☒ REVISED ☐ ISSUED	INCORPORATED CHANGE DOC.: WIP-M-663-00017A-W02-A-1 WIP-M-663-00017A-W03-A-1 WIP-M-663-00017A-W03-B-1	CHANGE PKG. NO. 012154 012368 012530	THIS DWG. SUPERSEDES: REV.: THIS DWG. SUPERSEDED BY: REV.:

COMMENTS:

WOLF CREEK NUCLEAR OPERATING CORPORATION

ELECTRONIC APPROVAL

DRAWING TITLE:

FIRE PROTECTION EVALUATIONS FOR UNIQUE OR UNBOUNDED FIRE BARRIER CONFIGURATION

DRAWING NUMBER:	SHEET:	REV:
M-663-00017A	1 of 1523	W05

DC RELEASED:
DC4 04/03/14

8 1/2 x 11 A SIZE

Page #	Revision
Cover Page	W05*
i	W05*
ii	W05*
iii	W05*
iv	W05*
v	W05*
vi	W05*
vii	W05*
viii	W05*
ix	W05*
1	W04
2	W04
3	W05*
4	W03
5	W03
6	W03
7	W03
8	W03
9	W03
10	W03
11	W03
12	W03
13	W03
14	W03
15	W03
16	W03
17	W03
18	W03
19	W03
20	W03
21	W03
22	W05*
23	W05*
24	W03
25	W03
26	W03
27	W04
28	W04
29	W04
30	W04
31	W04
32	W04
33	W04
34	W04
35	W04
36	W04
37	W04
38	W04
Attachment A1	
Pages 1-9	W01
Attachment A2	
Pages 1-9	W01

Page #	Revision
Attachment B1	
Pages 1-8	W04
Appendix B1	
B1-1	W01
B1-2	W01
B1-3	W01
B1-4	W01
B1-5	W01
B1-6	W01
B1-7	W01
B1-8	W01
B1-9	W01
B1-10	W01
B1-11	W01
B1-12	W01
B1-13	W01
B1-14	W01
B1-15	W01
B1-16	W01
B1-17	W04
B1-18	W04
B1-19	W04
B1-20	W04
B1-21	W01
B1-22	W01
B1-23	W01
B1-24	W01
B1-25	W01
B1-26	W01
B1-27	W01
B1-28	W01
B1-29	W01
B1-30	W01
B1-31	W01
B1-32	W01
B1-33	W01
B1-34	W01
B1-35	W01
B1-36	W01
B1-37	W01
B1-38	W01
B1-39	W01
B1-40	W01
B1-41	W01
B1-42	W01
B1-43	W01
B1-44	W01
B1-45	W01
B1-46	W01
B1-47	W01
B1-48	W01
B1-49	W01

Page #	Revision
B1-50	W01
B1-51	W01
B1-52	W01
B1-53	W01
B1-54	W01
B1-55	W01
B1-56	W01
B1-57	W01
B1-58	W01
B1-59	W01
B1-60	W01
B1-61	W01
B1-62	W01
B1-63	W01
B1-64	W01
B1-65	W01
B1-66	W01
B1-67	W01
B1-68	W01
B1-69	W01
B1-70	W01
B1-71	W01
B1-72	W01
B1-73	W01
B1-74	W01
B1-75	W01
B1-76	W01
B1-77	W01
B1-78	W01
B1-79	W01
B1-80	W01
B1-81	W01
B1-82	W01
B1-83	W01
B1-84	W01
B1-85	W01
B1-86	W01
B1-87	W01
B1-88	W01
B1-89	W01
B1-90	W01
B1-91	W01
B1-92	W01
B1-93	W01
B1-94	W01
B1-95	W01
B1-96	W01
B1-97	W01
B1-98	W01
B1-99	W01
B1-100	W01
B1-101	W01

Page #	Revision
B1-102	W01
B1-103	W01
B1-104	W01
B1-105	W01
B1-106	W01
B1-107	W01
B1-108	W01
B1-109	W01
B1-110	W01
B1-111	W01
B1-112	W01
B1-113	W01
B1-114	W01
B1-115	W01
B1-116	W01
B1-117	W01
B1-118	W01
B1-119	W01
B1-120	W01
B1-121	W01
B1-122	W01
B1-123	W01
B1-124	W01
B1-125	W01
B1-126	W01
B1-127	W01
B1-128	W01
B1-129	W01
B1-130	W01
B1-131	W01
B1-132	W01
B1-133	W01
B1-134	W01
B1-135	W01
B1-136	W01
B1-137	W01
B1-138	W01
B1-139	W01
B1-140	W01
B1-141	W01
B1-142	W01
B1-143	W01
B1-144	W01
B1-145	W01
B1-146	W01
B1-147	W01
B1-148	W01
B1-149	W01
B1-150	W01
B1-151	W01
B1-152	W01
B1-153	W01

*Changed this Revision

Page #	Revision
B1-154	W01
B1-155	W01
B1-156	W01
B1-157	W01
B1-158	W01
B1-159	W01
B1-160	W01
B1-161	W01
B1-162	W01
B1-163	W01
B1-164	W01
B1-165	W01
B1-166	W01
B1-167	W01
B1-168	W01
B1-169	W01
B1-170	W01
B1-171	W01
B1-172	W01
Attachment B2	
Pages 1-9	W04
Appendix B2	
B2-1	W04
B2-2	W04
B2-3	W04
B2-4	W04
B2-5	W04
B2-6	W04
B2-7	W04
B2-8	W04
B2-9	W04
B2-10	W04
B2-11	W04
B2-12	W04
B2-13	W04
B2-14	W04
B2-15	W04
B2-16	W04
B2-17	W04
B2-18	W04
B2-19	W04
B2-20	W04
B2-21	W04
B2-22	W04
B2-23	W04
B2-24	W04
B2-25	W04
B2-26	W04
B2-27	W04
B2-28	W04
B2-29	W04
B2-30	W04

Page #	Revision
B2-31	W04
B2-32	W04
B2-33	W04
B2-34	W04
B2-35	W04
B2-36	W04
B2-37	W04
B2-38	W04
B2-39	W04
B2-40	W04
B2-41	W04
B2-42	W04
B2-43	W04
B2-44	W04
B2-45	W04
B2-46	W04
B2-47	W04
B2-48	W04
B2-49	W04
B2-50	W04
B2-51	W04
B2-52	W04
B2-53	W04
B2-54	W04
B2-55	W04
B2-56	W04
B2-57	W04
B2-58	W04
B2-59	W04
B2-60	W04
B2-61	W04
B2-62	W04
B2-63	W04
B2-64	W04
B2-65	W04
B2-66	W04
B2-67	W04
B2-68	W04
B2-69	W04
B2-70	W04
B2-71	W04
B2-72	W04
B2-73	W04
B2-74	W04
B2-75	W04
B2-76	W04
B2-77	W04
B2-78	W04
B2-79	W04
B2-80	W04
B2-81	W04
B2-82	W04

Page #	Revision
B2-83	W04
B2-84	W04
B2-85	W04
B2-86	W04
B2-87	W04
B2-88	W04
B2-89	W04
B2-90	W04
B2-91	W04
B2-92	W04
B2-93	W04
B2-94	W04
B2-95	W04
Attachment B3	
Pages 1-8	W01
Appendix B3	
B3-1	W01
B3-2	W01
B3-3	W01
B3-4	W01
B3-5	W01
B3-6	W01
B3-7	W01
B3-8	W01
B3-9	W01
B3-10	W01
B3-11	W01
B3-12	W01
B3-13	W01
B3-14	W01
B3-15	W01
B3-16	W01
B3-17	W01
B3-18	W01
B3-19	W01
B3-20	W01
B3-21	W01
B3-22	W01
B3-23	W01
B3-24	W01
B3-25	W01
B3-26	W01
B3-27	W01
B3-28	W01
B3-29	W01
B3-30	W01
B3-31	W01
B3-32	W01
B3-33	W01
B3-34	W01
B3-35	W01
B3-36	W01

Page #	Revision
B3-37	W01
B3-38	W01
B3-39	W01
B3-40	W01
B3-41	W01
B3-42	W01
Attachment B4	
Pages 1-10	W01
Appendix B4	
B4-1	W01
B4-2	W01
B4-3	W01
B4-4	W01
B4-5	W01
B4-6	W01
B4-7	W01
B4-8	W01
B4-9	W01
B4-10	W01
B4-11	W01
B4-12	W01
B4-13	W01
B4-14	W01
B4-15	W01
B4-16	W01
B4-17	W01
B4-18	W01
B4-19	W01
B4-20	W01
B4-21	W01
B4-22	W01
Attachment B5	
Pages 1-7	W01
Appendix B5	
B5-1	W01
B5-2	W01
B5-3	W01
B5-4	W01
B5-5	W01
B5-6	W01
B5-7	W01
B5-8	W01
B5-9	W01
B5-10	W01
B5-11	W01
B5-12	W01
B5-13	W01
B5-14	W01
B5-15	W01
B5-16	W01
B5-17	W01
B5-18	W01

Page #	Revision
B5-19	W01
B5-20	W01
B5-21	W01
B5-22	W01
B5-23	W01
B5-24	W01
B5-25	W01
B5-26	W01
B5-27	W01
B5-28	W01
B5-29	W01
B5-30	W01
B5-31	W01
B5-32	W01
B5-33	W01
B5-34	W01
B5-35	W01
B5-36	W01
B5-37	W01
B5-38	W01
B5-39	W01
B5-40	W01
B5-41	W01
B5-42	W01
B5-43	W01
B5-44	W01
B5-45	W01
B5-46	W01
B5-47	W01
B5-48	W01
Attachment B6	
Pages 1-7	W01
Appendix B6	
B6-1	W01
B6-2	W01
B6-3	W01
B6-4	W01
B6-5	W01
B6-6	W01
B6-7	W01
B6-8	W01
B6-9	W01
B6-10	W01
B6-11	W01
B6-12	W01
B6-13	W01
B6-14	W01
B6-15	W01
B6-16	W01
B6-17	W01
B6-18	W01
B6-19	W01

Page #	Revision
B6-20	W01
B6-21	W01
B6-22	W01
B6-23	W01
B6-24	W01
Attachment B7	
Pages 1-8	W04
Appendix B7	
B7-1	W04
B7-2	W04
B7-3	W04
B7-4	W04
B7-5	W04
B7-6	W04
B7-7	W04
B7-8	W04
B7-9	W04
B7-10	W04
B7-11	W04
B7-12	W04
B7-13	W04
B7-14	W04
B7-15	W04
B7-16	W04
B7-17	W04
B7-18	W04
B7-19	W04
B7-20	W04
B7-21	W04
B7-22	W04
B7-23	W04
B7-24	W04
B7-25	W04
B7-26	W04
B7-27	W04
B7-28	W04
B7-29	W04
B7-30	W04
B7-31	W04
B7-32	W04
B7-33	W04
B7-34	W04
B7-35	W04
B7-36	W04
B7-37	W04
B7-38	W04
B7-39	W04
B7-40	W04
B7-41	W04
B7-42	W04
B7-43	W04
B7-44	W04

Page #	Revision
B7-45	W04
B7-46	W04
B7-47	W04
B7-48	W04
B7-49	W04
B7-50	W04
B7-51	W04
B7-52	W04
B7-53	W04
B7-54	W04
B7-55	W04
B7-56	W04
B7-57	W04
B7-58	W04
B7-59	W04
B7-60	W04
B7-61	W04
B7-62	W04
B7-63	W04
B7-64	W04
B7-65	W04
B7-66	W04
B7-67	W04
B7-68	W04
B7-69	W04
B7-70	W04
B7-71	W04
B7-72	W04
B7-73	W04
B7-74	W04
B7-75	W04
B7-76	W04
B7-77	W04
B7-78	W04
B7-79	W04
B7-80	W04
B7-81	W04
B7-82	W04
B7-83	W04
B7-84	W04
B7-85	W04
B7-86	W04
B7-87	W04
B7-88	W04
B7-89	W04
Attachment B8	
Pages 1-8	W01
Appendix B8	
B8-1	W01
B8-2	W01
B8-3	W01
B8-4	W01

Page #	Revision
B8-5	W01
B8-6	W01
B8-7	W01
B8-8	W01
B8-9	W01
B8-10	W01
B8-11	W01
B8-12	W01
B8-13	W01
B8-14	W01
B8-15	W01
B8-16	W01
B8-17	W01
B8-18	W01
B8-19	W01
B8-20	W01
B8-21	W01
B8-22	W01
B8-23	W01
B8-24	W01
B8-25	W01
B8-26	W01
B8-27	W01
B8-28	W01
B8-29	W01
B8-30	W01
B8-31	W01
B8-32	W01
B8-33	W01
B8-34	W01
B8-35	W01
B8-36	W01
B8-37	W01
B8-38	W01
B8-39	W01
B8-40	W01
B8-41	W01
B8-42	W01
B8-43	W01
B8-44	W01
B8-45	W01
B8-46	W01
B8-47	W01
B8-48	W01
B8-49	W01
B8-50	W01
B8-51	W01
B8-52	W01
B8-53	W01
B8-54	W01
B8-55	W01
B8-56	W01

Page #	Revision
B8-57	W01
B8-58	W01
B8-59	W01
B8-60	W01
B8-61	W01
B8-62	W01
B8-63	W01
B8-64	W01
B8-65	W01
B8-66	W01
B8-67	W01
B8-68	W01
B8-69	W01
B8-70	W01
B8-71	W01
B8-72	W01
B8-73	W01
B8-74	W01
B8-75	W01
B8-76	W01
B8-77	W01
B8-78	W01
B8-79	W01
B8-80	W01
B8-81	W01
B8-82	W01
B8-83	W01
B8-84	W01
B8-85	W01
B8-86	W01
B8-87	W01
B8-88	W01
B8-89	W01
B8-90	W01
B8-91	W01
B8-92	W01
B8-93	W01
B8-94	W01
B8-95	W01
B8-96	W01
B8-97	W01
B8-98	W01
B8-99	W01
B8-100	W01
B8-101	W01
B8-102	W01
B8-103	W01
B8-104	W01
B8-105	W01
B8-106	W01
B8-107	W01
B8-108	W01
B8-109	W01
B8-110	W01
B8-111	W01
B8-112	W01
B8-113	W01
B8-114	W01
B8-115	W01
B8-116	W01
B8-117	W01
B8-118	W01
B8-119	W01
B8-120	W01
B8-121	W01
B8-122	W01
B8-123	W01
B8-124	W01
B8-125	W01
B8-126	W01
B8-127	W01
B8-128	W01
B8-129	W01
B8-130	W01
B8-131	W01
B8-132	W01
B8-133	W01
B8-134	W01
B8-135	W01
B8-136	W01
B8-137	W01
B8-138	W01
B8-139	W01
B8-140	W01
B8-141	W01
B8-142	W01
B8-143	W01
B8-144	W01
B8-145	W01
B8-146	W01
B8-147	W01
B8-148	W01
B8-149	W01
B8-150	W01
B8-151	W01
B8-152	W01
B8-153	W01
B8-154	W01
B8-155	W01
B8-156	W01
B8-157	W01
B8-158	W01
B8-159	W01
B8-160	W01
B8-161	W01
B8-162	W01
B8-163	W01
B8-164	W01
B8-165	W01
B8-166	W01
B8-167	W01
B8-168	W01
B8-169	W01
B8-170	W01
B8-171	W01
B8-172	W01
B8-173	W01
B8-174	W01
B8-175	W01
B8-176	W01
B8-177	W01
B8-178	W01
B8-179	W01
B8-180	W01
Attachment B9	
Pages 1-7	W01
Appendix B9	
B9-1	W01
B9-2	W01
B9-3	W01
B9-4	W01
B9-5	W01
B9-6	W01
B9-7	W01
B9-8	W01
B9-9	W01
B9-10	W01
B9-11	W01
B9-12	W01
B9-13	W01
B9-14	W01
B9-15	W01
Attachment B10	
Pages 1-7	W01
Appendix B10	
B10-1	W01
B10-2	W01
B10-3	W01
B10-4	W01
B10-5	W01
B10-6	W01
Attachment B11	
Pages 1-7	W01
Appendix B11	
B11-1	W01
B11-2	W01
B11-3	W01
B11-4	W01
B11-5	W01
B11-6	W01
B11-7	W01
B11-8	W01
B11-9	W01
B11-10	W01
B11-11	W01
B11-12	W01
Attachment B12	
Pages 1-11	W01
Appendix B12	
B12-1	W01
B12-2	W01
B12-3	W01
B12-4	W01
B12-5	W01
B12-6	W01
B12-7	W01
B12-8	W01
B12-9	W01
B12-10	W01
B12-11	W01
B12-12	W01
B12-13	W01
B12-14	W01
B12-15	W01
B12-16	W01
B12-17	W01
B12-18	W01
B12-19	W01
B12-20	W01
B12-21	W01
B12-22	W01
B12-23	W01
B12-24	W01
Attachment B13	
Pages 1-19	W02
Appendix B13	
B13-1	W01
B13-2	W01
B13-3	W01
B13-4	W01
B13-5	W01
B13-6	W01
B13-7	W01
B13-8	W01
B13-9	W01
B13-10	W01
B13-11	W01
B13-12	W01

*Changed this Revision

Page #	Revision
B13-13	W01
B13-14	W01
B13-15	W01
B13-16	W01
B13-17	W01
B13-18	W01
B13-19	W01
B13-20	W01
B13-21	W01
B13-22	W01
B13-23	W01
B13-24	W01
B13-25	W01
B13-26	W01
B13-27	W01
B13-28	W01
B13-29	W01
B13-30	W01
B13-31	W01
B13-32	W01
B13-33	W01
B13-34	W01
B13-35	W01
B13-36	W01
B13-37	W01
B13-38	W01
B13-39	W01
B13-40	W01
B13-41	W01
B13-42	W01
B13-43	W01
B13-44	W01
B13-45	W01
B13-46	W01
B13-47	W01
B13-48	W01
B13-49	W01
B13-50	W01
B13-51	W01
B13-52	W01
B13-53	W01
B13-54	W01
B13-55	W01
B13-56	W01
B13-57	W01
B13-58	W01
B13-59	W01
B13-60	W01
B13-61	W01
B13-62	W01
B13-63	W01
B13-64	W01
B13-65	W01
B13-66	W01
B13-67	W01
B13-68	W01
B13-69	W01
B13-70	W01
B13-71	W01
B13-72	W01
B13-73	W01
B13-74	W01
B13-75	W01
B13-76	W01
B13-77	W01
B13-78	W01
B13-79	W01
B13-80	W01
B13-81	W01
B13-82	W01
B13-83	W01
B13-84	W01
B13-85	W01
B13-86	W01
B13-87	W01
B13-88	W01
Attachment C	
Page 1	W01
Attachment D1	
Pages 1-13	W05*
Attachment D2	
Pages 1-6	W01
Attachment E	
Page 1	W01
Attachment F1	
Pages 1-7	W01
Attachment G1	
Pages 1-16	W03
Appendix G1A	
G1A-1	W03
G1A-2	W03
G1A-3	W03
G1A-4	W03
G1A-5	W03
G1A-6	W03
G1A-7	W03
G1A-8	W03
G1A-9	W03
G1A-10	W03
G1A-11	W03
G1A-12	W03
G1A-13	W03
G1A-14	W03
G1A-15	W03
G1A-16	W03
G1A-17	W03
G1A-18	W03
G1A-19	W03
G1A-20	W03
G1A-21	W03
G1A-22	W03
G1A-23	W03
G1A-24	W03
G1A-25	W03
G1A-26	W03
G1A-27	W03
G1A-28	W03
G1A-29	W03
G1A-30	W03
G1A-31	W03
G1A-32	W03
G1A-33	W03
G1A-34	W03
G1A-35	W03
G1A-36	W03
G1A-37	W03
G1A-38	W03
G1A-39	W03
G1A-40	W03
G1A-41	W03
G1A-42	W03
G1A-43	W03
G1A-44	W03
G1A-45	W03
G1A-46	W03
G1A-47	W03
G1A-48	W03
G1A-49	W03
G1A-50	W03
G1A-51	W03
G1A-52	W03
G1A-53	W03
G1A-54	W03
G1A-55	W03
G1A-56	W03
G1A-57	W03
G1A-58	W03
G1A-59	W03
G1A-60	W03
G1A-61	W03
G1A-62	W03
G1A-63	W03
G1A-64	W03
G1A-65	W03
G1A-66	W03
G1A-67	W03
G1A-68	W03
G1A-69	W03
G1A-70	W03
G1A-71	W03
G1A-72	W03
G1A-73	W03
G1A-74	W03
G1A-75	W03
G1A-76	W03
G1A-77	W03
G1A-78	W03
G1A-79	W03
G1A-80	W03
G1A-81	W03
G1A-82	W03
G1A-83	W03
G1A-84	W03
G1A-85	W03
G1A-86	W03
G1A-87	W03
G1A-88	W03
G1A-89	W03
G1A-90	W03
G1A-91	W03
G1A-92	W03
G1A-93	W03
G1A-94	W03
G1A-95	W03
G1A-96	W03
G1A-97	W03
G1A-98	W03
G1A-99	W03
G1A-100	W03
G1A-101	W03
G1A-102	W03
G1A-103	W03
G1A-104	W03
G1A-105	W03
G1A-106	W03
G1A-107	W03
G1A-108	W03
G1A-109	W03
G1A-110	W03
G1A-111	W03
G1A-112	W03
G1A-113	W03
G1A-114	W03
G1A-115	W03
G1A-116	W03
G1A-117	W03
G1A-118	W03
G1A-119	W03

*Changed this Revision

Page #	Revision
G1A-120	W03
G1A-121	W03
G1A-122	W03
G1A-123	W03
G1A-124	W03
G1A-125	W03
G1A-126	W03
G1A-127	W03
G1A-128	W03
G1A-129	W03
G1A-130	W03
G1A-131	W03
G1A-132	W03
G1A-133	W03
G1A-134	W03
G1A-135	W03
G1A-136	W03
G1A-137	W03
G1A-138	W03
G1A-139	W03
G1A-140	W03
G1A-141	W03
G1A-142	W03
G1A-143	W03
G1A-144	W03
G1A-145	W03
G1A-146	W03
G1A-147	W03
G1A-148	W03
G1A-149	W03
G1A-150	W03
G1A-151	W03
G1A-152	W03
G1A-153	W03
G1A-154	W03
G1A-155	W03
G1A-156	W03
G1A-157	W03
G1A-158	W03
G1A-159	W03
G1A-160	W03
G1A-161	W03
G1A-162	W03
Attachment G2	
Pages 1-11	W03
Appendix G2A	
G2A-1	W03
G2A-2	W03
G2A-3	W03
Appendix G2B	
G2B-1	W03
G2B-2	W03

Page #	Revision
G2B-3	W03
G2B-4	W03
G2B-5	W03
G2B-6	W03
G2B-7	W03
G2B-8	W03
G2B-9	W03
G2B-10	W03
G2B-11	W03
G2B-12	W03
G2B-13	W03
G2B-14	W03
G2B-15	W03
G2B-16	W03
G2B-17	W03
G2B-18	W03
G2B-19	W03
G2B-20	W03
G2B-21	W03
G2B-22	W03
G2B-23	W03
G2B-24	W03
G2B-25	W03
G2B-26	W03
G2B-27	W03
G2B-28	W03
G2B-29	W03
G2B-30	W03
G2B-31	W03
G2B-32	W03
G2B-33	W03
G2B-34	W03
G2B-35	W03
G2B-36	W03
G2B-37	W03
G2B-38	W03
G2B-39	W03
G2B-40	W03
G2B-41	W03
G2B-42	W03
G2B-43	W03
G2B-44	W03
G2B-45	W03
G2B-46	W03
G2B-47	W03
G2B-48	W03
G2B-49	W03
G2B-50	W03
G2B-51	W03
G2B-52	W03
G2B-53	W03
G2B-54	W03

Page #	Revision
G2B-55	W03
G2B-56	W03
G2B-57	W03
G2B-58	W03
G2B-59	W03
G2B-60	W03
G2B-61	W03
G2B-62	W03
G2B-63	W03
G2B-64	W03
G2B-65	W03
G2B-66	W03
G2B-67	W03
G2B-68	W03
G2B-69	W03
G2B-70	W03
G2B-71	W03
G2B-72	W03
G2B-73	W03
G2B-74	W03
G2B-75	W03
G2B-76	W03
G2B-77	W03
G2B-78	W03
G2B-79	W03
Attachment G3	
Pages 1-13	W03
Appendix G3A	
G3A-1	W03
G3A-2	W03
Appendix G3B	
G3B-1	W03
G3B-2	W03
G3B-3	W03
G3B-4	W03
Appendix G3C	
G3C-1	W03
G3C-2	W03
G3C-3	W03
G3C-4	W03
G3C-5	W03
G3C-6	W03
G3C-7	W03
G3C-8	W03
G3C-9	W03
G3C-10	W03
G3C-11	W03
G3C-12	W03
G3C-13	W03
G3C-14	W03
G3C-15	W03
G3C-16	W03

Page #	Revision
G3C-17	W03
G3C-18	W03
G3C-19	W03
G3C-20	W03
G3C-21	W03
G3C-22	W03
G3C-23	W03
G3C-24	W03
G3C-25	W03
G3C-26	W03
G3C-27	W03
Appendix G3D	
G3D-1	W03
G3D-2	W03
G3D-3	W03
G3D-4	W03
G3D-5	W03
G3D-6	W03
G3D-7	W03
G3D-8	W03
G3D-9	W03
G3D-10	W03
G3D-11	W03
G3D-12	W03
G3D-13	W03
G3D-14	W03
G3D-15	W03
G3D-16	W03
G3D-17	W03
G3D-18	W03
G3D-19	W03
G3D-20	W03
G3D-21	W03
G3D-22	W03
G3D-23	W03
G3D-24	W03
G3D-25	W03
G3D-26	W03
G3D-27	W03
G3D-28	W03
G3D-29	W03
G3D-30	W03
G3D-31	W03
G3D-32	W03
G3D-33	W03
G3D-34	W03
G3D-35	W03
G3D-36	W03
G3D-37	W03
G3D-38	W03
G3D-39	W03
G3D-40	W03

Page #	Revision
G3D-41	W03
G3D-42	W03
G3D-43	W03
G3D-44	W03
G3D-45	W03
G3D-46	W03
G3D-47	W03
G3D-48	W03
G3D-49	W03
G3D-50	W03
Attachment G4	
Pages 1-12	W03
Appendix G4A	
G4A-1	W03
G4A-2	W03
Appendix G4B	
G4B-1	W03
G4B-2	W03
G4B-3	W03
G4B-4	W03
Appendix G4C	
G4C-1	W03
G4C-2	W03
G4C-3	W03
G4C-4	W03
G4C-5	W03
G4C-6	W03
G4C-7	W03
G4C-8	W03
G4C-9	W03
G4C-10	W03
G4C-11	W03
G4C-12	W03
G4C-13	W03
Appendix G4D	
G4D-1	W03
G4D-2	W03
G4D-3	W03
G4D-4	W03
G4D-5	W03
G4D-6	W03
G4D-7	W03
G4D-8	W03
G4D-9	W03
G4D-10	W03
G4D-11	W03
G4D-12	W03
G4D-13	W03
G4D-14	W03
G4D-15	W03
G4D-16	W03
G4D-17	W03
G4D-18	W03
G4D-19	W03
Attachment G5	
Pages 1-15	W03
Appendix G5A	
G5A-1	W03
G5A-2	W03
G5A-3	W03
G5A-4	W03
G5A-5	W03
G5A-6	W03
G5A-7	W03
G5A-8	W03
G5A-9	W03
G5A-10	W03
G5A-11	W03
G5A-12	W03
G5A-13	W03
G5A-14	W03
G5A-15	W03
G5A-16	W03
G5A-17	W03
G5A-18	W03
G5A-19	W03
G5A-20	W03
G5A-21	W03
G5A-22	W03
G5A-23	W03
G5A-24	W03
G5A-25	W03
G5A-26	W03
G5A-27	W03
G5A-28	W03
G5A-29	W03
G5A-30	W03
G5A-31	W03
G5A-32	W03
G5A-33	W03
G5A-34	W03
G5A-35	W03
G5A-36	W03
G5A-37	W03
G5A-38	W03
G5A-39	W03
G5A-40	W03
G5A-41	W03
G5A-42	W03
G5A-43	W03
G5A-44	W03
G5A-45	W03
G5A-46	W03
G5A-47	W03
G5A-48	W03
G5A-49	W03
G5A-50	W03
G5A-51	W03
G5A-52	W03
G5A-53	W03
G5A-54	W03
G5A-55	W03
G5A-56	W03
G5A-57	W03
G5A-58	W03
G5A-59	W03
G5A-60	W03
G5A-61	W03
G5A-62	W03
G5A-63	W03
Attachment H	
Page 1	W01

*Changed this Revision

TABLE OF CONTENTS

1.0 Purpose 1
2.0 Scope 1
3.0 Background 1
4.0 References 1
5.0 Methodology 4
6.0 Fire Barrier Walls and Floors/Ceilings 4
7.0 Penetration Seals 6
8.0 Fire Wrap 22
9.0 Hatches 23
10.0 Fire Doors 24
11.0 Fire Dampers 26
12.0 Structural Steel Fireproofing 27
13.0 Cable Tray Firestops & Cable Tray Covers 37

ATTACHMENTS

Attachment A – Fire Protection Evaluations for Unique Or Unbounded Fire Barrier Configurations
A1 – Fire Protection Evaluation for Control Room Floor Slab and Cable Trenches
A2 – Fire Protection Evaluation for Removable & Flanged Containment Penetrations Sealing Devices
Attachment B – Fire Protection Evaluations For Unique Or Unbounded Penetration Seal Configurations
B1 – Fire Protection Evaluation for Penetration Openings Assigned New Typical Detail Designs
B2 – Fire Protection Evaluation for Penetrations that Exceed Opening Size Limitation
B3 – Fire Protection Evaluation for Penetrations that Exceed Service Temperature Limitations
B4 – Fire Protection Evaluation for Penetrations that Exceed Movement Limitations
B5 – Fire Protection Evaluation for Penetrant Size Exceeding Typical Detail M-1 Limitation
B6 – Fire Protection Evaluation for Penetrant Size Exceeding Typical Detail M-6A Limitation
B7 – Fire Protection Evaluation for Penetrant Size Exceeding Typical Detail FB-1 Limitation
B8 – Fire Protection Evaluation for Penetrant Size Exceeding Typical Detail RB-5A Limitation
B9 – Fire Protection Evaluation for Penetrant Size Exceeding Typical Detail RB-1 or RB-8 Limitation
B10 – Fire Protection Evaluation for Penetration Opening with Steel Plates

B11 – Fire Protection Evaluation for Penetrations Interfacing with Seismic Gap Seals

B12 – Fire Protection Evaluation for Penetration Openings Crediting Calcium Silica and Fiberglass Piping Insulation

B13 – Fire Protection Evaluation for Penetration Openings with Unique Bounding Attributes (PIR 2005-2384)

Attachment C – Fire Protection Evaluations For Unique Or Unbounded Fire Wrap Configurations (There are currently no evaluations in this attachment)

Attachment D – Fire Protection Evaluations For Unique Or Unbounded Hatch/Panel Configurations

D1 – Fire Protection Evaluation for Containment Post-Tensioning Openings at "C" Buttress

D2 – Fire Protection Evaluation for Resin Loading Chute Cover Plate (Penetration P141S1028)

Attachment E – Fire Protection Evaluations For Unique Or Unbounded Fire Door Configurations (There are currently no evaluations in this attachment)

Attachment F – Fire Protection Evaluations For Unique Or Unbounded Fire Damper Configurations

F1 – Fire Protection Evaluation for Fire Dampers Beyond Barrier Plane

Attachment G – Fire Protection Evaluations For Unique Or Unbounded Structural Steel Fireproofing Configurations

G1 – Fire Protection Evaluation for Generic Fireproofing Issues

G2 – Fire Protection Evaluation for Structural Steel Fireproofing with Unprotected Thermal Shorts Within Open Rooms

G3 – Fire Protection Evaluation for Structural Steel Fireproofing With Unprotected Thermal Shorts in Closed Rooms with 650 kW Fire and No Ventilation or Forced Ventilation

G4 – Fire Protection Evaluation for Structural Steel Fireproofing With Unprotected Thermal Shorts in Closed Rooms with a Credible Fire and No Ventilation or Forced Ventilation

G5 – Fire Protection Evaluation for HAZ Assessment of Structural Steel Integral to Fire Boundary

Attachment H – Fire Protection Evaluations For Unique Or Unbounded Firestop and Cable Tray Cover Configurations (There are currently no evaluations in this attachment)

1.0 PURPOSE

1.1 Evaluate the adequacy of fire barrier and associated closure assembly configurations that are unique or not directly bounded by fire tested configurations.

1.2 Compile relevant information related to unique or unbounded fire barrier configurations into a single source reference document.

2.0 SCOPE

2.1 Fire barriers and associated closure components providing protection of redundant post fire safe shutdown (PFSSD) equipment and/or circuits. These fire barriers are necessary to satisfy Wolf Creek's comparison to 10 CFR 50 Appendix R, Section III.G.1 and III.G.2.

3.0 BACKGROUND

Generic Letter 86-10, identifies that fire area boundaries need not be completely sealed. However, the document further states that in such cases the licensee is required to perform an evaluation to assess the adequacy of fire area boundaries to determine if the barriers will withstand the hazards associated with the area and protect important equipment within the area from a fire outside the area.

At Wolf Creek all openings in fire boundaries are provided with some form of fire resistive penetration closure (penetration seal, fire damper, fire door, etc.). However, not all closures or closure attributes are directly bounded by 3-hour fire endurance testing. To address this issue, M-663-00017A serves as the primary evaluation/reference document for unique or unbounded fire barrier configurations.

4.0 REFERENCES

4.1 Wolf Creek Licensing Documents

4.1.1 WCNOC USAR, Section 9.5.1, including Appendices A through E

4.1.2 SNUPPS FSAR, Section 9.5.1.2.2.3, Rev. 14 and 15

4.1.3 Wolf Creek Supplemental Safety Evaluation Report (SSER) 5, Section 9.5.1.2

4.2 Regulatory Documents

4.2.1 10 CFR 50 Appendix R, Fire Protection Program For Nuclear Power Facilities Operating Prior to January 1, 1979

4.2.2 Generic Letter 86-10, Implementation of Fire Protection Requirements

4.2.3 Regulatory Guide 1.189, Fire Protection For Operating Nuclear Power Plants, April 2001

4.3 Industry Documents

4.3.1 ANSI A17.1, Safety Code for Elevators and Escalators

4.3.2 ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials

4.3.3 ASTM E 152, Standard Methods of Fire Tests of Door Assemblies

4.3.4 EPRI TR-100443, Methods of Quantitative Fire Hazards Analysis, May 1992

4.3.5 IEEE 317, Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations

4.3.6 IEEE 383, Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations

4.3.7 IEEE 384, Standard Criteria for Independence of Class 1E Equipment and Circuits

4.3.8 UL 10B, Standard for Safety Fire Tests of Door Assemblies

4.3.9 UL 555, Standard for Fire Dampers

4.3.10 UL N-711, (A-126-00001), Fire Test Report Of Loaded Restrained Beams Protected By Cementitious Mixture, Dated August 11, 1976

4.3.11 UL N-712, (A-126-00002), Fire Test Report Of Loaded Restrained Beams Protected By Cementitious Mixture, Dated May 13, 1977

4.4 Specifications

4.4.1 M-162C, Specification for Non-metallic Thermal Insulation for Piping and Equipment Located In Auxiliary Building, Control Building, Diesel Generator Building, Fuel Building, and Radwaste Building For The Wolf Creek Generating Station

4.4.2 A-126, Technical Specification For Cementitious Fireproofing Of Structural Steel For The Standardized Nuclear Unit Power Plant Unit (SNUPPS)

4.5 Calculations

4.5.1 FP-M-011, Evaluation of Adequacy of Albi Duraspray on Structural Steel

4.5.2 FP-M-012, Rev 0, Structural Steel Fireproofing Thermal Shorts and Omissions Evaluation

4.6 Design Change Packages

4.6.1 04585, Design to Remove Unique (Hatch/Valve) Thermo-Lag Coverings

4.6.2 05314, Clarify Use of Thresholds on Fire Doors

4.6.3 06513, Thermo-Lag Removed from A-16 Fire Stop

4.6.4 07037, Darmatt Fire Barrier Material Installation

4.6.5 09879, Replace SGK04A/B and SGK05A/B Air Conditioning Units

4.6.6 10257, Removal of Thermo-Lag from Hatch SKD/1207A

4.6.7 011038, Install Fire Wrap on Raceway in Fire Areas A-1 & A-18

4.6.8 011656, Install Fire Wrap on Raceway Associated to EMHV8803A in Fire Area A-1

4.6.9 011888, 1-Hour Fire Wrap for Conduit 114U3D5R

4.6.10 012322, Fire Areas A-6 AND C-35 Darmatt 3-Hour Border Installation

4.6.11 012368 and 012568, Fire Area A-8, 1-Hour Fire Wrap for Conduits 4J3C1N and 4U3D5P, respectively.

4.7 Other

4.7.1 Fire Test Report Project 14980-98207, Fire Endurance Test of a Wall Assembly Clad with Thermo-Lag 330-1

4.7.2 M-663-00017, Penetration Seal Typical Details, Rev. W20

4.7.3 M-663-00157, Fire Qualification Test on Silicone Foam Floor Penetration Seals, Slab 5

4.7.4 SLNRC 84-0014, Fire Protection Review

4.7.5 PIR 94-0143, Fire Door Gap Evaluation

4.7.6 PIR 2002-2805, Penetration Seal Issues

4.7.7 PIR 2002-2290, Darmatt Fire Wrap Issues

4.7.8 PIR 2005-2384, Penetrations Seals Requiring Field Work

4.7.9 PIR 2002-2287, Structural Steel Fireproofing With Unprotected Attachments

4.7.10 USQD 00-0012 (USAR CR 00-016), Evaluation of Unbounded Features in Fire Barrier Separating the Turbine Building and Auxiliary Building, Rev. 0

4.7.11 USQD 97-0163 (USAR CR 97-200) Evaluation of Missile Shields in Fire Barrier Separating the Turbine Building and Auxiliary Building, Rev. 0

4.7.12 USAR Figure 3.8.45, Reactor Building Personnel Hatch, Rev. 0

4.7.13 USAR Figure 3.8.47, Reactor Building Typical Pipe Penetration, Rev. 0

4.7.14 USAR Figure 3.8.48, Reactor Building Fuel Transfer Penetration, Rev. 0

4.7.15 USAR Figure 3.8.49, Reactor Building Electrical Penetration, Rev. 0

4.7.16 USAR Figure 3.8.50, Reactor Building Purge Line Penetrations, Rev. 0

4.7.17 E-1R8900, Sheet 65, Cable Tray Firestop Detail, Rev. 15

4.7.18 PSL-FPER-98-002, St. Lucie Unit #1 Fire Protection Evaluation for TSI Walls on Stairways

5.0 METHODOLOGY

5.1 This document was developed by Fire Protection to be a primary reference source for fire barrier related configurations that are unique or are not directly bounded by fire testing. Items compiled within this document are based on a comprehensive review of fire barriers and fire barrier documentation in comparison to design and regulatory commitment parameters delineated in Wolf Creek Fire Protection Program documents.

5.1.1 Predominantly, unique or unbounded configurations are evaluated within attachments to this document. However, where an existing document adequately addresses a unique or unbounded fire barrier feature, the unique/unbounded configuration is briefly described and the corresponding evaluation document is referenced within the appropriate fire barrier element section of this document.

5.1.2 Unique or unbounded configurations that were originally evaluated in FSAR submittals and/or NRC SERs that were a part of the original Fire Protection License Basis are discussed in the appropriate barrier element section of this document under the heading of "Issues Addressed in Original Fire Protection License Documents."

Typically, only minor changes were made to these discussions with no change in technical content or intent. Where change in technical content or intent was deemed necessary to strengthen an evaluation or address current in plant conditions that could impact the original conclusions, a detailed evaluation was completed and documented as an attachment to this document.

5.1.3 Unless specifically identified within an evaluation, credit is not taken for area detection or suppression.

6.0 FIRE BARRIER WALLS AND FLOORS/CEILINGS

6.1 Description

6.1.1 Fire barrier walls, floors, and ceilings are provided as dictated by the results of the Fire Hazards Analysis. Fire barrier walls are predominantly comprised of reinforced concrete or reinforced concrete masonry units (CMU). Fire barrier floors/ceilings are comprised of reinforced concrete, with or without corrugated metal Q-Deck.

6.2 Evaluation of Unique or Unbounded Configurations

6.2.1 Issues Addressed in Original Fire Protection License Documents

1. Trench Covers Between Fire Area F-2 and HMS-1

In Fire Area F-2 (Room 6104), the floor is on grade with the exception of a pipe trench, which opens into the room and connects with the Hot Machine Shop (HMS-1). The trench opening at grade in Room 6104 is closed by a heavy steel cover plate approximately 4 feet x 8 feet. At grade within the Hot Machine Shop the trench is covered by approximately 11" thick concrete plugs. This protective configuration for the trench ensures that fire will not propagate between the two Fire Areas.

6.2.2 Ceramic Fiber and Sheet Metal Fire Barrier Segment

A fire barrier wall segment on the 2016' elevation of the Control Building between rooms 3401 (Fire Area C-35) and 3416 (Fire Area C-14) is comprised of ceramic fiber between sheet metal. The unique wall assembly design and associated penetrations are evaluated as 3-hour fire (F) and temperature (T) rated by change package 09879.

6.2.3 Blow Out Panel for Penetration P135W2346 Between A-15 and T-2

A blow out panel is provided as a protective closure assembly for penetration P135W2346 in the fire barrier wall separating the 2000' elevation of the Turbine Building (Room 4351 and Fire Area T-2) from the Turbine Driven Auxiliary Feed Pump Room (Room 1331 and Fire Area A-15). The panel is provided to alleviate sudden pressure buildup in Room 1331 in the event of a High Energy Line Break (HELB). The panel is a UL listed per design U639. However, fire testing does not directly bound the installation of the panel beyond the barrier plane, on the Turbine Building side. This installation method is necessary to ensure that the panel could blow out and not wedge in the opening, in response to a HELB within Room 1331.

USQSD 00-0012 determined that the blow out panel provides a level of fire protection that is commensurate with fire hazards present in the respective fire areas.

6.2.4 Drains from Fire Area A-23 to T-2

Two open ended 20" diameter drain pipes communicate between the 2026' elevation of the Auxiliary Building 2026' Main Feed Water Pump Rooms (Rooms 1411 and 1412 and Fire Area A-23) and the 2000' elevation of the Turbine Building (Room 1331 and Fire Area T-2). The unsealed openings provide a drain path from Rooms 1411 and 1412 in the event of a main feedwater pipe rupture. The drains do not communicate across a common fire barrier between the two Fire Areas, as one drain pipe passes through Fire Area 15 and penetrates T-2 behind Rooms 4304 and 4305, while the other passes through A-14 and penetrates T-2 near column TC. The drain terminations in Fire Area T-2 are approximately 23 feet apart.

USQSD 00-0012 determined that the two drains achieve a level of fire protection that is commensurate with fire hazards present in the respective fire areas.

6.2.5 Missile Shield Separating Fire Areas A-23 and T-2

A non fire rated missile shield is provided at the 2065' elevation in the fire barrier wall separating the Turbine Building (Room 4501 and Fire T-2) from the Auxiliary Building Main Feedwater Pump and Valve Rooms (Rooms 1411, 1412, 1508, and 1509 and Fire Area A-23). The missile shield is comprised of four movable concrete sections that are normally fastened to the wall as a single unit. Each of the shield sections is 5'-8" wide by 17'-7' high by 2'-0" thick. The shield sections move on a rail system to allow entry into the Main Steam and Feedwater valve compartment. The bottom rails are supported on an approximately two foot high sill. The upper "C" channel is secured to the top section of the opening. There is an off-set approximately two inches between the back of the missile shield and the face of the barrier. Additionally, there is a gap of approximately 2-3 inches between the top of the sill and the bottom of the shield due to the rail assembly.

USQSD 97-0163 determined that the missile shield provides a level of fire protection that is commensurate with fire hazards present in the respective fire areas.

6.2.6 Other unique or unbounded fire barrier features are evaluated in Attachment A.

7.0 PENETRATION SEALS

7.1 Description

7.1.1 A penetration seal is comprised of the materials, parts, or assemblies, which close openings in fire boundaries necessary for the passage of mechanical or electrical penetrants. Penetration seals are also utilized for spare openings that were created for future penetrant use and seismic gap openings necessary to accommodate building movements. Typically, the seal provides the same fire resistance rating as the fire barrier. Penetration seal typical details and limiting parameters are provided in M-663-00017.

7.2 Evaluation of Unique or Unbounded Configurations

7.2.1 Issues Addressed in Original Fire Protection License Documents

1. Reactor Building Penetrations (Reference 4.1.2)

The Reactor Building shell is 4 feet thick, is lined with a continuous 1/4-inch thick liner plate, and is designed to be airtight at a design pressure of 60 psig. All penetrations through the containment shell are designed to ASME Section III. Since the penetrations are an integral part of the Reactor Building boundary and do not incorporate independent fire barrier seals, no testing was performed to establish a rating of the penetrations. The following discussions describe the Reactor Building mechanical and electrical penetrations into adjacent buildings:

Mechanical Penetrations

Refer to USAR Figures 3.8-47 and 3.8-50 for details of the process and sampling lines which penetrate the Reactor Building wall into the Auxiliary Building Fire Areas A-19, A-20, A-23, A-24, and A-25. In A-19 and A-20, the containment purge penetration (36-inch-diameter line) penetrates the containment. Redundant containment isolation valves are provided on either side of the Reactor Building wall. In A-23, A-24, and A-25, process and instrument lines are welded to the heads on larger penetration sleeves, which are in turn welded to the containment liner. Fire and smoke will not pass through or around the process/instrument lines due to the steel construction. The mechanical penetrations provide equivalent protection to a 3-hour fire barrier.

Electrical Penetrations

Electrical penetrations communicate with Fire Areas A-17 and A-18, which are Halon 1301 protected spaces with ionization detectors. The penetrations, shown on USAR Figure 3.8-49, consist of a steel sleeve through the Reactor Building wall, which is flanged in the Auxiliary Building. Each flange contains seven 3-inch-diameter penetrations, which are sealed with an epoxy based resin into which the solid electrical conductors have been molded. The electrical penetrations are designed to IEEE 317-76, which is the industry standard for containment electrical penetrations.

Mounted directly to the flange is a sealed NEMA-3R enclosure, which contains termination strips. These enclosures are air and dust-tight and help protect the penetration from postulated transient fires in the penetration room. Fires within the enclosures are not postulated due to the IEEE 383 cable, which is not susceptible to electrically generated fires. Due to lack of space within the enclosures, transient combustibles are not present within the enclosures.

On the Reactor Building side, all penetration sleeves are provided with similar NEMA-3R enclosures, which provide protection for the flanged penetration in the Auxiliary Building. Again, the cables within the enclosure and passing within the steel sleeved Reactor Building wall are qualified to IEEE 383. Only the four medium voltage penetrations providing power to the reactor coolant pumps are not provided with enclosures on the Reactor Building side of the penetration. Transient fires are not postulated in the vicinity of the electrical penetrations in the Reactor Building. Also, the areas containing the electrical penetrations and the cable trays in the area of the penetrations are provided with an area coverage sprinkler system as described in the Fire Hazards Analysis.

Based on the previous discussions, the separation of the Reactor Building and Auxiliary Building fire areas where electrical penetrations exist is ensured.

2. Fuel Transfer Tube Penetration

As shown on USAR Figure 3.8-48, the fuel transfer tube connects the Reactor and Fuel Buildings. A double-o-ring flange is located in the Reactor Building, and a manual gate valve is located in the Fuel Transfer Canal. Either barrier provides equivalent protection to a 3-hour barrier. In addition, the Fuel Transfer Canal contains no installed combustibles. (Reference 4.1.2)

7.2.2 Scope and Review Methodology for Unique/Unbounded Penetrations

As previously identified, M-663-00017 defines the critical parameter limitations of each typical detail utilized as a fire barrier penetration seal at Wolf Creek. The limitations established are based on industry fire testing coupled with engineering analysis. PIR 2002-2805 identified that in some instances, penetration seals do not conform to one or more of the bounding limitations of M-663-00017. To address this issue, the following selection and review methodology was established to evaluate penetration seals that do not conform to a typical detail limitation:

1. Transition all hardcopy M-0Y/M-1Y penetration seal design information to the Engineering Information System (EIS), as controlled electronic data.

2. Define all penetrations that provide PFSSD fire boundary protection.

3. Perform electronic data sorts for each penetration typical detail providing PFSSD fire boundary protection (Appendix R) against the following critical characteristic limitations, to identify the penetrations and associated attributes that do not conform to M-663-00017 limitations.

   - Opening size
   - Penetrant size
   - Penetrant movement
   - Penetrant temperature

4. Develop a walkdown checklist to ensure uniformity of review for each of the penetrations determined in Step 3) above, to be within the review scope.

5. Walkdown and collect relevant data, including photos and sketches where necessary, for each penetration within the review scope.

6. Review Quality Control documentation, field change requests, and non-conformance reports for each penetration within the review scope.

7. Evaluate the acceptability of each penetration considering the Wolf Creek fire barrier license commitments identified in M-663-00017. Document the evaluations within Attachment B to M-663-00017A.

8. Where it is determined that fieldwork is necessary to satisfy the required fire resistance rating, identify the issue and recommended resolution in a Performance Improvement Request (PIR).

9. Document acceptability of penetration seal field changes necessary to satisfy Step 7) above, in Attachment B to M-663-00017A.

Table 7.2.2-1 identifies each penetration that is evaluated within Attachment B. Some penetrations are included in multiple evaluations due to more than one attribute that does not conform to the limitations of the applicable bounding typical detail. In these instances, the potential cumulative affects of multiple unbounded attributes were considered for each penetration of concern.

Section 7.2.3 identifies the additional review methodology utilized for penetrations that do not satisfy unexposed side temperature (T) rating requirements.

Table 7.2.2-1
Penetrations Evaluated in Attachment B

Penetration #	Communicating Fire Areas		Attachment Evaluation(s)	Fire Resistance Rating
	Side 1	Side 2		
P111W1584	A-1	A-4	B8	3-hour F
P111W1794	A-1	RW-1	B1	3-hour F and T
P112W1377	A-1	C-1	B13	3-hour F
P112W1378	A-1	C-1	B2, B7	3-hour F
P112W1379	A-1	C-1	B13	3-hour F
P112W1380	A-1	C-1	B2, B7	3-hour F
P113W0420	A-1	A-5	B5	3-hour F and T
P113W0421	A-1	A-5	B13	3-hour F and T
P113W0482	A-1	A-5	B1, B4	3-hour F and T
P113W0483	A-1	A-5	B1, B4	3-hour F and T
P114W0423	A-1	A-6	B12	3-hour F
P121S0251	A-1	A-4	B1	3-hour F and T
P121S0257	A-1	A-4	B8	3-hour F
P121S0258	A-1	A-4	B8	3-hour F
P121S0263	A-1	A-4	B8	3-hour F
P121S0264	A-1	A-4	B2, B3	3-hour F and T

Penetration #	Communicating Fire Areas		Attachment Evaluation(s)	Fire Resistance Rating
	Side 1	Side 2		
P121S0265	A-1	A-4	B3	3-hour F and T
P121S0266	A-1	A-4	B8	3-hour F
P121S0267	A-1	A-4	B8	3-hour F
P121S0268	A-1	A-4	B8	3-hour F
P121S0271	A-1	A-4	B2, B7	3-hour F
P121S0273	A-1	A-4	B8	3-hour F
P121S0274	A-1	A-4	B8	3-hour F
P121S0275	A-1	A-4	B3, B8	3-hour F
P121S0277	A-1	A-4	B2, B3, B4, B9	3-hour F and T
P121S0278	A-1	A-4	B2, B9	3-hour F and T
P121S0279	A-1	A-4	B8	3-hour F
P121S0280	A-1	A-4	B8	3-hour F
P121S0281	A-1	A-4	B8	3-hour F
P121S0283	A-1	A-4	B8	3-hour F
P121S0284	A-1	A-4	B13	3-hour F
P121S0285	A-1	A-4	B13	3-hour F
P121S0287	A-1	A-4	B13	3-hour F
P121W1779	A-1	RW-1	B1	3-hour F and T
P121W1781	A-1	RW-1	B8	3-hour F
P121W1782	A-1	RW-1	B8	3-hour F
P122S0327	A-1	A-2	B3, B8	3-hour F
P122S0331	A-1	A-2	B8	3-hour F
P122S0338	A-1	A-2	B8	3-hour F
P122S0339	A-1	A-2	B3, B4, B8	3-hour F
P122S0340	A-1	A-2	B8	3-hour F
P122S0347	A-1	A-2	B9	3-hour F and T
P122S0349	A-1	A-2	B8	3-hour F
P122S0350	A-1	A-2	B8	3-hour F
P122S0351	A-1	A-2	B8	3-hour F
P122S0353	A-1	A-2	B1	3-hour F and T
P122S0357	A-1	A-2	B8	3-hour F
P122S0362	A-1	A-2	B2	3-hour F and T
P122S0367	A-1	A-2	B8	3-hour F
P122S0373	A-1	A-2	B8	3-hour F
P122W1739	A-1	A-3	B4	3-hour F and T
P123W0418	A-1	A-5	B4	3-hour F and T
P125S0203	A-33	A-1	B1	3-hour F and T
P125S0206	A-33	A-1	B1	3-hour F and T
P125W2309	A-33	T-2	B1	3-hour F and T
P125W2319	A-33	T-2	B1	3-hour F and T

Penetration #	Communicating Fire Areas		Attachment Evaluation(s)	Fire Resistance Rating
	Side 1	Side 2		
P125W2432	A-1	A-33	B12	3-hour F
P125W2434	A-6	A-33	B12	3-hour F
P131S0491	A-8	A-1	B6	3-hour F
P131S0492	A-8	A-1	B2, B7	3-hour F
P131S0504	A-8	A-1	B1	3-hour F and T
P131S0513	A-8	A-1	B8	3-hour F
P131S0517	A-8	A-1	B1	3-hour F and T
P131S0522	A-8	A-1	B8	3-hour F
P131S0525	A-8	A-1	B8	3-hour F
P131S0526	A-9	A-1	B3, B8	3-hour F
P131S0528	A-9	A-1	B3	3-hour F and T
P131S0529	A-9	A-1	B8	3-hour F
P131S0530	A-9	A-1	B3, B8	3-hour F
P131S0531	A-9	A-1	B3, B8	3-hour F
P131W1967	A-9	A-10	B1	3-hour F and T
P132S0680	A-8	A-1	B5	3-hour F
P132S0682	A-8	A-1	B2, B7	3-hour F
P132S0683	A-8	A-1	B2, B12	3-hour F
P132S0684	A-8	A-1	B2, B12	3-hour F
P132S0693	A-10	A-1	B2, B3	3-hour F and T
P132S0695	A-8	A-1	B1	3-hour F and T
P132S0697	A-10	A-1	B8	3-hour F
P132S0698	A-10	A-1	B8	3-hour F
P132S0699	A-8	A-1	B8	3-hour F
P132S0700	A-8	A-1	B8	3-hour F
P132S0704	A-8	A-1	B8	3-hour F
P132S0710	A-8	A-1	B8	3-hour F
P132S0713	A-8	A-1	B8	3-hour F
P132S0722	A-8	A-1	B8	3-hour F
P132S0723	A-8	A-1	B8	3-hour F
P132S0739	A-8	A-1	B2, B7	3-hour F
P132S0749	A-8	A-1	B1	3-hour F and T
P132W1433	A-8	CC-1	B12	3-hour F
P132W1440	A-8	CC-1	B5	3-hour F
P132W1441	A-8	CC-1	B5	3-hour F
P132W1844	A-8	A-3	B2, B7	3-hour F
P132W1845	A-8	A-3	B13	3-hour F
P133S0762	A-8	A-1	B13	3-hour F and T
P133S0769	A-25	A-1	B8	3-hour F
P133S0771	A-25	A-1	B8	3-hour F

Penetration #	Communicating Fire Areas		Attachment Evaluation(s)	Fire Resistance Rating
	Side 1	Side 2		
P133S0777	A-8	A-1	B1	3-hour F and T
P133S0780	A-8	A-1	B6	3-hour F
P133S0781	A-8	A-1	B6	3-hour F
P133S0784	A-25	A-1	B13	3-hour F
P133S0788	A-25	A-1	B13	3-hour F
P133S0793	A-25	A-1	B8	3-hour F
P133S0795	A-25	A-1	B1	3-hour F and T
P133S0799	A-25	A-1	B2, B3, B12	3-hour F
P133S0800	A-25	A-1	B8	3-hour F
P133S0801	A-25	A-1	B8	3-hour F
P133S0802	A-25	A-1	B8	3-hour F
P133S0806	A-25	A-1	B1	3-hour F and T
P133S0810	A-25	A-1	B3, B8	3-hour F
P133S0820	A-25	A-1	B8	3-hour F
P133W0447	A-8	A-5	B1	3-hour F and T
P133W0459	A-8	A-8	B1	Not an Appendix R Barrier
P133W0474	A-8	A-8	B1	Not an Appendix R Barrier
P133W1475	A-25	F-3	B1	3-hour F and T
P133W2037	A-8	A-25	B13	3-hour F
P133W2038	A-8	A-25	B1	3-hour F and T
P133W2039	A-8	A-25	B5	3-hour F
P133W2042	A-8	A-25	B13	3-hour F
P134S0860	A-24	A-1	B2, B3, B12	3-hour F
P134S0864	A-24	A-1	B8	3-hour F
P134S0865	A-24	A-1	B8	3-hour F
P134S0874	A-24	A-1	B1	3-hour F and T
P134S0875	A-24	A-1	B8	3-hour F
P134S0877	A-24	A-1	B13	3-hour F
P134S0878	A-24	A-1	B1	3-hour F and T
P134S0879	A-8	A-1	B1	3-hour F and T
P134S0902	A-8	A-1	B1	3-hour F and T
P134S0911	A-24	A-1	B8	3-hour F
P134S0912	A-24	A-1	B8	3-hour F
P134S0918	A-24	A-1	B8	3-hour F
P134S0919	A-24	A-1	B8	3-hour F
P134W0436	A-8	A-6	B1	3-hour F and T
P134W2053	A-8	A-24	B2, B9	3-hour F and T
P134W2054	A-8	A-24	B13	3-hour F
P134W2653	A-6	T-2	B10	3-hour F
P135S0217	A-14	A-33	B1	3-hour F and T

Penetration #	Communicating Fire Areas		Attachment Evaluation(s)	Fire Resistance Rating
	Side 1	Side 2		
P135S0218	A-13	A-33	B1	3-hour F and T
P135S0219	A-13	A-33	B1	3-hour F and T
P135S0223	A-14	A-33	B1	3-hour F and T
P135S0227	A-15	A-33	B3	3-hour F and T
P135S0232	A-15	A-33	B2, B7	3-hour F
P135S0233	A-15	A-33	B2, B7	3-hour F
P135S0932	A-29	A-29	B1	Not an Appendix R Barrier
P135W2203	A-33	A-30	B1	3-hour F and T
P135W2208	A-13	A-29	B5	3-hour F
P135W2212	A-14	A-13	B1	3-hour F and T
P135W2426	A-33	A-14	B1	3-hour F and T
P135W2449	A-29	A-30	B5	3-hour F
P141S1014	A-16	A-8	B2, B7	3-hour F
P141S1015	A-16	A-8	B13	3-hour F
P141S1023	A-16	A-8	B13	3-hour F
P141S1028	A-26	A-8	D2	3-hour F
P141S1034	A-16	A-8	B10	3-hour F
P141W1854	A-8	A-9	B8	3-hour F
P141W1907	A-16	A-26	B13	3-hour F
P141W1908	A-16	A-26	B13	3-hour F
P141W1909	A-16	A-26	B1	3-hour F and T
P141W1913	A-16	A-26	B13	3-hour F and T
P141W1980	A-16	A-9	B8	3-hour F
P141W2486	A-16	A-26	B2, B7	3-hour F
P141W2487	A-16	A-26	B6	3-hour F
P142S1052	A-27	A-8	B1	3-hour F and T
P142S1079	A-16	A-8	B6	3-hour F
P142S1083	A-16	A-3	B2, B13	3-hour F
P142S1086	A-16	A-3	B2, B13	3-hour F
P142S1097	A-27	A-8	B1	3-hour F and T
P142W1932	A-16	A-10	B13	3-hour F
P142W1933	A-16	A-10	B2, B9	3-hour F and T
P143S1102	A-16	A-8	B1	3-hour F and T
P143S1111	A-16	A-8	B1	3-hour F and T
P143W1488	A-5	F-4	B2, B7	3-hour F
P143W1489	A-5	F-4	B2, B7	3-hour F
P143W2514	A-16	A-5	B13	3-hour F
P143W2515	A-16	A-5	B13	3-hour F
P144S1173	A-18	A-24	B1	3-hour F and T
P145S0943	A-23	A-29	B2	3-hour F and T

Penetration #	Communicating Fire Areas		Attachment Evaluation(s)	Fire Resistance Rating
	Side 1	Side 2		
P145S0944	A-23	A-29	B2	3-hour F and T
P145S0946	A-23	A-30	B2	3-hour F and T
P145S0947	A-23	A-30	B2	3-hour F and T
P145S0952	A-23	A-15	B2, B3, B13	3-hour F and T
P145S0954	A-23	A-15	B2, B3, B13	3-hour F and T
P145S0955	A-23	T-2	B1	3-hour F and T
P145S1010	A-23	A-15	B4	3-hour F and T
P145W2338	A-23	A-23	B1	Not an Appendix R Barrier
P145W2339	A-23	A-23	B1	Not an Appendix R Barrier
P145W2341	A-23	A-23	B1	Not an Appendix R Barrier
P145W2342	A-23	A-23	B1	Not an Appendix R Barrier
P145W2344	A-23	A-23	B1	Not an Appendix R Barrier
P145W2345	A-23	A-23	B1	Not an Appendix R Barrier
P145W2468	A-23	T-2	B2, B3, B4	3-hour F and T
P145W2469	A-23	T-2	B2, B3, B4	3-hour F and T
P145W2470	A-23	T-2	B2, B3, B4	3-hour F and T
P145W2471	A-23	T-2	B2, B3, B4	3-hour F and T
P151S1196	A-20	A-26	B6	3-hour F
P152W1421	A-19	CC-1	B13	3-hour F
P152W2581	A-21	A-22	B1	3-hour F and T
P152W2585	A-19	A-22	B2, B7	3-hour F
P152W2617	A-19	A-22	B7	3-hour F
P152W2623	A-19	A-22	B1	3-hour F and T
P153W2543	A-19	A-20	B1	3-hour F and T
P153W2550	A-20	A-5	B1	3-hour F and T
P153W2557	A-19	A-20	B6	3-hour F
P153W2627	A-20	A-5	B1	3-hour F and T
P154S1267	A-19	A-16	B5	3-hour F
P311W0839	C-1	CC-1	B2, B7	3-hour F
P311W0841	C-1	CC-1	B13	3-hour F
P311W0842	C-1	CC-1	B13	3-hour F
P311W0845	C-1	CC-1	B13	3-hour F
P311W0846	C-1	CC-1	B1	3-hour F and T
P321S0081	C-5	C-1	B5	3-hour F
P321S0083	C-6	C-1	B1	3-hour F and T
P321S0084	C-6	C-1	B1	3-hour F and T
P321S0085	C-6	C-1	B7	3-hour F
P321S0086	C-6	C-1	B7	3-hour F
P321S0097	C-6	C-1	B1	3-hour F and T
P321S0110	C-6	C-1	B1	3-hour F and T

Penetration #	Communicating Fire Areas		Attachment Evaluation(s)	Fire Resistance Rating
	Side 1	Side 2		
P321S0115	C-5	C-1	B1	3-hour F and T
P321S0123	C-6	C-1	B7	3-hour F
P331S0127	C-10	C-6	B1	3-hour F and T
P331S0136	C-10	C-6	B1	3-hour F and T
P331S0137	C-10	C-6	B1	3-hour F and T
P331S0138	C-10	C-6	B1	3-hour F and T
P331S0139	C-10	C-6	B1	3-hour F and T
P331S0143	C-10	C-6	B1	3-hour F and T
P331S0200	C-9	C-5	B1	3-hour F and T
P331W0162	C-9	C-10	B5	3-hour F
P331W0882	C-10	D-1	B1	3-hour F and T
P331W0883	C-10	D-1	B1	3-hour F and T
P331W0890	C-10	D-2	B1	3-hour F and T
P341S0272	C-6	C-6	B1	Not an Appendix R Barrier
P341S0288	C-15	C-10	B1	3-hour F and T
P341S0306	C-16	C-9	B1	3-hour F and T
P341S0311	C-16	C-9	B1	3-hour F and T
P341W0209	C-35	C-13	B5	3-hour F
P341W0216	C-35	C-14	B5	3-hour F
P341W0227	C-35	C-16	B5	3-hour F
P341W0250	C-35	C-15	B5	3-hour F
P341W0380	C-16	C-16	B1	Not an Appendix R Barrier
P351S0339	C-21	C-15	B1	3-hour F and T
P351S0356	C-21	C-15	B1	3-hour F and T
P351S0371	C-21	C-16	B5	3-hour F
P361S0462	C-27	C-21	B1	3-hour F and T
P361S1052	C-30	C-23	B1	3-hour F and T
P361S1055	C-30	C-23	B1	3-hour F and T
P361S1083	C-32	C-25	B1	3-hour F and T
P371W0948	C-22	C-33	B13	3-hour F and T
P451S0318	T-12	T-8	B1	Not an Appendix R Barrier
P451S0321	T-12	T-8	B1	Not an Appendix R Barrier
P611W0071	F-1	F-3	B1	3-hour F and T
P611W0082	F-1	F-2	B7	3-hour F
P611W0083	F-2	F-3	B5	3-hour F
P611W0197	F-2	F-3	B2, B7	3-hour F
P611W0201	F-2	F-3	B1	3-hour F and T
P611W0206	F-2	F-3	B13	3-hour F
P621S0137	F-5	F-2	B1	3-hour F and T
P621S0153	F-5	F-3	B2, B7	3-hour F

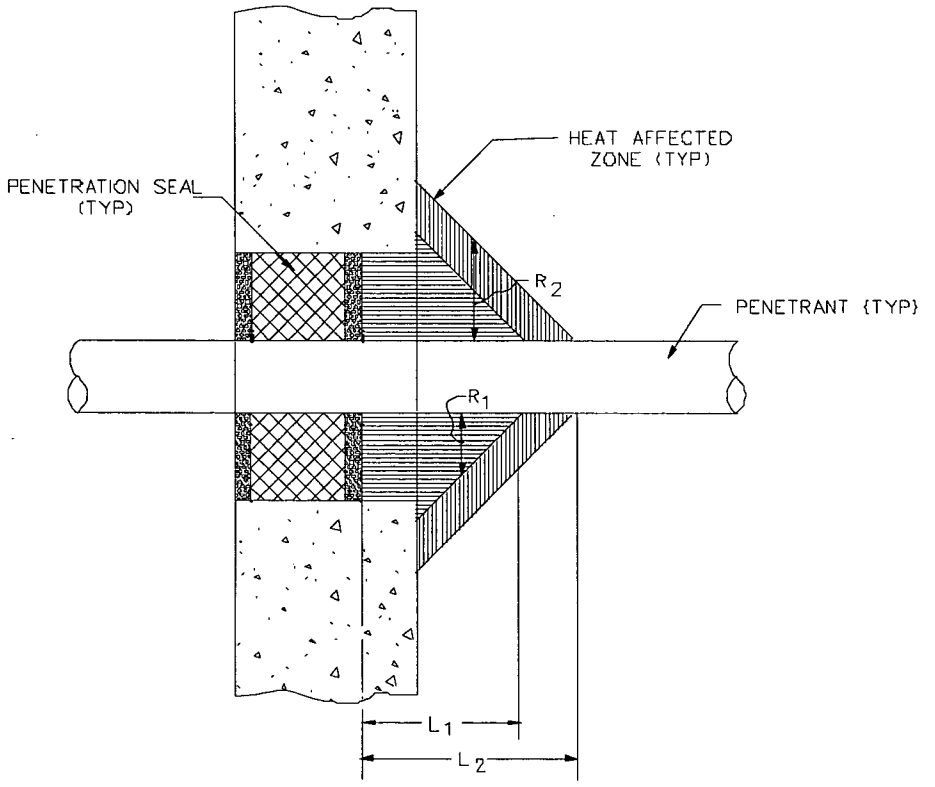
Penetration #	Communicating Fire Areas		Attachment Evaluation(s)	Fire Resistance Rating
	Side 1	Side 2		
P621S0156	F-4	F-3	B2, B7	3-hour F
P621S0157	F-4	F-2	B2, B7	3-hour F
P621S0158	F-5	F-2	B1	3-hour F and T
P621S0161	F-4	F-2	B6	3-hour F
P621S0162	F-4	F-2	B2, B7	3-hour F
P621S0179	F-4	F-2	B11	3-hour F and T
P621S0180	F-4	F-3	B11	3-hour F and T
P621W0009	F-4	F-5	B2, B7	3-hour F
P621W0011	F-4	F-5	B1	3-hour F and T
P621W0017	F-5	F-4	B2, B7	3-hour F
P621W0221	A-5	F-4	B2, B7	3-hour F
P621W0224	A-5	F-4	B2, B7	3-hour F
P631S0119	F-7	F-4	B11	3-hour F and T
P631S0120	F-7	F-4	B11	3-hour F and T
P641S0051	F-1	F-7	B11	3-hour F and T
P641S0052	F-1	F-6	B11	3-hour F and T
P712S0013	Radwaste	Radwaste	B1	Not an Appendix R Barrier
P712S0014	Radwaste	Radwaste	B1	Not an Appendix R Barrier
P712S0015	Radwaste	Radwaste	B1	Not an Appendix R Barrier
P712W1006	RW-1	Radwaste	B1	Not an Appendix R Barrier

7.2.3 Non-T Rated Penetrations

M-663-00017, identifies that where penetrations exist which do not satisfy temperature (T) rating requirements, a seal assembly with a fire (F) rating corresponding to the hourly rating of the associated barrier is acceptable, provided evaluation demonstrates that insitu combustibles and redundant PFSSD equipment/circuits on the unexposed barrier side will not be detrimentally affected by the increased penetrant temperatures.

The review methodology established to satisfy the M-663-00017 evaluation criteria for non-T rated seals involved the development of a heat affected zone for each applicable penetrant size. The heat affected zone, as depicted in Figure 7.2.3-1, is a length down the pipe and radius away from the pipe where unexposed side pipe temperatures could result in unacceptable thermal insult to redundant PFSSD circuits/equipment or auto-ignition of exposed insitu combustibles. For PFSSD circuits and IEEE 383 cable, this temperature limitation is 700°F. This limitation is based on EPRI TR-100443, which identifies that 700°F is a conservative damage threshold criterion for IEEE-383 qualified cable. Wolf Creek cable is IEEE-383 qualified. A 400°F temperature limitation was selected for other Class A combustibles. This limitation is based on the following considerations:

- M-663-00017 unexposed penetration seal surface limitation of 325°F plus ambient.
- Auto-ignition temperature of wood based materials (400°F to 500°F).
- EPTR TR-100443 identifies 425°F as the damage threshold for unqualified cable.



Notes:
1. Heat affected zone is typical for both barrier sides.
2. The size of the heat affected zone changes based on penetrant size.
3. L_1 = Distance along pipe where unexposed side pipe temperature is $\geq$ 700°F .
4. L_2 = Distance along pipe where unexposed side pipe temperature is $\geq$ 400°F.
5. R_1 = Distance from pipe where unexposed side air temperature is $\geq$ 700°F.
6. R_2 = Distance from pipe where unexposed side air temperature is $\geq$ 400°F.

Figure 7.2.3-1, Heat Affected Zone

The determination of heat affected zone distances encompassing the damage threshold temperature limits is based on application of fire test data and analytical heat transfer principles. Temperatures at various lengths down the pipe (L_1 and L_2 from Figure 7.2.3-1) are based on the following heat transfer equation:

$T = T_a + (T_s - T_a)e^{\wedge} (-mx)$ **Equation 1**

Where:

T = End point temperature (400°F and 700°F)

T_s = Exposed side temperature (1925°F from ASTM E-119 maximum temperature exposure)

T_a = Ambient unexposed side temperature (70°F)

E = Log e (2.71828)

m = (h/p/ka)^0.5
x = Distance (ft.)

For m = (h/p/ka)^0.5

h = Convective heat transfer coefficient (0.1 btu/hr-ft^2-F)
p = Perimeter of pipe (ft)
a = Area of pipe section (ft^2). Schedule 80 data was utilized for all pipe sizes with the exception of a 30" diameter pipe, which utilized the thickest wall size (Schedule 30) commercially available.
k = Thermal conductivity of steel (31 btu/hr-ft-F)

Equation 1 was applied for each pipe size of concern ranging from 2-1/2" to 30" in diameter. Distances in increments of 0.5 ft were utilized for each pipe until the damage threshold temperatures of $\leq$700°F and $\leq$400°F were identified at a length along the pipe from the fire exposed side. Tables 7.2.3-2A through 7.2.3-2C identify the results for the L_1 and L_2 heat affected zone distances, when applying Equation 1.

Application of Equation 1 is conservative in that it does not consider heat sink properties of the barrier. A low convective heat transfer coefficient was also utilized such that heat transfer to potential fluid media within the pipe is not a contributing factor to results. Additionally, comparison to unexposed side pipe temperatures recorded for fire tested assemblies in M-663-00157 further substantiates a conservative approach. Fire test M-663-00157 contained pipe penetrants up to 10" in diameter. The penetrations within the 12" concrete slab were sealed with a 12" depth of Silicone Foam. Each pipe penetrant contained a thermocouple located on the pipe 6" above the unexposed surface of the concrete slab. Table 7.2.3-1 provides a comparison of the fire tested temperatures recorded for these thermocouples in relation to the Table 7.2.3-2A through 7.2.3-2C calculated temperatures at a comparable 18" distance (12" for slab and 6" above slab). The Table 7.2.3-1 comparison reveals a significant conservative margin between tested and calculated results. This is predominantly attributed to the heat sink properties of the concrete slab and associated penetration seal, which are not accounted for in Equation 1.

Table 7.2.3-1
Comparison of Tested and Calculated Pipe Temperatures

Pipe Size (in)	M-663-00157 Temp. @ 6" Above Unexposed Side of Slab (°F)	Table 7.2.3-2A thru 7.2.3-2C Temp. @ 18" (°F)
2	156	1026
4	229	1163
	181	1163
6	344	1236
	323	1236
8	383	1277
	376	1277
10	455	1321

The radius distances of the heat affected zone (R_1 and R_2 in Figure 7.2.3-1) are based on the temperature drop across a 1" air space in a Thermo-Lag 330-1 wall assembly that was tested in accordance with ASTM E-119 requirements. An excerpt from an approved nuclear utility document (Reference 4.7.18) indicates that for test report 14980-98207 (Reference 4.7.1), informational thermocouples 31 and 32 were free floating and located approximately 1" from the unexposed wall surface. At the end of the test, temperatures recorded by these thermocouples were less than 130°F. Comparing an approximate 130°F temperature at 1" from the unexposed surface to the lowest surface temperatures recorded in the test yields a 222°F drop across the 1" air space. Utilizing the lowest unexposed side surface temperature presents a conservative delta between surface temperature and thermocouple readings 1" away from the unexposed surface. This presents reasonable data to equate the effects of an air gap distance away from thermally effected commodity. Utilizing the Table 7.2.3-2A through 7.2.3-2C L_1 and L_2 pipe temperatures, and applying a 222°F drop in temperature for every 1" of linear air space perpendicular to the pipe until the damage threshold temperatures are achieved, results in a conservative approximation of the heat affected zone radius. Tables 7.2.3-2A through 7.2.3-2C identify the radius distance for each 0.5 ft pipe length increment where calculated unexposed side penetrant temperatures exceeded the damage threshold criteria temperature limits.

Attachments B5 through B9 and B13 document the evaluations for penetration seal configurations that are 3-hour fire (F) rated but are not bounded by fire testing to a 3-hour T rating, due to penetrant size in relation to the as installed seal configuration. The review assessed each penetration on both barrier sides for the presence of redundant PFSSD circuits and combustibles within the heat affected zone, utilizing the Table 7.2.3-2A through 7.2.3-2C review distances corresponding to the penetrant size of concern. The heat affected zone review process was conducted in accordance with the guidance provided in Figure 7.2.3-2.

Specification M-162C controls the application of insulation near non-T rated pipe penetrations to ensure that in the future the penetrants will not be covered by combustible insulation within the heat affected zone.

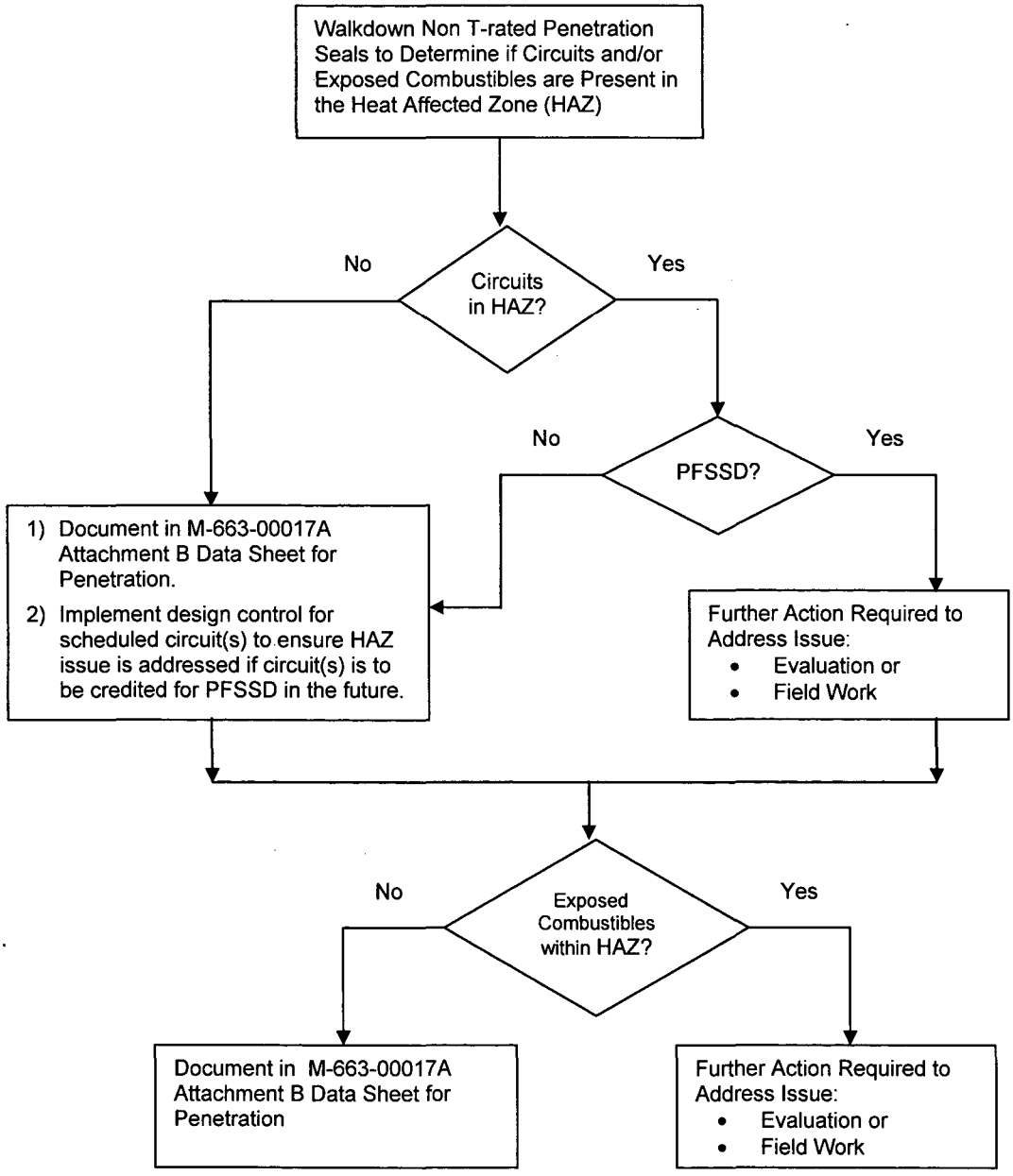


Figure 7.2.3-2, Heat Affected Zone Review Process

Table 7.2.3-2A, Heat Affected Zone Distances for 2" Through 5"Diameter Pipe*

L_1 & L_2 Distance (ft)	2" Pipe			2-1/2" Pipe			3" Pipe			4" Pipe			5" Pipe		
	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)
0.5	1557	3.9	5.2	1593	4.0	5.4	1607	4.1	5.4	1625	4.2	5.5	1641	4.2	5.6
1	1262	2.5	3.9	1321	2.8	4.1	1344	2.9	4.3	1374	3.0	4.4	1400	3.2	4.5
1.5	1026	1.5	2.8	1097	1.8	3.1	1126	1.9	3.3	1163	2.1	3.4	1196	2.2	3.6
2	836	0.6	2.0	914	1.0	2.3	945	1.1	2.5	987	1.3	2.6	1024	1.5	2.8
2.5	**684**	Contact	1.3	763	0.3	1.6	795	0.4	1.8	839	0.6	2.0	877	0.8	2.2
3	562		0.7	**639**	Contact	1.1	**671**	Contact	1.2	715	0.1	1.4	754	0.2	1.6
3.5	465		0.3	537		0.6	568		0.8	**610**	Contact	0.9	**649**	Contact	1.1
4	**386**		Contact	454		0.2	483		0.4	523		0.6	560		0.7
4.5				**385**		Contact	412		0.1	450		0.2	485		0.4
5							**354**		Contact	**389**		Contact	421		0.1
5.5													**368**		Contact

Table 7.2.3-2B, Heat Affected Zone Distances for 6" Through 14" Diameter Pipe*

L_1 & L_2 Distance (ft)	6" Pipe			8" Pipe			10" Pipe			12" Pipe			14" Pipe		
	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)
0.5	1659	4.3	5.7	1677	4.4	5.8	1697	4.5	5.8	1712	4.6	5.9	1721	4.6	5.9
1	1431	3.3	4.6	1463	3.4	4.8	1497	3.6	4.9	1524	3.7	5.1	1539	3.8	5.1
1.5	1236	2.4	3.8	1277	2.6	3.9	1321	2.8	4.1	1357	3.0	4.3	1377	3.0	4.4
2	1069	1.7	3.0	1116	1.9	3.2	1167	2.1	3.5	1209	2.3	3.6	1233	2.4	3.8
2.5	925	1.0	2.4	976	1.2	2.6	1032	1.5	2.8	1078	1.7	3.1	1105	1.8	3.2
3	803	0.5	1.8	855	0.7	2.0	914	1.0	2.3	962	1.2	2.5	991	1.3	2.7
3.5	**698**	Contact	1.3	750	0.2	1.6	810	0.5	1.8	860	0.7	2.1	889	0.9	2.2
4	608		0.9	**659**	Contact	1.2	719	0.1	1.4	769	0.3	1.7	799	0.4	1.8
4.5	531		0.6	581		0.8	**639**	Contact	1.1	**689**	Contact	1.3	719	0.1	1.4
5	464		0.3	512		0.5	569		0.8	618		1.0	**647**	Contact	1.1
5.5	408		0.0	453		0.2	508		0.5	555		0.7	583		0.8
6	**359**		Contact	402		0.0	454		0.2	499		0.4	527		0.6
6.5				**358**		Contact	406		0.0	450		0.2	477		0.3
7							**365**		Contact	406		0.0	432		0.1
7.5										**368**		Contact	**392**		Contact

Note * Refer to Figure 7.2.3-1 for depiction of L_1, L_2, R_1, and R_2.

Table 7.2.3-2C, Heat Affected Zone Distances for 16" Through 30" Diameter Pipe*

L_1 & L_2 Distance (ft)	16" Pipe			18" Pipe			20" Pipe			24" Pipe			30" Pipe**		
	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)	Temp. (°F)	R_1 Radius (in)	R_2 Radius (in)
0.5	1732	4.6	6.0	1741	4.7	6.0	1749	4.7	6.1	1763	4.8	6.1	1706	4.5	5.9
1	1559	3.9	5.2	1576	3.9	5.3	1590	4.0	5.4	1615	4.1	5.5	1513	3.7	5.0
1.5	1404	3.2	4.5	1426	3.3	4.6	1446	3.4	4.7	1480	3.5	4.9	1342	2.9	4.2
2	1265	2.5	3.9	1292	2.7	4.0	1316	2.8	4.1	1357	3.0	4.3	1192	2.2	3.6
2.5	1140	2.0	3.3	1171	2.1	3.5	1198	2.2	3.6	1244	2.5	3.8	1059	1.6	3.0
3	1029	1.5	2.8	1062	1.6	3.0	1091	1.8	3.1	1141	2.0	3.3	942	1.1	2.4
3.5	929	1.0	2.4	964	1.2	2.5	995	1.3	2.7	1048	1.6	2.9	839	0.6	2.0
4	839	0.6	2.0	875	0.8	2.1	907	0.9	2.3	962	1.2	2.5	748	0.2	1.6
4.5	759	0.3	1.6	795	0.4	1.8	828	0.6	1.9	884	0.8	2.2	**668**	Contact	1.2
5	**687**	Contact	1.3	724	0.1	1.5	756	0.3	1.6	813	0.5	1.9	597		0.9
5.5	623		1.0	**659**	Contact	1.2	**691**	Contact	1.3	748	0.2	1.6	535		0.6
6	565		0.7	600		0.9	632		1.0	**689**	Contact	1.3	480		0.4
6.5	514		0.5	548		0.7	579		0.8	635		1.1	432		0.1
7	468		0.3	501		0.5	531		0.6	585		0.8	**389**		Contact
7.5	426		0.1	458		0.3	487		0.4	540		0.6			
8	**389**		Contact	419		0.1	448		0.2	499		0.4			
8.5				**385**		Contact	412		0.1	462		0.3			
9							**380**		Contact	427		0.1			
9.5										**396**		Contact			

Notes:

* Refer to Figure 7.2.3-1 for depiction of L_1, L_2, R_1, and R_2.

** Heat affected zone review distance for 30" diameter pipe is reduced due to the Schedule 30 pipe wall thickness utilized in the equation. Schedule 30 is the thickest wall size commercially available for 30" diameter pipe.

7.2.4 Fire Area A-34 Penetration Seals

Change Package 012154 created new Fire Area A-34 on the 2000' elevation of the Auxiliary Building in effort to improve the post fire safe shutdown strategy for Fire Area A-8. The change package supporting documentation evaluates the acceptability for fire barrier penetration seals for the new Fire Area. Table 7.2.4 identifies the penetrations that are not directly bounded to M-663-00017 typical detail limitations. In each case, the subject seals satisfy 3-hour fire rating with no heat affect zone impact on either barrier side.

Table 7.2.4

Penetration No.	012154 Typical Detail
P132W1969	RB-7A/A-7
P132W1970	RB-5A
P132W1977	RB-7A/A-7
P132W1978	RB-7A/A-7

8.0 FIRE WRAP

8.1 Description

8.1.1 Fire wrap is predominantly comprised of Darmatt KM1 in a radiant energy shield, 1-hour, or 3-hour fire rated configuration, considering the protection requirements of 10 CFR 50 Appendix R, Section III.G.2. The fire wrap is provided for protection of redundant PFSSD circuit(s) within the same Fire Area.

8.1.2 Thermo-Lag 330-1 is utilized on a limited basis as a fire wrap material providing 1-hour fire rated protection, considering the protection requirements of 10 CFR 50 Appendix R, Section III.G.2. The fire wrap is provided for protection of redundant PFSSD circuit(s) within the same Fire Area.

8.2 Evaluation of Unique or Unbounded Configurations

8.2.1 Issues Addressed in Original Fire Protection License Documents

1. None.

8.2.2 Darmatt KM1 has been installed in the Reactor Building and Fire Areas A-6, A-24, A-33, and C-35 in accordance with the requirements of change package 07037. Configurations not directly bounded by fire testing associated with 07037, are evaluated within the change package documentation and PIR 2002-2290.

The 3-Hour Darmatt KM-1 installed in Fire Areas A-6 and C-35 have been installed without a border design at the wall interfaces. Fire testing reviews performed by fire protection revealed that a single layer, 3" min wide border design will be required to fully bound the barriers in accordance with GL-86-10, Supp 1 and ASTM E-119 time temperature requirements. The initial Darmatt KM-1 installation was in accordance with change package 07037. Border designs, installation requirements, and comparison to bounding fire tests is documented within change package 012322.

8.2.3 Darmatt KM1 has been installed in Fire Areas A-1 and A-18 in accordance with the requirements of change package 011038. Configurations not directly bounded by fire testing associated with 011038, are evaluated within the change package documentation.

8.2.4 Darmatt KM1 has been installed in Fire Area A-1 northeast corridor in accordance with the requirements of change package 011656. Configurations not directly bounded by fire testing associated with 011656, are evaluated within the change package documentation.

8.2.5 Thermo-Lag 330-1 has been installed in Fire Area A-8 corridor 1320. The fire wrap, which was originally installed to satisfy IEEE 384 electrical separation, was upgraded in accordance with change package 011888 to provide a 1-hour fire rated barrier. This fire barrier segment is evaluated within the change package documentation.

8.2.6 Darmatt KM1 has been installed in Fire Area A-8 northeast corridor, room 1320 in accordance with the requirements of change packages 012368 and 012568. Configurations not directly bounded by fire testing associated with 012368, are evaluated within the change package documentation. There are no Unbounded configurations associated with Change Package 012568.

8.2.7 Presently, there are no unique or unbounded configurations evaluated within an attachment for this fire barrier protective element.

9.0 HATCHES

9.1 Description

9.1.1 Equipment and personnel hatch openings are provided in various areas of the plant. Protection of these openings is provided by steel plate. The plate is either bare or encapsulated by a fire resistive material, depending on the fire hazards in the area.

9.2 Evaluation of Unique or Unbounded Configurations

9.2.1 Issues Addressed in Original Fire Protection License Documents

1. Auxiliary Building Equipment Hatches

The Auxiliary Building is provided with two sets of equipment hatchways in the northern and southern ends of the Auxiliary Building corridors. A monorail hoist serves each set of hatchways to allow equipment to be moved from one elevation to another. Hatch covers (checker plate steel) and automatic sprinkler protection are provided for each hatchway at elevations 2000'-0", 2026'-0", and 2047'-0" to separate the corridor fire areas (A-1, A-8, A-16, A-19, and A-20). (Reference 4.1.2 and 4.1.3)

2. Reactor Building Personnel Hatch

The personnel hatch, shown on USAR Figure 3.8-45, penetrates the Reactor Building into Fire Area A-20. The hatch has two bulk head doors on either side of the Reactor Building wall, which are secured by multiple pin latches. The gap between the door and the bulk heads is sealed by double o-ring gaskets. When closed, the gap between the door and the bulk head is less than 5 mills. The bulk heads and hatch doors are in series and provide redundant fire barrier protection. (Reference 4.1.2)

9.2.2 Hatches for RHR & Containment Spray Valve Encapsulation Tanks

At elevation 2000'-0" in the center of the Auxiliary Building, two adjacent hatchways are provided above the RHR and containment spray valve encapsulation tanks located on elevation 1988'-0". These two non-rated hatchways are covered with heavy steel plate covers. The major portion of the cover will only be removed when repair/maintenance work is performed on the encapsulated valves. The Pipe Chases (Rooms 1203 and 1204) at elevation 1988'-0" contain no process valves or electrical equipment.

Small vent valves are located in the curbed area surrounding the hatchways. Small sections of the covers are designed to allow removal for easy access to the vent valves.

These hatch covers are only provided for separation of Fire Areas A-1 and A-8 from a fire in Area A-8. Fires are not postulated in Rooms 1203 and 1204 because there are low fixed combustibles and the rooms are well separated from the remainder of Fire Area A-1. The two doors into the area are fire rated; however, the piping penetrations are not necessarily provided with fire-rated seals.

The above discussion was evaluated as acceptable in change package 04585.

9.2.3 Personnel Hatch Between Fire Areas A-1 and A-33

A small non-rated personnel hatch constructed of ¼" steel plate is provided between the Aux. Steam Condenser Recovery And Storage Tank Room 1129 (Fire Area A-1) and Pipe Chase area 1207 (Fire Area A-33). This hatch has been evaluated by change package 10257 as an acceptable fire barrier for the hazards present.

9.2.4 Emergency Escape Hatch Between Fire Areas A-23 and T-2

A small non-rated personnel hatch constructed of 3/16" checker plate steel is provided at the 2026' elevation between the Auxiliary Building Main Feed Water Pump Rooms (Rooms 1411 and 1412 and Fire Area A-23) and the Turbine Building 2015'-4" platform area (Room 4351 and Fire Area T-2). The hatch provides an emergency escape pathway from the lower elevations of the Auxiliary Building Area 5 in the event of a steam leak or pipe rupture. The hatch has been evaluated by USQD 00-0012 as an acceptable fire barrier for the hazards present.

10.0 FIRE DOORS

10.1 Description

10.1.1 A fire door assembly is the combination of a door, frame, and hardware that together provide a specific degree of fire protection to personnel passageway openings. Typically fire door assemblies are 3-hour fire rated.

10.2 Evaluation of Unique or Unbounded Configurations

10.2.1 Issues Addressed in Original Fire Protection License Documents

1. Missile Doors

An evaluation (Reference 4.7.4) was performed on the powerblock missile doors located in fire barrier walls to evaluate the doors based on the criteria established in ANSI/ASTM E 152, Standard Methods of Fire Tests of Door Assemblies. The evaluation concludes that the missile doors satisfactorily met the ASTM E 152 acceptance criteria.

The WCGS powerblock utilizes missile doors in fire-rated walls. These doors are identified in Table 10.2.1.1-1. Six of the doors are single swing and four are double swing doors. Each leaf of the doors is of similar construction, which includes a 2 1/2-inch-thick steel plate and vertical and horizontal reinforcing beams, which form a boxed-in area near the perimeter of the door. The multiple point latching mechanisms pass through the reinforcing beams and fix the doors in the opening. Missile doors, which are credited as fire doors, are provided at the following locations: (Reference 4.1.2 and 4.1.3)

Table 10.2.1.1-1
Missile Doors Credited As Fire Doors

Door #	Location Description	Communicating Fire Areas
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

2. Elevator and Dumbwaiter Doors

Elevator and dumbwaiter doors are rated at 1-1/2 hours as required by ANSI A17.1. The 1-1/2 hour doors are an industry standard and, as stated in ANSI A17.1, and are acceptable for use in a 2-hour rated elevator or dumbwaiter shaft. For a fire to propagate from one floor elevation to another, it would have to penetrate two doors. (Reference 4.1.2 and 4.1.3)

3. Water Tight Doors

A fire test was performed to evaluate the fire resistance performance of watertight doors located in fire barrier walls. The fire test was performed in accordance with the Standard for Fire Tests of Door Assemblies, UL 10B. Immediately after the fire exposure, the door was exposed to a hose stream test as specified for 3-hour fire doors. The watertight doors without gaskets are classified by UL as Special-Purpose Type Fire Doors and Frame Assemblies, Rating 3 hour (A). To achieve watertight integrity criteria, gasketing material was added to the door assembly in accordance with the manufacturer's recommendations. (Reference 4.1.2 and 4.1.3)

10.2.2 Change package 05314 and PIR 94-0143 evaluate the acceptability of up to a 1" gap between the door bottom edge and floor for swing type fire doors without integral seal packs. The fire doors identified in Table 10.2.2-1 contain a door bottom edge gap that exceeds NFPA 80 limitations. The PIR evaluated each of these as acceptable and generically evaluated up to a 1" door bottom edge gap for all swing type fire doors without integral seal packs.

Table 10.2.2-1
Fire Doors with Bottom Edge Gaps Exceeding NFPA 80 Limitations

Door #	Location Description	Communicating Fire Areas
32015	2032' Control Bldg. Lower Cable Spreading Room to Southwest Stairwell	C-21 to C-6
32092	1984' Control Bldg. Corridor 3206 to Corridor 3204	C-5 to C-6
34071	2016' Control Bldg. Corridor 3406 to Battery Room 3407	C-35 to C-16
43091	2000' Turbine Bldg 2000' Stairwell T-2 Turbine Building	Turbine Bldg. to life safety stairwell

10.2.3 Presently there are no unique or unbounded configurations evaluated within an attachment for this fire barrier protective element.

11.0 FIRE DAMPERS

11.1 Description

11.1.1 A fire damper is a device, installed in an air distribution system, designed to close automatically upon detection of heat, to interrupt migratory airflow, and restrict the passage of flame. Three-hour fire rated curtain type fire dampers are utilized within a 10 gauge (minimum) steel sleeve that is attached to the ductwork and supported by the barrier or sleeve enclosure. Fire dampers are typically located within the plane of the fire barrier, and meet UL 555 requirements.

11.2 Evaluation of Unique or Unbounded Configurations

11.2.1 Issues Addressed in Original Fire Protection License Documents
1. None.

11.2.2 Unique or unbounded fire damper configurations are evaluated in Attachment F.

12.0 STRUCTURAL STEEL FIREPROOFING

12.1 Description

12.1.1 Fireproofing utilized at Wolf Creek is a cementitious-based material covering structural steel to prevent structural member collapse in the event of fire exposure. Predominantly, a coating thickness necessary to achieve a 3-hour fire resistance rating is provided.

Albi Duraspray was used as the material of choice to protect structural steel (cementitious coatings) in Category I structures. In 2005 the manufacturer informed WCNOC that Albi Duraspray would no longer be manufactured or distributed. As a result, Monokote Z-146 was approved in September 2005 as a direct replacement or repair material. Currently the vast majority of plant structural steel in Category I structures is protected with Albi Duraspray. Both Albi Duraspray and Monokote Z-146 are cementitious and have similar physical characteristics, adhesion properties and fireproofing qualities.
Typically fireproofing is utilized to ensure structural integrity of steel building columns and beams that are integrated as an element of a fire barrier or steel structures that are part of the building that may be exposed to fire. It provides protection of safety significant equipment and/or life safety protection from room/area structural failure due to fire exposure. Cementitious fireproofing materials are applied to a sufficient thickness (qualified by fire testing) over the exposed surfaces of the structural member in a manner that will sufficiently bond the fireproofing clad to the substrate being protected. In some cases, lathing must be utilized to assure reliable adhesion to the underside of beams and repair areas in excess of one square foot.

12.2 Evaluation of Unique or Unbounded Configurations

12.2.1 Issues Addressed in Original Fire Protection License Documents

1. No fireproofing is provided for the Fuel building roof. Since the fire loading in this area is low, no credible fire can affect the roof. In addition, the roof is missile proof, 2-foot-thick reinforced concrete. Therefore, no fireproofing is required in this area. (Reference 4.1.2)General Background Information

At Wolf Creek, fireproofing material is generally applied over exposed surfaces of structural members with the exception of thermal shorts and intervening items. Refer to Figure 12.2.2-1 for a typical unprotected thermal short attachment. Underwriters Laboratories (UL) has tested several different size members utilizing both Albi Duraspray and Monokote Z-146 coatings to 3-hour ASTM E-119 fire exposures. The testing for beams and columns, utilized W8 x 28 steel shapes incorporating two protection methods; contour and boxed. However, testing of both techniques did not incorporate thermal short attachments. Therefore, the affect of heat flux into plant structural steel with unprotected thermal shorts is not directly bounded by fire testing. Additionally, FP-M-012 revealed that unprotected thermal shorts, larger than Unistrut, contribute to single point temperatures that in some cases exceed the ASTM E-119 acceptance criteria (1300°F for beam and 1200°F for column), assuming a 3-hour fire exposure. Typically, average temperatures satisfied the ASTM E-119 acceptance criteria.

Additionally, in various plant areas structural steel has been integrated as part of the fire barrier assembly. Refer to Figure 12.2.2-2 for a typical application of protected structural steel as an element of a fire barrier assembly. However, fire testing does not directly bound the use of protected steel as part of a fire barrier assembly. Such a configuration presents the potential to transmit detrimental temperatures to insitu combustibles and/or PFSSD circuits located in close proximity to the unexposed barrier side. This issue requires a Heat Affected Zone (HAZ) review similar to that discussed in Section 7.2.3 for non-T rated penetration seals.

Considering the above discussion, Section 12.2.4 and 12.2.6, and Attachments G1 through G5 demonstrate, via evaluation, that unique/unbounded structural steel fire protection configurations, including the omission of thermal short protection, do not compromise structural steel integrity. Section 1.1.1 identifies the overall fireproofing assessment review methodology utilized.

The evaluation approaches utilized were developed considering the structural steel fireproofing guidance provided in Section 4.2.2 of Regulatory Guide 1.189 (Revision 0), and Fire barrier evaluation guidance from Generic Letter 86-10. Relevant sections from each are repeated below:

Regulatory Guide 1.189, Section 4.2.2
Structural steel forming a part of or supporting fire barriers should be protected to provide fire resistance equivalent to that required of the barrier. Where the structural steel is not protected and has a lower fire rating than the required rating of the fire barrier, the configuration should be justified by a fire hazards analysis that shows the temperature the steel will reach during fire and the ability of the steel to carry the required loads at that temperature.....

Generic Letter 86-10, Enclosure 1 Item 4
The term "fire area" as used in Appendix R means an area sufficiently bounded to withstand the hazards associated with the area and, as necessary, to protect important equipment within the area from a fire outside the area. In order to meet the regulation, fire area boundaries need not be completely sealed floor-to-ceiling, wall-to-wall boundaries. However, all unsealed openings should be identified and considered the evaluating the effectiveness of the overall barrier. Where fire area boundaries are not wall-to-wall, floor-to-ceiling boundaries with all penetrations sealed to the fire rating required of the boundaries, licensees must perform an evaluation to assess the adequacy of fire boundaries in their plants to determine if the boundaries will withstand the hazards associated with the area.....

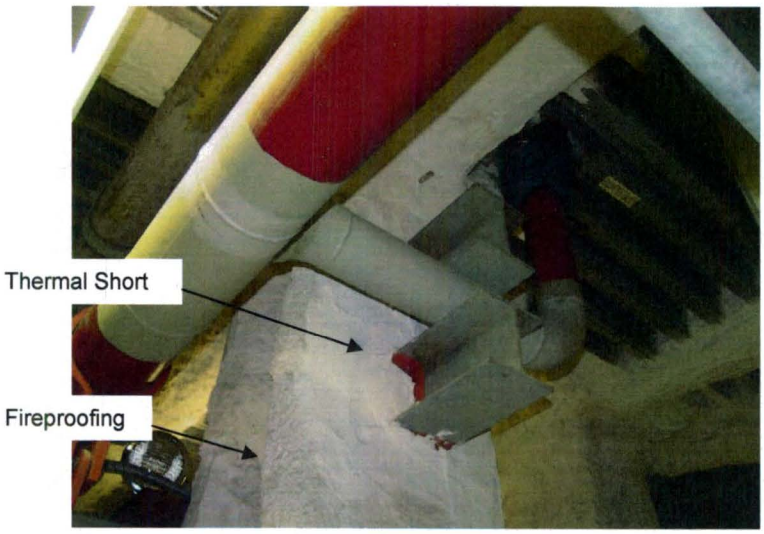


Figure 12.2.2-1,
Typical Unprotected Thermal Short Attachment

Figure 12.2.2-2
Typical Fireproofed Steel Integral to a Fire Barrier

12.2.3 Thermal Short and Barrier Assessment Methodology

The primary purpose of the fireproofing barrier review was to assess the impact of unprotected steel attachments (thermal shorts) on structural steel with fireproofing. In effort to address this issue, Fire Protection performed plant walk downs and inspections in all Safety Related areas to collect and record relevant thermal short data. The walk downs were conducted on a room-by-room basis utilizing structural steel drawings and a best effort visual inspection to determine the worse case thermal short configuration for columns, beams and where the structural steel serves as a 10 CFR 50 Appendix R fire boundary. Stairwells that separated Appendix R Fire Areas were reviewed by elevation because each elevation may have incorporated structural steel that separates fire areas with different combustible loading. The thermal short items identified for each room are considered the bounding configuration for all other thermal shorts within the confines of rooms and/or fire areas requiring structural steel fireproofing. The thermal short selection process did not take into consideration the load applied to the attachment member.

To determine a worse case scenario for thermal short attachment the following was considered:

- Location of attachments, (flange, web and height on columns), bottom flange on beams and higher attachments on columns are considered worse case verses web attachment on beams and attachment to columns that are attached low to the floor, provided attachments are similar in size and weight. No consideration was given to location on steel spans or to adjacent steel connections and load sharing member capability.
- Size & type of attachments (I beam shaped member verses tube steel, etc.), tube steel considered worse case due to area of unprotected steel.
- Concentration of attachments.
- Orientation of attachments.
- Size of structural steel.
- Appendix R separation, one-sided or two-sided structural steel protection and proximity of relevant circuits or components when thermal short impact is observed.
- Thickness of fireproofing when applied excessively thick in areas of issue, were documented to provide thermal credit.
- Structural Beams and columns with supporting or restraining wall interfaces.

To aid the evaluation process and to organize the data into similar configurations and conditions, field sketches were prepared to document the worse case scenario for thermal shorts and Appendix R HAZ issues, as determined by Fire Protection. The field sketches included room layout and thermal short/HAZ attachments within each room or area under review. Room sketches depict the room layout to locate each issue being evaluated and attachment sketches provide details such as size, critical dimensions and general orientation of the attachments to the building steel. Sketches are not to scale and only depict general attachment layout and configuration to closely resemble the attachment member orientation and location to the structural member. Detail sketches do not provide steel or contain structural connection designs, but however provide sufficient detail to assist in determining the affects of heat flux through the unprotected member into the structural beams, columns and/or the affect of HAZ to PFSSD circuits or components on the unexposed side of the barrier, when applicable.

Field sketches and photographs are provided in Attachment G to document the evaluation of worse case scenarios.

Following completion of field walk downs, issue categories were developed with each room assigned to the corresponding applicable categories. The unique/unbounded fireproofing categories necessary to address identified issues are summarized bellow.

- Attachment G1 – Fire Protection Evaluation for Generic Fireproofing Issues
  - Appendix R Barriers with Incorporated Structural Steel
  - Steel Internal to Cable Chases
  - Embedded Steel
  - Miscellaneous Steel
  - Steel Protection for Stairwells and Elevators
  - Diesel Building Structural Steel
  - Control Building Duct Chase
- Attachment G2 - Fire Protection Evaluation for Structural Steel Fireproofing with Unprotected Thermal Shorts Within Open Rooms
- Attachment G3 - Fire Protection Evaluation for Structural Steel Fireproofing With Unprotected Thermal Shorts in Closed Rooms with 650 kW Fire and No Ventilation or Forced Ventilation
- Attachment G4 - Fire Protection Evaluation for Structural Steel Fireproofing With Unprotected Thermal Shorts in Closed Rooms with a Credible Fire and No Ventilation or Forced Ventilation
- Attachment G5 - Fire Protection Evaluation for HAZ Assessment of Structural Steel Integral to Fire Boundary

Table 1.1.1-1 identifies each room reviewed for structural steel fireproofing unique/unbounded configurations and the corresponding applicable evaluation that applies to the room.

12.2.4 Design Omissions Due to Pipe Snubber and Struts:

Snubber and pipe strut attachment points present a unique issue concerning the fire proofing protection of structural steel. In some instances it is necessary to locally remove fireproofing to provide accessibility to the snubber clevis pins to allow snubber removal during functional testing and validation activities. When this is the case, Monokote Z-146 is used to restore the fireproofing in accordance with CNT-MC-600. It is acceptable to contour the Monokote Z-146 so future disassembly efforts will not require subsequent fireproofing removal, provided the omission area is no larger than 64 square inches. The rework area is contoured to allow free movement and not bind the snubber or strut in any direction and allow unrestricted access to the clevis pins. Contouring the fireproofing to provide sufficient space between snubber, strut components and fireproofing is necessary to accommodate design moments.

Figures 12.2.4-1 and 12.2.4-2 depict typical representation of fireproofing omissions where struts require unrestricted movement. Snubber attachment points are similar and require the same protection technique, producing the same protection or contoured configuration in the fireproofing finish. Therefore, contouring the fireproofing for either a strut or snubber attachment point is considered equivalent, whether on beams or columns.

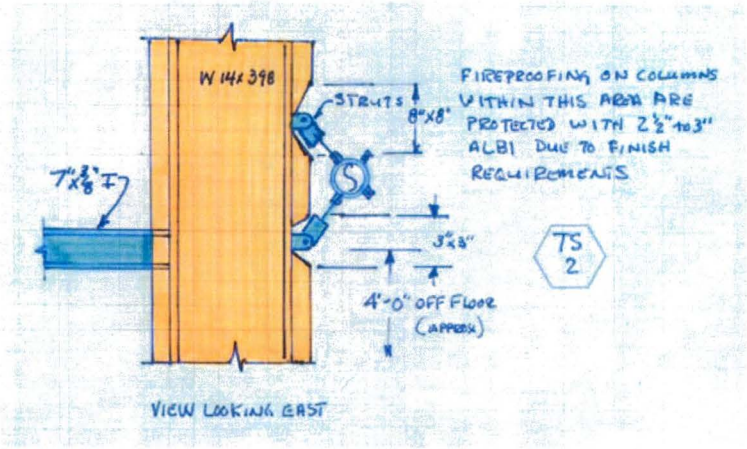


Figure 12.2.4-1
Typical Strut or Snubber Attachment Omission

Figure 12.2.4-2
Photo Of Typical Omission With Sloping Fireproofing

Evaluations and reviews of areas within the plant identified similar sized protection omissions through unprotected steel attachments or thermal shorts that were determined not to affect building steel, in the event of fire. Unprotected steel attachments are considered a worse case scenario when comparing reduced fireproofing in areas of snubber or strut attachment locations. The areas of reduced fireproofing are not devoid of fireproofing material and remain mostly protected with limited thickness in the area of attachment point with increased thickness toward the outer perimeter of the contoured areas. These areas of contoured fireproofing slope gradually and provide better protection than that of larger unprotected steel attachments with no thermal short protection. Because the fireproofing is sloped, it will diminish the affects of thermal heat flux into the building steel structure by reducing the unprotected area at the point of attachment. Although, not fully protected with full thickness fireproofing throughout attachment area, the areas are considered diminutive in nature when considering larger unprotected attachments found acceptable through analysis documented in Attachments G1 through G5.

Based on the above discussions, it is reasonable to conclude that the contoured areas accommodating snubber or strut movement would perform no worse than unprotected steel attachments found acceptable through analysis. Therefore, contoured fireproofing areas where snubber or strut attachments are required will not cause steel failures during fire exposures and are considered acceptable.

12.2.5 Calculation FP-M-011 evaluates the following:

1. Conditions where structural steel fireproofing does not conform to the minimum required thickness.

2. Protection adequacy of structural members that are smaller than fire tested member sizes.

3. Calculation FP-M-011 evaluated the Albi Duraspray coating thickness for unbounded sizes (smaller than tested) and found that the as-built thickness for the majority of coatings were adequate and identified where under thickness coatings were found they were to be reworked for compliance. Calculation FP-M-011 did not consider large or multiple omissions of protective coatings due to thermal short attachments (secondary members). Thermal Shorts and protection omissions are evaluated on a worse case basis by room and/or fire area, as documented in Attachments G1 through G4.

12.2.6 Interim Material Omission:

Based on the fireproofing evaluations documented in Attachments G1 through G4, interim removal of steel fireproofing (144 in^2) is permissible without administrative control (AP 10-104), Breach Authorization. These evaluations have demonstrated the acceptability of unprotected thermal shorts. Considering these evaluation results, it is reasonable to conclude that interim small material omission up to 144 in^2 is comparable to an unprotected thermal short, and does not present an unacceptable determent to structural steel performance.

13.0 CABLE TRAY FIRESTOPS & CABLE TRAY COVERS

13.1 Description

13.1.1 A firestop is a protective configuration provided to prevent the spread of fire along a combustible element. At Wolf Creek, this protective configuration is comprised of a combination of Silicone Foam and sheet metal covers for a limited number of cable trays.

13.2 Evaluation of Unique or Unbounded Configurations

13.2.1 Issues Addressed in Original Fire Protection License Documents

1. None

13.2.2 Auxiliary Building 2026' Corridor Room 1408 Cable Tray Firestops

Non-rated Silicone Foam firestop and sheet metal tray cover protection is provided for raceways 116J5B30, 116U5D30, and 116U5E30 in Room 1408 (Fire Area A-16). This protective configuration, as depicted in E-1R8900 Sheet 65, is provided to prevent fire propagation between redundant Component Cooling Water trains, which are separated by spatial distance. An approximate 12" cable tray segment on each side of the firestop was initially protected with Thermo-Lag 330-1. The firestop, tray cover, and Thermo-Lag 330-1 protective configuration was accepted in the original fire protection licensing basis, as documented in Reference 4.1.3. Change package 06513 evaluates as acceptable the firestops and sheet metal tray covers without the Thermo-Lag 330-1 protection, which was removed due to combustibility concerns associated with the Thermo-Lag material.

13.2.3 Presently, there are no unique or unbounded configurations evaluated within an attachment for this protective element.

WOLF CREEK
NUCLEAR OPERATING CORPORATION

M-663-00017A

Attachment A1

Fire Protection Evaluation For Control Room Floor Slab and Cable Trenches

Rev. No.	Prepared By	Date	Reviewed By	Date
W01	Wayne S Aregood	8/22/05	Jeff Suter	8/22/05

Table of Contents

Revision Log 3

1.0 Purpose 4

2.0 Scope 4

3.0 References 4

4.0 Evaluation 5

5.0 Conclusions 9

Revision Log

Revision	Reason for Revision
W01	Original Issue

1.0 Purpose

1.1 The purpose of this document is to evaluate an existing fire barrier design that does not conform to the temperature (T) rating requirements of ASTM E 119. This evaluation was conducted in effort to satisfy regulatory expectation regarding qualification and documentation of fire barrier issues. This evaluation was conducted in accordance with the guidance of NRC Generic Letter 86-10.

2.0 Scope

2.1 Control Room floor and cable trenches identified in Table I.

3.0 References

3.1 NRC Generic Letter 86-10, Implementation of Fire Protection Requirements, dated April 24, 1986

3.2 NRC Information Notice 88-04, Inadequate Qualification and Documentation of Fire Barrier Penetration Seals

3.3 10 CFR 50 Appendix R, Fire Protection Program For Nuclear Power Facilities Operating Prior To January 1, 1979

3.4 ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials

3.5 PIR 2005-0249, Control Room Cable Trench Design, compliance issue not meeting ASTM-E119 cold side temperature requirements (250°F + ambient).

3.6 Drawing E-0R3909, Raceway Sections and Details, Control Building, Rev 7.

3.7 Drawing E-1R3611, Raceway Plan Control Building Area 1, El. 2047'-6", Rev 0

3.8 Drawing C-1C3611, Control Building Area 1 Concrete Neat Lines & Reinforcing Plans Floor EL. 2047'-6", Rev. 0

3.9 Drawing C-0C3613, Control Building Area 1 Concrete Neat Lines & Reinforcing Partial; Plans & Details EL. 2047'-6", Rev. 3.

3.10 Drawing C-1003, Civil-Structural, Structural Steel and Concrete General Notes, Rev 6.

3.11 Drawing A-1335, Hot Laboratory Equipment & Furniture Layout Elevations and Details, EL. 1984'-0", Rev. 1

3.12 Specification C-101, Onsite Batch Plant And Furnishing Concrete For The Wolf Creek Generating Station, Rev. 26

3.13 Benjamin, I. A, 1961, Fire Resistance of Concrete, Symposium on Fire Resistance of Concrete, American Concrete Institute

3.14 The Fire Protection Handbook, 19th Edition, Volume 2

3.15 The SFPE Handbook of Fire Protection Engineering, 1st Edition

3.16 EPRI TR-100443, Methods of Quantitative Fire Hazards Analysis, May 1992

3.17 AP 10-102, Control of Combustibles, Rev. 9

3.18 XX-X-004, Combustible Fire Loading for Each Room in the Various Fire Areas at WCNOC, Rev. 3

3.19 IEEE 383, Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations.

3.20 ACI 301-72, Specification for Structural Concrete for Buildings (Revised 1981)

3.21 NUREG-1805, Fire Dynamics Tools Quantitative Fire Hazard Analysis Method for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program

4.0 Assumptions

4.1 Based on partial visual examinations of trenches EF159 and EF163, it is reasonable to conclude that the remaining nine trenches are constructed in a similar manner, utilizing the same protective softener material between cable and concrete surfaces.

5.0 Evaluation

5.1 Assessment of Condition to Design Requirements

The Control Room floor slab at elevation 2047'-6" is constructed in accordance with drawing C-1C3611 utilizing normal weight aggregate concrete per specification C-101. In general, the thickness of the Control Room floor is 8" throughout the entire area, except adjacent to the East and West walls and the 11 recessed cable trenches identified in Table I.

The areas spanning from the East and West walls to the first structural beam are approximately 10" wide and are constructed with a 2" corrugated steel Q-Deck, thus producing a 6" floor thickness within the Q-Deck valleys. Because the design utilizes 2" Q-Decking, structurally the floor slab is considered 8", but a 6" floor thickness can only be applied for fire rating. Application of Figure 1 from References 3.13 and 3.14 reveals that a normal weight aggregate floor segment that is at least 5-1/2" thick is qualified for a 3-hour fire (F) and temperature (T) rating per the requirements of ASTM E 119.

The integral cable trenches are recessed 3¼" within the slab, yielding a reinforced concrete barrier thickness of 4¾" at each trench. Cable trench details are depicted on drawing C-0C3613, while Figure 2 depicts a typical cable trench configuration. The floor trenches separate post fire safe shutdown (PFSSD) circuits from their redundant counterparts in the Lower Cable Spreading Room, located below the Control Room.

The trench area 4¾" concrete thickness will not allow the passage of flame or hose stream for a 3-hour duration, as the concrete is not consumed during fire exposure. However, application of Figure 1 reveals that the trench areas will not satisfy the unexposed side fire barrier temperature limit of 250°F plus ambient, as required by ASTM E 119. Therefore, further review is necessary to assess PFSSD capability regarding impact to cables within the trenches, where unexposed side temperatures would exceed 250°F plus ambient when subjected to an ASTM E 119 fire exposure.

TABLE I
Control Room Cable Trenches

Trench or Raceway No.	Building	Room No.	Room Description	Floor Elevation
EF159	Control	3605	Equip. Cabinet Area	2047'-6"
EF163	Control	3605	Equip. Cabinet Area	2047'-6"
EF150	Control	3601	Control Room	2047'-6"
EF151	Control	3601	Control Room	2047'-6"
EF152	Control	3601	Control Room	2047'-6"
EF153	Control	3601	Control Room	2047'-6"
EF154	Control	3601	Control Room	2047'-6"
EF155	Control	3601	Control Room	2047'-6"
EF156	Control	3601	Control Room	2047'-6"
EF157	Control	3601	Control Room	2047'-6"
EF159	Control	3601	Control Room	2047'-6"

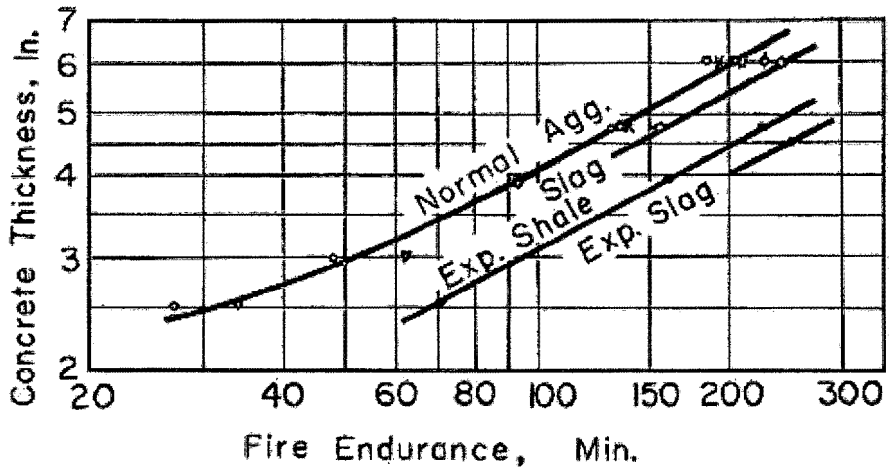


FIGURE 1
Relationship of Slab Thickness and Type of Aggregate

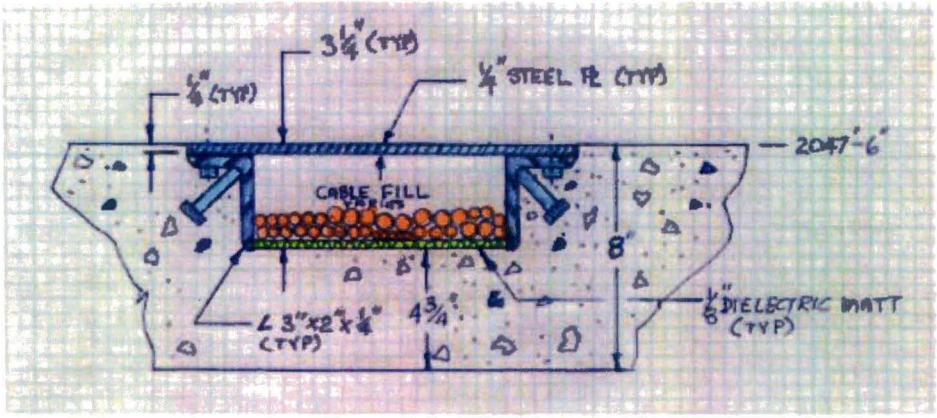


FIGURE 2
Typical Cable Trench Configuration

5.2 Evaluation of Condition

The failure mode necessitating evaluation is the potential effect of high temperature exposure to redundant PFSSD cables routed and lying within the trenches in the event of Lower Cable Spreading Room fire. No credit has been given to suppression systems located in the Lower Cable Spreading Room.

The Control Room reinforced concrete floor slab is constructed utilizing coarse normal weight aggregate and cement with combination of # 4 and # 6 rebar, 3" X 2" X ¼" thick steel angle embedded and recessed into the concrete at the upper trench corners and has a minimum compressive strength of 4000 psi. The corner angles are recessed ¼" to accommodate the ¼" trench flat steel cover plates to allow the floor surface to be completely flush eliminating any potential trip hazards within the Control Room. Each cable trench also contains a Unistrut support (A500 or equal) located approximately in the center of the trench throughout the entire length to provide support for the floor closure plate to prevent sagging and deformation. The Unistrut support is shown on Drawing E-40R3909. This Unistrut support is internal to the trenches and will have no impact to this evaluation.

The trenches contain IEEE 383 cable that is separated from the concrete barrier surface by a 1/8" thick layer of dielectric mat material to protect the cable from chaffing. The mat is a silicone elastomer based material (similar to silicone elastomer based materials used for sealing penetration openings). The mat provides some cable protection from direct radiant and conductive exposure. References 3.16 and 3.21 identify that the thermal insult threshold for IEEE 383 cable is 700°F. Figures 3 and 4 from Reference 3.15 reveal that a four inch slab thickness for either siliceous or carbonate based normal weight aggregate concrete results in unexposed side surfaces temperature of less than 500°F. This provides at least a 200°F margin between maximum unexposed side temperature development and the cable thermal insult threshold of the IEEE 383 cable. Additionally, the predominately 8" thick slab surrounding the trenches will provide added heat sink capability when compared to the constant floor slab thickness represented in Figures 3 and 4. Therefore, the data

presented in Figures 3 and 4 are considered conservative in respect to potential temperature exposure to the trench unexposed side surfaces.

Based on the potential exposure temperature of approximately 500°F during an ASTM E119 three-hour fire exposure and the cable within the trenches having a temperature qualification of 700°F, it is concluded that functionality of cables within the trenches will not be impacted. Therefore, there is no impact to PFSSD capability.

Moreover, the combustible loading (insitu and AP 10-102 transient combustible package allowance) within the Lower Cable Spreading Room would present a credible fire scenario that is significantly less severe than the 3hour exposure presented by an ASTM E 119 fire. Even when considering applied construction tolerances, as referenced in Drawing C-1003, Ref. 3.10 and ACI 301-72, Ref 3.19, the resulting trench minimum thicknesses will provide a conservative temperature exposure of 500°F, thus the trench slab thicknesses are bounded to this evaluation. Therefore, actual unexposed side trench temperatures would realistically be even less than 500°F, presenting an even greater thermal margin to cables within the trenches.

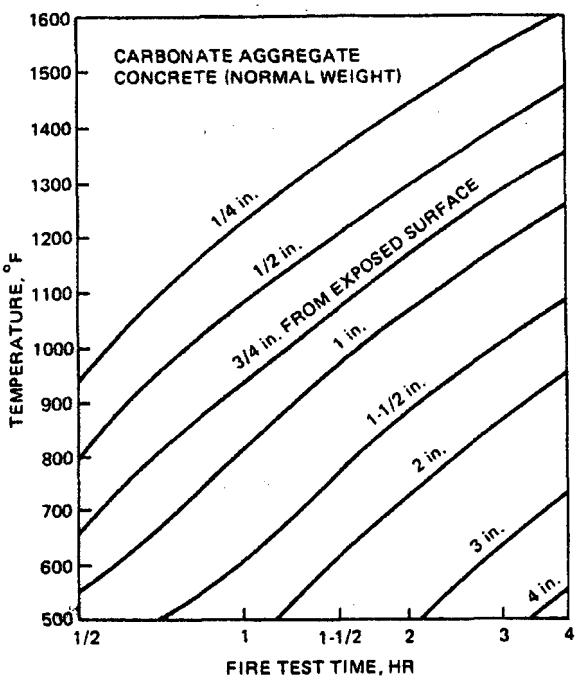


FIGURE 3
Temperatures within Concrete Slabs
(Normal Weight Carbonate Aggregate)

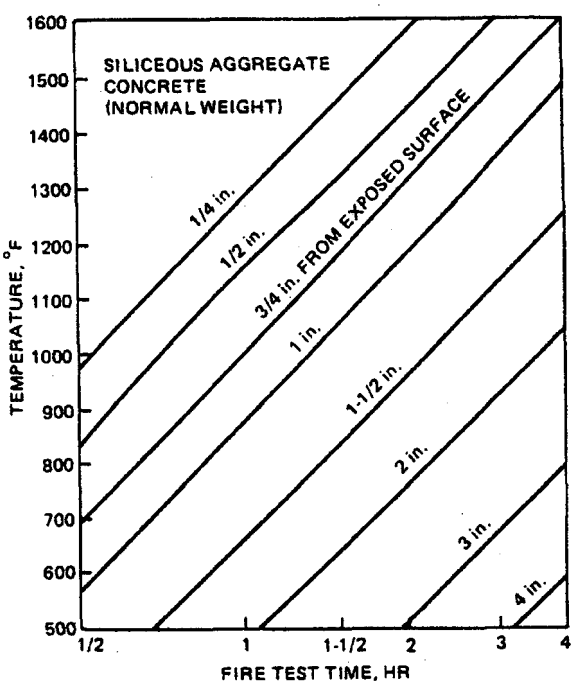


FIGURE 4
Temperatures within Concrete Slabs
(Normal Weight Siliceous Aggregate)

5.3 Post Fire Safe Shutdown Impact

There is no impact to PFSSD systems or components as a result of this evaluation. The cable trenches will not develop unexposed side temperatures that will challenge functionality of cables within the trenches. Therefore, PFSSD capability is not negatively impacted by the Control Room floor cable trench design.

6.0 Conclusions

The entire Control Room floor is 3-hour F and T rated with the exception of the cable trenches, which are only 3-hour F rated. The evaluation reveals that the maximum unexposed side cable trench temperatures will not exceed the thermal insult temperature of the cable, with substantial thermal margin. The Control Room floor and associated trenches satisfy regulatory requirements and commitments as well as WCNOC Fire Protection Program requirements, to prevent spread of fire from one fire area to another. It has also been determined through this evaluation that the lack of a T rating for the cable trenches will not affect the plant's ability to achieve and maintain PFSSD.

WOLF CREEK
NUCLEAR OPERATING CORPORATION

M-663-00017A

Attachment A2

Fire Protection Evaluation For Removable & Flanged Containment Penetrations Sealing Devices

Rev. No.	Prepared By	Date	Reviewed By	Date
W01	Wayne S Aregood	8/22/05	Jeff Suter	8/22/05

Table of Contents

Revision Log 3

1.0 Purpose 4

2.0 Scope 4

3.0 References 4

4.0 Assumptions 4

5.0 Evaluation 5

6.0 Conclusions 7

Revision Log

Revision	Reason for Revision
W01	Original Issue

1.0 Purpose

1.1 The purpose of this document is to evaluate an existing fire barrier design that has not been fire tested in accordance with ASTM E 119. This evaluation was conducted in effort to satisfy regulatory expectation regarding qualification and documentation of fire barrier issues. This evaluation was conducted in accordance with the guidance of NRC Generic Letter 86-10.

2.0 Scope

2.1 Table I removable and flanged Containment penetration devices with gaskets.

3.0 References

3.1 NRC Generic Letter 86-10, Implementation of Fire Protection Requirements, dated April 24, 1986

3.2 NRC Information Notice 88-04, Inadequate Qualification and Documentation of Fire Barrier Penetration Seals

3.3 10 CFR 50 Appendix R, Fire Protection Program For Nuclear Power Facilities Operating Prior To January 1, 1979

3.4 ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials

3.5 Drawing M-109A-00013, Containment Spray Isolation Valve Encapsulation (TEN02A), W13

3.6 Drawing M-109A-00014, Containment Spray Isolation Valve Encapsulation (TEN02B), W12

3.7 Drawing M-109A-00014, RHR Isolation Valve Encapsulation (TEJ01A), W13

3.8 Drawing M-109A-00016, RHR Isolation Valve Encapsulation (TEJ01B), W12

3.9 AP 10-102, Control of Combustibles, Rev. 9

3.10 XX-X-004, Combustible Fire Loading for Each Room in the Various Fire Areas at WCNOC, Rev. 3

4.0 Assumptions

4.1 It is assumed that the approved gasket materials have been used to seal the Containment penetration flanged sealing devices identified in Table II. This is acceptable based on a review of References 3.5 through 3.8.

5.0 Evaluation

5.1 Assessment of Condition to Design Requirements

Containment penetrations are installed through the Reactor Building boundary, separating Auxiliary Building from Reactor Building. These penetrations service plant systems that are required for plant functions during normal plant operations. Several of these penetrations (mechanical) are equipped with flanges and sealing gaskets to allow disassembly and reassembly for maintenance or modification evolutions. These penetration devices have not been specifically fire tested and therefore, an evaluation is required to determine fire impact to these penetration devices. Only the fire performance capabilities of the flanged designs are considered herein.

In general, Containment penetrations and the lack of specific fire testing is an industry issue. Containment penetration assemblies are not typical and differ in specific design attributes that would make it very difficult to bound to a specific fire test, if tested. Because these penetrations are typically constructed in a manner that does not promote fire propagation, little concern or emphasis has been given to Containment penetration sealing devices regarding fire performance.

This evaluation focuses on six (6) Containment penetrations that have been provided with flanged surfaces and gaskets that sometimes require disassembly and reassembly during refuel or unscheduled outages. These flanged gaskets could be affected by fire and are herein evaluated, Table I identifies these penetration devices.

TABLE I

Removable & Flanged Containment Penetration Devices

Penetration No.	Communication		Comment:
	Fire Area	Fire Area	
P-36	A-25	RB-1	AP 10-104, Used for routing maintenance support equipment.
P-68	A-25	RB-1	AP 10-104, Used for routing maintenance support equipment.
Encapsulated Valve Tank B (CTMT Spray) TEN02B	A-1	RB-1	AP 10-104, Encapsulation Boundary M-109A-00014
Encapsulated Valve Tank B (RHR) TEJ01B	A-1	RB-1	AP 10-104, Encapsulation Boundary M-109A-00016
Encapsulated Valve Tank A (CTMT Spray) TEN02A	A-1	RB-1	AP 10-104, Encapsulation Boundary M-109A-00013
Encapsulated Valve Tank A (RHR) TEJ01A	A-1	RB-1	AP 10-104, Encapsulation Boundary M-109A-00015

5.2 Evaluation of Condition

Each of the Table I penetrations are designed with flanged surfaces with a sealing gasket to ensure Containment Building pressure integrity. These gaskets are 1/16" thick and compressed between mechanical flanges to ensure Containment design pressure integrity. These gaskets are designed and manufactured by Garlock Sealing Technologies, Garlock, Inc. to resist steam saturation and have continuous operating temperature ratings of 400°F/650°F with a peak maximum exposure temperature rating of 700°F/1000°F, see Table II, below. Once compressed, the gaskets are not exposed to direct flame impingement and thus, not susceptible to ablative consumption during fire exposure. The remaining design surfaces and pressure features are heavy wall carbon steel or stainless steel material (tank, pipe & flanges) that are not generally affected by fire exposure.

WCNOC design indicates there are two approved gasket materials to be used for sealing the subject flanged penetrations; Garlock Blue-Gard Style 3200, or Style G-9920, both of which have high temperature sealing capabilities, as indicated in Table II. Gasket design data, as supplied by the manufacturers specification sheets, is provided in Figures 1 and 2.

TABLE II
Garlock Gasket Data

Gasket Type.	Color	Continuous Temp (F)	Max. Temp (F)	Figure No.
3200 Blue Gard	Off-white	400°	700°	1
G-9920	Mahogany w/Blue Band	650°	1000°	2

Further, the combustible loading (insitu and AP 10-102 transient combustible package allowance) within Table I Containment penetration areas presents a credible fire scenario that is significantly less severe than the 3-hour exposure presented by an ASTM E 119 fire. The combustible loading on either side of the barrier is LOW and these areas are not normally traveled during normal plant operations, thus limiting the use and storage of combustible materials in proximity to subject components. In the unlikely event a fire would occur on either side of the barrier, the LOW fire load could not produce a fire with such intensity to challenge the compressed gasket materials. Therefore, the integrity of the flanged surfaces and gaskets during postulated fire exposures in these areas would not become degraded to such a degree that would allow the passage of smoke, hot gases or flame to the other side of the barrier.

Therefore, it is reasonable to conclude that the flanged penetration surfaces with Garlock gaskets will not negatively impact the barrier to perform its intended function during fire exposure.

5.3 Post Fire Safe Shutdown Impact

There is no impact to PFSSD systems or components as a result of this evaluation. The removable & flanged Containment penetration sealing devices with Garlock gaskets will not allow the passage of flame through the Aux/Containment flanged penetration surface areas if exposed to fire. Therefore, PFSSD capability is not negatively impacted.

6.0 Conclusions

Based on the above discussions, it is reasonable to conclude that the removable & flanged Containment penetration sealing devices would not be affected by fire to a degree that would challenge barrier integrity. It has been determined through this evaluation that the removable & flanged Containment penetration seal devices satisfy regulatory requirements and commitments as well as WCNOC Fire Protection Program requirements, to prevent spread of fire from one Fire Area to another.

FIGURE 1

Garlock Sealing Technologies
Garlock Inc.
1666 Division Street
Palmyra, NY 14522-9360
(800) 448-6688
(315) 597-4811
FAX (315) 597-3196
http://www.garlock.net

Garlock® Style 3200 BLUE-GARD® Gasketing

Material: Aramid Fiber w/SBR Binder
Color: Off-White
Fluid Services: Water, Saturated Steam, Mild Acids, Alkalies, Inert Gases

Minimum Temperature: -40°F(-40°C)
Maximum Temperature: +700°F (371°C)
Continuous operating Temp.: 400°F (205°C
Pressure, Max.: 1200 psi (83 bar)
P x T, Max.: 350,000 (12,000)* 1/32"&1/16"
250,000 (8,000)* 1/8"

Meets MIL-G-24696 B

TEST METHOD	TYPICAL PHYSICAL PROPERTIES	TYPICAL RESULTS
ASTM F-37	**Sealability**	
	ml/hr. Leakage,	
	ASTM Fuel A (Isooctane):	0.1
	Gasket Load, 500 psi (3.5 N/mm^2)	
	Internal Pressure, 9.8 psig (.7 bar)	
	Nitrogen:	0.4
	Gasket Load, 3000 psi (20.7 N/mm^2)	
ASTM F-36	**Recovery**, min. (%):	50
ASTM F-36	**Compressibility**, (%) range:	7-17
ASTM F-38	**Creep Relaxation**, (%):	18.4
Method B	22 hrs. @ 212° F (100° C)	
ASTM F-146	**Fluid Resistance After Five Hours Immersions**	
	ASTM #1 Oil @ +300° F	
	Thickness Increase Range (%):	0-10
	Weight Increase, Maximum (%):	20
	ASTM IRM 903 Oil @ +300° F	
	Thickness Increase Range (%):	15-30
	Tensile Loss, Maximum (%):	70
	ASTM Fuel A @ 70 - 85°F	
	Thickness Increase Range (%):	0-15
	Weight Increase, Maximum (%):	25
	ASTM Fuel B @ 70 - 85°F	
	Thickness Increase Range (%):	5-20
	Weight Increase, Maximum (%):	30
ASTM F-152	**Tensile Strength** (psi)	
	Across Grain, psi (N/mm^2):	2800 (19.3MPa)
	Density, Lbs./Ft.^{3} (grams/cm^3):	100 (1.60)

ASTM F104 Line Callout - (Based on 1/32" thickness) F712900A9B4E45K5M9
9: Thickness Increase #3 Oil = 25-50%
A9: *(1) Nitrogen Leakage: 1.0 ml/hr max. (0.4 ml/hr typical)
**(2) ASTM Fuel A Leakage: 1.0 ml/hr max. (0.1 ml/hr typical)
M9: 2,250 psi (15 N/mm^2) min.
NOTE: (1) Test results in accordance with ASTM F-104; properties based on 0.8mm (1/32") sheet thickness.
+ When approaching max temperature, consult the Garlock Engineering Department.
*P x T, max. = maximum psi x °F or maximum (bar) x °C based on 1/16" thk.

11/01

FIGURE 2

Engineered Industrial Products
Garlock Sealing Technologies
1666 Division Street
Palmyra, New York 14522
1-315-597-4811
1-800-448-6688
Fax: 1-800-543-0398
www.garlock.net

GARLOCK STYLE G-9900

Compressed Graphite Fiber Gasketing

Color: Mahogany with Blue Brand
Binder: Nitrile (NBR)
Fluid Services: Saturated Steam, Water, Inert Gases, Aliphatic Hydrocarbons, Oils, Gasoline, Mild Acids and Mild Alkalies
Temp., Max.: +1000°F (+540°C); Continuous Operating Temp. +650°F (+340°C)
Pressure, Max.: 2000 psi
P x T, Max.: 700,000 (25,000) – 1/32"&1/16" , 350,000 (12,000) – 1/8"

ASTM Test Method	Typical Physical Properties	G-9900
F37	**Sealability**	
	Milliliters/Hr. Leakage,	
	ASTM Fuel A (isooctane):	0.1
	Gasket Load, 500 psi	
	Internal Pressure, 9.8 psi	
	Nitrogen:	0.1
	Gasket Load, 3000 psi	
	Internal Pressure, 30 psi	
F38	**Creep Relaxation** - % Relaxation	9.0
F36	**Recovery** - Min. Percent	65
F36	**Compressibility**- % Range	7 - 17
F146	**Fluid Resistance After Five Hour Immersions**:	
	ASTM #1 Oil @ +300°F	
	Thickness Increase Range:	0 - 5%
	Weight Increase, Max.:	10%
	ASTM #3 Oil @ +300°F	
	Thickness Increase Range:	0-10%
	Tensile Loss, Max.:	35%
	ASTM Fuel A @ 70-85°F	
	Thickness Increase Range:	0 - 5%
	Weight Increase, Max.:	7%
	ASTM Fuel B @ 70-85°F	
	Thickness Increase Range:	0-10%
	Weight Increase, Max.:	15%
F152	**Tensile Strength** - Across Grain, psi:	1800
	Density- lbs./ft.^{3}	110
	(grams/cm^3):	(1.76)
Specification:	ABS Approved	

NOTE: Test results in accordance with ASTM F104 properties based on 0.8mm(1/32") sheet thickness. 11/01

WOLF CREEK
NUCLEAR OPERATING CORPORATION

M-663-00017A

Attachment B1

Fire Protection Evaluation For Penetration Openings Assigned New Typical Detail Designs

Rev. No.	Prepared By	Date	Reviewed By	Date
W01	Wayne S Aregood	8/18/05	Jeff Suter	8/18/05
W04	Don Garbe	12/14/11	Jeff Suter	12/15/2011

Table of Contents

Revision Log 3

1.0 Purpose 4

2.0 Scope 4

3.0 References 4

4.0 Evaluation 4

5.0 Conclusions 8

Appendix B1, Penetration Seal Data ..... (172 Total Pages)

Revision Log

Revision	Reason for Revision
W01	Original Issue
W04	Penetrations P125W2309 and P125W2319 were changed from M-6A typical detail to G-1 typical detail with a steel cover plate by change package 013391

1.0 Purpose

1.1 The purpose of this document is to evaluate existing penetration seals that are not directly bounded to the typical detail limitations established in M-663-00017. This evaluation was conducted in effort to satisfy regulatory expectation regarding qualification and documentation of fire barrier penetration seals, as discussed in NRC Information Notice 88-04. This evaluation was conducted in accordance with the guidance of NRC Generic Letter 86-10.

2.0 Scope

2.1 Penetrations identified in Tables I and II.

3.0 References

3.1 NRC Generic Letter 86-10, Implementation of Fire Protection Requirements, dated April 24, 1986

3.2 NRC Information Notice 88-04, Inadequate Qualification and Documentation of Fire Barrier Penetration Seals

3.3 10 CFR 50 Appendix R, Fire Protection Program For Nuclear Power Facilities Operating Prior To January 1, 1979

3.4 LER 87-10, Technical Specification Violations – Inoperable Fire Barriers Caused By Personnel Errors

3.5 M-663-00017, Penetration Seal Typical Details, Rev. W20

3.6 PMR 01756, RTV Foam Penetration Seals Discrepancies

4.0 Assumptions

4.1 It is assumed that existing penetration seal materials have been installed as required by applicable typical design details and procedures. This is an acceptable assumption based on a review of the Quality Control documentation maintained during initial penetration seal installation activities and the intrusive inspections conducted to address LER 87-10, regarding seal material depth.

5.0 Evaluation

5.1 Assessment of Condition to Design Requirements

Initial typical detail assignment for the penetrations identified in Tables I and II resulted in a condition where at least one M-663-00017 typical detail critical parameter was not satisfied for each penetration seal. In the majority of the cases, the nonconforming parameter was penetrant size in relation to seal material depth.

TABLE I

Penetrations Bounded by Typical Detail Assignment

Penetration Number	Communicating Fire Areas		Old Typical Detail	New Typical Detail	Comments/Disposition
	Side 1	Side 2			
P111W1794	A-1	RW-1	M-1	M-6A	Bounded
P113W0482	A-1	A-5	M-1	M-6A	Bounded
P113W0483	A-1	A-5	M-1	M-6A	Bounded
P121S0251	A-1	A-4	RB-5A	RM-1A	Bounded
P121W1779	A-1	RW-1	RB-7A	RM-1A	Bounded
P122S0353	A-1	A-2	RB-5A	RB-1	Bounded
P125S0203	A-33	A-1	M-1	M-6A	Bounded
P125S0206	A-33	A-1	M-1	M-6A	Bounded
P125W2309	A-33	T-2	M-1 to M-6A	G-1	Bounded – Penetration was changed from M-6A to G-1 with a steel cover plate by change package 013391
P125W2319	A-33	T-2	M-1 to M-6A	G-1	Bounded – Penetration was changed from M-6A to G-1 with a steel cover plate by change package 013391
P131S0504	A-8	A-1	M-1	M-6A	Bounded
P131S0517	A-8	A-1	RB-7A	RM-1A	Bounded
P131W1967	A-9	A-10	M-1	M-6A	Bounded
P132S0695	A-8	A-1	I-3	A-7/RM-1A	Bounded
P132S0749	A-8	A-1	I-3	A-7/I-3	Bounded
P133S0777	A-8	A-1	M-1	M-6A	Bounded
P133S0795	A-25	A-1	M-1	M-6A	Bounded
P133S0806	A-25	A-1	RB-7A	RM-1A	Bounded
P133W0447	A-8	A-5	M-1	M-6A	Bounded
P133W1475	A-25	F-3	M-1	M-6A	Bounded
P133W2038	A-8	A-25	M-1	M-6A	Bounded
P134S0874	A-24	A-1	RM-1A	RM-1A	Bounded
P134S0878	A-24	A-1	I-3	A-7/RM-1A	Bounded
P134S0879	A-8	A-1	M-1	M-6A	Bounded
P134S0902	A-8	A-1	M-1	M-6A	Bounded
P134W0436	A-8	A-6	M-1	M-6A	Bounded
P135S0217	A-14	A-33	M-1	M-6A	Bounded
P135S0218	A-13	A-33	M-1	M-6A	Bounded
P135S0219	A-13	A-33	M-1	M-6A	Bounded
P135S0223	A-14	A-33	M-1	M-6A	Bounded
P135W2203	A-33	A-30	M-1	M-6A	Bounded
P135W2212	A-14	A-13	M-1	M-6A	Bounded
P135W2426	A-33	A-14	M-1	M-6A	Bounded
P141W1909	A-16	A-26	M-1	M-6A	Bounded

Penetration Number	Communicating Fire Areas		Old Typical Detail	New Typical Detail	Comments/Disposition
	Side 1	Side 2			
P142S1052	A-27	A-8	M-1	M-6A	Bounded
P142S1097	A-27	A-8	M-1	M-6A	Bounded
P143S1102	A-16	A-8	M-1	M-6A	Bounded
P143S1111	A-16	A-8	M-1	M-6A	Bounded
P144S1173	A-18	A-24	M-1	M-6A	Bounded
P145S0955	A-23	T-2	M-1	A-7/M-6A	Bounded
P152W2581	A-21	A-22	M-1	M-6A	Bounded
P152W2623	A-19	A-22	M-1	M-6A	Bounded
P153W2543	A-19	A-20	M-1	M-6A	Bounded
P153W2550	A-20	A-5	M-1	M-6A	Bounded
P153W2627	A-20	A-5	M-1	M-6A	Bounded
P311W0846	C-1	CC-1	M-1	M-6A	Bounded
P321S0083	C-6	C-1	M-1	M-6A	Bounded
P321S0084	C-6	C-1	M-1	M-6A	Bounded
P321S0097	C-6	C-1	M-1	M-6A	Bounded
P321S0110	C-6	C-1	M-1	M-6A	Bounded
P321S0115	C-5	C-1	M-1	M-6A	Bounded
P331S0127	C-10	C-6	M-1	M-6A	Bounded
P331S0136	C-10	C-6	M-1	M-6A	Bounded
P331S0137	C-10	C-6	M-1	M-6A	Bounded
P331S0138	C-10	C-6	M-1	M-6A	Bounded
P331S0139	C-10	C-6	M-1	M-6A	Bounded
P331S0143	C-10	C-6	M-1	M-6A	Bounded
P331S0200	C-9	C-5	M-1	M-18	Bounded
P331W0882	C-10	D-1	M-1	M-6A	Bounded
P331W0883	C-10	D-1	M-1	M-6A	Bounded
P331W0890	C-10	D-2	M-1	M-6A	Bounded
P341S0288	C-15	C-10	M-1	M-6A	Bounded
P341S0306	C-16	C-9	M-1	M-6A	Bounded
P341S0311	C-16	C-9	M-1	M-6A	Bounded
P351S0339	C-21	C-15	M-1	M-6A	Bounded
P351S0356	C-21	C-15	M-1	M-6A	Bounded
P361S0462	C-27	C-21	M-1	M-6A	Bounded
P361S1052	C-30	C-23	E-2A	E-2A	PMR 01756 evaluates an 8" seal depth as acceptable. Actual sealant depth (10") meets E-2A requirements, resulting in a bounded penetration.
P361S1055	C-30	C-23	E-2A	E-2A	PMR 01756 evaluates an 8" seal depth as acceptable. Actual sealant depth (11") meets E-2A requirements, resulting in a bounded penetration.

Penetration Number	Communicating Fire Areas		Old Typical Detail	New Typical Detail	Comments/Disposition
	Side 1	Side 2			
P361S1083	C-32	C-25	E-2A	E-2A	PMR 01756 evaluates an 8" seal depth as acceptable. Actual sealant depth (10-1/2") meets E-2A requirements, resulting in a bounded penetration.
P611W0071	F-1	F-3	M-1	M-6A	Bounded
P611W0201	F-2	F-3	M-1	M-6A	Bounded
P621S0137	F-5	F-2	M-1	M-6A	Bounded
P621S0158	F-5	F-2	M-1	M-6A	Bounded
P621W0011	F-4	F-5	M-1	M-6A	Bounded

TABLE II

Non-Appendix R Penetrations

Penetration Number	Communicating Fire Areas		Typical Detail	Comments/disposition
	Side 1	Side 2		
P133W0459	A-8	A-8	M-6A	Not an Appendix R Barrier, bounded
P133W0474	A-8	A-8	M-6A	Not an Appendix R Barrier, bounded
P135S0932	A-29	A-29	N/A	Not an Appendix R Barrier
P145W2338	A-23	A-23	FB-1	Not an Appendix R Barrier
P145W2339	A-23	A-23	FB-1	Not an Appendix R Barrier
P145W2341	A-23	A-23	N/A	Not an Appendix R Barrier
P145W2342	A-23	A-23	FB-1	Not an Appendix R Barrier
P145W2344	A-23	A-23	FB-1	Not an Appendix R Barrier
P145W2345	A-23	A-23	FB-1	Not an Appendix R Barrier
P341S0272	C-6	C-6	M-6A	Not an Appendix R Barrier, bounded
P341W0380	C-16	C-16	M-1	Not an Appendix R Barrier
P451S0318	T-12	T-8	N/R	Not an Appendix R Barrier, there is no seal installed
P451S0321	T-12	T-8	N/R	Not an Appendix R Barrier, there is no seal installed
P712S0013	Radwaste	Radwaste	RB-5A	Not an Appendix R Barrier
P712S0014	Radwaste	Radwaste	N/A	Not an Appendix R Barrier
P712S0015	Radwaste	Radwaste	RB-1	Not an Appendix R Barrier
P712W1006	RW-1	Radwaste	N/R	Not an Appendix R Barrier

5.2 Evaluation of Condition

Field inspection and review of the penetrations identified in Table I revealed that each contained a seal material type and depth that allowed reassignment of a M-663-00017 typical detail that fully bounds the penetration attributes to the

limitations of the new detail. The comprehensive assessment of penetration attributes was based on physical examinations and measurements implemented by Fire Protection personnel that have the necessary expertise to interpret physical characteristics and conditions to address bounding limitations and requirements in the re-assignment of typical detail designs, thus bounding the subject penetration seals within compliance parameters. Penetration data that supports the Table I detail reassignments and dispositions is provided in Appendix B1.

Field inspection, along with review of plant architectural and civil drawings, revealed that the Table II penetrations were incorrectly identified as providing 10 CFR 50 Appendix R separation protection for redundant post fire safe shutdown (PFSSD) equipment/circuits. These penetrations are actually either in non-fire barrier construction or fire barriers that are required only to satisfy life safety or insurance requirements. Considering this, the Table II penetrations have been removed from the Appendix R fire barrier penetration seal program. No further review of these penetrations is required since they have no nuclear safety significance. As such, they are not typically subjected to the same regulatory scrutiny as that of penetrations in fire barriers providing separation protection for PFSSD equipment/circuits.

5.3 Post Fire Safe Shutdown Impact

There is no impact to safe shutdown systems or components as a result of this evaluation. All penetration seals are either bounded to the limitations of a M-663-00017 typical detail or they are not Appendix R applicable.

6.0 Conclusions

The fire resistance rating of the penetration seals listed in Table I have been determined to meet plant requirements and commitments to maintain penetration openings at a fire resistance rating commensurate with the installed barrier. These penetrations have been physically examined; measured and comprehensively evaluated through plant walk downs to determine the appropriate typical detail assignment and bounding conditions. The new assigned typical details are consistent with limitations, configurations and critical attributes that bound each penetration seal listed.

Table II penetrations were incorrectly identified as providing 10 CFR 50 Appendix R separation protection for redundant PFSSD equipment/circuits. No further review of these penetrations is required since they have no nuclear safety significance regarding PFSSD.

Penetration Seal Data

Appendix: B1

Penetration #: P111W1794

Penetration Type: M-6A **Fire Area (Side 1):** A-1 **Fire Area (Side 2):** RW-1

Loc./Elev.: 1984'-11 **M-0X Dwg:** M-0X1916

1. **Barrier Thickness:** 36"
2. **Opening Size:** 16"D
3. **Penetrants:** (1)8"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** 21" recessed
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 13"
10. **Annular Gap (smallest):** 3"
11. **Gap between pen:** N/A
12. **Barrier Type:** F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** Yes

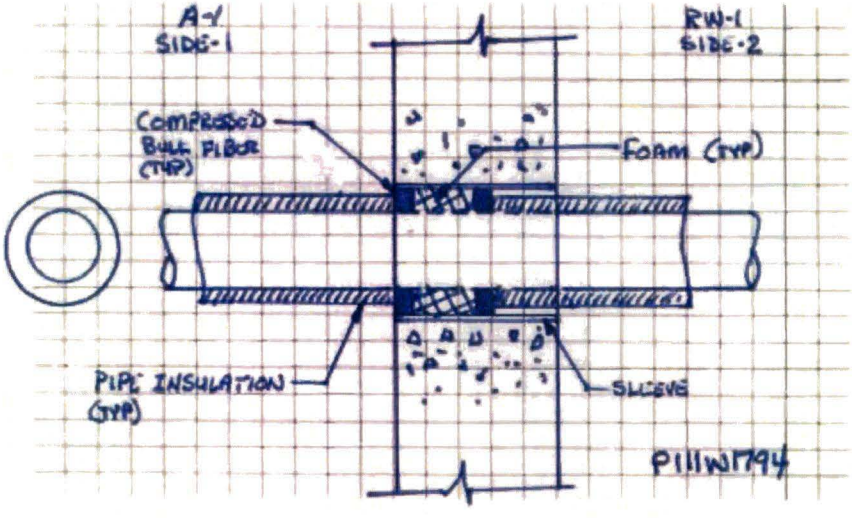
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Rad waste tunnel, room 7133, Fire Area RW-1 to A-1 Room 1102, used existing scaffold to inspect. Tunnel side has compressed bulk fiber.

Sketch:



Penetration Seal Data

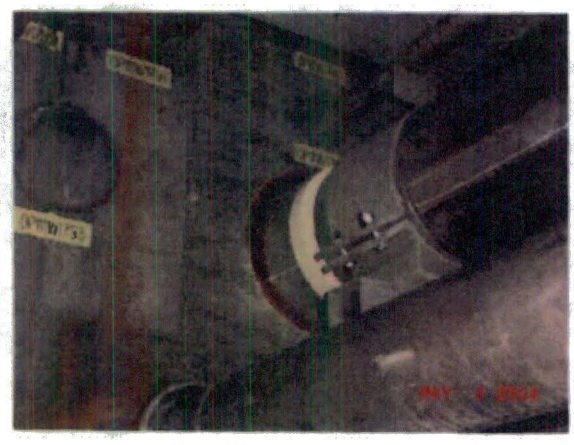
Appendix: B1

Photos: P111W1794

Fire Area A-1 (Side 1)

Fire Area A-1 (Side 1)

Fire Area RW-1 (Side 2)



Fire Area RW-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P113W0482

Penetration Type: M-6A **Fire Area (Side 1):** A-1 **Fire Area (Side 2):** A-5

Loc./Elev.: 1982'-10 **M-0X Dwg:** M-1X0360

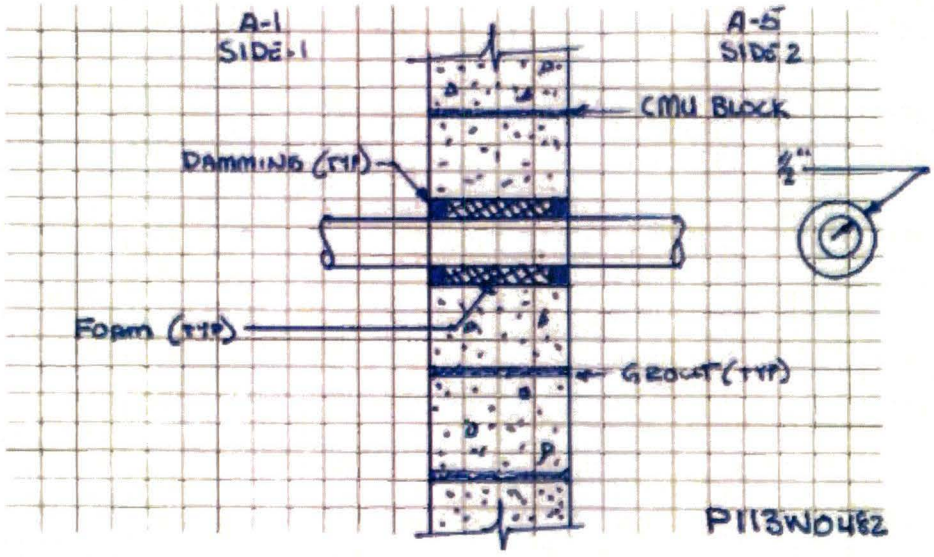
1. **Barrier Thickness:** 12" Nominal
2. **Opening Size:** 4"D
3. **Penetrants:** (1)1-1/2"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 10" Nominal
10. **Annular Gap (smallest):** 1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Concrete
14. **Pipe Insulated:** No

Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:
Copper Pipe

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P113W0482

Fire Area A-1 (Side 1)

Fire Area A-1 (Side 1)

Fire Area A-5 (Side 2)

Fire Area A-5 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P113W0483

Penetration Type: M-6A **Fire Area (Side 1):** A-1 **Fire Area (Side 2):** A-5

Loc./Elev.: 1980'-11 **M-0X Dwg:** M-1X0360

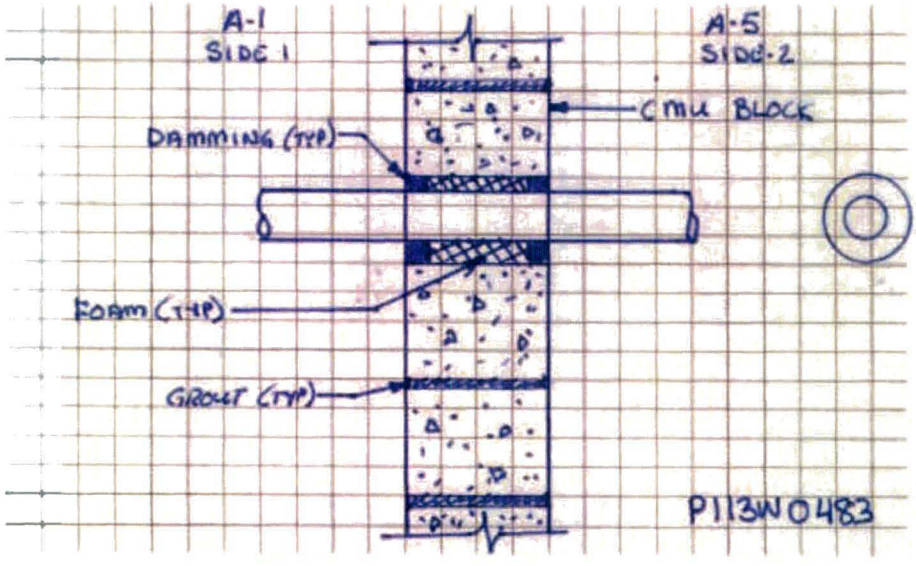
1. **Barrier Thickness:** 12" Nominal
2. **Opening Size:** 4"D
3. **Penetrants:** (1)1-1/2"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 10" Nominal
10. **Annular Gap (smallest):** 1"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Concrete
14. **Pipe Insulated:** No

Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:
Copper Pipe

Sketch:

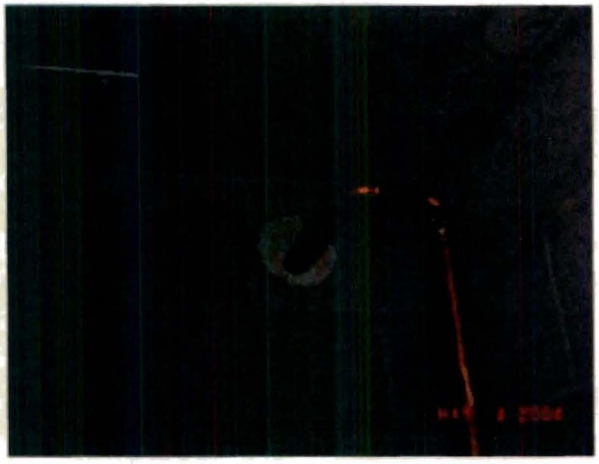


Penetration Seal Data

Appendix: B1

Photos: P113W0483

Fire Area A-1 (Side 1)



Fire Area A-1 (Side 1)

Fire Area A-5 (Side 2)

Fire Area A-5 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P121S0251

Penetration Type: RB-5A **Fire Area (Side 1):** A-1 **Fire Area (Side 2):** A-4

Loc./Elev.: 1988'-0" **M-0X Dwg:** M-0X1211

1. **Barrier Thickness:** 19"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)4"P
4. **Sealant Type:** HDSE/HDLE
5. **Damming Side1:** N/A
6. **Damming Side 2:** N/A
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** Accept
9. **Sealant Depth:** Assumed Per Detail
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F R W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

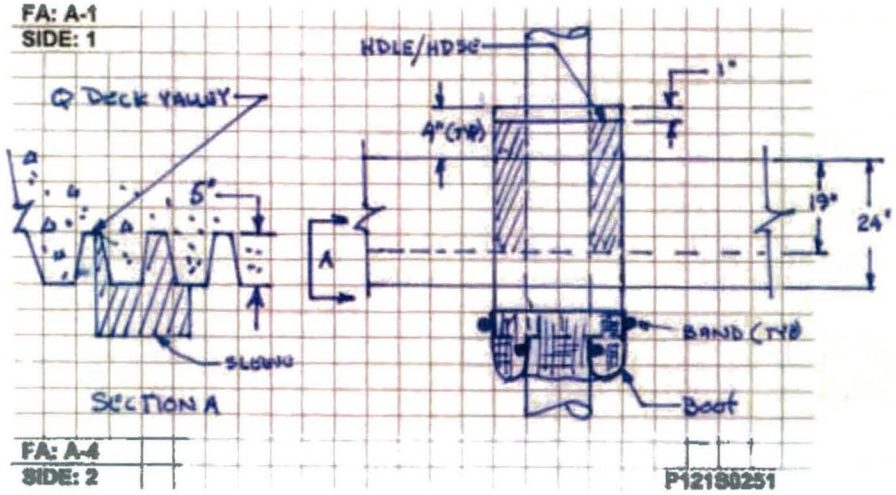
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

High density on top, with boot on bottom. Qualified without boot. Duct on top appears to interfere with boot installation.
Slab thickness determined by drawing C-0C1211.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P121S0251

Fire Area A-1 (Side 1)

Fire Area A-1 (Side 1)

Fire Area A-4 (Side 2)

Fire Area A-4 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P121W1779

Penetration Type: RM-1A **Fire Area (Side 1):** A-1 **Fire Area (Side 2):** RW-1

Loc./Elev.: 1990'-9 3 **M-0X Dwg:** M-0X1916

1. **Barrier Thickness:** 36"
2. **Opening Size:** 4"D
3. **Penetrants:** (1)2"P
4. **Sealant Type:** HDSE/HDLE
5. **Damming Side1:** N/A
6. **Damming Side 2:** N/A
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 36"
10. **Annular Gap (smallest):** 1-1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F R W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

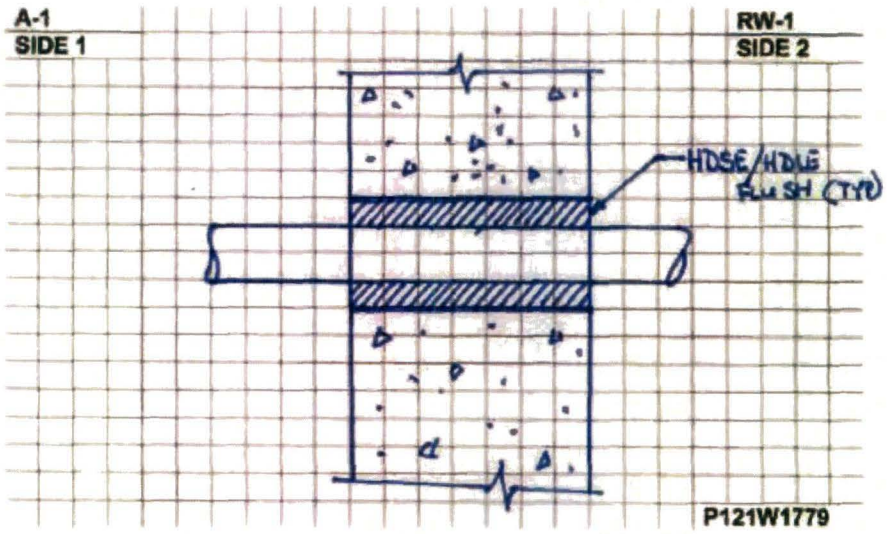
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Changed Detail from RB-7A to RM-1A, no annular gap and no degradation observed.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P121W1779

Fire Area A-1 (Side 1)

Fire Area A-1 (Side 1)

Fire Area RW-1 (Side 2)

Fire Area RW-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P122S0353

Penetration Type: RB-1 **Fire Area (Side 1):** A-1 **Fire Area (Side 2):** A-2

Loc./Elev.: 1988'-0" **M-0X Dwg:** M-0X1221

1. **Barrier Thickness:** 19"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)3"P
4. **Sealant Type:** Radflex
5. **Damming Side1:** Boot
6. **Damming Side 2:** Boot
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** Accept
9. **Sealant Depth:** Assumed Per Detail
10. **Annular Gap (smallest):** 3"
11. **Gap between pen:** N/A
12. **Barrier Type:** F R W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

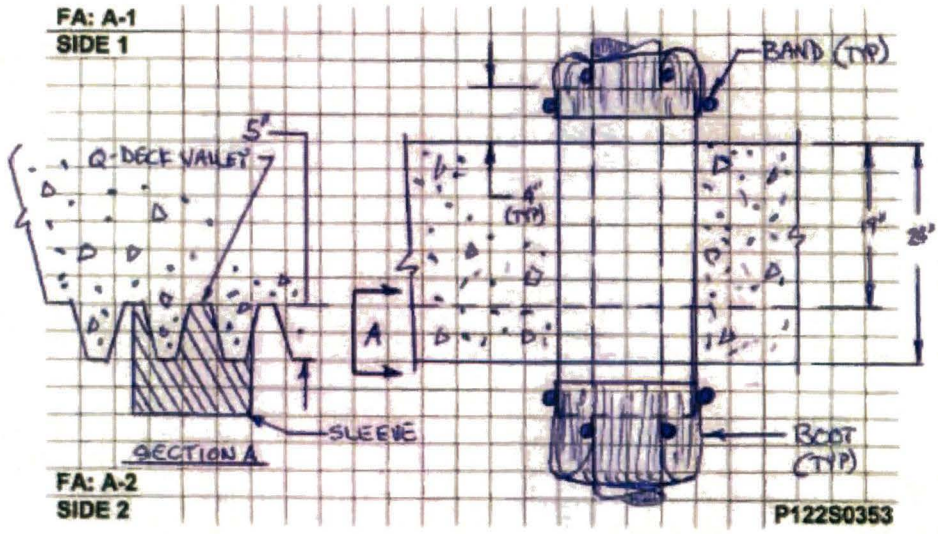
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Slab thickness determined from drawing C-0C1211. Detail changed to RB-1 based on the physical appearance of side 2 (bottom).

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P122S0353

Fire Area A-1 (Side 1)

Fire Area A-1 (Side 1)

Fire Area A-2 (Side 2)

Fire Area A-2 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P125S0203

Penetration Type: M-6A **Fire Area (Side 1):** A-33 **Fire Area (Side 2):** A-1

Loc./Elev.: 1989'-0" **M-0X Dwg:** M-1X1151

1. **Barrier Thickness:** 10"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Foam 1" recessed from sleeve en
6. **Damming Side 2:** Flush w/Q-deck
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 12"
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

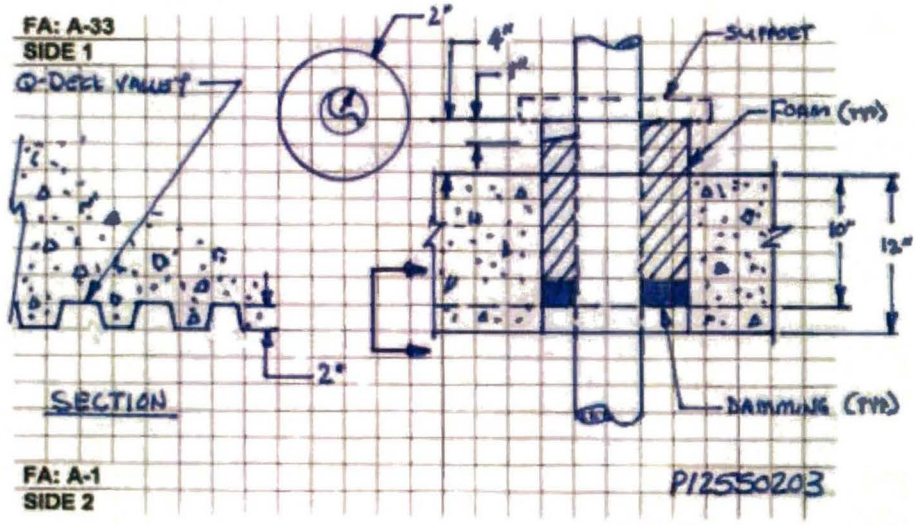
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Underside of slab has Q-Decking, effective barrier thickness is measured from corrugated valley.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P125S0203

Fire Area A-33 (Side 1)

Fire Area A-33 (Side 1)

Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P125S0206

Penetration Type: M-6A **Fire Area (Side 1):** A-33 **Fire Area (Side 2):** A-1

Loc./Elev.: 1989'-0" **M-0X Dwg:** M-1X1151

1. **Barrier Thickness:** 10"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush w/sleeve
6. **Damming Side 2:** 1" recessed
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 12"
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

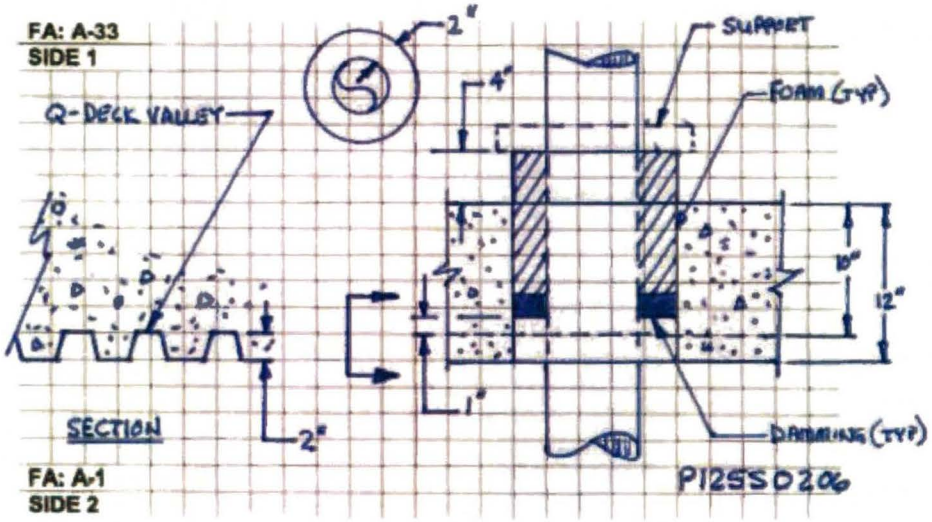
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Underside of slab has Q-Decking, effective barrier thickness is measured from corrugated valley.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P125S0206

Fire Area A-33 (Side 1)

Fire Area A-33 (Side 1)

Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P125W2309

Penetration Type: G-1 **Fire Area (Side 1):** A-33 **Fire Area (Side 2):** T-2

Loc./Elev.: 1993'-1 3/ **M-0X Dwg:** M-0X1928

1. **Barrier Thickness:** 42"
2. **Opening Size:** 14"X12"
3. **Penetrants:** (1)10"P
4. **Sealant Type:** Grout
5. **Damming Side1:** N/A
6. **Damming Side 2:** N/A
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 42"
10. **Annular Gap (smallest):** N/A
11. **Gap between pen:** N/A
12. **Barrier Type:** A F W
13. **Opening Sleeved or Concrete:** Concrete
14. **Pipe Insulated:** No

Jeff Suter
Prepared By:

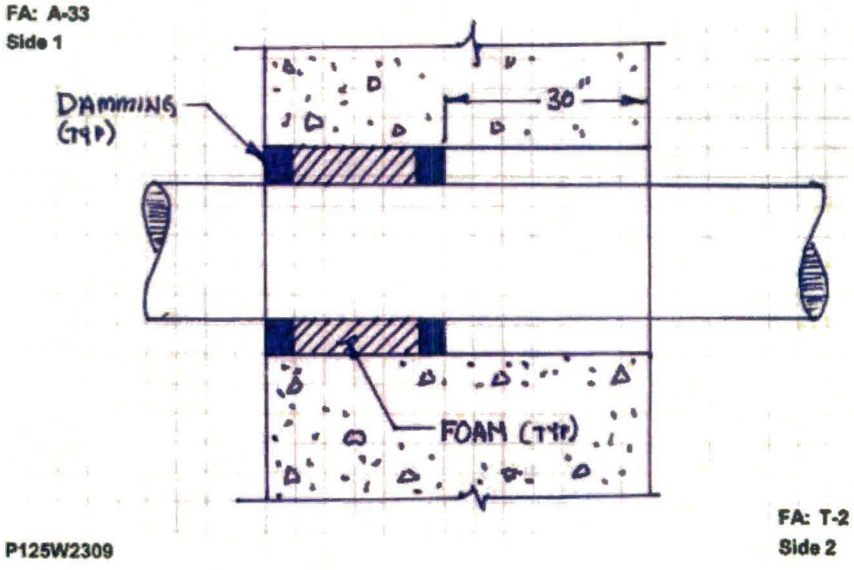
Don Garbe
Reviewed By:

Walkdown Comments:

Barrier thickness determined by Drawing M-1X01352.

Changed Detail from M-6A to G-1 with a steel cover plate per Change Package 013391. No sketch or photos are required for the detail change to G-1 (full barrier depth grout with a steel cover plate on both sides).

Sketch:



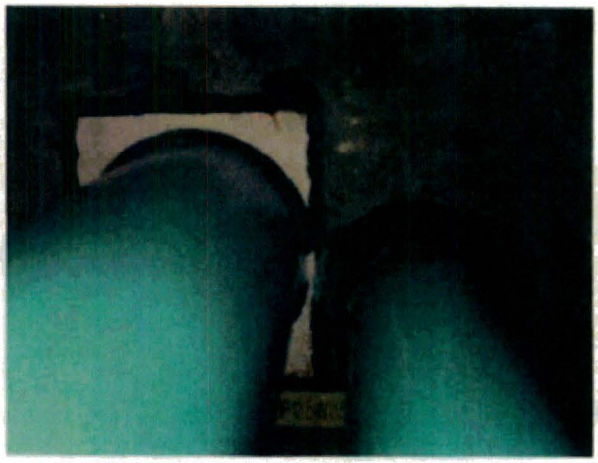
Penetration Seal Data

Appendix: B1

Photos: P125W2309

Fire Area A-33 (Side 1)

Fire Area A-33 (Side 1)



Fire Area T-2 (Side 2)

Fire Area T-2 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P125W2319

Penetration Type: G-1 **Fire Area (Side 1):** A-33 **Fire Area (Side 2):** T-2

Loc./Elev.: 1993'-8 3/8" **M-0X Dwg:** M-0X1928

1. **Barrier Thickness:** 36"
2. **Opening Size:** 14"D
3. **Penetrants:** (1)10"P
4. **Sealant Type:** Grout
5. **Damming Side1:** N/A
6. **Damming Side 2:** N/A
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 36"
10. **Annular Gap (smallest):** N/A
11. **Gap between pen:** N/A
12. **Barrier Type:** A F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Jeff Suter
Prepared By:

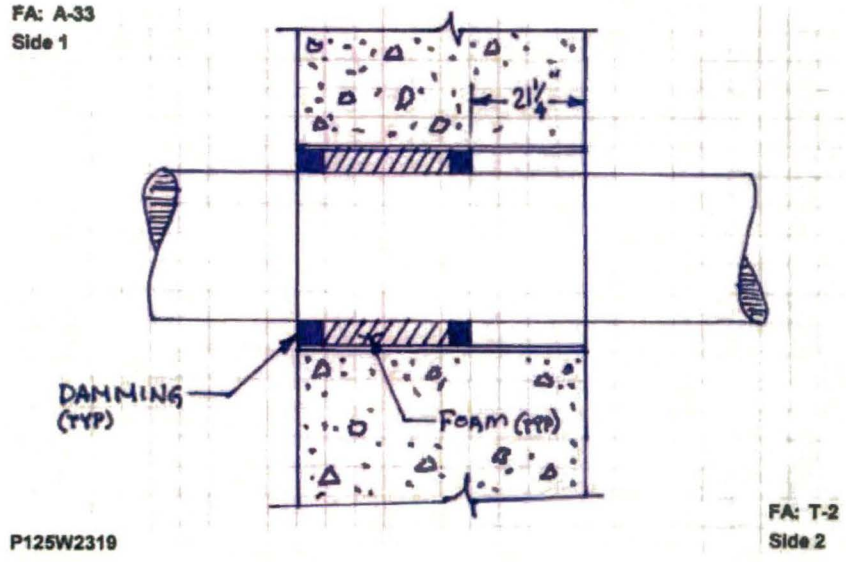
Don Garbe
Reviewed By:

Walkdown Comments:

T-2 (Side 2) is in the pipe trench in the Turbine. Barrier thickness determined by Drawing M-1X1352.

Changed Detail from M-6A to G-1 with a steel cover plate per Change Package 013391. No sketch or photos are required for the detail change to G-1 (full barrier depth grout with a steel cover plate on both sides).

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P125W2319

Fire Area A-33 (Side 1)

Fire Area A-33 (Side 1)

Fire Area T-2 (Side 2)

Fire Area T-2 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P131S0504

Penetration Type: M-6A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1311

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** N/A
6. **Damming Side 2:** Flush with barrier plane
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 11"
10. **Annular Gap (smallest):** 3/16"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Jeff Suter
Prepared By:

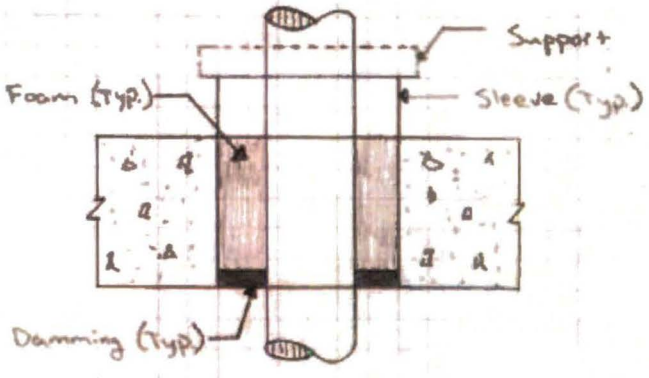
Wayne Aregood
Reviewed By:

Walkdown Comments:

Slab thickness based on C-1C1311. Side 1 foam was irregular with lowest point flush with the barrier plane. Changed detail to M-6A based on field inspection.

Sketch:

FA: A-8
Side 1



FA: A-1
Side 2

P131S0504

Penetration Seal Data

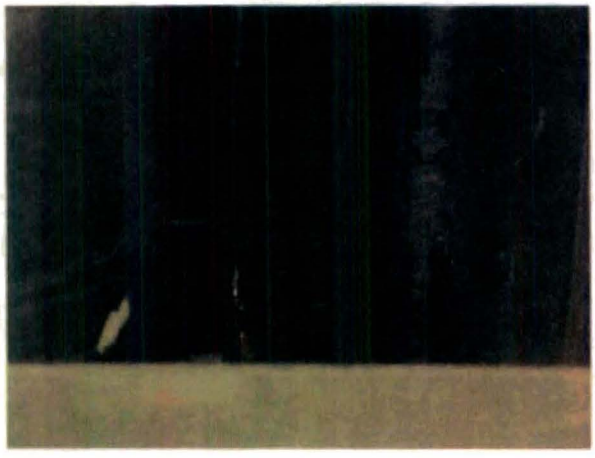
Appendix: B1

Photos: P131S0504

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 1)

Fire Area A-1 (Side 2)



Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P131S0517

Penetration Type: RM-1A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1311

1. **Barrier Thickness:** 20"
2. **Opening Size:** 8"D
3. **Penetrants:** (1)2"P
4. **Sealant Type:** HDSE/HDLE
5. **Damming Side1:** HDSE 2" above Slab
6. **Damming Side 2:** HDSE Flush
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 22"
10. **Annular Gap (smallest):** 2-1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F R
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

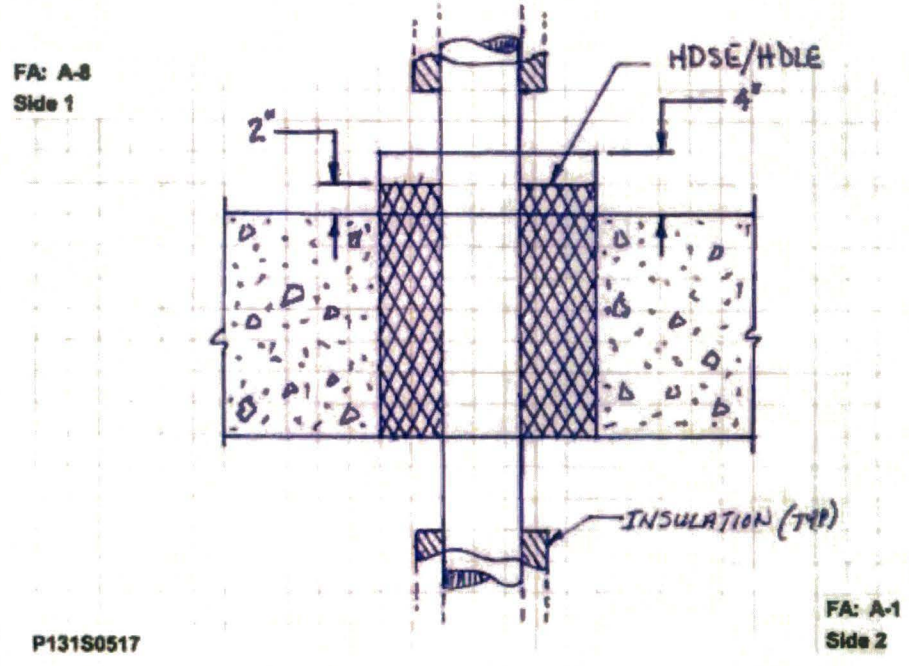
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Slab thickness based on C-1C1311. This seal is bounded no annular gap observed.

Sketch:

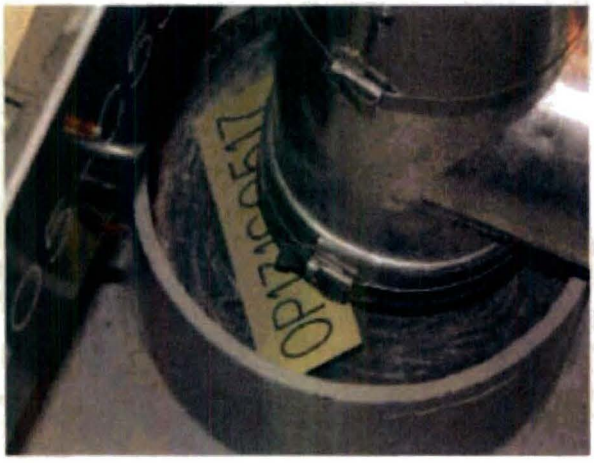


Penetration Seal Data

Appendix: B1

Photos: P131S0517

Fire Area A-8 (Side 1)



Fire Area A-8 (Side 1)

Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P131W1967

Penetration Type: M-6A **Fire Area (Side 1):** A-9 **Fire Area (Side 2):** A-10

Loc./Elev.: 2014'-6" **M-0X Dwg:** M-0X1920

1. **Barrier Thickness:** 24"
2. **Opening Size:** 24"D
3. **Penetrants:** (1)10"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** 10" recessed **
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 12"
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** Yes

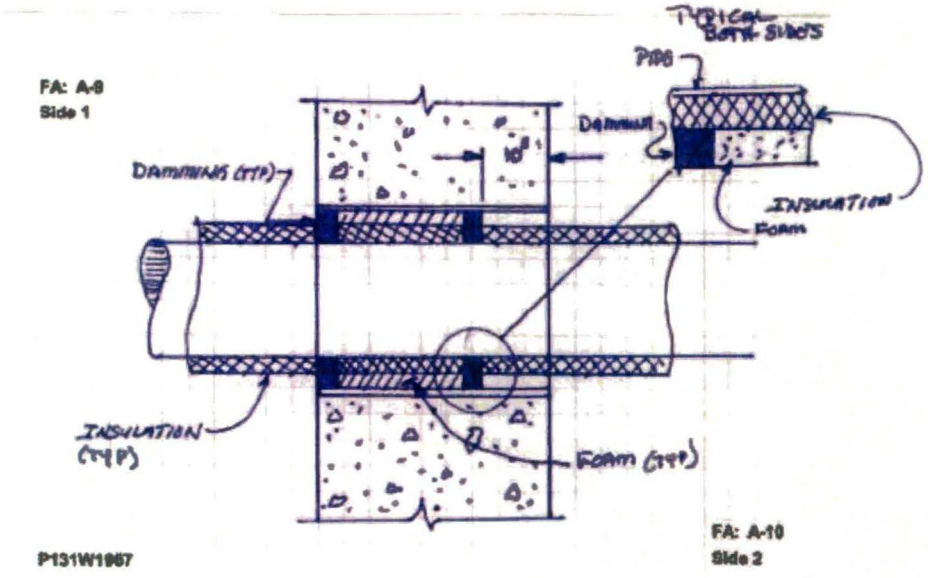
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Barrier thickness determined from Drawing C-1C1311. Side 2 is in a contaminated area (estimated depth). Detail changed from M-1 to M-6A based on actual sealant depth.

Sketch:

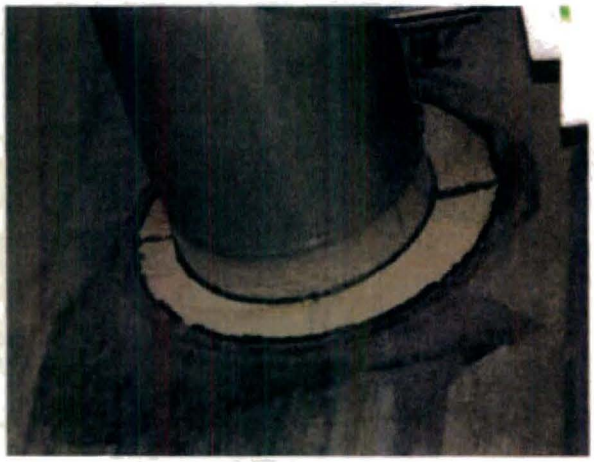


Penetration Seal Data

Appendix: B1

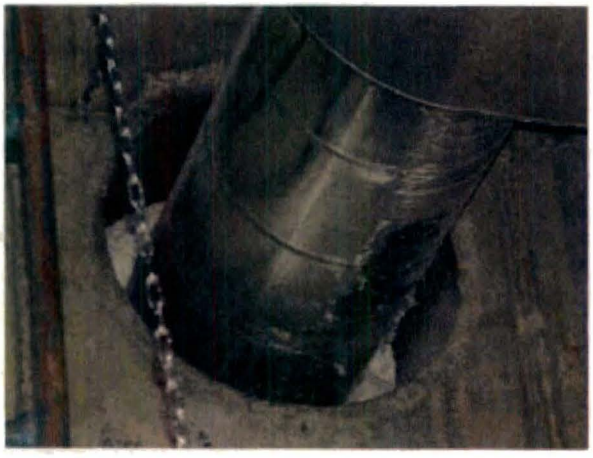
Photos: P131W1967

Fire Area A-9 (Side 1)



Fire Area A-9 (Side 1)

Fire Area A-10 (Side 2)



Fire Area A-10 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P132S0695

Penetration Type: A-7/RM-1A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1321

1. **Barrier Thickness:** 26"
2. **Opening Size:** 10"D
3. **Penetrants:** (17)3/8"J
4. **Sealant Type:** HDSE/HDLE *
5. **Damming Side1:** Sealant Flush w/Slab
6. **Damming Side 2:** Sealant Flush w/Ceiling
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 26"
10. **Annular Gap (smallest):** 1/4"
11. **Gap between pen:** 1/4"
12. **Barrier Type:** F R
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

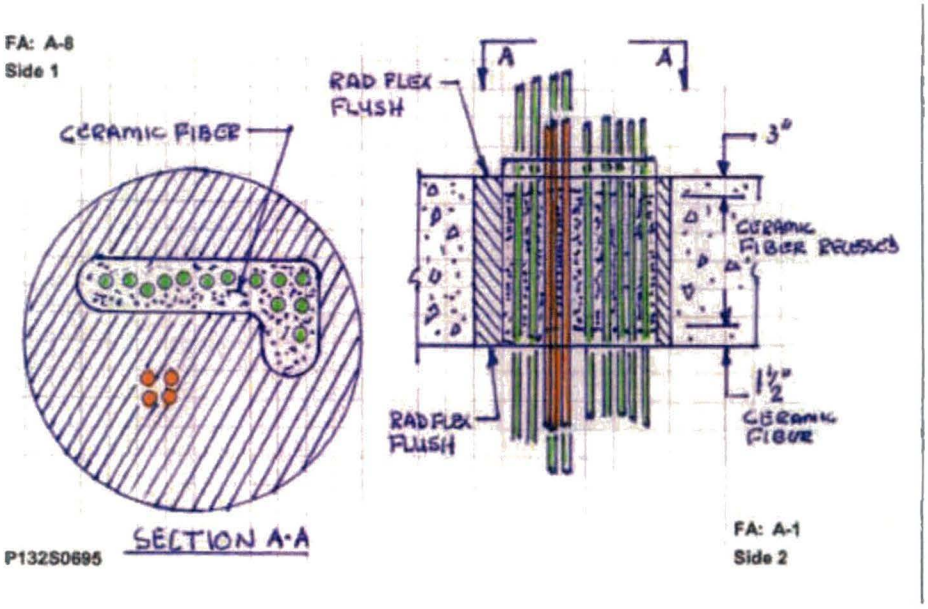
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Slab thickness based on C-1C1311. * Small section with sheet metal (annulus) insert around some instrument tubing with Ceramic Fiber fill. Hot tubing routed through Ceramic Fiber. Changed Detail to A-7/RM-1A. 21-1/2" Ceramic Fiber depth.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P132S0695

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 1)

Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P132S0749

Penetration Type: A-7/I-3 **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1321

1. **Barrier Thickness:** 26"
2. **Opening Size:** 8"D
3. **Penetrants:** (4)3/8"J
4. **Sealant Type:** HDSE/HDLE
5. **Damming Side1:** * Sealant flush w/slab
6. **Damming Side 2:** N/A
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 26"
10. **Annular Gap (smallest):** 1"
11. **Gap between pen:** 1/4"
12. **Barrier Type:** F R
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

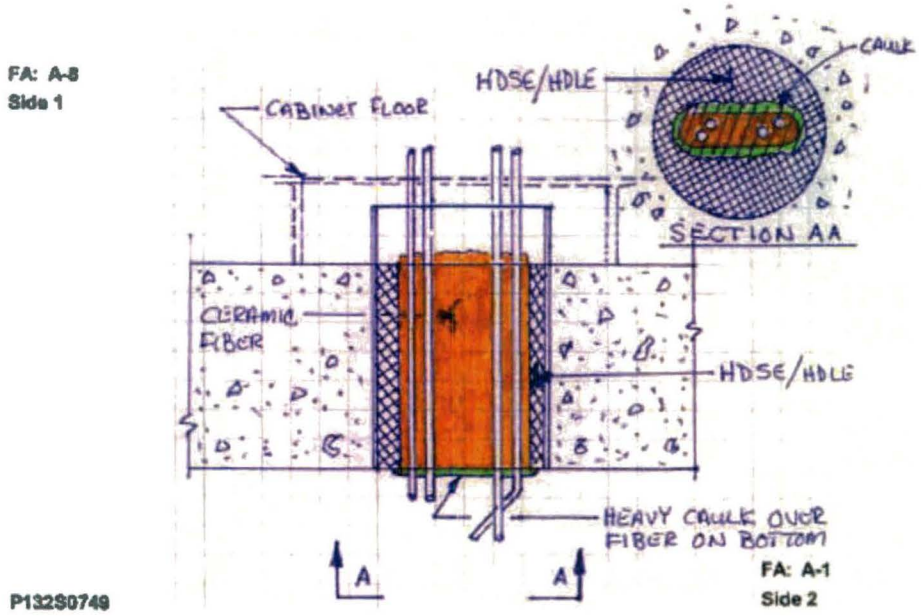
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Slab thickness based on C-1C1311. The top surface of the seal can only be partially seen through the hole in the cabinet floor (photo center). It appears that HDSE/HDLE is at least level with the floor slab with some bulk fiber in the cabinet cavity.

Sketch:



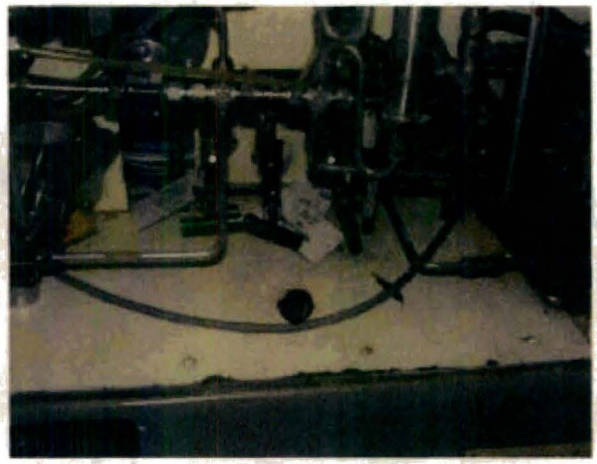
Penetration Seal Data

Appendix: B1

Photos: P132S0749

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 1)



Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P133S0777

Penetration Type: M-6A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-0X1331

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** N/A
6. **Damming Side 2:** 1" recessed
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 14"
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

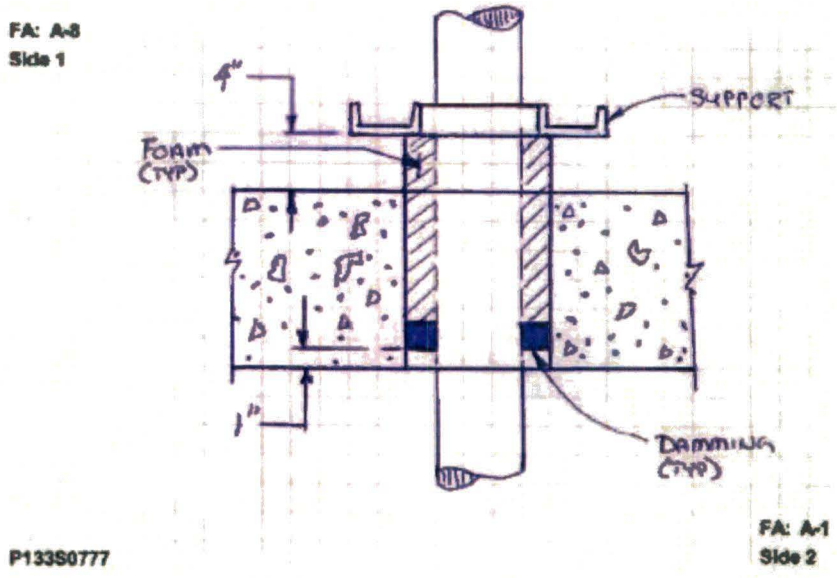
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Foam flush with top of 4" extended sleeve.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P133S0777

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 1)

Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P133S0795

Penetration Type: M-6A **Fire Area (Side 1):** A-25 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-0X1331

1. **Barrier Thickness:** 12"
2. **Opening Size:** 14"D
3. **Penetrants:** (1)10"P
4. **Sealant Type:** Foam
5. **Damming Side1:** N/A
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 11"
10. **Annular Gap (smallest):** 1"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

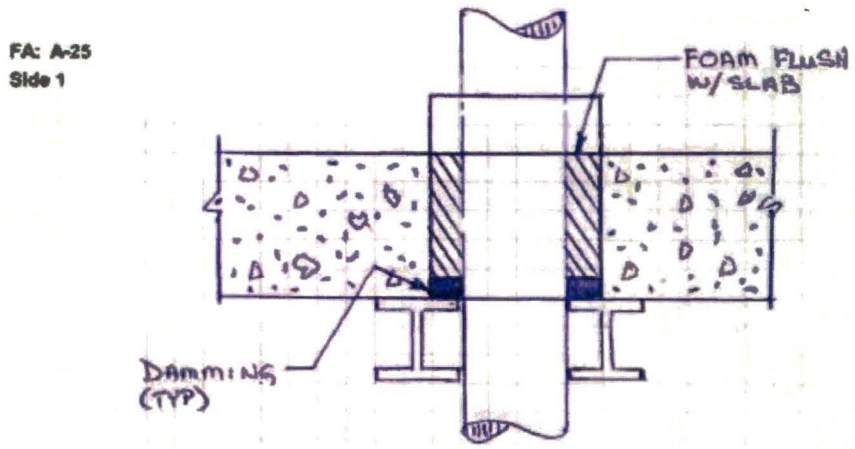
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Top side foam flush with top of slab. Changed to M-6A from M-1 based on seal depth.. Issue WR to evaluate foam used in Rad Boundary.

Sketch:



Penetration Seal Data

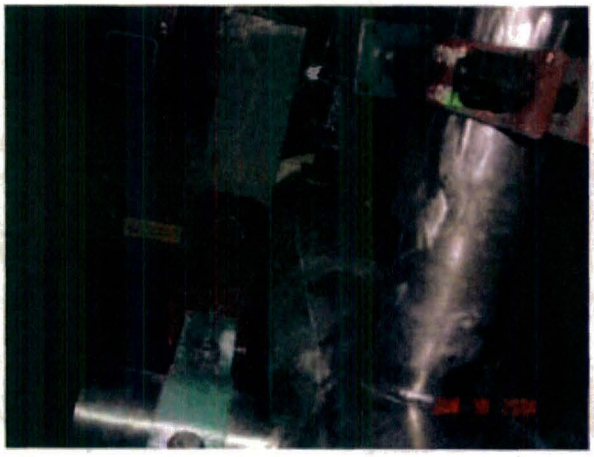
Appendix: B1

Photos: P133S0795

Fire Area A-25 (Side 1)

Fire Area A-25 (Side 1)

Fire Area A-1 (Side 2)



Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P133S0806

Penetration Type: RM-1A **Fire Area (Side 1):** A-25 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-0X1331

1. **Barrier Thickness:** 12"
2. **Opening Size:** 8"D
3. **Penetrants:** (1)3"P, (1)4"P
4. **Sealant Type:** HDSE/HDLE
5. **Damming Side1:** N/A
6. **Damming Side 2:** N/A
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 12"
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** 4"
12. **Barrier Type:** F R
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

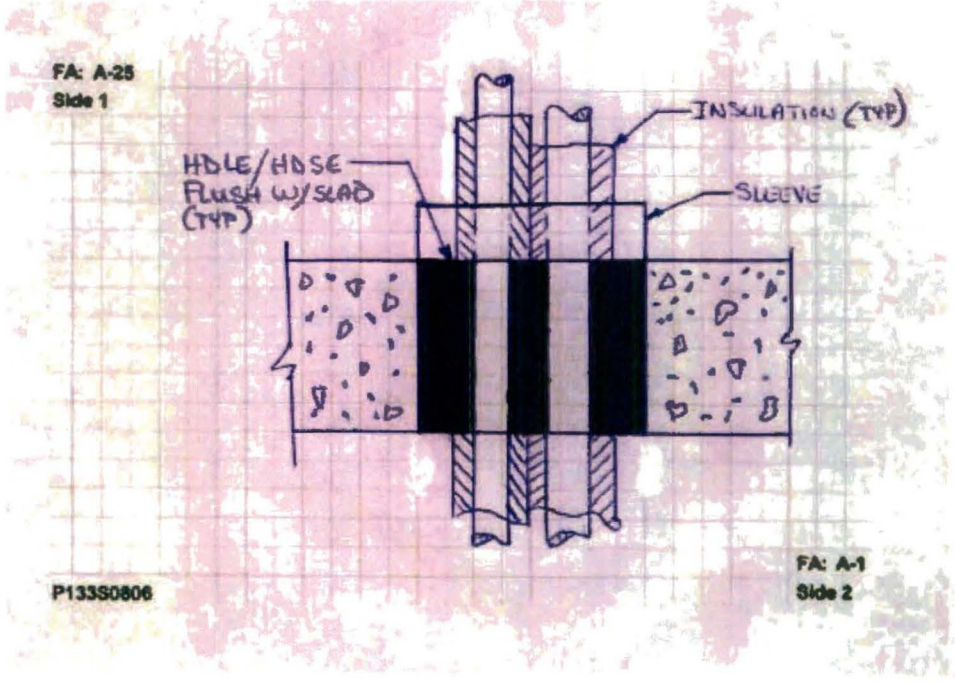
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Change Detail from RB-7A to RM-1A, based on plant inspection. HD sealant flush with slab, both sides of barrier, no gap present.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P133S0806

Fire Area A-25 (Side 1)

Fire Area A-25 (Side 1)

Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P133W0447

Penetration Type: M-6A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-5

Loc./Elev.: 2012'-10 **M-0X Dwg:** M-1X0360

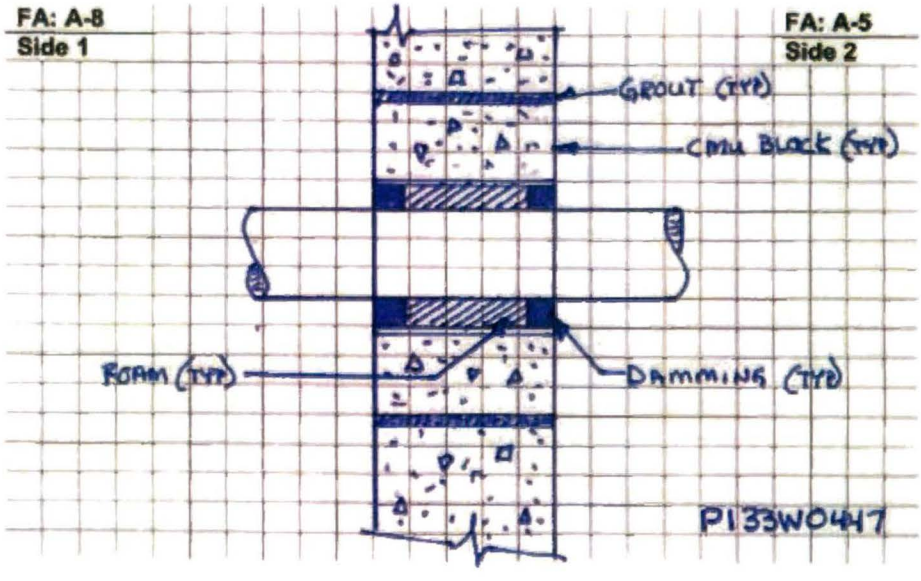
1. **Barrier Thickness:** 12" Nominal
2. **Opening Size:** 12"D
3. **Penetrants:** (1)8"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 10"
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Sketch:

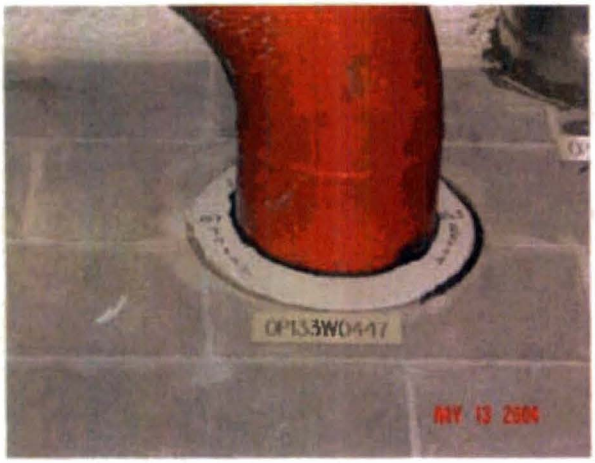


Penetration Seal Data

Appendix: B1

Photos: P133W0447

Fire Area A-8 (Side 1)



Fire Area A-8 (Side 1)

Fire Area A-5 (Side 2)

Fire Area A-5 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P133W0459

Penetration Type: M-6A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-8

Loc./Elev.: 2012'-10 **M-0X Dwg:** M-1X0360

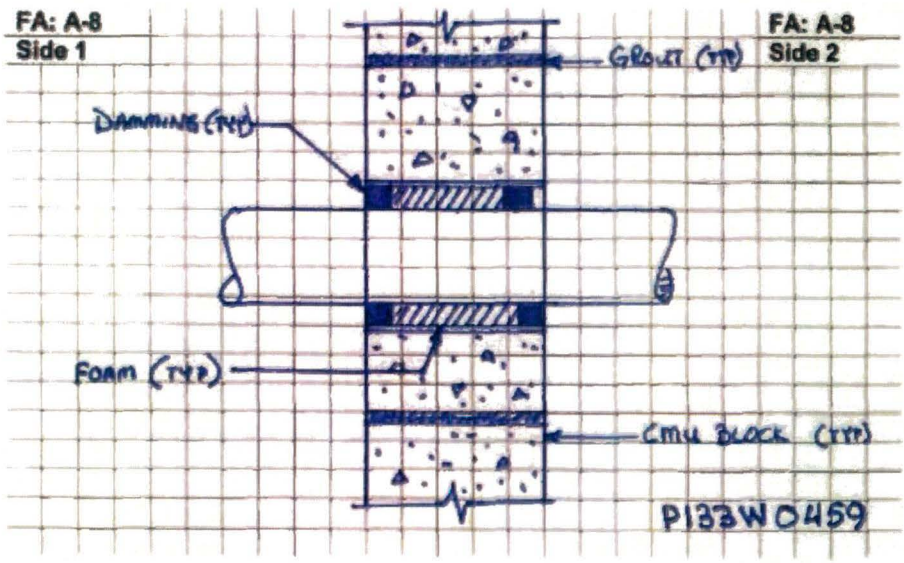
1. **Barrier Thickness:** 12" Nominal
2. **Opening Size:** 12"D
3. **Penetrants:** (1)8"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** 1/4" Recess
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 9-3/4" Nominal
10. **Annular Gap (smallest):** 1"
11. **Gap between pen:** N/A
12. **Barrier Type:** N
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P133W0459

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 2)

Fire Area A-8 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P133W0474

Penetration Type: M-6A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-8

Loc./Elev.: 2020'-8" **M-0X Dwg:** M-1X0360

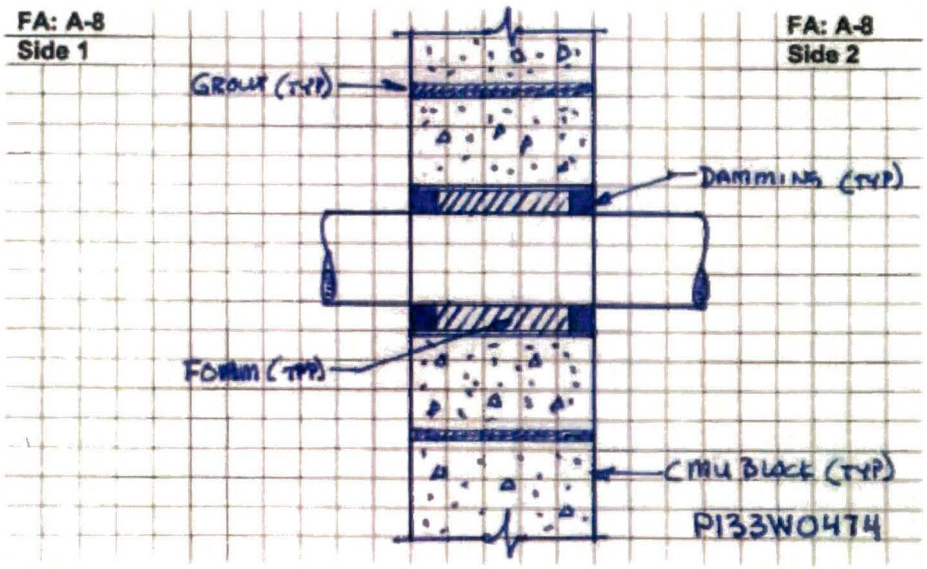
1. **Barrier Thickness:** 12" Nominal
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 10" Nominal
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** N
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Sketch:

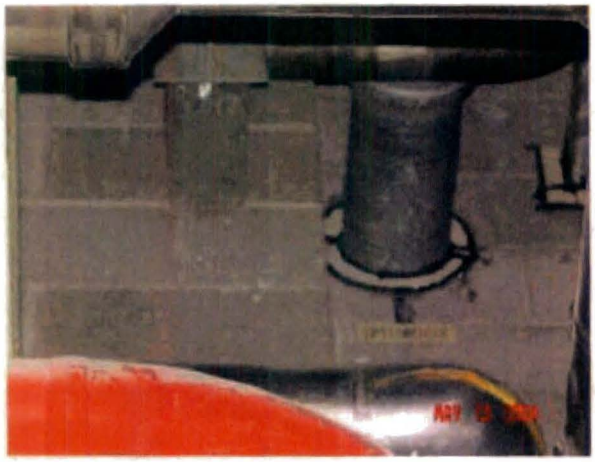


Penetration Seal Data

Appendix: B1

Photos: P133W0474

Fire Area A-8 (Side 1)



Fire Area A-8 (Side 1)

Fire Area A-8 (Side 2)

Fire Area A-8 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P133W1475

Penetration Type: M-6A **Fire Area (Side 1):** A-25 **Fire Area (Side 2):** F-3

Loc./Elev.: 2012'-0" **M-0X Dwg:** M-0X1907

1. **Barrier Thickness:** 24"
2. **Opening Size:** 12"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** 12-1/2" recess
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 9-1/2"
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** A F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

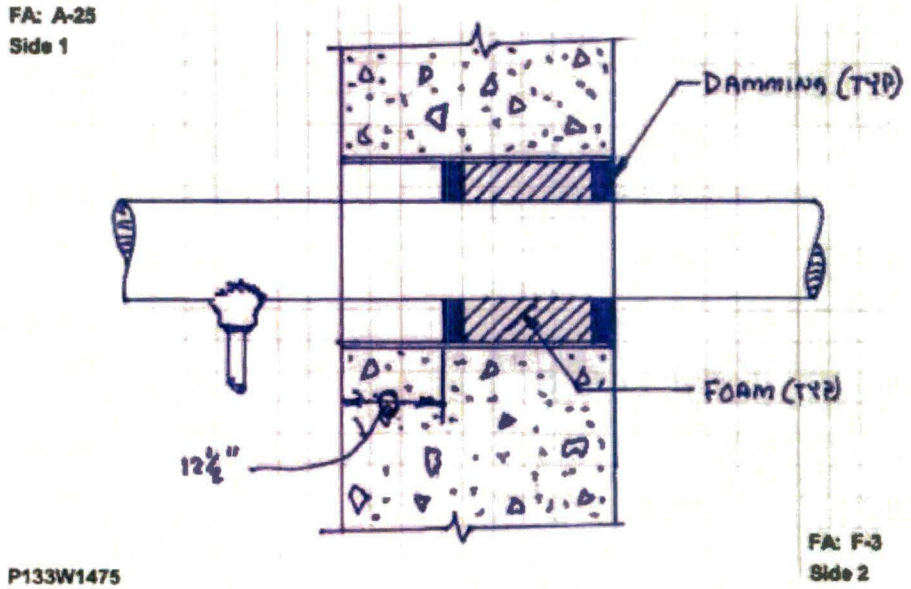
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Changed Detail from M-1 to M-6A based on actual seal depth.

Sketch:



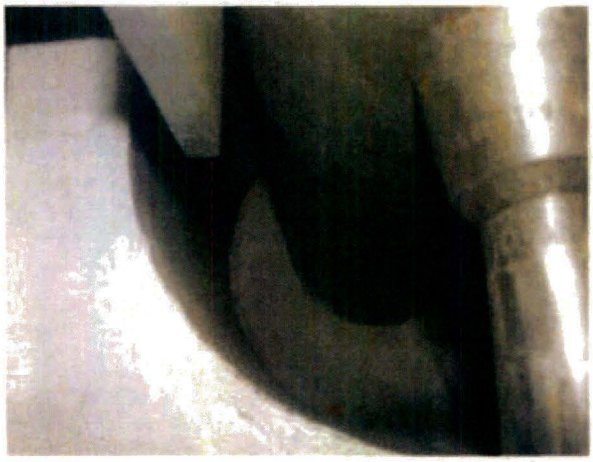
Penetration Seal Data

Appendix: B1

Photos: P133W1475

Fire Area A-25 (Side 1)

Fire Area A-25 (Side 1)



Fire Area F-3 (Side 2)

Fire Area F-3 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P133W2038

Penetration Type: M-6A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-25

Loc./Elev.: 2018'-6" **M-0X Dwg:** M-1X1921

1. **Barrier Thickness:** 39"
2. **Opening Size:** 12"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush with barrier plane
6. **Damming Side 2:** Recessed 23"
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 11"
10. **Annular Gap (smallest):** 1-1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

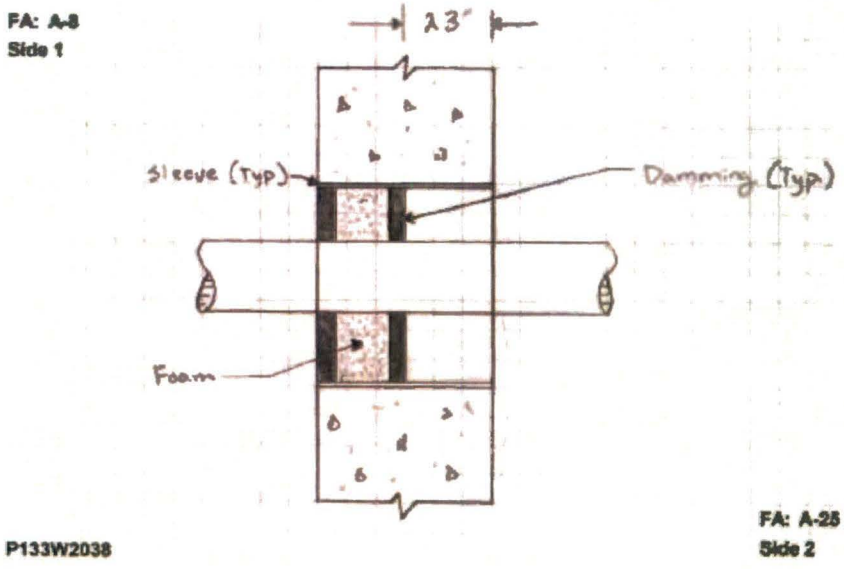
Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Change detail to M-6A based field inspection. Barrier thickness determined by Drawing C-1C1331 (wsa)
This is being accessed in RF14 verify seal thickness. (JFS)

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P133W2038

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 1)

Fire Area A-25 (Side 2)

Fire Area A-25 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P134S0874

Penetration Type: RM-1A **Fire Area (Side 1):** A-24 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1341

1. **Barrier Thickness:** 12"
2. **Opening Size:** 20"D
3. **Penetrants:** (1)14"P
4. **Sealant Type:** HDSE/HDLE
5. **Damming Side1:** Sealant flush w/ top of sleeve
6. **Damming Side 2:** Sealant Flush w/ ceiling
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 16"
10. **Annular Gap (smallest):** 2-1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F R
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** * No

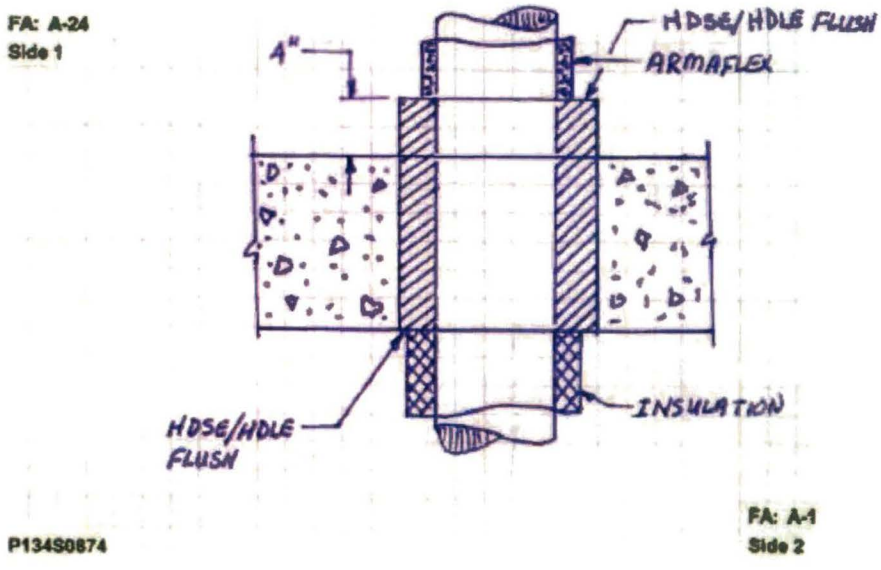
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Slab thickness based on drawing C-1C1311. * Insulation on bottom side with Armaflex on topside.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P134S0874

Fire Area A-24 (Side 1)

Fire Area A-24 (Side 1)

Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P134S0878

Penetration Type: A-7/RM-1A **Fire Area (Side 1):** A-24 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1341

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (6)3/8"J, (1)3/8"J
4. **Sealant Type:** HDSE/HDLE
5. **Damming Side1:** Sealant 1/2" above Slab
6. **Damming Side 2:** Sealant flush w/ceiling & sleeve
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 12-1/2"
10. **Annular Gap (smallest):** 3/4"
11. **Gap between pen:** 1/8"
12. **Barrier Type:** F R
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

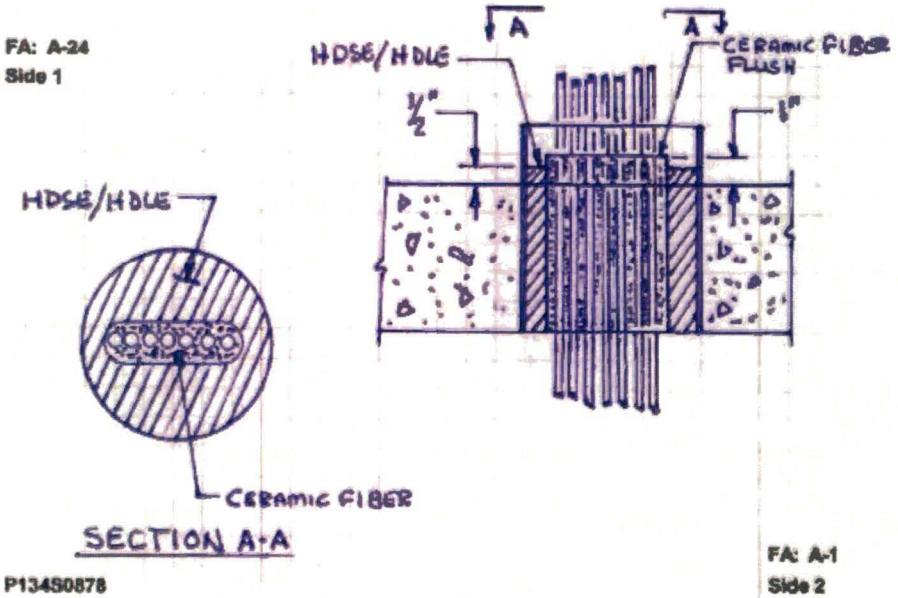
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Slab thickness based on drawing C-1C1311. Sheet Metal Annulus installed with ceramic fiber fill, 1/2" above sealant level. Ceramic fiber depth is 13" through annular sleeve. Changed Detail to A-7/RM-1A based on actual seal depth and configuration.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P134S0878

Fire Area A-24 (Side 1)

Fire Area A-24 (Side 1)

Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P134S0879

Penetration Type: M-6A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1341

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Foam Flush w/top of sleeve
6. **Damming Side 2:** 2" recessed
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 13"
10. **Annular Gap (smallest):** 1"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

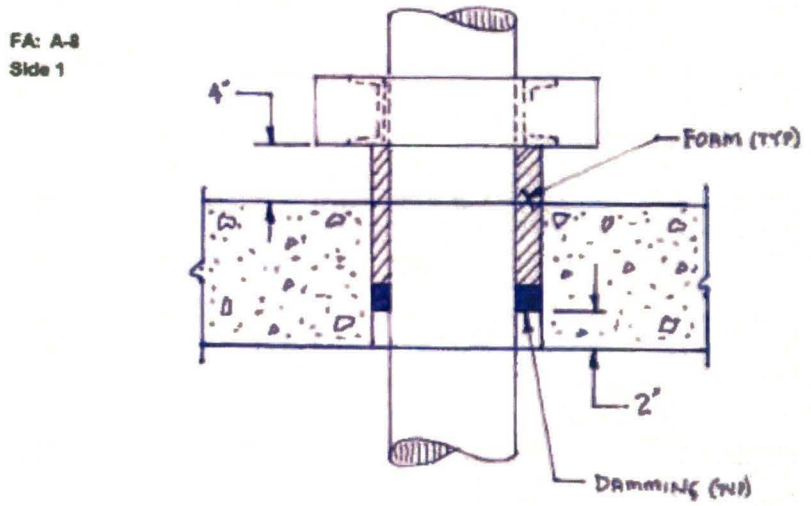
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Slab thickness based on drawing C-1C1311. Changed Detail from M-1 to M-6A based on actual sealant depth.

Sketch:



P134S0879

Penetration Seal Data

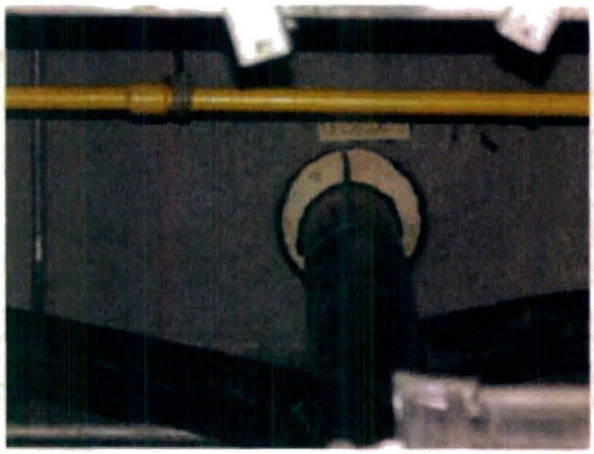
Appendix: B1

Photos: P134S0879

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 1)

Fire Area A-1 (Side 2)



Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P134S0902

Penetration Type: M-6A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-1

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1341

1. **Barrier Thickness:** 12"
2. **Opening Size:** 12"D
3. **Penetrants:** (1)8"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Foam 1/2" above Slab
6. **Damming Side 2:** Damming recessed 1-1/2"
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 10"
10. **Annular Gap (smallest):** 1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Wayne Aregood
Prepared By:

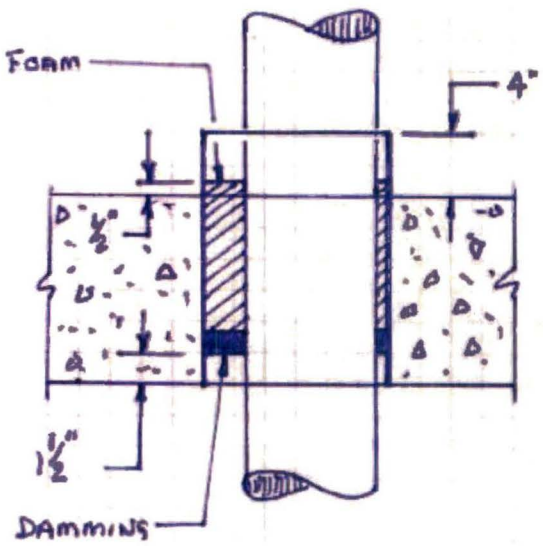
Jeff Suter
Reviewed By:

Walkdown Comments:

Slab thickness based on drawing C-1C1311. Topside Foam extends 1/2" above floor slab w/in sleeve. Changed Detail from M-1 to M-6A based on actual sealant Depth.

Sketch:

FA: A-8
Side 1



FA: A-1
Side 2

P134S0902

Penetration Seal Data

Appendix: B1

Photos: P134S0902

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 1)

Fire Area A-1 (Side 2)

Fire Area A-1 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P134W0436

Penetration Type: M-6A **Fire Area (Side 1):** A-8 **Fire Area (Side 2):** A-6

Loc./Elev.: 2009'-10 **M-0X Dwg:** M-1X0360

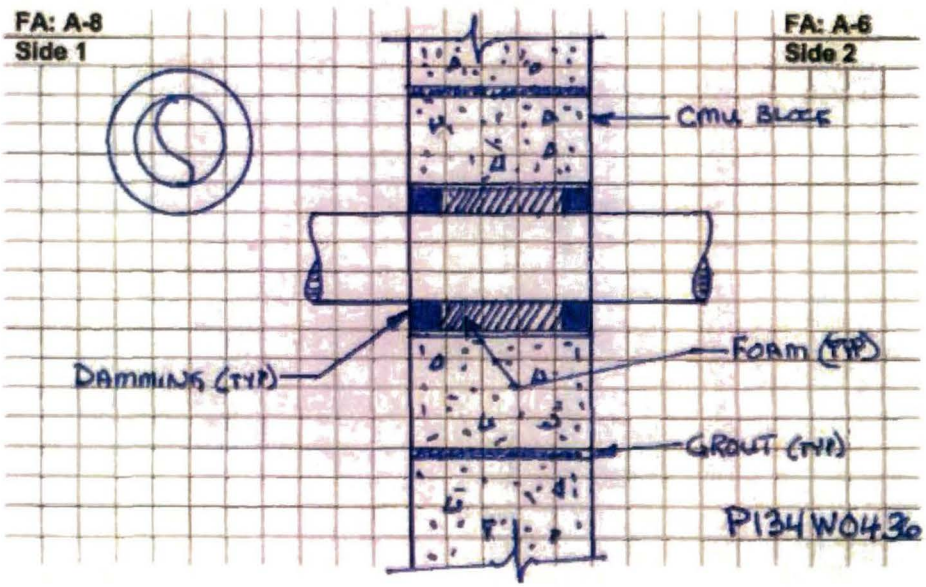
1. **Barrier Thickness:** 12" nominal
2. **Opening Size:** 8"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 10" Nominal
10. **Annular Gap (smallest):** 3/4" to 1"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P134W0436

Fire Area A-8 (Side 1)

Fire Area A-8 (Side 1)

Fire Area A-6 (Side 2)

Fire Area A-6 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P135S0217

Penetration Type: M-6A **Fire Area (Side 1):** A-14 **Fire Area (Side 2):** A-33

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1151

1. **Barrier Thickness:** 16"
2. **Opening Size:** 12"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Foam Flush W/sleeve
6. **Damming Side 2:** 7" recessed
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 12"
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** A F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

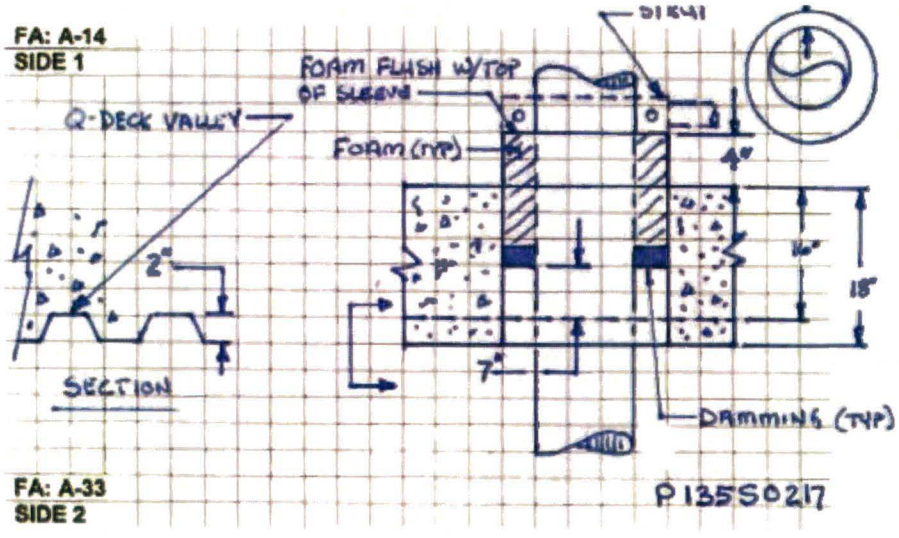
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Underside of slab has Q-Decking, effective barrier thickness is measured from corrugated valley.

Sketch:

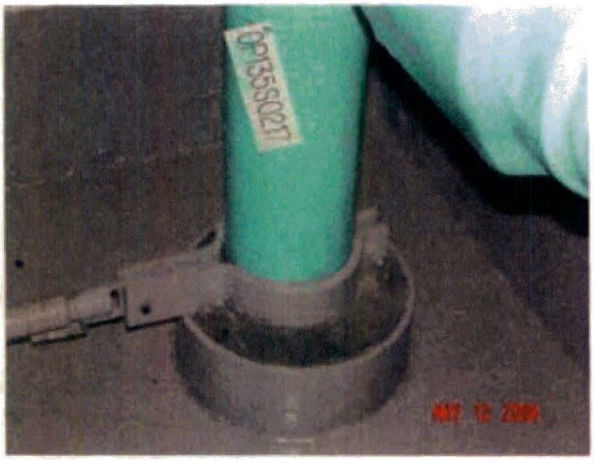


Penetration Seal Data

Appendix: B1

Photos: P135S0217

Fire Area A-14 (Side 1)



Fire Area A-14 (Side 1)

Fire Area A-33 (Side 2)

Fire Area A-33 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P135S0218

Penetration Type: M-6A **Fire Area (Side 1):** A-13 **Fire Area (Side 2):** A-33

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1151

1. **Barrier Thickness:** 16"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Foam flush w/sleeve
6. **Damming Side 2:** 8" recessed
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 11"
10. **Annular Gap (smallest):** 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** A F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

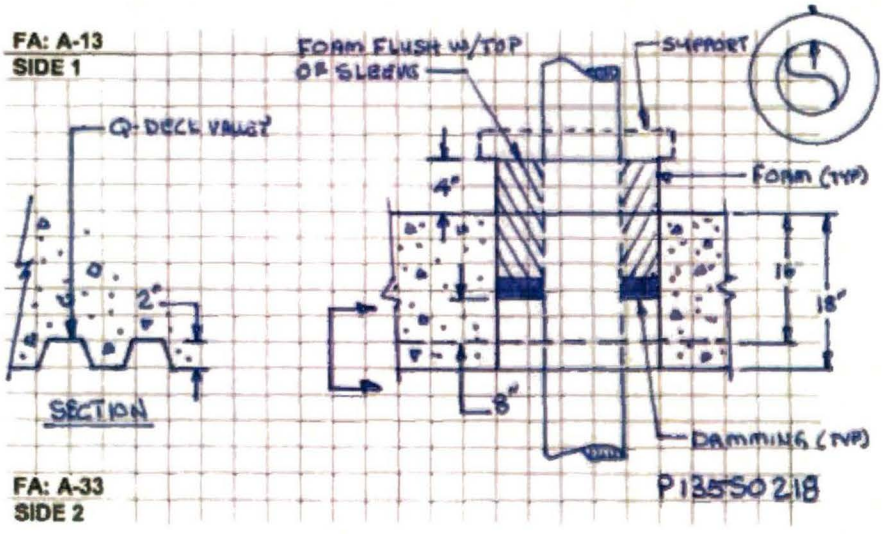
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Underside of slab has Q-Decking, effective barrier thickness is measured from corrugated valley.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P135S0218

Fire Area A-13 (Side 1)

Fire Area A-13 (Side 1)

Fire Area A-33 (Side 2)

Fire Area A-33 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P135S0219

Penetration Type: M-6A **Fire Area (Side 1):** A-13 **Fire Area (Side 2):** A-33

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1151

1. **Barrier Thickness:** 16"
2. **Opening Size:** 14"D
3. **Penetrants:** (1)8"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Foam Flush w/sleeve
6. **Damming Side 2:** 7" recessed
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 12 1/2"
10. **Annular Gap (smallest):** 1 3/4"
11. **Gap between pen:** N/A
12. **Barrier Type:** A F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

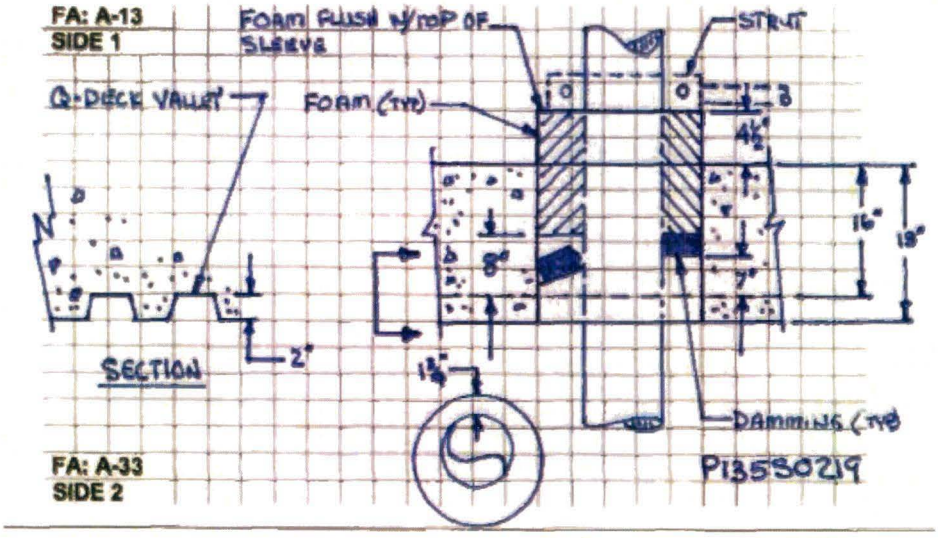
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Underside of slab has Q-Decking, effective barrier thickness is measured from corrugated valley. ** Damming broke and pulled away on bottom side. WR-04-043706 issued to correct. Damming corrected on 10-21-04 WO#04-263486-000, breach closed by Mark Strawder. Damming Continuity status changed to Accept.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P135S0219

Fire Area A-13 (Side 1)

Fire Area A-13 (Side 1)

Fire Area A-33 (Side 2)

Fire Area A-33 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P135S0223

Penetration Type: M-6A **Fire Area (Side 1):** A-14 **Fire Area (Side 2):** A-33

Loc./Elev.: 2000'-0" **M-0X Dwg:** M-1X1151

1. **Barrier Thickness:** 16"
2. **Opening Size:** 14"D
3. **Penetrants:** (1)8"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Foam flush w/sleeve
6. **Damming Side 2:** 8" recessed
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 12"
10. **Annular Gap (smallest):** 1 3/4"
11. **Gap between pen:** N/A
12. **Barrier Type:** A F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

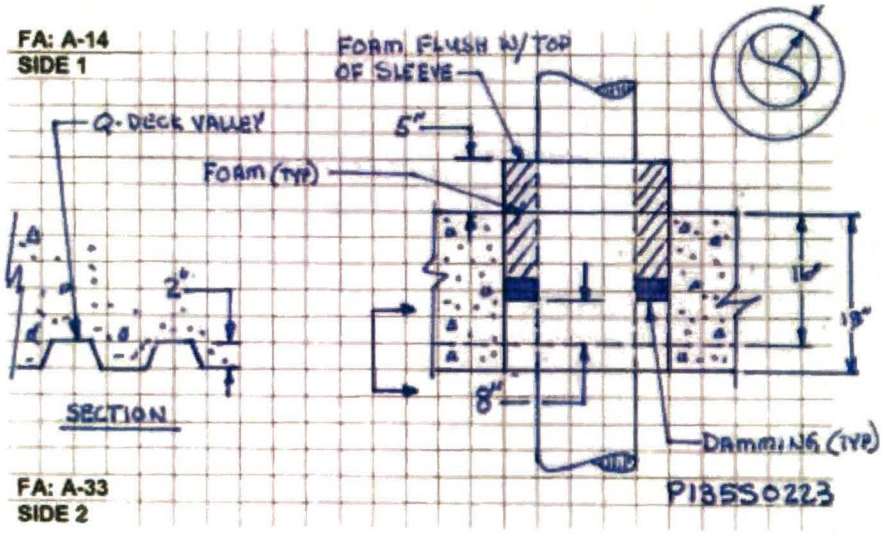
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Underside of slab has Q-Decking, effective barrier thickness is measured from corrugated valley.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P135S0223

Fire Area A-14 (Side 1)

Fire Area A-14 (Side 1)

Fire Area A-33 (Side 2)

Fire Area A-33 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P135S0932

Penetration Type: N/A **Fire Area (Side 1):** A-29 **Fire Area (Side 2):** A-29

Loc./Elev.: 2013'-6" **M-0X Dwg:** M-1X1352

1. **Barrier Thickness:** 12"
2. **Opening Size:** 18" X 10"
3. **Penetrants:** 16" X 12"V
4. **Sealant Type:** N/A
5. **Damming Side1:** N/A
6. **Damming Side 2:** N/A
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** No sealant
10. **Annular Gap (smallest):** N/A
11. **Gap between pen:** N/A
12. **Barrier Type:**
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Slab thickness based on C-1C1352. Open hole, communicates to same fire area. No further evaluation required. Remove from unbounded sort.

Sketch:

Penetration Seal Data

Appendix: B1

Photos: P135S0932

Fire Area A-29 (Side 1)

Fire Area A-29 (Side 1)

Fire Area A-29 (Side 2)

Fire Area A-29 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P135W2203

Penetration Type: M-6A **Fire Area (Side 1):** A-33 **Fire Area (Side 2):** A-30

Loc./Elev.: 2009 '-1" **M-0X Dwg:** M-1X1924

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 10"
10. **Annular Gap (smallest):** 1-3/4"
11. **Gap between pen:** N/A
12. **Barrier Type:** F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

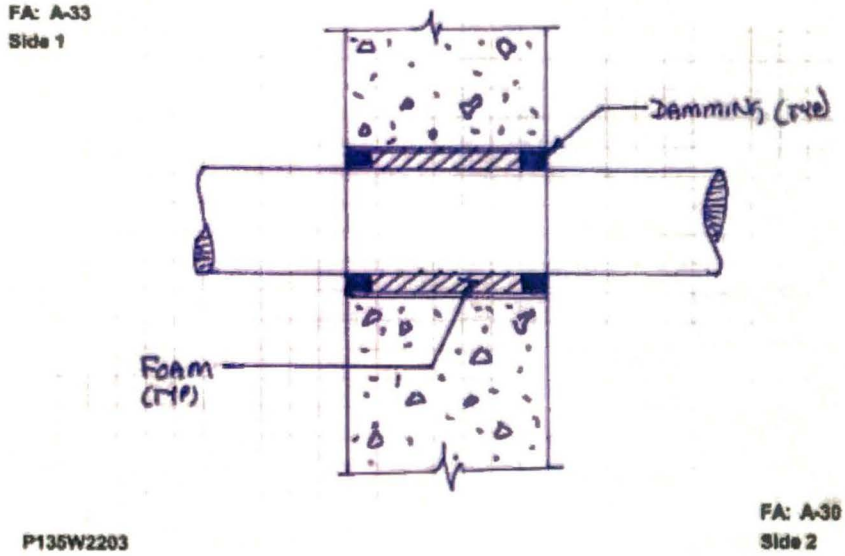
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Barrier thickness determined by Drawing M-1X1151 and field measurement. Changed Detail from M-1 to M-6A based on actual sealant depth.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P135W2203

Fire Area A-33 (Side 1)

Fire Area A-33 (Side 1)

Fire Area A-30 (Side 2)

Fire Area A-30 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P135W2212

Penetration Type: M-6A **Fire Area (Side 1):** A-14 **Fire Area (Side 2):** A-13

Loc./Elev.: 2009'-1" **M-0X Dwg:** M-1X1924

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** 1/4" recessed
6. **Damming Side 2:** 1/4" recessed
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 9-1/2"
10. **Annular Gap (smallest):** 3/4"
11. **Gap between pen:** N/A
12. **Barrier Type:** F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

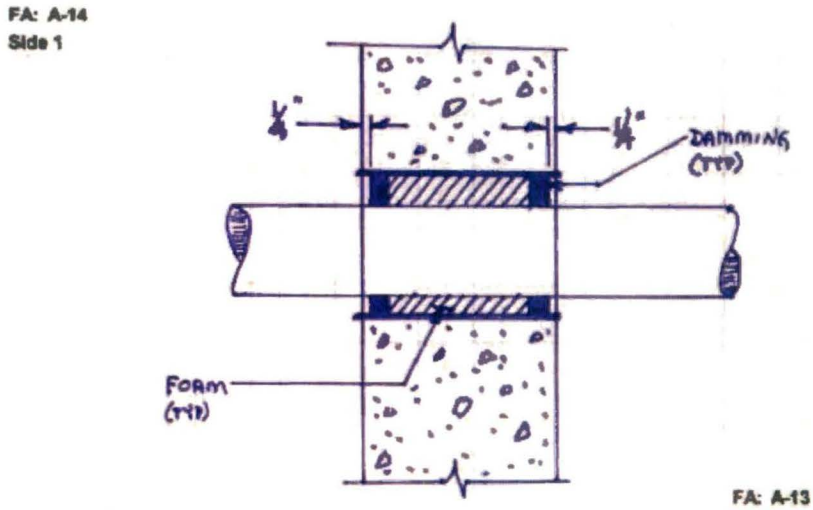
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Barrier thickness determined by Field measurement and Drawing M-1X1151. Changed Detail from M-1 to M-6A based on actual sealant depth.

Sketch:



Penetration Seal Data

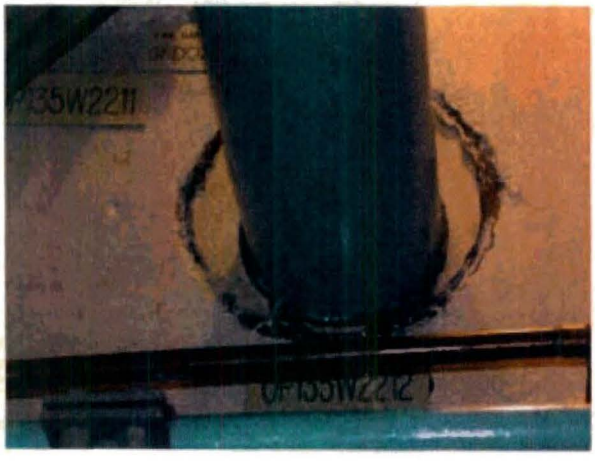
Appendix: B1

Photos: P135W2212

Fire Area A-14 (Side 1)

Fire Area A-14 (Side 1)

Fire Area A-13 (Side 2)



Fire Area A-13 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P135W2426

Penetration Type: M-6A **Fire Area (Side 1):** A-33 **Fire Area (Side 2):** A-14

Loc./Elev.: 2009'-1" **M-0X Dwg:** M-1X1932

1. **Barrier Thickness:** 24"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** 5" recessed
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 17"
10. **Annular Gap (smallest):** 1-1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** A F W
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

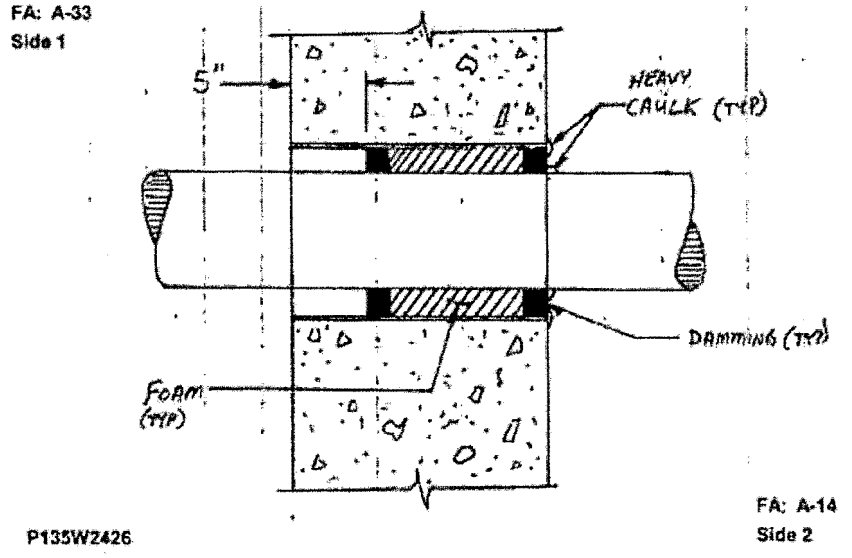
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Barrier thickness determined by Drawing C-1C1151. Changed Detail M-1 to M-6A based on actual sealant depth.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P135W2426

Fire Area A-33 (Side 1)

Fire Area A-33 (Side 1)

Fire Area A-14 (Side 2)

Fire Area A-14 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P141W1909

Penetration Type: M-6A **Fire Area (Side 1):** A-16 **Fire Area (Side 2):** A-26

Loc./Elev.: 2040'-2 1 **M-0X Dwg:** M-1X1919

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** Recessed 1/2"
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 9-1/2"
10. **Annular Gap (smallest):** 1/2'
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

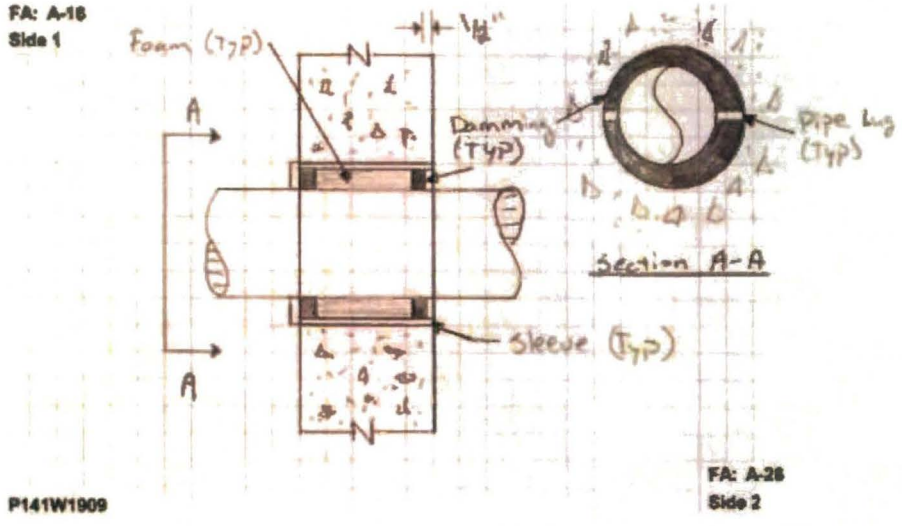
Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Changed detail to M-6A based on field inspection.

Sketch:

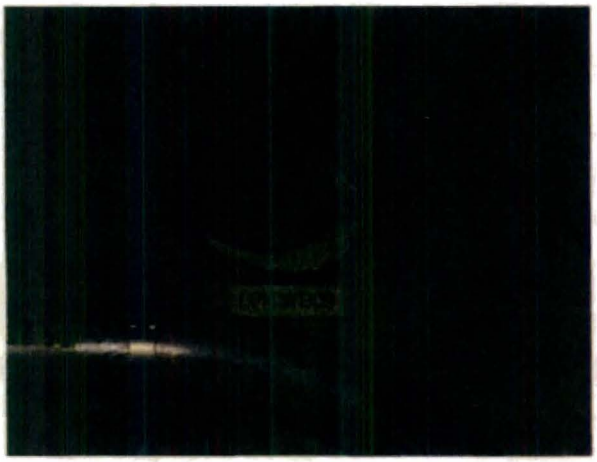


Penetration Seal Data

Appendix: B1

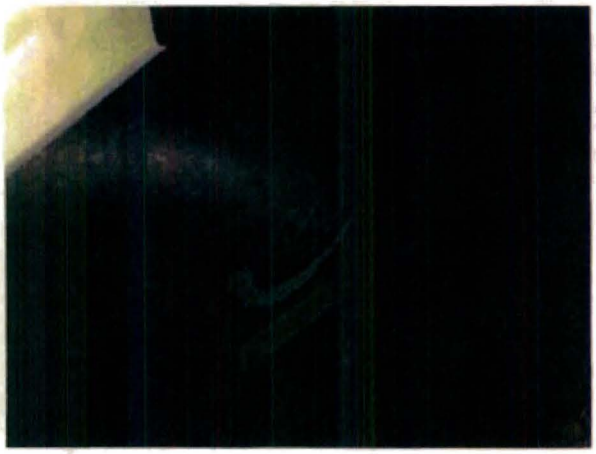
Photos: P141W1909

Fire Area A-16 (Side 1)



Fire Area A-16 (Side 1)

Fire Area A-26 (Side 2)



Fire Area A-26 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P142S1052

Penetration Type: M-6A **Fire Area (Side 1):** A-27 **Fire Area (Side 2):** A-8

Loc./Elev.: 2026'-0" **M-0X Dwg:** M-1X1421

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10" D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** N/A
6. **Damming Side 2:** Flush with barrier
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 11"
10. **Annular Gap (smallest):** 1-1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

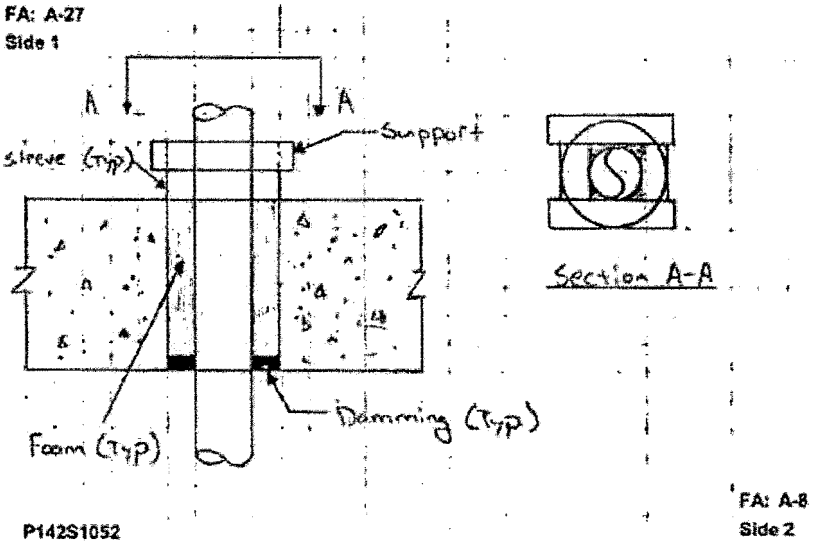
Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Slab thickness based on C-0C1411. Detail changed to M-6A. Topside foam is irregular with lowest point flush with floor.

Sketch:



Penetration Seal Data

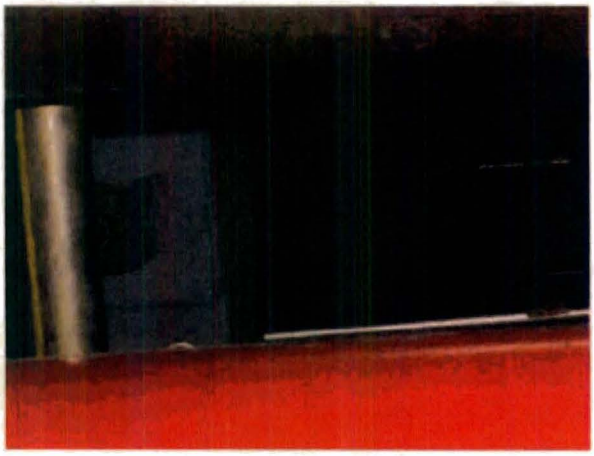
Appendix: B1

Photos: P142S1052

Fire Area A-27 (Side 1)

Fire Area A-27 (Side 1)

Fire Area A-8 (Side 2)



Fire Area A-8 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P142S1097

Penetration Type: M-6A **Fire Area (Side 1):** A-27 **Fire Area (Side 2):** A-8

Loc./Elev.: 2026'-0" **M-0X Dwg:** M-1X1421

1. **Barrier Thickness:** 24"
2. **Opening Size:** 8"D
3. **Penetrants:** (1)2-1/2"P
4. **Sealant Type:** Foam
5. **Damming Side1:** N/A
6. **Damming Side 2:** Flush with barrier plane
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 26-1/4"
10. **Annular Gap (smallest):** 1-1/8"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

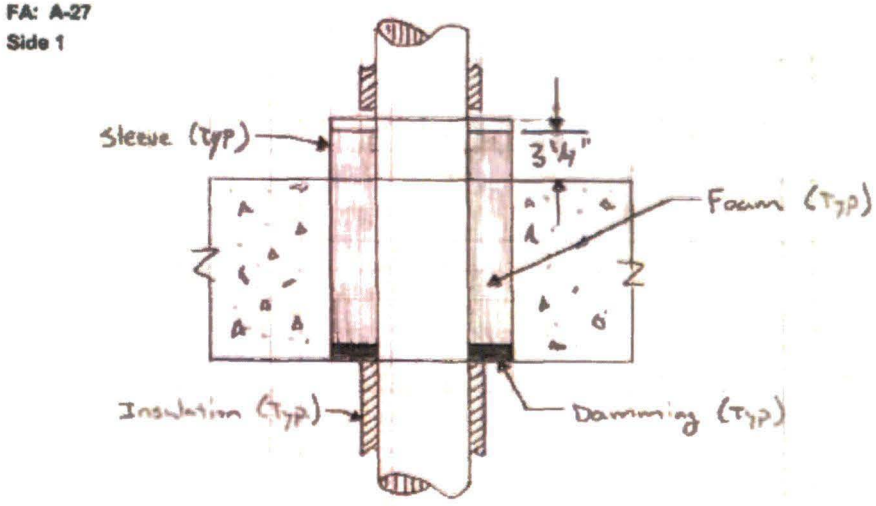
Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Slab thickness based on C-0C1411. Based on top side configuration. Insulation does not penetrate through seal.

Sketch:



Penetration Seal Data

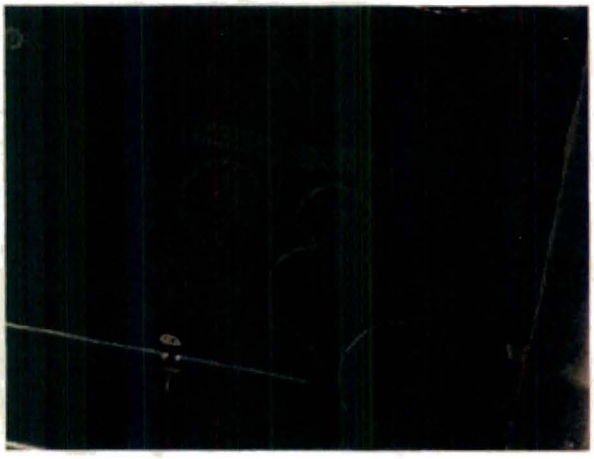
Appendix: B1

Photos: P142S1097

Fire Area A-27 (Side 1)

Fire Area A-27 (Side 1)

Fire Area A-8 (Side 2)



Fire Area A-8 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P143S1102

Penetration Type: M-6A **Fire Area (Side 1):** A-16 **Fire Area (Side 2):** A-8

Loc./Elev.: 2026'-0" **M-0X Dwg:** M-0X1431

1. **Barrier Thickness:** 12"
2. **Opening Size:** 12"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** N/A
6. **Damming Side 2:** Flush with barrier plane
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 14-1/2"
10. **Annular Gap (smallest):** 2-1/4"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

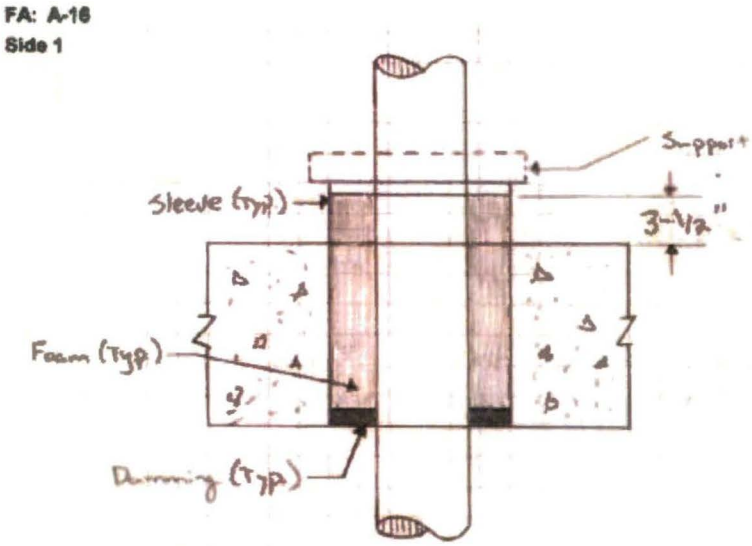
Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Slab thickness based on C-0C1411. Changed detail to M-6A based on field inspection.

Sketch:



Penetration Seal Data

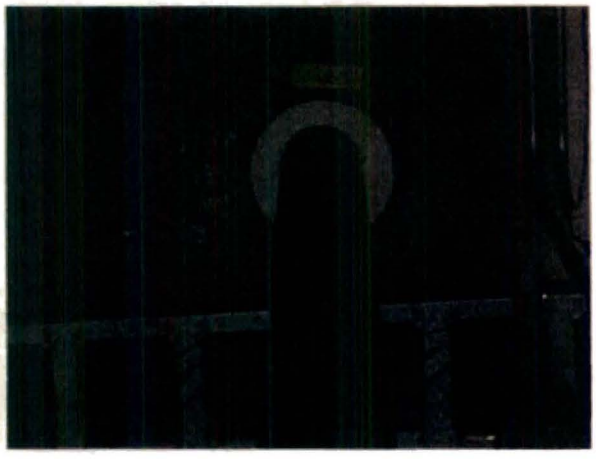
Appendix: B1

Photos: P143S1102

Fire Area A-16 (Side 1)

Fire Area A-16 (Side 1)

Fire Area A-8 (Side 2)



Fire Area A-8 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P143S1111

Penetration Type: M-6A **Fire Area (Side 1):** A-16 **Fire Area (Side 2):** A-8

Loc./Elev.: 2026'-0" **M-0X Dwg:** M-0X1431

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** N/A
6. **Damming Side 2:** Flush with barrier plane
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 12-1/4"
10. **Annular Gap (smallest):** Approx 2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

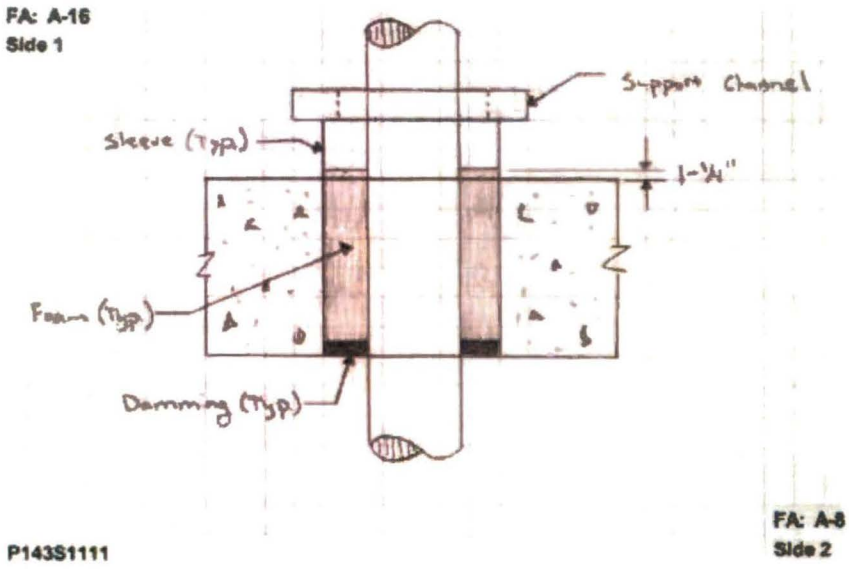
Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Slab thickness based on C-0C1411. Detail changed to M-6A based on field inspection.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P143S1111

Fire Area A-16 (Side 1)

Fire Area A-16 (Side 1)

Fire Area A-8 (Side 2)

Fire Area A-8 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P144S1173

Penetration Type: M-6A **Fire Area (Side 1):** A-18 **Fire Area (Side 2):** A-24

Loc./Elev.: 2026'-0" **M-0X Dwg:** M-1X1441

1. **Barrier Thickness:** 32"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** N/A
6. **Damming Side 2:** Recess 1/2"
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 36"
10. **Annular Gap (smallest):** 1-1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

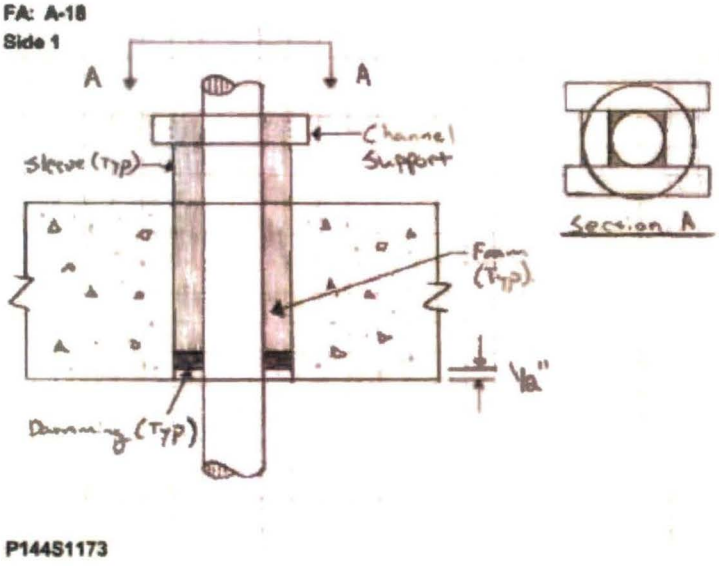
Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Slab thickness based on C-0C1411. Detail changed to M-6A based on field inspection.

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P144S1173

Fire Area A-18 (Side 1)

Fire Area A-18 (Side 1)

Fire Area A-24 (Side 2)

Fire Area A-24 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P145S0955

Penetration Type: M-6A/A-7 **Fire Area (Side 1):** A-23 **Fire Area (Side 2):** T-2

Loc./Elev.: 2026'-0" **M-0X Dwg:** M-1X1352

1. **Barrier Thickness:** 36"
2. **Opening Size:** 10"D
3. **Penetrants:** (4)1"P
4. **Sealant Type:** Foam/Ceramic fiber
5. **Damming Side1:** N/A
6. **Damming Side 2:** Recessed 26"
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 13"
10. **Annular Gap (smallest):** 1"
11. **Gap between pen:** 2-1/2"
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

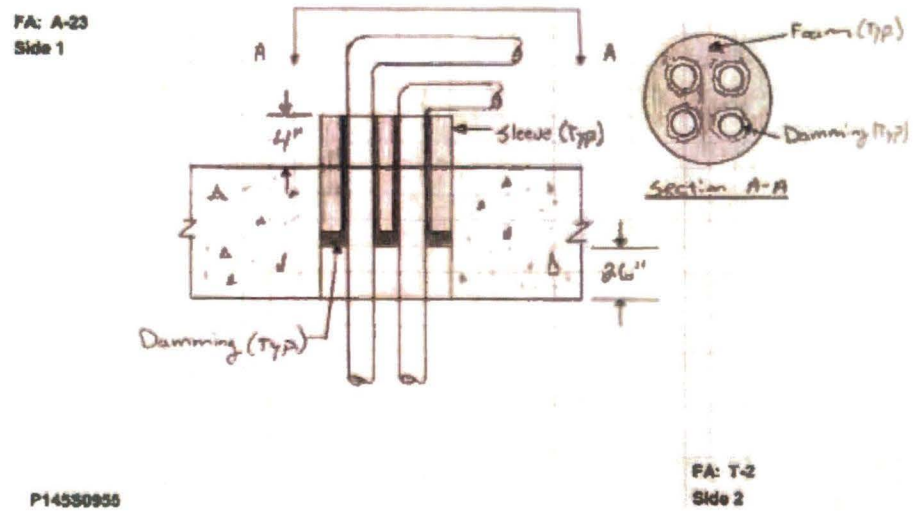
Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Slab thickness based on C-1C1352. Ceramic fiber around annulus of penetrants. No degradation due to temperature observed.

Sketch:

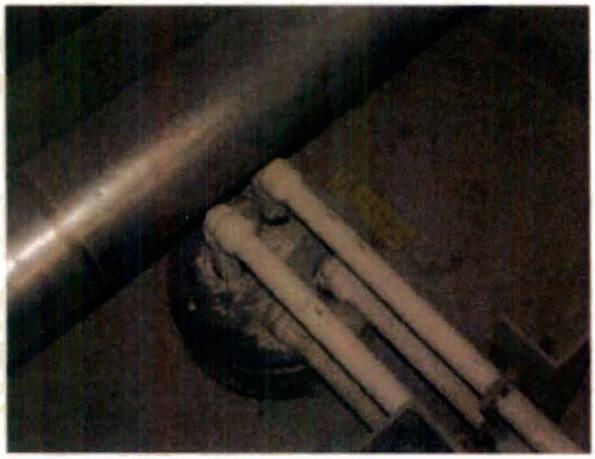


Penetration Seal Data

Appendix: B1

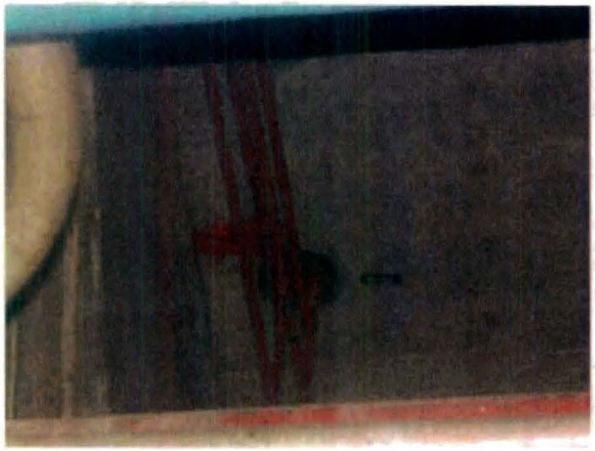
Photos: P145S0955

Fire Area A-23 (Side 1)



Fire Area A-23 (Side 1)

Fire Area T-2 (Side 2)



Fire Area T-2 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P145W2338

Penetration Type: FB-1 **Fire Area (Side 1):** A-23 **Fire Area (Side 2):** A-23

Loc./Elev.: 2028'-0" **M-0X Dwg:** M-1X1931

1. **Barrier Thickness:** 36"
2. **Opening Size:** 14"D
3. **Penetrants:** (1)4"P
4. **Sealant Type:** Ceramic Fiber
5. **Damming Side1:** Boot
6. **Damming Side 2:** Boot
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):**
9. **Sealant Depth:**
10. **Annular Gap (smallest):**
11. **Gap between pen:**
12. **Barrier Type:** A
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** Yes

Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Barrier Thickness determined by Drawing M-1X1352. This is not a fire barrier. It is located in the wall containing the escape access opening from Area 5.

Sketch:

Penetration Seal Data

Appendix: B1

Penetration #: P145W2339

Penetration Type: FB-1 **Fire Area (Side 1):** A-23 **Fire Area (Side 2):** A-23

Loc./Elev.: 2028'-0" **M-0X Dwg:** M-1X1931

1. **Barrier Thickness:** 36"
2. **Opening Size:** 14"D
3. **Penetrants:** (1)4"P
4. **Sealant Type:** Ceramic Fiber
5. **Damming Side1:** Boot
6. **Damming Side 2:** Boot
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):**
9. **Sealant Depth:**
10. **Annular Gap (smallest):**
11. **Gap between pen:**
12. **Barrier Type:** A
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** Yes

Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Barrier Thickness determined by Drawing M-1X1352. This is not a fire barrier. It is located in the wall containing the escape access opening from Area 5.

Sketch:

Penetration Seal Data

Appendix: B1

Penetration #: P145W2341

Penetration Type: N/A **Fire Area (Side 1):** A-23 **Fire Area (Side 2):** A-23

Loc./Elev.: 2031'-9" **M-0X Dwg:** M-1X1931

1. **Barrier Thickness:** 36"
2. **Opening Size:** 30"D
3. **Penetrants:** MANWAY
4. **Sealant Type:** Steel Hatch
5. **Damming Side1:** Boot
6. **Damming Side 2:** Boot
7. **Damming Continuity (Acc/Rej):**
8. **Boot Condition (Acc/Rej):**
9. **Sealant Depth:**
10. **Annular Gap (smallest):**
11. **Gap between pen:**
12. **Barrier Type:** A
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Barrier Thickness determined by Drawing M-1X1352. This is not a fire barrier. It is located in the wall containing the escape access opening from Area 5.

Sketch:

Penetration Seal Data

Appendix: B1

Penetration #: P145W2342

Penetration Type: FB-1 **Fire Area (Side 1):** A-23 **Fire Area (Side 2):** A-23

Loc./Elev.: 2028'-0" **M-0X Dwg:** M-1X1931

1. **Barrier Thickness:** 36"
2. **Opening Size:** 14"D
3. **Penetrants:** (1)4"P
4. **Sealant Type:** Ceramic Fiber
5. **Damming Side1:** Boot
6. **Damming Side 2:** Boot
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):**
9. **Sealant Depth:**
10. **Annular Gap (smallest):**
11. **Gap between pen:**
12. **Barrier Type:** A
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** Yes

Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Barrier Thickness determined by Drawing M-1X1352. This is not a fire barrier. It is located in the wall containing the escape access opening from Area 5.

Sketch:

Penetration Seal Data

Appendix: B1

Penetration #: P145W2344

Penetration Type: FB-1 (Remark 1 **Fire Area (Side 1):** A-23 **Fire Area (Side 2):** A-23

Loc./Elev.: 2026'-7 1 **M-0X Dwg:** M-1X1931

1. **Barrier Thickness:** 36"
2. **Opening Size:** 8"D
3. **Penetrants:** (4)1"P
4. **Sealant Type:** Ceramic Fiber
5. **Damming Side1:** Boot
6. **Damming Side 2:** Boot
7. **Damming Continuity (Acc/Rej):** N/A
8. **Boot Condition (Acc/Rej):**
9. **Sealant Depth:**
10. **Annular Gap (smallest):**
11. **Gap between pen:**
12. **Barrier Type:** A
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** Yes

Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Barrier Thickness determined by Drawing M-1X1352. This is not a fire barrier. It is located in the wall containing the escape access opening from Area 5.

Sketch:

Penetration Seal Data

Appendix: B1

Penetration #: P145W2345

Penetration Type: FB-1 **Fire Area (Side 1):** A-23 **Fire Area (Side 2):** A-23

Loc./Elev.: 2028'-0" **M-0X Dwg:** M-1X1931

1. **Barrier Thickness:**
2. **Opening Size:** 14"D
3. **Penetrants:** (1)4"P
4. **Sealant Type:** Ceramic Fiber
5. **Damming Side1:** Boot
6. **Damming Side 2:** Boot
7. **Damming Continuity (Acc/Rej):**
8. **Boot Condition (Acc/Rej):**
9. **Sealant Depth:**
10. **Annular Gap (smallest):**
11. **Gap between pen:**
12. **Barrier Type:** A
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

This is not a fire barrier. It is located in the wall containing the escape access opening from Area 5.

Sketch:

Penetration Seal Data

Appendix: B1

Penetration #: P152W2581

Penetration Type: M-6A **Fire Area (Side 1):** A-21 **Fire Area (Side 2):** A-22

Loc./Elev.: 2063'-11 **M-0X Dwg:** M-0X1947

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** 1/4" recessed
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 9-3/4"
10. **Annular Gap (smallest):** 1-1/8"
11. **Gap between pen:** N/A
12. **Barrier Type:** A F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

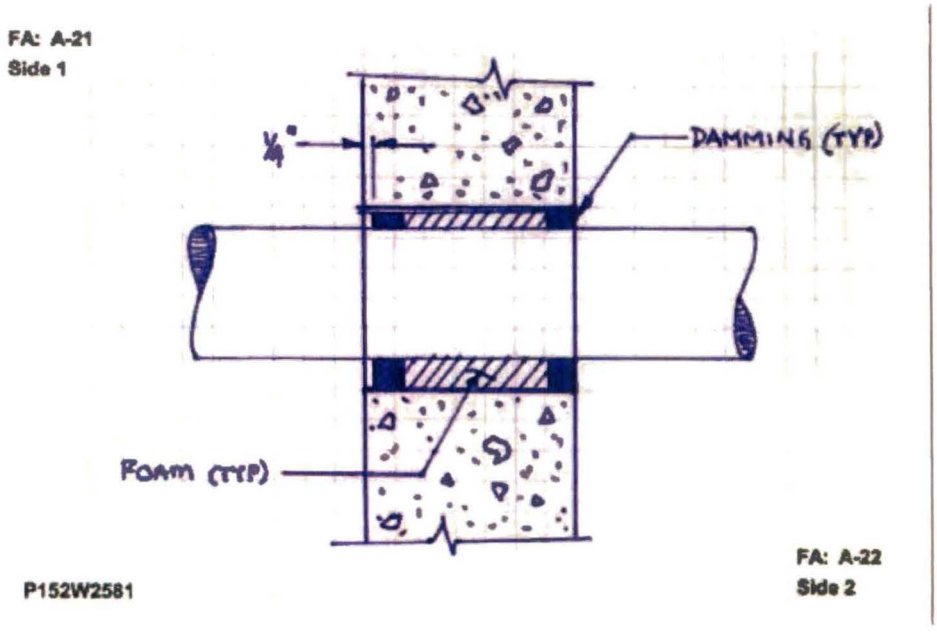
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Wall thickness determined by Drawing C-1C1521. Changed Detail from M-1 to M-6A based on actual seal depth.

Sketch:

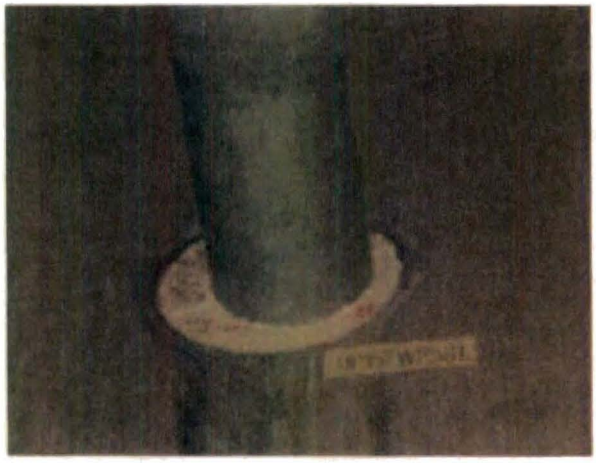


Penetration Seal Data

Appendix: B1

Photos: P152W2581

Fire Area A-21 (Side 1)



Fire Area A-21 (Side 1)

Fire Area A-22 (Side 2)

Fire Area A-22 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P152W2623

Penetration Type: M-6A **Fire Area (Side 1):** A-19 **Fire Area (Side 2):** A-22

Loc./Elev.: 2064'-3" **M-0X Dwg:** M-1X1948

1. **Barrier Thickness:** 12"
2. **Opening Size:** 10"D
3. **Penetrants:** (1)6"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 10"
10. **Annular Gap (smallest):** 1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** A F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

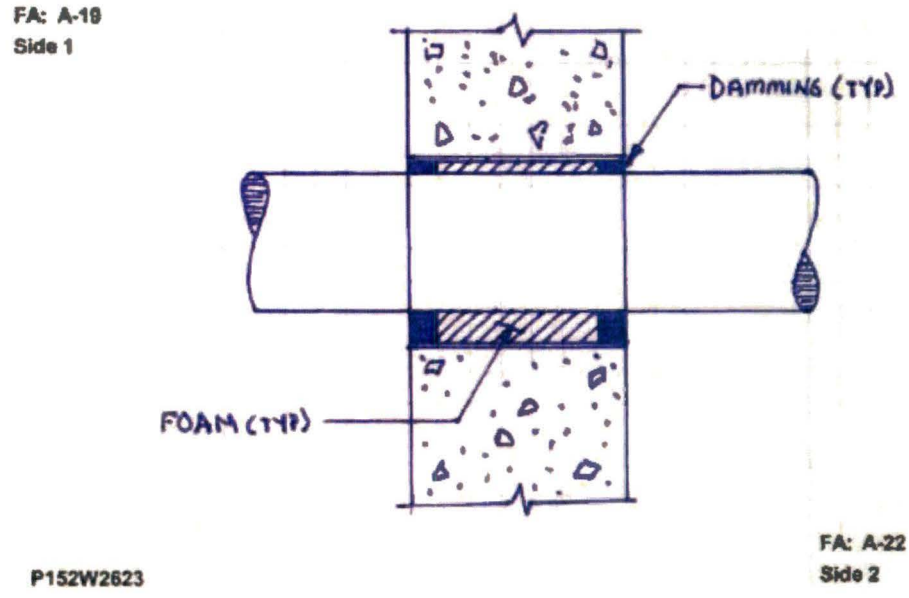
Wayne Aregood
Prepared By:

Jeff Suter
Reviewed By:

Walkdown Comments:

Barrier thickness based on drawing C-1C1521. Changed Detail from M-1 to M-6A

Sketch:



Penetration Seal Data

Appendix: B1

Photos: P152W2623

Fire Area A-19 (Side 1)

Fire Area A-19 (Side 1)

Fire Area A-22 (Side 2)

Fire Area A-22 (Side 2)

Penetration Seal Data

Appendix: B1

Penetration #: P153W2543

Penetration Type: M-6A **Fire Area (Side 1):** A-19 **Fire Area (Side 2):** A-20

Loc./Elev.: 2064'- 7" **M-0X Dwg:** M-0X1946

1. **Barrier Thickness:** 12"
2. **Opening Size:** 16"D
3. **Penetrants:** (1)8"P
4. **Sealant Type:** Foam
5. **Damming Side1:** Flush
6. **Damming Side 2:** Flush
7. **Damming Continuity (Acc/Rej):** Accept
8. **Boot Condition (Acc/Rej):** N/A
9. **Sealant Depth:** 10"
10. **Annular Gap (smallest):** 2-1/2"
11. **Gap between pen:** N/A
12. **Barrier Type:** F
13. **Opening Sleeved or Concrete:** Steel
14. **Pipe Insulated:** No

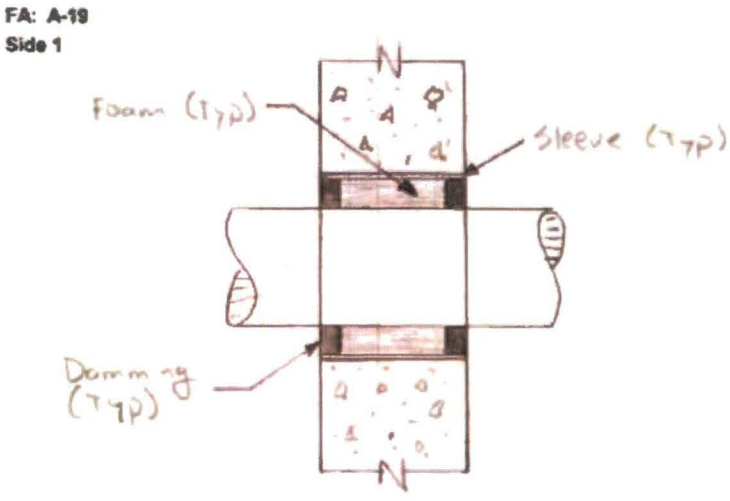
Jeff Suter
Prepared By:

Wayne Aregood
Reviewed By:

Walkdown Comments:

Changed detail to M-6A based on field inspection.

Sketch:



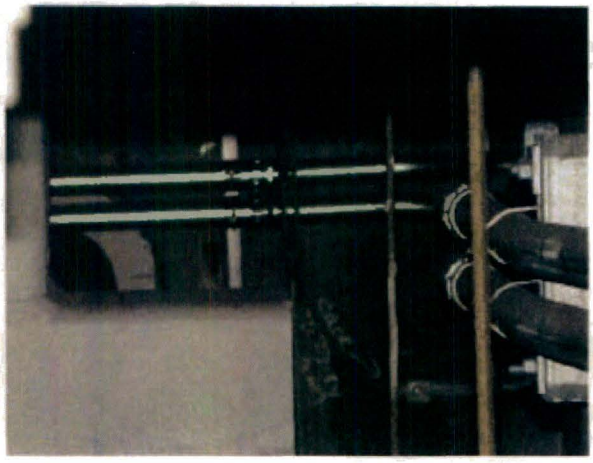
Penetration Seal Data

Appendix: B1

Photos: P153W2543

Fire Area A-19 (Side 1)

Fire Area A-19 (Side 1)



Fire Area A-20 (Side 2)

Fire Area A-20 (Side 2)