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JET-FIRE RESISTANCE TEST OF PROTECTIVE CONCEPTS INC.'S PASSIVE FIRE PROTECTION JACKET ASSEMBLY ON A TUBULAR SECTION IN ACCORDANCE WITH OFFSHORE TECHNOLOGY REPORT OTI 95 634, "JET-FIRE RESISTANCE TEST OF PASSIVE FIRE PROTECTION MATERIALS," 1996.

FINAL REPORT
Consisting of 64 Pages
SwRI® Project No. 01.06132.01.001
November 2002

Prepared for:

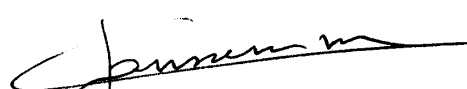
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Abstract

Southwest Research Institute's[®] (SwRI[®]) Department of Fire Technology, located in San Antonio, Texas, conducted a fire performance evaluation test of Protective Concepts Inc.'s passive fire protection (PFP) jacket assembly. The PFP system was tested on October 25, 2002, in accordance with the Offshore Technology Report OTI 95 634, "Jet-Fire Resistance Test of Passive Fire Protection Materials," 1996. Southwest Research Institute provided a fully instrumented pipe specimen to be insulated by Protective Concepts, Inc. The test specimen was a 3000-mm long pipe, 203-mm in diameter, with a wall thickness of 12.5 mm (Schedule 80). Twenty 1.6-mm diameter Inconel-sheathed Type-K thermocouples were placed at the interface of the pipe and the PFP jacket assembly to measure temperatures in the locations outlined by the standard.

Representatives of Protective Concepts, Inc., applied the PFP jacket assembly, identified as the Procon 2000, on October 24, 2002, with assistance from SwRI. The jacket assembly was a multi-layer assembly utilizing 128 kg/m³ density ceramic fiber, stainless steel foil, alumina silica, wire mesh, stainless steel quilting pins and a plasticized PVC exterior. The assembly was held in place with self-contained wire mesh-reinforced straps and stainless steel D-rings.

Protective Concepts, Inc.'s objective for the PFP jacket assembly was to protect the specimen temperature from rising to 427°C (800°F) in a 2-hr period. Protective Concepts, Inc.'s Fire Barrier System met their objective and protected the 203-mm, Schedule 80, tubular steel specimen as follows:

Tubular Jet-Fire Temperature Rise Summary (°C).

Time (min)	Left Side Temperature Rise (TCs 1-8)	Impingement Region Temperature Rise (TCs 9-12)	Right Side Temperature Rise (TCs 13-20)	Overall Average Temperature Rise	Maximum Single-Point Temperature Rise
15	10.4°C	8.8°C	19.7°C	13.8°C	43.3°C
30	45.0°C	35.7°C	58.8°C	48.7°C	100.7°C
45	84.9°C	71.5°C	100.7°C	88.5°C	147.8°C
60	130.1°C	113.1°C	148.7°C	134.1°C	188.6°C
90	227.3°C	210.2°C	249.0°C	232.6°C	279.9°C
120	317.6°C	307.5°C	336.6°C	323.2°C	362.4°C
150	413.4°C	404.7°C	411.9°C	411.1°C	437.1°C
180	494.3°C	484.9°C	485.2°C	488.8°C	510.7°C

Post-test inspection found the Procon 2000 PFP jacket assembly in good condition. The exterior layer (plasticized PVC) had completely deteriorated, exposing the wire mesh layer. The wire mesh remained intact and held all other layers in place. Graphical and tabular data is included in the report.

INTRODUCTION

The objective of this jet-fire resistance test was to determine the behavior of Protective Concepts Inc.'s passive fire protection (PFP) jacket assembly identified as Procon 2000. The Procon 2000 was designed to protect a steel pipe from rising to 427°C (800°F), over a 2-hr period. The jet-fire provides both high heat loads and high shear forces, to simulate a realistic sonic-velocity release of hydrocarbons. The tubular section jet-fire test specimen is used to simulate the application of insulating materials to pipes.

Although the jet-fire test is intended to simulate realistic jet-fire conditions, it cannot reproduce all factors exactly. This test method does not assess other important material properties such as weathering, ageing, shock resistance, explosion resistance, or smoke production. However, results of this test may be used as elements of an overall fire-risk assessment.

The results presented in this report apply only to the materials tested, in the manner tested, and not to any similar materials or material combinations.

TEST SPECIMEN

The test pipe was provided by SwRI. The test specimen was a 3000-mm long pipe, 203-mm in diameter, with a wall thickness of 12.5 mm (Schedule 80). The PFP jacket assembly was received at SwRI on October 24, 2002.

Instrumentation

SwRI instrumented the pipe sample with twenty 1.6-mm diameter Inconel-sheathed Type-K thermocouples. The thermocouples were placed at the interface of the pipe and PFP jacket assembly in the locations outlined by OTI 95 634 (see Figure 1). These thermocouples were attached by drilling small holes in the pipe so the thermocouple wires could be run from the inside of the pipe to the exterior of the pipe. The thermocouples had a minimum length of 100 mm from the tip along an isothermal plane (on the exterior of the pipe). The Inconel-sheathed thermocouple tips were peened shallow into the steel such that they were measuring the interface temperature between the pipe and PFP material.

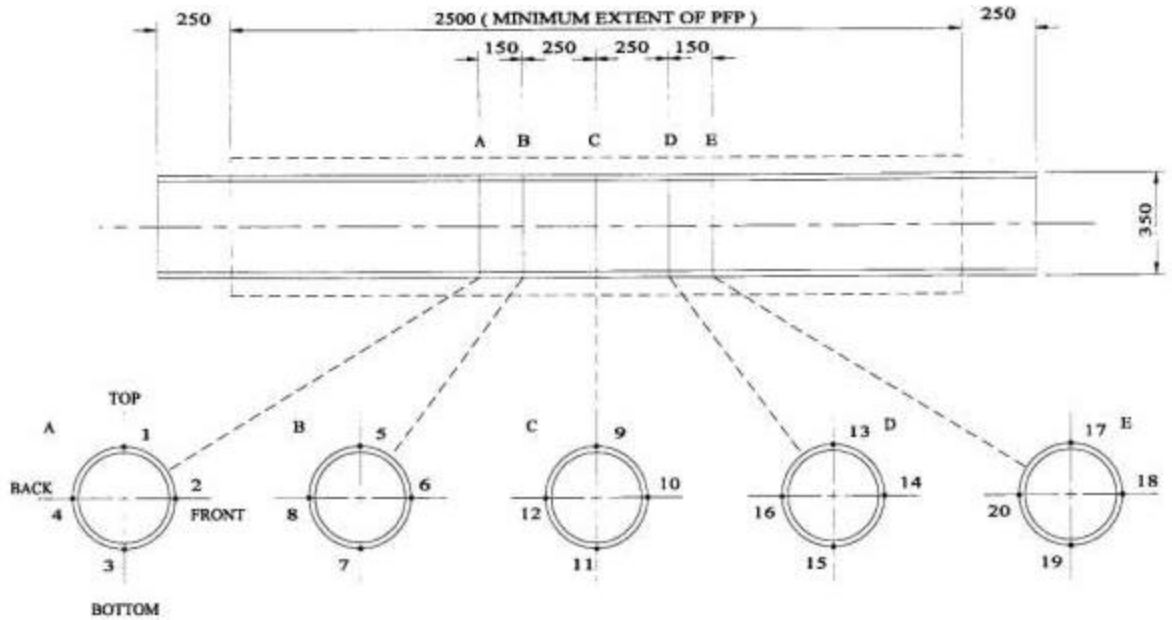


Figure 1. Thermocouple Locations (Dimensions in mm).

Passive Fire Protection Material

The Procon 2000 is a multi-layer PFP jacket assembly. The interior of the assembly consists of a nominal 64-mm layer of 128 kg/m³ ceramic fiber reinforced with a stainless steel foil, alumina silica layer, and wire mesh. The exterior of the assembly is covered with a layer of plastisized PVC. Layers are held together with stainless steel quilting pins. The Procon 2000 jacket assembly consisted of two halves with overlapping flaps utilizing strips of hook-and-loop fasteners. The two halves are connected together via their self-contained stainless steel-mesh straps (also covered with a layer of plastisized PVC) and stainless steel D-rings. Each half measured approximately 2640 mm long and 355 mm in diameter.

Representatives of Protective Concepts, Inc., installed the Procon 2000 jacket assembly over the 203 mm fully-instrumented pipe on October 24, 2002, with assistance from SwRI. The halves were secured tightly by hand with the straps and D-rings.

TEST PROCEDURE

The jet-fire resistance test outlined in the Offshore Technology Report OTI 95 634 test standard exposes a test sample to a jet flame produced by commercial propane, delivered as vapor without liquid fraction at a steady rate of $0.3 \pm .05$ kg/s. For tubular section test specimens, the jet flame is directed horizontally and normal to the rear wall of the open-fronted box and intersects the center of the test specimen. The tubular section is supported horizontally at mid-height across the

front of the open-fronted box and in direct contact with the front of its two sides. The tip of the nozzle is located 1 m away from the front surface of the PFP material.

TEST FACILITY

The jet-fire resistance test was performed at SwRI's Department of Fire Technology Jet-Fire Facility, located in San Antonio, Texas. The facility was equipped with an enclosure measuring 12 m wide x 18 m long x 12 m high. The test facility was equipped with two propane storage tanks with a capacity of approximately 7571 L (3704 kg) of liquid commercial propane, a 1530-kg/hr vaporizer, a jet nozzle assembly, and a dedicated data acquisition system.

Nozzle

The jet flame was delivered through a 300-mm long tapered nozzle. The forward 200 mm of the nozzle converges from a 52.0-mm inner-diameter inlet to a 17.8-mm inner-diameter outlet in order to produce sonic exit velocities. The nozzle is instrumented with a pressure transducer and a thermocouple 11 mm from the exit to measure the exiting gas conditions. Figure 2 below depicts the nozzle design.

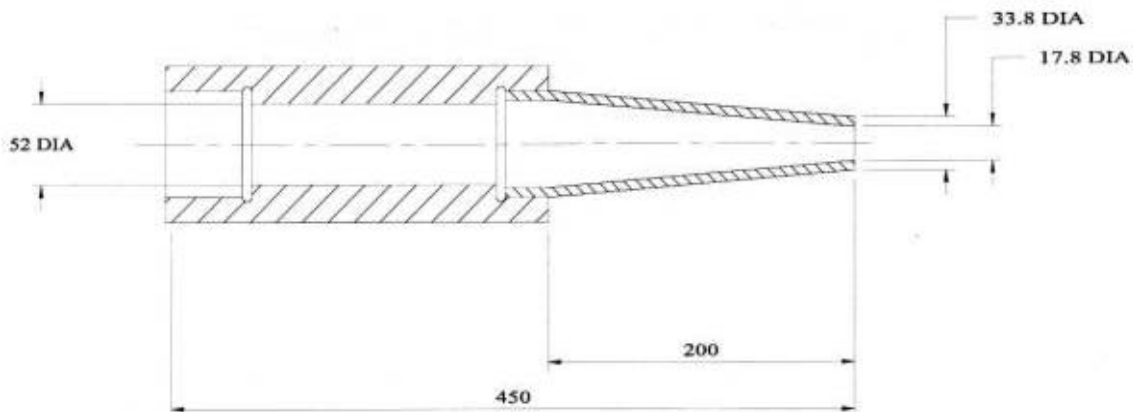


Figure 2. Jet-Fire Nozzle Diagram (Dimensions in mm).

Test Fuel

Commercial grade propane was vaporized and delivered to the jet flame with no liquid fraction. The gas flow rate was calculated according to ANSI Standard MPMS 14.3 (American Gas Association Report No. 3), "Natural Gas Fluids Measurements." This flow calculation uses the line temperature and static pressure, and the differential pressure across an orifice plate. These parameters are monitored on a single data acquisition system.

Test Setup

The jet-fire test specimen was supported with two metal brackets placed on either end of the pipe specimen. The area immediately around the brackets was insulated to prevent thermal transmission. The pipe was placed such that the tip of the nozzle was 1000 mm from the impingement point of the pipe, directly in the pipe's center. A steel deflection box (1500 x 1500 mm x 500 mm deep) was placed behind the pipe specimen such that the pipe specimen was in its center, as required by the OTI 95 634 test standard. Concrete blocks were placed around the deflection box in order to protect instrumentation.

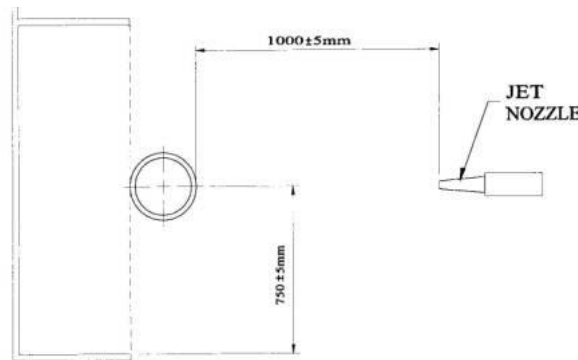


Figure 3. Jet Fire Setup.

Experimental

The jet-fire resistance test was conducted on October 25, 2002. Testing was witnessed by Mr. Alan Ester with Protective Concepts, Inc., and Mr. Gary Rektorik with DNV. Ambient conditions prior to the test were 20°C and 50% relative humidity. A pilot flame was ignited in front of the nozzle for ignition of the jet-flame. The jet-fire area was cleared and the jet-flame was ignited. At this time the data acquisition and video documentation were initiated.

Propane flow rate, sample temperatures, nozzle temperature, and nozzle pressure were recorded at 5-sec intervals. Nozzle pressure was monitored with a Sensotec 050 psi pressure transducer with a tolerance within 0.25% as determined by calibration at SwRI. An operator controlled the propane flow rate in order to achieve the $0.3 \pm .05$ kg/s flow outlined by the OTI 95 634 test standard. Water was applied to the floor immediately around the jet-fire to protect the concrete from spalling. Testing was continued for 180 min as requested by Protective Concepts, Inc. The actual average mass flow rate achieved during the test was 0.27 ± 0.01 kg/sec. At two short intervals (less than 2 min) during the test, excessive propane vaporization caused the pipes to freeze and temporarily slow the flow rate. This problem was quickly rectified and therefore considered insignificant to the test results. The total fuel used during the 180-min jet-fire exposure at this flow

was 2916 kg. This was verified to within 2% by the fact that the total contents of the 3704 kg capacity propane tanks filled to 80% (2963 kg) were emptied during this time period.

RESULTS

The jet-fire test specimen was monitored through a window in the control room and through a 1-meter opening below the front door to the test facility to note any significant changes. The plastisized PVC layer was deteriorated within the first 15 min of the test, exposing the wire mesh and alumina layers. Minimal erosion of the other layers occurred throughout the test. The temperatures directly in the jet-fire impingement were consistently lower throughout the test due to the cooling effect caused by non-combusted propane impinging the sample. At the conclusion of the jet fire test, there was no continued burning of the test specimen. Graphical test data is located in Appendix A, and tabular test data is located in Appendix B. Photographic documentation is provided in Appendix C. Calibration Certificates, and a material diagram are provided in Appendix D.

CONCLUSION

The OTI 95 634 test procedure provides a standard test method for evaluating the jet-fire performance of PFP, but does not outline specific pass/fail criteria. Protective Concepts, Inc.'s objective for the PFP jacket assembly was to protect the specimen temperature from rising to 427°C (800°F) in a 2-hr period. Protective Concepts, Inc.'s Fire Barrier System met their objective and protected the 203-mm, Schedule 80, tubular steel specimen as follows:

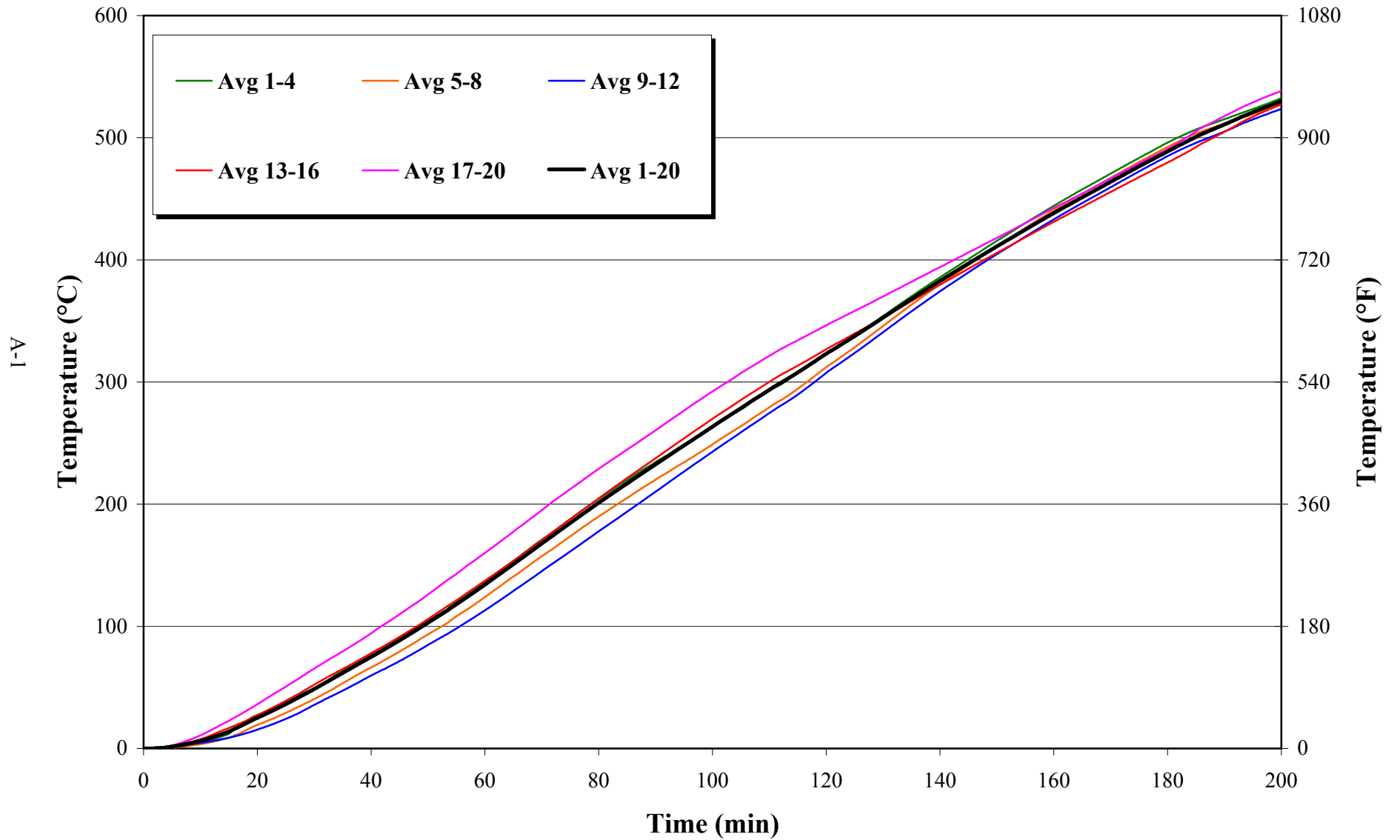
Table 1. Tubular Jet-Fire Temperature Rise Summary (°C).

Time (min)	Left Side Temperature Rise (TCs 1-8)	Impingement Region Temperature Rise (TCs 9-12)	Right Side Temperature Rise (TCs 13-20)	Overall Average Temperature Rise	Maximum Single-Point Temperature Rise
15	10.4°C	8.8°C	19.7°C	13.8°C	43.3°C
30	45.0°C	35.7°C	58.8°C	48.7°C	100.7°C
45	84.9°C	71.5°C	100.7°C	88.5°C	147.8°C
60	130.1°C	113.1°C	148.7°C	134.1°C	188.6°C
90	227.3°C	210.2°C	249.0°C	232.6°C	279.9°C
120	317.6°C	307.5°C	336.6°C	323.2°C	362.4°C
150	413.4°C	404.7°C	411.9°C	411.1°C	437.1°C
180	494.3°C	484.9°C	485.2°C	488.8°C	510.7°C

Appendix A
Graphical Data
(Consisting of 4 Pages)

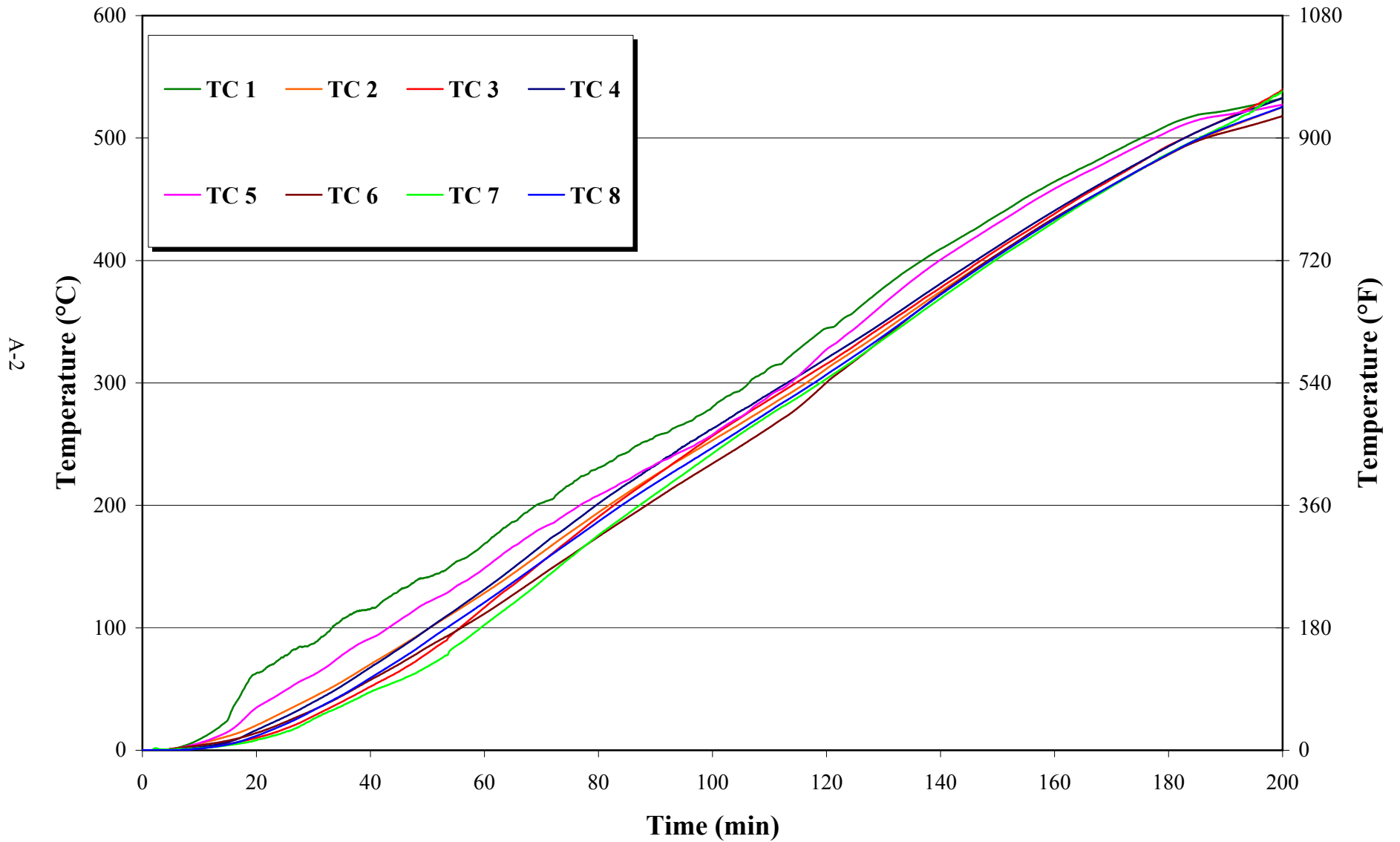
Protective Concepts, Inc.
SwRI Project No. 01.06132.01.001
Test Date: 25 October 2002
Test ID: 298pci1

Average Temperature Rises



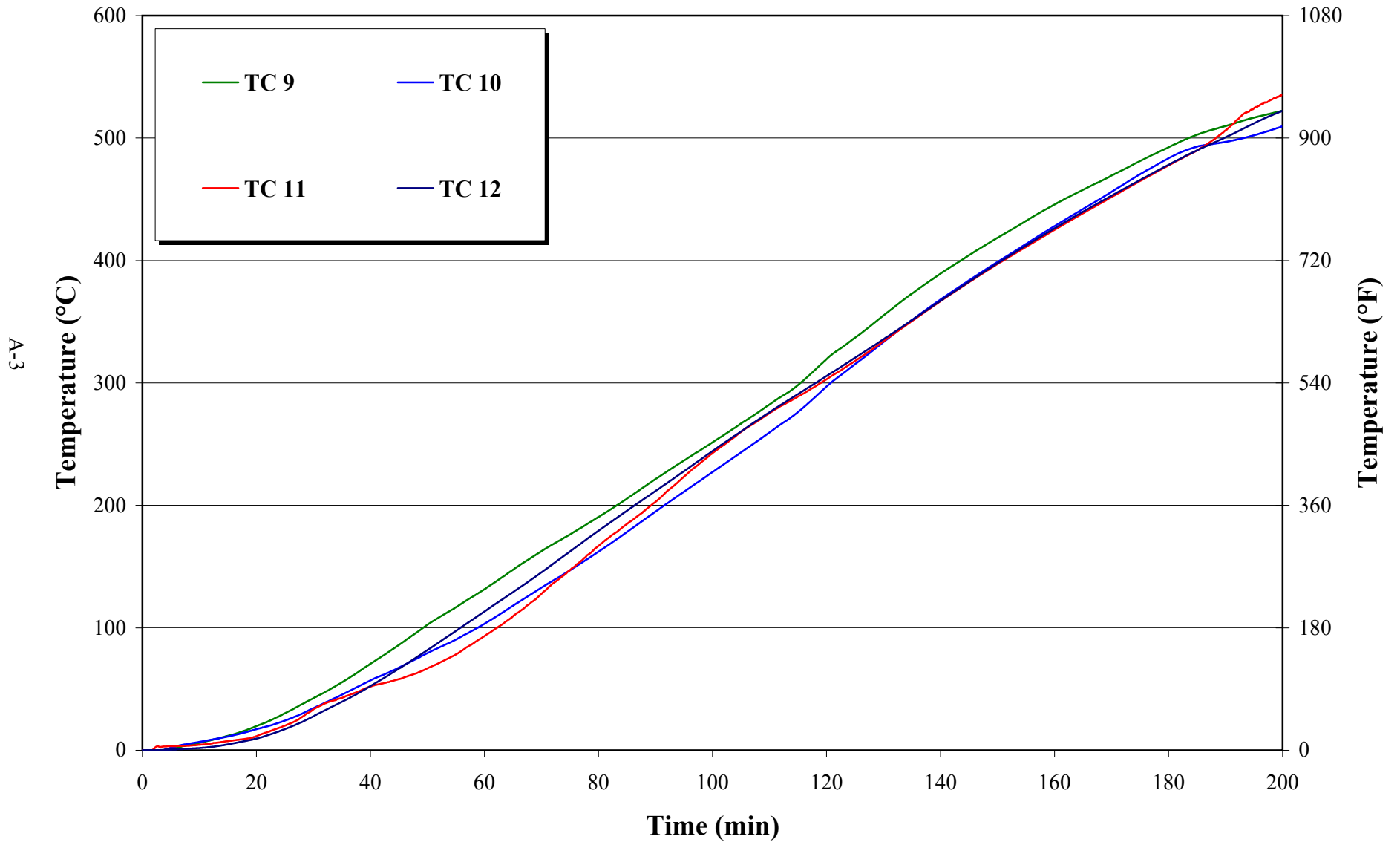
Protective Concepts, Inc.
SwRI Project No. 01.06132.01.001
Test Date: 25 October 2002
Test ID: 298pci1

Temperture Rises: Left Side TCs



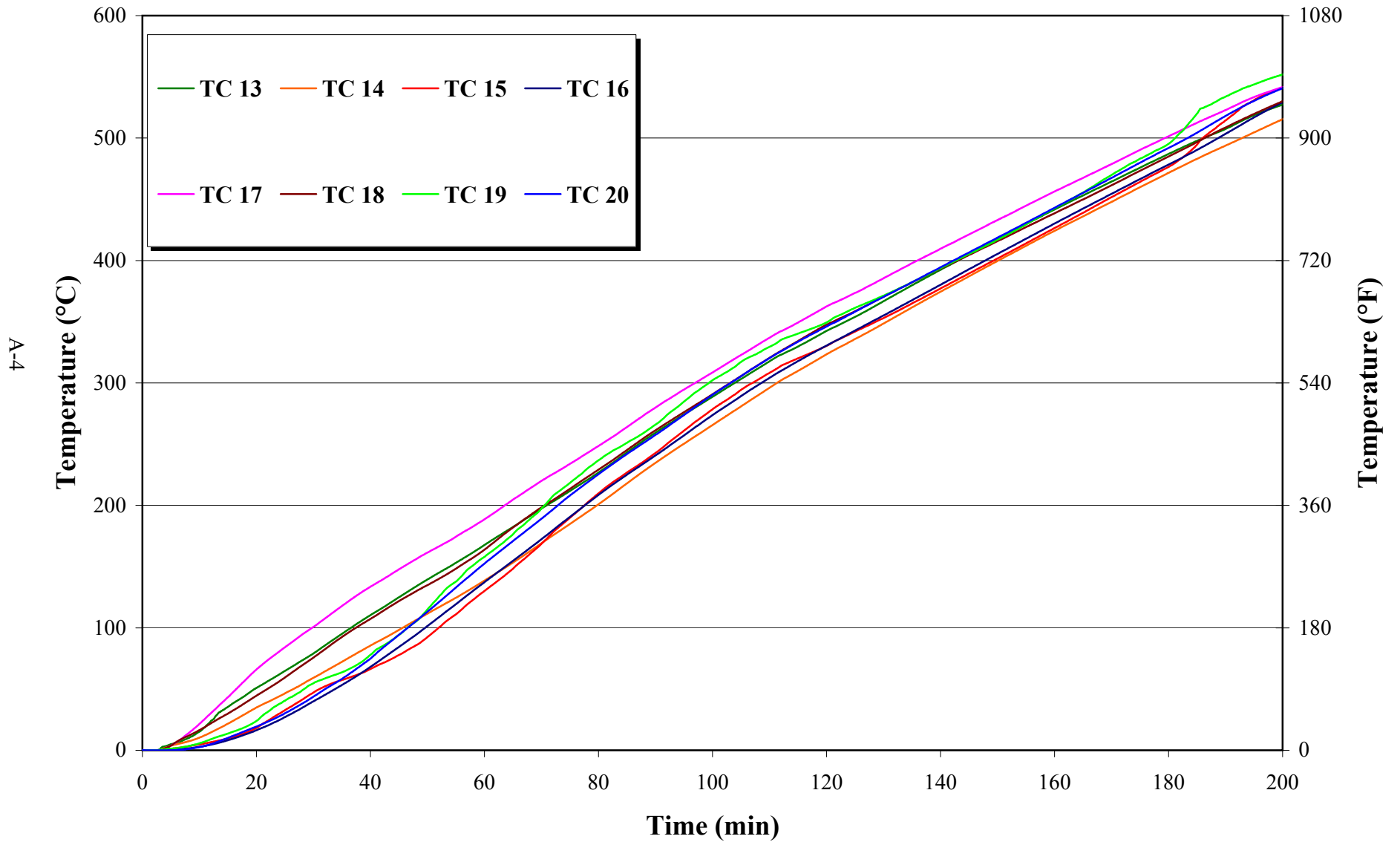
Protective Concepts, Inc.
SwRI Project No. 01.06132.01.001
Test Date: 25 October 2002
Test ID: 298pci1

Temperture Rises: Impingement Region TCs



Protective Concepts, Inc.
SwRI Project No. 01.06132.01.001
Test Date: 25 October 2002
Test ID: 298pci1

Temperture Rises: Right Side TCs



Appendix B
Tabular Data
(Consisting of 44 Pages)

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
0:00	195	40	69	8	17	32
0:30	291	60	58	26	18	19
1:00	325	60	56	35	21	20
1:30	314	60	55	33	22	20
2:00	318	60	53	34	21	21
2:30	319	60	52	35	20	21
3:00	319	60	52	35	19	21
3:30	330	60	53	37	19	21
4:00	324	60	53	36	19	21
4:30	321	60	52	35	19	21
5:00	316	60	52	35	20	22
5:30	318	60	51	36	21	22
6:00	328	60	53	37	22	22
6:30	324	60	53	36	23	23
7:00	318	60	52	35	25	24
7:30	321	60	52	36	26	25
8:00	320	60	52	37	27	25
8:30	320	60	52	37	28	26
9:00	317	60	52	36	28	26
9:30	320	60	51	37	28	26
10:00	326	60	52	38	29	27
10:30	320	60	51	38	29	27
11:00	315	60	50	37	29	27
11:30	316	60	49	38	29	28
12:00	311	60	51	36	29	28
12:30	324	60	52	38	29	28
13:00	309	60	49	36	30	28
13:30	319	60	50	38	30	28
14:00	311	60	50	36	29	28
14:30	301	60	48	35	29	28
15:00	313	60	49	37	28	28
15:30	316	35	50	37	28	28
16:00	324	37	52	38	28	28
16:30	311	35	49	37	29	29
17:00	319	36	50	38	29	29
17:30	319	36	50	38	29	29
18:00	319	36	50	38	29	29
18:30	325	34	49	40	29	29
19:00	316	35	49	37	29	29
19:30	309	34	48	37	29	29
20:00	311	33	47	38	29	29
20:30	317	36	49	38	28	29
21:00	327	34	50	40	28	29
21:30	320	35	49	39	28	29
22:00	323	37	51	38	28	29
22:30	313	35	49	37	28	30
23:00	322	36	51	38	29	30
23:30	321	36	50	38	29	30
24:00	322	35	49	39	29	30
24:30	323	37	51	38	29	30
25:00	314	35	49	38	29	30

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
25:30	312	35	49	37	29	31
26:00	312	35	48	37	29	31
26:30	314	35	48	38	29	30
27:00	304	34	48	35	28	30
27:30	317	35	49	38	28	30
28:00	326	37	51	39	28	30
28:30	324	36	50	39	28	30
29:00	332	37	51	40	28	31
29:30	315	36	49	37	29	31
30:00	312	35	49	37	29	31
30:30	329	35	50	40	29	31
31:00	315	35	49	38	29	31
31:30	324	35	50	39	29	31
32:00	313	35	49	37	29	31
32:30	312	35	49	37	28	31
33:00	310	35	48	37	28	31
33:30	329	36	51	39	27	31
34:00	315	36	50	37	27	31
34:30	322	35	49	39	27	31
35:00	322	37	51	38	28	31
35:30	315	36	50	37	29	31
36:00	320	36	50	38	29	32
36:30	310	35	49	37	30	32
37:00	307	35	48	36	29	32
37:30	320	34	48	39	29	32
38:00	310	35	49	36	28	32
38:30	323	37	51	38	28	32
39:00	320	36	50	38	28	32
39:30	326	35	50	40	29	32
40:00	313	35	49	37	29	32
40:30	319	34	48	39	29	32
41:00	326	34	49	40	29	32
41:30	311	36	50	36	28	32
42:00	329	34	49	41	28	32
42:30	316	35	49	38	28	32
43:00	326	36	50	39	28	32
43:30	312	35	49	37	28	32
44:00	310	35	49	37	28	32
44:30	306	35	48	36	28	32
45:00	315	35	49	37	27	32
45:30	318	36	50	37	27	32
46:00	308	35	48	36	28	32
46:30	312	35	48	37	28	32
47:00	311	34	48	37	28	32
47:30	303	34	47	36	27	32
48:00	312	35	48	37	27	32
48:30	318	36	49	38	27	32
49:00	334	36	51	41	27	32
49:30	322	36	50	38	27	32
50:00	325	35	49	40	28	32
50:30	321	36	50	39	29	33

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
51:00	315	35	49	38	29	33
51:30	312	35	48	37	28	33
52:00	314	36	49	37	28	33
52:30	304	34	47	36	28	33
53:00	302	33	46	36	28	32
53:30	322	35	49	39	27	32
54:00	310	35	48	36	26	32
54:30	315	36	50	36	26	32
55:00	333	35	50	41	26	32
55:30	319	37	50	37	26	32
56:00	320	36	50	38	27	32
56:30	326	36	51	39	28	32
57:00	309	35	48	37	29	33
57:30	314	35	49	38	29	33
58:00	310	35	48	37	28	33
58:30	305	34	47	36	28	33
59:00	313	35	48	37	27	32
59:30	320	36	50	38	27	32
60:00	314	35	49	37	27	32
60:30	325	37	51	39	27	33
61:00	317	35	49	38	28	33
61:30	315	35	49	37	28	33
62:00	308	35	48	37	28	33
62:30	311	35	48	37	28	33
63:00	304	35	48	35	27	33
63:30	325	36	50	39	27	33
64:00	317	36	49	38	27	33
64:30	322	36	50	38	28	33
65:00	317	35	49	38	28	33
65:30	315	35	49	38	28	33
66:00	311	35	48	37	28	33
66:30	323	36	50	38	28	33
67:00	313	35	49	37	28	33
67:30	316	35	49	38	28	33
68:00	314	34	48	38	28	33
68:30	314	35	48	38	28	33
69:00	315	34	47	38	27	33
69:30	324	36	50	39	26	33
70:00	321	36	49	38	26	33
70:30	320	36	49	38	27	33
71:00	333	36	50	41	27	33
71:30	328	37	50	40	28	33
72:00	322	36	49	39	28	33
72:30	322	35	49	40	29	33
73:00	325	36	50	40	29	34
73:30	310	34	47	37	29	34
74:00	310	34	47	38	29	34
74:30	300	34	47	35	28	33
75:00	325	36	50	39	28	33
75:30	314	35	49	37	27	33
76:00	321	35	48	39	27	33

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
76:30	333	35	50	41	27	33
77:00	318	36	49	38	28	33
77:30	326	34	48	41	29	34
78:00	321	36	49	39	29	34
78:30	312	35	49	37	29	34
79:00	322	34	47	41	28	34
79:30	300	34	47	35	28	33
80:00	315	33	47	38	26	33
80:30	299	32	45	36	26	32
81:00	305	34	47	36	25	32
81:30	312	35	48	37	25	32
82:00	321	36	50	38	25	32
82:30	312	35	48	37	25	32
83:00	329	36	50	40	25	32
83:30	325	37	50	39	26	32
84:00	326	36	50	39	27	32
84:30	306	35	48	36	28	33
85:00	320	36	49	38	28	33
85:30	312	35	48	38	29	33
86:00	305	35	48	36	29	33
86:30	304	35	48	36	28	33
87:00	304	34	47	36	28	33
87:30	326	34	49	40	27	33
88:00	321	37	51	38	28	33
88:30	322	37	50	38	28	33
89:00	315	35	48	38	29	34
89:30	316	35	48	38	29	34
90:00	315	36	49	38	29	34
90:30	309	36	49	36	29	34
91:00	314	35	49	38	28	34
91:30	317	35	49	38	28	34
92:00	309	35	48	36	28	34
92:30	315	36	50	37	29	34
93:00	306	34	47	37	29	34
93:30	303	34	47	36	29	34
94:00	304	34	47	37	29	34
94:30	323	36	50	39	28	34
95:00	327	36	49	40	28	34
95:30	338	34	48	44	28	34
96:00	314	35	48	38	29	34
96:30	309	35	48	37	29	34
97:00	308	34	47	37	28	34
97:30	323	34	48	40	28	34
98:00	317	36	49	38	28	33
98:30	320	34	48	40	28	33
99:00	303	34	47	35	28	34
99:30	292	33	45	34	27	34
100:00	296	33	45	35	27	33
100:30	305	35	48	35	26	33
101:00	306	34	46	37	26	33
101:30	325	36	49	39	26	33

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
102:00	325	36	50	39	26	33
102:30	317	36	49	37	26	33
103:00	319	36	49	38	27	33
103:30	328	34	49	41	28	33
104:00	317	36	49	38	28	34
104:30	317	36	49	38	29	34
105:00	305	34	47	37	29	34
105:30	312	35	48	37	28	34
106:00	305	34	47	36	28	34
106:30	310	34	47	37	27	33
107:00	304	34	46	36	27	33
107:30	315	36	49	37	26	33
108:00	315	35	48	38	26	33
108:30	309	35	48	37	27	33
109:00	329	36	50	40	27	33
109:30	336	37	50	42	28	33
110:00	311	32	46	39	28	34
110:30	192	18	25	23	28	34
111:00	117	5	10	14	27	34
111:30	61	1	3	5	27	34
112:00	315	4	27	60	27	39
112:30	319	36	49	39	29	34
113:00	307	34	47	37	30	35
113:30	302	32	46	36	28	33
114:00	294	32	44	35	24	32
114:30	288	31	44	34	22	31
115:00	287	31	43	33	21	30
115:30	319	32	45	40	20	30
116:00	306	34	47	36	20	29
116:30	312	35	47	37	21	29
117:00	317	36	49	37	21	30
117:30	318	35	48	38	22	30
118:00	315	35	48	37	23	31
118:30	315	35	48	38	24	31
119:00	295	33	45	35	25	32
119:30	188	17	25	22	26	32
120:00	111	5	9	13	25	32
120:30	84	2	5	9	26	33
121:00	47	1	2	3	26	33
121:30	312	35	49	36	27	34
122:00	303	35	48	35	29	34
122:30	292	33	45	34	29	34
123:00	250	27	38	29	27	33
123:30	199	19	27	23	25	32
124:00	149	11	17	17	24	32
124:30	330	37	51	39	24	32
125:00	319	36	50	37	26	32
125:30	317	36	49	37	26	32
125:45	317	35	49	38	27	33
126:00	301	35	48	35	27	33
126:15	311	35	49	36	27	33

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
126:30	302	34	47	35	27	33
126:45	308	36	49	36	27	33
127:00	303	34	47	36	27	33
127:15	310	36	49	36	27	33
127:30	307	34	47	36	27	33
127:45	319	36	49	38	27	33
128:00	325	36	50	39	27	33
128:15	316	35	49	38	27	33
128:30	315	37	50	37	27	33
128:45	314	35	48	37	27	33
129:00	313	36	49	37	27	33
129:15	329	36	50	40	28	33
129:30	311	36	49	36	28	33
129:45	316	36	50	37	28	33
130:00	330	36	49	41	29	34
130:15	310	35	48	37	29	34
130:30	314	34	47	39	29	34
130:45	305	34	47	36	29	34
131:00	298	33	46	36	29	34
131:15	310	34	47	38	29	34
131:30	314	34	48	38	28	34
131:45	301	34	47	35	28	33
132:00	316	35	49	38	27	33
132:15	300	34	46	35	27	33
132:30	318	35	48	38	27	33
132:45	322	34	49	39	27	33
133:00	320	35	48	39	27	33
133:15	321	36	50	38	27	33
133:30	304	35	48	35	27	33
133:45	310	35	48	36	27	33
134:00	312	35	49	37	27	33
134:15	321	34	48	40	28	33
134:30	301	34	47	36	28	33
134:45	296	34	47	34	28	34
135:00	314	34	48	38	28	34
135:15	295	34	46	34	28	34
135:30	316	34	48	38	27	33
135:45	299	34	47	35	27	33
136:00	311	35	49	36	27	33
136:15	300	34	46	35	27	33
136:30	304	35	48	35	27	33
136:45	314	36	49	37	27	33
137:00	306	34	47	36	27	33
137:15	310	36	49	36	27	33
137:30	322	36	49	39	27	33
137:45	318	34	47	39	27	33
138:00	305	34	47	36	27	33
138:15	314	35	48	38	28	33
138:30	313	35	48	37	28	33
138:45	307	34	47	37	28	33
139:00	314	36	49	37	28	33

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
139:15	306	35	47	36	27	33
139:30	313	35	49	37	27	33
139:45	320	35	48	39	26	33
140:00	298	34	47	34	26	33
140:15	304	34	47	36	26	33
140:30	309	35	48	36	26	33
140:45	306	33	45	37	26	33
141:00	298	33	45	35	26	33
141:15	307	34	46	37	26	33
141:30	293	32	45	34	26	33
141:45	304	34	47	36	25	32
142:00	322	32	45	41	25	32
142:15	298	33	45	35	25	32
142:30	299	33	46	35	25	32
142:45	314	35	48	38	25	32
143:00	317	35	49	38	25	32
143:15	306	34	47	36	25	32
143:30	318	36	49	38	25	32
143:45	301	34	47	35	25	32
144:00	318	35	49	38	25	32
144:15	323	36	50	39	26	32
144:30	310	35	48	36	26	32
144:45	315	36	50	37	26	32
145:00	323	36	49	39	27	33
145:15	315	34	47	39	27	33
145:30	306	34	47	37	28	33
145:45	305	35	48	36	28	33
146:00	299	33	46	36	28	33
146:15	309	34	47	37	28	33
146:30	300	33	45	36	27	33
146:45	303	34	47	35	27	33
147:00	324	33	48	40	27	33
147:15	309	35	47	37	26	33
147:30	323	35	49	39	26	33
147:45	309	34	47	37	26	33
148:00	317	36	49	38	26	33
148:15	309	34	47	37	26	33
148:30	309	35	48	36	27	33
148:45	311	36	49	36	27	33
149:00	313	35	48	37	27	33
149:15	295	34	46	34	27	33
149:30	297	34	46	35	27	33
149:45	302	34	47	35	27	33
150:00	297	33	46	35	27	33
150:15	306	35	47	36	27	33
150:30	296	33	45	35	27	33
150:45	305	34	47	36	27	33
151:00	312	35	49	37	27	33
151:15	299	34	47	35	27	33
151:30	319	35	48	38	27	33
151:45	316	35	48	38	27	33

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
152:00	299	33	46	35	27	33
152:15	309	34	47	38	27	33
152:30	304	34	47	36	27	33
152:45	295	33	45	35	27	33
153:00	301	34	47	35	27	33
153:15	307	32	45	38	27	33
153:30	293	33	46	34	27	33
153:45	310	35	48	37	26	33
154:00	319	32	46	40	26	33
154:15	298	33	46	35	26	33
154:30	303	34	46	36	26	33
154:45	309	34	47	37	26	33
155:00	308	32	44	39	26	33
155:15	295	32	44	35	26	33
155:30	293	33	45	34	26	32
155:45	292	32	44	35	26	33
156:00	304	34	47	36	26	32
156:15	290	32	44	34	25	32
156:30	295	33	46	34	25	32
156:45	315	35	48	38	25	32
157:00	295	33	46	34	25	32
157:15	306	35	48	36	25	32
157:30	318	33	47	39	25	32
157:45	302	34	47	35	25	32
158:00	315	36	49	37	25	32
158:15	301	34	47	35	25	32
158:30	312	35	48	37	26	33
158:45	319	36	49	38	26	33
159:00	312	34	48	37	26	33
159:15	301	34	46	36	27	33
159:30	303	34	47	36	27	33
159:45	303	34	47	36	27	33
160:00	306	32	46	37	27	33
160:15	288	32	44	34	27	33
160:30	293	32	45	35	27	33
160:45	289	31	43	35	26	33
161:00	292	32	44	34	26	33
161:15	308	34	47	37	26	32
161:30	298	33	45	35	25	32
161:45	311	35	47	37	25	32
162:00	317	35	48	38	25	32
162:15	310	34	47	37	25	32
162:30	320	35	49	38	25	32
162:45	317	35	48	38	25	32
163:00	323	36	49	39	25	32
163:15	305	34	47	36	25	32
163:30	307	35	48	36	25	32
163:45	315	36	49	37	25	32
164:00	308	35	47	36	26	32
164:15	310	35	48	37	26	32
164:30	311	35	48	37	26	33

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
164:45	317	34	48	39	27	33
165:00	297	33	46	35	27	33
165:15	301	34	47	35	27	33
165:30	296	33	45	35	27	33
165:45	301	34	46	35	27	33
166:00	312	35	48	37	27	33
166:15	313	34	47	38	27	33
166:30	294	33	45	35	27	33
166:45	298	33	46	35	27	33
167:00	297	34	47	35	27	33
167:15	309	34	47	37	26	33
167:30	295	33	45	35	26	32
167:45	306	35	48	36	25	32
168:00	298	33	45	35	25	32
168:15	308	34	47	36	24	32
168:30	314	35	48	37	24	31
168:45	306	35	47	36	24	31
169:00	316	35	48	37	24	31
169:15	301	34	46	35	24	31
169:30	309	35	48	36	24	31
169:45	310	35	48	36	24	31
170:00	312	33	47	37	25	31
170:15	302	33	46	36	25	31
170:30	297	33	45	35	25	32
170:45	306	34	46	37	25	32
171:00	299	33	45	36	25	32
171:15	305	34	47	36	25	32
171:30	294	33	45	34	25	31
171:45	307	34	47	36	24	31
172:00	292	33	45	34	24	31
172:15	302	34	47	35	24	31
172:30	316	33	48	38	24	31
172:45	306	34	47	36	25	31
173:00	310	35	49	36	25	32
173:15	309	34	46	37	25	32
173:30	310	35	48	37	25	32
173:45	314	35	49	37	26	32
174:00	312	34	48	37	26	32
174:15	303	34	47	36	27	33
174:30	300	34	47	35	28	33
174:45	302	34	47	36	28	33
175:00	303	34	47	36	28	33
175:15	300	32	45	37	28	33
175:30	292	32	45	35	28	33
175:45	303	34	46	36	28	33
176:00	288	32	44	34	28	33
176:15	307	34	47	37	27	33
176:30	294	32	45	35	27	33
176:45	312	34	48	37	26	33
177:00	290	33	45	34	26	33
177:15	311	35	48	37	26	33

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
177:30	311	33	46	38	26	33
177:45	303	34	47	35	26	33
178:00	316	35	48	38	26	33
178:15	298	33	46	35	27	33
178:30	312	35	48	37	27	33
178:45	324	35	48	40	27	33
179:00	313	34	47	38	28	34
179:15	305	33	46	37	29	34
179:30	299	32	45	37	31	34
179:45	289	31	43	35	32	35
180:00	284	30	42	35	33	36
180:15	275	29	40	34	35	36
180:30	263	27	38	33	36	37
180:45	252	26	36	31	37	37
181:00	243	24	34	31	38	38
181:15	239	23	33	30	38	38
181:30	229	22	32	29	39	39
181:45	224	21	31	28	40	39
182:00	213	20	29	26	40	39
182:15	208	19	28	26	40	39
182:30	200	18	27	25	40	39
182:45	192	17	25	24	40	40
183:00	185	16	24	23	40	40
183:15	180	15	23	22	40	40
183:30	174	14	22	21	40	40
183:45	173	13	21	22	40	40
184:00	169	13	20	21	39	40
184:15	160	12	19	20	39	40
184:30	158	11	18	20	39	40
184:45	148	10	17	18	39	40
185:00	146	9	16	18	38	40
185:15	27	0	1	1	38	40
185:30	32	0	21	1	38	40
185:45	41	0	33	1	38	39
186:00	41	0	34	1	38	39
186:15	37	0	34	1	38	38
186:30	44	0	35	1	38	36
186:45	39	0	35	1	37	36
187:00	42	0	35	1	37	35
187:15	35	0	35	1	37	35
187:30	38	0	35	1	37	35
187:45	37	0	35	1	37	34
188:00	38	0	35	1	37	34
188:15	34	0	35	1	36	34
188:30	35	0	35	1	36	34
188:45	42	0	36	1	36	34
189:00	37	0	36	1	36	34
189:15	39	0	36	1	36	34
189:30	38	0	36	1	36	34
189:45	35	0	36	1	35	34
190:00	35	0	36	1	35	34

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Flow Rate</u> (scfm)	<u>Nozzle Pressure</u> (psig)	<u>Static Pressure</u> (psig)	<u>Differential Pressure</u> ("H2O)	<u>Line Temp</u> (°C)	<u>Nozzle Temp</u> (°C)
190:15	40	0	36	1	35	34
190:30	36	0	36	1	35	34
190:45	41	0	36	1	35	34
191:00	41	0	36	1	35	34
191:15	43	0	36	1	34	35
191:30	45	0	36	1	34	35
191:45	37	0	36	1	34	35
192:00	34	0	36	1	34	35
192:15	39	0	36	1	34	34
192:30	38	0	36	1	33	34
192:45	38	0	36	1	33	34
193:00	38	0	37	1	33	34
193:15	37	0	37	1	33	33
193:30	42	0	37	1	33	34
193:45	41	0	37	1	33	34
194:00	40	0	37	1	32	34
194:15	34	0	37	1	32	34
194:30	35	0	37	1	32	34
194:45	39	0	37	1	32	33
195:00	33	0	37	1	32	33
195:15	41	0	37	1	32	33
195:30	40	0	37	1	32	33
195:45	44	0	37	1	31	33
196:00	38	0	37	1	31	33
196:15	35	0	37	1	31	32
196:30	37	0	37	1	31	32
196:45	36	0	37	1	31	32
197:00	33	0	37	1	31	32
197:15	33	0	37	1	31	32
197:30	22	0	37	0	30	32
197:45	22	0	37	0	30	32
198:00	31	0	37	0	30	32
198:15	20	0	37	0	30	32
198:30	35	0	37	1	30	33
198:45	38	0	37	1	30	33
199:00	40	0	37	1	30	33
199:15	34	0	37	1	30	33
199:30	40	0	37	1	29	32
199:45	37	0	37	1	29	32
200:00	38	0	37	1	29	32

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
0:00	20	20	20	20	20	20	20	20	20	20
0:30	20	20	20	20	20	20	20	20	20	20
1:00	20	20	20	20	20	20	20	20	20	20
1:30	20	20	20	20	20	20	20	20	20	20
2:00	20	20	20	20	20	20	20	21	20	20
2:30	20	20	20	20	20	20	20	22	20	21
3:00	20	20	20	20	20	20	20	21	20	20
3:30	20	20	20	20	20	20	20	21	20	20
4:00	21	20	20	20	20	21	21	21	20	21
4:30	21	21	20	20	21	21	21	21	20	21
5:00	21	21	21	20	21	21	21	21	20	21
5:30	21	21	21	21	21	21	22	21	20	21
6:00	22	22	21	21	21	22	22	21	20	21
6:30	23	22	21	21	22	22	22	21	21	22
7:00	23	22	21	21	22	23	22	21	21	22
7:30	24	23	22	21	22	23	23	21	21	22
8:00	25	23	22	22	23	24	23	22	21	22
8:30	26	24	22	22	23	24	23	22	21	23
9:00	27	24	22	22	24	25	24	22	21	23
9:30	28	25	22	22	24	26	24	22	21	23
10:00	29	25	22	23	25	26	24	22	22	24
10:30	30	26	23	23	25	27	25	22	22	24
11:00	32	26	23	23	26	28	25	22	22	25
11:30	33	27	23	24	27	28	25	22	22	25
12:00	34	28	23	24	27	29	26	23	23	26
12:30	36	28	24	24	28	30	26	23	23	26
13:00	37	29	24	25	29	31	26	23	23	27
13:30	39	30	24	25	29	32	27	23	24	27
14:00	41	30	25	26	30	33	27	24	24	28
14:30	43	31	25	26	31	34	28	24	25	28
15:00	45	31	25	27	32	35	28	24	25	29
15:30	51	32	26	27	34	37	29	25	26	30
16:00	56	33	26	28	36	38	29	25	26	31
16:30	60	34	27	29	37	40	30	25	27	32
17:00	63	34	27	30	39	42	30	26	27	33
17:30	68	35	28	31	40	44	31	26	28	34
18:00	72	36	28	32	42	47	31	27	29	35
18:30	76	37	29	33	44	49	32	27	30	36
19:00	80	38	29	35	45	51	33	27	30	37
19:30	82	39	30	36	47	53	34	28	31	39
20:00	83	40	30	37	48	55	34	28	32	40
20:30	84	41	31	38	48	57	35	29	33	40
21:00	85	43	32	39	49	58	36	30	34	41
21:30	86	44	32	40	51	59	37	30	35	42
22:00	89	45	33	41	52	61	38	31	36	43
22:30	90	46	34	42	53	62	39	32	37	44
23:00	91	47	34	43	54	63	39	32	38	45
23:30	93	48	35	44	55	65	40	33	39	46
24:00	94	49	36	45	56	66	41	33	40	47
24:30	96	51	37	46	57	68	42	34	40	48
25:00	97	52	38	47	59	69	43	35	41	49

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
25:30	98	53	39	48	60	70	44	36	43	50
26:00	100	54	39	50	61	72	45	36	44	52
26:30	102	55	40	51	62	73	46	37	45	53
27:00	103	56	41	52	63	75	47	38	46	54
27:30	105	58	42	53	64	76	48	39	47	55
28:00	105	59	44	54	65	77	49	41	48	56
28:30	105	60	45	56	66	79	50	42	49	57
29:00	105	61	46	57	67	80	51	43	50	58
29:30	107	62	47	58	69	81	52	44	52	59
30:00	107	64	48	59	70	82	53	46	53	61
30:30	109	65	49	61	71	83	54	47	54	62
31:00	111	66	50	62	72	84	55	48	55	63
31:30	113	67	52	63	74	86	56	49	57	64
32:00	114	68	53	64	75	87	57	50	58	66
32:30	116	70	54	66	76	89	59	51	59	67
33:00	119	71	55	67	78	91	60	52	60	68
33:30	122	72	56	68	80	93	61	53	62	70
34:00	123	73	57	70	81	94	62	54	63	71
34:30	124	75	59	71	82	96	63	55	64	72
35:00	127	76	60	73	84	98	65	56	65	74
35:30	128	77	61	74	85	100	66	58	67	75
36:00	129	79	62	76	86	101	67	59	68	76
36:30	131	80	63	77	88	103	69	60	69	78
37:00	132	82	65	79	89	104	70	61	71	79
37:30	133	83	66	80	91	106	71	62	72	80
38:00	134	84	67	82	92	107	72	63	74	82
38:30	135	86	68	83	93	108	74	65	75	83
39:00	135	87	70	85	94	110	75	66	76	84
39:30	135	89	71	86	95	111	76	67	78	85
40:00	136	90	72	88	96	112	78	68	79	87
40:30	136	92	73	89	98	113	79	69	81	88
41:00	137	93	75	91	99	114	80	70	82	89
41:30	139	94	76	92	100	115	81	71	84	90
42:00	141	96	77	94	102	117	83	72	85	92
42:30	143	97	78	95	103	118	84	73	87	93
43:00	144	99	80	97	105	120	85	74	88	94
43:30	146	100	81	98	106	121	87	74	89	96
44:00	148	101	82	100	108	123	88	75	91	97
44:30	149	103	83	101	109	125	89	76	92	98
45:00	150	104	84	103	111	126	90	77	94	100
45:30	152	106	86	104	112	128	92	78	95	101
46:00	153	107	87	106	113	129	93	79	97	102
46:30	154	108	89	108	115	131	95	80	98	104
47:00	155	110	90	109	116	132	96	81	100	105
47:30	157	111	92	111	118	134	97	82	101	106
48:00	159	113	93	112	119	136	99	83	103	108
48:30	160	114	95	114	121	137	100	85	105	109
49:00	161	116	96	116	122	139	102	86	106	111
49:30	161	117	98	117	123	140	103	87	108	112
50:00	161	119	99	119	125	141	104	89	109	114
50:30	162	120	101	121	126	142	106	90	111	115

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
51:00	163	122	103	122	127	143	107	91	113	116
51:30	164	123	104	124	129	145	108	93	114	118
52:00	164	125	106	125	130	146	110	94	116	119
52:30	166	126	108	127	132	147	111	95	118	120
53:00	167	128	109	129	133	148	112	97	119	122
53:30	168	129	111	130	135	149	114	98	121	123
54:00	170	131	114	132	137	151	115	102	122	125
54:30	172	132	116	133	138	152	116	104	124	127
55:00	174	133	118	135	140	154	118	105	125	128
55:30	175	135	119	137	141	156	119	107	127	130
56:00	176	136	121	138	143	157	120	108	128	131
56:30	177	138	123	140	144	158	122	110	130	133
57:00	178	139	125	142	146	159	123	112	132	134
57:30	180	141	127	143	148	161	125	114	133	136
58:00	181	142	129	145	149	162	126	115	135	138
58:30	183	144	131	147	151	164	127	117	136	139
59:00	185	145	133	148	153	166	129	119	138	141
59:30	187	147	135	150	155	167	130	121	139	142
60:00	189	148	137	151	156	169	132	123	141	144
60:30	190	150	139	153	158	171	133	124	143	146
61:00	192	151	141	155	160	172	135	126	144	147
61:30	194	153	143	157	162	174	136	128	146	149
62:00	196	155	145	158	163	176	138	130	148	151
62:30	198	156	146	160	165	178	139	131	149	153
63:00	200	158	148	162	167	180	141	133	151	154
63:30	202	159	150	163	169	182	142	135	152	156
64:00	203	161	152	165	170	183	144	137	154	158
64:30	205	163	153	167	172	185	146	138	156	159
65:00	207	164	155	169	174	187	147	140	157	161
65:30	207	166	157	171	175	188	149	142	159	163
66:00	209	168	159	173	177	189	150	144	161	164
66:30	211	169	161	174	179	191	152	145	162	166
67:00	214	171	162	176	181	193	154	147	164	168
67:30	214	173	164	178	182	194	155	149	166	169
68:00	217	174	166	180	184	196	157	151	167	171
68:30	218	176	168	182	186	197	158	153	169	173
69:00	220	178	170	183	188	199	160	154	171	174
69:30	221	179	172	185	189	200	162	157	172	176
70:00	222	181	174	187	191	202	163	158	174	178
70:30	223	183	176	189	193	203	165	160	176	179
71:00	224	185	177	191	194	204	166	162	177	181
71:30	225	186	179	193	196	205	168	164	179	182
72:00	225	188	181	195	197	206	170	166	181	184
72:30	228	190	183	196	199	207	171	168	182	186
73:00	230	191	185	197	201	209	173	170	184	187
73:30	232	193	187	199	203	211	174	172	186	189
74:00	234	195	189	201	205	212	176	174	187	191
74:30	236	196	191	202	206	214	177	176	189	192
75:00	237	198	192	204	208	215	179	177	191	194
75:30	238	200	194	206	210	216	180	179	192	196
76:00	240	201	196	208	211	218	182	181	194	197

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
76:30	242	203	198	209	213	220	184	183	196	199
77:00	244	204	200	211	215	221	185	185	197	201
77:30	244	206	202	213	216	222	187	187	199	202
78:00	245	208	204	215	218	224	188	189	201	204
78:30	247	209	205	216	220	225	190	190	202	205
79:00	249	211	207	218	221	226	192	192	204	207
79:30	249	213	209	220	223	227	193	194	205	209
80:00	251	214	211	222	224	229	195	196	207	210
80:30	252	216	212	223	226	230	196	198	209	212
81:00	253	217	214	225	227	231	198	199	210	213
81:30	254	219	216	227	229	232	199	201	212	215
82:00	256	221	218	228	231	233	201	203	214	216
82:30	257	222	219	230	232	234	202	205	215	218
83:00	258	224	221	231	234	236	204	206	217	219
83:30	260	225	223	233	235	237	205	208	219	221
84:00	261	227	225	235	237	239	207	209	220	222
84:30	262	228	226	236	238	240	209	211	222	224
85:00	263	230	228	238	240	241	210	213	223	225
85:30	265	231	230	239	241	242	212	215	225	227
86:00	267	233	231	241	243	243	213	216	226	228
86:30	269	235	233	242	245	245	215	218	228	230
87:00	270	236	235	244	246	246	216	220	229	231
87:30	271	238	236	245	247	248	218	221	231	233
88:00	272	239	238	247	249	249	219	223	232	234
88:30	273	240	239	248	250	250	221	225	234	236
89:00	274	242	241	250	252	251	222	226	235	237
89:30	275	243	243	251	253	252	224	228	237	239
90:00	277	245	244	253	255	254	225	230	238	240
90:30	278	246	246	255	256	255	227	231	240	242
91:00	278	248	248	256	257	256	228	233	241	243
91:30	279	249	249	258	259	257	230	234	243	245
92:00	279	251	251	259	260	258	231	236	244	246
92:30	281	252	252	261	262	259	233	238	246	247
93:00	283	254	254	262	263	261	234	240	247	249
93:30	284	255	256	264	265	262	236	241	249	250
94:00	285	256	257	265	266	263	237	243	250	252
94:30	286	258	259	267	267	264	239	244	251	253
95:00	287	259	261	268	269	265	240	246	253	255
95:30	288	260	262	270	270	266	242	248	254	256
96:00	289	262	264	272	271	267	243	249	256	257
96:30	290	263	266	273	273	268	244	251	257	259
97:00	292	265	267	274	274	270	246	253	259	260
97:30	293	266	269	276	276	271	247	254	260	262
98:00	294	267	270	277	277	273	249	256	262	263
98:30	296	269	272	278	279	274	250	258	263	265
99:00	297	270	274	280	280	275	252	259	265	266
99:30	298	272	275	282	282	277	253	261	266	268
100:00	300	273	277	283	283	278	254	263	267	269
100:30	302	275	278	284	285	280	256	264	269	271
101:00	304	276	280	286	286	282	257	266	270	272
101:30	306	277	282	287	288	283	259	268	272	274

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
102:00	307	279	283	288	289	285	260	269	273	275
102:30	309	280	285	290	291	286	262	271	275	277
103:00	310	281	286	292	292	288	263	272	276	278
103:30	311	283	288	293	294	289	264	274	278	280
104:00	313	284	289	295	295	290	266	276	279	281
104:30	313	286	290	296	296	292	267	277	281	283
105:00	314	287	292	297	298	293	269	279	282	284
105:30	316	288	294	299	299	294	270	280	284	286
106:00	318	290	295	300	301	296	272	282	285	287
106:30	321	291	297	301	302	298	273	284	287	289
107:00	323	293	298	303	304	300	275	285	288	290
107:30	325	294	300	304	306	302	276	287	290	292
108:00	326	295	301	306	307	303	278	288	291	293
108:30	327	297	302	307	308	305	279	290	293	295
109:00	328	298	304	309	310	306	281	291	294	296
109:30	331	300	305	310	311	308	282	293	296	298
110:00	332	301	307	311	313	310	284	294	297	300
110:30	334	303	308	313	314	312	285	296	299	301
111:00	335	304	310	314	316	313	287	297	300	303
111:30	335	306	311	316	317	314	289	299	302	304
112:00	336	307	312	317	318	315	290	300	303	305
112:30	337	308	314	319	320	316	292	301	305	307
113:00	340	310	315	320	321	318	293	303	306	308
113:30	342	311	317	321	323	320	295	304	307	310
114:00	344	313	318	323	324	322	296	306	309	311
114:30	345	314	320	324	326	324	298	307	310	313
115:00	347	316	321	326	327	326	300	308	312	315
115:30	349	317	323	327	329	328	302	310	313	316
116:00	351	319	324	328	331	330	304	311	315	318
116:30	353	320	326	330	332	332	306	313	316	320
117:00	355	322	327	331	334	334	308	314	318	322
117:30	357	323	329	333	335	337	310	316	319	323
118:00	358	325	330	334	337	339	312	317	321	325
118:30	360	327	331	336	338	341	314	319	322	327
119:00	362	328	333	337	340	343	316	321	324	329
119:30	364	330	334	339	342	346	318	322	326	331
120:00	365	332	336	340	343	348	321	324	327	332
120:30	365	333	337	342	344	349	323	325	329	334
121:00	366	335	338	343	346	351	325	327	330	336
121:30	367	336	340	345	347	352	326	328	332	337
122:00	369	338	342	346	349	354	328	330	333	339
122:30	371	339	343	347	350	356	330	331	335	340
123:00	373	341	345	349	352	358	331	333	336	342
123:30	374	342	346	350	353	360	333	335	338	344
124:00	375	344	348	352	355	361	335	336	340	345
124:30	377	345	349	353	356	363	337	338	341	347
125:00	379	347	351	355	358	365	339	339	343	349
125:30	381	348	353	356	359	367	340	341	344	350
125:45	382	349	353	357	360	368	341	342	345	351
126:00	383	350	354	358	361	369	342	343	346	352
126:15	384	351	355	358	362	370	343	344	347	353

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
126:30	385	351	356	359	363	371	344	344	347	354
126:45	386	352	357	360	364	372	345	345	348	355
127:00	387	353	357	361	364	373	346	346	349	356
127:15	388	354	358	361	365	374	347	347	350	356
127:30	389	354	359	362	366	375	348	348	351	357
127:45	389	355	360	363	367	376	348	349	351	358
128:00	390	356	361	364	368	377	349	349	352	359
128:15	391	357	361	364	368	378	350	350	353	360
128:30	392	358	362	365	369	379	351	351	354	361
128:45	393	358	363	366	370	380	352	352	355	362
129:00	394	359	364	367	371	381	353	353	355	363
129:15	395	360	364	367	372	382	354	354	356	363
129:30	396	361	365	368	373	383	355	354	357	364
129:45	397	362	366	369	373	384	356	355	358	365
130:00	398	362	367	370	374	385	357	356	359	366
130:15	399	363	368	371	375	386	358	357	360	367
130:30	400	364	368	371	376	387	359	358	360	368
130:45	400	365	369	372	377	388	360	359	361	369
131:00	401	366	370	373	377	389	361	359	362	370
131:15	402	366	371	374	378	390	362	360	363	371
131:30	403	367	371	374	379	391	362	361	364	371
131:45	404	368	372	375	380	392	363	362	365	372
132:00	405	369	373	376	381	393	364	363	365	373
132:15	406	370	374	377	382	394	365	364	366	374
132:30	407	370	375	378	382	394	366	364	367	375
132:45	407	371	375	378	383	395	367	365	368	376
133:00	408	372	376	379	384	396	368	366	369	377
133:15	409	373	377	380	385	397	369	367	370	378
133:30	410	374	378	381	386	398	370	368	371	378
133:45	411	375	378	382	386	399	371	368	371	379
134:00	412	375	379	382	387	400	372	369	372	380
134:15	412	376	380	383	388	401	373	370	373	381
134:30	413	377	381	384	389	402	374	371	374	382
134:45	414	378	382	385	390	403	375	372	375	383
135:00	415	379	382	386	390	404	375	373	376	384
135:15	415	379	383	386	391	405	376	373	376	384
135:30	416	380	384	387	392	406	377	374	377	385
135:45	417	381	385	388	393	407	378	375	378	386
136:00	418	382	386	389	393	407	379	376	379	387
136:15	419	383	386	390	394	408	380	377	380	388
136:30	419	383	387	390	395	409	381	378	381	389
136:45	420	384	388	391	396	410	382	379	382	390
137:00	421	385	389	392	397	411	383	379	382	390
137:15	422	386	390	393	397	412	384	380	383	391
137:30	422	387	390	393	398	413	384	381	384	392
137:45	423	387	391	394	399	414	385	382	385	393
138:00	424	388	392	395	400	414	386	383	386	394
138:15	425	389	393	396	401	415	387	384	387	395
138:30	425	390	393	397	401	416	388	384	387	395
138:45	426	391	394	397	402	417	389	385	388	396
139:00	427	391	395	398	403	418	390	386	389	397

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
139:15	428	392	396	399	404	418	390	387	390	398
139:30	428	393	396	400	404	419	391	388	391	399
139:45	429	394	397	400	405	420	392	388	392	399
140:00	430	395	398	401	406	421	393	389	392	400
140:15	430	395	399	402	407	422	394	390	393	401
140:30	431	396	400	403	407	422	395	391	394	402
140:45	431	397	400	404	408	423	396	392	395	403
141:00	432	398	401	404	409	424	396	393	396	403
141:15	433	399	402	405	410	425	397	393	396	404
141:30	433	399	403	406	410	426	398	394	397	405
141:45	434	400	403	407	411	426	399	395	398	406
142:00	435	401	404	407	412	427	400	396	399	407
142:15	435	402	405	408	413	428	401	397	400	407
142:30	436	402	406	409	413	428	401	397	400	408
142:45	437	403	406	410	414	429	402	398	401	409
143:00	438	404	407	410	415	430	403	399	402	410
143:15	438	405	408	411	416	431	404	400	403	411
143:30	439	405	409	412	416	431	405	401	404	411
143:45	440	406	410	413	417	432	405	402	404	412
144:00	440	407	410	413	418	433	406	402	405	413
144:15	441	408	411	414	419	434	407	403	406	414
144:30	442	409	412	415	419	434	408	404	407	414
144:45	442	409	413	416	420	435	409	405	408	415
145:00	443	410	413	416	421	436	410	406	408	416
145:15	444	411	414	417	421	437	410	406	409	417
145:30	444	412	415	418	422	437	411	407	410	418
145:45	445	412	416	419	423	438	412	408	411	418
146:00	446	413	417	420	424	439	413	409	412	419
146:15	446	414	418	420	424	440	414	410	412	420
146:30	447	415	418	421	425	440	414	411	413	421
146:45	448	415	419	422	426	441	415	411	414	422
147:00	448	416	420	423	427	442	416	412	415	422
147:15	449	417	421	423	427	443	417	413	416	423
147:30	450	418	421	424	428	443	418	414	416	424
147:45	451	418	422	425	429	444	418	415	417	425
148:00	452	419	423	426	430	445	419	415	418	425
148:15	452	420	424	426	431	446	420	416	419	426
148:30	453	420	425	427	431	446	421	417	419	427
148:45	454	421	425	428	432	447	421	418	420	428
149:00	454	422	426	429	433	448	422	419	421	428
149:15	455	423	427	429	433	449	423	419	422	429
149:30	456	423	428	430	434	449	424	420	423	430
149:45	457	424	428	431	435	450	425	421	423	431
150:00	457	425	429	432	436	451	425	422	424	431
150:15	458	426	430	432	436	451	426	422	425	432
150:30	459	426	431	433	437	452	427	423	426	433
150:45	459	427	431	434	438	453	428	424	426	434
151:00	460	428	432	435	439	453	428	425	427	434
151:15	461	428	433	435	439	454	429	426	428	435
151:30	461	429	434	436	440	455	430	426	429	436
151:45	462	430	434	437	441	456	431	427	429	437

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
152:00	463	431	435	438	442	456	431	428	430	437
152:15	463	431	436	438	442	457	432	429	431	438
152:30	464	432	437	439	443	458	433	429	432	439
152:45	465	433	437	440	444	459	434	430	433	440
153:00	466	433	438	441	444	459	434	431	433	440
153:15	466	434	439	441	445	460	435	431	434	441
153:30	467	435	439	442	446	461	436	432	435	442
153:45	468	436	440	443	447	462	437	433	436	443
154:00	469	436	441	444	447	462	437	434	436	443
154:15	470	437	442	444	448	463	438	434	437	444
154:30	470	438	442	445	449	464	439	435	438	445
154:45	471	439	443	446	450	465	440	436	439	446
155:00	472	439	444	446	450	465	440	437	439	446
155:15	472	440	444	447	451	466	441	437	440	447
155:30	473	441	445	448	452	467	442	438	441	448
155:45	474	442	446	449	452	467	443	439	442	449
156:00	474	442	447	449	453	468	444	440	442	449
156:15	475	443	447	450	454	469	444	440	443	450
156:30	476	444	448	451	455	469	445	441	444	451
156:45	476	444	449	452	455	470	446	442	445	452
157:00	477	445	449	452	456	471	446	443	445	452
157:15	477	446	450	453	457	472	447	444	446	453
157:30	478	447	451	454	457	472	448	444	447	454
157:45	479	447	452	454	458	473	449	445	447	454
158:00	479	448	452	455	459	474	449	446	448	455
158:15	480	449	453	456	459	474	450	447	449	456
158:30	481	449	454	457	460	475	451	447	450	457
158:45	481	450	455	457	461	476	452	448	450	457
159:00	482	451	455	458	462	476	452	449	451	458
159:15	483	452	456	459	462	477	453	450	452	459
159:30	483	452	457	459	463	478	454	450	453	459
159:45	484	453	458	460	464	478	454	451	453	460
160:00	484	454	458	461	464	479	455	452	454	461
160:15	485	454	459	461	465	480	456	453	455	461
160:30	486	455	460	462	466	480	456	453	455	462
160:45	486	456	461	463	466	481	457	454	456	463
161:00	487	456	461	464	467	481	458	455	457	464
161:15	487	457	462	464	468	482	458	456	458	464
161:30	488	458	463	465	468	483	459	457	458	465
161:45	489	458	464	466	469	483	460	457	459	466
162:00	489	459	465	466	470	484	461	458	460	466
162:15	490	460	465	467	470	485	461	459	460	467
162:30	490	461	466	468	471	485	462	459	461	468
162:45	491	461	467	468	472	486	463	460	462	468
163:00	491	462	467	469	472	486	463	461	463	469
163:15	492	463	468	470	473	487	464	462	463	470
163:30	493	463	469	471	474	487	465	462	464	470
163:45	493	464	470	471	474	488	465	463	465	471
164:00	494	465	470	472	475	489	466	464	465	472
164:15	495	465	471	473	476	489	466	464	466	472
164:30	495	466	472	473	477	490	467	465	467	473

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
164:45	496	467	472	474	477	490	468	466	467	474
165:00	496	467	473	475	478	491	468	467	468	474
165:15	497	468	474	475	478	492	469	467	469	475
165:30	497	469	474	476	479	492	470	468	470	476
165:45	498	469	475	477	480	493	470	469	470	476
166:00	498	470	476	477	480	493	471	469	471	477
166:15	499	471	476	478	481	494	472	470	472	478
166:30	499	471	477	479	482	494	472	471	472	478
166:45	500	472	478	479	482	495	473	472	473	479
167:00	501	473	478	480	483	496	474	472	474	480
167:15	501	473	479	481	484	496	474	473	474	480
167:30	502	474	480	481	484	497	475	474	475	481
167:45	503	475	480	482	485	497	476	474	476	482
168:00	503	475	481	483	486	498	476	475	476	482
168:15	504	476	482	483	486	498	477	476	477	483
168:30	504	477	482	484	487	499	478	476	478	483
168:45	505	477	483	485	487	500	478	477	478	484
169:00	506	478	484	485	488	500	479	478	479	485
169:15	506	479	484	486	489	501	480	478	480	485
169:30	507	479	485	487	489	501	480	479	480	486
169:45	507	480	486	487	490	502	481	480	481	487
170:00	508	481	486	488	491	503	482	481	482	487
170:15	509	481	487	488	491	503	482	481	482	488
170:30	509	482	488	489	492	504	483	482	483	489
170:45	510	483	489	490	493	504	484	483	484	489
171:00	510	483	489	490	493	505	484	483	484	490
171:15	511	484	490	491	494	506	485	484	485	491
171:30	511	485	491	492	495	506	486	485	485	491
171:45	512	485	491	492	495	507	486	485	486	492
172:00	513	486	492	493	496	507	487	486	487	493
172:15	513	487	493	494	497	508	487	487	487	493
172:30	514	487	493	494	497	509	488	488	488	494
172:45	514	488	494	495	498	509	489	488	489	495
173:00	515	489	495	496	498	510	489	489	489	495
173:15	516	489	495	496	499	510	490	490	490	496
173:30	516	490	496	497	500	511	491	490	491	496
173:45	517	491	497	497	500	512	491	491	491	497
174:00	517	491	497	498	501	512	492	492	492	498
174:15	518	492	498	499	502	513	493	492	493	498
174:30	519	493	499	499	502	513	493	493	493	499
174:45	519	493	499	500	503	514	494	494	494	500
175:00	520	494	500	501	504	515	495	494	495	500
175:15	520	495	501	501	504	515	495	495	495	501
175:30	521	495	502	502	505	516	496	496	496	502
175:45	521	496	502	503	505	516	497	496	496	502
176:00	522	496	503	503	506	517	497	497	497	503
176:15	522	497	504	504	507	518	498	498	498	503
176:30	523	498	504	505	507	518	498	499	498	504
176:45	523	498	505	505	508	519	499	499	499	505
177:00	524	499	506	506	509	519	500	500	500	505
177:15	524	500	506	506	509	520	500	501	500	506

**Protective Concepts, Inc.
Tubular Section Jet-Fire Test**

**Date: October 25, 2002
Test ID: 298pci1**

**SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634**

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
177:30	525	500	507	507	510	520	501	501	501	507
177:45	526	501	508	508	510	521	501	502	502	507
178:00	526	501	509	508	511	521	502	503	502	508
178:15	527	502	509	509	512	522	503	504	503	509
178:30	527	503	510	510	512	522	503	504	503	509
178:45	528	503	511	510	513	523	504	505	504	510
179:00	528	504	511	511	514	524	504	505	505	510
179:15	529	504	512	511	514	524	505	506	505	511
179:30	530	505	513	512	515	525	506	507	506	512
179:45	530	506	513	513	516	525	506	507	507	512
180:00	531	506	514	513	516	526	507	508	507	513
180:15	531	507	515	514	517	526	507	508	508	513
180:30	532	508	515	515	517	527	508	509	508	514
180:45	532	508	516	515	518	527	509	510	509	514
181:00	533	509	516	516	518	528	509	510	510	515
181:15	533	509	517	516	519	528	510	511	510	516
181:30	534	510	517	517	520	529	511	511	511	516
181:45	534	511	518	518	520	530	511	512	512	517
182:00	535	511	518	518	521	530	512	512	512	517
182:15	535	512	519	519	521	530	512	513	513	518
182:30	535	512	520	519	522	531	513	514	513	518
182:45	536	513	520	520	522	531	513	514	514	519
183:00	536	514	521	521	523	532	514	515	515	520
183:15	537	514	521	521	523	532	514	515	515	520
183:30	537	515	522	522	524	533	515	516	516	521
183:45	537	515	522	522	524	533	515	517	516	521
184:00	538	516	523	523	525	533	516	517	517	522
184:15	538	516	524	523	525	534	516	518	517	522
184:30	538	517	524	524	526	534	517	518	518	523
184:45	539	518	525	525	526	534	517	519	519	523
185:00	539	518	525	525	527	535	518	519	519	524
185:15	539	519	526	526	527	535	518	520	520	524
185:30	539	519	526	526	528	536	519	521	520	525
185:45	540	520	527	527	528	536	519	521	521	525
186:00	540	520	527	527	529	536	519	522	521	525
186:15	540	521	528	528	529	536	520	522	522	526
186:30	540	521	528	528	529	537	520	523	522	526
186:45	540	522	529	529	530	537	521	523	523	527
187:00	540	522	529	529	530	537	521	524	523	527
187:15	541	523	530	530	531	537	521	524	524	527
187:30	541	523	530	530	531	537	522	525	524	528
187:45	541	524	531	531	532	538	522	526	525	528
188:00	541	524	532	531	532	538	522	526	525	529
188:15	541	524	532	532	532	538	523	527	526	529
188:30	541	525	533	532	533	538	523	527	526	529
188:45	541	525	533	533	533	538	523	528	527	530
189:00	542	526	534	533	534	539	524	528	527	530
189:15	542	526	534	534	534	539	524	529	527	531
189:30	542	527	535	534	534	539	524	529	528	531
189:45	542	527	535	535	535	539	525	530	528	531
190:00	542	528	536	535	535	539	525	531	529	532

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 1	TC 2	TC 3	TC 4	Avg 1-4	TC 5	TC 6	TC 7	TC 8	Avg 5-8
190:15	543	528	536	536	536	539	525	531	529	532
190:30	543	529	537	536	536	540	526	532	530	532
190:45	543	529	537	537	537	540	526	532	530	533
191:00	543	530	538	537	537	540	526	533	531	533
191:15	544	530	538	538	537	540	527	533	531	534
191:30	544	530	539	538	538	540	527	534	531	534
191:45	544	531	539	539	538	541	527	535	532	535
192:00	544	531	540	539	539	541	528	535	532	535
192:15	544	532	541	539	539	541	528	536	533	535
192:30	545	532	541	540	539	541	528	537	533	536
192:45	545	533	542	540	540	541	528	537	534	536
193:00	545	533	542	541	540	542	529	538	534	537
193:15	545	534	543	541	541	542	529	539	534	537
193:30	546	534	543	542	541	542	529	539	535	537
193:45	546	534	544	542	542	542	530	540	535	538
194:00	546	535	544	543	542	542	530	540	536	538
194:15	546	535	545	543	542	543	530	541	536	538
194:30	547	536	545	543	543	543	531	542	537	539
194:45	547	536	546	544	543	543	531	542	537	539
195:00	547	537	546	544	544	543	531	543	537	540
195:15	547	537	547	545	544	543	532	544	538	540
195:30	548	537	548	545	544	544	532	545	538	541
195:45	548	538	548	546	545	544	532	545	539	541
196:00	548	538	549	546	545	544	533	547	539	541
196:15	548	539	549	546	546	544	533	547	539	542
196:30	549	539	550	547	546	544	533	548	540	542
196:45	549	540	551	547	547	545	534	549	540	543
197:00	549	540	551	548	547	545	534	550	541	543
197:15	549	540	552	548	548	545	534	550	541	544
197:30	550	541	553	549	548	545	535	551	542	544
197:45	550	541	553	549	548	546	535	552	542	545
198:00	550	542	554	549	549	546	535	553	542	545
198:15	551	542	555	550	549	546	536	554	543	546
198:30	551	543	556	550	550	546	536	555	543	546
198:45	551	543	556	551	550	546	536	555	544	546
199:00	552	543	557	551	551	547	537	556	544	547
199:15	552	544	557	551	551	547	537	556	544	547
199:30	552	544	558	552	552	547	537	557	545	548
199:45	552	545	559	552	552	547	538	557	545	548
200:00	553	545	560	553	553	548	538	559	546	549

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
0:00	20	20	20	20	20	20	20	20	20	20
0:30	20	20	20	20	20	20	20	20	20	20
1:00	20	20	20	20	20	20	20	20	20	20
1:30	20	20	20	20	20	20	20	20	20	20
2:00	20	20	21	20	21	20	20	20	20	20
2:30	20	20	24	20	21	20	20	20	20	20
3:00	20	20	23	20	21	21	21	21	21	21
3:30	20	20	23	21	21	23	22	21	21	21
4:00	21	21	24	21	21	24	22	21	21	22
4:30	21	22	24	21	22	24	23	21	21	22
5:00	22	22	24	21	22	25	24	22	21	23
5:30	22	23	24	21	22	26	25	22	21	23
6:00	23	24	24	21	23	27	25	22	21	23
6:30	23	24	24	21	23	27	26	22	21	24
7:00	24	25	24	21	23	28	26	23	21	24
7:30	24	25	24	22	23	29	27	23	22	25
8:00	25	26	24	22	24	30	28	24	22	25
8:30	25	26	24	22	24	31	28	24	22	26
9:00	25	26	24	22	24	33	29	24	22	26
9:30	26	27	25	22	25	34	30	25	23	27
10:00	26	27	25	22	25	36	31	25	23	28
10:30	27	28	25	22	25	37	32	26	24	29
11:00	28	28	25	23	26	39	33	26	24	29
11:30	28	28	26	23	26	42	34	26	24	30
12:00	29	29	26	23	26	44	35	27	25	31
12:30	29	29	26	23	27	46	36	27	25	32
13:00	30	30	27	24	27	49	37	28	26	33
13:30	30	30	27	24	28	51	38	28	27	34
14:00	31	31	27	24	28	53	40	29	27	35
14:30	32	31	28	25	29	54	41	29	28	36
15:00	32	32	28	25	29	56	42	30	29	37
15:30	33	32	28	26	30	57	43	31	29	38
16:00	33	33	28	26	30	59	45	31	30	39
16:30	34	33	29	27	31	60	46	32	31	40
17:00	35	34	29	27	31	62	47	33	32	41
17:30	36	34	29	27	32	63	49	34	32	42
18:00	36	35	30	28	33	65	50	34	33	43
18:30	37	36	30	28	34	67	51	35	34	44
19:00	38	36	30	29	34	68	53	36	35	45
19:30	39	37	31	29	35	70	54	37	36	46
20:00	40	38	32	30	36	71	55	39	37	48
20:30	41	38	33	30	37	73	56	40	38	49
21:00	42	39	34	31	37	74	58	42	39	50
21:30	43	39	35	32	38	75	59	43	40	51
22:00	44	40	35	33	39	77	60	44	41	52
22:30	45	41	36	33	40	78	61	46	42	53
23:00	46	41	37	34	41	79	62	47	43	55
23:30	47	42	38	35	42	81	63	49	44	56
24:00	48	43	39	36	43	82	64	50	45	57
24:30	49	44	40	37	44	84	66	52	46	58
25:00	51	45	41	38	45	85	67	53	47	59

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
25:30	52	45	42	39	46	87	68	55	49	61
26:00	53	46	42	40	47	88	69	56	50	62
26:30	54	47	43	40	48	89	70	57	51	63
27:00	56	48	45	41	49	91	72	59	52	64
27:30	57	49	46	42	50	92	73	60	54	66
28:00	58	50	48	44	51	94	74	62	55	67
28:30	59	51	49	45	52	95	76	63	56	68
29:00	61	53	51	46	54	96	77	65	58	70
29:30	62	54	52	47	55	98	78	66	59	71
30:00	63	55	54	48	56	99	80	68	60	73
30:30	64	56	55	49	57	101	81	69	62	74
31:00	65	57	56	51	58	103	82	70	63	75
31:30	67	58	58	52	60	104	83	71	64	77
32:00	68	59	59	53	61	106	85	72	66	78
32:30	69	60	60	54	62	108	86	74	67	79
33:00	70	61	60	55	63	109	87	74	68	80
33:30	72	62	61	57	64	111	89	75	70	82
34:00	73	63	62	58	65	112	90	76	71	83
34:30	75	65	63	59	67	114	91	77	72	84
35:00	76	66	63	60	68	115	93	78	74	85
35:30	77	67	64	61	69	117	94	79	75	87
36:00	79	68	65	62	70	119	95	79	76	88
36:30	80	69	66	64	71	120	97	80	78	89
37:00	82	70	67	65	72	122	98	81	79	90
37:30	83	72	68	66	74	123	99	82	81	92
38:00	85	73	68	67	75	125	101	83	82	93
38:30	86	74	70	69	76	126	102	83	84	94
39:00	88	75	71	70	78	128	103	84	85	96
39:30	89	76	72	71	79	129	105	86	87	97
40:00	91	77	72	73	80	131	106	87	88	98
40:30	93	79	73	74	81	132	107	88	90	100
41:00	94	80	74	76	82	134	108	89	92	101
41:30	96	81	74	77	84	135	110	90	93	102
42:00	97	82	75	78	85	136	111	91	95	104
42:30	99	83	75	80	86	138	112	92	97	105
43:00	100	84	76	81	87	139	113	93	98	106
43:30	102	85	77	83	88	141	115	94	100	108
44:00	103	86	77	84	89	142	116	96	101	109
44:30	105	87	78	86	91	144	117	97	103	110
45:00	106	88	79	87	92	145	119	98	105	112
45:30	108	89	79	89	93	147	120	99	106	113
46:00	110	90	80	90	94	148	121	101	108	115
46:30	111	91	81	91	96	150	123	102	110	116
47:00	113	93	82	93	97	151	124	104	111	117
47:30	115	94	82	95	98	153	125	105	113	119
48:00	116	95	83	96	100	154	127	106	115	120
48:30	118	96	84	98	101	156	128	107	116	122
49:00	120	97	85	99	102	157	129	109	118	123
49:30	121	99	86	101	104	158	131	111	120	125
50:00	123	100	87	102	105	160	132	113	122	126
50:30	125	101	88	104	107	161	133	115	124	128

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
51:00	126	102	89	105	108	163	135	117	125	129
51:30	127	103	90	107	109	164	136	119	127	131
52:00	129	104	92	108	110	165	137	121	129	132
52:30	130	105	93	110	112	167	138	122	131	134
53:00	132	106	94	112	113	168	140	125	133	136
53:30	133	107	95	113	114	169	141	126	134	137
54:00	134	109	96	115	116	171	142	128	136	139
54:30	136	110	98	116	117	172	144	130	138	140
55:00	137	111	99	118	119	173	145	131	140	142
55:30	139	112	100	119	120	175	146	133	142	143
56:00	140	113	102	121	122	176	148	135	143	145
56:30	142	115	103	123	123	178	149	138	145	146
57:00	143	116	105	124	124	179	150	140	147	148
57:30	145	117	106	126	126	181	152	141	149	150
58:00	146	118	108	127	127	182	153	143	151	151
58:30	148	120	109	129	129	183	155	145	152	153
59:00	149	121	111	131	130	185	156	147	154	154
59:30	150	122	112	132	132	186	157	149	156	156
60:00	152	124	114	134	133	188	159	150	158	158
60:30	154	125	115	135	135	190	160	152	159	159
61:00	155	126	117	137	137	191	162	154	161	161
61:30	157	128	118	138	138	193	163	156	163	162
62:00	158	129	120	140	140	194	165	158	165	164
62:30	160	131	121	142	141	195	166	159	166	166
63:00	161	132	123	143	143	197	168	161	168	167
63:30	163	134	125	145	144	198	169	163	170	169
64:00	165	135	126	146	146	200	171	165	172	171
64:30	166	137	128	148	148	201	172	167	173	172
65:00	168	138	130	149	149	203	174	169	175	174
65:30	169	140	132	151	151	204	175	171	177	176
66:00	171	141	133	153	152	206	177	173	179	177
66:30	173	143	135	154	154	207	178	175	180	179
67:00	174	144	137	156	156	209	180	177	182	181
67:30	176	146	139	157	157	210	181	179	184	182
68:00	177	147	140	159	159	212	183	181	186	184
68:30	179	149	142	161	161	213	185	183	187	186
69:00	180	150	144	162	162	215	186	185	189	187
69:30	182	152	146	164	164	216	188	187	191	189
70:00	183	153	148	166	166	218	189	189	193	191
70:30	185	155	150	167	167	219	191	191	195	193
71:00	186	156	152	169	169	221	193	194	196	194
71:30	187	157	155	171	170	222	194	196	198	196
72:00	189	159	157	172	172	223	196	198	200	198
72:30	190	160	158	174	174	225	197	200	202	200
73:00	191	162	160	176	175	226	199	202	204	201
73:30	193	163	162	178	177	228	200	204	206	203
74:00	194	164	164	179	178	229	202	206	207	205
74:30	195	166	166	181	180	231	204	208	209	206
75:00	197	167	168	183	182	232	205	210	211	208
75:30	198	169	170	184	183	234	207	212	213	210
76:00	199	170	171	186	185	235	208	214	215	211

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
76:30	201	172	173	188	187	237	210	216	216	213
77:00	202	173	175	190	188	238	212	218	218	215
77:30	204	175	177	191	190	240	213	220	220	217
78:00	205	176	180	193	192	241	215	222	222	218
78:30	207	178	181	195	193	242	216	224	224	220
79:00	208	179	183	196	195	244	218	226	225	222
79:30	210	181	185	198	196	246	220	228	227	223
80:00	211	183	187	200	198	247	221	230	229	225
80:30	212	184	189	201	200	249	223	232	231	227
81:00	214	186	191	203	201	250	225	234	232	228
81:30	215	187	193	205	203	252	226	236	234	230
82:00	217	189	195	206	205	253	228	237	236	232
82:30	218	190	197	208	206	255	230	239	237	234
83:00	220	192	198	209	208	257	231	241	239	235
83:30	221	194	200	211	209	259	233	242	241	237
84:00	223	195	202	213	211	260	235	244	242	238
84:30	224	197	204	214	213	262	237	246	244	240
85:00	226	199	205	216	214	264	238	247	245	242
85:30	228	200	207	218	216	265	240	249	247	243
86:00	229	202	209	219	217	267	242	250	249	245
86:30	231	204	210	221	219	269	244	252	250	247
87:00	232	205	212	223	221	270	245	253	252	248
87:30	234	207	214	224	222	272	247	255	253	250
88:00	236	209	216	226	224	274	249	256	255	251
88:30	237	210	218	227	226	275	250	258	256	253
89:00	239	212	220	229	227	277	252	260	258	255
89:30	240	214	222	231	229	278	253	261	260	256
90:00	242	215	223	232	231	280	255	263	261	258
90:30	243	217	225	234	232	281	257	265	263	260
91:00	245	219	227	235	234	283	258	267	264	261
91:30	247	220	230	237	236	284	260	269	266	263
92:00	248	222	232	239	237	286	261	271	268	264
92:30	250	223	234	240	239	287	263	272	269	266
93:00	251	225	236	242	241	289	265	274	271	268
93:30	253	227	238	243	242	290	266	276	273	269
94:00	254	228	240	245	244	292	268	278	274	271
94:30	256	230	242	247	245	293	269	280	276	273
95:00	257	232	244	248	247	295	271	281	277	274
95:30	259	233	246	250	249	296	272	283	279	276
96:00	260	235	248	252	250	298	274	285	281	277
96:30	262	236	250	253	252	299	275	287	283	279
97:00	263	238	252	255	254	300	277	289	284	281
97:30	264	240	254	256	255	302	278	290	286	282
98:00	266	241	256	258	257	303	280	292	288	284
98:30	267	243	257	260	258	305	281	294	289	285
99:00	269	244	259	261	260	306	283	295	291	287
99:30	270	246	261	263	262	308	284	297	292	289
100:00	272	248	263	265	263	309	286	299	294	290
100:30	273	249	265	266	265	310	288	301	296	292
101:00	275	251	267	268	266	312	289	302	297	293
101:30	276	252	268	270	268	313	291	304	299	295

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
102:00	278	254	270	271	270	315	292	305	300	296
102:30	279	256	272	273	271	316	294	307	302	298
103:00	281	257	273	274	273	318	295	308	303	299
103:30	283	259	275	276	274	319	297	310	305	301
104:00	284	260	277	278	276	321	298	311	306	302
104:30	286	262	279	279	278	322	300	313	308	304
105:00	287	264	280	281	279	324	301	315	310	306
105:30	289	265	282	282	281	325	303	316	311	307
106:00	290	267	284	284	282	326	304	318	313	309
106:30	292	269	285	286	284	328	306	319	314	310
107:00	293	270	287	287	285	329	307	320	316	312
107:30	295	272	288	289	287	331	309	322	317	313
108:00	296	273	290	290	289	332	310	323	319	315
108:30	298	275	291	292	290	334	312	324	320	316
109:00	300	277	293	293	292	335	313	326	322	318
109:30	301	278	294	295	293	337	315	327	323	319
110:00	303	280	296	296	295	338	316	329	324	320
110:30	304	282	297	298	296	340	318	330	326	322
111:00	306	283	299	300	298	341	319	331	327	323
111:30	308	285	300	301	300	342	321	333	329	325
112:00	309	287	302	302	301	343	322	334	330	326
112:30	311	288	303	304	302	344	324	335	331	327
113:00	312	290	304	305	304	346	325	336	333	329
113:30	313	291	305	307	305	347	326	337	334	330
114:00	315	293	307	308	307	348	328	338	336	331
114:30	317	295	308	310	308	349	329	339	337	333
115:00	319	297	309	311	310	350	330	340	338	334
115:30	321	299	311	313	312	351	332	341	339	335
116:00	323	301	312	314	313	353	333	342	341	336
116:30	325	303	313	316	315	354	334	343	342	338
117:00	327	305	315	317	317	355	336	344	343	339
117:30	329	307	316	319	319	356	337	345	345	340
118:00	331	309	317	320	321	358	338	346	346	342
118:30	333	311	319	322	322	359	340	347	347	343
119:00	336	313	320	323	324	360	341	348	348	344
119:30	338	315	322	325	326	362	342	350	350	346
120:00	340	317	323	326	328	363	344	351	351	347
120:30	342	319	325	327	330	364	345	352	352	349
121:00	344	321	327	329	331	365	346	353	353	350
121:30	346	323	328	330	333	366	348	355	354	351
122:00	347	325	329	332	334	367	349	356	356	352
122:30	349	327	331	333	336	368	350	357	357	354
123:00	350	329	332	335	338	370	351	358	358	355
123:30	352	330	334	336	339	371	352	359	359	356
124:00	354	332	335	338	341	372	354	360	361	357
124:30	356	334	337	339	343	373	355	361	362	359
125:00	357	336	338	341	344	374	356	362	363	360
125:30	359	337	340	342	346	376	357	363	364	361
125:45	360	338	341	343	347	376	358	364	365	362
126:00	361	339	341	344	347	377	359	365	366	363
126:15	362	340	342	345	348	377	359	365	366	363

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
126:30	363	341	343	345	349	378	360	366	367	364
126:45	363	342	344	346	350	379	360	366	367	365
127:00	364	343	345	347	351	379	361	367	368	365
127:15	365	344	345	348	352	380	362	367	369	366
127:30	366	345	346	348	353	381	362	368	369	366
127:45	367	346	347	349	353	381	363	368	370	367
128:00	368	346	348	350	354	382	364	369	371	368
128:15	369	347	349	351	355	382	364	369	371	368
128:30	370	348	350	351	356	383	365	370	372	369
128:45	371	349	350	352	357	384	366	371	372	370
129:00	372	350	351	353	358	384	366	371	373	370
129:15	373	351	352	354	359	385	367	372	374	371
129:30	374	352	353	355	359	386	368	372	374	372
129:45	375	353	354	355	360	386	368	373	375	372
130:00	376	354	354	356	361	387	369	373	375	373
130:15	376	355	355	357	362	388	370	374	376	374
130:30	377	356	356	358	363	388	370	375	377	375
130:45	378	357	357	358	364	389	371	375	377	375
131:00	379	357	358	359	365	390	371	376	378	376
131:15	380	358	359	360	365	390	372	376	379	377
131:30	381	359	359	361	366	391	373	377	379	377
131:45	382	360	360	361	367	392	373	377	380	378
132:00	383	361	361	362	368	392	374	378	380	379
132:15	384	362	362	363	369	393	375	379	381	379
132:30	385	363	363	364	370	394	375	379	382	380
132:45	386	364	364	365	371	394	376	380	382	381
133:00	386	365	364	365	371	395	377	380	383	381
133:15	387	366	365	366	372	396	377	381	384	382
133:30	388	366	366	367	373	396	378	382	384	383
133:45	389	367	367	368	374	397	379	382	385	383
134:00	390	368	368	369	375	398	379	383	385	384
134:15	391	369	369	369	376	398	380	383	386	385
134:30	392	370	369	370	377	399	381	384	387	385
134:45	393	371	370	371	377	399	381	385	387	386
135:00	393	372	371	372	378	400	382	385	388	387
135:15	394	373	372	372	379	401	383	386	389	387
135:30	395	374	373	373	380	401	383	386	389	388
135:45	396	374	373	374	381	402	384	387	390	389
136:00	397	375	374	375	382	403	385	388	390	389
136:15	398	376	375	376	382	403	385	388	391	390
136:30	398	377	376	376	383	404	386	389	392	391
136:45	399	378	377	377	384	405	387	390	392	391
137:00	400	379	377	378	385	405	387	390	393	392
137:15	401	379	378	379	386	406	388	391	394	393
137:30	402	380	379	380	387	407	389	391	394	393
137:45	403	381	380	380	387	407	389	392	395	394
138:00	403	382	381	381	388	408	390	393	395	395
138:15	404	383	382	382	389	408	390	393	396	395
138:30	405	384	382	383	390	409	391	394	397	396
138:45	406	384	383	384	391	410	392	394	397	397
139:00	407	385	384	384	391	410	392	395	398	397

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
139:15	407	386	385	385	392	411	393	396	399	398
139:30	408	387	386	386	393	412	394	396	399	399
139:45	409	388	386	387	394	412	394	397	400	399
140:00	410	389	387	388	395	413	395	397	401	400
140:15	410	389	388	388	395	413	395	398	401	401
140:30	411	390	389	389	396	414	396	399	402	401
140:45	412	391	390	390	397	415	397	399	402	402
141:00	413	392	390	391	398	415	397	400	403	403
141:15	414	393	391	391	399	416	398	401	404	403
141:30	414	393	392	392	399	416	399	401	404	404
141:45	415	394	393	393	400	417	399	402	405	405
142:00	416	395	393	394	401	418	400	402	406	405
142:15	417	396	394	395	402	418	401	403	406	406
142:30	417	396	395	395	402	419	401	404	407	407
142:45	418	397	396	396	403	420	402	404	408	407
143:00	419	398	397	397	404	420	402	405	408	408
143:15	419	399	397	398	405	421	403	405	409	409
143:30	420	399	398	398	405	421	404	406	409	409
143:45	421	400	399	399	406	422	404	407	410	410
144:00	422	401	400	400	407	423	405	407	411	410
144:15	422	402	400	401	408	423	406	408	411	411
144:30	423	403	401	401	409	424	406	409	412	412
144:45	424	403	402	402	409	425	407	409	413	412
145:00	425	404	403	403	410	425	407	410	413	413
145:15	425	405	403	404	411	426	408	410	414	414
145:30	426	406	404	405	412	426	409	411	414	414
145:45	427	406	405	405	412	427	409	412	415	415
146:00	428	407	406	406	413	428	410	412	416	416
146:15	428	408	406	407	414	428	411	413	416	416
146:30	429	409	407	408	415	429	411	413	417	417
146:45	430	410	408	408	415	430	412	414	418	418
147:00	431	410	409	409	416	430	413	415	418	418
147:15	431	411	409	410	417	431	413	415	419	419
147:30	432	412	410	411	418	431	414	416	419	420
147:45	433	413	411	411	418	432	414	417	420	420
148:00	433	413	412	412	419	433	415	417	421	421
148:15	434	414	412	413	420	433	416	418	421	422
148:30	435	415	413	414	421	434	416	418	422	422
148:45	436	416	414	414	421	435	417	419	423	423
149:00	436	416	415	415	422	435	418	420	423	424
149:15	437	417	415	416	423	436	418	420	424	424
149:30	438	418	416	417	424	436	419	421	424	425
149:45	438	419	417	417	424	437	419	421	425	425
150:00	439	419	418	418	425	438	420	422	426	426
150:15	440	420	418	419	426	438	421	423	426	427
150:30	440	421	419	420	426	439	421	423	427	427
150:45	441	421	420	420	427	439	422	424	428	428
151:00	442	422	420	421	428	440	422	424	428	429
151:15	442	423	421	422	429	441	423	425	429	429
151:30	443	424	422	423	429	441	424	426	429	430
151:45	444	424	422	423	430	442	424	426	430	431

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
152:00	444	425	423	424	431	443	425	427	431	431
152:15	445	426	424	425	431	443	426	428	431	432
152:30	446	426	425	425	432	444	426	428	432	432
152:45	446	427	425	426	433	444	427	429	433	433
153:00	447	428	426	427	434	445	427	429	433	434
153:15	448	429	427	428	434	446	428	430	434	434
153:30	448	429	427	428	435	446	429	431	434	435
153:45	449	430	428	429	436	447	429	431	435	436
154:00	450	431	429	430	436	447	430	432	436	436
154:15	451	432	429	430	437	448	431	432	436	437
154:30	451	432	430	431	438	449	431	433	437	438
154:45	452	433	431	432	439	449	432	434	438	438
155:00	453	434	432	433	439	450	432	434	438	439
155:15	453	435	432	433	440	451	433	435	439	439
155:30	454	435	433	434	441	451	434	436	439	440
155:45	455	436	434	435	442	452	434	436	440	441
156:00	456	437	434	435	442	452	435	437	441	441
156:15	456	438	435	436	443	453	435	437	441	442
156:30	457	438	436	437	444	454	436	438	442	443
156:45	458	439	436	438	444	454	437	439	442	443
157:00	458	440	437	438	445	455	437	439	443	444
157:15	459	441	438	439	446	456	438	440	444	445
157:30	460	441	438	440	447	456	439	441	444	445
157:45	460	442	439	440	447	457	439	441	445	446
158:00	461	443	440	441	448	457	440	442	446	446
158:15	462	443	441	442	449	458	440	442	446	447
158:30	462	444	441	442	449	458	441	443	447	448
158:45	463	445	442	443	450	459	442	444	447	448
159:00	464	446	443	444	451	460	442	444	448	449
159:15	464	446	443	445	451	460	443	445	449	450
159:30	465	447	444	445	452	461	443	446	449	450
159:45	466	448	445	446	453	461	444	446	450	451
160:00	466	448	445	447	453	462	445	447	451	451
160:15	467	449	446	447	454	463	445	447	451	452
160:30	467	450	447	448	455	463	446	448	452	453
160:45	468	451	447	449	456	464	446	449	452	453
161:00	469	451	448	449	456	464	447	449	453	454
161:15	469	452	449	450	457	465	448	450	454	455
161:30	470	453	450	451	458	466	448	451	454	455
161:45	471	453	450	451	458	466	449	451	455	456
162:00	471	454	451	452	459	467	449	452	455	456
162:15	472	455	452	453	460	467	450	452	456	457
162:30	472	455	452	453	460	468	451	453	457	458
162:45	473	456	453	454	461	468	451	454	457	458
163:00	474	457	454	455	462	469	452	454	458	459
163:15	474	458	454	456	462	470	452	455	458	459
163:30	475	458	455	456	463	470	453	456	459	460
163:45	475	459	456	457	464	471	453	456	460	461
164:00	476	460	456	458	464	471	454	457	460	461
164:15	476	460	457	458	465	472	455	457	461	462
164:30	477	461	458	459	466	472	455	458	462	463

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
164:45	478	462	458	460	466	473	456	459	462	463
165:00	478	462	459	460	467	474	456	459	463	464
165:15	479	463	460	461	467	474	457	460	463	464
165:30	479	464	460	462	468	475	458	461	464	465
165:45	480	465	461	462	469	475	458	461	465	466
166:00	480	465	462	463	469	476	459	462	465	466
166:15	481	466	462	464	470	476	459	463	466	467
166:30	482	467	463	464	471	477	460	463	466	467
166:45	482	467	464	465	471	478	461	464	467	468
167:00	483	468	464	466	472	478	461	464	468	469
167:15	483	469	465	466	473	479	462	465	468	469
167:30	484	469	466	467	473	479	462	466	469	470
167:45	484	470	466	467	474	480	463	466	469	470
168:00	485	471	467	468	475	480	464	467	470	471
168:15	486	471	468	469	475	481	464	468	471	472
168:30	486	472	468	469	476	481	465	468	471	472
168:45	487	473	469	470	477	482	465	469	472	473
169:00	487	474	470	471	477	483	466	470	472	474
169:15	488	474	470	471	478	483	467	470	473	474
169:30	489	475	471	472	478	484	467	471	474	475
169:45	489	476	472	473	479	484	468	471	474	475
170:00	490	476	472	473	480	485	468	472	475	476
170:15	490	477	473	474	480	485	469	473	475	477
170:30	491	478	474	475	481	486	469	473	476	477
170:45	492	479	474	475	482	487	470	474	477	478
171:00	492	479	475	476	482	487	471	475	477	478
171:15	493	480	476	477	483	488	471	475	478	479
171:30	493	481	476	477	484	488	472	476	478	480
171:45	494	481	477	478	484	489	472	476	479	480
172:00	495	482	477	478	485	489	473	477	480	481
172:15	495	483	478	479	486	490	474	478	480	481
172:30	496	484	479	480	486	491	474	478	481	482
172:45	496	484	479	480	487	491	475	479	481	483
173:00	497	485	480	481	488	492	475	480	482	483
173:15	497	486	481	482	488	492	476	480	483	484
173:30	498	487	481	482	489	493	477	481	483	484
173:45	499	487	482	483	490	493	477	481	484	485
174:00	499	488	483	484	490	494	478	482	484	486
174:15	500	489	483	484	491	495	478	483	485	486
174:30	500	489	484	485	492	495	479	483	486	487
174:45	501	490	485	485	492	496	480	484	486	488
175:00	502	491	485	486	493	496	480	485	487	488
175:15	502	491	486	487	493	497	481	485	487	489
175:30	503	492	487	487	494	497	481	486	488	489
175:45	503	493	487	488	495	498	482	486	489	490
176:00	504	494	488	489	495	498	483	487	489	491
176:15	505	494	489	489	496	499	483	488	490	491
176:30	505	495	489	490	497	500	484	488	490	492
176:45	506	495	490	491	497	500	484	489	491	492
177:00	506	496	490	491	498	501	485	490	492	493
177:15	507	497	491	492	498	501	486	490	492	494

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Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
177:30	507	497	492	492	499	502	486	491	493	494
177:45	508	498	492	493	500	502	487	491	493	495
178:00	508	499	493	494	500	503	487	492	494	495
178:15	509	499	494	494	501	503	488	493	495	496
178:30	510	500	494	495	502	504	488	493	495	496
178:45	510	501	495	495	502	505	489	494	496	497
179:00	511	501	496	496	503	505	490	494	496	498
179:15	511	502	496	497	503	506	490	495	497	498
179:30	512	503	497	497	504	506	491	496	498	499
179:45	512	503	497	498	505	507	491	496	498	499
180:00	513	504	498	499	505	507	492	497	499	500
180:15	513	505	499	499	506	508	493	497	499	501
180:30	514	505	499	500	506	508	493	498	500	501
180:45	515	506	500	500	507	509	494	499	500	502
181:00	515	506	501	501	508	510	494	500	501	502
181:15	516	507	501	502	508	510	495	500	502	503
181:30	516	507	502	502	509	511	495	501	502	504
181:45	517	508	502	503	509	511	496	502	503	504
182:00	517	508	503	503	510	512	497	503	503	505
182:15	518	509	504	504	510	512	497	504	504	506
182:30	518	509	504	505	511	513	498	505	505	506
182:45	519	510	505	505	512	513	498	505	505	507
183:00	519	510	505	506	512	514	499	506	506	507
183:15	520	511	506	506	513	514	500	507	506	508
183:30	520	511	507	507	513	515	500	508	507	509
183:45	521	512	507	508	514	516	501	509	508	509
184:00	521	512	508	508	514	516	501	510	508	510
184:15	522	512	508	509	515	517	502	511	509	511
184:30	522	513	509	509	515	517	502	513	509	511
184:45	523	513	510	510	516	518	503	514	510	512
185:00	523	513	510	510	516	518	503	515	511	513
185:15	524	514	511	511	517	519	504	517	511	513
185:30	524	514	512	511	517	519	505	518	512	514
185:45	524	514	513	512	518	520	505	520	513	515
186:00	525	514	513	513	518	520	506	520	513	515
186:15	525	515	514	513	518	521	506	521	514	516
186:30	526	515	515	514	519	521	507	522	515	517
186:45	526	515	515	514	519	522	507	523	515	517
187:00	526	515	516	515	520	522	508	524	516	518
187:15	527	515	517	515	520	523	508	525	517	519
187:30	527	515	518	516	521	523	509	526	517	519
187:45	527	516	519	516	521	523	509	527	518	520
188:00	528	516	519	517	522	524	510	528	518	520
188:15	528	516	520	517	522	524	511	528	519	521
188:30	528	516	521	518	523	525	511	530	520	522
188:45	529	516	522	518	523	525	512	530	520	522
189:00	529	516	523	519	523	526	512	531	521	523
189:15	529	517	524	519	524	526	513	532	522	523
189:30	530	517	525	520	524	527	513	533	522	524
189:45	530	517	526	520	525	527	514	534	523	525
190:00	530	517	527	521	525	528	514	535	524	525

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>									
	TC 9	TC 10	TC 11	TC 12	Avg 9-12	TC 13	TC 14	TC 15	TC 16	Avg 13-16
190:15	531	517	528	522	526	528	515	536	524	526
190:30	531	518	529	522	526	529	515	537	525	526
190:45	531	518	530	523	527	529	516	537	526	527
191:00	532	518	531	523	527	530	516	538	527	528
191:15	532	518	532	524	528	531	517	539	527	528
191:30	532	519	533	524	528	531	517	540	528	529
191:45	533	519	534	525	529	532	518	541	528	530
192:00	533	519	535	525	530	532	518	542	529	530
192:15	533	519	536	526	530	533	519	543	530	531
192:30	534	520	537	527	531	534	520	544	531	532
192:45	534	520	538	527	531	534	520	545	531	532
193:00	535	520	540	528	532	535	521	546	532	533
193:15	535	520	540	528	532	535	521	547	533	534
193:30	535	521	541	529	533	536	522	548	533	534
193:45	536	521	541	530	533	536	522	548	534	535
194:00	536	521	542	530	533	537	523	549	535	535
194:15	536	522	543	531	534	538	523	549	535	536
194:30	537	522	544	531	535	538	524	550	536	536
194:45	537	522	544	532	535	539	524	550	537	537
195:00	537	523	545	532	535	539	525	551	537	538
195:15	537	523	546	533	536	540	526	552	538	538
195:30	538	523	546	534	536	540	526	553	539	539
195:45	538	524	547	534	537	540	527	553	539	539
196:00	538	524	547	535	537	541	527	554	540	540
196:15	539	524	548	535	538	541	528	555	540	540
196:30	539	525	548	536	538	542	528	555	541	541
196:45	539	525	549	536	539	542	529	556	542	541
197:00	539	525	550	537	539	543	529	556	542	542
197:15	540	526	550	537	539	543	530	557	543	542
197:30	540	526	550	538	540	544	530	557	544	543
197:45	540	527	551	538	540	544	531	557	544	543
198:00	541	527	552	539	541	544	531	558	545	544
198:15	541	527	552	539	541	545	532	558	545	544
198:30	541	528	553	540	542	545	533	559	546	545
198:45	541	528	553	540	542	546	533	559	547	545
199:00	542	528	554	541	542	546	534	560	547	546
199:15	542	529	554	541	543	546	534	560	548	546
199:30	542	529	555	542	543	547	535	560	548	547
199:45	542	530	555	542	543	547	535	561	549	547
200:00	543	530	556	543	544	548	536	561	549	548

Protective Concepts, Inc.
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Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
0:00	20	20	20	20	20	20
0:30	20	20	20	20	20	20
1:00	20	20	20	20	20	20
1:30	20	20	20	20	20	20
2:00	20	20	20	20	20	20
2:30	20	20	20	20	20	21
3:00	20	21	21	20	20	21
3:30	21	21	21	20	21	21
4:00	22	22	21	20	21	21
4:30	23	23	21	20	22	21
5:00	24	24	22	20	23	22
5:30	26	26	22	21	23	22
6:00	27	27	22	21	24	23
6:30	29	29	22	21	25	23
7:00	30	30	23	21	26	23
7:30	32	31	23	21	26	24
8:00	34	32	24	21	27	24
8:30	36	33	24	22	28	25
9:00	38	34	25	22	29	25
9:30	40	36	25	23	30	26
10:00	42	37	26	23	31	27
10:30	44	38	27	23	32	27
11:00	46	39	28	24	33	28
11:30	48	41	28	25	35	29
12:00	51	42	29	25	36	29
12:30	53	44	30	26	37	30
13:00	55	45	31	27	38	31
13:30	57	46	32	28	40	32
14:00	59	48	32	29	41	32
14:30	62	49	33	30	42	33
15:00	64	50	34	30	43	34
15:30	66	52	35	31	44	35
16:00	68	53	36	32	46	36
16:30	71	55	36	33	47	37
17:00	73	56	37	34	48	38
17:30	75	57	38	35	50	40
18:00	77	59	39	36	51	41
18:30	80	60	40	37	52	42
19:00	82	62	41	38	54	43
19:30	84	63	43	39	55	44
20:00	86	65	44	40	57	45
20:30	88	66	46	41	58	46
21:00	90	68	48	42	60	47
21:30	92	69	50	43	61	49
22:00	94	71	52	44	62	50
22:30	96	72	53	45	64	51
23:00	98	74	55	46	65	52
23:30	99	75	57	47	67	53
24:00	101	77	58	48	68	54
24:30	103	78	59	49	70	55
25:00	104	80	61	51	71	57

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Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
25:30	106	81	62	52	72	58
26:00	108	83	64	53	74	59
26:30	110	85	65	54	75	60
27:00	111	86	66	56	77	61
27:30	113	88	67	57	78	63
28:00	115	90	69	58	80	64
28:30	116	91	71	60	81	65
29:00	118	93	73	61	83	66
29:30	120	94	74	63	84	68
30:00	121	96	75	64	86	69
30:30	123	98	76	66	87	70
31:00	124	99	77	67	89	72
31:30	126	101	78	69	90	73
32:00	128	103	79	70	92	74
32:30	130	105	80	72	93	75
33:00	131	106	81	73	94	77
33:30	133	108	81	74	96	78
34:00	135	110	82	76	97	79
34:30	136	111	83	77	98	81
35:00	138	113	84	79	100	82
35:30	140	114	85	80	101	83
36:00	141	116	86	82	103	85
36:30	143	118	87	84	104	86
37:00	145	119	88	85	106	87
37:30	146	121	90	87	107	89
38:00	148	122	91	88	108	90
38:30	150	123	93	90	110	91
39:00	151	125	94	92	112	93
39:30	152	126	96	94	113	94
40:00	154	128	98	95	115	95
40:30	155	129	100	97	116	97
41:00	157	130	102	99	118	98
41:30	158	132	104	101	120	99
42:00	159	134	105	103	121	101
42:30	161	135	106	105	122	102
43:00	162	136	108	107	124	103
43:30	164	138	109	109	126	105
44:00	165	139	111	111	127	106
44:30	167	141	113	113	129	107
45:00	168	142	115	115	130	109
45:30	170	144	116	117	132	110
46:00	171	145	118	118	133	112
46:30	172	146	121	120	135	113
47:00	174	148	122	122	137	114
47:30	175	149	124	124	138	116
48:00	176	150	126	126	140	117
48:30	178	152	127	128	141	119
49:00	179	153	130	130	143	120
49:30	181	154	133	132	145	122
50:00	182	155	135	134	146	123
50:30	183	157	138	135	148	125

Protective Concepts, Inc.
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SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
51:00	184	158	141	137	150	126
51:30	186	159	143	139	152	128
52:00	187	160	146	141	153	129
52:30	188	162	148	143	155	131
53:00	189	163	151	145	157	132
53:30	191	164	153	147	158	134
54:00	192	166	155	149	160	135
54:30	193	167	157	151	162	137
55:00	195	169	158	153	163	138
55:30	196	170	160	155	165	140
56:00	198	172	163	157	167	142
56:30	199	173	165	159	169	143
57:00	200	175	168	161	170	145
57:30	202	176	170	163	172	146
58:00	203	178	171	165	174	148
58:30	205	179	173	167	175	149
59:00	206	181	175	169	177	151
59:30	207	182	177	171	179	153
60:00	209	184	178	173	180	154
60:30	211	186	180	175	182	156
61:00	212	188	182	177	184	158
61:30	214	190	184	178	186	159
62:00	215	191	185	180	187	161
62:30	217	193	187	182	189	163
63:00	218	195	189	184	191	164
63:30	220	197	191	186	193	166
64:00	222	199	193	188	194	168
64:30	223	201	195	189	196	169
65:00	225	202	197	191	198	171
65:30	227	204	199	193	200	173
66:00	228	206	201	195	201	174
66:30	230	207	203	197	203	176
67:00	231	209	205	199	205	178
67:30	233	211	207	200	207	180
68:00	234	212	209	202	208	181
68:30	236	214	211	204	210	183
69:00	237	216	213	206	212	185
69:30	239	217	215	208	214	186
70:00	240	219	218	209	215	188
70:30	242	220	220	211	217	190
71:00	243	222	223	213	219	191
71:30	245	223	225	215	221	193
72:00	246	225	228	217	223	195
72:30	247	226	230	219	224	196
73:00	249	228	232	221	226	198
73:30	250	229	233	223	228	200
74:00	251	231	235	225	229	202
74:30	253	232	237	227	231	203
75:00	254	234	239	228	233	205
75:30	256	235	241	230	234	206
76:00	257	237	242	232	236	208

**Protective Concepts, Inc.
Tubular Section Jet-Fire Test**

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Test ID: 298pci1**

**SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634**

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
76:30	259	239	244	234	238	210
77:00	260	240	246	235	239	212
77:30	262	242	248	237	241	213
78:00	263	243	250	239	243	215
78:30	264	245	252	241	244	216
79:00	266	246	254	242	246	218
79:30	267	248	255	244	248	220
80:00	269	250	257	246	249	221
80:30	270	251	259	248	251	223
81:00	272	253	260	249	253	225
81:30	273	254	262	251	254	226
82:00	275	256	263	253	256	228
82:30	276	257	265	254	257	229
83:00	278	259	266	256	259	231
83:30	280	261	267	257	260	233
84:00	281	262	269	259	262	234
84:30	283	264	270	261	264	236
85:00	284	266	271	262	265	237
85:30	286	267	273	264	267	239
86:00	288	269	274	265	268	240
86:30	289	271	275	267	270	242
87:00	291	272	277	269	271	244
87:30	292	274	278	270	273	245
88:00	294	275	280	272	274	247
88:30	296	277	281	273	276	248
89:00	297	279	283	275	278	250
89:30	299	280	285	276	279	251
90:00	300	282	286	278	281	253
90:30	302	283	288	279	282	254
91:00	303	285	290	281	284	256
91:30	305	286	292	283	286	257
92:00	306	288	294	284	287	259
92:30	308	289	296	286	289	261
93:00	309	291	298	288	291	262
93:30	311	292	299	289	292	264
94:00	312	294	301	291	294	265
94:30	314	295	303	293	295	267
95:00	315	296	305	294	297	268
95:30	316	298	307	296	299	270
96:00	318	299	309	297	300	271
96:30	319	301	311	299	302	273
97:00	320	302	313	301	303	275
97:30	322	304	314	302	305	276
98:00	323	305	316	304	306	278
98:30	325	307	317	306	308	279
99:00	326	308	319	308	310	281
99:30	328	310	321	309	311	282
100:00	329	311	322	311	313	284
100:30	330	313	324	312	314	285
101:00	332	314	325	314	316	287
101:30	333	316	327	315	317	288

**Protective Concepts, Inc.
Tubular Section Jet-Fire Test**

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
102:00	335	317	328	317	319	290
102:30	336	319	329	318	320	291
103:00	338	320	331	320	321	293
103:30	339	322	332	321	323	294
104:00	340	323	334	323	324	296
104:30	342	324	336	324	326	297
105:00	343	326	337	326	328	299
105:30	345	327	339	327	329	300
106:00	346	329	340	329	331	302
106:30	347	330	341	331	332	303
107:00	349	332	342	332	333	305
107:30	350	334	343	333	335	307
108:00	352	335	345	335	336	308
108:30	353	336	346	336	338	309
109:00	355	338	347	338	339	311
109:30	356	339	349	339	340	312
110:00	357	341	350	341	342	314
110:30	359	342	351	342	343	315
111:00	360	344	352	343	345	317
111:30	361	345	354	345	346	318
112:00	363	346	355	346	347	320
112:30	364	348	356	347	349	321
113:00	365	349	357	349	350	322
113:30	366	351	358	350	351	324
114:00	367	352	359	351	352	325
114:30	368	353	360	353	353	327
115:00	370	355	361	354	355	328
115:30	371	356	361	355	356	330
116:00	372	357	362	357	357	331
116:30	374	359	363	358	358	333
117:00	375	360	364	359	359	334
117:30	376	361	365	360	361	336
118:00	378	363	366	362	362	337
118:30	379	364	367	363	363	339
119:00	380	365	368	364	364	340
119:30	382	367	369	365	366	342
120:00	383	368	370	366	367	343
120:30	384	369	371	368	368	345
121:00	385	370	373	369	369	346
121:30	386	371	374	370	370	348
122:00	387	372	375	371	372	349
122:30	388	373	376	372	373	351
123:00	389	375	377	374	374	352
123:30	390	376	378	375	375	353
124:00	392	377	379	376	376	355
124:30	393	378	381	377	377	356
125:00	394	379	382	379	379	358
125:30	395	380	383	380	380	359
125:45	395	381	383	380	380	360
126:00	396	381	384	381	381	361
126:15	397	382	384	382	381	362

**Protective Concepts, Inc.
Tubular Section Jet-Fire Test**

**Date: October 25, 2002
Test ID: 298pci1**

**SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634**

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
126:30	397	382	385	382	382	362
126:45	398	383	385	383	383	363
127:00	398	384	386	383	383	364
127:15	399	384	386	384	384	365
127:30	400	385	387	385	384	365
127:45	400	385	387	385	385	366
128:00	401	386	388	386	386	367
128:15	402	387	388	386	386	368
128:30	402	387	388	387	387	368
128:45	403	388	389	388	387	369
129:00	403	388	390	388	388	370
129:15	404	389	390	389	389	371
129:30	405	390	391	390	389	371
129:45	405	390	391	390	390	372
130:00	406	391	392	391	390	373
130:15	406	391	392	391	391	374
130:30	407	392	393	392	392	375
130:45	408	393	393	392	392	375
131:00	408	393	394	393	393	376
131:15	409	394	394	394	393	377
131:30	410	394	395	394	394	378
131:45	410	395	395	395	395	378
132:00	411	396	396	395	395	379
132:15	411	396	396	396	396	380
132:30	412	397	397	397	396	381
132:45	413	397	397	397	397	381
133:00	413	398	398	398	398	382
133:15	414	398	399	398	398	383
133:30	414	399	399	399	399	384
133:45	415	400	400	400	399	384
134:00	416	400	400	400	400	385
134:15	416	401	401	401	401	386
134:30	417	401	401	401	401	387
134:45	418	402	402	402	402	388
135:00	418	402	403	403	402	388
135:15	419	403	403	403	403	389
135:30	419	404	404	404	404	390
135:45	420	404	404	404	404	390
136:00	421	405	405	405	405	391
136:15	421	405	405	406	405	392
136:30	422	406	406	406	406	393
136:45	422	406	406	407	407	394
137:00	423	407	407	408	407	394
137:15	423	408	408	408	408	395
137:30	424	408	408	409	408	396
137:45	425	409	409	409	409	396
138:00	425	409	409	410	410	397
138:15	426	410	410	411	410	398
138:30	426	410	410	411	411	399
138:45	427	411	411	412	411	399
139:00	428	411	412	412	412	400

Protective Concepts, Inc.
Tubular Section Jet-Fire Test

Date: October 25, 2002
Test ID: 298pci1

SwRI Project No. 01.06132.01.001
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Time min:sec	Sample Temperatures (°C)					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
139:15	428	412	412	413	413	401
139:30	429	413	413	414	413	402
139:45	429	413	414	414	414	402
140:00	430	414	414	415	414	403
140:15	430	414	415	415	415	404
140:30	431	415	415	416	416	404
140:45	432	415	416	417	416	405
141:00	432	416	416	417	417	406
141:15	433	416	417	418	417	407
141:30	433	417	417	418	418	407
141:45	434	418	418	419	419	408
142:00	435	418	419	420	419	409
142:15	435	419	419	420	420	409
142:30	436	419	420	421	420	410
142:45	436	420	420	422	421	411
143:00	437	420	421	422	422	412
143:15	437	421	422	423	422	412
143:30	438	421	422	423	423	413
143:45	439	422	423	424	423	414
144:00	439	423	423	425	424	414
144:15	440	423	424	425	425	415
144:30	440	424	424	426	425	416
144:45	441	424	425	426	426	417
145:00	442	425	426	427	426	417
145:15	442	425	426	428	427	418
145:30	443	426	427	428	428	419
145:45	443	427	427	429	428	419
146:00	444	427	428	429	429	420
146:15	445	428	428	430	429	421
146:30	445	428	429	431	430	422
146:45	446	429	430	431	431	422
147:00	446	429	430	432	431	423
147:15	447	430	431	432	432	424
147:30	448	431	431	433	432	424
147:45	448	431	432	434	433	425
148:00	449	432	433	434	434	426
148:15	449	432	433	435	434	426
148:30	450	433	434	435	435	427
148:45	450	433	434	436	435	428
149:00	451	434	435	437	436	429
149:15	452	434	435	437	437	429
149:30	452	435	436	438	437	430
149:45	453	436	437	438	438	431
150:00	453	436	437	439	438	431
150:15	454	437	438	440	439	432
150:30	455	437	439	440	440	433
150:45	455	438	439	441	440	433
151:00	456	438	440	441	441	434
151:15	456	439	440	442	441	435
151:30	457	440	441	443	442	435
151:45	457	440	442	443	443	436

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SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
152:00	458	441	442	444	443	437
152:15	459	441	443	444	444	437
152:30	459	442	443	445	444	438
152:45	460	442	444	446	445	439
153:00	460	443	445	446	446	440
153:15	461	444	445	447	446	440
153:30	462	444	446	447	447	441
153:45	462	445	447	448	447	442
154:00	463	445	447	449	448	442
154:15	463	446	448	449	449	443
154:30	464	446	448	450	449	444
154:45	465	447	449	451	450	444
155:00	465	448	450	451	450	445
155:15	466	448	451	452	451	446
155:30	466	449	451	452	452	446
155:45	467	449	452	453	452	447
156:00	468	450	453	454	453	448
156:15	468	450	453	454	454	448
156:30	469	451	454	455	454	449
156:45	469	452	455	455	455	450
157:00	470	452	455	456	455	451
157:15	470	453	456	457	456	451
157:30	471	453	457	457	457	452
157:45	472	454	457	458	457	453
158:00	472	454	458	459	458	453
158:15	473	455	459	459	458	454
158:30	473	456	459	460	459	455
158:45	474	456	460	460	460	455
159:00	474	457	460	461	460	456
159:15	475	457	461	462	461	457
159:30	476	458	462	462	461	457
159:45	476	458	462	463	462	458
160:00	477	459	463	463	463	459
160:15	477	460	464	464	463	459
160:30	478	460	464	465	464	460
160:45	478	461	465	465	464	461
161:00	479	461	465	466	465	461
161:15	480	462	466	466	466	462
161:30	480	462	467	467	466	462
161:45	481	463	467	468	467	463
162:00	481	463	468	468	467	464
162:15	482	464	469	469	468	464
162:30	482	465	469	470	469	465
162:45	483	465	470	470	469	466
163:00	483	466	471	471	470	466
163:15	484	466	471	471	470	467
163:30	485	467	472	472	471	468
163:45	485	467	473	473	472	468
164:00	486	468	473	473	472	469
164:15	486	469	474	474	473	470
164:30	487	469	475	474	473	470

Protective Concepts, Inc.
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Test ID: 298pci1

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<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
164:45	487	470	475	475	474	471
165:00	488	470	476	476	475	471
165:15	488	471	476	476	475	472
165:30	489	471	477	477	476	473
165:45	490	472	478	477	476	473
166:00	490	473	479	478	477	474
166:15	491	473	479	479	478	475
166:30	491	474	480	479	478	475
166:45	492	474	481	480	479	476
167:00	492	475	482	480	480	477
167:15	493	475	482	481	480	477
167:30	493	476	483	482	481	478
167:45	494	477	484	482	481	478
168:00	495	477	485	483	482	479
168:15	495	478	485	484	483	480
168:30	496	478	486	484	483	480
168:45	496	479	487	485	484	481
169:00	497	479	487	485	485	482
169:15	497	480	488	486	485	482
169:30	498	481	489	487	486	483
169:45	499	481	489	487	486	484
170:00	499	482	490	488	487	484
170:15	500	482	491	488	488	485
170:30	500	483	492	489	488	485
170:45	501	484	492	490	489	486
171:00	501	484	493	490	489	487
171:15	502	485	494	491	490	487
171:30	503	485	494	492	491	488
171:45	503	486	495	492	491	489
172:00	504	487	496	493	492	489
172:15	504	487	496	493	493	490
172:30	505	488	497	494	493	491
172:45	505	488	498	495	494	491
173:00	506	489	499	495	494	492
173:15	507	490	499	496	495	492
173:30	507	490	500	497	496	493
173:45	508	491	500	497	496	494
174:00	508	491	501	498	497	494
174:15	509	492	501	498	497	495
174:30	509	492	502	499	498	496
174:45	510	493	503	500	499	496
175:00	511	494	503	500	499	497
175:15	511	494	504	501	500	497
175:30	512	495	504	502	500	498
175:45	512	495	505	502	501	499
176:00	513	496	506	503	502	499
176:15	513	497	506	503	502	500
176:30	514	497	507	504	503	501
176:45	515	498	507	505	503	501
177:00	515	498	508	505	504	502
177:15	516	499	509	506	505	502

Protective Concepts, Inc.
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SwRI Project No. 01.06132.01.001
 Test Type: OTI 95 634

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
177:30	516	500	509	506	505	503
177:45	517	500	510	507	506	504
178:00	517	501	511	508	506	504
178:15	518	501	511	508	507	505
178:30	518	502	512	509	507	505
178:45	519	502	512	509	508	506
179:00	520	503	513	510	509	507
179:15	520	504	513	511	509	507
179:30	521	504	514	511	510	508
179:45	521	505	515	512	510	508
180:00	522	505	516	512	511	509
180:15	522	506	516	513	512	510
180:30	523	506	517	513	512	510
180:45	523	507	518	514	513	511
181:00	524	508	520	515	514	511
181:15	525	508	521	515	514	512
181:30	525	509	522	516	515	513
181:45	526	509	523	516	516	513
182:00	526	510	524	517	516	514
182:15	527	511	525	518	517	514
182:30	527	511	526	518	518	515
182:45	528	512	528	519	519	516
183:00	528	512	529	520	519	516
183:15	529	513	531	520	520	517
183:30	530	513	532	521	521	517
183:45	530	514	533	521	522	518
184:00	531	515	535	522	522	519
184:15	531	515	536	523	523	519
184:30	532	516	537	523	524	520
184:45	532	516	539	524	525	520
185:00	533	517	540	525	526	521
185:15	533	518	542	525	526	522
185:30	534	518	544	526	527	522
185:45	534	519	545	527	528	523
186:00	535	520	545	527	528	523
186:15	535	520	545	528	529	524
186:30	536	521	546	529	530	524
186:45	537	521	546	530	530	525
187:00	537	522	547	530	531	525
187:15	538	523	547	531	531	526
187:30	538	523	548	532	532	526
187:45	539	524	549	532	533	527
188:00	539	524	549	533	533	527
188:15	540	525	550	534	534	528
188:30	540	526	551	534	534	528
188:45	541	526	551	535	535	529
189:00	541	527	552	536	536	529
189:15	542	527	553	536	536	530
189:30	542	528	553	537	537	530
189:45	543	528	554	538	537	531
190:00	543	529	554	538	538	531

**Protective Concepts, Inc.
Tubular Section Jet-Fire Test**

**Date: October 25, 2002
Test ID: 298pci1**

**SwRI Project No. 01.06132.01.001
Test Type: OTI 95 634**

<u>Time</u> min:sec	<u>Sample Temperatures (°C)</u>					
	TC 17	TC 18	TC 19	TC 20	Avg 17-20	Avg 1-20
190:15	544	530	555	539	539	532
190:30	544	530	555	540	539	532
190:45	545	531	556	540	540	533
191:00	545	531	556	541	540	533
191:15	546	532	557	542	541	534
191:30	547	532	557	542	542	534
191:45	547	533	558	543	542	535
192:00	548	534	559	544	543	535
192:15	548	534	559	544	543	536
192:30	549	535	560	545	544	536
192:45	549	535	560	545	544	537
193:00	550	536	561	546	545	537
193:15	550	536	561	547	546	538
193:30	551	537	562	547	546	538
193:45	551	537	562	548	547	539
194:00	552	538	562	548	547	539
194:15	552	538	563	549	548	540
194:30	553	539	563	550	548	540
194:45	553	540	564	550	549	541
195:00	554	540	564	551	549	541
195:15	554	541	565	551	550	542
195:30	555	541	565	552	550	542
195:45	555	542	565	552	551	542
196:00	556	542	566	553	551	543
196:15	556	543	566	554	552	543
196:30	556	543	567	554	552	544
196:45	557	544	567	555	553	544
197:00	557	544	568	555	553	545
197:15	558	545	568	556	554	545
197:30	558	545	568	556	554	546
197:45	558	546	569	557	555	546
198:00	559	546	569	557	555	547
198:15	559	547	570	558	556	547
198:30	560	547	570	558	556	548
198:45	560	548	570	559	556	548
199:00	560	548	571	559	557	548
199:15	561	549	571	560	557	549
199:30	561	549	571	560	558	549
199:45	562	550	572	561	558	550
200:00	562	550	572	561	559	550

Appendix C
Photographic Documentation
(Consisting of 3 Pages)



Figure C-1. Jet-Fire Tubular Section Prior to PFP Application.



Figure C-2. Jet-Fire Test Jacket Assembly Prior to Exposure.



Figure C-3. Jet-Fire Specimen During Testing.



Figure C-4. Impingement Region During Test.



Figure C-5. Jet-Fire Test Specimen Immediately After Test.



Figure C-6. Jet-Fire Test Specimen Impingement Region after Cool-Down.

Appendix D
Calibration Certificates, Material Diagram
(Consisting of 2 Pages)



DURO-SENSE CORPORATION
 20801 Higgins Court, Torrance, CA 90501
 Phone: (310) 533-6877 Fax: (310) 533-0330

TO: Southwest Research Institute
 6220 Culebra Road
 San Antonio, TX 78238

Date: October 23, 2002
 Calib No.: 55555
 Cust. P.O. : 3977001

CALIBRATION CERTIFICATE

This will certify that your material used to manufacture Type 'K' T/C assy # MTC-D-06321-G was/were calibrated I.A.W. calibration procedure 26.00 Rev. A on October 23, 2002 against our standard, which is traceable to the National Institute of Standards Technology.

Ambient Temperature: 74.00 °F
 Furnace Atmosphere: Air
 Humidity: 41.00%
 Temperature Points: See Below
 Lot #: REW0158-1346

CALIBRATION RESULTS ARE AS FOLLOWS:

Standard	Corrections	
	<u>Inside End</u>	<u>Outside End</u>
400 °F	+0.5 °F	+0.6 °F
800 °F	+1.0 °F	+1.0 °F
1200 °F	+1.4 °F	+1.3 °F

Calibration procedure I.A.W. ISO 10012-1:1992(E), ANSINCSSL Z540-1-1994, AMS 2750C, ASTM E 220-96, ASTM E 230-96, ASTM E 207-96
 The calibration of thermocouples is subject to change during use. The amount of change depends on factors such as temperature, time, and condition of use.
 Total Uncertainty of Readings is Less Than 0.1%. Accuracy I.A.W. industry standards noted in calibration procedure 26.0.
 This certificate shall not be reproduced except in full, without the written approval of the laboratory.


N.I.S.T. Recertification Date: February 10, 2003	<p>We hereby certify that the above is a true copy of our records.</p> <p>DURO-SENSE CORPORATION</p>  Quality Control Department
Leeds and Northrup K-5: Model 7555	
Precision Potentiometer S/N: 1752900	
Eppley Standard Cell: Model 100 - S/N 700851	
Cage Code: 58042	
Master Std. Thermocouple: Type 'S'	
N.I.S.T. Test Numbers: 266409	

Figure D-1. Thermocouple Calibration Certificate.

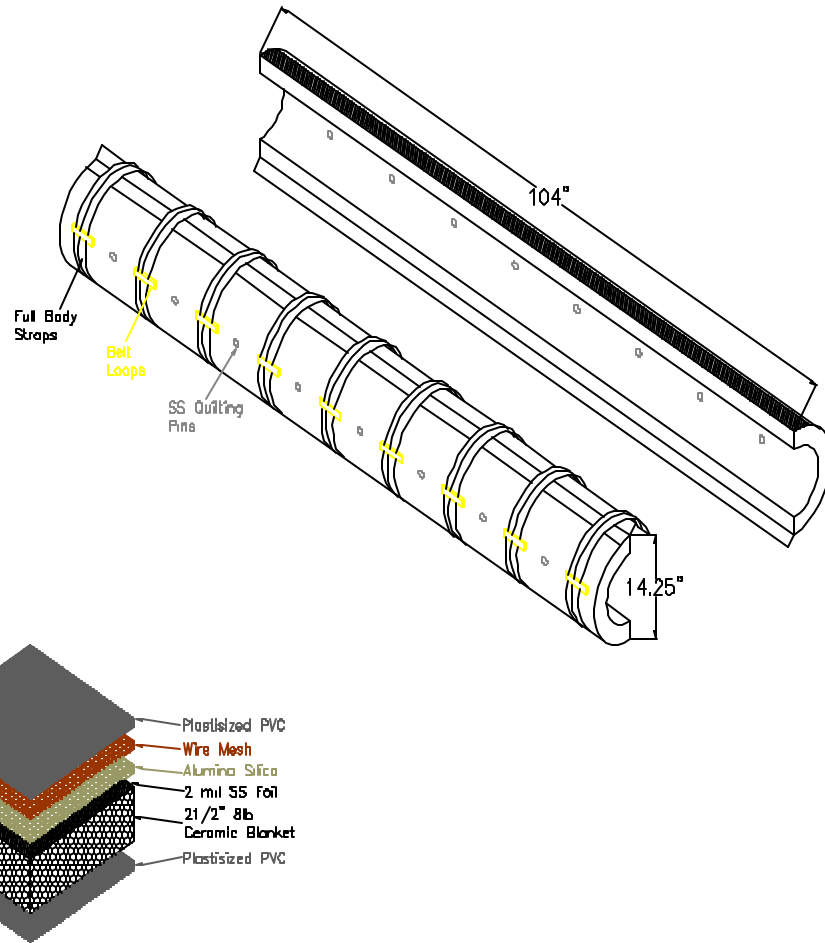


Figure D-5. General Construction Diagram.