

MAR 18 1994

MEMORANDUM FOR: Conrad E. McCracken, Chief
 Plant Systems Branch
 Division of Systems Safety and Analysis

THRU: K. Steven West, Chief
 Special Project Section
 Plant Systems Branch
 Division of Systems Safety and Analysis

FROM: Daniele Oudinot, Reactor Systems Engineer
 Special Project Section
 Plant Systems Branch
 Division of Systems Safety and Analysis

SUBJECT: TRIP REPORT - PHASE 2 OF NUMARC THERMO-LAG TEST PROGRAM -
 FIRE ENDURANCE TESTING OF ASSEMBLIES 2-2 AND 2-3

The enclosed trip report documents my observation of Thermo-Lag fire endurance testing performed by the Nuclear Management and Research Council (NUMARC). This report covers testing activities at Omega Point Laboratories, Elmendorf, Texas, during the period February 22-23, 1994.

Daniele Oudinot, Reactor Systems Engineer
 Special Project Section
 Plant Systems Branch
 Division of Systems Safety and Analysis

Enclosure:
 As stated

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TRIP REPORT

Facility: Omega Point Laboratories (OPL), Elmendorf, Texas
Industry Group: Nuclear Management and Resources Council (NUMARC)
Activity: Phase 2 of NUMARC Thermo-Lag fire test program
Trip Dates: February 22 and 23, 1994
Reviewer: D. Oudinot, NRR

INTRODUCTION

On February 22 and 23, 1994, I visited Omega Point Laboratories (OPL), Elmendorf, Texas. The purpose of the visit was to observe fire endurance testing for Phase 2 of NUMARC Thermo-Lag program. The following OPL personnel participated in the testing activities: Deggary Priest, President; Constance Humphrey, Vice President and Quality Assurance (QA) Manager; Cleda Patton, Assistant to the President and Assistant to the QA Manager; Herb Stansberry, Fire Technologist and Project Engineer; Kerry Hitchcock, Shop Foreman; Richard Beasley; and Laudencio Castanon. The contract personnel included Calvin Banning, Rick Dible, Liz Kleinsorg and Bud Auvil of Vectra. The NUMARC representatives who observed the tests were: Joe Colvin, Alex Marion, Biff Bradley and Morris Schreim. Other individuals who observed the tests were: Doug Brandes of Duke Power Co.; Mark Salley of TVA; Bill Rossfeld of Florida Power Corporation; Charles Fisher of Florida Power and Light; Bob Keaten of GPU Nuclear; Don Hintz of Entergy; Marvin Fertel of USCEA; Keith Roys of Toledo Edison; John Maracek of Beaver Valley Power Station; George Hunger of PECO Energy; Frank Garrett of Arizona Public Service; and Mike Launi of Sargent & Lundy.

EXECUTIVE SUMMARY

NUMARC performed fire endurance testing of assemblies 2-2 and 2-3 on February 22 and 23, 1994 respectively. These two fire tests completed all NUMARC Phase 2 tests scheduled to date.

Test Assembly 2-2 (1-hour) consisted of two Thermo-Lag box enclosures, one baseline and one upgraded, each containing three U-shaped aluminum conduits (3/4", 2", and 3" in diameter) and two U-shaped aluminum conduits individually wrapped with Thermo-Lag (3/4" and 2" in diameter). Temperatures recorded by thermocouples placed on the surface of conduits within the box enclosures (baseline and upgraded) did not exceed the average and maximum single point temperature criteria. However, the unexposed surface of the baseline Thermo-Lag box enclosure exceeded the average and the maximum single point criteria at 45 minutes and 52 minutes into the test respectively. The unexposed

surface of the upgraded Thermo-Lag box enclosure reached the average temperature criterion at 33 minutes into the test. Temperatures recorded on the surface of both individually-wrapped conduits exceeded the maximum single point temperature criterion 26 and 35 minutes into the test respectively. A fog nozzle hose stream test was performed upon completion of the fire endurance test.

Test Assembly 2-3 (3-hour baseline) consisted of three U-shaped aluminum conduits (3/4", 3", and 6" in diameter) individually wrapped with Thermo-Lag. Temperatures were recorded by thermocouples placed on the surface of the conduits. The 3/4" and 3" conduits exceeded the maximum single point temperature criterion 69 minutes and 91 minutes into the test respectively. The 3/4", 3", and 6" conduits exceeded the average temperature criterion at 63 minutes, 99 minutes, and 102 minutes into the test respectively. At 102 minutes, NUMARC terminated the test and a fog nozzle hose stream test was performed.

TESTING ACTIVITIES

BACKGROUND

The NUMARC test program for the qualification of Thermo-Lag fire barriers included two testing phases. Phase 1 consisted of six upgraded assemblies designed and funded by the vendor, Thermal Science, Inc. Phase 1 testing was completed on October 6, 1993. NUMARC discussed the test results with the staff during a meeting on October 18, 1993, and with the Commissioners during a meeting on November 24, 1993. By letter of February 8, 1994, NUMARC submitted Phase 1 test reports.

Phase 2 construction, which commenced on December 14, 1993, included eleven baseline and upgraded assemblies designed and funded by NUMARC. The test assemblies were designed to represent a large percentage of the configurations currently installed in the plants. Seven tests have been performed to date. The design upgrades and schedules of the four remaining Phase 2 tests have not been finalized by NUMARC.

ASSEMBLY 2-2

NUMARC tested Assembly 2-2 (1-hour) on February 22, 1994. This assembly consisted of two Thermo-Lag box enclosures (one baseline and one upgraded) and two conduits individually wrapped with Thermo-Lag.

Each box enclosure contained three U-shaped aluminum conduits (3/4", 2", and 3" in diameter) with a radial bend and a lateral bend box (LBD) as shown in Attachment 1. Each box enclosure was constructed of nominal 1/2" thick Thermo-Lag prefabricated panels with ribs and stress skin on one side. A score-and-fold method was used. The ribs, placed on the inside surface of the enclosures, were oriented parallel to the conduits. A butt joint was

located at the mid-span of the conduit run. The joints and seams of the baseline enclosure were pre-buttered with Thermo-Lag trowel grade material. The other box enclosure was upgraded with a 6" stress skin overlap on each side of the butt joint and a 3" stress skin overlap on each side of the seams.

The stress skin overlaps were secured with 1/2" staples. Tie wires, spaced at 6" intervals, were used to secure the seam stress skin to the butt joint stress skin. The joints and seams of the upgraded enclosure were post-buttered with trowel grade material. Additional construction details were provided in the trip report of February 14, 1994, from P. Madden to C. McCracken.

Two U-shaped aluminum conduits individually wrapped with Thermo-Lag (3/4" and 2" in diameter) completed Assembly 2-2. These conduits were designed for outdoor application and are representative of Turkey Point installed configurations. The straight runs of the conduits were enclosed in 1/2" thick baseline Thermo-Lag pre-shaped sections. One radial bend was enclosed with 1/2" thick baseline Thermo-Lag pre-shaped sections that were scored and folded. The lateral bend box (LBD) on the other radial bend was enclosed with baseline 1/2" thick Thermo-Lag panels cut and fitted to shape. A drainage hole (1/4" in diameter) was installed on the bottom part of the horizontal pre-shape Thermo-Lag section, 3" from the radial bend transition box. All butt and longitudinal joints were pre-buttered with 3M Interam Fire dam 150 caulk. The sections were secured with stainless steel bands placed within 2" of the butt joints and at 12" maximum intervals. Several coatings were then applied: First Thermo-Lag 350-500-10 topcoat, then Thermo-Lag 350-2000 chlorinated rubber base polymer topcoat, and finally Thermo-Lag 350-5000-10 polyurethane after a minimum cure time of 12 hours. Additional construction details were also provided in the trip report of February 14, 1994, from P. Madden to C. McCracken.

Assembly 2-2 was exposed to the ASTM E-119 standard time-temperature fire for one hour. Temperature readings were relayed to computers by one bare # 8 AWG copper conductor (instrumented with thermocouples every 6") installed on the external surface of each conduit and another routed through the interior of each conduit. At NRC request, four thermocouples were also installed on the unexposed surface of the enclosures to provide additional temperature data. The OPL Thermocouple Placement Log listed a total of 248 thermocouples. An ambient temperature of 71 °F at the onset of the test yielded temperature acceptance criteria of 321 °F (average) and 396 °F (maximum single point). Table 1 provides preliminary test data.

At the completion of the fire endurance test, Assembly 2-2 was lifted from the furnace and exposed to a hose stream test. The hose test was a 30° fog stream with nozzle pressure of 75 psi. This stream was applied to the entire test specimen from a distance of 5 feet for 5 minutes.

Table 1

NUMARC THERMO-LAG TEST PROGRAM PHASE
1-HOUR FIRE ENDURANCE TEST OF ASSEMBLY

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DESCRIPTION	ACCEPTANCE CRITERIA / RESULTS
Baseline Thermo-Lag box enclosing three conduits (3/4", 2" and 3" in diameter)	Avg temp. 321 °F / Avg unexposed surface temp. 407 °F @ 60 minutes Max temp. 396 °F / Max unexposed surface temp. 430 °F @ 60 minutes Post-fire barrier condition: No seam opening or burnthrough Fog hose stream: Seam opening in several locations Cable functionality test: N/A
3/4" conduit w/o cables inside baseline box enclosure	Avg temp. 321 °F / Avg conduit surface temp. 320 °F @ 60 minutes Max temp. 396 °F / Max conduit surface temp. 356 °F @ 60 minutes Cable functionality test: N/A
2" conduit w/o cables inside baseline box enclosure	Avg temp. 321 °F / Avg conduit surface temp. 320 °F @ 60 minutes Max temp. 396 °F / Max conduit surface temp. 366 °F @ 60 minutes Cable functionality test: N/A
3" conduit w/o cables inside baseline box enclosure	Avg temp. 321 °F / Avg conduit surface temp. 320 °F @ 60 minutes Max temp. 396 °F / Max conduit surface temp. 374 °F @ 60 minutes Cable functionality test: N/A
Upgraded Thermo-Lag box enclosing three conduits (3/4", 2" and 3" in diameter)	Avg temp. 321 °F / Avg unexposed surface temp. 362 °F @ 60 minutes Max temp. 396 °F / Max unexposed surface temp. 377 °F @ 60 minutes Post-fire barrier condition: No seam opening or burnthrough Fog hose stream: No openings Cable functionality test: N/A
3/4" conduit w/o cables inside upgraded box enclosure	Avg temp. 321 °F / Avg conduit surface temp. 273 °F @ 60 minutes Max temp. 396 °F / Max conduit surface temp. 300 °F @ 60 minutes Cable functionality test: N/A
2" conduit w/o cables inside upgraded box enclosure	Avg temp. 321 °F / Avg conduit surface temp. 266 °F @ 60 minutes Max temp. 396 °F / Max conduit surface temp. 314 °F @ 60 minutes Cable functionality test: N/A
3" conduit w/o cables inside upgraded box enclosure	Avg temp. 321 °F / Avg conduit surface temp. 250 °F @ 60 minutes Max temp. 396 °F / Max conduit surface temp. 306 °F @ 60 minutes Cable functionality test: N/A
3/4" conduit individually wrapped with Thermo-Lag pre-shaped sections (outdoor application)	Avg temp. 321 °F / Avg conduit surface temp. 1248 °F @ 60 minutes Max temp. 396 °F / Max conduit surface temp. 1419 °F @ 60 minutes Post-fire barrier condition: Seam opening and burnthrough Fog hose stream: Extensive seam opening Cable functionality test: N/A
2" conduit individually wrapped with Thermo-Lag pre-shaped sections (outdoor application)	Avg temp. 321 °F / Avg conduit surface temp. 481 °F @ 60 minutes Max temp. 396 °F / Max conduit surface temp. 729 °F @ 60 minutes Post-fire barrier condition: No seam opening or burnthrough Fog hose stream: No openings Cable functionality test: N/A

Observations

Temperatures of the conduit surfaces inside the baseline and the upgraded box enclosures did not exceed the fire endurance criteria of 321 °F (average) and 396 °F (maximum single point) at any time during the 1-hour test. However, the unexposed surface of the baseline Thermo-Lag box enclosure exceeded the average and the maximum single point criteria at 45 minutes and 52 minutes into the test respectively. The unexposed surface of the upgraded Thermo-Lag box enclosure reached the average temperature criterion at 33 minutes into the test.

Temperatures on the the surface of both the 3/4" and 2" conduits that were individually wrapped with Thermo-Lag (outdoor application) exceeded the average and maximum single point temperature criteria. The 3/4" conduit exceeded both the average and the maximum single point criteria at 26 minutes into the test. The 2" conduit exceeded the maximum single point criterion at 35 minutes into the test.

ASSEMBLY 2-3

NUMARC tested multi-conduit Assembly 2-3 (3-hour baseline) on February 23, 1994.

Test Assembly 2-3 (3-hour) consisted of three U-shaped aluminum conduits (3/4", 3", and 6" in diameter) each with a radial bend and an LBD as shown on Attachment 2. The straight runs of these conduits were enclosed in 3-hour 1" thick baseline Thermo-Lag pre-shaped sections with stress skin on both sides. The radial bend on each conduit was enclosed with mitered 3-hour baseline Thermo-Lag pre-shaped sections secured with steel bands. The LBD on each conduit was enclosed with baseline 3-hour baseline Thermo-Lag panels cut and fit to shape. The sections were secured with stainless steel bands placed 12" off center. All joints and seams were pre-buttered with trowel grade Thermo-Lag material.

Assembly 2-3 was exposed to the ASTM E-119 standard time-temperature fire for three hours. Temperature readings were relayed to computers by one bare #8 AWG copper conductor (instrumented with thermocouples every 6") installed on the external surface of each conduit. The OPL Thermocouple Placement Log listed a total of 182 thermocouples. An ambient temperature of 58 °F at the onset of the fire endurance test yielded temperature acceptance criteria of 308 °F (average) and 383 °F (maximum single point). Table 2 provides preliminary test data.

At the completion of the fire endurance test, Assembly 2-3 was lifted from the furnace and exposed to a hose stream test. The hose test was a 30° fog stream with nozzle pressure of 75 psi. This stream was applied to the entire test specimen from a distance of 5 feet for 5 minutes.

Table 2

NUMARC THERMO-LAG TEST PROGRAM PHASE 2
3-HOUR FIRE ENDURANCE TEST OF ASSEMBLY 2-3

DESCRIPTION	ACCEPTANCE CRITERIA / RESULTS
3/4" conduit	Avg temp. 308 °F / Avg conduit surface temp. 308 °F @ 63 minutes Max temp. 383 °F / Max conduit surface temp. 383 °F @ 68 minutes Post-fire barrier condition: No apparent seam openings, burnthrough and stress skin fused to conduit surface in straight-run horizontal sections Fog hose stream: Large (up to 2" wide) seam openings Cable functionality test: N/A
3" conduit	Avg temp. 308 °F / Avg conduit surface temp. 308 °F @ 99 minutes Max temp. 383 °F / Max conduit surface temp. 383 °F @ 91 minutes Post-fire barrier condition: No apparent seam opening Fog hose stream: Seam openings and burnthrough mostly in straight-run horizontal sections Cable functionality test: N/A
6" conduit	Avg temp. 308 °F / Avg conduit surface temp. 308 °F @ 102 minutes Max temp. 383 °F / Max conduit surface temp. not available (test terminated at 102 minutes) Post-fire barrier condition: No apparent seam opening or burnthrough Fog hose stream: Seam opening Cable functionality test: N/A

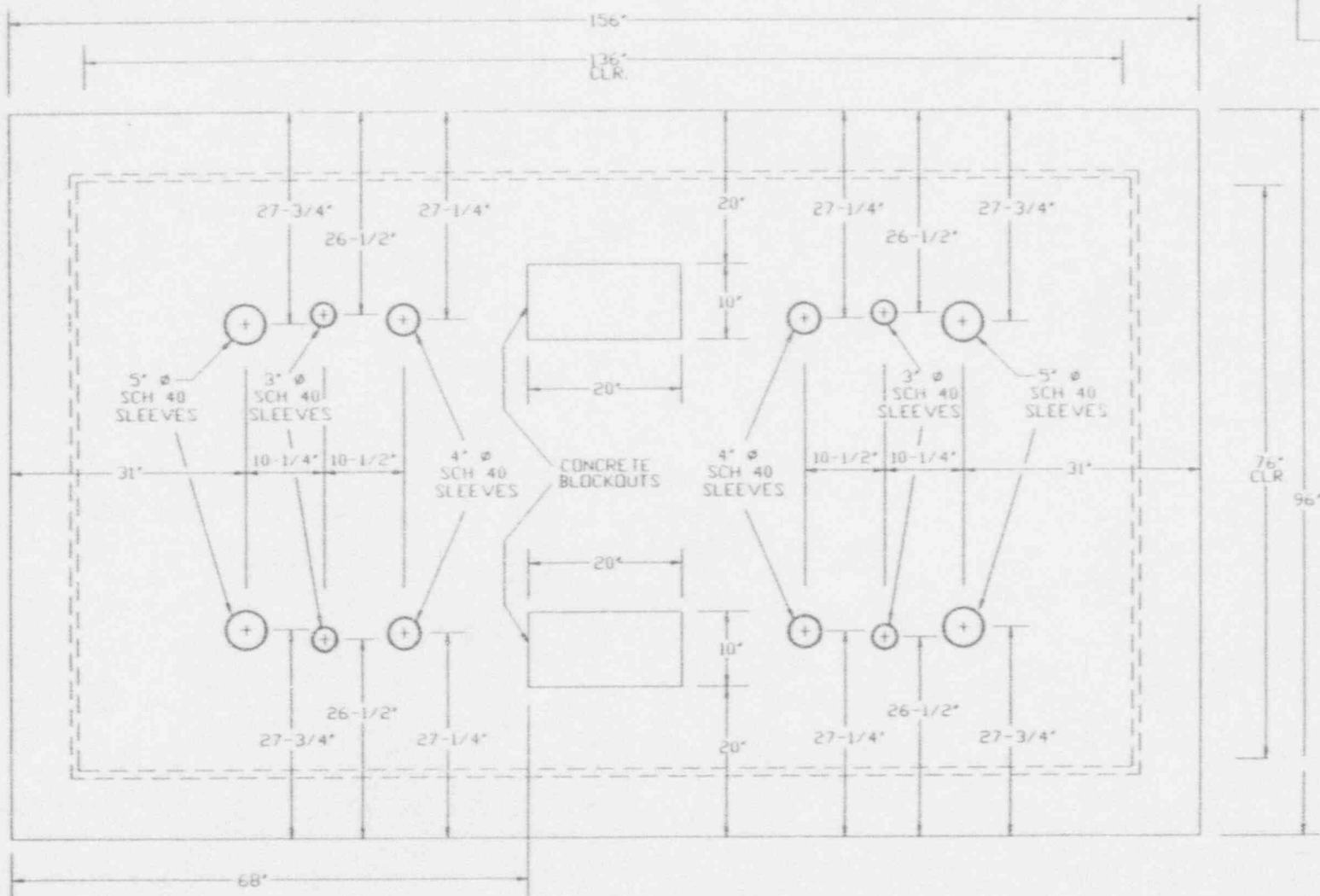
Observations

The 3/4" and 3" conduits exceeded the 383 °F (maximum single point) temperature criterion at 69 minutes and 91 minutes into the test respectively. The 3/4", 3", and 6" conduits exceeded the 308 °F average temperature criterion at 63 minutes, 99 minutes, and 102 minutes into the test respectively. At 102 minutes, NUMARC terminated the test, since it was obvious that the 6" conduit would also exceed the maximum single point temperature criterion before the end of the 3-hour standard fire exposure. The assembly was then lifted from the furnace and exposed to a hose stream test. The hose test was a 30" fog stream with nozzle pressure of 75 psi. This stream was applied to the entire test specimen from a distance of 5 feet for 5 minutes. The hose stream test dislodged a significant amount of charred Thermo-Lag material from the surfaces of the conduits.

ABELSON SCHEDULE (effective 4/11/94)

MON.	—	0
TUES	7:00 - 11:00	4 hrs
WED	9:00 - 4:45 {alt. 7:00 - 2:45}	7 hrs
THU	—	0
FRI	9:00 - 4:45 {alt 7:00 - 2:45}	7 hrs
		18 hrs total

REV.	DWN	ORIG	VER	APVD
1	ELT	PLD 1/19/94	REP 1/17/94	2LD 1/19/94



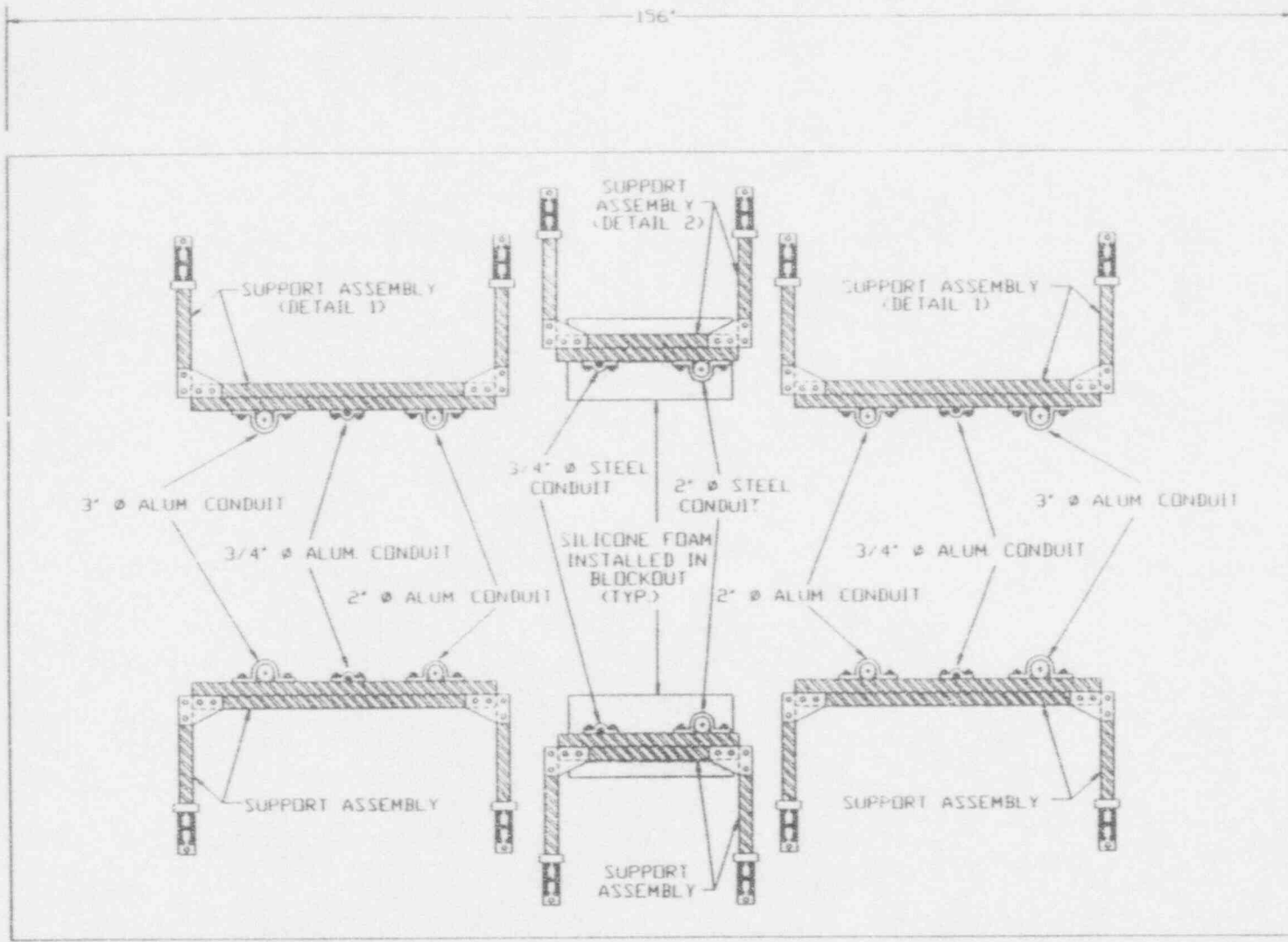
NOTES:

1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 2" UNL.
3. (*) DENOTES BILL OF MATERIAL ITEM NO. (SEE SCL 13A AND 13B).
4. REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND C/E DESIGNATION.
5. REFER TO DWG. 0784-00001-D-002 SH 3 FOR TEST INSTRUMENTATION REQUIREMENTS.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 1 REV. 1
TEST 2-2 (B1-A-Co/CI-E-75s/ CI-E-2s/B1-CoX)
FIG. 1 - CONCRETE SLAB PLAN

ATTACHMENT 1

REV	DWN	ORIG	VER	APVD
0	ELT	RLD 1/19/94	REP 1/19/94	RLD 1/19/94

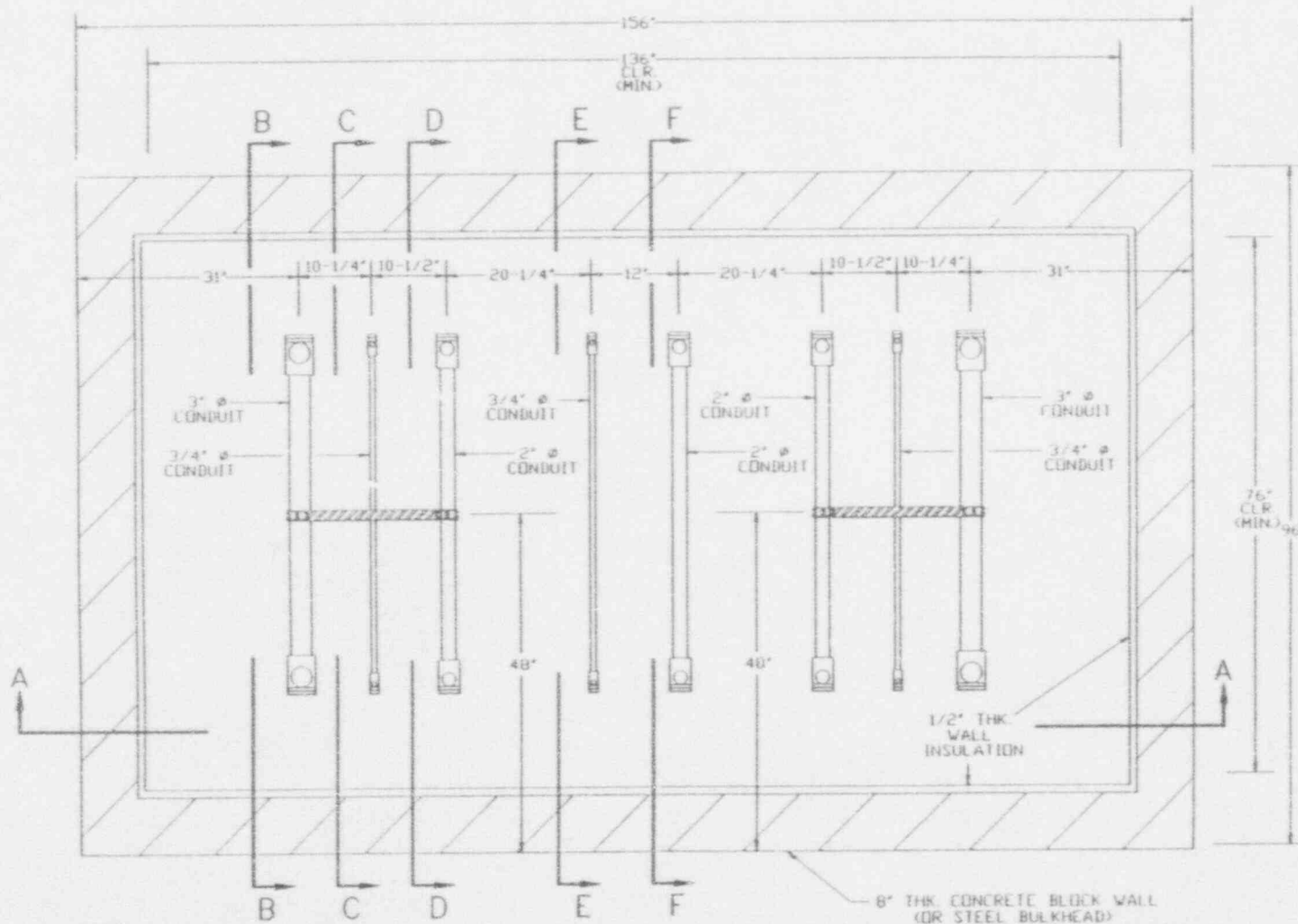


NOTES:

1. PIPE SLEEVES IN TEST DECK (NOT SHOWN FOR CLARITY) TO BE FILLED WITH DOW CORNING 3-6548 RTV SILICONE FOAM TO 6" DEPTH.
2. SUPPORT ASSEMBLIES TO BE LOCATED BY LAB TO CENTER CONDUITS IN DECK OPENINGS.
3. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
4. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 2" UNL.
5. ○ - DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 13A AND 13B)
6. REFER TO DWG. 0784-00001-0-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 2 REV. 0
TEST 2-2 (BI-A-Co/CI-E-75s/ CI-E-2s/BI-B-CoX)
FIG. 2 - SUPPORT PLAN

REV	DWN	ORIG	VER	APVD
0	ELT	RLO	RLO	RLO
		1/14/94	1/19/94	1/19/94

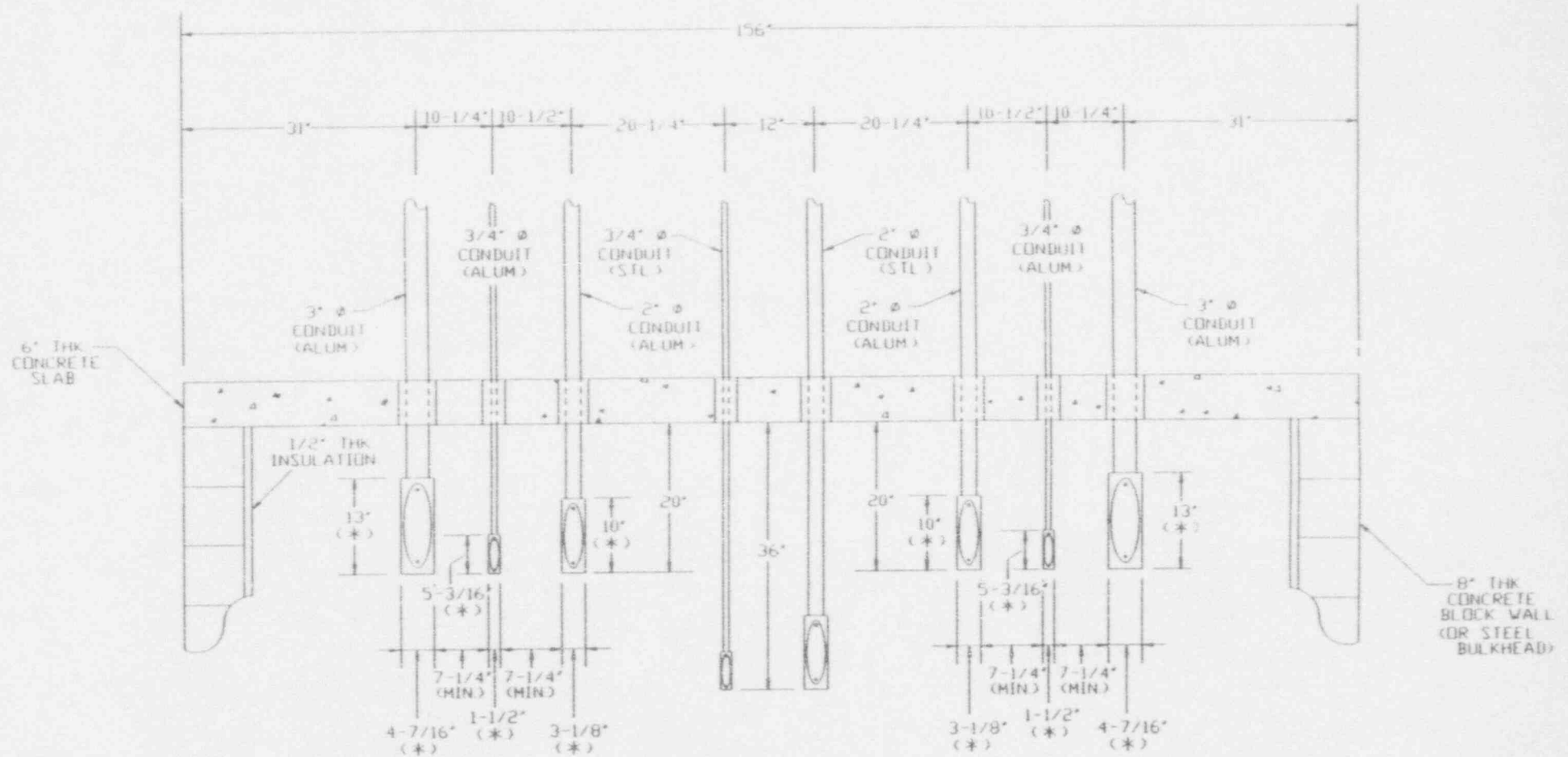


NOTES:

1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 2" UNL.
3. () DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 13A AND 13B).
4. REFER TO DWG. 0784-00001-D-002 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
5. INSTRUMENTATION REQUIREMENTS - THERMOCOUPLES SHALL BE INSTALLED AT 6" INTERVALS ALONG THE BOTTOM EXTERNAL SURFACE OF ALL CONDUITS AND LETTINGS. THERMOCOUPLES SHALL ALSO BE INSTALLED AT 6" INTERVALS ALONG A

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 3 REV. 0
TEST 2-2 (BI-A-Co/CI-E-75s/ CI-E-2s/BI-B-CoX)
FIG. 3 PLAN VIEW - BELOW DECK

REV	BWN	ORIG	VER	APVD
0	ELT	RCD 4/15/94	REP 1/19/94	RCD 1/19/94



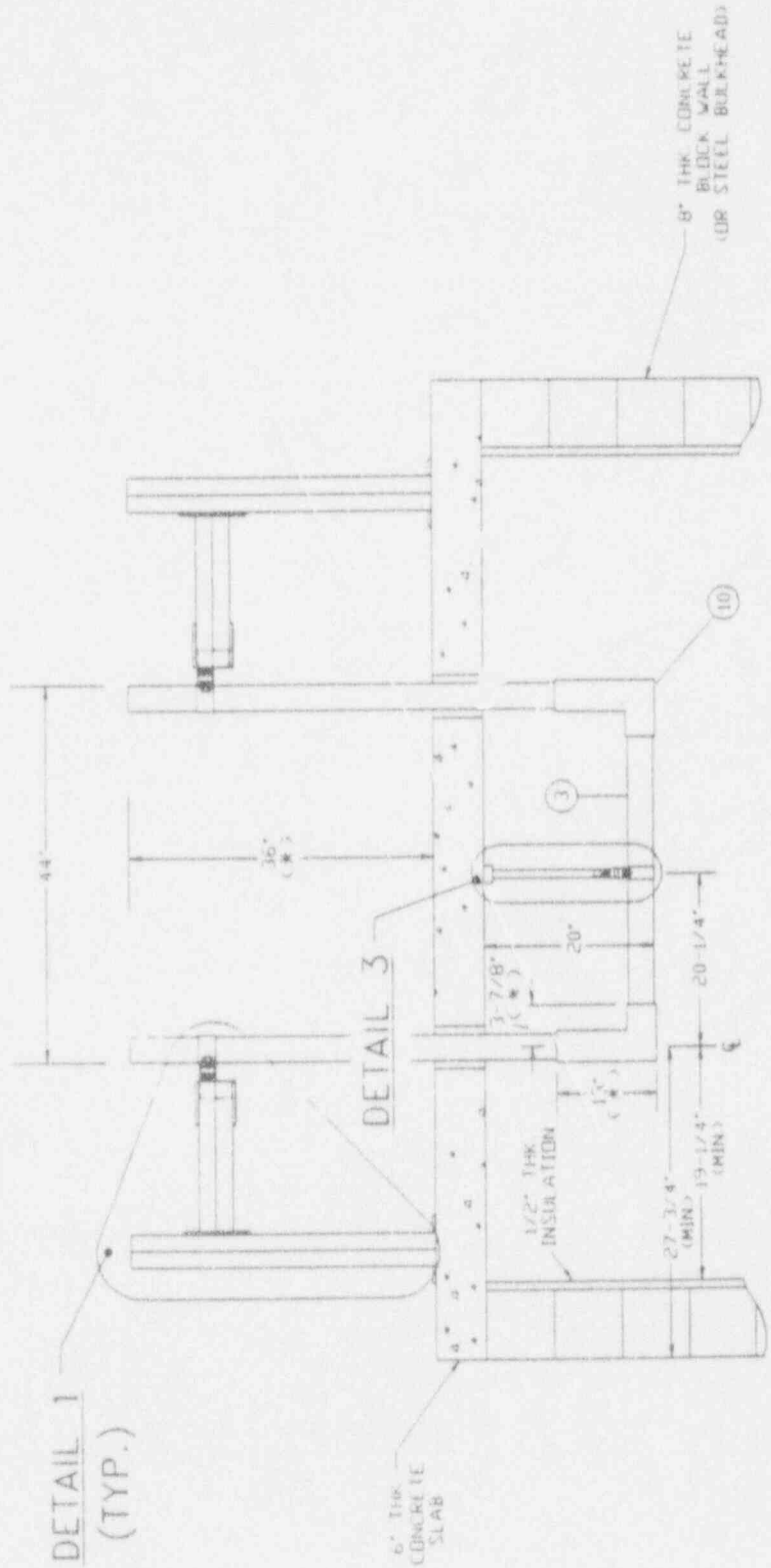
FRONT VIEW
(A-A)

NOTES:

1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- .2" UNL.
3. ○ DENOTES BILL OF MATERIAL ITEM NO. (SEE SH. 13A AND 13B).
4. REFER TO DWG. 0784-00001-B-000 FOR REVISION HISTORY, DESIGN CHANGE STATE AND U.F. DESIGNATION.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-B-002 SH. 4 REV. 0
TEST 2-2 (BI-A-Co/CI-E-75s/ CI-E-2s/BI-B-CoX)
FIG. 4 - FRONT ELEVATION VIEW

REV.	DATE	DRG.	VER.	APP'D.
	11/15/84	REP	REP	REP
				1/17/84

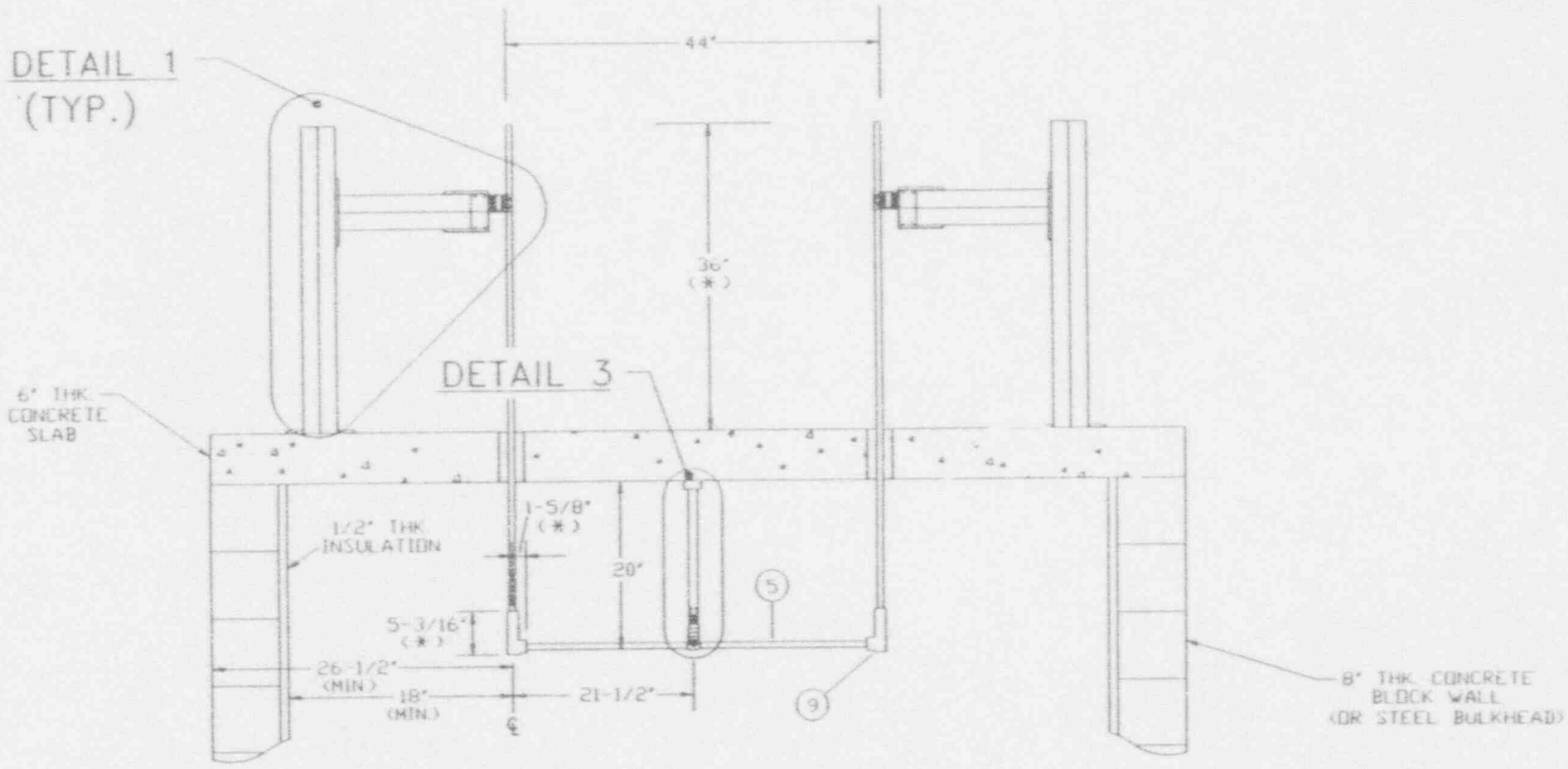


**3" Ø CONDUIT
(B-B)
(TYPICAL OF 2)**

- NOTES:**
- 1 DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES
 - 2 ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 2" UNL
 - 3 () - DENOTES BILL OF MATERIAL ITEM NO (SEE SH 13A AND 13B)
 - 4 REFER TO DWG. 0784-00001-B-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE RESTRICTIONS

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM DWG. 0784-00001-B-0002 SH 5 REV 0
TEST 2-2 (BI-A-Co/BI-B-CoX)
FIG. 5 ELEVATION VIEW - 3" Ø

REV.	BWN	ORIG.	VER.	APVD.
0	ELT	RLO 1/15/94	REP 1/19/94	RLO 1/19/94

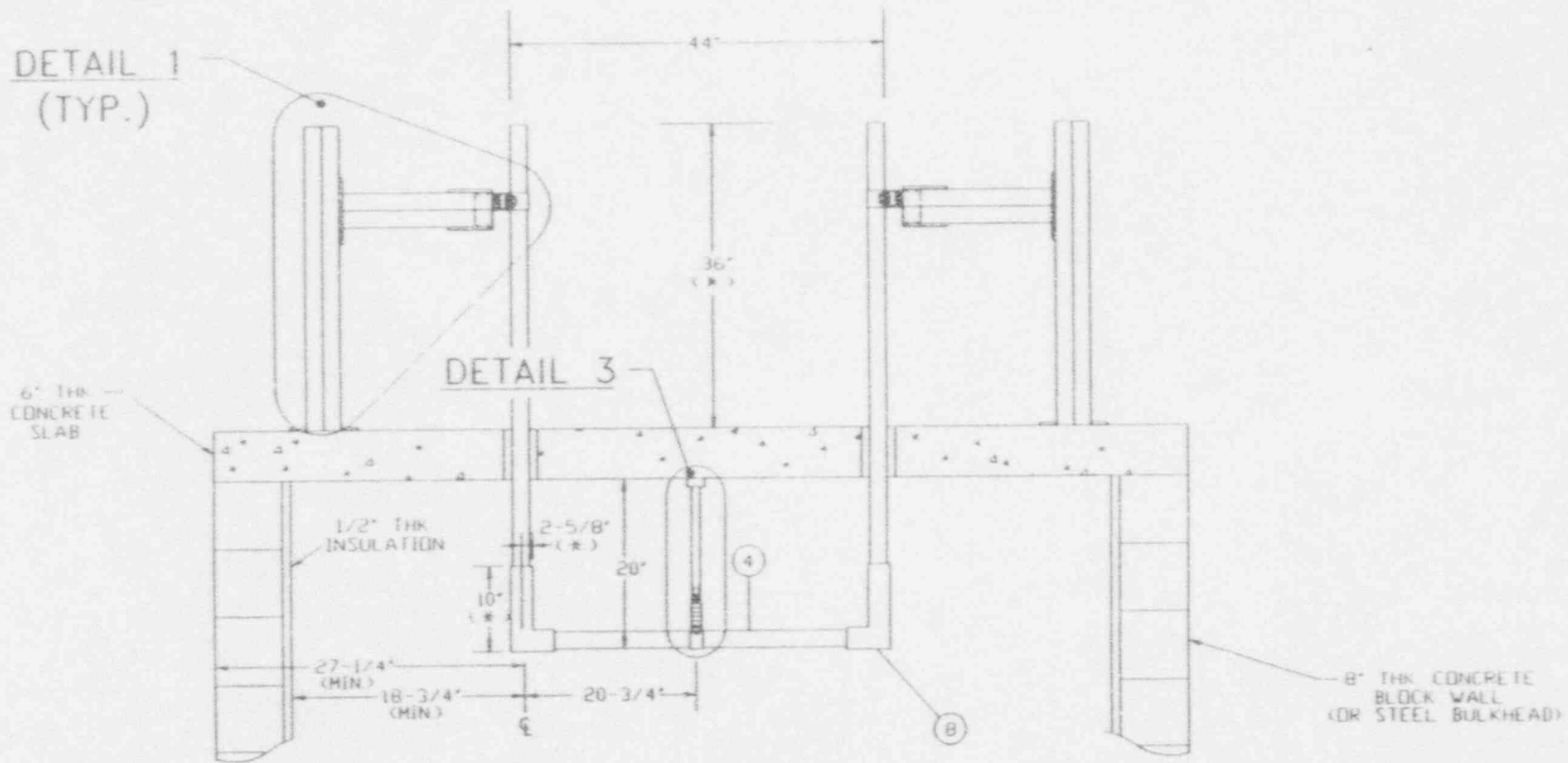


3/4" ϕ CONDUIT
(C-C)
(TYPICAL OF 2)

- NOTES:
1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
 2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- .2" UNL.
 3. () DENOTES BILL OF MATERIAL ITEM NO. (SEE SHEETS A AND B).
 4. REFER TO DWG. 0784-0001-B-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.

ABB IMPELL CORP. PROJ. NO. 0784-0001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-0001-B-002 SH 6 REV 0
TEST 2-2 (B1-A-Co/B1-B-CoX)
FIG. 6 ELEVATION VIEW - 3/4" ϕ (TYPICAL)

REV	BY	DATE	APP'D	DATE
0	ELT	RLO 1/19/94	RLO 1/19/94	RLO 1/19/94



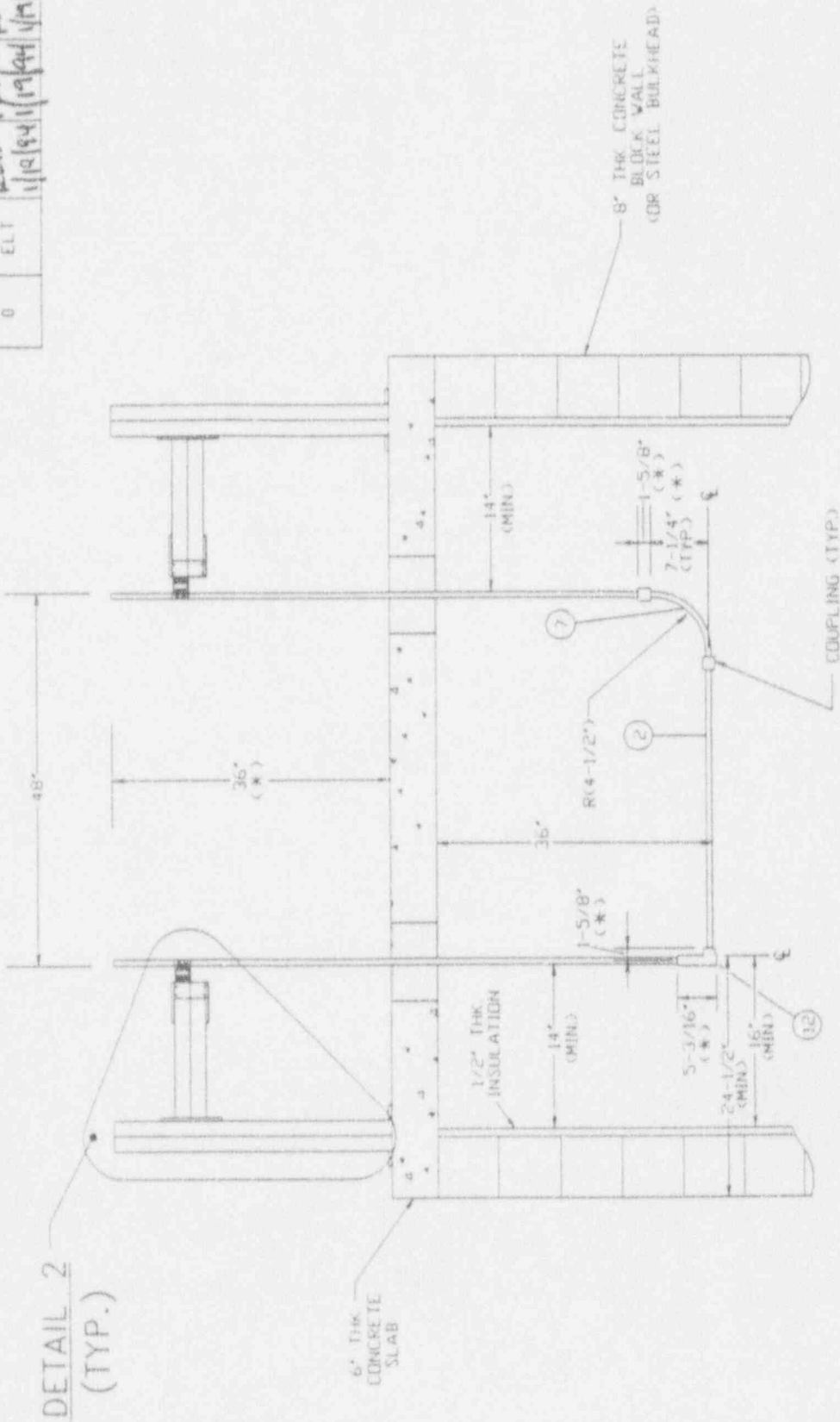
2" ϕ CONDUIT
(D-D)
(TYPICAL OF 2)

NOTES:

- 1 DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
- 2 ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- .2" UNL.
- 3 \circ - DENOTES BILL OF MATERIAL ITEM NO (SEE SH 13A AND 13B)
- 4 REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.

ABB IMPELL CORP PROJ. NO 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG 0784-00001-D-002 SH 7 REV 0
TEST 2-2 (B1-A-Co/B1-B-CoX)
FIG 7 ELEVATION VIEW - 2" ϕ CONDUIT

REV.	DWN.	ORIG.	VLR.	APVD.
0	ELT	RLO	1/18/84	1/19/84

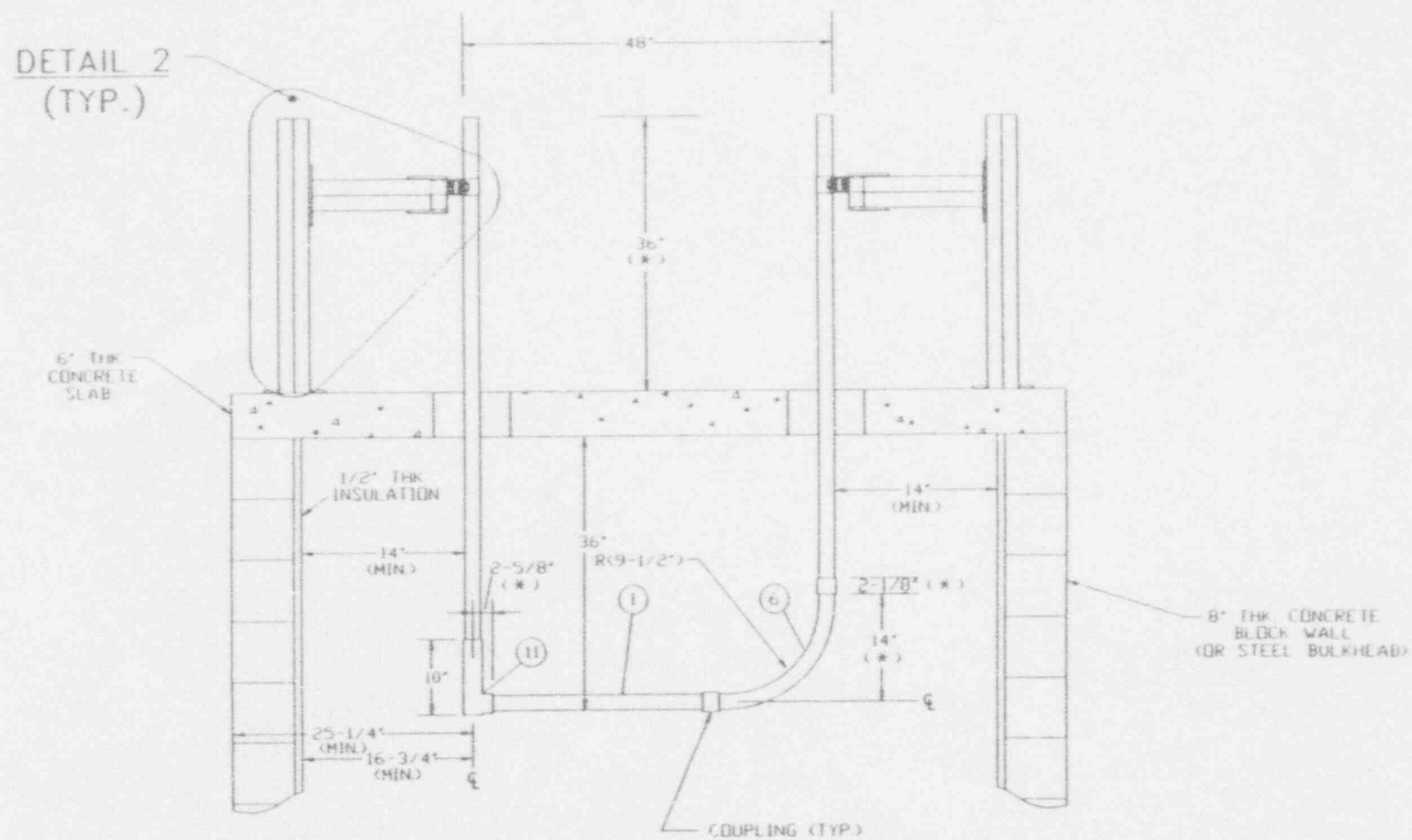


3/4" Ø CONDUIT (E-E)

- NOTES:
1. DIMENSIONS WITH ASTERISK (*) ARE CRITICAL AND PROVIDED FOR INFORMATION AND GENERAL GUIDANCE PURPOSES.
 2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF ±.2" UNL.
 3. DIMENSIONS FOR MATERIAL FROM THE CUT SHEET TO AIR LBS.
 4. REFER TO DWG. 0784-0001-B-002 SH B FOR REVISION HISTORY. DESIGN CHANGE STARTS ABOVE THIS DRAWING.

ABB IMPELL CORP PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM DWG. 0784-00001-B-002 SH B REV 0
TEST 2-2 (E-E-75s)
F.B. ELEVATION VIEW 3/4" Ø (E-E)

REV	DWN	ORIG	VER	APV/B
0	EL1	RLO	REP	RLO
		1/19/94	1/19/94	1/19/94

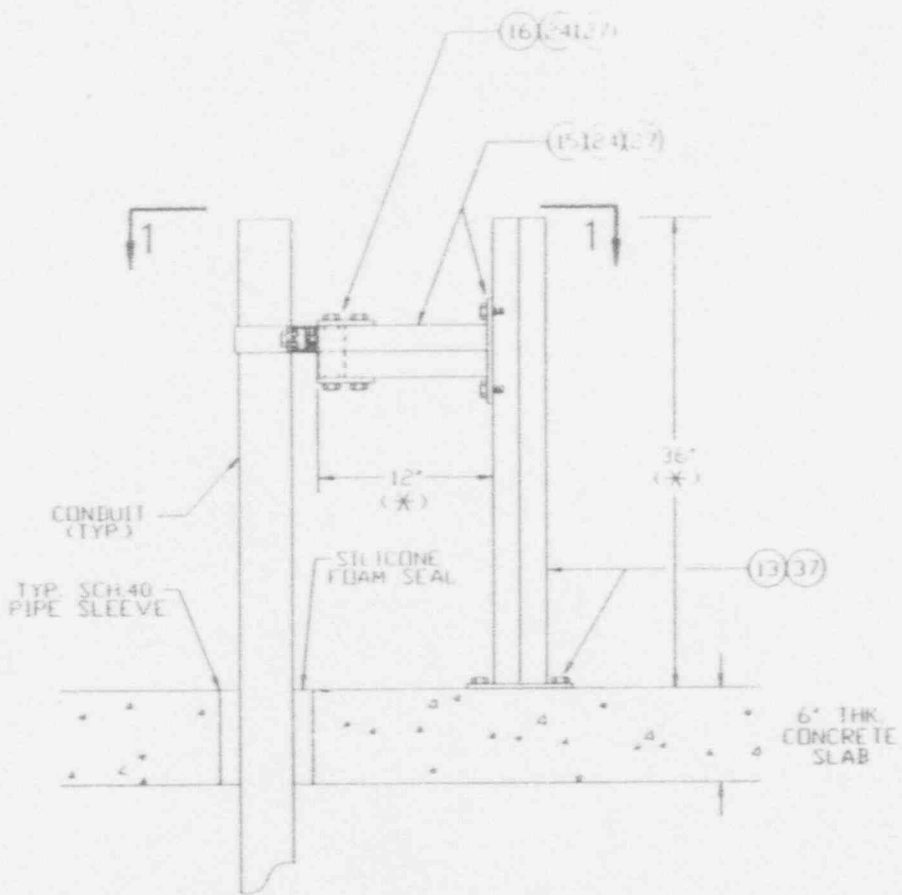


2" Ø CONDUIT
(F-F)

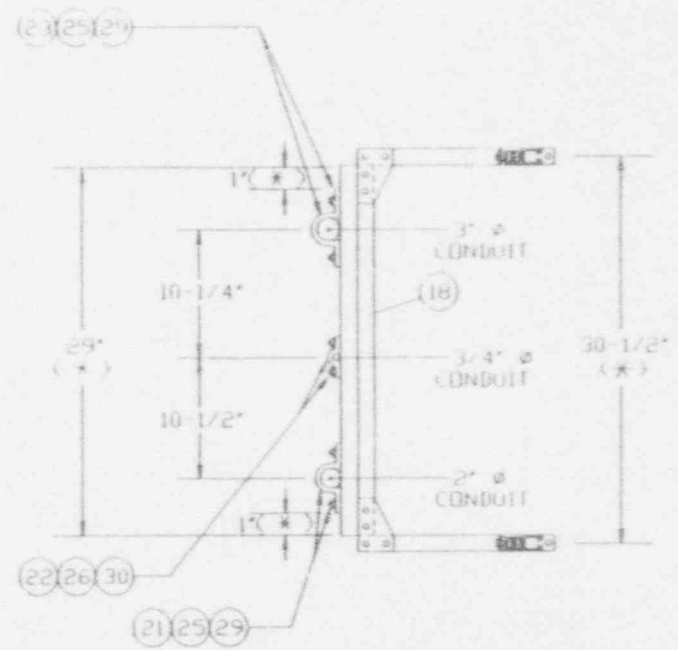
- NOTES:
1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSE.
 2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- .2" UNL.
 3. () DENOTES BILL OF MATERIAL ITEM NO. (SEE SH. 13A AND 13B).
 4. REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.

ABB IMPELL CORP PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 9 REV 0
TEST 2-2 (CI-E-2s)
FIG. 9 ELEVATION VIEW - 2" Ø CONDUIT

REV.	BY	ORIG.	VER.	APVD.
"	ELT	RLO 1/19/94	REP 1/19/94	RJD 1/19/94



DETAIL 1



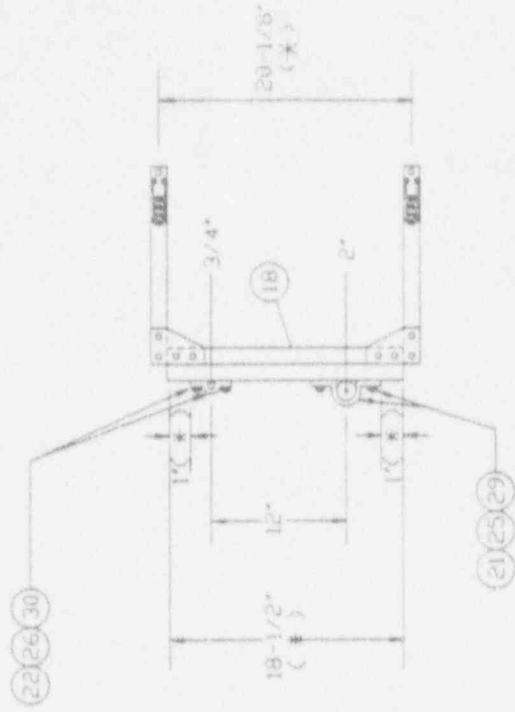
SECTION 1-1

NOTES:

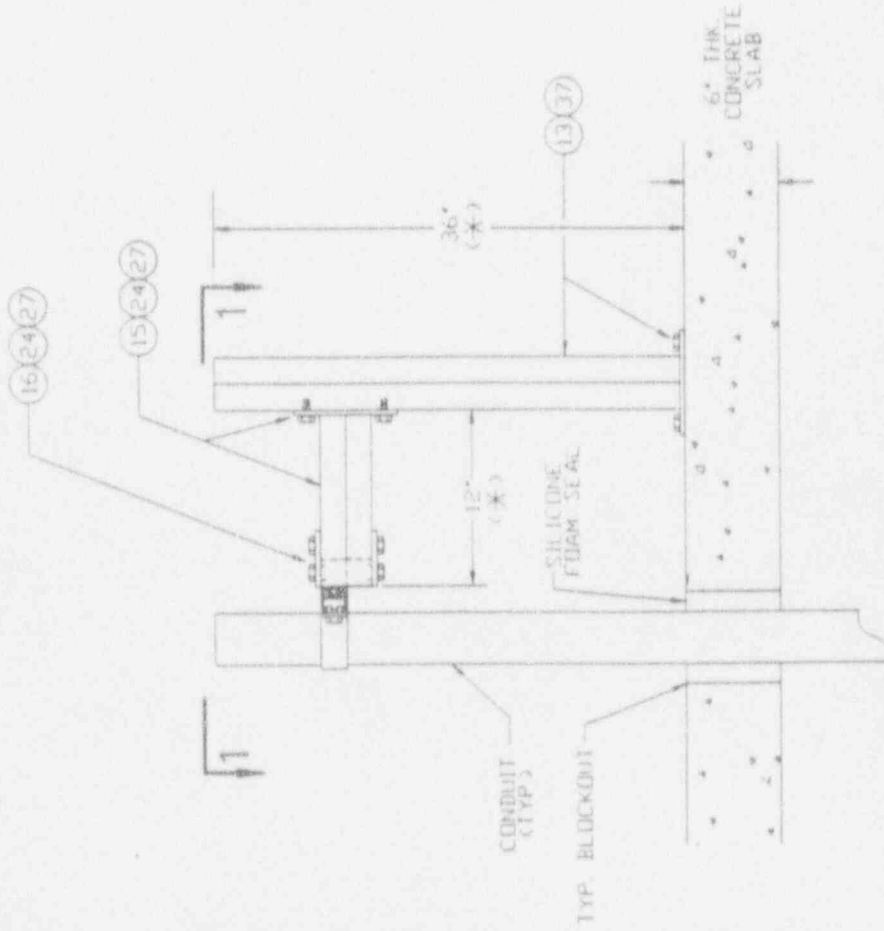
1. () DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 13A AND 13B)
2. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
3. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 1/2" UNL
4. SEE DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND CB DESIGNATION

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 10 REV. 0
TEST 2-2 (BI-A-Co/BI-B-CoX)
FIG. 10 - CONDUIT SUPPORT ASSEMBLY

REV	DWN	ORIG	VER	APVD
0	ELT	RJD 1/19/94	REP 1/19/94	RJD 1/19/94



SECTION 1-1



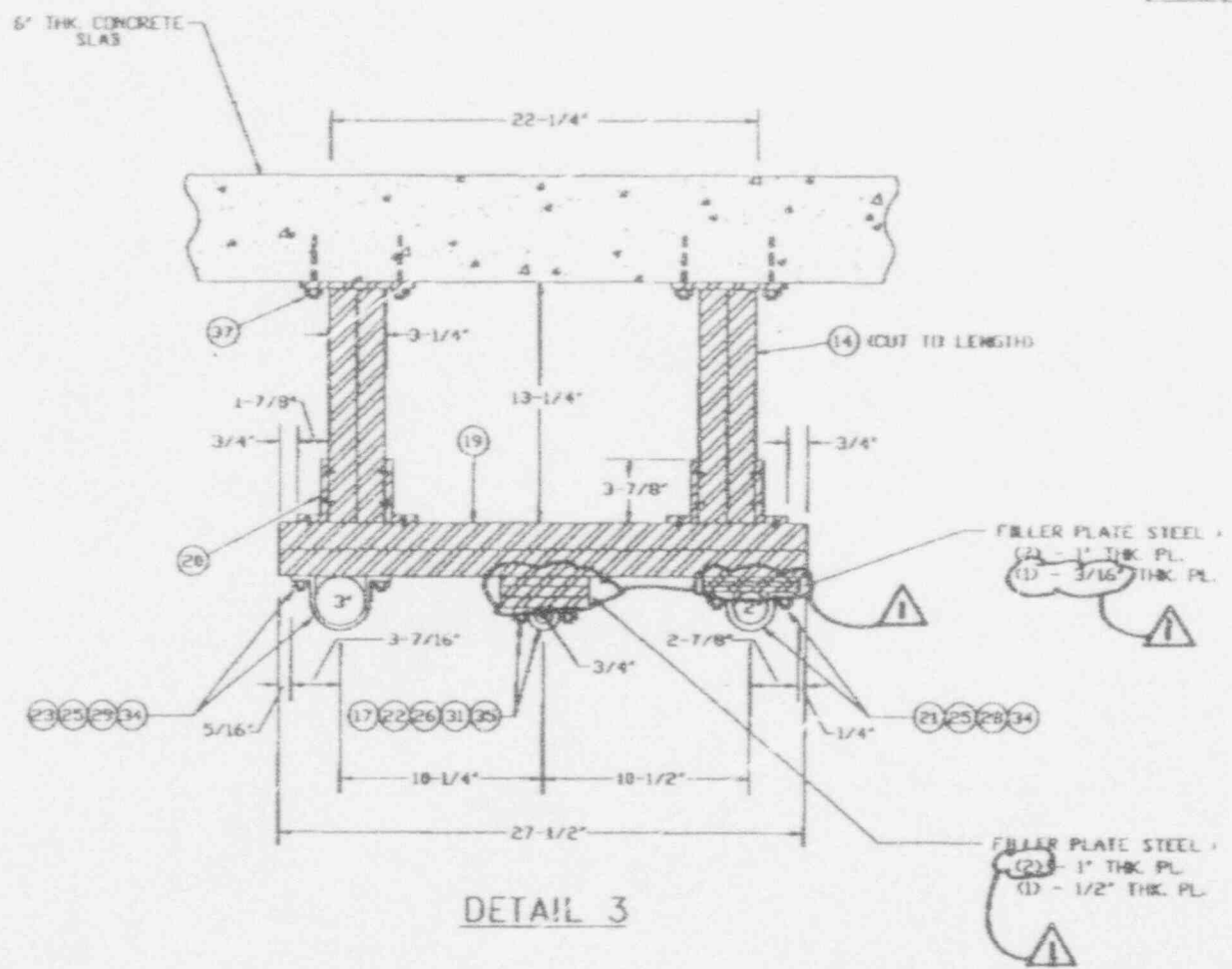
DETAIL 2

ABB IMPELL CORP PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM DWG. 0784-00001-D-002 SH II REV 0
TEST 2-2 CCTE-75s/CCTE-2s
FIG. II - CIRCUIT SUPPORT ASSEMBLY

NOTES:

1. () DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 13A AND 13B). DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR CONSTRUCTION AND GENERAL CIRCULATION PURPOSES.
2. ALL DIMENSIONS SHOWN HAVE WORKING TOLERANCE OF +/- 1/2" UNLESS SHOWN OTHERWISE.

REV.	BYN	ORIG.	CHK	APVD
1	ELT	RJD	RES	ELO
		1/21/94	1/21/94	1/21/94



DETAIL 3

NOTES:

1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 1/2" UNL
3. () DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 13A AND 13B).
4. REFER TO DWG. 0784-00001-B-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.

ADD IMPELL CENP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-B-002 SH 12 REV.1
TEST 2-2 (01-A-Co/01-B-CoX)
FIG. 12 - CONDUIT SUPPORT ASSEMBLY

ITEM NO.	DESCRIPTION	QUANTITY
1	2" Ø RIGID CONDUIT, GALVANIZED STEEL	15'
2	3/4" Ø RIGID CONDUIT, GALVANIZED STEEL	15'
3	3" Ø CONDUIT, RIGID ALUMINUM	25'
4	2" Ø CONDUIT, RIGID ALUMINUM	25'
5	3/4" Ø CONDUIT, RIGID ALUMINUM	25'
6	2" Ø STANDARD 90° RIGID CONDUIT RADIAL BEND, (9-1/2" R) THREADED BOTH ENDS w/COUPLINGS, GALVANIZED STEEL	1
7	3/4" Ø STANDARD 90° RIGID CONDUIT RADIAL BEND, (4-1/2" R) THREADED BOTH ENDS w/COUPLINGS, GALVANIZED STEEL	1
8	2" Ø THREADED HUB SIZE LATERAL BEND CONDULET, TYPE LB ALUMINUM, w/STAMPED ALUMINUM BLANK COVER, OPEN NEOPRENE GASKET AND COVER SCREWS.	4
9	3/4" Ø THREADED HUB SIZE LATERAL BEND CONDULET, TYPE LB ALUMINUM w/STAMPED ALUMINUM BLANK COVER, OPEN NEOPRENE GASKET AND COVER SCREWS.	4
10	3" Ø THREADED HUB SIZE LATERAL BEND CONDULET, TYPE LB ALUMINUM w/STAMPED ALUMINUM BLANK COVER, OPEN NEOPRENE GASKET AND COVER SCREWS.	4
11	2" Ø THREADED HUB SIZE LATERAL BEND CONDULET, TYPE LB FERALLOY OR MALLEABLE IRON w/STAMPED GALVANIZED STEEL BLANK COVER, OPEN NEOPRENE GASKET AND COVER SCREWS.	1
12	3/4" Ø THREADED HUB SIZE LATERAL BEND CONDULET, TYPE LB FERALLOY OR MALLEABLE IRON w/STAMPED GALVANIZED STEEL BLANK COVER, OPEN NEOPRENE GASKET AND COVER SCREWS.	1
13	UNISTRUT P2546 T-HANGER	12
14	UNISTRUT P2543 T-HANGER	4
15	UNISTRUT P2542 T-HANGER	12
16	UNISTRUT P1380 PLATE FITTING	24
17	UNISTRUT P1063 PLATE FITTING	10
18	UNISTRUT P1001C3 CHANNEL	20'

REV.	DWN.	ORIG.	VER.	APVD.
0	ELT	RLO 1/19/94	REP 1/19/94	RLO 1/19/94

ABB IMPELL CORP PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 13A REV. 0
TEST 2-2 (B1-A-Co/C1-E-75s/ C1-E-2s/B1-A-CoX)
FIG. 13 - BILL OF MATERIALS

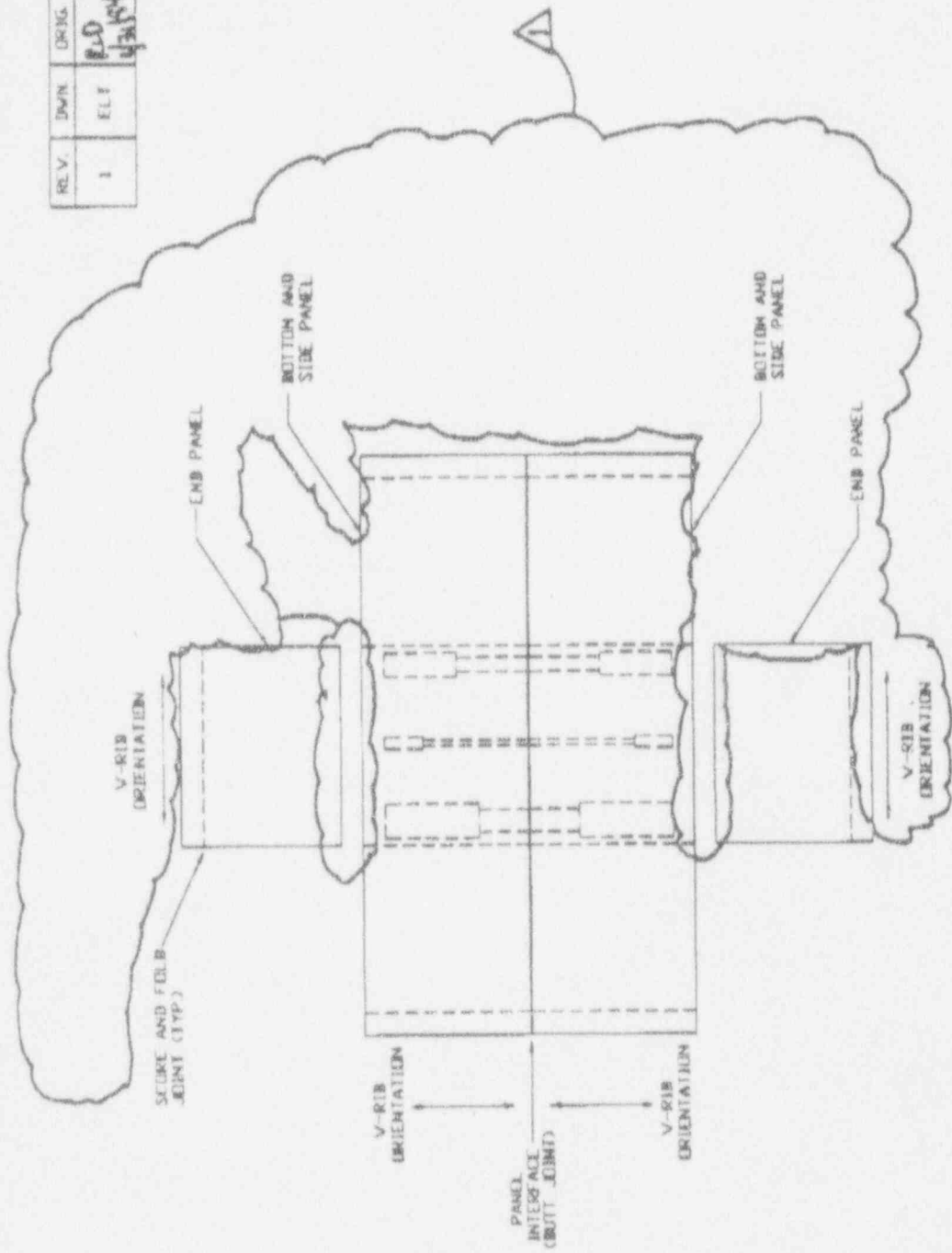
TEM NO.	DESCRIPTION	QUANTITY
19	UNISTRUT P1001 CHANNEL	10'
20	UNISTRUT P1346 90° ANGLE FITTING	8
21	UNISTRUT P2558-20 2' PIPE STRAP	8
22	UNISTRUT P2558-07 3/4' PIPE STRAP	8
23	UNISTRUT P2558-30 3' PIPE STRAP	6
24	UNISTRUT P1010 1/2" SPRING NUTS	144
25	UNISTRUT P1008 3/8" SPRING NUTS	28
26	UNISTRUT P1006-1420 1/4" SPRING NUTS	16
27	1/2" X 1-1/4" A307 BOLTS	144
28	3/8" X 4-1/2" A307 BOLTS	4
29	3/8" X 1-1/4" A307 BOLTS	24
30	1/4" X 1-1/4" A307 BOLTS	12
31	1/4" X 5-1/2" A307 BOLTS	4
32	1/2" NUTS	64
33	1/2" WASHERS	208
34	3/8" WASHERS	28
35	1/4" WASHERS	16
36	C3X41 A36 STEEL CHANNEL	20'
37	1/4" X 2-1/2" HILTI BOLTS (KWIK BOLT II)	32

REV	DWN	DRIG	VER	APVD
0	ELT	RLO 1/19/14	REP 1/19/14	RLO 1/19/14

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 13B REV D
TEST 2-2 (B1-A-Co/C1-E-75s/ C1-E-2s/B1-A-CoX)
FIG 13 - BILL OF MATERIALS

REV.	DWN	DRWG	VER	APPROV
1	ELT	BLD	REV	BLD

ABB IMPELL CORP PROJ. NO. 0784-00001
MILMARC PHASE 2 TEST PROGRAM DWG. 0784-00001-B-002 SH 14 REV 1
TEST 2-2 (BI-A-Ca/BI-B-CaX)
FIG. 14 - THERMO-LAG DETAILS



PLAN VIEW
1 HR. CONDUIT BOX DESIGN - BASELINE/UPGRADE
(PANEL ARRANGEMENT AND JOINT LOCATIONS
DEPICTED PRIOR TO FOLDING OF PANELS)

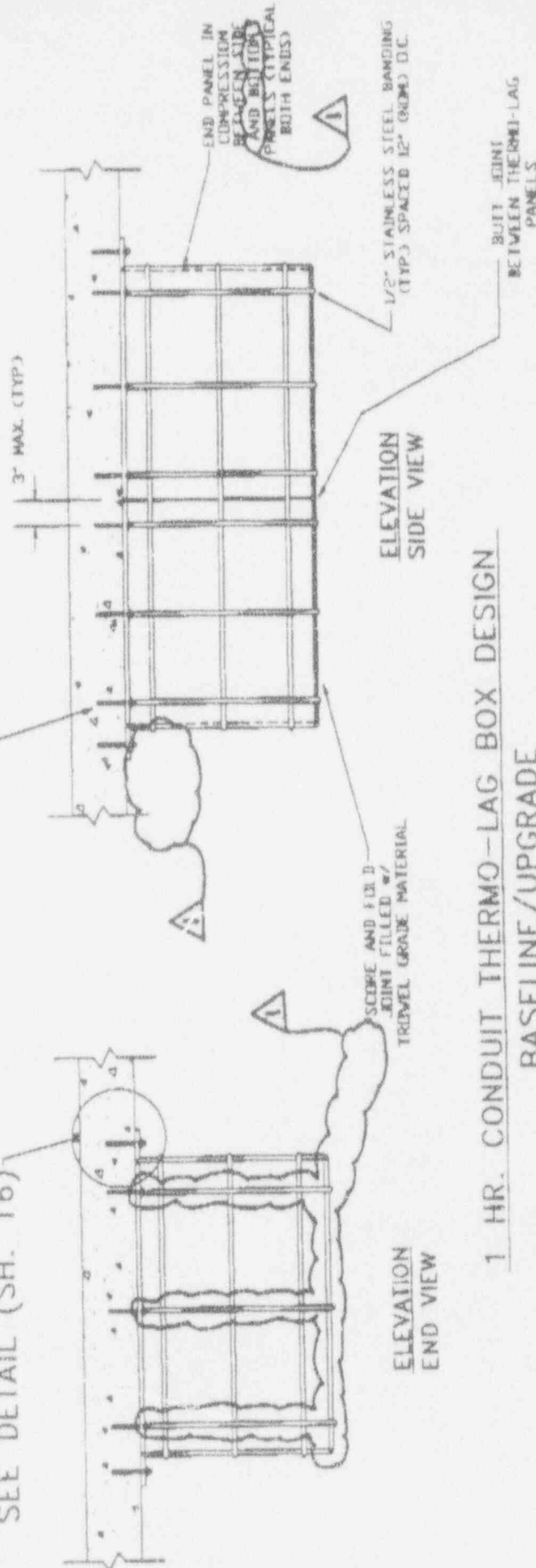
- NOTES:**
1. THERMO-LAG CONFIGURATION SHOWN FOR REFERENCE ONLY
 2. REFER TO SH 17 AND SH 20 FOR TYPICAL INSTALLATION NOTES
 3. REFER TO DWG. 0784-00001-B-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION
 4. REFER TO 0784-00001-S-01 FOR THERMO-LAG MATERIAL REQUIREMENTS

REV.	DWN.	DRG.	VER.	APVD.
1	ELT	RD 1/23/94	FEF 1/23/94	RD 1/23/94

SEE DETAIL (SH. 16)

THERMO-LAG PANEL ANCHORED TO CONCRETE W/ 1/4" DIA X 2-1/4" L.G. HELIX KVIK BOLT II FASTENERS SPACED 12" APART (MAX) O.C. (TYP)

ELEVATION END VIEW



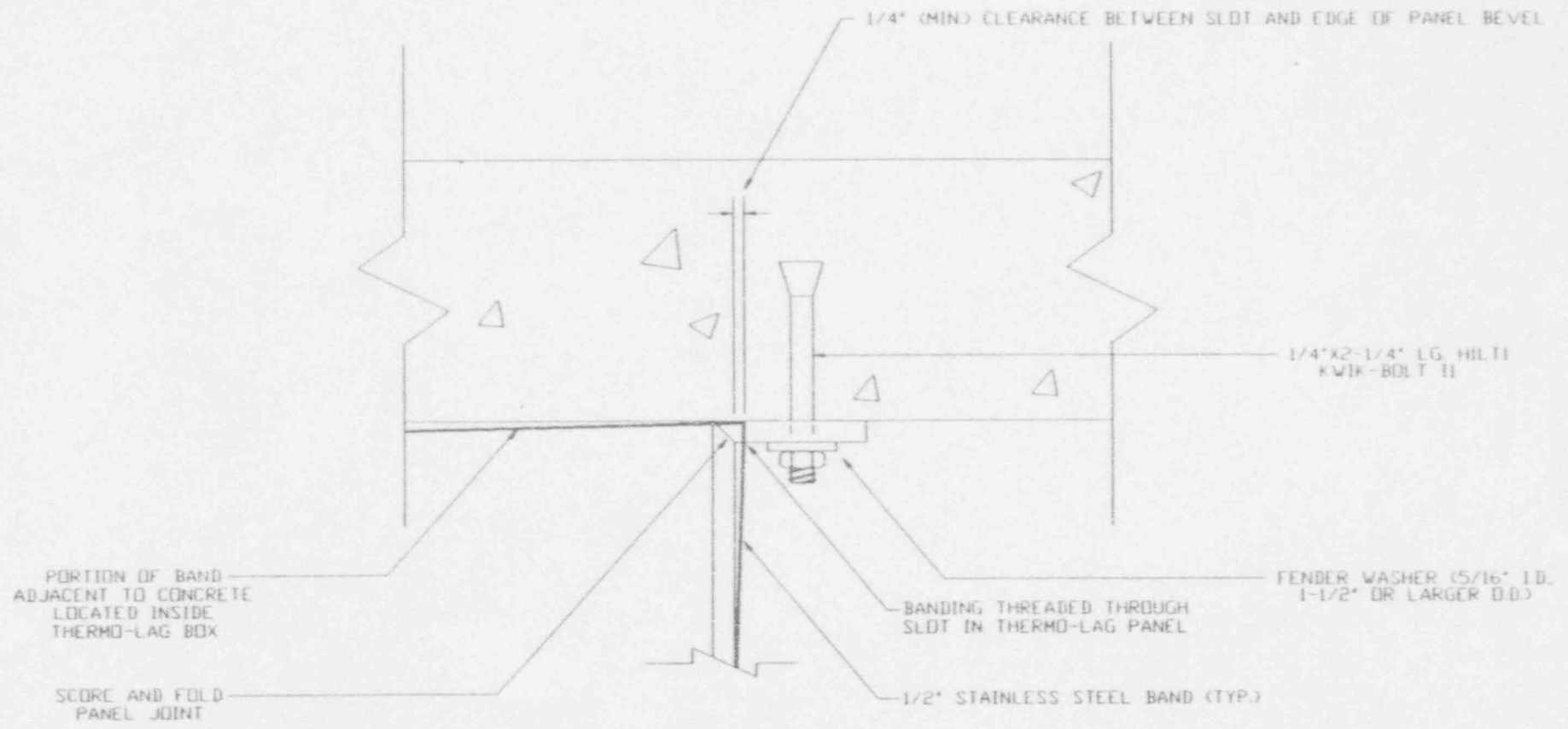
1 HR. CONDUIT THERMO-LAG BOX DESIGN
BASELINE/UPGRADE

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM DWG. 0784-00001-D-002 SH 15 REV. J
TEST 2-2 CBI-A-Co/BI-B-CoX
FIG. 15 - THERMO-LAG DETAILS

NOTES:

1. THERMO-LAG CONFIGURATION SHOWN FOR REFERENCE ONLY.
2. REFER TO SH 17 (AND SH 20) FOR TYPICAL INSTALLATION NOTES.
3. REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
4. REFER TO 0784-00001-S-01 FOR THERMO-LAG MATERIAL REQUIREMENTS.

REV.	DWN	ORIG.	VER.	APVD.
0	ELT	RJD 1/25/04	REP 1/25/04	RJD 1/26/04



1 HR. BOX DESIGN - BASELINE
TYPICAL CONCRETE ATTACHMENT
AND BANDING CONFIGURATION

NOTES:

1. THERMO-LAG CONFIGURATION SHOWN FOR REFERENCE ONLY.
2. REFER TO SH 17 FOR TYPICAL INSTALLATION NOTES.
3. REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
4. REFER TO 0784-00001-S-01 FOR THERMO-LAG MATERIAL SPECIFICATIONS.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 16 REV 0
TEST 2-2 (B1-A-Ca)
FIG. 16 - THERMO-LAG DETAILS

THERMO-LAG INSTALLATION NOTES - 1 HR. BASELINE CONDUIT BOX
DESIGN USING SCORE AND FOLD JOINTS

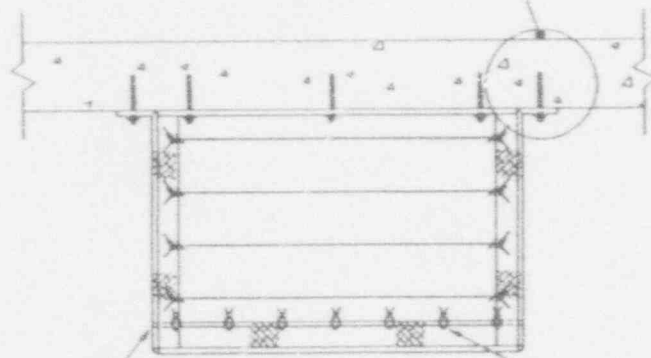
1. BOX TO BE CONSTRUCTED FROM 1 HR. THERMO-LAG PANELS. ~~BOTTOM AND ENDER SIDES OF BOX TO BE CONSTRUCTED FROM TWO PANELS WITH SCORING AND FOLD JOINTS WITH ONE BUTT JOINT BETWEEN PANELS. BUTT JOINT TO BE THREADED AT MID SPAN OF CONDUIT RUN (MID-LENGTH OF BOX). EACH END OF BOX TO BE CONSTRUCTED FROM ONE PANEL USING BUTT JOINTS WITH END PANEL IN COMPRESSION BETWEEN BOTH SIDES AND BOTTOM PANELS.~~
2. V-RIBS ON BOTTOM AND SIDE PANELS TO BE ORIENTED PARALLEL TO CONDUIT RUN. V-RIBS ON END PANELS TO BE ORIENTED HORIZONTALLY WHEN PANELS ARE INSTALLED. 1
3. PANELS TO BE INSTALLED WITH STRESS SKIN FACING PROTECTED COMMODITY.
4. BOX SHALL BE ATTACHED TO CONCRETE TEST DECK USING THERMO-LAG PANEL FLANGES. WITH NOMINAL 1/2" WIDTH PANELS TO BE FLANGED USING SCORE AND FOLD METHOD. WIDTH OF FLANGES MAY BE ADJUSTED TO COMPENSATE FOR "SQUARING UP" OF PANELS AS REQUIRED.
5. BOX SHALL BE ANCHORED TO CONCRETE TEST DECK WITH MULTI KWIK-BOLT II (1/4" DIA. X 2-1/4" LG.) ANCHORS INSTALLED AT NOMINAL 12" O.C. SPACING WITH BOLTS AT 1" (MAX.) DISTANCE FROM EDGE OF FLANGES. DRILL 5/16" DIA. HOLES THROUGH FLANGES TO ACCOMMODATE KWIK-BOLTS.
6. ALL JOINTS TO BE PRE-BUTTERED WITH THERMO-LAG 300-1 TROWEL GRADE MATERIAL INCLUDING THERMO-LAG PANEL FLANGES AT ATTACHMENT TO CONCRETE TEST DECK.
7. STAINLESS STEEL BANDING (1/2" WIDE) TO BE INSTALLED AT NOMINAL 12" O.C. SPACING WITH BANDS INSTALLED AT 1" (MAX.) DISTANCE FROM BUTT JOINTS AND SCORE AND FOLD CORNER AND FLANGE JOINTS.
8. BANDING TO BE FIRST INSTALLED CIRCUMFERENTIALLY AROUND ALL FOUR SIDES OF THERMO-LAG PANEL BOX PRIOR TO PANEL BOX FIT-UP. BANDING SHALL THEN BE INSTALLED TO SURROUND ALL FOUR SIDES AND BOTTOM OF BOX AND SHALL RUN ADJACENT TO BOTTOM SURFACE OF CONCRETE TEST DECK INSIDE BOX. FLANGE PORTION OF PANELS, INCLUDING INTEGRAL STRESS SKIN, SHALL BE SLOTTED AS NECESSARY TO ALLOW BANDING TO BE THREADED COMPLETELY THROUGH PANEL. BANDING SHALL BE THREADED THROUGH PANELS ON OPPOSITE SIDES OF BOX PRIOR TO ANCHORAGE OF PANELS TO CONCRETE TEST DECK. 1
9. WHERE THERMO-LAG PANELS ARE SLOTTED TO ACCOMMODATE BANDING, A 1/4" (MIN.) CLEARANCE SHALL BE MAINTAINED BETWEEN SLOT LOCATION AND BEVELED PORTION OF PANEL AT SCORE AND FOLD JOINTS.
10. MAXIMUM JOINT GAP BETWEEN PANELS DURING FIT-UP IS 1/4".
11. SCORE AND FOLD JOINTS AROUND BOTTOM OF THERMO-LAG PANEL BOX TO BE FILLED WITH TROWEL GRADE MATERIAL TO A 1/2" (MIN.), 5/8" (MAX.) DPT.
12. DURING CUTTING OF PANELS, ENSURE STRESS SKIN DOES NOT DISENGAGE FROM SUBSTRATE MATERIAL.
13. DURING SCORING OF PANELS, ENSURE STRESS SKIN INTEGRITY IS MAINTAINED.
14. LOT NUMBER TRACEABILITY AND INSTALLED LOCATION SHALL BE MAINTAINED FOR ALL THERMO-LAG MATERIALS.
15. THERMO-LAG SHALL NOT BE APPLIED TO TEST ITEMS UNTIL RELEASED BY TEST LABORATORY.
16. ALL QUESTIONS PERTAINING TO THERMO-LAG MATERIAL SHALL BE RESOLVED WITH THE ENGINEER PRIOR TO INSTALLATION.
17. V-RIBS ON FLANGES MAY BE FLATTENED AS REQUIRED FOR ATTACHMENT TO CONCRETE. 1
18. TOUCH-UP OF TROWEL GRADE APPLICATION FOLLOWING INSTALLATION IS ACCEPTABLE TO COMPENSATE FOR MATERIAL SHRINKAGE, TO OBTAIN 1/2" (MIN.) TO 5/8" (MAX.) DPT.

REV.	DWN.	ORIG.	VER.	APVD.
1	ELT	RLO 1/31/94	REP 1/31/94	RLO 1/31/94

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 17 REV.1
TEST 2-2 (BI-A-Co)
FIG. 17 - TYPICAL INSTALLATION NOTES

REV.	DWN	ORIG.	VER	APVD
0	ELT	RLO 1/25/94	REP 1/25/94	RLO 1/25/94

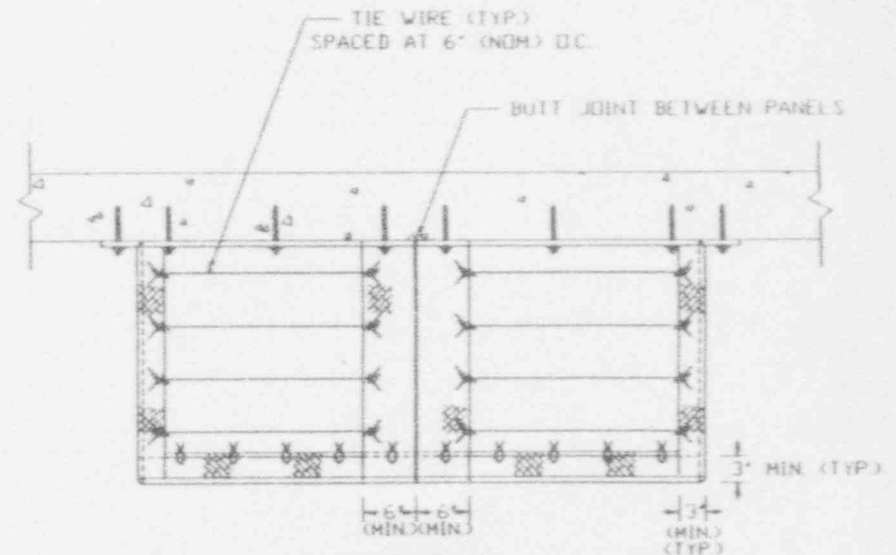
SEE DETAIL (SHT. 19)



LOWERMOST HORIZONTAL
STAINLESS STEEL
BAND (TYP.)

ELEVATION
END VIEW

TIE WIRE LOOP (TYP.)
SECURES STRESS SKIN TO
BANDING



TIE WIRE (TYP.)
SPACED AT 6" (NOM) O.C.

BUTT JOINT BETWEEN PANELS

ELEVATION
SIDE VIEW

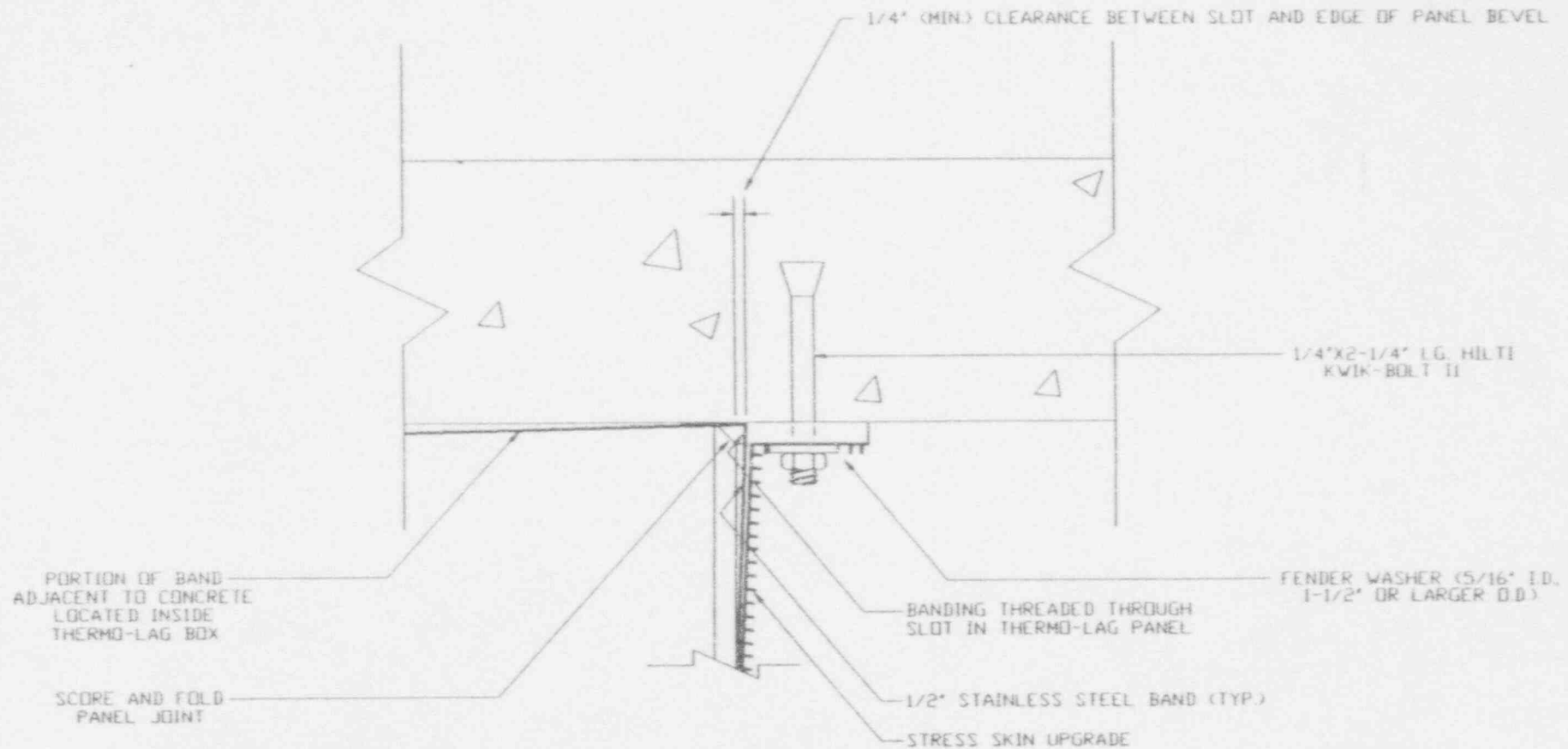
1 HR. CONDUIT THERMO-LAG BOX DESIGN
UPGRADE
(SHOWING STRESS SKIN)

NOTES:

1. THERMO-LAG CONFIGURATION SHOWN FOR REFERENCE ONLY
2. REFER TO SH 20 FOR TYPICAL INSTALLATION NOTES.
3. REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
4. REFER TO 0784-00001-S-01 FOR THERMO-LAG MATERIAL REQUIREMENTS.

ABB IMPELL CORP. PROJ NO 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 18 REV 0
TEST 2-2 (B1-B-CoX)
FIG 18 - ELEVATION - THERMO-LAG DETAILS

REV	DWN	ORIG.	VER.	APVD.
0	ELT	RLO 1/25/04	REP 1/25/04	RLO 1/25/04



1 HR. BOX DESIGN - UPGRADE
TYPICAL CONCRETE ATTACHMENT
AND BANDING CONFIGURATION
INCLUDING STRESS SKIN

NOTES:

1. THERMO-LAG CONFIGURATION SHOWN FOR REFERENCE ONLY.
2. REFER TO SH 20 FOR TYPICAL INSTALLATION NOTES.
3. REFER TO DWG 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
4. REFER TO 0784-00001-S-01 FOR THERMO-LAG MATERIAL REQUIREMENTS.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-B-002 SH 19 REV.0
TEST 2-2 (B1-B-CgX)
FIG 19 - THERMO-LAG DETAILS

THERMO-LAG INSTALLATION NOTES - 1 HR. UPGRADE CONDUIT BOX DESIGN USING SCORE AND FOLD JOINTS

1. BOX TO BE CONSTRUCTED FROM 1-HR THERMO-LAG PANELS. BOTTOM AND LONGER SIDES OF BOX TO BE CONSTRUCTED FROM TWO PANELS WITH BUTT JOINTS. V-RIBS ON BOTTOM AND LONGER SIDES OF BOX TO BE ORIENTED PARALLEL TO CONDUIT RUN. V-RIBS ON END PANELS TO BE ORIENTED HORIZONTALLY WHEN PANELS ARE INSTALLED. WITH END PANEL IN COMPRESSION BETWEEN BOTH SIDES AND BOTTOM PANELS.
2. V-RIBS ON BOTTOM AND SIDE PANELS TO BE ORIENTED PARALLEL TO CONDUIT RUN.
3. V-RIBS ON END PANELS TO BE ORIENTED HORIZONTALLY WHEN PANELS ARE INSTALLED.
4. PANELS TO BE INSTALLED WITH STRESS SKIN FACING PROTECTED COMMODITY.
5. BOX SHALL BE ATTACHED TO CONCRETE TEST DECK USING THERMO-LAG PANEL FLANGES. WITH PANELS TO BE FLANGED USING SCORE AND FOLD METHOD. WIDTH OF FLANGES MAY BE ADJUSTED TO COMPENSATE FOR "SQUARING UP" OF PANELS AS REQUIRED.
6. BOX SHALL BE ANCHORED TO CONCRETE TEST DECK WITH MILTI KWIK-BOLT II (1/4" DIA. X 2-1/4" LG.) ANCHORS INSTALLED AT NOMINAL 12" O.C. SPACING WITH BOLTS AT 3" (MAX.) DISTANCE FROM ENDS OF FLANGES. DRILL 5/16" DIA. HOLES THROUGH FLANGES TO ACCOMMODATE KWIK-BOLTS.
7. ALL JOINTS TO BE POST-BUTTERED WITH THERMO-LAG 300-1 TROWEL GRADE MATERIAL EXCEPT SCORE AND FOLD JOINTS AND THERMO-LAG PANEL FLANGES AT ATTACHMENT TO CONCRETE TEST DECK, WHICH SHALL BE PRE-BUTTERED.
8. STAINLESS STEEL BANDING (1/2" WIDE) TO BE INSTALLED AT NOMINAL 12" O.C. SPACING, WITH BANDS INSTALLED AT 3" (MAX.) DISTANCE FROM BUTT JOINTS AND SCORE AND FOLD CORNER AND FLANGE JOINTS.
9. BANDING TO BE FIRST INSTALLED CIRCUMFERENTIALLY AROUND ALL FOUR SIDES OF THERMO-LAG PANEL BOX PRIOR TO PANEL BOX FIT-UP. BANDING SHALL THEN BE INSTALLED TO SURROUND ALL FOUR SIDES AND BOTTOM OF BOX AND SMALL RUN ADJACENT TO BOTTOM SURFACE OF CONCRETE TEST DECK INSIDE BOX. FLANGE PORTION OF PANELS INCLUDING INTEGRAL STRESS SKIN SHALL BE SLOTTED AS NECESSARY TO ALLOW BANDING TO BE THREADED COMPLETELY THROUGH PANEL. BANDING SHALL BE THREADED THROUGH PANELS ON OPPOSITE SIDES OF BOX PRIOR TO ANCHORAGE OF PANELS TO CONCRETE TEST DECK.
10. WHERE THERMO-LAG PANELS ARE SLOTTED TO ACCOMMODATE BANDING, A 1/4" (MIN.) CLEARANCE SHALL BE MAINTAINED BETWEEN SLOT LOCATION AND BEVELED PORTION OF PANEL AT SCORE AND FOLD JOINTS.
11. MAXIMUM JOINT GAP BETWEEN PANELS DURING FIT-UP IS 1/4".
12. SCORE AND FOLD JOINTS AROUND BOTTOM OF THERMO-LAG PANEL BOX TO BE FILLED WITH TROWEL GRADE MATERIAL TO A 1/2" (MIN.), 5/8" (MAX.) DPT.
13. DURING CUTTING OF PANELS, ENSURE STRESS SKIN DOES NOT DISENGAGE FROM SUBSTRATE MATERIAL.
14. DURING SCORING OF PANELS, ENSURE STRESS SKIN INTEGRITY IS MAINTAINED.
15. V-RIBS ON FLANGES MAY BE FLATTENED AS REQUIRED FOR ATTACHMENT TO CONCRETE.
16. THE FOLLOWING NOTES APPLY TO UPGRADE REQUIREMENTS FOR THE 1-HR. THERMO-LAG PANEL BOX :
17. APPLY SUFFICIENT TROWEL GRADE SKIM COAT TO LAP SCORE AND FOLD JOINTS (AND BUTT JOINTS (ALL FOUR SIDES AT BOTTOM OF BOX ONLY) BY 4" (MIN.) TO 5" (MAX.).
18. INSTALL STRESS SKIN WRAP TO SCORE AND FOLD JOINTS (AND BUTT JOINTS (ALL FOUR SIDES AT BOTTOM OF BOX ONLY) TO LAP BOTTOM AND SIDES BY 3" (MIN.) EXTEND STRESS SKIN UP SIDES OF BOX AS NECESSARY TO LAP LOWERMOST HORIZONTAL STAINLESS STEEL BAND.
19. APPLY SUFFICIENT TROWEL GRADE SKIM COAT TO LAP BUTT JOINT BETWEEN PANELS (AT MID-LENGTH OF PANEL BOX) BY 7" (MIN.) TO 8" (MAX.).
20. INSTALL STRESS SKIN WRAP TO BUTT JOINT BETWEEN PANELS (AT MID-LENGTH OF PANEL BOX) TO LAP BOTH SIDES OF JOINT BY 6" (MIN.) TO 7" (MAX.) EXTEND STRESS SKIN UPWARD TO PANEL FLANGE AND HORIZONTALLY TO COVER FLANGE. MILTI BOLT TORQUE NUT AND FENDER WASHER TO BE REMOVED AND REINSTALLED OVER STRESS SKIN TO ANCHOR FIRMLY TO PANEL FLANGE AT FOUR LOCATIONS ADJACENT TO BUTT JOINT.
21. APPLY SUFFICIENT TROWEL GRADE SKIM COAT TO LAP CORNER BUTT JOINTS (JOINTS RUNNING VERTICALLY AT EACH CORNER OF BOX) BY 2" (MIN.) TO 3" (MAX.).

REV.	DWN	ORIG.	VER.	APVD.
1	ELT	RLO 1/21/94	REP 1/21/94	RLO 1/31/94

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 20A REV.1
TEST 2-2 (B1-B-Cax)
FIG. 20 - TYPICAL INSTALLATION NOTES

THERMO-LAG INSTALLATION NOTES - 1 HR. BASELINE CONDUITS (OUTDOOR APPLICATION)

1. ALL JOINTS TO BE PRE-BUTTERED WITH 3M INTERAM FIRE DAM 150 CAULK. CARE SHALL BE TAKEN NOT TO APPLY CAULK OUTSIDE OF ANY EDGE OR JOINT LOCATION. BEADING OF EDGES AND JOINTS WITH CAULKING IS NOT PERMITTED.
2. LONGITUDINAL JOINTS BETWEEN PRESHAPED SECTIONS ON HORIZONTAL CONDUIT PORTIONS SHALL BE ORIENTED ALONG OPPOSITE SIDES OF CONDUIT. JOINTS SHALL NOT BE ORIENTED ALONG THE VERTICAL AXIS OF CONDUITS. ORIENTATION OF LONGITUDINAL JOINTS BETWEEN PRESHAPED SECTIONS ON VERTICAL CONDUIT PORTIONS IS NONCRITICAL.
3. FOR BOTH CONDUITS, DRAINAGE HOLES SHALL BE INSTALLED THROUGH THE BOTTOM PRESHAPED SECTION AT A 3" DISTANCE (TOWARD THE LATERAL BEND FITTING) FROM THE EDGE OF THE COUPLING ON THE HORIZONTAL PORTION OF THE RADIAL BENDS.

4. TO INSTALL DRAINAGE HOLES, DRILL A 1/4" DIA. HOLE THROUGH THE BOTTOM PRESHAPED SECTION AT THE SPECIFIED LOCATION. APPLY ONE COAT OF THERMO-LAG 330-5000-10 POLYURETHANE TOPCOAT TO THE INSIDE OF THE DRAINAGE HOLE.
5. STAINLESS STEEL TIE WIRES (0.047" DIA) SHALL BE INSTALLED WITHIN 2' OF BUTT JOINTS BETWEEN PRESHAPED SECTIONS OR PANELS AND AT 12" MAX. INTERVALS WHERE POSSIBLE. CLOSER WIRE SPACING IS PERMISSIBLE WHERE NECESSARY TO RESULT IN A SECURE INSTALLATION (MINIMUM OF 1 WIRE PER INDIVIDUAL CONDUIT SECTION OR PANEL PIECE).
6. ONE (1) WIRE SHALL BE INSTALLED ON EACH SEPARATE MITERED SECTION ON RADIAL BENDS. TWO (2) WIRES (MAX.) MAY BE USED AS REQUIRED FOR A SECURE INSTALLATION.
7. MAXIMUM JOINT GAP BETWEEN PRESHAPED SECTIONS OR PANELS DURING FITUP IS 1/4".
8. PREFABRICATED THERMO-LAG MATERIALS TO BE INSTALLED WITH STRESS SKIN FACTOR PROTECTED COMMODITY. V-RIB ORIENTATION ON CONDULETS IS NONCRITICAL.
9. DURING CUTTING OF PANELS OR PRESHAPED SECTIONS, ENSURE STRESS SKIN DOES NOT DISENGAGE FROM SUBSTRATE MATERIAL.
10. EXTEND THERMO-LAG COVERAGE THROUGH TEST DECK FOR NOMINAL DISTANCE OF 12".
11. BASELINE CONDULET ENCLOSURES SHALL BE OF STANDARD BOX CONSTRUCTION USING 1 HR. THERMO-LAG V-RIB PANELS AND BUTT JOINTS (IE. SIDE PANELS IN COMPRESSION BETWEEN TOP AND BOTTOM PANELS) TWO PIECE CONSTRUCTION WITH PANELS CUT TO FIT BUTTED AROUND PRE-SHAPED CONDUIT SECTIONS WHERE CONDUITS ENTER BOX. PANELS SECURED USING CIRCUMFERENTIAL TIE WIRE WRAP, ONE WIRE (MIN.) PER PIECE, WITH TIE WIRES LOCATED 2" (MAX.) FROM JOINTS.
12. NOTES 13-18 APPLY TO UPGRADES TO CONDULET BOXES FOR 3/4" AND 2" CONDUITS.
13. APPLY A TROWEL GRADE BUILDUP (APPROX 1/8" VET) ON ALL SURFACES OF CONDULET BOXES AND EXTEND 3" DISTANCE OUTWARD ONTO PRE-SHAPED CONDUIT SECTIONS.
14. INSTALL STRESS SKIN PIECES TO ALL BUTT JOINTS TO LAP BOTH SIDES OF JOINT BY 3" (MIN.). WHERE CONDUITS ENTER PANEL BOX, CUT STRESS SKIN TO FIT AROUND CONDUIT WITH STRESS SKIN FLAPS CUT TO EXTEND AWAY FROM BOX ALONG CONDUIT FOR A 2" (MIN.) DISTANCE. ALL STRESS SKIN OVERLAPS TO BE 3" (MIN.) AS AN OPTION, STRESS SKIN WRAP MAY BE COMPOSED OF ONE OR TWO PIECES, CUT AND FOLDED TO ACHIEVE THE REQUIRED JOINT LAPS AS DESCRIBED ABOVE.
15. INSTALL STRESS SKIN WRAP AROUND CONDUITS, BUTTED AGAINST CONDULET BOX. STRESS SKIN TO BE 2" WIDE (MIN.) WITH ENDS OF WRAP HAVING A 2" (IN.) OVERLAP WRAP TO COVER FLAPS EXTENDING FROM STRESS SKIN ON CONDULET BOX.



REV.	DWN.	ORIG.	VER.	APVD.
1	ELT	RLO 1/31/94	RAP 1/31/94	RLO 1/31/94

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 22A REV.1
TEST 2-2 (C1-E-75s/C1-E-2s)
FIG. 22 - TYPICAL INSTALLATION NOTES

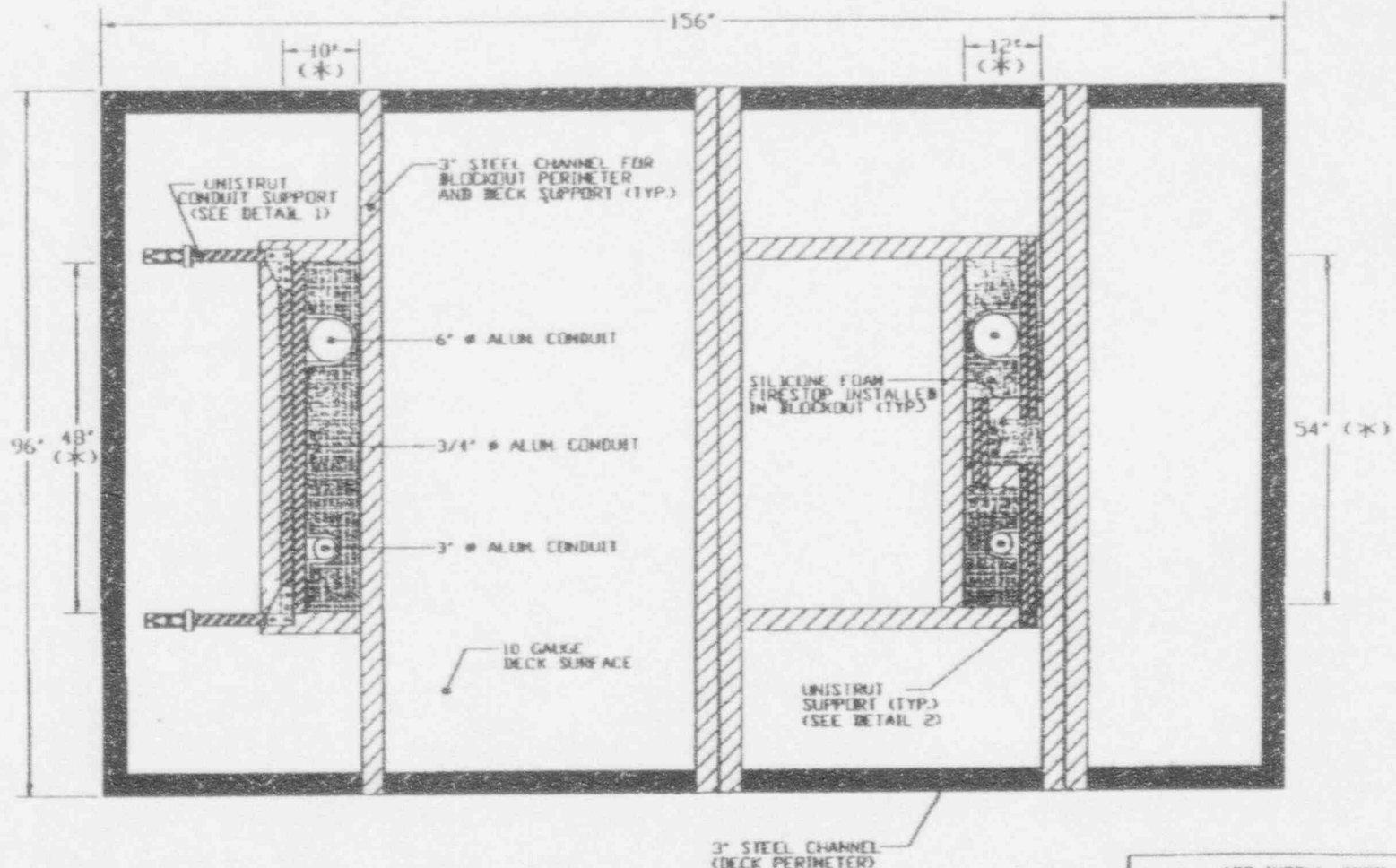
16. ALL STRESS SKIN TO BE SECURED TO PANEL SURFACES USING 1/2" TO 5/8" STAPLES LOCATED APPROX. 1/2" FROM EDGES AND AT APPROX. 2' INTERVALS. USE ADDITIONAL STAPLES AS REQUIRED TO RESULT IN A FLAT SURFACE AND THOROUGH TROWEL GRADE ADHESION.
17. SECURE ALL STRESS SKIN WITH TIE WIRES USING COMPLETE CIRCUMFERENTIAL WRAP AROUND CONDULET BOX AND CONDUITS. ONE WIRE (MIN.) PER STRESS SKIN PIECE WITH TIE WIRES LOCATED 2" (MAX.) FROM JOINTS. USE ADDITIONAL WIRES AS REQUIRED TO RESULT IN A FLAT SURFACE.
18. APPLY TROWEL GRADE BUILD-UP (APPROX. 1/4" VET) TO COVER ALL STRESS SKIN. TOUCH-UP OF TROWEL GRADE APPLICATION FOLLOWING INSTALLATION IS ACCEPTABLE TO COMPENSATE FOR MATERIAL SHRINKAGE. STRESS SKIN AREAS ON CONDULET BOXES SHOULD NOT BE READILY VISIBLE WHEN TROWEL GRADE MATERIAL HAS CURED.
19. TOPCOAT SHALL NOT BE APPLIED UNTIL THE FOLLOWING MINIMUM RECOMMENDED CURING TIMES HAVE ELAPSED:

3M INTERAM FIRE DAM 150 CAULK	2 HRS.
THERMO-LAG 350-2000 TOPCOAT	12 HRS.
20. THERMO-LAG 350-2000 CHLORINATED RUBBER BASE POLYMER TOPCOAT SHALL BE APPLIED PRIOR TO INSTALLING THERMO-LAG 350-2000-10 TOPCOAT. THE TOPCOAT IS TO BE APPLIED BY BRUSH OR ROLLER IN MULTIPLE PASSES IN CRISS-CROSS TECHNIQUES, AT A RATE OF 50 SQFT/GALLON. THIS WILL PROVIDE A WET THICKNESS OF 11 MILS OR A DRY THICKNESS OF 7 MILS. DO NOT COVER DRAINAGE HOLES.
21. THERMO-LAG 350-5000-10 POLYURETHANE SHALL BE APPLIED AFTER INSTALLING THERMO-LAG 350-2000 TOPCOAT. THE TOPCOAT IS TO BE APPLIED BY BRUSH OR ROLLER IN MULTIPLE PASSES IN CRISS-CROSS TECHNIQUES, AT A RATE OF 50 SQFT/GALLON. THIS WILL PROVIDE A WET THICKNESS OF 11 MILS OR A DRY THICKNESS OF 7 MILS. DO NOT COVER DRAINAGE HOLES.
22. LOT NUMBER TRACEABILITY AND INSTALLED LOCATION SHALL BE MAINTAINED FOR ALL THERMO-LAG MATERIALS.
23. THERMO-LAG SHALL NOT BE APPLIED TO TEST ITEMS UNTIL RELEASED BY TEST LABORATORY.
24. ALL QUESTIONS PERTAINING TO THERMO-LAG MATERIAL SHALL BE RESOLVED WITH THE ENGINEER PRIOR TO INSTALLATION.

REV.	DWN.	ORIG.	VER.	APVD.
0	ELT	RWD 1/21/94	REP 1/21/94	RWD 1/21/94

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-002 SH 22B REV. 0
TEST 2-2 (C1-E-.75s/C1-E-2s)
FIG. 22 - TYPICAL INSTALLATION NOTES

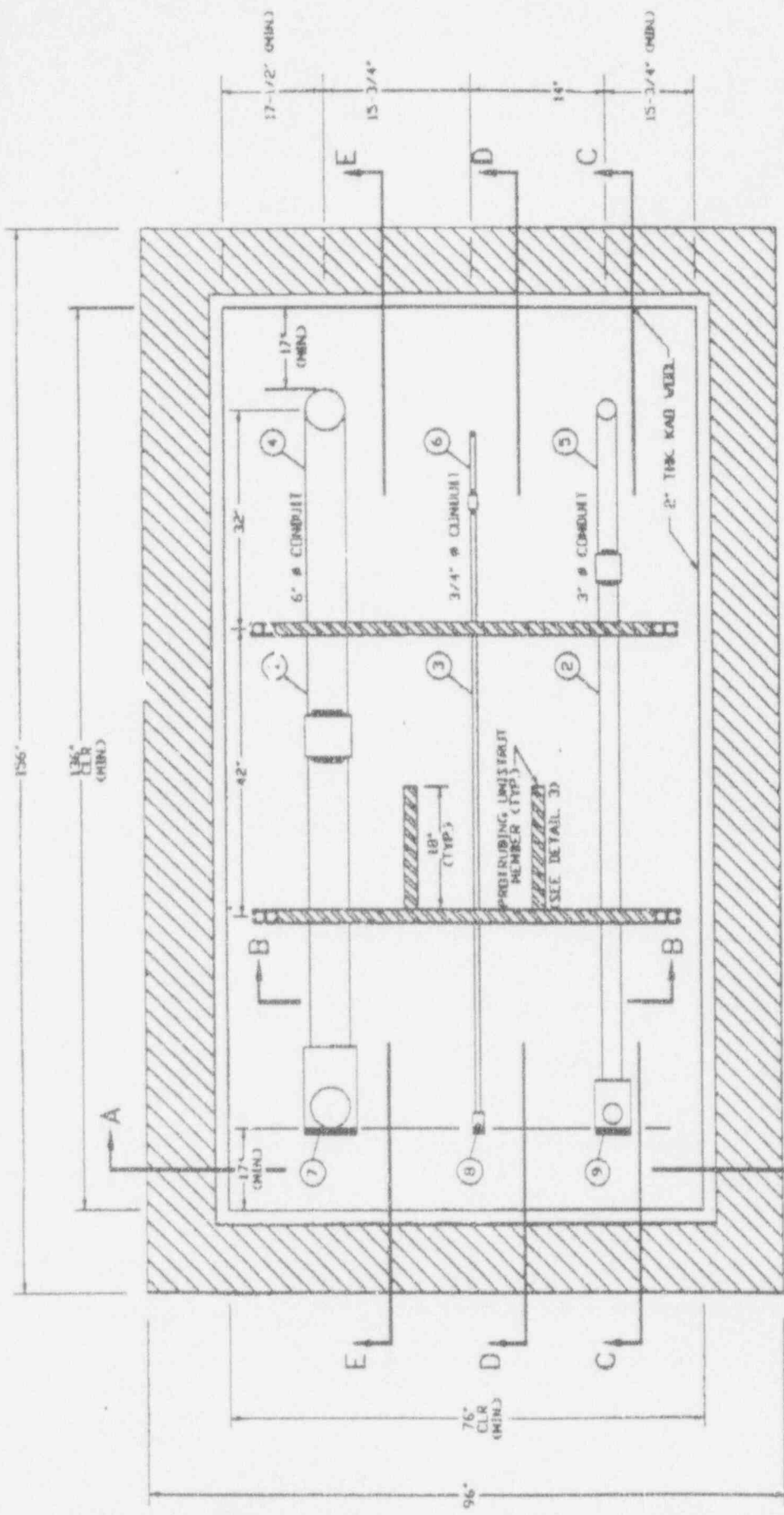
REV.	DWN.	DRG.	VER.	APVD.
0	ELT	RLO 12/29/83	REP 1/10/84	RLO 1/4/84



- NOTES:
1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
 2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 2" UNL.
 3. ○ - DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 11A)
 4. REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
 5. REFER TO DWG. 0784-00001-D-003 SH2 FOR TEST INSTRUMENTATION REQUIREMENTS.

ABB IMPELL CORP. PROJ. NO: 0784-00001
NUKARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-003 SH 1 REV. 0
TEST 2-3 (C3-A-75a/C3-A-3a/C3-A-6a)
FIG. 1 PLAN VIEW - ABOVE BECK

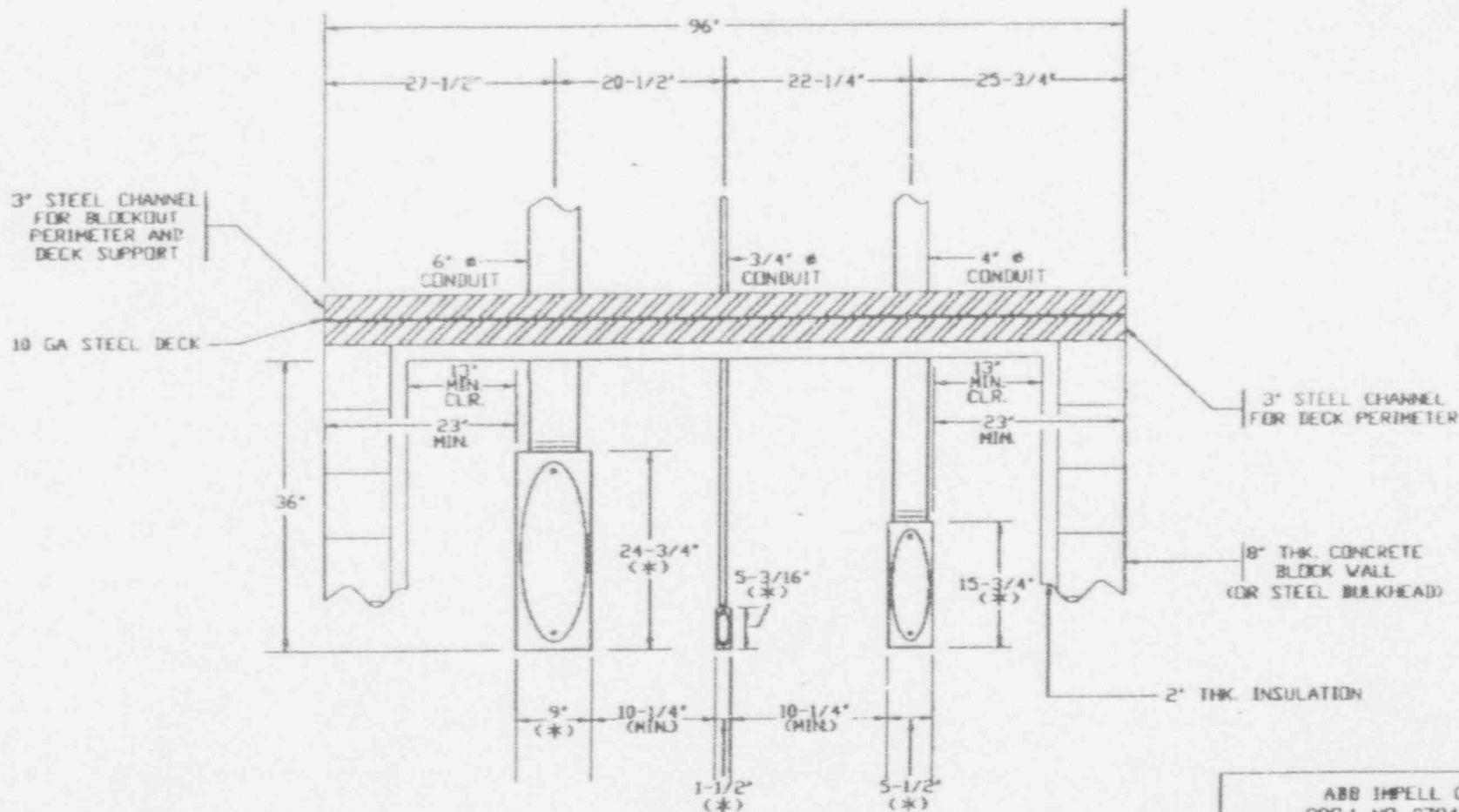
REV	DATE	BY	CHKD	APP'D
0	ELT	P.D.	REV	P.D.
		1/5/84		1/14/84



- NOTES:
1. DIMENSIONS WITH ASTERISK (*) ARE NOMINAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
 2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 2" UNL
 3. O - DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 11).
 4. REFER TO DWG. 0784-0000-D-008 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
 5. INSTRUMENTATION NEUTRIUMENTS - THERMOCOUPLES SHALL BE INSTALLED AT 6" INTERVALS ALONG THE BOTTOM EXTERNAL SURFACE OF ALL CONDUITS AND FITTINGS. THERMOCOUPLES SHALL ALSO BE INSTALLED AT 6" INTERVALS ALONG A #8 AWG BARE COPPER CONDUCTOR LOCATED INSIDE EACH CONDUIT ASSEMBLY.
 6. FOR PROTRUDING UNISTRUT MEMBER DETAIL SEE SH18.

ABB IMPELL CURRP. PROJ. NO. 0784-00001
NUMBER: PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-003 SH 2 REV. B
TEST 2-3 (C3-A-756/C3-A-34/C3-A-66)
FIG. 2 PLAN VIEW - BELOW DECK

LEFT END VIEW (A-A)

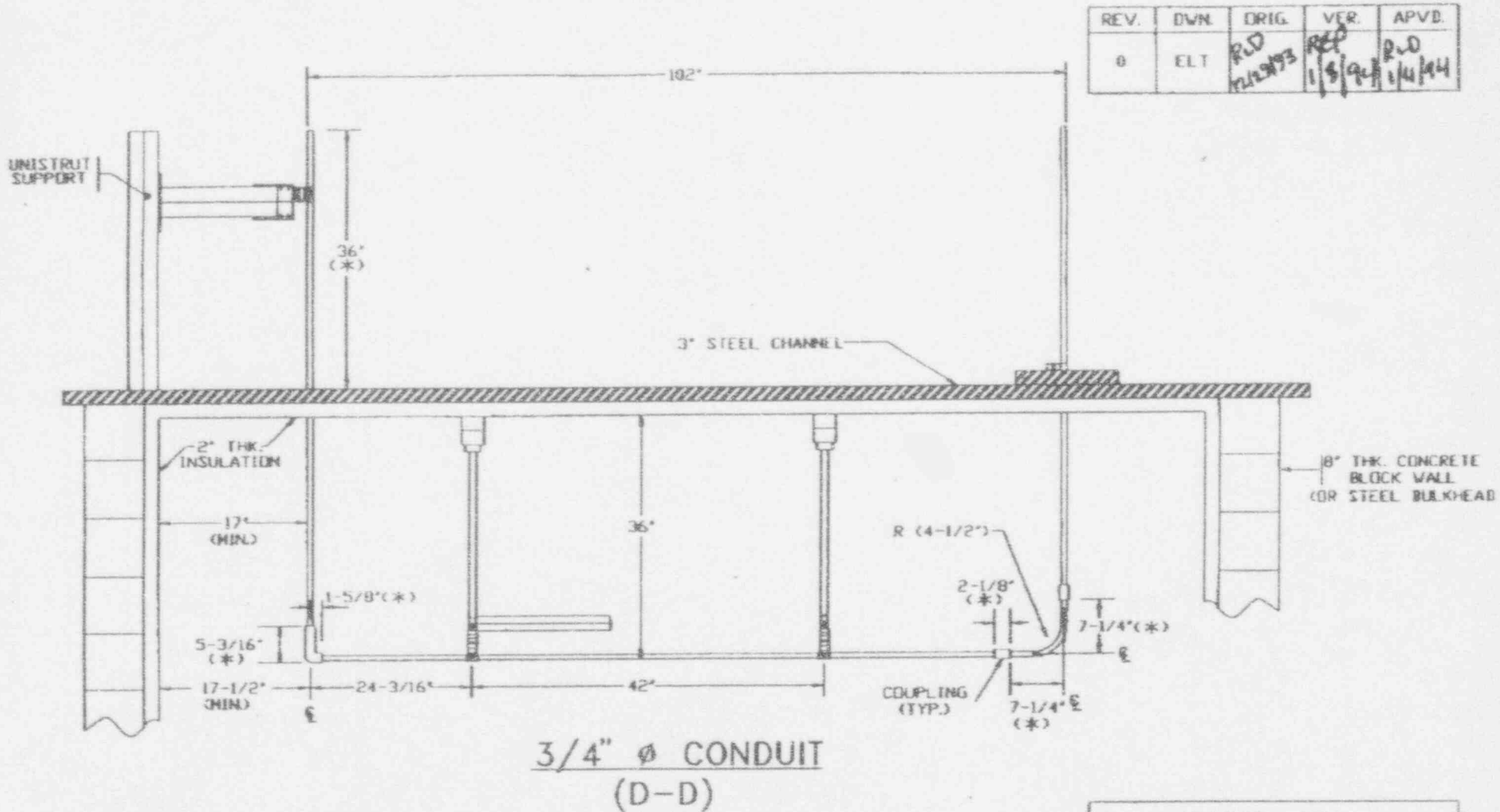


REV.	DWN.	DRIG.	VER.	APVB.
0	ELT	RLD 1/3/93	RFP 1/3/94	RLD 1/4/94

NOTES:

1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 2" UNL.
3. ○ - DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 11)
4. REFER TO DWG. 0784-00001 D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001 D-003 SH 3 REV. 0
TEST 2-3 (C3-A-.75a/C3-A-3a/C1-A-6a)
FIG. 3 - ELEVATION VIEW



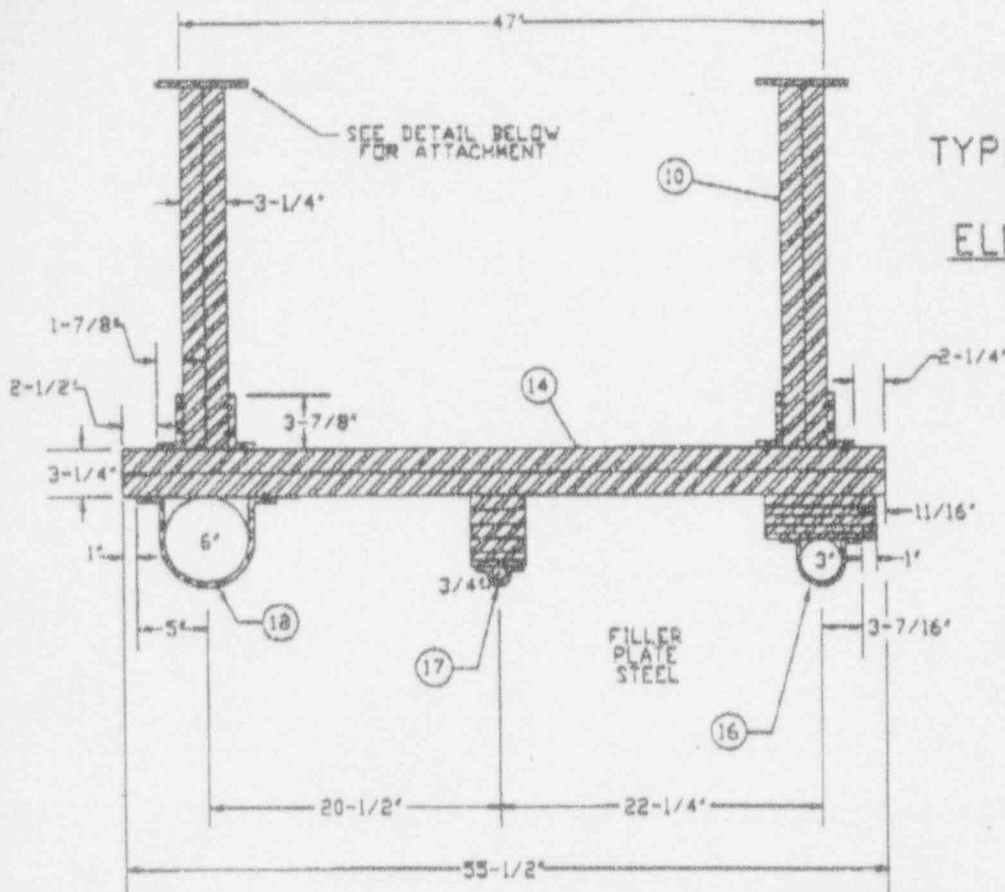
REV.	DWN.	ORIG.	VER.	APVD.
0	ELT	R.D. 12/29/93	R.D. 1/5/94	R.D. 1/4/94

NOTES:

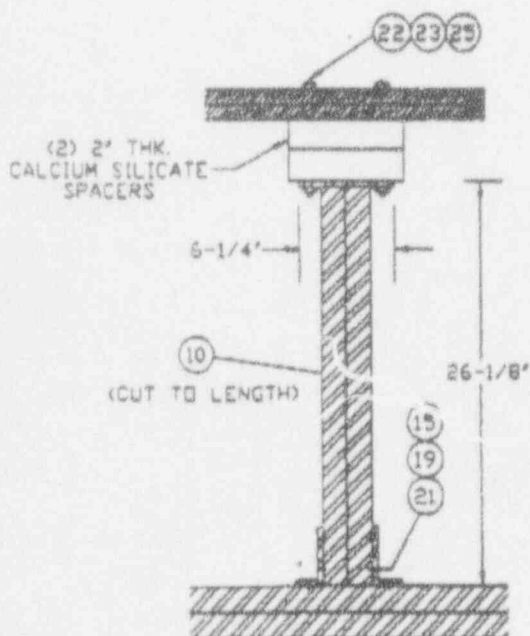
1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 2" UNL.
3. ○ - DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 11)
4. REFER TO DWG. 0784-0001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
5. FOR SUPPORT DETAILS SEE SH 7 THROUGH 9.
6. FOR PROTRUDING UNISTRUT DETAIL, SEE SH 10.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-003 SH 5 REV. 0
TEST 2-3 (C3-A-75a/C3-A-3a/C3-A-6a)
FIG 5 ELEVATION 3/4" Ø CONDUIT VIEW -

REV.	DWN.	ORIG.	VER.	APVD.
0	EL*	RLO 12/29/93	RES 1/3/94	RLO 1/4/94



TYPICAL SUPPORT ASSEMBLY
ELEVATION VIEW
B-B



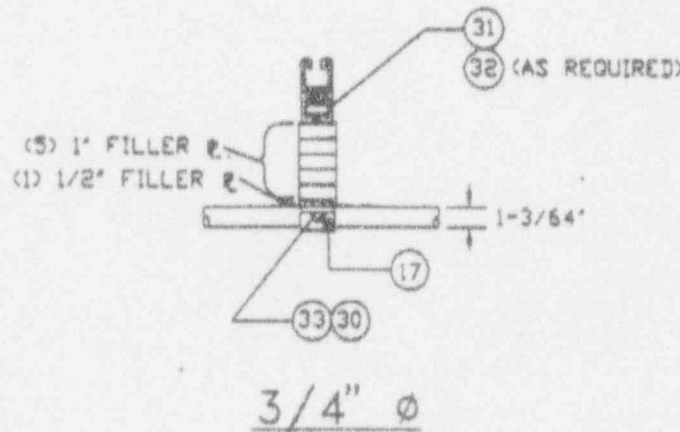
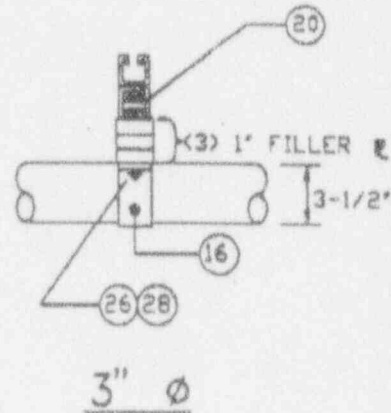
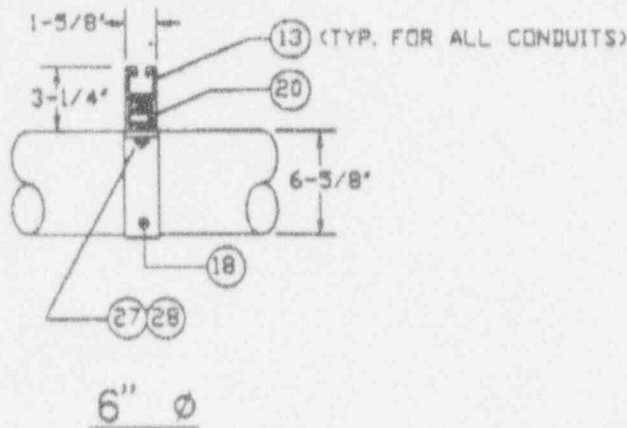
VERTICAL SUPPORT MEMBER (TYP.)

NOTES:

1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 1/2" UNQ.
3. ○ - DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 11).
4. REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
5. FOR FILLER PLATE AND CONDUIT ATTACHMENT DETAILS SEE SH. 8.
6. FOR PROTRUDING UNISTRUT DETAIL, SEE SH10.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-003 SH 7 REV.0
TEST 2-3 (C3-A-.75a/C3-A-3a/C3-A-6a)
FIG. 7 - SUPPORT DETAILS

REV.	DWN.	ORIG.	VER.	APVD.
0	ELT	RLD 12/23/93	RET 1/8/94	RLD 1/4/94

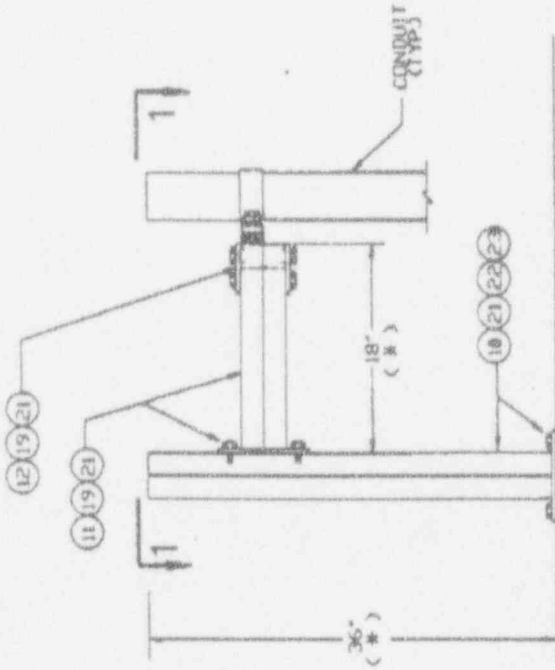


NOTES:

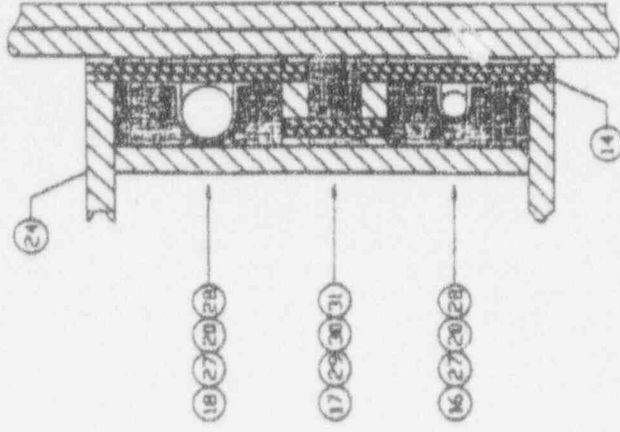
1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 1/2" UNO.
3. () - DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 11)
4. REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
5. FOR PROTRUDING UNISTRUT DETAIL, SEE SH.10.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-003 SH 8 REV.0
TEST 2-3 (C3-A-.75a/C3-A-3a/C3-A-6a)
FIG. 8 - CONDUIT CLAMP DETAILS

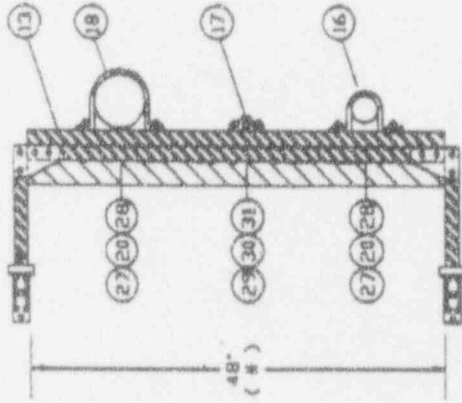
REV.	BY	ORIG.	VER.	APVD.
0	ELT	ELT	1/14/94	210



DETAIL 1



DETAIL 2



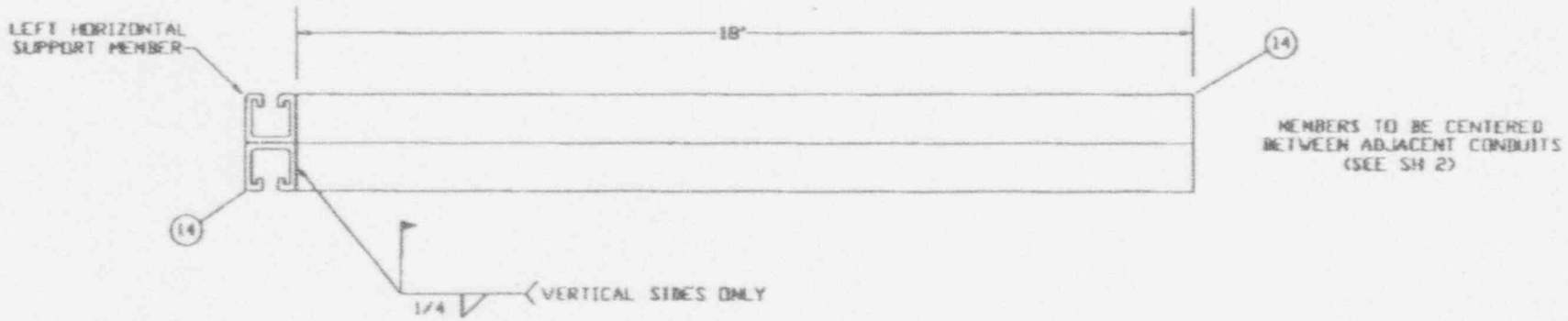
SECTION 1-1

ABB IMPELL CORP. PROJ NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM DWG. 0784-00001-B-003 SH 9 REV. 0
TEST 2-3 (C3-B-750/C3-B-30/C3-B-60)
FIG. 9 - CONDUIT SUPPORT DETAILS

NOTES:

1. ○ - DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 11)
2. DIMENSIONS WITH ASTERISK (*) ARE NUMERICAL AND PROVIDED FOR INFORMATION AND GENERAL CONTOURATION PURPOSES.
3. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 1/2" UNL.
4. SEE DWG. 0784-00001-B-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.

REV.	BY	ORIG.	VER.	APVD.
0	ELT	RD 12/2/83	RE 1/3/84	RD 1/4/84



DETAIL 3
PROTRUDING UNISTRUT MEMBER
AT SUPPORT ASSEMBLY
(TYP. OF 2)

NOTES:

1. DIMENSIONS WITH ASTERISK (*) ARE NONCRITICAL AND PROVIDED FOR INFORMATION AND GENERAL CONFIGURATION PURPOSES.
2. ALL OTHER DIMENSIONS HAVE WORKING TOLERANCE OF +/- 1/2" UNL.
3. ○ - DENOTES BILL OF MATERIAL ITEM NO. (SEE SH 11)
4. REFER TO DWG. 0784-00001-D-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-003 SH 10 REV. 0
TEST 2-3 (C3-A-75a/C3-A-3a/C3-A-6a)
FIG. 10 - PROTRUDING UNISTRUT DETAIL

ITEM NO.	DESCRIPTION	QUANTITY
1	6" Ø CONDUIT, RIGID ALUMINUM	20'
2	3" Ø CONDUIT, RIGID ALUMINUM	20'
3	3/4" Ø CONDUIT, RIGID ALUMINUM	20'
4	6" Ø STANDARD 90° RADIAL BEND, (30" R) THREADED BOTH ENDS w/COUPLINGS, RIGID ALUMINUM	1
5	3" Ø STANDARD 90° RADIAL BEND, (13" R) THREADED BOTH ENDS w/COUPLINGS, RIGID ALUMINUM	1
6	3/4" Ø STANDARD 90° RADIAL BEND, (4-1/2" R) THREADED BOTH ENDS w/COUPLINGS, RIGID ALUMINUM	1
7	6" Ø THREADED HUB SIZE LATERAL BEND CONDULET, TYPE LB ALUMINUM w/STAMPED ALUMINUM BLANK COVER, OPEN NEOPRENE GASKET AND COVER SCREWS.	1
8	3" Ø THREADED HUB SIZE LATERAL BEND CONDULET, TYPE LB ALUMINUM, w/STAMPED ALUMINUM BLANK COVER, OPEN NEOPRENE GASKET AND COVER SCREWS.	1
9	3/4" Ø THREADED HUB SIZE LATERAL BEND CONDULET, TYPE LB ALUMINUM w/STAMPED ALUMINUM BLANK COVER, OPEN NEOPRENE GASKET AND COVER SCREWS.	1
10	UNISTRUT P2546 T-HANGER	6
11	UNISTRUT P2543 T-HANGER	2
12	UNISTRUT P1380 PLATE FITTING	4
13	UNISTRUT P1001-3 CHANNEL	10'
14	UNISTRUT P1001 CHANNEL	20'
15	UNISTRUT P1346 90° ANGLE FITTING	8
16	UNISTRUT P2558-30 3" PIPE STRAP	4
17	UNISTRUT P2558-07 3/4" PIPE STRAP	4
18	UNISTRUT P2558-60 6" PIPE STRAP	4

REV.	DWN.	DRG.	VER.	APVD.
0	ELT	RJD 11/29/93	REP 1/3/94	RJD 1/4/94

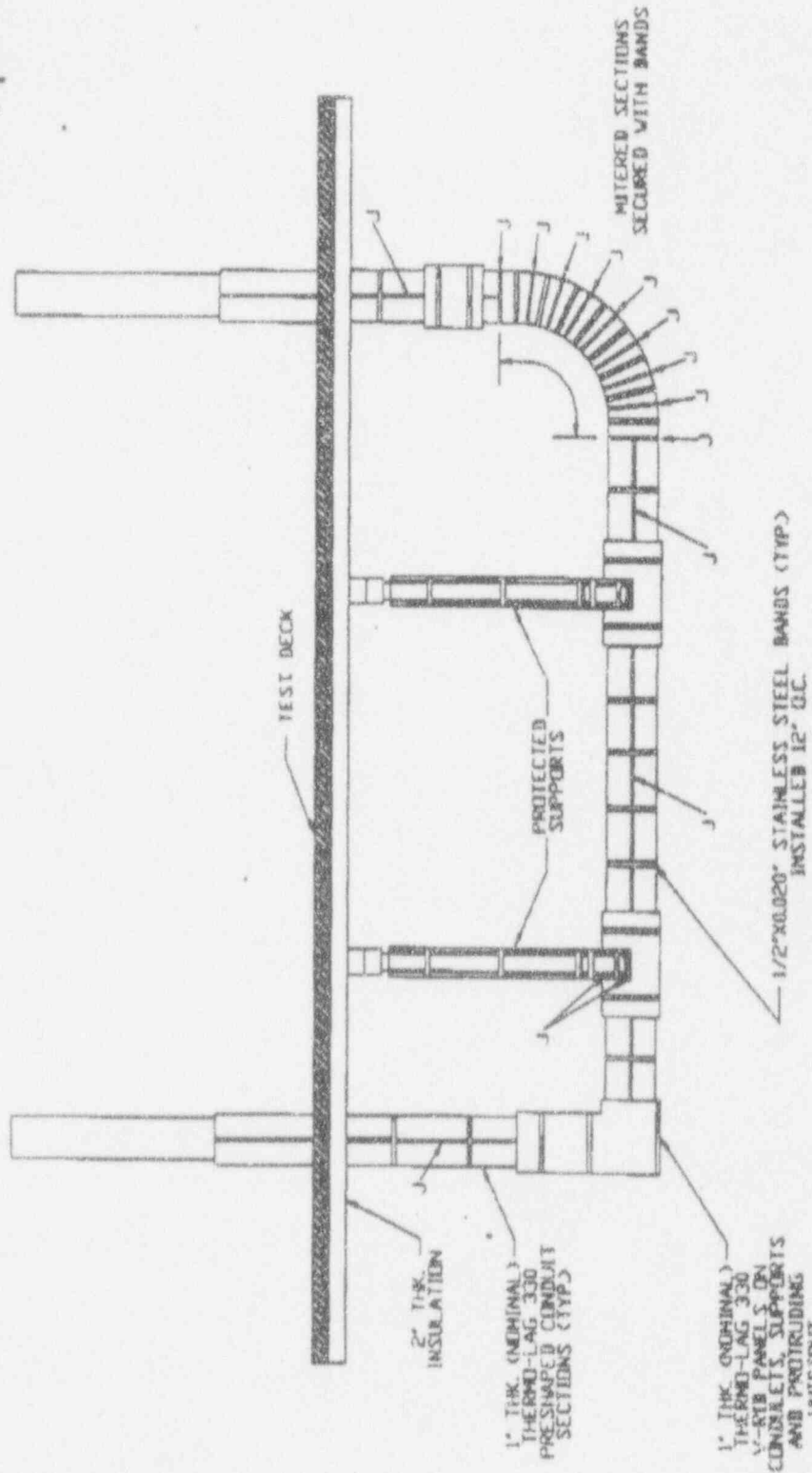
ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-003 SH 11A REV.0
TEST 2-3 (C3-B-75a/C3-B-3a/C3-B-6a)
FIG. 11 - BILL OF MATERIALS

ITEM NO.	DESCRIPTION	QUANTITY
19	UNISTRUT P1010 1/2" SPRING NUTS	44
20	UNISTRUT P1008 3/8" SPRING NUTS	24
21	1/2" X 1-1/4" A307 BOLTS	48
22	1/2" NUTS	20
23	1/2" WASHERS	64
24	C3X4.1 A36 STEEL CHANNEL (FOR BLOCKOUT FRAMING ONLY)	20'
25	1/2" ALL THREAD ROD (MILD STEEL)	5'
26	3/8" X 4-1/2" A307 BOLTS	4
27	3/8" X 1-1/4" A307 BOLTS	16
28	3/8" WASHERS	16
29	1/4" X 1-1/4" A307 BOLTS	4
30	1/4" WASHERS	8
31	UNISTRUT P1006 1/4" SPRING NUTS	8
32	UNISTRUT P1063 3/8" WASHERS	10
33	1/4" X 6-3/4" A307 BOLTS	4

REV.	DWN	ORIG.	VER.	APVD.
0	ELT	RJD 11/25/93	RJD 1/5/94	RJD 11/14/94

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-0-003 SH 118 REV'D
TEST 2-3 (C3-B-75a/C3-B-3a/C3-B-6a)
FIG. 11 - BILL OF MATERIALS

REV.	DRAWN	DRIG.	VER.	APV.B.
0	ELT	RED	RED	RED
		11/14/94	11/14/94	11/14/94



**TYPICAL CONDUIT INSTALLATION
3 HR. BASELINE
(3" Ø CONDUIT DEPICTED)**

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DMG. 0784-00001-B-003 SH 12 REV 0
TEST 2-3
(C3-A-750/C3-A-3a/C3-A-6a)
FIG 12 - TYPICAL THERMO-LAG INSTALLATION DETAILS

- NOTES:
1. RELATIVE JOINT LOCATIONS DENOTED BY "J".
 2. THERMO-LAG CONFIGURATION SHOWN FOR REFERENCE ONLY. REFER TO SHE3 FOR TYPICAL INSTALLATION NOTES.
 3. SEE DMG. 0784-00001-B-000 FOR REVISION HISTORY, DESIGN CHANGE STATUS AND USE DESIGNATION.
 4. REFER TO 0784-00001-S-01 FOR THERMO-LAG MATERIAL REQUIREMENTS.
 5. PROTRUDING UNISTRUT MEMBER NOT SHOWN FOR CLARITY.

THERMO-LAG INSTALLATION NOTES - 3 HR. BASELINE CONDUITS

1. ALL JOINTS TO BE PRE-BUTTERED WITH THERMO-LAG 330-1 TROWEL GRADE MATERIAL.
2. STAINLESS STEEL BANDING TO BE INSTALLED WITHIN 2" OF BUTT JOINTS BETWEEN PRESHAPED SECTIONS OR PANELS AND AT 12" (MAX.) INTERVALS WHERE POSSIBLE. CLOSER BAND SPACING IS PERMISSIBLE WHERE NECESSARY TO RESULT IN A SECURE INSTALLATION (MINIMUM OF 1 BAND PER INDIVIDUAL CONDUIT SECTION OR PANEL PIECE).
3. ONE (1) BAND SHALL BE INSTALLED ON EACH SEPARATE MITERED SECTION ON RADIAL BENDS. TWO (2) BANDS (MAX.) MAY BE USED AS REQUIRED FOR A SECURE INSTALLATION.
4. INSTALL MATERIAL ON CONDUITS FIRST AND CONDULETS AND SUPPORTS LAST.
5. MAXIMUM JOINT GAP BETWEEN PRESHAPED SECTIONS OR PANELS DURING FIT-UP IS 1/4".
6. V-RIB ORIENTATION ON PANELS INSTALLED ON CONDULETS, SUPPORTS AND PROTRUDING UNISTRUT MEMBERS IS NONCRITICAL.
7. EXTEND THERMO-LAG COVERAGE FULL LENGTH ON SUPPORTS. EXTEND THERMO-LAG COVERAGE ON PROTRUDING UNISTRUT FOR 17" (MIN.) TO 18" (MAX.) DISTANCE AS MEASURED FROM OUTSIDE OF CLOSEST CONDUIT ENVELOPE.
8. ALL THERMO-LAG PREFABRICATED MATERIALS TO BE INSTALLED WITH STRESS SKIN FACING PROTECTED COMMODITY.
9. TOUCH-UP OF PRE-BUTTERED JOINTS AFTER INSTALLATION IS ACCEPTABLE TO COMPENSATE FOR SHRINKAGE OF TROWEL GRADE MATERIAL TO OBTAIN 1" (MIN.) TO 1-1/4" (MAX.) DFT.
10. DURING CUTTING OF PANELS OR CONDUIT SECTIONS, ENSURE STRESS SKIN DOES NOT DISENGAGE FROM SUBSTRATE MATERIAL. DURING SCORING OF PANELS OR CONDUIT SECTIONS, ENSURE STRESS SKIN INTEGRITY IS MAINTAINED.
11. EXTEND THERMO-LAG COVERAGE THROUGH TEST DECK FOR NOMINAL DISTANCE OF 12".
12. LOT NUMBER TRACEABILITY AND INSTALLED LOCATION SHALL BE MAINTAINED FOR ALL THERMO-LAG MATERIALS.
13. THERMO-LAG SHALL NOT BE APPLIED TO TEST ITEM UNTIL RELEASED BY TEST LABORATORY.
14. ALL QUESTIONS PERTAINING TO THERMO-LAG MATERIAL APPLICATION SHALL BE RESOLVED WITH THE ENGINEER PRIOR TO INSTALLATION.

REV.	DWN.	ORIG.	VER.	APVD.
0	ELT	RLO 1/3/93	REP 1/3/94	RLO 1/4/94

ABB IMPELL CORP. PROJ. NO. 0784-00001
NUMARC PHASE 2 TEST PROGRAM
DWG. 0784-00001-D-003 SH 13 REV.0
TEST 2-3 (C3-A-75a/C3-A-3a/C3-A-6a)
FIG. 13 - TYPICAL INSTALLATION NOTES