199	214	217	216	218	216
51	204	203	214	217	217	218	216
52	208	207	215	218	217	218	217
53	211	210	215	219	218	219	218
54	213	213	216	221	219	219	219
55	214	214	216	223	219	220	220
56	215	217	216	225	220	221	222
57	216	220	217	227	221	222	224
58	216	222	218	229	223	224	226
59	217	224	219	232	225	226	228
60	219	226	221	234	227	227	230
Max Temp:	219	226	221	234	227	227	230
Max Allowed:	407	406	406	407	408	408	407

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 101 (°F)	TC # 102 (°F)	TC # 103 (°F)	TC # 104 (°F)	TC # 105 (°F)	TC # 106 (°F)
0	82	82	82	82	83	83
1	82	82	82	82	83	83
2	82	82	82	82	83	83
3	82	82	82	82	83	83
4	82	82	82	82	83	83
5	83	82	82	82	83	83
6	83	83	82	82	83	83
7	83	83	83	82	83	84
8	84	84	83	83	84	84
9	86	85	84	83	84	84
10	87	86	86	84	85	85
11	89	90	89	85	86	87
12	91	94	93	87	88	88
13	93	99	97	89	89	90
14	96	104	101	91	91	92
15	99	108	106	94	94	95
16	103	112	109	97	97	98
17	106	116	113	100	99	100
18	109	121	118	103	102	104
19	113	126	122	107	106	107
20	117	131	127	110	109	111
21	121	135	132	114	113	114
22	125	139	136	118	116	118
23	129	143	140	122	120	121
24	133	146	142	125	123	125
25	137	149	145	129	127	129
26	140	152	147	132	130	132
27	144	154	149	135	134	136
28	148	157	153	139	137	139
29	152	160	157	142	141	143
30	156	163	161	146	144	146
31	161	166	165	150	148	150
32	169	170	169	154	151	153
33	175	173	174	158	155	157
34	179	177	178	162	160	160
35	183	181	181	166	164	164
36	187	185	184	170	168	167
37	191	189	187	174	172	171
38	195	192	189	178	176	175
39	197	195	192	181	179	178
40	200	198	194	185	183	182

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 101 (°F)	TC # 102 (°F)	TC # 103 (°F)	TC # 104 (°F)	TC # 105 (°F)	TC # 106 (°F)
41	202	200	197	188	187	185
42	204	203	199	191	190	188
43	206	205	202	194	193	191
44	208	207	204	197	197	194
45	210	210	206	200	199	197
46	211	212	208	203	202	200
47	213	214	210	205	205	202
48	214	214	212	208	207	205
49	215	214	214	210	209	207
50	216	214	215	212	212	210
51	217	214	217	214	214	212
52	218	215	218	215	215	214
53	219	217	220	216	217	216
54	220	218	223	217	218	217
55	223	220	225	219	219	219
56	225	222	227	221	221	222
57	227	224	229	223	224	224
58	229	226	231	225	227	226
59	232	229	233	227	230	228
60	234	231	235	230	232	231
Max Temp:	234	231	235	230	232	231
Max Allowed:	407	407	407	407	408	408

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 107 (°F)	TC # 108 (°F)	TC # 109 (°F)	TC # 110 (°F)	TC # 111 (°F)	TC # 112 (°F)
0	82	82	83	82	82	82
1	82	82	83	82	82	82
2	82	82	83	82	82	82
3	82	82	83	82	82	82
4	82	82	83	82	82	82
5	83	82	83	82	82	82
6	83	83	83	82	82	82
7	83	83	83	82	82	82
8	83	83	84	82	83	82
9	84	84	84	83	83	83
10	84	85	85	84	84	83
11	86	86	86	85	86	84
12	87	88	88	87	87	86
13	89	89	90	89	89	88
14	92	91	92	91	91	90
15	95	94	94	93	93	92
16	98	96	96	96	96	94
17	101	99	98	98	98	96
18	104	102	101	100	100	99
19	108	105	104	103	103	101
20	112	108	106	106	106	104
21	116	111	109	109	108	106
22	119	115	113	112	111	108
23	123	118	116	116	114	111
24	126	122	119	119	117	113
25	130	126	123	122	120	116
26	134	129	126	125	123	119
27	137	133	130	128	127	122
28	141	136	133	132	130	125
29	144	140	137	135	133	128
30	147	144	141	138	136	131
31	151	149	145	142	139	135
32	154	153	149	145	143	138
33	158	157	153	149	146	141
34	161	161	156	152	150	145
35	165	165	160	156	153	148
36	169	169	164	159	157	152
37	172	172	168	163	160	156
38	175	176	172	167	164	162
39	179	180	175	171	168	166
40	182	183	179	174	171	170

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 107 (°F)	TC # 108 (°F)	TC # 109 (°F)	TC # 110 (°F)	TC # 111 (°F)	TC # 112 (°F)
41	185	187	182	178	175	174
42	188	190	186	182	179	178
43	191	193	189	185	183	183
44	194	196	192	189	187	187
45	197	198	195	192	190	190
46	200	201	198	195	193	195
47	202	203	201	198	196	197
48	205	206	203	201	199	200
49	207	208	206	204	202	203
50	209	210	209	206	205	206
51	212	212	211	209	208	208
52	213	213	213	211	210	210
53	214	215	214	212	212	212
54	216	216	216	214	214	213
55	217	218	218	216	216	214
56	218	221	220	218	218	215
57	219	224	223	220	221	216
58	221	227	226	223	223	218
59	223	229	229	225	226	220
60	226	231	232	228	228	222
Max Temp:	226	231	232	228	228	222
Max Allowed:	407	407	408	407	407	407

OMEGA POINT LABORATORIES

Time (min)	TC # 113 (°F)	TC # 114 (°F)	TC # 115 (°F)	TC # 116 (°F)	TC # 117 (°F)	TC # 118 (°F)
0	82	82	81	81	82	81
1	82	82	81	81	82	81
2	82	82	81	81	82	81
3	82	82	81	81	82	81
4	82	82	82	81	82	81
5	82	82	82	81	82	81
6	82	82	83	82	82	81
7	82	82	84	82	82	82
8	82	82	85	82	83	82
9	83	83	87	83	83	83
10	84	84	89	85	84	83
11	85	84	91	86	86	84
12	86	85	93	88	87	86
13	87	87	96	90	89	88
14	89	88	99	92	90	90
15	90	89	102	94	93	91
16	92	91	106	97	95	94
17	94	92	109	100	97	97
18	96	94	113	103	100	99
19	98	96	117	106	103	102
20	100	98	121	110	107	106
21	102	101	125	113	110	109
22	104	103	130	117	114	112
23	107	106	134	121	117	116
24	109	108	138	125	121	120
25	112	110	142	129	126	124
26	115	113	146	134	130	128
27	118	116	150	138	134	132
28	120	118	154	142	139	136
29	124	121	158	146	143	141
30	127	124	161	150	148	145
31	130	127	163	154	152	149
32	133	131	166	158	156	153
33	136	134	169	161	160	157
34	140	137	171	165	165	162
35	143	140	173	168	169	165
36	147	144	176	171	172	169
37	150	147	178	175	176	173
38	154	151	180	178	180	177
39	158	155	183	181	183	180
40	161	159	186	185	186	184

OMEGA POINT LABORATORIES

Time (min)	TC # 113 (°F)	TC # 114 (°F)	TC # 115 (°F)	TC # 116 (°F)	TC # 117 (°F)	TC # 118 (°F)
41	165	163	189	188	189	187
42	169	168	191	191	192	190
43	173	172	194	194	195	193
44	176	176	197	196	198	196
45	180	180	199	199	200	199
46	184	185	201	201	202	201
47	188	189	203	203	204	203
48	191	192	205	205	206	205
49	195	196	206	206	208	206
50	199	199	208	208	210	208
51	202	203	209	209	211	209
52	206	206	210	210	213	211
53	209	209	212	212	214	212
54	210	211	213	213	215	214
55	212	213	214	214	216	215
56	213	214	215	215	217	217
57	214	215	216	217	219	218
58	215	217	217	218	220	219
59	216	218	218	219	221	221
60	216	222	219	221	222	222
Max Temp:	216	222	219	221	222	222
Max Allowed:	407	407	406	406	407	406

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 119 (°F)	TC # 120 (°F)	TC # 121 (°F)	TC # 122 (°F)	TC # 123 (°F)	TC # 124 (°F)
0	81	81	82	82	82	82
1	81	81	82	82	82	82
2	81	81	82	82	82	82
3	81	81	82	82	82	82
4	81	81	82	82	82	82
5	81	81	82	82	82	82
6	81	81	82	82	82	82
7	82	82	83	82	82	82
8	82	82	83	83	82	82
9	82	82	84	84	83	83
10	83	83	84	84	84	84
11	84	84	86	86	84	84
12	86	86	87	87	86	86
13	87	87	89	89	87	87
14	90	90	92	91	89	88
15	92	92	95	93	90	90
16	95	95	97	95	92	92
17	98	98	100	98	94	94
18	101	101	103	101	97	96
19	105	104	106	104	99	99
20	108	108	110	107	102	101
21	112	111	113	110	106	104
22	115	115	117	114	109	107
23	119	119	121	117	112	110
24	123	123	125	121	116	113
25	127	127	128	125	119	117
26	131	131	132	128	123	120
27	135	135	136	132	126	124
28	139	140	140	135	130	127
29	143	144	144	139	134	131
30	147	148	147	143	138	135
31	151	152	151	147	142	139
32	155	156	155	151	146	143
33	159	160	159	154	150	147
34	163	164	163	158	154	151
35	167	168	167	162	158	155
36	171	172	171	165	162	159
37	175	175	176	169	165	163
38	178	179	179	173	169	167
39	182	182	183	176	173	171
40	185	185	185	180	177	175

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 119 (°F)	TC # 120 (°F)	TC # 121 (°F)	TC # 122 (°F)	TC # 123 (°F)	TC # 124 (°F)
41	189	189	189	183	181	179
42	192	192	192	187	185	183
43	195	194	195	190	187	186
44	197	197	198	193	190	189
45	199	200	200	195	193	192
46	201	202	202	198	196	195
47	204	204	204	200	198	198
48	206	206	206	202	201	201
49	207	208	208	205	203	203
50	209	210	209	207	205	206
51	211	212	210	209	208	208
52	212	214	212	212	210	210
53	214	215	213	214	212	212
54	215	217	214	216	214	214
55	216	218	216	217	215	215
56	217	219	216	219	217	217
57	219	221	217	221	220	219
58	220	222	218	222	222	221
59	221	224	219	224	223	223
60	223	225	221	225	225	224
Max Temp:	223	225	221	225	225	224
Max Allowed:	406	406	407	407	407	407

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 125 (°F)	TC # 126 (°F)	TC # 127 (°F)	TC # 128 (°F)	TC # 129 (°F)	TC # 130 (°F)
0	82	82	81	82	77	78
1	83	82	81	82	77	78
2	82	82	81	82	77	78
3	82	82	81	82	77	78
4	82	82	81	82	77	78
5	83	82	81	82	77	78
6	83	82	81	82	78	78
7	83	82	82	82	78	78
8	83	82	82	82	78	79
9	84	83	82	82	78	79
10	84	84	83	83	79	79
11	85	84	84	84	80	80
12	86	85	85	85	81	81
13	88	87	86	86	82	82
14	89	88	88	88	83	83
15	91	90	89	89	85	85
16	92	91	91	91	86	86
17	94	93	93	93	88	88
18	97	95	95	95	90	90
19	99	97	97	97	92	92
20	101	100	100	99	95	95
21	104	102	102	102	97	97
22	107	105	105	105	100	100
23	110	108	108	108	103	102
24	113	111	111	111	106	105
25	116	114	114	114	109	108
26	120	118	118	117	112	111
27	123	121	121	120	115	115
28	127	125	125	124	119	118
29	131	129	128	127	122	122
30	135	133	132	131	126	125
31	138	137	136	135	129	129
32	143	141	140	139	133	133
33	147	145	144	143	137	136
34	151	149	148	147	141	140
35	155	153	151	151	145	144
36	159	157	155	154	149	148
37	163	161	159	158	153	152
38	167	165	163	162	156	156
39	171	169	167	166	160	160
40	174	172	170	170	164	164

OMEGA POINT LABORATORIES

Time (min)	TC # 125 (°F)	TC # 126 (°F)	TC # 127 (°F)	TC # 128 (°F)	TC # 129 (°F)	TC # 130 (°F)
41	178	176	174	174	168	168
42	182	180	178	177	172	172
43	185	183	181	181	176	176
44	189	187	185	185	180	179
45	192	190	189	188	183	183
46	195	193	192	192	187	187
47	198	196	195	196	190	190
48	201	199	198	199	194	194
49	203	202	202	202	197	197
50	206	205	204	205	200	201
51	208	207	207	207	203	203
52	210	209	209	210	205	205
53	212	211	211	211	207	207
54	214	213	213	213	208	209
55	216	214	214	214	210	210
56	217	215	216	216	212	211
57	219	217	218	219	214	213
58	221	218	220	221	216	215
59	223	220	222	223	218	217
60	225	222	224	225	220	218
Max Temp:	225	222	224	225	220	218
Max Allowed:	407	407	406	407	402	403

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 131 (°F)	TC # 132 (°F)	TC # 133 (°F)	TC # 134 (°F)	TC # 135 (°F)	TC # 136 (°F)
0	78	78	78	78	78	78
1	78	78	78	78	78	78
2	78	78	78	78	78	78
3	78	78	78	78	78	78
4	78	78	78	78	78	78
5	78	78	78	79	78	78
6	78	78	78	79	78	78
7	78	78	78	80	79	79
8	79	78	78	81	79	79
9	79	79	79	82	80	80
10	79	79	79	84	81	80
11	80	79	79	86	82	82
12	81	80	80	88	84	83
13	81	81	81	90	86	85
14	82	82	81	93	88	87
15	84	83	82	96	91	89
16	85	84	83	99	93	92
17	86	85	85	102	96	94
18	88	87	86	106	99	97
19	90	89	88	109	103	101
20	92	91	91	113	106	104
21	95	93	94	117	110	108
22	97	96	97	121	114	112
23	100	99	100	126	118	116
24	103	102	103	130	122	120
25	106	105	106	134	126	124
26	109	108	109	138	130	128
27	113	111	112	142	135	133
28	116	114	115	146	139	137
29	120	117	119	150	143	142
30	123	121	122	153	147	146
31	127	124	125	155	151	150
32	130	128	128	158	154	154
33	134	131	131	161	158	158
34	138	135	135	163	162	162
35	142	138	138	166	165	165
36	145	142	141	169	168	169
37	149	146	144	172	172	172
38	153	149	148	175	175	176
39	157	153	151	178	178	179
40	161	157	155	181	181	182

OMEGA POINT LABORATORIES

Time (min)	TC # 131 (°F)	TC # 132 (°F)	TC # 133 (°F)	TC # 134 (°F)	TC # 135 (°F)	TC # 136 (°F)
41	165	161	159	185	184	185
42	169	165	163	187	187	188
43	174	169	167	190	190	191
44	178	172	171	193	193	194
45	181	176	174	196	195	196
46	185	180	178	198	198	198
47	189	184	182	199	199	200
48	192	188	186	201	201	202
49	197	193	190	203	203	204
50	200	197	194	204	204	205
51	203	200	198	205	205	207
52	205	203	201	207	207	208
53	207	206	204	208	208	209
54	208	207	207	209	209	210
55	210	208	208	210	210	212
56	211	209	209	211	211	213
57	211	210	210	212	212	214
58	212	210	210	212	213	215
59	214	211	211	213	214	216
60	215	211	212	214	216	218
Max Temp:	215	211	212	214	216	218
Max Allowed:	403	403	403	403	403	403

OMEGA POINT LABORATORIES

Time (min)	TC # 137 (°F)	TC # 138 (°F)	TC # 139 (°F)	TC # 140 (°F)	TC # 141 (°F)	TC # 142 (°F)
0	78	78	78	78	78	77
1	78	78	78	78	78	77
2	78	78	78	78	78	77
3	78	78	78	78	78	77
4	78	78	78	78	78	77
5	78	78	78	78	78	77
6	78	78	78	78	78	77
7	78	78	79	79	78	77
8	78	79	79	79	78	78
9	79	79	80	79	79	78
10	80	80	80	80	80	79
11	81	81	81	81	81	80
12	82	82	83	83	82	81
13	84	84	85	85	84	82
14	86	86	87	87	86	84
15	88	88	89	90	88	86
16	91	91	92	93	90	88
17	93	93	94	96	93	90
18	96	96	97	99	95	92
19	99	100	100	102	99	95
20	103	103	104	106	102	97
21	106	107	107	110	105	100
22	110	111	111	114	109	103
23	114	115	115	118	112	106
24	118	119	119	122	116	110
25	122	124	123	126	120	113
26	126	128	127	130	124	117
27	131	132	131	134	127	121
28	135	136	136	138	131	125
29	139	140	140	142	135	129
30	144	145	144	145	139	133
31	148	149	148	149	143	137
32	152	153	152	153	147	141
33	156	156	156	156	151	145
34	160	160	160	160	154	149
35	164	164	163	163	158	154
36	167	167	167	167	162	158
37	171	171	171	171	166	162
38	174	174	174	174	170	166
39	178	178	178	178	173	170
40	181	181	181	181	177	174

OMEGA POINT LABORATORIES

Time (min)	TC # 137 (°F)	TC # 138 (°F)	TC # 139 (°F)	TC # 140 (°F)	TC # 141 (°F)	TC # 142 (°F)
41	184	184	184	184	180	177
42	187	187	187	187	183	181
43	190	190	190	190	186	184
44	192	193	193	193	189	187
45	195	195	195	195	192	190
46	197	198	197	198	194	192
47	199	199	199	199	197	195
48	201	201	201	201	199	197
49	203	203	203	203	201	199
50	204	205	204	204	203	201
51	206	206	206	206	205	204
52	208	208	208	207	206	205
53	209	209	209	209	208	207
54	211	211	210	210	210	209
55	212	212	211	211	211	210
56	214	214	213	212	213	212
57	215	215	214	213	215	213
58	216	216	215	214	216	214
59	218	217	217	216	218	216
60	219	219	218	217	219	218
Max Temp:	219	219	218	217	219	218
Max Allowed:	403	403	403	403	403	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 143 (°F)	TC # 144 (°F)	TC # 145 (°F)	TC # 146 (°F)	TC # 147 (°F)	TC # 148 (°F)
0	78	77	77	78	78	78
1	78	77	78	78	78	78
2	78	77	77	78	78	78
3	78	77	78	78	78	78
4	78	77	78	78	78	78
5	78	77	78	78	78	78
6	78	78	78	78	78	78
7	78	78	78	78	78	78
8	78	78	78	78	79	78
9	79	79	79	79	79	79
10	79	79	79	79	80	79
11	80	80	80	80	80	80
12	81	81	81	81	81	81
13	82	82	82	82	82	82
14	83	84	84	83	84	83
15	85	85	85	85	85	85
16	87	87	87	87	87	87
17	89	89	89	89	89	88
18	91	91	91	91	91	90
19	94	93	93	93	93	93
20	96	96	96	96	96	95
21	99	98	98	98	98	97
22	102	101	101	101	101	100
23	105	104	104	104	104	103
24	108	107	107	107	107	106
25	111	111	110	110	110	109
26	115	114	114	114	113	112
27	119	117	117	117	117	116
28	122	121	121	121	121	119
29	126	125	125	125	124	123
30	130	129	129	129	128	127
31	135	133	133	133	132	130
32	139	137	137	136	136	134
33	143	141	141	140	140	138
34	147	145	145	144	143	142
35	152	150	149	148	147	145
36	156	154	153	152	151	149
37	160	158	157	156	155	153
38	164	162	161	160	159	157
39	169	167	165	163	163	161
40	172	171	169	167	167	165

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 143 (°F)	TC # 144 (°F)	TC # 145 (°F)	TC # 146 (°F)	TC # 147 (°F)	TC # 148 (°F)
41	176	175	173	171	171	169
42	180	178	176	175	175	173
43	183	182	180	179	178	177
44	187	185	184	182	182	180
45	189	189	187	186	185	184
46	192	191	190	189	189	188
47	195	194	193	192	192	191
48	197	197	196	196	196	195
49	199	199	199	198	199	198
50	201	201	201	201	201	201
51	204	203	203	203	203	203
52	206	205	206	205	206	205
53	207	207	207	207	207	207
54	209	209	209	209	209	209
55	210	210	210	210	210	210
56	212	212	211	211	211	211
57	213	213	212	212	212	212
58	214	215	213	213	214	213
59	216	216	214	215	215	214
60	217	218	216	216	217	216
Max Temp:	217	218	216	216	217	216
Max Allowed:	403	402	402	403	403	403

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 149 (°F)	TC # 150 (°F)	TC # 151 (°F)	TC # 152 (°F)	TC # 153 (°F)	TC # 154 (°F)
0	84	78	78	78	79	78
1	85	78	78	78	79	79
2	85	78	78	78	79	79
3	85	78	78	78	79	79
4	85	78	78	78	79	80
5	85	78	78	78	79	81
6	85	78	78	78	80	81
7	85	78	78	78	80	82
8	85	78	78	78	81	83
9	86	79	79	78	83	84
10	86	79	79	79	84	86
11	86	80	79	79	86	88
12	86	80	80	80	88	91
13	86	81	81	80	90	94
14	86	82	82	81	93	97
15	86	84	83	82	95	100
16	86	85	84	84	98	102
17	86	87	85	85	100	105
18	86	89	87	86	103	109
19	86	91	88	88	106	112
20	86	93	90	90	109	115
21	86	95	92	92	112	119
22	86	98	95	95	115	122
23	86	101	97	97	118	126
24	87	104	100	100	121	129
25	87	107	103	103	125	133
26	87	110	106	106	128	137
27	87	113	109	109	132	141
28	87	117	112	112	135	145
29	87	120	116	115	139	149
30	87	124	119	119	143	154
31	87	127	123	122	147	158
32	87	131	126	126	152	163
33	88	135	130	129	156	168
34	88	139	134	133	161	172
35	88	143	137	136	165	176
36	88	147	141	140	169	180
37	88	150	145	143	174	183
38	88	154	149	147	178	187
39	88	158	153	151	182	190
40	88	162	156	155	186	192

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 149 (°F)	TC # 150 (°F)	TC # 151 (°F)	TC # 152 (°F)	TC # 153 (°F)	TC # 154 (°F)
41	88	166	161	159	190	195
42	88	170	165	164	193	197
43	88	174	169	168	196	199
44	88	178	173	172	198	201
45	88	182	177	176	200	203
46	88	186	181	180	202	205
47	88	189	185	184	204	206
48	88	193	189	188	206	208
49	87	197	193	192	208	209
50	88	200	197	196	209	211
51	87	203	201	200	210	212
52	87	205	203	203	212	214
53	87	207	206	206	212	216
54	87	208	207	207	213	218
55	87	209	208	209	213	221
56	87	210	209	209	214	223
57	87	211	210	210	216	226
58	87	212	210	211	217	229
59	87	213	211	211	221	232
60	88	214	211	212	223	235
Max Temp:	88	214	211	212	223	235
Max Allowed:	409	403	403	403	404	403

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 155 (°F)	TC # 156 (°F)	TC # 157 (°F)	TC # 158 (°F)	TC # 159 (°F)	TC # 160 (°F)
0	78	78	79	78	78	78
1	79	78	79	78	78	78
2	78	78	79	78	78	78
3	79	78	79	78	78	78
4	79	78	79	78	78	78
5	79	79	79	78	78	78
6	79	79	79	78	78	79
7	80	79	79	79	79	83
8	81	80	80	79	80	85
9	82	81	81	80	81	85
10	84	82	82	81	82	85
11	85	84	84	83	86	86
12	87	86	85	85	89	88
13	89	88	87	88	92	91
14	92	90	90	90	95	93
15	94	93	92	93	98	96
16	97	95	95	95	102	99
17	100	98	98	99	105	102
18	104	101	101	101	109	105
19	107	104	104	104	112	108
20	110	108	107	108	114	113
21	113	111	110	111	117	116
22	116	115	113	114	120	119
23	120	119	117	118	123	123
24	123	124	121	121	126	126
25	127	128	125	125	130	130
26	131	133	129	129	134	133
27	135	137	133	133	138	137
28	140	142	138	137	142	141
29	144	146	142	141	146	145
30	149	150	146	146	150	149
31	154	154	150	150	154	153
32	158	158	154	154	158	157
33	162	162	158	158	162	161
34	167	165	162	162	166	166
35	170	169	166	166	169	169
36	174	172	170	170	173	173
37	177	175	173	174	177	177
38	180	178	176	177	180	181
39	183	181	180	181	183	185
40	186	183	183	184	186	187

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 155 (°F)	TC # 156 (°F)	TC # 157 (°F)	TC # 158 (°F)	TC # 159 (°F)	TC # 160 (°F)
41	189	186	187	187	189	190
42	192	189	189	189	192	193
43	194	191	192	191	194	196
44	196	194	194	194	197	198
45	199	196	197	196	199	200
46	201	199	199	198	202	203
47	203	201	201	201	204	205
48	205	203	203	203	206	206
49	207	206	206	205	208	208
50	208	209	208	208	210	209
51	211	212	212	211	212	211
52	215	215	215	214	215	213
53	218	219	218	217	218	215
54	222	222	222	220	221	217
55	225	226	225	223	223	219
56	228	229	228	226	226	221
57	231	233	232	230	229	224
58	234	236	235	233	232	227
59	238	239	239	236	235	230
60	241	243	242	240	239	233
Max Temp:	241	243	242	240	239	233
Max Allowed:	403	403	404	403	403	403

OMEGA POINT LABORATORIES

Time (min)	TC # 161 (°F)	TC # 162 (°F)	TC # 163 (°F)	TC # 164 (°F)	TC # 165 (°F)	TC # 166 (°F)
0	81	81	81	81	82	82
1	81	81	81	81	82	82
2	81	81	81	81	82	82
3	81	81	81	81	82	82
4	81	81	81	81	82	82
5	81	81	81	81	82	82
6	81	82	81	81	82	82
7	82	82	82	81	83	83
8	82	82	82	82	83	83
9	83	83	83	82	84	84
10	84	84	84	83	85	86
11	86	86	85	84	86	88
12	87	87	87	86	87	90
13	90	89	89	87	89	92
14	92	91	91	89	90	93
15	95	94	93	91	92	96
16	97	97	96	94	94	98
17	100	101	99	96	96	100
18	103	104	102	99	99	103
19	106	108	106	102	102	106
20	110	112	109	105	105	109
21	113	116	113	108	108	111
22	117	120	117	111	111	114
23	121	123	120	115	114	117
24	125	127	124	118	118	120
25	129	132	129	122	122	124
26	133	136	133	126	126	127
27	137	140	137	130	131	130
28	142	145	141	134	136	134
29	146	149	145	138	140	137
30	152	154	149	142	144	141
31	155	158	153	146	148	145
32	159	168	156	149	148	148
33	163	170	160	153	153	152
34	168	174	164	156	157	156
35	172	178	167	160	160	160
36	176	181	171	163	165	164
37	181	185	176	167	166	168
38	185	188	179	170	169	173
39	189	191	181	173	173	177
40	192	194	183	176	179	182

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 161 (°F)	TC # 162 (°F)	TC # 163 (°F)	TC # 164 (°F)	TC # 165 (°F)	TC # 166 (°F)
41	195	195	185	178	182	185
42	198	197	187	181	186	189
43	200	199	189	184	188	193
44	202	201	191	187	191	198
45	204	203	193	189	194	202
46	206	204	195	192	196	205
47	208	205	197	194	199	207
48	209	207	199	196	201	209
49	211	207	201	199	203	211
50	212	208	203	201	206	213
51	213	209	205	203	208	214
52	214	210	207	206	211	215
53	215	211	209	208	213	216
54	216	213	212	211	215	217
55	217	214	214	213	216	217
56	219	216	216	215	217	217
57	221	218	219	217	219	218
58	223	220	221	219	221	219
59	226	223	223	221	223	219
60	229	225	226	224	225	220
Max Temp:	229	225	226	224	225	220
Max Allowed:	406	406	406	406	407	407

OMEGA POINT LABORATORIES

Time (min)	TC # 167 (°F)	TC # 168 (°F)	TC # 169 (°F)	TC # 170 (°F)	TC # 171 (°F)	TC # 172 (°F)
0	82	82	81	82	81	82
1	82	82	81	82	81	82
2	82	82	81	82	81	82
3	82	82	81	82	81	82
4	82	82	81	82	81	82
5	82	82	82	82	82	82
6	82	82	82	83	82	82
7	83	83	82	84	82	82
8	83	83	83	85	83	82
9	84	84	83	86	84	83
10	85	85	84	88	85	84
11	87	86	86	89	86	85
12	88	88	87	91	87	86
13	90	89	89	93	89	87
14	92	91	91	95	91	88
15	94	93	93	97	92	90
16	96	95	94	99	94	91
17	98	97	97	101	96	93
18	100	100	99	103	98	95
19	104	102	101	106	100	97
20	106	105	104	108	102	99
21	109	108	107	111	104	101
22	112	111	110	114	106	103
23	116	114	113	117	108	105
24	119	117	116	119	111	107
25	122	120	119	122	113	110
26	126	123	122	124	115	112
27	128	126	125	127	118	115
28	131	129	128	130	120	117
29	134	133	131	132	123	121
30	138	136	134	135	125	124
31	141	140	137	137	128	127
32	144	143	140	140	132	130
33	148	146	144	143	135	133
34	152	150	147	146	138	136
35	156	153	151	149	140	138
36	160	156	154	152	144	142
37	163	160	157	158	147	144
38	167	163	161	161	149	147
39	171	167	165	164	152	150
40	175	171	168	167	155	153

Time (min)	TC # 167 (°F)	TC # 168 (°F)	TC # 169 (°F)	TC # 170 (°F)	TC # 171 (°F)	TC # 172 (°F)
41	179	175	172	170	158	156
42	183	178	175	172	160	159
43	187	182	179	175	162	162
44	190	186	182	178	164	165
45	194	189	186	180	167	168
46	198	192	189	183	170	171
47	201	196	191	186	172	173
48	204	199	194	189	175	176
49	207	202	197	191	178	179
50	210	204	200	194	180	182
51	212	207	203	197	182	185
52	214	209	206	199	184	188
53	215	212	208	201	186	191
54	216	213	210	203	188	193
55	217	215	212	206	190	196
56	217	216	214	208	192	198
57	217	217	215	209	195	201
58	218	217	216	211	197	203
59	218	218	216	212	199	205
60	219	218	216	214	200	207
Max Temp:	219	218	216	214	200	207
Max Allowed:	407	407	406	407	406	407

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 173 (°F)	TC # 174 (°F)	TC # 175 (°F)	TC # 176 (°F)	TC # 177 (°F)	TC # 178 (°F)
0	82	82	82	82	81	81
1	82	82	82	82	81	81
2	83	82	82	82	81	81
3	83	82	82	82	81	81
4	82	82	82	82	81	81
5	83	82	82	82	81	81
6	83	82	82	82	81	81
7	83	83	82	82	81	82
8	84	83	82	82	82	82
9	84	84	83	83	82	83
10	85	84	83	84	83	84
11	86	85	84	85	84	85
12	87	86	85	86	85	86
13	88	88	86	87	86	88
14	90	89	88	88	88	89
15	91	91	89	90	90	91
16	93	92	91	92	91	93
17	95	94	93	94	93	95
18	97	96	95	96	95	97
19	99	98	97	98	97	99
20	101	100	99	100	99	102
21	103	103	101	102	102	104
22	105	105	104	105	104	107
23	108	108	106	107	107	109
24	110	110	109	110	109	111
25	112	113	111	112	111	114
26	115	115	114	115	115	117
27	117	118	117	117	117	119
28	120	121	119	120	120	122
29	123	124	122	123	123	125
30	126	127	125	126	125	127
31	128	129	127	128	128	130
32	131	132	130	131	131	133
33	134	135	133	134	133	136
34	137	138	136	137	136	138
35	140	141	139	140	139	141
36	143	144	142	143	142	145
37	146	147	145	145	145	147
38	149	150	148	148	148	150
39	152	153	151	151	151	153
40	155	156	154	154	154	156

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 173 (°F)	TC # 174 (°F)	TC # 175 (°F)	TC # 176 (°F)	TC # 177 (°F)	TC # 178 (°F)
41	158	159	157	157	157	158
42	161	162	160	160	160	162
43	164	165	163	163	163	165
44	167	168	167	167	167	168
45	170	171	170	170	170	171
46	173	174	173	173	173	174
47	176	177	176	176	176	177
48	179	180	179	179	179	180
49	182	183	181	182	182	183
50	185	186	184	185	185	186
51	188	189	187	188	188	189
52	191	192	190	191	191	192
53	194	195	193	193	194	195
54	196	198	196	196	196	198
55	199	200	198	199	199	200
56	201	203	200	201	201	203
57	204	205	203	204	204	205
58	206	207	205	206	206	207
59	208	209	207	208	208	209
60	210	212	209	210	211	211
Max Temp:	210	212	209	210	211	211
Max Allowed:	407	407	407	407	406	406

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 179 (°F)	TC # 180 (°F)	TC # 181 (°F)	TC # 182 (°F)	TC # 183 (°F)	TC # 184 (°F)
0	80	80	82	81	81	81
1	80	80	82	81	81	81
2	80	80	82	81	81	81
3	80	80	82	81	81	81
4	80	80	82	81	81	81
5	80	80	82	81	81	81
6	81	81	82	82	81	81
7	81	81	82	82	81	82
8	81	81	82	82	82	82
9	82	81	83	82	82	82
10	83	82	83	83	82	82
11	84	83	84	84	83	83
12	85	84	85	84	84	84
13	87	85	86	85	85	85
14	88	86	87	87	86	86
15	90	88	89	88	87	87
16	92	89	90	89	88	88
17	94	91	92	91	90	89
18	96	93	93	93	91	91
19	98	95	95	94	93	93
20	100	97	97	96	95	94
21	103	99	99	98	97	96
22	105	102	102	100	99	98
23	107	104	104	103	101	100
24	110	106	106	105	103	102
25	113	109	108	107	106	105
26	115	111	111	110	108	107
27	118	114	113	112	110	109
28	120	117	116	115	113	112
29	123	119	118	117	115	114
30	126	122	121	120	118	117
31	128	124	124	122	121	120
32	131	127	126	125	124	122
33	133	130	129	128	126	125
34	136	133	132	131	129	127
35	139	135	135	133	132	130
36	142	138	137	139	135	133
37	145	141	140	142	138	136
38	147	144	143	144	141	139
39	151	147	146	147	144	142
40	154	150	149	150	146	145

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 179 (°F)	TC # 180 (°F)	TC # 181 (°F)	TC # 182 (°F)	TC # 183 (°F)	TC # 184 (°F)
41	157	153	152	153	150	149
42	160	156	155	156	153	152
43	163	160	158	159	156	156
44	166	163	162	162	160	159
45	170	166	166	166	163	163
46	176	169	169	169	166	166
47	177	172	172	172	169	169
48	180	175	175	176	173	172
49	183	178	178	179	176	176
50	186	182	181	182	180	179
51	189	185	185	185	183	182
52	192	188	188	188	186	186
53	194	191	191	190	189	189
54	197	194	194	193	192	192
55	200	197	196	196	195	194
56	202	199	199	199	198	197
57	205	202	202	201	200	200
58	207	204	204	204	202	202
59	209	207	206	206	205	204
60	211	209	208	208	207	207
Max Temp:	211	209	208	208	207	207
Max Allowed:	405	405	407	406	406	406

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 185 (°F)	TC # 186 (°F)	TC # 187 (°F)	TC # 188 (°F)	TC # 189 (°F)	TC # 190 (°F)
0	81	81	81	81	82	82
1	81	81	80	81	82	82
2	81	81	81	81	82	82
3	81	81	81	81	82	82
4	81	81	81	81	82	82
5	81	81	81	81	82	82
6	81	81	81	81	83	82
7	81	81	81	81	83	82
8	82	82	81	81	83	83
9	82	82	81	82	84	83
10	82	82	82	82	84	83
11	83	83	82	83	85	84
12	84	84	83	83	85	84
13	85	85	84	84	86	84
14	86	86	84	85	87	85
15	87	87	86	86	88	86
16	88	88	87	87	89	86
17	90	89	88	88	90	87
18	91	91	89	89	91	88
19	93	92	91	90	92	89
20	95	94	92	92	94	90
21	97	96	94	94	95	91
22	99	98	96	95	97	92
23	101	100	98	97	99	94
24	103	102	100	100	100	95
25	105	104	102	102	102	97
26	108	106	104	104	104	98
27	110	108	106	107	106	100
28	113	111	109	109	108	101
29	115	113	111	111	110	103
30	117	115	113	113	112	104
31	120	118	116	116	114	106
32	123	120	118	118	116	108
33	125	123	121	120	118	110
34	128	126	124	123	121	112
35	131	129	126	126	124	115
36	134	131	129	128	126	117
37	137	134	132	131	129	119
38	140	137	135	134	131	122
39	142	140	138	137	134	126
40	145	143	141	140	137	128

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 185 (°F)	TC # 186 (°F)	TC # 187 (°F)	TC # 188 (°F)	TC # 189 (°F)	TC # 190 (°F)
41	149	146	144	143	140	131
42	153	149	147	146	143	133
43	157	153	150	149	146	136
44	160	156	153	152	150	138
45	163	159	157	155	153	140
46	166	163	160	158	156	144
47	169	166	163	162	159	146
48	173	169	167	165	162	150
49	176	173	170	168	165	154
50	180	176	174	172	169	157
51	183	180	177	175	172	160
52	186	183	181	178	175	163
53	189	186	184	181	178	166
54	192	189	187	184	181	169
55	194	192	191	188	183	171
56	197	195	194	191	186	174
57	200	198	197	194	189	177
58	202	201	199	197	191	179
59	205	203	202	199	194	181
60	207	206	204	202	196	183
Max Temp:	207	206	204	202	196	183
Max Allowed:	406	406	406	406	407	407

OMEGA POINT LABORATORIES

Time (min)	TC # 191 (°F)	TC # 192 (°F)	TC # 193 (°F)	TC # 194 (°F)	TC # 195 (°F)	TC # 196 (°F)
0	82	82	81	81	81	81
1	82	82	81	81	81	81
2	82	82	81	81	81	81
3	82	82	81	82	81	81
4	82	82	81	82	82	81
5	82	82	81	82	82	81
6	82	82	82	82	82	81
7	82	82	82	82	83	82
8	82	83	83	83	83	82
9	83	84	84	84	84	83
10	84	84	85	85	85	84
11	84	85	86	86	87	85
12	86	86	87	87	88	87
13	87	88	88	89	90	88
14	88	89	90	91	91	90
15	89	91	92	92	93	92
16	91	93	94	94	95	94
17	93	94	96	96	98	96
18	94	97	98	99	100	98
19	96	99	100	101	102	100
20	98	101	102	103	104	102
21	100	103	105	106	107	104
22	102	106	108	109	109	107
23	105	108	110	111	112	109
24	107	111	113	114	115	112
25	109	113	116	117	118	115
26	112	116	118	120	120	118
27	114	118	121	123	123	120
28	117	121	124	126	126	123
29	119	124	126	129	128	126
30	122	126	129	132	131	128
31	124	129	132	135	134	131
32	127	132	135	138	136	134
33	129	135	138	140	139	136
34	132	137	140	143	142	139
35	135	140	143	146	144	142
36	138	143	146	148	147	145
37	141	145	149	151	149	148
38	144	148	151	154	152	151
39	147	151	154	157	155	154
40	150	154	157	160	158	157

Time (min)	TC # 191 (°F)	TC # 192 (°F)	TC # 193 (°F)	TC # 194 (°F)	TC # 195 (°F)	TC # 196 (°F)
41	153	158	160	163	161	160
42	157	161	164	165	164	163
43	160	164	167	168	167	167
44	163	167	171	171	170	170
45	167	171	174	174	173	172
46	170	174	177	177	176	176
47	173	177	180	180	179	179
48	177	180	182	182	182	182
49	180	182	185	185	184	186
50	183	185	187	188	187	190
51	187	188	190	190	190	193
52	190	191	193	193	193	196
53	192	194	195	196	195	199
54	195	197	198	198	198	202
55	198	199	200	200	200	202
56	200	201	202	203	203	205
57	202	203	204	205	205	207
58	204	206	206	207	207	209
59	206	208	208	210	210	211
60	208	209	210	212	212	213
Max Temp:	208	209	210	212	212	213
Max Allowed:	407	407	406	406	406	406

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 197 (°F)	TC # 198 (°F)	TC # 199 (°F)	TC # 200 (°F)	TC # 201 (°F)	TC # 202 (°F)
0	81	81	81	81	81	81
1	81	81	81	81	81	81
2	81	81	81	81	81	81
3	81	81	81	81	81	81
4	81	81	81	81	81	81
5	81	81	81	81	81	81
6	82	82	81	81	81	81
7	82	82	81	81	82	82
8	83	83	82	82	82	82
9	84	84	83	82	82	82
10	85	84	83	83	83	83
11	86	86	84	84	84	83
12	87	87	86	85	85	84
13	89	88	87	87	86	85
14	90	90	89	88	88	86
15	92	92	90	90	89	88
16	94	94	92	92	91	89
17	96	96	94	94	93	91
18	98	98	97	96	94	92
19	100	100	99	98	97	94
20	102	102	101	100	99	96
21	105	105	103	102	101	98
22	108	107	106	104	103	100
23	110	110	108	107	105	103
24	113	112	111	109	108	105
25	115	115	113	111	110	107
26	118	117	116	114	113	110
27	120	120	118	116	115	113
28	124	123	121	119	118	115
29	127	125	123	121	120	118
30	129	128	126	124	123	120
31	133	131	129	127	126	123
32	135	133	131	130	128	126
33	138	136	134	133	131	128
34	141	139	137	135	134	131
35	144	142	140	138	136	134
36	147	144	143	141	139	136
37	151	147	146	144	142	139
38	154	150	149	147	144	142
39	157	153	151	149	147	145
40	160	156	154	153	150	148

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 197 (°F)	TC # 198 (°F)	TC # 199 (°F)	TC # 200 (°F)	TC # 201 (°F)	TC # 202 (°F)
41	164	159	158	156	153	151
42	167	162	161	159	156	154
43	170	165	164	162	159	157
44	173	169	167	165	162	160
45	177	172	170	168	166	163
46	180	175	173	171	169	166
47	183	178	176	174	172	169
48	186	181	179	178	176	173
49	189	184	182	181	179	176
50	192	187	185	184	183	179
51	195	191	188	187	187	182
52	198	194	192	191	190	185
53	202	197	195	194	193	189
54	205	200	198	197	196	192
55	208	203	200	199	198	195
56	218	205	203	202	201	197
57	225	208	206	205	204	200
58	222	210	208	207	206	203
59	224	212	211	209	209	205
60	224	214	213	211	211	207
Max Temp:	225	214	213	211	211	207
Max Allowed:	406	406	406	406	406	406

OMEGA POINT LABORATORIES

Time (min)	TC # 203 (°F)	TC # 204 (°F)	TC # 205 (°F)	TC # 206 (°F)	TC # 207 (°F)	TC # 208 (°F)
0	81	81	81	81	81	81
1	81	81	81	81	81	81
2	81	82	81	81	81	81
3	81	82	81	81	81	81
4	81	82	81	81	81	81
5	81	82	81	81	81	81
6	82	82	81	81	81	81
7	82	82	82	81	81	81
8	82	82	82	81	81	81
9	82	83	82	81	82	82
10	83	83	83	82	82	82
11	84	84	84	83	82	83
12	84	85	84	83	83	83
13	85	86	85	84	84	84
14	87	88	87	85	85	85
15	88	89	88	86	86	86
16	89	91	89	88	87	87
17	91	92	90	89	88	88
18	92	94	92	90	89	89
19	94	96	94	92	91	90
20	96	98	96	93	92	91
21	98	100	97	95	94	93
22	100	102	99	97	95	94
23	102	104	101	99	97	96
24	105	106	104	101	99	97
25	107	108	106	103	101	99
26	109	111	108	105	103	101
27	112	113	110	108	105	103
28	115	116	113	110	108	105
29	117	118	115	113	110	107
30	120	121	117	115	112	109
31	122	123	120	118	115	111
32	125	126	122	120	117	113
33	127	128	125	123	120	116
34	130	131	128	126	122	118
35	133	134	130	128	124	120
36	136	137	133	131	127	122
37	138	139	136	134	130	125
38	141	142	139	136	133	127
39	144	145	142	139	135	130
40	147	148	145	143	138	133

Time (min)	TC # 203 (°F)	TC # 204 (°F)	TC # 205 (°F)	TC # 206 (°F)	TC # 207 (°F)	TC # 208 (°F)
41	150	151	148	147	141	136
42	153	154	152	150	145	138
43	157	157	155	153	148	142
44	160	161	158	156	151	145
45	163	164	161	159	154	148
46	166	167	165	162	158	151
47	169	170	168	166	161	154
48	172	173	171	169	164	158
49	175	176	174	172	168	161
50	178	180	178	176	171	164
51	182	183	181	179	174	168
52	185	186	184	182	178	171
53	188	189	188	185	181	174
54	191	192	191	189	185	177
55	194	195	194	192	188	180
56	197	198	197	195	191	183
57	200	201	199	198	194	186
58	202	204	202	201	196	188
59	205	206	205	203	199	190
60	207	208	207	206	202	193
Max Temp:	207	208	207	206	202	193
Max Allowed:	406	406	406	406	406	406

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Time (min)	TC # 209 (°F)	TC # 210 (°F)	TC # 211 (°F)	TC # 212 (°F)	TC # 213 (°F)	TC # 214 (°F)
0	80	80	80	79	81	80
1	80	80	80	79	81	81
2	80	80	80	79	81	81
3	80	80	80	79	81	81
4	80	80	80	79	81	81
5	80	80	80	79	81	81
6	80	81	80	80	81	81
7	80	81	81	80	82	81
8	80	82	81	81	82	82
9	80	83	82	81	83	82
10	81	84	84	82	84	83
11	81	86	85	84	86	84
12	81	88	87	85	87	86
13	82	90	89	87	89	88
14	82	92	91	89	91	89
15	83	94	93	91	93	91
16	84	97	96	93	95	94
17	85	99	99	96	98	96
18	86	102	102	99	100	99
19	87	105	105	101	103	101
20	88	108	108	104	106	104
21	89	111	111	107	109	107
22	90	113	114	110	111	109
23	91	116	117	113	115	113
24	92	119	120	117	118	116
25	94	122	123	120	121	119
26	95	125	126	123	124	122
27	97	127	129	126	128	126
28	98	130	132	129	132	129
29	100	133	135	133	136	133
30	102	136	138	136	140	136
31	104	140	142	139	144	140
32	105	143	145	143	147	144
33	107	146	149	147	151	147
34	109	149	153	150	155	152
35	112	152	156	154	160	156
36	114	155	160	159	164	161
37	116	159	164	163	168	166
38	118	162	168	167	172	170
39	121	166	171	172	177	175
40	123	170	176	176	181	179

OMEGA POINT LABORATORIES

Time (min)	TC # 209 (°F)	TC # 210 (°F)	TC # 211 (°F)	TC # 212 (°F)	TC # 213 (°F)	TC # 214 (°F)
41	126	174	180	181	185	183
42	129	178	184	185	189	187
43	132	182	188	190	193	191
44	135	186	192	194	197	195
45	138	189	196	198	200	198
46	141	193	200	202	203	202
47	144	197	204	205	207	205
48	147	201	208	208	209	208
49	150	204	210	210	211	210
50	154	207	212	212	213	212
51	157	210	213	212	214	214
52	160	211	214	213	215	214
53	162	212	214	213	216	215
54	165	213	214	214	216	216
55	167	214	214	214	216	217
56	170	215	215	215	217	218
57	173	215	215	216	218	219
58	175	216	216	218	220	221
59	177	216	217	219	222	223
60	179	217	219	221	224	224
Max Temp:	179	217	219	221	224	224
Max Allowed:	405	405	405	404	406	405

Time (min)	TC # 215 (°F)	TC # 216 (°F)	TC # 217 (°F)	TC # 218 (°F)	TC # 219 (°F)	TC # 220 (°F)
0	80	80	80	80	80	80
1	80	80	80	80	80	80
2	80	80	80	80	80	80
3	81	80	80	80	80	80
4	81	81	80	80	80	80
5	80	81	80	80	80	80
6	81	81	80	80	80	80
7	81	81	81	81	80	81
8	81	81	81	81	81	81
9	82	82	82	82	82	82
10	83	83	83	83	82	83
11	84	84	85	84	84	84
12	85	86	86	86	85	85
13	87	87	88	88	87	87
14	88	89	91	90	89	88
15	90	91	93	92	91	90
16	93	94	96	95	93	93
17	95	96	99	97	96	95
18	98	99	101	100	98	97
19	100	102	104	103	101	100
20	103	105	107	106	104	103
21	106	108	110	109	107	106
22	109	111	113	112	110	109
23	112	114	117	115	113	112
24	115	117	120	118	116	115
25	118	120	124	122	120	119
26	121	124	127	125	123	122
27	124	127	131	128	126	126
28	127	130	135	132	130	129
29	131	134	138	135	133	133
30	134	137	142	139	136	136
31	138	141	145	142	140	140
32	143	144	149	146	144	144
33	147	148	153	150	148	148
34	151	152	157	155	151	152
35	156	156	161	159	155	156
36	162	161	165	163	159	159
37	167	165	169	167	163	163
38	171	170	173	171	167	167
39	176	176	177	174	170	171
40	181	181	181	178	174	175

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Time (min)	TC # 215 (°F)	TC # 216 (°F)	TC # 217 (°F)	TC # 218 (°F)	TC # 219 (°F)	TC # 220 (°F)
41	185	185	185	181	178	179
42	189	190	189	185	182	182
43	193	194	193	188	186	186
44	197	198	196	192	190	190
45	201	201	199	195	193	193
46	205	205	202	199	197	196
47	207	208	205	202	201	199
48	210	210	207	205	204	202
49	212	212	209	207	207	204
50	213	213	211	210	209	207
51	214	214	212	211	211	208
52	214	214	213	213	212	210
53	215	215	214	214	213	212
54	215	215	215	215	214	213
55	216	216	216	216	215	214
56	217	217	217	217	216	215
57	219	219	218	218	217	216
58	220	220	220	220	218	217
59	222	222	222	221	220	218
60	223	223	223	223	221	219
Max Temp:	223	223	223	223	221	219
Max Allowed:	405	405	405	405	405	405

OMEGA POINT LABORATORIES

Time (min)	TC # 221 (°F)	TC # 222 (°F)	TC # 223 (°F)	TC # 224 (°F)	TC # 225 (°F)	TC # 226 (°F)
0	82	81	81	81	82	82
1	82	81	81	81	82	82
2	82	81	81	81	82	82
3	82	81	81	81	82	82
4	82	81	81	81	82	82
5	82	81	81	81	82	82
6	82	81	81	81	82	82
7	82	81	81	81	82	82
8	82	82	82	82	82	82
9	83	82	82	82	82	83
10	84	83	83	83	83	84
11	85	84	84	84	84	84
12	87	86	86	85	85	85
13	88	87	87	86	86	86
14	90	89	89	88	88	88
15	92	91	91	89	89	89
16	94	93	93	91	91	90
17	96	95	95	93	93	92
18	99	98	98	95	95	94
19	101	100	100	98	97	95
20	104	103	103	100	99	97
21	107	106	106	102	101	100
22	109	108	109	105	103	102
23	113	111	112	108	106	104
24	116	115	115	110	108	107
25	119	118	119	113	111	109
26	123	122	123	116	113	112
27	127	125	127	120	116	114
28	131	129	131	123	119	117
29	135	133	134	126	122	119
30	139	137	138	130	125	122
31	142	140	142	133	128	125
32	146	144	145	137	131	127
33	150	148	149	140	135	130
34	153	151	152	144	138	133
35	157	155	156	148	141	136
36	161	159	160	151	145	139
37	165	162	163	155	148	142
38	169	166	167	159	152	144
39	172	170	171	163	156	149
40	176	173	175	167	160	153

OMEGA POINT LABORATORIES

Time (min)	TC # 221 (°F)	TC # 222 (°F)	TC # 223 (°F)	TC # 224 (°F)	TC # 225 (°F)	TC # 226 (°F)
41	180	177	179	171	164	156
42	183	180	182	174	167	159
43	186	183	186	178	171	163
44	189	187	189	182	175	166
45	192	190	192	185	179	169
46	196	193	196	189	182	172
47	199	196	198	192	186	176
48	201	199	201	195	189	179
49	204	202	203	198	192	182
50	207	205	206	201	195	185
51	210	208	208	204	198	188
52	212	210	210	206	201	191
53	214	212	211	209	203	193
54	215	213	213	211	205	196
55	216	215	214	212	207	198
56	217	215	214	214	209	200
57	217	216	215	214	211	202
58	218	217	216	215	212	204
59	219	218	217	216	213	206
60	220	219	217	216	214	208
Max Temp:	220	219	217	216	214	208
Max Allowed:	407	406	406	406	407	407

OMEGA POINT LABORATORIES

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Time (min)	TC # 227 (°F)	TC # 228 (°F)	TC # 229 (°F)	TC # 230 (°F)	TC # 231 (°F)	TC # 232 (°F)
0	82	82	83	83	82	82
1	82	82	83	83	82	82
2	82	82	83	83	82	82
3	82	82	83	83	82	82
4	82	82	83	83	82	82
5	82	82	83	83	82	82
6	82	82	83	83	82	82
7	82	82	84	83	83	83
8	83	82	84	84	83	83
9	83	82	85	84	84	84
10	84	83	86	85	85	85
11	85	83	87	87	86	86
12	86	84	88	88	88	88
13	87	85	89	90	89	89
14	89	86	91	91	91	91
15	90	87	93	93	93	93
16	91	88	95	95	95	95
17	93	89	97	98	97	98
18	95	90	99	100	100	100
19	97	91	101	103	102	103
20	99	93	103	105	105	105
21	101	95	106	108	108	108
22	103	96	108	111	110	111
23	105	98	111	113	113	114
24	107	100	113	116	116	117
25	110	102	116	119	119	120
26	112	104	119	122	122	124
27	115	106	122	125	126	127
28	117	108	125	128	129	130
29	119	109	128	131	132	133
30	122	111	131	134	135	136
31	124	114	134	137	139	140
32	126	116	137	140	143	144
33	128	118	140	144	146	148
34	131	120	143	147	150	152
35	133	122	147	151	154	156
36	136	125	150	155	158	160
37	139	128	153	158	162	164
38	141	130	156	162	166	168
39	144	133	159	165	170	172
40	147	136	162	168	174	176

OMEGA POINT LABORATORIES

Time (min)	TC # 227 (°F)	TC # 228 (°F)	TC # 229 (°F)	TC # 230 (°F)	TC # 231 (°F)	TC # 232 (°F)
41	151	138	165	172	178	181
42	154	141	168	175	182	185
43	157	144	171	179	186	189
44	160	147	174	182	190	194
45	163	149	176	186	194	198
46	166	152	179	190	199	203
47	169	155	183	193	203	207
48	172	157	186	198	207	210
49	176	160	189	202	210	212
50	179	163	193	206	212	214
51	181	166	196	209	214	216
52	184	169	199	211	215	217
53	187	172	203	213	216	218
54	189	174	205	214	217	219
55	191	177	208	215	218	220
56	194	180	210	216	219	221
57	196	182	212	217	219	222
58	198	184	213	218	221	224
59	200	186	214	219	222	226
60	202	189	215	220	224	228
Max Temp:	202	189	215	220	224	228
Max Allowed:	407	407	408	408	407	407

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 233 (°F)	TC # 234 (°F)	TC # 235 (°F)	TC # 236 (°F)	TC # 237 (°F)	TC # 238 (°F)
0	82	82	82	82	82	82
1	82	82	82	82	82	82
2	82	82	82	82	82	82
3	82	82	82	82	82	82
4	82	82	82	82	82	82
5	82	82	82	82	82	82
6	82	82	82	82	82	82
7	82	82	82	82	82	82
8	83	83	83	83	83	82
9	84	84	84	84	83	83
10	85	85	85	84	84	83
11	86	86	86	86	85	84
12	88	88	88	87	86	85
13	89	90	90	89	87	87
14	91	92	92	91	89	88
15	93	94	94	93	91	90
16	95	96	97	95	93	91
17	98	99	99	97	95	93
18	100	101	101	100	97	95
19	103	104	104	102	99	98
20	106	106	107	105	102	100
21	108	109	109	107	104	102
22	111	112	112	110	106	105
23	114	115	115	112	109	107
24	117	118	118	115	112	110
25	120	121	121	118	114	112
26	124	124	124	121	117	115
27	127	127	127	124	120	118
28	130	131	131	128	123	121
29	133	135	136	131	126	124
30	137	139	140	135	130	127
31	140	143	144	139	133	130
32	144	147	148	143	137	133
33	148	151	152	147	141	137
34	153	155	156	151	144	140
35	156	159	160	155	148	144
36	161	163	164	159	152	147
37	165	167	168	163	155	151
38	168	171	172	167	159	154
39	172	175	176	171	163	158
40	177	179	180	174	167	161

OMEGA POINT LABORATORIES

Time (min)	TC # 233 (°F)	TC # 234 (°F)	TC # 235 (°F)	TC # 236 (°F)	TC # 237 (°F)	TC # 238 (°F)
41	181	183	184	178	170	165
42	185	187	188	182	174	168
43	190	192	192	185	177	171
44	194	196	196	189	181	175
45	199	200	199	192	184	178
46	203	203	202	196	187	181
47	207	207	205	199	189	184
48	210	210	208	201	192	187
49	212	212	210	204	195	190
50	214	214	212	206	198	193
51	215	215	213	208	201	196
52	216	216	215	210	203	198
53	218	217	216	212	205	201
54	219	218	217	213	208	203
55	220	219	218	215	209	206
56	221	221	219	216	211	208
57	223	222	221	218	213	211
58	224	224	222	219	215	213
59	226	226	224	221	217	215
60	228	228	226	223	219	217
Max Temp:	228	228	226	223	219	217
Max Allowed:	407	407	407	407	407	407

OMEGA POINT LABORATORIES

Time (min)	TC # 239 (°F)	TC # 240 (°F)	TC # 241 (°F)	TC # 242 (°F)	TC # 243 (°F)	TC # 244 (°F)
0	81	81	81	82	81	81
1	81	81	81	82	81	81
2	81	81	81	82	81	81
3	81	81	81	82	81	81
4	81	81	81	82	81	81
5	81	81	81	82	81	81
6	81	81	82	82	81	81
7	82	81	82	82	82	82
8	82	82	82	82	82	82
9	82	82	82	82	82	82
10	82	82	83	83	83	83
11	83	83	83	84	83	84
12	84	84	84	85	84	84
13	86	85	85	86	86	86
14	87	86	87	87	87	87
15	88	88	88	89	88	88
16	90	89	90	90	90	90
17	92	91	91	92	91	91
18	94	93	93	94	93	93
19	96	95	95	96	95	95
20	98	97	97	99	98	97
21	100	99	100	101	100	100
22	102	101	102	103	102	102
23	105	104	104	105	104	104
24	107	106	107	108	107	107
25	110	109	109	110	109	109
26	112	111	112	113	112	112
27	115	114	114	115	114	114
28	118	117	117	118	117	117
29	121	119	120	120	120	119
30	124	122	122	123	122	122
31	127	125	125	126	125	125
32	130	128	128	128	127	127
33	133	131	131	131	130	130
34	136	134	134	134	133	133
35	139	137	137	137	136	136
36	143	140	140	140	139	139
37	146	143	144	143	142	142
38	149	147	147	146	145	145
39	153	150	150	150	148	147
40	156	153	154	153	151	151

OMEGA POINT LABORATORIES

Time (min)	TC # 239 (°F)	TC # 240 (°F)	TC # 241 (°F)	TC # 242 (°F)	TC # 243 (°F)	TC # 244 (°F)
41	160	157	157	156	154	154
42	163	160	161	159	157	157
43	166	164	164	162	160	160
44	170	168	167	165	163	163
45	173	171	171	169	167	166
46	176	174	174	172	170	169
47	180	178	177	175	173	172
48	183	181	180	178	176	175
49	186	184	183	181	180	178
50	189	187	187	185	183	181
51	192	190	190	188	186	184
52	195	193	193	191	189	187
53	198	196	196	194	192	190
54	200	199	199	198	195	193
55	203	202	201	201	198	196
56	205	205	204	204	201	199
57	208	207	207	207	204	201
58	211	210	209	209	206	204
59	213	212	211	211	208	206
60	215	214	213	213	211	208
Max Temp:	215	214	213	213	211	208
Max Allowed:	406	406	406	407	406	406

OMEGA POINT LABORATORIES

Time (min)	TC # 245 (°F)	TC # 246 (°F)	TC # 247 (°F)	TC # 248 (°F)	TC # 249 (°F)	TC # 250 (°F)
0	83	82	82	82	82	82
1	83	82	82	82	82	82
2	83	82	82	82	83	82
3	83	82	82	82	83	82
4	83	82	82	82	83	82
5	83	82	82	83	83	82
6	83	82	82	83	83	82
7	83	83	83	83	83	83
8	84	83	83	83	83	83
9	84	84	83	84	84	83
10	85	85	84	84	84	84
11	86	86	84	85	85	84
12	87	87	85	86	86	86
13	88	88	86	88	87	87
14	89	90	88	89	89	88
15	91	91	90	90	90	89
16	92	93	91	92	92	91
17	94	95	92	93	93	93
18	96	97	94	95	95	95
19	98	99	95	97	97	97
20	100	100	97	99	99	99
21	102	102	99	101	102	101
22	104	105	101	103	104	103
23	106	107	103	105	106	106
24	109	109	104	108	109	108
25	111	111	106	110	111	111
26	114	113	108	112	114	113
27	116	116	110	115	116	116
28	119	118	112	117	119	118
29	121	120	114	119	121	121
30	124	123	116	122	124	124
31	127	126	118	124	126	126
32	130	129	120	127	129	129
33	133	132	122	130	132	132
34	136	135	124	133	135	135
35	138	137	126	135	137	137
36	142	140	129	138	140	140
37	144	143	131	141	143	143
38	147	145	133	144	146	146
39	150	148	135	147	149	149
40	153	151	138	150	152	152

OMEGA POINT LABORATORIES

Time (min)	TC # 245 (°F)	TC # 246 (°F)	TC # 247 (°F)	TC # 248 (°F)	TC # 249 (°F)	TC # 250 (°F)
41	156	153	140	153	155	154
42	159	156	142	156	158	158
43	162	159	145	160	161	161
44	165	162	147	163	164	164
45	167	164	149	166	167	167
46	170	167	152	169	170	170
47	173	169	154	172	173	173
48	176	171	157	175	176	176
49	179	174	160	178	179	179
50	181	176	162	181	182	182
51	184	178	165	184	185	185
52	187	181	167	187	188	188
53	190	183	169	190	191	191
54	192	186	172	192	193	193
55	195	189	174	195	196	196
56	198	191	176	198	198	198
57	200	193	179	200	201	201
58	203	195	181	202	203	203
59	205	198	183	204	205	205
60	207	200	185	206	207	207
Max Temp:	207	200	185	206	207	207
Max Allowed:	408	407	407	407	407	407

OMEGA POINT LABORATORIES

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Time (min)	TC # 251 (°F)	TC # 252 (°F)	TC # 253 (°F)	TC # 254 (°F)	TC # 255 (°F)
0	81	82	83	82	82
1	81	82	83	82	82
2	81	82	83	83	82
3	81	82	83	83	82
4	81	82	83	83	82
5	81	82	83	83	82
6	81	82	83	83	82
7	82	82	84	83	82
8	82	82	84	83	83
9	82	83	84	84	83
10	83	83	85	84	83
11	84	84	86	85	84
12	84	85	86	86	85
13	86	86	88	87	86
14	87	87	89	88	87
15	88	89	90	89	88
16	90	90	91	91	90
17	91	92	93	92	91
18	93	94	95	94	93
19	95	96	97	96	95
20	97	98	99	98	96
21	100	100	101	100	98
22	102	102	103	102	100
23	104	105	106	104	103
24	107	107	108	107	105
25	109	110	111	109	108
26	112	112	113	112	110
27	115	115	116	114	113
28	117	118	118	117	115
29	120	120	121	120	118
30	123	123	124	122	121
31	125	126	127	125	124
32	128	128	129	128	126
33	131	131	132	131	129
34	133	134	135	134	132
35	136	137	137	136	135
36	139	140	140	139	138
37	142	142	143	142	141
38	145	145	146	145	143
39	147	148	149	148	146
40	151	151	152	151	149

OMEGA POINT LABORATORIES

Time (min)	TC # 251 (°F)	TC # 252 (°F)	TC # 253 (°F)	TC # 254 (°F)	TC # 255 (°F)
41	154	154	155	154	152
42	157	157	158	157	156
43	160	160	161	160	159
44	163	163	164	163	162
45	166	166	167	166	165
46	169	169	170	169	168
47	172	172	173	172	171
48	175	175	176	175	174
49	178	178	180	178	178
50	181	181	183	181	181
51	184	185	186	185	184
52	187	188	189	188	187
53	190	190	192	191	190
54	192	193	194	194	193
55	195	196	197	196	196
56	198	198	199	199	198
57	200	201	202	201	200
58	202	203	204	203	203
59	204	205	206	205	205
60	206	207	208	207	207
Max Temp:	206	207	208	207	207
Max Allowed:	406	407	408	407	407

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 256 (°F)	TC # 257 (°F)	TC # 258 (°F)	TC # 259 (°F)	TC # 260 (°F)	TC # 261 (°F)	TC # 262 (°F)	TC # 263 (°F)	TC # 264 (°F)	TC # 265 (°F)	TC # 266 (°F)	TC # 267 (°F)
0	82	80	80	80	80	80	80	79	79	80	80	80
1	82	80	80	80	80	80	80	79	79	80	80	80
2	82	80	80	80	80	80	80	79	79	80	80	80
3	82	80	80	80	80	80	80	79	79	80	80	80
4	82	80	80	80	80	80	80	79	79	80	80	80
5	82	80	80	80	80	80	80	79	79	80	80	81
6	82	80	81	80	80	80	80	79	79	80	80	81
7	83	80	81	80	80	80	80	79	79	80	80	81
8	83	80	81	80	80	80	80	79	80	80	80	81
9	83	80	81	81	80	80	80	80	80	80	81	82
10	84	81	81	81	81	81	81	80	80	81	81	82
11	84	81	82	81	81	81	81	80	80	81	81	83
12	85	82	83	82	82	82	81	81	81	81	81	84
13	86	83	83	83	82	82	82	81	81	81	81	86
14	87	84	84	84	83	83	83	82	82	82	82	87
15	88	85	86	85	84	84	84	83	82	82	82	88
16	89	86	87	86	85	85	85	84	83	83	83	89
17	91	88	88	87	87	86	86	85	84	84	83	91
18	92	89	90	89	88	88	87	86	85	84	84	93
19	94	91	91	90	89	89	88	87	86	85	84	95
20	96	93	93	92	91	90	90	88	87	86	85	96
21	98	95	95	93	93	92	91	90	88	88	86	98
22	100	97	97	95	94	94	93	91	90	89	87	100
23	102	99	99	97	96	95	95	93	91	90	88	103
24	104	101	101	100	99	97	96	95	93	91	89	105
25	107	103	103	102	101	100	99	97	95	92	90	107
26	109	106	106	104	103	102	101	99	97	94	91	109
27	112	108	108	107	106	104	103	101	98	96	93	112
28	114	111	111	109	108	107	105	103	100	98	94	114
29	117	113	113	112	110	109	108	105	103	99	96	117
30	120	116	116	115	113	112	110	108	105	102	98	119
31	122	119	118	117	116	115	113	111	108	104	99	122
32	125	122	121	120	119	117	116	113	110	106	101	124
33	128	124	124	123	121	120	118	116	113	108	103	127
34	131	127	127	126	124	123	121	119	115	111	106	129
35	134	130	130	128	127	126	124	122	118	113	108	132
36	137	133	133	131	130	129	127	125	121	116	110	135
37	140	136	136	134	133	132	130	127	124	119	113	137
38	143	139	139	137	136	135	133	131	127	122	115	140
39	145	142	142	140	139	138	136	134	130	125	118	143

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 256 (°F)	TC # 257 (°F)	TC # 258 (°F)	TC # 259 (°F)	TC # 260 (°F)	TC # 261 (°F)	TC # 262 (°F)	TC # 263 (°F)	TC # 264 (°F)	TC # 265 (°F)	TC # 266 (°F)	TC # 267 (°F)
40	149	145	145	144	142	141	140	137	133	128	121	147
41	152	148	148	147	145	144	143	140	137	131	124	150
42	155	151	151	150	149	147	146	144	140	135	127	153
43	158	154	154	153	152	151	149	147	144	138	131	156
44	161	158	158	156	155	154	153	151	147	142	134	160
45	165	161	161	160	159	157	156	154	151	145	137	163
46	168	164	164	163	162	161	160	157	154	149	141	166
47	171	167	167	166	165	164	163	161	158	152	144	169
48	174	171	171	170	169	167	166	164	162	156	148	173
49	178	174	174	173	172	171	170	168	165	159	151	176
50	181	177	177	176	175	174	173	171	169	163	155	180
51	184	181	180	180	179	178	176	175	172	166	158	183
52	187	184	184	183	182	181	180	178	176	169	161	186
53	190	187	187	186	185	184	183	181	179	173	164	189
54	193	190	190	189	188	187	187	185	183	176	167	192
55	196	193	193	192	191	191	190	188	186	179	170	194
56	198	195	196	195	194	194	193	192	189	182	172	197
57	201	198	198	197	197	196	196	195	192	184	175	199
58	203	200	200	200	199	199	198	197	195	186	177	201
59	205	202	203	202	202	201	201	200	198	188	179	203
60	207	204	205	204	204	203	203	202	201	190	181	205
Max Temp:	207	204	205	204	204	203	203	202	201	190	181	205
Max Allowed:	407	405	405	405	405	405	405	404	404	405	405	405

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 268 (°F)	TC # 269 (°F)	TC # 270 (°F)	TC # 271 (°F)	TC # 272 (°F)	TC # 273 (°F)	TC # 274 (°F)	TC # 275 (°F)	TC # 276 (°F)	TC # 277 (°F)	TC # 278 (°F)	TC # 279 (°F)
0	80	80	79	79	79	79	79	79	79	80	80	79
1	80	80	79	79	79	79	79	79	79	80	80	79
2	80	80	79	79	79	79	79	79	79	80	80	79
3	80	80	79	79	79	79	79	79	79	80	80	79
4	80	80	79	79	79	79	79	79	79	80	80	79
5	80	80	79	79	79	79	79	79	79	80	80	79
6	80	80	79	79	79	79	79	79	79	80	80	79
7	81	80	79	79	79	79	79	79	79	80	80	79
8	81	80	80	79	79	80	79	79	79	80	80	80
9	81	81	80	80	80	80	80	79	79	81	80	80
10	82	81	81	80	80	81	80	80	80	81	81	80
11	83	82	82	81	81	81	81	80	80	82	81	81
12	84	83	82	82	82	82	82	81	81	82	82	81
13	85	84	84	83	83	83	83	82	82	83	83	82
14	86	85	85	84	84	84	84	83	83	84	84	83
15	88	87	86	86	86	86	85	84	84	85	84	84
16	89	88	88	87	87	87	86	85	85	86	86	85
17	91	90	90	89	89	88	88	87	87	88	87	86
18	93	92	91	91	90	90	89	88	88	89	88	87
19	95	94	93	93	92	92	91	90	90	91	90	89
20	97	96	96	95	94	94	93	92	92	92	91	90
21	99	98	98	97	97	96	95	94	94	94	93	92
22	101	101	100	100	99	98	97	96	96	96	95	94
23	104	103	103	102	101	100	99	98	98	99	97	96
24	106	106	105	105	104	103	102	100	100	101	99	98
25	108	108	108	107	106	106	104	103	102	103	102	100
26	111	111	110	110	109	108	107	106	105	105	104	102
27	113	113	113	113	112	111	109	108	108	108	106	105
28	116	116	116	115	114	113	112	111	110	110	109	107
29	118	118	118	118	117	116	115	113	113	113	111	109
30	121	121	121	120	120	119	117	116	115	116	114	112
31	124	124	123	123	122	121	120	119	118	118	117	115
32	126	126	126	126	125	124	123	122	121	121	120	118
33	129	129	129	128	128	127	126	124	124	124	122	120
34	131	131	131	131	130	130	129	127	127	127	125	123
35	134	134	134	134	133	132	131	130	129	130	128	126
36	137	137	136	136	136	135	134	133	132	133	131	129
37	140	140	139	139	138	138	137	136	135	136	134	132
38	142	142	142	142	141	141	140	139	138	139	137	135
39	145	145	145	145	144	144	143	142	141	142	140	138

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 268 (°F)	TC # 269 (°F)	TC # 270 (°F)	TC # 271 (°F)	TC # 272 (°F)	TC # 273 (°F)	TC # 274 (°F)	TC # 275 (°F)	TC # 276 (°F)	TC # 277 (°F)	TC # 278 (°F)	TC # 279 (°F)
40	148	148	148	147	147	147	146	145	144	145	144	142
41	151	151	151	151	150	150	149	148	148	148	147	145
42	154	154	154	154	153	153	152	151	151	151	150	148
43	158	157	157	157	156	156	155	154	154	154	153	152
44	161	160	160	160	159	159	158	157	157	158	156	155
45	164	164	163	163	162	162	162	161	160	161	160	158
46	167	167	166	166	166	165	165	164	164	164	163	162
47	170	170	169	169	169	169	168	167	167	167	166	165
48	174	173	173	172	172	172	171	170	170	171	169	168
49	177	176	176	175	175	175	174	174	173	174	173	172
50	180	180	179	179	178	178	178	177	177	177	176	175
51	183	183	182	182	181	181	181	180	180	180	179	178
52	186	186	185	185	184	185	184	183	183	183	183	182
53	189	189	188	188	187	187	187	186	186	187	186	185
54	192	192	191	191	190	190	190	189	189	190	189	188
55	195	194	194	193	193	193	192	192	192	193	192	191
56	197	197	196	196	196	196	195	195	195	195	194	194
57	199	199	199	198	198	198	198	197	197	198	197	196
58	201	201	201	200	200	200	200	199	199	200	199	199
59	203	203	203	202	202	202	202	201	201	202	202	201
60	205	205	205	204	204	204	204	203	203	204	204	203
Max Temp:	205	205	205	204	204	204	204	203	203	204	204	203
Max Allowed:	405	405	404	404	404	404	404	404	404	405	405	404

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 280 (°F)	TC # 281 (°F)	TC # 282 (°F)	TC # 283 (°F)	TC # 284 (°F)	TC # 285 (°F)	TC # 286 (°F)	TC # 287 (°F)	TC # 288 (°F)	TC # 289 (°F)	TC # 290 (°F)	TC # 291 (°F)
0	79	79	79	79	79	81	80		79	78	78	77
1	79	79	79	79	79	81	80		79	78	78	78
2	79	79	79	79	79	81	80		80	78	78	78
3	79	79	79	79	79	81	80		80	78	78	78
4	79	79	79	79	79	81	80		80	78	78	78
5	80	79	79	79	79	81	81		80	78	78	78
6	80	79	80	79	79	81	81		80	78	78	78
7	80	80	80	79	79	81	81		80	78	79	78
8	80	80	80	79	79	81	82		81	79	79	79
9	80	80	80	79	80	81	83		82	80	80	79
10	80	80	80	79	80	81	84		83	81	81	81
11	81	81	81	80	80	81	85		84	82	82	82
12	81	81	81	80	80	82	87		86	83	83	83
13	82	82	82	81	81	82	88		88	85	85	85
14	82	82	82	81	81	82	90		90	87	87	87
15	83	83	83	82	82	83	92		92	89	89	89
16	84	84	84	83	82	83	94		94	91	91	91
17	85	85	85	83	83	84	97		97	94	94	94
18	87	86	86	84	84	84	99		99	96	96	96
19	88	87	87	85	85	85	101		102	99	99	99
20	90	89	88	86	86	86	104		105	102	102	102
21	91	90	90	88	86	86	106		108	105	104	104
22	93	92	91	89	88	87	108		110	108	107	107
23	95	94	93	90	89	88	111		113	110	110	110
24	97	95	94	92	90	89	113		117	113	113	113
25	99	97	96	94	91	90	116		120	117	117	117
26	101	100	98	96	93	92	118		123	120	120	120
27	103	102	100	98	95	93	121		126	123	123	123
28	106	104	102	100	97	94	123		129	126	127	126
29	108	106	105	102	98	96	126		132	130	130	130
30	111	109	107	104	100	97	128		136	133	133	133
31	113	112	110	106	102	99	131		139	136	136	136
32	116	114	112	109	105	101	133		142	140	140	140
33	119	117	115	111	107	103	136		145	143	143	143
34	122	120	118	114	109	105	139		149	146	147	147
35	125	123	121	117	112	107	142		152	150	150	150
36	128	126	124	120	114	109	144		155	153	153	154
37	131	129	127	123	117	112	147		158	156	157	157
38	134	132	130	126	120	115	150		162	160	160	160
39	137	135	133	129	123	117	153		165	163	163	163

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 280 (°F)	TC # 281 (°F)	TC # 282 (°F)	TC # 283 (°F)	TC # 284 (°F)	TC # 285 (°F)	TC # 286 (°F)	TC # 287 (°F)	TC # 288 (°F)	TC # 289 (°F)	TC # 290 (°F)	TC # 291 (°F)
40	140	138	136	132	126	120	155		168	166	166	167
41	144	142	140	136	130	123	158		171	169	170	170
42	147	145	143	139	133	126	161		174	172	173	174
43	150	149	147	143	136	129	164		178	176	176	177
44	154	152	150	146	140	133	167		181	179	180	180
45	157	156	154	150	144	136	170		184	182	183	184
46	160	159	157	153	147	140	173		187	186	186	187
47	164	162	161	157	151	143	176		190	189	190	191
48	167	166	164	161	154	147	179		192	192	193	194
49	171	169	168	164	158	150	182		195	195	196	198
50	174	173	171	168	162	154	185		198	198	200	201
51	178	176	175	172	165	157	189		201	201	203	204
52	181	180	178	175	168	160	191		204	203	205	206
53	184	183	182	178	172	163	194		207	206	207	208
54	187	186	185	182	175	166	197		209	208	210	210
55	190	190	189	185	178	169	199		211	210	211	211
56	194	193	192	189	180	172	201		212	211	213	213
57	196	196	195	192	183	174	203		214	213	214	214
58	199	198	198	195	185	176	205		215	214	215	215
59	201	201	200	198	187	179	206		217	215	216	216
60	203	203	203	200	189	181	208		218	216	217	217
Max Temp:	203	203	203	200	189	181	208		218	216	217	217
Max Allowed:	404	404	404	404	404	406	405		404	403	403	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 292 (°F)	TC # 293 (°F)	TC # 294 (°F)	TC # 295 (°F)	TC # 296 (°F)	TC # 297 (°F)	TC # 298 (°F)	TC # 299 (°F)	TC # 300 (°F)	TC # 301 (°F)	TC # 302 (°F)	TC # 303 (°F)
0	77	78	78	78	78	78	78	77	77	78	77	77
1	77	78	78	77	78	78	78	77	77	78	78	77
2	77	78	78	77	78	78	78	78	77	78	78	77
3	77	78	78	78	78	78	78	77	77	78	77	77
4	78	78	78	78	78	78	78	77	77	78	78	77
5	78	78	78	78	78	78	78	78	77	78	78	77
6	78	79	79	78	78	78	78	78	78	78	78	77
7	78	79	79	78	78	79	79	78	78	79	78	77
8	79	80	80	79	79	79	79	79	79	79	78	78
9	80	81	81	80	80	80	80	80	79	80	79	78
10	81	82	82	81	81	81	81	81	81	81	80	79
11	82	84	83	82	82	82	82	82	82	82	81	80
12	84	86	85	84	83	83	83	83	83	84	82	81
13	86	88	87	86	85	85	85	85	85	86	84	82
14	88	90	89	88	87	86	87	87	87	88	86	84
15	90	92	91	90	89	88	89	89	89	90	88	86
16	93	95	94	92	91	91	91	91	92	92	90	88
17	95	98	97	95	93	93	93	93	94	94	92	89
18	98	100	99	97	96	95	95	96	97	97	94	91
19	101	103	102	100	99	98	98	99	99	99	97	93
20	104	106	105	103	101	100	100	101	102.	102	99	96
21	106	109	108	106	104	103	103	104	104	104	101	98
22	109	113	111	109	107	106	106	107	107	107	104	100
23	113	116	115	112	110	108	109	109	110	109	106	102
24	116	119	118	115	113	111	112	112	113	112	109	105
25	119	122	121	118	116	114	115	115	115	115	112	107
26	122	125	124	122	119	117	118	118	118	118	114	109
27	126	129	128	125	122	121	121	121	121	120	117	112
28	129	132	131	128	126	124	124	124	124	123	119	114
29	132	135	135	132	129	127	127	127	127	126	122	117
30	136	139	138	135	132	130	130	130	130	129	125	119
31	139	142	141	138	135	134	133	134	133	132	127	121
32	142	146	145	142	139	137	137	137	136	135	130	124
33	146	149	148	145	142	140	140	140	140	138	133	126
34	149	153	151	149	145	144	143	143	142	141	135	129
35	153	156	155	152	149	147	147	146	146	144	138	131
36	156	159	158	155	152	150	150	149	149	146	140	133
37	160	163	161	158	156	154	153	153	152	149	143	136
38	163	166	164	162	159	157	156	156	155	152	146	138
39	166	169	168	165	162	160	160	159	158	155	149	140

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 316 (°F)	TC # 317 (°F)	TC # 318 (°F)	TC # 319 (°F)	TC # 320 (°F)	TC # 321 (°F)	TC # 322 (°F)	TC # 323 (°F)	TC # 324 (°F)	TC # 325 (°F)	TC # 326 (°F)	TC # 327 (°F)
0	77	78	77	77	77	79	79	79	79	79	79	79
1	77	78	77	77	77	79	79	79	79	79	79	79
2	77	78	77	77	77	79	79	79	79	79	79	79
3	77	78	77	77	77	79	79	79	79	79	79	79
4	77	78	78	77	77	79	79	79	79	79	79	79
5	78	78	78	77	77	79	79	79	79	80	80	79
6	78	79	78	78	78	79	80	80	79	80	80	79
7	79	79	79	78	79	79	80	80	79	81	81	80
8	81	81	81	79	80	80	81	81	80	83	82	81
9	83	82	83	81	82	80	82	83	81	85	83	83
10	86	84	85	83	84	81	84	84	82	88	86	86
11	88	87	89	86	87	83	86	87	84	91	88	88
12	91	90	92	89	90	85	88	90	86	94	91	92
13	95	93	96	92	93	87	91	93	89	98	95	95
14	98	96	100	96	97	90	94	96	92	102	99	99
15	102	100	105	100	100	93	97	99	95	107	102	103
16	106	104	109	105	104	96	100	103	98	111	106	108
17	110	108	114	110	108	99	104	107	102	116	111	112
18	115	113	118	115	112	103	108	111	106	120	115	116
19	119	117	123	120	117	106	111	115	111	125	119	120
20	124	122	128	125	121	110	115	119	116	130	123	125
21	128	127	133	131	126	114	119	124	121	135	127	129
22	133	132	138	136	131	118	123	128	126	139	131	133
23	137	137	142	141	136	122	127	132	131	144	136	138
24	142	142	147	147	140	126	131	136	137	149	140	142
25	146	147	152	152	145	131	136	141	143	153	144	147
26	150	152	156	157	150	135	140	145	150	158	148	151
27	155	157	161	162	154	140	144	149	155	162	152	155
28	159	162	165	166	159	144	148	153	161	167	156	160
29	163	166	170	171	163	149	152	157	166	171	160	165
30	167	171	174	176	168	154	156	161	172	175	164	169
31	172	176	178	180	172	159	160	165	177	179	168	174
32	176	180	182	184	177	164	164	169	183	183	171	179
33	180	185	186	188	181	169	168	172	188	187	175	183
34	184	189	190	192	186	174	172	176	193	191	179	194
35	188	193	193	196	190	179	177	180	198	195	183	201
36	191	197	197	199	194	183	181	183	202	199	186	206
37	195	200	200	202	198	187	186	187	205	203	190	210
38	198	203	204	205	202	192	191	190	207	207	194	212
39	201	207	208	208	206	196	196	194	209	210	197	213

OMEGA POINT LABORATORIES

Time (min)	TC # 304 (°F)	TC # 305 (°F)	TC # 306 (°F)	TC # 307 (°F)	TC # 308 (°F)	TC # 309 (°F)	TC # 310 (°F)	TC # 311 (°F)	TC # 312 (°F)	TC # 313 (°F)	TC # 314 (°F)	TC # 315 (°F)
0	77	78	78	77	77	78	78	77	77	78	78	77
1	77	78	78	77	77	78	78	77	77	78	78	77
2	77	78	78	77	77	78	78	77	77	78	78	77
3	77	78	78	77	77	78	78	77	77	78	78	77
4	77	78	78	78	78	78	78	77	77	78	78	77
5	77	79	79	79	79	78	78	78	77	78	78	77
6	77	81	81	80	81	78	78	78	78	79	79	78
7	78	83	84	83	84	79	79	79	78	80	80	79
8	78	86	87	86	87	79	81	81	79	81	82	80
9	78	89	91	90	90	80	84	83	81	84	84	82
10	79	93	96	95	94	81	87	86	84	87	88	84
11	79	98	101	100	98	83	91	90	87	90	91	87
12	80	103	106	105	102	85	95	94	91	95	96	90
13	81	108	112	110	106	87	99	99	95	100	101	94
14	82	113	118	115	111	90	104	104	100	106	106	98
15	83	118	124	121	115	92	109	109	106	113	111	102
16	84	124	130	127	120	95	115	114	111	121	117	107
17	85	129	136	132	124	99	120	119	117	128	122	111
18	87	135	142	138	128	102	125	125	124	135	128	116
19	88	140	148	143	133	106	131	130	130	141	133	121
20	90	145	153	149	137	110	136	135	137	148	139	126
21	92	150	159	154	142	115	142	140	144	154	144	131
22	94	155	165	159	146	120	148	145	151	161	149	136
23	96	160	170	164	151	126	154	150	159	167	154	142
24	98	165	175	169	155	131	159	155	171	171	160	146
25	100	170	180	174	160	138	165	160	181	176	165	151
26	102	174	185	179	164	145	170	165	193	180	171	156
27	104	179	190	183	168	154	174	171	200	184	177	160
28	106	183	195	187	172	165	179	175	201	188	184	165
29	108	188	199	191	176	169	183	180	204	192	192	169
30	109	192	203	196	181	173	188	185	205	195	197	173
31	111	196	207	200	184	179	193	189	207	198	201	178
32	113	201	211	204	187	184	198	194	209	202	204	182
33	116	209	213	208	191	189	203	200	210	207	207	185
34	118	212	214	210	196	192	207	207	211	209	209	189
35	120	212	214	212	200	194	210	210	211	210	211	193
36	122	213	216	214	204	196	211	211	212	211	212	196
37	124	213	217	215	208	198	211	212	212	212	213	199
38	126	213	216	216	211	200	212	213	212	213	214	202
39	128	212	217	218	213	202	212	214	212	213	214	205

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 304 (°F)	TC # 305 (°F)	TC # 306 (°F)	TC # 307 (°F)	TC # 308 (°F)	TC # 309 (°F)	TC # 310 (°F)	TC # 311 (°F)	TC # 312 (°F)	TC # 313 (°F)	TC # 314 (°F)	TC # 315 (°F)
40	130	211	218	219	215	204	212	214	213	214	215	208
41	133	211	216	220	216	206	213	215	213	214	215	210
42	136	212	218	221	217	207	214	215	213	215	216	212
43	139	213	221	223	218	209	214	216	213	216	216	214
44	141	214	221	224	219	210	215	216	213	216	216	214
45	144	216	225	226	220	211	216	217	213	217	217	215
46	146	219	228	229	221	212	216	217	214	218	217	215
47	148	223	232	232	222	212	217	218	214	218	218	216
48	151	226	236	235	223	213	217	219	214	219	218	216
49	154	230	241	238	225	214	218	219	215	220	219	216
50	156	233	245	242	227	214	218	220	215	221	219	217
51	159	237	250	246	229	215	219	221	215	221	219	217
52	162	242	255	250	231	215	219	221	216	222	220	217
53	164	246	261	254	233	216	220	222	216	224	221	217
54	166	251	266	259	235	217	220	223	216	225	221	218
55	169	255	272	263	237	217	221	224	217	226	222	218
56	171	260	277	268	240	218	222	226	217	228	224	219
57	173	265	283	273	242	219	223	227	218	231	225	219
58	176	270	288	277	245	219	224	229	219	233	226	220
59	178	275	294	282	248	220	225	231	221	236	228	220
60	180	280	299	286	251	221	226	233	222	240	230	221
Max Temp:	180	280	299	286	251	221	226	233	222	240	230	221
Max Allowed:	402	403	403	402	402	403	403	402	402	403	403	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 316 (°F)	TC # 317 (°F)	TC # 318 (°F)	TC # 319 (°F)	TC # 320 (°F)	TC # 321 (°F)	TC # 322 (°F)	TC # 323 (°F)	TC # 324 (°F)	TC # 325 (°F)	TC # 326 (°F)	TC # 327 (°F)
40	204	209	210	210	209	200	200	198	210	213	201	214
41	207	212	212	212	211	205	205	201	210	215	204	214
42	209	213	213	214	212	212	208	205	212	216	207	215
43	212	214	214	214	213	212	211	207	213	217	211	215
44	213	214	215	215	214	213	212	209	213	219	213	215
45	215	215	216	215	215	213	214	211	214	219	215	215
46	216	215	216	216	215	214	215	213	214	220	216	216
47	216	215	217	216	216	214	215	214	215	221	217	216
48	216	216	217	216	216	214	216	215	215	221	218	216
49	216	216	217	216	217	214	216	215	216	221	219	216
50	216	216	218	217	217	214	216	216	216	222	219	217
51	216	216	218	217	217	215	216	216	217	222	220	217
52	216	216	218	217	218	216	216	216	217	222	220	217
53	217	217	219	218	218	216	217	217	218	223	221	217
54	217	217	219	218	219	217	217	217	219	223	221	217
55	217	217	220	219	219	217	217	217	219	224	222	217
56	217	217	220	219	220	218	217	217	220	225	222	218
57	218	218	221	220	221	218	217	217	221	225	223	218
58	219	218	222	220	222	219	217	218	221	226	223	219
59	219	218	223	221	223	220	217	218	222	228	224	219
60	220	219	225	222	224	220	218	219	223	229	225	220
Max Temp:	220	219	225	222	224	220	218	219	223	229	225	220
Max Allowed:	402	403	402	402	402	404	404	404	404	404	404	404

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 328 (°F)	TC # 329 (°F)	TC # 330 (°F)	TC # 331 (°F)	TC # 332 (°F)	TC # 333 (°F)	TC # 334 (°F)	TC # 335 (°F)	TC # 336 (°F)	TC # 337 (°F)	TC # 338 (°F)	TC # 339 (°F)
40	214	214	213	214	210	214	225	222	213	179	185	189
41	214	214	213	214	211	215	228	224	214	182	189	192
42	215	214	214	214	213	217	231	227	214	185	192	195
43	215	215	214	214	213	219	234	229	216	189	195	198
44	217	216	214	215	213	220	237	232	217	191	198	201
45	218	216	214	215	214	221	240	235	219	194	201	203
46	219	217	215	215	214	223	243	237	221	196	203	205
47	220	218	215	215	214	224	246	240	223	199	205	207
48	221	219	215	215	215	226	249	243	225	201	207	209
49	221	220	215	215	215	227	253	246	227	203	208	210
50	222	220	216	215	216	229	256	250	229	204	210	211
51	223	221	216	215	216	231	259	253	232	206	211	212
52	224	222	216	215	216	233	262	257	235	208	213	213
53	225	223	217	215	217	235	266	261	238	210	214	214
54	226	224	217	216	217	237	269	264	241	212	216	216
55	227	225	217	216	218	240	273	268	244	214	218	217
56	228	226	218	216	219	243	276	272	248	216	220	219
57	230	227	219	216	220	245	280	276	251	218	222	221
58	232	229	219	216	220	248	283	280	255	220	225	223
59	234	230	220	216	221	251	287	284	259	222	227	225
60	236	232	221	217	222	254	291	288	264	224	230	227
Max Temp:	236	232	221	217	222	254	291	288	264	224	230	227
Max Allowed:	404	404	404	404	404	404	404	404	404	404	404	404

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 340 (°F)	TC # 341 (°F)	TC # 342 (°F)	TC # 343 (°F)	TC # 344 (°F)	TC # 345 (°F)	TC # 346 (°F)	TC # 347 (°F)	TC # 348 (°F)	TC # 349 (°F)	TC # 350 (°F)	TC # 351 (°F)
0	78	79	79	79	79	79	79	79	79	80	79	79
1	78	79	79	79	79	79	79	79	79	80	79	79
2	78	79	79	79	79	79	79	79	79	80	79	79
3	78	79	79	79	79	79	79	79	79	80	79	79
4	78	79	79	79	79	79	79	79	79	80	79	79
5	78	79	79	79	79	79	79	79	79	80	79	79
6	78	79	79	79	79	79	79	79	79	80	79	79
7	78	79	79	79	79	79	79	79	79	80	79	79
8	79	80	79	79	79	79	79	79	79	80	79	79
9	79	80	80	80	79	79	79	79	79	80	80	79
10	79	80	80	80	79	80	79	79	79	80	80	80
11	80	81	81	81	80	80	80	80	80	81	80	80
12	81	82	82	82	81	81	81	81	81	81	81	81
13	82	83	83	83	82	82	81	81	81	82	82	82
14	84	84	84	85	83	83	82	82	82	83	83	83
15	86	86	86	86	84	85	84	84	84	85	84	85
16	88	89	88	89	86	87	86	86	86	86	86	87
17	91	91	91	91	88	90	88	88	88	88	88	89
18	94	94	93	93	91	92	90	90	90	90	90	91
19	97	97	96	96	93	95	92	92	92	93	92	93
20	101	100	99	99	96	98	95	95	95	95	95	96
21	105	104	103	103	100	101	98	98	98	98	98	99
22	109	108	106	106	103	105	102	102	101	101	101	102
23	113	112	110	110	107	109	106	106	105	104	104	106
24	117	116	114	114	111	113	110	110	108	108	108	109
25	122	120	118	118	115	117	114	114	113	112	111	113
26	127	125	123	122	119	121	118	118	117	116	115	117
27	131	129	127	127	124	125	123	123	121	120	120	121
28	136	134	131	131	128	130	128	128	126	125	124	126
29	140	138	136	136	133	134	133	132	130	129	128	130
30	145	143	141	140	137	139	137	137	135	134	133	135
31	149	147	145	145	142	143	142	141	140	138	137	139
32	154	152	150	149	147	148	146	145	144	143	142	144
33	158	156	154	154	151	152	151	150	149	148	146	149
34	163	161	159	158	156	157	155	154	153	152	151	153
35	168	166	164	163	160	161	159	158	158	157	156	158
36	172	170	168	167	164	165	164	163	162	162	160	162
37	177	175	172	171	169	170	168	167	167	166	165	167
38	181	179	177	175	173	174	172	172	171	171	169	172
39	185	183	181	180	177	178	176	176	176	175	174	176

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 340 (°F)	TC # 341 (°F)	TC # 342 (°F)	TC # 343 (°F)	TC # 344 (°F)	TC # 345 (°F)	TC # 346 (°F)	TC # 347 (°F)	TC # 348 (°F)	TC # 349 (°F)	TC # 350 (°F)	TC # 351 (°F)
40	189	187	185	184	181	182	181	180	180	180	178	180
41	192	191	189	188	185	186	185	184	184	184	183	185
42	196	194	192	191	189	190	189	188	188	188	187	189
43	199	198	196	195	193	194	192	192	192	192	191	193
44	201	201	199	198	196	197	196	196	196	196	194	196
45	204	204	202	201	199	200	199	199	199	199	198	200
46	206	206	205	204	202	203	202	202	202	202	201	203
47	208	208	207	206	205	205	204	204	204	205	203	205
48	209	209	208	208	207	207	206	206	206	207	206	207
49	210	210	210	209	208	208	208	208	208	208	208	209
50	211	212	211	210	210	210	209	209	209	210	209	210
51	212	212	212	211	211	211	210	210	211	211	211	211
52	213	213	212	212	212	212	212	212	212	212	212	213
53	213	214	213	213	213	212	212	213	213	213	213	214
54	214	214	214	214	213	213	213	214	214	214	214	215
55	215	215	214	214	214	214	214	215	215	215	216	217
56	216	215	215	215	215	215	215	216	216	216	217	218
57	217	216	216	216	216	216	216	217	217	217	219	220
58	218	217	217	217	217	217	217	218	218	219	220	222
59	220	218	217	218	218	218	219	220	220	221	222	224
60	221	219	219	219	219	219	220	221	222	223	224	226
Max Temp:	221	219	219	219	219	219	220	221	222	223	224	226
Max Allowed:	403	404	404	404	404	404	404	404	404	405	404	404

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 352 (°F)	TC # 353 (°F)	TC # 354 (°F)	TC # 355 (°F)	TC # 356 (°F)	TC # 357 (°F)	TC # 358 (°F)	TC # 359 (°F)	TC # 360 (°F)	TC # 361 (°F)	TC # 362 (°F)	TC # 363 (°F)
0	79	77	77	77	77	78	77	77	77	77	77	77
1	79	77	77	77	77	78	77	77	77	77	77	77
2	79	77	77	77	77	78	77	77	77	77	77	77
3	79	77	77	77	77	78	77	77	77	77	77	77
4	79	76	77	77	77	78	78	77	77	77	77	77
5	79	77	77	77	77	78	77	77	77	77	77	77
6	79	77	77	77	77	78	78	77	77	77	77	77
7	79	77	77	77	78	78	78	77	77	77	77	77
8	79	77	77	77	78	79	78	77	77	77	77	77
9	80	77	78	78	79	79	78	77	78	77	77	77
10	80	78	78	78	79	79	79	78	78	78	77	77
11	81	78	79	79	80	80	79	79	79	79	78	78
12	82	79	79	79	82	82	81	79	80	79	79	79
13	83	80	80	80	84	83	82	81	81	81	80	81
14	85	81	82	81	85	85	84	82	83	82	82	82
15	86	83	83	82	88	87	86	85	85	85	84	85
16	88	85	84	84	90	90	88	87	87	87	86	87
17	90	87	86	85	93	93	91	90	90	90	89	89
18	93	89	88	87	95	96	94	93	93	92	91	92
19	95	91	90	89	98	99	97	96	96	95	94	95
20	98	94	93	91	102	102	101	99	99	99	98	98
21	101	97	95	93	106	106	105	103	103	102	101	101
22	104	100	98	96	109	110	109	107	107	106	104	104
23	108	103	101	98	113	115	113	111	111	110	108	108
24	112	107	105	101	117	119	117	115	115	114	112	111
25	116	111	108	104	121	123	121	119	118	117	116	115
26	120	115	112	107	125	128	125	123	122	122	120	119
27	124	119	115	110	129	132	130	127	126	126	124	123
28	129	123	119	113	132	136	134	131	131	129	128	127
29	133	128	123	117	136	140	138	136	135	134	132	132
30	138	132	127	120	140	145	142	140	139	138	136	136
31	142	136	131	124	144	149	147	144	143	142	141	141
32	147	140	135	127	148	153	151	148	147	146	145	145
33	151	145	140	131	152	157	155	152	151	150	150	150
34	156	150	148	136	155	161	159	156	155	155	154	154
35	160	155	155	143	159	165	163	161	160	159	159	159
36	165	160	162	150	163	169	168	165	164	163	163	163
37	170	165	167	156	167	173	172	169	168	168	167	168
38	174	170	172	163	170	177	176	174	173	172	172	172
39	179	175	177	168	174	181	180	178	177	176	176	177

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 352 (°F)	TC # 353 (°F)	TC # 354 (°F)	TC # 355 (°F)	TC # 356 (°F)	TC # 357 (°F)	TC # 358 (°F)	TC # 359 (°F)	TC # 360 (°F)	TC # 361 (°F)	TC # 362 (°F)	TC # 363 (°F)
40	183	180	181	172	178	184	184	182	181	181	180	181
41	187	185	186	177	181	188	188	186	185	185	184	185
42	192	189	191	181	184	191	192	190	189	189	188	189
43	196	194	196	187	188	195	195	193	193	193	192	192
44	199	198	201	194	190	198	198	197	197	196	196	196
45	203	202	205	204	193	200	201	200	199	199	198	198
46	205	205	207	208	195	202	203	202	202	202	201	201
47	207	206	209	210	197	204	205	205	205	204	203	203
48	209	208	210	210	198	206	207	207	206	206	205	205
49	210	209	211	210	200	207	208	208	208	208	207	207
50	212	210	211	211	201	208	210	209	209	209	208	208
51	213	211	211	211	202	210	211	210	210	210	209	209
52	214	212	212	212	203	211	212	211	211	211	210	210
53	216	212	212	212	205	212	213	212	212	212	211	211
54	217	213	212	212	206	214	214	213	213	213	212	212
55	218	214	212	212	208	215	216	214	213	214	213	212
56	220	216	212	212	210	217	217	214	214	215	213	213
57	222	217	212	212	212	219	219	216	215	216	214	214
58	224	219	212	212	215	222	220	217	216	217	215	214
59	227	221	212	212	217	225	222	218	217	218	216	215
60	229	223	212	212	220	227	225	219	218	219	217	216
Max Temp:	229	223	212	212	220	227	225	219	218	219	217	216
Max Allowed:	404	402	402	402	402	403	402	402	402	402	402	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 364 (°F)	TC # 365 (°F)	TC # 366 (°F)	TC # 367 (°F)	TC # 368 (°F)	TC # 369 (°F)	TC # 370 (°F)	TC # 371 (°F)	TC # 372 (°F)	TC # 373 (°F)	TC # 374 (°F)	TC # 375 (°F)
0	76	77	77	77	76	77	77	77	76	77	77	77
1	76	77	76	77	76	77	77	77	76	77	77	77
2	77	77	76	77	76	77	77	77	76	78	78	77
3	76	78	77	77	76	77	77	77	76	77	77	77
4	77	78	76	77	76	77	77	77	76	77	78	77
5	77	78	77	77	77	77	77	77	76	77	78	77
6	77	78	77	77	77	77	77	77	76	77	77	77
7	77	78	77	77	77	77	77	77	76	77	78	77
8	77	78	77	77	77	77	77	77	77	77	78	78
9	77	78	77	77	77	77	77	77	77	77	78	78
10	77	78	77	77	77	77	78	77	77	78	78	79
11	78	79	78	78	78	78	78	77	77	78	78	80
12	80	80	79	79	78	79	79	78	78	78	78	81
13	82	82	80	79	79	79	79	78	78	79	79	83
14	84	84	81	81	80	80	80	80	79	79	79	84
15	87	86	83	82	81	81	82	81	80	80	80	86
16	89	88	85	84	83	83	83	82	81	81	81	88
17	91	91	87	86	85	84	85	84	83	82	81	91
18	94	93	90	88	87	87	86	86	85	84	82	94
19	96	96	93	91	89	89	89	88	86	86	84	97
20	99	99	95	93	91	91	91	90	89	88	85	100
21	102	103	99	96	94	93	93	93	91	90	87	103
22	106	106	102	99	97	97	96	95	94	92	89	106
23	109	109	106	102	100	100	99	98	97	95	91	110
24	113	113	109	106	104	103	102	101	100	98	93	114
25	117	118	113	109	107	106	106	105	103	101	96	118
26	121	122	117	113	111	110	109	108	106	104	98	122
27	125	126	122	117	115	114	113	112	110	108	101	126
28	129	131	126	121	119	118	117	116	114	111	104	130
29	134	135	130	126	123	122	121	120	118	115	107	134
30	138	139	135	130	127	126	125	124	122	119	110	139
31	143	144	139	134	132	131	130	129	126	122	113	143
32	147	148	144	139	136	135	135	133	130	126	117	147
33	152	153	148	143	141	140	139	138	135	130	120	151
34	156	157	153	148	145	144	144	143	139	134	123	155
35	160	161	157	152	150	149	149	147	144	138	127	159
36	165	166	161	157	155	154	153	152	148	142	130	163
37	169	170	166	162	159	158	158	157	153	147	134	167
38	173	174	170	166	164	163	163	162	158	151	138	172
39	177	178	174	171	169	168	167	166	162	156	141	176

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 364 (°F)	TC # 365 (°F)	TC # 366 (°F)	TC # 367 (°F)	TC # 368 (°F)	TC # 369 (°F)	TC # 370 (°F)	TC # 371 (°F)	TC # 372 (°F)	TC # 373 (°F)	TC # 374 (°F)	TC # 375 (°F)
40	181	182	179	175	174	173	172	171	167	160	145	180
41	185	186	183	180	178	177	177	176	172	165	149	183
42	189	190	187	184	182	182	181	180	176	169	153	187
43	193	193	190	188	186	186	185	184	181	174	157	191
44	196	197	194	191	190	190	189	188	185	178	161	193
45	199	199	197	195	194	193	193	192	189	183	165	196
46	201	202	200	198	197	197	196	195	193	187	169	198
47	203	204	202	201	200	200	199	198	196	191	174	199
48	205	206	204	203	202	202	202	201	199	194	178	201
49	207	207	206	205	204	204	204	203	201	196	182	202
50	208	209	208	207	206	206	206	205	203	199	185	203
51	209	210	209	208	207	208	207	206	204	201	187	204
52	210	211	210	210	209	209	209	208	206	202	190	204
53	211	212	212	211	210	210	210	209	208	204	192	205
54	212	214	214	212	211	212	212	211	209	205	193	206
55	213	215	215	214	212	213	213	212	211	207	195	207
56	213	216	217	215	214	214	214	214	212	208	196	208
57	214	217	219	217	215	216	216	215	214	209	198	209
58	215	219	221	219	217	217	217	217	214	210	199	211
59	216	220	222	220	218	219	219	218	216	210	200	212
60	218	222	225	222	220	221	221	220	217	211	201	214
Max Temp:	218	222	225	222	220	221	221	220	217	211	201	214
Max Allowed:	401	402	402	402	401	402	402	402	401	402	402	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 376 (°F)	TC # 377 (°F)	TC # 378 (°F)	TC # 379 (°F)	TC # 380 (°F)	TC # 381 (°F)	TC # 382 (°F)	TC # 383 (°F)	TC # 384 (°F)	TC # 385 (°F)	TC # 386 (°F)	TC # 387 (°F)
0	77	77	78	77	77	78	77	76	77	77	77	76
1	77	77	77	77	77	78	77	76	76	77	77	76
2	77	77	77	77	77	78	77	76	77	77	77	76
3	77	77	77	77	77	78	77	76	77	77	77	76
4	77	77	77	77	77	78	77	76	76	77	77	76
5	76	77	78	77	77	78	77	77	76	77	77	76
6	77	77	78	77	77	78	77	77	77	77	77	76
7	77	77	79	77	77	78	78	77	77	77	77	76
8	77	78	81	78	77	78	78	77	77	77	77	76
9	77	79	82	79	78	78	79	78	77	77	77	77
10	78	80	84	80	78	79	79	79	78	78	78	77
11	79	81	86	81	79	79	80	79	79	78	78	78
12	80	82	88	83	80	80	81	80	80	79	79	78
13	82	84	90	84	81	81	82	82	81	81	80	79
14	84	86	93	87	83	83	84	83	83	82	82	81
15	86	89	97	90	85	85	85	85	84	84	84	82
16	88	92	100	93	88	87	87	87	86	86	85	84
17	91	95	104	96	91	89	90	89	89	88	88	86
18	94	98	108	100	93	92	92	92	91	90	90	88
19	97	102	111	103	97	95	95	94	94	93	92	90
20	100	105	115	107	100	98	98	97	97	96	95	93
21	104	109	119	111	104	102	102	100	100	99	98	96
22	108	113	123	115	108	105	105	104	103	102	102	99
23	112	117	127	119	112	109	109	107	107	106	105	103
24	116	121	131	123	116	113	112	111	110	109	109	106
25	120	125	135	127	120	117	116	115	114	113	113	110
26	125	129	138	131	124	121	120	119	118	117	117	114
27	129	133	141	135	128	125	124	123	122	121	121	118
28	133	137	144	138	132	129	128	127	127	125	125	122
29	138	141	146	142	136	133	132	131	131	130	129	126
30	142	144	149	145	140	138	137	136	135	134	133	130
31	146	148	152	149	144	142	141	140	140	139	138	135
32	150	152	155	152	149	146	145	144	145	143	142	139
33	154	156	158	156	153	150	150	149	150	148	146	144
34	158	160	162	160	157	154	154	153	154	152	151	148
35	163	164	166	163	161	159	158	158	159	157	155	153
36	167	167	169	167	165	163	163	163	164	161	160	157
37	171	172	173	171	170	168	167	167	168	166	164	162
38	175	175	177	175	174	172	172	172	173	170	169	167
39	179	180	181	179	178	177	176	176	177	175	173	172

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 376 (°F)	TC # 377 (°F)	TC # 378 (°F)	TC # 379 (°F)	TC # 380 (°F)	TC # 381 (°F)	TC # 382 (°F)	TC # 383 (°F)	TC # 384 (°F)	TC # 385 (°F)	TC # 386 (°F)	TC # 387 (°F)
40	183	184	185	183	182	181	181	181	181	179	178	176
41	187	188	188	187	187	185	185	185	185	183	182	181
42	191	191	192	191	190	189	189	189	189	187	186	185
43	194	195	195	194	194	193	193	192	193	191	190	189
44	197	198	198	197	197	197	197	196	197	195	194	193
45	200	201	201	200	200	200	200	199	200	198	197	197
46	202	203	204	203	203	203	203	202	202	201	200	200
47	204	205	206	205	205	205	205	204	204	203	203	202
48	205	207	207	207	207	207	207	206	206	205	205	204
49	207	208	209	208	208	209	208	207	208	207	206	206
50	208	209	210	209	210	210	210	209	209	208	208	207
51	208	210	211	210	211	211	211	210	210	209	209	209
52	209	211	212	211	211	212	212	210	211	210	210	210
53	210	212	212	212	212	213	212	211	212	211	211	211
54	211	213	213	212	213	213	213	212	212	212	212	212
55	212	213	214	213	213	214	214	212	213	213	214	213
56	212	214	214	214	214	215	214	213	214	215	215	214
57	213	214	215	214	215	215	215	214	215	216	216	215
58	214	215	216	214	215	216	215	215	216	217	217	216
59	216	216	216	215	216	216	216	215	217	219	219	218
60	217	217	217	216	216	217	217	216	219	221	220	219
Max Temp:	217	217	217	216	216	217	217	216	219	221	220	219
Max Allowed:	402	402	403	402	402	403	402	401	402	402	402	401

OMEGA POINT LABORATORIES

Time (min)	TC # 388 (°F)	TC # 389 (°F)	TC # 390 (°F)	TC # 391 (°F)	TC # 392 (°F)	TC # 393 (°F)	TC # 394 (°F)	TC # 395 (°F)	TC # 396 (°F)	TC # 397 (°F)	TC # 398 (°F)	TC # 399 (°F)
0	77	77	77	77	77	77	77	77	77	77	77	77
1	77	77	77	77	77	77	77	77	77	77	77	77
2	77	77	77	77	77	77	77	77	77	77	77	77
3	77	77	77	77	77	77	77	77	77	77	77	77
4	77	77	77	77	77	77	77	77	77	77	77	77
5	77	77	77	77	77	77	77	77	77	77	77	77
6	77	77	77	77	77	77	77	77	77	77	77	77
7	77	77	77	77	77	77	77	77	77	77	77	77
8	77	77	77	77	77	77	77	77	77	77	77	77
9	77	77	77	77	77	77	78	77	77	77	77	77
10	77	77	77	77	77	77	78	78	78	77	77	77
11	78	78	78	78	78	78	79	79	79	78	78	78
12	78	78	78	79	79	78	80	80	79	79	79	79
13	79	79	79	79	80	79	81	81	80	80	80	80
14	80	80	80	81	81	79	82	82	82	81	81	81
15	82	81	82	82	82	81	84	84	84	83	83	83
16	83	83	83	84	84	82	86	86	86	85	85	86
17	85	85	85	85	86	84	88	88	88	87	88	88
18	87	87	87	87	88	85	90	90	90	90	90	91
19	89	89	89	90	90	87	93	93	93	92	93	94
20	92	91	92	92	92	89	95	96	96	95	96	98
21	95	94	94	95	95	91	98	99	99	98	100	101
22	98	97	97	98	98	93	101	102	103	102	103	105
23	101	100	100	101	101	96	105	106	106	105	107	108
24	104	103	103	104	104	99	108	109	110	109	110	112
25	108	107	107	108	107	101	111	113	114	113	114	116
26	112	111	111	112	111	104	115	117	118	117	118	120
27	116	115	114	115	114	107	119	121	122	121	122	123
28	120	119	118	119	118	110	122	125	126	125	126	127
29	124	123	122	123	121	114	126	129	130	129	130	131
30	128	127	126	127	125	117	130	134	135	133	134	134
31	132	131	130	131	129	120	134	138	139	137	138	138
32	137	135	134	135	132	124	138	142	143	142	142	142
33	141	140	139	139	136	127	142	147	148	146	146	146
34	146	145	143	143	140	131	146	151	152	150	150	150
35	150	149	148	147	144	134	151	155	156	154	155	154
36	155	154	152	152	148	138	155	160	161	159	159	158
37	160	159	157	156	152	142	159	164	165	163	163	162
38	165	163	162	161	156	145	164	169	170	168	167	166
39	169	168	167	165	160	149	168	173	174	172	172	171

Time (min)	TC # 388 (°F)	TC # 389 (°F)	TC # 390 (°F)	TC # 391 (°F)	TC # 392 (°F)	TC # 393 (°F)	TC # 394 (°F)	TC # 395 (°F)	TC # 396 (°F)	TC # 397 (°F)	TC # 398 (°F)	TC # 399 (°F)
40	174	173	171	170	164	153	172	177	178	176	176	175
41	179	178	176	174	168	157	176	181	182	180	180	179
42	183	182	180	178	172	161	180	185	186	184	184	183
43	187	186	185	183	176	165	184	188	190	188	187	186
44	191	190	189	187	181	169	187	191	193	191	191	190
45	195	194	193	191	185	173	190	194	195	194	194	193
46	198	197	196	194	190	178	193	197	198	197	196	195
47	201	200	199	198	194	183	195	199	200	199	199	198
48	203	203	202	201	198	188	197	200	201	201	201	200
49	205	205	204	203	201	192	198	202	203	202	202	201
50	207	206	206	205	203	195	199	203	204	203	203	203
51	208	208	207	207	205	199	200	204	204	204	204	203
52	210	209	209	208	207	202	201	204	205	205	204	204
53	211	210	210	210	208	205	202	205	205	205	205	205
54	212	212	211	211	210	207	202	206	206	206	206	205
55	213	213	213	212	211	209	203	206	206	206	206	206
56	214	214	214	214	212	211	202	206	207	206	206	206
57	215	215	215	215	212	212	200	200	207	207	207	207
58	216	217	217	216	213	213	198	197	206	208	208	208
59	218	218	218	218	213	213	194	197	206	208	209	209
60	220	220	220	219	214	214	193	198	206	209	210	211
Max Temp:	220	220	220	219	214	214	203	206	207	209	210	211
Max Allowed:	402	402	402	402	402	402	402	402	402	402	402	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 400 (°F)	TC # 401 (°F)	TC # 402 (°F)	TC # 403 (°F)	TC # 404 (°F)	TC # 405 (°F)	TC # 406 (°F)	TC # 407 (°F)	TC # 408 (°F)	TC # 409 (°F)	TC # 410 (°F)	TC # 411 (°F)
0	77	76	76	76	76	76	76	76	76	76	76	76
1	77	76	76	76	76	76	76	76	76	76	76	76
2	77	76	76	76	76	76	76	76	76	76	76	76
3	77	76	76	76	76	76	76	76	76	76	76	76
4	77	76	76	76	76	76	76	76	76	76	76	76
5	77	76	76	76	76	76	76	76	76	76	76	76
6	77	76	76	76	76	76	76	76	76	76	76	76
7	77	76	76	76	76	76	76	76	76	76	76	76
8	77	76	76	76	76	76	76	76	76	76	76	76
9	77	76	76	76	76	76	76	76	76	76	76	77
10	77	77	78	77	76	76	76	76	76	76	77	77
11	78	78	82	78	77	77	77	77	77	77	77	77
12	79	82	89	82	78	77	77	77	77	77	77	77
13	80	86	96	87	79	78	78	77	77	77	78	78
14	82	92	105	92	81	79	79	78	78	78	79	78
15	85	97	111	97	83	81	80	79	79	79	79	79
16	88	103	116	101	86	82	81	80	80	80	80	80
17	92	108	121	106	90	85	83	82	81	81	82	81
18	95	112	125	109	93	87	85	83	83	83	84	82
19	98	117	129	113	96	90	87	85	85	85	85	84
20	102	121	132	116	99	92	89	87	87	86	87	86
21	105	125	136	120	103	96	92	89	89	89	90	88
22	109	129	138	123	106	99	95	92	91	91	92	90
23	113	132	140	126	110	102	98	95	94	94	95	92
24	116	135	142	129	113	106	101	98	97	97	98	95
25	120	138	143	131	117	109	104	101	100	100	101	98
26	123	141	145	133	120	113	108	104	104	104	104	101
27	127	143	146	136	124	117	112	108	107	108	108	104
28	130	145	147	138	127	121	116	112	111	111	112	108
29	133	147	148	140	131	125	120	116	115	115	116	112
30	136	149	150	143	134	129	125	121	120	120	120	116
31	140	151	152	145	138	134	130	125	124	124	125	120
32	143	154	154	148	141	138	135	130	129	129	129	124
33	146	156	156	150	145	142	139	135	134	134	134	128
34	150	160	159	154	149	147	144	140	139	139	139	133
35	154	162	161	157	153	151	149	145	144	144	144	138
36	157	166	165	160	157	156	154	150	149	149	148	142
37	161	169	168	164	162	161	159	155	155	154	153	146
38	165	173	171	168	166	165	163	160	160	159	158	151
39	169	176	175	172	170	170	168	165	165	164	163	158

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 400 (°F)	TC # 401 (°F)	TC # 402 (°F)	TC # 403 (°F)	TC # 404 (°F)	TC # 405 (°F)	TC # 406 (°F)	TC # 407 (°F)	TC # 408 (°F)	TC # 409 (°F)	TC # 410 (°F)	TC # 411 (°F)
40	173	180	179	176	174	174	173	170	170	169	170	168
41	177	184	182	180	178	179	177	175	174	174	176	174
42	181	188	186	183	183	183	182	179	179	179	182	180
43	185	191	190	187	187	187	186	184	184	185	188	185
44	188	195	193	191	190	191	190	188	189	190	193	191
45	191	198	196	194	194	195	194	192	193	194	198	196
46	194	200	199	197	197	198	197	196	197	199	202	198
47	197	203	201	200	200	200	200	199	201	202	204	199
48	199	205	203	202	202	202	202	202	204	205	205	200
49	201	206	205	204	204	204	204	205	206	206	206	200
50	202	207	206	206	206	206	206	206	206	206	206	200
51	203	209	208	207	207	208	208	207	207	206	206	200
52	204	210	209	208	208	209	208	207	207	206	206	198
53	204	211	210	209	209	209	209	208	207	206	205	193
54	205	211	210	209	209	209	209	208	208	207	203	192
55	205	211	211	210	209	209	210	209	209	207	203	196
56	206	212	211	210	210	211	211	210	210	209	206	201
57	207	212	212	211	211	212	212	211	211	210	209	204
58	207	213	213	212	212	213	213	212	212	212	211	206
59	208	214	213	213	213	214	214	213	214	213	213	208
60	210	215	215	215	215	215	215	214	215	215	215	209
Max Temp:	210	215	215	215	215	215	215	214	215	215	215	209
Max Allowed:	402	401	401	401	401	401	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 412 (°F)	TC # 413 (°F)	TC # 414 (°F)	TC # 415 (°F)	TC # 416 (°F)	TC # 417 (°F)	TC # 418 (°F)	TC # 419 (°F)	TC # 420 (°F)	TC # 421 (°F)	TC # 422 (°F)	TC # 423 (°F)
0	76	76	76	76	76	76	76	76	76	76	76	76
1	76	77	76	76	76	76	76	76	76	75	75	75
2	76	76	76	76	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76	76	77	77	77
4	77	77	76	76	76	76	76	76	76	76	76	76
5	76	77	76	76	76	76	76	76	76	77	77	77
6	76	77	76	76	76	76	76	76	76	75	75	75
7	76	77	76	76	76	76	76	76	76	75	75	76
8	77	77	77	76	76	76	76	76	76	77	77	77
9	77	77	77	77	76	76	76	76	76	76	76	76
10	77	78	77	77	77	77	76	77	76	76	76	76
11	77	79	78	77	77	77	77	77	77	76	76	76
12	77	79	79	78	78	78	78	78	77	77	77	77
13	77	80	79	78	78	78	78	78	78	78	78	78
14	78	81	80	79	79	79	79	79	79	78	77	77
15	78	83	82	81	80	81	81	81	80	80	80	80
16	79	84	83	82	82	82	83	83	82	82	81	80
17	80	86	85	84	83	84	85	85	84	82	80	80
18	81	88	87	85	85	86	87	87	86	84	82	82
19	82	90	89	88	87	88	90	90	88	85	84	83
20	84	92	91	90	90	91	93	93	91	89	87	86
21	85	95	94	93	92	94	96	96	94	90	88	87
22	87	97	97	95	95	96	99	99	97	93	90	89
23	88	100	99	98	98	99	102	102	100	96	93	91
24	90	103	102	101	101	103	106	106	103	100	96	94
25	93	106	106	104	104	106	110	110	107	102	98	96
26	95	109	109	108	108	110	113	113	110	105	101	98
27	97	112	112	111	111	113	117	117	114	109	104	102
28	100	116	116	115	115	117	121	121	118	113	108	105
29	103	119	120	119	119	121	125	125	122	116	111	108
30	106	123	124	122	123	125	129	129	125	118	113	110
31	110	126	127	126	126	129	132	133	129	123	117	114
32	114	130	131	130	131	133	136	137	133	126	121	117
33	117	133	135	134	135	137	140	141	137	130	124	121
34	121	137	139	138	139	141	144	145	141	133	127	124
35	125	140	143	142	143	145	148	149	145	137	131	128
36	129	144	147	147	147	149	152	153	149	141	136	132
37	133	147	150	150	151	153	156	156	152	145	139	135
38	136	150	154	154	155	157	159	159	156	149	143	140
39	140	154	157	158	159	161	163	163	159	153	147	143

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 412 (°F)	TC # 413 (°F)	TC # 414 (°F)	TC # 415 (°F)	TC # 416 (°F)	TC # 417 (°F)	TC # 418 (°F)	TC # 419 (°F)	TC # 420 (°F)	TC # 421 (°F)	TC # 422 (°F)	TC # 423 (°F)
40	145	157	161	162	163	164	167	166	163	156	150	147
41	150	160	165	166	167	168	170	170	167	161	156	152
42	154	163	168	169	170	171	173	172	170	164	159	155
43	159	167	171	173	174	175	176	176	173	167	162	159
44	163	169	174	176	177	178	179	178	176	171	166	162
45	167	172	177	179	180	181	182	181	179	174	169	166
46	171	174	180	182	183	184	184	184	182	177	173	170
47	174	177	183	185	186	186	187	187	185	181	177	174
48	178	179	186	188	189	189	189	189	187	184	180	177
49	181	181	188	190	191	191	192	191	190	187	183	181
50	183	183	190	192	193	194	194	194	192	190	187	185
51	185	185	192	194	195	196	196	196	195	192	190	188
52	187	187	194	196	197	198	198	198	197	195	193	191
53	190	189	195	198	199	199	200	199	199	197	195	193
54	191	190	197	200	201	201	202	201	201	200	198	196
55	193	192	199	202	203	203	204	204	204	203	201	199
56	195	193	200	203	205	205	206	206	206	206	204	202
57	196	195	202	205	206	207	207	207	208	208	206	205
58	198	196	203	206	208	209	209	210	210	210	209	207
59	199	197	205	208	210	211	211	212	213	213	212	210
60	201	199	206	210	212	213	214	214	216	215	214	212
Max Temp:	201	199	206	210	212	213	214	214	216	215	214	212
Max Allowed:	401	401	401	401	401	401	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 424 (°F)	TC # 425 (°F)	TC # 426 (°F)	TC # 427 (°F)	TC # 428 (°F)	TC # 429 (°F)	TC # 430 (°F)	TC # 431 (°F)	TC # 432 (°F)	TC # 433 (°F)	TC # 434 (°F)	TC # 435 (°F)
0	76	76	76	76	76	76	76	77	78	77	77	77
1	75	75	75	75	76	76	76	76	77	76	76	76
2	76	76	76	76	76	76	76	77	78	77	77	77
3	77	77	77	77	77	77	77	77	77	77	77	76
4	76	76	76	76	76	76	76	76	76	76	76	76
5	77	77	77	77	77	77	77	77	77	77	77	77
6	75	75	76	76	76	76	76	77	78	77	77	77
7	76	76	76	76	76	76	76	77	78	77	77	77
8	77	77	77	77	77	77	77	76	77	76	76	76
9	76	76	76	76	76	76	76	76	78	77	76	76
10	76	76	76	76	76	76	76	76	79	77	77	76
11	76	76	76	76	76	76	76	76	79	78	77	77
12	77	77	77	77	77	77	77	76	80	78	77	77
13	78	78	78	78	78	78	78	78	83	81	80	79
14	77	77	77	77	77	77	77	78	84	82	80	80
15	79	79	79	79	79	79	79	78	85	83	81	81
16	80	80	80	80	80	80	79	78	87	84	83	82
17	80	79	79	79	79	79	78	79	90	87	85	84
18	81	81	81	81	80	80	79	80	92	89	87	87
19	82	82	82	82	81	81	80	81	94	91	89	88
20	85	85	85	84	84	83	82	81	96	93	91	90
21	86	86	85	85	84	83	83	82	99	96	93	92
22	88	88	87	87	86	85	84	83	102	99	96	95
23	90	90	89	89	88	87	86	85	106	103	101	100
24	93	93	92	92	91	90	88	86	109	106	104	103
25	95	94	94	93	92	91	89	87	111	108	106	105
26	97	96	96	95	94	92	91	90	115	113	111	110
27	100	99	99	98	97	95	93	92	119	117	115	114
28	104	103	102	101	100	98	96	93	121	120	118	117
29	107	105	104	104	102	100	98	95	125	124	122	121
30	108	107	106	105	104	101	99	97	128	128	126	125
31	112	111	110	109	107	105	102	100	132	132	131	130
32	115	114	112	112	110	108	105	101	134	135	134	133
33	119	117	116	115	113	111	108	105	139	140	139	139
34	122	120	119	118	116	113	110	106	141	143	142	142
35	126	124	122	121	119	116	113	109	145	147	146	146
36	130	128	126	125	123	120	117	111	148	150	150	150
37	133	131	129	128	126	123	119	114	151	154	155	155
38	137	135	133	132	130	127	123	119	156	159	160	160
39	141	139	137	136	134	130	127	122	159	163	164	164

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 424 (°F)	TC # 425 (°F)	TC # 426 (°F)	TC # 427 (°F)	TC # 428 (°F)	TC # 429 (°F)	TC # 430 (°F)	TC # 431 (°F)	TC # 432 (°F)	TC # 433 (°F)	TC # 434 (°F)	TC # 435 (°F)
40	145	142	140	139	137	134	130	127	162	166	167	167
41	150	148	146	144	142	139	135	131	165	170	171	171
42	153	151	149	148	146	142	139	136	169	174	175	176
43	157	155	153	152	150	146	144	140	171	176	177	178
44	160	158	156	155	153	150	148	147	175	180	182	182
45	164	162	160	159	157	154	153	152	177	182	184	185
46	168	166	164	163	161	158	156	155	180	186	188	188
47	172	170	168	167	165	162	158	157	183	189	191	191
48	176	174	172	171	169	166	161	157	184	190	192	193
49	179	178	176	175	173	170	166	161	188	194	196	196
50	183	181	180	179	177	174	170	163	188	195	197	197
51	186	185	183	182	180	177	173	166	190	196	199	199
52	189	188	187	186	184	181	177	169	192	198	201	202
53	192	190	189	188	187	184	180	173	194	201	203	204
54	195	194	193	192	191	188	184	176	196	203	205	206
55	198	197	196	195	194	191	187	178	196	203	206	207
56	201	200	199	198	197	194	190	181	196	205	207	209
57	204	203	202	201	200	197	193	183	197	206	209	210
58	206	205	204	204	202	199	195	186	197	205	211	212
59	209	208	207	207	205	202	197	188	196	205	211	213
60	211	210	209	209	207	204	199	189	193	204	212	214
Max Temp:	211	210	209	209	207	204	199	189	197	206	212	214
Max Allowed:	401	401	401	401	401	401	401	402	403	402	402	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 436 (°F)	TC # 437 (°F)	TC # 438 (°F)	TC # 439 (°F)	TC # 440 (°F)	TC # 441 (°F)	TC # 442 (°F)	TC # 443 (°F)	TC # 444 (°F)	TC # 445 (°F)	TC # 446 (°F)	TC # 447 (°F)
0	77	77	76	77	77	77	77	76	77	77	77	77
1	76	76	75	76	76	77	77	77	77	77	77	77
2	77	77	76	77	77	77	77	77	77	77	77	77
3	76	76	75	76	76	76	76	77	77	77	77	77
4	76	76	74	75	75	77	77	77	77	77	77	77
5	76	76	75	76	76	77	77	77	77	77	77	77
6	77	77	76	77	77	77	77	77	77	77	77	77
7	76	76	75	76	76	77	77	77	77	77	77	77
8	76	76	74	75	75	77	77	77	77	77	77	77
9	76	76	75	75	75	77	77	77	77	77	77	77
10	76	76	75	76	76	77	77	77	77	77	77	77
11	76	76	75	76	76	77	77	77	77	77	77	77
12	77	77	76	76	76	77	77	77	77	77	77	77
13	79	79	78	79	78	78	78	78	78	78	78	78
14	80	80	79	79	78	78	78	78	78	78	78	78
15	80	81	80	80	79	79	79	79	79	79	79	79
16	82	82	82	82	80	80	80	79	79	79	79	79
17	84	84	84	84	82	82	81	80	80	80	80	80
18	87	87	87	87	85	83	82	82	81	81	81	81
19	89	89	90	89	86	85	84	83	83	82	83	82
20	90	91	92	91	88	87	86	85	84	84	84	84
21	93	94	95	93	90	89	88	86	86	85	86	85
22	96	97	98	96	93	91	90	88	88	87	87	87
23	100	101	102	101	97	94	92	91	90	89	89	89
24	103	104	105	104	100	97	95	93	92	91	91	91
25	105	107	108	106	102	100	98	96	94	94	94	93
26	111	112	113	111	107	103	100	99	97	97	97	96
27	114	115	116	114	110	106	103	101	100	99	100	100
28	117	118	119	117	113	109	107	105	103	102	103	103
29	121	122	122	120	116	113	110	108	106	106	106	106
30	126	126	126	124	120	116	113	111	109	109	109	110
31	130	131	130	128	124	119	117	114	113	112	112	113
32	133	133	132	130	126	123	120	118	116	115	115	116
33	139	138	137	135	131	127	124	121	120	119	118	119
34	142	141	140	138	133	130	127	125	123	122	122	123
35	146	145	144	141	137	134	131	129	127	126	126	126
36	150	149	148	145	141	138	135	133	131	129	129	130
37	155	154	152	149	145	142	139	136	134	133	132	133
38	160	159	157	154	150	146	142	140	138	137	136	137
39	164	163	161	158	154	150	146	144	142	141	140	141

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 436 (°F)	TC # 437 (°F)	TC # 438 (°F)	TC # 439 (°F)	TC # 440 (°F)	TC # 441 (°F)	TC # 442 (°F)	TC # 443 (°F)	TC # 444 (°F)	TC # 445 (°F)	TC # 446 (°F)	TC # 447 (°F)
40	167	166	164	161	157	154	150	148	146	144	144	145
41	171	170	168	165	161	158	154	152	150	148	148	149
42	175	174	172	169	165	161	158	155	154	152	152	153
43	178	176	174	172	168	165	162	159	157	156	156	157
44	182	181	179	176	172	169	166	163	161	160	160	162
45	185	183	181	179	175	173	169	167	165	164	164	166
46	188	187	185	183	179	176	173	171	169	168	167	169
47	191	190	188	186	183	180	177	174	173	171	171	171
48	193	191	190	188	184	183	180	178	176	175	175	175
49	196	195	194	192	189	186	183	181	180	179	178	178
50	198	197	195	193	190	189	186	184	183	182	181	182
51	200	199	198	196	193	192	189	188	186	186	185	184
52	202	201	200	198	196	194	192	190	189	189	188	188
53	204	203	203	201	199	197	195	193	192	191	191	188
54	207	206	205	204	201	199	197	196	195	194	193	191
55	207	206	206	204	203	202	200	199	198	197	196	194
56	209	208	208	206	205	204	202	201	200	199	198	196
57	211	210	210	209	207	206	204	203	202	201	200	198
58	213	212	212	211	209	208	206	205	204	204	202	199
59	214	213	213	212	211	210	208	207	206	206	204	200
60	215	214	214	213	212	212	210	209	208	208	206	202
Max Temp:	215	214	214	213	212	212	210	209	208	208	206	202
Max Allowed:	402	402	401	402	402	402	402	401	402	402	402	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 448 (°F)	TC # 449 (°F)	TC # 450 (°F)	TC # 451 (°F)	TC # 452 (°F)	TC # 453 (°F)	TC # 454 (°F)	TC # 455 (°F)	TC # 456 (°F)	TC # 457 (°F)	TC # 458 (°F)	TC # 459 (°F)
0	77	77	77	77	77	77	77	77	77	77	76	76
1	77	77	77	78	77	77	77	77	77	77	76	76
2	77	77	77	77	77	77	77	77	77	77	76	76
3	77	77	77	78	77	77	77	77	77	76	76	76
4	77	77	77	78	77	77	77	77	77	77	76	76
5	77	77	77	79	77	77	77	77	77	77	76	76
6	77	77	77	79	78	77	77	77	77	77	76	76
7	77	77	77	80	78	77	77	77	77	77	76	76
8	77	77	77	81	78	77	77	77	77	77	77	76
9	77	77	77	82	79	77	77	77	77	77	77	76
10	77	77	77	83	79	78	77	77	77	77	77	77
11	77	77	77	84	80	78	78	77	77	77	77	77
12	77	77	78	85	81	79	78	78	78	78	77	77
13	78	78	78	87	82	80	79	79	79	79	78	78
14	78	78	78	89	84	81	80	79	80	80	79	78
15	78	78	78	91	85	82	81	81	81	81	80	79
16	79	79	79	93	87	83	82	82	82	82	81	80
17	80	80	80	96	89	85	84	84	84	84	82	81
18	81	81	80	98	92	87	86	86	86	86	84	82
19	82	82	81	101	94	90	89	88	89	88	86	84
20	83	83	82	105	97	92	91	91	91	90	88	85
21	84	84	83	108	100	95	94	94	94	93	90	87
22	86	86	84	111	103	98	97	97	97	95	93	89
23	88	88	86	115	106	101	100	100	100	98	95	92
24	90	90	88	118	110	104	103	103	103	101	98	94
25	92	94	92	121	113	108	107	107	107	105	101	97
26	96	98	96	125	117	112	110	110	110	108	104	100
27	99	102	100	128	121	115	114	114	114	112	108	103
28	103	105	104	131	125	119	118	118	118	115	111	106
29	106	109	107	134	128	123	122	122	122	119	115	109
30	110	112	111	137	132	127	126	126	126	123	118	113
31	113	116	114	140	135	131	130	130	130	127	122	116
32	116	119	118	142	139	135	134	134	133	131	126	120
33	120	123	121	144	142	139	138	138	138	134	129	124
34	123	126	125	147	145	143	142	142	142	139	133	128
35	127	130	128	149	149	147	146	146	146	143	137	131
36	131	134	132	151	152	151	150	150	150	147	141	135
37	134	138	136	153	155	155	154	154	154	151	145	139
38	138	142	140	155	158	158	158	159	158	155	149	143
39	142	145	144	157	161	162	162	163	163	159	153	147

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 448 (°F)	TC # 449 (°F)	TC # 450 (°F)	TC # 451 (°F)	TC # 452 (°F)	TC # 453 (°F)	TC # 454 (°F)	TC # 455 (°F)	TC # 456 (°F)	TC # 457 (°F)	TC # 458 (°F)	TC # 459 (°F)
40	146	149	148	160	164	165	166	167	167	163	157	152
41	151	154	152	162	167	169	170	171	171	167	162	156
42	154	158	156	165	169	172	174	175	175	171	165	160
43	159	161	160	167	172	175	177	178	178	175	169	163
44	163	166	165	170	175	179	181	182	182	179	173	167
45	167	170	169	172	178	182	184	185	185	182	177	171
46	170	174	172	175	181	185	187	188	188	185	180	175
47	173	177	175	177	184	188	190	191	191	188	183	179
48	175	178	177	179	186	190	192	194	194	191	187	182
49	178	180	179	181	189	193	194	196	196	194	189	185
50	182	184	182	184	191	195	197	198	198	196	192	188
51	185	186	185	185	193	197	198	200	200	198	194	191
52	189	190	189	187	195	199	200	201	201	200	197	194
53	188	190	190	189	197	200	202	203	203	201	199	196
54	192	194	193	190	198	202	203	204	204	203	201	198
55	195	197	194	192	199	203	205	205	206	204	203	201
56	196	197	196	193	201	204	206	207	207	206	204	203
57	197	198	196	194	202	206	207	208	208	207	206	205
58	197	197	196	195	203	207	208	209	209	208	207	206
59	195	197	196	196	204	208	209	210	210	210	209	208
60	197	197	196	197	205	209	210	211	211	211	210	210
Max Temp:	197	198	196	197	205	209	210	211	211	211	210	210
Max Allowed:	402	402	402	402	402	402	402	402	402	402	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 460 (°F)	TC # 461 (°F)	TC # 462 (°F)	TC # 463 (°F)	TC # 464 (°F)	TC # 465 (°F)	TC # 466 (°F)	TC # 467 (°F)	TC # 468 (°F)	TC # 469 (°F)	TC # 470 (°F)	TC # 471 (°F)
0	76	77	77	77	77	77	77	77	77	77	78	78
1	76	75	75	75	75	75	75	76	76	76	76	78
2	76	77	77	77	77	77	77	77	77	78	78	77
3	76	76	76	76	76	76	76	76	76	76	77	75
4	76	75	75	75	75	75	75	75	75	75	76	78
5	76	77	77	77	77	77	77	77	77	78	78	77
6	76	77	77	77	77	77	77	77	77	78	79	77
7	76	77	77	77	77	77	77	77	77	78	79	78
8	76	75	75	75	75	75	75	75	75	75	77	76
9	77	76	76	76	76	76	76	76	76	77	79	79
10	77	76	76	76	76	76	76	76	76	76	79	79
11	77	76	76	76	76	76	76	76	76	76	80	80
12	77	76	76	76	76	76	76	76	76	77	82	81
13	77	77	77	76	76	77	77	76	76	77	83	79
14	78	78	78	78	78	78	78	78	78	78	86	81
15	78	76	76	76	76	76	76	76	76	76	86	84
16	79	77	77	77	77	76	76	76	76	76	88	86
17	80	80	80	80	79	79	79	79	79	79	92	87
18	81	81	80	80	80	80	79	79	79	79	94	89
19	82	82	82	82	81	81	81	80	80	80	97	93
20	84	82	81	81	81	80	80	79	79	79	98	96
21	86	84	83	83	82	82	82	81	80	80	102	100
22	87	85	85	84	83	83	82	82	81	81	104	103
23	90	87	86	86	85	84	84	83	83	83	108	105
24	92	89	88	87	87	86	85	85	84	84	111	109
25	94	91	90	89	89	88	87	86	86	86	114	113
26	97	96	95	94	93	92	92	91	90	90	120	117
27	100	98	97	96	95	94	94	93	93	93	124	121
28	103	100	99	98	97	96	95	94	94	95	126	124
29	106	102	101	100	99	98	97	96	97	98	129	129
30	109	106	105	104	103	102	101	100	101	103	134	134
31	113	110	109	107	106	105	104	104	105	106	137	137
32	116	112	110	109	108	106	106	105	106	107	139	142
33	120	117	115	114	112	111	110	109	110	111	143	144
34	124	121	119	118	116	115	114	113	114	115	146	148
35	127	125	123	121	120	118	117	116	117	117	149	151
36	131	127	126	124	122	120	119	118	119	119	150	156
37	135	132	130	128	127	125	124	122	123	123	154	159
38	139	135	134	132	130	128	127	125	126	125	156	160
39	143	139	137	135	133	131	130	129	128	128	158	164

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 460 (°F)	TC # 461 (°F)	TC # 462 (°F)	TC # 463 (°F)	TC # 464 (°F)	TC # 465 (°F)	TC # 466 (°F)	TC # 467 (°F)	TC # 468 (°F)	TC # 469 (°F)	TC # 470 (°F)	TC # 471 (°F)
40	147	144	142	140	138	136	135	133	132	132	162	167
41	151	147	145	143	141	139	137	135	135	134	163	170
42	156	152	150	148	146	144	142	140	139	138	167	173
43	160	155	153	151	149	147	145	144	144	144	169	178
44	164	161	159	156	154	152	151	151	155	157	173	181
45	168	164	162	160	158	156	156	157	160	162	176	184
46	172	168	166	164	162	161	161	163	165	167	178	187
47	175	173	171	169	167	166	166	168	171	172	181	189
48	179	175	173	171	170	169	169	171	174	174	182	191
49	182	180	178	177	175	174	174	176	178	180	185	192
50	186	184	182	181	179	178	178	181	182	183	187	195
51	189	185	184	182	181	181	180	184	185	185	187	196
52	192	188	187	186	184	184	183	185	186	185	188	197
53	194	193	192	190	189	188	187	187	188	188	191	199
54	197	196	194	193	192	191	190	191	190	190	193	199
55	199	196	196	194	193	192	191	191	191	190	193	200
56	201	199	198	197	196	195	194	193	192	191	194	201
57	203	201	201	200	199	198	196	194	192	191	196	202
58	205	204	203	202	201	200	199	195	192	192	197	203
59	207	205	204	203	202	201	200	195	190	190	197	204
60	209	207	206	205	205	203	202	197	191	191	198	206
Max Temp:	209	207	206	205	205	203	202	197	192	192	198	206
Max Allowed:	401	402	402	402	402	402	402	402	402	402	403	403

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 472 (°F)	TC # 473 (°F)	TC # 474 (°F)	TC # 475 (°F)	TC # 476 (°F)	TC # 477 (°F)	TC # 478 (°F)	TC # 479 (°F)	TC # 480 (°F)	TC # 481 (°F)	TC # 482 (°F)	TC # 483 (°F)
0	78	77	77	77	77	77	77	77	77	76	76	76
1	77	77	77	77	77	77	77	77	77	76	76	76
2	77	76	76	76	76	76	76	76	76	76	76	76
3	75	75	75	75	75	75	75	74	74	77	77	77
4	78	77	77	77	77	77	77	77	77	76	76	76
5	77	77	77	77	77	77	77	77	76	76	76	76
6	77	76	76	76	76	76	76	76	76	76	76	76
7	77	77	77	77	77	77	77	77	76	76	76	76
8	76	76	75	75	75	75	75	75	75	77	77	77
9	78	78	78	78	78	78	77	77	77	76	76	76
10	78	78	78	78	78	78	77	77	77	76	76	76
11	79	79	78	78	78	78	78	77	77	76	76	76
12	80	79	79	79	79	79	78	78	78	77	77	77
13	78	78	77	77	78	77	76	76	76	77	78	78
14	80	79	79	79	80	78	77	77	76	77	77	77
15	83	82	82	82	83	81	80	79	79	78	78	78
16	84	83	83	83	84	82	80	79	79	80	80	79
17	85	85	84	84	85	83	81	79	79	80	80	80
18	88	87	86	86	87	85	82	80	80	81	81	81
19	92	91	90	90	91	88	85	83	82	82	81	81
20	95	94	93	93	95	91	87	85	84	84	83	83
21	99	98	96	96	98	94	90	87	86	85	84	84
22	102	101	99	99	101	97	92	89	88	87	87	86
23	104	103	101	101	103	98	93	89	88	89	89	88
24	108	107	105	105	106	102	96	92	90	91	91	90
25	112	111	110	109	110	106	100	95	93	94	93	92
26	116	115	113	113	114	109	103	98	95	95	95	94
27	120	119	117	117	117	113	106	101	98	98	97	96
28	124	122	121	120	120	115	108	103	100	101	100	100
29	128	127	125	124	124	119	112	107	104	105	104	103
30	134	132	131	129	130	124	117	112	108	107	106	105
31	137	135	134	132	132	127	120	114	110	110	109	108
32	142	141	139	137	137	132	125	119	115	114	113	111
33	144	143	141	140	139	134	127	121	117	117	116	115
34	149	148	146	144	144	139	132	126	122	121	119	118
35	153	152	150	148	148	143	136	130	126	125	123	122
36	157	157	155	153	153	148	141	135	131	129	127	126
37	161	160	158	157	157	152	145	139	135	132	131	129
38	163	162	160	159	159	154	148	141	137	137	135	133
39	166	166	164	163	162	158	152	146	142	141	139	137

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 472 (°F)	TC # 473 (°F)	TC # 474 (°F)	TC # 475 (°F)	TC # 476 (°F)	TC # 477 (°F)	TC # 478 (°F)	TC # 479 (°F)	TC # 480 (°F)	TC # 481 (°F)	TC # 482 (°F)	TC # 483 (°F)
40	170	170	168	166	166	162	156	150	146	145	143	141
41	173	173	172	170	170	166	160	155	150	150	147	145
42	176	177	175	173	173	170	164	158	154	153	151	149
43	181	181	179	178	178	174	169	164	160	158	155	153
44	184	184	182	181	181	178	173	168	164	161	158	156
45	187	188	186	184	184	181	177	172	168	165	163	160
46	190	190	189	187	187	184	180	175	172	169	167	164
47	193	193	191	190	190	187	183	179	175	173	170	168
48	194	195	193	192	192	189	186	181	178	177	175	173
49	196	197	195	194	194	191	188	184	181	180	178	176
50	199	199	198	197	196	195	191	188	185	184	182	180
51	200	200	199	198	198	196	193	190	188	188	186	184
52	201	202	201	200	200	198	196	193	191	191	189	188
53	202	203	203	202	202	201	198	196	194	193	192	190
54	203	204	203	203	203	202	200	197	196	196	195	193
55	204	205	204	204	204	203	201	199	198	199	198	196
56	204	205	205	205	205	205	203	201	200	201	200	199
57	205	206	206	206	206	206	204	203	202	203	202	201
58	206	207	207	207	207	207	206	204	203	204	204	203
59	207	208	208	208	208	208	207	206	205	206	205	205
60	209	210	210	210	210	211	210	208	207	207	206	206
Max Temp:	209	210	210	210	210	211	210	208	207	207	206	206
Max Allowed:	403	402	402	402	402	402	402	402	402	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 484 (°F)	TC # 485 (°F)	TC # 486 (°F)	TC # 487 (°F)	TC # 488 (°F)	TC # 489 (°F)	TC # 490 (°F)	TC # 491 (°F)	TC # 492 (°F)	TC # 493 (°F)	TC # 494 (°F)	TC # 495 (°F)
0	76	76	76	76	76	77	76	77	77	77	76	76
1	76	76	76	76	76	77	77	76	76	76	76	76
2	76	76	76	76	76	77	77	77	77	77	77	77
3	77	77	77	77	77	78	78	77	77	77	77	77
4	76	76	76	76	76	77	77	76	76	76	76	76
5	76	76	76	76	76	77	77	77	77	77	77	77
6	76	76	76	76	76	77	77	78	77	77	77	77
7	76	76	76	76	76	78	77	78	77	77	77	77
8	77	77	77	77	77	80	80	78	77	77	77	77
9	76	76	76	76	76	80	80	79	78	77	77	77
10	76	76	76	76	77	82	82	80	79	78	78	78
11	76	76	76	76	77	84	84	83	81	79	79	79
12	77	77	77	77	77	87	87	85	82	81	81	80
13	78	78	78	78	78	91	91	89	86	84	84	83
14	77	77	78	78	78	93	93	92	88	86	86	85
15	78	79	78	79	79	97	98	95	91	88	89	88
16	79	80	80	80	80	101	102	99	94	92	93	91
17	80	80	80	80	80	105	106	104	99	96	97	96
18	81	81	81	81	81	109	111	108	103	100	102	100
19	81	81	81	81	82	113	115	112	107	104	106	104
20	83	83	83	83	83	118	120	116	110	108	110	108
21	84	84	84	84	84	121	125	121	115	113	115	113
22	86	86	86	86	86	126	130	126	119	118	120	118
23	88	88	88	88	89	131	135	131	125	123	125	124
24	90	90	90	90	90	135	140	136	129	127	130	129
25	92	92	92	92	92	140	145	141	134	132	135	134
26	94	94	94	94	94	143	149	146	140	138	141	140
27	96	96	96	97	97	147	153	151	145	143	146	145
28	99	99	99	100	100	152	159	156	150	148	151	150
29	103	103	103	103	103	156	164	160	154	153	155	155
30	105	105	105	105	105	159	167	165	159	158	161	160
31	108	108	108	109	108	164	172	170	164	163	166	165
32	111	111	111	112	111	168	176	174	168	167	170	169
33	115	115	115	115	114	172	181	179	173	173	175	174
34	118	118	118	118	117	176	185	184	178	177	179	178
35	121	121	121	122	120	180	189	188	182	181	183	182
36	125	125	125	125	123	185	192	192	186	185	187	186
37	128	128	128	128	126	189	196	195	191	189	190	190
38	133	133	133	133	130	194	200	199	195	193	194	194
39	137	136	136	136	133	200	200	202	198	197	198	197

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 484 (°F)	TC # 485 (°F)	TC # 486 (°F)	TC # 487 (°F)	TC # 488 (°F)	TC # 489 (°F)	TC # 490 (°F)	TC # 491 (°F)	TC # 492 (°F)	TC # 493 (°F)	TC # 494 (°F)	TC # 495 (°F)
40	140	140	140	139	136	203	202	203	202	201	201	200
41	144	144	144	144	140	206	205	204	204	203	203	203
42	148	147	147	147	143	207	206	207	206	206	206	206
43	152	151	151	151	147	208	207	207	207	207	208	207
44	155	155	154	154	150	207	208	209	209	209	209	209
45	159	159	158	158	154	208	210	210	209	210	210	210
46	163	163	162	162	157	209	211	211	210	210	211	211
47	167	166	166	165	161	210	212	213	211	211	212	212
48	172	171	171	170	165	211	214	214	212	212	213	213
49	175	174	174	173	168	211	216	216	214	213	214	214
50	179	178	178	177	172	212	219	218	214	214	214	214
51	183	183	182	181	177	214	223	221	216	214	215	215
52	187	186	186	185	181	216	226	223	217	214	215	215
53	189	189	189	188	184	219	229	226	219	215	216	216
54	192	192	192	191	188	224	233	229	221	217	217	217
55	196	195	195	195	191	229	238	232	222	217	217	218
56	198	198	198	197	194	234	242	235	224	219	218	219
57	200	200	200	199	196	239	247	239	226	220	220	220
58	202	202	202	201	198	244	251	242	228	222	221	221
59	204	204	204	203	200	249	256	245	230	223	222	221
60	205	205	205	204	200	254	260	249	232	224	223	222
Max Temp:	205	205	205	204	200	254	260	249	232	224	223	222
Max Allowed:	401	401	401	401	401	402	401	402	402	402	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 496 (°F)	TC # 497 (°F)	TC # 498 (°F)	TC # 499 (°F)	TC # 500 (°F)	TC # 501 (°F)	TC # 502 (°F)	TC # 503 (°F)	TC # 504 (°F)	TC # 505 (°F)	TC # 506 (°F)	TC # 507 (°F)
0	76	76	76	76	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76	76	76	76	76
2	77	77	77	77	77	76	76	76	76	76	76	76
3	77	77	77	77	77	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76	76	76	76	76
5	77	77	77	77	77	76	76	76	76	76	76	77
6	77	77	77	77	77	76	76	76	76	76	77	77
7	77	77	76	76	76	76	76	76	76	76	77	77
8	77	76	76	76	76	76	76	76	77	77	77	77
9	77	77	77	76	76	76	76	76	77	77	77	77
10	77	77	77	77	77	77	77	77	77	78	78	78
11	78	78	78	78	77	77	77	77	78	79	79	79
12	80	79	79	79	78	78	78	78	79	80	81	80
13	82	82	82	81	81	79	79	79	81	82	82	82
14	85	84	84	83	82	81	81	80	83	84	85	84
15	86	86	85	84	84	83	83	82	85	87	87	86
16	90	89	89	87	87	86	85	84	87	90	90	88
17	95	93	93	91	90	89	88	87	90	93	93	91
18	99	97	96	95	94	92	91	90	93	96	96	94
19	102	101	100	98	97	96	95	93	96	100	100	97
20	106	105	104	102	101	100	99	97	100	104	104	101
21	111	109	108	106	105	104	103	100	104	108	108	104
22	116	114	113	111	110	109	107	104	108	112	112	108
23	122	120	119	117	115	114	112	109	112	117	117	112
24	127	125	123	121	120	119	117	114	116	121	121	116
25	132	130	129	126	125	124	122	118	121	126	126	120
26	138	135	134	132	131	129	128	123	125	131	130	124
27	143	141	139	137	136	135	133	129	130	135	135	129
28	148	146	145	143	141	140	138	133	135	140	140	133
29	153	150	149	147	146	145	143	139	140	145	145	137
30	158	156	154	152	151	150	149	144	144	149	149	142
31	163	161	160	158	157	155	153	149	149	154	154	147
32	167	165	164	162	160	160	158	154	154	159	159	152
33	173	171	169	167	166	164	163	159	159	164	164	157
34	177	175	173	172	171	169	167	164	164	169	169	163
35	181	179	178	176	175	173	172	170	170	173	174	169
36	184	182	181	180	179	178	177	175	175	178	179	175
37	188	187	186	184	184	183	182	181	181	183	184	181
38	192	191	190	189	189	187	187	186	186	187	188	186
39	196	195	194	193	193	192	192	191	191	192	192	191

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 496 (°F)	TC # 497 (°F)	TC # 498 (°F)	TC # 499 (°F)	TC # 500 (°F)	TC # 501 (°F)	TC # 502 (°F)	TC # 503 (°F)	TC # 504 (°F)	TC # 505 (°F)	TC # 506 (°F)	TC # 507 (°F)
40	200	199	198	198	197	196	196	195	195	196	197	196
41	202	202	201	201	200	200	199	199	199	200	200	199
42	205	205	205	204	204	203	202	202	202	203	203	203
43	207	206	206	205	205	205	205	204	204	206	206	205
44	209	208	208	207	207	207	206	206	206	208	208	207
45	210	210	209	209	208	208	208	207	208	210	210	209
46	211	211	210	210	209	209	209	208	209	211	212	210
47	212	212	211	211	211	210	210	209	210	213	214	211
48	213	212	212	211	211	211	210	210	211	214	216	213
49	214	213	213	213	212	211	211	210	211	216	218	214
50	214	214	213	213	212	212	212	211	212	218	220	215
51	215	214	214	213	213	212	212	211	213	219	222	217
52	215	215	214	214	213	212	212	212	213	221	224	219
53	216	215	215	214	214	213	213	212	215	224	226	221
54	217	216	216	215	215	213	213	212	216	226	228	223
55	217	216	216	215	215	214	213	212	218	228	230	225
56	218	218	217	216	216	214	213	213	221	231	233	227
57	219	219	218	217	216	215	214	214	223	233	236	229
58	220	220	219	218	217	215	215	215	226	236	238	232
59	221	220	219	219	218	216	215	216	228	239	241	235
60	222	221	220	219	218	217	216	217	230	241	245	238
Max Temp:	222	221	220	219	218	217	216	217	230	241	245	238
Max Allowed:	401	401	401	401	401	401	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Time (min)	TC # 508 (°F)	TC # 509 (°F)	TC # 510 (°F)
0	77	76	76
1	77	76	76
2	77	77	76
3	77	77	76
4	77	76	76
5	77	77	76
6	77	77	76
7	77	77	76
8	77	77	77
9	78	77	77
10	78	78	77
11	79	78	78
12	79	79	79
13	80	80	79
14	82	81	81
15	83	83	82
16	84	84	83
17	86	86	85
18	88	88	87
19	90	90	89
20	92	92	92
21	94	95	94
22	96	97	97
23	99	100	99
24	101	103	102
25	104	106	105
26	107	109	109
27	110	112	112
28	113	115	116
29	116	119	119
30	119	122	123
31	122	126	127
32	126	130	131
33	129	134	135
34	133	138	139
35	137	142	143
36	140	146	147
37	144	150	151
38	148	153	155
39	151	157	159

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 508 (°F)	TC # 509 (°F)	TC # 510 (°F)
40	154	161	163
41	158	164	166
42	161	168	169
43	165	171	173
44	167	174	176
45	170	177	179
46	173	180	182
47	176	182	184
48	178	185	187
49	180	187	189
50	183	190	192
51	185	192	195
52	187	194	197
53	189	197	200
54	191	199	202
55	193	201	205
56	195	203	208
57	197	206	210
58	199	208	213
59	201	211	216
60	203	213	218
Max Temp:	203	213	218
Max Allowed:	402	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 511 (°F)	TC # 512 (°F)	TC # 513 (°F)	TC # 514 (°F)	TC # 515 (°F)	TC # 516 (°F)	TC # 517 (°F)	TC # 518 (°F)	TC # 519 (°F)	TC # 520 (°F)	TC # 521 (°F)	TC # 522 (°F)
0	76	76	76	76	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76	76	76	76	76	76
6	76	76	76	76	76	76	76	76	76	76	76	76
7	76	76	76	76	76	76	76	76	76	76	76	76
8	76	76	76	76	76	76	76	76	76	76	76	76
9	77	76	76	76	76	76	76	76	76	76	76	76
10	77	77	76	76	76	76	76	76	76	76	76	76
11	77	77	77	77	77	77	76	76	76	76	76	77
12	78	78	77	77	77	77	77	77	77	77	77	77
13	79	79	78	78	78	77	77	77	77	77	77	77
14	80	80	79	79	79	78	78	78	77	77	78	78
15	81	81	81	80	80	79	79	78	78	78	78	79
16	83	82	82	82	81	80	80	79	79	79	79	79
17	84	84	84	84	83	82	81	80	80	80	80	80
18	86	86	86	85	84	83	82	82	81	81	81	81
19	89	88	88	87	86	85	84	83	82	82	82	83
20	91	90	90	90	88	87	85	85	84	84	84	84
21	93	93	92	92	91	89	88	87	86	85	85	86
22	96	95	95	94	93	92	90	89	87	87	87	87
23	99	98	98	97	96	94	92	91	90	89	89	89
24	101	101	101	100	99	97	95	94	92	91	91	91
25	105	104	104	103	102	100	98	96	94	93	93	93
26	108	107	107	106	105	103	101	99	97	96	96	96
27	111	110	110	109	108	106	104	103	100	99	98	98
28	115	114	113	113	111	110	108	106	103	101	101	101
29	119	118	117	116	115	113	111	109	106	105	104	103
30	122	121	121	120	119	117	115	113	110	108	107	106
31	126	125	125	124	122	120	118	117	113	111	110	109
32	130	129	129	127	126	124	122	120	117	115	113	112
33	134	133	133	131	130	128	126	124	121	118	116	115
34	138	137	137	135	134	132	130	128	124	122	120	119
35	143	142	141	140	138	136	134	132	128	126	123	122
36	147	146	145	143	142	141	138	136	132	129	127	125
37	151	150	149	148	147	145	142	140	136	133	131	129
38	154	153	153	152	151	149	147	144	140	137	134	132
39	158	157	157	156	155	153	151	148	144	141	138	136

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 511 (°F)	TC # 512 (°F)	TC # 513 (°F)	TC # 514 (°F)	TC # 515 (°F)	TC # 516 (°F)	TC # 517 (°F)	TC # 518 (°F)	TC # 519 (°F)	TC # 520 (°F)	TC # 521 (°F)	TC # 522 (°F)
40	162	161	160	160	159	157	155	152	147	144	142	140
41	165	165	164	164	163	161	158	155	151	148	146	144
42	169	168	168	167	167	165	162	159	155	152	150	147
43	172	171	171	171	170	168	166	163	159	156	154	151
44	175	175	174	174	174	172	169	166	162	159	157	155
45	178	178	178	178	177	175	172	169	166	163	161	159
46	181	181	181	181	180	178	176	173	169	167	165	163
47	184	184	184	184	183	181	179	176	172	170	169	166
48	187	187	187	187	186	184	181	178	175	174	172	170
49	190	190	190	190	189	187	184	181	179	177	176	173
50	193	193	193	192	192	190	187	184	182	180	179	177
51	195	195	195	195	194	192	189	187	185	183	182	180
52	198	198	198	198	197	195	192	189	187	186	185	183
53	201	201	201	200	199	197	194	192	190	189	188	186
54	203	203	203	203	201	199	196	194	193	192	191	189
55	206	206	206	205	204	201	198	197	195	195	194	192
56	209	209	209	208	206	203	201	199	198	197	196	194
57	212	212	211	210	208	205	203	201	200	199	198	196
58	215	215	214	213	210	207	205	203	202	201	200	199
59	218	218	217	215	213	210	207	204	204	205	202	200
60	221	221	220	218	215	212	209	208	206	205	204	202
Max Temp:	221	221	220	218	215	212	209	208	206	205	204	202
Max Allowed:	401	401	401	401	401	401	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 523 (°F)	TC # 524 (°F)	TC # 525 (°F)	TC # 526 (°F)	TC # 527 (°F)	TC # 528 (°F)	TC # 529 (°F)	TC # 530 (°F)	TC # 531 (°F)	TC # 532 (°F)	TC # 533 (°F)	TC # 534 (°F)
0	76	76	76	76	77	77	76	76	76	76	76	76
1	76	76	76	76	77	77	76	76	76	76	76	76
2	76	76	76	76	77	77	76	76	76	76	76	76
3	76	76	76	76	77	77	76	76	76	76	76	76
4	76	76	76	76	77	77	76	76	76	76	76	76
5	76	76	76	76	77	76	76	76	76	76	76	76
6	76	76	76	76	77	77	76	76	76	76	76	76
7	76	76	76	76	77	77	76	76	76	76	76	76
8	76	76	76	76	77	77	77	76	76	76	76	76
9	76	76	76	76	77	77	77	76	76	76	76	76
10	76	76	77	77	77	77	77	77	76	76	76	76
11	77	77	77	77	78	77	77	77	77	77	76	76
12	77	77	77	77	78	78	77	77	77	77	77	77
13	77	77	78	78	79	78	78	78	77	77	77	77
14	78	78	78	78	79	79	78	78	78	78	78	77
15	79	79	79	79	80	79	79	79	79	78	78	78
16	79	79	79	80	81	80	80	80	79	79	79	79
17	80	81	80	80	82	81	81	81	80	80	80	79
18	82	82	81	81	83	82	82	82	81	81	81	80
19	83	83	83	82	84	84	83	83	83	82	82	81
20	84	84	84	83	85	85	85	84	84	84	83	83
21	86	86	85	85	87	87	86	86	86	85	85	84
22	87	87	87	86	88	88	88	88	87	87	86	86
23	89	89	88	87	90	90	90	89	89	89	88	87
24	91	91	90	89	91	92	92	91	91	90	90	89
25	93	93	92	90	93	94	94	93	93	92	92	91
26	95	95	94	92	95	96	96	96	95	94	94	93
27	98	97	96	94	97	98	98	98	97	97	96	95
28	100	99	98	96	99	100	100	100	100	99	98	97
29	103	102	100	98	101	102	103	102	102	101	100	99
30	105	105	103	100	103	105	105	105	104	104	103	101
31	108	107	105	102	106	107	107	107	107	106	105	104
32	111	110	108	105	108	110	110	110	109	109	108	106
33	114	113	111	107	110	112	113	112	112	111	110	109
34	117	116	113	109	113	115	115	115	115	114	113	111
35	120	119	116	112	115	117	118	118	117	116	115	114
36	123	122	119	115	118	120	121	120	120	119	118	117
37	127	125	122	117	121	123	123	123	123	122	121	119
38	130	128	125	120	123	126	126	126	126	125	124	122
39	133	131	128	122	126	128	129	129	128	128	127	125

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 523 (°F)	TC # 524 (°F)	TC # 525 (°F)	TC # 526 (°F)	TC # 527 (°F)	TC # 528 (°F)	TC # 529 (°F)	TC # 530 (°F)	TC # 531 (°F)	TC # 532 (°F)	TC # 533 (°F)	TC # 534 (°F)
40	137	135	131	125	129	131	132	132	131	130	129	128
41	140	138	134	128	131	134	135	135	134	133	132	131
42	144	141	137	130	134	137	138	138	137	136	135	134
43	148	145	140	133	137	140	141	141	140	139	138	137
44	151	148	143	135	140	143	144	144	143	142	141	140
45	155	152	146	137	143	146	147	147	146	146	144	143
46	159	155	149	140	146	149	150	150	149	149	148	146
47	162	158	151	142	149	152	153	153	153	152	151	149
48	166	162	154	145	152	155	156	156	156	155	154	152
49	169	165	157	147	154	158	159	159	159	158	157	155
50	173	168	160	150	158	161	162	163	162	161	160	159
51	176	171	163	152	160	164	165	166	165	164	163	162
52	179	174	166	155	163	167	168	169	168	167	167	165
53	182	177	169	157	166	170	171	172	171	170	170	168
54	185	180	172	160	169	173	174	175	174	174	173	171
55	188	183	174	162	172	176	177	178	177	177	176	174
56	191	186	177	165	174	178	180	180	180	180	179	178
57	193	188	180	167	177	181	183	183	183	182	182	181
58	195	190	182	170	179	184	186	186	186	185	185	183
59	197	193	184	172	182	186	188	189	188	188	187	186
60	199	195	187	174	184	188	190	191	191	191	190	189
Max Temp:	199	195	187	174	184	188	190	191	191	191	190	189
Max Allowed:	401	401	401	401	402	402	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 535 (°F)	TC # 536 (°F)	TC # 537 (°F)	TC # 538 (°F)	TC # 539 (°F)	TC # 540 (°F)	TC # 541 (°F)	TC # 542 (°F)	TC # 543 (°F)	TC # 544 (°F)	TC # 545 (°F)	TC # 546 (°F)
0	76	76	76	76	76	76	76	76	76	76	76	77
1	76	76	76	76	76	76	76	76	76	76	76	77
2	76	76	76	76	76	76	76	76	76	76	76	77
3	76	76	76	76	76	76	76	76	76	76	76	77
4	76	76	76	76	76	76	76	76	76	76	76	77
5	76	76	76	76	76	76	76	76	76	76	76	77
6	76	76	76	76	76	76	76	76	76	76	76	77
7	76	76	76	76	76	76	76	76	76	76	76	77
8	76	76	76	76	76	76	76	76	76	76	76	77
9	76	76	76	76	76	76	76	76	76	76	76	77
10	76	76	76	76	76	76	76	76	76	76	76	77
11	76	76	76	76	76	76	76	76	76	76	76	78
12	76	76	76	76	76	76	76	76	76	76	76	78
13	77	77	76	76	76	76	76	76	76	76	76	78
14	77	77	77	77	77	76	76	76	76	76	77	79
15	78	77	77	77	77	77	77	77	76	77	77	80
16	78	78	78	77	77	77	77	77	77	77	77	81
17	79	79	78	78	78	78	77	77	77	77	77	82
18	80	79	79	79	78	78	78	78	77	77	77	83
19	81	80	80	79	79	79	78	78	78	78	78	84
20	82	81	81	80	80	79	79	79	78	78	78	85
21	83	82	82	81	81	80	80	79	79	79	78	87
22	85	84	83	82	82	81	80	80	79	79	79	88
23	86	85	84	83	83	82	81	81	80	80	80	90
24	88	87	86	85	84	83	82	82	81	81	80	91
25	89	88	87	86	86	85	84	83	82	81	81	93
26	91	90	89	88	87	86	85	84	83	82	82	95
27	93	92	91	90	89	88	86	86	84	84	83	97
28	95	94	93	91	91	89	88	87	86	85	83	99
29	98	96	95	93	92	91	90	89	87	86	84	101
30	100	98	97	95	94	93	91	90	88	87	86	104
31	102	100	99	97	96	95	93	92	90	89	87	106
32	104	103	101	100	99	97	95	94	92	90	88	108
33	107	105	103	102	101	99	97	96	94	92	89	110
34	109	108	106	104	103	101	99	98	96	93	91	113
35	112	110	108	107	105	103	101	100	98	95	92	115
36	115	113	111	109	108	106	104	102	100	97	94	118
37	117	116	114	112	110	108	106	104	102	99	96	120
38	120	118	116	115	113	111	109	107	104	101	97	122
39	123	121	119	117	116	113	111	109	106	103	99	125

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 535 (°F)	TC # 536 (°F)	TC # 537 (°F)	TC # 538 (°F)	TC # 539 (°F)	TC # 540 (°F)	TC # 541 (°F)	TC # 542 (°F)	TC # 543 (°F)	TC # 544 (°F)	TC # 545 (°F)	TC # 546 (°F)
40	126	124	122	120	119	116	114	112	109	105	101	128
41	129	127	125	123	121	119	117	114	111	108	103	131
42	132	130	128	126	124	122	119	117	114	110	105	133
43	135	133	131	129	127	125	122	120	117	113	108	136
44	138	136	134	132	130	128	125	123	119	115	110	139
45	141	139	137	135	134	131	128	126	122	118	112	142
46	144	142	140	138	137	134	131	129	125	121	115	145
47	147	145	143	142	140	137	135	132	128	124	117	148
48	150	149	147	145	143	141	138	135	131	126	120	151
49	154	152	150	148	147	144	141	138	134	129	122	154
50	157	155	153	152	150	147	144	142	138	132	125	157
51	160	158	157	155	153	151	148	145	141	135	128	160
52	163	162	160	158	157	154	151	148	144	139	131	163
53	167	165	163	162	160	157	155	152	147	142	133	166
54	170	168	167	165	163	161	158	155	151	145	136	170
55	173	171	170	168	167	164	161	159	154	148	139	172
56	176	175	173	171	170	168	165	162	157	151	141	175
57	179	178	176	175	173	171	168	166	161	154	144	178
58	182	181	179	178	177	174	172	169	164	157	147	180
59	185	184	182	181	180	177	175	172	167	160	149	183
60	188	187	185	184	183	180	178	175	170	163	152	185
Max Temp:	188	187	185	184	183	180	178	175	170	163	152	185
Max Allowed:	401	401	401	401	401	401	401	401	401	401	401	402

OMEGA POINT LABORATORIES

Time (min)	TC # 547 (°F)	TC # 548 (°F)	TC # 549 (°F)	TC # 550 (°F)	TC # 551 (°F)	TC # 552 (°F)	TC # 553 (°F)	TC # 554 (°F)	TC # 555 (°F)	TC # 556 (°F)	TC # 557 (°F)	TC # 558 (°F)
0	76	76	76	76	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76	76	76	76	76
5	77	76	76	76	76	76	76	76	76	76	76	76
6	77	76	76	76	76	76	76	76	76	76	76	76
7	77	76	76	76	76	76	76	76	76	76	76	76
8	77	76	76	76	76	76	76	76	76	76	76	76
9	77	77	77	76	76	76	76	76	76	76	76	76
10	77	77	77	76	76	76	76	76	76	76	76	76
11	77	77	77	77	77	77	77	76	76	76	76	76
12	78	77	77	77	77	77	77	77	77	76	76	76
13	78	78	78	78	78	77	77	77	77	77	77	76
14	79	79	78	78	78	78	78	77	77	77	77	77
15	79	79	79	79	79	79	78	78	78	77	77	77
16	80	80	80	80	80	79	79	79	78	78	78	78
17	82	81	81	81	80	80	80	79	79	79	78	78
18	83	83	82	82	82	81	81	80	80	79	79	79
19	84	84	84	83	83	83	82	81	81	80	80	79
20	85	85	85	85	85	84	83	83	82	82	81	80
21	87	87	87	87	86	85	85	84	83	83	82	81
22	89	89	89	88	88	87	86	86	85	84	83	82
23	90	91	91	90	90	89	88	87	86	86	85	84
24	92	93	93	92	92	91	90	89	88	87	86	85
25	94	95	95	95	94	93	92	91	90	89	88	87
26	96	97	97	97	96	95	94	93	92	91	89	88
27	99	99	99	99	98	97	96	95	94	93	91	90
28	101	102	102	101	101	100	99	97	96	95	93	92
29	103	104	104	104	103	102	101	100	98	97	95	94
30	105	106	107	106	105	104	103	102	101	99	97	96
31	108	109	109	109	108	107	106	104	103	101	100	98
32	110	111	112	111	110	109	108	107	105	104	102	100
33	113	114	114	114	113	112	111	109	108	106	104	103
34	115	116	117	116	116	114	113	112	110	109	107	105
35	118	119	120	119	118	117	116	114	113	111	109	107
36	120	122	122	122	121	120	118	117	116	114	112	110
37	123	124	125	125	124	122	121	120	118	117	114	112
38	125	127	128	127	126	125	124	122	121	119	117	115
39	128	130	131	130	129	128	127	125	124	122	120	118

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 547 (°F)	TC # 548 (°F)	TC # 549 (°F)	TC # 550 (°F)	TC # 551 (°F)	TC # 552 (°F)	TC # 553 (°F)	TC # 554 (°F)	TC # 555 (°F)	TC # 556 (°F)	TC # 557 (°F)	TC # 558 (°F)
40	131	133	133	133	132	131	130	128	127	125	123	121
41	134	136	136	136	135	134	133	131	130	128	125	123
42	137	138	139	139	138	137	135	134	133	131	128	126
43	140	141	142	142	141	140	139	137	135	134	131	129
44	143	144	145	145	144	143	142	140	139	137	134	132
45	146	148	148	148	147	146	145	143	142	140	138	136
46	149	151	151	151	150	149	148	146	145	143	141	139
47	152	154	155	154	153	152	151	150	148	146	144	142
48	155	157	158	157	157	155	154	153	151	150	147	145
49	158	160	161	160	160	159	157	156	155	153	151	149
50	161	163	164	164	163	162	161	159	158	156	154	152
51	164	166	167	167	166	165	164	162	161	159	157	155
52	167	169	170	170	169	168	167	166	164	163	161	159
53	170	172	173	173	172	171	170	169	168	166	164	162
54	173	175	176	176	175	174	173	172	171	169	167	165
55	176	178	179	179	178	177	176	175	174	173	171	169
56	179	181	182	182	181	181	179	178	177	176	174	172
57	182	184	185	185	184	183	182	181	180	179	177	175
58	185	187	187	187	187	186	185	184	183	182	180	178
59	187	189	190	190	190	189	188	187	186	185	183	182
60	189	192	192	193	192	192	191	190	189	188	186	184
Max Temp:	189	192	192	193	192	192	191	190	189	188	186	184
Max Allowed:	401	401	401	401	401	401	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 559 (°F)	TC # 560 (°F)	TC # 561 (°F)	TC # 562 (°F)	TC # 563 (°F)	TC # 564 (°F)	TC # 565 (°F)	TC # 566 (°F)	TC # 567 (°F)	TC # 568 (°F)	TC # 569 (°F)	TC # 570 (°F)
0	76	76	76	76	76	76	77	76	76	76	76	76
1	76	76	76	76	76	76	77	76	76	76	76	76
2	76	76	76	76	76	76	77	76	76	76	76	76
3	76	76	76	76	76	76	77	76	76	76	76	76
4	76	76	76	76	76	76	77	76	76	76	76	76
5	76	76	76	76	76	76	77	76	76	76	76	76
6	76	76	76	76	76	76	77	76	76	76	76	76
7	76	76	76	76	76	76	77	77	76	76	76	76
8	76	76	76	76	76	76	77	77	76	76	76	76
9	76	76	76	76	76	76	77	77	77	76	76	76
10	76	76	76	76	76	76	78	77	77	77	77	76
11	76	76	76	76	76	76	78	78	77	77	77	77
12	76	76	76	76	76	76	79	78	78	78	77	77
13	76	76	76	76	76	76	79	79	78	78	78	78
14	77	76	76	76	76	76	80	80	79	79	79	79
15	77	77	77	77	77	77	81	81	80	80	80	80
16	77	77	77	77	77	77	82	82	82	81	81	81
17	78	78	77	77	77	77	84	84	83	83	82	82
18	78	78	78	78	77	77	85	85	85	84	84	84
19	79	79	78	78	78	78	87	87	87	86	85	85
20	80	80	79	78	78	78	89	89	89	88	87	87
21	81	80	80	79	79	78	91	91	91	90	89	89
22	82	81	81	80	79	79	93	93	93	92	92	92
23	83	82	81	81	80	79	95	96	95	95	94	94
24	85	84	82	81	81	80	97	98	98	97	97	97
25	86	85	84	82	81	81	100	101	101	100	99	99
26	87	86	85	84	82	81	102	103	103	103	102	102
27	89	88	86	85	83	82	104	106	106	105	105	105
28	91	89	88	86	84	83	107	109	109	108	108	108
29	93	91	89	87	86	84	109	111	112	111	111	111
30	95	93	91	89	87	85	112	114	115	115	114	114
31	97	95	93	90	88	86	114	117	118	118	117	117
32	99	97	94	92	90	87	117	120	121	121	121	120
33	101	99	96	94	91	89	120	123	124	124	124	124
34	103	101	98	96	93	90	122	126	128	128	127	127
35	106	103	101	98	95	92	125	129	131	131	131	131
36	108	106	103	100	97	93	129	133	135	135	135	135
37	110	108	105	102	99	96	131	136	138	139	139	139
38	113	111	108	104	102	99	135	140	142	143	143	143
39	116	113	110	107	105	102	138	143	146	147	147	147

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 559 (°F)	TC # 560 (°F)	TC # 561 (°F)	TC # 562 (°F)	TC # 563 (°F)	TC # 564 (°F)	TC # 565 (°F)	TC # 566 (°F)	TC # 567 (°F)	TC # 568 (°F)	TC # 569 (°F)	TC # 570 (°F)
40	119	116	113	110	109	106	141	147	150	151	151	151
41	121	119	115	113	112	109	144	151	154	156	156	156
42	124	122	118	116	116	113	148	155	159	160	160	160
43	127	125	121	120	119	116	152	158	163	164	165	164
44	130	128	125	123	123	120	155	163	167	168	169	169
45	133	131	128	126	126	123	159	167	171	173	173	173
46	137	134	131	129	130	127	162	170	175	177	177	177
47	140	137	134	133	133	131	166	174	179	181	181	181
48	143	140	138	137	137	134	170	178	183	185	185	185
49	146	144	141	141	141	138	173	182	186	188	189	189
50	150	147	145	144	144	142	176	185	190	192	192	192
51	153	151	148	147	147	145	179	188	193	195	195	195
52	157	154	151	150	150	148	182	191	195	197	198	198
53	160	158	155	153	153	151	185	193	198	199	200	200
54	163	161	158	157	157	154	187	195	200	201	202	202
55	167	164	161	160	160	158	189	197	201	203	204	204
56	170	168	165	162	162	160	191	199	203	205	205	205
57	173	171	168	165	164	162	193	200	204	206	207	207
58	177	174	171	168	166	164	194	201	206	207	208	208
59	180	178	174	171	168	167	195	203	207	209	209	210
60	183	180	177	174	171	169	196	204	208	210	211	211
Max Temp:	183	180	177	174	171	169	196	204	208	210	211	211
Max Allowed:	401	401	401	401	401	401	402	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 571 (°F)	TC # 572 (°F)	TC # 573 (°F)	TC # 574 (°F)	TC # 575 (°F)	TC # 576 (°F)	TC # 577 (°F)	TC # 578 (°F)	TC # 579 (°F)	TC # 580 (°F)	TC # 581 (°F)	TC # 582 (°F)
0	76	76	76	76	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76	76	76	76	76	76
6	76	76	76	76	76	76	76	76	76	76	76	76
7	76	76	76	76	76	76	76	76	76	76	76	76
8	76	76	76	76	76	76	76	76	76	76	76	76
9	76	76	76	76	76	76	76	76	76	76	76	76
10	76	76	76	76	76	76	76	76	76	76	76	76
11	77	77	77	76	76	76	76	76	76	76	76	76
12	77	77	77	77	77	77	77	76	76	76	76	77
13	78	78	78	77	77	77	77	77	77	77	77	77
14	79	79	78	78	78	78	78	77	77	77	77	77
15	80	80	79	79	79	78	78	78	78	77	77	77
16	81	81	80	80	80	79	79	79	78	78	78	78
17	82	82	82	81	81	80	80	80	79	79	79	78
18	84	84	83	82	82	82	81	81	80	79	79	79
19	85	85	85	84	83	83	82	82	81	80	80	80
20	87	87	87	86	85	84	84	83	82	81	81	81
21	89	89	89	88	87	86	86	85	84	82	82	81
22	92	91	91	90	89	88	87	87	85	84	83	83
23	94	94	93	92	91	90	89	88	87	85	84	84
24	97	96	96	94	93	92	91	90	89	87	86	85
25	99	99	98	97	96	95	94	92	91	89	87	86
26	102	102	101	100	98	97	96	95	93	90	89	88
27	105	105	104	102	101	100	98	97	95	92	91	89
28	108	108	107	105	104	102	101	100	97	94	93	91
29	111	111	110	108	107	105	104	102	100	97	95	93
30	114	114	113	111	110	108	107	105	103	99	97	95
31	117	117	116	115	113	112	110	108	105	101	99	96
32	121	120	119	118	117	115	114	111	108	104	101	98
33	124	124	123	121	120	118	117	115	111	107	103	101
34	128	127	126	125	123	122	120	118	114	109	106	103
35	131	131	130	128	127	125	124	121	117	112	108	105
36	135	135	134	132	131	129	127	125	121	115	111	107
37	139	139	137	136	134	133	131	128	124	118	114	110
38	143	142	141	139	138	136	134	132	127	121	117	112
39	147	146	145	143	142	140	138	135	131	124	120	115

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 571 (°F)	TC # 572 (°F)	TC # 573 (°F)	TC # 574 (°F)	TC # 575 (°F)	TC # 576 (°F)	TC # 577 (°F)	TC # 578 (°F)	TC # 579 (°F)	TC # 580 (°F)	TC # 581 (°F)	TC # 582 (°F)
40	151	150	149	147	146	144	142	139	134	128	123	119
41	155	154	153	151	150	148	146	143	138	131	126	122
42	160	159	157	155	153	151	149	146	142	135	129	124
43	164	163	161	159	157	155	153	150	145	138	133	128
44	168	167	165	163	161	159	157	154	149	142	136	130
45	172	171	169	167	165	163	161	158	153	146	140	133
46	176	175	173	171	169	167	165	162	157	149	143	136
47	180	179	176	174	172	170	168	165	160	153	146	139
48	184	183	180	178	176	174	172	169	164	156	149	142
49	188	186	184	182	180	177	175	172	167	160	153	145
50	191	190	187	185	183	181	179	176	171	163	156	148
51	194	193	191	188	186	184	182	179	174	166	159	151
52	197	195	193	191	189	187	185	182	177	170	162	154
53	199	198	196	194	192	190	188	185	180	173	165	157
54	201	200	199	197	195	193	191	188	183	176	168	160
55	203	202	201	199	198	196	194	191	186	179	171	163
56	205	204	203	201	200	198	196	193	189	182	174	165
57	207	206	205	203	202	200	199	196	191	184	177	168
58	208	207	206	205	204	202	200	198	193	187	179	170
59	210	209	208	207	205	204	202	200	195	189	182	172
60	211	210	209	208	207	206	204	201	197	191	184	175
Max Temp:	211	210	209	208	207	206	204	201	197	191	184	175
Max Allowed:	401	401	401	401	401	401	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 583 (°F)	TC # 584 (°F)	TC # 585 (°F)	TC # 586 (°F)	TC # 587 (°F)	TC # 588 (°F)	TC # 589 (°F)	TC # 590 (°F)	TC # 591 (°F)	TC # 592 (°F)	TC # 593 (°F)	TC # 594 (°F)
0	76	77	77	76	76	76	76	76	76	76	76	76
1	76	77	77	76	76	76	76	76	76	76	76	76
2	76	77	77	76	76	76	76	76	76	76	76	76
3	76	77	77	76	76	76	76	76	76	76	76	76
4	76	77	77	76	76	76	76	76	76	76	76	76
5	76	77	77	76	76	76	76	76	76	76	76	76
6	76	77	77	76	76	76	76	76	76	76	76	76
7	76	77	77	77	76	76	76	76	76	76	76	76
8	76	77	77	77	77	76	76	76	76	76	76	76
9	76	77	77	77	77	77	77	77	76	76	76	76
10	76	78	77	77	77	77	77	77	77	76	76	76
11	76	78	78	78	78	77	77	77	77	77	76	76
12	77	79	79	78	78	78	78	78	77	77	77	77
13	77	79	79	79	79	79	79	78	78	77	77	77
14	77	80	80	80	80	80	80	79	79	78	78	77
15	77	81	81	81	81	81	81	80	80	79	78	78
16	78	83	83	82	82	82	82	81	81	80	79	79
17	78	84	84	84	84	84	84	83	82	81	80	79
18	79	85	86	86	86	85	85	84	83	82	81	80
19	79	87	87	88	87	87	87	86	85	83	82	81
20	80	89	89	90	90	89	89	88	87	85	83	82
21	81	90	91	92	92	91	91	90	88	87	85	84
22	82	92	94	94	94	94	93	92	90	88	87	85
23	83	95	96	96	96	96	96	94	92	90	88	87
24	84	97	98	99	99	99	98	97	95	93	90	89
25	85	99	101	102	102	101	101	99	97	95	92	91
26	86	102	104	104	104	104	103	102	100	97	95	93
27	87	104	106	107	107	107	106	104	102	99	97	95
28	89	107	109	110	110	110	109	107	105	102	99	97
29	90	109	112	113	113	113	112	110	108	105	102	100
30	92	112	115	116	116	116	116	114	111	108	104	102
31	93	115	118	119	120	120	119	117	114	111	107	105
32	95	117	121	123	123	123	123	120	117	114	110	107
33	97	121	124	126	127	127	126	124	121	117	113	110
34	99	124	127	129	130	131	130	128	124	120	116	113
35	101	127	131	133	134	134	134	131	128	124	119	116
36	103	130	134	137	138	138	138	135	132	127	123	119
37	105	133	137	140	142	142	141	139	135	131	126	122
38	108	136	141	144	145	146	145	143	139	134	129	126
39	113	139	145	148	149	150	149	147	143	138	133	129

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 583 (°F)	TC # 584 (°F)	TC # 585 (°F)	TC # 586 (°F)	TC # 587 (°F)	TC # 588 (°F)	TC # 589 (°F)	TC # 590 (°F)	TC # 591 (°F)	TC # 592 (°F)	TC # 593 (°F)	TC # 594 (°F)
40	117	142	148	152	153	154	153	151	147	142	136	132
41	119	145	152	155	157	158	157	155	151	145	140	136
42	122	149	155	159	161	162	161	159	155	149	144	139
43	124	152	159	163	165	166	165	163	159	153	147	143
44	126	155	162	167	169	170	169	167	162	157	151	146
45	128	158	166	171	173	174	173	171	166	160	154	150
46	131	161	170	175	177	178	177	175	170	164	158	153
47	133	165	173	179	182	182	181	179	174	168	161	157
48	136	168	177	183	185	186	185	182	177	171	165	160
49	138	171	180	186	189	190	189	186	181	175	168	164
50	141	174	183	189	192	193	192	189	184	178	172	167
51	144	177	186	192	195	196	195	192	187	181	175	171
52	146	180	189	195	197	198	197	195	190	184	178	174
53	149	183	191	197	200	201	200	197	193	187	181	177
54	151	185	194	199	202	203	202	199	195	190	185	181
55	152	188	196	201	204	205	204	202	198	193	187	184
56	154	190	198	203	205	206	205	203	200	195	190	187
57	156	192	199	204	207	208	207	205	202	198	193	189
58	157	193	201	206	208	210	209	207	204	200	195	192
59	158	195	202	207	210	211	210	209	206	202	198	195
60	160	196	204	209	212	213	212	210	207	204	200	198
Max Temp:	160	196	204	209	212	213	212	210	207	204	200	198
Max Allowed:	401	402	402	401	401	401	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 595 (°F)	TC # 596 (°F)	TC # 597 (°F)	TC # 598 (°F)	TC # 599 (°F)	TC # 600 (°F)	TC # 601 (°F)	TC # 602 (°F)	TC # 603 (°F)	TC # 604 (°F)	TC # 605 (°F)	TC # 606 (°F)
0	76	76	76	76	76	76	77	77	77	77	77	77
1	76	76	76	76	76	76	77	77	77	77	77	77
2	76	76	76	76	76	76	77	77	77	77	77	77
3	76	76	76	76	76	76	77	77	77	77	77	77
4	76	76	76	76	76	76	77	77	77	77	77	77
5	76	76	76	76	76	76	77	77	77	77	77	77
6	76	76	76	76	76	76	77	77	77	77	77	77
7	76	76	76	76	76	76	77	77	77	77	77	77
8	76	76	76	76	76	76	77	77	77	77	77	77
9	76	76	76	76	76	76	77	77	77	78	77	77
10	76	76	76	76	76	76	77	77	78	78	77	77
11	76	76	76	76	76	76	77	77	78	78	78	78
12	77	77	77	77	77	77	77	77	78	79	78	78
13	77	77	77	77	77	77	78	78	79	79	79	78
14	77	77	77	77	77	77	78	78	80	80	79	79
15	78	78	78	78	78	78	79	79	81	81	80	80
16	78	79	79	78	79	79	80	80	82	82	81	81
17	79	79	79	79	79	79	81	80	83	83	82	82
18	80	80	80	80	80	80	82	81	84	85	84	83
19	81	81	81	81	81	81	83	82	86	86	85	85
20	82	82	82	82	82	82	84	84	87	88	87	86
21	84	84	84	84	83	83	86	85	89	89	88	88
22	85	85	85	85	85	85	87	86	91	91	90	90
23	87	87	87	87	86	86	89	88	93	93	93	92
24	89	88	88	88	88	88	91	90	95	95	95	94
25	91	90	90	90	90	89	93	91	98	97	97	97
26	92	92	92	92	92	91	95	93	100	100	100	99
27	94	94	94	94	93	93	97	95	103	102	102	102
28	97	96	96	96	96	95	99	97	105	104	105	104
29	99	98	98	98	98	97	101	99	108	107	107	107
30	101	101	100	100	100	99	104	102	110	110	110	110
31	104	103	103	102	102	101	106	104	113	112	113	113
32	106	106	105	105	104	104	109	106	116	115	116	116
33	109	108	108	107	107	106	111	108	119	118	119	119
34	112	111	110	110	109	108	114	111	122	120	122	122
35	115	113	113	112	112	111	117	114	125	123	125	125
36	117	116	116	115	114	113	119	116	128	126	128	128
37	120	119	118	118	117	116	122	119	131	129	131	131
38	124	122	121	121	120	119	125	121	134	132	134	134
39	127	125	124	123	123	121	128	124	137	135	137	138

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 595 (°F)	TC # 596 (°F)	TC # 597 (°F)	TC # 598 (°F)	TC # 599 (°F)	TC # 600 (°F)	TC # 601 (°F)	TC # 602 (°F)	TC # 603 (°F)	TC # 604 (°F)	TC # 605 (°F)	TC # 606 (°F)
40	130	128	127	126	125	124	131	127	140	138	140	141
41	133	131	130	129	128	127	134	129	144	141	144	144
42	136	134	133	132	131	129	137	132	147	144	147	147
43	140	138	136	135	134	132	140	135	150	147	150	150
44	143	141	140	138	137	135	143	137	153	150	153	153
45	147	144	143	141	140	138	145	140	156	153	156	156
46	150	148	146	145	143	141	148	142	159	156	159	160
47	154	151	149	148	146	144	151	145	162	159	162	162
48	157	155	153	151	149	147	153	147	165	162	165	165
49	161	158	156	155	153	150	156	149	167	164	168	168
50	164	162	160	158	156	153	158	151	170	167	170	171
51	168	165	163	161	159	156	161	153	173	170	173	173
52	171	169	166	165	162	159	163	155	175	172	176	176
53	175	172	170	168	166	162	165	157	178	175	178	179
54	178	176	173	171	169	165	167	159	180	177	181	181
55	181	179	176	174	172	168	170	161	183	179	183	184
56	184	182	180	177	175	171	172	163	185	182	186	186
57	187	185	183	181	178	174	174	165	187	184	188	189
58	190	188	186	183	181	177	176	168	190	186	191	191
59	193	191	189	186	184	179	178	170	192	188	193	193
60	195	193	191	189	186	182	181	172	194	190	195	195
Max Temp:	195	193	191	189	186	182	181	172	194	190	195	195
Max Allowed:	401	401	401	401	401	401	402	402	402	402	402	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 607 (°F)	TC # 608 (°F)	TC # 609 (°F)	TC # 610 (°F)	TC # 611 (°F)	TC # 612 (°F)	TC # 613 (°F)	TC # 614 (°F)	TC # 615 (°F)	TC # 616 (°F)	TC # 617 (°F)	TC # 618 (°F)
0	77	77	77	77	77	77	76	76	77	77	77	77
1	77	77	77	77	77	77	77	77	77	77	77	77
2	77	77	77	77	77	77	77	76	77	77	77	77
3	77	77	77	77	77	77	77	77	77	77	77	77
4	77	76	77	77	77	77	77	77	77	77	77	77
5	77	77	77	77	77	77	77	77	77	77	77	77
6	77	77	77	77	77	77	77	77	77	77	77	77
7	77	77	77	77	77	77	77	77	77	77	77	77
8	77	77	77	77	77	77	77	77	77	77	77	77
9	77	77	77	77	77	77	77	77	77	77	77	77
10	77	77	77	77	77	77	77	77	77	77	77	77
11	78	78	78	77	77	77	77	77	77	77	77	77
12	78	78	78	78	78	77	77	77	77	77	77	77
13	78	78	78	78	78	78	78	78	78	78	78	77
14	79	79	79	79	79	78	78	78	78	78	78	78
15	80	80	80	80	79	79	79	79	79	79	79	78
16	81	81	81	80	80	80	80	80	79	80	79	79
17	82	82	82	81	81	81	81	80	80	80	80	80
18	83	83	83	83	82	82	81	81	81	81	81	80
19	85	85	84	84	84	83	83	82	82	82	82	81
20	86	86	86	85	85	84	84	83	83	83	83	82
21	88	88	87	87	86	86	85	85	85	84	84	83
22	90	90	89	89	88	87	87	86	86	86	86	85
23	92	92	91	90	90	89	88	88	87	87	87	86
24	94	94	93	92	92	91	90	90	89	89	88	88
25	97	96	96	95	94	93	92	92	91	91	90	89
26	99	99	98	97	96	95	94	94	93	93	92	91
27	102	101	100	99	99	97	96	96	95	95	94	93
28	104	104	103	102	101	100	99	98	97	97	96	95
29	107	107	106	104	104	102	101	100	100	99	98	97
30	110	110	108	107	106	105	104	103	102	102	101	99
31	113	113	111	110	109	108	106	106	105	104	103	101
32	116	115	114	113	112	111	109	108	107	107	106	104
33	119	118	117	116	115	113	112	111	110	109	108	106
34	122	121	120	119	118	116	115	114	113	112	111	109
35	125	125	123	122	121	119	118	117	116	115	114	111
36	128	128	126	125	124	122	121	120	119	118	117	114
37	131	131	129	128	127	125	124	123	122	121	120	117
38	135	134	133	132	130	129	127	126	125	124	123	120
39	138	137	136	135	134	132	130	129	128	127	126	123

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 607 (°F)	TC # 608 (°F)	TC # 609 (°F)	TC # 610 (°F)	TC # 611 (°F)	TC # 612 (°F)	TC # 613 (°F)	TC # 614 (°F)	TC # 615 (°F)	TC # 616 (°F)	TC # 617 (°F)	TC # 618 (°F)
40	141	140	139	138	137	135	133	132	131	130	129	126
41	144	144	142	141	140	138	136	135	134	133	132	129
42	147	147	145	144	143	141	140	138	137	136	135	132
43	151	150	149	147	146	144	143	142	140	139	138	135
44	154	153	152	151	149	148	146	145	144	143	141	138
45	157	156	155	154	153	151	149	148	147	146	144	141
46	160	160	158	157	156	154	153	151	150	149	148	145
47	163	162	161	160	159	157	155	154	153	152	151	148
48	166	165	164	163	162	160	158	157	156	155	154	151
49	168	168	167	166	165	163	161	160	159	158	157	153
50	171	171	169	168	167	166	164	163	162	161	159	156
51	174	174	172	171	171	169	167	166	165	164	163	160
52	177	176	175	174	174	172	171	169	168	168	166	163
53	179	179	178	177	176	175	173	172	171	170	169	166
54	182	182	181	180	179	177	176	175	174	173	172	169
55	184	184	183	182	182	180	179	178	177	176	175	172
56	187	187	186	185	184	183	181	180	180	179	177	175
57	189	189	188	187	187	185	184	183	182	182	180	177
58	192	191	191	190	189	188	187	186	185	184	183	180
59	194	194	193	192	192	190	189	188	188	187	186	183
60	196	196	195	194	194	193	192	191	190	190	188	186
Max Temp:	196	196	195	194	194	193	192	191	190	190	188	186
Max Allowed:	402	402	402	402	402	402	401	401	402	402	402	402

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 619 (°F)	TC # 620 (°F)	TC # 621 (°F)	TC # 622 (°F)	TC # 623 (°F)	TC # 624 (°F)	TC # 625 (°F)	TC # 626 (°F)	TC # 627 (°F)	TC # 628 (°F)	TC # 629 (°F)	TC # 630 (°F)
0	77	77	76	77	77	77	76	76	76	76	76	76
1	77	77	76	77	77	77	76	76	76	76	76	76
2	77	77	76	77	77	77	77	76	77	76	76	76
3	77	77	76	77	77	77	76	76	76	76	76	76
4	77	77	76	77	77	77	76	76	76	76	76	76
5	77	77	76	77	77	77	77	76	76	76	76	76
6	77	77	76	77	77	77	77	77	77	76	76	76
7	77	77	76	77	77	77	77	77	76	76	76	76
8	77	77	76	77	77	77	77	77	77	76	76	76
9	77	77	76	77	77	77	77	77	77	77	77	77
10	77	77	76	78	77	77	77	77	77	77	77	77
11	77	77	76	78	78	77	77	77	77	77	77	77
12	77	77	77	79	78	78	78	78	78	77	77	77
13	77	77	77	79	79	78	78	78	78	78	78	78
14	78	78	77	80	79	79	79	79	79	78	78	78
15	78	78	78	81	80	80	80	79	79	79	79	79
16	79	79	78	81	81	81	80	80	80	80	80	79
17	79	79	79	83	82	82	82	81	81	81	81	80
18	80	80	79	84	84	83	83	83	82	82	82	81
19	81	81	80	85	85	85	84	84	84	83	83	83
20	82	81	81	87	87	86	86	86	85	85	84	84
21	83	82	81	88	88	88	88	87	87	86	86	85
22	84	83	82	90	90	90	90	89	89	88	87	87
23	85	85	83	92	92	92	92	91	91	90	89	89
24	87	86	85	94	94	94	94	94	93	92	91	91
25	88	87	86	96	97	97	96	96	95	94	93	93
26	90	89	87	98	99	99	99	98	98	97	96	95
27	91	90	89	101	101	102	101	101	100	99	98	97
28	93	92	90	103	104	104	104	103	103	102	100	100
29	95	93	92	106	107	107	107	106	105	104	103	102
30	97	95	93	108	109	110	109	109	108	107	106	105
31	99	97	95	111	112	112	112	112	111	110	108	107
32	102	99	97	114	115	115	115	115	114	113	111	110
33	104	102	99	116	117	118	118	118	117	116	114	113
34	106	104	101	119	120	121	121	121	120	119	117	116
35	109	106	103	122	123	124	124	124	123	122	120	119
36	111	109	105	124	126	127	127	127	126	125	123	122
37	114	111	108	127	129	130	130	130	129	128	127	126
38	117	114	110	130	132	133	133	133	132	131	130	129
39	120	117	113	133	135	136	136	136	136	135	133	132

OMEGA POINT LABORATORIES

Time (min)	TC # 619 (°F)	TC # 620 (°F)	TC # 621 (°F)	TC # 622 (°F)	TC # 623 (°F)	TC # 624 (°F)	TC # 625 (°F)	TC # 626 (°F)	TC # 627 (°F)	TC # 628 (°F)	TC # 629 (°F)	TC # 630 (°F)
40	123	119	115	136	138	139	140	140	139	138	136	135
41	126	122	118	139	141	143	143	143	142	141	140	139
42	129	125	121	142	145	146	146	146	145	144	143	142
43	132	128	123	145	148	149	149	149	148	147	146	145
44	135	131	126	148	151	152	152	152	152	151	149	148
45	138	134	129	151	154	155	155	155	155	154	153	152
46	141	138	133	154	157	158	158	158	158	157	155	155
47	144	140	136	157	160	161	161	161	161	160	159	158
48	147	143	138	160	162	164	164	164	164	163	161	161
49	150	146	141	162	165	167	167	167	166	165	164	163
50	153	149	144	165	168	169	170	170	169	168	167	166
51	156	153	148	167	170	172	172	172	172	171	170	169
52	160	156	152	170	173	175	175	175	175	174	172	172
53	163	159	154	173	176	177	178	178	177	176	175	174
54	166	162	157	175	178	180	180	180	180	179	178	177
55	168	165	160	177	181	182	183	183	182	182	180	180
56	171	167	162	180	183	185	185	185	185	184	183	182
57	174	170	165	182	185	187	188	188	187	187	186	185
58	177	173	168	184	188	189	190	190	190	189	188	187
59	180	176	170	186	190	191	192	192	192	191	190	190
60	182	178	172	188	192	194	194	195	194	194	193	192
Max Temp:	182	178	172	188	192	194	194	195	194	194	193	192
Max Allowed:	402	402	401	402	402	402	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 631 (°F)	TC # 632 (°F)	TC # 633 (°F)	TC # 634 (°F)	TC # 635 (°F)	TC # 636 (°F)	TC # 637 (°F)	TC # 638 (°F)	TC # 639 (°F)	TC # 640 (°F)	TC # 641 (°F)	TC # 642 (°F)
0	76	76	76	76	76	76	76	76	76	76	77	76
1	76	76	76	76	76	76	76	76	76	76	77	76
2	76	76	76	76	76	76	76	76	76	76	77	77
3	76	76	76	76	76	76	76	76	76	76	77	77
4	76	76	76	76	76	76	76	76	76	76	77	77
5	76	76	76	76	76	76	76	76	76	76	77	77
6	76	76	76	76	76	76	76	76	76	76	77	77
7	76	76	76	76	76	76	76	76	76	76	77	77
8	76	76	76	76	76	76	76	76	76	76	77	77
9	77	77	76	76	76	76	76	76	76	76	78	77
10	77	77	77	77	77	77	77	77	77	77	78	78
11	77	77	77	77	77	77	77	77	77	77	79	78
12	77	77	77	77	77	77	77	77	77	77	79	79
13	78	78	77	77	77	77	77	77	77	77	80	80
14	78	78	78	78	78	78	78	78	77	77	81	81
15	79	79	78	78	78	78	78	78	78	78	83	82
16	79	79	79	79	79	79	79	79	78	78	84	83
17	80	80	80	80	80	80	79	79	79	79	86	85
18	81	81	81	81	81	80	80	80	80	79	87	87
19	82	82	82	82	82	81	81	81	80	80	89	89
20	84	83	83	83	83	82	82	82	81	81	91	91
21	85	85	85	84	84	84	83	83	82	82	93	93
22	87	86	86	86	86	85	85	84	83	83	96	95
23	88	88	88	88	87	87	86	85	85	84	98	98
24	90	90	90	89	89	88	87	87	86	85	100	100
25	92	92	91	91	91	90	89	88	87	86	103	103
26	94	94	93	93	93	92	91	90	89	88	105	106
27	97	96	96	95	95	94	93	92	90	89	108	109
28	99	99	98	98	97	96	95	94	92	91	111	112
29	101	101	100	100	99	98	97	95	94	92	113	114
30	104	104	103	102	102	100	99	98	96	94	116	118
31	107	106	106	105	105	103	101	100	98	96	119	121
32	110	109	108	108	107	105	104	102	100	98	122	124
33	112	112	111	111	110	108	106	104	102	100	125	127
34	115	115	114	113	113	111	109	107	104	102	128	130
35	119	118	117	117	116	114	112	110	107	104	131	134
36	122	121	120	120	119	117	115	112	109	107	134	137
37	125	124	123	123	122	120	118	115	112	109	137	140
38	128	128	127	126	125	123	121	118	115	112	140	143
39	131	131	130	129	129	126	124	121	118	115	143	147

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 631 (°F)	TC # 632 (°F)	TC # 633 (°F)	TC # 634 (°F)	TC # 635 (°F)	TC # 636 (°F)	TC # 637 (°F)	TC # 638 (°F)	TC # 639 (°F)	TC # 640 (°F)	TC # 641 (°F)	TC # 642 (°F)
40	135	134	133	133	132	129	127	125	121	118	146	150
41	138	137	136	136	135	133	130	128	124	121	150	153
42	141	141	140	139	139	136	134	131	127	124	153	157
43	144	144	143	143	142	139	137	134	130	127	156	160
44	148	147	146	146	145	143	140	137	133	130	159	163
45	151	151	150	149	149	146	143	141	136	133	162	166
46	154	154	153	152	152	149	147	144	139	136	165	169
47	157	157	156	155	155	152	150	147	143	140	168	172
48	160	160	159	158	158	155	153	150	146	143	170	175
49	163	163	162	161	161	158	156	153	149	146	173	178
50	166	165	164	164	164	161	159	156	152	149	175	180
51	168	168	167	167	167	164	162	159	155	152	178	183
52	171	171	170	170	169	167	165	162	158	154	181	186
53	174	174	173	173	172	170	167	165	161	157	183	188
54	176	176	176	175	175	173	170	167	163	159	186	190
55	179	179	178	178	178	175	173	170	166	162	188	193
56	182	182	181	181	180	178	176	173	168	165	190	195
57	184	184	184	183	183	181	179	176	171	167	192	197
58	187	187	186	186	186	184	181	178	174	169	194	198
59	189	189	189	188	188	186	184	181	176	172	196	200
60	192	192	191	191	191	189	187	184	179	174	197	201
Max Temp:	192	192	191	191	191	189	187	184	179	174	197	201
Max Allowed:	401	401	401	401	401	401	401	401	401	401	402	401

OMEGA POINT LABORATORIES

Time (min)	TC # 643 (°F)	TC # 644 (°F)	TC # 645 (°F)	TC # 646 (°F)	TC # 647 (°F)	TC # 648 (°F)	TC # 649 (°F)	TC # 650 (°F)	TC # 651 (°F)	TC # 652 (°F)	TC # 653 (°F)	TC # 654 (°F)
0	76	76	76	76	76	76	76	76	76	76	76	76
1	76	76	76	76	76	76	76	76	76	76	76	76
2	76	76	76	76	76	76	76	76	76	76	76	76
3	76	76	76	76	76	76	76	76	76	76	76	76
4	76	76	76	76	76	76	76	76	76	76	76	76
5	76	76	76	76	76	76	76	76	76	76	76	76
6	77	76	76	76	76	76	76	76	76	76	76	76
7	77	76	76	76	76	76	76	76	76	76	76	76
8	77	77	77	76	76	76	76	76	76	76	76	76
9	77	77	77	77	77	77	77	77	77	76	76	76
10	77	77	77	77	77	77	77	77	77	77	77	77
11	78	77	77	77	77	77	77	77	77	77	77	77
12	78	78	78	78	78	78	78	78	78	78	77	77
13	79	79	79	79	79	79	79	78	78	78	78	78
14	80	80	80	80	80	80	80	79	79	79	79	79
15	81	81	81	81	81	81	81	81	80	80	80	80
16	83	82	82	82	82	82	82	82	82	81	81	81
17	84	84	84	84	84	84	84	83	83	82	82	82
18	86	85	85	85	85	85	85	85	84	84	84	84
19	88	87	87	87	87	87	87	87	86	85	85	85
20	90	89	89	89	89	90	89	89	88	87	87	87
21	92	92	92	92	92	92	91	91	90	89	89	89
22	95	94	94	94	94	94	94	93	93	92	91	91
23	97	97	97	97	97	97	96	96	95	94	93	93
24	100	99	99	99	99	100	99	98	98	96	96	96
25	103	102	102	102	102	103	102	101	100	99	99	99
26	106	105	105	105	105	105	105	104	103	102	101	101
27	109	108	108	108	108	108	108	107	106	104	104	104
28	112	111	111	111	111	112	111	110	109	107	107	107
29	115	114	114	114	115	115	114	113	112	110	110	110
30	118	118	118	118	118	118	118	117	115	114	113	112
31	121	121	121	121	121	122	121	120	119	117	116	116
32	125	124	125	125	125	125	125	124	122	120	119	119
33	128	128	128	128	128	129	128	127	126	124	123	122
34	131	131	131	132	132	132	131	130	129	127	126	125
35	135	135	135	135	135	136	135	134	133	131	129	129
36	138	138	139	139	139	139	139	138	136	134	133	132
37	142	142	142	142	143	143	142	141	140	138	136	135
38	145	146	146	146	147	147	146	145	143	141	140	139
39	148	149	150	150	150	150	150	149	147	145	143	142

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 643 (°F)	TC # 644 (°F)	TC # 645 (°F)	TC # 646 (°F)	TC # 647 (°F)	TC # 648 (°F)	TC # 649 (°F)	TC # 650 (°F)	TC # 651 (°F)	TC # 652 (°F)	TC # 653 (°F)	TC # 654 (°F)
40	152	153	153	153	154	154	153	152	151	148	147	146
41	155	156	157	157	157	158	157	156	154	152	151	149
42	159	160	160	160	161	161	160	159	158	156	154	153
43	162	163	164	164	164	165	164	163	161	159	158	156
44	165	166	167	167	168	168	167	166	165	162	161	159
45	169	170	170	171	171	171	170	170	168	166	164	163
46	172	173	174	174	174	175	174	173	171	169	168	166
47	175	176	177	177	178	178	177	176	174	172	171	169
48	177	179	180	180	181	181	180	179	177	175	174	172
49	180	182	183	183	184	183	182	181	180	178	176	175
50	183	185	186	186	186	186	185	184	183	181	179	177
51	186	187	188	189	189	189	188	187	185	183	182	180
52	188	190	191	191	191	191	190	189	188	186	184	182
53	191	192	193	194	194	194	192	191	190	188	186	185
54	193	195	196	196	196	196	195	194	192	190	189	187
55	195	197	198	198	198	198	197	196	194	193	191	189
56	197	199	200	200	200	200	199	198	196	195	193	191
57	199	200	201	202	202	201	200	199	198	197	195	193
58	201	202	203	203	203	203	202	201	200	199	197	195
59	202	204	204	205	205	205	204	203	202	201	199	197
60	204	205	206	206	206	206	206	205	204	203	201	199
Max Temp:	204	205	206	206	206	206	206	205	204	203	201	199
Max Allowed:	401	401	401	401	401	401	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 655 (°F)	TC # 656 (°F)	TC # 657 (°F)	TC # 658 (°F)	TC # 659 (°F)	TC # 660 (°F)	TC # 661 (°F)	TC # 662 (°F)	TC # 663 (°F)	TC # 664 (°F)	TC # 665 (°F)	TC # 666 (°F)
0	76	76	76	76	76	76	76	76	76	77	77	77
1	76	76	76	76	76	77	76	77	76	77	77	76
2	76	76	76	76	76	76	77	77	77	77	77	77
3	76	76	76	76	76	76	77	77	77	77	77	77
4	76	76	76	76	76	76	77	77	77	77	77	77
5	76	76	76	76	76	77	77	77	77	77	77	77
6	76	76	76	76	76	77	77	77	77	77	77	77
7	76	76	76	76	76	77	77	78	77	77	77	77
8	76	76	76	76	76	78	78	79	78	78	78	78
9	76	76	76	76	76	79	79	79	79	78	79	78
10	77	77	76	76	76	80	81	81	80	79	80	79
11	77	77	77	77	77	81	82	82	82	81	81	80
12	77	77	77	77	77	83	85	84	83	82	82	82
13	78	78	78	78	77	85	87	86	85	84	84	83
14	79	78	78	78	78	87	90	88	88	86	86	85
15	80	79	79	79	79	90	93	90	90	88	88	88
16	81	80	80	80	79	92	96	93	93	90	91	90
17	82	82	81	81	80	95	99	96	95	93	93	93
18	83	83	82	82	81	98	102	99	98	96	96	95
19	85	85	84	83	82	101	105	102	101	99	99	98
20	87	86	85	85	84	105	109	106	105	102	102	101
21	89	88	87	86	85	108	112	109	108	105	106	105
22	91	90	89	88	87	112	116	112	112	109	110	108
23	93	92	91	90	88	116	120	116	116	112	113	112
24	95	95	93	92	90	120	123	119	120	116	117	115
25	98	97	95	94	92	124	127	122	124	120	121	119
26	100	99	98	96	94	128	130	126	128	124	125	123
27	103	102	100	98	96	132	134	129	132	127	129	127
28	106	105	103	101	98	136	137	133	137	131	132	131
29	109	107	105	103	101	140	140	137	141	135	136	135
30	111	110	108	106	103	144	144	140	145	139	139	139
31	114	113	111	108	105	148	148	144	149	143	143	144
32	118	116	114	111	108	152	151	148	152	147	147	148
33	121	119	116	114	110	156	155	152	156	152	151	152
34	124	122	119	116	113	160	159	156	160	156	155	157
35	127	126	122	119	115	163	163	159	163	160	158	161
36	130	129	125	122	118	167	166	163	167	164	162	165
37	134	132	128	125	120	171	170	167	170	168	166	169
38	137	135	132	128	123	174	174	171	174	172	170	174
39	140	138	135	131	126	178	177	175	178	176	174	178

OMEGA POINT LABORATORIES

Time (min)	TC # 655 (°F)	TC # 656 (°F)	TC # 657 (°F)	TC # 658 (°F)	TC # 659 (°F)	TC # 660 (°F)	TC # 661 (°F)	TC # 662 (°F)	TC # 663 (°F)	TC # 664 (°F)	TC # 665 (°F)	TC # 666 (°F)
40	144	142	138	134	128	181	180	179	181	180	178	181
41	147	145	141	137	131	185	183	182	185	184	182	185
42	150	148	144	140	134	188	186	186	188	187	186	188
43	154	151	147	142	136	190	189	188	190	190	189	191
44	157	154	150	145	139	192	191	191	192	193	192	193
45	160	157	153	148	142	194	193	193	194	195	194	195
46	163	160	156	151	144	196	195	195	196	196	195	197
47	166	163	158	153	146	197	196	196	197	197	197	198
48	169	166	161	156	149	198	197	197	198	198	198	199
49	172	169	163	158	151	199	198	198	199	199	199	200
50	174	171	166	160	153	200	199	199	200	200	200	201
51	177	173	168	163	155	201	200	200	201	201	201	202
52	179	176	170	165	157	202	201	201	202	202	202	203
53	182	178	173	167	159	203	201	201	203	203	204	204
54	184	180	175	169	161	204	202	202	205	205	205	205
55	186	183	177	171	163	205	203	203	207	206	207	206
56	188	185	179	174	165	207	204	204	209	208	209	207
57	190	187	181	176	167	208	204	205	211	210	212	207
58	192	189	183	178	169	210	205	205	213	212	214	208
59	194	191	186	180	171	211	206	206	215	214	217	208
60	196	193	188	182	173	213	207	207	218	217	220	209
Max Temp:	196	193	188	182	173	213	207	207	218	217	220	209
Max Allowed:	401	401	401	401	401	401	401	401	401	402	402	402

OMEGA POINT LABORATORIES

Time (min)	TC # 667 (°F)	TC # 668 (°F)	TC # 669 (°F)	TC # 670 (°F)	TC # 671 (°F)	TC # 672 (°F)	TC # 673 (°F)	TC # 674 (°F)	TC # 675 (°F)	TC # 676 (°F)	TC # 677 (°F)	TC # 678 (°F)
0	77	76	77	77	77	77	76	76	76	76	76	76
1	77	77	77	77	77	77	77	76	77	76	76	77
2	77	77	77	77	77	77	76	76	76	76	76	77
3	77	77	77	77	77	77	76	76	76	76	76	77
4	77	77	77	77	77	77	77	76	77	76	76	77
5	77	77	77	77	77	77	77	77	77	76	76	77
6	77	77	77	77	77	77	77	77	77	76	76	77
7	77	77	77	77	77	77	77	77	77	77	77	77
8	78	77	77	77	77	78	77	77	77	77	77	77
9	78	78	78	77	78	79	78	78	78	77	77	78
10	79	80	79	78	78	80	79	79	78	78	77	79
11	80	85	80	79	79	81	80	80	79	79	78	80
12	82	91	82	80	80	82	82	81	80	79	78	81
13	84	97	84	81	82	84	84	83	81	80	79	83
14	87	103	86	83	83	85	86	85	82	82	80	85
15	89	108	89	85	85	87	89	87	84	83	81	87
16	92	111	92	87	87	90	92	89	85	84	83	89
17	95	115	95	89	89	92	95	91	87	86	84	91
18	98	118	98	92	91	94	99	94	89	88	86	94
19	101	122	102	94	94	97	102	97	91	90	88	97
20	104	125	105	97	97	100	105	100	94	93	91	100
21	108	128	108	100	100	103	108	103	96	95	93	103
22	111	130	112	103	104	106	111	106	99	97	96	106
23	115	132	115	107	107	110	115	109	101	100	98	109
24	119	135	119	110	111	113	118	112	104	103	101	113
25	122	137	122	114	115	117	122	116	107	106	104	117
26	126	139	126	118	119	120	125	119	111	109	107	121
27	130	141	129	122	123	124	129	122	114	112	110	125
28	133	143	133	127	127	127	133	126	117	115	113	129
29	137	145	137	131	131	131	137	129	121	119	116	133
30	141	147	140	136	135	135	140	133	124	122	120	137
31	145	151	144	141	139	139	144	136	128	125	123	141
32	149	154	148	146	144	142	147	139	132	129	126	144
33	153	157	152	150	149	146	151	143	135	133	130	148
34	157	160	156	155	153	149	154	147	139	137	133	151
35	161	164	160	159	158	153	158	150	142	140	137	155
36	165	168	164	163	162	156	161	154	146	144	141	158
37	169	171	168	168	167	160	165	157	150	148	144	162
38	173	175	173	172	171	163	169	161	155	151	148	165
39	176	179	177	176	176	167	174	165	159	155	152	169

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 667 (°F)	TC # 668 (°F)	TC # 669 (°F)	TC # 670 (°F)	TC # 671 (°F)	TC # 672 (°F)	TC # 673 (°F)	TC # 674 (°F)	TC # 675 (°F)	TC # 676 (°F)	TC # 677 (°F)	TC # 678 (°F)
40	180	182	180	180	180	170	177	168	163	159	156	172
41	184	185	184	184	183	173	181	172	166	163	160	175
42	187	188	187	187	187	177	185	175	170	167	164	179
43	190	191	190	190	190	180	187	178	173	171	168	182
44	193	193	192	193	192	183	190	181	177	174	171	185
45	195	195	194	195	194	186	191	184	180	178	175	187
46	196	196	196	196	196	189	193	186	183	181	178	190
47	198	198	197	197	197	191	195	189	185	184	181	192
48	199	199	198	198	198	193	196	191	188	187	184	193
49	200	199	199	199	199	195	197	193	190	190	188	195
50	201	200	200	200	200	196	198	195	192	192	191	196
51	201	201	200	201	200	198	199	197	195	194	193	197
52	202	202	201	201	202	199	199	198	196	196	195	198
53	203	202	202	202	203	200	200	200	198	197	197	199
54	204	203	203	203	205	200	201	201	199	199	198	200
55	205	204	204	203	206	201	202	202	201	200	199	201
56	205	205	205	204	208	202	202	203	202	202	201	202
57	206	206	206	205	210	203	203	204	204	204	202	203
58	207	207	208	206	212	204	204	206	206	205	203	203
59	209	208	210	207	214	205	205	208	208	208	205	204
60	210	209	212	209	216	206	206	210	210	210	206	205
Max Temp:	210	209	212	209	216	206	206	210	210	210	206	205
Max Allowed:	402	401	402	402	402	402	401	401	401	401	401	401

OMEGA POINT LABORATORIES

Time (min)	TC # 679 (°F)	TC # 680 (°F)	TC # 681 (°F)	TC # 682 (°F)	TC # 683 (°F)	Ambient (°F)	E119 Std Curve (°F)	Furnace Average (°F)	Furnace # 1 (°F)
0	76	76	77	77	77	82	68	76	72
1	76	76	77	77	77	83	254	102	110
2	76	76	77	77	77	83	440	198	274
3	76	76	77	77	77	83	627	486	731
4	76	76	77	77	77	83	813	870	1130
5	76	77	77	77	77	83	1000	1151	1296
6	77	77	77	77	77	83	1060	1243	1346
7	77	77	77	77	77	83	1120	1210	1283
8	77	78	77	77	77	83	1180	1132	1173
9	78	78	78	78	78	83	1240	1111	1151
10	79	79	78	78	78	83	1300	1216	1262
11	80	80	79	79	79	83	1327	1371	1375
12	81	82	80	80	79	84	1346	1496	1455
13	83	83	81	81	80	83	1364	1482	1475
14	85	85	82	82	81	84	1380	1373	1358
15	87	87	84	84	83	83	1395	1256	1224
16	89	89	85	85	84	83	1410	1208	1194
17	91	92	87	87	86	83	1423	1284	1310
18	95	94	89	89	88	83	1436	1421	1431
19	99	97	91	91	90	83	1448	1499	1512
20	102	101	94	93	92	84	1459	1476	1527
21	106	103	96	96	94	84	1470	1477	1546
22	110	106	99	98	97	84	1480	1481	1560
23	113	110	101	101	99	84	1490	1490	1572
24	117	113	104	104	102	84	1499	1498	1583
25	121	117	107	107	105	84	1508	1508	1596
26	125	120	110	110	108	85	1517	1516	1610
27	128	123	114	114	111	85	1525	1511	1595
28	132	127	117	117	114	85	1533	1492	1570
29	136	130	120	120	118	85	1541	1470	1539
30	140	134	124	124	121	86	1548	1475	1553
31	143	138	128	128	125	85	1555	1525	1616
32	147	142	132	131	128	85	1562	1577	1662
33	150	145	135	134	132	85	1569	1613	1690
34	153	148	139	138	136	85	1576	1542	1594
35	156	152	143	142	140	86	1582	1505	1562
36	159	155	147	145	143	85	1588	1539	1619
37	163	159	151	149	147	85	1594	1552	1630
38	167	163	155	153	151	84	1600	1555	1628
39	170	166	159	157	154	85	1606	1565	1640

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	TC # 679 (°F)	TC # 680 (°F)	TC # 681 (°F)	TC # 682 (°F)	TC # 683 (°F)	Ambient (°F)	E119 Std Curve (°F)	Furnace Average (°F)	Furnace # 1 (°F)
40	174	169	163	161	158	85	1612	1574	1641
41	177	173	167	164	162	85	1617	1599	1676
42	180	176	171	168	166	85	1622	1611	1689
43	183	179	175	172	169	85	1627	1612	1677
44	186	182	178	176	173	86	1633	1619	1681
45	188	185	181	179	176	86	1638	1629	1688
46	190	187	184	182	180	86	1642	1646	1719
47	192	190	187	186	183	86	1647	1648	1717
48	194	192	190	189	186	85	1652	1660	1737
49	195	194	192	191	189	84	1656	1667	1734
50	197	196	194	194	192	86	1661	1669	1728
51	198	197	196	195	194	84	1665	1659	1709
52	199	199	198	197	196	85	1669	1646	1694
53	199	200	199	198	198	85	1674	1643	1699
54	200	201	200	200	199	84	1678	1650	1705
55	201	202	201	201	201	84	1682	1655	1709
56	202	203	202	202	202	84	1686	1662	1715
57	203	205	203	203	203	85	1690	1661	1710
58	204	206	204	204	205	84	1693	1674	1727
59	205	208	205	206	207	85	1697	1686	1742
60	206	210	208	207	208	85	1701	1692	1749
Max Temp:	206	210	208	207	208				
Max Allowed:	401	401	402	402	402				

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	Furnace # 2 (°F)	Furnace # 3 (°F)	Furnace # 4 (°F)	Furnace # 5 (°F)	Furnace # 6 (°F)	Furnace # 7 (°F)
0	77	78	73	78	75	75
1	96	91	105	98	99	105
2	176	164	215	171	226	199
3	396	401	461	409	615	544
4	702	788	771	761	1077	1047
5	963	1126	1027	1031	1340	1312
6	1159	1262	1219	1117	1399	1336
7	1220	1245	1242	1096	1330	1256
8	1185	1181	1166	1037	1237	1150
9	1166	1157	1147	1014	1214	1123
10	1257	1251	1265	1084	1338	1239
11	1379	1378	1413	1199	1524	1392
12	1486	1499	1521	1327	1649	1539
13	1531	1512	1528	1346	1570	1494
14	1462	1417	1429	1258	1430	1373
15	1363	1320	1302	1151	1304	1245
16	1308	1267	1243	1109	1260	1201
17	1353	1313	1322	1171	1359	1303
18	1464	1428	1459	1281	1539	1444
19	1555	1515	1553	1356	1598	1513
20	1552	1499	1526	1367	1540	1472
21	1558	1501	1527	1386	1535	1470
22	1569	1506	1530	1407	1532	1472
23	1586	1515	1538	1434	1535	1482
24	1594	1527	1544	1456	1538	1495
25	1604	1542	1551	1474	1543	1508
26	1607	1553	1557	1482	1553	1518
27	1605	1557	1542	1495	1541	1510
28	1588	1539	1530	1485	1524	1485
29	1571	1515	1506	1470	1503	1461
30	1575	1510	1515	1476	1505	1475
31	1613	1553	1564	1515	1563	1533
32	1655	1610	1620	1547	1626	1584
33	1692	1646	1662	1568	1659	1624
34	1641	1589	1585	1521	1569	1530
35	1596	1540	1538	1494	1534	1507
36	1614	1569	1573	1535	1575	1542
37	1631	1579	1592	1552	1582	1557
38	1639	1581	1589	1566	1581	1564
39	1646	1590	1601	1573	1596	1573

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	Furnace # 2 (°F)	Furnace # 3 (°F)	Furnace # 4 (°F)	Furnace # 5 (°F)	Furnace # 6 (°F)	Furnace # 7 (°F)
40	1655	1599	1607	1587	1598	1588
41	1673	1621	1630	1602	1626	1611
42	1682	1634	1644	1613	1637	1622
43	1686	1639	1641	1626	1635	1624
44	1689	1649	1649	1634	1648	1628
45	1702	1656	1661	1647	1652	1644
46	1719	1666	1685	1657	1670	1657
47	1721	1671	1684	1657	1675	1650
48	1727	1681	1702	1666	1690	1662
49	1729	1687	1700	1683	1696	1670
50	1730	1686	1700	1691	1696	1677
51	1722	1676	1686	1685	1678	1669
52	1706	1666	1671	1672	1666	1651
53	1696	1664	1669	1665	1670	1644
54	1702	1663	1678	1668	1674	1656
55	1712	1665	1686	1676	1676	1664
56	1716	1672	1692	1682	1684	1676
57	1710	1676	1684	1683	1684	1668
58	1729	1682	1706	1692	1695	1688
59	1737	1694	1720	1702	1709	1698
60	1743	1702	1727	1710	1718	1705

Max Temp:
Max Allowed:

OMEGA POINT LABORATORIES

Project No. 97259 TVA/TSI October 19, 1994

Time (min)	Furnace # 8 (°F)	Furnace # 9 (°F)	Furnace # 10 (°F)
0	80	73	77
1	106	95	110
2	210	157	187
3	556	332	412
4	1005	666	750
5	1282	1051	1077
6	1317	1144	1129
7	1245	1108	1072
8	1153	1039	997
9	1136	1018	986
10	1261	1097	1107
11	1421	1302	1327
12	1556	1455	1474
13	1507	1430	1426
14	1384	1318	1303
15	1263	1205	1182
16	1216	1149	1129
17	1272	1254	1186
18	1410	1417	1332
19	1493	1479	1411
20	1460	1438	1376
21	1455	1431	1362
22	1453	1429	1350
23	1453	1435	1345
24	1453	1442	1346
25	1457	1451	1354
26	1461	1460	1359
27	1461	1449	1359
28	1440	1425	1336
29	1424	1394	1316
30	1420	1401	1317
31	1468	1459	1363
32	1526	1525	1416
33	1555	1573	1462
34	1497	1483	1406
35	1459	1449	1369
36	1490	1478	1390
37	1499	1492	1401
38	1506	1486	1408
39	1514	1502	1413

Time (min)	Furnace # 8 (°F)	Furnace # 9 (°F)	Furnace # 10 (°F)
40	1522	1512	1434
41	1539	1548	1459
42	1550	1561	1474
43	1557	1556	1476
44	1565	1567	1482
45	1574	1571	1495
46	1587	1589	1508
47	1599	1590	1512
48	1608	1607	1519
49	1619	1620	1529
50	1624	1625	1535
51	1619	1610	1532
52	1610	1597	1523
53	1607	1603	1517
54	1609	1613	1528
55	1615	1610	1532
56	1622	1622	1541
57	1626	1624	1541
58	1634	1636	1554
59	1644	1650	1560
60	1651	1654	1565

Max Temp:
Max Allowed:

OMEGA POINT LABORATORIES

Appendix E

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

ACCEPTABILITY DOCUMENTATION

TEST DECK #6: PROJECT NO. 97259

The following signatures attest to the review and acceptance of each attribute listed regarding the above-noted test article:

I. CABLE TRAY/CONDUIT ASSEMBLY

C Humphrey — Omega Point Laboratories, Inc. — 8/25/94 Date

TVA / TSI — 8/29/94 Date

II. ELECTRICAL CABLE INSTALLATION

N/A

Omega Point Laboratories, Inc. — Date

TVA / TSI — Date

III. THERMOCOUPLE INSTALLATION

C Humphrey — Omega Point Laboratories, Inc. — 8/26/94 Date

TVA / TSI — 8/29/94 Date

Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, Texas 78112-9784
210-635-8100 / FAX: 210-635-8101
800-966-5253

IV. FIRE PROTECTION BARRIER

Cleda Patton — 9/19/94
Omega Point Laboratories, Inc. — Date

[signature] — 10/17/94
TVA / TSI — Date

V. FINAL PRE-BURN INSPECTION

Cleda Patton — 10/19/94
Omega Point Laboratories, Inc. — Date

[signature] — 10/19/94
TVA / TSI — Date

OMEGA POINT LABORATORIES

Event Log

EVENT LOG

TSI / TVA

Client # 11960

PROJECT NUMBERS:

97257
97258
97259
97260

OMEGA POINT LABORATORIES, INC.
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112
1-800-966-5253

EVENT LOG

TVA/TSI

Client #11960

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

97257 #4 Concrete slab with (2) 1" steel conduits, (8) 4" alum. conduits & (6) cable trays.
97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
Purchase order received from TSI to begin construction on these four test decks.	7/18/94	CH
Construction of Test Deck #7 begins by OPL welders.	7/20/94	CH
Conduit sections are cut and installation begins on Test Deck #7 by OPL technicians.	7/26	CH
Conduit sections are all installed on Test Deck #7.	7/28	CH
Thermocouple installation begins on Test Deck #7.	7/28	CH
Thermocouple installation is completed by OPL technicians.	7/29	CH
Test Deck #7 assembly is verified by OPL QA/QC.	7/29	CH
All thermocouples are verified on Test Deck #7 by OPL QA/QC and the assembly is accepted by TVA proj. mgr.	8/1/94	CH
The conduit covers for the 3/4" conduits were not	8/1/94	CH

EVENT LOG

TVA/TSI

Client #11960

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

97257 #4 Concrete slab with (2) 1" steel conduits, (8) 4" alum. conduits & (6) cable trays.
97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
Shipped by TVA. Omega Point technicians have fabricated a cover from steel plate for the 3/4" steel conduit. The 3/4" aluminum conduit cover was found from another distributor and is held with two stainless steel tie wires.	8/1/94	CH
CPL technicians begin construction on the test frame for Test Decks #5 and #6.	8/1/94	CH
Rich Lohman, TSI is on site to witness construction procedures.	8/1	CH
Pat Madden USNRC arrives at Omega Point	8/1	CH
TVA insulators arrive at Omega Point and begin the application of Thermo-Lag to Test Deck #7. The insulators are: Ben Loveless, Bernard McQueen	8/2/94	CH
Test frames for Test	8/2	CH

EVENT LOG

TVA/TSI

Client #11960

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97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
Decks #5 and #6 are completed and verified by OPL QA.	8/2/94	CH
4" Conduits on the outside of group are each fitted with one piece (½) of pipe covered) on Test Deck #7.	8/2	CH
Fold pieces of flat stock Thermo-Lag are cut to fit between conduit sections at transition from the individually wrapped to boxed conduits on Deck #7.	8/2	CH
Curved radius of the seven 4" conduits is insulated with V-ribbed Thermo-Lag panels which have been scored and bent to fit the curve on Test Deck #7 and held with stainless steel tie wire.	8/3	94
Concrete slab was poured for Test Decks #5 and #6 by OPL technicians.	8/3/94	CH
Side and top panels of Test Deck #6 details are	8/3 & 8/4	CH

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
verified by OPL QA.	8/4/94	CH
Vertical section of deck #7 on LB end is boxed in with the V-rib panel Thermo-Lag and held with stainless steel tie wire. This boxed in section has threaded bolts with washers and nuts penetrating the box between conduits.	8/4	CH
measured cut and fit 3/4" conduit sections with the Thermo-Lag preformed conduit. Gravel grade material to complete this Test Deck #7 will be shipped at a later date. Ampacity testing priority will delays the completion of this test deck #7 by TVA installers.	8/5	CH
	8/5/94	CH
Side panels of Test Deck #4 is verified by OPL.	8/5	
Concrete is poured into Test Deck #4 and remaining sections of Test Deck #6.	8/5	CH

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
front slab panels for Test Deck #5 and #6 and the side slab panel for Test Deck #6 are put into the large furnace at a low temperature to accellerate the curing process of the concrete. These panels are removed from the furnace on 8/16/94.	8/12/94	CH
Side slab panels for Test Deck #4 are put in the large furnace for curing. The front panel of this test deck uses a slab stripped of JB's & conduits done for TVA previously, but not tested.	8/16/94	CH
The sides panels for Test Deck #6 are welded together by CPI technicians.	8/18/94	CH
The side panels are removed from the furnace for Test Deck #4.	8/19/94	CH
Construction of the conduits	8/19/94	CH

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ITEM	DATE	INITIALS
and thermocouple placement started 8/18 Continues for Test #6.	8/19/94	CH
Thermocouple placement verification is done by OPL QA/QC for Test #6.	8/22	CH
OPL technicians start welding side panels on Test #4.	8/22	CH
Mark Talley TVA arrives at Omega Point to manage Therm-O-Rag installers.	8/22	CH
TVA insulators arrive at OPL to complete Test #7 and start ampacity test insulation. The following installers are on site: Arnold Wright, ~~Tony Cole~~ Bernard McQueen, Josh H. Stewart, Jr., Ben Loveless	8/23	CH
Daniele Oudinot USNRC arrived at OPL to witness insulation procedures on 8/22/94.		

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
Fabricated pull box for Test Deck #6 is received by OPL QA/QC.	8/23/94	CH
Twelve buckets of NEI Thermo-Lag 330-1 trowel grade material have been transferred to the TVA stock by an authorization letter from Biff Bradley. This material comes from TSI batch no. 93-10049 and the expiration date has been extended six months by TSI to January 1995.	8/23	CH
The completion of Test Deck #7 has been resumed by the TVA installers.	8/24	CH
Thermo-Lag trowel grade material in putty form is added to the inside corners of the Therm-Lag panels and conduit sections on Test Deck #7.	8/25	CH
Upgrade is started on		

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ITEM	DATE	INITIALS
tray using stress skin panels. The nuts and washers are removed from the bolts and replaced over the stress skin layer. The overlapped stress skin is stitched with stain steel tie wire and fastened with staples.	8/25/94	CH
All of the conduit sections and the pull box have been installed on test deck #6 by OPL technicians and verified by OPL QA/QC. The placement of the thermocouples is completed and verified.	8/25	CH
Shipment of Therm-Tag 330-1 conduit sections, panels and trowel grade material is received by OPL from TSI.	8/25	CH
Construction continues on test #4 with cutting the tray section supports.	8/25	CH
application of the stain-	8/26	CH

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
steel stress skin is completed on deck #7 and the covering of trowel grade material is started.	8/26/94	CH
The bolt heads are covered with trowel grade material in putty form and held with strapes of stress skin and fastened with staples.	8/26	CH
The assembly of conduits for test deck #5 is started by OPI technicians.	8/26	CH
Test deck #6 is stood up in the vertical position and leg supports are welded in place.	8/26	CH
OPI technicians install the penetration seals in test deck #6.	8/26	CH
Test deck #6 is completed by OPI and is turned over to TVA installers.	8/27	CH
TVA insulators continue to apply the trowel grade Therms-Lag over	8/27	CH

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ITEM	DATE	INITIALS
the stress skin on test deck #7.	8/27/94	CH
The sections of two CH bare supports on test #7 are now wrapped totally with Thermo-Lag panel material. This consists of about 16" in length of the 4" diameter tube steel which supports the middle section of the assembly. These were previously left un-insulated.	8/27	CH
Welding continues on tray supports for test deck #4.	8/27	CH
Boxed conduit section of test deck #7 is polished smooth.	8/27	CH
Test deck #6 is started by TVA installers. The group of eight 4" conduits are boxed as one and held together by threaded bolts and tie wire.	8/29/94	CH
	8/29/94	CH

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
OPL technicians begin thermo-couple layout for Deck #5.	8/29/94	CH
Thermo-Lag wrap of the group of (8) 4" conduits on test deck #6 is completed.	8/30	CH
The first layer of Thermo-Lag preformed conduit sections are installed on both 3/4" conduits on test deck #7.	8/30	CH
Applied the second layer of Thermo-Lag conduit sections to both of the 3/4" conduits on Test Deck #7.	8/31/94	CH
Thermocouple installation on the conduit surfaces begin for Test Deck #5.	8/31	CH
Twenty-four additional thermocouples are added to test deck #7. These are placed on the outside edges at 18" intervals, on the two rear conduits of the grouping of (4) 3" steel conduits and the group of (4) 1" steel conduits. This was done to satisfy the requirement	9/8/94	CH
	9/8/94	CH

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
that the thermocouples be placed at the inside surface of the Therm-Tec material. The existing thermocouples on the two rear conduits of each group are facing the inside or center of the box. These additional 24 thermocouples are verified by OPL QA/QC.	9/8/94	CH
Type B lead plates are installed on Test Deck #6 enclosure of the four 3" conduits. Type shore and fold method is used with a backing piece at the butt joint. a 1/4" threaded rod encloses this group of conduits at this joint.	9/8/94	CH
OPL welders continue construction of Test Deck #4	9/9	CH
TVA installers continue insulation of Test Deck #6 with the wraps of the four 1" conduits using Type A lead plates and staggered butt joints. Started the junction	9/10 9/10 9/10	CH CH

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
box enclosure using the score and fold method and the Type A baseplates.	9/10/94	CH
Installed upper baseplate and support insulation on Test Deck #6. Wrapped Thermo-Lag preformed conduit around the JB conduits.	9/12/94	CH
Added skim coat and stress skin to the eight conduit enclosure and stitched with tie wire at overlap.	9/12/94	CH
Installed stress skin on conduits and JB enclosures.	9/13	CH
Stainless steel tie wire used for stitching the stress skin on Test Deck #6.	9/13	CH
QC technicians begin thermocouple layout for Test Deck #4.	9/14	CH
Thermocouples are applied to conduits on Test Deck #4.	9/15 CH	CH
Continued to install stress skin on ~~Assembly~~ Test Deck #6. Skim coat is applied over the stress skin.	9/14/94	

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ITEM	DATE	INITIALS
Finish coat of the trowel grade material is applied over the 1" and 4" conduit enclosures on Test Deck #6. Attached anchor bolts to the large junction box on Test Deck #5. These bolts penetrate the Thermo-Lag panels and hold it to the junction box. The Thermo-Lag panels have two inches of the panel stress skin left bare to attach to the concrete deck surface. The stainless steel stress skin layer is applied and bolted leaving a 2" overlap on the deck.	9/15/94	CH
The 3" and 2" conduit enclosures are covered with the Thermo-Lag panel using the score and fold method. Tie wires were attached to the conduit straps and pulled thru holes drilled in the panels	9/15 9/16 9/16 CH	CH CH

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
To attach boxes to deck.	9/16/94	CH
Started 7 conduit enclosure		
using an individual piece		
method. Support pieces		
of Therm-Tag panel were		
installed between conduits		
and some scrap pieces		
on top of CB's to provide		
an even top surface		
before the Therm-Tag		
panels were applied. Tie		
wipes to conduit straps		
thru panels keep the		
boxes held tightly.	9/16	CH
Installed slides on the	9/17	CH
7 conduit enclosure on		
deck #5. Added stress skin		
and the trowel grade		
skim coat to the junction	9/17	CH
box.		
Completed skim coat on	9/19/94	CH
junction box and applied		
stress skin and skim coat		
of trowel grade material		
on the 7 conduit enclosure		
on deck #5.	9/19	

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
The final tie wires are attached to the conduit and pull box enclosures on deck #6. This test article is complete.	9/19/94	CH
TVA/TSI Test Plan Clarification number 001 is issued to address the change of the Unistrut design on Test Deck #4.	9/20/94	CH
Polished junction box on deck #5 and applied skim coat to the 7 conduit enclosure.	9/20	CH
The edge frames were added to the enclosures. Four different frame types were used. These are bolted to the concrete deck and skim coated with trowel grade Thermo-Lag on test deck #5.	9/21	CH
Bolts are cut flush and covered with the trowel grade material on deck #5.	9/22	CH
Trowel grade "putty" is	9/22	CH

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ITEM	DATE	INITIALS
added on all frames edges to concrete surface for a beveled finish on deck #5.	9/22	CH
all TVA personnel depart from Omega Point.	9/22	CH
Omega Point technicians continue fabrication of supports on test deck #4.	9/23	CH
Omega Point technicians apply thermocouples on test deck #4.	9/24	CH
Test deck #4 is completed by OPL technicians and QA/QC verification is done.	9/26	CH
Mark Salley TVA on site. Shipment of T-L received.	9/26	CH
Test deck #4 is turned over to TVA installers Arnold Wright and ~~Wayne~~ CH Derrick Starnes.	9/27	CH
Installation of the Thermo Lag panel begins on the Large Boxed assembly.	9/27	CH

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
of 8 conduits on test deck #4. Sections of the Therms-Lag panel are cut to fit around the conduit with the seams butting at the vertical centerline. Small pieces of Therms-Lag panel 3" wide are used as a backing board held with trowel grade material at inside seams. Stress skin cut in 3" widths covers the outside surface of these seams and is held with trowel grade material and staples.	9/27/94	CH
Large conduit box on test deck #4 is assembled.	9/28	CH
There are two treatments of the butt joints done. One uses a string of backing board on the inside with stress skin and bolts tying it together with trowel grade material.	9/28	CH

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97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
The second butt joint treatment consists of bolts at a 12" spacing in the seam with fender washers and a strip of panel over the bolt heads with stress skin and trowel grade material. Staples attach the stress skin to the panels.	9/28/94	CH
Began Thermo-Lag cover of cable trays and the structural steel supports of deck #4.	9/28 9/29	CH CH
Continued application of Thermo-Lag on cable trays on deck #4. On the (5) cable tray ~~sect~~ assembly, the two bottom trays are protected with Thermo-Lag.	9/30	CH
Application of Thermo-Lag continues on the cable tray support assembly in test #4. Baseplates are placed and held with anchor	10/1 10/1	CH CH

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ITEM	DATE	INITIALS
bolts using 1¼" washers under the nuts. Trowel grade Thermo-Lag is applied over the spanel tie wires on the 5 tray assembly.	10/1/94	CH
Completed the (5) cabel tray assembly on test #4 and began insulating the (3) tray assembly. On this (3) tray assembly only the middle tray is protected with the Thermo-Lag 330-1 panel. The top and bottom cable tray sections are bare. A piece of 3/8" Thermo-Lag had to be used on the support where the cladded middle tray restricted the clearance. Stress skin covers this middle tray and is fastened with staples.	10/3	CH
Completed Thermo-Lag coverage on the (3) cable tray assembly of deck #4.	10/4	CH
	10/4	CH
	10/4	CH

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97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
Applied the trowel grade material to the (3) cable tray assembly on deck #4 and completed the base-plates. These were constructed in the same manner as the baseplates on the (5) tray assembly.	10/4/94	CH
A skim coat of the Therma-Lag trowel grade material has been applied to the preformed conduit sections for the 4" conduits before their installation due to the limited space available.	10/4	CH
Polished Therma-Lag surface on cable tray supports of deck #4.	10/5	CH
Cut and applied panels on the (2) 1" steel conduit box on deck #4. Used the two joint details. The side panel uses the back plate method and the top joint uses the 1¼" washers on the bolts at the seam.	10/5	CH

EVENT LOG

TVA/TSI

Client #11960

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

97257 #4 Concrete slab with (2) 1" steel conduits, (8) 4" alum. conduits & (6) cable trays.
97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
Completed butt joint seam on test deck # 4 1" conduit box with 3" stress skin overlap, stapled and skimmed with trowel grade material. Installed two layers of the preformed conduit sections over the exposed 1" metal conduits. These layers are prebuttered and the seams are staggered 90° and fastened with stainless steel tie wire 6" o.c.	10/6/94	CH
Continued with the stresskin application to the 1" conduit box on test deck #4. The seams are overlapped 3 inches and stitched together every 6".	10/6	CH
Started putting stress skin on the large box enclosure of the 4" conduits.	10/7	CH
Wrapped all exposed 4" conduit ends in thermo-Lag preformed conduit sections on deck # 4. All	10/7 10/8	CH CH
	10/8/94	CH

EVENT LOG

TVA/TSI

Client #11960

NOTE:
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97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
pieces prebuttered and held with tie wire.	10/8/94	CH
Pierce TVA on site.	10/8	CH
"Picture frame" pieces bolted to concrete sides and floor of test article over the stress skin on test deck #4. Trowel grade material bevels panel edges to concrete.	10/10	CH
Conduit frames installed where the conduits enter the boxed enclosure.	10/10	
Picture frame border pieces are completed and skim coat started on large box enclosure of test deck #4. The trowel grade material "putty balls" are installed over bolt ends and covered with squares of stress skin stapled down.	10/11	CH
Continued with the "putty balls" over the bolt ends and skim coat on deck #4.	10/12	CH

EVENT LOG

TVA/TSI

Client #11960

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97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
More spin coat of trowel is applied to deck #4.	10/13/94	CH
Continued touch-up of deck #4	10/14	CH
Test deck #7 is placed on the test furnace after the final inspection by OPL technicians.	10/17	CH
Herb Stansberry does the final pre-burn inspection checklist as 532 thermocouples are attached to the OPL data acquisition equipment. The temperature at the start of test for deck #7 is 82° and the relative humidity is 72%. On site to witness the test of deck #7 are:		
Peg Priest, Omega Point Labs	10/18	CH
Kerry Fitchcock " " "		
Herb Stansberry " " "		
Connie Humphrey " " "		
Cleda Patton " " "		
Laudencio Castanon " " "		
Richard Beasley " " "		
JJ Pierce TVA	10/18	CH

EVENT LOG

TVA/TSI

Client #11960

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

97257 #4 Concrete slab with (2) 1" steel conduits, (8) 4" alum. conduits & (6) cable trays.
97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
Mark Sallee TVA	10/18/94	CH
Rick Woody "		
Brian Trent "		
Rick Johnson TSI		
Tim Hill "		
Jet Singh USNRC		
Jess Bittel Hughes Assoc.		
The test of Deck #7 begins at 9:43 and is completed in one hour. The hose stream test follows using OPL pressure gage #92LE003, calibration due 1/20/95. The pressure at the fog nozzle is 75psi using a 30° spray pattern from a distance of five feet for five minutes. Following the hose stream test the test article was torn down to inspect the condition of the Thermo-Lag material.	10/18	CH
Final layer of the trowel grade skim coat is applied to Test Deck #4. The 30 day cure time begins.	10/19	
	10/19	

EVENT LOG

TVA/TSI

Client #11960

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97257 #4 Concrete slab with (2) 1" steel conduits, (8) 4" alum. conduits & (6) cable trays.
97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
Test deck #6 is placed in front of the furnace after final inspection by OPL technician.	10/18	SP
Herb Stansberry does the final pre-burn inspection checklist as 683 thermocouples are attached to the OPL data acquisition equipment. The temperature at the start of the test for deck #6 is 82° and the relative humidity is 80%.	10/19	SP
On site to witness the test of deck # 6 are:		
Dec Priest Omega Point Labs	10/19	SP
Kerry Hitchcock " " "		
Herb Stansberry " " "		
Cleda Patton " " "		
Dingyi Huang " " "		
Laudencio Castanon " " "		
Richard Beasley " " "		
JJ Pierce TVA		
Mark Salley "		
Rick Woodly "		
Brian Gent "		
Rich Lohman TSI		
Jim Hill "		
Jit Singh USNRC		

EVENT LOG

TVA/TSI

Client #11960

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

97257 #4 Concrete slab with (2) 1" steel conduits, (8) 4" alum. conduits & (6) cable trays.
97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
The test of Deck #6 begins at 12:18 pm and is completed in one hour. Hose stream test follows using OPL pressure gage # 921 E003. calibration due 1/20/95. Pressure at the fog nozzle is 75 psi using a 30° spray pattern from a distance of five feet for five minutes. Due to considerable heat from the test deck, tear down will be conducted on 10/20/94.	10/19	SP
Test Deck #6 was torn down to inspect the condition of the Thermo-Lag material.	10/20	SP
Test Deck # 5 is prepared for the fire test on 10/27. Steel Studs material has been placed around test deck perimeter to extend the gasketing surface of the furnace. Steel Studs are covered on the inside with 2 layers of 5/8" gypsum wall board, type X and covered in turn with 1" Ceramic fiber blanket. Test Deck #5 is placed in front	10/24 10/25 10/26	SP SP SP

EVENT LOG

TVA/TSI

Client #11960

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97257 #4 Concrete slab with (2) 1" steel conduits, (8) 4" alum. conduits & (6) cable trays.
97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
of the furnace after final inspection by OPL technicians.	10/26	SS
Herb Stansberry does the final pre-burn inspection checklist as 434 thermocouples are attached to the OPL data acquisition equipment. The temperature at the start of the test for deck #5 is 60° and the relative humidity is 76%. On site to witness the test of deck #5 are:	10/27	SS
Deg Priest Omega Point Labs		
Kerry Hitchcock " " "		
Cleda Patton " " "		
Herb Stansberry " " "		
Laudencio Castanon " " "		
Richard Beasley " " "		
Mark Salley TVA		
Rick Woodly "		
Brian Gent "		
Rashid Abbas "		
Ben Evans TSI		
Tim Hill "		
Ed Connelle USNRC		
Bob McDaniel Florida Power & Light		

EVENT LOG

TVA/TSI

Client #11960

NOTE:
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97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
The test of deck #5 begins at 9:01 am and is completed in one hour. Hose stream test follows using OPL pressure gage # 92LE003, calibration due 11/20/95. Pressure at the fog nozzle is 75 psi using a 30° spray pattern from a distance of five feet for five minutes. Following the hose stream test the test article was allowed to cool and tear down was conducted in the afternoon to inspect the condition of the Thermo-Lag.	10/27	SP
Penetration seals started by OPL technicians on test deck #4. It was noticed that some trowel grade material was missing on the preformed sections of conduit where they entered the boxed section. TVA installers added trowel grade material at this time to repair. See TVA data sheet, dated 11/9/94 on test deck #4.	10/27 11/9 11/9 11/9/94	SP CH CH

EVENT LOG

TVA/TSI

Client #11960

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97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
The penetration seals are completed by OPI technicians on Test Deck #4. This test article is inspected by OPI Quality assurance and accepted as ready to test by TVA. Test Deck #4 is placed on the test furnace.	11/16/94	CH
	11/16	CH
Pretest checklist is performed by Herb Stansbury and 574 thermocouples are attached to the Omega Point data acquisition system. The ambient temperature at time of test start is 64° with the relative humidity at 82%.	11/17	CH
The fire test of deck #4 began at 10:30 am. On site to witness this test are:		
Dee Priest Omega Point Labs	11/17	CH
Connie Humphrey " " "		
Cleda Patton " " "		
Kerry Hitchcock " " "		
Richard Beasley " " "		
Herb Stansbury " " "	11/17	CH

EVENT LOG

TVA/TSI

Client #11960

NOTE:
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97257 #4 Concrete slab with (2) 1" steel conduits, (8) 4" alum. conduits & (6) cable trays.
97258 #5 Concrete wall with 5'x3'x2' J-Box, (2) steel conduits & (10) alum. conduits.
97259 #6 Concrete wall with (4) 1" steel conduit, (8) 4" alum., (4) 3" steel & (1) 4" steel conduit with a 60"x12"x12" pull box.
97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

ITEM	DATE	INITIALS
Teudencio Catanon Omega Point	11/17/94	CH
Mark Talley TVA		
Kent Brown "		
Rick Woody "		
Brian Hunt "		
Gordon Embrey TSI		
Jet Singh USNRC		
This test of deck #4 is completed at 11:30 and is followed by a five minute hose stream test using the 30° spray fog nozzle with 75 psi from a distance of five feet. The tear down and inspection of this test article will be done tomorrow due to the heat maintained in the concrete.	11/17	CH
	11/17/94	CH

Installation Details

ATTACHMENT 1

DATA SHEET

Sheet 1 of 3

RACEWAY ID 97259 WP/WR NO. Test Deck 6 (4 sides box)

LOT/CONTRACT NO. Travel 93-1049 Board - F94-04005 EXPIRATION DATE Jan 95

CRAFTSMAN [signature] Preshape 4" - F94-07003 DATE 8/29/94

QC INSPECTOR C Humphrey DATE 8/29/94

TYPICAL DRAWING NO. _____

MONITORING POINTS

	FIRST LAYER	SECOND LAYER
FASTENER SPACING		
SEAMS OFFSET	NA	
JOINTS OFFSET	NA	
18" RULE		
CIRCUMFERENCE		
SURFACE APPEARANCE		
MESH OVERLAPS		

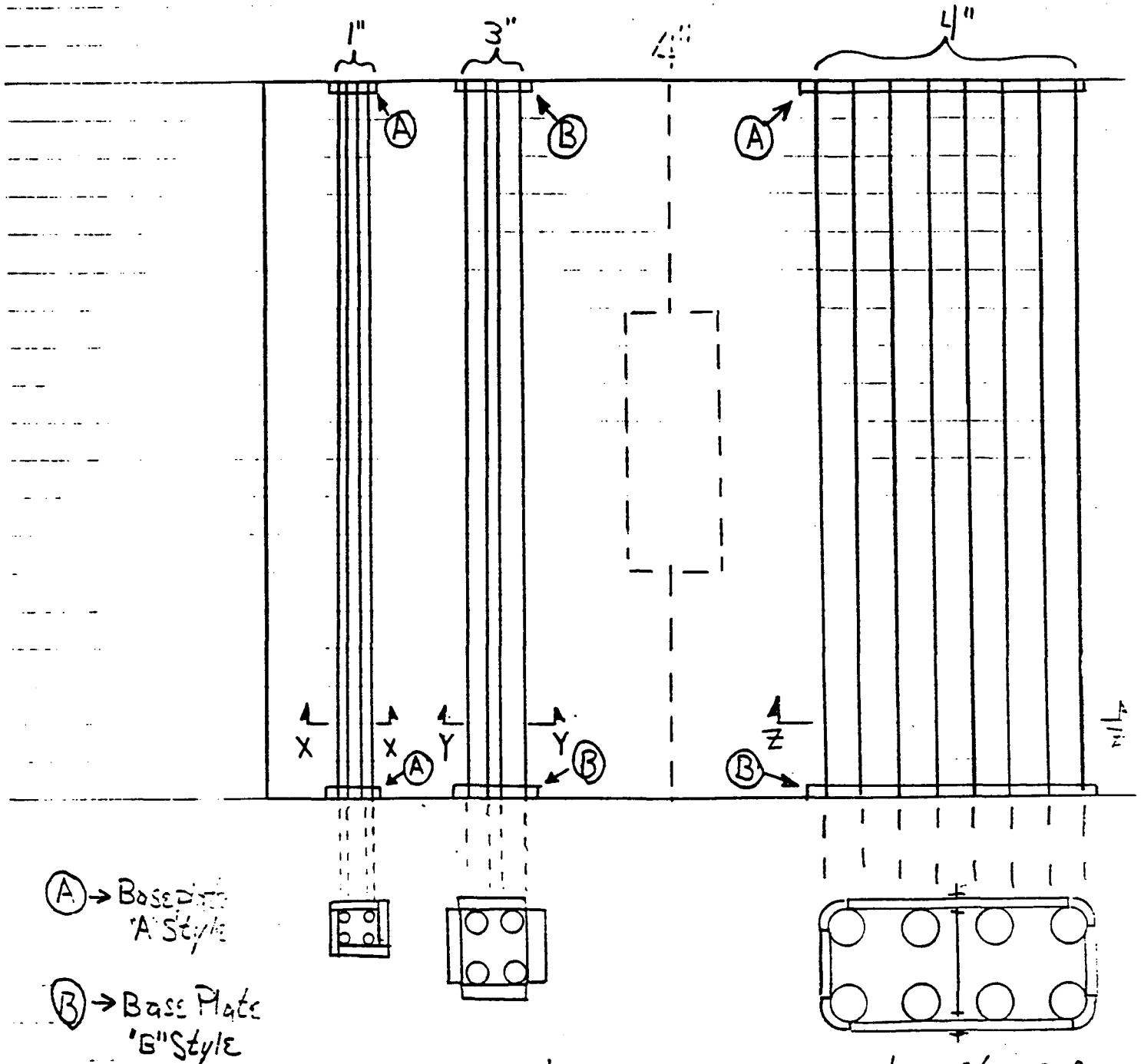
NA

REMARKS: Started the Installation of Thermo-Lay. The eight, 4" conduits will be the first. All details as shown on following sheets.

Thicknesses of board & preformed $\frac{1}{2}$" to $\frac{11}{16}$"

SUBJECT 97259 Test Deck 6 PROJECT Four-Side Box

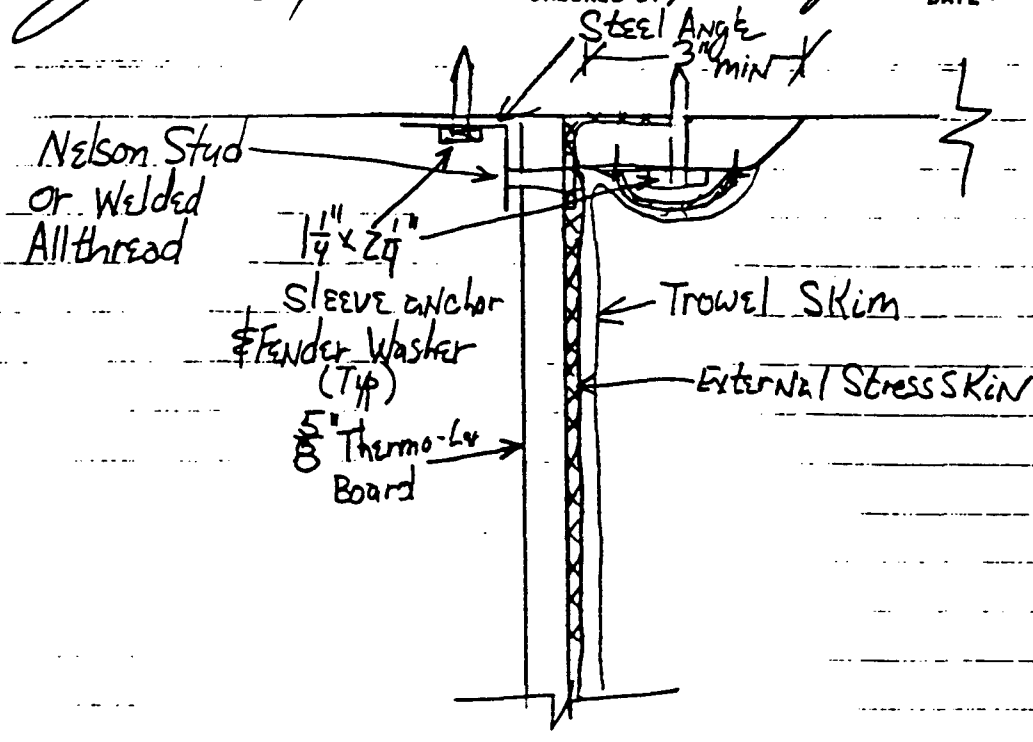
COMPUTED BY [signature] DATE 8/29/94 CHECKED BY C Humphrey DATE 8/29/94



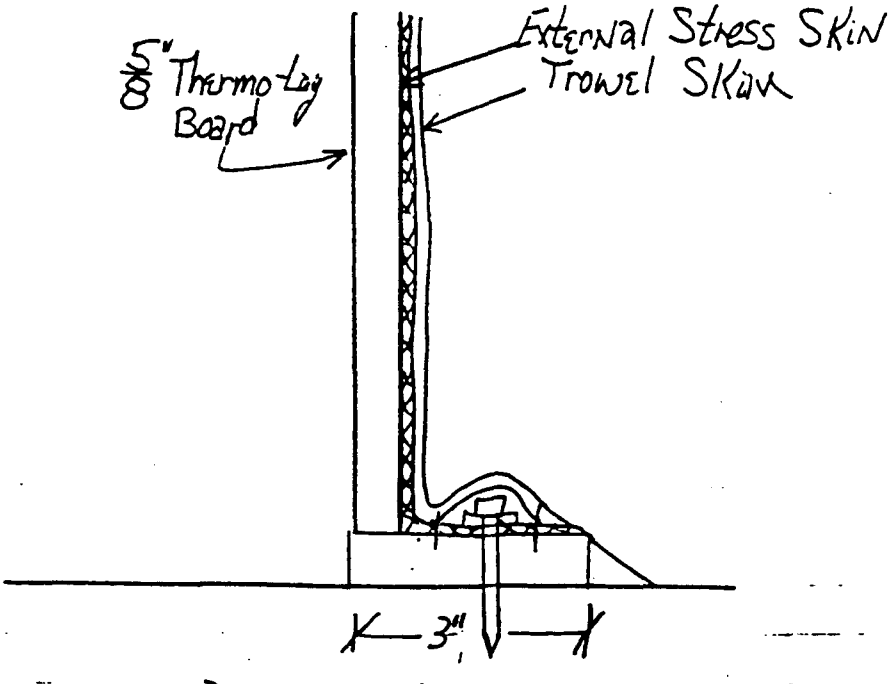
SUBJECT 97759 Test Deck 6 PROJECT Four-Side Box

690

COMPUTED BY [signature] DATE 8/29/94 CHECKED BY C Humphrey DATE 8/29/94



Baseplate Type "A"



Baseplate Type "B"

ATTACHMENT 1

DATA SHEET

RACEWAY ID 97259 WP/WR NO. Deck #6 Sheet 1 of 1

LOT/CONTRACT NO. Trowel 93-11049 Board 94-04005 EXPIRATION DATE Jan 95

CRAFTSMAN [signature] DATE 8/30/94

QC INSPECTOR [signature] DATE 8-30-94

TYPICAL DRAWING NO. _____

Preformed 4" F94-07003, F94-06082 1/2" to 11/16"

MONITORING POINTS

	FIRST LAYER	SECOND LAYER
FASTENER SPACING	OK	
SEAMS OFFSET	NA	
JOINTS OFFSET	NA	
18" RULE	NA	
CIRCUMFERENCE	NA	
SURFACE APPEARANCE	Not yet	
MESH OVERLAPS	Not yet	

REMARKS: Completed covering 8, 4" conduit assembly with Thermo-Lag. Next step will be to cover (360°) with stress skin and trowel skim coat, & final fit wire.

ATTACHMENT 1

DATA SHEET

4-Sided Enclosures

RACEWAY ID Test Assembly 6 WP/WR NO. 97259

LOT/CONTRACT NO. Trowel 94-08008 EXPIRATION DATE FEB 95

CRAFTSMAN JJ Pierce DATE 9/9/94

QC INSPECTOR C Patton DATE 9/9/94

TYPICAL DRAWING NO. _____

MONITORING POINTS

	FIRST LAYER	SECOND LAYER
FASTENER SPACING	6" MAX	
SEAMS OFFSET	NA	
JOINTS OFFSET	NA	
18" RULE	NA	
CIRCUMFERENCE	NA	
SURFACE APPEARANCE	ok	
MESH OVERLAPS	2"	

REMARKS: 5/8" Panel Lot # 94-03097 (MAX 3/4", MIN 1/2") Attached baseplates (type B) and enclosure around the 4-3" conduits (used score and fold for enclosure). Used backing piece at butt joint. Backing piece made of ~6" long (3" on each side of joint), 5/8" panel and attached with 1/4" All-Thread rod, nuts & washers (backing piece on two sides - opposing - only). Started 4 piece enclosure around 4-1" conduits.

APPENDIX 7.1

C-98 REV. 0 SEN-98-01

ATTACHMENT 1

DATA SHEET

RACEWAY ID 4-Sided Enclosure WP/WR NO. 97259-TEST DECK 6

LOT/CONTRACT NO. TROWEL 94-08008 EXPIRATION DATE FEB 95

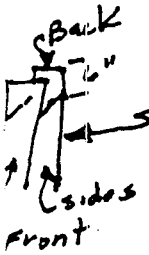
CRAFTSMAN JL Pierce DATE 9/10/94

QC INSPECTOR C Humphrey DATE 9/10/94

TYPICAL DRAWING NO. _____

MONITORING POINTS

	FIRST LAYER	SECOND LAYER
FASTENER SPACING	6" spacing	
SEAMS OFFSET	NA	
JOINTS OFFSET	~~NA~~ See Remarks	
18" RULE	N/A	JLP 9/10/94
CIRCUMFERENCE	N/A	
SURFACE APPEARANCE	ok	
MESH OVERLAPS	N/A	



REMARKS: Completed 1st layer on 4-1" conduits. Butt joints staggered ~ 6". Type A baseplate installed. Started JB enclosure (used score & fold method). 5/8" panel Lot # 93-11048 (max 3/4", min 1/2"). 4" Preformed Lot (max 3/4", min 1/2") #94-06051, 94-07003. (max 3/4", min 1/2") 5/8" Panel Lot 94-07014 (max 3/4", min 1/2"). Installed Type A baseplates at conduit penetrations.

ATTACHMENT 1

DATA SHEET

RACEWAY ID 4 Sided Enclosures WP/WR NO. 97259 - TEST DECK 6

LOT/CONTRACT NO. TROWEL 93-11049 94-08008 EXPIRATION DATE JAN 95 FEB 95

CRAFTSMAN JJ Pierce DATE 9/12/94

QC INSPECTOR C Humphrey DATE 9/12/94

TYPICAL DRAWING NO. _____

MONITORING POINTS

	FIRST LAYER	SECOND LAYER (STRESS SKIN)
FASTENER SPACING	ok	ok
SEAMS OFFSET	NA	N/A
JOINTS OFFSET	NA	N/A
18" RULE	N/A	N/A
CIRCUMFERENCE	N/A	N/A
SURFACE APPEARANCE	ok	See Remarks
MESH OVERLAPS	ok	ok

REMARKS: Installed upper baseplate & support protection. Install collar around conduit enclosure at JB interface. Collar ~ 2" wide and made from preformed 4" conduit (Thermo-Lag) pieces and spread apart to fit. Applied skim coat and stress skin to B conduit enclosure. 18 gauge tie wire was used to stitch stress skin together at overlap. Enclosure too close to concrete to staple stress skin. Can't get hand all the way across back side. Need to make this a 3-sided enclosure in Stat plant unless enough space exists between enclosure and barrier.

-34-

ATTACHMENT 1

DATA SHEET

RACEWAY ID 4 Sided Enclosures WP/WR NO. TEST DECK 6

LOT/CONTRACT NO. TROWEL 93-11049 94-08008 EXPIRATION DATE JAN 95 FEB 95

CRAFTSMAN J.A. Pierce DATE 9/13/94

QC INSPECTOR C Humphrey DATE 9/13/94

TYPICAL DRAWING NO. _____

MONITORING POINTS

	FIRST LAYER	SECOND LAYER
FASTENER SPACING	ok	
SEAMS OFFSET	NA	
JOINTS OFFSET	NA	
18" RULE	N/A	
CIRCUMFERENCE	N/A	
SURFACE APPEARANCE	ok	
MESH OVERLAPS	Yes	

REMARKS: Installed stress skin on 1" conduits & 3" conduits and JB enclosures. 18 gauge tie wire used for stress skin stitching.

NOTE: Raceway should ~~be~~ have more than 6" clearance from wall, floor, ceiling if using 4-sided enclosure. If clearance is 6" or less, use 3-sided enclosure. -34- This applies to enclosures larger than 12" wide.

WBPP - 7197A

ATTACHMENT 1

DATA SHEET

RACEWAY ID 4-Sided Enclosures WP/WR NO. TEST DECK 6

LOT/CONTRACT NO. TROWEL 93-11049 94-08008 EXPIRATION DATE JAN 95 FEB 95

CRAFTSMAN JJ Pierce DATE 9/14/94

QC INSPECTOR C Humphrey DATE _____

TYPICAL DRAWING NO. _____

MONITORING POINTS

	FIRST LAYER	SECOND LAYER
FASTENER SPACING		ok
SEAMS OFFSET	NA	N/A
JOINTS OFFSET	NA	N/A
18" RULE		N/A
CIRCUMFERENCE		N/A
SURFACE APPEARANCE		ok
MESH OVERLAPS		YES

REMARKS: Installed stress skin on the 1" conduit enclosure. Used 18 gauge tie wire to stitch stress skin overlap together. Installed stress skin on JB. Lapped JB stress skin up on conduit ~2" and installed collar over this. Used 18 gauge tie wire for stitching stress skin overlap around JB. Installed skim coat over stress skin on both enclosures. 3" conduit enclosure ready for final tie wire

ATTACHMENT 1

DATA SHEET

RACEWAY ID 4-Sided Enclosures WP/WR NO. TEST DECK 6

LOT/CONTRACT NO. TROWEL 94-08008 EXPIRATION DATE FEB 95

CRAFTSMAN JJ Pierce DATE 9/15/94

QC INSPECTOR Cleda Patton DATE 9-15-94

TYPICAL DRAWING NO. _____

MONITORING POINTS

	FIRST LAYER	SECOND LAYER
FASTENER SPACING		
SEAMS OFFSET	NA	
JOINTS OFFSET	NA	
18" RULE		
CIRCUMFERENCE		
SURFACE APPEARANCE		
MESH OVERLAPS		

REMARKS: Finish coat/smooth JB enclosure, 1" conduit enclosure, 4" conduit enclosure.

ATTACHMENT 1

DATA SHEET

RACEWAY ID 4-SIDED ENCLOSURE WP/WR NO. TEST DECK 6

LOT/CONTRACT NO. N/A EXPIRATION DATE N/A

CRAFTSMAN JJ Pierce DATE 9/19/94

QC INSPECTOR C. Patton DATE 9-19-94

TYPICAL DRAWING NO. _____

MONITORING POINTS

	FIRST LAYER	SECOND LAYER
FASTENER SPACING		
SEAMS OFFSET	NA	
JOINTS OFFSET	NA	
18" RULE		
CIRCUMFERENCE		
SURFACE APPEARANCE		
MESH OVERLAPS		

JJP 9/19/94

REMARKS: Attached final tie wires to all configurations. Assembly now ready for testing after 30 day cure (i.e. Oct 16, 1994). Some touch-up trowel applied to JB assembly.

Certifications of Calibration and Conformance

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97332-38
RECEIVED FROM PMC
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1416 - 11960
DATE RECEIVED 8-16-94
DATE INSPECTED 8-16-94
INSPECTED BY: CBatton

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	
TC Plug	11400	200	200	0	T-1 Plug	Y	Y	Good	None	X			
TC Jack	11400	200	200	0	T-2 Jack	Y	Y	Good	None	X			

FORM
1/29/93

100

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Janice Welch
PMC Corporation
57 Harvey Road

Londonderry NH 03053

PO Number: 1140-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Cleda Patton Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/15/94	UPS Red Label		8-16-94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	T-1 Plug	100		
2.	T-2 Jack	100		

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 8-15-94

Special Instructions

Shipment Must Include Certificate of Conformance on Materials.

Ordered By: Cleda Patton

Project #: TSI/TVA AMPACITY

Total	
Shipping	
Tax	
Invoice Total	

PMC CORPORATION
1170 N. GILBERT STREET, ANAHEIM, CA. 92801 • FAX (800) 753-5595 • PHONE (714) 563-0332

SPECIALIZING IN WIRE, CABLE & TEMPERATURE SENSORS

SOLD TO

OMEGA POINT LABS
16015 SHADY FALLS RD.
ELMENDORF, TX 78112

SHIP TO

OMEGA POINT LABS
16015 SHADY FALLS RD.
ELMENDORF, TX 78112
ATTN: CLETA

DATE RECEIVED	CUSTOMER NO.	PMC JOB NO.
8-15-94		TC-6229

REQUESTED SHIP	CUSTOMER P.O. NUMBER	SHIP VIA	TERMS
8-15-94	11400	UPS/RED	NET 15

ITEM	QUANTITY ORDERED	PART NUMBER / DESCRIPTION	QTY. BACK ORDERED	QTY. SHIPPED
1	100	T-1 PLUG	0	100
2	100	T-2 JACK	0	100

SPECIAL INSTRUCTIONS:

2850

DATE SHIPPED	BILL OF LADING NO.	NO. OF PACKAGES	WEIGHT	PPD	COL.	PARTIAL	COMPLETE	PACKED BY
8-15-94	UPS	1	9#	X			X	GP

White - Anaheim Office • Goldenrod - New Hampshire Office • Canary - Packing Slip 22

PMC

CERTIFICATE OF CONFORMANCE

TO Omega Point Labs
16015 Shady Falls Rd.
Elmendorf, TX 78112

DATE 8-15-94
CUSTOMER PO# 1140Q
JOB # TC-6229

PMC P/N	QUANTITY	CUSTOMER P/N	SPEC
T-1 (Plug)	100		
T-2 (Jack)	100		

ADDITIONAL INFORMATION (IF REQUIRED):

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.

Shayne Dickson 8/15/94
Quality Assurance Inspector

Manny Moreno
Quality Assurance Manager

1170 N. GILBERT STREET
ANAHEIM, CA.
92801
(714) 563-0332
FAX (800) 753-5595

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185-87; 97257-260
RECEIVED FROM PMC
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1417 - 11960
DATE RECEIVED 8-22-94
DATE INSPECTED 8-22-94
INSPECTED BY: CBatton

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	
TC Wire	11230	40K	37K	0	KK-TA/TA-24	Y	Y	Good	None	X			LOT#'s: 105966-972; 106460; 106837-839
													Order is considered complete within 10% of original amount CH

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

205

Vendor:

Janice Welch
PMC Corporation
57 Harvey Road

Londonderry NH 03053

PO Number: 1123-Q

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Constance A. Humphrey
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
6/28/94	UPS Blue Label	MS-1123Q-97185	7-11-94	30

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Teflon Coated Thermocouple Wire KK-TA/TA-24	40,000		
2.	Calibration data	1		

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Humphrey
Date 6/28/94

Special Instructions

Include Certificates of Conformance to ASTM E230-93 Special Limits of Error and Calibration data required to 200°F, 400°F, 600°F, 800°F and 1000°F traceable to NIST

Ordered By: Constance A. Humphrey

Project #: ~~OPL Equipment~~ CH
TVA/TSI
Proj # 97185

Total	
Shipping	
Tax	
Invoice Total	

Recd 8/22/94 12,550ft
8/23/94 6,175ft.
Recd 9/8/94 5,000ft
9/20/94 13,856

705

OMEGA POINT LABORATORIES
MATERIAL PURCHASING SPECIFICATIONS

SPECIFICATION NUMBER: MS--1123Q-97185

VENDOR: PMC

VENDOR PRODUCT NUMBER: KK-TA/TA-24

PRODUCT DESCRIPTION: Teflon Coated Thermocouple Wire

Material as defined above shall be provided in accordance with the Critical Characteristics as listed below:

TEST	DESCRIPTION	SPECIFICATION RANGES MINIMUM	MAXIMUM
ASTM E230-93	Std. Temperature-EMF Tables for Standardized Thermocouples	Temp. Range +32°F to +545°F Special Limits of Error ±2°F	

QUALITY ASSURANCE REQUIREMENTS

1.0 QUALITY PROGRAM

Seller shall furnish this item in accordance with Quality Program approved by Omega Point Laboratories. Material specified herein is to be produced and tested in accordance with vendor quality standards, methods, guidelines and manufacturing instructions as defined in that Quality Program.

2.0 QUALITY VERIFICATION

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

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

3.0 CERTIFICATIONS

3.1 Certification that supplied materials comply with this material specification and listing Critical Characteristics shall be provided. This certificates shall reference Omega Point Labs purchase order number and specification number for all material furnished under this specification. This Certification shall be signed by the appropriate vendor representative.

3.2 The material furnished under this specification shall be a product that complies with the following:

3.2.1 Has been tested and passed all tests specified herein.

3.2.2 Manufacturing methods for this material have not changed. Vendor will advise Omega Point in writing of any changes in the manufacturing prior to material manufacture.

3.2.3 Raw materials used in the manufacture of this material meet Vendor specifications.

4.0 AUDITS/RIGHTS OF ACCESS

Omega Point Labs reserves the right to audit your facility to verify compliance with the purchase order and specification requirements with a minimum ten (10) day notice.

5.0 IDENTIFICATION

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

6.0 PACKING/SHIPPING

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

All materials shall be suitably crated, boxed or otherwise prepared for shipment to prevent damage during handling and shipping.

QUALITY ASSURANCE APPROVAL

C Humphrey

Title Quality Assurance Mgr.

Date 6/28/94

CH

AVL Verification

Class: B

OMEGA POINT LABORATORIES

708

OMEGA POINT LABORATORIES
COMMERCIAL GRADE DEDICATION

PURCHASING SPEC. NO: MS-1123Q-97185

PRODUCT: Thermocouple Wire

MANUFACTURER: PMC Corporation
57 Harvey Road
Londonderry, NH 03053

SUPPLIER: (same)
ADDRESS:
CITY:
STATE/ZIP:
PHONE: (603) 432-9473

TECHNICAL EVALUATION

DESCRIPTION: Teflon Coated Thermocouple Wire

DOES IT PERFORM SAFETY FUNCTION? YES:

Material testing and equipment calibration

DOES ITEM MEET CRITERIA OF CGI DEFINITION? Yes

Item meets all three criteria of CGI listed below:

a) not subject to design or specification requirements that are unique to nuclear facilities; and

b) used in applications other than nuclear facilities; and

c) is ordered from manufacturer or supplier on the basis of specifications set forth in the manufacturers published product description.

TECHNICAL EVALUATION PERFORMED BY:

Project Manager
Date 6/28/94

VERIFIED BY:

C Humphrey
Q/A Manager
Date 6/28/94

PRODUCT: Teflon Coated Thermocouple Wire

SPEC NO: KK-TA/TA-24

IDENTIFICATION OF CRITICAL CHARACTERISTICS:

TEST	DESCRIPTION	SPECIFICATION RANGES MINIMUM	MAXIMUM
ASTM E230-93	Std. Temperature-EMF Tables for Standardized Thermocouples	Temp. Range +32°F to +545°F Special Limits of Error ±2°F	

IDENTIFICATION OF CRITICAL CHARACTERISTICS PERFORMED BY:

PROJECT MANAGER
DATE 6/28/94

VERIFIED BY:

C. Humphrey
Q/A MANAGER
DATE 6/28/94

PRODUCT: KK-TA/TA-24 Thermocouple Wire

SPEC NO: MS-11230-97185

ACCEPTANCE METHOD:

METHOD

Source Verification

Performance Record

Purchase order to vendor includes the Omega Point Material Specification listing critical characteristics of CGI material.

All shipments to include appropriate Certification documents listing all critical characteristics.

Material receiving shall include verification of Compliance Report with prescribed critical characteristics. Copies of Compliance Report and verification to be attached to the receiving report.

ACCEPTANCE METHOD DETERMINATION BY:

C Humphrey

DATE: 6/28/94

PFA Insulated Thermocouple Wire

PRODUCT CODE: TA/TA

Our customers have grown to expect only the highest quality products from PMC. We are continuously committed to meet the specific needs of industry and our customers. This construction includes Teflon* PFA insulataion extruded on the single conductors which are then laid parallel and jacketed with Teflon PFA.

Teflon PFA (perfluoroalkoxy) was released in 1972 by Dupont. It possesses similar properties of the other Teflon products such as outstanding electrical characteristics, resistance to virtually all chemicals and excellent flame resistance.

PFA is a true thermoplastic material extrudable by conventional means, and available in long continuous lengths. This construction provides flexibility and toughness with stress crack resistance, resistance to weather, non-aging characterisics, and low coefficient of friction for ease of pulling through conduit.

Like TFE, suggested upper continuous temperature is 500°F (260°C), however, it does not have TFE's solder iron resistance.

The thermocouple grade products shown are used to form temperature sensors and the extension grade products become the interconnecting link in the temperature sensing system.

You will find our qualified sales and engineering staff eager to assist in selecting a design to meet the requirements of your specific application. Variations of this construction are available upon request, including aluminum Mylar* to reduce noise problems found in so many of today's plants.

Typical applications include aircraft and automotive engine testing, rapid transit cables, and down hole cable in the oil industry.

*Registered trademark of E.I. DuPont Inc.

Calibrated conductors for high system accuracy

500°F (260°C) PFA insulation for improved electrical properties and high temperature applications

500°F (260°C) PFA jacket for chemical inertness to solvents, acids and oils

GRADE OF WIRE	GAUGE SIZE	WIRE TYPE	PART NUMBERS				
			TYPE J	TYPE K	TYPE T	TYPE E	TYPE N
THERMOCOUPLE	20	SOLID	J-TA/TA-20	K-TA/TA-20	T-TA/TA-20	E-TA/TA-20	N-TA/TA-20
THERMOCOUPLE	24	SOLID	J-TA/TA-24	K-TA/TA-24	T-TA/TA-24	E-TA/TA-24	N-TA/TA-24
THERMOCOUPLE	30	SOLID	J-TA/TA-30	K-TA/TA-30	T-TA/TA-30	E-TA/TA-30	N-TA/TA-30

The above part numbers represent the more popular constructions. However, other designs are available upon request.

PMC CORPORATION
57 Harvey Road
Londonderry, NH
03053

Tel. (603) 432-9473
FAX (603) 432-0435

Color code & initial calibration tolerances for thermocouple wire

THERMOCOUPLE TYPE		COLOR CODE		INITIAL CALIBRATION TOLERANCES		
WIRE ALLOYS	ANSI SYMBOL	+/- INDIVIDUAL	JACKET	TEMPERATURE RANGE	STANDARD LIMITS	SPECIAL LIMITS
*Iron (+) vs. Constantan™ (-)	J	WHITE/RED	BROWN	+32°F (0°C) to +545°F (+285°C) +545°F (+285°C) to +1400°F (+750°C)	±4°F (2.2°C) ±.75%	±2°F (1.1°C) ±.4%
Chromel™ (+) vs. *Alumel™ (-)	K	YELLOW/RED	BROWN	-330°F (-200°C) to -165°F (-110°C) -165°F (-110°C) to +32°F (0°C) +32°F (0°C) to +545°F (+285°C) ~~+545°F (+285°C) to +2300°F (+1250°C)~~	±2% ±4°F (2.2°C) ±4°F (2.2°C) ±.75%	±2°F (1.1°C) ~~±.4%~~
Copper (+) vs. Constantan™ (-)	T	BLUE/RED	BROWN	-330°F (-200°C) to -85°F (-65°C) -85°F (-65°C) to +270°F (+130°C) +270°F (+130°C) to +660°F (+350°C)	±1.5% ±1.8°F (1°C) ±.75%	±.8% ±.9°F (.5°C) ±.4%
Chromel ™ (+) vs. Constantan ™ (-)	E	PURPLE/RED	BROWN	-330°F (-200°C) to -270°F (-170°C) -270°F (-170°C) to +480°F (+250°C) +480°F (+250°C) to +640°F (+340°C) +640°F (+340°C) to +1600°F (+900°C)	±1% ±3°F (1.7°C) ±3°F (1.7°C) ±.5%	±1.8°F (1°C) ±1.8°F (1°C) ±.4% ±.4%
Nicrosil™ (+) vs. Nisil™ (-)	N	ORANGE/RED	BROWN	+32°F (0°C) to +545°F (+285°C) +545°F (+285°C) to +2300°F (+1250°C)	±4°F (2.2°C) ±.75%	±2°F (1.1°C) ±.4%

Color code and initial calibration tolerances for extension wire

*Iron vs. Constantan™	JX	WHITE/RED	BLACK	+32°F (0°C) to +400°F (+200°C)	±4°F (2.2°C)	±2°F (1.1°C)
Chromel™ vs. *Alumel™	KX	YELLOW/RED	YELLOW	+32°F (0°C) to +400°F (+200°C)	±4°F (2.2°C)	±2°F (1.1°C)
Copper vs. Constantan™	TX	BLUE/RED	BLUE	-75°F (-60°C) to +210°F (+100°C)	±2°F (1.1° C)	±1°F (.5°C)
Chromel™ vs. Constantan™	EX	PURPLE/RED	PURPLE	+32°F (0°C) to +400°F (+200°C)	±3°F (1.7°C)	±2°F (1.1°C)
Nicrosil™ vs. Nisil™	NX	ORANGE/RED	ORANGE	+32°F (0°C) to +400°F (+200°C)	±4°F (2.2°C)	±2°F (1.1°C)
Copper vs. Copper Alloy	SX RX	BLACK/RED	GREEN	+75°F (+25°C) to +400°F (+200°C)	±12°F (7°C)	

* Magnetic
™Trade Mark, Hoskins Mfg. Co.

NOTE – Percent limits apply directly to temperatures in °C units, but for °F equivalents are applied to the numbers of °F above or below the ice point (+32°F). (i.e., Limit (°F) = (Temp. °F – 32°F) X Percentage)

Thermocouple wire cannot be expected to meet the limits of error at temperatures below the ice point unless specified at time of purchase.

TA/TA physical properties

INSULATION CHARACTERISTICS	INSULATION	JACKET
SPECIFIC GRAVITY	2.15	2.15
DUROMETER HARDNESS	55	55
TENSILE STRENGTH p.s.i. (min.)	4000 p.s.i.	4000 p.s.i.
ELONGATION %(min.)	300%	300%
MINIMUM BEND RADIUS	5 X O.D.	10 X O.D.
ABRASION RESISTANCE	VERY GOOD	VERY GOOD
CUT THROUGH RESISTANCE	GOOD	GOOD
MOISTURE RESISTANCE	EXCELLENT	EXCELLENT
SOLDER IRON RESISTANCE	VERY GOOD	VERY GOOD
SERVICE TEMPERATURE	500°F(260°C) CONTINUOUS 550°F(288°C) SINGLE EXPOSURE	500°F(260°C) CONTINUOUS 550°F(288°C) SINGLE EXPOSURE
FLAME TEST	NON-FLAMMABLE	NON-FLAMMABLE

GAUGE SIZE	NOMINAL INSULATION WALL(INCHES)	NOMINAL JACKET WALL(INCHES)	NOMINAL DIAMETER (INCHES)	APPROX. SHIP. WEIGHT LBS. PER 1000 FT
20	.008	.010	.068 X .116	12
24	.008	.010	.056 X .092	7
30	.004	.006	.030 X .048	2

PRICING POLICY > Shipments will be invoiced at PMC's prices in effect at time of shipment. Quotations are given with an escalation clause and prices, terms, and conditions are subject to change without prior notice. PMC will, however, make every attempt to hold to current quoted prices. All prices quoted are in United States currency, and shall be subject to correction for errors. Unless otherwise stated in writing to PMC.

EELS, SPOOLS & COILS > All shipments, unless specified otherwise by PMC, are made on non-returnable reels, spools or coils in one continuous length.

H AGES & RETURNS > All claims for shortage or incorrect material must be made within 10 days after receipt of the goods to which such claim pertains. Goods may only be returned for credit within 1 month of the date of authorization. Goods that are special in any way shall not be returned to PMC. Material returned for any reason, without written authorization will be refused and returned at shipper's expense. A return request must be processed through our Londonderry, N.H. sales office.

TOLERANCES > Due to allowances in manufacturing processes for wire, cable and similar products, PMC reserves the right to ship a variation of ±10% from the quantity of such goods ordered. Physical tolerances shown are nominal. Shipping weights are an average of all types of conductors and are listed for estimating only. These weights can vary substantially due to different types of spools, reels and/or conductors.

713

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

SOLD TO

OMEGA POINT LABS. INC.
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

SHIP TO

OMEGA POINT LABS. IN
16015 SHADY FALLS RD
ELMENDORF, TX 781

78238

DATE RECEIVED	CUSTOMER NO.	E	O	T	PMC JOB NO.
7/27/94	OMEG001	60	60	60	10734

CUSTOMER P.O. NUMBER	REQUESTED SHIP	SCHEDULED SHIP	CODE
11330			1. MFT 5. METERS 2. CFT 6. FEET 3. POUNDS 7. LOT 4. EACH NET 8. OTHER

SHIP VIA	F.O.B.	TERMS
UPS BLUE	LONDONDERRY, NH	

ITEM	QUANTITY ORDERED	PART NUMBER / DESCRIPTION	QUANTITY SHIPPED
1	20000.00	KK-TQ/TQ-24 REF. MS11230-97185 SCHED. SHIP 8.5/94	18,705'
2	20000.00	KK-TQ/TQ-24 REF. MS11230-97185 SCHED SHIP 8/31/94	
3	1.00	CALIBRATION AT 200, 400, 600, 800 AND 1000°F (7) CAL DATA REQUIRED	

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:

UPS SDA

DATE SHIPPED	BILL OF LADING NO.	NO. OF PACKAGES	WEIGHT	PPD	COL.	PARTIAL	COMPLETE	PACKED BY
8/16/94	—	4	129#	✓		✓		

PACKING SLIP

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

SOLD TO
OMEGA POINT LABS, INC.
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

78238

SHIP TO
OMEGA POINT LABS, INC
16015 SHADY FALLS ROA
ELMENDORF, TX 781

DATE RECEIVED	CUSTOMER NO.	E	O	T	PMC JOB NO.
7/27/94	OMEG001	00	00	00	18704

CUSTOMER P.O. NUMBER	REQUESTED SHIP	SCHEDULED SHIP
11130		

SHIP VIA	F.O.B.	TERMS
UPS BLUE	LONDONDERRY, NH	NET 10

CODE
1. MFT 5. METERS
2. CFT 6. FEET
3. POUNDS 7. LOT
4. EACH NET 8. OTHER

ITEM	QUANTITY ORDERED	PART NUMBER / DESCRIPTION	QUANTITY SHIPPED
2	20000.00	KK-TA-T4-24 REF. MC11130-97135 SCHED. SHIP 8/31/94	5000
3	1.00	CALIBRATION AT 200, 400, 600, 800 AND 1000°F I/C CAL DATA REQUIRED	

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

SPECIAL INSTRUCTIONS: UPS Blue

DATE SHIPPED	BILL OF LADING NO.	NO. OF PACKAGES	WEIGHT	PPD	COL.	PARTIAL	COMPLETE	PACKED BY
8-21-94		1	34	✓		✓		

PACKING SLIP

715

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

SOLD TO

OMEGA POINT LABS, INC.
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

SHIP TO

OMEGA POINT LABS, Inc
16015 SHADY FALLS RD.
ELMENDORF, TX 7811

78238

DATE RECEIVED	CUSTOMER NO.	E	O	T	PMC JOB NO.
7/27/94	OMEG001	60	50	MO	10774

CUSTOMER P.O. NUMBER	REQUESTED SHIP	SCHEDULED SHIP	CODE
11231			1. MFT 5. METERS 2. CFT 6. FEET 3. POUNDS 7. LOT 4. EACH NET 8. OTHER

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

ITEM	QUANTITY ORDERED	PART NUMBER / DESCRIPTION	QUANTITY SHIPPED
	15000.00	KK-TA. TP-24 REF. MS11230-97135	13856
3	1.00	CALIBRATION AT 300, 400, 500, 800 AND 1000 DEG F CAL DATA REQUIRED	1

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:

UPS Blue

DATE SHIPPED	BILL OF LADING NO.	NO. OF PACKAGES	WEIGHT	PPD	COL.	PARTIAL	COMPLETE	PACKED BY
7/29/94	—	2	93	✓			✓	

PACKING SLIP

PMC

CERTIFICATE OF CONFORMANCE

TO OMEGA POINT LABS INC.
16015 SHADY FALLS RD.
ELMENDORF, TX 78112

DATE 8/15/94
CUSTOMER PO# 11230
JOB # 18794

PMC P/N	QUANTITY	CUSTOMER P/N	SPEC
KK-TA/TA-24	18,705'		MS11230-97185

THE FOLLOWING WIRE SPOOLS HAVE BEEN MANUFACTURED FROM BARE WIRE SPOOL #105966, REEL NOS. 20752, 20753; SPOOL NOS. 105967, 105968, 105969, 105970, 105971 AND 105972, REEL NOS. 18242, 17623.

ADDITIONAL INFORMATION (IF REQUIRED):

SPOOL NO.	IN ERROR 200°F	IN ERROR 400°F	IN ERROR 600°F	IN ERROR 800°F	IN ERROR 1000°F
105966 - INSIDE	-0.5	+0.4	-1.9	-2.2	-0.8
105966 - OUTSIDE	+0.1	+1.1	-1.0	-1.1	+0.4
105967 - INSIDE	-0.2	0	-2.2	-2.0	+0.4
105968					
105969					
105970					
105971					
105972 - OUTSIDE	+0.1	+0.7	-1.2	-0.9	+1.4

ALL SPOOLS ARE TAKEN FROM LARGE MASTER SPOOLS IN ROTATION. CALIBRATION SHOWS BEGINNING OF FIRST SPOOL AND END OF LAST SPOOL.
CALIBRATION RESULTS ARE TRACEABLE TO NIST AND MEET SPECIAL LIMITS OF ERROR AS DEFINED IN ASTM-E-230 AND COMPLY TO MIL STD. 45662.

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

PMC

CERTIFICATE OF CONFORMANCE

TO OMEGA POINT LABS INC. DATE 8/31/94

16015 SHADY FALLS ROAD CUSTOMER PO# 11230

ELMENDORF, TX 78112 JOB # 18794-2

PMC P/N	QUANTITY	CUSTOMER P/N	SPEC
KK-TA/TA-24	5000'		MS-1123Q-97185

THE FOLLOWING WIRE SPOOL HAS BEEN MANUFACTURED FROM BARE WIRE REEL NOS. (POS.) 18554 AND (NEG.) 18555

ADDITIONAL INFORMATION (IF REQUIRED):

SPOOL NO.	IN ERROR 200°	IN ERROR 400°	IN ERROR 600°	IN ERROR 800°	IN ERROR 1000°
106460 - INSIDE	+1.0	-0.1	-2.1	-2.2	+0.2
106460 - OUTSIDE	+1.0	-0.2	-2.0	-2.0	+0.3

CALIBRATION SHOWS THE BEGINNING AND END ON SPOOL 106460.

CALIBRATION RESULTS ARE TRACEABLE TO NIST AND MEET SPECIAL LIMITS OF ERROR AS DEFINED IN ASTM-E-230 AND COMPLY TO MIL STD 45662.

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.

John Robinson
Quality Assurance Inspector

Quality Assurance Manager

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

PMC

CERTIFICATE OF CONFORMANCE

TO OMEGA POINT LABS
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

DATE 9/15/94
CUSTOMER PO# 11230
JOB # 18794-2

PMC P/N	QUANTITY	CUSTOMER P/N	SPEC
KK-TA/TA-24	13,856'		MS11230-97185

THE FOLLOWING WIRE SPOOLS 106837, 106838 AND 106839 HAVE BEEN MANUFACTURED FROM BARE WIRE REELS 18554 (POSITIVE) AND 18555 (NEGATIVE).

ADDITIONAL INFORMATION (IF REQUIRED):

SPOOL NOS.	IN ERROR 200°F	IN ERROR 400°F	IN ERROR 600°F	IN ERROR 800°F	IN ERROR 1000°F
106837	+0.3	-0.5	-2.4	-2.3	-0.1
106838					
106839	+0.1	-0.4	-2.3	-1.9	-0.4

ALL SPOOLS ARE TAKEN FROM LARGE MASTER SPOOLS IN ROTATION. CALIBRATION SHOWS THE BEGINNING OF FIRST SPOOL AND END OF LAST SPOOL. CALIBRATION RESULTS ARE TRACEABLE TO NIST AND MEET SPECIAL LIMITS OF ERROR AS DEFINED IN ASTM-E-230 AND COMPLY TO MIL STD-45662.

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.

John Robinson
Quality Assurance Inspector

Quality Assurance Manager

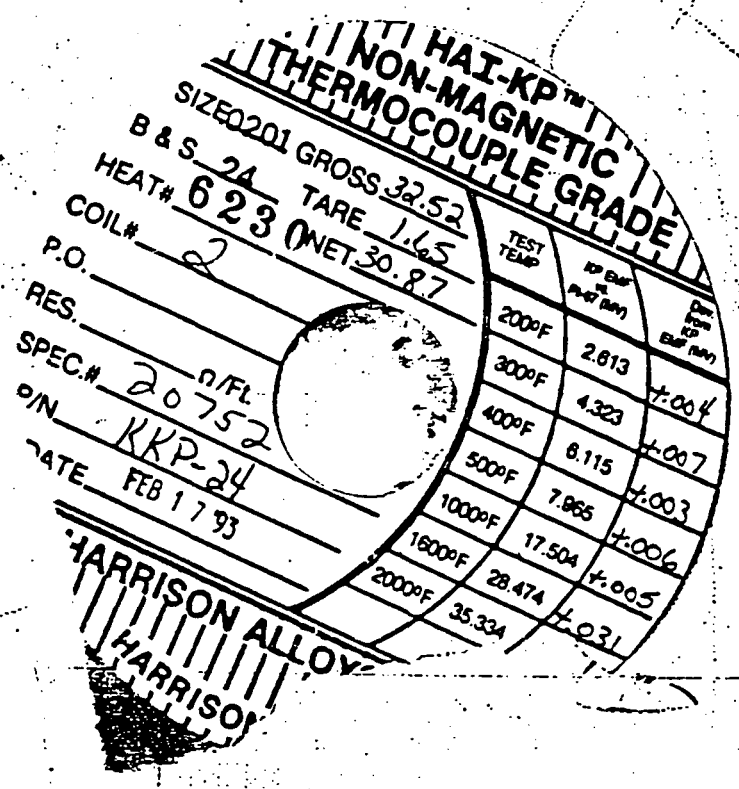
57 HARVEY ROAD
LONDONDERRY, NH
03053
(603) 432-WIRE
FAX (603) 432-0435

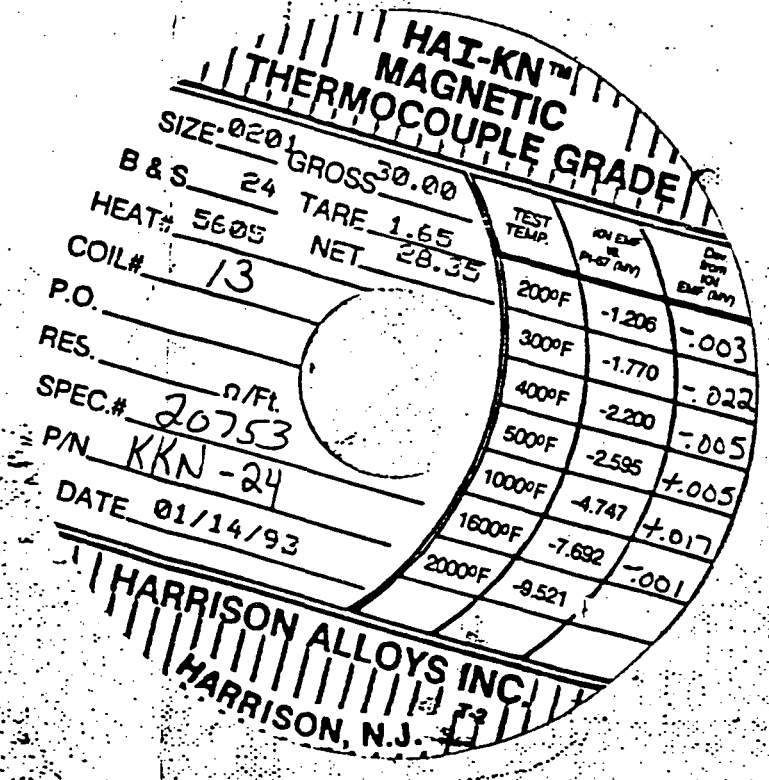
good KK material to Special Limitson

Wire used for Spool 105-946.

Run # 6518

1-13-94

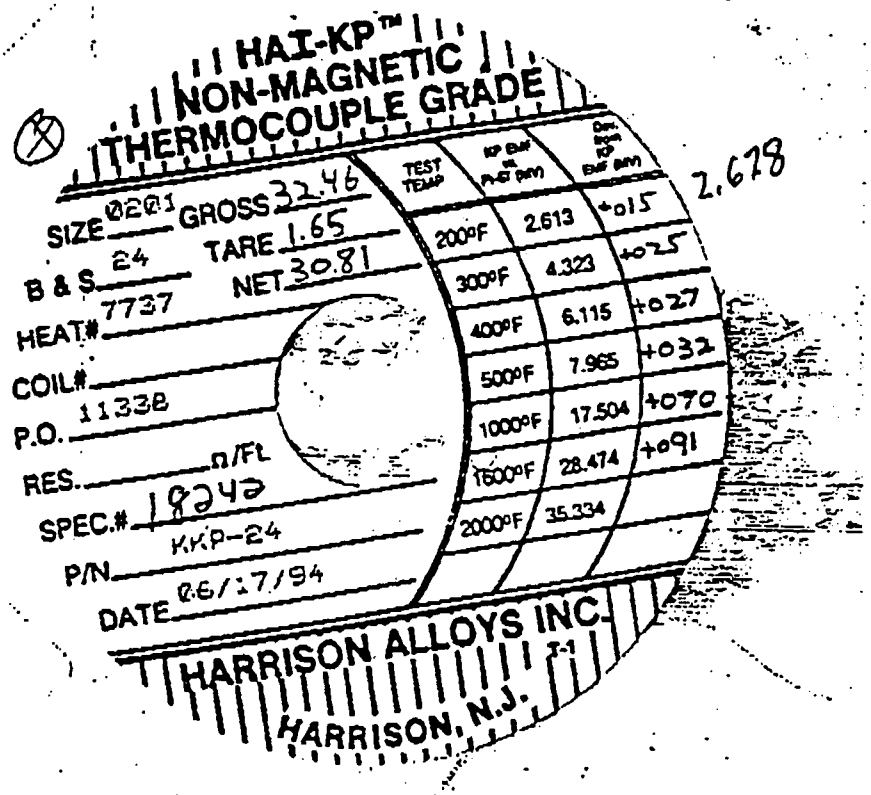




720

Bare Wire Reel # 18242 used on Spool #s

105-967, 105-968, 105-969, 105-970, 105-971 & 105-972



2.678

Bare Wire Rel# 17623 Used
on Spool#'s 105-967, 105-968, 105-969
105-970, 105-971 & 105-972

HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE

SIZE .0201 GROSS 33.31
B & S 24 TARE 1.65
HEAT# 5605 NET 31.66
COIL# 14
P.O.
RES. Ω/Ft.
SPEC.# 17623
P/N KKN-24
DATE 01/14/93

TEST TEMP.	KN EMF vs. Pt-67 (MV)	Deviation from KN EMF (MV)
200°F	-1.206	-.003
300°F	-1.770	-.015
400°F	-2.200	+.002
500°F	-2.595	+.014
1000°F	-4.747	+.018
1600°F	-7.692	-.008
2000°F	-9.521	

HARRISON ALLOYS INC.
HARRISON, N.J.

These Two Reels were used in The Manufacture of Spool # 106460

T.C.

HAI-KP™
NON-MAGNETIC
THERMOCOUPLE GRADE

SIZE .020 GROSS 32.64
B & S 24 TARE 1.65
HEAT# 6748 NET 30.99
COIL# 6
P.O. P11338REPL
RES. Ω/Ft.
SPEC.# 18554
P/N KKP-24
DATE 07/27/94

TEST TEMP	KP EMF vs Pt-67 (MV)	Dev. from KP EMF (MV)
200°F	2.613	-.001
300°F	4.323	-.003
400°F	6.115	-.005
500°F	7.965	-.013
1000°F	17.504	-.026
1600°F	28.474	-.002
2000°F	35.334	-.125

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

HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE

SIZE .020 GROSS 31.64
B & S 24 TARE 1.65
HEAT# 2975 NET 29.99
COIL# 2
P.O. P11338 REPL
RES. Ω/Ft.
SPEC.# 18555
P/N KKN-24
DATE 05/15/94

TEST TEMP.	KN EMF vs Pt-67 (MV)	Dev. from KN EMF (MV)
200°F	-1.206	-.003
300°F	-1.770	-.013
400°F	-2.200	-.062
500°F	-2.595	+.002
1000°F	-4.747	-.036
1600°F	-7.692	-.101
2000°F	-9.521	-.180

HARRISON ALLOYS INC.
HARRISON, N.J.
T-3

HAI-KP™
NON-MAGNETIC
THERMOCOUPLE GRADE

SIZE .020 GROSS 32.64
B & S 24 TARE 1.65
HEAT# 6748 NET 30.99
COIL# 6
P.O. P11338REPL
RES. _____ Ω/Ft.
SPEC.# 18554
P/N KKP-24
DATE 07/27/94

TEST TEMP	KP EMF vs Pt-67 (MV)	Dev. from KP EMF (MV)
200°F	2.613	-.001
300°F	4.323	-.003
400°F	6.115	-.005
500°F	7.965	-.013
1000°F	17.504	-.026
1600°F	28.474	-.002
2000°F	35.334	-.125

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

HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE

SIZE .020 GROSS 31.64
B & S 24 TARE 1.65
HEAT# 2975 NET 29.99
COIL# 2
P.O. P11338 REPL
RES. _____ Ω/Ft.
SPEC.# 18555
P/N KKN-24
DATE 05/15/94

TEST TEMP.	KN EMF vs Pt-67 (MV)	Dev. from KN EMF (MV)
200°F	-1.206	-.003
300°F	-1.770	-.013
400°F	-2.200	-.062
500°F	-2.595	+.002
1000°F	-4.747	-.036
1600°F	-7.692	-.101
2000°F	-9.521	-.180

HARRISON ALLOYS INC.
HARRISON, N.J.
T-3

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97257-97260
RECEIVED FROM PMC
PROJECT LOCATION Omega Point Labs

REPORT NUMBER A35-11960
DATE RECEIVED 9-7-94
DATE INSPECTED 9-8-94
INSPECTED BY: J Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
TeWire	1139Q	12K	12K	0	KK-TA/TA-24	Y	Y	Good	None	X			Spool #'s 106461 - inside, 106462 and 106463 - outside.

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Janice Welch
PMC Corporation
57 Harvey Road

Londonderry NH 03053

PO Number: 1139-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Cleda Patton Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/5/94	UPS Ground	MS-1139Q-11960	8/26/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	KK-TA/TA-24	12,000		
2.	Calibration Data	1		

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 8-5-94

Special Instructions

Include Certificates of Conformance to ASTM E230-93 Special Limits of Error and Calibration data required to 200°F, 400°F, 600°F, 800°F and 1000°F traceable to NIST

Ordered By: Cleda Patton

Project #: 11960

Total	
Shipping	
Tax	
Invoice Total	

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

SOLD TO

OMEGA POINT LABS, INC.
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

78208

SHIP TO

OMEGA POINT LABS, I[illegible]
16015 SHADY FALLS [illegible]
ELMENDORF, TX 78[illegible]

DATE RECEIVED	CUSTOMER NO.	E	O	T	PMC JOB NO.
8/11/94	OME3001	60	30	20	[illegible]

CUSTOMER P.O. NUMBER	REQUESTED SHIP	SCHEDULED SHIP
11390	8/31/94	8/31/94

SHIP VIA	F.O.B.	TERMS
UPS	LONDONDERRY NH	NET 30

CODE
1. MFT 5. METERS
2. CFT 6. FEET
3. POUNDS 7. LOT
4. EACH NET 8. OTHER

ITEM	QUANTITY ORDERED	PART NUMBER / DESCRIPTION	QUANTITY SHIPPED
1	12000.00	KK-18.TA-24 REF. MS11390-11960	12285
2	1.00	CALIBRATION AT 200, 400, 600, 800 AND 1000°F T/C CAL DATA REQUIRED	1

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
8-31-94	—	2	83	✓			✓	

PACKING SLIP

PMC

CERTIFICATE OF CONFORMANCE

TO OMEGA POINT LABORATORIES INC.
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112-9784

DATE 8/31/94
CUSTOMER PO# 1139-O
JOB # 18959

PMC P/N	QUANTITY	CUSTOMER P/N	SPEC
KK-TA/TA-24	12,285'		MS-1139O-11960

ALL OF THE FOLLOWING WIRE SPOOLS HAVE BEEN MANUFACTURED FROM BARE WIRE REEL NOS. (POS.) 18578 AND (NEG.) 18579

ADDITIONAL INFORMATION (IF REQUIRED):

SPOOL NOS.	IN ERROR 200°	IN ERROR 400°	IN ERROR 600°	IN ERROR 800°	IN ERROR 1000°
106461 - INSIDE	+0.5	-0.2	-2.4	-2.6	-0.3
106462					
106463 - OUTSIDE	+0.6	-0.1	-2.1	-2.3	-0.1

ALL SPOOLS ARE TAKEN FROM LARGE MASTER SPOOLS IN ROTATION. CALIBRATION SHOWS BEGINNING OF FIRST SPOOL AND END OF LAST SPOOL.
CALIBRATION RESULTS ARE TRACEABLE TO NIST AND MEET SPECIAL LIMITS OF ERROR AS DEFINED IN ASTM-E-230 AND COMPLIES TO MIL STD 45662.

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.

John Robinson
Quality Assurance Inspector

Thomas M. Coffey
Quality Assurance Manager

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

These Two Rolls were used To Manufacture Job No. 18959

T.C.

good KK. Special Limits 8-16-94

HAI-KP™
NON-MAGNETIC
THERMOCOUPLE GRADE

SIZE Ø201 GROSS 31.78
B & S 24 TARE 1.65
HEAT# 2981 NET 30.13
COIL#
P.O. 11338
RES. n/FL
SPEC.# 18578
P/N KKP -24
DATE 08/09/94

TEST TEMP	EMF (mV)	DEV. (mV)
200°F	2.613	+002
300°F	4.323	+007
400°F	6.115	-002
500°F	7.985	-004
1000°F	17.508	-004
1600°F	28.474	+033
2000°F	35.334	

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

HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE

SIZE Ø201 GROSS 32.04
B & S 24 TARE 1.65
HEAT# 2879 NET 30.39
COIL# 1
P.O. 11338
RES. n/FL
SPEC.# 18579
P/N KKN-24
DATE 08/09/94

TEST TEMP.	EMF (mV)	DEV. (mV)
200°F	-1.206	-003
300°F	-1.770	-017
400°F	-2.200	-006
500°F	-2.595	-001
1000°F	-4.747	-016
1600°F	-7.692	-065
2000°F	-9.521	-141

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

OMEGA POINT LABORATORIES
COMMERCIAL GRADE DEDICATION

PURCHASING SPEC. NO: MS- 11392-11960

PRODUCT: Thermocouple Wire

MANUFACTURER: PMC Corporation
57 Harvey Road
Londonderry, NH 03053

SUPPLIER: (same)
ADDRESS:
CITY:
STATE/ZIP:
PHONE: (603) 432-9473

TECHNICAL EVALUATION

DESCRIPTION: Teflon Coated Thermocouple Wire

DOES IT PERFORM SAFETY FUNCTION? YES:
Material testing and equipment calibration

DOES ITEM MEET CRITERIA OF CGI DEFINITION? Yes

Item meets all three criteria of CGI listed below:

a) not subject to design or specification requirements that are unique to nuclear facilities; and

b) used in applications other than nuclear facilities; and

c) is ordered from manufacturer or supplier on the basis of specifications set forth in the manufacturers published product description.

TECHNICAL EVALUATION PERFORMED BY:

Project Manager
Date 8/5/94

VERIFIED BY:

C Humphrey
Q/A Manager
Date 8/5/94

PRODUCT: Teflon Coated Thermocouple Wire

SPEC NO: KK-TA/TA-24
MS-1139Q-11960

IDENTIFICATION OF CRITICAL CHARACTERISTICS:

TEST	DESCRIPTION	SPECIFICATION RANGES MINIMUM	MAXIMUM
ASTM E230-93	Std. Temperature-EMF Tables for Standardized Thermocouples	Temp. Range +32°F to +545°F Special Limits of Error ±2°F	

IDENTIFICATION OF CRITICAL CHARACTERISTICS PERFORMED BY:

PROJECT MANAGER
DATE 8/5/94

VERIFIED BY:

C Humphrey
Q/A MANAGER
DATE 8/5/94

PRODUCT: KK-TA/TA-24 Thermocouple Wire

SPEC NO: MS- 11390-11960

ACCEPTANCE METHOD:

METHOD

Source Verification

Performance Record

Purchase order to vendor includes the Omega Point Material Specification listing critical characteristics of CGI material.

All shipments to include appropriate Certification documents listing all critical characteristics.

Material receiving shall include verification of Compliance Report with prescribed critical characteristics. Copies of Compliance Report and verification to be attached to the receiving report.

ACCEPTANCE METHOD DETERMINATION BY:

C Humphrey

DATE: 8/5/94

OMEGA POINT LABORATORIES
MATERIAL PURCHASING SPECIFICATIONS

SPECIFICATION NUMBER: MS-11390-11960

VENDOR: PMC

VENDOR PRODUCT NUMBER: KK-TA/TA-24

PRODUCT DESCRIPTION: Teflon Coated Thermocouple Wire

Material as defined above shall be provided in accordance with the Critical Characteristics as listed below:

TEST	DESCRIPTION	SPECIFICATION RANGES MINIMUM	MAXIMUM
ASTM E230-93	Std. Temperature-EMF Tables for Standardized Thermocouples	Temp. Range +32°F to +545°F Special Limits of Error ±2°F	

QUALITY ASSURANCE REQUIREMENTS

1.0 QUALITY PROGRAM

Seller shall furnish this item in accordance with Quality Program approved by Omega Point Laboratories. Material specified herein is to be produced and tested in accordance with vendor quality standards, methods, guidelines and manufacturing instructions as defined in that Quality Program.

2.0 QUALITY VERIFICATION

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

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

3.0 CERTIFICATIONS

3.1 Certification that supplied materials comply with this material specification and listing Critical Characteristics shall be provided. This certificates shall reference Omega Point Labs purchase order number and specification number for all material furnished under this specification. This Certification shall be signed by the appropriate vendor representative.

3.2 The material furnished under this specification shall be a product that complies with the following:

3.2.1 Has been tested and passed all tests specified herein.

3.2.2 Manufacturing methods for this material have not changed. Vendor will advise Omega Point in writing of any changes in the manufacturing prior to material manufacture.

3.2.3 Raw materials used in the manufacture of this material meet Vendor specifications.

4.0 AUDITS/RIGHTS OF ACCESS

Omega Point Labs reserves the right to audit your facility to verify compliance with the purchase order and specification requirements with a minimum ten (10) day notice.

5.0 IDENTIFICATION

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

6.0 PACKING/SHIPPING

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

All materials shall be suitably crated, boxed or otherwise prepared for shipment to prevent damage during handling and shipping.

QUALITY ASSURANCE APPROVAL

C Humphrey

Title Quality Assurance Mgr.

Date 8/5/94

CH

AVL Verification

Class: B

OMEGA POINT LABORATORIES

PFA Insulated Thermocouple Wire

PRODUCT CODE: TA/TA

Our customers have grown to expect only the highest quality products from PMC. We are continuously committed to meet the specific needs of industry and our customers. This construction includes Teflon* PFA insulataion extruded on the single conductors which are then laid parallel and jacketed with Teflon PFA.

Teflon PFA (perfluoroalkoxy) was released in 1972 by Dupont. It possesses similar properties of the other Teflon products such as outstanding electrical characteristics, resistance to virtually all chemicals and excellent flame resistance.

PFA is a true thermoplastic material extrudable by conventional means, and available in long continuous lengths. This construction provides flexibility and toughness with stress crack resistance, resistance to weather, non-aging characterisics and low coefficient of friction for ease of pulling through conduit.

Like TFE, suggested upper continuous temperature is 500°F (260°C), however, it does not have TFE's solder iron resistance.

The thermocouple grade products shown are used to form temperature sensors and the extension grade products become the interconnecting link in the temperature sensing system.

You will find our qualified sales and engineering staff eager to assist in selecting a design to meet the requirements of your specific application. Variations of this construction are available upon request, including aluminum Mylar* to reduce noise problems found in so many of today's plants.

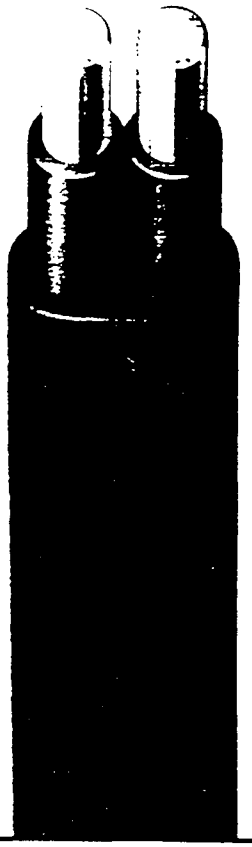
Typical applications include aircraft and automotive engine testing, rapid transit cables, and down hole cable in the oil industry.

*Registered trademark of E.I. DuPont Inc.

Calibrated conductors for high system accuracy

500°F (260°C) PFA insulation for improved electrical properties and high temperature applications

500°F (260°C) PFA jacket for chemical inertness to solvents, acids and oils



GRADE OF WIRE	GAUGE SIZE	WIRE TYPE	PART NUMBERS				
			TYPE J	TYPE K	TYPE T	TYPE E	TYPE N
THERMOCOUPLE	20	SOLID	J-TA/TA-20	K-TA/TA-20	T-TA/TA-20	E-TA/TA-20	N-TA/TA-20
THERMOCOUPLE	24	SOLID	J-TA/TA-24	K-TA/TA-24	T-TA/TA-24	E-TA/TA-24	N-TA/TA-24
THERMOCOUPLE	30	SOLID	J-TA/TA-30	K-TA/TA-30	T-TA/TA-30	E-TA/TA-30	N-TA/TA-30

The above part numbers represent the more popular constructions. However, other designs are available upon request.

PMC CORPORATION
57 Harvey Road
Londonderry, NH
03053

Tel. (603) 432-9473
FAX (603) 432-0435

Color code & initial calibration tolerances for thermocouple wire

THERMOCOUPLE TYPE		COLOR CODE		INITIAL CALIBRATION TOLERANCES		
WIRE ALLOYS	ANSI SYMBOL	+/- INDIVIDUAL	JACKET	TEMPERATURE RANGE	STANDARD LIMITS	SPECIAL LIMITS
*Iron (+) vs. Constantan™ (-)	J	WHITE/RED	BROWN	+32°F (0°C) to +545°F (+285°C) +545°F (+285°C) to +1400°F (+750°C)	±4°F (2.2°C) ±.75%	±2°F (1.1°C) ±.4%
Chromel™ (+) vs. *Alumel™ (-)	K	YELLOW/RED	BROWN	-330°F (-200°C) to -165°F (-110°C) -165°F (-110°C) to +32°F (0°C) +32°F (0°C) to +545°F (+285°C) +545°F (+285°C) to +2300°F (+1250°C)	±2% ±4°F (2.2°C) ±4°F (2.2°C) ±.75%	 ±2°F (1.1°C) ±.4%
Copper (+) vs. Constantan™ (-)	T	BLUE/RED	BROWN	-330°F (-200°C) to -85°F (-65°C) -85°F (-65°C) to +270°F (+130°C) +270°F (+130°C) to +660°F (+350°C)	±1.5% ±1.8°F (1°C) ±.75%	±.8% ±.9°F (.5°C) ±.4%
Chromel™ (+) vs. Constantan™ (-)	E	PURPLE/RED	BROWN	-330°F (-200°C) to -270°F (-170°C) -270°F (-170°C) to +480°F (+250°C) +480°F (+250°C) to +640°F (+340°C) +640°F (+340°C) to +1600°F (+900°C)	±1% ±3°F (1.7°C) ±3°F (1.7°C) ±.5%	±1.8°F (1°C) ±1.8°F (1°C) ±.4% ±.4%
Nicrosil™ (+) vs. Nisil™ (-)	N	ORANGE/RED	BROWN	+32°F (0°C) to +545°F (+285°C) +545°F (+285°C) to +2300°F (+1250°C)	±4°F (2.2°C) ±.75%	±2°F(1.1°C) ±.4%

Color code and initial calibration tolerances for extension wire

*Iron vs. Constantan™	JX	WHITE/RED	BLACK	+32°F (0°C) to +400°F (+200°C)	±4°F (2.2°C)	±2°F (1.1°C)
Chromel™ vs. *Alumel™	KX	YELLOW/RED	YELLOW	+32°F (0°C) to +400°F (+200°C)	±4°F (2.2°C)	±2°F (1.1°C)
Copper vs. Constantan™	TX	BLUE/RED	BLUE	-75°F (-60°C) to +210°F (+100°C)	±2°F (1.1° C)	±1°F (.5°C)
Chromel™ vs. Constantan™	EX	PURPLE/RED	PURPLE	+32°F (0°C) to +400°F (+200°C)	±3°F (1.7°C)	±2°F (1.1°C)
Nicrosil™ vs. Nisil™	NX	ORANGE/RED	ORANGE	+32°F (0°C) to +400°F (+200°C)	±4°F (2.2°C)	±2°F (1.1°C)
Copper vs. Copper Alloy	SX RX	BLACK/RED	GREEN	+75°F (+25°C) to +400°F (+200°C)	±12°F (7°C)	

* Magnetic
™Trade Mark, Hoskins Mfg. Co.

NOTE – *Percent limits* apply directly to temperatures in °C units, but for °F equivalents are applied to the numbers of °F above or below the ice point (+32°F).
I.e., Limit (°F) = (Temp. °F – 32°F) X Percentage)

Thermocouple wire cannot be expected to meet the limits of error at temperatures below the ice point unless specified at time of purchase.

TA/TA physical properties

INSULATION CHARACTERISTICS	INSULATION	JACKET
SPECIFIC GRAVITY	2.15	2.15
DUROMETER HARDNESS	55	55
TENSILE STRENGTH p.s.i. (min.)	4000 p.s.i.	4000 p.s.i.
ELONGATION %(min.)	300%	300%
MINIMUM BEND RADIUS	5 X O.D.	10 X O.D.
ABRASION RESISTANCE	VERY GOOD	VERY GOOD
CUT THROUGH RESISTANCE	GOOD	GOOD
MOISTURE RESISTANCE	EXCELLENT	EXCELLENT
SOLDER IRON RESISTANCE	VERY GOOD	VERY GOOD
SERVICE TEMPERATURE	500°F(260°C) CONTINUOUS 550°F(288°C) SINGLE EXPOSURE	500°F(260°C) CONTINUOUS 550°F(288°C) SINGLE EXPOSURE
FLAME TEST	NON-FLAMMABLE	NON-FLAMMABLE

GAUGE SIZE	NOMINAL INSULATION WALL(INCHES)	NOMINAL JACKET WALL(INCHES)	NOMINAL DIAMETER (INCHES)	APPROX. SHIP. WEIGHT LBS. PER 1000 FT
20	.008	.010	.068 X .116	12
24	.008	.010	.056 X .092	7
30	.004	.006	.030 X .048	2

PRICING POLICY > Shipments will be invoiced at PMC's prices in effect at time of shipment. Quotations are given with an escalation clause and prices, terms, and conditions are subject to change without prior notice. PMC will, however, make every attempt to hold to current quoted prices. All prices quoted are in United States currency, and shall be subject to correction for errors. Unless otherwise stated in writing to PMC.

:ELS, SPOOLS & COILS > All shipments, unless specified otherwise by PMC, are made on non-returnable reels, spools or coils in one continuous length.

GES & RETURNS > All claims for shortage or incorrect material must be made within 10 days after receipt of the goods to which such claim pertains. Goods may only be returned for credit within 1 month of the date of authorization. Goods that are special in any way shall not be returned to PMC. Material returned for any reason, without written authorization will be refused and returned at shipper's expense. A return request must be processed through our Londonderry, N.H. sales office.

TOLERANCES > Due to allowances in manufacturing processes for wire, cable and similar products, PMC reserves the right to ship a variation of ±10% from the quantity of such goods ordered. Physical tolerances shown are nominal. Shipping weights are an average of all types of conductors and are listed for estimating only. These weights can vary substantially due to different types of spools, reels and/or conductors.

Omega Point Laboratories, Inc.

16015 Shady Falls Rd..
Elmendorf, Texas 78112
800-966-5253 FAX 210-635-8101

Certificate of Calibration

Certification No.:	92021
Calibration Date:	5-23-94
Recalibration Date:	11-23-94
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 -0.49 / +0.84 on all 200 channels

Cailibration Performed/Approved by:

Herbert W. Stansberry II,
Fire Test Technologist

OMEGA POINT LABORATORIES

Omega Point Laboratories, Inc.

16015 Shady Falls Rd..
Elmendorf, Texas 78112
800-966-5253 FAX 210-635-8101

Certificate of Calibration

Certification No.:	92022
Calibration Date:	5-28-94
Recalibration Date:	11-28-94
Manufacturer:	Omega Point Laboratories, Inc.
Model No.:	100 Channel DAU
Serial No.:	1041
Equipment Description:	100 Channel Data Acquisition System with Fluke Computer Front End
Calibration Sources:	Digicator Digital Calibrator, Model #CL-466, Serial #703297

PERFORMANCE:

Better than -0.62 / +1.49 on all 100 channels

Cailibration Performed/Approved by:

Herbert W. Stansberry II,
Fire Test Technologist

OMEGA POINT LABORATORIES

Omega Point Laboratories, Inc.

16015 Shady Falls Rd..
Elmendorf, Texas 78112
800-966-5253 FAX 210-635-8101

Certificate of Calibration

Certification No.:	92023
Calibration Date:	9-14-94
Recalibration Date:	3-14-95
Manufacturer:	Omega Point Laboratories, Inc.
Model No.:	416 Channel DAU
Serial No.:	72594-72604,72606-72614
Equipment Description:	416 Channel Data Acquisition System with TempScan 1000, 6 TempScan EXP/10 Extension Units & 13 TC/32 Cards
Calibration Sources:	Digicator Digital Calibrator, Model #CL-466, Serial #703297

PERFORMANCE:

Better than -1.21 / +1.54 on all 416 channels

Cailibration Performed/Approved by:

Herbert W. Stansberry II,
Fire Test Technologist

OMEGA POINT LABORATORIES

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME Omega Point Labs
CLIENT/PROJECT NUMBER OPL Equipment
RECEIVED FROM Rothe
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1411 . OPL
DATE RECEIVED 8-1-94
DATE INSPECTED 8-1-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	CONTD MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Digital Temp. Calibr	1131-0	1	1	0	Serial No 703297	Y	Y	Good	None	X			Calibration Service - arrived in specs. at Rothe.

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Rothe Development
4614 Sinclair Road

San Antonio TX 78222

PO Number: 1131-Q

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Cleda Patton
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
7/19/94	Their Truck		8-2-94	30

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Digital Calibrator SN# 703297 - Calibration Service	1	$60.00	$60.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 7-19-94

Special Instructions

Please include Certificate of Calibration and Calibration Data Sheets

Ordered By: Cleda Patton

Project #: OPL Equipment

Total	$60.00
Shipping	
Tax	
Invoice Total	**$60.00**

EQUIPMENT DELIVERY RECEIPT

Rothe Development, Inc.
Metrology Services Division
[redacted] Sinclair Rd.
[redacted] Antonio, TX 78222-2099
(210)648-3131

Date: 08/01/94
Control: 556

Company: Omega Point Laboratories
Contact: Ms. Connie Humphrey
Address: 16015 Shady Falls Road
City: Elmendorf, TX 78112-9784
Phone: 635-8100

Item	W.O. #	Customer P.O.	Mfgr.	Model	Serial No.	Description
1	44184	1131-Q	Omega	CL-466-L-1	703297	Digital Temp Calibrator

[redacted]ived by:

Date:

RDI 3003

Rothe Development, Inc.

4614 SINCLAIR RD. SAN ANTONIO, TEXAS 78222-2099

210-648-3131 FAX: 210-648-4091

METROLOGY SERVICES DIVISION
PRECISION MEASUREMENT EQUIPMENT LABORATORY
TRACEABLE TO NIST

742

CHARGE # 107 CONTROL # 556 - 8477

WORK ORDER # 44184

RECEIVED FROM Omega Point Laboratories DATE 07/20/94

ADDRESS 16015 Shady Falls Road PHONE# 635-8100
Elmendorf, TX 78112-9784

CONTACT (NAME) Ms. Connie Humphrey FAX#

PURCHASE ORDER # 1131-Q

CUSTOMER COMMENTS TAXABLE 8.25%

ITEM

MFG Omega

MODEL CL-466-L-1

SERIAL # 703297

TYPE Digital Temp Calibrator

ACCES. RCVD. Power cord
Probe Handle

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

CALIBRATION DATE 29 July 94

DATE DUE 29 Jan 95

CALIBRATION INTERVAL 6 mo.

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

CKT REF #	QTY.	MFG PART #	DESCRIPTION	COST

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

PARTS TOTAL		
REPAIR LABOR		
SHIPPING		
TEAR DOWN CHARGE		
CALIBRATION	160.00	
TAX	12	40
TOTAL	172	40

R #'s 20,30,208,150

COMMENTS CAL DATA PROVIDED

WORK PERFORMED:

Cal'd

EN 74 °F

H. 34 %

SPECS: (MFG) RDI

PROCEDURE: (MFG) RDI OTHER

RDI 2002

SHIP VIA: _____ DATE: _____

RECEIVED BY: _____

50-390 TVA WATTS BAR 1

PHASE 2 THERMO-LAG FIRE BARRIER
QUALIFICATION FIRE TEST RESULTS

REC'D W/LTR DTD 12/23/94....9501120202

50-390 (13) 12/23/94

9501120202

Rothe Development Inc.

Metrology Services Division

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

Certificate of Calibration

35555

CAL DATE: 07/29/94

DUE DATE: 01/29/95

ISSUED TO: Omega Point Laboratories
16015 Shady Falls Road
Elmendorf, TX 78112-9784
635-8100

CONTROL: 556 - 8477

SPECIFICATIONS: MFG
PROCEDURE: MFG
WORK ORDER #: 44184
CUSTOMER PO #: 1131-Q

MFG Omega

MODEL CL-466-L-1

SERIAL # 703297

TYPE Digital Temp Calibrator

RECEIVED IN-SPECS [x]
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 34%

Test Report Number and Calibration Standards Used

Ref #	Model #	Mfgr	Serial #	Description	Cal Date	Int	Cal Due
TR 20	5700A	FLUKE	4605002	CALIBRATOR	05/25/94	3	08/25/94
TR 30	3458A	HP	2823A01926	DMM	05/25/94	3	08/25/94
TR 208	PT138P	Logan	9424-3	TEMPERATURE PROBE	06/14/94	12	06/14/95
TR 150	TRC-III	OMEGA	41007	ICE POINT REFERENCE	11/02/93	12	11/02/94

Test Report Numbers

DCV FLUKE CERT# DH70
ACV FLUKE CERT# DP30
[illegible] NIST TEST# 250839
[illegible] NIST TEST# 251316
Hz WWVB Transmission

INSPECTED BY Jose A Mendoza
COMMENTS:

DI 1001

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA : OMEGA CL-466

CUSTOMER: Omega Point Laboratories DATE: 29 July 94

WORK ORDER: 44184 TECH: 11

SERIAL: 703297 INST NO: 8477

CAL DATA TAKEN INCOMING ✓ OUTGOING ✓

CONDITION IN TOLERANCE ✓ OUT OF TOLERANCE

TYPE J	DEG F	READING	TOL
-5.760	-200	-199.7	+/- .6
-3.492	-100	-99.8	+/- .6
0.000	32	32.1	+/- .6
1.942	100	100.1	+/- .6
7.947	300	300.0	+/- .6
14.108	500	500.0	+/- .6
21.785	750	750.0	+/- .6
29.515	1000	1000.0	+/- .6
37.688	1250	1250.0	+/- .6
46.503	1500	1500.0	+/- .6
53.525	1700	1700.0	+/- .6

	DEG C	READING	TOL
-4.632	-100	-99.8	+/- .5
0.000	0	.0	+/- .5
5.268	100	100.0	+/- .5
16.325	300	299.9	+/- .5
33.096	600	599.9	+/- .5
51.875	900	900.0	+/- .5

TYPE K	DEG F	READING	TOL
-2.699	-100	-100.0	+/- 1.2
0.000	32	32.0	+/- .8
1.520	100	100.0	+/- .8
6.092	300	299.9	+/- .8
10.560	500	499.8	+/- .8
16.349	750	749.7	+/- .8
22.251	1000	999.7	+/- .8
28.148	1250	1249.8	+/- .8
33.913	1500	1499.9	+/- .8
39.485	1750	1750.0	+/- .8
44.856	2000	2000.1	+/- .8
49.996	2250	2250.2	+/- .8
54.845	2500	2500.3	+/- .8

TYPE K	DEG C	READING	TOL
-3.553	-100	-99.6	+/- .8
0.000	0	.0	+/- .5
4.095	100	100.0	+/- .5
12.207	300	299.9	+/- .5
20.640	500	499.8	+/- .5
31.214	750	749.9	+/- .5
41.269	1000	1000.0	+/- .5
50.633	1250	1250.1	+/- .5
54.125	1350	1350.2	+/- .5

TYPE T	DEG F	READING	TOL
-5.341	-300	-300.3	+/- 1.5
-4.149	-200	-200.3	+/- 1.5
-2.581	-100	-100.3	+/- 1.5
0.000	32	31.8	+/- .6
1.518	100	99.7	+/- .6
6.647	300	299.7	+/- .6
12.572	500	499.8	+/- .6
19.095	700	699.9	+/- .6

	DEG C	READING	TOL
-5.439	-190	-190.3	+/- 1.0
-3.378	-100	-100.2	+/- 1.0
0.000	0	-.1	+/- .4
4.277	100	99.8	+/- .4
9.286	200	199.8	+/- .4
14.860	300	299.9	+/- .4
20.252	390	389.9	+/- .4

TYPE E	DEG F	READING	TOL
-8.404	-300	-299.8	+/- .7
-6.471	-200	-200.1	+/- .7
-3.976	-100	-100.1	+/- .7
0.000	32	31.9	+/- .7
2.281	100	99.8	+/- .7
9.708	300	299.7	+/- .7
17.942	500	499.8	+/- .7
28.854	750	749.8	+/- .7
40.056	1000	999.8	+/- .7
51.246	1250	1250.0	+/- .7
62.240	1500	1500.0	+/- .7
75.024	1800	1800.1	+/- .7

	DEG C	READING	TOL
-5.237	-100	-99.8	+/- .4
0.000	0	.0	+/- .4
6.317	100	99.9	+/- .4
21.033	300	299.9	+/- .4
36.999	500	499.8	+/- .4
53.110	700	699.9	+/- .4
68.783	900	900.0	+/- .4
76.358	1000	1000.0	+/- .4

MV INPUT	READING	TOL
-10	-9.99	.01% OF
0	0.00	RDG+/-2CT
10	9.99	
30	29.99	
50	49.99	
75	75.00	
100	100.00	

MA INPUT	READING	TOL
0	.000	.01% OF
5	4.999	RDG+/-2CT
10	10.000	
15	15.000	
20	20.001	

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME Omega Point Labs
CLIENT/PROJECT NUMBER OPL Equipment
RECEIVED FROM Rothe Development
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1377 . OPL
DATE RECEIVED 2-28-94
DATE INSPECTED 2-28-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Digital Calibrater	11129	1	1	—	SN# 703297	Y	Y	good	None	X			Calibration services only
Delmhorst Moisture Detector	11129	1	1	—	model BD-8 SN# 5855	Y	Y	good	None	X			

FORM
1/29/93

ORIGINAL

OMEGA POINT LABORATORIES
CALIBRATION DATA SHEET

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

Calibration Date 2/24/94 Next Cal. Due on or before: 8/24/94

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: 2/14/94
Return Date: 2/28/94
P.O. #: 11120

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

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Rothe Development
4614 Sinclair Road

San Antonio TX 78222

PO Number: 1112-Q

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Constance A. Humphrey
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	F.O.B.	Date Required	Terms
2/14/94	Their Truck			30

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Digital Calibrater SN# 703297 - Calibration Service	1	~~$60.00~~ 160.00	~~$60.00~~ 173.20 incl. Tax
2.	Delmhorst Moisture Detector Model BD-8, SN# 5855 Calibration Service	1	~~$160.00~~ 40.00	~~$160.00~~ 43.30

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 2-14-94

Special Instructions

Certificates of Calibration traceable to NIST

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

Total	~~$220.00~~
Shipping	216.50
Tax	
Invoice Total	~~$220.00~~ 216.50

EQUIPMENT DELIVERY RECEIPT

750

Rothe Development, Inc.
Metrology Services Division
[redacted] Sinclair Rd.
[redacted] Antonio, TX 78222-2099
(210)648-3131

Date: 02/25/94
Control: 556

Company: Omega Point Laboratories
Contact: Ms. Connie Humphrey
Address: 16015 Shady Falls Road
City: Elmendorf, TX 78112-9784
Phone: 635-8100

Item	W.O. #	Customer P.O.	Mfgr.	Model	Serial No.	Description
1	42180	1112-Q	Omega	CL-466-L-1	703297	Digital Temp Calibrator
2	42181	1112-Q	Delmhorst	BD-8	5855	Moisture Detector

[redacted] ived by:

Date:

RDI 3003

Rothe Development, Inc.
4614 SINCLAIR RD. SAN ANTONIO, TEXAS 78222-2099
210-648-3131 FAX: 210-648-4091

METROLOGY SERVICES DIVISION
PRECISION MEASUREMENT EQUIPMENT LABORATORY
TRACEABLE TO NIST

751

CHARGE # 107 CONTROL # 556 - 8477

WORK ORDER # 42180

RECEIVED FROM Omega Point Laboratories DATE 02/14/94

ADDRESS 16015 Shady Falls Road
Elmendorf, TX 78112-9784 PHONE# 635-8100

CONTACT (NAME) Ms. Connie Humphrey FAX#

PURCHASE ORDER # 1112-Q

CUSTOMER COMMENTS TAXABLE 8.25% Before + After DATA Required

ITEM

MFG Omega

MODEL CL-466-L-1

SERIAL # 703297

TYPE Digital Temp Calibrator

ACCES. RCVD. Probe handle

☐ REPAIR
☑ OPERATIONAL CHECK
☑ CALIBRATION

CALIBRATION DATE 24FEB94

DATE DUE 24AUG94

CALIBRATION INTERVAL 6 MO.

☑ RECEIVED IN SPECS.
☐ RECEIVED INOPERATIVE
☐ RECEIVED OUT OF SPECS.

CKT REF #	QTY.	MFG PART #	DESCRIPTION	COST

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

PARTS TOTAL		
REPAIR LABOR		
SHIPPING		
TEAR DOWN CHARGE		
CALIBRATION	160.00	
TAX	13.20	
TOTAL	173.20	

R #'s 20, 30, 150, 243

OMMENTS CAL DATA PROVIDED

ORK PERFORMED: Optimized mV + mA functions.

Cal'd

EM 72 °F

H. 27 %

SPECS: (MFG) RDI

PROCEDURE: (MFG) RDI OTHER

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

33929

CAL DATE: 02/24/94

DUE DATE: 08/24/94

ISSUED TO: Omega Point Laboratories
16015 Shady Falls Road
Elmendorf, TX 78112-9784
635-8100

CONTROL: 556 - 8477

SPECIFICATIONS: MFG
PROCEDURE: MFG
WORK ORDER #: 42180
CUSTOMER PO #: 1112-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 [redacted]nary NIST Calibration or Secondary Calibration performed by other Metrological facilities. Ambient conditions: Temperature 72oF , Relative Humidity 27% .

Test Report Number and Calibration Standards Used

Ref #	Model #	Mfgr	Serial #	Description	Cal Date	Int	Cal Due
TR 20	5700A	FLUKE	4605002	CALIBRATOR	11/26/93	3	02/26/94
TR 30	3458A	HP	2823A01926	DMM	11/26/93	3	02/26/94
TR 150	TRC-III	OMEGA	41007	ICE POINT REFERENCE	11/02/93	12	11/02/94
TR 243	138P	LOGAN	9350-1	TEMPERATURE PROBE	12/21/93	12	12/21/94

Test Report Numbers

DCV FLUKE CERT# DH70
ACV FLUKE CERT# DP30
[redacted] NIST TEST# 250839
[redacted] NIST TEST# 251316
Hz WWVB Transmission

INSPECTED BY Joe A Mendoza
COMMENTS:

DI 1001

ROTHE DEVELOPMENT METROLOGY SERVICES

CALIBRATION DATA : OMEGA CL-466

WORK ORDER # 42180

CUSTOMER Omega Point Labs.

SERIAL 703297

DATE 24FEB94

TECH # 11

RECEIVED IN SPECS ✓ RECEIVED OUT OF SPECS _____

RECEIVED INOPERATIVE _____

TYPE J	DEG F	INCOMING	OUTGOING	TOL
-5.760	-200	-200.0	-200.0	+/- .6
-3.492	-100	-100.0	-100.0	+/- .6
0.000	32	32.0	32.0	+/- .6
1.942	100	99.9	99.9	+/- .6
7.947	300	299.8	299.8	+/- .6
14.108	500	499.8	499.8	+/- .6
21.785	750	749.8	749.8	+/- .6
29.515	1000	999.8	999.8	+/- .6
37.688	1250	1249.8	1249.8	+/- .6
46.503	1500	1500.0	1500.0	+/- .6
53.525	1700	1700.0	1700.0	+/- .6

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

TYPE K	DEG F	INCOMING	OUTGOING	TOL
-2.699	-100	-100.0	-100.0	+/- 1.2
0.000	32	32.0	32.0	+/- .8
1.520	100	100.0	100.0	+/- .8
6.092	300	299.9	299.9	+/- .8
10.560	500	499.8	499.8	+/- .8
16.349	750	749.7	749.7	+/- .8
22.251	1000	999.7	999.7	+/- .8
28.148	1250	1249.7	1249.7	+/- .8
33.913	1500	1499.8	1499.8	+/- .8
39.485	1750	1749.8	1749.8	+/- .8
44.856	2000	2000.0	2000.0	+/- .8
49.996	2250	2250.0	2250.0	+/- .8
54.845	2500	2500.0	2500.0	+/- .8

TYPE K	DEG C	INCOMING	OUTGOING	TOL
-3.553	-100	-99.6	-99.6	+/- .8
0.000	0	.0	.0	+/- .5
4.095	100	99.9	99.9	+/- .5
12.207	300	299.9	299.9	+/- .5
20.640	500	499.8	499.8	+/- .5
31.214	750	749.8	749.8	+/- .5
41.269	1000	999.9	999.9	+/- .5
50.633	1250	1250.0	1250.0	+/- .5
54.125	1350	1350.0	1350.0	+/- .5

TYPE T	DEG F	INCOMING	OUTGOING	TOL
-5.341	-300	-300.4	-300.4	+/- 1.5
-4.149	-200	-200.3	-200.3	+/- 1.5
-2.581	-100	-100.2	-100.2	+/- 1.5
0.000	32	31.9	31.9	+/- .6
1.518	100	99.8	99.8	+/- .6
6.647	300	299.8	299.8	+/- .6
12.572	500	499.9	499.9	+/- .6
19.095	700	699.9	699.9	+/- .6

	DEG C	INCOMING	OUTGOING	TOL
-5.439	-190	-190.1	-190.1	+/- 1.0
-3.378	-100	-100.0	-100.0	+/- 1.0
0.000	0	-.0	-.0	+/- .4
4.277	100	99.8	99.8	+/- .4
9.286	200	199.9	199.9	+/- .4
14.860	300	299.9	299.9	+/- .4
20.252	390	389.9	389.9	+/- .4

TYPE E	DEG F	INCOMING	OUTGOING	TOL
-8.404	-300	-299.7	-299.7	+/- .7
-6.471	-200	-200.0	-200.0	+/- .7
-3.976	-100	-100.0	-100.0	+/- .7
0.000	32	32.0	32.0	+/- .7
2.281	100	99.8	99.8	+/- .7
9.708	300	299.6	299.6	+/- .7
17.942	500	499.7	499.7	+/- .7
28.854	750	749.8	749.8	+/- .7
40.056	1000	999.6	999.6	+/- .7
51.246	1250	1249.8	1249.8	+/- .7
62.240	1500	1499.8	1499.8	+/- .7
75.024	1800	1799.9	1799.9	+/- .7

	DEG C	INCOMING	OUTGOING	TOL
-5.237	-100	-99.9	-99.9	+/- .4
0.000	0	-.0	-.0	+/- .4
6.317	100	99.9	99.9	+/- .4
21.033	300	299.9	299.9	+/- .4
36.999	500	499.8	499.8	+/- .4
53.110	700	699.9	699.9	+/- .4
68.783	900	899.9	899.9	+/- .4
76.358	1000	999.9	999.9	+/- .4

MV INPUT	INCOMING	OUTGOING	TOL
-10	-9.99	-9.99	.01% OF
0	.00	.00	RDG+/-2CT
10	9.99	9.99	
30	29.99	29.99	
50	49.98	49.99	
75	74.98	74.99	
100	99.98	100.00	

MA INPUT	INCOMING	OUTGOING	TOL
0	.001	.000	.01% OF
5	4.997	4.999	RDG+/-2CT
10	9.997	9.999	
15	14.997	15.000	
20	19.996	20.000	

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME Omega Point Labs
CLIENT/PROJECT NUMBER OPL Equip
RECEIVED FROM Metropley Metrology
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1371 - OPL
DATE RECEIVED 2-2-94
DATE INSPECTED 2-2-94
INSPECTED BY: CPatton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
0-100 PSI GAGE	11030	1	1	–	SN. 92LE003	Y	Y	good	None	X			Calibration Services only
0-60 PSI Gage	11030	1	1	–	SN92LE002	Y	Y	good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Floyd Passmore
Metroplex Metrology Lab
2312 Municipal Parkway

Bedford TX 76021

PO Number: **1103-Q**

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Cleda Patton
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	F.O.B.	Date Required	Terms
1/13/94	UPS Ground			30

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	0-100 psi Pressure gauge Model No. JD-GF Serial No. 92 LE 003	1	$25.00	$25.00
2.	0-60 psi Pressure gauge Model No. JC-GF Serial NO. 92 LE 002	1	$25.00	$25.00
	plus tax & shipping			

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 1-13-94

Special Instructions

Please include Certificates of Calibration and Calibration Data

Ordered By: Cleda Patton
Project #: OPL Equipment

Total	**$50.00**
Shipping	
Tax	
Invoice Total	**$50.00**

TEST № 424132

METROPLEX METROLOGY LABORATORY INCORPORATED
P.O. BOX 210249 BEDFORD, TEXAS 76095-7249
2312 MUNICIPAL PARKWAY BEDFORD, TEXAS 76021-4842
METRO (817) 267-4999

Certificate of Calibration

We certify the accuracy of this Mc Daniel Controls, Inc. 0 to 100 Liquid Filled PSI Gage, Mod.# None, S/N 92LE003, subdivided in 1 lb. increments, property of Omega Point Laboratories, Inc., 16015 Shady Falls Road, Elmendorf, 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 pressure gage meets all the requirements of **Federal Specifications GGG-G-76E, GG-G-66-B** and **Instrument Calibration Procedure (I.C.P.) No. D25A and M20.** 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.

Instrument used in calibration: Chandler Dead Weight Tester, S/N 20759 (Cal. 12/28/93 Due 12/28/94). **NIST Test #737/229495. Expires: 10-2-94.**
Received Condition: In Tolerance
Technician ID: #4

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	39.9	-.1	.1%
50	49.2	-.8	.1%
60	59.3	-.7	.1%
70	69.3	-.7	.1%
80	79.4	-.6	.1%
90	89.4	-.6	.1%
100	100.5	+.5	.1%

IN COMPLIANCE WITH GOVERNMENT REGULATIONS CALIBRATION TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

TEST IN COMPLIANCE WITH MIL-STD-45662A

President

Weta Passmore
Date Cal: 1-20-94
Date Due: 1-20-95

WP/kb

INVOICE

No. 42531 759

METROPLEX METROLOGY LABORATORY

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

Refer to above number in correspondence regarding this charge.

2312 MUNICIPAL PARKWAY

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

BEDFORD, TEXAS 76021 February 1, 1994

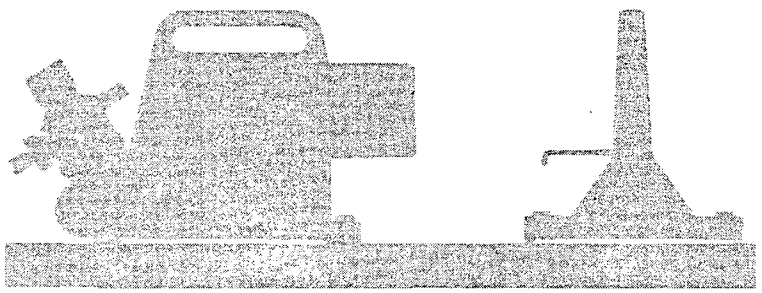
SOLD TO
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

SHIP TO
Same

(214) 635-8100

VIA UPS CUSTOMER P/O NO. 1103-Q TERMS *NET 30* F.O.B. BEDFORD, TEXAS

Item No.	Qty.	DESCRIPTION	Unit Price	Amount
1	1	McDaniel Controls, Inc. 0-100 Liquid Filled PSI Gage, S/N 92LE0003 Cal. & Cert.		
2	1	McDaniel Controls, Inc. 0-60 Liquid Filled PSI Gage, S/N 92LE002 Cal. & Cert.		



IF YOUR REMITTANCE IS POSTMARKED BY 2/16/94, YOU MAY DEDUCT $1.20 FROM THIS INVOICE. (DISCOUNT EXCLUDES TAX.)
OUR TERMS ARE NET 30 DAYS FROM THE DATE OF THIS INVOICE.

Parts	Tools	Calibration Certification	Repairs	Shipping & Handling	Tax	TOTAL	
		60.00		8.04	5.61		73.65

Cust.# 11549
bb
p

Masters at Repairs and Calibration of Precision Measuring Instruments

Please Pay ▲

PACKING SLIP

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES 17 PIECES GROSS WEIGHT 9440 LBS.

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 158100 THERMO-LAG Preshaped Conduit Sections Thickness: 0.625" ± 0.125" Nom. Size: 1"	16 Pieces	F94-02053
Item 01	16 Pieces (In 1 Carton)	

No Shelf Life On Conduit

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 158400 THERMO-LAG Preshaped Conduit Sections Thickness: 0.625" ± 0.125" Nom. Size: 4"	5 Pieces	F9-105037
	3 Pieces	F92-09051
	10 Pieces	F92-11018
Item 02	10 Pieces	F94-03018
No Shelf Life On Conduit	28 Pieces (In 2 Cartons)	

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O Bryant

David O Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

TSI

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 238100 THERMO-LAG Preshaped Conduit Sections Thickness: 0.375" ± 0.125" Nom. Size: 1"	16 Pieces	F94-04005

Item 03

No Shelf Life On Conduit

16 Pieces
(In 1 Carton)

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O'Bryant
Manager Quality Control

763

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 338300 THERMO-LAG Preshaped Conduit Sections Thickness: 0.375" ± 0.125" Nom. Size: 3"	8 Pieces	F94-02053
Item 04	8 Pieces (In 1 Carton)	

No Shelf Life On Conduit

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 438300 THERMO-LAG Preshaped Conduit Sections Thickness: 0.375" ± 0.125" Nom. Size: 3"	3 Pieces 5 Pieces	F92-10009 F93-06008
Item 05	8 Pieces (In 1 Carton)	

No Shelf Life On Conduit

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant
David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 1384X6 - THERMO-	1 PANEL	F93-11048
LAG 330 RIBBED PANEL	4	F94-02012
NOMINAL 3/8" THICK, 4'x6½' NOM.	1	F94-03018
	1	F94-06051
ITEM 06	7 PANELS (ON 1 PALLET)	

NO SHELF LIFE LIFE ON PANELS

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O'Bryant
Manager Quality Control

TSI

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 1584X6 - THERMO-	1	F93-11048
LAG RIBBED PANEL, NOMINAL 5/8"	9	F94-02012
4' X 6½'	6	F94-02053
	9	F94-03018
	7	F94-03028
ITEM 07	14	F94-03047
	46 PANELS (ON 4 PALLETS)	

NO SHELF LIFE ON PANELS

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O Bryant
Manager Quality Control

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PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO-LAG 330-1 SUBLIMING COATING TROWEL GRADE ITEM 08 1 x 5 gallon pail containing temperature recorder EXP. DATE: DECEMBER 1994 SHELF LIFE SIX MONTHS FROM DATE OF SHIPMENT STORE ABOVE 32 F AND BELOW 100 F AT ALL TIMES	2000 LB. (40 x 50 Lb. Pails) (ON 2 PALLETS)	94-05093

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O Bryant
Manager Quality Control

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Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

21334

TSI

CERTIFICATE OF ANALYSIS

CUSTOMER

OMEGA POINT LABORATORY
%TENNESSEE VALLEY AUTHORITY
16015 SHADY FALLS RD
ELMENDORFF, TX 78112

DATE OF SHIPMENT 30 JUNE 1994
PURCHASE ORDER NO: CONTRACT #TV 92362V
RELEASE NO:
CUSTOMER PART NO:

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

LOT NUMBER	QUANTITY	TEST NO:	DESCRIPTION	ANALYSIS	SPECIFICATION
94-05093	2000 LB. (40 x 50 LB. PAILS	A-2	WT/GALLON	10.16	10.5 ± 1.5
		A-3	pH	8.5	8 +

ITEM 08

EXPIRATION DATE: DECEMBER 1994

SHELF LIFE: SIX MONTHS FROM DATE OF SHIPMENT
STORE MATERIAL ABOVE 32°F AND BELOW 100°F AT ALL TIMES

THIS IS TO CERTIFY THAT THE ABOVE DESIGNATED MATERIAL HAS BEEN TESTED AND DID COMPLY WITH LISTED SPECIFICATIONS WHEN SUPPLIED. THE MATERIAL IS SUBJECT TO THE CONDITIONS LISTED ON TSI'S INVOICE. THE ABOVE IS A COPY OF INFORMATION ON FILE AND THE LOT ACCEPTANCE DATA IS AVAILABLE FOR EXAMINATION.

REVIEWED BY: Danielle Bryant DATE: 30 JUNE 1994 PAGE NO. 1

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
STRESS SKIN-ASTM E437 type 304 stainless steel, plain weave, 8 x 8 square mesh wire cloth, 0.017 dia. wire, or equal.	100 LB. (IN 1 CARTON)	F062494

Item 09

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O'Bryant
Manager Quality Control

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
STAINLESS STEEL TIE WIRE 16 Gauge, Annealed type 304	100 LB. (3 ROLLS)	N/A
Item 10		
STAINLESS STEEL BANDING Type 304 Thickness: .0.020" x 0.5" x 200 Ft. Rolls	3 Rolls	070693
STAINLESS STEEL CLIPS SIZE. 1/2" WIDE X 0.020"	1 CARTON (1000 CLIPS)	112691
ITEM 11	(ALL ABOVE ITEMS IN 1 CARTON)	

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O Bryant
Manager Quality Control

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

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PACKING LIST

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 158340 THERMO-LAG Preshaped Conduit Sections Thickness: 0.625" ± 0.125" Nom. Size: 3/4"	10 Pieces	F94-02053
Item 12	10 Pieces (In 1 Carton)	

No Shelf Life On Conduit

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O Bryant

David O Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 238340	2 Pieces	F92-02005
THERMO-LAG Preshaped Conduit Sections	1 Piece	F92-03029
Thickness: 0.375" ± 0.125" Nom. Size: 3/4"	1 Piece	F94-02012
	6 Pieces	F94-04005
Item 13	10 Pieces (In 1 Carton)	

No Shelf Life On Conduit

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TS1/TUA
CLIENT/PROJECT NUMBER 11960-97185.8687
RECEIVED FROM TS1
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1393 - 11960
DATE RECEIVED 7-8-94
DATE INSPECTED 7-8-94
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	
Temp. Recorder	NA	0	1	0	Recorder # 0301 Chart tape # 27	Y	N	Good	None	X			Receiving Verifications Only. Temperature Recorder has been returned to TS1. CP
Thermo Lag 1" pre shaped conduit	NA	0	16	0	Part # 158100 F94-02053	Y	Y	Good	None	X			
Thermo Lag 4" pre shaped conduit	NA	0	5	0	Part # 158400 F9-105037	Y	Y	Good	None	X			
Thermo Lag 4" pre shape Conduit	NA	0	3	0	Part # 158400 F92-09051	Y	Y	Good	None	X			
Thermo Lag 4" pre shaped conduit	NA	0	10	0	Part # 158400 F92-11018	Y	Y	Good	None	X			
Thermo Lag 4" pre shaped Conduit	NA	0	10	0	Part # 158400 F94-03018	Y	Y	Good	None	X			
Thermo Lag 1" pre shaped conduit	NA	0	16	0	Part # 238100 F94-04005	Y	Y	Good	None	X			
Thermo Lag 3" pre shaped conduit	NA	0	8	0	Part # 338300 F94-02053	Y	Y	Good	None	X			
Thermo Lag 3" pre shaped Conduit	NA	0	3	0	Part # 438300 F92-10009	Y	Y	Good	None	X			
Thermo Lag 3" pre shaped Conduit	NA	0	5	0	Part # 438300 F93-06008	Y	Y	Good	None	X			
Thermo Lag 330 Ribbed Panel 3/8"	NA	0	1	0	Part # 1584X6 F93-11048	Y	Y	Good	None	X			
Thermo Lag 330 Ribbed Panel 3/8"	NA	0	4	0	Part # 1584X6 F94-02013	Y	Y	Good	None	X			
Thermo Lag 330 Ribbed Panel 3/8"	NA	0	1	0	Part # 1384X6 F94-03018	Y	Y	Good	None	X			
Thermo Lag 330 Ribbed Panel 3/8"	NA	0	1	0	Part # 1384X6 F94-06057	Y	Y	Good	None	X			
Thermo Lag 330 Ribbed Panel 5/8"	NA	0	1	0	Part # 1584X6 F93-11048	Y	Y	Good	None	X			
Thermo Lag 330 Ribbed Panel 5/8"	NA	0	9	0	Part # 1584X6 F94-02012	Y	Y	Good	None	X			

FORM
1/29/93

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97185, 86687
RECEIVED FROM TSI
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1393 - 11960
DATE RECEIVED 7-8-94
DATE INSPECTED 7-8-94
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	
Thermo Lag 330 Ribbed Panel 5/8"	NA	0	6	0	Part# 1584X6 F94-02053	Y	Y	Good	None	X			Receiving Verification only. Expedite entry of grade is December 1994
Thermo Lag 330 Ribbed Panel 5/8"	NA	0	9	0	Part# 1584X6 F94-03018	Y	Y	Good	None	X			
Thermo Lag 330 Ribbed Panel 5/8"	NA	0	7	0	Part# 1584X6 F94-03028	Y	Y	Good	None	X			
Thermo Lag 330 Ribbed Panel 5/8"	NA	0	14	0	Part# 1584X6 F94-03047	X	Y	Good	None	X			
Thermo Lag 330-1 Trowel grade	NA	0	40	0	94-05093	X	Y	Good	None	X			
Stress-Skin	NA	0	100lb	0	F062494	Y	Y	Good	None	X			
Stainless Steel Tie Wire	NA	0	100lb	0	16ga, Type 304	Y	Y	Good	None	X			
Stainless Steel Banding	NA	0	3 rolls	0	070693	Y	Y	Good	None	X			
Stainless steel Clips	NA	0	1000	0	112691	Y	Y	Good	None	X			
Thermo Lag 3/4" pre shaped conduit	NA	0	10	0	Part# 158340 F94-02053	Y	Y	Good	None	X			
Thermo Lag 3/4" pre shaped conduit	NA	0	2	0	Part# 238340 F92-02005	Y	Y	Good	None	X			
Thermo Lag 3/4" pre shaped conduit	NA	0	1	0	Part# 238340 F92-03029	Y	Y	Good	None	X			
Thermo Lag 3/4" pre Shaped Conduit	NA	0	1	0	Part# 238340 F94-02012	Y	Y	Good	None	X			
Thermo Lag 3/4" pre shaped Conduit	NA	0	6	0	Part# 238340 F94-04005	Y	Y	Good	None	X			

FORM
1/29/93

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES 17 PIECES GROSS WEIGHT 9440 LBS.

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 158100 THERMO-LAG Preshaped Conduit Sections Thickness: 0.625" ± 0.125" Nom. Size: 1"	16 Pieces	F94-02053
Item 01	16 Pieces (In 1 Carton)	

No Shelf Life On Conduit

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant
David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

776

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 158400 THERMO-LAG Preshaped Conduit Sections Thickness: 0.625" ± 0.125" Nom. Size: 4"	5 Pieces	F9-105037
	3 Pieces	F92-09051
	10 Pieces	F92-11018
	10 Pieces	F94-03018
Item 02		
	28 Pieces (In 2 Cartons)	
No Shelf Life On Conduit		

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O Bryant

David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 238100 THERMO-LAG Preshaped Conduit Sections Thickness: 0.375" ± 0.125" Nom. Size: 1"	16 Pieces	F94-04005
Item 03 No Shelf Life On Conduit	16 Pieces (In 1 Carton)	

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O Bryant

David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 338300 THERMO-LAG Preshaped Conduit Sections Thickness: 0.375" ± 0.125" Nom. Size: 3"	8 Pieces	F94-02053
Item 04	8 Pieces (In 1 Carton)	

No Shelf Life On Conduit

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O Bryant

David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 438300 THERMO-LAG Preshaped Conduit Sections Thickness: 0.375" ± 0.125" Nom. Size: 3"	3 Pieces 5 Pieces	F92-10009 F93-06008
Item 05	8 Pieces (In 1 Carton)	

No Shelf Life On Conduit

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 1384X6 - THERMO-	1 PANEL	F93-11048 ✓
LAG 330 RIBBED PANEL	4	F94-02012 ✓
NOMINAL 3/8" THICK, 4'x6½' NOM.	1	F94-03018 ✓
	1	F94-06051 ✓
ITEM 06	7 PANELS (ON 1 PALLET)	

NO SHELF LIFE LIFE ON PANELS

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O'Bryant
Manager Quality Control

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 1584X6 - THERMO-	1	F93-11048 ✓
LAG RIBBED PANEL, NOMINAL 5/8"	9	F94-02012 ✓
4' X 6½'	6	F94-02053 ✓
	9	F94-03018 ✓
	7	F94-03028 ✓
ITEM 07	14	F94-03047 ✓
	46 PANELS (ON 4 PALLETS)	

NO SHELF LIFE ON PANELS

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O'Bryant
Manager Quality Control

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO-LAG 330-1 SUBLIMING COATING TROWEL GRADE ITEM 08 1 x 5 gallon pail containing temperature recorder EXP. DATE: DECEMBER 1994 SHELF LIFE SIX MONTHS FROM DATE OF SHIPMENT STORE ABOVE 32 F AND BELOW 100 F AT ALL TIMES	2000 LB. (40 x 50 Lb. Pails) (ON 2 PALLETS)	94-05093

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O'Bryant
David O'Bryant
Manager Quality Control

783

21334

CERTIFICATE OF ANALYSIS

CUSTOMER

OMEGA POINT LABORATORY
%TENNESSEE VALLEY AUTHORITY
16015 SHADY FALLS RD
ELMENDORFF, TX 78112

DATE OF SHIPMENT: 30 JUNE 1994
PURCHASE ORDER NO: CONTRACT #TV 92362V
RELEASE NO:
CUSTOMER PART NO:

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

LOT NUMBER	QUANTITY	TEST NO:	DESCRIPTION	ANALYSIS	SPECIFICATION
94-05093	2000 LB. (40 x 50 LB. PAILS	A-2	WT/GALLON	10.16	10.5 ± 1.5
		A-3	pH	8.5	8 +

ITEM 08

EXPIRATION DATE: DECEMBER 1994

SHELF LIFE: SIX MONTHS FROM DATE OF SHIPMENT
STORE MATERIAL ABOVE 32°F AND BELOW 100°F AT ALL TIMES

THIS IS TO CERTIFY THAT THE ABOVE DESIGNATED MATERIAL HAS BEEN TESTED AND DID COMPLY WITH LISTED SPECIFICATIONS WHEN SUPPLIED. THE MATERIAL IS SUBJECT TO THE CONDITIONS LISTED ON TSI'S INVOICE. THE ABOVE IS A COPY OF INFORMATION ON FILE AND THE LOT ACCEPTANCE DATA IS AVAILABLE FOR EXAMINATION.

REVIEWED BY: Ward O'Bryant DATE: 30 JUNE 1994 PAGE NO. 1

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
STRESS SKIN-ASTM E437 type 304 stainless steel, plain weave, 8 x 8 square mesh wire cloth, 0.017 dia. wire, or equal.	100 LB. (IN 1 CARTON)	F062494

Item 09

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O'Bryant
David O'Bryant
Manager Quality Control

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
STAINLESS STEEL TIE WIRE 16 Gauge, Annealed type 304	100 LB. (3 ROLLS)	N/A
Item 10		
STAINLESS STEEL BANDING Type 304 Thickness: .0.020" x 0.5" x 200 Ft. Rolls	3 Rolls	070693
STAINLESS STEEL CLIPS SIZE. 1/2" WIDE X 0.020"	1 CARTON (1000 CLIPS)	112691
ITEM 11	(ALL ABOVE ITEMS IN 1 CARTON)	

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 30 June 1994
BILL OF LADING: 21334
MODE: DYNAMIC TRANSIT PREPAID

David O'Bryant
Manager Quality Control

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 158340 THERMO-LAG Preshaped Conduit Sections Thickness: 0.625" ± 0.125" Nom. Size: 3/4"	10 Pieces	F94-02053
Item 12	10 Pieces (In 1 Carton)	

No Shelf Life On Conduit

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David O'Bryant

David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA Part No. 238340	2 Pieces	F92-02005
THERMO-LAG Preshaped Conduit Sections	1 Piece	F92-03029
Thickness: 0.375" ± 0.125" Nom. Size: 3/4"	1 Piece	F94-02012
	6 Pieces	F94-04 05
Item 13	10 Pieces (In 1 Carton)	

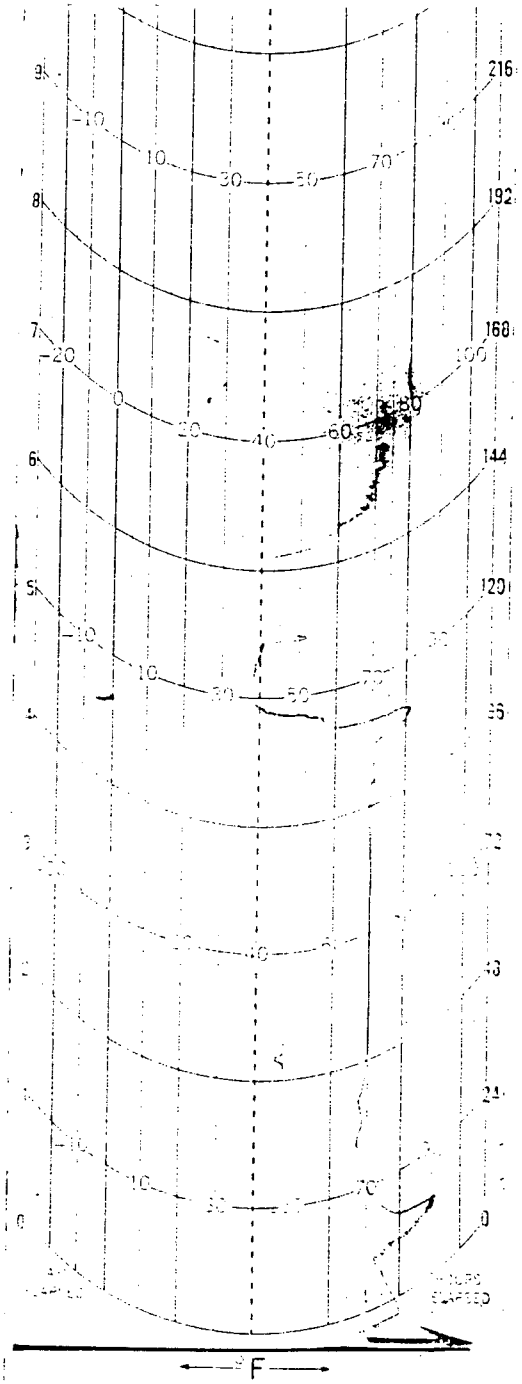
No Shelf Life On Conduit

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant
Manager Quality Control

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207



CAR WALL

ADVANCE CHART → ← MATCH

CAR No.

CITY: San Antonio / TX

CONSIGNEE: Omega Point

CAR CONT:

PER:

CITY: St. Louis

SHIPPER: TGI

DATE: 6-30-94 TIME: 1:30pm

INSTR. No.

CHART 27

LOAD CARTRIDGE – ADVANCE CHART

32 DAY (–30° + 110° F)

PART NO. 840-95

PARTLOW THERMA-GARD

NEW HARTFORD, N.Y. 13413

START

789

...subject to the classifications and tariffs in effect on the date of issue of this Original Bill of Lading,

SHORT FORM — ORIGINAL — NOT NEGOTIABLE

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

From THERMAL SCIENCE, INC.

A ST. LOUIS, MISSOURI 63026

CONTRACT ORDER TV 92362V

Carrier DYNAMIC TRUCK PREPAID PROTECTIVE SERVICE 6/8 30 19 94 Shipper's No. 21334

Consigned to OMEGA POINT LABORATORY % TVA CONTRACT TV 92362V Agent's No.

Destination 16015 SHADY FALLS ROAD (Mail or street address of consignee—For purposes of notification only)

Route ELMENDORFF, TEXAS 78112 State of County of

Delivering Carrier Vehicle or Car Initial No.

No. Packages	HM	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	*Weight (Subject to Correction)	Class or Rate	Check Column
1	✓	CARTON TVA PART #158100			
2	✓	16 PCS. 1" ITEM 01	100 lb.		
		CARTONS TVA PART NO. 158400			
1	✓	28 PCS. 4" ITEM 02	300		
		CARTON TVA PART NO. 238100			
1	✓	16 PCS. 1" ITEM 03	150		
		CARTON TVA PART NO. 338300			
1	✓	8 PCS. 3 INCH (UPGRADE) ITEM 04	90		
		CARTON TVA PART NO. 438300			
1	✓	8 PCS. 3" (UPGRADE)			
		PALLET TVA PART NO. 1384X6 ITEM 05	90		
	✓	7 EA. THERMO LAG 330 RIBBED PANEL	700		
4	✓	3/8" THICKNESS 4' x 6½' NOM. ITEM 06			
		PALLETS TVA PART NO. 1584X6			
	✓	46 PANELS THERMO LAG 330 RIBBED PANEL	5200 lb.		
	✓	5/8" THICKNESS NOM. 4' x 6½' ITEM 7			
	✓	PALLETS CONTAINING: 40 x 50 LB. PAILS			
	✓	THERMO LAG 330-1 SUBLIMING COATING	2400		
	✓	TROWEL GRADE ITEM 08 TVA PART TG-330-			
1	✓	1 x 5 gal. pail containng temp recorder			
	✓	STORE ABOVE 32 F AND BELOW 100F AT ALL TIMES			
	✓	CARTON CONTAINING STRESS SKIN ASTM E437	120 lb.		
	✓	TYPE 304 -SS Wire/plain weave 8x8 square			
	✓	mesh wire cloth 0.017" DIA. Wire ITEM 09			
	✓	CARTON CONTAINING			
	✓	3 Rolls SS Banding ITEM [redacted] 11	140 Lb		
	✓	3 Rolls (100 Lb.) SS TIE WIRE TYPE 304			
	✓	ITEM 10			
	✓	1 BOX OF 1000 [redacted] SS CLIPS ITEM 11			
	✓	CARTON TVA PART NO. 158340			
	✓	3/4" [redacted] 50 PCS. ITEM 12	50		
	✓	CARTON TVA PART NO. 238340			
	✓	SIZE: 3/4 INCH UPGRADE ITEM 13 (10 PCS.)	100		

Subject to Section 7 conditions of applicable bill lading, if this shipment is to b delivered to the consignee without recourse on th consignor, the consignor sha sign the following statement: The carrier shall not mak delivery of this shipmen without payment of freight and all other lawful charges.

Per (Signature of Consignor.)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

TO BE PREPAID

Received $ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per (The signature here acknowledges only the amount prepaid.)

Charges Advanced:

$

C. O. D. SHIPMENT

C. O. D. Amt.

Collection Fee

Total Charges

...oxes used for this shipment conform to the specifications set forth in the box maker's certificate thereon, and all other requirements of Rule 41, of the Consolidate... ...ification.

...ertify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according ...able regulations of the Department of Transportation.

...art moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

...print in lieu of stamp; not a part of Bill of Lading approved by the Department of Transportation.

...the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.

...declared value of the property is hereby specifically stated by the shipper to be not exceeding

NT IS CORRECTLY DESCRIBED.

EIGHT ... LBS.

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation." NOTE: Preprinted certificates conforming with 49 CFR 173, 430 (a) in effect January 30, 1978, may be used through June 30, 1979.

Per Shipper

...MAL SCIENCE, INC.

...st office address of shipper

Shipper, Per

2200 Cassens Dr., St. Louis, MO 63026

Agent, Per

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TUA
CLIENT/PROJECT NUMBER 11960-97185-87, 97257-60
RECEIVED FROM TSI
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1413 - 11960
DATE RECEIVED 8-3-94
DATE INSPECTED 8-3-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	CONTD MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Stress Skin	NA	0	1	0	SS-008-0170-36	Y	Y	good	None	X			1 roll - 100' X 36" - 8X8 mesh .017 wire Receiving Verification Only

FORM
1/29/93

PACKING LIST

791

SOLD TO
3500
Thermal Science
2200 Cassens Drive
St. Louis, MO

63026

SHIP TO
[redacted]
Omega Point Laboratories
16015 Shady Falls Road
Elmendorff, Texas

78112

CUSTOMER ORDER NO.	DATE SHIPPED
12492	8-2-94
DATE ORDER RECEIVED	**SHIPPED VIA**
8/ 2/94	UPS Next Day
OUR ORDER NO.	
12492	
RESALE NO./STATUS	
Interstate 0	
FREIGHT TERMS	

NG	INIT.	CONTACT
UPS-NEXT DAY AIR	Ken	Denise

QUANTITY ORDERED*	DESCRIPTION						QUANTITY SHIPPED*
	PART NUMBER	MESH	WIRE	MATERIAL	WIDTH	CODE	
300.00	SS-008-0170-36 M016	8X8	.017	304SS	36"	A	300.00

Attn: Richard Lohman

1 ROLL 100'-0" X 36"

MATERIAL RECEIVED BY _____

*UNIT OF MEASURE IS SQ. FT. UNLESS OTHERWISE NOTED.

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97257-60+97332-38
RECEIVED FROM TSI
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1430 - 11960
DATE RECEIVED ~~8-29-94~~ 8/31/94
DATE INSPECTED ~~8-29-94~~ 8/31/94 CH
INSPECTED BY: C Patton 8/31/94 CH

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	Rec'd	B.O.	I.D. NO.	CONID MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	Hold	Reject	REMARKS
Stress Skin	NA	0	2rolls	0	SS-008-010-48	Y	N	Good	None	X			Receiving Verification Only
SS Tie Wire	NA	0	25lbs	0	16ga, annealed Type 304	Y	Y	Good	None	X			

FORM
1/29/93

PACKING LIST 793

SOLD TO
6573
Thermal Science
2200 Cassens Drive
St. Louis, MO
63026

SHIP TO
~~Thermal Science~~
Omega Point Laboratories
C/O TVA, Attn: Mark Sallee
16015 Shady Falls Road
Elmendorff, Texas
78112

CUSTOMER ORDER NO.	DATE SHIPPED
12569	
DATE ORDER RECEIVED	**SHIPPED VIA**
8/26/94	UPS NXT Day Air
OUR ORDER NO.	
12569	
RESALE NO./STATUS	
Interstate 0	
FREIGHT TERMS	

ING	INIT.	CONTACT
UPS-NEXT DAY AIR	Ken	Denise

314-942-1283

QUANTITY ORDERED*	DESCRIPTION PART NUMBER / MESH / WIRE / MATERIAL / WIDTH / CODE	QUANTITY SHIPPED*
600.00	SS-008-0170-48 8X8 .017 304SS 48" A I606	600.00

150'-0" X 48"

MATERIAL RECEIVED BY ____________________

*UNIT OF MEASURE IS SQ. FT. UNLESS OTHERWISE NOTED.

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 26 AUGUST 1994

TEMPERATURE RECORDER N/A CHART TAPE NO. N/A

TOTAL NO. OF PACKAGES 1 CARTON GROSS WEIGHT 30 LBS.

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
STAINLESS STEEL TIE WIRE 16 Gauge, Annealed type 304	25 LBS.	N/A

Item 10

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV 92362V, to Omega Point Laboratories San Antonio, TX, for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112.

DATE: 26 AUGUST 1994
BILL OF LADING: 21416
MODE: UPS PREPAID

David O'Bryant
Manager Quality Control

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

8/3/94

Cal Banning
Vectra c/o Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, Texas 78112

Dear Sir:

The in-house retain sample of Thermo-Lag 330-1 Trowel Grade batch #93-11049, was examined and tested. The results were within our published quality control standards.

Based on these results, the expiration date could be extended to read January 1995. The new expiration date would not include the extension of the original written warranty or any implied warranty.

Note that the sample tested was not received from the storage facilities of Omega Point Laboratories.

Regards,

David O'Bryant
QC Manager

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. 1085-Q c/o #1 DATE: 10 Dec 1993

TEMPERATURE RECORDER 030128 CHART TAPE NO. 10

TOTAL NO. OF PACKAGES see pg 1 GROSS WEIGHT see pg 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
Thermo-Lag 330-1 Subliming Coating - Trowel Grade Mfg. Date Nov. 24, 1993 Item 9	70 X 50 Lb Pail (3500 Lbs)	93-11049
Shelf Life: Six (6) months from date of shipment Storage Conditions: Above 32°F and below 100°F		
Temperature Recorder Item 10	1 Recorder	N/A

This will certify that the above listed THERMO-LAG Materials, shipped under Purchase Order No. 1085-Q c/o #1, to Omega Point Laboratories San Antonio, TX, Meet the requirements of "Specifications for the Procurement of Fire Barrier Materials 0784-00001-S-01, Rivision 3" for Nuclear Management and Resources Council (NUMARC) 1776 Eye Street, N.W., Suite 300, Washington, D.C. The material meets the requirements of the purchase order. This material does not contain asbestos.

DATE: 10 Dec 1993
BILL OF LADING: 21069
MODE OF TRANSPORT: C.V. SOHN PREPAID

B.E. EVANS
MANAGER OF QUALITY CONTROL

CERTIFICATE OF ANALYSIS

CUSTOMER

Omega Point Laboratories
6868 Alamo Downs Parkway
San Antonio, TX 78238

DATE OF SHIPMENT: December 10, 1993
PURCHASE ORDER NO: 1085-Q c/o #1
RELEASE NO:
CUSTOMER PART NO: Item #9

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

LOT NUMBER	QUANTITY	TEST NO:	DESCRIPTION	ANALYSIS	SPECIFICATION
93-11049	70 X 50 Lb. Pails	A-2	Wt/Gallon	10.13	10.5 ± 1.5
Mfg. Date: Nov. 24, 1993	(3500 Lbs)	A-3	pH	8.36	8 +

n #9

Temperature Recorder (1) with the shipment

Material Expiration Date: June 1994

SHELF LIFE: SIX MONTHS FROM DATE OF SHIPMENT
STORE MATERIAL ABOVE 32°F AND BELOW 100°F AT ALL TIMES

THIS IS TO CERTIFY THAT THE ABOVE DESIGNATED MATERIAL HAS BEEN TESTED AND DID COMPLY H LISTED SPECIFICATIONS WHEN SUPPLIED. THE MATERIAL IS SUBJECT TO THE CONDITIONS LISTED ON TSI'S INVOICE. THE ABOVE IS A COPY OF INFORMATION ON FILE AND THE LOT ACCEPTANCE DATA IS AVAILABLE FOR EXAMINATION.

REVIEWED BY: B Elvin DATE: December 10, 1993

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: ThermoLag 330-1

DATE PRINTED.: 8/24/89
DATE REVISED: 7/7/89
By A. Thorpe

THERMAL SCIENCE INC
2200 Cassens Dr
Fenton , MO 63026
PHONE: (314) 349-1233
EMERGENCY PHONE: (314) 349-1267

HMIS HAZARD RATINGS			
LEAST	0	HEALTH HAZARD	2*
SLIGHT	1	FLAMMABILITY HAZARD	0
MODERATE	2	REACTIVITY HAZARD	0
HIGH	3	MAXIMUM PERSONAL	
EXTREME	4	PROTECTION	B

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: Thermolag 330-1

PRODUCT CLASS : Latex Fire Resistive Coating

D.O.T. HAZARD CLASS: none
D.O.T. Shipping Name: Cold Water Paint
D.O.T. UN Number:

SECTION II - PHYSICAL DATA

APPEARANCE AND ODOR :Milky white pasty mastic, ammoniacal odor

BOILING POINT (at 760 mm Hg): 220-240 F
VAPOR PRESSURE (at 20C or 68F): nil
EVAPORATION RATE (ether = 1) much slower
VAPOR DENSITY (air = 1) : 0.6
Volatile Organic Content (VOC) : < 0.1 lb/gal

SPECIFIC GRAVITY (water = 1): 1.3
WEIGHT PER GALLON (lbs.): 10.6
PERCENT VOLATILES BY VOLUME: 45
SOLUBILITY IN WATER: Very

SECTION III - HAZARDOUS COMPONENTS

TRADE NAME	CAS #	PERCENT BY VOLUME	OCCUPATIONAL EXPOSURE LIMITS OSHA PEL	ACGIH TLV
Crystalline Silica (quartz) (total dust)	14808-60-7	1-5 %	30 mg/m^3 %SiO2 +2	
(respirable dust)			10 mg/m^3 %SiO2 +2	0.1 mg/m^3
Ammonia	1336-21-6	< 0.1 %	50 ppm	25 ppm
Fibrous glass,continuous filament (total dust)	65997-17-3	1-5 %	15 mg/m^3	10 mg/m^3
(respirable dust)			5 mg/m^3	

* Indicates toxic chemicals subject to the reporting requirements of Section 313 of Title III and of 40 CFR 372
Carcinogenicity of Silica: NTP: No IARC: Yes Z List: Yes OSHA Reg: Not as carcinogen
Appears on Table Z-3 for Mineral Dusts in 29 CFR § 1910.1000
IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans(vol 42,1987) concludes that there is sufficient evidence for the carcinogenicity of crystalline silica to experimental animals, and there is limited evidence for the carcinogenicity of crystalline silica to humans. IARC Class 2A.
Carcinogenicity of fibrous glass: NTP: No IARC: Yes Z List: No OSHA Reg: No
IARC categorized fibrous glass as not classifiable with respect to human carcinogenicity.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION
OSHA : Non-combustible
DOT : Non-combustible

FLASH POINT : None
TEST METHOD:

FLAMMABILITY LIMITS LEL: NA UEL: NA

EXTINGUISHING MEDIA :

SPECIAL FIRE FIGHTING PROCEDURES :Wet Product will not burn but will smoke and spatter if exposed to flames. Firefighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS : Sealed containers may rupture if overheated. Cool with water spray.

HAZARDOUS DECOMPOSITION PRODUCTS : Thermal oxidative decomposition can produce toxic gases, including oxides of nitrogen and carbon monoxide.

SECTION V - REACTIVITY DATA

STABILITY	UNSTABLE STABLE	X	CONDITIONS TO AVOID: Not applicable

INCOMPATIBILITY (MATERIALS TO AVOID) : Strong Oxidizers, Strong Bases

HAZARDOUS POLYMERIZATION	MAY OCCUR WILL NOT OCCUR X	CONDITIONS TO AVOID : Not applicable

SECTION VI - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: See HAZARDOUS COMPONENTS list in Section III.

EFFECTS OF OVEREXPOSURE :
Eyes: Direct contact with product may result in eye irritation.
Skin: Prolonged or repeated contact with product may cause skin irritation.
Breathing: Excessive inhalation can cause irritation of the mucous membranes of the nose, throat and respiratory tract, headache and nausea.
Swallowing:

FIRST AID PROCEDURES :
If in Eyes: Flush with flowing water immediately and continously for 15minutes. Consult medical personnel.
If on Skin: Thoroughly wash exposed area with soap and water. Remove and wash contaminated clothing before reuse. Destroy contaminated shoes. Consult medical personnel if swelling or reddening occurs.
If Swallowed: If conscious, give two glasses of water to drink. Get immediate medical attention.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED : Keep unnecessary people away. Contain spill with inert material (sand, earth, ect) and transfer the material to containers for recovery or disposal. Keep spill out of sewers and open bodies of water. Floors may be slippery, care should be exercized to avoid falls.

WASTE DISPOSAL METHOD : Burn in adaquate incinerator or bury in an approved landfill.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION TYPE : Mechanical local exhaust at point of mist release is preferred.

RESPIRATORY PROTECTION : None required if good ventilation is maintained. Otherwise wear MSHA/NIOSH approved respirator suitable for vapor, mist or dust concentrations encountered.

PROTECTIVE GLOVES : Impervious, cotton lined rubber EYE PROTECTION : Safety glasses.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE : Use only with adaquate ventilation. Prevent prolonged breathing of vapor or mist. Prevent contact with eyes. Do not take internally. Keep out of the reach of children.

STORAGE TEMP. MAX 100 F MIN 32 F

OTHER PRECAUTIONS :

NUCLEAR ENERGY INSTITUTE

August 23, 1994

Ms. Connie Humphry
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Dear Connie:

This letter authorizes Omega Point to release up to twelve containers of trowel grade Thermo-Lag 330 material from NEI stock (batch number 93-11049) to Mark Salley of TVA, in exchange for an equal number of containers of trowel grade material from TVA stock to be delivered later this week.

Please contact me if you have any questions.

Sincerely,

Biff Bradley
Senior Project Manager

REB/

1776 I STREET, NW SUITE 400 WASHINGTON, DC 20006-3708 PHONE 202.739.8000 FAX 202.785.4019

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TS1/TUA
CLIENT/PROJECT NUMBER 11960-97185-87, 97258 thru 97220 9733 thru 97338
RECEIVED FROM TS1
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1421 . 11960
DATE RECEIVED 8-25-94
DATE INSPECTED 8-25-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	Rec'd	B.O.	I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	Hold	Reject	REMARKS
Temperature Recorder	NA	0	1	0	Chart # 71 #40	Y	X	GOOD	None	X			Receiving Verification only
Thermo Lag 330-1 Trowel grade	NA	0	15	0	94-05093	Y	Y	GOOD	NONE	X			
" "	NA	0	45	0	94-08008	Y	Y	GOOD	NONE	X			
Thermo Lag 330-1 Ribbed Panel	NA	0	10	0	158400 F94-02012	Y	X	Good	None	X			
" "	NA	0	1	0	158400 F94-03028	X	Y	Good	None	X			
" "	NA	0	4	0	158400 F94-03047	Y	Y	Good	None	X			
" "	NA	0	7	0	158400 F94-04005	Y	Y	Good	None	X			
" "	NA	0	16	0	158400 F94-07014	Y	Y	Good	None	X			
" "	NA	0	1	0	158400 F94-07023	Y	Y	Good	None	X			
4" Thermo Lag 330-1 Preshaped Conduit	NA	0	1	0	158400 F92-08038	X	Y	Good	None	X			
4" Thermo Lag Preshaped Conduit	NA	0	1	0	158400 F92-10031	Y	Y	Good	None	X			
" "	NA	0	4	0	158400 F94-06051	Y	Y	Good	None	X			
" "	NA	0	8	0	158400 F94-06082	Y	Y	Good	None	X			
" "	NA	0	15	0	158400 F94-07003	Y	Y	Good	None	X			
1" Thermo Lag 330-1 Preshaped Conduit	NA	0	7	0	238100 F94-07023								
" "	NA	0	3	0	238100 F94-08003								

FORM
1/29/93

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960 97185-87 & 97332-38 97258-60
RECEIVED FROM TSI
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1421 - 11960
DATE RECEIVED 8-25-94
DATE INSPECTED 8-25-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	Rec'd	B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	Hold	Reject	REMARKS
3/4" Thermo Lag 330-1 Preshaped conduit	NA	0	4	0	158340 F94-02053	Y	Y	Good	None	X			Receiving Verification Only
" "	NA	0	6	0	158340 F94-03047	Y	Y	Good	None	X			
" "	NA	0	10	0	238340 F94-07014	Y	Y	Good	None	X			
1" Thermo Lag 330-1 Preshaped Conduit	NA	0	1	0	158100 F92-11009	X	Y	Good	None	X			
" "		0	5	0	158100 F93-09045	Y	Y	Good	None	X			
" "		0	3	0	158100 F93-09047	Y	Y	Good	None	X			
" "		0	1	0	158100 F94-06051	X	X	Good	None	X			
Stress Skin type 304	NA	0	1	0	TYPE 304 8x8 0.017dia	Y	Y	Good	None	X			

FORM
1/29/93

803

THIS SHIPPING ORDER

must be legibly filled in, in Ink, in Indelible Pencil, or by Permanent Carbonless Impression, and retained by the Agent.

804

ECEIVE, subject to the classifications and tariffs in effect on the date of the issue of this Shipping Order,

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

From THERMAL SCIENCE, INC. TVA CONTRACT NO. TV92363V

At ST. LOUIS, MISSOURI 63026 8/18 19 94 Shipper's No. 21398

Carrier DYNAMIC TRANSIT PREPAID Agent's No.

Consigned to TENNESSEE VALLEY AUTHORITY c/o OMEGA POINT LABORATORIES (Mail or street address of consignee---For purposes of notification only.)

Destination 16015 SHADY FALLS ROAD State of County of

Route ELMENDORFF, TX 78112

Delivering Carrier Vehicle or Car Initial No.

No Packages	HM	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	* Weight (Subject to Correction)	Class or Rate	Check Column
2		PALLETS CONTAINING: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE TVA PART NO. TG-330 60 x 50 LB. PAILS STORE ABOVE 32F AT ALL TIMES 1 x 5 Gal. Pail Containing Temp. Recorder	3250 LBS.		
3		PALLETS CONTAINING: THERMO LAG PREFABRICATED PANELS TVA PART NO. 1584X6 30 PANELS 5/8" NOMINAL 4' x 6'	3500 LBS.		
2		PALLETS CONTAINING: ✓ 8 CARTONS: TVA PART NO. 158400 29 PIECES 4"	200 LBS.		
		✓ 1 CARTON: TVA PART NO. 238340 10 PIECES 3/4"	90 LBS.		
		✓ 1 CARTON: TVA PART NO. 158340 10 PIECES 3/4"	90 LBS.		
		✓ 1 CARTON: TVA PART NO. 158100 10 PIECES 1"	80 LBS.		
		✓ 1 CARTON: TVA PART NO. 238100 10 PIECES 1"	90 LBS.		
		[redacted]	[redacted]		
		✓ 1 CARTON: STAINLESS SKIN ASTM E437 Type 304 ss-plain weave 8x8 square mesh wire cloth	50 LBS.		

Subject to Section 7 of conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Per (Signature of Consignor)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

Received $ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per (The signature here acknowledges only the amount prepaid.)

Charges Advanced:
$

C. O. D. SHIPMENT
C. O. D. Amt
Collection Fee
Total Charges

* The rate boxes used for this shipment conform to the specifications set forth in the box maker's certificate thereon, and all other requirements of Rule 41, of the Consolidated Freight Classification.

† This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation.

‡ If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

§ Shipper's imprint in lieu of stamp; not a part of Bill of Lading approved by the Department of Transportation.

NOTE--Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.

The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

THIS [redacted]MENT IS CORRECTLY DESCRIBED.

CORRECT WEIGHT IS LBS.

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation." NOTE: Preprinted certificates complying with 49 CFR 173, 430 (a) in effect on June 30, 1976, may be used through June 30, 1979.

Per Shipper

THERMAL SCIENCE, INC. Shipper, Per

Agent must detach and retain this Shipping Order and must sign the Original Bill of Lading.

Permanent post office address of shipper 2200 Cassens Dr., St. Louis, MO 63026

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. TVA CONTRACT NO. TV92362V DATE: 18 AUGUST 1994

TEMPERATURE RECORDER 40 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES 7 PALLETS GROSS WEIGHT 7350 LBS.

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE	750 LBS. (15 x 50 LB. PAILS)	94-05093
EXP. DATE: FEBRUARY 1995 1 x 5 Gallon pail containing Temperature Recorder	2250 LBS. (45 x 50 LB. PAILS)	94-08008
SHELF LIFE SIX MONTHS FROM DATE OF SHIPMENT	3000 LBS. (60 x 50 LB. PAILS)	

STORE ABOVE 32F AND BELOW
100F AT ALL TIMES

This will certify that the above listed THERMO LAG Materials, shipped under Contract Order No. TV92362V, to Omega Point Lab., Elmendorf, TX Meet the requirements of TSI's manufactured and written Quality Control Spec. for TVA This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER QUALITY CONTROL

DATE: 18 AUGUST 1994
BILL OF LADING: 21398
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

21398

CERTIFICATE OF ANALYSIS

CUSTOMER

TENNESSEE VALLEY AUTHORITY
% OMEGA POINT LABORATORY
16015 SHADY FALLS RD.
ELMENDORF, TEXAS 78112

DATE OF SHIPMENT 18 AUGUST 1994
PURCHASE ORDER NO: TESTING/
RELEASE NO:
CUSTOMER PART NO:

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

LOT NUMBER	QUANTITY	TEST NO:	DESCRIPTION	ANALYSIS	SPECIFICATION
94-05093	750 LB. (15 x 50 LB. PAILS	A-2	WT/GALLON	10.16	10.5 ± 1.5
		A-3	pH	8.5	8 +

EXP. DATE: FEB. 1995

SHELF LIFE: SIX MONTHS FROM DATE OF SHIPMENT
STORE MATERIAL ABOVE 32°F AND BELOW 100°F AT ALL TIMES

THIS IS TO CERTIFY THAT THE ABOVE DESIGNATED MATERIAL HAS BEEN TESTED AND DID COMPLY WITH LISTED SPECIFICATIONS WHEN SUPPLIED. THE MATERIAL IS SUBJECT TO THE CONDITIONS LISTED ON TSI'S INVOICE. THE ABOVE IS A COPY OF INFORMATION ON FILE AND THE LOT ACCEPTANCE DATA IS AVAILABLE FOR EXAMINATION.

REVIEWED BY: David O Bryant DATE: 18 AUGUST 1994 PAGE NO. 1

807

21398

TSI

CERTIFICATE OF ANALYSIS

CUSTOMER

TENNESSEE VALLEY AUTHORITY

%OMEGA POINT LABORATORY

16015 SHADY FALLS RD.

ELMENDORF, TEXAS 78112

DATE OF SHIPMENT 18 AUGUST 1994

PURCHASE ORDER NO: TESTING/

RELEASE NO:

CUSTOMER PART NO:

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

LOT NUMBER	QUANTITY	TEST NO:	DESCRIPTION	ANALYSIS	SPECIFICATION
94-08008	2250 LB. (45 x 50 LB. PAILS)	A-2	WT/GALLON	10.01	10.5 ± 1.5
		A-3	pH	8.31	8 +

EXP. DATE: FEB. 1995

SHELF LIFE: SIX MONTHS FROM DATE OF SHIPMENT
STORE MATERIAL ABOVE 32°F AND BELOW 100°F AT ALL TIMES

THIS IS TO CERTIFY THAT THE ABOVE DESIGNATED MATERIAL HAS BEEN TESTED AND DID COMPLY WITH LISTED SPECIFICATIONS WHEN SUPPLIED. THE MATERIAL IS SUBJECT TO THE CONDITIONS LISTED ON TSI'S INVOICE. THE ABOVE IS A COPY OF INFORMATION ON FILE AND THE LOT ACCEPTANCE DATA IS AVAILABLE FOR EXAMINATION.

REVIEWED BY: Harold O'Bryant DATE: 18 AUGUST 1994

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994

TEMPERATURE RECORDER 40 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 1584X6	1	F94-02012
THERMO LAG RIBBED PANEL	1	F94-03028
NOMINAL 5/8"	4	F94-03047
4' x 6½'	7	F94-04005
	16	F94-07014
	1	F94-07023
	30 PANELS (ON 3 PALLETS)	

NO SHELF LIFE ON PANELS

This will certify that the above listed THERMO LAG Materials, shipped under Contract Order No. TV92362V, to Omega Point Lab., Elmendorf, TX Meet the requirements of TSI's manufactured and written Quality Control Spec. for TVA This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER QUALITY CONTROL

DATE: 18 AUGUST 1994
BILL OF LADING: 21398
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

809

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994

TEMPERATURE RECORDER 40 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 158400	1 PIECE	F92-08038
THERMO LAG PRESHAPED	1 PIECE	F92-10031
CONDUIT SECTIONS	4 PIECES	F94-06051
THICKNESS: 0.625" ± 0.125" NOMINAL	8 PIECES	F94-06082
SIZE: 4"	15 PIECES	F94-07003
	29 PIECES (IN 2 CARTONS)	

NO SHELF LIFE ON CONDUIT

This will certify that the above listed THERMO LAG Materials, shipped under Contract Order No. TV92362V, to Omega Point Lab., Elmendorf, TX Meet the requirements of TSI's manufactured and written Quality Control Spec. for TVA This material does not contain asbestos.

David O Bryant

DAVID O'BRYANT
MANAGER QUALITY CONTROL

DATE: 18 AUGUST 1994
BILL OF LADING: 21398
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

810

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994

TEMPERATURE RECORDER 40 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 238100 THERMO LAG PRESHAPED CONDUIT SECTIONS THICKNESS: 0.375" ± 0.125" NOMINAL SIZE: 1"	7 PIECES 3 PIECES 10 PIECES (IN 1 CARTON)	F94-07023 F94-08003

NO SHELF LIFE ON CONDUIT

This will certify that the above listed THERMO LAG Materials, shipped under Contract Order No. TV92362V, to Omega Point Lab., Elmendorf, TX Meet the requirements of TSI's manufactured and written Quality Control Spec. for TVA This material does not contain asbestos.

David O Bryant

DAVID O'BRYANT
MANAGER QUALITY CONTROL

DATE: 18 AUGUST 1994
BILL OF LADING: 21398
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994

TEMPERATURE RECORDER 40 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 158340 THERMO LAG PRESHAPED CONDUIT SECTIONS THICKNESS: 0.625" ± 0.125" NOMINAL SIZE: 3/4"	4 PIECES 6 PIECES 10 PIECES (IN 1 CARTON)	F94-02053 F94-03047

NO SHELF LIFE ON CONDUIT

This will certify that the above listed THERMO LAG Materials, shipped under Contract Order No. TV92362V, to Omega Point Lab., Elmendorf, TX Meet the requirements of TSI's manufactured and written Quality Control Spec. for TVA This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER QUALITY CONTROL

DATE: 18 AUGUST 1994
BILL OF LADING: 21398
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994

TEMPERATURE RECORDER 40 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 238340 THERMO LAG PRESHAPED CONDUIT SECTIONS THICKNESS: 0.375" ± 0.125" NOMINAL SIZE: 3/4"	10 PIECES (IN 1 CARTON)	F94-07014

NO SHELF LIFE ON CONDUIT

This will certify that the above listed THERMO LAG Materials, shipped under Contract Order No. TV92362V, to Omega Point Lab., Elmendorf, TX Meet the requirements of TSI's manufactured and written Quality Control Spec. for TVA This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER QUALITY CONTROL

DATE: 18 AUGUST 1994
BILL OF LADING: 21398
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994

TEMPERATURE RECORDER 40 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
TVA PART NO. 158100	1 PIECE	F92-11009
THERMO LAG PRESHAPED CONDUIT	5 PIECES	F93-09045
SECTIONS	3 PIECES	F93-09047
THICKNESS: 0.625" ± 0.125" NOMINAL	1 PIECES	F94-06051
SIZE: 1"	10 PIECES (IN 1 CARTON)	

NO SHELF LIFE ON CONDUIT

This will certify that the above listed THERMO LAG Materials, shipped under Contract Order No. TV92362V, to Omega Point Lab., Elmendorf, TX Meet the requirements of TSI's manufactured and written Quality Control Spec. for TVA This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER QUALITY CONTROL

DATE: 18 AUGUST 1994
BILL OF LADING: 21398
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994

TEMPERATURE RECORDER 40 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
STRESS SKIN-ASTM E437 Type 304 stainless steel, plain weave 8x8 square mesh wire cloth 0.017 dia. wire	50 LBS. (IN 1 CARTON)	N/A

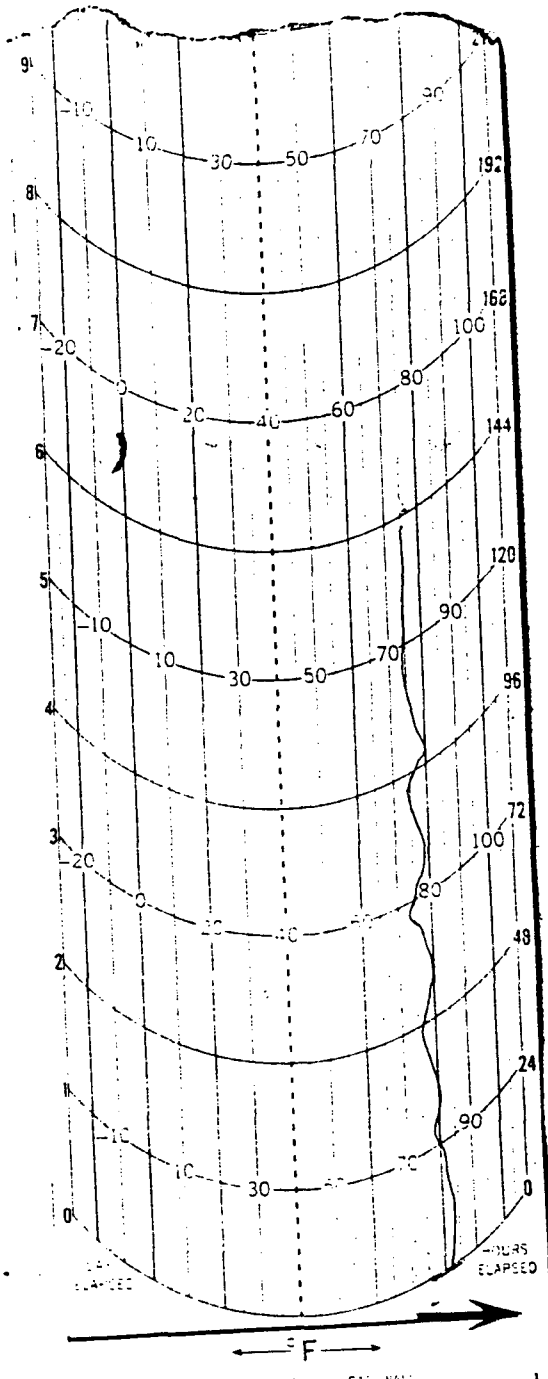
This will certify that the above listed THERMO LAG Materials, shipped under Contract Order No. TV92362V, to Omega Point Lab., Elmendorf, TX Meet the requirements of TSI's manufactured and written Quality Control Spec. for TVA This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER QUALITY CONTROL

DATE: 18 AUGUST 1994
BILL OF LADING: 21398
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207



CAR NO.:
CITY: San Antonio, TX
CONSIGNEE: IVA/c/o Omega Point
CAR CONT:
PER:
CITY: St. Louis
SHIPPER: TST
DATE: 7/18/94 TIME: 9:50
INSTR. No.

CHART 71

32 DAY (–30° + 110° F)
PART NO. 840-95
PARTLOW THERMA-GARD
NEW HARTFORD, N.Y. 13413
START

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97553-55
RECEIVED FROM TSI
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1439 . 11960
DATE RECEIVED 9-26-94
DATE INSPECTED 9-26-94
INSPECTED BY: CPatton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Thermo-Lag panel 1"X4'X6½'	NA	0	1	0	F94-08003	Y	N	Good	None	X			Thermo-Lag 330-1 trowel grade upgrade 3/95
" "	NA	0	20	0	F94-08021	Y	Y	Good	None	X			
" "	NA	0	1	0	F94-08022	Y	Y	Good	None	X			
Thermo-Lag 770-1 Panels 3/8"X40"X94"	NA	0	11	0	F94-08026	Y	Y	Good	None	X			
" "	NA	0	19	0	F94-08030	Y	Y	Good	None	X			
Thermo-Lag panel 5/8"X4'X6½'	NA	0	1	0	F94-08003	Y	Y	Good	None	X			
" "	NA	0	2	0	F94-08022	Y	Y	Good	None	X			
" "	NA	0	14	0	F94-08044	Y	Y	Good	None	X			
Stainless steel Banding ½"X0.20"X200'	NA	0	8 Rolls	0	NA	Y	Y	Good	None	X			
Stainless Steel Clips ½"	NA	0	1K	0	NA	Y	Y	Good	None	X			
Stainless Steel tie wire 16 gauge	NA	0	1 Roll	0	NA	Y	Y	Good	None	X			
Stress Skin ASTM E437. 8X8 sq. mesh 0.017 dia	NA	0	1 Roll	0	NA	Y	Y	Good	None	X			
Thermo-Lag preshaped Conduit 5"	NA	0	5	0	F94-08003	Y	Y	Good	None	X			
" "	NA	0	11	0	F94-08021	Y	Y	Good	None	X			
Thermo-Lag 330-1 Trowel Grade	NA	0	10	0	94-08008	Y	Y	Good	None	X			
Temp recorder	NA	0	1	0	#41	Y	Y	Good	None	X			

FORM
1/29/93

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TUA
CLIENT/PROJECT NUMBER 11960-97553-55
RECEIVED FROM TSI
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1439 - 11960
DATE RECEIVED 9-26-94
DATE INSPECTED 9-26-94
INSPECTED BY: CPatton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Thermo-Lag 770-1 trowel grade	NA	0	20	0	94-09009	Y	Y	GOOD	None	X			Thermo-Lag 770-1 trowel grade expires 3/95

FORM
1/29/93

STRAIGHT BILL OF LADING — SHORT FORM — ORIGINAL — NOT NEGOTIABLE

818

RECEIVED, subject to the classifications and tariffs in effect on the date of issue of this Original Bill of Lading,

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

From **THERMAL SCIENCE, INC.**
At **ST. LOUIS, MISSOURI 63026**

CONTRACT ORDER NO. TV92362V

9/23 19 94 Shipper's No. 21467

Carrier DYNAMIC TRANSIT PREPAID Agent's No.

Consigned to OMEGA POINT LABORATORIES c/o TVA CONTACT NO. TV92362V
(Mail or street address of consignee—For purposes of notification only.)

Destination 16015 SHADY FALLS State of County of

Route ELMENDORFF, TX 78112

Delivering Carrier Vehicle or Car Initial No.

No. Packages	HM	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	*Weight (Sub. to Correction)	Class or Rate	Check Column
3		PALLETS CONTAINING: THERMO LAG PANELS 22 PANELS NOMINAL 1" 4' x 6½' ITEM 01	4400#		
2		PALLETS CONTAINING: THERMO LAG PANELS 17 PANELS NOMINAL 5/8" 4'x6½' ITEM 02	1700#		
2		CARTONS CONTAINING: THERMO LAG PRESHAPED CONDUIT 16 PCS. 1.250" + 0.250" SIZE: 5" ITEM-03	200#		
2		PALLETS CONTAINING: THERMO LAG 770-1 PANELS 30 PANELS 3/8" NOM. 40"x94" NOM. ITEM 04	2250#		
		PALLETS CONTAINING: THERMO LAG 330-1 COATING-TROWEL GRADE 10 x 50 LB. PAILS ITEM 05 STORE ABOVE 32f AND BELOW 100F AT ALL TIMES	550#		
		PALLETS CONTAINING: THERMO LAG 770-1 COATING-TROWEL GRADE 20 x 50 LB. PAILS ITEM 06 STORE ABOVE 32f AND BELOW 100f AT ALL TIMES	1100#		
		STAINLESS STEEL BANDING ITEM 07 1/2" x 0.20" x 200 ft. 8 ROLLS	80#		
		STAINLESS STEEL CLIPS ½" ITEM-08 1000 clips (1 box)	10#		
		STAINLESS STEEL TIE WIRE ITEM 09 16 gauge 1 ROLL	10#		
		STRESS SKIN-ASTM E437 type 304 ITEM 10 stainless steel, plain weave 8 x 8 sq. mesh wire cloth 0.017 dia. wire 1 ROLL	25#		

Subject to Section 7 of conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Per
(Signature of Consignor.)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

Received $ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per
(The signature here acknowledges only the amount prepaid.)

Charges Advanced:
$

C. O. D. SHIPMENT
C. O. D. Amt.
Collection Fee
Total Charges

† The fibre boxes used for this shipment conform to the specifications set forth in the box maker's certificate thereon, and all other requirements of Rule 41, of the Consolidated Freight Classification.

† This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation.
* If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."
† Shipper's imprint in lieu of stamp; not a part of Bill of Lading approved by the Department of Transportation.
NOTE—Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed of declared value of the property is hereby specifically stated by the shipper to be not exceeding

THIS SHIPMENT IS CORRECTLY DESCRIBED.
CORRECT WEIGHT IS LBS.

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation." NOTE: Preprinted certificates complying with 49 CFR 173, 430 (a) in effect on June 30, 1978, may be used through June 30, 1979.

Per Shipper

THERMAL SCIENCE, INC. Shipper, Per Agent, Per

Permanent post office address of shipper **2200 Cassens Dr., St. Louis, MO 63026**

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994

TEMPERATURE RECORDER 41 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES _____ GROSS WEIGHT 10,300 LBS.

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
✓THERMO LAG RIBBED PANEL NOMINAL 1 " 4' x 6½'	1 PANEL 20 PANELS 1 PANEL 22 PANELS (on 3 pallets)	F94-08003 F94-08021 F94-08022

ITEM 01

NO SHELF LIFE ON PANELS

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

G. Furaus

G. Furaus
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANPORT: Dynamic Transit Prepaid

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

PACKING LIST.

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994

TEMPERATURE RECORDER 41 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
✓ THERMO-LAG 770-1 PANELS 3/8" NOMINAL 40" x 94" NOMINAL	11 PANELS 19 PANELS 30 PANELS (on 2 pallets)	F94-08026 F94-08030

ITEM 04

NO SHELF LIFE ON PANELS

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

G. Furaus

G. Furaus
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANPORT: Dynamic Transit Prepaid

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Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

PACKING LIST

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994

TEMPERATURE RECORDER 41 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG RIBBED PANEL NOMINAL 5/8" 4' x 6½' NOMINAL	1 PANEL 2 PANELS 14 PANELS	F94-08003 F94-08022 F94-08044
	17 PANELS (on 2 pallets)	
ITEM 02		

NO SHELF LIFE FOR PANELS

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

G. Furaus

G. Furaus
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANPORT: Dynamic Transit Prepaid

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994

TEMPERATURE RECORDER 41 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
✓Stainless Steel Banding 1/2" x 0.20" x 200 ft. ITEM 07	8 ROLLS	N/A
✓Stainless steel clips 1/2" ITEM 08	1 BOX (1000 clips)	N/A
✓Stainless steel tie wire 16 gauge ITEM 09	1 ROLL	N/A

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

G. Furaus

G. Furaus
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANPORT: Dynamic Transit Prepaid

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PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994

TEMPERATURE RECORDER 41 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
✓STRESS SKIN-ASTM E437 type 304 stainless steel, plain weave 8 x 8 square mesh wire cloth 0.017 dia. wire, or equal.	1 ROLL	N/A

ITEM 10

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

G. Furaus

G. Furaus
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANPORT: Dynamic Transit Prepaid

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994

TEMPERATURE RECORDER 41 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
✓THERMO-LAG Preshaped Conduit Sections Thickness: 1.250" ± 0.250" Size: 5"	5 PIECES 11 PIECES 16 PIECES (in 2 cartons)	F94-08003 F94-08021

Item 03

NO SHELF LIFE ON CONDUIT

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

G. Furaus

G. Furaus
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANPORT: Dynamic Transit Prepaid

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CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994

TEMPERATURE RECORDER 41 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
✓THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE	500 LBS. (10 x 50 Lb. Pails)	94-08008

ITEM 05

EXP. DATE: MARCH 1995

✓1 x 5 Gal. Pail containing
Temperature recorder

SHELF LIFE SIX MONTHS
FROM DATE OF SHIPMENT

STORE ABOVE 32F AND BELOW 100F
AT ALL TIMES

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

G. Furaus

G. Furaus
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANPORT: Dynamic Transit Prepaid

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Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

CERTIFICATE OF ANALYSIS

CUSTOMER

OMEGA POINT LABORATORY
%TENNESSEE VALLEY AUTHORITY
16015 SHADY FALLS RD
ELMENDORFF, TX 78112

DATE OF SHIPMENT: 23 SEPTEMBER 1994
PURCHASE ORDER NO: CONTRACT #TV 92362V
RELEASE NO:
CUSTOMER PART NO:

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

LOT NUMBER	QUANTITY	TEST NO:	DESCRIPTION	ANALYSIS	SPECIFICATION
94-08008	500 LBS. (10 x 50 Lb. Pails)	A-2	WT/GALLON	10.16	10.5 ± 1.5
		A-3	pH	8.5	8 +

EXPIRATION DATE:

SHELF LIFE: SIX MONTHS FROM DATE OF SHIPMENT
STORE MATERIAL ABOVE 32°F AND BELOW 100°F AT ALL TIMES

THIS IS TO CERTIFY THAT THE ABOVE DESIGNATED MATERIAL HAS BEEN TESTED AND DID COMPLY WITH LISTED SPECIFICATIONS WHEN SUPPLIED. THE MATERIAL IS SUBJECT TO THE CONDITIONS LISTED ON TSI'S INVOICE. THE ABOVE IS A COPY OF INFORMATION ON FILE AND THE LOT ACCEPTANCE DATA IS AVAILABLE FOR EXAMINATION.

REVIEWED BY: David O'Bryant DATE: 23 Sept 1994

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994

TEMPERATURE RECORDER 41 CHART TAPE NO. 71

TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
✓THERMO LAG 770-1 COATING TROWEL GRADE ITEM 06 EXP. DATE: MARCH 1995 1 x 5 Gal. Pail containing Temperature Recorder	1000 LBS. (20 x 50 Lb. Pails)	94-09009

SHELF LIFE SIX MONTHS
FROM DATE OF SHIPMENT

STORE ABOVE 32F AND BELOW 100F
AT ALL TIMES

This will certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

G. Furaus

G. Furaus
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANPORT: Dynamic Transit Prepaid

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

CERTIFICATE OF ANALYSIS

CUSTOMER

OMEGA POINT LABORATORY
%TENNESSEE VALLEY AUTHORITY
16015 SHADY FALLS RD
ELMENDORFF, TX 78112

DATE OF SHIPMENT 23 SEPTEMBER 1994
PURCHASE ORDER NO: CONTRACT #TV 92362V
RELEASE NO:
CUSTOMER PART NO:

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

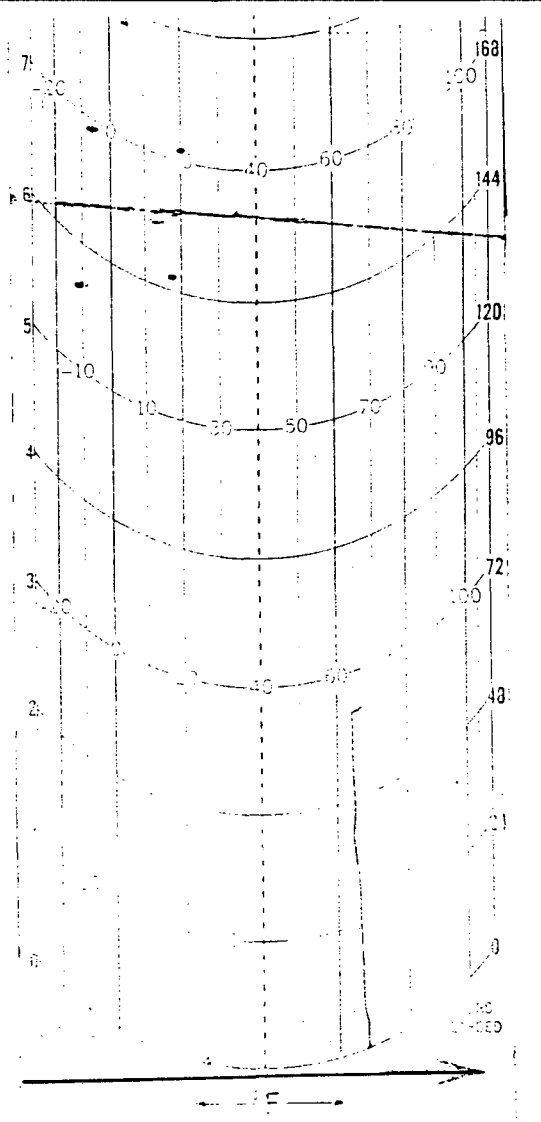
LOT NUMBER	QUANTITY	TEST NO:	DESCRIPTION	ANALYSIS	SPECIFICATION
94-09009	1000 LBS. (20 x 50 Lb. Pails)	A-2	WT/GALLON	10.16	10.5 ± 1.5
		A-3	pH	8.5	8 ÷

EXPIRATION DATE:

SHELF LIFE: SIX MONTHS FROM DATE OF SHIPMENT
STORE MATERIAL ABOVE 32°F AND BELOW 100°F AT ALL TIMES

THIS IS TO CERTIFY THAT THE ABOVE DESIGNATED MATERIAL HAS BEEN TESTED AND DID COMPLY WITH LISTED SPECIFICATIONS WHEN SUPPLIED. THE MATERIAL IS SUBJECT TO THE CONDITIONS LISTED ON TSI'S INVOICE. THE ABOVE IS A COPY OF INFORMATION ON FILE AND THE LOT ACCEPTANCE DATA IS AVAILABLE FOR EXAMINATION.

REVIEWED BY: David O Bryant DATE: 23 Sept 1994 PAGE NO. 1



CAR NO.
CITY San Antonio, Tx
CONSIGNEE: TVA / Omega Pint
CAR CONT.
PER:
CITY St. Louis
SHIPPER TSL
DATE 9-23-94 TIME: 10:15 am
INSTR. NO.

CHART 71

31 DAY (–30° + 110° F)
PART NO. 840-95
PARTLOW THERMA-GARD
NEW HARTFORD, N.Y. 13413
START

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Thermo-Lag 770

DATE PRINTED: 9/24/92
DATE REVISED: 1/15/91
By A. Thorpe

THERMAL SCIENCE, INC.
2200 Cassens Dr.
Fenton , MO 63026

PHONE: (314) 349-1233
EMERGENCY PHONE: (314) 349-1267

HMIS HAZARD RATINGS

LEAST	0	HEALTH HAZARD	2
SLIGHT	1	FLAMMABILITY HAZARD	0
MODERATE	2	REACTIVITY HAZARD	0
HIGH	3	MAXIMUM PERSONAL	
EXTREME	4	PROTECTION	B

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME:	Thermo-Lag 770	D.O.T. HAZARD CLASS:	none
		D.O.T. Shipping Name:	Cold Water Paint
PRODUCT CLASS :	Latex Fire Resistive Coating	D.O.T. UN Number:	none

SECTION II - PHYSICAL DATA

APPEARANCE AND ODOR :Milky white, pasty mastic, no odor.

BOILING POINT (at 760 mm Hg):	220-240 F	SPECIFIC GRAVITY (water = 1):	1.16
VAPOR PRESSURE (at 20°C or 68°F):	nil	WEIGHT PER GALLON (lbs.):	9.7
EVAPORATION RATE (ether = 1) :	much slower	PERCENT VOLATILES BY VOLUME:	40
VAPOR DENSITY (air = 1) :	0.6	SOLUBILITY IN WATER:	Yes
Volatile Organic Content (VOC) :	0.18 lb/gal	pH	7–8

SECTION III - HAZARDOUS COMPONENTS

TRADE NAME	CAS #	PERCENT BY VOLUME	OCCUPATIONAL EXPOSURE LIMITS OSHA PEL	ACGIH TLV
Ethylene Glycol	107-21-1	1.2 %		50 ppm
* Vinyl Acetate	108-05-4	<0.15	10 ppm 20ppm STEL	10 ppm 20ppm SHORT
Fibrous glass,continuous filament (total dust) (respirable dust)	65997-17-3	2 %	 15 mg/m^3 5 mg/m^3	 10 mg/m^3

* Indicates toxic chemicals subject to the reporting requirements of Section 313 of Title III and of 40 CFR 372
Carcinogenicity of fibrous glass: NTP: No IARC: Yes Z List: No OSHA Reg: No
IARC categorized fibrous glass as not classifiable with respect to human carcinogenicity.
Vinyl Acetate Monomer, a residual componet of this product, is a possible human cancer hazard based on tests with laboratory animals. Vinyl Acetate has not been identified as a carcinogen by NTP, IARC or OSHA. Total residual monomer does not exceed 0.15%.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION
OSHA : Non-combustible
DOT Non-combustible

FLASH POINT : None
TEST METHOD:

FLAMMABILITY LIMITS LEL: Not Applicable UEL: Not Applicable

EXTINGUISHING MEDIA : Non-flammable (aqueous emulsion).

SPECIAL FIRE FIGHTING PROCEDURES :Wet Product will not burn but will smoke and spatter if exposed to flames. Firefighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS : Sealed containers may rupture if overheated. Cool with water spray.

HAZARDOUS DECOMPOSITION PRODUCTS : Thermal oxidative decomposition can produce toxic gases, including oxides of nitrogen and carbon monoxide.

SECTION V - REACTIVITY DATA

STABILITY	UNSTABLE STABLE	 X	CONDITIONS TO AVOID: Not applicable

INCOMPATIBILITY (MATERIALS TO AVOID) : Strong Oxidizers, Strong Bases

HAZARDOUS POLYMERIZATION	MAY OCCUR WILL NOT OCCUR X	CONDITIONS TO AVOID : Not applicable

SECTION VI - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE :
Eyes: Direct contact with product may result in eye irritation.
Skin: Prolonged or repeated contact with product may cause skin irritation.
Breathing: Excessive inhalation can cause irritation of the mucous membranes of the nose, throat and respiratory tract, headache and nausea.
Swallowing: Excessive exposure may cause central nervous system effects, cardio-pulmonary effects, and kidney failure.

FIRST AID PROCEDURES :
If in Eyes: Flush with flowing water immediately and continuously for 15 minutes. Consult medical personnel.
If on Skin: Thoroughly wash exposed area with soap and water. Remove and wash contaminated clothing before reuse. . Consult medical personnel if swelling or reddening occurs.
If Swallowed: If conscious, give two glasses of water to drink. Get immediate medical attention.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED : Keep unnecessary people away. Contain spill with inert material (sand, earth, etc.) and transfer the material to containers for recovery or disposal. Keep spill out of sewers and open bodies of water. Floors may be slippery, care should be exercised to avoid falls.

WASTE DISPOSAL METHOD : Burn in adequate incinerator or bury in an approved landfill.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION TYPE : Mechanical local exhaust at point of mist release is preferred.

RESPIRATORY PROTECTION : None required if good ventilation is maintained. Otherwise wear MSHA/NIOSH approved respirator suitable for vapor, mist or dust concentrations encountered.

PROTECTIVE GLOVES: Impervious, cotton lined rubber EYE PROTECTION: Safety glasses.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE : Use only with adequate ventilation. Prevent prolonged breathing of vapor or mist. Prevent contact with eyes. Do not take internally. Keep out of the reach of children.

STORAGE TEMP. MAX 100 F MIN 32 F

OTHER PRECAUTIONS :

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Thermo-Lag 330-1

DATE PRINTED: 9/24/92
DATE REVISED: 7/7/89
By A. Thorpe

THERMAL SCIENCE, INC.
2200 Cassens Dr.
Fenton , MO 63026

PHONE: (314) 349-1233
EMERGENCY PHONE: (314) 349-1267

HMIS HAZARD RATINGS

LEAST	0	HEALTH HAZARD	2*
SLIGHT	1	FLAMMABILITY HAZARD	0
MODERATE	2	REACTIVITY HAZARD	0
HIGH	3	MAXIMUM PERSONAL	
EXTREME	4	PROTECTION	B

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: Thermo-Lag 330-1

PRODUCT CLASS : Latex Fire Resistive Coating

D.O.T. HAZARD CLASS: none
D.O.T. Shipping Name: Cold Water Paint
D.O.T. UN Number:

SECTION II - PHYSICAL DATA

APPEARANCE AND ODOR :Milky white pasty mastic, ammoniacal odor

BOILING POINT (at 760 mm Hg) :	220-240 F	SPECIFIC GRAVITY (water = 1):	1.3
VAPOR PRESSURE (at 20°C or 68°F):	nil	WEIGHT PER GALLON (lbs.) :	10.6
EVAPORATION RATE (ether = 1) :	much slower	PERCENT VOLATILES BY VOLUME:	45
VAPOR DENSITY (air = 1) :	0.6	SOLUBILITY IN WATER:	Very
Volatile Organic Content (VOC) :	< 0.1 lb/gal		

SECTION III - HAZARDOUS COMPONENTS

TRADE NAME	CAS #	PERCENT BY VOLUME	OCCUPATIONAL EXPOSURE LIMITS OSHA PEL	ACGIH TLV
Crystalline Silica (quartz)	14808-60-7	1-5 %		
(total dust)			30 mg/m^3 %SiO2 +2	
(respirable dust)			10 mg/m^3 %SiO2 +2	0.1 mg/m^3
Ammonia	1336-21-6	< 0.1 %	50 ppm	25 ppm
Fibrous glass,continuous filament	65997-17-3	1-5 %		
(total dust)			15 mg/m^3	10 mg/m^3
(respirable dust)			5 mg/m^3	

* Indicates toxic chemicals subject to the reporting requirements of Section 313 of Title III and of 40 CFR 372
Carcinogenicity of Silica: NTP: No IARC: Yes Z List: Yes OSHA Reg: Not as carcinogen
Appears on Table Z-3 for Mineral Dusts in 29 CFR § 1910.1000
IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans(vol 42,1987) concludes that there is sufficient evidence for the carcinogenicity of crystalline silica to experimental animals, and there is limited evidence for the carcinogenicity of crystalline silica to humans. IARC Class 2A.
Carcinogenicity of fibrous glass: NTP: No IARC: Yes Z List: No OSHA Reg: No
IARC categorized fibrous glass as not classifiable with respect to human carcinogenicity.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION
OSHA : Non-combustible
DOT Non-combustible

FLASH POINT : None
TEST METHOD:

FLAMMABILITY LIMITS LEL: NA UEL: NA

EXTINGUISHING MEDIA : Non-flammable (aqueous emulsion).

SPECIAL FIRE FIGHTING PROCEDURES :Wet Product will not burn but will smoke and spatter if exposed to flames. Firefighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS : Sealed containers may rupture if overheated. Cool with water spray.

HAZARDOUS DECOMPOSITION PRODUCTS : Thermal oxidative decomposition can produce toxic gases, including oxides of nitrogen and carbon monoxide.

SECTION V - REACTIVITY DATA

STABILITY	UNSTABLE STABLE	X	CONDITIONS TO AVOID: Not applicable

INCOMPATIBILITY (MATERIALS TO AVOID) : Strong Oxidizers, Strong Bases

HAZARDOUS POLYMERIZATION	MAY OCCUR WILL NOT OCCUR X	CONDITIONS TO AVOID : Not applicable

SECTION VI - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE :
Eyes: Direct contact with product may result in eye irritation.
Skin: Prolonged or repeated contact with product may cause skin irritation.
Breathing: Excessive inhalation can cause irritation of the mucous membranes of the nose, throat and respiratory tract, headache and nausea.
Swallowing: Excessive exposure may cause central nervous system effects, cardio-pulmonary effects, and kidney failure.

FIRST AID PROCEDURES :
If in Eyes: Flush with flowing water immediately and continuously for 15 minutes. Consult medical personnel.
If on Skin: Thoroughly wash exposed area with soap and water. Remove and wash contaminated clothing before reuse. Destroy contaminated shoes. Consult medical personnel if swelling or reddening occurs.
If Swallowed: If conscious, give two glasses of water to drink. Get immediate medical attention.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED : Keep unnecessary people away. Contain spill with inert material (sand, earth, etc.) and transfer the material to containers for recovery or disposal. Keep spill out of sewers and open bodies of water. Floors may be slippery, care should be exercised to avoid falls.

WASTE DISPOSAL METHOD : Burn in adequate incinerator or bury in an approved landfill.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION TYPE : Mechanical local exhaust at point of mist release is preferred.

RESPIRATORY PROTECTION : None required if good ventilation is maintained. Otherwise wear MSHA/NIOSH approved respirator suitable for vapor, mist or dust concentrations encountered.

PROTECTIVE GLOVES: Impervious, cotton lined rubber EYE PROTECTION: Safety glasses.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE : Use only with adequate ventilation. Prevent prolonged breathing of vapor or mist. Prevent contact with eyes. Do not take internally. Keep out of the reach of children.

STORAGE TEMP. MAX 100 F MIN 32 F

OTHER PRECAUTIONS :

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA/TSI
CLIENT/PROJECT NUMBER 11960-97553-55
RECEIVED FROM TSI
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1446.11960
DATE RECEIVED 10/11/94
DATE INSPECTED 10/11/94
INSPECTED BY: C Humphrey

ITEM NO.	ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	Rec'd	B.O.	I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS SEE	ACCEPTANCE Accept	Hold	Reject	REMARKS
1.	TEST ARTICLE 3 STEEL COLUMNS	N/A	0	3	0	SIZE 16" X 36"	N	N	GOOD	REMARKS NONE CH	X			TEST ARTICLES (ITEMS 1-6) REC'D WITH THIS SHPMT, BUT ARE NOT PART OF PROJECTS #97553 THRU #97555, RECEIVING VERIFICATION ONLY. CH
2.	TEST ARTICLE 1 STEEL COLUMN	N/A	0	1	0	SIZE 10" X 36"	N	N	"	"	X			
3.	TEST ARTICLE U SHAPE	N/A	0	1	0	CLADDED U-SHAPE	N	N	"	"	X			
4.	TEST ARTICLE CONDUIT 3"	N/A	0	1	0	3" X 10 FT CLADDED	N	N	"	"	X			
5.	TEST ARTICLE CONDUIT 1½"	N/A	0	1	0	1½" X 10 FT CLADDED	N	N	"	"	X			
6.	TEST ARTICLE 18" CABLE TRAY	N/A	0	1	0	18" X 12 FT. CLADDED	N	N	"	"	X			
7.	THERMO-LAG 1" 330-1 PANELS	N/A	0	7	0	LOT NUMBERS F94-08021	Y	Y	"	NONE	X			
	"	N/A	0	1	0	F94-08022	Y	Y	"	"	X			
8.	THERMO-LAG 330-1 TROWEL GRADE	N/A	0	10	0	94-08008	Y	Y	"	"	X			
9.	THERMO-LAG 770-1 TROWEL GRADE	N/A	0	20	0	94-09009	Y	Y	"	"	X			
10.	TEMPERATURE CHART RECORDER	N/A	0	1	0	CHART #27	N	N	"	RETURNED TO TSI	X			
11.	1" THERMO-LAG 330 CONDUIT SECTIONS	N/A	0	3	0	LOT NO. F92-06031	Y	Y	"	NONE	X			
	"	N/A	0	6	0	F93-06008	Y	Y	"	"	X			
	"	N/A	0	3	0	F93-06046	Y	Y	"	"	X			
	"	N/A	0	4	0	F93-09045	Y	Y	"	"	X			
	"	N/A	0	1	0	F93-09069	Y	Y	"	"	X			

FORM 1/29/93

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA/TSI
CLIENT/PROJECT NUMBER 11960-97553-55
RECEIVED FROM TSI
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1446.11960
DATE RECEIVED 10/11/94
DATE INSPECTED 10/11/94
INSPECTED BY: C. Humphrey

ITEM NO.	ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	Rec'd	B.O.	I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	Hold	Reject	REMARKS
11.	1" THERMO-LAG 330 CONDUIT SECTIONS	N/A	0	7	0	Lot No. F94-08021	Y	Y	GOOD	NONE	X			CHART RECORDER RETURNED TO TSI. TEMPERATURES RECORDED ARE WITHIN ACCEPTABLE RANGE. C/F RECEIVING VERIFICATION ONLY.
12.	2" THERMO-LAG 330 CONDUIT SECTIONS	N/A	0	3	0	F94-08021	Y	Y	"	"	X			
	"	N/A	0	13	0	F94-08022	Y	Y	"	"	X			
13.	THERMO-LAG HIGH TEMP FABRIC	N/A	0	1	0	440-75 42" X 60YD.	Y	Y	"	"	X			

FORM
1/29/93

8317

STRAIGHT BILL OF LADING — SHORT FORM — ORIGINAL — NOT NEGOTIABLE

838

RECEIVED, subject to the classifications and tariffs in effect on the date of issue of this Original Bill of Lading,

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

From **THERMAL SCIENCE, INC.** TVA CONTRACT #92362V

At **ST. LOUIS, MISSOURI 63026** 10/7/94 19 ____ Shipper's No. 21494

Carrier DYNAMIC TRUCK PREPAID Agent's No. ____

Consigned to TENNESSEE VALLEY AUTHORITY % OMEGA POINT LABORATORY
(Mail or street address of consignee—For purposes of notification only.)

Destination 16015 SHADY FALLS ROAD State of ____ County of ____

Route ____

Delivering Carrier ELMENDORFF, TX 78112 Vehicle or Car Initial ____ No. ____

No. Packages	HM	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	* Weight (Sub. to Correction)	Class or Rate	Check Column
1		PALLET CONTAINING 3 COLUMNS 16 x 50 1 COLUMN 10 x 49 3 FT. LONG (ED TAYLOR)	800 Lb		
1		PALLET CONTAINING 3 INCH CONDUIT U SHAPE TEST ARTICLE	400 LB.		
1		PALLET CONTANING: 3 INCH CONDUIT 10 FT. STRAIGHT 1½ INCH CONDUIT 10 FT. STRAIGHT	100 LB		
1		PALLET CONTAINING: 18 INCH CABLE TRAY 12 FT	500 LB.		
		TVA ORDER/ 21494			
1		PALLET CONTAINING: 8 PANELS SIZE: 4' x 6½' NOMINAL THICKNESS: 1.25" + 0.250" ITEM 1	1800 LB.		
1		PALLET CONTANINING: 10 x 50 LB. PAILS THERMO LAG 330-1 SUBLIMING COATING ITEM 5 20 x 50 LB. PAILS THERMO LAG XXXX 770-1 COATING ITEM 6 1 x 5 gal. pail CONT. TEMP. RECORDER STORE ABOVE 32 F AND BELOW 100 F AT ALL TIMES	1750 LB.		
1		CARTONS OF THERMO LAG 330 PRESHAPED CONDUIT SIZE 1" x 250" 24 Pcs. (11) CARTON OF 2" x 1.250" 16 Pc. (12)	125 lb. 100 Lb.		
1		CARTON CONTAINING: 1 ROLL THERMO LAG 440-75 HI TEMP FABRIC SIZE: 42 INCH X 60 YDS. 30 LB.			

Subject to Section 7 of conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Per ____
(Signature of Consignor.)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

PPd

Received $ ____ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per ____
(The signature here acknowledges only the amount prepaid.)

Charges Advanced:
$ ____

C. O. D. SHIPMENT
C. O. D. Amt. ____
Collection Fee ____
Total Charges ____

The fibre boxes used for this shipment conform to the specifications set forth in the box maker's certificate thereon, and all other requirements of Rule 41, of the Consolidated Freight Classification.

This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation.
If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."
Shipper's imprint in lieu of stamp; not a part of Bill of Lading approved by the Department of Transportation.
NOTE—Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding ____

THIS SHIPMENT IS CORRECTLY DESCRIBED.

CORRECT WEIGHT IS ____ LBS.

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation." NOTE: Preprinted certificates complying with 49 CFR 173, 430 (a) in effect on June 30, 1978, may be used through June 30, 1979.

Per ____ Shipper

THERMAL SCIENCE, INC. Shipper, Per June Elizalde Agent, Per ____

Permanent post office address of shipper **2200 Cassens Dr., St. Louis, MO 63026**

THERMAL SCIENCE INC.

PACKING LIST

SHIP TO:

OMEGA POINT LAB.
16015 SHADY FALLS RD
ELMENDORFF, TX 78112

P.O.# TEST ARTICLE
RELEASE NO:
DATE: 7 OCTOBER 1994
BILL OF LADING:
MODE: TRUCK LINE
CARRIER: DYNAMIC TRUCK PPD

TEMPERATURE RECORDER NO: NA
CHART TAPE NO: NA

TOTAL NO. OF PACKAGES: 3 PALLETS
GROSS WEIGHT: 1000 LBS

PRODUCT DESCRIPTION	NET QUANITY	BATCH LOT NUMBER	NUMBER OF ITEMS PER BATCH/LOT
TEST ARTICLES			
3 INCH CONDUIT U SHAPE (ON 1 PALLET	1	NA	1
3 INCH CONDUIT STRAIGHT 10 FT.	1	NA	1
1½ INCH CONDUIT STRAIGHT 10 FT. (ON 1 PALLET	1	NA	1
18 INCH CABLE TRAY 12 FT. (ON 1 PALLET	1	NA	1

Scott Pozanek
HEAD OF SHIPPING

THERMAL SCIENCE INC.

PAGE 2 OF 2

PACKING LIST

SHIP TO:

OMEGA POINT LAB.
16015 SHADY FALLS RD
ELMENDORFF, TX 78112

P.O.# TEST ARTICLE
RELEASE NO:
DATE: 7 OCTOBER 1994
BILL OF LADING:
MODE: TRUCK LINE
CARRIER: DYNAMIC TRUCK PPD

TEMPERATURE RECORDER NO: NA
CHART TAPE NO: NA
TOTAL NO. OF PACKAGES: 1 PALLET
GROSS WEIGHT: 800 LB. LBS

PRODUCT DESCRIPTION	NET QUANITY	BATCH LOT NUMBER	NUMBER OF ITEMS PER BATCH/LOT
COLUMNS 16 X 50	3	NA	3
10 X 49	1	NA	1
3 FOOT LONG/			
(ED TAYLOR)			

Scott Pozsich
HEAD OF SHIPPING

841

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 7 OCTOBER 1994

TEMPERATURE RECORDER 007763 CHART TAPE NO. 27

TOTAL NO. OF PACKAGES 5 PCS. GROSS WEIGHT 3805 LB.

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG 330 PREFABRICATED PANELS SIZE: 4' x 6½' NOMINAL THICKNESS: 1.250" ± 0.250"	7 PANELS	F94-08021
	1	F94-08022
	8 PANELS (ON 1 PALLET)	
ITEM 1		

NO SHELF LIFE ON PANEL

This is to certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 7 OCTOBER 1994
BILL OF LADING: 21494
MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 7 OCTOBER 1994

TEMPERATURE RECORDER SEE PAGE 1 CHART TAPE NO. SEE PAGE 1

TOTAL NO. OF PACKAGES SEE PAGE 1 GROSS WEIGHT SEE PAGE 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE ITEM 5 EXP. DATE: MARCH 1995 1 x 5 gal. pail containing temp. recorder SHELF LIFE SIX MONTHS FROM DATE OF SHIPMENT STORE ABOVE 32 F AND BELOW 100 F AT ALL TIMES	500 LB. (10 x 50 LB. PAILS)	94-08008

This is to certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 7 OCTOBER 1994
BILL OF LADING: 21494
MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 7 OCTOBER 1994

TEMPERATURE RECORDER SEE PAGE 1 CHART TAPE NO. SEE PAGE 1

TOTAL NO. OF PACKAGES SEE PAGE 1 GROSS WEIGHT SEE PAGE 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG 770-1 COATING	1000 LB.	94-09009
TROWEL GRADE	(20 x 50 LB. PAILS)	
ITEM 6		
EXP. DATE: MARCH 1995		
SHELF LIFE SIX MONTHS FROM DATE OF SHIPMENT		
STORE ABOVE 32 F AND BELOW 100 F AT ALL TIMES		

This is to certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 7 OCT. 1994
BILL OF LADING: 21494
MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

21494

CERTIFICATE OF ANALYSIS

CUSTOMER

TENNESSEE VALLEY AUTHORITY
OMEGA POINT LABORATORY
16015 SHADY FALLS ROAD
ELMENDORFF, TX 78112

DATE OF SHIPMENT 7 OCTOBER 1994
PURCHASE ORDER NO: CONTRACT TV 92362V
RELEASE NO:
CUSTOMER PART NO:

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

LOT NUMBER	QUANTITY	TEST NO:	DESCRIPTION	ANALYSIS	SPECIFICATION
94-08008	500 LB. (10 x 50 Lb. PAILS)	A-2	WT/GALLON	10.01	10.5 ± 1.5
		A-3	pH	8.31	8 +

EXP. DATE: MARCH 1995

ITEM 5

SHELF LIFE: SIX MONTHS FROM DATE OF SHIPMENT
STORE MATERIAL ABOVE 32°F AND BELOW 100°F AT ALL TIMES

THIS IS TO CERTIFY THAT THE ABOVE DESIGNATED MATERIAL HAS BEEN TESTED AND DID COMPLY WITH LISTED SPECIFICATIONS WHEN SUPPLIED. THE MATERIAL IS SUBJECT TO THE CONDITIONS LISTED ON TSI'S INVOICE. THE ABOVE IS A COPY OF INFORMATION ON FILE AND THE LOT ACCEPTANCE DATA IS AVAILABLE FOR EXAMINATION.

REVIEWED BY: David O Bryant DATE: 7 OCTOBER 1994

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 7 OCTOBER 1994

TEMPERATURE RECORDER SEE PAGE 1 CHART TAPE NO. SEE PAGE 1

TOTAL NO. OF PACKAGES SEE PAGE 1 GROSS WEIGHT SEE PAGE 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG 330 PRESHAPED CONDUIT SECTION	3 PCS.	F92-06031
	6	F93-06008
	3	F93-06046
SIZE: 1"	4	F93-09045
THICKNESS: 1.250" ± 0.250"	1	F93-09069
	7	F94-08021
ITEM 11	24 PCS.	
NO SHELF LIFE ON CONDUIT	(IN 1 CARTON)	

This is to certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O Bryant

DAVID O BRYANT
MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 7 OCTOBER 1994
BILL OF LADING: 21494
MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 7 OCTOBER 1994

TEMPERATURE RECORDER SEE PAGE 1 CHART TAPE NO. SEE PAGE 1

TOTAL NO. OF PACKAGES SEE PAGE 1 GROSS WEIGHT SEE PAGE 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG 330 PRESHAPED CONDUIT SECTIONS	3 PIECES	F94-08021
	13	F94-08022
SIZE: 2" THICKNESS: 1.250" ± 0.250"	16 PCS. (IN 1 CARTON)	
NO SHELF LIFE ON CONDUIT		

ITEM 12

This is to certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 7 OCTOBER 1994
BILL OF LADING: 21494
MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 7 OCTOBER 1994

TEMPERATURE RECORDER SEE PAGE 1 CHART TAPE NO. SEE PAGE 1

TOTAL NO. OF PACKAGES SEE PAGE 1 GROSS WEIGHT SEE PAGE 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG 440-75 HIGH TEMPERATURE FABRIC	1 ROLL	NA

SIZE: 42 INCH WIDE X 60 YDS.

ITEM 14

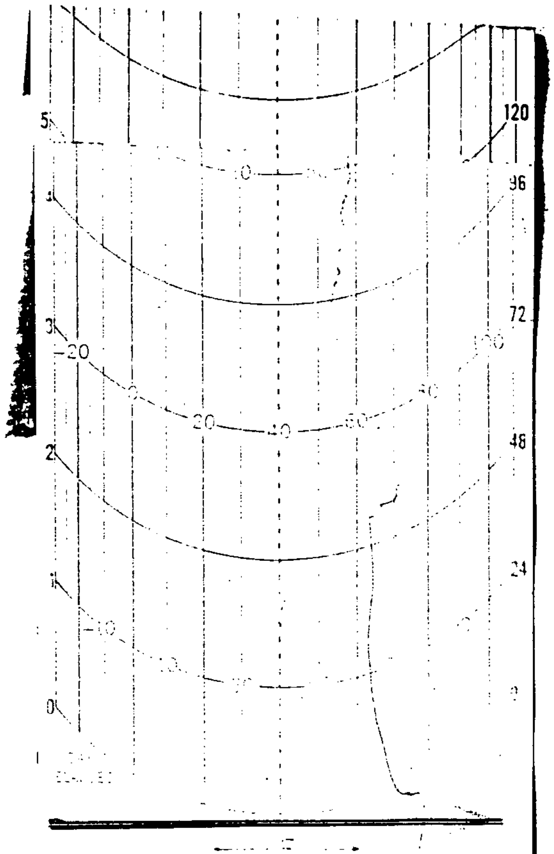
This is to certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 7 OCTOBER 1994
BILL OF LADING: 21494
MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207



CAR No.
CITY San Antonio, TX.
CONSIGNEE TVA - Omaha-East
CAR CONT.
PER.
CITY St. Louis
SHIPPER TSI
DATE 10-8-94 TIME 8215
INSTR. No.

CHART 27

2. FILL IN DATA
1. LOAD CARTRIDGE

32 DAY (-30° + 110° F)

PART NO. 640-95

PARTLOW THERMA-GARD

NEW HARTFORD, N.Y. 13413

START

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: ThermoLag 330-1

DATE PRINTED.: 8/24/89
DATE REVISED: 7/7/89
By A. Thorpe

THERMAL SCIENCE INC
2200 Cassens Dr
Fenton , MO 63026
PHONE: (314) 349-1233
EMERGENCY PHONE: (314) 349-1267

HMIS HAZARD RATINGS

LEAST	0	HEALTH HAZARD	2*
SLIGHT	1	FLAMMABILITY HAZARD	0
MODERATE	2	REACTIVITY HAZARD	0
HIGH	3	MAXIMUM PERSONAL PROTECTION	B
EXTREME	4		

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: Thermolag 330-1

PRODUCT CLASS : Latex Fire Resistive Coating

D.O.T. HAZARD CLASS: none
D.O.T. Shipping Name: Cold Water Paint
D.O.T. UN Number:

SECTION II - PHYSICAL DATA

APPEARANCE AND ODOR :Milky white pasty mastic, ammoniacal odor

BOILING POINT (at 760 mm Hg): 220-240 F
VAPOR PRESSURE (at 20C or 68F): nil
EVAPORATION RATE (ether = 1) much slower
VAPOR DENSITY (air = 1) : 0.6
Volatile Organic Content (VOC) : < 0.1 lb/gal

SPECIFIC GRAVITY (water = 1): 1.3
WEIGHT PER GALLON (lbs.): 10.6
PERCENT VOLATILES BY VOLUME: 45
SOLUBILITY IN WATER: Very

SECTION III - HAZARDOUS COMPONENTS

TRADE NAME	CAS #	PERCENT BY VOLUME	OCCUPATIONAL EXPOSURE LIMITS OSHA PEL	ACGIH TLV
Crystalline Silica (quartz) (total dust)	14808-60-7	1-5 %	30 mg/m^3 %SiO2 +2	
(respirable dust)			10 mg/m^3 %SiO2 +2	0.1 mg/m^3
Ammonia	1336-21-6	< 0.1 %	50 ppm	25 ppm
Fibrous glass,continuous filament (total dust)	65997-17-3	1-5 %	15 mg/m^3	10 mg/m^3
(respirable dust)			5 mg/m^3	

* Indicates toxic chemicals subject to the reporting requirements of Section 313 of Title III and of 40 CFR 372
Carcinogenicity of Silica: NTP: No IARC: Yes Z List: Yes OSHA Reg: Not as carcinogen
Appears on Table Z-3 for Mineral Dusts in 29 CFR § 1910.1000
IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans(vol 42,1987) concludes that there is sufficient evidence for the carcinogenicity of crystalline silica to experimental animals, and there is limited evidence for the carcinogenicity of crystalline silica to humans. IARC Class 2A.
Carcinogenicity of fibrous glass: NTP: No IARC: Yes Z List: No OSHA Reg: No
IARC categorized fibrous glass as not classifiable with respect to human carcinogenicity.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION
OSHA : Non-combustible
DOT : Non-combustible

FLASH POINT : None
TEST METHOD:

FLAMMABILITY LIMITS LEL: NA UEL: NA

EXTINGUISHING MEDIA :

SPECIAL FIRE FIGHTING PROCEDURES :Wet Product will not burn but will smoke and spatter if exposed to flames. Firefighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS : Sealed containers may rupture if overheated. Cool with water spray.

HAZARDOUS DECOMPOSITION PRODUCTS : Thermal oxidative decomposition can produce toxic gases, including oxides of nitrogen and carbon monoxide.

SECTION V - REACTIVITY DATA

STABILITY	UNSTABLE STABLE	 X	CONDITIONS TO AVOID: Not applicable

INCOMPATIBILITY (MATERIALS TO AVOID) : Strong Oxidizers, Strong Bases

HAZARDOUS POLYMERIZATION	MAY OCCUR WILL NOT OCCUR X	CONDITIONS TO AVOID : Not applicable

SECTION VI - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: See HAZARDOUS COMPONENTS list in Section III.

EFFECTS OF OVEREXPOSURE :
Eyes: Direct contact with product may result in eye irritation.
Skin: Prolonged or repeated contact with product may cause skin irritation.
Breathing: Excessive inhalation can cause irritation of the mucous membranes of the nose, throat and respiratory tract, headache and nausea.
Swallowing:

FIRST AID PROCEDURES :
If in Eyes: Flush with flowing water immediately and continously for 15minutes. Consult medical personnel.
If on Skin: Thoroughly wash exposed area with soap and water. Remove and wash contaminated clothing before reuse. Destroy contaminated shoes. Consult medical personnel if swelling or reddening occurs.
If Swallowed: If conscious, give two glasses of water to drink. Get immediate medical attention.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED : Keep unnecessary people away. Contain spill with inert material (sand, earth, ect) and transfer the material to containers for recovery or disposal. Keep spill out of sewers and open bodies of water. Floors may be slippery, care should be exercized to avoid falls.

WASTE DISPOSAL METHOD : Burn in adaquate incinerator or bury in an approved landfill.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION TYPE : Mechanical local exhaust at point of mist release is preferred.

RESPIRATORY PROTECTION : None required if good ventilation is maintained. Otherwise wear MSHA/NIOSH approved respirator suitable for vapor, mist or dust concentrations encountered.

PROTECTIVE GLOVES : Impervious, cotton lined rubber EYE PROTECTION : Safety glasses.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE : Use only with adaquate ventilation. Prevent prolonged breathing of vapor or mist. Prevent contact with eyes. Do not take internally. Keep out of the reach of children.

STORAGE TEMP. MAX 100 F MIN 32 F

OTHER PRECAUTIONS :

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Thermo-Lag 770

DATE PRINTED: 9/24/92
DATE REVISED: 1/15/91
By A. Thorpe

THERMAL SCIENCE, INC.
2200 Cassens Dr.
Fenton , MO 63026

PHONE: (314) 349-1233
EMERGENCY PHONE: (314) 349-1267

HMIS HAZARD RATINGS

LEAST	0	HEALTH HAZARD	2
SLIGHT	1	FLAMMABILITY HAZARD	0
MODERATE	2	REACTIVITY HAZARD	0
HIGH	3	MAXIMUM PERSONAL	
EXTREME	4	PROTECTION	B

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME:	Thermo-Lag 770	D.O.T. HAZARD CLASS:	none
		D.O.T. Shipping Name:	Cold Water Paint
PRODUCT CLASS :	Latex Fire Resistive Coating	D.O.T. UN Number:	none

SECTION II - PHYSICAL DATA

APPEARANCE AND ODOR :Milky white, pasty mastic, no odor.

BOILING POINT (at 760 mm Hg) :	220-240 F	SPECIFIC GRAVITY (water = 1):	1.16
VAPOR PRESSURE (at 20°C or 68°F):	nil	WEIGHT PER GALLON (lbs.) :	9.7
EVAPORATION RATE (ether = 1) :	much slower	PERCENT VOLATILES BY VOLUME:	40
VAPOR DENSITY (air = 1) :	0.6	SOLUBILITY IN WATER:	Yes
Volatile Organic Content (VOC) :	0.18 lb/gal	pH	7–8

SECTION III - HAZARDOUS COMPONENTS

TRADE NAME	CAS #	PERCENT BY VOLUME	OCCUPATIONAL EXPOSURE LIMITS OSHA PEL	ACGIH TLV
Ethylene Glycol	107-21-1	1.2 %		50 ppm
* Vinyl Acetate	108-05-4	<0.15	10 ppm 20ppm STEL	10 ppm 20ppm SHORT
Fibrous glass,continuous filament (total dust) (respirable dust)	65997-17-3	2 %	 15 mg/m^3 5 mg/m^3	 10 mg/m^3

* Indicates toxic chemicals subject to the reporting requirements of Section 313 of Title III and of 40 CFR 372
Carcinogenicity of fibrous glass: NTP: No IARC: Yes Z List: No OSHA Reg: No
IARC categorized fibrous glass as not classifiable with respect to human carcinogenicity.
Vinyl Acetate Monomer, a residual componet of this product, is a possible human cancer hazard based on tests with laboratory animals. Vinyl Acetate has not been identified as a carcinogen by NTP, IARC or OSHA. Total residual monomer does not exceed 0.15%.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION
OSHA : Non-combustible
DOT Non-combustible

FLASH POINT : None
TEST METHOD:

FLAMMABILITY LIMITS LEL: Not Applicable UEL: Not Applicable

EXTINGUISHING MEDIA : Non-flammable (aqueous emulsion).

SPECIAL FIRE FIGHTING PROCEDURES :Wet Product will not burn but will smoke and spatter if exposed to flames. Firefighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS : Sealed containers may rupture if overheated. Cool with water spray.

HAZARDOUS DECOMPOSITION PRODUCTS : Thermal oxidative decomposition can produce toxic gases, including oxides of nitrogen and carbon monoxide.

SECTION V - REACTIVITY DATA

STABILITY	UNSTABLE STABLE	 X	CONDITIONS TO AVOID: Not applicable

INCOMPATIBILITY (MATERIALS TO AVOID) : Strong Oxidizers, Strong Bases

HAZARDOUS POLYMERIZATION	MAY OCCUR WILL NOT OCCUR X	CONDITIONS TO AVOID : Not applicable

SECTION VI - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE :
Eyes: Direct contact with product may result in eye irritation.
Skin: Prolonged or repeated contact with product may cause skin irritation.
Breathing: Excessive inhalation can cause irritation of the mucous membranes of the nose, throat and respiratory tract, headache and nausea.
Swallowing: Excessive exposure may cause central nervous system effects, cardio-pulmonary effects, and kidney failure.

FIRST AID PROCEDURES :
If in Eyes: Flush with flowing water immediately and continuously for 15 minutes. Consult medical personnel.
If on Skin: Thoroughly wash exposed area with soap and water. Remove and wash contaminated clothing before reuse. . Consult medical personnel if swelling or reddening occurs.
If Swallowed: If conscious, give two glasses of water to drink. Get immediate medical attention.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED : Keep unnecessary people away. Contain spill with inert material (sand, earth, etc.) and transfer the material to containers for recovery or disposal. Keep spill out of sewers and open bodies of water. Floors may be slippery, care should be exercised to avoid falls.

WASTE DISPOSAL METHOD : Burn in adequate incinerator or bury in an approved landfill.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION TYPE : Mechanical local exhaust at point of mist release is preferred.

RESPIRATORY PROTECTION : None required if good ventilation is maintained. Otherwise wear MSHA/NIOSH approved respirator suitable for vapor, mist or dust concentrations encountered.

PROTECTIVE GLOVES: Impervious, cotton lined rubber EYE PROTECTION: Safety glasses.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE : Use only with adequate ventilation. Prevent prolonged breathing of vapor or mist. Prevent contact with eyes. Do not take internally. Keep out of the reach of children.

STORAGE TEMP. MAX 100 F MIN 32 F

OTHER PRECAUTIONS :

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97553-555
RECEIVED FROM TSI
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1448 - 11960
DATE RECEIVED 10-14-94
DATE INSPECTED 10-14-94
INSPECTED BY: Cleda 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	
Thermo Lag 770-1 Panels	NA	0	5	0	F94-08026	Y	Y	GOOD	None	X			Receiving verification only.
" "	"	0	40	0	F94-08030	Y	Y	GOOD	None	X			
" "	"	0	18	0	F94-09009	Y	Y	GOOD	None	X			
Thermo Lag Pre Shaped Conduit 4"	NA	0	8	0	F94-08021	Y	Y	GOOD	None	X			

FORM
1/29/93

RECEIVE, subject to the classifications and tariffs in effect on the date of the issue of this Shipping Order,

856

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

From THERMAL SCIENCE INC
ST. LOUIS, MISSOURI 63026

10/12/ 19 94 Shipper's No.

Carrier DYNAMIC TRUCK PREPAID

Agent's No.

(Mail or street address of consignee—For purpose of notification only.)

Consigned to TENNESSEE VALLEY AUTHORITY % OMEGA POINT LAB

Destination 16015 SHADY FALLS RD State of County of

Route ELMENDORFF, TX 78112

Delivering Carrier Vehicle or Car Initial No.

No. Packages	HM	KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	* Weight (Sub. to Correction)	Class or Rate	Check Column
4		PALLETS CONTAINING: 63 PANELS THERMO-LAG 770-1 panels SIZE: 40 INCH x 94 INCH THICKNESS: 3/8 INCH ITEM 4	4800 LB.		
1		CARTON CONTAINING: 8 PCS. THERMO-LAG 330 PRESHAPED CONDUIT SECTIONS SIZE: 4 INCH THICKNESS: 1.250" ± 0.250" ITEM 13			
		DELIVER THURSDAY 10/13/94 SURE !!!!!!!			
		2			

Subject to Section 7 of conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:

The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Per
(Signature of Consignor.)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

Prepaid

Received $ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per
(The signature here acknowledges only the amount prepaid.)

Charges Advanced:

$

C. O. D. SHIPMENT

C. O. D. Amt.

Collection Fee

Total Charges

† The fibre boxes used for this shipment conform to the specifications set forth in the box maker's certificate thereon, and all other requirements of Rule 41, of the Consolidated Freight Classification.

† This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation.

* If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

† Shipper's imprint in lieu of stamp; not a part of Bill of Lading approved by the Department of Transportation.

NOTE—Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.

The agreed of declared value of the property is hereby specifically stated by the shipper to be not exceeding

THIS SHIPMENT IS CORRECTLY DESCRIBED.

C WEIGHT IS LBS.

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation." NOTE: Preprinted certificates complying with 49 CFR 173, 430 (a) in effect on June 30, 1978, may be used through June 30, 1979.

Per Shipper

THERMAL SCIENCE, INC.

Shipper, Per

Agent must detach and retain this Shipping Order and must sign the Original Bill of Lading.

Permanent post office address of shipper 2200 Cassens Dr., St. Louis, MO 63026

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: OCTOBER 1994

TEMPERATURE RECORDER NA CHART TAPE NO. NA

TOTAL NO. OF PACKAGES 5 PIECES GROSS WEIGHT 5000 LB.

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG 770-1 PANELS SIZE: 40 INCH X 94 INCH THICKNESS: 3/8 INCH	5 PANELS	F94-08026
	40	F94-08030
	18	F94-09009
	63 PANELS	

ITEM 4

NO SHELF LIFE ON PANEL

This is to certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 12 OCTOBER 1994
BILL OF LADING: 21499
MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

TSI

PACKING LIST

AND

CERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: OCTOBER 1994

TEMPERATURE RECORDER NA CHART TAPE NO. NA

TOTAL NO. OF PACKAGES SEE PAGE 1 GROSS WEIGHT SEE PAGE 1

PRODUCT DESCRIPTION	QUANTITY	BATCH NUMBER
THERMO LAG 330 PRESHAPED CONDUIT SECTION	8 PCS.	F94-08021
SIZE: 4 INCH THICKNESS: 1.250" ± 0.250"	8 PCS. (IN 1 CARTON)	

ITEM 13

NO SHELF LIFE ON CONDUIT

This is to certify that the above listed THERMO-LAG Materials shipped under Contract Order No. TV92362V, to Omega Point Laboratories, San Antonio, TX, Meet the requirements of Thermal Science, Inc. manufactured and written Quality Control specifications for Tennessee Valley Authority c/o Omega Point Laboratories, 16015 Shady Falls Road, Elmendorff, TX 78112. This material does not contain asbestos.

David O'Bryant

DAVID O'BRYANT
MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 12 OCTOBER 1994
BILL OF LADING: 21499
MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

THERMAL SCIENCE, INC. • 2200 CASSENS DR. • ST. LOUIS, MO 63026 • (314) 349-1233
Telex: 209901 (Answerback: TSI UR) • Telecopier (314) 349-1207

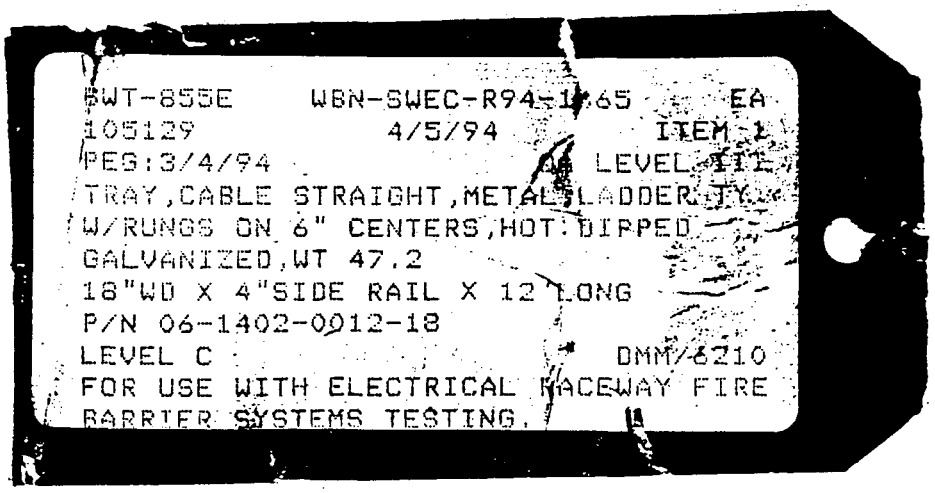
Q/A RECEIVING REPORT

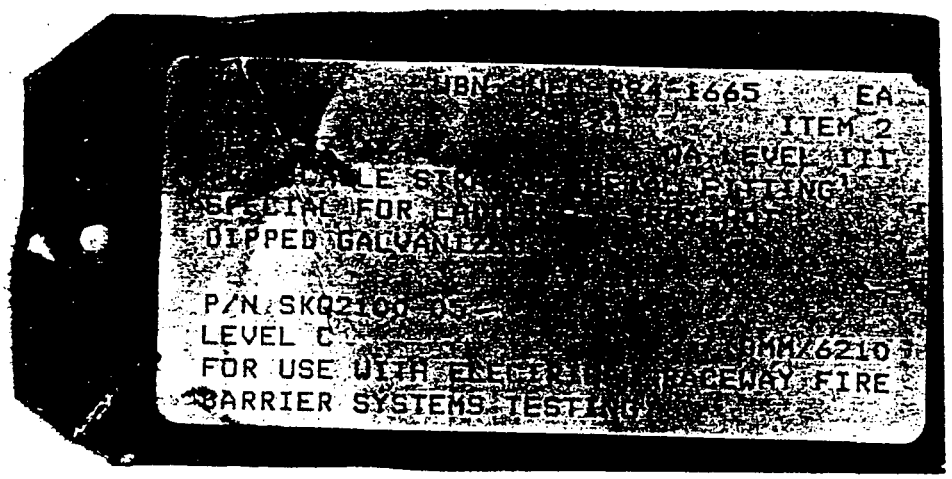
CLIENT/PROJECT NAME TVA/TSI
CLIENT/PROJECT NUMBER 11210/TBD
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1384 - 11210
DATE RECEIVED 5-23-94
DATE INSPECTED 5-31-94
INSPECTED BY:

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	
galv. Double Crosses	NA	0	6	0	SKQ2100-05	Y	N	Poor	None	X			Receiving Verification only; materials used upon delivery; 6 pieces were damaged (4) double crosses and (2) ladders
galv. ladders	NA	0	5	0	06-1402-0012-18	Y	N	Poor	None	X			

FORM
1/29/93


SWT-855E WBN-SWEC-R94-1665 EA
105129 4/5/94 ITEM 1
PES:3/4/94 QA LEVEL III
TRAY,CABLE STRAIGHT,METAL LADDER TY.
W/RUNGS ON 6" CENTERS,HOT DIPPED
GALVANIZED,WT 47.2
18"WD X 4"SIDE RAIL X 12'LONG
P/N 06-1402-0012-18
LEVEL C DMM/6210
FOR USE WITH ELECTRICAL RACEWAY FIRE
BARRIER SYSTEMS TESTING.


EA
ITEM 2
QA LEVEL III
P/N SKQ2100-05
LEVEL C
DMM/6210
FOR USE WITH ELECTRICAL RACEWAY FIRE
BARRIER SYSTEMS TESTING

ELMENDORF ... FALLS RD 8100 ... DVNT ... VALLEY AUTHORIT 861

05916702 TX 78112

FREIGHT BILL NUMBER 345 608 583

WATTS BAR NUCLEAR PLANT
SPRING CITY
00994265 TN 37381

PO# ~~NONE~~

CITY RTE/BYD SCAC 2M

DEST SNT

20

OVERNITE PHONE NUMBER (210)662-0966

PICK UP DATE 05/16/94

ORIG KNX

ADV CAR ~~NONE~~

BL#

AD

Peggy

OV 61.75

BD

OVERNITE TRANSPORTATION COMPANY

345 608 583

COLLECT THIS AMOUNT $6

OTC

DRIVER COL

# PCS	HM	PT	DESCRIPTION OF ARTICLES AND SPECIAL MARKINGS	WEIGHT	NMFC	RATE	CHARGES
2			2 HANDLING UNIT(S) SK CABLE TRAYS 58.00% DISCOUNT 80205	300	061220-02	49.01 LESS	147. 85.

OVERNITE

1 Pcs Busted Damage
1 loose upon Del

2 TTL PCS

DELIVERY EXCEPTIONS

TTL WT 300

SIGNATURE	FIRM	ODOM	ARRIVE	DEPART	TOTAL CHARGES
[illegible signature]	[illegible]	009	9:16	9:45	
		DATE 5-23-94	PCS 1	INITIALS ROW	61.75 C

RECEIVED THE ABOVE PROPERTY IN GOOD CONDITION EXCEPT AS NOTED.

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185, 86+87
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1396 - 11960
DATE RECEIVED 7-15-94
DATE INSPECTED 7-15-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COMM MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
1" c-clamps	NA	0	16	0	512	Y	N	Good	None	X			Receiving verification Only.
2" c-clamps	NA	0	16	0	515	Y	N	good	None	X			
2.5" c-clamps	NA	0	3	0	516	Y	N	good	None	X			
3" c-clamps	NA	0	12	0	517	X	N	good	None	X			
4" c-clamps	NA	0	53	0	519	Y	N	good	None	X			
5" c-clamps	NA	0	3	0	520	X	N	good	None	X			
Junction Box	NA	0	2	0	A3L6043612P	Y	N	good	None	X			
3/4" 90° steel	NA	0	1	0	GAL34ELL	Y	N	good	None	X			
3/4" 90° Alum	NA	0	1	0	ALU34ELL	X	N	good	None	X			
1" cap	NA	0	2	0	PLG100R	Y	N	good	None	X			
2" cap	NA	0	5	0	PLG200A	X	N	good	None	X			
3" cap	NA	0	1	0	PLG300A	Y	N	good	None	X			
3/4" Alum Coupling	NA	0	2	0	NA	Y	N	good	None	X			
4" LB's (Conduit outlets)	NA	0	7	0	NA	X	N	good	None	X			
w/covers + gaskets													

FORM
1/29/93

TVA 144 (FD-5-70)

SHIPPING TICKET

No. 53094-00873

863

SHIPPER TENNESSEE VALLEY AUTHORITY

POINT OF ORIGIN NEAR ATHENS, AL 35611 7/14 19 94

SHIPPING STOREROOM BROWNS FERRY NUCLEAR PLANT

AUTHORITY DAN OLIVER-MGR-M&PS-BFNP

SHIP TO

OMEGA POINT LAB
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112-9784

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)

DEBIT

BILL TO

CREDIT

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC – ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
1		CONDUIT, C-CLAMP, 1", #512		16	EA		
2		CONDUIT C-CLAMP, 2", #515		16	EA		
3		CONDUIT C-CLAMP, 2.5", #516		3	EA		
4		CONDUIT C-CLAMP, 3", #517		12	EA		
5		CONDUIT C-CLAMP, 4", #519		53	EA		
6		CONDUIT C-CLAMP, 5", 520		3	EA		
7		JUNCTION BOX, #A3L60H3612LP		2	EA		
8		ELBOW, 90 DEG, 3/4", STEEL, #GAL34ELL		1	EA		
9		ELBOW, 90 DEG, 3/4", ALUM, #ALU34ELL		1	EA		
10		ELBOW, 90 DEG, 4", STEEL, #GAL4ELL		7	EA		
11		CAP, 1", #PLG100R		2	EA		
12		CAP, 2", #PLG200A		5	EA		
		CAP, 3", #PLG300A		1	EA		
		COUPLING, 3/4", ALUMINUM		2	EA		
15		CONDUIT OUTLET, 4"		7	EA		

QA-C

REF: 1023000

FOR THERMO-LAG FIRE TESTING

3 PALLETS @ 1056LB

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

DATE SHIPPED 7/14/19 94 G. B. L. No. TV N/A METHOD OF SHIPMENT FED EX

SHIPPING NOTICE

TO BE ENCLOSED WITH MATERIAL WHEN NO OTHER PACKING SLIP IS USED: OTHERWISE, TO CONSIGNEE UNDER SEPARATE COVER.

TO BE FILLED IN BY RECEIVING OFFICE

SERIAL NO. OF FORM 1677

COST
CARRIER'S CHARGE
DELIVERY CHARGES
TOTAL COST

MATERIAL RECEIVED 19
NAME OF CARRIER DTX
MATERIAL CHECKED IN BY
STORES LEDGER POSTED BY

0115008526

TRACKING NUMBER 0115008526

864

RECIPIENT'S COPY

1 From (Your Name) Please Print: DANNY T. ROBINSON

Date: 7-14-94

Your Phone Number (Very Important): (205-729-4641

Company: TVA/BROWNS FERRY NUCLEAR PLT

Department/Floor No.

Street Address: BROWNS FERRY ROAD

City: ATHENS | State: AL | ZIP Required: 35611

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

2 To (Recipient's Name) Please Print

Recipient's Phone Number (Very Important) (   )

Company: OMEGA POINT LAB

Department/Floor No.

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 16015 SHADY FALLS ROAD

City: ELMENDORF | State: TX | ZIP Required: 78112-9784

3 PAYMENT
1 [X] Bill Sender
2 [ ] Bill Recipient's FedEx Acct. No.
3 [ ] Bill 3rd Party FedEx Acct. No.
4 [ ] Bill Credit Card
5 [ ] Cash/Check

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here
Street Address
City | State | ZIP Required

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning†)
11 [ ] OTHER PACKAGING
16 [ ] FEDEX LETTER*
12 [ ] FEDEX PAK*
13 [ ] FEDEX BOX
14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon. No Saturday delivery†)
51 [ ] OTHER PACKAGING
56 [ ] FEDEX LETTER*
52 [ ] FEDEX PAK*
53 [ ] FEDEX BOX
54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day †)
30 [ ] ECONOMY*
* Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Government Overnight (Restricted for authorized users only)
46 [ ] GOV'T LETTER
41 [ ] GOV'T PACKAGE

Freight Service (for packages over 150 lbs.)
70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required)
80 [X] TWO-DAY FREIGHT**

† Delivery commitment may be later in some areas.
** Declared Value Limit $500. Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service
1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
2 [X] DELIVER WEEKDAY

Saturday Service
31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling
4 [ ] DANGEROUS GOODS (Extra charge)
6 [ ] DRY ICE — Dangerous Goods Shipper's Declaration not required
Dry Ice 9, UN 1845 ____ x ____ kg. 904 III
[ ] DESCRIPTION
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

6

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1	223	
1	458	
1	375	
Total 3	Total 1056	Total

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs.

L x W x H

Received At
1 [ ] Regular Stop
2 [X] On-Call Stop
3 [ ] Drop Box
4 [ ] B.S.C.
5 [ ] Station

7 Release Signature:

Emp. No. | Date

[ ] Cash Received
[ ] Return Shipment
[ ] Third Party [ ] Chg. To Del. [ ] Chg. To Hold

Street Address
City | State | Zip

Received By:
X

Date/Time Received | FedEx Employee Number

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 3/94
PART #137204 FXEM 5/94
FORMAT #158

158

5/20/94

TO:

Omega Point Lab
16015 Shady Falls Road
Elmendorf, Texas
78112-9784

Sirs,

This Material is being supplied to you by the TVA Browns Ferry Nuclear Plant in support of the Thermolag Fire and Ampacity Testing your facility is working on.

If you have any questions or need additional information please contact D.P. Burrell at 205-729-7589.

R.P. Hyde
Lead Procurement Engineer
Browns Ferry Nuclear Plant

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97185-87
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1388 - 11960
DATE RECEIVED 6-28-94
DATE INSPECTED 6-28-94
INSPECTED BY: Q Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	Rec'd	B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	Hold	Reject	REMARKS
12" Radial Bend	NA	–	1	–	06-1079-9112-12-4	Y	N	Good	None	X			Receiving Verification Only. (1) 18" cable tray is damaged + (2) 18" covers are damaged on one end.
18" Radial Bend	NA	–	4	–	06-1079-9112-18-4	Y	N	"	"	X			
18" Radial Bend Cover	NA	–	1	–	40-2000-9112-18-2	Y	N	"	"	X			
24" Radial Bend	NA	–	2	–	06-1079-9112-24-4	Y	N	"	"	X			
12" Cable Tray	NA	–	3	–	06-1079-0012-12	Y	N	"	"	X			
18" Cable Tray	NA	–	10	–	06-1079-0012-18	Y	N	"	"	X			
24" Cable Tray	NA	–	5	–	06-1079-0012-24	Y	N	"	"	X			
18" Cable Tray Covers	NA	–	2	–	galv sheeting 4½" turned edges	X	N	"	"	X			
Splice plates	NA	–	49pr	–	1079-1302-02	Y	N	"	"	X			
Hinged Splice plts	NA	–	12pr	–	1079-1302-02	Y	N	"	"	X			
Cable 16AWG	NA	–	1 reel	–	Reel # 12963	X	N	"	"	X			
Nuts/Bolts	NA	–	488	–	N/A	Y	N	"	"	X			

FORM
1/29/93

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA / TSI
CLIENT/PROJECT NUMBER 11210 - TBD
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1386 . 11210
DATE RECEIVED 6-3-94
DATE INSPECTED 6-6-94
INSPECTED BY: C. Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	Rec'd	B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	Hold	Reject	REMARKS
3/4" Alumn Conduit	NA	-	2	-	AVK-542K	Y	N	Good	None	X			Receiving verification only NON-SAFETY RELATED MATERIAL. CH
2" Alum Conduit	NA	-	5	-	AVK-543K	Y	N	"	"	X			
2.5" Alum Conduit	NA	-	1	-	BBN-621X	Y	N	"	"	X			
3" Alum Conduit	NA	-	2	-	BDF-089A	Y	N	"	"	X			
4" Alum Conduit	NA	-	22	-	BEV-087A	Y	N	"	"	X			
3/4" Steel Conduit	NA	-	2	-	AWD-014Y	Y	N	"	"	X			
1" Steel Conduit	NA	-	10	-	AWD-015W	Y	N	"	"	X			
3" Steel Conduit	NA	-	5	-	AWD-019L	Y	N	"	"	X			
4" Steel Conduit	NA	-	14	-	AWD-020F	Y	N	"	"	X			
5" Steel Conduit	NA	-	1	-	BBY-741J	Y	N	"	"	X			
3/4" Alum LB	NA	-	1	-	BTY-197J	Y	N	"	"	X			
2" Alum LB	NA	-	5	-	BTY-256W	Y	N	"	"	X			
2.5" Alum LB	NA	-	1	-	BTY-260H	Y	N	"	"	X			
3" Alum LB	NA	-	4	-	BTY-265V	Y	N	"	"	X			
3/4" Steel LB	NA	-	1	-	BTY-196L	Y	N	"	"	X			
1" Steel LB	NA	-	2	-	BTM-778C	Y	N	"	"	X			

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA/TSI
CLIENT/PROJECT NUMBER 11210
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1386 - 11210
DATE RECEIVED 6-3-94
DATE INSPECTED 6-6-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	Rec'd	B.O.	I.D. NO.	COND MATL Y/N	CERT. REC'D Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	Hold	Reject	REMARKS
4" Steel LB	NA	-	5	-	BTY-191Y	Y	N	Good	None	X			Receiving Verification Only NON SAFETY-RELATED MATERIAL C&I
3/4" Steel Coupling	NA	-	2	-	BEV-325X	Y	N	"	"	X			
1" Steel Coupling	NA	-	4	-	BLD-538F	X	N	"	"	X			
3" Steel Coupling	NA	-	3	-	BKR-844C	Y	N	"	"	X			
4" Steel Coupling	NA	-	15	-	BGD-652A	Y	N	"	"	X			
3/4" Alum Coupling	NA	-	2	-	BTY-644K	Y	N	"	"	X			
2" Alum Coupling	NA	-	5	-	BEV-326V	Y	N	"	"	X			
2.5" Alum Coupling	NA	-	1	-	BGW-557N	X	N	"	"	X			
3" Alum Coupling	NA	-	4	-	BET-731P	Y	N	"	"	X			
4" Alum Coupling	NA	-	8	-	BET-732M	Y	N	"	"	X			

FORM
1/29/93

SHIPPING TICKET

NO. 880

SHIPPER TENNESSEE VALLEY AUTHORITY

POINT OF ORIGIN NEAR, ATHENS, AL. 35611 5-25- 19

SHIPPING STOREROOM BROWNS FERRY NUCLEAR PLANT

AUTHORITY DAN OLIVER, SUPV., M&PS

SHIP TO
OMEGA POINT LAB
16015 SHADY FALLS ROAD
ELKENDORF, TX 78112

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)

DEBIT 000512L

BILL TO

CREDIT

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC – ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
1.	2	Conduit, 3/4" Aluminum	AVK-542K	2	PC		
2.	5	Conduit, 2" Aluminum	AVK-543K	5	PC		
3.	1	Conduit, 2.5" Aluminum	BBH-521X	1	PC		
4.	2	Conduit, 3" Aluminum	BDF-089A	2	PC		
5.	22	Conduit, 4" Aluminum	BEV-087A	22	PC		
6.	2	Conduit, 3/4" Stl (AWD-014Y)	AWD-014Y	2	PC		
7.	XX 10	Conduit, 1" Stl (AWD-015W)	AWD-015W	10	PC		
8.	5	Conduit, 3" Stl	AWD-019L	5	PC		
9.	14	Conduit, 4" Stl	AWD-020F	14	PC		
10.	1	Conduit, 5" Stl	BBY-741J	1	PC		
11.	1	Conduit LB, 3/4" aluminum	BTY-197J	1	EA		
12.	5	Conduit LB, 2" aluminum	BTY-256W	5	EA		
13.	1	Conduit LB, 2.5" aluminum	BTY-260B	1	EA		
14.	4	Conduit LB, 3" aluminum	BTY-265V	4	EA		
15.	1	Conduit LB, 3/4" Stl	BTY-196L	1	EA		
16.	X 2	Conduit LB, 1" Stl	BTM-778C	2	EA		
17.	7	Conduit LB, 4" Stl	BTY-191Y	7	EA		
18.	2	Conduit Coupling, 3/4" Stl	BEV-325X	2	EA		
19.	4	Conduit Coupling, 1" Stl	BLD-538F	4	EA		
20.	3	Conduit Coupling, 3" Stl	BKR-344G	3	EA		
21.	15	Conduit Coupling, 4" Stl	BGD-652A	15	EA		
22.	2	Conduit Coupling, 3/4" Aluminum	BTY-644K	2	EA		
23.	5	Conduit Coupling, 2" Aluminum	BEV-326V	5	EA		
24.	1	Conduit Coupling, 2.5" Aluminum	BGW-557M	1	EA		
25.	4	Conduit Coupling, 3" Aluminum	BET-731P	4	EA		
26.	8	Conduit Coupling, 4" Aluminum	XBBET-732M	8	EA		

This material shipped per memo from Claudia Dyar of 5-25-94 for Thermolag Test

REFERENCE TRACKING #9400031847
QA III
SHIPPED BY OVERNITE PER INSTRUCTIONS FROM K. WRIGHT/F. PRIEST

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

DATE SHIPPED 5-25- 19 94 G. B. L. No. TV N/A METHOD OF SHIPMENT OVERNITE

SHIPPING NOTICE.

TO BE ENCLOSED WITH MATERIAL WHEN NO OTHER PACKING SLIP IS USED: OTHERWISE, TO CONSIGNEE UNDER SEPARATE COVER.

TO BE FILLED IN BY RECEIVING OFFICE

SERIAL NO. OF FORM

1677

COST
CARRIER'S CHARGE
DELIVERY CHARGES
TOTAL COST

MATERIAL RECEIVED 19
NAME OF CARRIER W. BURT
MATERIAL CHECKED IN BY
STORES LEDGER POSTED BY

CONSIGNEE CUSTOMER COPY (BLUE)

OMEGA POINT LAB
16015 SHADY FALES RD
ENDORF TX 78112
6358100

INBOUND TRAILER: 288858 OVNT
FREIGHT BILL NUMBER: 391 634 025
CITY RTE/BYD SCAC: 2M
DEST: SNT

SHIPPER
TVA
NUCLEAR PLANT
BROWNS FERRY RD
ATHENS AL 35611
02521271 (205)729-2000

391 634 026

PO# NONE
OVERNITE PHONE NUMBER: (210)662-0966
PICK UP DATE: 05/25/94
ORIG: DCT
ADV CAR
BL# 5569400740
AD OV BD

31

DELIVERY RECEIPT COPY: 1

OVERNITE TRANSPORTATION COMPANY

391 634 025

COLLECT THIS AMOUNT

$.
$.

# PCS	HM	PT	DESCRIPTION OF ARTICLES AND SPECIAL MARKINGS	WEIGHT	NMFC	RATE	CHARGES
4		SK	4 HANDLING UNIT(S) CONDUIT & FITTING SECTION 7 SIGNED BILL TO: 00501491 80205	2567	050940-00		

OVERNITE

1-2"x10' AO. Conduit bent Roger [illegible] 6-2-94

4 TTL PCS
TTL WT 2567

DELIVERY EXCEPTIONS	SIGNATURE	FIRM	ODOM	ARRIVE	DEPART	TOTAL CHARGES
	[signature]		DATE	PCS	INITIALS	P

RECEIVED THE ABOVE PROPERTY IN GOOD CONDITION EXCEPT AS NOTED

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA
CLIENT/PROJECT NUMBER 11210
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1383 . 11210
DATE RECEIVED 5-9-94
DATE INSPECTED 5-10-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
3" gal. Conduit	NA	-	2	-	720092260 AWD-019L	Y	N	Good	None	X			Receiving Verification Only
3" 90 Elbow	NA	-	1	-	1008122 BLN-258A	Y	N	Good	None	X			
3" Pipe Strap Retaining	NA	-	3	-	42981B BJN-409R	Y	N	Good	None	X			

FORM
1/29/93

TVA 144 (FD-5-70)

SHIPPING TICKET

NO. 202-94-0020

872

SHIPPER MARK WILLIAMS

POINT OF ORIGIN SPRING CITY,TN 37381 4-28-94 19___

SHIPPING STOREROOM NUCLEAR STORES WBNP

AUTHORITY MARK WILLIAMS

SHIP TO
OMEGA POINT LABORATORIES,INC
16015 SHADY FALLS ROAD
ELMENDORF,TX 78112-9784

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)

DEBIT

RECORD ONLY

BILL TO

CREDIT

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC — ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
		THIS MATERIAL TO USED IN A FIRE TESTING PROGRAM SHIP PER J.J. PIERCE MAT BOUGT ON 575 NO 784401					
1	2	CONDUIT 3 in,galv. 720092260	AWD-019L	2	pc		
2	1	ELBOW 90 deg,3 in 1008122	BLB-258A	1	ea		
3	3	STRAP RETAINING 3 in PIPE 42981B	BJN-409R	3	ea		
		ALL ITEMS QA 3					
		5/2/94 THIS MATERIAL CONTAINS NO RADIOACTIVITY					

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

DATE SHIPPED 4-28-94 19___ G. B. L. No. TV_____ METHOD OF SHIPMENT MOTOR

8 — SHIPPER'S COPY

RETAINED BY SHIPPER AS RECORD OF SHIPMENT.

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97185.86.487
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1397 - 11960
DATE RECEIVED 7-18-94
DATE INSPECTED 7-18-94
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	
3/4" Strap C-Clamp	NA	0	4	0	NA	Y	N	good	None	X			Receiving Verification Only.
2.5" plug	NA	0	1	0	NA	Y	N	good	None	X			

FORM
1/29/93

TVA 144 (FD-5-70)

TENNESSEE VALLEY AUTHORITY
SHIPPING TICKET

No. 856-94-0087 874

SHIPPER TENNESSEE VALLEY AUTHORITY POINT OF ORIGIN NEAR ATHENS, AL. 35611 07/15 19 94

SHIPPING STOREROOM BROWNS FERRY NUCLEAR PLANT AUTHORITY DAN OLIVER, SUPV. M&PS

SHIP TO	ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)
OMEGA POINT LAB 16015 SHADY FALLS RD. ELSENDORF, TX. 78112	DEBIT 0005121
BILL TO	CREDIT

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC – ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
1		STRAP 3/4" MAL IRON		4	EA		
2		PLUG 2 1/2".		1	EA		
		THIS MATERIAL SHIPPED FOR THERMOLAG TEST.					
		REF : TRACKING # 9400031847					

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

DATE SHIPPED 07/15 19 94 G. B. L. No. TV METHOD OF SHIPMENT FED EXP

5 – SHIPPING NOTICE

TO BE ENCLOSED WITH MATERIAL WHEN NO OTHER PACKING SLIP IS USED: OTHERWISE, TO CONSIGNEE UNDER SEPARATE COVER.

TO BE FILLED IN BY RECEIVING OFFICE

SERIAL NO. OF FORM 1677

COST CARRIER'S CHARGE DELIVERY CHARGES TOTAL COST

MATERIAL RECEIVED JUNE 19

NAME OF CARRIER

MATERIAL CHECKED IN BY

STORES LEDGER POSTED BY

FEDERAL EXPRESS

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL — PACKAGE TRACKING NUMBER 011500853[illegible]

4159[illegible] 011500853[illegible]

RECIPIENT'S COPY

1 Date 7-15-94

From (Your Name) Please Print	Your Phone Number (Very Important)	2 To (Recipient's Name) Please Print	Recipient's Phone Number (Very Important)
	(205) 729-4641		( )
Company: TVA/BROWNS FERRY NUCLEAR PLT	Department/Floor No.	Company: Omega Point Lab	Department/Floor No.
Street Address: BROWNS FERRY ROAD		Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 1615 Shady Hill Rd	
City: ATHENS	State: AL	ZIP Required: 3 5 6 1 1	City: Elmendorf State: TX ZIP Required: 78112

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here
Street Address
City State ZIP Required

3 PAYMENT 1 ☐ Bill Sender 2 ☐ Bill Recipient's FedEx Acct. No. 3 ☐ Bill 3rd Party FedEx Acct. No. 4 ☐ Bill Credit Card 5 ☐ Cash/Check

4 SERVICES (Check only one box)

Priority Overnight	Standard Overnight
11 ☒ OTHER PACKAGING*	51 ☐ OTHER PACKAGING
16 ☐ FEDEX LETTER*	56 ☐ FEDEX LETTER*
12 ☐ FEDEX PAK*	52 ☐ FEDEX PAK*
13 ☐ FEDEX BOX	53 ☐ FEDEX BOX
14 ☐ FEDEX TUBE	54 ☐ FEDEX TUBE
Economy Two-Day	**Government Overnight**
30 ☐ ECONOMY*	46 ☐ GOVT LETTER
	41 ☐ GOVT PACKAGE

*Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Freight Service (for packages over 150 lbs.)
70 ☐ OVERNIGHT FREIGHT** (Confirmed reservation required) †
80 ☐ TWO-DAY FREIGHT**
†Delivery commitment may be later in some areas. *Declared Value Limit $500 **Call for delivery schedule

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service
1 ☐ HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
2 ☒ DELIVER WEEKDAY

Saturday Service
31 ☐ HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)
3 ☐ DELIVER SATURDAY (Extra charge) (Not available to all locations)
9 ☐ SATURDAY PICK-UP (Extra charge)

Special Handling
4 ☐ DANGEROUS GOODS (Extra charge)
6 ☐ DRY ICE Dangerous Goods Shipper's Declaration not required
Dry Ice, 9, UN 1845, ____ X ____ kg, 904 (II)
☐ _____
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

6

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1		
Total	Total	Total

DIM SHIPMENT (Chargeable Weight) ☐ _____ lbs.
L x W x H

Received At
1 ☐ Regular Stop 3 ☐ Drop Box
2 ☒ On-Call Stop 4 ☐ B.S.C. 5 ☐ Station

7 Release Signature:

Emp. No. Date
☐ Cash Received
☐ Return Shipment
☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
City State Zip
Received By: X
Date/Time Received FedEx Employee Number

Federal Express
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 3.94
FORMAT #158
158
PRINTED IN U.S.A.

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185,86,87
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1392.11960
DATE RECEIVED 7-7-94
DATE INSPECTED 7-8-94
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" gal. conduit	NA	0	2	0	NA	Y	N	Good	None	X			Receiving verification only
1" gal. conduit	NA	0	3	0	NA	Y	N	Good	None	X			

FORM
1/29/93

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97257-60+97332-38
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1429 - 11960
DATE RECEIVED 8-29-94
DATE INSPECTED 8-29-94
INSPECTED BY: A 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" LB Cover	NA	0	5	0	BMB329W	Y	N	Good	None	X			Receiving Verification Only
4" gasket	NA	0	5	0	BMB330P	Y	N	Good	None	X			
1" LB Cover	NA	0	2	0	BPP177F	Y	N.	Good	None	X			
2½-3" LB Covers	NA	0	5	0	BBT792M	Y	N.	Good	None	X			
2½-3" Gaskets	NA	0	5	0	BGP836C	X	N.	Good	None	X			
2" Gasket	NA	0	5	0	BGK730W	Y	N.	Good	None	X			
1" gasket	NA	0	2	0	BPQ043N	Y	N.	Good	None	X			
2" LB Cover	NA	0	5	0	AQP157N	Y	N	Good	None	X			

FORM
1/29/93

877

TVA 144 (FD-5-70)

TENNESSEE VALLEY AUTHORITY

SHIPPING TICKET

No. 862-94-0974878

SHIPPER J.M. WILLIAMS

POINT OF ORIGIN NEAR SPRING,CITY, TN 37381 8-26 19 94

SHIPPING STOREROOM WATTS BAR NUCLEAR PLANT

AUTHORITY R.D. HALL PROJ MGR N.E.

TO

OMEGA POINT LABORATURIES, INC
16015 SHADY FALLS RD
ELMENDORF, TX 78112
ATTN: MARK SALLEY

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)

DEBIT

0001429

BILL TO

CREDIT

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC — ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
1		4 IN LB	EMB329W	5	EA		
2		4 IN GASKET	EMB330P	5	EA		
3		1 IN LG COVER	BPP177P	2	EA		
4		2-1/2 - 3 IN LB COVER	EBT792M	5	EA		
5		2-1/2 -3 IN LB GASKET	BGP636C	5	EA		
6		1 IN GASKET BPQ043N		2	EA		
7		2IN GASKET	BGK730W	5	EA		
8		2 IN LB COVER AQP157N		5	EA		
		QA LEVEL III					
		FOR TESTING					

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

GFC

DATE SHIPPED 8-26 19 94 G. B. L. No. TV

METHOD OF SHIPMENT UPS-NDA

INSPECTOR'S COPY

SHIPMENT TO TVA POINTS — TO CONSIGNEE UNDER SEPARATE COVER. CONSIGNEE RECORDS DATE SHIPMENT WAS RECEIVED, NOTES ANY EXCEPTIONS AND SIGNS CERTIFICATE. ALSO ATTACHES COPY OF FREIGHT OR EXPRESS ARRIVAL NOTICE AND FORWARDS TO ACCOUNTING OFFICE.
SHIPMENTS TO OUTSIDE POINTS — SHIPPER ENTERS AMOUNT OF TRANSPORTATION CHARGEABLE TO TVA WITH ACCOUNT NUMBER TO BE CHARGED AND FORWARDS TO ACCOUNTING OFFICE WITH THE ORIGINAL.

I CERTIFY THAT THE ARTICLES OR SERVICES LISTED ABOVE HAVE BEEN RECEIVED IN QUANTITY AND QUALITY SPECIFIED. EXCEPT AS NOTED.

RECEIVED _____ 19___ SIGNED _____

CARRIER _____ TITLE _____

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185-87 + 97332-38 + 97257-60
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1425 - 11960
DATE RECEIVED 8-26-94
DATE INSPECTED 8-26-94
INSPECTED BY: CPatton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
1" galv Conduit	NA	0	100'	0	AWD-015W	Y	N	Good	None	X			Receiving Verification Only

FORM
1/29/93

TVA 144 (FD-5-70)

TENNESSEE VALLEY AUTHORITY

SHIPPING TICKET

No. 35694-01057 880

SHIPPER TENNESSEE VALLEY AUTHORITY

POINT OF ORIGIN NEAR, ATHENS, AL. 35611 8-24- 1994

SHIPPING STOREROOM BROWNS FERRY NUCLEAR PLANT

AUTHORITY DAN OLIVER, SUPV., M&PS

TO
OMEGA POINT LAB
16015 SHADY FALLS ROAD
ELKENDORF, TX 78112

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)
DEBIT
0005131

BILL TO

CREDIT

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC – ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
1.	100	Conduit, Metal, Rigid steel, Galv., 1.0 IN. Dia X 10 FT LG	AWD-015W	100	FT		
		Shipped per the attached letter. Thermolag Fire and Ampacity Testing.					
		QA III					

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

DATE SHIPPED 8-24 1994 G. B. L. No. TV N/A METHOD OF SHIPMENT FEDEX

SHIPPING NOTICE

TO BE ENCLOSED WITH MATERIAL WHEN NO OTHER PACKING SLIP IS USED: OTHERWISE, TO CONSIGNEE UNDER SEPARATE COVER.

TO BE FILLED IN BY RECEIVING OFFICE

SERIAL NO. OF FORM

1677

COST
CARRIER'S CHARGE
DELIVERY CHARGES
TOTAL COST

MATERIAL RECEIVED 19
CARRIER
MATERIAL CHECKED IN BY
STORES LEDGER POSTED BY

5/20/94

TO:

Omega Point Lab
16015 Shady Falls Road
Elmendorf, Texas
78112-9784

Sirs,

This Material is being supplied to you by the TVA Browns Ferry Nuclear Plant in support of the Thermolag Fire and Ampacity Testing your facility is working on.

If you have any questions or need additional information please contact D.P. Burrell at 205-729-7589.

Claudia Hyde for-

R.P. Hyde
Lead Procurement Engineer
Browns Ferry Nuclear Plant

238

FEDERAL EXPRESS

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL PACKAGE TRACKING NUMBER 9569284303

4131M 9569284303

RECIPIENT'S COPY

1 Date

From (Your Name) Please Print | Your Phone Number (Very Important)

Company | Department/Floor No.

Street Address

City | State | ZIP Required

2 To (Recipient's Name) Please Print | Recipient's Phone Number (Very Important)

Company | Department/Floor No.

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.)

City | State | ZIP Required

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here
Street Address
City | State | ZIP Required

3 PAYMENT 1 ☐ Bill Sender 2 ☐ Bill Recipient's FedEx Acct. No 3 ☐ Bill 3rd Party FedEx Acct. No 4 ☐ Bill Credit Card 5 ☐ Cash/Check

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business afternoon)
11 ☐ OTHER PACKAGING
16 ☐ FEDEX LETTER*
12 ☐ FEDEX PAK*
13 ☐ FEDEX BOX
14 ☐ FEDEX TUBE

Standard Overnight (No Saturday delivery)
51 ☐ OTHER PACKAGING
56 ☐ FEDEX LETTER*
52 ☐ FEDEX PAK*
53 ☐ FEDEX BOX
54 ☐ FEDEX TUBE

Economy Two-Day (Delivery by second business day †)
30 ☐ ECONOMY*
* Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Government Overnight (Restricted for authorized users only)
46 ☐ GOVT LETTER
41 ☐ GOVT PACKAGE

Freight Service (for packages over 150 lbs.)
70 ☐ OVERNIGHT FREIGHT ** (Confirmed reservation required)
80 ☐ TWO-DAY FREIGHT **
† Delivery commitment may be later in some areas.
** Declared Value Limit $500. Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service
☐ HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
☒ DELIVER WEEKDAY

Saturday Service
31 ☐ HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)
3 ☐ DELIVER SATURDAY (Extra charge) (Not available to all locations)
9 ☐ SATURDAY PICK-UP (Extra charge)

Special Handling
4 ☐ DANGEROUS GOODS (Extra charge)
6 ☐ DRY ICE — Dangerous Goods Shipper's Declaration not required
Dry Ice, 9, UN 1845, ____ X ____ kg, 904 III
☐ DISCRETION
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

6 Weight | YOUR DECLARED VALUE (See right)
Total | Total | Total

DIM SHIPMENT (Chargeable Weight)
☐ lbs.
L x W x H

Received At
1 ☐ Regular Stop | 3 ☐ Drop Box
2 ☐ On-Call Stop | 4 ☐ B.S.C. | 5 ☐ Station

7 Release Signature:

Emp. No. | Date
☐ Cash Received
☐ Return Shipment
☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
State | Zip
Received By:
X
Date/Time Received | FedEx Employee Number

Federal Express Use
Base Charges
Other 1
Other 2
Total Charges

REVISION DATE 3/94
PART #137204 FXEM 4/94
FORMAT #158
158

Q/A RECEIVING REPORT

OMEGA POINT LABORATORIES

CLIENT/PROJECT NAME: TSI / TVA

CLIENT/PROJECT NUMBER: 11960-97185-87+97257-60

RECEIVED FROM: TVA

PROJECT LOCATION: Omega Point Labs

REPORT NUMBER: 1414 . 11960

DATE RECEIVED: 8-10-94

DATE INSPECTED: 8-10-94

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
1" steel Conduit	NA	(7)	7	0	AWD-015W	Y	N	Good	None	X			Receiving Verification only 10' lengths for a total 70 feet CP

FORM
1/29/93

TVA 144 (FD-5-70)

TENNESSEE VALLEY AUTHORITY
SHIPPING TICKET

No. S5694-Q1017

SHIPPER: TENNESSEE VALLEY AUTHORITY

POINT OF ORIGIN: NEAR, ATHENS, AL. 35611 8-8- 1994

SHIPPING STOREROOM: BROWNS FERRY NUCLEAR PLANT

AUTHORITY: DAN OLIVER, SUPV., M&PS

SHIP TO: MR OMEGA POINT LABS
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)

DEBIT: 005131 ~~RECORD ONLY~~

BILL TO

CREDIT: 0002W63

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC - ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
1.	70	Conduit, metal rigid steel, Galv., Thickwall, 1.0 IN DIA X 10 FT LG.	AWD-015W	70	FT		
		SENT FOR FIRE TESTING PROGRAM					
		QA III					

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

SHIPPED 8-6- 19 94 G. B. L. No. TV N/A METHOD OF SHIPMENT FEDEX (TWO DAY FRT)

5 - SHIPPING NOTICE

TO BE ENCLOSED WITH MATERIAL WHEN NO OTHER PACKING SLIP IS USED: OTHERWISE, TO CONSIGNEE UNDER SEPARATE COVER.

TO BE FILLED IN BY RECEIVING OFFICE

SERIAL NO. OF FORM

1677

COST

CARRIER'S CHARGE

DELIVERY CHARGES

TOTAL COST

MATERIAL RECEIVED 19

NAME OF CARRIER C. W. BURT

MATERIAL CHECKED IN BY

STORES LEDGER POSTED BY

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER

4159M 0115008830

RECIPIENT'S COPY

1 Date 8-8-94

From (Your Name) Please Print

Your Phone Number (205-729-

Company

ATHENS

Street Address

City: ATHENS State: AL ZIP Required: 3 5 6

2 To (Recipient's Name) Please Print

Company

Department/Floor No.

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes)

1601 Sandy Falls

City: Elmendorf State: TX ZIP Required: 78112

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here
Street Address
City State ZIP Required

3 PAYMENT 1 Bill Sender 2 Bill Recipient's FedEx Acct. No. 3 Bill 3rd Party FedEx Acct. No. 4 Bill Credit Card
5 Cash/Check

4 SERVICES

5 DELIVERY AND SPECIAL HANDLING

6 PACKAGES WEIGHT In Pounds Only YOUR DECLARED VALUE

1 126

OTHER OTHER

11 FEDEX LETTER

52 FEDEX PAK

13 FEDEX BOX 53 FEDEX BOX

14 FEDEX TUBE 54 FEDEX TUBE

Economy Two-Day

30 ECONOMY*

*Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Government Overnight (Restricted for authorized users only)

46 GOV'T LETTER

41 GOV'T PACKAGE

Freight Service (for packages over 150 lbs.)

70 [X] OVERNIGHT FREIGHT**

80 TWO-DAY FREIGHT

** Confirmed reservation required

† Delivery commitment may be later in some areas.

2 DELIVER WEEKDAY

Saturday

31 HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)

3 DELIVER SATURDAY (Extra charge) (Not available to all locations)

9 SATURDAY PICK-UP (Extra charge)

Special Handling

4 DANGEROUS GOODS (Extra charge)

6 DRY ICE Dangerous Goods Shipper's Declaration not required

12 HOLIDAY DELIVERY (Extra charge)

Total Total 125 Total

DIM SHIPMENT (Chargeable Weight)

L x W x H

Received At

3 Drop Box
4 B.S.C.
5 Station

Emp. No. Date

Cash Received

Return Shipment

Third Party Chg. To Del. Chg. To Hold

Street

Received By:
X

Date/Time Received FedEx Employee Number

7 Release Signature

FedEx Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 3/94
PART #137201 FXEM 5/94
FORMAT #158

158

© 1994 FEDEX
PRINTED IN U.S.A.

885

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185-87 & 97332-38 97257-60
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1426 - 11960
DATE RECEIVED 8-26-94
DATE INSPECTED 8-26-94
INSPECTED BY: CPatton

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	
Junction Box	0	0	1	0	Ref # 94-5349	Y	N/A	Good	None	X			Receiving Verification Only
1'X1'X5'													NOTE: cut

FORM
1/29/93

TVA 144 (FD-5-70)

TENNESSEE VALLEY AUTHORITY

SHIPPING TICKET

No. G 578597

887

SHIPPER TVA - HORACE CROWDEN

POINT OF ORIGIN MUSCLE SHOALS, AL 8-24- 19 94

SHIPPING STOREROOM POWER SERVICE SHOPS

AUTHORITY BPN-N-94-0071

TO

OMEGA POINT LAB
16015 Shady Falls Road
Elmendorf, Texas 78112
ATTN: M. D. Black

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)

DEBIT

Record Only

BILL TO

Same

CREDIT

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC – ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
1		Junction box		1	ea		

Per: C. Allsbrooks
REF: 94-5349

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

7 – EXTRA COPY TO _____

TO DIVISION OF PURCHASING, CHATTANOOGA.

TO PURCHASING FOR ALL PERSONAL PROPERTY SHIPMENTS AUTHORIZED BY FORM 81, TRANSFER ORDER, OR USED AS EXTRA COPY AS REQUIRED.

5/20/94

TO: N. D. Black

Omega Point Lab
16015 Shady Falls Road
Elmendorf, Texas
78112-9784

Sirs,

This Material is being supplied to you by the TVA Browns Ferry Nuclear Plant in support of the Thermolag Fire and Ampacity Testing your facility is working on.

If you have any questions or need additional information please contact D.P. Burrell at 205-729-7589.

R.P. Hyde
Lead Procurement Engineer
Browns Ferry Nuclear Plant

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA/TSI
CLIENT/PROJECT NUMBER 11960/97553-55
RECEIVED FROM TVA
PROJECT LOCATION OPL

REPORT NUMBER 14421 11960
DATE RECEIVED 10/6/94
DATE INSPECTED 10/6/94
INSPECTED BY: C Humphrey

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	
5" STEEL CONDUIT	N/A	0	4	0	BBY-74LJ	Y	N	OK	NONE	X			Receiving Inspection only.
3" " "	"	0	2	0	AWD-019L	Y	N	OK	"	X			
2" " "	"	0	2	0	AWD-017Q	Y	N	OK	"	X			
3" IRON LB	"	0	1	0	BBM-589C	Y	N	OK	"	X			
3" LB COVER	"	0	1	0	BTX-383T	Y	N	OK	"	X			
3" LB GASKET	"	0	1	0	BTY-337W	Y	N	OK	"	X			
2" LB COVER	"	0	1	0	BTX-381Y	Y	N	OK	"	X			
2" LB GASKET	"	0	1	0	BTY-336Y	Y	N	OK	"	X			
1" IRON LB	"	0	2	0	BTM-778C	Y	N	OK	"	X			
1" LB COVER	"	0	2	0	BTX-375R	Y	N	OK	"	X			
1" LB GASKET	"	0	2	0	BTY-329V	Y	N	OK	"	X			

FORM
1/4/89

TVA 144 (FD-5-70)

SHIPPING TICKET

No. 55694-00010

890

SHIPPER TENNESSEE VALLEY AUTHORITY

POINT OF ORIGIN NEAR, ATHENS, AL. 35611 10-4- 1994

SHIPPING STOREROOM BROWNS FERRY NUCLEAR PLANT

AUTHORITY DAN OLIVER, SUPV., M&PS

SHIP TO
OMEGA POINT LAB
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)
DEBIT
00035LG

BILL TO

CREDIT

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC – ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
1.	40	5" Conduit	BBY-741J	40	FT		
2.	20	3" Conduit	AWD-019L	20	FT		
3.	20	2" Conduit	AWD-017Q	20	FT		
4.	1	3" Iron LB	BBM-589C	1	EA		
5.	1	3" LB Cover	BTX-383T	1	EA		
6.	1	3" LB Gasket	BTY-337W	1	EA		
7.	1	2"LB Cover	BTX-381Y	1	EA		
8.	1	2" LB Gasket	BTY-336Y	1	EA		
9.	2	1" Iron LB	BTM-778C	2	EA		
10.	2	1" LB Cover	BTX-375R	2	EA		
11.	2	1" LB Gasket	BTY-329V	2	EA		

This material supplied to support the Thermolag Fire and Ampacity Testing

QA III

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

USVA #74

DATE SHIPPED 10-4- 19 94 G. B. L. No. TV N/A METHOD OF SHIPMENT FEDEX TWO-DAY FRT

SHIPPING NOTICE

TO BE ENCLOSED WITH MATERIAL WHEN NO OTHER PACKING SLIP IS USED: OTHERWISE, TO CONSIGNEE UNDER SEPARATE COVER.

TO BE FILLED IN BY RECEIVING OFFICE

SERIAL NO. OF FORM

1677

COST
CARRIER'S CHARGE
DELIVERY CHARGES
TOTAL COST

MATERIAL RECEIVED 19
NAME OF CARRIER C. W. BURT
MATERIAL CHECKED IN BY
STORES LEDGER POSTED BY

C019333775

PACKAGE TRACKING NUMBER 281939317

RECIPIENT'S COPY

1 [redacted]

From (Your Name) Please Print: C. J. Burt

Date: 10-4-94

Company: TVA/BROWNS FERRY NUCLEAR PLT

Your Phone Number (Very Important): (205)729-6641

Department/Floor No.:

Street Address: BROWNS FERRY RD

City: ATHENS

State: AL

ZIP Required: 35611

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

2 To (Recipient's Name) Please Print

Recipient's Phone Number (Very ...: ( )

Company: Omega Paint ...

Department/Fl...

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 16015 Spring Falls Road

City: Elmendorf

State: TX

ZIP Required: 78112

3 PAYMENT
1 ☐ Bill Sender
2 ☐ Bill Recipient's FedEx Acct. No.
3 ☐ Bill 3rd Party FedEx Acct. No.
4 ☐ Bill Credit Card
5 ☐ Cash/Check

[redacted]

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning†)
11 ☐ OTHER PACKAGING
16 ☐ FEDEX LETTER*
12 ☐ FEDEX PAK*
13 ☐ FEDEX BOX
14 ☐ FEDEX TUBE

Standard Overnight (Delivery by next business afternoon; No Saturday delivery†)
51 ☐ OTHER PACKAGING
56 ☐ FEDEX LETTER*
52 ☐ FEDEX PAK*
53 ☐ FEDEX BOX
54 ☐ FEDEX TUBE

Economy Two-Day (Delivery by second business day†)
30 ☐ ECONOMY*
*Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Government Overnight (Restricted for authorized users only)
46 ☐ GOVT LETTER
41 ☐ GOVT PACKAGE

Freight Service (for packages over 150 lbs.)
70 ☐ OVERNIGHT FREIGHT** (Confirmed reservation required)
80 ☒ TWO-DAY FREIGHT**

†Delivery commitment may be later in some areas.
*Declared Value Limit $500.
**Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service
1 ☐ HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
2 ☒ DELIVER WEEKDAY

Saturday Service
31 ☐ HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)
3 ☐ DELIVER SATURDAY (Extra charge) (Not available to all locations)
9 ☐ SATURDAY PICK-UP (Extra charge)

Special Handling
4 ☐ DANGEROUS GOODS (Extra charge)
6 ☐ DRY ICE — Dangerous Goods Shipper's Declaration not required
☐ Dry Ice, 9, UN 1845, ____ x ____ kg. 904 III — DESCRIPTION
12 ☐ HOLDING DELIVERY (If offered) (Extra charge)

6

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1	200	
1	827	
Total	Total 827	Total
1	200	

DIM SHIPMENT (Chargeable Weight) 1 ~~256~~ lbs.
120 x 048 x 042

Received At
1 ☐ Regular Stop
2 ☒ On-Call Stop
3 ☐ Drop Box
4 ☐ B.S.C.
5 ☐ Station

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here
Street Address
City
State
ZIP Required

Emp. No.	Date

☐ Cash Received
☐ Return Shipment
☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold

Street Address
City | State | Zip

Received By: X

Date/Time Received | FedEx Employee Number

7 Release Signature:

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 4/94
PART #145412 FXEM 8/94
FORMAT #160

160

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA/TS1
CLIENT/PROJECT NUMBER 11960-92553-55
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1447-11960
DATE RECEIVED 10/12/94
DATE INSPECTED 10/12/94
INSPECTED BY: C Humphrey

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
5" CONDUIT STRAP	N/A	0	6	0	P2558-50	Y	N	GOOD	NONE	X			RECEIVING VERIFICATION ONLY CK
2" " "	"	0	3	0	N2558-20EG	Y	N	"	"	X			
1" " "	"	0	6	0	N2558-10EG	Y	N	"	"	X			

FORM
1/29/93

TVA 144 (FD-5-70)

SHIPPING TICKET

No. 858-15485 893

SHIPPER L J. Wheeler

POINT OF ORIGIN Soddy Daisy, Tn 10-11 19 94

SHIPPING STOREROOM Sequoyah Nuclear Stores

AUTHORITY L. J. Wheeler

SHIP TO

Omega Point Laboratories
16015 Shady Falls Rd
Elmendorf, Texas 78112
ATTN: Kent Brown

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)

DEBIT

00014PG

BILL TO

CREDIT

ITEM	QUANTITY ORDERED	DESCRIPTION	PSC – ITEM No. BIN No.	QUANTITY DELIVERED	UNIT	UNIT PRICE	AMOUNT
1	6	5" two Hole conduit strap P|N P2558-50 RD 964707 it 11 3-13-85	BLT-609G	6	EA		
2	3	2" two hole conduit strap P|N N2558-20EG Lot C0350 1008070 it 2 2-18--94	Bla-296W	3	EA		
3	6	1" two hole conduit straps P|N N2558-10EG lot C0149 RD 331168 Item 5 4-6-93	AWN-628T	6	Ea		

Shipped per WBN Peg package T69941008800
and memo from Larry Mays to P. Truss

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

DATE SHIPPED 10-11 19 94. B. L. No. TV

METHOD OF SHIPMENT Fed Ex

SHIPPING NOTICE

TO BE ENCLOSED WITH MATERIAL WHEN NO OTHER PACKING SLIP IS USED: OTHERWISE, TO CONSIGNEE UNDER SEPARATE COVER.

TO BE FILLED IN BY RECEIVING OFFICE

SERIAL NO. OF FORM

1677

COST

CARRIER'S CHARGE

DELIVERY CHARGES

TOTAL COST

MATERIAL RECEIVED 19

NAME OF CARRIER

MATERIAL CHECKED IN BY

STORES LEDGER POSTED BY

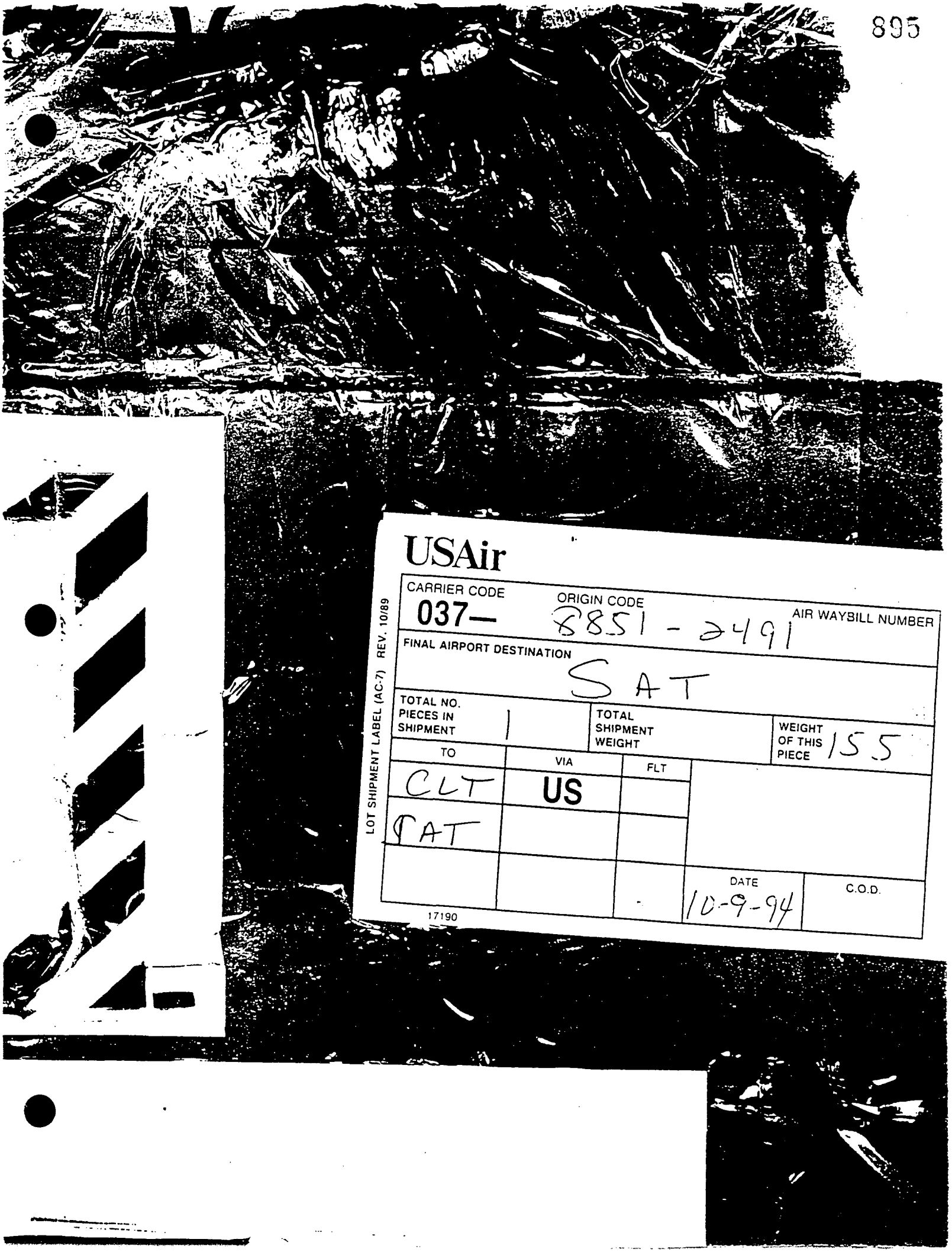
Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA/TSI
CLIENT/PROJECT NUMBER 11960-97553-55
RECEIVED FROM TVA
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1445.11960
DATE RECEIVED 10/10/94
DATE INSPECTED 10/10/94
INSPECTED BY: C Humphrey

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
5" LB WITH COVERS + GASKETS	N/A	0	2	0	LB500-M	Y	N	Good	None	X			RECEIVING VERIFICATION ONLY. NO MATERIAL CERTS RECEIVED. NO PACKING LIST RECEIVED. CH
2" LB	N/A	0	1	0	LB200-M	Y	N	"	"	X			

FORM
1/29/93



USAir

LOT SHIPMENT LABEL (AC-7) REV. 10/89

CARRIER CODE	ORIGIN CODE	AIR WAYBILL NUMBER
037—	8851 - 2491	

FINAL AIRPORT DESTINATION: SAT

TOTAL NO. PIECES IN SHIPMENT	TOTAL SHIPMENT WEIGHT	WEIGHT OF THIS PIECE
1		155

TO	VIA	FLT		
CLT	US			
SAT				
			DATE	C.O.D.
			10-9-94	

17190

☐ PREPAID
☐ COLLECT

--- DELIVERY SERVICE, INC.
P.O. BOX 460289
SAN ANTONIO, TEXAS 78246-0289
PHONE (210) 826-8110
RRC NO. 4756

№ 896 1274

DATE

CARRIER Sonic

SHIPPER

ADDRESS

CITY

AIRBILL NO. TEH 31453

CONSIGNEE Omega Point Labs

ADDRESS 16015 Shady Falls Rd

CITY Elmendorf TX 78112

NO PIECES	DESCRIPTION	WEIGHT		
1	Tom Kent Brown			
	REFERENCE NO.			
	US 8851-9491	155		

Carrier & liability not more than $50.00 unless a greater value is declared. Carrier is not responsible for concealed damage nor for freight claims after 48 hours. Shipment is accepted in apparent good order except as noted

DRIVER

DRIVER

DRIVER

DRIVER

SHIPPERS SIG

RECEIVED GOOD ORDER

TIME

DATE

TIME

DATE

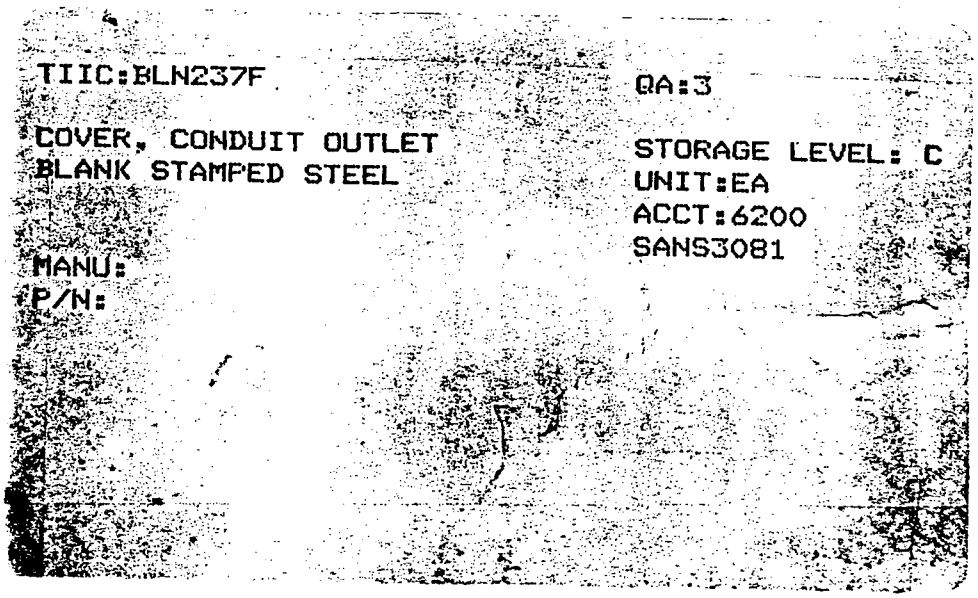
C.O.D. AMOUNT →

BUS/AIRLINE CHARGES →

TOTAL →

BTY259N WBN-SWEC-R93-7273 EA
1006841 12-28-93 IT# 2
QA LEVEL III PEG DATE: 12-9-93
CONDUIT OUTLET,ELEC,MI,2",
THD RIGID HUB,TYPE LB,
P/N: LB-200-M
STORAGE LEVEL C MED/6230

BLN236H WBN EA.
44286B-01 03-12-90
QA. LEVEL III STORAGE LEVEL C
COND. OUTLET,ELECT. TYPE LB,FORM 35
PN:LB500-M
MFG:APPLETON ELECT.
SANE3606 NS/6200 RDR



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185, 86+87
RECEIVED FROM Soltec
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1390 - 11960
DATE RECEIVED 7-6-94
DATE INSPECTED 7-6-94
INSPECTED BY: CPatton

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	
Channel	11250	10	10	—	CAN3X4.1#X20	Y	Y	GOOD	NONE	X			
3"X4.10 Channel X20													
ANGLE IRON 4"X4"X½X20	11250	1	1	—	ANG 4X C07	Y	Y	GOOD	NONE	X			

FORM
1/29/93

868

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Toltec Steel Products, Inc
5390 Dietrich Road

San Antonio TX 78219

PO Number: 1125-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Cleda Patton Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
7/5/94	Their Truck		7-6-94	30

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Channel 3"x4.1	10	$23.58	$235.80
2.	Angle Iron 4"x4"x1/2" 20 ft. sections	1	$66.05	$66.05

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 7-5-94

Special Instructions

Please include MTR's (Material Test Reports)

Ordered By: Cleda Patton

Project #: 11960 - 97185

Total	$301.85
Shipping	
Tax	
Invoice Total	**$301.85**

* * * * * * * * * * * * * * * *
* S A L E S O R D E R 28564 *
* * * * * * * * * * * * * * * *

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH
SAN ANTONIO, TX 78219

DELIVER PICKING TICKET

M+R's attached

BILL TO: 000477
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 78112

SHIP TO:
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 781120000

PURCHASE ORDER: 1125-Q
PLACED BY: CLEDA
TELEPHONE #: (512) 635-8100
SHIP VIA:
COMMENTS:

ORDER DATE: 7/05/94
REQUEST DATE: 7/05/94
SALESMAN: CASEY HARMS

LINE	ORDER QTY	SHIP QTY	COD PART NUMBER	DESCRIPTION	WEIGHT	UNIT COST	EXTEND COST
01		10	CHN 3X4.1#X20	3" X 4.1# CHANNEL X 20	820	28.75	235.75
02	1	1	ANG 4XC07	4 X 4 X 1/2 X 20	256	25.80	66.05

T[illegible] WEIGHT: 1076 LBS

RECEIVED BY: Richard Reasby

NET BEFORE TAX	301.80
TAX.....	23.39
GRAND TOTAL...	325.19

smi

UCTURAL METALS, INC.
X 911, SEGUIN, TEXAS 78156-0911
512-372-8200

CERTIF TEST REPORT

The following tests conform to the requirements of the specifications listed.

WE HEREBY CERTIFY THAT THE FOL OWING DATA IS A TRUE COPY FROM TESTS P ED IN OUR LABORATORY.

DAN SCHACHT 12/ 8/92
QUALITY CONTROL MANAGER

SIN# S76813
BOL NO B9374105

INV NO V145995
INV DATE 12/07/92

S 768400
O TOL TEC PRODUCTS
L 5390 DIETRICH
D SAN ANTONIO TX
T 78219
O

S 8000
H TOL TEC
I P/U @ MILL
P TX
T
O

HEAT NO	SECTION	SPECIFICATION	T #	YIELD PSI	TENSILE PSI	ELONG %	ELONG IN	R.A. %	BEND TEST DIAM	BEND TEST RSL	DATE ROLLED	LB/FT
01099	F 4X1/2	ASTM A36-89	1	49000	73500	31.0	8				060492	4.7
01109	F 5X3/8	ASTM A36-89	1	50500	70200	32.0	8				060492	6.2
01415	L 3X2X1/4	ASTM A36-89	1	53800	77700	29.0	8				062392	4.0
02376	L 2.5X2.5X1/4	ASTM A36-89	1	55000	76500	28.5	8				081792	3.9
02888	L 4X4X1/2	ASTM A36-89	1	51200	75500	29.0	8				091592	12.6
02973	SQ 1	ASTM A36-89	1	50000	72000	21.0	8				091992	3.3
03369	L 1.25X1.25X1/8	A36 MODIFIED	1	56900	85900	21.0	8				102292	0.9
03559	RD 1	ASTM A36-89	1	53500	75200	23.0	8				102992	2.6

HEAT NO	C	MN	P	S	SI	CU	CR	NI	MO	CB	V	AL	CE		BHN
01099	.16	0.79	.012	.035	.21	.49	0.18	0.24	.051	.001	.0020	.002	.00		
01109	.17	0.70	.007	.030	.19	.38	0.09	0.13	.046	.001	.0020	.001	.00		
01415	.17	0.77	.015	.041	.18	.52	0.19	0.17	.047	.000	.0020	.001	.00		
02376	.20	0.74	.009	.025	.21	.55	0.08	0.19	.045	.000	.0010	.003	.00		
02888	.20	0.63	.010	.038	.19	.60	0.14	0.15	.041	.000	.0110	.001	.00		
02973	.19	0.65	.008	.024	.16	.43	0.08	0.14	.042	.000	.0010	.001	.00		
03369	.21	0.79	.018	.027	.18	.55	0.20	0.18	.043	.000	.0040	.001	.00		
03559	.19	0.68	.011	.031	.16	.39	0.10	0.15	.041	.000	.0010	.001	.00		

EMARKS: THIS STEEL IS MELTED AND MANUFACTURED IN THE USA AND IS FREE FROM MERCURY CONTAMINATION IN THE PROCE

FOR ADDITIONAL COPIES
CALL ACCOUNTING
(512) 372-8225.

STRUCTURAL METALS, INC.
BOX [redacted] SEGUIN, TEXAS 78156-0911
210-372-[redacted]200

CERTIFIED TEST REPORT

The following tests conform to the requirements of the specifications listed.

WE HEREBY CERTIFY THAT THE FOLLOWING DATA IS A TRUE COPY FROM TESTS PERFORMED IN OUR LABORATORY.

DAN SCHACHT
QUALITY CONTROL MANAGER

4/29/94

S 768400
O TOL TEC PRODUCTS
L 5390 DIETRICH
D SAN ANTONIO TX
T 78219
O

S 8000
H TOL TEC
I P/U ^ MILL
P SEGUIN TX
T
O

S115812
NO B9418932

NO V183809
DATE 04/28/94

	SECTION		SPECIFICATION	T #	YIELD PSI	TENSILE PSI	ELONG %	ELONG IN	R.A. %	BEND TEST DIAM	BEND TEST RSL	DATE ROLLED	LB/FT
1	C 3X4.1	20	ASTM A36-91	1	52500	75600	31.0	8				110293	4.100
5	F 3X3/8	20	ASTM A36-91	1	51800	75000	27.0	8				122093	3.720
9	L 3X3X3/16	20	ASTM A36-91	1	54200	75300	31.0	8				010394	3.670
3	L 4X4X1/4	20	ASTM A36-91	1	54200	77000	31.0	8				021894	6.600
4	\4 REBAR	20	ASTM A615-93 GRADE 60 AASHTO M31	1	66000	103000	13.0	8		1.750	OK	042394	0.640
5	\4 REBAR	20	ASTM A615-93 GRADE 60 AASHTO M31	1	65500	102000	12.6	8		1.750	OK	042394	0.640
2	L 4X3X3/8	20	ASTM A36-93a	1	52100	76300	32.5	8				040994	8.500
1	L 4X3X1/4	20	ASTM A36-93a	1	53100	73900	30.0	8				041094	5.750

	C	MN	P	S	SI	CU	CR	NI	MO	CB	V	AL	CE		BHN	
1	.17	0.74	.012	.034	.21	.39	0.17	0.18	.052	.000	.0010	.002	.00			517
5	.16	0.71	.011	.035	.23	.45	0.13	0.16	.051	.000	.0010	.002	.00			517
9	.17	0.77	.011	.031	.24	.39	0.09	0.16	.064	.001	.0030	.003	.00			517
3	.17	0.70	.007	.020	.20	.39	0.12	0.18	.061	.000	.0010	.001	.00			517
4	.35	0.96	.012	.036	.25	.38	0.12	0.16	.046	.001	.0020	.002	.00			517
5	.37	0.96	.014	.040	.24	.46	0.10	0.15	.038	.001	.0030	.002	.00			517
2	.15	0.86	.009	.022	.22	.44	0.17	0.21	.044	.000	.0020	.000	.00			517
1	.15	0.77	.012	.027	.23	.43	0.25	0.20	.056	.002	.0030	.001	.00			517

100% MELTED AND MANUFACTURED IN THE USA AND FREE FROM MERCURY CONTAMINATION IN THE PROCESS

FOR ADDITIONAL COPIES
CALL ACCOUNTING
(210) 372-8225.

206

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97185, 97260, 97332 & 97338
RECEIVED FROM Toltec
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1422 . 11960
DATE RECEIVED 8-23-94
DATE INSPECTED 8-23-94
INSPECTED BY: Q Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
6"X6"X1/2X40' Tubing	11440	40'	40'	0	14B6XC09X40	Y	Y	Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Toltec Steel Products, Inc
5390 Dietrich Road

San Antonio TX 78219

PO Number: 1144-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Cleda Patton Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/23/94	Their Truck		8/24/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Tubing-6" x 6" x 1/2"	40'		$0.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 8-23-94

Special Instructions

Please include MTR's

Ordered By: Cleda Patton

Project #: TSI/TVA

Total	$0.00
Shipping	
Tax	
Invoice Total	**$0.00**

* * * * * * * * * * * * * * * * *
* S A L E S O R D E R 29830 *
* * * * * * * * * * * * * * * * *

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH
SAN ANTONIO, TX 78219

DELIVER PICKING TICKET

BILL TO: 000477
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 78112

SHIP TO:
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 781120000

PURCHASE ORDER: 1144 2
PLACED BY: KERRY
SHIP VIA:
COMMENTS:

TELEPHONE #: (512) 635-8100

ORDER DATE: 8/23/94
SALESMAN: CASEY HARMS

REQUEST DATE: 8/29/94

LINE	ORDER QTY	SHIP QTY	COD PART NUMBER	DESCRIPTION	WEIGHT	UNIT COST	EXTEND COST
01	1	1	TUB 6XC09X40	6 X 6 X 500 X 40	1419	1999.00	799.60
02	0	0		MUST HAVE MTR **	0	.00	.00
03	2	2	AN6 2XC03X25ALUM	2 X 2 X 1/4 X 25 ALUMINUM	56	255.00	141.53

WEIGHT: 1466 LBS
RECEIVED BY:

NET BEFORE TAX	941.13
TAX.....	72.94
GRAND TOTAL...	1014.07

P. 01

TOTAL P.01
PAGE.001

666 8402

ID 6358101

FROM TOLTEC STEEL 6614672

08/25/1994 11:02

906 AUG 25 '94 11:02

…NAME AND ADDRESS OF PRODUCER'S PLANT … PRODUCTRICE
FIRMA U [redacted] SCHRIFT DES HERSTELLERWERKS

VALE…
USINE DE [redacted]L
57480 RETTEL FRANCE

PAGE-SHEET-S [redacted] 1
CERTIFICAT DE RECEPTION
INSPECTION CERTIFICATE - ABNAHMEPRUFZEUGNIS
MODELE 3.1.B (A49.001) DIN 50049

ACHETEUR - PURCHASER - BESTELLER
FRANCOSTEEL CORPORATION SALES
HOUSTON
UNITED STATES

NO.COMMANDE ACHETEUR
PURCHASER'S ORDER N°
BESTELLUNG NR
FNY 553 - 8180 Q

NO COMMANDE USINE
PLANT ORDER NUMBER
WERKSBESTELL NUMMER
3-M -20227

AVIS D'EXPEDITION N°
DISPATCH NOTE N°
VERSANDANZEIGE NR
8 -130487

POSTE / ITEM / POST	DIMENSIONS EN POUCES / DIMENSIONS / ABMESSUNGEN	QUANTITE TOTALE-TOTAL QUANTITY-GESAMTMENGE: NOMBRE-NUMBER / ANZAHL	LONGUEUR(FEET): LENGTH-LANGE	MASSE (LBS) / MASS - MASSE
2	6" X 6" X ,500"	8	320,01	11221
3	7" X 7" X 3/8"	5	200,00	6569
6	8" X 8" X ,500"	2	79,98	3946
11	12" X 2" X ,250"	10	400,00	9016
12	12" X 4" X ,250"	6	239,93	6239

NUANCE D'ACIER - STEEL GRADE - STAHLSORTE
ASTM A 500 GRADE B ERW

NORME OU SPECIFICATION DU PRODUIT
PRODUCT STANDARD OR SPECIFICATION
PRODUKTNORM BZW.- SPEZIFIKATION

STRUCTURAL SQUARE AND RECTANGULAR TUBES
ERW ASTM A 500 GRADE B (WITH MIN. PSI YIELD 46000)

ANALYSE SUR TUBES EN % - PIPES ANALYSIS - ROHRANALYSE

POSTE / ITEM / POST	NO DE LA COULEE / NUMBER OF CAST / NUMMER DES GUSSES	C	MN	P	S	SI	AL	BO	CR	MO	V	CU	TI	NI	NB	SN
2	14836	0,126	1,440													
2	24904	0,160	1,450	0,012	0,007											
3	26255	0,131	1,400	0,018	0,008											
6	15158	0,158	1,430	0,016	0,009											
11	15158	0,158	1,430	0,013	0,007											
12	26401	0,169	1,510	0,013	0,007											
				0,020	0,007											

TRACTION - TENSILE TEST - ZUGVERSUCH
EPROUVETTE - TEST PIECE - PROBE

POSTE / ITEM / POST	VALEURS GARANTIES - GUARANTEED VALUES / GEWAHRLEISTETE WERTE: RE (PSI)	RM (PSI)	A %	RM(A-2)
2	68655	74691	25,2	
2	71936	77592	25,2	
3	62073	71936	28,6	
6	69905	75562	28,5	
11	61348	71791	32,9	
12	63669	75997	32,2	

POSTE / ITEM / POST	ESSAI HYDRAULIQUE / HYDRAULIC TEST / WASSERPRUFDRUCK	
2	S	BAR
2	S	BAR
3	S	BAR
6	S	BAR
11	S	BAR
12	S	BAR

NOUS ATTESTONS QUE LES PRODUITS SONT CONFORMES AUX STIPULATIONS DE LA COMMANDE
WE CERTIFY THAT THE DELIVRED PRODUCTS COMPLY WITH THE REQUIREMENTS OF THE ORDER.
ES WIRD BESTATIGT, DAS DIE GELIEFERTEN-ERZEUGNISSE DEN BESTIMMUNGEN DER BESTELLUNG ENTSPRECHEN.

RESPONSABLE SECTEUR QUALITE: M. SZKOLNIK
PRODUCTEUR / PRODUCER / HERSTELLER

DATE DATUM : 29/11/93

XT 77444

To: Kerry
From: B.T.
6x6x500
Sq Tube

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185-87 & 97332-38 97257-60
RECEIVED FROM Soltec
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1427 . 11960
DATE RECEIVED 8-25-94
DATE INSPECTED 8-25-94
INSPECTED BY: C Humphrey

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	
Angle Iron 3½" x 2½" x 3/8" x 20'	11469	1	1	0	ANG-3½x2½x05	Y	Y	Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Toltec Steel Products, Inc
5390 Dietrich Road

San Antonio TX 78219

PO Number: 1146-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Kerry M. Hitchcock Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/25/94	Their Truck		8-25-94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	3-1/2"x2-1/2"x3/8" angle iron	1	$44.57	$44.57

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements"
QA Approval C Patton
Date 8-25-94

Special Instructions

Please include MTR's.

Ordered By: Kerry Hitchcock

Project #: TSI/TVA

Total	$44.57
Shipping	
Tax	$3.45
Invoice Total	$48.02

* * * * * * * * * * * * * * * * *
* S A L E S O R D E R 29259 *
* * * * * * * * * * * * * * * * *

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH
SAN ANTONIO, TX 78219

DELIVER PICKING TICKET

BILL TO: 000477
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 78112

SHIP TO:
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 781120000

PURCHASE ORDER: 11460
PLACED BY:
SHIP VIA:
COMMENTS:

TELEPHONE #: (210) 635-9100

ORDER DATE: 3/25/94
SALESMAN: CASEY HARMS

REQUEST DATE: 8/25/94

NE	ORDER QTY	SHIP QTY	COD PART NUMBER	DESCRIPTION	WEIGHT	UNIT COST	EXTEND COST
1	1	1	ANG 3-1/2X2-1/2XC05	3-1/2 X 2-1/2 X 3/8 X 20	144	30.95	44.57

TOTAL WEIGHT: 144 LBS

RECEIVED BY: _____

NET BEFORE TAX	44.57
TAX.....	3.45
GRAND TOTAL...	48.02

CO·STEEL LASCO
A Division of Co-Steel Inc.
Hopkins St. South, Whitby, Ontario, Canada L1N 5T1
TEL.: WHITBY 905-668-8811 • TORONTO 416-364-6138
FAX: 905-668-6469
DUNS 20-183-2094

MATERIAL LISTED BELOW WAS SHIPPED ON BILL OF LADING AND LOADING REPORT NUMBER

TESTING LABORATORY REPORT
COMPTE RENDU DU LABORATOIRE D'ESSAI

• PHYSICAL PROPERTIES • PROPRIÉTÉS PHYSIQUES
• CHEMICAL ANALYSIS • ANALYSE CHIMIQUE

JUL. 18,1994 20:25

097068

3234

O'NEAL STEEL
108 BOGGSTOWN RD.
SHELBYVILLE, INDIANA
U.S.A.
46176

ATTENTION:

CUST. ORDER NUMBERS / N° DE COMM DU CLIENT: SEE * BELOW

MATERIAL TESTED / MATÉRIAU ÉPROUVÉ | HEAT NO. / N° DE CHALEUR | YIELD STRENGTH / LIMITE D'ÉLASTICITÉ | TENSILE STRENGTH / RÉSISTANCE DE TRACTION | ELONGATION GAUGE LENGTH / LONGUEUR DE JAUGE | GRADE / NUANCE

CHANNELS
7 @ 14.75 C6255 58995 PSI 78671 PSI 25.0% IN ASTM-A36-91 SA-36
MATERIAL SPECS: 33081 PART #: PART NAME: ASTM A709 GR36
* B-31613

C	MN	P	S	SI
0.1700	0.6700	0.0050	0.0160	0.1500

ANGLES - STRUCTURAL
3 1/2 X 2 1/2 X 1/2 C3387 50240 PSI 75932 PSI 29.0% IN 8 IN ASTM-A36-91 SA-36
MATERIAL SPECS: 0105961 PART #: PART NAME: ASTM 709 GR36
* B-07177

C	MN	P	S	SI
0.1900	0.7600	0.0040	0.0150	0.1860

ANGLES - STRUCTURAL
4 X 4 X 5/16 C6904 52263 PSI 78902 PSI 28.0% IN 8 IN ASTM-A36-91 SA-36
MATERIAL SPECS: 01 10841 PART #: PART NAME: ASTM 709 GR36
* F-04643

C	MN	P	S	SI
0.2100	0.8500	0.0070	0.0200	0.2080

ROUND BARS-NON-ALLOY
1 1/8 INCH DIAM C6745 49536 PSI 73057 PSI 30.0% IN 8 IN ASTM-A36-91 SA-36
MATERIAL SPECS: 03 15951 PART #: PART NAME: ASTM 709 GR36
* X-23757

C	MN	P	S	SI
0.1900	0.7300	0.0050	0.0240	0.1900

CO·STEEL LASCO A DIVISION OF CO-STEEL INC. CERTIFIES THAT THE ABOVE RESULTS ARE A TRUE AND CORRECT COPY OF THE

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 1960-97185-87, 97257-60
RECEIVED FROM Joltec Steel
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1404 - 11960
DATE RECEIVED 7-21-94
DATE INSPECTED 7-21-94
INSPECTED BY: C Batton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Plate ½"x12"x20'	11320	1	1	0	FLT ½X12	Y		Good	None	X			
Sq tubing 4"x4"x¼"x20'	11320	1	1	0	TUBAXCOLX20	X		Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Toltec Steel Products, Inc
5390 Dietrich Road

San Antonio TX 78219

PO Number: 1132-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Cleda Patton Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
7/20/94	Their Truck		7/21/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	1/2"x 12"x20' Plate	1	$126.40	$126.40
2.	4"x4"x1/4" x24' Square Tubing	1	$103.22	$103.22

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 7-20-94

Special Instructions

Please include MTR's (Material Test Reports)

Ordered By: Cleda Patton

Project #: TSI/TVA-Deck 7

Total	$229.62
Shipping	
Tax	$17.80
Invoice Total	$247.42

* * * * * * * * * * * * * * * * *
* S A L E S O R D E R 28761 *
* * * * * * * * * * * * * * * * *

TOLTEC STEEL PRODUCTS, INC.
3390 DIETRICH
SAN ANTONIO, TX 78219

DELIVER PICKING TICKET

BILL TO: 000477
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 78112

SHIP TO:
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 781120000

PURCHASE ORDER: 11329
PLACED BY: CLETA
TELEPHONE #: (512) 635-8100
SHIP VIA:
COMMENTS:

ORDER DATE: 7/20/94
REQUEST DATE: 7/20/94
SALESMAN: CASEY HARMS

LNE	ORDER QTY	SHIP QTY	COD PART NUMBER	DESCRIPTION	WEIGHT	UNIT COST	EXTEND COST
01	1	1	FLT 1/2X12	1/2 X 12 X 20	408	30.75	126.40
02	1	1	TUB 4XC06X20	4 X 4 X 250 X 20	244	516.10	103.22

WEIGHT: 652 LBS

RECEIVED BY: Jane Reynolds

NET BEFORE TAX	229.62
TAX.....	17.80
GRAND TOTAL...	247.42

B/L # 72969

NUCOR STEEL
A Division of NUCOR Corporation
JEWETT, TEXAS 75846 (903) 626-4461

Date 2/94

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH RD.
SAN ANTONIO, TX 78219

CERTIFIED MILL TEST REPORT

43579

SOLD TO: TOLTEC
5390 DETRICH RD.
SAN ANTONIO TX 78219

SHIP TO: TOLTEC
5390 DETRICH RD

SIZE / GRADE	HEAT NUMBER	CUSTOMER PO NUMBER	TENSILE PSI	YIELD PSI	8 INCH SCALE ELONG %	C	Mn	Si	S	P	V	Nb	Cu	Cr	Ni	Mo
1/2 X 12 ASTM A36-93/ASME SA36-89	345-0467	#534	73600	50000	27	.17	.74	.26	.03	.02	.000	.000	.48	.09	.11	.033
3/4 X 12 ASTM A36-93/ASME SA36-89	334-2690	#534	73700	49100	23	.13	.72	.21	.03	.01	.000	.000	.26	.14	.10	.031
1/2 X 10 ASTM A529-92 GD 50	343-0813	#534	81800	56400	21	.23	.90	.26	.04	.02	.000	.000	.40	.16	.12	.040
3/8 X 8 ASTM A36-93/ASME SA36-89	343-0790	#534	65500	47700	25	.16	.75	.22	.04	.02	.000	.000	.38	.10	.12	.038
2 X 1 X 1/8 ASTM A36-93/ASME SA36-89	332-2362	#534	80000	59500	28	.15	.82	.24	.04	.02	.000	.000	.37	.20	.16	.049
2 X 2 X 1/4 ASTM A36-93/ASME SA36-89	341-1165	#534	70500	50400	30	.15	.75	.22	.04	.02	.000	.000	.48	.17	.17	.057
4 X 3 X 3/8 ASTM A36-93/ASME SA36-89	342-0736	#534	63700	43800	27	.13	.71	.16	.03	.02	.000	.000	.33	.10	.10	.024
3 X 4.1 ASTM A36-93/ASME SA36-89	341-1085	#534	70500	49800	25	.12	.82	.25	.03	.01	.000	.000	.60	.13	.11	.034
6 X 8.2 ASTM A36-93/ASME SA36-89	343-0661	#534	72300	54400	24	.20	.85	.25	.04	.02	.000	.000	.55	.15	.13	.057

MELTED AND MANUFACTURED IN U.S.A.

CHIEF METALLURGIST

614

HANNA

Certification

391000 5/12/94 PAGE 915

Shipped From:
Hanna Steel Corporation
Tube Division
3600 Avenue C
P.O. Box 558
Fairfield AL 35064

Cust P.O.: 8731
Date Shipped: 5/11/94
Load Tally 3-44104
Invoice # 394103

RECEIVED
MAY 16 1994

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH RD.
SAN ANTONIO, TX 78219

Mail To:
Sunbelt Metal Service Inc
P O Box 43839
Austin TX 78745

Ship To:
Sunbelt Metal Service Inc
South Loop 4
Buda TX 78610

Item	Heat #	ASTM Grade	Description	Yield	Tensile	Elong	Rockwell
4 7150712			2X3 RECT 3/16 HRA500 20.000FT				
CONTINUED							
153179	01403	A500 B		66,000	76,000	26.0	B84
153179	45472	A500 B		68,500	76,500	27.0	B86
153184	51226	A500 B		62,000	73,000	28.0	B82

Total Weight 7,826

Heat #	C	MN	P	S	SI
01403	.170	.790	.012	.007	.020
45472	.170	.780	.017	.009	.030
51226	.160	.740	.015	.013	.020

4600412		5 SQ 1/4	HRA500	40.000FT			
55060	1304854	A500 B		65,000	75,500	31.0	B84

Total Weight 5,616

Heat #	C	MN	P	S	SI
1304854	.170	.720	.011	.012	.005

4301112		2 SQ 11GA	HRA500	20.000FT			
3223	C85226	A500 B		55,000	69,000	30.0	B80
3224	C85226	A500 B		55,000	69,000	30.0	B80

Total Weight 6,100

Heat #	C	MN	P	S	SI
C85226	.180	.750	.013	.009	.017

ina Steel Corporation
2 Commerce Avenue
. Box 558
field, Alabama 35064
) 780-1111
IS No. 00-402-9294

SUBJECT TO TERMS AND CONDITIONS ON BACK

Milton Stewart
Metallurgist

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97257
RECEIVED FROM Toltec
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1440 . 11960
DATE RECEIVED 9-23-94
DATE INSPECTED 9-26-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Angle iron	11540	4	4	0	ANG1-½XC01	Y	Y	Good	None	X			
1½"x1½"x⅛"x20													

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Toltec Steel Products, Inc
5390 Dietrich Road

San Antonio TX 78219

PO Number: 1154-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Kerry M. Hitchcock Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
9/17/94	Their Truck		9/21/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	1-1/2"x1-1/2"x1/8"x20' Angle Iron ANG 1-1/2xCO1	4	$6.51	$26.03

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 9-17-94

Special Instructions

Please include MTR's.

Ordered By: Kerry Hitchcock

Project #: TSI/TVA

Total	$26.03
Shipping	
Tax	$2.02
Invoice Total	$28.05

* * * * * * * * * * * * * * *
* S A L E S O R D E R 24569 *
* * * * * * * * * * * * * * *

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH
SAN ANTONIO, TX 78219

DELIVER PICKING TICKET

BILL TO: 000477
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 78112

SHIP TO:
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 78112-0000

PURCHASE ORDER: 1154 0
PLACED BY: KERRY
SHIP VIA:
COMMENTS:

TELEPHONE #: (210) 635-9104

ORDER DATE: 5/31/94
SALESMAN: CASEY HARRIS

REQUEST DATE: 6 6, 94

LINE	ORDER QTY	SHIP QTY	COG PART NUMBER	DESCRIPTION	WEIGHT	UNIT COST	EXTEND COST
1	4	4	ANG 1-1 2X20	1-1/2 X 1-1/2 X 1/3 X 20	98	26.75	26.03
2	1	1		****MILL CERTS REQUIRED	0	.00	.00

WEIGHT: 98 LBS.

RECEIVED BY: Richard Z Beasley

NET BEFORE TAX	26.03
TAX.....	2.02
GRAND TOTAL...	28.05

BO[illegible], SEGUIN, TEXAS 78156-0911
512-[illegible]8200

CERTIFIED TEST REPORT

The following tests conform to the requirements of the specifications listed.

[illegible] IS A TRUE COPY FROM TESTS PERFORMED IN OUR LABORATORY.

QUALITY CONTROL MANAGER [illegible]

[illegible] 2/93

…#	S82439
… NO	B9379472

SOLD TO: 170000 TOLTEC STEEL PRODUCTS, INC. / [illegible] RD. / P O BOX [illegible] SAN ANTONIO, TX 78219 / HOUSTON TX 77241

SHIP TO: 8001 TOLTEC STEEL PRODUCTS, INC. / [illegible] RD. / P/U @ THE MILL / SAN ANTONIO, TX 78219 / SEGUIN TX

…T	SECTION	SPECIFICATION	T #	YIELD PSI	TENSILE PSI	ELONG %	ELONG IN	R.A. %	BEND TEST DIAM	BEND TEST RSL	DATE ROLLED	LB/FT
60	L 2.5X2.5X3/16	ASTM A36-89	1	53300	75000	31.5	8				081692	2.9
96	L 1.5X1.5X1/8	ASTM A36-89	1	55700	75200	23.0	8				101992	1.2
32	L 2X2X1/4	ASTM A36-89	1	52200	74600	27.5	8				113092	3.0
85	L 3X2X3/16	ASTM A36-91	1	55400	77800	29.0	8				011393	3.0
			2	55400	77200	29.0						
93	L 3X3X1/2	ASTM A36-91	1	60000	79900	25.0	8				012793	9.40
96	L 3.5X3.5X1/4	ASTM A36-89	1	55600	77000	35.0	8				040792	5.74

…T	C	MN	P	S	SI	CU	CR	NI	MO	CB	V	AL	CE		BHN	
60	.16	0.81	.009	.031	.21	.52	0.10	0.18	.048	.000	.0020	.003	.00			1145
96	.19	0.65	.007	.031	.20	.34	0.11	0.11	.034	.000	.0010	.001	.00			1145
32	.19	0.61	.011	.035	.17	.43	0.09	0.16	.046	.000	.0010	.002	.00			1145
85	.20	0.63	.006	.028	.21	.41	0.10	0.16	.041	.000	.0010	.002	.00			1145
93	.20	0.76	.007	.021	.21	.28	0.13	0.17	.069	.000	.0170	.003	.00			1145
96	.18	0.72	.010	.030	.20	.48	0.11	0.14	.032	.000	.0020	.000	.00			1145

…S:

THIS STEEL IS MELTED AND MANUFACTURED IN THE USA AND IS FREE FROM MERCURY CONTAMINATION IN THE PROCES

FOR ADDITIONAL COPIES
CALL ACCOUNTING
(512) 372-8225

919

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97185, 86+87, 9725-60
RECEIVED FROM Summers
PROJECT LOCATION Omega Point Labs

REPORT NUMBER B99 - 11960
DATE RECEIVED 7-7-94
DATE INSPECTED 7-7-94
INSPECTED BY: A. 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	
7 Strand Bare #8 Copper Wire	1121Q	1K	1K	0	BASTR7SD8	Y	Y	Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1121-Q

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Cleda Patton
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
6/27/94	Their Truck		6/30/94	30

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	7 Strand Bare #8 Copper Wire BARE8STR	1000	$0.69	$690.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 6-27-94

Special Instructions

Please include all Certificates of Conformance to Catalog Specifications

Ordered By: Cleda Patton

Project #: 11960

Total	$690.00
Shipping	
Tax	
Invoice Total	**$690.00**

 922

SUMMERS ELECTRIC COMPANY
A Summers Bros. Inc. company

ORIGINAL

PACKING SLIP

NUMBER	PAGE
080330601	1

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

06-JUL-1994, 11:26

I W Am

SOLD TO: 09843800
OMEGA POINT LABORATORIES
15015 SHADY FALLS ROAD
ATTN: ACCOUNTS PAYABLE DEPT.
ELMENDORF, TX 78112

SHIP TO:
OMEGA POINT LABORATORIES
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

243

4hR
3MAll

TCI-8:30

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
1121-Q		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLSM	TAX	TERMS
28-JUN-1994	03-JUL-1994	Our Truck	PC	243	000	10th, Net 20th

LINE	QTY ORD	QTY B.O.	QTY SHIP	PART NUMBER / DESCRIPTION	BIN LOC / STOCK	INST	UNIT PRICE		EXTENDED PRICE
002	1000	0	1000	COP BARE-8 STR SOFT DRAWN BARE C	33500	Y	140.00	M	140.00
	3000	0	3000	3M 06228 STD CABLE TIE	19-E-5 06228		20.48	C	614.40

Freight, if applicable, to be billed later

SUB TOTAL	:	754.40
FREIGHT	:	.00
TAX	:	58.46
TOTAL	:	812.86

PICKED BY | CHECKED BY | DATE 7/6/94 | CUSTOMER SIGNATURE

MASTER FORM #2280

SERVICE WIRE CO.

MANUFACTURER

CULLODEN, WV (304)743-8600 PITTSBURGH, PA (412)325-1666 HOUSTON, TX (713)674-6666

923

THIS MATERIAL IS MADE TO APPROPRIATE UL, ASTM, OR CUSTOMER STANDARDS AS SPECIFIED BY THE ORDER.

MADE BY:

SHIP TO:
SUMMERS-SAN ANTONIO
2400 BROCKTON
PO BOX 17747
SAN ANTONIO TX 78217

ORDER NO: 355686

SHIP/SPECIAL INSTRUCTIONS:
PP/ADD FOB ORIGIN
MARK PO # 510026009
510026009

#79 TX 779-675

66287011695

MFG DATE

BASTR7SD8
8 AWG 7STR
BARE CU STRAND SD

GROSS ____ TARE ____ NET ____ FEET 1000

CUTTING

DRAWING

STRANDING

CABLING

ARMOR

JACKET

INSULATION

TESTING

SUMMERS ELECTRIC

June 18, 1992

To Whom It May concern:

I hereby certify that on 7-3-94 we, Summers Electric, provided the material called for on your Purchase Order # 1121-Q on our Bill of Lading (shipping document) # 080330601, in accordance with all applicable requirements for shipment. I further certify that the supplies that were provided are of the quality specified and are in all respects in conformance with purchase order requirements.

Date: 7-20-94
Signature: John Hank
Title: INSIDE SALES

2400 BROCKTON
P.O. BOX 17747
SAN ANTONIO, TEXAS 78217
512/824-1451

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185-187 + 97257 to 97260
RECEIVED FROM Summers
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1406 - 11960
DATE RECEIVED 7-22-94
DATE INSPECTED 7-22-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
galv Cond Strap	11340	7	7	0	KINC105-4	Y	Y	Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

John Harnett
Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1134-Q

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
7/22/94	Pick up		7/22/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Galv Cond Strap-KIN C105-4	7	$2.36	$16.49

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 7-22-94

Special Instructions

Please include Certificate of Conformance

Ordered By: Kerry Hitchcock
Project #: 11960 -group 1

Total	$16.49
Shipping	
Tax	$1.27
Invoice Total	**$17.76**

SUMMERS ELECTRIC COMPANY
A Summers Group, Inc. company

CONTROL

PACKING SLIP

NUMBER	PAGE
080764101	1

22-JUL-1994, 08:53

TYA

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
16015 SHADY FALLS ROAD
ATTN: ACCOUNTS PAYABLE DEPT.
ELMENDORF, TX 78112

SHIP TO:
OMEGA POINT LABORATORIES
2400 BROCKTON

SAN ANTONIO, TX 78217

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
1340			WC

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
2-JUL-1994	22-JUL-1994	Will Call	PC	236	000	10th, Net 20th

LINE	QTY. ORD.	QTY. B.O.	QTY. SHIP.	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
01	7	0	7	KIN C105-4 GALV COND STRAP	24-A-2 75951		235.63	C	16.49

SUB TOTAL	:	16.49
FREIGHT	:	.00
TAX	:	1.27
TOTAL	:	17.76

MASTER FORM #2250

PICKED BY [ ] CHECKED BY [ ] DATE [ ] CUSTOMER SIGNATURE [ ]

SUMMERS ELECTRIC

June 18, 1992

To Whom It May concern:

I hereby certify that on 7-22-94 we, Summers Electric, provided the material called for on your Purchase Order # 11340 on our Bill of Lading (shipping document) # 080764101. in accordance with all applicable requirements for shipment. I further certify that the supplies that were provided are of the quality specified and are in all respects in conformance with purchase order requirements.

Date: 7-26-94
Signature: John Harris
Title: INSIDE SALES

2400 BROCKTON
P.O. BOX 17747
SAN ANTONIO, TEXAS 78217
512/824-1451

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME T51/TUA
CLIENT/PROJECT NUMBER 11960-97185-8[illegible]97257-60
RECEIVED FROM Summers Electric
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1418 .11960
DATE RECEIVED 8-23-94
DATE INSPECTED 8-23-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Junction box	11410	1	1	0	MS?. 12x12x60	Y	Y	Good	None	X			
12ga. flat cover Welded Ends													

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1141-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Kerry M. Hitchcock Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/18/94			8-22-94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Junction Box 12ga 12"x12"x60"	1	$186.00	$186.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval c Patton
Date 8-19-94

Special Instructions

Must meet NEMA 1 specifications.

Ordered By: Kerry Hitchcock

Project #: TVA/TSI
Proj# 97259
Test deck #6

Total	$186.00
Shipping	
Tax	$14.42
Invoice Total	$200.42

SUMMERS ELECTRIC COMPANY
A Summers Group, Inc. company

CUSTOMER

PACKING SLIP 931

PACKING SLIP NUMBER	PAGE
081251801	1

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

18-AUG-1994, 10:43

SOLD TO: 08643800
OMEGA POINT LABORATORIES
16015 SHADY FALLS ROAD
ATTN: ACCOUNTS PAYABLE DEPT.
ELMENDORF, TX 78112

SHIP TO: OMEGA POINT LABORATORIES
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
410		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
-AUG-1994	18-AUG-1994	Our Truck	PC	236	000	10th, Net 20th

LINE	QTY. ORD.	QTY. B.O.	QTY. SHP.	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	INST	UNIT PRICE	UM	EXTENDED PRICE
1	1	0	1	MS? 12X12X60		Y	186.00	E	186.00
				WELDED ENDS 12X60 FLAT COVER 12 GA., NEMA 1 PAD					

Freight, if applicable, to be billed later

SUB TOTAL	:	186.00
FREIGHT	:	.00
TAX	:	14.42
TOTAL	:	200.42

DELIVER TODAY 2-23 PLEASE CD PLEASE CODE

PICKED BY [ ] CHECKED BY [ ] DATE [ ] CUSTOMER SIGNATURE [Richard D Beasley] 1:00

MASTER FORM #2250

SUMMERS ELECTRIC

June 18, 1992

To Whom It May concern:

I hereby certify that on 8-18-94 we, Summers Electric, provided the material called for on your Purchase Order # 11410 on our Bill of Lading (shipping document) # 08125180 1, in accordance with all applicable requirements for shipment. I further certify that the supplies that were provided are of the quality specified and are in all respects in conformance with purchase order requirements.

Date: 9-27-94
Signature: John Hamm
Title: INSIDE SALES

2400 BROCKTON
P.O. BOX 17747
SAN ANTONIO, TEXAS 78217
512/824-1451

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185-97187 +97332-97267-97260-97338
RECEIVED FROM Summers Electric
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1420 . 11960
DATE RECEIVED 8-24+25-94
DATE INSPECTED 8-24+25-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY Order	Rec'd	B.O.	I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE Accept	Hold	Reject	REMARKS
4" steel locknut	11450	4	4	0	KPT 110	X	X	Good	None	X			
4" gal Cond Strap	11450	25	25	0	KIN-C105-4	Y	X	Good	None	X			
3" gal Cond Strap	11450	15	15	0	KIN-C105-3	Y	Y	Good	None	X			
2½" gal cond strap	11450	5	5	0	KIN-C105-2½	Y	Y	Good	None	X			
2" gal Cond Strap	11450	20	20	0	KIN-C105-2	Y	Y	Good	None	X			
3" Sq Head Plug	11450	3	3	0	APP PLG300S	Y	Y	Good	None	X			
1" gal cond Strap	11450	10	10	0	KIN-C105-1	Y	Y	Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Summers Electric
2400 Brockton

San Antonio TX 78217

PO Number: 1145-Q

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Kerry M. Hitchcock
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/24/94	Their Truck			

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	4" Steel Locknut - BPT 110	4	$1.65	$6.60
2.	Galv Cond Strap - KIN C105-4	25	$2.36	$59.00
3.	Galv Cond Strap - KIN C105-3	15	$1.71	$25.65
4.	Galv Cond Strap - KIN C105-2-1/2	5	$1.58	$7.90
5.	Galv Cond Strap - KIN C105-2	20	$1.31	$26.20
6.	Galv Cond Strap - KIN C105-1	10	$0.95	$9.50
7.	3" SQ Head Plug - APP PLG300S	3	$12.73	$38.19

Special Instructions

Please include Certificate of Conformance.

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 8-24-94

Ordered By: Kerry Hitchcock

Project #: TSI/TVA

Total	$173.04
Shipping	
Tax	$13.42
Invoice Total	$186.46

SUMMERS ELECTRIC COMPANY
A Summers Group, Inc. company

CUSTOMER

PACKING SLIP 935

NUMBER	PAGE
178378001	1

24-AUG-1994, 12:15

FROM: 318 W. JOSEPHINE
SAN ANTONIO, TX 78212

SOLD TO: 08643800
OMEGA POINT LABORATORIES
16015 SHADY FALLS ROAD
ATTN: ACCOUNTS PAYABLE DEPT.
ELMENDORF, TX 78112

SHIP TO: OMEGA POINT LABORATORIES
318 W JOSEPHINE
SAN ANTONIO, TX 78212

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
1450		KERRY	WC

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
4-AUG-1994	24-AUG-1994	Will Call	PC	220	000	10th, Net 20th

LINE	QTY. ORD.	QTY. B.O.	QTY. SHP.	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
01	4	0	4	BPT 110 4-IN STEEL LOCKNUT	11-B-3 00110		165.00	C	6.60
02	25	0	25	KIN C105-4 GALV COND STRAP	17-A-1 75951		235.63	C	58.91
03	15	0	15	KIN C103-3 GALV COND STRAP	17-A-1 75945		171.22	C	25.68
04	5	0	5	KIN C105-2-1/2 GALV COND STRAP	17-A-1 75942		158.45	C	7.92
05	20	0	20	KIN C105-2 GALV COND STRAP	17-A-1 75939		131.00	C	26.20
06	10	0	10	KIN C105-1 GALV COND STRAP	17-A-1 75930		95.05	C	9.51

SUB TOTAL	:	134.82
FREIGHT	:	.00
TAX	:	10.46
TOTAL	:	145.28

REV. 8/94

MASTER FORM #2263 SE-TX

PICKED BY [ ] CHECKED BY [ ] DATE [ ] RECEIVED BY [ ]

SUMMERS ELECTRIC COMPANY
A Summers Group, Inc. company

CUSTOMER

PACKING SLIP 936

PACKING SLIP NUMBER	PAGE
081360401	1

24-AUG-1994, 12:16

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 08643800
OMEGA POINT LABORATORIES
16015 SHADY FALLS ROAD
ATTN: ACCOUNTS PAYABLE DEPT.
ELMENDORF, TX 78112

SHIP TO:
OMEGA POINT LABORATORIES
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

CUSTOMER PO NUMBER	JOB NAME	CONTACT	TYPE
1450		KERRY	DEL

ORDER DATE	SHIP DATE	SHIP VIA	FRT	SLS	TAX	TERMS
4-AUG-1994	24-AUG-1994	Our Truck	PC	236	000	10th, Net 20th

LINE	QTY. ORD.	QTY. B.O.	QTY. SHP.	PART NUMBER / DESCRIPTION	BIN LOC. / UPC	NST	UNIT PRICE	UM	EXTENDED PRICE
02	3	0	3	APP PLG300S 3-IN SQ HEAD PLUG	27-C-3 65260		12.73	E	38.19

DELIVER TOMORROW IS OK

SUB TOTAL	:	38.19
FREIGHT	:	.00
TAX	:	2.96
TOTAL	:	41.15

MASTER FORM #2250

PICKED BY | CHECKED BY | DATE 8/24/94 | CUSTOMER SIGNATURE Richard Z Beasley

SUMMERS ELECTRIC

June 18, 1992

To Whom It May concern:

I hereby certify that on 8-24-94 we, Summers Electric, provided the material called for on your Purchase Order # 11450 on our Bill of Lading (shipping document) # 081360401, in accordance with all applicable requirements for shipment. I further certify that the supplies that were provided are of the quality specified and are in all respects in conformance with purchase order requirements.

Date: 9-27-94
Signature: John Harris
Title: INSIDE SALES

2400 BROCKTON
P.O. BOX 17747
SAN ANTONIO, TEXAS 78217
512/824-1451

938

SUMMERS ELECTRIC

June 18, 1992

To Whom It May concern:

I hereby certify that on 8-24-94 we, Summers Electric, provided the material called for on your Purchase Order # 1145Q on our Bill of Lading (shipping document) # 178378001, in accordance with all applicable requirements for shipment. I further certify that the supplies that were provided are of the quality specified and are in all respects in conformance with purchase order requirements.

Date: 9-27-94
Signature: John Harris
Title: INSIDE SALES

2400 BROCKTON
P.O. BOX 17747
SAN ANTONIO, TEXAS 78217
512/824-1451

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA/TSI
CLIENT/PROJECT NUMBER 11960/97553-55
RECEIVED FROM B-Line Systems
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1443.11960
DATE RECEIVED 10/5/94
DATE INSPECTED 10/11/94
INSPECTED BY: C Humphreys

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
12" steel cable tray	11570	2	2	0	248P-09-12-144	Y	Y	Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Sue Messerlie
B-Line Systems
509 West Monroe

Highland IL 62249

PO Number: 1157-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Constance A. Humphrey Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
9/28/94	UPS Red Label			

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	12" steel cable tray 248P-09-12-144	2		$0.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 9-28-94

Special Instructions

See attached purchasing specifications and Quality Assurance Requirements.

Ordered By: Constance A. Humphrey

Project #: TSI-97553-55

Total	$0.00
Shipping	
Tax	
Invoice Total	**$0.00**

VENDOR PURCHASING SPECIFICATION AND QUALITY ASSURANCE REQUIREMENTS

Vendor B-Line

Purchase Order No. 11570

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 condition 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.

PURCHASING SPECIFICATIONS
PAGE 2 OF 3

VENDOR B-Line
PURCHASE ORDER NO. 11570

☒ 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 B-Line
PURCHASE ORDER NO. 1157Q

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 9/28/94

944

SHIPPING ORDER

15:56:40

S

B-LINE® SYSTEMS, INC.
509 West Monroe Street
Highland, Illinois 62249-0326
Phone: 618-654-2184

B-Line Systems INC ®

SHIPPING ORDER NO.	
RS1 SYM	8942-9261

DATE
9/29/94

0026073

SOLD TO:

OMEGA POINT LABORATORY
16015 SHADDY FALLS RD

ELMENDORF TX 78112

Belnie 9-30-94

SHIP TO:

OMEGA POINT LABORATORY
16015 SHADDY FALLS RD

ELMENDORF TX 78112

PAGE NO. 1 OF 1 TERMS - NET 30 DAYS

1-CTN=6 #

CUST. ORDER NO.	DATE RECEIVED	LAST SHIPPED	SHIPPING DATE	VIA	COL	PPD	CHG	ALLC
11570	9/29/94		10/03/94	AE		X	X	

DIV.	SALESMAN	SHIP FROM	F.O.B.	DATE SHIPPED	B/L	WEIGHT
7	8800 E	TROY	TROY	10-3-94	358077	79#

TOM FENOGLIO

1 of 2 - 73

ORDERED	DUE	SHIPPED	BACK ORDER	UNIT	*	PART NUMBER	DESCRIPTION
2	2	2	—	PC		24BP09-12-144	STR SECTION ITM 1
							____ BUNDLE(S) OF ____ PC(S) EA.
		S/O				1126-34200	9/29/94 WGT. 36.1600 971-3204 ML
2	2	2	—	PR		9ZN-8004	SPLICE PLATE ITM 2
							LOCATION: I002 H05-2
							____ CARTON(S) OF ____ PR(S) EA.
							WGT. 2.4000 703-0000 ML

FREIGHT CHARGES FROM TROY TO FOLLOW

TOTAL WEIGHT 77.1200

ANY SHORTAGE OR DAMAGE CLAIM MUST BE REPORTED IN WRITING TO ADDRESS SHOWN ABOVE, WITHIN TEN (10) DAYS FROM DATE OF SHIPMENT.

FORM 102 A

[redacted]

CERTIFICATE OF CONFORMANCE

P. O. No.: 11570 REV. —

SPECIFICATION: CATALOG CT3 REV. —

PRIME VENDOR: B-LINE SYSTEMS, INC.

SUPPLIER: SAME

ADDRESS: 509 WEST MONROE ST., HIGHLAND, ILLINOIS 62249

DESCRIPTION OF EQUIPMENT: 248P09-12-144, 9ZN-8004

IDENTIFICATION: ON ATTACHED SHIPPING ORDER 8942 - 9261

APPROVED EXCEPTIONS: NONE

M.T.R.'S ATTACHED: NONE

SUPPLIERS CERTIFICATION

This is to certify that the products identified herein have been manufactured/supplied under B-Line Systems approved quality assurance program and are in comformance with the procurement quality requirements including applicable codes, standards, and specifications as identified in the above referenced documents. Any supporting documentation will be forwarded or retained in accordance with purchase order requirements.

Rick Cain
Signature

10/11/94
Date

QUALITY ASSURANCE INSPECTOR
Title

B-LINE SYSTEMS, INC.
Organization

B-LINE ® SYSTEMS, INC.
509 West Monroe Street
Highland, IL 62249, U.S.A
Phone: 618/654-2184

AMERICAN Freightways®

PAGE 01 OF 01

800-826-3875

P. O. Box 840, Harrison, Arkansas 72602-0840 (ARFW)

FREIGHT BILL NUMBER
Refer To This Number

014 6371503 RO

CONSIGNEE
02215441
OMEGA POINT LABORATORY

16015 SHADDY FALLS RD
ELMENDORF TX 78112

SHIPPER
00950456 P3067
B LINE SYSTEMS

EXIT ARFW DOCK
SAINT LOUIS MO 63147

DATE 10/03/94

ORIGIN STL **DEST.** SAT

BL# 0035 8077

PCS	HM	DESCRIPTION	WT (LBS)	NMFC	CLASS	RATE	TOTAL CHARGES
		PO1#: 11570					
1		BRACES BRACKETS NOI O OR S 3/16" OR THICKER	6	104600-00	050		
1		CABLE RACKS TRAYS TROUGHS OR CABLE WAY STL 16 GA OR THICKER SECTION 7 SIGNED	73	061220-01	060		
2			79			PPD	4.20

RECEIVED IN GOOD CONDITION EXCEPT AS NOTED
FIRM:

BY: June Elizalde

DELIVERED BY: R Knight

DATE: 10-5-94

CONSIGNEE COPY

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME T&I / TVA
CLIENT/PROJECT NUMBER 11960-97257-60+97332-38
RECEIVED FROM U.S. Sales
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1428 - 11960
DATE RECEIVED 8-26-94
DATE INSPECTED 8-29-94
INSPECTED BY: Q 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	
Pipe Clamps 1"	11420	10	10	-	P-2558-10	Y		Good	None	X			Complete Shipment
Pipe Clamps 4"	11420	40	40	-	P-2558-40	Y		Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

948

Vendor:

Johnny Boyd
U.S. Sales Company, Inc.
318 W. Melrose Place

San Antonio TX 78212

PO Number:

1142-Q

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Constance A. Humphrey
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/19/94	Their Truck		8/22/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	P1000 Channel	20'		$0.00
2.	P1001 Channel	40'		$0.00
3.	P2558-40 4" pipe straps	40		$0.00
4.	P2558-10 1" pipe straps	10		$0.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 8-19-94

Special Instructions

Please include all Certificates of Conformance to Catalog Specifications

Ordered By: Constance A. Humphrey

Project #: TVA/TS,

Total	$0.00
Shipping	
Tax	
Invoice Total	**$0.00**

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: 8/26/94

Invoice: 21630

YOUR ORDER NO.	JOB NAME	Terms: 2% – 10 days, Net 30 days
1142 G		

QUANTITY	DESCRIPTION	LIST	UNIT	DISCOUNT	AMOUNT
10	D-255E-10 1 Pipe Clamps CC				
30	P-253-40 4 " " "				
	Date Ordered 10 P-253-40				

TAX

TOTAL

Received By C Humphreys ☐ Tax Exempt

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: 9/26/84

Invoice: 21664

YOUR ORDER NO.	JOB NAME	Terms: 2% – 10 days, Net 30 days
1142 Q		

QUANTITY	DESCRIPTION	LIST	UNIT	DISCOUNT	AMOUNT
10	P-2559-4D 4 Hold-Down Straps				

TAX

TOTAL

Received By Jim Clifford

☐ Tax Exempt

U.S. Sales Co., Inc.

318 W. Melrose Place
San Antonio, Texas 78212
(210) 829-7044

August 30, 1994

CERTIFICATION OF COMPLIANCE

Omega Point Labs
16015 Shady Falls Rd.
Elmendorf, Texas 78112-9784

Attn: Cleda

Customer Order No. 1142 Q

Material: 20' P-1000 (PS-200)
40' P-1001 (PS-200 2T3)
10 P-2558-10
40 P-2558-40

This is to certify that the materials shipped to fill the above order have been manufactured in accordance with standard manufacturing procedures and specifications for these products.

U. S. SALES CO.
Johnny Boyd
Johnny Boyd, President

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960- 97185-87, 97257-60, 97832-38
RECEIVED FROM U.S. Sales
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1419 - 11960
DATE RECEIVED 8-23-
DATE INSPECTED CP's
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Channel	1142Q	20'	20'	0	P-1008 (PS-200)	Y		Good	None	X			partial shipment
Channel	1142Q	40'	40'	0	P-1001 (PS-200 2T3)	X		Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc. 953
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Johnny Boyd
U.S. Sales Company, Inc.
318 W. Melrose Place

San Antonio TX 78212

PO Number:

1142-Q

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Constance A. Humphrey
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/19/94	Their Truck		8/22/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	P1000 Channel	20'		$0.00
2.	P1001 Channel	40'		$0.00
3.	P2558-40 4" pipe straps	40		$0.00
4.	P2558-10 1" pipe straps	10		$0.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 8-19-94

Special Instructions

Please include all Certificates of Conformance to Catalog Specifications

Ordered By: Constance A. Humphrey

Project #: TVA/TS1

Total	$0.00
Shipping	
Tax	
Invoice Total	**$0.00**

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: 8/23/84

Invoice: 21596

YOUR ORDER NO.	JOB NAME	Terms: 2% – 10 days, Net 30 days
1142 Q		

QUANTITY	DESCRIPTION	LIST	UNIT	DISCOUNT	AMOUNT
20	P-1000 Channel 10 E G. ([illegible])				
40	P-1001 " " " ([illegible])				
				TAX	
				TOTAL	

Received By Richard D. Beasley

☐ Tax Exempt

U.S. Sales Co., Inc.

318 W. Melrose Place
San Antonio, Texas 78212
(210) 829-7044

August 30, 1994

CERTIFICATION OF COMPLIANCE

Omega Point Labs
16015 Shady Falls Rd.
Elmendorf, Texas 78112-9784

Attn: Cleda

Customer Order No. 1142 Q

Material: 20' P-1000 (PS-200)
40' P-1001 (PS-200 2T3)
10 P-2558-10
40 P-2558-40

This is to certify that the materials shipped to fill the above order have been manufactured in accordance with standard manufacturing procedures and specifications for these products.

U. S. SALES CO.
Johnny Boyd
Johnny Boyd, President

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
REPORT NUMBER 1431.11960
CLIENT/PROJECT NUMBER 11960-97185-87.97267-60.97332-38
DATE RECEIVED 8-30-94
RECEIVED FROM Hilti, Inc
DATE INSPECTED 8-30-94
PROJECT LOCATION Omega Point Labs
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Kwik Bolt	11480	200	200	0	00045360S	Y	Y	Good	None	X			
1/2"x2 1/4"													

FORM
1/29/93

956

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Hilti, Inc.
853 Isom Road

San Antonio TX 78216

PO Number: **1148-Q**

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Cleda Patton Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/29/94	Their Truck		8/30/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Hilti Bolt 1/4" x 2-1/4"	200		$0.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 8-29-94

Special Instructions

Please include Certificate of Conformance.

Ordered By: Cleda Patton

Project #: TSI/TVA

Total	$0.00
Shipping	
Tax	
Invoice Total	$0.00

HILTI®

No. 459353-01

* *FIRST ORIGINAL* * * *FIRST ORIGIN

13635 STEMMONS FREEWAY
FARMERS BRANCH, TX 75234

OMEGA POINT LABORATORIES
16015 SHADY FALL ROAD

ELMENDORF TX 78112

NOTES:
CLETA 0 - -

CUST. PO #
1148Q

RDER DATE	ORDER #	SLS #	SLS NAME	SHIP LOC.	X-REF# = Y
8/29/94	459353-01	1750	RICHARD CARPENTER	51	08/29/94-16:16:33

CCT. #	ACCT. NAME AND CUSTOMER PURCHASE ORDER NO.	DDAATT
8989177	OMEGA POINT LABORATORIES 1148Q	58-07-01

HANK YOU FOR CALLING HILTI CUSTOMER SERVICE 1-800-879-8000
ICK DAVITO EXT 6109

NE	ITEM #	ITEM DESCRIPTION	DUE	SHIP	B/O	BIN-LOC
1	000453605	KWIK BOLT II 14-214(100/BX)	2	2		R5
		* * * END OF SHIPPER * * *				
		HILTI IS CLASSIFIED AS A LARGE BUSINESS				

SHIPMENT MODE
☐ LOCAL ☐ BUS
☐ TRUCK ☐ AIR
☐ UPS ☐ WAL IN

CARRIER

BILL OF LADING #

FREIGHT COST

CHARGE TO CUSTOME
☐ YES ☐ NC

NO. OF PACKAGES

WEIGHT
_____LBS_____OZ

DATE SHIPPED

PICKED BY
GG

CHECKED BY

CEIVED BY

DATE RECEIVED

PACKED BY

LE

02-6 (1-92) 000964502

PACKING SLIP

SUBJECT TO TERMS AND CONDITIONS ON REVERSE SIDE

HILTI®

No. 459353-01

* *FIRST ORIGINAL* *
13635 STEMMONS FREEWAY
FARMERS BRANCH, TX 75234

OMEGA POINT LABORATORIES
16015 SHADY FALL ROAD

ELMENDORF TX 78112

NOTES:
CLETA 0 - -

CUST. PO #
1148Q

HILTI®

No. 459353-01

* *FIRST ORIGINAL* *
13635 STEMMONS FREEWAY
FARMERS BRANCH, TX 75234

SHIP TO
OMEGA POINT LABORATORIES
16015 SHADY FALL ROAD

ELMENDORF TX 78112

NOTES:
CLETA 0 - -

CUST. PO #
1148Q

ORDER DATE	ORDER #	SLS #	SLS NAME	SHIP LOC.	X-REF# = Y
8/29/94	459353-01	1750	RICHARD CARPENTER	51	08/29/94-16:16:23

ACCT. #	ACCT. NAME AND CUSTOMER PURCHASE ORDER NO.	DDAATT
8989177	OMEGA POINT LABORATORIES 1148Q	58-07-01

THANK YOU FOR CALLING HILTI CUSTOMER SERVICE 1-800-879-8000
NICK DAVITO EXT 6109

LINE	ITEM #	ITEM DESCRIPTION	DUE	SHIP	B/O	BIN-LOC
1	000453605	KWIK BOLT II 14-214(100/BX)	2	2		R5
		* * * END OF SHIPPER * * *				
		HILTI IS CLASSIFIED AS A LARGE BUSINESS				

SHIPMENT MODE
☐ LOCAL ☐ BUS
☐ TRUCK ☐ AIR
☐ UPS ☐ WAL IN

CARRIER

BILL OF LADING #

FREIGHT COST

CHARGE TO CUST
☐ YES ☐

NO. OF PACK

WEIGHT
_____LBS.

DATE SHI

PICKED

CHECK
2

PACI
2

RECEIVED BY

DATE RECEIVED

TITLE

202-6 (1-92) 000964502

COPY

SUBJECT TO TERMS AND CONDITIONS ON REVE

960

5400 South 122nd East Ave.
P.O. Box 21148
Tulsa, OK 74121
Phone (918) 252-6000
Telex No. 6886124
Fax No. (918) 252-6558

Date: September 13, 1994

Customer: Omega Point Laboratories

Customer P.O.: 1148-Q

Subject: **Certificate of Conformance**

Quantity: 2 Boxes 1/4 x 2 1/4 HKBII(Item #000453605)

To Whom it May Concern:

This is to certify that Hilti Kwik-Bolt II is manufactured in compliance with our standard specifications which state the following:

A. **Stud bolt material is AISI 1038** except for the following bolt sizes which are **AISI 11L41: 3/8 x 7, 3/4 x 12 and all 1" diameter bolts.** The **AISI 1038** bolt material meets the chemical requirements for **ASTM Specification A510** while the **AISI 11L41** material meets the chemical requirements for **ASTM Specification A108.**

B. The expansion **wedges** are made from **AISI 1010** steel except for the 3/4" x 12" and all 1" diameter which are made of AISI 304 Stainless Steel.

C. **Hex Nuts** are of commercial manufacture, meeting **ASTM A563, Gr. A,** and ANSI B18.2.2.

D. **Washers** are fabricated from SAE standard material in accordance with ASA Standard #B27.2-1965 SAE 1005/1020, superseded by **ANSI B18.22.1 1965 (R-1975).**

E. **Kwik-Bolts** conform to the description provided in Federal Specification **FF-S-325, Group II Type 4 Class I, Interim Amendment-3, dated July 16, 1965.**

F. **Bolts, Nuts and Washers** are **zinc plated** in accordance with **ASTM B633-85, Type III, SC1.**

The above products were manufactured in Tulsa, Oklahoma and supplied in accordance with Hilti's QA program, BHB-NQP-101 Rev. I, dated 01/94, 10CFR part 21 and 10 CFR 50 Appendix B. Additionally, they meet the requirements of the above referenced purchase order number.

Sincerely,

J. Metcalf
Quality/Environmental Engineer

JM
coc2a

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI-TVA
CLIENT/PROJECT NUMBER 11960-97258 #5
RECEIVED FROM Hilti
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1432.11960
DATE RECEIVED 8-30-94
DATE INSPECTED 8-30-94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
KwikBolt II 3/8"x3 3/4"	11510	200	200	0	000453647	Y		Good	None	X			
KwikBolt II 1/2"x7"	11510	100	100	0	000453795	Y		Good	None	X			
Drill Bit 6"x1/2"	11510	1	1	0	000280370	Y		Good	None	X			

FORM
1/29/93

961

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Hilti, Inc.
853 Isom Road

San Antonio TX 78216

PO Number: 1151-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Kerry M. Hitchcock Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
8/31/94	Their Truck		8/31/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Kwik Bolt II 3/8"x3-3/4" 000453647	200		$0.00
2.	Drill Bit 1/2"x6" 000280370	1		$0.00
3.	Kwik Bolt II 1/2"x7" 000453795	100		$0.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 8-31-94

Special Instructions

Please include Certificate of Conformance.

Ordered By: Kerry Hitchcock

Project #: TSI/TVA

Total	$0.00
Shipping	
Tax	
Invoice Total	$0.00

HILTI®

963

Tulsa, Oklahoma 74146
Phone (918) 252-6000

T/S NO.	T/S NAME	STORE NO.	ASSIGNED F.O. NO.	X REFERENCE NO.

☐-NEW ACC'T. ☐ ADDRESS/NAME CHANGE

ACCOUNT NUMBER 5918117 7

CUSTOMER PHONE NUMBER ( ) —

PURCHASE ORDER NUMBER 1151Q

BILL TO
NAME Omega Flash
STREET
P.O. BOX
CITY STATE ZIP

SHIP TO
CITY STATE ZIP

MARKET CODES

MARKET: ☐1 = Trans. ☐2 = Util. ☐3 = Telecom ☐4 = Non-Res. ☐5 = Res.

NATURE: ☐1 = Maint. ☐2 = Renov. ☐3 = New Const. ☐4 = OEM ☐5 = Manufacturing ☐6 = Resale ☐7 = Export

SOLD TO GOV AGENCY: ☐1 = Local ☐2 = State. ☐3 = Fed. ☐4 = Not Sold to Gov. Agency

SOLD FOR GOV PROJECT: ☐1 = Local ☐2 = State. ☐3 = Fed. ☐4 = Not Sold to Gov. Project

POINT OF SALE: ☐1 = Office ☐2 = Job Site

KEY JOB SITE: YES NO IF YES KEY JOB SITE #

TAX STATUS T E

COMPLETE ONLY IF APPLICABLE
① Ship to T/S For Delivery ② Confirms Prior Whse. Shipmt.

IF TAX EXEMPT FORWARD CERTIFICATE TO TULSA

APPROVAL #

CUSTOMER SITE

PROMO

CONTRACT #

LINE NO.	CAT. NO.	DATED MAT. *	DESCRIPTION/NOTES	TOTAL QTY. ORDERED	DELIVERED QTY. VAN	DELIVERED QTY. STORE	TO BE SHIPPED QTY. STORE	TO BE SHIPPED QTY. WHSE	UNIT PRICE	$ AMOUNT
			KB3/533/4	2		2				
			KB1/27	1		1				
			TEC/76	1		1				

NOTES/SHIPPING INSTRUCTIONS

DELIVERY: ☐ COMPLETE ☐ PARTIAL AS SHOWN BALANCE TO BE SHIPPED.

CASH ☐ CHECK #

AMT. REC'D. $

DRIVER'S LICENSE # STATE EXP. DATE

PHONED IN ORDER ☐ NAME

LINE NO.	TOOL MODEL	PRODUCT SERIAL NO.

ITEMS INDICATED BY (*) HAVE LIMITED SHELF LIFE. RETURNS FOR CREDIT MORE THAN (30) THIRTY DAYS PAST INVOICE DATE WILL NOT BE ACCEPTED.

CUSTOMER'S INITIALS X KMH

Salesmen are not authorized to make warranties regarding specific applications —

CUSTOMER'S SIGNATURE X Kerry Hilterbrand

DATE 8-30-94 TITLE Tech

TOTAL ORDER $

TAX

FREIGHT

NET ORDER $

SHIP C.O.D. $

APPROVED BY

DATE ENTERED TIME

S.E. OPERATOR

SUBJECT TO TERMS AND CONDITIONS ON REVERSE SIDE.

TOOLS WARRANTED TO ORIGINAL PURCHASER ONLY

5400 South 122nd East Ave.
P.O. Box 21148
Tulsa, OK 74121
Phone (918) 252-6000
Telex No. 6866124
Fax No. (918) 252-6558

Date: September 13, 1994

Customer: Omega Point Laboratories

Customer P.O.: 1151-Q

Subject: **Certificate of Conformance**

Quantity: 2 Boxes 3/8 x 3 3/4 HKBII(Item #000453647)
1 Box 1/2 x 7 HKBII(Item #000453795)

To Whom it May Concern:

This is to certify that Hilti Kwik-Bolt II is manufactured in compliance with our standard specifications which state the following:

A. **Stud bolt material** is **AISI 1038** except for the following bolt sizes which are **AISI 11L41: 3/8 x 7, 3/4 x 12 and all 1" diameter bolts.** The **AISI 1038** bolt material meets the chemical requirements for **ASTM Specification A510** while the **AISI 11L41** material meets the chemical requirements for **ASTM Specification A108.**

B. The expansion **wedges** are made from **AISI 1010** steel except for the 3/4" x 12" and all 1" diameter which are made of AISI 304 Stainless Steel.

C. **Hex Nuts** are of commercial manufacture, meeting **ASTM A563, Gr. A,** and ANSI B18.2.2.

D. **Washers** are fabricated from SAE standard material in accordance with ASA Standard #B27.2-1965 SAE 1005/1020, superseded by **ANSI B18.22.1 1965 (R-1975).**

E. **Kwik-Bolts** conform to the description provided in Federal Specification **FF-S-325, Group II Type 4 Class I, Interim Amendment-3, dated July 16, 1965.**

F. **Bolts, Nuts and Washers** are **zinc plated** in accordance with **ASTM B633-85, Type III, SC1.**

The above products were manufactured in Tulsa, Oklahoma and supplied in accordance with Hilti's QA program, BHB-NQP-101 Rev. I, dated 01/94, 10CFR part 21 and 10 CFR 50 Appendix B. Additionally, they meet the requirements of the above referenced purchase order number.

Sincerely,

J. Metcalf
Quality/Environmental Engineer

JM
coc2a

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97553-55+
RECEIVED FROM Hilti 97257
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1441 - 11960
DATE RECEIVED 9/30/94
DATE INSPECTED 9/30/94
INSPECTED BY: C Patton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
Hilti quick Bolt II 2¼"x¼"	1159Q	200	200	0	KB¼-2¼	Y	Y	Good	None	X			
Hilti quick Bolt II ¼"x4½"	1159Q	100	100	0	KB¼-4½	Y	Y	Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Steve Hood
Hilti, Inc.
853 Isom Road

San Antonio TX 78216

PO Number: 1159-Q

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

Bill To:	Ship To:
Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784	Cleda Patton Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
9/29/94	Pick up		9/30/94	

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	Hilti Quick Bolt II 1/4"x 2-1/4"	200		$0.00
2.	Hilti Quick Bolt II 1/4"x4½" CH	100		$0.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 9/29/94

Special Instructions

Certificate of Compliance/Conformance

Ordered By: Cleda Patton

Project #: TSI/TVA

Total	$0.00
Shipping	
Tax	
Invoice Total	**$0.00**

CUSTOMER COPY

867

Tulsa, Oklahoma 74146
Phone (918) 252-6000

T/S NO.	T/S NAME	STORE NO.	ASSIGNED F.O. NO.	X REFERENCE NO.

☐ NEW ACC'T. ☐ ADDRESS/NAME CHANGE

ACCOUNT NUMBER 8781177

CUSTOMER PHONE NUMBER ( ) -

PURCHASE ORDER NUMBER 11590

BILL TO
NAME
STREET
P.O. BOX
CITY | STATE | ZIP

SHIP TO
CITY | STATE | ZIP

MARKET CODES

MARKET	☐ 1 = Trans.	☐ 2 = Util.	☐ 3 = Telecom	☐ 4 = Non-Res.	☐ 5 = Res.	
NATURE	☐ 1 = Maint.	☐ 2 = Renov.	☐ 3 = New Const.	☐ 4 = OEM	☐ 5 = Manufacturing	☐ 6 = Resale ☐ 7 = Export
SOLD TO GOV AGENCY	☐ 1 = Local	☐ 2 = State.	☐ 3 = Fed.	☐ 4 = Not Sold to Gov. Agency		
SOLD FOR GOV PROJECT	☐ 1 = Local	☐ 2 = State.	☐ 3 = Fed.	☐ 4 = Not Sold to Gov. Project		
POINT OF SALE:	☐ 1 = Office	☐ 2 = Job Site				
KEY JOB SITE:	YES	NO	IF YES KEY JOB SITE #			

TAX STATUS T E

COMPLETE ONLY IF APPLICABLE
① Ship to T/S For Delivery ② Confirms Prior Whse. Shipmt.

IF TAX EXEMPT FORWARD CERTIFICATE TO TULSA
APPROVAL #
CUSTOMER SITE
PROMO
CONTRACT #

LINE NO.	CAT. NO.	DATED MAT. *	DESCRIPTION/NOTES	TOTAL QTY. ORDERED	DELIVERED QTY. VAN	DELIVERED QTY. STORE	TO BE SHIPPED QTY. STORE	TO BE SHIPPED QTY. WHSE	UNIT PRICE	$ AMOUNT
1			ICB 1/4-3 1/4	2		2				
2			ICB 1/4-4 1/2	1		1				

NOTES/SHIPPING INSTRUCTIONS

TOTAL ORDER
$
TAX
FREIGHT
NET ORDER $

DELIVERY; ☐ COMPLETE ☐ PARTIAL AS SHOWN BALANCE TO BE SHIPPED.

CASH ☐ CHECK #

AMT. REC'D. $

DRIVER'S LICENSE # STATE EXP. DATE

PHONED IN ORDER ☐ NAME

SHIP C.O.D. $

APPROVED BY

DATE ENTERED TIME

S.E. OPERATOR

LINE NO.	TOOL MODEL	PRODUCT SERIAL NO.

ITEMS INDICATED BY (*) HAVE LIMITED SHELF LIFE. RETURNS FOR CREDIT MORE THAN (30) THIRTY DAYS PAST INVOICE DATE WILL NOT BE ACCEPTED.

CUSTOMER'S INITIALS
X

Salesmen are not authorized to make warranties regarding specific applications –

CUSTOMER'S SIGNATURE X Kerry Hatchett

DATE 9/30 TITLE

SUBJECT TO TERMS AND CONDITIONS ON REVERSE SIDE.

TOOLS WARRANTED TO ORIGINAL PURCHASER ONLY

000965350 F-333 (2/92)

968

5400 South 122nd East Ave.
P.O. Box 21148
Tulsa, OK 74121
Phone (918) 252-6000
Telex No. 6868124
Fax No. (918) 252-6558

Date: October 13, 1994

Customer: Omega Point Laboratories Inc.

Customer P.O.: 1159-Q

Subject: **Certificate of Conformance**

Quantity: 2 Boxes 1/4 x 2 1/4 HKBII(Item #000453605)
1 Box 1/4 x 4 1/2 HKBII(Item #000453787)

To Whom it May Concern:

This is to certify that Hilti Kwik-Bolt II is manufactured in compliance with our standard specifications which state the following:

A. **Stud bolt material** is **AISI 1038** except for the following bolt sizes which are **AISI 11L41: 3/8 x 7, 3/4 x 12 and all 1" diameter bolts.** The **AISI 1038** bolt material meets the chemical requirements for **ASTM Specification A510** while the **AISI 11L41** material meets the chemical requirements for **ASTM Specification A108.**

B. The expansion **wedges** are made from **AISI 1010** steel except for the 3/4" x 12" and all 1" diameter which are made of AISI 304 Stainless Steel.

C. **Hex Nuts** are of commercial manufacture, meeting **ASTM A563, Gr. A,** and ANSI B18.2.2.

D. **Washers** are fabricated from SAE standard material in accordance with ASA Standard #B27.2-1965 SAE 1005/1020, superseded by **ANSI B18.22.1 1965 (R-1975).**

E. **Kwik-Bolts** conform to the description provided in Federal Specification **FF-S-325, Group II Type 4 Class I, Interim Amendment-3, dated July 16, 1965.**

F. **Bolts, Nuts and Washers** are **zinc plated** in accordance with **ASTM B633-85, Type III, SC1.**

The above products were manufactured in Tulsa, Oklahoma and supplied in accordance with Hilti's QA program, BHB-NQP-101 Rev. I, dated 01/94.

Sincerely,

J. Metcalf
Quality/Environmental Engineer

JM
coc2a

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
CLIENT/PROJECT NUMBER 11960-97185-87+97257-60
RECEIVED FROM Ramsey Electric Supply Co.
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1407.11960
DATE RECEIVED 7-26-94
DATE INSPECTED 7-26-94
INSPECTED BY: C. Patterson

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
4"X12'X24" ladders	NA	0	5	0	06-1079-0012-24	Y	N	Good	None	X			Receiving Verification Only
24" flngd std Cover	NA	0	1	0	2000-0012-24	Y	N						
Adj. Riser Conn. Pair	NA	0	2	0	06-1079-130702	Y	N	Good	None	X			
Cover Conn 1"flg 3" Gap	NA	0	50	0	06-1079-1895-30	Y	N	Good	None	X			

FORM
1/29/93

WESTERN, INC. *Manufacturers*

623 OLYMPIC BLVD. P.O. BOX 1399
MONTEBELLO, CALIFORNIA 90640-1399
TELEPHONE (213) 723-8919
FAX (213) 728-5023

PAGE 1

INVOICE NO. 14739

SOLD TO
Ramsey Electric Supply Co.
2310 Rossville Blvd.
Chattanooga, TN 37401

SHIP TO
Omega Point Lab
16015 Shady Falls Rd.
Elmendorf, TX 78112

Attn: Jim TVA Field Eng.
MARK: 1029342

DATE OF INVOICE	DATE OF ORDER	CUSTOMER ORDER NO.	SALESMAN
	7/22/94	0020056	PROF L @

	SHIP VIA	PART. DEL.	COMPLETE DELIVERY
7/25/94	Emery Air Frt ACCT# 541-015-053 3rd Party Billing		

ITEM NO.	CATALOG NUMBER	DESCRIPTION	QUANTITY TOTAL ORDER	QUANTITY PREV. SHIPPED	QUANTITY THIS SHIP'T	QUANTITY BACK ORDERED	[redacted]
1	06-1D79-0012-24	4" Stl Ladder 12'L 24"W	5	0	5		[redacted]
2	2000-0012-24	Flngd Stl Cover, Str 24"W	1	0	1		[redacted]
3	06-1D79-1307-02	Adj. Riser Conn. Pair	2	0	2		[redacted]
4	06-1D79-1895-30	Cover Conn. 1"Flg 3" Gap	50	0	50		[redacted]

PLEASE PAY FROM THIS INVOICE - NO OTHER STATEMENT WILL BE SENT. THANK YOU. NO ADJUSTMENTS WILL BE MADE ON SHORTAGE OR DEFECTIVE MERCHANDISE UNLESS CLAIM IS MADE WITHIN 30 DAYS FROM RECEIPT OF SHIPMENT. MERCHANDISE IS NOT SUBJECT TO RETURN FOR CREDIT UNLESS AUTHORIZED BY THIS COMPANY.
INTEREST AT A RATE OF 1½% PER MONTH WILL BE CHARGED ON ALL PAST DUE INVOICE.

TERMS: NO GOODS TO BE RETURNED OR CREDITED WITHOUT OUR CONSENT. GOODS COVERED BY THIS INVOICE WERE PRODUCED IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE FAIR LABOR STANDARDS ACT OF 1938, AS AMENDED. PRICES ARE IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS. WHILE PRICES SHOWN ARE THE CURRENT PRICES, ORDER WILL BE BILLED AT PREVAILING PRICES AT TIME OF SHIPMENT.

PACKING LIST

THANK YOU

970

STOP!

READ THIS NOTICE

THIS SHIPMENT IS YOUR PROPERTY

The carrier accepted responsibility for safe delivery when he accepted and signed for your merchandise. When it arrives:

- Check tray, fittings and miscellaneous details including hardware for external damage.
- Check part count and make sure you received everything that is shown on the packing list.

IF THERE IS A PROBLEM:

1. Make a note of the damage on the face of the shipping receipt. Example: "2 damaged 12' Trays - Feb 25 - John Doe." You may now accept the shipment and you can keep the damaged material or let the carrier keep it. Do not ship it back to P-W and do not throw it away. If you let the carrier keep it, make a note of that on the receipt too. Don't assume that the carrier or yourself will remember what happened to the items later. If you lose the damaged material the claim is dead. If the carrier loses it, it's his problem.
2. Make a detailed note for yourself, like "Bent Rungs, two 1C31-0012-12, returned to Terminal." The part numbers are on a sticker attached to the part. You'll need this to reorder and it could come in handy later.
3. Call the carrier's Claims department and they will fax you a damage claim form. They may send an inspector to look at the part(s). When they pay you, they probably will want the damaged parts for possible salvage value.
4. Call your Distributor and reorder whatever is damaged. The sooner you do, the sooner you will have your replacement parts.

THE CARRIER OWES YOU:

- The value of whatever was damaged, and:
- The costs for re-shipping.

For instance, in the above example, you are owed the value of the two pieces of tray and whatever it costs to ship the two replacement pieces.

Many carriers will ship the replacement pieces free to save themselves the hassle of processing the claim for the freight. Notify your Distributor of any such arrangement because in order to get your free shipment, the carrier will usually require the shipper to note on the bill of lading something like "Ship Free - See Joe, Seattle Terminal." If this is not on the bill of lading you'll get charged for the shipment and then you'll have to file a claim for that.

IN SHORT:

- **NOTE IRREGULARITIES ON THE SHIPPING RECEIPT**
- **FILE YOUR CLAIM RIGHT AWAY**
- **GET YOUR REPLACEMENT PARTS STARTED IMMEDIATELY**
- **DON'T LOSE TRACK OF YOUR DAMAGED PARTS!**

The carrier wants your, and our, business. Satisfy his needs for documentation and verification and he'll be happy to pay your claim.

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
CLIENT/PROJECT NUMBER 11960-97185-87, 97257-
RECEIVED FROM Southwestern Wire Cloth Co
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1403 - 11960
DATE RECEIVED 7-20-94
DATE INSPECTED 7-20-94
INSPECTED BY: C Dalton

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	
Tie Wire .062"	NA	0	100#	0	30455.062"	Y	N	Good	None	X			Receiving Verification Only.

FORM
1/29/93

Southwestern Wire Cloth

P.O. BOX 35608
TULSA, OKLAHOMA 74153
(918) 251-2679
FAX (918) 251-0375

1831 W. SAM HOUSTON PARKWAY N.
HOUSTON, TEXAS 77043
(713) 973-2959
FAX (713) 973-1857

ORDER NO: 973
PAGE:
DATE:
REQ. SHIP DATE:

SOLD TO

SHIP TO

CUSTOMER P. O.	ORDER DATE	SLSP	TERMS	SHIPPED FROM	SHIPPED VIA	FREIGHT

QUANTITY ORDERED	QUANTITY SHIPPED	QUANTITY B.O.	PART NUMBER	DESCRIPTION	U/M
	100				

Sherry #6

SEE REVERSE SIDE FOR ADDITIONAL TERMS AND CONDITIONS OF SALE

PACKING LIST

974

This Memorandum is an acknowledgement that a Bill of Lading has been issued and is not the Original Bill of Lading, nor a copy or duplicate, covering the property named herein, and is intended solely for filing or record.

SMC #5183
ICC-MC 190566

Cannonball Trucking, Inc.

P.O. Box 262523, Houston, Texas 77207-2523 • 644-7300
Fax # (713) 644-9431

58098

CTI W/B NO.
CTI CONTROL NO.
DATE 7-20-94

SHIPPERS B/L NO.
S... RS ORDER NO.
CONSIGNEES ORDER NO.
RELEASE NO.

INTRASTATE ☐ ICC ☐ LOCAL ☐

FROM: SHIPPER	TO: CONSIGNEE
Southwestern Wire Cloth	Omega Paint Laboratory
STREET ADDRESS: 7631 W Belt North	STREET ADDRESS: 16013 Shady Hills St.
CITY: Dall, TX STATE ZIP	CITY: Elmendorf STATE: TX ZIP: 78112
LOCATION DOCK SHIP	LOCATION DOCK SHIP
LEASE RIG. WELL NO.	LEASE RIG. WELL NO.

DRIVER	TRUCK NO.	TRAILER NO.	EQUIPMENT USED	LENGTH	WIDTH	HEIGHT
Sherry	#6		20			

BILL TO:	TARIFF MILEAGE	REGULATED BY	TARIFF
SPECIAL INSTRUCTIONS:	PLUS MILEAGE	ITEM NO.	COLUMN NO.

# PCS.	COMMODITY OR SERVICE RENDERED	HRS/WEIGHT	RATE	AMOUNT
2	Rolls Wire	100#		
☐	FUEL SURCHARGE			
☐	EXTRA STOPS			
☐	EXCLUSIVE USE OF VEHICLE REQUESTED			
☐	EXPEDITED SERVICE REQUESTED			
	TOTAL →			

C.O.D. CHARGE TO BE PAID BY { SHIPPER ☐ CONSIGNEE ☐

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement.
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges

(Signature of Shipper)

If charges are to be prepaid, write or stamp here. "To be Prepaid."

If charges are to be C.O.D. the carrier accepts no such responsibility, unless amount is here specified and this section signed by consignor.

$
C.O.D. Amount

Signature of Shipper

Received $ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per
(The signature here acknowledges only the amount prepaid.)

$
Charges Advanced

PICK-UP RECORD (To be completed at Shipper's location)

SHIPPER NOTIFIED OF ARRIVAL		LOADING BEGAN		LOADING COMPLETED		UNIT RELEASED	
Date	Time	Date	Time	Date	Time	Date	Time

REASON FOR DELAY IN LOADING (IF ANY)
I hereby certify that the dates and time shown above are correct.
SHIPPER CO. NAME ______ BY ______ SHIPPER'S AGENT TITLE ______

DELIVERY RECORD AND RECEIPT (to be completed at Delivery location)

CONSIGNEE NOTIFIED OF ARRIVAL		UNLOADING BEGAN		UNLOADING COMPLETED		UNIT RELEASED	
Date	Time	Date	Time	Date	Time	Date	Time

REASON FOR DELAY IN UNLOADING (IF ANY)
I hereby certify that the dates and time shown above are correct.
CONSIGNEE CO. NAME ______ BY ______ CONSIGNEE'S AGENT TITLE ______

RECEIVE, subject to the classifications and lawfully filed tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment.
Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

SHIPPER'S NAME		RECEIVER'S NAME / RECEIVED ABOVE ARTICLES IN GOOD ORDER	CONSIGNEE
BY	DATE	BY [signature]	DATE 7-20-94

...nt moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is carrier's or shipper's weight.
...ere the rate is dependent on value, shippers are required to state in writing the agreed
o... ...d value of property hereby specifically stated by the shipper to be not exceeding: $ per
"It is understood and agreed that payment in full for work authorized hereunder shall be due seven (7) days after date hereof and if not paid in full within thirty (30) days, all amounts due shall carry interest at the rate of eighteen (18%) per cent per annum, in the event the claim is referred to an attorney for handling, the defendant shall bear full responsibility for all legal fees and any interest expense subsuquent thereto."

CARRIER
CANNONBALL TRUCKING, INC.
P.O.BOX 262523
Houston, Texas 77207-2523
Permanent post office address of carrier

I hereby certify that the dates and time shown is correct.
CARRIER **CANNONBALL TRUCKING,INC.** DATE 7-20-94
DRIVER Sherry #6

All Amounts due under this waybill are due and payable in Houston, Harris County, Texas

CONSIGNEE COPY

Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TUA
CLIENT/PROJECT NUMBER 11960-97185.86+87
RECEIVED FROM Adams Bolt & Screw
PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1394 . 11960
DATE RECEIVED 7-11-94
DATE INSPECTED 7-12-94
INSPECTED BY: CPatton

ITEM DESCRIPTION	P.O. NO.	QUANTITY			I.D. NO.	COND MATL Y/N	CERT. RECD Y/N	CONTAINER INTEGRITY	EXCEPTIONS	ACCEPTANCE			REMARKS
		Order	Rec'd	B.O.						Accept	Hold	Reject	
1/2" Medium Lock Washers	11260	1K	1K	0	1/2" Lock Washers	Y	Y	Good	None	X			
1/2" nuts	11260	1K	1K	0	1/2" Galvanized Hex Nuts	Y	Y	Good	None	X			

FORM
1/29/93

PURCHASE ORDER

Omega Point Laboratories, Inc.
16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

Randy
Alamo Bolt & Screw, Inc.
10101 Jones Maltsberger

San Antonio TX 78216

PO Number:

1126-Q

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

Bill To:

Accounts Payable
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Ship To:

Cleda Patton
Omega Point Laboratories, Inc.
16015 Shady Falls Road
Elmendorf, TX 78112-9784

Order Date	Ship Via	P.O. Spec. No.	Date Required	Terms
7/11/94	Their Truck		7-12-94	30

Item No.	Description	Quantity Ordered	Unit Price	Extended Amount
1.	1/2" Medium Lock Washers	1000	$0.02	$23.00
2.	1/2" Finished Hex Nuts	1000	$0.04	$40.00

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
QA Approval C Patton
Date 7-11-94

Special Instructions

Please include Certification of Conformance.

Ordered By: Cleda Patton

Project #: TSI/TVA

Total	$63.00
Shipping	
Tax	$4.88
Invoice Total	**$67.88**

ALAMO Bolt and Screw, Inc.

INVOICE NO.: 0279940

10101 JONES MALTSBERGER
SAN ANTONIO, TX. 78216
512-342-9544

TO:
OMEGA POINT LABORATORIES
16015 SHADY FALLS RD.
ELMENDORF, TX. 78112

SHIP TO:
OMEGA POINT LABORATORIES
16015 SHADY FALLS RD.
ELMENDORF, TX. 78112

ACCOUNT NO.	SALESMAN NO.	PURCHASE ORDER NO.	SHIP VIA	COL	PPD	DATE SHIPPED	TERMS	INVOICE DATE	PAGE
073666	QYD	11260	DEL AM				NET 10	07/11/94	1

QTY. ORDERED	QTY. SHIPPED	QTY. BACK ORDERED	PROD. LINE	PART NO.	DESCRIPTION	UNIT PRICE	EXTENDED PRICE
1000	1000		SLW	1/2	MEDIUM LOCK WASHERS ZINC	2.30	23.00
1000	1000		HNC	1/2	FINISHED HEX NUTS NC ZINC	4.00	40.00
					2 BOXS		

WE APPRECIATE YOUR BUSINESS.

THANK YOU

SALE AMOUNT	63.00
SALES TAX	6.83
TOTAL	69.83

RECEIVED BY: [signature]

IVAN

ALAMO
Bolt and Screw, Inc.
10101 JONES MALTSBERGER
SAN ANTONIO, TEXAS 78216
PHONE: 342-9544
AREA CODE 210
FAX: (210) 342-9594

June 18, 1992

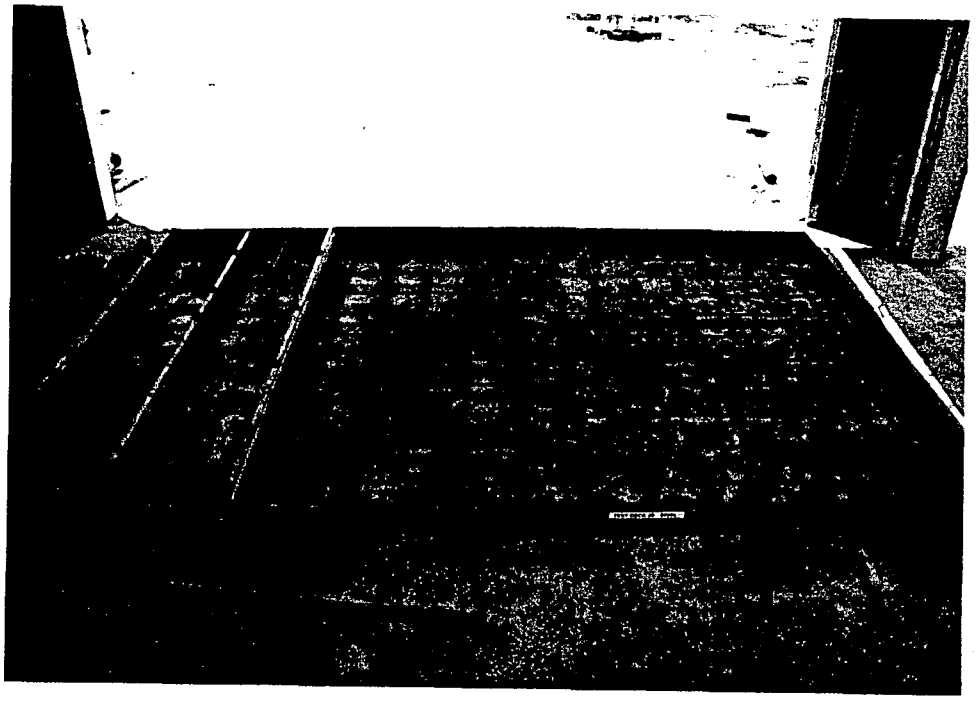
To Whom It May concern:

I hereby certify that on 7/11/94 we, ALAMO Bolt & Screw provided the material called for on your Purchase Order # 1126-Q on our Bill of Lading (shipping document) # 279340 in accordonce with all applicable requirements for shipment. I further certify that the supplies that were provided are of the quality specified and are in all respects in conformance with purchase order requirements.

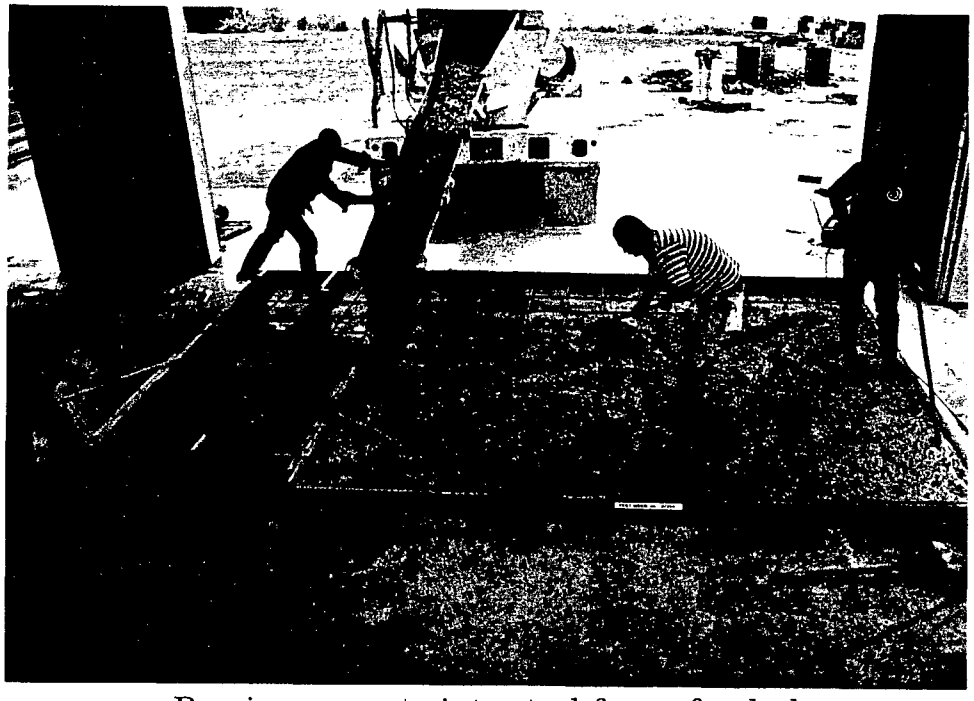
Date: 7/25/94
Signature: Teresa H. DeBord
Title: Office Manager

Appendix F

PHOTOGRAPHS

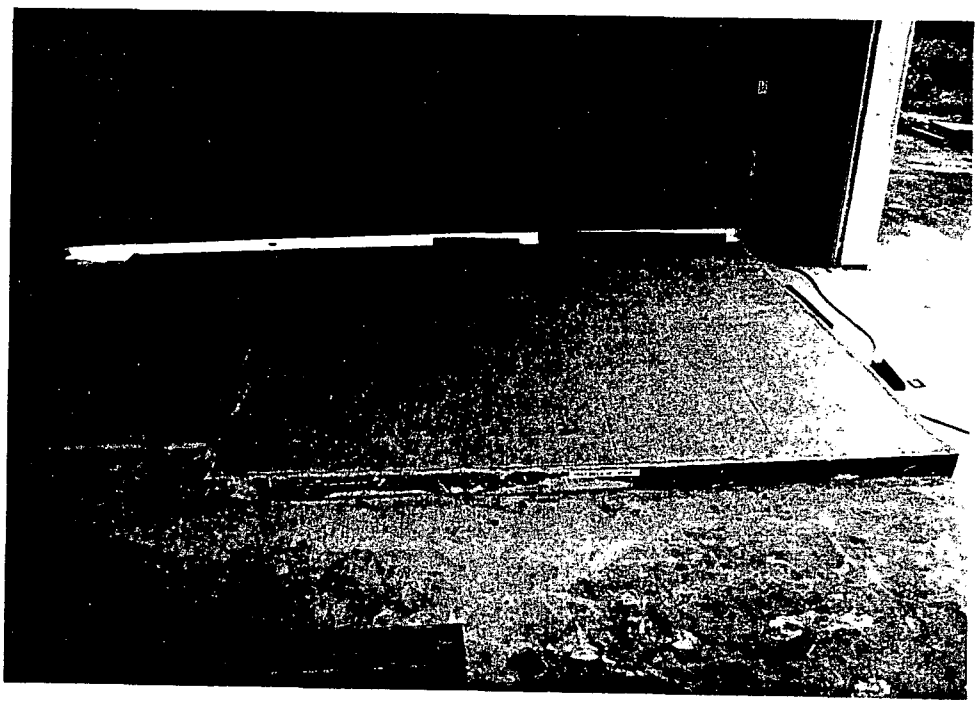


Steel forms for deck wall and sides.

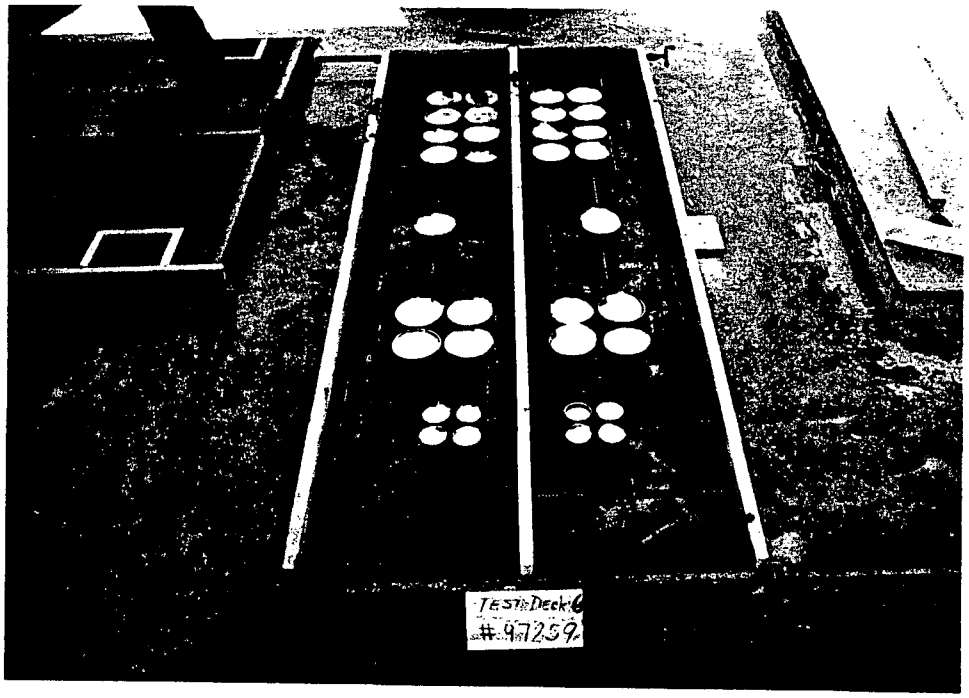


Pouring concrete into steel forms for deck.

Finishing concrete surface.

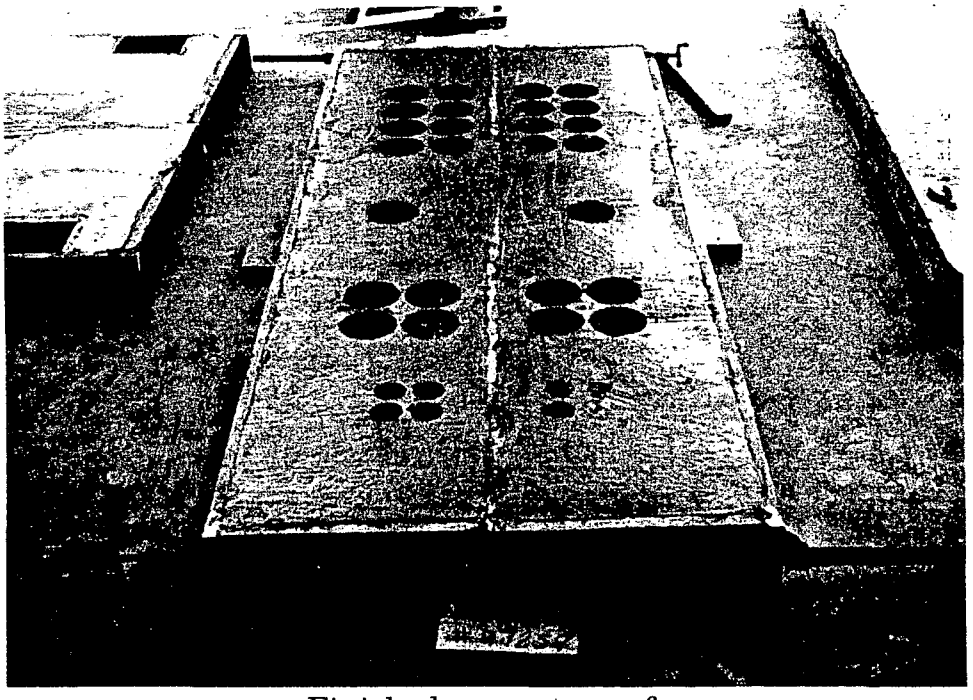


Finished concrete surface.

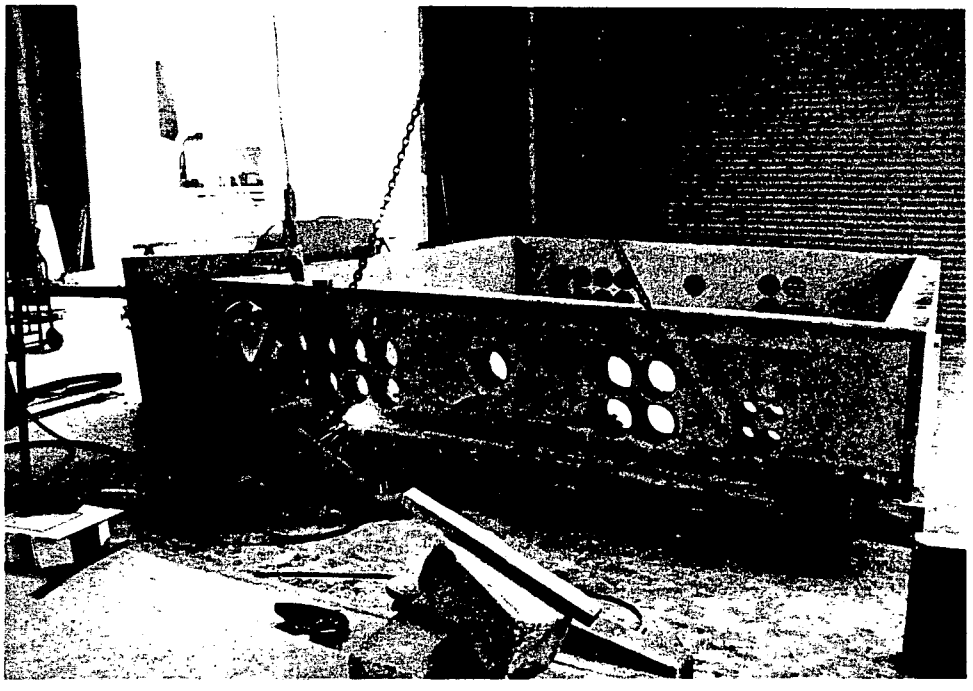


Steel forms for deck top and bottom.

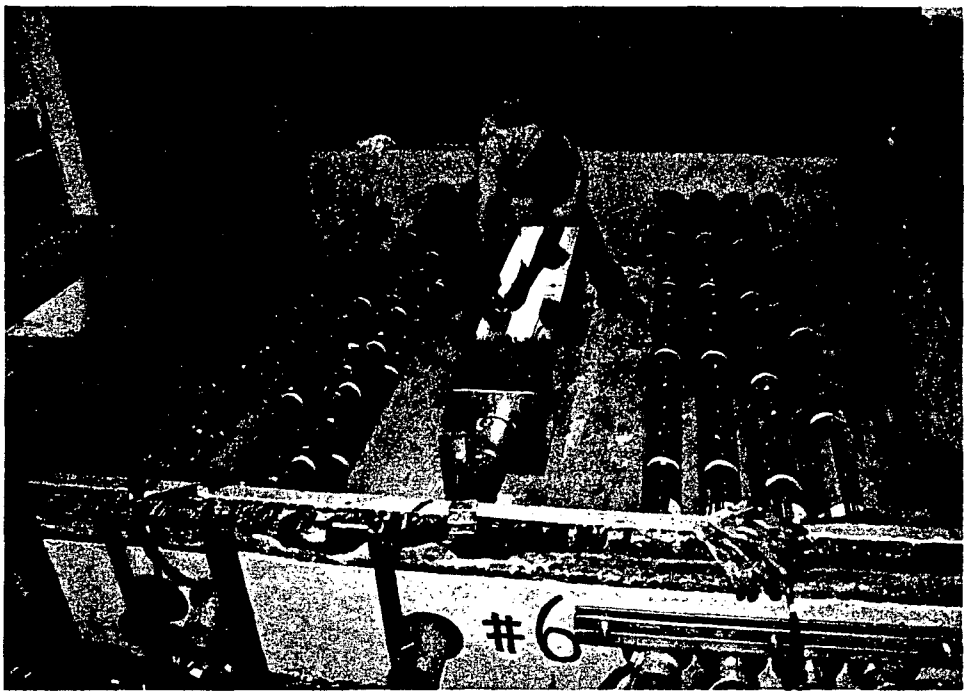
Pouring concrete into steel forms.



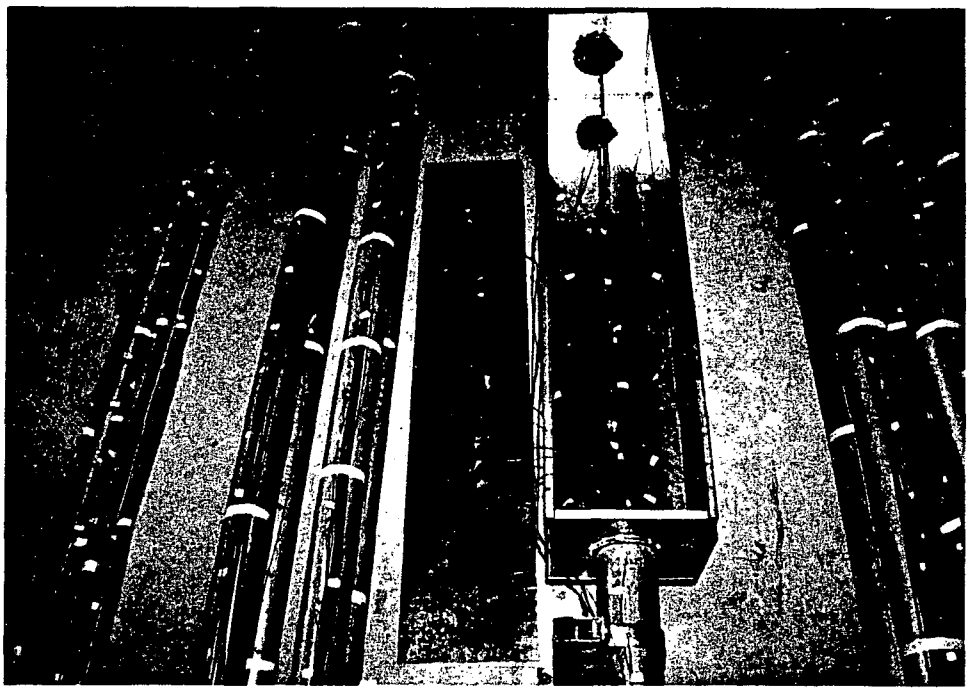
Finished concrete surface.



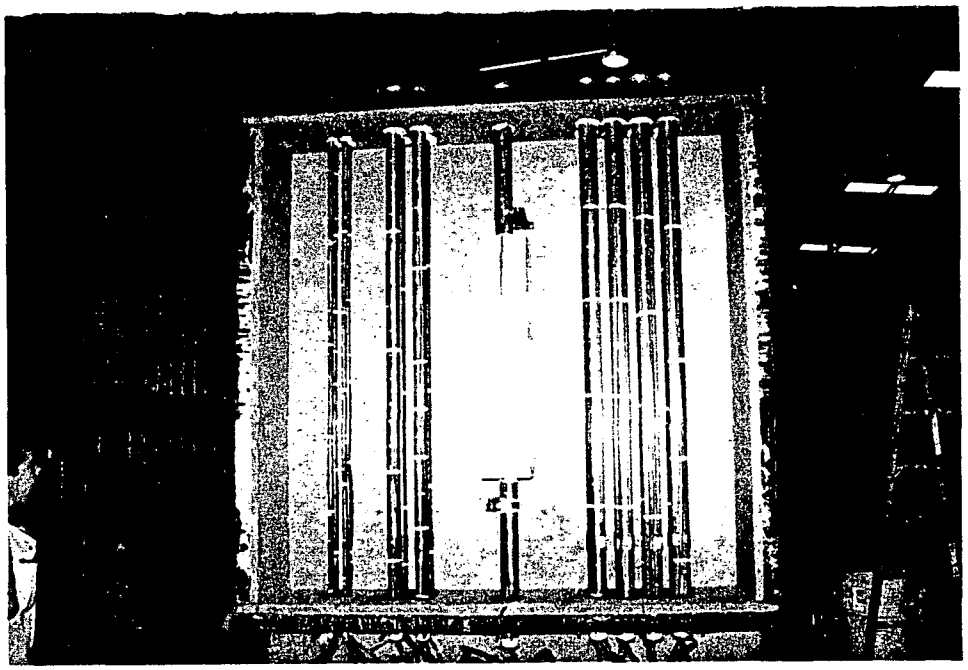
Assembling concrete sections into completed deck.



Installation of thermocouples onto test items.

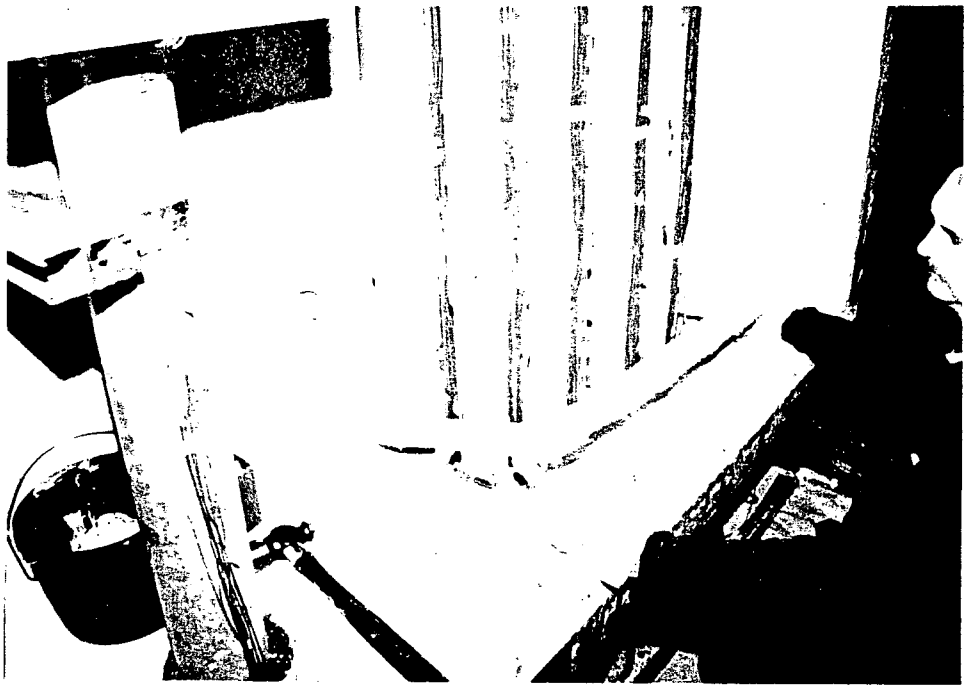


Interior view of instrumented junction box.

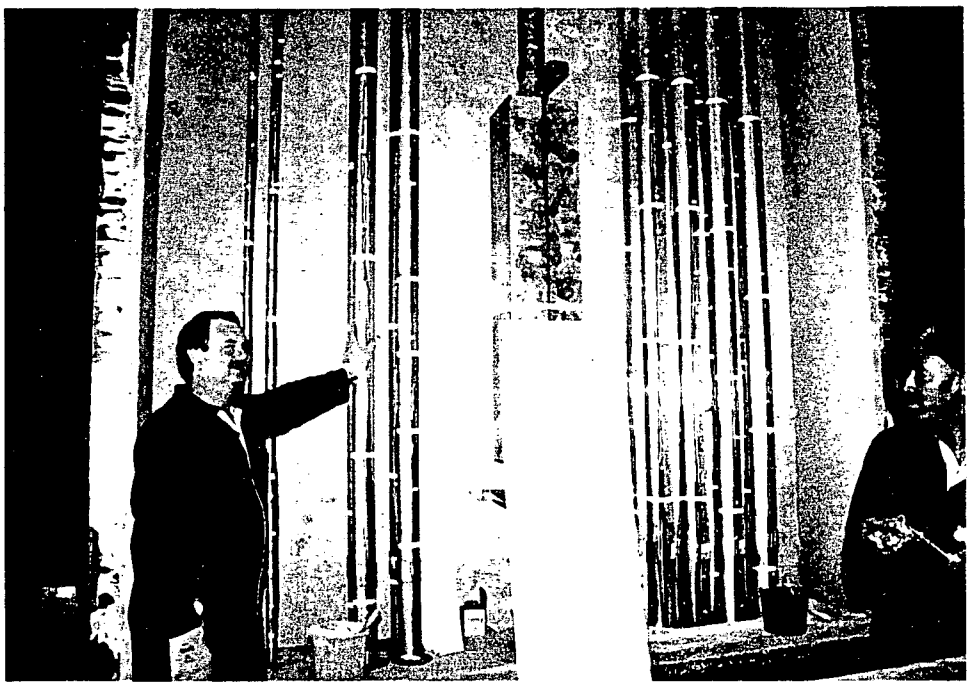


Assembled test deck, standing upright.

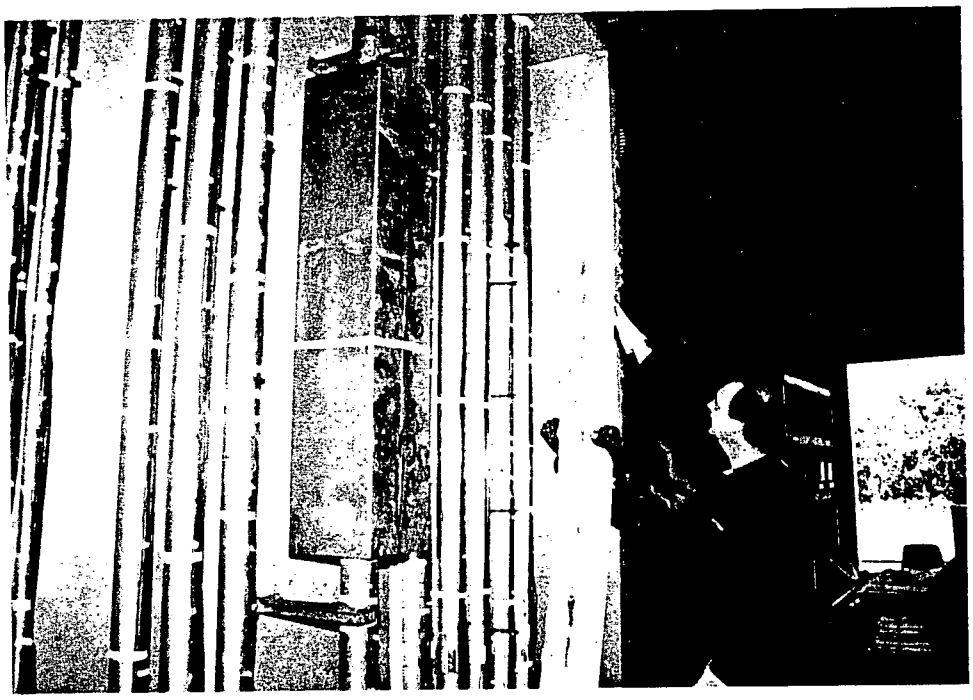
Base plate material mocked-up on bottom of set of 4 in. conduits.



Pre-buttered base plate material installed at base of 4 in. conduit set.



Pre-buttered panel to be installed on lower rear of 4 in. conduit set.

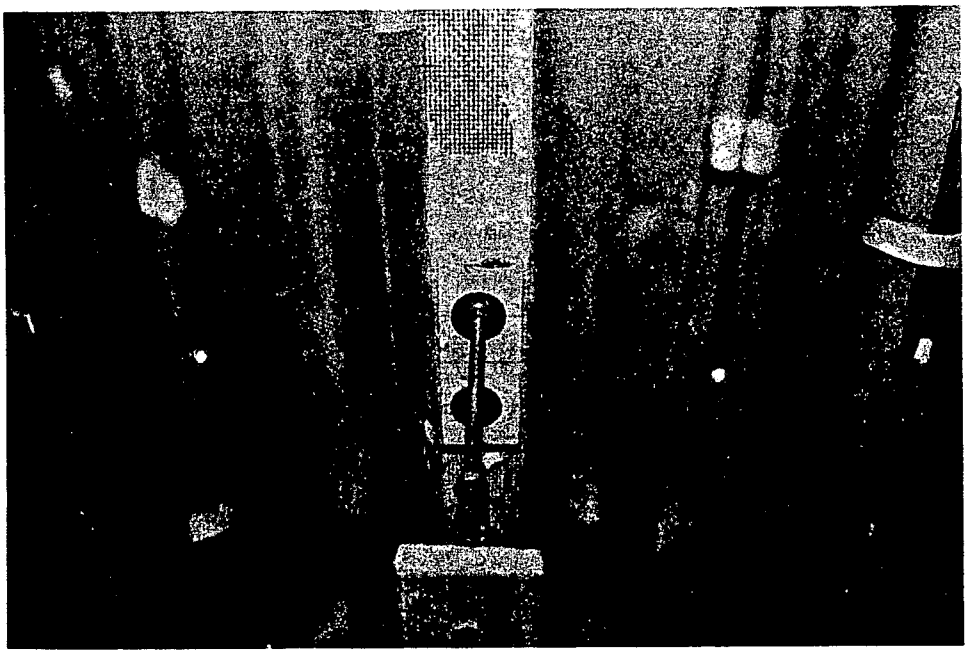


Pre-buttered panel installed on lower front of 4 in. conduit set.

Panel secured with threaded rod, washers and nuts.

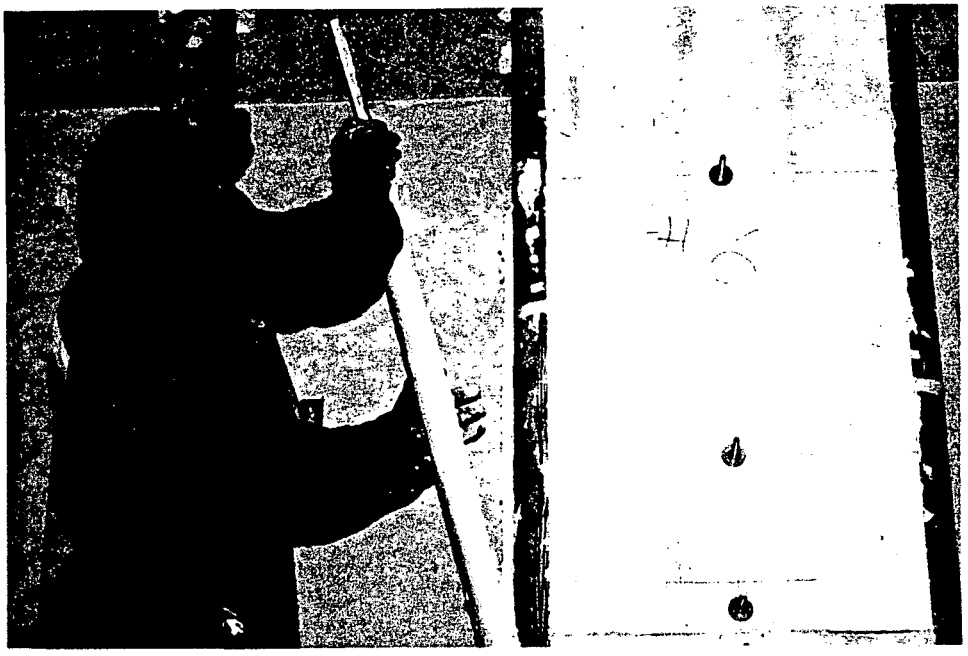
Pre-shaped sections, cut lengthwise, installed on corners of 4 in. conduit set.

Sides of conduits and radial bends pre-buttered prior to panel installation.



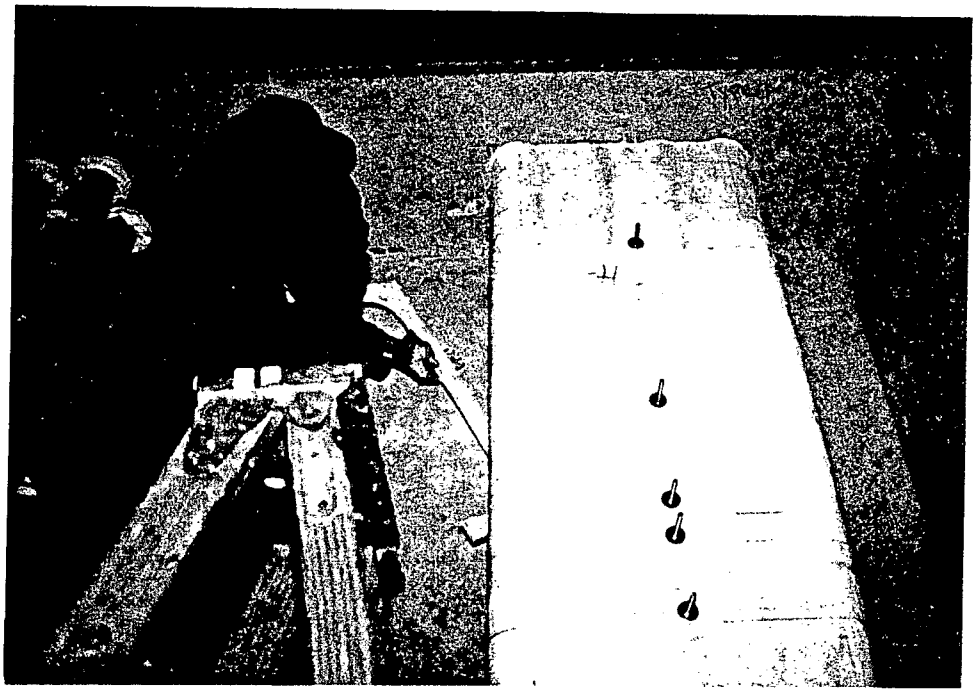
Close view of threaded rod, washers, nuts and panel strips used at joints in enclosure containing 4 in. conduits.

Pre-buttered panel installed on side of 4 in. conduit set.

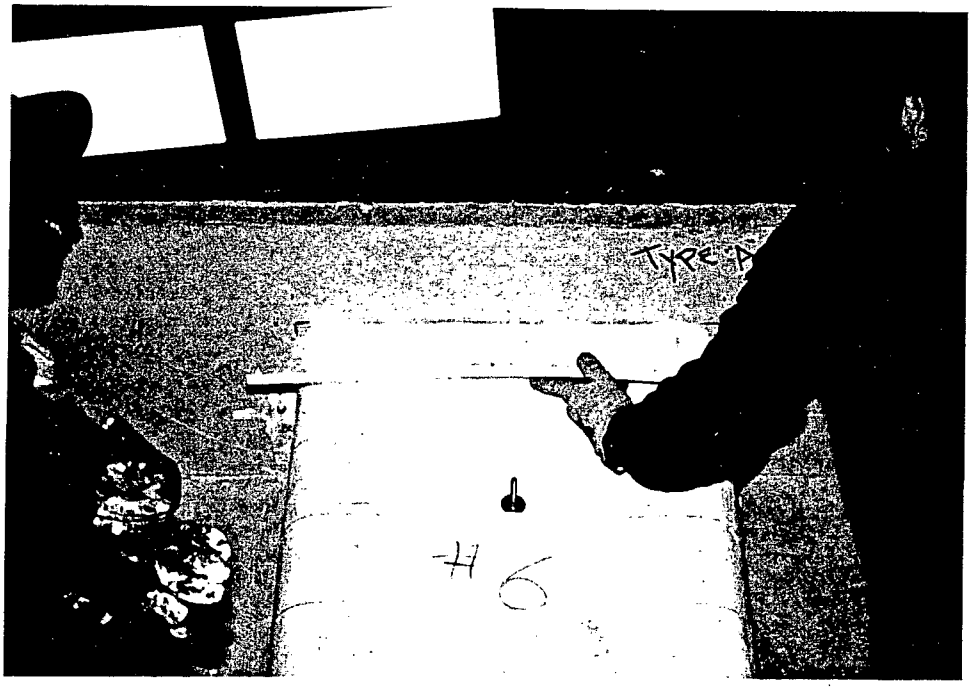


Pre-buttered cut pre-shaped section installed at corner of 4 in. conduit set.

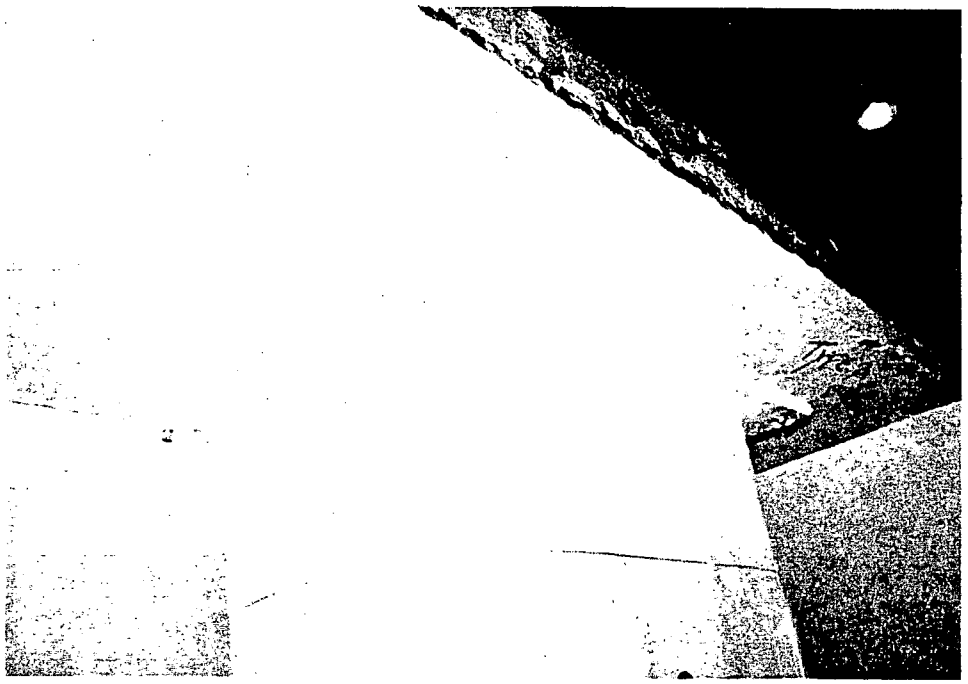
Pre-buttered cut pre-shaped sections installed at corners of 4 in. conduit set.



Pre-buttered panels installed as upper base plate.



Pre-buttered panels installed as upper base plate.

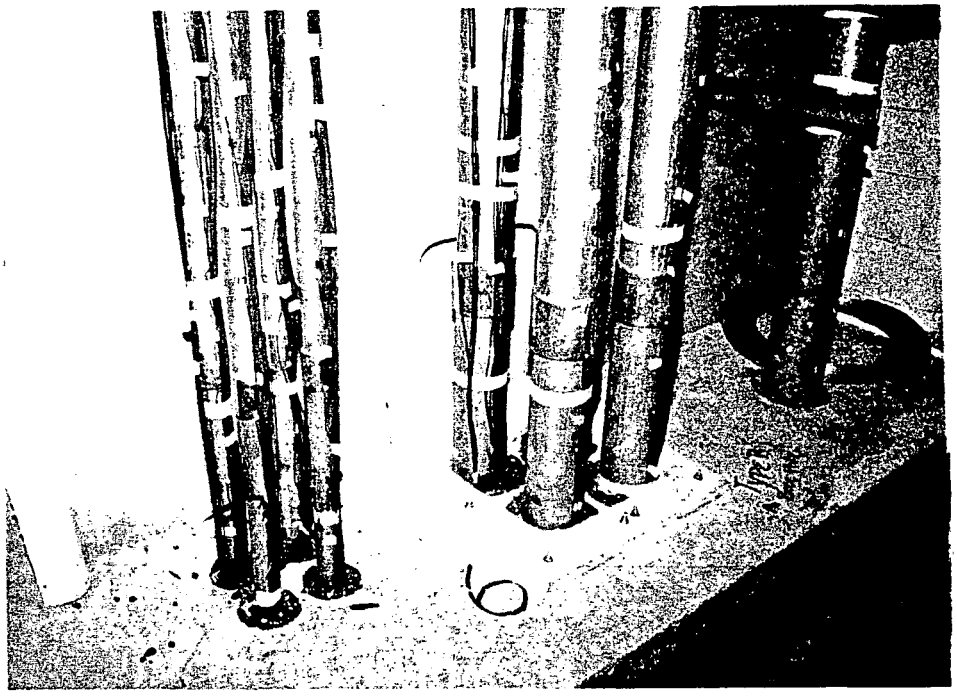


Fully installed upper base plate configuration.

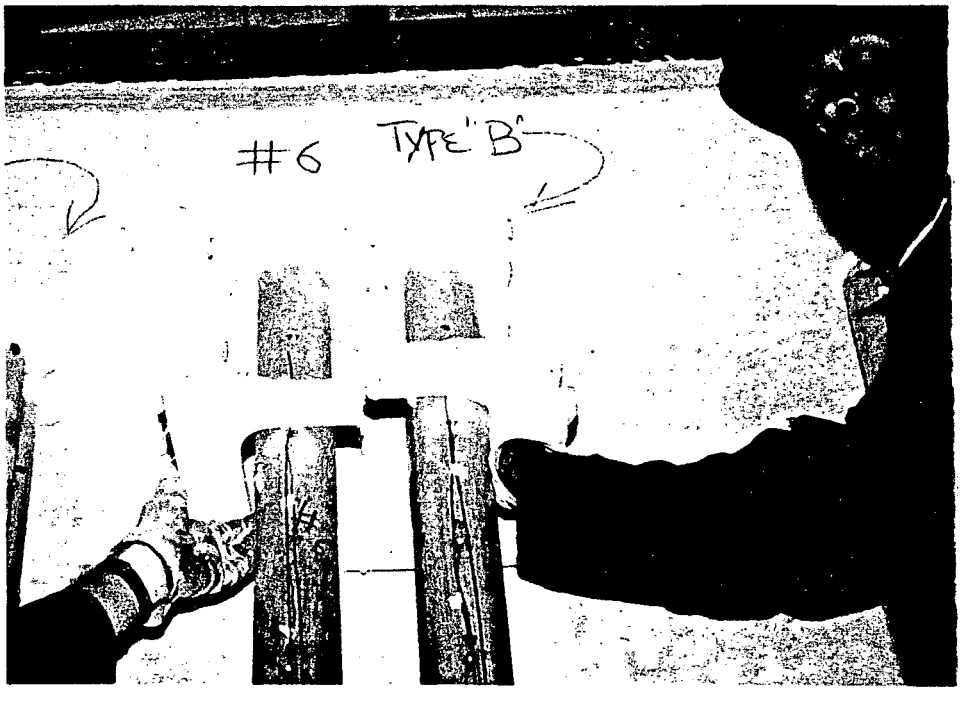
Panel installation complete on set of 4 in. conduits.

Additional thermocouples installed on set of 3 in. conduits.

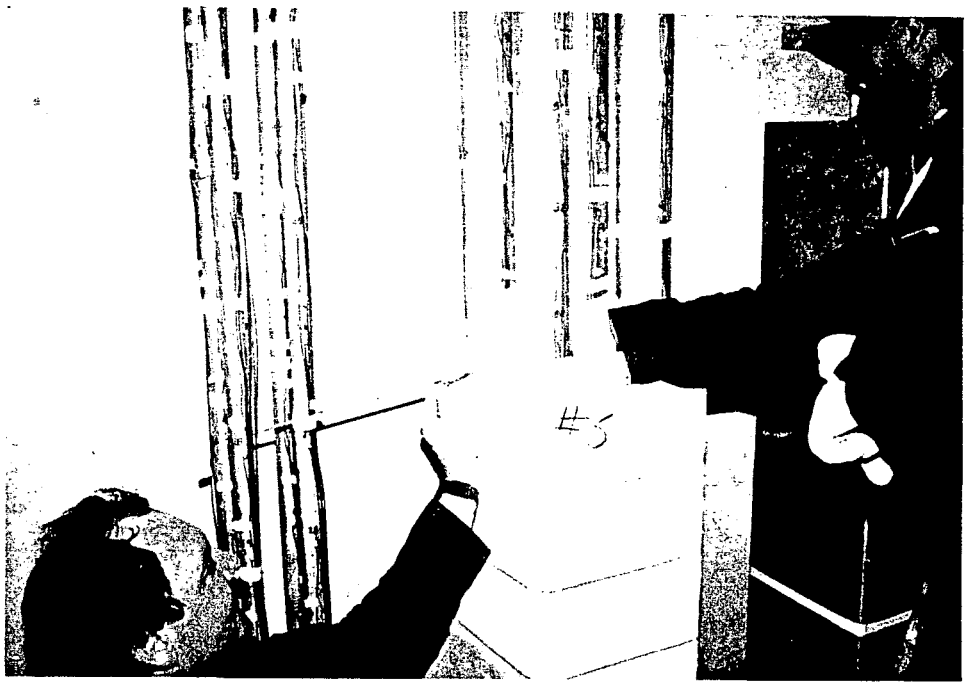
Additional thermocouples installed on set of 1 in. conduits.



Base plate installed on bottom of 3 in. conduit set.

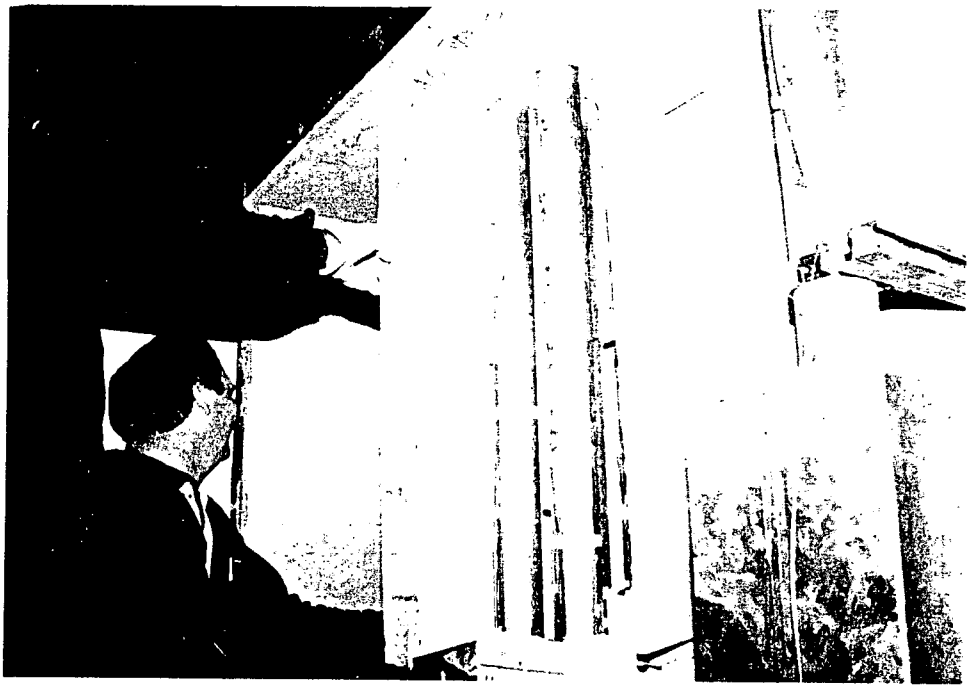


Installation of upper base plate on 3 in. conduit set.

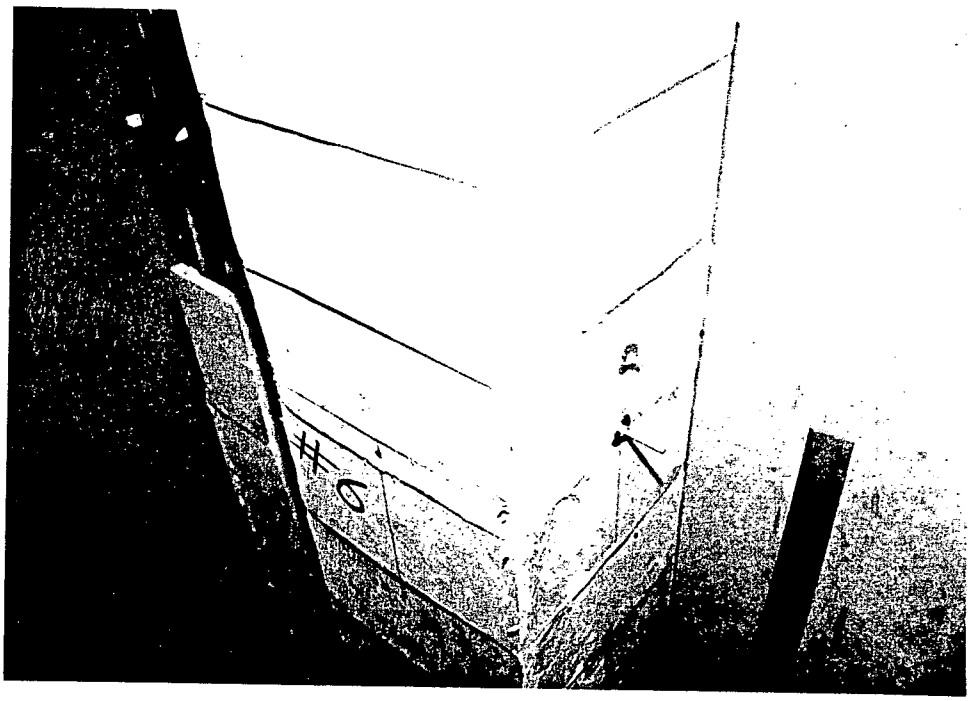


Installation of threaded rod at joint in panels in 3 in. conduit set.

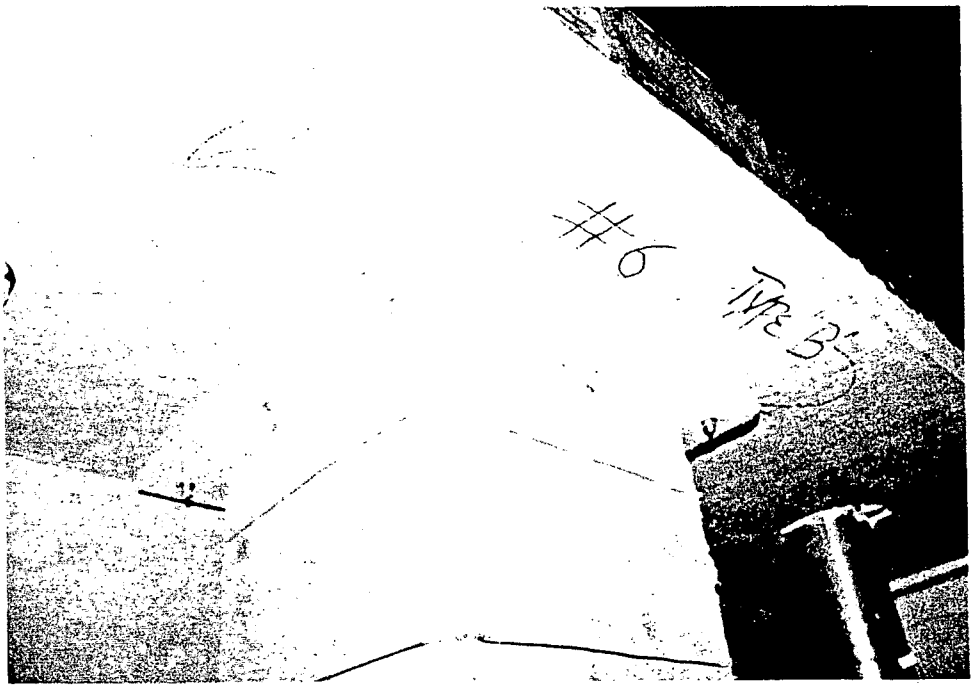
Panels secured at joint location with threaded rod, washers and nuts.



Pre-buttered, scored and folded panel installed on upper portion of 3 in. conduits.

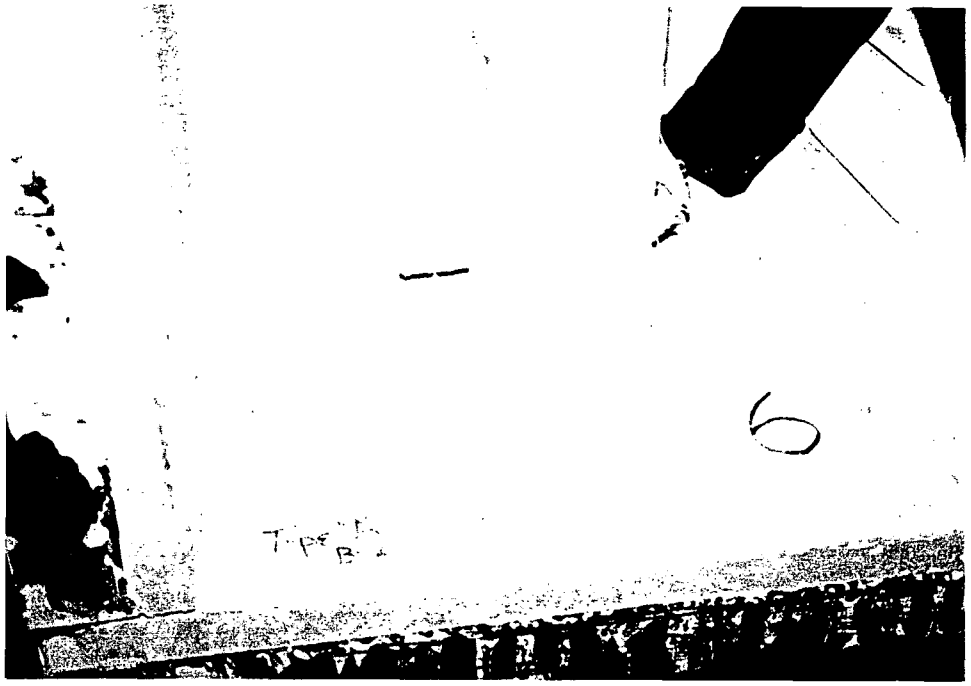


Joint between panels in 3 in. conduit set.

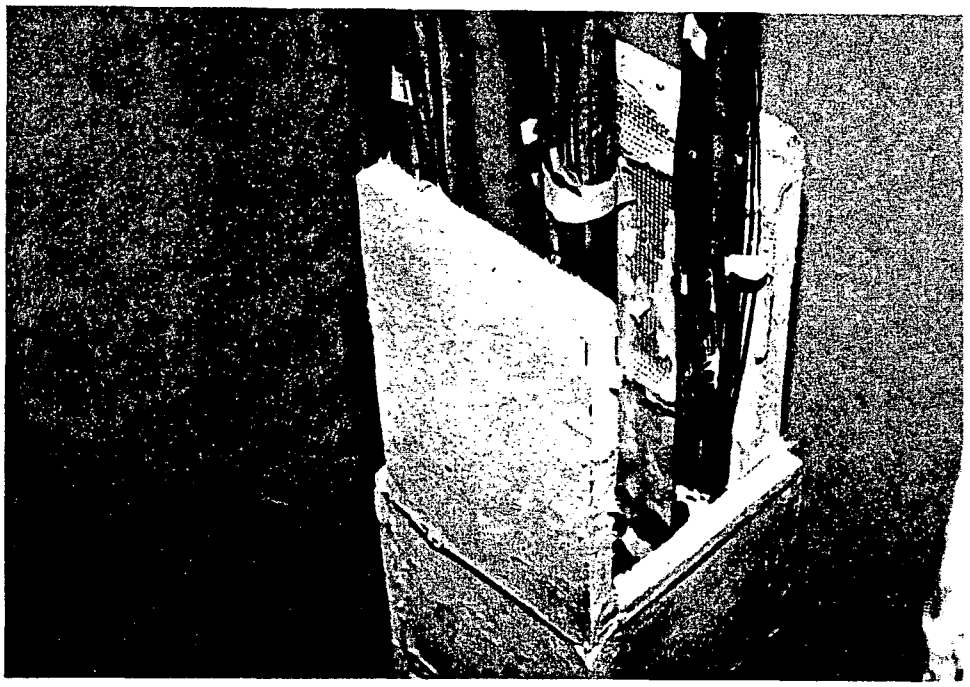


Upper base plate installed and panels in place on 3 in. conduit set.

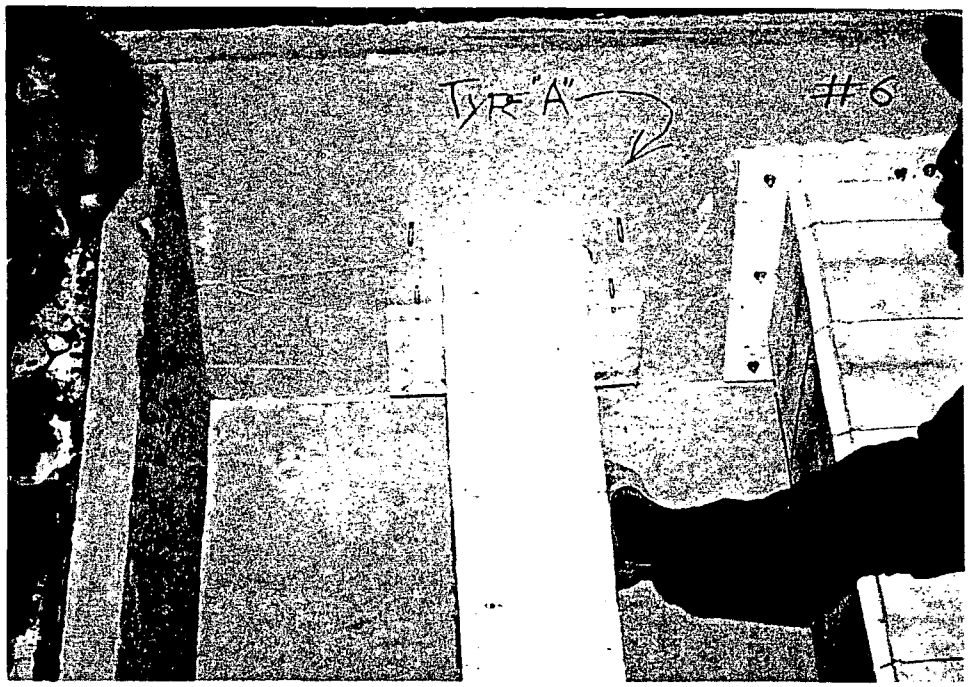
Pre-buttered, separate panels installed on 1 in. conduit set.



Bottom base plate installed on 1 in. conduit set.



Bottom portion of joint in 1 in. conduit set.

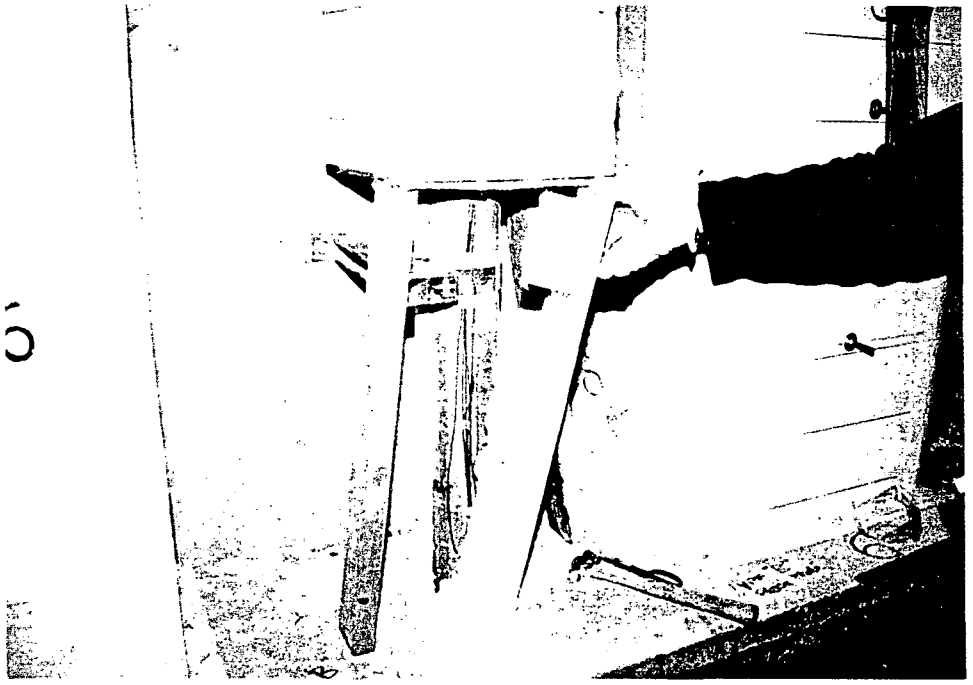


Upper base plate installed on 1 in. conduit set.

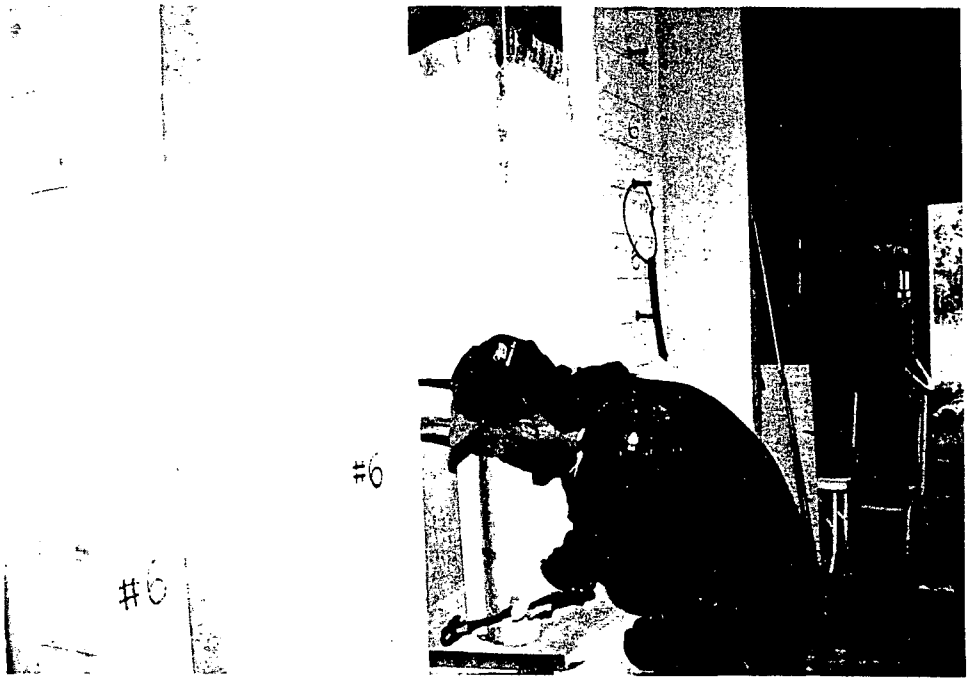
Panels secured with stainless steel tie wire.

Pre-buttered, scored and folded panel installed on bottom of junction box.

Pre-buttered, scored and folded panel installed on bottom of junction box.



Pre-shaped conduit section installed on conduit below junction box.

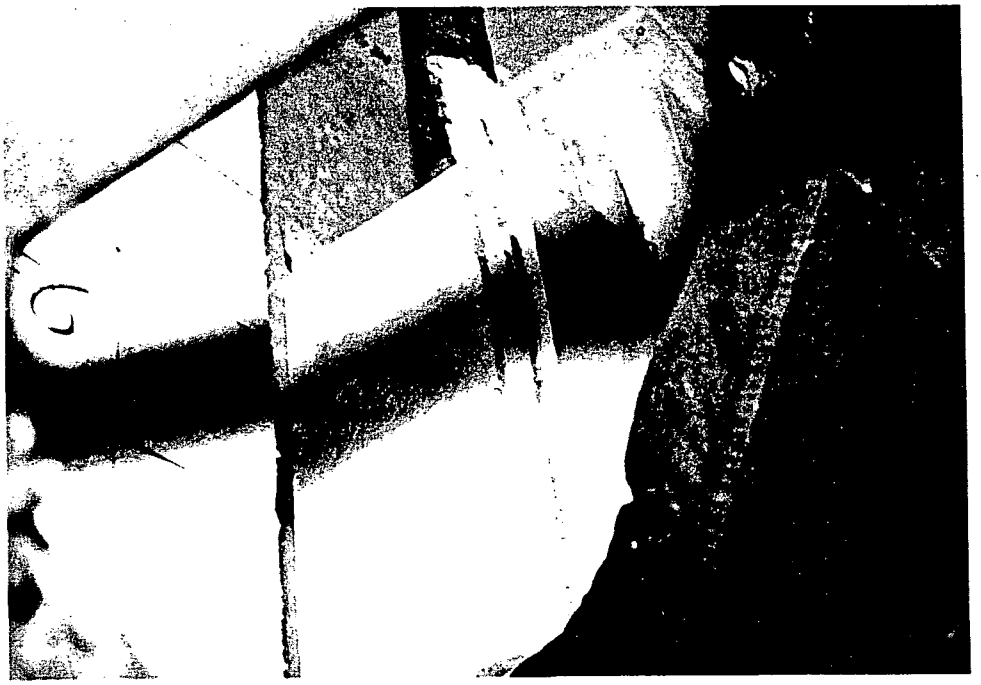


Pre-shaped conduit section installed on conduit below junction box.

Stress skin overlaps secured to junction box enclosure.

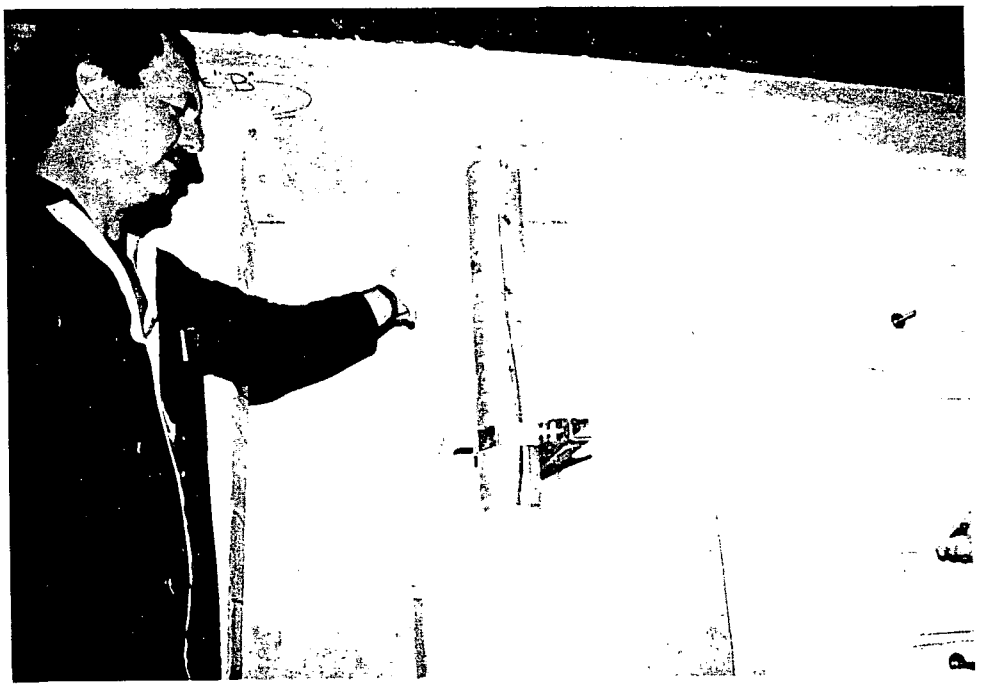
Bottom base plate installed at base of conduit below junction box.

Scored and folded panel installed on top portion of junction box.

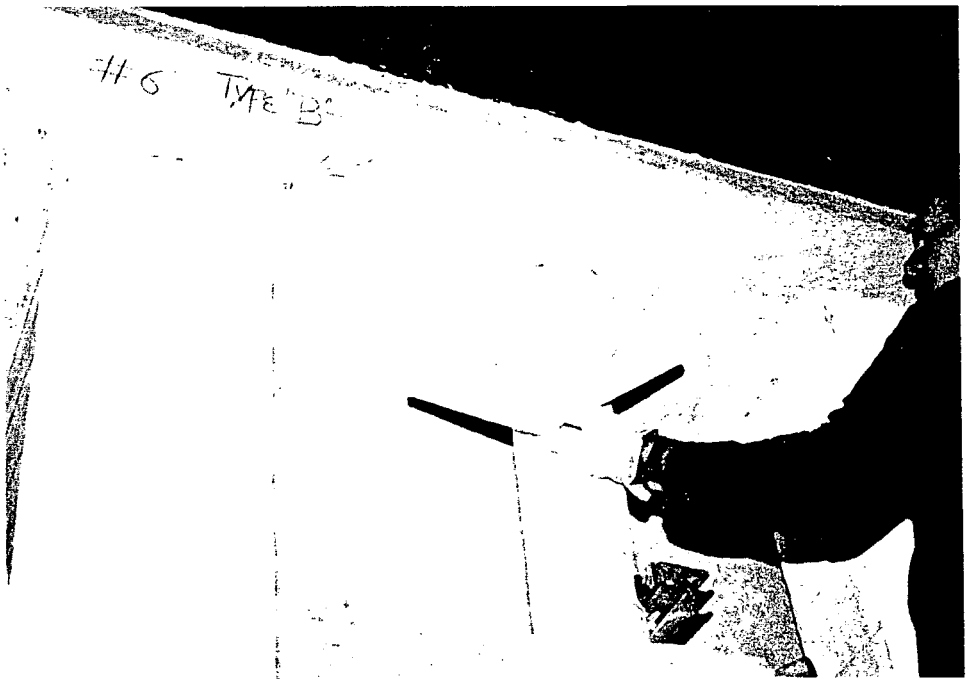


Scored and folded panel installed on top portion of junction box.

Scored and folded panel installed on top portion of junction box.

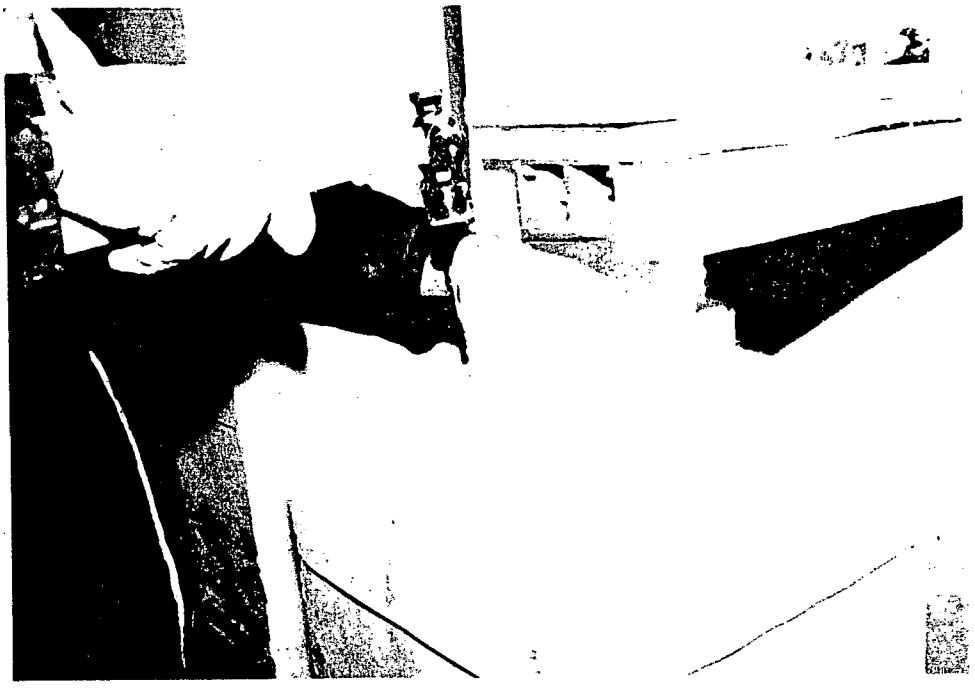


Pre-shaped conduit sections installed on conduit above junction box.

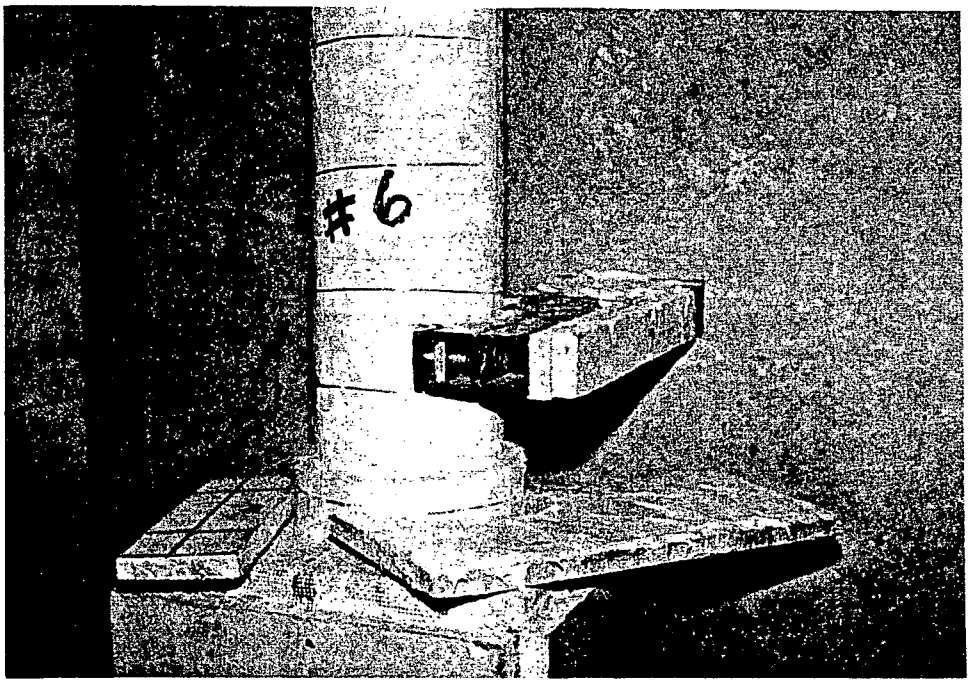


Upper base plate installed at top of conduit above junction box.

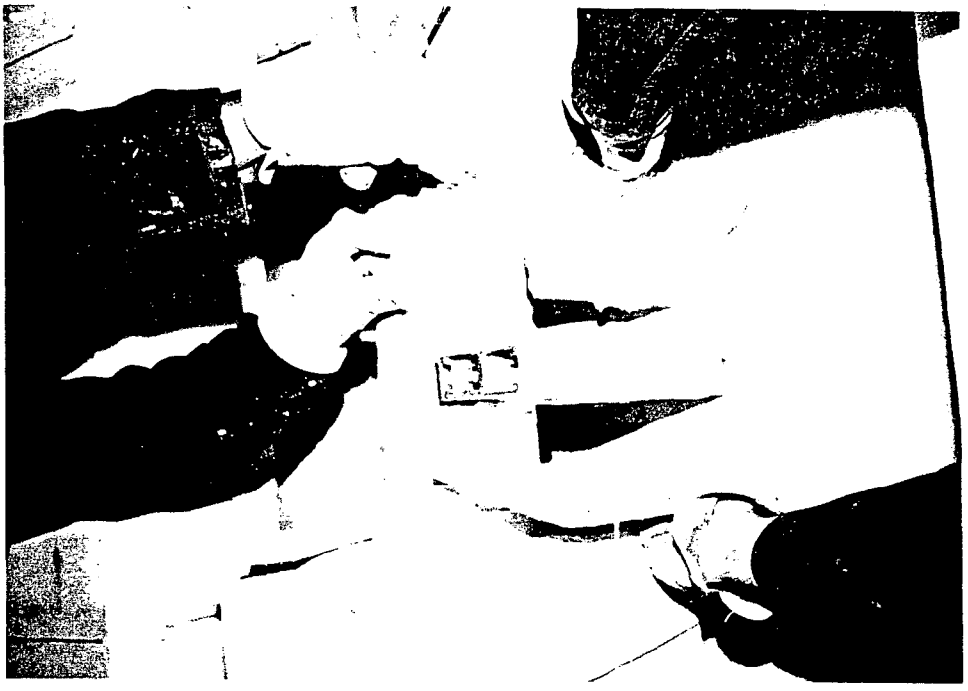
Sections of pre-shaped material fit into place at junction box to conduit interface.



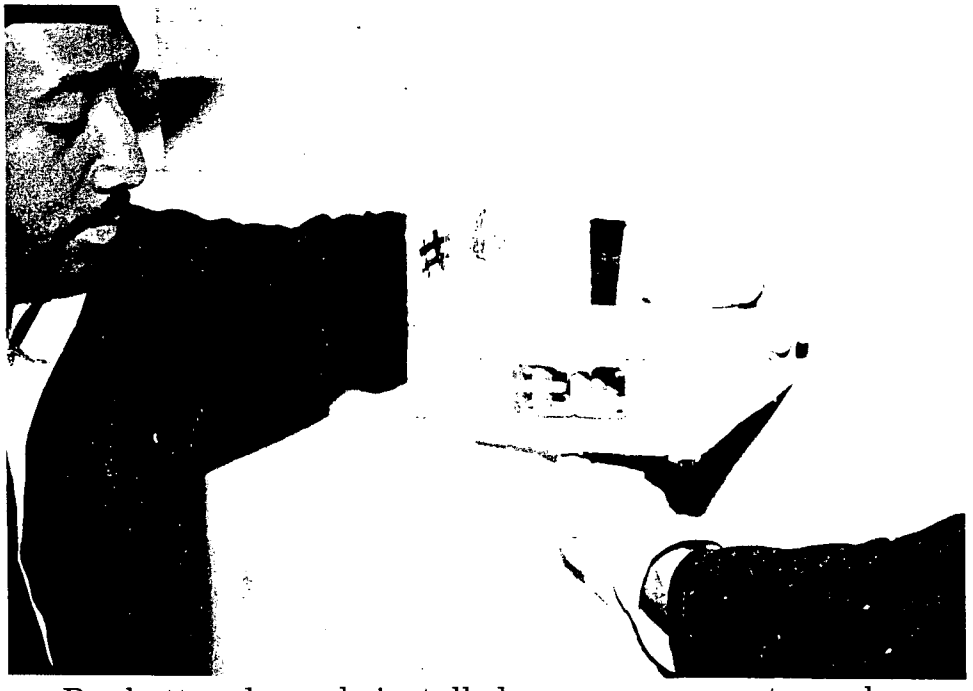
Sections of pre-shaped material fit into place at junction box to conduit interface.



Pre-buttered panels installed on upper support member.

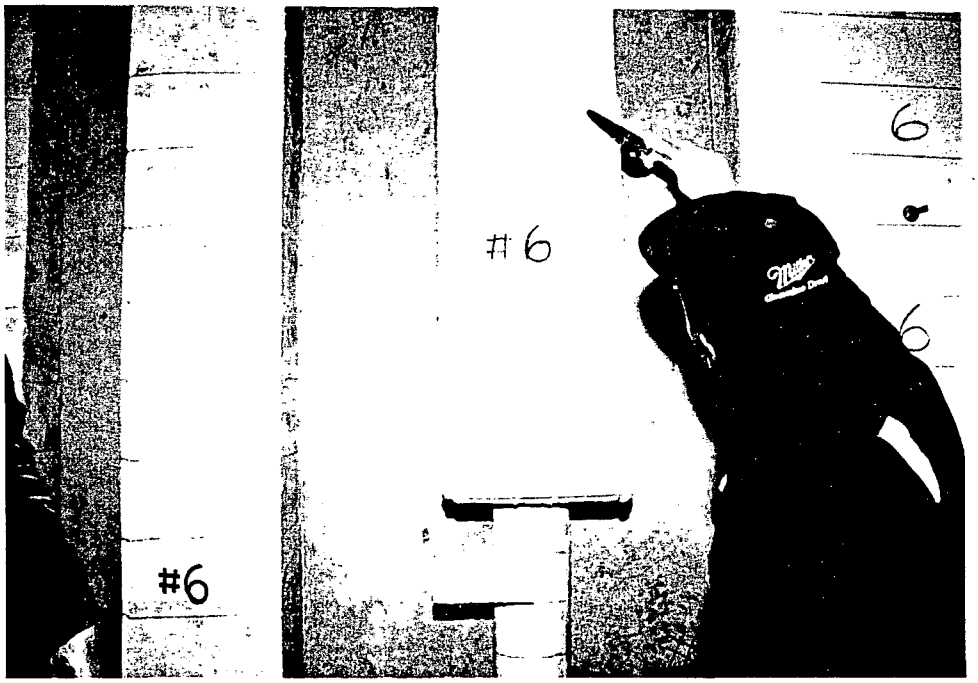


Pre-buttered panels installed on upper support member.



Pre-buttered panels installed on upper support member.

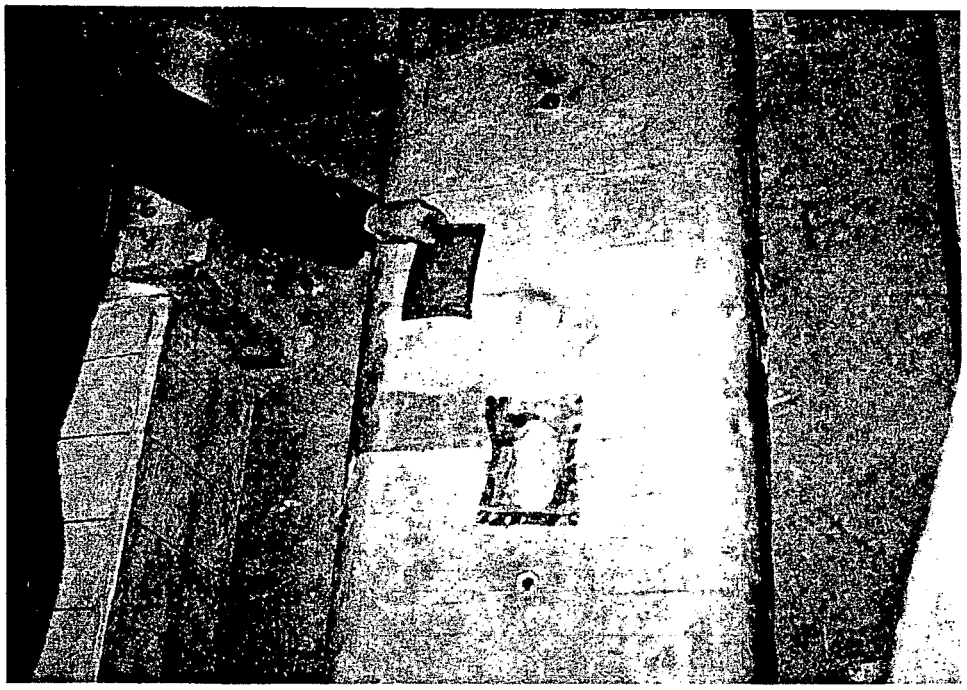
Pre-buttered panels installed on upper support member.



Corner of junction box enclosure filled with trowel grade material.

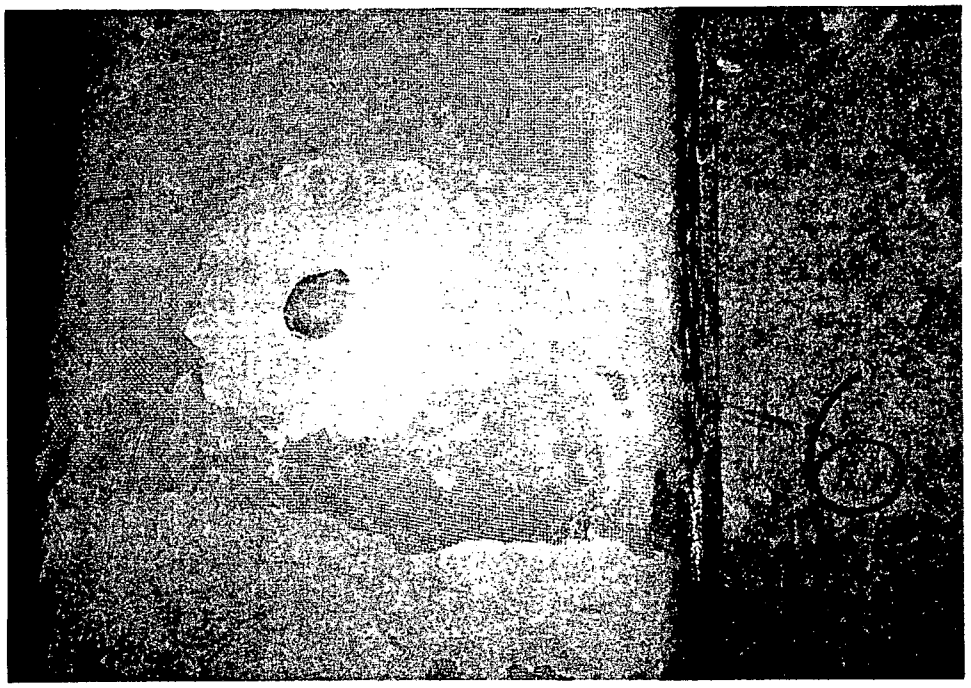
External stress skin wrapped around 4 in. conduit enclosure.

External stress skin wrapped around 4 in. conduit enclosure.

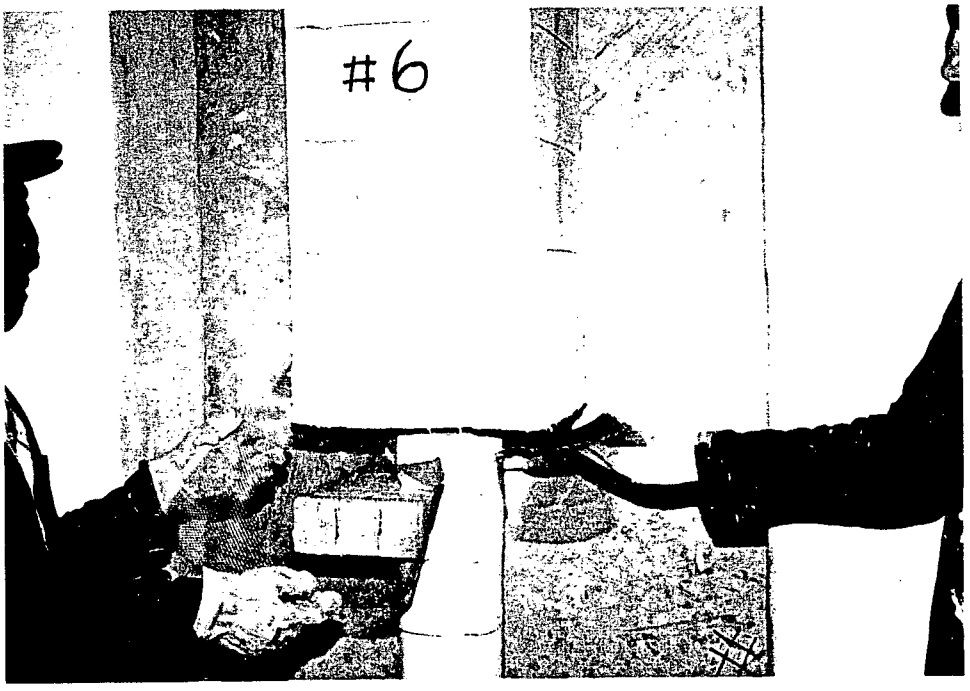


Washers and nuts covered with mounds of trowel grade and patches of external stress skin, stapled in place.

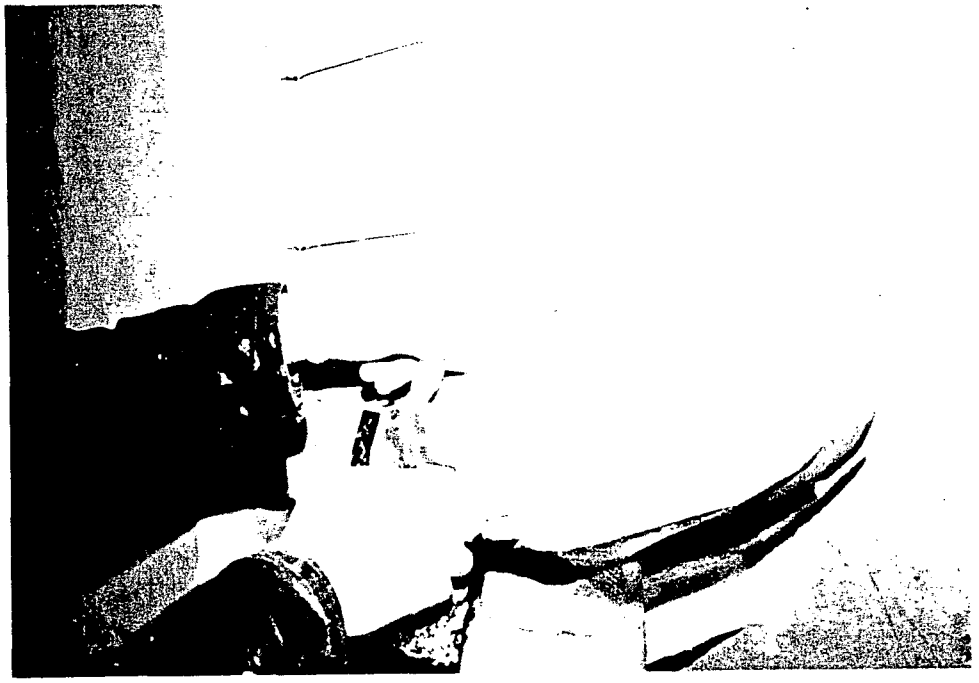
External stress skin patches stapled in place.



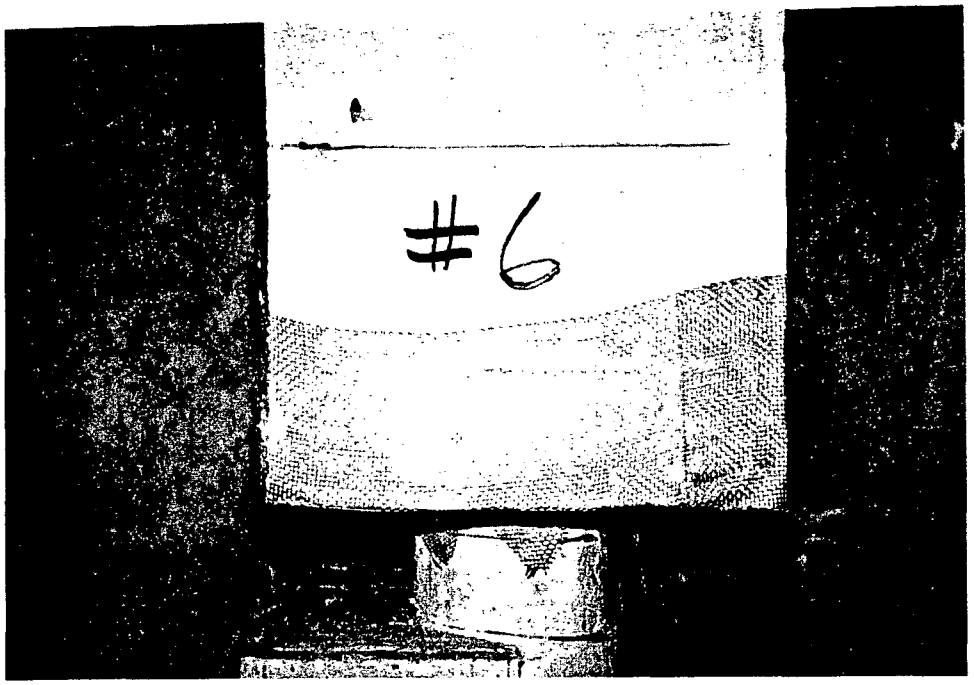
Trowel grade material applied over external stress skin patches.



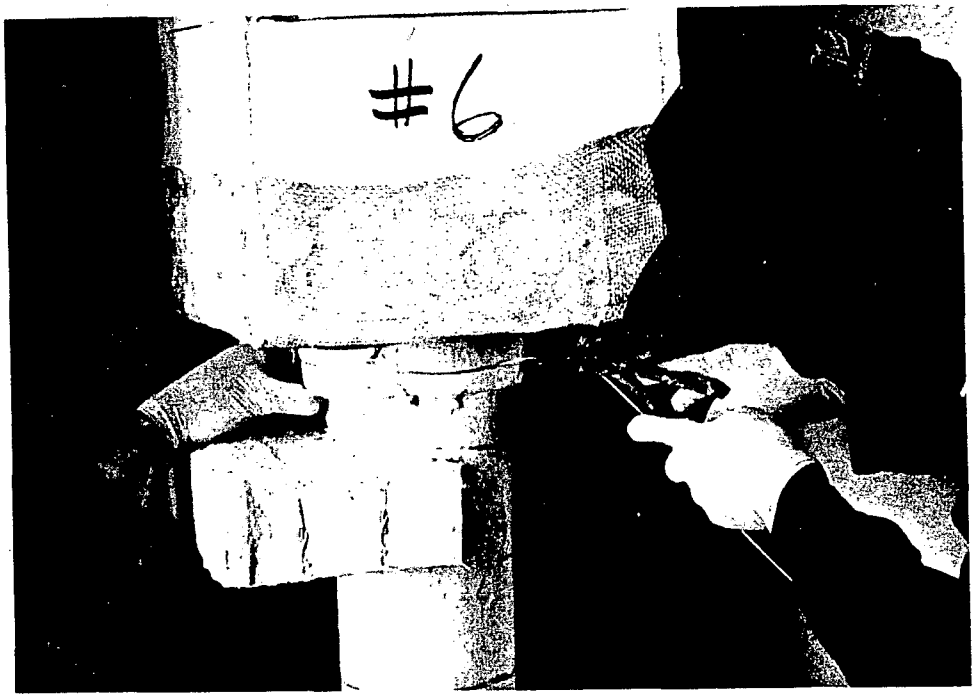
External stress skin installed on bottom of junction box.



External stress skin secured to junction box enclosure with staples.



External stress skin secured to junction box enclosure with staples.



Section of pre-shaped material installed over external stress skin under junction box, and secured with stainless steel tie wire.

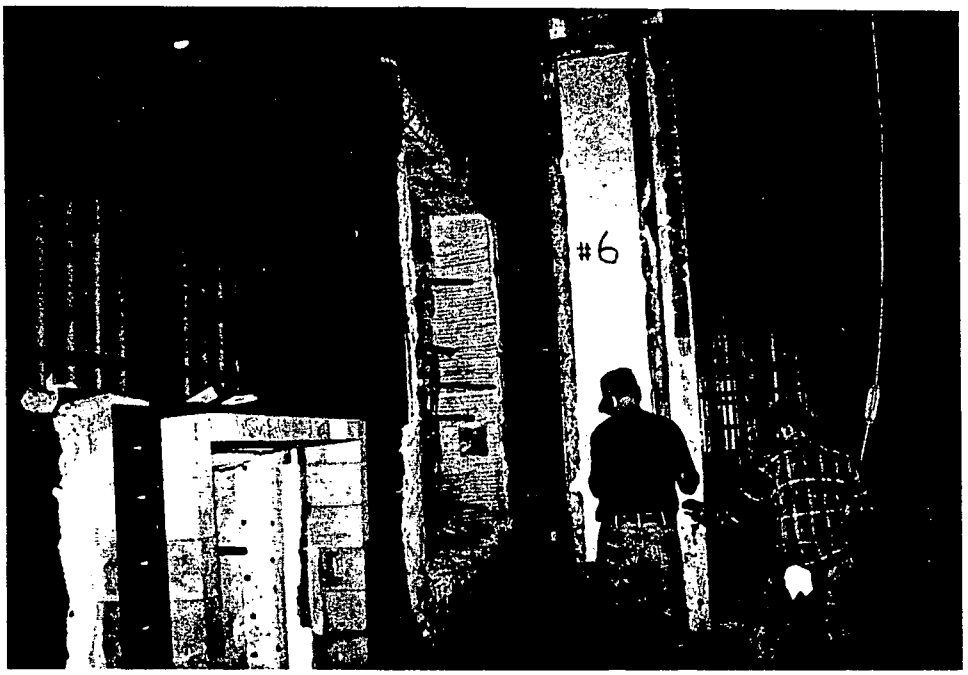
External stress skin wrapped around junction box enclosure.

Joint in external stress skin stitched with stainless steel tie wire.

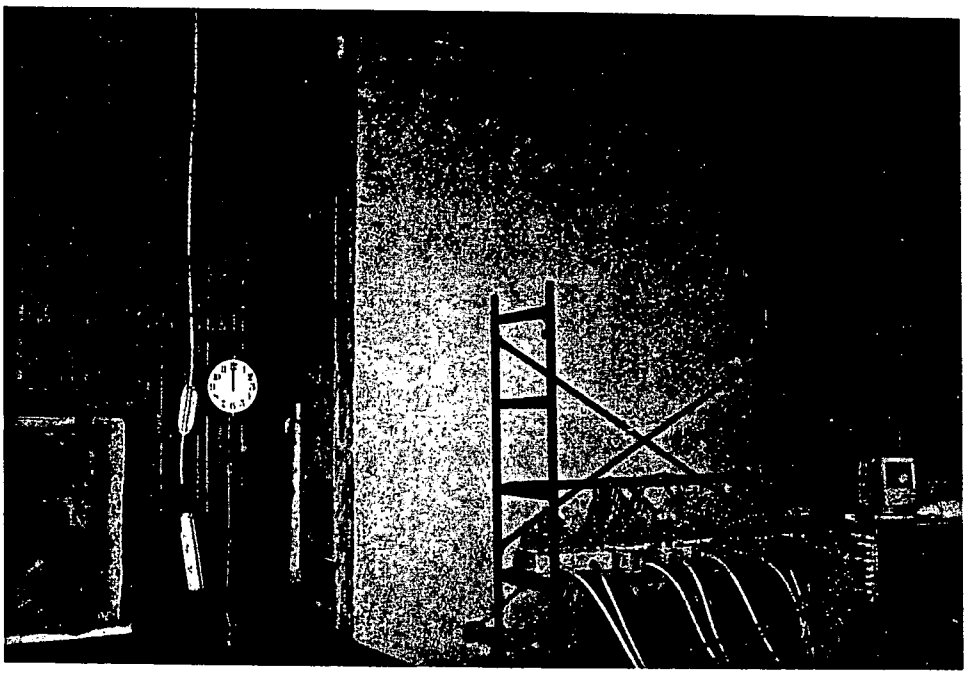
3 in. conduit enclosure wrapped with external stress skin.

1 in. conduit enclosure wrapped with external stress skin.

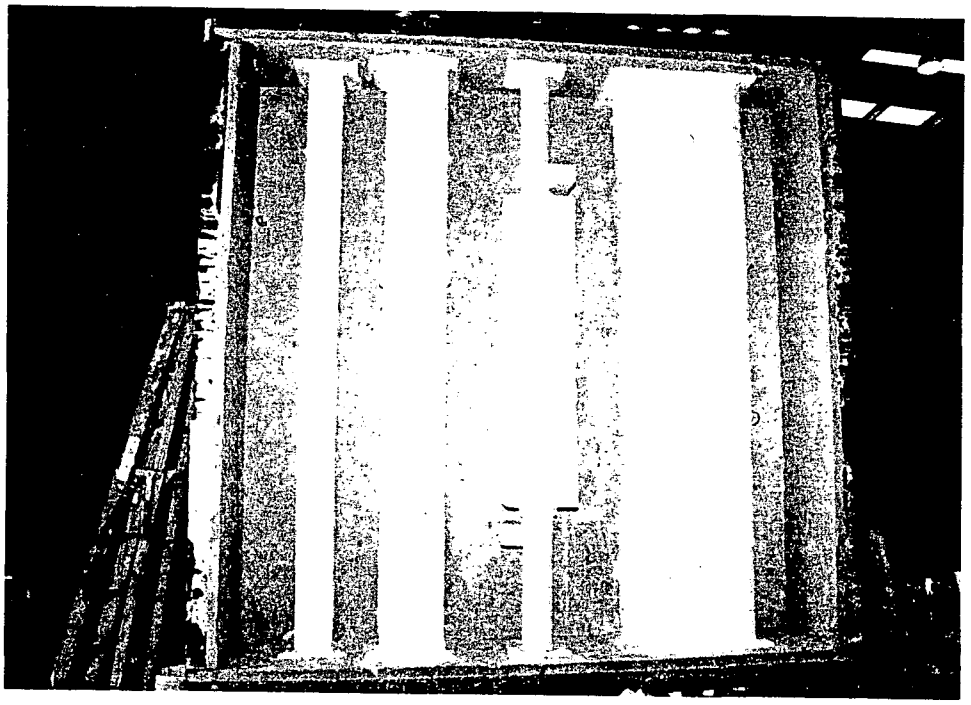
Skim coat of trowel grade material applied over all external stress skin.



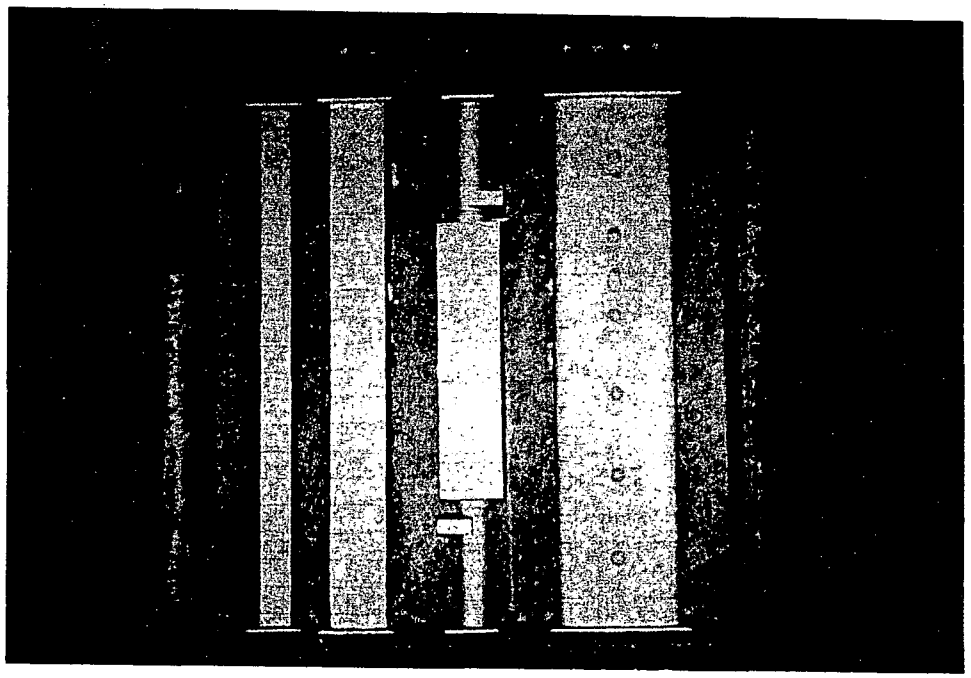
Installation of test deck onto test furnace.



Test deck prior to start of fire exposure.

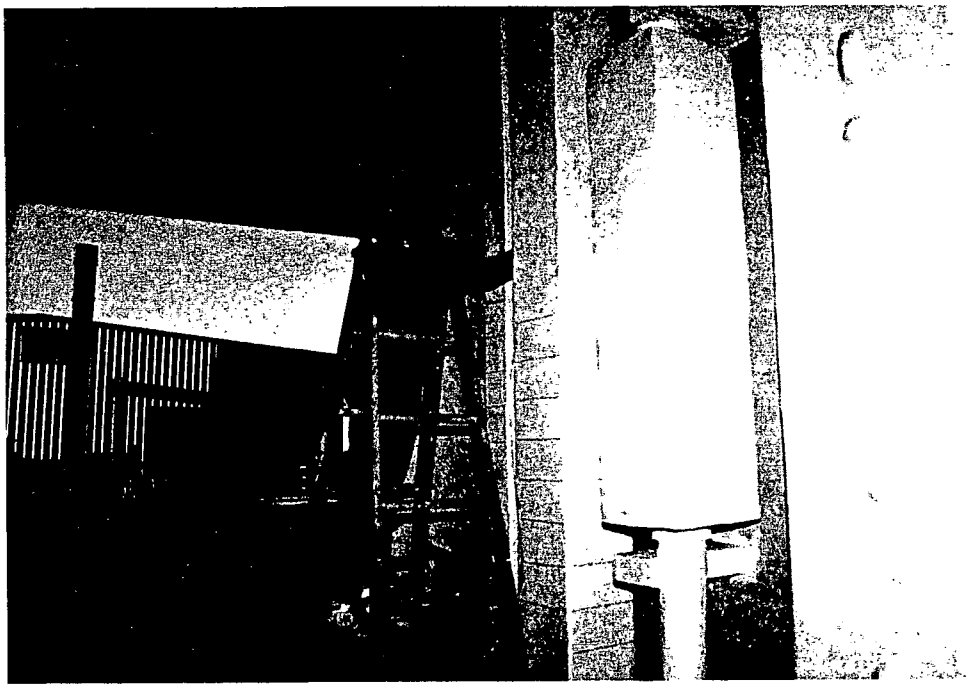


Completed installation of conduit enclosures.

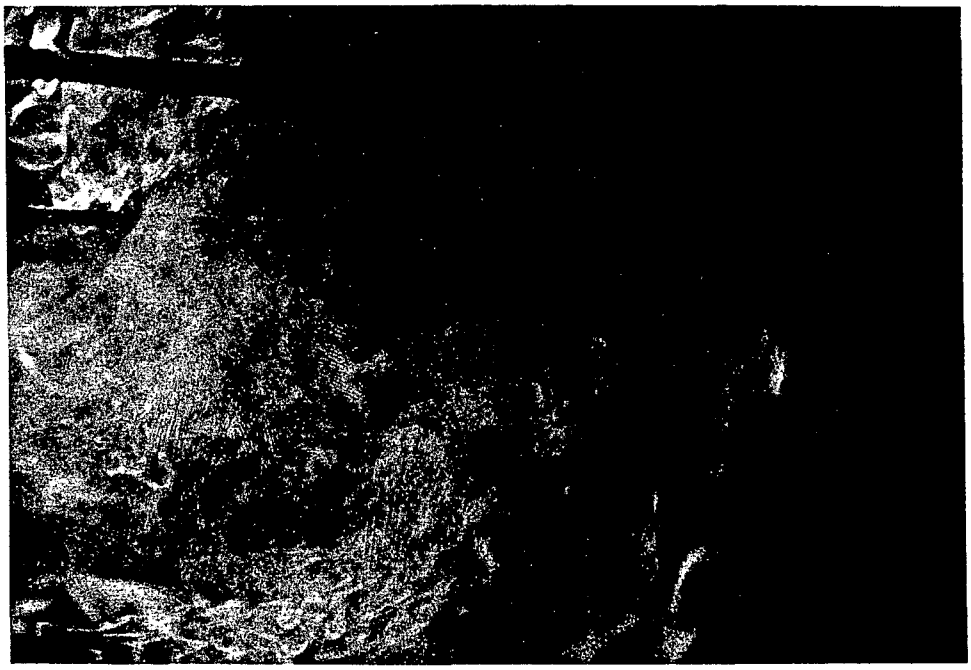


Test deck prior to placement onto test furnace.

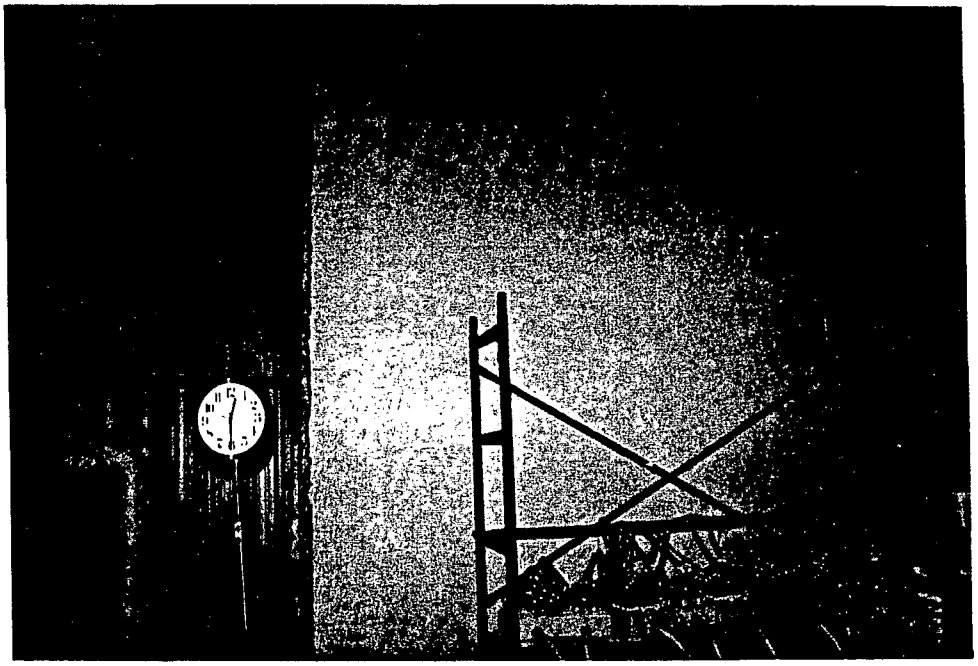
Skim coat of trowel grade material applied over all external stress skin.



Stainless steel tie wire installed over skim coat of trowel grade material.



Furnace interior during fire exposure.

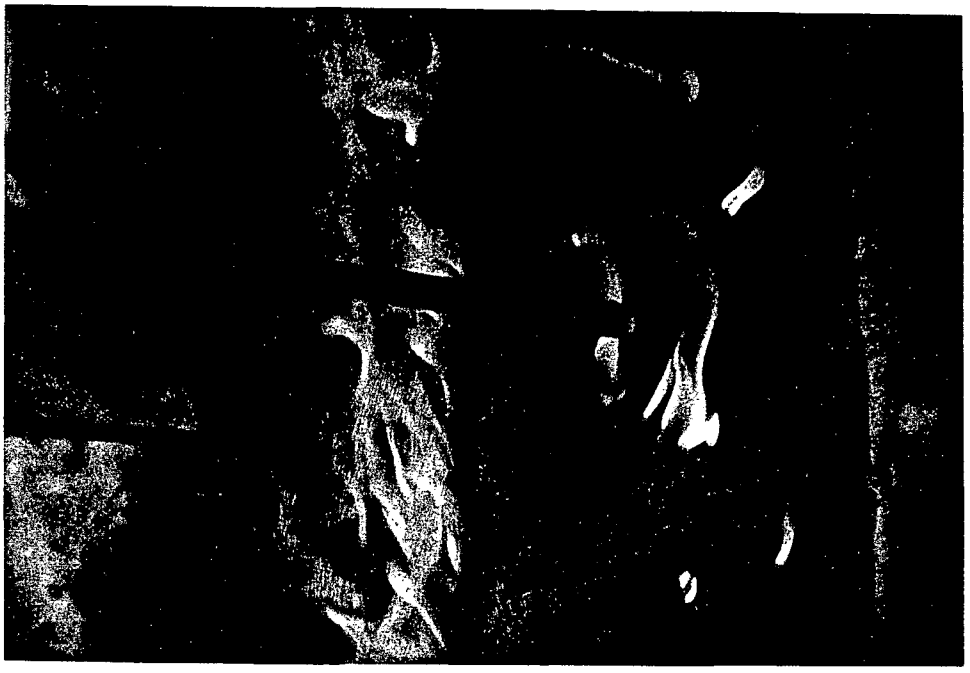


Test deck after thirty minutes of exposure.

Furnace interior during fire exposure.

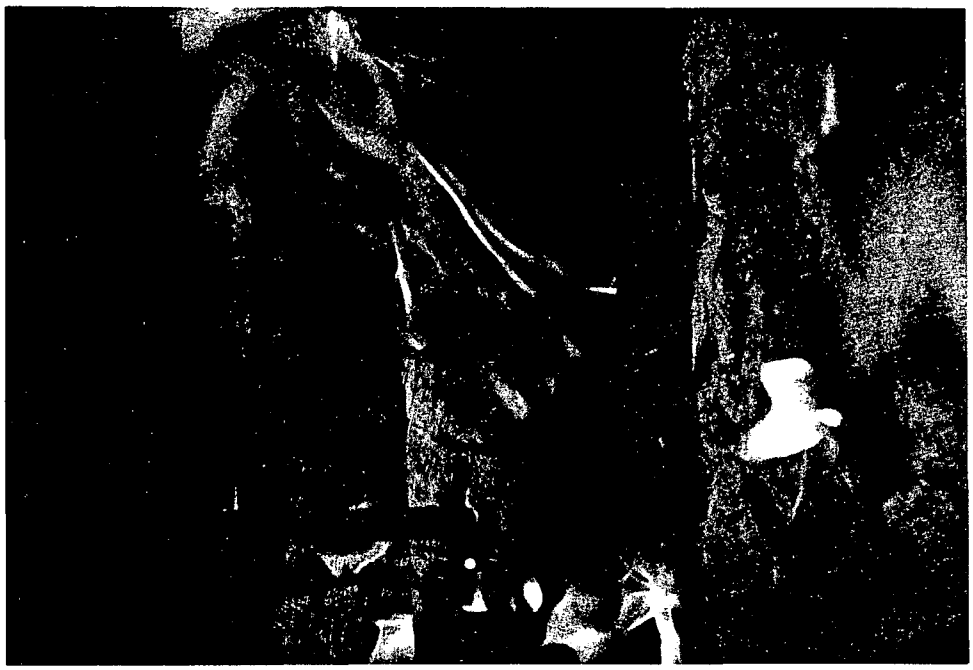
Furnace interior during fire exposure.

Furnace interior during fire exposure.

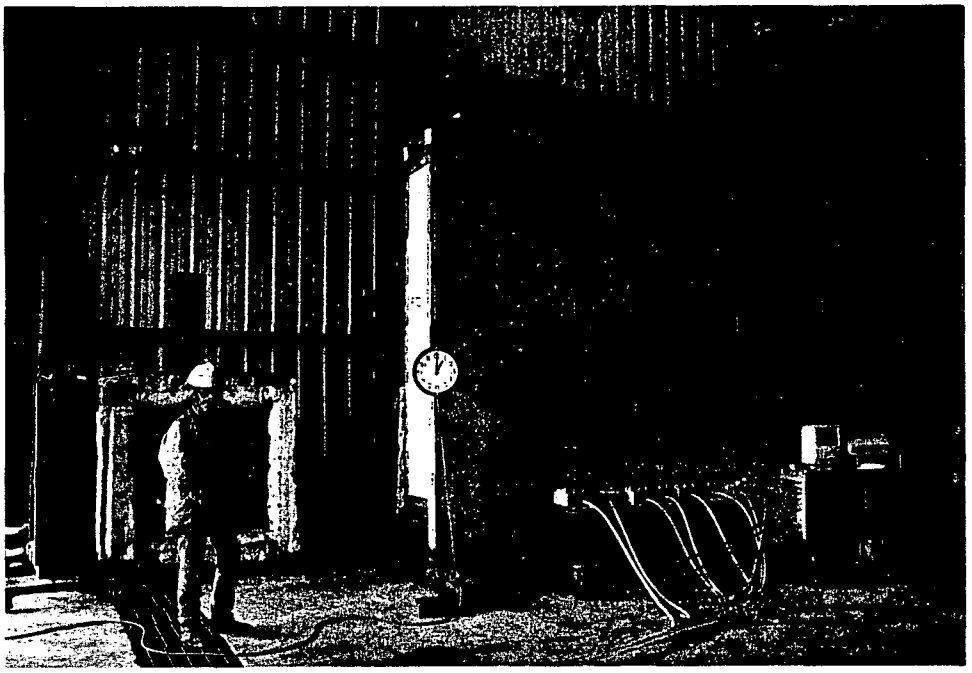


Furnace interior during fire exposure.

Furnace interior during fire exposure.

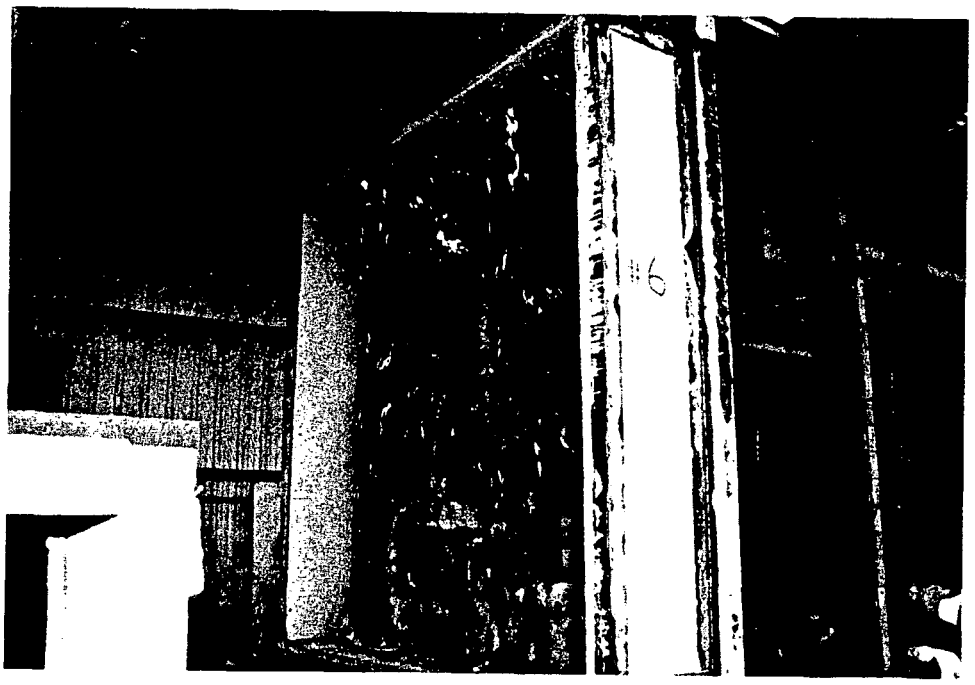


Furnace interior during fire exposure.

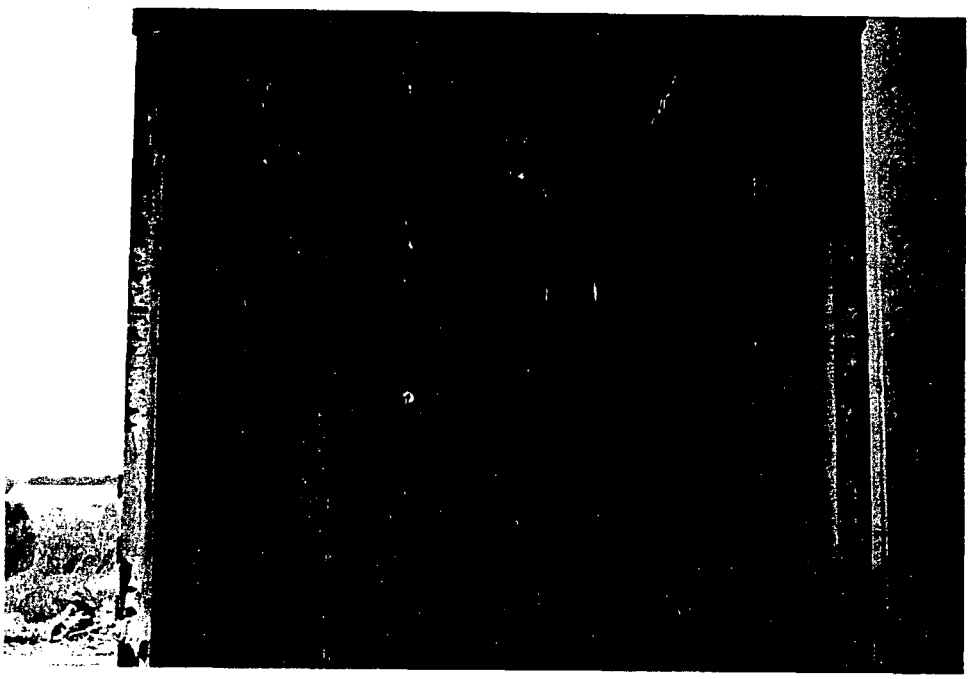


Test furnace at end of fire exposure period (one hour).

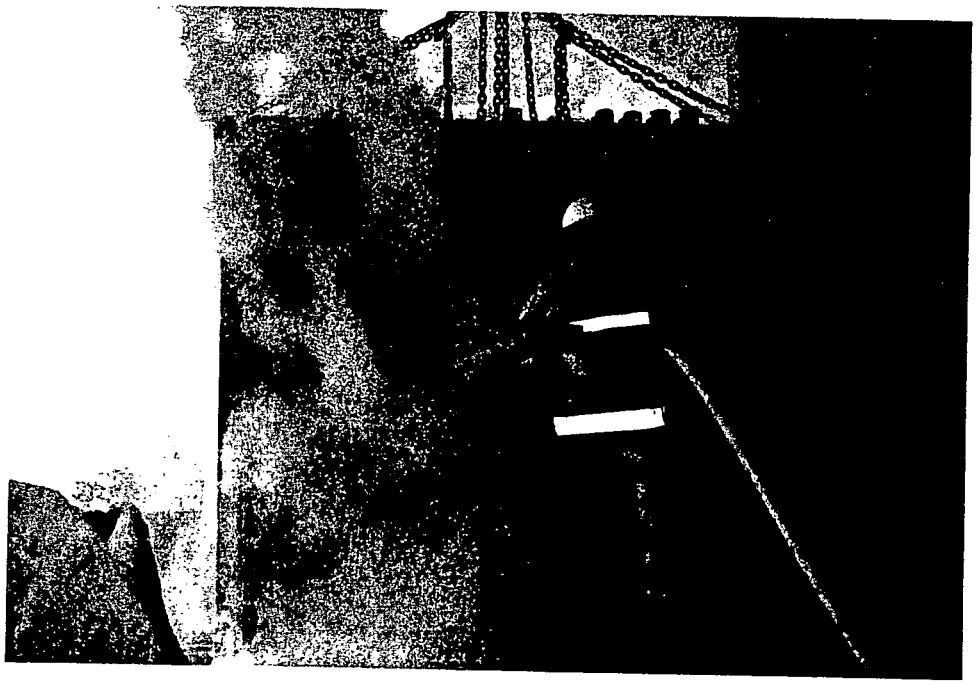
Test deck removed from furnace for hose stream test.



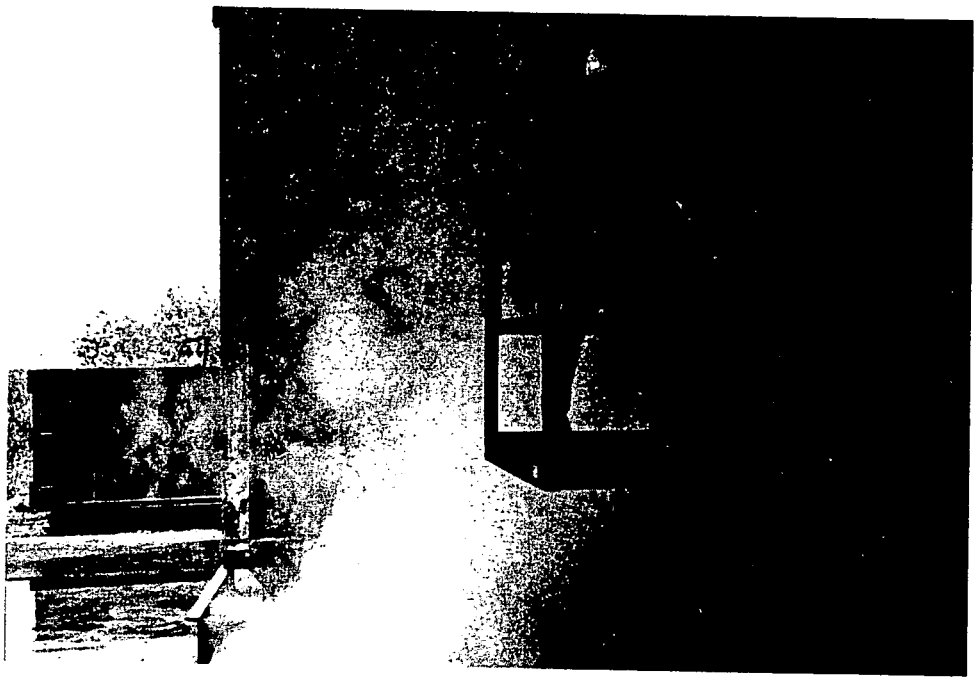
Test deck prior to water hose stream test.



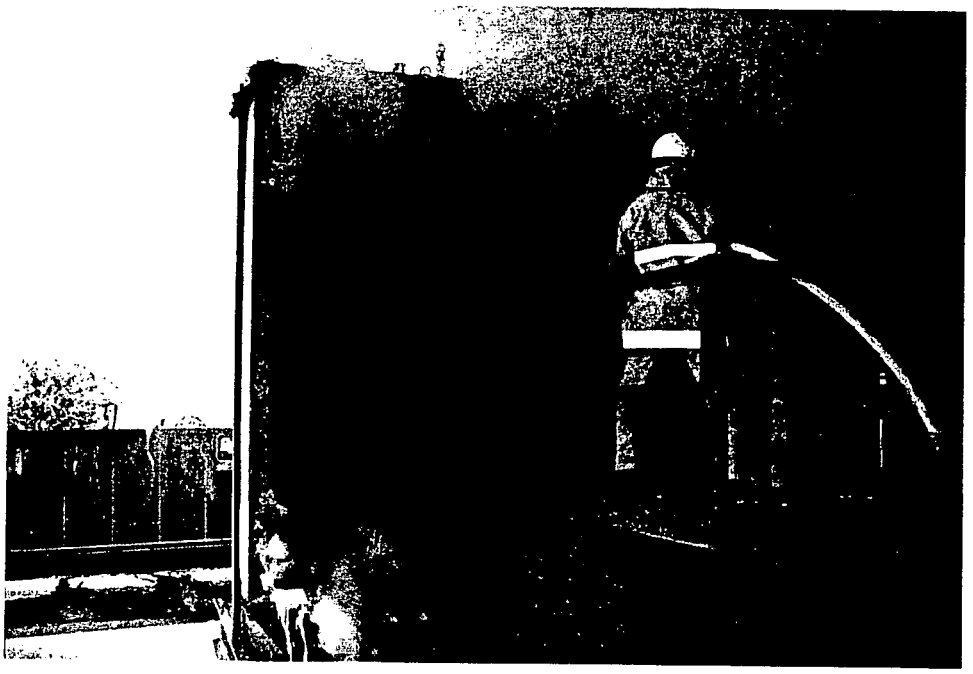
Test deck prior to water hose stream test.



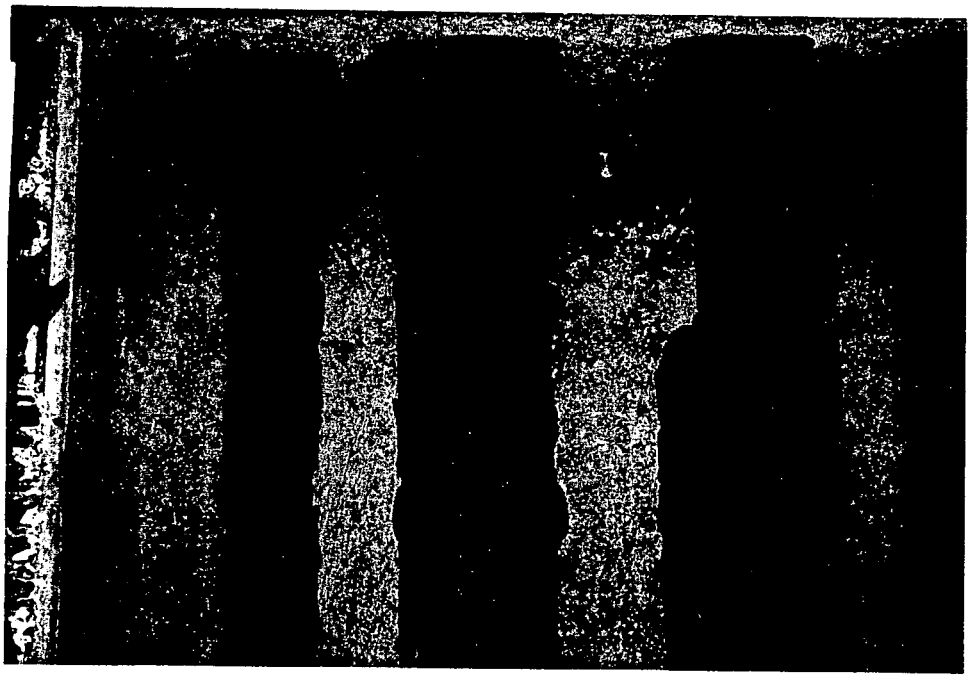
Water hose stream test.



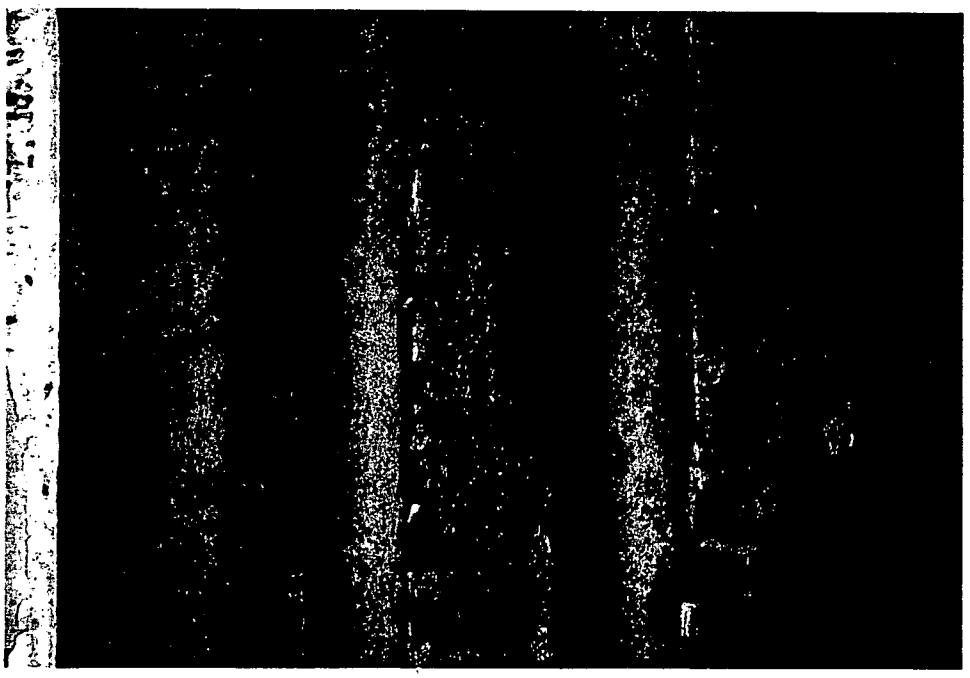
Water hose stream test.



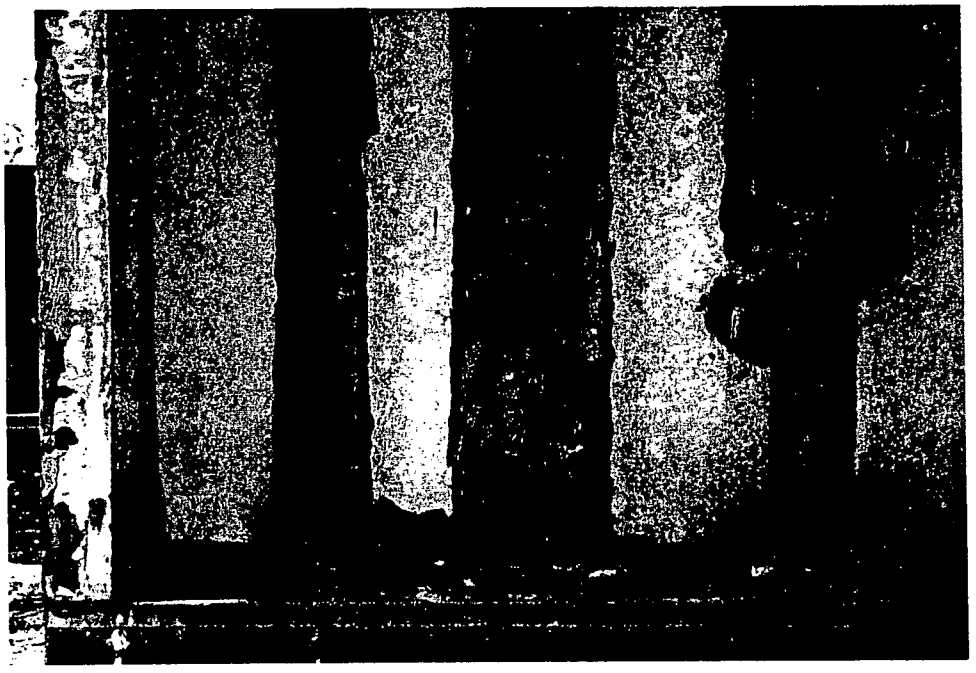
Water hose stream test.



Test deck after water hose stream test.

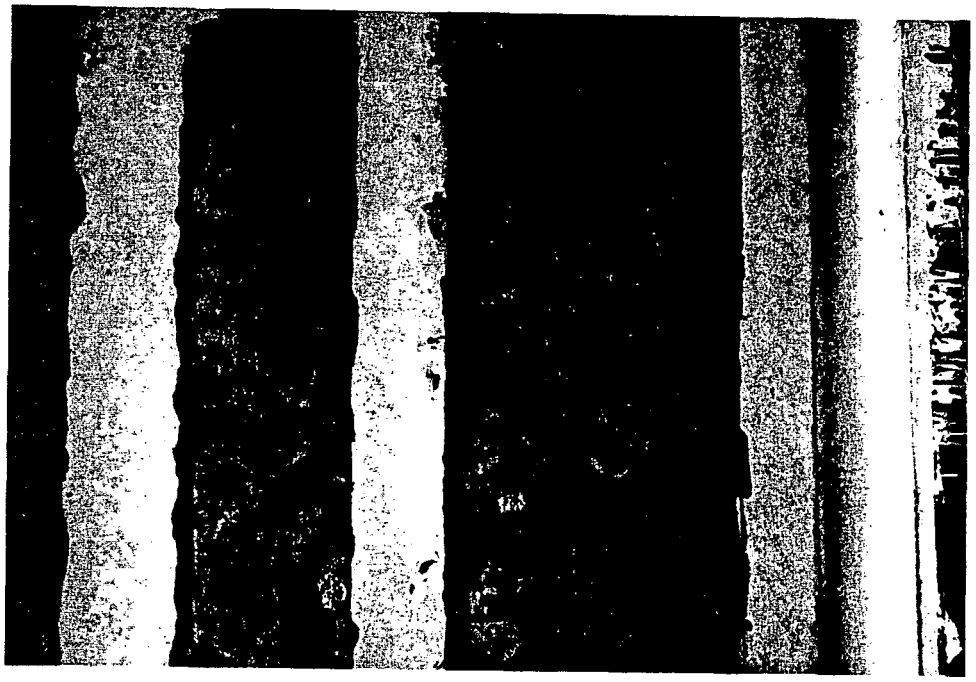


Test deck after water hose stream test.

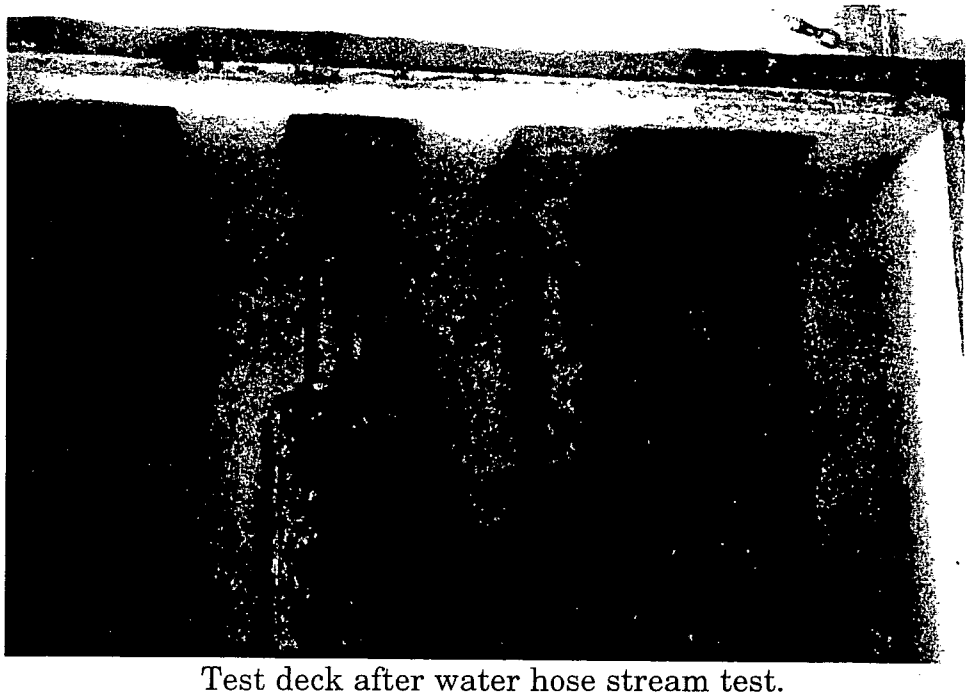


Test deck after water hose stream test.

Test deck after water hose stream test.



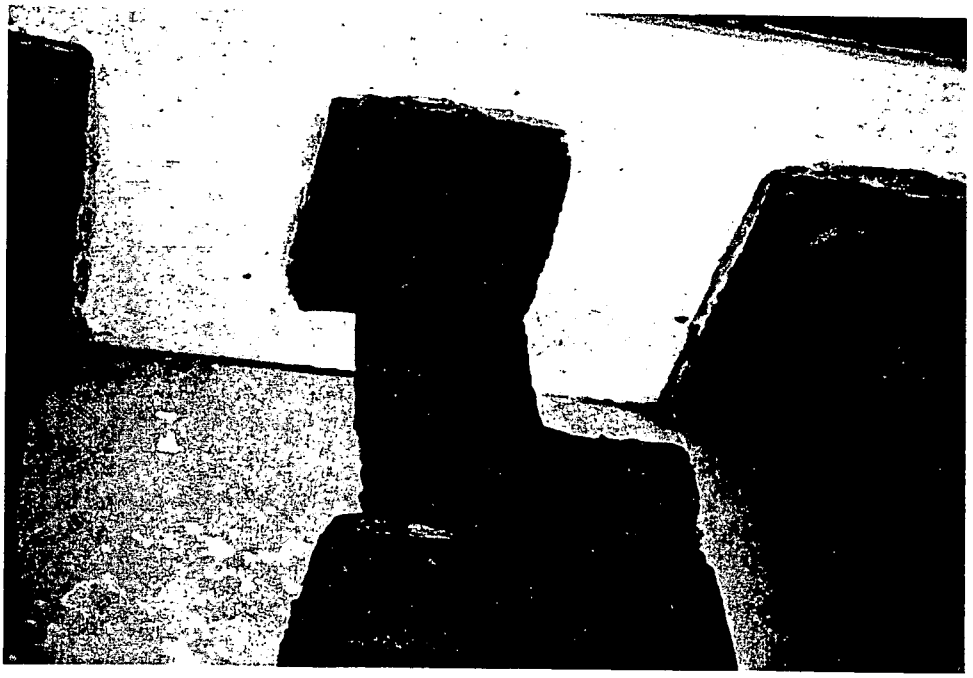
Test deck after water hose stream test.



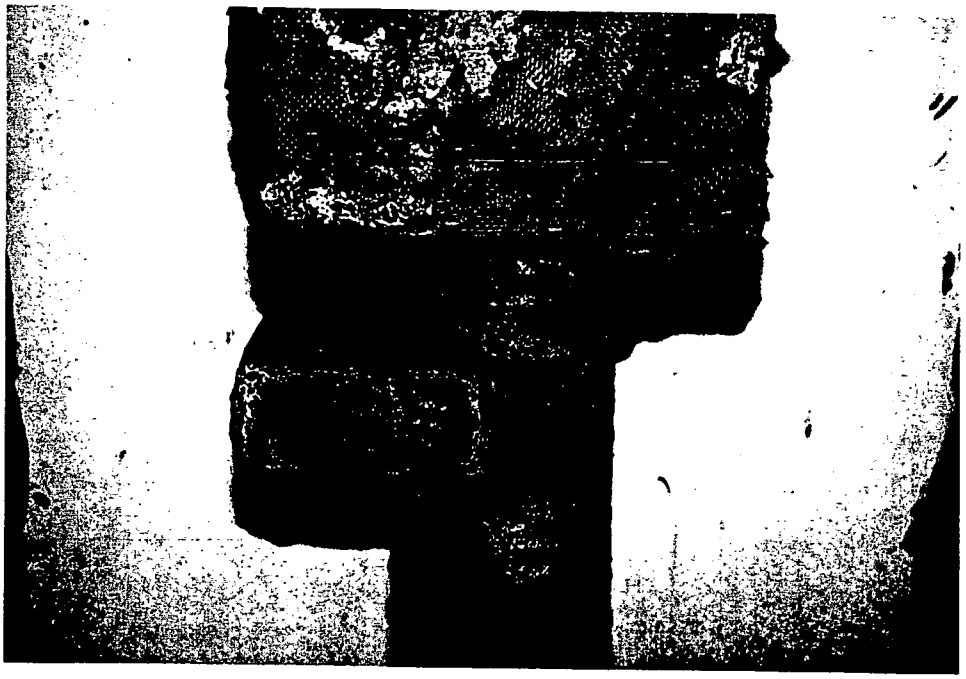
Test deck after water hose stream test.

Base plates on bottom of 1 in. and 3 in. conduit enclosures.

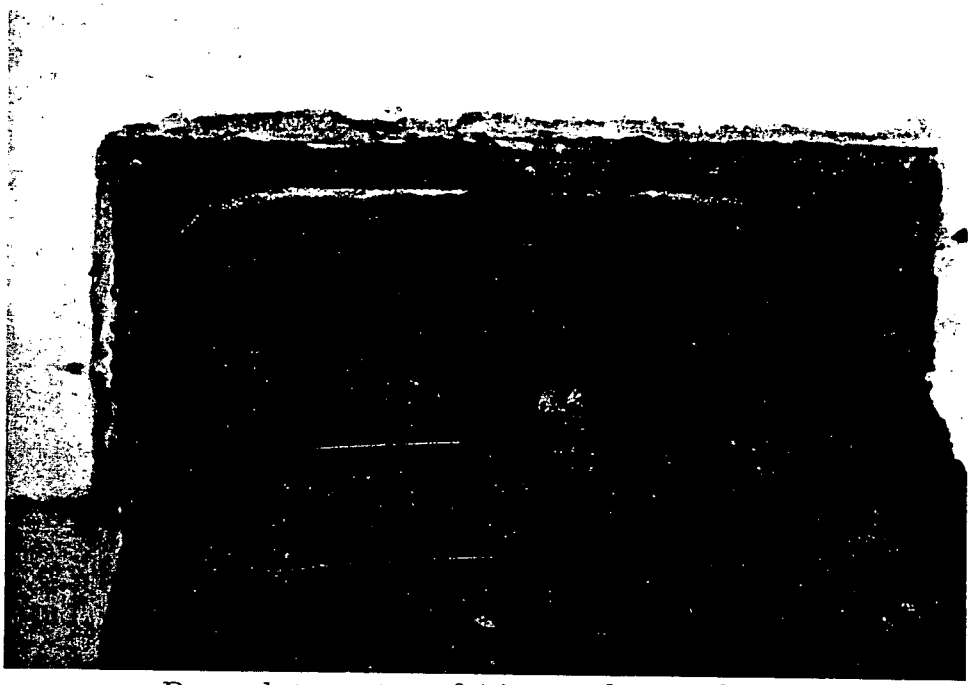
Base plates on top of 1 in. and 3 in. conduit enclosures.



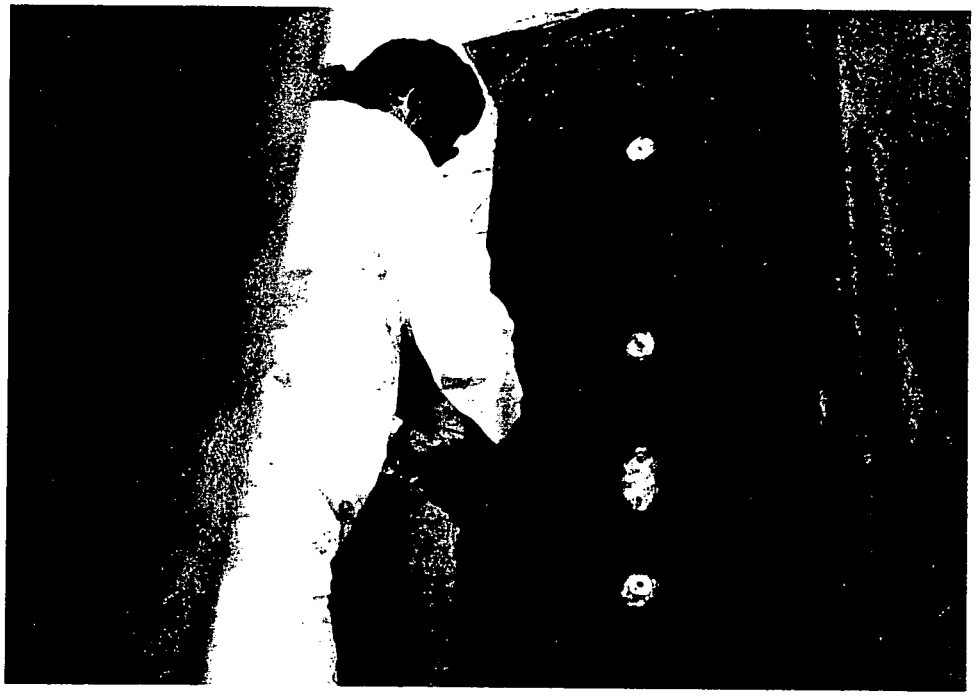
Base plate on top of 4 in. conduit enclosures with junction box.



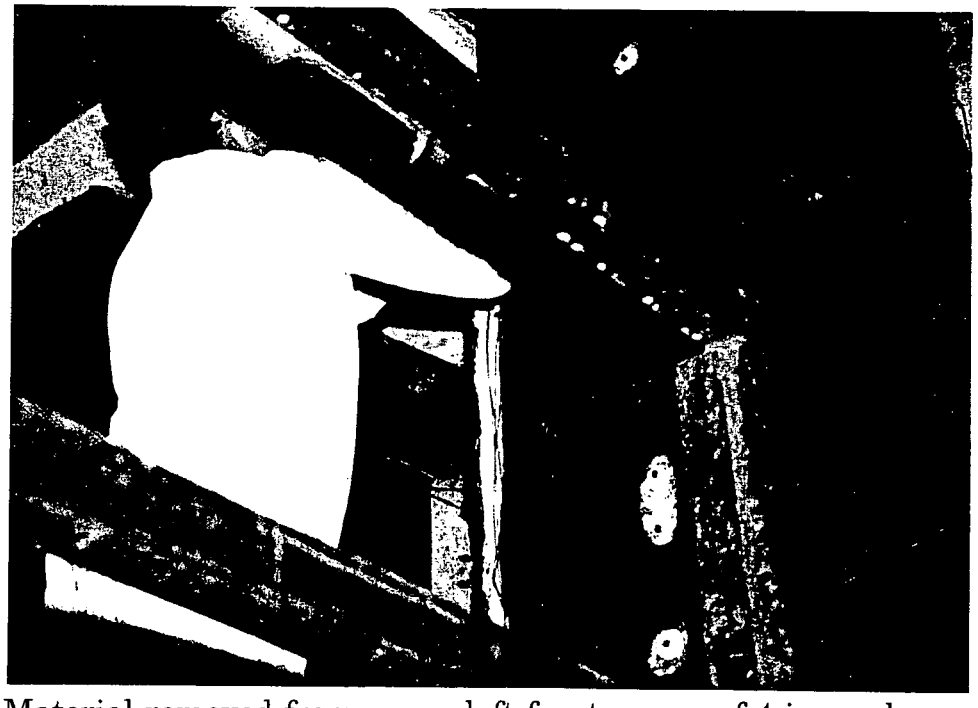
Bottom of junction box.



Base plate on top of 4 in. conduit enclosures.



External stress skin and trowel grade mounds removed from 4 in. enclosure.



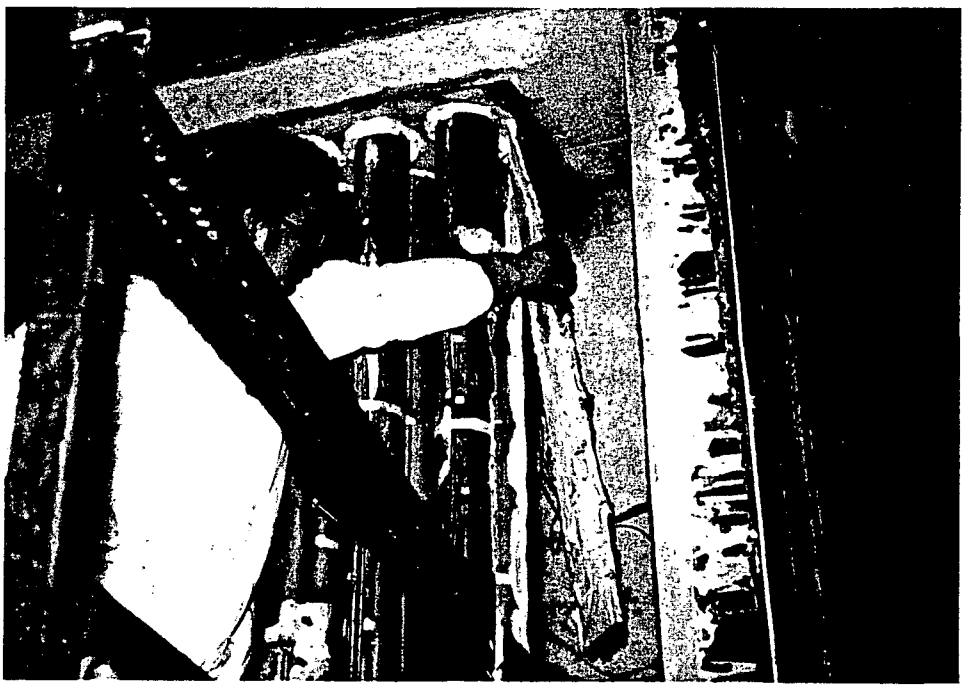
Material removed from upper left front corner of 4 in. enclosure.

Joint section of 4 in. conduit enclosure.

Char layer removed exposing external stress skin.

Material removed from upper front of 4 in. enclosure.

Material removed from front of 4 in. enclosure.



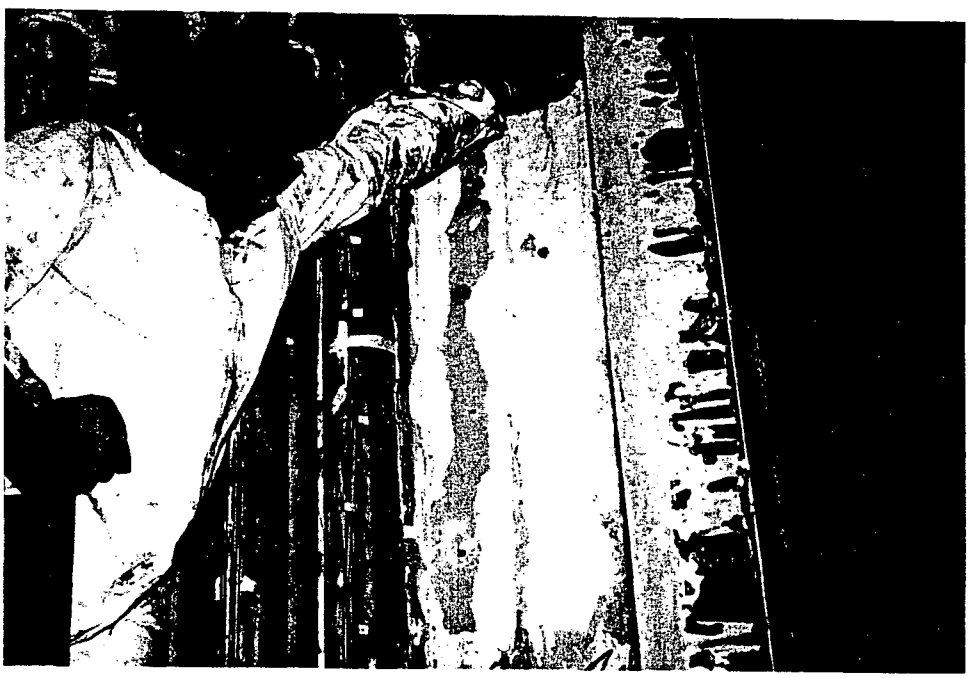
Material removed from upper right side of 4 in. enclosure.

Material removed from right side of 4 in. enclosure.

Material removed from left side of 4 in. enclosure.

Material removed from upper left side of 4 in. enclosure.

Upper interior of 4 in. enclosure.



Material removed from upper rear of 4 in. enclosure.

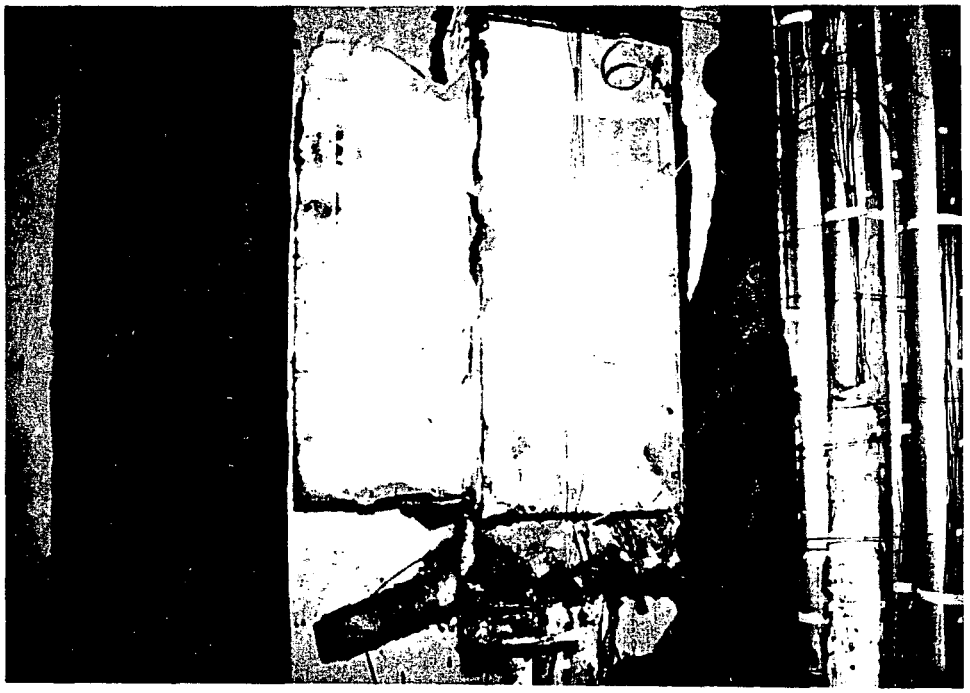
Material removed from upper front of junction box.

Material removed from lower front of junction box.

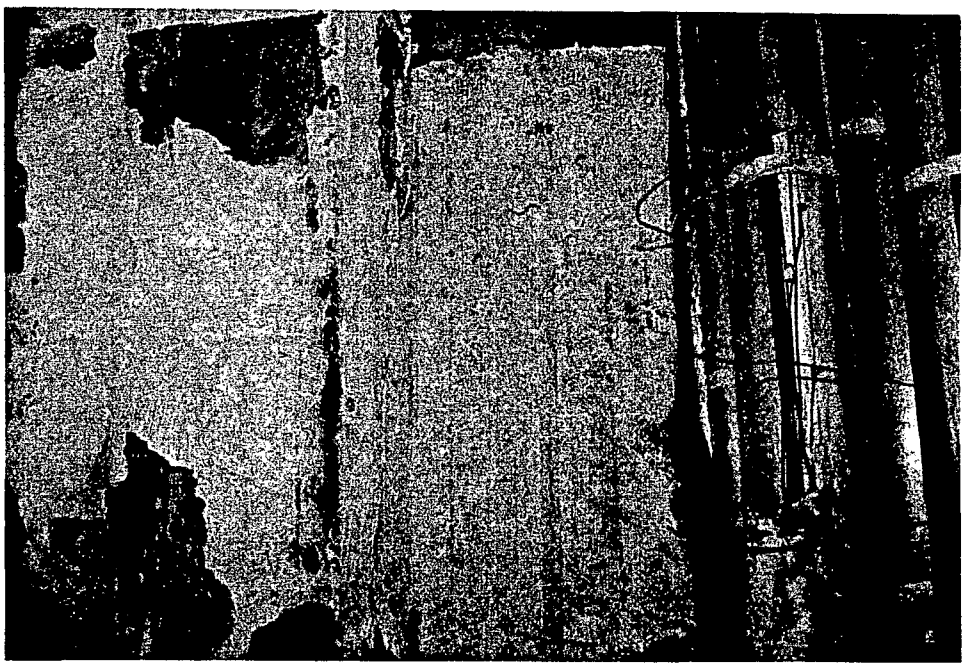
Material removed from conduit below junction box.

Material removed from support member below junction box.

Material removed from support below junction box.



Material removed from lower left side of junction box.

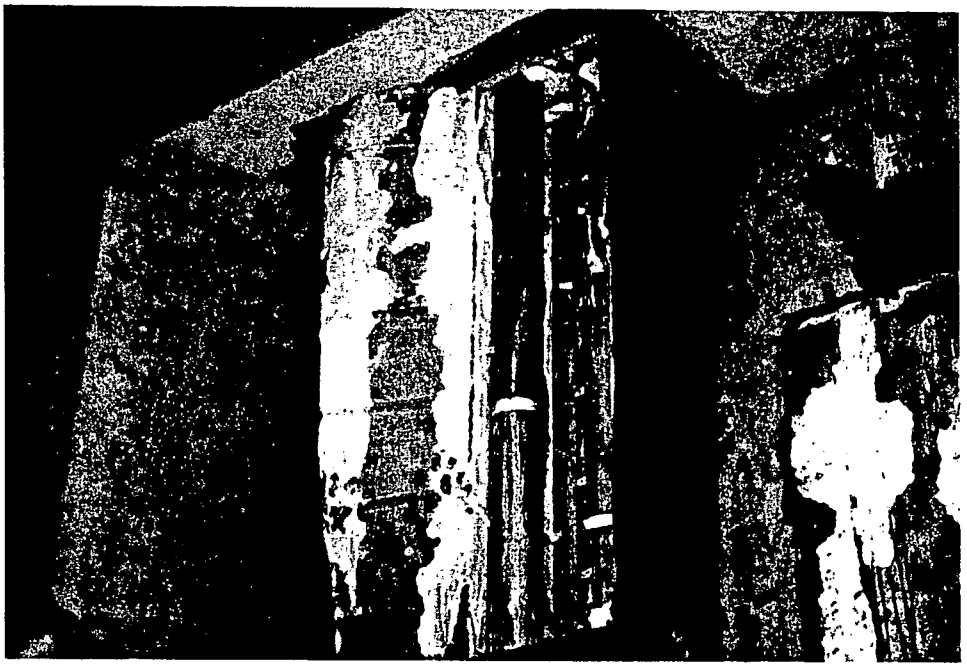


Material removed from lower right side of junction box.

Material removed from upper sides of junction box.

Material removed from conduit above junction box.

External stress skin removed from 3 in. enclosure.



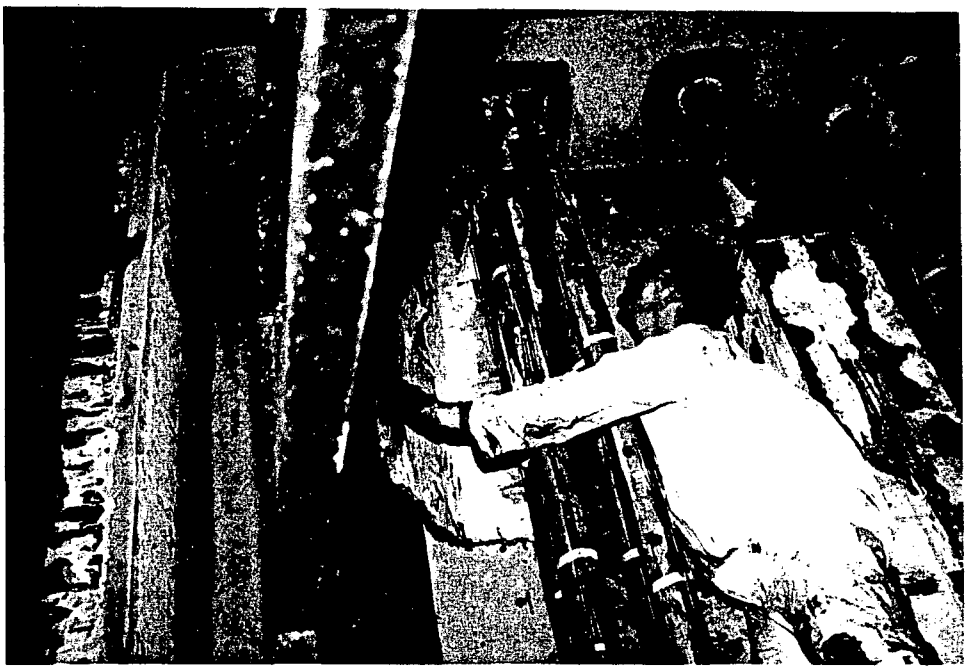
Material removed from upper front of 3 in. enclosure.

Material removed from front of 3 in. enclosure.

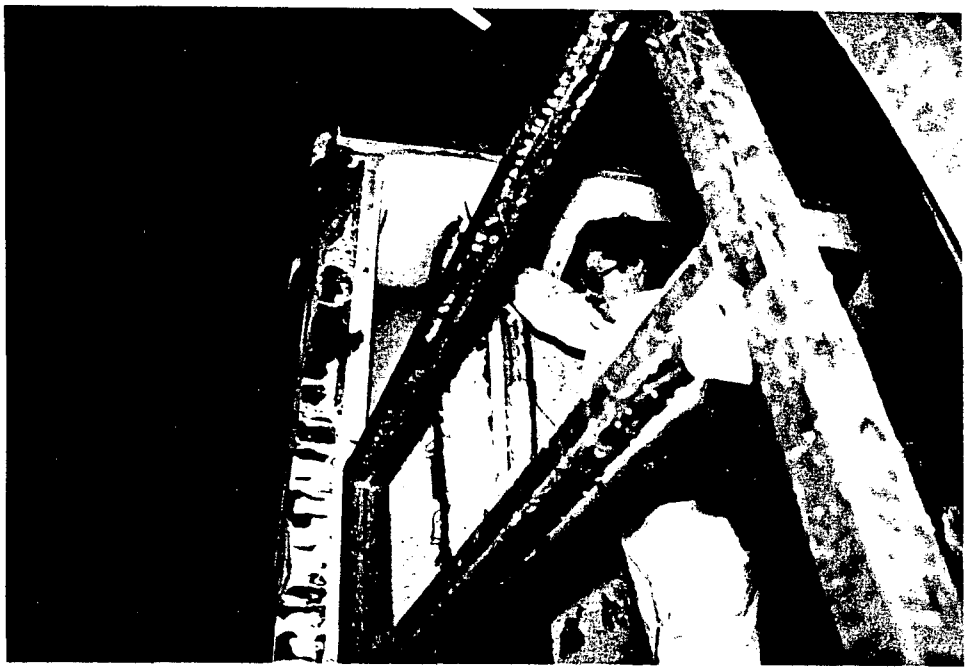
Material removed from right side of 3 in. enclosure.

Material removed from lower rear of 3 in. enclosure.

Material removed from upper right of 3 in. enclosure.



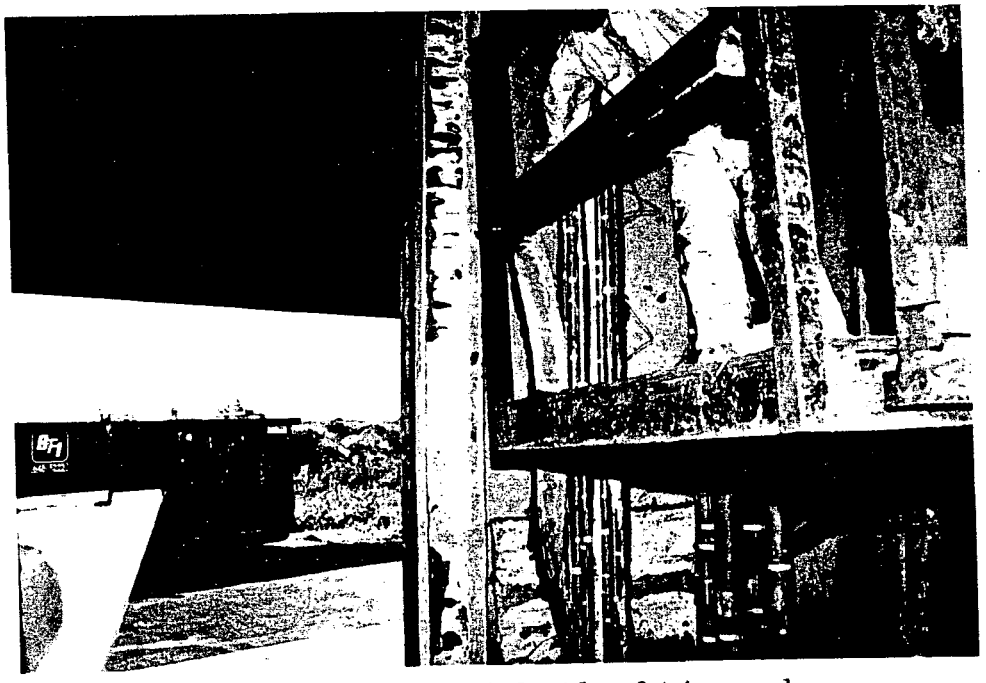
Material removed from upper portion of 3 in. enclosure.



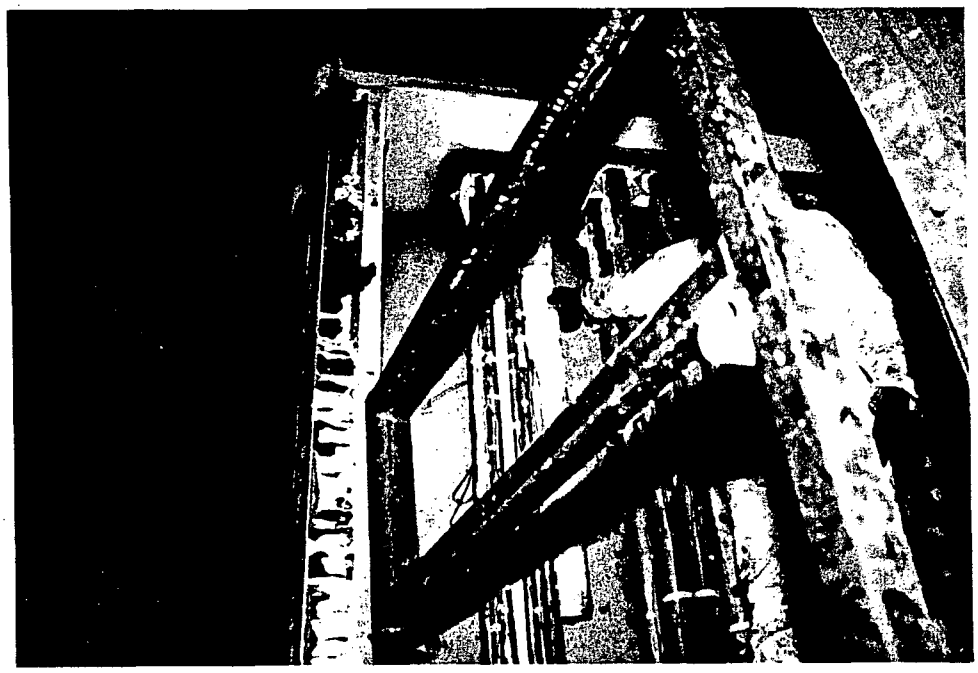
Material removed from upper front of 1 in. enclosure.

Material removed from front of 1 in. enclosure.

Material removed from left side of 1 in. enclosure.



Material removed from left side of 1 in. enclosure.

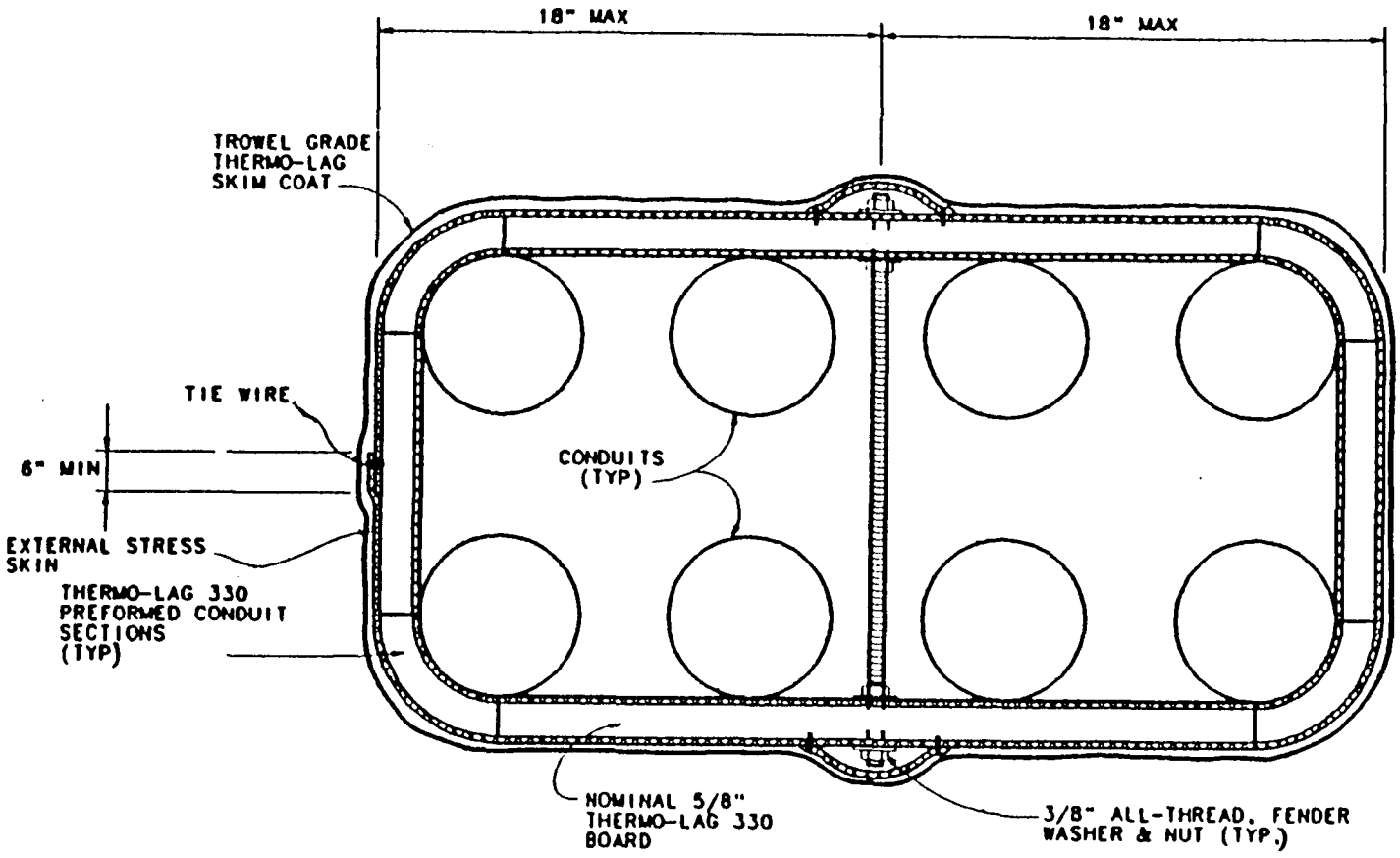


Material removed from right side of 1 in. enclosure.

Material removed from right side of 1 in. enclosure.

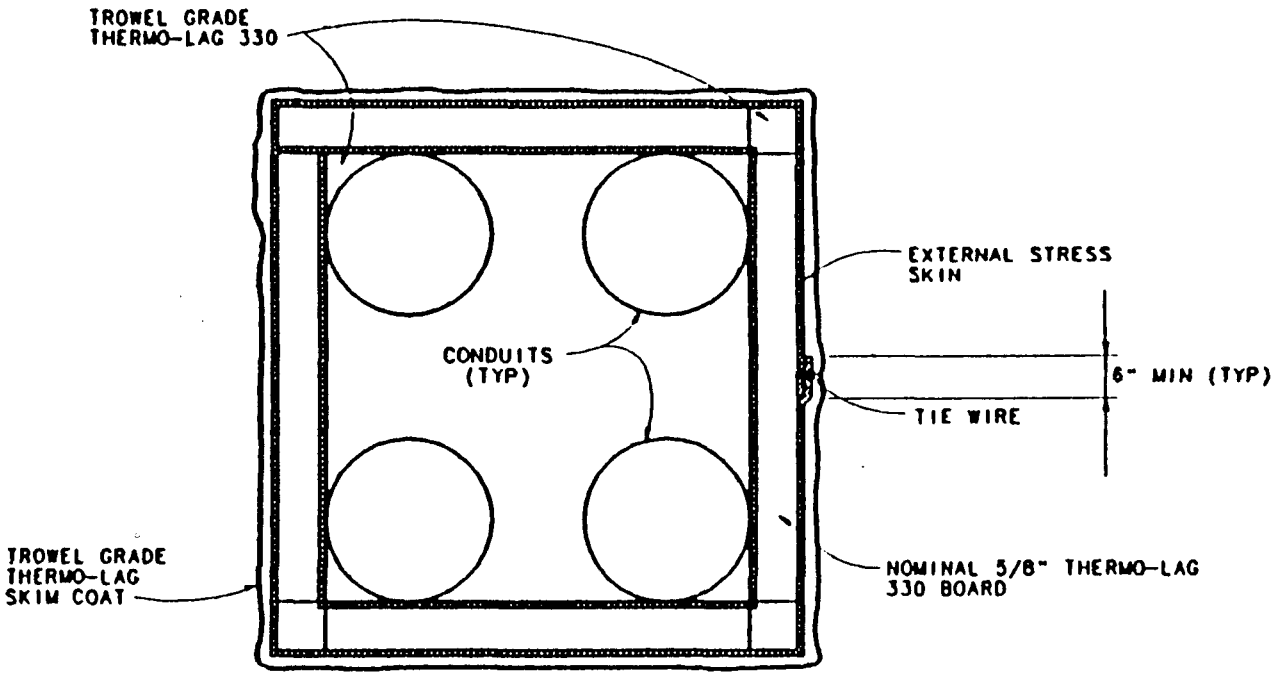
Appendix G

THERMO-LAG® INSTALLATION DETAILS



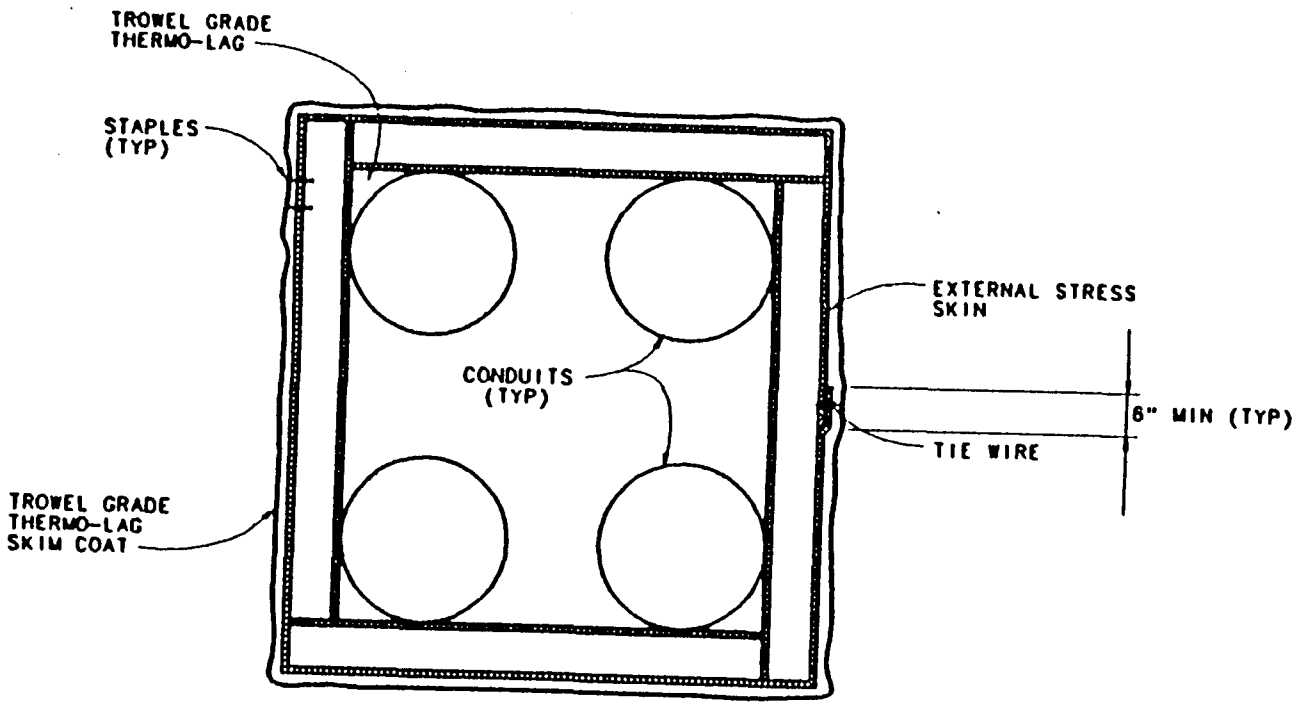
A16-A16
PREFORMED SECTION/BOARD METHOD

N.T.S.



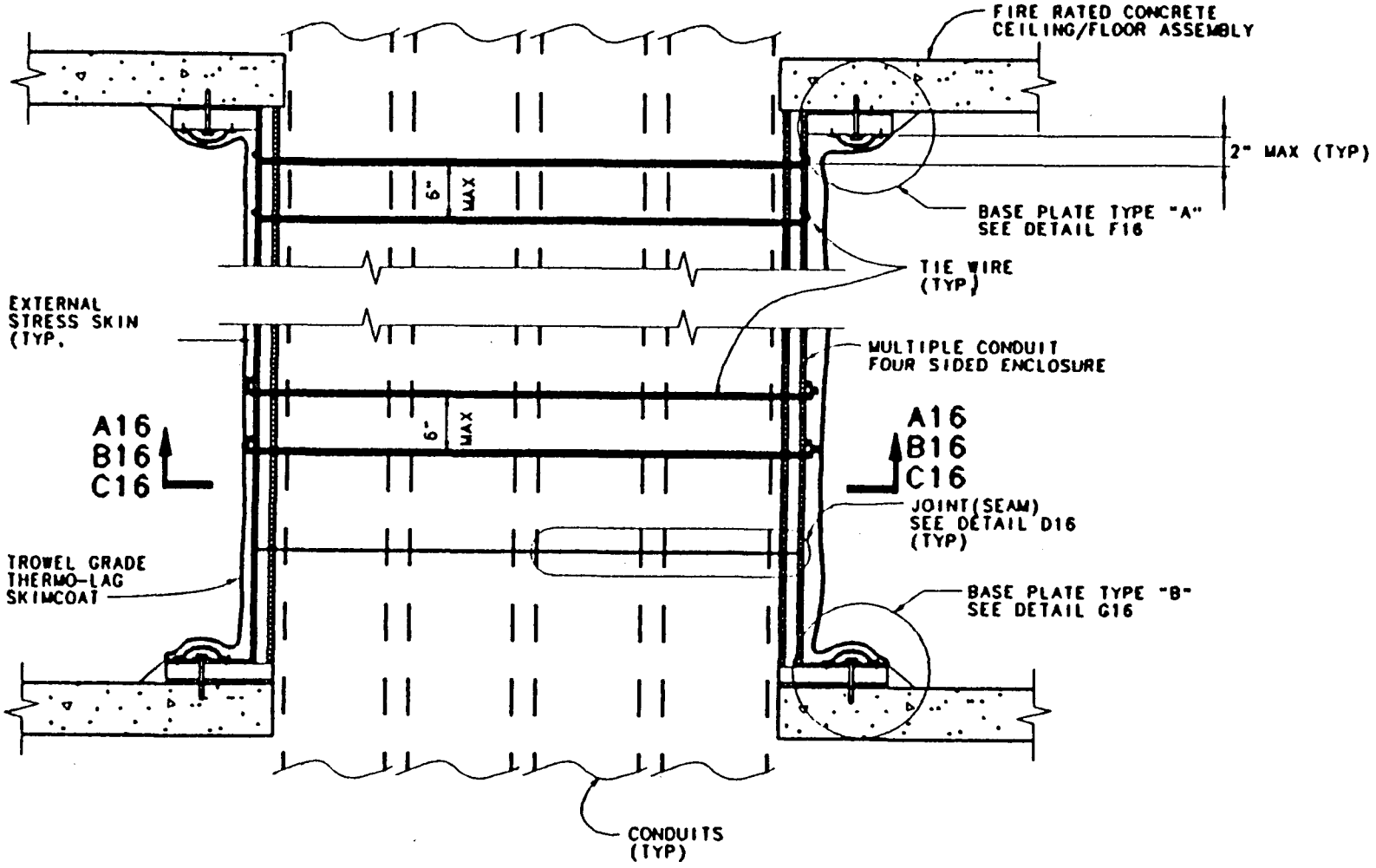
B16-B16
SCORE AND FOLD METHOD

N.T.S.



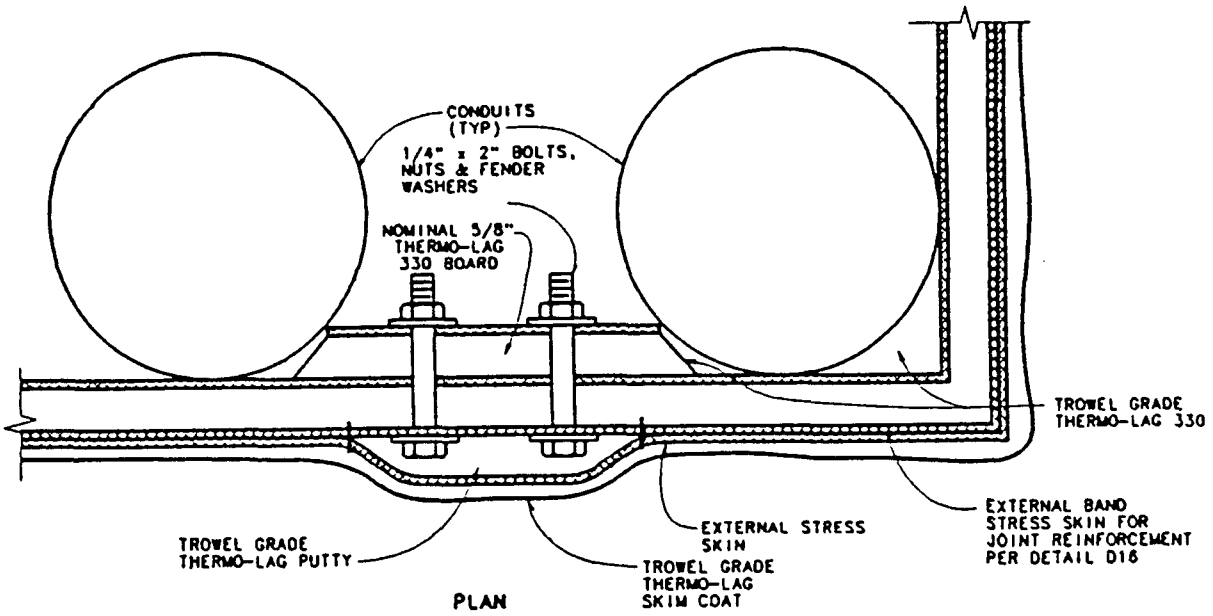
C16-C16
SEPARATE BOARD METHOD

N.T.S.



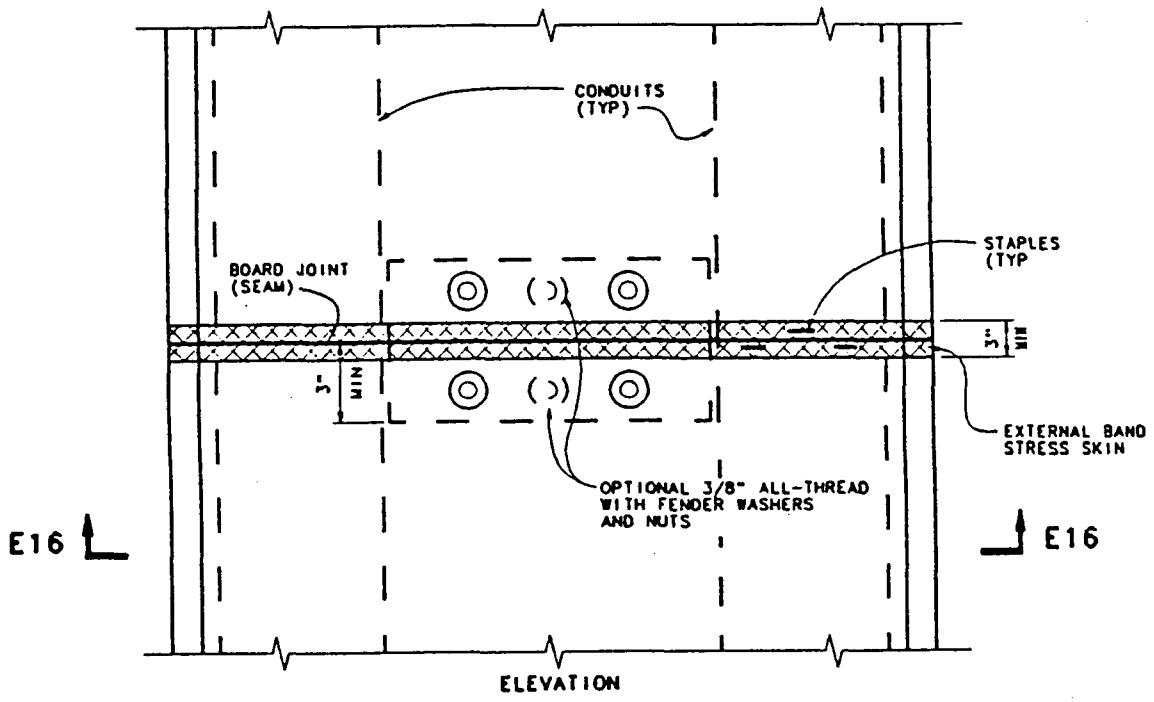
ELEVATION - MULTIPLE CONDUITS FOUR SIDED ENCLOSURE

N.T.S.



E16–E16
JOINT BACKING BOARD

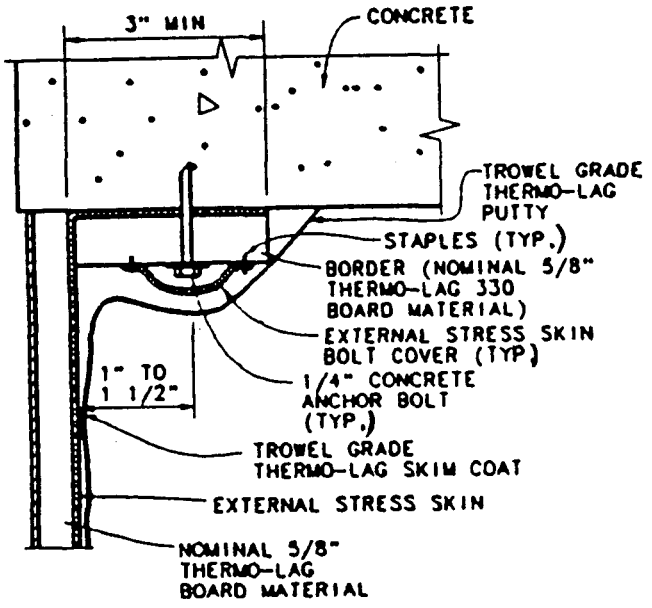
N.T.S.



DETAIL D16
JOINT BACKING BOARD

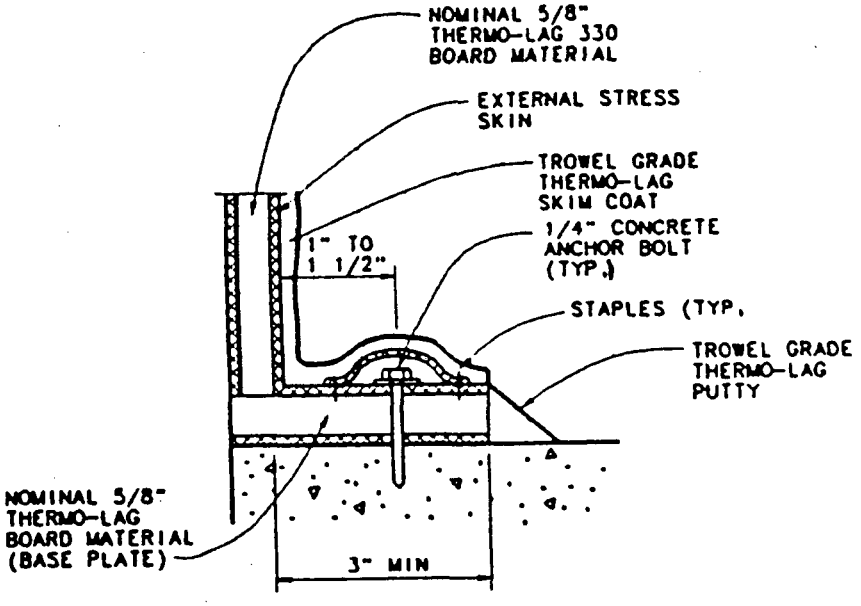
(TYP FOR A16–A16, B16–B16 & C16–C16)

N.T.S.



DET F16
CONCRETE - THERMO-LAG INTERFACE TYPE "A"

N.T.S.



DET G16
CONCRETE - THERMO-LAG INTERFACE TYPE "B"

N.T.S.

TEST REPORT TRANSMITTAL FORM

To: Rubin Feldman
Thermal Science, Inc.
2200 Cassens Drive
St. Louis, MO 63026
(314) 349-1233

Re: Project No. 11960-97259

Enclosed, please find our final report on the above referenced project. Should you notice any errors or omissions, please bring them to our attention immediately and we will correct the problem as quickly as possible.

Two additional copies of this report are being prepared for you and will be shipped at a later date. An additional copy of the test report will also be sent to TVA at a later date.

We appreciate your business and look forward to working with you again soon.

Sincerely,

Herbert W. Stansberry II,
Fire Test Technologist

c.c. Mark H. Salley
TVA
Watts Bar Nuclear Plant IOB-1M
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Highway 68 near Spring City
Spring City, TN 37381
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