

Test Report: #TR-193

Revision: 0

Date: 03/25/85

Transco Products Inc. Test Report: #TR-193

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 aluminum 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: 3/29/85

Gregory J. Jarosz
Manager of Technical Development
Transco Products Inc.

QC Approval by:

Brian Alexander Date: 3/29/85

Brian Alexander
Quality Control

FOR INFORMATION ONLY

8509160392 850829
PDR ADOCK 05000423
F PDR

INFORMATION ONLY

TABLE OF CONTENTS:

Section "A", Synopsis:	Page	1	
Section "B", Test Slab:	Page	2	
Section "C", Penetrating Elements:	Pages	2	- 3
Section "D", Seal Installation:	Page	4	
Section "E", Thermocouples:	Page	5	
Section "F", Test:	Page	6	
Section "G", Hose Stream Tests:	Page	7	
Section "H", Laboratory Notes and Data:	Pages	8	- 14
Section "I", Post Test Observations:	Page	15	
Attachment "A", Specimen Drawings:	Page	1	of 1
Attachment "B", Furnace Drawings:	Pages	2	of 2
Attachment "C", Thermocouple Map:	Page	1	of 1
Attachment "D", Seal Installation Procedure:	Pages	8	of 8
Attachment "E", QC Installation Records:	Pages	12	of 12

INFORMATION ONLY

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 aluminum 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 test performed for informational purposes).

The penetrating element used in this test was arranged as shown in Attachment "A". The single piece aluminum 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 aluminum 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 portions 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. "Cerawool") 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 21-26, and 31 were tied with brass wire to their respective items at the seal/item interfaces. Seal surface thermocouples 30, 46, and 47 (along with sleeve thermocouple 48) were laid onto their respective surfaces and weighted for contact.

Thermocouples 32 through 45 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.:
21	1/C #14 (SIS) cable:	161
22	5/C #12 (ALS) cable:	170
23	9/C #14 (BIW) cable:	160
24	1/C #14 cable:	T/C malfunction
25	10 pr. #18 cable:	148
26	Triax cable:	192
30	Conduit seal surface:	144
31	Conduit (unexposed end):	161
32	Conduit (0" from sur. seal surface):	627
33	Conduit (0" from sur. seal surface):	668
34	Conduit (6" from sur. seal surface):	454
35	Conduit (6" from sur. seal surface):	475
36	Conduit (12" from sur. seal surface):	334
37	Conduit (12" from sur. seal surface):	354
38	Conduit (18" from sur. seal surface):	267
39	Conduit (18" from sur. seal surface):	271
40	Conduit (24" from sur. seal surface):	224
41	Conduit (24" from sur. seal surface):	227
42	Conduit (30" from sur. seal surface):	192 (cont.)

SECTION "E" (cont.)
THERMOCOUPLES:

T/C #:	Description:	Degrees F at 3 Hrs.:
43	Conduit (30" from sur. seal surface): 196
44	Conduit (36" from sur. seal surface): 165
45	Conduit (36" from sur. seal surface): 171
46	Surrounding seal surface: 303
47	Surrounding seal surface: 269
48	Sleeve: 118

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.

No smoke or other occurrences were noted during the test except for slight expansion (approximately 1/4") of the seal material beginning at about one hour and ten minutes into the test.

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.

INFORMATION ONLY

CR5573 - TRANSCO TR193 - 03/16/85

TEST COMMENTS

0:02:00 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 .00 NEG.

SMOKE CLASS L

PEN A = TR196

PEN B = TR195

PEN C = TR193

PEN D = TR194

INFORMATION ONLY

CR5573 - TRANSCO TR193 - 03/18/85
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	1550	1550	0
0:35	1593	1584	9
0:40	1605	1613	-8
0:45	1620	1638	-18
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 %

INFORMATION ONLY

CR5573 - TRANSCO TR193 - 03/18/85
UNEXPOSED TEMP. READINGS (DEG. F.)

TEST TIME, Hr:Min	T/C NO.					
	19	20	21	22	23	24
0:00	71	70	72	71	71	72
0:05	71	70	71	71	71	72
0:10	71	70	71	71	71	72
0:15	71	70	73	72	71	71
0:20	72	71	75	74	72	69
0:25	73	72	79	77	72	67
0:30	75	73	84	81	74	65
0:35	77	75	89	86	75	63
0:40	79	77	93	90	78	61
0:45	83	80	98	95	81	61
0:50	86	84	102	99	85	57
0:55	90	88	105	103	88	57
1:00	94	93	108	107	92	54
1:05	99	99	111	110	96	53
1:10	105	105	114	114	100	52
1:15	109	112	117	117	103	52
1:20	114	116	120	120	107	50
1:25	119	124	123	124	110	46
1:30	123	131	125	127	113	51
1:35	128	138	127	130	116	47
1:40	132	144	130	133	120	44
1:45	138	151	133	135	123	49
1:50	141	158	134	138	126	46
1:55	145	164	137	141	129	43
2:00	150	171	139	143	131	45
2:10	159	182	142	148	137	42
2:20	166	193	146	153	142	41
2:30	174	202	150	158	147	41
2:40	178	210	154	162	151	41
2:50	181	217	158	167	156	39
3:00	190	223	161	170	160	41

INFORMATION ONLY

CR5573 - TRANSCO TR193 - 03/18/85
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	80	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	126
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	186	260	261	387	138
2:50	145	190	268	269	395	142
3:00	148	192	276	281	408	144

INFORMATION ONLY

CR5573 - TRANSCO TR193 - 03/18/85
UNEXPOSED TEMP. READINGS (DEG. F.)

TEST TIME, Hr:Min	T/C NO.					
	31	32	33	34	35	36
0:00	72	70	70	71	71	71
0:05	71	98	111	79	83	74
0:10	71	156	178	112	122	91
0:15	73	222	248	160	175	124
0:20	77	275	294	200	214	149
0:25	82	311	329	228	241	168
0:30	87	342	361	252	264	184
0:35	93	368	389	271	285	197
0:40	97	388	410	287	299	207
0:45	102	407	421	300	310	216
0:50	106	423	437	309	319	221
0:55	109	435	450	318	328	227
1:00	112	447	464	327	339	234
1:05	115	457	477	334	348	238
1:10	117	470	490	342	355	245
1:15	120	486	501	350	364	250
1:20	123	483	510	356	371	255
1:25	126	486	520	364	378	262
1:30	128	491	529	369	385	264
1:35	130	499	540	376	392	270
1:40	133	509	550	383	399	275
1:45	134	519	561	391	407	282
1:50	136	527	571	395	414	284
1:55	138	537	586	404	419	290
2:00	140	542	604	408	426	295
2:10	144	556	620	421	437	304
2:20	147	588	634	429	448	312
2:30	151	604	648	438	457	319
2:40	155	618	661	447	466	325
2:50	158	624	664	452	470	331
3:00	161	627	668	454	475	334

INFORMATION ONLY

CR5573 - TRANSOCO TR193 - 03/18/85
UNEXPOSED TEMP. READINGS (DEG. F.)

TEST TIME, Hr:Min	T/C NO.					
	37	38	39	40	41	42
0:00	71	71	71	71	71	71
0:05	74	73	72	72	72	72
0:10	95	85	80	77	75	74
0:15	131	112	102	96	90	86
0:20	155	128	121	110	107	96
0:25	173	140	135	122	121	106
0:30	189	153	147	133	131	116
0:35	204	161	156	140	137	122
0:40	215	167	164	144	143	127
0:45	223	0	170	150	147	131
0:50	230	180	176	153	151	134
0:55	237	184	180	155	154	136
1:00	244	189	185	159	158	140
1:05	251	193	190	162	161	143
1:10	258	199	194	165	165	145
1:15	264	201	199	169	168	149
1:20	270	206	203	173	172	152
1:25	275	211	208	176	175	155
1:30	281	209	212	179	179	158
1:35	286	212	216	182	182	159
1:40	292	217	221	184	186	160
1:45	297	221	225	188	188	164
1:50	302	223	228	189	191	165
1:55	307	228	231	193	193	167
2:00	311	232	235	195	196	169
2:10	320	239	243	200	202	172
2:20	330	247	251	206	209	177
2:30	337	253	257	212	214	181
2:40	344	258	263	216	219	185
2:50	349	263	268	221	223	189
3:00	354	267	271	224	227	192

INFORMATION ONLY

CR5573 - TRANSCO TR193 - 03/18/85
UNEXPOSED TEMP. READINGS (DEG. F.)

TEST TIME, Hr:Min	T/C NO.					
	43	44	45	46	47	48
0:00	71	71	71	70	70	70
0:05	71	71	71	70	70	70
0:10	73	72	72	73	71	74
0:15	83	75	75	81	75	74
0:20	95	82	81	90	82	75
0:25	107	88	87	102	90	76
0:30	116	96	94	114	100	78
0:35	122	102	100	126	110	80
0:40	127	106	105	137	119	79
0:45	131	110	110	150	128	81
0:50	134	114	114	162	137	84
0:55	136	116	116	171	146	91
1:00	139	119	119	182	155	90
1:05	142	122	122	191	163	96
1:10	145	124	125	199	170	96
1:15	149	126	128	207	180	97
1:20	152	130	131	215	185	101
1:25	155	132	134	223	194	93
1:30	158	135	137	225	201	100
1:35	160	137	139	232	205	107
1:40	162	139	141	241	214	98
1:45	164	141	143	246	216	109
1:50	166	142	145	246	223	105
1:55	168	143	147	253	230	99
2:00	170	145	149	256	228	112
2:10	175	148	153	273	242	108
2:20	180	152	157	273	246	116
2:30	185	155	161	288	253	114
2:40	189	159	165	293	261	109
2:50	193	163	168	301	266	117
3:00	196	165	171	303	269	118

INFORMATION ONLY

INFORMATION ONLY

Test Report: #TR-193
Revision: 0
Date: 03/25/85
Page: 15 of 15

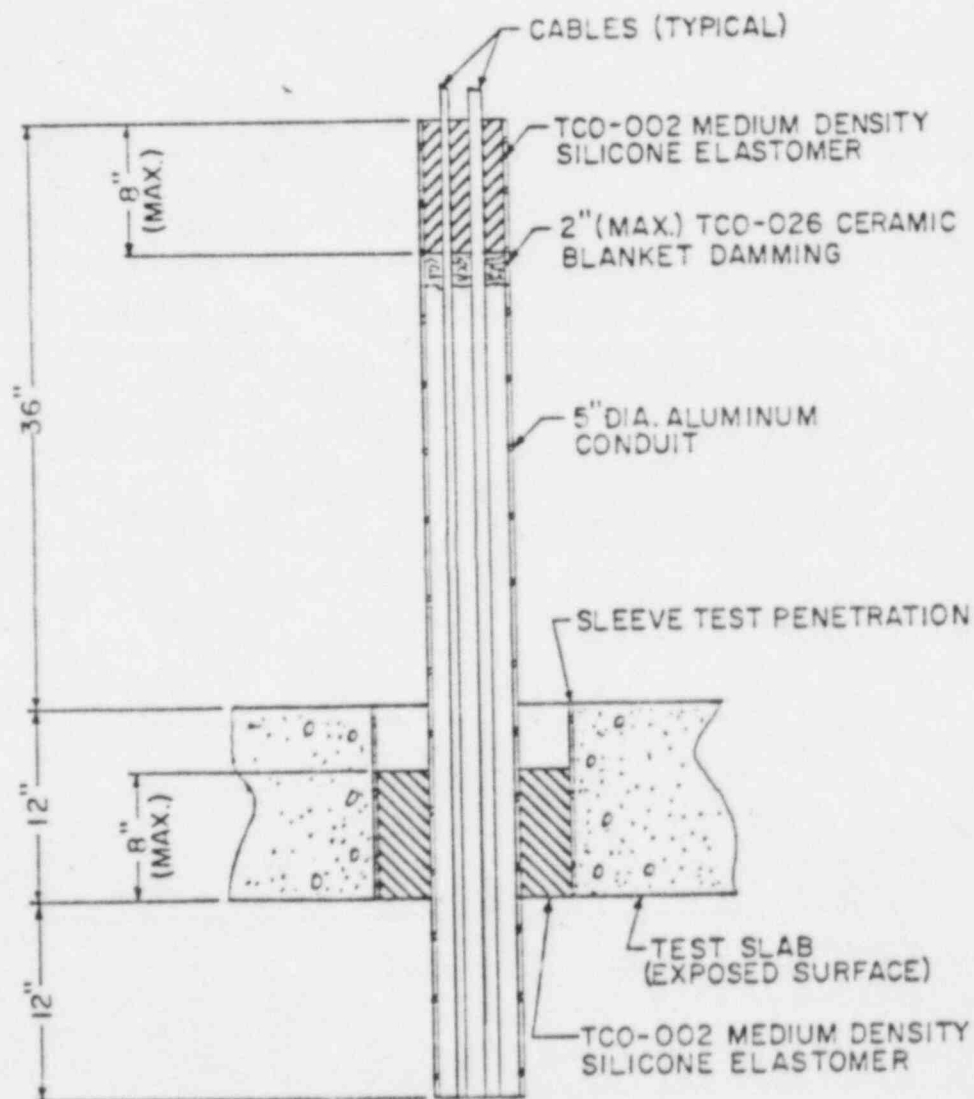
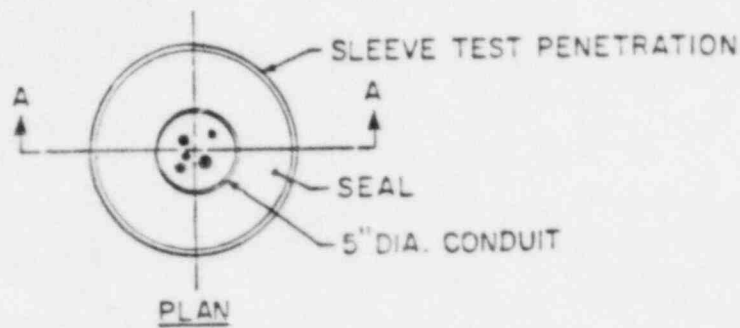
SECTION "I"
POST TEST OBSERVATIONS:

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 had burned away up to this point. No other damage was noted to the conduit beyond this point.

No damage was noted to the specimen on its unexposed surface. The exposed surface of the seal had formed a hard char layer approximately 3" deep into the seal.

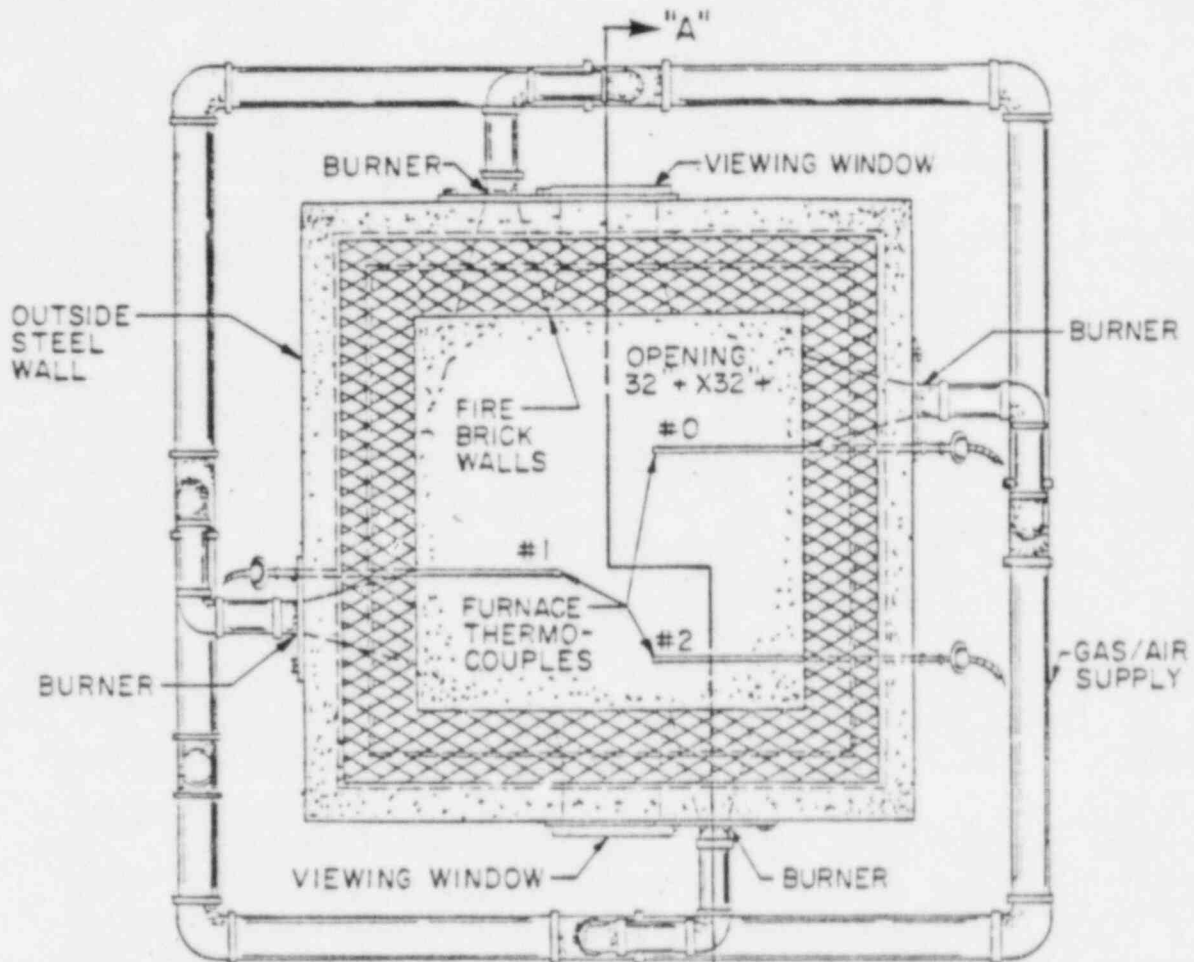
The conduit seal and seal surrounding it passed both the fire and hose stream tests and met the performance requirements of ANI and IEEE 634.

INFORMATION ONLY

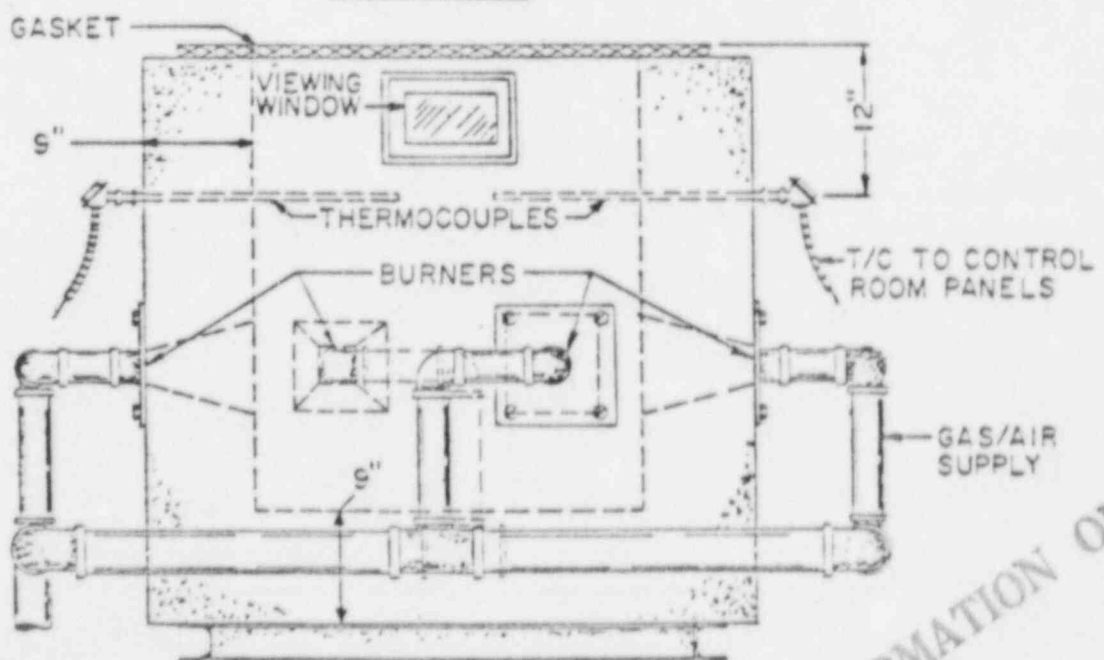


SECTION "A-A"
TEST # TR-193
TCO-002 MEDIUM DENSITY
SILICONE ELASTOMER SEAL FOR
ALUMINUM CONDUIT

INFORMATION ONLY

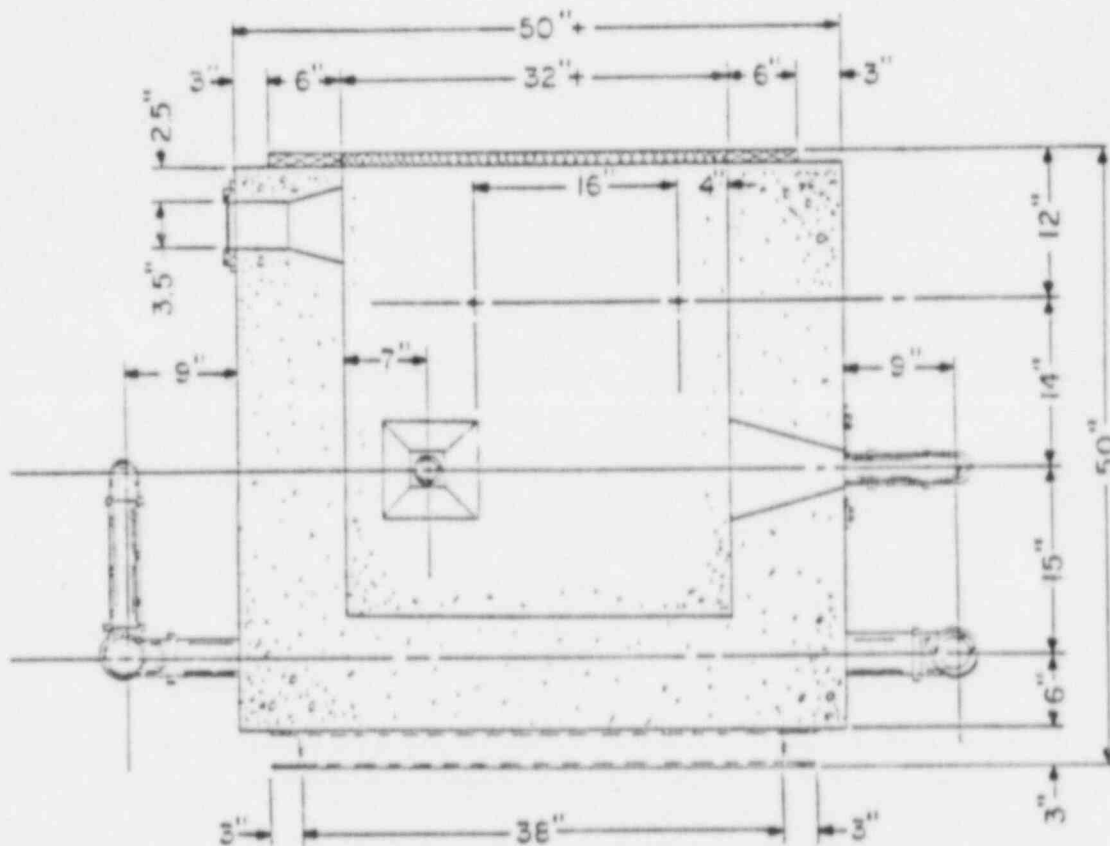


PLAN VIEW



ELEVATION VIEW
 OF FURNACE

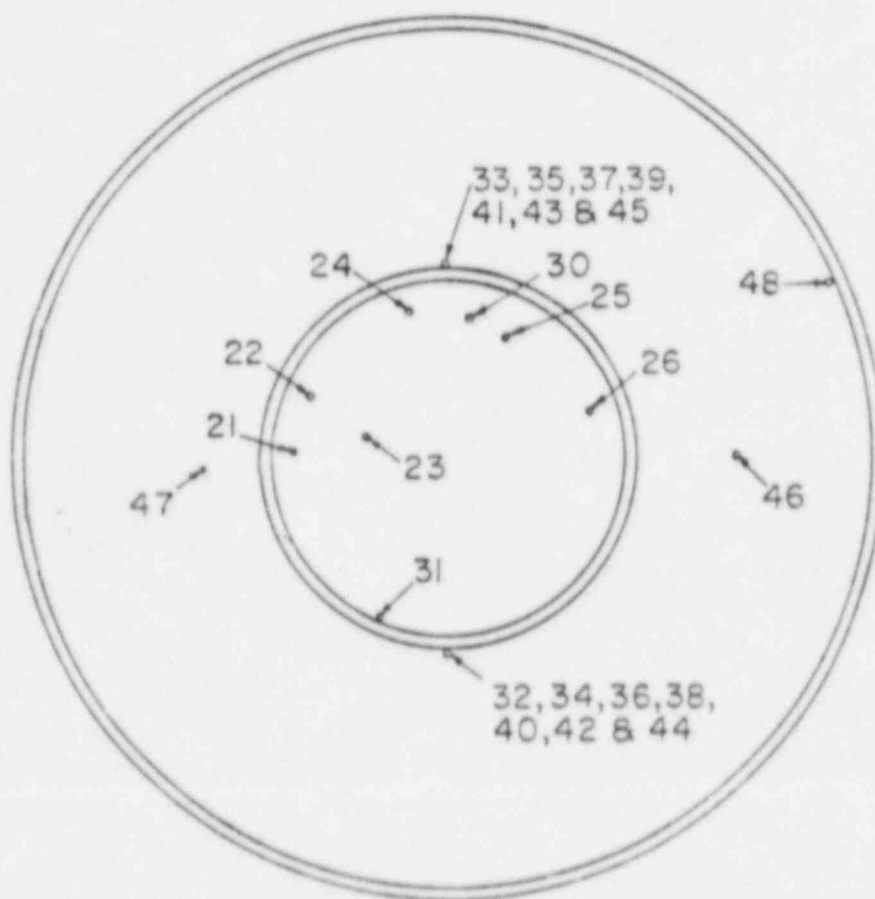
INFORMATION ONLY



SECTION "A-A"
OF FURNACE

INFORMATION ONLY

THERMOCOUPLE MAP



TEST #TR-193

T/C #	DESCRIPTION
21	SIS #4
22	ALS
23	9/C #14
24	I/C #14
25	IO TW PR #18
26	TRIA
30	SEAL SURFACE
31	CONDUIT
32	CONDUIT (0" UP FROM SURROUNDING SEAL)
33	" " " " " "
34	6" FROM BOTTOM ON CONDUIT
35	" " " " " "
36	12" " " " " "
37	" " " " " "
38	18" " " " " "
39	" " " " " "
40	24" " " " " "
41	" " " " " "
42	30" " " " " "
43	" " " " " "
44	36" " " " " "
45	" " " " " "
46	ANNULAR SEAL SURFACE
47	" " " " " "
48	SLEEVE

INFORMATION ONLY

TITLE:

SPECIAL PROCESSES - SILICONE ELASTOMER

No. PSQAP 9.10

Page 1 of 8

Revision 1

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

INFORMATION ONLY

TITLE:

SPECIAL PROCESSES - SILICONE ELASTOMER

No. PSQAP 9.10
Page 2 of 8
Revision 1

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.

INFORMATION ONLY

Technical Approvals As Required:

6-25-83 Date

6-25-83 Date
Signature

6-25-83 Date

Signature

TITLE:

SPECIAL PROCESSES - SILICONE ELASTOMER

No. PSQAP 9.10

Page 3 of 8

Revision 1

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

Technical Approvals As Required:

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

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

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

INFORMATION ONLY

TITLE:

SPECIAL PROCESSES - SILICONE ELASTOMER

No. PSQAP 9.10

Page 4 of 8

Revision 1

caution must be exercised when making alterations to avoid damage to any penetrating items (i.e.; cables, instrument tubing, etc.) or 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:
- Hand printed next to the opening using a waterproof flow marker.
 - Stenciled next to the opening using paint applied by brush, roll, or spray.
 - 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:
- Temporary damming, where applicable, is totally removed and disposed of.
 - Temporary supports, where applicable, such as duct tape, wood shims, etc., have been removed and disposed of.
 - Seals are neatly trimmed where applicable to floor, wall, ceiling, and penetration surfaces.
 - 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).
 - The proper materials were used for the sealing, damming, and identification of the penetration.

Technical Approvals As Required:

QA Approval By *Allen D. Rapp* Date *6-28-83*
Signature

Frank Date *6-28-83*
Signature

INFORMATION ONLY

TITLE:

SPECIAL PROCESSES - SILICONE ELASTOMER

No. PSQAP 9.10

Page 5 of 8

Revision 1

- 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 grey 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.

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:

Signature: *Allen B. Ruff* Date: 6-18-83

Signature: *[Signature]* Date: 6-18-83

INFORMATION ONLY

SPECIAL PROCESSES - SILICONE ELASTOMER

Transco Products Inc.

FIELD DATA SHEET

JOE NO. _____
 INSTALLER _____
 LOT/BATCH NO. _____
 DATE INSTALLED _____

TYPE OF SEAL (Check One)

☐ CT GYPSUM

☐ SILICONE FOAM
☐ RADIATION SHIELDING SILICONE (1 PCF)
☐ SILICONE ELASTOMER
☐ TRANSBOND 50M
☐ TRANSBOND 150M

Weight of Sample (grams) _____

[illegible]

Technical Approvals As Required:

Dr. Approval: Dr. J. L. Smith Date: 12-8-83

6-28-35
D.S.

Figure 2

INFORMATION ONLY

ATTACHMENT "E"
QC INSPECTION RECORDS:

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

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

INFORMATION ONLY.

☐

1263

Quantity: 2 CARTONS
6 CARTRIDGES
EACH 10.302

Date: 2/27/85

☐ Collect

Amount

Brian Alexander 2/27/85
Quality Representative/Date

TRANSOCO PRODUCTS INC.
☐ Creator ☐ Jacksonville ☒ P.C.A. ☐

Supplier: TRANSOCO PRODUCTS INC., BYRON N.P.S. FROM BYRON
Item: MEDIUM DENSITY SILICONE Purchase Order: N/A (SEE COMPOSITION RECORD)
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

MATERIAL: MEDIUM DENSITY SILICONE

SITE	P.C.A. FACILITY	ROOM/AREA	FIRE RESEARCH	ELEVATION
1	2	3	4	5

[illegible]

INFORMATION ONLY.

:Y8 J403

CUSTOMER ACCEPTANCE:

TRANSCO PRODUCTS INC.

BATCH SAMPLE DENSITY MEASUREMENT RECORD

Rev. 0

Gram Scale ☐
Serial No. _____

Material MDS
Density > 90 lbs/ft³

INSPECTOR _____ DATE _____
INITIAL _____

BATCH NUMBER	COMBINED WEIGHT (grams)	CUP WEIGHT (grams)	FOAM WEIGHT (grams)	CUP VOLUME (ml)	62.3 CONVERSION FACTOR	DENSITY (lbs./cu.ft.)
<u>052</u> <u>TR-158)</u> <u>ALSO USED</u> <u>IN TR-158</u> <u>PAIRS - TRAY A</u> <u>VD TRAY B)</u>	<u>531.2</u>	<u>10</u>	<u>521.2</u>	<u>295</u>	x 62.3	<u>110.07</u>
<u>053</u> <u>R-169)</u>	<u>548.5</u>	<u>10</u>	<u>538.5</u>	<u>295</u>	x 62.3	<u>113.70</u>
<u>054</u> <u>R-180)</u>	<u>538.4</u>	<u>10</u>	<u>528.4</u>	<u>295</u>	x 62.3	<u>111.59</u>
<u>054</u> <u>R-193)</u>	<u>529.9</u>	<u>10.5</u>	<u>519.4</u>	<u>300</u>	x 62.3	<u>107.86</u>
<u>054</u> <u>R-194)</u>	<u>524.9</u>	<u>10.5</u>	<u>514.4</u>	<u>300</u>	x 62.3	<u>106.82</u>
					x 62.3	
					x 62.3	
					x 62.3	
					x 62.3	
					x 62.3	
					x 62.3	
					x 62.3	

INFORMATION ONLY

RPT

1-4-8

BSA

1-8-8

BSA

1-10-8

BSA

3/13/8

BSA

3/13/8

Transco Products Inc.

FIELD DATA SHEET

JOS # 4622

MILLSTONE UNIT #3

INSTALLER(S) BOB EATT. GENE VAN CLEAVE

DATE INSTALLED 3/13/85

TYPE OF SEAL (Check One):

☐ CT GYPSUM

☐ SILICONE FOAM

(MEDIUM DENSITY)

☐ SILICONE FORM (MEDIUM DENSITY)
☒ RADIATION SHIELDING SILICONE (107.31 PCF)
(446)

☐ TRANSBOND 150M

[illegible]

TRANSCO PRODUCTS INC.

Q C SAMPLE
INSPECTION RECORD

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

[illegible][illegible]

TEST # TR-193

- 1) Test TR-193 was specified to have High Density silicone with a height of 12" in conduit and with a height of 12" in annular space around conduit. This was changed to Medium Density with a height of 8" in conduit and with a height of 8" in annular space around conduit.
- 2) All cable loadings and element locations for TR-193 were in accordance with Attachment 'A' and Appendix 'A'.
- 3) Seal installation was in accordance with the latest revision of PSQAP installation procedure approved for use at Millstone Unit 3.
- 4) All thermocouple placements and locations were correct.
- 5) Final inspection of #TR-193 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° from a distance of 10 ft. for 24 sec.

The above details of test TR-193 were correct.
Correct measurements of 10ft and 24 sec were taken.

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

INFORMATION ONLY

CONSTRUCTION TECHNOLOGY LABORATORIES

A Division of the PORTLAND CEMENT ASSOCIATION

1400 L STREET, N.W., WASHINGTON, D.C. 20004

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

Project

Initials

Checked

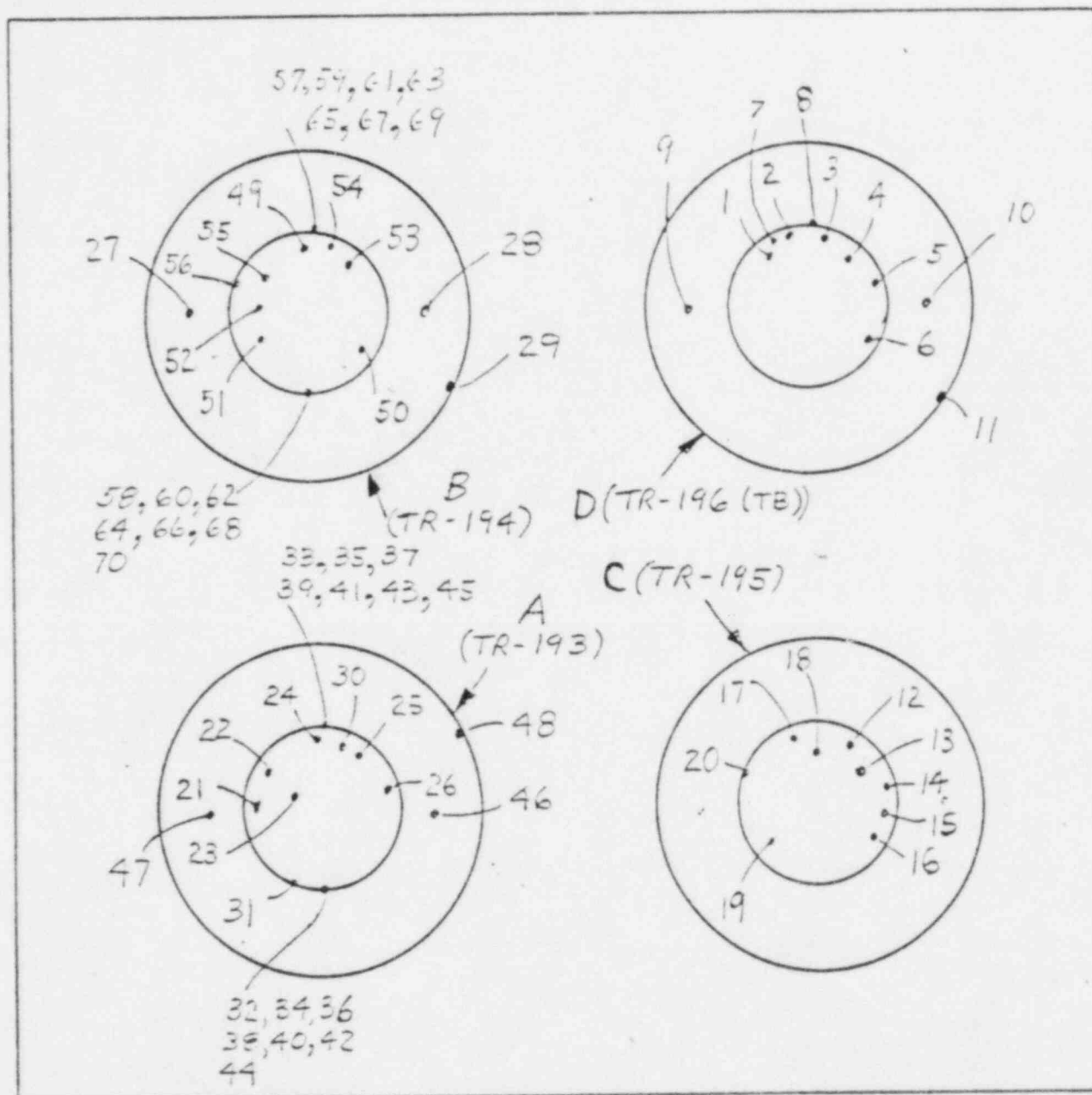
Sheet

Date

Revised

of

Date



INFORMATION ONLY

A-TR-193 ALUM CONDUIT (EXT. 40" ABOVE SEAL) 8" MDSE IN COND., 8" MDSE IN ANNULAR SPACE

B-TR-194 STEEL CONDUIT (EXT. 40" ABOVE SEAL) 8" MDSE IN COND., 8" MDSE IN ANNULAR SPACE

C-TR-195 12" SILICONE FOAM IN COND., 12" GROUTED SEAL IN ANNULAR SPACE.

D-TR-196 TRANSBOND IN COND., TRANSBOND IN ANNULAR SPACE

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 B ANNULAR SEAL SURFACE

1/2 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 B SEAL & CONDUIT INT.

INFORMATION ONLY

F/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" " " " "

INFORMATION ONLY