

Test Report: #TR-194  
Revision: 0  
Date: 03/25/85

Transco Products Inc. Test Report: #TR-194

Fire and Hose Stream Test of an 8" thick specimen of #TCO-002 Medium Density Silicone Elastomer used in an electrical sleeve opening penetrated by an extended steel conduit.

For Millstone Nuclear Power Station, Unit 3  
Northeast Utilities Service Company  
Contract No. 2400.000-680  
(J.O. 12179)

This Report is the property of:  
Northeast Utilities Service Company  
Millstone Nuclear Power Station, Unit 3

By: Gregory J. Jarosz Date: 03/27/85  
Gregory J. Jarosz  
Manager of Technical Development  
Transco Products Inc.

QC Approval by:  
Brian Alexander Date: 3/27/85  
Brian Alexander  
Quality Control

FOR INFORMATION ONLY

8509160395 850829  
PDR ADOCK 05000423  
F PDR

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a Division of the PORTLAND CEMENT ASSOCIATION

## construction technology Laboratories

8420 Old Orchard Road, Skokie, Illinois 60077-4321 • Phone 312 965-7500

May 1, 1985

Mr. Gregory J. Jarosz  
Manager of Technical Development  
Transco Products, Inc.  
55 East Jackson Blvd.  
Chicago, Illinois 60604

Transco Fire Test Report #TR-194

Dear Mr. Jarosz:

We have received a copy of your Test Report #TR-194, dated March 25, 1985, describing fire and hose stream tests of #TCO-002 Medium Density Silicone Elastomer seals. This test was performed on March 18, 1985, at the fire research facilities of Construction Technology Laboratories.

After review, we find that the report accurately describes test procedures, observations during test, and quantitative results.

Very truly yours,

Michael Gillen  
Senior Research Engineer  
Fire Research Section

MG/sr

Copy to--  
W. G. Corley  
E. A. B. Salse  
T. J. Rowe  
Central Files  
CR5573-4324

INFORMATION ONLY

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SECTION "A"  
SYNOPSIS:

The purpose of this test was to demonstrate the ability of an eight (8) inch thick firestop of #TCO-002 Medium Density Silicone Elastomer penetrated by an extended steel conduit (and seal within the conduit) to withstand a three (3) hour fire test as defined by ANI and IEEE 634.

The test was performed 03/18/85 at Portland Cement Association (Skokie, Illinois) on a representative floor specimen. At the conclusion of the fire test, the seal specimen was subjected to a hose stream test in accordance with ANI requirements (along with two additional hose stream tests performed for informational purposes).

The penetrating element used in this test was arranged as shown in Attachment "A". The single piece steel conduit extended a minimum of 12" below and 40" above the surrounding firestop. The conduit was filled with cables to 55.25% of its cross-sectional area. Cable sizes tested were in accordance with ANI and IEEE 634 requirements and included both copper and aluminum power cables.

The conditions demonstrated in this fire test are as follows:

- 1.) 5" dia. x 60" long steel conduit using a 55.25% by cross-sectional cable fill consisting of approximately 1/3 power, 1/3 control and 1/3 instrument cables sealed with 8" of #TCO-002 Medium Density Silicone Elastomer (plus 2" of #TCO-026 Ceramic Blanket) at the unexposed end of the conduit.
- 2.) Representative cable types and percentages of fills found at Millstone Nuclear Station, Unit 3.
- 3.) 8" thick #TCO-002 Medium Density Silicone Elastomer seal around the conduit installed flush with the slab's exposed surface.
- 4.) A conduit penetrating a steel sleeve opening.

**INFORMATION ONLY**



SECTION "B"  
TEST SLAB:

The concrete test slab used for this test measured 48" x 48" x 12" thick and was penetrated by four 12" diameter steel sleeves. One of these four 12" diameter steel sleeves was used for the test. The test slab was designed and fabricated by PCA/CTL.

SECTION "C"  
PENETRATING ELEMENTS:

The 5" diameter by 60" long single piece conduit was located on center to the 12" diameter sleeve opening. The conduit extended 12" below and 40" above the firestop. The exposed end of the conduit (beneath the slab) was capped with a steel connector and plug.

The conduit was filled with representative cable types and percentages of fills found at Millstone Nuclear Power Station, Unit 3. The cable sizes tested were in accordance with ANI and IEEE requirements.

The conduit was filled to 55.25% of its cross-sectional area with approximately 1/3 power, 1/3 control, and 1/3 instrument cables. Power cables included both copper and aluminum conductors. The cables extended approximately 12" below and not less than 36" above the test slab (40" above the firestop).

Cable fills are found on page number 3 of this report.

**INFORMATION ONLY**

SECTION "C" (Cont.)  
PENETRATING ELEMENTS:

The cable fill of the conduit was as follows:

Man.	Mark #:	Description:	Con.:	Dia. (")	Area: ("2)	Qty.:	Total Area:
------	---------	--------------	-------	-------------	---------------	-------	----------------

(power cables:)

Kerite	NHP-18	1/C 500 MCM	Cu	1.25	1.2271	1	1.2271
Kerite	NHP-42	1/C 500 MCM	Al	1.76	2.4328	1	2.4328

(total power cables: 3.6599)

(control cables:)

Kerite	NHN-05	7/C #14	Cu	0.76	0.4536	1	0.4536
Okonite	NHT-24	1/C #14	Cu	0.21	0.0346	1	0.0346
Okonite	NHT-37	9/C #14	Cu	0.81	0.5153	1	0.5153
Okonite	NHT-40	12/C #14	Cu	0.97	0.7389	1	0.7389
Okonite	NHT-59	12/C #12	Cu	1.05	0.8659	1	0.8659
Okonite	NHT-66	2/C # 8	Cu	0.72	0.4072	1	0.4072
Rockbestos	None	5/C #12 (ALS)	Cu	0.73	0.4185	1	0.4185
Brand Rex	None	1/C # 4 (SIS)	Cu	0.40	0.1257	1	0.1257

(total control cables: 3.5597)

(instrument cables:)

BIW	NHS-97	9/C #14	Cu	0.81	0.5153	1	0.5153
BIW	NHQ-20	4/C #16	Cu	0.55	0.2376	1	0.2376
BIW	NHQ-61	Triax	Cu	0.55	0.2376	1	0.2376
BIW	NHQ-49	Thermocouple	Cu	0.50	0.1963	1	0.1963
BIW	NHQ-12	3/C #16	Cu	0.50	0.1963	1	0.1963
(NUSCO)	NHS-69	5/C #10	Cu	0.65	0.3318	1	0.3318
BIW	NHQ-15	10 pr. #18	Cu	1.40	1.5394	1	1.5394
(RCI)	NHQ-47	24/C #16	Cu	0.69	0.3739	1	0.3739

(total instrument cables: 3.6282)

(total all cables used: 10.8478)

**INFORMATION ONLY**

SECTION "D"  
SEAL INSTALLATION:

The #TCO-002 Medium Density Silicone Elastomer seals were installed using applicable sections of Transco Products Inc.'s installation and QC procedure PSQAP 9.10, Rev. 1 (Attachment "D").

The medium density silicone elastomer was installed 8" (max.) deep in the unexposed end of the conduit and space around the conduit. Prior to sealing the conduit, 2" (max.) of #TCO-026 Ceramic Blanket (Johns-Manville's 4 lb. "Cera wool") was installed 8" below the unexposed end of the conduit and served as permanent damming which was left in place for the test.

Inhibition of cure occurred at the cables/conduit seal interfaces and was left unrepaired for the test. TPI QC records for the seal installation work can be found in Attachment "E".

Prior to conducting the test, the unexposed cable ends were capped with Dow Corning #96-081 Silicone Adhesive.

INFORMATION ONLY

SECTION "E"  
THERMOCOUPLES:

Thermocouples were mounted to the slab to gather temperature data throughout the test. Temperatures were documented at five minute intervals for the first two hours and then at ten minute increments for the remaining hour of the test.

Thermocouples 49-54, and 56 were tied with brass wire to their respective items at the seal/item interfaces. Seal surface thermocouples 27, 28, and 55 (along with sleeve thermocouple 29) were laid onto their respective surfaces and weighted for contact.

Thermocouples 57 through 70 were tied with brass wire directly to the conduit and were covered with 1" x 1" x 1/8" thick ceramic fiber pads. These thermocouples were mounted in groups of two (180 degrees apart from each other) starting flush with the surrounding seal and extending up every 6" to the top of the conduit.

Furnace atmosphere temperatures were monitored and documented in accordance with ASTM E-119 requirements. Three thermocouples are permanently mounted inside of the furnace 12" below the specimen for this purpose.

Thermocouples were mounted as follows:

T/C #:	Description:	Degree F at 3 Hrs.:
27	Surrounding seal surface: . . . . .	276
28	Surrounding seal surface: . . . . .	281
29	Sleeve: . . . . .	408
49	1/C #4 SIS cable: . . . . .	116
50	5/C #12 ALS cable: . . . . .	117
51	9/C #14 (BIW) cable: . . . . .	114
52	1/C #14 cable: . . . . .	113
53	10 pr. #18 cable: . . . . .	102
54	Triax cable: . . . . .	113
55	Conduit seal surface: . . . . .	109
56	Conduit: . . . . .	115
57	Conduit (0" from sur. seal surface): . . . . .	450
58	Conduit (0" from sur. seal surface): . . . . .	430
59	Conduit (6" from sur. seal surface): . . . . .	256
60	Conduit (6" from sur. seal surface): . . . . .	272
61	Conduit (12" from sur. seal surface): . . . . .	188
62	Conduit (12" from sur. seal surface): . . . . .	218
63	Conduit (18" from sur. seal surface): . . . . .	182
64	Conduit (18" from sur. seal surface): . . . . .	184 (cont.)

INFORMATION ONLY

SECTION "E" (cont.)  
THERMOCOUPLES:

T/C #:	Description:	Degrees F at 3 Hrs.:
65	Conduit (24" from sur. seal surface):	..... 167
66	Conduit (24" from sur. seal surface):	..... 172
67	Conduit (30" from sur. seal surface):	..... 140
68	Conduit (30" from sur. seal surface):	..... 144
69	Conduit (36" from sur. seal surface):	..... 119
70	Conduit (36" from sur. seal surface):	..... 122

The thermocouples were placed and mapped by TPI QC. Thermocouple map can be found in Attachment "C".

SECTION "F"  
TEST:

The fire test was conducted in accordance with the ASTM E-119 time/temperature curve for three hours. PCA/CTL personnel documented specimen thermocouple and furnace atmosphere temperatures and recorded test observations.

Light smoke began at the unexposed end of the conduit at 2 minutes and lasted an additional 23 minutes. At 45 minutes into the test, liquid inhibited silicone from the seal/cable interfaces began to drip down the conduit. No other occurrences were noted.

The furnace draft pressure averaged -0.08" of water pressure throughout the test. Furnace drawings can be found in Attachment "B".

INFORMATION ONLY

SECTION "G"  
HOSE STREAM TESTS:

After the conclusion of the fire test, the specimen was removed from the furnace and placed on its side for the hose stream test. Although the specimen was required to be subjected to only the ANI hose stream test, two additional tests were conducted for informational purposes.

Each test was conducted for a minimum period of 24 seconds based on a 2.5 minute exposure for every 100 square feet of slab area. Prior to conducting the test, TPI QC personnel verified the distance between the specimen and hose nozzle. The tests were as follows:

- 1.) ANI: 75 psi hose stream delivered through a 1.5" diameter hose equipped with a fog nozzle set at a discharge angle of 15 degrees from a distance of 10 feet with a flow rate of 75 gpm.
- 2.) IEEE: Same as above except that the discharge angle is increased to 30 degrees.
- 3.) ASTM: 30 psi solid hose stream delivered through a 2.5" diameter hose equipped with a 1.125" tip set on a playpipe from a distance of 20 feet.

No water projected through the specimen's unexposed surface during any of the tests.

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TEST COMMENTS

0:00:00 LIGHT SMOKE NOTED AT THE TOP OF PEN D PIPE  
0:20:00 STEAM BEING BLOWN OFF AT THE TOP OF PEN D PIPE  
0:25:00 SMOKE NO LONGER NOTED AT THE TOP OF PEN D PIPE  
0:45:00 BLACK LIQUID MATERIAL NOTED COMING FROM TOP OF PEN D AROUND  
THE PIPE  
1:10:00 MINOR EXPANSION NOTED IN SEAL IN PEN C

HOSE STREAM TESTS:

NO WATER PROJECTED BEYOND THE UNEXPOSED SURFACE DURING ANI HOSE STREAM  
STREAM TEST FOR 24 SEC.

NO WATER PROJECTED BEYOND THE UNEXPOSED SURFACE DURING IEEE-634 HOSE  
STREAM TEST FOR 24 SEC.

NO WATER PROJECTED BEYOND THE UNEXPOSED SURFACE DURING ASTM E-119 HOSE  
STREAM TEST FOR 24 SEC.

NOTES:

DRAFT RUN AT .08 NEG.  
SMOKE CLASS L

PEN A = TR196  
PEN B = TR195  
PEN C = TR193  
PEN D = TR194

INFORMATION ONLY

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FURNACE ATMOSPHERE TEMPERATURE (DEG. F)

TEST TIME, Hr:Min	FURNACE TEMP. F	ASTM E119 TEMP. F	VARIATION FROM ASTM TEMP. F
0:00	77	68	9
0:05	1000	1000	0
0:10	1375	1300	75
0:15	1441	1399	42
0:20	1429	1462	-33
0:25	1515	1510	5
0:30	1558	1550	8
0:35	1593	1584	9
0:40	1605	1613	-8
0:45	1628	1638	-10
0:50	1657	1661	-4
0:55	1675	1681	-6
1:00	1691	1700	-9
1:05	1712	1718	-6
1:10	1734	1735	-1
1:15	1745	1750	-5
1:20	1759	1765	-6
1:25	1767	1779	-12
1:30	1786	1792	-6
1:35	1795	1804	-9
1:40	1804	1815	-11
1:45	1813	1826	-13
1:50	1827	1835	-8
1:55	1842	1843	-1
2:00	1855	1850	5
2:10	1868	1862	6
2:20	1869	1875	-6
2:30	1886	1888	-2
2:40	1903	1900	3
2:50	1911	1912	-1
3:00	1922	1925	-3

AREA UNDER CURVE= 294597 DEG. F-MINUTES  
AREA UNDER ASTM E119 CURVE= 294600 DEG. F-MINUTES  
VARIATION FROM ASTM CURVE= -0.0010 %

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UNEXPOSED TEMP. READINGS (DEG. F.)

TEST TIME, Hr:Min	T/C NO.					
	25	26	27	28	29	30
0:00	71	71	70	70	70	72
0:05	71	71	70	70	70	72
0:10	71	71	70	70	74	71
0:15	71	72	72	74	82	72
0:20	72	75	75	90	93	75
0:25	73	79	81	87	106	78
0:30	75	84	89	95	121	82
0:35	78	90	98	104	140	86
0:40	81	94	107	113	161	90
0:45	84	99	117	123	183	94
0:50	87	103	126	133	198	97
0:55	91	106	135	142	204	100
1:00	94	109	145	152	217	103
1:05	97	112	153	160	229	105
1:10	100	115	161	167	241	108
1:15	103	119	167	175	254	110
1:20	106	121	176	182	265	112
1:25	109	124	184	190	274	115
1:30	111	127	190	195	283	116
1:35	114	129	198	202	291	118
1:40	116	131	203	208	299	120
1:45	119	133	208	212	307	123
1:50	121	135	214	217	313	123
1:55	123	137	218	224	321	125
2:00	125	147	223	229	328	127
2:10	129	168	237	235	344	129
2:20	134	176	246	246	358	132
2:30	137	181	251	255	373	136
2:40	141	188	260	261	387	138
2:50	145	190	268	269	395	142
3:00	148	192	276	281	408	144

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UNEXPOSED TEMP. READINGS (DEG. F.)

TEST TIME, Hr:Min	T/C NO.					
	49	50	51	52	53	54
0:00	72	72	71	72	73	71
0:05	71	71	71	71	73	71
0:10	71	71	71	71	73	71
0:15	71	71	71	72	73	71
0:20	72	72	72	72	73	72
0:25	73	73	72	73	73	72
0:30	74	74	73	74	74	73
0:35	75	75	73	75	75	75
0:40	76	77	74	76	76	76
0:45	78	78	75	78	78	77
0:50	79	80	77	79	79	79
0:55	81	81	78	80	80	80
1:00	82	83	79	82	81	82
1:05	84	85	80	83	82	83
1:10	86	86	82	84	83	84
1:15	87	88	84	86	84	86
1:20	89	89	86	87	84	87
1:25	90	90	87	89	85	89
1:30	91	92	89	90	86	90
1:35	93	93	90	91	87	91
1:40	94	95	92	93	88	93
1:45	95	96	93	93	89	94
1:50	96	97	94	95	89	95
1:55	98	98	95	96	90	96
2:00	99	99	96	96	91	97
2:10	102	102	100	100	93	99
2:20	105	106	103	103	95	102
2:30	108	109	105	105	97	106
2:40	111	112	108	108	99	109
2:50	114	115	111	110	100	111
3:00	116	117	114	113	102	113

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UNEXPOSED TEMP. READINGS (DEG. F.)

TEST TIME, Hr:Min	T/C NO.					
	55	56	57	58	59	60
0:00	72	72	70	70	71	71
0:05	72	71	74	73	71	72
0:10	71	71	89	91	74	84
0:15	72	71	130	120	91	118
0:20	72	72	202	144	120	133
0:25	73	72	239	162	149	137
0:30	73	73	257	181	162	144
0:35	74	75	269	201	169	156
0:40	74	76	274	219	172	170
0:45	76	77	290	232	179	182
0:50	77	79	306	247	186	189
0:55	79	80	310	257	191	195
1:00	80	82	309	266	192	202
1:05	82	84	308	276	196	207
1:10	83	86	311	284	200	213
1:15	85	87	315	291	205	218
1:20	86	89	319	298	209	222
1:25	88	90	323	305	214	226
1:30	89	91	329	310	217	229
1:35	90	93	335	314	218	233
1:40	91	94	339	319	221	234
1:45	92	95	343	324	222	236
1:50	93	96	351	331	224	236
1:55	95	98	358	336	227	236
2:00	95	99	367	339	228	238
2:10	98	102	384	355	230	243
2:20	100	105	401	377	237	249
2:30	103	108	412	391	241	256
2:40	105	110	424	406	245	261
2:50	107	113	436	416	251	266
3:00	109	115	450	430	256	272

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UNEXPOSED TEMP. READINGS (DEG. F.)

TEST TIME, Hr:Min	T/C NO.					
	61	62	63	64	65	66
0:00	71	71	71	71	72	72
0:05	71	72	71	71	71	72
0:10	73	77	72	73	72	73
0:15	89	98	86	83	78	83
0:20	107	114	96	95	86	91
0:25	129	120	112	105	94	93
0:30	137	128	122	113	103	105
0:35	141	134	127	120	108	110
0:40	137	142	124	122	107	109
0:45	143	152	128	127	108	111
0:50	149	161	131	133	115	118
0:55	151	168	134	141	118	123
1:00	151	172	139	146	121	126
1:05	155	177	141	146	121	124
1:10	160	181	142	146	121	124
1:15	156	184	143	146	121	123
1:20	164	190	145	148	122	124
1:25	171	196	148	152	123	125
1:30	172	198	153	157	125	127
1:35	177	203	160	164	127	130
1:40	179	207	165	169	131	133
1:45	179	208	171	176	134	137
1:50	181	206	175	183	139	142
1:55	182	203	175	185	146	149
2:00	180	203	175	186	152	156
2:10	181	205	176	185	157	160
2:20	183	207	178	183	159	161
2:30	182	210	180	181	161	163
2:40	185	213	180	183	162	165
2:50	186	215	181	183	164	168
3:00	188	218	182	184	167	172

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UNEXPOSED TEMP. READINGS (DEG. F.)

TEST TIME, H:Min	T/C NO.			
	67	68	69	70
0:00	72	72	72	72
0:05	71	71	71	71
0:10	71	72	71	71
0:15	73	76	72	72
0:20	77	80	72	73
0:25	82	87	74	74
0:30	89	93	75	77
0:35	92	95	78	79
0:40	93	95	79	81
0:45	93	95	80	83
0:50	96	99	82	84
0:55	98	101	83	86
1:00	100	103	85	88
1:05	101	104	87	89
1:10	102	104	89	90
1:15	102	105	90	91
1:20	103	106	91	93
1:25	104	106	92	94
1:30	106	108	94	95
1:35	107	109	95	97
1:40	108	111	96	98
1:45	110	112	97	99
1:50	112	115	98	100
1:55	115	117	100	102
2:00	119	120	101	103
2:10	124	126	105	107
2:20	129	131	108	110
2:30	132	134	111	114
2:40	134	138	114	117
2:50	137	141	116	119
3:00	140	144	119	122

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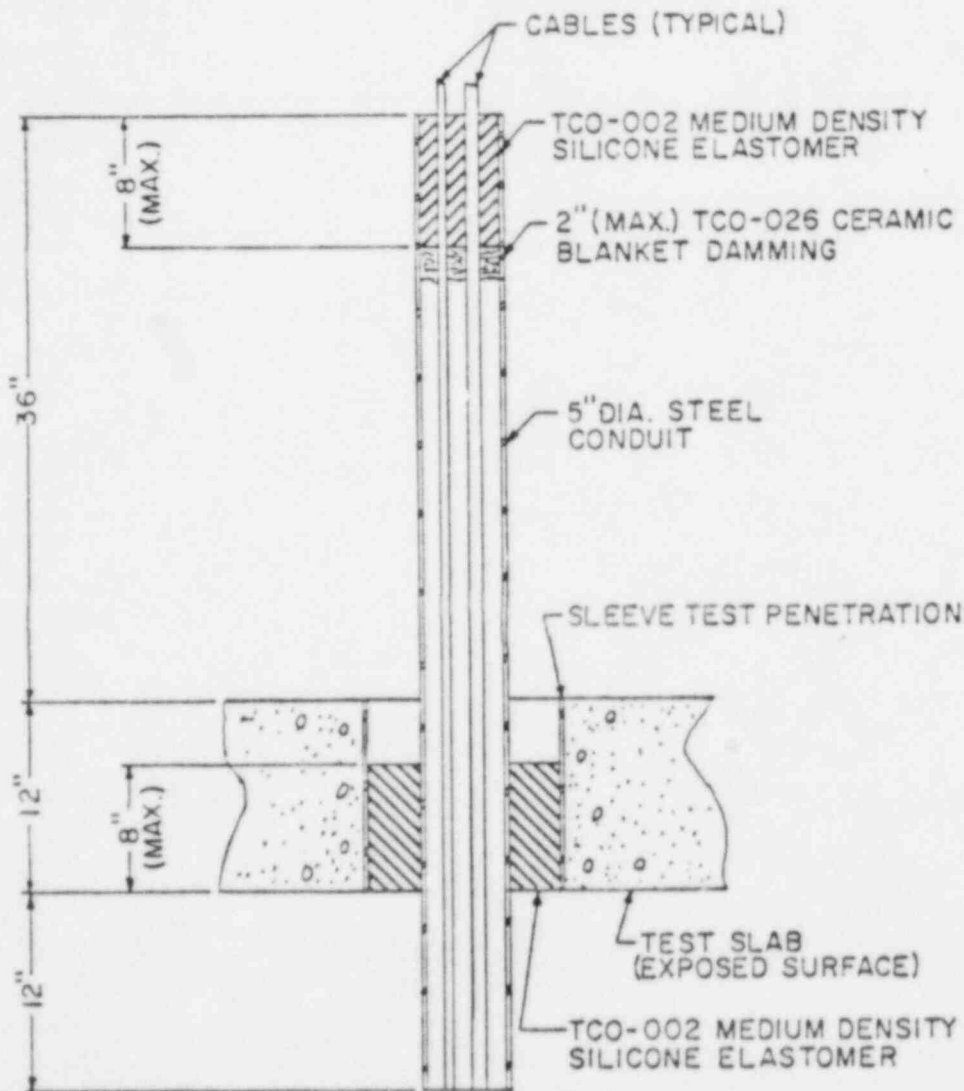
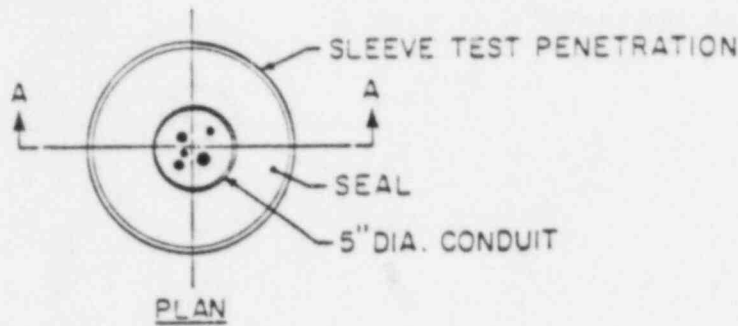
SECTION "I"  
POST TEST OBSERVATIONS:

After the fire test, it was observed that seal's exposed surface had expanded approximately 1" out of the penetration at the conduit. The conduit was still intact but discolored from the fire. No other damage to the conduit was noted.

No visual changes were noted to the specimen on its unexposed surface (except for where inhibited silicone had dripped down the conduit). The exposed surface of the seal had formed a hard char layer approximately 3" deep into the seal.

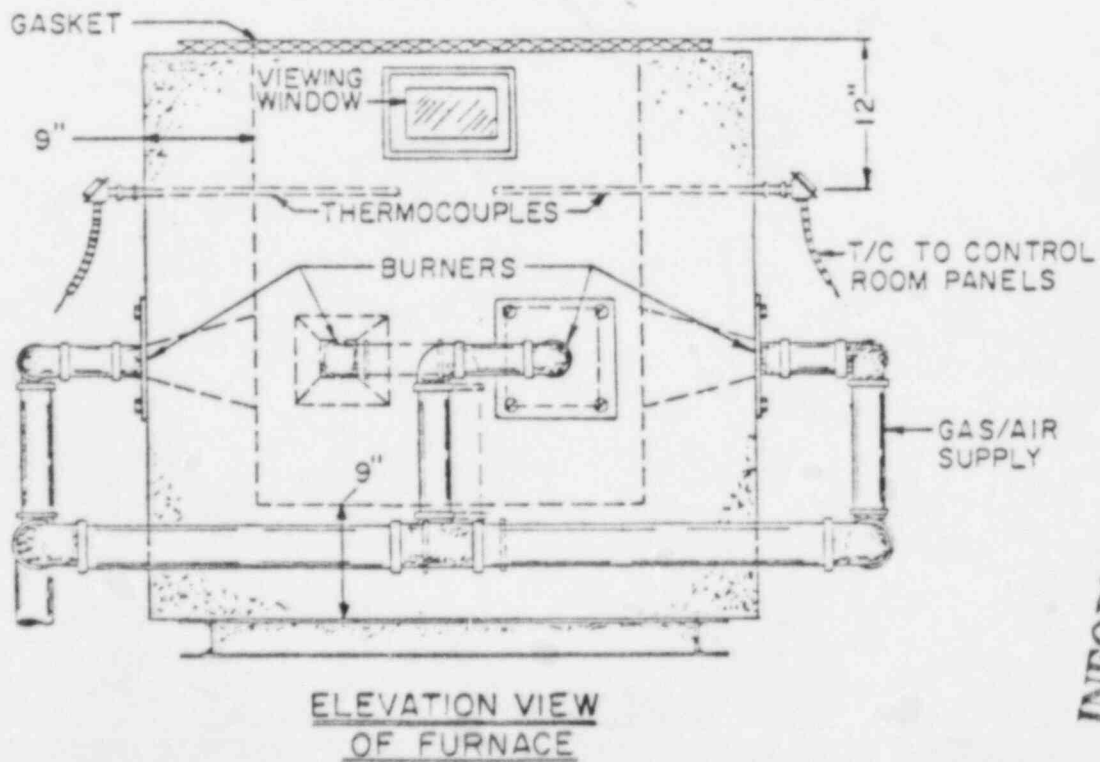
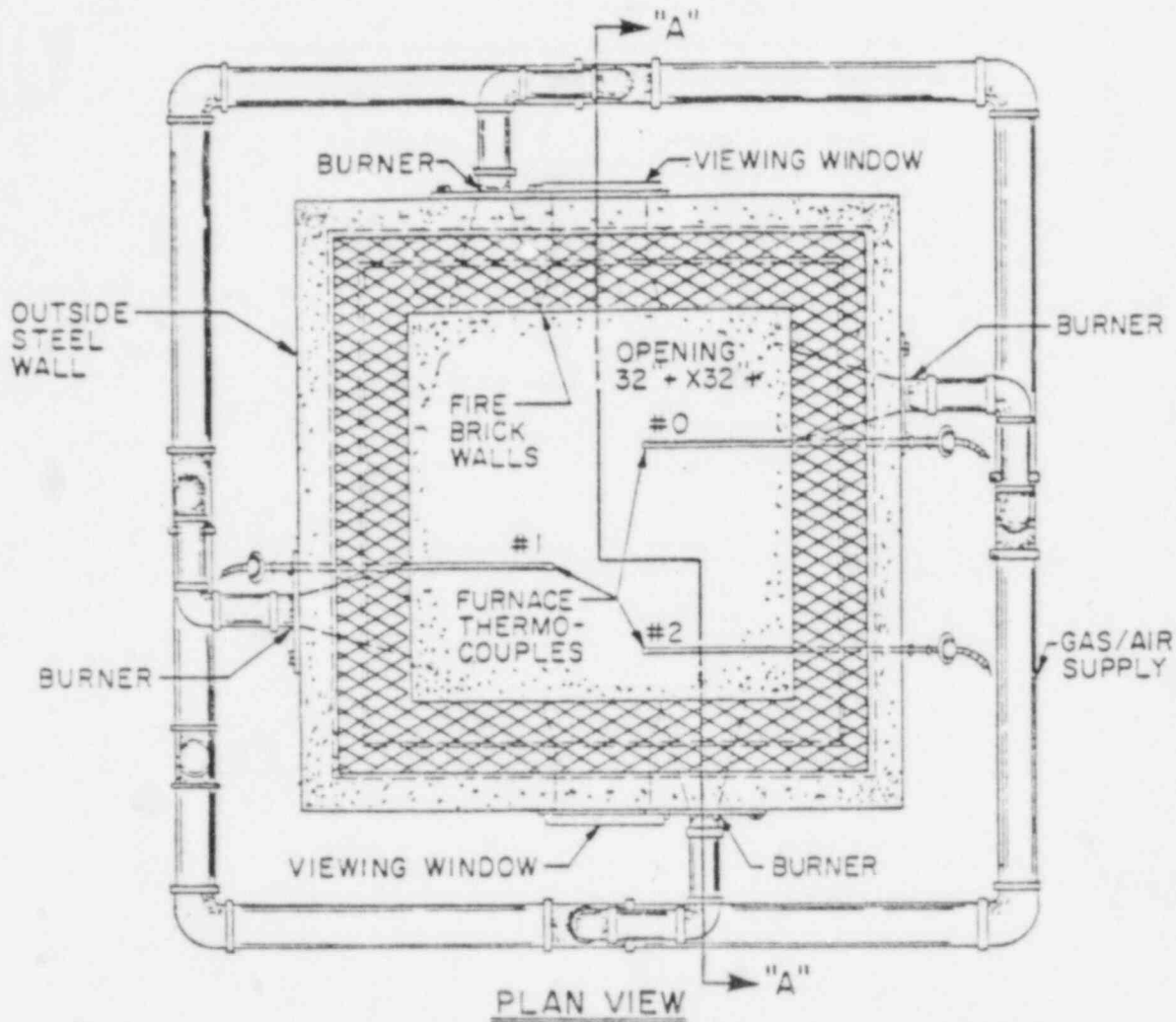
The conduit seal and seal surrounding it had passed both the fire and hose stream tests and met the performance requirements of ANI and IEEE 634.

**INFORMATION ONLY**



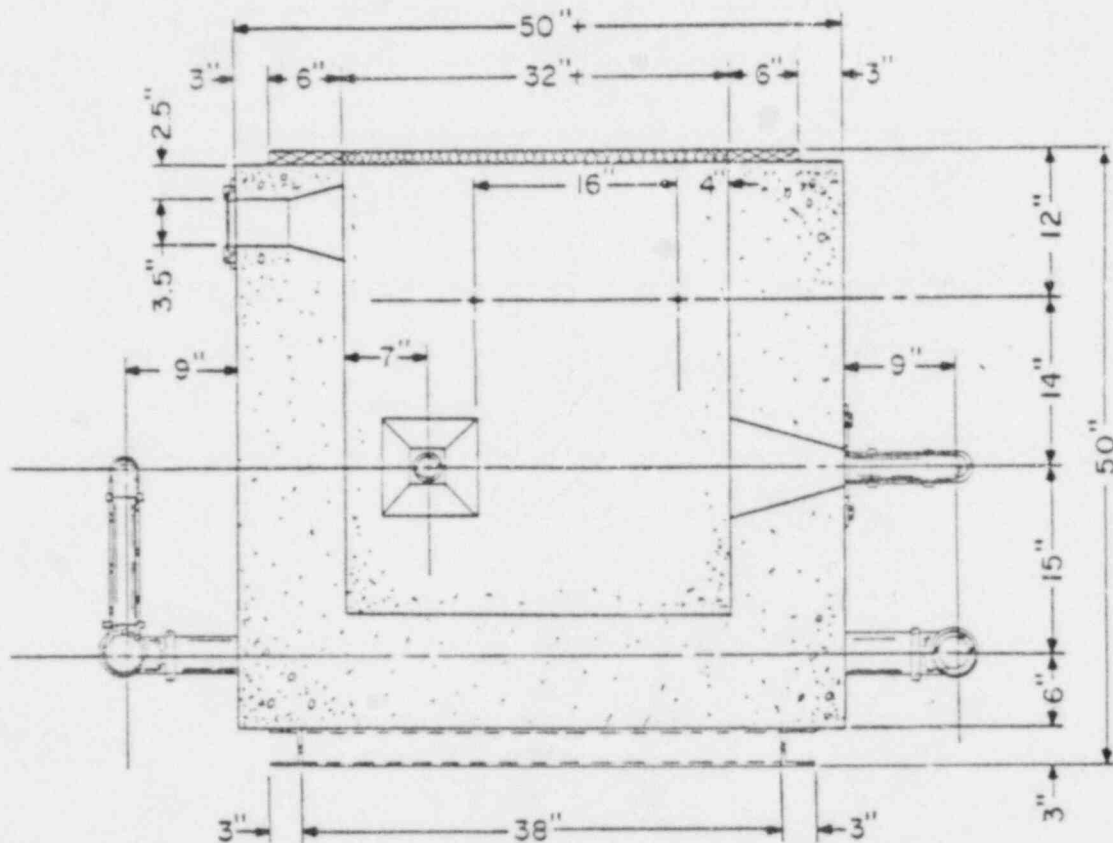
SECTION "A-A"  
 TEST # TR-194  
 TCO-002 MEDIUM DENSITY  
 SILICONE ELASTOMER SEAL FOR  
 STEEL CONDUIT

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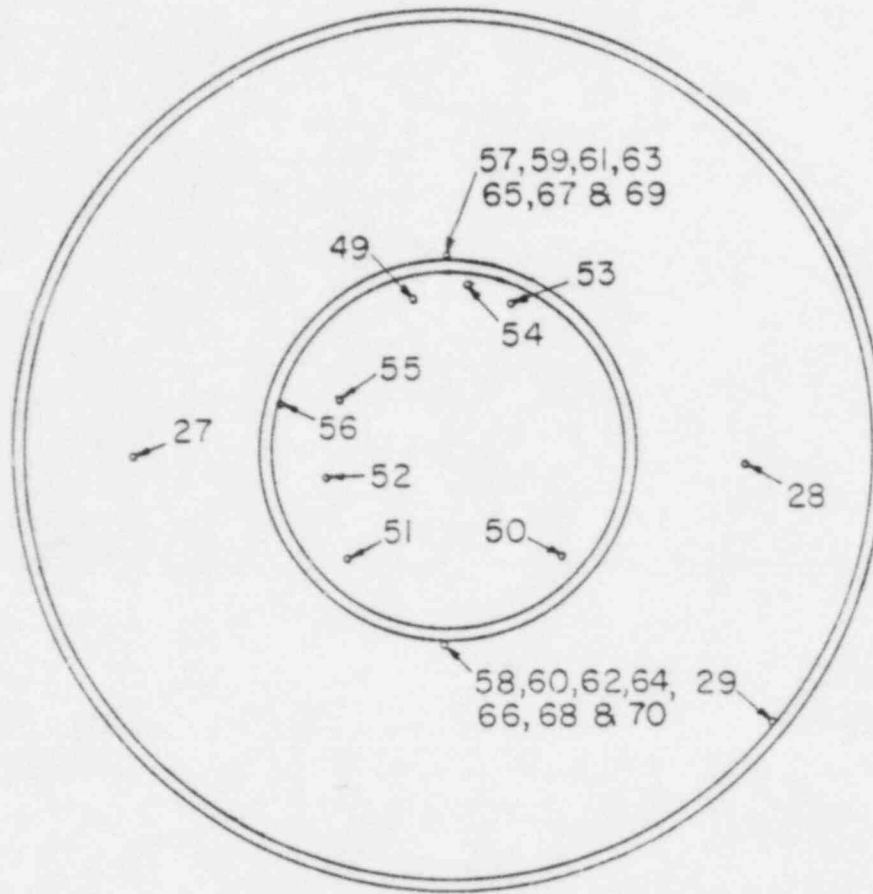




SECTION "A-A"  
OF FURNACE

INFORMATION ONLY

# THERMOCOUPLE MAP



## TEST #TR-194

T/C #	DESCRIPTION
27	ANNULAR SEAL SURFACE
28	" " "
29	SLEEVE
49	SIS #4
50	ALS
51	9/C #14
52	1/C #14
53	10 TW PR #18
54	TRIAX
55	SEAL SURFACE
56	CONDUIT
57	CONDUIT (0" UP FROM SURROUNDING SEAL)
58	" " " " " "
59	6" FROM BOTTOM ON CONDUIT
60	" " " " "
61	12" " " " "
62	" " " " "
63	18" " " " "
64	" " " " "
65	24" " " " "
66	" " " " "
67	30" " " " "
68	" " " " "
69	36" " " " "
70	" " " " "

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## 9.1 PURPOSE

This procedure defines the method of installing and inspecting Silicone Elastomer Seals.

## 9.2 REFERENCES

10CFR50 Appendix B  
Penetration Seal Quality Assurance Program Manual  
PSQAP 8.0, 9.0, 10.0, 10.1, 15.0

## 9.3 PROCEDURE

- 9.3.1 The Transco Field Superintendent and qualified craft personnel are responsible for the installation of Silicone Elastomer materials in accordance with this procedure. Quality Control Personnel are responsible for inspection activities per this procedure.
- 9.3.2 Prior to installing the seal materials, the penetration shall have been identified per PSQAP 8.0 and the damming operations shall have been completed per PSQAP 9.0.
- 9.3.3 The Transco Field Superintendent/Designee shall obtain a copy of the "Field Takeoff, Installation, and Inspection Record" (Figure 1) from Quality Control which will indicate those penetrations which are released for final sealing operations. This form is normally obtained at the start of each work day or shift. Penetrations shall not be sealed unless release is indicated on the form. An alternate release method/form may be used if found to be more efficient in issuing releases to production, but all data required on the Field Takeoff, Installation, and Inspection Record form shall be completed.
- 9.3.4 For traceability purposes, the material supplier has assigned unique numbers for each lot of material manufactured. Each container of silicone, both parts A and B, is to have a lot number clearly printed on it and a green stripe indicating it is acceptable for production use (per PSQAP 10.0). Containers without a lot number and/or a green paint stripe are not to be used, are to be segregated from acceptable materials, and the Quality Control Manager is to be notified.
- 9.3.5 Installation of Silicone Elastomer can be accomplished by utilizing dispensing equipment, or may be hand mixed and applied as specific conditions dictate.
- 9.3.6 Prior to installation of the Silicone Elastomer, the field installer shall complete the top portion of the "Field Data Sheet" (Figure 2) indicating, among other information, the

Technical Approvals As Required:

Date: 6-28-83  
 Signature: [Signature]  
 Date: 6-28-83  
 Signature: [Signature]

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the batch number assigned to the Silicone Elastomer. A batch is defined as each time the material holding tanks are refilled with material. Batch numbers are assigned beginning with "001" and continuing consecutively. Any time a batch remains in the holding tanks at the end of a shift or the end of the work day and the holding tanks are not refilled when work resumes, then a unique and consecutive batch letter shall be assigned to the end of the existing batch number beginning with the letter "A".

Example:

EV118009 - 005

EV118009 - 005A

EV118009 = Material supplier lot number

005 = The 5th batch used from lot EV118009

A = A stop in production and resumption without a material refill.

During the installation operations, all penetration numbers which receive a specific batch of Silicone Elastomer shall be listed on the Field Data Sheet.

In some cases, equipment may be used which attaches directly to the material containers instead of having "holding tanks". In these cases, the manufacturer supplied lot number alone is all that is required.

9.3.7

Samples of the Silicone Elastomer are taken to verify that the material is suitable for installation.

- a) Two samples are made in two disposable sample cups supplied by Quality Control Personnel. These two samples shall be made for each lot/batch of Silicone Elastomer used in the dispensing unit (also for lettered batches). These two sample cups must be filled sufficiently to assure that cured samples are at or above the top of the sample cups.
- b) The lot/batch number, installer's initials, and date shall be affixed on the two sample cups by the installer. These two samples are for Quality Control and shall be properly stored until turned over to Quality Control Personnel, normally at the end of the shift.
- c) The field installer shall evaluate one of these samples prior to installation activities. This sample shall be flush with sample cup top. Using a gram scale, weigh the sample to the nearest 1/10 of a gram. This weight is recorded on the Field Data Sheet and should be within the following acceptable tolerances:

70-95 lbs. per cubic foot, unless otherwise specified.

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Technical Approvals As Required:

By: *[Signature]* Date: 6-25-83

By: *[Signature]* Date: 6-25-83

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Should the sample weight not be acceptable, Quality Control Personnel are to be contacted immediately and work shall not proceed.

9.3.8 During Silicone Elastomer installation, the QC Inspector shall perform in-process inspections at random stages of the installation process. During these inspections, the QC Inspector shall observe specific installation procedures such as cleanliness, spreading of electrical cables, proper use of the Field Data Sheet, etc.. These inspections shall be documented on the applicable Field Data Sheet using the "REMARKS" column to indicate any instructions for re-processing of a penetration to correct in-process deficiencies. Upon satisfactory completion of required re-processing, the QC Inspector shall initial and date the re-processing noted previously on the Field Data Sheet as being complete.

9.3.9 Installation of the Silicone Elastomer shall be accomplished as follows:

- a) Prior to installation, individual silicone components shall be thoroughly mixed using a drill motor and mixing paddle.
- b) The individual components, A and B, shall now be mixed together in one container at a ratio of 1:1 by weight or volume using a heavy duty mixer motor and mixing head for approximately two minutes. If a dispensing unit is used, the A and B components are not mixed together but are poured into separate holding tanks in the dispensing unit, or are pumped directly from the material containers, as applicable.
- c) If dispensing units are used, consult the applicable instruction manuals as required - PROPRIETARY.
- d) Samples shall now be prepared and evaluated per 9.3.7 above.
- e) Install the Silicone Elastomer into the penetration by using the dispensing unit, hand pouring or pumping as the field condition dictates. WATCH FOR LEAKAGE!
- f) Installed Silicone Elastomer shall be allowed to cure for a minimum of twenty-four hours at which time all damming shall be removed, as applicable, and excess material removed and the penetration seal trimmed flush with wall or floor surface.
- g) General good housekeeping shall be maintained at all times.

9.3.10 Alterations for additions to or deletions from previously sealed penetrations can be made by carefully cutting out enough Silicone Elastomer to permit the addition or deletion, or by using core boring equipment if space allows. In either case, extreme

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Technical Approvals As Required:

QA Approval By: *[Signature]* Date: 6-28-83

6-28-83

*[Signature]*

Date

Initial

Date

Initial

Date

Initial

Date

Initial

Date

Initial

Date

Initial

Date

Initial



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caution must be exercised when making alterations to avoid damage to any penetrating items (i.e.; cables, instrument tubing, etc.) to surrounding seal material. The added opening should be made straight through the seal and made only slightly larger than the item to be added. Deletions should be carefully pulled out and only a minimal amount of Silicone Elastomer should be removed in order to facilitate the deletion.

- 9.3.11 Minor repairs are permissible by removing a small portion (1"-2") of the surrounding Silicone Elastomer to provide a good, clean surface for the new Silicone Elastomer to bond to. Prepare, sample, and seal the altered area following the instructions outlined in 9.3.6 through 9.3.9 above.
- 9.3.12 Permanent identification of completed penetration seals is performed by production personnel and must be done prior to final inspection by Quality Control Personnel. The method for identification may be accomplished by any of the following methods or as specified by the customer:
- a) Hand printed next to the opening using a waterproof flow marker.
  - b) Stenciled next to the opening using paint applied by brush, roll, or spray.
  - c) Steel tags attached with adhesive next to the opening.
- 9.3.13 Quality Control Personnel shall perform final inspection of the completed seals when released by production for inspection activities. Items to be considered during final inspection shall be a minimum of the following:
- a) Temporary damming, where applicable, is totally removed and disposed of.
  - b) Temporary supports, where applicable, such as duct tape, wood shims, etc., have been removed and disposed of.
  - c) Seals are neatly trimmed where applicable to floor, wall, ceiling, and penetration surfaces.
  - d) Penetration fill is sufficient to completely fill or overfill the penetration to the specified fill depth, and no visible voids or openings exist. Seal material is cured (no wet or tacky material is present).
  - e) The proper materials were used for the sealing, damming, and identification of the penetration.

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- f) Permanent identification is affixed near the penetration and is correct and is acceptably attached.
- g) Work location is clean.
- h) The dispersion of Silicone Elastomer around the cables in the penetration shall be inspected. If the Silicone Elastomer is not dispersed between the cables in a penetration, the seal shall be repaired per Section 9.3.11.

9.3.14 Quality Control Personnel shall inspect the samples of Silicone Elastomer supplied to them by production (9.3.7b). One sample shall be cut open and examined for:

- a) Color - Dark gray to black (this may vary based on additives used)
- b) Cell structure - Uniform and free from elongated cells
- c) Texture - Solid, set, firm, with no tackiness.

Acceptable comparison samples shall be available for the Quality Control Inspector to reference for an acceptable Silicone Elastomer product. This inspection shall be documented on the QC Sample Inspection Record (Figure 3). The second sample shall be flush with the top of the sample cup and weighed on the gram scales. The sample density shall then be determined and documented per PSQAP 10.1.

9.3.15 Upon acceptance of the completed Silicone Elastomer seal and testing samples, the final inspection activity (per this procedure and 10.1) is documented on the Field Takeoff, Installation, and Inspection Record indicating, among other information, the date accepted and the inspector's initials. If the inspection results in a rejection status, a Report of Nonconformance is issued and the penetration is tagged with a "Reject" tag per PSQAP 15.0. The Field Takeoff, Installation, and Inspection Record is not initialled until all nonconformances have been resolved and corrective action completed and accepted.

#### 4. DOCUMENTS/RECORDS

- 9.4.1 The nonpermanent documents applicable to this procedure are the "Field Data Sheet" and the "QC Sample Inspection Record".
- 9.4.2 The permanent document applicable to this procedure is the "Field Takeoff, Installation, and Inspection Record".

INFORMATION ONLY

Technical Approvals As Required:

Approval By: *Allen B. Ruff*  
Signature: *Allen B. Ruff*  
Date: 6-28-83

Approval By: *[Signature]*  
Signature: *[Signature]*  
Date: 6-28-83

SPECIAL PROCESSES - SILICONE ELASTOMER

Revision 1

### FIELD THERMOFF INSTALLATION AND INSPECTION RECORD

Transco Products Inc.

## MATERIALS

17 JAN 1971

25

Y. NIV/2007

OLD FASHION TAILOR.

[illegible]

CUSTOMER ACCEPTANCE:  
(IF REQUIRED)

SIGNATURE

DATE \_\_\_\_\_

PAKISTAN

INITIAL

DATE \_\_\_\_\_

Figure 1

**INFORMATION ONLY**



FIELD DATA SHEET

Weight of Sample (grams)

Figure 2

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Transco Products Inc.

QC SAMPLE  
INSPECTION RECORD

SITE:

[illegible]

INFORMATION ONLY

Figure 3

Attachment "E"  
Test Report: #TR-194  
Revision: 0  
Date: 03/25/85  
Page: 1 of 12

ATTACHMENT "E"  
QC INSPECTION RECORDS:

The following pages consist of the Quality Control records for this test. These records are:

- a.) Receiving Inspection Reports: ..... 2 pages
- b.) Field Take-Off, Installation, and Inspection  
Record: ..... 1 page
- c.) Batch Sample Density Measurement Records: ..... 1 page
- d.) Field Data Sheets: ..... 1 page
- e.) QC Sample Inspection Record: ..... 1 page
- f.) Handwritten notes regarding specimen fabrication,  
cable loadings, etc.: ..... 2 pages
- g.) Mapping of thermocouple layouts: ..... 3 pages

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10

Date: 2/27/85.

Amount

Remarks:

**INFORMATION ONLY**

☐ Creator ☐ Jacksonville ☒ P.C.A. ☐ ☐ ☐

Supplier: TRANSO PRODUCTS INC., BYRON N.P.S. Purchase Order: N/A (SEE COMPOSITION RECORDS) FROM BYRON

Item: MEDIUM DENSITY SILICONE Quantity: 6 DRUMS Date: 1-4-85

☐ Prepaid ☐ Collect Amount: \_\_\_\_\_

Qty. received	Description	Certification of Conformance	Mill Test Report	Heat/Lot/Batch Number	Physical Appearance	Check Analysis required
2	55 GAL DRUMS (PRE-MIXED) MDS	YES	N/A	052 (A { B)	GOOD	N/A
2	" " " "	YES	N/A	053 (A { B)	"	
2	" " " "	YES	N/A	054 (A { B)	"	

Remarks: FOR TEST NOS. TR-158 { TR-169  
 AVERAGE CUP WT. = 10 GRAMS  
 " CUP VOL. = 295 ML

Check analysis submitted on    /    /    Receipt Inspection Considered Acceptable  
 Job No.     
 Rev. 0     
**INFORMATION ONLY**  
Ramon P. Tancin 1-4-85  
 Quality Representative/Doc





# RANSCO PRODUCTS INC.

## BATCH SAMPLE DENSITY MEASUREMENT RECORD

Gram Scale  
Serial No. \_\_\_\_\_

Material MDS  
Density > 90 lbs/ft<sup>3</sup>

INSPECTOR  
INITIAL \_\_\_\_\_ DATE \_\_\_\_\_

ATCH NUMBER	COMBINED WEIGHT (grams)	CUP WEIGHT (grams)	FOAM WEIGHT (grams)	CUP VOLUME (ml)	62.3 CONVERSION FACTOR	DENSITY (lbs./cu. ft.)	INSPECTOR INITIAL	DATE
052 (158)	531.2	10	521.2	295	x 62.3	110.07	RPT	1-4-8
ISO USED					x 62.3			
V TR-158					x 62.3			
MRS. TRAY A					x 62.3			
TRAY B)					x 62.3			
053 (169)	548.5	10	538.5	295	x 62.3	113.70	BSA	1-8-8
					x 62.3			
054 (180)	538.4	10	528.4	295	x 62.3	111.59	BSA	1-10-8
					x 62.3			
054 (193)	529.9	10.5	519.4	300	x 62.3	107.86	BSA	3/13/8
					x 62.3			
054 (194)	524.9	10.5	514.4	300	x 62.3	106.82	BSA	3/13/8
					x 62.3			
					x 62.3			
					x 62.3			
					x 62.3			
					x 62.3			

INFORMATION ONLY

Transco Products Inc.

FIELD DATA SHEET

JOE # 4622

MILLSTONE UNIT #3

INSTALLER(S) BOP EAST - GENE VAN CLEAVE

DATE INSTALLED 3/13/85

TYPE OF SEAL (Check One):

☐ CT GYFSUM

☐ SILICONE FOAM (MEDIUM DENSITY)  
☒ RADIATION SHIELDING SILICONE (10.731 PCF)  
(HVL)

TRANSBOND 150M

[illegible]



TRANSCO PRODUCTS INC.

Q C SAMPLE

## INSPECTION RECORD

SITE: P.C.A. (FIRE RESEARCH)

[illegible][illegible]

TEST # TR-194

- 1) All materials, dimensions, cable loadings and element locations for TR-194 were in accordance with Attachment 'A' and appendix 'A'.
- 2) Seal installation was in accordance with the latest revision of PSQAP installation procedure approved for use at Millstone Unit 3.
- 3) All thermocouple placements and locations were correct.
- 4) Final inspection of # TR-194 showed every detail to be correct.

signed Brian Alexander  
Quality Assurance Inspector

date 3/18/85

INFORMATION ONLY

## Fire Hose Stream Test

- 1) ANI 75 psi through 1.5" dia hose equipped with a fog nozzle set at a discharge angle of  $15^{\circ}$  from a distance of 10 ft. for 24 sec.

The above details of test TR-194 were correct.  
Correct measurements of 10 ft and 24 sec were taken

signed Brian Alexander  
Quality Assurance Inspector  
date 3/18/85

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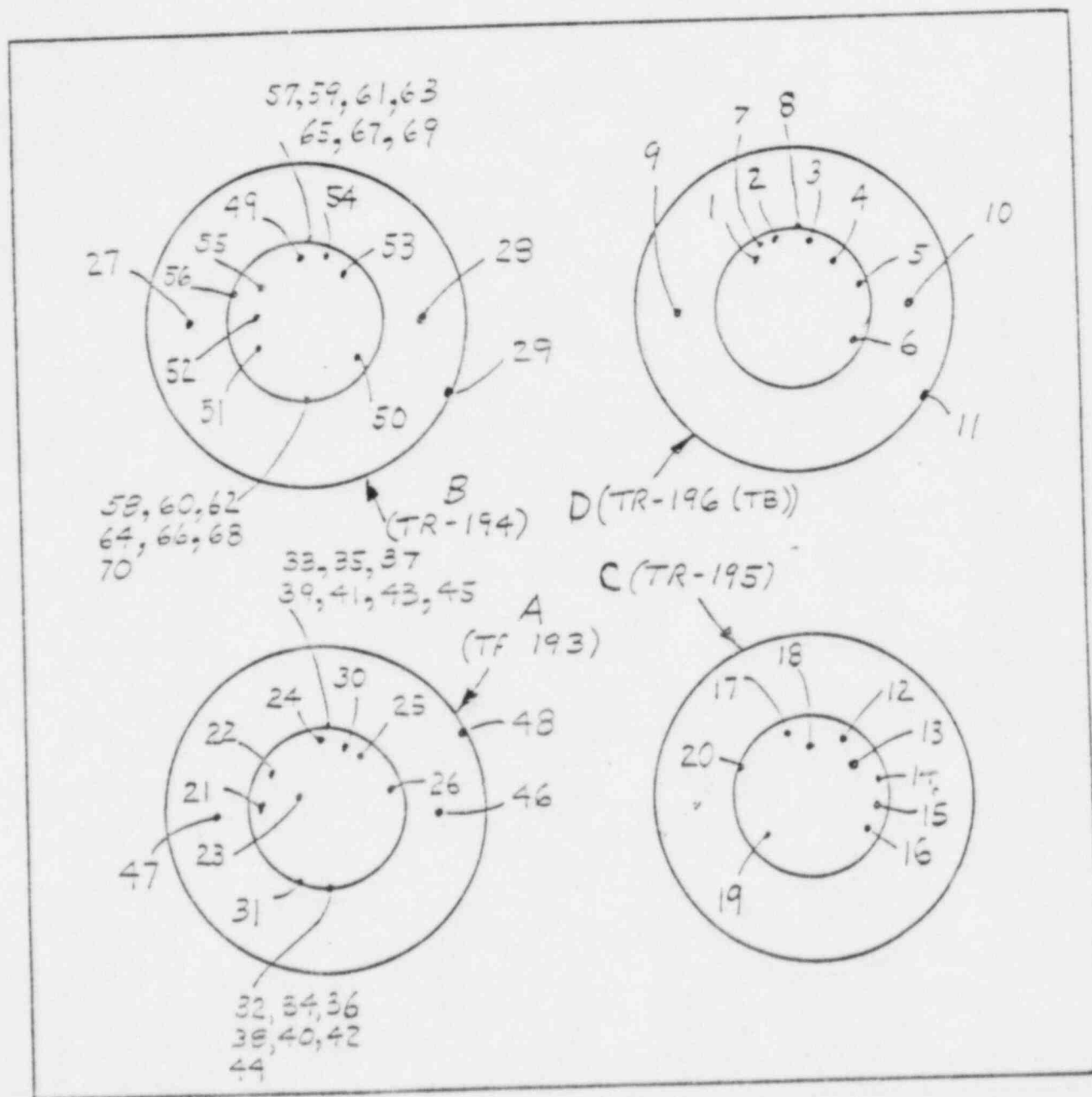
INFORMATION ONLY

# CONSTRUCTION TECHNOLOGY LABORATORIES

A Division of the PORTLAND CEMENT ASSOCIATION  
5400 Old Orchard Road, Skokie, Illinois 60077 Area Code 312 965-7500

Project \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_  
Initials \_\_\_\_\_ Date \_\_\_\_\_  
Checked \_\_\_\_\_ Date \_\_\_\_\_ Revised \_\_\_\_\_ Date \_\_\_\_\_

Title TR-193, TR-194, TR-195, TR-196



INFORMATION ONLY

- A-TR-193 ALUM CONDUIT (EXT. 40" ABOVE SEAL) 8" MOSE IN COND., 8" MOSE IN ANNULAR SPACE
- B-TR-194 STEEL CONDUIT (EXT. 40" ABOVE SEAL) 8" MOSE IN COND., 8" MOSE IN ANNULAR SPACE
- C-TR-195 12" SILICONE FOAM IN COND., 12" GROUTED SEAL IN ANNULAR SPACE.
- D-TR-196 TRANSBOND IN COND.,

1/2	MEMBER	DESCRIPTION
1	D	1 7/8 #12
2	D	7/8 #14
3	D	SIS #4
4	D	1/2 MCM 500
5	D	1/2 #14
6	D	1/2 MCM 350
7	D	SEAL SURFACE
8	D	CONDUIT & SEAL INT.
9	D	ANNULAR SPACE SURF.
10	D	ANNULAR SPACE SURF.
11	D	ANNULAR SPACE SEAL & OUTER COND. INT.
12	C	1 7/8 #12
13	C	5/8 #10
14	C	9/8 #14
15	C	10 TW PR #18
16	C	1/2 #14
17	C	ALS
18	C	TRIAX
19	C	SEAL SURFACE
20	C	SEAL & CONDUIT INT.
21	A	SIS #4
22	A	ALS
23	A	9/8 #14
24	A	1/2 #14
25	A	10 TW PR #18
26	A	TRIAX
27	B	ANNULAR SEAL SURFACE
28	R	ANNULAR SEAL SURFACE

7/8	MEMBER	DESCRIPTION
29	B	ANNULAR SEAL & COND. INT.
30	A	SEAL SURFACE
31	A	CONDUIT & SEAL INT.
32	A	ANNULAR SPACE SEAL & INNER COND. INT.
33	A	ANNULAR SPACE SEAL & INNER COND. INT.
34	A	6" FROM BOTTOM ON COND.
35	A	6" FROM BOTTOM ON COND.
36	A	12" FROM BOTTOM ON COND.
37	A	12" FROM BOTTOM ON COND.
38	A	18" FROM BOTTOM ON COND.
39	A	18" FROM BOTTOM ON COND.
40	A	24" FROM BOTTOM ON COND.
41	A	24" FROM BOTTOM ON COND.
42	A	30" FROM BOTTOM ON COND.
43	A	30" FROM BOTTOM ON COND.
44	A	36" FROM BOTTOM ON COND.
45	A	36" FROM BOTTOM ON COND.
46	A	ANNULAR SEAL SURFACE
47	A	ANNULAR SEAL SURFACE
48	A	ANNULAR SEAL & COND. INT.
49	B	SIS #4
50	B	ALS
51	B	9/8 #14
52	B	1/2 #14
53	B	10 TW PR #18
54	B	TRIAX
55	B	SEAL SURFACE
56	R	SEAL & CONDUIT INT.

INFORMATION ONLY

T/C	MEMBER	DESCRIPTION
57	B	ANNULAR SPACE SEAL & INNER COND. INT.
58	B	ANNULAR SPACE SEAL & INNER COND. INT.
59	B	6" FROM BOTTOM ON COND,
60	B	6" " " "
61	B	12" " " "
62	B	12" " " "
63	B	18" " " "
64	B	18" " " "
65	B	24" " " "
66	B	24" " " "
67	B	30" " " "
68	B	30" " " "
69	B	36" " " "
70	B	36" " " "

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