

PROJECT ALL DISCIPLINE MECHANICAL
CONTRACT TV-92362V UNIT 0
DESCRIPTION FIRE ENDURANCE TESTING
DOCUMENT NO. 11960-97258

R. 9.2 941212 863

QA Record

**FIRE ENDURANCE TEST
OF THERMO-LAG® 330-1
FIRE PROTECTIVE ENVELOPES
(Three Sided Box Enclosures
Encasing Groups of Horizontal
Conduits and a Large Junction Box)**

Project No. 11960-97258
(Volume 1 of 2)

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

November 23, 1994

Prepared For:

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in cooperation with

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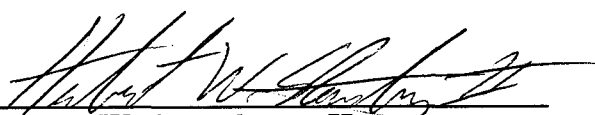
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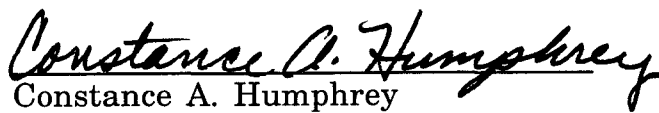
ABSTRACT

A group of seven aluminum conduits ranging from 2 in. to 3 in. diameter, a group of two 1 in. diameter steel conduits, a group of three 3 in. aluminum conduits and a large junction box, 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

12/11/94
Date


Constance A. Humphrey
Manager, QA Dept.

12/1/94
Date


Deggary N. Priest
President

12/1/94
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:

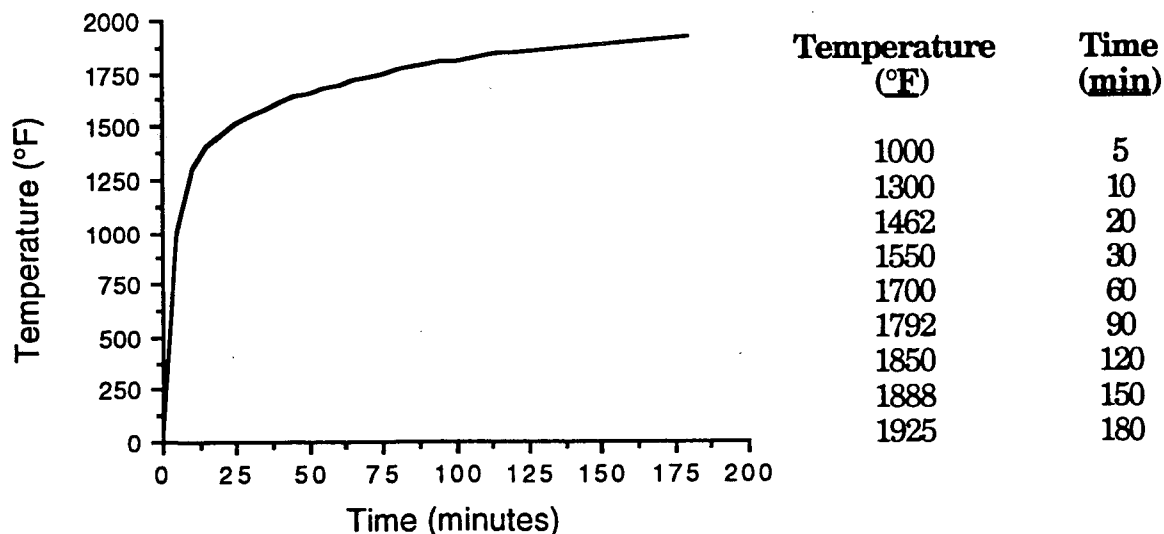


Figure 1

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 are built up 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 ($\pm 1.1^{\circ}\text{C}$)," 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 chassis, 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.

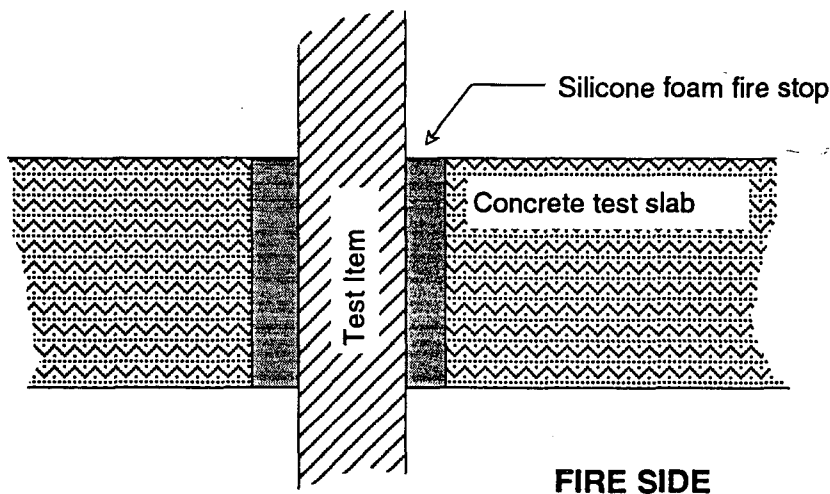
HOSE STREAM TEST

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. Wooden forms were placed within the framework to provide blockouts for conduits and thermocouple leads to pass through the finished slab. Normal weight concrete was poured into the slab frame 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, lengths of 12 in. steel channel were 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 |
|-----------------------------|-----------------|
| 3" Aluminum Conduit | 2.41 lbs/lin.ft |
| 3" Aluminum Condulet LB | 5.84 lbs |
| 2-1/2" Aluminum Conduit | 1.81 lbs/lin.ft |
| 2-1/2" Aluminum Condulet LB | 4.90 lbs |
| 2" Aluminum Conduit | 1.12 lbs/lin.ft |
| 2" Aluminum Condulet LB | 2.96 lbs |
| 1" Steel Conduit | 1.49 lbs/lin.ft |
| 1" Iron Condulet LB | 1.70 lbs |
| 5'x3'x2' Steel Junction Box | 193.75 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).

TEST ITEM (CONDUITS AND JUNCTION BOX)

The 5 ft wide by 3 ft high x 2 ft deep steel junction box was fastened directly to the slab wall with anchor bolts. The box was positioned to be in the lower, right hand corner of the furnace during the test.

A group of three 3 in. diameter aluminum conduits was installed to one side of the junction box to be in the lower left hand corner of the furnace during the test. Each of the three conduits passed through a rectangular breakout in the concrete wall and entered an aluminum conduit LB (long side parallel with the slab). The conduit then extended vertically, along the slab, and was capped with a coupling and a plug. The three conduits had an overall vertical dimension of 36 in. and were spaced 6 in. apart. All three conduits were fastened to the wall with unistrut supports and conduit clamps in two places (spaced 18 in. apart with one 6 in. from the capped ends of the conduits).

A group of two 1 in. diameter steel conduits was installed above the junction box and the bank of three 3 in. diameter aluminum conduits. Each of the 1 in. steel conduits passed through a rectangular breakout in the concrete wall and entered a malleable iron conduit LB (long side parallel with the slab). The conduit then extended horizontally, along the slab, and was capped with a coupling and a plug. The pair of conduits had an overall horizontal dimension of 96 in. and were spaced 3 in. apart. Both conduits were fastened to the wall with unistrut supports and conduit clamps in three places (spaced 36 in. apart with one 12 in. from the capped ends of the conduits).

A group of five 2 in. diameter, one 2-1/2 in. diameter and one 3 in. diameter aluminum conduit was installed above the bank of two 1 in. steel conduits. The 2-1/2 in. diameter conduit was the second conduit down from the top of the group and the 3 in. diameter conduit was the fourth down from the top. Each of the seven aluminum conduits passed through a rectangular breakout in the concrete wall and entered an aluminum conduit LB (long side parallel with the slab). The conduit then extended horizontally, along the slab, and was capped with a coupling and a plug. The bank of conduits had an overall horizontal dimension of 96 in. and were spaced nominally 4 in. apart. All the conduits were fastened to

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 |
|-----------------------------|------------|
| 3" Aluminum Conduit | lbs/lin.ft |
| 3" Aluminum Condulet LB | lbs |
| 2-1/2" Aluminum Conduit | lbs/lin.ft |
| 2-1/2" Aluminum Condulet LB | lbs |
| 2" Aluminum Conduit | lbs/lin.ft |
| 2" Aluminum Condulet LB | lbs |
| 1" Steel Conduit | lbs/lin.ft |
| 1" Iron Condulet LB | lbs |
| 5'x3'x2' Steel Junction Box | 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 stainless steel annealed tie wire, stainless steel stress skin (type 304, plain weave and 8x8 square wire cloth, 0.017 in. wire diameter).

TEST ITEM (CONDUITS AND JUNCTION BOX)

The 5 ft wide by 3 ft high x 2 ft deep steel junction box was fastened directly to the slab wall with anchor bolts. The box was positioned to be in the lower, right hand corner of the furnace during the test.

A group of three 3 in. diameter aluminum conduits was installed to one side of the junction box to be in the lower left hand corner of the furnace during the test. Each of the three conduits passed through a rectangular breakout in the concrete wall and entered an aluminum conduit LB (long side parallel with the slab). The conduit then extended vertically, along the slab, and was capped with a coupling and a plug. The three conduits had an overall vertical dimension of 36 in. and were spaced 6 in. apart. All three conduits were fastened to the wall with unistrut supports and conduit clamps in two places (spaced 18 in. apart with one 6 in. from the capped ends of the conduits).

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A group of five 2 in. diameter, one 2-1/2 in. diameter and one 3 in. diameter aluminum conduit was installed above the bank of two 1 in. steel conduits. The 2-1/2 in. diameter conduit was the second conduit down from the top of the group and the 3 in. diameter conduit was the fourth down from the top. Each of the seven aluminum conduits passed through a rectangular breakout in the concrete wall and entered an aluminum conduit LB (long side parallel with the slab). The conduit then extended horizontally, along the slab, and was capped with a coupling and a plug. The bank of conduits had an overall horizontal dimension of 96 in. and were spaced nominally 4 in. apart. All the conduits were fastened to

the wall with unistrut supports and conduit clamps in three places (spaced 36 in. apart with one 12 in. from the capped ends of the conduits).

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: $\pm 1.1^{\circ}\text{C}$, 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. To maintain the placement of the bare #8 wires within the capped conduits, a hole was drilled in the center of each conduit plug, just large enough for the bare #8 wire to pass through. The wires were passed through the plugs and retained using a copper crimp splice as described above.

In order to get a realistic measurement of the temperatures on the conduit surfaces, similar thermocouples were positioned nominally every 6 in. along the conduits, 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 blackout as the conduit.

Thermocouples were similarly 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 (with the exception of the face toward the concrete slab). A hole in the steel junction box and in the concrete slab was provided to allow passage of the thermocouple leads to the cold side of the test wall.

THERMO-LAG® 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® 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 three-sided conduit enclosures, and to cover the junction box.

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.

Application Methods

Two different designs were used to install the Thermo-Lag® 330-1 in the three-sided configurations.

Score and Fold Method - 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 conduits against the concrete. The board material was pre-buttered on all interior surfaces that contacted the conduits and/or concrete. Thermo-Lag® 330-1 Trowel Grade and putty material were used to square the corners along the folds. The "Generic TVA Upgrade" (described later in the document) was applied to the completed assembly. This method was used on the three 3in. aluminum conduits and on the two 1 in. steel conduits.

Separate Board Method - For this method of installation, nominal 5/8 in. board material was cut to form the sides and top of an appropriately sized box to enclose the conduits. The cuts were staggered and boards were installed internally, between the conduits, to afford additional support, and to keep the assembly square. The enclosure board material was pre-buttered on all interior surfaces that contacted the conduits, other board material (including internal support boards) and/or concrete. The "Generic TVA Upgrade" (described later in the document) was applied to the completed assembly. This method was used on the seven conduit grouping.

Junction Box - The junction box was enclosed with board material (with V-ribs flattened) using the Separate Board Method. All internal surfaces were pre-buttered with trowel grade material prior to installation. The panels were secured to the junction box using 1/4 in. diameter bolts, fender washers and nuts. The "Generic TVA Upgrade" (described later in the document) was applied to the completed assembly.

"Generic TVA Upgrade" - A skim coat of trowel grade material was applied to the enclosure and external 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 27, 1994, by Herbert W. Stansberry II, Project Manager, with the following persons present:

| | | |
|--------------------|---|--------------------------------|
| Ed Connell | - | USNRC |
| Rashid Abbas | - | T.V.A. |
| Mark Salley | - | T.V.A. |
| Rick Woody | - | T.V.A. |
| Brian Gent | - | T.V.A. |
| Ben Evens | - | TSI |
| Tim Hill | - | TSI |
| Bob McDaniel | - | Florida Power & Light |
| 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 9:01 a.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 0:42 (min:sec) had ignited fairly uniformly across the exposed surfaces. By 1:12 (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 below. An explanation of the allowable limits is given following the table.

| LOCATION | MAX. TEMP. (°F) | AVG. TEMP. (°F) |
|-------------------------------|--------------------|--------------------|
| UPPER BANK OF CONDUITS | | |
| Top Conduit (2" Aluminum) | 175 | 168 |
| Top Conduit Bare #8 | 166 | 154 |
| 2nd Conduit (2-1/2" Aluminum) | 141 | 132 |
| 2nd Conduit Bare #8 | 142 | 125 |
| 3rd Conduit (2" Aluminum) | 157 | 135 |
| 3rd Conduit Bare #8 | 156 | 123 |
| 4th Conduit (3" Aluminum) | 146 | 125 |
| 4th Conduit Bare #8 | 141 | 115 |
| 5th Conduit (2" Aluminum) | 123 | 114 |
| 5th Conduit Bare #8 | 126 | 108 |
| 6th Conduit (2" Aluminum) | 163 | 146 |
| 6th Conduit Bare #8 | 156 | 134 |
| Bottom Conduit (2" Aluminum) | 159 | 145 |
| Bottom Conduit Bare #8 | 155 | 134 |



| LOCATION (cont.) | MAX. TEMP. (°F) | AVG. TEMP. (°F) |
|--------------------------------|--------------------|--------------------|
| MIDDLE BANK OF CONDUITS | | |
| Top Conduit (1" Steel) | 186 | 180 |
| Top Conduit Bare #8 | 186 | 176 |
| Bottom Conduit (1" Steel) | 182 | 173 |
| Bottom Conduit Bare #8 | 190 | 173 |
| BOTTOM BANK OF CONDUITS | | |
| Left Conduit (3" Aluminum) | 171 | 148 |
| Left Conduit Bare #8 | 182 | 146 |
| Center Conduit (3" Aluminum) | 168 | 149 |
| Center Conduit Bare #8 | 176 | 144 |
| Right Conduit (3" Aluminum) | 187 | 156 |
| Right Conduit Bare #8 | 175 | 145 |
| JUNCTION BOX INTERIOR | 223 | 200 |

The average initial temperature for all thermocouples at the start of the test was 62°F, yielding an allowable temperature increase of 250°F, or 312°F actual for the average temperatures. (A 325°F increase above the 62°F initial temperature yields a maximum allowable individual temperature of 387°F, in accordance with ASTM E119-88.) All of the thermocouples on within the multiple conduit enclosures and within the junction box enclosure 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.



TOP 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 3/8 in. and 1/2 in. of uncharred material remaining. Inner support boards completely intact and undamaged. |
| Top horizontal section. | Up to 3/4 in. char depth on base plate around enclosure with 3/8 in. to 1/2 in. intact against concrete. Up to 3/4 in. char depth across panel, still covering layer of external stress skin. Approximately 1/2 in. char depth under external stress skin. Approximately 1/2 in. of uncharred material remaining. Material completely intact at interface with base plate against concrete. |
| Bottom horizontal section. | Up to 3/4 in. char depth on base plate around enclosure with 3/8 in. to 1/2 in. intact against concrete. 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 1/2 in. of uncharred material remaining. Material completely intact at interface with base plate against concrete. |
| Vertical sides. | Up to 3/4 in. char depth on base plate around enclosure with 3/8 in. to 1/2 in. intact against concrete. 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 1/2 in. of uncharred material remaining. Material completely intact at interface with base plate against concrete. |



MIDDLE 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 3/8 in. and 1/2 in. of uncharred material remaining. Inner support boards completely intact and undamaged. |
| Top horizontal section. | Up to 3/4 in. char depth on base plate around enclosure with 3/8 in. to 1/2 in. intact against concrete. 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 1/2 in. of uncharred material remaining. Material completely intact at interface with base plate against concrete. |
| Bottom horizontal section. | Up to 3/4 in. char depth on base plate around enclosure with 3/8 in. to 1/2 in. intact against concrete. 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 1/2 in. of uncharred material remaining. Material completely intact at interface with base plate against concrete. |
| Vertical sides. | Up to 3/4 in. char depth on base plate around enclosure with 3/8 in. to 1/2 in. intact against concrete. 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 1/2 in. of uncharred material remaining. Material completely intact at interface with base plate against concrete. |



BOTTOM 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 3/8 in. and 1/2 in. of uncharred material remaining. |
| Top horizontal section. | Up to 3/4 in. char depth on base plate around enclosure with 3/8 in. to 1/2 in. intact against concrete. 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. Material completely intact at interface with base plate against concrete. |
| Bottom horizontal section. | Up to 3/4 in. char depth on base plate around enclosure with 3/8 in. to 1/2 in. intact against concrete. Up to 3/4 in. char depth across panel still covering most of external stress skin. Approximately 1/2 in. char depth under external stress skin. Approximately 3/8 in. of uncharred material remaining. Material completely intact at interface with base plate against concrete. |
| Vertical sides. | Up to 3/4 in. char depth on base plate around enclosure with 3/8 in. to 1/2 in. intact against concrete. 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. Material completely intact at interface with base plate against concrete. |



JUNCTION BOX ENCLOSURE

| LOCATION | OBSERVATION |
|----------------------------|---|
| Front vertical section. | Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below. External stress skin and trowel grade mounds still intact. Approximately 1/2 in. char depth under external stress skin. Approximately 3/8 in. of uncharred material remaining. |
| Top horizontal section. | Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below. External stress skin and trowel grade mounds still intact. Approximately 1/2 in. char depth under external stress skin. Approximately 3/8 in. of uncharred material remaining. Up to 3/4 in. char depth on base plate with 3/8 in. uncharred material against concrete. |
| Bottom horizontal section. | Up to 3/4 in. char depth across panel still covering most of external stress skin. External stress skin and trowel grade mounds still intact. Approximately 1/2 in. char depth under external stress skin. Approximately 3/8 in. of uncharred material remaining. Up to 3/4 in. char depth on base plate with 3/8 in. uncharred material against concrete. |
| Vertical sides. | Most of outer char layer dislodged by hose stream test, exposing layer of external stress skin below. External stress skin and trowel grade mounds still intact. Approximately 1/2 in. char depth under external stress skin. Approximately 3/8 in. of uncharred material remaining. Up to 3/4 in. char depth on base plate with 3/8 in. uncharred material against concrete. |



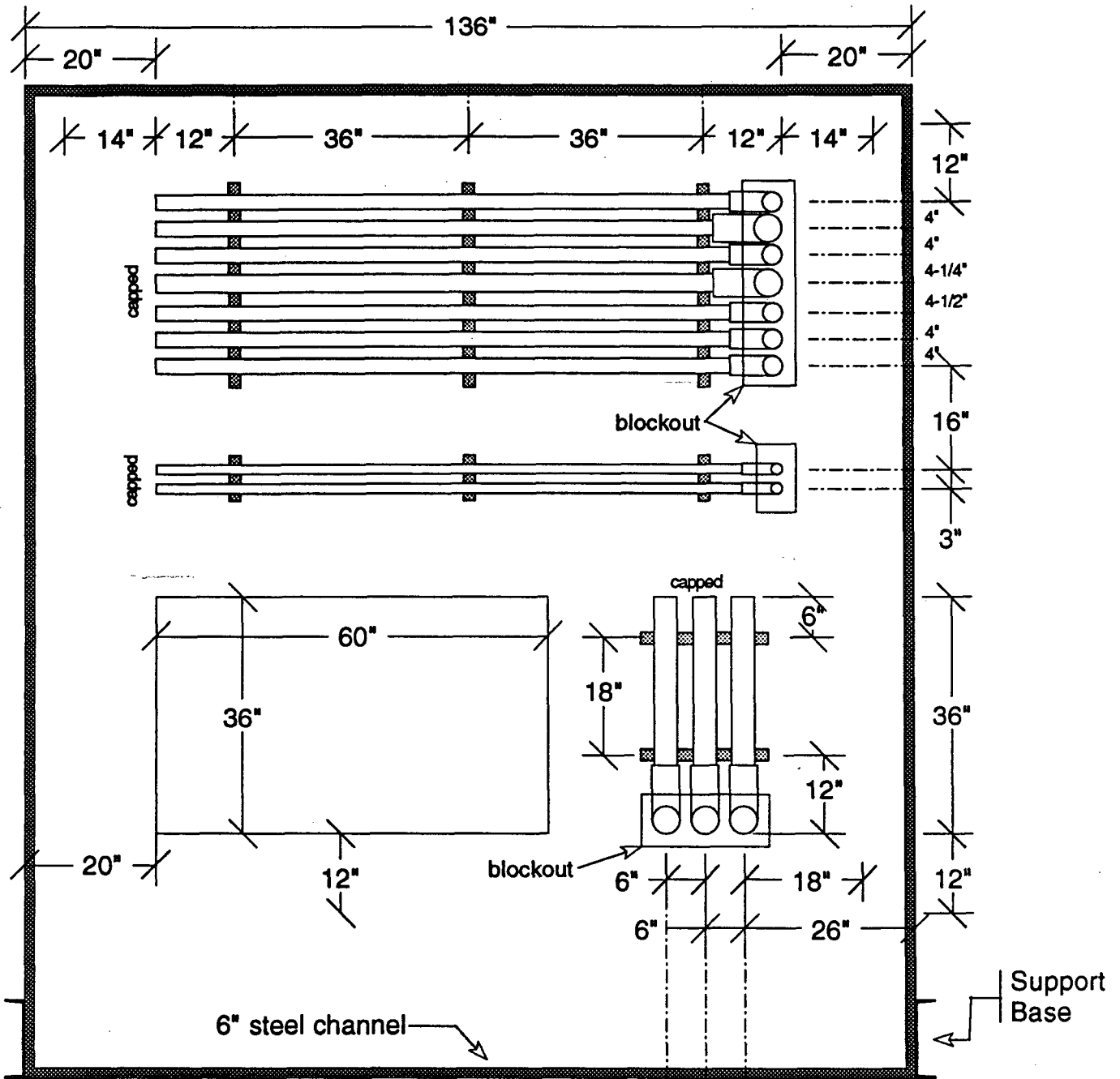
CONCLUSIONS

Each of the multiple conduit enclosures and the 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.



Appendix A
CONSTRUCTION DRAWINGS



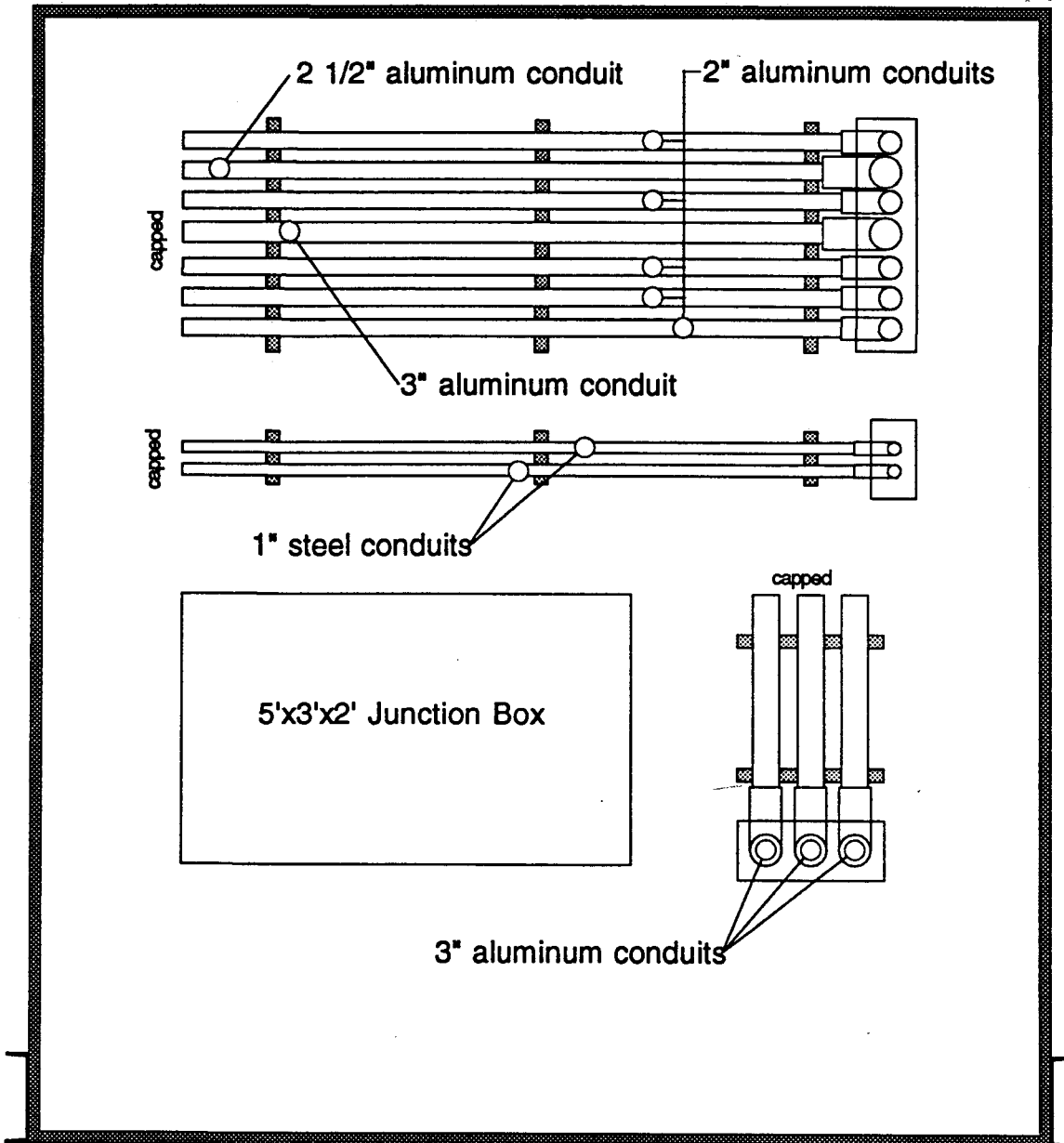


ELEVATION VIEW

NOTE:
Viewed from cold side.
Concrete slab transparent for
visibility of test specimen.

| | |
|--|---------------|
| OMEGA POINT LABORATORIES, INC. | |
| Project No. 11960-97258 | |
| TVA / TSI | |
| Fig. 1 Test Article ELEVATION VIEW Test Deck #5, Rev. 1 | |
| Drawn by: <i>H. Shantroy</i> | Date: 7/25/94 |
| Approved by: <i>C. Humphrey</i> | Date: 7/25/94 |
| TVA Approval: <i>J. Price</i> | Date: 7/27/94 |

Scale: 1/2"=1'

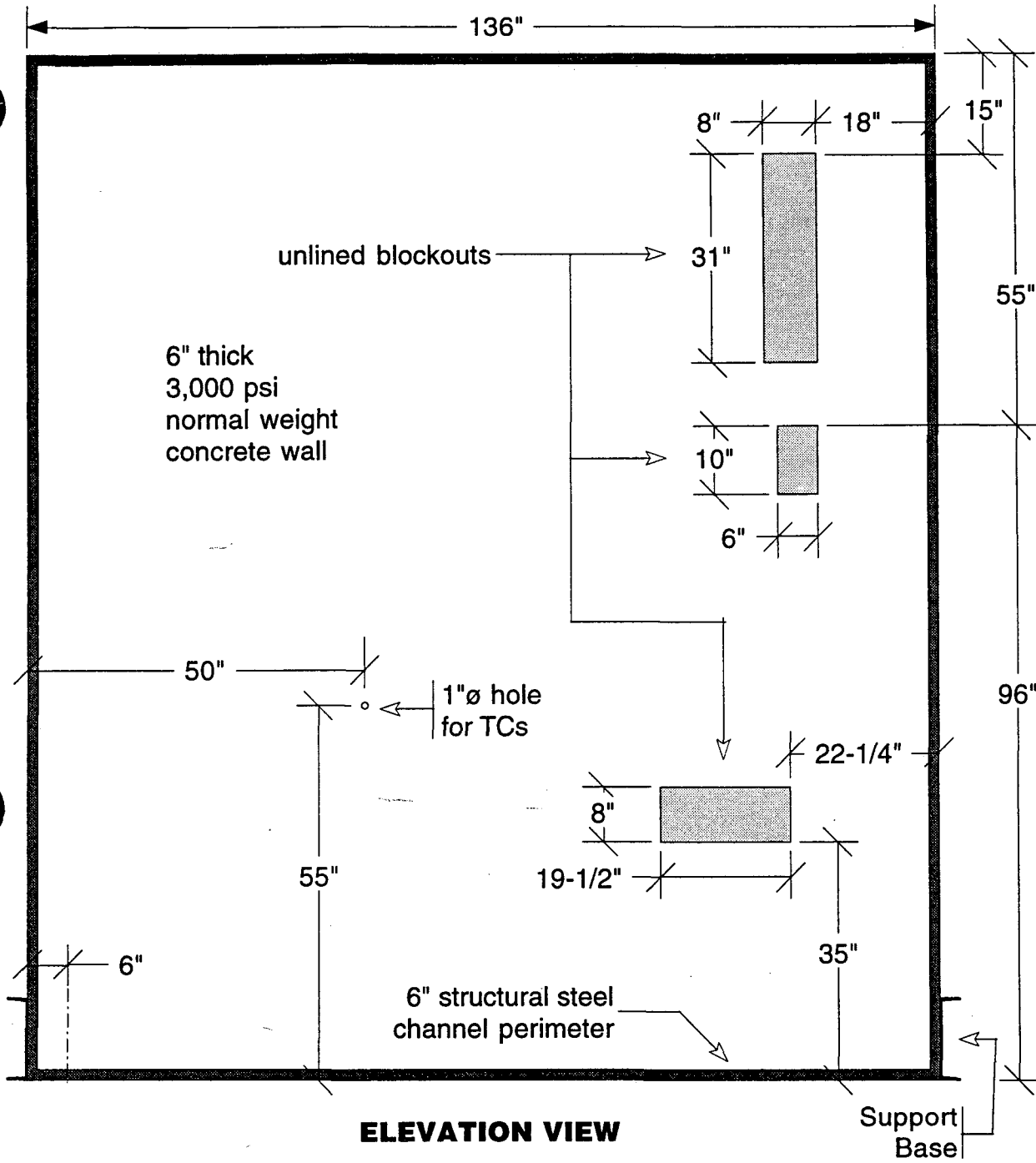


ELEVATION VIEW

NOTE:
 Viewed from cold side.
 Concrete slab transparent for
 visibility of test specimen.

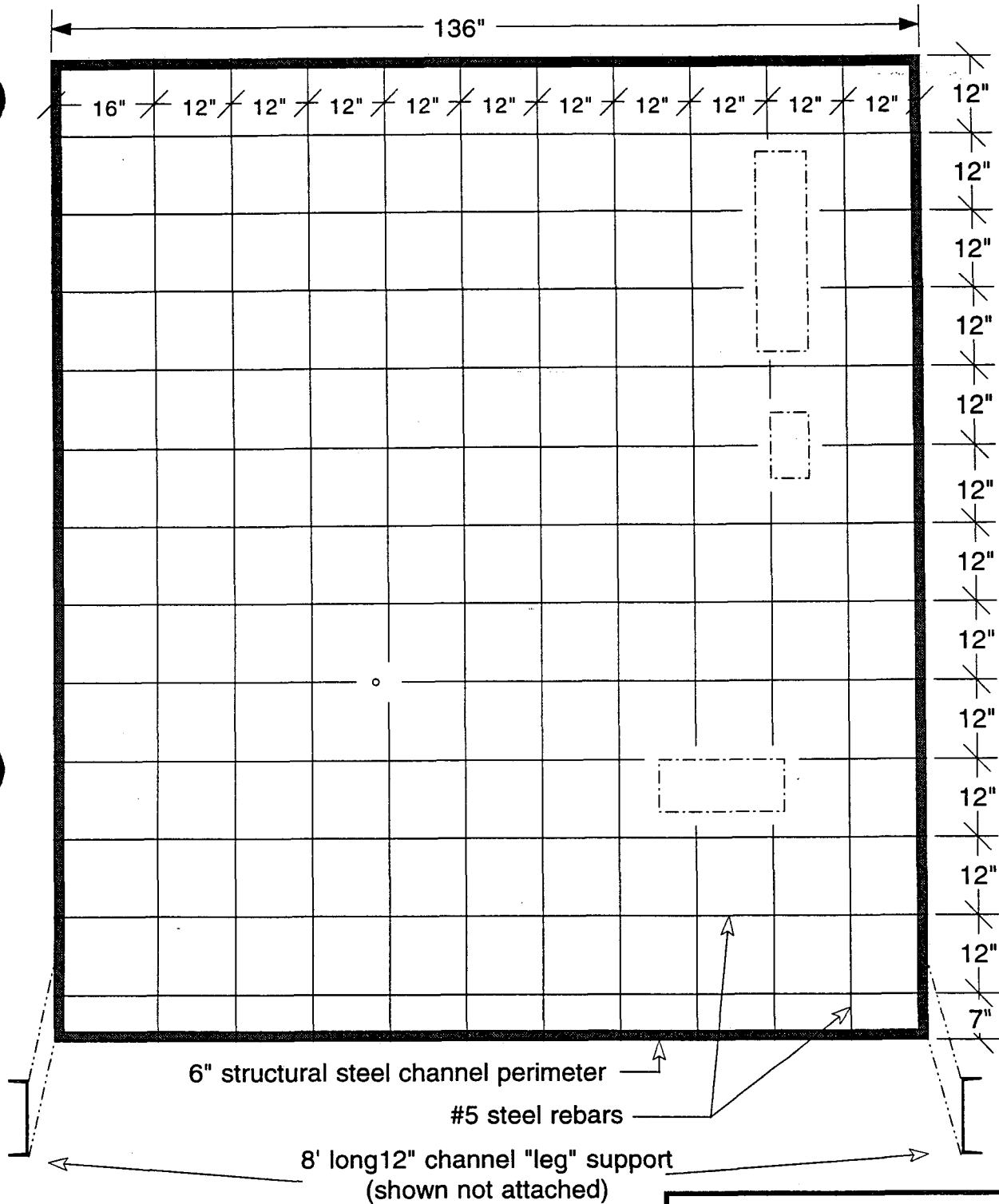
| | |
|---|---------------|
| OMEGA POINT LABORATORIES, INC. Project No. 11960-97258 | |
| TVA / TSI | |
| Fig. 1a Test Article ELEVATION VIEW Test Deck #5, Rev. 1 | |
| Drawn by: <i>H. S. Smith</i> | Date: 7/25/94 |
| Approved by: <i>C. Humphrey</i> | Date: 7/25/94 |
| TVA Approval: <i>J. Price</i> | Date: 7/27/94 |

Scale: 1/2"=1'



| | |
|---|---------------|
| OMEGA POINT LABORATORIES, INC. Project No. 11960-97258 | |
| TVA / TSI | |
| Fig. 2 Test Slab ELEVATION VIEW Test Deck #5, Rev. 1 | |
| Drawn by: <i>H. Hampton</i> | Date: 7/22/94 |
| Approved by: <i>H. Hampton</i> | Date: 7/25/94 |
| TVA Approval: <i>J. P. Rice</i> | Date: 7/27/94 |

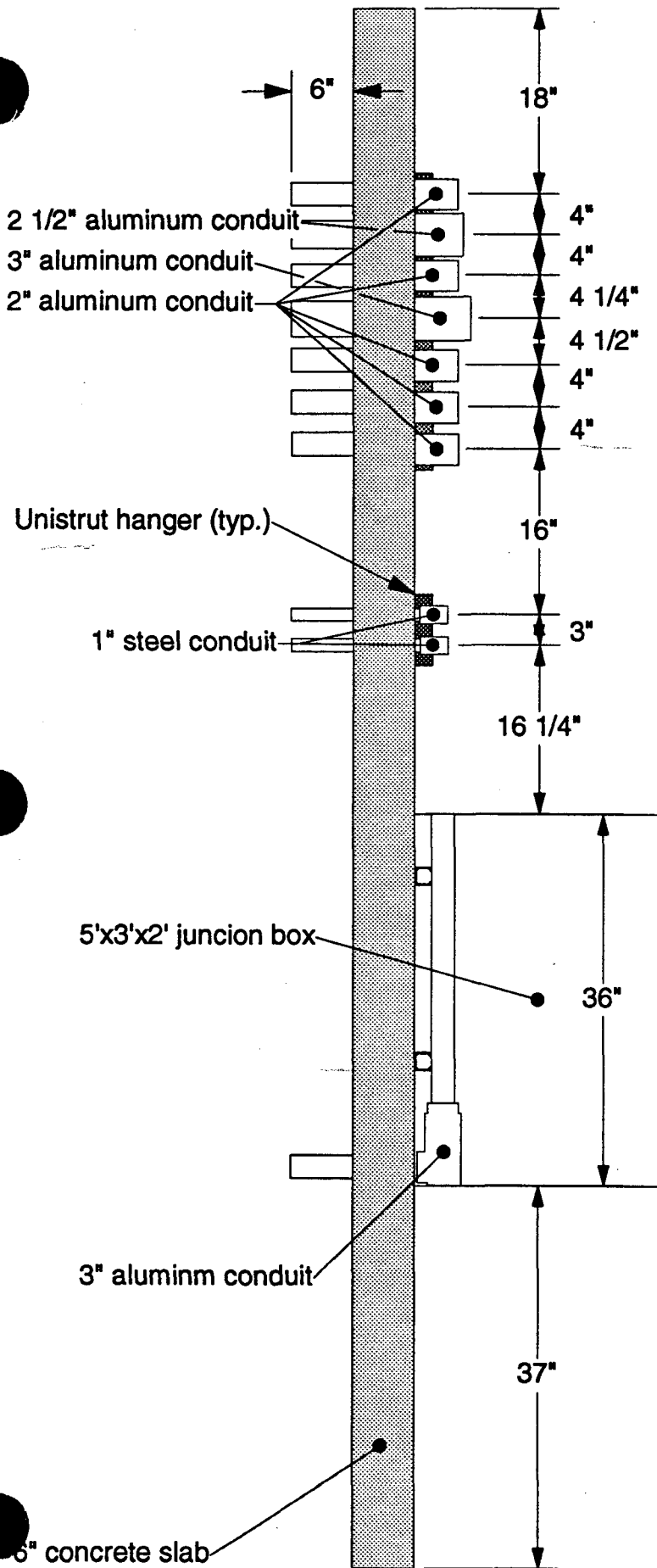
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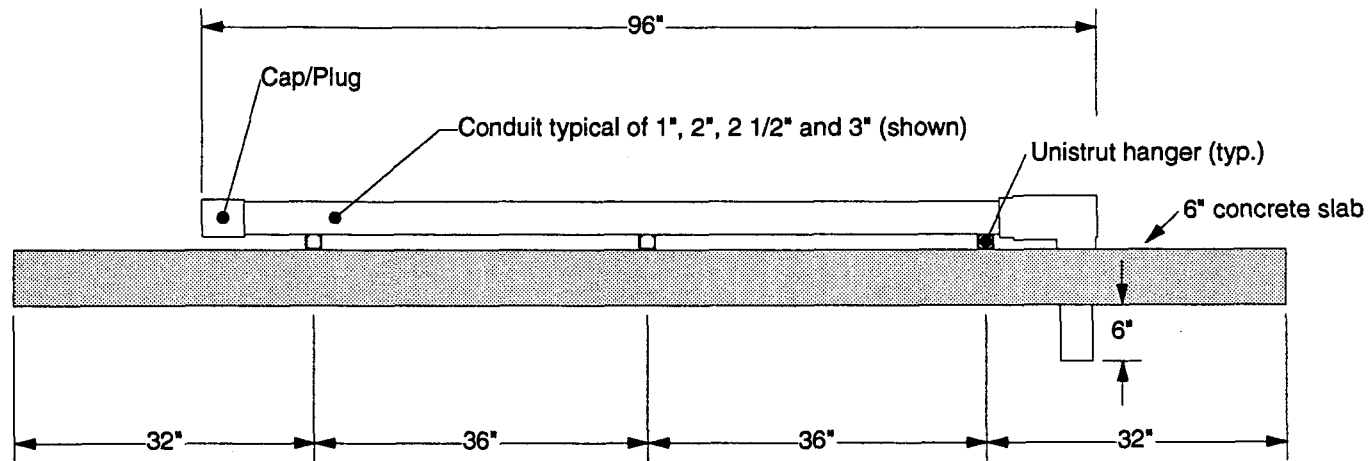
ELEVATION VIEW

| | |
|--|---------------|
| OMEGA POINT LABORATORIES, INC. | |
| Project No. 11960-97258 | |
| TVA / TSI | |
| Fig. 3 Test Slab REINFORCEMENT Test Deck #5, Rev. 1 | |
| Drawn by: <i>H. Starks</i> | Date: 7/22/94 |
| Approved by: <i>C. Humphrey</i> | Date: 7/25/94 |
| TVA Approval: <i>J. Pierce</i> | Date: 7/27/94 |

Scale: 1/2"=1'



| | |
|---|---------------|
| OMEGA POINT LABORATORIES, INC. Project No. 11960-97258 | |
| TVA / TSI | |
| Fig. 4 Right End Elevation View - Test Deck #5, Rev. 1 | |
| Drawn by: <i>H. S. [Signature]</i> | Date: 7/25/94 |
| Appr'd by: <i>C. Humphrey</i> | Date: 7/25/94 |
| TVA Appr'l: <i>J. Pierce</i> | Date: 7/27/94 |



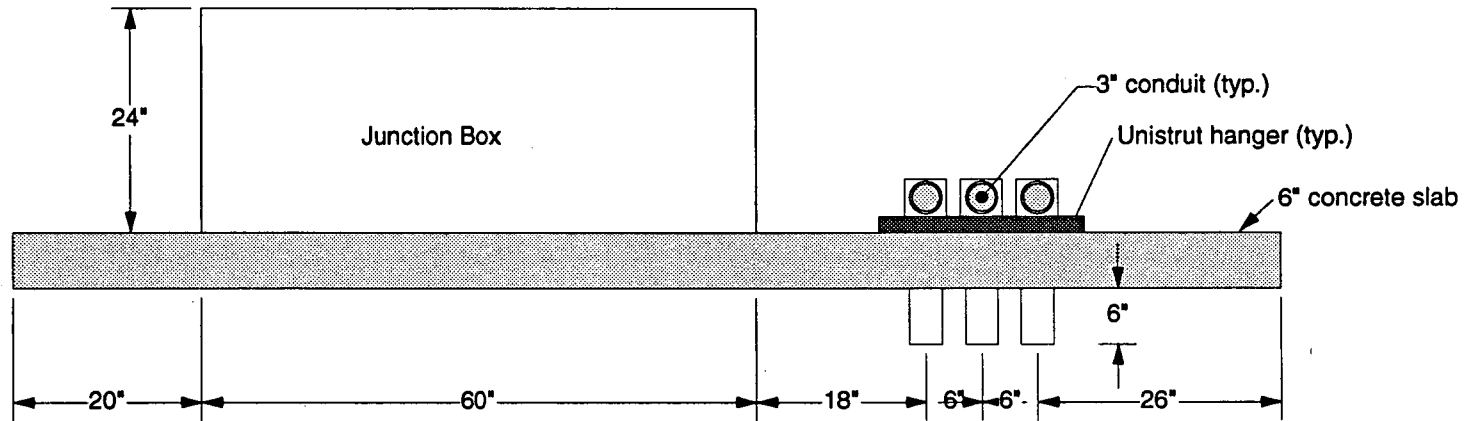
OMEGA POINT LABORATORIES, INC.
Project No. 11960-97258

TVA / TSI

Fig. 5 Typical Sectional Plan View -
Test Deck #5, Rev. 1

Drawn by: *[Signature]* Date: 7/20/94
Appr'd by: *C. Humphrey* Date: 7/29/94

TVA Appr'l: *J. Pierce* Date: 8/1/94



OMEGA POINT LABORATORIES, INC.
Project No. 11960-97258

TVA / TSI

Fig. 6 Typical Sectional Plan View -
Test Deck #5, Rev. 1

Drawn by: *H. Stokes* Date: 7/29/94
Appr'd by: *C. Humphrey* Date: 7/29/94

TVA Appr'l: *J. Pierce* Date: 8/1/94

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

CHECKED BY MARK H. SALLEY

SIGNATURE J.J. Pierce

SIGNATURE Mark H. Salley

DATE 7/11/94

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 thermocouples, 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 $\pm 1.1^{\circ}$ 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.

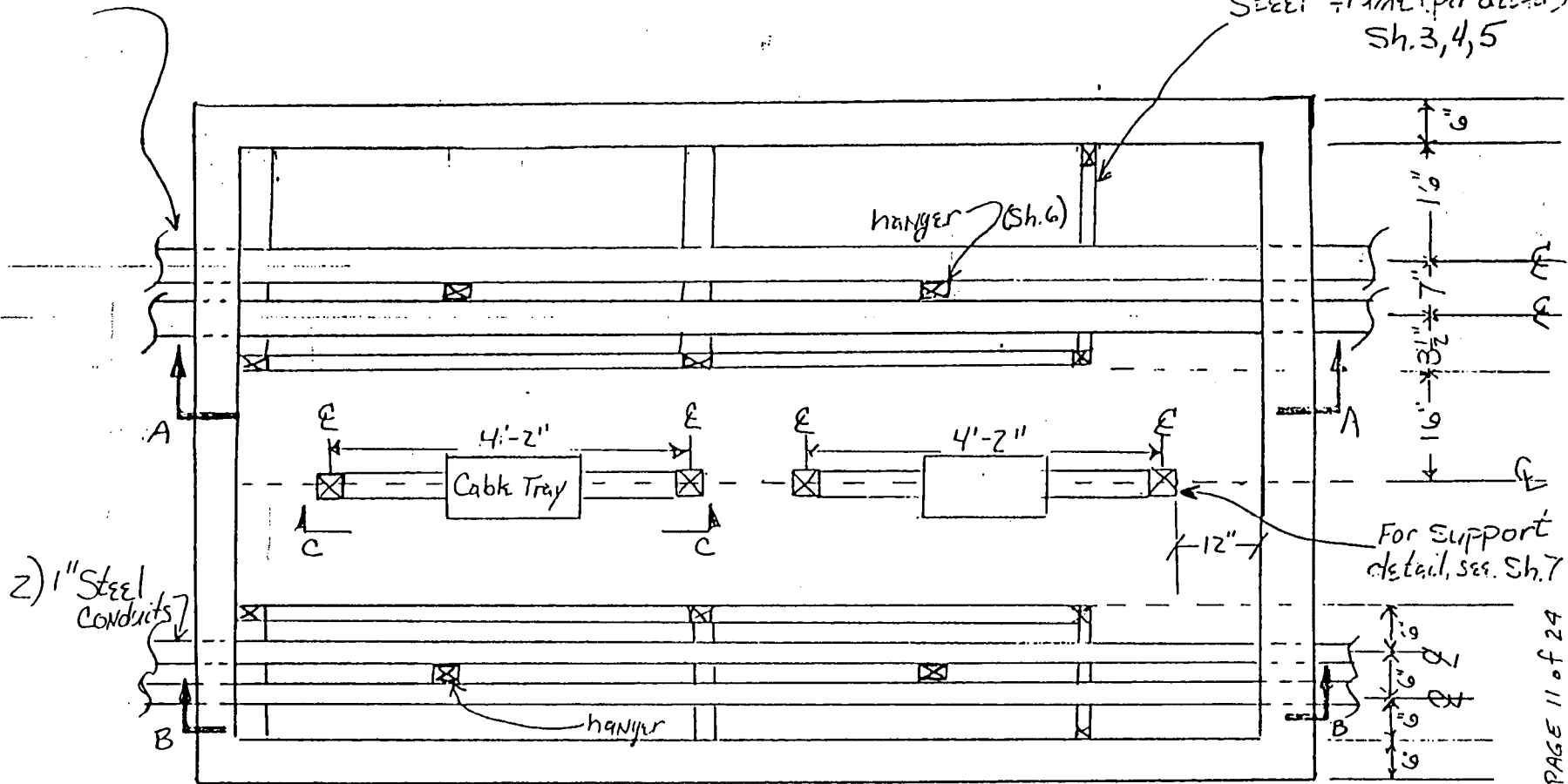
- 10.3 The test report shall be prepared in sufficient detail to summarize the total testing activity. The report shall include as a minimum:
- a. Date of the test
 - b. Location of the test
 - c. Description of the test furnace and test article
 - d. Calibration documentation of all thermocouples
 - 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

Test Deck #4

COMPUTER DATE
CHECKED DATE

8) 4" AL. Conduits

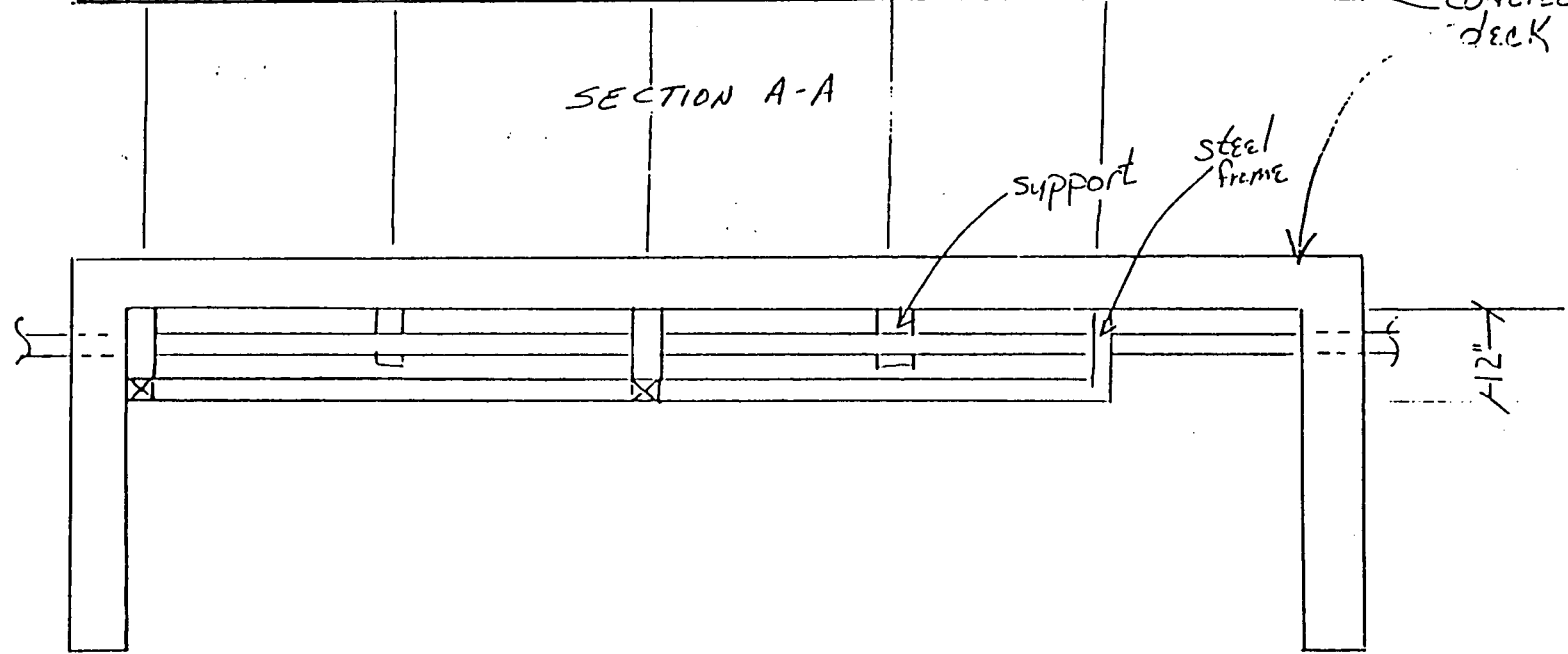
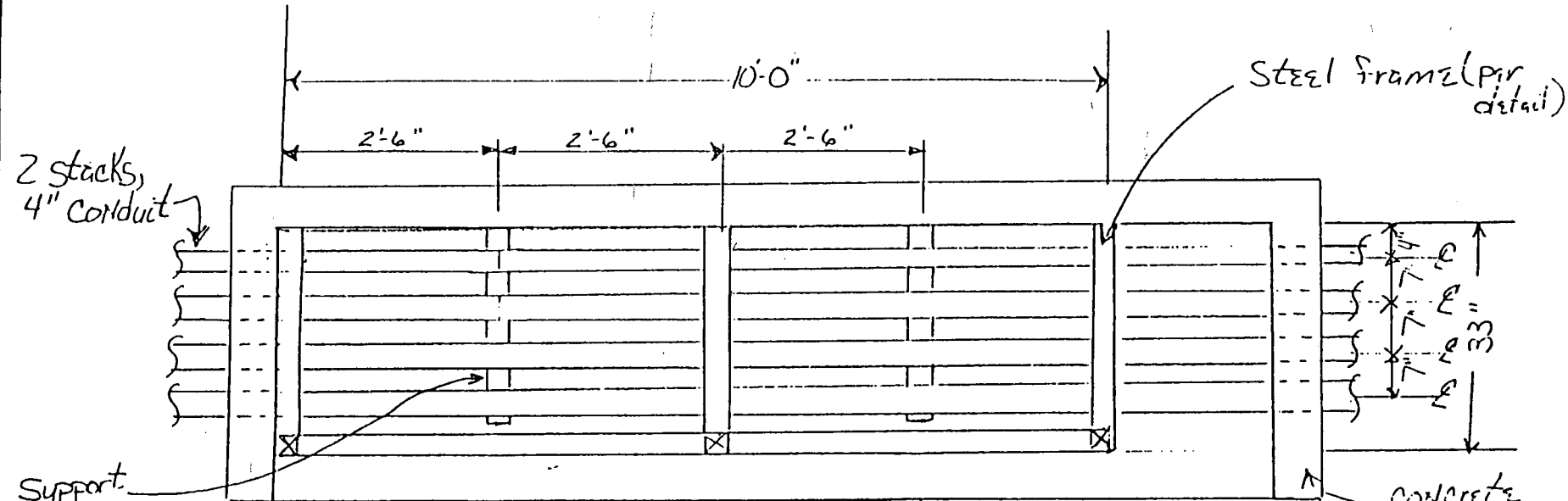


Plan

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

COMPUTED DATE
CHECKED DATE

TEST DECK #4



3 of 7

To other supports

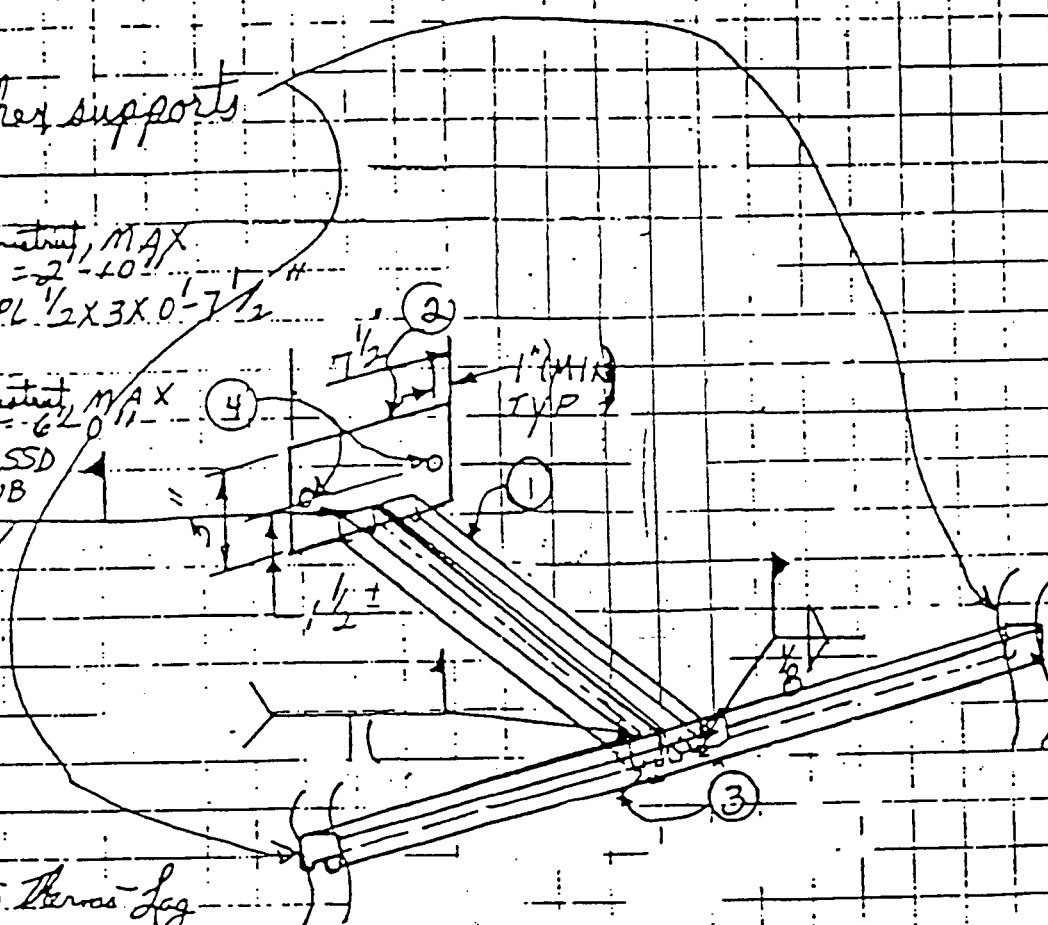
① P1001A Unistrut, MAX LENGTH = 2'-10"

② Plate steel, PL 1/2 X 3 X 0'-7 1/2"

③ P1000 Unistrut, MAX LENGTH = 6'-0"

④ Anchor 1/2" SSD for WB

3-SIDES



Supports Thermopile Leg

Add the above support to drawing 48N1314-5 for the following location:

1-376-11300 @ 10'-2" W of u at A1 Elev ≈ 761'

47A053-90 series can apply

WR 11605

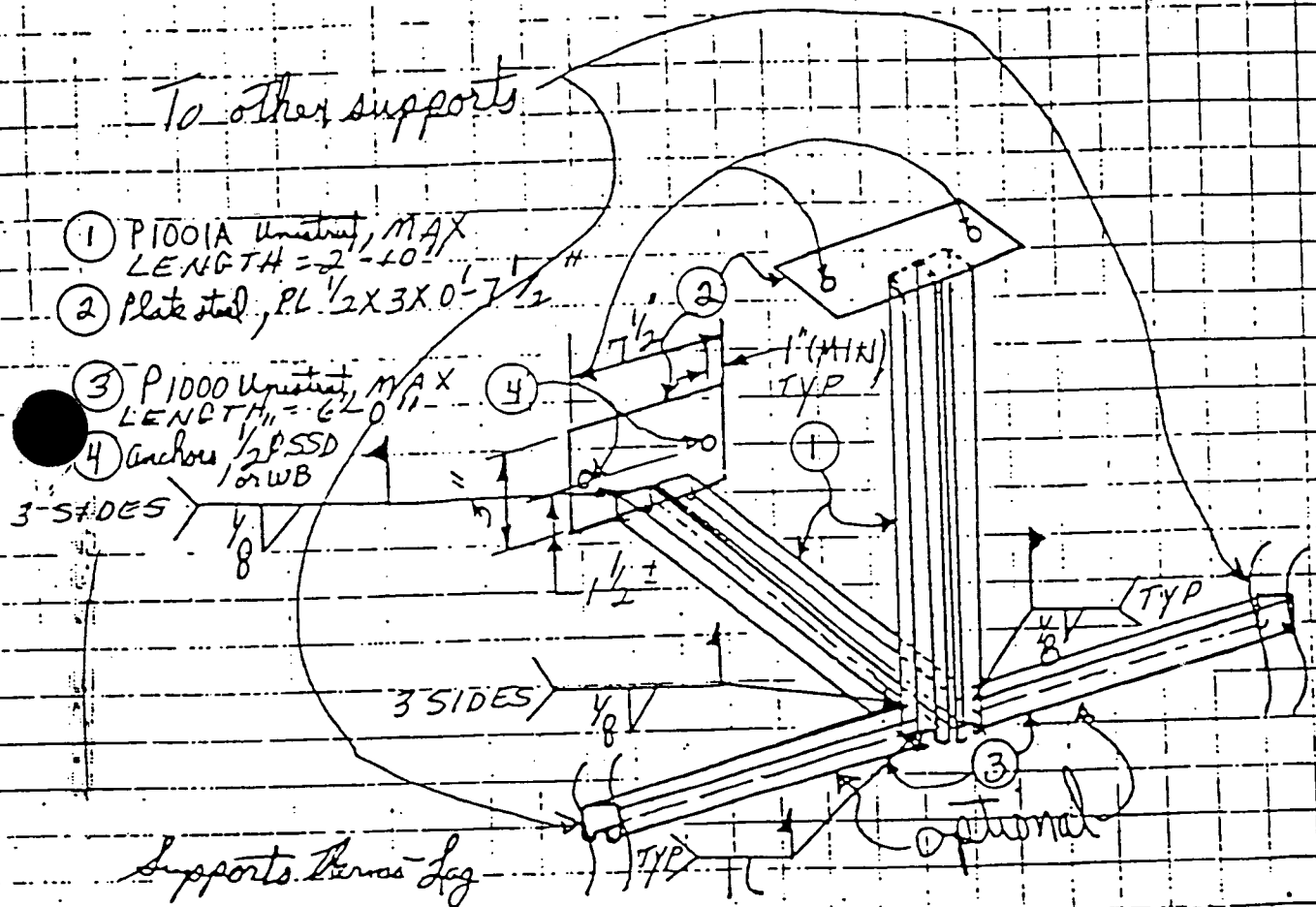
PAGE VI-59 of VI-101

FCR-3451 R2

EV 7

To other supports

- ① P1001A Unistrut, MAX LENGTH = 2'-10"
- ② Plate steel, PL 1/2 X 3 X 0'-7 1/2"
- ③ P1000 Unistrut, MAX LENGTH = 6'-0"
- ④ Anchors 1/2" SSD or WB



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

11374-11377
11378-11379
R2

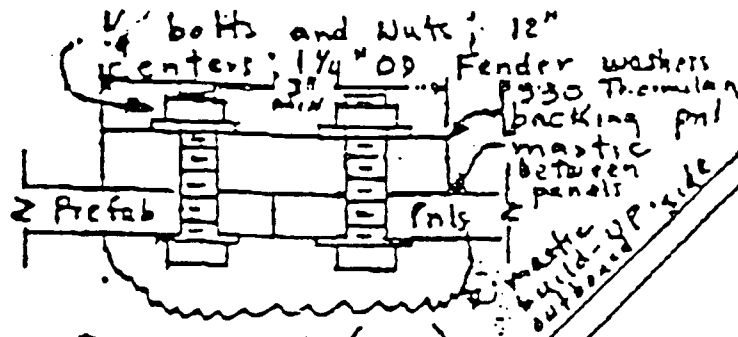
- ① ≈ 6' 7 1/2" W of u at A1 Elev ≈ 761'
- ② ≈ 15' 11" W of u at A1
- ③ ≈ 0' 8" W of t at A1
- ④ ≈ 11' 4" W of t at A1
- ⑤ ≈ 17' 4" W of t at A1

47A053-90 series can apply

WR 11605
PAGE II-58 of VI-101

FCR-345) R

TSI FIRE BARRIER INST - SPECIAL



DETAIL A (ALT)

1 1/2 x 1 1/2" angle steel construction; wall and ceiling

Steel Support; I-Beam and/or Unistrut

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)

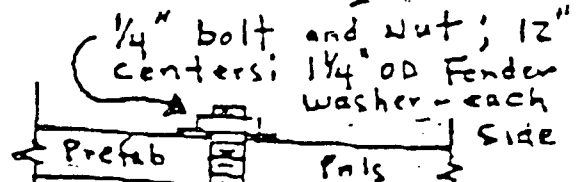
Secured to Concrete ceiling

Concrete Wall

See Detail A

Conduits penetrating envelope end

Prefabricated panel seam with no steel support behind seam. See Detail A. Bolts on 12" centers



Mastic build-up, outboard side, per TSI std. INSTR

* Pnl's joined with mastic

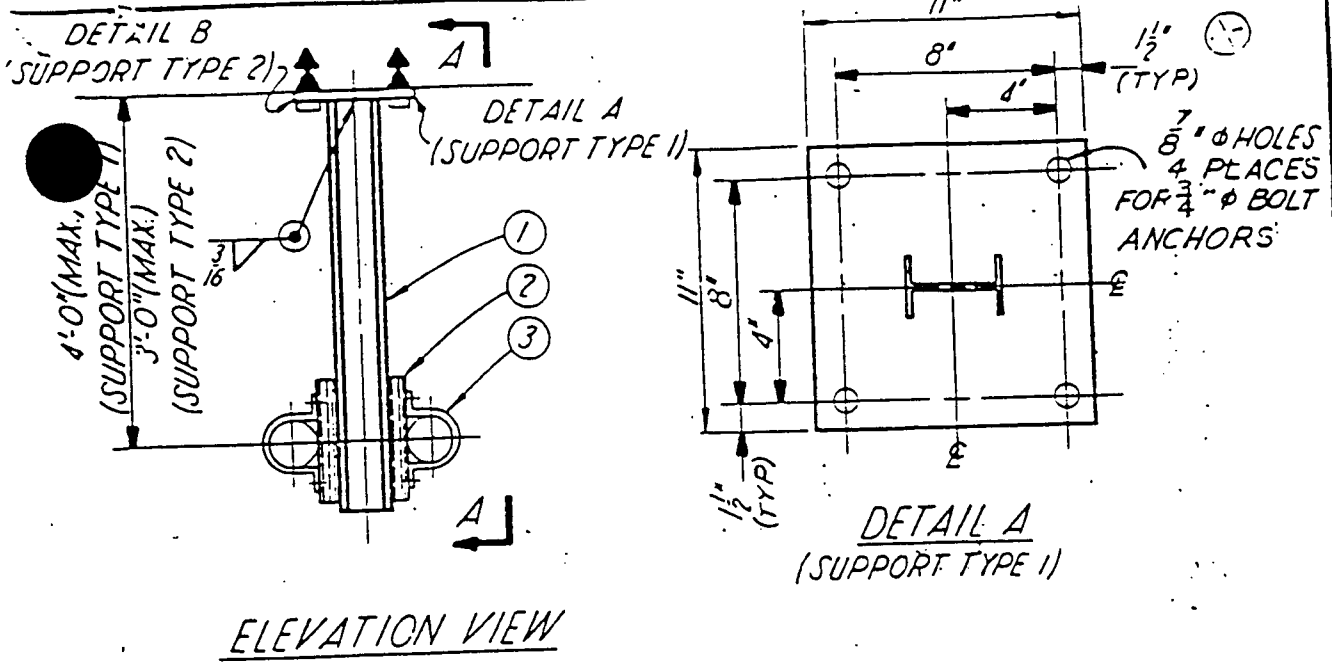
NOTE: Thermo-lag Material furnished on contract 84KBS-836467

PAGE 8 OF 8

Detail A

0047

42



ELEVATION VIEW

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 | W6X15.5 |
| 2 | 30 | 30 | 7 | 9 | 9 | 5 | 3 | 3 | 2 | W4X13 |

- NOTES:
- FOR GEN. NOTES & REQUIREMENTS SEE 47A056-1.
 - 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.
 - THIS SUPPORT CAN BE MOUNTED TO FLOORS, CEILING, & WALLS USING EMBED. STEEL OR THE PL W/ CONC. ANCHORS.
 - THIS SUPPORT CAN BE USED AS AN AXIAL FOR UP TO 25FT OF CONDUIT WHEN USING OPTIONAL BRACE AS SHOWN IN SECTION A-A
 - 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.
 - COMPANION DWG 47A056-53A

- NOTE *:
- THIS DWG SHALL NOT BE USED AFTER NOV. 22 1965 WITHOUT PRIOR APPROVAL
 - THIS DWG HAS BEEN REPLACED BY 47A056-1053

NOT TO SCALE

| | | | | | | | |
|--|--------|----------|------|------|------|------|------|
| 1 | LE 530 | 11-22-53 | W/LW | FKCA | INSP | 122 | TPV |
| REVISIONS 1. DATE 11-22-53 BY W/LW FOR 3770 | | | | | | | |
| DESIGN | DATE | DSGN | DRWN | CHKD | SUPY | ENGR | INSP |
| W/LW | | | | | | | |
| CHKD | | | | | | | |
| W.G. MONROE | | | | | | | |
| SUPY | | | | | | | |
| J.S. ARRINGTON | | | | | | | |

SEISMIC CLASS I STRUCTURES

MECHANICAL SEISMIC SUPPORT CONDUIT

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

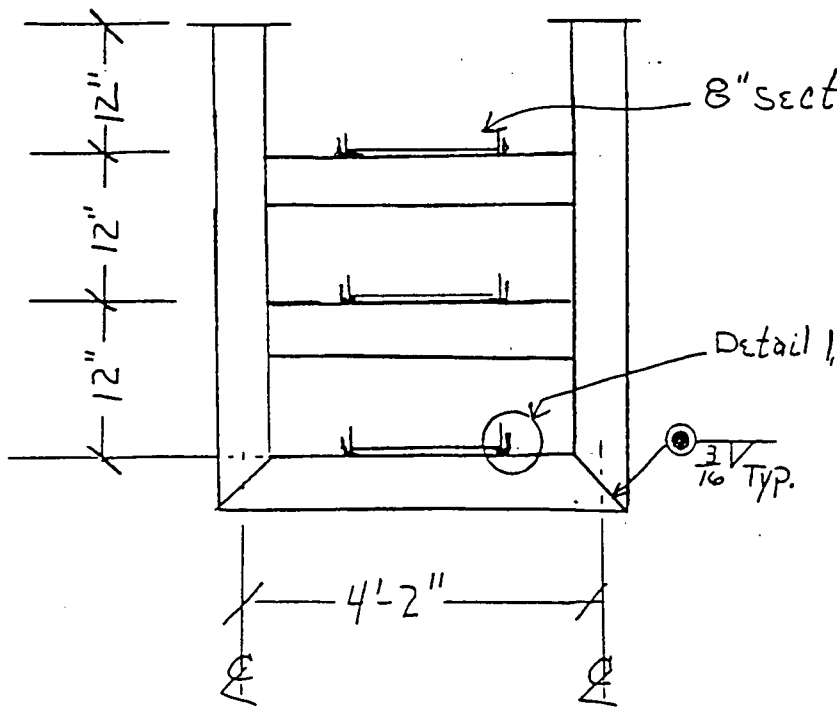
APPROVED: J.L. King
RECOMMENDED: R.M. Be:ceb
KNORVILLE 11-23-75 451M 47A056-53

TEST DECK #4

COMPUTED _____ DATE _____

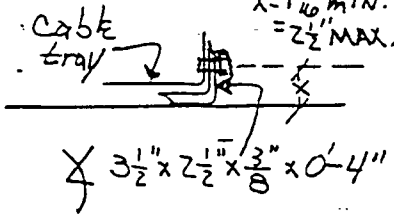
CHECKED _____ DATE _____

Cable Tray Support Details



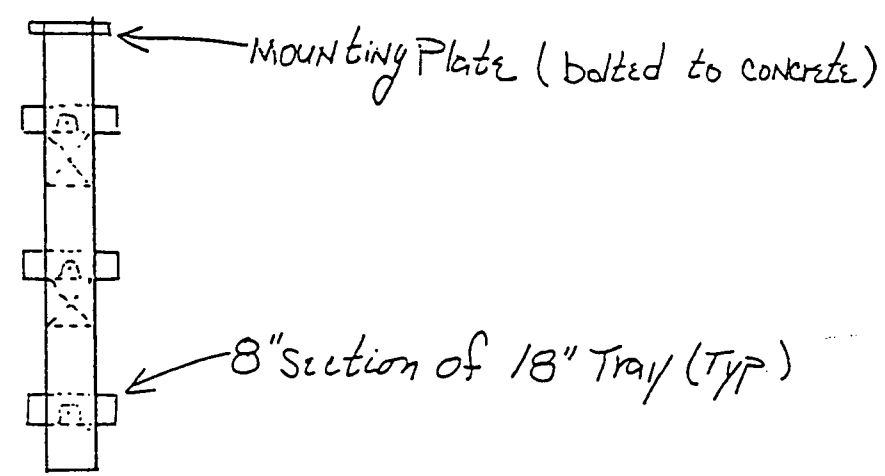
8" section, 18" Tray (TYP)

Bolt Hole:
X = 1 9/16" MIN.
= 2 1/2" MAX.



Detail 1

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



- Notes:
- 1) Tube Steel 6" x 6" x 0.5", ASTM-A 500 Grade B or ASTM A501
 - 2) Weld size 1/16" less than tube thickness.
 - 3)

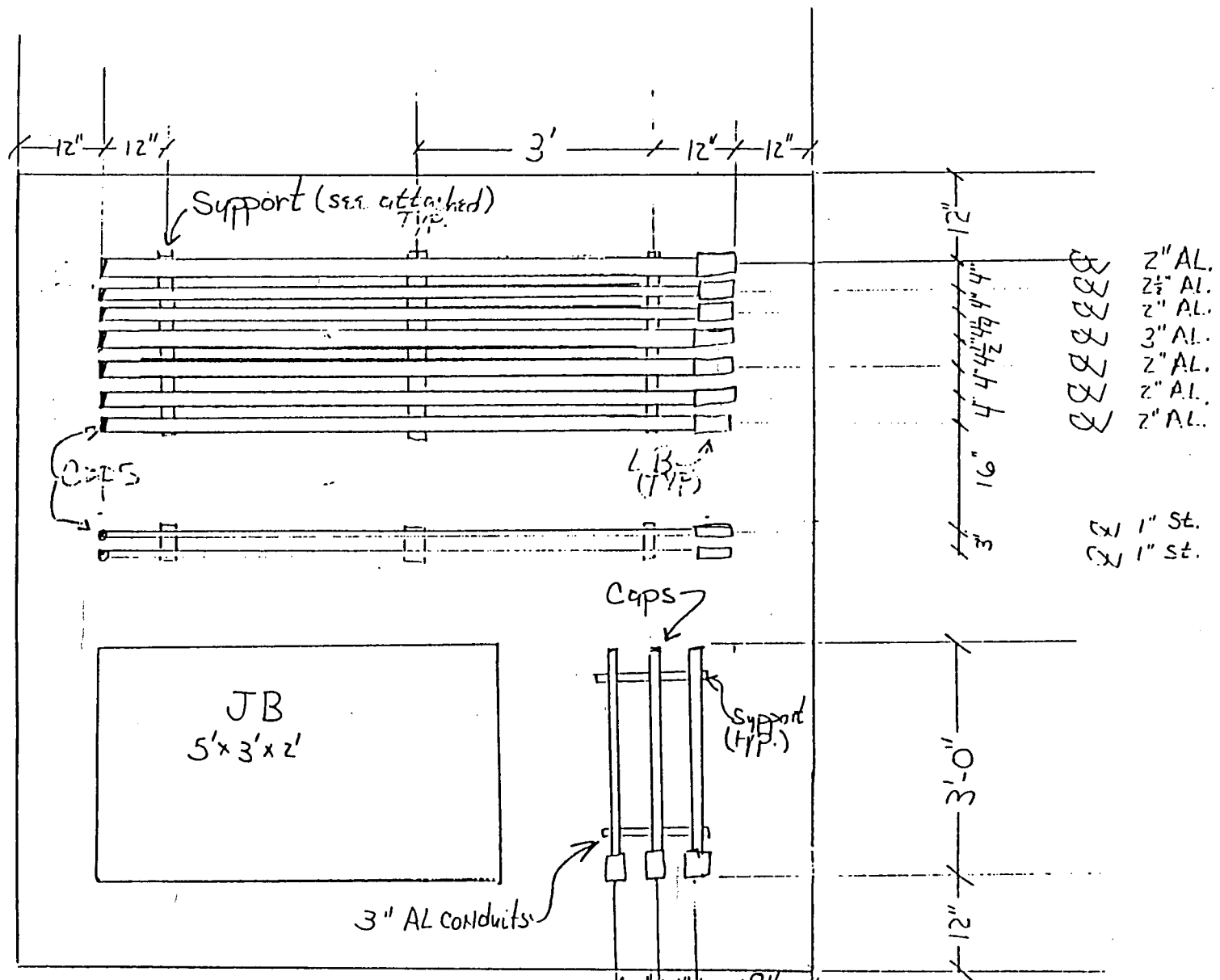
3 Sided - Boxed Conduits
 Large JB (Wall Config)

SHEET 1 OF 2

44

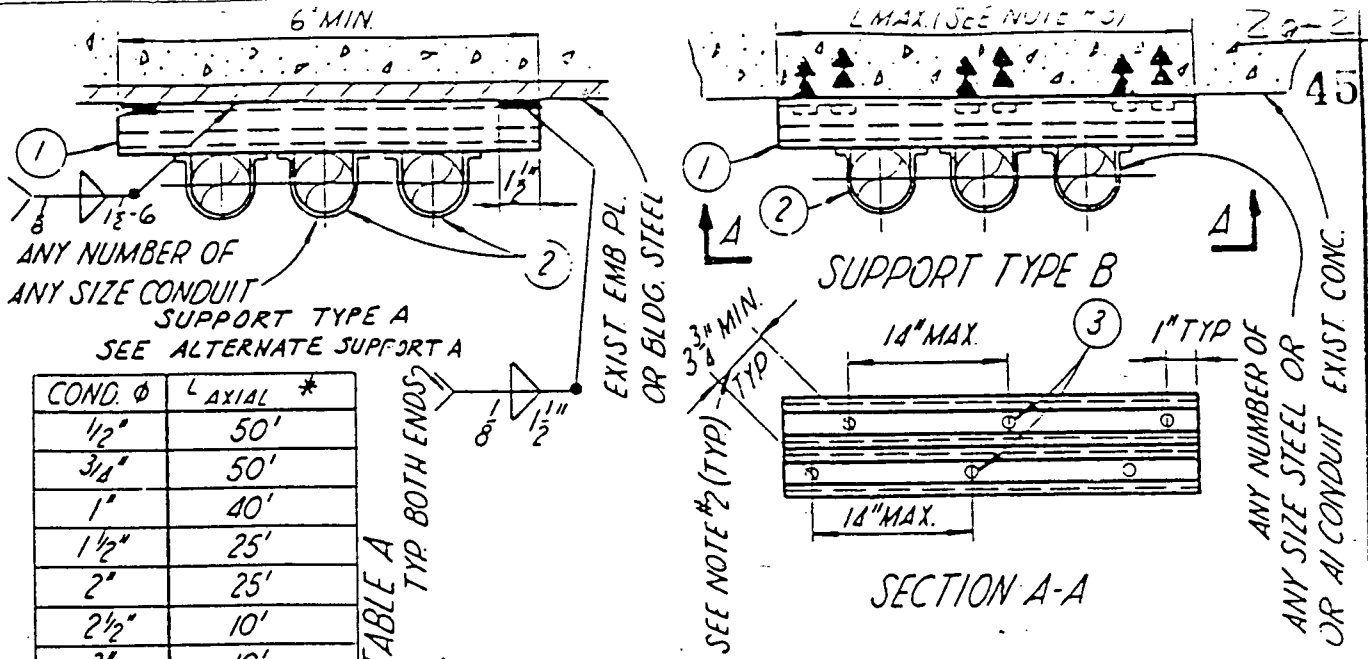
COMPUTED DATE
 CHECKED DATE

TEST DECK #5



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

NOTE *
 1. THIS DWG SHALL NOT BE USED A... R NOV 22 1985
 WITHOUT PRIOR DE APPROVAL
 2. THIS DWG HAS BEEN REPLACED BY 47A056-1059



| COND. Ø | 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' |

TABLE A
TYP BOTH ENDS

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

NOT TO SCALE

NOTES:

- FOR GENERAL NOTES & SPECIFICATIONS SEE 47A056-1
- BOLT ANCHORS MUST BE A MIN. OF 3 3/4" APART IN ACCORDANCE W/ GENERAL CONSTRUCTION SPECIFICATION G-32.
- 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.
- CONDUITS MUST BE ATTACHED TO EITHER CHANNEL OF THE P1001A UNISTRUT BETWEEN BOLT ANCHORS SECURING THAT PARTICULAR CHANNEL.
- THIS SUPPORT MAY BE ATTACHED TO WALLS, FLOORS, OR CEILINGS.
- 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
- 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".
- COMPANION DWG 47A056-59A.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| Rev | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | |
| Appr | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spec | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Insp | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Engr | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Subm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drawn | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chkd | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Design | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

REVISED PER FCR 2598 R1

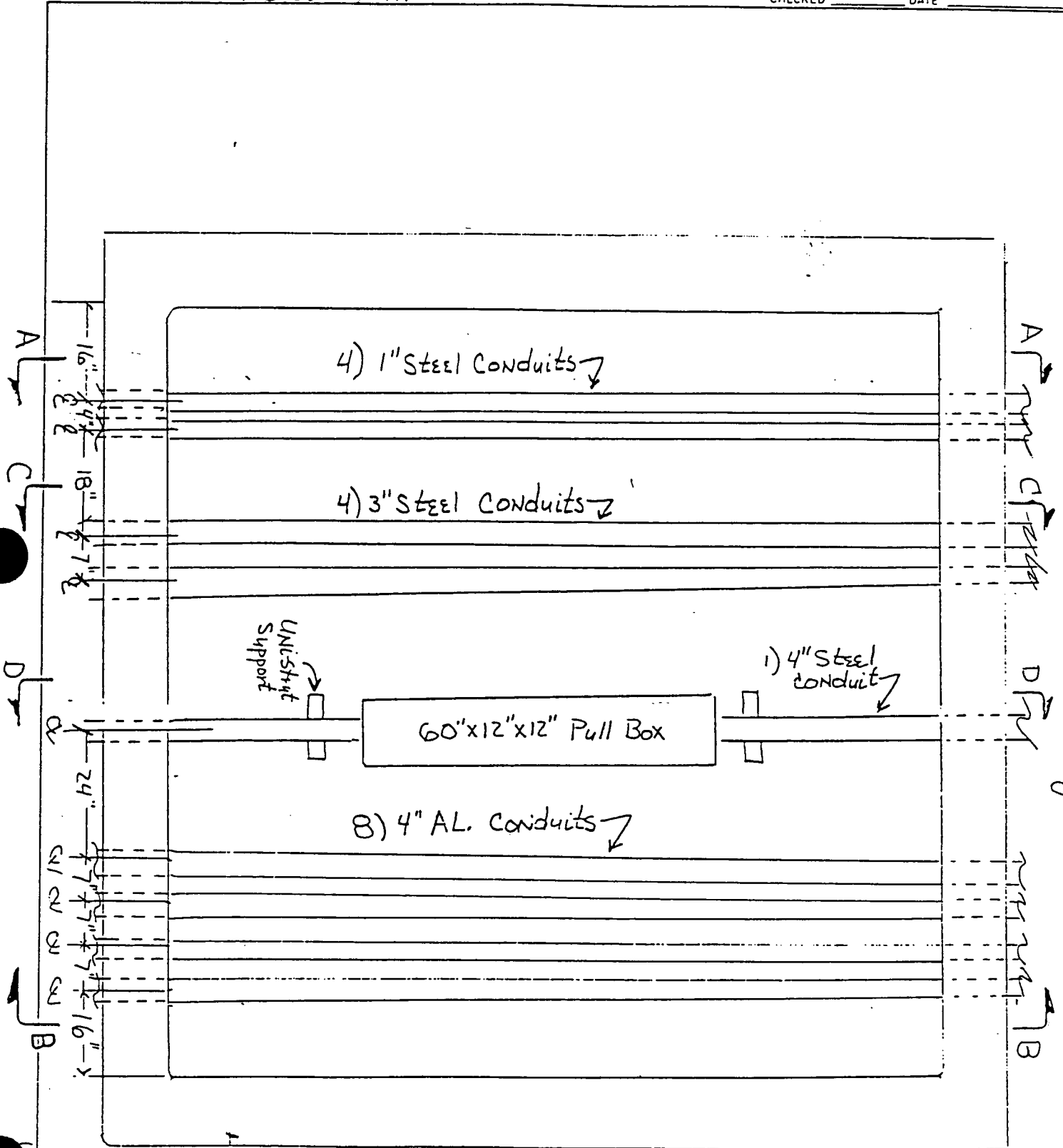
| | | | | | | | | | | | | | | | |
|--------|---------|---|---|---------------------------|-------------------|---|----|---|---|---|---|---|---|---|---|
| 5 | AS REQD | TS (SIZE AS REQD) | 5 | L6530 | 1 1/2 x 3/4 x 1/8 | 2 | PK | / | / | / | / | / | / | / | / |
| 4 | AS REQD | P1001 UNISTRUT (LENGTH VARIES) | | ADDED NOTE * PER FCR 3770 | | | | | | | | | | | |
| 3 | AS REQD | 3/8" Ø BOLT ANCHOR ASSEMBLIES | | ECN NO | DATE | | | | | | | | | | |
| 2 | AS REQD | P2558 UNISTRUT PIPE STRAPS W/ NUTS, BOLTS, & FLAT WASHERS | | | | | | | | | | | | | |
| 1 | 1 | P1001A UNISTRUT (LENGTH VARIES) | | | | | | | | | | | | | |
| MK. NO | QTY. | MATL. DESCRIPTION | | | | | | | | | | | | | |

| | | |
|-------------------------------------|--------------------------------|------------------------|
| REV. PER SQ-FCR-1121 FOR ECN L-5198 | SEISMIC CLASS I STRUCTURE | |
| ADDED NOTE 2 | MECHANICAL | |
| ADDED NOTE 7 PER FCR 646 | SEISMIC SUPPORT | |
| | CONDUIT | |
| | SEQUOYAH NUCLEAR PLANT | |
| | TENNESSEE VALLEY AUTHORITY | |
| | DIVISION OF ENGINEERING DESIGN | |
| Q | | |
| DESIGN G.H. BIGG | APPROVED | APPROVED |
| DRWN C.V. HENDERSON | O.A. Henderson | R.C. ... |
| CHKD W.G. MONROE | ENGINEER | |
| SUPY J.S. ARRINGTON | | |
| | KNOXVILLE | 1-19-77 451M147A056-59 |

TEST DECK
Concrete Wall

COMPUTED _____ DATE _____

CHECKED _____ DATE _____



1.0000 VIEW LOCATION: 1000, 1000, 1000

Concrete Test Frame

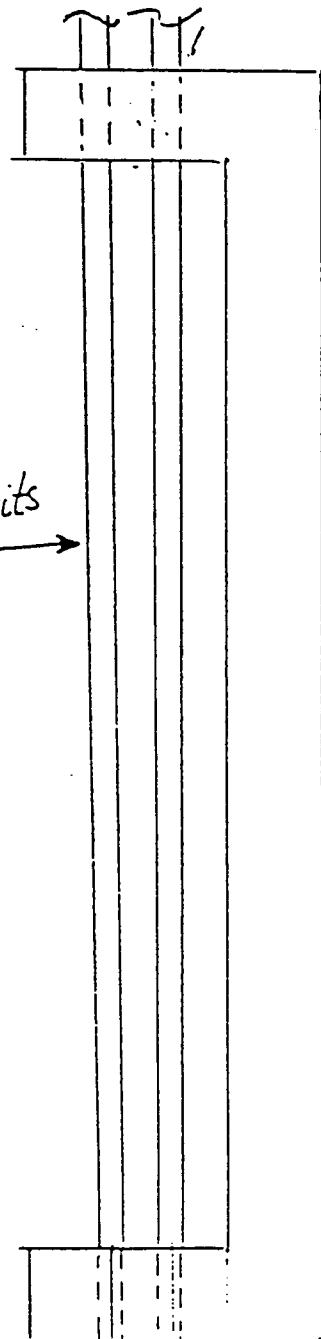
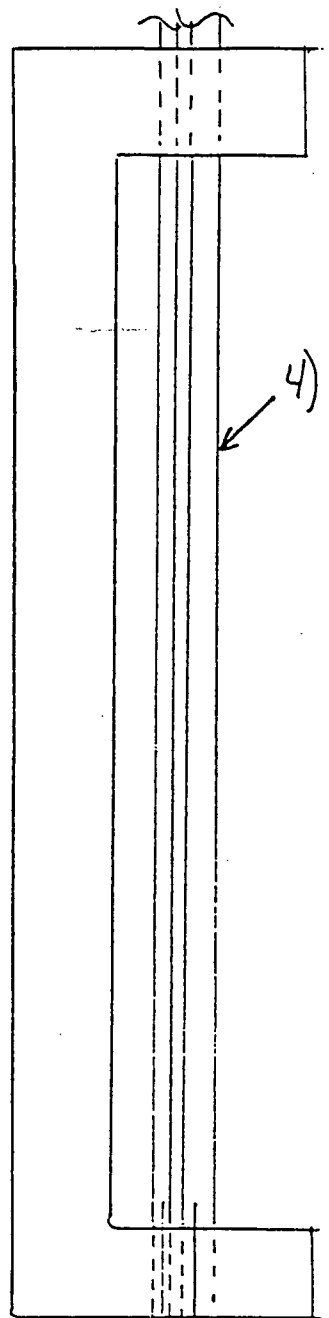
1.0000 VIEW: 1000, 1000, 1000

TEST DECK #6

COMPUTED _____ DATE _____
CHECKED _____ DATE _____

Left View

Right View



4) 1" Steel Conduits

8) 4" AL. conduits

"A-A"

"B-B"

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

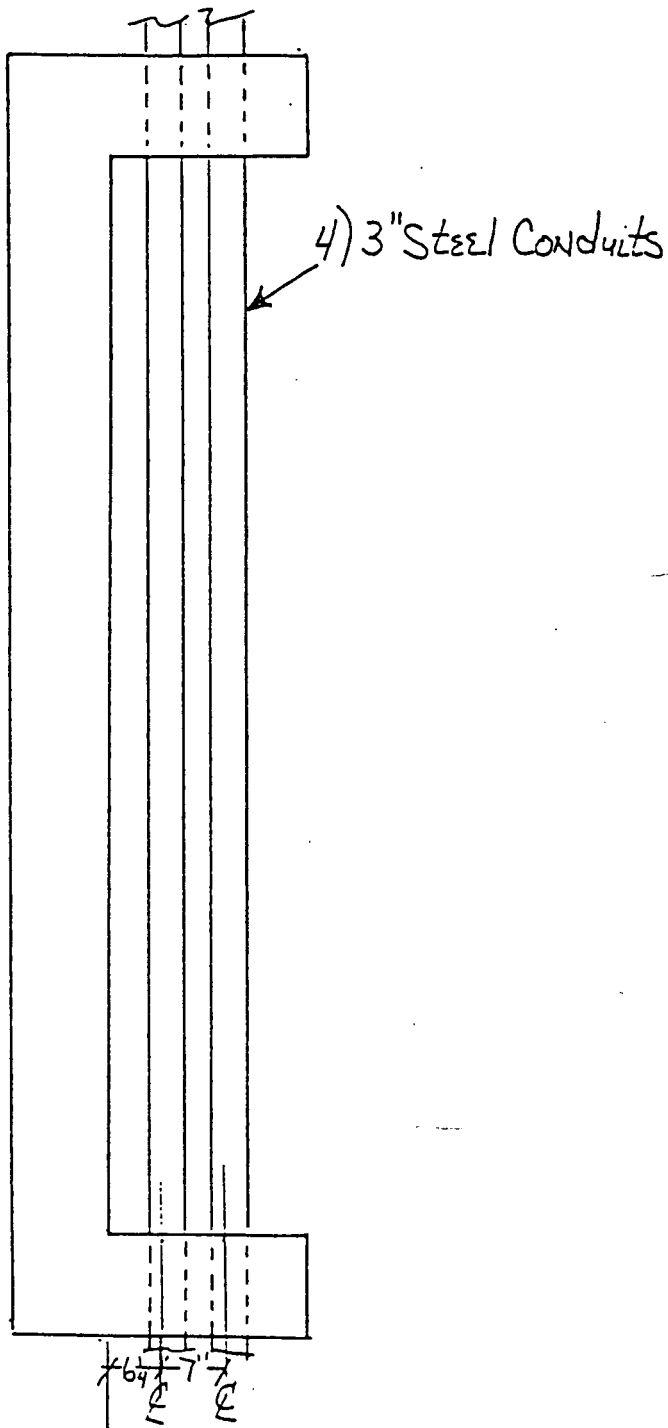
EVA 11030 (VM-7/75)

Test Deck #6

COMPUTED _____ DATE _____

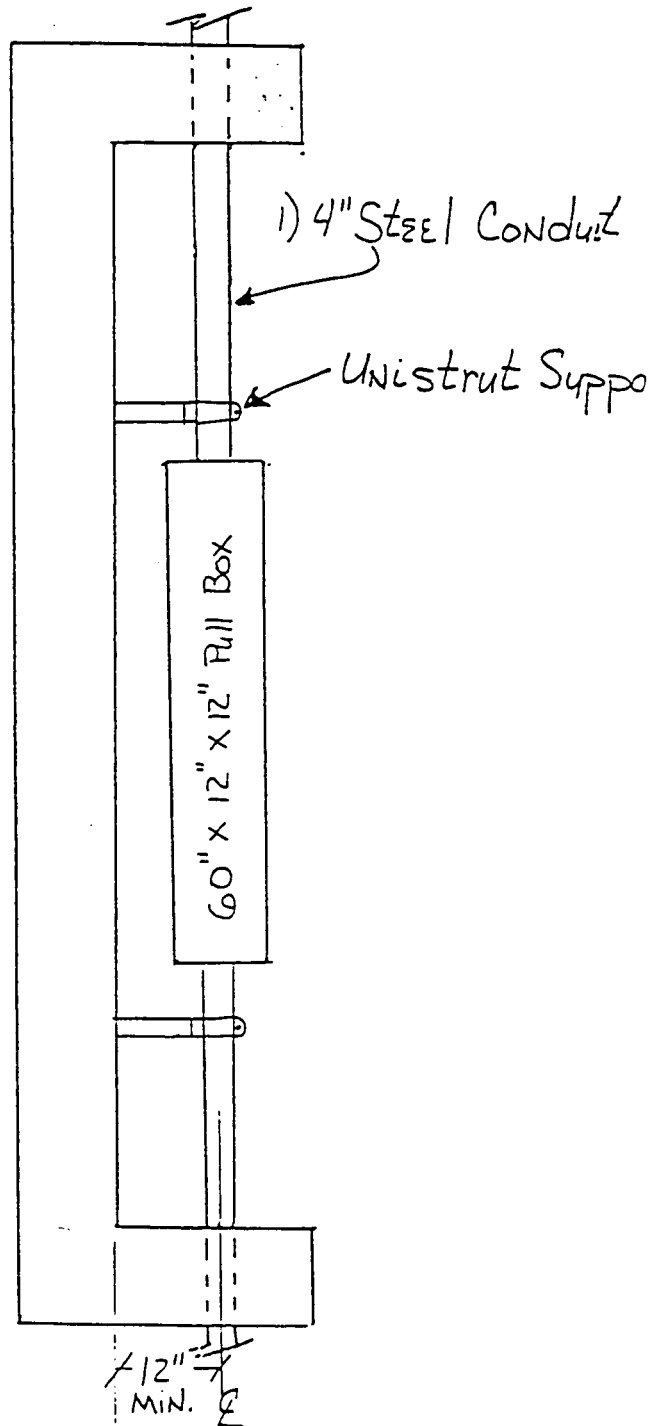
CHECKED _____ DATE _____

Left View



"C-C"

Left View



"D-D"

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

Large Ganged Conduit

01 of 2

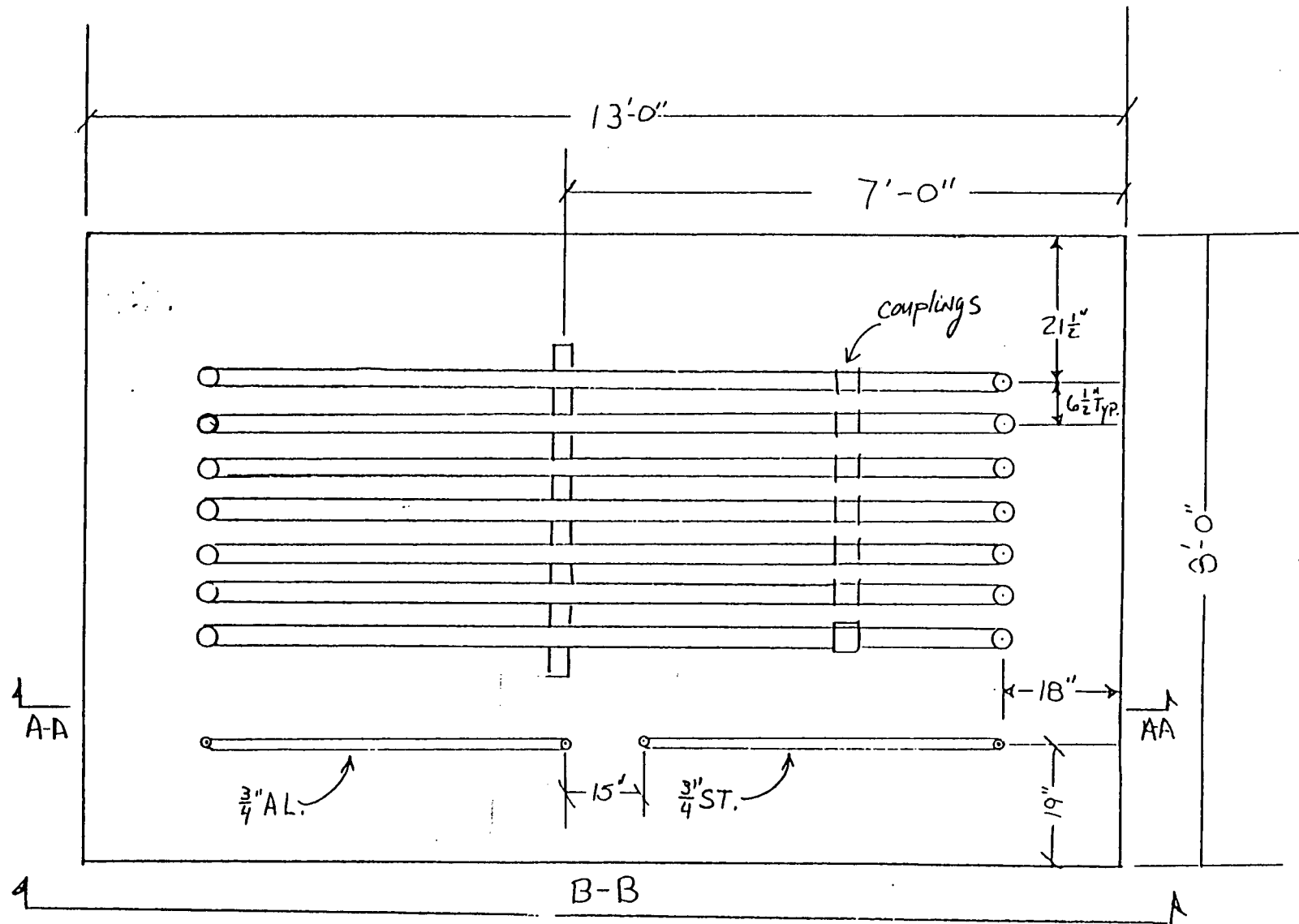
49

TEST DECK #7

STEEL DECK - Horiz -

COMPUTED *MM* DATE

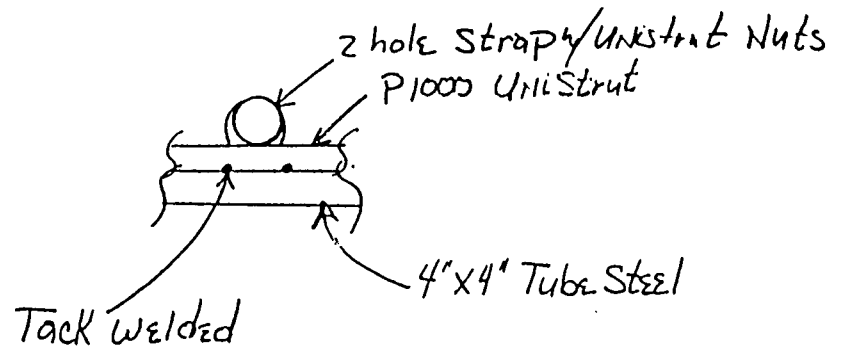
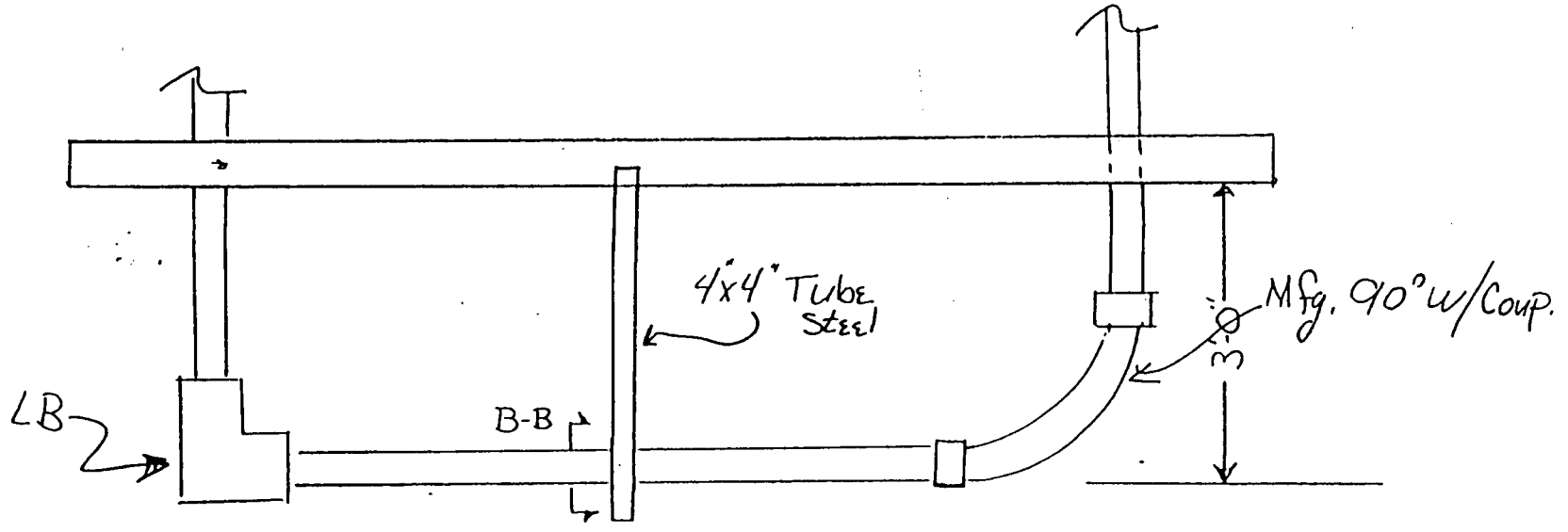
CHECKED _____ DATE



7) 4" Steel conduits. Spaced 6 1/2" ON C
 PLAN VIEW

COMPUTED DATE
CHECKED DATE

Elevation A-A




Note: The two 3/4" conduits (1 AL, 1 ST) 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.

Report No. 11960-97258
TVA / Thermal Science, Inc.

November 23, 1994
APPENDICES

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

9403240197

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 APCS 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

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

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 conditions³ from the thermal effects⁴ 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.

Licenses 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 an engineering evaluation acceptable to the staff, such as demonstrating cable functionality. For those licenses 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

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.

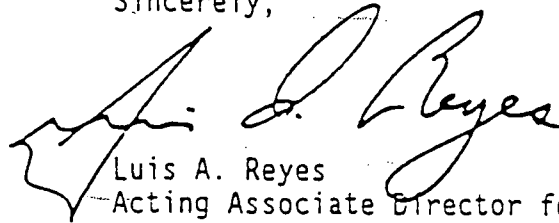
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March 25, 1994

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

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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 the 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 75602, 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 R⁵, 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

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 temperature⁶ 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.)

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 the thermocouples within the test specimen at the onset of the fire exposure during 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 85-10, 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 °C [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 conditions⁸ 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,

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 [$\pm \frac{1}{2}$ 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

Inclusion 1

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 JB's which have only one thermocouple placed on each JB surface, the individual JB surface thermocouples should be averaged together. For larger JB's which have more than 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 runs 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 than 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 $\frac{1}{2}$ -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 [$2\frac{1}{2}$ -inch] hose discharging through a standard 2.9 cm [$1\frac{1}{2}$ -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 $2\frac{1}{2}$ 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 [$2\frac{1}{2}$ -inch] national standard playpipe with a 2.9 cm [$1\frac{1}{2}$ -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 $2\frac{1}{2}$ 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 [$1\frac{1}{2}$ -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 [$1\frac{1}{2}$ -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.S. Nuclear Regulatory Commission

- | | |
|-------------------|---|
| May 1, 1976 | Branch Technical Position (APCSB) 9.5-1, "Fire Protection Program." |
| February 24, 1977 | Appendix A to the Branch Technical Position APCS 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." |

May 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 effects 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:

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

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., 1-25-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 voltages¹⁰ which, when applied to power, control and instrumentation cables, would constitute an acceptable cable functionality test.

| <u>TYPE</u> | <u>OPERATING VOLTAGE</u> | <u>MEGGER TEST VOLTAGE</u> | <u>HIGH POTENTIAL TEST VOLTAGE</u> |
|------------------------------|--------------------------|----------------------------|---|
| 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.

¹⁰ The review guidance for Megger and Hi-Pot test voltages was derived from 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 |
|---|---|--|
| <p>Temperature, as measured on the external surface of the Raceway, should not exceed 163 °C [325 °F] (Note 1).</p> <p>This temperature is determined by averaging temperature readings of similar series of thermocouple (e.g., cable tray side rail) (Note 2).</p> <p>Barrier Condition - Fire barrier should remain intact. No visible signs of component, raceway or cables after fire and hose stream test.</p> <p>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.</p> | <p>Temperature, as measured on the unexposed side of the fire barrier material, should not exceed 163 °C [325 °F].</p> <p>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.</p> <p>Hose Stream Test - solid stream test as specified in NFPA 251.</p> | <p>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.</p> <p>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.</p> <p>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.</p> |

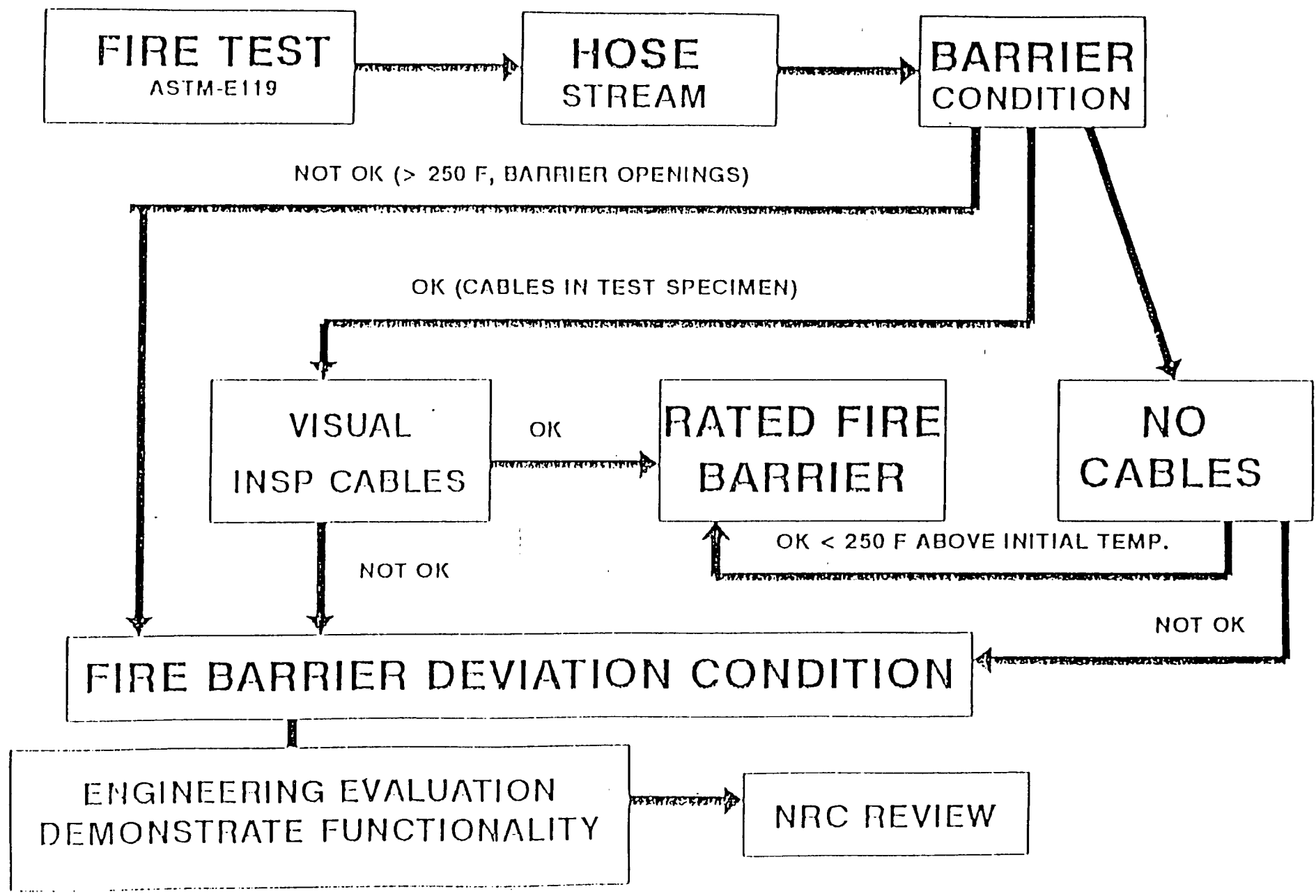
| GL 86-10, SUPP. 1 | GL 86-10 | RATIONALE FOR CLARIFICATION |
|---|---|--|
| <p>Cable condition - When cables are included in the test specimen, post-fire condition must be visually inspected. Cables should show no signs of degraded conditions resulting from the thermal affects of the fire exposure.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

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

| | | |
|--|---|--|
| <p>Functionality should be demonstrated if any of the preceding criteria are exceeded (Note 5).</p> <p>Methods when cables are excluded from test specimen:</p> <p>Comparison of internal temp. profiles to EQ and LOCA test data.</p> <p>Air oven test of cables at rated voltage with Megger and Hi-Pot tests (Note 6)</p> <p>Method when cables are in test specimen include megger and Hi-Pot testing (Note 7)</p> <p>Demonstration of functionality should also consider operating temperature of the cables inside the fire barrier at the onset of the fire exposure.</p> | <p>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.</p> | <p>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.</p> |
|--|---|--|

- 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 (50 percent) immediately after the fire exposure.

NRC FIRE TESTING ACCEPTANCE CRITERIA 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.

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 (3.38mm²) 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:

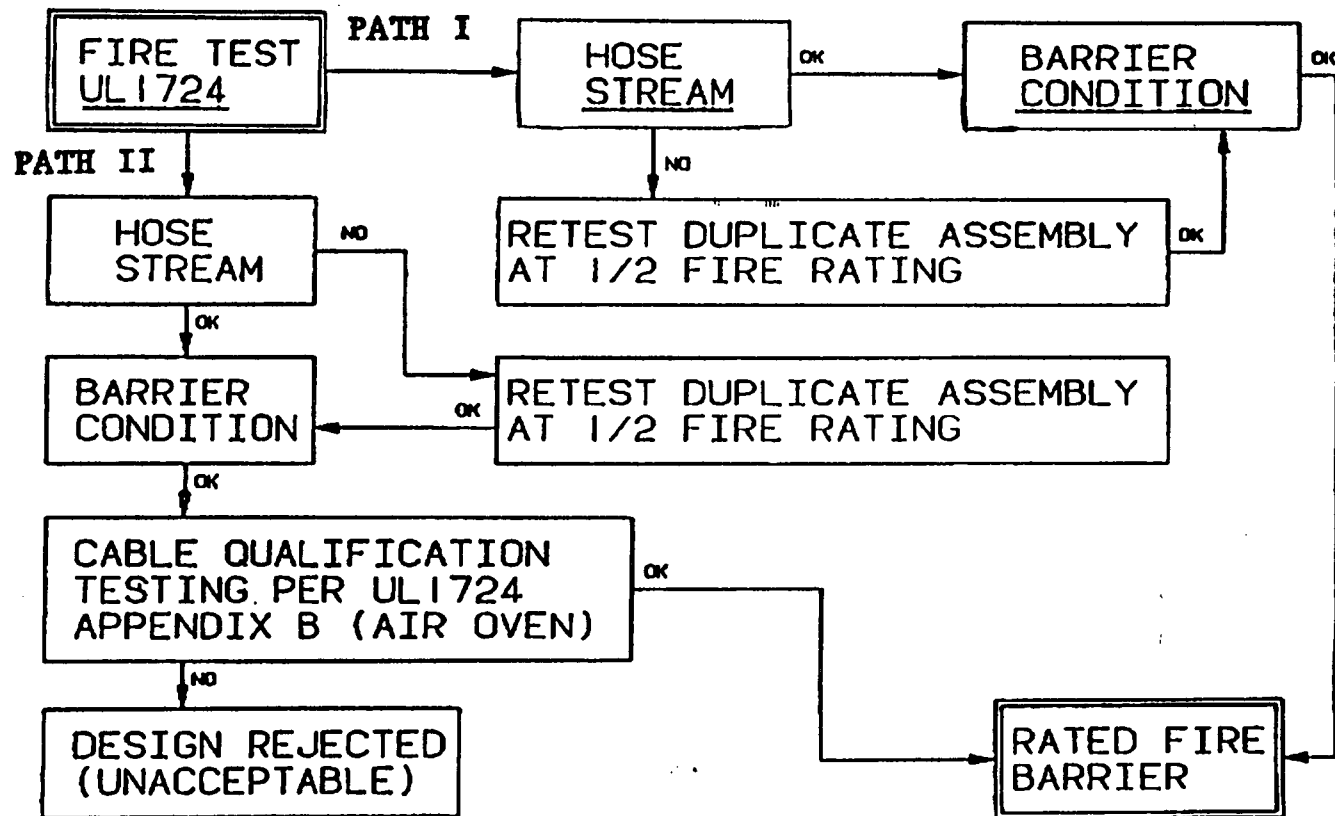
- (1) The exterior surface temperature of the electrical raceway will be recorded (cold side of the barrier). If the average temperature recorded by the exterior thermocouples is less than 250°F (121°C) above their initial temperature and no individual thermocouple is in excess of 325°F (163°C) above 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/MAERE) 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 $\Delta T_{avg} \leq 250^{\circ}F$ AND $\Delta T_{max.} \leq 325^{\circ}F$

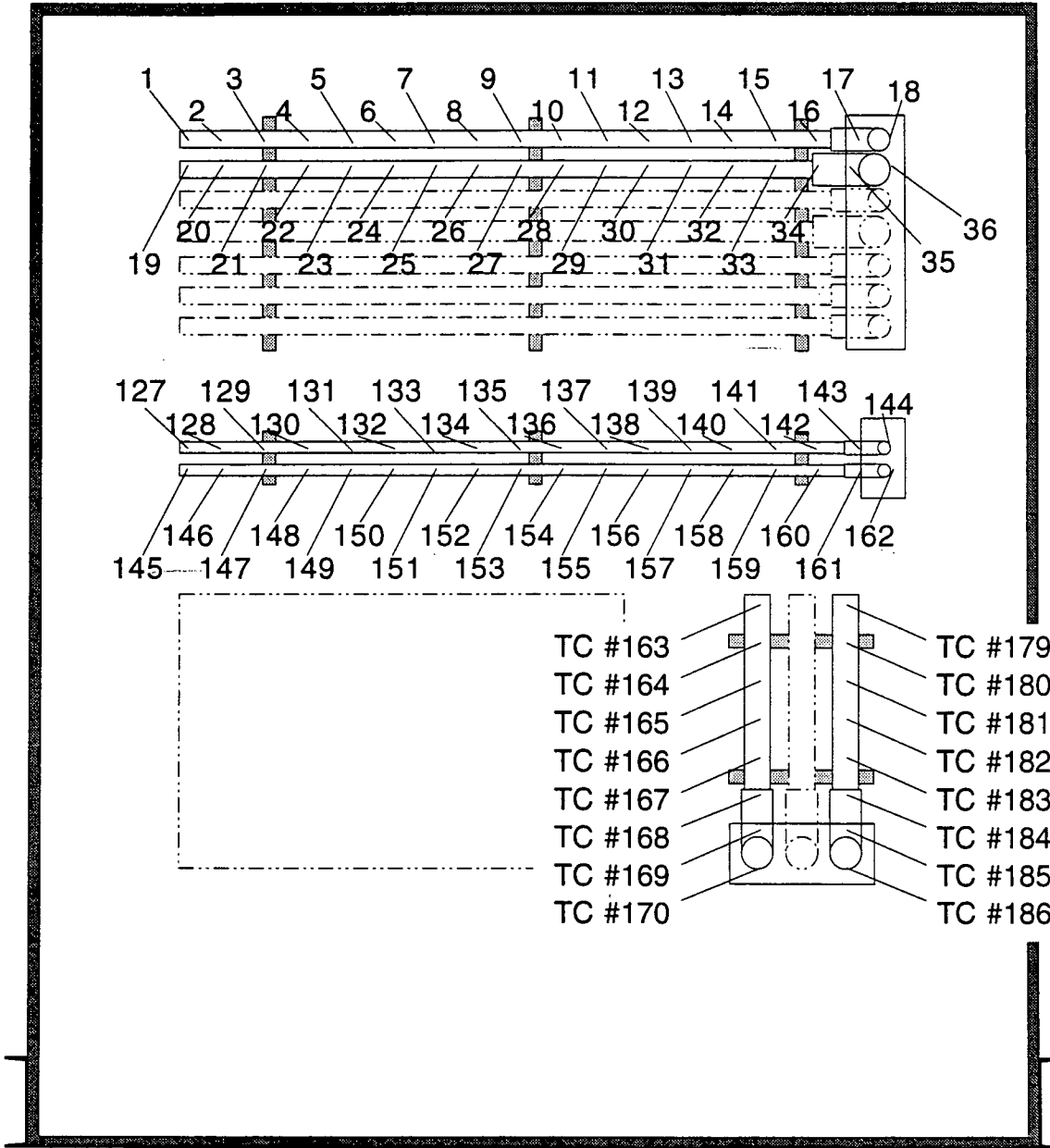
PATH II - RACEWAY $\Delta T_{avg} \geq 250^{\circ}F$ OR $\Delta T_{max.} \geq 325^{\circ}F$

Report No. 11960-97258
TVA / Thermal Science, Inc.

November 23, 1994
APPENDICES

Appendix C
THERMOCOUPLE LOCATIONS



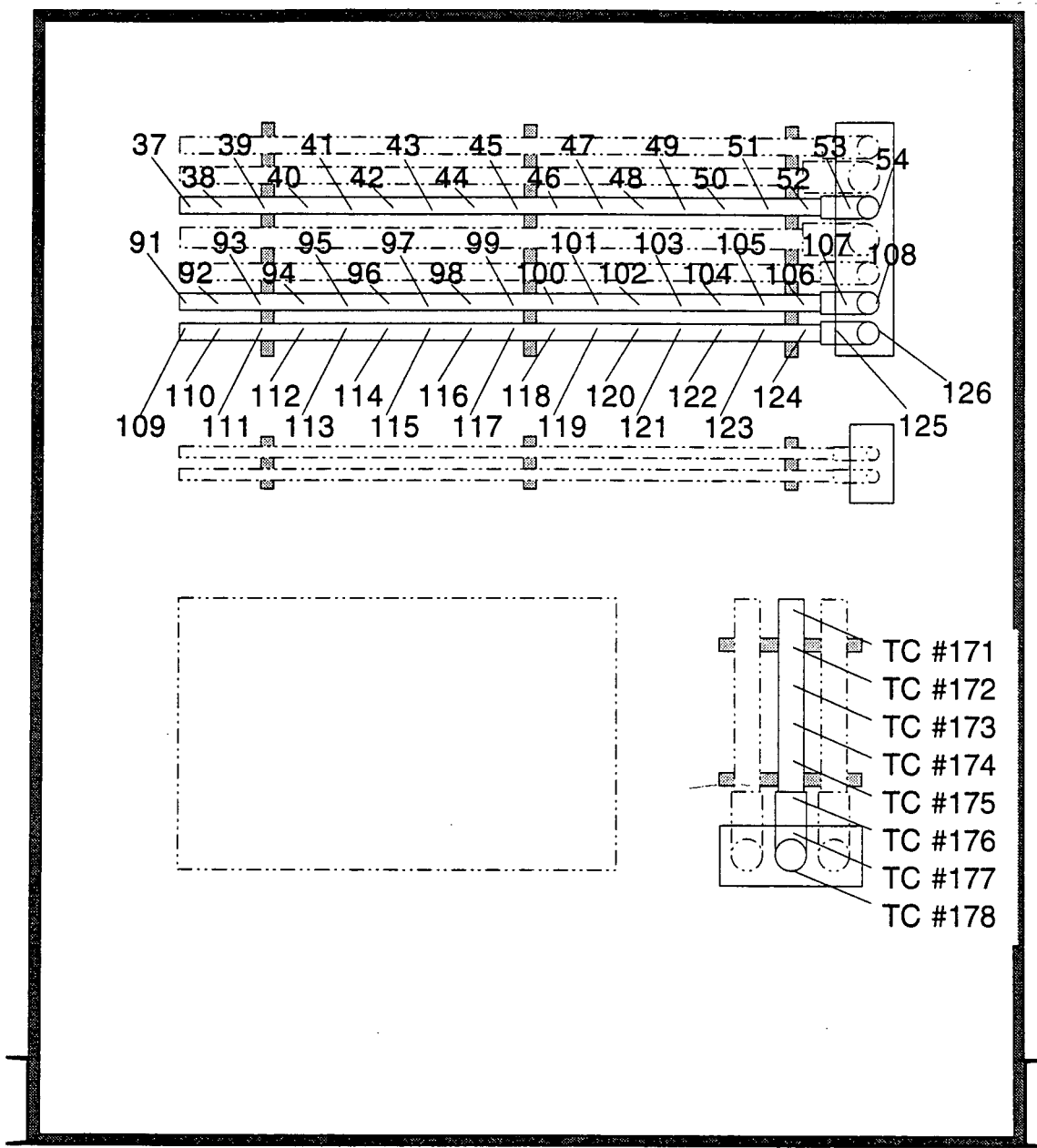


ELEVATION VIEW

NOTE:
Viewed from cold side.
Concrete slab transparent for
visibility of test specimen.

| | |
|---|--------------|
| OMEGA POINT LABORATORIES, INC. | |
| Project No. 11960-97258 | |
| TVA / TSI | |
| Fig. 7 Thermocouple Locations Test Deck #5, Rev. 1 | |
| Drawn by: <i>H. Smith</i> | Date: 9/7/94 |
| Approved by: <i>C. Humphrey</i> | Date: 9/7/94 |



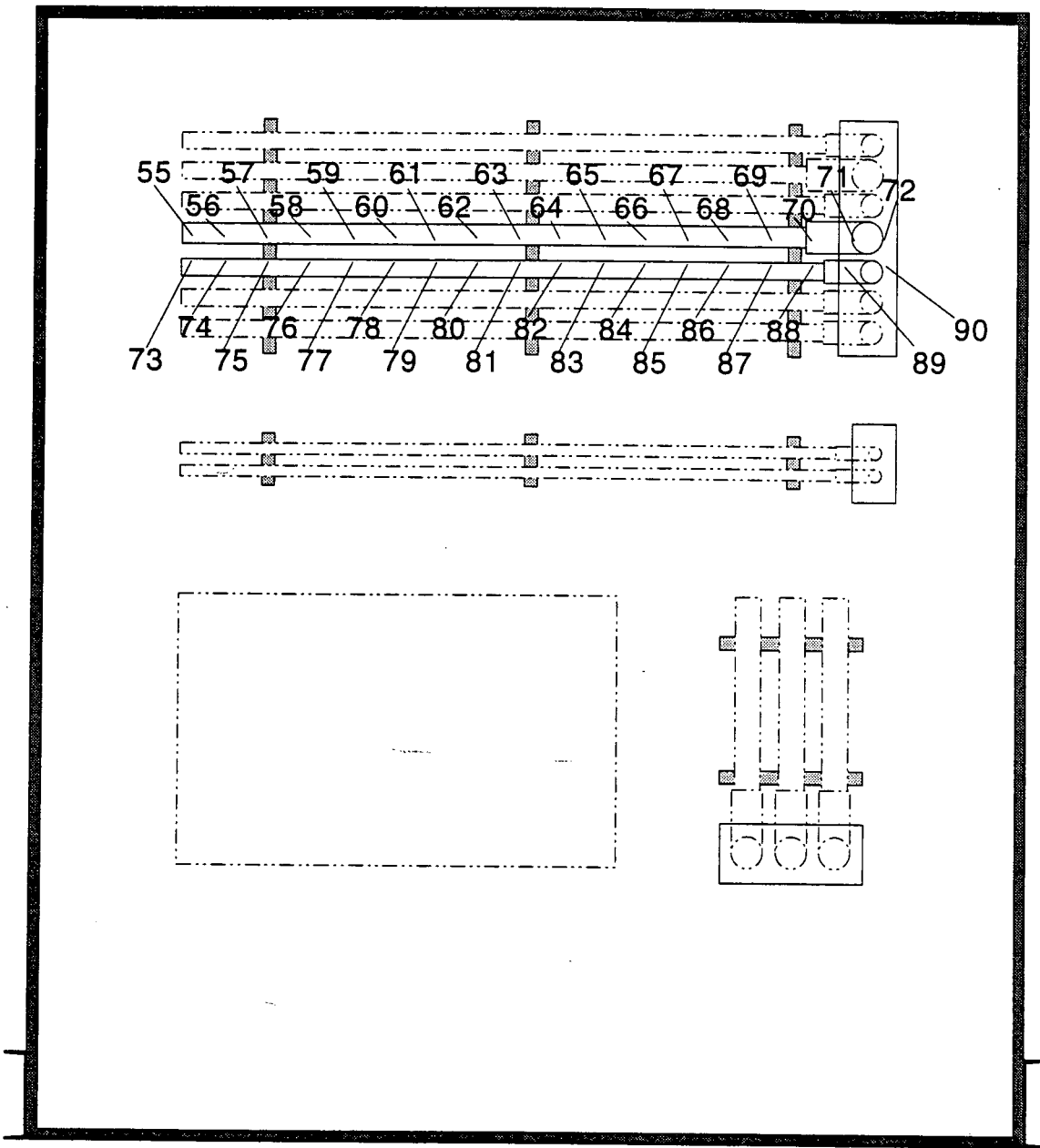


ELEVATION VIEW

NOTE:
 Viewed from cold side.
 Concrete slab transparent for
 visibility of test specimen.

| | |
|---|--------------|
| OMEGA POINT LABORATORIES, INC. Project No. 11960-97258 | |
| TVA / TSI | |
| Fig. 8 Thermocouple Locations Test Deck #5, Rev. 1 | |
| Drawn by: <i>H. [Signature]</i> | Date: 9/7/94 |
| Approved by: <i>C. Humphrey</i> | Date: 9/7/94 |





ELEVATION VIEW

NOTE:
 Viewed from cold side.
 Concrete slab transparent for
 visibility of test specimen.

| | |
|---|--------------|
| OMEGA POINT LABORATORIES, INC. | |
| Project No. 11960-97258 | |
| TVA / TSI | |
| Fig. 9 Thermocouple Locations Test Deck #5, Rev. 1 | |
| Drawn by: <i>[Signature]</i> | Date: 9/7/94 |
| Approved by: <i>[Signature]</i> | Date: 9/7/94 |



THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

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 #: 97258

Test Deck #: 5

Item: 2" Aluminum Conduit Surface

Third From Top in Upper Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E37 | On right side surface of the conduit, 1" from concrete wall. |
| E38 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E39 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E40 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E41 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E42 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E43 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E44 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E45 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E46 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E47 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E48 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E49 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E50 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E51 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E52 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E53 | On fireside surface of the conduit, 6" left of previous thermocouple. |
| E54 | On fireside surface of the conduit, 6" left of previous thermocouple, 1" right of capped end of conduit, on coupling. |
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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. 97258

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Project #: 97258

Test Deck #: 5

Item: 3" Aluminum Conduit Surface

Fourth From Top in Upper Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|--|
| E55 | On fireside surface of the conduit, 1" right of capped end of conduit, on coupling. |
| E56 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E57 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E58 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E59 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E60 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E61 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E62 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E63 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E64 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E65 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E66 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E67 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E68 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E69 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E70 | On fireside surface of the conduit, 6" right of previous thermocouple, on condulet. |
| E71 | On fireside surface of the conduit, 6" right of previous thermocouple, on condulet. |
| E72 | On right side surface of the condulet, 6" from previous thermocouple, 1" from concrete wall. |
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NOTE: TCs shall be numbered sequentially from 1 upwards for each deck assembly. Prefixes shall be added as follows: C (upper wire), and E (engineering TC), for instance c1, E35, etc.

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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

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Project #: 97258

Test Deck #: 5

Item: 2" Aluminum Conduit Surface

Sixth From Top in Upper Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E91 | On fireside surface of the conduit, 1" right of capped end of conduit, on coupling. |
| E92 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E93 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E94 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E95 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E96 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E97 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E98 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E99 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E100 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E101 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E102 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E103 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E104 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E105 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E106 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E107 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E108 | On right side surface of the conduit, 6" from previous thermocouple, 1" from concrete wall. |
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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. 97258

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Project #: 97258

Test Deck #: 5

Item: 2" Aluminum Conduit Surface

Bottom Conduit in Upper Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E109 | On fireside surface of the conduit, 1" right of capped end of conduit, on coupling. |
| E110 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E111 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E112 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E113 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E114 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E115 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E116 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E117 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E118 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E119 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E120 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E121 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E122 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E123 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E124 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E125 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E126 | On right side surface of the conduit, 6" from previous thermocouple, 1" from concrete wall. |
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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

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Project #: 97258
 Test Deck #: 5
 Item: 2" Aluminum Conduit Surface
Fifth From Top in Upper Array
 (viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E73 | On fireside surface of the conduit, 1" right of capped end of conduit, on coupling. |
| E74 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E75 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E76 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E77 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E78 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E79 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E80 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E81 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E82 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E83 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E84 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E85 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E86 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E87 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E88 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E89 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E90 | On right side surface of the conduit, 6" from previous thermocouple, 1" from concrete wall. |
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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. 97258

NOTE:
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Project #: 97258
 Test Deck #: 5
 Item: 1" Steel Conduit Surface
Top Conduit in Middle Array
 (viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E127 | On fireside surface of the conduit, 1" right of capped end of conduit, on coupling. |
| E128 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E129 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E130 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E131 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E132 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E133 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E134 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E135 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E136 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E137 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E138 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E139 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E140 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E141 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E142 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E143 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E144 | On right side surface of the conduit, 6" from previous thermocouple, 1" from concrete wall. |
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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

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Project #: 97258
Test Deck #: 5
Item: 1" Steel Conduit Surface
Bottom Conduit in Middle Array
(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E145 | On fireside surface of the conduit, 1" right of capped end of conduit, on coupling. |
| E146 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E147 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E148 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E149 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E150 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E151 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E152 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E153 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E154 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E155 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E156 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E157 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E158 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E159 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E160 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E161 | On fireside surface of the conduit, 6" right of previous thermocouple. |
| E162 | On right side surface of the conduit, 6" from previous thermocouple, 1" from concrete wall. |
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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

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Project #: 97258

Test Deck #: 5

Item: 3" Aluminum Conduit Surface

Left Conduit in Lower Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E163 | On fireside surface of the conduit, 1" below capped end of conduit, on coupling. |
| 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 bottom surface of the conduit, 6" from previous thermocouple, 1" from concrete wall. |
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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

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Project #: 97258

Test Deck #: 5

Item: 3" Aluminum Conduit Surface

Center Conduit in Lower Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E171 | On fireside surface of the conduit, 1" below capped end of conduit, on coupling. |
| E172 | On fireside surface of the conduit, 6" below previous thermocouple. |
| 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 bottom surface of the conduit, 6" from previous thermocouple, 1" from concrete wall. |
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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

Project #: 97258
Test Deck #: 5
Item: 3" Aluminum Conduit Surface
Right Conduit in Lower Array
(viewed from fireside)

NOTE:
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| TC Number | Description of exact physical location |
|-----------|---|
| E179 | On fireside surface of the conduit, 1" below capped end of conduit, on coupling. |
| 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 bottom surface of the conduit, 6" from previous thermocouple, 1" from concrete wall. |
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Project #: 97258

Test Deck #: 5

Item: Large Steel Junction Box

Interior Surface

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E187 | On the cover of the JB, 6" right of and 6" below the top left corner. |
| E188 | On the cover of the JB, 12" right of the previous thermocouple. |
| E189 | On the cover of the JB, 12" right of the previous thermocouple. |
| E190 | On the cover of the JB, 12" right of the previous thermocouple. |
| E191 | On the cover of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
| E192 | On the cover of the JB, 6" right of and 18" below the top left corner. |
| E193 | On the cover of the JB, 12" right of the previous thermocouple. |
| E194 | On the cover of the JB, 12" right of the previous thermocouple. |
| E195 | On the cover of the JB, 12" right of the previous thermocouple. |
| E196 | On the cover of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
| E197 | On the cover of the JB, 6" right of and 30" below the top left corner. |
| E198 | On the cover of the JB, 12" right of the previous thermocouple. |
| E199 | On the cover of the JB, 12" right of the previous thermocouple. |
| E200 | On the cover of the JB, 12" right of the previous thermocouple. |
| E201 | On the cover of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
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Project #: 97258
 Test Deck #: 5
 Item: Large Steel Junction Box
Interior Surface

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|--|
| E202 | On the bottom of the JB, 6" right of and 6" away from the lower left corner. |
| E203 | On the bottom of the JB, 12" right of the previous thermocouple. |
| E204 | On the bottom of the JB, 12" right of the previous thermocouple. |
| E205 | On the bottom of the JB, 12" right of the previous thermocouple. |
| E206 | On the bottom of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
| E207 | On the bottom of the JB, 6" right of and 18" away from the lower left corner. |
| E208 | On the bottom of the JB, 12" right of the previous thermocouple. |
| E209 | On the bottom of the JB, 12" right of the previous thermocouple. |
| E210 | On the bottom of the JB, 12" right of the previous thermocouple. |
| E211 | On the bottom of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
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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. 97258

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 #: 97258

Test Deck #: 5

Item: Large Steel Junction Box
Interior Surface Toward Wall

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|--|
| E212 | On the back of the JB, 6" right of and 6" above the lower left corner. |
| E213 | On the back of the JB, 12" right of the previous thermocouple. |
| E214 | On the back of the JB, 12" right of the previous thermocouple. |
| E215 | On the back of the JB, 12" right of the previous thermocouple. |
| E216 | On the back of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
| E217 | On the back of the JB, 6" right of and 18" above the lower left corner. |
| E218 | On the back of the JB, 12" right of the previous thermocouple. |
| E219 | On the back of the JB, 12" right of the previous thermocouple. |
| E220 | On the back of the JB, 12" right of the previous thermocouple. |
| E221 | On the back of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
| E222 | On the back of the JB, 6" right of and 30" above the lower left corner. |
| E223 | On the back of the JB, 12" right of the previous thermocouple. |
| E224 | On the back of the JB, 12" right of the previous thermocouple. |
| E225 | On the back of the JB, 12" right of the previous thermocouple. |
| E226 | On the back of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
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THEMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

NOTE:

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Project #: 97258

Test Deck #: 5

Item: Large Steel Junction Box

Interior Surface

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E227 | On the top of the JB, 6" right of and 18" away from the lower left corner. |
| E228 | On the top of the JB, 12" right of the previous thermocouple. |
| E229 | On the top of the JB, 12" right of the previous thermocouple. |
| E230 | On the top of the JB, 12" right of the previous thermocouple. |
| E231 | On the top of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
| E232 | On the top of the JB, 6" right of and 6" away from the lower left corner. |
| E233 | On the top of the JB, 12" right of the previous thermocouple. |
| E234 | On the top of the JB, 12" right of the previous thermocouple. |
| E235 | On the top of the JB, 12" right of the previous thermocouple. |
| E236 | On the top of the JB, 12" right of the previous thermocouple, 6" from right side of JB. |
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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. 97258

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 #: 97258

Test Deck #: 5

Item: Large Steel Junction Box

Interior Surface

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| E237 | On the left side of the JB, 6" above of and 18" away from the lower left corner. |
| E238 | On the left side of the JB, 12" above the previous thermocouple. |
| E239 | On the left side of the JB, 12" above the previous thermocouple, 6" below the top of the JB. |
| E240 | On the left side of the JB, 6" above of and 6" away from the lower left corner. |
| E241 | On the left side of the JB, 12" above the previous thermocouple. |
| E242 | On the left side of the JB, 12" above the previous thermocouple, 6" below the top of the JB. |
| E243 | On the right side of the JB, 6" above of and 18" away from the lower left corner. |
| E244 | On the right side of the JB, 12" above the previous thermocouple. |
| E245 | On the right side of the JB, 12" above the previous thermocouple, 6" below the top of the JB. |
| E246 | On the right side of the JB, 6" above of and 6" away from the lower left corner. |
| E247 | On the right side of the JB, 12" above the previous thermocouple. |
| E248 | On the right side of the JB, 12" above the previous thermocouple, 6" below the top of the JB. |
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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. 97258

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 #: 97258

Test Deck #: 5

Item: 2" Aluminum Conduit Bare #8
Top Conduit in Upper Array
 (viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| C249 | On bare #8 inside conduit, 1" right of capped end of conduit. |
| C250 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C3251 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C252 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C253 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C254 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C255 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C256 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C257 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C258 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C259 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C260 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C261 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C262 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C263 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C264 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C265 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C266 | On bare #8 inside conduit, 6" right of previous thermocouple. |
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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. 97258

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 #: 97258
Test Deck #: 5
Item: 2-1/2" Aluminum Conduit Bare #8
Second From Top in Upper Array
(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| C267 | On bare #8 inside conduit, 1" right of capped end of conduit. |
| C268 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C269 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C270 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C271 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C272 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C273 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C274 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C275 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C276 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C277 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C278 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C279 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C280 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C281 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C282 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C283 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C284 | On bare #8 inside conduit, 6" right of previous thermocouple. |
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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. 97258

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 #: 97258
Test Deck #: 5
Item: 2" Aluminum Conduit Bare #8
Third From Top in Upper Array
(viewed from fireside)

Table with 2 columns: TC Number and Description of exact physical location. Rows include TC numbers C285 through C302 with descriptions like 'On bare #8 inside conduit, 1" right of capped end of conduit.'

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

TERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

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 #: 97258
Test Deck #: 5
Item: 3" Aluminum Conduit Bare #8
Fourth From Top in Upper Array
(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| C303 | On bare #8 inside conduit, 1" right of capped end of conduit. |
| C304 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C305 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C306 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C307 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C308 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C309 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C310 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C311 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C312 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C313 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C314 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C315 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C316 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C317 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C318 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C319 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C320 | On bare #8 inside conduit, 6" right of previous thermocouple. |
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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

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 #: 97258
 Test Deck #: 5
 Item: 2" Aluminum Conduit Bare #8
Fifth From Top in Upper Array
 (viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| C321 | On bare #8 inside conduit, 1" right of capped end of conduit. |
| C322 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C323 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C324 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C325 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C326 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C327 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C328 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C329 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C330 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C331 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C332 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C333 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C334 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C335 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C336 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C337 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C338 | On bare #8 inside conduit, 6" right of previous thermocouple. |
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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

NOTE:

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Project #: 97258

Test Deck #: 5

Item: 2" Aluminum Conduit Bare #8

Sixth From Top in Upper Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| C339 | On bare #8 inside conduit, 1" right of capped end of conduit. |
| C340 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C341 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C342 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C343 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C344 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C345 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C346 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C347 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C348 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C349 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C350 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C351 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C352 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C353 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C354 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C355 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C356 | On bare #8 inside conduit, 6" right of previous thermocouple. |
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THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

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 #: 97258
 Test Deck #: 5
 Item: 2" Aluminum Conduit Bare #8
Bottom Conduit in Upper Array
 (viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| C357 | On bare #8 inside conduit, 1" right of capped end of conduit. |
| C358 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C359 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C360 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C361 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C362 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C363 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C364 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C365 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C366 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C367 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C368 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C369 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C370 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C371 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C372 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C373 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C374 | On bare #8 inside conduit, 6" right of previous thermocouple. |
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PLEASE USE THE BACK OF THIS SHEET FOR DRAWINGS, IF NECESSARY

THERMOCOUPLE PLACEMENT LOG - PROJECT NO. 97258

NOTE:
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Project #: 97258

Test Deck #: 5

Item: 1" Steel Conduit Bare #8
Top Conduit in Middle Array
 (viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| C375 | On bare #8 inside conduit, 1" right of capped end of conduit. |
| C376 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C377 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C378 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C379 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C380 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C381 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C382 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C383 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C384 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C385 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C386 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C387 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C388 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C389 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C390 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C391 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C392 | On bare #8 inside conduit, 6" right of previous thermocouple. |
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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. 97258

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 #: 97258

Test Deck #: 5

Item: 1" Steel Conduit Bare #8

Bottom Conduit in Middle Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|---|
| C393 | On bare #8 inside conduit, 1" right of capped end of conduit. |
| C394 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C395 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C396 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C397 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C398 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C399 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C400 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C401 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C402 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C403 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C404 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C405 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C406 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C407 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C408 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C409 | On bare #8 inside conduit, 6" right of previous thermocouple. |
| C410 | On bare #8 inside conduit, 6" right of previous thermocouple. |
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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. 97258

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 #: 97258

Test Deck #: 5

Item: 3" Aluminum Conduit Bare #8

Center Conduit in Lower Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|--|
| C419 | On bare #8 in the conduit, 1" below capped end of conduit. |
| C420 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C421 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C422 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C423 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C424 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C425 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C426 | On bare #8 in the conduit, 6" below previous thermocouple. |
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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. 97258

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 #: 97258

Test Deck #: 5

Item: 3" Aluminum Conduit Bare #8
Right Conduit in Lower Array

(viewed from fireside)

| TC Number | Description of exact physical location |
|-----------|--|
| C427 | On bare #8 in the conduit, 1" below capped end of conduit. |
| C428 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C429 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C430 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C431 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C432 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C433 | On bare #8 in the conduit, 6" below previous thermocouple. |
| C434 | On bare #8 in the conduit, 6" below previous thermocouple. |
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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

Report No. 11960-97258
TVA / Thermal Science, Inc.

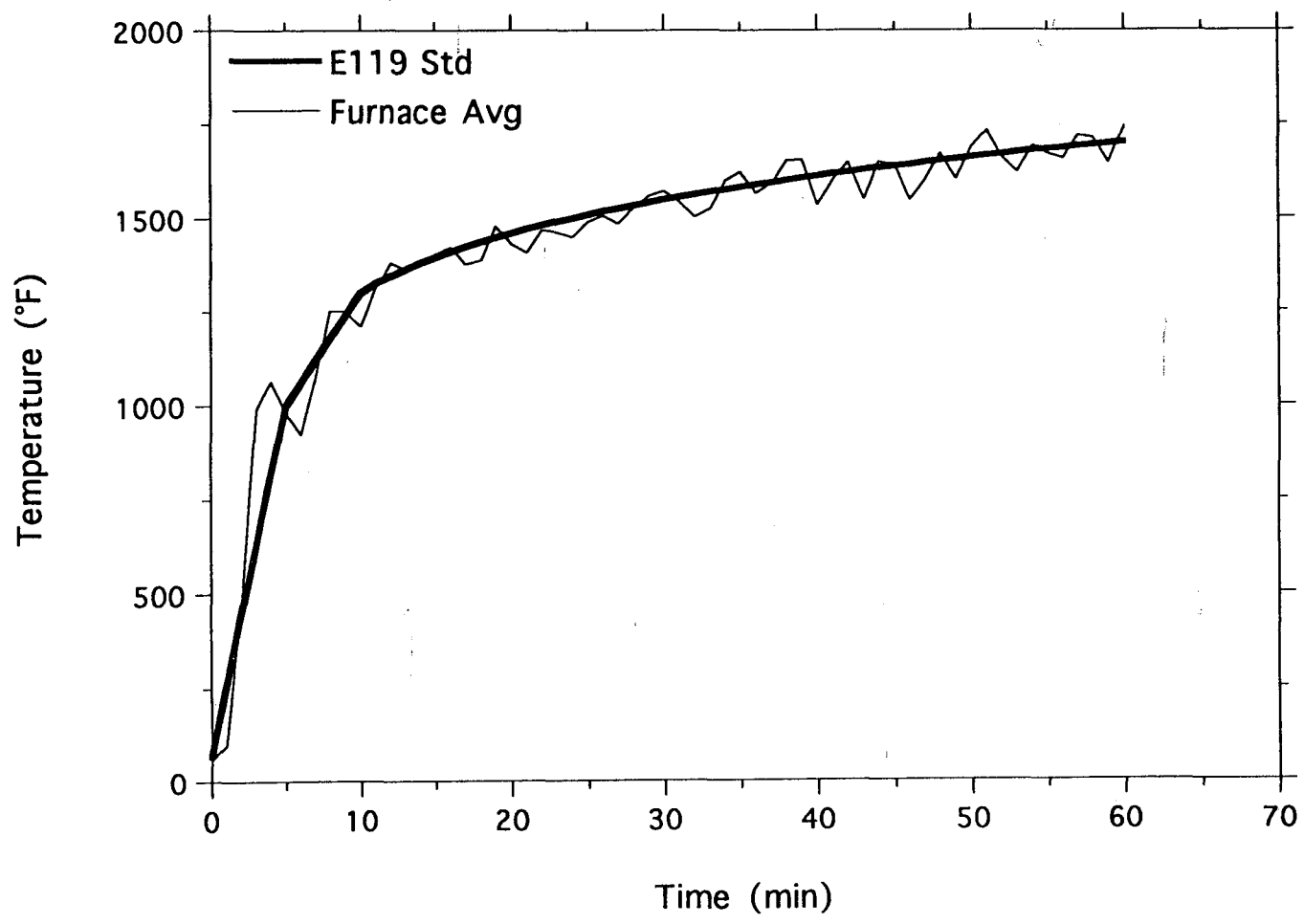
November 23, 1994
APPENDICES

Appendix D
TEST DATA



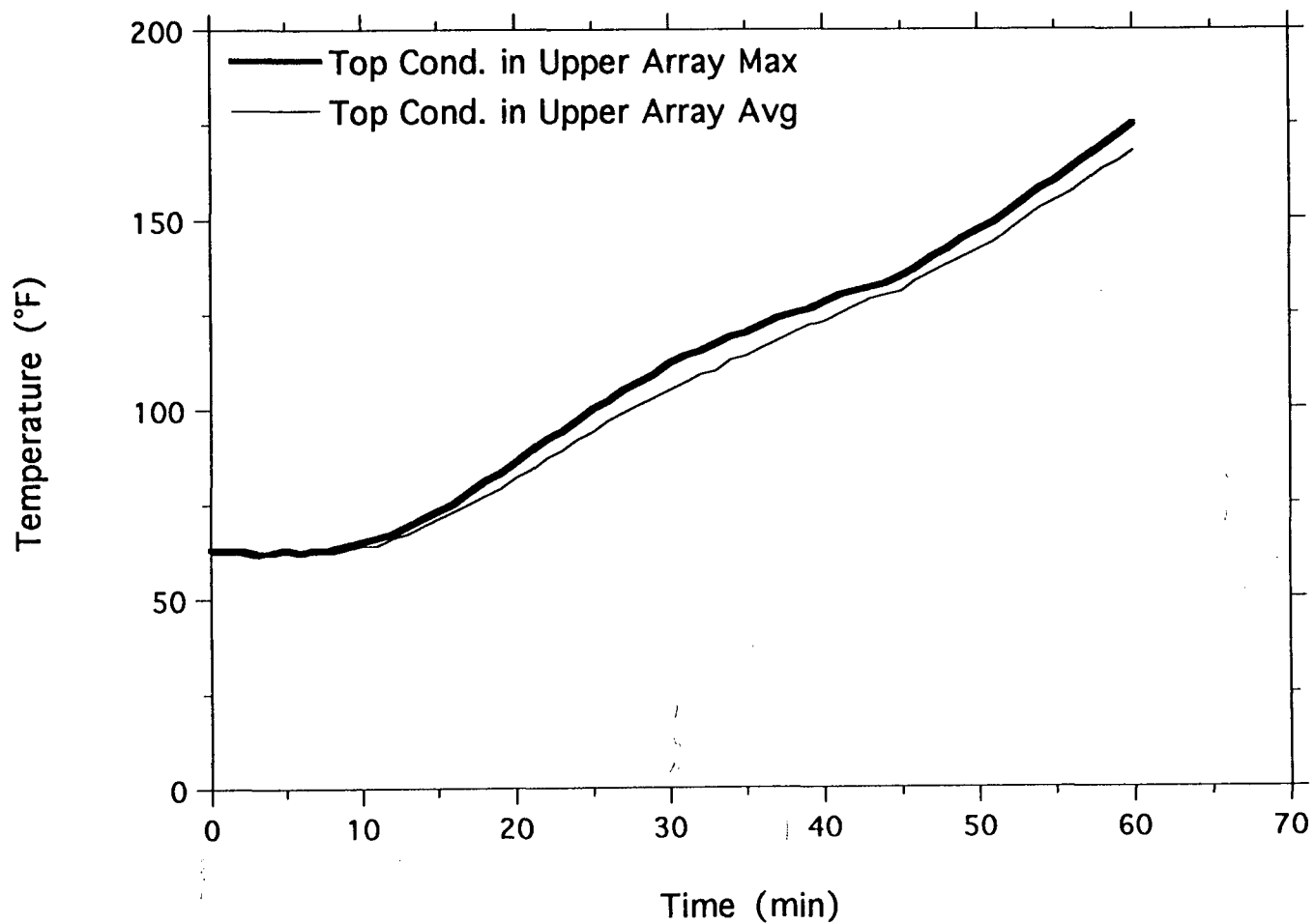
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LABORATORIES

TSI/TVA
Project No. 11960-97258
Furnace Temperature

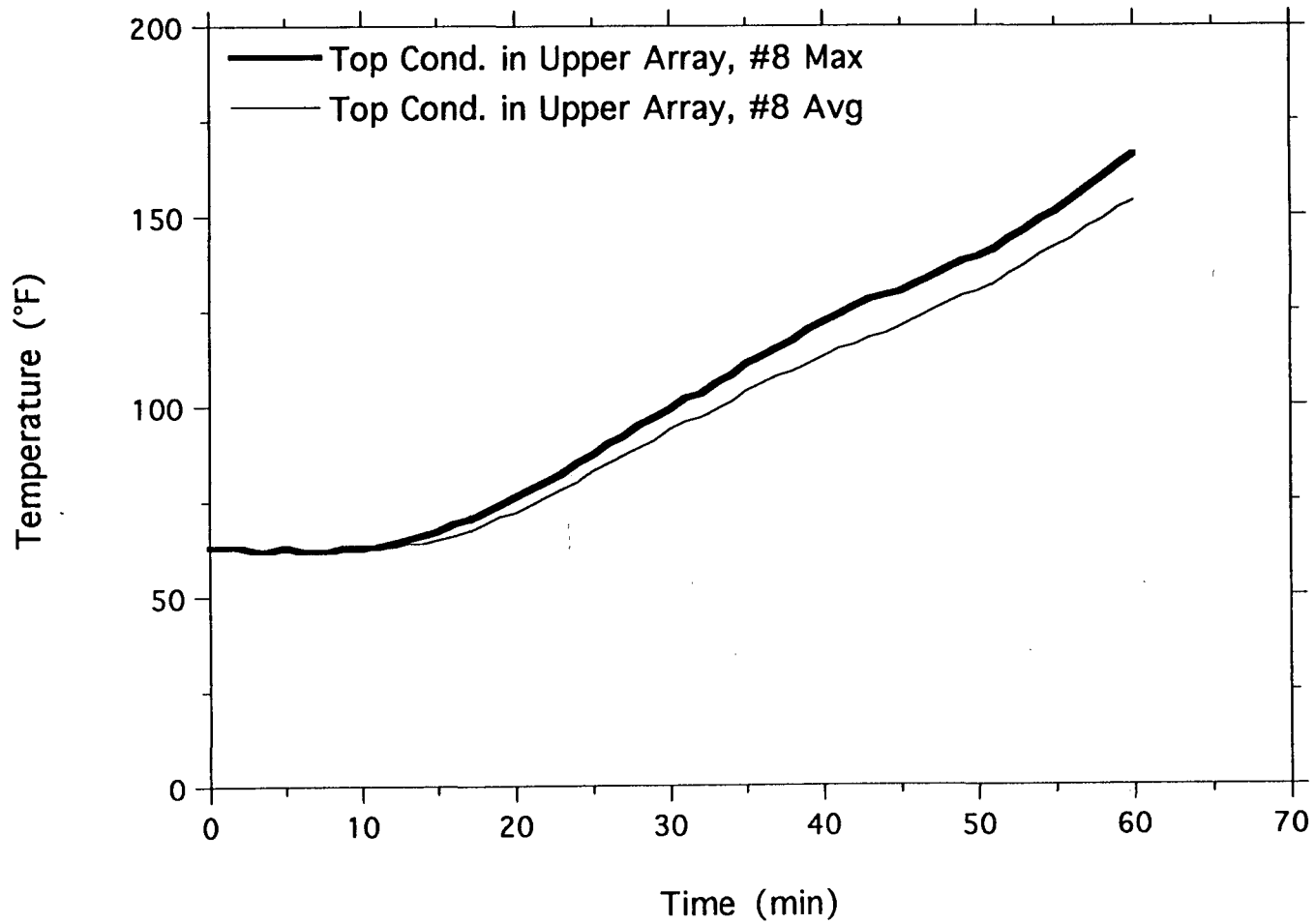


OMEGA POINT
LABORATORIES

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Project No. 11960-97258
Conduit Temperatures



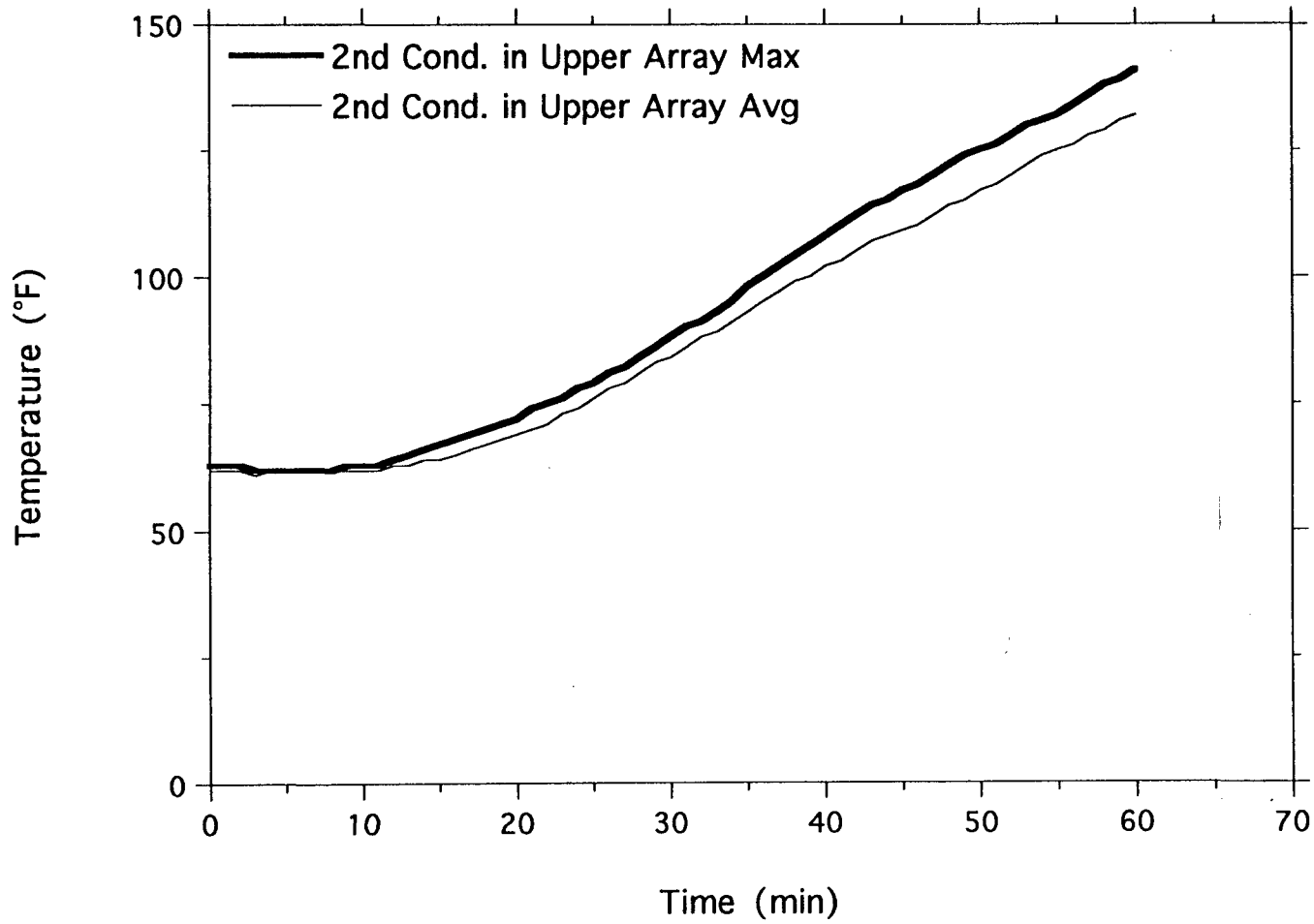
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Conduit Temperatures



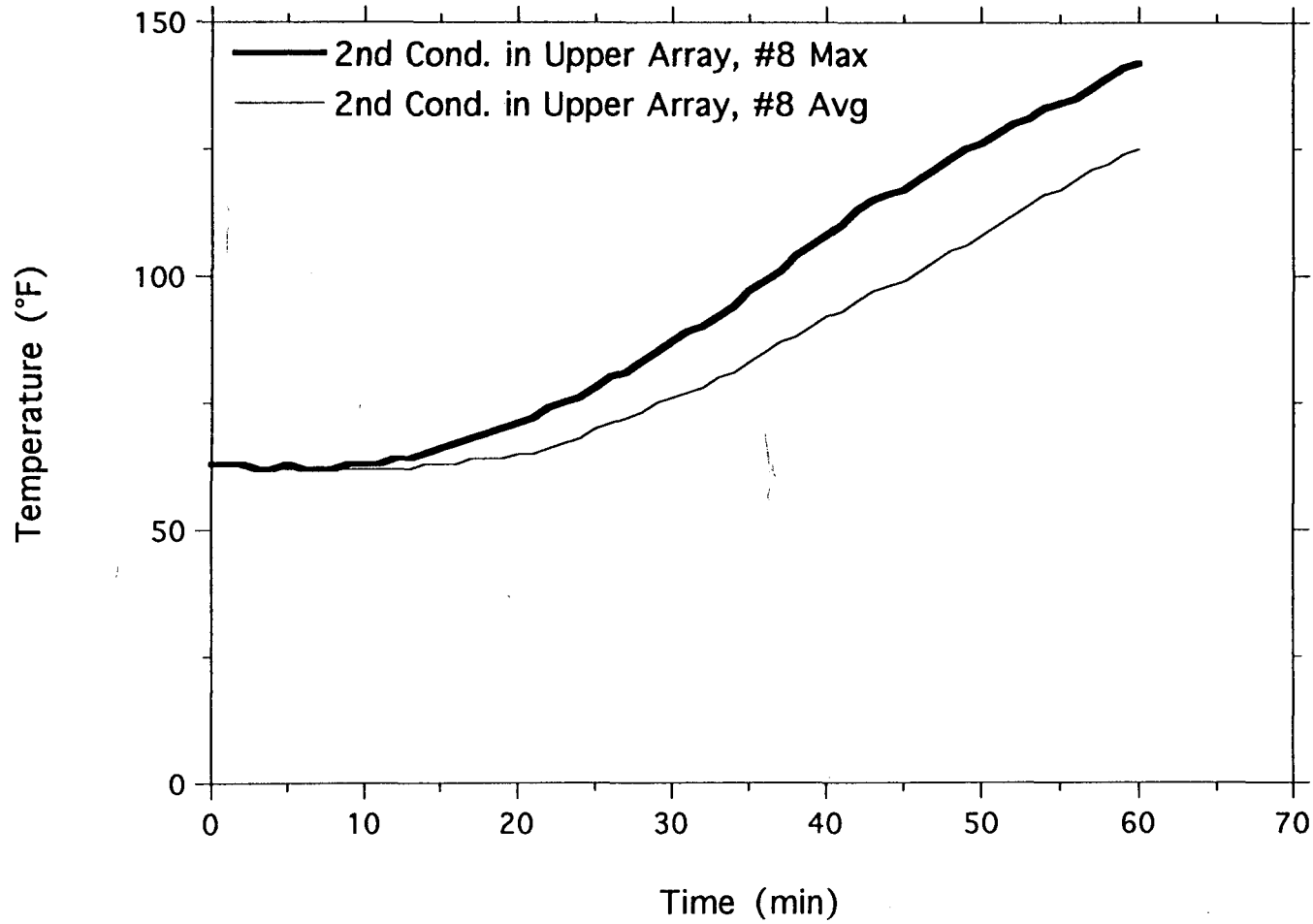
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LABORATORIES

OMEGA POINT
LABORATORIES

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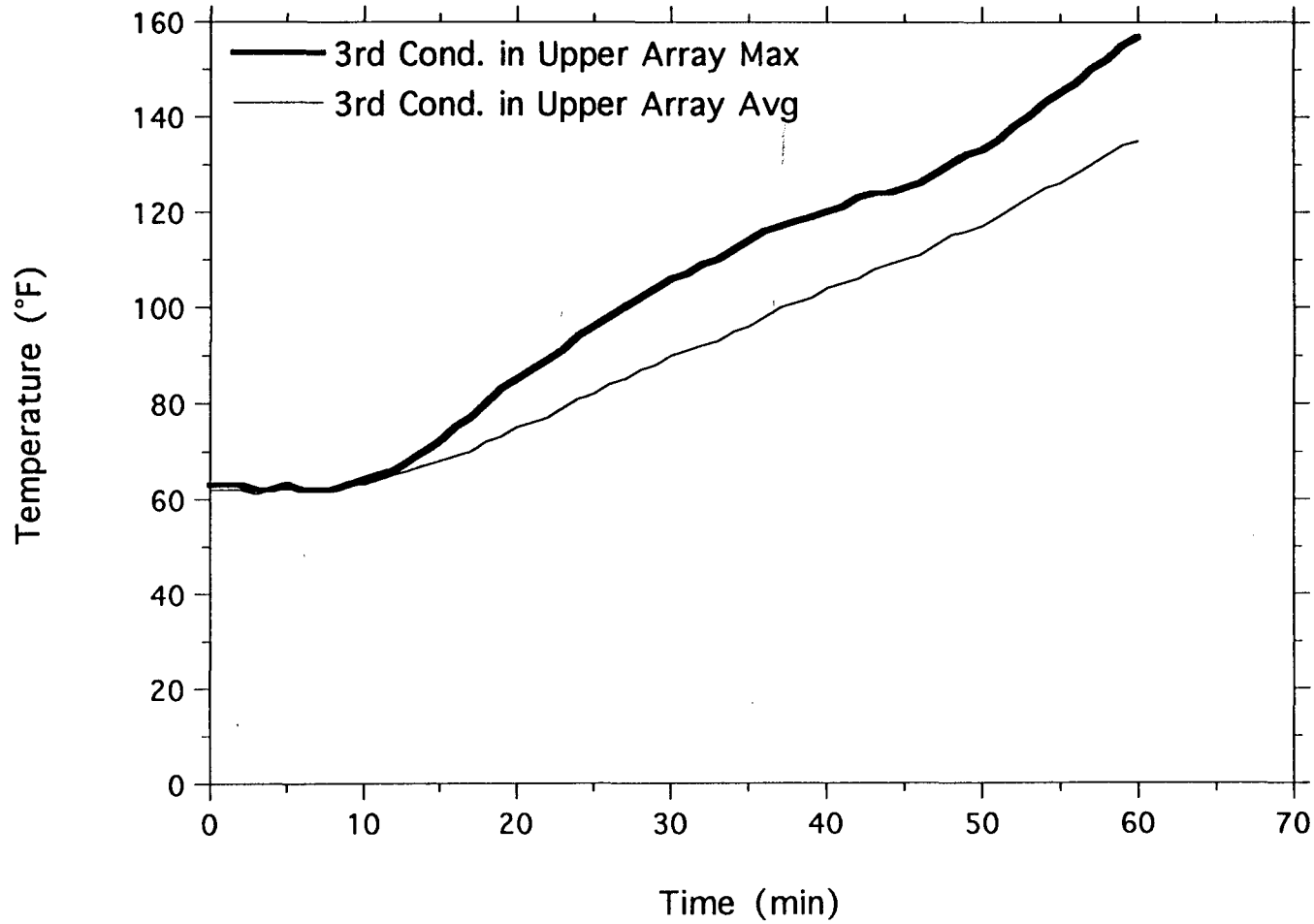


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Conduit Temperatures



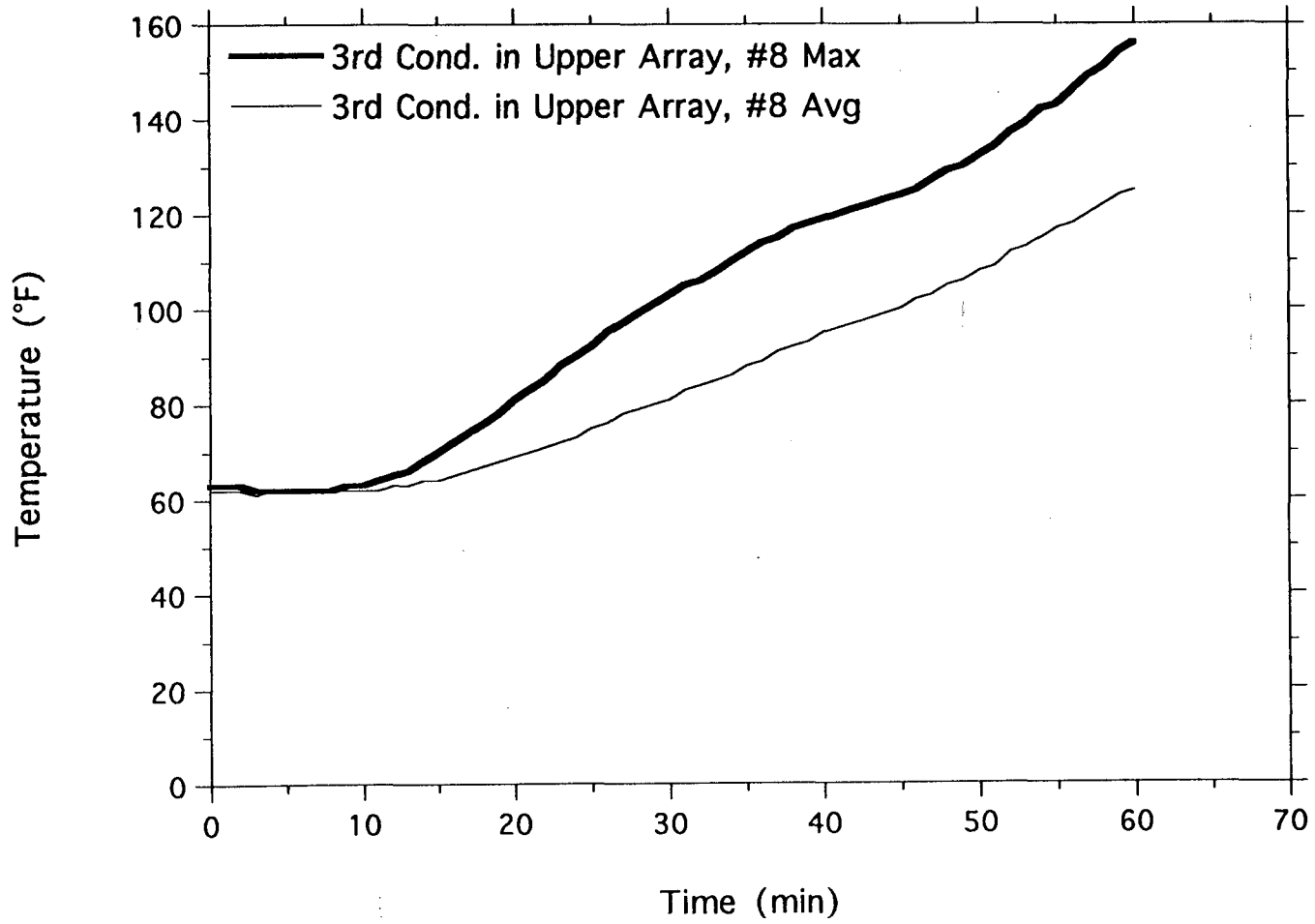
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LABORATORIES

TSI/TVA
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Conduit Temperatures



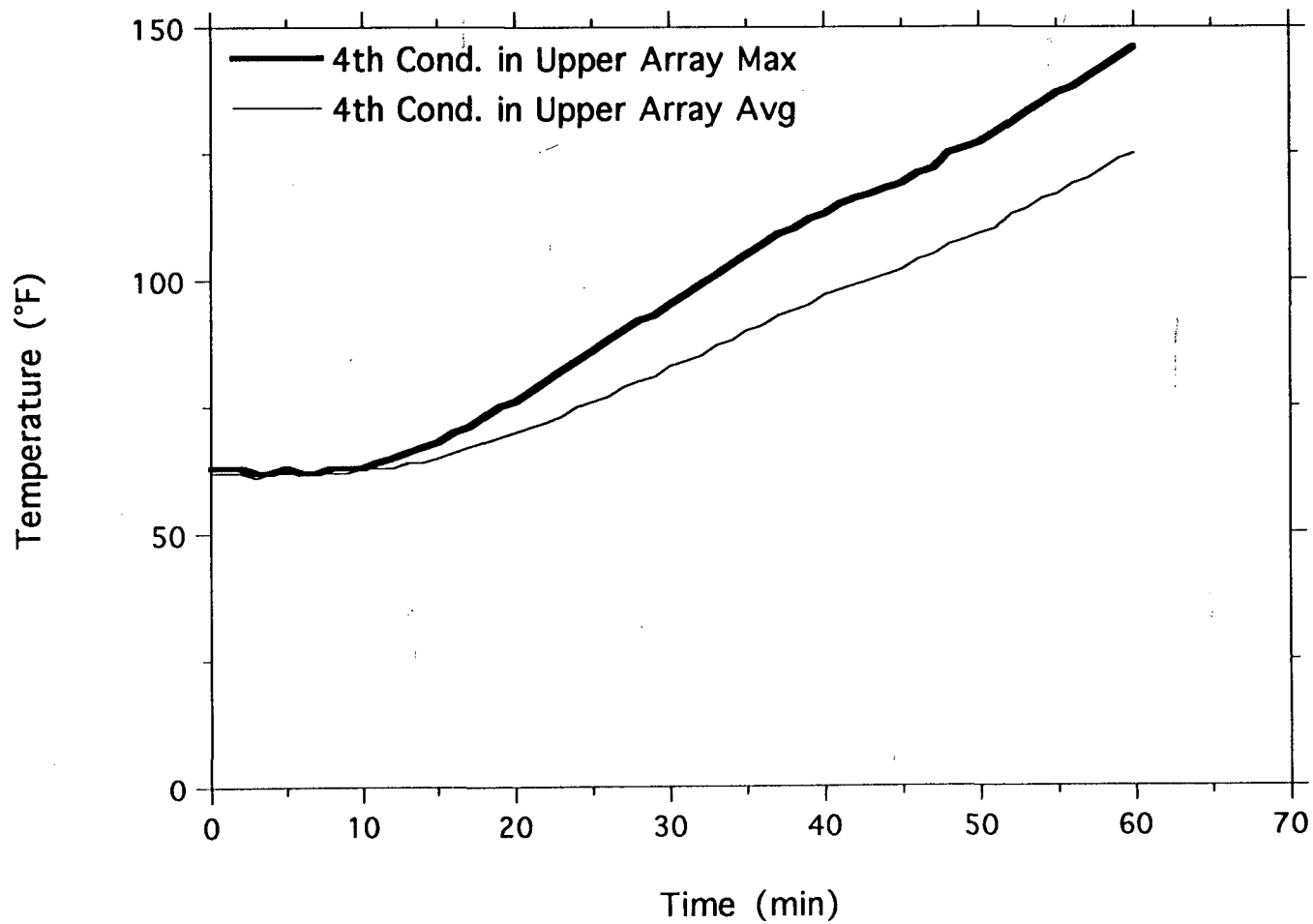
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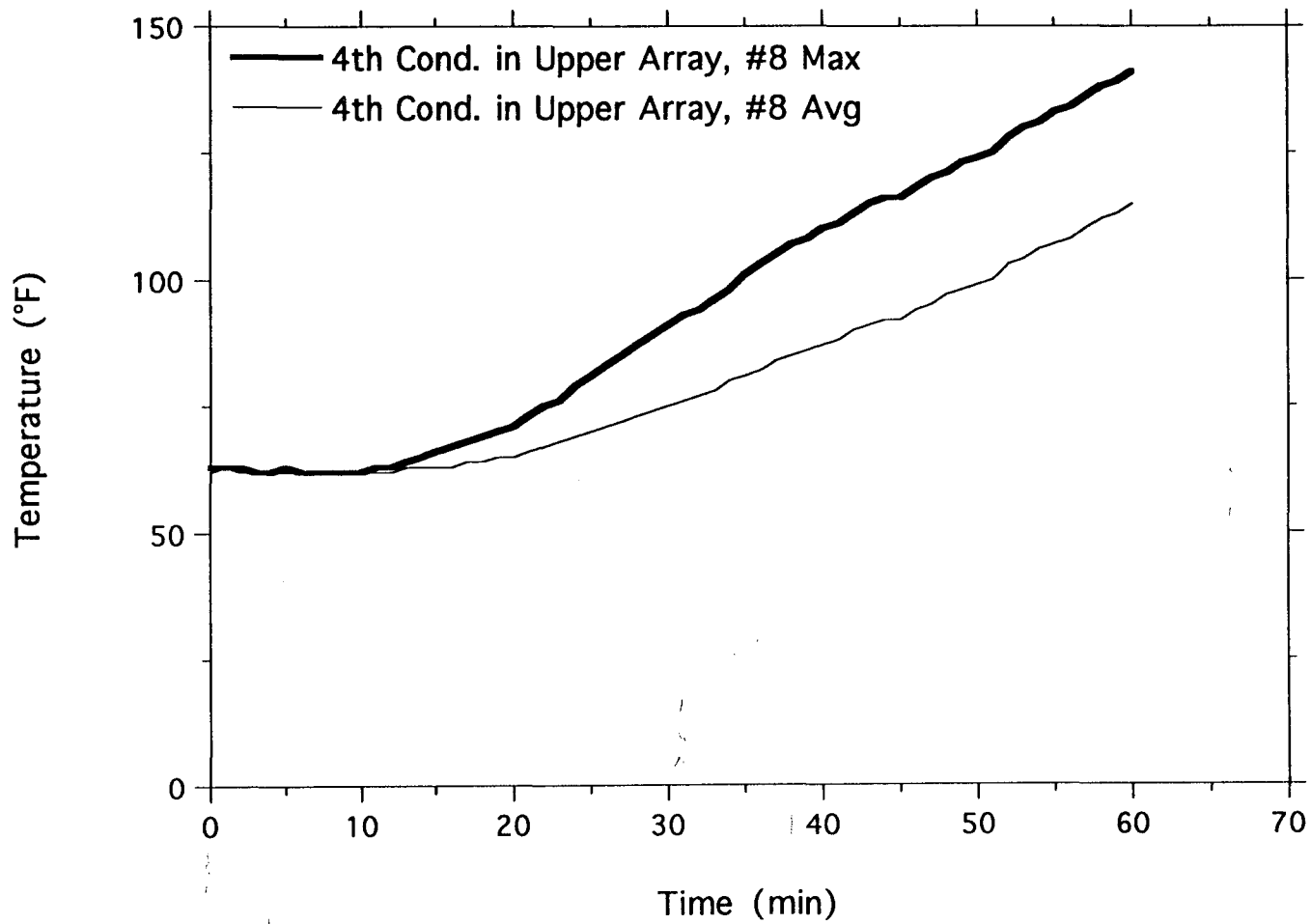
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Conduit Temperatures



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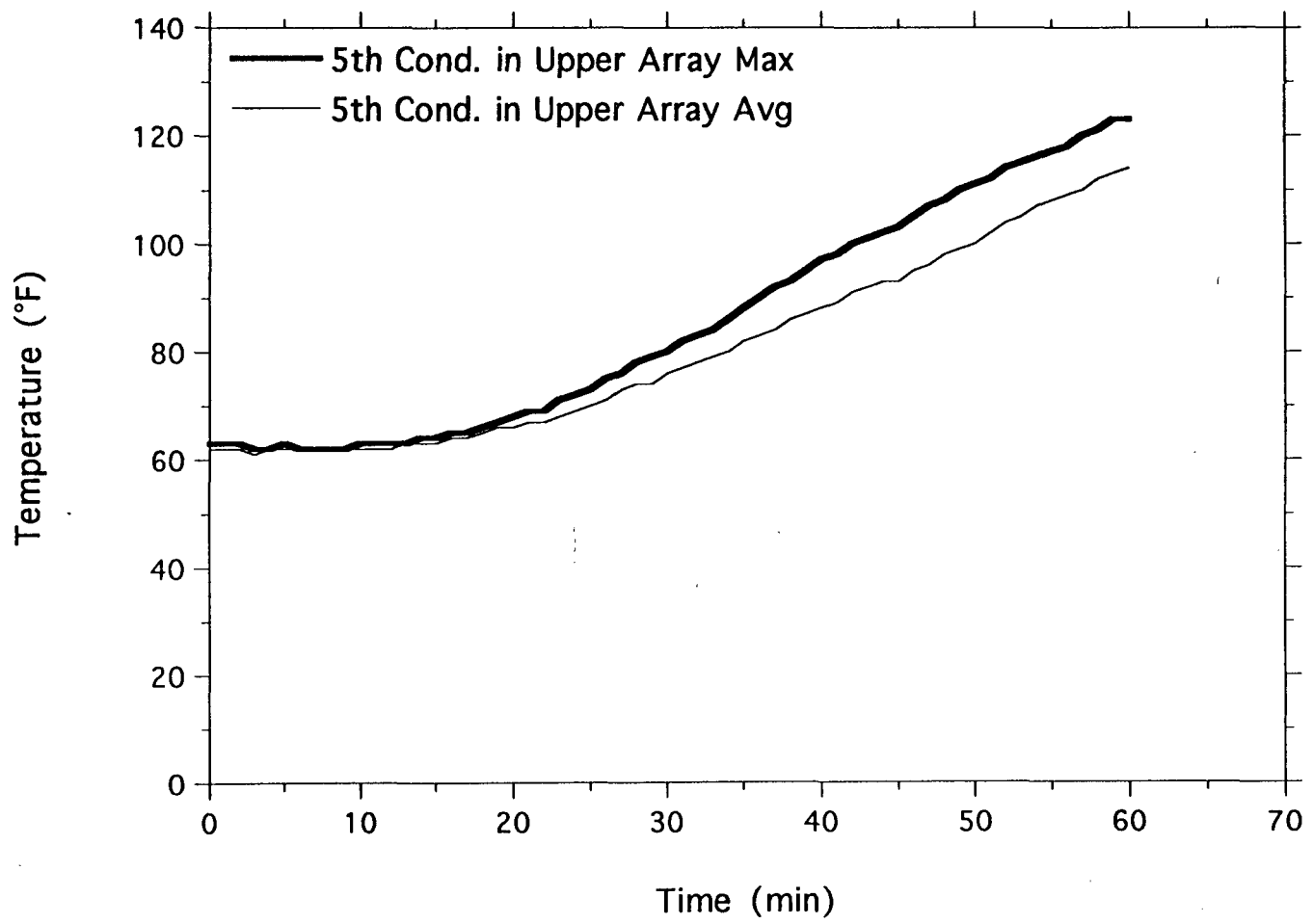
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Project No. 11960-97258
Conduit Temperatures



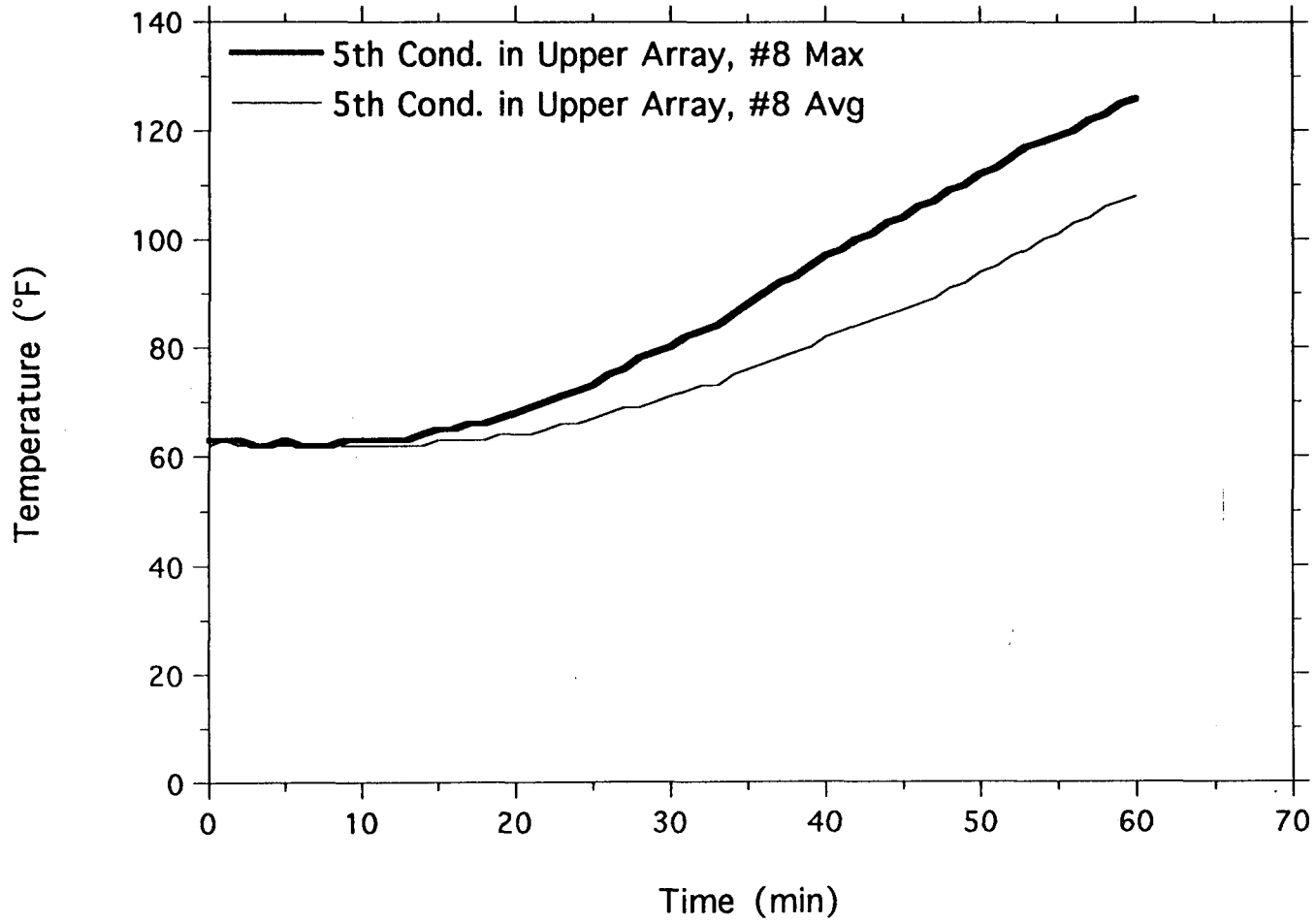
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LABORATORIES

OMEGA POINT
LABORATORIES

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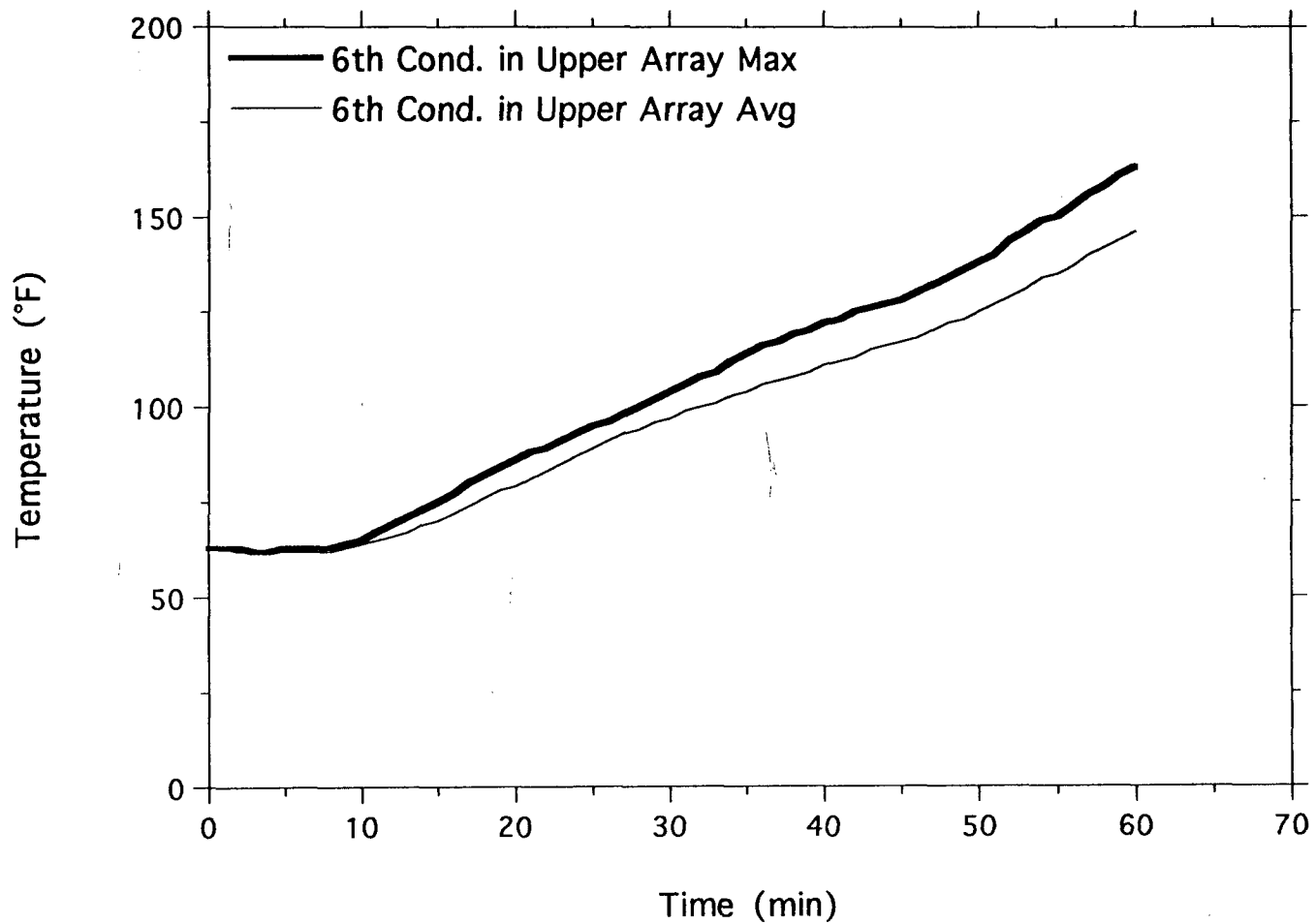


TSI/TVA
Project No. 11960-97258
Conduit Temperatures



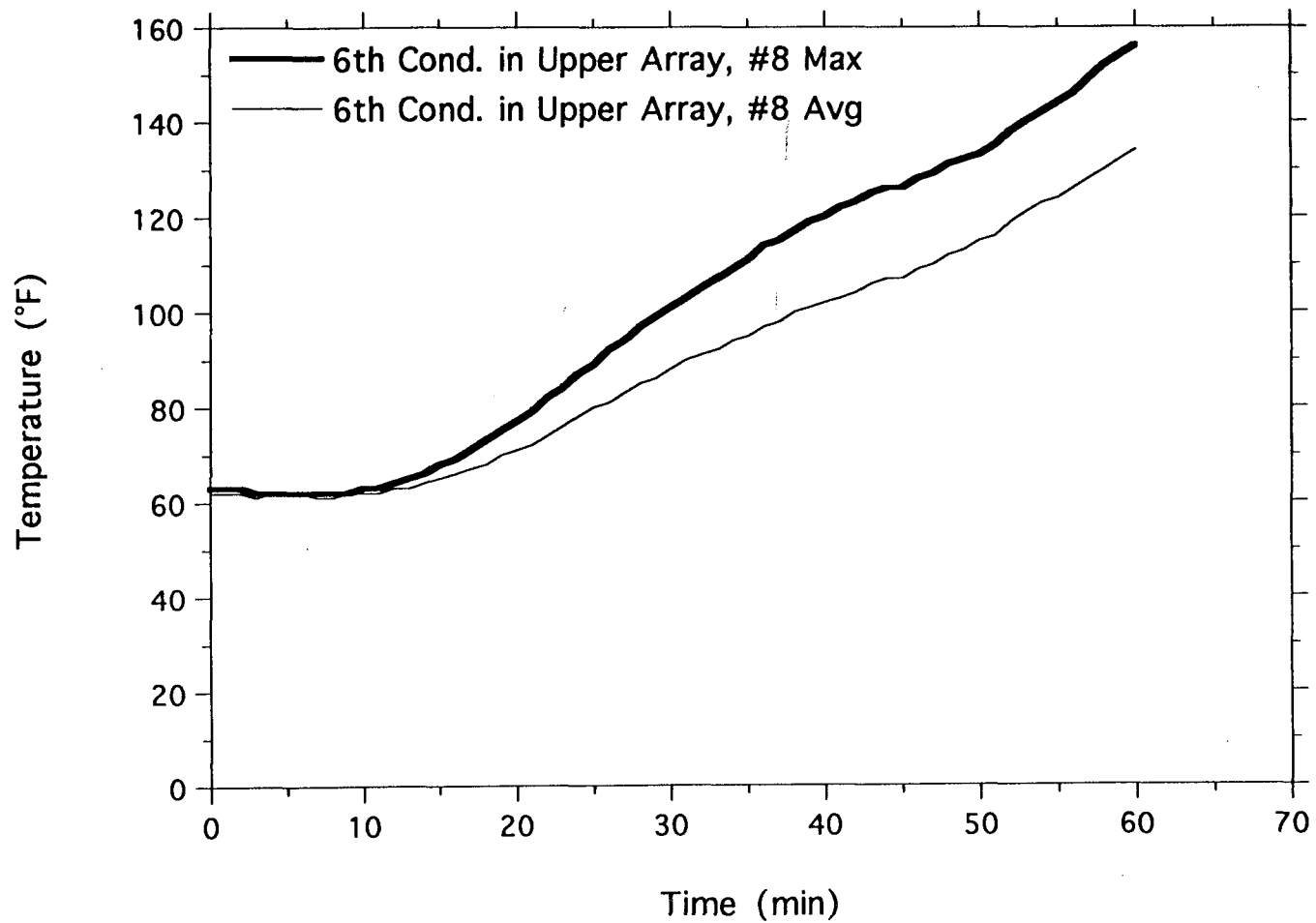
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LABORATORIES

TSI/TVA
Project No. 11960-97258
Conduit Temperatures



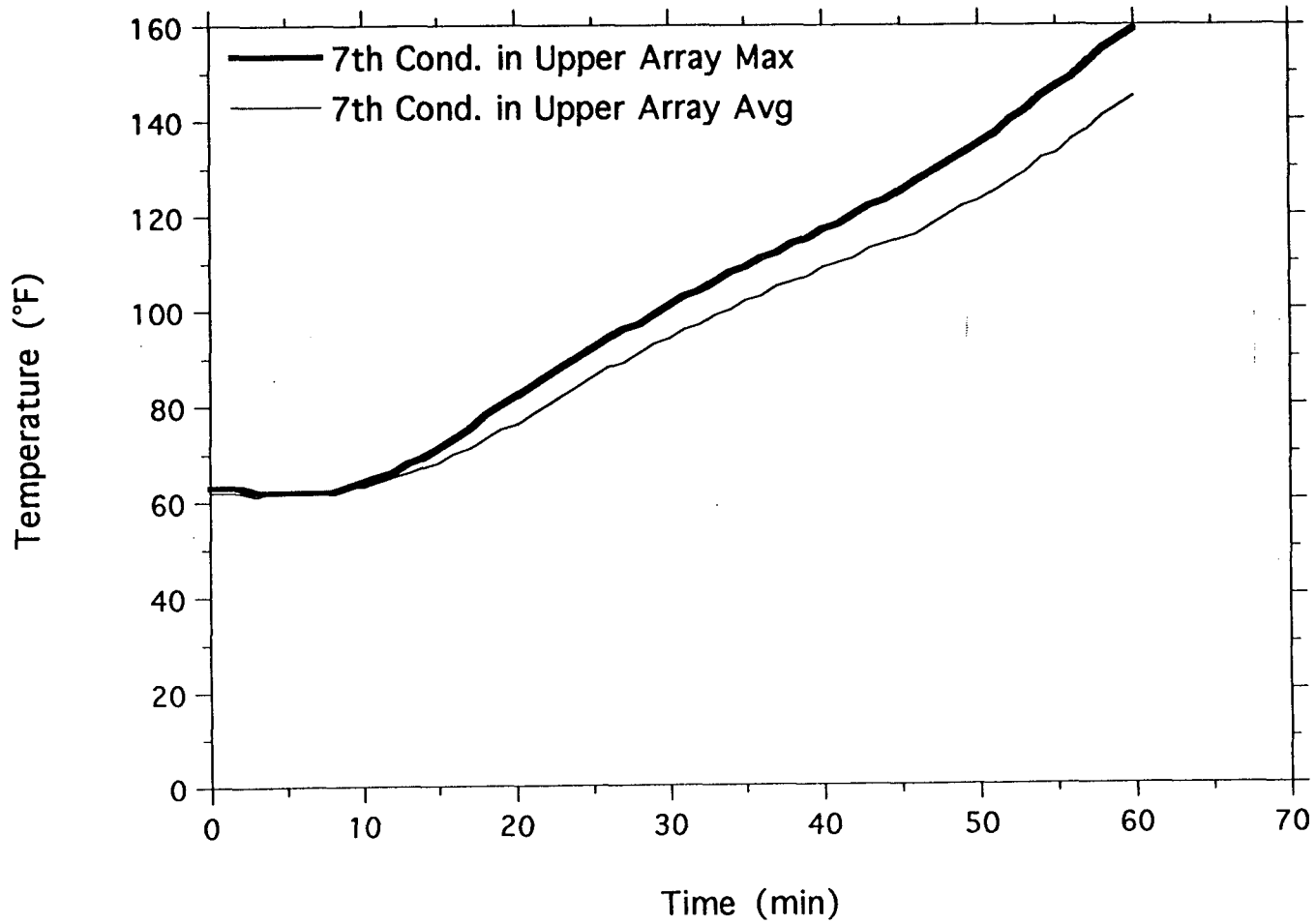
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TSI/TVA
Project No. 11960-97258
Conduit Temperatures



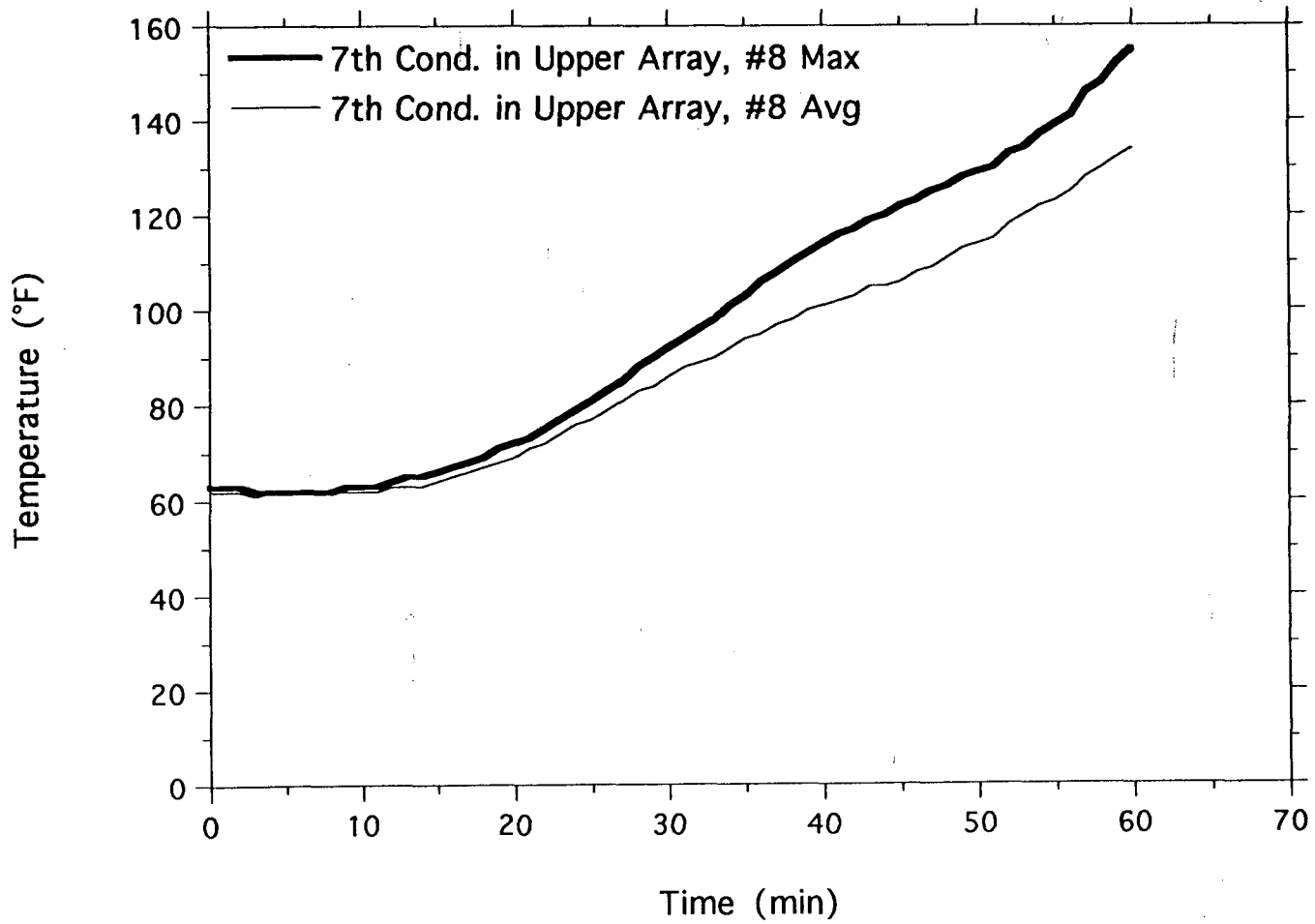
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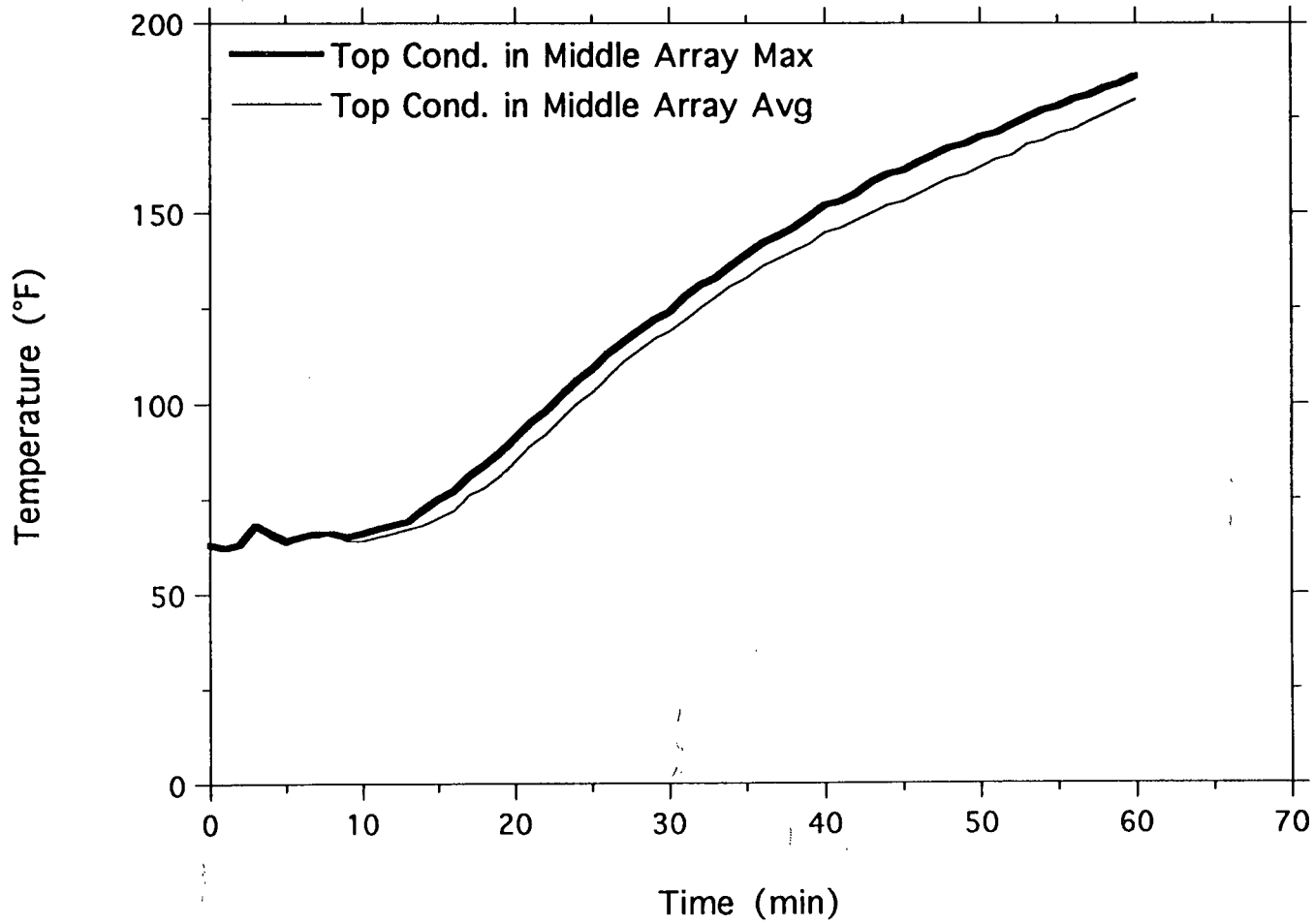
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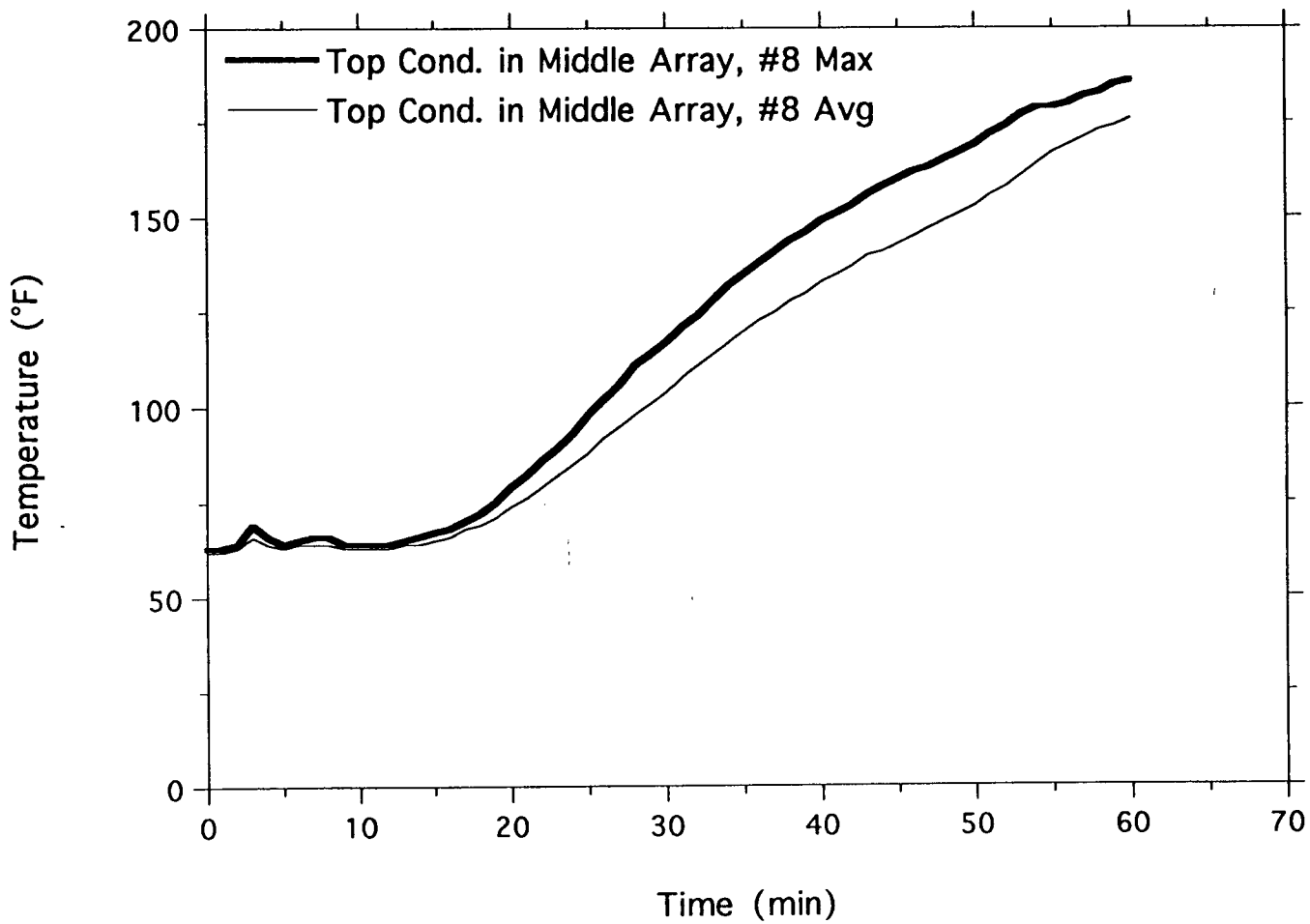
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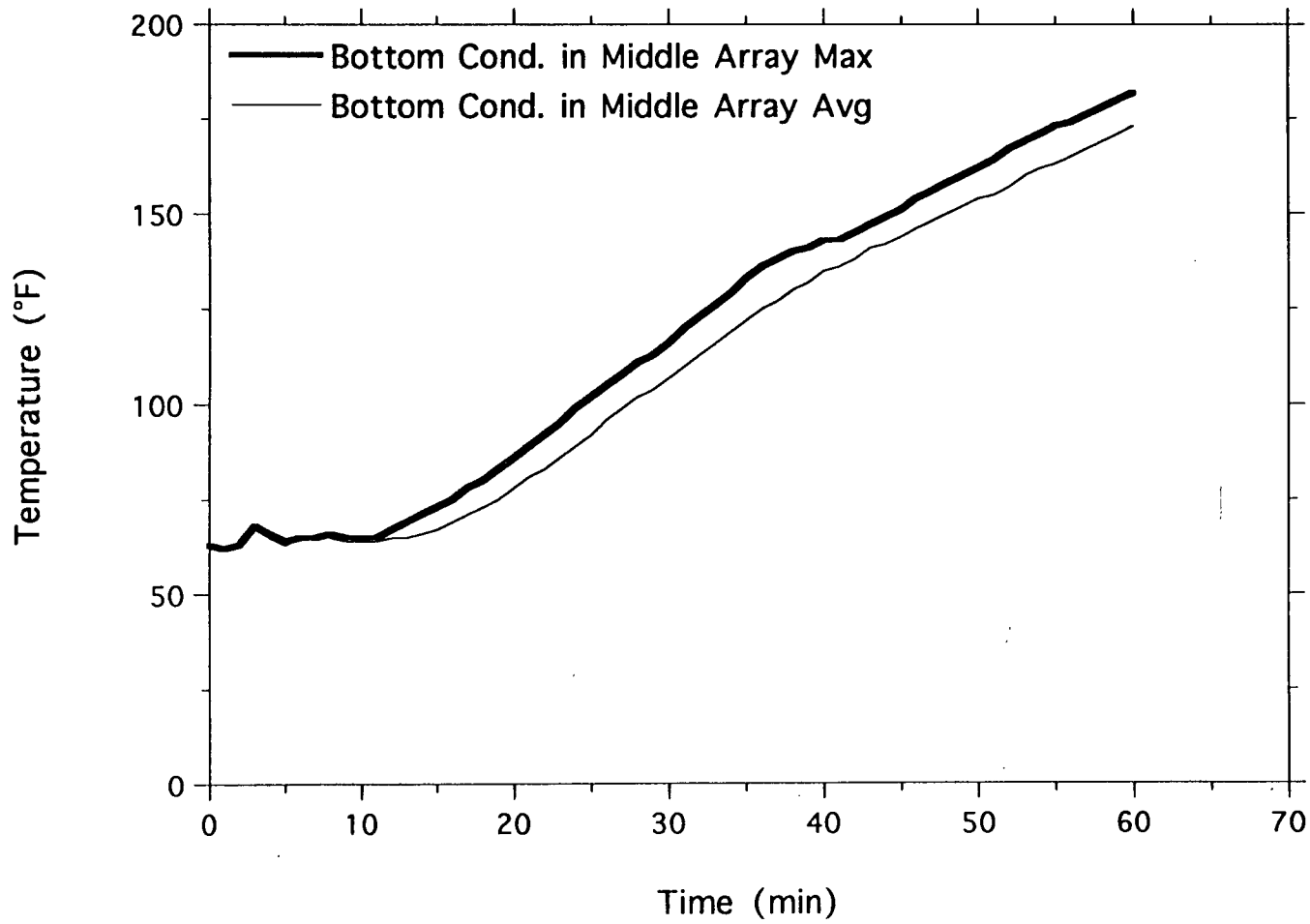
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Conduit Temperatures



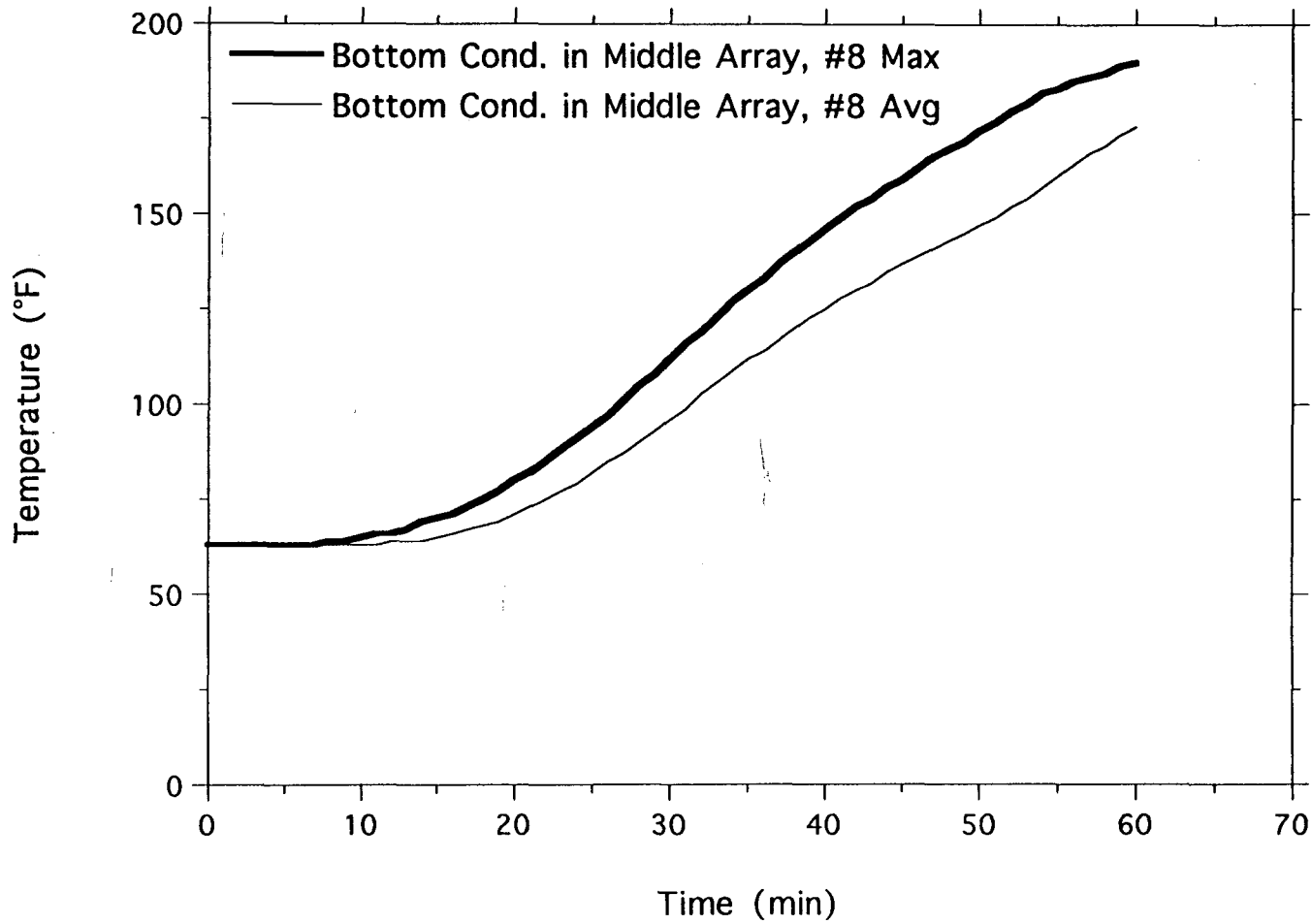
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Conduit Temperatures



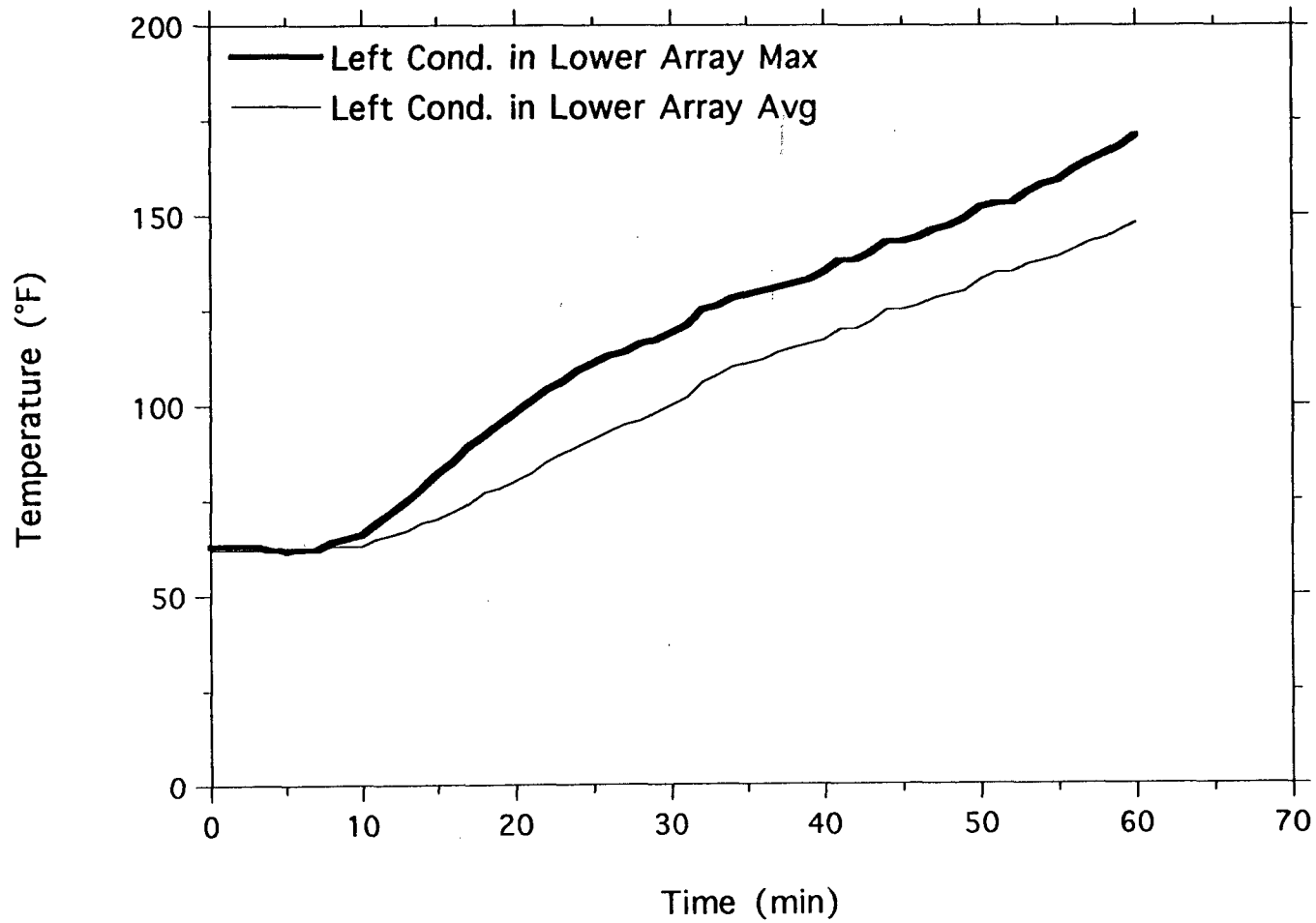
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Conduit Temperatures



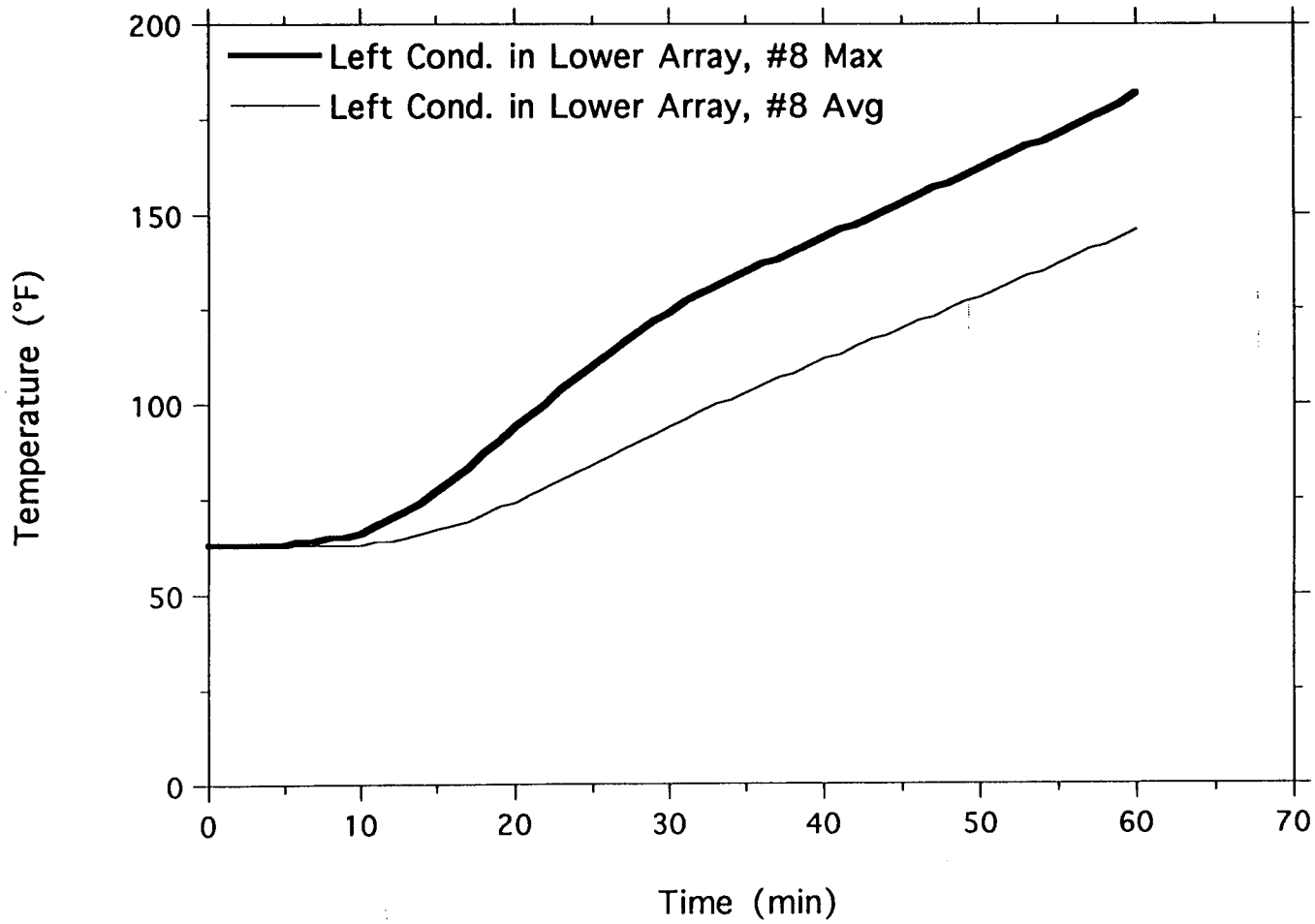
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Conduit Temperatures



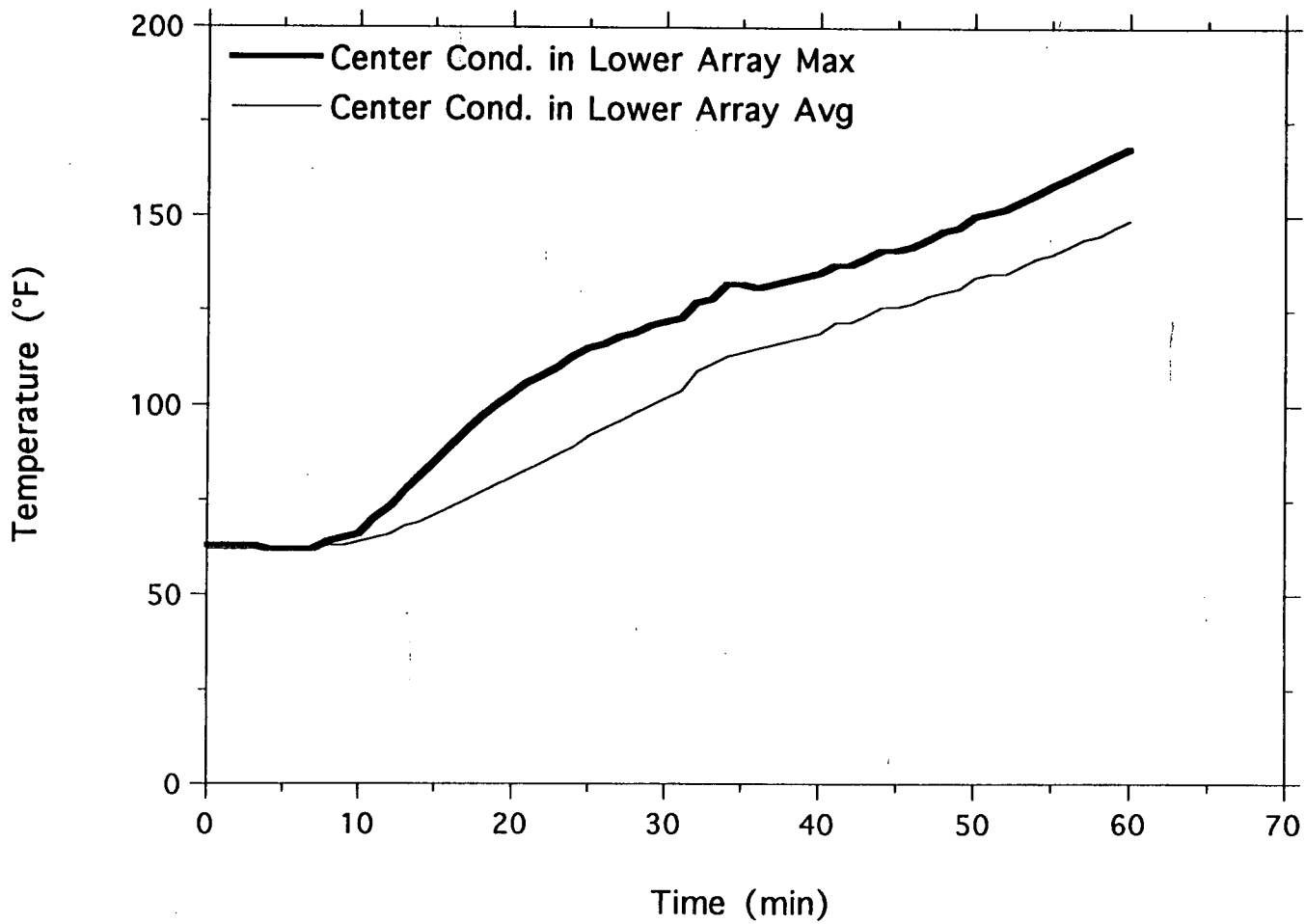
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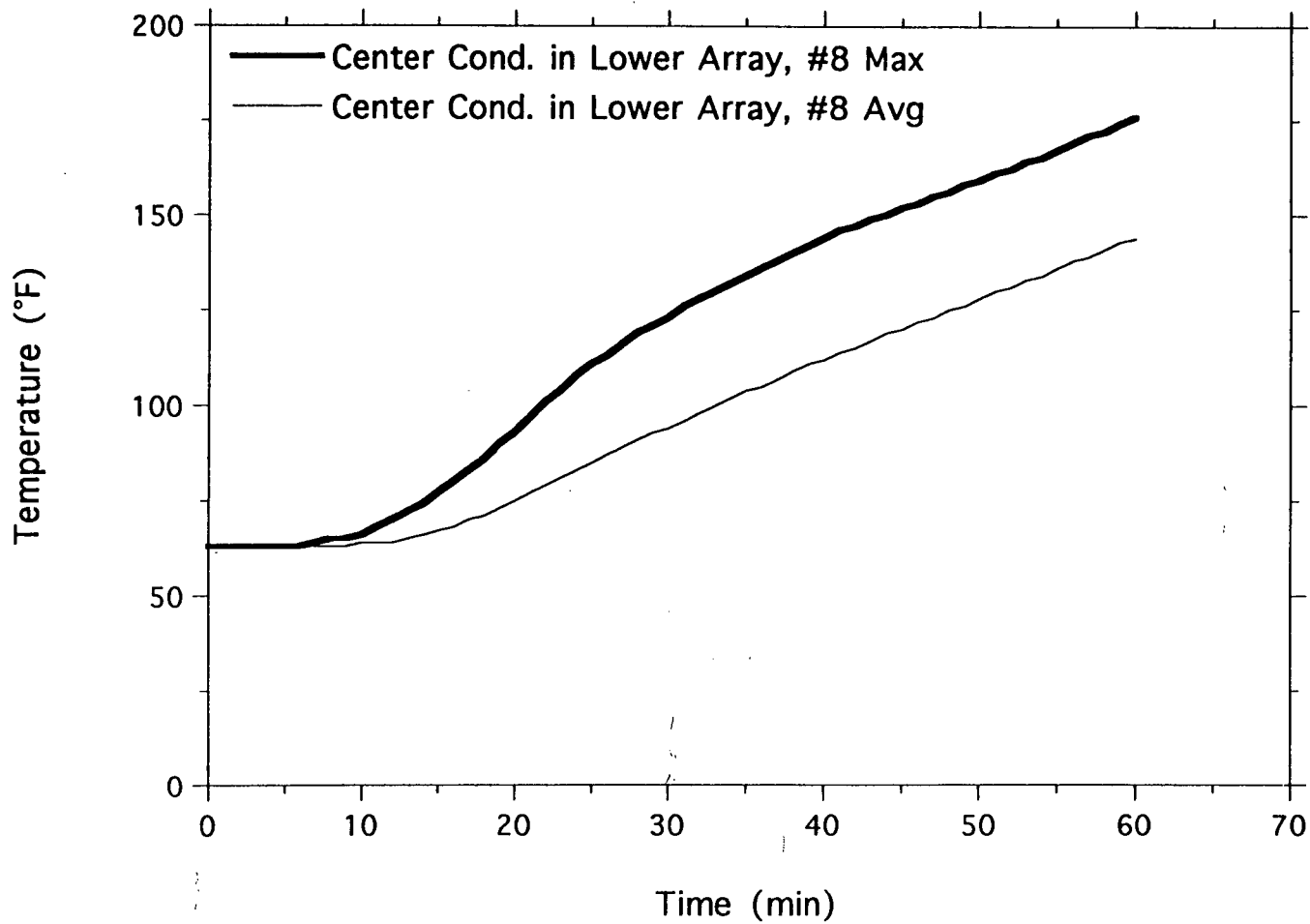
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Conduit Temperatures



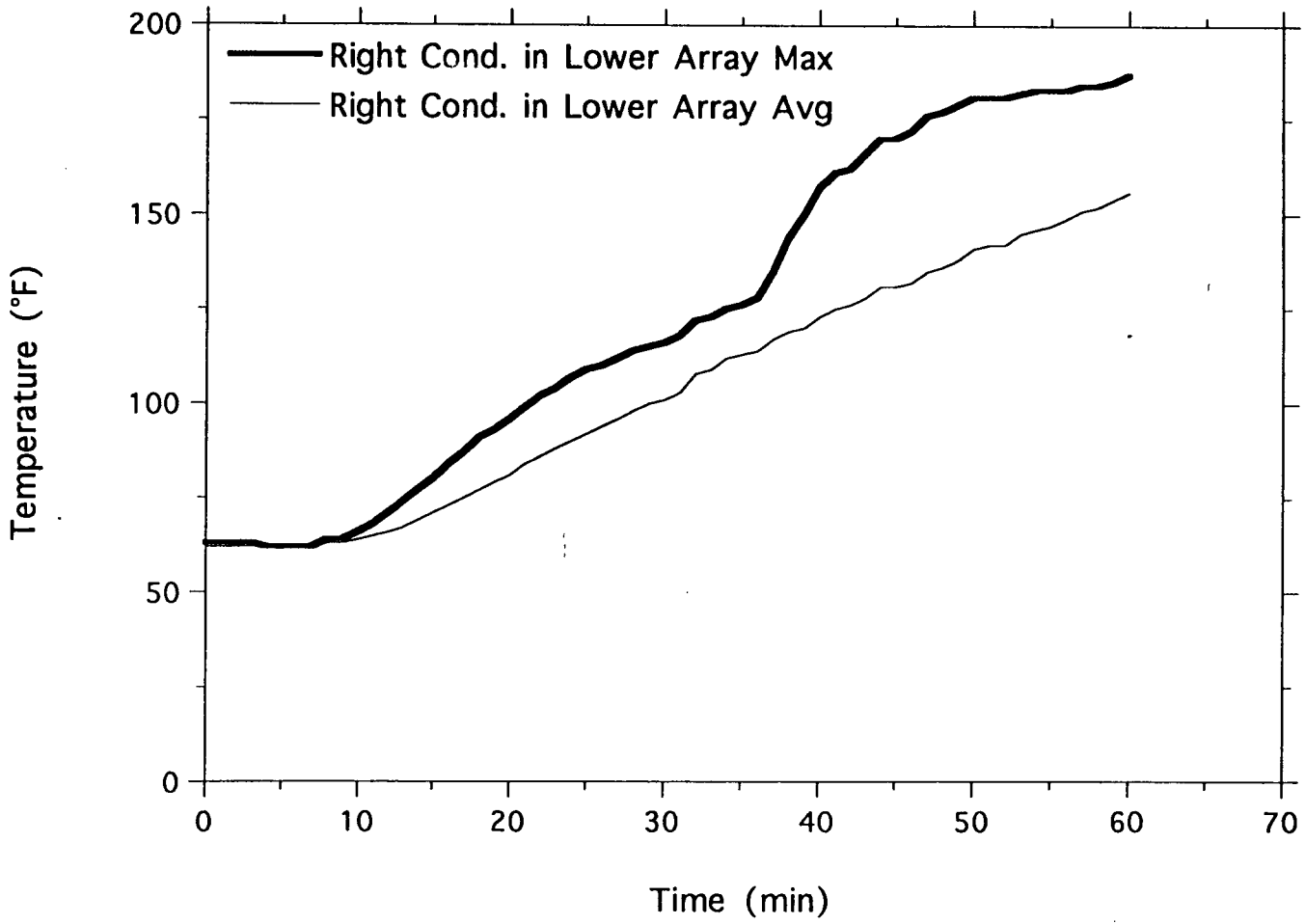
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Conduit Temperatures



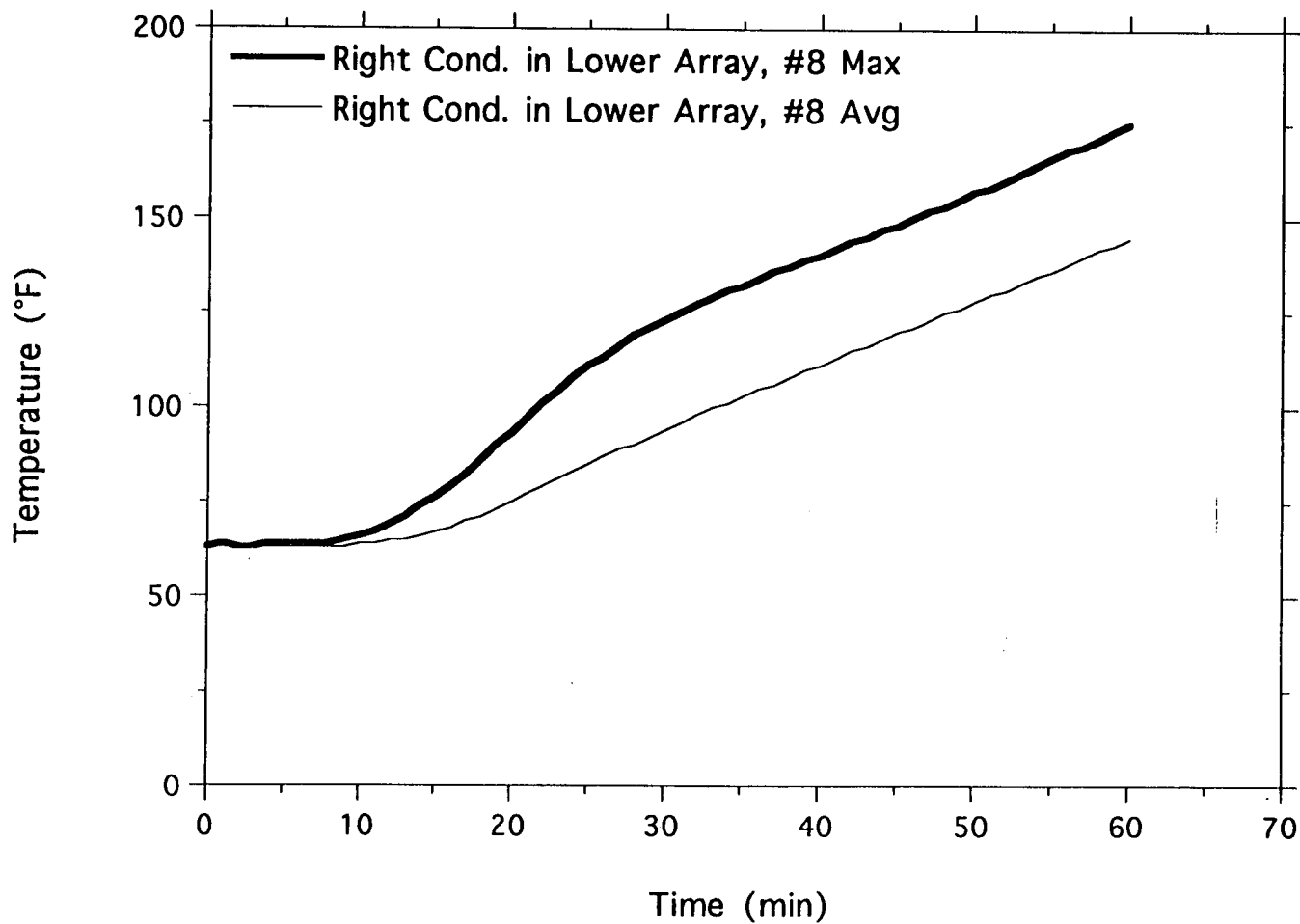
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TSI/TVA
Project No. 11960-97258
Conduit Temperatures



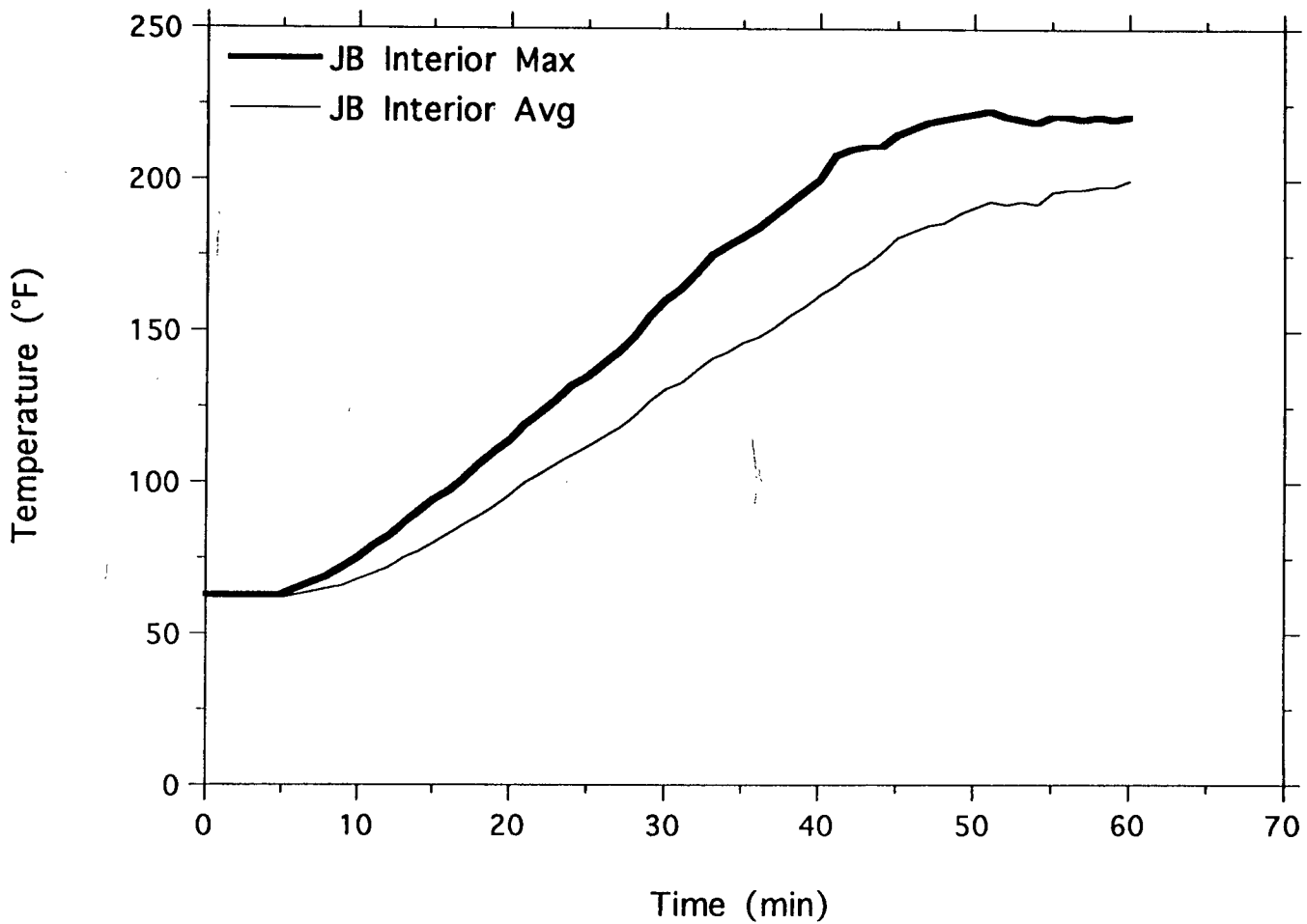
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TSI/TVA
Project No. 11960-97258
Conduit Temperatures



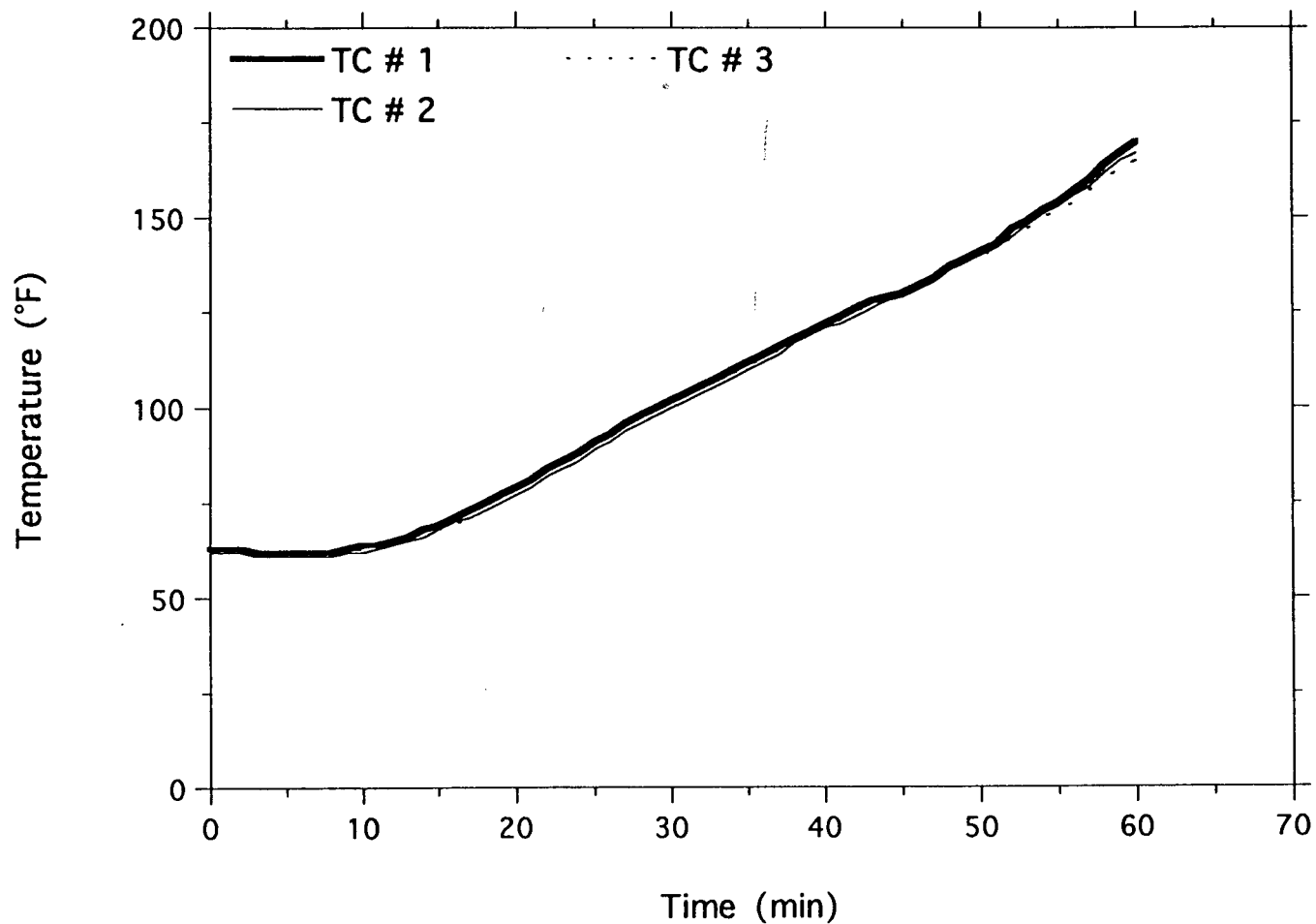
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TSI/TVA
Project No. 11960-97258
Junction Box Temperatures



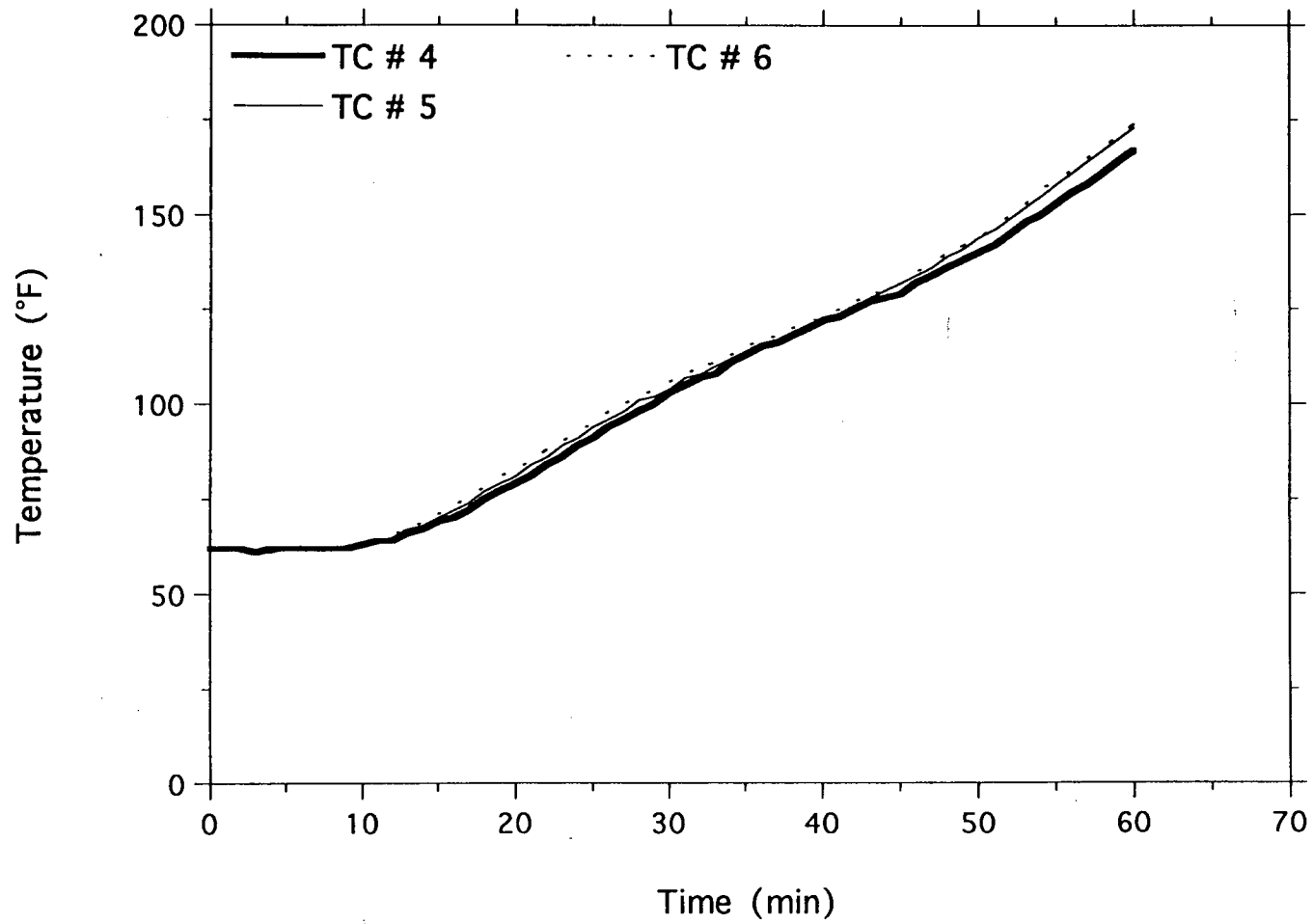
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (Top Conduit in Upper Array)



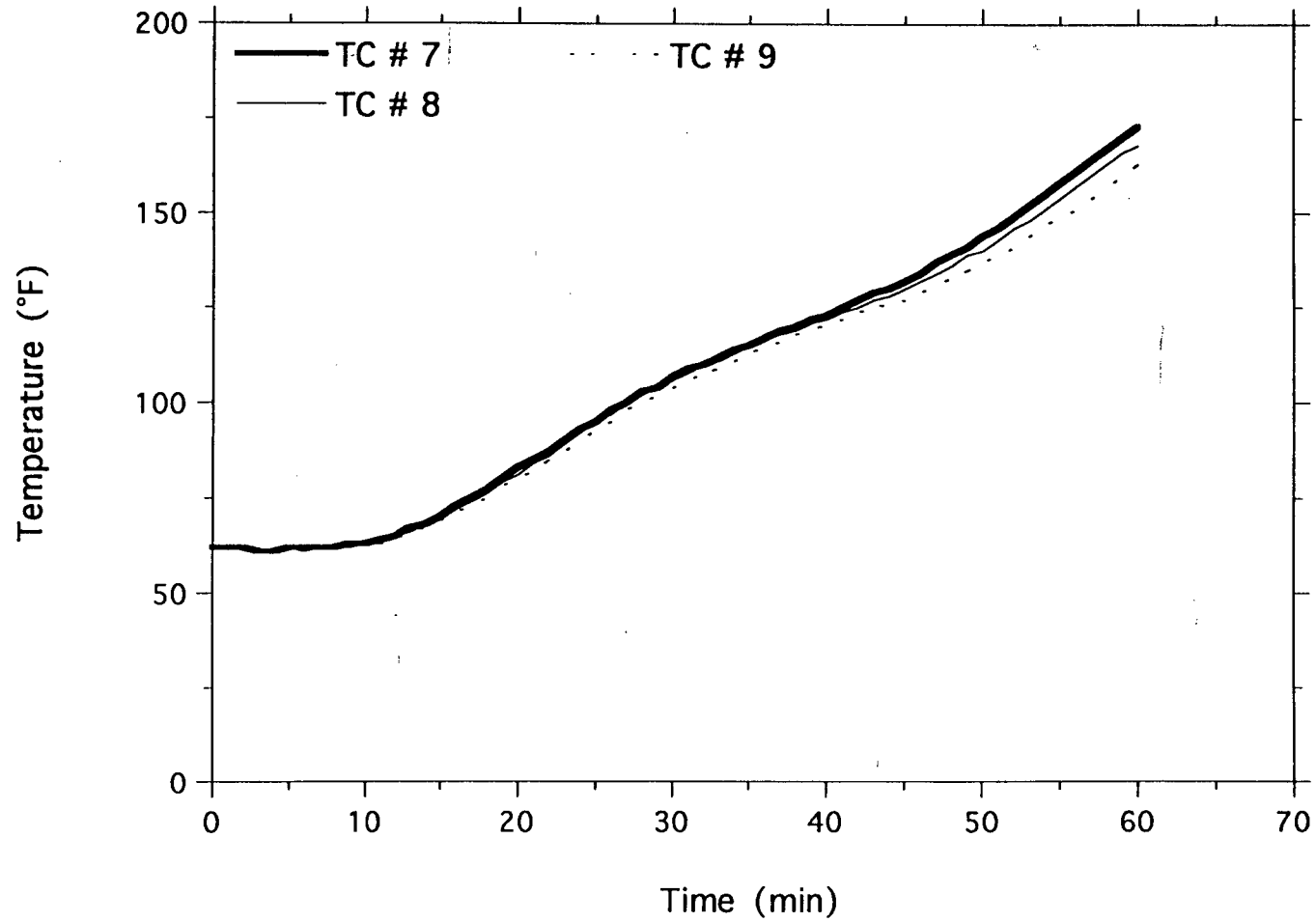
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (Top Conduit in Upper Array)



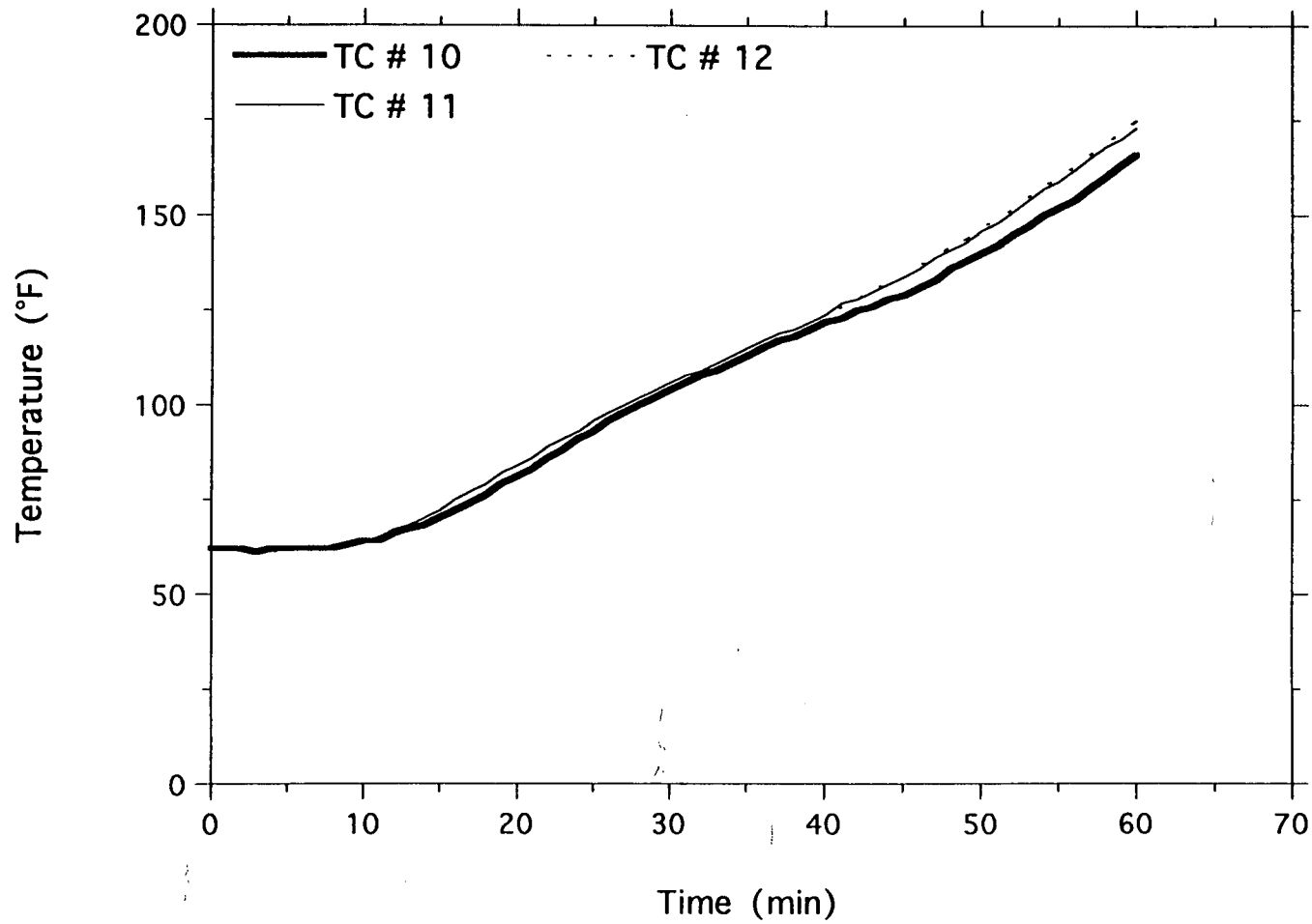
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (Top Conduit in Upper Array)



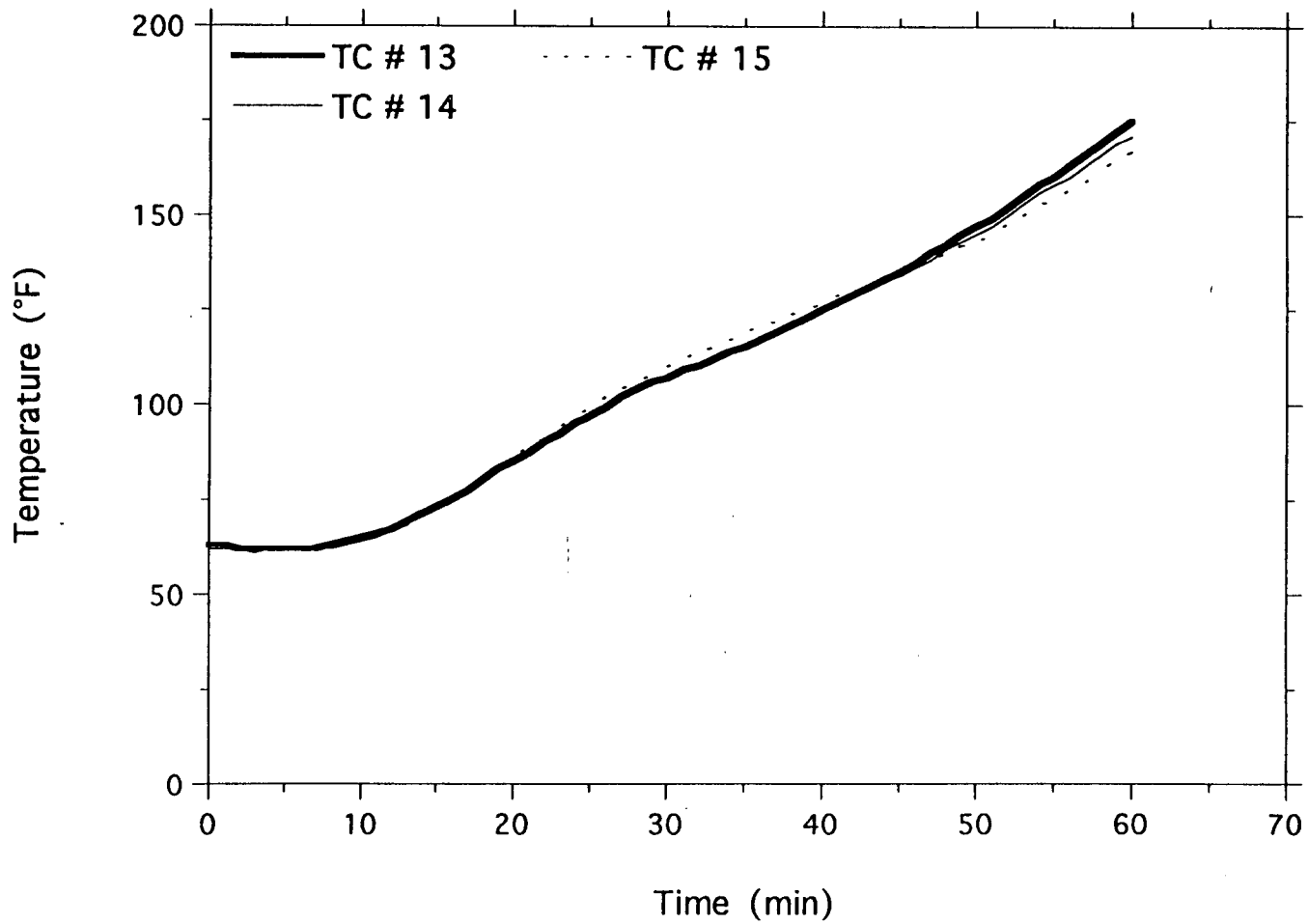
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (Top Conduit in Upper Array)



OMEGA POINT
LABORATORIES

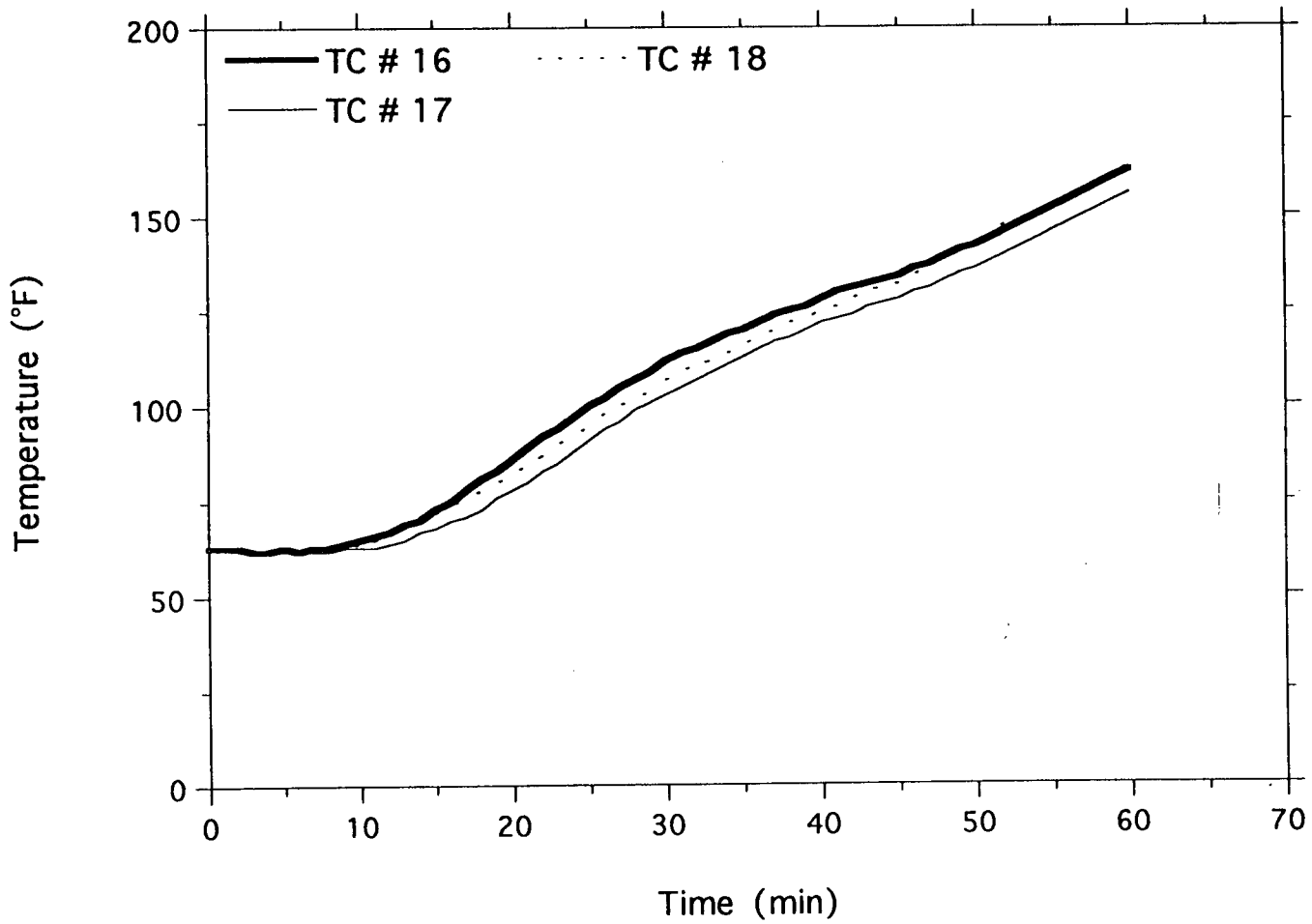
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Project No. 11960-97258
2" (Top Conduit in Upper Array)



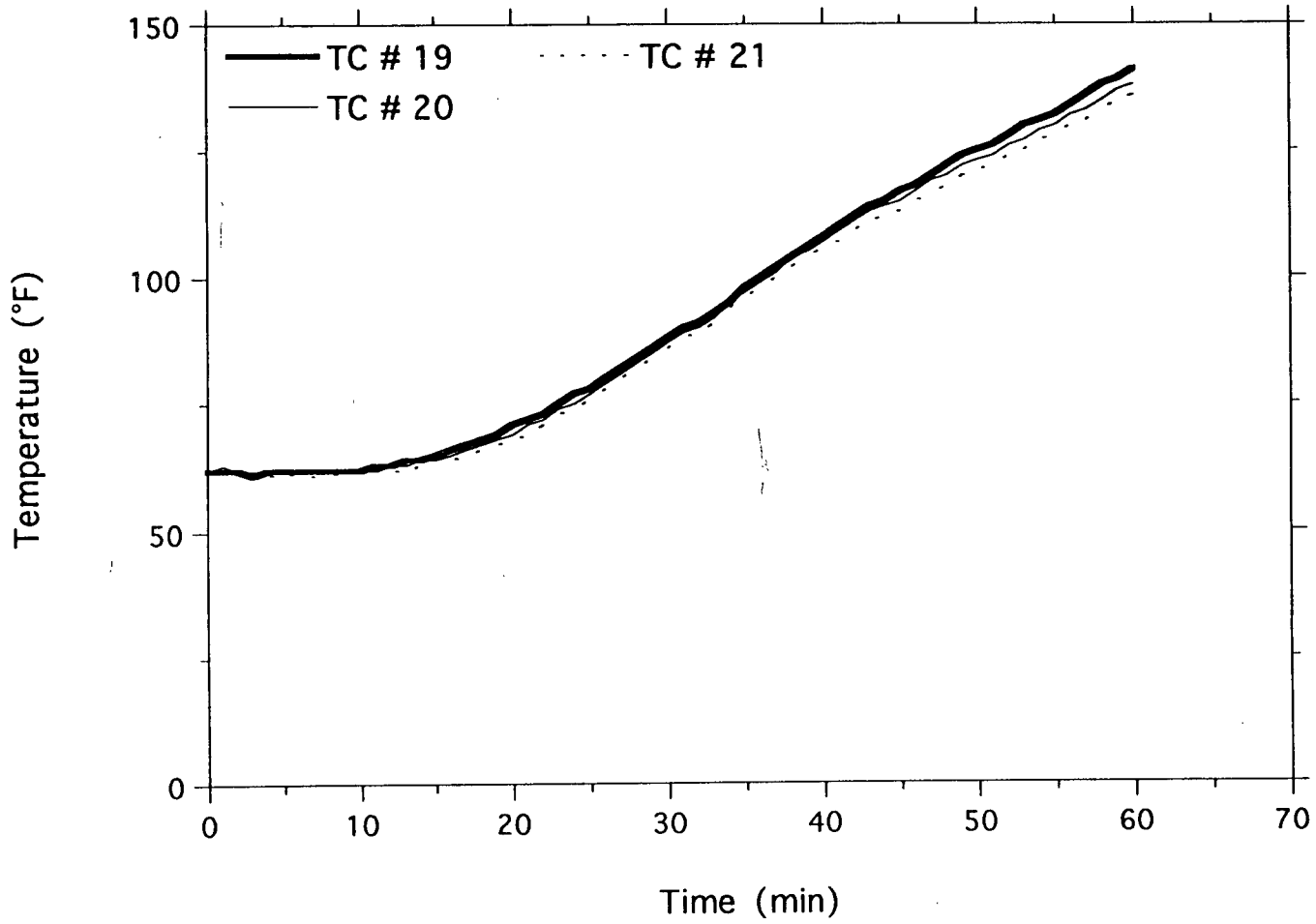
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (Top Conduit in Upper Array)

OMEGA POINT
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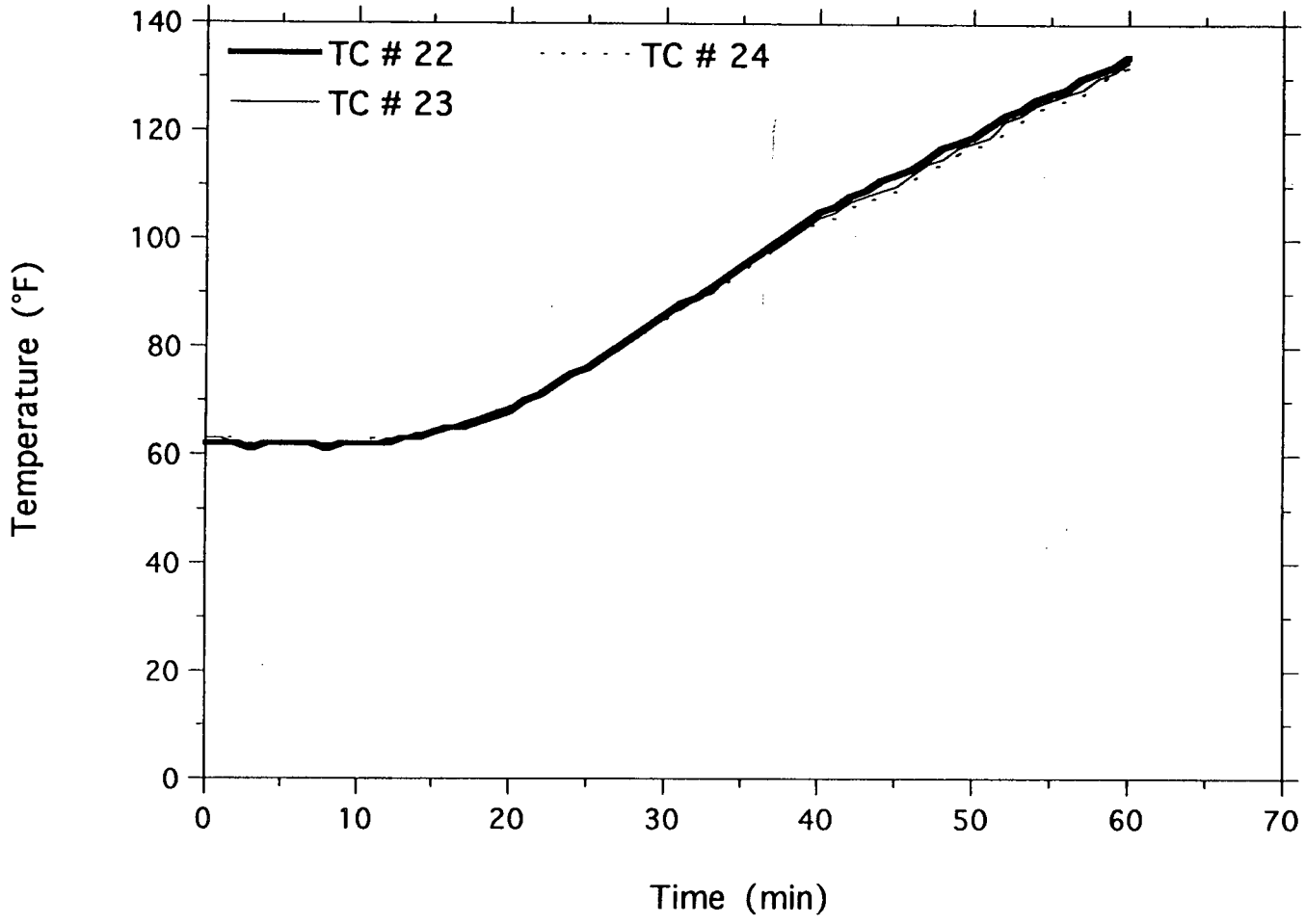


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Project No. 11960-97258
2-1/2" (2nd Conduit in Upper Array)



OMEGA POINT
LABORATORIES

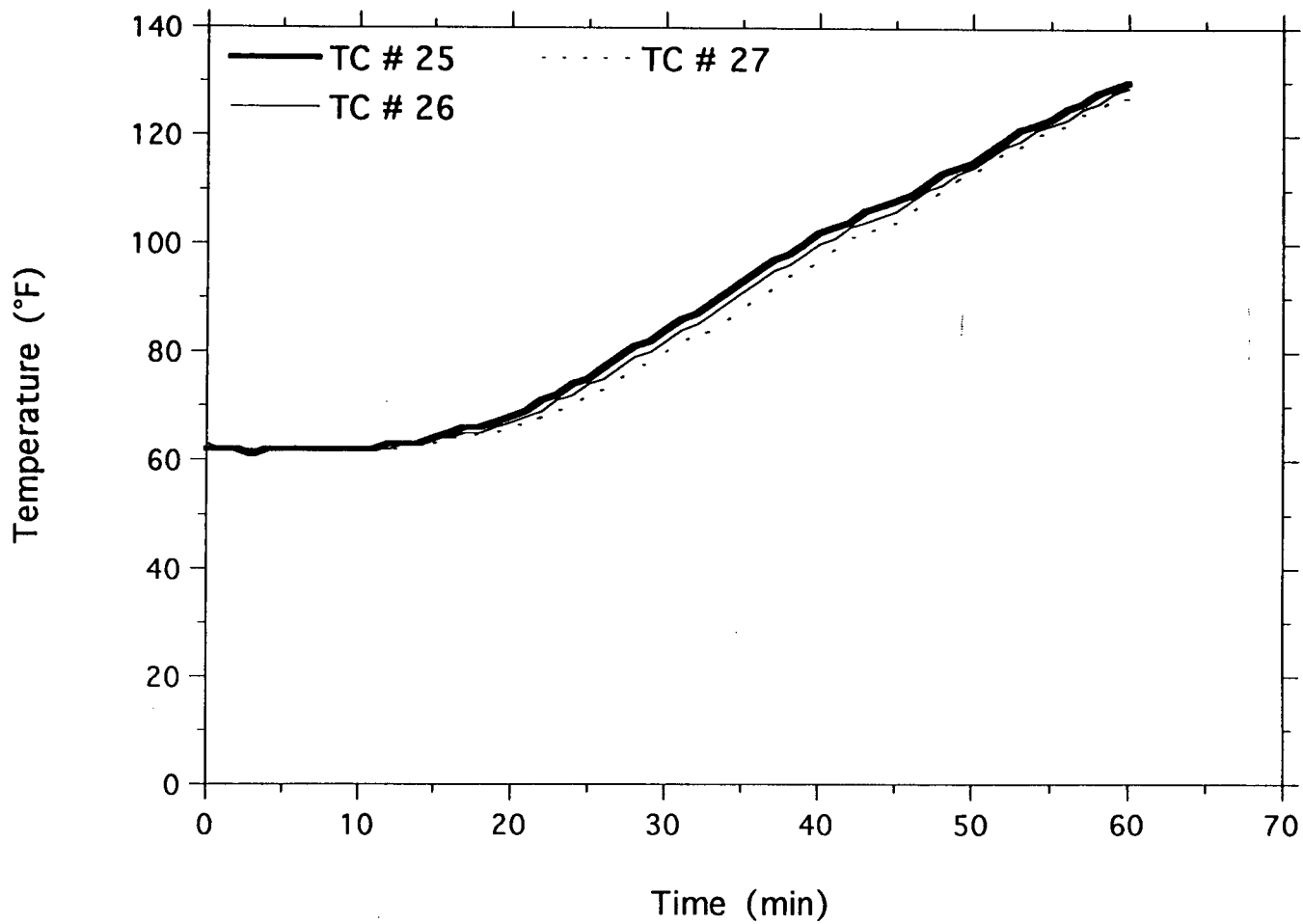
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Project No. 11960-97258
2-1/2" (2nd Conduit in Upper Array)



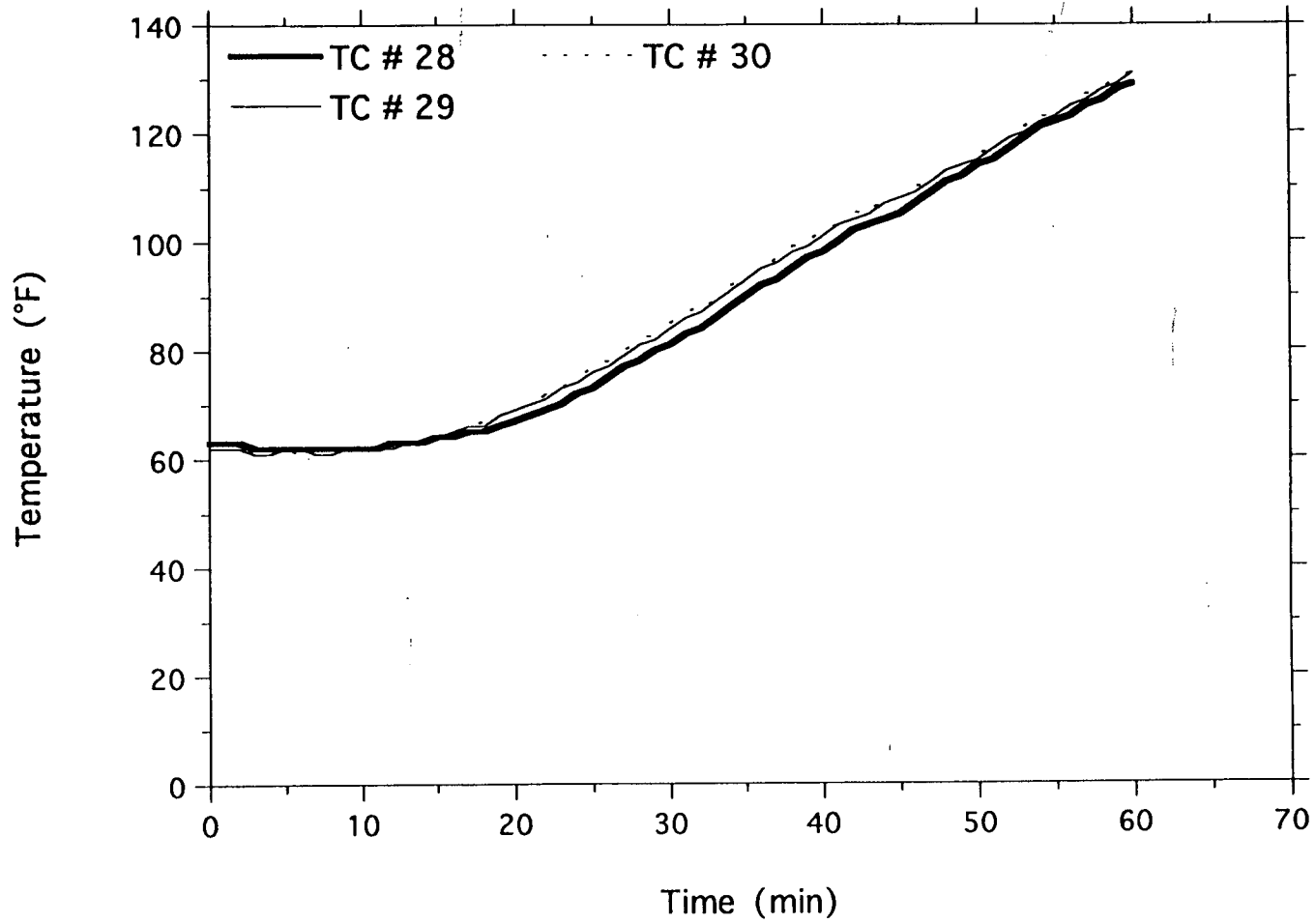
OMEGA POINT
LABORATORIES

OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2-1/2" (2nd Conduit in Upper Array)

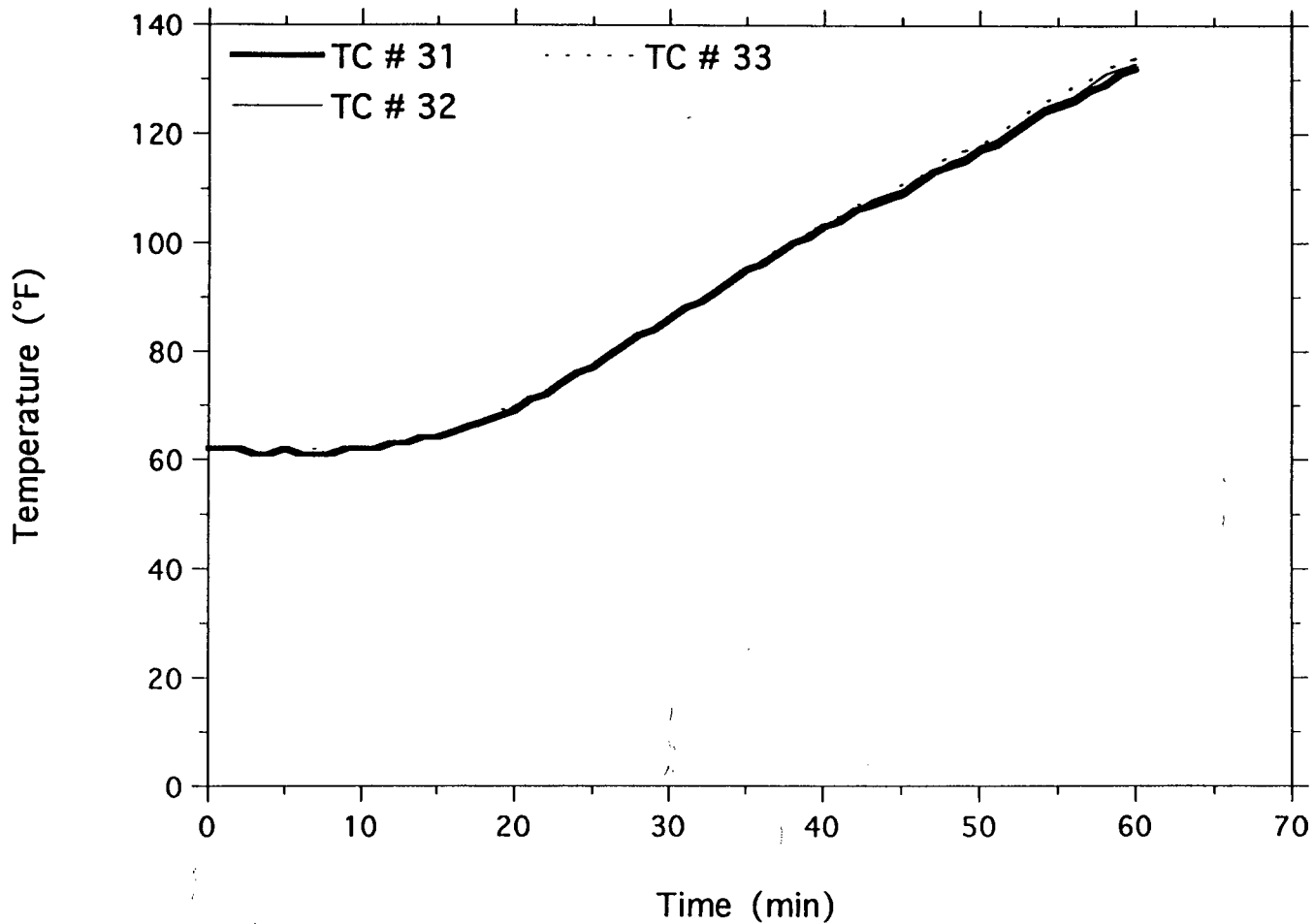


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Project No. 11960-97258
2-1/2" (2nd Conduit in Upper Array)



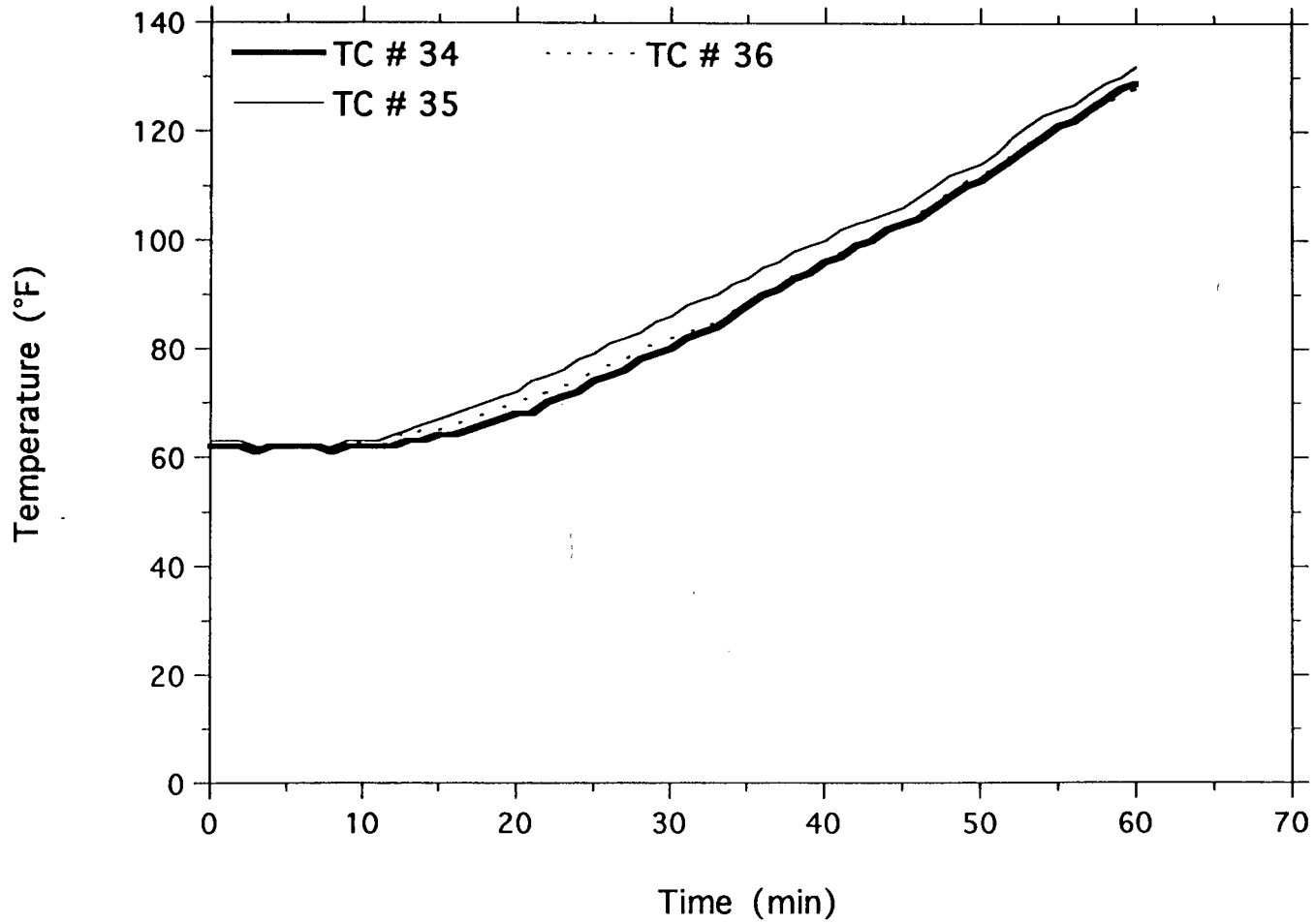
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2-1/2" (2nd Conduit in Upper Array)



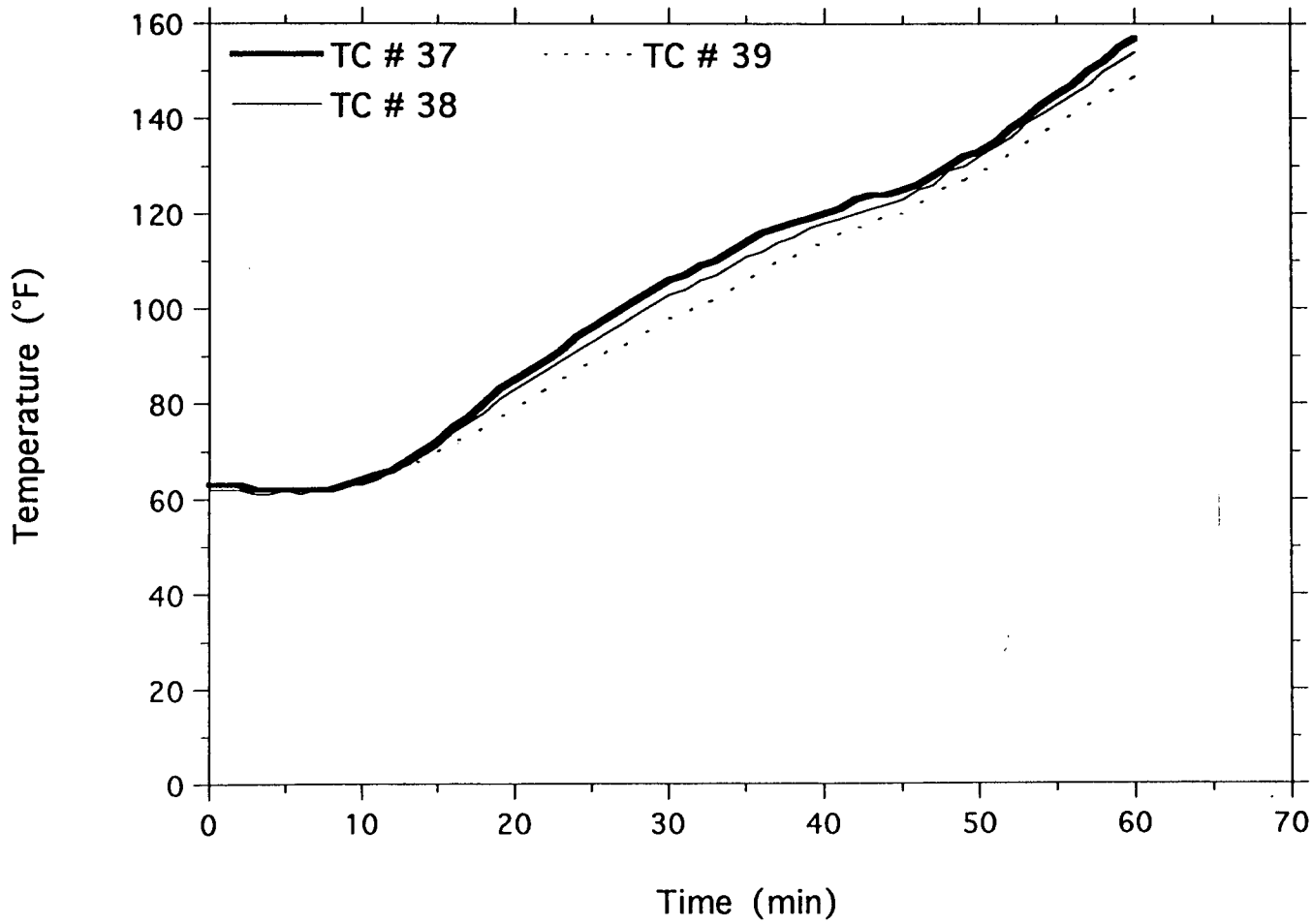
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2-1/2" (2nd Conduit in Upper Array)



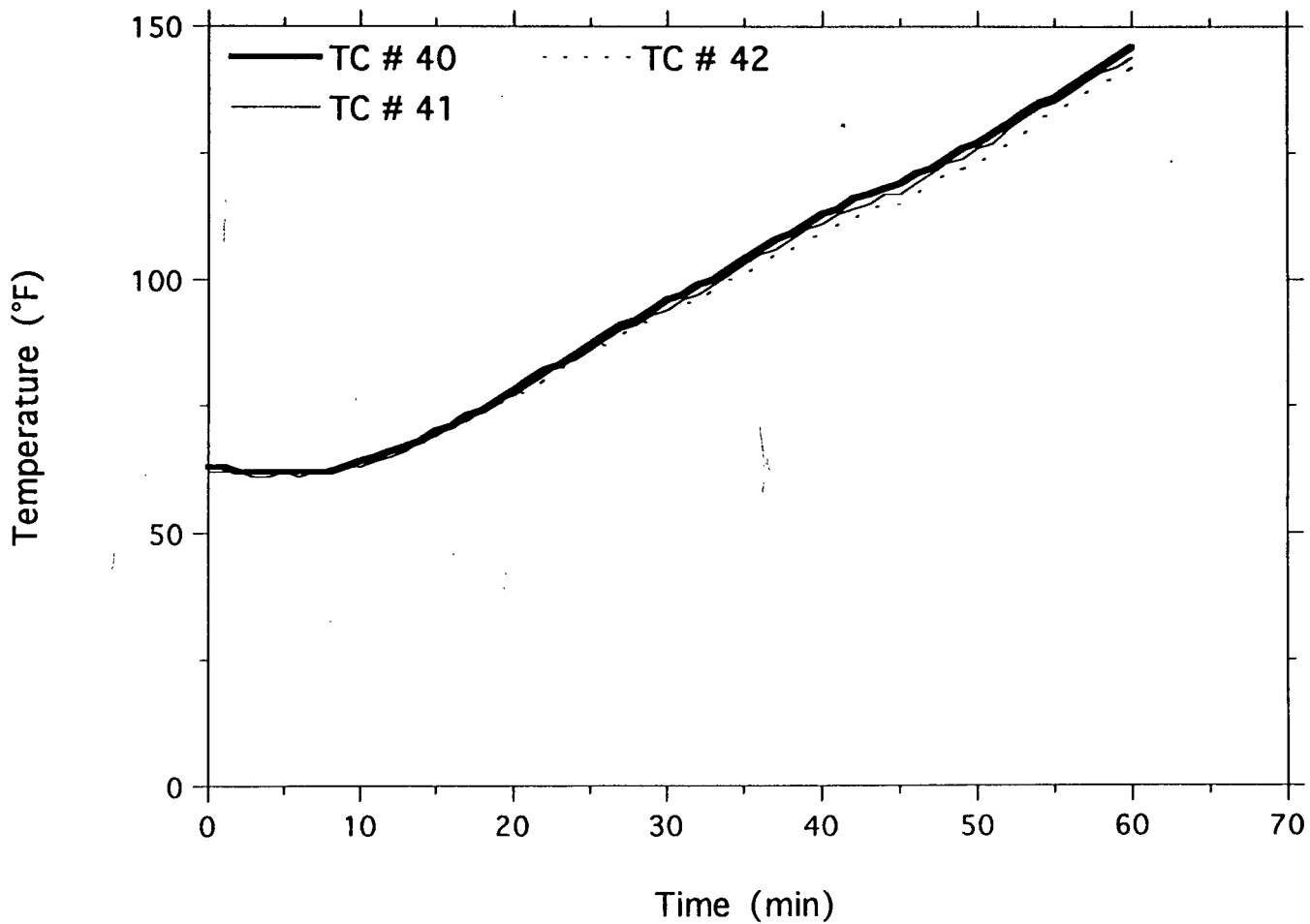
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LABORATORIES

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Project No. 11960-97258
2" (3rd Conduit in Upper Array)



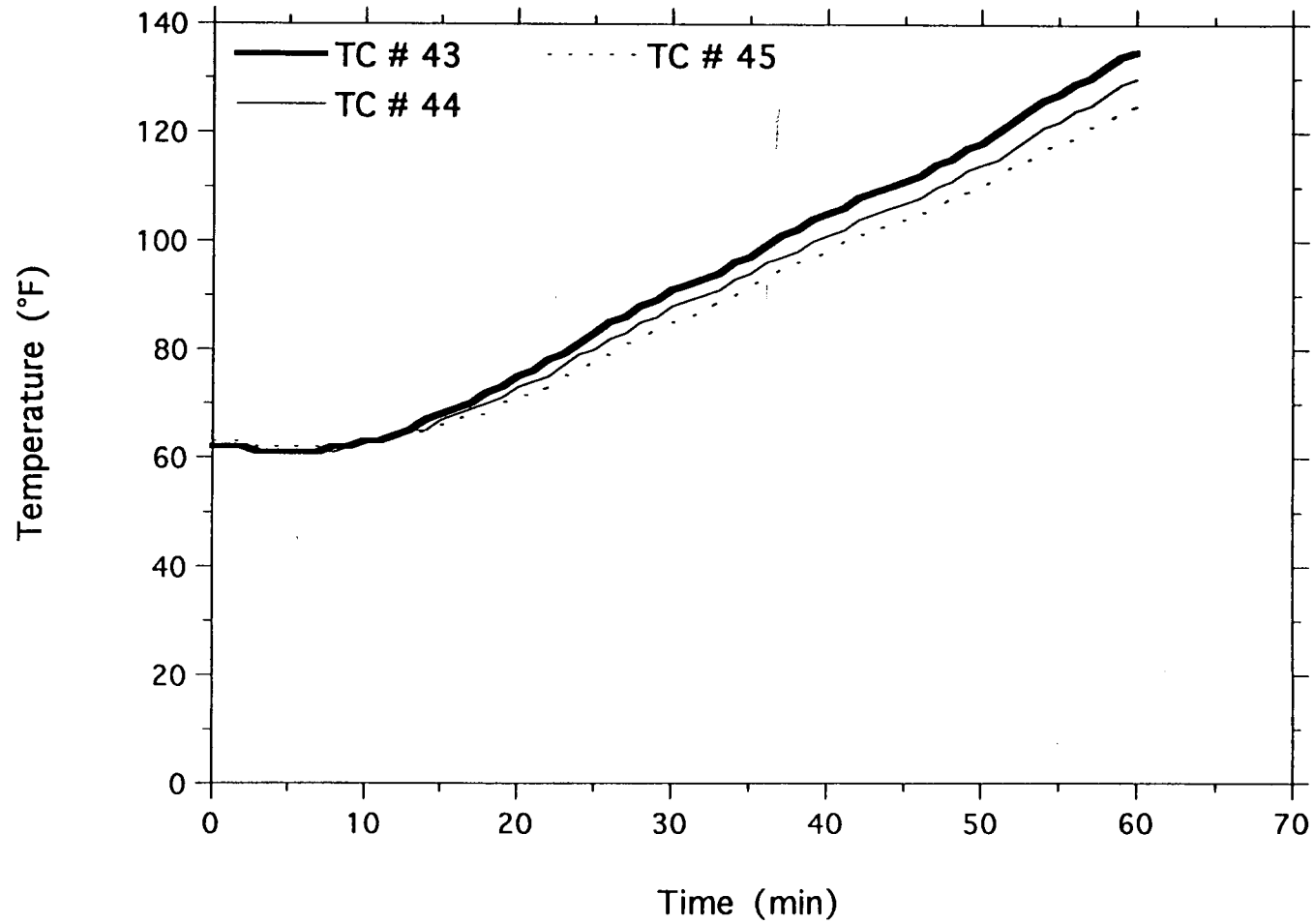
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (3rd Conduit in Upper Array)



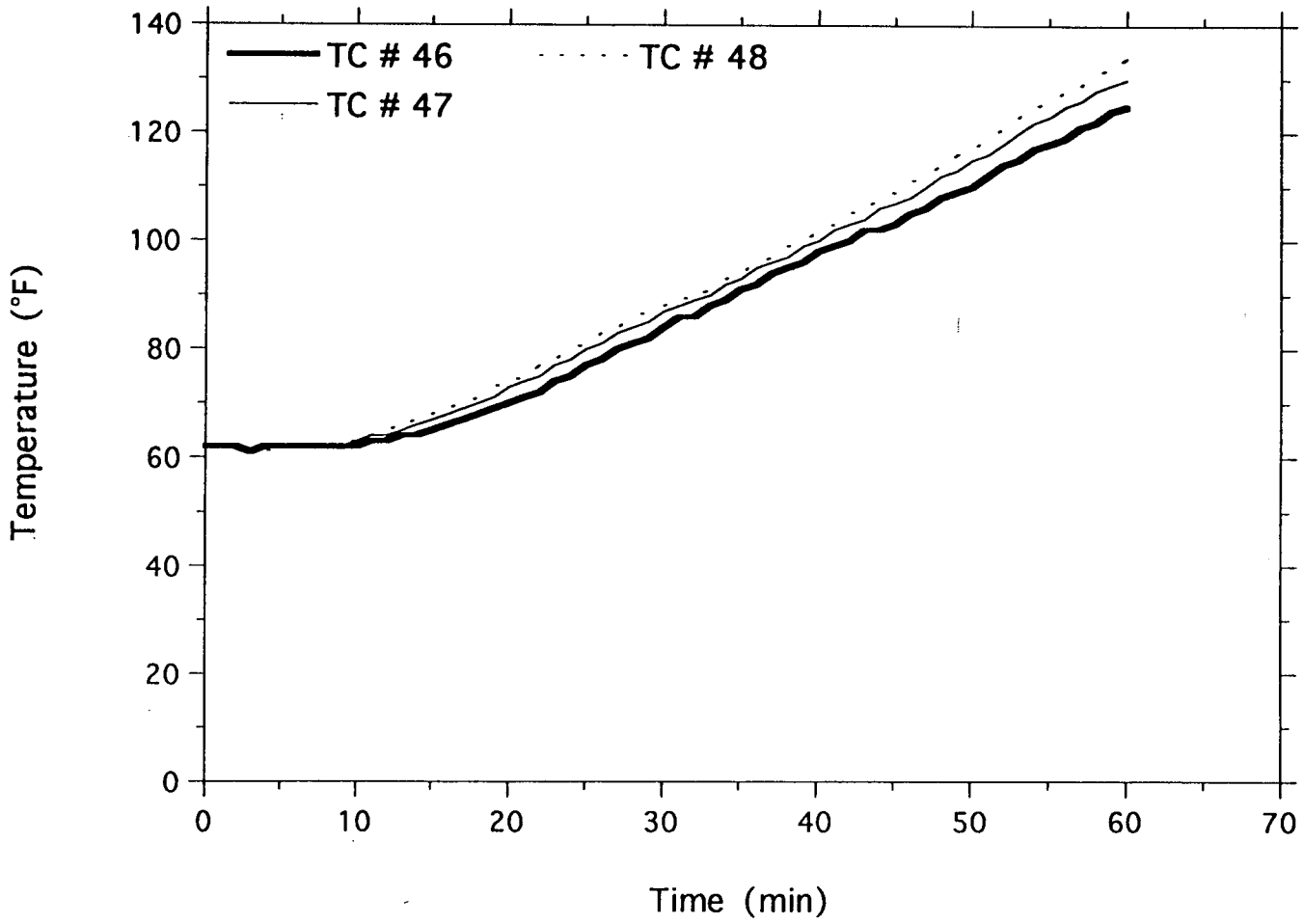
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LABORATORIES

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Project No. 11960-97258
2" (3rd Conduit in Upper Array)



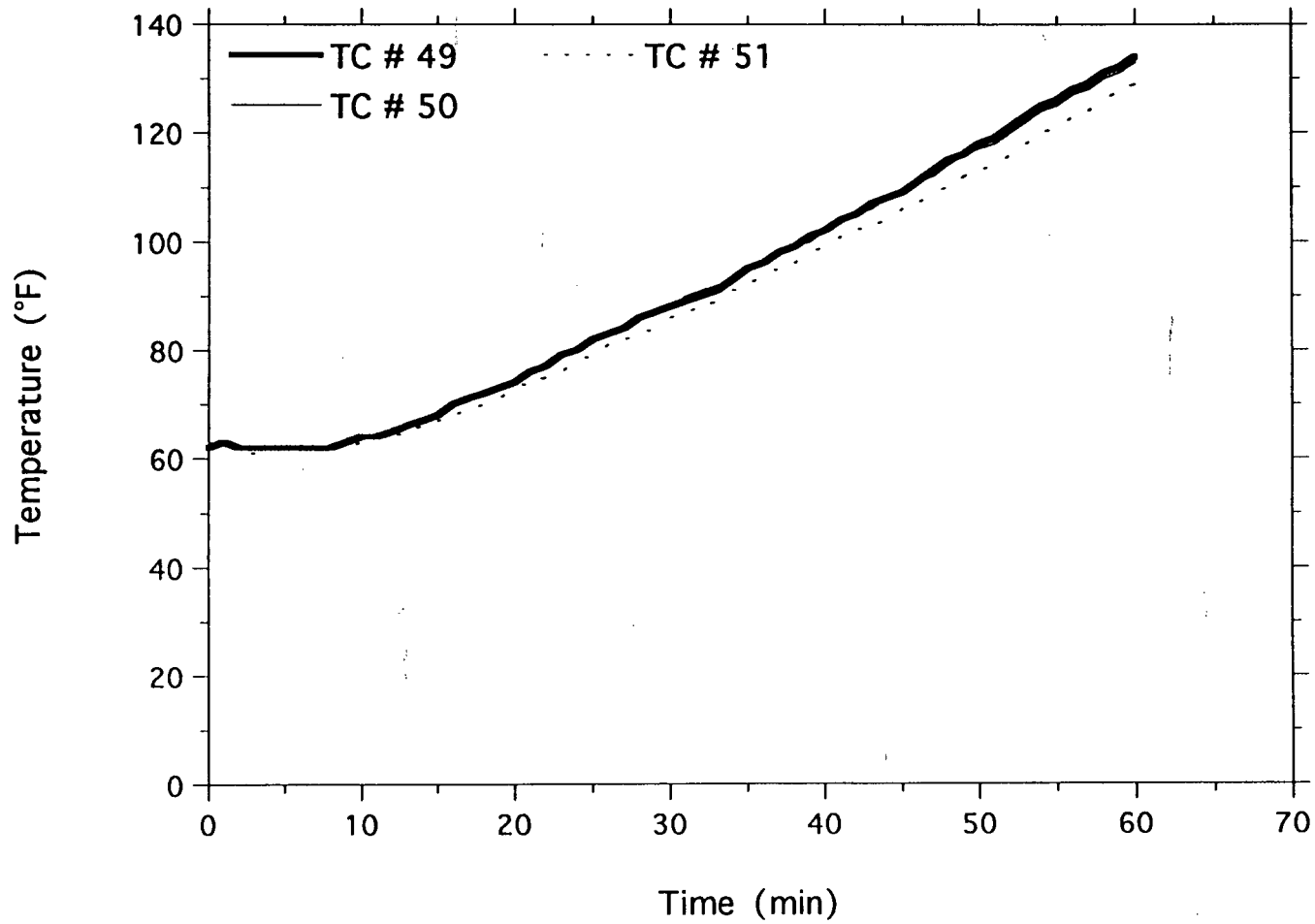
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LABORATORIES

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2" (3rd Conduit in Upper Array)



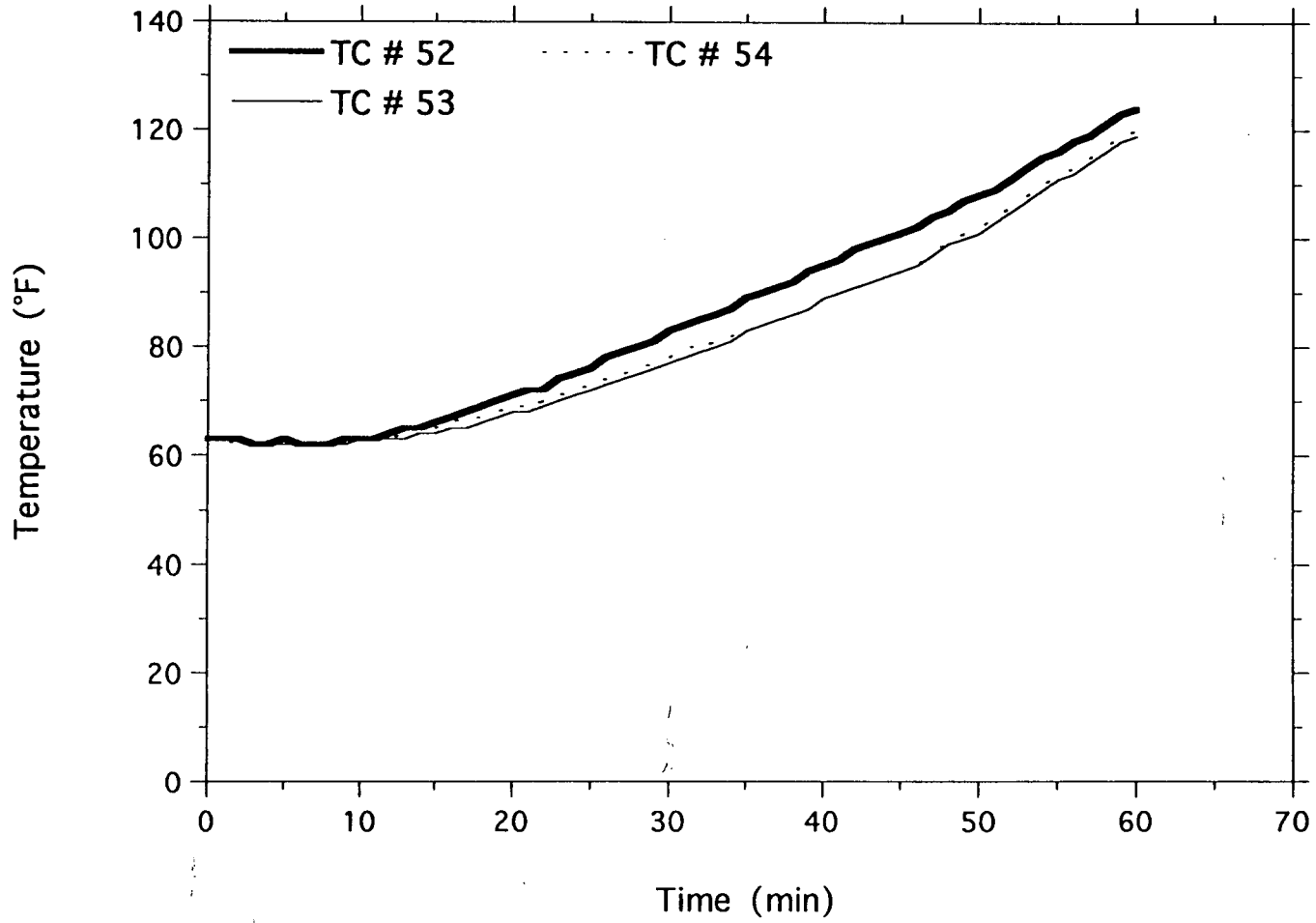
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LABORATORIES

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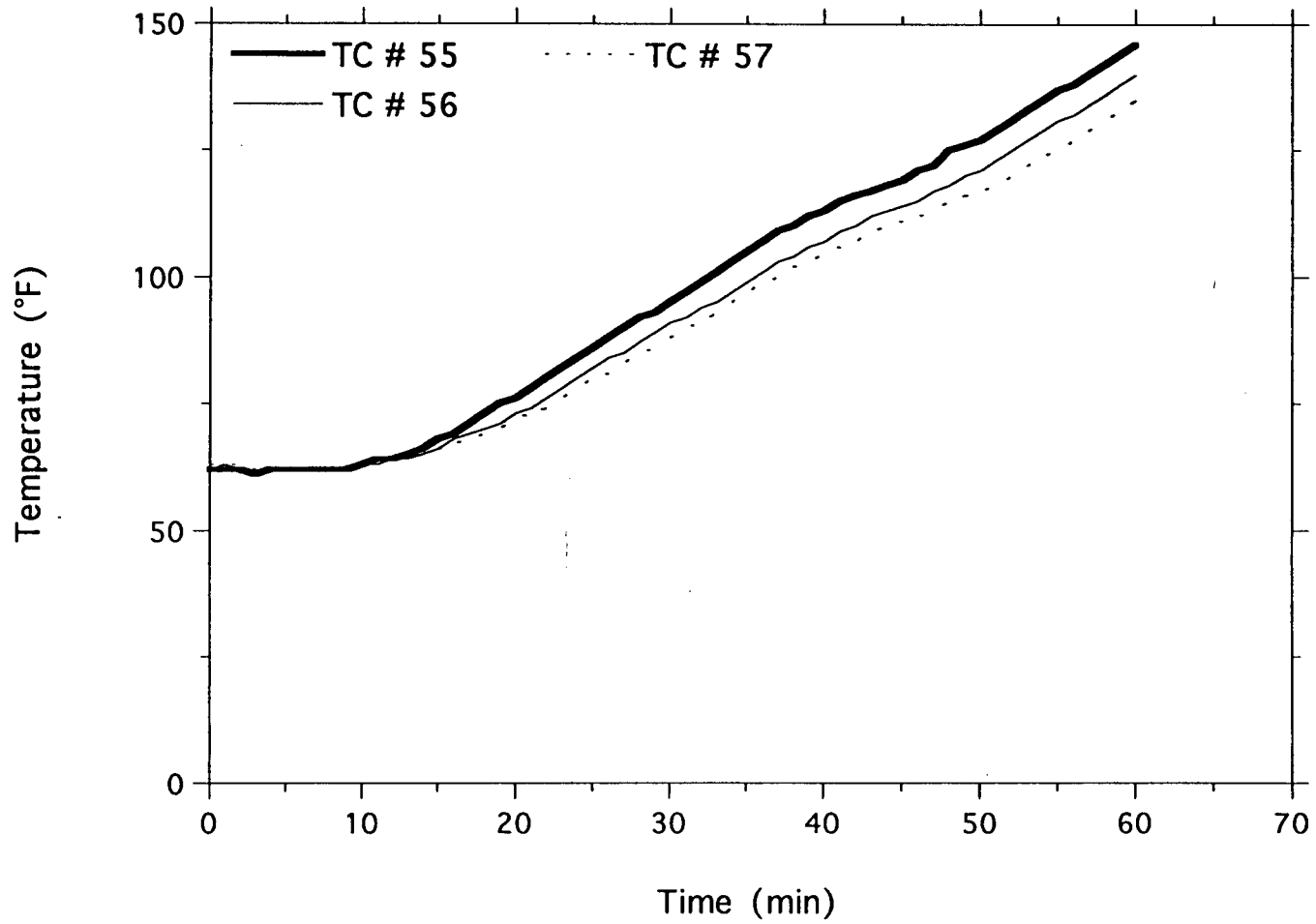
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LABORATORIES

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2" (3rd Conduit in Upper Array)



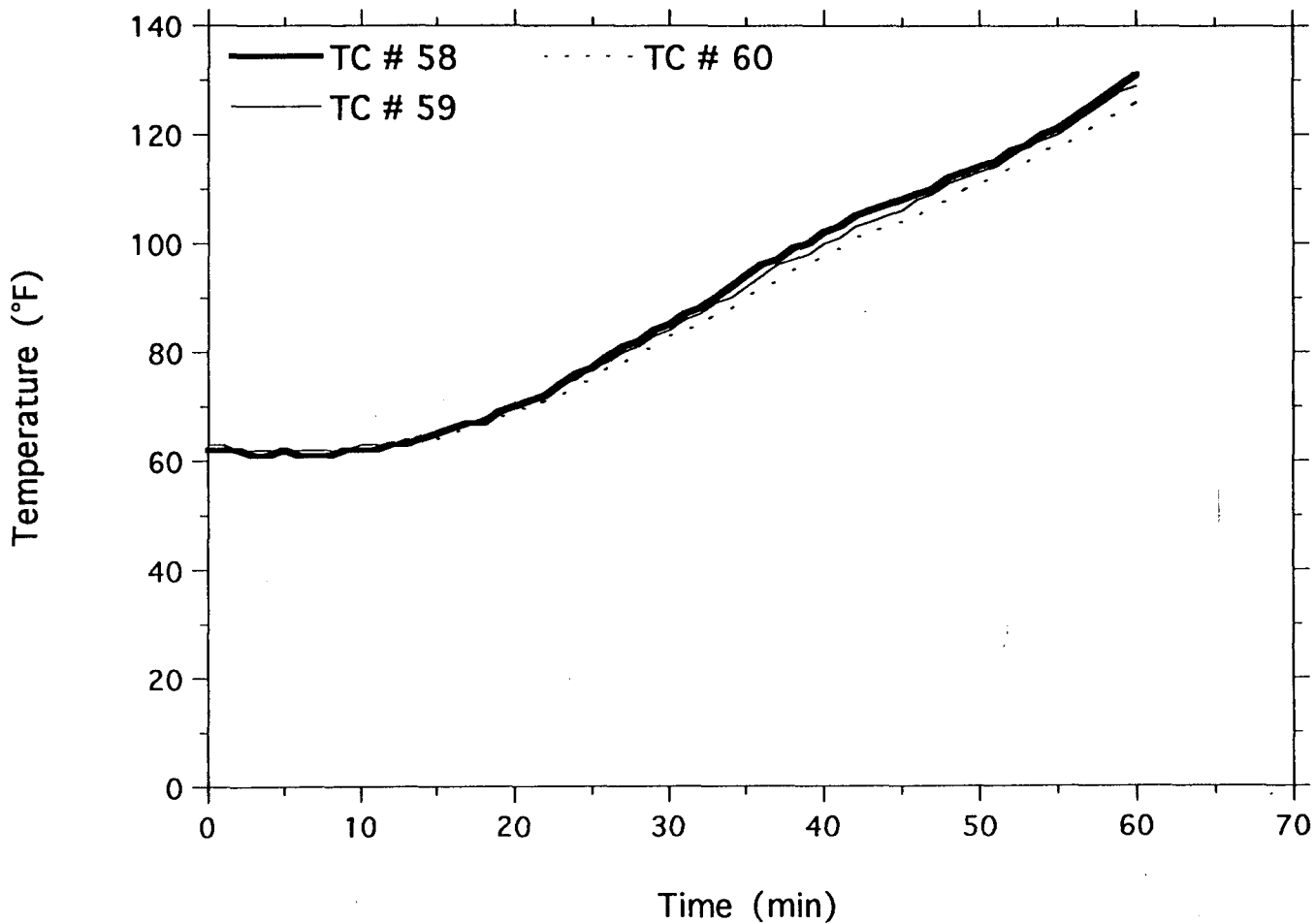
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LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (4th Conduit in Upper Array)



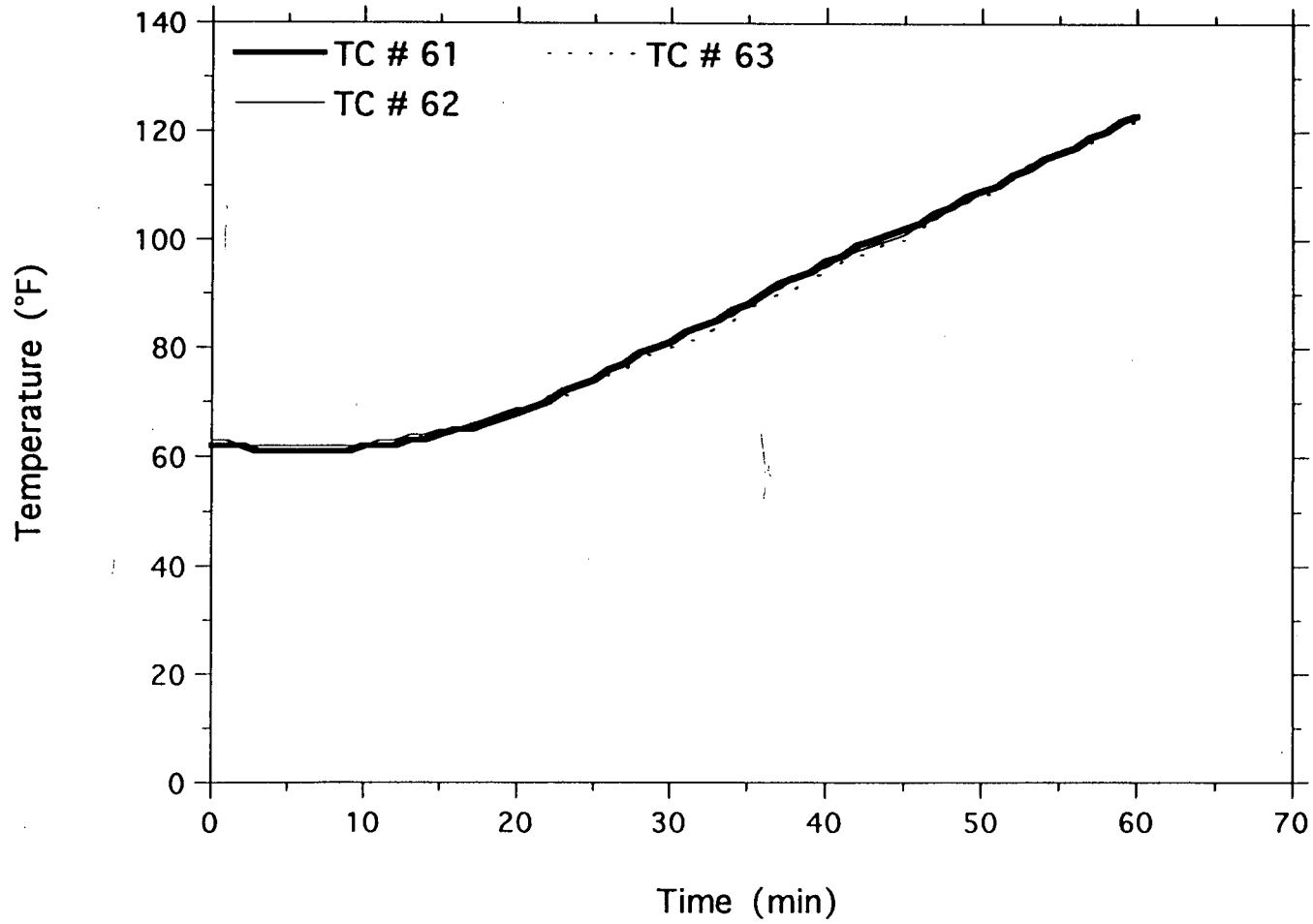
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LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (4th Conduit in Upper Array)



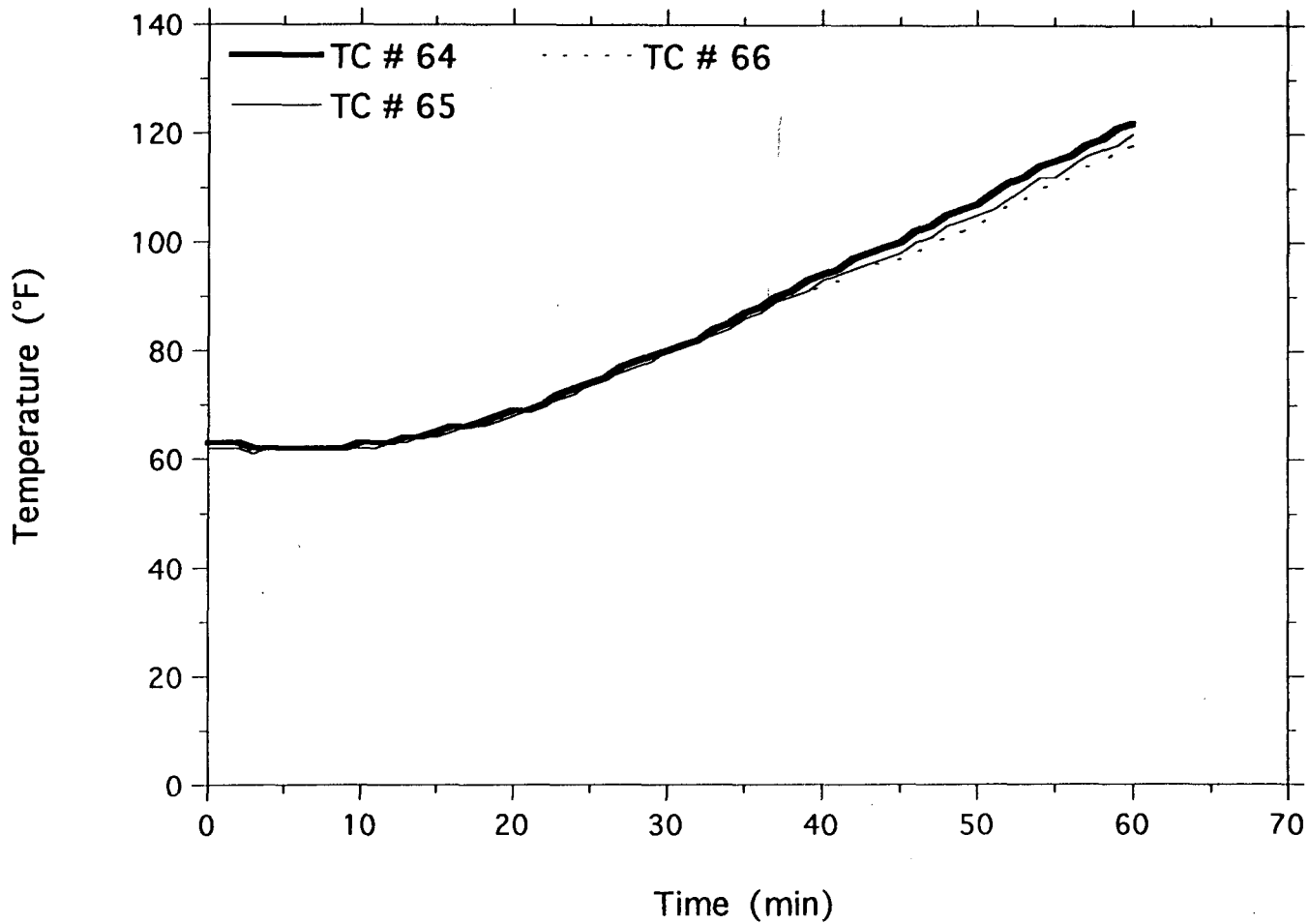
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LABORATORIES

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Project No. 11960-97258
3" (4th Conduit in Upper Array)



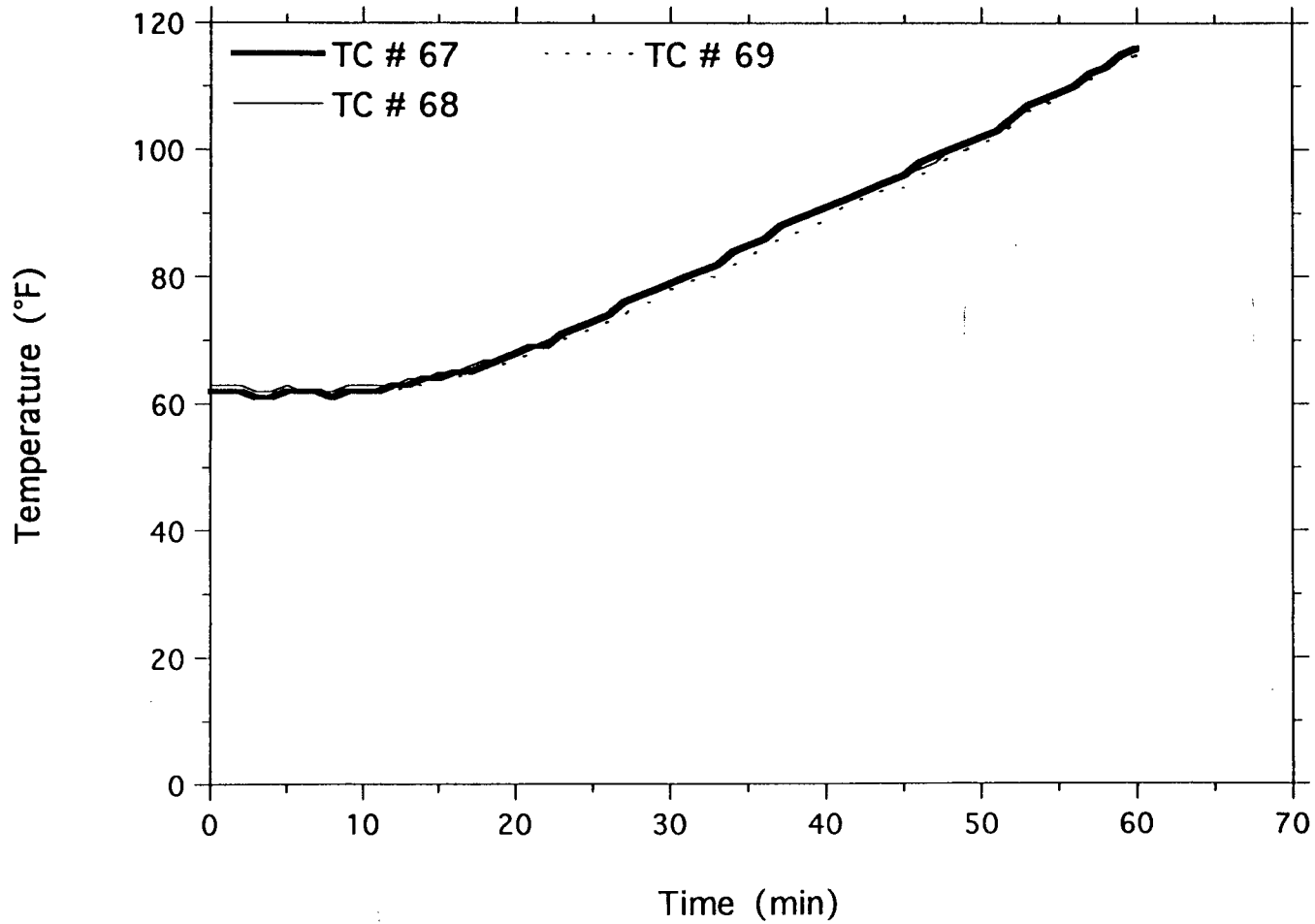
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LABORATORIES

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3" (4th Conduit in Upper Array)



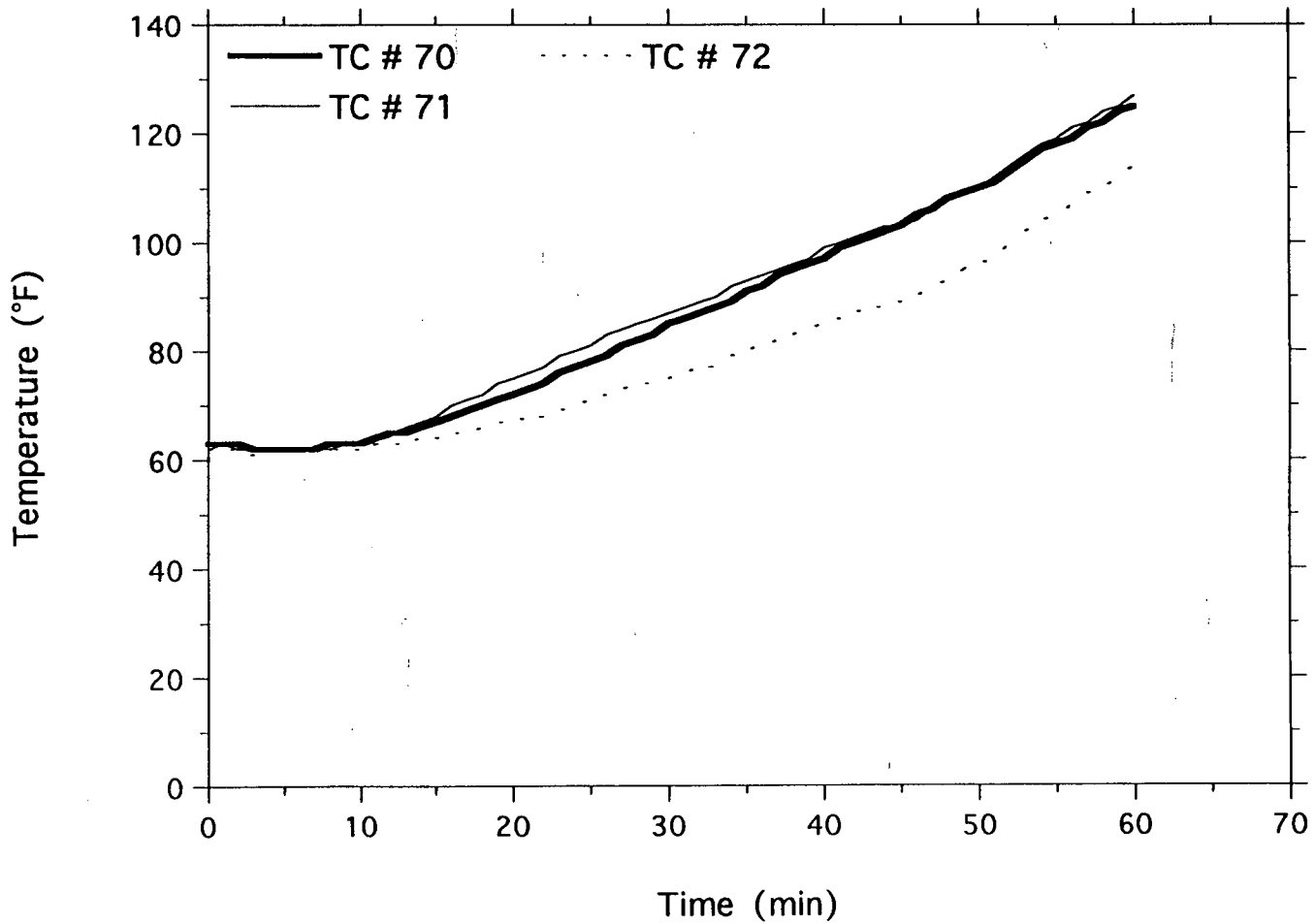
OMEGA POINT
LABORATORIES

TSI/TVA
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3" (4th Conduit in Upper Array)



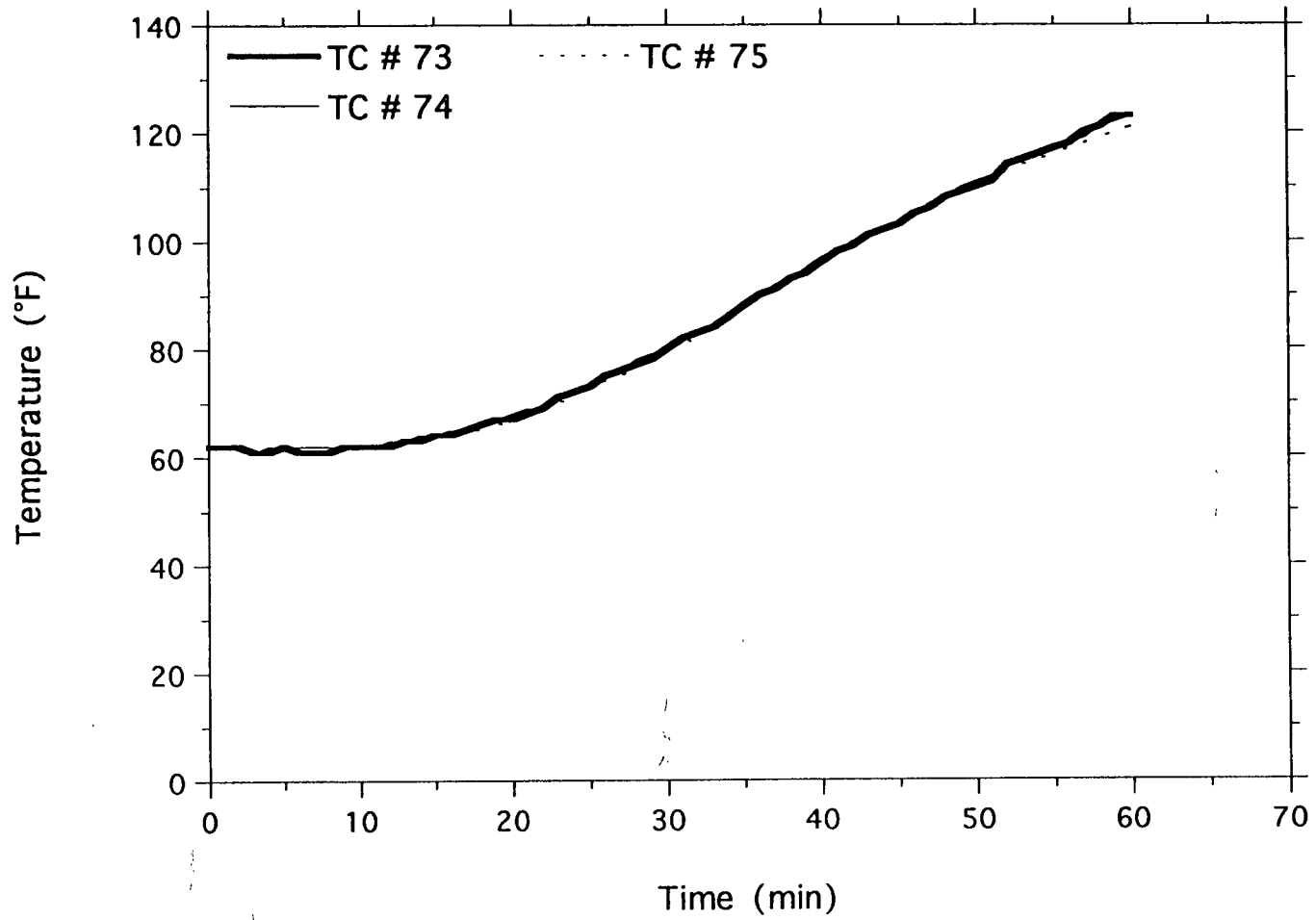
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LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (4th Conduit in Upper Array)



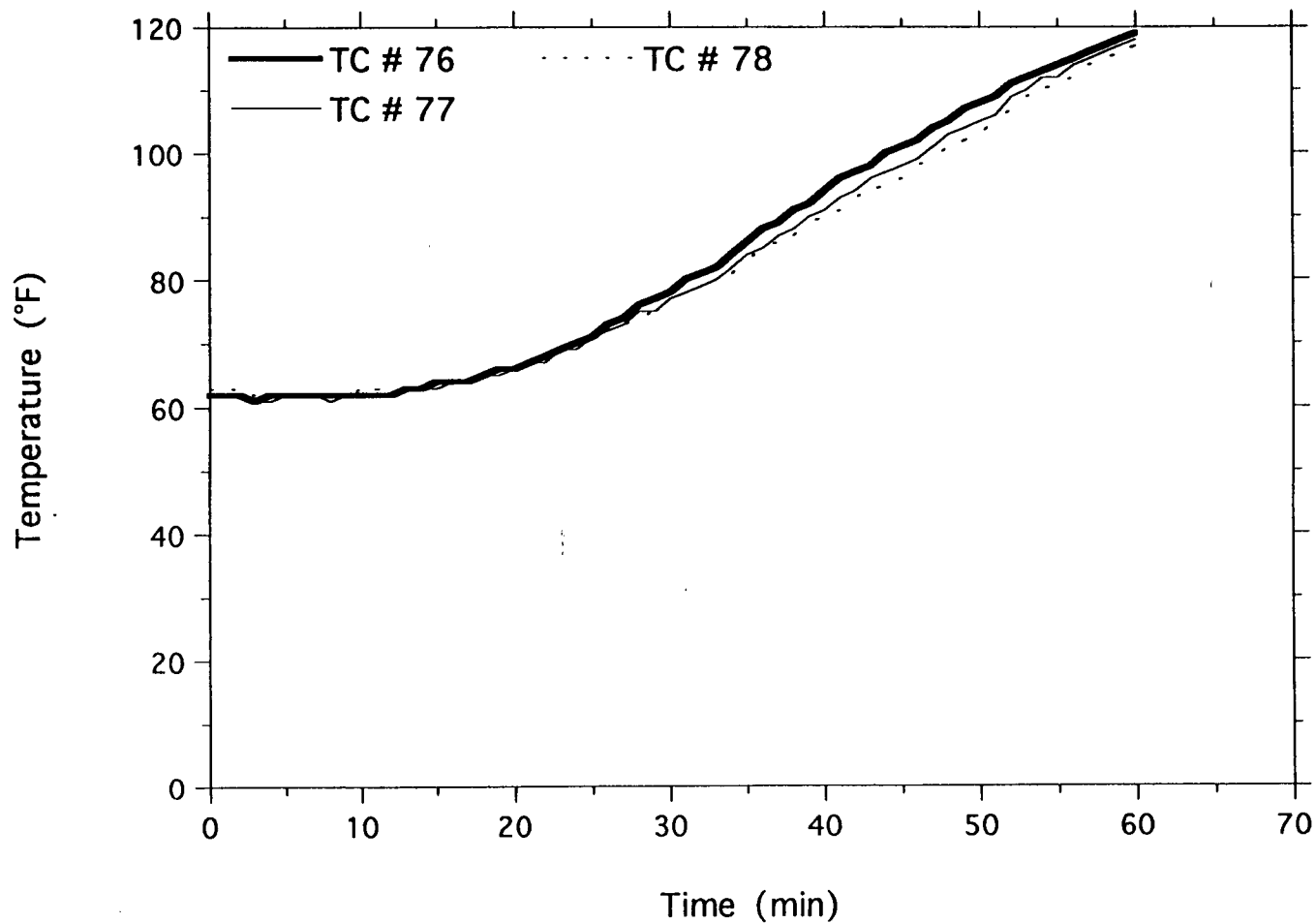
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (5th Conduit in Upper Array)



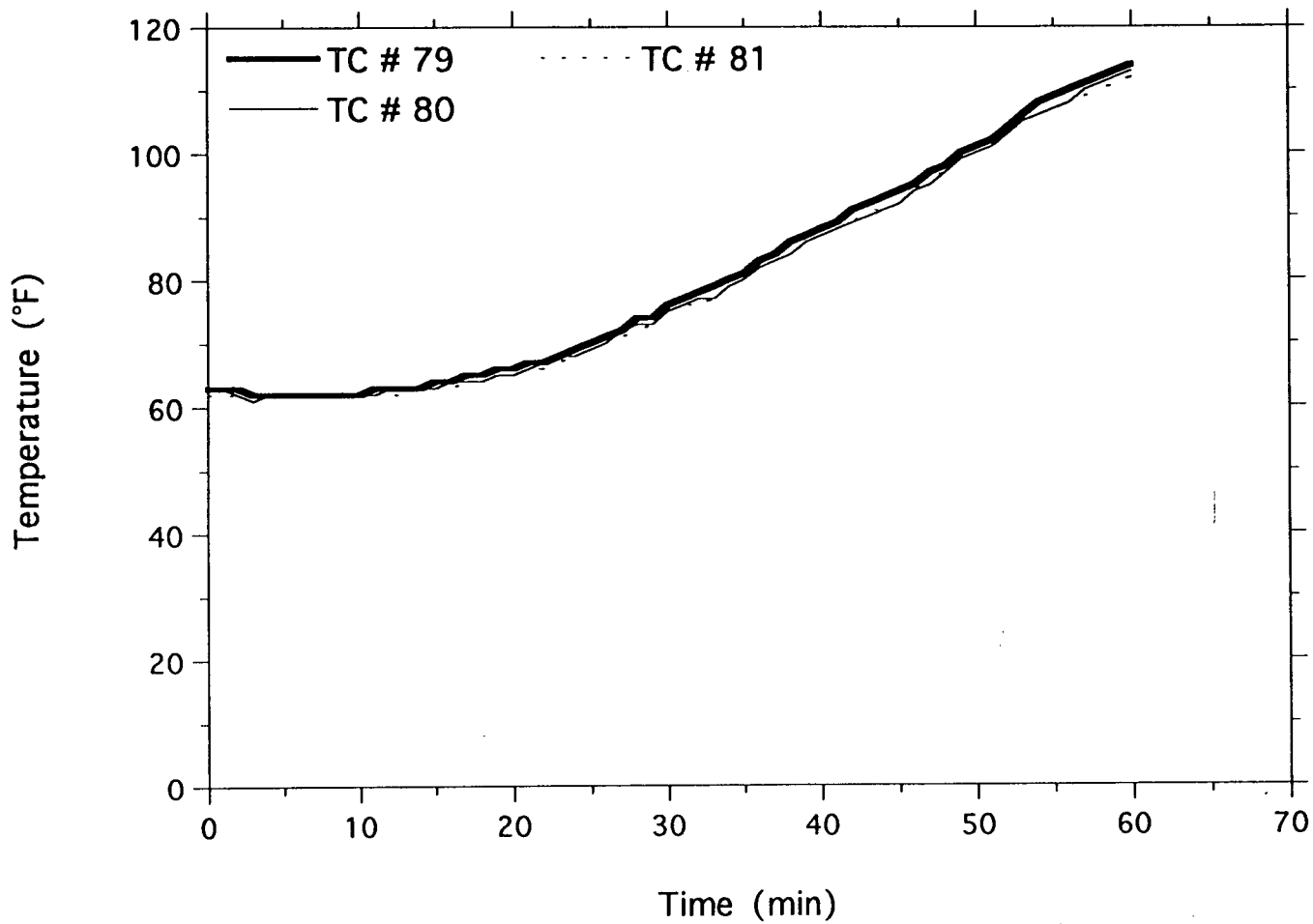
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (5th Conduit in Upper Array)



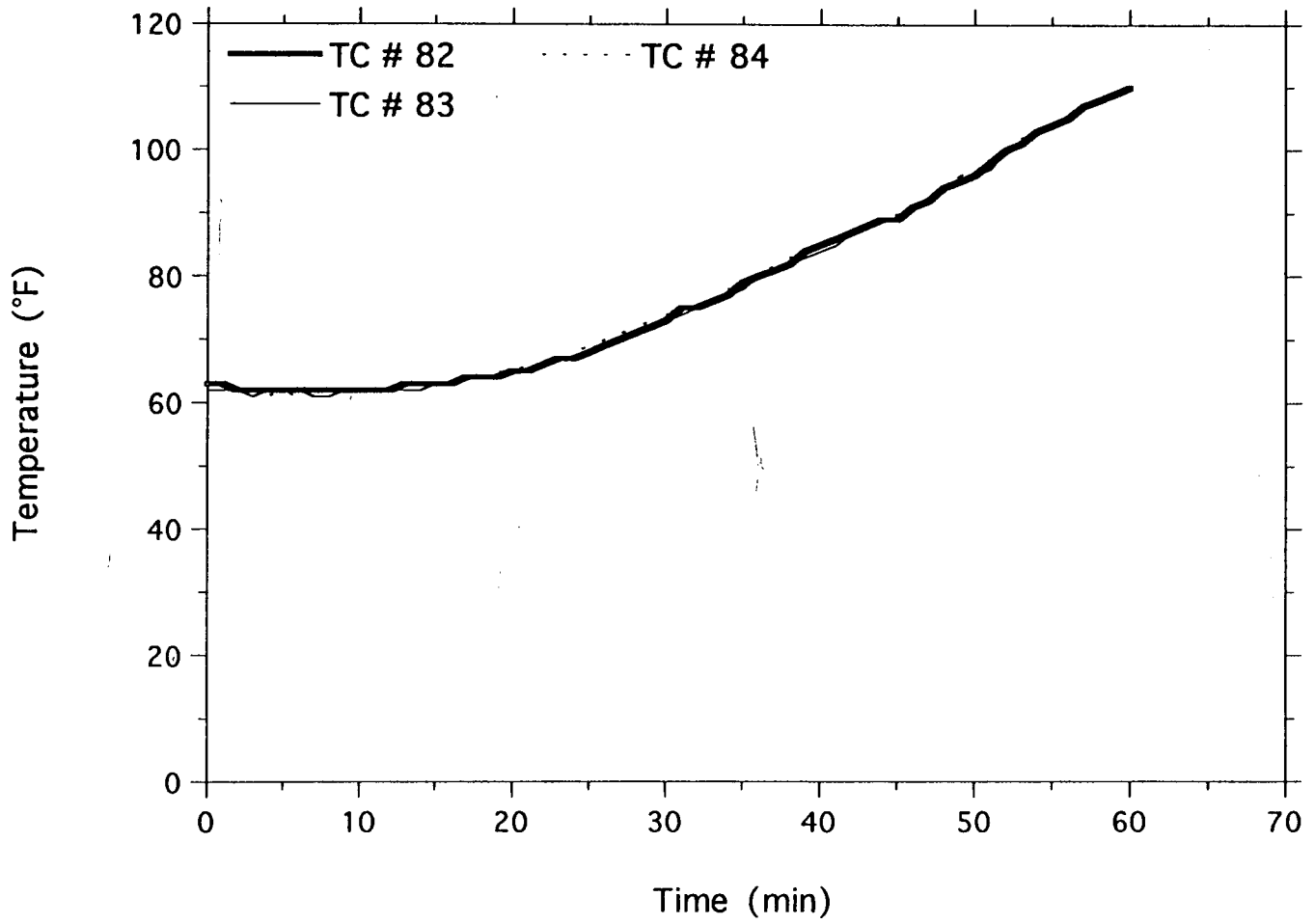
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (5th Conduit in Upper Array)



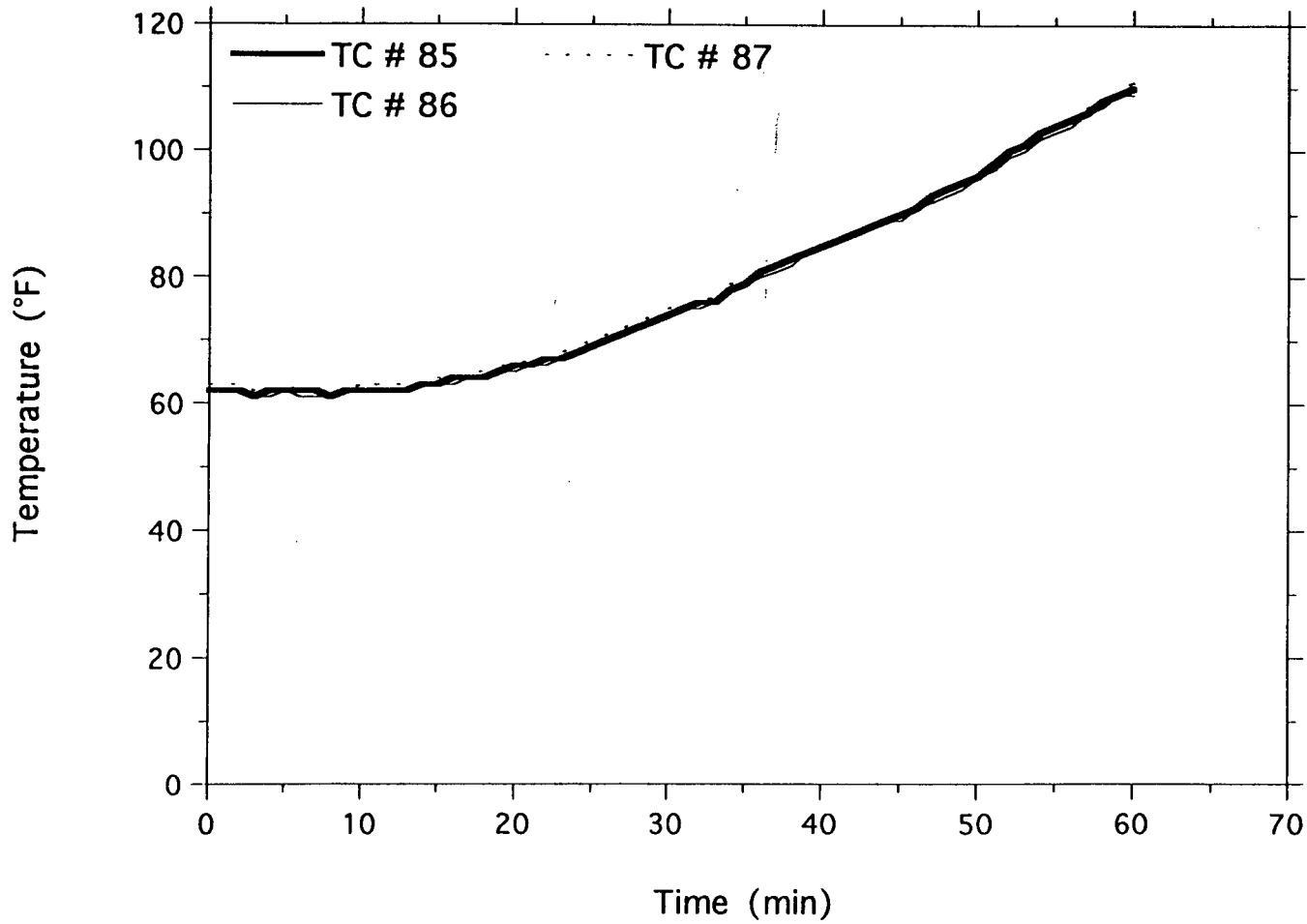
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (5th Conduit in Upper Array)



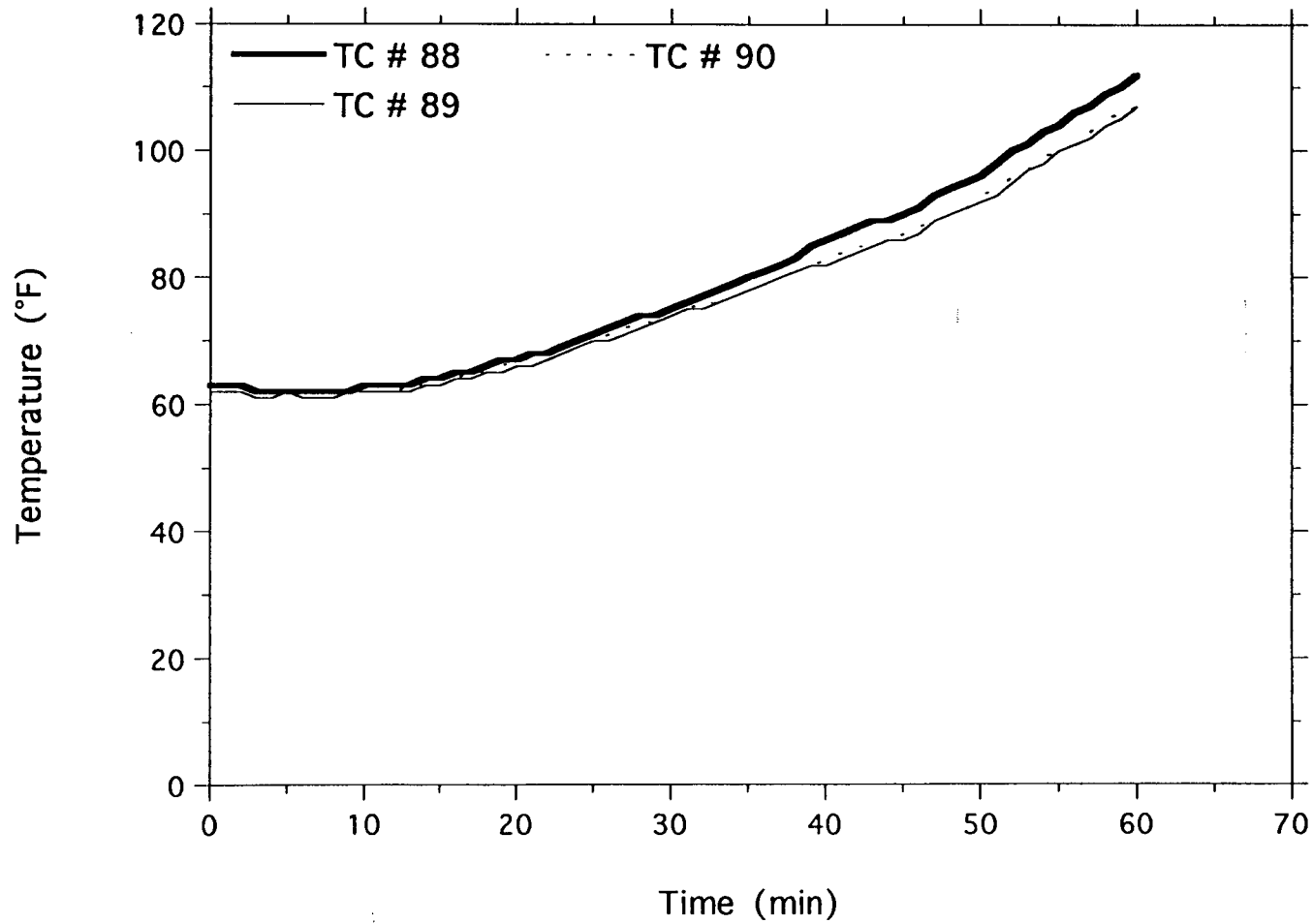
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (5th Conduit in Upper Array)



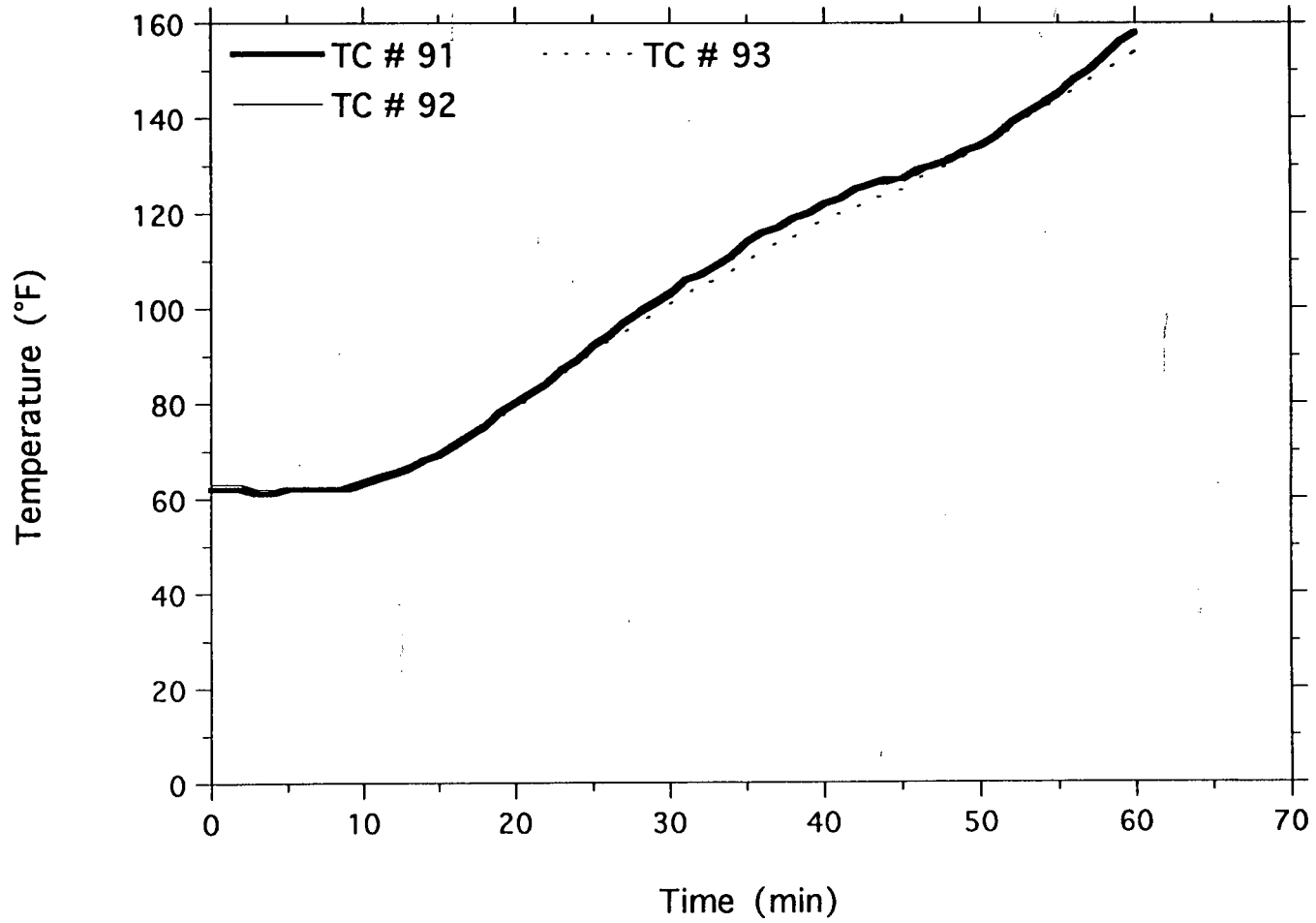
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (5th Conduit in Upper Array)



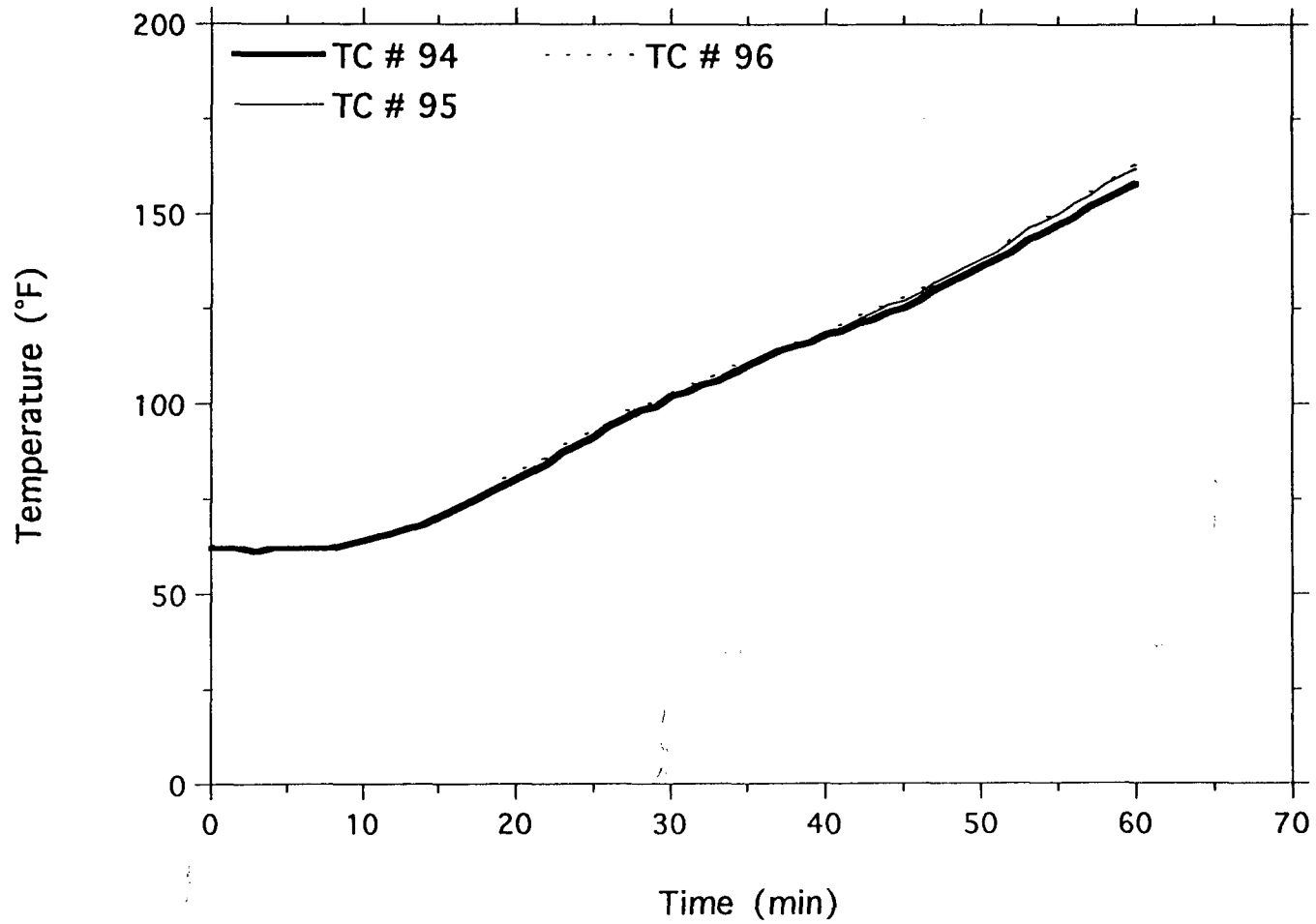
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (6th Conduit in Upper Array)



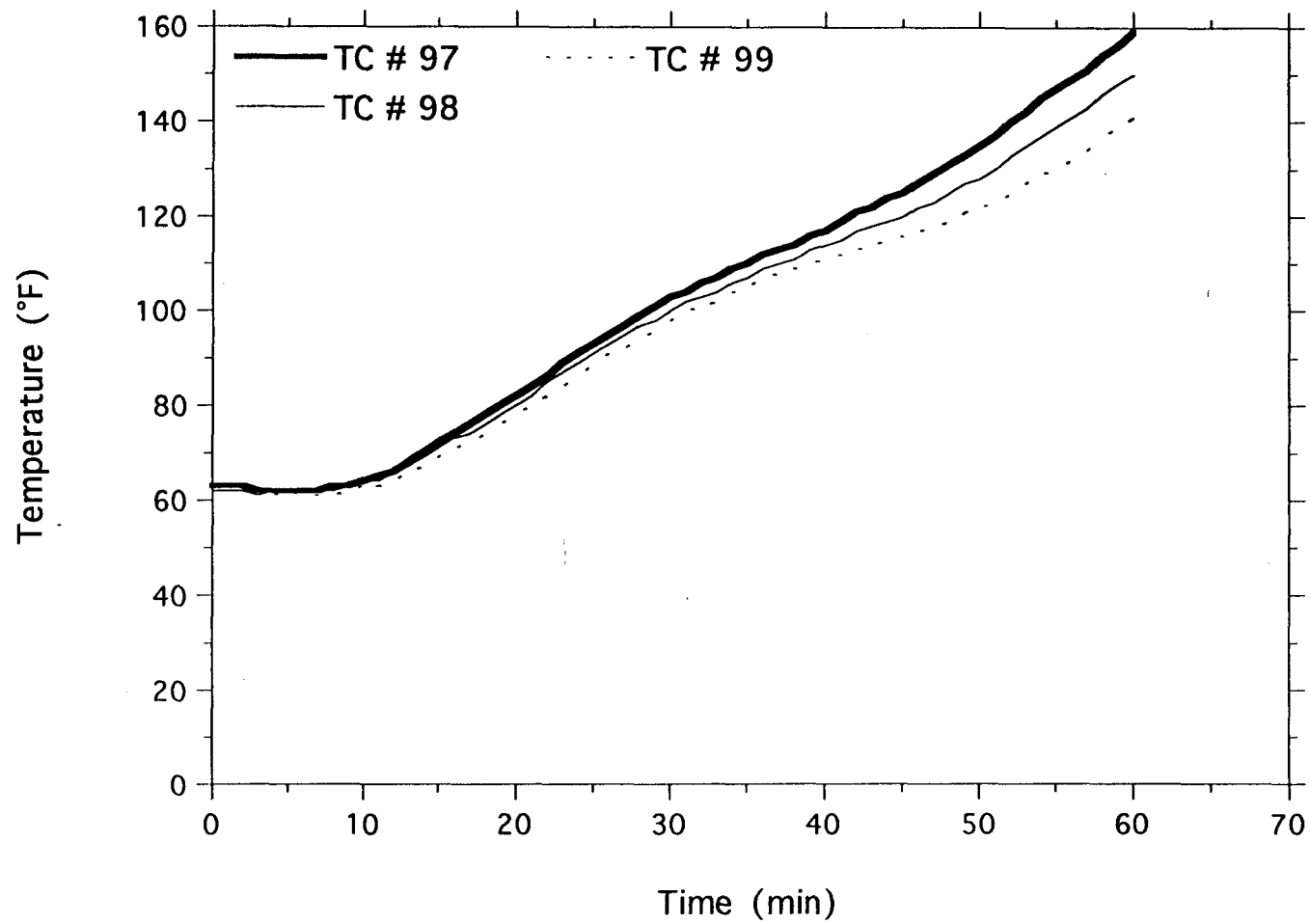
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (6th Conduit in Upper Array)



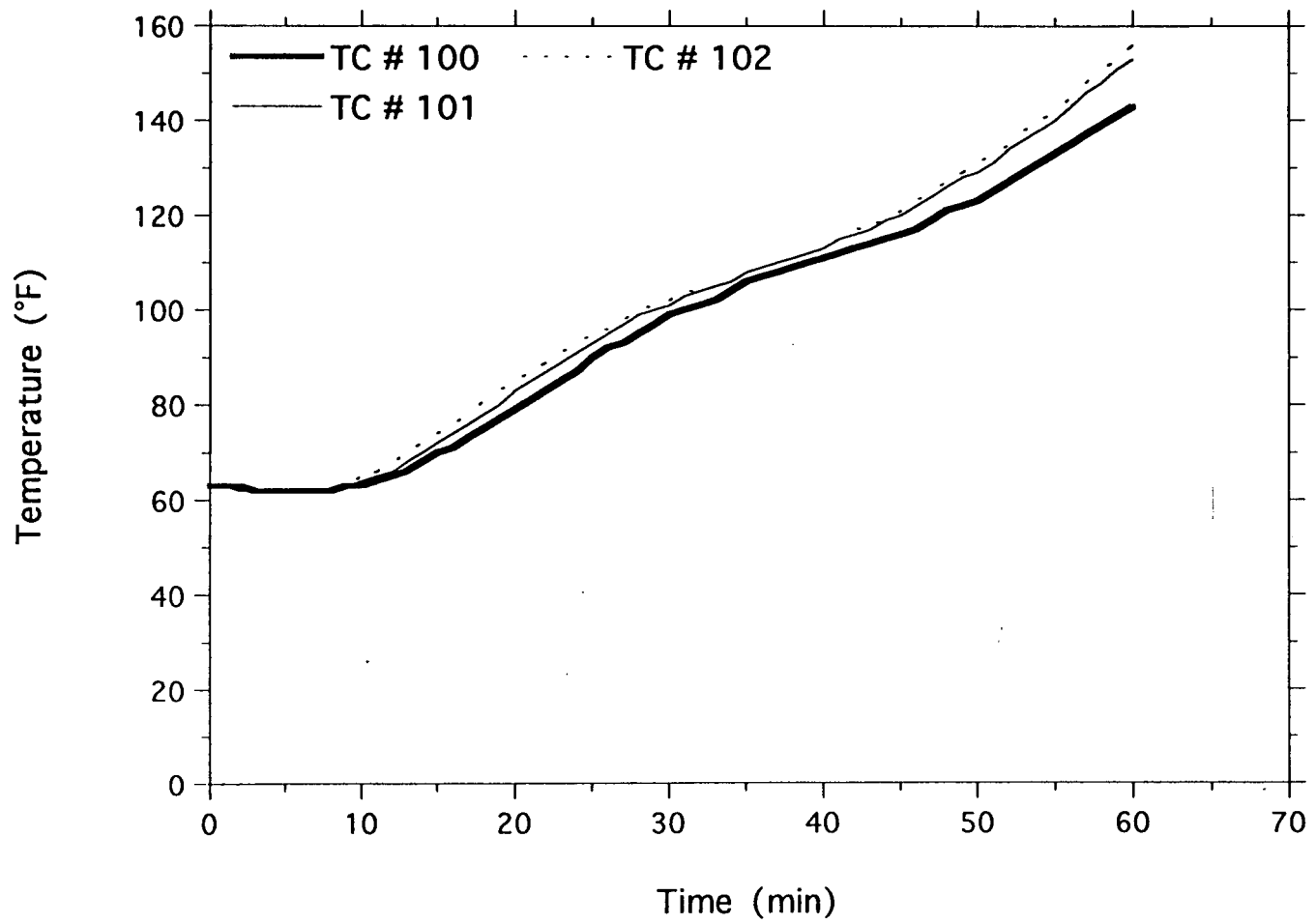
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (6th Conduit in Upper Array)



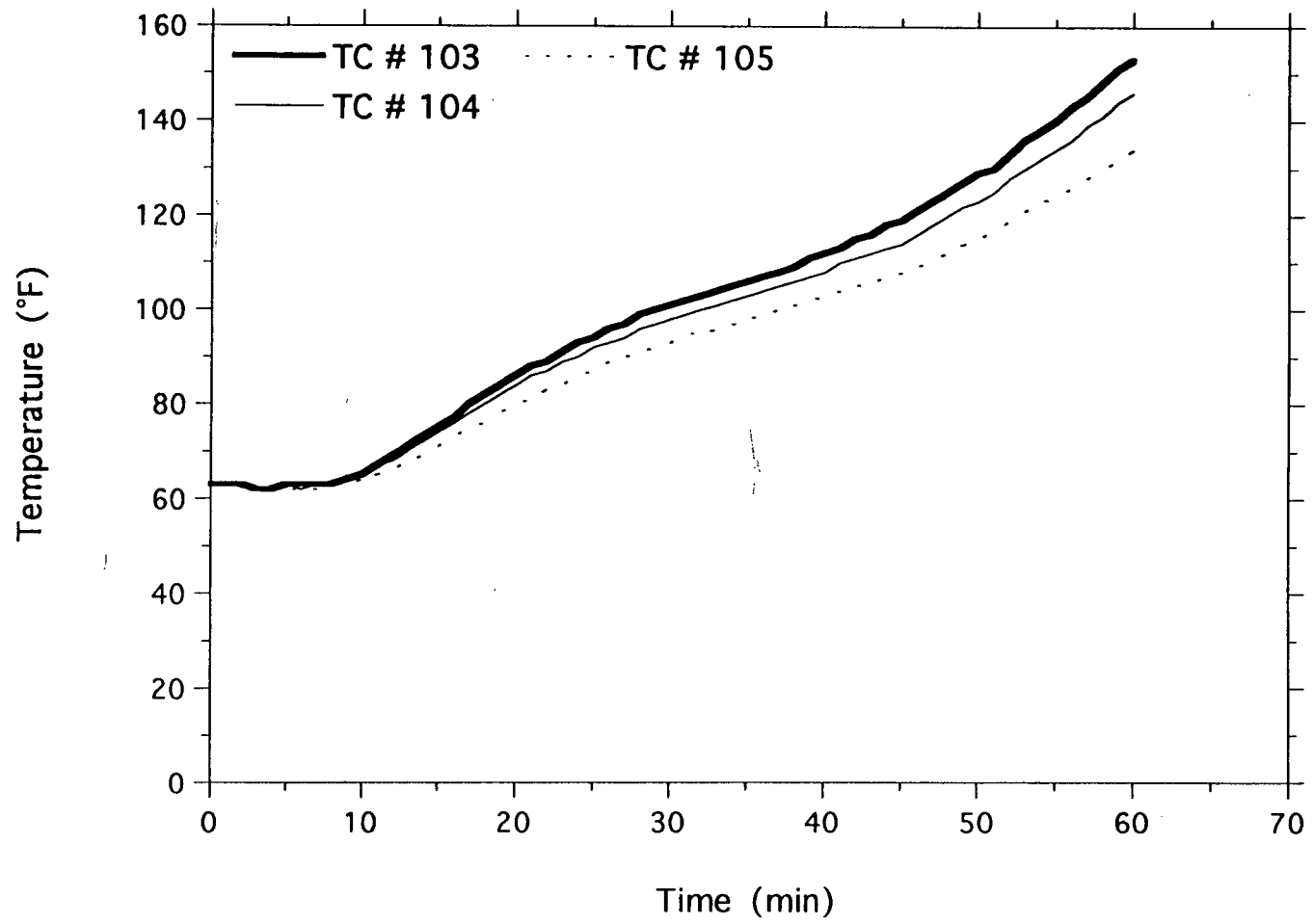
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (6th Conduit in Upper Array)



OMEGA POINT
LABORATORIES

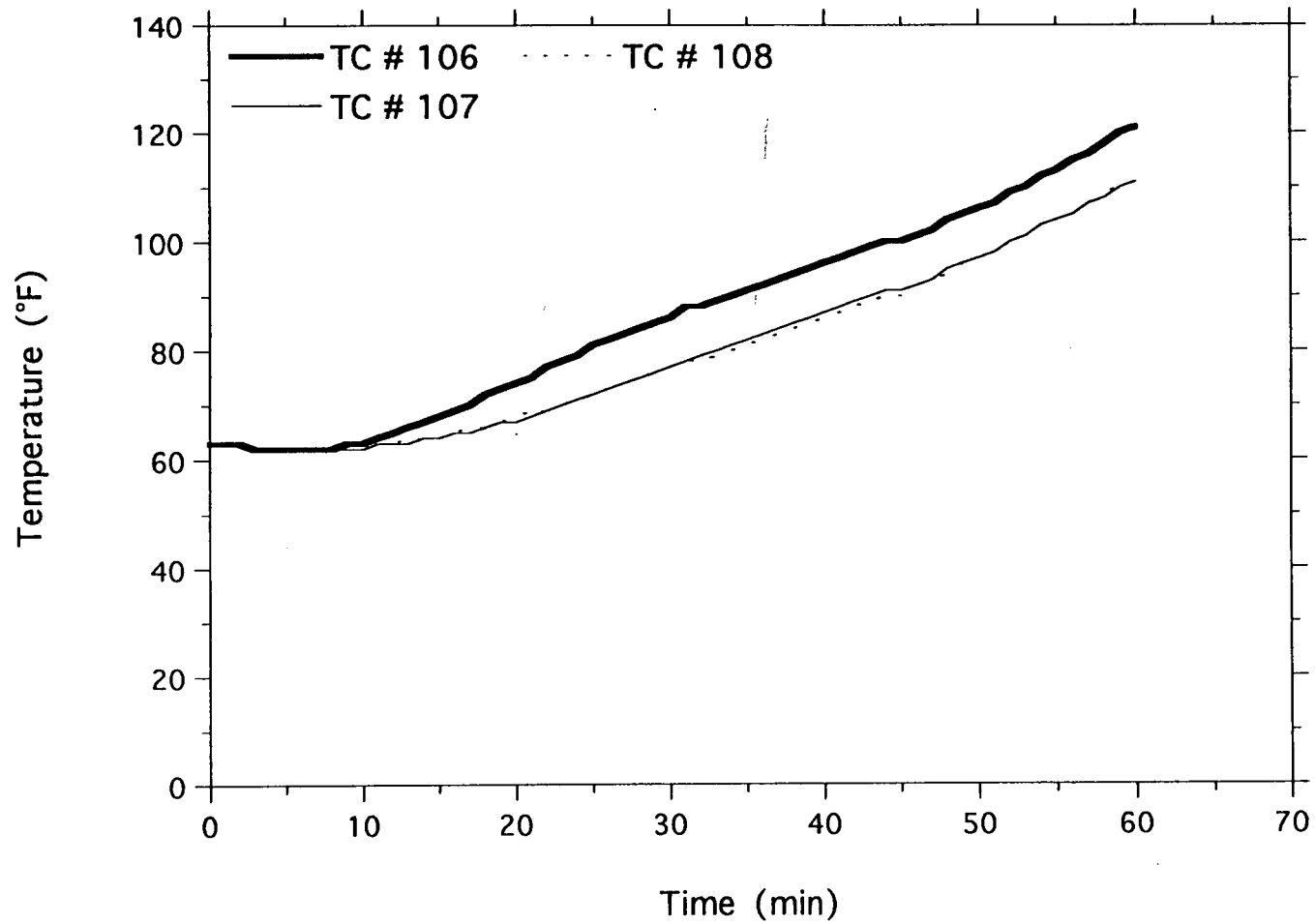
TSI/TVA
Project No. 11960-97258
2" (6th Conduit in Upper Array)



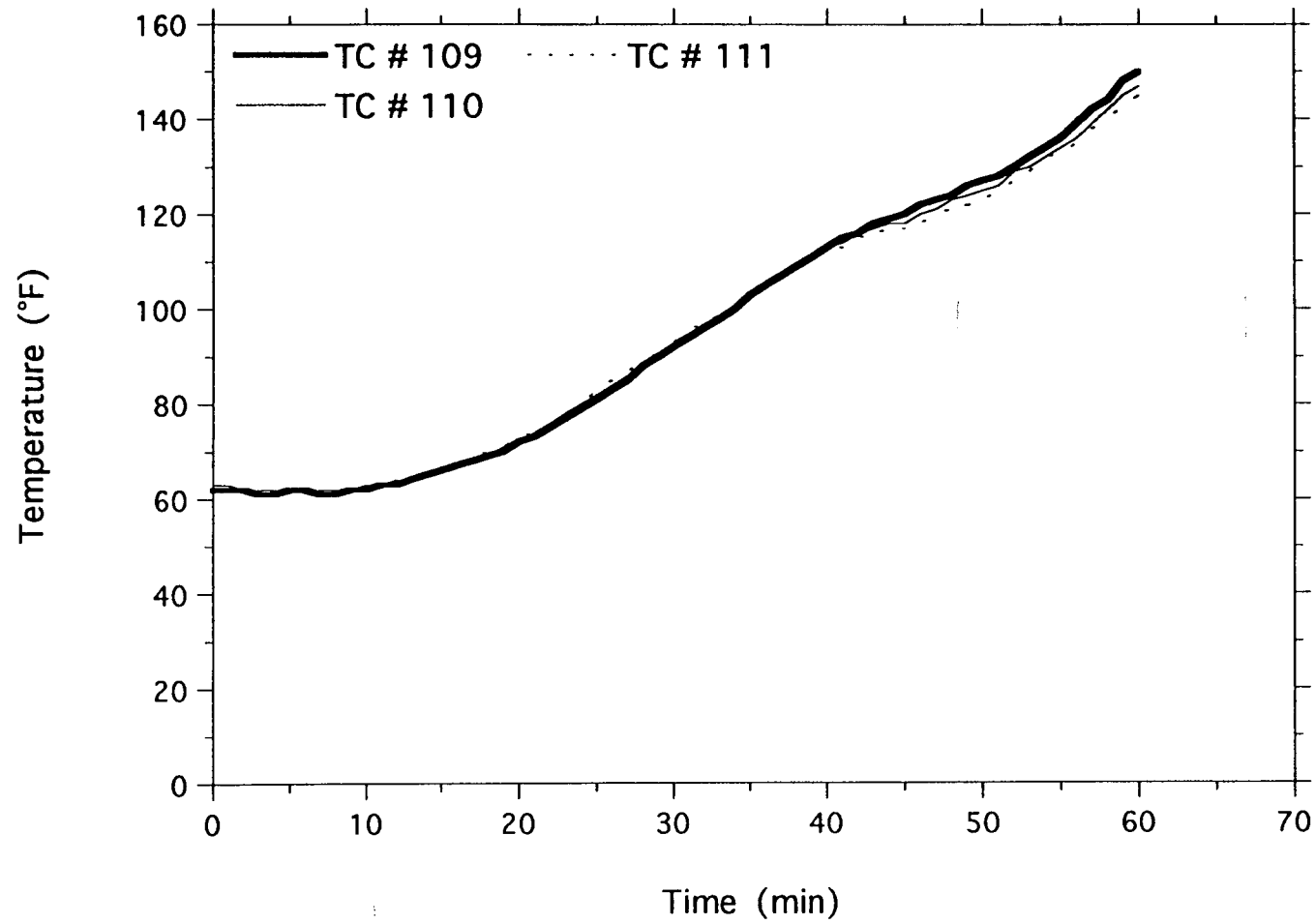
OMEGA POINT
LABORATORIES

OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (6th Conduit in Upper Array)

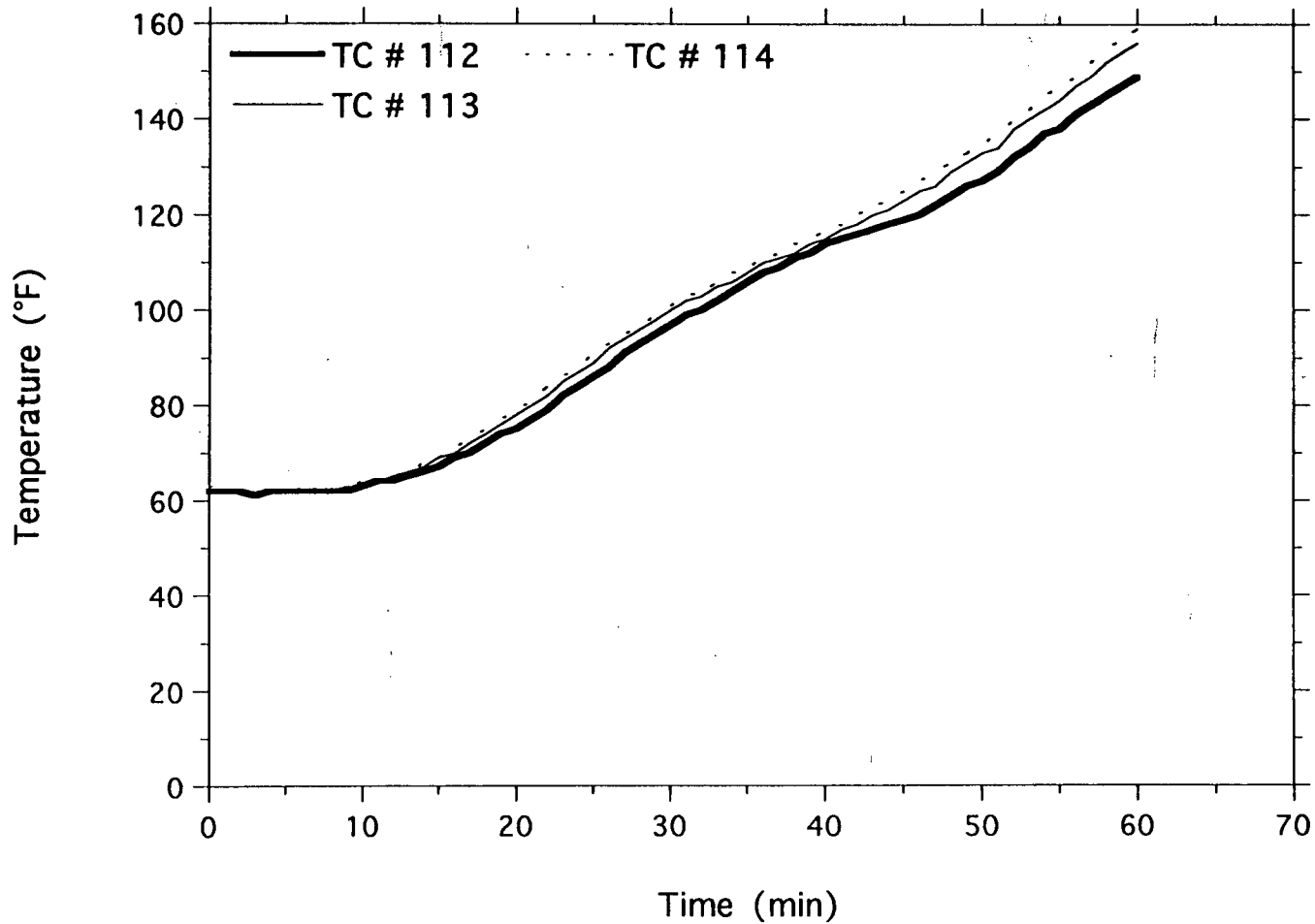


TSI/TVA
Project No. 11960-97258
2" (Bottom Conduit in Upper Array)



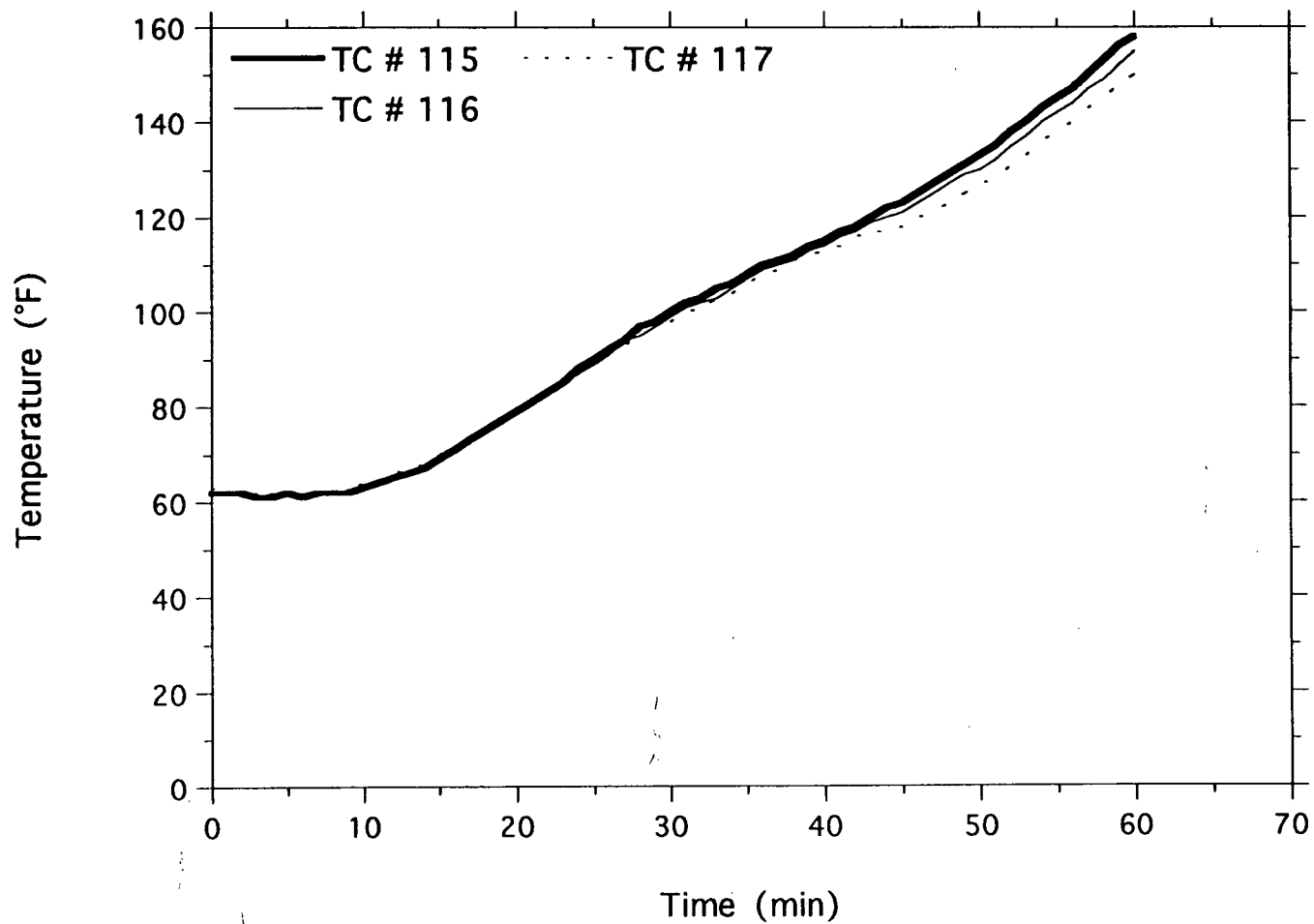
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (Bottom Conduit in Upper Array)



OMEGA POINT
LABORATORIES

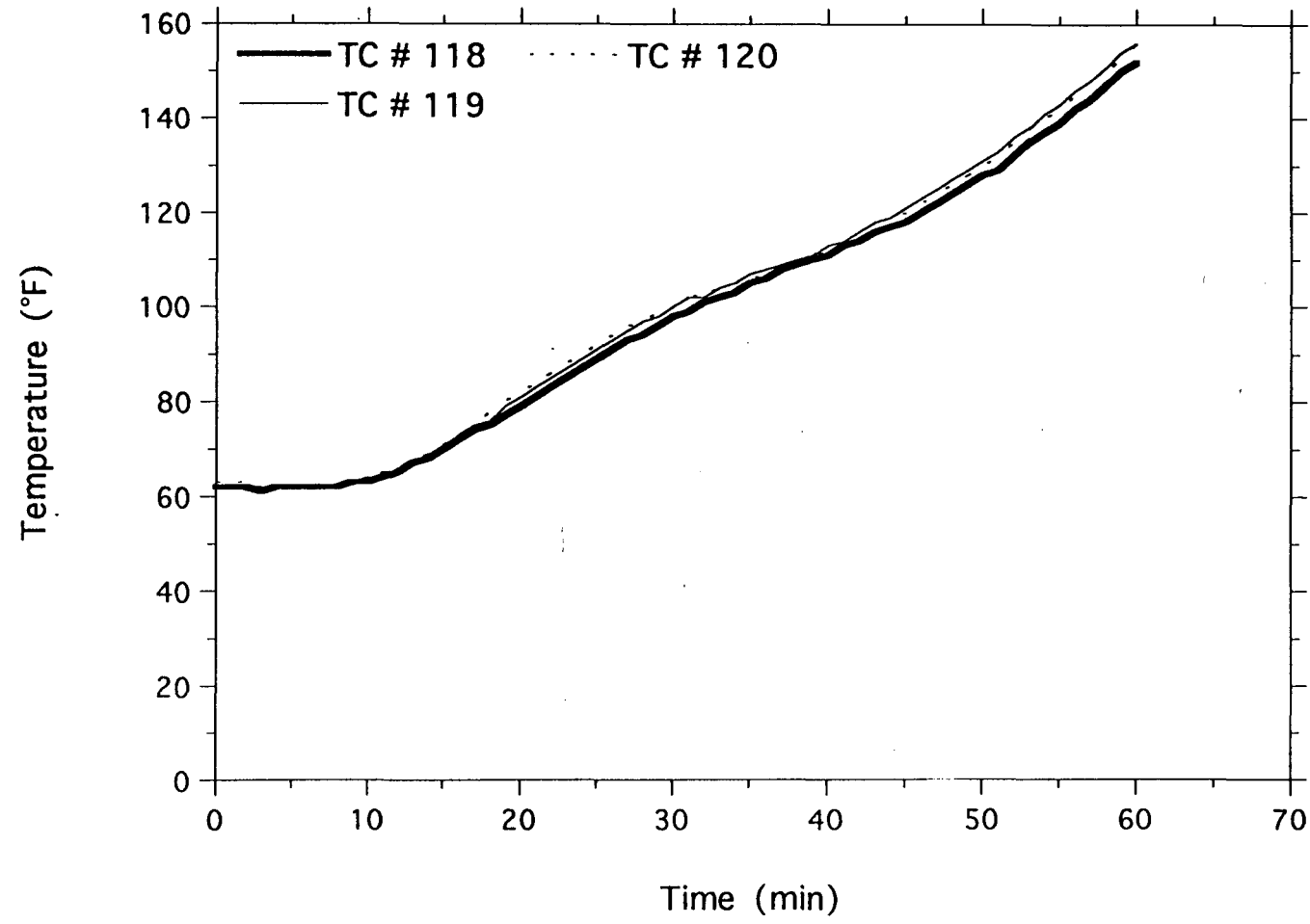
TSI/TVA
Project No. 11960-97258
2" (Bottom Conduit in Upper Array)



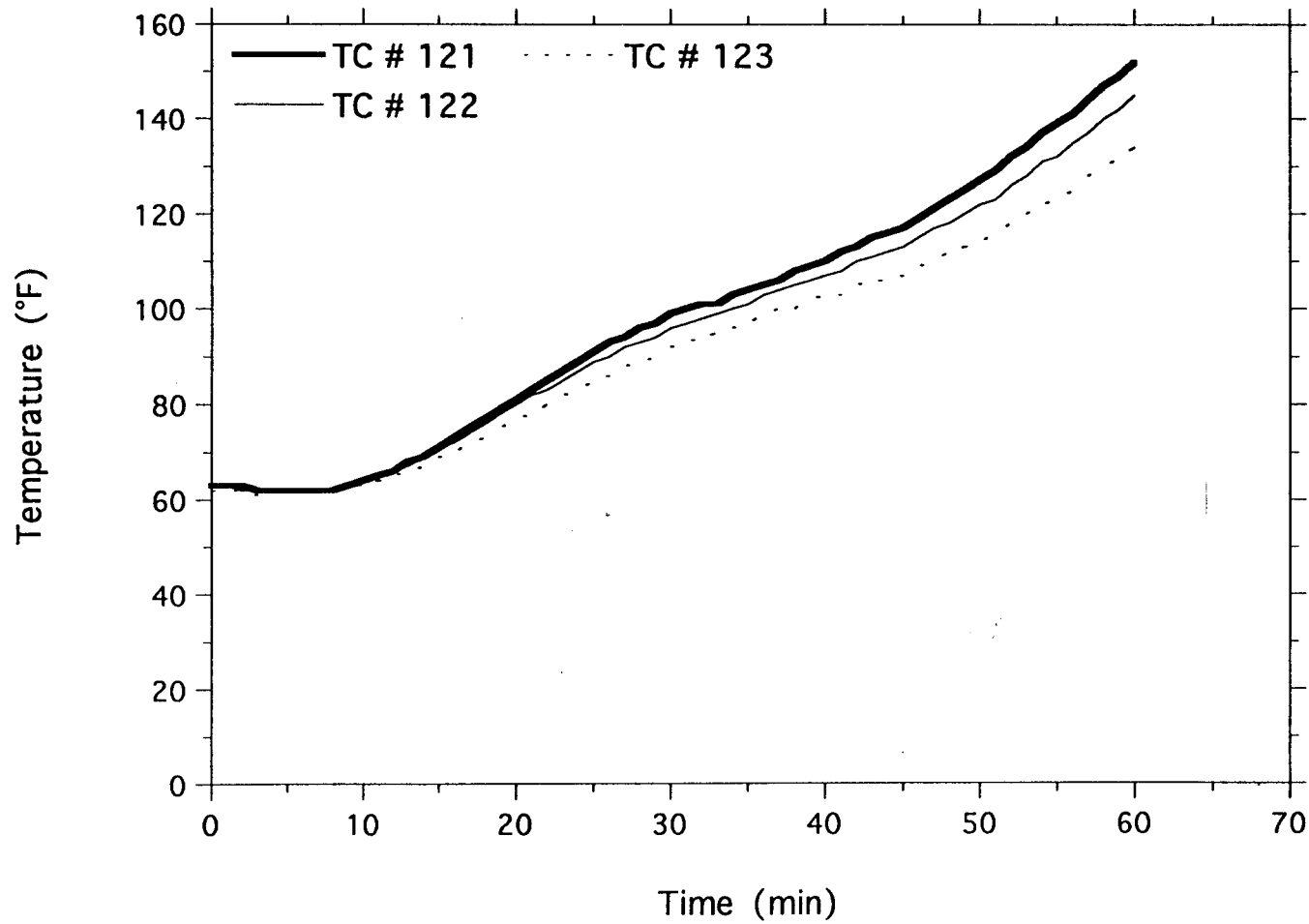
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (Bottom Conduit in Upper Array)

OMEGA POINT
LABORATORIES

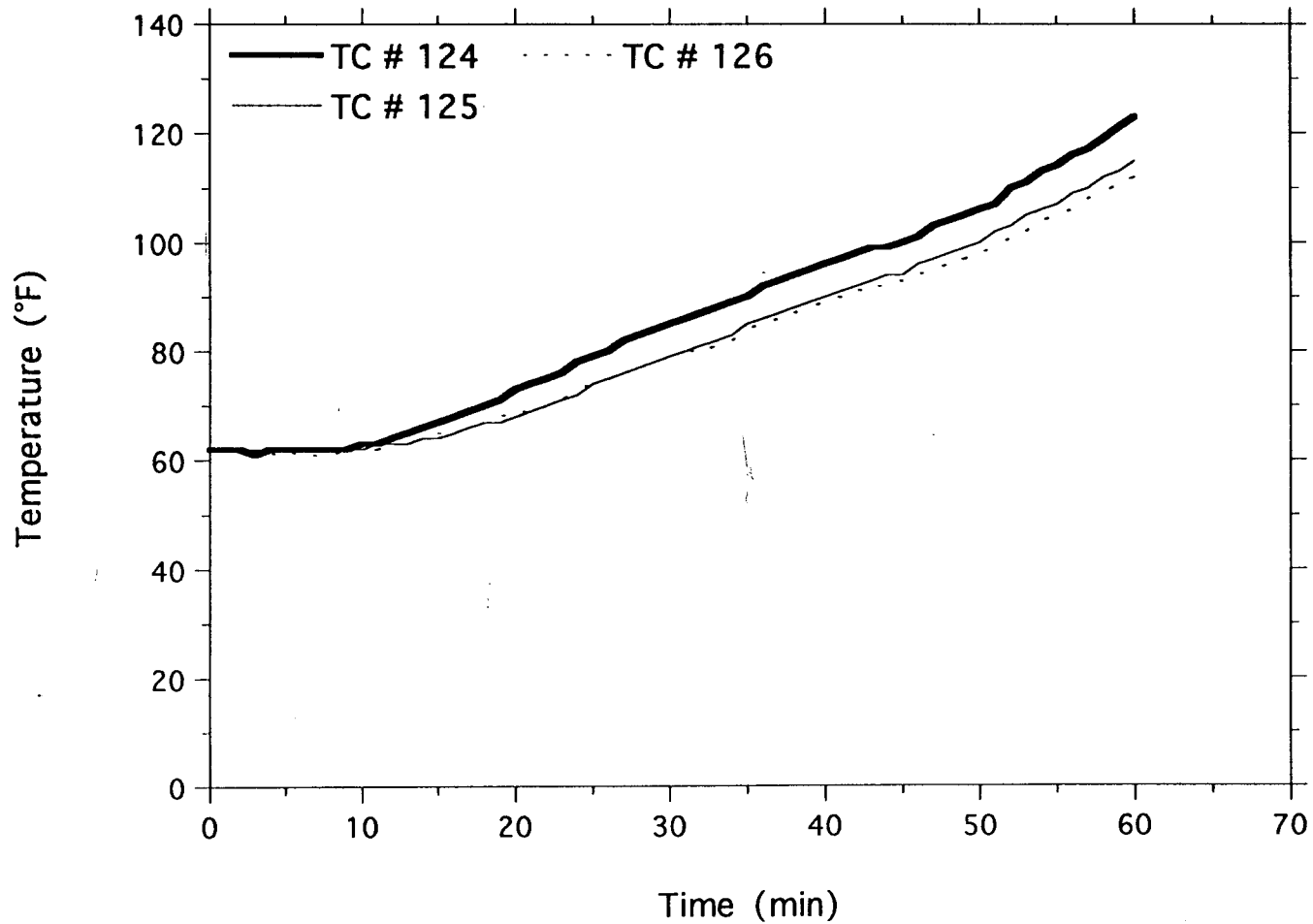


TSI/TVA
Project No. 11960-97258
2" (Bottom Conduit in Upper Array)



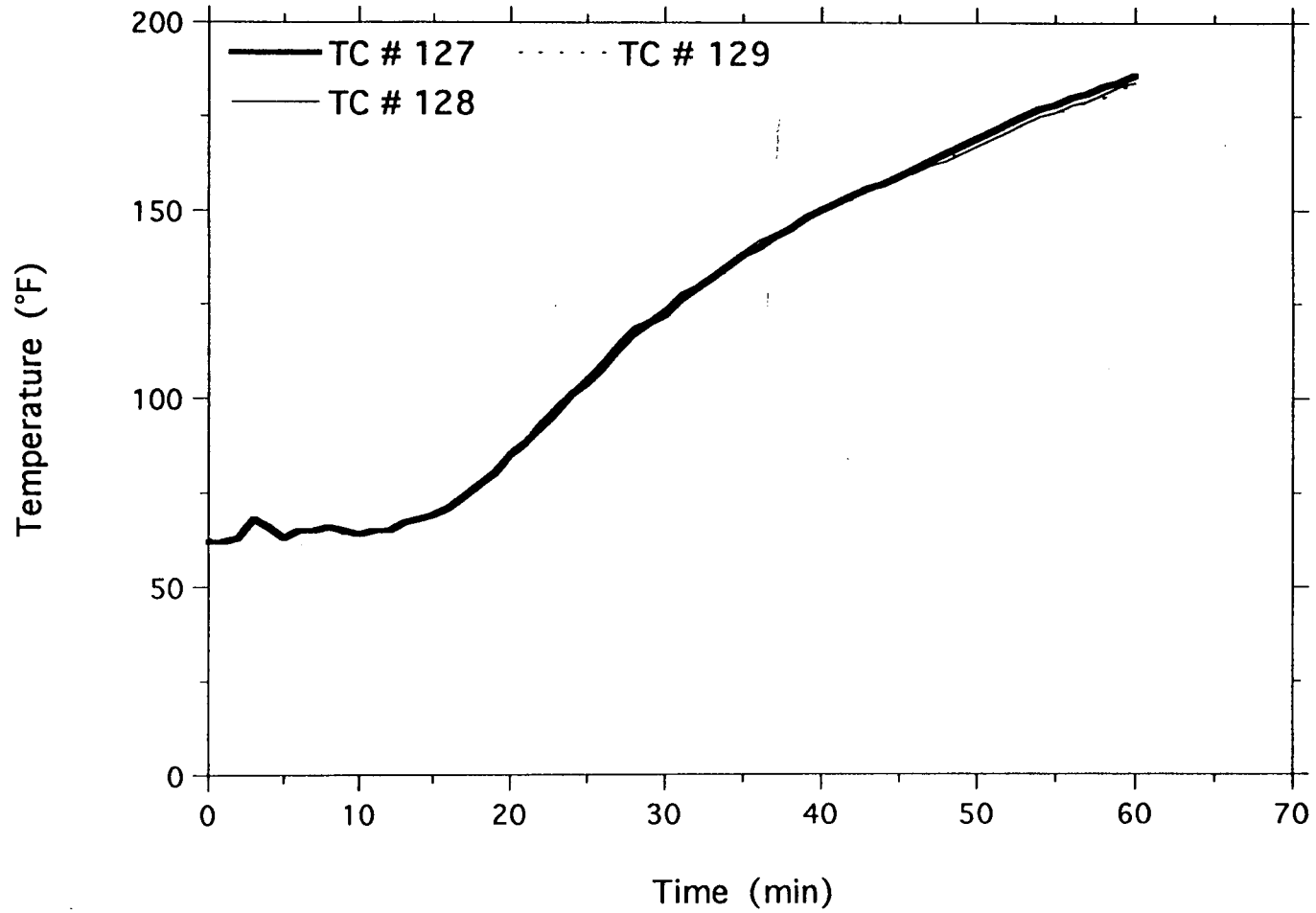
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" (Bottom Conduit in Upper Array)



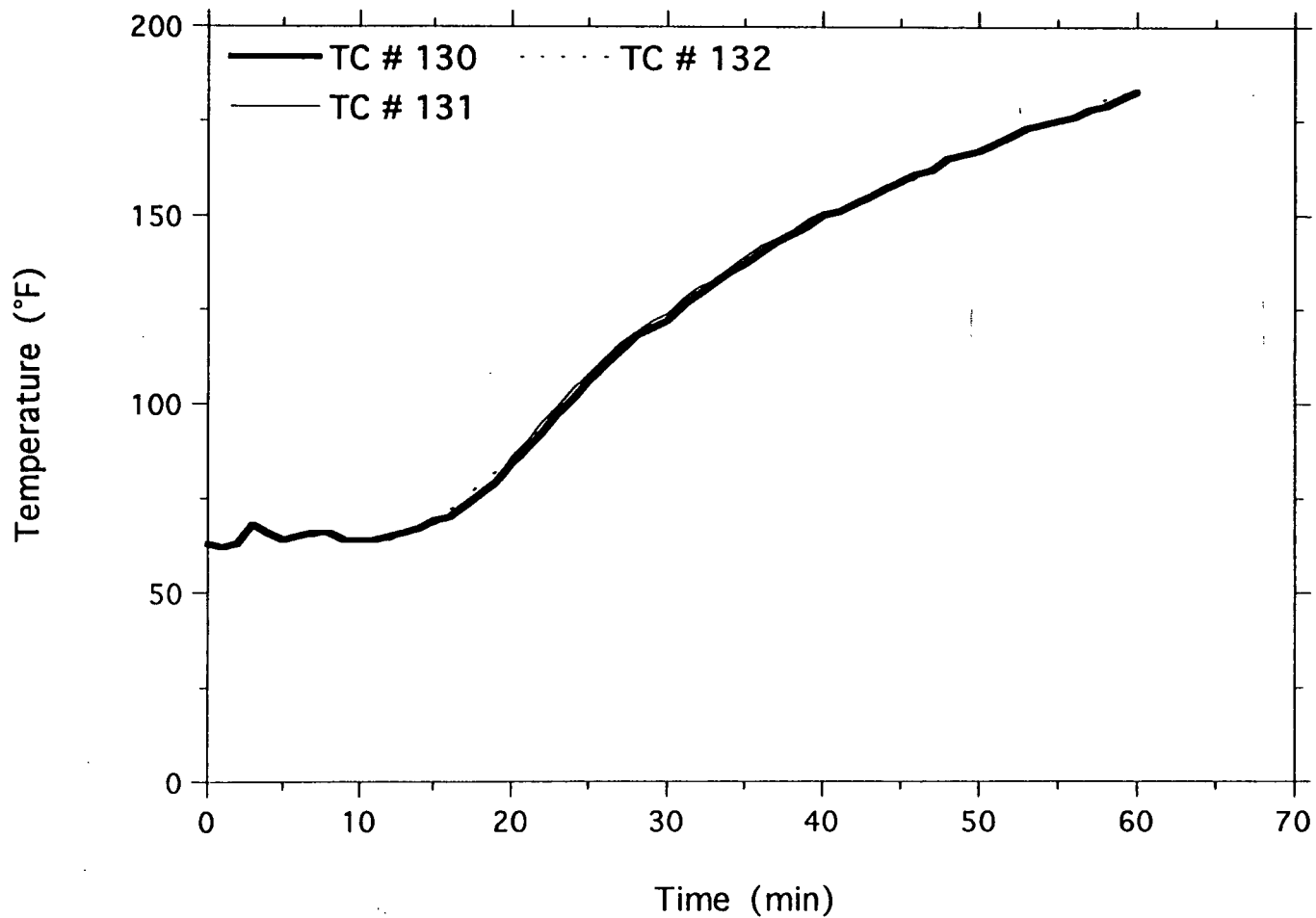
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Top Conduit in Middle Array)



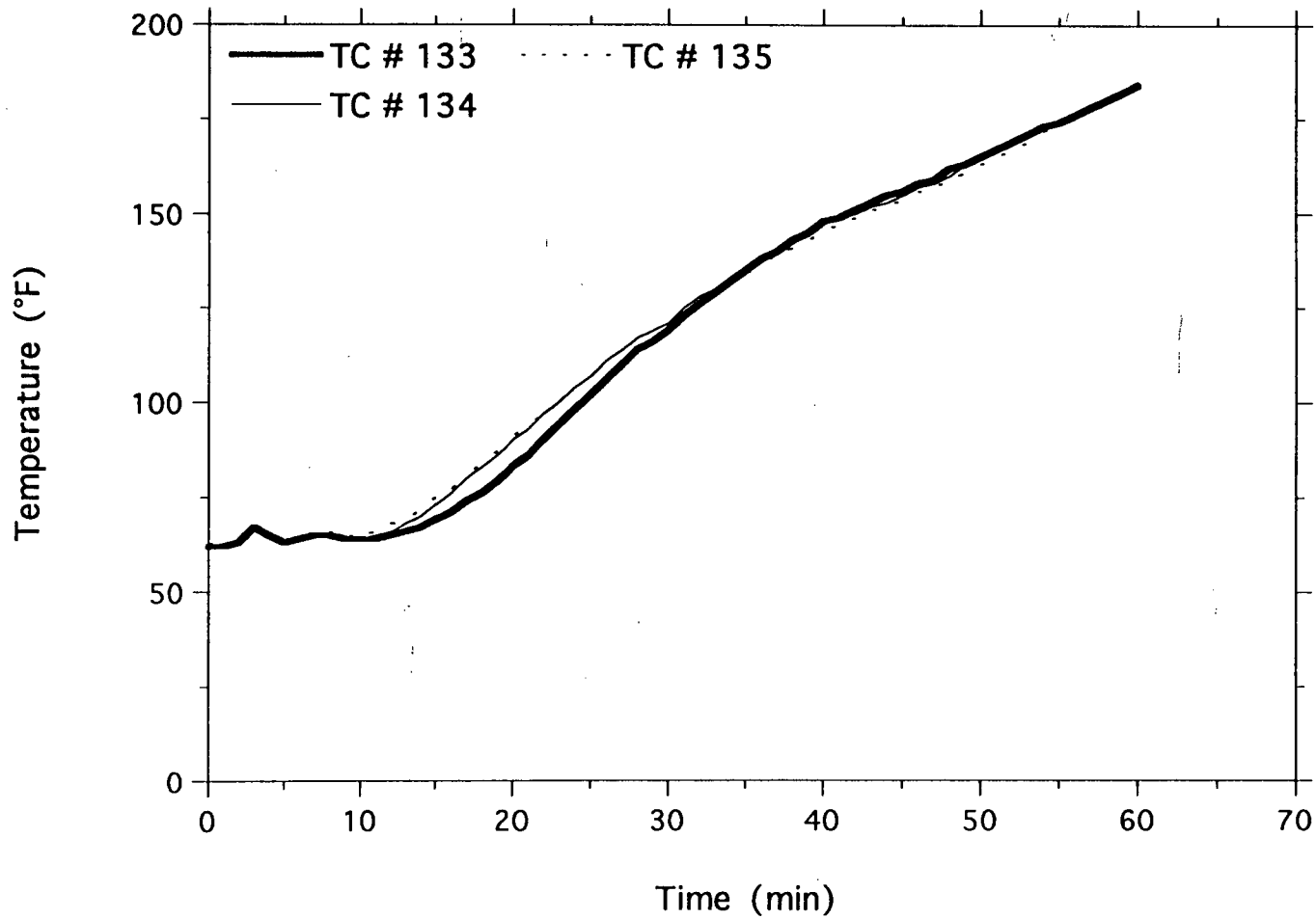
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Top Conduit in Middle Array)



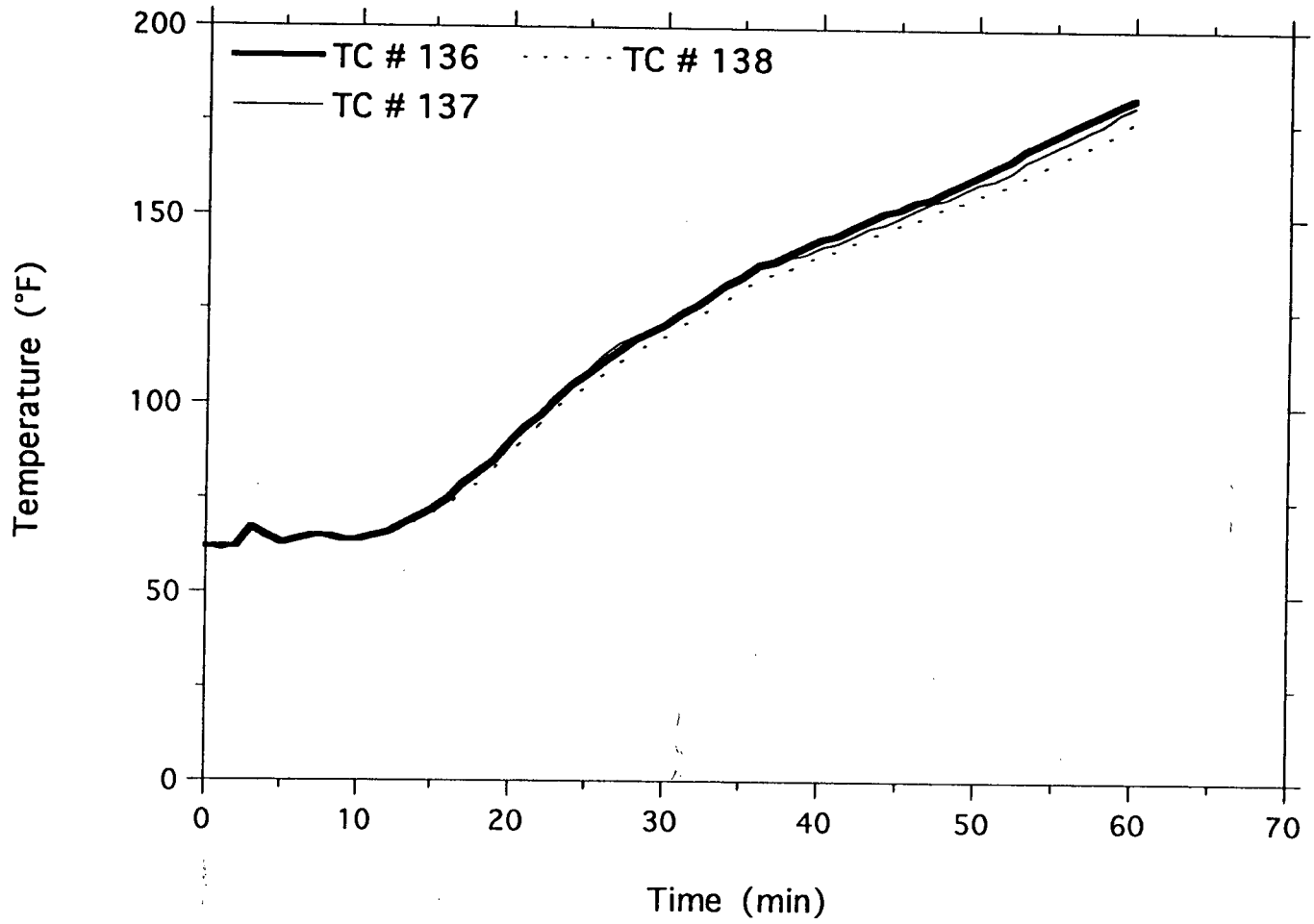
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Top Conduit in Middle Array)



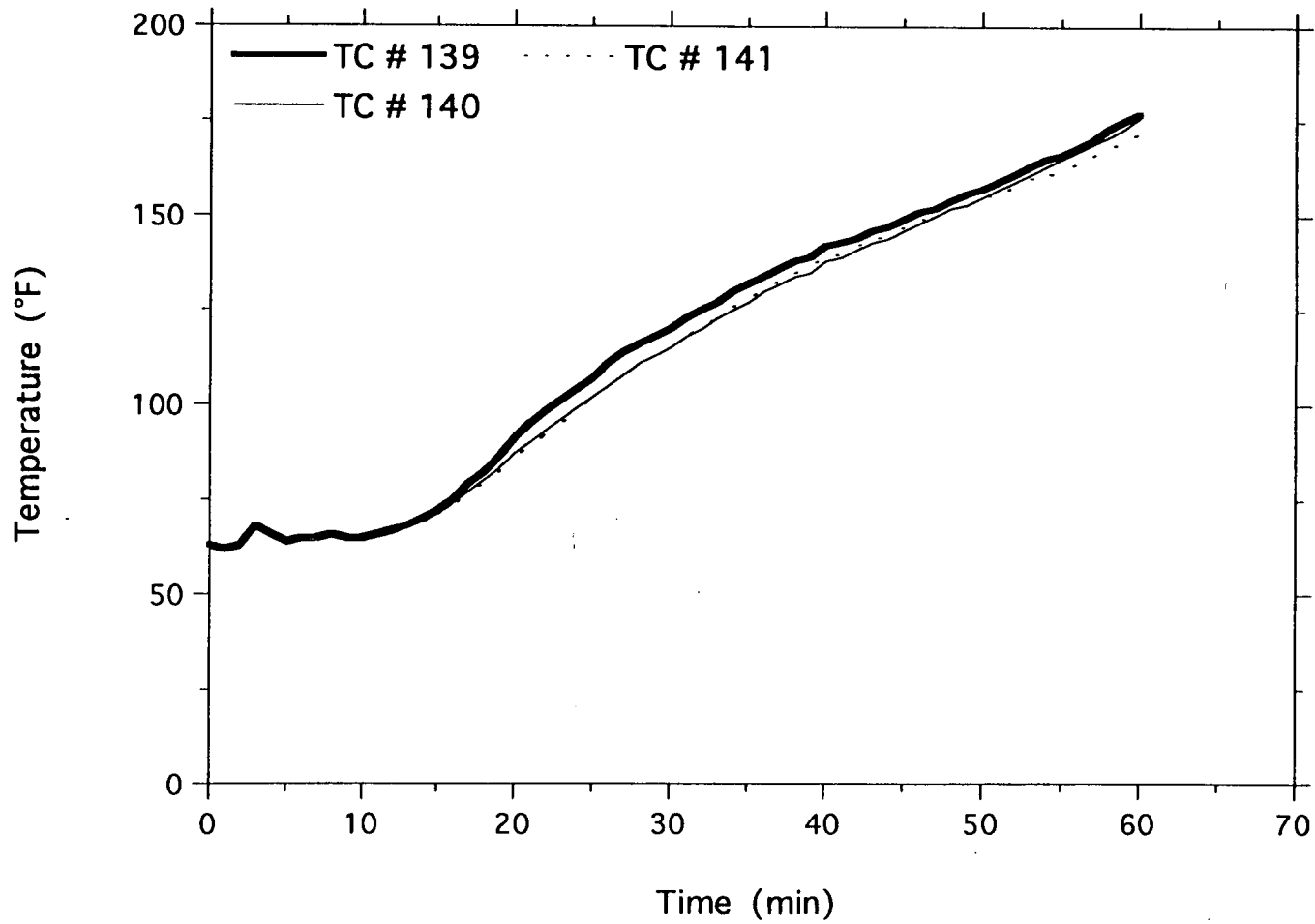
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Top Conduit in Middle Array)



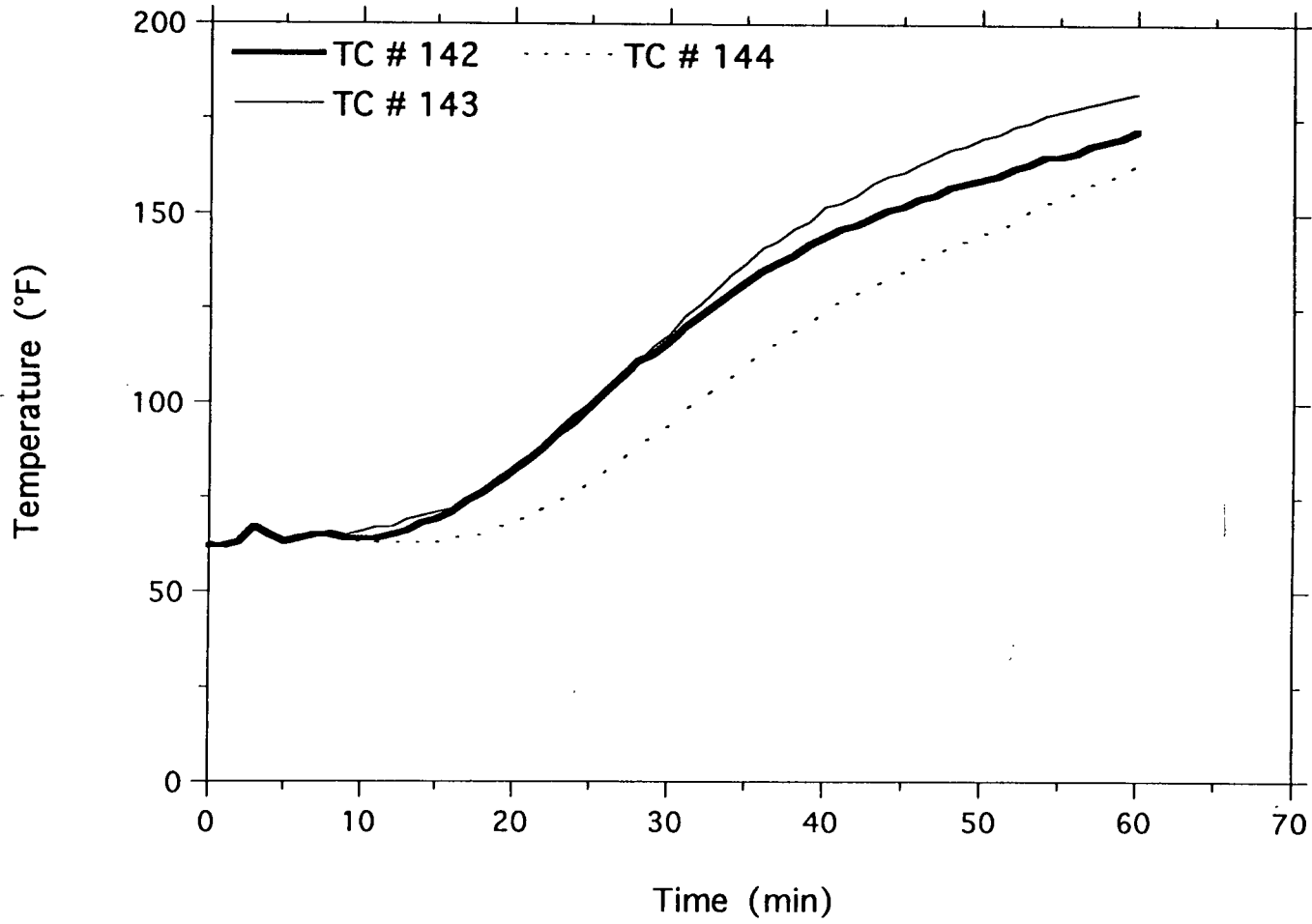
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Top Conduit in Middle Array)



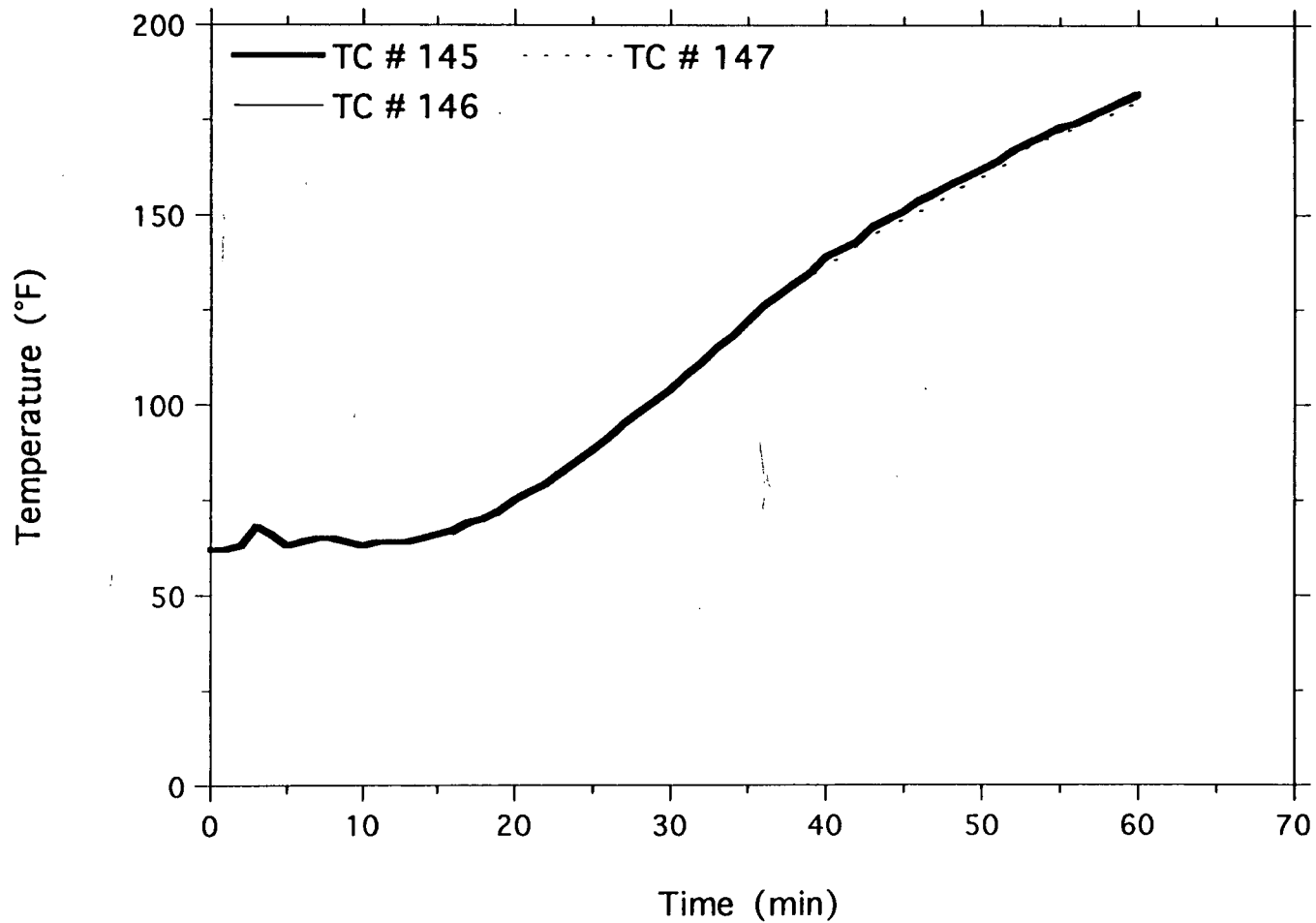
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Top Conduit in Middle Array)



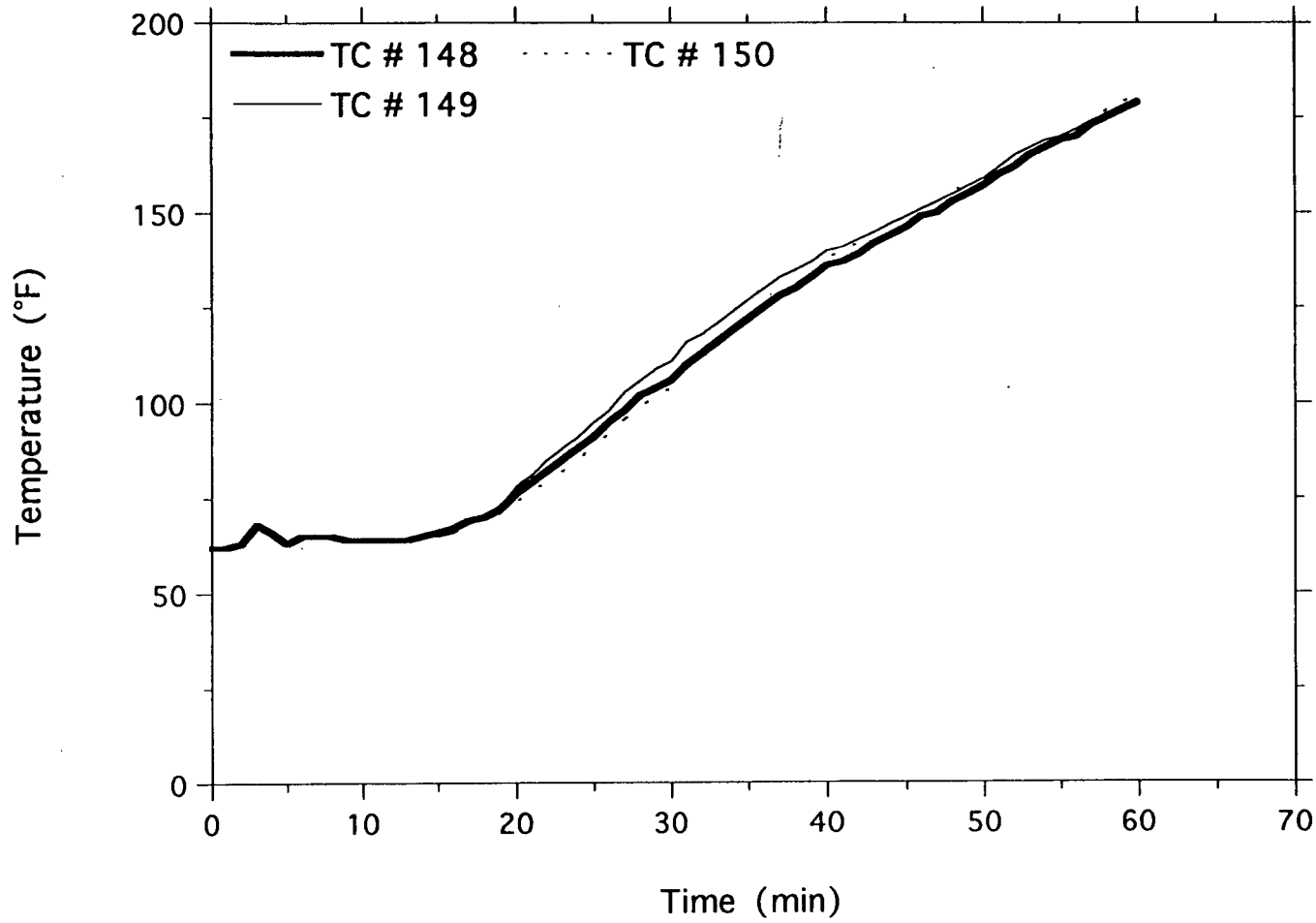
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Bottom Conduit in Middle Array)



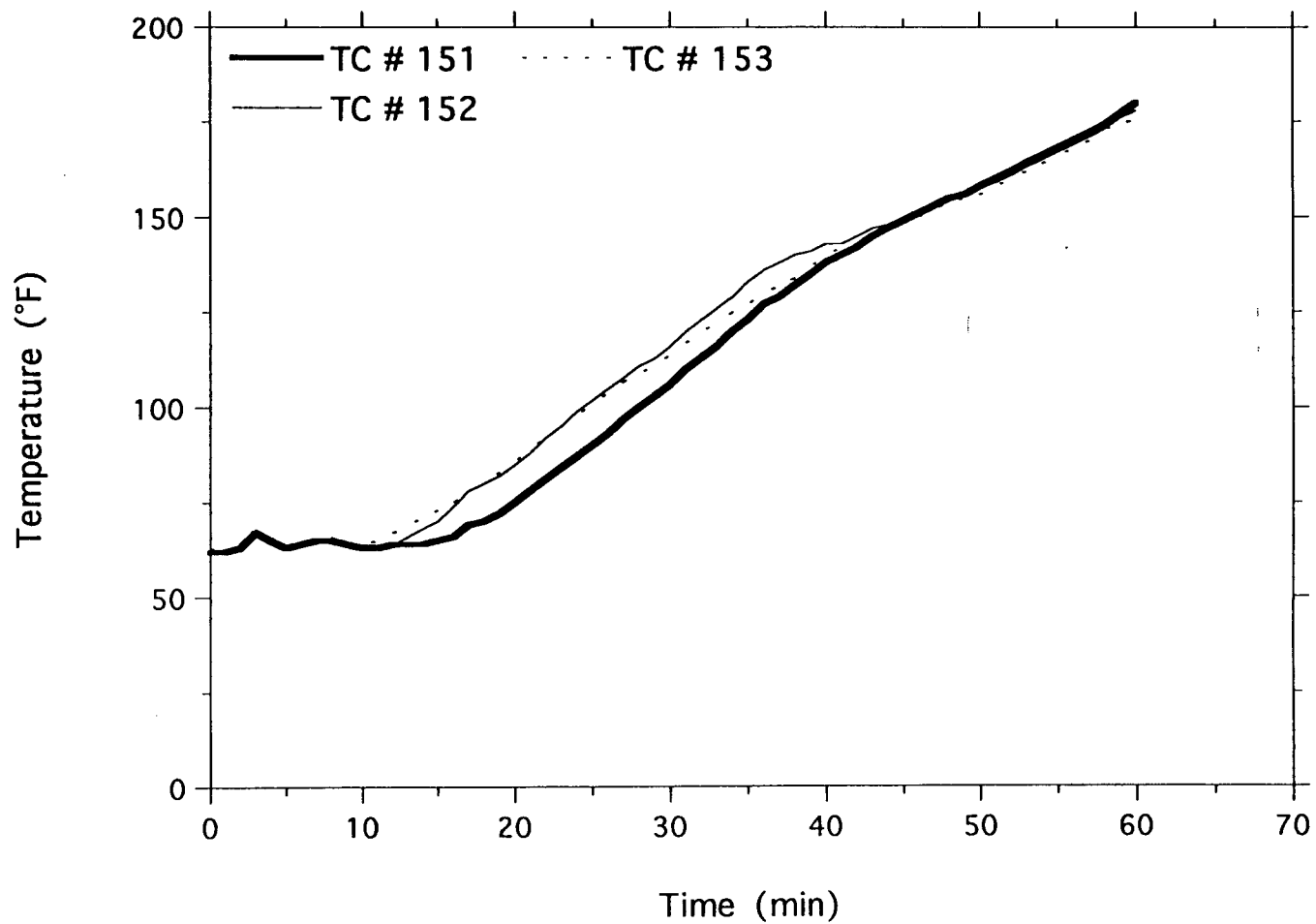
SEIERS
LABORATORIES
OMEGA POINT

TSI/TVA
Project No. 11960-97258
1" (Bottom Conduit in Middle Array)



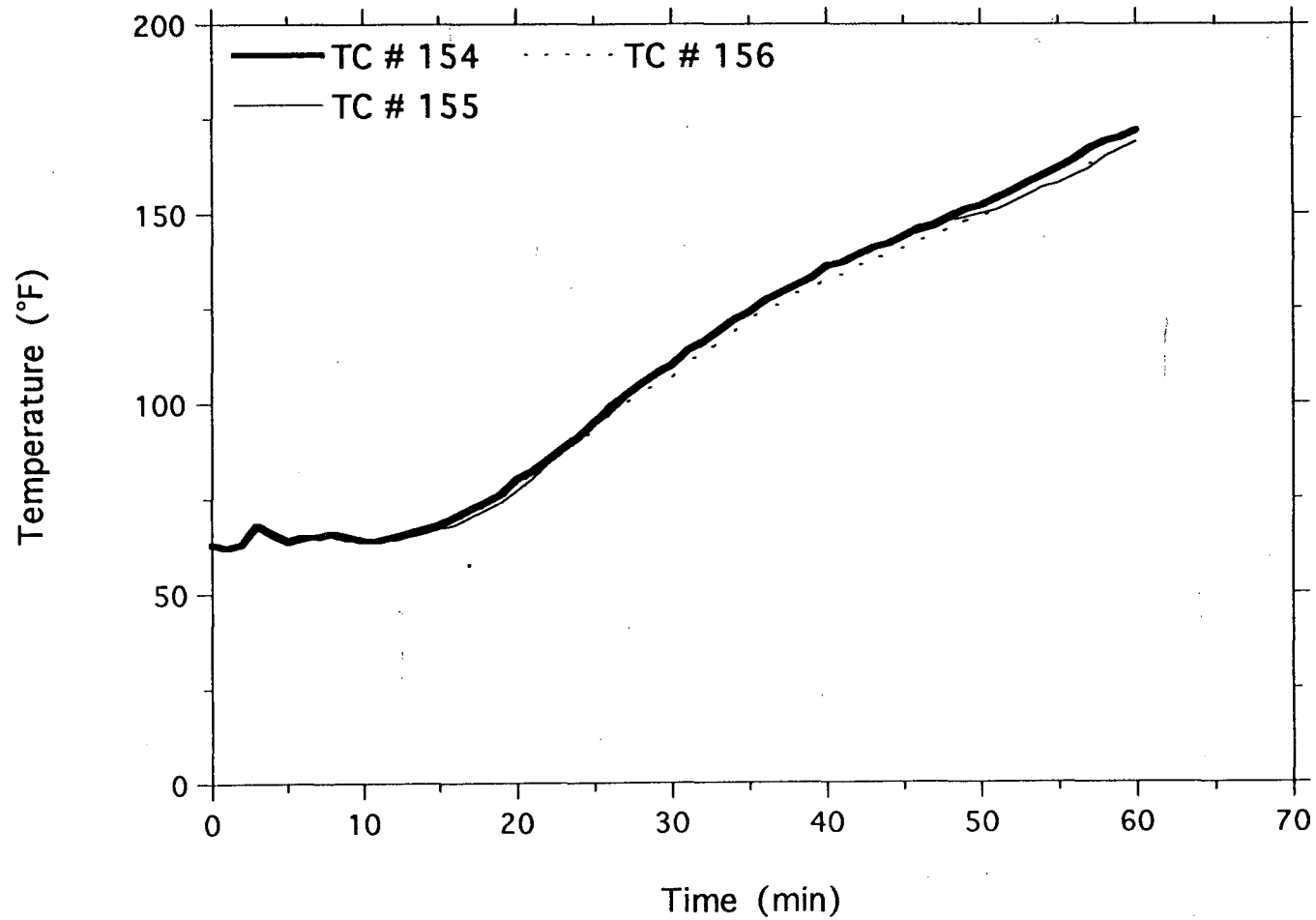
SEABOARD
LABORATORIES
OMEGA POINT

TSI/TVA
Project No. 11960-97258
1" (Bottom Conduit in Middle Array)



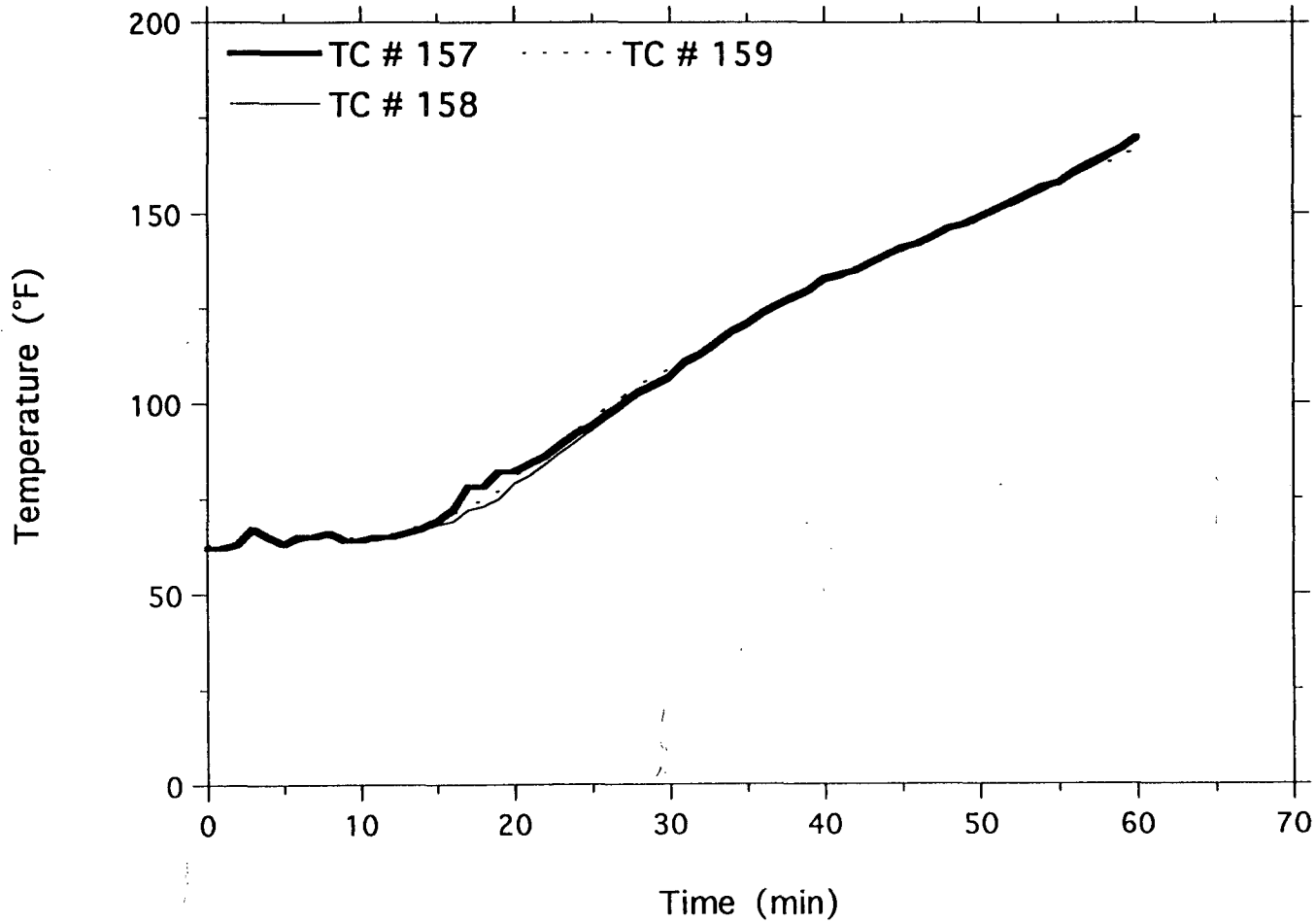
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Bottom Conduit in Middle Array)



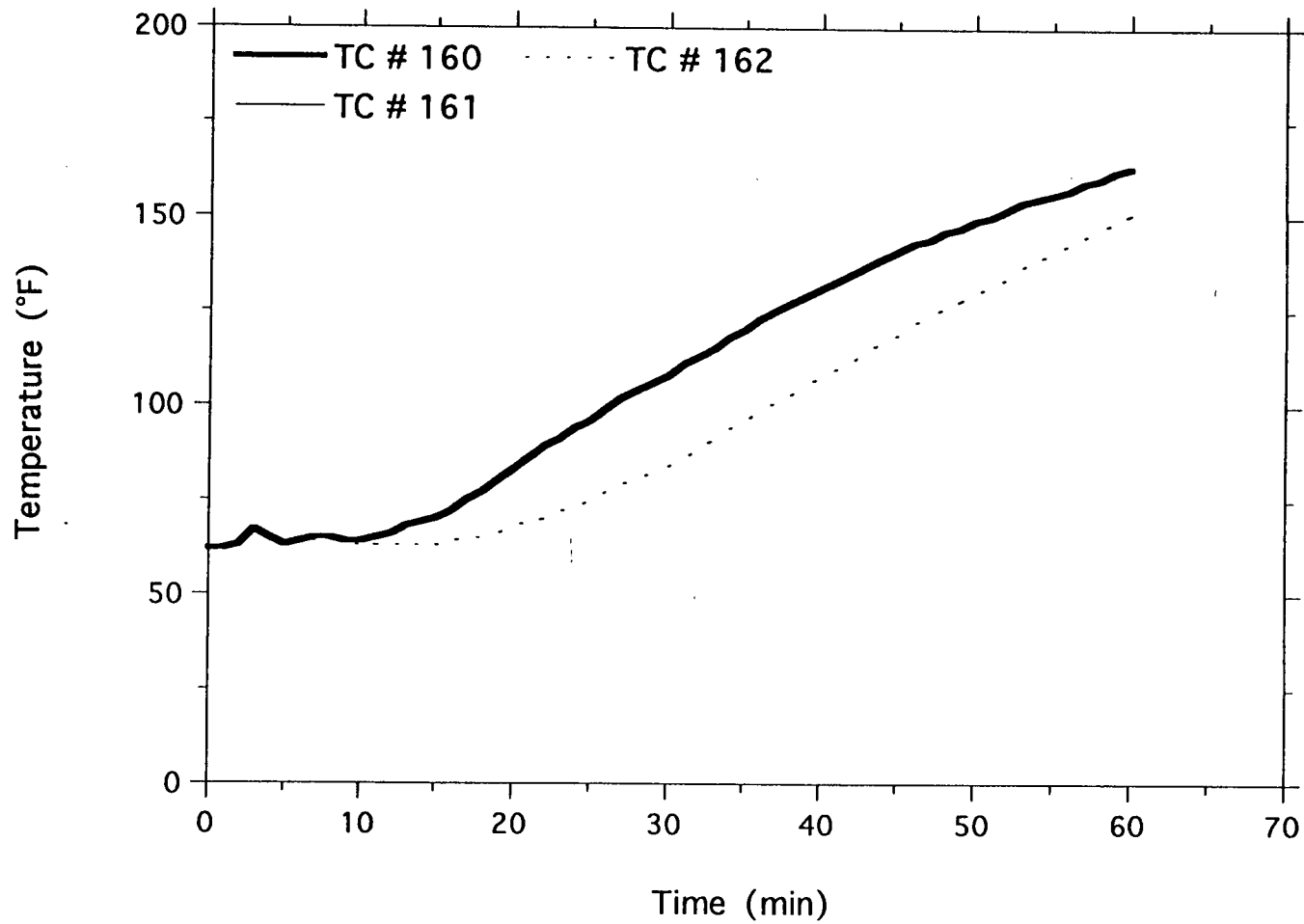
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Bottom Conduit in Middle Array)



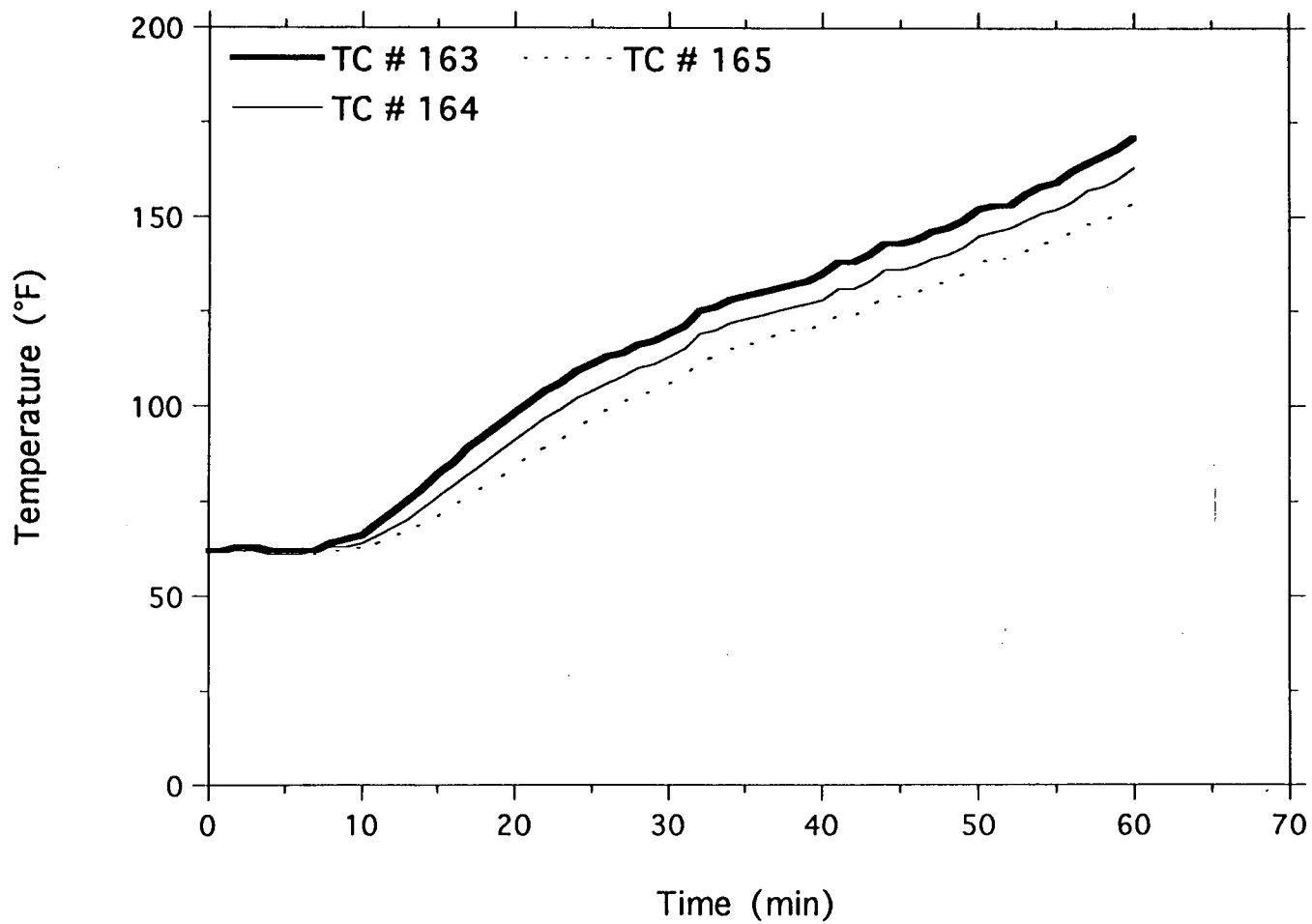
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" (Bottom Conduit in Middle Array)



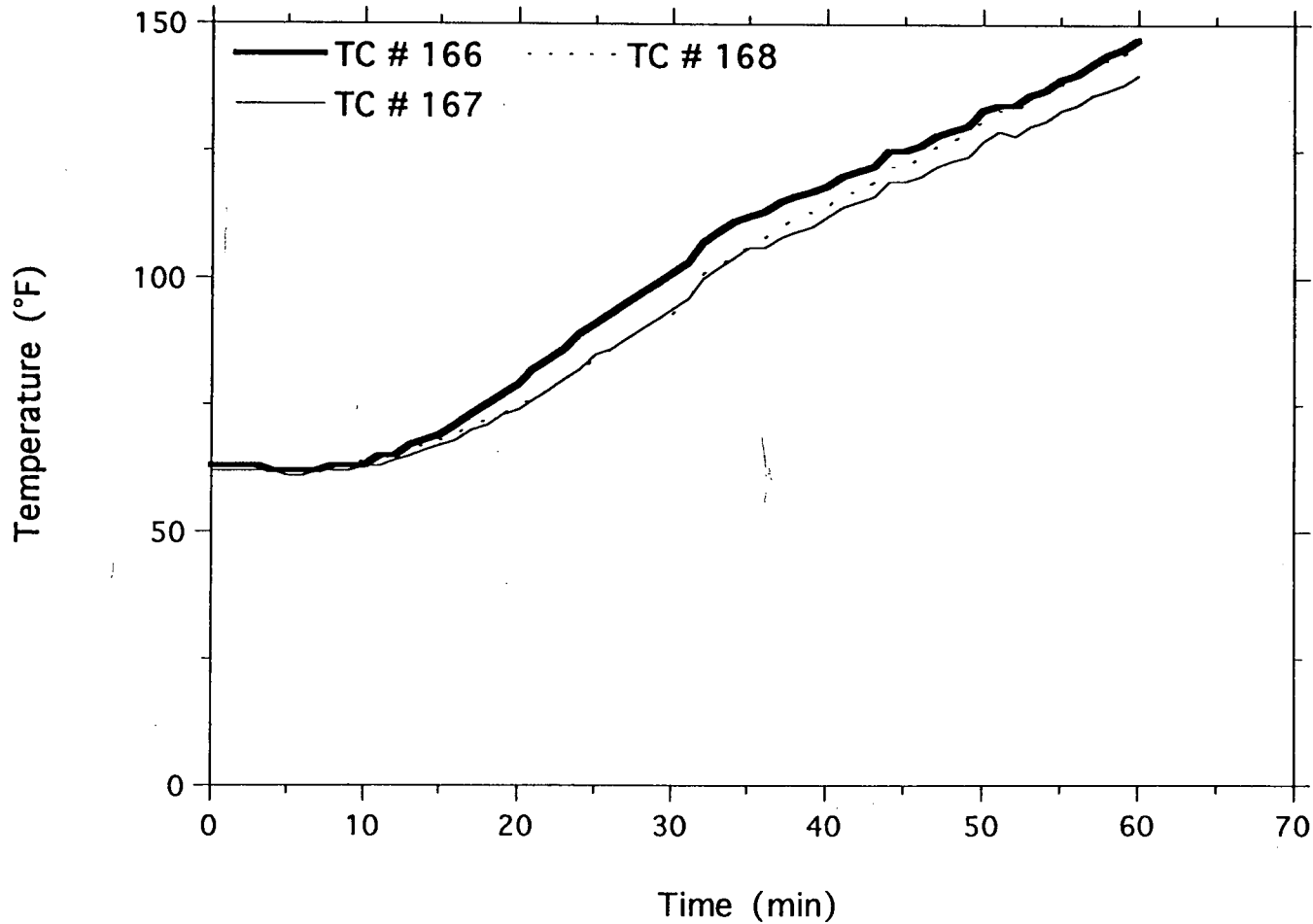
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (Left Conduit in Bottom Array)



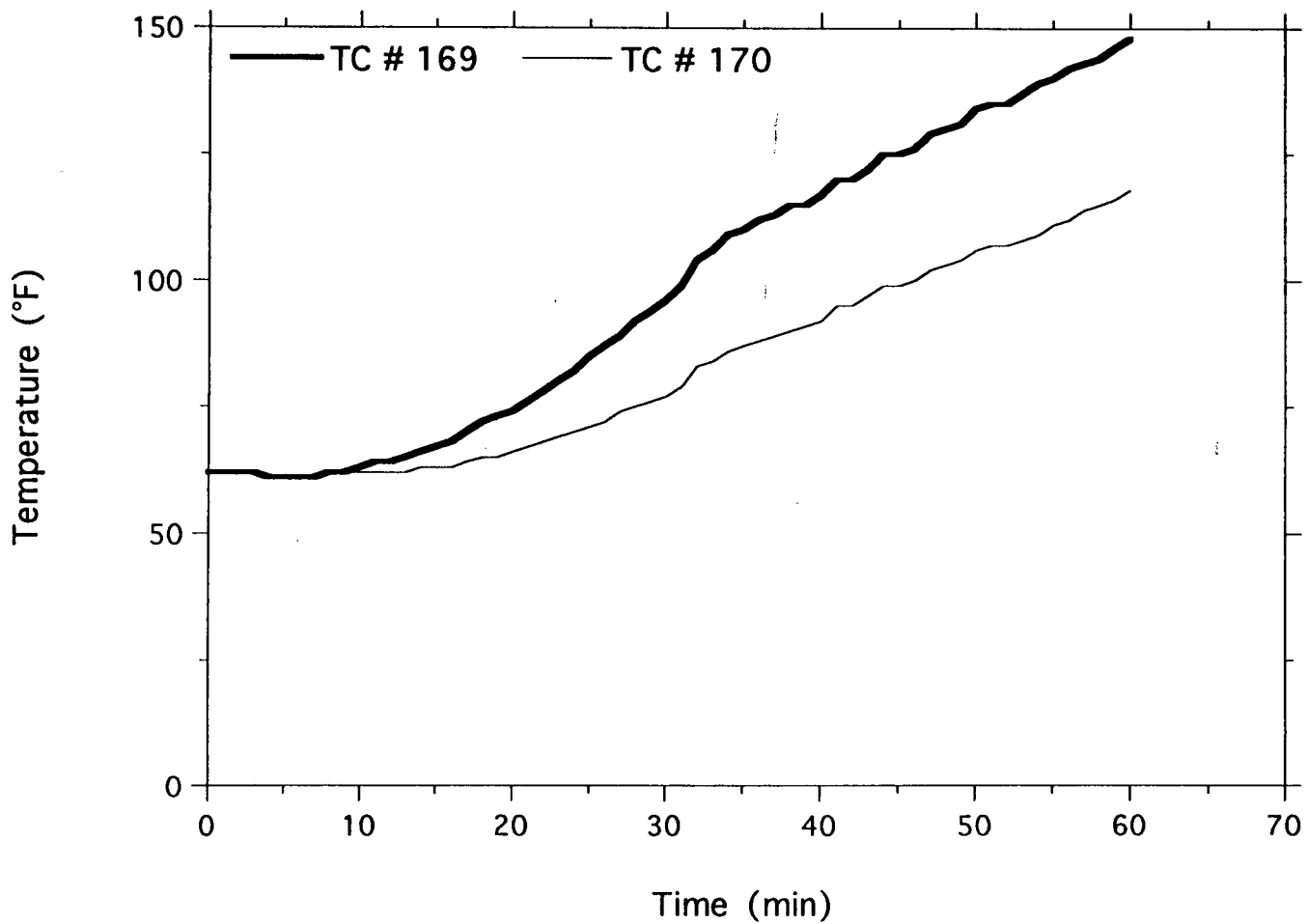
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (Left Conduit in Bottom Array)



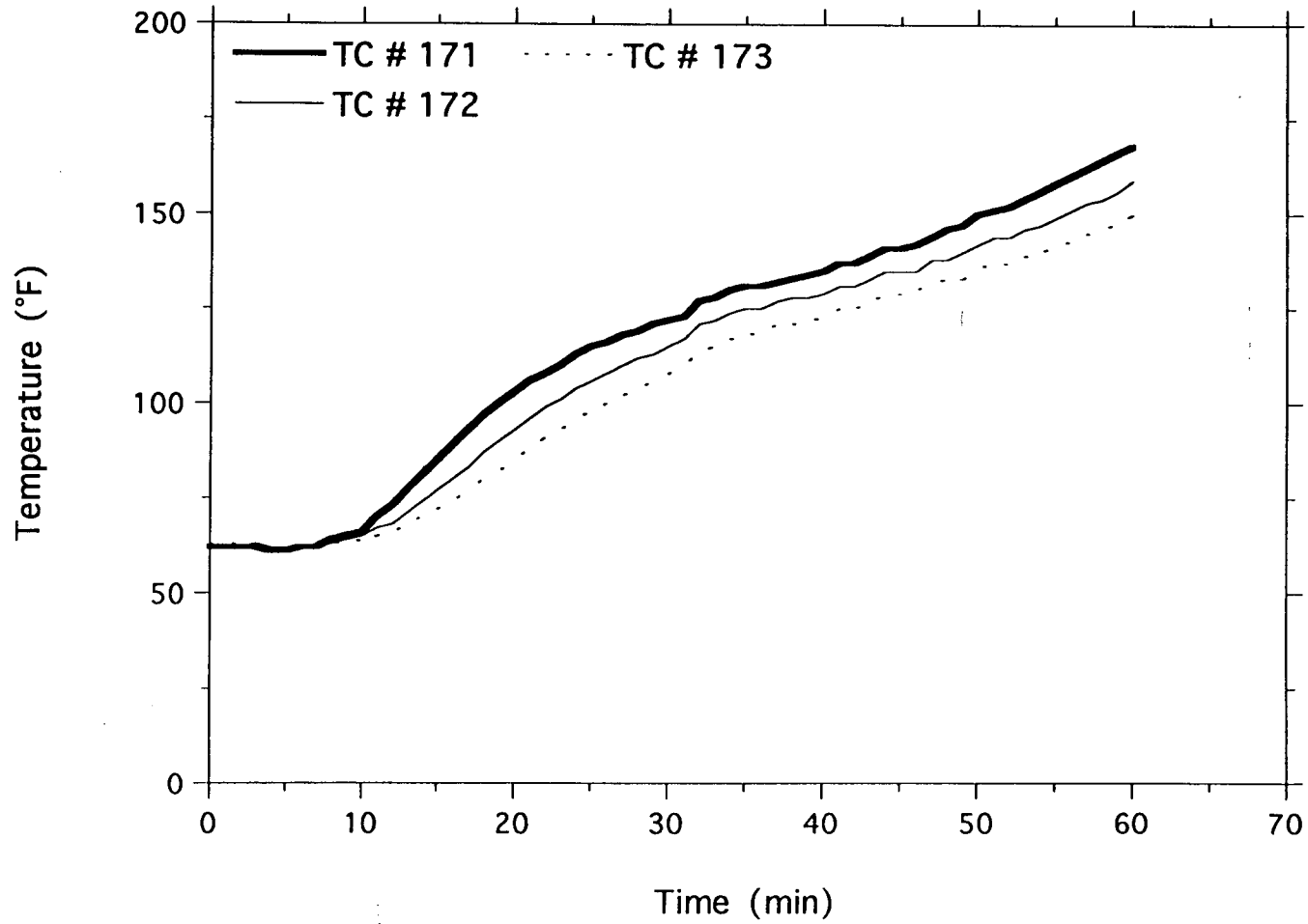
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (Left Conduit in Bottom Array)



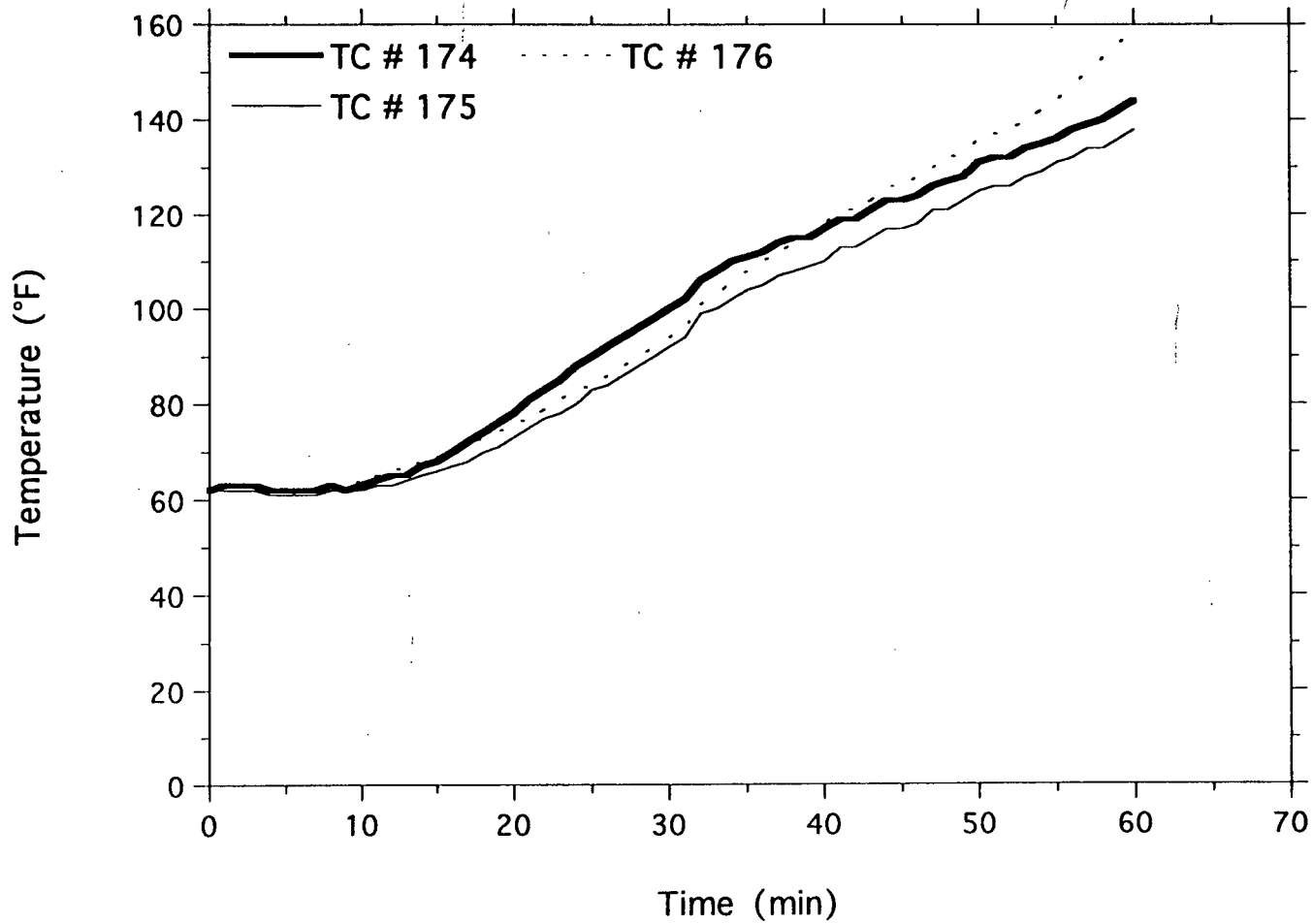
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (Center Conduit in Bottom Array)



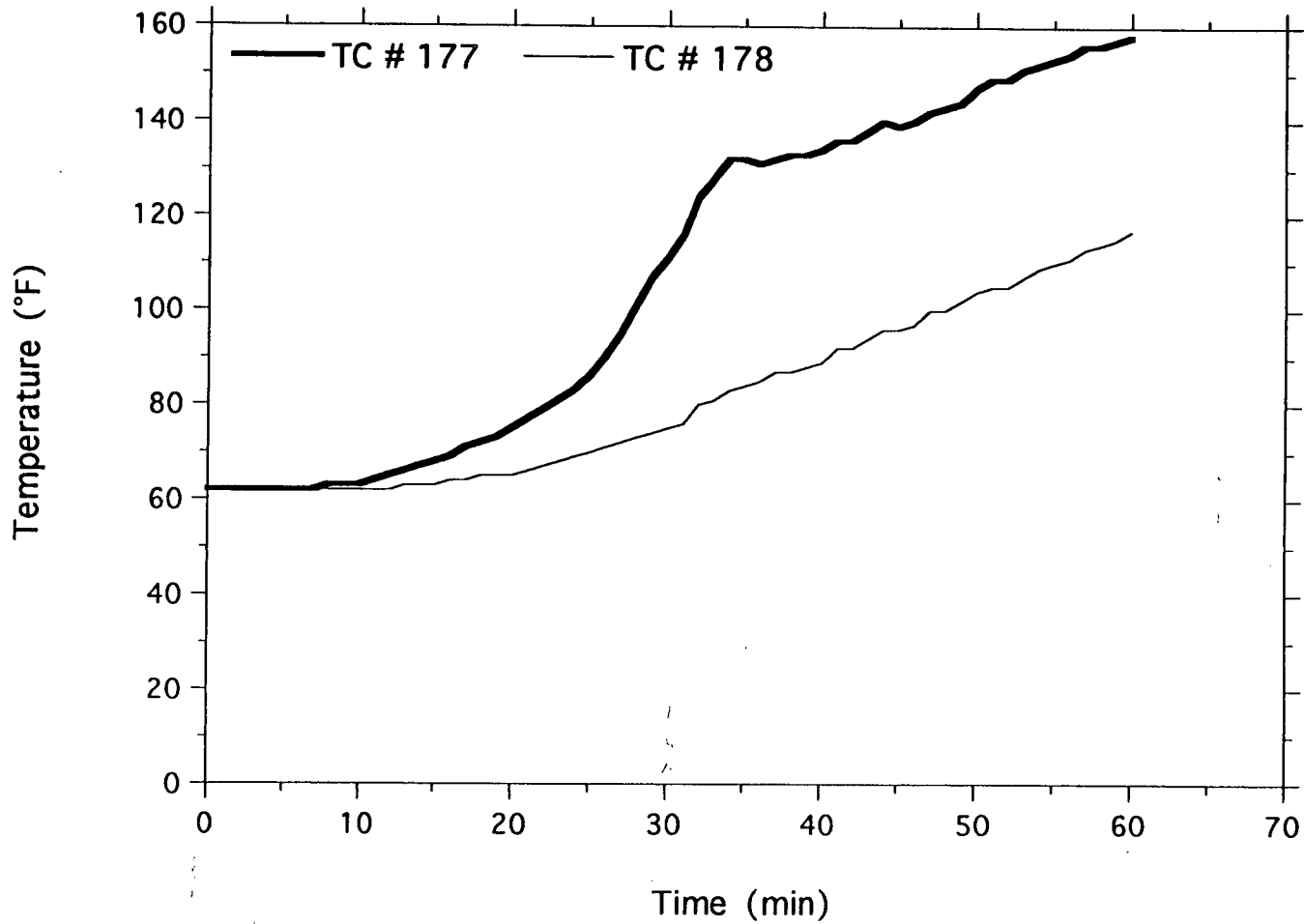
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (Center Conduit in Bottom Array)



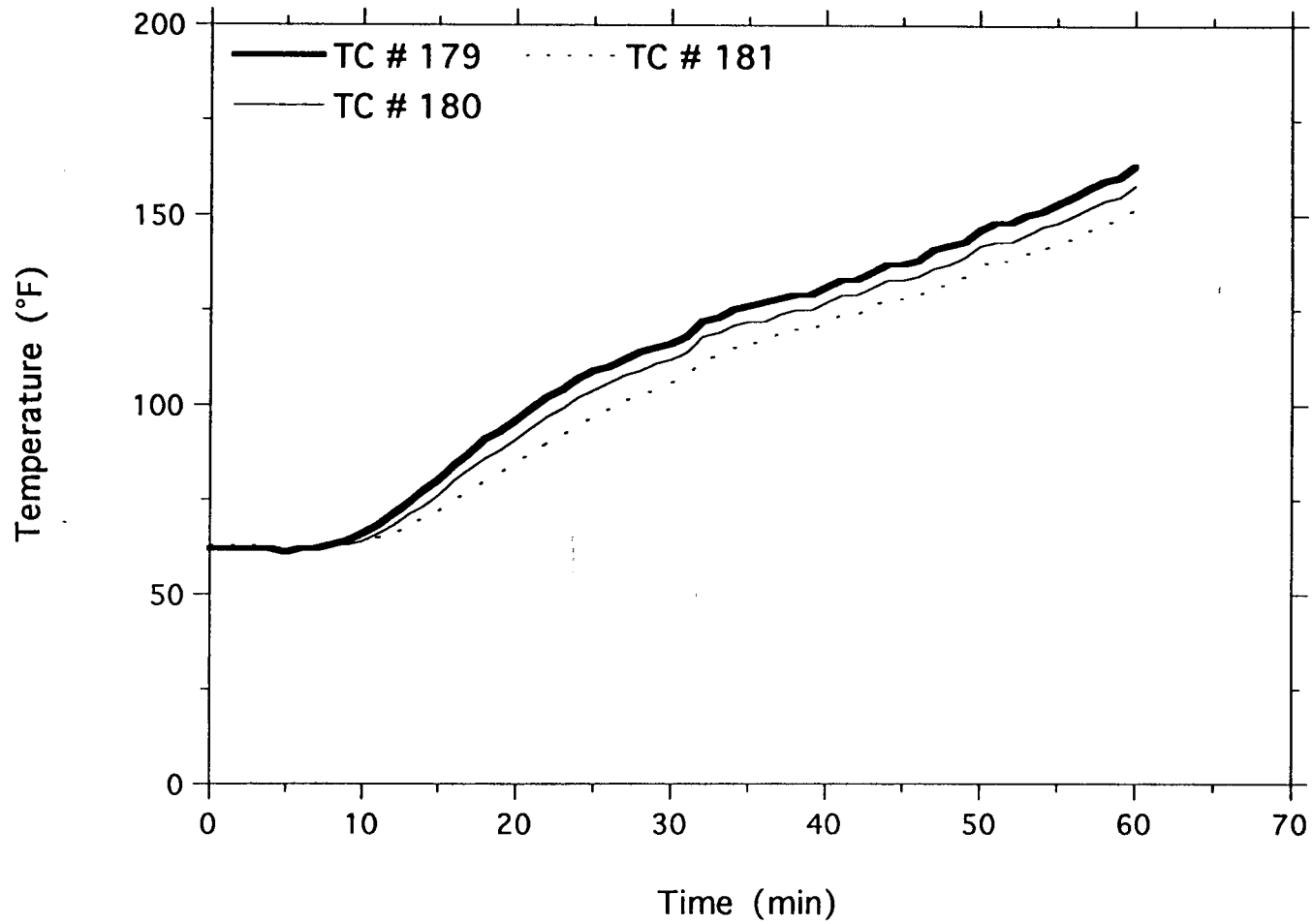
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (Center Conduit in Bottom Array)



OMEGA POINT
LABORATORIES

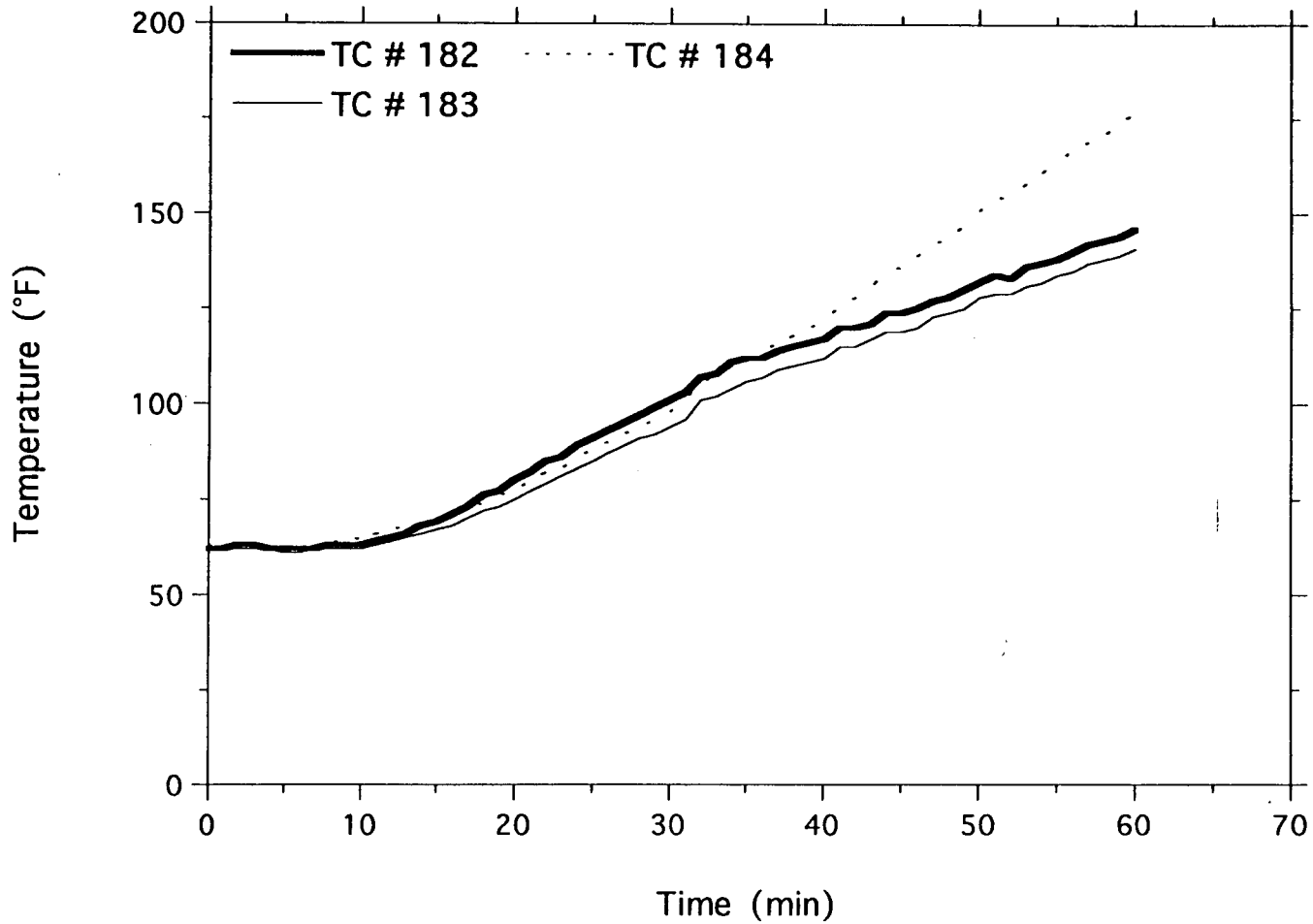
TSI/TVA
Project No. 11960-97258
3" (Right Conduit in Bottom Array)



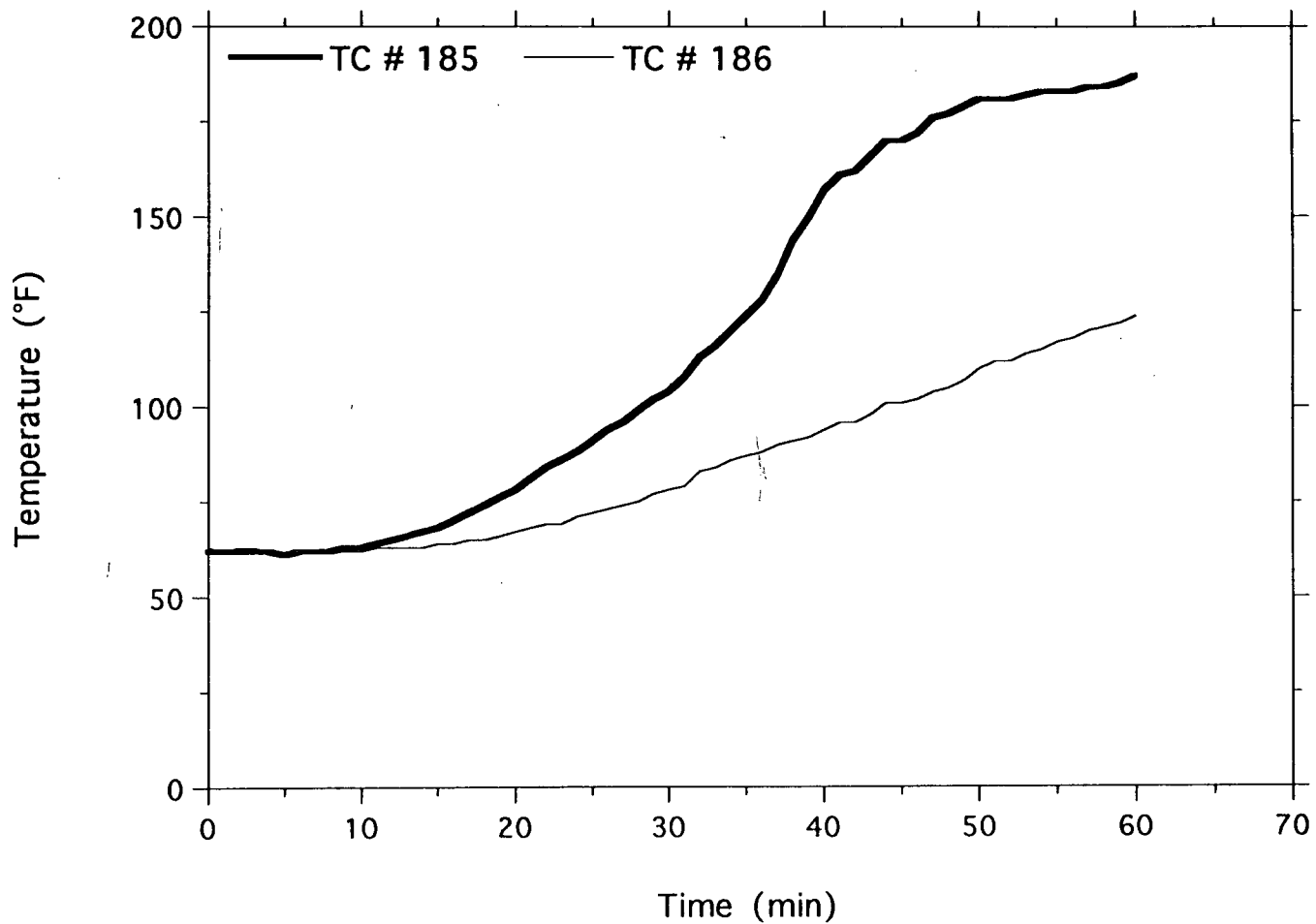
SEI
LABORATORIES
OMEGA POINT

OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" (Right Conduit in Bottom Array)

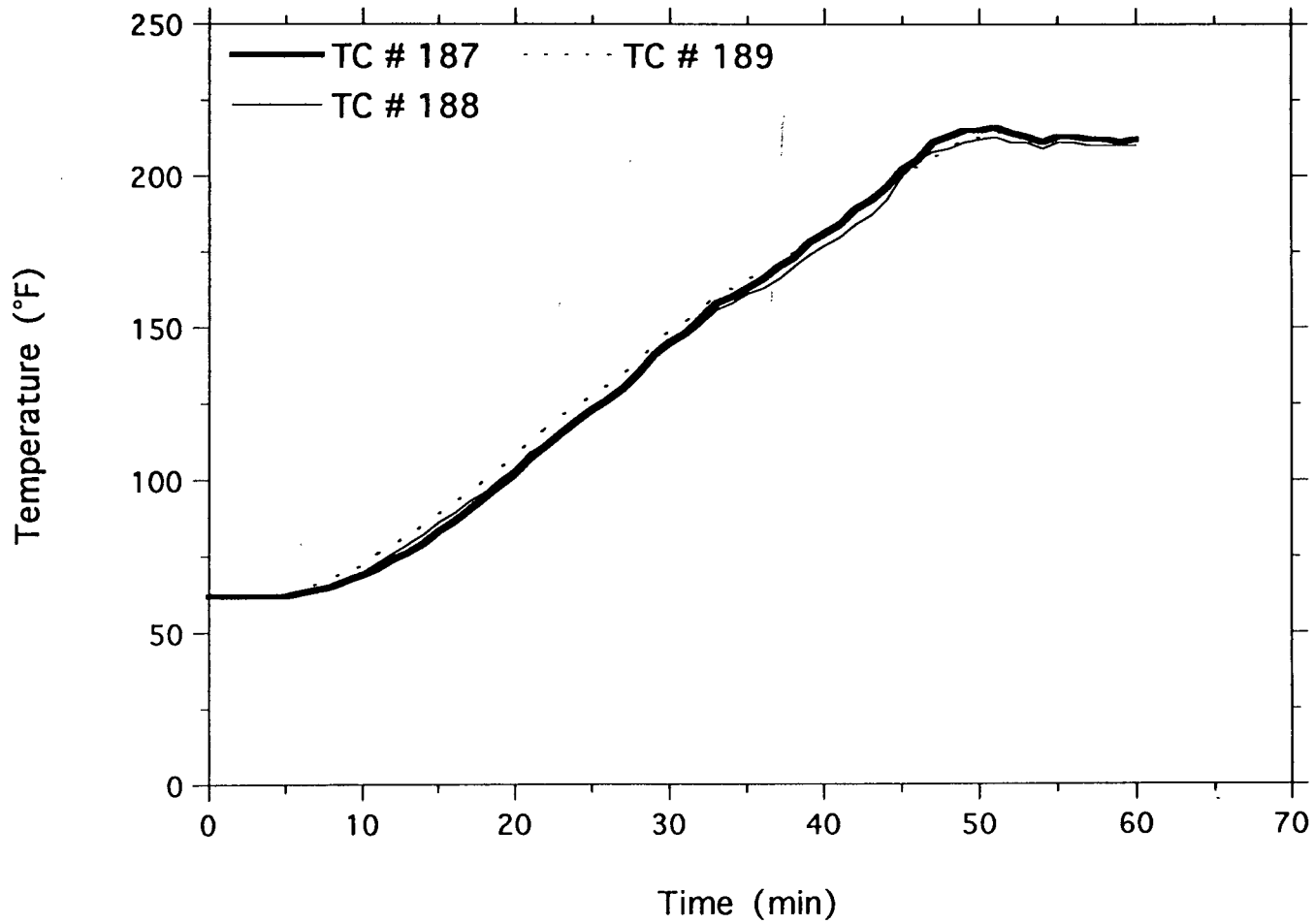


TSI/TVA
Project No. 11960-97258
3" (Right Conduit in Bottom Array)



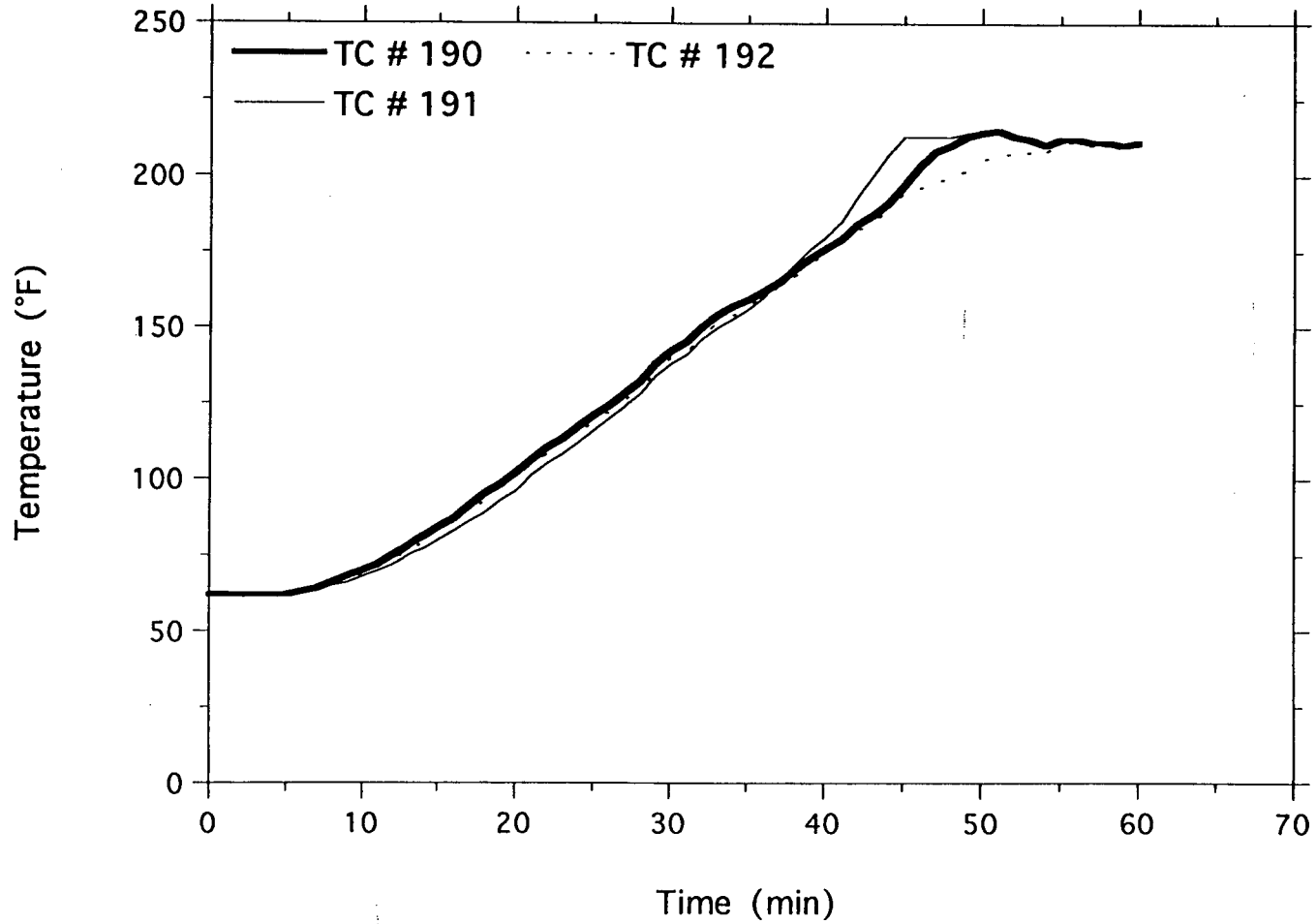
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



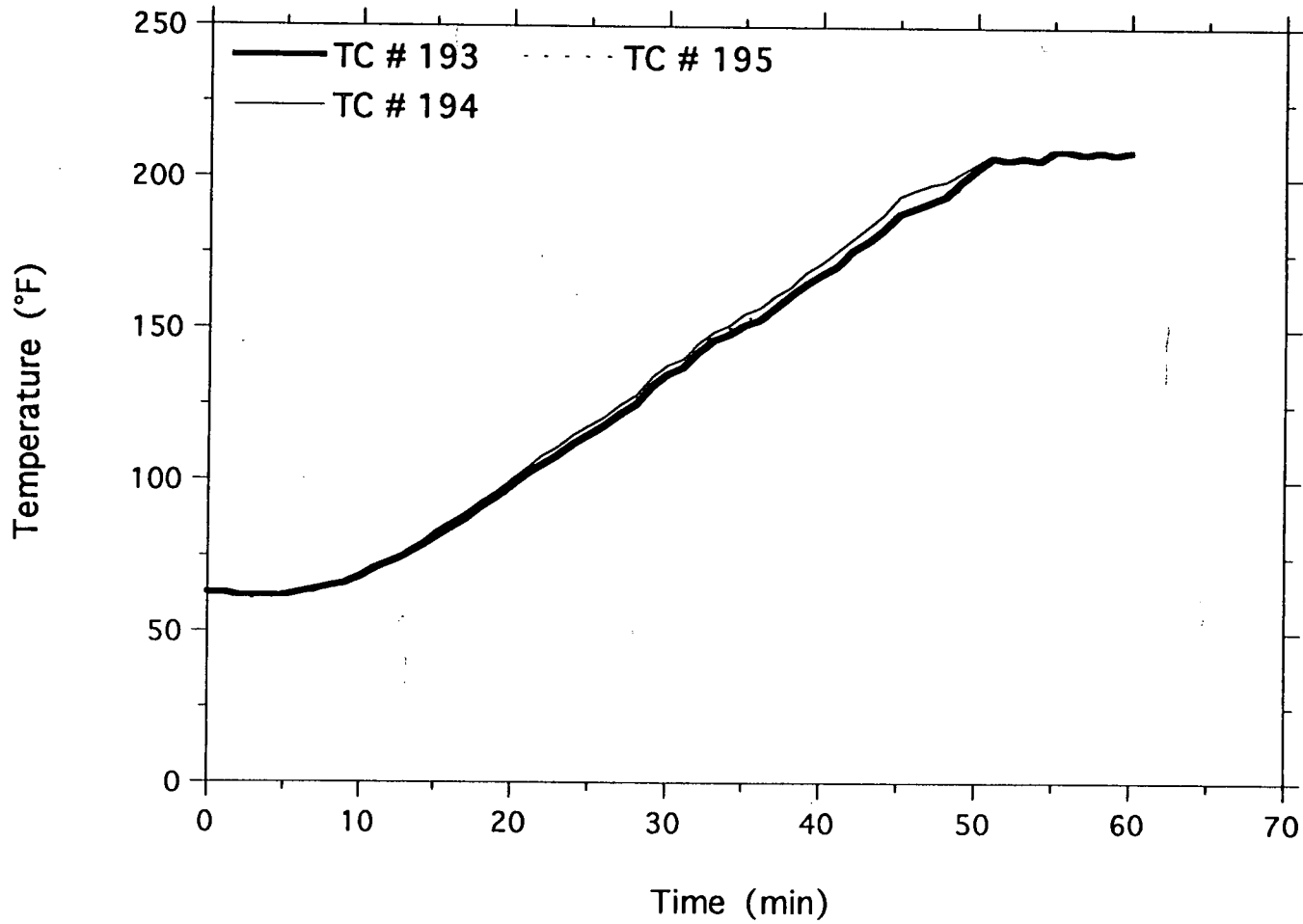
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



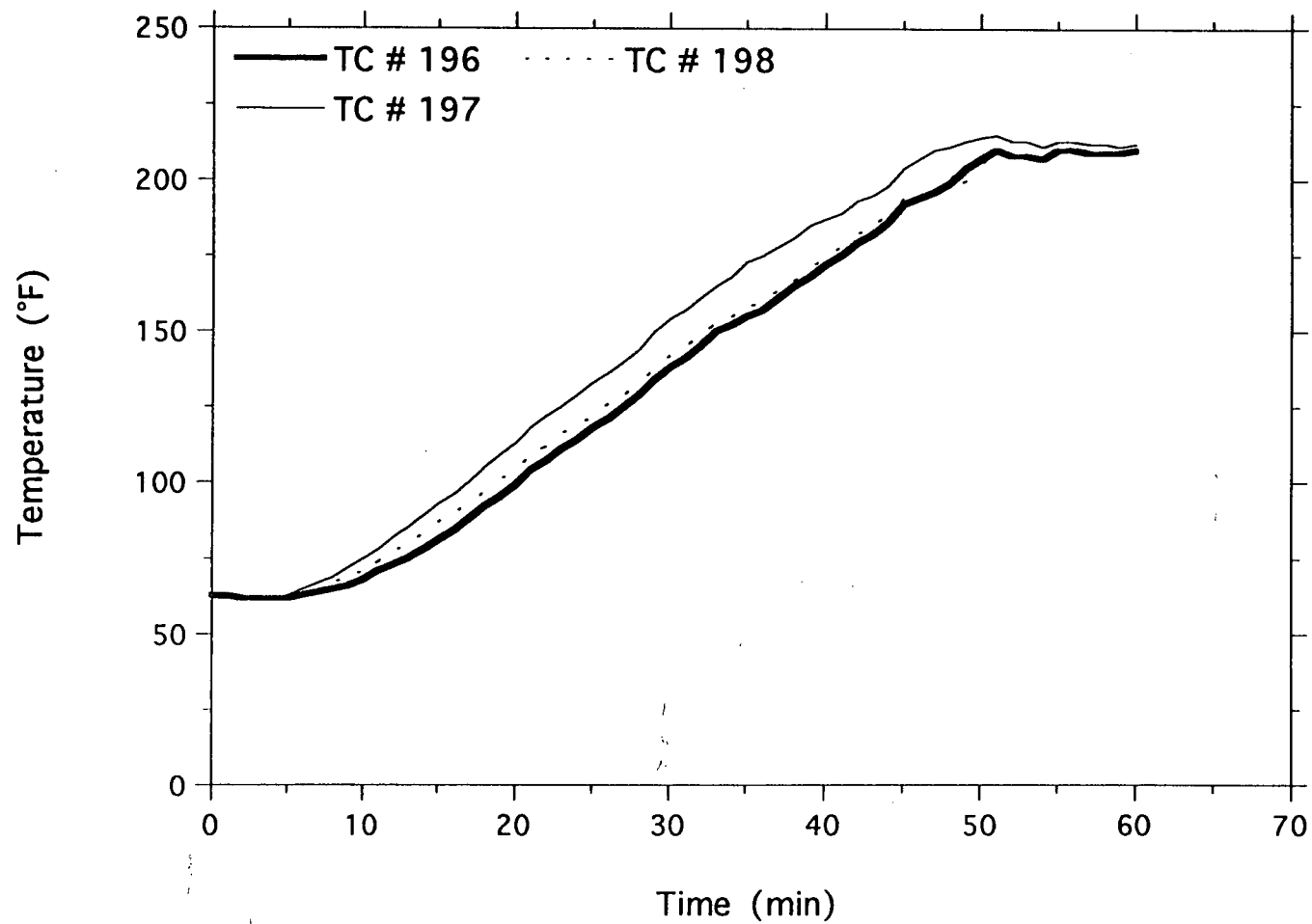
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



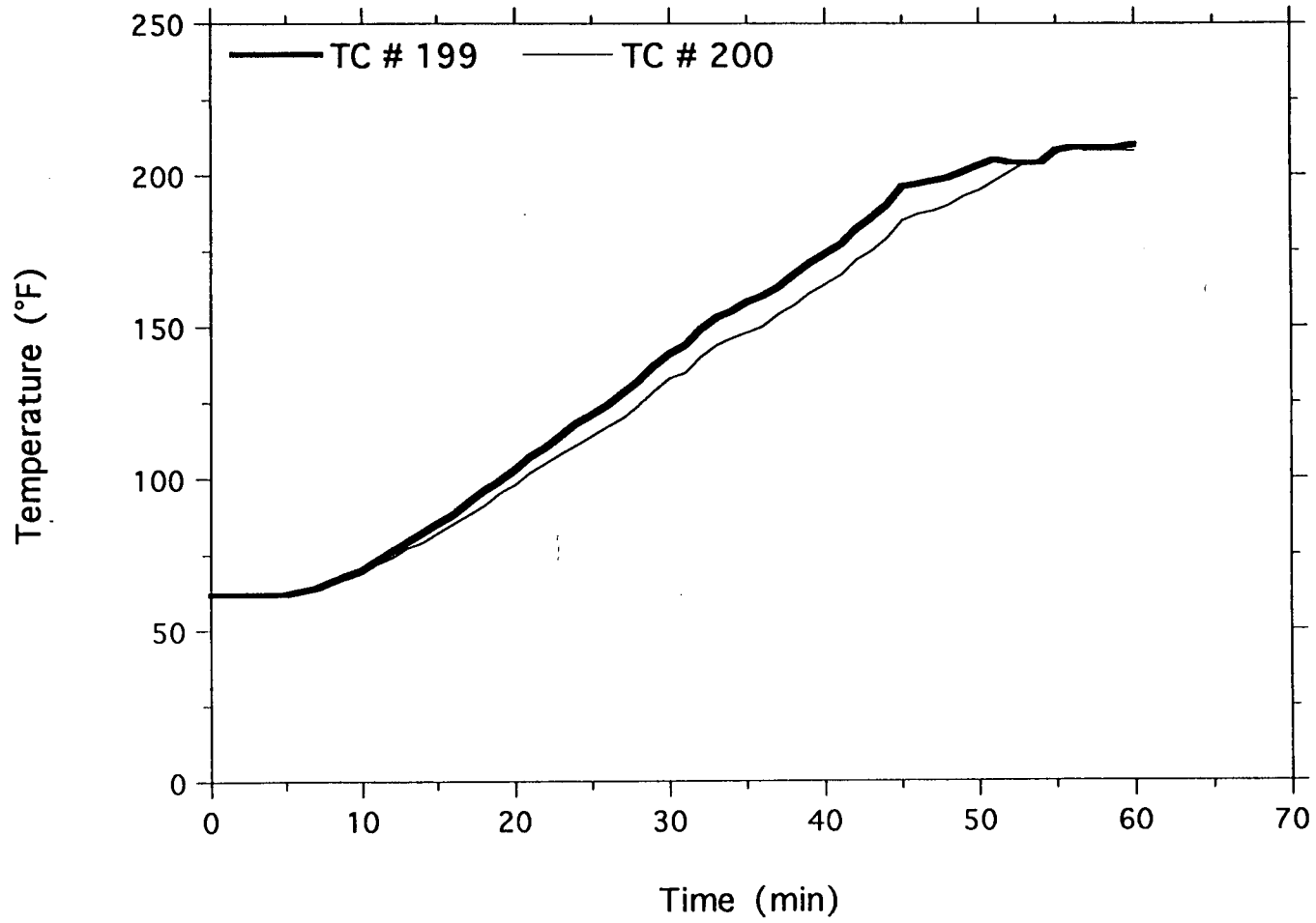
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



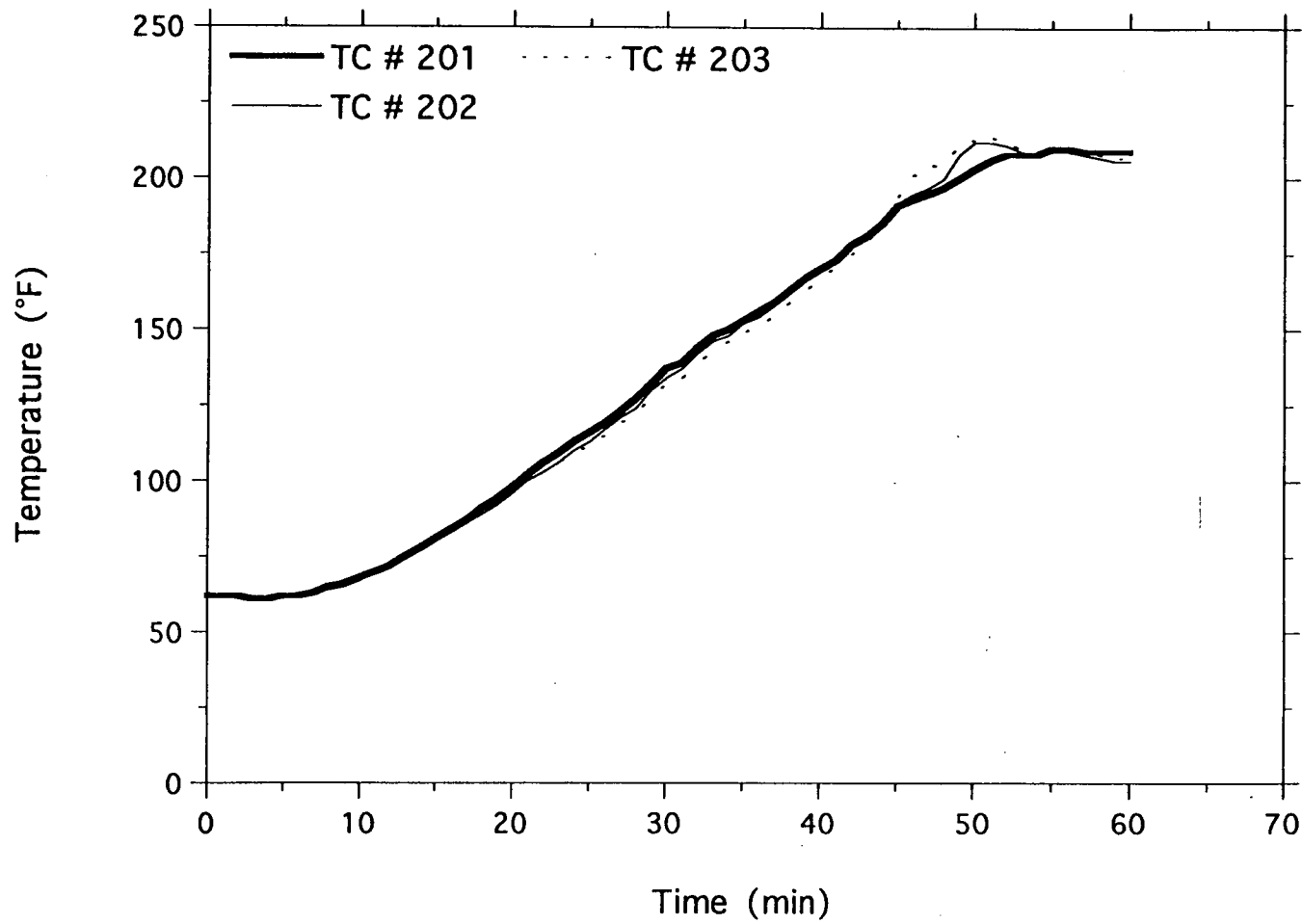
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



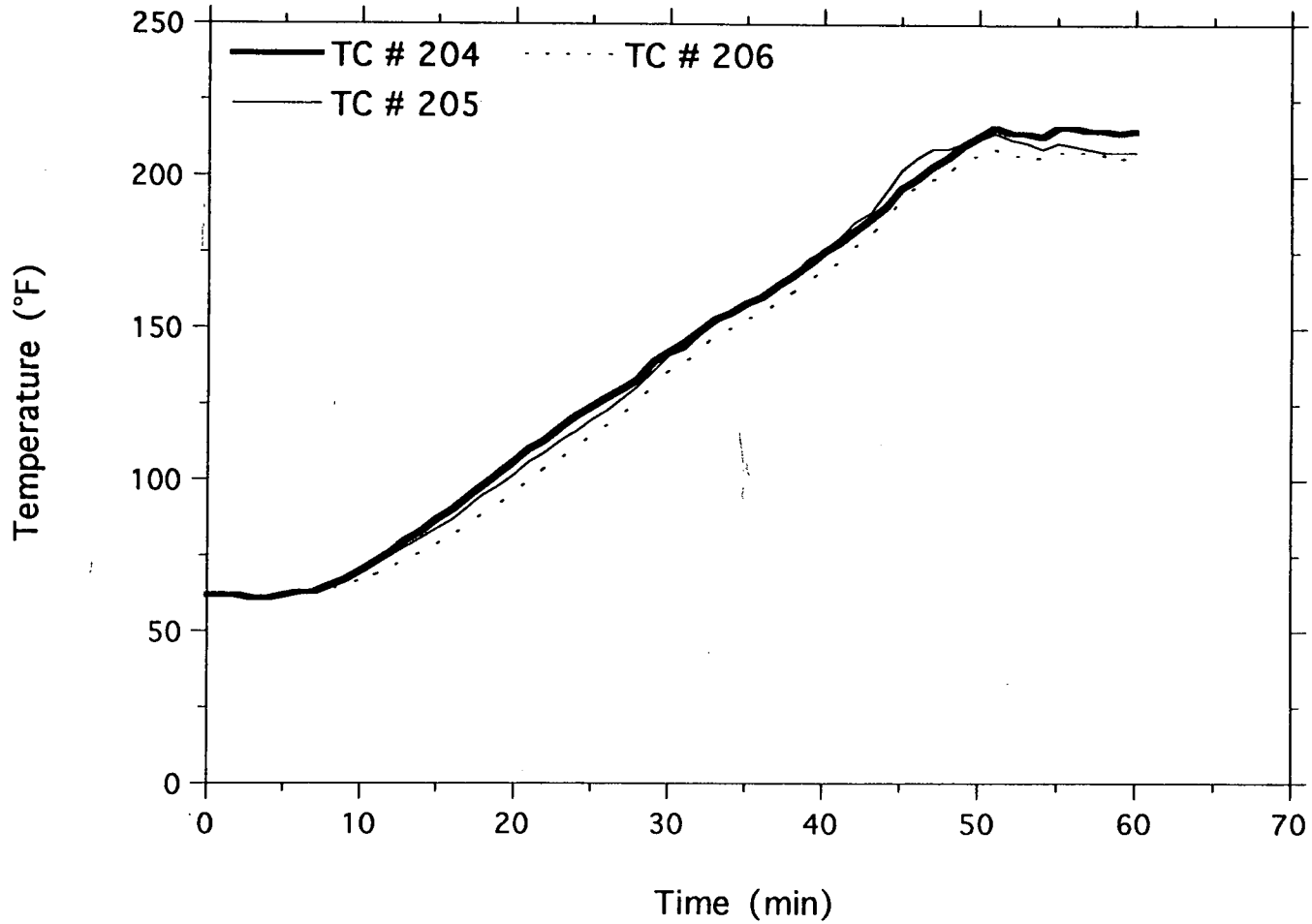
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



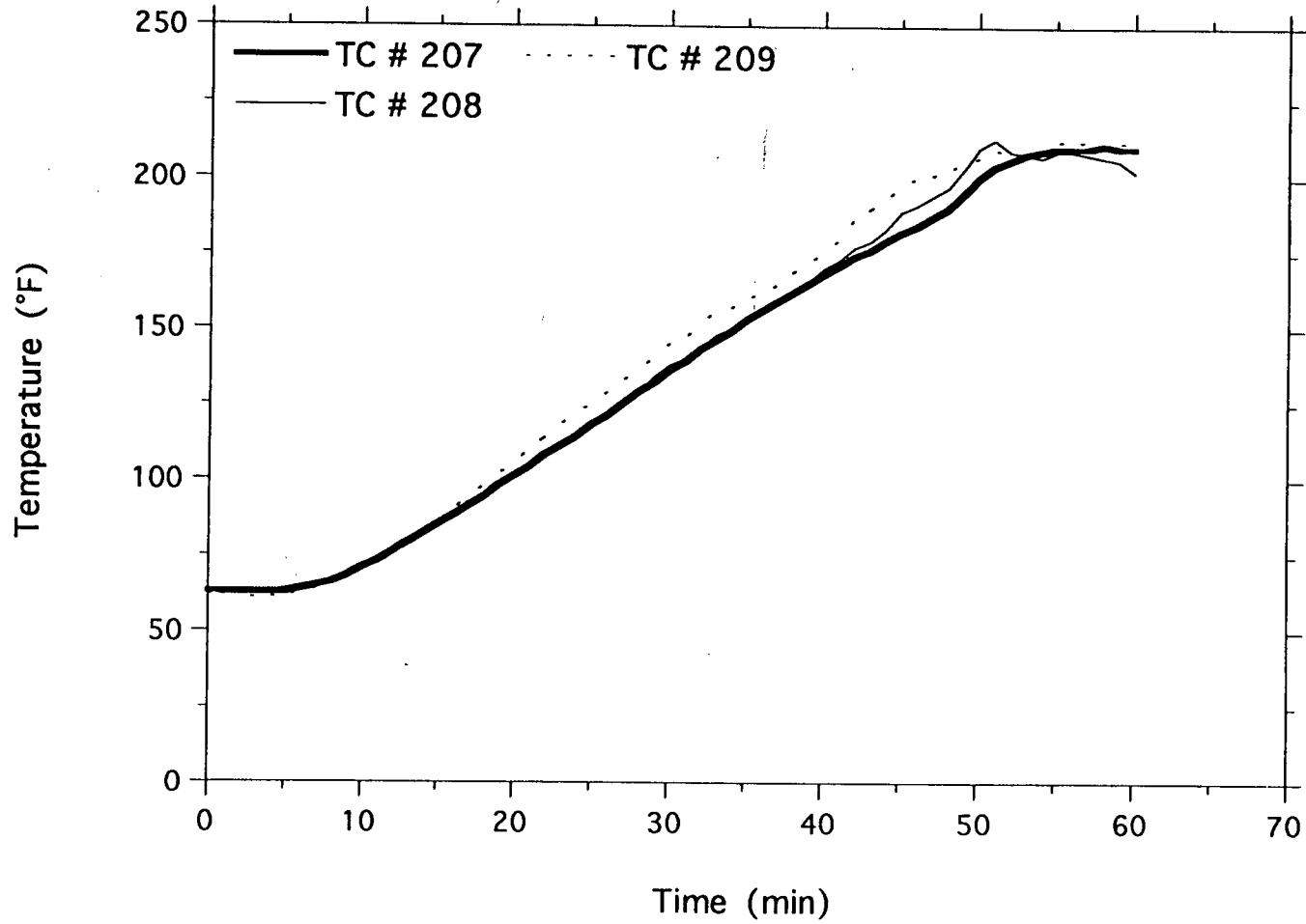
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



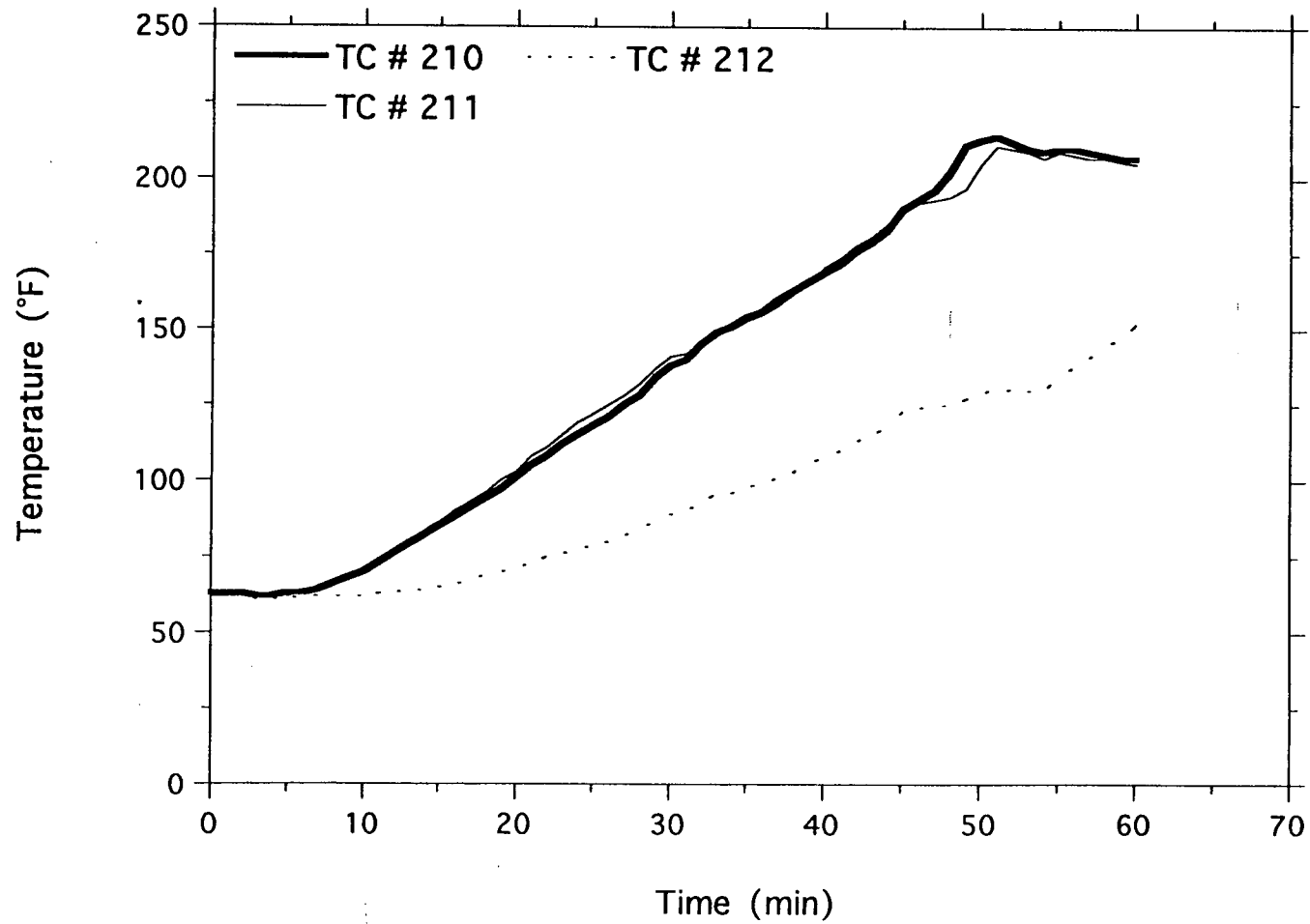
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



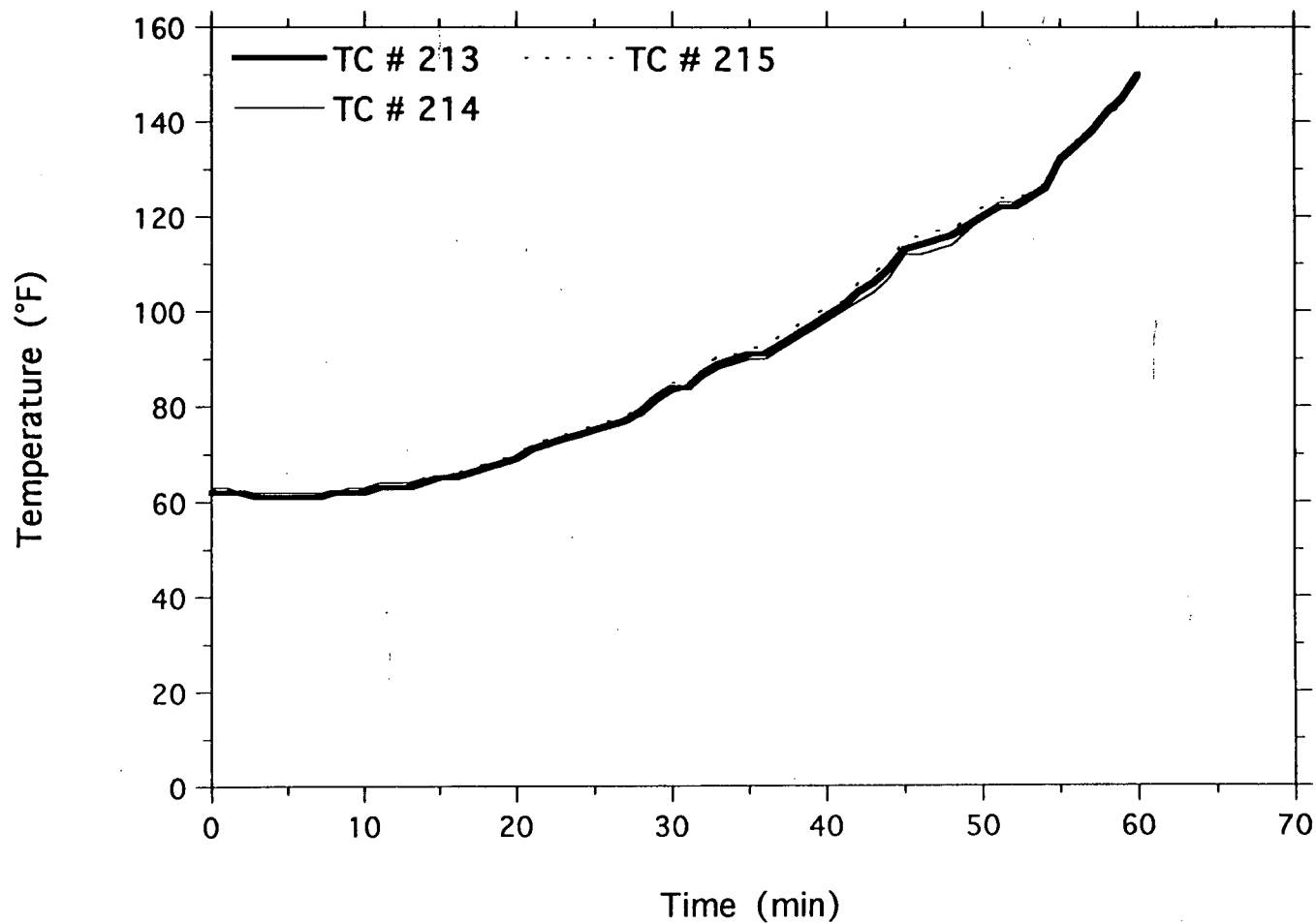
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



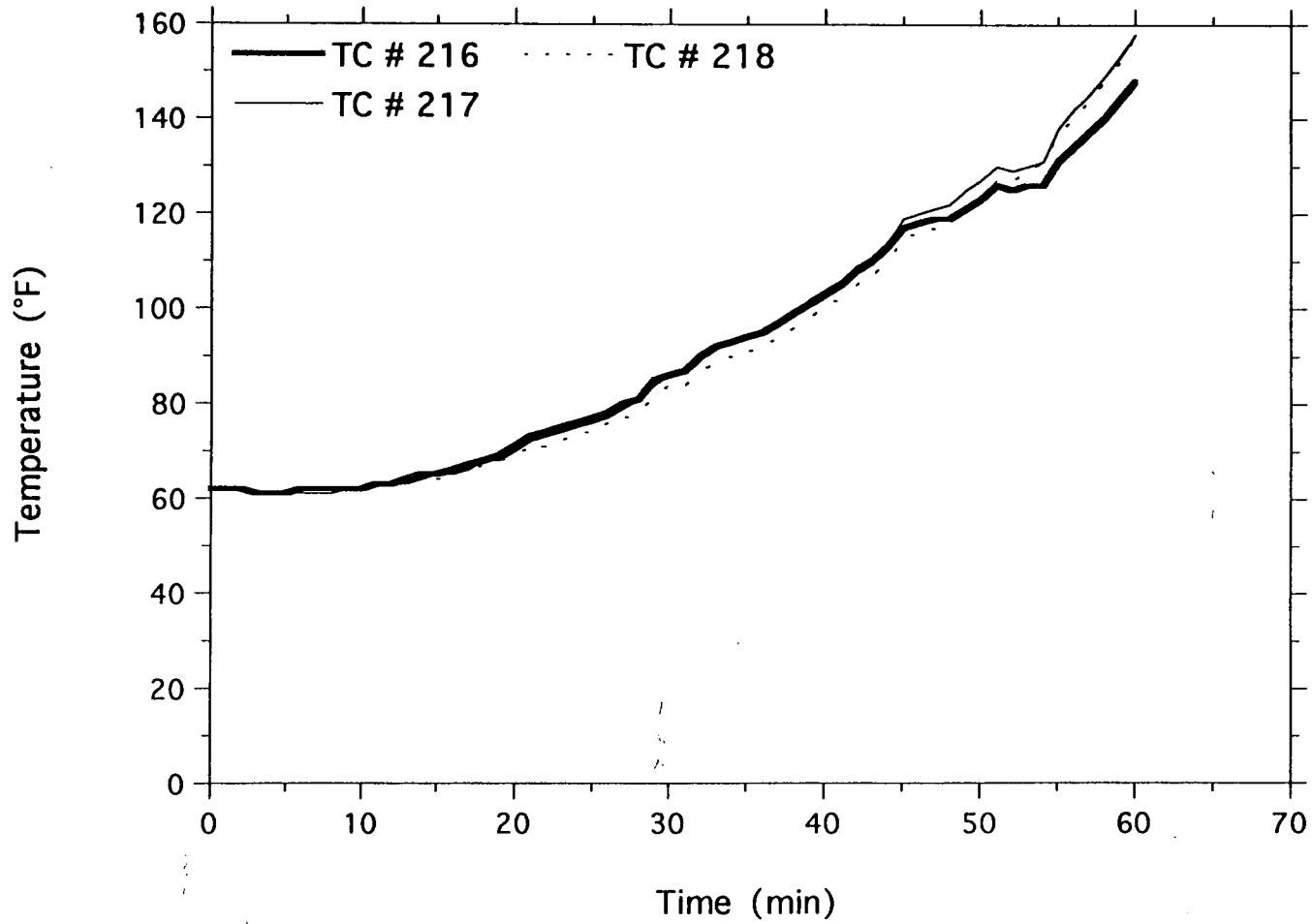
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



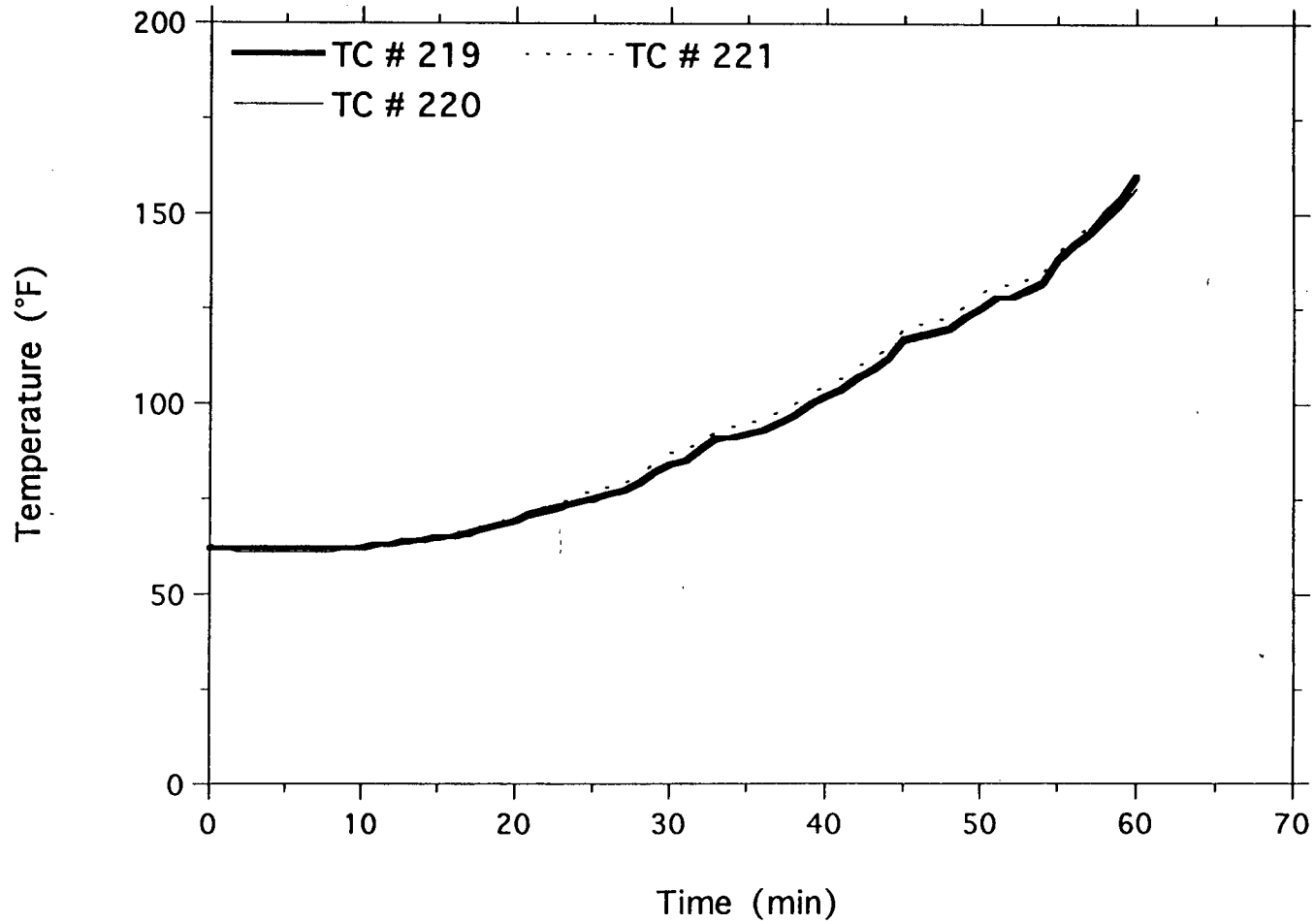
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



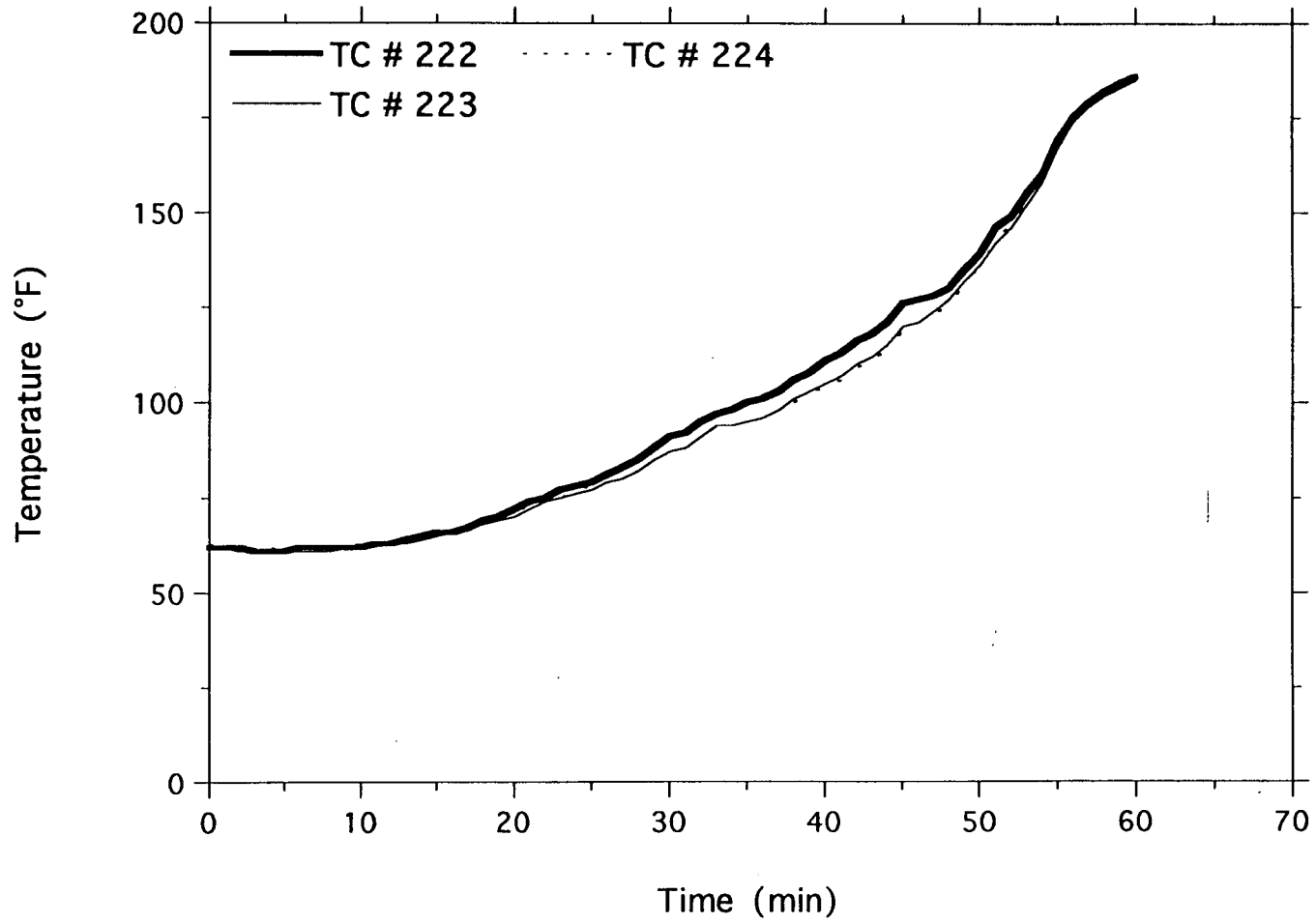
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



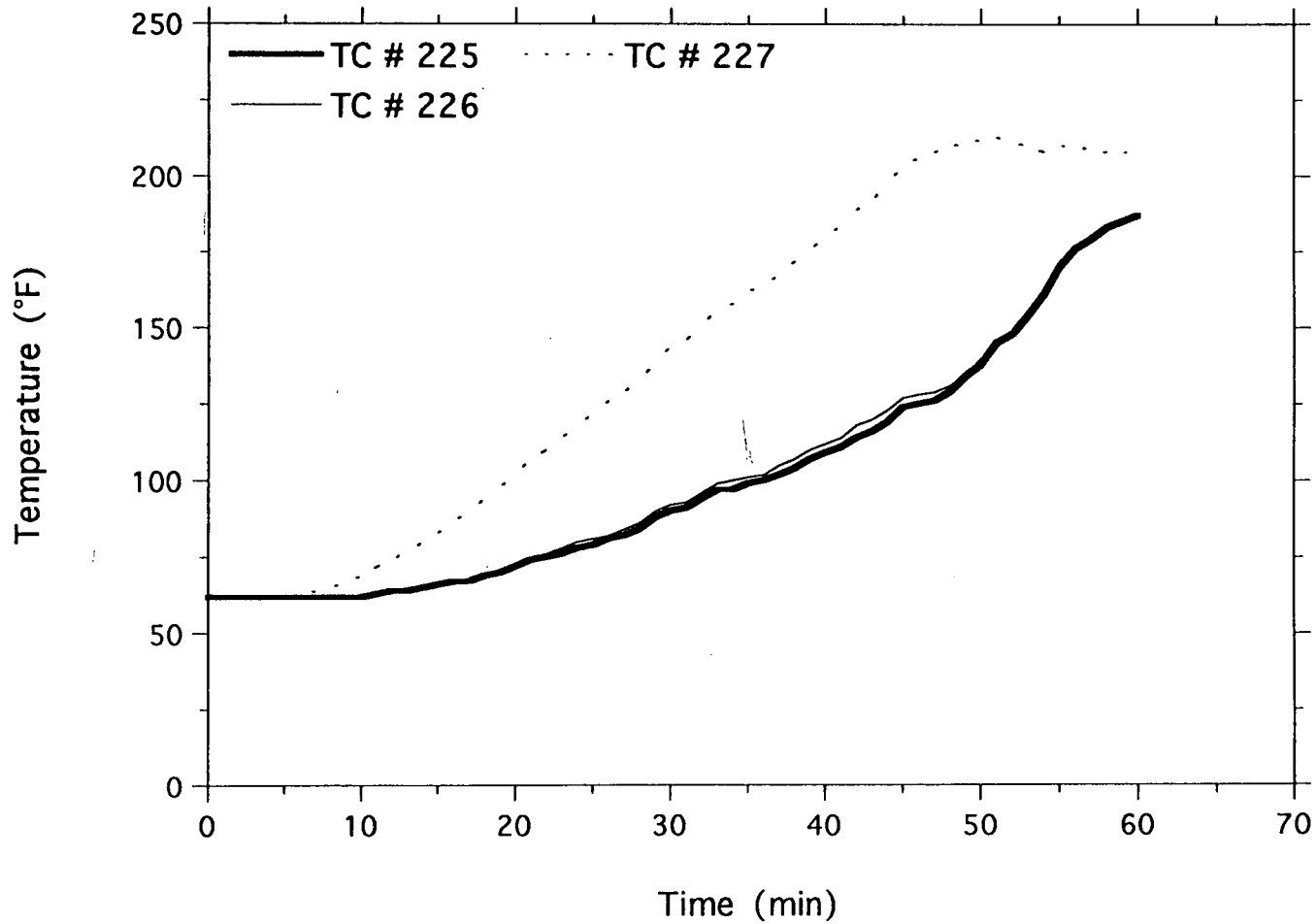
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



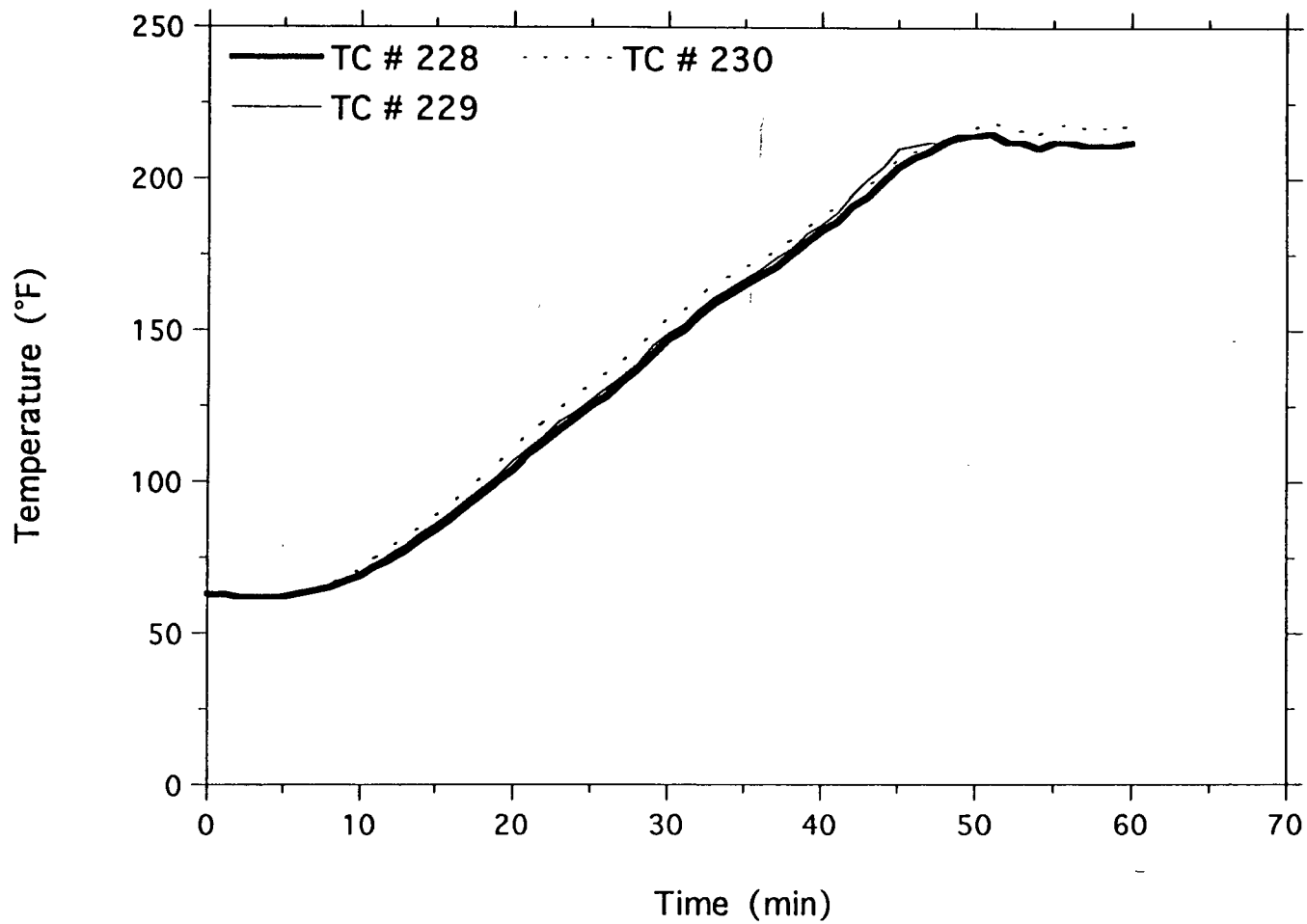
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



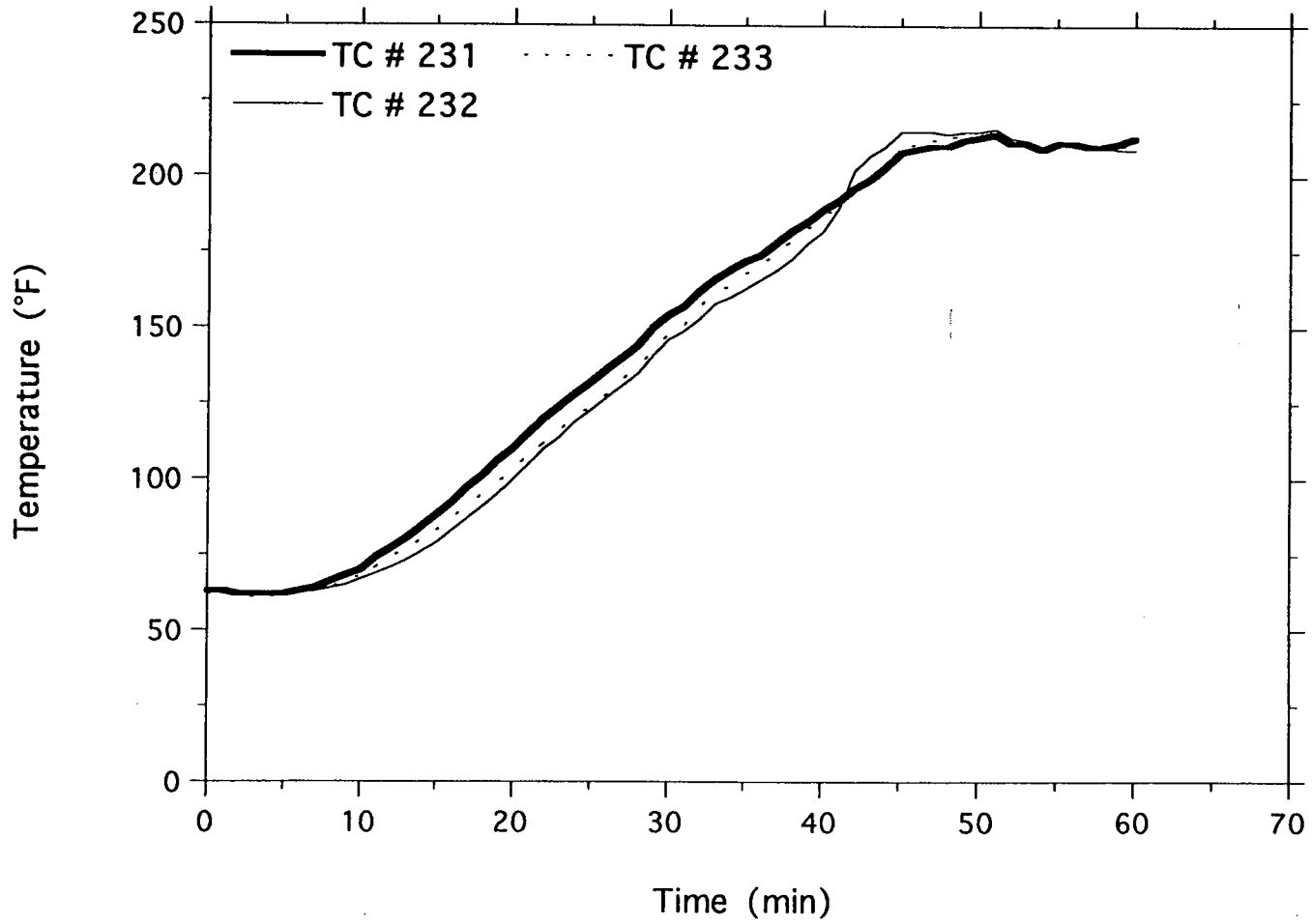
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box, Interior



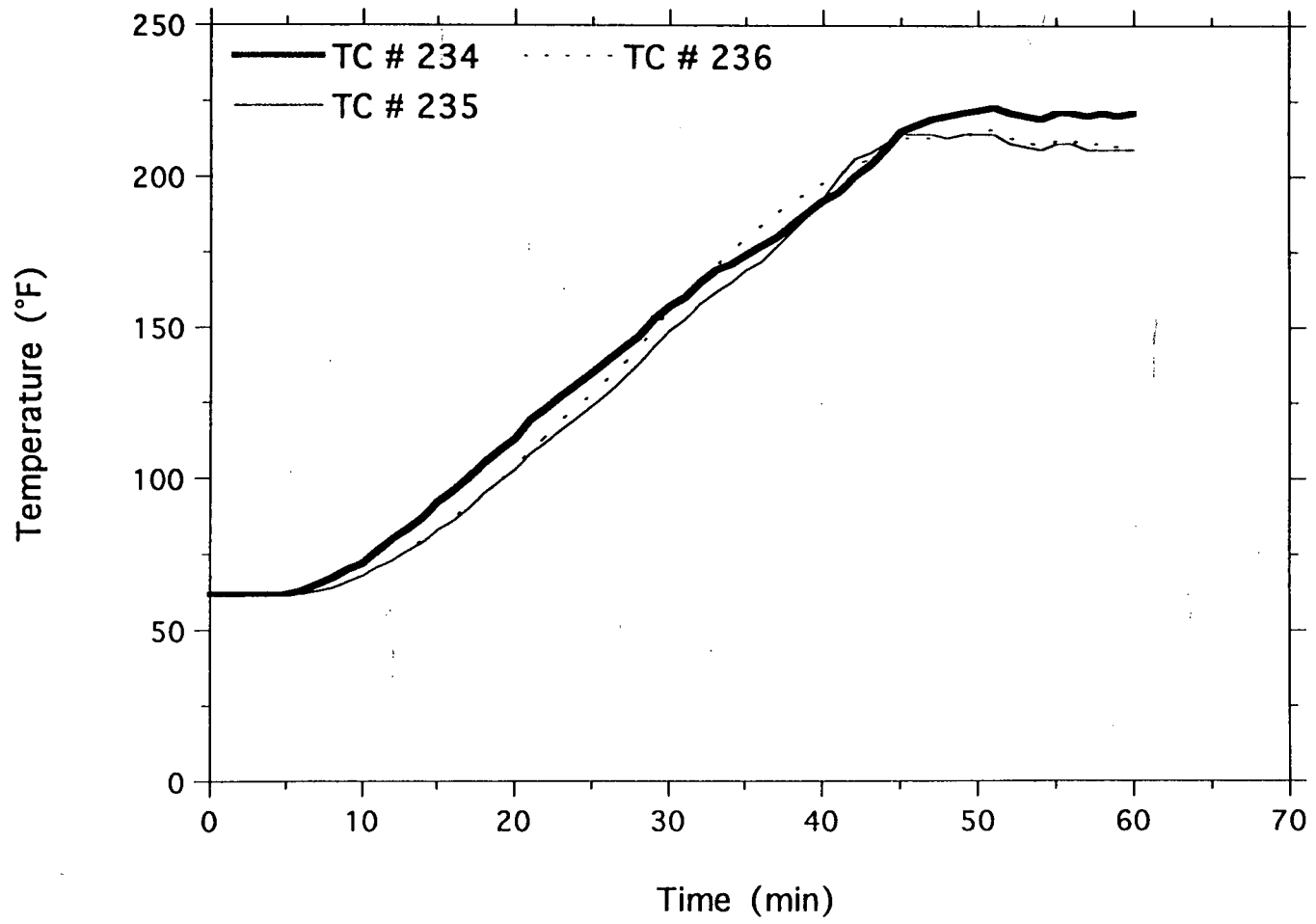
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



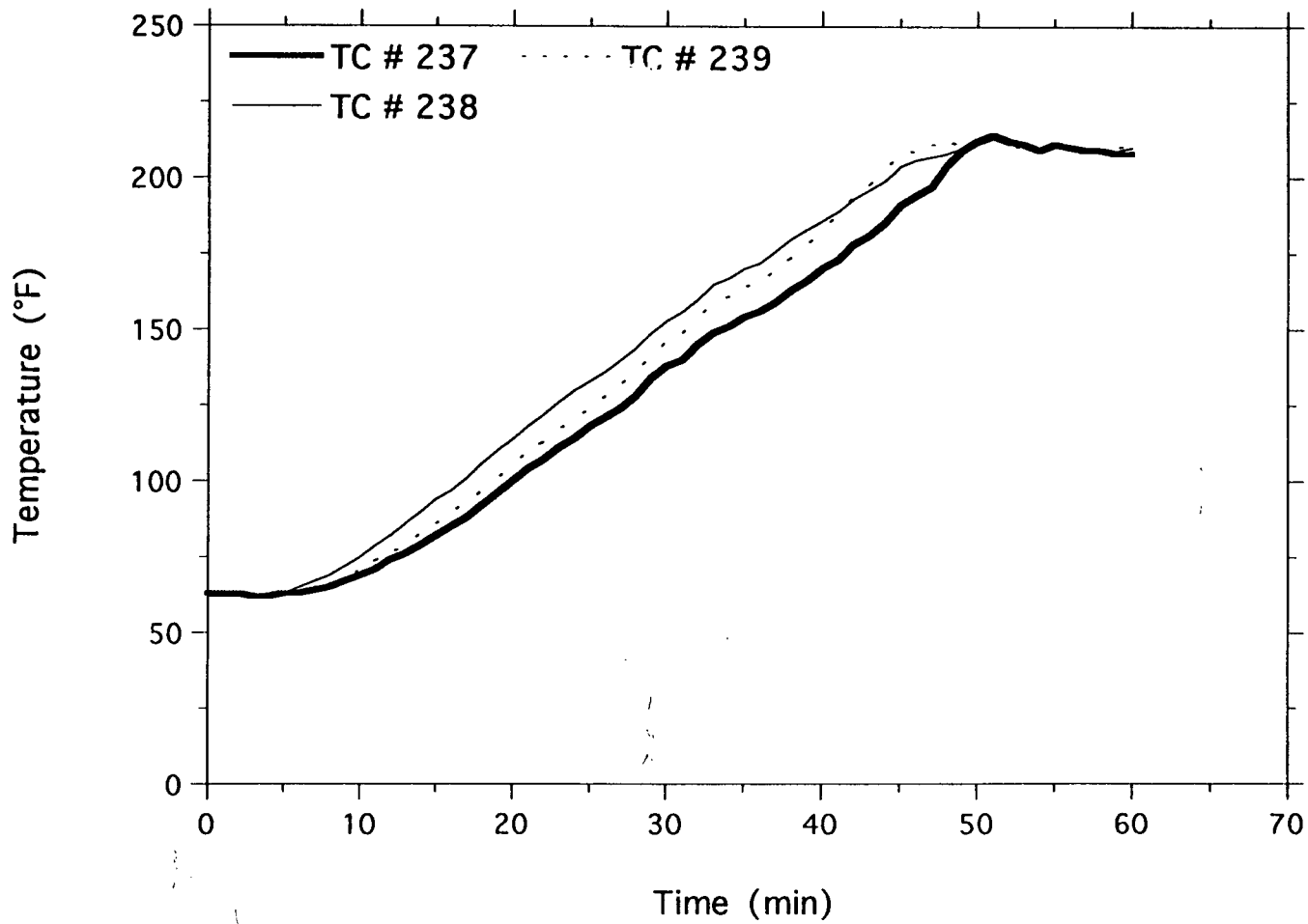
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



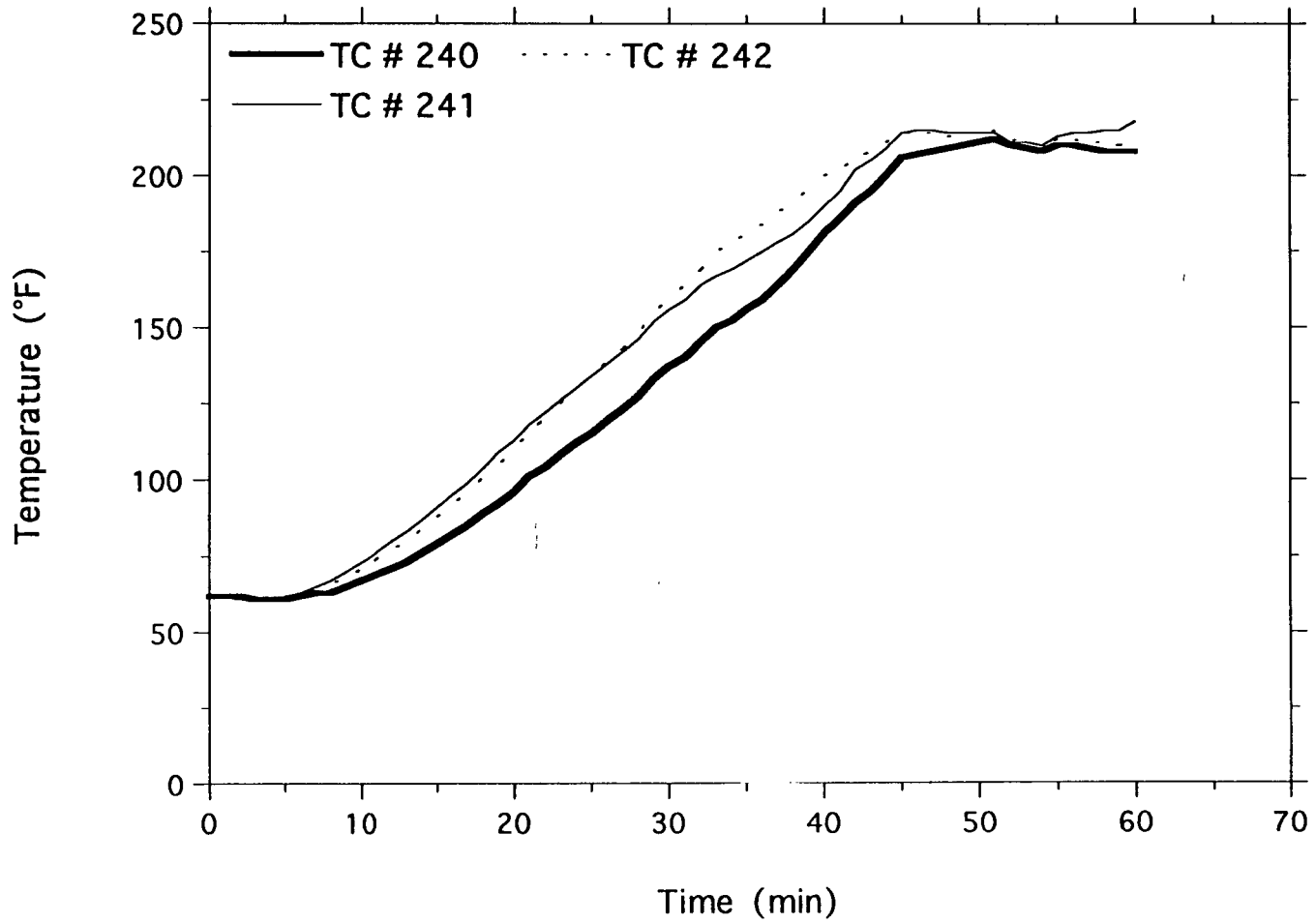
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



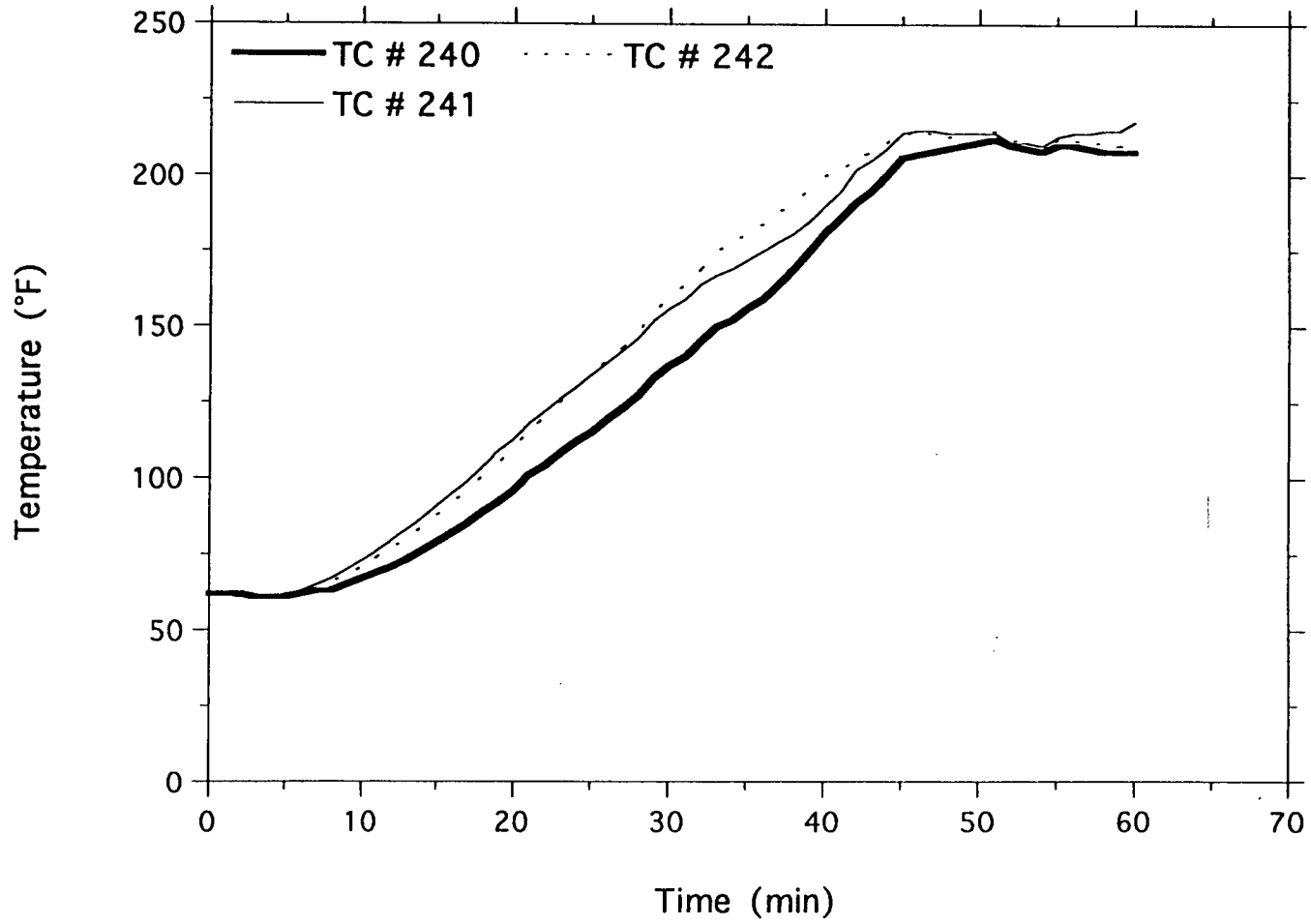
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



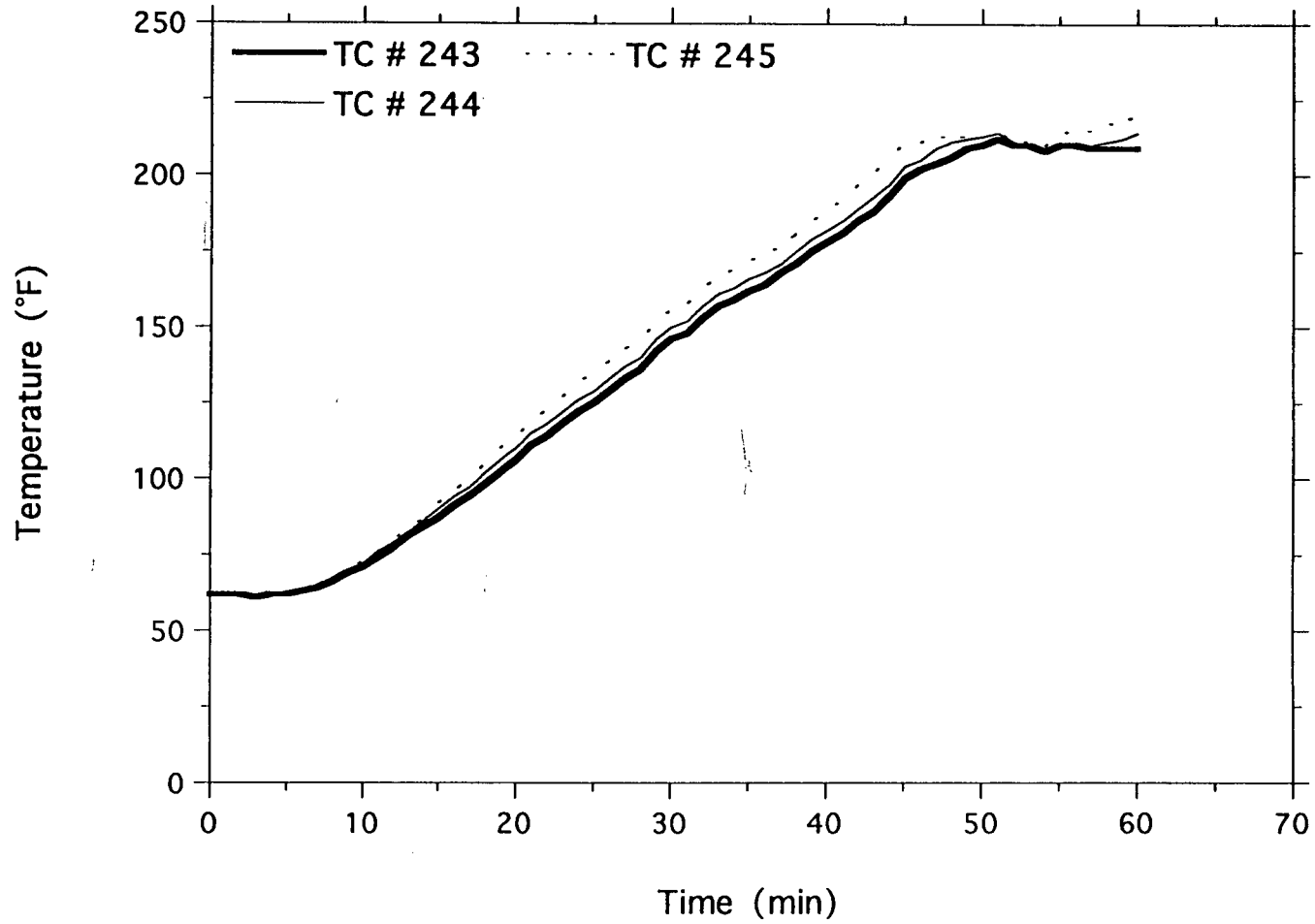
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



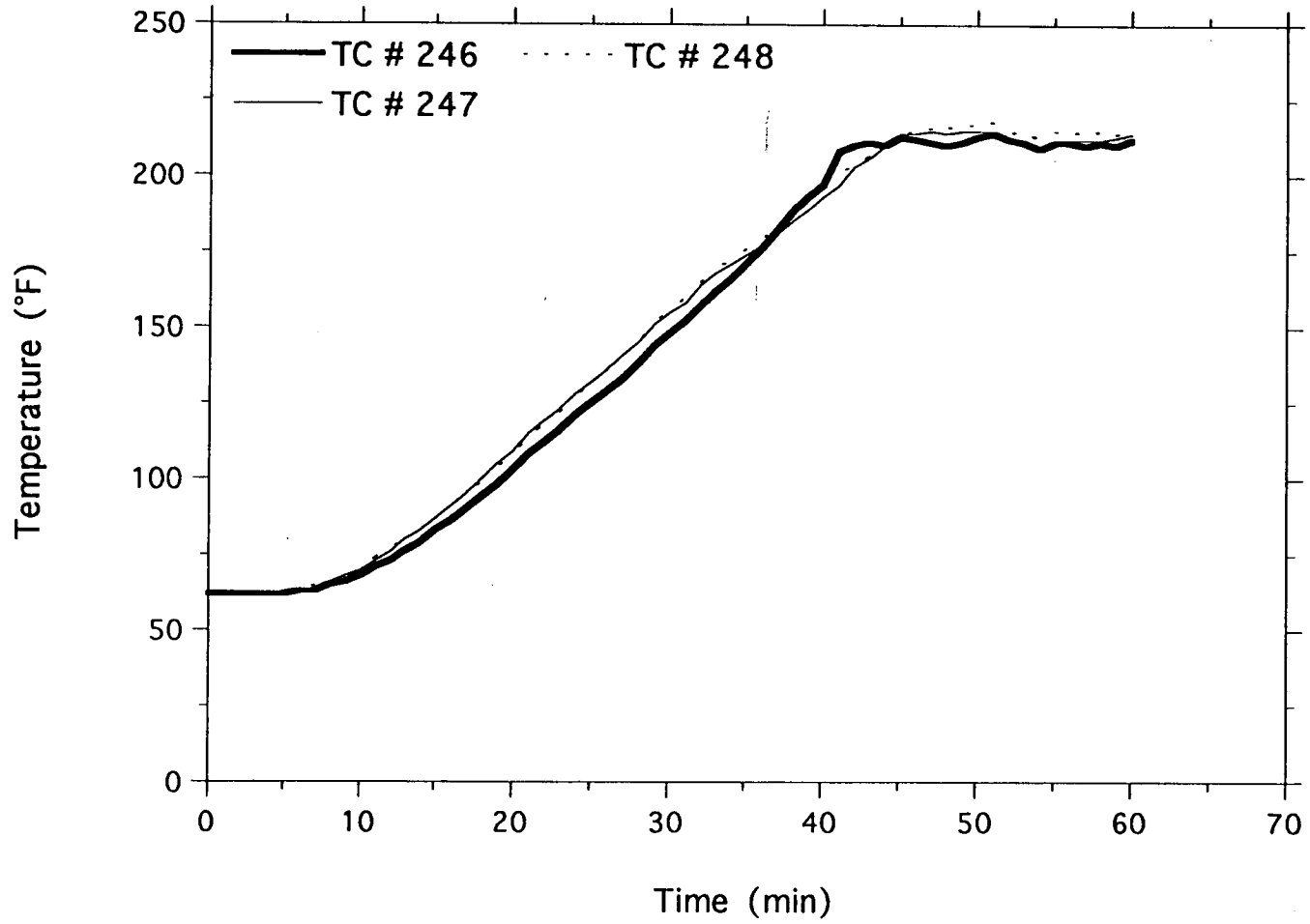
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box Interior



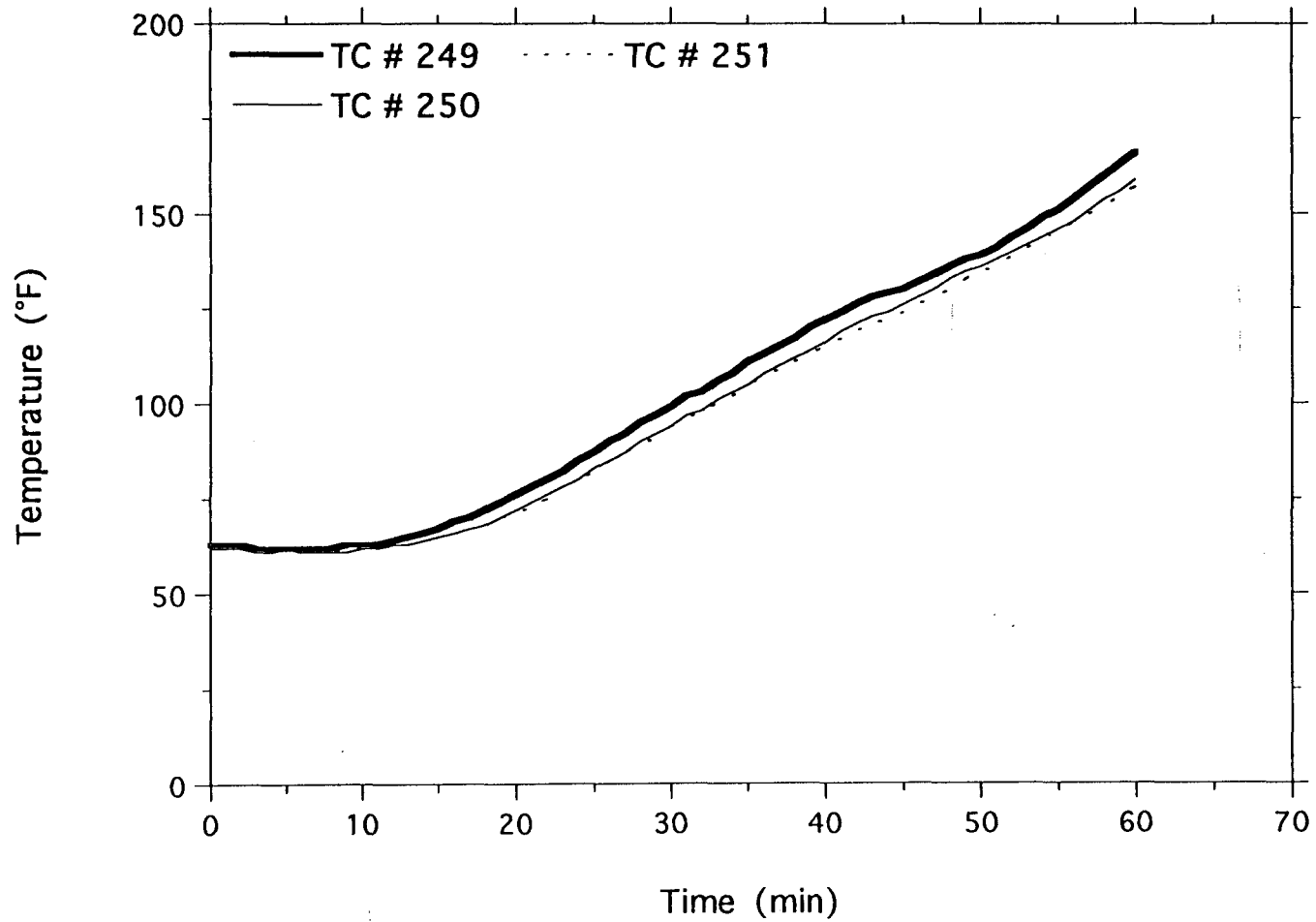
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
Junction Box, Interior



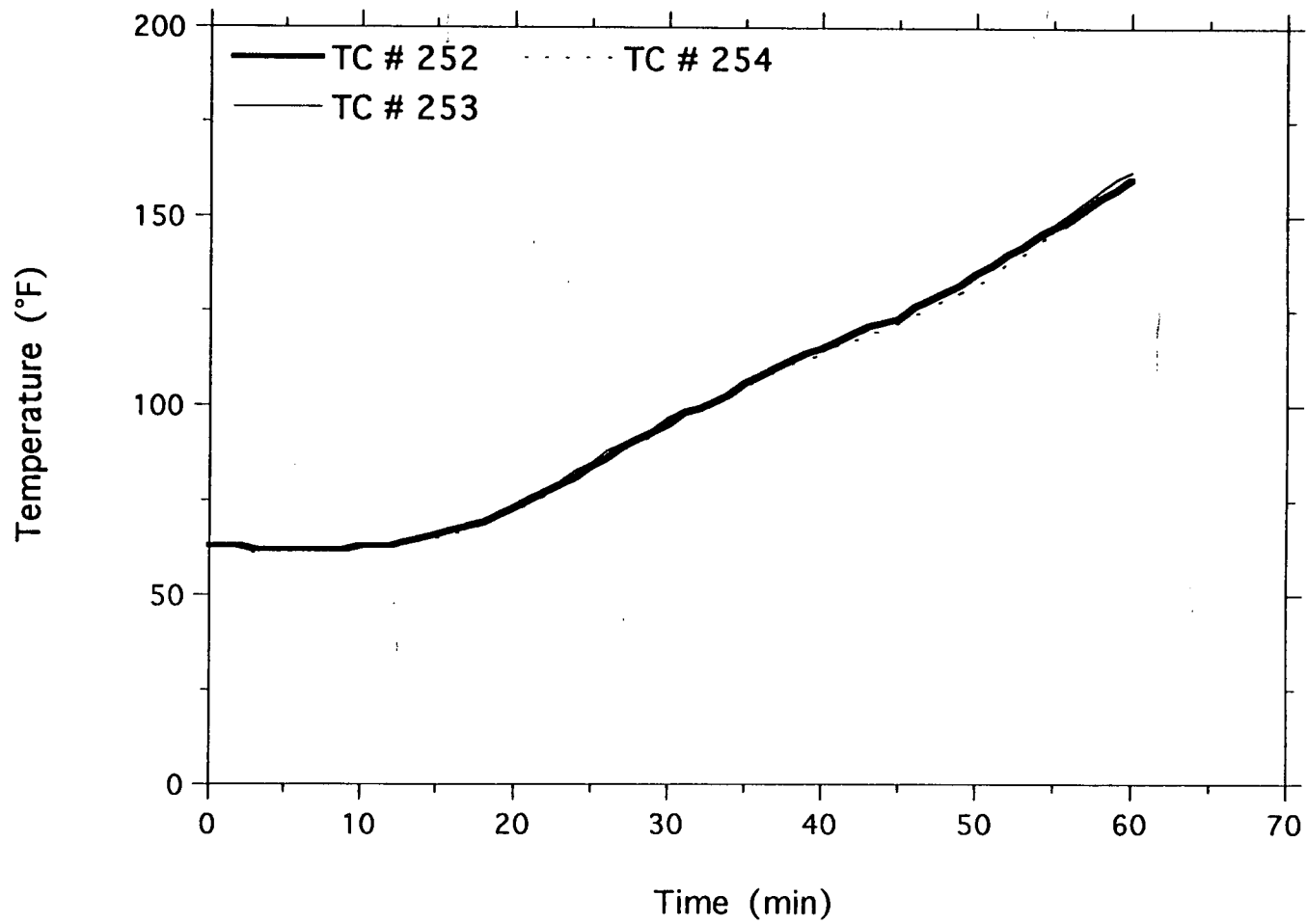
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Top Cond. in Upper Array)



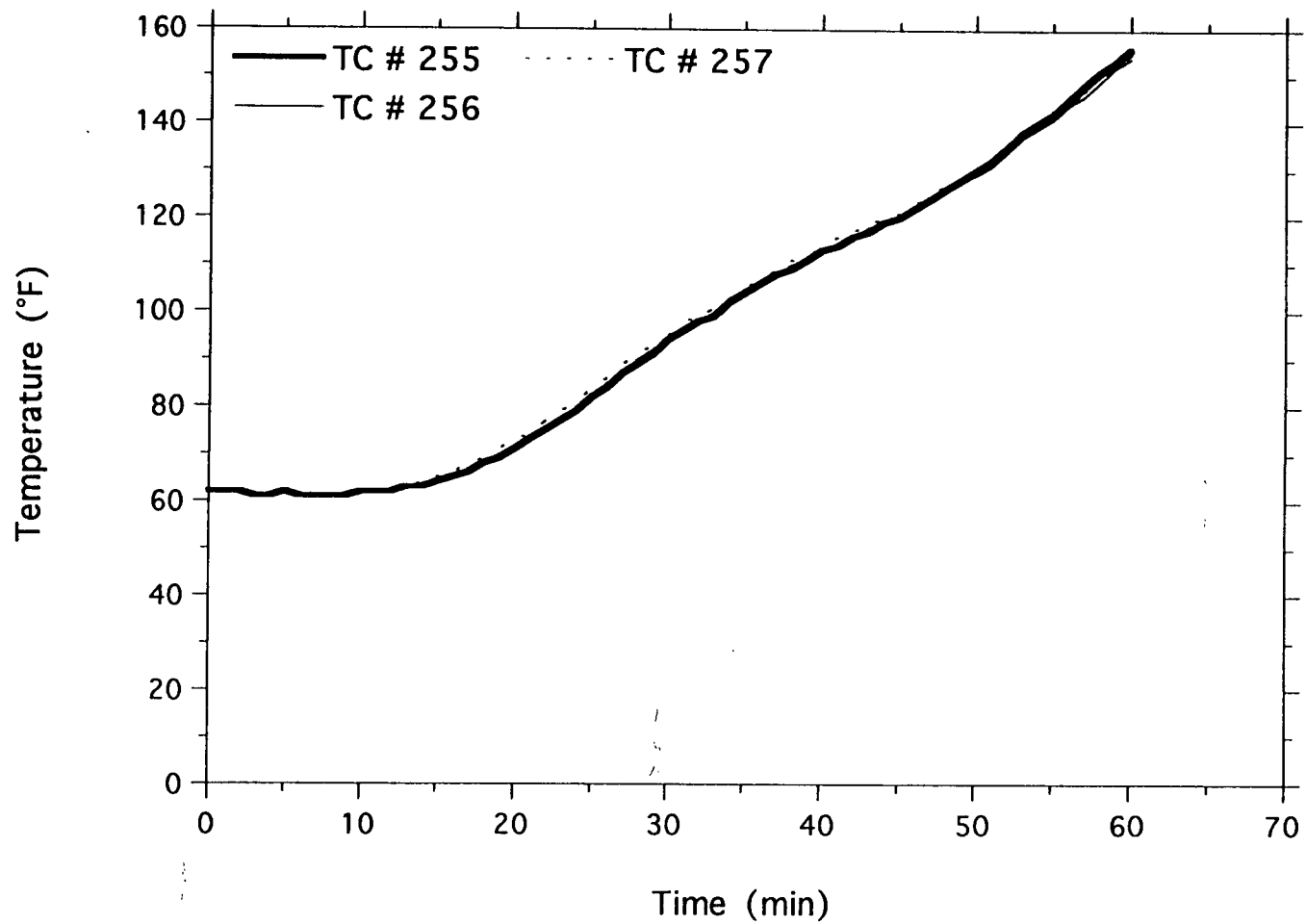
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Top Cond. in Upper Array)



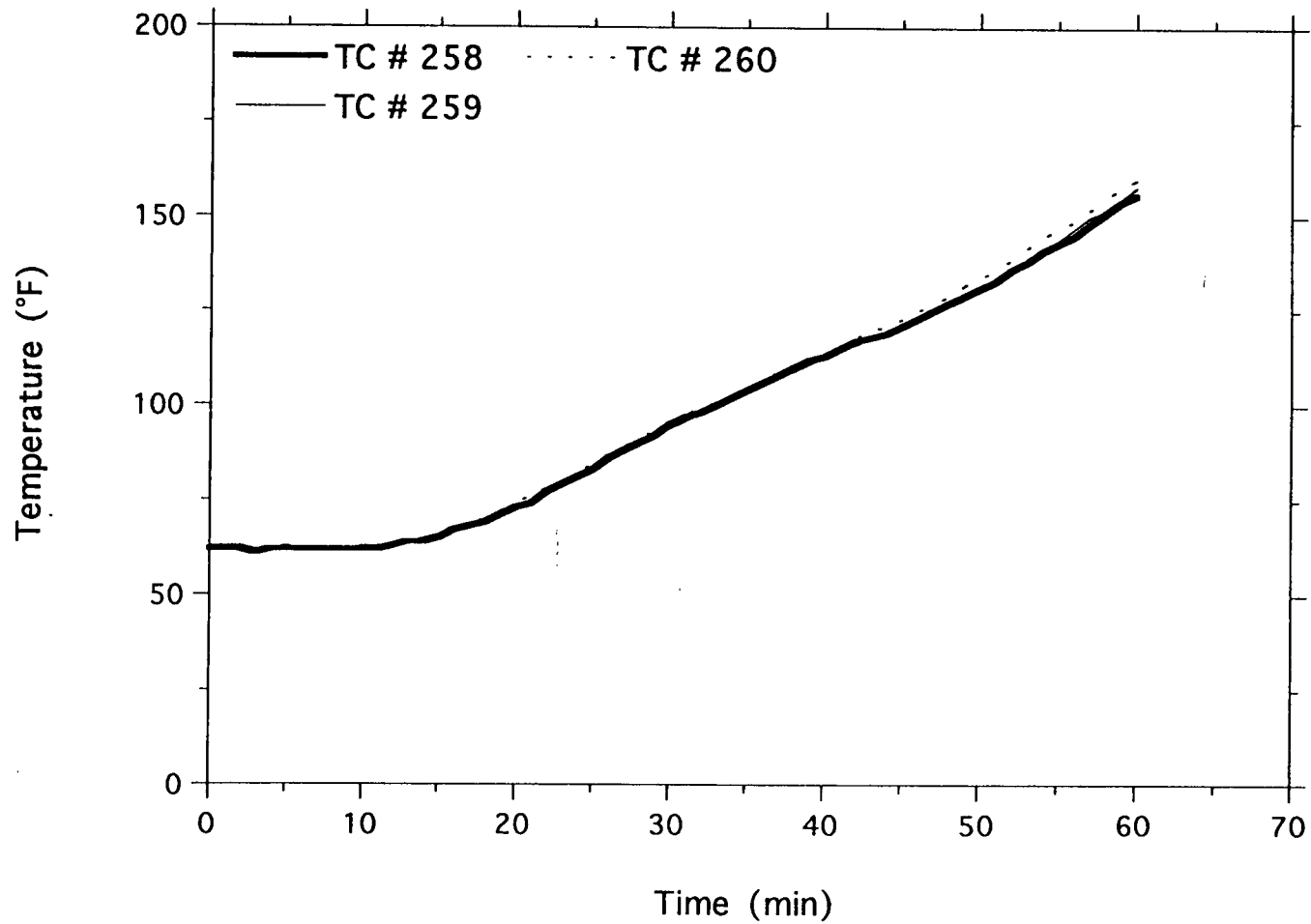
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Top Cond. in Upper Array)



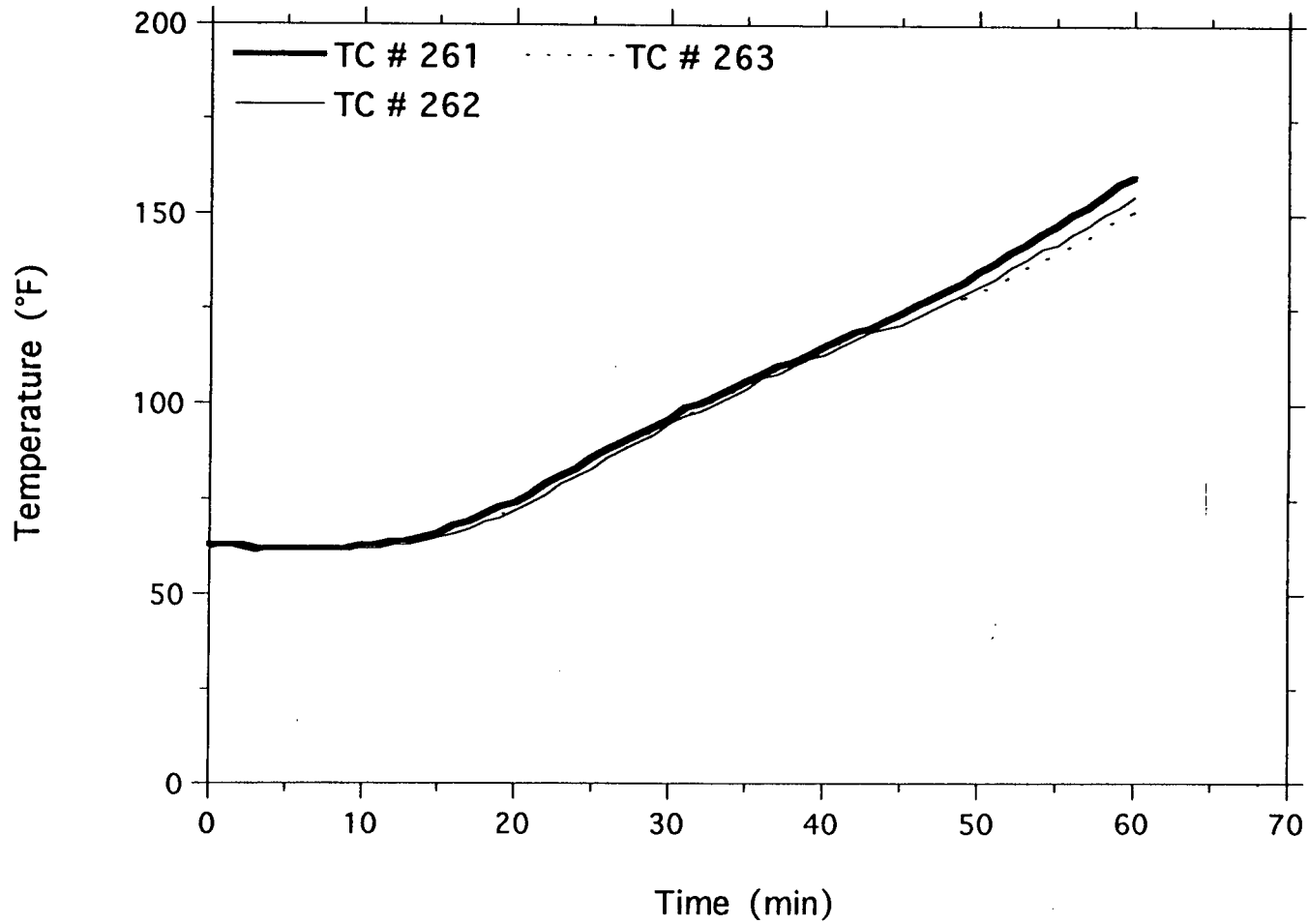
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Top Cond. in Upper Array)



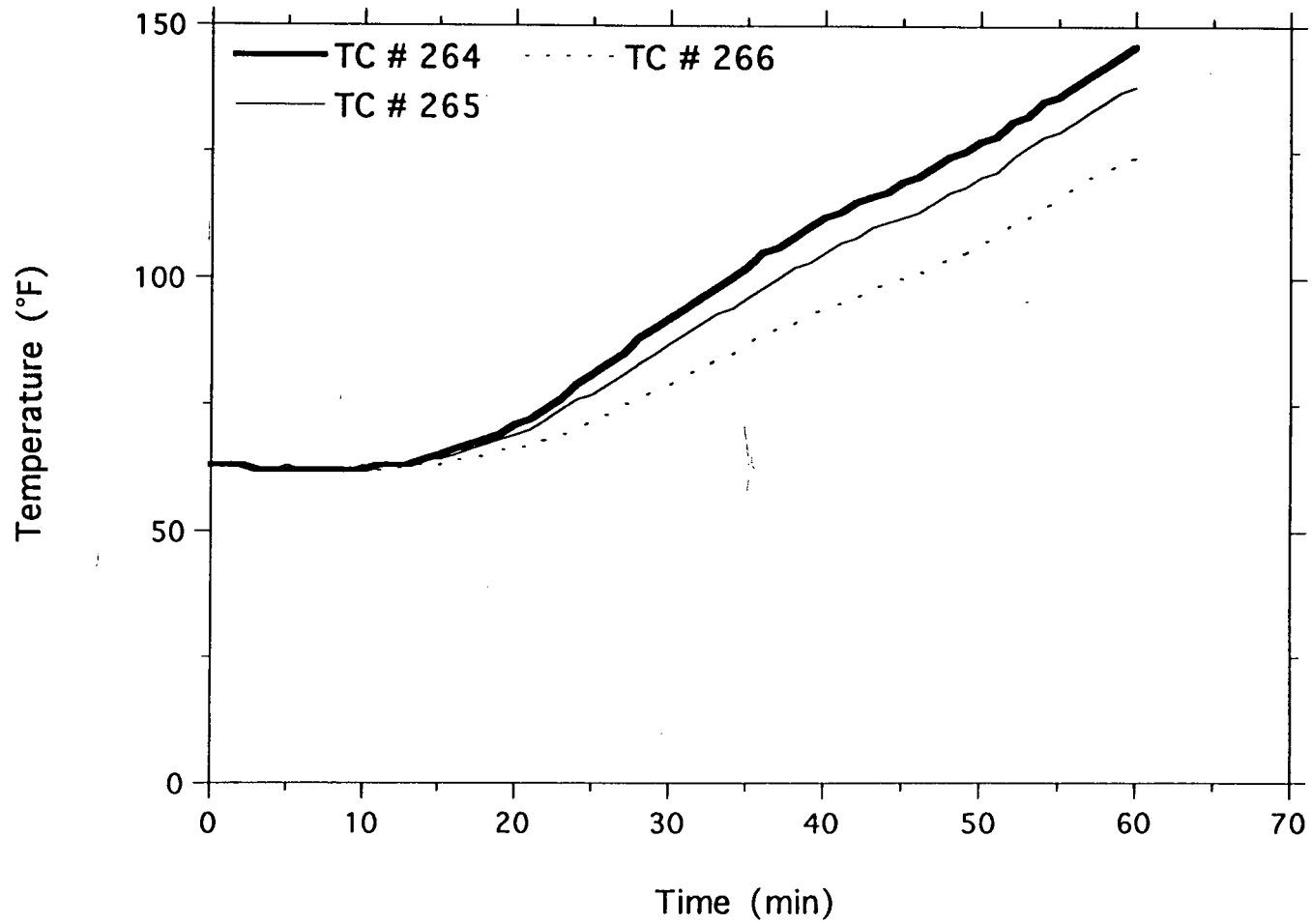
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Top Cond. in Upper Array)



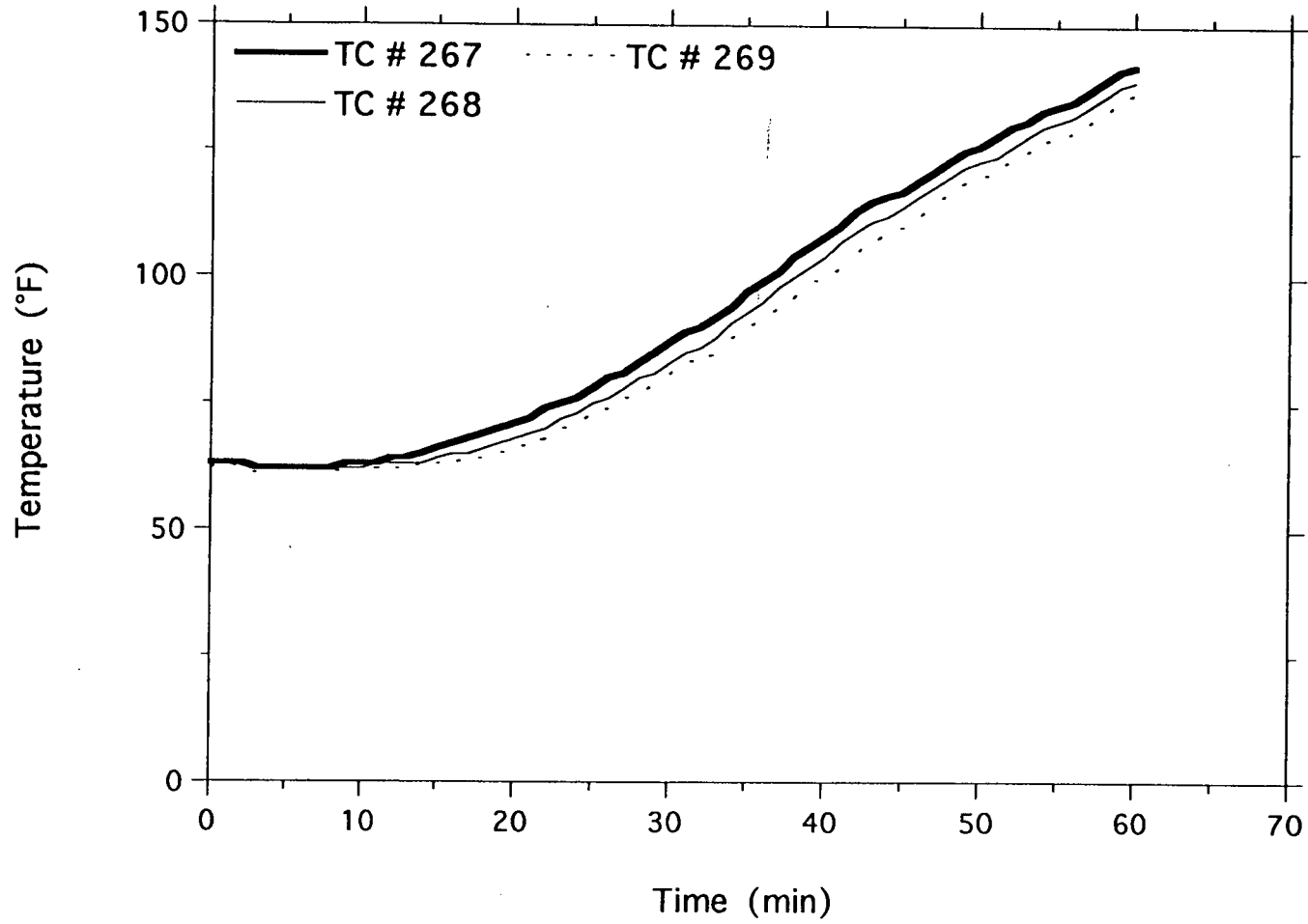
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Top Cond. in Upper Array)



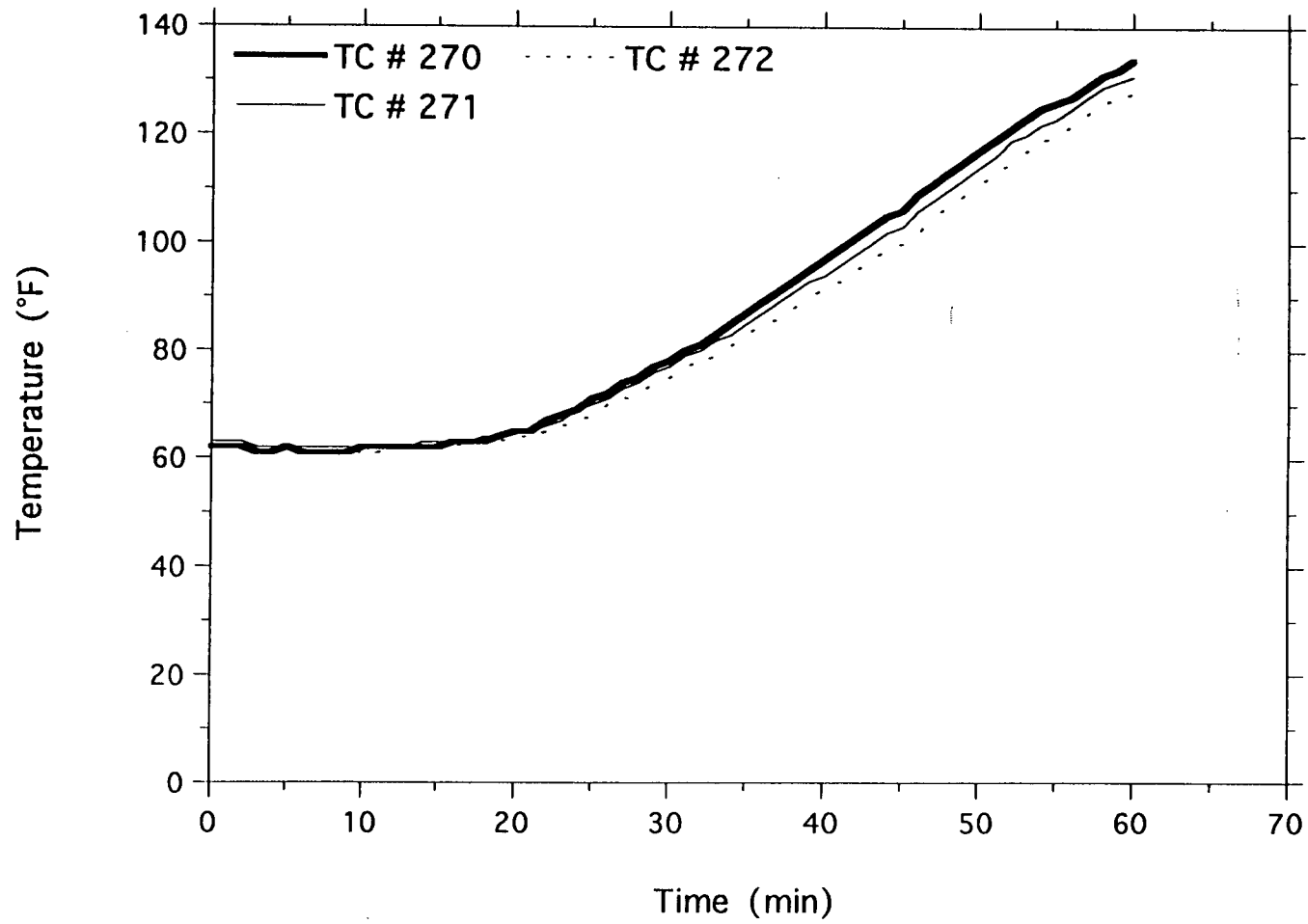
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2-1/2" Bare #8 (2nd Cond. in Upper Array)



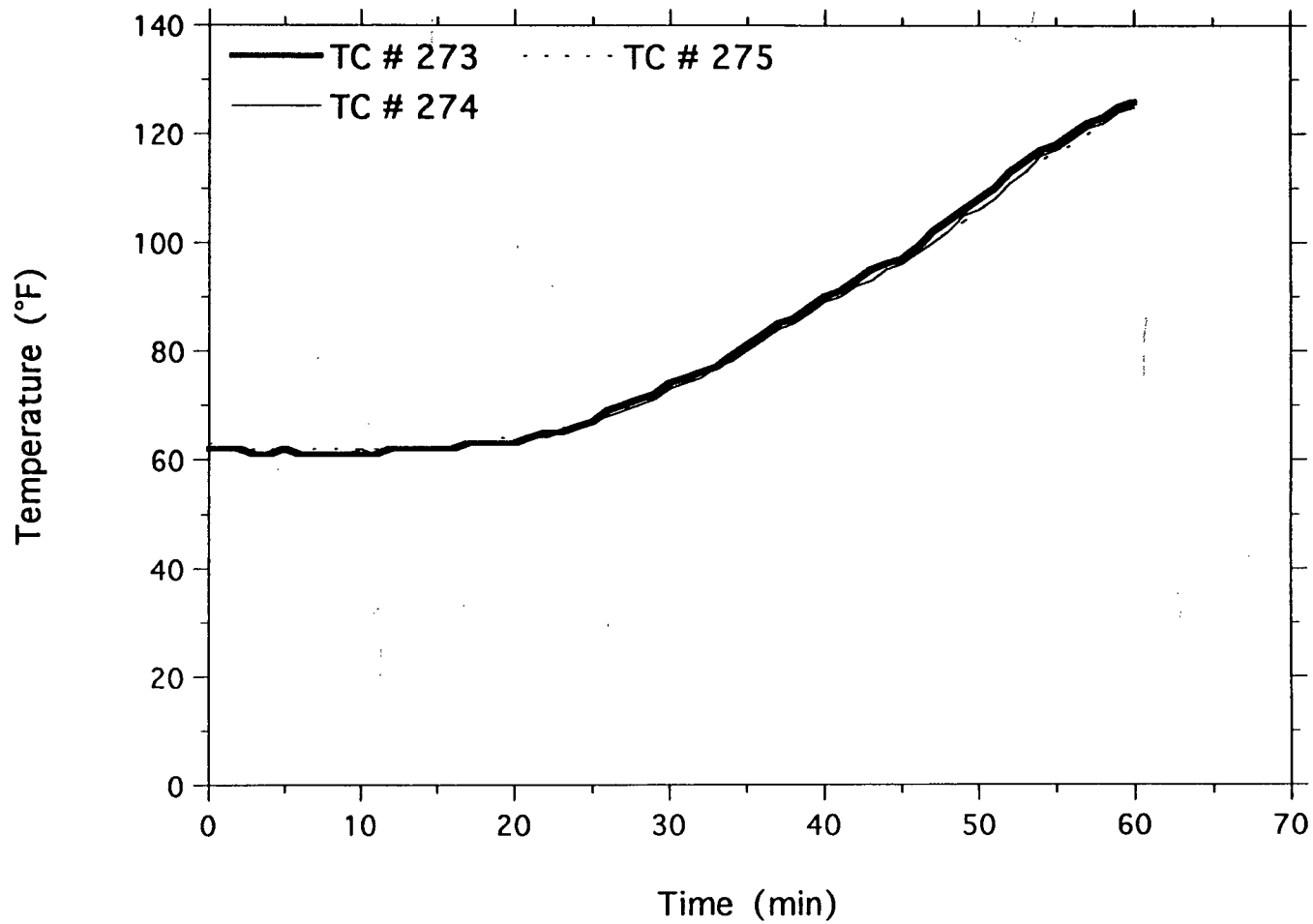
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2-1/2" Bare #8 (2nd Cond. in Upper Array)



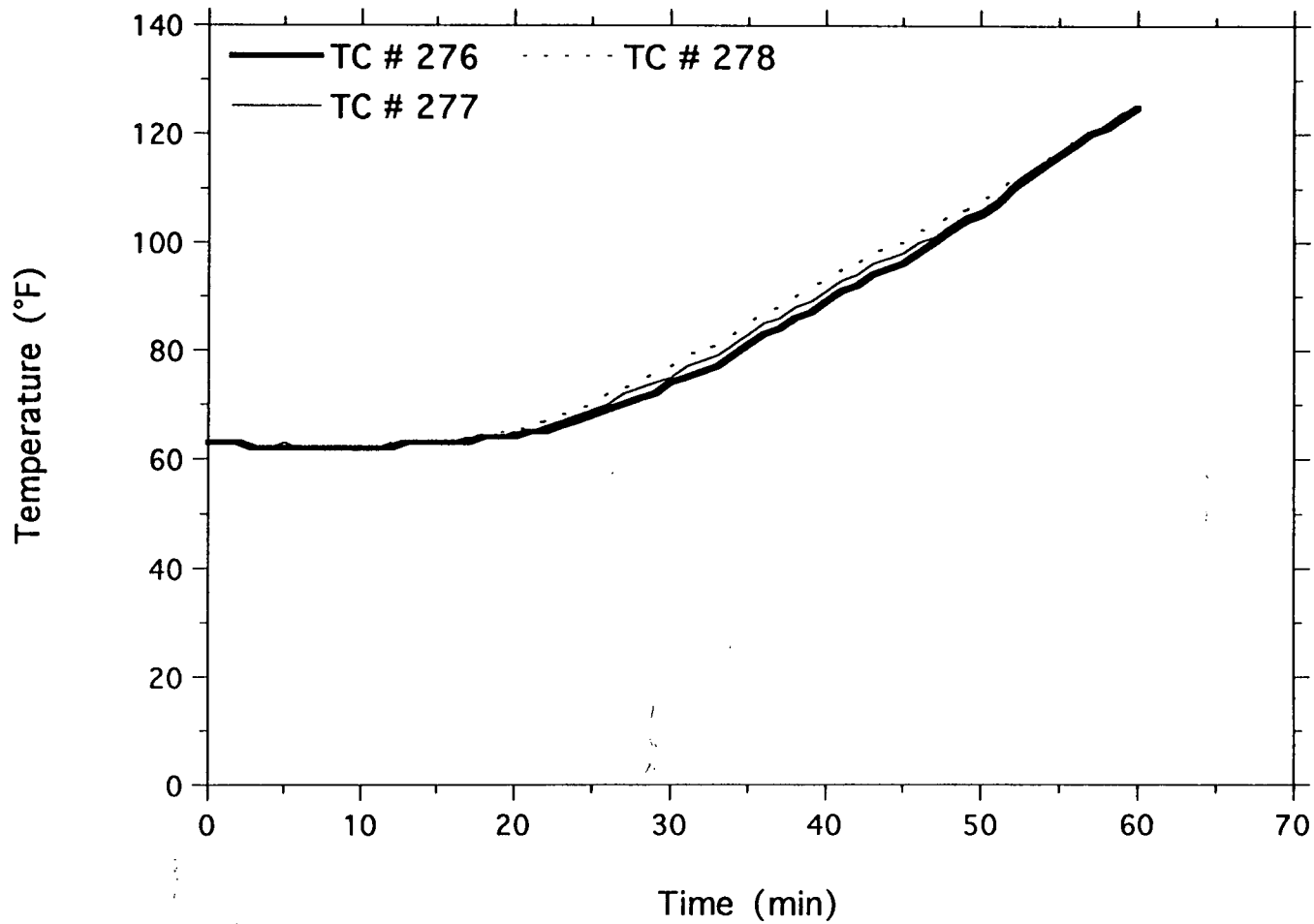
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2-1/2" Bare #8 (2nd Cond. in Upper Array)



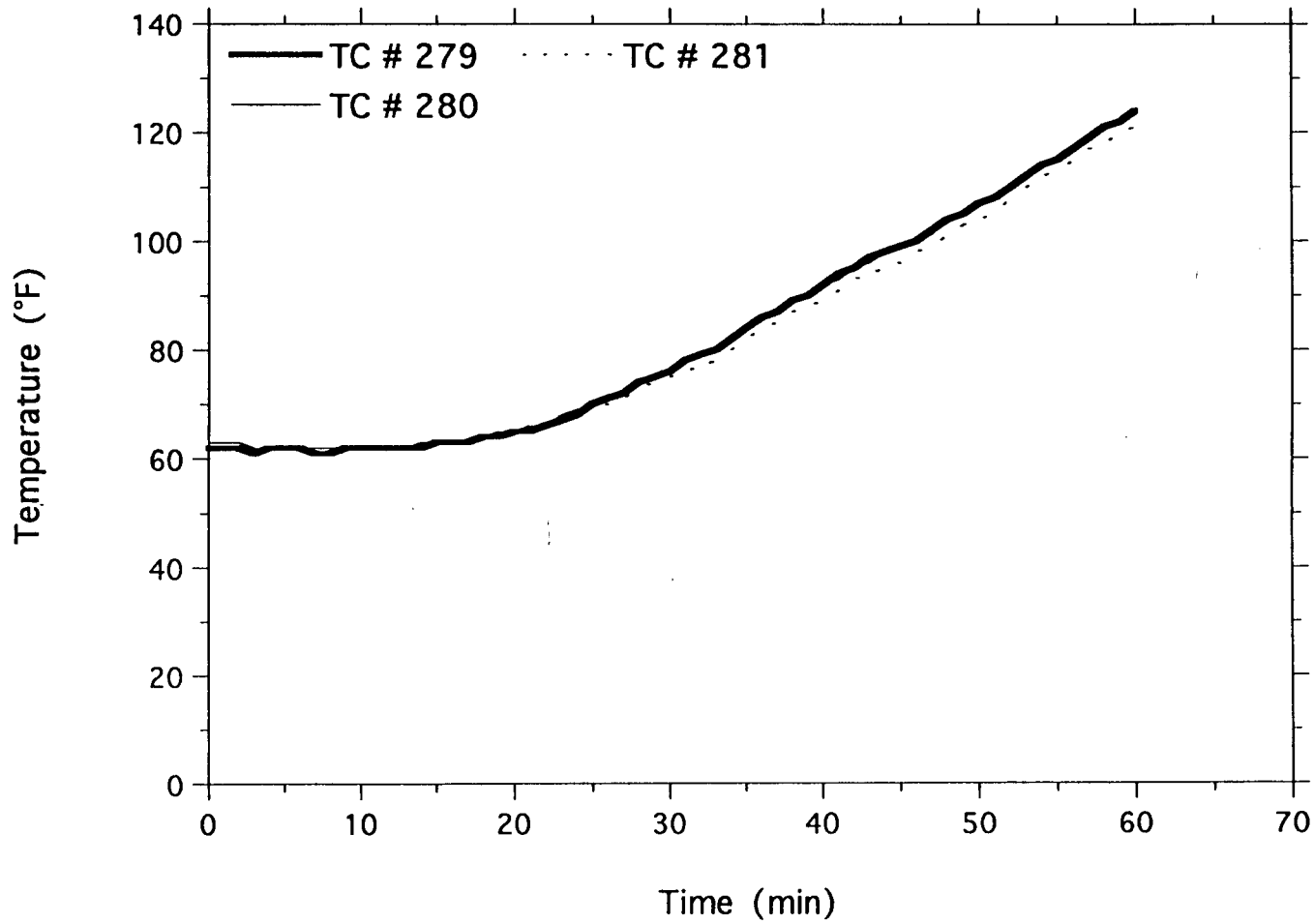
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2-1/2" Bare #8 (2nd Cond. in Upper Array)



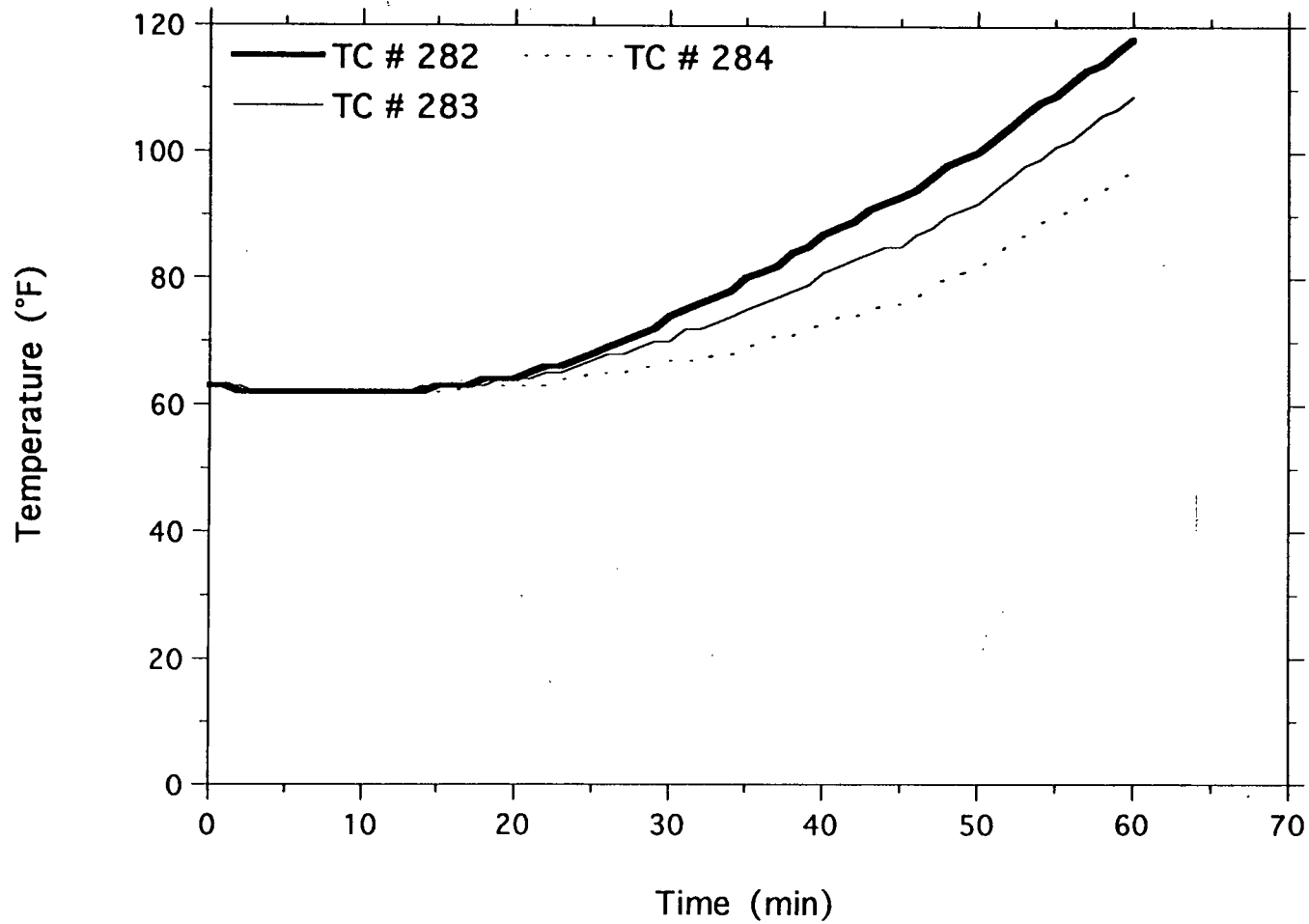
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LABORATORIES

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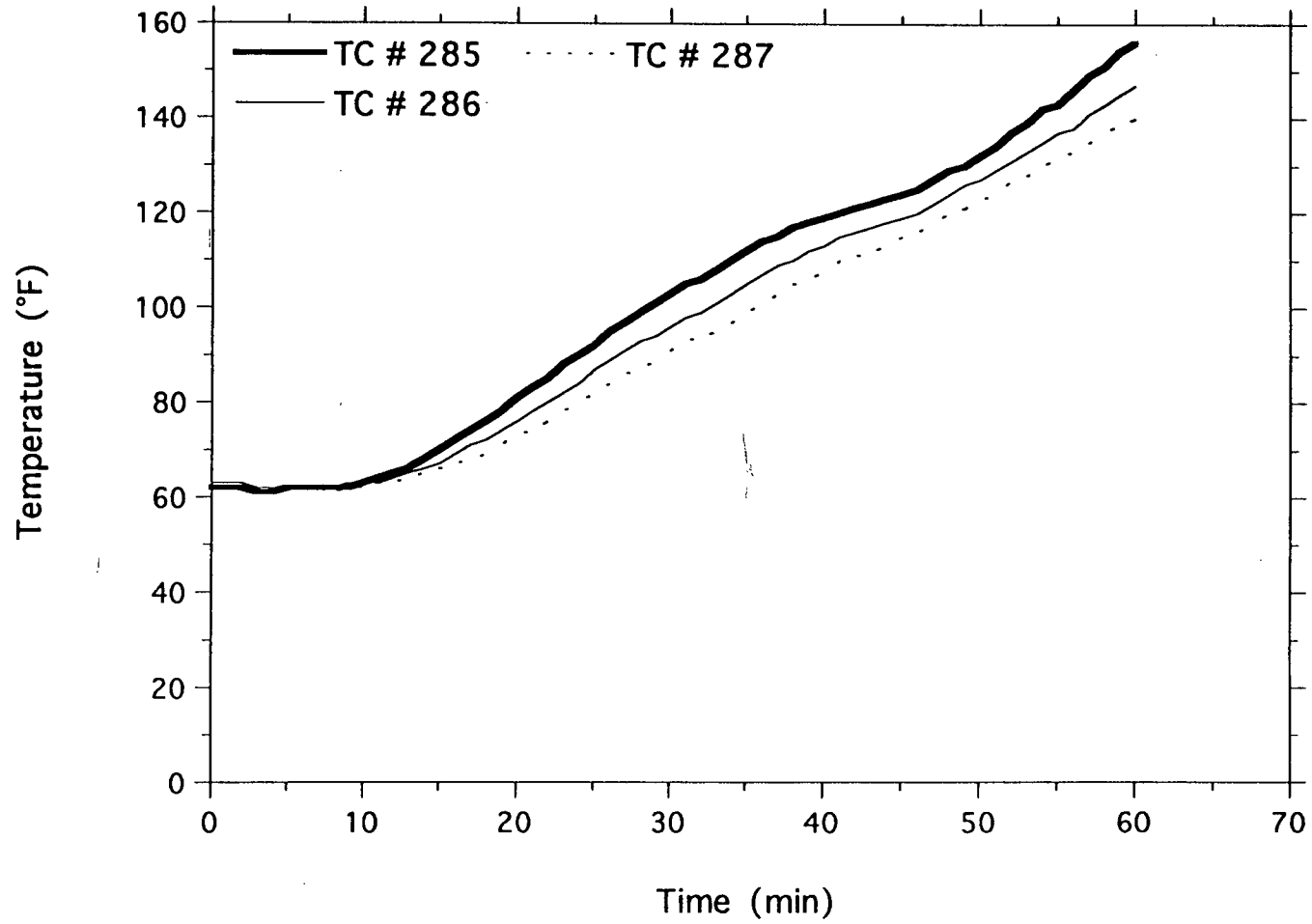
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LABORATORIES

TSI/TVA
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2-1/2" Bare #8 (2nd Cond. in Upper Array)



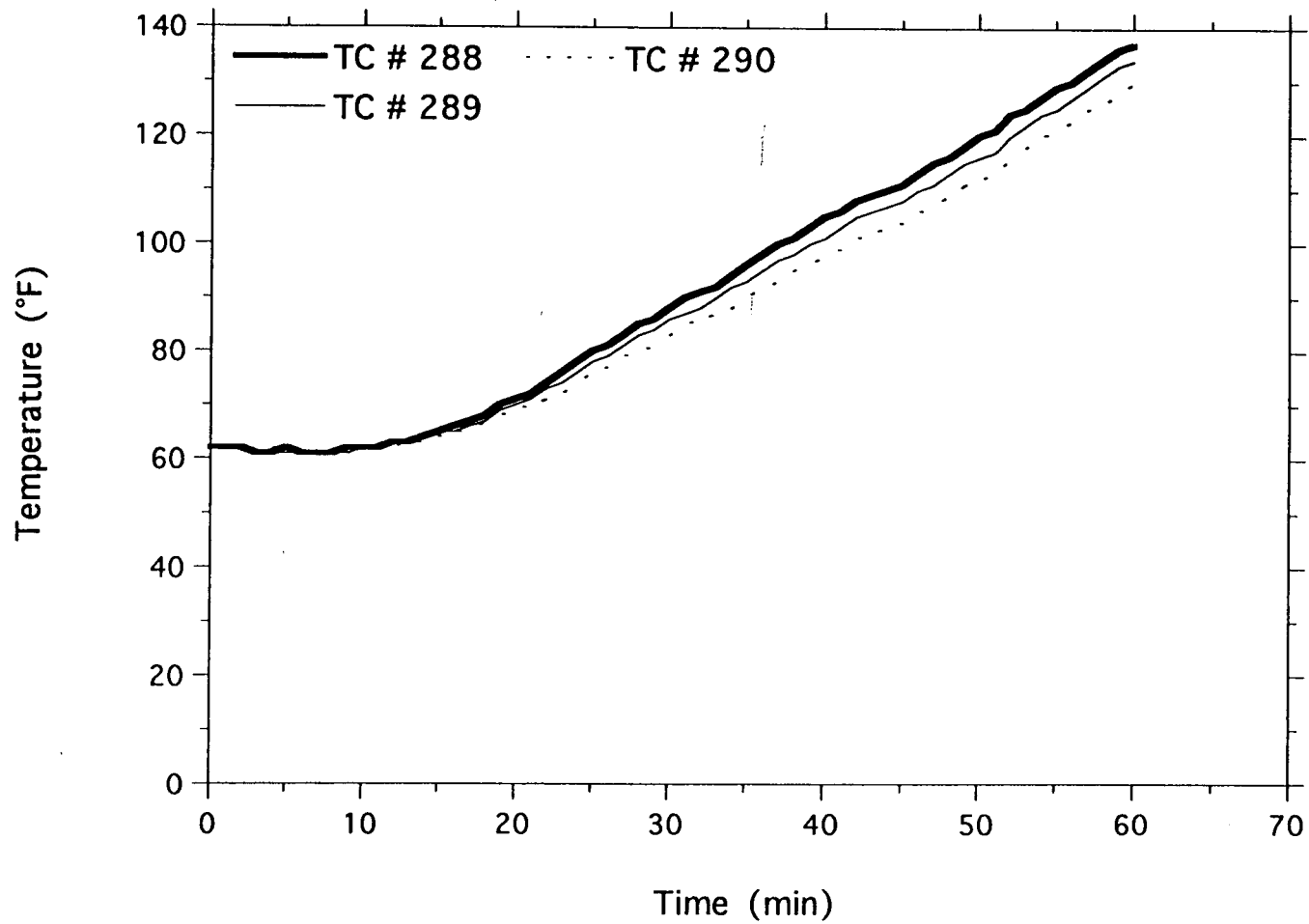
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LABORATORIES

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2" Bare #8 (3rd Cond. in Upper Array)



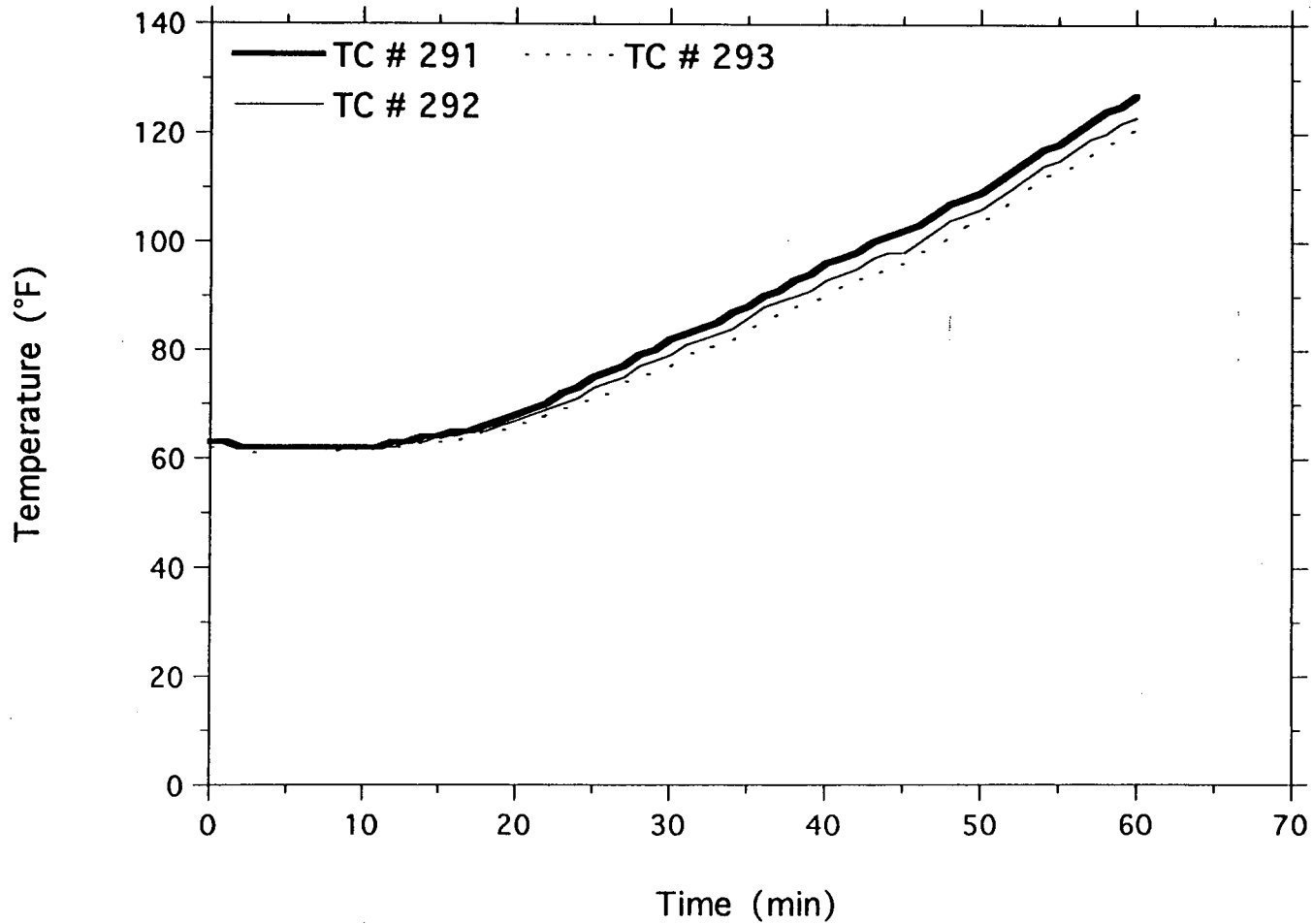
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LABORATORIES

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2" Bare #8 (3rd Cond. in Upper Array)



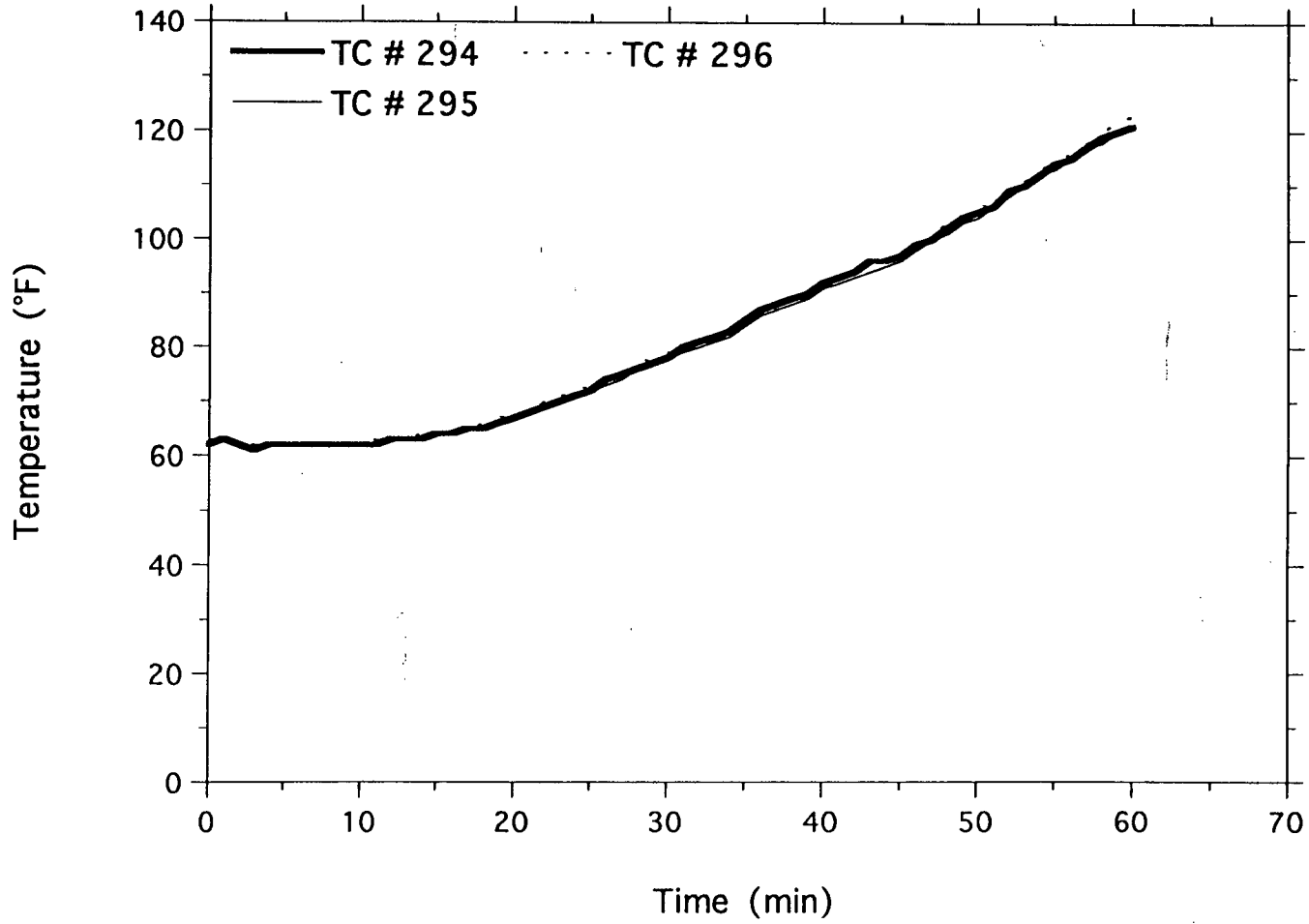
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (3rd Cond. in Upper Array)



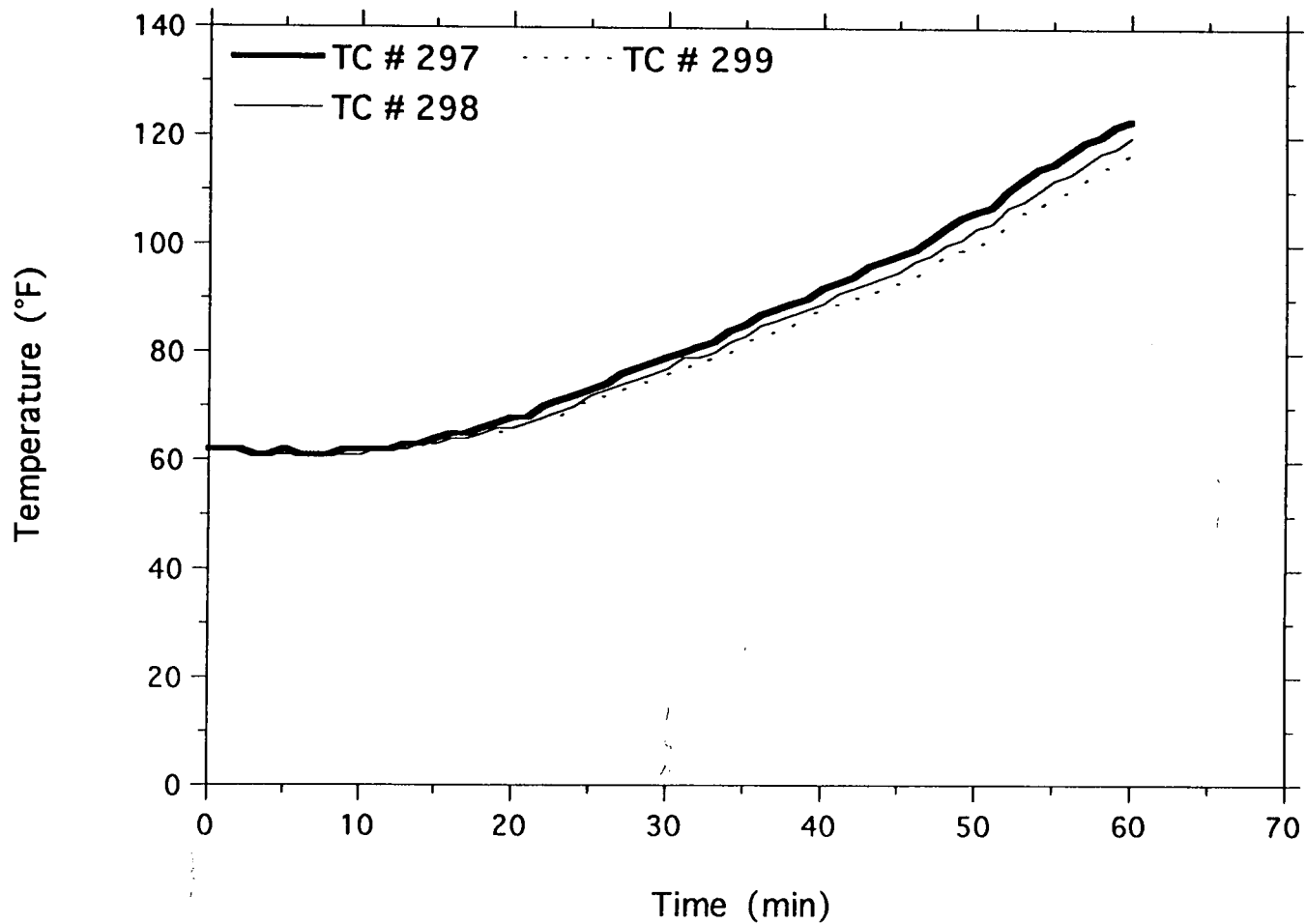
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (3rd Cond. in Upper Array)



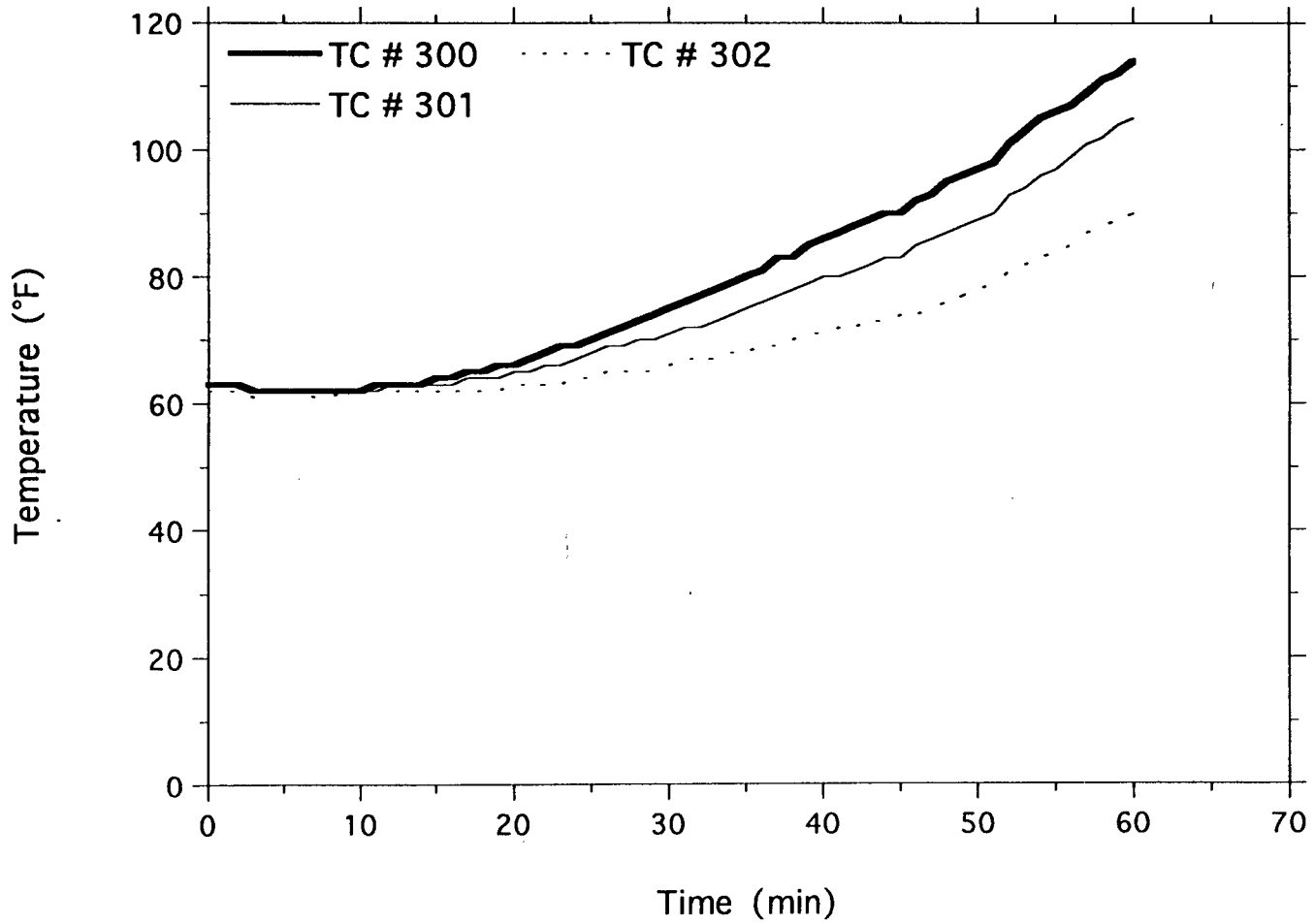
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (3rd Cond. in Upper Array)



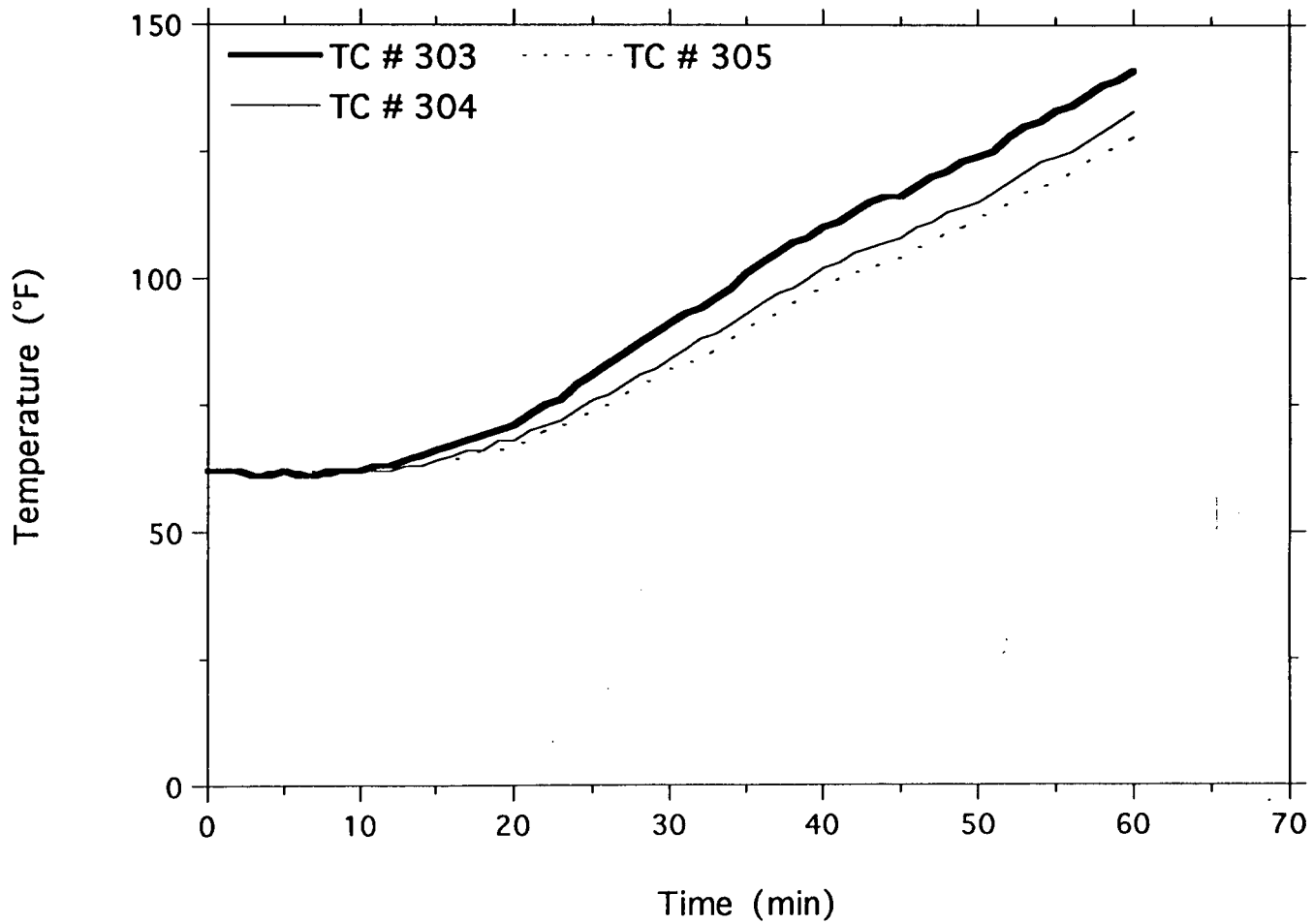
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (3rd Cond. in Upper Array)



OMEGA POINT
LABORATORIES

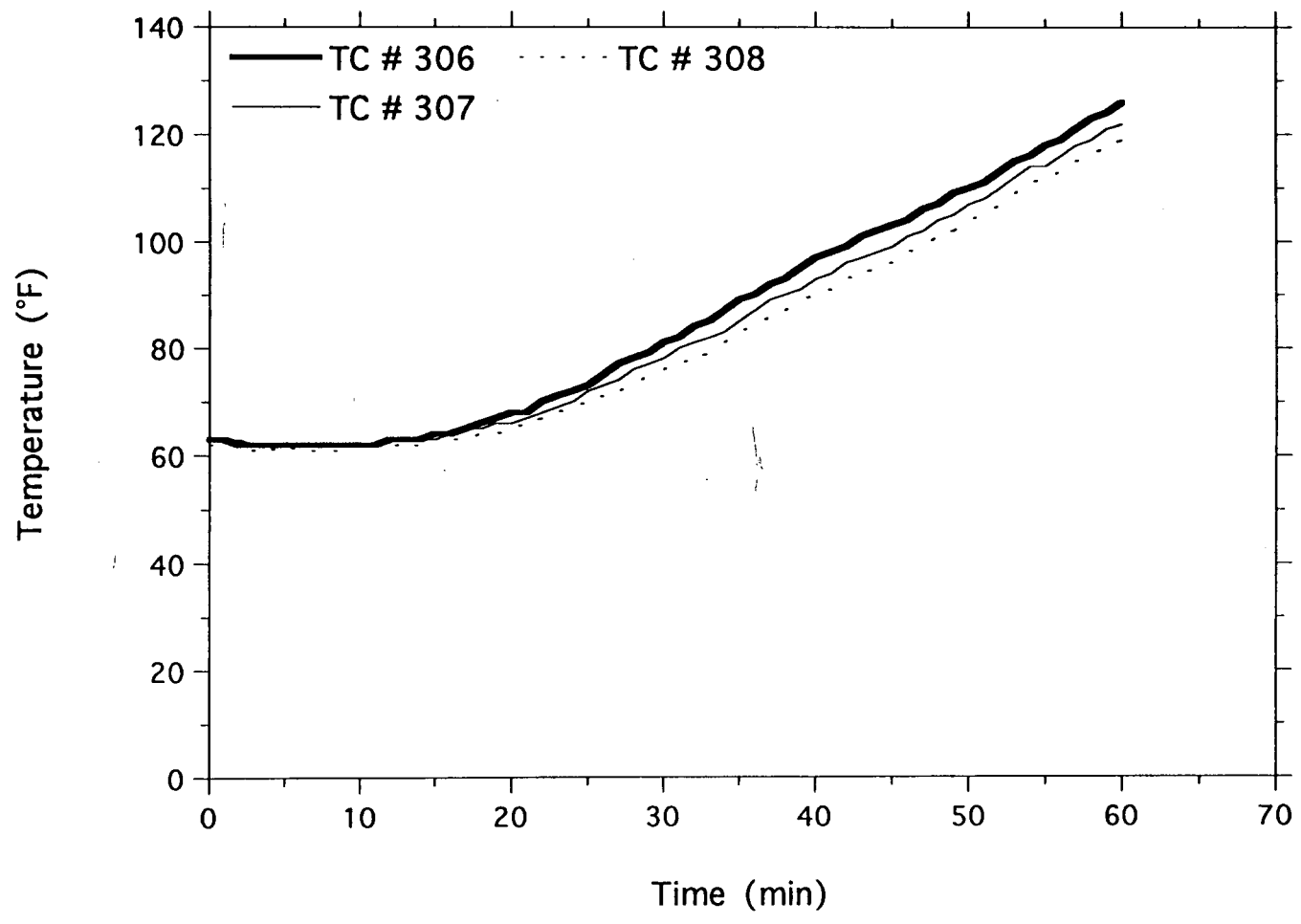
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Project No. 11960-97258
3" Bare #8 (4th Cond. in Upper Array)



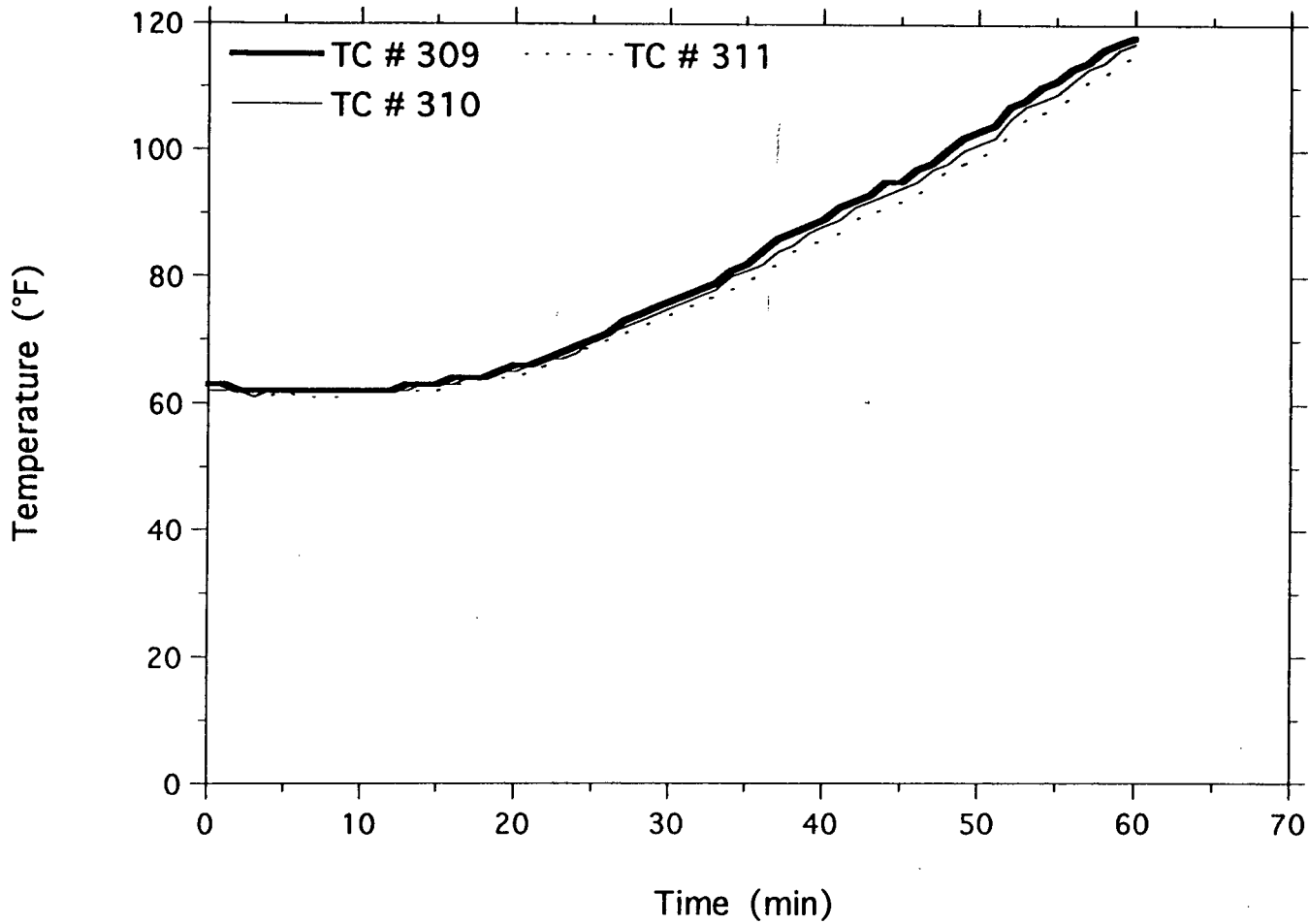
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (4th Cond. in Upper Array)

OMEGA POINT
LABORATORIES

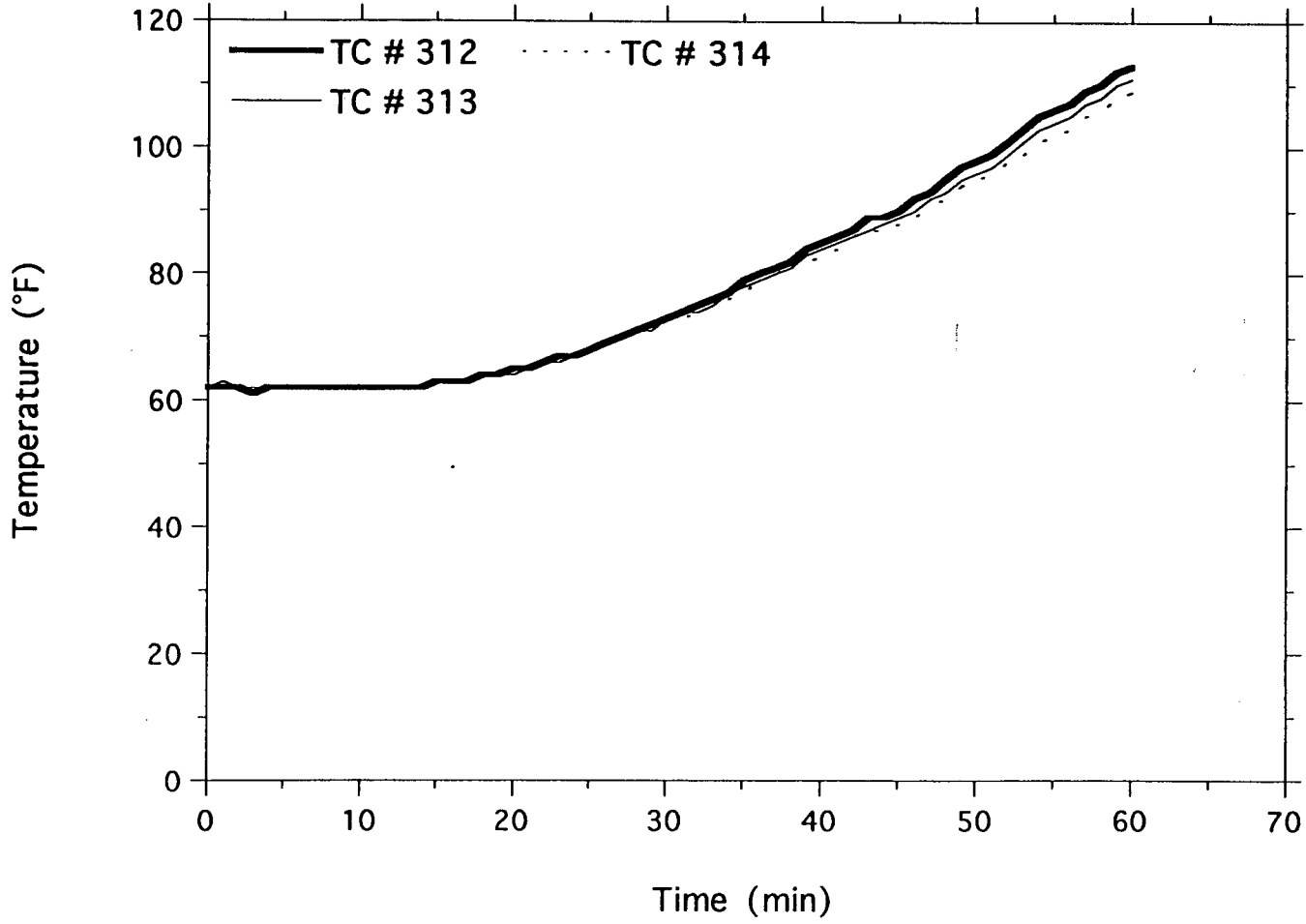


TSI/TVA
Project No. 11960-97258
3" Bare #8 (4th Cond. in Upper Array)



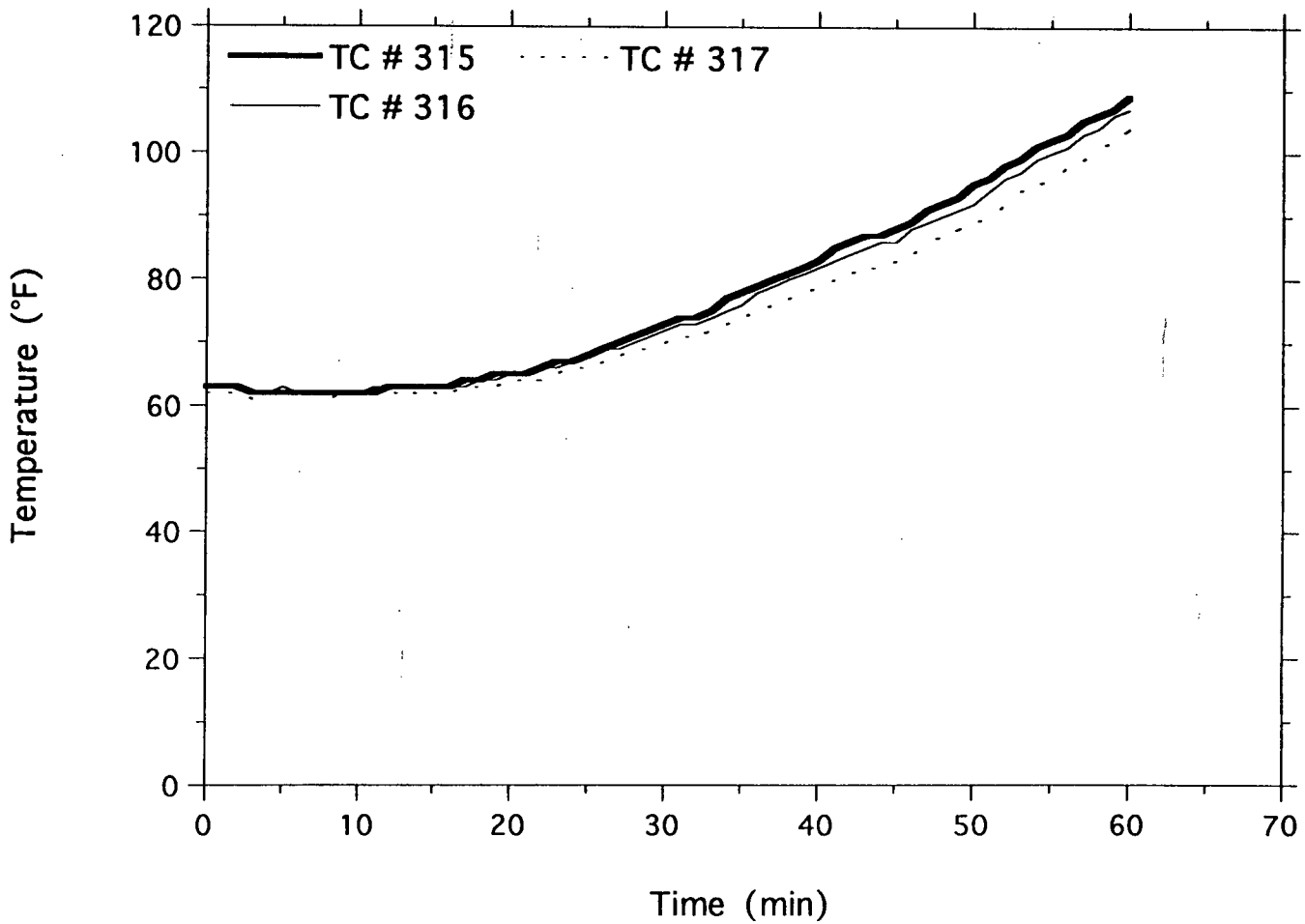
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (4th Cond. in Upper Array)



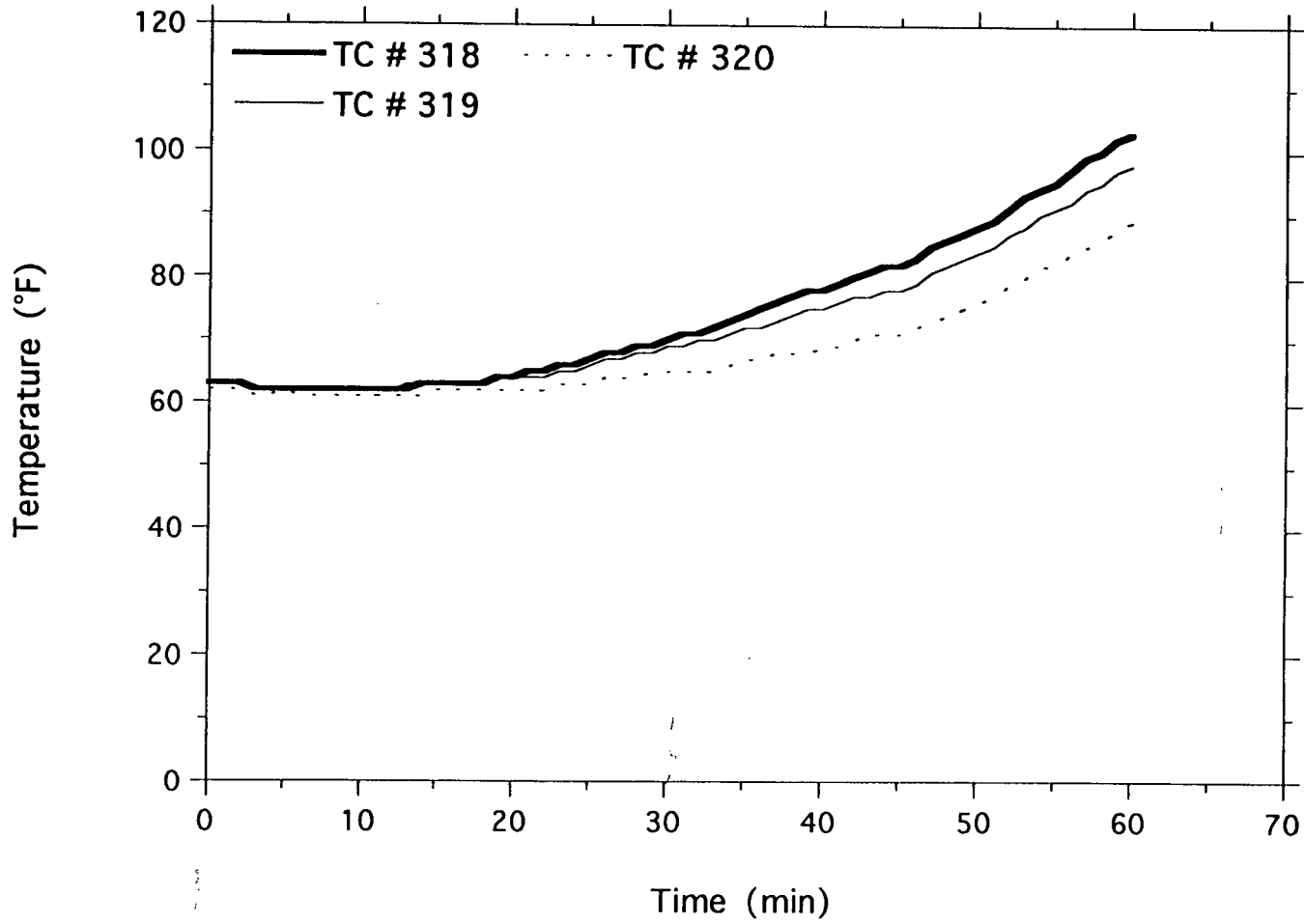
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (4th Cond. in Upper Array)



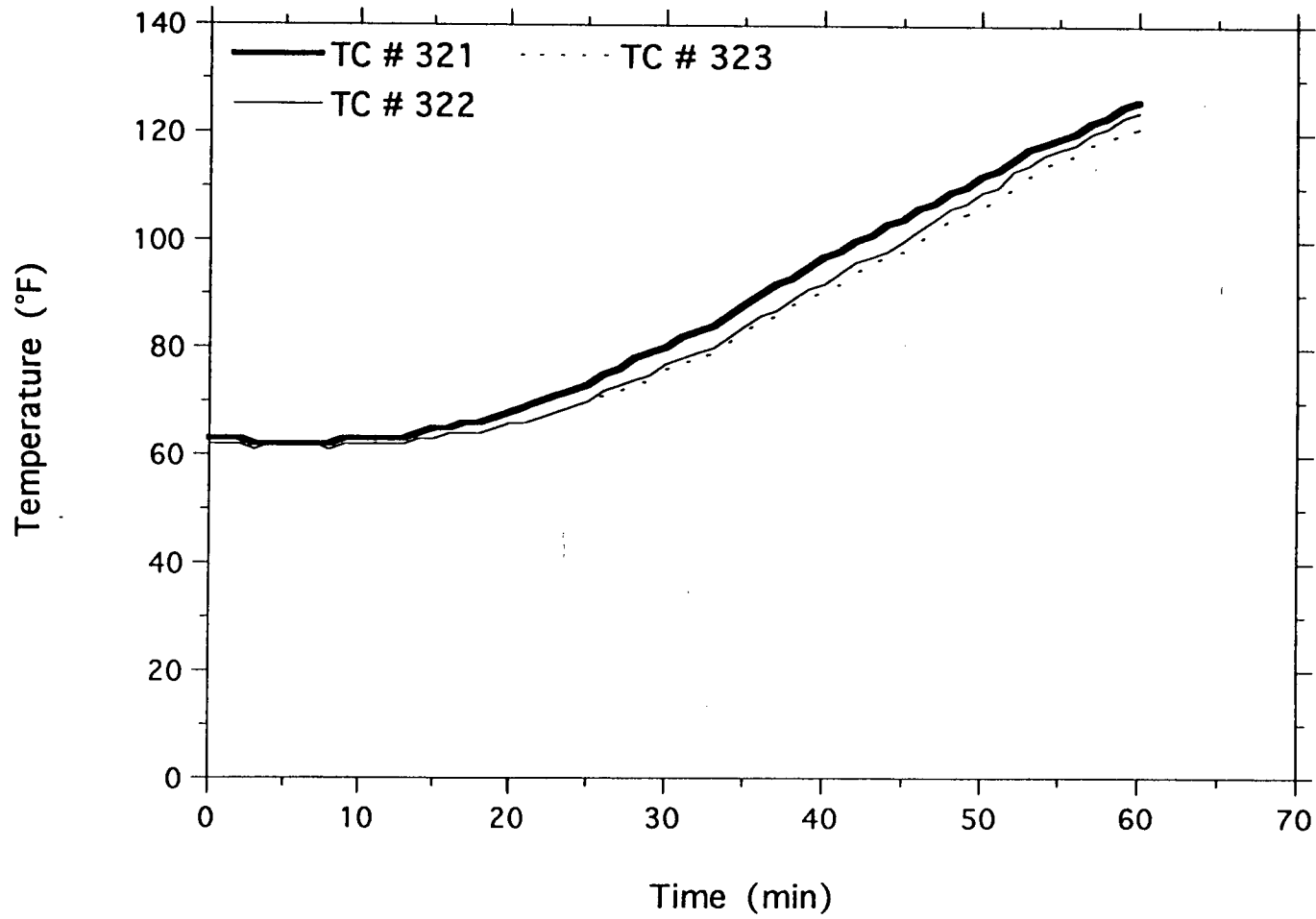
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (4th Cond. in Upper Array)



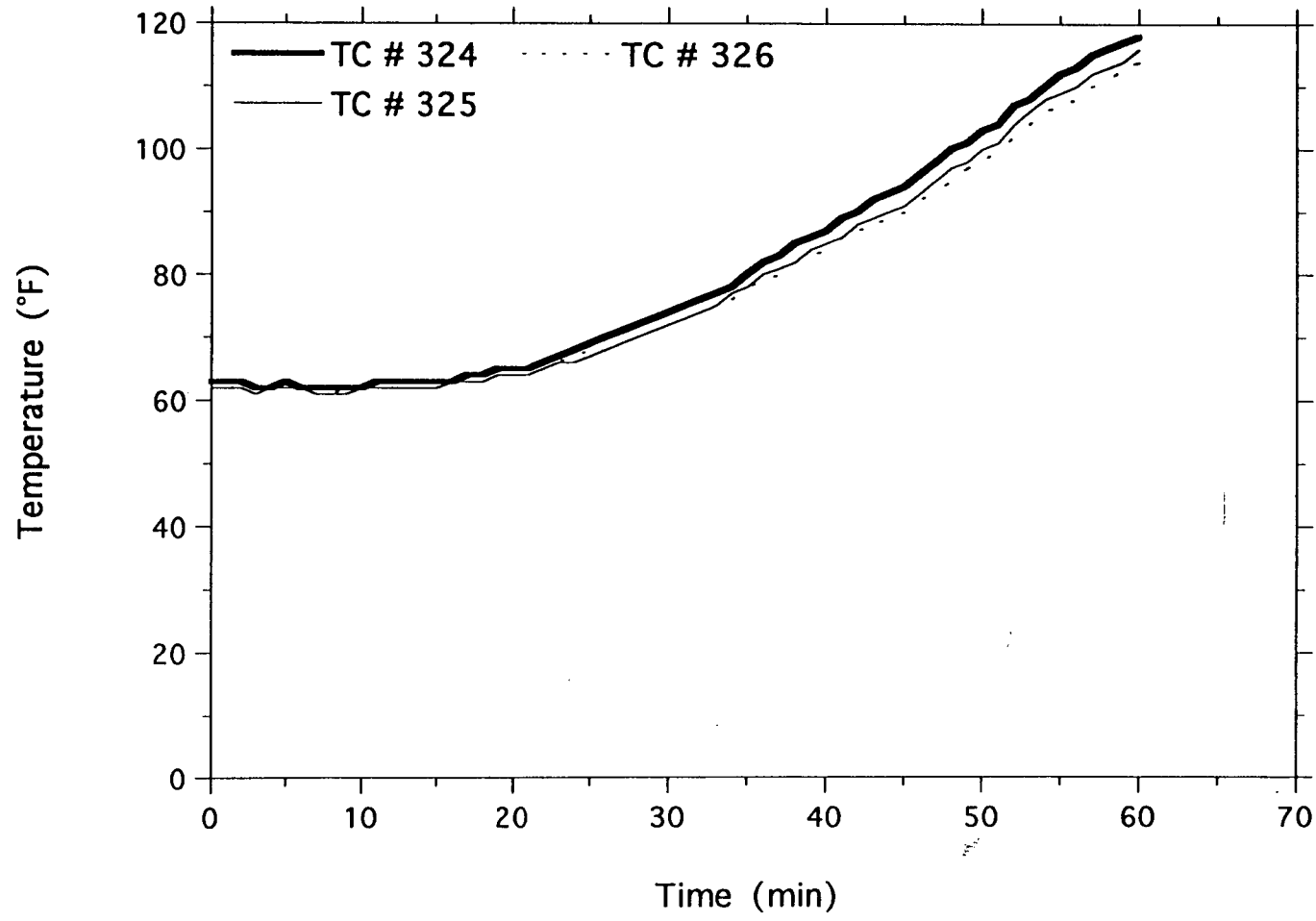
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (5th Cond. in Upper Array)



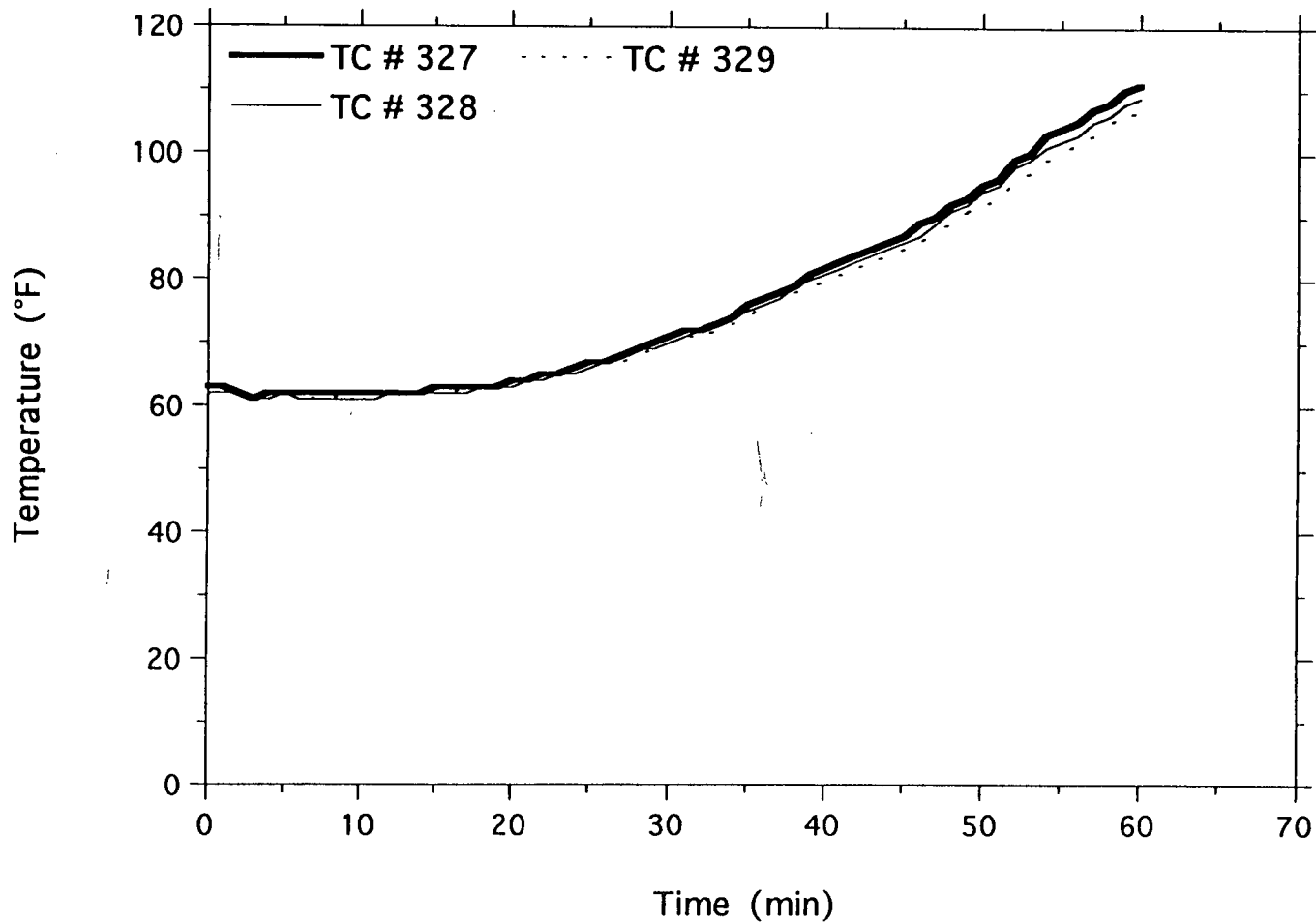
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (5th Cond. in Upper Array)



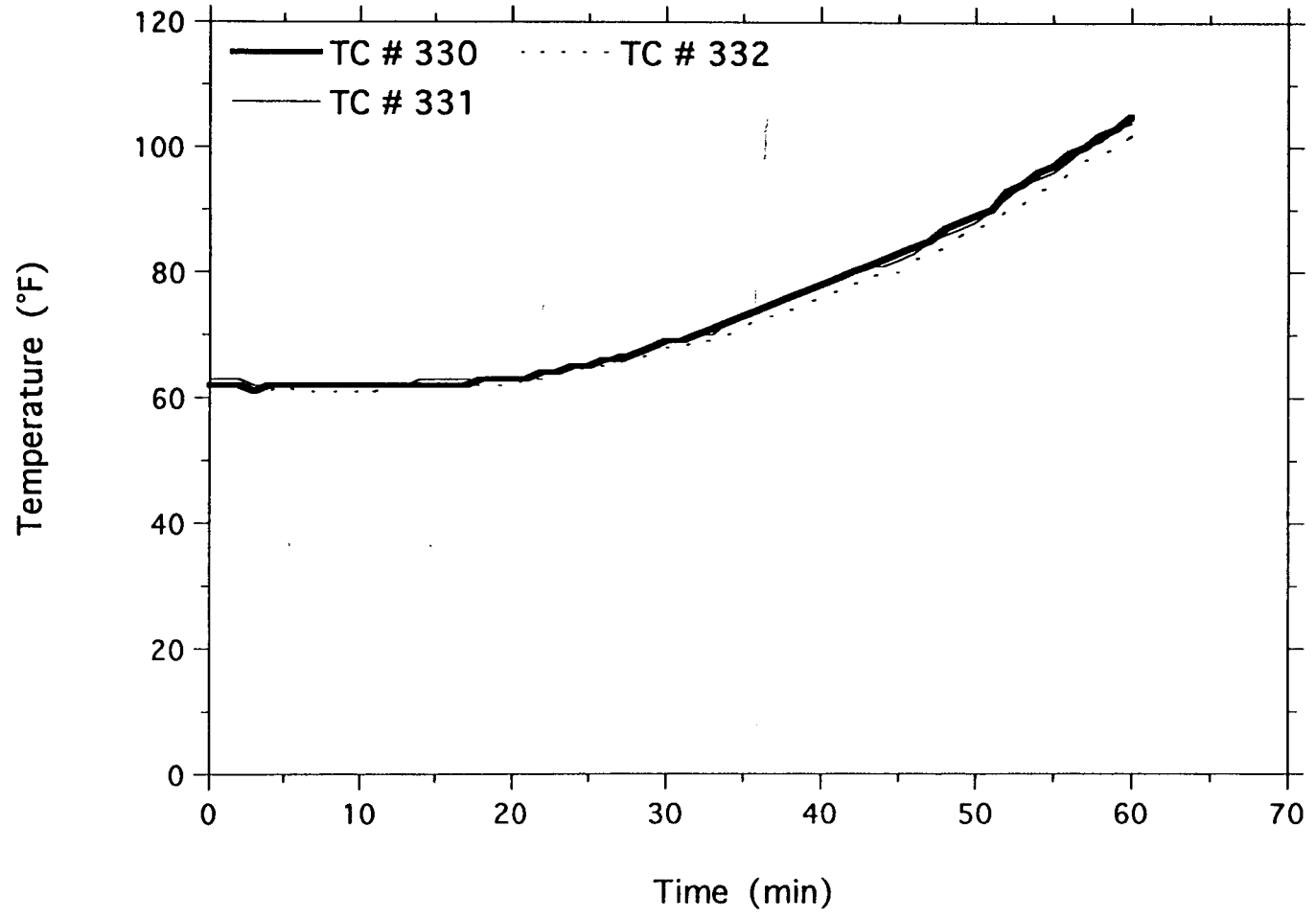
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (5th Cond. in Upper Array)



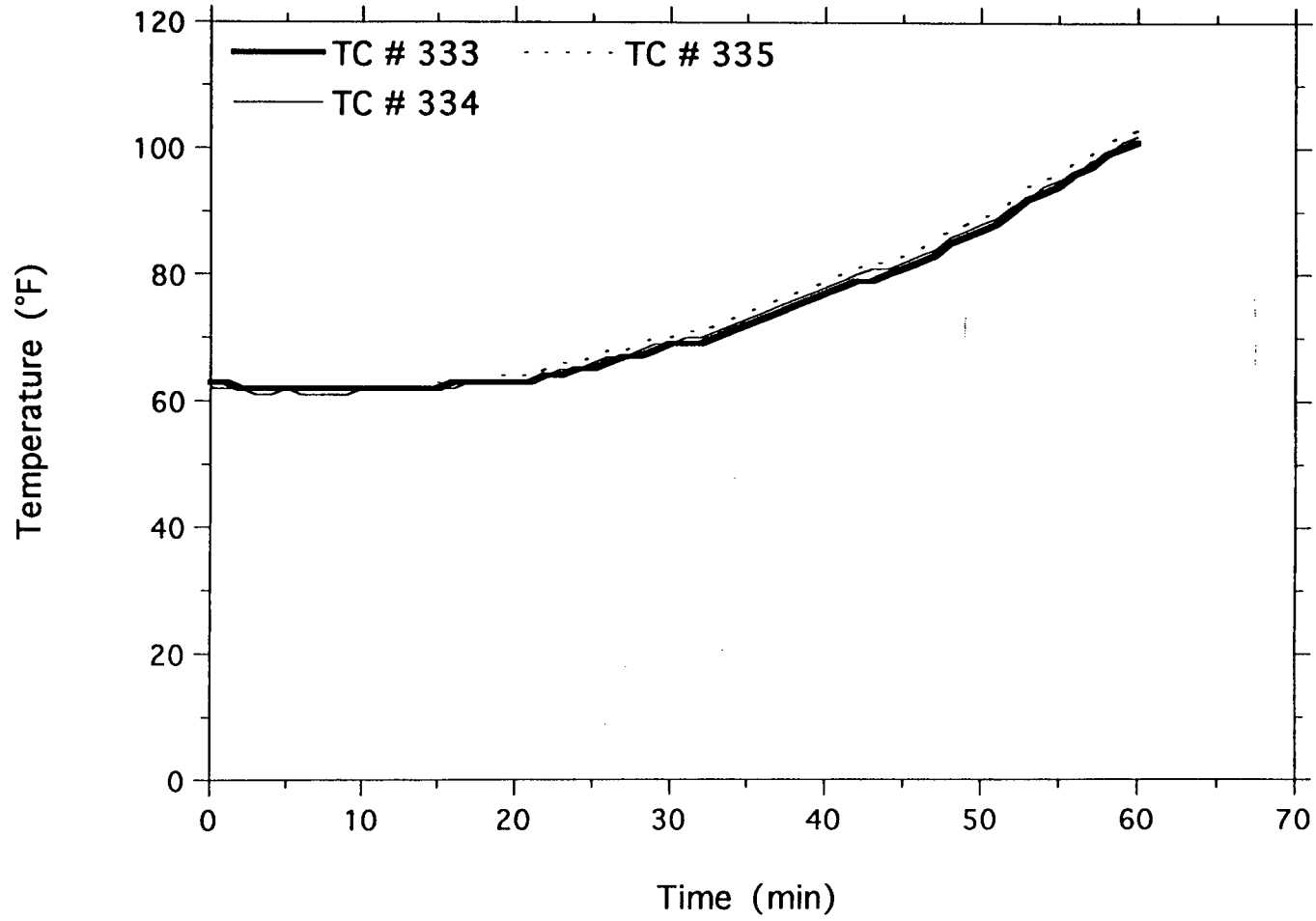
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (5th Cond. in Upper Array)



OMEGA POINT
LABORATORIES

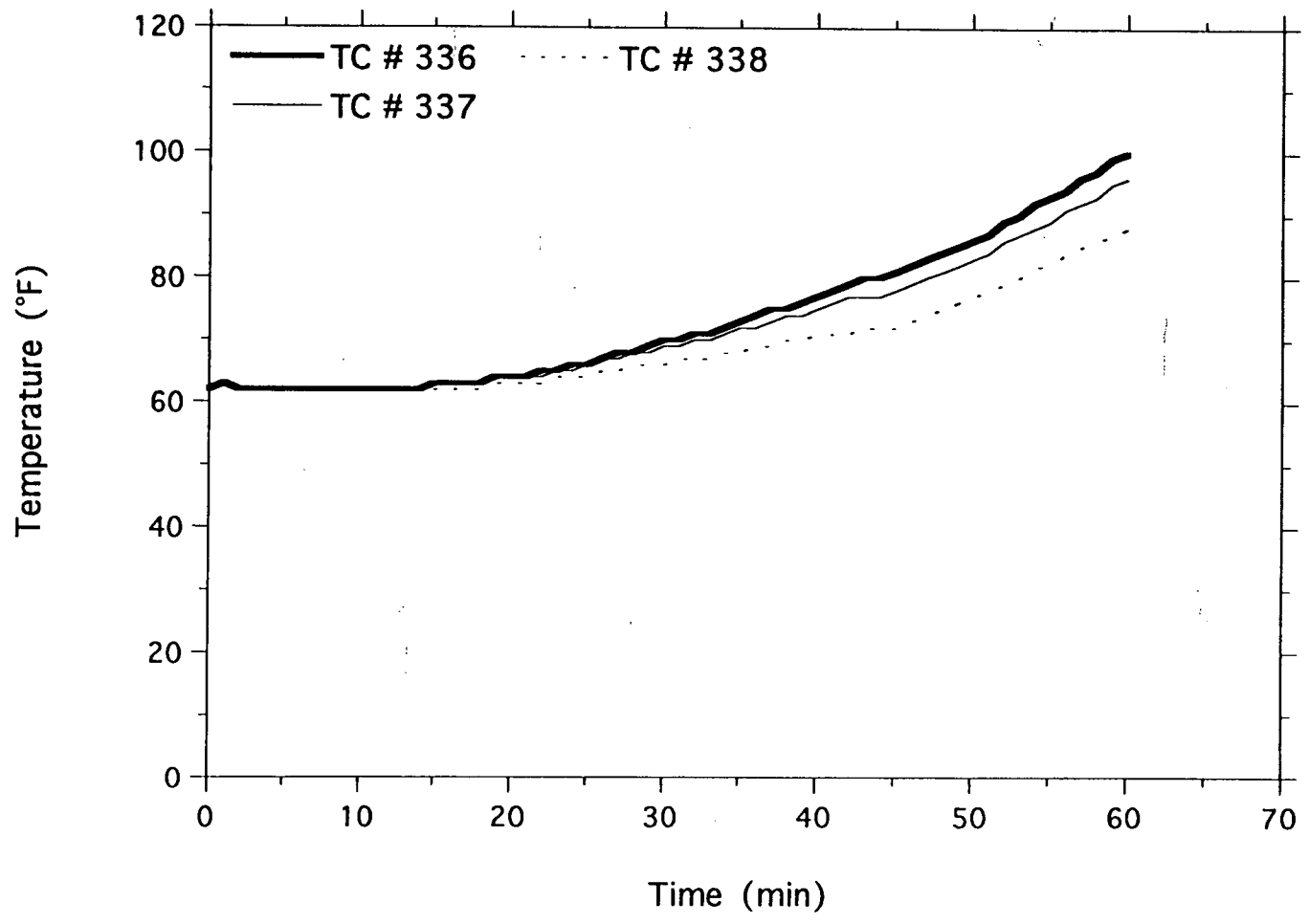
TSI/TVA
Project No. 11960-97258
2" Bare #8 (5th Cond. in Upper Array)



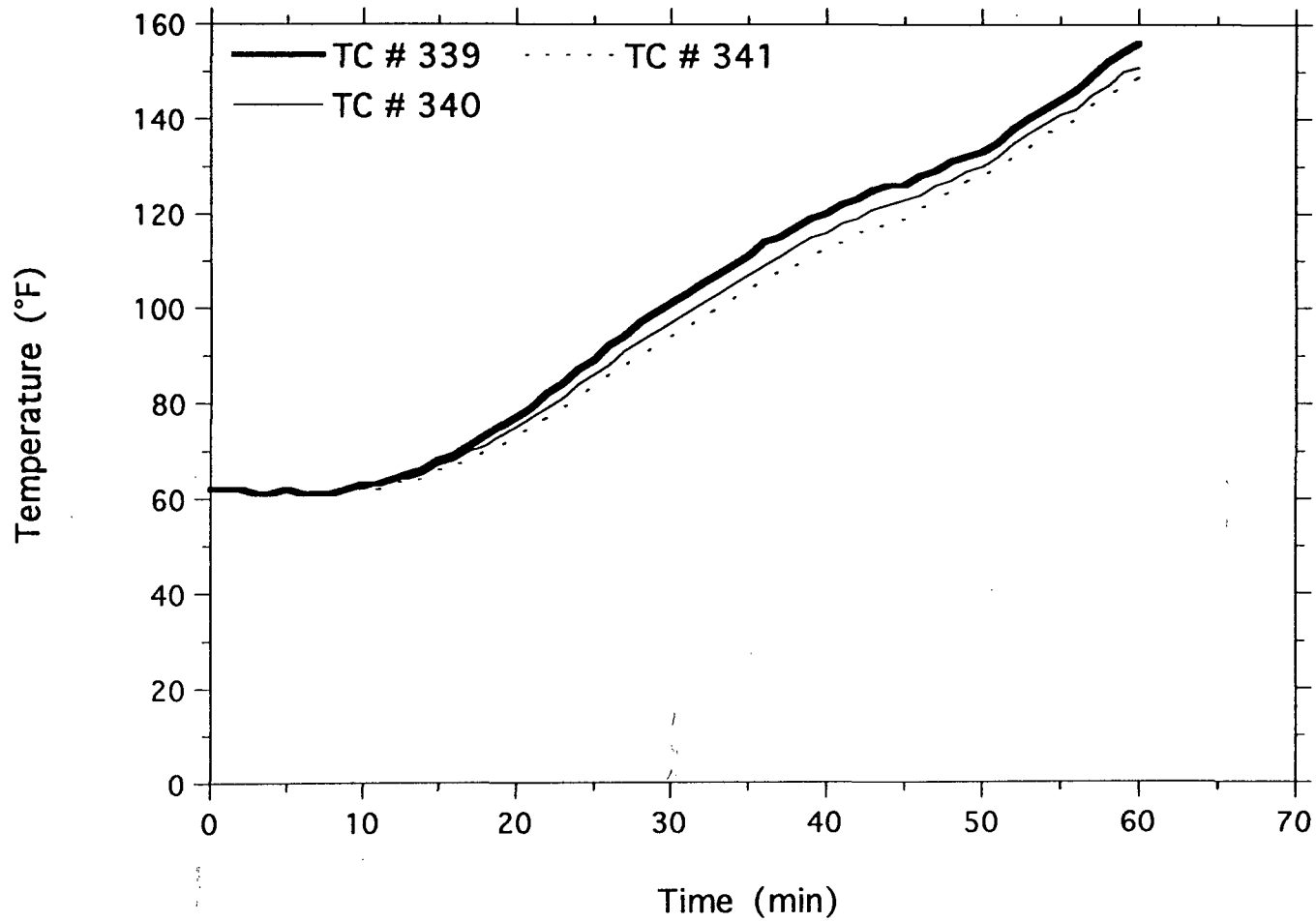
OMEGA POINT
LABORATORIES

OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (5th Cond. in Upper Array)

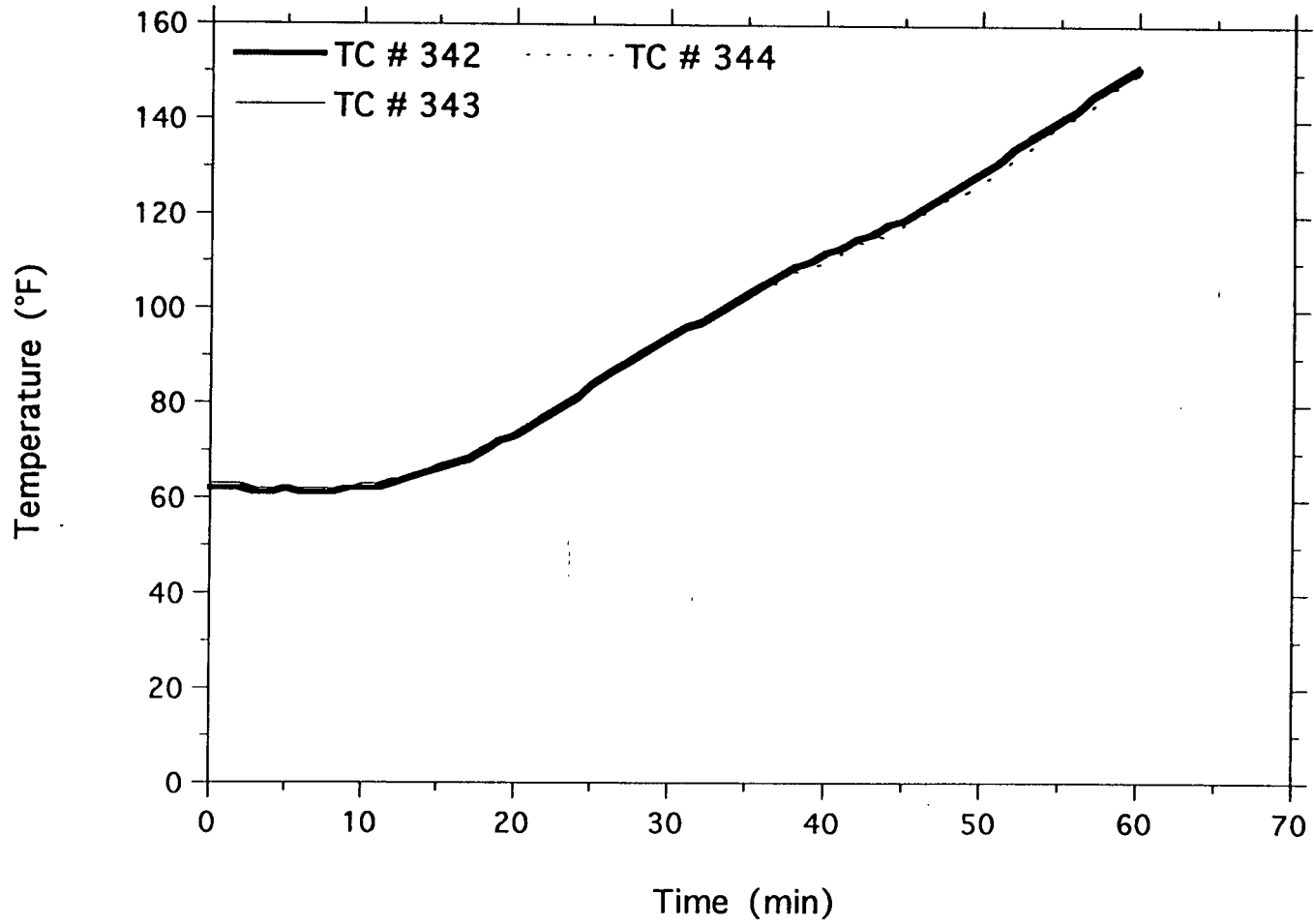


TSI/TVA
Project No. 11960-97258
2" Bare #8 (6th Cond. in Upper Array)



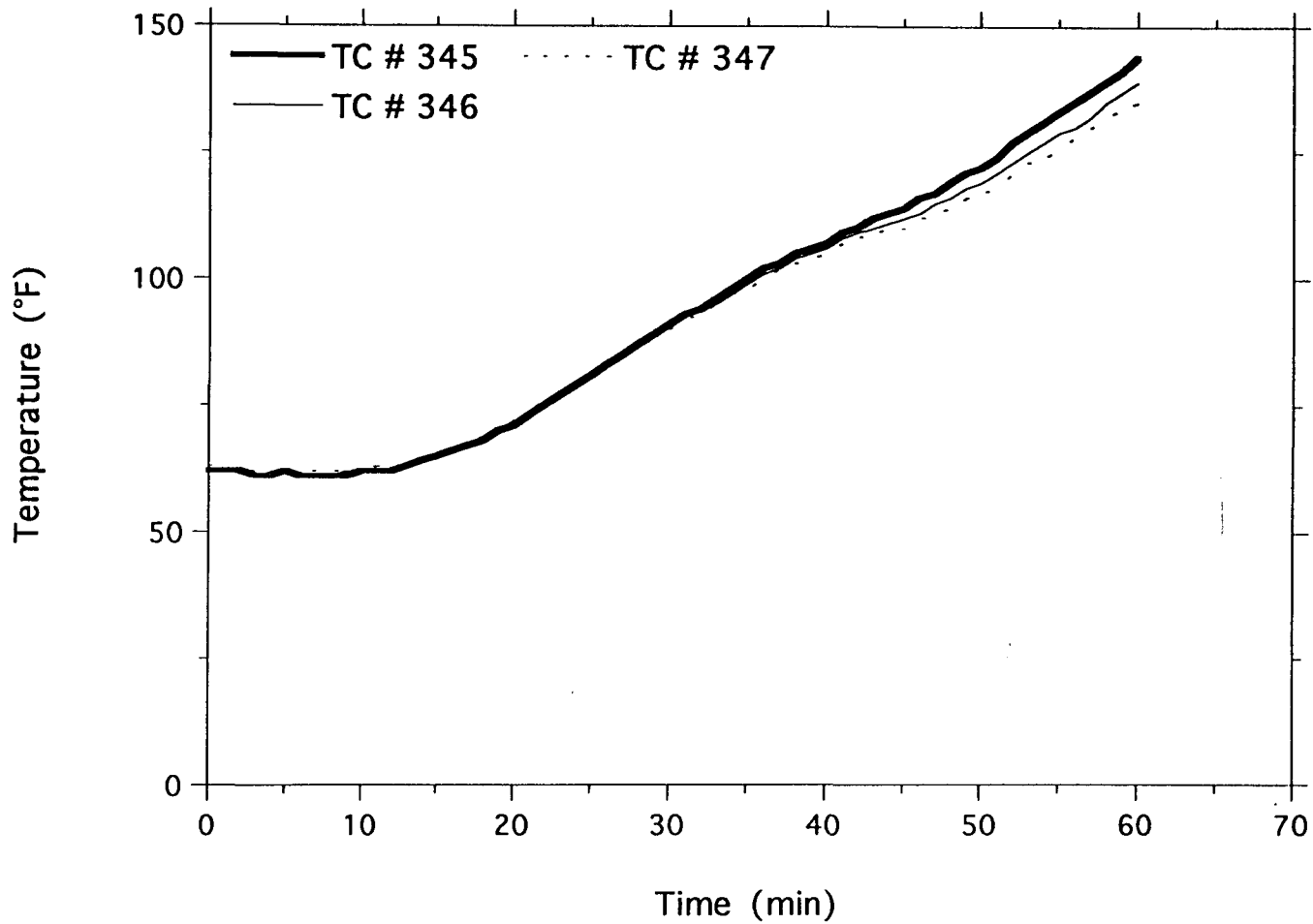
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (6th Cond. in Upper Array)



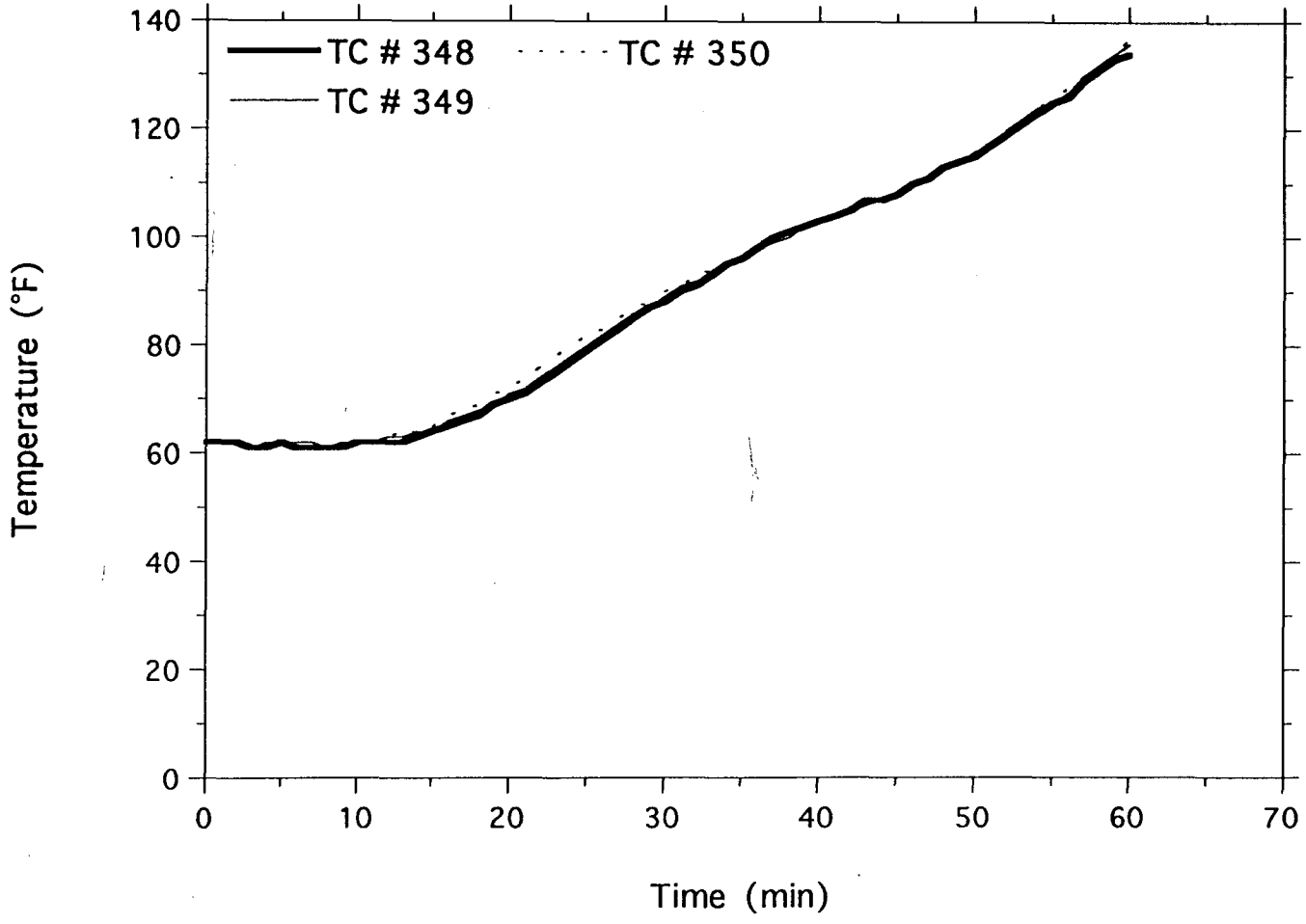
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (6th Cond. in Upper Array)



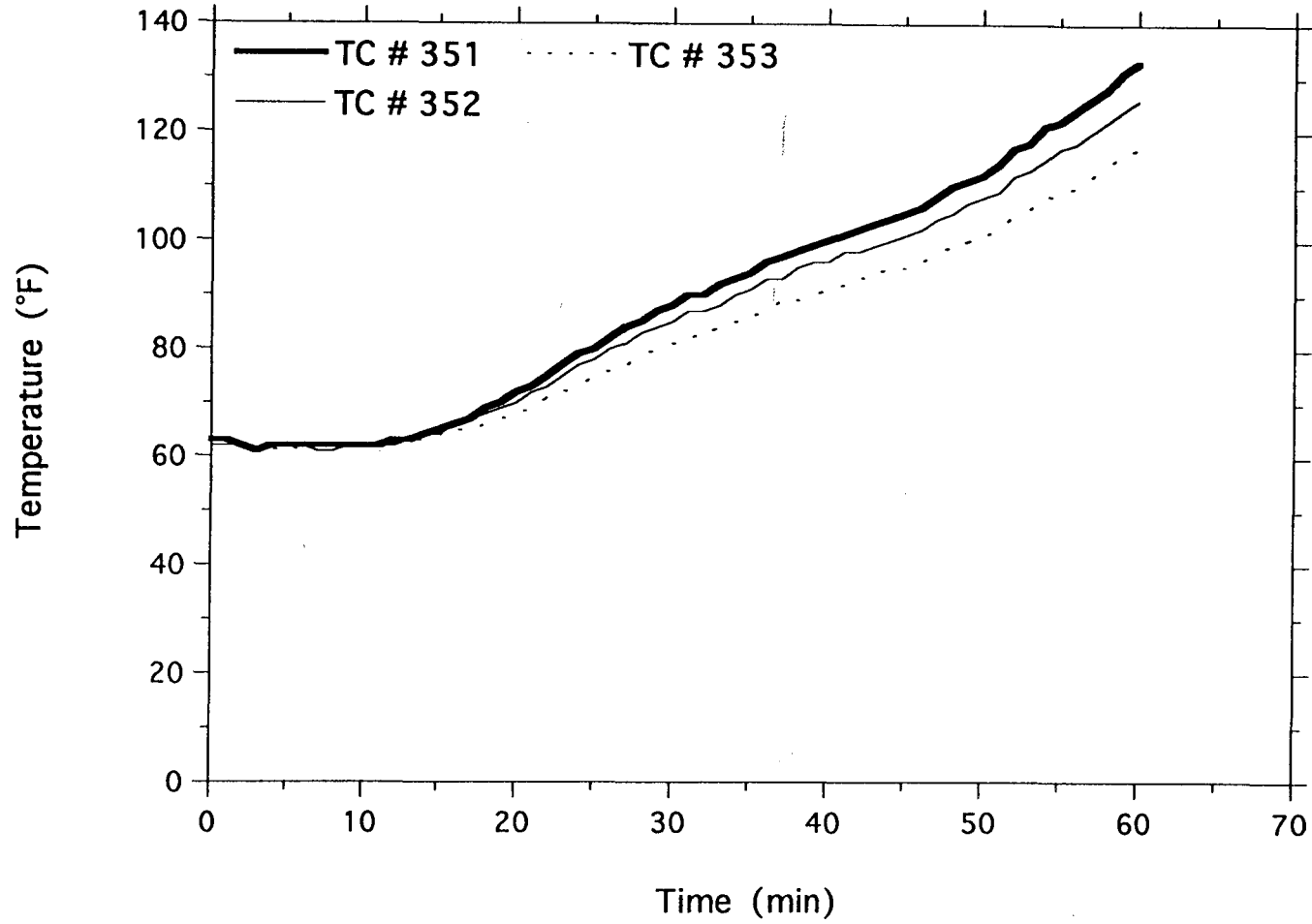
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (6th Cond. in Upper Array)



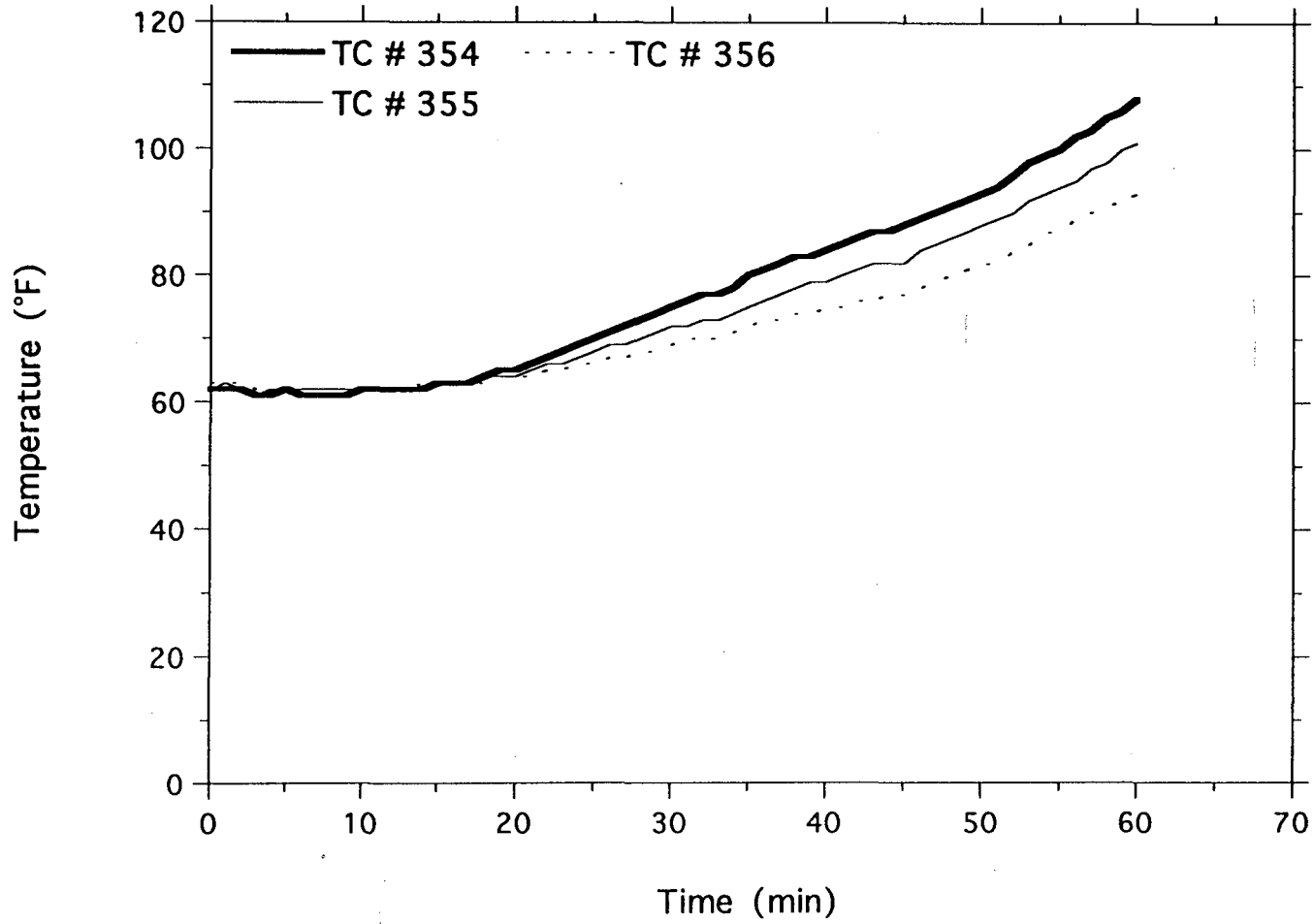
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (6th Cond. in Upper Array)



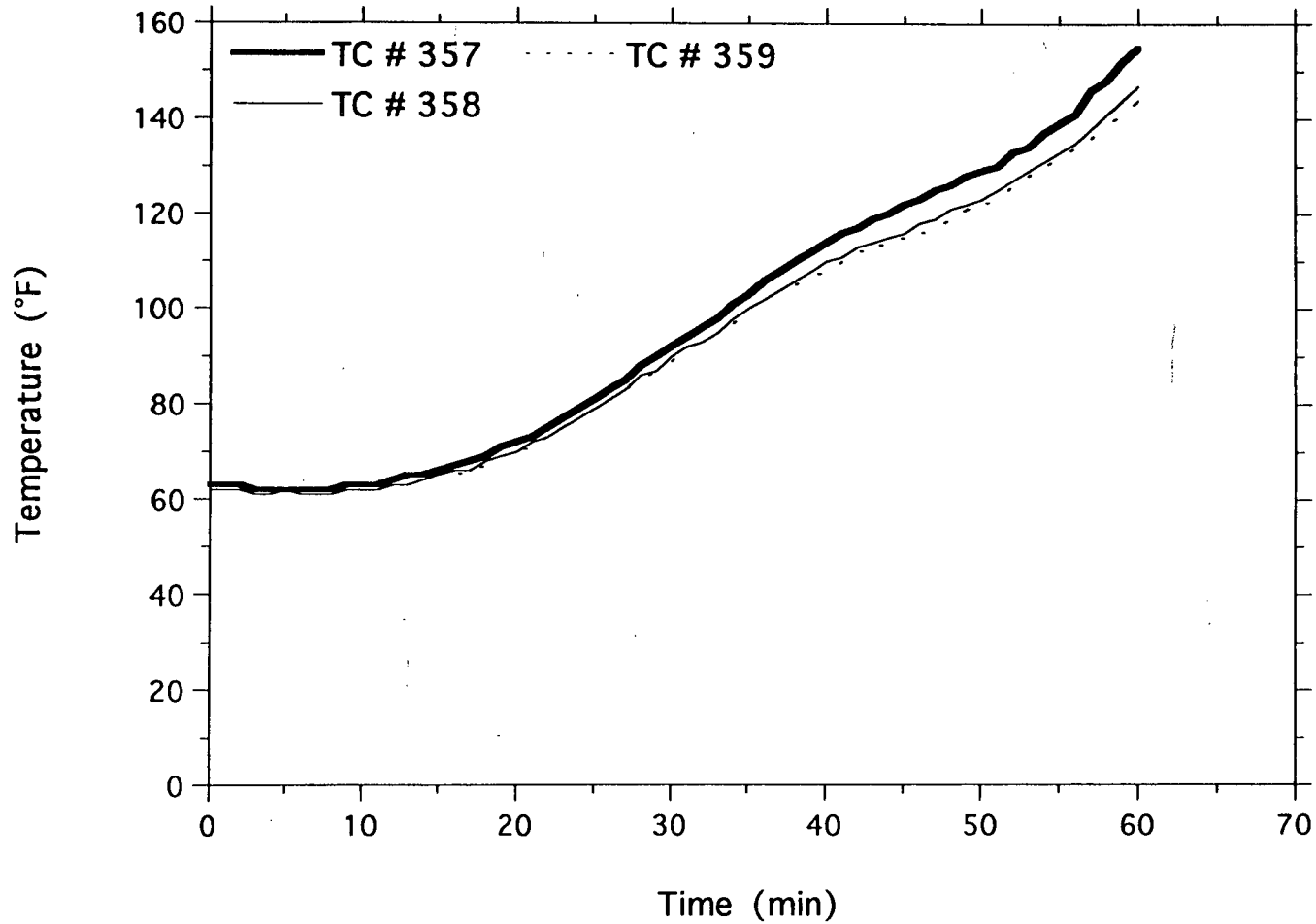
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (6th Cond. in Upper Array)



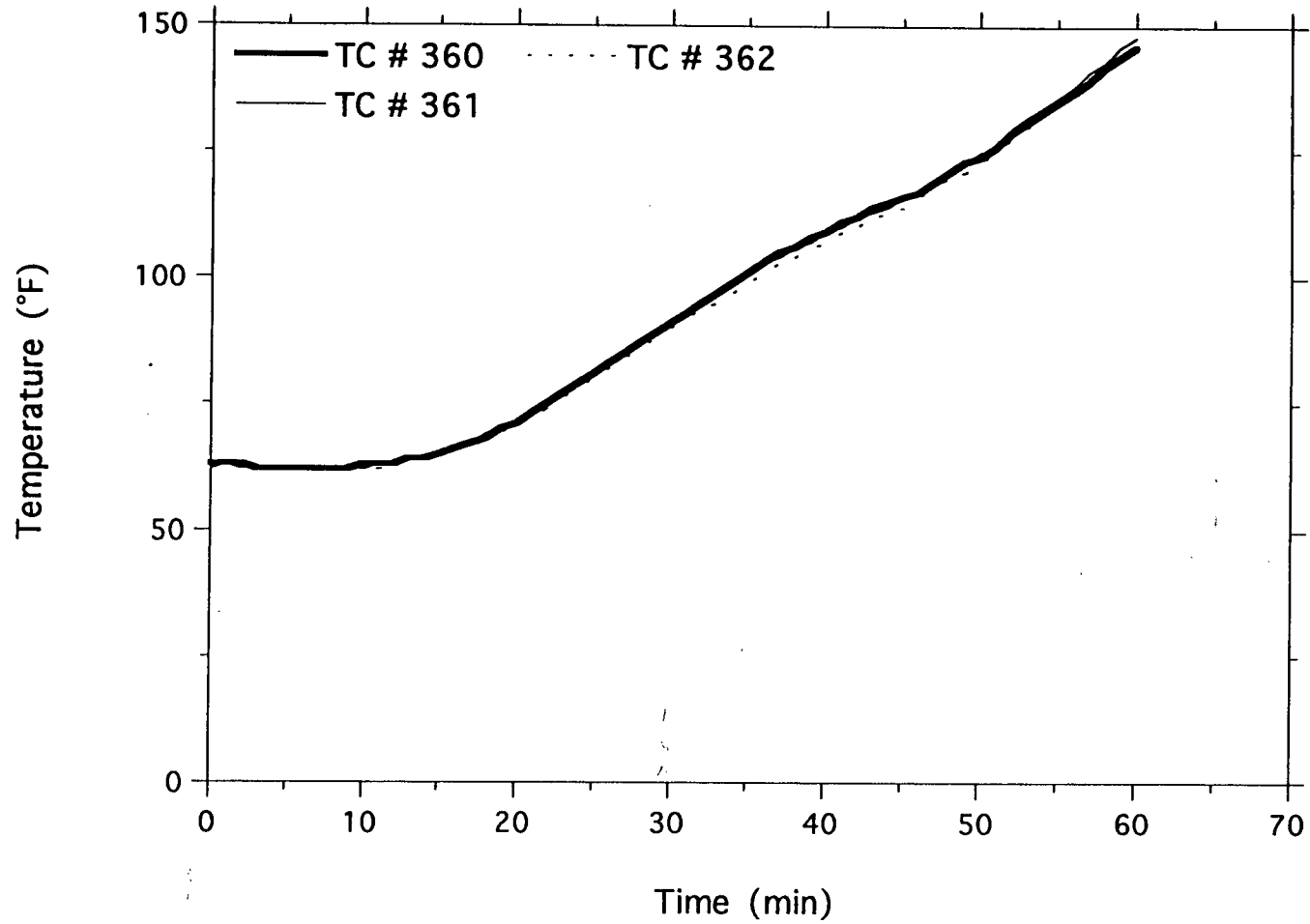
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Bottom Cond. in Upper Array)



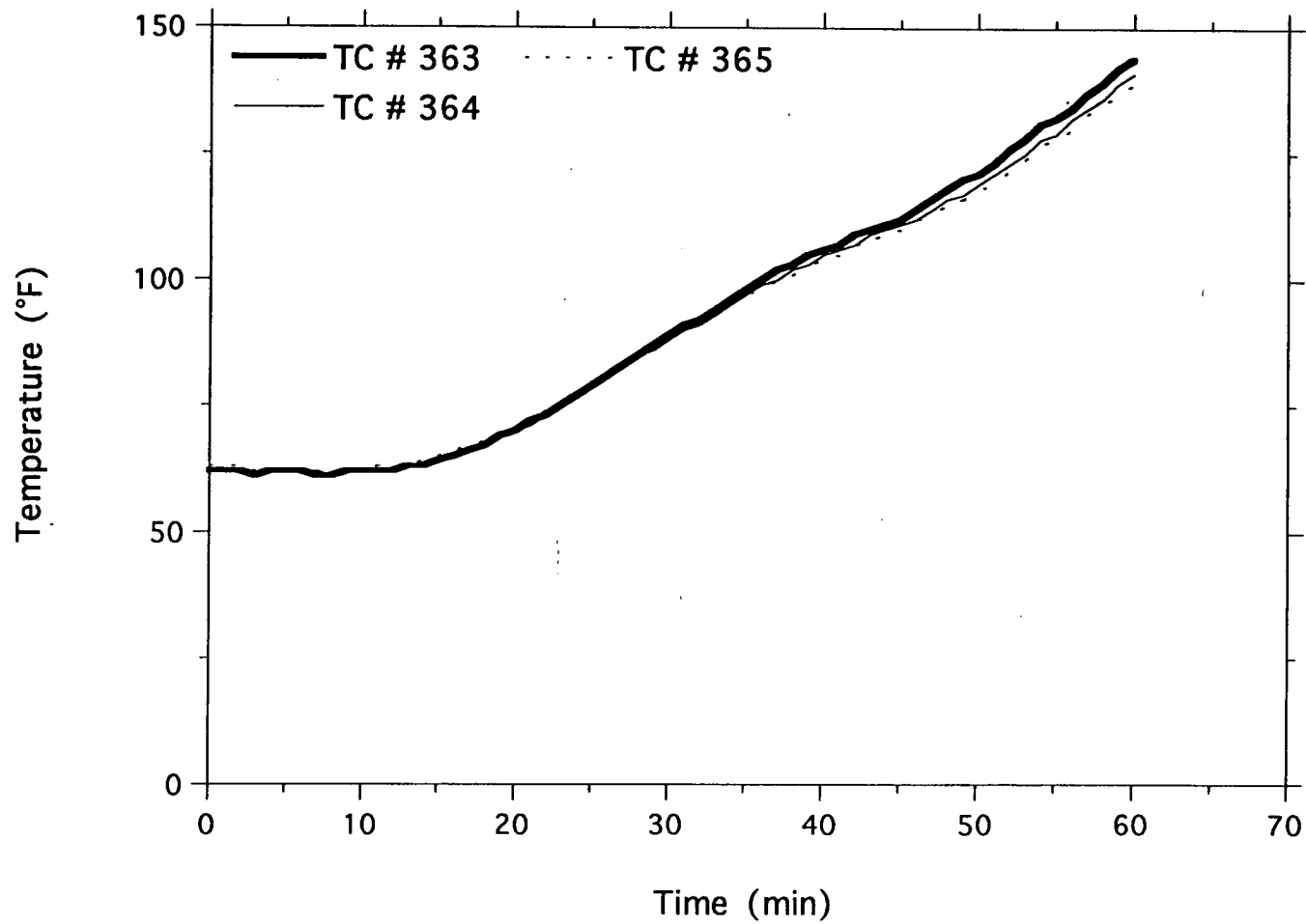
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Bottom Cond. in Upper Array)



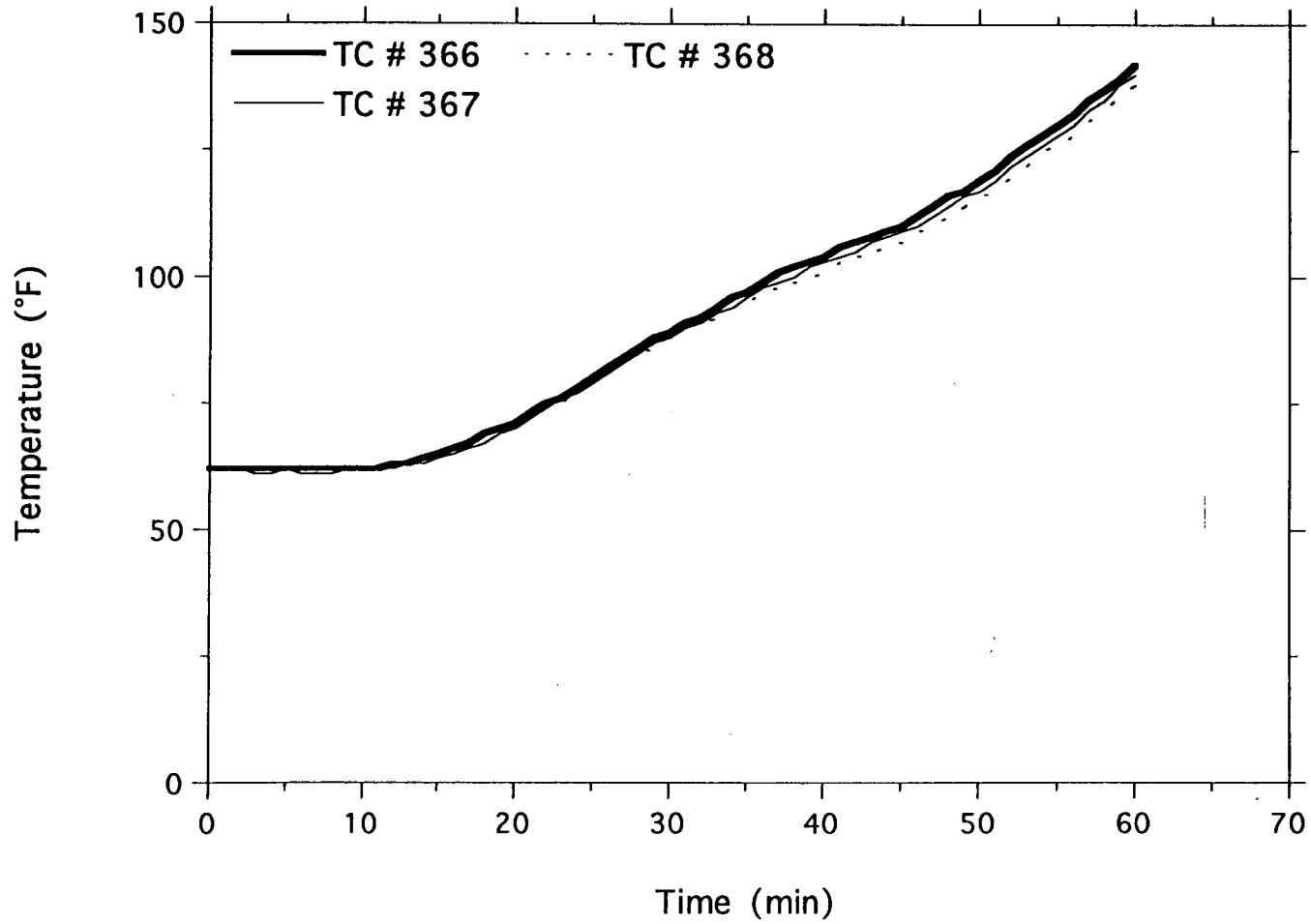
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Bottom Cond. in Upper Array)



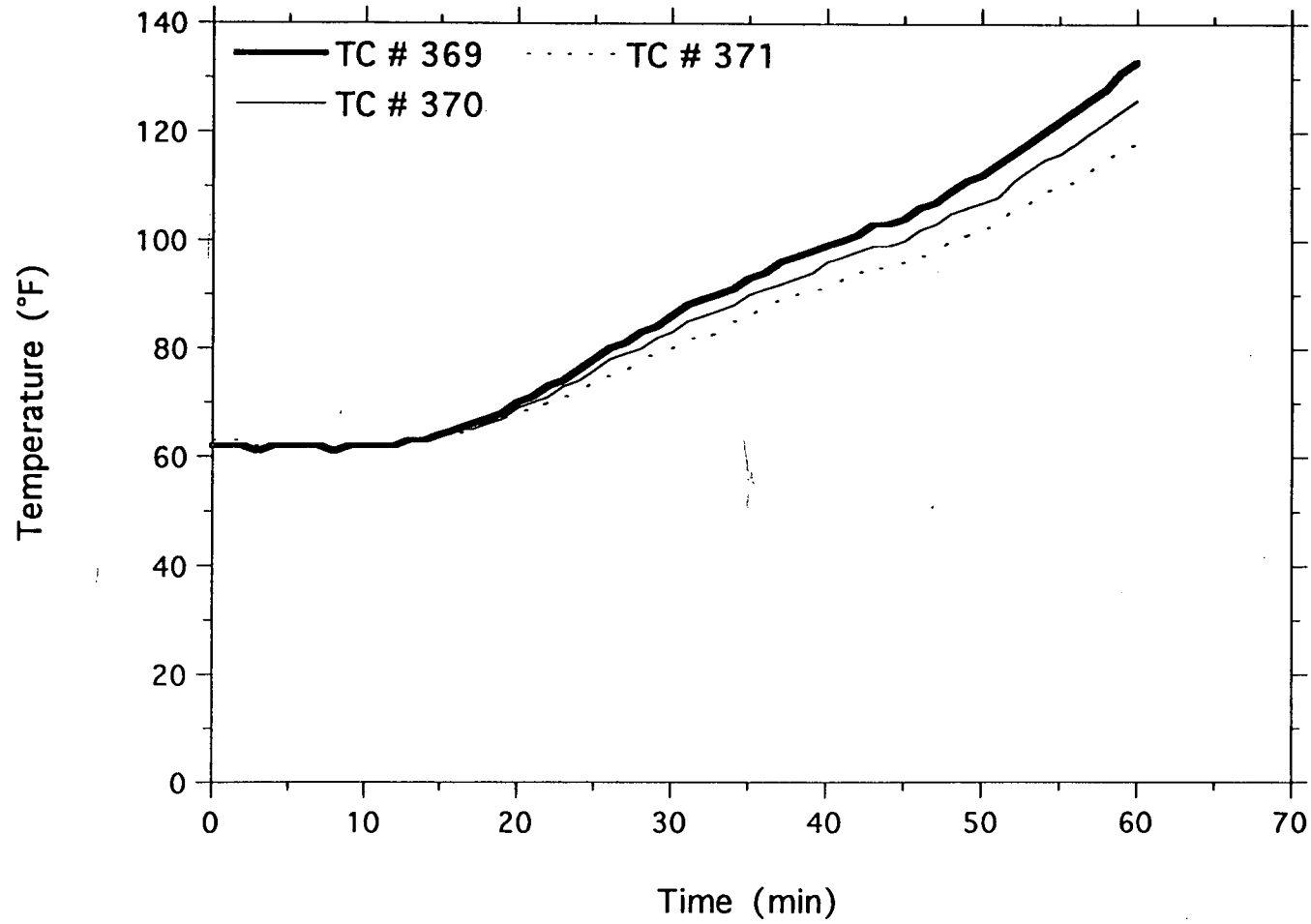
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Bottom Cond. in Upper Array)



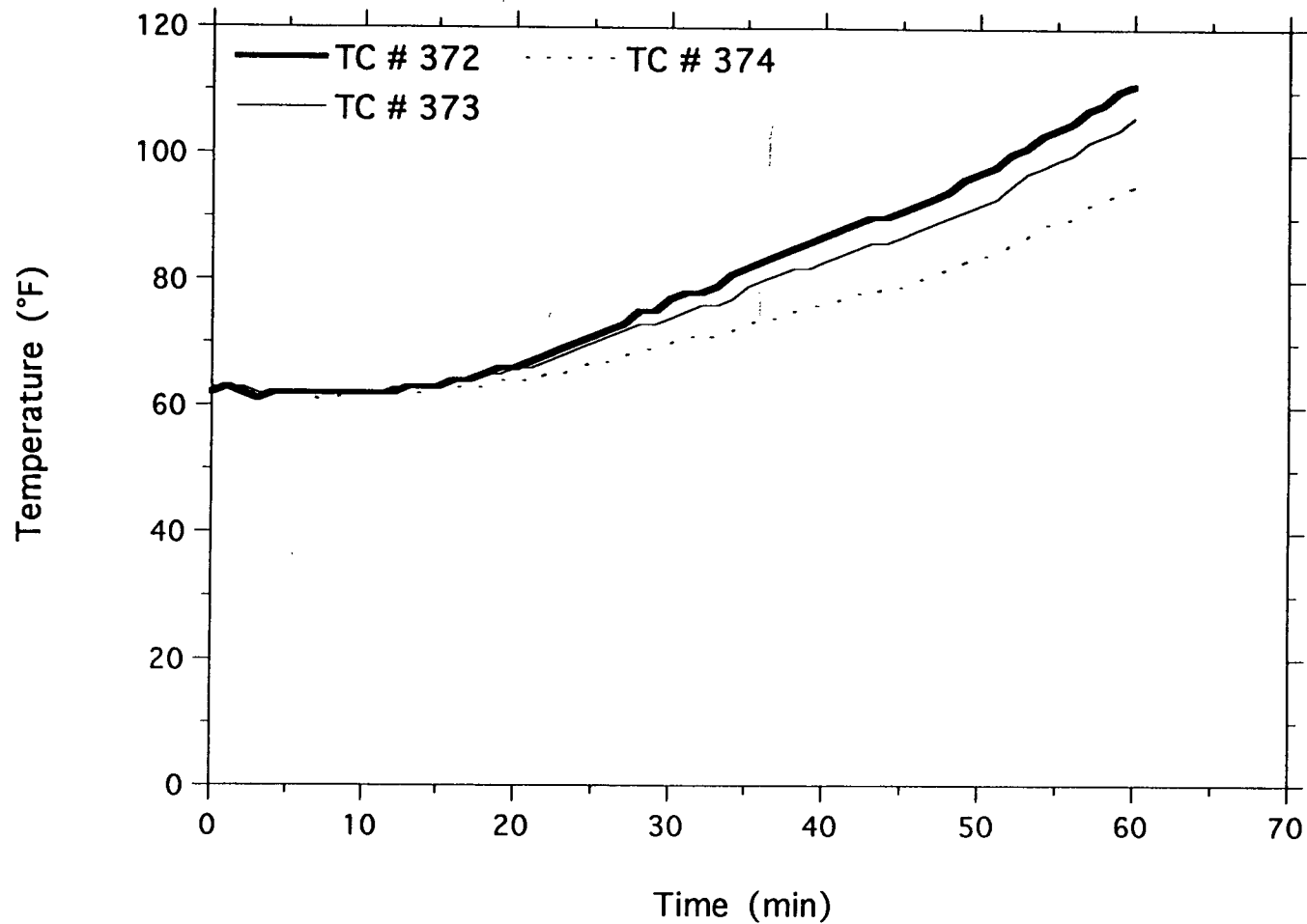
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LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Bottom Cond. in Upper Array)



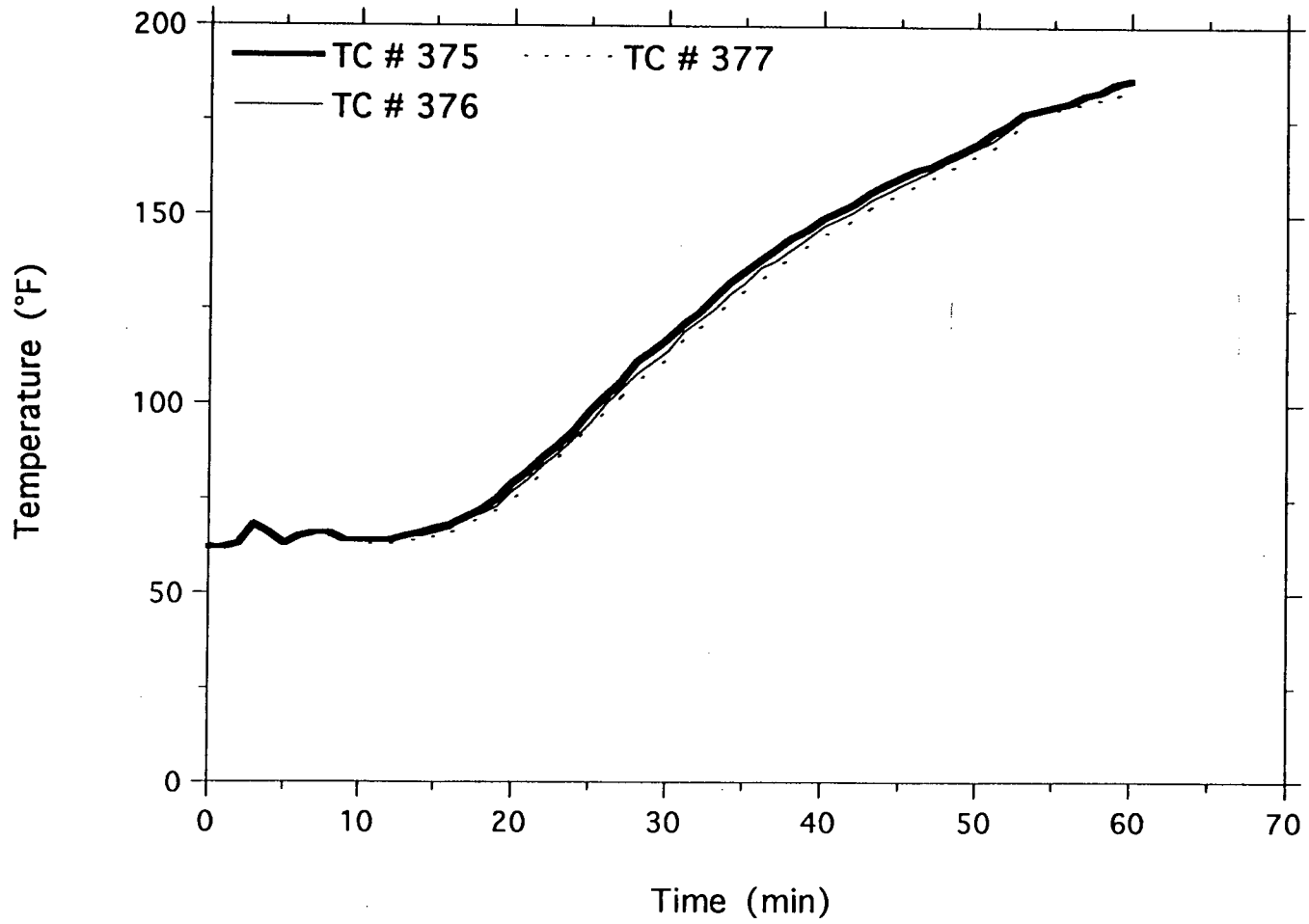
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
2" Bare #8 (Bottom Cond. in Upper Array)



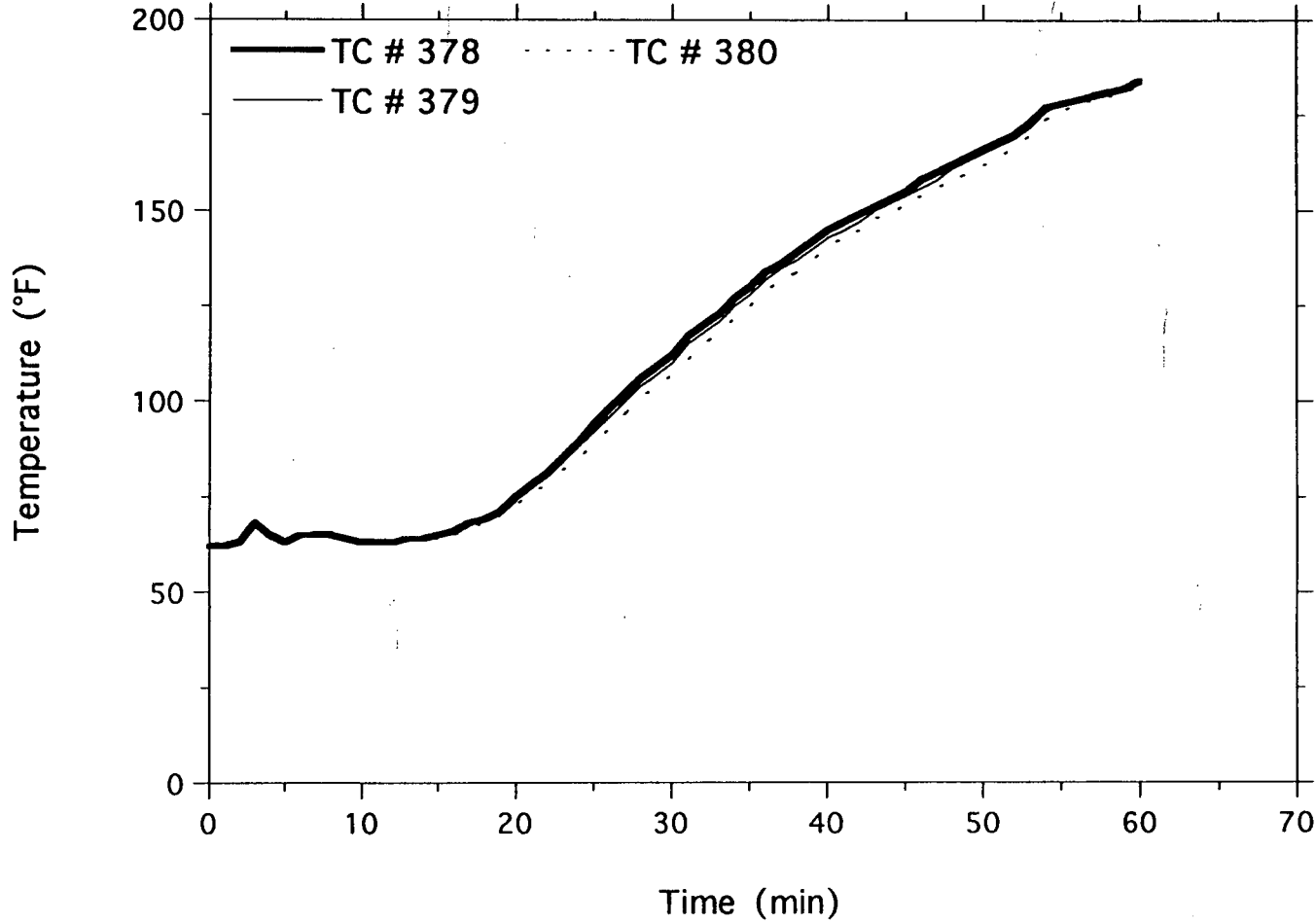
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" Bare #8 (Top Cond. in Middle Array)



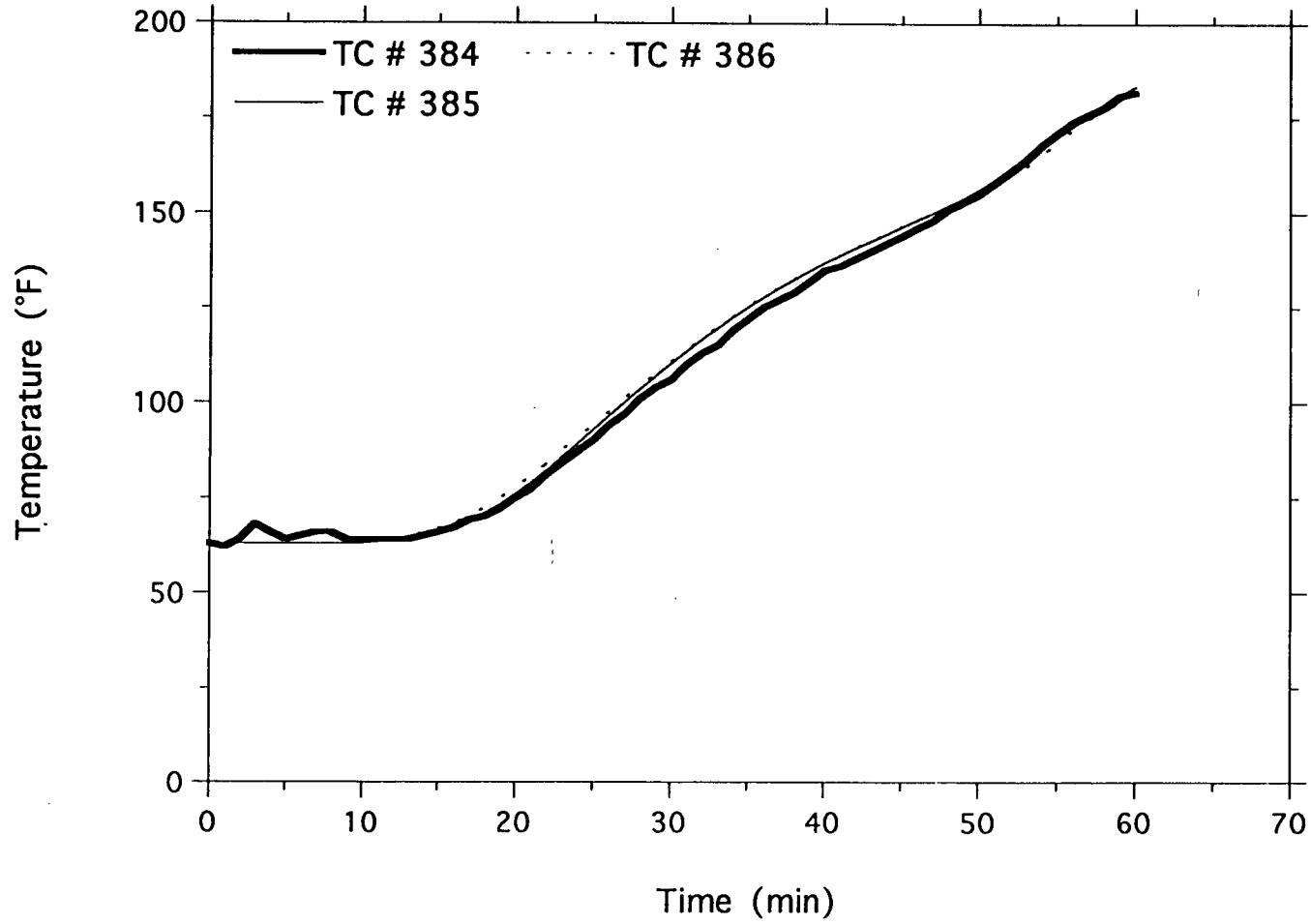
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" Bare #8 (Top Cond. in Middle Array)



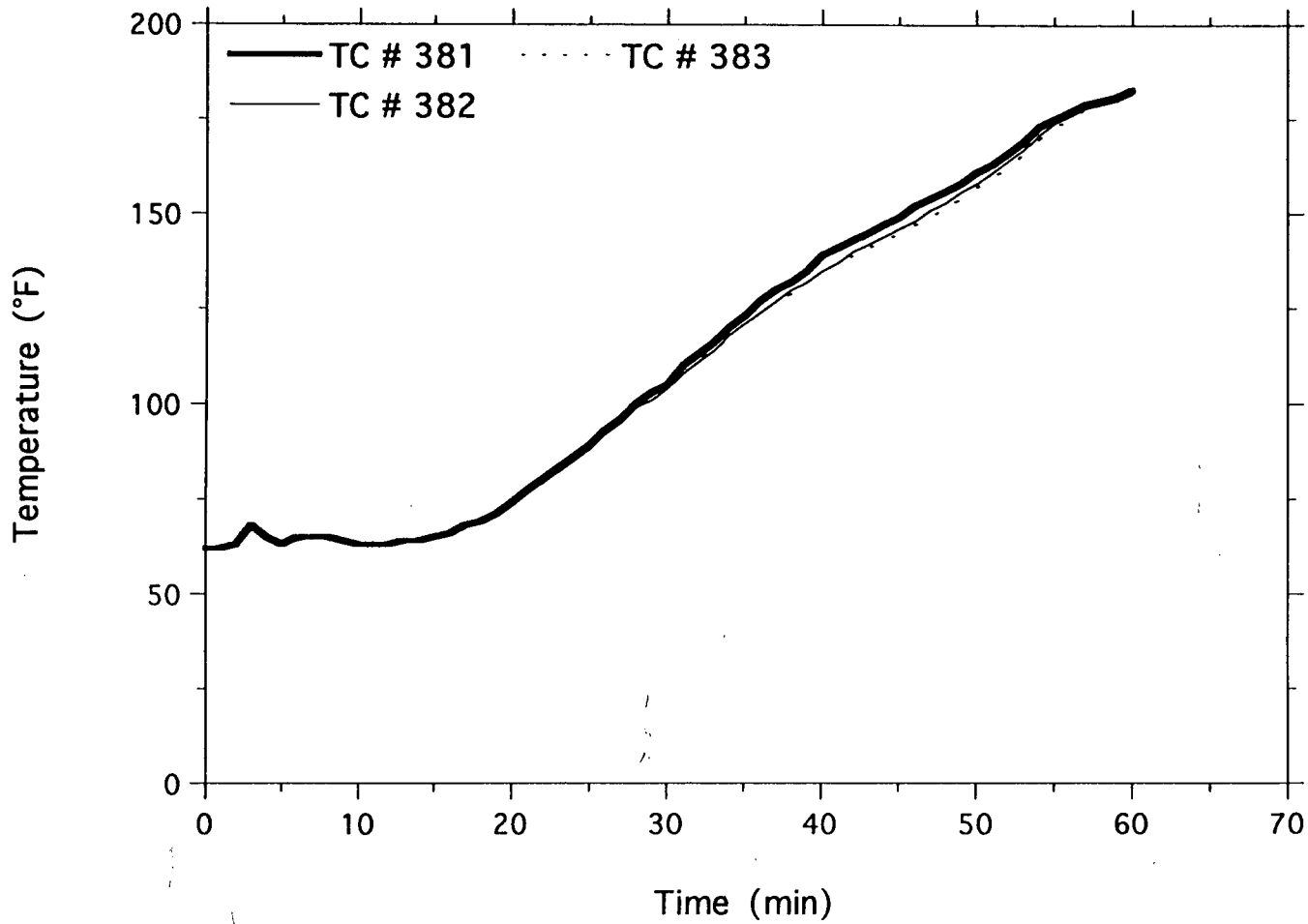
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" Bare #8 (Top Cond. in Middle Array)



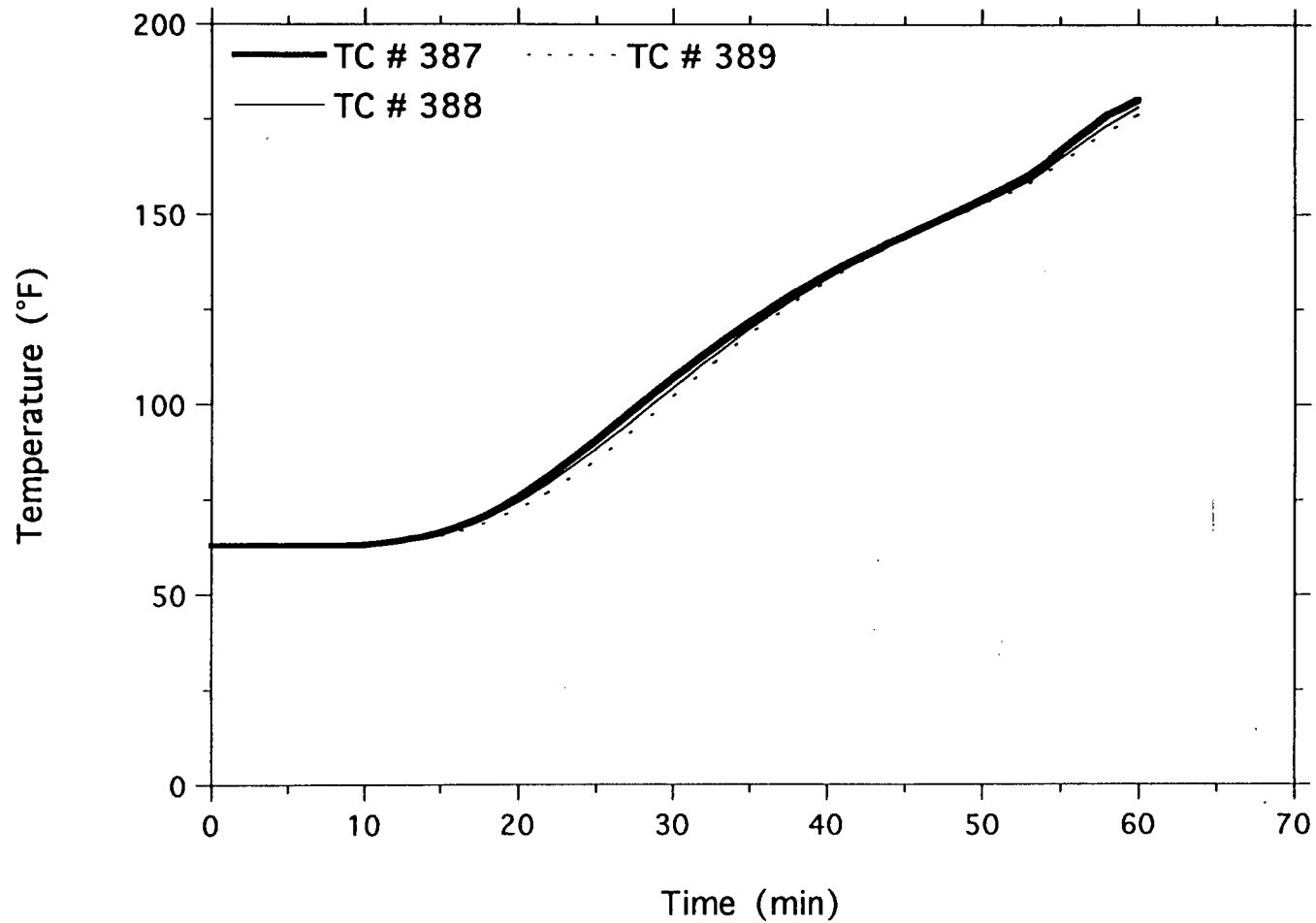
OMEGA POINT
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TSI/TVA
Project No. 11960-97258
1" Bare #8 (Top Cond. in Middle Array)



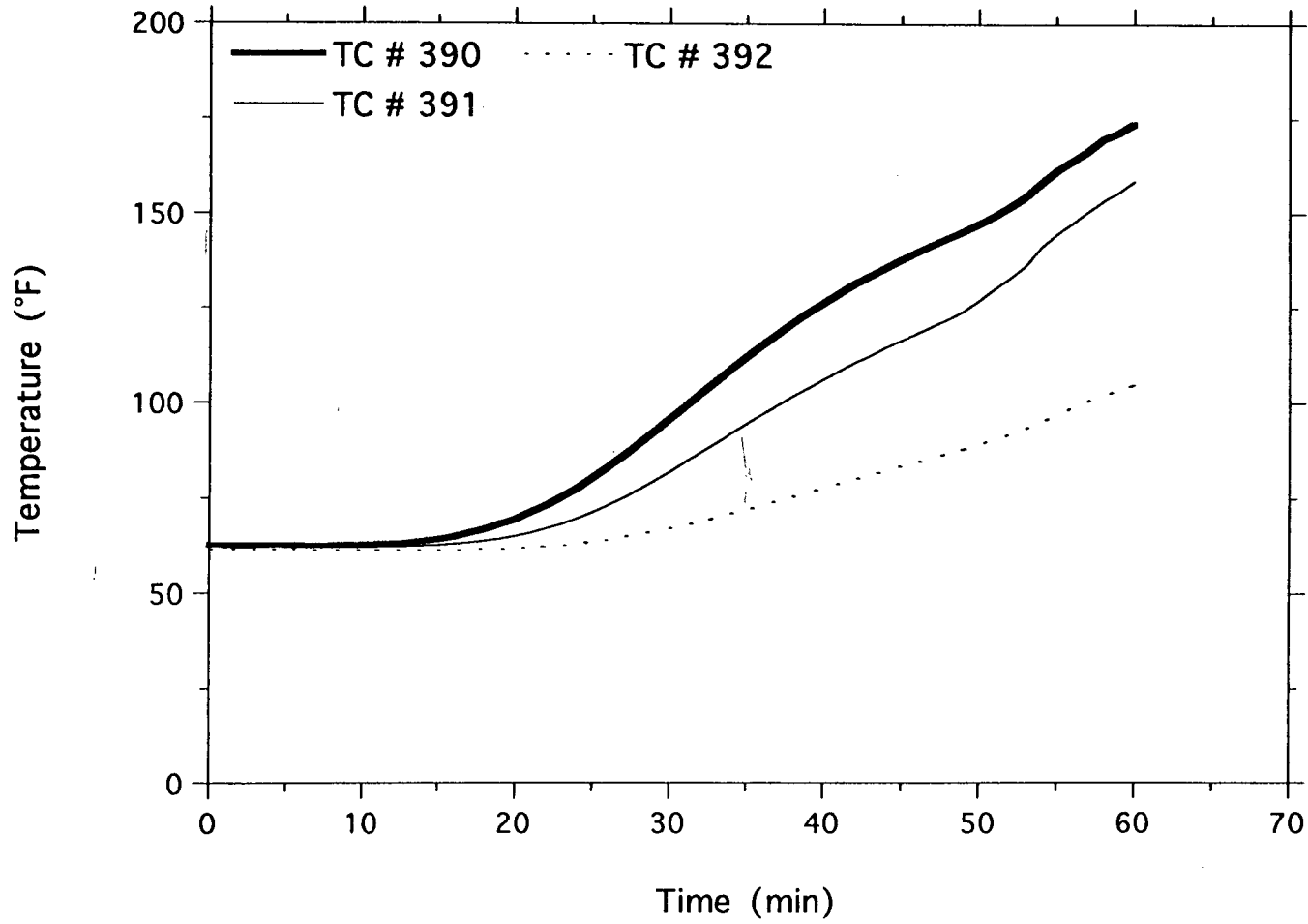
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1" Bare #8 (Top Cond. in Middle Array)



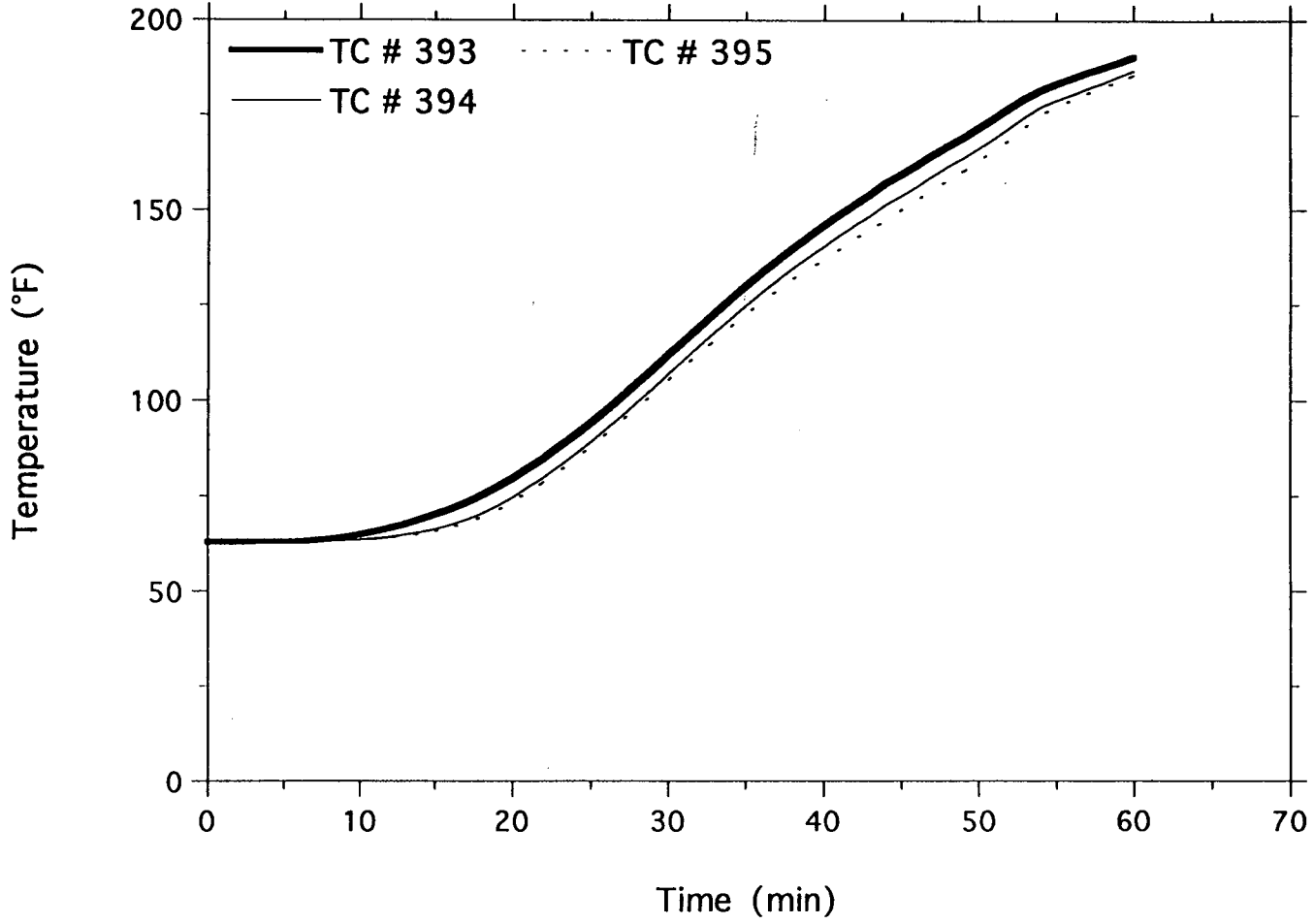
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Project No. 11960-97258
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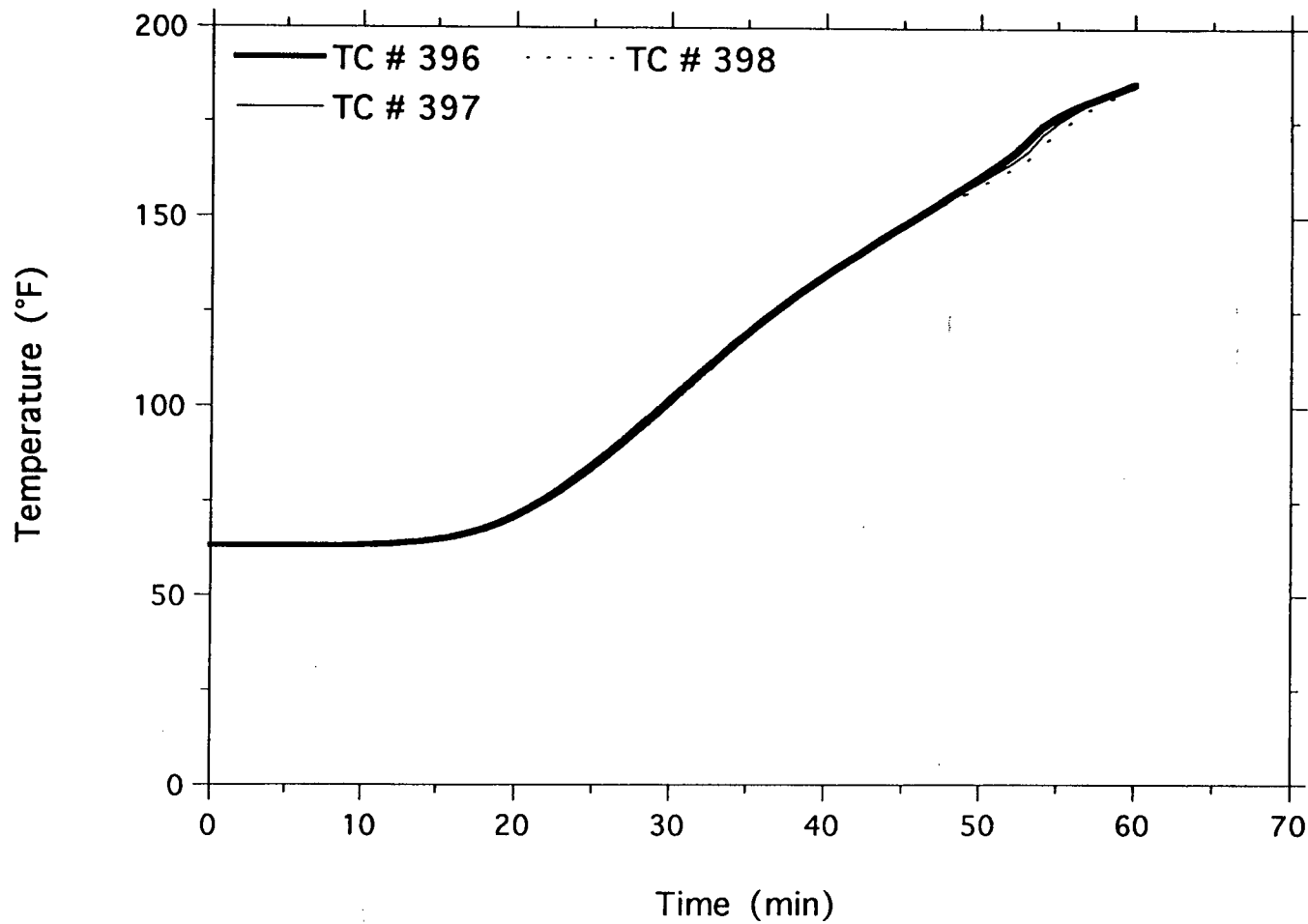
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LABORATORIES

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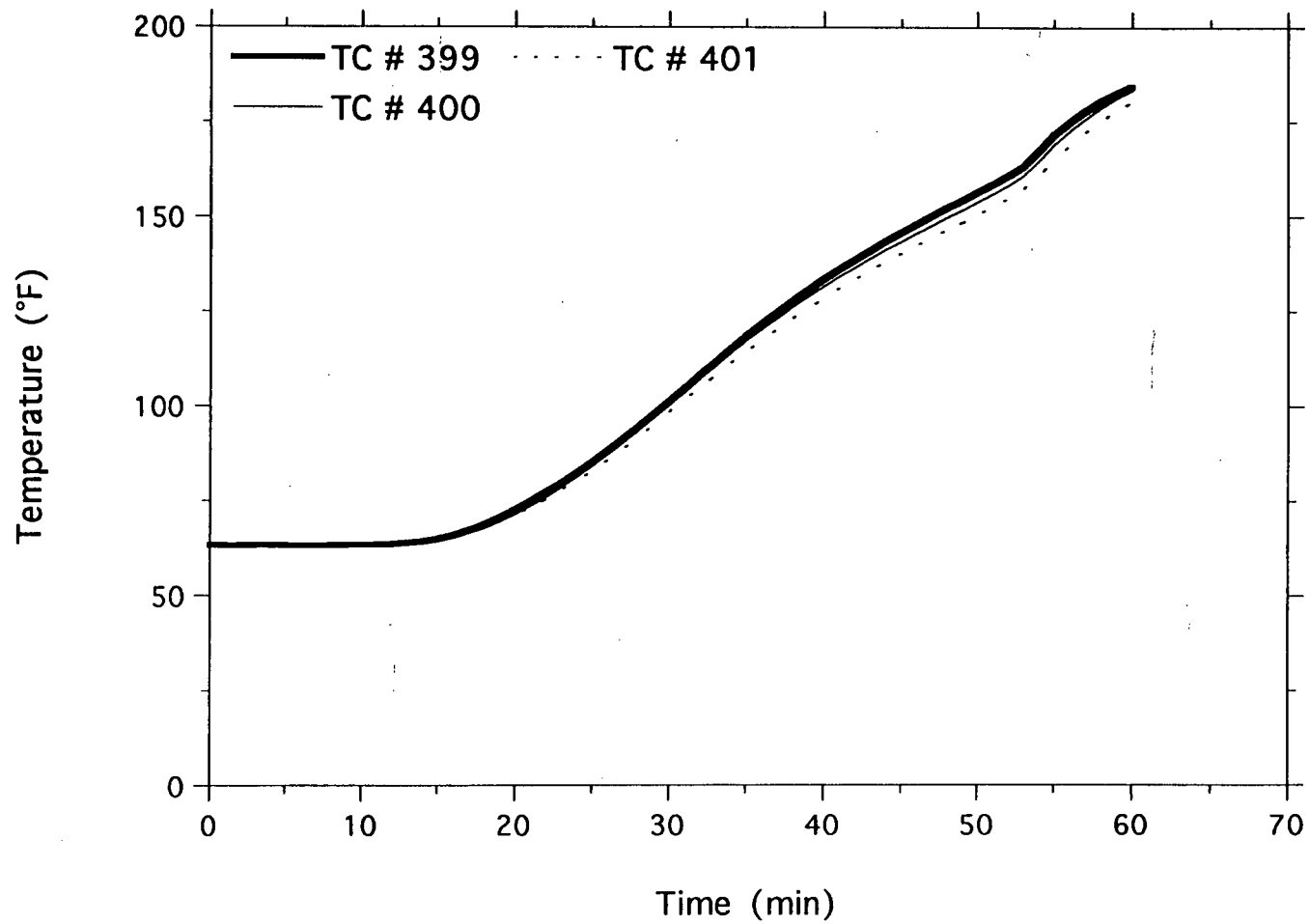
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LABORATORIES

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Project No. 11960-97258
1" Bare #8 (Bottom Cond. in Middle Array)



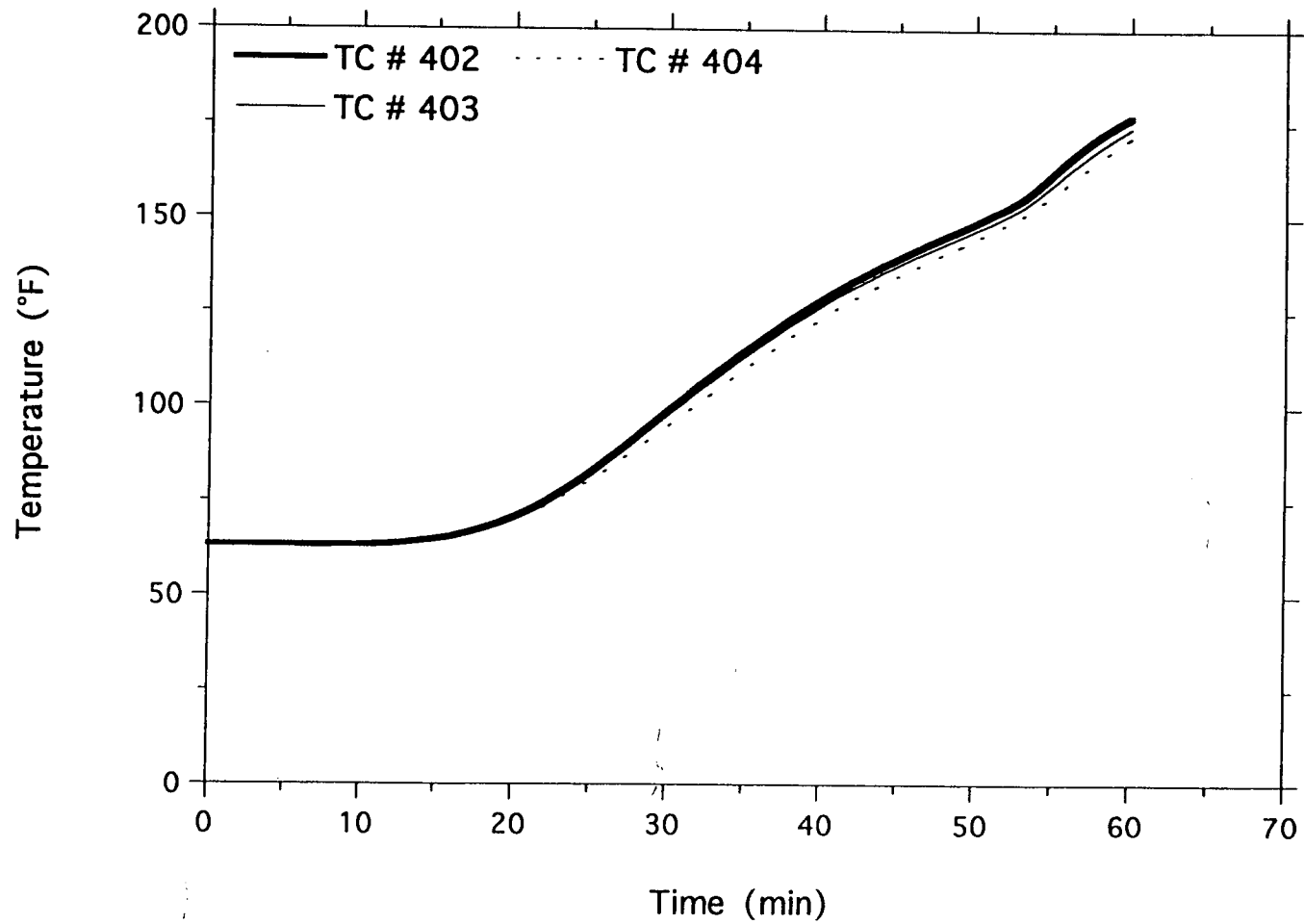
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LABORATORIES

TSI/TVA
Project No. 11960-97258
1" Bare #8 (Bottom Cond. in Middle Array)



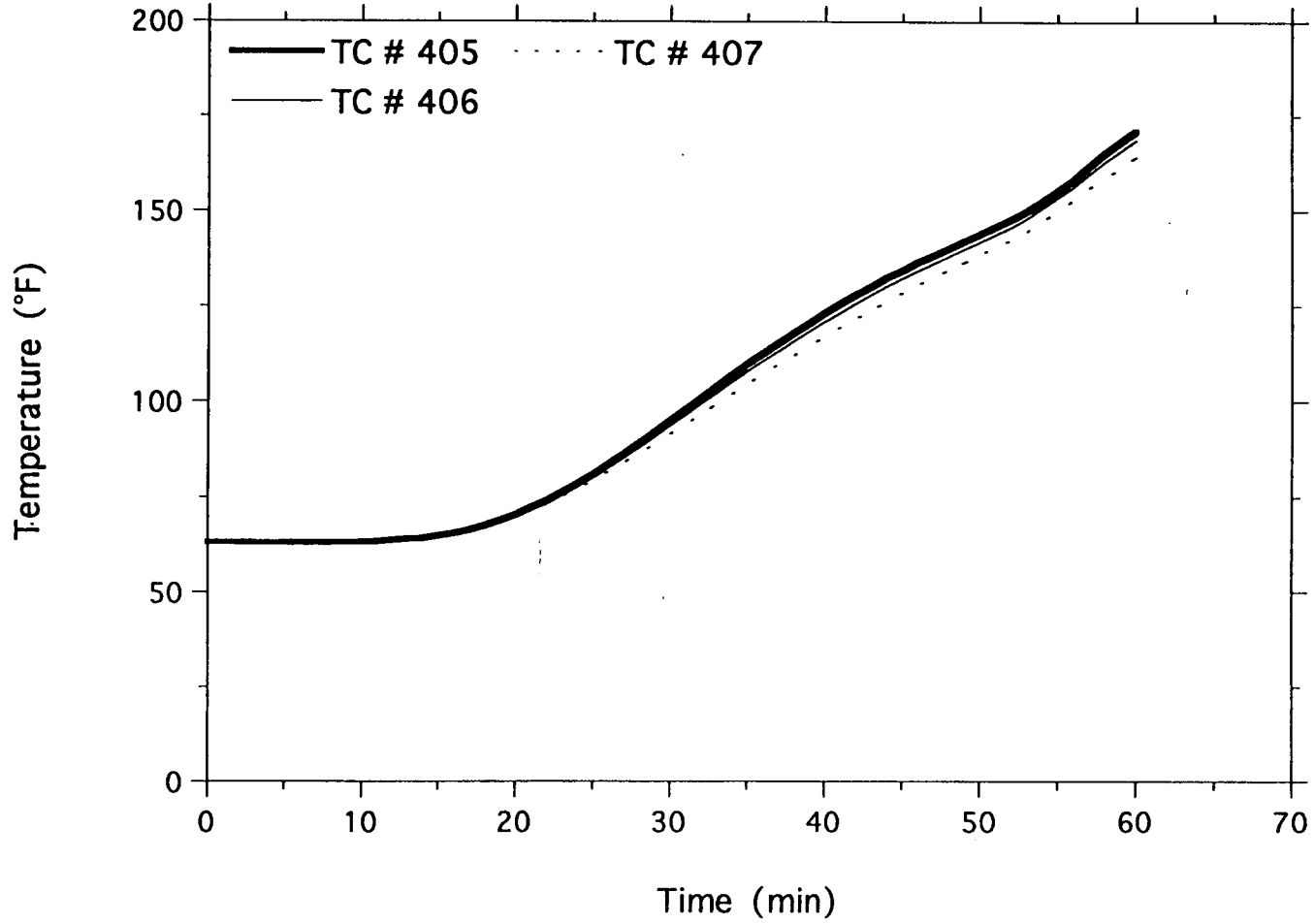
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LABORATORIES

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Project No. 11960-97258
1" Bare #8 (Bottom Cond. in Middle Array)



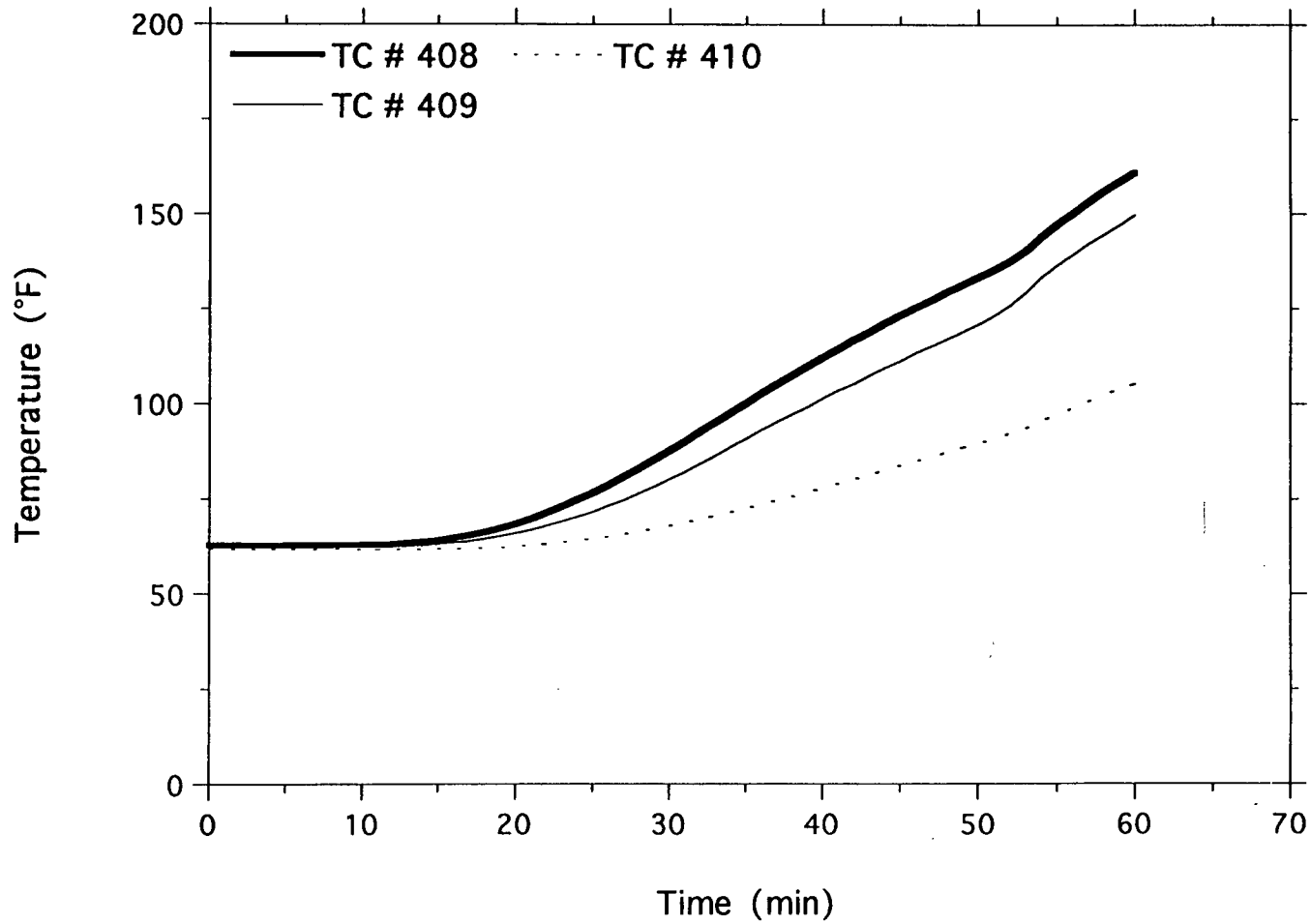
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LABORATORIES

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Project No. 11960-97258
1" Bare #8 (Bottom Cond. in Middle Array)



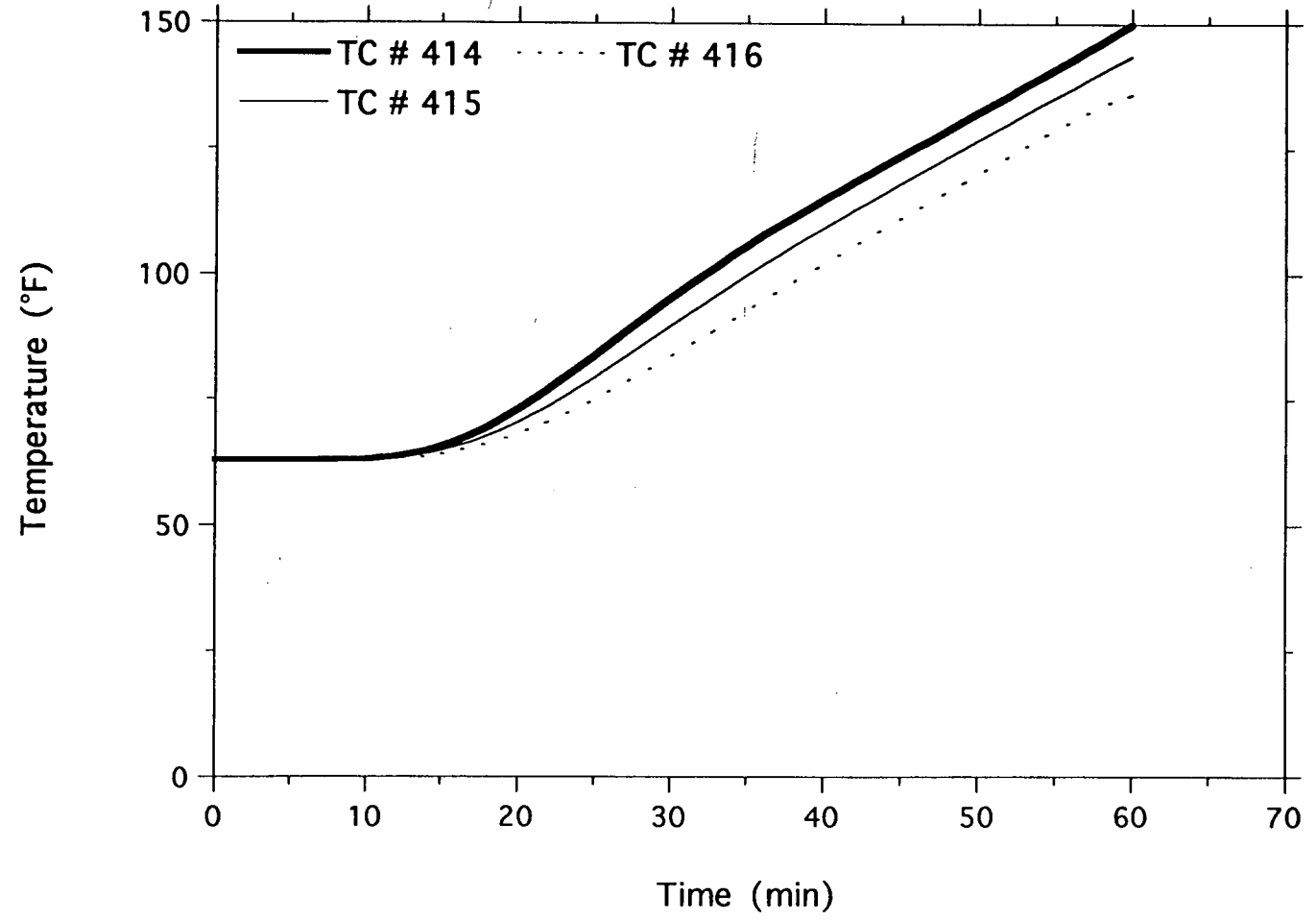
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
1" Bare #8 (Bottom Cond. in Middle Array)



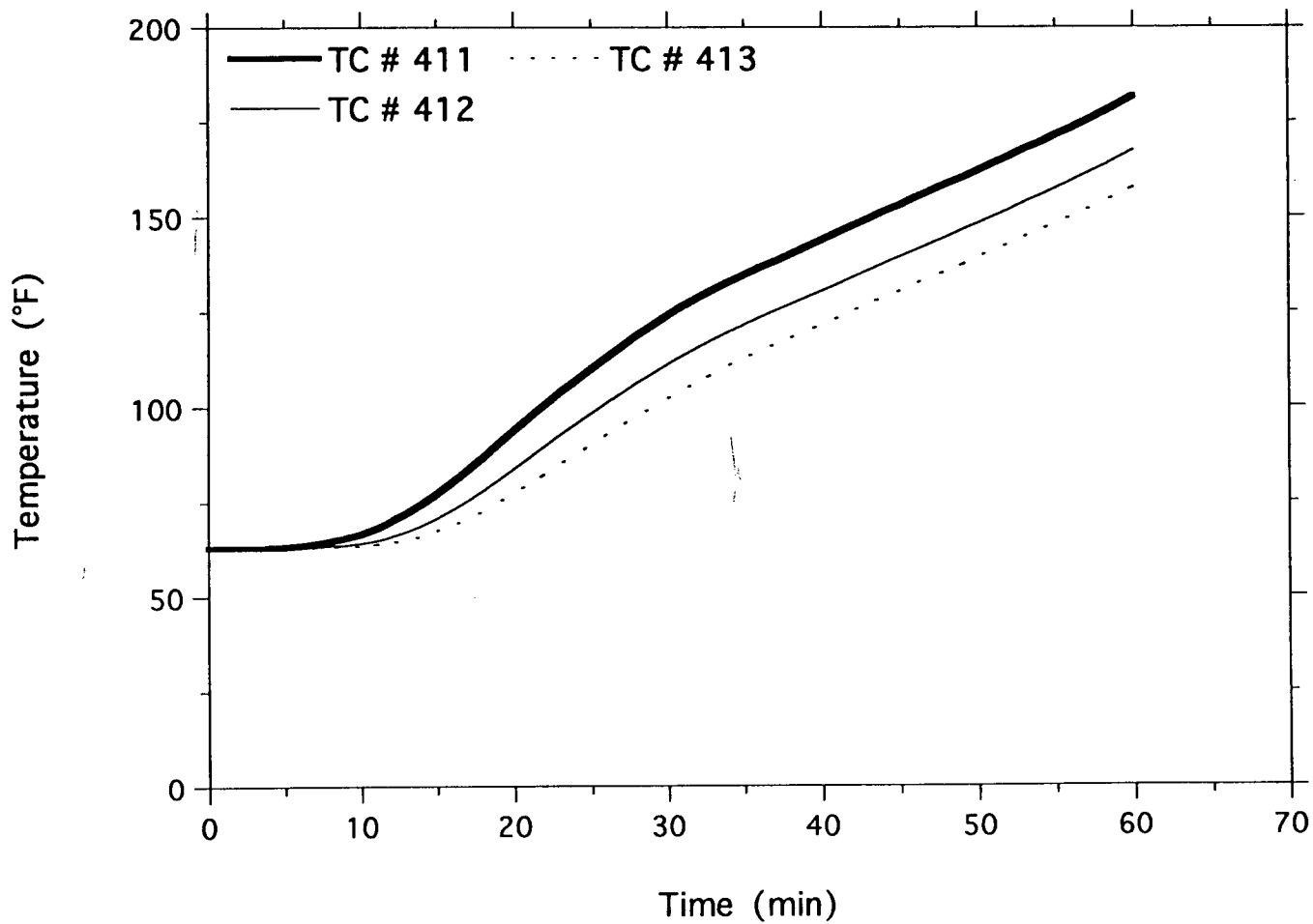
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (Left Cond. in Lower Array)



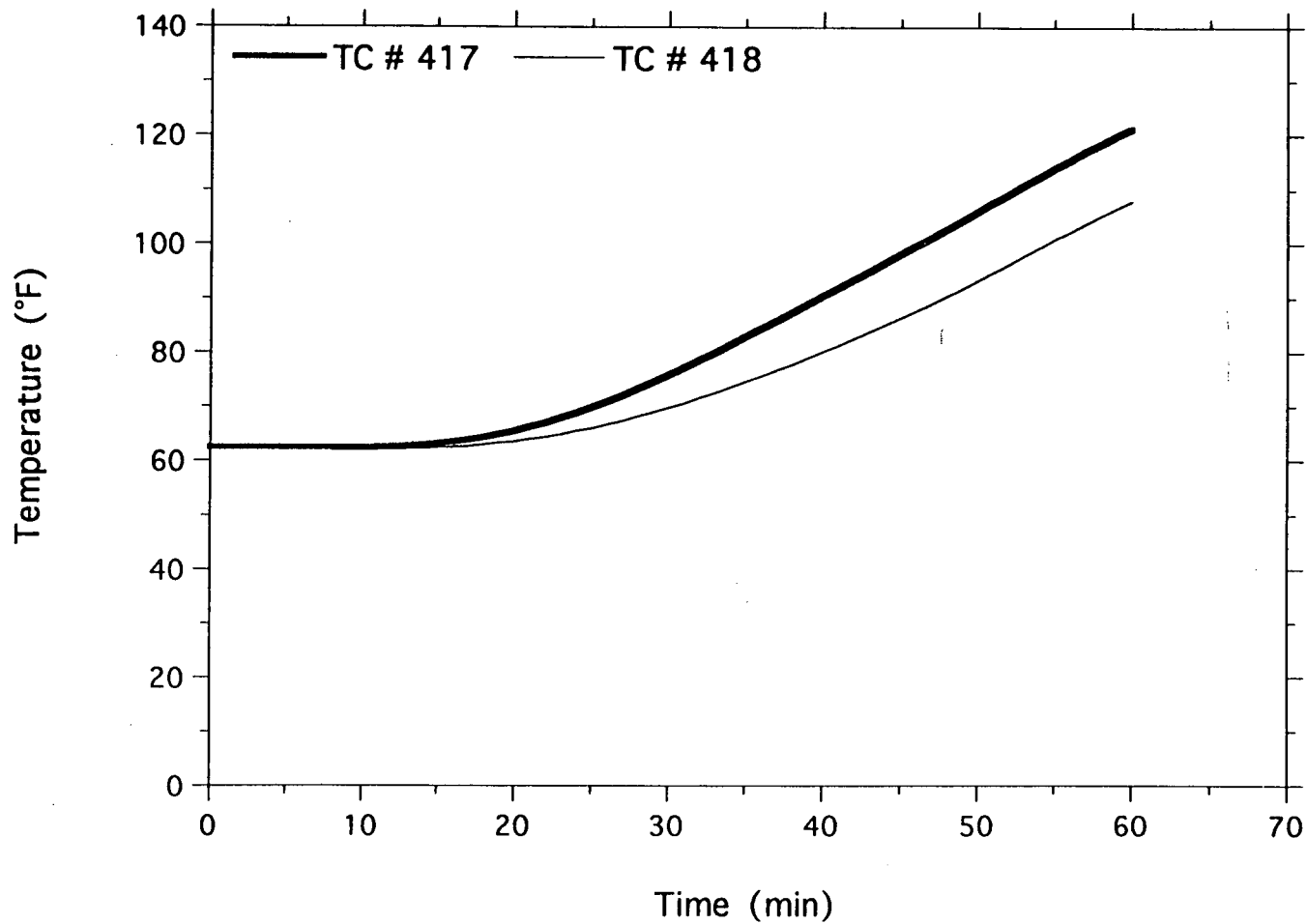
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LABORATORIES

TSI/TVA
Project No. 11960-97258
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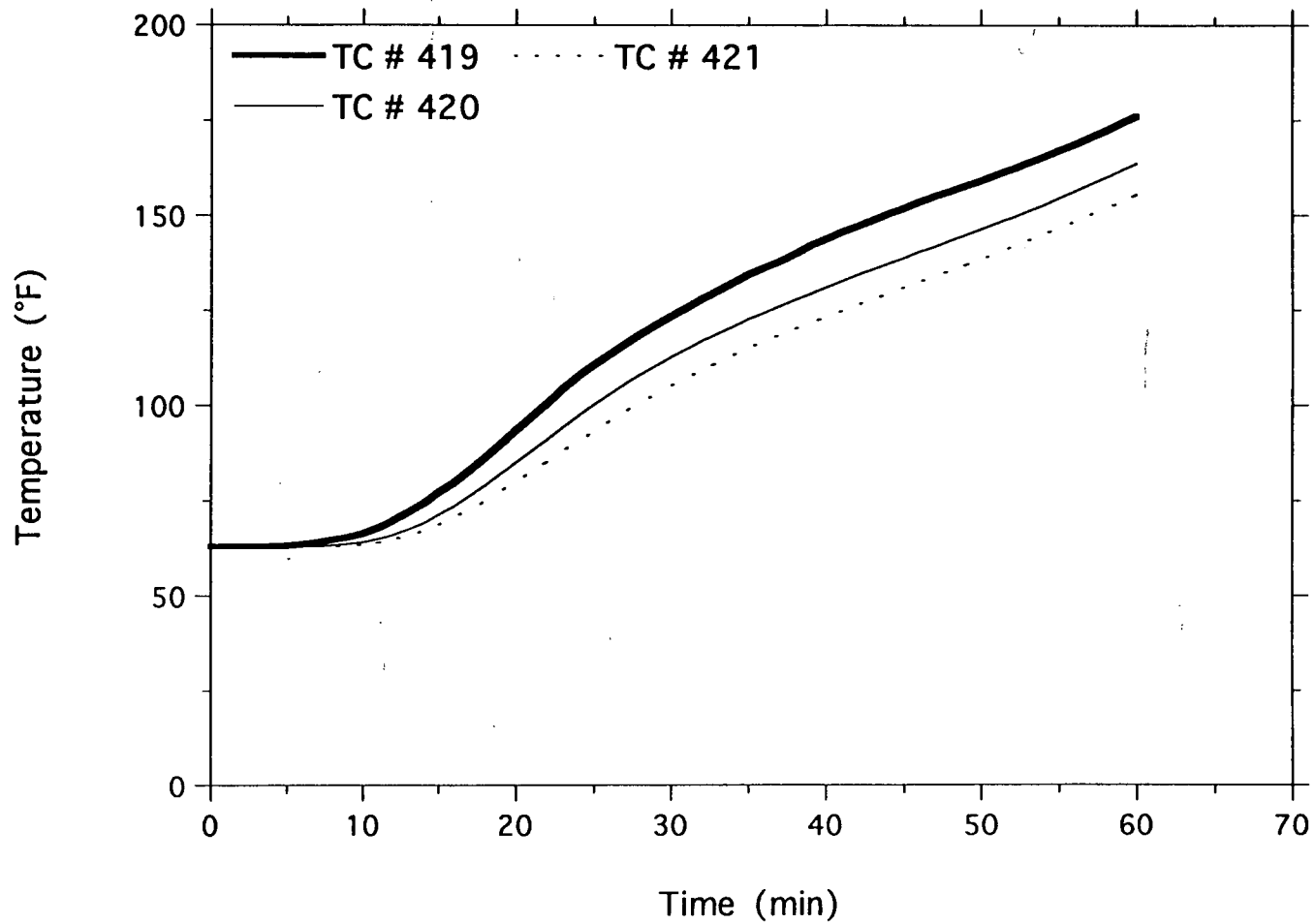
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TSI/TVA
Project No. 11960-97258
3" Bare #8 (Left Cond. in Lower Array)



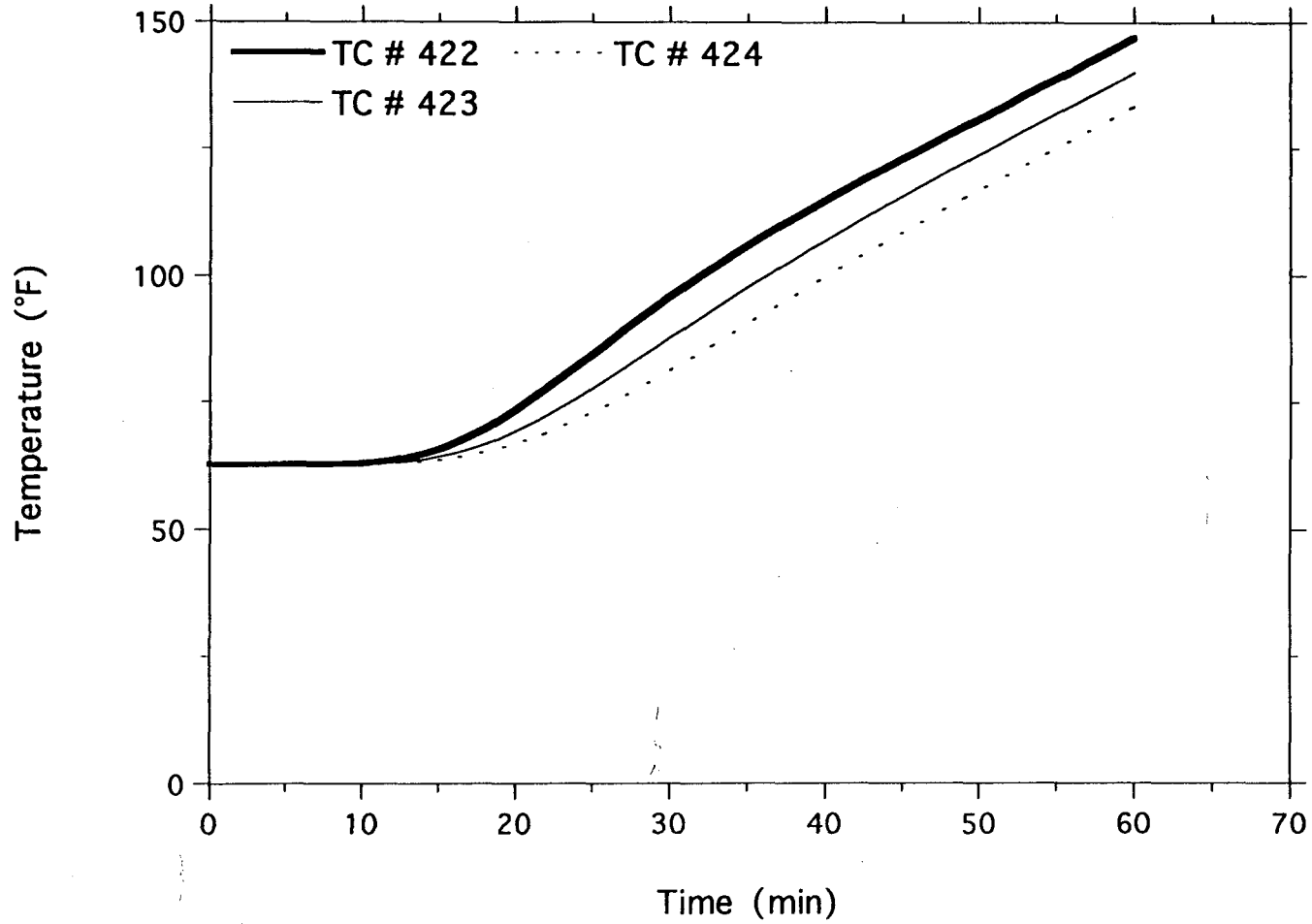
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LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (Center Cond. in Lower Array)



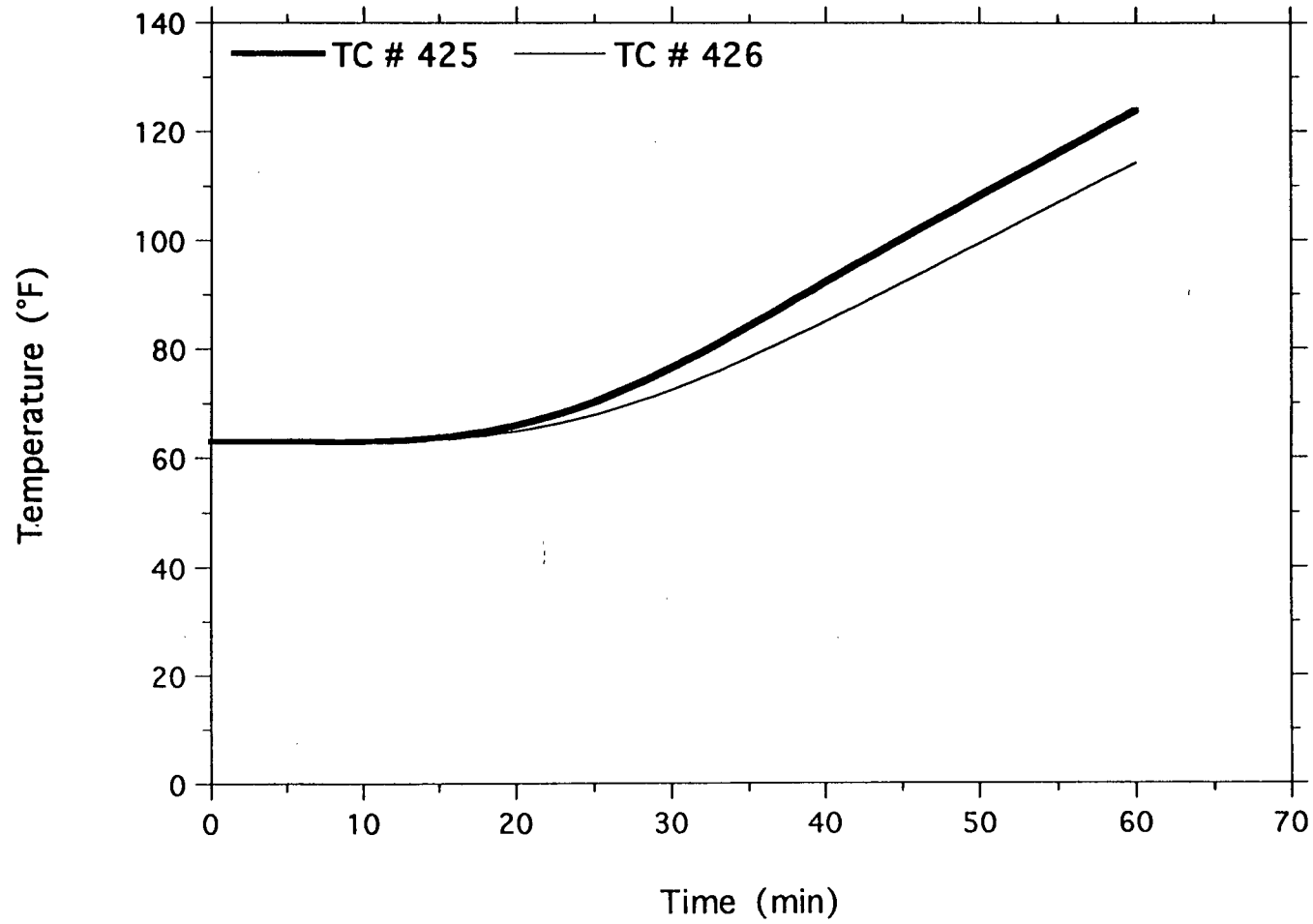
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LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (Center Cond. in Lower Array)



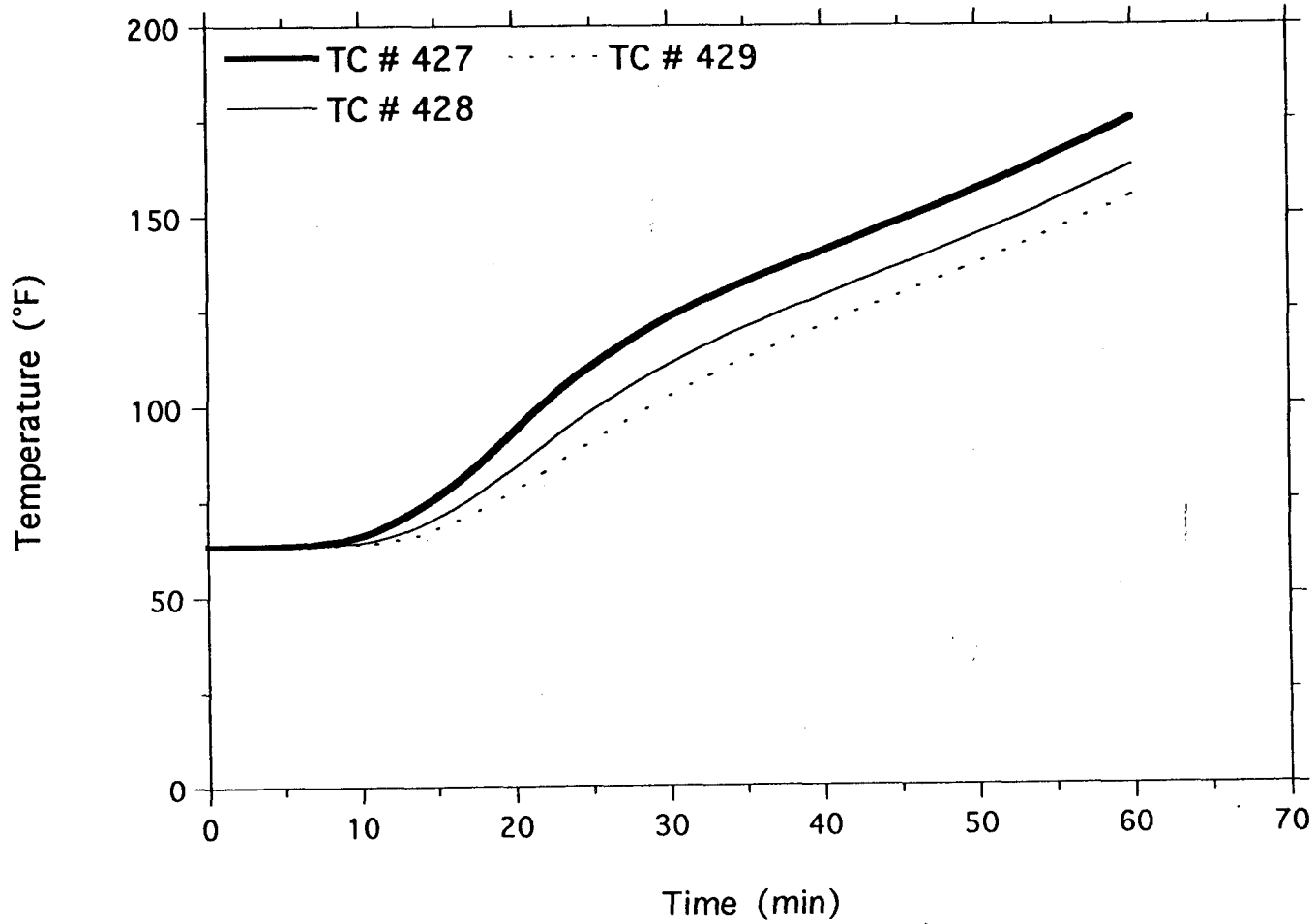
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LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (Center Cond. in Lower Array)



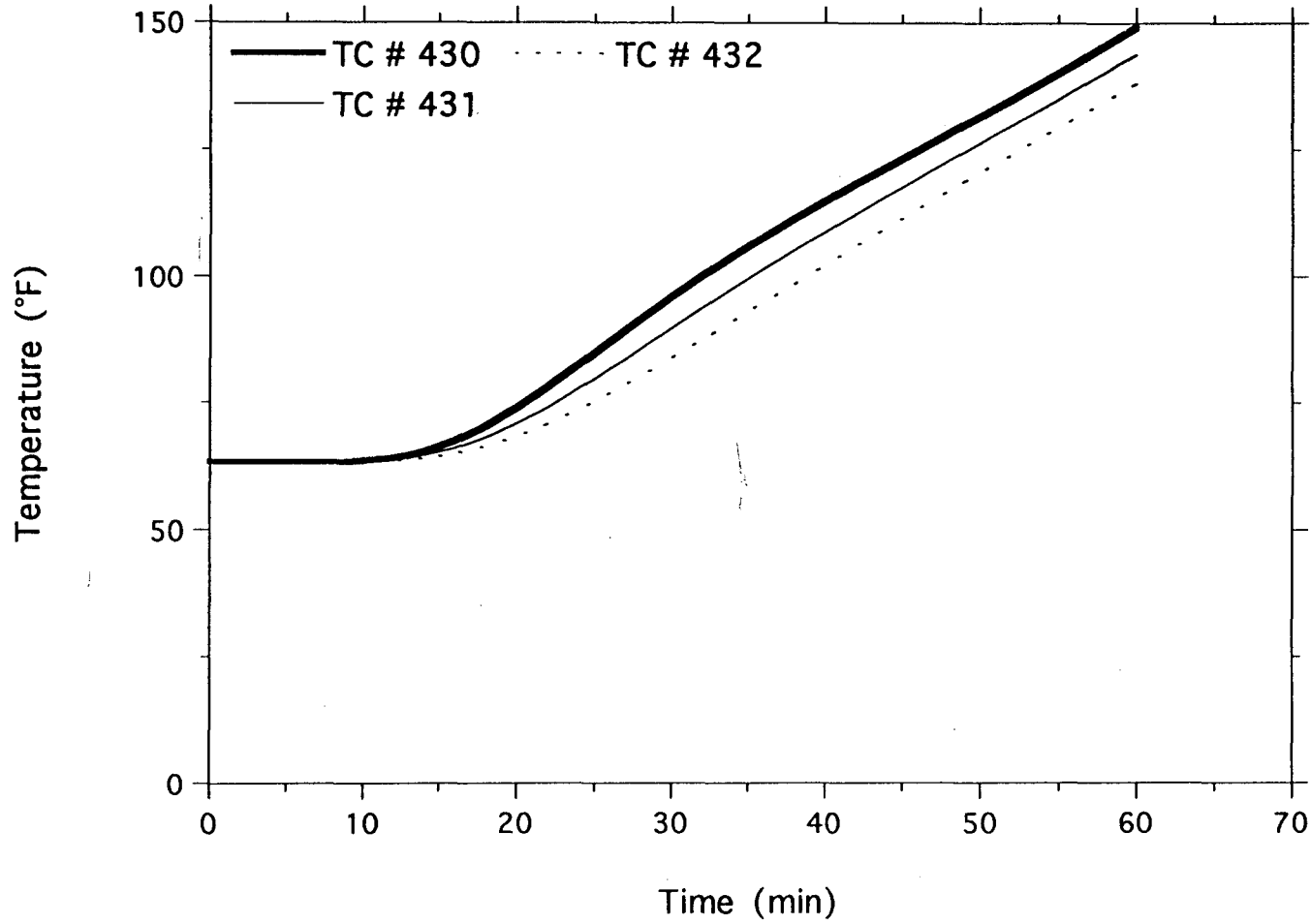
OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (Right Cond. in Lower Array)



OMEGA POINT
LABORATORIES

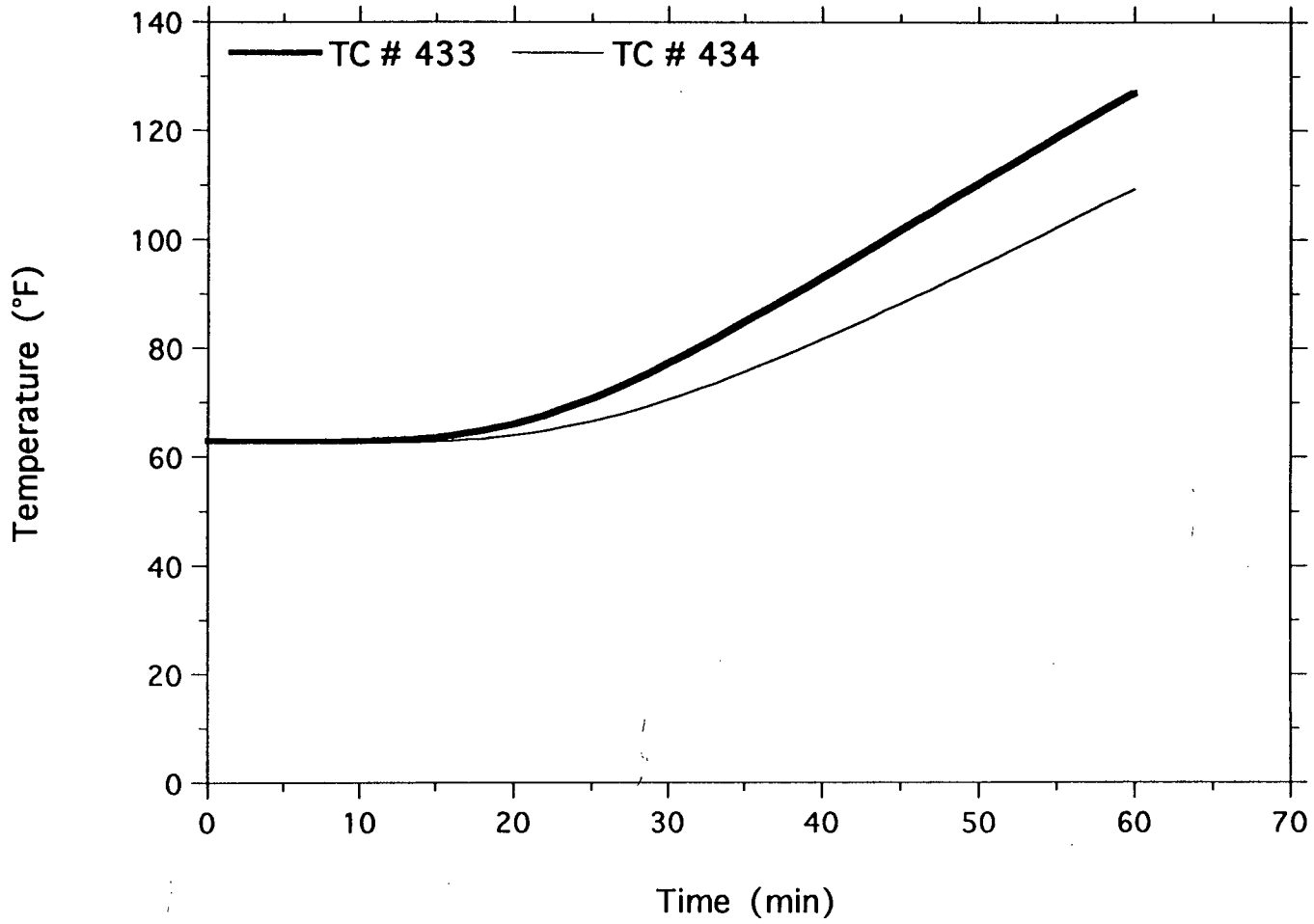
TSI/TVA
Project No. 11960-97258
3" Bare #8 (Right Cond. in Lower Array)



OMEGA POINT
LABORATORIES

TSI/TVA
Project No. 11960-97258
3" Bare #8 (Right Cond. in Lower Array)

OMEGA POINT
LABORATORIES



**FIRE ENDURANCE TEST
OF THERMO-LAG® 330-1
FIRE PROTECTIVE ENVELOPES
(Three Sided Box Enclosures
Encasing Groups of Horizontal
Conduits and a Large Junction Box)**

Project No. 11960-97258
(Volume 2 of 2)

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

November 23, 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)

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Report No. 11960-97258
TVA / Thermal Science, Inc.

November 23, 1994
APPENDICES

Appendix D
TEST DATA (continued)



| Time (min) | 2" Al., Top Conduit in Upper Array Bare #8 Average (°F) | 2-1/2" Al., 2nd Conduit in Upper Array Surface Maximum (°F) | 2-1/2" Al., 2nd Conduit in Upper Array Surface Average (°F) |
|---------------|--|--|--|
| 0 | 63 | 63 | 62 |
| 1 | 63 | 63 | 62 |
| 2 | 63 | 63 | 62 |
| 3 | 62 | 62 | 61 |
| 4 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 |
| 8 | 62 | 62 | 62 |
| 9 | 62 | 63 | 62 |
| 10 | 62 | 63 | 62 |
| 11 | 63 | 63 | 62 |
| 12 | 63 | 64 | 63 |
| 13 | 64 | 65 | 63 |
| 14 | 64 | 66 | 64 |
| 15 | 65 | 67 | 64 |
| 16 | 66 | 68 | 65 |
| 17 | 67 | 69 | 66 |
| 18 | 69 | 70 | 67 |
| 19 | 71 | 71 | 68 |
| 20 | 72 | 72 | 69 |
| 21 | 74 | 74 | 70 |
| 22 | 76 | 75 | 71 |
| 23 | 78 | 76 | 73 |
| 24 | 80 | 78 | 74 |
| 25 | 83 | 79 | 76 |
| 26 | 85 | 81 | 78 |
| 27 | 87 | 82 | 79 |
| 28 | 89 | 84 | 81 |
| 29 | 91 | 86 | 83 |
| 30 | 94 | 88 | 84 |
| 31 | 96 | 90 | 86 |
| 32 | 97 | 91 | 88 |
| 33 | 99 | 93 | 89 |
| 34 | 101 | 95 | 91 |
| 35 | 104 | 98 | 93 |
| 36 | 106 | 100 | 95 |
| 37 | 108 | 102 | 97 |
| 38 | 109 | 104 | 99 |

| Time (min) | 2" Al., Top Conduit in Upper Array Bare #8 Average (°F) | 2-1/2" Al., 2nd Conduit in Upper Array Surface Maximum (°F) | 2-1/2" Al., 2nd Conduit in Upper Array Surface Average (°F) |
|---------------------|--|--|--|
| 39 | 111 | 106 | 100 |
| 40 | 113 | 108 | 102 |
| 41 | 115 | 110 | 103 |
| 42 | 116 | 112 | 105 |
| 43 | 118 | 114 | 107 |
| 44 | 119 | 115 | 108 |
| 45 | 121 | 117 | 109 |
| 46 | 123 | 118 | 110 |
| 47 | 125 | 120 | 112 |
| 48 | 127 | 122 | 114 |
| 49 | 129 | 124 | 115 |
| 50 | 130 | 125 | 117 |
| 51 | 132 | 126 | 118 |
| 52 | 135 | 128 | 120 |
| 53 | 137 | 130 | 122 |
| 54 | 140 | 131 | 124 |
| 55 | 142 | 132 | 125 |
| 56 | 144 | 134 | 126 |
| 57 | 147 | 136 | 128 |
| 58 | 149 | 138 | 129 |
| 59 | 152 | 139 | 131 |
| 60 | 154 | 141 | 132 |
| Max Temp: | 154 | 141 | 132 |
| Max Allowed: | 313 | 388 | 312 |

| Time (min) | 2-1/2" Al., 2nd Conduit in Upper Array Bare #8 Maximum (°F) | 2-1/2" Al., 2nd Conduit in Upper Array Bare #8 Average (°F) | 2" Al., 3rd Conduit in Upper Array Surface Maximum (°F) |
|---------------|--|--|--|
| 0 | 63 | 63 | 63 |
| 1 | 63 | 63 | 63 |
| 2 | 63 | 63 | 63 |
| 3 | 62 | 62 | 62 |
| 4 | 62 | 62 | 62 |
| 5 | 63 | 62 | 63 |
| 6 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 |
| 8 | 62 | 62 | 62 |
| 9 | 63 | 62 | 63 |
| 10 | 63 | 62 | 64 |
| 11 | 63 | 62 | 65 |
| 12 | 64 | 62 | 66 |
| 13 | 64 | 62 | 68 |
| 14 | 65 | 63 | 70 |
| 15 | 66 | 63 | 72 |
| 16 | 67 | 63 | 75 |
| 17 | 68 | 64 | 77 |
| 18 | 69 | 64 | 80 |
| 19 | 70 | 64 | 83 |
| 20 | 71 | 65 | 85 |
| 21 | 72 | 65 | 87 |
| 22 | 74 | 66 | 89 |
| 23 | 75 | 67 | 91 |
| 24 | 76 | 68 | 94 |
| 25 | 78 | 70 | 96 |
| 26 | 80 | 71 | 98 |
| 27 | 81 | 72 | 100 |
| 28 | 83 | 73 | 102 |
| 29 | 85 | 75 | 104 |
| 30 | 87 | 76 | 106 |
| 31 | 89 | 77 | 107 |
| 32 | 90 | 78 | 109 |
| 33 | 92 | 80 | 110 |
| 34 | 94 | 81 | 112 |
| 35 | 97 | 83 | 114 |
| 36 | 99 | 85 | 116 |
| 37 | 101 | 87 | 117 |
| 38 | 104 | 88 | 118 |

| Time (min) | 2-1/2" Al., 2nd Conduit in Upper Array Bare #8 Maximum (°F) | 2-1/2" Al., 2nd Conduit in Upper Array Bare #8 Average (°F) | 2" Al., 3rd Conduit in Upper Array Surface Maximum (°F) |
|---------------------|--|--|--|
| 39 | 106 | 90 | 119 |
| 40 | 108 | 92 | 120 |
| 41 | 110 | 93 | 121 |
| 42 | 113 | 95 | 123 |
| 43 | 115 | 97 | 124 |
| 44 | 116 | 98 | 124 |
| 45 | 117 | 99 | 125 |
| 46 | 119 | 101 | 126 |
| 47 | 121 | 103 | 128 |
| 48 | 123 | 105 | 130 |
| 49 | 125 | 106 | 132 |
| 50 | 126 | 108 | 133 |
| 51 | 128 | 110 | 135 |
| 52 | 130 | 112 | 138 |
| 53 | 131 | 114 | 140 |
| 54 | 133 | 116 | 143 |
| 55 | 134 | 117 | 145 |
| 56 | 135 | 119 | 147 |
| 57 | 137 | 121 | 150 |
| 58 | 139 | 122 | 152 |
| 59 | 141 | 124 | 155 |
| 60 | 142 | 125 | 157 |
| Max Temp: | 142 | 125 | 157 |
| Max Allowed: | 388 | 313 | 388 |



| Time (min) | 2" Al., 3rd Conduit in Upper Array Surface Average (°F) | 2" Al., 3rd Conduit in Upper Array Bare #8 Maximum (°F) | 2" Al., 3rd Conduit in Upper Array Bare #8 Average (°F) |
|------------|---|---|---|
| 0 | 62 | 63 | 62 |
| 1 | 62 | 63 | 62 |
| 2 | 62 | 63 | 62 |
| 3 | 61 | 62 | 61 |
| 4 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 |
| 8 | 62 | 62 | 62 |
| 9 | 63 | 63 | 62 |
| 10 | 63 | 63 | 62 |
| 11 | 64 | 64 | 62 |
| 12 | 65 | 65 | 63 |
| 13 | 66 | 66 | 63 |
| 14 | 67 | 68 | 64 |
| 15 | 68 | 70 | 64 |
| 16 | 69 | 72 | 65 |
| 17 | 70 | 74 | 66 |
| 18 | 72 | 76 | 67 |
| 19 | 73 | 78 | 68 |
| 20 | 75 | 81 | 69 |
| 21 | 76 | 83 | 70 |
| 22 | 77 | 85 | 71 |
| 23 | 79 | 88 | 72 |
| 24 | 81 | 90 | 73 |
| 25 | 82 | 92 | 75 |
| 26 | 84 | 95 | 76 |
| 27 | 85 | 97 | 78 |
| 28 | 87 | 99 | 79 |
| 29 | 88 | 101 | 80 |
| 30 | 90 | 103 | 81 |
| 31 | 91 | 105 | 83 |
| 32 | 92 | 106 | 84 |
| 33 | 93 | 108 | 85 |
| 34 | 95 | 110 | 86 |
| 35 | 96 | 112 | 88 |
| 36 | 98 | 114 | 89 |
| 37 | 100 | 115 | 91 |
| 38 | 101 | 117 | 92 |



| Time (min) | 2" Al., 3rd Conduit in Upper Array Surface Average (°F) | 2" Al., 3rd Conduit in Upper Array Bare #8 Maximum (°F) | 2" Al., 3rd Conduit in Upper Array Bare #8 Average (°F) |
|---------------------|--|--|--|
| 39 | 102 | 118 | 93 |
| 40 | 104 | 119 | 95 |
| 41 | 105 | 120 | 96 |
| 42 | 106 | 121 | 97 |
| 43 | 108 | 122 | 98 |
| 44 | 109 | 123 | 99 |
| 45 | 110 | 124 | 100 |
| 46 | 111 | 125 | 102 |
| 47 | 113 | 127 | 103 |
| 48 | 115 | 129 | 105 |
| 49 | 116 | 130 | 106 |
| 50 | 117 | 132 | 108 |
| 51 | 119 | 134 | 109 |
| 52 | 121 | 137 | 112 |
| 53 | 123 | 139 | 113 |
| 54 | 125 | 142 | 115 |
| 55 | 126 | 143 | 117 |
| 56 | 128 | 146 | 118 |
| 57 | 130 | 149 | 120 |
| 58 | 132 | 151 | 122 |
| 59 | 134 | 154 | 124 |
| 60 | 135 | 156 | 125 |
| Max Temp: | 135 | 156 | 125 |
| Max Allowed: | 312 | 388 | 312 |

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| Time (min) | 3" Al., 4th Conduit in Upper Array Surface Maximum (°F) | 3" Al., 4th Conduit in Upper Array Surface Average (°F) | 3" Al., 4th Conduit in Upper Array Bare #8 Maximum (°F) |
|---------------|--|--|--|
| 0 | 63 | 62 | 63 |
| 1 | 63 | 62 | 63 |
| 2 | 63 | 62 | 63 |
| 3 | 62 | 61 | 62 |
| 4 | 62 | 62 | 62 |
| 5 | 63 | 62 | 63 |
| 6 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 |
| 8 | 63 | 62 | 62 |
| 9 | 63 | 62 | 62 |
| 10 | 63 | 63 | 62 |
| 11 | 64 | 63 | 63 |
| 12 | 65 | 63 | 63 |
| 13 | 66 | 64 | 64 |
| 14 | 67 | 64 | 65 |
| 15 | 68 | 65 | 66 |
| 16 | 70 | 66 | 67 |
| 17 | 71 | 67 | 68 |
| 18 | 73 | 68 | 69 |
| 19 | 75 | 69 | 70 |
| 20 | 76 | 70 | 71 |
| 21 | 78 | 71 | 73 |
| 22 | 80 | 72 | 75 |
| 23 | 82 | 73 | 76 |
| 24 | 84 | 75 | 79 |
| 25 | 86 | 76 | 81 |
| 26 | 88 | 77 | 83 |
| 27 | 90 | 79 | 85 |
| 28 | 92 | 80 | 87 |
| 29 | 93 | 81 | 89 |
| 30 | 95 | 83 | 91 |
| 31 | 97 | 84 | 93 |
| 32 | 99 | 85 | 94 |
| 33 | 101 | 87 | 96 |
| 34 | 103 | 88 | 98 |
| 35 | 105 | 90 | 101 |
| 36 | 107 | 91 | 103 |
| 37 | 109 | 93 | 105 |
| 38 | 110 | 94 | 107 |

OMEGA POINT
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| Time (min) | 3" Al., 4th Conduit in Upper Array Surface Maximum (°F) | 3" Al., 4th Conduit in Upper Array Surface Average (°F) | 3" Al., 4th Conduit in Upper Array Bare #8 Maximum (°F) |
|---------------|--|--|--|
| 39 | 112 | 95 | 108 |
| 40 | 113 | 97 | 110 |
| 41 | 115 | 98 | 111 |
| 42 | 116 | 99 | 113 |
| 43 | 117 | 100 | 115 |
| 44 | 118 | 101 | 116 |
| 45 | 119 | 102 | 116 |
| 46 | 121 | 104 | 118 |
| 47 | 122 | 105 | 120 |
| 48 | 125 | 107 | 121 |
| 49 | 126 | 108 | 123 |
| 50 | 127 | 109 | 124 |
| 51 | 129 | 110 | 125 |
| 52 | 131 | 113 | 128 |
| 53 | 133 | 114 | 130 |
| 54 | 135 | 116 | 131 |
| 55 | 137 | 117 | 133 |
| 56 | 138 | 119 | 134 |
| 57 | 140 | 120 | 136 |
| 58 | 142 | 122 | 138 |
| 59 | 144 | 124 | 139 |
| 60 | 146 | 125 | 141 |
| Max Temp: | 146 | 125 | 141 |
| Max Allowed: | 388 | 312 | 388 |

| Time (min) | 3" Al., 4th Conduit in Upper Array Bare #8 Average (°F) | 2" Al., 5th Conduit in Upper Array Surface Maximum (°F) | 2" Al., 5th Conduit in Upper Array Surface Average (°F) |
|------------|---|---|---|
| 0 | 62 | 63 | 62 |
| 1 | 63 | 63 | 62 |
| 2 | 62 | 63 | 62 |
| 3 | 62 | 62 | 61 |
| 4 | 62 | 62 | 62 |
| 5 | 62 | 63 | 62 |
| 6 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 |
| 8 | 62 | 62 | 62 |
| 9 | 62 | 62 | 62 |
| 10 | 62 | 63 | 62 |
| 11 | 62 | 63 | 62 |
| 12 | 62 | 63 | 62 |
| 13 | 63 | 63 | 63 |
| 14 | 63 | 64 | 63 |
| 15 | 63 | 64 | 63 |
| 16 | 63 | 65 | 64 |
| 17 | 64 | 65 | 64 |
| 18 | 64 | 66 | 65 |
| 19 | 65 | 67 | 66 |
| 20 | 65 | 68 | 66 |
| 21 | 66 | 69 | 67 |
| 22 | 67 | 69 | 67 |
| 23 | 68 | 71 | 68 |
| 24 | 69 | 72 | 69 |
| 25 | 70 | 73 | 70 |
| 26 | 71 | 75 | 71 |
| 27 | 72 | 76 | 73 |
| 28 | 73 | 78 | 74 |
| 29 | 74 | 79 | 74 |
| 30 | 75 | 80 | 76 |
| 31 | 76 | 82 | 77 |
| 32 | 77 | 83 | 78 |
| 33 | 78 | 84 | 79 |
| 34 | 80 | 86 | 80 |
| 35 | 81 | 88 | 82 |
| 36 | 82 | 90 | 83 |
| 37 | 84 | 92 | 84 |
| 38 | 85 | 93 | 86 |



| Time (min) | 3" Al., 4th Conduit in Upper Array Bare #8 Average (°F) | 2" Al., 5th Conduit in Upper Array Surface Maximum (°F) | 2" Al., 5th Conduit in Upper Array Surface Average (°F) |
|---------------------|--|--|--|
| 39 | 86 | 95 | 87 |
| 40 | 87 | 97 | 88 |
| 41 | 88 | 98 | 89 |
| 42 | 90 | 100 | 91 |
| 43 | 91 | 101 | 92 |
| 44 | 92 | 102 | 93 |
| 45 | 92 | 103 | 93 |
| 46 | 94 | 105 | 95 |
| 47 | 95 | 107 | 96 |
| 48 | 97 | 108 | 98 |
| 49 | 98 | 110 | 99 |
| 50 | 99 | 111 | 100 |
| 51 | 100 | 112 | 102 |
| 52 | 103 | 114 | 104 |
| 53 | 104 | 115 | 105 |
| 54 | 106 | 116 | 107 |
| 55 | 107 | 117 | 108 |
| 56 | 108 | 118 | 109 |
| 57 | 110 | 120 | 110 |
| 58 | 112 | 121 | 112 |
| 59 | 113 | 123 | 113 |
| 60 | 115 | 123 | 114 |
| Max Temp: | 115 | 123 | 114 |
| Max Allowed: | 312 | 388 | 312 |



| Time (min) | 2" Al., 5th Conduit in Upper Array Bare #8 Maximum (°F) | 2" Al., 5th Conduit in Upper Array Bare #8 Average (°F) | 2" Al., 6th Conduit in Upper Array Surface Maximum (°F) |
|---------------|--|--|--|
| 0 | 63 | 62 | 63 |
| 1 | 63 | 63 | 63 |
| 2 | 63 | 62 | 63 |
| 3 | 62 | 62 | 62 |
| 4 | 62 | 62 | 62 |
| 5 | 63 | 62 | 63 |
| 6 | 62 | 62 | 63 |
| 7 | 62 | 62 | 63 |
| 8 | 62 | 62 | 63 |
| 9 | 63 | 62 | 64 |
| 10 | 63 | 62 | 65 |
| 11 | 63 | 62 | 67 |
| 12 | 63 | 62 | 69 |
| 13 | 63 | 62 | 71 |
| 14 | 64 | 62 | 73 |
| 15 | 65 | 63 | 75 |
| 16 | 65 | 63 | 77 |
| 17 | 66 | 63 | 80 |
| 18 | 66 | 63 | 82 |
| 19 | 67 | 64 | 84 |
| 20 | 68 | 64 | 86 |
| 21 | 69 | 64 | 88 |
| 22 | 70 | 65 | 89 |
| 23 | 71 | 66 | 91 |
| 24 | 72 | 66 | 93 |
| 25 | 73 | 67 | 95 |
| 26 | 75 | 68 | 96 |
| 27 | 76 | 69 | 98 |
| 28 | 78 | 69 | 100 |
| 29 | 79 | 70 | 102 |
| 30 | 80 | 71 | 104 |
| 31 | 82 | 72 | 106 |
| 32 | 83 | 73 | 108 |
| 33 | 84 | 73 | 109 |
| 34 | 86 | 75 | 112 |
| 35 | 88 | 76 | 114 |
| 36 | 90 | 77 | 116 |
| 37 | 92 | 78 | 117 |
| 38 | 93 | 79 | 119 |

| Time (min) | 2" Al., 5th Conduit in Upper Array Bare #8 Maximum (°F) | 2" Al., 5th Conduit in Upper Array Bare #8 Average (°F) | 2" Al., 6th Conduit in Upper Array Surface Maximum (°F) |
|---------------|--|--|--|
| 39 | 95 | 80 | 120 |
| 40 | 97 | 82 | 122 |
| 41 | 98 | 83 | 123 |
| 42 | 100 | 84 | 125 |
| 43 | 101 | 85 | 126 |
| 44 | 103 | 86 | 127 |
| 45 | 104 | 87 | 128 |
| 46 | 106 | 88 | 130 |
| 47 | 107 | 89 | 132 |
| 48 | 109 | 91 | 134 |
| 49 | 110 | 92 | 136 |
| 50 | 112 | 94 | 138 |
| 51 | 113 | 95 | 140 |
| 52 | 115 | 97 | 144 |
| 53 | 117 | 98 | 146 |
| 54 | 118 | 100 | 149 |
| 55 | 119 | 101 | 150 |
| 56 | 120 | 103 | 153 |
| 57 | 122 | 104 | 156 |
| 58 | 123 | 106 | 158 |
| 59 | 125 | 107 | 161 |
| 60 | 126 | 108 | 163 |
| Max Temp: | 126 | 108 | 163 |
| Max Allowed: | 388 | 312 | 388 |

| Time (min) | 2" Al., 6th Conduit in Upper Array Surface Average (°F) | 2" Al., 6th Conduit in Upper Array Bare #8 Maximum (°F) | 2" Al., 6th Conduit in Upper Array Bare #8 Average (°F) |
|---------------|--|--|--|
| 0 | 63 | 63 | 62 |
| 1 | 63 | 63 | 62 |
| 2 | 62 | 63 | 62 |
| 3 | 62 | 62 | 61 |
| 4 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 |
| 7 | 62 | 62 | 61 |
| 8 | 62 | 62 | 61 |
| 9 | 63 | 62 | 62 |
| 10 | 64 | 63 | 62 |
| 11 | 65 | 63 | 62 |
| 12 | 66 | 64 | 63 |
| 13 | 67 | 65 | 63 |
| 14 | 69 | 66 | 64 |
| 15 | 70 | 68 | 65 |
| 16 | 72 | 69 | 66 |
| 17 | 74 | 71 | 67 |
| 18 | 76 | 73 | 68 |
| 19 | 78 | 75 | 70 |
| 20 | 79 | 77 | 71 |
| 21 | 81 | 79 | 72 |
| 22 | 83 | 82 | 74 |
| 23 | 85 | 84 | 76 |
| 24 | 87 | 87 | 78 |
| 25 | 89 | 89 | 80 |
| 26 | 91 | 92 | 81 |
| 27 | 93 | 94 | 83 |
| 28 | 94 | 97 | 85 |
| 29 | 96 | 99 | 86 |
| 30 | 97 | 101 | 88 |
| 31 | 99 | 103 | 90 |
| 32 | 100 | 105 | 91 |
| 33 | 101 | 107 | 92 |
| 34 | 103 | 109 | 94 |
| 35 | 104 | 111 | 95 |
| 36 | 106 | 114 | 97 |
| 37 | 107 | 115 | 98 |
| 38 | 108 | 117 | 100 |

| Time (min) | 2" Al., 6th Conduit in Upper Array Surface Average (°F) | 2" Al., 6th Conduit in Upper Array Bare #8 Maximum (°F) | 2" Al., 6th Conduit in Upper Array Bare #8 Average (°F) |
|---------------------|--|--|--|
| 39 | 109 | 119 | 101 |
| 40 | 111 | 120 | 102 |
| 41 | 112 | 122 | 103 |
| 42 | 113 | 123 | 104 |
| 43 | 115 | 125 | 106 |
| 44 | 116 | 126 | 107 |
| 45 | 117 | 126 | 107 |
| 46 | 118 | 128 | 109 |
| 47 | 120 | 129 | 110 |
| 48 | 122 | 131 | 112 |
| 49 | 123 | 132 | 113 |
| 50 | 125 | 133 | 115 |
| 51 | 127 | 135 | 116 |
| 52 | 129 | 138 | 119 |
| 53 | 131 | 140 | 121 |
| 54 | 134 | 142 | 123 |
| 55 | 135 | 144 | 124 |
| 56 | 137 | 146 | 126 |
| 57 | 140 | 149 | 128 |
| 58 | 142 | 152 | 130 |
| 59 | 144 | 154 | 132 |
| 60 | 146 | 156 | 134 |
| Max Temp: | 146 | 156 | 134 |
| Max Allowed: | 313 | 388 | 312 |

| Time (min) | 2" Al., Bottom Conduit in Upper Array Surface Maximum (°F) | 2" Al., Bottom Conduit in Upper Array Surface Average (°F) | 2" Al., Bottom Conduit in Upper Array Bare #8 Maximum (°F) |
|---------------|---|---|---|
| 0 | 63 | 62 | 63 |
| 1 | 63 | 62 | 63 |
| 2 | 63 | 62 | 63 |
| 3 | 62 | 61 | 62 |
| 4 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 |
| 8 | 62 | 62 | 62 |
| 9 | 63 | 63 | 63 |
| 10 | 64 | 63 | 63 |
| 11 | 65 | 64 | 63 |
| 12 | 66 | 65 | 64 |
| 13 | 68 | 66 | 65 |
| 14 | 69 | 67 | 65 |
| 15 | 71 | 68 | 66 |
| 16 | 73 | 70 | 67 |
| 17 | 75 | 71 | 68 |
| 18 | 78 | 73 | 69 |
| 19 | 80 | 75 | 71 |
| 20 | 82 | 76 | 72 |
| 21 | 84 | 78 | 73 |
| 22 | 86 | 80 | 75 |
| 23 | 88 | 82 | 77 |
| 24 | 90 | 84 | 79 |
| 25 | 92 | 86 | 81 |
| 26 | 94 | 88 | 83 |
| 27 | 96 | 89 | 85 |
| 28 | 97 | 91 | 88 |
| 29 | 99 | 93 | 90 |
| 30 | 101 | 94 | 92 |
| 31 | 103 | 96 | 94 |
| 32 | 104 | 97 | 96 |
| 33 | 106 | 99 | 98 |
| 34 | 108 | 100 | 101 |
| 35 | 109 | 102 | 103 |
| 36 | 111 | 103 | 106 |
| 37 | 112 | 105 | 108 |
| 38 | 114 | 106 | 110 |

| Time (min) | 2" Al., Bottom Conduit in Upper Array Surface Maximum (°F) | 2" Al., Bottom Conduit in Upper Array Surface Average (°F) | 2" Al., Bottom Conduit in Upper Array Bare #8 Maximum (°F) |
|---------------------|---|---|---|
| 39 | 115 | 107 | 112 |
| 40 | 117 | 109 | 114 |
| 41 | 118 | 110 | 116 |
| 42 | 120 | 111 | 117 |
| 43 | 122 | 113 | 119 |
| 44 | 123 | 114 | 120 |
| 45 | 125 | 115 | 122 |
| 46 | 127 | 116 | 123 |
| 47 | 129 | 118 | 125 |
| 48 | 131 | 120 | 126 |
| 49 | 133 | 122 | 128 |
| 50 | 135 | 123 | 129 |
| 51 | 137 | 125 | 130 |
| 52 | 140 | 127 | 133 |
| 53 | 142 | 129 | 134 |
| 54 | 145 | 132 | 137 |
| 55 | 147 | 133 | 139 |
| 56 | 149 | 136 | 141 |
| 57 | 152 | 138 | 146 |
| 58 | 155 | 141 | 148 |
| 59 | 157 | 143 | 152 |
| 60 | 159 | 145 | 155 |
| Max Temp: | 159 | 145 | 155 |
| Max Allowed: | 388 | 312 | 388 |

| Time (min) | 2" Al., Bottom Conduit in Upper Array Bare #8 Average (°F) | 1" Steel, Top Conduit in Middle Array Surface Maximum (°F) | 1" Steel, Top Conduit in Middle Array Surface Average (°F) |
|---------------|---|---|---|
| 0 | 62 | 63 | 62 |
| 1 | 62 | 62 | 62 |
| 2 | 62 | 63 | 63 |
| 3 | 61 | 68 | 68 |
| 4 | 62 | 66 | 65 |
| 5 | 62 | 64 | 63 |
| 6 | 62 | 65 | 65 |
| 7 | 62 | 66 | 65 |
| 8 | 62 | 66 | 66 |
| 9 | 62 | 65 | 64 |
| 10 | 62 | 66 | 64 |
| 11 | 62 | 67 | 65 |
| 12 | 63 | 68 | 66 |
| 13 | 63 | 69 | 67 |
| 14 | 63 | 72 | 68 |
| 15 | 64 | 75 | 70 |
| 16 | 65 | 77 | 72 |
| 17 | 66 | 81 | 76 |
| 18 | 67 | 84 | 78 |
| 19 | 68 | 87 | 81 |
| 20 | 69 | 91 | 85 |
| 21 | 71 | 95 | 89 |
| 22 | 72 | 98 | 92 |
| 23 | 74 | 102 | 96 |
| 24 | 76 | 106 | 100 |
| 25 | 77 | 109 | 103 |
| 26 | 79 | 113 | 107 |
| 27 | 81 | 116 | 111 |
| 28 | 83 | 119 | 114 |
| 29 | 84 | 122 | 117 |
| 30 | 86 | 124 | 119 |
| 31 | 88 | 128 | 122 |
| 32 | 89 | 131 | 125 |
| 33 | 90 | 133 | 128 |
| 34 | 92 | 136 | 131 |
| 35 | 94 | 139 | 133 |
| 36 | 95 | 142 | 136 |
| 37 | 97 | 144 | 138 |
| 38 | 98 | 146 | 140 |

| Time (min) | 2" Al., Bottom Conduit in Upper Array Bare #8 Average (°F) | 1" Steel, Top Conduit in Middle Array Surface Maximum (°F) | 1" Steel, Top Conduit in Middle Array Surface Average (°F) |
|---------------|---|---|---|
| 39 | 100 | 149 | 142 |
| 40 | 101 | 152 | 145 |
| 41 | 102 | 153 | 146 |
| 42 | 103 | 155 | 148 |
| 43 | 105 | 158 | 150 |
| 44 | 105 | 160 | 152 |
| 45 | 106 | 161 | 153 |
| 46 | 108 | 163 | 155 |
| 47 | 109 | 165 | 157 |
| 48 | 111 | 167 | 159 |
| 49 | 113 | 168 | 160 |
| 50 | 114 | 170 | 162 |
| 51 | 115 | 171 | 164 |
| 52 | 118 | 173 | 165 |
| 53 | 120 | 175 | 168 |
| 54 | 122 | 177 | 169 |
| 55 | 123 | 178 | 171 |
| 56 | 125 | 180 | 172 |
| 57 | 128 | 181 | 174 |
| 58 | 130 | 183 | 176 |
| 59 | 132 | 184 | 178 |
| 60 | 134 | 186 | 180 |
| Max Temp: | 134 | 186 | 180 |
| Max Allowed: | 312 | 388 | 312 |

| Time (min) | 1" Steel, Top Conduit in Middle Array Bare #8 Maximum (°F) | 1" Steel, Top Conduit in Middle Array Bare #8 Average (°F) | 1" Steel, Bottom Conduit in Middle Array Surface Maximum (°F) |
|---------------|---|---|--|
| 0 | 63 | 62 | 63 |
| 1 | 63 | 62 | 62 |
| 2 | 64 | 63 | 63 |
| 3 | 69 | 66 | 68 |
| 4 | 66 | 64 | 66 |
| 5 | 64 | 63 | 64 |
| 6 | 65 | 64 | 65 |
| 7 | 66 | 64 | 65 |
| 8 | 66 | 64 | 66 |
| 9 | 64 | 63 | 65 |
| 10 | 64 | 63 | 65 |
| 11 | 64 | 63 | 65 |
| 12 | 64 | 63 | 67 |
| 13 | 65 | 64 | 69 |
| 14 | 66 | 64 | 71 |
| 15 | 67 | 65 | 73 |
| 16 | 68 | 66 | 75 |
| 17 | 70 | 68 | 78 |
| 18 | 72 | 69 | 80 |
| 19 | 75 | 71 | 83 |
| 20 | 79 | 74 | 86 |
| 21 | 82 | 76 | 89 |
| 22 | 86 | 79 | 92 |
| 23 | 89 | 82 | 95 |
| 24 | 93 | 85 | 99 |
| 25 | 98 | 88 | 102 |
| 26 | 102 | 92 | 105 |
| 27 | 106 | 95 | 108 |
| 28 | 111 | 98 | 111 |
| 29 | 114 | 101 | 113 |
| 30 | 117 | 104 | 116 |
| 31 | 121 | 108 | 120 |
| 32 | 124 | 111 | 123 |
| 33 | 128 | 114 | 126 |
| 34 | 132 | 117 | 129 |
| 35 | 135 | 120 | 133 |
| 36 | 138 | 123 | 136 |
| 37 | 141 | 125 | 138 |
| 38 | 144 | 128 | 140 |

| Time (min) | 1" Steel, Top Conduit in Middle Array Bare #8 Maximum (°F) | 1" Steel, Top Conduit in Middle Array Bare #8 Average (°F) | 1" Steel, Bottom Conduit in Middle Array Surface Maximum (°F) |
|---------------|---|---|--|
| 39 | 146 | 130 | 141 |
| 40 | 149 | 133 | 143 |
| 41 | 151 | 135 | 143 |
| 42 | 153 | 137 | 145 |
| 43 | 156 | 140 | 147 |
| 44 | 158 | 141 | 149 |
| 45 | 160 | 143 | 151 |
| 46 | 162 | 145 | 154 |
| 47 | 163 | 147 | 156 |
| 48 | 165 | 149 | 158 |
| 49 | 167 | 151 | 160 |
| 50 | 169 | 153 | 162 |
| 51 | 172 | 156 | 164 |
| 52 | 174 | 158 | 167 |
| 53 | 177 | 161 | 169 |
| 54 | 179 | 164 | 171 |
| 55 | 179 | 167 | 173 |
| 56 | 180 | 169 | 174 |
| 57 | 182 | 171 | 176 |
| 58 | 183 | 173 | 178 |
| 59 | 185 | 174 | 180 |
| 60 | 186 | 176 | 182 |
| Max Temp: | 186 | 176 | 182 |
| Max Allowed: | 388 | 312 | 388 |

| Time (min) | 1" Steel, Bottom Conduit in Middle Array Surface Average (°F) | 1" Steel, Bottom Conduit in Middle Array Bare #8 Maximum (°F) |
|---------------|--|--|
| 0 | 62 | 63 |
| 1 | 62 | 63 |
| 2 | 63 | 63 |
| 3 | 68 | 63 |
| 4 | 65 | 63 |
| 5 | 63 | 63 |
| 6 | 65 | 63 |
| 7 | 65 | 63 |
| 8 | 65 | 64 |
| 9 | 64 | 64 |
| 10 | 64 | 65 |
| 11 | 64 | 66 |
| 12 | 65 | 66 |
| 13 | 65 | 67 |
| 14 | 66 | 69 |
| 15 | 67 | 70 |
| 16 | 69 | 71 |
| 17 | 71 | 73 |
| 18 | 73 | 75 |
| 19 | 75 | 77 |
| 20 | 78 | 80 |
| 21 | 81 | 82 |
| 22 | 83 | 85 |
| 23 | 86 | 88 |
| 24 | 89 | 91 |
| 25 | 92 | 94 |
| 26 | 96 | 97 |
| 27 | 99 | 101 |
| 28 | 102 | 105 |
| 29 | 104 | 108 |
| 30 | 107 | 112 |
| 31 | 110 | 116 |
| 32 | 113 | 119 |
| 33 | 116 | 123 |
| 34 | 119 | 127 |
| 35 | 122 | 130 |
| 36 | 125 | 133 |
| 37 | 127 | 137 |
| 38 | 130 | 140 |

| Time (min) | 1" Steel, Bottom Conduit in Middle Array Surface Average (°F) | 1" Steel, Bottom Conduit in Middle Array Bare #8 Maximum (°F) |
|---------------|--|--|
| 39 | 132 | 143 |
| 40 | 135 | 146 |
| 41 | 136 | 149 |
| 42 | 138 | 152 |
| 43 | 141 | 154 |
| 44 | 142 | 157 |
| 45 | 144 | 159 |
| 46 | 146 | 162 |
| 47 | 148 | 165 |
| 48 | 150 | 167 |
| 49 | 152 | 169 |
| 50 | 154 | 172 |
| 51 | 155 | 174 |
| 52 | 157 | 177 |
| 53 | 160 | 179 |
| 54 | 162 | 182 |
| 55 | 163 | 183 |
| 56 | 165 | 185 |
| 57 | 167 | 186 |
| 58 | 169 | 187 |
| 59 | 171 | 189 |
| 60 | 173 | 190 |
| Max Temp: | 173 | 190 |
| Max Allowed: | 312 | 388 |



| Time (min) | 1" Steel, Bottom Conduit in Middle Array Bare #8 Average (°F) | 3" Al., Left Conduit in Lower Array Surface Maximum (°F) | 3" Al., Left Conduit in Lower Array Surface Average (°F) |
|---------------|--|---|---|
| 0 | 63 | 63 | 62 |
| 1 | 63 | 63 | 62 |
| 2 | 63 | 63 | 62 |
| 3 | 63 | 63 | 62 |
| 4 | 63 | 62 | 62 |
| 5 | 63 | 62 | 61 |
| 6 | 63 | 62 | 62 |
| 7 | 63 | 62 | 62 |
| 8 | 63 | 64 | 63 |
| 9 | 63 | 65 | 63 |
| 10 | 63 | 66 | 63 |
| 11 | 63 | 69 | 65 |
| 12 | 64 | 72 | 66 |
| 13 | 64 | 75 | 67 |
| 14 | 64 | 78 | 69 |
| 15 | 65 | 82 | 70 |
| 16 | 66 | 85 | 72 |
| 17 | 67 | 89 | 74 |
| 18 | 68 | 92 | 77 |
| 19 | 69 | 95 | 78 |
| 20 | 71 | 98 | 80 |
| 21 | 73 | 101 | 82 |
| 22 | 75 | 104 | 85 |
| 23 | 77 | 106 | 87 |
| 24 | 79 | 109 | 89 |
| 25 | 82 | 111 | 91 |
| 26 | 85 | 113 | 93 |
| 27 | 87 | 114 | 95 |
| 28 | 90 | 116 | 96 |
| 29 | 93 | 117 | 98 |
| 30 | 96 | 119 | 100 |
| 31 | 99 | 121 | 102 |
| 32 | 103 | 125 | 106 |
| 33 | 106 | 126 | 108 |
| 34 | 109 | 128 | 110 |
| 35 | 112 | 129 | 111 |
| 36 | 114 | 130 | 112 |
| 37 | 117 | 131 | 114 |
| 38 | 120 | 132 | 115 |

| Time (min) | 1" Steel, Bottom Conduit in Middle Array Bare #8 Average (°F) | 3" Al., Left Conduit in Lower Array Surface Maximum (°F) | 3" Al., Left Conduit in Lower Array Surface Average (°F) |
|---------------------|--|---|---|
| 39 | 123 | 133 | 116 |
| 40 | 125 | 135 | 117 |
| 41 | 128 | 138 | 120 |
| 42 | 130 | 138 | 120 |
| 43 | 132 | 140 | 122 |
| 44 | 135 | 143 | 125 |
| 45 | 137 | 143 | 125 |
| 46 | 139 | 144 | 126 |
| 47 | 141 | 146 | 128 |
| 48 | 143 | 147 | 129 |
| 49 | 145 | 149 | 130 |
| 50 | 147 | 152 | 133 |
| 51 | 149 | 153 | 135 |
| 52 | 152 | 153 | 135 |
| 53 | 154 | 156 | 137 |
| 54 | 157 | 158 | 138 |
| 55 | 160 | 159 | 139 |
| 56 | 163 | 162 | 141 |
| 57 | 166 | 164 | 143 |
| 58 | 168 | 166 | 144 |
| 59 | 171 | 168 | 146 |
| 60 | 173 | 171 | 148 |
| Max Temp: | 173 | 171 | 148 |
| Max Allowed: | 313 | 388 | 312 |

| Time (min) | 3" Al., Left Conduit in Lower Array Bare #8 Maximum (°F) | 3" Al., Left Conduit in Lower Array Bare #8 Average (°F) | 3" Al., Center Conduit in Lower Array Surface Maximum (°F) |
|---------------|---|---|---|
| 0 | 63 | 63 | 63 |
| 1 | 63 | 63 | 63 |
| 2 | 63 | 63 | 63 |
| 3 | 63 | 63 | 63 |
| 4 | 63 | 63 | 62 |
| 5 | 63 | 63 | 62 |
| 6 | 64 | 63 | 62 |
| 7 | 64 | 63 | 62 |
| 8 | 65 | 63 | 64 |
| 9 | 65 | 63 | 65 |
| 10 | 66 | 63 | 66 |
| 11 | 68 | 64 | 70 |
| 12 | 70 | 64 | 73 |
| 13 | 72 | 65 | 77 |
| 14 | 74 | 66 | 81 |
| 15 | 77 | 67 | 85 |
| 16 | 80 | 68 | 89 |
| 17 | 83 | 69 | 93 |
| 18 | 87 | 71 | 97 |
| 19 | 90 | 73 | 100 |
| 20 | 94 | 74 | 103 |
| 21 | 97 | 76 | 106 |
| 22 | 100 | 78 | 108 |
| 23 | 104 | 80 | 110 |
| 24 | 107 | 82 | 113 |
| 25 | 110 | 84 | 115 |
| 26 | 113 | 86 | 116 |
| 27 | 116 | 88 | 118 |
| 28 | 119 | 90 | 119 |
| 29 | 122 | 92 | 121 |
| 30 | 124 | 94 | 122 |
| 31 | 127 | 96 | 123 |
| 32 | 129 | 98 | 127 |
| 33 | 131 | 100 | 128 |
| 34 | 133 | 101 | 132 |
| 35 | 135 | 103 | 132 |
| 36 | 137 | 105 | 131 |
| 37 | 138 | 107 | 132 |
| 38 | 140 | 108 | 133 |

| Time (min) | 3" Al., Left Conduit in Lower Array Bare #8 Maximum (°F) | 3" Al., Left Conduit in Lower Array Bare #8 Average (°F) | 3" Al., Center Conduit in Lower Array Surface Maximum (°F) |
|---------------|---|---|---|
| 39 | 142 | 110 | 134 |
| 40 | 144 | 112 | 135 |
| 41 | 146 | 113 | 137 |
| 42 | 147 | 115 | 137 |
| 43 | 149 | 117 | 139 |
| 44 | 151 | 118 | 141 |
| 45 | 153 | 120 | 141 |
| 46 | 155 | 122 | 142 |
| 47 | 157 | 123 | 144 |
| 48 | 158 | 125 | 146 |
| 49 | 160 | 127 | 147 |
| 50 | 162 | 128 | 150 |
| 51 | 164 | 130 | 151 |
| 52 | 166 | 132 | 152 |
| 53 | 168 | 134 | 154 |
| 54 | 169 | 135 | 156 |
| 55 | 171 | 137 | 158 |
| 56 | 173 | 139 | 160 |
| 57 | 175 | 141 | 162 |
| 58 | 177 | 142 | 164 |
| 59 | 179 | 144 | 166 |
| 60 | 182 | 146 | 168 |
| Max Temp: | 182 | 146 | 168 |
| Max Allowed: | 388 | 313 | 388 |

| Time (min) | 3" Al., Center Conduit in Lower Array Surface Average (°F) | 3" Al., Center Conduit in Lower Array Bare #8 Maximum (°F) | 3" Al., Center Conduit in Lower Array Bare #8 Average (°F) |
|---------------|---|---|---|
| 0 | 62 | 63 | 63 |
| 1 | 62 | 63 | 63 |
| 2 | 62 | 63 | 63 |
| 3 | 62 | 63 | 63 |
| 4 | 62 | 63 | 63 |
| 5 | 62 | 63 | 63 |
| 6 | 62 | 63 | 63 |
| 7 | 62 | 64 | 63 |
| 8 | 63 | 65 | 63 |
| 9 | 63 | 65 | 63 |
| 10 | 64 | 66 | 64 |
| 11 | 65 | 68 | 64 |
| 12 | 66 | 70 | 64 |
| 13 | 68 | 72 | 65 |
| 14 | 69 | 74 | 66 |
| 15 | 71 | 77 | 67 |
| 16 | 73 | 80 | 68 |
| 17 | 75 | 83 | 70 |
| 18 | 77 | 86 | 71 |
| 19 | 79 | 90 | 73 |
| 20 | 81 | 93 | 75 |
| 21 | 83 | 97 | 77 |
| 22 | 85 | 101 | 79 |
| 23 | 87 | 104 | 81 |
| 24 | 89 | 108 | 83 |
| 25 | 92 | 111 | 85 |
| 26 | 94 | 113 | 87 |
| 27 | 96 | 116 | 89 |
| 28 | 98 | 119 | 91 |
| 29 | 100 | 121 | 93 |
| 30 | 102 | 123 | 94 |
| 31 | 104 | 126 | 96 |
| 32 | 109 | 128 | 98 |
| 33 | 111 | 130 | 100 |
| 34 | 113 | 132 | 102 |
| 35 | 114 | 134 | 104 |
| 36 | 115 | 136 | 105 |
| 37 | 116 | 138 | 107 |
| 38 | 117 | 140 | 109 |

| Time (min) | 3" Al., Center Conduit in Lower Array Surface Average (°F) | 3" Al., Center Conduit in Lower Array Bare #8 Maximum (°F) | 3" Al., Center Conduit in Lower Array Bare #8 Average (°F) |
|---------------|---|---|---|
| 39 | 118 | 142 | 111 |
| 40 | 119 | 144 | 112 |
| 41 | 122 | 146 | 114 |
| 42 | 122 | 147 | 115 |
| 43 | 124 | 149 | 117 |
| 44 | 126 | 150 | 119 |
| 45 | 126 | 152 | 120 |
| 46 | 127 | 153 | 122 |
| 47 | 129 | 155 | 123 |
| 48 | 130 | 156 | 125 |
| 49 | 131 | 158 | 126 |
| 50 | 134 | 159 | 128 |
| 51 | 135 | 161 | 130 |
| 52 | 135 | 162 | 131 |
| 53 | 137 | 164 | 133 |
| 54 | 139 | 165 | 134 |
| 55 | 140 | 167 | 136 |
| 56 | 142 | 169 | 138 |
| 57 | 144 | 171 | 139 |
| 58 | 145 | 172 | 141 |
| 59 | 147 | 174 | 143 |
| 60 | 149 | 176 | 144 |
| Max Temp: | 149 | 176 | 144 |
| Max Allowed: | 312 | 388 | 313 |

| Time (min) | 3" Al., Right Conduit in Lower Array Surface Maximum (°F) | 3" Al., Right Conduit in Lower Array Surface Average (°F) | 3" Al., Right Conduit in Lower Array Bare #8 Maximum (°F) |
|---------------|--|--|--|
| 0 | 63 | 62 | 63 |
| 1 | 63 | 62 | 64 |
| 2 | 63 | 62 | 63 |
| 3 | 63 | 62 | 63 |
| 4 | 62 | 62 | 64 |
| 5 | 62 | 62 | 64 |
| 6 | 62 | 62 | 64 |
| 7 | 62 | 62 | 64 |
| 8 | 64 | 63 | 64 |
| 9 | 64 | 63 | 65 |
| 10 | 66 | 64 | 66 |
| 11 | 68 | 65 | 67 |
| 12 | 71 | 66 | 69 |
| 13 | 74 | 67 | 71 |
| 14 | 77 | 69 | 74 |
| 15 | 80 | 71 | 76 |
| 16 | 84 | 73 | 79 |
| 17 | 87 | 75 | 82 |
| 18 | 91 | 77 | 86 |
| 19 | 93 | 79 | 90 |
| 20 | 96 | 81 | 93 |
| 21 | 99 | 84 | 97 |
| 22 | 102 | 86 | 101 |
| 23 | 104 | 88 | 104 |
| 24 | 107 | 90 | 108 |
| 25 | 109 | 92 | 111 |
| 26 | 110 | 94 | 113 |
| 27 | 112 | 96 | 116 |
| 28 | 114 | 98 | 119 |
| 29 | 115 | 100 | 121 |
| 30 | 116 | 101 | 123 |
| 31 | 118 | 103 | 125 |
| 32 | 122 | 108 | 127 |
| 33 | 123 | 109 | 129 |
| 34 | 125 | 112 | 131 |
| 35 | 126 | 113 | 132 |
| 36 | 128 | 114 | 134 |
| 37 | 135 | 117 | 136 |
| 38 | 144 | 119 | 137 |

| Time (min) | 3" Al., Right Conduit in Lower Array Surface Maximum (°F) | 3" Al., Right Conduit in Lower Array Surface Average (°F) | 3" Al., Right Conduit in Lower Array Bare #8 Maximum (°F) |
|---------------------|--|--|--|
| 39 | 150 | 120 | 139 |
| 40 | 157 | 123 | 140 |
| 41 | 161 | 125 | 142 |
| 42 | 162 | 126 | 144 |
| 43 | 166 | 128 | 145 |
| 44 | 170 | 131 | 147 |
| 45 | 170 | 131 | 148 |
| 46 | 172 | 132 | 150 |
| 47 | 176 | 135 | 152 |
| 48 | 177 | 136 | 153 |
| 49 | 179 | 138 | 155 |
| 50 | 181 | 141 | 157 |
| 51 | 181 | 142 | 158 |
| 52 | 181 | 142 | 160 |
| 53 | 182 | 145 | 162 |
| 54 | 183 | 146 | 164 |
| 55 | 183 | 147 | 166 |
| 56 | 183 | 149 | 168 |
| 57 | 184 | 151 | 169 |
| 58 | 184 | 152 | 171 |
| 59 | 185 | 154 | 173 |
| 60 | 187 | 156 | 175 |
| Max Temp: | 187 | 156 | 175 |
| Max Allowed: | 388 | 312 | 388 |

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| Time (min) | 3" Al., Right Conduit in Lower Array Bare #8 Average (°F) | Junction Box Interior Surface Maximum (°F) | Junction Box Interior Surface Average (°F) |
|---------------|--|---|---|
| 0 | 63 | 63 | 62 |
| 1 | 63 | 63 | 62 |
| 2 | 63 | 63 | 62 |
| 3 | 63 | 63 | 62 |
| 4 | 63 | 63 | 62 |
| 5 | 63 | 63 | 62 |
| 6 | 63 | 65 | 63 |
| 7 | 63 | 67 | 64 |
| 8 | 63 | 69 | 65 |
| 9 | 63 | 72 | 66 |
| 10 | 64 | 75 | 68 |
| 11 | 64 | 79 | 70 |
| 12 | 65 | 82 | 72 |
| 13 | 65 | 86 | 75 |
| 14 | 66 | 90 | 77 |
| 15 | 67 | 94 | 80 |
| 16 | 68 | 97 | 83 |
| 17 | 70 | 101 | 86 |
| 18 | 71 | 106 | 89 |
| 19 | 73 | 110 | 92 |
| 20 | 75 | 114 | 96 |
| 21 | 77 | 119 | 100 |
| 22 | 79 | 123 | 103 |
| 23 | 81 | 127 | 106 |
| 24 | 83 | 132 | 109 |
| 25 | 85 | 135 | 112 |
| 26 | 87 | 139 | 115 |
| 27 | 89 | 143 | 118 |
| 28 | 90 | 148 | 122 |
| 29 | 92 | 155 | 127 |
| 30 | 94 | 160 | 131 |
| 31 | 96 | 164 | 133 |
| 32 | 98 | 169 | 137 |
| 33 | 100 | 175 | 141 |
| 34 | 101 | 178 | 143 |
| 35 | 103 | 181 | 146 |
| 36 | 105 | 184 | 148 |
| 37 | 106 | 188 | 151 |
| 38 | 108 | 192 | 155 |

OMEGA POINT
LABORATORIES

| Time (min) | 3" Al., Right Conduit in Lower Array Bare #8 Average (°F) | Junction Box Interior Surface Maximum (°F) | Junction Box Interior Surface Average (°F) |
|---------------------|--|---|---|
| 39 | 110 | 196 | 158 |
| 40 | 111 | 200 | 162 |
| 41 | 113 | 208 | 165 |
| 42 | 115 | 210 | 169 |
| 43 | 116 | 211 | 172 |
| 44 | 118 | 211 | 176 |
| 45 | 120 | 215 | 181 |
| 46 | 121 | 217 | 183 |
| 47 | 123 | 219 | 185 |
| 48 | 125 | 220 | 186 |
| 49 | 126 | 221 | 189 |
| 50 | 128 | 222 | 191 |
| 51 | 130 | 223 | 193 |
| 52 | 131 | 221 | 192 |
| 53 | 133 | 220 | 193 |
| 54 | 135 | 219 | 192 |
| 55 | 136 | 221 | 196 |
| 56 | 138 | 221 | 197 |
| 57 | 140 | 220 | 197 |
| 58 | 142 | 221 | 198 |
| 59 | 143 | 220 | 198 |
| 60 | 145 | 221 | 200 |
| Max Temp: | 145 | 223 | 200 |
| Max Allowed: | 313 | 388 | 312 |



| 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 | 63 | 62 | 63 | 62 | 62 | 62 | 62 | 62 | 62 |
| 1 | 63 | 62 | 63 | 62 | 62 | 62 | 62 | 62 | 62 |
| 2 | 63 | 62 | 63 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 62 | 61 | 62 | 61 | 61 | 61 | 61 | 61 | 61 |
| 4 | 62 | 61 | 62 | 62 | 61 | 62 | 61 | 61 | 61 |
| 5 | 62 | 61 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 61 | 62 | 62 | 62 | 62 | 62 | 61 | 62 |
| 7 | 62 | 61 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 8 | 62 | 61 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 9 | 63 | 62 | 62 | 62 | 62 | 63 | 63 | 62 | 62 |
| 10 | 64 | 62 | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| 11 | 64 | 63 | 64 | 64 | 64 | 64 | 64 | 64 | 63 |
| 12 | 65 | 64 | 64 | 64 | 65 | 66 | 65 | 65 | 64 |
| 13 | 66 | 65 | 65 | 66 | 67 | 67 | 67 | 66 | 66 |
| 14 | 68 | 66 | 66 | 67 | 68 | 69 | 68 | 68 | 67 |
| 15 | 69 | 68 | 68 | 69 | 70 | 71 | 70 | 70 | 69 |
| 16 | 71 | 70 | 69 | 70 | 72 | 73 | 73 | 72 | 71 |
| 17 | 73 | 71 | 71 | 72 | 74 | 76 | 75 | 74 | 73 |
| 18 | 75 | 73 | 73 | 75 | 77 | 78 | 77 | 76 | 75 |
| 19 | 77 | 75 | 75 | 77 | 79 | 81 | 80 | 79 | 78 |
| 20 | 79 | 77 | 77 | 79 | 81 | 83 | 83 | 81 | 80 |
| 21 | 81 | 79 | 79 | 81 | 84 | 85 | 85 | 84 | 82 |
| 22 | 84 | 82 | 82 | 84 | 86 | 88 | 87 | 86 | 85 |
| 23 | 86 | 84 | 84 | 86 | 89 | 90 | 90 | 89 | 87 |
| 24 | 88 | 86 | 86 | 89 | 91 | 93 | 93 | 92 | 90 |
| 25 | 91 | 89 | 89 | 91 | 94 | 95 | 95 | 95 | 93 |
| 26 | 93 | 91 | 91 | 94 | 96 | 98 | 98 | 97 | 95 |
| 27 | 96 | 94 | 94 | 96 | 98 | 100 | 100 | 100 | 98 |
| 28 | 98 | 96 | 96 | 98 | 101 | 102 | 103 | 102 | 100 |
| 29 | 100 | 98 | 98 | 100 | 102 | 104 | 104 | 104 | 102 |
| 30 | 102 | 100 | 100 | 103 | 104 | 106 | 107 | 106 | 104 |
| 31 | 104 | 102 | 102 | 105 | 107 | 108 | 109 | 108 | 106 |
| 32 | 106 | 104 | 104 | 107 | 108 | 110 | 110 | 110 | 108 |
| 33 | 108 | 106 | 106 | 108 | 110 | 111 | 112 | 111 | 109 |
| 34 | 110 | 108 | 109 | 111 | 112 | 113 | 114 | 113 | 111 |
| 35 | 112 | 110 | 111 | 113 | 114 | 115 | 115 | 115 | 113 |
| 36 | 114 | 112 | 113 | 115 | 116 | 117 | 117 | 117 | 115 |
| 37 | 116 | 114 | 115 | 116 | 117 | 118 | 119 | 118 | 116 |
| 38 | 118 | 117 | 117 | 118 | 119 | 120 | 120 | 119 | 118 |
| 39 | 120 | 119 | 119 | 120 | 121 | 122 | 122 | 121 | 119 |
| 40 | 122 | 121 | 121 | 122 | 123 | 123 | 123 | 122 | 121 |

| 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 | 124 | 122 | 123 | 123 | 124 | 125 | 125 | 124 | 122 |
| 42 | 126 | 124 | 125 | 125 | 126 | 127 | 127 | 125 | 124 |
| 43 | 128 | 126 | 127 | 127 | 128 | 129 | 129 | 127 | 125 |
| 44 | 129 | 128 | 128 | 128 | 130 | 130 | 130 | 128 | 126 |
| 45 | 130 | 129 | 130 | 129 | 132 | 132 | 132 | 130 | 127 |
| 46 | 132 | 131 | 131 | 132 | 134 | 135 | 134 | 132 | 129 |
| 47 | 134 | 133 | 134 | 134 | 136 | 137 | 137 | 134 | 131 |
| 48 | 137 | 136 | 136 | 136 | 139 | 140 | 139 | 136 | 133 |
| 49 | 139 | 138 | 138 | 138 | 141 | 142 | 141 | 139 | 135 |
| 50 | 141 | 140 | 140 | 140 | 144 | 144 | 144 | 140 | 137 |
| 51 | 143 | 142 | 141 | 142 | 146 | 147 | 146 | 143 | 139 |
| 52 | 147 | 145 | 145 | 145 | 149 | 150 | 149 | 146 | 141 |
| 53 | 149 | 148 | 147 | 148 | 152 | 153 | 152 | 148 | 144 |
| 54 | 152 | 151 | 150 | 150 | 155 | 157 | 155 | 151 | 147 |
| 55 | 154 | 153 | 152 | 153 | 158 | 159 | 158 | 154 | 149 |
| 56 | 157 | 156 | 154 | 156 | 161 | 162 | 161 | 157 | 151 |
| 57 | 160 | 158 | 157 | 158 | 164 | 165 | 164 | 160 | 154 |
| 58 | 164 | 162 | 160 | 161 | 167 | 168 | 167 | 163 | 157 |
| 59 | 167 | 165 | 163 | 164 | 170 | 171 | 170 | 166 | 160 |
| 60 | 170 | 167 | 165 | 167 | 173 | 174 | 173 | 168 | 163 |
| Max Temp: | 170 | 167 | 165 | 167 | 173 | 174 | 173 | 168 | 163 |
| Max Allowed: | 388 | 387 | 388 | 387 | 387 | 387 | 387 | 387 | 387 |

| Time (min) | TC # 10 (°F) | TC # 11 (°F) | TC # 12 (°F) | TC # 13 (°F) | TC # 14 (°F) | TC # 15 (°F) | TC # 16 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 62 | 62 | 62 | 63 | 62 | 62 | 63 |
| 1 | 62 | 62 | 62 | 63 | 62 | 62 | 63 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 | 63 |
| 3 | 61 | 61 | 61 | 62 | 61 | 62 | 62 |
| 4 | 62 | 62 | 61 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 | 63 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 62 | 63 |
| 8 | 62 | 62 | 62 | 63 | 62 | 62 | 63 |
| 9 | 63 | 63 | 63 | 64 | 63 | 63 | 64 |
| 10 | 64 | 64 | 64 | 65 | 64 | 64 | 65 |
| 11 | 64 | 65 | 65 | 66 | 65 | 65 | 66 |
| 12 | 66 | 67 | 67 | 67 | 67 | 67 | 67 |
| 13 | 67 | 68 | 68 | 69 | 68 | 68 | 69 |
| 14 | 68 | 70 | 70 | 71 | 71 | 71 | 70 |
| 15 | 70 | 72 | 72 | 73 | 73 | 73 | 73 |
| 16 | 72 | 75 | 75 | 75 | 75 | 75 | 75 |
| 17 | 74 | 77 | 77 | 77 | 78 | 78 | 78 |
| 18 | 76 | 79 | 79 | 80 | 80 | 80 | 81 |
| 19 | 79 | 82 | 82 | 83 | 83 | 83 | 83 |
| 20 | 81 | 84 | 84 | 85 | 86 | 86 | 86 |
| 21 | 83 | 86 | 86 | 87 | 88 | 89 | 89 |
| 22 | 86 | 89 | 89 | 90 | 90 | 91 | 92 |
| 23 | 88 | 91 | 91 | 92 | 93 | 94 | 94 |
| 24 | 91 | 93 | 93 | 95 | 95 | 97 | 97 |
| 25 | 93 | 96 | 96 | 97 | 98 | 99 | 100 |
| 26 | 96 | 98 | 98 | 99 | 100 | 102 | 102 |
| 27 | 98 | 100 | 100 | 102 | 102 | 104 | 105 |
| 28 | 100 | 102 | 102 | 104 | 104 | 106 | 107 |
| 29 | 102 | 104 | 104 | 106 | 106 | 108 | 109 |
| 30 | 104 | 106 | 106 | 107 | 108 | 110 | 112 |
| 31 | 106 | 108 | 108 | 109 | 110 | 112 | 114 |
| 32 | 108 | 109 | 109 | 110 | 111 | 114 | 115 |
| 33 | 109 | 111 | 111 | 112 | 113 | 115 | 117 |
| 34 | 111 | 113 | 112 | 114 | 114 | 117 | 119 |
| 35 | 113 | 115 | 114 | 115 | 116 | 119 | 120 |
| 36 | 115 | 117 | 116 | 117 | 118 | 121 | 122 |
| 37 | 117 | 119 | 118 | 119 | 120 | 122 | 124 |
| 38 | 118 | 120 | 120 | 121 | 122 | 124 | 125 |
| 39 | 120 | 122 | 122 | 123 | 123 | 125 | 126 |
| 40 | 122 | 124 | 124 | 125 | 125 | 127 | 128 |

| Time (min) | TC # 10 (°F) | TC # 11 (°F) | TC # 12 (°F) | TC # 13 (°F) | TC # 14 (°F) | TC # 15 (°F) | TC # 16 (°F) |
|---------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 41 | 123 | 127 | 126 | 127 | 127 | 129 | 130 |
| 42 | 125 | 128 | 128 | 129 | 129 | 130 | 131 |
| 43 | 126 | 130 | 131 | 131 | 131 | 132 | 132 |
| 44 | 128 | 132 | 132 | 133 | 133 | 133 | 133 |
| 45 | 129 | 134 | 134 | 135 | 134 | 134 | 134 |
| 46 | 131 | 136 | 137 | 137 | 136 | 136 | 136 |
| 47 | 133 | 139 | 139 | 140 | 138 | 138 | 137 |
| 48 | 136 | 141 | 142 | 142 | 141 | 140 | 139 |
| 49 | 138 | 143 | 144 | 145 | 143 | 142 | 141 |
| 50 | 140 | 146 | 147 | 147 | 145 | 143 | 142 |
| 51 | 142 | 148 | 149 | 149 | 147 | 145 | 144 |
| 52 | 145 | 151 | 152 | 152 | 150 | 148 | 146 |
| 53 | 147 | 154 | 155 | 155 | 153 | 150 | 148 |
| 54 | 150 | 157 | 158 | 158 | 156 | 153 | 150 |
| 55 | 152 | 159 | 160 | 160 | 158 | 154 | 152 |
| 56 | 154 | 162 | 163 | 163 | 160 | 157 | 154 |
| 57 | 157 | 165 | 166 | 166 | 163 | 159 | 156 |
| 58 | 160 | 168 | 169 | 169 | 166 | 162 | 158 |
| 59 | 163 | 170 | 172 | 172 | 169 | 165 | 160 |
| 60 | 166 | 173 | 175 | 175 | 171 | 167 | 162 |
| Max Temp: | 166 | 173 | 175 | 175 | 171 | 167 | 162 |
| Max Allowed: | 387 | 387 | 387 | 388 | 387 | 387 | 388 |



| Time (min) | TC # 17 (°F) | TC # 18 (°F) | TC # 19 (°F) | TC # 20 (°F) | TC # 21 (°F) | TC # 22 (°F) | TC # 23 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 63 | 63 | 62 | 62 | 62 | 62 | 63 |
| 1 | 63 | 63 | 62 | 63 | 62 | 62 | 63 |
| 2 | 63 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 62 | 62 | 61 | 62 | 61 | 61 | 62 |
| 4 | 62 | 62 | 62 | 62 | 61 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 61 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 61 | 62 | 62 |
| 8 | 62 | 63 | 62 | 62 | 61 | 61 | 62 |
| 9 | 63 | 63 | 62 | 62 | 62 | 62 | 62 |
| 10 | 63 | 64 | 62 | 62 | 62 | 62 | 62 |
| 11 | 63 | 65 | 63 | 62 | 62 | 62 | 62 |
| 12 | 64 | 67 | 63 | 63 | 62 | 62 | 63 |
| 13 | 65 | 68 | 64 | 63 | 62 | 63 | 63 |
| 14 | 67 | 70 | 64 | 64 | 63 | 63 | 64 |
| 15 | 68 | 72 | 65 | 64 | 64 | 64 | 64 |
| 16 | 70 | 74 | 66 | 65 | 64 | 65 | 65 |
| 17 | 71 | 76 | 67 | 66 | 65 | 65 | 66 |
| 18 | 73 | 78 | 68 | 67 | 66 | 66 | 67 |
| 19 | 76 | 80 | 69 | 68 | 67 | 67 | 68 |
| 20 | 78 | 82 | 71 | 69 | 68 | 68 | 69 |
| 21 | 80 | 85 | 72 | 71 | 69 | 70 | 70 |
| 22 | 83 | 87 | 73 | 72 | 71 | 71 | 71 |
| 23 | 85 | 90 | 75 | 74 | 73 | 73 | 73 |
| 24 | 88 | 92 | 77 | 75 | 74 | 75 | 75 |
| 25 | 91 | 95 | 78 | 77 | 76 | 76 | 76 |
| 26 | 94 | 98 | 80 | 79 | 78 | 78 | 78 |
| 27 | 96 | 100 | 82 | 81 | 80 | 80 | 80 |
| 28 | 99 | 102 | 84 | 83 | 82 | 82 | 82 |
| 29 | 101 | 104 | 86 | 85 | 84 | 84 | 84 |
| 30 | 103 | 107 | 88 | 87 | 86 | 86 | 86 |
| 31 | 105 | 109 | 90 | 89 | 88 | 88 | 87 |
| 32 | 107 | 111 | 91 | 90 | 89 | 89 | 89 |
| 33 | 109 | 112 | 93 | 92 | 91 | 91 | 90 |
| 34 | 111 | 114 | 95 | 95 | 94 | 93 | 93 |
| 35 | 113 | 116 | 98 | 97 | 96 | 95 | 95 |
| 36 | 115 | 118 | 100 | 99 | 98 | 97 | 97 |
| 37 | 117 | 120 | 102 | 101 | 100 | 99 | 98 |
| 38 | 118 | 122 | 104 | 104 | 102 | 101 | 100 |
| 39 | 120 | 123 | 106 | 105 | 104 | 103 | 102 |
| 40 | 122 | 125 | 108 | 107 | 106 | 105 | 104 |

| Time (min) | TC # 17 (°F) | TC # 18 (°F) | TC # 19 (°F) | TC # 20 (°F) | TC # 21 (°F) | TC # 22 (°F) | TC # 23 (°F) |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 41 | 123 | 126 | 110 | 109 | 107 | 106 | 105 |
| 42 | 124 | 128 | 112 | 111 | 109 | 108 | 107 |
| 43 | 126 | 130 | 114 | 113 | 111 | 109 | 108 |
| 44 | 127 | 131 | 115 | 114 | 112 | 111 | 109 |
| 45 | 128 | 132 | 117 | 115 | 113 | 112 | 110 |
| 46 | 130 | 134 | 118 | 117 | 115 | 113 | 112 |
| 47 | 131 | 137 | 120 | 119 | 116 | 115 | 114 |
| 48 | 133 | 139 | 122 | 120 | 118 | 117 | 115 |
| 49 | 135 | 141 | 124 | 122 | 120 | 118 | 117 |
| 50 | 136 | 143 | 125 | 123 | 121 | 119 | 118 |
| 51 | 138 | 145 | 126 | 124 | 122 | 121 | 119 |
| 52 | 140 | 148 | 128 | 126 | 124 | 123 | 122 |
| 53 | 142 | 149 | 130 | 127 | 125 | 124 | 123 |
| 54 | 144 | 151 | 131 | 129 | 127 | 126 | 125 |
| 55 | 146 | 152 | 132 | 130 | 128 | 127 | 126 |
| 56 | 148 | 154 | 134 | 132 | 130 | 128 | 127 |
| 57 | 150 | 156 | 136 | 133 | 131 | 130 | 128 |
| 58 | 152 | 158 | 138 | 135 | 133 | 131 | 130 |
| 59 | 154 | 160 | 139 | 137 | 135 | 132 | 131 |
| 60 | 156 | 162 | 141 | 138 | 136 | 134 | 133 |
| Max Temp: | 156 | 162 | 141 | 138 | 136 | 134 | 133 |
| Max Allowed: | 388 | 388 | 387 | 387 | 387 | 387 | 388 |

| Time (min) | TC # 24 (°F) | TC # 25 (°F) | TC # 26 (°F) | TC # 27 (°F) | TC # 28 (°F) | TC # 29 (°F) | TC # 30 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 63 | 62 | 63 | 63 | 63 | 62 | 62 |
| 1 | 63 | 62 | 62 | 63 | 63 | 62 | 62 |
| 2 | 63 | 62 | 62 | 62 | 63 | 62 | 62 |
| 3 | 62 | 61 | 62 | 62 | 62 | 61 | 61 |
| 4 | 62 | 62 | 62 | 62 | 62 | 61 | 61 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 | 61 |
| 7 | 62 | 62 | 62 | 62 | 62 | 61 | 61 |
| 8 | 62 | 62 | 62 | 62 | 62 | 61 | 61 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 63 | 62 | 62 | 62 | 62 | 62 | 62 |
| 12 | 63 | 63 | 62 | 62 | 63 | 62 | 62 |
| 13 | 63 | 63 | 63 | 62 | 63 | 63 | 63 |
| 14 | 64 | 63 | 63 | 63 | 63 | 63 | 63 |
| 15 | 64 | 64 | 64 | 63 | 64 | 64 | 64 |
| 16 | 65 | 65 | 64 | 64 | 64 | 65 | 65 |
| 17 | 66 | 66 | 65 | 64 | 65 | 66 | 66 |
| 18 | 67 | 66 | 65 | 65 | 65 | 66 | 67 |
| 19 | 68 | 67 | 66 | 65 | 66 | 68 | 68 |
| 20 | 69 | 68 | 67 | 66 | 67 | 69 | 69 |
| 21 | 70 | 69 | 68 | 67 | 68 | 70 | 70 |
| 22 | 71 | 71 | 69 | 68 | 69 | 71 | 72 |
| 23 | 73 | 72 | 71 | 69 | 70 | 73 | 73 |
| 24 | 75 | 74 | 72 | 70 | 72 | 74 | 75 |
| 25 | 77 | 75 | 74 | 72 | 73 | 76 | 77 |
| 26 | 78 | 77 | 75 | 73 | 75 | 77 | 78 |
| 27 | 80 | 79 | 77 | 75 | 77 | 79 | 80 |
| 28 | 82 | 81 | 79 | 77 | 78 | 81 | 82 |
| 29 | 83 | 82 | 80 | 78 | 80 | 82 | 83 |
| 30 | 85 | 84 | 82 | 80 | 81 | 84 | 85 |
| 31 | 87 | 86 | 84 | 82 | 83 | 86 | 87 |
| 32 | 89 | 87 | 85 | 83 | 84 | 87 | 88 |
| 33 | 90 | 89 | 87 | 84 | 86 | 89 | 89 |
| 34 | 92 | 91 | 89 | 86 | 88 | 91 | 92 |
| 35 | 94 | 93 | 91 | 88 | 90 | 93 | 93 |
| 36 | 96 | 95 | 93 | 90 | 92 | 95 | 95 |
| 37 | 98 | 97 | 95 | 92 | 93 | 96 | 97 |
| 38 | 100 | 98 | 96 | 94 | 95 | 98 | 99 |
| 39 | 102 | 100 | 98 | 95 | 97 | 99 | 100 |
| 40 | 103 | 102 | 100 | 97 | 98 | 101 | 102 |

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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) |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 41 | 104 | 103 | 101 | 99 | 100 | 103 | 103 |
| 42 | 106 | 104 | 103 | 101 | 102 | 104 | 105 |
| 43 | 107 | 106 | 104 | 102 | 103 | 105 | 106 |
| 44 | 108 | 107 | 105 | 103 | 104 | 107 | 107 |
| 45 | 109 | 108 | 106 | 104 | 105 | 108 | 108 |
| 46 | 111 | 109 | 108 | 106 | 107 | 109 | 110 |
| 47 | 113 | 111 | 110 | 108 | 109 | 111 | 111 |
| 48 | 114 | 113 | 111 | 110 | 111 | 113 | 113 |
| 49 | 116 | 114 | 113 | 112 | 112 | 114 | 114 |
| 50 | 117 | 115 | 114 | 113 | 114 | 115 | 116 |
| 51 | 118 | 117 | 116 | 115 | 115 | 117 | 117 |
| 52 | 120 | 119 | 118 | 117 | 117 | 119 | 119 |
| 53 | 122 | 121 | 119 | 118 | 119 | 120 | 121 |
| 54 | 124 | 122 | 121 | 120 | 121 | 122 | 123 |
| 55 | 125 | 123 | 122 | 121 | 122 | 123 | 123 |
| 56 | 126 | 125 | 123 | 122 | 123 | 125 | 125 |
| 57 | 127 | 126 | 125 | 124 | 125 | 126 | 127 |
| 58 | 129 | 128 | 126 | 125 | 126 | 128 | 128 |
| 59 | 131 | 129 | 128 | 127 | 128 | 129 | 130 |
| 60 | 132 | 130 | 129 | 127 | 129 | 131 | 131 |
| Max Temp: | 132 | 130 | 129 | 127 | 129 | 131 | 131 |
| Max Allowed: | 388 | 387 | 388 | 388 | 388 | 387 | 387 |



| Time (min) | TC # 31 (°F) | TC # 32 (°F) | TC # 33 (°F) | TC # 34 (°F) | TC # 35 (°F) | TC # 36 (°F) | TC # 37 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 62 | 62 | 62 | 62 | 63 | 63 | 63 |
| 1 | 62 | 62 | 62 | 62 | 63 | 63 | 63 |
| 2 | 62 | 62 | 62 | 62 | 63 | 63 | 63 |
| 3 | 61 | 61 | 61 | 61 | 62 | 62 | 62 |
| 4 | 61 | 61 | 61 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 61 | 61 | 62 | 62 | 62 | 62 | 62 |
| 7 | 61 | 61 | 62 | 62 | 62 | 62 | 62 |
| 8 | 61 | 61 | 61 | 61 | 62 | 62 | 62 |
| 9 | 62 | 62 | 62 | 62 | 63 | 62 | 63 |
| 10 | 62 | 62 | 62 | 62 | 63 | 63 | 64 |
| 11 | 62 | 62 | 62 | 62 | 63 | 63 | 65 |
| 12 | 63 | 63 | 63 | 62 | 64 | 64 | 66 |
| 13 | 63 | 63 | 63 | 63 | 65 | 64 | 68 |
| 14 | 64 | 64 | 64 | 63 | 66 | 65 | 70 |
| 15 | 64 | 64 | 64 | 64 | 67 | 65 | 72 |
| 16 | 65 | 65 | 65 | 64 | 68 | 66 | 75 |
| 17 | 66 | 66 | 66 | 65 | 69 | 67 | 77 |
| 18 | 67 | 67 | 67 | 66 | 70 | 68 | 80 |
| 19 | 68 | 68 | 69 | 67 | 71 | 69 | 83 |
| 20 | 69 | 70 | 70 | 68 | 72 | 70 | 85 |
| 21 | 71 | 71 | 71 | 68 | 74 | 71 | 87 |
| 22 | 72 | 72 | 72 | 70 | 75 | 72 | 89 |
| 23 | 74 | 74 | 74 | 71 | 76 | 73 | 91 |
| 24 | 76 | 76 | 76 | 72 | 78 | 74 | 94 |
| 25 | 77 | 77 | 77 | 74 | 79 | 76 | 96 |
| 26 | 79 | 79 | 79 | 75 | 81 | 77 | 98 |
| 27 | 81 | 81 | 81 | 76 | 82 | 78 | 100 |
| 28 | 83 | 83 | 83 | 78 | 83 | 80 | 102 |
| 29 | 84 | 84 | 84 | 79 | 85 | 81 | 104 |
| 30 | 86 | 86 | 86 | 80 | 86 | 82 | 106 |
| 31 | 88 | 88 | 88 | 82 | 88 | 83 | 107 |
| 32 | 89 | 89 | 89 | 83 | 89 | 84 | 109 |
| 33 | 91 | 91 | 91 | 84 | 90 | 85 | 110 |
| 34 | 93 | 93 | 93 | 86 | 92 | 87 | 112 |
| 35 | 95 | 95 | 95 | 88 | 93 | 89 | 114 |
| 36 | 96 | 97 | 97 | 90 | 95 | 90 | 116 |
| 37 | 98 | 98 | 99 | 91 | 96 | 92 | 117 |
| 38 | 100 | 100 | 100 | 93 | 98 | 93 | 118 |
| 39 | 101 | 102 | 102 | 94 | 99 | 95 | 119 |
| 40 | 103 | 103 | 104 | 96 | 100 | 96 | 120 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 31 (°F) | TC # 32 (°F) | TC # 33 (°F) | TC # 34 (°F) | TC # 35 (°F) | TC # 36 (°F) | TC # 37 (°F) |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 41 | 104 | 105 | 105 | 97 | 102 | 98 | 121 |
| 42 | 106 | 106 | 107 | 99 | 103 | 99 | 123 |
| 43 | 107 | 108 | 108 | 100 | 104 | 100 | 124 |
| 44 | 108 | 109 | 109 | 102 | 105 | 102 | 124 |
| 45 | 109 | 110 | 111 | 103 | 106 | 103 | 125 |
| 46 | 111 | 112 | 112 | 104 | 108 | 105 | 126 |
| 47 | 113 | 113 | 114 | 106 | 110 | 107 | 128 |
| 48 | 114 | 115 | 116 | 108 | 112 | 109 | 130 |
| 49 | 115 | 116 | 117 | 110 | 113 | 111 | 132 |
| 50 | 117 | 118 | 118 | 111 | 114 | 112 | 133 |
| 51 | 118 | 119 | 120 | 113 | 116 | 114 | 135 |
| 52 | 120 | 121 | 122 | 115 | 119 | 116 | 138 |
| 53 | 122 | 123 | 124 | 117 | 121 | 118 | 140 |
| 54 | 124 | 125 | 126 | 119 | 123 | 119 | 143 |
| 55 | 125 | 126 | 127 | 121 | 124 | 120 | 145 |
| 56 | 126 | 127 | 129 | 122 | 125 | 122 | 147 |
| 57 | 128 | 129 | 130 | 124 | 127 | 124 | 150 |
| 58 | 129 | 131 | 132 | 126 | 129 | 125 | 152 |
| 59 | 131 | 132 | 133 | 128 | 130 | 127 | 155 |
| 60 | 132 | 133 | 134 | 129 | 132 | 128 | 157 |
| Max Temp: | 132 | 133 | 134 | 129 | 132 | 128 | 157 |
| Max Allowed: | 387 | 387 | 387 | 387 | 388 | 388 | 388 |

| Time (min) | TC # 38 (°F) | TC # 39 (°F) | TC # 40 (°F) | TC # 41 (°F) | TC # 42 (°F) | TC # 43 (°F) | TC # 44 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 62 | 62 | 63 | 62 | 62 | 62 | 62 |
| 1 | 62 | 62 | 63 | 62 | 62 | 62 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 61 | 61 | 62 | 61 | 61 | 61 | 61 |
| 4 | 61 | 62 | 62 | 61 | 61 | 61 | 61 |
| 5 | 62 | 62 | 62 | 62 | 62 | 61 | 61 |
| 6 | 61 | 62 | 62 | 61 | 62 | 61 | 61 |
| 7 | 62 | 62 | 62 | 62 | 62 | 61 | 61 |
| 8 | 62 | 62 | 62 | 62 | 62 | 62 | 61 |
| 9 | 63 | 63 | 63 | 63 | 63 | 62 | 62 |
| 10 | 63 | 64 | 64 | 63 | 64 | 63 | 63 |
| 11 | 64 | 64 | 65 | 64 | 64 | 63 | 63 |
| 12 | 66 | 66 | 66 | 65 | 65 | 64 | 64 |
| 13 | 67 | 67 | 67 | 66 | 67 | 65 | 65 |
| 14 | 69 | 68 | 68 | 68 | 68 | 67 | 65 |
| 15 | 71 | 70 | 70 | 69 | 69 | 68 | 67 |
| 16 | 74 | 72 | 71 | 71 | 71 | 69 | 68 |
| 17 | 76 | 73 | 73 | 72 | 72 | 70 | 69 |
| 18 | 78 | 75 | 74 | 74 | 74 | 72 | 70 |
| 19 | 81 | 77 | 76 | 76 | 75 | 73 | 71 |
| 20 | 83 | 79 | 78 | 77 | 77 | 75 | 73 |
| 21 | 85 | 81 | 80 | 79 | 78 | 76 | 74 |
| 22 | 87 | 83 | 82 | 81 | 80 | 78 | 75 |
| 23 | 89 | 85 | 83 | 83 | 82 | 79 | 77 |
| 24 | 91 | 87 | 85 | 84 | 84 | 81 | 79 |
| 25 | 93 | 89 | 87 | 86 | 86 | 83 | 80 |
| 26 | 95 | 91 | 89 | 88 | 87 | 85 | 82 |
| 27 | 97 | 92 | 91 | 90 | 89 | 86 | 83 |
| 28 | 99 | 94 | 92 | 91 | 91 | 88 | 85 |
| 29 | 101 | 96 | 94 | 93 | 92 | 89 | 86 |
| 30 | 103 | 98 | 96 | 94 | 94 | 91 | 88 |
| 31 | 104 | 99 | 97 | 96 | 95 | 92 | 89 |
| 32 | 106 | 101 | 99 | 97 | 96 | 93 | 90 |
| 33 | 107 | 102 | 100 | 99 | 98 | 94 | 91 |
| 34 | 109 | 104 | 102 | 101 | 100 | 96 | 93 |
| 35 | 111 | 106 | 104 | 103 | 101 | 97 | 94 |
| 36 | 112 | 108 | 106 | 105 | 103 | 99 | 96 |
| 37 | 114 | 110 | 108 | 106 | 105 | 101 | 97 |
| 38 | 115 | 111 | 109 | 108 | 106 | 102 | 98 |
| 39 | 117 | 113 | 111 | 110 | 108 | 104 | 100 |
| 40 | 118 | 114 | 113 | 111 | 109 | 105 | 101 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 38 (°F) | TC # 39 (°F) | TC # 40 (°F) | TC # 41 (°F) | TC # 42 (°F) | TC # 43 (°F) | TC # 44 (°F) |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 41 | 119 | 116 | 114 | 113 | 111 | 106 | 102 |
| 42 | 120 | 117 | 116 | 114 | 112 | 108 | 104 |
| 43 | 121 | 118 | 117 | 115 | 114 | 109 | 105 |
| 44 | 122 | 120 | 118 | 117 | 115 | 110 | 106 |
| 45 | 123 | 120 | 119 | 117 | 115 | 111 | 107 |
| 46 | 125 | 122 | 121 | 119 | 117 | 112 | 108 |
| 47 | 126 | 124 | 122 | 121 | 119 | 114 | 110 |
| 48 | 129 | 126 | 124 | 123 | 121 | 115 | 111 |
| 49 | 130 | 127 | 126 | 124 | 122 | 117 | 113 |
| 50 | 132 | 129 | 127 | 126 | 123 | 118 | 114 |
| 51 | 134 | 130 | 129 | 127 | 125 | 120 | 115 |
| 52 | 136 | 133 | 131 | 130 | 127 | 122 | 117 |
| 53 | 139 | 135 | 133 | 132 | 129 | 124 | 119 |
| 54 | 141 | 137 | 135 | 134 | 132 | 126 | 121 |
| 55 | 143 | 139 | 136 | 135 | 133 | 127 | 122 |
| 56 | 145 | 141 | 138 | 137 | 135 | 129 | 124 |
| 57 | 147 | 143 | 140 | 139 | 137 | 130 | 125 |
| 58 | 150 | 145 | 142 | 141 | 139 | 132 | 127 |
| 59 | 152 | 147 | 144 | 142 | 140 | 134 | 129 |
| 60 | 154 | 149 | 146 | 144 | 142 | 135 | 130 |
| Max Temp: | 154 | 149 | 146 | 144 | 142 | 135 | 130 |
| Max Allowed: | 387 | 387 | 388 | 387 | 387 | 387 | 387 |

| Time (min) | TC # 45 (°F) | TC # 46 (°F) | TC # 47 (°F) | TC # 48 (°F) | TC # 49 (°F) | TC # 50 (°F) | TC # 51 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 63 | 62 | 62 | 62 | 62 | 63 | 62 |
| 1 | 63 | 62 | 62 | 62 | 63 | 63 | 62 |
| 2 | 63 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 62 | 61 | 61 | 61 | 62 | 62 | 61 |
| 4 | 62 | 62 | 62 | 61 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 8 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 9 | 62 | 62 | 62 | 63 | 63 | 63 | 62 |
| 10 | 63 | 62 | 63 | 63 | 64 | 64 | 63 |
| 11 | 63 | 63 | 64 | 64 | 64 | 64 | 64 |
| 12 | 64 | 63 | 64 | 65 | 65 | 65 | 64 |
| 13 | 64 | 64 | 65 | 66 | 66 | 66 | 65 |
| 14 | 65 | 64 | 66 | 67 | 67 | 67 | 66 |
| 15 | 66 | 65 | 67 | 68 | 68 | 68 | 67 |
| 16 | 67 | 66 | 68 | 69 | 70 | 70 | 68 |
| 17 | 68 | 67 | 69 | 70 | 71 | 71 | 69 |
| 18 | 68 | 68 | 70 | 71 | 72 | 72 | 70 |
| 19 | 70 | 69 | 71 | 73 | 73 | 73 | 71 |
| 20 | 71 | 70 | 73 | 74 | 74 | 74 | 73 |
| 21 | 72 | 71 | 74 | 75 | 76 | 76 | 74 |
| 22 | 73 | 72 | 75 | 77 | 77 | 77 | 75 |
| 23 | 75 | 74 | 77 | 78 | 79 | 79 | 76 |
| 24 | 76 | 75 | 78 | 80 | 80 | 80 | 78 |
| 25 | 78 | 77 | 80 | 81 | 82 | 82 | 79 |
| 26 | 79 | 78 | 81 | 83 | 83 | 83 | 81 |
| 27 | 81 | 80 | 83 | 84 | 84 | 84 | 82 |
| 28 | 82 | 81 | 84 | 86 | 86 | 86 | 83 |
| 29 | 84 | 82 | 85 | 87 | 87 | 87 | 84 |
| 30 | 85 | 84 | 87 | 88 | 88 | 88 | 86 |
| 31 | 86 | 86 | 88 | 89 | 89 | 90 | 87 |
| 32 | 87 | 86 | 89 | 90 | 90 | 91 | 88 |
| 33 | 89 | 88 | 90 | 91 | 91 | 92 | 89 |
| 34 | 90 | 89 | 92 | 93 | 93 | 93 | 91 |
| 35 | 92 | 91 | 93 | 94 | 95 | 95 | 92 |
| 36 | 93 | 92 | 95 | 96 | 96 | 96 | 94 |
| 37 | 95 | 94 | 96 | 97 | 98 | 98 | 95 |
| 38 | 96 | 95 | 97 | 99 | 99 | 99 | 96 |
| 39 | 97 | 96 | 99 | 100 | 101 | 100 | 98 |
| 40 | 98 | 98 | 100 | 102 | 102 | 102 | 99 |

OMEGA POINT
LABORATORIES

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| Time (min) | TC # 45 (°F) | TC # 46 (°F) | TC # 47 (°F) | TC # 48 (°F) | TC # 49 (°F) | TC # 50 (°F) | TC # 51 (°F) |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 41 | 100 | 99 | 102 | 103 | 104 | 104 | 101 |
| 42 | 101 | 100 | 103 | 105 | 105 | 105 | 102 |
| 43 | 102 | 102 | 104 | 106 | 107 | 106 | 103 |
| 44 | 103 | 102 | 106 | 108 | 108 | 108 | 104 |
| 45 | 104 | 103 | 107 | 109 | 109 | 109 | 106 |
| 46 | 105 | 105 | 108 | 111 | 111 | 111 | 107 |
| 47 | 106 | 106 | 110 | 112 | 113 | 112 | 109 |
| 48 | 108 | 108 | 112 | 114 | 115 | 114 | 110 |
| 49 | 109 | 109 | 113 | 116 | 116 | 116 | 112 |
| 50 | 110 | 110 | 115 | 117 | 118 | 117 | 113 |
| 51 | 112 | 112 | 116 | 119 | 119 | 118 | 114 |
| 52 | 114 | 114 | 118 | 121 | 121 | 120 | 116 |
| 53 | 115 | 115 | 120 | 123 | 123 | 122 | 118 |
| 54 | 117 | 117 | 122 | 125 | 125 | 124 | 120 |
| 55 | 118 | 118 | 123 | 126 | 126 | 125 | 121 |
| 56 | 119 | 119 | 125 | 128 | 128 | 127 | 123 |
| 57 | 121 | 121 | 126 | 129 | 129 | 128 | 124 |
| 58 | 122 | 122 | 128 | 131 | 131 | 130 | 126 |
| 59 | 124 | 124 | 129 | 132 | 132 | 131 | 128 |
| 60 | 125 | 125 | 130 | 134 | 134 | 133 | 129 |
| Max Temp: | 125 | 125 | 130 | 134 | 134 | 133 | 129 |
| Max Allowed: | 388 | 387 | 387 | 387 | 387 | 388 | 387 |

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) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 63 | 63 | 63 | 62 | 62 | 63 | 62 |
| 1 | 63 | 63 | 63 | 62 | 63 | 63 | 62 |
| 2 | 63 | 63 | 62 | 62 | 62 | 63 | 62 |
| 3 | 62 | 62 | 62 | 61 | 61 | 62 | 61 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 | 61 |
| 5 | 63 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 | 61 |
| 7 | 62 | 62 | 62 | 62 | 62 | 62 | 61 |
| 8 | 62 | 62 | 62 | 62 | 62 | 62 | 61 |
| 9 | 63 | 62 | 62 | 62 | 62 | 63 | 62 |
| 10 | 63 | 63 | 63 | 63 | 63 | 63 | 62 |
| 11 | 63 | 63 | 63 | 64 | 63 | 63 | 62 |
| 12 | 64 | 63 | 63 | 64 | 64 | 64 | 63 |
| 13 | 65 | 63 | 64 | 65 | 64 | 64 | 63 |
| 14 | 65 | 64 | 65 | 66 | 65 | 65 | 64 |
| 15 | 66 | 64 | 65 | 68 | 66 | 66 | 65 |
| 16 | 67 | 65 | 66 | 69 | 68 | 67 | 66 |
| 17 | 68 | 65 | 67 | 71 | 69 | 68 | 67 |
| 18 | 69 | 66 | 67 | 73 | 70 | 69 | 67 |
| 19 | 70 | 67 | 68 | 75 | 71 | 70 | 69 |
| 20 | 71 | 68 | 69 | 76 | 73 | 72 | 70 |
| 21 | 72 | 68 | 69 | 78 | 74 | 73 | 71 |
| 22 | 72 | 69 | 70 | 80 | 76 | 74 | 72 |
| 23 | 74 | 70 | 71 | 82 | 78 | 76 | 74 |
| 24 | 75 | 71 | 72 | 84 | 80 | 78 | 76 |
| 25 | 76 | 72 | 73 | 86 | 82 | 80 | 77 |
| 26 | 78 | 73 | 74 | 88 | 84 | 81 | 79 |
| 27 | 79 | 74 | 75 | 90 | 85 | 83 | 81 |
| 28 | 80 | 75 | 76 | 92 | 87 | 85 | 82 |
| 29 | 81 | 76 | 77 | 93 | 89 | 86 | 84 |
| 30 | 83 | 77 | 78 | 95 | 91 | 88 | 85 |
| 31 | 84 | 78 | 80 | 97 | 92 | 90 | 87 |
| 32 | 85 | 79 | 80 | 99 | 94 | 91 | 88 |
| 33 | 86 | 80 | 81 | 101 | 95 | 93 | 90 |
| 34 | 87 | 81 | 82 | 103 | 97 | 95 | 92 |
| 35 | 89 | 83 | 83 | 105 | 99 | 97 | 94 |
| 36 | 90 | 84 | 84 | 107 | 101 | 99 | 96 |
| 37 | 91 | 85 | 85 | 109 | 103 | 100 | 97 |
| 38 | 92 | 86 | 86 | 110 | 104 | 102 | 99 |
| 39 | 94 | 87 | 87 | 112 | 106 | 103 | 100 |
| 40 | 95 | 89 | 89 | 113 | 107 | 105 | 102 |

| Time (min) | TC # 52 (°F) | TC # 53 (°F) | TC # 54 (°F) | TC # 55 (°F) | TC # 56 (°F) | TC # 57 (°F) | TC # 58 (°F) |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 41 | 96 | 90 | 90 | 115 | 109 | 106 | 103 |
| 42 | 98 | 91 | 91 | 116 | 110 | 107 | 105 |
| 43 | 99 | 92 | 92 | 117 | 112 | 109 | 106 |
| 44 | 100 | 93 | 93 | 118 | 113 | 110 | 107 |
| 45 | 101 | 94 | 94 | 119 | 114 | 111 | 108 |
| 46 | 102 | 95 | 95 | 121 | 115 | 112 | 109 |
| 47 | 104 | 97 | 98 | 122 | 117 | 113 | 110 |
| 48 | 105 | 99 | 99 | 125 | 118 | 115 | 112 |
| 49 | 107 | 100 | 101 | 126 | 120 | 116 | 113 |
| 50 | 108 | 101 | 102 | 127 | 121 | 117 | 114 |
| 51 | 109 | 103 | 104 | 129 | 123 | 118 | 115 |
| 52 | 111 | 105 | 106 | 131 | 125 | 120 | 117 |
| 53 | 113 | 107 | 108 | 133 | 127 | 122 | 118 |
| 54 | 115 | 109 | 110 | 135 | 129 | 124 | 120 |
| 55 | 116 | 111 | 112 | 137 | 131 | 125 | 121 |
| 56 | 118 | 112 | 113 | 138 | 132 | 127 | 123 |
| 57 | 119 | 114 | 115 | 140 | 134 | 129 | 125 |
| 58 | 121 | 116 | 117 | 142 | 136 | 131 | 127 |
| 59 | 123 | 118 | 119 | 144 | 138 | 133 | 129 |
| 60 | 124 | 119 | 120 | 146 | 140 | 135 | 131 |
| Max Temp: | 124 | 119 | 120 | 146 | 140 | 135 | 131 |
| Max Allowed: | 388 | 388 | 388 | 387 | 387 | 388 | 387 |

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| Time (min) | TC # 59 (°F) | TC # 60 (°F) | TC # 61 (°F) | TC # 62 (°F) | TC # 63 (°F) | TC # 64 (°F) | TC # 65 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 63 | 62 | 62 | 63 | 62 | 63 | 62 |
| 1 | 63 | 62 | 62 | 63 | 63 | 63 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 63 | 62 |
| 3 | 62 | 61 | 61 | 62 | 62 | 62 | 61 |
| 4 | 62 | 61 | 61 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 61 | 62 | 62 | 62 | 62 |
| 6 | 62 | 61 | 61 | 62 | 62 | 62 | 62 |
| 7 | 62 | 61 | 61 | 62 | 62 | 62 | 62 |
| 8 | 62 | 61 | 61 | 62 | 62 | 62 | 62 |
| 9 | 62 | 62 | 61 | 62 | 62 | 62 | 62 |
| 10 | 63 | 62 | 62 | 62 | 62 | 63 | 62 |
| 11 | 63 | 62 | 62 | 63 | 62 | 63 | 62 |
| 12 | 63 | 63 | 62 | 63 | 63 | 63 | 63 |
| 13 | 64 | 63 | 63 | 64 | 63 | 64 | 63 |
| 14 | 64 | 64 | 63 | 64 | 64 | 64 | 64 |
| 15 | 65 | 64 | 64 | 65 | 65 | 65 | 64 |
| 16 | 66 | 65 | 65 | 65 | 65 | 66 | 65 |
| 17 | 67 | 66 | 65 | 66 | 66 | 66 | 66 |
| 18 | 68 | 67 | 66 | 67 | 67 | 67 | 66 |
| 19 | 69 | 68 | 67 | 68 | 68 | 68 | 67 |
| 20 | 70 | 69 | 68 | 69 | 68 | 69 | 68 |
| 21 | 71 | 70 | 69 | 69 | 69 | 69 | 69 |
| 22 | 72 | 71 | 70 | 71 | 70 | 70 | 70 |
| 23 | 74 | 72 | 72 | 72 | 71 | 72 | 71 |
| 24 | 75 | 74 | 73 | 73 | 72 | 73 | 72 |
| 25 | 77 | 75 | 74 | 74 | 74 | 74 | 74 |
| 26 | 78 | 77 | 76 | 76 | 75 | 75 | 75 |
| 27 | 80 | 78 | 77 | 77 | 76 | 77 | 76 |
| 28 | 81 | 80 | 79 | 79 | 78 | 78 | 77 |
| 29 | 83 | 81 | 80 | 80 | 79 | 79 | 78 |
| 30 | 84 | 83 | 81 | 81 | 80 | 80 | 80 |
| 31 | 86 | 84 | 83 | 83 | 81 | 81 | 81 |
| 32 | 87 | 85 | 84 | 84 | 82 | 82 | 82 |
| 33 | 89 | 87 | 85 | 85 | 84 | 84 | 83 |
| 34 | 90 | 88 | 87 | 86 | 85 | 85 | 84 |
| 35 | 92 | 90 | 88 | 88 | 87 | 87 | 86 |
| 36 | 94 | 92 | 90 | 90 | 89 | 88 | 87 |
| 37 | 96 | 93 | 92 | 91 | 90 | 90 | 89 |
| 38 | 97 | 95 | 93 | 93 | 91 | 91 | 90 |
| 39 | 98 | 96 | 94 | 94 | 93 | 93 | 91 |
| 40 | 100 | 98 | 96 | 95 | 94 | 94 | 93 |

| Time (min) | TC # 59 (°F) | TC # 60 (°F) | TC # 61 (°F) | TC # 62 (°F) | TC # 63 (°F) | TC # 64 (°F) | TC # 65 (°F) |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 41 | 101 | 99 | 97 | 97 | 96 | 95 | 94 |
| 42 | 103 | 101 | 99 | 98 | 97 | 97 | 95 |
| 43 | 104 | 102 | 100 | 99 | 98 | 98 | 96 |
| 44 | 105 | 103 | 101 | 100 | 100 | 99 | 97 |
| 45 | 106 | 104 | 102 | 101 | 100 | 100 | 98 |
| 46 | 108 | 105 | 103 | 103 | 102 | 102 | 100 |
| 47 | 109 | 107 | 105 | 104 | 104 | 103 | 101 |
| 48 | 111 | 108 | 106 | 106 | 106 | 105 | 103 |
| 49 | 112 | 110 | 108 | 107 | 107 | 106 | 104 |
| 50 | 113 | 111 | 109 | 109 | 108 | 107 | 105 |
| 51 | 114 | 112 | 110 | 110 | 109 | 109 | 106 |
| 52 | 116 | 114 | 112 | 112 | 112 | 111 | 108 |
| 53 | 118 | 115 | 113 | 114 | 113 | 112 | 110 |
| 54 | 119 | 117 | 115 | 115 | 115 | 114 | 112 |
| 55 | 120 | 118 | 116 | 116 | 116 | 115 | 112 |
| 56 | 122 | 119 | 117 | 117 | 117 | 116 | 114 |
| 57 | 124 | 121 | 119 | 119 | 118 | 118 | 116 |
| 58 | 126 | 123 | 120 | 120 | 120 | 119 | 117 |
| 59 | 128 | 124 | 122 | 122 | 121 | 121 | 118 |
| 60 | 129 | 126 | 123 | 123 | 122 | 122 | 120 |
| Max Temp: | 129 | 126 | 123 | 123 | 122 | 122 | 120 |
| Max Allowed: | 388 | 387 | 387 | 388 | 387 | 388 | 387 |

343

| Time (min) | TC # 66 (°F) | TC # 67 (°F) | TC # 68 (°F) | TC # 69 (°F) | TC # 70 (°F) | TC # 71 (°F) | TC # 72 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 62 | 62 | 63 | 62 | 63 | 62 | 62 |
| 1 | 62 | 62 | 63 | 62 | 63 | 63 | 62 |
| 2 | 62 | 62 | 63 | 62 | 63 | 62 | 62 |
| 3 | 61 | 61 | 62 | 61 | 62 | 62 | 61 |
| 4 | 62 | 61 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 63 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 8 | 62 | 61 | 62 | 62 | 63 | 62 | 62 |
| 9 | 62 | 62 | 63 | 62 | 63 | 63 | 62 |
| 10 | 62 | 62 | 63 | 62 | 63 | 63 | 62 |
| 11 | 63 | 62 | 63 | 62 | 64 | 64 | 63 |
| 12 | 63 | 63 | 63 | 62 | 65 | 65 | 63 |
| 13 | 64 | 63 | 64 | 63 | 65 | 66 | 63 |
| 14 | 64 | 64 | 64 | 63 | 66 | 67 | 64 |
| 15 | 64 | 64 | 65 | 64 | 67 | 68 | 64 |
| 16 | 65 | 65 | 65 | 64 | 68 | 70 | 65 |
| 17 | 66 | 65 | 66 | 65 | 69 | 71 | 65 |
| 18 | 67 | 66 | 67 | 66 | 70 | 72 | 66 |
| 19 | 67 | 67 | 67 | 66 | 71 | 74 | 67 |
| 20 | 68 | 68 | 68 | 67 | 72 | 75 | 67 |
| 21 | 69 | 69 | 69 | 68 | 73 | 76 | 68 |
| 22 | 70 | 69 | 70 | 69 | 74 | 77 | 68 |
| 23 | 71 | 71 | 71 | 70 | 76 | 79 | 69 |
| 24 | 72 | 72 | 72 | 71 | 77 | 80 | 70 |
| 25 | 74 | 73 | 73 | 72 | 78 | 81 | 71 |
| 26 | 75 | 74 | 74 | 73 | 79 | 83 | 72 |
| 27 | 76 | 76 | 76 | 74 | 81 | 84 | 73 |
| 28 | 77 | 77 | 77 | 76 | 82 | 85 | 74 |
| 29 | 78 | 78 | 78 | 76 | 83 | 86 | 74 |
| 30 | 80 | 79 | 79 | 78 | 85 | 87 | 75 |
| 31 | 81 | 80 | 80 | 79 | 86 | 88 | 76 |
| 32 | 82 | 81 | 81 | 80 | 87 | 89 | 77 |
| 33 | 83 | 82 | 82 | 80 | 88 | 90 | 77 |
| 34 | 84 | 84 | 84 | 82 | 89 | 92 | 79 |
| 35 | 86 | 85 | 85 | 83 | 91 | 93 | 80 |
| 36 | 87 | 86 | 86 | 85 | 92 | 94 | 81 |
| 37 | 89 | 88 | 88 | 86 | 94 | 95 | 82 |
| 38 | 90 | 89 | 89 | 87 | 95 | 96 | 83 |
| 39 | 91 | 90 | 90 | 88 | 96 | 97 | 84 |
| 40 | 92 | 91 | 91 | 89 | 97 | 99 | 85 |

OMEGA POINT
LABORATORIES

350

| Time (min) | TC # 66 (°F) | TC # 67 (°F) | TC # 68 (°F) | TC # 69 (°F) | TC # 70 (°F) | TC # 71 (°F) | TC # 72 (°F) |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 41 | 93 | 92 | 92 | 91 | 99 | 100 | 86 |
| 42 | 95 | 93 | 93 | 92 | 100 | 101 | 87 |
| 43 | 96 | 94 | 94 | 93 | 101 | 102 | 88 |
| 44 | 96 | 95 | 95 | 94 | 102 | 103 | 88 |
| 45 | 97 | 96 | 96 | 94 | 103 | 103 | 89 |
| 46 | 98 | 98 | 97 | 96 | 105 | 104 | 90 |
| 47 | 100 | 99 | 98 | 97 | 106 | 106 | 92 |
| 48 | 101 | 100 | 100 | 99 | 108 | 108 | 93 |
| 49 | 102 | 101 | 101 | 100 | 109 | 109 | 95 |
| 50 | 103 | 102 | 102 | 101 | 110 | 110 | 96 |
| 51 | 105 | 103 | 103 | 102 | 111 | 112 | 97 |
| 52 | 107 | 105 | 105 | 104 | 113 | 114 | 100 |
| 53 | 108 | 107 | 107 | 106 | 115 | 116 | 102 |
| 54 | 110 | 108 | 108 | 107 | 117 | 118 | 104 |
| 55 | 111 | 109 | 109 | 108 | 118 | 119 | 105 |
| 56 | 112 | 110 | 110 | 110 | 119 | 121 | 107 |
| 57 | 114 | 112 | 112 | 111 | 121 | 122 | 109 |
| 58 | 115 | 113 | 113 | 113 | 122 | 124 | 110 |
| 59 | 117 | 115 | 115 | 114 | 124 | 125 | 112 |
| 60 | 118 | 116 | 116 | 115 | 125 | 127 | 114 |
| Max Temp: | 118 | 116 | 116 | 115 | 125 | 127 | 114 |
| Max Allowed: | 387 | 387 | 388 | 387 | 388 | 387 | 387 |

OMEGA POINT
LABORATORIES

351

| Time (min) | TC # 73 (°F) | TC # 74 (°F) | TC # 75 (°F) | TC # 76 (°F) | TC # 77 (°F) | TC # 78 (°F) | TC # 79 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 62 | 62 | 62 | 62 | 62 | 63 | 63 |
| 1 | 62 | 62 | 62 | 62 | 62 | 63 | 63 |
| 2 | 62 | 62 | 62 | 62 | 62 | 63 | 63 |
| 3 | 61 | 61 | 61 | 61 | 61 | 62 | 62 |
| 4 | 61 | 62 | 61 | 62 | 61 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 61 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 61 | 62 | 61 | 62 | 62 | 62 | 62 |
| 8 | 61 | 62 | 61 | 62 | 61 | 62 | 62 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 63 | 62 |
| 11 | 62 | 62 | 62 | 62 | 62 | 63 | 63 |
| 12 | 62 | 63 | 62 | 62 | 62 | 63 | 63 |
| 13 | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| 14 | 63 | 64 | 63 | 63 | 63 | 63 | 63 |
| 15 | 64 | 64 | 64 | 64 | 63 | 64 | 64 |
| 16 | 64 | 65 | 64 | 64 | 64 | 64 | 64 |
| 17 | 65 | 65 | 65 | 64 | 64 | 65 | 65 |
| 18 | 66 | 66 | 65 | 65 | 65 | 65 | 65 |
| 19 | 67 | 67 | 66 | 66 | 65 | 66 | 66 |
| 20 | 67 | 68 | 67 | 66 | 66 | 66 | 66 |
| 21 | 68 | 69 | 68 | 67 | 67 | 67 | 67 |
| 22 | 69 | 69 | 69 | 68 | 67 | 68 | 67 |
| 23 | 71 | 71 | 70 | 69 | 69 | 69 | 68 |
| 24 | 72 | 72 | 71 | 70 | 69 | 70 | 69 |
| 25 | 73 | 73 | 73 | 71 | 71 | 71 | 70 |
| 26 | 75 | 75 | 74 | 73 | 72 | 72 | 71 |
| 27 | 76 | 76 | 75 | 74 | 73 | 73 | 72 |
| 28 | 77 | 78 | 77 | 76 | 75 | 74 | 74 |
| 29 | 78 | 79 | 78 | 77 | 75 | 75 | 74 |
| 30 | 80 | 80 | 80 | 78 | 77 | 77 | 76 |
| 31 | 82 | 82 | 81 | 80 | 78 | 78 | 77 |
| 32 | 83 | 83 | 82 | 81 | 79 | 79 | 78 |
| 33 | 84 | 84 | 84 | 82 | 80 | 80 | 79 |
| 34 | 86 | 86 | 86 | 84 | 82 | 81 | 80 |
| 35 | 88 | 88 | 88 | 86 | 84 | 83 | 81 |
| 36 | 90 | 90 | 90 | 88 | 85 | 85 | 83 |
| 37 | 91 | 92 | 91 | 89 | 87 | 86 | 84 |
| 38 | 93 | 93 | 93 | 91 | 88 | 87 | 86 |
| 39 | 94 | 95 | 95 | 92 | 90 | 89 | 87 |
| 40 | 96 | 97 | 96 | 94 | 91 | 90 | 88 |

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 | 98 | 98 | 98 | 96 | 93 | 91 | 89 |
| 42 | 99 | 100 | 99 | 97 | 94 | 93 | 91 |
| 43 | 101 | 101 | 101 | 98 | 96 | 94 | 92 |
| 44 | 102 | 102 | 102 | 100 | 97 | 95 | 93 |
| 45 | 103 | 103 | 103 | 101 | 98 | 96 | 94 |
| 46 | 105 | 105 | 105 | 102 | 99 | 98 | 95 |
| 47 | 106 | 107 | 106 | 104 | 101 | 99 | 97 |
| 48 | 108 | 108 | 108 | 105 | 103 | 101 | 98 |
| 49 | 109 | 110 | 109 | 107 | 104 | 102 | 100 |
| 50 | 110 | 111 | 110 | 108 | 105 | 103 | 101 |
| 51 | 111 | 112 | 111 | 109 | 106 | 105 | 102 |
| 52 | 114 | 114 | 113 | 111 | 109 | 107 | 104 |
| 53 | 115 | 115 | 114 | 112 | 110 | 109 | 106 |
| 54 | 116 | 116 | 115 | 113 | 112 | 110 | 108 |
| 55 | 117 | 117 | 116 | 114 | 112 | 111 | 109 |
| 56 | 118 | 118 | 117 | 115 | 114 | 112 | 110 |
| 57 | 120 | 119 | 118 | 116 | 115 | 114 | 111 |
| 58 | 121 | 121 | 119 | 117 | 116 | 115 | 112 |
| 59 | 123 | 122 | 120 | 118 | 117 | 116 | 113 |
| 60 | 123 | 123 | 121 | 119 | 118 | 117 | 114 |
| Max Temp: | 123 | 123 | 121 | 119 | 118 | 117 | 114 |
| Max Allowed: | 387 | 387 | 387 | 387 | 387 | 388 | 388 |



353

| Time (min) | TC # 80 (°F) | TC # 81 (°F) | TC # 82 (°F) | TC # 83 (°F) | TC # 84 (°F) | TC # 85 (°F) | TC # 86 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 63 | 62 | 63 | 62 | 62 | 62 | 62 |
| 1 | 63 | 62 | 63 | 62 | 62 | 62 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 61 | 62 | 62 | 61 | 61 | 61 | 61 |
| 4 | 62 | 62 | 62 | 62 | 61 | 62 | 61 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 61 | 62 | 61 |
| 7 | 62 | 62 | 62 | 61 | 61 | 62 | 61 |
| 8 | 62 | 62 | 62 | 61 | 61 | 61 | 61 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 12 | 63 | 62 | 62 | 62 | 62 | 62 | 62 |
| 13 | 63 | 62 | 63 | 62 | 62 | 62 | 62 |
| 14 | 63 | 63 | 63 | 62 | 63 | 63 | 63 |
| 15 | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| 16 | 64 | 63 | 63 | 63 | 63 | 64 | 63 |
| 17 | 64 | 64 | 64 | 64 | 64 | 64 | 64 |
| 18 | 64 | 64 | 64 | 64 | 64 | 64 | 64 |
| 19 | 65 | 65 | 64 | 64 | 65 | 65 | 65 |
| 20 | 65 | 65 | 65 | 65 | 65 | 66 | 65 |
| 21 | 66 | 66 | 65 | 65 | 66 | 66 | 66 |
| 22 | 67 | 66 | 66 | 66 | 66 | 67 | 66 |
| 23 | 68 | 67 | 67 | 67 | 67 | 67 | 67 |
| 24 | 68 | 68 | 67 | 67 | 68 | 68 | 68 |
| 25 | 69 | 69 | 68 | 68 | 69 | 69 | 69 |
| 26 | 70 | 70 | 69 | 69 | 70 | 70 | 70 |
| 27 | 72 | 71 | 70 | 70 | 71 | 71 | 71 |
| 28 | 73 | 72 | 71 | 71 | 72 | 72 | 72 |
| 29 | 73 | 73 | 72 | 72 | 73 | 73 | 73 |
| 30 | 75 | 75 | 73 | 73 | 74 | 74 | 74 |
| 31 | 76 | 76 | 75 | 74 | 75 | 75 | 75 |
| 32 | 77 | 76 | 75 | 75 | 75 | 76 | 75 |
| 33 | 77 | 77 | 76 | 76 | 76 | 76 | 76 |
| 34 | 79 | 79 | 77 | 77 | 78 | 78 | 78 |
| 35 | 80 | 80 | 79 | 78 | 79 | 79 | 79 |
| 36 | 82 | 82 | 80 | 80 | 80 | 81 | 80 |
| 37 | 83 | 83 | 81 | 81 | 82 | 82 | 81 |
| 38 | 84 | 84 | 82 | 82 | 83 | 83 | 82 |
| 39 | 86 | 86 | 84 | 83 | 84 | 84 | 84 |
| 40 | 87 | 87 | 85 | 84 | 85 | 85 | 85 |

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) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 41 | 88 | 88 | 86 | 85 | 86 | 86 | 86 |
| 42 | 89 | 89 | 87 | 87 | 87 | 87 | 87 |
| 43 | 90 | 91 | 88 | 88 | 88 | 88 | 88 |
| 44 | 91 | 91 | 89 | 89 | 89 | 89 | 89 |
| 45 | 92 | 92 | 89 | 89 | 90 | 90 | 89 |
| 46 | 94 | 94 | 91 | 91 | 91 | 91 | 91 |
| 47 | 95 | 96 | 92 | 92 | 93 | 93 | 92 |
| 48 | 97 | 97 | 94 | 94 | 94 | 94 | 93 |
| 49 | 99 | 99 | 95 | 95 | 96 | 95 | 94 |
| 50 | 100 | 100 | 96 | 96 | 97 | 96 | 96 |
| 51 | 101 | 101 | 98 | 97 | 98 | 98 | 97 |
| 52 | 103 | 103 | 100 | 100 | 100 | 100 | 99 |
| 53 | 105 | 105 | 101 | 101 | 102 | 101 | 100 |
| 54 | 106 | 106 | 103 | 103 | 103 | 103 | 102 |
| 55 | 107 | 107 | 104 | 104 | 104 | 104 | 103 |
| 56 | 108 | 108 | 105 | 105 | 105 | 105 | 104 |
| 57 | 110 | 109 | 107 | 107 | 107 | 106 | 106 |
| 58 | 111 | 110 | 108 | 108 | 108 | 108 | 107 |
| 59 | 112 | 111 | 109 | 109 | 109 | 109 | 109 |
| 60 | 113 | 112 | 110 | 110 | 110 | 110 | 109 |
| Max Temp: | 113 | 112 | 110 | 110 | 110 | 110 | 109 |
| Max Allowed: | 388 | 387 | 388 | 387 | 387 | 387 | 387 |

| Time (min) | TC # 87 (°F) | TC # 88 (°F) | TC # 89 (°F) | TC # 90 (°F) | TC # 91 (°F) | TC # 92 (°F) | TC # 93 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | 63 | 63 | 62 | 62 | 62 | 63 | 63 |
| 1 | 63 | 63 | 62 | 62 | 62 | 63 | 63 |
| 2 | 63 | 63 | 62 | 62 | 62 | 63 | 63 |
| 3 | 62 | 62 | 61 | 61 | 61 | 62 | 62 |
| 4 | 62 | 62 | 61 | 61 | 61 | 62 | 62 |
| 5 | 63 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 61 | 61 | 62 | 62 | 62 |
| 7 | 62 | 62 | 61 | 61 | 62 | 62 | 62 |
| 8 | 62 | 62 | 61 | 61 | 62 | 62 | 62 |
| 9 | 62 | 62 | 62 | 62 | 62 | 63 | 63 |
| 10 | 63 | 63 | 62 | 62 | 63 | 64 | 64 |
| 11 | 63 | 63 | 62 | 62 | 64 | 65 | 65 |
| 12 | 63 | 63 | 62 | 62 | 65 | 66 | 66 |
| 13 | 63 | 63 | 62 | 63 | 66 | 67 | 67 |
| 14 | 63 | 64 | 63 | 63 | 68 | 68 | 68 |
| 15 | 64 | 64 | 63 | 64 | 69 | 70 | 70 |
| 16 | 64 | 65 | 64 | 64 | 71 | 72 | 71 |
| 17 | 65 | 65 | 64 | 65 | 73 | 74 | 73 |
| 18 | 65 | 66 | 65 | 65 | 75 | 76 | 75 |
| 19 | 66 | 67 | 65 | 66 | 78 | 78 | 77 |
| 20 | 66 | 67 | 66 | 67 | 80 | 80 | 79 |
| 21 | 67 | 68 | 66 | 67 | 82 | 82 | 81 |
| 22 | 67 | 68 | 67 | 68 | 84 | 85 | 84 |
| 23 | 68 | 69 | 68 | 69 | 87 | 87 | 86 |
| 24 | 69 | 70 | 69 | 69 | 89 | 90 | 88 |
| 25 | 70 | 71 | 70 | 70 | 92 | 93 | 91 |
| 26 | 71 | 72 | 70 | 71 | 94 | 95 | 93 |
| 27 | 72 | 73 | 71 | 72 | 97 | 97 | 95 |
| 28 | 73 | 74 | 72 | 73 | 99 | 100 | 97 |
| 29 | 74 | 74 | 73 | 73 | 101 | 102 | 99 |
| 30 | 75 | 75 | 74 | 74 | 103 | 104 | 101 |
| 31 | 76 | 76 | 75 | 75 | 106 | 106 | 103 |
| 32 | 76 | 77 | 75 | 76 | 107 | 108 | 105 |
| 33 | 77 | 78 | 76 | 76 | 109 | 109 | 106 |
| 34 | 79 | 79 | 77 | 77 | 111 | 112 | 108 |
| 35 | 80 | 80 | 78 | 78 | 114 | 114 | 110 |
| 36 | 81 | 81 | 79 | 79 | 116 | 116 | 112 |
| 37 | 82 | 82 | 80 | 80 | 117 | 117 | 114 |
| 38 | 83 | 83 | 81 | 81 | 119 | 119 | 115 |
| 39 | 84 | 85 | 82 | 82 | 120 | 120 | 117 |
| 40 | 85 | 86 | 82 | 83 | 122 | 122 | 119 |

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 | 86 | 87 | 83 | 84 | 123 | 123 | 120 |
| 42 | 87 | 88 | 84 | 85 | 125 | 125 | 121 |
| 43 | 88 | 89 | 85 | 85 | 126 | 126 | 123 |
| 44 | 89 | 89 | 86 | 86 | 127 | 126 | 124 |
| 45 | 90 | 90 | 86 | 87 | 127 | 127 | 125 |
| 46 | 91 | 91 | 87 | 88 | 129 | 128 | 127 |
| 47 | 93 | 93 | 89 | 89 | 130 | 130 | 129 |
| 48 | 94 | 94 | 90 | 90 | 131 | 132 | 130 |
| 49 | 95 | 95 | 91 | 91 | 133 | 133 | 132 |
| 50 | 96 | 96 | 92 | 93 | 134 | 135 | 134 |
| 51 | 98 | 98 | 93 | 94 | 136 | 136 | 135 |
| 52 | 100 | 100 | 95 | 96 | 139 | 139 | 138 |
| 53 | 101 | 101 | 97 | 97 | 141 | 141 | 140 |
| 54 | 103 | 103 | 98 | 99 | 143 | 144 | 142 |
| 55 | 104 | 104 | 100 | 100 | 145 | 146 | 144 |
| 56 | 105 | 106 | 101 | 101 | 148 | 148 | 146 |
| 57 | 107 | 107 | 102 | 103 | 150 | 150 | 148 |
| 58 | 108 | 109 | 104 | 105 | 153 | 153 | 150 |
| 59 | 110 | 110 | 105 | 106 | 156 | 156 | 152 |
| 60 | 111 | 112 | 107 | 107 | 158 | 158 | 154 |
| Max Temp: | 111 | 112 | 107 | 107 | 158 | 158 | 154 |
| Max Allowed: | 388 | 388 | 387 | 387 | 387 | 388 | 388 |



357

| Time (min) | TC # 94 (°F) | TC # 95 (°F) | TC # 96 (°F) | TC # 97 (°F) | TC # 98 (°F) | TC # 99 (°F) | TC # 100 (°F) |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| 0 | 62 | 62 | 63 | 63 | 62 | 62 | 63 |
| 1 | 62 | 62 | 63 | 63 | 62 | 62 | 63 |
| 2 | 62 | 62 | 62 | 63 | 62 | 62 | 63 |
| 3 | 61 | 61 | 62 | 62 | 61 | 61 | 62 |
| 4 | 62 | 62 | 62 | 62 | 62 | 61 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 61 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 61 | 62 |
| 8 | 62 | 62 | 62 | 63 | 62 | 61 | 62 |
| 9 | 63 | 63 | 63 | 63 | 63 | 62 | 63 |
| 10 | 64 | 64 | 64 | 64 | 64 | 63 | 63 |
| 11 | 65 | 65 | 65 | 65 | 64 | 63 | 64 |
| 12 | 66 | 66 | 66 | 66 | 66 | 64 | 65 |
| 13 | 67 | 67 | 67 | 68 | 67 | 66 | 66 |
| 14 | 68 | 69 | 69 | 70 | 69 | 67 | 68 |
| 15 | 70 | 71 | 71 | 72 | 71 | 69 | 70 |
| 16 | 72 | 73 | 73 | 74 | 73 | 71 | 71 |
| 17 | 74 | 75 | 75 | 76 | 74 | 72 | 73 |
| 18 | 76 | 77 | 77 | 78 | 76 | 74 | 75 |
| 19 | 78 | 79 | 80 | 80 | 78 | 76 | 77 |
| 20 | 80 | 81 | 82 | 82 | 80 | 78 | 79 |
| 21 | 82 | 83 | 84 | 84 | 82 | 80 | 81 |
| 22 | 84 | 85 | 86 | 86 | 85 | 82 | 83 |
| 23 | 87 | 88 | 89 | 89 | 87 | 84 | 85 |
| 24 | 89 | 90 | 91 | 91 | 89 | 86 | 87 |
| 25 | 91 | 92 | 93 | 93 | 91 | 89 | 90 |
| 26 | 94 | 94 | 95 | 95 | 93 | 91 | 92 |
| 27 | 96 | 97 | 98 | 97 | 95 | 92 | 93 |
| 28 | 98 | 99 | 99 | 99 | 97 | 94 | 95 |
| 29 | 99 | 100 | 101 | 101 | 98 | 96 | 97 |
| 30 | 102 | 102 | 103 | 103 | 100 | 98 | 99 |
| 31 | 103 | 104 | 105 | 104 | 102 | 100 | 100 |
| 32 | 105 | 105 | 106 | 106 | 103 | 101 | 101 |
| 33 | 106 | 107 | 108 | 107 | 104 | 102 | 102 |
| 34 | 108 | 109 | 110 | 109 | 106 | 104 | 104 |
| 35 | 110 | 111 | 111 | 110 | 107 | 105 | 106 |
| 36 | 112 | 112 | 113 | 112 | 109 | 107 | 107 |
| 37 | 114 | 114 | 114 | 113 | 110 | 108 | 108 |
| 38 | 115 | 115 | 116 | 114 | 111 | 109 | 109 |
| 39 | 116 | 117 | 117 | 116 | 113 | 110 | 110 |
| 40 | 118 | 119 | 119 | 117 | 114 | 111 | 111 |

OMEGA POINT
LABORATORIES

358

| Time (min) | TC # 94 (°F) | TC # 95 (°F) | TC # 96 (°F) | TC # 97 (°F) | TC # 98 (°F) | TC # 99 (°F) | TC # 100 (°F) |
|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| 41 | 119 | 120 | 121 | 119 | 115 | 112 | 112 |
| 42 | 121 | 122 | 123 | 121 | 117 | 113 | 113 |
| 43 | 122 | 124 | 125 | 122 | 118 | 114 | 114 |
| 44 | 124 | 126 | 126 | 124 | 119 | 115 | 115 |
| 45 | 125 | 127 | 128 | 125 | 120 | 116 | 116 |
| 46 | 127 | 129 | 130 | 127 | 122 | 117 | 117 |
| 47 | 130 | 132 | 132 | 129 | 123 | 118 | 119 |
| 48 | 132 | 134 | 134 | 131 | 125 | 119 | 121 |
| 49 | 134 | 136 | 136 | 133 | 127 | 121 | 122 |
| 50 | 136 | 138 | 138 | 135 | 128 | 122 | 123 |
| 51 | 138 | 140 | 140 | 137 | 130 | 123 | 125 |
| 52 | 140 | 143 | 144 | 140 | 133 | 125 | 127 |
| 53 | 143 | 146 | 146 | 142 | 135 | 127 | 129 |
| 54 | 145 | 148 | 149 | 145 | 137 | 129 | 131 |
| 55 | 147 | 150 | 150 | 147 | 139 | 130 | 133 |
| 56 | 149 | 153 | 153 | 149 | 141 | 132 | 135 |
| 57 | 152 | 155 | 156 | 151 | 143 | 134 | 137 |
| 58 | 154 | 158 | 158 | 154 | 146 | 137 | 139 |
| 59 | 156 | 160 | 161 | 156 | 148 | 139 | 141 |
| 60 | 158 | 162 | 163 | 159 | 150 | 141 | 143 |
| Max Temp: | 158 | 162 | 163 | 159 | 150 | 141 | 143 |
| Max Allowed: | 387 | 387 | 388 | 388 | 387 | 387 | 388 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 101 (°F) | TC # 102 (°F) | TC # 103 (°F) | TC # 104 (°F) | TC # 105 (°F) | TC # 106 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 63 | 63 | 63 | 63 |
| 1 | 63 | 63 | 63 | 63 | 63 | 63 |
| 2 | 62 | 63 | 63 | 63 | 63 | 63 |
| 3 | 62 | 62 | 62 | 62 | 62 | 62 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 63 | 63 | 62 | 62 |
| 6 | 62 | 62 | 63 | 62 | 62 | 62 |
| 7 | 62 | 62 | 63 | 63 | 62 | 62 |
| 8 | 62 | 63 | 63 | 63 | 63 | 62 |
| 9 | 63 | 63 | 64 | 64 | 63 | 63 |
| 10 | 64 | 65 | 65 | 65 | 64 | 63 |
| 11 | 65 | 66 | 67 | 67 | 65 | 64 |
| 12 | 66 | 68 | 69 | 68 | 66 | 65 |
| 13 | 68 | 70 | 71 | 70 | 68 | 66 |
| 14 | 70 | 72 | 73 | 72 | 69 | 67 |
| 15 | 72 | 74 | 75 | 74 | 71 | 68 |
| 16 | 74 | 76 | 77 | 76 | 73 | 69 |
| 17 | 76 | 78 | 80 | 78 | 75 | 70 |
| 18 | 78 | 81 | 82 | 80 | 76 | 72 |
| 19 | 80 | 83 | 84 | 82 | 78 | 73 |
| 20 | 83 | 85 | 86 | 84 | 80 | 74 |
| 21 | 85 | 87 | 88 | 86 | 81 | 75 |
| 22 | 87 | 89 | 89 | 87 | 83 | 77 |
| 23 | 89 | 91 | 91 | 89 | 84 | 78 |
| 24 | 91 | 93 | 93 | 90 | 86 | 79 |
| 25 | 93 | 95 | 94 | 92 | 87 | 81 |
| 26 | 95 | 96 | 96 | 93 | 89 | 82 |
| 27 | 97 | 98 | 97 | 94 | 90 | 83 |
| 28 | 99 | 100 | 99 | 96 | 91 | 84 |
| 29 | 100 | 101 | 100 | 97 | 92 | 85 |
| 30 | 101 | 102 | 101 | 98 | 93 | 86 |
| 31 | 103 | 104 | 102 | 99 | 95 | 88 |
| 32 | 104 | 104 | 103 | 100 | 95 | 88 |
| 33 | 105 | 105 | 104 | 101 | 96 | 89 |
| 34 | 106 | 106 | 105 | 102 | 97 | 90 |
| 35 | 108 | 108 | 106 | 103 | 98 | 91 |
| 36 | 109 | 109 | 107 | 104 | 99 | 92 |
| 37 | 110 | 110 | 108 | 105 | 100 | 93 |
| 38 | 111 | 111 | 109 | 106 | 101 | 94 |
| 39 | 112 | 112 | 111 | 107 | 102 | 95 |
| 40 | 113 | 113 | 112 | 108 | 103 | 96 |

360

| Time (min) | TC # 101 (°F) | TC # 102 (°F) | TC # 103 (°F) | TC # 104 (°F) | TC # 105 (°F) | TC # 106 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 115 | 115 | 113 | 110 | 104 | 97 |
| 42 | 116 | 117 | 115 | 111 | 105 | 98 |
| 43 | 117 | 118 | 116 | 112 | 106 | 99 |
| 44 | 119 | 119 | 118 | 113 | 107 | 100 |
| 45 | 120 | 121 | 119 | 114 | 108 | 100 |
| 46 | 122 | 123 | 121 | 116 | 109 | 101 |
| 47 | 124 | 125 | 123 | 118 | 111 | 102 |
| 48 | 126 | 127 | 125 | 120 | 112 | 104 |
| 49 | 128 | 129 | 127 | 122 | 114 | 105 |
| 50 | 129 | 131 | 129 | 123 | 115 | 106 |
| 51 | 131 | 133 | 130 | 125 | 117 | 107 |
| 52 | 134 | 135 | 133 | 128 | 119 | 109 |
| 53 | 136 | 138 | 136 | 130 | 121 | 110 |
| 54 | 138 | 140 | 138 | 132 | 123 | 112 |
| 55 | 140 | 142 | 140 | 134 | 124 | 113 |
| 56 | 143 | 145 | 143 | 136 | 126 | 115 |
| 57 | 146 | 148 | 145 | 139 | 128 | 116 |
| 58 | 148 | 151 | 148 | 141 | 130 | 118 |
| 59 | 151 | 153 | 151 | 144 | 132 | 120 |
| 60 | 153 | 156 | 153 | 146 | 134 | 121 |
| Max Temp: | 153 | 156 | 153 | 146 | 134 | 121 |
| Max Allowed: | 388 | 388 | 388 | 388 | 388 | 388 |

| Time (min) | TC # 107 (°F) | TC # 108 (°F) | TC # 109 (°F) | TC # 110 (°F) | TC # 111 (°F) | TC # 112 (°F) |
|------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 0 | 63 | 63 | 62 | 63 | 62 | 62 |
| 1 | 63 | 63 | 62 | 63 | 62 | 62 |
| 2 | 63 | 63 | 62 | 62 | 62 | 62 |
| 3 | 62 | 62 | 61 | 62 | 61 | 61 |
| 4 | 62 | 62 | 61 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 62 | 62 | 61 | 62 | 62 | 62 |
| 8 | 62 | 62 | 61 | 62 | 62 | 62 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 62 | 63 | 62 | 63 | 63 | 63 |
| 11 | 63 | 63 | 63 | 63 | 63 | 64 |
| 12 | 63 | 63 | 63 | 64 | 64 | 64 |
| 13 | 63 | 64 | 64 | 64 | 64 | 65 |
| 14 | 64 | 64 | 65 | 65 | 65 | 66 |
| 15 | 64 | 64 | 66 | 66 | 66 | 67 |
| 16 | 65 | 65 | 67 | 67 | 67 | 69 |
| 17 | 65 | 66 | 68 | 68 | 69 | 70 |
| 18 | 66 | 66 | 69 | 69 | 70 | 72 |
| 19 | 67 | 67 | 70 | 71 | 71 | 74 |
| 20 | 67 | 68 | 72 | 72 | 73 | 75 |
| 21 | 68 | 69 | 73 | 74 | 74 | 77 |
| 22 | 69 | 69 | 75 | 76 | 76 | 79 |
| 23 | 70 | 70 | 77 | 78 | 78 | 82 |
| 24 | 71 | 71 | 79 | 80 | 80 | 84 |
| 25 | 72 | 72 | 81 | 82 | 83 | 86 |
| 26 | 73 | 73 | 83 | 84 | 85 | 88 |
| 27 | 74 | 74 | 85 | 86 | 87 | 91 |
| 28 | 75 | 75 | 88 | 88 | 89 | 93 |
| 29 | 76 | 76 | 90 | 90 | 91 | 95 |
| 30 | 77 | 77 | 92 | 93 | 93 | 97 |
| 31 | 78 | 78 | 94 | 95 | 96 | 99 |
| 32 | 79 | 78 | 96 | 97 | 97 | 100 |
| 33 | 80 | 79 | 98 | 98 | 99 | 102 |
| 34 | 81 | 80 | 100 | 101 | 101 | 104 |
| 35 | 82 | 81 | 103 | 103 | 103 | 106 |
| 36 | 83 | 82 | 105 | 105 | 105 | 108 |
| 37 | 84 | 83 | 107 | 107 | 107 | 109 |
| 38 | 85 | 84 | 109 | 109 | 109 | 111 |
| 39 | 86 | 85 | 111 | 111 | 111 | 112 |
| 40 | 87 | 86 | 113 | 113 | 112 | 114 |



362

| Time (min) | TC # 107 (°F) | TC # 108 (°F) | TC # 109 (°F) | TC # 110 (°F) | TC # 111 (°F) | TC # 112 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 88 | 87 | 115 | 114 | 113 | 115 |
| 42 | 89 | 88 | 116 | 116 | 115 | 116 |
| 43 | 90 | 89 | 118 | 117 | 116 | 117 |
| 44 | 91 | 90 | 119 | 118 | 117 | 118 |
| 45 | 91 | 90 | 120 | 118 | 117 | 119 |
| 46 | 92 | 92 | 122 | 120 | 118 | 120 |
| 47 | 93 | 93 | 123 | 121 | 120 | 122 |
| 48 | 95 | 94 | 124 | 123 | 121 | 124 |
| 49 | 96 | 96 | 126 | 124 | 122 | 126 |
| 50 | 97 | 97 | 127 | 125 | 123 | 127 |
| 51 | 98 | 98 | 128 | 126 | 125 | 129 |
| 52 | 100 | 100 | 130 | 129 | 127 | 132 |
| 53 | 101 | 101 | 132 | 130 | 129 | 134 |
| 54 | 103 | 103 | 134 | 132 | 132 | 137 |
| 55 | 104 | 104 | 136 | 134 | 133 | 138 |
| 56 | 105 | 105 | 139 | 136 | 135 | 141 |
| 57 | 107 | 107 | 142 | 139 | 138 | 143 |
| 58 | 108 | 109 | 144 | 142 | 140 | 145 |
| 59 | 110 | 110 | 148 | 145 | 143 | 147 |
| 60 | 111 | 111 | 150 | 147 | 145 | 149 |
| Max Temp: | 111 | 111 | 150 | 147 | 145 | 149 |
| Max Allowed: | 388 | 388 | 387 | 388 | 387 | 387 |

OMEGA POINT
LABORATORIES

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| Time (min) | TC # 113 (°F) | TC # 114 (°F) | TC # 115 (°F) | TC # 116 (°F) | TC # 117 (°F) | TC # 118 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 62 | 62 | 63 | 62 |
| 1 | 62 | 63 | 62 | 62 | 63 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 61 | 62 | 61 | 61 | 62 | 61 |
| 4 | 62 | 62 | 61 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 61 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 62 |
| 8 | 62 | 62 | 62 | 62 | 62 | 62 |
| 9 | 63 | 63 | 62 | 62 | 63 | 63 |
| 10 | 63 | 64 | 63 | 63 | 64 | 63 |
| 11 | 64 | 64 | 64 | 64 | 64 | 64 |
| 12 | 65 | 65 | 65 | 65 | 66 | 65 |
| 13 | 66 | 66 | 66 | 66 | 67 | 67 |
| 14 | 67 | 68 | 67 | 67 | 68 | 68 |
| 15 | 69 | 69 | 69 | 69 | 70 | 70 |
| 16 | 70 | 71 | 71 | 71 | 72 | 72 |
| 17 | 72 | 73 | 73 | 73 | 73 | 74 |
| 18 | 74 | 75 | 75 | 75 | 75 | 75 |
| 19 | 76 | 77 | 77 | 77 | 77 | 77 |
| 20 | 78 | 79 | 79 | 79 | 79 | 79 |
| 21 | 80 | 81 | 81 | 81 | 81 | 81 |
| 22 | 82 | 84 | 83 | 83 | 83 | 83 |
| 23 | 85 | 86 | 85 | 85 | 85 | 85 |
| 24 | 87 | 88 | 88 | 87 | 87 | 87 |
| 25 | 89 | 91 | 90 | 89 | 89 | 89 |
| 26 | 92 | 93 | 92 | 91 | 91 | 91 |
| 27 | 94 | 95 | 94 | 94 | 93 | 93 |
| 28 | 96 | 97 | 97 | 95 | 95 | 94 |
| 29 | 98 | 99 | 98 | 97 | 97 | 96 |
| 30 | 100 | 101 | 100 | 99 | 98 | 98 |
| 31 | 102 | 103 | 102 | 101 | 100 | 99 |
| 32 | 103 | 104 | 103 | 102 | 101 | 101 |
| 33 | 105 | 106 | 105 | 103 | 103 | 102 |
| 34 | 106 | 108 | 106 | 105 | 104 | 103 |
| 35 | 108 | 109 | 108 | 107 | 106 | 105 |
| 36 | 110 | 111 | 110 | 109 | 108 | 106 |
| 37 | 111 | 112 | 111 | 110 | 109 | 108 |
| 38 | 112 | 114 | 112 | 111 | 111 | 109 |
| 39 | 114 | 115 | 114 | 113 | 112 | 110 |
| 40 | 115 | 117 | 115 | 114 | 113 | 111 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 113 (°F) | TC # 114 (°F) | TC # 115 (°F) | TC # 116 (°F) | TC # 117 (°F) | TC # 118 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 117 | 118 | 117 | 116 | 114 | 113 |
| 42 | 118 | 120 | 118 | 117 | 116 | 114 |
| 43 | 120 | 122 | 120 | 119 | 117 | 116 |
| 44 | 121 | 123 | 122 | 120 | 117 | 117 |
| 45 | 123 | 125 | 123 | 121 | 118 | 118 |
| 46 | 125 | 127 | 125 | 123 | 120 | 120 |
| 47 | 126 | 129 | 127 | 125 | 121 | 122 |
| 48 | 129 | 131 | 129 | 127 | 123 | 124 |
| 49 | 131 | 133 | 131 | 129 | 125 | 126 |
| 50 | 133 | 135 | 133 | 130 | 127 | 128 |
| 51 | 134 | 137 | 135 | 132 | 128 | 129 |
| 52 | 138 | 140 | 138 | 135 | 131 | 132 |
| 53 | 140 | 142 | 140 | 137 | 133 | 135 |
| 54 | 142 | 145 | 143 | 140 | 136 | 137 |
| 55 | 144 | 147 | 145 | 142 | 138 | 139 |
| 56 | 147 | 149 | 147 | 144 | 140 | 142 |
| 57 | 149 | 152 | 150 | 147 | 143 | 144 |
| 58 | 152 | 155 | 153 | 149 | 145 | 147 |
| 59 | 154 | 157 | 156 | 152 | 148 | 150 |
| 60 | 156 | 159 | 158 | 155 | 150 | 152 |
| Max Temp: | 156 | 159 | 158 | 155 | 150 | 152 |
| Max Allowed: | 387 | 388 | 387 | 387 | 388 | 387 |

| Time (min) | TC # 119 (°F) | TC # 120 (°F) | TC # 121 (°F) | TC # 122 (°F) | TC # 123 (°F) | TC # 124 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 63 | 63 | 62 | 62 |
| 1 | 62 | 63 | 63 | 63 | 62 | 62 |
| 2 | 62 | 63 | 63 | 62 | 62 | 62 |
| 3 | 61 | 62 | 62 | 62 | 61 | 61 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 62 |
| 8 | 62 | 62 | 62 | 62 | 62 | 62 |
| 9 | 63 | 63 | 63 | 63 | 63 | 62 |
| 10 | 64 | 64 | 64 | 64 | 63 | 63 |
| 11 | 64 | 65 | 65 | 65 | 64 | 63 |
| 12 | 66 | 66 | 66 | 66 | 65 | 64 |
| 13 | 67 | 68 | 68 | 67 | 66 | 65 |
| 14 | 69 | 69 | 69 | 69 | 67 | 66 |
| 15 | 70 | 71 | 71 | 71 | 69 | 67 |
| 16 | 73 | 73 | 73 | 72 | 70 | 68 |
| 17 | 75 | 75 | 75 | 74 | 72 | 69 |
| 18 | 76 | 78 | 77 | 76 | 73 | 70 |
| 19 | 79 | 80 | 79 | 78 | 75 | 71 |
| 20 | 81 | 82 | 81 | 80 | 77 | 73 |
| 21 | 83 | 84 | 83 | 82 | 78 | 74 |
| 22 | 85 | 86 | 85 | 83 | 80 | 75 |
| 23 | 87 | 88 | 87 | 85 | 82 | 76 |
| 24 | 89 | 90 | 89 | 87 | 83 | 78 |
| 25 | 91 | 92 | 91 | 89 | 85 | 79 |
| 26 | 93 | 94 | 93 | 90 | 86 | 80 |
| 27 | 95 | 96 | 94 | 92 | 88 | 82 |
| 28 | 97 | 97 | 96 | 93 | 89 | 83 |
| 29 | 98 | 99 | 97 | 94 | 90 | 84 |
| 30 | 100 | 100 | 99 | 96 | 92 | 85 |
| 31 | 102 | 102 | 100 | 97 | 93 | 86 |
| 32 | 102 | 103 | 101 | 98 | 94 | 87 |
| 33 | 104 | 104 | 101 | 99 | 95 | 88 |
| 34 | 105 | 105 | 103 | 100 | 96 | 89 |
| 35 | 107 | 106 | 104 | 101 | 97 | 90 |
| 36 | 108 | 107 | 105 | 103 | 99 | 92 |
| 37 | 109 | 108 | 106 | 104 | 100 | 93 |
| 38 | 110 | 109 | 108 | 105 | 100 | 94 |
| 39 | 111 | 111 | 109 | 106 | 102 | 95 |
| 40 | 113 | 112 | 110 | 107 | 103 | 96 |

365

OMEGA POINT
LABORATORIES

366

| Time (min) | TC # 119 (°F) | TC # 120 (°F) | TC # 121 (°F) | TC # 122 (°F) | TC # 123 (°F) | TC # 124 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 114 | 114 | 112 | 108 | 103 | 97 |
| 42 | 116 | 116 | 113 | 110 | 105 | 98 |
| 43 | 118 | 118 | 115 | 111 | 106 | 99 |
| 44 | 119 | 119 | 116 | 112 | 106 | 99 |
| 45 | 121 | 120 | 117 | 113 | 107 | 100 |
| 46 | 123 | 122 | 119 | 115 | 109 | 101 |
| 47 | 125 | 124 | 121 | 117 | 110 | 103 |
| 48 | 127 | 126 | 123 | 118 | 112 | 104 |
| 49 | 129 | 128 | 125 | 120 | 113 | 105 |
| 50 | 131 | 130 | 127 | 122 | 114 | 106 |
| 51 | 133 | 132 | 129 | 123 | 116 | 107 |
| 52 | 136 | 135 | 132 | 126 | 118 | 110 |
| 53 | 138 | 138 | 134 | 128 | 120 | 111 |
| 54 | 141 | 140 | 137 | 131 | 122 | 113 |
| 55 | 143 | 142 | 139 | 132 | 123 | 114 |
| 56 | 146 | 145 | 141 | 135 | 125 | 116 |
| 57 | 148 | 148 | 144 | 137 | 128 | 117 |
| 58 | 151 | 150 | 147 | 140 | 130 | 119 |
| 59 | 154 | 153 | 149 | 142 | 132 | 121 |
| 60 | 156 | 156 | 152 | 145 | 134 | 123 |
| Max Temp: | 156 | 156 | 152 | 145 | 134 | 123 |
| Max Allowed: | 387 | 388 | 388 | 388 | 387 | 387 |

OMEGA POINT
LABORATORIES

367

| Time (min) | TC # 125 (°F) | TC # 126 (°F) | TC # 127 (°F) | TC # 128 (°F) | TC # 129 (°F) | TC # 130 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 62 | 62 | 63 | 63 |
| 1 | 62 | 62 | 62 | 62 | 62 | 62 |
| 2 | 62 | 62 | 63 | 63 | 63 | 63 |
| 3 | 62 | 61 | 68 | 68 | 68 | 68 |
| 4 | 62 | 61 | 66 | 66 | 66 | 66 |
| 5 | 62 | 62 | 63 | 63 | 64 | 64 |
| 6 | 62 | 61 | 65 | 65 | 65 | 65 |
| 7 | 62 | 61 | 65 | 65 | 65 | 66 |
| 8 | 62 | 61 | 66 | 66 | 66 | 66 |
| 9 | 62 | 62 | 65 | 64 | 64 | 64 |
| 10 | 62 | 62 | 64 | 64 | 64 | 64 |
| 11 | 63 | 62 | 65 | 65 | 64 | 64 |
| 12 | 63 | 63 | 65 | 66 | 65 | 65 |
| 13 | 63 | 63 | 67 | 67 | 67 | 66 |
| 14 | 64 | 64 | 68 | 68 | 68 | 67 |
| 15 | 64 | 65 | 69 | 69 | 70 | 69 |
| 16 | 65 | 65 | 71 | 71 | 72 | 70 |
| 17 | 66 | 66 | 74 | 75 | 75 | 73 |
| 18 | 67 | 67 | 77 | 78 | 78 | 76 |
| 19 | 67 | 68 | 80 | 81 | 81 | 79 |
| 20 | 68 | 69 | 85 | 85 | 85 | 84 |
| 21 | 69 | 69 | 88 | 89 | 89 | 88 |
| 22 | 70 | 70 | 92 | 94 | 93 | 92 |
| 23 | 71 | 71 | 96 | 98 | 97 | 97 |
| 24 | 72 | 73 | 101 | 102 | 101 | 101 |
| 25 | 74 | 74 | 104 | 106 | 105 | 106 |
| 26 | 75 | 75 | 108 | 110 | 109 | 110 |
| 27 | 76 | 76 | 113 | 115 | 113 | 114 |
| 28 | 77 | 77 | 117 | 119 | 117 | 118 |
| 29 | 78 | 78 | 120 | 121 | 120 | 120 |
| 30 | 79 | 79 | 122 | 124 | 122 | 122 |
| 31 | 80 | 80 | 126 | 128 | 126 | 126 |
| 32 | 81 | 80 | 129 | 130 | 128 | 129 |
| 33 | 82 | 81 | 132 | 133 | 131 | 132 |
| 34 | 83 | 82 | 135 | 136 | 134 | 135 |
| 35 | 85 | 84 | 138 | 139 | 137 | 137 |
| 36 | 86 | 85 | 140 | 142 | 140 | 140 |
| 37 | 87 | 86 | 143 | 144 | 142 | 143 |
| 38 | 88 | 87 | 145 | 146 | 145 | 145 |
| 39 | 89 | 88 | 148 | 148 | 147 | 147 |
| 40 | 90 | 89 | 150 | 151 | 150 | 150 |

OMEGA POINT
LABORATORIES

368

| Time (min) | TC # 125 (°F) | TC # 126 (°F) | TC # 127 (°F) | TC # 128 (°F) | TC # 129 (°F) | TC # 130 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 91 | 90 | 152 | 152 | 151 | 151 |
| 42 | 92 | 91 | 154 | 154 | 153 | 153 |
| 43 | 93 | 92 | 156 | 156 | 155 | 155 |
| 44 | 94 | 92 | 157 | 157 | 157 | 157 |
| 45 | 94 | 93 | 159 | 159 | 158 | 159 |
| 46 | 96 | 94 | 161 | 160 | 160 | 161 |
| 47 | 97 | 95 | 163 | 162 | 162 | 162 |
| 48 | 98 | 96 | 165 | 163 | 164 | 165 |
| 49 | 99 | 97 | 167 | 165 | 165 | 166 |
| 50 | 100 | 98 | 169 | 167 | 167 | 167 |
| 51 | 102 | 99 | 171 | 169 | 169 | 169 |
| 52 | 103 | 101 | 173 | 171 | 171 | 171 |
| 53 | 105 | 102 | 175 | 173 | 173 | 173 |
| 54 | 106 | 104 | 177 | 175 | 175 | 174 |
| 55 | 107 | 105 | 178 | 176 | 176 | 175 |
| 56 | 109 | 106 | 180 | 178 | 177 | 176 |
| 57 | 110 | 108 | 181 | 179 | 179 | 178 |
| 58 | 112 | 109 | 183 | 181 | 180 | 179 |
| 59 | 113 | 111 | 184 | 183 | 182 | 181 |
| 60 | 115 | 112 | 186 | 184 | 184 | 183 |
| Max Temp: | 115 | 112 | 186 | 184 | 184 | 183 |
| Max Allowed: | 387 | 387 | 387 | 387 | 388 | 388 |

| Time (min) | TC # 131 (°F) | TC # 132 (°F) | TC # 133 (°F) | TC # 134 (°F) | TC # 135 (°F) | TC # 136 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 62 | 62 | 63 | 62 |
| 1 | 62 | 62 | 62 | 62 | 62 | 62 |
| 2 | 63 | 63 | 63 | 63 | 63 | 62 |
| 3 | 68 | 68 | 67 | 67 | 68 | 67 |
| 4 | 66 | 66 | 65 | 65 | 66 | 65 |
| 5 | 64 | 64 | 63 | 63 | 64 | 63 |
| 6 | 65 | 65 | 64 | 64 | 65 | 64 |
| 7 | 65 | 66 | 65 | 65 | 65 | 65 |
| 8 | 66 | 66 | 65 | 65 | 66 | 65 |
| 9 | 64 | 64 | 64 | 64 | 65 | 64 |
| 10 | 64 | 64 | 64 | 64 | 65 | 64 |
| 11 | 64 | 64 | 64 | 65 | 66 | 65 |
| 12 | 64 | 65 | 65 | 66 | 68 | 66 |
| 13 | 66 | 66 | 66 | 68 | 69 | 68 |
| 14 | 67 | 68 | 67 | 70 | 72 | 70 |
| 15 | 68 | 70 | 69 | 73 | 75 | 72 |
| 16 | 70 | 72 | 71 | 76 | 77 | 75 |
| 17 | 74 | 75 | 74 | 80 | 81 | 79 |
| 18 | 77 | 79 | 76 | 83 | 84 | 82 |
| 19 | 80 | 82 | 79 | 86 | 87 | 85 |
| 20 | 86 | 86 | 83 | 90 | 91 | 90 |
| 21 | 90 | 90 | 86 | 93 | 94 | 94 |
| 22 | 95 | 94 | 90 | 97 | 97 | 97 |
| 23 | 99 | 98 | 94 | 100 | 100 | 101 |
| 24 | 104 | 102 | 98 | 104 | 104 | 105 |
| 25 | 108 | 107 | 102 | 107 | 107 | 108 |
| 26 | 112 | 111 | 106 | 111 | 111 | 111 |
| 27 | 116 | 115 | 110 | 114 | 114 | 114 |
| 28 | 119 | 118 | 114 | 117 | 117 | 117 |
| 29 | 122 | 121 | 116 | 119 | 119 | 119 |
| 30 | 124 | 123 | 119 | 121 | 121 | 121 |
| 31 | 128 | 127 | 123 | 125 | 124 | 124 |
| 32 | 131 | 129 | 126 | 128 | 127 | 126 |
| 33 | 133 | 132 | 129 | 130 | 129 | 129 |
| 34 | 136 | 135 | 132 | 133 | 132 | 132 |
| 35 | 139 | 138 | 135 | 136 | 134 | 134 |
| 36 | 142 | 141 | 138 | 139 | 137 | 137 |
| 37 | 144 | 143 | 140 | 141 | 139 | 138 |
| 38 | 146 | 145 | 143 | 143 | 141 | 140 |
| 39 | 149 | 147 | 145 | 145 | 143 | 142 |
| 40 | 151 | 150 | 148 | 148 | 146 | 144 |

370

| Time (min) | TC # 131 (°F) | TC # 132 (°F) | TC # 133 (°F) | TC # 134 (°F) | TC # 135 (°F) | TC # 136 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 152 | 152 | 149 | 149 | 147 | 145 |
| 42 | 154 | 153 | 151 | 150 | 149 | 147 |
| 43 | 156 | 156 | 153 | 152 | 151 | 149 |
| 44 | 158 | 157 | 155 | 153 | 152 | 151 |
| 45 | 159 | 158 | 156 | 155 | 154 | 152 |
| 46 | 161 | 160 | 158 | 157 | 156 | 154 |
| 47 | 163 | 162 | 159 | 158 | 157 | 155 |
| 48 | 165 | 164 | 162 | 160 | 159 | 157 |
| 49 | 166 | 166 | 163 | 163 | 161 | 159 |
| 50 | 167 | 167 | 165 | 165 | 163 | 161 |
| 51 | 169 | 169 | 167 | 167 | 165 | 163 |
| 52 | 171 | 171 | 169 | 169 | 167 | 165 |
| 53 | 173 | 173 | 171 | 171 | 169 | 168 |
| 54 | 174 | 174 | 173 | 173 | 172 | 170 |
| 55 | 175 | 175 | 174 | 175 | 174 | 172 |
| 56 | 177 | 177 | 176 | 177 | 176 | 174 |
| 57 | 178 | 179 | 178 | 179 | 178 | 176 |
| 58 | 180 | 181 | 180 | 181 | 180 | 178 |
| 59 | 181 | 182 | 182 | 183 | 182 | 180 |
| 60 | 183 | 185 | 184 | 185 | 184 | 182 |
| Max Temp: | 183 | 185 | 184 | 185 | 184 | 182 |
| Max Allowed: | 388 | 388 | 387 | 387 | 388 | 387 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 137 (°F) | TC # 138 (°F) | TC # 139 (°F) | TC # 140 (°F) | TC # 141 (°F) | TC # 142 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 63 | 62 | 63 | 62 |
| 1 | 61 | 62 | 62 | 61 | 62 | 62 |
| 2 | 62 | 63 | 63 | 62 | 63 | 63 |
| 3 | 67 | 67 | 68 | 67 | 67 | 67 |
| 4 | 65 | 65 | 66 | 65 | 65 | 65 |
| 5 | 63 | 63 | 64 | 63 | 64 | 63 |
| 6 | 64 | 64 | 65 | 64 | 65 | 64 |
| 7 | 65 | 65 | 65 | 64 | 65 | 65 |
| 8 | 65 | 65 | 66 | 65 | 66 | 65 |
| 9 | 64 | 64 | 65 | 64 | 65 | 64 |
| 10 | 64 | 64 | 65 | 64 | 65 | 64 |
| 11 | 65 | 65 | 66 | 65 | 66 | 64 |
| 12 | 66 | 66 | 67 | 66 | 67 | 65 |
| 13 | 68 | 67 | 68 | 68 | 68 | 66 |
| 14 | 70 | 69 | 70 | 69 | 70 | 68 |
| 15 | 72 | 71 | 72 | 71 | 71 | 69 |
| 16 | 74 | 73 | 75 | 74 | 73 | 71 |
| 17 | 78 | 77 | 79 | 77 | 77 | 74 |
| 18 | 81 | 79 | 82 | 80 | 79 | 76 |
| 19 | 85 | 83 | 86 | 83 | 82 | 79 |
| 20 | 89 | 87 | 91 | 87 | 86 | 82 |
| 21 | 93 | 91 | 95 | 90 | 89 | 85 |
| 22 | 98 | 95 | 98 | 93 | 92 | 88 |
| 23 | 102 | 99 | 101 | 96 | 95 | 92 |
| 24 | 106 | 102 | 104 | 99 | 98 | 96 |
| 25 | 109 | 105 | 107 | 102 | 102 | 99 |
| 26 | 113 | 108 | 111 | 105 | 105 | 103 |
| 27 | 116 | 111 | 114 | 108 | 108 | 107 |
| 28 | 118 | 114 | 116 | 111 | 111 | 111 |
| 29 | 120 | 116 | 118 | 113 | 113 | 113 |
| 30 | 122 | 118 | 120 | 115 | 115 | 116 |
| 31 | 125 | 121 | 123 | 118 | 118 | 120 |
| 32 | 127 | 123 | 125 | 120 | 121 | 123 |
| 33 | 129 | 126 | 127 | 123 | 123 | 126 |
| 34 | 131 | 128 | 130 | 125 | 126 | 129 |
| 35 | 133 | 131 | 132 | 127 | 128 | 132 |
| 36 | 136 | 133 | 134 | 130 | 131 | 135 |
| 37 | 137 | 135 | 136 | 132 | 133 | 137 |
| 38 | 139 | 136 | 138 | 134 | 135 | 139 |
| 39 | 140 | 138 | 139 | 135 | 137 | 142 |
| 40 | 142 | 140 | 142 | 138 | 139 | 144 |

372

| Time (min) | TC # 137 (°F) | TC # 138 (°F) | TC # 139 (°F) | TC # 140 (°F) | TC # 141 (°F) | TC # 142 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 143 | 141 | 143 | 139 | 140 | 146 |
| 42 | 145 | 143 | 144 | 141 | 142 | 147 |
| 43 | 147 | 145 | 146 | 143 | 144 | 149 |
| 44 | 148 | 146 | 147 | 144 | 145 | 151 |
| 45 | 150 | 148 | 149 | 146 | 147 | 152 |
| 46 | 152 | 149 | 151 | 148 | 149 | 154 |
| 47 | 154 | 151 | 152 | 150 | 150 | 155 |
| 48 | 155 | 153 | 154 | 152 | 152 | 157 |
| 49 | 157 | 154 | 156 | 153 | 153 | 158 |
| 50 | 159 | 156 | 157 | 155 | 155 | 159 |
| 51 | 160 | 157 | 159 | 157 | 156 | 160 |
| 52 | 162 | 159 | 161 | 159 | 158 | 162 |
| 53 | 165 | 161 | 163 | 161 | 160 | 163 |
| 54 | 167 | 163 | 165 | 163 | 161 | 165 |
| 55 | 169 | 165 | 166 | 165 | 162 | 165 |
| 56 | 171 | 167 | 168 | 167 | 164 | 166 |
| 57 | 173 | 169 | 170 | 169 | 166 | 168 |
| 58 | 175 | 171 | 173 | 171 | 168 | 169 |
| 59 | 178 | 173 | 175 | 173 | 170 | 170 |
| 60 | 180 | 176 | 177 | 176 | 172 | 172 |
| Max Temp: | 180 | 176 | 177 | 176 | 172 | 172 |
| Max Allowed: | 387 | 387 | 388 | 387 | 388 | 387 |

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| Time (min) | TC # 143 (°F) | TC # 144 (°F) | TC # 145 (°F) | TC # 146 (°F) | TC # 147 (°F) | TC # 148 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 62 | 62 | 62 | 62 |
| 1 | 62 | 62 | 62 | 62 | 62 | 62 |
| 2 | 63 | 63 | 63 | 63 | 63 | 63 |
| 3 | 67 | 67 | 68 | 68 | 68 | 68 |
| 4 | 65 | 65 | 66 | 66 | 65 | 66 |
| 5 | 64 | 63 | 63 | 63 | 63 | 63 |
| 6 | 65 | 64 | 64 | 65 | 64 | 65 |
| 7 | 65 | 65 | 65 | 65 | 65 | 65 |
| 8 | 66 | 65 | 65 | 65 | 65 | 65 |
| 9 | 65 | 64 | 64 | 64 | 64 | 64 |
| 10 | 66 | 63 | 63 | 64 | 63 | 64 |
| 11 | 67 | 63 | 64 | 64 | 64 | 64 |
| 12 | 67 | 63 | 64 | 64 | 64 | 64 |
| 13 | 69 | 63 | 64 | 64 | 64 | 64 |
| 14 | 70 | 63 | 65 | 65 | 65 | 65 |
| 15 | 71 | 63 | 66 | 66 | 66 | 66 |
| 16 | 72 | 64 | 67 | 66 | 66 | 67 |
| 17 | 75 | 65 | 69 | 68 | 69 | 69 |
| 18 | 76 | 65 | 70 | 70 | 70 | 70 |
| 19 | 78 | 67 | 72 | 71 | 72 | 72 |
| 20 | 81 | 68 | 75 | 74 | 75 | 76 |
| 21 | 84 | 70 | 77 | 77 | 77 | 79 |
| 22 | 87 | 72 | 79 | 79 | 80 | 82 |
| 23 | 91 | 74 | 82 | 82 | 83 | 85 |
| 24 | 94 | 76 | 85 | 85 | 86 | 88 |
| 25 | 98 | 79 | 88 | 88 | 89 | 91 |
| 26 | 103 | 82 | 91 | 91 | 92 | 95 |
| 27 | 107 | 85 | 95 | 94 | 96 | 98 |
| 28 | 111 | 89 | 98 | 98 | 99 | 102 |
| 29 | 115 | 91 | 101 | 101 | 102 | 104 |
| 30 | 118 | 94 | 104 | 104 | 105 | 106 |
| 31 | 123 | 98 | 108 | 108 | 109 | 110 |
| 32 | 126 | 101 | 111 | 111 | 112 | 113 |
| 33 | 130 | 104 | 115 | 115 | 115 | 116 |
| 34 | 134 | 107 | 118 | 118 | 119 | 119 |
| 35 | 137 | 110 | 122 | 122 | 122 | 122 |
| 36 | 141 | 114 | 126 | 125 | 126 | 125 |
| 37 | 143 | 116 | 129 | 129 | 129 | 128 |
| 38 | 146 | 119 | 132 | 132 | 131 | 130 |
| 39 | 148 | 121 | 135 | 135 | 134 | 133 |
| 40 | 152 | 125 | 139 | 138 | 137 | 136 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 143 (°F) | TC # 144 (°F) | TC # 145 (°F) | TC # 146 (°F) | TC # 147 (°F) | TC # 148 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 153 | 127 | 141 | 141 | 139 | 137 |
| 42 | 155 | 129 | 143 | 143 | 142 | 139 |
| 43 | 158 | 131 | 147 | 146 | 145 | 142 |
| 44 | 160 | 133 | 149 | 148 | 147 | 144 |
| 45 | 161 | 135 | 151 | 151 | 149 | 146 |
| 46 | 163 | 138 | 154 | 153 | 151 | 149 |
| 47 | 165 | 139 | 156 | 155 | 153 | 150 |
| 48 | 167 | 142 | 158 | 158 | 156 | 153 |
| 49 | 168 | 143 | 160 | 160 | 158 | 155 |
| 50 | 170 | 145 | 162 | 162 | 160 | 157 |
| 51 | 171 | 146 | 164 | 164 | 162 | 160 |
| 52 | 173 | 148 | 167 | 166 | 165 | 162 |
| 53 | 174 | 151 | 169 | 169 | 168 | 165 |
| 54 | 176 | 153 | 171 | 171 | 170 | 167 |
| 55 | 177 | 154 | 173 | 172 | 171 | 169 |
| 56 | 178 | 156 | 174 | 174 | 173 | 170 |
| 57 | 179 | 158 | 176 | 176 | 175 | 173 |
| 58 | 180 | 159 | 178 | 178 | 176 | 175 |
| 59 | 181 | 161 | 180 | 179 | 178 | 177 |
| 60 | 182 | 163 | 182 | 181 | 180 | 179 |
| Max Temp: | 182 | 163 | 182 | 181 | 180 | 179 |
| Max Allowed: | 388 | 388 | 387 | 387 | 387 | 387 |

| Time (min) | TC # 149 (°F) | TC # 150 (°F) | TC # 151 (°F) | TC # 152 (°F) | TC # 153 (°F) | TC # 154 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 62 | 62 | 63 | 63 |
| 1 | 62 | 62 | 62 | 62 | 62 | 62 |
| 2 | 63 | 63 | 63 | 63 | 63 | 63 |
| 3 | 68 | 68 | 67 | 68 | 68 | 68 |
| 4 | 66 | 66 | 65 | 65 | 66 | 66 |
| 5 | 64 | 64 | 63 | 63 | 64 | 64 |
| 6 | 65 | 65 | 64 | 64 | 65 | 65 |
| 7 | 65 | 65 | 65 | 65 | 65 | 65 |
| 8 | 65 | 65 | 65 | 65 | 66 | 66 |
| 9 | 64 | 64 | 64 | 64 | 64 | 65 |
| 10 | 64 | 64 | 63 | 64 | 64 | 64 |
| 11 | 64 | 64 | 63 | 64 | 65 | 64 |
| 12 | 64 | 64 | 64 | 64 | 67 | 65 |
| 13 | 64 | 64 | 64 | 66 | 69 | 66 |
| 14 | 65 | 65 | 64 | 68 | 71 | 67 |
| 15 | 65 | 65 | 65 | 70 | 73 | 68 |
| 16 | 66 | 66 | 66 | 74 | 75 | 70 |
| 17 | 69 | 68 | 69 | 78 | 78 | 72 |
| 18 | 71 | 70 | 70 | 80 | 80 | 74 |
| 19 | 73 | 71 | 72 | 82 | 83 | 76 |
| 20 | 78 | 74 | 75 | 85 | 86 | 80 |
| 21 | 81 | 77 | 78 | 88 | 89 | 82 |
| 22 | 85 | 79 | 81 | 92 | 92 | 85 |
| 23 | 88 | 82 | 84 | 95 | 95 | 88 |
| 24 | 91 | 85 | 87 | 99 | 98 | 91 |
| 25 | 95 | 89 | 90 | 102 | 101 | 95 |
| 26 | 98 | 92 | 93 | 105 | 104 | 98 |
| 27 | 103 | 96 | 97 | 108 | 107 | 102 |
| 28 | 106 | 99 | 100 | 111 | 109 | 105 |
| 29 | 109 | 102 | 103 | 113 | 111 | 108 |
| 30 | 111 | 104 | 106 | 116 | 114 | 110 |
| 31 | 116 | 109 | 110 | 120 | 117 | 114 |
| 32 | 118 | 112 | 113 | 123 | 120 | 116 |
| 33 | 121 | 115 | 116 | 126 | 122 | 119 |
| 34 | 124 | 119 | 120 | 129 | 125 | 122 |
| 35 | 127 | 122 | 123 | 133 | 127 | 124 |
| 36 | 130 | 126 | 127 | 136 | 130 | 127 |
| 37 | 133 | 129 | 129 | 138 | 132 | 129 |
| 38 | 135 | 131 | 132 | 140 | 134 | 131 |
| 39 | 137 | 134 | 135 | 141 | 137 | 133 |
| 40 | 140 | 138 | 138 | 143 | 140 | 136 |

| Time (min) | TC # 149 (°F) | TC # 150 (°F) | TC # 151 (°F) | TC # 152 (°F) | TC # 153 (°F) | TC # 154 (°F) |
|--------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 41 | 141 | 140 | 140 | 143 | 142 | 137 |
| 42 | 143 | 142 | 142 | 145 | 143 | 139 |
| 43 | 145 | 145 | 145 | 147 | 145 | 141 |
| 44 | 147 | 147 | 147 | 148 | 147 | 142 |
| 45 | 149 | 149 | 149 | 150 | 149 | 144 |
| 46 | 151 | 151 | 151 | 152 | 150 | 146 |
| 47 | 153 | 153 | 153 | 154 | 152 | 147 |
| 48 | 155 | 156 | 155 | 155 | 154 | 149 |
| 49 | 157 | 157 | 156 | 156 | 155 | 151 |
| 50 | 159 | 159 | 158 | 158 | 156 | 152 |
| 51 | 162 | 161 | 160 | 159 | 158 | 154 |
| 52 | 165 | 163 | 162 | 161 | 160 | 156 |
| 53 | 167 | 165 | 164 | 163 | 162 | 158 |
| 54 | 169 | 167 | 166 | 165 | 164 | 160 |
| 55 | 170 | 169 | 168 | 167 | 166 | 162 |
| 56 | 172 | 171 | 170 | 169 | 168 | 164 |
| 57 | 174 | 174 | 172 | 171 | 170 | 167 |
| 58 | 175 | 177 | 174 | 173 | 173 | 169 |
| 59 | 177 | 179 | 177 | 176 | 174 | 170 |
| 60 | 180 | 181 | 180 | 178 | 176 | 172 |
| Max Temp: | 180 | 181 | 180 | 178 | 176 | 172 |
| Max Allowed: | 387 | 387 | 387 | 387 | 388 | 388 |



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| Time (min) | TC # 155 (°F) | TC # 156 (°F) | TC # 157 (°F) | TC # 158 (°F) | TC # 159 (°F) | TC # 160 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 62 | 62 | 63 | 62 |
| 1 | 62 | 62 | 62 | 62 | 62 | 62 |
| 2 | 63 | 63 | 63 | 63 | 63 | 63 |
| 3 | 67 | 67 | 67 | 67 | 68 | 67 |
| 4 | 65 | 65 | 65 | 65 | 65 | 65 |
| 5 | 63 | 64 | 63 | 63 | 64 | 63 |
| 6 | 64 | 65 | 65 | 64 | 65 | 64 |
| 7 | 65 | 65 | 65 | 65 | 65 | 65 |
| 8 | 65 | 65 | 66 | 65 | 66 | 65 |
| 9 | 64 | 64 | 64 | 64 | 65 | 64 |
| 10 | 64 | 64 | 64 | 64 | 65 | 64 |
| 11 | 64 | 64 | 65 | 64 | 65 | 65 |
| 12 | 64 | 65 | 65 | 65 | 66 | 66 |
| 13 | 65 | 66 | 66 | 66 | 67 | 68 |
| 14 | 66 | 66 | 67 | 67 | 68 | 69 |
| 15 | 67 | 68 | 69 | 68 | 69 | 70 |
| 16 | 68 | 69 | 72 | 69 | 71 | 72 |
| 17 | 70 | 71 | 78 | 72 | 73 | 75 |
| 18 | 72 | 73 | 78 | 73 | 75 | 77 |
| 19 | 74 | 75 | 82 | 75 | 77 | 80 |
| 20 | 77 | 79 | 82 | 79 | 81 | 83 |
| 21 | 80 | 81 | 84 | 81 | 83 | 86 |
| 22 | 84 | 84 | 86 | 84 | 86 | 89 |
| 23 | 87 | 87 | 89 | 87 | 90 | 91 |
| 24 | 92 | 90 | 92 | 90 | 93 | 94 |
| 25 | 96 | 93 | 94 | 93 | 96 | 96 |
| 26 | 100 | 97 | 97 | 96 | 99 | 99 |
| 27 | 103 | 100 | 100 | 99 | 102 | 102 |
| 28 | 106 | 103 | 103 | 102 | 105 | 104 |
| 29 | 109 | 105 | 105 | 104 | 107 | 106 |
| 30 | 111 | 107 | 107 | 106 | 109 | 108 |
| 31 | 114 | 111 | 111 | 110 | 112 | 111 |
| 32 | 116 | 113 | 113 | 112 | 114 | 113 |
| 33 | 119 | 116 | 116 | 115 | 117 | 115 |
| 34 | 122 | 119 | 119 | 118 | 119 | 118 |
| 35 | 125 | 122 | 121 | 120 | 122 | 120 |
| 36 | 127 | 125 | 124 | 123 | 125 | 123 |
| 37 | 129 | 126 | 126 | 125 | 126 | 125 |
| 38 | 131 | 129 | 128 | 127 | 128 | 127 |
| 39 | 133 | 130 | 130 | 129 | 131 | 129 |
| 40 | 136 | 133 | 133 | 132 | 133 | 131 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 155 (°F) | TC # 156 (°F) | TC # 157 (°F) | TC # 158 (°F) | TC # 159 (°F) | TC # 160 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 137 | 134 | 134 | 133 | 134 | 133 |
| 42 | 139 | 136 | 135 | 135 | 136 | 135 |
| 43 | 141 | 138 | 137 | 137 | 138 | 137 |
| 44 | 142 | 139 | 139 | 139 | 139 | 139 |
| 45 | 144 | 141 | 141 | 140 | 141 | 141 |
| 46 | 145 | 143 | 142 | 142 | 143 | 143 |
| 47 | 146 | 144 | 144 | 144 | 145 | 144 |
| 48 | 148 | 146 | 146 | 146 | 146 | 146 |
| 49 | 149 | 148 | 147 | 147 | 148 | 147 |
| 50 | 150 | 149 | 149 | 149 | 150 | 149 |
| 51 | 151 | 151 | 151 | 151 | 151 | 150 |
| 52 | 153 | 153 | 153 | 152 | 153 | 152 |
| 53 | 155 | 155 | 155 | 154 | 155 | 154 |
| 54 | 157 | 157 | 157 | 156 | 157 | 155 |
| 55 | 158 | 158 | 158 | 158 | 158 | 156 |
| 56 | 160 | 160 | 161 | 160 | 160 | 157 |
| 57 | 162 | 163 | 163 | 162 | 162 | 159 |
| 58 | 165 | 165 | 165 | 164 | 163 | 160 |
| 59 | 167 | 167 | 167 | 167 | 165 | 162 |
| 60 | 169 | 169 | 170 | 169 | 167 | 163 |
| Max Temp: | 169 | 169 | 170 | 169 | 167 | 163 |
| Max Allowed: | 387 | 388 | 387 | 387 | 388 | 387 |

| Time (min) | TC # 161 (°F) | TC # 162 (°F) | TC # 163 (°F) | TC # 164 (°F) | TC # 165 (°F) | TC # 166 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 0 | 62 | 62 | 62 | 62 | 63 |
| 1 | 0 | 62 | 62 | 62 | 62 | 63 |
| 2 | 0 | 63 | 63 | 62 | 62 | 63 |
| 3 | 0 | 67 | 63 | 62 | 62 | 63 |
| 4 | 0 | 65 | 62 | 61 | 61 | 62 |
| 5 | 0 | 63 | 62 | 61 | 61 | 62 |
| 6 | 0 | 64 | 62 | 61 | 61 | 62 |
| 7 | 0 | 64 | 62 | 62 | 61 | 62 |
| 8 | 0 | 65 | 64 | 63 | 62 | 63 |
| 9 | 0 | 63 | 65 | 63 | 62 | 63 |
| 10 | 0 | 63 | 66 | 64 | 63 | 63 |
| 11 | 0 | 63 | 69 | 66 | 64 | 65 |
| 12 | 0 | 63 | 72 | 68 | 66 | 65 |
| 13 | 0 | 63 | 75 | 70 | 67 | 67 |
| 14 | 0 | 63 | 78 | 73 | 69 | 68 |
| 15 | 0 | 63 | 82 | 76 | 71 | 69 |
| 16 | 0 | 64 | 85 | 79 | 74 | 71 |
| 17 | 0 | 65 | 89 | 82 | 76 | 73 |
| 18 | 0 | 65 | 92 | 85 | 79 | 75 |
| 19 | 0 | 66 | 95 | 88 | 81 | 77 |
| 20 | 0 | 68 | 98 | 91 | 84 | 79 |
| 21 | 0 | 69 | 101 | 94 | 87 | 82 |
| 22 | 0 | 70 | 104 | 97 | 89 | 84 |
| 23 | 0 | 72 | 106 | 99 | 91 | 86 |
| 24 | 0 | 73 | 109 | 102 | 94 | 89 |
| 25 | 0 | 75 | 111 | 104 | 97 | 91 |
| 26 | 0 | 77 | 113 | 106 | 99 | 93 |
| 27 | 0 | 79 | 114 | 108 | 101 | 95 |
| 28 | 0 | 81 | 116 | 110 | 103 | 97 |
| 29 | 0 | 82 | 117 | 111 | 104 | 99 |
| 30 | 0 | 84 | 119 | 113 | 106 | 101 |
| 31 | 0 | 86 | 121 | 115 | 108 | 103 |
| 32 | 0 | 89 | 125 | 119 | 112 | 107 |
| 33 | 0 | 91 | 126 | 120 | 113 | 109 |
| 34 | 0 | 94 | 128 | 122 | 115 | 111 |
| 35 | 0 | 96 | 129 | 123 | 116 | 112 |
| 36 | 0 | 99 | 130 | 124 | 117 | 113 |
| 37 | 0 | 101 | 131 | 125 | 119 | 115 |
| 38 | 0 | 103 | 132 | 126 | 120 | 116 |
| 39 | 0 | 106 | 133 | 127 | 120 | 117 |
| 40 | 0 | 108 | 135 | 128 | 122 | 118 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 161 (°F) | TC # 162 (°F) | TC # 163 (°F) | TC # 164 (°F) | TC # 165 (°F) | TC # 166 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 0 | 110 | 138 | 131 | 124 | 120 |
| 42 | 0 | 112 | 138 | 131 | 124 | 121 |
| 43 | 0 | 115 | 140 | 133 | 126 | 122 |
| 44 | 0 | 117 | 143 | 136 | 129 | 125 |
| 45 | 0 | 119 | 143 | 136 | 129 | 125 |
| 46 | 0 | 122 | 144 | 137 | 130 | 126 |
| 47 | 0 | 124 | 146 | 139 | 132 | 128 |
| 48 | 0 | 126 | 147 | 140 | 133 | 129 |
| 49 | 0 | 128 | 149 | 142 | 135 | 130 |
| 50 | 0 | 130 | 152 | 145 | 138 | 133 |
| 51 | 0 | 132 | 153 | 146 | 139 | 134 |
| 52 | 0 | 134 | 153 | 147 | 139 | 134 |
| 53 | 0 | 137 | 156 | 149 | 141 | 136 |
| 54 | 0 | 139 | 158 | 151 | 143 | 137 |
| 55 | 0 | 141 | 159 | 152 | 144 | 139 |
| 56 | 0 | 143 | 162 | 154 | 146 | 140 |
| 57 | 0 | 145 | 164 | 157 | 148 | 142 |
| 58 | 0 | 147 | 166 | 158 | 149 | 144 |
| 59 | 0 | 149 | 168 | 160 | 151 | 145 |
| 60 | 0 | 151 | 171 | 163 | 154 | 147 |
| Max Temp: | 0 | 151 | 171 | 163 | 154 | 147 |
| Max Allowed: | 325 | 387 | 387 | 387 | 387 | 388 |

| Time (min) | TC # 167 (°F) | TC # 168 (°F) | TC # 169 (°F) | TC # 170 (°F) | TC # 171 (°F) | TC # 172 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 62 | 62 | 62 | 62 |
| 1 | 62 | 62 | 62 | 62 | 62 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 62 | 62 | 62 | 62 | 62 | 63 |
| 4 | 62 | 62 | 61 | 61 | 61 | 62 |
| 5 | 61 | 62 | 61 | 61 | 61 | 62 |
| 6 | 61 | 62 | 61 | 61 | 62 | 62 |
| 7 | 62 | 62 | 61 | 61 | 62 | 62 |
| 8 | 62 | 63 | 62 | 62 | 64 | 63 |
| 9 | 62 | 63 | 62 | 62 | 65 | 64 |
| 10 | 63 | 64 | 63 | 62 | 66 | 65 |
| 11 | 63 | 65 | 64 | 62 | 70 | 67 |
| 12 | 64 | 65 | 64 | 62 | 73 | 68 |
| 13 | 65 | 66 | 65 | 62 | 77 | 71 |
| 14 | 66 | 67 | 66 | 63 | 81 | 74 |
| 15 | 67 | 68 | 67 | 63 | 85 | 77 |
| 16 | 68 | 69 | 68 | 63 | 89 | 80 |
| 17 | 70 | 71 | 70 | 64 | 93 | 83 |
| 18 | 71 | 72 | 72 | 65 | 97 | 87 |
| 19 | 73 | 73 | 73 | 65 | 100 | 90 |
| 20 | 74 | 75 | 74 | 66 | 103 | 93 |
| 21 | 76 | 76 | 76 | 67 | 106 | 96 |
| 22 | 78 | 78 | 78 | 68 | 108 | 99 |
| 23 | 80 | 80 | 80 | 69 | 110 | 101 |
| 24 | 82 | 82 | 82 | 70 | 113 | 104 |
| 25 | 85 | 84 | 85 | 71 | 115 | 106 |
| 26 | 86 | 86 | 87 | 72 | 116 | 108 |
| 27 | 88 | 88 | 89 | 74 | 118 | 110 |
| 28 | 90 | 90 | 92 | 75 | 119 | 112 |
| 29 | 92 | 92 | 94 | 76 | 121 | 113 |
| 30 | 94 | 93 | 96 | 77 | 122 | 115 |
| 31 | 96 | 96 | 99 | 79 | 123 | 117 |
| 32 | 100 | 101 | 104 | 83 | 127 | 121 |
| 33 | 102 | 102 | 106 | 84 | 128 | 122 |
| 34 | 104 | 105 | 109 | 86 | 130 | 124 |
| 35 | 106 | 106 | 110 | 87 | 131 | 125 |
| 36 | 106 | 108 | 112 | 88 | 131 | 125 |
| 37 | 108 | 110 | 113 | 89 | 132 | 127 |
| 38 | 109 | 112 | 115 | 90 | 133 | 128 |
| 39 | 110 | 113 | 115 | 91 | 134 | 128 |
| 40 | 112 | 114 | 117 | 92 | 135 | 129 |

| Time (min) | TC # 167 (°F) | TC # 168 (°F) | TC # 169 (°F) | TC # 170 (°F) | TC # 171 (°F) | TC # 172 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 114 | 117 | 120 | 95 | 137 | 131 |
| 42 | 115 | 117 | 120 | 95 | 137 | 131 |
| 43 | 116 | 119 | 122 | 97 | 139 | 133 |
| 44 | 119 | 122 | 125 | 99 | 141 | 135 |
| 45 | 119 | 122 | 125 | 99 | 141 | 135 |
| 46 | 120 | 124 | 126 | 100 | 142 | 135 |
| 47 | 122 | 126 | 129 | 102 | 144 | 138 |
| 48 | 123 | 127 | 130 | 103 | 146 | 138 |
| 49 | 124 | 129 | 131 | 104 | 147 | 140 |
| 50 | 127 | 131 | 134 | 106 | 150 | 142 |
| 51 | 129 | 133 | 135 | 107 | 151 | 144 |
| 52 | 128 | 133 | 135 | 107 | 152 | 144 |
| 53 | 130 | 135 | 137 | 108 | 154 | 146 |
| 54 | 131 | 137 | 139 | 109 | 156 | 147 |
| 55 | 133 | 138 | 140 | 111 | 158 | 149 |
| 56 | 134 | 140 | 142 | 112 | 160 | 151 |
| 57 | 136 | 142 | 143 | 114 | 162 | 153 |
| 58 | 137 | 143 | 144 | 115 | 164 | 154 |
| 59 | 138 | 144 | 146 | 116 | 166 | 156 |
| 60 | 140 | 146 | 148 | 118 | 168 | 159 |
| Max Temp: | 140 | 146 | 148 | 118 | 168 | 159 |
| Max Allowed: | 387 | 387 | 387 | 387 | 387 | 387 |

| Time (min) | TC # 173 (°F) | TC # 174 (°F) | TC # 175 (°F) | TC # 176 (°F) | TC # 177 (°F) | TC # 178 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 62 | 62 | 62 | 62 |
| 1 | 63 | 63 | 62 | 62 | 62 | 62 |
| 2 | 63 | 63 | 62 | 62 | 62 | 62 |
| 3 | 63 | 63 | 62 | 62 | 62 | 62 |
| 4 | 62 | 62 | 61 | 61 | 62 | 62 |
| 5 | 62 | 62 | 61 | 61 | 62 | 62 |
| 6 | 62 | 62 | 61 | 62 | 62 | 62 |
| 7 | 62 | 62 | 61 | 62 | 62 | 62 |
| 8 | 63 | 63 | 62 | 63 | 63 | 62 |
| 9 | 63 | 62 | 62 | 63 | 63 | 62 |
| 10 | 64 | 63 | 62 | 64 | 63 | 62 |
| 11 | 65 | 64 | 63 | 65 | 64 | 62 |
| 12 | 66 | 65 | 63 | 66 | 65 | 62 |
| 13 | 68 | 65 | 64 | 67 | 66 | 63 |
| 14 | 70 | 67 | 65 | 68 | 67 | 63 |
| 15 | 72 | 68 | 66 | 69 | 68 | 63 |
| 16 | 74 | 70 | 67 | 70 | 69 | 64 |
| 17 | 77 | 72 | 68 | 71 | 71 | 64 |
| 18 | 80 | 74 | 70 | 73 | 72 | 65 |
| 19 | 82 | 76 | 71 | 74 | 73 | 65 |
| 20 | 85 | 78 | 73 | 76 | 75 | 65 |
| 21 | 88 | 81 | 75 | 77 | 77 | 66 |
| 22 | 91 | 83 | 77 | 79 | 79 | 67 |
| 23 | 93 | 85 | 78 | 81 | 81 | 68 |
| 24 | 96 | 88 | 80 | 83 | 83 | 69 |
| 25 | 98 | 90 | 83 | 84 | 86 | 70 |
| 26 | 100 | 92 | 84 | 86 | 90 | 71 |
| 27 | 102 | 94 | 86 | 88 | 95 | 72 |
| 28 | 104 | 96 | 88 | 90 | 101 | 73 |
| 29 | 106 | 98 | 90 | 92 | 107 | 74 |
| 30 | 108 | 100 | 92 | 94 | 111 | 75 |
| 31 | 110 | 102 | 94 | 96 | 116 | 76 |
| 32 | 114 | 106 | 99 | 101 | 124 | 80 |
| 33 | 115 | 108 | 100 | 103 | 128 | 81 |
| 34 | 117 | 110 | 102 | 106 | 132 | 83 |
| 35 | 118 | 111 | 104 | 108 | 132 | 84 |
| 36 | 119 | 112 | 105 | 110 | 131 | 85 |
| 37 | 121 | 114 | 107 | 112 | 132 | 87 |
| 38 | 121 | 115 | 108 | 114 | 133 | 87 |
| 39 | 122 | 115 | 109 | 116 | 133 | 88 |
| 40 | 123 | 117 | 110 | 118 | 134 | 89 |

| Time (min) | TC # 173 (°F) | TC # 174 (°F) | TC # 175 (°F) | TC # 176 (°F) | TC # 177 (°F) | TC # 178 (°F) |
|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 41 | 125 | 119 | 113 | 121 | 136 | 92 |
| 42 | 125 | 119 | 113 | 121 | 136 | 92 |
| 43 | 127 | 121 | 115 | 123 | 138 | 94 |
| 44 | 129 | 123 | 117 | 126 | 140 | 96 |
| 45 | 129 | 123 | 117 | 126 | 139 | 96 |
| 46 | 130 | 124 | 118 | 128 | 140 | 97 |
| 47 | 132 | 126 | 121 | 130 | 142 | 100 |
| 48 | 133 | 127 | 121 | 132 | 143 | 100 |
| 49 | 133 | 128 | 123 | 133 | 144 | 102 |
| 50 | 136 | 131 | 125 | 136 | 147 | 104 |
| 51 | 137 | 132 | 126 | 137 | 149 | 105 |
| 52 | 137 | 132 | 126 | 138 | 149 | 105 |
| 53 | 139 | 134 | 128 | 140 | 151 | 107 |
| 54 | 140 | 135 | 129 | 142 | 152 | 109 |
| 55 | 142 | 136 | 131 | 144 | 153 | 110 |
| 56 | 143 | 138 | 132 | 147 | 154 | 111 |
| 57 | 145 | 139 | 134 | 150 | 156 | 113 |
| 58 | 146 | 140 | 134 | 153 | 156 | 114 |
| 59 | 148 | 142 | 136 | 156 | 157 | 115 |
| 60 | 150 | 144 | 138 | 158 | 158 | 117 |
| Max Temp: | 150 | 144 | 138 | 158 | 158 | 117 |
| Max Allowed: | 388 | 387 | 387 | 387 | 387 | 387 |



| Time (min) | TC # 179 (°F) | TC # 180 (°F) | TC # 181 (°F) | TC # 182 (°F) | TC # 183 (°F) | TC # 184 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 63 | 62 | 62 | 63 |
| 1 | 62 | 62 | 63 | 62 | 62 | 62 |
| 2 | 62 | 62 | 63 | 63 | 62 | 63 |
| 3 | 62 | 62 | 63 | 63 | 62 | 63 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 61 | 62 | 62 | 62 | 61 | 62 |
| 6 | 62 | 62 | 62 | 62 | 61 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 62 |
| 8 | 63 | 63 | 63 | 63 | 62 | 64 |
| 9 | 64 | 63 | 63 | 63 | 62 | 64 |
| 10 | 66 | 64 | 64 | 63 | 62 | 65 |
| 11 | 68 | 66 | 65 | 64 | 63 | 66 |
| 12 | 71 | 68 | 66 | 65 | 64 | 67 |
| 13 | 74 | 71 | 68 | 66 | 65 | 68 |
| 14 | 77 | 73 | 70 | 68 | 66 | 68 |
| 15 | 80 | 76 | 72 | 69 | 67 | 70 |
| 16 | 84 | 80 | 75 | 71 | 68 | 71 |
| 17 | 87 | 83 | 77 | 73 | 70 | 73 |
| 18 | 91 | 86 | 80 | 76 | 72 | 74 |
| 19 | 93 | 88 | 82 | 77 | 73 | 76 |
| 20 | 96 | 91 | 85 | 80 | 75 | 77 |
| 21 | 99 | 94 | 87 | 82 | 77 | 80 |
| 22 | 102 | 97 | 90 | 85 | 79 | 82 |
| 23 | 104 | 99 | 92 | 86 | 81 | 83 |
| 24 | 107 | 102 | 95 | 89 | 83 | 86 |
| 25 | 109 | 104 | 97 | 91 | 85 | 88 |
| 26 | 110 | 106 | 99 | 93 | 87 | 90 |
| 27 | 112 | 108 | 101 | 95 | 89 | 92 |
| 28 | 114 | 109 | 103 | 97 | 91 | 94 |
| 29 | 115 | 111 | 104 | 99 | 92 | 96 |
| 30 | 116 | 112 | 106 | 101 | 94 | 98 |
| 31 | 118 | 114 | 108 | 103 | 96 | 101 |
| 32 | 122 | 118 | 112 | 107 | 101 | 106 |
| 33 | 123 | 119 | 113 | 108 | 102 | 107 |
| 34 | 125 | 121 | 115 | 111 | 104 | 110 |
| 35 | 126 | 122 | 116 | 112 | 106 | 112 |
| 36 | 127 | 122 | 117 | 112 | 107 | 114 |
| 37 | 128 | 124 | 119 | 114 | 109 | 116 |
| 38 | 129 | 125 | 120 | 115 | 110 | 118 |
| 39 | 129 | 125 | 120 | 116 | 111 | 120 |
| 40 | 131 | 127 | 122 | 117 | 112 | 122 |

| Time (min) | TC # 179 (°F) | TC # 180 (°F) | TC # 181 (°F) | TC # 182 (°F) | TC # 183 (°F) | TC # 184 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 133 | 129 | 124 | 120 | 115 | 126 |
| 42 | 133 | 129 | 124 | 120 | 115 | 128 |
| 43 | 135 | 131 | 126 | 121 | 117 | 131 |
| 44 | 137 | 133 | 128 | 124 | 119 | 135 |
| 45 | 137 | 133 | 128 | 124 | 119 | 136 |
| 46 | 138 | 134 | 129 | 125 | 120 | 139 |
| 47 | 141 | 136 | 131 | 127 | 123 | 142 |
| 48 | 142 | 137 | 132 | 128 | 124 | 144 |
| 49 | 143 | 139 | 134 | 130 | 125 | 147 |
| 50 | 146 | 142 | 137 | 132 | 128 | 151 |
| 51 | 148 | 143 | 138 | 134 | 129 | 154 |
| 52 | 148 | 143 | 138 | 133 | 129 | 155 |
| 53 | 150 | 145 | 140 | 136 | 131 | 158 |
| 54 | 151 | 147 | 141 | 137 | 132 | 161 |
| 55 | 153 | 148 | 143 | 138 | 134 | 164 |
| 56 | 155 | 150 | 144 | 140 | 135 | 167 |
| 57 | 157 | 152 | 146 | 142 | 137 | 169 |
| 58 | 159 | 154 | 148 | 143 | 138 | 171 |
| 59 | 160 | 155 | 149 | 144 | 139 | 174 |
| 60 | 163 | 158 | 152 | 146 | 141 | 177 |
| Max Temp: | 163 | 158 | 152 | 146 | 141 | 177 |
| Max Allowed: | 387 | 387 | 388 | 387 | 387 | 388 |

| Time (min) | TC # 185 (°F) | TC # 186 (°F) | TC # 187 (°F) | TC # 188 (°F) | TC # 189 (°F) | TC # 190 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 62 | 62 | 63 | 62 |
| 1 | 62 | 62 | 62 | 62 | 62 | 62 |
| 2 | 62 | 63 | 62 | 62 | 62 | 62 |
| 3 | 62 | 63 | 62 | 62 | 62 | 62 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 61 | 62 | 62 | 62 | 63 | 62 |
| 6 | 62 | 62 | 63 | 63 | 64 | 63 |
| 7 | 62 | 62 | 64 | 64 | 66 | 64 |
| 8 | 62 | 62 | 65 | 66 | 68 | 66 |
| 9 | 63 | 62 | 67 | 68 | 70 | 68 |
| 10 | 63 | 62 | 69 | 70 | 72 | 70 |
| 11 | 64 | 63 | 71 | 73 | 76 | 72 |
| 12 | 65 | 63 | 74 | 76 | 79 | 75 |
| 13 | 66 | 63 | 76 | 79 | 82 | 78 |
| 14 | 67 | 63 | 79 | 82 | 85 | 81 |
| 15 | 68 | 64 | 83 | 86 | 89 | 84 |
| 16 | 70 | 64 | 86 | 89 | 93 | 87 |
| 17 | 72 | 65 | 90 | 93 | 96 | 91 |
| 18 | 74 | 65 | 94 | 96 | 100 | 95 |
| 19 | 76 | 66 | 98 | 100 | 104 | 98 |
| 20 | 78 | 67 | 102 | 104 | 108 | 102 |
| 21 | 81 | 68 | 107 | 109 | 113 | 106 |
| 22 | 84 | 69 | 111 | 112 | 117 | 110 |
| 23 | 86 | 69 | 115 | 115 | 121 | 113 |
| 24 | 88 | 71 | 119 | 119 | 124 | 117 |
| 25 | 91 | 72 | 123 | 123 | 128 | 121 |
| 26 | 94 | 73 | 126 | 126 | 131 | 124 |
| 27 | 96 | 74 | 130 | 130 | 135 | 128 |
| 28 | 99 | 75 | 135 | 134 | 139 | 132 |
| 29 | 102 | 77 | 141 | 140 | 145 | 138 |
| 30 | 104 | 78 | 145 | 144 | 149 | 142 |
| 31 | 108 | 79 | 148 | 147 | 152 | 145 |
| 32 | 113 | 83 | 153 | 151 | 156 | 150 |
| 33 | 116 | 84 | 158 | 156 | 161 | 154 |
| 34 | 120 | 86 | 160 | 158 | 163 | 157 |
| 35 | 124 | 87 | 163 | 161 | 166 | 159 |
| 36 | 128 | 88 | 166 | 163 | 168 | 162 |
| 37 | 135 | 90 | 170 | 166 | 171 | 165 |
| 38 | 144 | 91 | 173 | 170 | 175 | 169 |
| 39 | 150 | 92 | 178 | 174 | 179 | 173 |
| 40 | 157 | 94 | 181 | 177 | 182 | 176 |

| Time (min) | TC # 185 (°F) | TC # 186 (°F) | TC # 187 (°F) | TC # 188 (°F) | TC # 189 (°F) | TC # 190 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 161 | 96 | 184 | 180 | 184 | 179 |
| 42 | 162 | 96 | 189 | 184 | 189 | 184 |
| 43 | 166 | 98 | 192 | 187 | 191 | 187 |
| 44 | 170 | 101 | 196 | 192 | 195 | 191 |
| 45 | 170 | 101 | 202 | 200 | 201 | 197 |
| 46 | 172 | 102 | 205 | 205 | 203 | 203 |
| 47 | 176 | 104 | 211 | 208 | 206 | 208 |
| 48 | 177 | 105 | 213 | 209 | 209 | 210 |
| 49 | 179 | 107 | 215 | 211 | 212 | 213 |
| 50 | 181 | 110 | 215 | 212 | 213 | 214 |
| 51 | 181 | 112 | 216 | 213 | 215 | 215 |
| 52 | 181 | 112 | 214 | 211 | 213 | 213 |
| 53 | 182 | 114 | 213 | 211 | 212 | 212 |
| 54 | 183 | 115 | 211 | 209 | 211 | 210 |
| 55 | 183 | 117 | 213 | 211 | 213 | 212 |
| 56 | 183 | 118 | 213 | 211 | 213 | 212 |
| 57 | 184 | 120 | 212 | 210 | 212 | 211 |
| 58 | 184 | 121 | 212 | 210 | 212 | 211 |
| 59 | 185 | 122 | 211 | 210 | 211 | 210 |
| 60 | 187 | 124 | 212 | 210 | 212 | 211 |
| Max Temp: | 187 | 124 | 216 | 213 | 215 | 215 |
| Max Allowed: | 387 | 388 | 387 | 387 | 388 | 387 |

| Time (min) | TC # 191 (°F) | TC # 192 (°F) | TC # 193 (°F) | TC # 194 (°F) | TC # 195 (°F) | TC # 196 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 63 | 62 | 62 | 63 |
| 1 | 63 | 62 | 63 | 62 | 62 | 63 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 62 | 62 | 62 | 62 | 61 | 62 |
| 4 | 62 | 62 | 62 | 62 | 61 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 63 | 63 | 63 | 63 | 62 | 63 |
| 7 | 64 | 64 | 64 | 63 | 63 | 64 |
| 8 | 65 | 65 | 65 | 65 | 64 | 65 |
| 9 | 66 | 67 | 66 | 66 | 66 | 66 |
| 10 | 68 | 69 | 68 | 68 | 68 | 68 |
| 11 | 70 | 71 | 71 | 71 | 70 | 71 |
| 12 | 72 | 74 | 73 | 73 | 72 | 73 |
| 13 | 75 | 76 | 75 | 76 | 75 | 75 |
| 14 | 77 | 79 | 78 | 79 | 78 | 78 |
| 15 | 80 | 83 | 81 | 83 | 81 | 81 |
| 16 | 83 | 86 | 84 | 86 | 84 | 84 |
| 17 | 86 | 89 | 87 | 89 | 87 | 88 |
| 18 | 89 | 93 | 91 | 93 | 91 | 92 |
| 19 | 93 | 97 | 94 | 96 | 94 | 95 |
| 20 | 96 | 100 | 98 | 100 | 98 | 99 |
| 21 | 101 | 105 | 102 | 104 | 102 | 104 |
| 22 | 105 | 108 | 105 | 108 | 105 | 107 |
| 23 | 108 | 112 | 108 | 111 | 109 | 111 |
| 24 | 112 | 115 | 112 | 115 | 113 | 114 |
| 25 | 116 | 119 | 115 | 118 | 116 | 118 |
| 26 | 120 | 122 | 118 | 121 | 119 | 121 |
| 27 | 124 | 126 | 122 | 125 | 123 | 125 |
| 28 | 128 | 130 | 125 | 128 | 127 | 129 |
| 29 | 134 | 135 | 131 | 134 | 132 | 134 |
| 30 | 138 | 140 | 135 | 138 | 136 | 138 |
| 31 | 141 | 142 | 137 | 140 | 139 | 141 |
| 32 | 146 | 147 | 142 | 145 | 144 | 145 |
| 33 | 150 | 152 | 146 | 149 | 148 | 150 |
| 34 | 153 | 154 | 148 | 151 | 150 | 152 |
| 35 | 156 | 157 | 151 | 155 | 153 | 155 |
| 36 | 160 | 160 | 153 | 157 | 155 | 157 |
| 37 | 166 | 164 | 157 | 161 | 158 | 161 |
| 38 | 171 | 167 | 161 | 164 | 162 | 165 |
| 39 | 176 | 171 | 165 | 169 | 165 | 168 |
| 40 | 180 | 175 | 168 | 172 | 169 | 172 |

| Time (min) | TC # 191 (°F) | TC # 192 (°F) | TC # 193 (°F) | TC # 194 (°F) | TC # 195 (°F) | TC # 196 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 185 | 178 | 171 | 176 | 171 | 175 |
| 42 | 193 | 182 | 176 | 180 | 176 | 179 |
| 43 | 200 | 185 | 179 | 184 | 179 | 182 |
| 44 | 207 | 189 | 183 | 188 | 183 | 186 |
| 45 | 213 | 195 | 188 | 194 | 189 | 192 |
| 46 | 213 | 196 | 190 | 196 | 191 | 194 |
| 47 | 213 | 198 | 192 | 198 | 193 | 196 |
| 48 | 213 | 200 | 194 | 199 | 194 | 199 |
| 49 | 214 | 202 | 199 | 202 | 197 | 204 |
| 50 | 215 | 205 | 203 | 205 | 202 | 207 |
| 51 | 215 | 208 | 207 | 208 | 206 | 210 |
| 52 | 213 | 207 | 206 | 207 | 206 | 208 |
| 53 | 211 | 208 | 207 | 208 | 206 | 208 |
| 54 | 210 | 208 | 206 | 207 | 206 | 207 |
| 55 | 212 | 211 | 209 | 210 | 209 | 210 |
| 56 | 212 | 211 | 209 | 210 | 209 | 210 |
| 57 | 211 | 210 | 208 | 209 | 208 | 209 |
| 58 | 210 | 210 | 209 | 209 | 208 | 209 |
| 59 | 210 | 210 | 208 | 209 | 208 | 209 |
| 60 | 210 | 211 | 209 | 209 | 209 | 210 |
| Max Temp: | 215 | 211 | 209 | 210 | 209 | 210 |
| Max Allowed: | 388 | 388 | 388 | 387 | 387 | 388 |

| Time (min) | TC # 197 (°F) | TC # 198 (°F) | TC # 199 (°F) | TC # 200 (°F) |
|---------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 62 | 62 |
| 1 | 62 | 62 | 62 | 62 |
| 2 | 62 | 62 | 62 | 62 |
| 3 | 62 | 62 | 62 | 62 |
| 4 | 62 | 62 | 62 | 62 |
| 5 | 63 | 63 | 62 | 62 |
| 6 | 65 | 64 | 63 | 63 |
| 7 | 67 | 65 | 64 | 64 |
| 8 | 69 | 67 | 66 | 66 |
| 9 | 72 | 69 | 68 | 67 |
| 10 | 75 | 71 | 70 | 69 |
| 11 | 78 | 74 | 73 | 72 |
| 12 | 82 | 77 | 76 | 74 |
| 13 | 85 | 80 | 79 | 77 |
| 14 | 89 | 83 | 82 | 79 |
| 15 | 93 | 87 | 85 | 82 |
| 16 | 96 | 90 | 88 | 85 |
| 17 | 100 | 93 | 92 | 88 |
| 18 | 105 | 97 | 96 | 91 |
| 19 | 109 | 101 | 99 | 95 |
| 20 | 113 | 104 | 103 | 98 |
| 21 | 118 | 109 | 107 | 102 |
| 22 | 122 | 112 | 110 | 105 |
| 23 | 125 | 116 | 114 | 108 |
| 24 | 129 | 119 | 118 | 111 |
| 25 | 133 | 122 | 121 | 114 |
| 26 | 136 | 126 | 124 | 117 |
| 27 | 140 | 129 | 128 | 120 |
| 28 | 144 | 133 | 132 | 124 |
| 29 | 150 | 138 | 137 | 129 |
| 30 | 154 | 142 | 141 | 133 |
| 31 | 157 | 145 | 144 | 135 |
| 32 | 161 | 149 | 149 | 140 |
| 33 | 165 | 153 | 153 | 144 |
| 34 | 168 | 155 | 155 | 146 |
| 35 | 173 | 158 | 158 | 148 |
| 36 | 175 | 160 | 160 | 150 |
| 37 | 178 | 164 | 163 | 154 |
| 38 | 181 | 167 | 167 | 157 |
| 39 | 185 | 171 | 171 | 161 |
| 40 | 187 | 175 | 174 | 164 |

| Time (min) | TC # 197 (°F) | TC # 198 (°F) | TC # 199 (°F) | TC # 200 (°F) |
|---------------------|------------------|------------------|------------------|------------------|
| 41 | 189 | 178 | 177 | 167 |
| 42 | 193 | 182 | 182 | 172 |
| 43 | 195 | 185 | 186 | 175 |
| 44 | 198 | 189 | 190 | 179 |
| 45 | 204 | 194 | 196 | 185 |
| 46 | 207 | 195 | 197 | 187 |
| 47 | 210 | 197 | 198 | 188 |
| 48 | 211 | 197 | 199 | 190 |
| 49 | 213 | 200 | 201 | 193 |
| 50 | 214 | 205 | 203 | 195 |
| 51 | 215 | 210 | 205 | 198 |
| 52 | 213 | 209 | 204 | 201 |
| 53 | 213 | 209 | 204 | 204 |
| 54 | 211 | 208 | 204 | 205 |
| 55 | 213 | 211 | 208 | 208 |
| 56 | 213 | 211 | 209 | 209 |
| 57 | 212 | 210 | 209 | 208 |
| 58 | 212 | 210 | 209 | 208 |
| 59 | 211 | 209 | 209 | 208 |
| 60 | 212 | 210 | 210 | 208 |
| Max Temp: | 215 | 211 | 210 | 209 |
| Max Allowed: | 387 | 388 | 387 | 387 |

| Time (min) | TC # 201 (°F) | TC # 202 (°F) | TC # 203 (°F) | TC # 204 (°F) | TC # 205 (°F) | TC # 206 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 63 | 62 | 63 | 62 |
| 1 | 62 | 62 | 63 | 62 | 63 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 61 | 62 | 62 | 61 | 62 | 62 |
| 4 | 61 | 62 | 62 | 61 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 63 | 63 | 63 | 62 |
| 7 | 63 | 63 | 64 | 63 | 64 | 63 |
| 8 | 65 | 64 | 65 | 65 | 66 | 64 |
| 9 | 66 | 65 | 66 | 67 | 68 | 65 |
| 10 | 68 | 67 | 68 | 70 | 70 | 67 |
| 11 | 70 | 70 | 70 | 73 | 73 | 69 |
| 12 | 72 | 72 | 72 | 76 | 75 | 71 |
| 13 | 75 | 74 | 75 | 80 | 78 | 74 |
| 14 | 78 | 77 | 77 | 83 | 81 | 76 |
| 15 | 81 | 80 | 80 | 87 | 84 | 79 |
| 16 | 84 | 83 | 83 | 90 | 87 | 82 |
| 17 | 87 | 86 | 86 | 94 | 91 | 85 |
| 18 | 91 | 89 | 89 | 98 | 95 | 89 |
| 19 | 94 | 92 | 92 | 102 | 98 | 92 |
| 20 | 98 | 96 | 96 | 106 | 102 | 96 |
| 21 | 102 | 100 | 100 | 110 | 106 | 100 |
| 22 | 106 | 103 | 103 | 113 | 109 | 104 |
| 23 | 109 | 106 | 106 | 117 | 113 | 107 |
| 24 | 113 | 110 | 109 | 121 | 116 | 111 |
| 25 | 116 | 113 | 112 | 124 | 120 | 115 |
| 26 | 119 | 117 | 115 | 127 | 123 | 118 |
| 27 | 123 | 121 | 119 | 130 | 127 | 122 |
| 28 | 127 | 124 | 122 | 133 | 131 | 126 |
| 29 | 132 | 130 | 128 | 139 | 136 | 132 |
| 30 | 137 | 134 | 132 | 142 | 141 | 136 |
| 31 | 139 | 137 | 134 | 145 | 143 | 139 |
| 32 | 144 | 142 | 139 | 149 | 148 | 143 |
| 33 | 148 | 146 | 143 | 153 | 153 | 148 |
| 34 | 150 | 148 | 146 | 155 | 155 | 150 |
| 35 | 153 | 152 | 149 | 158 | 158 | 153 |
| 36 | 156 | 154 | 151 | 160 | 161 | 155 |
| 37 | 159 | 158 | 155 | 164 | 165 | 159 |
| 38 | 163 | 162 | 159 | 167 | 168 | 162 |
| 39 | 167 | 166 | 163 | 171 | 173 | 166 |
| 40 | 170 | 169 | 167 | 175 | 176 | 169 |

| Time (min) | TC # 201 (°F) | TC # 202 (°F) | TC # 203 (°F) | TC # 204 (°F) | TC # 205 (°F) | TC # 206 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 173 | 173 | 171 | 178 | 180 | 172 |
| 42 | 178 | 178 | 175 | 182 | 185 | 177 |
| 43 | 181 | 182 | 179 | 186 | 188 | 181 |
| 44 | 185 | 186 | 185 | 190 | 195 | 186 |
| 45 | 191 | 192 | 194 | 196 | 202 | 193 |
| 46 | 193 | 195 | 201 | 199 | 206 | 197 |
| 47 | 195 | 197 | 204 | 203 | 209 | 199 |
| 48 | 197 | 200 | 205 | 206 | 209 | 201 |
| 49 | 200 | 208 | 211 | 210 | 211 | 206 |
| 50 | 203 | 212 | 213 | 213 | 212 | 207 |
| 51 | 206 | 212 | 214 | 216 | 214 | 209 |
| 52 | 208 | 211 | 212 | 214 | 212 | 207 |
| 53 | 208 | 209 | 210 | 214 | 211 | 207 |
| 54 | 208 | 208 | 209 | 213 | 209 | 206 |
| 55 | 210 | 209 | 210 | 216 | 211 | 208 |
| 56 | 210 | 209 | 210 | 216 | 210 | 208 |
| 57 | 209 | 208 | 208 | 215 | 209 | 208 |
| 58 | 209 | 207 | 208 | 215 | 208 | 207 |
| 59 | 209 | 206 | 207 | 214 | 208 | 206 |
| 60 | 209 | 206 | 207 | 215 | 208 | 207 |
| Max Temp: | 210 | 212 | 214 | 216 | 214 | 209 |
| Max Allowed: | 387 | 387 | 388 | 387 | 388 | 387 |

| Time (min) | TC # 207 (°F) | TC # 208 (°F) | TC # 209 (°F) | TC # 210 (°F) | TC # 211 (°F) | TC # 212 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 62 | 63 | 62 | 62 |
| 1 | 63 | 62 | 62 | 63 | 62 | 62 |
| 2 | 63 | 62 | 62 | 63 | 62 | 62 |
| 3 | 63 | 62 | 61 | 62 | 62 | 61 |
| 4 | 63 | 62 | 61 | 62 | 62 | 61 |
| 5 | 63 | 62 | 62 | 63 | 62 | 61 |
| 6 | 64 | 63 | 62 | 63 | 63 | 62 |
| 7 | 65 | 64 | 64 | 64 | 65 | 62 |
| 8 | 66 | 66 | 65 | 66 | 67 | 62 |
| 9 | 68 | 68 | 67 | 68 | 69 | 62 |
| 10 | 71 | 70 | 70 | 70 | 71 | 62 |
| 11 | 73 | 73 | 73 | 73 | 74 | 63 |
| 12 | 76 | 76 | 76 | 76 | 77 | 63 |
| 13 | 79 | 78 | 79 | 79 | 80 | 64 |
| 14 | 82 | 82 | 83 | 82 | 83 | 64 |
| 15 | 85 | 85 | 86 | 85 | 86 | 65 |
| 16 | 88 | 88 | 90 | 88 | 90 | 66 |
| 17 | 91 | 91 | 94 | 91 | 93 | 67 |
| 18 | 94 | 95 | 98 | 94 | 96 | 69 |
| 19 | 98 | 98 | 102 | 97 | 100 | 70 |
| 20 | 101 | 101 | 105 | 101 | 103 | 71 |
| 21 | 104 | 105 | 110 | 105 | 108 | 73 |
| 22 | 108 | 109 | 114 | 108 | 111 | 75 |
| 23 | 111 | 112 | 118 | 112 | 115 | 76 |
| 24 | 114 | 115 | 122 | 115 | 119 | 77 |
| 25 | 118 | 118 | 125 | 118 | 122 | 79 |
| 26 | 121 | 122 | 129 | 121 | 125 | 80 |
| 27 | 125 | 125 | 133 | 125 | 128 | 82 |
| 28 | 129 | 129 | 136 | 128 | 132 | 84 |
| 29 | 132 | 134 | 141 | 134 | 137 | 87 |
| 30 | 136 | 138 | 145 | 138 | 141 | 89 |
| 31 | 139 | 140 | 147 | 140 | 142 | 90 |
| 32 | 143 | 144 | 152 | 145 | 146 | 93 |
| 33 | 146 | 148 | 156 | 149 | 149 | 96 |
| 34 | 149 | 150 | 157 | 151 | 150 | 96 |
| 35 | 153 | 153 | 160 | 154 | 153 | 98 |
| 36 | 156 | 155 | 162 | 156 | 155 | 99 |
| 37 | 159 | 159 | 165 | 160 | 158 | 101 |
| 38 | 162 | 162 | 169 | 163 | 162 | 103 |
| 39 | 165 | 166 | 172 | 166 | 166 | 106 |
| 40 | 168 | 170 | 176 | 169 | 171 | 108 |

| Time (min) | TC # 207 (°F) | TC # 208 (°F) | TC # 209 (°F) | TC # 210 (°F) | TC # 211 (°F) | TC # 212 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 171 | 173 | 180 | 172 | 174 | 110 |
| 42 | 174 | 177 | 187 | 176 | 178 | 113 |
| 43 | 176 | 179 | 190 | 179 | 181 | 115 |
| 44 | 179 | 183 | 193 | 183 | 185 | 118 |
| 45 | 182 | 189 | 198 | 190 | 190 | 123 |
| 46 | 184 | 191 | 200 | 193 | 192 | 124 |
| 47 | 187 | 194 | 201 | 196 | 193 | 125 |
| 48 | 190 | 197 | 203 | 202 | 194 | 125 |
| 49 | 195 | 203 | 205 | 211 | 197 | 127 |
| 50 | 200 | 210 | 207 | 213 | 205 | 129 |
| 51 | 204 | 213 | 210 | 214 | 211 | 131 |
| 52 | 206 | 209 | 208 | 212 | 210 | 130 |
| 53 | 208 | 208 | 209 | 210 | 209 | 130 |
| 54 | 209 | 207 | 209 | 209 | 207 | 130 |
| 55 | 210 | 209 | 212 | 210 | 209 | 135 |
| 56 | 210 | 209 | 213 | 210 | 208 | 138 |
| 57 | 210 | 208 | 212 | 209 | 207 | 141 |
| 58 | 211 | 207 | 212 | 208 | 207 | 145 |
| 59 | 210 | 206 | 212 | 207 | 206 | 147 |
| 60 | 210 | 202 | 212 | 207 | 205 | 152 |
| Max Temp: | 211 | 213 | 213 | 214 | 211 | 152 |
| Max Allowed: | 388 | 388 | 387 | 388 | 387 | 387 |

| Time (min) | TC # 213 (°F) | TC # 214 (°F) | TC # 215 (°F) | TC # 216 (°F) | TC # 217 (°F) | TC # 218 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 63 | 62 | 62 | 62 |
| 1 | 62 | 63 | 62 | 62 | 62 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 61 | 62 | 62 | 61 | 61 | 61 |
| 4 | 61 | 62 | 62 | 61 | 61 | 61 |
| 5 | 61 | 62 | 62 | 61 | 61 | 61 |
| 6 | 61 | 62 | 62 | 62 | 61 | 62 |
| 7 | 61 | 62 | 62 | 62 | 61 | 62 |
| 8 | 62 | 62 | 62 | 62 | 61 | 62 |
| 9 | 62 | 63 | 62 | 62 | 62 | 62 |
| 10 | 62 | 63 | 63 | 62 | 62 | 62 |
| 11 | 63 | 64 | 63 | 63 | 63 | 63 |
| 12 | 63 | 64 | 64 | 63 | 63 | 63 |
| 13 | 63 | 64 | 64 | 64 | 63 | 63 |
| 14 | 64 | 65 | 65 | 65 | 64 | 64 |
| 15 | 65 | 65 | 65 | 65 | 65 | 64 |
| 16 | 65 | 66 | 66 | 66 | 65 | 65 |
| 17 | 66 | 66 | 67 | 67 | 66 | 66 |
| 18 | 67 | 68 | 68 | 68 | 68 | 67 |
| 19 | 68 | 68 | 69 | 69 | 68 | 68 |
| 20 | 69 | 69 | 70 | 71 | 70 | 69 |
| 21 | 71 | 71 | 72 | 73 | 72 | 71 |
| 22 | 72 | 72 | 73 | 74 | 73 | 71 |
| 23 | 73 | 73 | 74 | 75 | 74 | 72 |
| 24 | 74 | 74 | 75 | 76 | 75 | 74 |
| 25 | 75 | 75 | 76 | 77 | 76 | 74 |
| 26 | 76 | 76 | 77 | 78 | 77 | 76 |
| 27 | 77 | 77 | 78 | 80 | 79 | 77 |
| 28 | 79 | 78 | 80 | 81 | 81 | 78 |
| 29 | 82 | 81 | 83 | 85 | 84 | 82 |
| 30 | 84 | 83 | 85 | 86 | 86 | 84 |
| 31 | 84 | 84 | 85 | 87 | 87 | 84 |
| 32 | 87 | 86 | 88 | 90 | 90 | 87 |
| 33 | 89 | 88 | 91 | 92 | 92 | 89 |
| 34 | 90 | 89 | 91 | 93 | 93 | 90 |
| 35 | 91 | 90 | 92 | 94 | 94 | 91 |
| 36 | 91 | 90 | 93 | 95 | 95 | 92 |
| 37 | 93 | 92 | 95 | 97 | 97 | 94 |
| 38 | 95 | 94 | 97 | 99 | 99 | 96 |
| 39 | 97 | 96 | 99 | 101 | 102 | 98 |
| 40 | 99 | 98 | 101 | 103 | 104 | 101 |

| Time (min) | TC # 213 (°F) | TC # 214 (°F) | TC # 215 (°F) | TC # 216 (°F) | TC # 217 (°F) | TC # 218 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 101 | 100 | 102 | 105 | 106 | 102 |
| 42 | 104 | 102 | 106 | 108 | 109 | 105 |
| 43 | 106 | 104 | 108 | 110 | 111 | 107 |
| 44 | 109 | 107 | 111 | 113 | 114 | 110 |
| 45 | 113 | 112 | 115 | 117 | 119 | 115 |
| 46 | 114 | 112 | 116 | 118 | 120 | 116 |
| 47 | 115 | 113 | 117 | 119 | 121 | 117 |
| 48 | 116 | 114 | 117 | 119 | 122 | 118 |
| 49 | 118 | 117 | 120 | 121 | 125 | 121 |
| 50 | 120 | 120 | 122 | 123 | 127 | 124 |
| 51 | 122 | 123 | 124 | 126 | 130 | 127 |
| 52 | 122 | 123 | 124 | 125 | 129 | 127 |
| 53 | 124 | 125 | 125 | 126 | 130 | 129 |
| 54 | 126 | 126 | 127 | 126 | 131 | 131 |
| 55 | 132 | 131 | 132 | 131 | 138 | 137 |
| 56 | 135 | 135 | 135 | 134 | 142 | 140 |
| 57 | 138 | 138 | 137 | 137 | 145 | 144 |
| 58 | 142 | 142 | 141 | 140 | 149 | 148 |
| 59 | 145 | 145 | 144 | 144 | 153 | 152 |
| 60 | 150 | 150 | 149 | 148 | 158 | 158 |
| Max Temp: | 150 | 150 | 149 | 148 | 158 | 158 |
| Max Allowed: | 387 | 388 | 388 | 387 | 387 | 387 |

| Time (min) | TC # 219 (°F) | TC # 220 (°F) | TC # 221 (°F) | TC # 222 (°F) | TC # 223 (°F) | TC # 224 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 63 | 62 | 62 | 63 |
| 1 | 62 | 62 | 62 | 62 | 62 | 63 |
| 2 | 62 | 61 | 62 | 62 | 61 | 62 |
| 3 | 62 | 61 | 62 | 61 | 61 | 62 |
| 4 | 62 | 61 | 62 | 61 | 61 | 62 |
| 5 | 62 | 61 | 62 | 61 | 61 | 62 |
| 6 | 62 | 61 | 62 | 62 | 61 | 62 |
| 7 | 62 | 61 | 62 | 62 | 61 | 62 |
| 8 | 62 | 61 | 62 | 62 | 61 | 62 |
| 9 | 62 | 62 | 62 | 62 | 62 | 63 |
| 10 | 62 | 62 | 63 | 62 | 62 | 63 |
| 11 | 63 | 63 | 63 | 63 | 63 | 63 |
| 12 | 63 | 63 | 63 | 63 | 63 | 64 |
| 13 | 64 | 63 | 64 | 64 | 63 | 64 |
| 14 | 64 | 64 | 65 | 65 | 64 | 65 |
| 15 | 65 | 64 | 65 | 66 | 65 | 66 |
| 16 | 65 | 65 | 66 | 66 | 66 | 67 |
| 17 | 66 | 65 | 67 | 67 | 67 | 67 |
| 18 | 67 | 67 | 68 | 69 | 68 | 69 |
| 19 | 68 | 68 | 69 | 70 | 69 | 70 |
| 20 | 69 | 69 | 70 | 72 | 70 | 71 |
| 21 | 71 | 70 | 72 | 74 | 72 | 73 |
| 22 | 72 | 71 | 73 | 75 | 74 | 74 |
| 23 | 73 | 72 | 74 | 77 | 75 | 75 |
| 24 | 74 | 74 | 76 | 78 | 76 | 77 |
| 25 | 75 | 74 | 77 | 79 | 77 | 78 |
| 26 | 76 | 76 | 78 | 81 | 79 | 79 |
| 27 | 77 | 77 | 79 | 83 | 80 | 80 |
| 28 | 79 | 79 | 81 | 85 | 82 | 82 |
| 29 | 82 | 82 | 85 | 88 | 85 | 85 |
| 30 | 84 | 84 | 87 | 91 | 87 | 87 |
| 31 | 85 | 85 | 88 | 92 | 88 | 88 |
| 32 | 88 | 88 | 90 | 95 | 91 | 91 |
| 33 | 91 | 90 | 93 | 97 | 94 | 94 |
| 34 | 91 | 91 | 94 | 98 | 94 | 94 |
| 35 | 92 | 92 | 95 | 100 | 95 | 95 |
| 36 | 93 | 93 | 96 | 101 | 96 | 96 |
| 37 | 95 | 95 | 98 | 103 | 98 | 98 |
| 38 | 97 | 97 | 100 | 106 | 101 | 100 |
| 39 | 100 | 99 | 103 | 108 | 103 | 103 |
| 40 | 102 | 102 | 105 | 111 | 105 | 104 |

| Time (min) | TC # 219 (°F) | TC # 220 (°F) | TC # 221 (°F) | TC # 222 (°F) | TC # 223 (°F) | TC # 224 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 104 | 103 | 107 | 113 | 107 | 106 |
| 42 | 107 | 106 | 110 | 116 | 110 | 109 |
| 43 | 109 | 109 | 112 | 118 | 112 | 111 |
| 44 | 112 | 112 | 115 | 121 | 115 | 114 |
| 45 | 117 | 116 | 120 | 126 | 120 | 119 |
| 46 | 118 | 117 | 121 | 127 | 121 | 121 |
| 47 | 119 | 118 | 122 | 128 | 124 | 123 |
| 48 | 120 | 119 | 123 | 130 | 127 | 126 |
| 49 | 123 | 122 | 126 | 135 | 132 | 131 |
| 50 | 125 | 125 | 129 | 139 | 136 | 136 |
| 51 | 128 | 128 | 132 | 146 | 142 | 143 |
| 52 | 128 | 128 | 131 | 149 | 146 | 147 |
| 53 | 130 | 129 | 133 | 155 | 152 | 153 |
| 54 | 132 | 131 | 135 | 160 | 158 | 159 |
| 55 | 138 | 137 | 140 | 169 | 167 | 169 |
| 56 | 142 | 141 | 144 | 175 | 174 | 175 |
| 57 | 145 | 144 | 147 | 179 | 178 | 179 |
| 58 | 150 | 148 | 151 | 182 | 181 | 182 |
| 59 | 154 | 152 | 155 | 184 | 183 | 184 |
| 60 | 160 | 157 | 160 | 186 | 185 | 187 |
| Max Temp: | 160 | 157 | 160 | 186 | 185 | 187 |
| Max Allowed: | 387 | 387 | 388 | 387 | 387 | 388 |

| Time (min) | TC # 225 (°F) | TC # 226 (°F) | TC # 227 (°F) | TC # 228 (°F) | TC # 229 (°F) | TC # 230 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 63 | 63 | 62 | 62 |
| 1 | 62 | 62 | 62 | 63 | 62 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 62 | 62 | 62 | 62 | 62 | 62 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 63 | 63 | 63 | 63 |
| 7 | 62 | 62 | 64 | 64 | 64 | 64 |
| 8 | 62 | 62 | 65 | 65 | 66 | 66 |
| 9 | 62 | 62 | 67 | 67 | 67 | 69 |
| 10 | 62 | 63 | 69 | 69 | 70 | 71 |
| 11 | 63 | 63 | 72 | 72 | 73 | 75 |
| 12 | 64 | 64 | 74 | 74 | 76 | 78 |
| 13 | 64 | 64 | 77 | 77 | 79 | 82 |
| 14 | 65 | 65 | 80 | 81 | 83 | 85 |
| 15 | 66 | 66 | 83 | 84 | 86 | 89 |
| 16 | 67 | 67 | 87 | 88 | 90 | 93 |
| 17 | 67 | 68 | 90 | 92 | 94 | 97 |
| 18 | 69 | 70 | 94 | 96 | 98 | 102 |
| 19 | 70 | 71 | 98 | 100 | 102 | 106 |
| 20 | 72 | 73 | 102 | 104 | 107 | 111 |
| 21 | 74 | 75 | 107 | 109 | 111 | 116 |
| 22 | 75 | 76 | 110 | 113 | 115 | 120 |
| 23 | 76 | 78 | 114 | 117 | 120 | 124 |
| 24 | 78 | 80 | 118 | 121 | 123 | 129 |
| 25 | 79 | 81 | 122 | 125 | 127 | 132 |
| 26 | 81 | 82 | 126 | 128 | 131 | 136 |
| 27 | 82 | 84 | 129 | 133 | 135 | 140 |
| 28 | 84 | 86 | 133 | 137 | 139 | 144 |
| 29 | 88 | 90 | 139 | 142 | 145 | 150 |
| 30 | 90 | 92 | 144 | 147 | 149 | 154 |
| 31 | 91 | 93 | 146 | 150 | 152 | 157 |
| 32 | 94 | 96 | 151 | 155 | 157 | 161 |
| 33 | 97 | 99 | 156 | 159 | 161 | 166 |
| 34 | 97 | 100 | 158 | 162 | 164 | 168 |
| 35 | 99 | 101 | 162 | 165 | 167 | 171 |
| 36 | 100 | 102 | 164 | 168 | 170 | 173 |
| 37 | 102 | 105 | 168 | 171 | 174 | 177 |
| 38 | 104 | 107 | 172 | 175 | 177 | 180 |
| 39 | 107 | 110 | 176 | 179 | 182 | 184 |
| 40 | 109 | 112 | 180 | 183 | 185 | 188 |

| Time (min) | TC # 225 (°F) | TC # 226 (°F) | TC # 227 (°F) | TC # 228 (°F) | TC # 229 (°F) | TC # 230 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 111 | 114 | 184 | 186 | 189 | 191 |
| 42 | 114 | 118 | 189 | 191 | 195 | 195 |
| 43 | 116 | 120 | 192 | 194 | 200 | 198 |
| 44 | 119 | 123 | 198 | 199 | 204 | 202 |
| 45 | 124 | 127 | 204 | 204 | 210 | 207 |
| 46 | 125 | 128 | 206 | 207 | 211 | 209 |
| 47 | 126 | 129 | 208 | 209 | 212 | 211 |
| 48 | 129 | 131 | 210 | 212 | 212 | 213 |
| 49 | 134 | 135 | 211 | 214 | 213 | 215 |
| 50 | 138 | 140 | 212 | 214 | 214 | 217 |
| 51 | 145 | 146 | 213 | 215 | 215 | 219 |
| 52 | 148 | 149 | 211 | 212 | 212 | 217 |
| 53 | 154 | 155 | 210 | 212 | 212 | 216 |
| 54 | 161 | 161 | 208 | 210 | 210 | 215 |
| 55 | 170 | 170 | 210 | 212 | 212 | 218 |
| 56 | 176 | 176 | 210 | 212 | 212 | 218 |
| 57 | 179 | 179 | 209 | 211 | 211 | 217 |
| 58 | 183 | 183 | 208 | 211 | 211 | 217 |
| 59 | 185 | 185 | 208 | 211 | 211 | 217 |
| 60 | 187 | 187 | 208 | 212 | 212 | 218 |
| Max Temp: | 187 | 187 | 213 | 215 | 215 | 219 |
| Max Allowed: | 387 | 387 | 388 | 388 | 387 | 387 |

| Time (min) | TC # 231 (°F) | TC # 232 (°F) | TC # 233 (°F) | TC # 234 (°F) | TC # 235 (°F) | TC # 236 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 62 | 62 | 62 | 62 |
| 1 | 63 | 63 | 62 | 62 | 62 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 62 | 62 | 61 | 62 | 62 | 62 |
| 4 | 62 | 62 | 61 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 63 | 63 | 62 | 63 | 62 | 62 |
| 7 | 64 | 63 | 63 | 65 | 63 | 63 |
| 8 | 66 | 64 | 64 | 67 | 64 | 64 |
| 9 | 68 | 65 | 66 | 70 | 66 | 66 |
| 10 | 70 | 67 | 68 | 72 | 68 | 68 |
| 11 | 74 | 69 | 71 | 76 | 71 | 71 |
| 12 | 77 | 71 | 74 | 80 | 73 | 73 |
| 13 | 80 | 73 | 77 | 83 | 76 | 76 |
| 14 | 84 | 76 | 80 | 87 | 79 | 80 |
| 15 | 88 | 79 | 83 | 92 | 83 | 83 |
| 16 | 92 | 83 | 87 | 96 | 86 | 87 |
| 17 | 97 | 87 | 91 | 100 | 90 | 91 |
| 18 | 101 | 91 | 95 | 105 | 95 | 95 |
| 19 | 106 | 95 | 99 | 109 | 99 | 99 |
| 20 | 110 | 100 | 103 | 113 | 103 | 104 |
| 21 | 115 | 105 | 108 | 119 | 108 | 109 |
| 22 | 120 | 110 | 112 | 123 | 112 | 114 |
| 23 | 124 | 114 | 116 | 127 | 116 | 119 |
| 24 | 128 | 119 | 121 | 131 | 120 | 124 |
| 25 | 132 | 123 | 124 | 135 | 124 | 128 |
| 26 | 136 | 127 | 128 | 139 | 128 | 133 |
| 27 | 140 | 131 | 133 | 143 | 133 | 138 |
| 28 | 144 | 135 | 137 | 147 | 138 | 143 |
| 29 | 150 | 141 | 143 | 153 | 144 | 150 |
| 30 | 154 | 146 | 148 | 157 | 149 | 156 |
| 31 | 157 | 149 | 151 | 160 | 153 | 160 |
| 32 | 162 | 153 | 157 | 165 | 158 | 166 |
| 33 | 166 | 158 | 162 | 169 | 162 | 171 |
| 34 | 169 | 160 | 164 | 171 | 165 | 175 |
| 35 | 172 | 163 | 168 | 174 | 169 | 180 |
| 36 | 174 | 166 | 171 | 177 | 172 | 184 |
| 37 | 178 | 169 | 175 | 180 | 177 | 188 |
| 38 | 182 | 173 | 179 | 184 | 182 | 192 |
| 39 | 185 | 178 | 183 | 188 | 187 | 195 |
| 40 | 189 | 182 | 187 | 192 | 193 | 198 |

| Time (min) | TC # 231 (°F) | TC # 232 (°F) | TC # 233 (°F) | TC # 234 (°F) | TC # 235 (°F) | TC # 236 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 192 | 190 | 190 | 195 | 200 | 201 |
| 42 | 196 | 202 | 195 | 200 | 206 | 204 |
| 43 | 199 | 207 | 199 | 204 | 208 | 206 |
| 44 | 203 | 210 | 203 | 209 | 211 | 209 |
| 45 | 208 | 215 | 209 | 215 | 214 | 213 |
| 46 | 209 | 215 | 211 | 217 | 214 | 213 |
| 47 | 210 | 215 | 212 | 219 | 214 | 213 |
| 48 | 210 | 214 | 213 | 220 | 213 | 213 |
| 49 | 212 | 215 | 214 | 221 | 214 | 214 |
| 50 | 213 | 215 | 215 | 222 | 214 | 215 |
| 51 | 214 | 216 | 216 | 223 | 214 | 216 |
| 52 | 211 | 213 | 213 | 221 | 211 | 213 |
| 53 | 211 | 212 | 212 | 220 | 210 | 212 |
| 54 | 209 | 210 | 210 | 219 | 209 | 210 |
| 55 | 211 | 212 | 212 | 221 | 211 | 212 |
| 56 | 211 | 211 | 212 | 221 | 211 | 212 |
| 57 | 210 | 210 | 211 | 220 | 209 | 211 |
| 58 | 210 | 210 | 211 | 221 | 209 | 211 |
| 59 | 211 | 209 | 210 | 220 | 209 | 210 |
| 60 | 213 | 209 | 211 | 221 | 209 | 211 |
| Max Temp: | 214 | 216 | 216 | 223 | 214 | 216 |
| Max Allowed: | 388 | 388 | 387 | 387 | 387 | 387 |

| Time (min) | TC # 237 (°F) | TC # 238 (°F) | TC # 239 (°F) | TC # 240 (°F) | TC # 241 (°F) | TC # 242 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 62 | 62 | 62 | 62 |
| 1 | 63 | 62 | 62 | 62 | 62 | 62 |
| 2 | 63 | 62 | 62 | 62 | 61 | 62 |
| 3 | 62 | 62 | 62 | 61 | 61 | 61 |
| 4 | 62 | 62 | 62 | 61 | 61 | 61 |
| 5 | 63 | 63 | 62 | 61 | 62 | 62 |
| 6 | 63 | 65 | 63 | 62 | 63 | 63 |
| 7 | 64 | 67 | 64 | 63 | 65 | 64 |
| 8 | 65 | 69 | 66 | 63 | 67 | 66 |
| 9 | 67 | 72 | 68 | 65 | 70 | 68 |
| 10 | 69 | 75 | 71 | 67 | 73 | 71 |
| 11 | 71 | 79 | 74 | 69 | 76 | 74 |
| 12 | 74 | 82 | 76 | 71 | 80 | 77 |
| 13 | 76 | 86 | 79 | 73 | 83 | 80 |
| 14 | 79 | 90 | 83 | 76 | 87 | 84 |
| 15 | 82 | 94 | 86 | 79 | 91 | 88 |
| 16 | 85 | 97 | 90 | 82 | 95 | 92 |
| 17 | 88 | 101 | 93 | 85 | 99 | 96 |
| 18 | 92 | 106 | 97 | 89 | 104 | 101 |
| 19 | 96 | 110 | 101 | 92 | 109 | 105 |
| 20 | 100 | 114 | 105 | 96 | 113 | 110 |
| 21 | 104 | 118 | 110 | 101 | 118 | 116 |
| 22 | 107 | 122 | 113 | 104 | 122 | 120 |
| 23 | 111 | 126 | 117 | 108 | 126 | 125 |
| 24 | 114 | 130 | 121 | 112 | 130 | 130 |
| 25 | 118 | 133 | 124 | 115 | 134 | 134 |
| 26 | 121 | 136 | 128 | 119 | 138 | 139 |
| 27 | 124 | 140 | 132 | 123 | 142 | 143 |
| 28 | 128 | 144 | 136 | 127 | 146 | 148 |
| 29 | 134 | 149 | 142 | 133 | 152 | 155 |
| 30 | 138 | 153 | 146 | 137 | 156 | 160 |
| 31 | 140 | 156 | 149 | 140 | 159 | 164 |
| 32 | 145 | 160 | 154 | 145 | 164 | 169 |
| 33 | 149 | 165 | 159 | 150 | 167 | 175 |
| 34 | 151 | 167 | 161 | 152 | 169 | 178 |
| 35 | 154 | 170 | 164 | 156 | 172 | 181 |
| 36 | 156 | 172 | 166 | 159 | 175 | 184 |
| 37 | 159 | 176 | 170 | 164 | 178 | 188 |
| 38 | 163 | 180 | 174 | 169 | 181 | 191 |
| 39 | 166 | 183 | 178 | 175 | 185 | 196 |
| 40 | 170 | 186 | 183 | 181 | 190 | 200 |

| Time (min) | TC # 237 (°F) | TC # 238 (°F) | TC # 239 (°F) | TC # 240 (°F) | TC # 241 (°F) | TC # 242 (°F) |
|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 41 | 173 | 189 | 188 | 186 | 195 | 202 |
| 42 | 178 | 193 | 194 | 191 | 202 | 206 |
| 43 | 181 | 196 | 198 | 195 | 205 | 208 |
| 44 | 185 | 199 | 203 | 200 | 209 | 211 |
| 45 | 191 | 204 | 208 | 206 | 214 | 214 |
| 46 | 194 | 206 | 209 | 207 | 215 | 214 |
| 47 | 197 | 207 | 211 | 208 | 215 | 214 |
| 48 | 204 | 208 | 211 | 209 | 214 | 213 |
| 49 | 209 | 210 | 212 | 210 | 214 | 214 |
| 50 | 212 | 211 | 213 | 211 | 214 | 214 |
| 51 | 214 | 213 | 214 | 212 | 214 | 215 |
| 52 | 212 | 211 | 211 | 210 | 211 | 212 |
| 53 | 211 | 211 | 210 | 209 | 211 | 211 |
| 54 | 209 | 209 | 209 | 208 | 210 | 210 |
| 55 | 211 | 211 | 211 | 210 | 213 | 212 |
| 56 | 210 | 211 | 211 | 210 | 214 | 212 |
| 57 | 209 | 210 | 210 | 209 | 214 | 211 |
| 58 | 209 | 210 | 210 | 208 | 215 | 211 |
| 59 | 208 | 209 | 210 | 208 | 215 | 210 |
| 60 | 208 | 210 | 211 | 208 | 218 | 211 |
| Max Temp: | 214 | 213 | 214 | 212 | 218 | 215 |
| Max Allowed: | 388 | 387 | 387 | 387 | 387 | 387 |



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| Time (min) | TC # 243 (°F) | TC # 244 (°F) | TC # 245 (°F) | TC # 246 (°F) | TC # 247 (°F) | TC # 248 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 62 | 62 | 63 | 63 |
| 1 | 62 | 62 | 62 | 62 | 63 | 63 |
| 2 | 62 | 62 | 62 | 62 | 62 | 63 |
| 3 | 61 | 61 | 62 | 62 | 62 | 62 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 63 |
| 6 | 63 | 63 | 64 | 63 | 63 | 63 |
| 7 | 64 | 65 | 65 | 63 | 64 | 65 |
| 8 | 66 | 67 | 67 | 65 | 66 | 66 |
| 9 | 69 | 69 | 70 | 66 | 68 | 68 |
| 10 | 71 | 72 | 73 | 68 | 70 | 70 |
| 11 | 74 | 76 | 76 | 71 | 73 | 74 |
| 12 | 77 | 79 | 80 | 73 | 76 | 77 |
| 13 | 81 | 82 | 83 | 76 | 80 | 80 |
| 14 | 84 | 86 | 87 | 79 | 83 | 83 |
| 15 | 87 | 90 | 92 | 83 | 87 | 87 |
| 16 | 91 | 94 | 96 | 86 | 91 | 91 |
| 17 | 94 | 97 | 100 | 90 | 95 | 95 |
| 18 | 98 | 102 | 105 | 94 | 100 | 99 |
| 19 | 102 | 106 | 110 | 98 | 105 | 104 |
| 20 | 106 | 110 | 114 | 103 | 109 | 108 |
| 21 | 111 | 115 | 119 | 108 | 115 | 114 |
| 22 | 114 | 118 | 123 | 112 | 119 | 118 |
| 23 | 118 | 122 | 127 | 116 | 123 | 122 |
| 24 | 122 | 126 | 132 | 121 | 128 | 127 |
| 25 | 125 | 129 | 135 | 125 | 132 | 132 |
| 26 | 129 | 133 | 139 | 129 | 136 | 136 |
| 27 | 133 | 137 | 143 | 133 | 141 | 141 |
| 28 | 136 | 140 | 146 | 138 | 145 | 145 |
| 29 | 142 | 146 | 152 | 144 | 151 | 152 |
| 30 | 146 | 150 | 156 | 148 | 155 | 156 |
| 31 | 148 | 152 | 158 | 152 | 158 | 160 |
| 32 | 153 | 157 | 163 | 157 | 164 | 165 |
| 33 | 157 | 161 | 167 | 162 | 168 | 170 |
| 34 | 159 | 163 | 169 | 166 | 171 | 172 |
| 35 | 162 | 166 | 172 | 171 | 174 | 176 |
| 36 | 164 | 168 | 174 | 176 | 177 | 179 |
| 37 | 168 | 171 | 177 | 182 | 181 | 184 |
| 38 | 171 | 175 | 181 | 188 | 185 | 188 |
| 39 | 175 | 179 | 185 | 193 | 189 | 194 |
| 40 | 178 | 182 | 189 | 197 | 193 | 199 |

OMEGA POINT
LABORATORIES

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| Time (min) | TC # 243 (°F) | TC # 244 (°F) | TC # 245 (°F) | TC # 246 (°F) | TC # 247 (°F) | TC # 248 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 181 | 185 | 192 | 208 | 197 | 201 |
| 42 | 185 | 189 | 197 | 210 | 203 | 204 |
| 43 | 188 | 193 | 201 | 211 | 206 | 207 |
| 44 | 193 | 197 | 206 | 210 | 210 | 210 |
| 45 | 199 | 203 | 211 | 213 | 214 | 214 |
| 46 | 202 | 205 | 211 | 212 | 214 | 215 |
| 47 | 204 | 209 | 213 | 211 | 215 | 216 |
| 48 | 206 | 211 | 213 | 210 | 214 | 216 |
| 49 | 209 | 212 | 213 | 211 | 215 | 217 |
| 50 | 210 | 213 | 213 | 213 | 215 | 217 |
| 51 | 212 | 214 | 214 | 214 | 215 | 218 |
| 52 | 210 | 211 | 212 | 212 | 213 | 215 |
| 53 | 210 | 210 | 211 | 211 | 212 | 214 |
| 54 | 208 | 209 | 210 | 209 | 210 | 213 |
| 55 | 210 | 211 | 214 | 211 | 212 | 215 |
| 56 | 210 | 211 | 215 | 211 | 212 | 215 |
| 57 | 209 | 210 | 215 | 210 | 212 | 214 |
| 58 | 209 | 211 | 217 | 211 | 212 | 215 |
| 59 | 209 | 212 | 218 | 210 | 213 | 214 |
| 60 | 209 | 214 | 220 | 212 | 214 | 215 |
| Max Temp: | 212 | 214 | 220 | 214 | 215 | 218 |
| Max Allowed: | 387 | 387 | 387 | 387 | 388 | 388 |

| Time (min) | TC # 249 (°F) | TC # 250 (°F) | TC # 251 (°F) | TC # 252 (°F) | TC # 253 (°F) | TC # 254 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 62 | 63 | 63 | 63 |
| 1 | 63 | 62 | 62 | 63 | 63 | 63 |
| 2 | 63 | 62 | 62 | 63 | 63 | 63 |
| 3 | 62 | 61 | 61 | 62 | 62 | 61 |
| 4 | 62 | 61 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 61 | 62 | 62 | 62 | 62 |
| 7 | 62 | 61 | 62 | 62 | 62 | 62 |
| 8 | 62 | 61 | 61 | 62 | 62 | 62 |
| 9 | 63 | 61 | 62 | 62 | 62 | 62 |
| 10 | 63 | 62 | 62 | 63 | 63 | 62 |
| 11 | 63 | 62 | 62 | 63 | 63 | 63 |
| 12 | 64 | 63 | 63 | 63 | 63 | 63 |
| 13 | 65 | 63 | 63 | 64 | 64 | 64 |
| 14 | 66 | 64 | 64 | 65 | 65 | 64 |
| 15 | 67 | 65 | 65 | 66 | 66 | 65 |
| 16 | 69 | 66 | 66 | 67 | 67 | 66 |
| 17 | 70 | 67 | 67 | 68 | 69 | 67 |
| 18 | 72 | 68 | 68 | 69 | 70 | 69 |
| 19 | 74 | 70 | 70 | 71 | 72 | 71 |
| 20 | 76 | 72 | 71 | 73 | 74 | 72 |
| 21 | 78 | 74 | 73 | 75 | 76 | 74 |
| 22 | 80 | 76 | 75 | 77 | 78 | 76 |
| 23 | 82 | 78 | 78 | 79 | 80 | 79 |
| 24 | 85 | 80 | 80 | 81 | 83 | 81 |
| 25 | 87 | 83 | 82 | 84 | 85 | 83 |
| 26 | 90 | 85 | 85 | 86 | 88 | 86 |
| 27 | 92 | 87 | 87 | 89 | 90 | 88 |
| 28 | 95 | 90 | 89 | 91 | 92 | 90 |
| 29 | 97 | 92 | 91 | 93 | 94 | 92 |
| 30 | 99 | 94 | 94 | 95 | 97 | 95 |
| 31 | 102 | 97 | 96 | 98 | 99 | 97 |
| 32 | 103 | 98 | 98 | 99 | 100 | 99 |
| 33 | 106 | 101 | 100 | 101 | 102 | 101 |
| 34 | 108 | 103 | 102 | 103 | 104 | 103 |
| 35 | 111 | 105 | 105 | 106 | 106 | 105 |
| 36 | 113 | 108 | 107 | 108 | 109 | 107 |
| 37 | 115 | 110 | 109 | 110 | 110 | 109 |
| 38 | 117 | 112 | 111 | 112 | 112 | 111 |
| 39 | 120 | 114 | 113 | 114 | 114 | 112 |
| 40 | 122 | 116 | 115 | 115 | 116 | 114 |

| Time (min) | TC # 249 (°F) | TC # 250 (°F) | TC # 251 (°F) | TC # 252 (°F) | TC # 253 (°F) | TC # 254 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 124 | 119 | 117 | 117 | 117 | 116 |
| 42 | 126 | 121 | 119 | 119 | 119 | 117 |
| 43 | 128 | 123 | 121 | 121 | 121 | 119 |
| 44 | 129 | 124 | 122 | 122 | 122 | 120 |
| 45 | 130 | 126 | 124 | 123 | 124 | 122 |
| 46 | 132 | 128 | 126 | 126 | 126 | 124 |
| 47 | 134 | 130 | 128 | 128 | 128 | 126 |
| 48 | 136 | 133 | 130 | 130 | 131 | 128 |
| 49 | 138 | 135 | 133 | 132 | 133 | 130 |
| 50 | 139 | 136 | 135 | 135 | 135 | 132 |
| 51 | 141 | 138 | 136 | 137 | 137 | 134 |
| 52 | 144 | 140 | 139 | 140 | 141 | 138 |
| 53 | 146 | 142 | 141 | 142 | 143 | 140 |
| 54 | 149 | 144 | 144 | 145 | 146 | 143 |
| 55 | 151 | 146 | 145 | 147 | 148 | 146 |
| 56 | 154 | 148 | 148 | 149 | 151 | 148 |
| 57 | 157 | 151 | 150 | 152 | 154 | 151 |
| 58 | 160 | 154 | 152 | 155 | 157 | 154 |
| 59 | 163 | 156 | 155 | 157 | 160 | 157 |
| 60 | 166 | 159 | 157 | 160 | 162 | 160 |
| Max Temp: | 166 | 159 | 157 | 160 | 162 | 160 |
| Max Allowed: | 388 | 387 | 387 | 388 | 388 | 388 |

| Time (min) | TC # 255 (°F) | TC # 256 (°F) | TC # 257 (°F) | TC # 258 (°F) | TC # 259 (°F) | TC # 260 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 62 | 62 | 63 | 63 |
| 1 | 62 | 62 | 62 | 62 | 63 | 63 |
| 2 | 62 | 62 | 62 | 62 | 63 | 63 |
| 3 | 61 | 61 | 61 | 61 | 62 | 62 |
| 4 | 61 | 61 | 61 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 63 | 62 |
| 6 | 61 | 61 | 61 | 62 | 62 | 62 |
| 7 | 61 | 61 | 61 | 62 | 62 | 62 |
| 8 | 61 | 61 | 61 | 62 | 62 | 62 |
| 9 | 61 | 61 | 62 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 63 | 63 |
| 11 | 62 | 62 | 62 | 62 | 63 | 63 |
| 12 | 62 | 62 | 63 | 63 | 63 | 64 |
| 13 | 63 | 63 | 63 | 64 | 64 | 64 |
| 14 | 63 | 63 | 64 | 64 | 65 | 65 |
| 15 | 64 | 64 | 65 | 65 | 66 | 66 |
| 16 | 65 | 65 | 66 | 67 | 67 | 67 |
| 17 | 66 | 66 | 68 | 68 | 68 | 69 |
| 18 | 68 | 68 | 69 | 69 | 69 | 70 |
| 19 | 69 | 70 | 71 | 71 | 71 | 72 |
| 20 | 71 | 71 | 73 | 73 | 73 | 74 |
| 21 | 73 | 73 | 74 | 74 | 74 | 76 |
| 22 | 75 | 75 | 77 | 77 | 76 | 78 |
| 23 | 77 | 77 | 79 | 79 | 79 | 80 |
| 24 | 79 | 80 | 81 | 81 | 81 | 82 |
| 25 | 82 | 82 | 84 | 83 | 83 | 85 |
| 26 | 84 | 85 | 86 | 86 | 85 | 87 |
| 27 | 87 | 87 | 89 | 88 | 88 | 89 |
| 28 | 89 | 90 | 91 | 90 | 90 | 92 |
| 29 | 91 | 92 | 93 | 92 | 92 | 93 |
| 30 | 94 | 94 | 95 | 95 | 94 | 96 |
| 31 | 96 | 96 | 98 | 97 | 96 | 98 |
| 32 | 98 | 98 | 99 | 98 | 98 | 99 |
| 33 | 99 | 100 | 101 | 100 | 100 | 101 |
| 34 | 102 | 102 | 103 | 102 | 102 | 103 |
| 35 | 104 | 104 | 105 | 104 | 104 | 105 |
| 36 | 106 | 106 | 107 | 106 | 106 | 107 |
| 37 | 108 | 108 | 109 | 108 | 108 | 109 |
| 38 | 109 | 110 | 111 | 110 | 109 | 111 |
| 39 | 111 | 111 | 112 | 112 | 111 | 112 |
| 40 | 113 | 113 | 114 | 113 | 113 | 114 |

| Time (min) | TC # 255 (°F) | TC # 256 (°F) | TC # 257 (°F) | TC # 258 (°F) | TC # 259 (°F) | TC # 260 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 114 | 114 | 116 | 115 | 115 | 116 |
| 42 | 116 | 116 | 117 | 117 | 116 | 118 |
| 43 | 117 | 118 | 119 | 118 | 118 | 120 |
| 44 | 119 | 119 | 120 | 119 | 120 | 121 |
| 45 | 120 | 120 | 121 | 121 | 121 | 123 |
| 46 | 122 | 122 | 123 | 123 | 123 | 125 |
| 47 | 124 | 124 | 125 | 125 | 125 | 127 |
| 48 | 126 | 126 | 127 | 127 | 128 | 129 |
| 49 | 128 | 128 | 128 | 129 | 130 | 132 |
| 50 | 130 | 129 | 130 | 131 | 132 | 134 |
| 51 | 132 | 131 | 132 | 133 | 134 | 136 |
| 52 | 135 | 134 | 135 | 136 | 137 | 139 |
| 53 | 138 | 137 | 137 | 138 | 139 | 142 |
| 54 | 140 | 139 | 140 | 141 | 142 | 145 |
| 55 | 142 | 141 | 142 | 143 | 144 | 147 |
| 56 | 145 | 144 | 144 | 145 | 147 | 149 |
| 57 | 148 | 146 | 147 | 148 | 150 | 152 |
| 58 | 151 | 149 | 150 | 151 | 152 | 155 |
| 59 | 153 | 152 | 152 | 154 | 155 | 158 |
| 60 | 156 | 154 | 155 | 156 | 158 | 160 |
| Max Temp: | 156 | 154 | 155 | 156 | 158 | 160 |
| Max Allowed: | 387 | 387 | 387 | 387 | 388 | 388 |

| Time (min) | TC # 261 (°F) | TC # 262 (°F) | TC # 263 (°F) | TC # 264 (°F) | TC # 265 (°F) | TC # 266 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 63 | 63 | 63 | 63 |
| 1 | 63 | 63 | 63 | 63 | 63 | 63 |
| 2 | 63 | 62 | 63 | 63 | 63 | 63 |
| 3 | 62 | 61 | 62 | 62 | 62 | 62 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 63 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 62 |
| 8 | 62 | 62 | 62 | 62 | 62 | 62 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 63 | 62 | 62 | 62 | 63 | 62 |
| 11 | 63 | 62 | 63 | 63 | 63 | 62 |
| 12 | 64 | 63 | 63 | 63 | 63 | 62 |
| 13 | 64 | 63 | 64 | 63 | 63 | 63 |
| 14 | 65 | 64 | 64 | 64 | 64 | 63 |
| 15 | 66 | 65 | 65 | 65 | 64 | 63 |
| 16 | 68 | 66 | 66 | 66 | 65 | 64 |
| 17 | 69 | 67 | 67 | 67 | 66 | 64 |
| 18 | 71 | 69 | 69 | 68 | 67 | 65 |
| 19 | 73 | 70 | 71 | 69 | 68 | 66 |
| 20 | 74 | 72 | 72 | 71 | 69 | 66 |
| 21 | 76 | 74 | 74 | 72 | 70 | 67 |
| 22 | 79 | 76 | 76 | 74 | 72 | 68 |
| 23 | 81 | 79 | 79 | 76 | 74 | 69 |
| 24 | 83 | 81 | 81 | 79 | 76 | 70 |
| 25 | 86 | 83 | 83 | 81 | 77 | 72 |
| 26 | 88 | 86 | 86 | 83 | 79 | 73 |
| 27 | 90 | 88 | 88 | 85 | 81 | 75 |
| 28 | 92 | 90 | 91 | 88 | 83 | 76 |
| 29 | 94 | 92 | 93 | 90 | 85 | 78 |
| 30 | 96 | 95 | 95 | 92 | 87 | 79 |
| 31 | 99 | 97 | 97 | 94 | 89 | 81 |
| 32 | 100 | 98 | 99 | 96 | 91 | 82 |
| 33 | 102 | 100 | 101 | 98 | 93 | 84 |
| 34 | 104 | 102 | 103 | 100 | 94 | 85 |
| 35 | 106 | 104 | 105 | 102 | 96 | 87 |
| 36 | 108 | 107 | 107 | 105 | 98 | 89 |
| 37 | 110 | 108 | 109 | 106 | 100 | 90 |
| 38 | 111 | 110 | 111 | 108 | 102 | 91 |
| 39 | 113 | 112 | 112 | 110 | 103 | 93 |
| 40 | 115 | 113 | 114 | 112 | 105 | 94 |

| Time (min) | TC # 261 (°F) | TC # 262 (°F) | TC # 263 (°F) | TC # 264 (°F) | TC # 265 (°F) | TC # 266 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 117 | 115 | 116 | 113 | 107 | 95 |
| 42 | 119 | 117 | 117 | 115 | 108 | 96 |
| 43 | 120 | 119 | 119 | 116 | 110 | 98 |
| 44 | 122 | 120 | 120 | 117 | 111 | 99 |
| 45 | 124 | 121 | 121 | 119 | 112 | 100 |
| 46 | 126 | 123 | 123 | 120 | 113 | 101 |
| 47 | 128 | 125 | 125 | 122 | 115 | 102 |
| 48 | 130 | 127 | 127 | 124 | 117 | 104 |
| 49 | 132 | 129 | 128 | 125 | 118 | 105 |
| 50 | 135 | 131 | 130 | 127 | 120 | 107 |
| 51 | 137 | 133 | 131 | 128 | 121 | 108 |
| 52 | 140 | 136 | 134 | 131 | 124 | 111 |
| 53 | 142 | 138 | 136 | 132 | 126 | 112 |
| 54 | 145 | 141 | 138 | 135 | 128 | 114 |
| 55 | 147 | 142 | 140 | 136 | 129 | 116 |
| 56 | 150 | 145 | 142 | 138 | 131 | 118 |
| 57 | 152 | 147 | 144 | 140 | 133 | 120 |
| 58 | 155 | 150 | 147 | 142 | 135 | 121 |
| 59 | 158 | 152 | 149 | 144 | 137 | 123 |
| 60 | 160 | 155 | 151 | 146 | 138 | 124 |
| Max Temp: | 160 | 155 | 151 | 146 | 138 | 124 |
| Max Allowed: | 388 | 387 | 388 | 388 | 388 | 388 |

| Time (min) | TC # 267 (°F) | TC # 268 (°F) | TC # 269 (°F) | TC # 270 (°F) | TC # 271 (°F) | TC # 272 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 62 | 62 | 63 | 62 |
| 1 | 63 | 63 | 63 | 62 | 63 | 62 |
| 2 | 63 | 63 | 62 | 62 | 63 | 62 |
| 3 | 62 | 62 | 61 | 61 | 62 | 61 |
| 4 | 62 | 62 | 62 | 61 | 62 | 61 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 61 | 62 | 61 |
| 7 | 62 | 62 | 62 | 61 | 62 | 61 |
| 8 | 62 | 62 | 61 | 61 | 62 | 61 |
| 9 | 63 | 62 | 62 | 61 | 62 | 61 |
| 10 | 63 | 62 | 62 | 62 | 62 | 61 |
| 11 | 63 | 63 | 62 | 62 | 62 | 61 |
| 12 | 64 | 63 | 62 | 62 | 62 | 62 |
| 13 | 64 | 63 | 62 | 62 | 62 | 62 |
| 14 | 65 | 63 | 63 | 62 | 63 | 62 |
| 15 | 66 | 64 | 63 | 62 | 63 | 62 |
| 16 | 67 | 65 | 63 | 63 | 63 | 62 |
| 17 | 68 | 65 | 64 | 63 | 63 | 63 |
| 18 | 69 | 66 | 64 | 63 | 64 | 63 |
| 19 | 70 | 67 | 65 | 64 | 64 | 63 |
| 20 | 71 | 68 | 66 | 65 | 65 | 64 |
| 21 | 72 | 69 | 67 | 65 | 65 | 64 |
| 22 | 74 | 70 | 68 | 67 | 66 | 65 |
| 23 | 75 | 72 | 70 | 68 | 67 | 66 |
| 24 | 76 | 73 | 71 | 69 | 69 | 67 |
| 25 | 78 | 75 | 73 | 71 | 70 | 68 |
| 26 | 80 | 76 | 74 | 72 | 71 | 70 |
| 27 | 81 | 78 | 76 | 74 | 73 | 71 |
| 28 | 83 | 80 | 77 | 75 | 74 | 72 |
| 29 | 85 | 81 | 79 | 77 | 76 | 74 |
| 30 | 87 | 83 | 81 | 78 | 77 | 75 |
| 31 | 89 | 85 | 83 | 80 | 79 | 77 |
| 32 | 90 | 86 | 84 | 81 | 80 | 78 |
| 33 | 92 | 88 | 85 | 83 | 82 | 79 |
| 34 | 94 | 91 | 88 | 85 | 83 | 81 |
| 35 | 97 | 93 | 90 | 87 | 85 | 83 |
| 36 | 99 | 95 | 92 | 89 | 87 | 85 |
| 37 | 101 | 98 | 94 | 91 | 89 | 86 |
| 38 | 104 | 100 | 96 | 93 | 91 | 88 |
| 39 | 106 | 102 | 99 | 95 | 93 | 90 |
| 40 | 108 | 104 | 100 | 97 | 94 | 92 |

| Time (min) | TC # 267 (°F) | TC # 268 (°F) | TC # 269 (°F) | TC # 270 (°F) | TC # 271 (°F) | TC # 272 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 110 | 107 | 102 | 99 | 96 | 93 |
| 42 | 113 | 109 | 105 | 101 | 98 | 95 |
| 43 | 115 | 111 | 107 | 103 | 100 | 97 |
| 44 | 116 | 112 | 109 | 105 | 102 | 99 |
| 45 | 117 | 114 | 110 | 106 | 103 | 100 |
| 46 | 119 | 116 | 112 | 109 | 106 | 102 |
| 47 | 121 | 118 | 115 | 111 | 108 | 105 |
| 48 | 123 | 120 | 117 | 113 | 110 | 107 |
| 49 | 125 | 122 | 119 | 115 | 112 | 109 |
| 50 | 126 | 123 | 120 | 117 | 114 | 111 |
| 51 | 128 | 124 | 121 | 119 | 116 | 113 |
| 52 | 130 | 126 | 124 | 121 | 119 | 115 |
| 53 | 131 | 128 | 125 | 123 | 120 | 117 |
| 54 | 133 | 130 | 127 | 125 | 122 | 119 |
| 55 | 134 | 131 | 128 | 126 | 123 | 120 |
| 56 | 135 | 132 | 129 | 127 | 125 | 122 |
| 57 | 137 | 134 | 131 | 129 | 127 | 124 |
| 58 | 139 | 136 | 133 | 131 | 129 | 126 |
| 59 | 141 | 138 | 135 | 132 | 130 | 127 |
| 60 | 142 | 139 | 137 | 134 | 131 | 128 |
| Max Temp: | 142 | 139 | 137 | 134 | 131 | 128 |
| Max Allowed: | 388 | 388 | 387 | 387 | 388 | 387 |

| Time (min) | TC # 273 (°F) | TC # 274 (°F) | TC # 275 (°F) | TC # 276 (°F) | TC # 277 (°F) | TC # 278 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 63 | 63 | 63 | 63 |
| 1 | 62 | 62 | 63 | 63 | 63 | 63 |
| 2 | 62 | 62 | 62 | 63 | 63 | 63 |
| 3 | 61 | 61 | 62 | 62 | 62 | 62 |
| 4 | 61 | 61 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 63 | 62 |
| 6 | 61 | 61 | 62 | 62 | 62 | 62 |
| 7 | 61 | 61 | 62 | 62 | 62 | 62 |
| 8 | 61 | 61 | 62 | 62 | 62 | 62 |
| 9 | 61 | 61 | 62 | 62 | 62 | 62 |
| 10 | 61 | 62 | 62 | 62 | 62 | 62 |
| 11 | 61 | 61 | 62 | 62 | 62 | 62 |
| 12 | 62 | 62 | 62 | 62 | 63 | 62 |
| 13 | 62 | 62 | 62 | 63 | 63 | 63 |
| 14 | 62 | 62 | 62 | 63 | 63 | 63 |
| 15 | 62 | 62 | 62 | 63 | 63 | 63 |
| 16 | 62 | 62 | 63 | 63 | 63 | 63 |
| 17 | 63 | 63 | 63 | 63 | 64 | 64 |
| 18 | 63 | 63 | 63 | 64 | 64 | 64 |
| 19 | 63 | 63 | 64 | 64 | 64 | 65 |
| 20 | 63 | 63 | 64 | 64 | 65 | 65 |
| 21 | 64 | 64 | 64 | 65 | 65 | 66 |
| 22 | 65 | 64 | 65 | 65 | 66 | 67 |
| 23 | 65 | 65 | 66 | 66 | 67 | 68 |
| 24 | 66 | 66 | 66 | 67 | 68 | 69 |
| 25 | 67 | 67 | 67 | 68 | 69 | 70 |
| 26 | 69 | 68 | 68 | 69 | 70 | 72 |
| 27 | 70 | 69 | 69 | 70 | 72 | 73 |
| 28 | 71 | 70 | 71 | 71 | 73 | 74 |
| 29 | 72 | 71 | 72 | 72 | 74 | 76 |
| 30 | 74 | 73 | 73 | 74 | 75 | 77 |
| 31 | 75 | 74 | 75 | 75 | 77 | 79 |
| 32 | 76 | 75 | 75 | 76 | 78 | 80 |
| 33 | 77 | 77 | 77 | 77 | 79 | 81 |
| 34 | 79 | 78 | 78 | 79 | 81 | 83 |
| 35 | 81 | 80 | 80 | 81 | 83 | 85 |
| 36 | 83 | 82 | 82 | 83 | 85 | 87 |
| 37 | 85 | 84 | 84 | 84 | 86 | 88 |
| 38 | 86 | 85 | 85 | 86 | 88 | 90 |
| 39 | 88 | 87 | 87 | 87 | 89 | 92 |
| 40 | 90 | 89 | 89 | 89 | 91 | 93 |

| Time (min) | TC # 273 (°F) | TC # 274 (°F) | TC # 275 (°F) | TC # 276 (°F) | TC # 277 (°F) | TC # 278 (°F) |
|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 41 | 91 | 90 | 90 | 91 | 93 | 95 |
| 42 | 93 | 92 | 92 | 92 | 94 | 96 |
| 43 | 95 | 93 | 93 | 94 | 96 | 98 |
| 44 | 96 | 95 | 95 | 95 | 97 | 99 |
| 45 | 97 | 96 | 96 | 96 | 98 | 100 |
| 46 | 99 | 98 | 98 | 98 | 100 | 102 |
| 47 | 102 | 100 | 100 | 100 | 101 | 103 |
| 48 | 104 | 102 | 102 | 102 | 103 | 105 |
| 49 | 106 | 105 | 104 | 104 | 105 | 106 |
| 50 | 108 | 106 | 106 | 105 | 106 | 108 |
| 51 | 110 | 108 | 108 | 107 | 108 | 109 |
| 52 | 113 | 111 | 111 | 110 | 111 | 112 |
| 53 | 115 | 113 | 113 | 112 | 113 | 113 |
| 54 | 117 | 116 | 115 | 114 | 115 | 115 |
| 55 | 118 | 117 | 117 | 116 | 116 | 117 |
| 56 | 120 | 119 | 118 | 118 | 118 | 119 |
| 57 | 122 | 121 | 120 | 120 | 120 | 120 |
| 58 | 123 | 122 | 122 | 121 | 122 | 122 |
| 59 | 125 | 124 | 124 | 123 | 124 | 124 |
| 60 | 126 | 125 | 125 | 125 | 125 | 125 |
| Max Temp: | 126 | 125 | 125 | 125 | 125 | 125 |
| Max Allowed: | 387 | 387 | 388 | 388 | 388 | 388 |



| Time (min) | TC # 279 (°F) | TC # 280 (°F) | TC # 281 (°F) | TC # 282 (°F) | TC # 283 (°F) | TC # 284 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 63 | 63 | 63 | 63 |
| 1 | 62 | 63 | 63 | 63 | 63 | 63 |
| 2 | 62 | 63 | 63 | 62 | 63 | 62 |
| 3 | 61 | 62 | 62 | 62 | 62 | 62 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 61 | 62 | 62 | 62 | 62 | 62 |
| 8 | 61 | 62 | 62 | 62 | 62 | 62 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 62 | 62 | 62 | 62 |
| 12 | 62 | 62 | 62 | 62 | 62 | 62 |
| 13 | 62 | 62 | 62 | 62 | 62 | 62 |
| 14 | 62 | 63 | 63 | 62 | 63 | 62 |
| 15 | 63 | 63 | 63 | 63 | 63 | 62 |
| 16 | 63 | 63 | 63 | 63 | 63 | 62 |
| 17 | 63 | 63 | 63 | 63 | 63 | 63 |
| 18 | 64 | 64 | 64 | 64 | 63 | 63 |
| 19 | 64 | 65 | 64 | 64 | 64 | 63 |
| 20 | 65 | 65 | 65 | 64 | 64 | 63 |
| 21 | 65 | 66 | 65 | 65 | 64 | 63 |
| 22 | 66 | 66 | 66 | 66 | 65 | 63 |
| 23 | 67 | 68 | 67 | 66 | 65 | 64 |
| 24 | 68 | 69 | 68 | 67 | 66 | 64 |
| 25 | 70 | 70 | 69 | 68 | 67 | 65 |
| 26 | 71 | 71 | 70 | 69 | 68 | 65 |
| 27 | 72 | 72 | 71 | 70 | 68 | 65 |
| 28 | 74 | 74 | 73 | 71 | 69 | 66 |
| 29 | 75 | 75 | 74 | 72 | 70 | 66 |
| 30 | 76 | 76 | 75 | 74 | 70 | 67 |
| 31 | 78 | 78 | 76 | 75 | 72 | 67 |
| 32 | 79 | 79 | 77 | 76 | 72 | 67 |
| 33 | 80 | 80 | 78 | 77 | 73 | 68 |
| 34 | 82 | 82 | 80 | 78 | 74 | 68 |
| 35 | 84 | 84 | 82 | 80 | 75 | 69 |
| 36 | 86 | 86 | 84 | 81 | 76 | 70 |
| 37 | 87 | 87 | 85 | 82 | 77 | 71 |
| 38 | 89 | 89 | 87 | 84 | 78 | 71 |
| 39 | 90 | 90 | 88 | 85 | 79 | 72 |
| 40 | 92 | 92 | 89 | 87 | 81 | 73 |

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| Time (min) | TC # 279 (°F) | TC # 280 (°F) | TC # 281 (°F) | TC # 282 (°F) | TC # 283 (°F) | TC # 284 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 94 | 93 | 91 | 88 | 82 | 74 |
| 42 | 95 | 95 | 93 | 89 | 83 | 74 |
| 43 | 97 | 96 | 94 | 91 | 84 | 75 |
| 44 | 98 | 98 | 95 | 92 | 85 | 76 |
| 45 | 99 | 99 | 96 | 93 | 85 | 76 |
| 46 | 100 | 100 | 98 | 94 | 87 | 77 |
| 47 | 102 | 102 | 99 | 96 | 88 | 79 |
| 48 | 104 | 104 | 101 | 98 | 90 | 80 |
| 49 | 105 | 105 | 103 | 99 | 91 | 81 |
| 50 | 107 | 107 | 104 | 100 | 92 | 82 |
| 51 | 108 | 108 | 105 | 102 | 94 | 83 |
| 52 | 110 | 110 | 108 | 104 | 96 | 86 |
| 53 | 112 | 112 | 110 | 106 | 98 | 87 |
| 54 | 114 | 114 | 112 | 108 | 99 | 89 |
| 55 | 115 | 115 | 113 | 109 | 101 | 90 |
| 56 | 117 | 117 | 115 | 111 | 102 | 91 |
| 57 | 119 | 119 | 117 | 113 | 104 | 93 |
| 58 | 121 | 121 | 118 | 114 | 106 | 94 |
| 59 | 122 | 122 | 120 | 116 | 107 | 96 |
| 60 | 124 | 124 | 121 | 118 | 109 | 97 |
| Max Temp: | 124 | 124 | 121 | 118 | 109 | 97 |
| Max Allowed: | 387 | 388 | 388 | 388 | 388 | 388 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 285 (°F) | TC # 286 (°F) | TC # 287 (°F) | TC # 288 (°F) | TC # 289 (°F) | TC # 290 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 62 | 62 | 62 | 62 |
| 1 | 62 | 63 | 62 | 62 | 62 | 62 |
| 2 | 62 | 63 | 62 | 62 | 62 | 62 |
| 3 | 61 | 62 | 61 | 61 | 61 | 61 |
| 4 | 61 | 62 | 62 | 61 | 61 | 62 |
| 5 | 62 | 62 | 62 | 62 | 61 | 62 |
| 6 | 62 | 62 | 62 | 61 | 61 | 62 |
| 7 | 62 | 62 | 62 | 61 | 61 | 61 |
| 8 | 62 | 62 | 61 | 61 | 61 | 61 |
| 9 | 62 | 63 | 62 | 62 | 61 | 62 |
| 10 | 63 | 63 | 62 | 62 | 62 | 62 |
| 11 | 64 | 63 | 63 | 62 | 62 | 62 |
| 12 | 65 | 64 | 63 | 63 | 63 | 62 |
| 13 | 66 | 65 | 64 | 63 | 63 | 63 |
| 14 | 68 | 66 | 65 | 64 | 64 | 63 |
| 15 | 70 | 67 | 66 | 65 | 65 | 64 |
| 16 | 72 | 69 | 67 | 66 | 65 | 65 |
| 17 | 74 | 71 | 68 | 67 | 66 | 65 |
| 18 | 76 | 72 | 69 | 68 | 67 | 67 |
| 19 | 78 | 74 | 71 | 70 | 69 | 68 |
| 20 | 81 | 76 | 73 | 71 | 70 | 69 |
| 21 | 83 | 78 | 74 | 72 | 71 | 70 |
| 22 | 85 | 80 | 76 | 74 | 73 | 71 |
| 23 | 88 | 82 | 78 | 76 | 74 | 72 |
| 24 | 90 | 84 | 80 | 78 | 76 | 74 |
| 25 | 92 | 87 | 82 | 80 | 78 | 76 |
| 26 | 95 | 89 | 84 | 81 | 79 | 77 |
| 27 | 97 | 91 | 86 | 83 | 81 | 79 |
| 28 | 99 | 93 | 87 | 85 | 83 | 80 |
| 29 | 101 | 94 | 89 | 86 | 84 | 81 |
| 30 | 103 | 96 | 91 | 88 | 86 | 83 |
| 31 | 105 | 98 | 93 | 90 | 87 | 85 |
| 32 | 106 | 99 | 94 | 91 | 88 | 86 |
| 33 | 108 | 101 | 95 | 92 | 90 | 87 |
| 34 | 110 | 103 | 97 | 94 | 92 | 88 |
| 35 | 112 | 105 | 99 | 96 | 93 | 90 |
| 36 | 114 | 107 | 101 | 98 | 95 | 92 |
| 37 | 115 | 109 | 103 | 100 | 97 | 93 |
| 38 | 117 | 110 | 105 | 101 | 98 | 95 |
| 39 | 118 | 112 | 106 | 103 | 100 | 96 |
| 40 | 119 | 113 | 108 | 105 | 101 | 98 |

| Time (min) | TC # 285 (°F) | TC # 286 (°F) | TC # 287 (°F) | TC # 288 (°F) | TC # 289 (°F) | TC # 290 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 120 | 115 | 110 | 106 | 103 | 99 |
| 42 | 121 | 116 | 111 | 108 | 105 | 101 |
| 43 | 122 | 117 | 112 | 109 | 106 | 102 |
| 44 | 123 | 118 | 113 | 110 | 107 | 103 |
| 45 | 124 | 119 | 115 | 111 | 108 | 104 |
| 46 | 125 | 120 | 116 | 113 | 110 | 106 |
| 47 | 127 | 122 | 118 | 115 | 111 | 107 |
| 48 | 129 | 124 | 120 | 116 | 113 | 109 |
| 49 | 130 | 126 | 121 | 118 | 115 | 111 |
| 50 | 132 | 127 | 123 | 120 | 116 | 112 |
| 51 | 134 | 129 | 124 | 121 | 117 | 113 |
| 52 | 137 | 131 | 127 | 124 | 120 | 116 |
| 53 | 139 | 133 | 128 | 125 | 122 | 118 |
| 54 | 142 | 135 | 130 | 127 | 124 | 120 |
| 55 | 143 | 137 | 132 | 129 | 125 | 121 |
| 56 | 146 | 138 | 133 | 130 | 127 | 123 |
| 57 | 149 | 141 | 135 | 132 | 129 | 125 |
| 58 | 151 | 143 | 137 | 134 | 131 | 126 |
| 59 | 154 | 145 | 139 | 136 | 133 | 128 |
| 60 | 156 | 147 | 140 | 137 | 134 | 130 |
| Max Temp: | 156 | 147 | 140 | 137 | 134 | 130 |
| Max Allowed: | 387 | 388 | 387 | 387 | 387 | 387 |

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| Time (min) | TC # 291 (°F) | TC # 292 (°F) | TC # 293 (°F) | TC # 294 (°F) | TC # 295 (°F) | TC # 296 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 62 | 62 | 63 | 63 |
| 1 | 63 | 63 | 62 | 63 | 63 | 63 |
| 2 | 62 | 62 | 62 | 62 | 62 | 63 |
| 3 | 62 | 62 | 61 | 61 | 62 | 62 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 62 |
| 8 | 62 | 62 | 61 | 62 | 62 | 62 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 62 | 62 | 62 | 63 |
| 12 | 63 | 62 | 62 | 63 | 63 | 63 |
| 13 | 63 | 63 | 62 | 63 | 63 | 63 |
| 14 | 64 | 63 | 63 | 63 | 63 | 64 |
| 15 | 64 | 64 | 63 | 64 | 64 | 64 |
| 16 | 65 | 64 | 63 | 64 | 64 | 65 |
| 17 | 65 | 65 | 64 | 65 | 65 | 65 |
| 18 | 66 | 65 | 65 | 65 | 65 | 66 |
| 19 | 67 | 66 | 65 | 66 | 66 | 67 |
| 20 | 68 | 67 | 66 | 67 | 67 | 68 |
| 21 | 69 | 68 | 67 | 68 | 68 | 68 |
| 22 | 70 | 69 | 68 | 69 | 69 | 70 |
| 23 | 72 | 70 | 69 | 70 | 70 | 71 |
| 24 | 73 | 71 | 70 | 71 | 71 | 72 |
| 25 | 75 | 73 | 71 | 72 | 72 | 73 |
| 26 | 76 | 74 | 72 | 74 | 73 | 74 |
| 27 | 77 | 75 | 74 | 75 | 74 | 75 |
| 28 | 79 | 77 | 75 | 76 | 76 | 77 |
| 29 | 80 | 78 | 76 | 77 | 77 | 78 |
| 30 | 82 | 79 | 77 | 78 | 78 | 79 |
| 31 | 83 | 81 | 79 | 80 | 79 | 80 |
| 32 | 84 | 82 | 80 | 81 | 80 | 81 |
| 33 | 85 | 83 | 81 | 82 | 81 | 82 |
| 34 | 87 | 84 | 82 | 83 | 82 | 83 |
| 35 | 88 | 86 | 84 | 85 | 84 | 85 |
| 36 | 90 | 88 | 85 | 87 | 86 | 86 |
| 37 | 91 | 89 | 87 | 88 | 87 | 88 |
| 38 | 93 | 90 | 88 | 89 | 88 | 89 |
| 39 | 94 | 91 | 89 | 90 | 89 | 90 |
| 40 | 96 | 93 | 90 | 92 | 91 | 91 |

OMEGA POINT
LABORATORIES

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| Time (min) | TC # 291 (°F) | TC # 292 (°F) | TC # 293 (°F) | TC # 294 (°F) | TC # 295 (°F) | TC # 296 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 97 | 94 | 92 | 93 | 92 | 93 |
| 42 | 98 | 95 | 93 | 94 | 93 | 94 |
| 43 | 100 | 97 | 94 | 96 | 94 | 95 |
| 44 | 101 | 98 | 95 | 96 | 95 | 97 |
| 45 | 102 | 98 | 96 | 97 | 96 | 97 |
| 46 | 103 | 100 | 98 | 99 | 98 | 99 |
| 47 | 105 | 102 | 99 | 100 | 100 | 101 |
| 48 | 107 | 104 | 101 | 102 | 101 | 103 |
| 49 | 108 | 105 | 103 | 104 | 103 | 104 |
| 50 | 109 | 106 | 104 | 105 | 104 | 106 |
| 51 | 111 | 108 | 105 | 106 | 106 | 107 |
| 52 | 113 | 110 | 108 | 109 | 108 | 110 |
| 53 | 115 | 112 | 110 | 110 | 110 | 111 |
| 54 | 117 | 114 | 112 | 112 | 112 | 113 |
| 55 | 118 | 115 | 113 | 114 | 113 | 115 |
| 56 | 120 | 117 | 114 | 115 | 115 | 116 |
| 57 | 122 | 119 | 116 | 117 | 117 | 118 |
| 58 | 124 | 120 | 118 | 119 | 118 | 120 |
| 59 | 125 | 122 | 119 | 120 | 120 | 122 |
| 60 | 127 | 123 | 121 | 121 | 121 | 123 |
| Max Temp: | 127 | 123 | 121 | 121 | 121 | 123 |
| Max Allowed: | 388 | 388 | 387 | 387 | 388 | 388 |

| Time (min) | TC # 297 (°F) | TC # 298 (°F) | TC # 299 (°F) | TC # 300 (°F) | TC # 301 (°F) | TC # 302 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 62 | 63 | 63 | 62 |
| 1 | 62 | 62 | 62 | 63 | 63 | 62 |
| 2 | 62 | 62 | 62 | 63 | 63 | 62 |
| 3 | 61 | 61 | 61 | 62 | 62 | 61 |
| 4 | 61 | 61 | 61 | 62 | 62 | 62 |
| 5 | 62 | 61 | 62 | 62 | 62 | 62 |
| 6 | 61 | 61 | 61 | 62 | 62 | 62 |
| 7 | 61 | 61 | 61 | 62 | 62 | 61 |
| 8 | 61 | 61 | 61 | 62 | 62 | 61 |
| 9 | 62 | 61 | 61 | 62 | 62 | 62 |
| 10 | 62 | 61 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 62 | 63 | 62 | 62 |
| 12 | 62 | 62 | 62 | 63 | 63 | 62 |
| 13 | 63 | 62 | 62 | 63 | 63 | 62 |
| 14 | 63 | 63 | 63 | 63 | 63 | 62 |
| 15 | 64 | 63 | 63 | 64 | 63 | 62 |
| 16 | 65 | 64 | 64 | 64 | 63 | 62 |
| 17 | 65 | 64 | 64 | 65 | 64 | 62 |
| 18 | 66 | 65 | 65 | 65 | 64 | 62 |
| 19 | 67 | 66 | 65 | 66 | 64 | 62 |
| 20 | 68 | 66 | 66 | 66 | 65 | 63 |
| 21 | 68 | 67 | 67 | 67 | 65 | 63 |
| 22 | 70 | 68 | 68 | 68 | 66 | 63 |
| 23 | 71 | 69 | 68 | 69 | 66 | 63 |
| 24 | 72 | 70 | 70 | 69 | 67 | 64 |
| 25 | 73 | 72 | 71 | 70 | 68 | 64 |
| 26 | 74 | 73 | 72 | 71 | 69 | 65 |
| 27 | 76 | 74 | 73 | 72 | 69 | 65 |
| 28 | 77 | 75 | 74 | 73 | 70 | 65 |
| 29 | 78 | 76 | 75 | 74 | 70 | 65 |
| 30 | 79 | 77 | 76 | 75 | 71 | 66 |
| 31 | 80 | 79 | 77 | 76 | 72 | 67 |
| 32 | 81 | 79 | 78 | 77 | 72 | 67 |
| 33 | 82 | 80 | 79 | 78 | 73 | 67 |
| 34 | 84 | 82 | 80 | 79 | 74 | 68 |
| 35 | 85 | 83 | 82 | 80 | 75 | 68 |
| 36 | 87 | 85 | 83 | 81 | 76 | 69 |
| 37 | 88 | 86 | 84 | 83 | 77 | 69 |
| 38 | 89 | 87 | 85 | 83 | 78 | 70 |
| 39 | 90 | 88 | 87 | 85 | 79 | 71 |
| 40 | 92 | 89 | 88 | 86 | 80 | 71 |

426

| Time (min) | TC # 297 (°F) | TC # 298 (°F) | TC # 299 (°F) | TC # 300 (°F) | TC # 301 (°F) | TC # 302 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 93 | 91 | 89 | 87 | 80 | 72 |
| 42 | 94 | 92 | 90 | 88 | 81 | 72 |
| 43 | 96 | 93 | 91 | 89 | 82 | 73 |
| 44 | 97 | 94 | 92 | 90 | 83 | 73 |
| 45 | 98 | 95 | 93 | 90 | 83 | 74 |
| 46 | 99 | 97 | 94 | 92 | 85 | 74 |
| 47 | 101 | 98 | 96 | 93 | 86 | 75 |
| 48 | 103 | 100 | 98 | 95 | 87 | 76 |
| 49 | 105 | 101 | 99 | 96 | 88 | 77 |
| 50 | 106 | 103 | 100 | 97 | 89 | 78 |
| 51 | 107 | 104 | 101 | 98 | 90 | 79 |
| 52 | 110 | 107 | 104 | 101 | 93 | 81 |
| 53 | 112 | 108 | 106 | 103 | 94 | 82 |
| 54 | 114 | 110 | 107 | 105 | 96 | 83 |
| 55 | 115 | 112 | 109 | 106 | 97 | 84 |
| 56 | 117 | 113 | 110 | 107 | 99 | 85 |
| 57 | 119 | 115 | 112 | 109 | 101 | 87 |
| 58 | 120 | 117 | 114 | 111 | 102 | 88 |
| 59 | 122 | 118 | 115 | 112 | 104 | 89 |
| 60 | 123 | 120 | 117 | 114 | 105 | 90 |
| Max Temp: | 123 | 120 | 117 | 114 | 105 | 90 |
| Max Allowed: | 387 | 387 | 387 | 388 | 388 | 387 |

| Time (min) | TC # 303 (°F) | TC # 304 (°F) | TC # 305 (°F) | TC # 306 (°F) | TC # 307 (°F) | TC # 308 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 62 | 63 | 63 | 62 |
| 1 | 62 | 62 | 62 | 63 | 63 | 62 |
| 2 | 62 | 62 | 62 | 62 | 63 | 62 |
| 3 | 61 | 61 | 61 | 62 | 62 | 61 |
| 4 | 61 | 62 | 62 | 62 | 62 | 61 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 61 | 62 | 62 | 62 | 62 | 61 |
| 7 | 61 | 61 | 62 | 62 | 62 | 61 |
| 8 | 62 | 61 | 61 | 62 | 62 | 61 |
| 9 | 62 | 62 | 62 | 62 | 62 | 61 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 63 | 62 | 62 | 62 | 62 | 62 |
| 12 | 63 | 62 | 62 | 63 | 63 | 62 |
| 13 | 64 | 63 | 63 | 63 | 63 | 62 |
| 14 | 65 | 63 | 63 | 63 | 63 | 62 |
| 15 | 66 | 64 | 64 | 64 | 63 | 63 |
| 16 | 67 | 65 | 64 | 64 | 64 | 63 |
| 17 | 68 | 66 | 65 | 65 | 65 | 63 |
| 18 | 69 | 66 | 66 | 66 | 65 | 64 |
| 19 | 70 | 68 | 66 | 67 | 66 | 64 |
| 20 | 71 | 68 | 67 | 68 | 66 | 65 |
| 21 | 73 | 70 | 68 | 68 | 67 | 66 |
| 22 | 75 | 71 | 70 | 70 | 68 | 67 |
| 23 | 76 | 72 | 71 | 71 | 69 | 68 |
| 24 | 79 | 74 | 72 | 72 | 70 | 69 |
| 25 | 81 | 76 | 74 | 73 | 72 | 70 |
| 26 | 83 | 77 | 75 | 75 | 73 | 71 |
| 27 | 85 | 79 | 77 | 77 | 74 | 72 |
| 28 | 87 | 81 | 79 | 78 | 76 | 73 |
| 29 | 89 | 82 | 80 | 79 | 77 | 75 |
| 30 | 91 | 84 | 82 | 81 | 78 | 76 |
| 31 | 93 | 86 | 83 | 82 | 80 | 77 |
| 32 | 94 | 88 | 84 | 84 | 81 | 78 |
| 33 | 96 | 89 | 86 | 85 | 82 | 79 |
| 34 | 98 | 91 | 88 | 87 | 83 | 81 |
| 35 | 101 | 93 | 90 | 89 | 85 | 83 |
| 36 | 103 | 95 | 92 | 90 | 87 | 84 |
| 37 | 105 | 97 | 93 | 92 | 89 | 86 |
| 38 | 107 | 98 | 95 | 93 | 90 | 87 |
| 39 | 108 | 100 | 97 | 95 | 91 | 89 |
| 40 | 110 | 102 | 98 | 97 | 93 | 90 |

423

| Time (min) | TC # 303 (°F) | TC # 304 (°F) | TC # 305 (°F) | TC # 306 (°F) | TC # 307 (°F) | TC # 308 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 111 | 103 | 100 | 98 | 94 | 91 |
| 42 | 113 | 105 | 101 | 99 | 96 | 93 |
| 43 | 115 | 106 | 102 | 101 | 97 | 94 |
| 44 | 116 | 107 | 103 | 102 | 98 | 95 |
| 45 | 116 | 108 | 104 | 103 | 99 | 96 |
| 46 | 118 | 110 | 106 | 104 | 101 | 98 |
| 47 | 120 | 111 | 107 | 106 | 102 | 99 |
| 48 | 121 | 113 | 109 | 107 | 104 | 101 |
| 49 | 123 | 114 | 110 | 109 | 105 | 102 |
| 50 | 124 | 115 | 112 | 110 | 107 | 104 |
| 51 | 125 | 117 | 113 | 111 | 108 | 105 |
| 52 | 128 | 119 | 115 | 113 | 110 | 107 |
| 53 | 130 | 121 | 117 | 115 | 112 | 109 |
| 54 | 131 | 123 | 118 | 116 | 114 | 111 |
| 55 | 133 | 124 | 119 | 118 | 114 | 112 |
| 56 | 134 | 125 | 121 | 119 | 116 | 113 |
| 57 | 136 | 127 | 123 | 121 | 118 | 115 |
| 58 | 138 | 129 | 125 | 123 | 119 | 116 |
| 59 | 139 | 131 | 126 | 124 | 121 | 118 |
| 60 | 141 | 133 | 128 | 126 | 122 | 119 |
| Max Temp: | 141 | 133 | 128 | 126 | 122 | 119 |
| Max Allowed: | 387 | 387 | 387 | 388 | 388 | 387 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 309 (°F) | TC # 310 (°F) | TC # 311 (°F) | TC # 312 (°F) | TC # 313 (°F) | TC # 314 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 62 | 62 | 62 | 62 |
| 1 | 63 | 62 | 62 | 62 | 63 | 63 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 62 | 61 | 61 | 61 | 62 | 62 |
| 4 | 62 | 62 | 61 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 61 | 62 | 62 | 62 |
| 7 | 62 | 62 | 61 | 62 | 62 | 62 |
| 8 | 62 | 62 | 61 | 62 | 62 | 62 |
| 9 | 62 | 62 | 61 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 62 | 62 | 62 | 62 |
| 12 | 62 | 62 | 62 | 62 | 62 | 62 |
| 13 | 63 | 62 | 62 | 62 | 62 | 62 |
| 14 | 63 | 63 | 62 | 62 | 62 | 62 |
| 15 | 63 | 63 | 62 | 63 | 63 | 63 |
| 16 | 64 | 63 | 63 | 63 | 63 | 63 |
| 17 | 64 | 64 | 63 | 63 | 63 | 63 |
| 18 | 64 | 64 | 64 | 64 | 64 | 64 |
| 19 | 65 | 65 | 64 | 64 | 64 | 64 |
| 20 | 66 | 65 | 64 | 65 | 64 | 64 |
| 21 | 66 | 66 | 65 | 65 | 65 | 65 |
| 22 | 67 | 67 | 66 | 66 | 66 | 66 |
| 23 | 68 | 67 | 67 | 67 | 66 | 66 |
| 24 | 69 | 68 | 68 | 67 | 67 | 67 |
| 25 | 70 | 70 | 69 | 68 | 68 | 68 |
| 26 | 71 | 71 | 70 | 69 | 69 | 69 |
| 27 | 73 | 72 | 71 | 70 | 70 | 70 |
| 28 | 74 | 73 | 72 | 71 | 71 | 71 |
| 29 | 75 | 74 | 73 | 72 | 71 | 71 |
| 30 | 76 | 75 | 74 | 73 | 73 | 73 |
| 31 | 77 | 76 | 75 | 74 | 74 | 73 |
| 32 | 78 | 77 | 76 | 75 | 74 | 74 |
| 33 | 79 | 78 | 77 | 76 | 75 | 75 |
| 34 | 81 | 80 | 78 | 77 | 77 | 76 |
| 35 | 82 | 81 | 79 | 79 | 78 | 77 |
| 36 | 84 | 82 | 81 | 80 | 79 | 79 |
| 37 | 86 | 84 | 82 | 81 | 80 | 80 |
| 38 | 87 | 85 | 84 | 82 | 81 | 81 |
| 39 | 88 | 87 | 85 | 84 | 83 | 82 |
| 40 | 89 | 88 | 86 | 85 | 84 | 83 |

| Time (min) | TC # 309 (°F) | TC # 310 (°F) | TC # 311 (°F) | TC # 312 (°F) | TC # 313 (°F) | TC # 314 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 91 | 89 | 87 | 86 | 85 | 84 |
| 42 | 92 | 91 | 89 | 87 | 86 | 86 |
| 43 | 93 | 92 | 90 | 89 | 87 | 87 |
| 44 | 95 | 93 | 91 | 89 | 88 | 87 |
| 45 | 95 | 94 | 92 | 90 | 89 | 88 |
| 46 | 97 | 95 | 93 | 92 | 90 | 89 |
| 47 | 98 | 97 | 95 | 93 | 92 | 91 |
| 48 | 100 | 98 | 97 | 95 | 93 | 92 |
| 49 | 102 | 100 | 98 | 97 | 95 | 94 |
| 50 | 103 | 101 | 99 | 98 | 96 | 95 |
| 51 | 104 | 102 | 100 | 99 | 97 | 96 |
| 52 | 107 | 105 | 103 | 101 | 99 | 98 |
| 53 | 108 | 107 | 105 | 103 | 101 | 99 |
| 54 | 110 | 108 | 106 | 105 | 103 | 101 |
| 55 | 111 | 109 | 107 | 106 | 104 | 102 |
| 56 | 113 | 111 | 109 | 107 | 105 | 103 |
| 57 | 114 | 113 | 111 | 109 | 107 | 105 |
| 58 | 116 | 114 | 112 | 110 | 108 | 106 |
| 59 | 117 | 116 | 114 | 112 | 110 | 108 |
| 60 | 118 | 117 | 115 | 113 | 111 | 109 |
| Max Temp: | 118 | 117 | 115 | 113 | 111 | 109 |
| Max Allowed: | 388 | 387 | 387 | 387 | 387 | 387 |

| Time (min) | TC # 315 (°F) | TC # 316 (°F) | TC # 317 (°F) | TC # 318 (°F) | TC # 319 (°F) | TC # 320 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 62 | 63 | 63 | 62 |
| 1 | 63 | 63 | 62 | 63 | 63 | 62 |
| 2 | 63 | 63 | 62 | 63 | 63 | 62 |
| 3 | 62 | 62 | 61 | 62 | 62 | 61 |
| 4 | 62 | 62 | 62 | 62 | 62 | 61 |
| 5 | 62 | 63 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 61 |
| 7 | 62 | 62 | 62 | 62 | 62 | 61 |
| 8 | 62 | 62 | 61 | 62 | 62 | 61 |
| 9 | 62 | 62 | 62 | 62 | 62 | 61 |
| 10 | 62 | 62 | 62 | 62 | 62 | 61 |
| 11 | 62 | 63 | 62 | 62 | 62 | 61 |
| 12 | 63 | 63 | 62 | 62 | 62 | 61 |
| 13 | 63 | 63 | 62 | 62 | 63 | 61 |
| 14 | 63 | 63 | 62 | 63 | 63 | 61 |
| 15 | 63 | 63 | 62 | 63 | 63 | 62 |
| 16 | 63 | 63 | 62 | 63 | 63 | 62 |
| 17 | 64 | 63 | 63 | 63 | 63 | 62 |
| 18 | 64 | 64 | 63 | 63 | 63 | 62 |
| 19 | 65 | 64 | 63 | 64 | 64 | 62 |
| 20 | 65 | 65 | 64 | 64 | 64 | 62 |
| 21 | 65 | 65 | 64 | 65 | 64 | 62 |
| 22 | 66 | 66 | 64 | 65 | 64 | 62 |
| 23 | 67 | 66 | 65 | 66 | 65 | 63 |
| 24 | 67 | 67 | 66 | 66 | 65 | 63 |
| 25 | 68 | 68 | 66 | 67 | 66 | 63 |
| 26 | 69 | 69 | 67 | 68 | 67 | 64 |
| 27 | 70 | 69 | 68 | 68 | 67 | 64 |
| 28 | 71 | 70 | 69 | 69 | 68 | 64 |
| 29 | 72 | 71 | 69 | 69 | 68 | 65 |
| 30 | 73 | 72 | 70 | 70 | 69 | 65 |
| 31 | 74 | 73 | 71 | 71 | 69 | 65 |
| 32 | 74 | 73 | 71 | 71 | 70 | 65 |
| 33 | 75 | 74 | 72 | 72 | 70 | 65 |
| 34 | 77 | 75 | 73 | 73 | 71 | 66 |
| 35 | 78 | 76 | 74 | 74 | 72 | 67 |
| 36 | 79 | 78 | 75 | 75 | 72 | 67 |
| 37 | 80 | 79 | 76 | 76 | 73 | 68 |
| 38 | 81 | 80 | 77 | 77 | 74 | 68 |
| 39 | 82 | 81 | 78 | 78 | 75 | 68 |
| 40 | 83 | 82 | 79 | 78 | 75 | 69 |

| Time (min) | TC # 315 (°F) | TC # 316 (°F) | TC # 317 (°F) | TC # 318 (°F) | TC # 319 (°F) | TC # 320 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 85 | 83 | 80 | 79 | 76 | 69 |
| 42 | 86 | 84 | 81 | 80 | 77 | 70 |
| 43 | 87 | 85 | 82 | 81 | 77 | 71 |
| 44 | 87 | 86 | 82 | 82 | 78 | 71 |
| 45 | 88 | 86 | 83 | 82 | 78 | 71 |
| 46 | 89 | 88 | 84 | 83 | 79 | 72 |
| 47 | 91 | 89 | 86 | 85 | 81 | 73 |
| 48 | 92 | 90 | 87 | 86 | 82 | 74 |
| 49 | 93 | 91 | 88 | 87 | 83 | 75 |
| 50 | 95 | 92 | 89 | 88 | 84 | 76 |
| 51 | 96 | 94 | 90 | 89 | 85 | 77 |
| 52 | 98 | 96 | 92 | 91 | 87 | 79 |
| 53 | 99 | 97 | 94 | 93 | 88 | 80 |
| 54 | 101 | 99 | 95 | 94 | 90 | 82 |
| 55 | 102 | 100 | 96 | 95 | 91 | 82 |
| 56 | 103 | 101 | 98 | 97 | 92 | 84 |
| 57 | 105 | 103 | 99 | 99 | 94 | 85 |
| 58 | 106 | 104 | 101 | 100 | 95 | 86 |
| 59 | 107 | 106 | 102 | 102 | 97 | 88 |
| 60 | 109 | 107 | 104 | 103 | 98 | 89 |
| Max Temp: | 109 | 107 | 104 | 103 | 98 | 89 |
| Max Allowed: | 388 | 388 | 387 | 388 | 388 | 387 |

| Time (min) | TC # 321 (°F) | TC # 322 (°F) | TC # 323 (°F) | TC # 324 (°F) | TC # 325 (°F) | TC # 326 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 63 | 63 | 62 | 62 |
| 1 | 63 | 62 | 63 | 63 | 62 | 62 |
| 2 | 63 | 62 | 63 | 63 | 62 | 62 |
| 3 | 62 | 61 | 62 | 62 | 61 | 61 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 63 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 61 | 62 |
| 8 | 62 | 61 | 62 | 62 | 61 | 61 |
| 9 | 63 | 62 | 62 | 62 | 61 | 62 |
| 10 | 63 | 62 | 62 | 62 | 62 | 62 |
| 11 | 63 | 62 | 62 | 63 | 62 | 62 |
| 12 | 63 | 62 | 63 | 63 | 62 | 62 |
| 13 | 63 | 62 | 63 | 63 | 62 | 62 |
| 14 | 64 | 63 | 63 | 63 | 62 | 62 |
| 15 | 65 | 63 | 63 | 63 | 62 | 62 |
| 16 | 65 | 64 | 64 | 63 | 63 | 63 |
| 17 | 66 | 64 | 64 | 64 | 63 | 63 |
| 18 | 66 | 64 | 64 | 64 | 63 | 63 |
| 19 | 67 | 65 | 65 | 65 | 64 | 64 |
| 20 | 68 | 66 | 66 | 65 | 64 | 64 |
| 21 | 69 | 66 | 66 | 65 | 64 | 64 |
| 22 | 70 | 67 | 67 | 66 | 65 | 65 |
| 23 | 71 | 68 | 68 | 67 | 66 | 66 |
| 24 | 72 | 69 | 69 | 68 | 66 | 67 |
| 25 | 73 | 70 | 70 | 69 | 67 | 68 |
| 26 | 75 | 72 | 71 | 70 | 68 | 68 |
| 27 | 76 | 73 | 72 | 71 | 69 | 69 |
| 28 | 78 | 74 | 73 | 72 | 70 | 70 |
| 29 | 79 | 75 | 74 | 73 | 71 | 71 |
| 30 | 80 | 77 | 76 | 74 | 72 | 72 |
| 31 | 82 | 78 | 77 | 75 | 73 | 73 |
| 32 | 83 | 79 | 78 | 76 | 74 | 74 |
| 33 | 84 | 80 | 79 | 77 | 75 | 75 |
| 34 | 86 | 82 | 81 | 78 | 77 | 76 |
| 35 | 88 | 84 | 83 | 80 | 78 | 78 |
| 36 | 90 | 86 | 85 | 82 | 80 | 79 |
| 37 | 92 | 87 | 86 | 83 | 81 | 80 |
| 38 | 93 | 89 | 88 | 85 | 82 | 82 |
| 39 | 95 | 91 | 89 | 86 | 84 | 83 |
| 40 | 97 | 92 | 91 | 87 | 85 | 84 |

| Time (min) | TC # 321 (°F) | TC # 322 (°F) | TC # 323 (°F) | TC # 324 (°F) | TC # 325 (°F) | TC # 326 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 98 | 94 | 92 | 89 | 86 | 86 |
| 42 | 100 | 96 | 94 | 90 | 88 | 87 |
| 43 | 101 | 97 | 96 | 92 | 89 | 88 |
| 44 | 103 | 98 | 97 | 93 | 90 | 89 |
| 45 | 104 | 100 | 98 | 94 | 91 | 90 |
| 46 | 106 | 102 | 100 | 96 | 93 | 92 |
| 47 | 107 | 104 | 102 | 98 | 95 | 93 |
| 48 | 109 | 106 | 104 | 100 | 97 | 95 |
| 49 | 110 | 107 | 105 | 101 | 98 | 97 |
| 50 | 112 | 109 | 106 | 103 | 100 | 98 |
| 51 | 113 | 110 | 108 | 104 | 101 | 100 |
| 52 | 115 | 113 | 110 | 107 | 104 | 102 |
| 53 | 117 | 114 | 112 | 108 | 106 | 104 |
| 54 | 118 | 116 | 114 | 110 | 108 | 106 |
| 55 | 119 | 117 | 115 | 112 | 109 | 107 |
| 56 | 120 | 118 | 116 | 113 | 110 | 108 |
| 57 | 122 | 120 | 118 | 115 | 112 | 110 |
| 58 | 123 | 121 | 119 | 116 | 113 | 111 |
| 59 | 125 | 123 | 120 | 117 | 114 | 113 |
| 60 | 126 | 124 | 121 | 118 | 116 | 114 |
| Max Temp: | 126 | 124 | 121 | 118 | 116 | 114 |
| Max Allowed: | 388 | 387 | 388 | 388 | 387 | 387 |

| Time (min) | TC # 327 (°F) | TC # 328 (°F) | TC # 329 (°F) | TC # 330 (°F) | TC # 331 (°F) | TC # 332 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 62 | 62 | 63 | 62 |
| 1 | 63 | 62 | 62 | 62 | 63 | 62 |
| 2 | 62 | 62 | 62 | 62 | 63 | 62 |
| 3 | 61 | 61 | 61 | 61 | 62 | 61 |
| 4 | 62 | 61 | 62 | 62 | 62 | 61 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 61 | 62 | 62 | 62 | 61 |
| 7 | 62 | 61 | 61 | 62 | 62 | 61 |
| 8 | 62 | 61 | 61 | 62 | 62 | 61 |
| 9 | 62 | 61 | 62 | 62 | 62 | 61 |
| 10 | 62 | 61 | 62 | 62 | 62 | 61 |
| 11 | 62 | 61 | 62 | 62 | 62 | 61 |
| 12 | 62 | 62 | 62 | 62 | 62 | 62 |
| 13 | 62 | 62 | 62 | 62 | 62 | 62 |
| 14 | 62 | 62 | 62 | 62 | 63 | 62 |
| 15 | 63 | 62 | 62 | 62 | 63 | 62 |
| 16 | 63 | 62 | 62 | 62 | 63 | 62 |
| 17 | 63 | 62 | 63 | 62 | 63 | 62 |
| 18 | 63 | 63 | 63 | 63 | 63 | 62 |
| 19 | 63 | 63 | 63 | 63 | 63 | 62 |
| 20 | 64 | 63 | 63 | 63 | 63 | 62 |
| 21 | 64 | 64 | 64 | 63 | 63 | 63 |
| 22 | 65 | 64 | 64 | 64 | 64 | 63 |
| 23 | 65 | 65 | 65 | 64 | 64 | 64 |
| 24 | 66 | 65 | 65 | 65 | 65 | 64 |
| 25 | 67 | 66 | 66 | 65 | 65 | 65 |
| 26 | 67 | 67 | 67 | 66 | 66 | 65 |
| 27 | 68 | 68 | 67 | 66 | 67 | 66 |
| 28 | 69 | 69 | 68 | 67 | 67 | 66 |
| 29 | 70 | 69 | 69 | 68 | 68 | 67 |
| 30 | 71 | 70 | 70 | 69 | 69 | 68 |
| 31 | 72 | 71 | 71 | 69 | 69 | 68 |
| 32 | 72 | 72 | 71 | 70 | 70 | 69 |
| 33 | 73 | 73 | 72 | 71 | 70 | 69 |
| 34 | 74 | 74 | 73 | 72 | 72 | 70 |
| 35 | 76 | 75 | 74 | 73 | 73 | 71 |
| 36 | 77 | 76 | 76 | 74 | 74 | 73 |
| 37 | 78 | 77 | 77 | 75 | 75 | 73 |
| 38 | 79 | 79 | 78 | 76 | 76 | 74 |
| 39 | 81 | 80 | 79 | 77 | 77 | 75 |
| 40 | 82 | 81 | 80 | 78 | 78 | 76 |

| Time (min) | TC # 327 (°F) | TC # 328 (°F) | TC # 329 (°F) | TC # 330 (°F) | TC # 331 (°F) | TC # 332 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 83 | 82 | 81 | 79 | 79 | 77 |
| 42 | 84 | 83 | 82 | 80 | 80 | 78 |
| 43 | 85 | 84 | 83 | 81 | 81 | 79 |
| 44 | 86 | 85 | 84 | 82 | 81 | 80 |
| 45 | 87 | 86 | 85 | 83 | 82 | 80 |
| 46 | 89 | 87 | 86 | 84 | 83 | 82 |
| 47 | 90 | 89 | 88 | 85 | 85 | 83 |
| 48 | 92 | 91 | 89 | 87 | 86 | 84 |
| 49 | 93 | 92 | 91 | 88 | 87 | 86 |
| 50 | 95 | 94 | 92 | 89 | 88 | 87 |
| 51 | 96 | 95 | 93 | 90 | 90 | 88 |
| 52 | 99 | 98 | 96 | 93 | 92 | 90 |
| 53 | 100 | 99 | 97 | 94 | 94 | 91 |
| 54 | 103 | 101 | 99 | 96 | 95 | 93 |
| 55 | 104 | 102 | 100 | 97 | 96 | 94 |
| 56 | 105 | 103 | 102 | 99 | 98 | 96 |
| 57 | 107 | 105 | 103 | 100 | 100 | 98 |
| 58 | 108 | 106 | 105 | 102 | 101 | 99 |
| 59 | 110 | 108 | 106 | 103 | 103 | 100 |
| 60 | 111 | 109 | 107 | 105 | 104 | 102 |
| Max Temp: | 111 | 109 | 107 | 105 | 104 | 102 |
| Max Allowed: | 388 | 387 | 387 | 387 | 388 | 387 |

| Time (min) | TC # 333 (°F) | TC # 334 (°F) | TC # 335 (°F) | TC # 336 (°F) | TC # 337 (°F) | TC # 338 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 62 | 62 | 62 | 62 |
| 1 | 63 | 62 | 63 | 63 | 63 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 62 | 61 | 62 | 62 | 62 | 62 |
| 4 | 62 | 61 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 61 | 62 | 62 | 62 | 62 |
| 7 | 62 | 61 | 62 | 62 | 62 | 62 |
| 8 | 62 | 61 | 62 | 62 | 62 | 62 |
| 9 | 62 | 61 | 62 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 62 | 62 | 62 | 62 |
| 12 | 62 | 62 | 62 | 62 | 62 | 62 |
| 13 | 62 | 62 | 62 | 62 | 62 | 62 |
| 14 | 62 | 62 | 62 | 62 | 62 | 62 |
| 15 | 62 | 62 | 63 | 63 | 63 | 62 |
| 16 | 63 | 62 | 63 | 63 | 63 | 62 |
| 17 | 63 | 63 | 63 | 63 | 63 | 62 |
| 18 | 63 | 63 | 63 | 63 | 63 | 62 |
| 19 | 63 | 63 | 64 | 64 | 64 | 63 |
| 20 | 63 | 63 | 64 | 64 | 64 | 63 |
| 21 | 63 | 63 | 64 | 64 | 64 | 63 |
| 22 | 64 | 64 | 65 | 65 | 64 | 63 |
| 23 | 64 | 65 | 66 | 65 | 65 | 64 |
| 24 | 65 | 65 | 66 | 66 | 65 | 64 |
| 25 | 65 | 66 | 67 | 66 | 66 | 64 |
| 26 | 66 | 67 | 68 | 67 | 67 | 65 |
| 27 | 67 | 67 | 68 | 68 | 67 | 65 |
| 28 | 67 | 68 | 69 | 68 | 68 | 66 |
| 29 | 68 | 69 | 70 | 69 | 68 | 66 |
| 30 | 69 | 69 | 70 | 70 | 69 | 66 |
| 31 | 69 | 70 | 71 | 70 | 69 | 67 |
| 32 | 69 | 70 | 71 | 71 | 70 | 67 |
| 33 | 70 | 71 | 72 | 71 | 70 | 67 |
| 34 | 71 | 72 | 73 | 72 | 71 | 68 |
| 35 | 72 | 73 | 74 | 73 | 72 | 68 |
| 36 | 73 | 74 | 75 | 74 | 72 | 69 |
| 37 | 74 | 75 | 76 | 75 | 73 | 69 |
| 38 | 75 | 76 | 77 | 75 | 74 | 70 |
| 39 | 76 | 77 | 78 | 76 | 74 | 70 |
| 40 | 77 | 78 | 79 | 77 | 75 | 71 |

| Time (min) | TC # 333 (°F) | TC # 334 (°F) | TC # 335 (°F) | TC # 336 (°F) | TC # 337 (°F) | TC # 338 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 78 | 79 | 80 | 78 | 76 | 71 |
| 42 | 79 | 80 | 81 | 79 | 77 | 71 |
| 43 | 79 | 81 | 82 | 80 | 77 | 72 |
| 44 | 80 | 81 | 82 | 80 | 77 | 72 |
| 45 | 81 | 82 | 83 | 81 | 78 | 72 |
| 46 | 82 | 83 | 84 | 82 | 79 | 73 |
| 47 | 83 | 84 | 86 | 83 | 80 | 74 |
| 48 | 85 | 86 | 87 | 84 | 81 | 75 |
| 49 | 86 | 87 | 88 | 85 | 82 | 76 |
| 50 | 87 | 88 | 89 | 86 | 83 | 77 |
| 51 | 88 | 89 | 90 | 87 | 84 | 78 |
| 52 | 90 | 91 | 92 | 89 | 86 | 79 |
| 53 | 92 | 92 | 94 | 90 | 87 | 80 |
| 54 | 93 | 94 | 95 | 92 | 88 | 82 |
| 55 | 94 | 95 | 96 | 93 | 89 | 82 |
| 56 | 96 | 96 | 98 | 94 | 91 | 84 |
| 57 | 97 | 98 | 99 | 96 | 92 | 85 |
| 58 | 99 | 99 | 101 | 97 | 93 | 86 |
| 59 | 100 | 101 | 102 | 99 | 95 | 87 |
| 60 | 101 | 102 | 103 | 100 | 96 | 88 |
| Max Temp: | 101 | 102 | 103 | 100 | 96 | 88 |
| Max Allowed: | 388 | 387 | 387 | 387 | 387 | 387 |

| Time (min) | TC # 339 (°F) | TC # 340 (°F) | TC # 341 (°F) | TC # 342 (°F) | TC # 343 (°F) | TC # 344 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 62 | 62 | 63 | 62 |
| 1 | 62 | 62 | 62 | 62 | 63 | 62 |
| 2 | 62 | 62 | 62 | 62 | 63 | 62 |
| 3 | 61 | 61 | 61 | 61 | 62 | 61 |
| 4 | 61 | 61 | 61 | 61 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 61 | 61 | 61 | 61 | 62 | 62 |
| 7 | 61 | 61 | 61 | 61 | 62 | 62 |
| 8 | 61 | 61 | 61 | 61 | 62 | 62 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 63 | 62 | 62 | 62 | 63 | 62 |
| 11 | 63 | 63 | 62 | 62 | 63 | 63 |
| 12 | 64 | 64 | 63 | 63 | 64 | 63 |
| 13 | 65 | 64 | 64 | 64 | 64 | 64 |
| 14 | 66 | 65 | 64 | 65 | 65 | 65 |
| 15 | 68 | 67 | 66 | 66 | 67 | 66 |
| 16 | 69 | 68 | 67 | 67 | 68 | 67 |
| 17 | 71 | 70 | 68 | 68 | 69 | 68 |
| 18 | 73 | 71 | 70 | 70 | 71 | 70 |
| 19 | 75 | 73 | 71 | 72 | 72 | 72 |
| 20 | 77 | 75 | 73 | 73 | 74 | 73 |
| 21 | 79 | 77 | 75 | 75 | 76 | 75 |
| 22 | 82 | 79 | 77 | 77 | 78 | 77 |
| 23 | 84 | 81 | 79 | 79 | 80 | 79 |
| 24 | 87 | 84 | 81 | 81 | 82 | 81 |
| 25 | 89 | 86 | 84 | 84 | 84 | 84 |
| 26 | 92 | 88 | 86 | 86 | 87 | 86 |
| 27 | 94 | 91 | 88 | 88 | 89 | 88 |
| 28 | 97 | 93 | 90 | 90 | 91 | 90 |
| 29 | 99 | 95 | 92 | 92 | 93 | 92 |
| 30 | 101 | 97 | 94 | 94 | 95 | 94 |
| 31 | 103 | 99 | 96 | 96 | 97 | 96 |
| 32 | 105 | 101 | 98 | 97 | 98 | 97 |
| 33 | 107 | 103 | 100 | 99 | 100 | 99 |
| 34 | 109 | 105 | 102 | 101 | 102 | 101 |
| 35 | 111 | 107 | 104 | 103 | 104 | 103 |
| 36 | 114 | 109 | 106 | 105 | 106 | 104 |
| 37 | 115 | 111 | 108 | 107 | 107 | 106 |
| 38 | 117 | 113 | 109 | 109 | 109 | 108 |
| 39 | 119 | 115 | 111 | 110 | 110 | 109 |
| 40 | 120 | 116 | 113 | 112 | 112 | 110 |

| Time (min) | TC # 339 (°F) | TC # 340 (°F) | TC # 341 (°F) | TC # 342 (°F) | TC # 343 (°F) | TC # 344 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 122 | 118 | 114 | 113 | 114 | 112 |
| 42 | 123 | 119 | 116 | 115 | 115 | 114 |
| 43 | 125 | 121 | 117 | 116 | 117 | 115 |
| 44 | 126 | 122 | 118 | 118 | 118 | 116 |
| 45 | 126 | 123 | 119 | 119 | 119 | 118 |
| 46 | 128 | 124 | 121 | 121 | 121 | 120 |
| 47 | 129 | 126 | 123 | 123 | 123 | 122 |
| 48 | 131 | 127 | 125 | 125 | 125 | 124 |
| 49 | 132 | 129 | 127 | 127 | 127 | 125 |
| 50 | 133 | 130 | 128 | 129 | 129 | 127 |
| 51 | 135 | 132 | 130 | 131 | 131 | 129 |
| 52 | 138 | 135 | 132 | 134 | 134 | 132 |
| 53 | 140 | 137 | 134 | 136 | 137 | 134 |
| 54 | 142 | 139 | 137 | 138 | 139 | 137 |
| 55 | 144 | 141 | 138 | 140 | 141 | 139 |
| 56 | 146 | 142 | 140 | 142 | 143 | 141 |
| 57 | 149 | 145 | 143 | 145 | 146 | 143 |
| 58 | 152 | 147 | 145 | 147 | 148 | 146 |
| 59 | 154 | 150 | 147 | 149 | 150 | 148 |
| 60 | 156 | 151 | 149 | 151 | 152 | 150 |
| Max Temp: | 156 | 151 | 149 | 151 | 152 | 150 |
| Max Allowed: | 387 | 387 | 387 | 387 | 388 | 387 |

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| Time (min) | TC # 345 (°F) | TC # 346 (°F) | TC # 347 (°F) | TC # 348 (°F) | TC # 349 (°F) | TC # 350 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 63 | 62 | 62 | 62 |
| 1 | 62 | 62 | 63 | 62 | 62 | 62 |
| 2 | 62 | 62 | 62 | 62 | 62 | 62 |
| 3 | 61 | 61 | 62 | 61 | 61 | 61 |
| 4 | 61 | 61 | 62 | 61 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 61 | 61 | 62 | 61 | 62 | 62 |
| 7 | 61 | 61 | 62 | 61 | 62 | 62 |
| 8 | 61 | 61 | 62 | 61 | 61 | 61 |
| 9 | 61 | 62 | 62 | 61 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 63 | 62 | 62 | 62 |
| 12 | 62 | 62 | 63 | 62 | 63 | 63 |
| 13 | 63 | 63 | 63 | 62 | 63 | 64 |
| 14 | 64 | 64 | 64 | 63 | 64 | 64 |
| 15 | 65 | 65 | 65 | 64 | 64 | 65 |
| 16 | 66 | 66 | 66 | 65 | 66 | 67 |
| 17 | 67 | 67 | 67 | 66 | 67 | 68 |
| 18 | 68 | 68 | 69 | 67 | 68 | 69 |
| 19 | 70 | 70 | 70 | 69 | 69 | 71 |
| 20 | 71 | 72 | 72 | 70 | 71 | 72 |
| 21 | 73 | 73 | 73 | 71 | 72 | 74 |
| 22 | 75 | 75 | 75 | 73 | 74 | 76 |
| 23 | 77 | 77 | 77 | 75 | 76 | 78 |
| 24 | 79 | 79 | 79 | 77 | 78 | 80 |
| 25 | 81 | 81 | 81 | 79 | 80 | 82 |
| 26 | 83 | 83 | 83 | 81 | 82 | 83 |
| 27 | 85 | 85 | 85 | 83 | 84 | 85 |
| 28 | 87 | 87 | 87 | 85 | 86 | 87 |
| 29 | 89 | 89 | 88 | 87 | 87 | 88 |
| 30 | 91 | 91 | 90 | 88 | 89 | 90 |
| 31 | 93 | 93 | 92 | 90 | 91 | 91 |
| 32 | 94 | 94 | 93 | 91 | 92 | 93 |
| 33 | 96 | 95 | 95 | 93 | 93 | 94 |
| 34 | 98 | 97 | 97 | 95 | 95 | 95 |
| 35 | 100 | 99 | 98 | 96 | 96 | 97 |
| 36 | 102 | 101 | 100 | 98 | 98 | 98 |
| 37 | 103 | 102 | 102 | 100 | 99 | 99 |
| 38 | 105 | 104 | 103 | 101 | 100 | 100 |
| 39 | 106 | 105 | 104 | 102 | 102 | 102 |
| 40 | 107 | 106 | 105 | 103 | 103 | 103 |

| Time (min) | TC # 345 (°F) | TC # 346 (°F) | TC # 347 (°F) | TC # 348 (°F) | TC # 349 (°F) | TC # 350 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 109 | 108 | 107 | 104 | 104 | 104 |
| 42 | 110 | 109 | 108 | 105 | 105 | 105 |
| 43 | 112 | 110 | 109 | 107 | 106 | 106 |
| 44 | 113 | 111 | 110 | 107 | 107 | 107 |
| 45 | 114 | 112 | 110 | 108 | 108 | 108 |
| 46 | 116 | 113 | 112 | 110 | 110 | 110 |
| 47 | 117 | 115 | 113 | 111 | 111 | 111 |
| 48 | 119 | 116 | 114 | 113 | 113 | 113 |
| 49 | 121 | 118 | 116 | 114 | 114 | 114 |
| 50 | 122 | 119 | 117 | 115 | 116 | 116 |
| 51 | 124 | 121 | 118 | 117 | 117 | 117 |
| 52 | 127 | 123 | 121 | 119 | 120 | 120 |
| 53 | 129 | 125 | 123 | 121 | 122 | 122 |
| 54 | 131 | 127 | 124 | 123 | 124 | 124 |
| 55 | 133 | 129 | 126 | 125 | 125 | 126 |
| 56 | 135 | 130 | 128 | 126 | 127 | 128 |
| 57 | 137 | 132 | 130 | 129 | 130 | 130 |
| 58 | 139 | 135 | 132 | 131 | 132 | 132 |
| 59 | 141 | 137 | 134 | 133 | 134 | 134 |
| 60 | 144 | 139 | 135 | 134 | 136 | 137 |
| Max Temp: | 144 | 139 | 135 | 134 | 136 | 137 |
| Max Allowed: | 387 | 387 | 388 | 387 | 387 | 387 |

| Time (min) | TC # 351 (°F) | TC # 352 (°F) | TC # 353 (°F) | TC # 354 (°F) | TC # 355 (°F) | TC # 356 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 62 | 62 | 62 | 63 |
| 1 | 63 | 62 | 62 | 62 | 63 | 63 |
| 2 | 62 | 62 | 62 | 62 | 62 | 63 |
| 3 | 61 | 61 | 61 | 61 | 61 | 62 |
| 4 | 62 | 62 | 61 | 61 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 61 | 61 | 62 | 62 |
| 7 | 62 | 61 | 61 | 61 | 62 | 62 |
| 8 | 62 | 61 | 61 | 61 | 62 | 62 |
| 9 | 62 | 62 | 62 | 61 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 62 | 62 | 62 | 62 |
| 12 | 63 | 62 | 62 | 62 | 62 | 62 |
| 13 | 63 | 63 | 63 | 62 | 62 | 62 |
| 14 | 64 | 64 | 63 | 62 | 62 | 63 |
| 15 | 65 | 64 | 64 | 63 | 63 | 63 |
| 16 | 66 | 66 | 65 | 63 | 63 | 63 |
| 17 | 67 | 67 | 65 | 63 | 63 | 63 |
| 18 | 69 | 68 | 66 | 64 | 64 | 63 |
| 19 | 70 | 69 | 67 | 65 | 64 | 64 |
| 20 | 72 | 70 | 68 | 65 | 64 | 64 |
| 21 | 73 | 72 | 69 | 66 | 65 | 64 |
| 22 | 75 | 73 | 71 | 67 | 66 | 65 |
| 23 | 77 | 75 | 72 | 68 | 66 | 65 |
| 24 | 79 | 77 | 73 | 69 | 67 | 66 |
| 25 | 80 | 78 | 75 | 70 | 68 | 66 |
| 26 | 82 | 80 | 76 | 71 | 69 | 67 |
| 27 | 84 | 81 | 77 | 72 | 69 | 67 |
| 28 | 85 | 83 | 79 | 73 | 70 | 68 |
| 29 | 87 | 84 | 80 | 74 | 71 | 68 |
| 30 | 88 | 85 | 81 | 75 | 72 | 69 |
| 31 | 90 | 87 | 82 | 76 | 72 | 70 |
| 32 | 90 | 87 | 83 | 77 | 73 | 70 |
| 33 | 92 | 88 | 84 | 77 | 73 | 70 |
| 34 | 93 | 90 | 85 | 78 | 74 | 71 |
| 35 | 94 | 91 | 86 | 80 | 75 | 72 |
| 36 | 96 | 93 | 87 | 81 | 76 | 73 |
| 37 | 97 | 93 | 89 | 82 | 77 | 73 |
| 38 | 98 | 95 | 89 | 83 | 78 | 74 |
| 39 | 99 | 96 | 90 | 83 | 79 | 74 |
| 40 | 100 | 96 | 91 | 84 | 79 | 75 |

| Time (min) | TC # 351 (°F) | TC # 352 (°F) | TC # 353 (°F) | TC # 354 (°F) | TC # 355 (°F) | TC # 356 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 101 | 98 | 92 | 85 | 80 | 75 |
| 42 | 102 | 98 | 93 | 86 | 81 | 76 |
| 43 | 103 | 99 | 94 | 87 | 82 | 76 |
| 44 | 104 | 100 | 95 | 87 | 82 | 77 |
| 45 | 105 | 101 | 95 | 88 | 82 | 77 |
| 46 | 106 | 102 | 96 | 89 | 84 | 78 |
| 47 | 108 | 104 | 98 | 90 | 85 | 79 |
| 48 | 110 | 105 | 99 | 91 | 86 | 80 |
| 49 | 111 | 107 | 100 | 92 | 87 | 81 |
| 50 | 112 | 108 | 101 | 93 | 88 | 82 |
| 51 | 114 | 109 | 102 | 94 | 89 | 82 |
| 52 | 117 | 112 | 105 | 96 | 90 | 84 |
| 53 | 118 | 113 | 106 | 98 | 92 | 85 |
| 54 | 121 | 115 | 108 | 99 | 93 | 87 |
| 55 | 122 | 117 | 109 | 100 | 94 | 87 |
| 56 | 124 | 118 | 110 | 102 | 95 | 89 |
| 57 | 126 | 120 | 112 | 103 | 97 | 90 |
| 58 | 128 | 122 | 114 | 105 | 98 | 91 |
| 59 | 131 | 124 | 116 | 106 | 100 | 92 |
| 60 | 133 | 126 | 117 | 108 | 101 | 93 |
| Max Temp: | 133 | 126 | 117 | 108 | 101 | 93 |
| Max Allowed: | 388 | 387 | 387 | 387 | 387 | 388 |

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| Time (min) | TC # 357 (°F) | TC # 358 (°F) | TC # 359 (°F) | TC # 360 (°F) | TC # 361 (°F) | TC # 362 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 62 | 62 | 63 | 62 | 63 |
| 1 | 63 | 62 | 62 | 63 | 63 | 63 |
| 2 | 63 | 62 | 62 | 63 | 62 | 62 |
| 3 | 62 | 61 | 61 | 62 | 62 | 62 |
| 4 | 62 | 61 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 61 | 62 | 62 | 62 | 62 |
| 7 | 62 | 61 | 62 | 62 | 62 | 62 |
| 8 | 62 | 61 | 62 | 62 | 62 | 62 |
| 9 | 63 | 62 | 62 | 62 | 62 | 62 |
| 10 | 63 | 62 | 62 | 63 | 62 | 62 |
| 11 | 63 | 62 | 62 | 63 | 63 | 62 |
| 12 | 64 | 63 | 63 | 63 | 63 | 63 |
| 13 | 65 | 63 | 63 | 64 | 64 | 63 |
| 14 | 65 | 64 | 64 | 64 | 64 | 64 |
| 15 | 66 | 65 | 65 | 65 | 65 | 65 |
| 16 | 67 | 66 | 65 | 66 | 66 | 66 |
| 17 | 68 | 66 | 66 | 67 | 67 | 67 |
| 18 | 69 | 68 | 67 | 68 | 69 | 68 |
| 19 | 71 | 69 | 69 | 70 | 70 | 69 |
| 20 | 72 | 70 | 70 | 71 | 71 | 71 |
| 21 | 73 | 72 | 71 | 73 | 73 | 72 |
| 22 | 75 | 73 | 73 | 75 | 75 | 74 |
| 23 | 77 | 75 | 75 | 77 | 77 | 76 |
| 24 | 79 | 77 | 77 | 79 | 79 | 78 |
| 25 | 81 | 79 | 79 | 81 | 81 | 80 |
| 26 | 83 | 81 | 81 | 83 | 83 | 82 |
| 27 | 85 | 83 | 83 | 85 | 85 | 84 |
| 28 | 88 | 86 | 85 | 87 | 87 | 86 |
| 29 | 90 | 87 | 87 | 89 | 89 | 88 |
| 30 | 92 | 90 | 89 | 91 | 91 | 90 |
| 31 | 94 | 92 | 92 | 93 | 93 | 92 |
| 32 | 96 | 93 | 93 | 95 | 95 | 94 |
| 33 | 98 | 95 | 95 | 97 | 97 | 95 |
| 34 | 101 | 98 | 97 | 99 | 99 | 97 |
| 35 | 103 | 100 | 100 | 101 | 101 | 99 |
| 36 | 106 | 102 | 102 | 103 | 103 | 101 |
| 37 | 108 | 104 | 104 | 105 | 104 | 103 |
| 38 | 110 | 106 | 105 | 106 | 106 | 104 |
| 39 | 112 | 108 | 107 | 108 | 107 | 106 |
| 40 | 114 | 110 | 108 | 109 | 109 | 107 |

OMEGA POINT
LABORATORIES

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| Time (min) | TC # 357 (°F) | TC # 358 (°F) | TC # 359 (°F) | TC # 360 (°F) | TC # 361 (°F) | TC # 362 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 116 | 111 | 110 | 111 | 110 | 109 |
| 42 | 117 | 113 | 112 | 112 | 112 | 110 |
| 43 | 119 | 114 | 113 | 114 | 113 | 112 |
| 44 | 120 | 115 | 114 | 115 | 114 | 113 |
| 45 | 122 | 116 | 115 | 116 | 116 | 114 |
| 46 | 123 | 118 | 116 | 117 | 117 | 116 |
| 47 | 125 | 119 | 117 | 119 | 119 | 118 |
| 48 | 126 | 121 | 119 | 121 | 121 | 120 |
| 49 | 128 | 122 | 121 | 123 | 123 | 121 |
| 50 | 129 | 123 | 122 | 124 | 125 | 123 |
| 51 | 130 | 125 | 123 | 126 | 126 | 125 |
| 52 | 133 | 127 | 126 | 129 | 130 | 128 |
| 53 | 134 | 129 | 128 | 131 | 132 | 130 |
| 54 | 137 | 131 | 130 | 133 | 134 | 133 |
| 55 | 139 | 133 | 132 | 135 | 136 | 134 |
| 56 | 141 | 135 | 134 | 137 | 138 | 137 |
| 57 | 146 | 138 | 136 | 139 | 141 | 139 |
| 58 | 148 | 141 | 139 | 142 | 143 | 141 |
| 59 | 152 | 144 | 141 | 144 | 146 | 144 |
| 60 | 155 | 147 | 144 | 146 | 148 | 146 |
| Max Temp: | 155 | 147 | 144 | 146 | 148 | 146 |
| Max Allowed: | 388 | 387 | 387 | 388 | 387 | 388 |

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| Time (min) | TC # 363 (°F) | TC # 364 (°F) | TC # 365 (°F) | TC # 366 (°F) | TC # 367 (°F) | TC # 368 (°F) |
|------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 0 | 62 | 62 | 63 | 62 | 62 | 62 |
| 1 | 62 | 62 | 63 | 62 | 62 | 62 |
| 2 | 62 | 62 | 63 | 62 | 62 | 62 |
| 3 | 61 | 61 | 62 | 62 | 61 | 61 |
| 4 | 62 | 62 | 62 | 62 | 61 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 61 | 62 |
| 7 | 61 | 62 | 62 | 62 | 61 | 61 |
| 8 | 61 | 61 | 62 | 62 | 61 | 61 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 63 | 62 | 62 | 62 |
| 12 | 62 | 62 | 63 | 63 | 62 | 62 |
| 13 | 63 | 63 | 63 | 63 | 63 | 63 |
| 14 | 63 | 63 | 64 | 64 | 63 | 63 |
| 15 | 64 | 64 | 65 | 65 | 64 | 64 |
| 16 | 65 | 65 | 66 | 66 | 65 | 65 |
| 17 | 66 | 66 | 67 | 67 | 66 | 66 |
| 18 | 67 | 67 | 68 | 69 | 67 | 67 |
| 19 | 69 | 69 | 69 | 70 | 69 | 69 |
| 20 | 70 | 70 | 71 | 71 | 70 | 70 |
| 21 | 72 | 71 | 72 | 73 | 72 | 72 |
| 22 | 73 | 73 | 74 | 75 | 74 | 74 |
| 23 | 75 | 75 | 75 | 76 | 76 | 75 |
| 24 | 77 | 77 | 77 | 78 | 77 | 77 |
| 25 | 79 | 79 | 79 | 80 | 79 | 79 |
| 26 | 81 | 81 | 81 | 82 | 81 | 81 |
| 27 | 83 | 83 | 83 | 84 | 83 | 83 |
| 28 | 85 | 85 | 85 | 86 | 85 | 85 |
| 29 | 87 | 86 | 86 | 88 | 87 | 86 |
| 30 | 89 | 88 | 88 | 89 | 88 | 88 |
| 31 | 91 | 90 | 90 | 91 | 90 | 90 |
| 32 | 92 | 91 | 91 | 92 | 91 | 91 |
| 33 | 94 | 93 | 93 | 94 | 93 | 92 |
| 34 | 96 | 95 | 95 | 96 | 94 | 94 |
| 35 | 98 | 97 | 97 | 97 | 96 | 95 |
| 36 | 100 | 99 | 98 | 99 | 98 | 97 |
| 37 | 102 | 100 | 100 | 101 | 99 | 98 |
| 38 | 103 | 102 | 101 | 102 | 100 | 99 |
| 39 | 105 | 103 | 103 | 103 | 102 | 100 |
| 40 | 106 | 105 | 104 | 104 | 103 | 101 |



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| Time (min) | TC # 363 (°F) | TC # 364 (°F) | TC # 365 (°F) | TC # 366 (°F) | TC # 367 (°F) | TC # 368 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 107 | 106 | 105 | 106 | 104 | 103 |
| 42 | 109 | 107 | 107 | 107 | 105 | 104 |
| 43 | 110 | 109 | 108 | 108 | 107 | 105 |
| 44 | 111 | 110 | 109 | 109 | 108 | 106 |
| 45 | 112 | 111 | 110 | 110 | 109 | 107 |
| 46 | 114 | 112 | 112 | 112 | 110 | 109 |
| 47 | 116 | 114 | 113 | 114 | 112 | 110 |
| 48 | 118 | 116 | 115 | 116 | 114 | 112 |
| 49 | 120 | 117 | 116 | 117 | 116 | 114 |
| 50 | 121 | 119 | 118 | 119 | 117 | 116 |
| 51 | 123 | 121 | 119 | 121 | 119 | 117 |
| 52 | 126 | 123 | 122 | 124 | 122 | 120 |
| 53 | 128 | 125 | 124 | 126 | 124 | 122 |
| 54 | 131 | 128 | 127 | 128 | 126 | 125 |
| 55 | 132 | 129 | 128 | 130 | 128 | 126 |
| 56 | 134 | 132 | 130 | 132 | 130 | 128 |
| 57 | 137 | 134 | 133 | 135 | 133 | 131 |
| 58 | 139 | 136 | 135 | 137 | 135 | 133 |
| 59 | 142 | 139 | 137 | 139 | 138 | 136 |
| 60 | 144 | 141 | 139 | 142 | 140 | 138 |
| Max Temp: | 144 | 141 | 139 | 142 | 140 | 138 |
| Max Allowed: | 387 | 387 | 388 | 387 | 387 | 387 |

| Time (min) | TC # 369 (°F) | TC # 370 (°F) | TC # 371 (°F) | TC # 372 (°F) | TC # 373 (°F) | TC # 374 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 63 | 62 | 63 | 62 |
| 1 | 62 | 62 | 63 | 63 | 63 | 62 |
| 2 | 62 | 62 | 63 | 62 | 63 | 62 |
| 3 | 61 | 61 | 62 | 61 | 62 | 61 |
| 4 | 62 | 62 | 62 | 62 | 62 | 62 |
| 5 | 62 | 62 | 62 | 62 | 62 | 62 |
| 6 | 62 | 62 | 62 | 62 | 62 | 62 |
| 7 | 62 | 62 | 62 | 62 | 62 | 61 |
| 8 | 61 | 61 | 62 | 62 | 62 | 61 |
| 9 | 62 | 62 | 62 | 62 | 62 | 62 |
| 10 | 62 | 62 | 62 | 62 | 62 | 62 |
| 11 | 62 | 62 | 62 | 62 | 62 | 62 |
| 12 | 62 | 62 | 63 | 62 | 63 | 62 |
| 13 | 63 | 63 | 63 | 63 | 63 | 62 |
| 14 | 63 | 63 | 63 | 63 | 63 | 62 |
| 15 | 64 | 64 | 64 | 63 | 63 | 63 |
| 16 | 65 | 65 | 64 | 64 | 64 | 63 |
| 17 | 66 | 65 | 65 | 64 | 64 | 63 |
| 18 | 67 | 66 | 66 | 65 | 65 | 63 |
| 19 | 68 | 67 | 67 | 66 | 65 | 64 |
| 20 | 70 | 69 | 68 | 66 | 66 | 64 |
| 21 | 71 | 70 | 69 | 67 | 66 | 64 |
| 22 | 73 | 71 | 70 | 68 | 67 | 65 |
| 23 | 74 | 73 | 71 | 69 | 68 | 65 |
| 24 | 76 | 74 | 72 | 70 | 69 | 66 |
| 25 | 78 | 76 | 74 | 71 | 70 | 67 |
| 26 | 80 | 78 | 75 | 72 | 71 | 67 |
| 27 | 81 | 79 | 76 | 73 | 72 | 68 |
| 28 | 83 | 80 | 78 | 75 | 73 | 69 |
| 29 | 84 | 82 | 79 | 75 | 73 | 69 |
| 30 | 86 | 83 | 80 | 77 | 74 | 70 |
| 31 | 88 | 85 | 82 | 78 | 75 | 71 |
| 32 | 89 | 86 | 82 | 78 | 76 | 71 |
| 33 | 90 | 87 | 83 | 79 | 76 | 71 |
| 34 | 91 | 88 | 85 | 81 | 77 | 72 |
| 35 | 93 | 90 | 86 | 82 | 79 | 73 |
| 36 | 94 | 91 | 88 | 83 | 80 | 74 |
| 37 | 96 | 92 | 89 | 84 | 81 | 74 |
| 38 | 97 | 93 | 90 | 85 | 82 | 75 |
| 39 | 98 | 94 | 91 | 86 | 82 | 76 |
| 40 | 99 | 96 | 91 | 87 | 83 | 76 |

| Time (min) | TC # 369 (°F) | TC # 370 (°F) | TC # 371 (°F) | TC # 372 (°F) | TC # 373 (°F) | TC # 374 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 100 | 97 | 93 | 88 | 84 | 77 |
| 42 | 101 | 98 | 94 | 89 | 85 | 78 |
| 43 | 103 | 99 | 95 | 90 | 86 | 78 |
| 44 | 103 | 99 | 95 | 90 | 86 | 79 |
| 45 | 104 | 100 | 96 | 91 | 87 | 79 |
| 46 | 106 | 102 | 97 | 92 | 88 | 80 |
| 47 | 107 | 103 | 98 | 93 | 89 | 81 |
| 48 | 109 | 105 | 100 | 94 | 90 | 82 |
| 49 | 111 | 106 | 101 | 96 | 91 | 83 |
| 50 | 112 | 107 | 102 | 97 | 92 | 84 |
| 51 | 114 | 108 | 103 | 98 | 93 | 84 |
| 52 | 116 | 111 | 106 | 100 | 95 | 86 |
| 53 | 118 | 113 | 107 | 101 | 97 | 87 |
| 54 | 120 | 115 | 109 | 103 | 98 | 89 |
| 55 | 122 | 116 | 110 | 104 | 99 | 89 |
| 56 | 124 | 118 | 111 | 105 | 100 | 90 |
| 57 | 126 | 120 | 113 | 107 | 102 | 92 |
| 58 | 128 | 122 | 115 | 108 | 103 | 93 |
| 59 | 131 | 124 | 117 | 110 | 104 | 94 |
| 60 | 133 | 126 | 118 | 111 | 106 | 95 |
| Max Temp: | 133 | 126 | 118 | 111 | 106 | 95 |
| Max Allowed: | 387 | 387 | 388 | 387 | 388 | 387 |

| Time (min) | TC # 375 (°F) | TC # 376 (°F) | TC # 377 (°F) | TC # 378 (°F) | TC # 379 (°F) | TC # 380 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 62 | 62 | 63 | 62 |
| 1 | 62 | 62 | 62 | 62 | 63 | 62 |
| 2 | 63 | 64 | 63 | 63 | 64 | 63 |
| 3 | 68 | 69 | 68 | 68 | 69 | 68 |
| 4 | 66 | 66 | 65 | 65 | 66 | 65 |
| 5 | 63 | 64 | 63 | 63 | 64 | 63 |
| 6 | 65 | 65 | 65 | 65 | 65 | 65 |
| 7 | 66 | 66 | 65 | 65 | 66 | 65 |
| 8 | 66 | 66 | 65 | 65 | 66 | 65 |
| 9 | 64 | 64 | 64 | 64 | 64 | 64 |
| 10 | 64 | 64 | 63 | 63 | 64 | 63 |
| 11 | 64 | 64 | 63 | 63 | 64 | 63 |
| 12 | 64 | 64 | 63 | 63 | 64 | 63 |
| 13 | 65 | 65 | 64 | 64 | 64 | 63 |
| 14 | 66 | 65 | 64 | 64 | 64 | 64 |
| 15 | 67 | 66 | 65 | 65 | 65 | 64 |
| 16 | 68 | 67 | 66 | 66 | 66 | 65 |
| 17 | 70 | 70 | 68 | 68 | 68 | 67 |
| 18 | 72 | 71 | 70 | 69 | 69 | 68 |
| 19 | 75 | 73 | 72 | 71 | 71 | 70 |
| 20 | 79 | 77 | 75 | 75 | 75 | 73 |
| 21 | 82 | 80 | 78 | 78 | 77 | 76 |
| 22 | 86 | 84 | 82 | 81 | 81 | 78 |
| 23 | 89 | 87 | 86 | 85 | 84 | 82 |
| 24 | 93 | 91 | 90 | 89 | 88 | 85 |
| 25 | 98 | 95 | 94 | 94 | 92 | 89 |
| 26 | 102 | 100 | 98 | 98 | 96 | 93 |
| 27 | 106 | 104 | 102 | 102 | 100 | 97 |
| 28 | 111 | 108 | 106 | 106 | 104 | 101 |
| 29 | 114 | 111 | 109 | 109 | 107 | 104 |
| 30 | 117 | 114 | 112 | 112 | 110 | 107 |
| 31 | 121 | 119 | 117 | 117 | 115 | 111 |
| 32 | 124 | 122 | 120 | 120 | 118 | 115 |
| 33 | 128 | 125 | 123 | 123 | 121 | 118 |
| 34 | 132 | 129 | 127 | 127 | 125 | 122 |
| 35 | 135 | 132 | 130 | 130 | 128 | 125 |
| 36 | 138 | 136 | 133 | 134 | 132 | 129 |
| 37 | 141 | 138 | 136 | 136 | 135 | 132 |
| 38 | 144 | 141 | 139 | 139 | 137 | 134 |
| 39 | 146 | 144 | 142 | 142 | 140 | 137 |
| 40 | 149 | 147 | 145 | 145 | 143 | 141 |

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OMEGA POINT
LABORATORIES

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| Time (min) | TC # 375 (°F) | TC # 376 (°F) | TC # 377 (°F) | TC # 378 (°F) | TC # 379 (°F) | TC # 380 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 151 | 149 | 146 | 147 | 145 | 143 |
| 42 | 153 | 151 | 149 | 149 | 147 | 145 |
| 43 | 156 | 154 | 152 | 151 | 150 | 148 |
| 44 | 158 | 156 | 154 | 153 | 152 | 149 |
| 45 | 160 | 158 | 156 | 155 | 154 | 152 |
| 46 | 162 | 160 | 158 | 158 | 156 | 154 |
| 47 | 163 | 162 | 160 | 160 | 158 | 156 |
| 48 | 165 | 164 | 162 | 162 | 161 | 158 |
| 49 | 167 | 166 | 164 | 164 | 163 | 160 |
| 50 | 169 | 168 | 166 | 166 | 165 | 162 |
| 51 | 172 | 170 | 168 | 168 | 167 | 164 |
| 52 | 174 | 173 | 171 | 170 | 169 | 167 |
| 53 | 177 | 176 | 175 | 173 | 172 | 170 |
| 54 | 178 | 179 | 178 | 177 | 176 | 174 |
| 55 | 179 | 179 | 178 | 178 | 178 | 176 |
| 56 | 180 | 180 | 179 | 179 | 179 | 178 |
| 57 | 182 | 182 | 180 | 180 | 181 | 179 |
| 58 | 183 | 183 | 181 | 181 | 182 | 180 |
| 59 | 185 | 184 | 182 | 182 | 182 | 181 |
| 60 | 186 | 186 | 184 | 184 | 184 | 183 |
| Max Temp: | 186 | 186 | 184 | 184 | 184 | 183 |
| Max Allowed: | 387 | 388 | 387 | 387 | 388 | 387 |

| Time (min) | TC # 381 (°F) | TC # 382 (°F) | TC # 383 (°F) | TC # 384 (°F) | TC # 385 (°F) | TC # 386 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 62 | 63 | 63 | 63 |
| 1 | 62 | 62 | 62 | 62 | 63 | 63 |
| 2 | 63 | 63 | 63 | 64 | 63 | 63 |
| 3 | 68 | 68 | 68 | 68 | 63 | 63 |
| 4 | 65 | 65 | 65 | 66 | 63 | 63 |
| 5 | 63 | 63 | 63 | 64 | 63 | 63 |
| 6 | 65 | 64 | 65 | 65 | 63 | 63 |
| 7 | 65 | 65 | 65 | 66 | 63 | 63 |
| 8 | 65 | 65 | 65 | 66 | 63 | 63 |
| 9 | 64 | 64 | 64 | 64 | 63 | 63 |
| 10 | 63 | 63 | 64 | 64 | 63 | 63 |
| 11 | 63 | 63 | 63 | 64 | 63 | 64 |
| 12 | 63 | 63 | 64 | 64 | 64 | 64 |
| 13 | 64 | 64 | 64 | 64 | 64 | 65 |
| 14 | 64 | 64 | 65 | 65 | 65 | 66 |
| 15 | 65 | 65 | 65 | 66 | 66 | 67 |
| 16 | 66 | 66 | 66 | 67 | 67 | 68 |
| 17 | 68 | 68 | 68 | 69 | 69 | 70 |
| 18 | 69 | 70 | 70 | 70 | 71 | 72 |
| 19 | 71 | 71 | 72 | 72 | 73 | 75 |
| 20 | 74 | 74 | 75 | 75 | 76 | 78 |
| 21 | 77 | 77 | 77 | 77 | 79 | 81 |
| 22 | 80 | 79 | 80 | 81 | 82 | 84 |
| 23 | 83 | 82 | 83 | 84 | 86 | 87 |
| 24 | 86 | 85 | 86 | 87 | 89 | 91 |
| 25 | 89 | 88 | 89 | 90 | 93 | 94 |
| 26 | 93 | 92 | 93 | 94 | 96 | 98 |
| 27 | 96 | 95 | 96 | 97 | 100 | 101 |
| 28 | 100 | 99 | 100 | 101 | 104 | 105 |
| 29 | 103 | 101 | 102 | 104 | 107 | 108 |
| 30 | 105 | 104 | 105 | 106 | 110 | 111 |
| 31 | 110 | 108 | 109 | 110 | 114 | 114 |
| 32 | 113 | 111 | 111 | 113 | 117 | 117 |
| 33 | 116 | 114 | 115 | 115 | 120 | 120 |
| 34 | 120 | 118 | 118 | 119 | 123 | 123 |
| 35 | 123 | 121 | 121 | 122 | 125 | 126 |
| 36 | 127 | 124 | 124 | 125 | 128 | 128 |
| 37 | 130 | 127 | 127 | 127 | 130 | 130 |
| 38 | 132 | 130 | 129 | 129 | 133 | 133 |
| 39 | 135 | 132 | 132 | 132 | 135 | 135 |
| 40 | 139 | 135 | 135 | 135 | 137 | 137 |

| Time (min) | TC # 381 (°F) | TC # 382 (°F) | TC # 383 (°F) | TC # 384 (°F) | TC # 385 (°F) | TC # 386 (°F) |
|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 41 | 141 | 137 | 137 | 136 | 139 | 139 |
| 42 | 143 | 140 | 139 | 138 | 141 | 141 |
| 43 | 145 | 142 | 141 | 140 | 143 | 143 |
| 44 | 147 | 144 | 143 | 142 | 145 | 145 |
| 45 | 149 | 146 | 145 | 144 | 146 | 147 |
| 46 | 152 | 148 | 147 | 146 | 148 | 148 |
| 47 | 154 | 151 | 149 | 148 | 150 | 150 |
| 48 | 156 | 153 | 152 | 151 | 152 | 152 |
| 49 | 158 | 156 | 154 | 153 | 154 | 154 |
| 50 | 161 | 158 | 157 | 155 | 156 | 156 |
| 51 | 163 | 161 | 160 | 158 | 159 | 158 |
| 52 | 166 | 164 | 162 | 161 | 161 | 160 |
| 53 | 169 | 167 | 166 | 164 | 164 | 162 |
| 54 | 173 | 171 | 170 | 168 | 168 | 166 |
| 55 | 175 | 174 | 173 | 171 | 171 | 169 |
| 56 | 177 | 176 | 175 | 174 | 174 | 172 |
| 57 | 179 | 178 | 178 | 176 | 177 | 175 |
| 58 | 180 | 179 | 180 | 178 | 179 | 177 |
| 59 | 181 | 180 | 181 | 181 | 181 | 180 |
| 60 | 183 | 182 | 183 | 182 | 184 | 182 |
| Max Temp: | 183 | 182 | 183 | 182 | 184 | 182 |
| Max Allowed: | 387 | 387 | 387 | 388 | 388 | 388 |



| Time (min) | TC # 387 (°F) | TC # 388 (°F) | TC # 389 (°F) | TC # 390 (°F) | TC # 391 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 63 | 63 | 62 |
| 1 | 63 | 63 | 63 | 63 | 62 |
| 2 | 63 | 63 | 63 | 63 | 62 |
| 3 | 63 | 63 | 63 | 63 | 62 |
| 4 | 63 | 63 | 63 | 63 | 62 |
| 5 | 63 | 63 | 63 | 63 | 62 |
| 6 | 63 | 63 | 63 | 63 | 62 |
| 7 | 63 | 63 | 63 | 63 | 62 |
| 8 | 63 | 63 | 63 | 63 | 62 |
| 9 | 63 | 63 | 63 | 63 | 62 |
| 10 | 63 | 63 | 63 | 63 | 62 |
| 11 | 64 | 63 | 63 | 63 | 62 |
| 12 | 64 | 64 | 64 | 63 | 62 |
| 13 | 65 | 64 | 64 | 63 | 62 |
| 14 | 65 | 65 | 65 | 64 | 62 |
| 15 | 66 | 66 | 65 | 64 | 63 |
| 16 | 68 | 67 | 66 | 65 | 63 |
| 17 | 69 | 69 | 68 | 66 | 63 |
| 18 | 71 | 70 | 69 | 67 | 64 |
| 19 | 73 | 72 | 71 | 68 | 64 |
| 20 | 75 | 74 | 73 | 69 | 65 |
| 21 | 78 | 77 | 75 | 71 | 66 |
| 22 | 81 | 79 | 77 | 73 | 67 |
| 23 | 84 | 82 | 80 | 75 | 68 |
| 24 | 87 | 85 | 83 | 77 | 70 |
| 25 | 91 | 88 | 86 | 80 | 71 |
| 26 | 94 | 91 | 89 | 83 | 73 |
| 27 | 97 | 95 | 92 | 86 | 75 |
| 28 | 100 | 98 | 95 | 89 | 77 |
| 29 | 104 | 101 | 99 | 92 | 80 |
| 30 | 107 | 104 | 102 | 96 | 82 |
| 31 | 110 | 108 | 106 | 99 | 84 |
| 32 | 113 | 111 | 109 | 102 | 87 |
| 33 | 116 | 114 | 112 | 106 | 89 |
| 34 | 119 | 117 | 116 | 109 | 92 |
| 35 | 122 | 120 | 119 | 112 | 94 |
| 36 | 124 | 123 | 122 | 115 | 97 |
| 37 | 127 | 126 | 125 | 118 | 99 |
| 38 | 130 | 128 | 127 | 121 | 102 |
| 39 | 132 | 131 | 130 | 124 | 104 |
| 40 | 134 | 133 | 133 | 126 | 106 |

OMEGA POINT
LABORATORIES

456

| Time (min) | TC # 387 (°F) | TC # 388 (°F) | TC # 389 (°F) | TC # 390 (°F) | TC # 391 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 136 | 135 | 135 | 129 | 109 |
| 42 | 138 | 137 | 137 | 131 | 111 |
| 43 | 140 | 140 | 139 | 133 | 113 |
| 44 | 142 | 142 | 141 | 136 | 115 |
| 45 | 144 | 144 | 143 | 138 | 117 |
| 46 | 146 | 145 | 145 | 140 | 118 |
| 47 | 148 | 147 | 147 | 142 | 120 |
| 48 | 150 | 149 | 149 | 143 | 122 |
| 49 | 152 | 151 | 151 | 145 | 124 |
| 50 | 154 | 153 | 153 | 147 | 127 |
| 51 | 156 | 155 | 154 | 149 | 130 |
| 52 | 158 | 157 | 156 | 152 | 133 |
| 53 | 160 | 159 | 158 | 154 | 136 |
| 54 | 163 | 162 | 161 | 158 | 141 |
| 55 | 167 | 165 | 164 | 161 | 145 |
| 56 | 170 | 168 | 167 | 164 | 147 |
| 57 | 173 | 171 | 169 | 166 | 150 |
| 58 | 176 | 174 | 172 | 170 | 153 |
| 59 | 178 | 176 | 174 | 171 | 156 |
| 60 | 180 | 178 | 176 | 174 | 159 |
| Max Temp: | 180 | 178 | 176 | 174 | 159 |
| Max Allowed: | 388 | 388 | 388 | 388 | 387 |

OMEGA POINT
LABORATORIES

457

| Time (min) | TC # 392 (°F) | TC # 393 (°F) | TC # 394 (°F) | TC # 395 (°F) | TC # 396 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 63 | 63 | 63 | 63 |
| 1 | 62 | 63 | 63 | 63 | 63 |
| 2 | 61 | 63 | 63 | 63 | 63 |
| 3 | 62 | 63 | 63 | 63 | 63 |
| 4 | 61 | 63 | 63 | 63 | 63 |
| 5 | 61 | 63 | 63 | 63 | 63 |
| 6 | 61 | 63 | 63 | 63 | 63 |
| 7 | 61 | 63 | 63 | 63 | 63 |
| 8 | 61 | 64 | 63 | 63 | 63 |
| 9 | 61 | 64 | 63 | 63 | 63 |
| 10 | 61 | 65 | 64 | 63 | 63 |
| 11 | 61 | 66 | 64 | 64 | 63 |
| 12 | 61 | 66 | 64 | 64 | 64 |
| 13 | 61 | 67 | 65 | 64 | 64 |
| 14 | 61 | 69 | 65 | 65 | 64 |
| 15 | 61 | 70 | 66 | 66 | 65 |
| 16 | 61 | 71 | 67 | 67 | 66 |
| 17 | 62 | 73 | 69 | 68 | 66 |
| 18 | 62 | 75 | 70 | 69 | 68 |
| 19 | 62 | 77 | 72 | 71 | 69 |
| 20 | 62 | 80 | 75 | 73 | 71 |
| 21 | 62 | 82 | 77 | 76 | 73 |
| 22 | 62 | 85 | 80 | 79 | 76 |
| 23 | 63 | 88 | 83 | 82 | 78 |
| 24 | 63 | 91 | 86 | 85 | 81 |
| 25 | 64 | 94 | 89 | 88 | 84 |
| 26 | 64 | 97 | 93 | 91 | 88 |
| 27 | 65 | 101 | 96 | 95 | 91 |
| 28 | 66 | 105 | 100 | 98 | 95 |
| 29 | 66 | 108 | 103 | 102 | 98 |
| 30 | 67 | 112 | 107 | 105 | 102 |
| 31 | 68 | 116 | 111 | 109 | 105 |
| 32 | 69 | 119 | 114 | 113 | 109 |
| 33 | 70 | 123 | 118 | 116 | 112 |
| 34 | 71 | 127 | 122 | 119 | 116 |
| 35 | 72 | 130 | 125 | 123 | 119 |
| 36 | 73 | 133 | 128 | 126 | 123 |
| 37 | 74 | 137 | 132 | 129 | 126 |
| 38 | 75 | 140 | 135 | 132 | 129 |
| 39 | 77 | 143 | 138 | 135 | 132 |
| 40 | 78 | 146 | 141 | 137 | 135 |

OMEGA POINT
LABORATORIES

458

| Time (min) | TC # 392 (°F) | TC # 393 (°F) | TC # 394 (°F) | TC # 395 (°F) | TC # 396 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 79 | 149 | 143 | 140 | 137 |
| 42 | 80 | 152 | 146 | 142 | 140 |
| 43 | 81 | 154 | 149 | 145 | 143 |
| 44 | 82 | 157 | 152 | 148 | 145 |
| 45 | 83 | 159 | 154 | 150 | 148 |
| 46 | 85 | 162 | 156 | 153 | 150 |
| 47 | 86 | 165 | 159 | 155 | 153 |
| 48 | 87 | 167 | 162 | 158 | 155 |
| 49 | 88 | 169 | 164 | 160 | 158 |
| 50 | 89 | 172 | 166 | 163 | 161 |
| 51 | 90 | 174 | 169 | 166 | 163 |
| 52 | 92 | 177 | 172 | 169 | 166 |
| 53 | 93 | 179 | 175 | 172 | 170 |
| 54 | 95 | 182 | 177 | 175 | 174 |
| 55 | 97 | 183 | 179 | 177 | 177 |
| 56 | 99 | 185 | 181 | 179 | 179 |
| 57 | 101 | 186 | 182 | 181 | 181 |
| 58 | 102 | 187 | 184 | 182 | 182 |
| 59 | 103 | 189 | 185 | 184 | 184 |
| 60 | 105 | 190 | 187 | 186 | 185 |
| Max Temp: | 105 | 190 | 187 | 186 | 185 |
| Max Allowed: | 387 | 388 | 388 | 388 | 388 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 397 (°F) | TC # 398 (°F) | TC # 399 (°F) | TC # 400 (°F) | TC # 401 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 63 | 63 | 63 |
| 1 | 63 | 63 | 63 | 63 | 63 |
| 2 | 63 | 63 | 63 | 63 | 63 |
| 3 | 63 | 63 | 63 | 63 | 63 |
| 4 | 63 | 63 | 63 | 63 | 63 |
| 5 | 63 | 63 | 63 | 63 | 63 |
| 6 | 63 | 63 | 63 | 63 | 63 |
| 7 | 63 | 63 | 63 | 63 | 63 |
| 8 | 63 | 63 | 63 | 63 | 63 |
| 9 | 63 | 63 | 63 | 63 | 63 |
| 10 | 63 | 63 | 63 | 63 | 63 |
| 11 | 63 | 63 | 63 | 63 | 63 |
| 12 | 64 | 64 | 64 | 64 | 64 |
| 13 | 64 | 64 | 64 | 64 | 64 |
| 14 | 64 | 64 | 64 | 65 | 64 |
| 15 | 65 | 65 | 65 | 65 | 65 |
| 16 | 65 | 65 | 66 | 67 | 66 |
| 17 | 66 | 66 | 67 | 68 | 67 |
| 18 | 67 | 68 | 68 | 70 | 68 |
| 19 | 69 | 69 | 70 | 71 | 70 |
| 20 | 71 | 71 | 72 | 73 | 71 |
| 21 | 72 | 73 | 74 | 76 | 73 |
| 22 | 75 | 75 | 77 | 78 | 75 |
| 23 | 77 | 78 | 79 | 80 | 78 |
| 24 | 80 | 80 | 82 | 83 | 80 |
| 25 | 83 | 83 | 85 | 86 | 83 |
| 26 | 86 | 87 | 88 | 89 | 86 |
| 27 | 90 | 90 | 91 | 92 | 89 |
| 28 | 93 | 93 | 94 | 95 | 92 |
| 29 | 97 | 97 | 98 | 98 | 95 |
| 30 | 101 | 100 | 101 | 101 | 98 |
| 31 | 104 | 104 | 104 | 104 | 102 |
| 32 | 108 | 108 | 108 | 108 | 105 |
| 33 | 112 | 111 | 111 | 111 | 108 |
| 34 | 115 | 115 | 115 | 114 | 111 |
| 35 | 119 | 118 | 118 | 117 | 114 |
| 36 | 122 | 122 | 122 | 120 | 118 |
| 37 | 125 | 125 | 125 | 123 | 120 |
| 38 | 128 | 128 | 128 | 126 | 123 |
| 39 | 132 | 131 | 131 | 129 | 126 |
| 40 | 135 | 134 | 133 | 132 | 129 |

460

| Time (min) | TC # 397 (°F) | TC # 398 (°F) | TC # 399 (°F) | TC # 400 (°F) | TC # 401 (°F) |
|---------------------|---------------|---------------|---------------|---------------|---------------|
| 41 | 137 | 137 | 136 | 134 | 131 |
| 42 | 140 | 140 | 139 | 137 | 134 |
| 43 | 143 | 142 | 141 | 139 | 136 |
| 44 | 145 | 145 | 143 | 141 | 138 |
| 45 | 148 | 147 | 146 | 143 | 140 |
| 46 | 150 | 150 | 148 | 146 | 142 |
| 47 | 152 | 152 | 150 | 148 | 144 |
| 48 | 155 | 154 | 152 | 150 | 146 |
| 49 | 157 | 156 | 154 | 152 | 148 |
| 50 | 159 | 158 | 156 | 154 | 151 |
| 51 | 162 | 161 | 159 | 156 | 153 |
| 52 | 164 | 163 | 161 | 158 | 155 |
| 53 | 167 | 165 | 163 | 161 | 158 |
| 54 | 172 | 169 | 167 | 165 | 161 |
| 55 | 175 | 173 | 172 | 169 | 165 |
| 56 | 178 | 176 | 175 | 173 | 169 |
| 57 | 180 | 179 | 178 | 176 | 172 |
| 58 | 182 | 181 | 180 | 179 | 176 |
| 59 | 183 | 183 | 182 | 181 | 178 |
| 60 | 185 | 185 | 184 | 184 | 180 |
| Max Temp: | 185 | 185 | 184 | 184 | 180 |
| Max Allowed: | 388 | 388 | 388 | 388 | 388 |



461

| Time (min) | TC # 402 (°F) | TC # 403 (°F) | TC # 404 (°F) | TC # 405 (°F) | TC # 406 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 63 | 63 | 63 |
| 1 | 63 | 63 | 63 | 63 | 63 |
| 2 | 63 | 63 | 63 | 63 | 63 |
| 3 | 63 | 63 | 63 | 63 | 63 |
| 4 | 63 | 63 | 63 | 63 | 63 |
| 5 | 63 | 63 | 63 | 63 | 63 |
| 6 | 63 | 63 | 63 | 63 | 63 |
| 7 | 63 | 63 | 63 | 63 | 63 |
| 8 | 63 | 63 | 63 | 63 | 63 |
| 9 | 63 | 63 | 63 | 63 | 63 |
| 10 | 63 | 63 | 63 | 63 | 63 |
| 11 | 63 | 63 | 63 | 63 | 63 |
| 12 | 64 | 63 | 63 | 64 | 63 |
| 13 | 64 | 64 | 64 | 64 | 64 |
| 14 | 64 | 64 | 64 | 64 | 64 |
| 15 | 65 | 65 | 65 | 65 | 65 |
| 16 | 66 | 65 | 65 | 65 | 65 |
| 17 | 66 | 66 | 66 | 66 | 66 |
| 18 | 68 | 67 | 67 | 67 | 67 |
| 19 | 69 | 69 | 68 | 69 | 68 |
| 20 | 71 | 70 | 70 | 70 | 70 |
| 21 | 72 | 72 | 72 | 72 | 71 |
| 22 | 75 | 74 | 74 | 74 | 73 |
| 23 | 77 | 76 | 76 | 76 | 75 |
| 24 | 80 | 79 | 78 | 78 | 78 |
| 25 | 83 | 82 | 81 | 81 | 80 |
| 26 | 86 | 85 | 83 | 83 | 83 |
| 27 | 89 | 88 | 86 | 86 | 85 |
| 28 | 92 | 91 | 89 | 89 | 88 |
| 29 | 95 | 95 | 92 | 92 | 91 |
| 30 | 99 | 98 | 95 | 95 | 94 |
| 31 | 102 | 101 | 98 | 98 | 96 |
| 32 | 105 | 104 | 101 | 101 | 99 |
| 33 | 109 | 107 | 104 | 104 | 102 |
| 34 | 112 | 110 | 107 | 107 | 105 |
| 35 | 115 | 113 | 110 | 110 | 108 |
| 36 | 118 | 116 | 113 | 112 | 111 |
| 37 | 120 | 119 | 116 | 115 | 113 |
| 38 | 123 | 122 | 119 | 118 | 116 |
| 39 | 126 | 124 | 121 | 121 | 119 |
| 40 | 128 | 127 | 124 | 123 | 121 |



462

| Time (min) | TC # 402 (°F) | TC # 403 (°F) | TC # 404 (°F) | TC # 405 (°F) | TC # 406 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 131 | 129 | 126 | 126 | 123 |
| 42 | 133 | 131 | 129 | 128 | 126 |
| 43 | 135 | 134 | 131 | 130 | 128 |
| 44 | 137 | 136 | 133 | 132 | 130 |
| 45 | 139 | 138 | 135 | 134 | 132 |
| 46 | 141 | 140 | 137 | 136 | 134 |
| 47 | 143 | 142 | 139 | 138 | 136 |
| 48 | 145 | 143 | 141 | 140 | 138 |
| 49 | 147 | 145 | 143 | 142 | 140 |
| 50 | 149 | 147 | 145 | 144 | 142 |
| 51 | 151 | 149 | 147 | 146 | 144 |
| 52 | 153 | 151 | 149 | 148 | 146 |
| 53 | 155 | 153 | 151 | 150 | 148 |
| 54 | 158 | 156 | 154 | 153 | 151 |
| 55 | 162 | 159 | 157 | 155 | 154 |
| 56 | 166 | 163 | 160 | 158 | 156 |
| 57 | 169 | 166 | 163 | 162 | 160 |
| 58 | 172 | 169 | 166 | 165 | 163 |
| 59 | 175 | 172 | 169 | 168 | 166 |
| 60 | 177 | 174 | <u>172</u> | 171 | 169 |
| Max Temp: | 177 | 174 | 172 | 171 | 169 |
| Max Allowed: | 388 | 388 | 388 | 388 | 388 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 407 (°F) | TC # 408 (°F) | TC # 409 (°F) | TC # 410 (°F) | TC # 411 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 62 | 62 | 63 |
| 1 | 63 | 63 | 62 | 62 | 63 |
| 2 | 63 | 63 | 62 | 62 | 63 |
| 3 | 63 | 63 | 62 | 62 | 63 |
| 4 | 63 | 63 | 62 | 62 | 63 |
| 5 | 63 | 63 | 62 | 62 | 63 |
| 6 | 63 | 63 | 62 | 62 | 64 |
| 7 | 63 | 63 | 62 | 62 | 64 |
| 8 | 63 | 63 | 62 | 62 | 65 |
| 9 | 63 | 63 | 62 | 62 | 65 |
| 10 | 63 | 63 | 62 | 62 | 66 |
| 11 | 63 | 63 | 62 | 62 | 68 |
| 12 | 63 | 63 | 63 | 62 | 70 |
| 13 | 64 | 63 | 63 | 62 | 72 |
| 14 | 64 | 64 | 63 | 62 | 74 |
| 15 | 65 | 64 | 63 | 62 | 77 |
| 16 | 65 | 65 | 63 | 62 | 80 |
| 17 | 66 | 65 | 64 | 62 | 83 |
| 18 | 67 | 66 | 64 | 62 | 87 |
| 19 | 68 | 67 | 65 | 62 | 90 |
| 20 | 70 | 68 | 66 | 63 | 94 |
| 21 | 71 | 70 | 67 | 63 | 97 |
| 22 | 73 | 71 | 68 | 63 | 100 |
| 23 | 75 | 73 | 69 | 64 | 104 |
| 24 | 77 | 75 | 70 | 64 | 107 |
| 25 | 79 | 76 | 72 | 64 | 110 |
| 26 | 81 | 78 | 73 | 65 | 113 |
| 27 | 84 | 81 | 75 | 66 | 116 |
| 28 | 86 | 83 | 76 | 66 | 119 |
| 29 | 89 | 85 | 78 | 67 | 122 |
| 30 | 91 | 88 | 80 | 68 | 124 |
| 31 | 94 | 90 | 82 | 69 | 127 |
| 32 | 97 | 93 | 84 | 70 | 129 |
| 33 | 99 | 95 | 87 | 71 | 131 |
| 34 | 102 | 98 | 89 | 72 | 133 |
| 35 | 105 | 100 | 91 | 73 | 135 |
| 36 | 107 | 103 | 93 | 74 | 137 |
| 37 | 110 | 105 | 95 | 75 | 138 |
| 38 | 112 | 107 | 97 | 76 | 140 |
| 39 | 115 | 110 | 99 | 77 | 142 |
| 40 | 117 | 112 | 101 | 78 | 144 |

461

| Time (min) | TC # 407 (°F) | TC # 408 (°F) | TC # 409 (°F) | TC # 410 (°F) | TC # 411 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 119 | 114 | 104 | 79 | 146 |
| 42 | 122 | 117 | 105 | 80 | 147 |
| 43 | 124 | 119 | 108 | 81 | 149 |
| 44 | 126 | 121 | 110 | 83 | 151 |
| 45 | 128 | 123 | 111 | 84 | 153 |
| 46 | 131 | 125 | 113 | 85 | 155 |
| 47 | 133 | 127 | 115 | 86 | 157 |
| 48 | 135 | 129 | 117 | 87 | 158 |
| 49 | 136 | 131 | 119 | 88 | 160 |
| 50 | 138 | 133 | 121 | 90 | 162 |
| 51 | 140 | 135 | 123 | 91 | 164 |
| 52 | 142 | 137 | 126 | 92 | 166 |
| 53 | 145 | 140 | 129 | 94 | 168 |
| 54 | 148 | 144 | 133 | 96 | 169 |
| 55 | 150 | 147 | 137 | 97 | 171 |
| 56 | 153 | 150 | 139 | 99 | 173 |
| 57 | 156 | 153 | 142 | 101 | 175 |
| 58 | 159 | 156 | 145 | 102 | 177 |
| 59 | 162 | 158 | 147 | 104 | 179 |
| 60 | 164 | 161 | 150 | 105 | 182 |
| Max Temp: | 164 | 161 | 150 | 105 | 182 |
| Max Allowed: | 388 | 388 | 387 | 387 | 388 |

OMEGA POINT
LABORATORIES

465

| Time (min) | TC # 412 (°F) | TC # 413 (°F) | TC # 414 (°F) | TC # 415 (°F) | TC # 416 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 63 | 63 | 63 |
| 1 | 63 | 63 | 63 | 63 | 63 |
| 2 | 63 | 63 | 63 | 63 | 63 |
| 3 | 63 | 63 | 63 | 63 | 63 |
| 4 | 63 | 63 | 63 | 63 | 63 |
| 5 | 63 | 63 | 63 | 63 | 63 |
| 6 | 63 | 63 | 63 | 63 | 63 |
| 7 | 63 | 63 | 63 | 63 | 63 |
| 8 | 63 | 63 | 63 | 63 | 63 |
| 9 | 64 | 63 | 63 | 63 | 63 |
| 10 | 64 | 63 | 63 | 63 | 63 |
| 11 | 65 | 64 | 63 | 63 | 63 |
| 12 | 66 | 64 | 64 | 63 | 63 |
| 13 | 67 | 65 | 64 | 64 | 63 |
| 14 | 69 | 66 | 65 | 64 | 64 |
| 15 | 71 | 67 | 66 | 65 | 64 |
| 16 | 73 | 69 | 67 | 66 | 65 |
| 17 | 75 | 71 | 68 | 67 | 65 |
| 18 | 78 | 73 | 69 | 68 | 66 |
| 19 | 81 | 75 | 71 | 69 | 67 |
| 20 | 84 | 77 | 73 | 70 | 68 |
| 21 | 87 | 80 | 75 | 72 | 69 |
| 22 | 90 | 82 | 77 | 74 | 71 |
| 23 | 93 | 85 | 79 | 76 | 72 |
| 24 | 96 | 88 | 81 | 77 | 73 |
| 25 | 98 | 90 | 84 | 79 | 75 |
| 26 | 101 | 93 | 86 | 82 | 77 |
| 27 | 104 | 95 | 88 | 84 | 78 |
| 28 | 106 | 98 | 91 | 86 | 80 |
| 29 | 109 | 100 | 93 | 88 | 82 |
| 30 | 111 | 102 | 95 | 90 | 84 |
| 31 | 114 | 105 | 97 | 92 | 86 |
| 32 | 116 | 107 | 100 | 94 | 87 |
| 33 | 118 | 109 | 102 | 96 | 89 |
| 34 | 120 | 111 | 104 | 98 | 91 |
| 35 | 122 | 113 | 106 | 100 | 93 |
| 36 | 124 | 115 | 108 | 102 | 95 |
| 37 | 125 | 117 | 110 | 104 | 97 |
| 38 | 127 | 118 | 111 | 106 | 99 |
| 39 | 129 | 120 | 113 | 108 | 100 |
| 40 | 131 | 122 | 115 | 109 | 102 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 412 (°F) | TC # 413 (°F) | TC # 414 (°F) | TC # 415 (°F) | TC # 416 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 132 | 124 | 117 | 111 | 104 |
| 42 | 134 | 125 | 118 | 113 | 106 |
| 43 | 136 | 127 | 120 | 115 | 108 |
| 44 | 138 | 129 | 122 | 116 | 109 |
| 45 | 139 | 130 | 124 | 118 | 111 |
| 46 | 141 | 132 | 125 | 120 | 113 |
| 47 | 143 | 134 | 127 | 122 | 115 |
| 48 | 145 | 136 | 129 | 123 | 117 |
| 49 | 146 | 137 | 130 | 125 | 118 |
| 50 | 148 | 139 | 132 | 127 | 120 |
| 51 | 150 | 141 | 134 | 129 | 122 |
| 52 | 152 | 143 | 136 | 130 | 124 |
| 53 | 154 | 145 | 137 | 132 | 126 |
| 54 | 156 | 146 | 139 | 134 | 127 |
| 55 | 157 | 148 | 141 | 135 | 129 |
| 56 | 159 | 150 | 143 | 137 | 131 |
| 57 | 161 | 152 | 144 | 139 | 132 |
| 58 | 163 | 154 | 146 | 140 | 134 |
| 59 | 165 | 156 | 148 | 142 | 135 |
| 60 | 168 | 158 | 150 | 144 | 136 |
| Max Temp: | 168 | 158 | 150 | 144 | 136 |
| Max Allowed: | 388 | 388 | 388 | 388 | 388 |

| Time (min) | TC # 417 (°F) | TC # 418 (°F) | TC # 419 (°F) | TC # 420 (°F) | TC # 421 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 62 | 62 | 63 | 63 | 63 |
| 1 | 62 | 62 | 63 | 63 | 63 |
| 2 | 62 | 62 | 63 | 63 | 63 |
| 3 | 62 | 62 | 63 | 63 | 63 |
| 4 | 62 | 62 | 63 | 63 | 63 |
| 5 | 62 | 62 | 63 | 63 | 63 |
| 6 | 62 | 62 | 63 | 63 | 63 |
| 7 | 62 | 62 | 64 | 63 | 63 |
| 8 | 62 | 62 | 65 | 63 | 63 |
| 9 | 62 | 62 | 65 | 64 | 63 |
| 10 | 62 | 62 | 66 | 64 | 64 |
| 11 | 62 | 62 | 68 | 65 | 64 |
| 12 | 63 | 62 | 70 | 66 | 65 |
| 13 | 63 | 62 | 72 | 67 | 66 |
| 14 | 63 | 62 | 74 | 69 | 67 |
| 15 | 63 | 62 | 77 | 71 | 69 |
| 16 | 63 | 63 | 80 | 74 | 71 |
| 17 | 64 | 63 | 83 | 76 | 73 |
| 18 | 64 | 63 | 86 | 79 | 75 |
| 19 | 65 | 63 | 90 | 82 | 77 |
| 20 | 65 | 64 | 93 | 85 | 80 |
| 21 | 66 | 64 | 97 | 88 | 83 |
| 22 | 67 | 64 | 101 | 91 | 85 |
| 23 | 68 | 65 | 104 | 94 | 88 |
| 24 | 69 | 65 | 108 | 97 | 91 |
| 25 | 70 | 66 | 111 | 100 | 93 |
| 26 | 71 | 67 | 113 | 103 | 96 |
| 27 | 72 | 67 | 116 | 106 | 98 |
| 28 | 73 | 68 | 119 | 108 | 101 |
| 29 | 75 | 69 | 121 | 111 | 103 |
| 30 | 76 | 70 | 123 | 113 | 105 |
| 31 | 77 | 71 | 126 | 115 | 107 |
| 32 | 79 | 72 | 128 | 117 | 109 |
| 33 | 80 | 73 | 130 | 119 | 111 |
| 34 | 81 | 74 | 132 | 121 | 113 |
| 35 | 83 | 75 | 134 | 123 | 115 |
| 36 | 84 | 76 | 136 | 125 | 117 |
| 37 | 86 | 77 | 138 | 126 | 119 |
| 38 | 87 | 78 | 140 | 128 | 120 |
| 39 | 89 | 79 | 142 | 130 | 122 |
| 40 | 90 | 80 | 144 | 131 | 123 |

| Time (min) | TC # 417 (°F) | TC # 418 (°F) | TC # 419 (°F) | TC # 420 (°F) | TC # 421 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 92 | 81 | 146 | 133 | 125 |
| 42 | 93 | 83 | 147 | 134 | 126 |
| 43 | 95 | 84 | 149 | 136 | 128 |
| 44 | 97 | 85 | 150 | 137 | 130 |
| 45 | 98 | 86 | 152 | 139 | 131 |
| 46 | 100 | 88 | 153 | 140 | 133 |
| 47 | 101 | 89 | 155 | 142 | 134 |
| 48 | 103 | 90 | 156 | 143 | 136 |
| 49 | 104 | 92 | 158 | 145 | 137 |
| 50 | 106 | 93 | 159 | 146 | 139 |
| 51 | 108 | 95 | 161 | 148 | 140 |
| 52 | 109 | 96 | 162 | 150 | 142 |
| 53 | 111 | 98 | 164 | 151 | 143 |
| 54 | 112 | 99 | 165 | 153 | 145 |
| 55 | 114 | 101 | 167 | 155 | 147 |
| 56 | 115 | 102 | 169 | 156 | 148 |
| 57 | 117 | 104 | 171 | 158 | 150 |
| 58 | 118 | 105 | 172 | 160 | 152 |
| 59 | 120 | 107 | 174 | 162 | 154 |
| 60 | 121 | 108 | 176 | 164 | 156 |
| Max Temp: | 121 | 108 | 176 | 164 | 156 |
| Max Allowed: | 387 | 387 | 388 | 388 | 388 |

| Time (min) | TC # 422 (°F) | TC # 423 (°F) | TC # 424 (°F) | TC # 425 (°F) | TC # 426 (°F) |
|---------------|------------------|------------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 63 | 63 | 63 |
| 1 | 63 | 63 | 63 | 63 | 63 |
| 2 | 63 | 63 | 63 | 63 | 63 |
| 3 | 63 | 63 | 63 | 63 | 63 |
| 4 | 63 | 63 | 63 | 63 | 63 |
| 5 | 63 | 63 | 63 | 63 | 63 |
| 6 | 63 | 63 | 63 | 63 | 63 |
| 7 | 63 | 63 | 63 | 63 | 63 |
| 8 | 63 | 63 | 63 | 63 | 63 |
| 9 | 63 | 63 | 63 | 63 | 63 |
| 10 | 63 | 63 | 63 | 63 | 63 |
| 11 | 63 | 63 | 63 | 63 | 63 |
| 12 | 64 | 63 | 63 | 63 | 63 |
| 13 | 64 | 63 | 63 | 63 | 63 |
| 14 | 65 | 64 | 63 | 63 | 63 |
| 15 | 66 | 64 | 64 | 64 | 63 |
| 16 | 67 | 65 | 64 | 64 | 64 |
| 17 | 68 | 66 | 65 | 64 | 64 |
| 18 | 70 | 67 | 65 | 65 | 64 |
| 19 | 71 | 68 | 66 | 65 | 64 |
| 20 | 73 | 69 | 67 | 66 | 65 |
| 21 | 75 | 71 | 68 | 67 | 65 |
| 22 | 78 | 72 | 69 | 67 | 66 |
| 23 | 80 | 74 | 70 | 68 | 66 |
| 24 | 82 | 76 | 72 | 69 | 67 |
| 25 | 84 | 78 | 73 | 70 | 68 |
| 26 | 87 | 80 | 75 | 71 | 69 |
| 27 | 89 | 82 | 76 | 72 | 69 |
| 28 | 91 | 84 | 78 | 74 | 70 |
| 29 | 94 | 86 | 80 | 75 | 71 |
| 30 | 96 | 88 | 81 | 76 | 72 |
| 31 | 98 | 90 | 83 | 78 | 74 |
| 32 | 100 | 92 | 85 | 79 | 75 |
| 33 | 102 | 94 | 87 | 81 | 76 |
| 34 | 104 | 96 | 89 | 83 | 77 |
| 35 | 106 | 98 | 91 | 84 | 78 |
| 36 | 108 | 100 | 92 | 86 | 80 |
| 37 | 110 | 102 | 94 | 87 | 81 |
| 38 | 111 | 103 | 96 | 89 | 82 |
| 39 | 113 | 105 | 98 | 91 | 84 |
| 40 | 115 | 107 | 100 | 92 | 85 |

470

| Time (min) | TC # 422 (°F) | TC # 423 (°F) | TC # 424 (°F) | TC # 425 (°F) | TC # 426 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 117 | 109 | 102 | 94 | 86 |
| 42 | 118 | 111 | 103 | 95 | 88 |
| 43 | 120 | 112 | 105 | 97 | 89 |
| 44 | 121 | 114 | 107 | 99 | 91 |
| 45 | 123 | 116 | 109 | 100 | 92 |
| 46 | 125 | 117 | 110 | 102 | 94 |
| 47 | 126 | 119 | 112 | 103 | 95 |
| 48 | 128 | 121 | 114 | 105 | 97 |
| 49 | 129 | 122 | 115 | 107 | 98 |
| 50 | 131 | 124 | 117 | 108 | 99 |
| 51 | 132 | 126 | 119 | 110 | 101 |
| 52 | 134 | 127 | 120 | 111 | 102 |
| 53 | 136 | 129 | 122 | 113 | 104 |
| 54 | 137 | 130 | 124 | 114 | 105 |
| 55 | 139 | 132 | 125 | 116 | 107 |
| 56 | 140 | 134 | 127 | 118 | 108 |
| 57 | 142 | 135 | 129 | 119 | 110 |
| 58 | 144 | 137 | 130 | 121 | 111 |
| 59 | 145 | 138 | 132 | 122 | 113 |
| 60 | 147 | 140 | 133 | 124 | 114 |
| Max Temp: | 147 | 140 | 133 | 124 | 114 |
| Max Allowed: | 388 | 388 | 388 | 388 | 388 |

OMEGA POINT
LABORATORIES

| Time (min) | TC # 427 (°F) | TC # 428 (°F) | TC # 429 (°F) | TC # 430 (°F) | TC # 431 (°F) | 471 |
|---------------|------------------|------------------|------------------|------------------|------------------|-----|
| 0 | 63 | 63 | 63 | 63 | 63 | |
| 1 | 64 | 63 | 63 | 63 | 63 | |
| 2 | 63 | 63 | 63 | 63 | 63 | |
| 3 | 63 | 63 | 63 | 63 | 63 | |
| 4 | 64 | 63 | 63 | 63 | 63 | |
| 5 | 64 | 63 | 63 | 63 | 63 | |
| 6 | 64 | 64 | 63 | 63 | 63 | |
| 7 | 64 | 64 | 63 | 63 | 63 | |
| 8 | 64 | 64 | 63 | 63 | 63 | |
| 9 | 65 | 64 | 64 | 63 | 63 | |
| 10 | 66 | 64 | 64 | 64 | 63 | |
| 11 | 67 | 65 | 64 | 64 | 64 | |
| 12 | 69 | 66 | 65 | 64 | 64 | |
| 13 | 71 | 67 | 65 | 65 | 64 | |
| 14 | 74 | 69 | 67 | 65 | 65 | |
| 15 | 76 | 71 | 68 | 66 | 65 | |
| 16 | 79 | 73 | 69 | 67 | 66 | |
| 17 | 82 | 75 | 71 | 69 | 67 | |
| 18 | 86 | 78 | 73 | 70 | 68 | |
| 19 | 90 | 81 | 76 | 72 | 69 | |
| 20 | 93 | 84 | 78 | 74 | 71 | |
| 21 | 97 | 87 | 80 | 76 | 72 | |
| 22 | 101 | 90 | 83 | 78 | 74 | |
| 23 | 104 | 93 | 86 | 80 | 76 | |
| 24 | 108 | 96 | 88 | 82 | 78 | |
| 25 | 111 | 99 | 91 | 85 | 80 | |
| 26 | 113 | 102 | 93 | 87 | 82 | |
| 27 | 116 | 104 | 96 | 89 | 84 | |
| 28 | 119 | 107 | 98 | 91 | 86 | |
| 29 | 121 | 109 | 100 | 94 | 88 | |
| 30 | 123 | 111 | 103 | 96 | 90 | |
| 31 | 125 | 113 | 105 | 98 | 92 | |
| 32 | 127 | 115 | 107 | 100 | 94 | |
| 33 | 129 | 117 | 109 | 102 | 96 | |
| 34 | 131 | 119 | 111 | 104 | 98 | |
| 35 | 132 | 121 | 112 | 106 | 100 | |
| 36 | 134 | 122 | 114 | 108 | 102 | |
| 37 | 136 | 124 | 116 | 110 | 103 | |
| 38 | 137 | 126 | 118 | 111 | 105 | |
| 39 | 139 | 127 | 119 | 113 | 107 | |
| 40 | 140 | 129 | 121 | 115 | 109 | |

| Time (min) | TC # 427 (°F) | TC # 428 (°F) | TC # 429 (°F) | TC # 430 (°F) | TC # 431 (°F) |
|---------------------|------------------|------------------|------------------|------------------|------------------|
| 41 | 142 | 130 | 123 | 117 | 111 |
| 42 | 144 | 132 | 124 | 118 | 112 |
| 43 | 145 | 134 | 126 | 120 | 114 |
| 44 | 147 | 135 | 127 | 122 | 116 |
| 45 | 148 | 137 | 129 | 123 | 118 |
| 46 | 150 | 138 | 131 | 125 | 119 |
| 47 | 152 | 140 | 132 | 127 | 121 |
| 48 | 153 | 142 | 134 | 128 | 123 |
| 49 | 155 | 143 | 136 | 130 | 125 |
| 50 | 157 | 145 | 137 | 132 | 126 |
| 51 | 158 | 147 | 139 | 133 | 128 |
| 52 | 160 | 148 | 141 | 135 | 130 |
| 53 | 162 | 150 | 142 | 137 | 132 |
| 54 | 164 | 152 | 144 | 138 | 133 |
| 55 | 166 | 154 | 146 | 140 | 135 |
| 56 | 168 | 156 | 148 | 142 | 137 |
| 57 | 169 | 157 | 149 | 144 | 139 |
| 58 | 171 | 159 | 151 | 146 | 140 |
| 59 | 173 | 161 | 153 | 147 | 142 |
| 60 | 175 | 163 | 155 | 149 | 144 |
| Max Temp: | 175 | 163 | 155 | 149 | 144 |
| Max Allowed: | 388 | 388 | 388 | 388 | 388 |

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| Time (min) | TC # 432 (°F) | TC # 433 (°F) | TC # 434 (°F) |
|---------------|------------------|------------------|------------------|
| 0 | 63 | 63 | 63 |
| 1 | 63 | 63 | 63 |
| 2 | 63 | 63 | 63 |
| 3 | 63 | 63 | 63 |
| 4 | 63 | 63 | 63 |
| 5 | 63 | 63 | 63 |
| 6 | 63 | 63 | 63 |
| 7 | 63 | 63 | 63 |
| 8 | 63 | 63 | 63 |
| 9 | 63 | 63 | 63 |
| 10 | 63 | 63 | 63 |
| 11 | 63 | 63 | 63 |
| 12 | 63 | 63 | 63 |
| 13 | 64 | 63 | 63 |
| 14 | 64 | 63 | 63 |
| 15 | 64 | 64 | 63 |
| 16 | 65 | 64 | 63 |
| 17 | 66 | 64 | 63 |
| 18 | 66 | 65 | 63 |
| 19 | 67 | 65 | 64 |
| 20 | 68 | 66 | 64 |
| 21 | 70 | 67 | 64 |
| 22 | 71 | 68 | 65 |
| 23 | 72 | 69 | 65 |
| 24 | 74 | 70 | 66 |
| 25 | 75 | 71 | 67 |
| 26 | 77 | 72 | 67 |
| 27 | 79 | 73 | 68 |
| 28 | 80 | 74 | 69 |
| 29 | 82 | 76 | 70 |
| 30 | 84 | 77 | 71 |
| 31 | 86 | 79 | 72 |
| 32 | 88 | 80 | 73 |
| 33 | 89 | 82 | 74 |
| 34 | 91 | 83 | 75 |
| 35 | 93 | 85 | 76 |
| 36 | 95 | 86 | 77 |
| 37 | 97 | 88 | 78 |
| 38 | 99 | 90 | 79 |
| 39 | 100 | 91 | 80 |
| 40 | 102 | 93 | 82 |

OMEGA POINT
LABORATORIES

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| Time (min) | TC # 432 (°F) | TC # 433 (°F) | TC # 434 (°F) |
|--------------|---------------|---------------|---------------|
| 41 | 104 | 95 | 83 |
| 42 | 106 | 96 | 84 |
| 43 | 108 | 98 | 86 |
| 44 | 110 | 100 | 87 |
| 45 | 112 | 102 | 88 |
| 46 | 113 | 103 | 90 |
| 47 | 115 | 105 | 91 |
| 48 | 117 | 107 | 92 |
| 49 | 119 | 109 | 94 |
| 50 | 121 | 110 | 95 |
| 51 | 122 | 112 | 97 |
| 52 | 124 | 114 | 98 |
| 53 | 126 | 115 | 99 |
| 54 | 128 | 117 | 101 |
| 55 | 130 | 119 | 102 |
| 56 | 131 | 120 | 104 |
| 57 | 133 | 122 | 105 |
| 58 | 135 | 124 | 107 |
| 59 | 136 | 125 | 108 |
| 60 | 138 | 127 | 109 |
| Max Temp: | 138 | 127 | 109 |
| Max Allowed: | 388 | 388 | 388 |



| Time (min) | E119 Std (°F) | Furnace Avg (°F) | Ambient (°F) | Furnace # 1 (°F) | Furnace # 2 (°F) | Furnace # 3 (°F) |
|---------------|------------------|---------------------|-----------------|---------------------|---------------------|---------------------|
| 0 | 68 | 60 | 62 | 61 | 61 | 61 |
| 1 | 254 | 99 | 62 | 97 | 77 | 76 |
| 2 | 440 | 455 | 62 | 357 | 270 | 226 |
| 3 | 627 | 990 | 62 | 923 | 796 | 616 |
| 4 | 813 | 1064 | 62 | 1068 | 1004 | 852 |
| 5 | 1000 | 980 | 61 | 967 | 965 | 865 |
| 6 | 1060 | 923 | 61 | 908 | 915 | 836 |
| 7 | 1120 | 1077 | 61 | 1103 | 1030 | 951 |
| 8 | 1180 | 1254 | 61 | 1366 | 1244 | 1204 |
| 9 | 1240 | 1253 | 61 | 1373 | 1294 | 1274 |
| 10 | 1300 | 1212 | 61 | 1318 | 1277 | 1257 |
| 11 | 1327 | 1313 | 61 | 1485 | 1359 | 1365 |
| 12 | 1346 | 1381 | 62 | 1564 | 1449 | 1481 |
| 13 | 1364 | 1364 | 61 | 1514 | 1449 | 1473 |
| 14 | 1380 | 1375 | 61 | 1538 | 1460 | 1489 |
| 15 | 1395 | 1405 | 62 | 1579 | 1488 | 1523 |
| 16 | 1410 | 1423 | 62 | 1598 | 1513 | 1547 |
| 17 | 1423 | 1378 | 61 | 1507 | 1485 | 1497 |
| 18 | 1436 | 1388 | 61 | 1541 | 1479 | 1502 |
| 19 | 1448 | 1479 | 61 | 1655 | 1553 | 1609 |
| 20 | 1459 | 1431 | 62 | 1549 | 1528 | 1553 |
| 21 | 1470 | 1408 | 62 | 1525 | 1501 | 1523 |
| 22 | 1480 | 1468 | 61 | 1619 | 1542 | 1588 |
| 23 | 1490 | 1463 | 61 | 1589 | 1547 | 1586 |
| 24 | 1499 | 1450 | 61 | 1575 | 1531 | 1567 |
| 25 | 1508 | 1491 | 61 | 1632 | 1561 | 1612 |
| 26 | 1517 | 1506 | 62 | 1639 | 1580 | 1634 |
| 27 | 1525 | 1485 | 62 | 1627 | 1560 | 1609 |
| 28 | 1533 | 1525 | 62 | 1689 | 1594 | 1655 |
| 29 | 1541 | 1559 | 62 | 1730 | 1636 | 1695 |
| 30 | 1548 | 1573 | 61 | 1763 | 1659 | 1711 |
| 31 | 1555 | 1542 | 61 | 1718 | 1643 | 1677 |
| 32 | 1562 | 1504 | 61 | 1657 | 1618 | 1628 |
| 33 | 1569 | 1524 | 62 | 1689 | 1639 | 1646 |
| 34 | 1576 | 1601 | 61 | 1773 | 1719 | 1729 |
| 35 | 1582 | 1623 | 61 | 1787 | 1754 | 1750 |
| 36 | 1588 | 1565 | 61 | 1713 | 1699 | 1689 |
| 37 | 1594 | 1593 | 61 | 1749 | 1712 | 1708 |
| 38 | 1600 | 1652 | 61 | 1801 | 1770 | 1761 |
| 39 | 1606 | 1656 | 61 | 1791 | 1786 | 1771 |
| 40 | 1612 | 1535 | 61 | 1637 | 1684 | 1643 |

4476

| Time (min) | E119 Std (°F) | Furnace Avg (°F) | Ambient (°F) | Furnace # 1 (°F) | Furnace # 2 (°F) | Furnace # 3 (°F) |
|---------------|------------------|---------------------|-----------------|---------------------|---------------------|---------------------|
| 41 | 1617 | 1602 | 61 | 1746 | 1718 | 1703 |
| 42 | 1622 | 1648 | 61 | 1788 | 1765 | 1758 |
| 43 | 1627 | 1549 | 59 | 1665 | 1674 | 1662 |
| 44 | 1633 | 1649 | 60 | 1789 | 1739 | 1759 |
| 45 | 1638 | 1643 | 61 | 1767 | 1757 | 1763 |
| 46 | 1642 | 1548 | 61 | 1662 | 1667 | 1670 |
| 47 | 1647 | 1602 | 61 | 1739 | 1694 | 1724 |
| 48 | 1652 | 1671 | 62 | 1804 | 1757 | 1793 |
| 49 | 1656 | 1604 | 61 | 1734 | 1699 | 1728 |
| 50 | 1661 | 1687 | 62 | 1812 | 1755 | 1799 |
| 51 | 1665 | 1733 | 62 | 1876 | 1801 | 1843 |
| 52 | 1669 | 1661 | 61 | 1799 | 1754 | 1768 |
| 53 | 1674 | 1622 | 61 | 1760 | 1707 | 1725 |
| 54 | 1678 | 1692 | 61 | 1826 | 1759 | 1786 |
| 55 | 1682 | 1670 | 62 | 1800 | 1753 | 1760 |
| 56 | 1686 | 1657 | 61 | 1791 | 1734 | 1749 |
| 57 | 1690 | 1719 | 61 | 1849 | 1779 | 1808 |
| 58 | 1693 | 1714 | 61 | 1845 | 1786 | 1811 |
| 59 | 1697 | 1646 | 61 | 1772 | 1730 | 1745 |
| 60 | 1701 | 1745 | 61 | 1872 | 1784 | 1845 |

477

| Time (min) | Furnace # 4 (°F) | Furnace # 5 (°F) | Furnace # 6 (°F) | Furnace # 7 (°F) | Furnace # 8 (°F) |
|---------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| 0 | 60 | 61 | 60 | 60 | 60 |
| 1 | 82 | 118 | 106 | 116 | 106 |
| 2 | 307 | 466 | 534 | 538 | 510 |
| 3 | 824 | 1008 | 1085 | 1112 | 1093 |
| 4 | 1004 | 1069 | 1126 | 1123 | 1107 |
| 5 | 937 | 985 | 1037 | 1019 | 1009 |
| 6 | 885 | 930 | 976 | 960 | 943 |
| 7 | 995 | 1091 | 1140 | 1163 | 1069 |
| 8 | 1217 | 1265 | 1300 | 1305 | 1217 |
| 9 | 1246 | 1259 | 1283 | 1267 | 1205 |
| 10 | 1210 | 1217 | 1240 | 1214 | 1165 |
| 11 | 1299 | 1320 | 1332 | 1313 | 1246 |
| 12 | 1389 | 1385 | 1392 | 1367 | 1308 |
| 13 | 1378 | 1372 | 1379 | 1343 | 1297 |
| 14 | 1384 | 1379 | 1387 | 1347 | 1308 |
| 15 | 1411 | 1409 | 1414 | 1374 | 1333 |
| 16 | 1436 | 1432 | 1434 | 1391 | 1349 |
| 17 | 1396 | 1391 | 1397 | 1352 | 1317 |
| 18 | 1392 | 1399 | 1407 | 1363 | 1324 |
| 19 | 1486 | 1485 | 1499 | 1462 | 1399 |
| 20 | 1440 | 1439 | 1454 | 1416 | 1374 |
| 21 | 1413 | 1416 | 1430 | 1390 | 1355 |
| 22 | 1457 | 1476 | 1493 | 1461 | 1399 |
| 23 | 1461 | 1470 | 1484 | 1453 | 1403 |
| 24 | 1445 | 1459 | 1471 | 1435 | 1394 |
| 25 | 1480 | 1503 | 1513 | 1483 | 1430 |
| 26 | 1499 | 1516 | 1525 | 1496 | 1448 |
| 27 | 1479 | 1501 | 1504 | 1469 | 1428 |
| 28 | 1519 | 1545 | 1545 | 1511 | 1464 |
| 29 | 1553 | 1577 | 1576 | 1539 | 1494 |
| 30 | 1565 | 1590 | 1589 | 1546 | 1504 |
| 31 | 1532 | 1558 | 1559 | 1513 | 1478 |
| 32 | 1494 | 1519 | 1524 | 1476 | 1444 |
| 33 | 1514 | 1539 | 1549 | 1495 | 1459 |
| 34 | 1586 | 1613 | 1625 | 1568 | 1528 |
| 35 | 1613 | 1635 | 1642 | 1591 | 1549 |
| 36 | 1552 | 1573 | 1581 | 1531 | 1504 |
| 37 | 1578 | 1602 | 1613 | 1567 | 1527 |
| 38 | 1642 | 1664 | 1672 | 1634 | 1579 |
| 39 | 1645 | 1668 | 1670 | 1640 | 1584 |
| 40 | 1515 | 1538 | 1545 | 1514 | 1490 |

OMEGA POINT
LABORATORIES

| Time (min) | Furnace # 4 (°F) | Furnace # 5 (°F) | Furnace # 6 (°F) | Furnace # 7 (°F) | Furnace # 8 (°F) |
|---------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| 41 | 1573 | 1608 | 1626 | 1585 | 1544 |
| 42 | 1634 | 1654 | 1666 | 1634 | 1584 |
| 43 | 1527 | 1552 | 1564 | 1526 | 1503 |
| 44 | 1615 | 1654 | 1679 | 1635 | 1588 |
| 45 | 1622 | 1650 | 1662 | 1628 | 1582 |
| 46 | 1525 | 1554 | 1560 | 1521 | 1501 |
| 47 | 1566 | 1610 | 1627 | 1579 | 1545 |
| 48 | 1645 | 1683 | 1695 | 1657 | 1607 |
| 49 | 1581 | 1617 | 1622 | 1580 | 1545 |
| 50 | 1652 | 1705 | 1713 | 1678 | 1624 |
| 51 | 1706 | 1753 | 1750 | 1728 | 1666 |
| 52 | 1636 | 1687 | 1670 | 1651 | 1595 |
| 53 | 1593 | 1645 | 1633 | 1609 | 1555 |
| 54 | 1660 | 1717 | 1708 | 1694 | 1624 |
| 55 | 1649 | 1700 | 1680 | 1666 | 1603 |
| 56 | 1632 | 1685 | 1668 | 1649 | 1592 |
| 57 | 1690 | 1750 | 1731 | 1723 | 1653 |
| 58 | 1694 | 1742 | 1722 | 1709 | 1649 |
| 59 | 1627 | 1667 | 1653 | 1629 | 1585 |
| 60 | 1711 | 1762 | 1772 | 1743 | 1692 |

| Time (min) | Furnace # 9 (°F) | Furnace # 10 (°F) |
|---------------|---------------------|----------------------|
| 0 | 60 | 60 |
| 1 | 99 | 111 |
| 2 | 681 | 662 |
| 3 | 1266 | 1181 |
| 4 | 1198 | 1086 |
| 5 | 1059 | 955 |
| 6 | 979 | 896 |
| 7 | 1158 | 1065 |
| 8 | 1261 | 1164 |
| 9 | 1205 | 1121 |
| 10 | 1146 | 1076 |
| 11 | 1240 | 1172 |
| 12 | 1264 | 1215 |
| 13 | 1233 | 1198 |
| 14 | 1242 | 1213 |
| 15 | 1270 | 1245 |
| 16 | 1274 | 1261 |
| 17 | 1222 | 1215 |
| 18 | 1239 | 1235 |
| 19 | 1325 | 1318 |
| 20 | 1281 | 1273 |
| 21 | 1264 | 1259 |
| 22 | 1330 | 1317 |
| 23 | 1326 | 1308 |
| 24 | 1314 | 1304 |
| 25 | 1355 | 1341 |
| 26 | 1368 | 1352 |
| 27 | 1337 | 1335 |
| 28 | 1362 | 1370 |
| 29 | 1393 | 1395 |
| 30 | 1398 | 1403 |
| 31 | 1367 | 1378 |
| 32 | 1332 | 1346 |
| 33 | 1348 | 1366 |
| 34 | 1429 | 1435 |
| 35 | 1454 | 1453 |
| 36 | 1399 | 1408 |
| 37 | 1431 | 1438 |
| 38 | 1503 | 1496 |
| 39 | 1510 | 1495 |
| 40 | 1387 | 1393 |

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| Time (min) | Furnace # 9 (°F) | Furnace # 10 (°F) |
|---------------|---------------------|----------------------|
| 41 | 1462 | 1455 |
| 42 | 1509 | 1488 |
| 43 | 1406 | 1407 |
| 44 | 1528 | 1502 |
| 45 | 1513 | 1486 |
| 46 | 1405 | 1410 |
| 47 | 1474 | 1461 |
| 48 | 1558 | 1512 |
| 49 | 1477 | 1457 |
| 50 | 1595 | 1535 |
| 51 | 1642 | 1568 |
| 52 | 1552 | 1501 |
| 53 | 1512 | 1477 |
| 54 | 1604 | 1540 |
| 55 | 1576 | 1518 |
| 56 | 1561 | 1513 |
| 57 | 1636 | 1568 |
| 58 | 1621 | 1558 |
| 59 | 1543 | 1506 |
| 60 | 1666 | 1600 |



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.





ACCEPTABILITY DOCUMENTATION

TEST DECK #5: PROJECT NO. 97258

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.

8/31/94
Date

Mark J. Salley
TVA / TSI

8/31/94
Date

II. ELECTRICAL CABLE INSTALLATION

N/A

Omega Point Laboratories, Inc.

Date

TVA / TSI

Date

III. THERMOCOUPLE INSTALLATION

C Humphrey
Omega Point Laboratories, Inc.

9/13/94
Date

Mark J. Salley
TVA / TSI

9/19/94
Date

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800-966-5253

IV. FIRE PROTECTION BARRIER

Alveda Patton
Omega Point Laboratories, Inc.
W. J. Sullivan
TVA / TSI

9-22-94
Date
9/22/94
Date

V. FINAL PRE-BURN INSPECTION

Alveda Patton
Omega Point Laboratories, Inc.
W. J. Sullivan
TVA / TSI

10/27/94
Date
10/27/94
Date



Report No. 11960-97258
TVA / Thermal Science, Inc.

November 23, 1994
APPENDICES

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

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| 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 |

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| 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 |
| OPL technicians begin construction on the test frame for Test Decks #5 and #6. | 8/1/94 | CH |
| Rich Johnson, TSI is on site to witness construction procedures. | 8/1 | CH |
| Pvt Madden USAFRC 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: | 8/2/94 | CH |
| Ben Loveless Bernard McQueen | | |
| Test frames for Test | 8/3 | CH |

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| 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 (1/2 of pipe covered) on Test Deck #7. | 8/2 | CH |
| Eight pieces of flat stock Thermo-Zag 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-Zag 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 slabs are 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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| 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-tag and held with stainless steel tie wire. This boxed in section had 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-tag preformed conduit. Grovel grade material to complete this Test Deck #7 will be shipped at a later date. Ampacity testing priority will delay the completion of this test deck #7 by TVA installers. | 8/5/94 | CH |
| Side panels of Test Deck #4 is verified by OPL. | 8/5 | CH |
| Concrete is poured into Test Deck #4 and remaining sections of Test Deck #6. | 8/5 | CH |

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| 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 accelerate 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 side panels for Test Deck #6 are welded together by OPL 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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| 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 Salley TVA arrives at Omega Point to manage Thermo Tag installers. | 8/22 | CH |
| TVA insulators arrive at OPL to complete Test # 7 and start compacity test insulation. The following installers are on site: | 8/22 | CH |
| Arnold Wright | | |
| Ray Colby Bernard McQueen | | |
| John H. Stewart, Sr. | | |
| Ben Loveless | | |
| Danielle Oudinot USNRC arrived at OPL to witness insulation procedures on 8/22/94. | 8/23 | CH |

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| Fabricated pull box for Test Deck #6 is received by OPL QA/QC | 8/23/94 | CH |
| Twelve buckets of NEI Thermo-tag 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. 93-14049 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. | 8/23 | CH |
| Thermo-tag trowel grade material in puffy form is added to the inside corners of the Thermo-tag panels and conduit sections on Test Deck #7. | 8/24 | CH |
| Upgrade is started on | 8/25 | CH |

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| 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 Thermo-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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| 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 squares of stress skin and fastened with staples. | 8/26 | CH |
| The assembly of conduits for test deck #5 is started by OPL technicians. | 8/26 | CH |
| Test deck #6 is stood up in the vertical position and leg supports are welded in place. | 8/26 | CH |
| OPL technicians install the penetration seals in test deck #6. | 8/26 | CH |
| Test deck #6 is completed by OPL and is turned over to TVA installers. | 8/26 | CH |
| TVA installers continue to apply the trowel grade Thermo-tag over | 8/27 | CH |
| | 8/27 | CH |

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| <i>the stress skin on test deck #7.</i> | <i>8/27/94</i> | <i>CH</i> |
| <i>The sections of ^{two} 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.</i> | <i>8/27</i> | <i>CH</i> |
| <i>welding continues on tray supports for test deck #4.</i> | <i>8/27</i> | <i>CH</i> |
| <i>Boxed conduit section of test deck #7 is polished smooth.</i> | <i>8/27</i> | <i>CH</i> |
| <i>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.</i> | <i>8/29/94</i> | <i>CH</i> |

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| OPL technicians begin thermo couple layout for deck #5. | 8/29/94 | CH |
| Thermo tag wrap of the group of (8) 4" conduits on test deck #6 is completed. | 8/30 | CH |
| The first layer of Thermo-tag preformed conduit sections are installed on both 3/4" conduits on test deck #7. | 8/30 | CH |
| Applied the second layer of Thermo-tag 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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| that the thermocouples be placed at the inside surface of the Thermo-tag 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 PA/CA! | 9/8/94 | CH |
| Type B base plates are installed on Test Deck #6 enclosure of the four 3" conduits. Ope score and fold method is used with Dg 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 wrap of the four 1" conduits using Type A base plates and staggered butt joints. | 9/10 | CH |
| | 9/10 | CH |
| Started the junction | 9/10 | CH |

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| 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-Faq preformed conduit around the JB conduits. | 9/12/94 | CH |
| Added skin 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 |
| OPC technicians begin thermocouple layout for Test Deck #4. | 9/14 | CH |
| Thermocouples are applied to conduits on Test Deck #4. | 9/14 | CH |
| Continued to install stress skin on assembly Test Deck #6. Skin coat is applied over the stress skin. | 9/14/94 | CH |

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| Finish coat of the trowel grade material is applied over the 1" and 4" conduit enclosures on Test Deck #6. | 9/15/94 | CH |
| 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 | CH |
| The 3" and 2" conduit enclosures are covered with the Thermo-Lag panel using the score and fold method. The wires were attached to the conduit straps and pulled thru holes drilled in the panels. | 9/16 | CH |
| | 9/15 | CH |
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| <p>To attach boxes to deck. Started 7 conduit enclosure using an individual piece method. Support pieces of Thermo-Lag panel were installed between conduits and some scrap pieces on top of LB's to provide an even top surface before the Thermo-Lag panels were applied. Ties wires to conduit straps thru panels keeps the boxes held tightly.</p> | <p>9/16/94</p> | <p>CH</p> |
| <p>Installed side on the 7 conduit enclosure on deck #5. Added stress skin and the trowel grade skin coat to the junction box.</p> | <p>9/16 9/17</p> | <p>CH CH</p> |
| <p>Completed skin coat on junction box and applied stress skin and skin coat of trowel grade material on the 7 conduit enclosure on deck #5.</p> | <p>9/17 9/19/94</p> | <p>CH CH</p> |

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| 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-Zag 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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| 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 OPC 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 Starnes. | 9/27 | CH |
| Installation of the Thermo Tag panel begins on the large boxed assembly. | 9/27 | 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.

Page 18 of ___

| ITEM | DATE | INITIALS |
|---|---------|----------|
| of 8 conduits on test deck #4. Sections of the Shermos-Lag panel are cut to fit around the conduit with the seams butting at the vertical centerline. Small pieces of Shermos-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. There are two treatments of the butt joints done. One uses a strip of backing board on the inside with stress skin and bolts tying it together with trowel grade material. | 9/27/94 | CH |
| | 9/28 | CH |

EVENT LOG

TVA/TSI

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 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

Page 19 of ___

| 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 head with stress skin and trowel grade material. Staples attach the stress skin to the panels. | 9/28/94 | CH |
| Began Thermo-tag cover of cable trays and the structural steel supports of deck #4. | 9/28 9/29 | CH CH |
| Continued application of Thermo-tag on cable trays on deck #4. On the (5) cable tray sect assembly, the two bottom trays are protected with Thermo-tag. | 9/30 | CH |
| Application of Thermo-tag continues on the cable tray support assembly in test #14. Baseplates are placed and held with anchor | 10/1 | CH |
| | 10/1 | CH |

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 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

Page 20 of _____

| ITEM | DATE | INITIALS |
|---|---------|----------|
| bolts using 1/4" washers under the nuts. Flouel grade Thermo-tag is applied over the panel tie wires on the 5' tray assembly. | 10/1/94 | CH |
| Completed the (5) cable 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-tag 330-1 panel. | 10/3 | CH |
| The top and bottom cable tray sections are bare. A piece of 3/8" Thermo-tag 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-tag coverage on the (3) cable tray assembly of deck #4. | 10/4 | CH |
| | 10/4 | CH |

EVENT LOG

TVA/TSI

Client #11960

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 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum. & (1) 3/4" steel conduit.

Page 21 of

| ITEM | DATE | INITIALS |
|--|---------|----------|
| Applied the trowel grade material to the (3) cable tray assembly on deck #4 and completed the baseplates. These were constructed in the same manner as the baseplates on the (5) tray assembly. | 10/4/94 | CH |
| A skim coat of the Thermo-tag 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 Thermo-tag 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 1/4" washers on the bolts at the seam. | 10/5 | CH |

EVENT LOG

TVA/TSI

Client #11960

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 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

Page 22 of _____

| ITEM | DATE | INITIALS |
|--|---------|----------|
| Completed butt joint seam on test deck #4 1" conduit box with 3" stress skin overlap, stapled and skimmed with travel grade material. | 10/6/94 | CH |
| Installed two layers of the preformed conduit sections over the exposed 1" metal conduits. These layers are pre-buttered and the seams are staggered 90° and fastened with stainless steel tie wire 6" oc. | 10/6 | CH |
| Continued with the stress skin application to the 1" conduit box on test deck #4. The seams are overlapped 3 inches and stitched together every 6". | 10/7 | 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 | 10/8 | CH |
| | 10/8/94 | CH |

EVENT LOG

TVA/TSI

Client #11960

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 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

Page 23 of ___

| ITEM | DATE | INITIALS |
|--|---------|----------|
| pieces prebattered and held with tie wire. | 10/8/98 | 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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Page 24 of ___

| ITEM | DATE | INITIALS |
|---|----------|----------|
| More spins 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: | 10/18 | CH |
| Reg. Priest, Onea Point Labs | 10/18 | CH |
| Kerry Hitchcock " " " | | |
| Herb Stansberry " " " | | |
| Connie Humphrey " " " | | |
| Cleda Patton " " " | | |
| Laudencio Castanon " " " | | |
| Richard Beasley " " " | | |
| JJ Pierce TVA | 10/18 | CH |

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TVA/TSI

Client #11960

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 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum. & (1) 3/4" steel conduit.

Page 25 of 11

| ITEM | DATE | INITIALS |
|--|-------------------------|----------|
| Mark Saller TVA | 10/18/94 | CH |
| Rich Woods " | | |
| Brian Lent " | | |
| Rich Johnson TSI | | |
| Tim Hill " | | |
| Jet Singh USNRC | | |
| Jas Bittel Hughes Assoc. | | |
| The test of Deck #7 begins at 9:43 and is completed in one hour. The hot stream test follows using OPL pressure gage #92 STE003, 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 hot stream test the test article was torn down to inspect the condition of the Thermo-Fog material. | 10/18 | CH |
| Final layer of the trowel grade skins coat is applied to test Deck #4. The 30 day cure time begins. | 10/18 10/19 10/19 | CH |

EVENT LOG

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 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

Page 26 of ___

| ITEM | DATE | INITIALS |
|---|-------|----------|
| Test deck #6 is placed in front of the furnace after final inspection by OPL technician. | 10/18 | 8 |
| 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%. On site to witness the test of deck #6 are: | 10/19 | 8 |
| Deq Priest Omega Point Labs | 10/19 | 8 |
| Kerry Hitchcock " " " | | |
| Herb Stansberry " " " | | |
| Cleda Patton " " " | | |
| Dingyi Huang " " " | | |
| Laudencio Castanon " " " | | |
| Richard Beasley " " " | | |
| JJ Pierce TVA | | |
| Mark Salley " | | |
| Rick Woody " | | |
| Brian Gent " | | |
| Rich Lohman TSI | | |
| Jim Hill " | | |
| Jit Singh USNRC | | |

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 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

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| ITEM | DATE | INITIALS |
|--|-------|----------|
| The test of Deck #6 begins at 12:18 pm and is completed in one hour. Hose stream test follows using OPI pressure gauge # 921E003, 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 | 8 |
| Test Deck #6 was torn down to inspect the condition of the Thermo-Lag material. | 10/20 | 8 |
| Test Deck #5 is prepared for the first 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. | 10/24 | 8 |
| | 10/25 | 8 |
| | 10/26 | 8 |
| Test Deck #5 is placed in front | | |

EVENT LOG

TVA/TSI

Client #11960

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- 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

Page 28 of _____

| ITEM | DATE | INITIALS |
|--|-------|----------|
| of the furnace after final inspection by OPL technicians. | 10/26 | SP |
| Herb Stansberry does the final pre-burn inspection | 10/27 | SP |
| checklist as 434 thermocouples are attached to the OPL data acquisition equipment. The temperature at the start of the test for deck #5 is 10° and the relative humidity is 76%. On site to witness the test of deck #5 are: | 10/27 | SP |
| Deq Priest Omega Point Labs | | |
| Kerry Hitchcock " " " | | |
| Cleda Patton " " " | | |
| Herb Stansberry " " " | | |
| Laudencio Castanon " " " | | |
| Richard Beasley " " " | | |
| Mark Sallee TVA | | |
| Rick Woody " " | | |
| Brian Gent " " | | |
| Rashid Abbas " " | | |
| Ben Evans TSI | | |
| Tim Hill " " | | |
| Ed Donnell USNRC | | |
| Bob McDaniel Florida Power & Light | | |

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- 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum.. & (1) 3/4" steel conduit.

Page 29 of _____

| ITEM | DATE | INITIALS |
|---|--------------------------------|-------------------------|
| <p>The test deck #5 begins at 9:01am and is completed in one hour. Base stream test follows using OPL pressure gage # 92LE003, calibration due 1/20/95. 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 allowed to cool and tear down was conducted in the afternoon to inspect the condition of the Thermo-Tag.</p> | <p>10/27</p> | <p>ST</p> |
| <p>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.</p> | <p>10/27 11/9 11/9</p> | <p>ST CH CH</p> |

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 97260 #7 Steel deck with (7) 4" steel conduits. (1) 3/4" alum. & (1) 3/4" steel conduit.

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| ITEM | DATE | INITIALS |
|--|----------|----------|
| The penetration seals are completed by OPL technicians on Test Deck #4. | 11/16/94 | CH |
| This test article is inspected by OPL Quality Assurance and accepted as ready to test by TVA. Test Deck #4 is placed on the test furnace. | 11/16 | CH |
| Pretest checklist is performed by Herb Stanbury 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: | 11/17 | CH |
| Doc Priest Omega Point Labs | " | " |
| Connie Humphrey | " | " |
| Oletha Patton | " | " |
| Harry Hitchcock | " | " |
| Richard Basley | " | " |
| Herb Stanbury | 11/17 | CH |

Report No. 11960-97258
TVA / Thermal Science, Inc.

November 23, 1994
APPENDICES

Installation Details



ATTACHMENT 1

DATA SHEET

RACEWAY ID 3-SIDED ENCLOSURE WP/VR NO. TEST DECK 5
 LOT/CONTRACT NO. TROWEL 94-08008 EXPIRATION DATE FEB 95
 CRAFTSMAN J.P. Pierce DATE 9/15/94
 QC INSPECTOR Alveda Patton DATE 9-15-94
 TYPICAL DRAWING NO. _____

MONITORING POINTS

| | FIRST LAYER | SECOND LAYER |
|--------------------|---------------------------|--------------|
| PASTER SPACING | <u>within 18" spacing</u> | |
| SEAMS OFFSET | <u>NA</u> | |
| JOINTS OFFSET | <u>NA</u> | |
| 18" RULE | <u>N/A</u> | |
| CIRCUMFERENCE | <u>N/A</u> | |
| SURFACE APPEARANCE | <u>ok</u> | |
| MESH OVERLAPS | <u>N/A</u> | |

REMARKS: Attached anchor bolts for Thermo-Lag panels on large JB. 5/8" Panel Lot # 94-07014 (max 3/4", min 1/2")
Installed panels on JB. Left 2" of stress skin on each piece to overlap. 5'x3' piece installed first, 5'x2' side pieces next and 3'x2' end pieces last. JB ready for stress skin.

ATTACHMENT 1

DATA SHEET

RACEWAY ID 3-Sided Enclosures WP/WR NO. TEST DECK 5
 LOT/CONTRACT NO. TROWEL 94-08008 EXPIRATION DATE FEB 95
 CRAFTSMAN J.P. Pierce DATE 9/16/94
 QC INSPECTOR Cleda Patton DATE 9-16-94
 TYPICAL DRAWING NO. _____

MONITORING POINTS

| | FIRST LAYER | SECOND LAYER |
|--------------------|--------------------|--------------|
| PASTERER SPACING | <u>See Remarks</u> | _____ |
| SEAMS OFFSET | <u>NA</u> | _____ |
| JOINTS OFFSET | <u>NA</u> | _____ |
| 18" RULE | <u>N/A</u> | _____ |
| CIRCUMFERENCE | <u>N/A</u> | _____ |
| SURFACE APPEARANCE | <u>ok</u> | _____ |
| MESH OVERLAPS | _____ | _____ |

REMARKS: 3-Conduit Enclosure - Panel Lot # 94-07014
(max 3/4" min 1/2"). Use score & fold method.
2-conduit Enclosure - Panel Lot # 94-07014 (max 3/4", min 1/2")
Use score & fold method. See attached for additional
details. Tie wires attached to conduit straps and pulled
thru small holes drilled in Thermo-Lag. Tie wires
installed as needed to obtain tight fit.

SUBJECT 3-Sided Enclosures

PROJECT _____

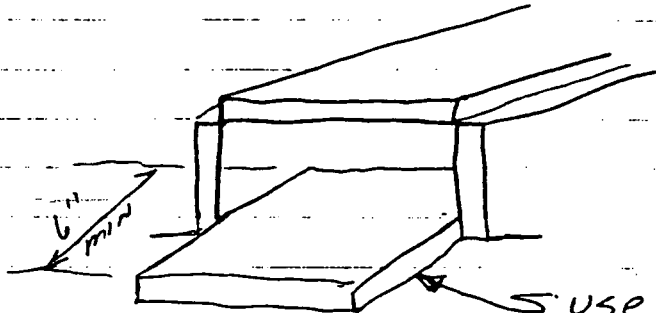
COMPUTED BY J.P. Pince

DATE 9/16/94

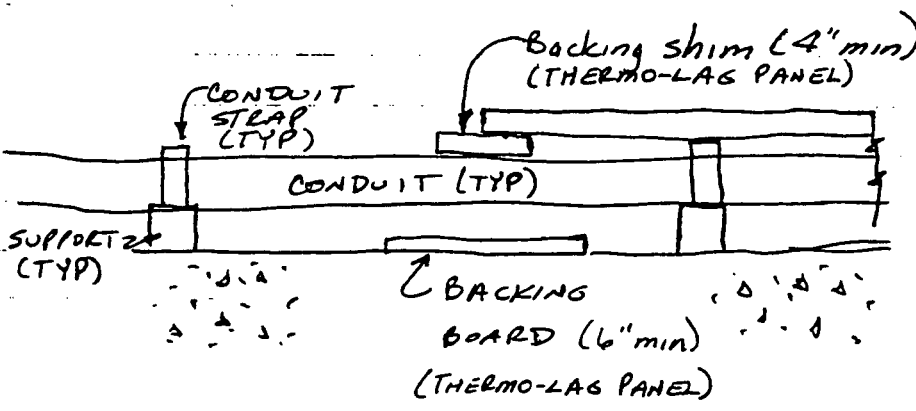
CHECKED BY W. Patton

DATE 9-16-94

TWO-CONDUIT ENCLOSURE



when
 use backing board at butt
 joint is between conduit supports.
 Backing board shall be a minimum
 of 6" long.



ATTACHMENT 1

DATA SHEET

RACEWAY ID 3-Sided Enclosures WP/VR NO. TEST DECK 5

LOT/CONTRACT NO. TROWEL 94-08008 EXPIRATION DATE FEB 95

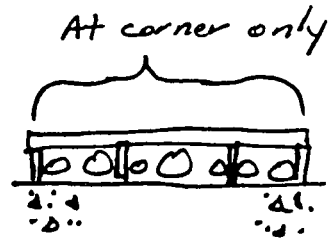
CRAFTSMAN J.P. Pierce DATE 9/16/94

QC INSPECTOR Patton DATE 9-16-94

TYPICAL DRAWING NO. _____

MONITORING POINTS

| | FIRST LAYER | SECOND LAYER |
|--------------------|--------------------|--------------|
| PASTERER SPACING | <u>See Remarks</u> | _____ |
| SEAMS OFFSET | <u>NA</u> | _____ |
| JOINTS OFFSET | <u>NA</u> | _____ |
| 18" RULE | <u>N/A</u> | _____ |
| CIRCUMFERENCE | <u>N/A</u> | _____ |
| SURFACE APPEARANCE | <u>OK</u> | _____ |
| MESH OVERLAPS | _____ | _____ |



REMARKS: Started 7 conduit enclosure. Put support (5/8" Thermo-Lag) as shown to level top of enclosure.

Used scrap pieces of Thermo-Lag on top of LBs to even up the surface. Panel Lot # 94-07014 (3/4" - 1/2") & 94-02012 (3/4" - 1/2"). Use individual piece method.

Tie wires attached to conduit straps and pulled thru small holes drilled in Thermo-Lag. Tie wires installed as needed to accomplish tight fit.

ATTACHMENT 1

DATA SHEET

RACEWAY ID 3-SIDED ENCLOSURES WP/WR NO. TEST DECK 5
 LOT/CONTRACT NO. TROWEL 94-08008 EXPIRATION DATE FEB 95
 CRAFTSMAN J.P. Pierce DATE 9/17/94
 QC INSPECTOR C. Humphrey DATE 9/17/94
 TYPICAL DRAWING NO. _____

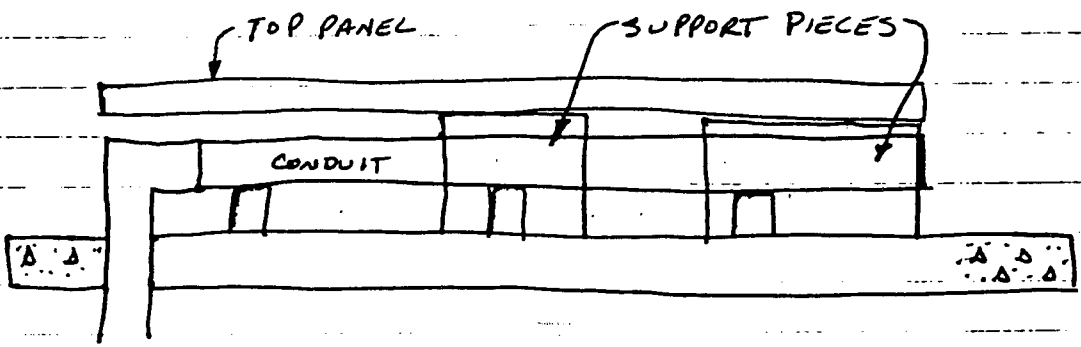
MONITORING POINTS

| | FIRST LAYER | SECOND LAYER |
|--------------------|------------------|--------------|
| PASTER SPACING | <u>As needed</u> | _____ |
| SEAMS OFFSET | <u>NA</u> | _____ |
| JOINTS OFFSET | <u>NA</u> | _____ |
| 18" RULE | <u>N/A</u> | _____ |
| CIRCUMFERENCE | <u>N/A</u> | _____ |
| SURFACE APPEARANCE | <u>ok</u> | _____ |
| MESH OVERLAPS | <u>ok</u> | _____ |

REMARKS: 7 conduit Enclosure - Installed sides & end pieces.
See sketch on page 2 of 2. Used nails to hold
the sides and ends to the top piece. The nails will be
removed after the trowel grade dries. Packed holes (for
tie wires) with trowel putty. Installed stress skin,
and skim coat on JB.

SUBJECT 3-SIDED ENCLOSURE - 7 CONDUIT ASSEMBLY PROJECT TVA/TSE

COMPLETED BY J. Pierce 9/17/94 DATE
CHECKED BY C. Humphrey 9/19/94 DATE



ATTACHMENT 1

DATA SHEET

RACEWAY ID 3-SIDED ENCLOSURES WP/NR NO. TEST DECK 5
 LOT/CONTRACT NO. TRAVEL 99-08008 EXPIRATION DATE FEB 95
 CRAFTSMAN J.P. Pierce DATE 9/19/94
 QC INSPECTOR Patton DATE 9-19-94
 TYPICAL DRAWING NO. _____

MONITORING POINTS

| | FIRST LAYER | SECOND LAYER |
|--------------------|-------------|--------------|
| PASTER SPACING | _____ | _____ |
| SEAMS OFFSET | <u>NA</u> | _____ |
| JOINTS OFFSET | <u>NA</u> | _____ |
| 18" RULE | _____ | _____ |
| CIRCUMFERENCE | _____ | _____ |
| SURFACE APPEARANCE | _____ | _____ |
| MESH OVERLAPS | _____ | _____ |

REMARKS: Removed nails from 7 conduit enclosure. Applied skim coat to Large JB. Filled in corners/edges of 2 & 3 conduit enclosures (the score & fold assemblies) with putty. Applied skim coat and stress skin to 7 conduit enclosure.

ATTACHMENT 1

DATA SHEET

RACEWAY ID 3-SIDED ENCLOSURE WP/NR NO. TEST DECK 5

LOT/CONTRACT NO. TROWEL 99-08008 EXPIRATION DATE FEB 95

CRAFTSMAN J. Pierce DATE 9/20/94

QC INSPECTOR C. Humphrey DATE 9/20/94

TYPICAL DRAWING NO. _____

MONITORING POINTS

| | FIRST LAYER | SECOND LAYER |
|--------------------|-------------|--------------|
| PASTERER SPACING | _____ | _____ |
| SEAMS OFFSET | <u>NA</u> | _____ |
| JOINTS OFFSET | <u>NA</u> | _____ |
| 18" RULE | _____ | _____ |
| CIRCUMFERENCE | _____ | _____ |
| SURFACE APPEARANCE | _____ | _____ |
| MESH OVERLAPS | _____ | _____ |

9/20/94

REMARKS: Polished JB with Scotch-Brite pads & water.
Applied skim coat to 7-conduit enclosure.

Installed Edge (3") frame on Large JB.

AUG-15-1994 09:27 FROM TUA WBN NE TO 12058374411537370478 P.02

G-98 REV. 0 SRN-98-01

Sheet 1 of 2

ATTACHMENT 1

DATA SHEET

RACEWAY ID Deck #5 WP/WR NO. 97258
 LOT/CONTRACT NO. Trowel 94-03008 EXPIRATION DATE Feb 95
 CRAFTSMAN [Signature] DATE 9/21/94
 QC INSPECTOR [Signature] DATE 9/21/94
 TYPICAL DRAWING NO. _____

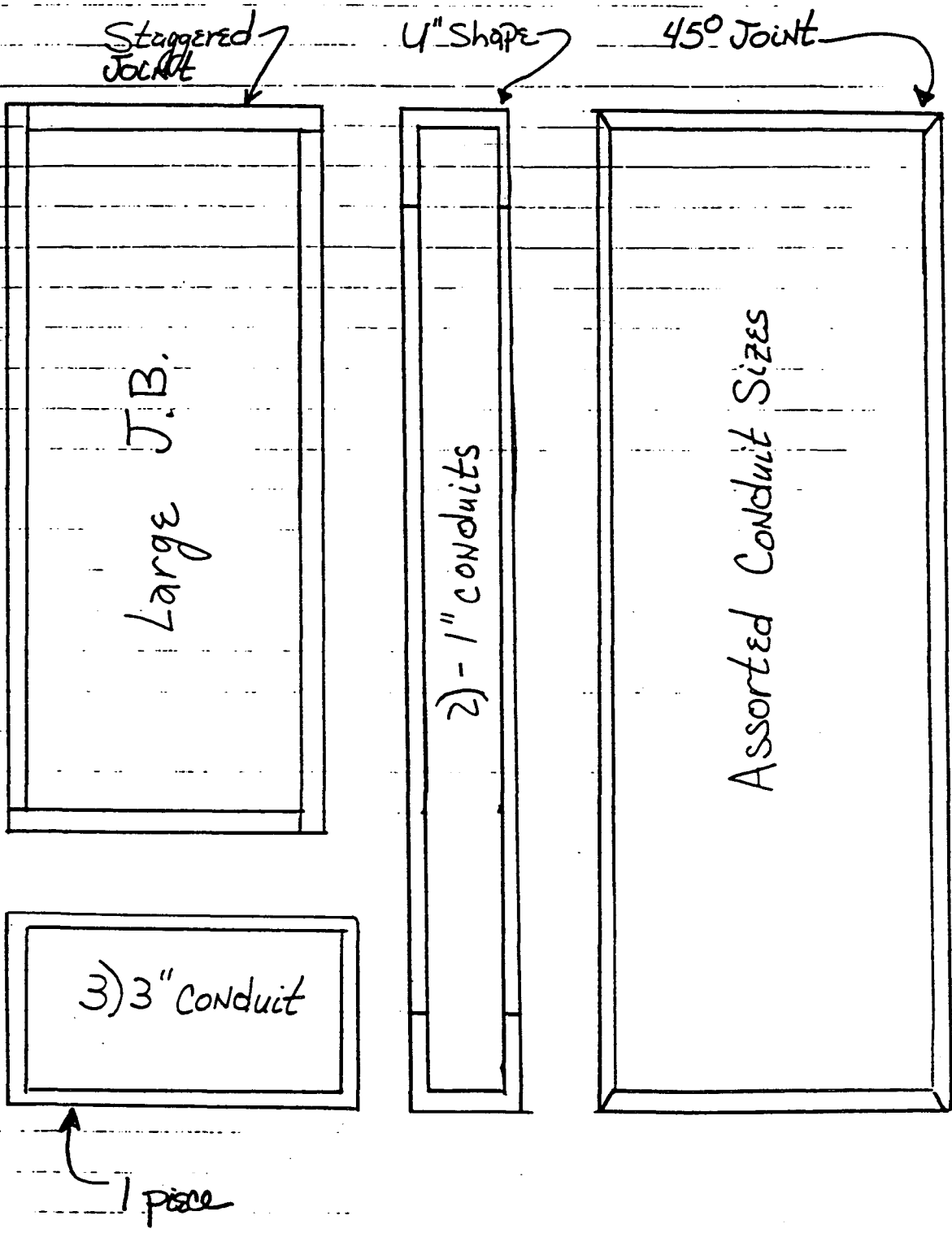
MONITORING POINTS

| | FIRST LAYER | SECOND LAYER |
|--------------------|-----------------------|--------------|
| FASTENER SPACING | _____ | _____ |
| SEAMS OFFSET | <u>NA</u> | _____ |
| JOINTS OFFSET | <u>NA</u> | _____ |
| 18" RULE | <u>NA</u> | _____ |
| CIRCUMFERENCE | <u>NA</u> | _____ |
| SURFACE APPEARANCE | <u>- IN PROCESS -</u> | _____ |
| MESH OVERLAPS | <u>YES</u> | _____ |

REMARKS: - Added Edge frames per sheet 2.
- Finished adding external stress skin
& Skim coat.

SUBJECT Deck #5 PROJECT 97258
 COMPUTED BY Walter Salley DATE 9/21/94 CHECKED BY C Humphrey DATE 9/21/94

Frame Details



AUG-15-1994 09:27 FROM TUA WBN NE TO 12058374411537370478 P.02

G-98 REV. 0 SRX-98-01

Sheet 1 of 1

ATTACHMENT 1

DATA SHEET

RACEWAY ID 97258 WP/WR NO. Deck #5

LOT/CONTRACT NO. _____ EXPIRATION DATE _____

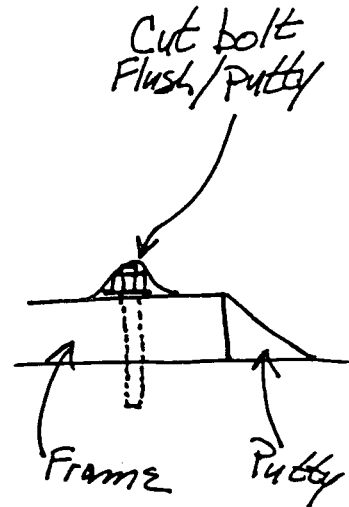
CRAFTSMAN [Signature] DATE 9/22/94

QC INSPECTOR [Signature] DATE 9/22/94

TYPICAL DRAWING NO. _____

MONITORING POINTS

| | FIRST LAYER | SECOND LAYER |
|--------------------|-----------------|--------------|
| FASTENER SPACING | <u>Complete</u> | _____ |
| SEAMS OFFSET | <u>NA</u> | _____ |
| JOINTS OFFSET | <u>NA</u> | _____ |
| 18" RULE | <u>NA</u> | _____ |
| CIRCUMFERENCE | <u>NA</u> | _____ |
| SURFACE APPEARANCE | <u>Complete</u> | _____ |
| MESH OVERLAPS | <u>Complete</u> | _____ |



REMARKS: - Finished Assembly -

- Cut bolts flush & putty over top
- 45° putty from edge of frame to concrete.

This deck is complete!

Report No. 11960-97258
TVA / Thermal Science, Inc.

November 23, 1994
APPENDICES

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: C. Patton

| ITEM DESCRIPTION | P.O. NO. | QUANTITY | | | I.D. NO. | COMD MATL Y/N | CERT. RECD Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|------------------|----------|----------|-------|------|----------|---------------------|----------------------|------------------------|------------|------------|------|--------|---------|
| | | Order | Rec'd | B.O. | | | | | | Accept | Hold | Reject | |
| TC Plug | 1140Q | 200 | 200 | 0 | T-1 Plug | Y | Y | Good | None | X | | | |
| TC Jack | 1140Q | 200 | 200 | 0 | T-2 Jack | Y | Y | Good | None | X | | | |
| | | | | | | | | | | | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc. 532

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:

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 |
|------------|---------------|----------------|---------------|-------|
| 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 | | |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u>C Patton</u> Date <u>8-15-94</u></p> | | | | |

Special Instructions

Shipment Must Include Certificate of Conformance on Materials.

Ordered By: Cleda Patton

Project #: TSI/TVA **AMACITY**

| |
|--------------------------|
| 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:

| | | | | | | | | |
|--------------|--------------------|-----------------|--------|-----|------|---------|----------|-----------|
| DATE SHIPPED | BILL OF LADING NO. | NO. OF PACKAGES | WEIGHT | PPD | COL. | PARTIAL | COMPLETE | PACKED BY |
| 8-15-94 | 4PS | 1 | 9# | X | | | X | GP |



CERTIFICATE OF CONFORMANCE

TO Omega Point Labs DATE 8-15-94
16015 Shady Falls Rd. CUSTOMER PO# 1140Q
Elmendorf, TX 78112 JOB # TC-6229

| PMC P/N | QUANTITY | CUSTOMER P/N | SPEC |
|-------------------|------------|--------------|---------|
| <u>T-1 (Plug)</u> | <u>100</u> | <u></u> | <u></u> |
| <u>T-2 (Jack)</u> | <u>100</u> | <u></u> | <u></u> |
| <u></u> | <u></u> | <u></u> | <u></u> |

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.

Shasho Zickler 8/15/94
 Quality Assurance Inspector

Manny Moore
 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 11960-91185-87; 91257-260
 RECEIVED FROM PMC
 PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1417-11960
 DATE RECEIVED 8-22-94
 DATE INSPECTED 8-22-94
 INSPECTED BY: CBatten

| ITEM DESCRIPTION | P.O. NO. | QUANTITY | | | I.D. NO. | COMD MATL Y/N | CERT. RECD Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|------------------|----------|----------|-------|------|------------|---------------------|----------------------|------------------------|------------|------------|------|--------|--|
| | | Order | Rec'd | B.O. | | | | | | Accept | Hold | Reject | |
| TC Wire | 11230 | 40K | 37K | 0 | KK-TA/TA-A | Y | Y | GOOD | None | X | | | LOT #'s: 105966-972; 106460; 106837-839 Order is considered complete within 10% of original amount CFI |
| | | | | | | | | | | | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc. 536

16015 Shady Falls Road, Elmhendorf, TX 78112-9784
 (210) 635-8100 FAX: (210) 635-8101



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:

Ship To:

| | |
|---|--|
| Accounts Payable Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmhendorf, TX 78112-9784 | Constance A. Humphrey Omega Point Laboratories, Inc. 16015 Shady Falls Road Elmhendorf, 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-TATA-24 | 40,000 | | |
| 2. | Calibration data | 1 | | |
| <p>“See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements.” QA Approval <u>C. Humphrey</u> Date <u>6/28/94</u></p> | | | | |

Special Instructions

Ordered By: Constance A. Humphrey

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

Project #: ~~GPL~~ Equipment CK
TVA/TSI
 Proj # 97185

| |
|--------------------|
| Total Shipping Tax |
| Invoice Total |

Rec'd 8/22/94 12,550ft
 8/23/94 6,175ft.
 Rec'd 9/8/94 5,000ft
 9/20/94 13,856ft

**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
COMMERCIAL GRADE DEDICATION

PURCHASING SPEC. NO: MS-1123Q-97185

PRODUCT: Thermocouple Wire

MANUFACTURER: PMC Corporation
57 Harvey Road
Londonderry, NH 03053

SUPPLIER: _____
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:

VERIFIED BY:

[Signature]
Project Manager
Date 6/28/94

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:

VERIFIED BY:

Harold W. Standaert II
 PROJECT MANAGER
 DATE 6/28/94

C. Humphrey
 Q/A MANAGER
 DATE 6/28/94

PRODUCT: KK-TA/TA-24 Thermocouple Wire

SPEC NO: MS-1123Q-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 insulation 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 characteristics, 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.

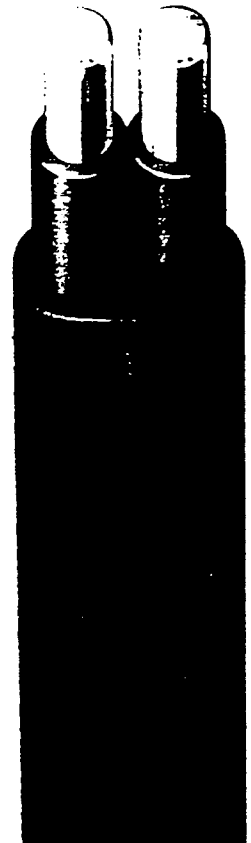
Calibrated conductors for high system accuracy



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

*Registered trademark of E.I. DuPont Inc.

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™ (-) | NI | 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 | GAUGE SIZE | NOMINAL INSULATION WALL (INCHES) | NOMINAL JACKET WALL (INCHES) | NOMINAL DIAMETER (INCHES) | APPROX. SHIP. WEIGHT LBS. PER 1000 FT |
|--------------------------------|---|---|------------|----------------------------------|------------------------------|---------------------------|---------------------------------------|
| SPECIFIC GRAVITY | 2.15 | 2.15 | 20 | .008 | .010 | .068 X .116 | 12 |
| DUROMETER HARDNESS | 55 | 55 | | | | | |
| TENSILE STRENGTH p.s.i. (min.) | 4000 p.s.i. | 4000 p.s.i. | 24 | .008 | .010 | .056 X .092 | 7 |
| ELONGATION % (min.) | 300% | 300% | | | | | |
| MINIMUM BEND RADIUS | 5 X O.D. | 10 X O.D. | 30 | .004 | .006 | .030 X .048 | 2 |
| 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 | | | | | |

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.

REELS, SPOOLS & COILS > All shipments, unless specified otherwise by PMC, are made on non-returnable reels, spools or coils in one continuous length.

SHORTAGES & 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.

The material contained in this document is presented in good faith and believed to be reliable and accurate. However, because testing conditions may vary and material quality or information that may be provided in whole or part by others may be beyond our control, no warranty, expressed or implied, is given and PMC Corporation can assume no liability for results obtained or damages incurred through the application of the data tests presented. NOTE: PMC reserves the right to substitute an equal product on all registered trademark items.



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

SPECIALIZING IN WIRE, CABLES & TEMPERATURE

SOLD TO

SHIP TO

OMEGA POINT LABS. INC.
16015 SHADY FALLS ROAD
ELMENDORF, TX 78113

OMEGA POINT LABS. INC.
16015 SHADY FALLS ROAD
ELMENDORF, TX 78113

78258

| DATE RECEIVED | CUSTOMER NO. | E | O | T | PMC JOB NO. |
|---------------|--------------|----|----|----|-------------|
| 7/27/94 | OMEG001 | 50 | 50 | 50 | 18750 |

| CUSTOMER P.O. NUMBER | REQUESTED SHIP | SCHEDULED SHIP | CODE |
|----------------------|-----------------|----------------|---|
| 11030 | | | 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 |
|------|------------------|---|------------------|
| | 20000.00 | KK-TA/TQ-24 REF. MS11230-97185 SCHED. SHIP 8/5/94 | 18,705' |
| 2 | 20000.00 | KK-TA/TQ-24 REF. MS11230-97185 SCHED. SHIP 8/31/94 | |
| 3 | 1.00 | CALIBRATION AT 200, 400, 600, 800 AND 1000°F (70) 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.

ADDITIONAL INSTRUCTIONS:

UPS
SDP

| 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.
 15015 SHADY FALLS ROAD
 ELMENDORF, TX 78112

SHIP TO

OMEGA POINT LABS. INC.
 15015 SHADY FALLS ROAD
 ELMENDORF, TX 78112

78238

| DATE RECEIVED | CUSTOMER NO. | E | O | T | PMC JOB NO. |
|---------------|--------------|----|----|----|-------------|
| 7/27/94 | OMEG001 | 60 | 60 | 60 | 10704 |

| CUSTOMER P.O. NUMBER | REQUESTED SHIP | SCHEDULED SHIP | CODE |
|----------------------|-----------------|----------------|---|
| 11200 | | | 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 | |

| QUANTITY ORDERED | PART NUMBER / DESCRIPTION | QUANTITY SHIPPED |
|------------------|---|------------------|
| 20000.00 | KK-TA, TA-34 REF. NO. 1390-27125 ORDER, SHIP 3/31/94 | 5000 |
| 1.00 | CALIBRATION KIT 200, 400, 500, 300, AND 1000 FT I/O 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 BLUE

| DATE SHIPPED | BILL OF LADING NO. | NO. OF PACKAGES | WEIGHT | PPD | COL. | PARTIAL | COMPLETE | PACKED BY |
|--------------|--------------------|-----------------|--------|-----|------|---------|----------|-----------|
| F-21-94 | | 1 | 34 | | | | | |



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 78112

78238

| DATE RECEIVED | CUSTOMER NO. | E | O | T | PMC JOB NO. |
|---------------|--------------|----|----|----|-------------|
| 7/27/94 | GMEB001 | 50 | 50 | 50 | 13774 |

| CUSTOMER P.O. NUMBER | REQUESTED SHIP | SCHEDULED SHIP | CODE | |
|----------------------|-----------------|----------------|-------------|----------|
| 110381 | | | 1. MFT | 5 METERS |
| SHIP VIA | F.O.B. | TERMS | 2. CFT | 6 FEET |
| UPS BLUE | LONDONDERRY, NH | NET 15 | 3. POUNDS | 7 LOT |
| | | | 4. EACH NET | 8 OTHER |

| ITEM | QUANTITY ORDERED | PART NUMBER / DESCRIPTION | QUANTITY SHIPPED |
|------|------------------|---|------------------|
| | 15000.00 | KK-TA TA-24 REF. MS11830-97135 | 13856 |
| 3 | 1.00 | CALIBRATION AT 200, 400, 600, 800 AND 1000°F 1% 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.

ADDITIONAL INSTRUCTIONS:

UPS BLUE

| DATE SHIPPED | BILL OF LADING NO. | NO. OF PACKAGES | WEIGHT | PPD | COL. | PARTIAL | COMPLETE | PACKED BY |
|--------------|--------------------|-----------------|--------|-------------------------------------|------|---------|-------------------------------------|--------------------|
| 7/16/94 | — | 2 | 93 | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> | <i>[Signature]</i> |

PACKING SLIP



CERTIFICATE OF CONFORMANCE

TO OMEGA POINT LABS INC. DATE 8/15/94
16015 SHADY FALLS RD. CUSTOMER PO# 11230
EIMENDORF, TX 78112 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 | IN ERROR | IN ERROR | IN ERROR | IN ERROR |
|------------------|----------|----------|----------|----------|----------|
| | 200°F | 400°F | 600°F | 800°F | 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.

Thomas M. Coffey

 Quality Assurance Inspector

Raymond J. ...

 Quality Assurance Manager

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



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 |
|--------------------|--------------|--------------|-----------------------|
| <u>KK-TA/TA-24</u> | <u>5000'</u> | <u></u> | <u>MS-1123Q-97185</u> |

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

Thomas M. Coffey

 Quality Assurance Manager

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



CERTIFICATE OF CONFORMANCE

TO OMEGA POINT LABS DATE 9/15/94
16015 SHADY FALLS ROAD CUSTOMER PO# 11230
ELMENDORF, TX 78112 JOB # 18794-2

| PMC P/N | QUANTITY | CUSTOMER P/N | SPEC |
|--------------------|----------------|--------------|----------------------|
| <u>KK-TA/TA-24</u> | <u>13.856'</u> | <u></u> | <u>MS11230-97185</u> |

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

Thomas W. Coffey

 Quality Assurance Manager

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

Good KK material to
SPECIAL LIMITSON

Run# 0518

1-13-94

Wire used for
Spool 105966

550

**HAI-KP™
NON-MAGNETIC
THERMOCOUPLE GRADE**

SIZE: 0201 GROSS 32.52
B & S 24 TARE 1.65
HEAT# 623 NET 30.87

COIL# 2

P.O. _____

RES. _____

SPEC.# 20752

P/N KKP-24

DATE FEB 17 93

| TEST TEMP | 100 ELEM P-107 (mV) | Dev from 100 ELEM (mV) |
|-----------|------------------------|------------------------------|
| 200°F | 2.813 | +0.04 |
| 300°F | 4.323 | +0.07 |
| 400°F | 6.115 | +0.03 |
| 500°F | 7.965 | +0.06 |
| 1000°F | 17.504 | +0.05 |
| 1600°F | 28.474 | +0.31 |
| 2000°F | 35.334 | |

HARRISON ALLOY
HARRISON

**HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE**

SIZE: 0201 GROSS 30.00
B & S 24 TARE 1.65
HEAT# 5605 NET 28.35

COIL# 13

P.O. _____

RES. _____

SPEC.# 20753

P/N KKN-24

DATE 01/14/93

| TEST TEMP | 100 ELEM P-107 (mV) | Dev from 100 ELEM (mV) |
|-----------|------------------------|------------------------------|
| 200°F | -1.208 | -0.003 |
| 300°F | -1.770 | -0.022 |
| 400°F | -2.200 | -0.005 |
| 500°F | -2.595 | +0.005 |
| 1000°F | -4.747 | +0.017 |
| 1600°F | -7.692 | -0.01 |
| 2000°F | -9.521 | |

HARRISON ALLOYS INC.
HARRISON, N.J.

Bare Wire Reel # 18242 used on Spool #s

551

105967, 105968, 105969, 105970, 105971 & 105972

HAI-KP™
NON-MAGNETIC
THERMOCOUPLE GRADE

⊗

| TEST TEMP | IP Error mV @ 90% | SP Error mV @ 90% |
|-----------|----------------------|----------------------|
| 200°F | 2.613 | +0.15 |
| 300°F | 4.323 | +0.25 |
| 400°F | 6.115 | +0.27 |
| 500°F | 7.965 | +0.32 |
| 1000°F | 17.504 | +0.70 |
| 1600°F | 28.474 | +0.91 |
| 2000°F | 35.334 | |

2.678

SIZE 0201 GROSS 32.46
 B & S 24 TARE 1.65
 HEAT# 7737 NET 30.81

COIL# _____
 P.O. 11338
 RES. _____ n/fl
 SPEC.# 18242
 P/N KKP-24
 DATE 06/17/94

HARRISON ALLOYS INC.
HARRISON, N.J.

552

Bare Wire Prod# 17623 Used
On Spool#s 105967, 105968, 105969
105970, 105971 + 105972

HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE

| | | | | |
|----------------|--------------|------------|-------------|--------------|
| SIZE: 0201 | GROSS: 33.31 | TEST TEMP. | IN EMF (mV) | OUT EMF (mV) |
| B & S: 24 | TARE: 1.65 | 200°F | -1.206 | -0.003 |
| HEAT#: 5605 | NET: 31.66 | 300°F | -1.770 | -0.015 |
| COIL#: 14 | | 400°F | -2.200 | +0.002 |
| P.O. | | 500°F | -2.595 | +0.014 |
| RES. n/fl | | 1000°F | -4.747 | +0.018 |
| SPEC#: 17623 | | 1600°F | -7.692 | -0.008 |
| P/N: KKN-24 | | 2000°F | -8.521 | |
| DATE: 01/14/93 | | | | |

HARRISON ALLOYS INC.
HARRISON, N.J.

AUG 23 '94 07:30

1 800 639 5701

PAGE.003

These Two Reels were used
 in The Manufacture of
 Spool # 106460

T.C.

HAI-KP™
 NON-MAGNETIC
 THERMOCOUPLE GRADE

SIZE .0201 GROSS 32.64
 B & S 24 TARE 1.65
 HEAT# 6748 NET 30.99
 COIL# 6
 P.O. P11338 REPL
 RES. n/Fl
 SPEC.# 18554
 P/N KKP-24
 DATE 07/27/94

| TEST TEMP | KP EMF vs Pt-Cr (mV) | Dev from KP EMF (mV) |
|-----------|----------------------|----------------------|
| 200°F | 2.613 | -0.01 |
| 300°F | 4.323 | -0.03 |
| 400°F | 6.115 | -0.05 |
| 500°F | 7.965 | -0.13 |
| 1000°F | 17.504 | -0.26 |
| 1600°F | 28.474 | -0.02 |
| 2000°F | 35.334 | -1.25 |

HARRISON ALLOYS INC.
 HARRISON, N.J.

HAI-KN™
 MAGNETIC
 THERMOCOUPLE GRADE

SIZE .0201 GROSS 31.64
 B & S 24 TARE 1.65
 HEAT# 2975 NET 29.99
 COIL# 2
 P.O. P11338 REPL
 RES. n/Fl
 SPEC.# 18555
 P/N KKN-24
 DATE 05/15/94

| TEST TEMP | KN EMF vs Pt-Cr (mV) | Dev from KN EMF (mV) |
|-----------|----------------------|----------------------|
| 200°F | -1.206 | -0.03 |
| 300°F | -1.770 | -0.13 |
| 400°F | -2.200 | -0.062 |
| 500°F | -2.585 | 0.02 |
| 1000°F | -4.747 | -0.36 |
| 1600°F | -7.632 | -0.101 |
| 2000°F | -8.521 | -1.80 |

HARRISON ALLOYS INC.
 HARRISON, N.J.

HAI-KP™
NON-MAGNETIC
THERMOCOUPLE GRADE

| | | | | |
|-----------------|-------------|-----------|-------------------|------------------------|
| SIZE .020 | GROSS 32.64 | TEST TEMP | KP EMF mV (mV) | Dev. KP EMF (mV) |
| B & S 24 | TARE 1.65 | 200°F | 2.613 | -001 |
| HEAT# 6748 | NET 30.99 | 300°F | 4.323 | -003 |
| COIL# 6 | | 400°F | 6.115 | -005 |
| P.O. P11338REPL | | 500°F | 7.965 | -013 |
| RES. n/FL | | 1000°F | 17.504 | -026 |
| SPEC.# 18554 | | 1600°F | 28.474 | -002 |
| P/N KKP-24 | | 2000°F | 35.334 | -125 |
| DATE 07/27/94 | | | | |

HARRISON ALLOYS INC.
HARRISON, N.J.

HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE

| | | | | |
|------------------|-------------|-----------|-------------------|------------------------|
| SIZE .020 | GROSS 31.64 | TEST TEMP | KN EMF mV (mV) | Dev. KN EMF (mV) |
| B & S 24 | TARE 1.65 | 200°F | -1.206 | -003 |
| HEAT# 2975 | NET 29.99 | 300°F | -1.770 | -013 |
| COIL# 2 | | 400°F | -2.200 | -062 |
| P.O. P11338 REPL | | 500°F | -2.595 | 1002 |
| RES. n/FL | | 1000°F | -4.747 | -036 |
| SPEC.# 18555 | | 1600°F | -7.692 | -101 |
| P/N KKN-24 | | 2000°F | -9.521 | -180 |
| DATE 05/15/94 | | | | |

HARRISON ALLOYS INC.
HARRISON, N.J.



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
 CLIENT/PROJECT NUMBER 11960-97257-47260
 RECEIVED FROM PMC
 PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1435-11960
 DATE RECEIVED 9-7-94
 DATE INSPECTED 9-8-94
 INSPECTED BY: D 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 | |
| TcWire | 1139Q | 12K | 12K | 0 | KK-TA/TA-24 | Y | Y | Good | None | X | | | Spool #'s 106461 - inside, 106462 and 106463 - outside. |
| | | | | | | | | | | | | | |
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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

Ordered By: Cleda Patton

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

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

SHIP TO

OMEGA POINT LABS. INC.
 16015 SHADY FALLS ROAD
 ELMENDORF, TX 78112

OMEGA POINT LABS. INC.
 16015 SHADY FALLS ROAD
 ELMENDORF, TX 78112

78238

| DATE RECEIVED | CUSTOMER NO. | E | O | T | PMC JOB NO. |
|---------------|--------------|----|----|----|-------------|
| 3/11/94 | OMEG001 | 50 | 50 | 20 | 11390 |

| CUSTOMER P.O. NUMBER | REQUESTED SHIP | SCHEDULED SHIP | CODE | |
|----------------------|----------------|----------------|-------------|----------|
| 11390 | 24319A | 24319A | 1. MFT | 5 METERS |
| SHIP VIA | F.O.B. | TERMS | 2. CFT | 6 FEET |
| UPS | LONDONDERRY NH | NET 30 | 3. POUNDS | 7. LOT |
| | | | 4. EACH NET | 8. OTHER |

| ITEM | QUANTITY ORDERED | PART NUMBER / DESCRIPTION | QUANTITY SHIPPED |
|------|------------------|---|------------------|
| 1 | 12000.00 | FR-19, TA-84 REF. MS11390-11390 | 12285 |
| 2 | 1.00 | CALIBRATION OF CBL 400, 500, 600 AND 100017 TUB 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 |
|--------------|--------------------|-----------------|--------|-----|------|---------|----------|-----------|
| 3-31-94 | | 2 | 83 | | | | | |



CERTIFICATE OF CONFORMANCE

TO OMEGA POINT LABORATORIES INC. DATE 8/31/94
16015 SHADY FALLS ROAD CUSTOMER PO# 1139-0
ELMENDORF, TX 78112-9784 JOB # 18959

| PMC P/N | QUANTITY | CUSTOMER P/N | SPEC |
|--------------------|----------------|--------------|-----------------------|
| <u>KK-TA/TA-24</u> | <u>12,285'</u> | | <u>MS-11390-11960</u> |

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 Rods were used to 553
 Manufacture Job No. 18959
 T.C.

9000. 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 | OHM | OHM | OHM |
|-----------|--------|-------|-------|
| | 200PF | 300PF | 400PF |
| 200PF | 2.613 | +002 | |
| 300PF | 4.323 | +007 | |
| 400PF | 6.115 | -002 | |
| 500PF | 7.965 | -004 | |
| 1000PF | 17.504 | -004 | |
| 1600PF | 28.474 | +033 | |
| 2000PF | 35.234 | | |

HARRISON ALLOYS INC.
HARRISON, N.J.

HAI-KN™
MAGNETIC
THERMOCOUPLE GRADE

SIZE Ø202 GROSS 32.04
 B & S 24 TARE 1.65
 HEAT# 2879 NET 30.39

COIL# _____
 P.O. 11338
 RES. n/FL
 SPEC.# 18579
 P/N KKN-24
 DATE 08/09/94

| TEST TEMP | OHM | OHM | OHM |
|-----------|--------|-------|-------|
| | 200PF | 300PF | 400PF |
| 200PF | -1.206 | -003 | |
| 300PF | -1.710 | -017 | |
| 400PF | -2.200 | -006 | |
| 500PF | -2.595 | -001 | |
| 1000PF | -4.747 | -016 | |
| 1600PF | -7.692 | -065 | |
| 2000PF | -9.521 | -141 | |

HARRISON ALLOYS INC.
HARRISON, N.J.

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: _____
 ADDRESS: (same)
 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:

VERIFIED BY:

[Signature]
 Project Manager
 Date 8/5/94

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:

VERIFIED BY:

Harold W. Spence II
 PROJECT MANAGER
 DATE 8/5/94

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

CA
AVL Verification
Class: B





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 insulation 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 characteristics, 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 | | |
|----------------------------------|-------------|----------------|--------|---|---|--|
| | 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 | GAUGE SIZE | NOMINAL INSULATION WALL (INCHES) | NOMINAL JACKET WALL (INCHES) | NOMINAL DIAMETER (INCHES) | APPROX. SHIP. WEIGHT LBS. PER 1000 FT |
|--------------------------------|---|---|------------|----------------------------------|------------------------------|---------------------------|---------------------------------------|
| SPECIFIC GRAVITY | 2.15 | 2.15 | 20 | .008 | .010 | .068 X .116 | 12 |
| DUROMETER HARDNESS | 55 | 55 | | | | | |
| TENSILE STRENGTH p.s.i. (min.) | 4000 p.s.i. | 4000 p.s.i. | 24 | .008 | .010 | .056 X .092 | 7 |
| ELONGATION % (min.) | 300% | 300% | | | | | |
| MINIMUM BEND RADIUS | 5 X O.D. | 10 X O.D. | 30 | .004 | .006 | .030 X .048 | 2 |
| 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 | | | | | |

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.

REELS, SPOOLS & COILS > All shipments, unless specified otherwise by PMC, are made on non-returnable reels, spools or coils in one continuous length.

SHORTAGES & 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.

The material contained in this document is presented in good faith and believed to be reliable and accurate. However, because testing conditions may vary and material quality of information that may be provided in whole or part by others may be beyond our control, no warranty, expressed or implied, is given and PMC Corporation can assume no liability for results obtained or damages incurred through the application of the data tests presented. NOTE: PMC reserves the right to substitute an equal product on all registered trademark items.

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

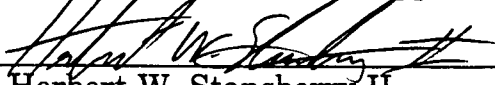
Equipment Description: 200 Channel Data Acquisition System with
Fluke Computer Front End and Extender
Chassis

Calibration Sources: Digicator Digital Calibrator,
Model #CL-466, Serial #703297

PERFORMANCE:

Better than -0.49 / +0.84 on all 200 channels

Calibration Performed/Approved by:



Herbert W. Stansberry II,
Fire Test Technologist



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

Calibration Performed/Approved by:


 Herbert W. Stansberry II,
 Fire Test Technologist



563

Omega Point Laboratories, Inc.

16015 Shady Falls Rd.
Elmendorf, Texas 78112
800-966-5253 FAX 210-635-8101

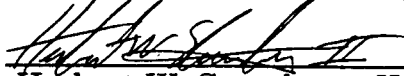
Certificate of Calibration

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

Calibration Performed/Approved by:



Herbert W. Stansberry II,
Fire Test Technologist





Q/A RECEIVING REPORT

CLIENT/PROJECT NAME Omega Point Labs
 CLIENT/PROJECT NUMBER OPC Equipment
 RECEIVED FROM Rothe
 PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1A11 . OPL
 DATE RECEIVED 8-1-94
 DATE INSPECTED 8-1-94
 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 Temp. Calibr. | 1131-0 | 1 | 1 | 0 | serial No 703297 | Y | Y | Good | None | X | | | Calibration Service - Arrived in spec. at Rothe. |
| | | | | | | | | | | | | | |
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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 "See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u>C Patton</u> Date <u>7-19-94</u> | 1 | \$60.00 | \$60.00 |

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

572

Rothe Development, Inc.
Technology Services Division
11111 Sinclair Rd.
San 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. | Mfr. | Model | Serial No. | Description |
|------|--------|---------------|-------|------------|------------|-------------------------|
| 1 | 44184 | 1131-Q | Omega | CL-466-L-1 | 703297 | Digital Temp Calibrator |

Received by:

Date:



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 578
TRACEABLE TO NIST

CHARGE # 107

CONTROL # 556 - 8477

WORK ORDER # 44184

C
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T
E
M

RECEIVED FROM **Omega Point Laboratories**

DATE **07/20/94**

MFG **Omega**

ADDRESS **16015 Shady Falls Road
Elmendorf, TX 78112-9784**

PHONE# **635-8100**

MODEL **CL-466-L-1**

CONTACT (NAME) **Ms. Connie Humphrey**

FAX#

SERIAL # **703297**

PURCHASE ORDER # **1131-Q**

TYPE **Digital Temp Calibrator**

CUSTOMER COMMENTS **TAXABLE 8.25%**

ACCES. RCVD.

**Power cord
Probe handle**

- REPAIR
- OPERATIONAL CHECK
- CALIBRATION

CALIBRATION DATE **29 July 94**

CALIBRATION INTERVAL

- RECEIVED IN SPECS.
- RECEIVED INOPERATIVE
- RECEIVED OUT OF SPECS.

DATE DUE **29 Jan 95**

6 mo.

| 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 |

TR #'s **2030, 208, 150**

COMMENTS **CAL DATA PROVIDED**

WORK PERFORMED:

cal'd

TEMP **74** °F
R.H. **34** %

SPECS: MFG RDI
PROCEDURE: MFG RDI OTHER

RDI 2002
SHIP VIA: _____ DATE: _____ RECEIVED BY: _____



Rothe Development Inc.

574

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

MFG Omega

MODEL CL-466-L-1

SERIAL # 703297

CONTROL: 556 - 8477

TYPE Digital Temp Calibrator

SPECIFICATIONS: MFG

RECEIVED IN-SPECS

PROCEDURE: MFG

OUT-OF-SPECS

WORK ORDER #: 44184

CUSTOMER PO #: 1131-Q

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 74°F, Relative Humidity 34%

Test Report Number and Calibration Standards Used

| Ref # | Model # | Mfr | 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 | Losan | 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
NIST TEST# 250839
NIST TEST# 251316
Hz MWB Transmission

INSPECTED BY
COMMENTS:

Jose A Mendez

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 | <u>-99.6</u> | +/- .8 |
| 0.000 | 0 | <u>.0</u> | +/- .5 |
| 4.095 | 100 | <u>100.0</u> | +/- .5 |
| 12.207 | 300 | <u>299.9</u> | +/- .5 |
| 20.640 | 500 | <u>499.8</u> | +/- .5 |
| 31.214 | 750 | <u>749.9</u> | +/- .5 |
| 41.269 | 1000 | <u>1000.0</u> | +/- .5 |
| 50.633 | 1250 | <u>1250.1</u> | +/- .5 |
| 54.125 | 1350 | <u>1350.2</u> | +/- .5 |

| TYPE T | DEG F | READING | TOL |
|--------|-------|---------------|---------|
| -5.341 | -300 | <u>-300.3</u> | +/- 1.5 |
| -4.149 | -200 | <u>-200.3</u> | +/- 1.5 |
| -2.581 | -100 | <u>-100.3</u> | +/- 1.5 |
| 0.000 | 32 | <u>31.8</u> | +/- .6 |
| 1.518 | 100 | <u>99.7</u> | +/- .6 |
| 6.647 | 300 | <u>299.7</u> | +/- .6 |
| 12.572 | 500 | <u>499.8</u> | +/- .6 |
| 19.095 | 700 | <u>699.9</u> | +/- .6 |

| | DEG C | READING | TOL |
|--------|-------|---------------|---------|
| -5.439 | -190 | <u>-190.3</u> | +/- 1.0 |
| -3.378 | -100 | <u>-100.2</u> | +/- 1.0 |
| 0.000 | 0 | <u>-</u> | +/- .4 |
| 4.277 | 100 | <u>99.8</u> | +/- .4 |
| 9.286 | 200 | <u>199.8</u> | +/- .4 |
| 14.860 | 300 | <u>299.9</u> | +/- .4 |
| 20.252 | 390 | <u>389.9</u> | +/- .4 |

| TYPE E | DEG F | READING | TOL |
|--------|-------|---------------|--------|
| -8.404 | -300 | <u>-299.8</u> | +/- .7 |
| -6.471 | -200 | <u>-200.1</u> | +/- .7 |
| -3.976 | -100 | <u>-100.1</u> | +/- .7 |
| 0.000 | 32 | <u>31.9</u> | +/- .7 |
| 2.281 | 100 | <u>99.8</u> | +/- .7 |
| 9.708 | 300 | <u>299.7</u> | +/- .7 |
| 17.942 | 500 | <u>499.8</u> | +/- .7 |
| 28.854 | 750 | <u>749.8</u> | +/- .7 |
| 40.056 | 1000 | <u>999.8</u> | +/- .7 |
| 51.246 | 1250 | <u>1250.0</u> | +/- .7 |
| 62.240 | 1500 | <u>1500.0</u> | +/- .7 |
| 75.024 | 1800 | <u>1800.1</u> | +/- .7 |

| | DEG C | READING | TOL |
|--------|-------|---------------|--------|
| -5.237 | -100 | <u>-99.8</u> | +/- .4 |
| 0.000 | 0 | <u>.0</u> | +/- .4 |
| 6.317 | 100 | <u>99.9</u> | +/- .4 |
| 21.033 | 300 | <u>299.9</u> | +/- .4 |
| 36.999 | 500 | <u>499.8</u> | +/- .4 |
| 53.110 | 700 | <u>699.9</u> | +/- .4 |
| 68.783 | 900 | <u>900.0</u> | +/- .4 |
| 76.358 | 1000 | <u>1000.0</u> | +/- .4 |

MV INPUT

-10
0
10
30
50
75
100

READING

-9.99
0.00
9.99
29.99
49.99
75.00
100.00

TOL
.01% OF
RDG+/-2CT

MA INPUT

0
5
10
15
20

READING

.000
4.999
10.000
15.000
20.000

TOL
.01% OF
RDG+/-2CT



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME Omega Point Labs
 CLIENT/PROJECT NUMBER OPL Equipment
 RECEIVED FROM Roth 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 Calibrator | 1112Q | 1 | 1 | - | SN# 703297 | Y | Y | good | None | X | | | Calibration services only |
| Delmhorst Moisture Detector | 1112Q | 1 | 1 | - | model BD-8 SN# 5855 | Y | Y | good | None | X | | | |
| | | | | | | | | | | | | | |
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**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. #: 1112 Q

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

PURCHASE ORDER

Omega Point Laboratories, Inc. 1180

16015 Shady Falls Road, Elmhurst, 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:

Ship To:

Accounts Payable
 Omega Point Laboratories, Inc.
 16015 Shady Falls Road
 Elmhurst, TX 78112-9784

Constance A. Humphrey
 Omega Point Laboratories, Inc.
 16015 Shady Falls Road
 Elmhurst, 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 Calibrator SN# 703297 - Calibration Service | 1 | \$60.00 160.00 | \$60.00 173.70 <i>incl. tax</i> |
| 2. | Delmhorst Moisture Detector Model BD-8, SN# 5855 Calibration Service | 1 | \$160.00 40.00 | \$160.00 43.70 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u>C Patton</u> Date <u>2-14-94</u></p> | | | | |

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

581

Rothe Development, Inc.
Technology Services Division
Sinclair Rd.
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. | Mfr. | 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 |

Received by:

Date:



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

582

CHARGE # 107

CONTROL # 556 - 8477

WORK ORDER # 42180

CUSTOMER

RECEIVED FROM **Omega Point Laboratories** DATE **02/14/94**

ADDRESS **16015 Shady Falls Road** PHONE# **635-8100**
Elmendorf, TX 78112-9784

CONTACT (NAME) **Ms. Connie Humphrey** FAX#

PURCHASE ORDER # **1112-Q**

CUSTOMER COMMENTS **TAXABLE 8.25% Before + After DATA Required**

MFG **Omega**

MODEL **CL-466-L-1**

SERIAL # **703297**

TYPE **Digital Temp Calibrator**

ACCES. RCVD. **Probe handle**

REPAIR
 OPERATIONAL CHECK
 CALIBRATION

CALIBRATION DATE **24 FEB 94**
DATE DUE **24 AUG 94**

CALIBRATION INTERVAL
6 MO.

RECEIVED IN SPECS.
 RECEIVED INOPERATIVE
 RECEIVED OUT OF SPECS.

| CKT REF # | QTY. | MFG PART # | DESCRIPTION | COST | ROTHER TECH. | OUR P.O. # |
|-----------|------|------------|-------------|------|-------------------|---------------|
| | | | | | <i>WW</i> | |
| | | | | | REPAIR LABOR HRS. | SERVICE CODE |
| | | | | | | <i>J</i> |
| | | | | | PARTS TOTAL | |
| | | | | | REPAIR LABOR | |
| | | | | | SHIPPING | |
| | | | | | TEAR DOWN CHARGE | |
| | | | | | CALIBRATION | 160.00 |
| | | | | | TAX | 13.20 |
| | | | | | TOTAL | 173.20 |

THIS IS NOT A FINAL INVOICE

TR #'s **20, 30, 150, 243**

COMMENTS **CAL DATA PROVIDED**

WORK PERFORMED: **Optimized MV + mA functions.**

Cal'd

TEMP **72** °F

R.H. **27** %

SPECS: FFG RDI

PROCEDURE: FFG RDI OTHER



Rothe Development Inc.

583

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

MFG Omega

MODEL CL-466-L-1

SERIAL # 703297

CONTROL: 556 - 8477

TYPE Digital Temp Calibrator

SPECIFICATIONS: MFG

PROCEDURE: MFG

WORK ORDER #: 42180

CUSTOMER PO #: 1112-Q

RECEIVED IN-SPECS

OUT-OF-SPECS

All Calibration measurements performed at ROTHE DEVELOPMENT INC. METROLOGY SERVICES meet the requirements of MIL-STD-45662A, and are traceable to the National Institute of Standards and Technology through Primary NIST Calibration or Secondary Calibration performed by other Metrological facilities. Ambient conditions: Temperature 72°F, Relative Humidity 27%

Test Report Number and Calibration Standards Used

| Ref # | Model # | Mfr | 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
NIST TEST# 250839
NIST TEST# 251316
Hz WWVB Transmission

INSPECTED BY
COMMENTS:

Jose A Mendez

ROTHE DEVELOPMENT METROLOGY SERVICES

584

CALIBRATION DATA : OMEGA CL-466

WORK ORDER # 42180
 CUSTOMER Omega Point Labs.
 SERIAL 703297
 DATE 24 FEB 04
 TECH # 11

RECEIVED IN SPECS ✓

RECEIVED OUT OF SPECS _____

RECEIVED INOPERATIVE _____

| TYPE J | DEG F | INCOMING | OUTGOING | TOL |
|--------|-------|---------------|---------------|--------|
| -5.760 | -200 | <u>-200.0</u> | <u>-200.0</u> | +/- .6 |
| -3.492 | -100 | <u>-100.0</u> | <u>-100.0</u> | +/- .6 |
| 0.000 | 32 | <u>32.0</u> | <u>32.0</u> | +/- .6 |
| 1.942 | 100 | <u>99.9</u> | <u>99.9</u> | +/- .6 |
| 7.947 | 300 | <u>299.8</u> | <u>299.8</u> | +/- .6 |
| 14.108 | 500 | <u>499.8</u> | <u>499.8</u> | +/- .6 |
| 21.785 | 750 | <u>749.8</u> | <u>749.8</u> | +/- .6 |
| 29.515 | 1000 | <u>999.8</u> | <u>999.8</u> | +/- .6 |
| 37.688 | 1250 | <u>1249.8</u> | <u>1249.8</u> | +/- .6 |
| 46.503 | 1500 | <u>1500.0</u> | <u>1500.0</u> | +/- .6 |
| 53.525 | 1700 | <u>1700.0</u> | <u>1700.0</u> | +/- .6 |

| | DEG C | INCOMING | OUTGOING | TOL |
|--------|-------|---------------|---------------|--------|
| -4.632 | -100 | <u>-100.0</u> | <u>-100.0</u> | +/- .5 |
| 0.000 | 0 | <u>.0</u> | <u>.0</u> | +/- .5 |
| 5.268 | 100 | <u>99.9</u> | <u>99.9</u> | +/- .5 |
| 16.325 | 300 | <u>299.8</u> | <u>299.8</u> | +/- .5 |
| 33.096 | 600 | <u>599.8</u> | <u>599.8</u> | +/- .5 |
| 51.875 | 900 | <u>899.9</u> | <u>899.9</u> | +/- .5 |

| TYPE K | DEG F | INCOMING | OUTGOING | TOL |
|--------|-------|---------------|---------------|---------|
| -2.699 | -100 | <u>-100.0</u> | <u>-100.0</u> | +/- 1.2 |
| 0.000 | 32 | <u>32.0</u> | <u>32.0</u> | +/- .8 |
| 1.520 | 100 | <u>100.0</u> | <u>100.0</u> | +/- .8 |
| 6.092 | 300 | <u>299.9</u> | <u>299.9</u> | +/- .8 |
| 10.560 | 500 | <u>499.8</u> | <u>499.8</u> | +/- .8 |
| 16.349 | 750 | <u>749.7</u> | <u>749.7</u> | +/- .8 |
| 22.251 | 1000 | <u>999.7</u> | <u>999.7</u> | +/- .8 |
| 28.148 | 1250 | <u>1249.7</u> | <u>1249.7</u> | +/- .8 |
| 33.913 | 1500 | <u>1499.8</u> | <u>1499.8</u> | +/- .8 |
| 39.485 | 1750 | <u>1749.8</u> | <u>1749.8</u> | +/- .8 |
| 44.856 | 2000 | <u>2000.0</u> | <u>2000.0</u> | +/- .8 |
| 49.996 | 2250 | <u>2250.0</u> | <u>2250.0</u> | +/- .8 |
| 54.845 | 2500 | <u>2500.0</u> | <u>2500.0</u> | +/- .8 |

| TYPE K | DEG C | INCOMING | OUTGOING | TOL |
|--------|-------|---------------|---------------|--------|
| -3.553 | -100 | <u>-99.6</u> | <u>-99.6</u> | +/- .8 |
| 0.000 | 0 | <u>.0</u> | <u>.0</u> | +/- .5 |
| 4.095 | 100 | <u>99.9</u> | <u>99.9</u> | +/- .5 |
| 12.207 | 300 | <u>299.9</u> | <u>299.9</u> | +/- .5 |
| 20.640 | 500 | <u>499.8</u> | <u>499.8</u> | +/- .5 |
| 31.214 | 750 | <u>749.8</u> | <u>749.8</u> | +/- .5 |
| 41.269 | 1000 | <u>999.9</u> | <u>999.9</u> | +/- .5 |
| 50.633 | 1250 | <u>1250.0</u> | <u>1250.0</u> | +/- .5 |
| 54.125 | 1350 | <u>1350.0</u> | <u>1350.0</u> | +/- .5 |

| TYPE T | DEG F | INCOMING | OUTGOING | TOL |
|--------|-------|---------------|---------------|---------|
| -5.341 | -300 | <u>-300.4</u> | <u>-300.4</u> | +/- 1.5 |
| -4.149 | -200 | <u>-200.3</u> | <u>-200.3</u> | +/- 1.5 |
| -2.581 | -100 | <u>-100.2</u> | <u>-100.2</u> | +/- 1.5 |
| 0.000 | 32 | <u>31.9</u> | <u>31.9</u> | +/- .6 |
| 1.518 | 100 | <u>99.8</u> | <u>99.8</u> | +/- .6 |
| 6.647 | 300 | <u>299.8</u> | <u>299.8</u> | +/- .6 |
| 12.572 | 500 | <u>499.9</u> | <u>499.9</u> | +/- .6 |
| 19.095 | 700 | <u>699.9</u> | <u>699.9</u> | +/- .6 |

| | DEG C | INCOMING | OUTGOING | TOL |
|--------|-------|---------------|---------------|---------|
| -5.439 | -190 | <u>-190.1</u> | <u>-190.1</u> | +/- 1.0 |
| -3.378 | -100 | <u>-100.0</u> | <u>-100.0</u> | +/- 1.0 |
| 0.000 | 0 | <u>.0</u> | <u>.0</u> | +/- .4 |
| 4.277 | 100 | <u>99.8</u> | <u>99.8</u> | +/- .4 |
| 9.286 | 200 | <u>199.9</u> | <u>199.9</u> | +/- .4 |
| 14.860 | 300 | <u>299.9</u> | <u>299.9</u> | +/- .4 |
| 20.252 | 390 | <u>389.9</u> | <u>389.9</u> | +/- .4 |

| TYPE E | DEG F | INCOMING | OUTGOING | TOL |
|--------|-------|---------------|---------------|--------|
| -8.404 | -300 | <u>-299.7</u> | <u>-299.7</u> | +/- .7 |
| -6.471 | -200 | <u>-200.0</u> | <u>-200.0</u> | +/- .7 |
| -3.976 | -100 | <u>-100.0</u> | <u>-100.0</u> | +/- .7 |
| 0.000 | 32 | <u>32.0</u> | <u>32.0</u> | +/- .7 |
| 2.281 | 100 | <u>99.8</u> | <u>99.8</u> | +/- .7 |
| 9.708 | 300 | <u>299.6</u> | <u>299.6</u> | +/- .7 |
| 17.942 | 500 | <u>499.7</u> | <u>499.7</u> | +/- .7 |
| 28.854 | 750 | <u>749.8</u> | <u>749.8</u> | +/- .7 |
| 40.056 | 1000 | <u>999.6</u> | <u>999.6</u> | +/- .7 |
| 51.246 | 1250 | <u>1249.8</u> | <u>1249.8</u> | +/- .7 |
| 62.240 | 1500 | <u>1499.8</u> | <u>1499.8</u> | +/- .7 |
| 75.024 | 1800 | <u>1799.9</u> | <u>1799.9</u> | +/- .7 |

| | DEG C | INCOMING | OUTGOING | TOL |
|--------|-------|--------------|--------------|--------|
| -5.237 | -100 | <u>-99.9</u> | <u>-99.9</u> | +/- .4 |
| 0.000 | 0 | <u>.0</u> | <u>.0</u> | +/- .4 |
| 6.317 | 100 | <u>99.9</u> | <u>99.9</u> | +/- .4 |
| 21.033 | 300 | <u>299.9</u> | <u>299.9</u> | +/- .4 |
| 36.999 | 500 | <u>499.8</u> | <u>499.8</u> | +/- .4 |
| 53.110 | 700 | <u>699.9</u> | <u>699.9</u> | +/- .4 |
| 68.783 | 900 | <u>899.9</u> | <u>899.9</u> | +/- .4 |
| 76.358 | 1000 | <u>999.9</u> | <u>999.9</u> | +/- .4 |

MV INPUT

| | INCOMING | OUTGOING |
|-----|--------------|---------------|
| -10 | <u>-9.99</u> | <u>-9.99</u> |
| 0 | <u>.00</u> | <u>.00</u> |
| 10 | <u>9.99</u> | <u>9.99</u> |
| 30 | <u>29.99</u> | <u>29.99</u> |
| 50 | <u>49.98</u> | <u>49.99</u> |
| 75 | <u>74.98</u> | <u>74.99</u> |
| 100 | <u>99.98</u> | <u>100.00</u> |

TOL
.01% OF
RDG+/-2CT

MA INPUT

| | INCOMING | OUTGOING |
|----|---------------|---------------|
| 0 | <u>.001</u> | <u>.000</u> |
| 5 | <u>4.997</u> | <u>4.999</u> |
| 10 | <u>9.997</u> | <u>9.999</u> |
| 15 | <u>14.997</u> | <u>15.000</u> |
| 20 | <u>19.996</u> | <u>20.000</u> |

TOL
.01% OF
RDG+/-2CT



Q/A RECEIVING REPORT

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

REPORT NUMBER 1371 - OPL
 DATE RECEIVED 2-2-94
 DATE INSPECTED 2-2-94
 INSPECTED BY: Patton

| ITEM DESCRIPTION | P.O. NO. | QUANTITY | | | I.D. NO. | COMM. MAIL 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 | - | SN 92LE002 | Y | Y | Good | None | X | | | |
| | | | | | | | | | | | | | |
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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:

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 | 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 <u>C Patton</u> Date <u>1-13-94</u> | | | | |

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 N^o 424132

METROPLEX METROLOGY LABORATORY INCORPORATED

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

Certificate of Calibration

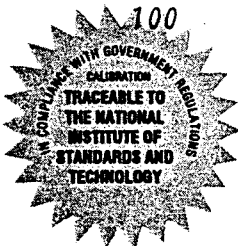
We certify the accuracy of this Mc Daniel Controls, Inc. 0 to 100 Liquid Filled PSI Gage, Mod.# None, S/N 92LE003, subdivided in 1 lb. increments, property of Omega Point Laboratories, Inc., 16015 Shady Falls Road, Elmendorf, Texas. The accuracy of this instrument has been determined from Reference Standards 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 PRESSURE OF PSI GAGE | INDICATED | 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% |



TEST IN COMPLIANCE WITH MIL-STD-45662A

President

Weta Passmore
Date Cal: 1-20-94
Date Due: 1-20-95

WP/kb

INVOICE

No. 4253190

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

METROPLEX METROLOGY LABORATORY

Refer to above number in
correspondence regarding
this charge.

2312 MUNICIPAL PARKWAY

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

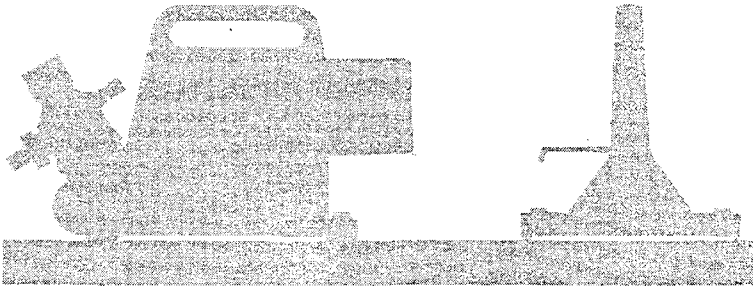
BEDFORD, TEXAS 76021 February 1, 1994

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. | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | |
| <p>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.</p> | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Parts</td> <td>Tools</td> <td>Calibration Certification</td> <td>Repairs</td> <td>Shipping & Handling</td> <td>Tax</td> </tr> <tr> <td></td> <td></td> <td>60.00</td> <td></td> <td>8.04</td> <td>5.61</td> </tr> </table> | | | Parts | Tools | Calibration Certification | Repairs | Shipping & Handling | Tax | | | 60.00 | | 8.04 | 5.61 | <table border="1"> <tr> <td>TOTAL</td> <td>73.65</td> </tr> </table> | | TOTAL | 73.65 |
| Parts | Tools | Calibration Certification | Repairs | Shipping & Handling | Tax | | | | | | | | | | | | | |
| | | 60.00 | | 8.04 | 5.61 | | | | | | | | | | | | | |
| TOTAL | 73.65 | | | | | | | | | | | | | | | | | |

Cust. # 11549

kb
p

Masters at Repairs and Calibration
of Precision Measuring Instruments

Please Pay ▲

PACKING SLIP

PACKING LISTANDCERTIFICATE 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.

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-----------------|---------------------|
| TVA Part No. 158100 THERMO-LAG Preshaped Conduit Sections Thickness: 0.625" \pm 0.125" Nom. Size: 1" | 16 Pieces | F94-02053 |

Item 01

16 Pieces
(In 1 Carton)

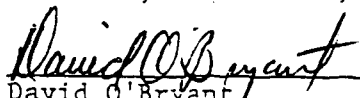
No Shelf Life On Conduit

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.

DATE OF SHIPMENT: 30 June 1994

BILL OF LADING: 21334

MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID


 David O' Bryant
 Manager Quality Control

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---------------------------------|-----------------------------|---------------------|
| TVA Part No. 158400 | 5 Pieces | F9-105037 |
| THERMO-LAG Preshaped Conduit | | |
| Sections | 3 Pieces | F92-09051 |
| Thickness: 0.625" + 0.125" Nom. | | |
| Size: 4" | 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.

DATE OF SHIPMENT: 30 June 1994
 BILL OF LADING: 21334
 MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O Bryant
 David O Bryant
 Manager Quality Control

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-----------------|---------------------|
| TVA Part No. 238100 THERMO-LAG Preshaped Conduit Sections Thickness: 0.375" \pm 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.

DATE OF SHIPMENT: 30 June 1994
 BILL OF LADING: 21334
 MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O'Bryant
 David O'Bryant
 Manager Quality Control

PACKING LISTANDCERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994

TEMPERATURE RECORDER 030117 CHART TAPE NO. 27TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
|----------------------------|-----------------|---------------------|

| | | |
|--|----------|-----------|
| TVA Part No. 338300 THERMO-LAG Preshaped Conduit Sections Thickness: 0.375" \pm 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.

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O' Bryant
David O' Bryant
Manager Quality Control

PACKING LISTANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994TEMPERATURE RECORDER 030117 CHART TAPE NO. 27TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|---------------------------|---------------------|
| TVA Part No. 438300 THERMO-LAG Preshaped Conduit Sections | 3 Pieces | F92-10009 |
| Thickness: 0.375" \pm 0.125" Nom. Size: 3" | 5 Pieces | 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.

DATE OF SHIPMENT: 30 June 1994
 BILL OF LADING: 21334
 MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O'Bryant
 David O'Bryant
 Manager Quality Control

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---------------------------------|---------------------------|---------------------|
| 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
 David O Bryant
 Manager Quality Control

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--------------------------------|-----------------|---------------------|
| 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
 David O. Bryant
 Manager Quality Control

PACKING LISTANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994TEMPERATURE RECORDER 030117 CHART TAPE NO. 27TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
|----------------------------|-----------------|---------------------|

| | | |
|---------------------------------------|------------------------------------|----------|
| THERMO-LAG 330-1 SUBLIMING COATING | 2000 LB. (40 x 50 Lb. Pails) | 94-05093 |
|---------------------------------------|------------------------------------|----------|

TROWEL GRADE

ITEM 08

(ON 2 PALLETS)

1 x 5 gallon pail containing
temperature recorder

EXP. DATE: DECEMBER 1994

SHELF LIFE SIX MONTHS FROM DATE
OF SHIPMENTSTORE ABOVE 32 F AND BELOW 100 F AT ALL
TIMES

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

21334



CERTIFICATE OF ANALYSIS

CUSTOMER

OMEGA POINT LABORATORY DATE OF SHIPMENT 30 JUNE 1994
 %TENNESSEE VALLEY AUTHORITY PURCHASE ORDER NO: CONTRACT #TV 92362V
 16015 SHADY FALLS RD RELEASE NO:
 ELMENDORFF, TX 78112 .CUSTOMER PART NO:

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

| <u>LOT NUMBER</u> | <u>QUANTITY</u> | <u>TEST NO:</u> | <u>DESCRIPTION</u> | <u>ANALYSIS</u> | <u>SPECIFICATION</u> |
|-------------------|------------------------------------|-----------------|--------------------|-----------------|----------------------|
| 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: David Bryant DATE: 30 JUNE 1994 PAGE NO. 1



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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|-----------------|---------------------|
| 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. | F062494 |
| | (IN 1 CARTON) | |

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

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|---------------------------------|---------------------|
| 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

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|----------------------------|---------------------|
| TVA Part No. 158340 THERMO-LAG Preshaped Conduit Sections Thickness: 0.625" \pm 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.

DATE OF SHIPMENT: 30 June 1994
 BILL OF LADING: 21334
 MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O Bryant
 David O Bryant
 Manager Quality Control


PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|----------------------------|---------------------|
| TVA Part No. 238340 | 2 Pieces | F92-02005 |
| THERMO-LAG Preshaped Conduit Sections | 1 Piece | F92-03029 |
| Thickness: 0.375" \pm 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.

DATE OF SHIPMENT: 30 June 1994
 BILL OF LADING: 21334
 MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID


 David O'Bryant
 Manager Quality Control



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TS1/TVA REPORT NUMBER 1393 - 11960
 CLIENT/PROJECT NUMBER 11960-97185.86887 DATE RECEIVED 7-8-94
 RECEIVED FROM TS1 DATE INSPECTED 7-8-94
 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 | R.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. CPT |
| 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 | X | 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# 1384X6 F93-11048 | X | Y | Good | None | X | | | |
| Thermo Lag 330 Ribbed Panel 3/8" | NA | 0 | 4 | 0 | Part# 1384X6 F94-02012 | Y | Y | Good | None | X | | | |
| Thermo Lag 330 Ribbed Panel 3/8" | NA | 0 | 1 | 0 | Part# 1384X6 F94-03618 | Y | Y | Good | None | X | | | |
| Thermo Lag 330 Ribbed Panel 3/8" | NA | 0 | 1 | 0 | Part# 1384X6 F94-06051 | 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 | | | |



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA
 CLIENT/PROJECT NUMBER 11960-97185, 86887
 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 | R.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. Exp date on travel 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 Travel grade | NA | 0 | 40 | 0 | 94-05093 | X | Y | Good | None | X | | | |
| Stress-skin | NA | 0 | 1000 | 0 | F062494 | Y | Y | Good | None | X | | | |
| Stainless Steel Dieline | NA | 0 | 1000 | 0 | 1bga, type 304 | Y | Y | Good | None | X | | | |
| Stainless Steel Banding | NA | 0 | 3000 | 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 | X | Y | Good | None | X | | | |

PACKING LISTANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994TEMPERATURE RECORDER 030117 CHART TAPE NO. 27TOTAL NO. OF PACKAGES 17 PIECES GROSS WEIGHT 9440 LBS.

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-----------------|---------------------|
| 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.

DATE OF SHIPMENT: 30 June 1994

BILL OF LADING: 21334

MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O' Bryant
David O' Bryant
Manager Quality Control



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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|-----------------------------|---------------------|
| TVA Part No. 158400 | 5 Pieces | F9-105037 |
| THERMO-LAG Preshaped Conduit Sections | 3 Pieces | F92-09051 |
| Thickness: 0.625" ± 0.125" Nom. Size: 4" | 10 Pieces | F92-11018 |
| Item 02 | 10 Pieces | F94-03018 |
| No Shelf Life On Conduit | 28 Pieces (In 2 Cartons) | |

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DATE OF SHIPMENT: 30 June 1994
 BILL OF LADING: 21334
 MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O. Bryant
 David O' Bryant
 Manager Quality Control



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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-----------------|---------------------|
| TVA Part No. 238100 THERMO-LAG Preshaped Conduit Sections Thickness: 0.375" + 0.125" Nom. Size: 1" | 16 Pieces | F94-04005 |

Item 03

16 Pieces

No Shelf Life On Conduit

(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.

DATE OF SHIPMENT: 30 June 1994
 BILL OF LADING: 21334
 MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O Bryant
 David O Bryant
 Manager Quality Control



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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-----------------|---------------------|
| 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.

DATE OF SHIPMENT: 30 June 1994
 BILL OF LADING: 21334
 MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O Bryant
 David O Bryant
 Manager Quality Control

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---------------------------------|-----------------|---------------------|
| TVA Part No. 438300 | 3 Pieces | F92-10009 |
| THERMO-LAG Preshaped Conduit | | |
| Sections | 5 Pieces | F93-06008 |
| Thickness: 0.375" + 0.125" Nom. | | |
| Size: 3" | | |
| <hr/> | | |
| Item 05 | 8 Pieces | |
| | (In 1 Carton) | |

No Shelf Life On Conduit

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DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O'Bryant
David O'Bryant
Manager Quality Control



611 ✓

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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|---------------------------|---------------------|
| TVA PART NO. 1384X6 - THERMO- LAG 330 RIBBED PANEL | 1 PANEL | F93-11048 ✓ |
| NOMINAL 3/8" THICK, 4'x6½' NOM. | 4 | F94-02012 ✓ |
| | 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
David O'Bryant
Manager Quality Control



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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--------------------------------|-----------------|---------------------|
| 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
David O' Bryant
Manager Quality Control



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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
|----------------------------|-----------------|---------------------|

| | | |
|------------------------------------|---------------------------------|----------|
| THERMO LAG 330-1 SUBLIMING COATING | 2000 LB. (40 x 50 Lb. Pails) | 94-05093 |
|------------------------------------|---------------------------------|----------|

TROWEL GRADE

ITEM 08

(ON 2 PALLETS)

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

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

21334

CERTIFICATE OF ANALYSIS

CUSTOMER

OMEGA POINT LABORATORY

DATE OF SHIPMENT 30 JUNE 1994

TENNESSEE VALLEY AUTHORITY

PURCHASE ORDER NO: CONTRACT #TV 92362V

16015 SHADY FALLS RD

RELEASE NO:

ELMENDORFF, TX 78112

CUSTOMER PART NO:

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

| <u>LOT NUMBER</u> | <u>QUANTITY</u> | <u>TEST NO:</u> | <u>DESCRIPTION</u> | <u>ANALYSIS</u> | <u>SPECIFICATION</u> |
|-------------------|------------------------------------|-----------------|--------------------|-----------------|----------------------|
| 94-05093 | 2000 LB. (40 x 50 LB. PAISLS | 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: *Ronald O. Bryant*

DATE:

30 JUNE 1994

PAGE NO. 1

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-----------------|---------------------|
| 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. | F062494 |
| | (IN 1 CARTON) | |

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

PACKING LISTANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994TEMPERATURE RECORDER 030117 CHART TAPE NO. 27TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
|----------------------------|-----------------|---------------------|

| | | |
|---|----------------------|-----|
| 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



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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-----------------|---------------------|
| TVA Part No. 158340 THERMO-LAG Preshaped Conduit Sections Thickness: 0.625" \pm 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.

DATE OF SHIPMENT: 30 June 1994
BILL OF LADING: 21334
MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O Bryant
David O Bryant
Manager Quality Control

PACKING LISTANDCERTIFICATE OF CONFORMANCE

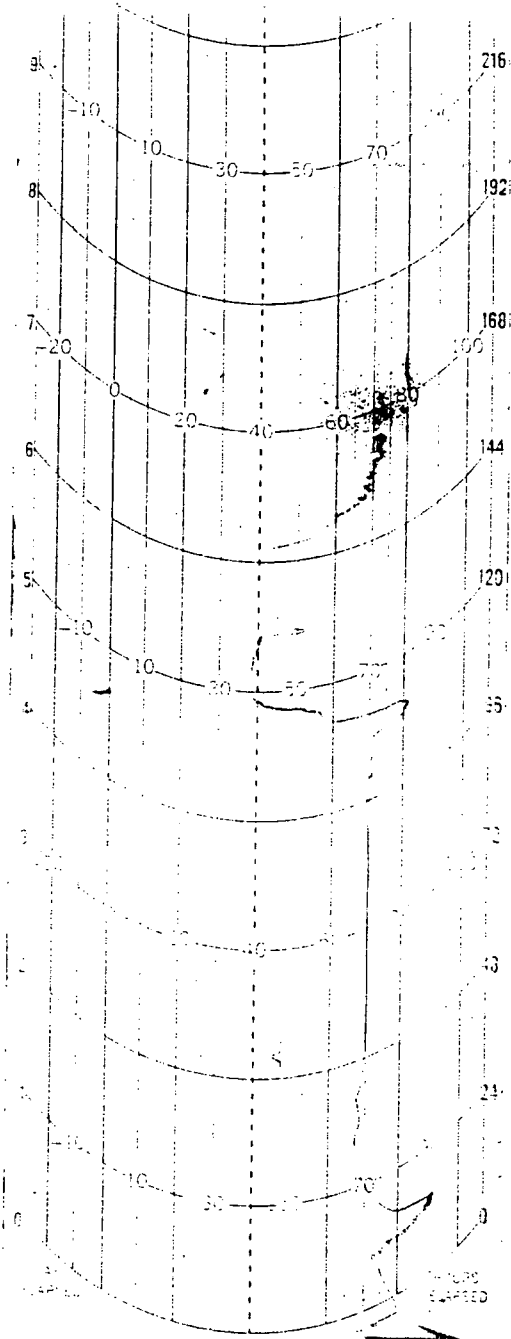
PURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 30 JUNE 1994
 TEMPERATURE RECORDER 030117 CHART TAPE NO. 27
 TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---------------------------------|-----------------|---------------------|
| 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.

DATE OF SHIPMENT: 30 June 1994
 BILL OF LADING: 21334
 MODE OF TRANSPORT: DYNAMIC TRANSIT PREPAID

David O Bryant
 David O Bryant
 Manager Quality Control



CAR No. _____
 CITY: San Antonio / Tx
 CONSIGNEE: Omega Paint
 CAR CONT: _____
 PER: _____
 CITY: St. Louis
 SHIPPER: TOI
 DATE: 6-30-94 TIME: 1:30 pm
 INSTR. No. _____

CHART 27
32 DAY (-30° + 110° F)
 LOAD CARTRIDGE - ADVANCE CHART
 32 DAY (-30° + 110° F)
 PART NO. 840-95
 PARTLOW THERMA-GARD
 NEW HARTFORD, N.Y. 13413
 START

ORIGINAL - NOT NEGOTIABLE

620

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 its route to said destination. It is mutually agreed, as to each carrier of all or any portion 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 Freight Classification and 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.

THERMAL SCIENCE, INC.
ST. LOUIS, MISSOURI 63026

CONTRACT ORDER TV 92362V

Carrier DYNAMIC TRUCK PREPAID PROTECTIVE SERVICE

6/9 30 19 94

Shipper's No. 21334

Consigned to OMEGA POINT LABORATORY % TVA CONTRACT TV 92362V

Agent's No. _____

Destination 16015 SHADY FALLS ROAD
Route ELMENDORFF, TEXAS 78112

State of _____

(Mail or street address of consignee—for purposes of notification only)

County of _____

Delivering Carrier _____

| No. Packages | HM | KIND OF PACKAGE, DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS | Weight (Sub. to Correction) | Class or Rate | Check Column | No. |
|--------------|----|---|-----------------------------|---------------|--------------|--|
| 1 | ✓ | CARTON TVA PART NO. 158100 | 100 lb | | | Subject to Section 7 conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the part of 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. |
| 2 | ✓ | 16 PCS. ITEM 01 | 300 | | | |
| 1 | ✓ | CARTONS TVA PART NO. 158400 | 150 | | | |
| 1 | ✓ | 28 PCS. ITEM 02 | 90 | | | |
| 1 | ✓ | CARTON TVA PART NO. 238100 | 90 | | | |
| 1 | ✓ | 16 PCS. ITEM 03 | 700 | | | |
| 1 | ✓ | CARTON TVA PART NO. 338300 | 5200 lb | | | |
| 1 | ✓ | 8 PCS. 3 INCH (UPGRADE) ITEM 04 | 2400 | | | |
| 1 | ✓ | CARTON TVA PART NO. 438300 | 120 lb | | | |
| 1 | ✓ | 8 PCS. 3" (UPGRADE) ITEM 05 | 140 lb | | | |
| 1 | ✓ | PALLET TVA PART NO. 1384X6 | 50 | | | |
| 4 | ✓ | 7 EA. THERMO LAG 330 RIBBED PANEL 3/8" THICKNESS 4' x 6' NOM. ITEM 06 | 100 | | | |
| 2 | ✓ | PALLETS TVA PART NO. 1584X6 | 50 | | | |
| 1 | ✓ | 46 PANELS THERMO LAG 330 RIBBED PANEL 5/8" THICKNESS NOM. 4' x 6' ITEM 7 | 100 | | | |
| 1 | ✓ | PALLETS CONTAINING 40 x 50 LB. PAILS THERMO LAG 330-I SUBLIMING COATING TROWEL GRADE ITEM 08 TVA PART TG-330 | 100 | | | |
| 1 | ✓ | 1 x 5 gal. pail containing temp. recorder STORE ABOVE 32 F AND BELOW 100 F AT ALL TIMES | 100 | | | |
| 1 | ✓ | CARTON CONTAINING STRESS SKIN ASTM E437 TYPE 304 -SS Wire/plain weave 8x8 square mesh wire cloth 0.017" DIA. Wire ITEM 09 | 100 | | | |
| 1 | ✓ | CARTON CONTAINING 3 Rolls SS Banding ITEM 11 | 100 | | | |
| 1 | ✓ | 3 Rolls (100 lb.) SS TIE WIRE TYPE 304 ITEM 10 | 100 | | | |
| 1 | ✓ | 1 BOX OF 1000 SS CLIPS ITEM 11 | 100 | | | |
| 1 | ✓ | CARTON TVA PART NO. 158320 | 50 | | | |
| 1 | ✓ | 3/4" 10 PCS ITEM 12 | 100 | | | |
| 1 | ✓ | CARTON TVA PART NO. 238340 | 100 | | | |
| 1 | ✓ | SIZE: 3/4 INCH UPGRADE ITEM 13 (10 PCS.) | | | | |

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 _____

1. Packages 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 Classification.
2. To certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to applicable regulations of the Department of Transportation, the shipper must stamp or 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.
3. If declared value of the property is hereby specifically stated by the shipper to be not exceeding _____.

MENTIONED DIRECTLY DESCRIBED.
WEIGHT _____ LBS.

THERMAL SCIENCE, INC.

Shipper, Per _____
2200 Cassens Dr., St. Louis, MO 63026

Dynamic Transport Agent, Per _____

Post office address of shipper



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. | COND. MATL. Y/N | CERT. RECD. Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|------------------|----------|----------|-------|------|----------------|-----------------|-----------------|---------------------|------------|------------|------|--------|--|
| | | Order | Rec'd | R.O. | | | | | | Accept | Hold | Reject | |
| Stress Skin | NA | 0 | 1 | 0 | SS-008-0170-36 | Y | Y | good | None | X | | | Receiving Verification Only 1 roll - 100' X 36" - 8X8 mesh - 017 mesh |
| | | | | | | | | | | | | | |
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SOLD TO
 3500 Thermal Science
 2200 Cassens Drive
 St. Louis, MO
 63026

SHIP TO
 Omega Point Laboratories
 16015 Shady Falls Road
 Elmendorff, Texas
 78112

| | |
|-----------------------------------|-----------------------------|
| CUSTOMER ORDER NO. 12492 | DATE SHIPPED 8-7-74 |
| DATE ORDER RECEIVED 8/2/74 | SHIPPED VIA UPS Next Day |
| OUR ORDER NO. 12492 | [Barcode] |
| RESALE NO./STATUS Interstate 0 | |
| FREIGHT TERMS | |

UPS-NEXT DAY AIR
 INIT. Ken CONTACT Denise

| QUANTITY ORDERED* | PART NUMBER | DESCRIPTION | NET WT | WIRE | MATERIAL | WIDTH | CODE |
|-------------------|---------------------|-------------|--------|-------|----------|-------|------|
| 300.00 | SS-008-0170-36 M016 | 3X8 | .017 | 304SS | 36" | A | |

314-043-1000

QUANTITY SHIPPED*
 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 TSL/TVA
 CLIENT/PROJECT NUMBER 11960-97257-60+97332-38
 RECEIVED FROM TSL
 PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1430 - 11960
 DATE RECEIVED ~~8-29-94~~ 8/31/94
 DATE INSPECTED ~~8-29-94~~ CH
 INSPECTED BY: C Patton 8/31/94
 CH

| 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 | |
| Stress Skin | NA | 0 | 2 rolls | 0 | SS-008-017-48 | Y | N | Good | None | X | | | Receiving Verification Only |
| SS Tie Wire | NA | 0 | 25 lbs | 0 | 16 ga, annealed type 304 | Y | Y | Good | None | X | | | |
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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. 12569 | DATE SHIPPED |
| DATE ORDER RECEIVED 8/26/94 | SHIPPED VIA UPS Next Day Air |
| OUR ORDER NO. 12569 | |
| RESALE NO./STATUS Interstate 0 | |
| FREIGHT TERMS | |

| | | | |
|-------------------|--------------|-------------------|--------------|
| UPS-NEXT DAY, AIR | INIT. Ken | CONTACT Denise | 314-947-1233 |
|-------------------|--------------|-------------------|--------------|

| QUANTITY ORDERED | DESCRIPTION | QUANTITY SHIPPED |
|------------------|--|------------------|
| 600.00 | SS-008-0170-48 8X8 .017 304SS 48" A I606 150'-0" x 48" | 600.00 |

MATERIAL RECEIVED BY _____

*UNIT OF MEASURE IS SQ. FT. UNLESS OTHERWISE NOTED.

PACKING LISTANDCERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 26 AUGUST 1994

TEMPERATURE RECORDER N/A CHART TAPE NO. N/ATOTAL NO. OF PACKAGES 1 CARTON GROSS WEIGHT 30 LBS.

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|-----------------|---------------------|
| 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

 David O'Bryant
 Manager Quality Control



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,

A handwritten signature in cursive script that reads "David O'Bryant".

David O'Bryant
QC Manager


PACKING LISTANDCERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. 1085-0 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-------------------------------|---------------------|
| 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. 1085-0 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, Revision 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 | DATE OF SHIPMENT December 10, 1993 |
| 6868 Alamo Downs Parkway | PURCHASE ORDER NO: 1085-Q c/o #1 |
| San Antonio, TX 78238 | RELEASE NO: _____ |
| CUSTOMER PART NO: Item #9 | |

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

| <u>LOT NUMBER</u> | <u>QUANTITY</u> | <u>TEST NO:</u> | <u>DESCRIPTION</u> | <u>ANALYSIS</u> | <u>SPECIFICATION</u> |
|-------------------|-------------------|-----------------|--------------------|-----------------|----------------------|
| 93-11049 | 70 X 50 Lb. Pails | A-2 | Wt/Gallon | 10.13 | 10.5 + 1.5 |
| Mfg. Date: | (3500 Lbs) | A-3 | pH | 8.36 | 8 + |
| Dec. 24, 1993 | | | | | |
| Item #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 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: *Blawan* 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 PROTECTION | B |
| EXTREME | 4 | | |

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: ThermoLag 330-1 D.O.T. HAZARD CLASS: none
 PRODUCT CLASS: Latex Fire Resistive Coating 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 | |
| (respirable dust) | | | %SiO ₂ +2 10 mg/m ³ | 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.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: ThermoLag 330-1

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION FLASH POINT : None
OSHA : Non-combustible TEST METHOD:
DOT : Non-combustible

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 continuously 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 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.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: ThermoLag 330-1

631

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 :

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. It is the user's responsibility to determine the suitability of this information for the adoption of the necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available.



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,

A handwritten signature in black ink that reads 'Biff Bradley'. The signature is written in a cursive style with a large, sweeping loop at the end.

Biff Bradley
Senior Project Manager

REB/



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TUA REPORT NUMBER 1A21-11960
 CLIENT/PROJECT NUMBER 11960-97185-87, 97257, 97331, 97260, 97338 DATE RECEIVED 8-25-94
 RECEIVED FROM TSI DATE INSPECTED 8-25-94
 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 | |
| Temperature Records | NA | 0 | 1 | 0 | Chart # 71 #40 | Y | X | GOOD | None | X | | | Receiving Verification only |
| Thermo Lag 330-1 crousel 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 | 1 | 0 | 1584x6 F94-02012 | Y | X | Good | None | X | | | |
| " " | NA | 0 | 1 | 0 | 1584x6 F94-03028 | X | Y | Good | None | X | | | |
| " " | NA | 0 | 4 | 0 | 1584x6 F94-03047 | Y | Y | Good | None | X | | | |
| " " | NA | 0 | 7 | 0 | 1584x6 F94-04005 | Y | Y | Good | None | X | | | |
| " " | NA | 0 | 16 | 0 | 1584x6 F94-07014 | Y | Y | Good | None | X | | | |
| " " | NA | 0 | 1 | 0 | 1584x6 F94-07023 | Y | Y | Good | None | X | | | |
| 4" Thermo Lag 330-1 Preshaped Conduit | NA | 0 | 1 | 0 | 158400 F92-08038 | X | Y | Good | Wore | X | | | |
| 4" Thermo Lag Preshaped Conduit | NA | 0 | 1 | 0 | 158400 F92-10031 | Y | Y | Good | Wore | 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 | | | | | | | | |



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
 CLIENT/PROJECT NUMBER 1960 ^{97185-87 + 97332-38} ₉₇₂₅₈₋₆₀
 RECEIVED FROM TSI
 PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1A21 - 11960
 DATE RECEIVED 8-25-94
 DATE INSPECTED 8-25-94
 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 | |
| 3/4" 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 0.017 dia | Y | Y | Good | None | X | | | |
| | | | | | | | | | | | | | |
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THIS SHIPPING ORDER

must be legibly filled in, in ink, in indelible pencil, or by permanent carbonless impression, and retained by the Agent.

635

RECEIVE, 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 portion 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**

TVA CONTRACT NO. **TV923631**

8/18 19 94 Shipper's No. **21398**

Carrier **DYNAMIC TRANSIT PREPAID**

Agent's No. _____

(Mail or street address of consignee--For purposes of notification only.)

Consigned to **TENNESSEE VALLEY AUTHORITY c/o OMEGA POINT LABORATORIES**

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 (Sub 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 | 2250 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: ✓ 2 CARTONS: TVA PART NO. 158400 29 PIECES 4" ✓ 1 CARTON: TVA PART NO. 238340 10 PIECES 3/4" ✓ 1 CARTON: TVA PART NO. 158340 10 PIECES 3/4" ✓ 1 CARTON: TVA PART NO. 158100 10 PIECES 1" ✓ 1 CARTON: TVA PART NO. 238100 10 PIECES 1" ✓ 1 CARTON: STRESS SKIN ASTM E437 Type 304 ss-plain weave 8x8 square mesh wire cloth | 200 LBS. 90 LBS. 90 LBS. 80 LBS. 90 LBS. 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 \$ _____
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 above 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 _____

CONTENT IS CORRECTLY DESCRIBED

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 on June 30, 1976, may be used through June 30, 1979.

CORRECT WEIGHT IS _____ LBS.

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

PAGE 1 of 10

ANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. TVA CONTRACT NO. TV92362V DATE: 18 AUGUST 1994TEMPERATURE RECORDER 40 CHART TAPE NO. 71TOTAL NO. OF PACKAGES 7 PALLETS GROSS WEIGHT 7350 LBS.

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-------------------------------------|---------------------|
| 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



21398

CERTIFICATE OF ANALYSIS

CUSTOMER

TENNESSEE VALLEY AUTHORITY DATE OF SHIPMENT 18 AUGUST 1994
% OMEGA POINT LABORATORY PURCHASE ORDER NO: TESTING/
16015 SHADY FALLS RD. RELEASE NO: _____
ELMENDORF, TEXAS 78112 CUSTOMER PART NO: _____

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

| <u>LOT NUMBER</u> | <u>QUANTITY</u> | <u>TEST NO:</u> | <u>DESCRIPTION</u> | <u>ANALYSIS</u> | <u>SPECIFICATION</u> |
|-------------------|-----------------------------------|-----------------|--------------------|-----------------|----------------------|
| 94-05093 | 750 LB. (15 x 50 LB. PAISLS | 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. Bryan J DATE: 18 AUGUST 1994 PAGE NO. 1

21398

CERTIFICATE OF ANALYSIS

CUSTOMER

TENNESSEE VALLEY AUTHORITY

DATE OF SHIPMENT 18 AUGUST 1994

%OMEGA POINT LABORATORY

PURCHASE ORDER NO: TESTING/

16015 SHADY FALLS RD.

RELEASE NO: _____

ELMENDORF, TEXAS 78112

CUSTOMER PART NO: _____

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

| <u>LOT NUMBER</u> | <u>QUANTITY</u> | <u>TEST NO:</u> | <u>DESCRIPTION</u> | <u>ANALYSIS</u> | <u>SPECIFICATION</u> |
|-------------------|------------------------------------|-----------------|--------------------|-----------------|----------------------|
| 4-08008 | 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:

David O. Bryant

DATE:

18 AUGUST 1994

PAGE NO. 1

PACKING LISTANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994TEMPERATURE RECORDER 40 CHART TAPE NO. 71TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
| 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 |
| | <u>1</u> | 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

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|------------------|---------------------|
| TVA PART NO. 158400 | 1 PIECE | F92-08038 |
| THERMO LAG PRESHAPED | 1 PIECE | F92-10031 |
| CONDUIT SECTIONS | 4 PIECES | F94-06051 |
| THICKNESS: 0.625" \pm 0.125" NOMINAL | 8 PIECES | F94-06082 |
| SIZE: 4" | <u>15 PIECES</u> | 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

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|----------------------------|---------------------|
| TVA PART NO. 238100 | 7 PIECES | F94-07023 |
| THERMO LAG PRESHAPED CONDUIT SECTIONS | <u>3 PIECES</u> | F94-08003 |
| THICKNESS: 0.375" \pm 0.125" NOMINAL 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 LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|----------------------------|---------------------|
| TVA PART NO. 158340 | 4 PIECES | F94-02053 |
| THERMO LAG PRESHAPED CONDUIT SECTIONS | 6 PIECES | F94-03047 |
| THICKNESS: 0.625" ± 0.125" NOMINAL SIZE: 3/4" | 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 LISTANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994TEMPERATURE RECORDER 40 CHART TAPE NO. 71TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|----------------------------|---------------------|
| TVA PART NO. 238340 THERMO LAG PRESHAPED CONDUIT SECTIONS THICKNESS: 0.375" \pm 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

PACKING LISTANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994TEMPERATURE RECORDER 40 CHART TAPE NO. 71TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|------------------------------------|----------------------------|---------------------|
| 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

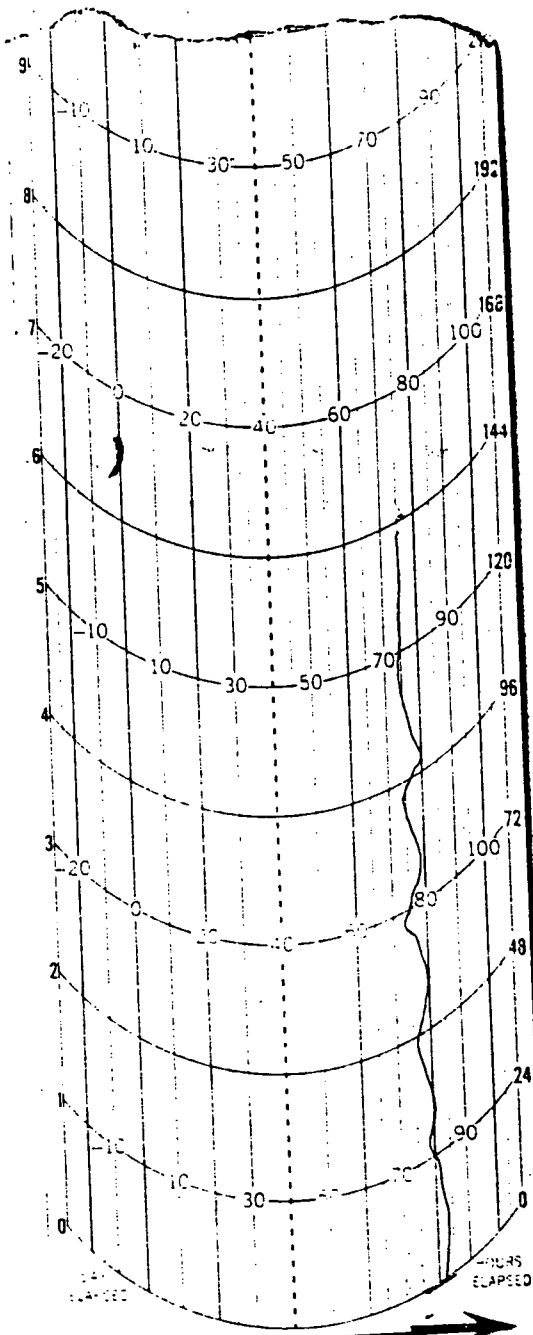
PACKING LISTANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. TVA CONTRACT #TV92362V DATE: 18 AUGUST 1994TEMPERATURE RECORDER 40 CHART TAPE NO. 71TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|--------------------------|---------------------|
| 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



CAR NO. _____
 CITY: San Antonio, TX
 CONSIGNEE: IWA/Co. Omaha, Neb.
 CAR CONT: _____
 PER: _____
 CITY: St. Louis
 SHIPPER: TSI
 DATE: 7/18/54 TIME: 9:56
 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: CRatto

| 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 | R.O. | | | | | | Accept | Hold | Reject | |
| Thermo-Lag panel 1"X4'X6 1/2" | NA | 0 | 1 | 0 | F94-08003 | Y | Y | Good | None | X | | | Thermo-lag 330-1 Inrousel grade update 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 T10-1 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'X6 1/2" | 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 1/2"X0.20"X200' | NA | 0 | 8pc | 0 | NA | Y | Y | Good | None | X | | | |
| Stainless Steel Clips 1/2" | NA | 0 | 1K | 0 | NA | Y | Y | Good | None | X | | | |
| Stainless Steel tie wire 16 gauge | NA | 0 | 1roll | 0 | NA | Y | Y | Good | None | X | | | |
| Stress Skin-ASTME437, 8X8 mesh 0.017 dia | NA | 0 | 1roll | 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 Inrousel grade | NA | 0 | 10 | 0 | 94-08008 | Y | Y | Good | None | X | | | |
| Temp recorder | NA | 0 | 1 | 0 | # 41 | Y | Y | Good | None | X | | | |



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: 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 | |
| Thermo-fag 770-1 trawel grade | NA | 0 | 20 | 0 | 94-09009 | Y | Y | GOOD | None | X | | | Thermo-fag 770-1 trawel grade expired 3/95 |
| | | | | | | | | | | | | | |
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STRAIGHT BILL OF LADING - SHORT FORM - ORIGINAL - NOT NEGOTIABLE

070

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, in accordance with the bill of lading, to the 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.

THERMAL SCIENCE, INC.
ST. LOUIS, MISSOURI 63026
 CONTRACT ORDER NO. TV92362V
 9/23 19 94 Shipper's No. 21467

Carrier DYNAMIC TRANSIT PREPAID Agent's No. _____
 (Mail or street address of consignee—For purposes of notification only.)

Consigned to OMEGA POINT LABORATORIES c/o TVA CONTACT NO. TV92362V

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 6 1/2' ITEM Q1 | 4400# | | |
| 2 | | PALLETS CONTAINING: THERMO LAG PANELS 17 PANELS NOMINAL 5/8" 4' x 6 1/2' ITEM Q2 | 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 3f 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 1/2" 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-fia. wire | 25# | | |
| | | 1 ROLL 1 | | | |

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 or declared value of the property is hereby specifically stated by the shipper to be not exceeding _____

THE SHIPMENT IS CORRECTLY DESCRIBED. _____
 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: Prepaid certificates complying with 49 CFR 173.430 (a) in effect on June 30, 1976, may be used through June 30, 1978.
 Consignor's WEIGHT IS _____ LBS. _____ Shipper

THERMAL SCIENCE, INC. Shipper, Per _____ Agent, Per _____
 Permanent post office address of shipper **2200 Cassens Dr., St. Louis, MO 63026**

PACKING LIST.ANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994TEMPERATURE RECORDER 41 CHART TAPE NO. 71TOTAL NO. OF PACKAGES GROSS WEIGHT 10,300 LBS.

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
| ✓ THERMO LAG RIBBED PANEL | 1 PANEL | F94-08003 |
| NOMINAL 1 " | 20 PANELS | F94-08021 |
| 4' x 6½' | 1 PANEL | F94-08022 |
| | 22 PANELS | |
| | (on 3 pallets) | |

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 TRANSPORT: Dynamic Transit Prepaid

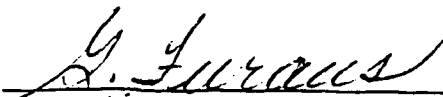
PACKING LIST.ANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994TEMPERATURE RECORDER 41 CHART TAPE NO. 71TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------------------|---------------------|
| ✓ THERMO-LAG 770-1 PANELS | 11 PANELS | F94-08026 |
| 3/8" NOMINAL | 19 PANELS | F94-08030 |
| 40" x 94" NOMINAL | 30 PANELS (on 2 pallets) | |

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
 Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
 BILL OF LADING: 21467
 MODE OF TRANSPORT: Dynamic Transit Prepaid

PACKING LIST.ANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------------------|---------------------|
| THERMO LAG RIBBED PANEL | 1 PANEL | F94-08003 |
| NOMINAL 5/8" | 2 PANELS | F94-08022 |
| 4' x 6½' NOMINAL | 14 PANELS | F94-08044 |
| ITEM 02 | 17 PANELS (on 2 pallets) | |

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
 Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
 BILL OF LADING: 21467
 MODE OF TRANSPORT: Dynamic Transit Prepaid

PACKING LIST.ANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|-----------------------|---------------------|
| ✓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
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
 BILL OF LADING: 21467
 MODE OF TRANSPORT: Dynamic Transit Prepaid

PACKING LIST.ANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994TEMPERATURE RECORDER 41 CHART TAPE NO. 71TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
|----------------------------|-----------------|---------------------|

| | | |
|--|--------|-----|
| ✓ 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
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANSPORT: Dynamic Transit Prepaid



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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--------------------------------|-----------------|---------------------|
| ✓ THERMO-LAG Preshaped Conduit | 5 PIECES | F94-08003 |
| Sections | 11 PIECES | F94-08021 |
| Thickness: 1.250" ± 0.250" | | |
| Size: 5" | 16 PIECES | |
| | (in 2 cartons) | |

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
 Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
 BILL OF LADING: 21467
 MODE OF TRANSPORT: Dynamic Transit Prepaid

PACKING LIST., ANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 23 SEPTEMBER 1994TEMPERATURE RECORDER 41 CHART TAPE NO. 71TOTAL NO. OF PACKAGES See Page 1 GROSS WEIGHT See Page 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
|----------------------------|-----------------|---------------------|


| | | |
|---|------------------------------------|----------|
| ✓ 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 recorderSHELF LIFE SIX MONTHS
FROM DATE OF SHIPMENTSTORE 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
Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
BILL OF LADING: 21467
MODE OF TRANSPORT: Dynamic Transit Prepaid



CERTIFICATE OF ANALYSIS

CUSTOMER

OMEGA POINT LABORATORY DATE OF SHIPMENT 23 SEPTEMBER 1994

%TENNESSEE VALLEY AUTHORITY PURCHASE ORDER NO: CONTRACT #TV 92362V

16015 SHADY FALLS RD RELEASE NO: _____

ELMENDORFF, TX 78112 .CUSTOMER PART NO: _____

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

| <u>LOT NUMBER</u> | <u>QUANTITY</u> | <u>TEST NO:</u> | <u>DESCRIPTION</u> | <u>ANALYSIS</u> | <u>SPECIFICATION</u> |
|-------------------|------------------------------------|-----------------|--------------------|-----------------|----------------------|
| 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: Navid O. Bryant DATE: 23 Sept 1994 PAGE NO. 1

PACKING LIST.ANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
|----------------------------|-----------------|---------------------|

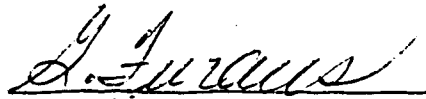
| | | |
|--|-------------------------------------|----------|
| ✓ THERMO LAG 770-1 COATING TROWEL GRADE | 1000 LBS. (20 x 50 Lb. Pails) | 94-09009 |
|--|-------------------------------------|----------|

ITEM 06

EXP. DATE: MARCH 1995

1 x 5 Gal. Pail containing
Temperature RecorderSHELF LIFE SIX MONTHS
FROM DATE OF SHIPMENTSTORE 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 78122. This material does not contain asbestos.


 G. Furaus
 Quality Assurance Manager

DATE OF SHIPMENT: 23 September 1994
 BILL OF LADING: 21467
 MODE OF TRANSPORT: Dynamic Transit Prepaid



CERTIFICATE OF ANALYSIS

CUSTOMER

| | | |
|----------------------------|--------------------|---------------------|
| OMEGA POINT LABORATORY | DATE OF SHIPMENT | 23 SEPTEMBER 1994 |
| TENNESSEE VALLEY AUTHORITY | PURCHASE ORDER NO: | CONTRACT #TV 92362V |
| 16015 SHADY FALLS RD | RELEASE NO: | |
| ELMENDORFF, TX 78112 | CUSTOMER PART NO: | |

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

| <u>LOT NUMBER</u> | <u>QUANTITY</u> | <u>TEST NO:</u> | <u>DESCRIPTION</u> | <u>ANALYSIS</u> | <u>SPECIFICATION</u> |
|-------------------|-------------------------------------|-----------------|--------------------|-----------------|----------------------|
| 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:

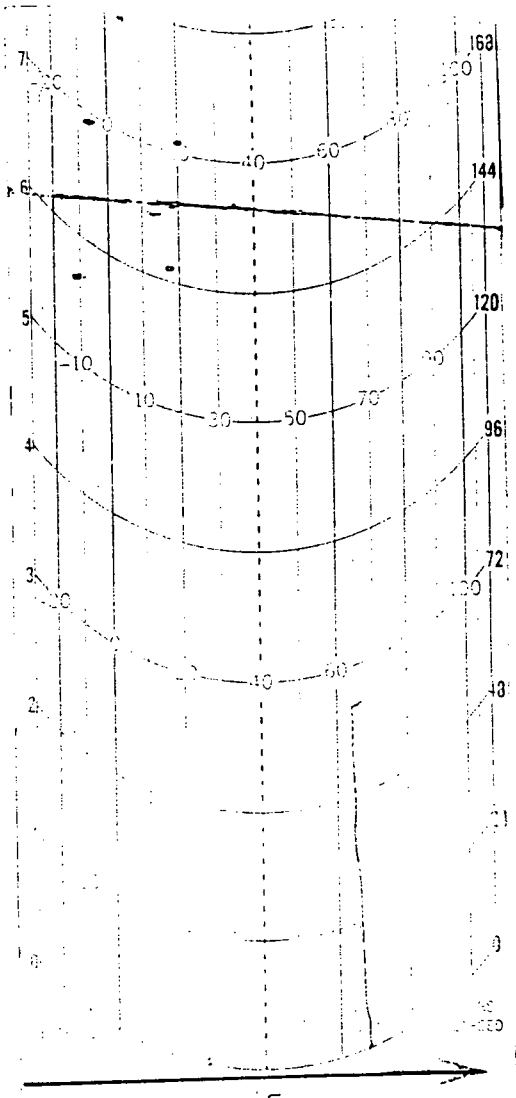
SHELF LIFE: SIX MONTHS FROM DATE OF SHIPMENT
STORE MATERIAL ABOVE 32° F AND BELOW 100° F AT
ALL TIMES

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 Part
 CAR COPY: _____
 PER: _____
 CITY: St. Louis
 SHIPPER: TSL
 DATE: 9-23-94 TIME: 10:15am
 INSTR. NO. _____

CHART 71
 24 HOURS
 30 DAY (-30° + 110° F)
 PART NO. 840-95
 PARTLOW THERMA-GARD
 NEW HARTFORD, N.Y. 10410
 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 PROTECTION | B |
| EXTREME | 4 | | |

SECTION I - PRODUCT IDENTIFICATION

| | | | |
|-----------------|------------------------------|-----------------------|------------------|
| PRODUCT NAME: | Thermo-Lag 770 | D.O.T. HAZARD CLASS: | none |
| PRODUCT CLASS : | Latex Fire Resistive Coating | D.O.T. Shipping Name: | Cold Water Paint |
| | | 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%.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Thermo-Lag 770

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.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Thermo-Lag 770

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 :

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. It is the user's responsibility to determine the suitability of this information for the adoption of the necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available.

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 PROTECTION | B |
| EXTREME | 4 | | |

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: Thermo-Lag 330-1

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:

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) (total dust) | 14808-60-7 | 1-5 % | 30 mg/m ³ | |
| (respirable dust) | | | 10 mg/m ³ | 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.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Thermo-Lag 330-1

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.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Thermo-Lag 330-1

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 :

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. It is the user's responsibility to determine the suitability of this information for the adoption of the necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available.



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA/TS1
 CLIENT/PROJECT NUMBER 11960-97553-55
 RECEIVED FROM TS1
 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 | | | I.D. NO. | COND. MATL Y/N | CERT. RECD Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|----------|---------------------------------------|----------|----------|-------|------|---------------------------|----------------|----------------|---------------------|--------------------|------------|------|--------|---|
| | | | Order | Rec'd | R.O. | | | | | | Accept | Hold | Reject | |
| 1. | TEST ARTICLE 3 STEEL COLUMNS | N/A | 0 | 3 | 0 | SIZE 16" X 36" | N | N | GOOD | REMARKS NONE | X | | | #97553, RECEIVING VERIFICATION ONLY. PART OF PROJECTS #97553 THRU WITH THIS SHPMT, BUT ARE NOT TEST ARTICLES (ITEMS 1-6) RECD. |
| 2. | TEST ARTICLE 1 STEEL COLUMN | N/A | 0 | 1 | 0 | SIZE 10" X 36" | N | N | " | " | X | | | |
| 3. | TEST ARTICLE L 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 1 1/2" | N/A | 0 | 1 | 0 | 1 1/2" 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 | 1 of 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 TS1 | X | | | |
| 11. | 1" THERMO-LAG 330 CONDUIT SECTIONS | N/A | 0 | 3 | 0 | 1 of 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 | | | |

RECEIVING VERIFICATION ONLY



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 | | | I.D. NO. | COND. MATL. Y/N | CERT. RECD. Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS | |
|----------|------------------------------------|----------|----------|-------|------|--------------------|-----------------|-----------------|---------------------|------------|------------|------|--------|------------------------------------|---|
| | | | Order | Rec'd | B.O. | | | | | | Accept | Hold | Reject | | |
| 11. | 1" THERMO-LAG 330 CONDUIT SECTIONS | N/A | 0 | 7 | 0 | 10+ No. F94-08021 | Y | Y | GOOD | None | X | | | RECEIVING VERIFICATION ONLY. CH | CHART REORDER RETURNED TO TSI. TEMPERATURES RECORDED ARE WITHIN ACCEPTABLE RANGE. |
| 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 | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | |

STRAIGHT BILL OF LADING - SHORT FORM - ORIGINAL - NOT NEGOTIABLE

669

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 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 transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

THERMAL SCIENCE, INC.
ST. LOUIS, MISSOURI 63026

TVA CONTRACT 92362V

At ST. LOUIS, MISSOURI 63026 Date 10/7/94 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 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 | 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. |
|--------------|----|---|-----------------------------|---------------|--------------|--|
| 1 | | PALLET CONTAINING 3 COLUMNS 16 x 50 1 COLUMN 10' x 49 3 FT. LONG (ED TAYLOR) | 800 Lb | | | Per _____ (Signature of Consignor.) If charges are to be prepaid, write or stamp here, "To be Prepaid." P P d 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 _____ |
| 1 | | PALLET CONTAINING 3 INCH CONDUIT U SHAPE TEST ARTICLE | 400 LB. | | | |
| 1 | | PALLET CONTAINING: 3 INCH CONDUIT 10 FT. STRAIGHT 1 1/2 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 6 1/2' NOMINAL THICKNESS: 1.25" + 0.250" ITEM 1 | 1800 LB. | | | |
| 1 | | PALLET CONTAINING: 10 x 50 LB. PAILS THERMO LAG 330-1 SUBLIMING COATING ITEM 5 20 x 50 LB. PAILS THERMO LAG XXX 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) | 125 lb. | | | |
| 1 | | CARTON OF 2" x 1.250" 16 Pcs. (12) | 100 Lb. | | | |
| 1 | | CARTON CONTAINING: 1 ROLL THERMO LAG 440-75 HI TEMP FABRIC SIZE: 42 INCH X 60 YDS. 30 LB. | 30 LB. | | | |

† 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 amount 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. _____ Per _____ Shipper

THERMAL SCIENCE, INC. Shipper, Per Jane Elizabeth Agent, Per _____
 Permanent post office address of shipper 2200 Cassens Dr., St. Louis, MO 63026



PACKING LIST

SHIP TO:

| | | |
|----------------------------------|-----------------|-------------------|
| OMEGA POINT LAB. | P.O.# | TEST ARTICLE |
| 16015 SHADY FALLS RD | RELEASE NO: | |
| ELMENDORFF, TX 78112 | 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 QUANTITY | 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 Poyard
HEAD OF SHIPPING



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: 1 PALLET

GROSS WEIGHT: 800 LB. LBS

| PRODUCT DESCRIPTION | NET QUANTITY | 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 Pozars
HEAD OF SHIPPING

PACKING LISTANDCERTIFICATE 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.

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|---------------------------|---------------------|
| THERMO LAG 330 PREFABRICATED PANELS | 7 PANELS | F94-08021 |
| SIZE: 4' x 6½' NOMINAL THICKNESS: 1.250" ± 0.250" | 1 | F94-08022 |
| ITEM 1 | 8 PANELS (ON 1 PALLET) | |

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

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|-----------------|---------------------|
|----------------------------|-----------------|---------------------|

| | | |
|---------------------------------------|-----------------------------------|----------|
| THERMO LAG 330-1 SUBLIMING COATING | 500 LB. (10 x 50 LB. PAILS) | 94-08008 |
|---------------------------------------|-----------------------------------|----------|

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

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
 MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 7 OCTOBER 1994
 BILL OF LADING: 21494
 MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

PACKING LIST.ANDCERTIFICATE OF CONFORMANCEPURCHASE ORDER NO. CONTRACT ORDER NO. TV92362V DATE: 7 OCTOBER 1994TEMPERATURE RECORDER SEE PAGE 1 CHART TAPE NO. SEE PAGE 1TOTAL NO. OF PACKAGES SEE PAGE 1 GROSS WEIGHT SEE PAGE 1


| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|---------------------|---------------------|
| 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 SHIPMENTSTORE 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
 MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 7 OCT. 1994
 BILL OF LADING: 21494
 MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

21494

CERTIFICATE OF ANALYSIS

CUSTOMER

TENNESSEE VALLEY AUTHORITY DATE OF SHIPMENT 7 OCTOBER 1994
OMEGA POINT LABORATORY PURCHASE ORDER NO: CONTRACT TV 92362V
16015 SHADY FALLS ROAD RELEASE NO: _____
ELMENDORFF, TX 78112 CUSTOMER PART NO: _____

PRODUCT DESCRIPTION: THERMO LAG 330-1 SUBLIMING COATING TROWEL GRADE

| <u>LOT NUMBER:</u> | <u>QUANTITY</u> | <u>TEST NO:</u> | <u>DESCRIPTION</u> | <u>ANALYSIS</u> | <u>SPECIFICATION</u> |
|--------------------|----------------------------------|-----------------|--------------------|-----------------|----------------------|
| 94-08008 | 500 LB. (10 x 50 Lb. PAIS) | 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 PAGE NO. 1

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|--------------------------|---------------------|
| 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 | | |
| NO SHELF LIFE ON CONDUIT | 24 PCS. (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
 MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 7 OCTOBER 1994
 BILL OF LADING: 21494
 MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

PACKING LIST.ANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-----------------|---------------------|
| THERMO LAG 330 PRESHAPED CONDUIT SECTIONS | 3 PIECES | F94-08021 |
| | <u>13</u> | F94-08022 |
| SIZE: 2" | 16 PCS. | |
| THICKNESS: 1.250" ± 0.250" | (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

PACKING LIST.ANDCERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: 7 OCTOBER 1994

TEMPERATURE RECORDER SEE PAGE 1 CHART TAPE NO. SEE PAGE 1

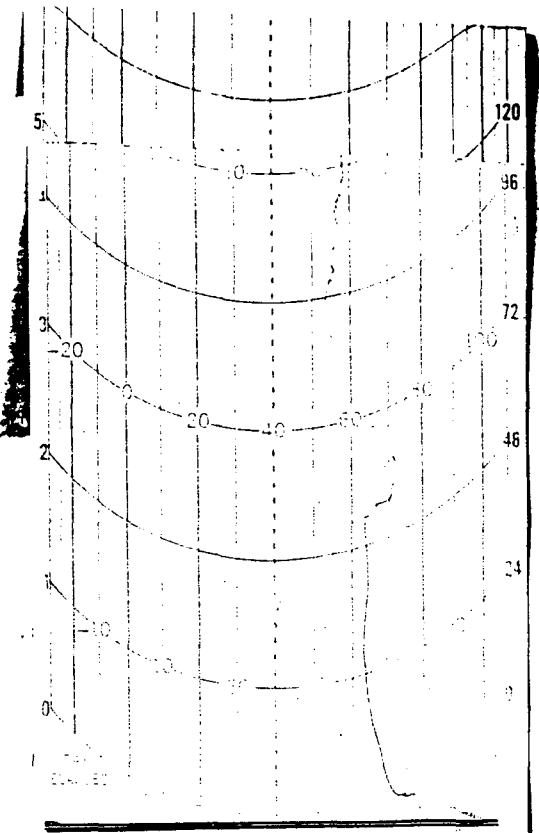
TOTAL NO. OF PACKAGES SEE PAGE 1 GROSS WEIGHT SEE PAGE 1

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|---|-----------------|---------------------|
| THERMO LAG 440-75 HIGH TEMPERATURE FABRIC SIZE: 42 INCH WIDE X 60 YDS. ITEM 14 | 1 ROLL | NA |

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



CAR No. _____
 CITY San Antonio, TX.
 CONSIGNEE TVA - Omega Plant
 CAR CONT. _____
 PER. _____
 CITY St. Louis
 SHIPPER TSL
 DATE 10-8-74 TIME 8715
 INSTR. No. _____

CHART 27
 2. FILL BY DATA
 1. LOAD CAPACITY - 4000 LBS
 32 DAY (-30° + 110° F)
 PART NO. 840-95
FARTLOW THERMAL-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 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:

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) (respirable dust) | 14808-60-7 | 1-5 % | 30 mg/m ³ | |
| | | | %SiO ₂ +2 10 mg/m ³ | 0.1 mg/m ³ |
| Ammonia Fibrous glass,continuous filament (total dust) (respirable dust) | 1336-21-6 | < 0.1 % | 50 ppm | 25 ppm |
| | 65997-17-3 | 1-5 % | 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 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.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: ThermoLag 330-1

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION FLASH POINT : None
OSHA : Non-combustible TEST METHOD:
DOT : Non-combustible

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 continuously 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 adaaquate incinerator or bury in an approved landfill.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION TYPE : Mechanical local exhaust at point of mist release is preferred.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: ThermoLag 330-1

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 :

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. It is the user's responsibility to determine the suitability of this information for the adoption of the necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available.

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 PROTECTION | B |
| EXTREME | 4 | | |

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%.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Thermo-Lag 770

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.

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MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Thermo-Lag 770

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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 :

The Information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. It is the user's responsibility to determine the suitability of this Information for the adoption of the necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available.



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. RECD. Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|-----------------------------------|----------|----------|-------|------|-----------|-----------------|-----------------|---------------------|------------|------------|------|--------|------------------------------|
| | | Order | Rec'd | B.O. | | | | | | Accept | Hold | Reject | |
| Thermos 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 | | | |
| Thermos Lag Pre Shaped Conduit 4" | NA | 0 | 8 | 0 | F94-08024 | Y | Y | GOOD | None | X | | | |
| | | | | | | | | | | | | | |
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RECEIVE, 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 the 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, if mutually agreed, as to each carrier of all or any portion 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.

SHIPPER'S NAME: THERMAL SCIENCE, INC. ST. LOUIS, MISSOURI 63026
 DATE: 10/12/1994
 CARRIER: DYNAMIC TRUCK PREPAID
 SHIPPER'S NO. _____
 AGENT'S NO. _____

CONSIGNEE TO: TENNESSEE VALLEY AUTHORITY % OMEGA POINT LAB
 DESTINATION: 16015 SHADY FALLS RD State of _____ County of _____
 ROUTE: ELMENDORFF, TX 78122
 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 BAG 770 - PERMITS SIZE: 40 INCH X 94 INCH THICKNESS: 3/8 INCH ITEM 4 | 1800 LB. | | |
| 1 | | CARTON CONTAINING: 8 PCS. THERMO BAG 330 PRESHAPED CONDUIT SECTIONS SIZE: 4 INCH THICKNESS: 1.250 - 1.0.250 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 \$ _____ apply in prepayment of the charges on the proper described hereon.

Agent or Cashier _____

Per _____
 (The signature he 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. WEIGHT IS _____ LBS.
 Per *Jane Elvick* Shipper

THERMAL SCIENCE, INC. Shipper, Per _____
 Permanent post office address of shipper: 2200 Cassens Dr., St. Louis, MO 63026
 Agent must detach and retain this Shipping Order and must sign the Original Bill of Lading.

PACKING LIST.ANDCERTIFICATE OF CONFORMANCE

PURCHASE ORDER NO. _____ CONTRACT ORDER NO. TV92362V DATE: OCTOBER 1994

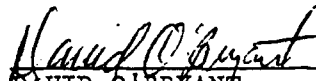
TEMPERATURE RECORDER NA CHART TAPE NO. NATOTAL NO. OF PACKAGES 5 PIECES GROSS WEIGHT 5000 LB.

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|----------------------------|------------------|---------------------|
| THERMO LAG 770-1 PANELS | 5 PANELS | F94-08026 |
| SIZE: 40 INCH X 94 INCH | 40 | F94-08030 |
| THICKNESS: 3/8 INCH | 18 | F94-09009 |
| | <u>63 PANELS</u> | |

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

MANAGER OF QUALITY CONTROL

DATE OF SHIPMENT: 12 OCTOBER 1994
 BILL OF LADING: 21499
 MODE OF TRANSPORT: DYNAMIC TRUCK PREPAID

PACKING LISTANDCERTIFICATE 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

| <u>PRODUCT DESCRIPTION</u> | <u>QUANTITY</u> | <u>BATCH NUMBER</u> |
|--|-------------------------|---------------------|
| 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



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. RECD 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 were loose upon delivery; 6 pieces were damaged slightly, 2 ladders and 2 double crosses. | |
| galv. ladders | NA | 0 | 5 | 0 | 06-1402-0012-18 | Y | N | POOR | None | X | | | |
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BWT-855E WBN-SWEC-R94-1665 EA
 105129 4/5/94 ITEM 1
 REG:3/4/94 LEVEL III
 TRAY, CABLE STRAIGHT, METAL LADDER TYPE
 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

WBN-SWEC-R94-1665 EA
 ITEM 2
 LEVEL III
 TRAY, CABLE STRAIGHT, METAL LADDER TYPE
 W/RUNGS ON 6" CENTERS, HOT DIPPED
 GALVANIZED, WT 47.2
 18"WD X 4"SIDE RAIL X 12" LONG
 P/N SKQ210-05
 LEVEL C DMM/6210
 FOR USE WITH ELECTRICAL RACEWAY FIRE
 BARRIER SYSTEMS TESTING

SHADY FALLS RD TX 78112
ELMENDORF 05916702

QUINT
FREIGHT BILL NUMBER
345 608 583
CITY RATE/BYD SCAC
2M
DEST
SNT
PICK UP DATE
05/16/94
ORIG
KNX

VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT
SPRING CITY TN 37381
00994265
ADV CAR NONE
BL#
AD

PO# NONE
OVERNITE PHONE NUMBER
20
107662-0766

W. Jessy



COLLECT THIS AMOUNT \$6
DRIVER COL

OVERNITE TRANSPORTATION COMPANY

| # PCS | HM | PT | DESCRIPTION OF ARTICLES AND SPECIAL MARKINGS | WEIGHT | NMFC | RATE | CHARGES |
|---------|----|----|--|--------|-----------|---------------|---------------------------|
| 2 | | | 2 SK CABLE TRAYS 58.00% DISCOUNT 80205 HANDLING UNITS | 300 | 061220-02 | 49.01 LESS | 147. 85. |
| TTL PCS | | | TTL WT | 300 | | | TOTAL CHARGES \$1.75 C |



Loose upon Del

SIGNATURE
[Signature]
FIRM
[Firm Name]

ODOM
009
ARRIVE
9:16
DEPART
9:45
DATE
5/23/94
PCS
11A
INITIALS
ROW

RECEIVED THE ABOVE PROPERTY IN GOOD CONDITION EXCEPT AS NOTED.



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TS1/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. | COND. 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 | A3L6043612LP | 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 | Y | N | good | None | X | | | |
| 1" cap | NA | 0 | 2 | 0 | PLG100R | Y | N | good | None | X | | | |
| 2" cap | NA | 0 | 5 | 0 | PLG200A | Y | 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 | Y | N | good | None | X | | | |
| w/covers & gaskets | | | | | | | | | | | | | |

SHIPPING TICKET

SHIPPER **TENNESSEE VALLEY AUTHORITY**

POINT OF ORIGIN **NEAR ATHENS, AL 35611 7/14 19 94**

SHIPPING ROOM **BROWNS FERRY NUCLEAR PLANT**

AUTHORITY **DAN OLIVER-HGR-H&PS-BFNP 894**

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, #CAL3AELL | | 1 | EA | | |
| 9 | | ELBOW, 90 DEG, 3/4", ALUM, #ALU3AELL | | 1 | EA | | |
| 10 | | ELBOW, 90 DEG, 4", STEEL, #CAL4ELL | | 7 | EA | | |
| 11 | | CAP, 1", #PLG100R | | 2 | EA | | |
| 12 | | CAP, 2", #PLG200A | | 5 | EA | | |
| 13 | | CAP, 3", #PLG300A | | 1 | EA | | |
| 14 | | COUPLING, 3/4", ALUMINUM | | 2 | EA | | |
| 15 | | CONDUIT OUTLET, 4" | | 7 | EA | | |

QA-0

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 NAME OF CARRIER MATERIAL CHECKED IN BY STORES LEDGER POSTED BY
DIE

0115008526

TRACKING NUMBER 0115008526

695

RECIPIENT'S COPY

Date 7-14-94

From (Your Name) Please Print
DANNY T. ROBINSON

Your Phone Number (Very Important)
(205-729-4641)

To (Recipient's Name) Please Print

Recipient's Phone Number (Very Important)

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.)

16015 SHADY FALLS ROAD

City
ATHENS

State
AL

ZIP Required
3 5 6 1 1

City
ELMENDORF

State
TX

ZIP Required
78112-9784

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

PAYMENT Bill Sender 2 Bill Recipient's FedEx Acct. No. 3 Bill 3rd Party FedEx Acct. No. 4 Bill Credit Card

IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here

Street Address
City
State
ZIP Required

SERVICES (Check only one box)

DELIVERY AND SPECIAL HANDLING (Check services required)

| PACKAGES | WEIGHT in Pounds OZ | YOUR DECLARED VALUE (See right) |
|----------|---------------------|---------------------------------|
| 1 | 223 | |
| 1 | 458 | |
| 1 | 975 | |
| Total | Total | Total |
| 3 | 1056 | |

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 _____

- 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*

- Weekday Service** (Fill in Section H)
- HOLD AT FEDEX LOCATION WEEKDAY
 - DELIVER WEEKDAY
- Saturday Service** (Fill in Section H)
- HOLD AT FEDEX LOCATION SATURDAY
 - DELIVER SATURDAY (Extra charge) (Not available to all locations)
 - SATURDAY PICK-UP (Extra charge)
- Special Handling**
- DANGEROUS GOODS (Extra charge)
 - DRY ICE (Dangerous Goods Shipper's Declaration not required)
 - HOLIDAY DELIVERY (Extra charge)

DIM SHIPMENT (Chargeable Weight)

_____ lbs.

L x W x H

Received At

- Regular Stop
- Drop Box
- B.S.C.
- Station

REVISION DATE 3/94
PART #137204-FXEM 5/94
FORMAT #158

158

© 1992-93 FEDEX
PRINTED IN U.S.A.

5/20/94

090

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: A. 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 | |
| 12" Radial Bend | NA | - | 1 | - | 06-1079-9112-12-4 | Y | N | Good | None | X | | | Receiving Verification only. 118" cable tray is damaged; (2) 24" 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 | - | 90lb sheeting 1/2" turned edges | X | N | " | " | X | | | |
| Splice plates | NA | - | 4 | - | 1079-1302-22 | Y | N | " | " | X | | | |
| Hinged Splice plts | NA | - | 2 | - | 1079-1302-02 | Y | N | " | " | X | | | |
| Cable lbrags | NA | - | 1 | - | Reel #12963 | X | N | " | " | X | | | |
| Nuts/Bolts | NA | - | 488 | - | N/A | Y | N | " | " | X | | | |



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 | | | I.D. NO. | COND. MATL. Y/N | CERT. RECD Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|--------------------|----------|----------|-------|------|----------|-----------------|----------------|---------------------|------------|------------|------|--------|---|
| | | Order | Rec'd | R.O. | | | | | | Accept | Hold | Reject | |
| 3/4" Alum 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 | | | I.D. NO. | COND. MATL. Y/N | CERT. RECD. Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|---------------------|----------|----------|-------|------|----------|-----------------|-----------------|---------------------|------------|------------|------|--------|--|
| | | Order | Rec'd | R.O. | | | | | | Accept | Hold | Reject | |
| 4" steel LB | NA | - | 5 | - | BTY-191Y | Y | N | Good | None | X | | | Receiving Verification Only NON SAFETY-RELATED MATERIAL. CH |
| 3/4" Steel Coupling | NA | - | 2 | - | BEV-325X | Y | N | " | " | X | | | |
| 1" Steel Coupling | NA | - | 4 | - | BLD-538F | Y | 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 | - | BTX-644K | Y | N | " | " | X | | | |
| 2" Alum Coupling | NA | - | 5 | - | BEV-326V | Y | N | " | " | X | | | |
| 2.5" Alum Coupling | NA | - | 1 | - | BGW-557N | Y | N | " | " | X | | | |
| 3" Alum Coupling | NA | - | 4 | - | BET-731P | Y | N | " | " | X | | | |
| 4" Alum Coupling | NA | - | 8 | - | BET-732M | Y | N | " | " | X | | | |
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SHIPPING TICKET

MISSISSIPPI VALLEY AUTHORITY

NEAR, ATHENS, AL. 35611 5-25-94

SHIPPER

POINT OF ORIGIN

SHIPPING ROOM BROWNS FERRY NUCLEAR PLANT

AUTHORITY DAN OLIVER, SUPV., MGS

TO
 OMEGA POINT LAB
 16015 SHADY FALLS ROAD
 ELMBORF, 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-542M | 2 | PC | | |
| 2. | 5 | Conduit, 2" Aluminum | AVK-543K | 5 | PC | | |
| 3. | 1 | Conduit, 2.5" Aluminum | BKH-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. | 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 | BEY-741J | 1 | PC | | |
| 11. | 1 | Conduit LB, 3/4" aluminum | BTY-197J | 1 | EA | | |
| | 5 | Conduit LB, 2" aluminum | BTY-256W | 5 | EA | | |
| | 1 | Conduit LB, 2.5" aluminum | BTY-260H | 1 | EA | | |
| | 4 | Conduit LB, 3" aluminum | BTY-265V | 4 | EA | | |
| 15. | 1 | Conduit LB, 3/4" Stl | BTY-196L | 1 | EA | | |
| 16. | 2 | Conduit LB, 1" Stl | BTH-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-557H | 1 | EA | | |
| 25. | 4 | Conduit Coupling, 3" Aluminum | BET-731P | 4 | EA | | |
| 26. | 8 | Conduit Coupling, 4" Aluminum | XBET-732M | 8 | EA | | |

This material shipped per memo from Claudia Dyar of 5-25-94 for Thermomag Test

REFERENCE TRACKING #9400031847
 QA III

SHIPPED BY OVERSITE PER INSTRUCTIONS FROM K. WRIGHT/F. PRIZST

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

DATE SHIPPED 5-25-19 94 G. B. L. No. TV N/A METHOD OF SHIPMENT OVERSITE

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 NAME OF CARRIER, BURT MATERIAL CHECKED IN BY STORES LEDGER POSTED BY

201

CONSIGNEE

CUSTOMER COPY (BLUE)

OMEGA POINT LAB

015 SHADY FALES RD
MENDORF

TX 78112

6358100

INBOUND TRAILER

288858 OVNT

FREIGHT BILL NUMBER

391 634 025

CITY RTE/BYD/SCAC

2M

PICK UP DATE

05/25/94

SHIPPER

TVA

NUCLEAR PLANT
BROWNS FERRY RD
ATHENS

02521271

ADV CAR

BL#

5569400740

AD

OV

BD

391 634 025

AL 35611

(205)729-2000

PO# NONE

OVERNITE PHONE NUMBER

(210)662-0966

DEST

SNT

ORIG

DCT

31

DELIVERY RECEIPT COPY: 1

OVERNITE TRANSPORTATION COMPANY




COLLECT THIS AMOUNT

\$. 0

\$. 0

391 634 025

| # PCS | HM | PT | DESCRIPTION OF ARTICLES AND SPECIAL MARKINGS | WEIGHT | NMFC | RATE | CHARGES |
|-------------------|----|----|---|--------|-----------|--------|---------------|
| 4 | | | 4 HANDLING UNIT(S) SK CONDUIT & FITTING SECTION 7 SIGNED BILL TO: 00501491 ★ 80205  | 2567 | 050940-00 | | |
| 4 ← TTL PCS | | | | 2567 | | | |
| LIVERY EXCEPTIONS | | | SIGNATURE | FIRM | ODOM | ARRIVE | DEPART |
| | | | <i>Cloda Patton</i> | | | | |
| | | | RECEIVED THE ABOVE PROPERTY IN GOOD CONDITION EXCEPT AS NOTED | | | DATE | INITIALS |
| | | | | | | PCS | |
| | | | | | | | TOTAL CHARGES |
| | | | | | | | P. |

Conduit bent
begun June 6-2-94



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: CRallon

| 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 AWA-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 BIN-409R | Y | N | Good | None | X | | | |
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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. RECD. Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|------------------|----------|----------|-------|------|----------|-----------------|-----------------|---------------------|------------|------------|------|-----------------------------|---------|
| | | Order | Rec'd | R.O. | | | | | | Accept | Hold | Reject | |
| 3/4" strap 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 | | | |
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TENNESSEE VALLEY AUTHORITY
SHIPPING TICKET

No. 856-94-00877

SHIPPER TENNESSEE VALLEY AUTHORITY POINT OF ORIGIN NEAR ATHENS, AL. 35611 07/15 19 94
 SHIPPING ROOM BROWN'S FERRY NUCLEAR PLANT AUTHORITY DAVE OLIVER, SRV. M&PS 705

SHIP TO OMEGA POINT LAB
16015 SHADY FALLS RD.
ELENDORF, AL. 36112

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 | | STRAP 3/4" MAL IRON | | 4 | EA | | |
| 2 | | PLUG 2 1/2". | | 1 | EA | | |
| THIS MATERIAL SHIPPED FOR THERMOLAC TEST. | | | | | | | |
| KEY : 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 _____ MATERIAL RECEIVED _____ 19 _____
 CARRIER'S NAME OF _____
 CHARGE CARRIER _____
 DELIVERY MATERIAL CHECKED _____
 CHARGES IN BY _____
 TOTAL STORES LEDGER _____
 COST _____ 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.

AIRBILL - PACKAGE TRACKING NUMBER

0115008530

41504

0115008530

RECIPIENT'S COPY

Date 7-15-74

From (Your Name) Please Print: TVA/BROWNS FERRY NUCLEAR PLT; Your Phone Number (Very Important): (205) 720-4641; To (Recipient's Name) Please Print: Omega Point Lab; Recipient's Phone Number (Very Important):

Company: TVA/BROWNS FERRY NUCLEAR PLT; Department/Floor No.; Company: Omega Point Lab; Department/Floor No.:

Street Address: BROWN'S 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: 35011; City: Elwood; State: TX; ZIP Required: 75012

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.); IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here

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

SERVICES (Check only one box); DELIVERY AND SPECIAL HANDLING (Check services required); PACKAGES; WEIGHT in Pounds Only; YOUR DECLARED VALUE (See right)

Priority Overnight (Delivery by next business morning); Standard Overnight (Delivery by next business afternoon, No Saturday delivery); 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)

Economy Two-Day (Delivery by second business day); Government Overnight (Restricted for authorized users only); Special Handling: 4 DANGEROUS GOODS (Extra charge); 6 DRY ICE (Dangerous Goods Shipper's Declaration not required); DIM SHIPMENT (Chargeable Weight)

Freight Services: 70 OVERNIGHT FREIGHT; 80 TWO-DAY FREIGHT; Received At: 1 Regular Stop; 2 On-Call Stop; 3 Drop Box; 4 B.S.C.; 5 Station; 7 Release Signature

REVISION DATE 3-94 PART 117100-1-EM FORMAT #158 158 PRINTED IN U.S.A.



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA REPORT NUMBER 1392-11960
 CLIENT/PROJECT NUMBER 11960-97185, 86, 87 DATE RECEIVED 7-7-94
 RECEIVED FROM TVA DATE INSPECTED 7-8-94
 PROJECT LOCATION Omega Point Labs INSPECTED BY: @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 | |
| 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 | | | |
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Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TS1/TVA
 CLIENT/PROJECT NUMBER 11960-97257-60+9732-38
 RECEIVED FROM TVA
 PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1429-11960
 DATE RECEIVED 8-29-94
 DATE INSPECTED 8-29-94
 INSPECTED BY: 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 | |
| 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 | | | |
| 2 1/2-3" LB Covers | NA | 0 | 5 | 0 | BBT792M | Y | N | Good | None | X | | | |
| 2 1/2-3" 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 | | | |
| | | | | | | | | | | | | | |
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SHIPPER J.M. WILLIAMS POINT OF ORIGIN NEAR SPRING, CITY, TN 37381 8-26, 94

LOADING ROOM WATTS BAR NUCLEAR PLANT AUTHORITY R.D. HALL PROJ MGR H.E. 709

TO **OMEGA POINT LABORATORIES, INC**
16015 SHADY FALLS RD
ELMENDORF, TN 37112
ATTN: MARK SALLEY

ACCT NO. (DO NOT INCLUDE TRANSPORTATION CHARGES)
DEBIT
00014P9

BILL TO

CREDIT

| ITEM | QUANTITY ORDERED | DESCRIPTION | PSC - ITEM NO. BIN No. | QUANTITY DELIVERED | UNIT | UNIT PRICE | AMOUNT |
|------|------------------|------------------------|------------------------|--------------------|------|------------|--------|
| 1 | | 4 IN LB | BMB329W | 5 ✓ | EA ✓ | | |
| 2 | | 4 IN GASKET | BMB330P | 5 ✓ | EA ✓ | | |
| 3 | | 1 IN LG COVER | BPP177W | 2 ✓ | EA ✓ | | |
| 4 | | 2-1/2 - 3 IN LB COVER | NBT792M | 5 ✓ | EA ✓ | | |
| 5 | | 2-1/2 - 3 IN LB GASKET | BGP836C | 5 ✓ | EA ✓ | | |
| 6 | | 1 IN GASKET BPQ043N | | 2 ✓ | EA ✓ | | |
| 7 | | 2 IN GASKET | BCK730W | 5 ✓ | EA ✓ | | |
| 8 | | 2 IN LB COVER AQP157H | | 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-MDA

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 REPORT NUMBER 1425-11960
 CLIENT/PROJECT NUMBER 11960-97185-87 + 97332-38 DATE RECEIVED 8-26-94
 RECEIVED FROM TVA DATE INSPECTED 8-26-94
 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 | | |
| 1" galv conduit | NA | 0 | 100' | 0 | AWD-015W | Y | N | Good | None | X | | | Receiving Verification Only | |
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TENNESSEE VALLEY AUTHORITY
SHIPPING TICKET

No. 35694-01057 711

SHIPPER **TENNESSEE VALLEY AUTHORITY**

POINT OF ORIGIN **NEAR, ATHENS, AL. 35611 8-24-94**

SHIPPING ROOM **BROWNS FERRY NUCLEAR PLANT**

AUTHORITY **DAN OLIVER, SUPV., W&PS**

SHIP TO
**OMEGA POINT LAB
16015 SHAWT FALLS ROAD
KLENDORF, 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., 1.9 IN. Dia X 10 FT LG Shipped per the attached letter. Thermolag Fire and Ampacity Testing. QA III | AWD-015W | 100 | FT | | |

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

DATE SHIPPED 8-24 1994 G. B. L. No. TV N/A METHOD OF SHIPMENT FEDEX *H/10 #12*

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 _____ MATERIAL RECEIVED _____ 19 _____
CARRIER'S CHARGE **ONE FC BURT**
DELIVERY CHARGES _____ CARRIER _____
TOTAL COST _____ 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.

Claudio Hyde for

R.P. Hyde
Lead Procurement Engineer
Browns Ferry Nuclear Plant



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

756 120 1303

713

4131M

9569284303

RECIPIENT'S COPY

| | | | |
|--|--|---|---|
| Date | | | |
| From (Your Name) Please Print | | Your Phone Number (Very Important) | To (Recipient's Name) Please Print |
| Company | | Department/Floor No. | Company |
| Department/Floor No. | | Department/Floor No. | Department/Floor No. |
| Street Address | | Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.) | |
| City | State | ZIP Required | City |
| YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice) | | IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here | |
| PAYMENT <input type="checkbox"/> Bill Sender <input type="checkbox"/> Bill Recipient's FedEx Acct. No. <input type="checkbox"/> Bill 3rd Party FedEx Acct. No. <input type="checkbox"/> Bill Credit Card <input type="checkbox"/> Cash <input type="checkbox"/> Check | | Street Address | |
| City | | State | ZIP Required |
| 4 SERVICES (Check only one box) | | 5 DELIVERY AND SPECIAL HANDLING (Check services required) | |
| 11 <input type="checkbox"/> OTHER PACKAGING 16 <input type="checkbox"/> FEDEX LETTER* 12 <input type="checkbox"/> FEDEX PAK* 13 <input type="checkbox"/> FEDEX BOX 14 <input type="checkbox"/> FEDEX TUBE | 51 <input type="checkbox"/> OTHER PACKAGING 56 <input type="checkbox"/> FEDEX LETTER* 52 <input type="checkbox"/> FEDEX PAK* 53 <input type="checkbox"/> FEDEX BOX 54 <input type="checkbox"/> FEDEX TUBE | 31 <input type="checkbox"/> HOLD AT FEDEX LOCATION SATURDAY (Fall in Section H) 9 <input type="checkbox"/> SATURDAY PICK-UP (Extra charge) (Not available to all locations) 4 <input type="checkbox"/> DANGEROUS GOODS (Extra charge) 6 <input type="checkbox"/> DRY ICE (Dangerous Goods Shipper's Declaration not required) 12 <input type="checkbox"/> HOLIDAY DELIVERY (if offered) (Extra charge) | 6 DIM SHIPMENT (Chargeable Weight) L x W x H Received At: <input type="checkbox"/> Regular Stop <input checked="" type="checkbox"/> Drop Box <input type="checkbox"/> On-Call Stop <input type="checkbox"/> BSC <input type="checkbox"/> Station |
| 30 <input type="checkbox"/> ECONOMY* 46 <input type="checkbox"/> GOVT LETTER 41 <input type="checkbox"/> GOVT PACKAGE | | Emp. No. _____ Date _____ <input type="checkbox"/> Cash Received <input type="checkbox"/> Return Shipment <input type="checkbox"/> Third Party <input type="checkbox"/> Chg. To Del. <input type="checkbox"/> Chg. To Hold Street Address _____ State _____ Zip _____ Received By: X Date/Time Received _____ FedEx Employee Number _____ | |
| 70 <input checked="" type="checkbox"/> OVERNIGHT FREIGHT** (Confirmed reservation required) | | Federal Express Use Base Charges _____ Other 1 _____ Other 2 _____ Total Charges _____ REVISION DATE 3/94 PART # 137204 FXEM 4/94 FORMAT #158 158 © 1992-93 FEDEX PRINTED IN U.S.A. | |



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TS1/TVA REPORT NUMBER 1414 . 11960
 CLIENT/PROJECT NUMBER 11960-97185-87+97257-6 DATE RECEIVED 8-10-94
 RECEIVED FROM TVA DATE INSPECTED 8-10-94
 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 | | |
| 1" steel conduit | NA | ⊙ | 7 | ⊙ | AWD-015W | Y | N | GOOD | None | X | | | Receiving Verification only 10' lengths for a total of 70 feet CJP | |
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TENNESSEE VALLEY AUTHORITY
SHIPPING TICKET

No. 55694-01017

PER TENNESSEE VALLEY AUTHORITY

POINT OF ORIGIN

NEAR, ADDRESS, AL. 35611 8-2-94

SHIPPING STOREROOM BROWNS FERRY NUCLEAR PLANT

AUTHORITY

RAM OLIVER, SUPV., MAPS

SHIP TO
 IN OKPCA POINT LABS
 15015 SHASTY FALLS ROAD
 ELKHORNF, TX 78112

ACCT NO.
DEBIT

(DO NOT INCLUDE TRANSPORTATION CHARGES)

0005151

RECORD-SLIP

BILL TO

CREDIT

0002465

| 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. SENT FOR FIRE TESTING PROGRAM QA III | AWD-015W | 70 | FT | | |

SHIPPING WEIGHT

DISTRIBUTION OF TRANSPORTATION CHARGES

5 SHIPPED

8-6

19 94 G. B. L. No. TV

N/A

METHOD OF SHIPMENT

FEDEX (2ND DAY EXT)

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

1877

CARRIER'S CHARGE
 DELIVERY CHARGES
 TOTAL COST

MATERIAL RECEIVED 19
 NAME OF CARRIER C. G. BURET
 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.

AIRBILL
 PACKAGE
 TRACKING-NUMBER

0115008830

4159M

0115008830

RECIPIENT'S COPY

| | | | | | | | |
|--|--|---|--|--|--|---|--|
| Sender (Your Name) Please Print L. W. Doyt | | Your Phone Number (205) 723-5421 | | Recipient (Your Name) Please Print L. W. Doyt | | Recipient Phone Number (205) 723-5421 | |
| Company AMERICAN AIRWAYS FEDERAL AVIATION ADMINISTRATION | | | | Company AMERICAN AIRWAYS FEDERAL AVIATION ADMINISTRATION | | | |
| Street Address 1601 S. Shady Falls Road | | | | Exact Street Address (Include Apt. No., Bldg. or P.O. Zip Codes) 1601 S. Shady Falls Road | | | |
| City LATHENS | | State AL | | City Edmond | | State OK | |
| ZIP Required 35116 | | ZIP Required 78112 | | IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here Street Address City State ZIP Required | | | |
| PAYMENT <input type="checkbox"/> Bill Sender <input type="checkbox"/> Bill Recipient's FedEx Acct. No. <input type="checkbox"/> Bill 3rd Party FedEx Acct. No. <input type="checkbox"/> Bill Credit Card | | | | Emp. No. _____ Date _____ | | | |
| 5 <input type="checkbox"/> Cash <input type="checkbox"/> Check | | | | 6 <input type="checkbox"/> Cash Receipt <input type="checkbox"/> Return Slip <input type="checkbox"/> Third Party <input type="checkbox"/> Chg. To Del. <input type="checkbox"/> Hold <input type="checkbox"/> Other 1 | | | |
| 4 SERVICES (See back of box) | | 5 DELIVERY ADDRESS | | 6 DIMENSIONS (inches) | | 7 WEIGHT (pounds) | |
| 10 <input type="checkbox"/> OTHER LETTER MAIL | | 11 <input type="checkbox"/> DELIVER WEDNESDAY | | 12 <input type="checkbox"/> DIM SHIPMENT (Check) | | 8 Total _____ Total _____ | |
| 13 <input type="checkbox"/> FEDEX BOX | | 14 <input type="checkbox"/> FEDEX TUBE | | 9 <input type="checkbox"/> SATURDAY PICK-UP (Extra charge) | | 10 <input type="checkbox"/> DANGEROUS GOODS (Extra charge) | |
| 15 <input type="checkbox"/> FEDEX TWO-DAY (Restrict for authorized users only) | | 16 <input type="checkbox"/> GOVERNMENT OVERNIGHT (Restrict for authorized users only) | | 17 <input type="checkbox"/> BOYT LETTER | | 18 <input type="checkbox"/> BOYT PACKAGE | |
| 19 <input type="checkbox"/> ECONOMY* (Economy Letter (Rate not available. Minimum charge: One Pound Equivalent)) | | 20 <input type="checkbox"/> OVERNIGHT FREIGHT (for packages over 50 lbs.) | | 21 <input type="checkbox"/> TWO-DAY FREIGHT (Restrict for authorized users only) | | 22 <input type="checkbox"/> HOLIDAY DELIVERY (Restrict for authorized users only) | |
| 23 <input type="checkbox"/> RELEASE SIGNATURE | | | | 24 <input type="checkbox"/> RELEASE SIGNATURE | | | |

REVISION DATE 3/94
 PART #137/114 FXEM 5/94
 FORMAT #158
158
 © 1994 FEDEX
 PRINTED IN U.S.A.



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA REPORT NUMBER 1426-11960
 CLIENT/PROJECT NUMBER 11960-97185-87 + 97332-38 DATE RECEIVED 8-26-94
 RECEIVED FROM TVA DATE INSPECTED 8-26-94
 PROJECT LOCATION Omega Point Labs INSPECTED BY: C. Patton

| ITEM DESCRIPTION | P.O. NO. | QUANTITY | | | I.D. NO. | COMD MATL Y/N | CERT. RECD Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|--------------------------|----------|----------|-------|-----|------------------|---------------------|----------------------|------------------------|------------|------------|------|--------|---|
| | | Order | Rec'd | B O | | | | | | Accept | Hold | Reject | |
| Junction Box 1'x1'x5' | 0 | 0 | 1 | 0 | Ref # 94-5349 | Y | X | Good | None | X | | | NOTE: OK Receiving Verification Only |
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SHIPPING TICKET

No. G 518551

718

SHIPPER **TVA - HORACE CROWDEN**

POINT OF ORIGIN **MUSCLE SHOALS, AL 8-24-**

94

SHIPPING ROOM **POWER SERVICE SHOPS**

AUTHORITY **3FN-K-94-0071**

TO
**OMEGA POINT LAB
 16015 Shady Falls Road
 Elmhurst, Texas 78112
 ATTN: W. 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 144211960
 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. RECD Y/N | CONTAINER INTEGRITY | EXCEPTIONS | ACCEPTANCE | | | REMARKS |
|------------------|-----------------------|----------|-------|------|----------|----------------|----------------|---------------------|------------|------------|------|--------|------------------------------|
| | | Order | Rec'd | B.O. | | | | | | Accept | Hold | Reject | |
| 5" STEEL CONDUIT | N/A | 0 | 4 | 0 | BBY-741J | Y | N | OK | NONE | X | | | Receiving verification only. |
| 3" " " | " | 0 | 2 | 0 | AWD-019L | Y | N | OK | " | X | | | |
| 2" " " | " | 0 | 2 | 0 | AWD-017G | 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 | | | |
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SHIPPING TICKET

No.

55694-00010

SHIPPER **TENNESSEE VALLEY AUTHORITY**

POINT OF ORIGIN **NEAR, ATHENS, AL. 35611 10-4-1994**

721

SHIPPING ROOM **BROWNS FERRY NUCLEAR PLANT**

AUTHORITY **DAN OLIVER, SUPV., WAPS**

SHIP TO
**OMEGA POINT LAB
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112**

ACCT NO. (DO NOT INCLUDE TRANSPORTATION CHARGES)
DEBIT
00035LQ

BILL TO

CREDIT

| ITEM | QUANTITY ORDERED | DESCRIPTION | PSC - ITEM NO. BIN NO. | QUANTITY DELIVERED | UNIT | UNIT PRICE | AMOUNT |
|------|------------------|----------------|------------------------|--------------------|------|------------|--------|
| 1. | 40 | 5" Conduit ✓ | BBY-74LJ | 40 | FT | | |
| 2. | 20 | 3" Conduit ✓ | AJD-019L | 20 | FT | | |
| 3. | 20 | 2" Conduit ✓ | AJD-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

DATE SHIPPED **10-4-**

94 G. B. L. No. TV

N/A

METHOD OF SHIPMENT **FEDEX TWO-DAY FRI**

HSVA 174

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 _____ MATERIAL RECEIVED _____ 19 _____
 CARRIER'S CHARGE _____ NAME OF **C. W. BURT**
 DELIVERY CHARGES _____ CARRIER _____
 TOTAL COST _____ MATERIAL CHECKED _____
 IN BY _____ STORES LEDGER POSTED BY _____

6017333775

PACKAGE TRACKING NUMBER

28193337

RECIPIENT'S COPY

722

Date: 10-4-94

From (Your Name) Please Print: C.W. Burt

Your Phone Number (Very Important): (202) 720-4641

To (Recipient's Name) Please Print: [Blank]

Company: TVA/BROWNS FERRY NUCLEAR PLT

Street Address: BROWNS FERRY RD

City: ATHENS

Company: [Blank]

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 16015 Steady Falls Road

City: [Blank]

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.): [Blank]

State: AL ZIP Required: 33511

State: TX ZIP Required: 75112

PAYMENT 1 Bill Sender 2 Bill Recipient's FedEx Acct. No. 3 Bill 3rd Party FedEx Acct. No. 4 Bill Credit Card

IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here

SERVICES (Check only one box)

DELIVERY AND SPECIAL HANDLING (Check services required)

- Priority Overnight (Delivery by next business morning)
 - 11 OTHER PACKAGING
 - 18 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
- Government Overnight (Reserved for authorized users only)
 - 46 GOVT LETTER
 - 41 GOVT PACKAGE

- 1 HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
- 2 DELIVER WEEKDAY
- 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 (if offered) (Extra charge)

| PACKAGES | WEIGHT in Pounds Only | YOUR DECLARED VALUE (See page 1) |
|----------|-----------------------|----------------------------------|
| 1 | 200 | |
| 1 | 827 | |
| Total | 827 | |
| Total | 1300 | |

IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here

Street Address: [Blank]

City: [Blank] State: [Blank] ZIP Required: [Blank]

Emp. No.: [Blank] Date: [Blank]

Cash Received

Return Shipment

Third Party Chg. To Del. Chg. To Hold

Street Address: [Blank]

City: [Blank] State: [Blank] Zip: [Blank]

Received By: X

Date/Time Received: [Blank] FedEx Employee Number: [Blank]

Received At:

1 Regular Stop 3 Drop Box

2 On-Call Stop 4 B.S.C.

5 Station

Release Signature: [Blank]

REVISION DATE 4/94
PART #145412 FAX #504
FORMAT #160

160

© 1993-94 FEDEX
PRINTED IN U.S.A.



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 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 OK |
| 2" " " | " | 0 | 3 | 0 | N2558-20EG | Y | N | " | " | X | | | |
| 1" " " | " | 0 | 6 | 0 | N2558-10EG | Y | N | " | " | X | | | |
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SHIPPER **L. J. Wheeler** POINT OF ORIGIN **Soddy Daisy, TN** 10-11 19 94

724

SHIPPING ROOM **Sequoyah Nuclear Stores** AUTHORITY **L. J. Wheeler**

TO
**Omega Point Laboratories
16015 Shady Falls Rd
Klemendorf, Texas 78112
ATTN: Kent Brown**

ACCT No. (DO NOT INCLUDE TRANSPORTATION CHARGES)
DEBIT
G0014PG

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 H2558-20EG Lot C0350 1008070 It 2 2-18-94 | Bla-296W | 3 | EA | | |
| | 6 | 1" two hole conduit straps P/N H2558-10EG lot C0149 RD 331168 Item 5 4-6-93 | AWN-628T | 6 | Ea | | |

Shipped per WBN Peg package T49941008800 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 _____ MATERIAL RECEIVED _____ 19 _____
CARRIER'S NAME OF _____
CHARGE CARRIER _____
DELIVERY MATERIAL CHECKED _____
CHARGES IN BY _____
TOTAL STORES LEDGER _____
COST POSTED BY _____



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TVA/TSI REPORT NUMBER 1445-11960
 CLIENT/PROJECT NUMBER 11960-97553-55 DATE RECEIVED 10/10/94
 RECEIVED FROM TVA DATE INSPECTED 10/10/94
 PROJECT LOCATION Omega Point Labs 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 | | | |
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726

USAir

CARRIER CODE **037-** ORIGIN CODE **8851-2491** AIR WAYBILL NUMBER

FINAL AIRPORT DESTINATION **SAT**

TOTAL NO. PIECES IN SHIPMENT **1** TOTAL SHIPMENT WEIGHT **155** WEIGHT OF THIS PIECE **155**

| TO | VIA | FLT | DATE | C.O.D. |
|------------|-----------|-----|----------------|--------|
| CLT | US | | 10-9-94 | |
| SAT | | | | |

17190

LOT SHIPMENT LABEL (AC-7) REV. 10/89



PREPAID
 COLLECT

DELIVERY SERVICE, INC.
P.O. BOX 460289
SAN ANTONIO, TEXAS 78246-0289
PHONE (210) 826-8110
RRC NO. 4756

727
No 1274

DATE _____

| | | |
|-------------------------|--|---------------------------------------|
| CARRIER Sonic | | AIRBILL NO. TEH 31453 |
| SHIPPER | | CONSIGNEE Omega Point Lines |
| ADDRESS | | ADDRESS 14015 Shady Falls |
| CITY | | CITY Patterson TX 75777 |
| NO. PIECES | | DESCRIPTION 11th unit below |
| 1 | | REFERENCE NO. US 88512491 |
| | | WEIGHT 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 | SHIPPER'S SIG | TIME | C.O.D. AMOUNT |
| DRIVER | | DATE | BUS/AIRLINE CHARGES |
| DRIVER | RECEIVED GOOD ORDER | TIME 1:00 | |
| DRIVER | | DATE | 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

TIIC:BLN237F

QA:3

COVER, CONDUIT OUTLET
BLANK STAMPED STEEL

STORAGE LEVEL: C
UNIT:EA
ACCT:6200
SANS3081

MANU:

P/N:



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA REPORT NUMBER 1390-11960
 CLIENT/PROJECT NUMBER 11960-97185, 86+87 DATE RECEIVED 7-6-94
 RECEIVED FROM Jolter DATE INSPECTED 7-6-94
 PROJECT LOCATION Omega Point Labs INSPECTED BY: CPatterson

| 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 | 11250 | 10 | 10 | - | CAN 3X4.1#X20 | Y | Y | GOOD | NONE | X | | | |
| 3"X4.10 Channel X20 | | | | | | | | | | | | | |
| ANGLE IRON 4"X4"X1/2"X20 | 11250 | 1 | 1 | - | ANG 4XC07 | Y | Y | GOOD | NONE | X | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc.

16015 Shady Falls Road, Elmendorf, TX 78112-9784
 (210) 635-8100 FAX: (210) 635-8101

730



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:

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 |
|------------|-------------|----------------|---------------|-------|
| 7/5/94 | 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 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u>C Patton</u> Date <u>7-5-94</u></p> | | | | |

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 |

* SALES ORDER 28564 *

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH
SAN ANTONIO, TX 78219

DELIVER PICKING TICKET

BILL TO: 000477
OMEGA POINT LABORATORIES

SHIP TO:
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMENDORF, TEXAS 78112

16015 SHADY FALLS
ELMENDORF, TEXAS 781120000

*M + P's
attached*

PURCHASE ORDER: 1125-0
PLACED BY: CLEDA
SHIP VIA:
COMMENTS:

TELEPHONE #: (512) 535-8100

ORDER DATE: 7/05/94
SALESMAN: CASEY HARMS
ORDER SHIP

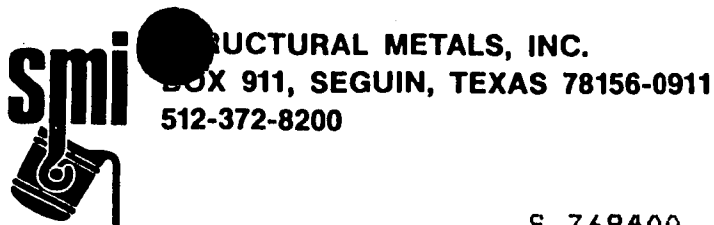
REQUEST DATE: 7/05/94

| LINE | QTY | QTY | COD PART NUMBER | DESCRIPTION | WEIGHT | UNIT COST | EXTEND COST |
|------|-----|-----|-----------------|------------------------|--------|-----------|-------------|
| 01 | 10 | 10 | CHN 3X4.1X20 | 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 |

WEIGHT: 1076 LBS

RECEIVED BY: *Richard B. Beasley*

NET BEFORE TAX 301.80
TAX..... 23.39
GRAND TOTAL... 325.19



STRUCTURAL METALS, INC.
 BOX 911, SEGUIN, TEXAS 78156-0911
 512-372-8200

CERTIFICATE TEST REPORT

WE HEREBY CERTIFY THAT THE FOLLOWING DATA IS A TRUE COPY FROM TESTS PERFORMED IN OUR LABORATORY.

The following tests conform to the requirements of the specifications listed.

DAN SCHACHT
 QUALITY CONTROL MANAGER

12/ 8/92

| | | | |
|----------|----------|--------------------|--------------|
| SIN# | S76813 | S 768400 | S 8000 |
| BOL NO | B9374105 | O TOL TEC PRODUCTS | H TOL TEC |
| | | L 5390 DIETRICH | I F/U @ MILL |
| | | D SAN ANTONIO | P TX |
| INV NO | U145995 | T | T |
| INV DATE | 12/07/92 | TX 78219 | O |

| HEAT NO | SECTION | SPECIFICATION | T # | YIELD PSI | TENSILE PSI | ELONG % IN | R.A. % | BEND TEST DIAM 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 | |

REMARKS: 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.

732



STRUCTURAL METALS, INC.
BOX SEGUIN, TEXAS 78156-0911
210-372-8200

CERTIFIED TEST REPORT

WE HEREBY CERTIFY THAT THE FOLLOWING DATA
 IS A TRUE COPY FROM TESTS PERFORMED IN
 LABORATORY.

The following tests conform to the requirements
 of the specifications listed.

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

| | SECTION | | SPECIFICATION | T # | YIELD PSI | TENSILE PSI | ELONG % IN | R.A. % | BEND TEST | | DATE ROLLED | LB/FT | |
|---|---------|----------|---------------|-------------------------------------|-----------|-------------|------------|--------|-----------|-------|-------------|--------|-------|
| | | | | | | | | | DIAM | RSL | | | |
| 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.

733



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TS1/TVA REPORT NUMBER 1422-11960
 CLIENT/PROJECT NUMBER 11960-97185, 97255, 97332 DATE RECEIVED 8-23-94
 RECEIVED FROM Toltec DATE INSPECTED 8-23-94
 PROJECT LOCATION Omega Point Labs 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"x1/2"x40' Tubing | 1144Q | 40' | 40' | 0 | TUB6XCO9X40 | Y | Y | GOOD | None | X | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc.



16015 Shady Falls Road, Elmendorf, TX 78112-9784
 (210) 635-8100 FAX: (210) 635-8101

Vendor:

PO Number:

Toltec Steel Products, Inc
 5390 Dietrich Road

 San Antonio TX 78219

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 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u>C Patton</u> Date <u>8-23-94</u></p> | | | | |

Special Instructions

Ordered By: Cleda Patton

Please include MTR's

Project #: TSI/TVA

| | |
|----------------------|---------------|
| Total | \$0.00 |
| Shipping Tax | |
| Invoice Total | \$0.00 |

* S A L E S O R D E R 29230 *

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH
SAN ANTONIO, TX 78219

DELIVER PICKING TICKET

BILL TO: 000477
OMEGA POINT LABORATORIES

SHIP TO:
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMHORF, TEXAS 78112

16015 SHADY FALLS
ELMHORF, TEXAS 781120000

PURCHASE ORDER: 1144 J
PLACED BY: KERRY
SHIP VIA:
COMMENTS:

TELEPHONE #: (512) 635-8100

ORDER DATE: 8/23/94
SALESMAN: CASEY HARMS

REQUEST DATE: 8/23/94

| ORDER | SHIP | QTY | QTY | COO PART NUMBER | DESCRIPTION | WEIGHT | UNIT COST | EXTEND COST |
|-------|------|-----|-----|-----------------|---------------------------|--------|-----------|-------------|
| 01 | 1 | 1 | 1 | TUB 5X09X40 | 6 X 6 X 500 X 40 | 1410 | 1999.00 | 799.80 |
| 02 | 0 | 0 | 0 | | MUST HAVE MTR ** | 0 | 1.00 | .00 |
| 03 | 2 | 2 | 2 | ANG 2X03X25ALUM | 2 X 2 X 1/4 X 25 ALUMINUM | 56 | 255.00 | 141.53 |

WEIGHT: 1465 LBS

RECEIVED BY: *[Signature]*

NET BEFORE TAX 241.13
TAX..... 72.94
GRAND TOTAL... 1014.07

ADDRESS OF PRODUCER'S PLANT
 FIRMA UMSCHRIFFT DES HERSTELLERWERKS

V A L E :
 USINE DE :
 57480 RETTEL FRANCE

PAGE-SHEET-S 1
 CERTIFICATE DE RECEPTION
 INSPECTION CERTIFICATE - ABNAHMEPROTOKOLLIS
 MODELE 3.1.B (A49.001) DIN 50049

ACHETEUR - PURCHASER - BESTELLER : NO. COMMANDE ACHETEUR
 PURCHASER'S ORDER N°
 FRANCOSTEEL CORPORATION SALES : BESTELLUNG NR
 HOUSTON :
 UNITED STATES : FNY 553 - 8180 Q

NO. COMMANDE USINE : AVIS D'EXPEDITION N°
 PLANT ORDER NUMBER : DISPATCH NOTE N°
 WERKBESTELL NUMBER : VERSANDANZEIGE NR
 3-M -20227 : 8 -130487

| ITEM | DIMENSIONS EN POUCES | QUANTITE TOTALE-TOTAL QUANTITY-GESAMTHEIT | LONGUEUR (FEET) | MASSE (LBS) |
|------|----------------------|---|-----------------|--------------|
| POST | ABMESSUNGEN | ANZAHL | LENGHT-LANGE | MASS - MASSE |
| 2 | 16" X 6" X .500" | 8 | 320,01 | 11221 |
| 3 | 17" 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 | 239,99 | 6239 |

HUANCE D'ACIER - STEEL GRADE - STAHLORTE
 ASTM A 500 GRADE B ERW
 NORME OU SPECIFICATION DU PRODUIT
 PRODUCT STANDARD OR SPECIFICATION
 PRODUKTFORM BZW. - SPEZIFIKATION
 STRUCTURAL SQUARE AND RECTANGULAR TUBES
 ERW ASTM A 500 GRADE B (WITH MIN. PSI YIELD 46000)

ANALYSE SUR TUBES EN S - PIPES ANALYSIS - ROHREANALYSE

| POSTE: NO DE LA COULEE | ITEM: NUMBER OF CAST | POST: NUMER DES GUSSES | C | MN | P | S | SI | AL | BO | CR | MO | V | CU | TI | NI | NB | SW |
|------------------------|----------------------|------------------------|-------|-------|-------|-------|----|----|----|----|----|---|----|----|----|----|----|
| 2 | 14836 | | 0,126 | 1,440 | 0,012 | 0,007 | | | | | | | | | | | |
| 2 | 24904 | | 0,160 | 1,450 | 0,018 | 0,008 | | | | | | | | | | | |
| 3 | 26255 | | 0,131 | 1,400 | 0,016 | 0,009 | | | | | | | | | | | |
| 6 | 15158 | | 0,158 | 1,430 | 0,013 | 0,007 | | | | | | | | | | | |
| 11 | 15158 | | 0,158 | 1,430 | 0,013 | 0,007 | | | | | | | | | | | |
| 12 | 26401 | | 0,169 | 1,510 | 0,020 | 0,007 | | | | | | | | | | | |

TRACTION - TENSILE TEST - ZUGVERSUCH
 EPROUVETTE - TEST PIECE - PROBE

| POSTE: VALEURS GARANTIES | ITEM: GUARANTEED VALUES | POST: GEWAHRLEISTETE WERTE | RE (PSI) | RM (PSI) | A 4 | RM(A-2) |
|--------------------------|-------------------------|----------------------------|----------|----------|-----|---------|
| 2 | 68455 | 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: ESSAI HYDRAULIQUE : NOUS ATTESTONS QUE LES
 ITEM: HYDRAULIC TEST : PRODUITS SONT CONFORMES AUX
 POST: WASSERPRUFDRUCK : STIPULATIONS DE LA COMMANDE
 WE CERTIFY THAT THE DELIVERED
 BAR : PRODUCTS COMPLY WITH THE
 BAR : REQUIREMENTS OF THE ORDER.
 BAR : ES WIRD BESTATIGT, DAS DIE
 BAR : GELIEFERTEN-ERZEUGNISSE DEN
 BAR : BESTIMMUNGEN DER BESTELLUNG
 BAR : ENTSPRECHEN.

RESPONSABLE: PRODUCTEUR :
 SECTEUR : PRODUCER
 QUALITE : HERSTELLER
 M. SZKOLNIK
 DATE DATUM : 29/11/93

Handwritten note in a circle:
 To: Kenny
 From: B.B
 6x6x500
 Square

Handwritten note: XT 77444

TOTAL P. 01
 PAGE. 001
 666 B402
 736
 AUG 25 '94 11:02



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TS1/TVA REPORT NUMBER 1427-11960
 CLIENT/PROJECT NUMBER 11960-97185-87 97332-38 DATE RECEIVED 8-25-94
 RECEIVED FROM Jaltec DATE INSPECTED 8-25-94
 PROJECT LOCATION Omega Point Labs 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 | R.O. | | | | | | Accept | Hold | Reject | |
| Angle Iron 3 1/2" x 2 1/2" x 3/8" x 20' | 11460 | 1 | 1 | 0 | ANG-3 1/2 x 2 1/2 x 3/8 | Y | Y | Good | None | X | | | |
| | | | | | | | | | | | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc.



16015 Shady Falls Road, Elmendorf, TX 78112-9784
(210) 635-8100 FAX: (210) 635-8101

Vendor:

PO Number:

Toltec Steel Products, Inc
5390 Dietrich Road

1146-Q

San Antonio TX 78219

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 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements"</p> <p>QA Approval <u><i>a Patton</i></u></p> <p>Date <u>8-25-94</u></p> | | | | |

Special Instructions

Ordered By: Kerry Hitchcock

Please include MTR's.

Project #: TSI/TVA

| | |
|----------------------|----------------|
| Total | \$44.57 |
| Shipping | |
| Tax | \$3.45 |
| Invoice Total | \$48.02 |

* SALES ORDER 29259 *

TOLTEC STEEL PRODUCTS, INC.
5390 DIETRICH
SAN ANTONIO, TX 78219

DELIVER PICKING TICKET

BILL TO: 000477
OMEGA POINT LABORATORIES

SHIP TO:
OMEGA POINT LABORATORIES

16015 SHADY FALLS
ELMHENDORF, TEXAS 78112

16015 SHADY FALLS
ELMHENDORF, TEXAS 781120000

PURCHASE ORDER: 11460

PLACED BY:

TELEPHONE 4: (210) 535-3100

SHIP VIA:

COMMENTS:

ORDER DATE: 8/25/94

REQUEST DATE: 8/25/94

SALESMAN: CHASEY HARRIS

| LINE | SHIP | QTY | COO PART NUMBER | DESCRIPTION | WEIGHT | UNIT COST | EXTEND COST |
|------|------|-----|---------------------|--------------------------|--------|-----------|-------------|
| 01 | | 1 | ANB 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: _____

Ken [Signature]

NET BEFORE TAX 44.57
TAX..... 3.45
GRAND TOTAL... 48.02

A Division of Co-Steel Inc.

TESTING LABORATORY REPORT
COMpte RENDU DU LABORATOIRE D'ESSAI

• PHYSICAL PROPERTIES • CHEMICAL ANALYSIS
• PROPRIÉTÉS PHYSIQUES • ANALYSE CHIMIQUE

JUL. 18, 1994
20:25

097068

O'NEAL STEEL
108 BOGGSTOWN RD.
SHELBYVILLE, INDIANA
U.S.A.

46176

ATTENTION: 22364

CLIENT ORDER NUMBER
N° DE COMMANDE DU CLIENT

SEE * BELOW

PAGE # 01

PROPERTY OF CO-STEEL INC. / PROPRIÉTÉ DE CO-STEEL INC. / INFORMATION TO BE KEPT CONFIDENTIAL / INFORMATION À GARDER EN CONFIDENCE / INFORMATION TO BE KEPT CONFIDENTIAL / INFORMATION À GARDER EN CONFIDENCE

CHANNELS
7 @ 14.75

C6255 58995 PSI 78671 PSI 25.0% IN

ASTM-A36-91 SA-36
ASTM A709 GR36

MATERIAL SPECS: 33081
* B-31613

PART #:

PART NAME:

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
* B-07177

PART #:

PART NAME:

ASTM 709 GR36

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
ASTM 709 GR36

MATERIAL SPECS: 01 10841
* F-04643

PART #:

PART NAME:

C MN P S SI
0.2100 0.8500 0.0070 0.0200 0.2080

ROUND BARS-NON-ALLOY

1 1/8 INCH DIAMETER

C6745 49536 PSI 73057 PSI 30.0% IN 8 IN

ASTM-A36-91 SA-36
ASTM 709 GR36

MATERIAL SPECS: 03 15951
* X-23757

PART #:

PART NAME:

C MN P S SI
0.1900 0.7300 0.0050 0.0240 0.1900



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA REPORT NUMBER 1404 - 11960
 CLIENT/PROJECT NUMBER 11960-97185-87, 97257-60 DATE RECEIVED 7-21-94
 RECEIVED FROM Jaltec Steel DATE INSPECTED 7-21-94
 PROJECT LOCATION Omega Point Labs INSPECTED BY: D. 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 | |
| Plate 1/2"x12"x20' | 11320 | 1 | 1 | 0 | FLT 1/2X12 | Y | | Good | None | X | | | |
| Sq tubing 4"x4"x1/4"x20' | 11320 | 1 | 1 | 0 | TUBAX006 X20 | X | | Good | None | X | | | |
| | | | | | | | | | | | | | |
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Omega Point Laboratories, Inc.

PURCHASE ORDER

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:

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 |
|------------|-------------|----------------|---------------|-------|
| 7/20/94 | 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 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements" QA Approval <u>C Patton</u> Date <u>7-20-94</u></p> | | | | |

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 |

* SALES ORDER 28761 *

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: 11329
PLACED BY: CLETA
SHIP VIA:
COMMENTS:

TELEPHONE #: (512) 635-8100

ORDER DATE: 7/20/94
SALESMAN: CASEY HARMS

REQUEST DATE: 7/20/94

| LINE | QTY | ORD PART NUMBER | DESCRIPTION | WEIGHT | UNIT COST | EXTEND COST |
|------|-----|-----------------|------------------|--------|-----------|-------------|
| 01 | 1 | FLT 1/2X12 | 1/2 X 12 X 20 | 408 | 30.95 | 125.40 |
| 02 | 1 | TUB 4XC26X20 | 4 X 4 X 250 X 20 | 244 | 515.10 | 103.22 |

WEIGHT: 652 LBS

RECEIVED BY: *Gene Elzalde*

| | |
|----------------|--------|
| NET BEFORE TAX | 229.62 |
| TAX..... | 17.80 |
| GRAND TOTAL... | 247.42 |

B/L # 72969

NUCOR CORPORATION
A Division of Nucor Corporation
JEWETT, TEXAS 75646 PH (903) 626-4461

Date

TOLTEC STEEL PRODUCTS, INC.
5390 DETRICH RD.
SAN ANTONIO, TX 78219

CERTIFIED MILL TEST REPORT

43579

SOLD TOLTEC
TO: 5390 DETRICH RD.
SAN ANTONIO TX 78219

SHIP TOLTEC
TO: 5390 DETRICH RD

8 INCH
SCALE

| SIZE GRADE | HEAT NUMBER | CUSTOMER PO NUMBER | TENSILE PSI | YIELD PSI | ELONG % | C | Mn | Si | S | P | V | Nb | Cu | Cr | Ni | Mo |
|---------------------------------------|----------------|-----------------------|----------------|--------------|------------|-----|-----|-----|-----|-----|------|------|-----|-----|-----|------|
| 2 X 12 ASTM A36-93/ASME SA36-89 | 345-0467 | 8534 | 73600 | 50000 | 27 | .17 | .74 | .26 | .03 | .02 | .000 | .000 | .48 | .09 | .11 | .033 |
| 4 X 12 ASTM A36-93/ASME SA36-89 | 334-2690 | 8534 | 73700 | 49100 | 23 | .13 | .72 | .21 | .03 | .01 | .000 | .000 | .26 | .14 | .10 | .031 |
| 2 X 10 ASTM A529-92 GD 50 | 343-0813 | 8534 | 81800 | 56400 | 21 | .23 | .90 | .26 | .04 | .02 | .000 | .000 | .40 | .16 | .12 | .040 |
| 8 X 8 ASTM A36-93/ASME SA36-89 | 343-0790 | 8534 | 65500 | 47700 | 25 | .16 | .75 | .22 | .04 | .02 | .000 | .000 | .38 | .10 | .12 | .038 |
| X 1 X 1/8 ASTM A36-93/ASME SA36-89 | 332-2362 | 8534 | 80000 | 59500 | 28 | .15 | .82 | .24 | .04 | .02 | .000 | .000 | .37 | .20 | .16 | .049 |
| X 2 X 1/4 ASTM A36-93/ASME SA36-89 | 341-1165 | 8534 | 70500 | 50400 | 30 | .15 | .75 | .22 | .04 | .02 | .000 | .000 | .48 | .17 | .17 | .057 |
| X 3 X 3/8 ASTM A36-93/ASME SA36-89 | 342-0736 | 8534 | 63700 | 43800 | 27 | .13 | .71 | .16 | .03 | .02 | .000 | .000 | .33 | .10 | .10 | .024 |
| X 4.1 ASTM A36-93/ASME SA36-89 | 341-1085 | 8534 | 70500 | 49800 | 25 | .12 | .82 | .25 | .03 | .01 | .000 | .000 | .60 | .13 | .11 | .034 |
| X 8.2 ASTM A36-93/ASME SA36-89 | 343-0661 | 8534 | 72300 | 54400 | 24 | .20 | .85 | .25 | .04 | .02 | .000 | .000 | .55 | .15 | .13 | .057 |

[Signature]
CHIEF METALLURGIST
745

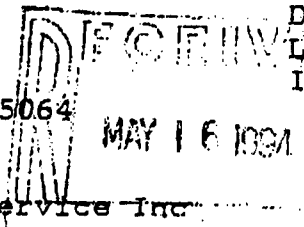
Certification

391000 5/12/94 2

746

Shipped to 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
 COLTEC STEEL PRODUCTS, INC.
 5390 DIETRICH RD.
 SAN ANTONIO, TX 78219



Shipped to Sunbelt Metal Service Inc
 P O Box 43839
 Austin TX 78745

Ship To: Sunbelt Metal Service Inc
 South Loop 4
 Buda TX 78610

| Heat # | ASIM 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 |
| 153179 45472 | A500 B | | | 68,500 | 76,500 | 27.0 |
| 153184 51226 | A500 B | | | 62,000 | 73,000 | 28.0 |
| 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 |

| | | | | | | |
|----------------|----------|--------|----------|--------|--------|------|
| 5 4600412 | 5 SQ 1/4 | HRA500 | 40.000FT | | | |
| 155060 1304854 | A500 B | | | 65,000 | 75,500 | 31.0 |
| Total Weight | | | 5,616 | | | |

| Heat # | C | MN | P | S | SI |
|---------|------|------|------|------|------|
| 1304854 | .170 | .720 | .011 | .012 | .005 |

| | | | | | | |
|--------------|-----------|--------|----------|--------|--------|------|
| 4301112 | 2 SQ 11GA | HRA500 | 20.000FT | | | |
| 43223 C85226 | A500 B | | | 55,000 | 69,000 | 30.0 |
| 43224 C85226 | A500 B | | | 55,000 | 69,000 | 30.0 |
| Total Weight | | | 6,100 | | | |

| Heat # | C | MN | P | S | SI |
|--------|------|------|------|------|------|
| C85226 | .180 | .750 | .013 | .009 | .017 |

Hanna Steel Corporation
 812 Commerce Avenue
 P.O. Box 558
 Fairfield, Alabama 35064
 (205) 780-1111
 UNS 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 1/2" x 1 1/2" x 1/8" x 20 | 1154Q | 4 | 4 | 0 | ANG1-1/2 XCO1 | Y | Y | Good | None | X | | | |
| | | | | | | | | | | | | | |
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PURCHASE ORDER

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 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u><i>C Patton</i></u> Date <u>9-17-94</u></p> | | | | |

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 24559 +

ROLTED STEEL PRODUCTS, INC.
5890 DIETRICH
SAN ANTONIO, TX 78219

DELIVER PICKING TICKET

BILL TO: 000477
OMEGA POINT LABORATORIES
16015 SHADY FALLS
ELKENDORF, TEXAS 78112

SHIP TO:
OMEGA POINT LABORATORIES
16015 SHADY FALLS
ELKENDORF, TEXAS 781120000

PURCHASE ORDER: 71154 9
PLACED BY: KERRY
DATE: 11/14
COMMENTS:

TELEPHONE #: (817) 535-9100

ORDER DATE: 11/21/74
SALESMAN: CASEY MARNE

REQUEST DATE: 11/21/74

ORDER SHIP

QTY CDB PART NUMBER

DESCRIPTION

WEIGHT

NET

EXTEND

COST

COST

4 ANG 1-1 BX01

1-1/2 X 1-1/2 X 1/3 X 20

98

26.15

26.13

***HILL CERTS REQUIRED

0

.30

.30

WEIGHT: 98 LBS

RECEIVED BY: *Richard J. Beasley*

NET BEFORE TAX 26.03
TAX..... 2.06
GRAND TOTAL... 28.05



STRUCTURAL METALS, INC.
 BO SEGUIN, TEXAS 78156-0911
 512-372-8200

CERTIFIED TEST REPORT

WEIGHT BY WEIGHT TEST FOR MERCURY CONTAMINATION
 IS A TRUE COPY FROM TESTS PERFORMED IN OUR
 LABORATORY.

The following tests conform to the requirements
 of the specifications listed.

QUALITY CONTROL MANAGER

12/27/93

S 170000 TOLTEC STEEL PRODUCTS, INC.
 D 5500 DEERTRICH RD.
 L P O BOX 3100 SAN ANTONIO, TX 78219
 D HOUSTON TX
 T 77241

S 8001 TOLTEC STEEL PRODUCTS, INC.
 H 5500 DEERTRICH RD.
 L P O BOX 3100 SAN ANTONIO, TX 78219
 P SEGUIN TX

| SECTION | SPECIFICATION | T # | YIELD PSI | TENSILE PSI | ELONG % IN | R.A. % | BEND TEST DIAM RSL | DATE ROLLED | LB/FT |
|-------------------|---------------|-----|-----------|-------------|------------|--------|--------------------|-------------|-------|
| 60 L 2.5X2.5X3/16 | ASTM A36-89 | 1 | 53300 | 75000 | 31.5 8 | | | 081692 | 2.95 |
| 76 L 1.5X1.5X1/8 | ASTM A36-89 | 1 | 55700 | 75200 | 23.0 8 | | | 101992 | 1.20 |
| 32 L 2X2X1/4 | ASTM A36-89 | 1 | 52200 | 74600 | 27.5 8 | | | 113092 | 3.05 |
| 35 L 3X2X3/16 | ASTM A36-91 | 1 | 55400 | 77800 | 29.0 8 | | | 011393 | 3.02 |
| | | 2 | 55400 | 77200 | 29.0 | | | | |
| 73 L 3X3X1/2 | ASTM A36-91 | 1 | 60000 | 79900 | 25.0 8 | | | 012793 | 9.40 |
| 76 L 3.5X3.5X1/4 | ASTM A36-89 | 1 | 55600 | 77000 | 35.0 8 | | | 040792 | 5.74 |

| 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 |
| 76 | .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 |
| 35 | .20 | 0.63 | .006 | .028 | .21 | .41 | 0.10 | 0.16 | .041 | .000 | .0010 | .002 | .00 | 1145 |
| 73 | .20 | 0.76 | .007 | .021 | .21 | .28 | 0.13 | 0.17 | .069 | .000 | .0170 | .003 | .00 | 1145 |
| 76 | .18 | 0.72 | .010 | .030 | .20 | .48 | 0.11 | 0.14 | .032 | .000 | .0020 | .000 | .00 | 1145 |

THIS STEEL IS MELTED AND MANUFACTURED IN THE USA AND IS FREE FROM MERCURY CONTAMINATION IN THE PROCESS

FOR ADDITIONAL COPIES
 CALL ACCOUNTING
 (512) 372-8225

750



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA REPORT NUMBER B99-11960
 CLIENT/PROJECT NUMBER 11960-97185, 86+87, 9725, -60 DATE RECEIVED 7-7-94
 RECEIVED FROM Summers DATE INSPECTED 7-7-94
 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 | |
| 7 strand Bare #8 Copper Wire | 1121Q | 1K | 1K | 0 | BASTR7SD8 | Y | Y | GOOD | None | X | | | |
| | | | | | | | | | | | | | |
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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 "See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u>C Patton</u> Date <u>6-27-94</u> | 1000 | \$0.69 | \$690.00 |

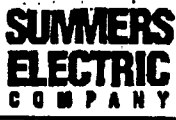
Special Instructions

Please include all Certificates of Conformance to Catalog Specifications

Ordered By: Cleda Patton

Project #: 11960

| | |
|---------------|----------|
| Total | \$690.00 |
| Shipping Tax | |
| Invoice Total | \$690.00 |



ORIGINAL

753

PACKING SLIP

FROM: 2400 BRUCKTON
3800 ANTONIO, TX 78217

480330501 1

06-JUL-1994, 11:26

In Am

SOLD TO: 09540800
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

243

*4hr
SMALL*

| | | | |
|-------------|-------------|-----------|---------------------------|
| 121-0 | KERRY | DEL | TCI-8:30 |
| 28-JUN-1994 | 03-JUL-1994 | Our Truck | FC 243 000 10th, Net 20th |

| QTY | UNIT | DESCRIPTION | PRICE | TOTAL |
|--|------|--|-----------------|-----------------|
| 1000 | | 1000 COP BARE-B STR SOFT DRAWN BARE C | 33500 | 140100 M 140.00 |
| 3000 | | 3000 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: *[Signature]*
 CHECKED BY: *[Signature]*
 DATE: *7/26/94*
 CUSTOMER SIGNATURE: *[Signature]*

SERVICE WIRE CO.

MANUFACTURER

CULLOEN, WV (304) 743-8600

PITTSBURGH, PA (412) 325-1666

HOUSTON, TX (713) 674-6666

THIS MATERIAL IS MADE
TO APPROPRIATE UL,
ASTM, OR CUSTOMER
STANDARDS AS SPECIFIED
BY THE ORDER.

754

SHIP TO:
SUMMERS-SAN ANTONIO
2400 BROCKTON
PO BOX 17747
SAN ANTONIO TX

ORDER NO: 355686

78217

MADE BY:

CUTTING

DRAWING

SHIP/SPECIAL INSTRUCTIONS:

PP/ADD FOB ORIGIN
MARK PO # 510026009
510026009

#79 TX 779-675

STRANDING

CABLING



66287011695

MFG DATE

ARMOR

BASTR7SD8
8 AWG 7STR
BARE CU STRAND SD

JACKET

INSULATION

GROSS

TARE

NET

1.000

TESTING



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 Hawk
 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 REPORT NUMBER 1406 - 11960
CLIENT/PROJECT NUMBER 11960-97185-187 + 97257 to 97260 DATE RECEIVED 7-22-94
RECEIVED FROM Sumner DATE INSPECTED 7-22-94
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 | |
| <u>Galv Cond Strap</u> | <u>11340</u> | <u>7</u> | <u>7</u> | <u>0</u> | <u>KINC105-4</u> | <u>Y</u> | <u>Y</u> | <u>GOOD</u> | <u>None</u> | <u>X</u> | | | |
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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 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u><i>C Patton</i></u> Date <u>7-22-94</u></p> | | | | |

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

758

PACKING SLIP

FROM: 2400 BROCKTON
SAN ANTONIO, TX 78217

| NUMBER | PAGE |
|-----------|------|
| 080764101 | 1 |

22-JUL-1994, 08:53

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

TVA

| 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. SHP. | PART NUMBER | DESCRIPTION | BIN LOC. | UPC | UNIT PRICE | UM | EXTENDED PRICE |
| 01 | 7 | 0 | 7 | KIN C105-4 | GALV COND STRAP | 24-A-2 | 75951 | 235.62 | C | 16.49 |
| SUB TOTAL : 16.49 FREIGHT : .00 TAX : 1.27 TOTAL : 17.76 | | | | | | | | | | |

PICKED BY

net

CHECKED BY

DATE

CUSTOMER SIGNATURE

Kenn Hester



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 # 1134Q 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 Hawk
Title: INSIDE SALES



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
 CLIENT/PROJECT NUMBER 11960-97185-87497257-60
 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 | R.O. | | | | | | Accept | Hold | Reject | |
| Junction box flat cover 12 ga. welded ends | 1141Q | 1 | 1 | 0 | MS? 12x12x60 | Y | Y | GOOD | None | X | | | |
| | | | | | | | | | | | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc.

16015 Shady Falls Road, Elmendorf, TX 78112-9784
 (210) 635-8100 FAX: (210) 635-8101



761

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:

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 |
|------------|----------|----------------|---------------|-------|
| 8/18/94 | | | 8-22-94 | |

| Item No. | Description | Quantity Ordered | Unit Price | Extended Amount |
|--|----------------------------------|------------------|------------|-----------------|
| 1. | Junction Box 12ga 12"x12"x60" | 1 | \$186.00 | \$186.00 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u><i>d Patton</i></u> Date <u>8-19-94</u></p> | | | | |

Special Instructions

Must meet NEMA 1 specifications.

Ordered By: Kerry Hitchcock

Project #: TVATSI
 Proj# 97259
 Test deck #6

| | |
|----------------------|-----------------|
| Total | \$186.00 |
| Shipping | |
| Tax | \$14.42 |
| Invoice Total | \$200.42 |

| | |
|---------------------|------|
| PACKING SLIP NUMBER | PAGE |
| 081251801 | 1 |

18-AUG-1994, 10:43

*JAP
TEQUAN
CD*

M: 2400 BROCKTON
SAN ANTONIO, TX 78217

SOLD TO: 09643800
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 | | | | | | |
| 1410 | | KERRY | DEL | | | | | | |
| ORDER DATE | SHIP DATE | SHIP VIA | FRT | SLS | TAX | TERMS | | | |
| 8-AUG-1994 | 18-AUG-1994 | Our Truck | PC | 236 | 000 | 10th, Net 20th | | | |
| LINE | QTY. ORD. | QTY. B.O. | QTY. SHIP | PART NUMBER | BIN LOC. | INST | UNIT PRICE | UM | EXTENDED PRICE |
| | | | | DESCRIPTION | | | | | |
| | | | | | | | | | |

01 1 0 1 MS? 12X12X60 Y 195.00 E 195.00

WELDED ENDS 12X60 FLAT COVER 12 GA. NEMA 1
PAD

Freight, if applicable, to be billed later

SUB TOTAL : 195.00
FREIGHT : .00
TAX : 14.42
TOTAL : 200.42

*Delivered
today
8-23-94
2200
CD*



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 # 1141Q on our Bill of Lading (shipping document) # 081251801, 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: [Handwritten Signature]
 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 11960-97185-97187-97332-97264-97260-97338
 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 | | | 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" steel locknut | 1145Q | 4 | 4 | 0 | KPT110 | X | X | Good | None | X | | | |
| 4" gal Cond Strap | 1145Q | 25 | 25 | 0 | KIN-C105-4 | Y | X | Good | None | X | | | |
| 3" gal Cond Strap | 1145Q | 15 | 15 | 0 | KIN-C105-3 | Y | Y | Good | None | X | | | |
| 2 1/2" gal cond strap | 1145Q | 5 | 5 | 0 | KIN-C105-2 1/2 | Y | Y | Good | None | X | | | |
| 2" gal Cond Strap | 1145Q | 20 | 20 | 0 | KIN-C105-2 | Y | Y | Good | None | X | | | |
| 3" sq Head Plug | 1145Q | 3 | 3 | 0 | APP PLB3005 | X | Y | Good | None | X | | | |
| 1" gal Cond Strap | 1145Q | 10 | 10 | 0 | KIN-C105-1" | X | Y | Good | None | X | | | |
| | | | | | | | | | | | | | |
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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

Ordered By: Kerry Hitchcock

Please include Certificate of Conformance.

Project #: TSI/TVA

| | |
|----------------------|-----------------|
| Total | \$173.04 |
| Shipping Tax | \$13.42 |
| Invoice Total | \$186.46 |

"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements."
 QA Approval *[Signature]*
 Date 8-24-94

**SUMMERS
ELECTRIC
COMPANY**

A Summers Group, Inc. company

CUSTOMER

PACKING SLIP **766**

318 W. JOSEPHINE
SAN ANTONIO, TX 78212

| | |
|-----------|------|
| NUMBER | PAGE |
| 178378001 | 1 |

24-AUG-1994, 12:15

SOLD TO: 08643800
OMEGA POINT LABORATORIES
15015 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 |
|--------------------|----------|---------|------|
| 11450 | | KERRY | WC |

| ORDER DATE | SHIP DATE | SHIP VIA | FRT | SLS | TAX | TERMS |
|-------------|-------------|-----------|-----|-----|-----|----------------|
| 24-AUG-1994 | 24-AUG-1994 | Will Call | PC | 236 | 000 | 10th. Net 20th |

| LINE | QTY. ORD. | QTY. B.O. | QTY. SHIP | PART NUMBER | DESCRIPTION | BIN LOC. | UPC | UNIT PRICE | UM | EXTENDED PRICE |
|------|-----------|-----------|-----------|----------------|--------------------|----------|-------|------------|----|----------------|
| 001 | 4 | 0 | 4 | BPT 110 | 4-IN STEEL LOCKNUT | 11-8-3 | 00110 | 155.00 | C | 6.20 |
| 002 | 25 | 0 | 25 | KIN C105-4 | GALV COND STRAP | 17-A-1 | 75951 | 235.63 | C | 58.91 |
| 003 | 15 | 0 | 15 | KIN C105-3 | GALV COND STRAP | 17-A-1 | 75945 | 171.22 | C | 25.68 |
| 004 | 5 | 0 | 5 | KIN C105-2-1/2 | GALV COND STRAP | 17-A-1 | 75942 | 153.45 | C | 7.92 |
| 005 | 20 | 0 | 20 | KIN C105-2 | GALV COND STRAP | 17-A-1 | 75939 | 131.00 | C | 26.20 |
| 006 | 10 | 0 | 10 | KIN C105-1 | GALV COND STRAP | 17-A-1 | 75930 | 95.05 | C | 9.51 |

SUB TOTAL : 134.80
FREIGHT : .00
TAX : 10.42
TOTAL : 145.22

REV. 8/94

MASTER FORM #2263 SE-1

PICKED BY

[Signature]

CHECKED BY

[Signature]

DATE

[Signature]

RECEIVED BY

[Signature]



CUSTOMER

PACKING SLIP 767

| PACKING SLIP NUMBER | PAGE |
|---------------------|------|
| 081360401 | 1 |

24-AUG-1994, 12:16

DM: 2400 BROCKTON
SAN ANTONIO, TX 78217

SHIP TO: OMEGA POINT LABORATORIES
16015 SHADY FALLS ROAD
ELMENDORF, TX 78112

SOLD TO: 08643800
OMEGA POINT LABORATORIES
16015 SHADY FALLS ROAD
ATTN: ACCOUNTS PAYABLE DEPT.
ELMENDORF, TX 78112

1/2/94

704

*L4NR
Small UK
8:00*

| | | | | | | | | | | | |
|--------------------|-------------|-----------|-----------|-------------|-------------|----------------|-----|-----|------------|----|----------------|
| CUSTOMER PO NUMBER | JOB NAME | CONTACT | TYPE | | | | | | | | |
| 11450 | | KERRY | DEL | | | | | | | | |
| ORDER DATE | SHIP DATE | SHIP VIA | FRT | SLS | TAX | TERMS | | | | | |
| 24-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 |

| | | | | | | | | | | | |
|-----|---|--|---|-------------|-------------------|--------|-------|--|---------|--|-------|
| 002 | 3 | | 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

PICKED BY

[Signature]

CHECKED BY

[Signature]

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 # 1145Q 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

769



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) # 178328001 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/TS1
 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 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 | |
| 12" steel cable tray | 1157Q | 2 | 2 | 0 | 248P-09-12-144 | Y | Y | Good | None | X | | | |
| | | | | | | | | | | | | | |
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771

Omega Point Laboratories, Inc.

PURCHASE ORDER

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:

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

| | | | | |
|---------|---------------|--|--|--|
| 9/28/94 | UPS Red Label | | | |
|---------|---------------|--|--|--|

| Item No. | Description | Quantity Ordered | Unit Price | Extended Amount |
|----------|---|------------------|------------|-----------------|
| 1. | 12" steel cable tray 248P-09-12-144 "See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u>CSutton</u> Date <u>9-28-94</u> | 2 | | \$0.00 |

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. 1157Q

PAGE 1 OF 3

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 prior 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.

- 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

SHIPPING ORDER

15156140

S

B-LINE SYSTEMS, INC.
509 West Monroe Street
Highland, Illinois 62249-0326
Phone: 618-654-2184



RS1
SYM

| |
|--------------------|
| SHIPPING ORDER NO. |
| 8942-9261 |
| DATE |
| 9/29/94 |

775

0026073

SOLD TO:

OMEGA POINT LABORATORY
16015 SHADDY FALLS RD
ELMENDORF TX 78112

SHIP TO:

OMEGA POINT LABORATORY
16015 SHADDY FALLS RD
ELMENDORF TX 78112

*Bein's
9-30-94*

PAGE NO. 1 OF 1 TERMS - NET 30 DAYS

1-CTN=6

8
9
4
2
9
2
6
1

| CUST. ORDER NO. | DATE RECEIVED | LAST SHIPPED | SHIPPING DATE | VIA | COL | PPD | CHG | INC |
|-----------------|---------------|--------------|---------------|-----|-----|-----|-----|-----|
| 11579 | 9/29/94 | | 10/03/94 | AP | | | X | X |

| DIV. | SALESMAN | SHIP FROM | F.O.B. | DATE SHIPPED | B/L | WEIGHT |
|------|----------|-----------|--------|--------------|--------|-----------------|
| 7 | 8800 E | TROY | TROY | 10-3-94 | 358077 | 79 ⁿ |

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 | 1124-34200 | 9/29/94 | WGT. 36.1600 971-3204 ML |
| 2 | 2 | 2 | - | PR | | 9ZN-8004 | SPLICE PLATE ITM 2 LOCATION: 1002 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

CERTIFICATE OF CONFORMANCE

776

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: 248 P09-12-144, 92N-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 conformance 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.

Rich 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





PAGE

FREIGHT BILL NUMBER

Refer To This Number

014 6371503 RO



800-826-3875 01 OF 01
P. O. Box 840, Harrison, Arkansas 72602-0840 (ARFW)

| | | | | |
|--|--|--|---------------------|-------------------------|
| CONSIGNEE 02215441 OMEGA POINT LABORATORY 16015 SHADY FALLS RD ELHENDOFF TX 79112 | | 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 NDI 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:

Jane Elizalde

DELIVERED BY:

R. Knight

DATE:

10-5-94

CONSIGNEE COPY

424



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME T21/TVA REPORT NUMBER 1428-11960
 CLIENT/PROJECT NUMBER 11960-97257-60+97332-38 DATE RECEIVED 8-26-94
 RECEIVED FROM U.S. Sales DATE INSPECTED 8-29-94
 PROJECT LOCATION Omega Point Labs 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 | |
| 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 | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc.

16015 Shady Falls Road, Elmendorf, TX 78112-9784

(210) 635-8100

FAX: (210) 635-8101 779



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:

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 |
|------------|-------------|----------------|---------------|-------|
| 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

Ordered By: Constance A. Humphrey

Please include all Certificates of Conformance to Catalog Specifications

Project #: TVA/TS1

| | |
|----------------------|---------------|
| Total | \$0.00 |
| Shipping Tax | |
| Invoice Total | \$0.00 |

U. S. SALES COMPANY, INC.

780

CONTRACTORS SPECIALTIES
 "SINCE 1948"
 318 W. MELROSE PLACE
 SAN ANTONIO, TEXAS 78212

PHONE 829-7044

Sold To: OMEGA Point- Lass

Date: 8/20/94

Invoice: **21630**

| | | |
|----------------|----------|----------------------------------|
| YOUR ORDER NO. | JOB NAME | Terms: 2% - 10 days, Net 30 days |
| 1142 G | | |

| QUANTITY | DESCRIPTION | LIST | UNIT | DISCOUNT | AMOUNT |
|---------------------------|-----------------------------|------|------|----------|--------|
| 10 | D-2555-10 1 Pipe Columns CC | | | | |
| 30 | P-2553-40 4 - - - | | | | |
| DUAL ORDERED 10 P-2553-40 | | | | | |
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Received By: C. Humphrey Tax Exempt

TAX

TOTAL

U. S. SALES COMPANY, INC.

CONTRACTORS SPECIALTIES
"SINCE 1948"
318 W. MELROSE PLACE
SAN ANTONIO, TEXAS 78212

PHONE 829-7044

Sold To:

OMEGA POINT LADS

Date: 8/20/54

Invoice: 21664

YOUR ORDER NO.

JOB NAME

Terms: 2% - 10 days, Net 30 days

1142 Q

| QUANTITY | DESCRIPTION | LIST | UNIT | DISCOUNT | AMOUNT |
|----------|------------------------------|------|------|----------|--------|
| 10 | P.2558-40 4 Hole Down Straps | | | | |
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Received By

Gene Clizilde

Tax Exempt

TAX
TOTAL

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, President



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA
 CLIENT/PROJECT NUMBER 11960-97185-87, 97257-60
 RECEIVED FROM U.S. Sales
 PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1419 . 11960
 DATE RECEIVED 8-23
 DATE INSPECTED CP
 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-1000 (PS-200) | X | | Good | None | X | | | partial shipment |
| Channel | 1142Q | 40' | 40' | 0 | P-1001 (PS-200 2T3) | X | | Good | None | X | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc.

16015 Shady Falls Road, Elmendorf, TX 78112-9784
 (210) 635-8100 FAX: (210) 635-8101

784



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 #: TUA/TS1

| | |
|----------------------|---------------|
| Total | \$0.00 |
| Shipping Tax | |
| Invoice Total | \$0.00 |

U. S. SALES COMPANY, INC.

785

CONTRACTORS SPECIALTIES
"SINCE 1948"
318 W. MELROSE PLACE
SAN ANTONIO, TEXAS 78212

PHONE 829-7044

Sold To: OMEGA POINT LABS Date: 8/25/64

Invoice: **21596**

YOUR ORDER NO. 1142 Q JOB NAME _____ Terms: 2% - 10 days, Net 30 days

| QUANTITY | DESCRIPTION | LIST | UNIT | DISCOUNT | AMOUNT |
|----------|------------------------------|------|------|----------|--------|
| 20 | P-1000 Channel 10 E & (7/24) | | | | |
| 40 | P-1001 - - - (10-200273) | | | | |
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Received By Richard D. Beasley Tax Exempt

TAX _____
TOTAL _____

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, President



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TVA REPORT NUMBER 1431-11960
 CLIENT/PROJECT NUMBER 11960-97185-87-97267-60 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 1/2" x 2 1/4" | 11480 | 200 | 200 | 0 | 000453605 | Y | Y | Good | None | X | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc.

16015 Shady Falls Road, Elmendorf, TX 78112-9784

(210) 635-8100

FAX: (210) 635-8101

788



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 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u>C Patton</u> Date <u>8-29-94</u></p> | | | | |

Special Instructions

Ordered By: Cleda Patton

Please include Certificate of Conformance.

Project #: TSI/TVA

| | |
|----------------------|---------------|
| Total | \$0.00 |
| Shipping Tax | |
| Invoice Total | \$0.00 |



No. 459353-01

789

* *FIRST ORIGINAL* * * *FIRST ORIGINAL* *
13635 STEMMONS FREEWAY
MERS BRANCH, TX 75234

S
H
P OMEGA POINT LABORATORIES
16015 SHADY FALL ROAD

T
O ELMENDORF TX 78112

NOTES:
CLETA 0 - -

CUST. PO # 1148Q

| | | | | | |
|------------|-----------|-------|-------------------|-----------|-------------------|
| ORDER DATE | ORDER # | SLS # | SLS NAME | SHIP LOC. | X-REF# = Y |
| 08/29/94 | 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 1-800-079-8000
DICK DAVITO EXT 6109

| LINE | ITEM # | ITEM DESCRIPTION | DUE | SHIP | B/O | BIN-LOC | SHIPMENT MODE |
|------|-----------|--|-----|------|-----|---------|--|
| 1 | 000453605 | KWIK BOLT II 14-214(100/BX) * * * END OF SHIPPER * * * HILTI IS CLASSIFIED AS A LARGE BUSINESS | | 2 | | R5 | <input type="checkbox"/> LOCAL <input type="checkbox"/> BL <input type="checkbox"/> TRUCK <input type="checkbox"/> AI <input type="checkbox"/> UPS <input type="checkbox"/> W <hr/> CARRIER <hr/> BILL OF LADING # <hr/> FREIGHT COST <hr/> CHARGE TO CUSTO <input type="checkbox"/> YES <input type="checkbox"/> N <hr/> NO. OF PACKAGE <hr/> WEIGHT -----LBS----- <hr/> DATE SHIPPED <hr/> PICKED BY GG <hr/> CHECKED BY EM |

| | | |
|-------------|---------------|-----------|
| RECEIVED BY | DATE RECEIVED | PACKED BY |
| | | EM |



No. 459353-01

* * FIRST ORIGINAL * *
13535 STEMMONS FREEWAY
FARMERS BRANCH, TX 75234



No. 459353-01

* * FIRST ORIGINAL * *
13535 STEMMONS FREEWAY
FARMERS BRANCH, TX 75234

790

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I OMEGA POINT LABORATORIES
P 16015 SHADY FALL ROAD

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P 16015 SHADY FALL ROAD

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CUST. PO #

CUST. PO #

1148Q

1148Q

| ORDER DATE | ORDER # | SLS # | SLS NAME | SHIP LOC. | X-REF# = Y |
|------------|-----------|-------|-------------------|-----------|-------------------|
| 08/29/94 | 459353-01 | 1750 | RICHARD CARPENTER | 51 | 08/29/94-16:16:23 |

| ACCT. # | ACCT. NAME AND CUSTOMER PURCHASE ORDER NO. | DAAAT |
|---------|--|----------|
| 8989177 | OMEGA POINT LABORATORIES 1148Q | 58-07-01 |

THANK YOU FOR CALLING HILTI CUSTOMER SERVICE 1-800-879-8000
DICK DAVITO EXT 6109

| LINE | ITEM # | ITEM DESCRIPTION | DUE | SHIP | B/O | BIN-LOC | SHIPMENT MODE |
|------|-----------|--|-----|------|-----|---------|---|
| 1 | 000453605 | KWIK BOLT II 14-214(100/BX) * * * END OF SHIPPER * * * HILTI IS CLASSIFIED AS A LARGE BUSINESS | | 2 | | R5 | <input type="checkbox"/> LOCAL <input type="checkbox"/> BUS <input type="checkbox"/> TRUCK <input type="checkbox"/> AIR <input type="checkbox"/> UPS <input type="checkbox"/> WA II <hr/> CARRIER <hr/> BILL OF LADING # <hr/> FREIGHT COST <hr/> CHARGE TO CUST <input type="checkbox"/> YES <input type="checkbox"/> NO <hr/> NO. OF PACK <hr/> WEIGHT _____ LBS. <hr/> DATE SHIP <hr/> PICKED <hr/> CHECK <hr/> PACI |

RECEIVED BY

DATE RECEIVED



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)

5400 South 122nd East Ave.
P.O. Box 21148
Tulsa, OK 74121
Phone (918) 252-6000
Telex No. 8888124
Fax No. (918) 252-6558



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 Hulti
 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 | |
| Kwik Bolt II 3/8" x 3 3/4" | 1151Q | 200 | 200 | 0 | 000453647 | Y | | Good | None | X | | | |
| Kwik Bolt II 1/2" x 7" | 1151Q | 100 | 100 | 0 | 000453795 | Y | | Good | None | X | | | |
| DRILL BIT 6" x 1/2" | 1151Q | 1 | 1 | 0 | 000280370 | Y | | Good | None | X | | | |
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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 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u><i>[Signature]</i></u> Date <u>8-31-94</u></p> | | | | |

Special Instructions

Ordered By: Kerry Hitchcock

Please include Certificate of Conformance.

Project #: TSI/TVA

| | |
|----------------------|---------------|
| Total | \$0.00 |
| Shipping Tax | |
| Invoice Total | \$0.00 |



794

Tulsa, Oklahoma 74146 Phone (918) 252-6000

T/S NO. T/S NAME STORE NO. ASSIGNED F.O. NO. X REFERENCE NO.

NEW ACCT. ADDRESS/NAME CHANGE

CUSTOMER PHONE NUMBER () -

PURCHASE ORDER NUMBER 1151Q

ACCOUNT NUMBER 591811177

SHIP TO

B NAME: *Megan Fawcett*

I STREET

L

P.O. BOX

O CITY STATE ZIP

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

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. | | TO BE SHIPPED QTY. | | UNIT PRICE | \$ AMOUNT |
|----------|----------|------------|-------------------|--------------------|----------------|----------|--------------------|------|------------|-----------|
| | | | | | VAN | STORE | STORE | WHSE | | |
| | | | <i>KB 3/33/4</i> | <i>2</i> | | <i>2</i> | | | | |
| | | | <i>KB 1/2.7</i> | <i>1</i> | | <i>1</i> | | | | |
| | | | <i>Teck 26</i> | <i>1</i> | | <i>1</i> | | | | |

NOTES/SHIPPING INSTRUCTIONS

TOTAL ORDER \$ _____

TAX _____

FREIGHT _____

NET ORDER \$ _____

SHIP C.O.D. \$ _____

APPROVED BY _____

DATE ENTERED _____ TIME _____

S.E. OPERATOR _____

DELIVERY: COMPLETE PARTIAL AS SHOWN

CASH CHECK # _____ AMT. REC'D. \$ _____

DRIVER'S LICENSE # _____ STATE _____ EXP. DATE _____

PHONED IN ORDER NAME _____

| LINE NO. | TOOL MODEL | PRODUCT SERIAL NO. |
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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 KAH*

Salesmen are not authorized to make warranties regarding specific applications -

CUSTOMER'S SIGNATURE *X Megan Fawcett*

DATE *8-30-94* TITLE *Tech*

SUBJECT TO TERMS AND CONDITIONS ON REVERSE SIDE.



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)

6400 South 122nd East Ave.
P.O. Box 21148
Tulsa, OK 74121
Phone (918) 252-6000
Telex No. 6866124
Fax No. (918) 252-6558



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 REPORT NUMBER 1441 . 11960
 CLIENT/PROJECT NUMBER 11960-97553-55+ DATE RECEIVED 9/30/94
 RECEIVED FROM Hilti ⁹⁷²⁵⁷ DATE INSPECTED 9/30/94
 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 | |
| Hilti quick Bolt II 2 1/4" x 1/4" | 1159Q | 200 | 200 | 0 | KB 1/4-2 1/4 | Y | Y | Good | None | X | | | |
| Hilti Quick Bolt II 1/2" x 4 1/2" | 1159Q | 100 | 100 | 0 | KB 1/4-4 1/2 | Y | Y | Good | None | X | | | |
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PURCHASE ORDER

Omega Point Laboratories, Inc. 797

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:

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 |
|------------|----------|----------------|---------------|-------|
| 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"x4 1/2" <i>CK</i> | 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 |



Tulsa, Oklahoma 74146 Phone (918) 252-6000

T/S NO. T/S NAME STORE NO. ASSIGNED F.O. NO. X REFERENCE NO.

-NEW ACCT. ADDRESS/NAME CHANGE

ACCOUNT NUMBER: 898177

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 #

CUSTOMER PHONE NUMBER

PURCHASE ORDER NUMBER: 11590

SHIP TO: *[Handwritten Signature]*

CITY STATE ZIP

MARKET NATURE SOLD TO GOV AGENCY SOLD FOR GOV PROJECT POINT OF SALE KEY JOB SITE

TAX STATUS COMPLETE ONLY IF APPLICABLE

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. | | TO BE SHIPPED QTY. | | UNIT PRICE | \$ AMOUNT |
|----------|----------|--------------|-------------------|--------------------|----------------|-------|--------------------|------|------------|-----------|
| | | | | | VAN | STORE | STORE | WHSE | | |
| 1 | | | KB 1/4-2 1/4 | 2 | | 2 | | | | |
| | | | KB 1/4-4 1/2 | 1 | | 1 | | | | |

NOTES/SHIPPING INSTRUCTIONS

TOTAL ORDER \$

DELIVERY: COMPLETE PARTIAL AS SHOWN

CASH CHECK # AMT. REC'D. \$

DRIVER'S LICENSE # STATE EXP. DATE PHONED IN ORDER NAME

TAX

FREIGHT

NET ORDER \$

| LINE NO. | TOOL MODEL | PRODUCT SERIAL NO. |
|----------|------------|--------------------|
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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 *[Handwritten Signature]*

DATE: 9/30 TITLE

SHIP C.O.D. \$

APPROVED BY

DATE ENTERED TIME

S.E. OPERATOR

SUBJECT TO TERMS AND CONDITIONS ON REVERSE SIDE.

799



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: 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, SCl.

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 REPORT NUMBER 1407-11960
 CLIENT/PROJECT NUMBER 11960-97185-87+97257-62 DATE RECEIVED 7-26-94
 RECEIVED FROM Ramsey Electric Supply Co. DATE INSPECTED 7-26-94
 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 | |
| 4"X12'X24" Ladders | NA | 0 | 5 | 0 | 06-1D79-0012-2A | Y | N | GOOD | NONE | X | | | Receiving Verification Only |
| 24" flngd stl Cover | NA | 0 | 1 | 0 | 2000-0012-2A | Y | N | | | | | | |
| Adj. Riser Conn. Pair | NA | 0 | 2 | 0 | 06-1D79-1307-02 | Y | N | Good | None | X | | | |
| Cover Conn 1" flng 3" gap | NA | 0 | 50 | 0 | 06-1D79-1845-30 | Y | N | Good | None | X | | | |
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WESTERN, INC. *Manufacturers*

623 OLYMPIC BLVD. P.O. BOX 1399
MONTEBELLO, CALIFORNIA 90640-1399
TELEPHONE (213) 723-8919
FAX (213) 728-5023

INVOICE NO.

14739

S
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O

Ramsey Electric Supply Co.
2310 Rossville Blvd.
Chattanooga, TN 37401

S
H
I
P
T
O

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 @ |
| 7/25/94 | SHIP VIA | ACCT# 541-015-053 | PART. DEL. |
| | Emery Air Frt | 3rd Party Billing | COMPLETE DELIVERY |

| ITEM NO. | CATALOG NUMBER | DESCRIPTION | QUANTITY | | | | AMOUNT | AMOUNT |
|----------|-----------------|---------------------------|-------------|---------------|-------------|--------------|--------|--------|
| | | | TOTAL ORDER | PREV. SHIPPED | THIS SHIP'T | BACK ORDERED | | |
| 1 | 06-1D79-0012-24 | 4" Stl Ladder 12'L 24"W | 5 | 0 | 5 | | | |
| 2 | 2000-0012-24 | Flngd Stl Cover, Str 24"W | 1 | 0 | 1 | | | |
| 3 | 06-1D79-1307-02 | Adj. Riser Conn. Pair | 2 | 0 | 2 | | | |
| 4 | 06-1D79-1895-30 | Cover Conn. 1"Flg 3" Gap | 50 | 0 | 50 | | | |

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 108

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!**

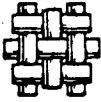
The carrier wants your, and our, business. Satisfy his needs for documentation and verification and he'll be happy to pay your claim.



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI / TVA REPORT NUMBER 1403 - 11960
 CLIENT/PROJECT NUMBER 11960-97185-87, 97257- DATE RECEIVED 7-20-94
 RECEIVED FROM Southwestern Wire Cloth DATE INSPECTED 7-20-94
 PROJECT LOCATION Omega Point Labs INSPECTED BY: O Dalton

| 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 | | |
| <u>Die Wire .062"</u> | <u>NA</u> | <u>0</u> | <u>100#</u> | <u>0</u> | <u>304SS .062"</u> | <u>Y</u> | <u>N</u> | <u>Good</u> | <u>None</u> | <u>X</u> | | | <u>Receiving Verification Only</u> | |
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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: 804
PAGE:
DATE:
REQ. SHIP DATE:

SOLD TO: [Faded text]

SHIP TO: [Faded text]

| CUSTOMER P. O. | | | ORDER DATE | SLSP | TERMS | SHIPPED | | FREIGHT |
|----------------|---------|------|-------------|------|-------|------------------|------------------------------|---------|
| | | | | | | FROM | VIA | |
| | | | | | | | <i>Handwritten signature</i> | |
| QUANTITY | | | PART NUMBER | | | DESCRIPTION | | U/M |
| ORDERED | SHIPPED | B.O. | | | | | | |
| 100 | 100 | | | | | | | |
| | | | | | | <i>Sherry #6</i> | | |

SEE REVERSE SIDE FOR ADDITIONAL TERMS AND CONDITIONS OF SALE
PACKING LIST

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.

58098805

SMC #5183
ICC-MC 190566



CTI W/B NO. _____
CTI CONTROL NO. _____
DATE 7-20-94

Cannonball Trucking, Inc.

P.O. Box 262523, Houston, Texas 77207-2523 • 644-7300
Fax # (713) 644-9431

SHIPPER'S B/L NO. _____
SHIPPER'S ORDER NO. _____
CONSIGNEES ORDER NO. _____
RELEASE NO. _____

INTRASTATE LOCAL

| | | | | | |
|---|-------|----------|---|-------|---------------------|
| FROM: SHIPPER <u>Southwestern Wire Cloth</u> | | | TO: CONSIGNEE <u>Omega Pout Laboratories</u> | | |
| STREET ADDRESS <u>7631 W Belt North</u> | | | STREET ADDRESS <u>10018 Shady Hollow St</u> | | |
| CITY <u>DEW, TX</u> | STATE | ZIP | CITY <u>Elmendorf, TX</u> | STATE | ZIP <u>75112</u> |
| LOCATION | DOCK | SHIP | LOCATION | DOCK | SHIP |
| LEASE | RIG. | WELL NO. | LEASE | RIG. | WELL NO. |

| DRIVER | TRUCK NO. | TRAILER NO. | EQUIPMENT USED | LENGTH | WIDTH | HEIGHT |
|-----------------------|-----------|-------------|----------------|--------------|------------|--------|
| <u>Sherry</u> | <u>#6</u> | | <u>20</u> | | | |
| BILL TO: | | | TARIFF MILEAGE | REGULATED BY | TARIFF | |
| SPECIAL INSTRUCTIONS: | | | PLUS MILEAGE | ITEM NO. | COLUMN NO. | |

| # PCS. | COMMODITY OR SERVICE RENDERED | HRS/WEIGHT | RATE | AMOUNT | C.O.D. CHARGE TO BE PAID BY |
|----------------|-------------------------------|-------------|------|--------|---|
| <u>2</u> | <u>Rolls Wire</u> | <u>100#</u> | | | <input type="checkbox"/> SHIPPER <input type="checkbox"/> 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. |
| TOTAL → | | | | | \$ |

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 _____

Agent or Cashier

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 _____

Charges Advanced

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 <u>Southwestern Wire Cloth</u> | RECEIVER'S NAME <u>Omega Pout Laboratories</u> |
| BY _____ DATE _____ | RECEIVED ABOVE ARTICLES IN GOOD ORDER BY <u>Gene Chynide</u> DATE <u>7-20-94</u> |

When property is moved 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. Where the rate is dependent on value, shippers are required to state in writing the agreed 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 subsequent thereto.

CARRIER

CANNONBALL TRUCKING, INC.
P.O. BOX 262523
Houston, Texas 77207-2523

I hereby certify that the dates and time shown is correct.
CARRIER **CANNONBALL TRUCKING, INC.** DATE 7-20-94
DRIVER Sherry #6



Q/A RECEIVING REPORT

CLIENT/PROJECT NAME TSI/TUA
 CLIENT/PROJECT NUMBER 11960-97185.86+87
 RECEIVED FROM Alamo Bolt & Screw
 PROJECT LOCATION Omega Point Labs

REPORT NUMBER 1394-11960
 DATE RECEIVED 7-11-94
 DATE INSPECTED 7-12-94
 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 | |
| ^{1/2"} Medium Lock Washers | 1126Q | 1K | 1K | 0 | ^{lock} 1/2" Washers | Y | Y | Good | None | X | | | |
| ^{1/2"} nuts | 1126Q | 1K | 1K | 0 | ^{finished} 1/2" Hex Nuts | Y | Y | Good | None | X | | | |
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PURCHASE ORDER

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 |
| <p>"See Special Instructions Regarding Purchasing Specifications for Quality Assurance Requirements." QA Approval <u>C Patton</u> Date <u>7-11-94</u></p> | | | | |

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.: 0279340

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 | |
|---------------------------------|--------------|--------------------|------------|----------|---------------------------|--------------|------------|----------------|-------|--|
| 073066 | Q9D | 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 | | |
| <i>2 BOXES</i> | | | | | | | | | | |
| WE APPRECIATE YOUR BUSINESS. | | | | | | | | SALE AMOUNT | 67.00 | |
| THANK YOU | | | | | | | | SALES TAX | 4.88 | |
| RECEIVED BY: <i>[Signature]</i> | | | | | | | | TOTAL | 71.88 | |

IVAN

808



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 # 1126-0
on our Bill of Lading (shipping document) # 279340
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.

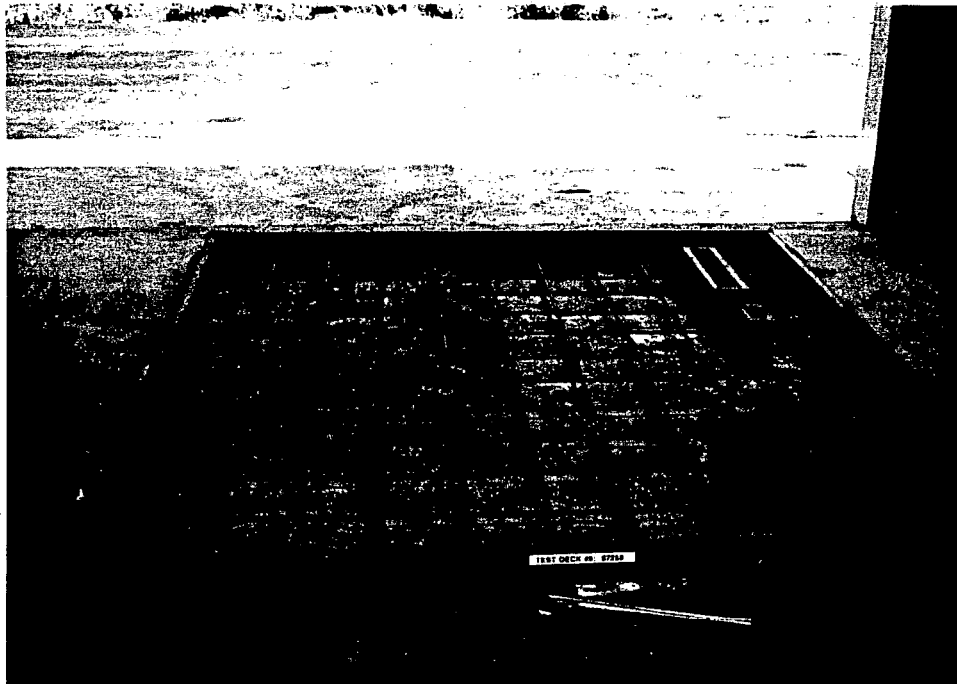
Date: 7/25/94
Signature: Luis H. DeBorja
Title: Office Manager

Report No. 11960-97258
TVA / Thermal Science, Inc.

November 23, 1994
APPENDICES

Appendix F
PHOTOGRAPHS

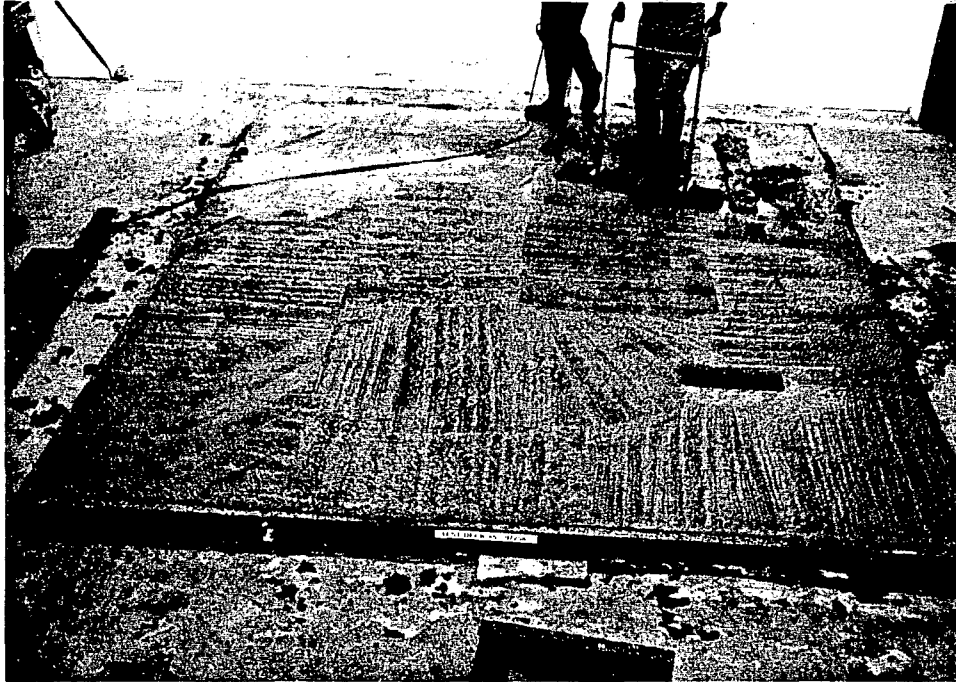




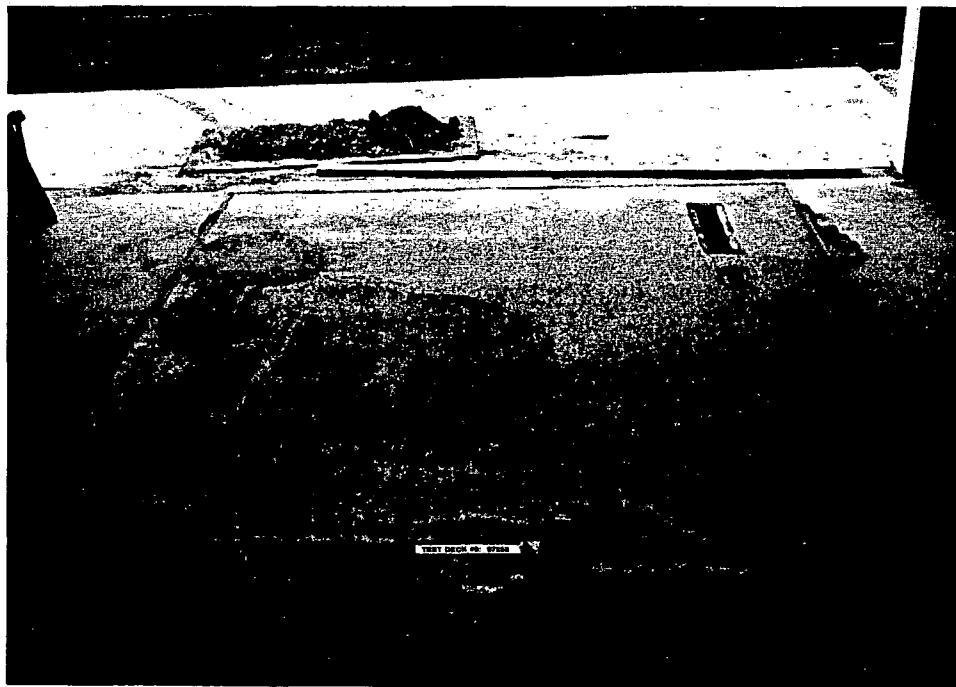
Steel form for deck wall.



Pouring concrete into steel form for deck.

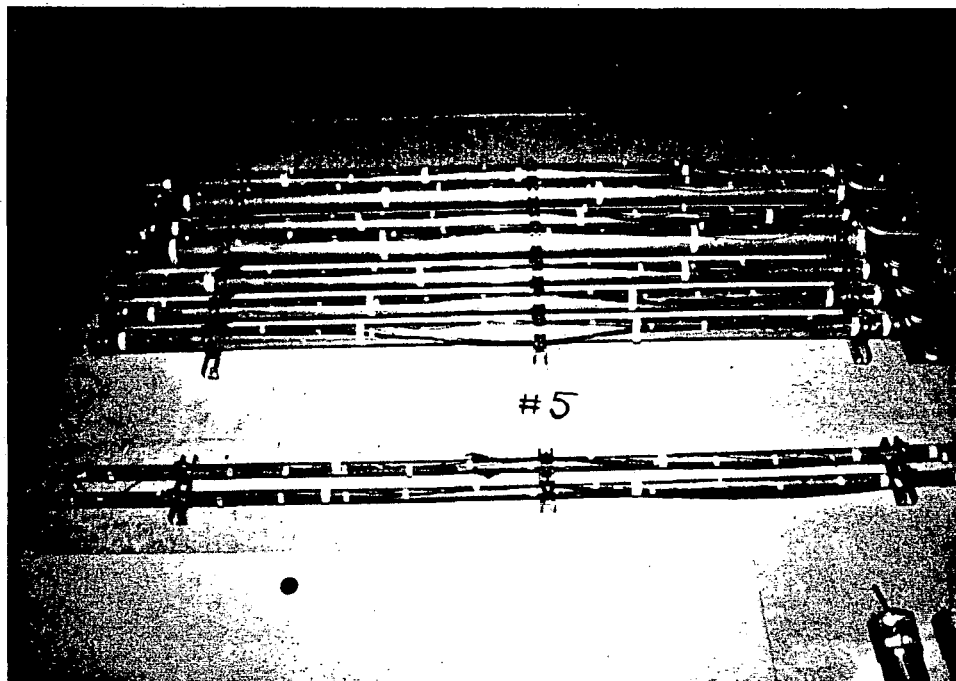


Finishing concrete surface.

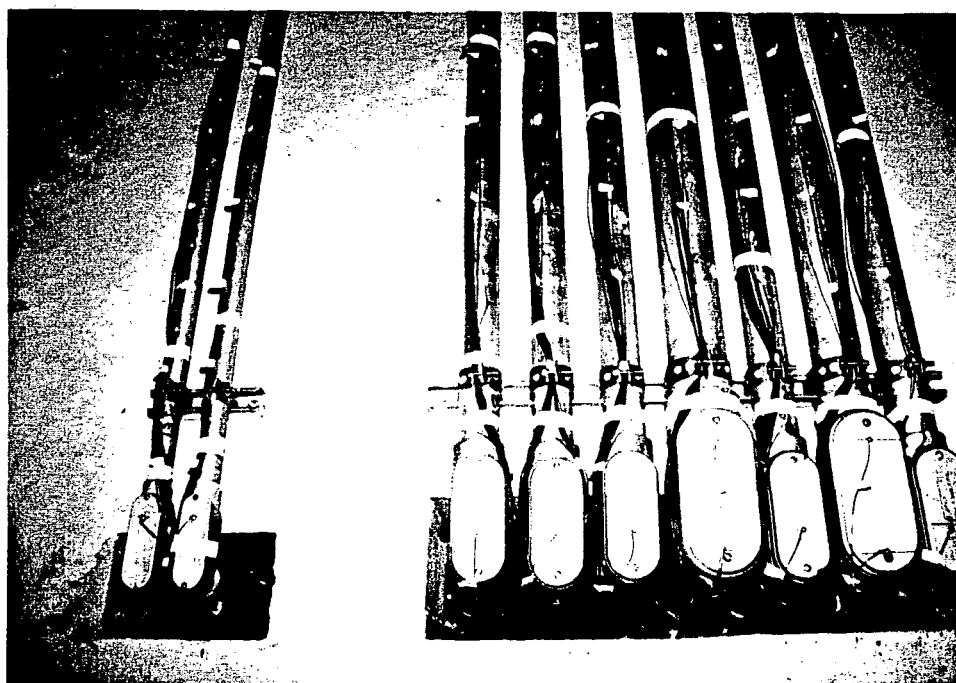


Finished concrete surface.

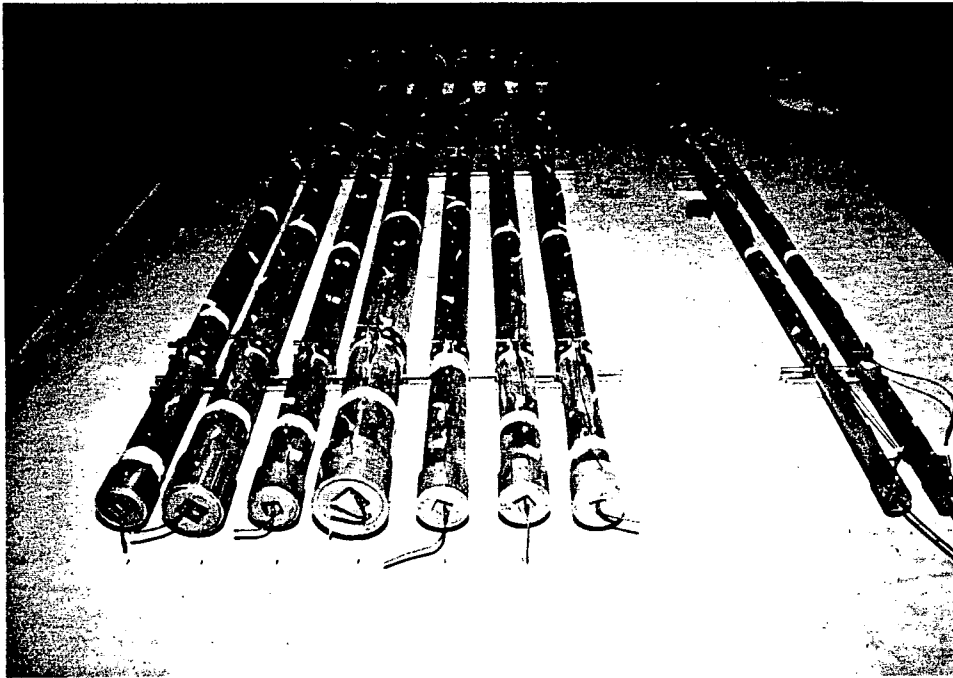




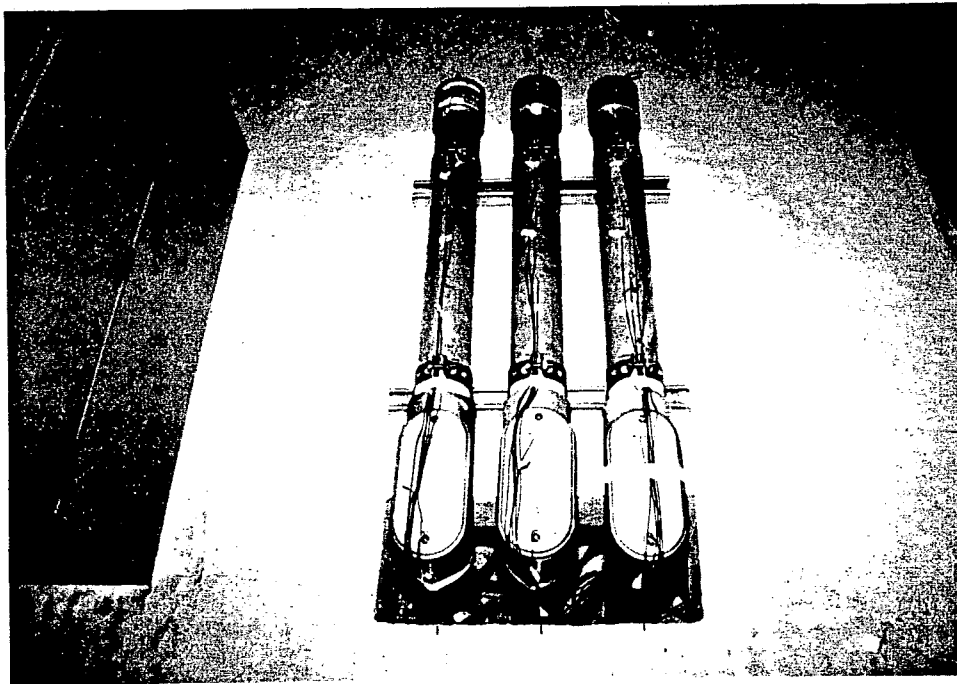
Upper and middle conduit banks.



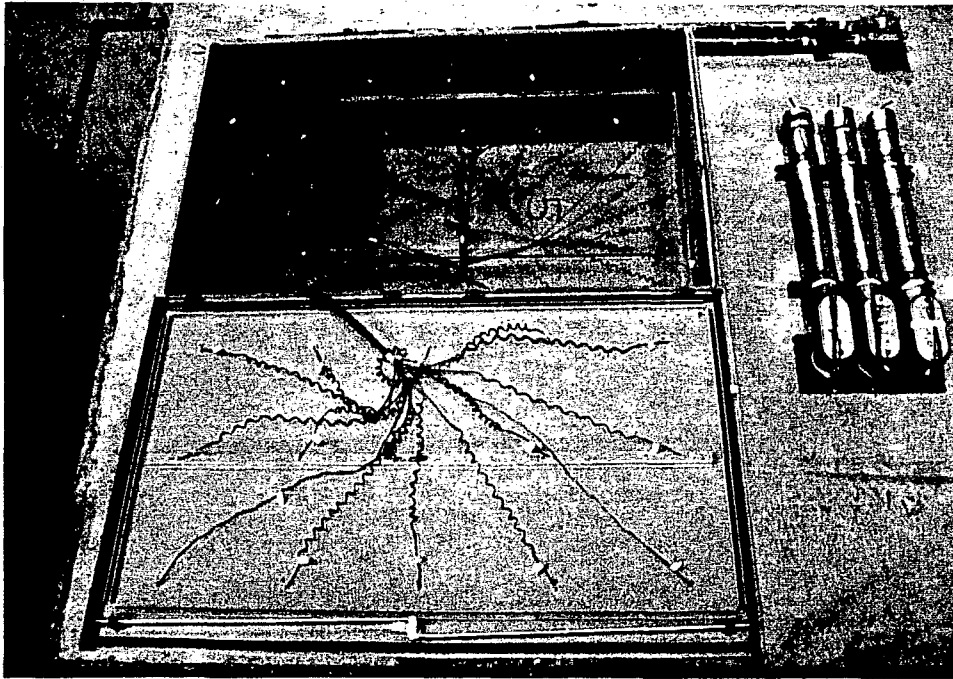
LBs in upper and middle conduit banks.



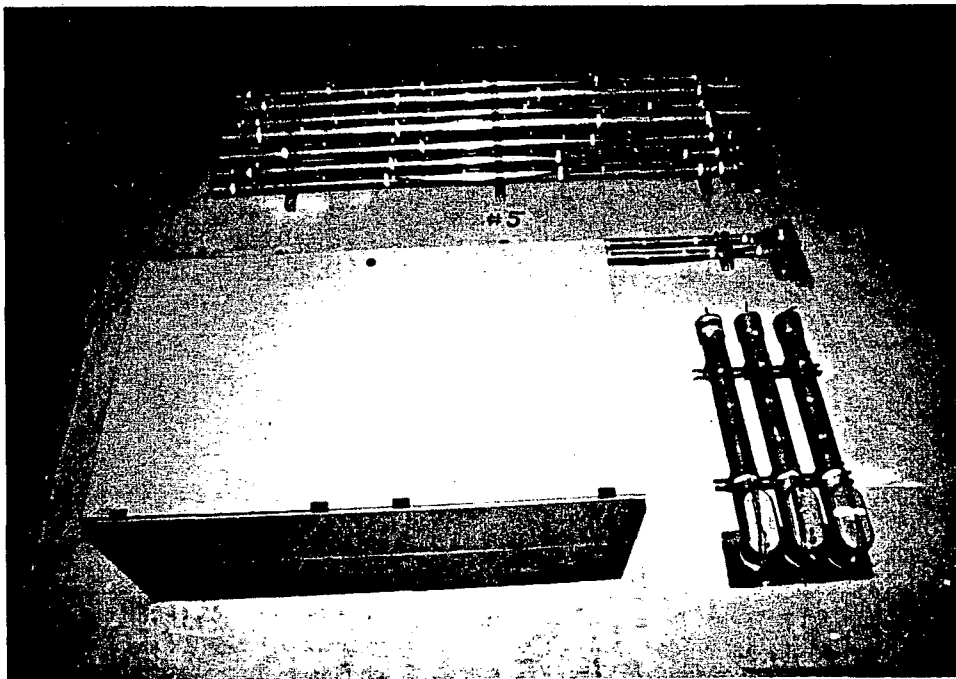
Capped end in upper and middle conduit banks.



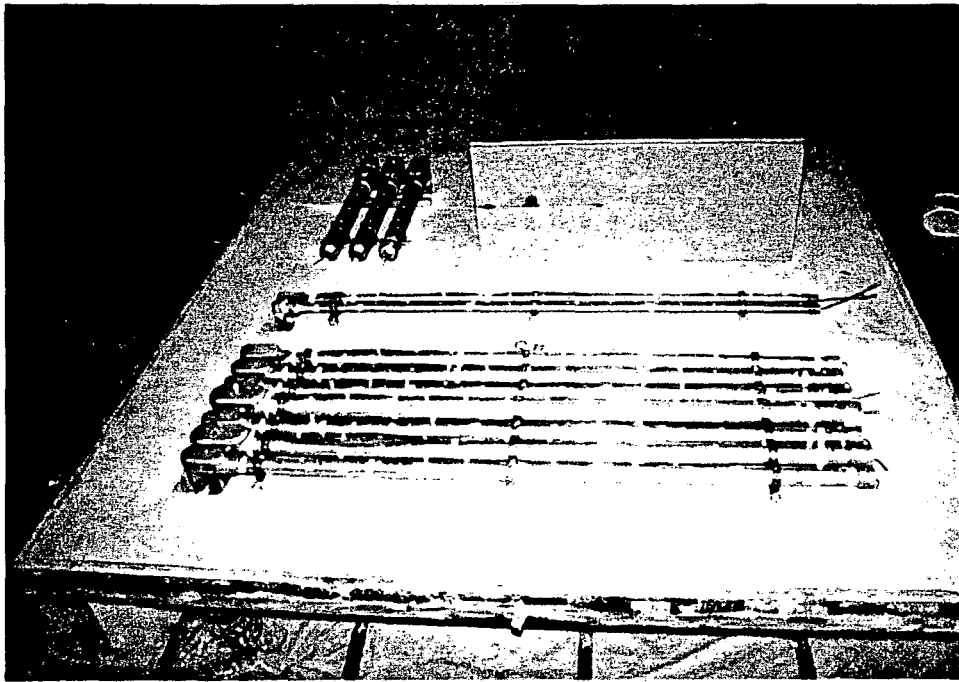
Lower conduit bank.



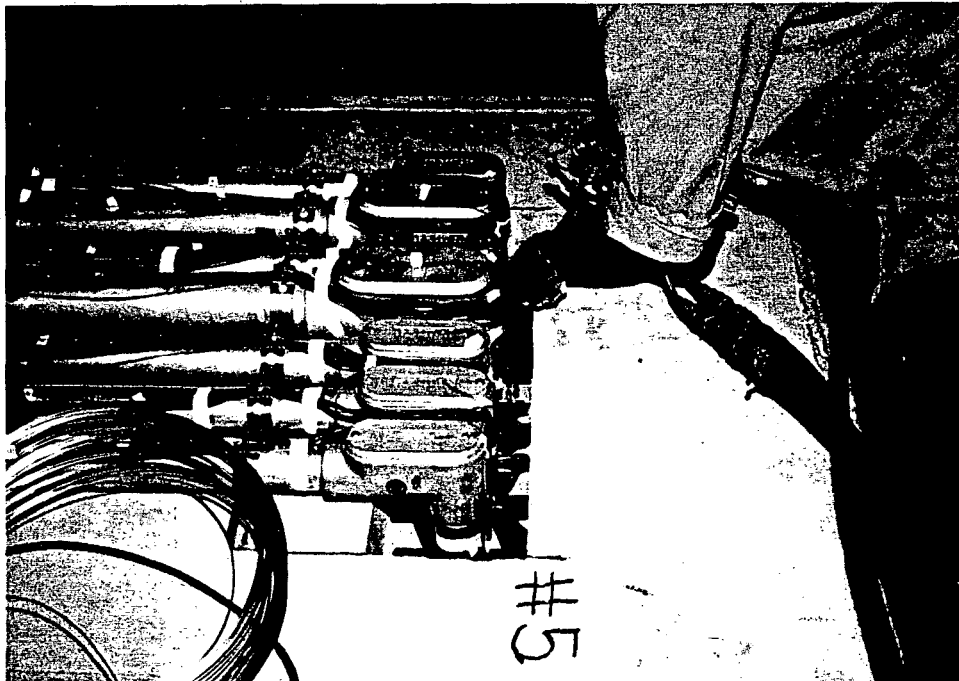
Interior of junction box showing instrumentation.



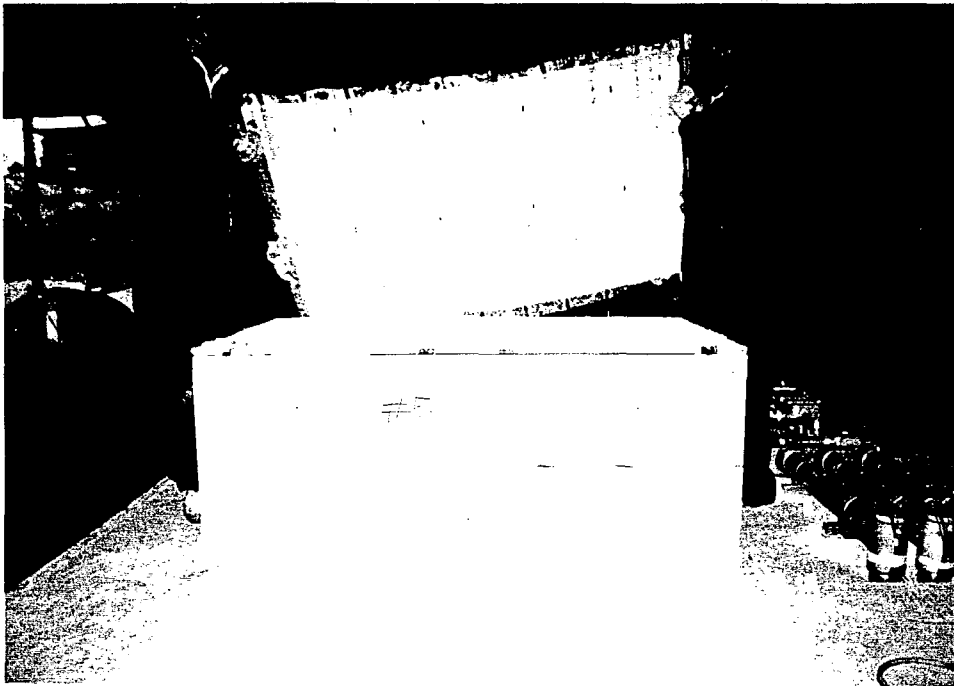
Assembled test deck.



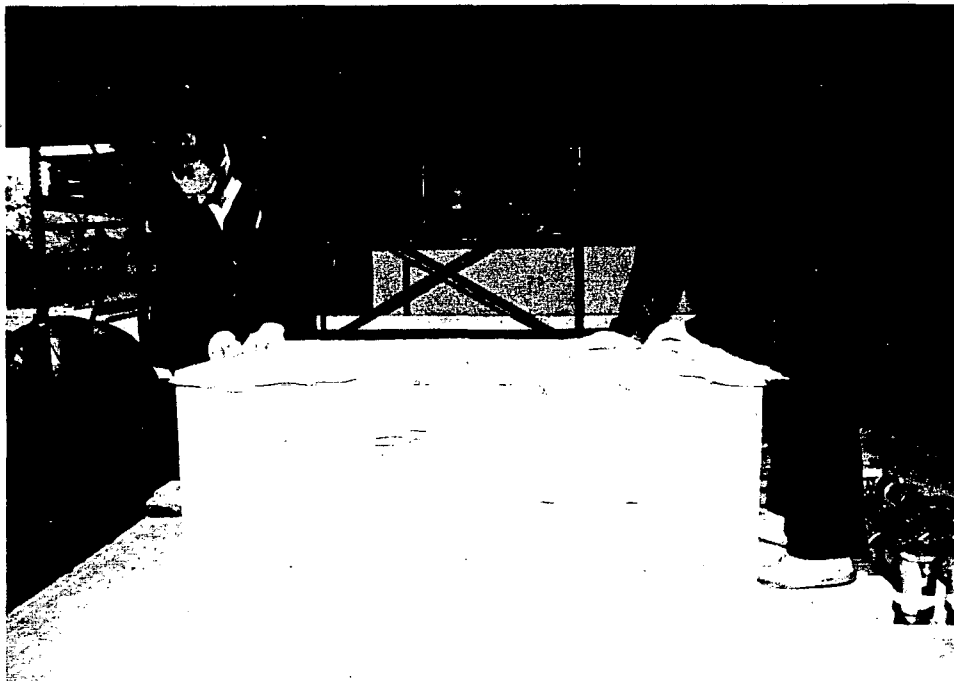
Assembled test deck.



Silicone foam seal material installed into concrete blockouts.



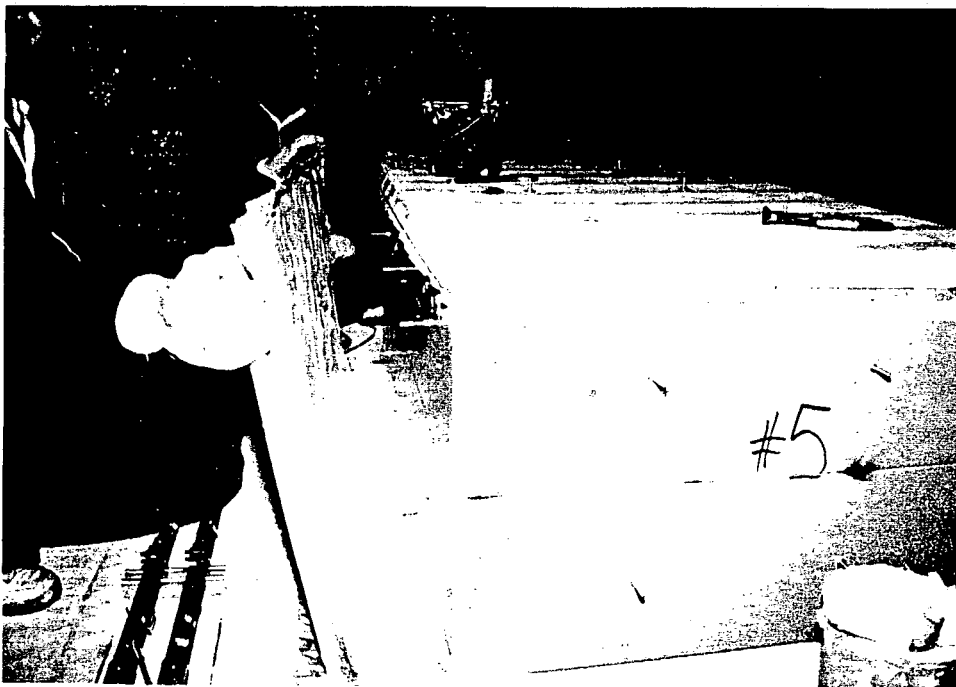
Panel installed onto pre-buttered junction box cover.



Panel installed onto pre-buttered junction box cover.



Panel secured with fender washers and nuts.



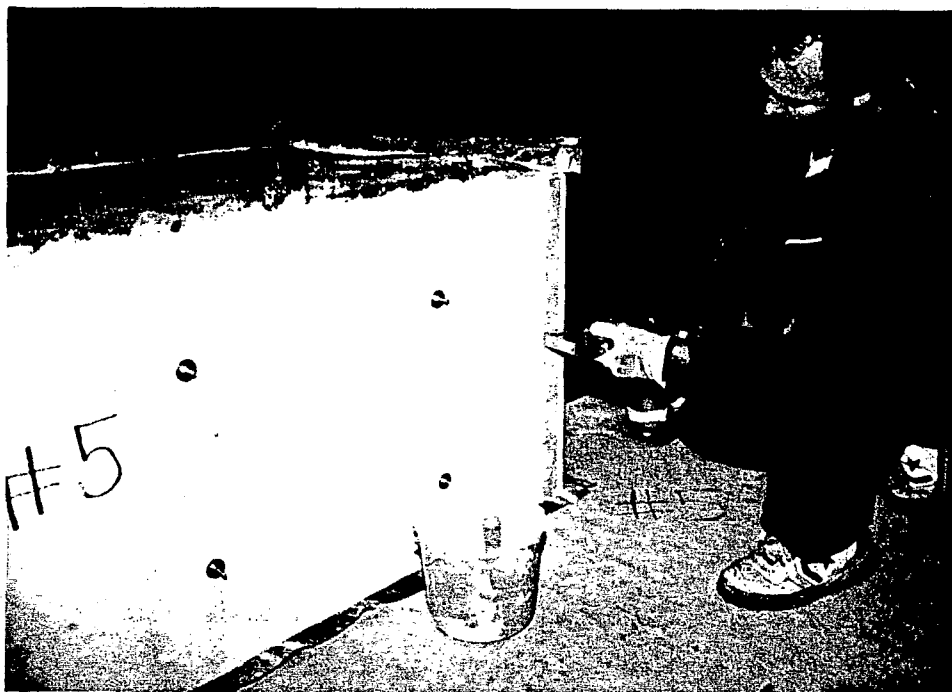
Pre-buttered panel installed on top side of junction box.



Stress skin flaps stapled in place.



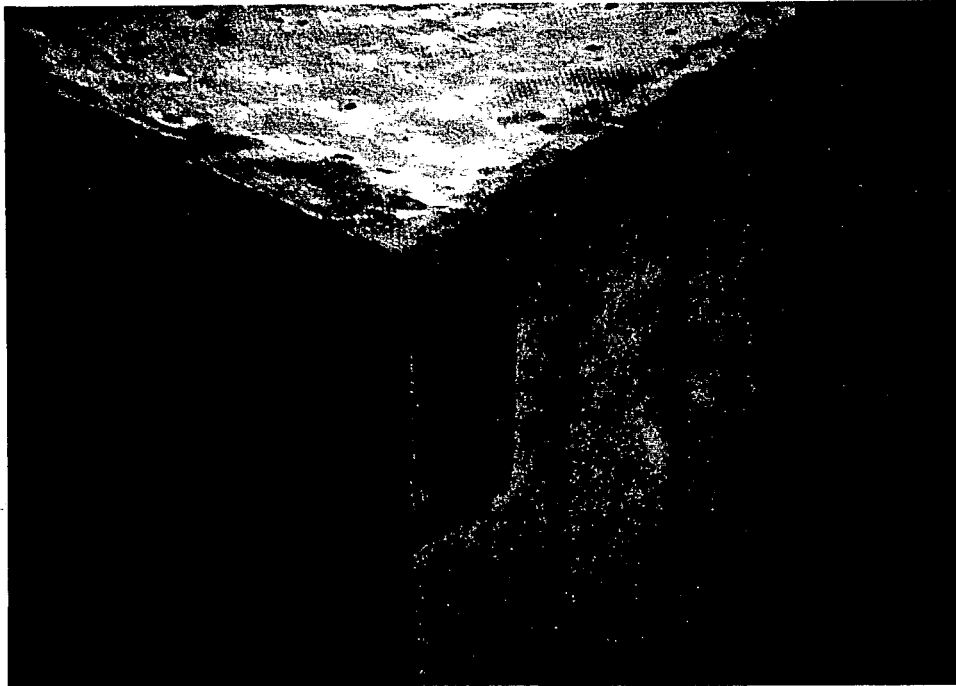
Pre-buttered panel installed on left side of junction box.



Stress skin flaps stapled in place.



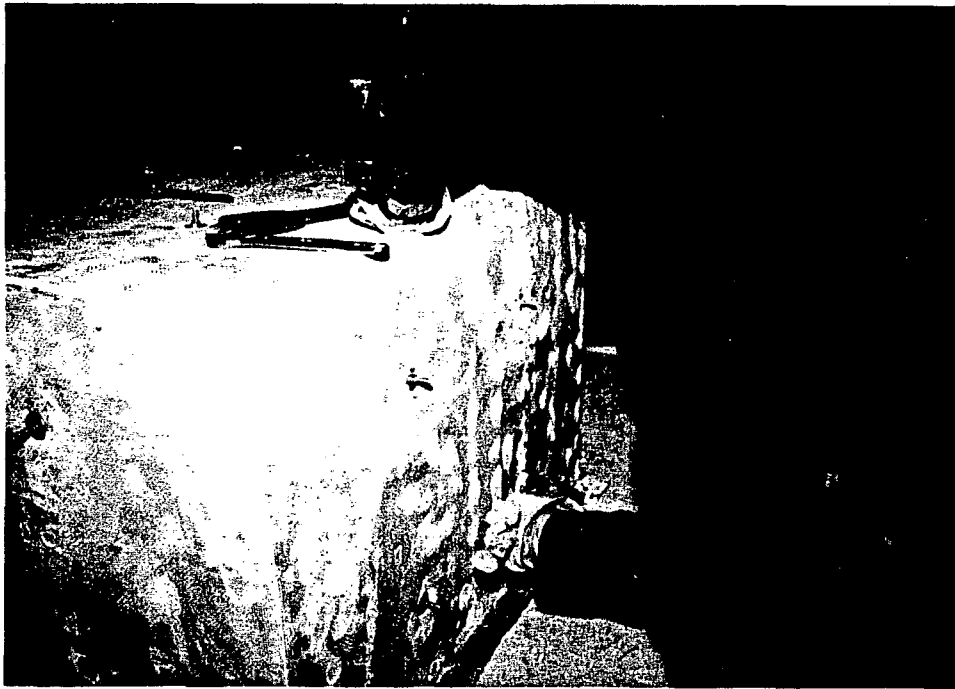
External stress skin wrapped around junction box enclosure.



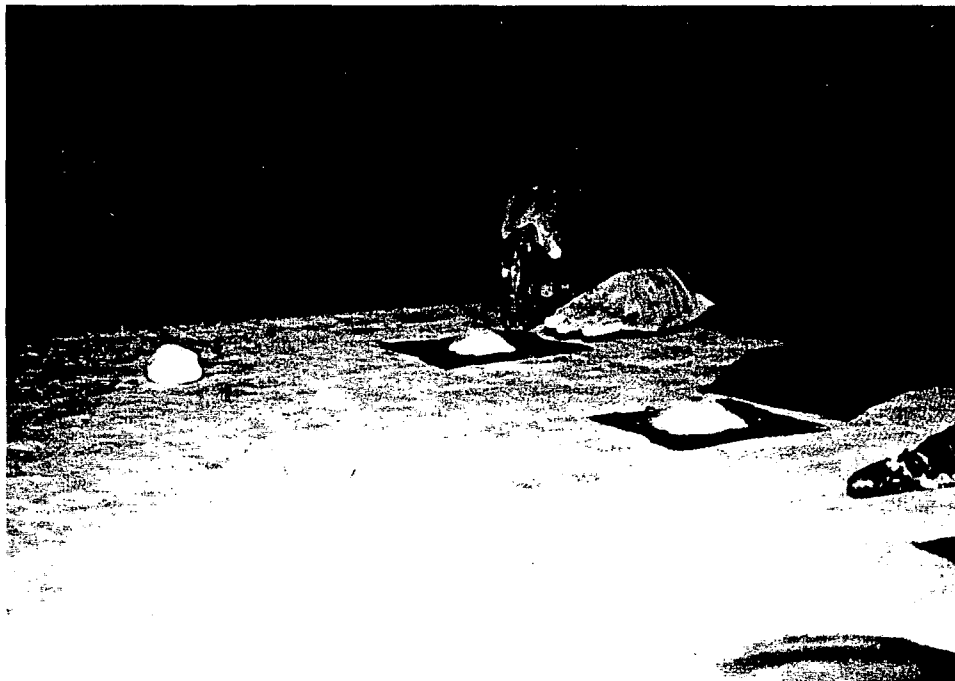
Typical corner installation with external stress skin.



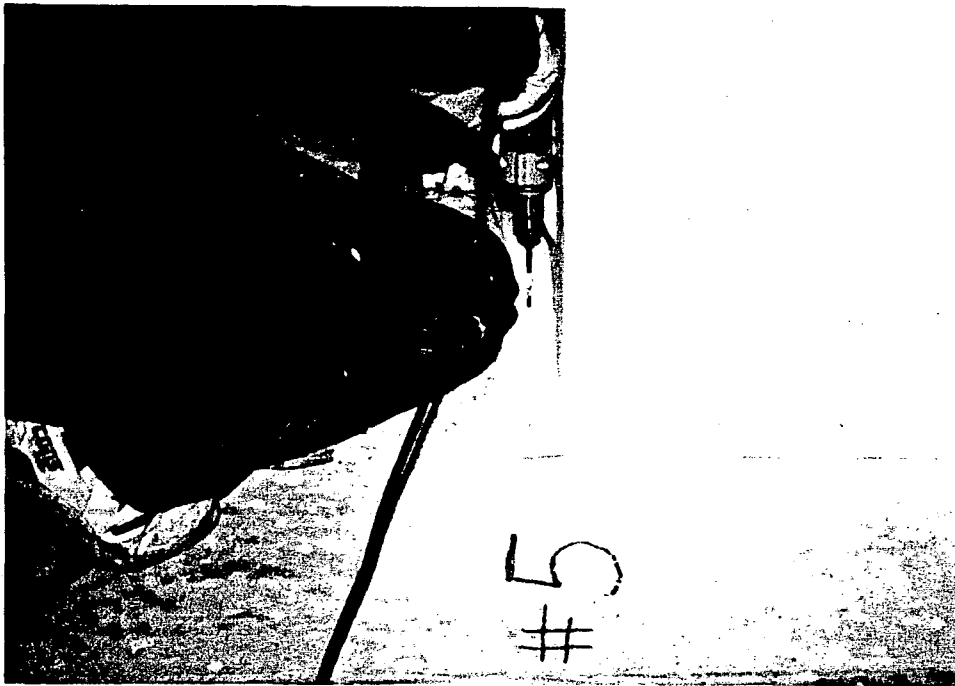
External stress skin wrapped around side of junction box enclosure.



External stress skin stapled in place.



Washers and nuts covered with trowel grade mounds and external stress skin.

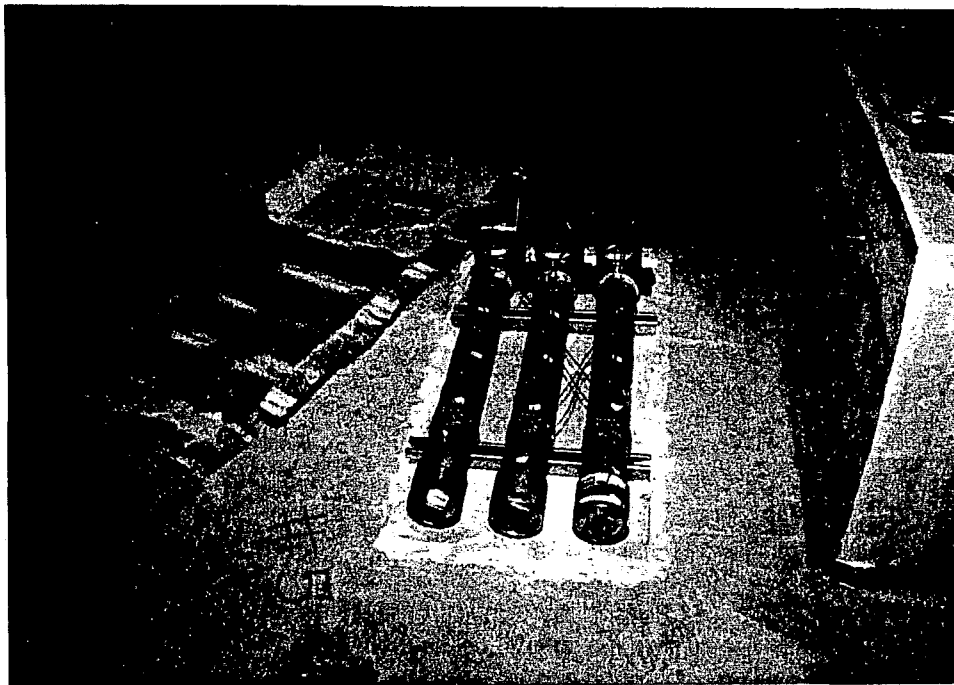


Holes drilled in concrete slab for anchors to secure the base plate.

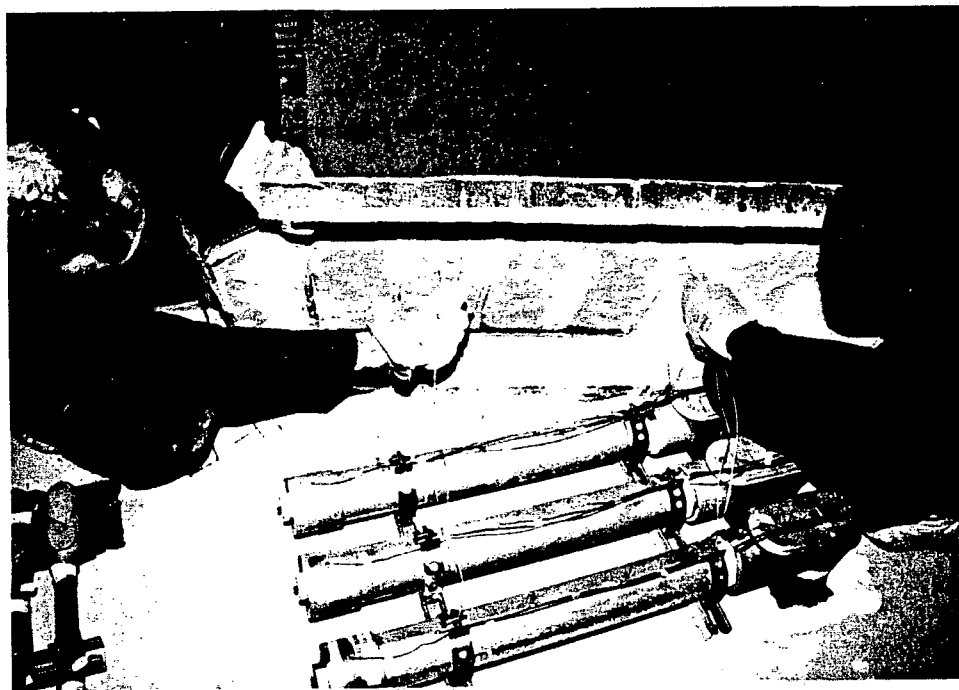


Pre-buttered panel installed as base plate around junction box enclosure.

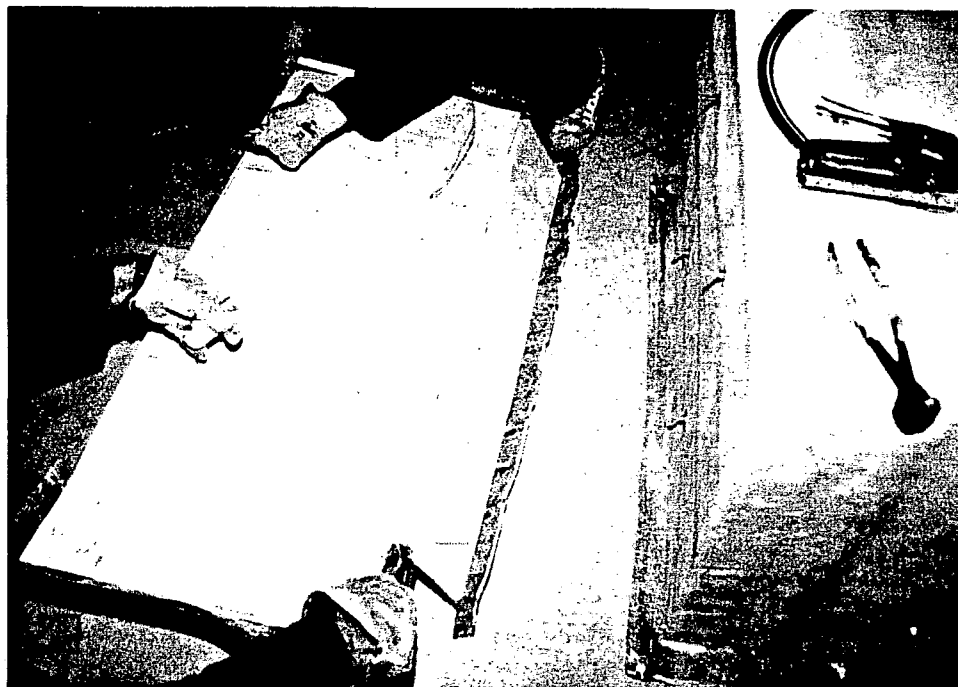




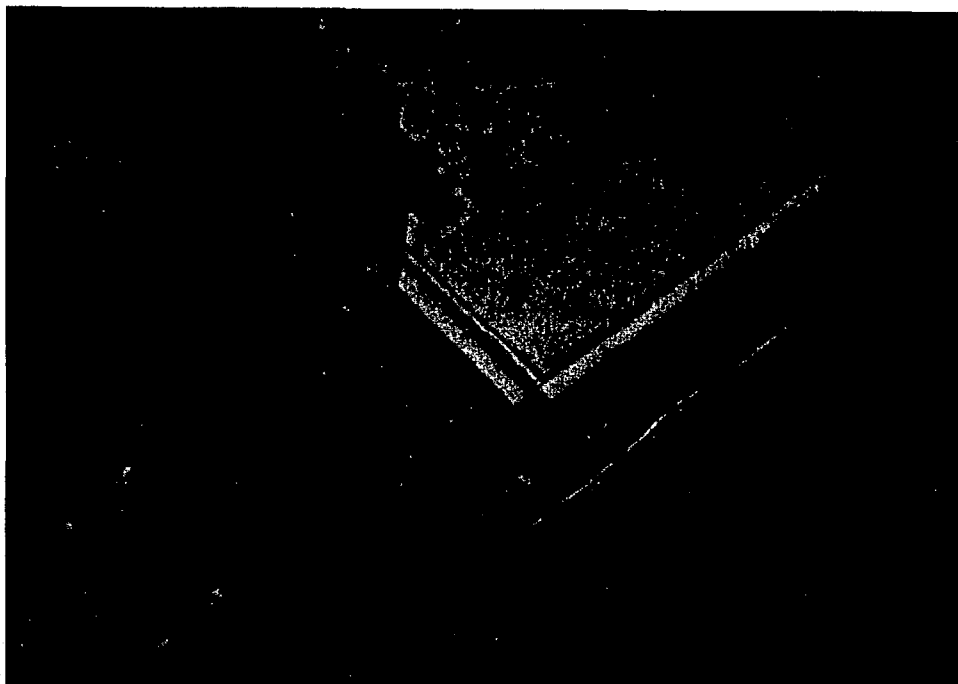
Pre-buttered panel to be installed over lower conduit bank.



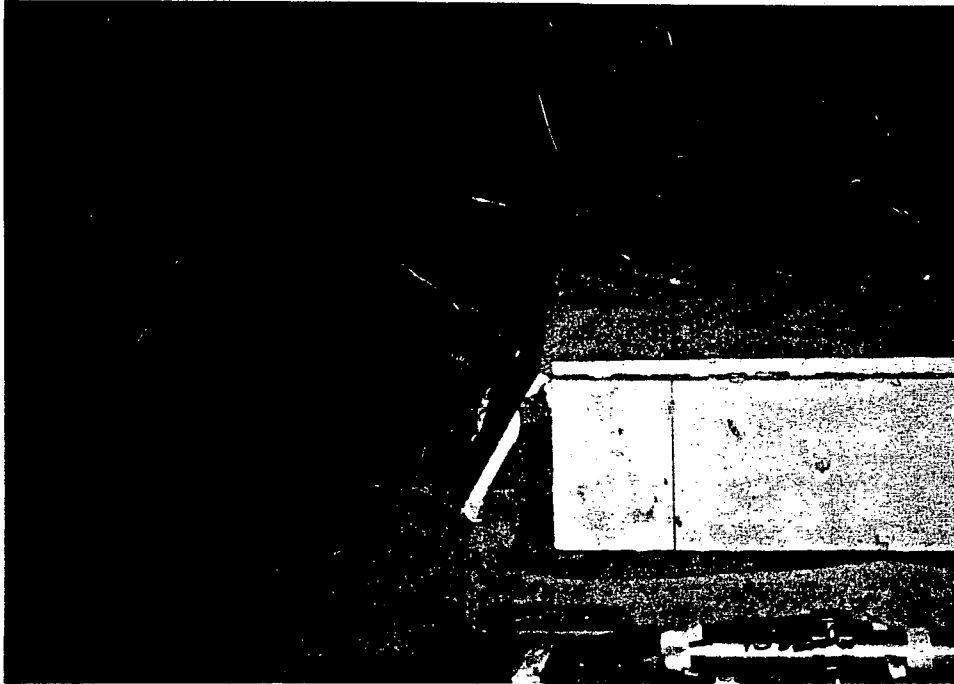
Stainless steel tie wires run through the panel installed over lower conduit bank.



Stainless steel tie wires run through the panel installed over lower conduit bank.



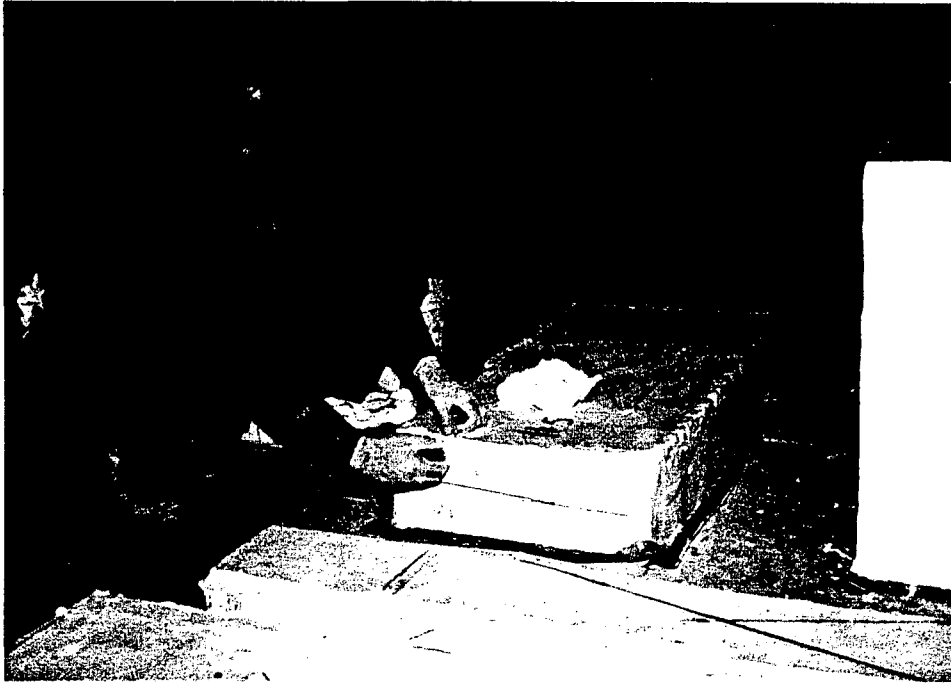
Sides of box formed by folding panel at scored lines.



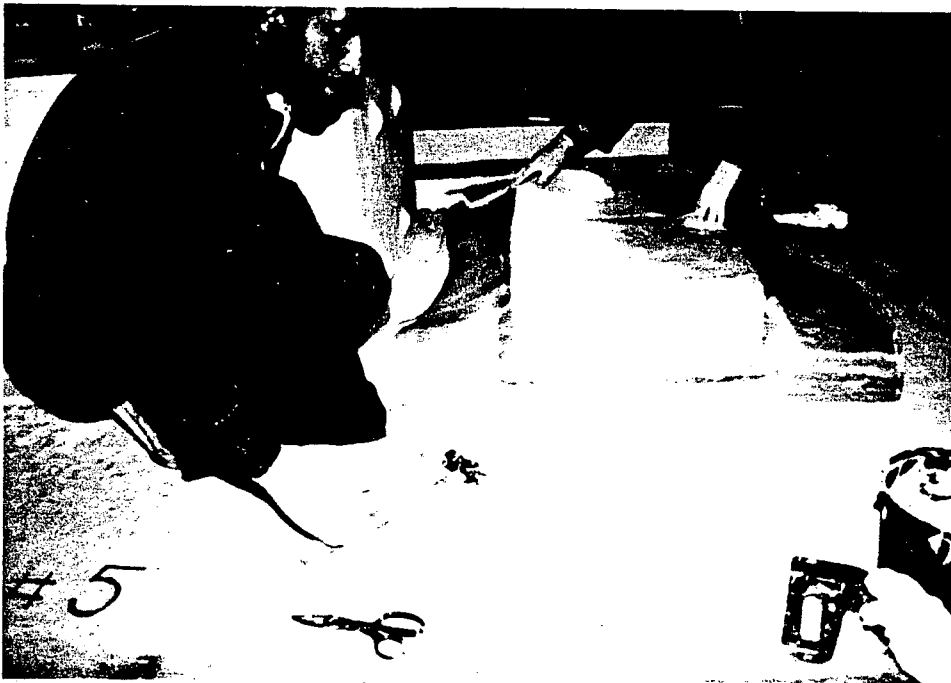
Stainless steel tie wires run through the panel installed over lower conduit bank.



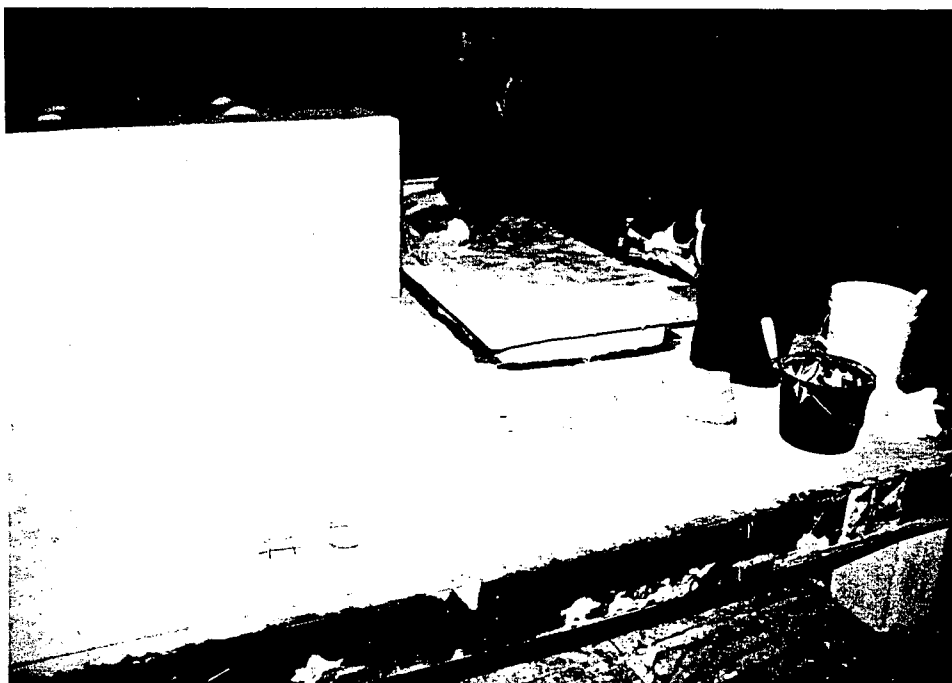
Stainless steel tie wires tightened to secure box to lower conduit bank.



Sides of box secured with stainless steel tie wire.



External stress skin installed over lower conduit bank enclosure.



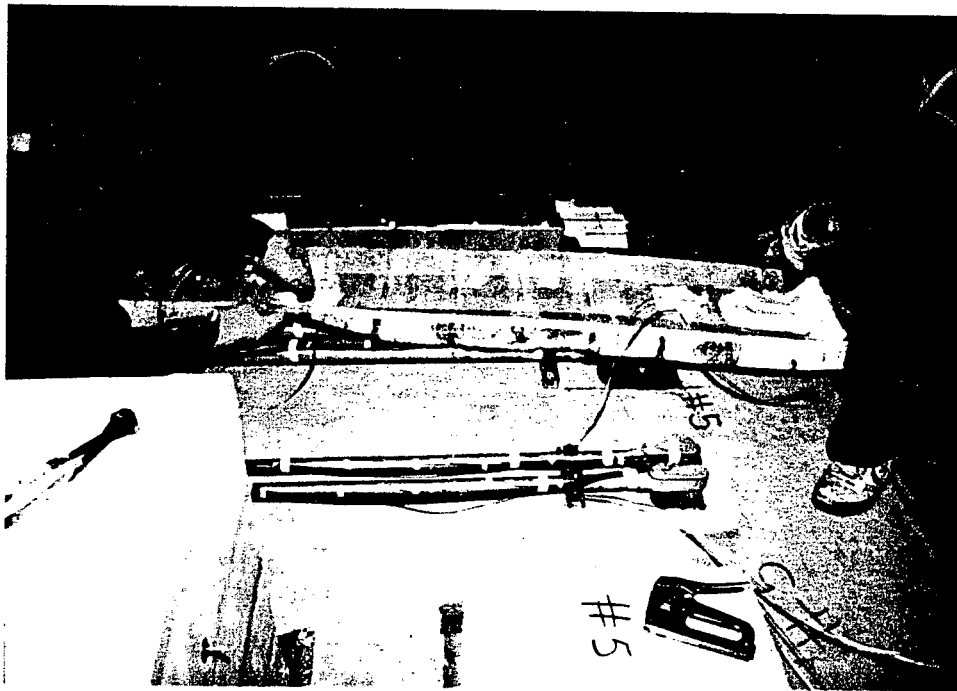
Base plate installed around lower conduit enclosure.



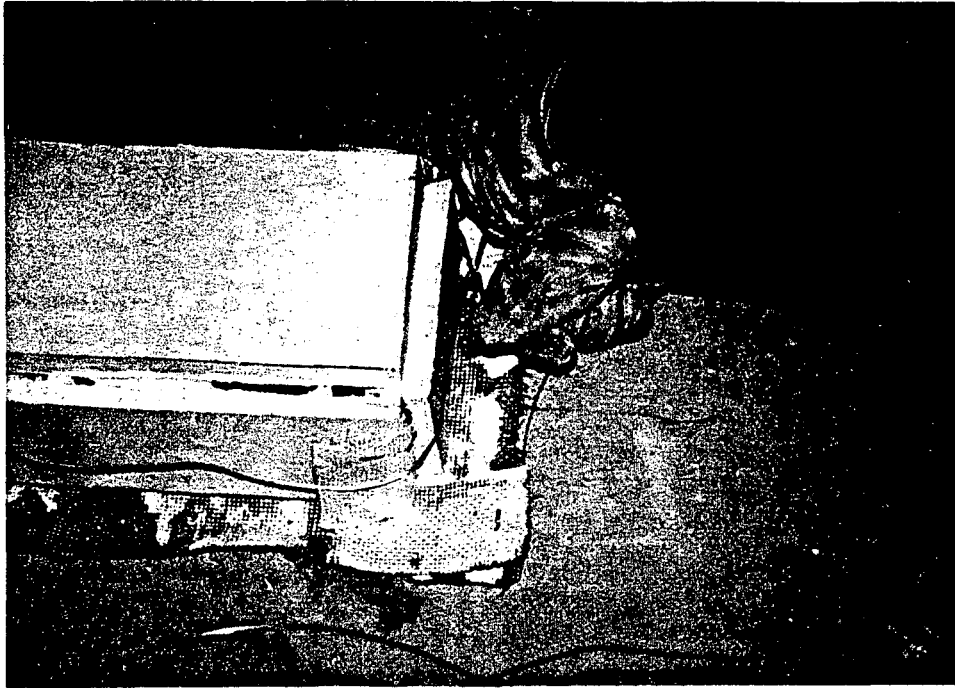
Holes drilled in concrete slab for anchors to secure the base plate.



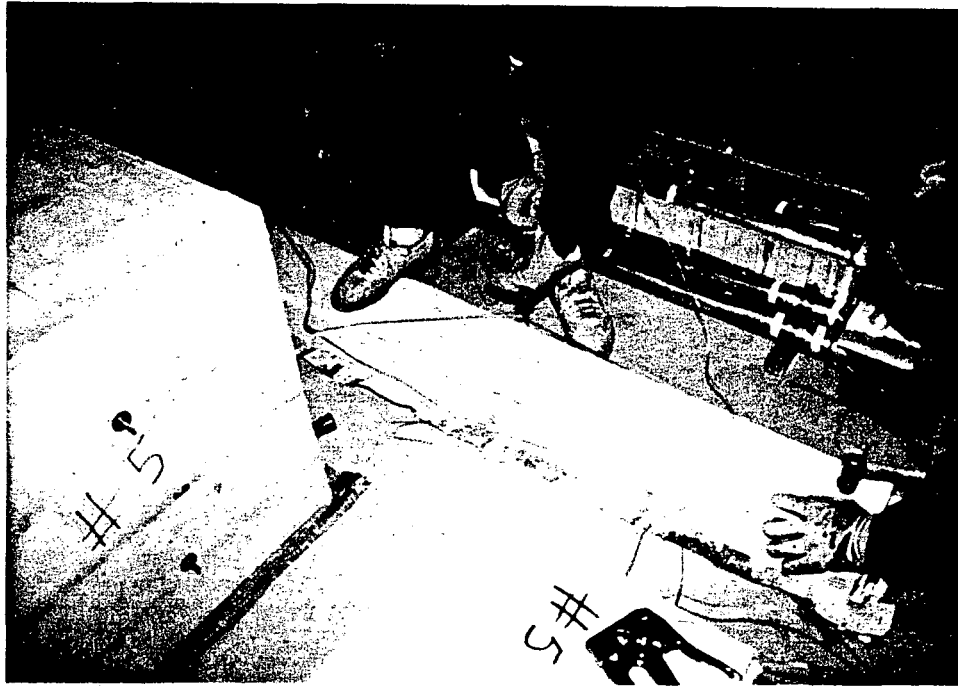
Skim coat of trowel grade material applied to lower conduit bank enclosure.



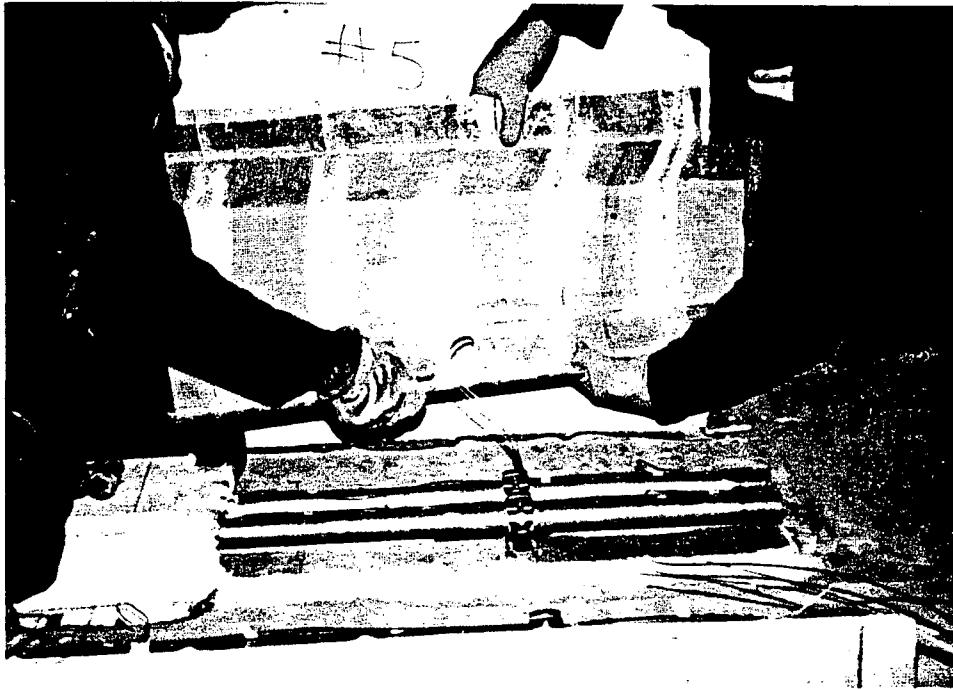
Pre-buttered, scored and folded panel installed on middle conduit bank.



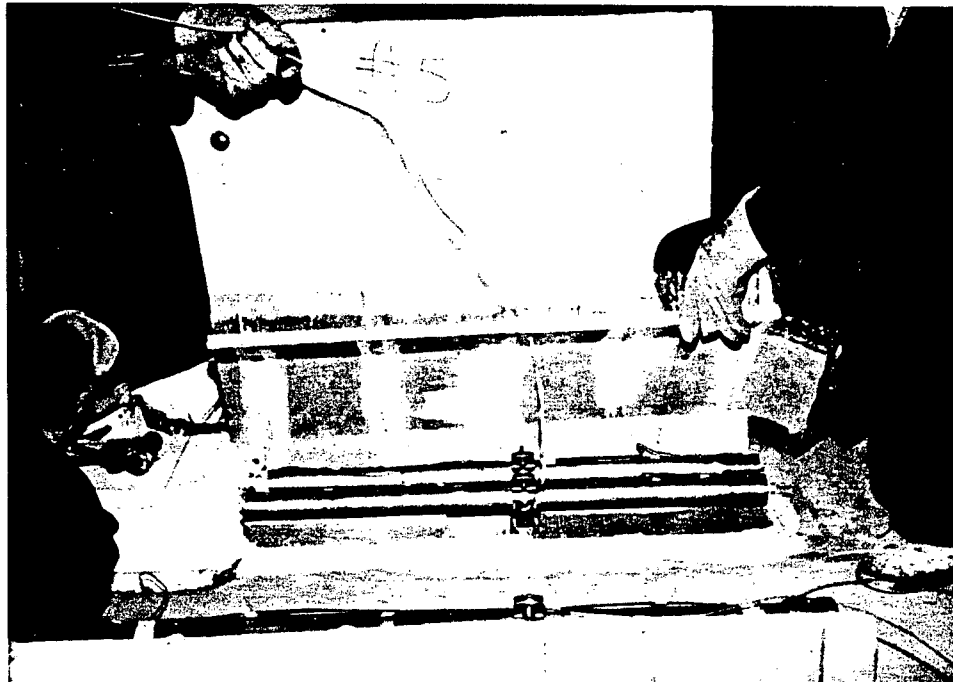
Sides of enclosure formed by folding panel along scored lines.



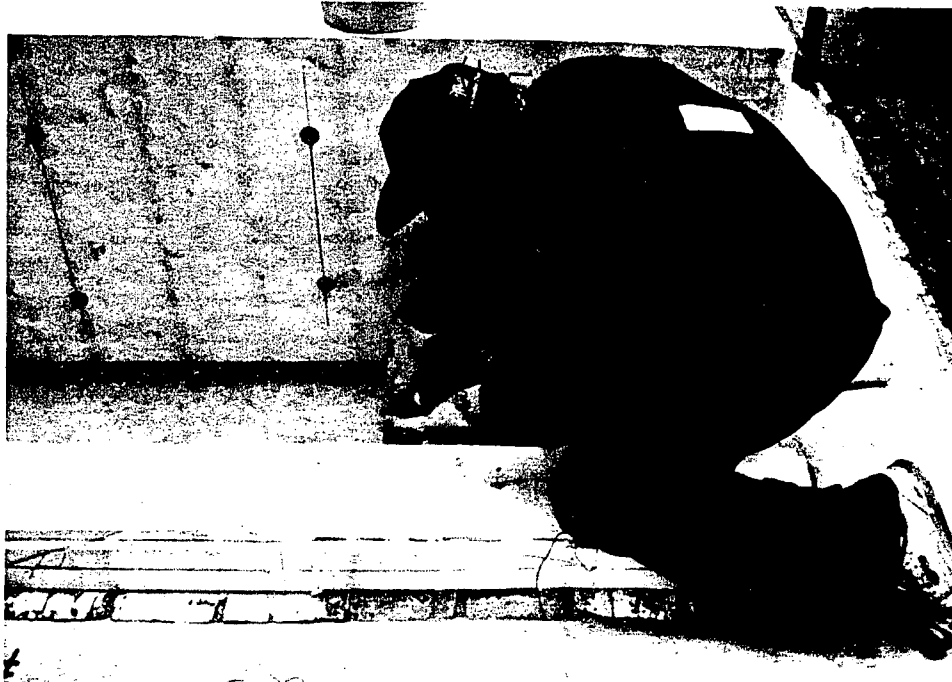
Panel secured to middle conduit bank with stainless steel tie wires.



Scored and folded panel installed to fully enclose the middle conduit bank.



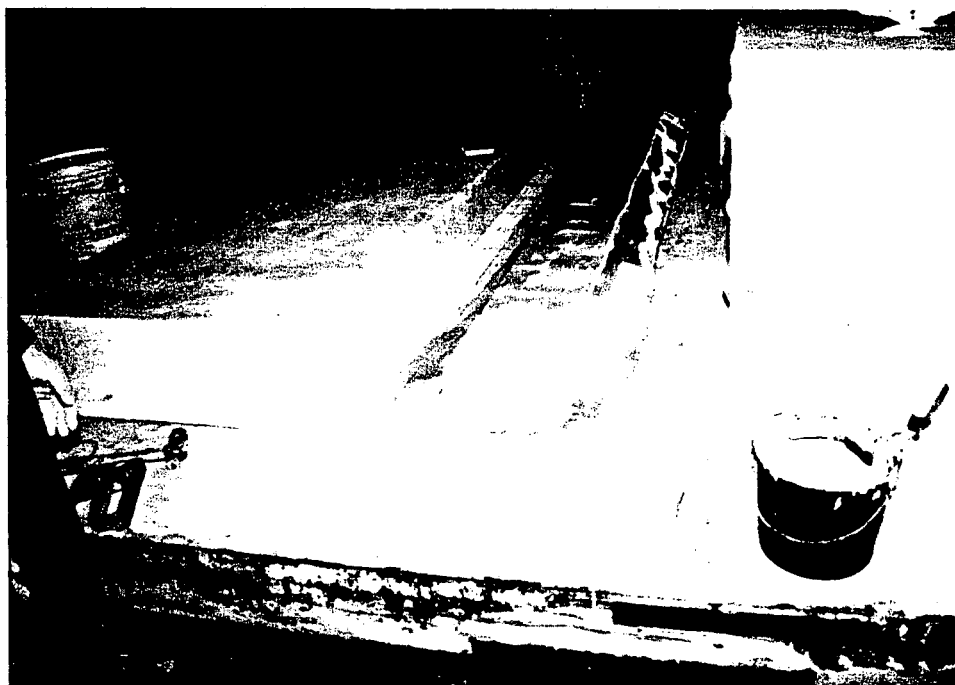
Stainless steel tie wires passed through the panel installed over the middle conduit bank.



Tie wires tightened to secured the enclosure panels to the middle conduit bank.



Trowel grade material applied to all joints, seams and scored fold on enclosure.

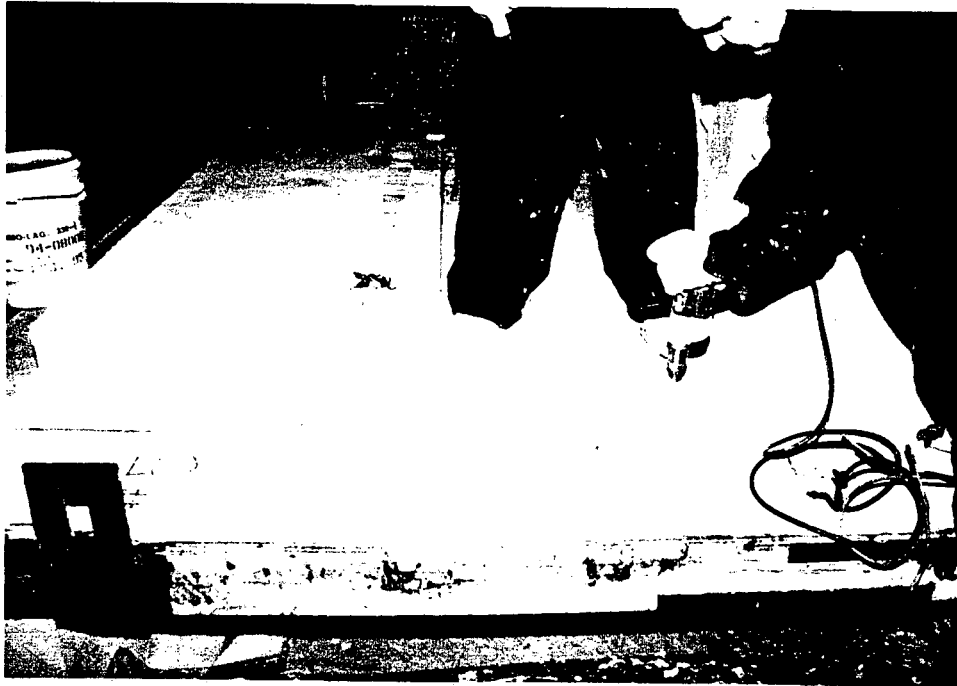


External stress skin installed over middle conduit enclosure.

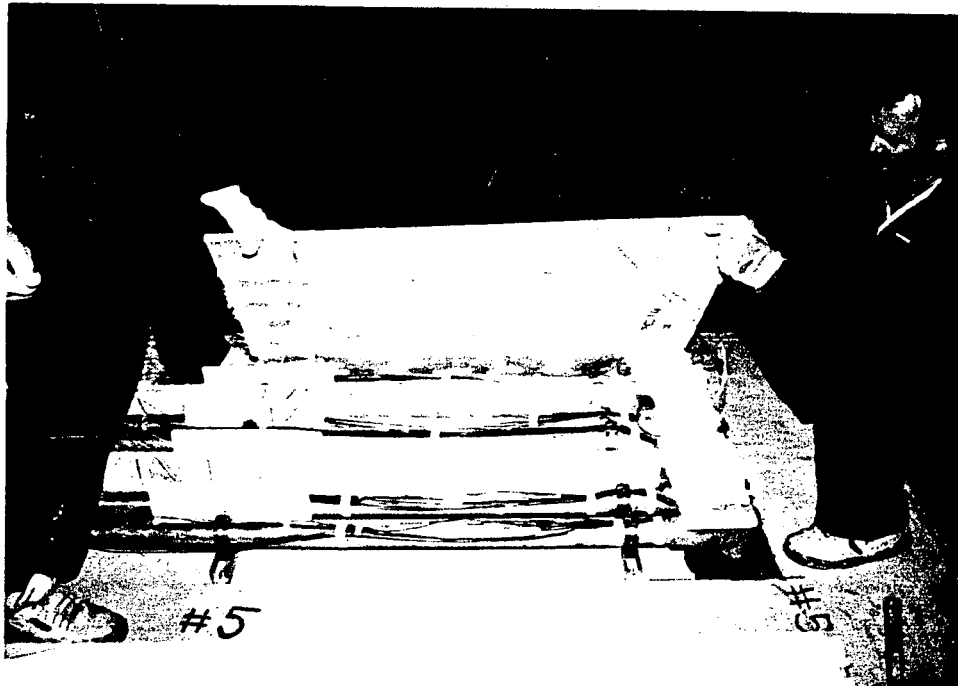


External stress skin stapled in place.

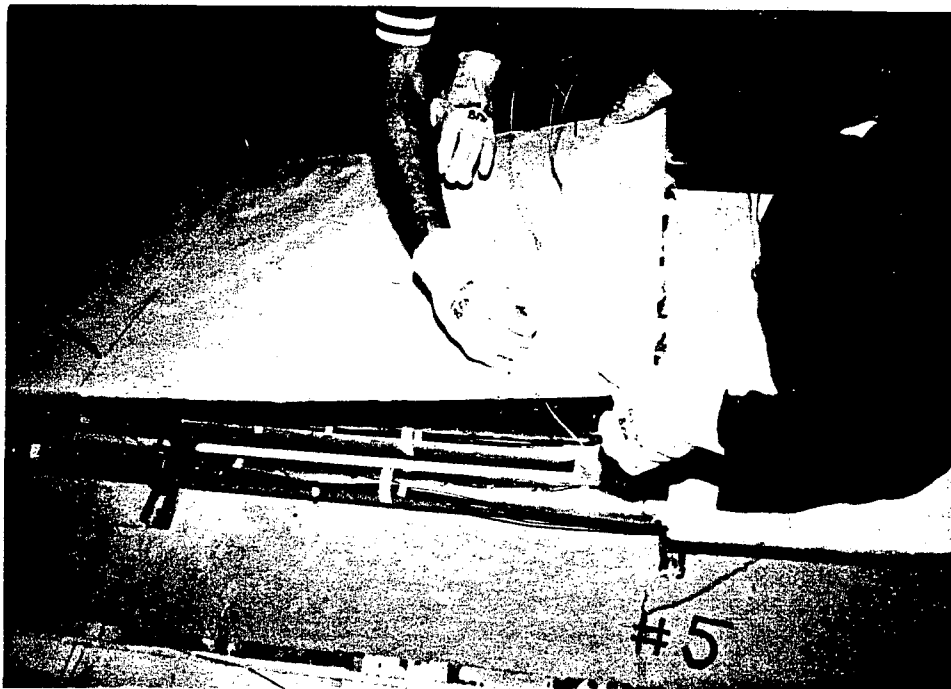




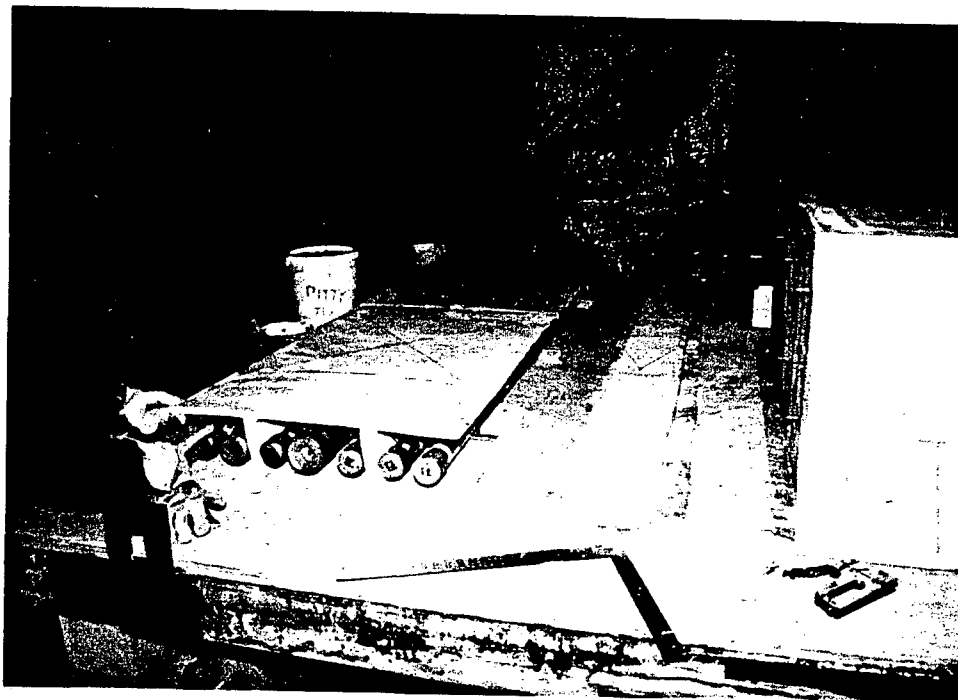
Base plate panels installed around middle conduit bank enclosure.



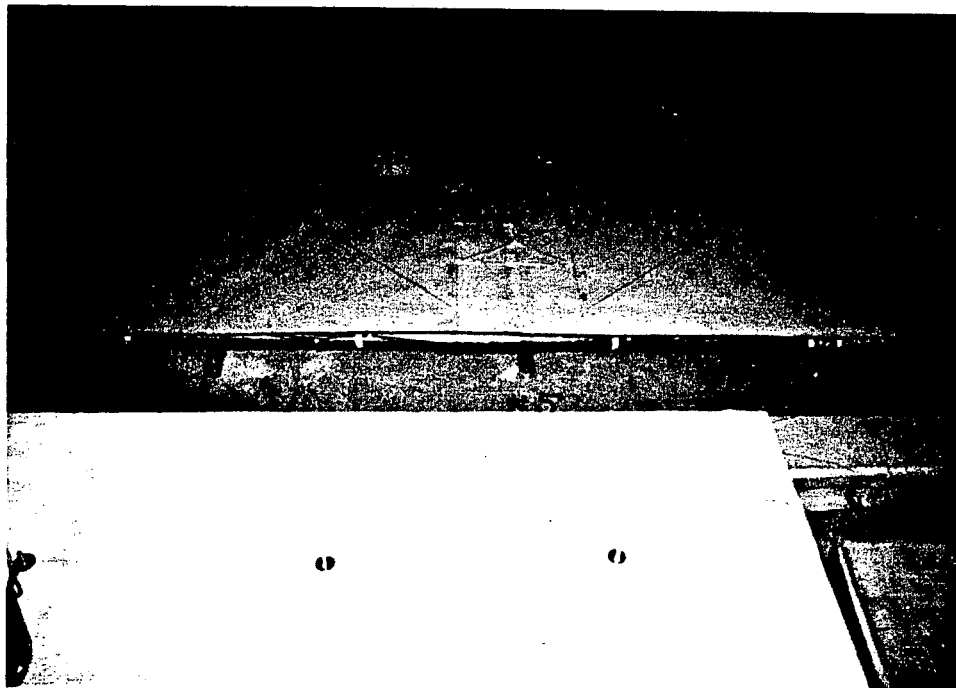
Pre-buttered panel installed over top bank of conduits (note vertical panels provide additional support for top cover).



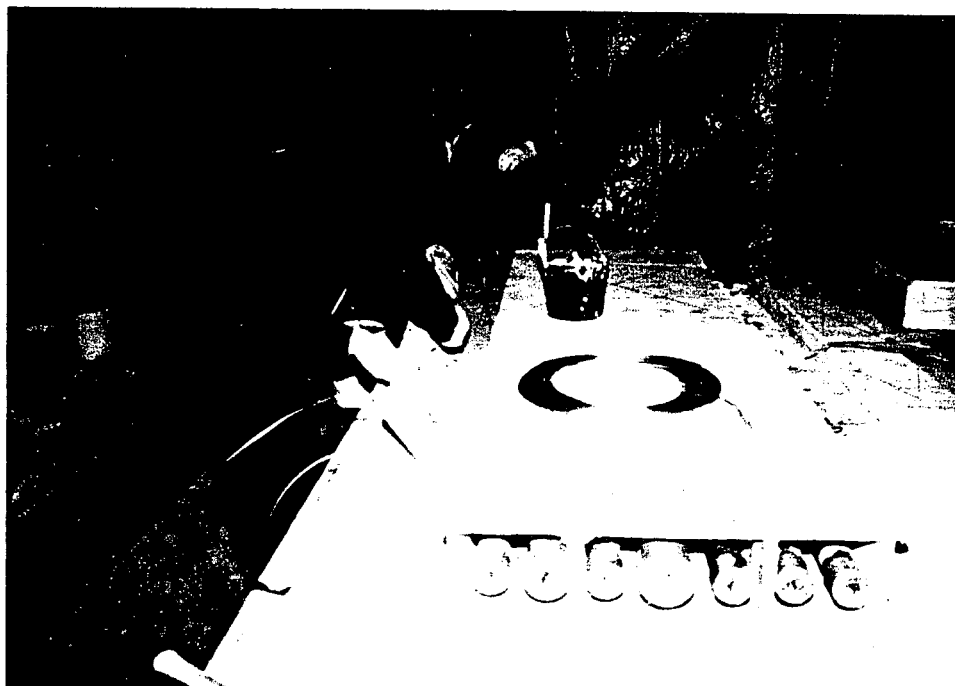
Stainless steel tie wires passed through panels to provide a means of securing.



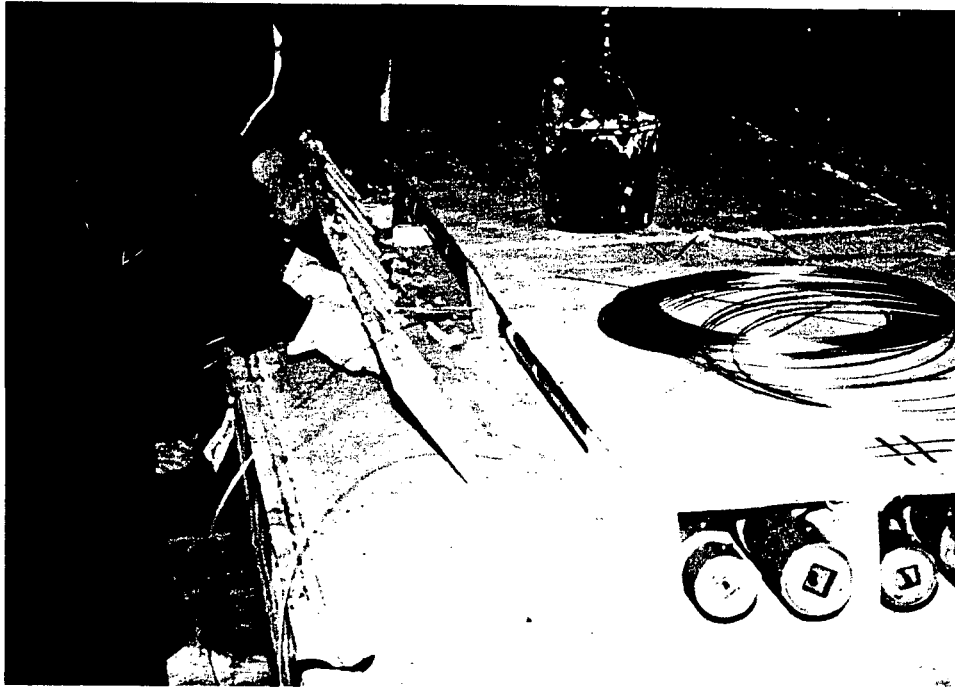
Top panel fully secured to top bank of conduits.



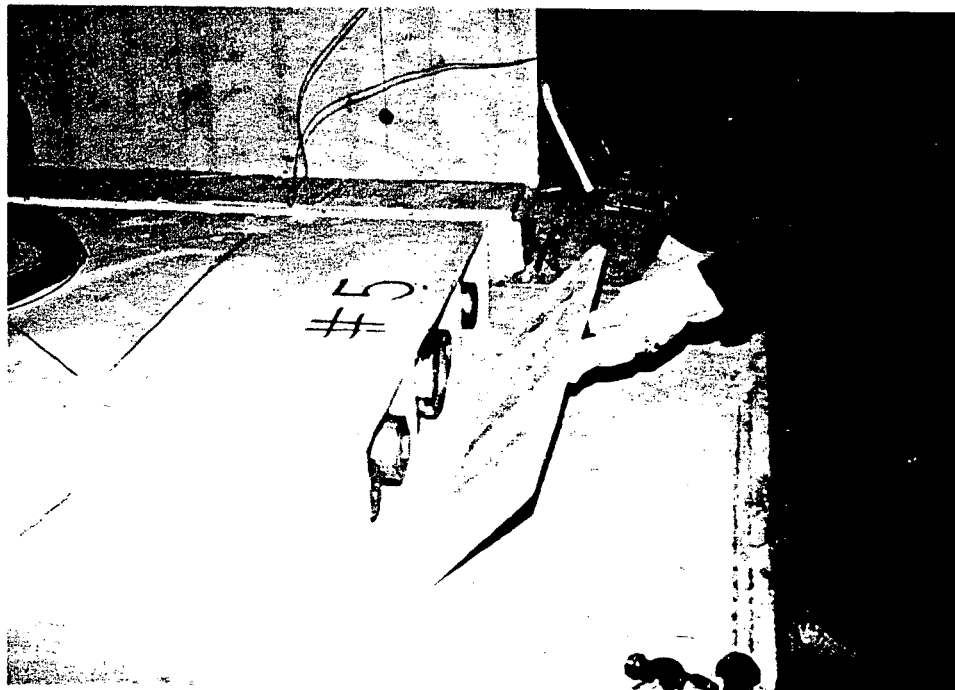
Top panel fully secured to top bank of conduits.



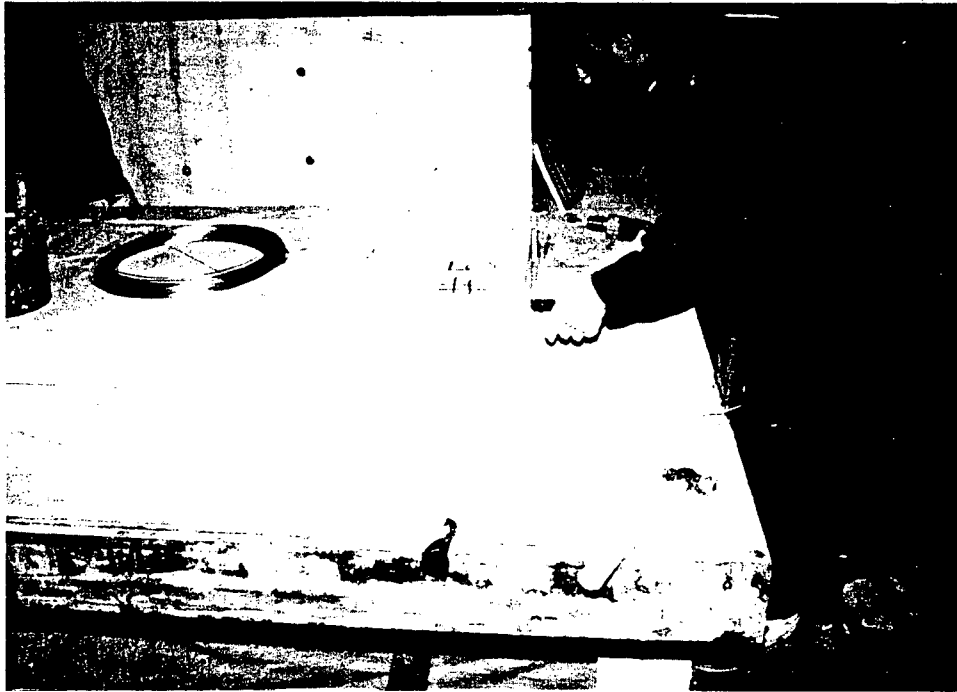
Pre-buttered panels installed on sides of top conduit bank enclosure.



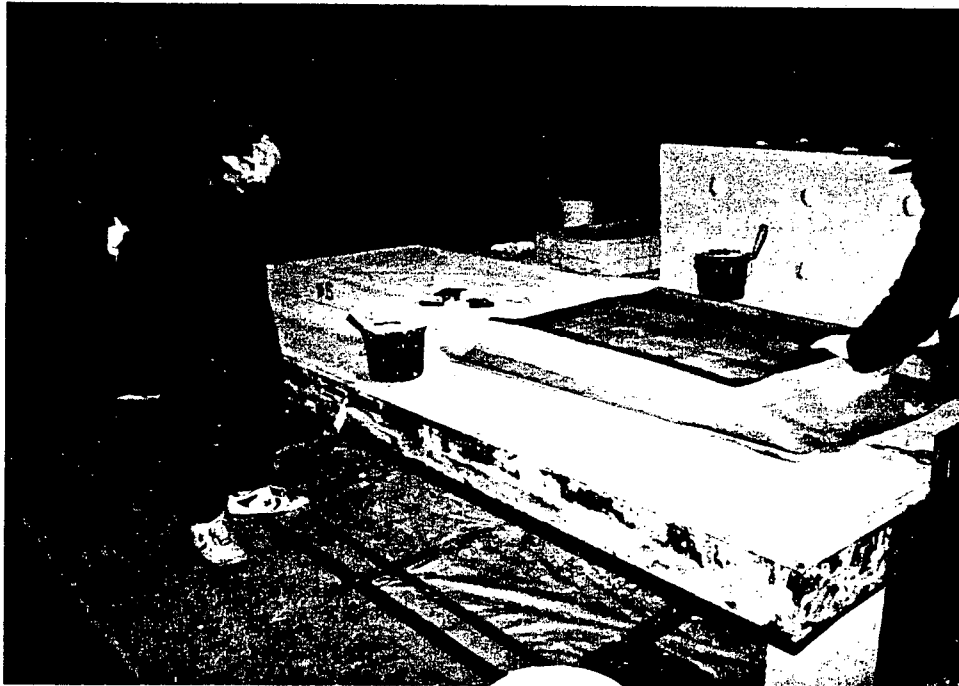
Pre-buttered panels installed on sides of top conduit bank enclosure.



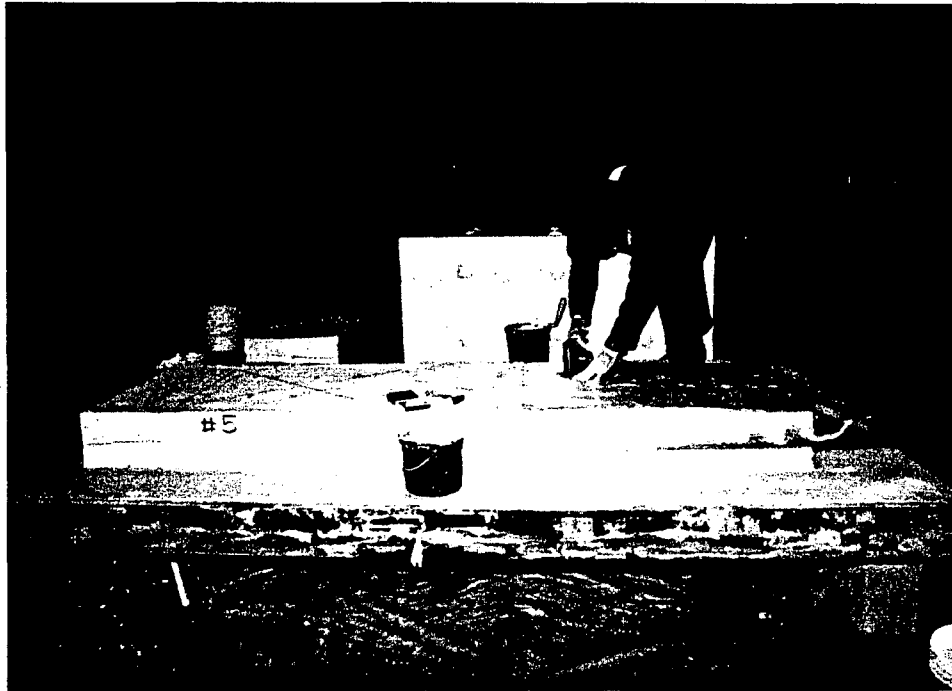
Pre-buttered panels installed on sides of top conduit bank enclosure.



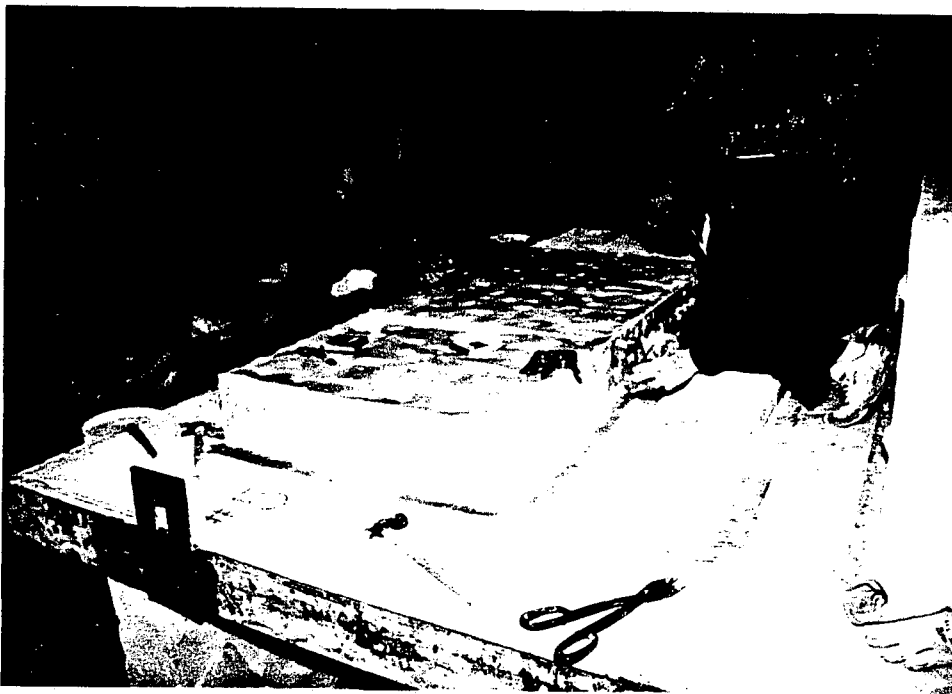
Panels secured with stainless steel tie wires.



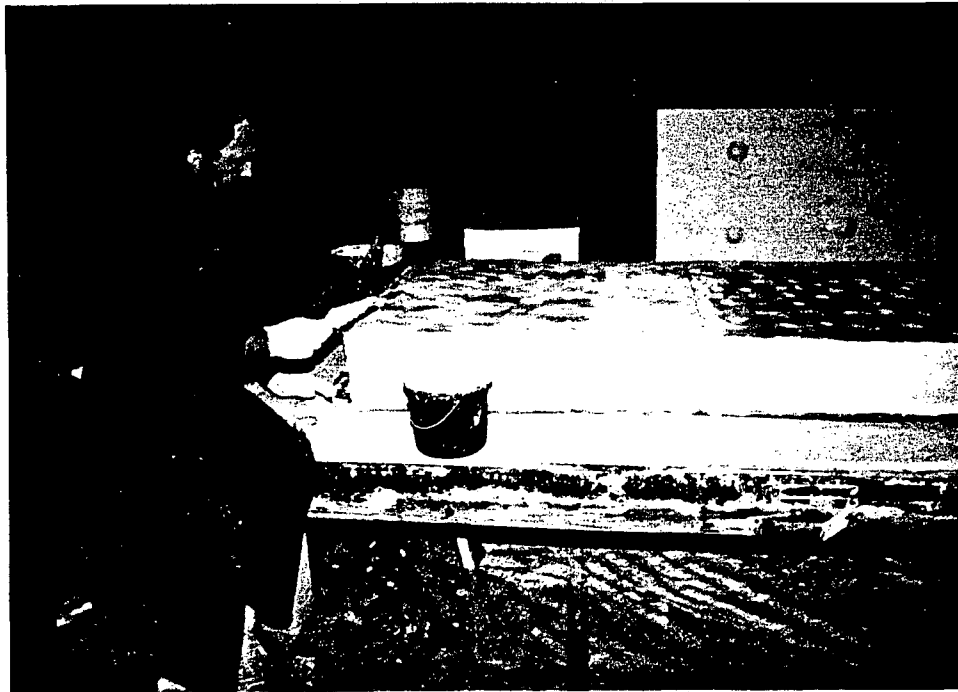
External stress skin installed over top conduit bank enclosure.



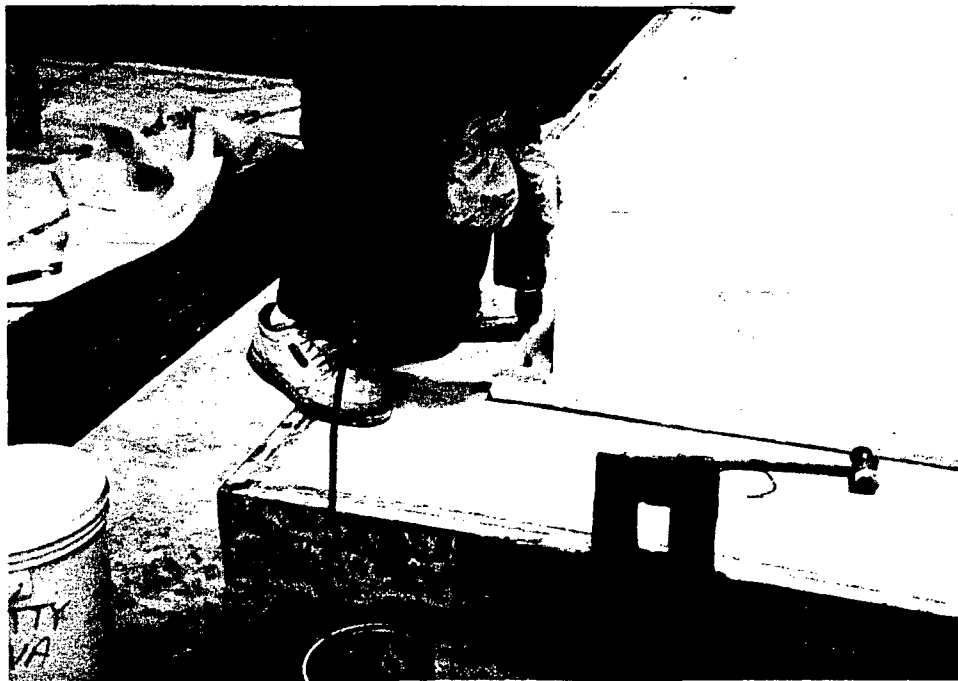
External stress skin stapled in place.



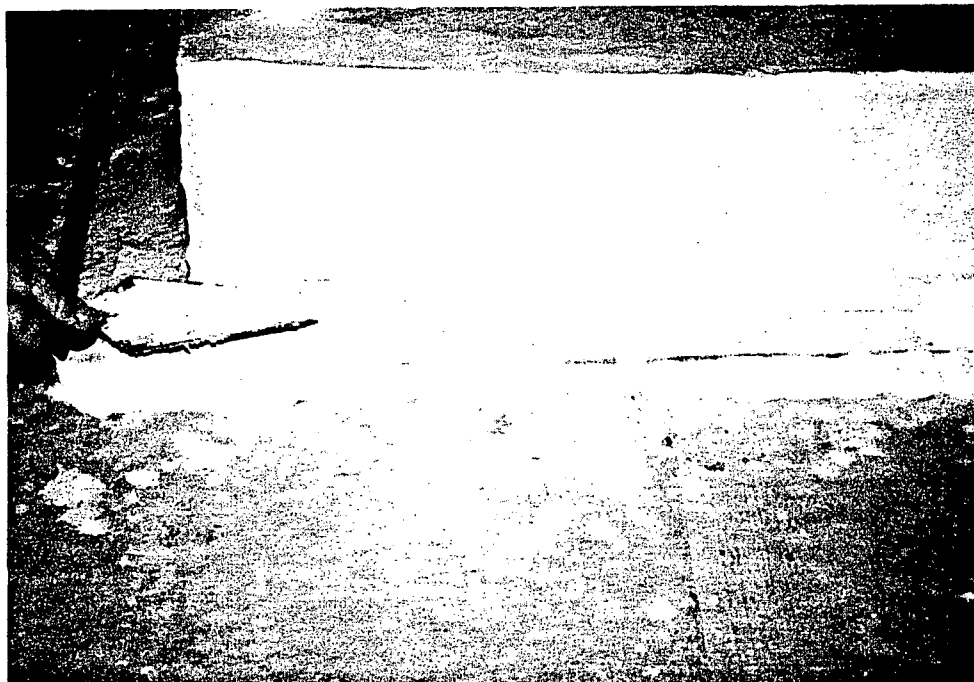
External stress skin stapled in place.



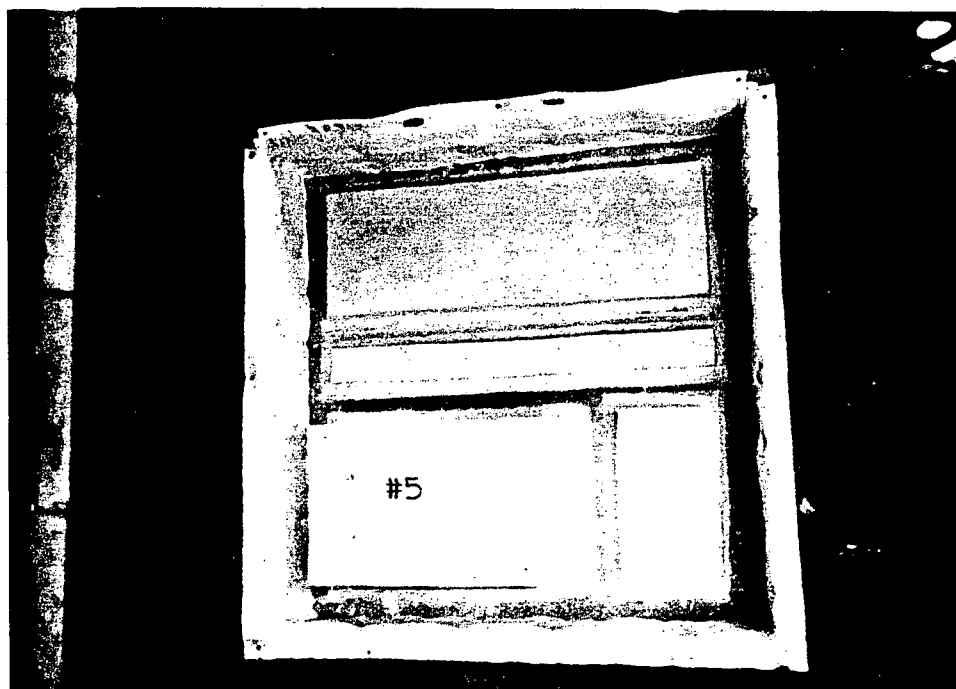
Skim coat of trowel grade material applied over external stress skin.



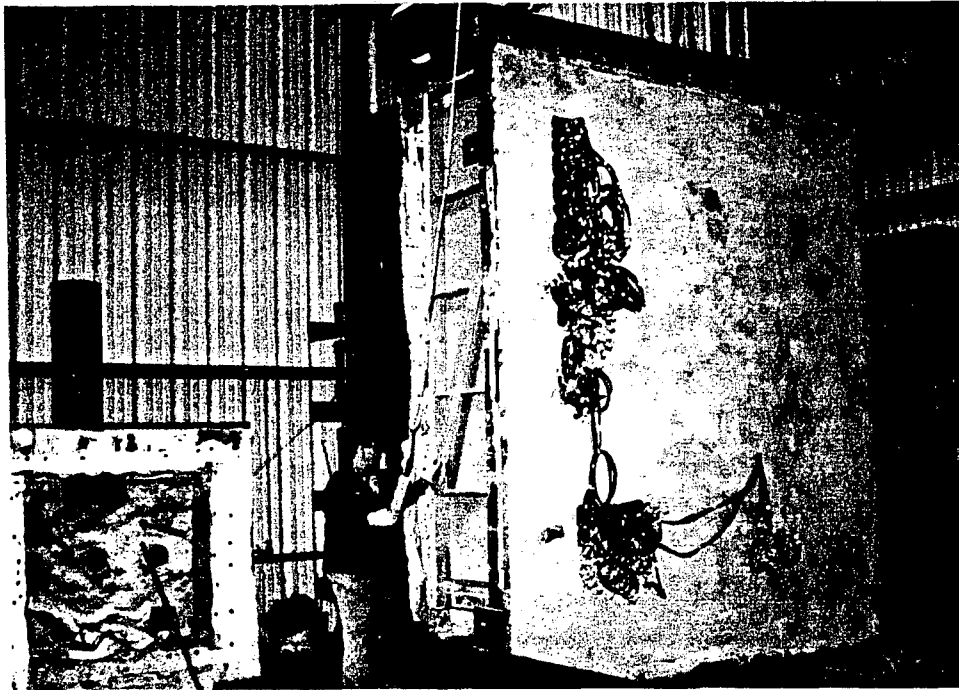
Panels installed around top conduit bank enclosure as base plates.



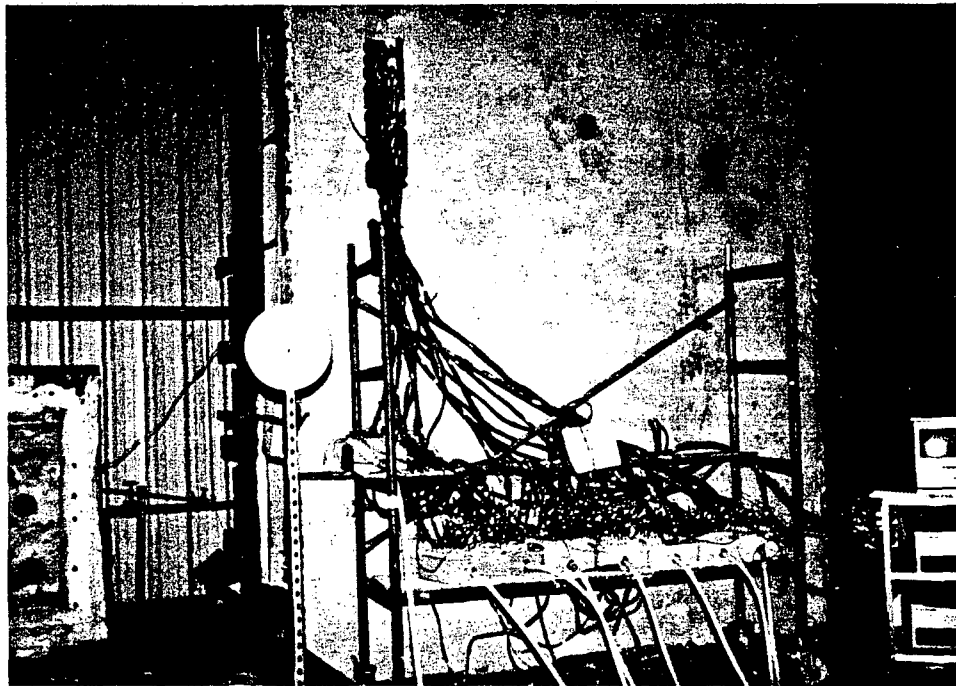
Trowel grade material applied to joints and seams and used to bevel edges of base plates.



Completed test deck prior to installation onto test furnace.



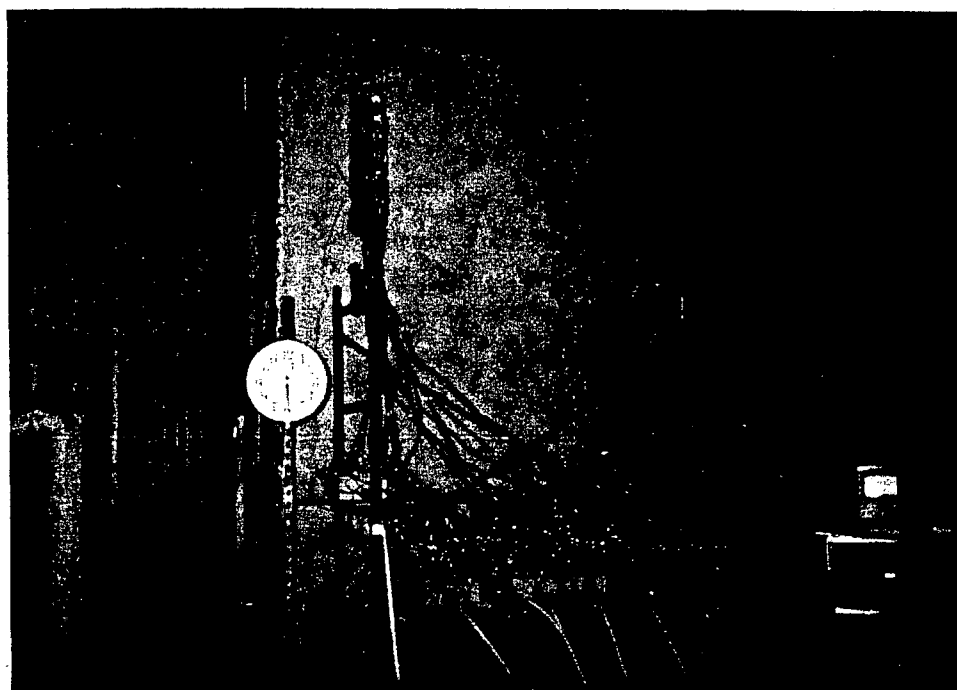
Test deck installed against test furnace.



Test furnace immediately prior to start of exposure.

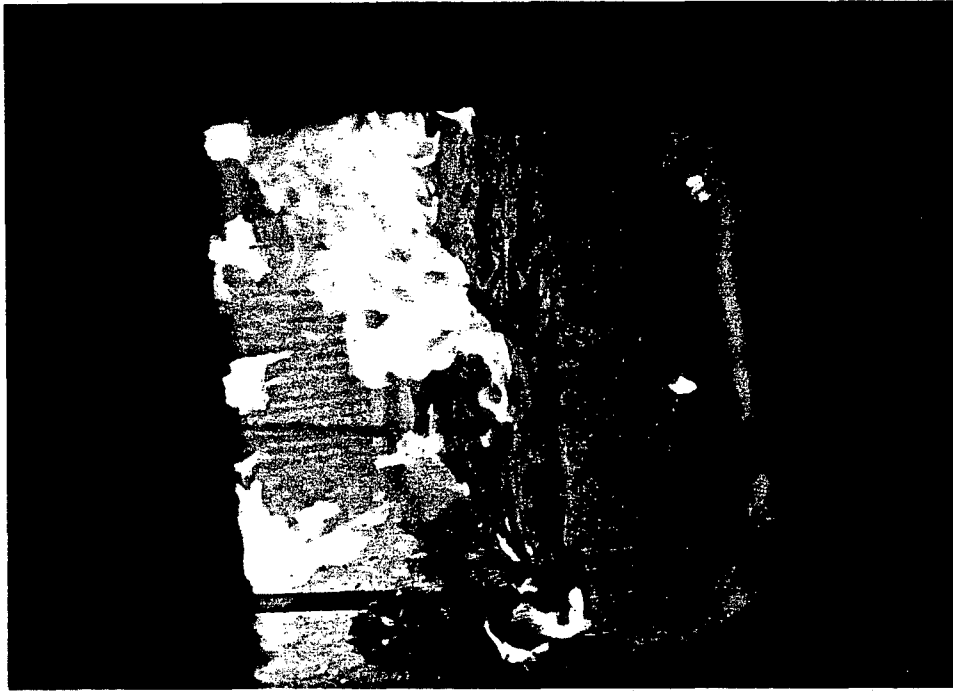


Furnace interior during fire exposure.

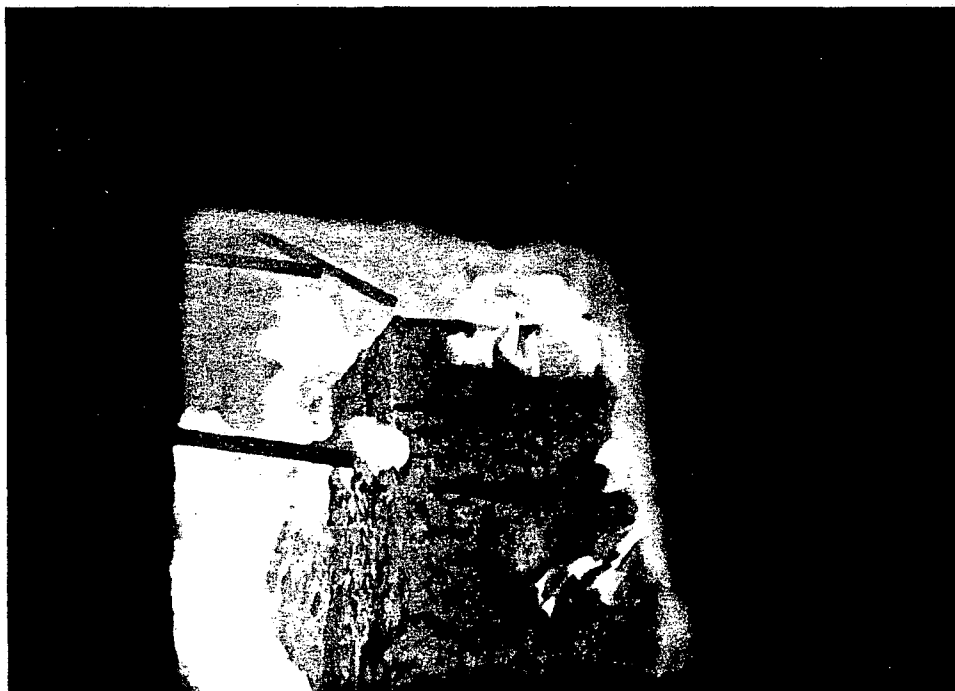


Test deck after thirty minutes.

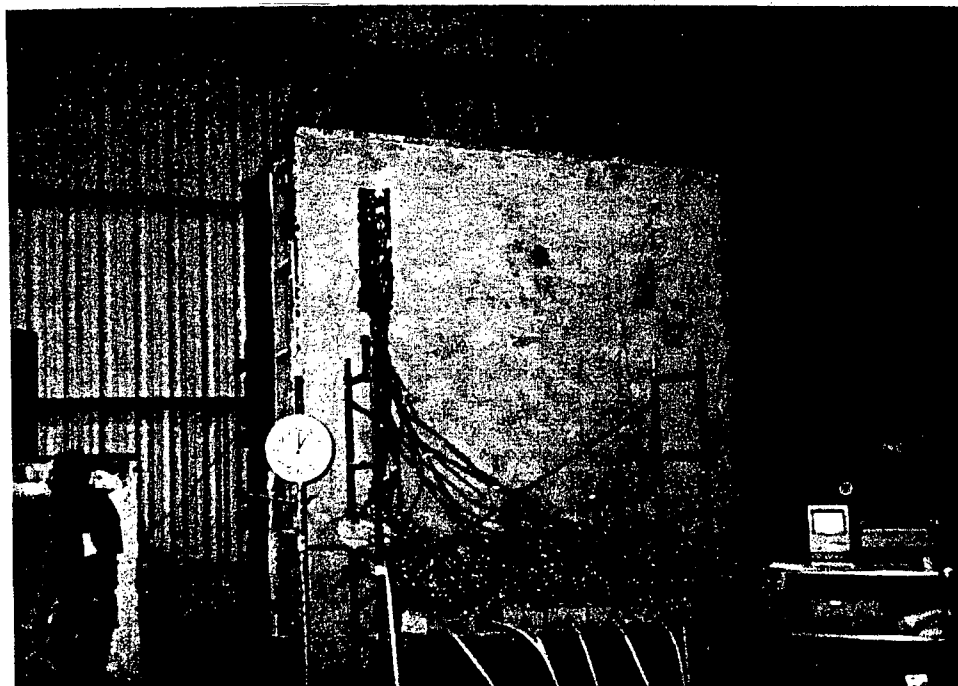
OMEGA POINT
LABORATORIES



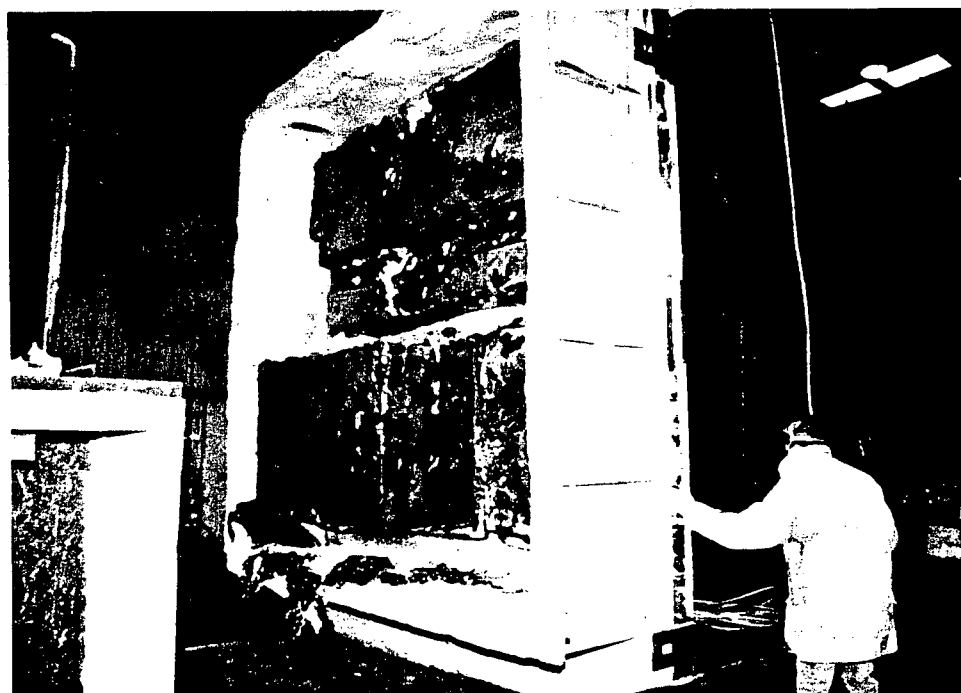
Furnace interior during fire exposure.



Furnace interior during fire exposure.



Test deck at end of fire exposure period (one hour).



Test deck removed from furnace.



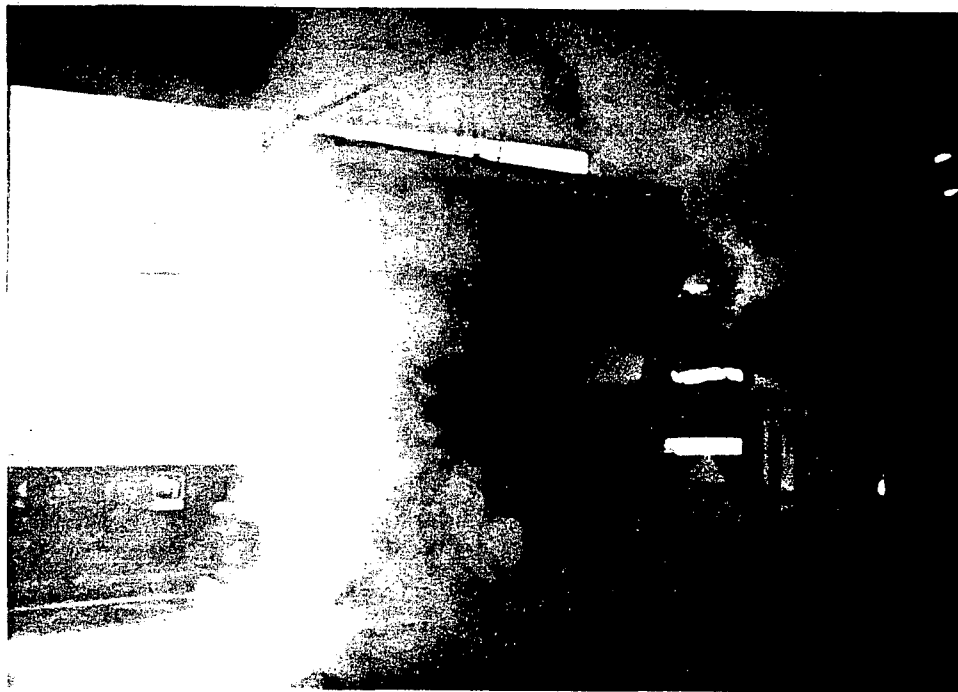
Test deck prior to hose stream.



Top and middle conduit banks prior to hose stream.

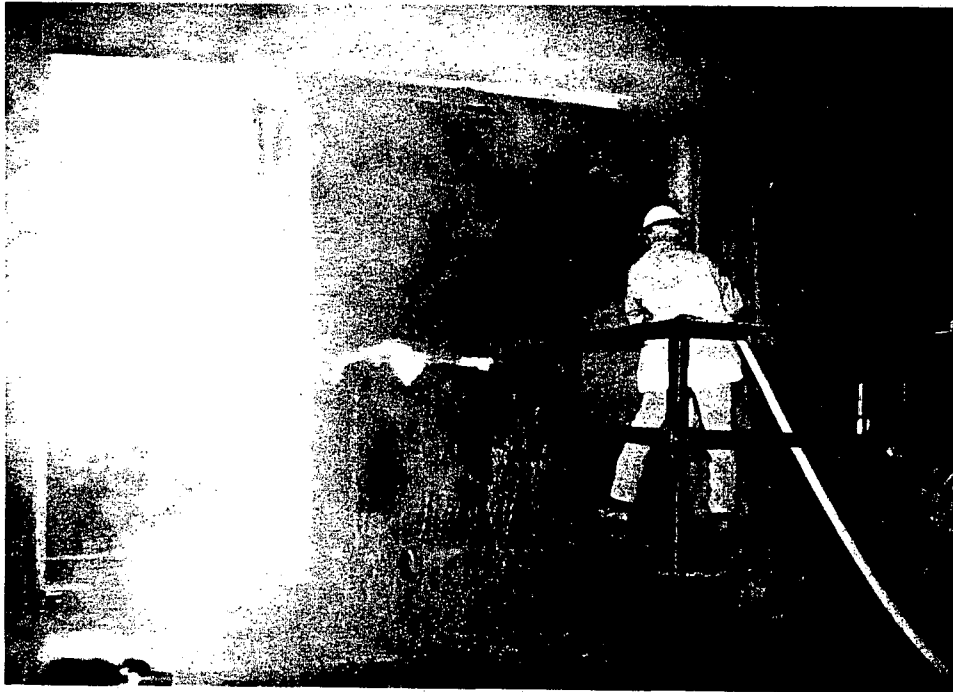


Lower conduit bank prior to hose stream.



Water hose stream test.

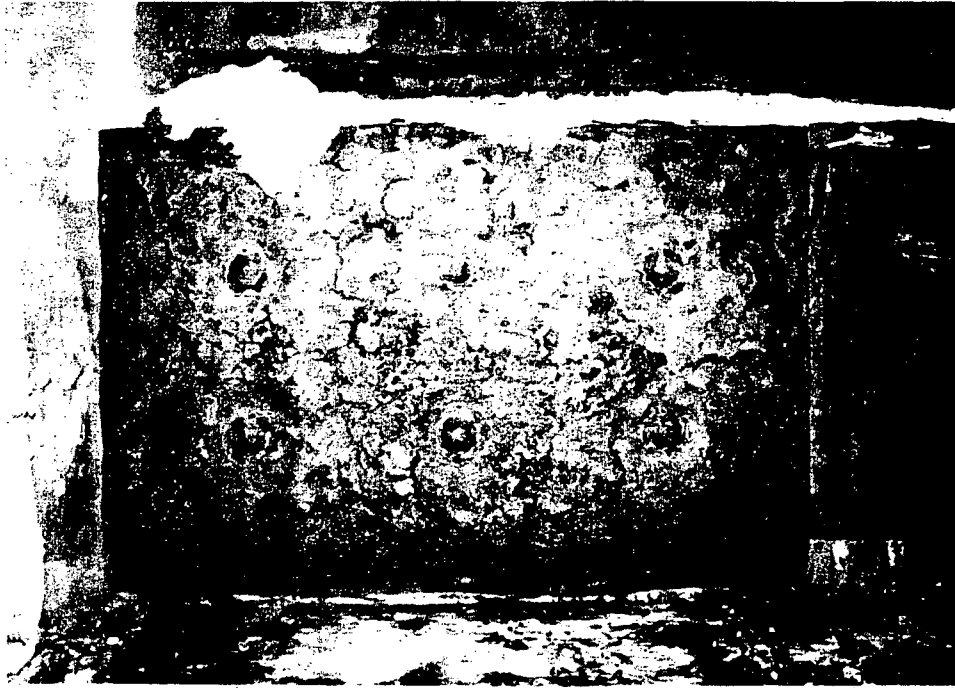
OMEGA POINT
LABORATORIES



Water hose stream test.



Lower conduit bank enclosure after hose stream.



Junction box enclosure after hose stream.



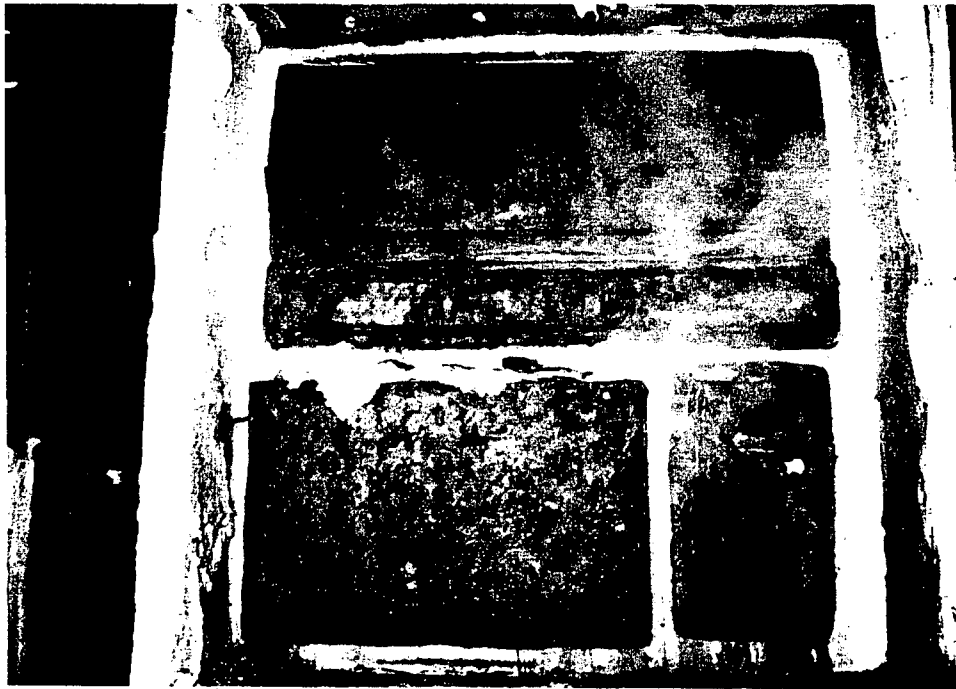
Top conduit bank enclosure after hose stream.



Top and middle conduit bank enclosures after hose stream.



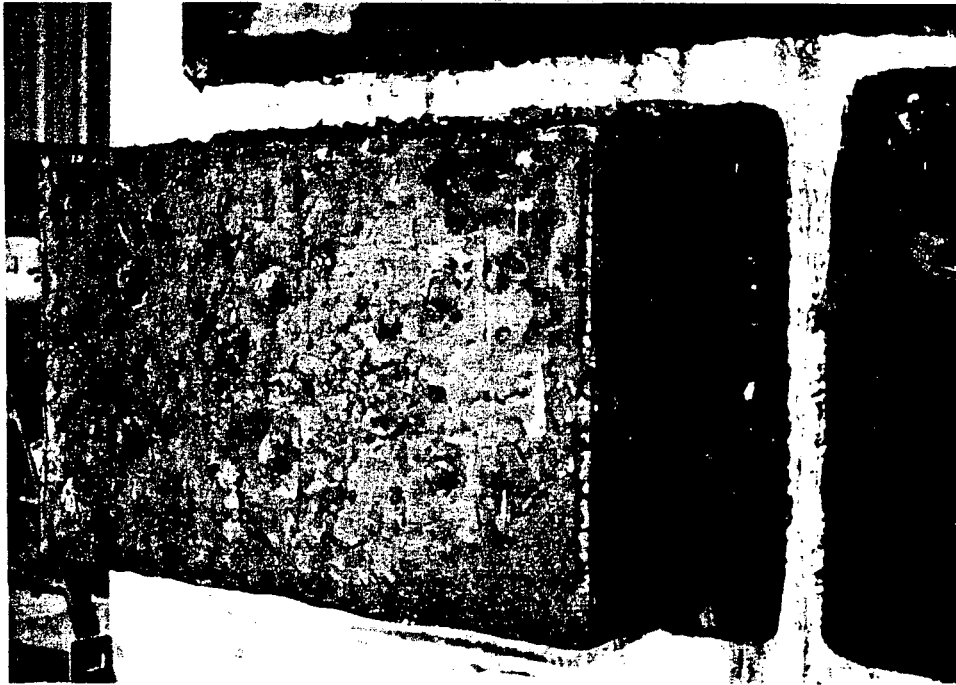
Middle conduit bank enclosure after hose stream.



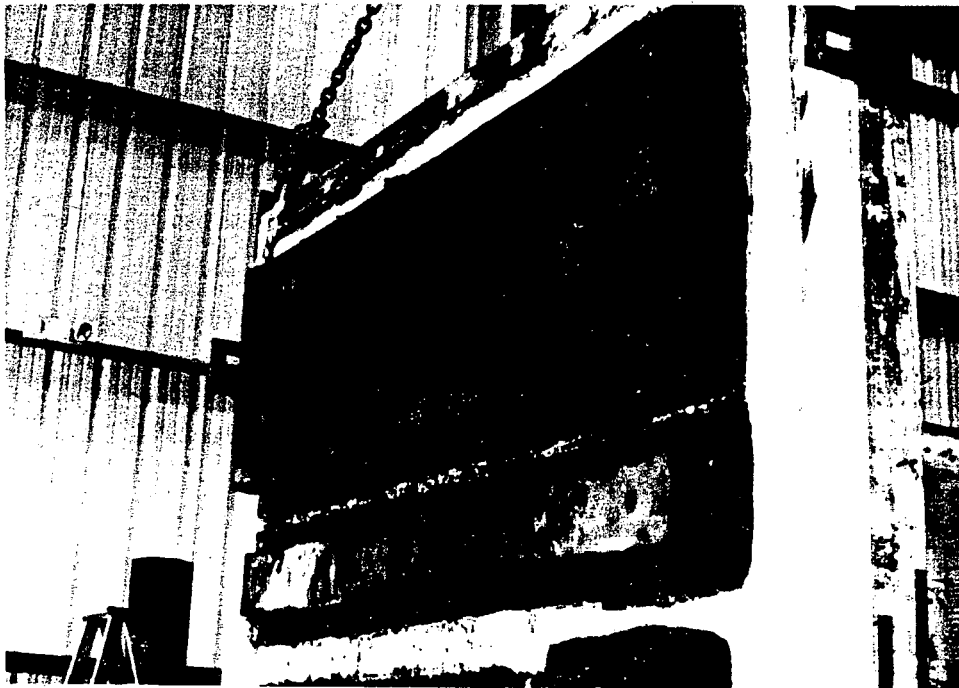
Test deck after hose stream.



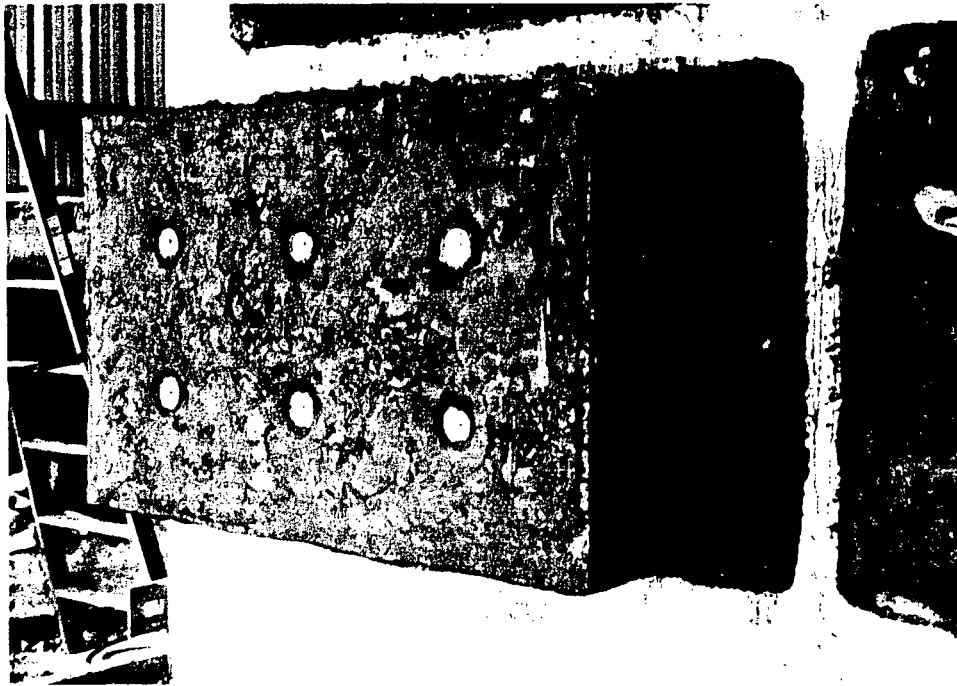
Lower conduit bank enclosure.



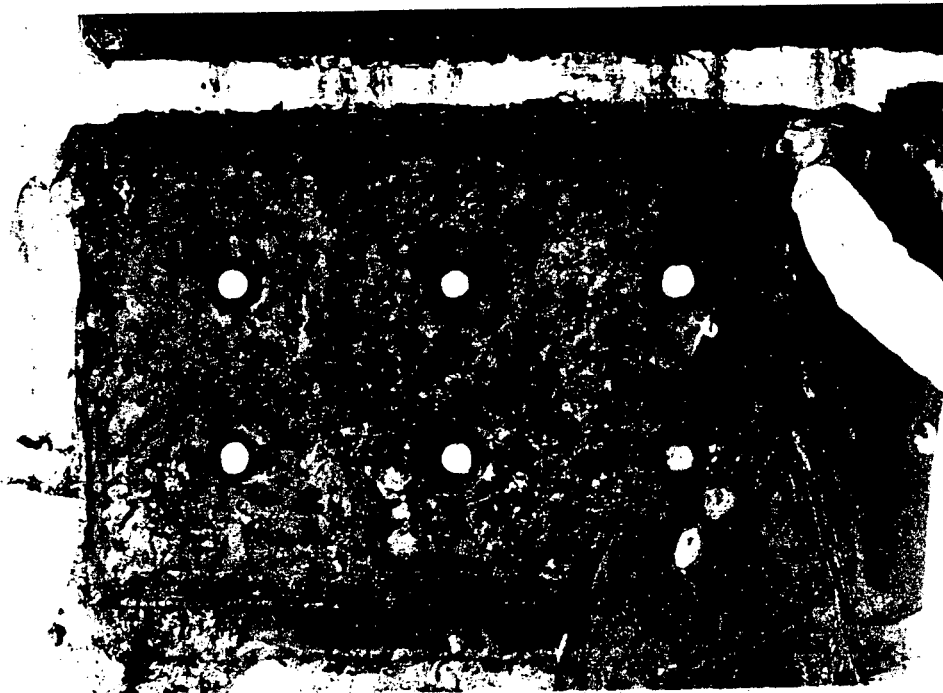
Junction box enclosure.



Top and middle conduit bank enclosures.



Trowel grade mounds removed from junction box.



External stress skin removed from junction box.



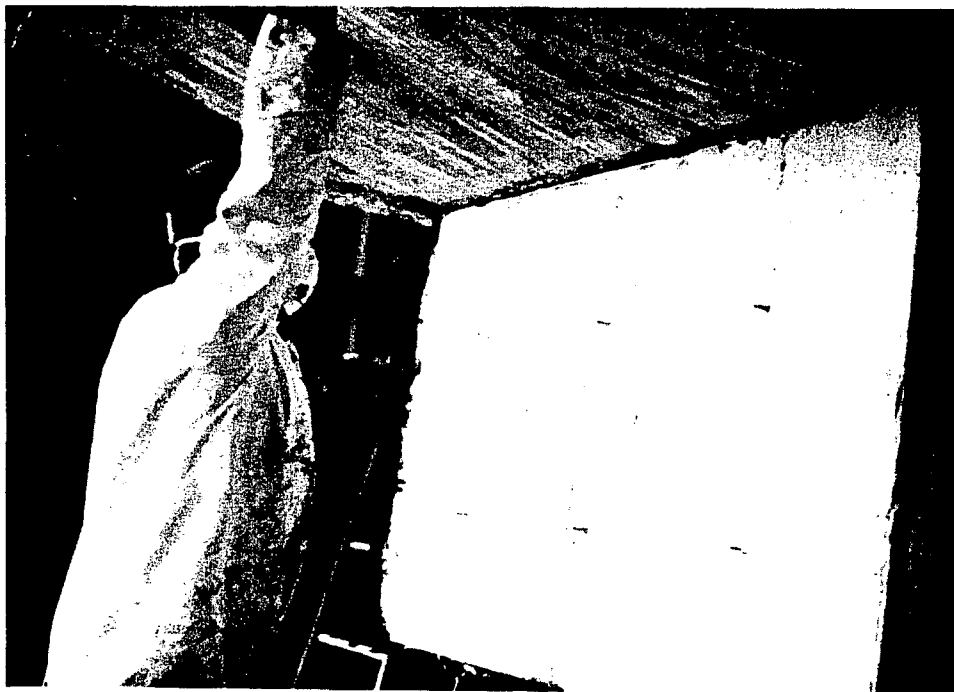
Material removed from left side of junction box.



Material removed from bottom side of junction box.



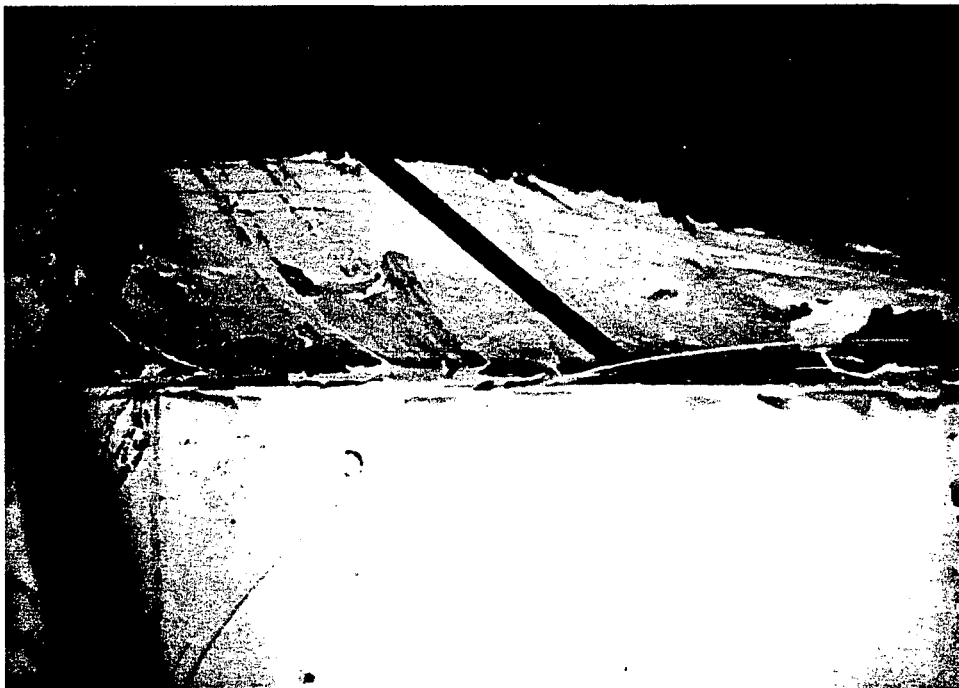
Material removed from right side of junction box.



Material removed from junction box cover.



Material removed from junction box cover.



Material removed from top side of junction box.



External stress skin removed from lower conduit bank.



Material removed from front of lower conduit bank (stress skin peeled from removed panel - not a separate piece).



Interior of lower conduit bank enclosure.



Material on bottom of lower conduit bank enclosure.



Base plate material removed from middle conduit bank.



External stress skin removed from middle conduit bank.



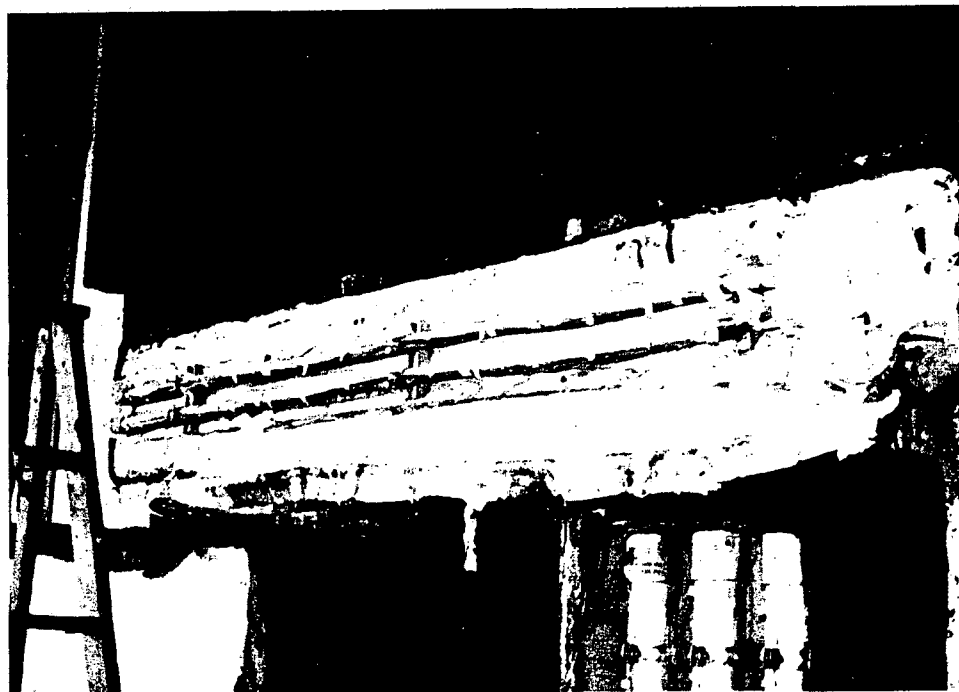
External stress skin removed from middle conduit bank.



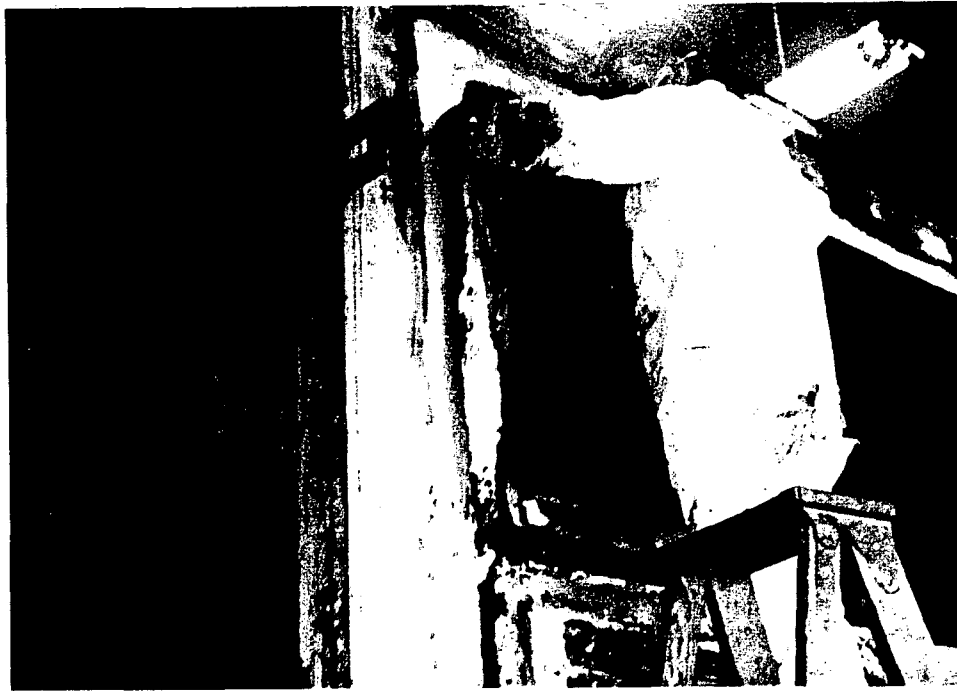
External stress skin removed from middle conduit bank.



Material removed from middle conduit bank.



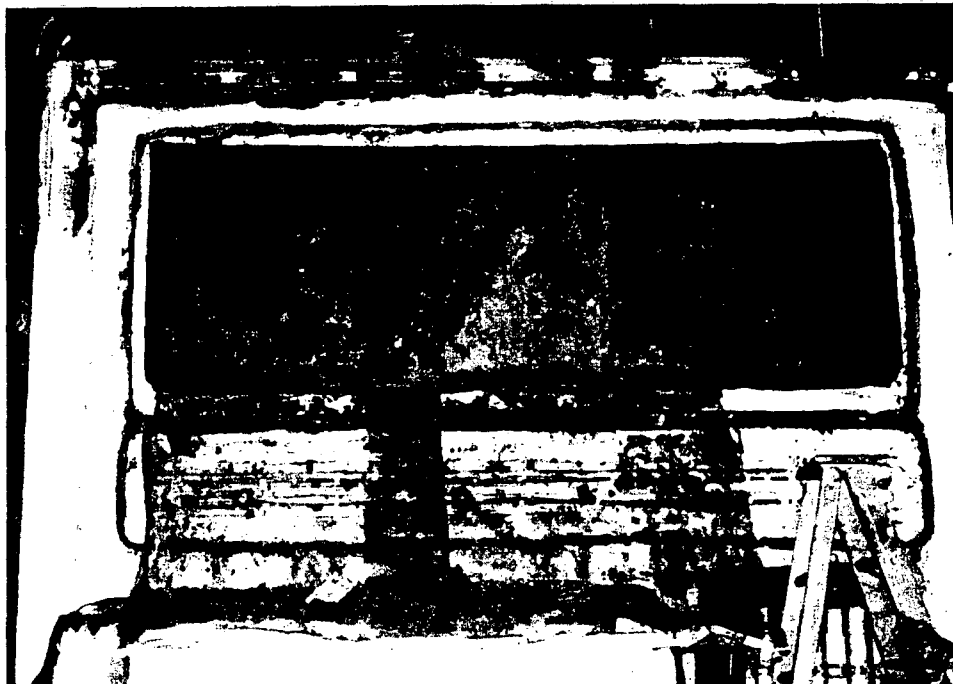
Material removed from middle conduit bank.



Base plate material removed from top conduit bank.



Base plate material removed from top conduit bank.



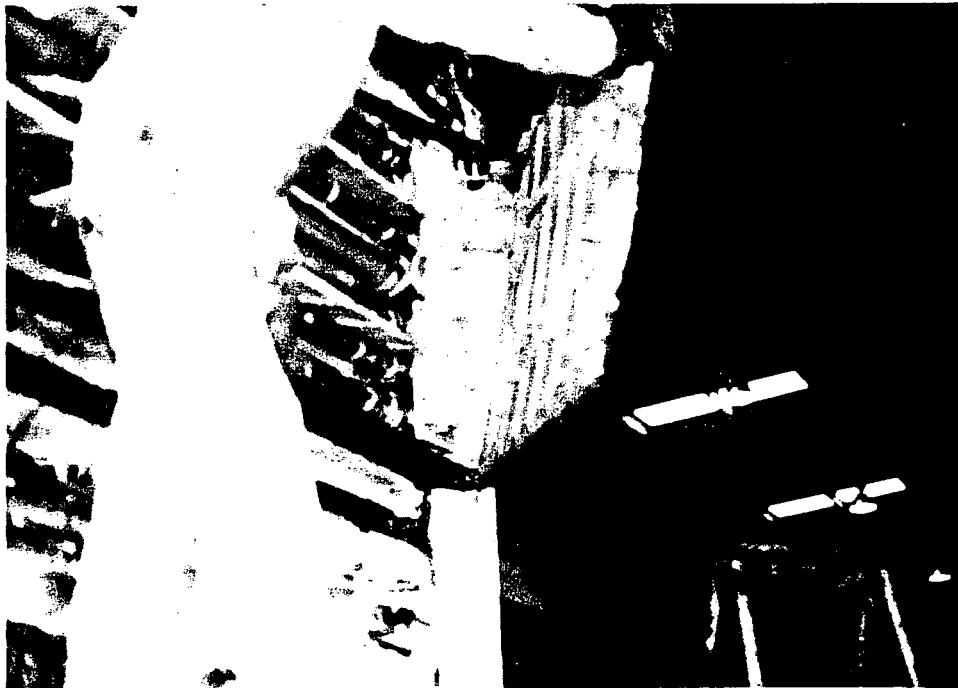
External stress skin removed from top conduit bank.



Material removed from top conduit bank.



Material removed from top conduit bank.



Material removed from top conduit bank.

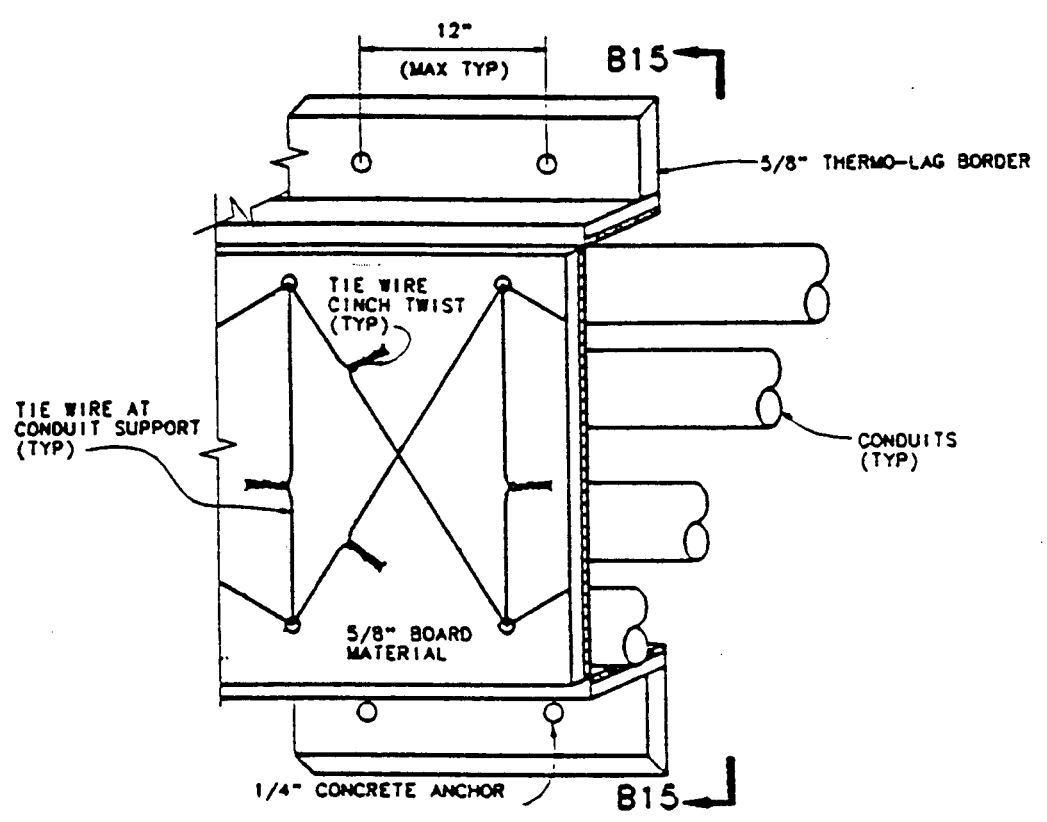


Material removed from test deck.

Appendix G

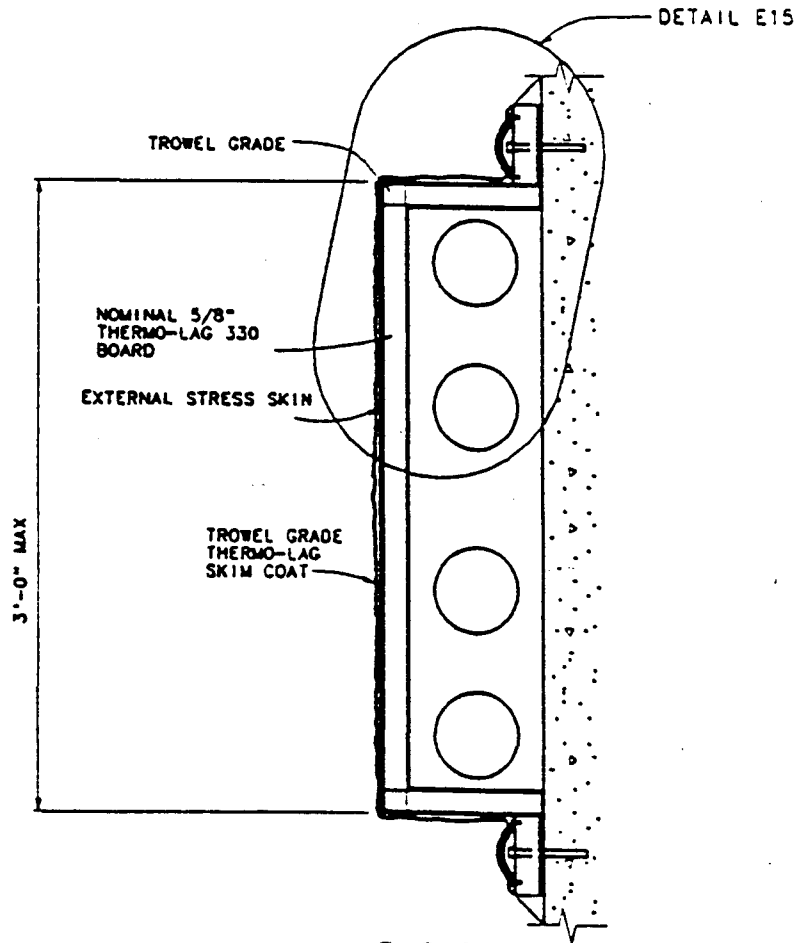
THERMO-LAG® 330-1 INSTALLATION DETAILS



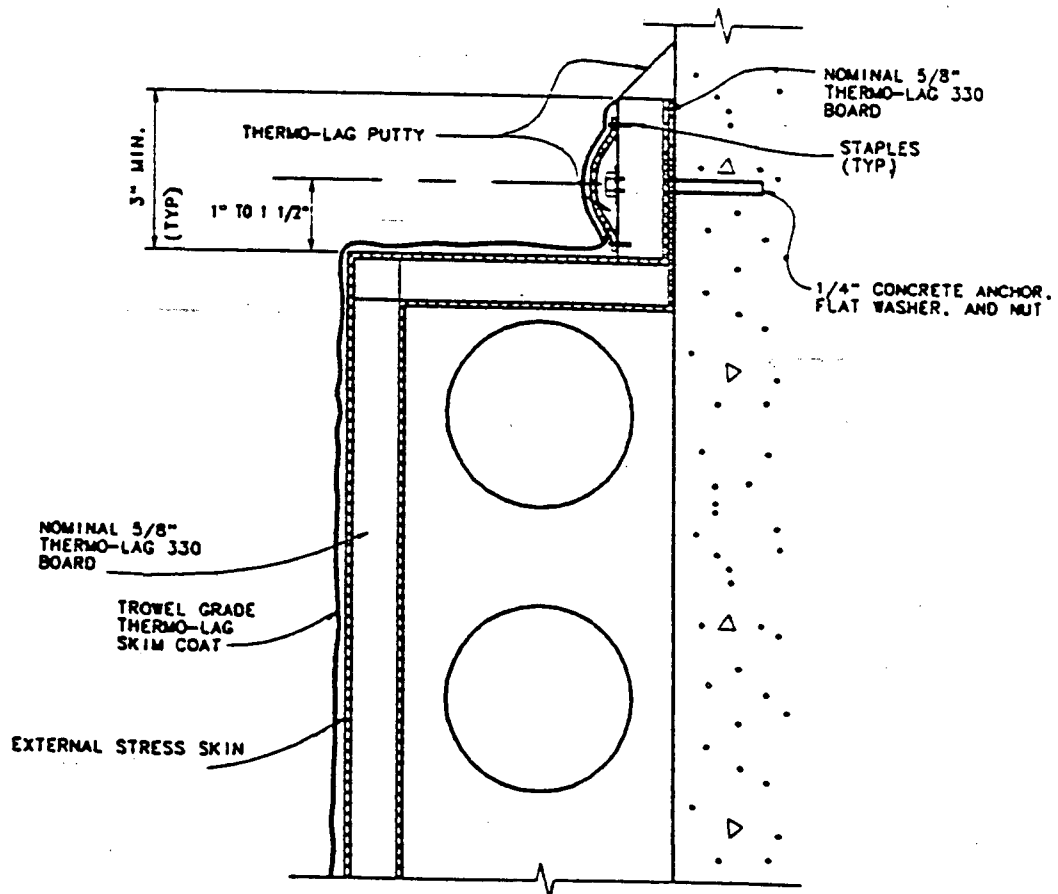


MULTIPLE CONDUIT - THREE-SIDED - ENCLOSURE
SURFACE MOUNTED CONDUITS
SCORE & FOLD METHOD

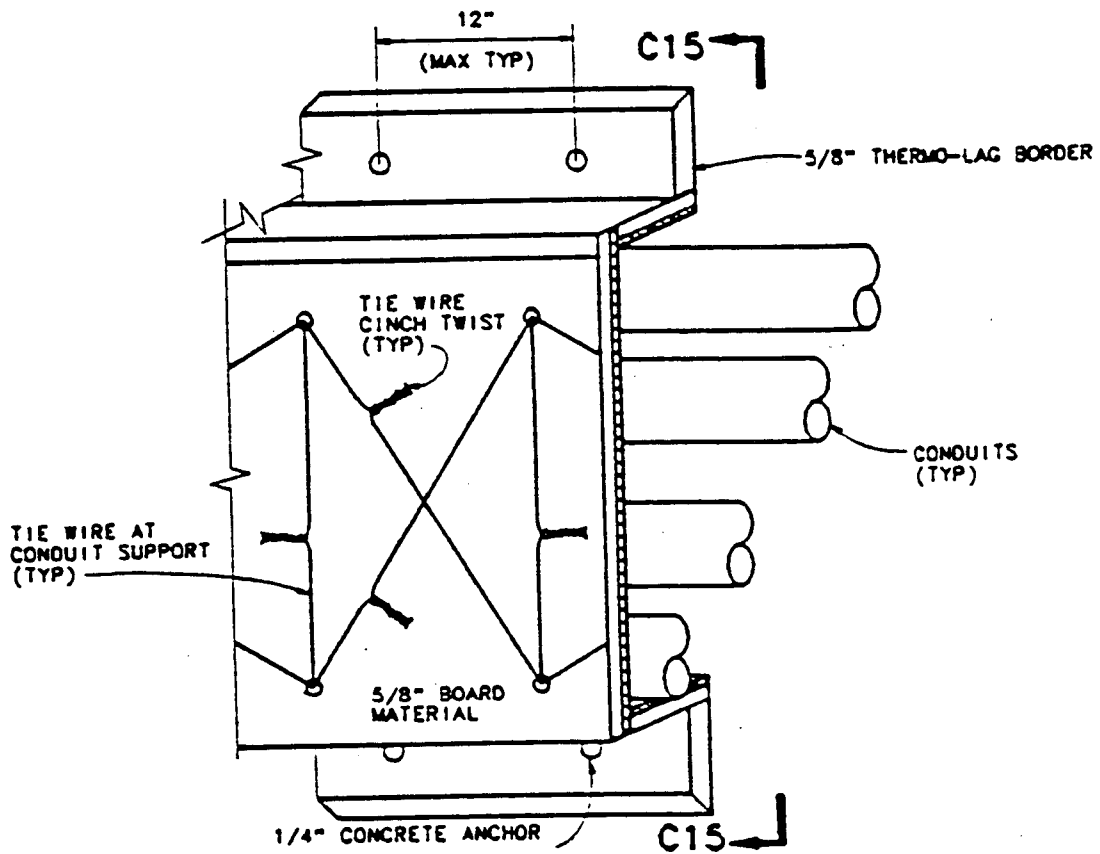
M.T.S.



B15-B15
N.T.S.

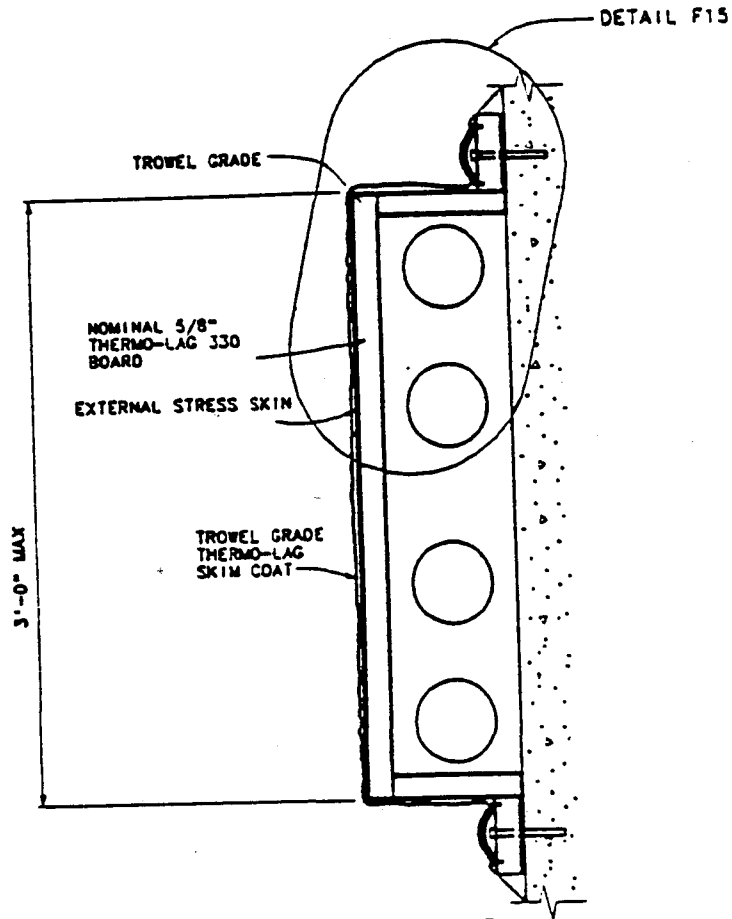


DET E15
N.T.S.

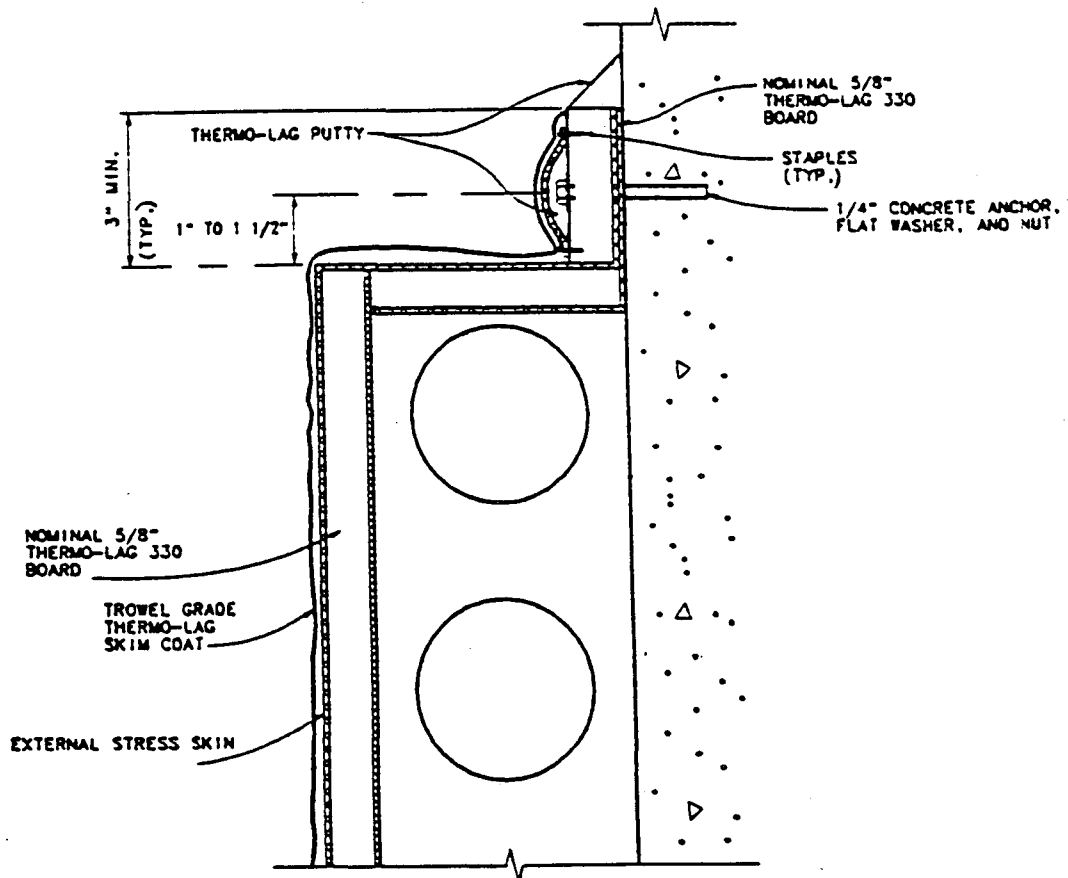


**MULTIPLE CONDUIT - THREE-SIDED - ENCLOSURE
SURFACE MOUNTED CONDUITS
SEPARATE BOARD METHOD**

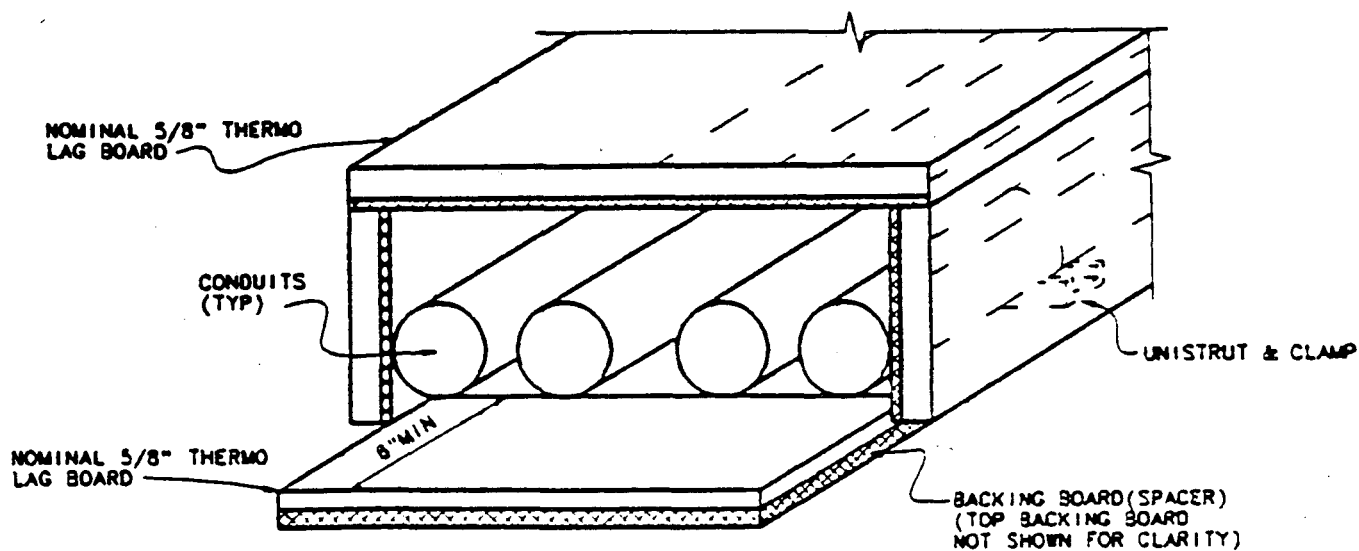
N.T.S.



C15-C15
N.T.S.

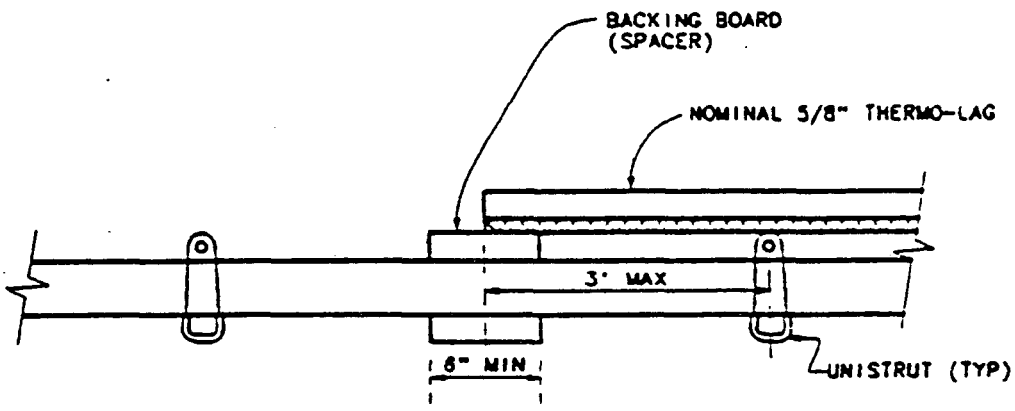


DET F15
N.T.S.



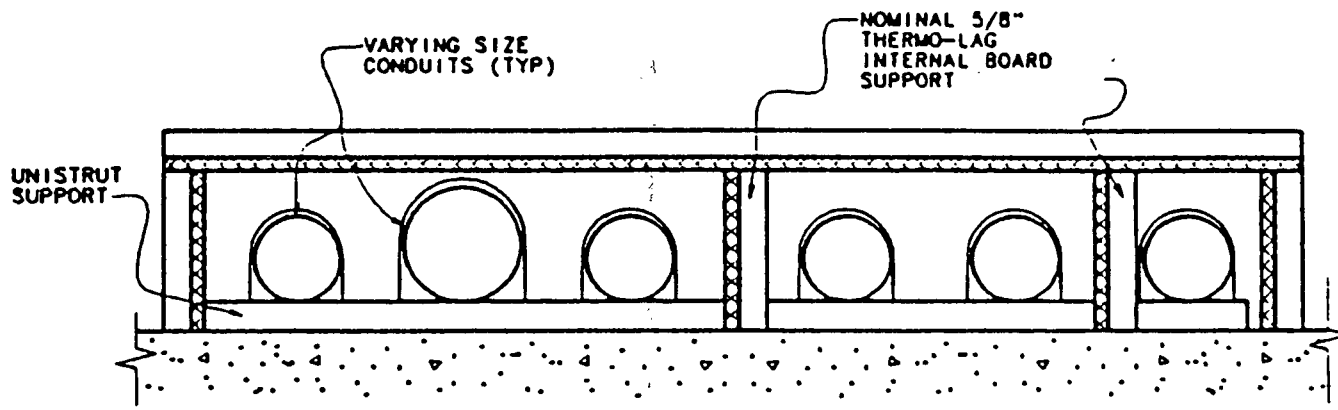
DET G15

N.T.S.



DET H15

N.T.S - EXTERNAL STRESS SKIN AND SIDE REMOVED TO SHOW DETAIL.



DET K15
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. 11960-97258

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
P.O. Box 2000
Highway 68 near Spring City
Spring City, TN 37381
(6 copies)

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Elmendorf, Texas 78112-9784
210-635-8100 / FAX: 210-635-8101
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