ATTACHMENT 4

London Nuclear PROJECT OPERATING PROCEDURES	Section: OP-001	Revision: -E-	Effective Date: 5/31/84	Page: 1 of 1
	Title: PEACH BOTTOM DECONTAMINATION			

PEACH BOTTOM
RECIRCULATION LINE
CAN-DECON
OPERATING PROCEDURES

STATION SPECIAL PROCEDURE

No. 694

PEACH BOTTOM RECIRCULATION LINES
CAN-DECON OPERATING PROCEDURES

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DRAWINGS

1.0 PURPOSE

The purpose of this document is to provide a set of operating procedures and guidelines for the operation of the Decontamination System as applied to the Peach Bottom Unit 2 Recirculation Piping System including segments of the RHR and RWCU systems.

It is the intent of this procedure to outline the various steps required to decontaminate these systems.

CHANGES THAT DO NOT CHANGE THE INTENT OF THIS PROCEDURE MAY BE MADE PROVIDED THAT THE CHANGES ARE DOCUMENTED ON THIS PROCEDURE AND INITIALED BY A MEMBER OF SHIFT SUPERVISION AND ONE MEMBER OF THE PORC TO SIGNIFY APPROVAL. THE PORC MEMBER APPROVAL MAY BE GRANTED BY TELEPHONE. ANY CHANGE TO THIS PROCEDURE WHICH CHANGES ITS INTENT MUST BE REVIEWED AND APPROVED BY THE PORC PRIOR TO IMPLEMENTATION.

2.0 REFERENCES

M-351-19	P&ID Nuclear Boiler, Unit 2
M-361-SH1	P&ID Residual Heat Removal System Unit 2
M-15	Equipment Location Reactor and Radwaste Building Unit 2 Plan at Elevation 135'-0"
M-354-17	P&ID Reactor Water Cleanup System
M-20	Equipment Location Reactor and Radwaste Building Unit 2
SK11084	GE, Piping Isometric of Recirculation System
112D3501	GE, Manifold
137C8201	GE, Pipe Cap Assembly
137C8200	GE, Plate
137C8202	GE, Decontamination Fittings
3603-C-5000-1	LN-1, Decontamination Equipment Flow Diagram
3603-A-5009-1	LN-4/5 Flow Diagrams Heater System System Diagram
3603-B-5001-1	LN-1, Decontamination Equipment Equipment Installation Interconnections

3603-A-5005-1	LN-4, Decontamination Equipment Equipment Installation Interconnections
3838-B-5000-1	Flow Diagram: Decontamination of Reactor Recirculation Pumps Suction and Discharge
3838-L-2000-1	General Equipment Location
3838-B-5001-1 3838-B-5001-2 3838-B-5001-3 3838-B-5001-4	Flow Diagrams: Decontamination of Reactor Recirculation Pumps Suction and Discharge
112-E-3502	Decon Cuts within Drywell
796-E-601	Routing of Decon Hose
Figures 6.4.1 - 6.4.9	Flange Joint Arrangements
Figure 6.2	Field Run Hose and Flange Configuration.

3.0 PREREQUISITES

1) The preparation of plant interface locations (valved out/tagged, drained/vented, blanked/adapted, unplugged etc.) with appropriate blocking permits (as required by LN drawing 3838-B-5001-1).

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SSV

2) Sufficient concrete shield blocks available to construct temporary shielding as per LN Drawing 3603-B-5001-1. (Drawing specifies a concrete shielding thickness of 2 ft.)

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PECo Const.

3) Appropriate piping isolated by CB&I. (See Appendix B).

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GE

4) 20,000 Gallons condensate transfer available to fill system.

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SSV

5) Drains available to accept system volume at end of decontamination. Total system volume will be drained to the torus or radwaste.

____
SSV

6) Preoperational testing and inspection of LN equipment before shipping to Peach Bottom

LNEC

7) Radiation work permits available

GE

8) HP coverage needed for all decon operations.

9) All chemicals listed in Section 6.19 are available

LN

10) All chemical analysis equipment outlined in Section 6.20 are available

LN

11) Check meter batteries and calibration

LN

12) Remove insulation around recirculation line isolation valves (MO-43A, 43B, 53A, 53B)

GE

13) Preparations made to adequately support all temporary lines and hose, and protect all hose outside drywell from traffic. See Section 6.4, Figures 6.4.1 through 6.4.9

GE/LN

14) Verify installation of plastic over drywell openings to torus.

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GE/LN

15) Verify that no more than 50% of the insulation on piping and equipment has been removed.

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GE/LN

16) **Recirculation suction and recirculation discharge valves are to be closed but not back seated.**

Precaution →

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Unit 2 Operator

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4.0 PRECAUTIONS

1) During equipment installation, all possible hardware connections are to be installed prior to drywell entry.

2) **During performance of all phases of decontamination project work, the control room extension 4223 or 4423 shall be notified of any significant leakage from plant systems or decontamination equipment.**

3) Do not backseat recirc. valves

5.0 EQUIPMENT AND/OR TOOLS

5.1 LN decontamination equipment consisting of:

1) one ion exchange skid

2) one auxiliary equipment skid (pump skid)

3) two supplementary heating skids

5.2 <u>Supplementary equipment and miscellaneous supplies quantities</u>:

1) 40 cu. ft. of IRN-77 and 40 cu. ft. of IRN-78

2) 4 stainless steel corrosion coupons

3) 70 kg of LND-101A

4) 10 gallons of 35% solution of hydrazine in water.

5) 5 gallons Rodine 31A

6) miscellaneous installation tools and equipment

7) two fabricated spool pieces for Recirculation system decontamination connections

8) 10 - 2" ball valves, 16 - 3" ball valves

9) 2" hose and fittings, total length of 350 ft

10) 3" hose and fittings, total length 900 ft

11) 1-1/2" hose and fittings, total length of 200 ft

12) 1" hose and fittings, total length of 150 ft

13) 2- 3" 150# crosses

14) spray shields and collection pans for each flanged joint in the flow path. Catch pans to be set beneath the 43 and 53 isolation valves. (CB & I supplied.

15) hydrostatic test pump

16) An overhead crane (or forklift truck) with a 6 ton rating. If a forklift truck is used, the required fork length is 8-1/2'.

17) Eberline E-530N equipped with a HP220A tungsten shielded detector (supplied and calibrated by LN)

18) One Gamma meter having a range of 0 to 1000 R/hr (supplied by Station.)

19) Two Gamma meters having a range of 0 to 2 R/hr (supplied by Station).

20) Station approved plastic sheeting to cover torus vents. (PECo supplied).

6.0 PROCEDURES

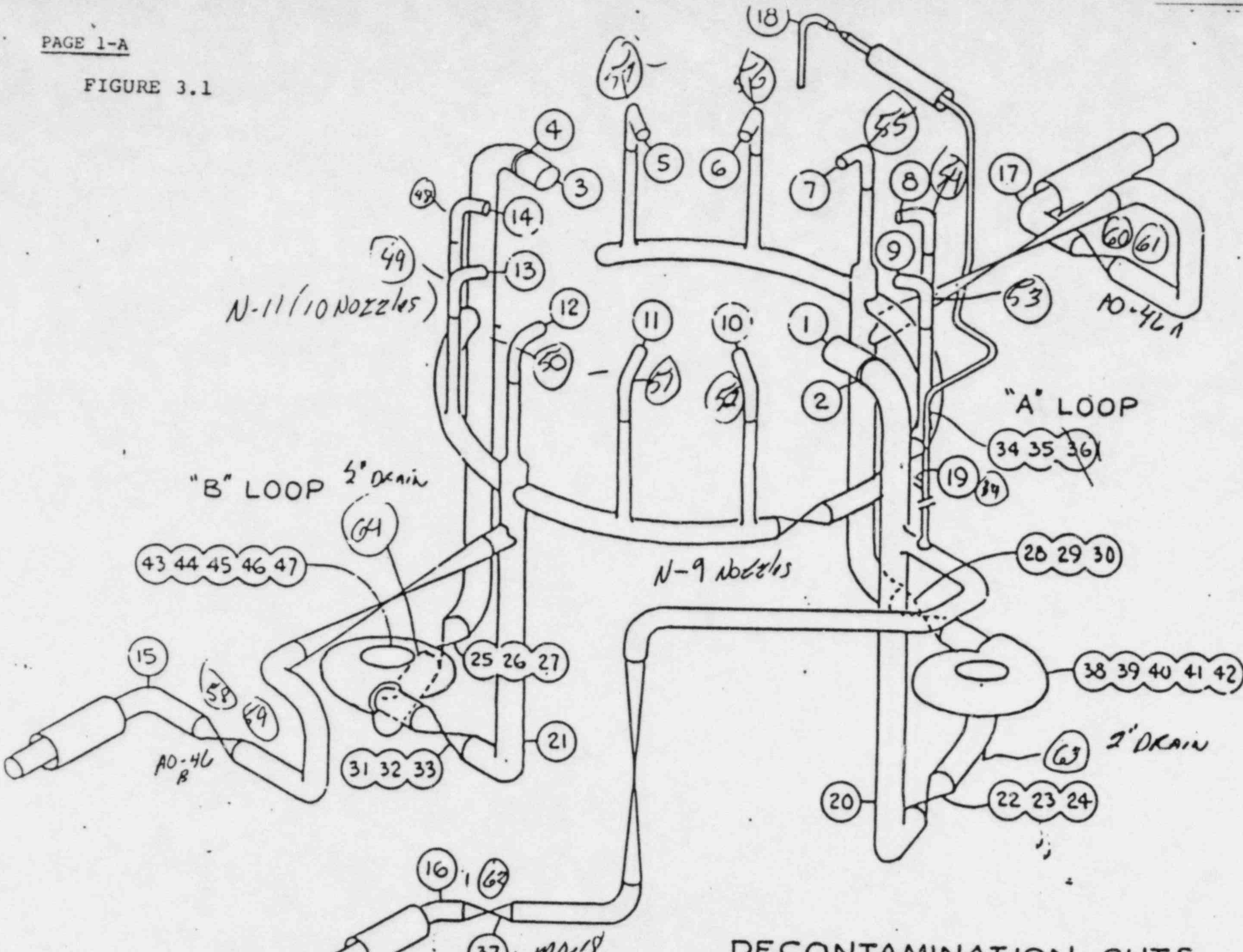
6.1 Applicability

The decontamination effort, for Peach Bottom Unit #2 Recirculation System, is a one time application prior to replacing the piping in this system and segments of piping in associated systems.

The decontamination system is based on the "all cut scenerio" which eliminates any process fluid from entering the vessel. Prior to cutting the various segments of pipe, it is assumed all preliminary preparations have been carried out as outlined in the Peach Bottom Unit 2 Recirculation Piping Decontamination Activity Schedule, latest revision. The procedure, therefore, is based on receiving the recirculation system in a drained depressurized state with all the appropriate adapters on the cut pipe ends.

The procedure outlines the tasks required to setup the decontamination flow path, to operate and monitor the decontamination equipment and process and to dismantle the temporary connections and components used during this effort.

FIGURE 3.1



DECONTAMINATION CUTS
IDENTIFICATION

6.2 DEFINITIONS

The following terminology is frequently used in the text of the procedure:

Decontamination Connection

"Decontamination connection" is a spool piece fabricated to mate with LN 3"-150# flanged hose fitting and the 4"-900# extended flanges located at the suction of both A and B recirculation pumps. These connections are used as tie-in locations for the decontamination equipment.

Suction Side Decontamination

"Suction side decontamination" is the portion of the recirculation piping system which consists of the piping from the closed recirculation pump discharge valve, through the pump and pump suction isolation valve through the recirculation piping up to the safe ends through the 3" hose connected to the safe end on the suction line of the other loop. Two segments of additional piping, (RHR supply and RWCU suction), are included in this flow path as well (refer to Drawing 3838-5001-3 and 3838-B-5001-4).

Discharge Side Decontamination

"Discharge side decontamination" is the portion of the recirculation piping system which consists of the piping from the closed recirculation pump suction valves, through the pump and pump discharge piping, header and the risers through the temporary decon manifold header to the risers, header and discharge piping of the other loop. Two segments of additional piping, (RHR return loop A and RHR return loop B), are included in this flow path as well (refer to Drawing 3838-B-5001-1 and 3838-B-5001-2).

Decontamination System

This terminology refers to all piping, valves, components etc. that will be in contact with the CAN-DECON reagent, therefore the decontamination system consists of the recirculation discharge and suction, RHR return, RHR supply and RWCU lines and the decontamination equipment as well.

6.3 Receipt and Uncrating of LN Equipment

a) Inspect exterior of all shipping crates for possible damage. Verify arrival of all containers.

LNEC

b) Inspect all paperwork pertaining to shipment including:

1) health physics surveys

HP

2) invoice - if any damage is apparent at this time or if crates were not tarped during shipment, ensure it is noted on invoice before acceptance. Have driver sign and, if possible, photograph apparent damage. Notify LN offices immediately.

LNEC

c) Lift equipment from truck with overhead crane or forklift truck.

LNEC

d) If necessary, temporarily store equipment, accompanying hoses and fittings indoors, if possible, leaving a minimum of 2'-0" on all sides for uncrating.

e) HP coverage required. Uncrate skids by removing all lag bolts from top section. Lift top off and out of way. (Check sides of top marked for proper alignment during re-assembly.)

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LNEC

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HP

f) Depending on equipment availability and overhead clearance, skids can either be lifted out of crate through top (<u>must</u> use lifting lugs, located on top of pump skid and on bottom of IX skid), or can remove sides by removing lag bolts on corners and bottom (mark all joints before removing to insure proper realignment during re-assembly).

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LNEC

g) Lift skids off bottom of crates. Lower wheels on skids by tightening nuts on wheel channels located on corners of skids and roll into place as per 3838-L-2000-1.

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LNEC

h) Receipt inspection.

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LNEC/GEQA

6.4 <u>Mechanical Installation and Interconnections</u>

THIS SECTION DEFINES THE FIELD RUN PIPE, HOSE SUPPORT AND JOINT CONNECTION ARRANGEMENT FOR THE TEMPORARY DECONTAMINATION FLOW PATH. SEE THE FOLLOWING REFERENCES AND INSTRUCTIONS REQUIRED TO COMPLETE STEPS 6.4 a) THROUGH 6.4 v). CONTINUOUS HP COVERAGE IS REQUIRED.

1) Drawings 3603-B-5001-1 and 3603-A-5005-1

2) Figure 6.3 Routing of Decon Hose.

3) Figure 6.4.1, Flange Joint General Arrangement.

4) Figure 6.4.2, RHR Return - Loop 'A' Joint Arrangement

5) Figure 6.4.3, RHR Return - Loop 'B' Joint Arrangement

6) Figure 6.4.4, RHR Suction Joint Arrangement.

7) Figure 6.4.5, Nozzle N6A Joint Arrangement

8) Figure 6.4.6, Nozzle N6B Joint Arrangement

9) Figure 6.4.7, RWCU Joint Arrangement

10) Figure 6.4.8, N2A - N2B Manifold and Jumper Joint Arrangement.

11) Figure 6.4.9, N1A, N1B Joint Arrangement.

12) Figure 6.4.10, Flange Joint Bolt-Up Data Sheet.

ALL HOSE IS FIELD RUN, HOSE CLAMP/RESTRAINTS SHALL BE UTILIZED TO BEAR THE UNSUPPORTED LOAD OF WATER FILLED HOSE, THE CLAMPS/RESTRAINTS SHALL BE SECURED TO AVAILABLE RAILINGS, GRATES, STEEL BEAMS OR NON-VITAL PIPE.

HOSE PROTECTORS SHALL BE INSTALLED AT LOCATIONS WHERE CONTINUOUS PERSONNEL ACCESS OVER INSTALLED HOSE IS NECESSARY. LIMITED ACCESS LOCATIONS WILL NOT BE COVERED WITH HOSE PROTECTORS. HOSE WILL BE RUN HORIZONTIALLY WHERE POSSIBLE, TO PERMIT LAYING FLANGED JOINTS ON THE DECK. LEAK COLLECTION PANS WILL BE INSTALLED UNDER FLANGED JOINTS WHERE POSSIBLE. SPLASH SHIELDS WILL BE PLACED OVER EACH FLANGED HOSE CONNECTION JOINT. LEAK COLLECTION PANS WILL BE PLACED UNDER THE 43A/B AND 53A/B MO VALVES.

HOSE CRADLES WILL BE INSTALLED AT LOCATIONS WHERE HOSE MUST RUN OVER SHARP EDGES.

A FLANGE JOINT BOLT-UP DATA SHEET WILL BE COMPLETED FOR ALL FLANGE CONNECTIONS AND NOTED ON THE FLANGE JOINT ARRANGEMENT DATA SHEET, TABLES 6.4.2 - 6.4.9. DATA SHEETS SHALL BE ATTACHED TO THIS PROCEDURE AS APPENDIX D.

SHOULD IT BECOME NECESSARY TO FIELD ASSEMBLE A HOSE TO NIPPLE CONNECTION. SEE APPENDIX C, SPECIAL ASSEMBLY INSTRUCTIONS.

a) CB&I - interconnect pump skid, ion exchange skid and heating skid using 2" and 3" hoses, and install isolation valves at the ends of the hose between heater skid and pump skid.

LNEC/GEQA

b) CB&I - Bolt one 3" cross-tee fitting together and connect to decontamination equipment suction.

LNEC/GEQA

c) CB&I - connect 3" suction hose to decontamination equipment and run to decontamination connection at recirculation pump "B" suction.

- CB&I - install 3" isolating valve at each end of hose prior to connection

  LNEC/GEQA

- CB&I - make final connection between hose and decontamination connection

  GE-QA/LNEC

LN - SUPPLY 3"-150# RF X 4"-900# T/G REDUCER.

d) CB&I - connect 3" hose to decontamination equipment suction and run to RHR return Loop 'B' connection. (Tie-in point upstream of valve AO-10-46B).

LNEC/GEQA

- CB&I - install 3" isolating valve at each end of hose prior to connection

LNEC/GEQA

- CB&I - make final connection between hose and RHR loop "B" connection

GEQA/LNEC

CONNECTION PREPARED WITH 3", 150# FLANGE

e) CB&I - connect 3" hose to decontamination equipment suction and run to RHR return loop "A" connection. (Tie-in point is upstream of valve AO-10-46A.)

LNEC/GEQA

- CB&I - install 3" isolating valve at each end of hose prior to connection

LNEC/GEQA

- CB&I - make final connection between hose and RHR loop "A" connection

GEQA/LNEC

CONNECTION PREPARED WITH 3", 150# FLANGE

f) CB&I - connect 3" discharge hose to decontamination equipment at auxiliary electric heater skid inlet.

LNEC/GEQA

g) CB&I - bolt one 3" - cross-tee fitting to auxiliary electric heater outlet.

LNEC/GEQA

h) CB&I - connect 3" hose at auxiliary electric heater outlet and run to decontamination connection at recirculation pump "A" suction.

LNEC/GEQA

1) CB&I - install 3" isolating valve at each end of hose prior to connection

LNEC/GEQA

2) CB&I - make final connection between 3" hose and decontamination connection

GEQA/LNEC

LN TO SUPPLY 3"-150# RF X 4"-900# T/G REDUCER.

i) CB&I - connect 3" hose to decontamination equipment discharge and run to RHR supply connection. (Tie-in point is downstream of valve MO-18.)

LNEC/GEQA

- CB&I - install 3" isolating valve at each end of hose prior to connection

LNEC/GEQA

- CB&I - make final connection between hose and RHR supply connection

GEQA/LNEC

CONNECTION PREPARED WITH 3", 150# FLANGE

j) CB&I - connect 3" hose to decontamination equipment discharge and run to RWCU connection.

LNEC/GEQA

- CB&I - install 3" isolating valve at each end of hose prior to connection.

LNEC/GEQA

- CB&I - make final connection between hose and RWCU connection

GEQA/LNEC

CONNECTION PREPARED WITH 3", 150# FLANGE

k) SP - supply and locate lead shield blankets on interconnecting hoses, so as to minimize radiation exposure in the immediate vicinity of the pump and ion exchange skids.

STATION MAINTENANCE & HP

l) CB&I - run and connect 3" hose from recirculation suction loop"A" connection to recirculation suction loop"B" connection. (See Drawing 3838-B-5000-1.)

GEQA/LNEC

CONNECTIONS PREPARED WITH 3", 150# FLANGES

- CB&I - install 3" isolating valve at each end of hose prior to connection

LNEC/GEQA

m) CB&I - run 2" hose from all 5 riser connections on loop "B" and connect to manifold.

GE-QA/LNEC

- CB&I - install 2" isolating valve on riser end of hose prior to connection

GE-QA/LNEC

- CB&I - install manifold as per Drawing 112D3501

GE-QA/LNEC

n) CB&I - run 2" hose from all 5 riser connections on loop "A" and connect to manifold.

GE-QA/LNEC

- CB&I - to install 2" isolating valve on riser end of hose prior to connection

LNEC/GEQA

- CB&I - install manifold as per Drawing 112D3501.

GE-QA/LNEC

o) CB&I - run 3" hose from loop "A" manifold connection to loop "B" 3" connection, and connect.

GE-QA/LNEC

- CB&I - install 3" isolating valves at each end of hose prior to connection

LNEC/GEQA

p) CB&I - connect 1-1/2" hose to decontamination equipment and run to Station service water supply.

LNEC/GEQA

- CB&I - make final connection between service water supply connection and hose

GE-QA/LNEC

- CB&I - install tell-tale drain line between service water supply and decontamination equipment, complete with isolation valve.

q) CB&I - connect 1-1/2" hose and run to Station Rad waste (local floor drain).

LNEC/GEQA

- CB&I - make final connection between cooling water return connection and hose

GE-QA/LNEC

r) CB&I - connect 1" hose from decontamination pump skid and run to Station floor drain.

GE-QA/LNEC

CB&I - verify drain is unplugged

SP

s) CB&I - connect 1" hose from electric heater skid and run to Station floor drain.

LNEC/GEQA

CB&I - verify drain is unplugged

GE-QA/LNEC

t) CB&I - connect 1" hose from ion exchange skid and run to Station floor drain.

LNEC/GEQA

CB&I - verify drain is unplugged

GE-QA/LNEC

u) CB&I - connect 1-1/2" hose to line CD1-1/2" located on ion exchange skid and run to Station condensate transfer supply.

- CB&I - install tell-tale drain line between ~~service water~~ condensate transfer supply and decontamination equipment complete with isolation valve

1" CONDENSATE SUPPLY LINE LOCATED ON PUMP SKID (LN-1) WILL NOT BE USED.

LNEC/GEQA

- CB&I - make final connection between hose and condensate transfer supply or demin water

GE-QA/LNEC

v) CB&I - connect 1-1/2" slurry hose and run to liner.

LNEC/GEQA

- CB&I - make final connection between hose and liner.

GE-QA/LNEC

- CB&I - supply 1-1/2" - 150# RF x 4"-150# RF reducer

w) CB&I - connect Nitrogen cylinder c/w regulator (adjustable within the range 10-100 psig) to decontamination equipment.

LNEC/GEQA

x) LN install corrosion coupons.

LNEC/GEQA

y) LN load ion exchange resins as per Section 6.7.2. This is initial loading.

6.5 Temporary Shielding

a) CB&I - construct temporary shielding (dense concrete blocks) around the ion exchange skid as detailed on LN Drawing 3603-B-5001-1.

MAINTENANCE/GEQA

b) CB&I - lay lead blankets on temporary hose lines, located near pump skid.

MAINTENANCE/GEQA

SHIELD WALL MAY BE CONSTRUCTED DURING EQUIPMENT SETUP.

Verify concrete shielding blocks are installed as designated and that no cracks are present.

LNEC/HP

6.6 Electrical Connections

a) PECo El Construction - install a 480 Volt, 300 Amp, 3 phase power to LN pump skid (see LN Drawing 3603-B-5001-1).

PECo El Const./GEQA

b) PECo El Construction - supply 480 Volt, 400 Amp, 3 phase power to electric heater skid (see LN Drawing 3603-A-5005-1).

PECo El Constr./GEQA

SUMMARY - 6.3 - 6.6

Final Verification of Completion of Equipment Installation.

LNEC/GEQA

6.7 Preparation for Startup

6.7.1 Decontamination System Verification

a) Verify that Decontamination equipment is isolated from Recirculation Piping System by closing the following valves (if open):

CU1-V1	Hose Isolation - Process End
CU3-V4	Hose Isolation - Process End
V1	RHR Return "A" Isolation - Skid End
V2	RHR Return "B" Isolation - Skid End
V5	RHR Supply Isolation - Skid End
V6	RWCU Isolation - Skid End

LNEC/GEQA

b) Verify that decontamination equipment is connected to Station services and process systems as described in Sections 6.4 to 6.6 of this procedure.

LNEC/GEQA

c) Verify that following Station services are available:

1) condensate transfer available to line CD-301

2) service water available to line CW-301

3) power available to the auxiliary equipment and supplementary heater skids

LNEC/GEQA

d) Verify that corrosion coupons are installed in CU-103.

LNEC/GEQA

e) Verify that the status of the decontamination valves and equipment is as per Tables 6.1, 6.2 and 6.3 (see LN Drawing 3603-C-5000-1) with the exceptions given in 6.7.1(a). If not, correct positions

LNEC/GEQA

6.7.2 **Addition of Ion Exchange Resin**

Add ion exchange resin to each ion exchange column as follows. Equipment designations are for column CU-201. Equivalent designations for columns CU-202 and CU-203 are shown in brackets respectively.

a) Open CV1-V1 (CV1-V2/V3) to relieve any pressure in the vessel.

b) Close CU4-V1 (CU4-V2/V3) and CU5-V1 (CU5-V2/V3)

c) Remove access flange.

d) Fill CU-201 approximately one third full of condensate or demin by opening CD1-V4 and adjusting CD1-V1 (CD1-V2/V3).

e) Fill CU-201 (CU-202/203) with resin as indicated below:

6.5 ft^3 IRN-77 (strong acid cation)
and 0.5 ft^3 IRN-78 (strong base anion) on top of the IRN-77

MAINTAIN WATER LEVEL AT OR ABOVE THAT OF THE RESIN DURING ADDITION.

THIS SECTION IS USED FOR ALL RESIN LOADING INCLUDING THE INITIAL FILL DESCRIBED IN SECTION 6.4 (Y).

f) Once addition of resin is complete, raise water level to top of flange, reinstall access flange and fill column with water by opening CD1-V1 (CD1-V2/V3).

g) When water appears at vent pot CV-206, close CD1-V1 (CD1-V2/V3), CV1-V1 (CV1-V2/V3) and CD1-V4.

h) Lock RS1-V6 shut to avoid any inadvertent manipulation during the decontamination.

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LNEC/GEQA

Ion exchange resin loaded.

6.7.3 Initial Filling and Venting (HP Hold Point)

a) The decontamination equipment is initially filled while the equipment remains isolated from the recirculation system. Prior to filling all the components on decontamination equipment are placed on line by opening or verifying open the following valves:

CU2-V6	Main Cooler Inlet
CU6-V1	Reverse Flow Isolation
CU7-V1	Reverse Flow Isolation
CD2-V2	Surge Tank Isolation
CS1-V1	Before Sample Isolation
CS1-V2	Before Sample Isolation
CS3-V1	After IX Sample Isolation
CS3-V2	After IX Sample Isolation
CI2-V1	Chemical Injection Inlet Isolation
CI3-V1	Chemical Injection Outlet Isolation
CU4-V9	Purification Flow Control
CU5-V8	Purification Flow Control
CU4-V3	IX CU-203 Inlet
CU5-V3	IX CU-203 Outlet
CU4-V2	IX CU-202 Inlet
CU5-V2	IX CU-202 Outlet
CU4-V1	IX CU-201 Inlet
CU5-V1	IX CU-201 Outlet

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LNEC/GEQA

b) Open, or verify open, CD1-V4 and CD1-V6 while surge tank sight glass indication is monitored. Once the water level rises to the low water level mark on the tank, throttle back on CD1-V4.

At this point, all components on LN equipment are vented individually as follows:

c) Open CV5-V1 to vent chemical injection vessel CI-101, when flow is verified to SG-101, close CV5-V1.

d) Open CV4-V1 to vent main cooler CU-104 outlet line, once flow is verified to SG-101, close CV4-V1.

e) Open CV3-V1 to vent heater CU-105, once flow is verified to SG-101, close CV3-V1.

f) Open CS4-V1 to vent sample lines, once flow to sample sink is verified, close CS4-V1.

g) Open CV1-V1, to vent ion exchange column CU-201, when flow is verified through SG-202, close CV1-V1.

h) Open CV1-V2 to vent ion exchange column CU-202, when flow is verified through SG-202, close CV1-V2.

i) Open CV1-V3 to vent ion exchange column CU-203, when flow is verified through SG-202, close CV1-V3.

j) Open CV10-V1 to vent electric heater skid (Skid 4) process line, when flow is verified through SG-401, close CV10-V1.

k) Close CD1-V4 and CD1-V6. Isolate condensate supply (station side).

l) Supply cooling water to main cooler (CU-104) and sample cooler (CS-101) by opening CW2-V1 and CW3-V1. When condensate appears on sample cooler coil, then cooling water flow is verified. Close valves CW2-V1 and CW3-V1. Isolate cooling water supply (station side) and open tell-tale to drain.

Decontaminacion equipment filled/vented

LNEC/GE-QA

6.8 Pre-Operational Testing of Decontamination Equipment

Carry out a series of tests on the decontamination equipment prior to system startup. These are as follows:

6.8.1 Heater Circuit Test

a) Energize the power supplies to heater CU-105 by switching circuit breaker switches to ON.

b) Select individual heater control panel switches to ON. Verify heaters will not energize in the no flow condition.

c) Turn off or verify off all heater switches.
Heater circuit test complete.

LNEC/GE-QA

6.8.2 Decontamination Equipment Leak Test (HP Hold Point)

MONITOR HYDRO PRESSURE CONSTANTLY, USING CALIBRATED GAUGE ON PUMP SKID TO PROTECT AGAINST OVER-PRESSURIZATION

Hydro test the decontamination equipment to 225 psig by the following method (HP PRESENT FOR LEAK TEST).

a) Install hydrostatic test pump to line HT2-1/2" skid. Open valve HT2-V1.

b) Isolate all pressure gauges by closing valves CU1-V5, CU3-V5, CU2-V10, CU2-V11, CI1-V3, CU10-V5, CU11-V4 CU1-V6.

c) Use the hydrostatic test pump to increase system pressure to 130 psig. At this point, the relief valves RV1-V1, RV1-V2, RV1-V3 and RV10-V1 are individually checked to ensure each valve relieves.

d) If required, reset the relief valves until they relieve at the desired pressure of 130 psig. Upon satisfactory operation, each relief valve is removed or plugged for the duration of the system leak test.

e) Increase system pressure to 225 psig in steps as indicated on pressure indicator located on hydrostatic test pump.

f) Hold pressure at 225 psig ($\pm$ 23 psig) for a minimum of 30 minutes.

g) Check all exposed joints for leaks.

h) After the system is checked for leaks and the necessary adjustments are completed, decrease the system pressure to 125 psig by opening CV2-V1, close HT2-V1, and disconnect the hydrostatic test pump.

ALLOWABLE TOLERANCE DURING HYDROSTATIC TEST IS 10% OVER 30 MINUTE INTERVAL.

pressure drip tolerance

i) Secure demineralized water or condensate flow

j) Open valves CU1-V5, CU3-V5, CU2-V10, CU2-V11, CI1-V3, CU10-V5 and CU11-V4 CU1-V6.

System leak test complete.

NEC/GE-QA

6.8 3 **High/Low Pressure Switch Check** No. 1

a) With the equipment pressure at 125 psig as per Section 6.8.2, the control switch for circulating pump CU-102 is selected to ON. Verify CU-102 will not energize in the high pressure condition. Return pump switch to OFF position.

b) Open CV2-V1 to lower pressure (PI-101) to 20 psig, then close CV2-V1.

c) Select CU-102 control switch to ON. Verify CU-102 will not energize in the low pressure condition.

d) Lower pressure to atmospheric and reinstall relief valves RV1-V1, RV1-V2 and RV1-V3 and remove plug from RV10-V1.

Pressure switch test complete.

LNEC/GE-QA

6.8.4 Circulating Pump (CU-102) Test

This test is performed with the decontamination equipment isolated from the recirculation system.

a) Open, or check open the following valves:

CU1-V3	Skid Inlet Isolation
CU1-V4	Circulation Pump Suction
CU2-V9	Heater Inlet Isolation
CU3-V1	Heater Outlet Isolation
CU6-V1	Reverse Flow Isolation
CD2-V2	Surge Tank Isolation

b) Close or check closed the following valves:

CU1-V2	Hose Isolation Skid End
CU10-V1	Hose Isolation
CU5-V8	Purification Flow Control
CU2-V3	Circulation Pump Discharge
CU4-V4	IX Cleanup Inlet Isolation
CU5-V4	IX Cleanup Outlet Isolation
CU3-V2	Skid Outlet Isolation
V1	RHR Return "A" Isolation
V2	RHR Return "B" Isolation
CU2-V2	Circulation Pump Bypass

c) Adjust pressure in decontamination equipment to 35 psig by opening ST1-V1, and ST1-V2 until PI-101 indicates required pressure.

d) Adjust valve CU2-V8 to one turn open.

e) Push start button for circulation pump CU-102.

f) Slowly open valve CU2-V8.

g) Adjust flow in pump skid loop to 250 GPM ± 50 GPM by opening valves CU2-V8 and CU2-V2. Monitor flow on indicator FI-101.

Pump Test Complete ________ LN/GE-QA

6.8.5 **High/Low Pressure Switch Check - No. 2**

Recheck the pressure switches during pump open flow test to ensure the circulation pump CU-102 will shutdown on increasing and decreasing pressure conditions.

a) Increasing Pressure

1) Place nitrogen cylinder on line and slowly increase system pressure to <u>100</u> psig ± 5 psig (high pressure setpoint <u>125</u> psig ± 5 psig) as indicated on PI-102 by opening valve ST1-V1 and ST1-V2. Continue to increase pressure until circulation pump CU-102 stops on high pressure trip. Close ST1-V1 and ST1-V2. Adjustments to setpoint must be made at this time and the procedure repeated as necessary.

2) Depressurize system to <u>35</u> psig ± 5 psig as indicated on PI-101 by opening valve CV2-V1.

3) Restart circulating pump CU-102 by opening CU2-V2 and throttling CU2-V8 to <u>1</u> turn open. Start pump and throttle flow to 250 ±50 GPM as indicated on FI-101.

b) Decreasing Pressure

1) While circulation pump CU-102 is running, lower system pressure below setpoint (30 psig ± 4 psig) by opening valve CV2-V1. Continue to decrease pressure until CU-102 stops on low pressure trip. Close CV2-V1. Adjustments to setpoint must be made at the time, and if so, repeat check.

2) On completion of check, place the nitrogen cylinder on line by opening valve ST1-V1 and ST1-V2 to increase system pressure to 45 psig ± 10 psig.

3) Restart circulating pump CU-102 by opening valve CU2-V2 and throttling valve CU2-V8 to 1 turn open. Start pump and throttle flow to 250 GPM ± 50 GPM as indicated on FI-101.

High/Low Pressure Switch Check - No. 2 Complete

LNEC/GE-QA

6.8.6 Flow Check Through Ion Exchange Columns

a) Check valve CU4-V13 is closed and open valves CU4-V4 and CU5-V4. Monitor flow indicator FI-202.

b) Adjust flow in ion exchange skid to approximately 40 GPM on FI-202 by adjusting valve CU2-V8. Enter on log sheet as per table 6.10.

c) Check flow in each ion exchange column by:

1) closing valves CU4-V1/V2 and monitoring flow indicator FI-202 to check flow through ion exchange column CU-203. Record FI-202 reading

2) open valve CU4-V2 and close valve CU4-V3. Monitor FI-202 to check flow through ion exchange column CU-202. Record and compare with previous flow through CU-203.

3) open valve CU4-V1 and close valve CU4-V2. Monitor FI-202 to check flow through ion exchange column CU-201. Compare with previous flows through CU-203 and CU-202.

THE FLOWS THROUGH EACH COLUMN SHALL AGREE WITHIN 5 GPM. IF THIS IS NOT THE CASE, REPEAT THE TEST TO LOCATE AND RECTIFY THE PROBLEM.

LNEC/GE-QA

d) Upon completion, open valves CU4-V1/V2/V3 and leave the ion exchange columns valved in.

Ion exchange column flow check complete.

LNEC/GE-QA

6.8.7 Heater Control Checks

a) Check high temperature cutoff switch is set to 285°F.

b) Turn CU-105 heater switches on.

c) Check indication lights are on.

d) Check operation of high temperature cutoff switch by adjusting temperature cutoff below indicated temperature.

e) Repeat sets (a) through (d) for heater CU-401.

f) Restore set points to normal condition (285°F).

Both heater control checks complete.

LNEC/GE-QA

6.9 Preparation of the Recirculation Decontamination System

Both the suction and discharge sides of the recirculation decontamination system are filled, vented and tested for leaks simultaneously. All further tests and decontamination will be carried out separately.

PERIODIC WALK-DOWN OF THE SYSTEM SHALL BE INITIATED WHEN THE HOSES AND SYSTEM ARE PRESSURIZED. THE INTEGRITY OF FILLED PRESSURIZED HOSE, HOSE (FLANGE AND NIPPLE) CONNECTIONS AND COMPONENT JOINTS SHALL BE VERIFIED. WALK-DOWN SHALL BE CONDUCTED ON THE HOUR AND HALF HOUR BY TWO ASSIGNED PERSONNEL. ALL OBSERVATIONS SHALL BE RECORDED IN A LOG MAINTAINED BY THE DECONTAMINATION SUPERVISOR. THE CONTROL ROOM X 4223 or X 4423 SHALL BE NOTIFIED OF ANY SIGNIFICANT LEAKAGE FROM PLANT SYSTEMS OR EQUIPMENT.

6.9.1 Decontamination System Valve Status

a) Align Recirculation RHR and RWCU system valve as follows:

Valve Designation	Description	Position
MO-53A	Recirculation Pump "A" Discharge Isolation	Open
MO-53B	Recirculation Pump "B" Discharge Isolation	Open
MO-43A	Recirculation Pump "A" Suction Isolation	Open
MO-43B	Recirculation Pump "B" Suction Isolation	Open
MO-66A	Ring Header "A" Bypass	Open
MO-66B	Ring Header "B" Bypass	Open
MO-65A	Ring Header "A" Crosstie	Open
MO-65B	Ring Header "B" Crosstie	Open
POS-81A	RHR Return "A"	Open
POS-81B	RHR Return "B"	Open
AO-46A	RHR Return "A" Check	Open
AO-46B	RHR Return "B" Check	Open
MO12-15	RWCU Suction Isolation	Open
MAN 12-46	RWCU Suction	Open
MO-10-18	RHR Supply	Open
MAN10-88	RHR Supply	Open
M0-12-18	RWCU Supply	Open
163A	RHR Return 'A' Check By-Pass	Open
163B	RHR Return 'B' Check By-Pass	Open

b) Check open, or open, all temporary valves V1 through V26 as per Table 6.4

LNDC/GE-QA

6.9.2 Filling and Venting (HP Hold Point)

a) Open/check open the following valves:

CU1-V1	Hose Isolation Process End
CU1-V2	Hose Isolation Skid End
CU10-V1	Hose Isolation
CU2-V3	Circulation Pump Discharge Isolation
CU3-V4	Hose Isolation Process End
CU3-V1	Heater Outlet Isolation
CU3-V2	Skid Outlet Isolation
CU2-V8	Main Cooler Bypass
CU2-V9	Heater Inlet Isolation
CU10-V2	Hose Isolation
CU3-V3	Hose Isolation Skid End
CU6-V1	Reverse Flow Isolation
CU7-V1	Reverse Flow Isolation
CU4-V4	IX Cleanup Isolation
CU4-V14	Hose CU-301 Isolation
CU4-V15	Hose CU-301 Isolation
V11	Recirculation Loop "A" Suction Vent
V12	Recirculation Loop "B" Suction Vent
V27	RWCU Vent

b) Check and record reading on TM-201, totalizing flow meter.

c) Open CD1-V4 and adjust CD1-V6 open to obtain a reasonable fill rate on TM-201 (using condensate water supply).

d) Check decontamination system temporary connections inside and outside drywell for leakage.

e) When system water inventory approaches 9200 gallons, as indicated on TM-201, throttle back on CD1-V6 and monitor drains from temporary vent valves V11, V12, and V27.

f) Close V11, V12, and V27 as water appears in its respective drain line.

g) Flow is reverified through ion exchange columns by opening CV1-V1 (CV1-V2/V3). When flow is verified through SG-201, CV1-V1 (CV1-V2/V3) is closed.

h) Close CD4-V1 and CD1-V6 when system is full of water.

System is filled and vented.

LNEC/GE-QA

6.9.3 **System Leak Test (HP Hold Point)**

a) Place the nitrogen cylinder on line by opening ST1-V1 and ST1-V2 and the Nitrogen gas cover pressure is gradually increased to 125 psig on pressure indicator PI-101. Close ST1-V1.

b) Hold pressure at 125 psig (± 5 psig) for a minimum of 30 minutes.

c) Check all exposed joints for leaks, and complete the necessary adjustments, crack open CV2-V1 and reduce the pressure to approximately 35 psig. Close CV2-V1.

d) If leaks are detected in system, repair per GE recommendation, and MRF's for station equipment.

e) If leaks are detected in the LN decontamination equipment and/or temporary connections, then corrective action shall be taken as deemed necessary.

System leak test completed.

LNDC/GE-QA

6.10 Preoperational Testing - Suction Side

6.10.1 Pre-decontamination Radiation Survey

a) Perform initial radiation survey of recirculation system as detailed in Section 6.27.

LN/GEQA/HP

6.10.2 Valve Status

a) Position valves in accordance with Tables 6.1 through 6.5 for initial valve status to commence preoperational testing on the suction side.

Table 6.2, 6.2, 6.3 and 6.4 ____________ LNDC/GE-QA/

Table 6.5 ____________ Unit 2 Operator

b) Close the following valves:

V1	RHR Return "A" Isolation - Skid End
V2	RHR Return "B" Isolation - Skid End
V5	RHR Supply Isolation - Skid End
V6	RWCU Isolation - Skid End
CU2-V2	Circulation Pump Bypass
CU4-V4	IX Cleanup Inlet

LNDC/GE-QA

6.10.3 Flow Test at Operating Conditions

a) Notify Unit 2 Operator to secure drywell coolers during heat-up and decon.

LN-GEQA

b) Throttle CU2-V8 to 1 turn open.

c) Start circulating pump CU-102 and throttle flow to approximately 250 ± 50 GPM by opening CU2-V8 and adjusting CU2-V2 to a cracked open position.

d) Once flow is established in the recirculation suction lines, then valve in RHR and RWCU lines by opening valves V5 and V6. Check all temporary connections inside and outside drywell for leakage.

e) Vent decontamination system as necessary.

f) Check flow through RHR supply line by closing valves CU3-V3 and V6. Monitor FI-101.

g) Check flow through RWCU line by opening V6 and closing V5. Monitor FI-101.

h) On completion of satisfactory flow through the recirculation suction, RWCU and RHR supply lines open valves CU3-V3 and V5 and commence heatup.

i) Select heater CU-105 to auto to commence heatup to 250°F ± 5°F.

j) Select auxiliary electric heater CU-401 to"auto".

k) As temperature is heating up, bleed-off system to maintain a system pressure of 40 psig ± 5 psig as indicated on PI-101. This is accomplished by opening valves CD2-V2 and RD2-V4 as necessary.

l) Monitor system, once temperature is reached, hold for at least 30 minutes. Check all temporary connections inside and outside drywell for leaks, when temperature reaches 200°F and again at 250°F ± 5°F. Take corrective action to repair leaks.

Record in Operations Log Sheet, Table 6.10. Temporary hand-held temperature read-out devices will be used to monitor temperatures around the circuit.

LNDC/GEQA (200°F) LNDC/GEQA (250°F)

m) On completion of satisfactory operation, select heaters CU-105 and CU-401 to OFF. Allow temperature to drop below 200°F.

n) On completion of test, select CU-102 to OFF.

LNDC/GE-QA

6.11 Preoperational Testing - Discharge Side

6.11.1 **Valve Status**

a) Position valves as per Tables 6.1, 6.2, 6.3, 6.4, and 6.6 to commence preoperational testing on the discharge side.

Table 6.1, 6.2, 6.3 and 6.4

LNDC/GE-QA

Table 6.6

Unit 2 Operator

b) Close the following valves:

V1	RHR Return "A" Isolation - Skid End
V2	RHR Return "B" Isolation - Skid End
V5	RHR Supply Isolation - Skid End
V6	RWCU Pump Bypass
CU2-V2	Circulation Pump Bypass
CU4-V4	IX Cleanup Inlet

LNDC/GE-QA

6.11.2 **Flow Test at Operating Conditions**

a) Throttle CU2-V8 to 1 turn open.

b) Start circulating pump CU-102 and throttle flow to approximately 250 GPM ± 50 GPM on flow indicator FI-101 by opening CU2-V8 and adjusting CU2-V2, to a cracked open position.

c) Vent decontamination system as necessary.

d) Once flow is established in the recirculation discharge lines, then valve in RHR return lines by opening valves V1 and V2. Check all temporary connections inside and outside drywell for leakage.

e) Monitor flow indicator FI-101 and continue venting as required.

f) Flow through RHR return "B" line is checked by closing valves CU1-V2 and V1. Monitor FI-101.

g) Flow through RHR return "A" line is checked by opening V1 and closing V2. Monitor FI-101.

h) On completion of satisfactory operation, open CU1-V2 and V2 and commence heatup.

i) Select heater CU-105, to auto to commence heatup to 250°F ± 5°F.

j) Select auxiliary electric heater CU-401 to auto.

k) As temperature is heating up, system shall be bled-off to maintain a system pressure of 40 psig as indicated on PI-101. This is accomplished by opening valves CD2-V2 and RD2-V4 as necessary.

l) Monitor system, once temperature is reached, hold for at least 30 minutes. Check all temporary connections inside and outside drywell for leaks, when temperature reaches 200°F and again at 250°F ± 5°F. Take corrective action to fix leaks. Record in Operations Log Sheet, Table 6.10. Temporary, hand-held temperature read-out devices will be used to monitor temperatures.

m) On completion of satisfactory operation, maintain system temperature at 250°F ± 5°F.

Flow test at operating conditions completed.

LNDC/GEQA (200°F)	LNDC/GEQA (250°F)

6.12 Discharge Side Decontamination

The following subsections detail the procedure used for performing the decontamination of the discharge side of the recirculation piping and RHR return lines. To decontaminate effectively, the discharge side is divided into two separate flow paths. Refer to LN Drawings 3838-B-5001-1, Flow Path #1 and 3838-B-5001-2, Flow Path #2. Piping and components on Flow Path #1 will be decontaminated first, then Flow Path #2.

6.12.1 **Valve Status**

Align the decontamination system valves to incorporate the flow path designated in Flow Path #1, Refer to LN Drawing 3838-B-5001-1.

a) Position valves as per Tables 6.1, 6.3, 6.4 and 6.6.

Table 6.1, 6.3 and 6.4

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LNDC/GEQA

Table 6.6

____
Unit 2 Operator

b) Close the following valves:

V1	RHR Return "A" Isolation Skid End
V2	RHR Return "B" Isolation - Skid End
V5	RHR Supply Isolation - Skid End
V6	RWCU Isolation - Skid End

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LNDC/GEQA

c) Throttle the following valves:

MO-65A - Ring Header "A" Crosstie

____
Unit 2 Operator

Riser Valves: V13, V14, V15, V16, V17, V18, V19, V20, V21, V22 as necessary, to vary decon flows, if needed to accelerate decon in one or more risers.

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LNDC/GEQA

6.12.2 Hydrazine Injection

Add sufficient hydrazine (35% solution of hydrazine in water) to the decontamination system via chemical injection vessel CI-101 to obtain a concentration of 100 ppb oxygen.

Add hydrazine according to the following steps:

a) Open CV5-V1 and monitor pressure indicator PI-103 until vessel pressure reads 0 psig.

b) Open RD2-V6 until level in vessel as indicated on CI-101 sight glass reaches 1/2 level, ± 10 inches, then close RD2-V6 and CV5-V1.

c) Open CI1-V1 and add 8 litres of 35% hydrazine to CI-102.

d) Once hydrazine has been injected, close CI1-V1 and open CI3-V1 then CI2-V1.

e) Keep CI-101 on line for a minimum of 5 minutes, to ensure hydrazine has been injected.

f) Close CI2-V1 and CI3-V1.

g) Perform sampling to establish the dissolved oxygen concentration (as per Section 6.24 of this procedure), and steps (a) through (f) are repeated as necessary to lower the dissolved oxygen levels below 100 ppb.

KEEP HYDRAZINE IN A TIGHT SEALED CONTAINER WHILE NOT IN USE. SAFETY GLASSES OR FACE SHIELD AND RUBBER GLOVES MUST BE WORN WHILE INJECTING HYDRAZINE.

h) Enter appropriate data in Reagent Addition Check Sheet, Table 6.7.

i) Place ion exchange columns on line by opening CU4-V4 adjusting CU2-V8 to achieve 60 GPM ± 15 GPM on FI-202.

Satisfactory Hydrazine levels. ______ LNDC/GEQA

6.12.3 Reagent Injection

Add reagent according to the following steps:

a) Put information tags on Drywell floor drain and equipment drain sump pumps to prevent automatic operation during time when reagent is part of the decon flow path. When sump pump out is required, Unit 2 Operator shall contact the GE Decon Supervisor at extension 4350 or 4441 to verify that reagent has not leaked to the sumps.

____
Unit 2 Operator

b) Open CV5-V1 and monitor pressure indicator PI-103 until vessel pressure reads 0 psig.

c) Open RD2-V6 until level in vessel as indicated on CI-101 sight glass reaches 1/2 level, ± 12 inches, then close RD2-V6 and CV5-V1.

d) Open CI1-V1 and add 25 KG of CAN-DECON reagent, LND-101A to CI-101.

e) Once reagent has been injected, rinse chemical addition valve CI1-V1 with condensate supply then close CI1-V1 and open CI3-V1 then CI2-V1.

f) Keep CI-101 on line for a minimum of 5 minutes, to ensure reagent has been injected.

g) Close CI2-V1 and CI3-V1.

h) Perform sampling to establish the dissolved reagent concentration (as per Section 6.24 of this procedure), repeat steps (a) through (f) as necessary to achieve 0.1 wt% ± 0.02% concentrations.

i) Enter appropriate data in Reagent Addition Check Sheet; Table 6.7.

Reagent injection completed.

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LNDC/GEQA

6.12.4 Rodine 31 A Injection

Add sufficient Rodine 31A to the decontamination system via chemical injection vessel CI-101 to obtain a concentration of .01% ± 0.005% wt.

Add Rodine 31A according to the following steps:

a) Open CV5-V1 and monitor pressure indicator PI-103 until vessel pressure reads 0 psig.

b) Open RD2-V6 until level in vessel as indicated on CI-101 sight glass reaches 1/2 level, ± 10 inches, then close RD2-V6 and CV5-V1.

c) Open CI1-V1 and added 0.5 gallons of Rodine 31A to CI-102.

d) Once Rodine 31A has been injected, close CI1-V1 and open CI3-V1 then CI2-V1.

e) Keep CI-101 on line for a minimum of 5 minutes, to ensure Rodine 31A has been injected.

f) Close CI2-V1 and CI3-V1.

g) Sampling as per Section 6.24 of this procedure. Repeat (a) to (g) as necessary to achieve desired concentration.

h) Enter appropriate date in Reagent Addition Check Sheet, Table 6.7.

Satisfactory Rodine 31A levels.

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LNDC/GEQA

6.12.5 Reagent Regeneration

a) Add reagent (or reagent components) necessary to maintain a reagent concentration at 0.1 ± 0.02 wt%.

b) Continue sampling, as described in Section 6.24. Maintain temperature at 250°F ± 5°F. Refer to sampling check sheet for verification.

c) Monitor radiation levels on decontamination flow path lines to ensure levels are satisfactorily decreasing (as per Section 6.28 of this procedure and record readings on Table 6.9). Flow path may be adjusted accordingly to allow for better decontamination flow rates in areas that require it.

d) If additional resin is required during reagent regeneration, slurry spent resin as per Section 6.14, add new resin as per Section 6.7.2 and document addition in Table 6.1.2.

e) Reverse flow during the decontamination at approximately hourly intervals or as specified by the LN field supervisor: Open CU7-V1 and CU6-V1 and close CU1-V3 and CU3-V2.

f) Monitor activity levels around the decontamination equipment at 2 hour intervals. Enter appropriate data in Radiation Monitor Check Sheet Table 6.9. Repeat Steps c), d), e) and f) as required.

g) Upon completion of decontamination Flow Path #1, (LN Drawing 3838-B-5001-1), adjust the flow path to incorporate the RHR Return lines as shown in Flow Path #2, LN Drawing 3838-B-5001-2.

Align valves as follows:

V1	RHR Return "A" Iso.-Skid End	Open
V2	RHR Return "B" Iso.-Skid End	Open
V25	Manifold "A" Isolation	Close
V26	Manifold "B" Isolation	Close
CU1-V2	Hose Isolation - Skid End	Close

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LNDC/GEQA

h) Termination of discharge side decontamination shall be declared by the LN Chemist in conjunction with the PECo Chemistry representative, and GE Engineer/Manager. Refer to Section 6.26 for termination criteria.

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LN/GE/PECo

i) When the discharge side regeneration phase has been completed, select pump CU-102 to OFF and isolate decontamination equipment by closing the following valves:

V1 RHR Return Isolation - Skid End
V2 RHR Return Isolation - Skid End

LNDC/GEQA

6.13 Suction Side Decontamination

Upon completion of activity removal on the discharge piping and associated piping segments, preparations will be made to decontaminate the suction piping. Again, to decontaminate effectively, the suction side piping will be divided into two separate flow paths. Refer to LN Drawings 3838-B-5001-3, Flow Path #3 and 3838-B-5001-4, Flow Path #4. Piping and components on Flow Path #3 will be decontaminated first, then Flow Path #4.

6.13.1 Valve Status

Align the decontamination system valves to incorporate the flow path designated in Flow Path #3. Refer to LN Drawing 3838-B-5001-3.

a) Check or adjust valves to be as per Tables 6.1, 6.3, 6.4 and 6.5.

Table 6.1, 6.3 and 6.4

LNDC/GEQA

Table 6.5

Unit 2 Operator

b) Check or close the following valves:

V1 RHR Return "A" Isolation - Skid End
V2 RHR Return "B" Isolation - Skid End
V5 RHR Supply Isolation - Skid End
V6 RWCU Isolation - Skid End

LNDC/GEQA

6.13.2 Startup and Heatup

a) Close CU2-V2 and CU4-V4. Throttle CU2-V8 to one turn open.

b) Start circulating pump CU-102 and raise flow to approximately 250 ± 50 GPM on PI-101.

c) Select heaters CU-105 and CU-401 to auto to commence heatup to 250°F.

d) As temperature is rising, bleed-off system to maintain a system pressure of 45psig ± 10 as indicated on PI-101. This is accomplished by opening valves CD2-V2 and RD2-V4 as necessary.

6.13.3 Hydrazine Injection

Add 6 litres of 35% hydrazine to the suction side as per Section 6.12.2 of this procedure.

Satisfactory Hydrazine levels achieved.

LNDC/GEQA

6.13.4 Reagent Injection

Add 6 kg of LND-101A to the suction side as per Section 6.12.3 of this procedure.

Reagent injection completed.

LNDC/GEQA

6.13.5 Rhodine 31A Injection

Add Rhodine 31A as per Section 6.12.4

LNDC/GEQA

6.13.6 Reagent Regeneration

The reagent regeneration phase for the suction side is performed as per Section 6.12.5 (a) to (f) of this procedure.

a) Upon completion of decontaminating the piping and components on Flow Path #3 (LN Drawing 3838-B-5001-3), the flow path is adjusted to incorporate the RHR supply and RWCU lines as shown in Flow Path #4, LN Drawing 3838-B-5001-4.

b) Termination of the suction side decontamination shall be declared by the LN Chemists in conjunction with PECo Chemistry Representative and GE Engineer/Manager as per Section 6.26.

LN/GEQA/PECo

6.13.7 Reagent Removal (Suction Side)

a) On completion of the decontamination process, select all heater control switches to <u>OFF</u>. Open valve V9.

b) Provide cooling water to the main circuit cooler (CU-106) by opening valve CW2-V1 (optional).

c) Cool the decontamination system to below 180°F (optional).

d) Once the decontamination system temperature drops to below 180°F, cooling water isolated by closing valve CW2-V1 (optional).

e) Isolate the ion exchange columns, CU-201/202/203 by closing CU5-V1/V2/V3 and CU4-V1/V2/V3.

f) Slurry resin from CU-201/202/203 according to the procedure in Section 6.14 and refill with mixed bed resin (7:1 by volume ratio of anion/cation according to the procedure in Section 6.7.2.

g) Put the ion exchange columns on line by opening CU4-V1/V2/V3 and CU5-V1/V2/V3. Open valve CU2-V2 close CU2-V8. Adjust CU2-V2 to obtain a purification flow rate of 90 GPM as indicated on FI-202.

h) Adjust flow as recommended by LNFS, during this phase to include the RHR supply and RWCU lines (Flow Path #4). This is accomplished by closing valve CU3-V3 and throttling valve V9. To return to Flow Path #3, open CU3-V3 and V9 and close V5 and V6.

LNDC/GEQA

i) Maintain operation until the conductivity on the suction side piping is approximately 100 uhmo/cm at which time reagent removal on the discharge side is commenced.

LNDC/GEQA

6.13.8 **Reagent Removal (Discharge Side)**

a) Select pump CU-102 to OFF, and close V5 and V6.

LNDC/GEQA

b) Set valves as per Tables 6.1, 6.2, 6.3, 6.4, and 6.6 to commence reagent removal on the discharge side. (Valve status is setup for Flow Path #1.)

Tables 6.2, 6.2, 6.3 and 6.4 LNDC/GEQA

Table 6.6 Unit 2 Operator

c) Throttle valve CU2-V8 to 1 turn open.

LNDC/GEQA

d) Start circulating pump CU-102 and adjust flow to 90 GPM on FI-202 by opening CU2-V2 and CU4-V4.

e) Adjust flow is adjusted, as recommended by LNFS, during this phase to include the RHR return lines (Flow Path #2). This is accomplished by opening valves V1 and V2 and closing V25 and V26. To return to Flow Path #1, valves V25 and V26 are opened and V1, V2 are closed.

f) Maintain operation until the conductivity on the discharge side is approximately 10 umho. (Further slurrying and refilling of ion exchange columns may be required, if so, see Section 6.14 and 6.7.2).

g) Once conductivity on this side is < 10 umhos/cm or as specified by Station, switch the system to check the conductivity levels on the other side (suction piping). For further reagent removal in suction side piping, see Section 6.13.7. Operation is continued until the conductivity levels on both the suction and discharge piping is within station requirements.

LNDC/GEQA

h) Remove information tags from drywell floor drain and equipment drain sump pumps

Unit 2 Operator

i) Remove plastic sheeting from drywell torus vents

GEQA/LN

6.13.9 System Shutdown

Once the steps in Section 6.13.9 are complete, the decontamination equipment is shutdown as follows:

a) Select heater elements CU-105 and CU-401 to <u>OFF</u>.

b) Select circulating pump CU-102 to <u>OFF</u>.

c) Close the following isolation valves:

CU1-V1, CU3-V4, V1, V2, V5 and V6.

d) Depressurize decontamination equipment as follows:

1) check closed, or close, ST1-V1

2) open CD2-V2 and CV2-V1

3) check pressure indication on PI-101 and PI-102 reaches zero

e) Commence final slurry operations as per Section 6.14 and drain down procedures as per Section 6.15.

System shutdown.

LNDC/GEQA

6.14 Resin Slurry

The purpose of this step is to transfer the radioactive resin from each of the ion exchange columns to the resin liners.. The following procedure is for slurrying the resin from ion exchange column CU-201. Equivalent equipment designations for CU-102 and CU-203 are shown in brackets. Do Not proceed further without the specific concurrence of GE Engineer/Manager, LNFS, Health Physics and Shift Supervisor.

6.14.1 **Slurry Preparations**

a) Set up radiation monitoring equipment as required to measure radiation levels before, during, and after slurry operation.

b) Make all personnel involved aware of the hazards during the slurry process. Personnel not essential to the operation are kept clear of the area.

LN/GEQA/SSV

6.14.2 Slurry Operation

The resins from each ion exchange column are removed separately. Valve designations are given below for slurrying column CU-201. Equivalent designations for columns CU-202 and CU-203 are shown in brackets respectively.

a) Check closed, or close, CU4-V1 (CU4-V2/V3), CU5-V1 (CU5-V2/V3) and CV1-V1 (CV1-V2/V3).

b) Unlock and open RS1-V6. Open CD1-V4 and CD1-V5 to approximately half throttle to establish flow in the slurry header. Confirm water flow to resin liner.

c) Open CD1-V1 (CD1-V2/V3) to provide condensate water to the ion exchange column to initiate slurry.

d) Open RS1-V1 (RS1-V2/V3), and confirm resin flow in sight glass RS-201).

e) Monitor sight glass RS-201 remotely with a high range gamma probe for resin flow. Continue slurry flow until the sight glass indicates that no resin is floating and radiation measurements indicate that no significant amount of residual resin is in the column.

f) Stroke RS1-V1 (RS1-V2/V3) and monitor the sight glass for additional resin flow.

g) Close CD1-V1 (CD1-V2/V3 and CD1-V4). CV1-V1 (V2/V3) are stroked to vent columns.

h) Enter data in Table 6.12 (Section 6.7.2) and sign check offs.

Resin slurry complete. - See Table in Section 6.7.2 for sign-off.

6.15 Draining

The following steps outline the draining of the decontamination system once the system is shutdown and isolated from the recirculation system. Verify with SSV that floor drains can be used, or that drain should go to torus.

a) Open valve RD2-V4 to drain the surge tank.

b) Once system has depressurized to < 10 psig, then open the following valves:

RD1-V1/V2/V3
RD2-V1/V2/V3/V4/V5/V6/V7/V8
CV2-V1
CV3-V1
CV4-V1
CV5-V1
CV1-V1/V2/CV3/V4/V5
RS2-V1/V2/V3
CU4-V1/V2/V3
CU5-V1/V2/V3
CU7-V1
CU6-V1
CV5-V1
CV4-V1
CV2-V1
CV3-V1
RD10-V1, RD10-V3

c) Open CS1-V1/V2 and CS3-V1/V3 to drain the sampling lines.

LNDC/GEQA

d) Remove the threaded cap from the Temporary A and B suction Loop drain lines. Attach a hose to the threaded end, running the hose to an adjacent torus vent.

GEQA/LN

e) SSV to drain recirculation piping through recirculation pump drains.

f) Once the ion exchange columns are drained, the remaining radiation fields are checked to make certain they are at acceptable levels.

Draining complete.

____
SSV

SIGNIFICANT DEAD-LEGS ARE TO BE MANUALLY DRAINED TO PLASTIC BOTTLES AND RE-ADDED TO THE LONDON NUCLEAR ION EXCHANGE EQUIPMENT

6.16 Decontamination System Dismantling

Upon completion of the decontamination, dismantle the system in the following manner:

a) Conduct a post-decontamination radiation survey of the reactor recirculation system as detailed in Section 6.18, Radiation Monitoring and Dose Control Procedures.

b) Conduct a radiation survey of the decontamination equipment to determine if there is any unacceptable radiation. Surface areas that are contaminated are washed until the level of radiation is reduced to acceptable levels.

c) Uncouple the decontamination equipment from the reactor recirculation system. Hoses are drained at a convenient floor drain connection.

d) Secure service water supply and open valves CW2-V1 and CW3-V1 to drain the service water lines. Disconnect the service water supply and return lines.

e) Secure demin or condensate water and CD1-V4, CD1-V5, CD1-V6 and open CD1-V1/V2/V3. Close root valve on condensate or demin water valve, and disconnect the condensate or demin water line.

f) Remove the radioactive waste drain line.

g) Uncouple the 480 V electrical connection from Skid 2 and 4.

h) Disconnect the resin slurry hose from the connection to the liner.

i) Remove decon test coupons.

j) Disconnect the Nitrogen bottle and regulator from the surge tank.

k) Remove the temporary shielding walls.

l) Disconnect Skid 1, Skid 2 and Skid 4.

m) Seal all open pipe ends on LN equipment with blank flanges.

Dismantling complete.

LNEC/GEQA

6.17 Crating and Shipping LN Equipment

a) Raise wheels on skids then place on bottom of crate (be sure wheels are fully raised and skids are located in same position as they were when they were uncrated).

b) Bolt sides of crate together insuring proper alignment. Use lag bolts (Do Not use nails or glue).

c) Perform all necessary Health Physics surveys.

d) If no additional shielding is needed, then place tops on crates assuring proper alignment, use lag bolts (Do Not use nails or glue).

e) Load on truck using an overhead crane or fork truck with a minimum rating of 6 tons (12,000 pounds) with a minimum fork length of 8-1/2'.

f) Tarp and secure all crates to truck.

Crating Complete.

LNEC/GEQA

TABLE 6.1

VALVE STATUS: DECONTAMINATION EQUIPMENT
STATIC REFERENCE STATE

CHECK	VALVE #	SIZE	DESCRIPTION	TYPE	POSITION	SKID
	CU1 V1	3"	Hose Iso. Process End	Ball	Open	___
	CU1 V2	3"	Hose Iso. Skid End	Ball	Open	___
	CU1 V3	3"	Skid Inlet Iso	Ball	Open	LN-1
	CU1 V4	3"	Circ. Pump Suction	Ball	Open	LN-1
	CU1 V5	1/2"	Press. Instr.Iso.	Globe	Open	LN-1
	CU1 V6	1/2"	Press. Instr.Iso.	Globe	Open	LN-1
	CU2 V1	2"	Circ. Pump Check	Check		LN-1
	CU2 V2	3"	Circ. Pump Bypass	Ball	Open	LN-1
	CU2 V3	3"	Circ. Pump Discharge Iso.	Globe	Open	LN-1
	CU2 V4	1-1/2"	Coupon Holder Inlet	Ball	Open	LN-1
	CU2 V5	1-1/2"	Coupon Holder Outlet.	Ball	Open	LN-1
	CU2 V6	3"	Main Cooler In.	Ball	Closed	LN-1
	CU2 V7	3"	Main Cooler Out.	Ball	Locked-Open	LN-1
	CU2 V8	3"	Main Cooler Bypass	Globe	Open	LN-1
	CU2 V9	3"	Heater In. Iso.	Ball	Locked-Open	LN-1
	CU2 V10	1/2"	Press. Instr.Iso.	Globe	Open	LN-1
	CU2-V11	1/2"	Press. Instr.Iso.	Globe	Open	LN-1
	CU3 V1	3"	Heater Out. Iso.	Ball	Open	LN-1
	CU3 V2	3"	Skid Out. Iso.	Ball	Open	LN-1
	CU3 V3	3"	Hose Iso. Skid End	Ball	Open	LN-1
	CU3 V4	3"	Hose Iso.-Process End	Ball	Open	LN-1
	CU3 V5	1/2"	Press. Instr.Iso.	Globe	Open	LN-1
	CU4 V1	1-1/2"	Exch Column CU-201 Inlet Isolation	Globe	Open	LN-2
	CU4 V2	1-1/2"	Exch Column CU-202 Inlet Iso.	Globe	Open	LN-2
	CU4 V3	1-1/2"	Exch Column CU-203 Inlet Iso.	Globe	Open	LN-2

TABLE 6.1 (Continued)

CHECK VALVE #	SIZE	DESCRIPTION	TYPE	POSITION	SKID
CU4 V4	2"	IX Cleanup In.Iso.	Ball	Open	LN-2
CU4 V5	2"	IX Iso.	Globe	Open	LN-2
CU4 V13	2"	IX Cleanup Bypass	Globe	Closed	LN-2
CU4 V14	2"	Hose CU-301 Iso.	Ball	Open	____
CU4 V15	2"	Hose CU-301 Iso.	Ball	Open	____
CU5 V1	1-1/2"	Exch. Col. CU-201 Out. Iso.	Ball	Open	LN-2
CU5 V2	1-1/2"	Exch. Col. CU-202 Out. Iso.	Ball	Open	LN-2
CU5 V3	1-1/2"	Exch. Col. CU-203 Out. Iso.	Ball	Open	LN-2
CU5 V4	2"	IX Cleanup Outlet Isolation	Ball	Open	LN-2
CU5 V5	2"	Hose CU-302 Iso.	Ball	Open	____
CU5 V6	2"	Hose CU-302 Iso.	Ball	Open	____
CU5 V7	2"	Purification Reverse Flow	Check	N/A	LN-1
CU5 V8	2"	Purification Flow Control	Ball	Closed	LN-1
CU5 V9	2"	Purification Flow Flow Control	Ball	Open	LN-1
CU6 V1	3"	Reverse Flow Iso.	Globe	Closed	LN-1
CU7-V1	3"	Reverse Flow Iso.	Globe	Closed	LN-1
CI1-V1	2"	Chemical Addition	Ball	Locked Closed	LN-1
CI1-V2	1/2"	Cooling Water Iso.	Globe	Closed	LN-1
CI1 V3	1/2"	Chemical Injection Pressure Isolation	Globe	Open	LN-1
CI2 V1	1"	Chemical Injection Inlet Isolation	Ball	Closed	LN-1
CI3 V1	1"	Chemical Injection Outlet Iso.	Ball	Closed	LN-1
ST1 V1	1/2"	Nitrogen Iso.	Globe	Closed	LN-1
CV1 V1	1/2"	Exch. Column CU-201 Vent	Globe	Closed	LN-2
CV1 V2	1/2"	Exch. Column CU-202 Vent	Globe	Closed	LN-2

TABLE 6.1 (Continued)

CHECK	VALVE #	SIZE	DESCRIPTION	TYPE	POSITION	Skid
	CV1 V3	1/2"	Exch. Column CU-203 Vent	Globe	Closed	LN-2
	CV1 V4	1/2"	Vent	Globe	Closed	LN-2
	CV1 V5	1/2"	Vent	Globe	Closed	LN-2
	RV1 V4		1/2"Relief Iso.	Ball	Locked /Open	LN-2
	CV1 V6	1"	Vent Pot Check	Swing Check	N/A	LN-2
	CV2 V1	1/2"	Surge Tank Vent	Globe	Closed	LN-1
	CV3 V11	1/2"	Heater Vent	Globe	Closed	LN-1
	CV4 V1	1/2"	Main Cooler Out. Line Vent	Globe	Closed	LN-1
	CV5 V1	1/2"	Chemical Inj. Vent	Globe	Closed	LN-1
	CV6 V1	1/2"	Main Cooler Shell Vent	Globe	Closed	LN-1
	CD1 V1	1-1/2"	Exch. Col. CU-201 Cond. Inlet Iso.	Ball	Closed	LN-2
	CD1 V2	1-1/2"	Exch. Col. CU-203 Cond. Inlet Iso.	Ball	Closed	LN-2
	CD1 V3	1-1/2"	Exch. Col. CU-203 Cond. Inlet Iso.	Ball	Closed	LN-2
	CD1 V4	1-1/2"	Cond. In. Iso.	Ball	Closed	LN-2
	CD1 V5	1-1/2"	Cond. Bypass to Slurry	Ball	Closed	LN-2
	CD1 V6	1-1/2"	Condensate Bypass to Skid Inlet	Ball	Closed	LN-2
	CD2 V1	1"	Cond. Supply Iso.	Globe	Closed	LN-1
	ST1 V2	1/2"	Nitrogen Iso.	Globe	Closed	LN-1
	ST1 V3	1/2"	Nitrogen Iso.	Globe	Closed	LN-1
	CD2 V2	1-1/2"	Surge Tank Iso.	Ball	Closed	LN-1
	RV1 V1	1/2"	Surge Tank Relief	Relief	As Installed	LN-1
	RV1 V2	1/2"	Heater Relief	Relief	As Installed	LN-1
	RV1 V3	1/2"	Chemical Injection Vessel Relief	Relief	As Installed	LN-1

TABLE 6.1 (Continued)

CHECK	VALVE #	SIZE	DESCRIPTION	TYPE	POSITION	Skid
	CW2 V1	1-1/2"	Cooling Water Return Iso.	Ball	Closed	LN-1
	CW3 V1	3/4"	Sample Cooler C.W. Supply Iso.	Ball	Open	LN-1
	CW5 V1	1/2"	Chemical Inj. C.W. Supply Iso.	Check	N/A	LN-1
	CW5 V2	1/2"	Wash Down Iso.	Globe	Closed	LN-1
	CS1 V1	1/2"	Before Sample Isolation	Ball	Closed	LN-1
	CS1 V2	1/2"	Before Sample Iso.	Ball	Closed	LN-1
	CS3 V1	1/2"	After IX Sample Isolation	Ball	Closed	LN-1
	CS3 V2	1/2"	After IX Sample Isolation	Ball	Closed	LN-1
	CS4 V1	1/2"	Sample Sink Iso.	Globe	Closed	LN-1
	RS1 V1	1-1/2"	Exch. Col. CU-201 Slurry Iso.	Ball	Closed	LN-2
	RS1 V2	1-1/2"	Exch. Col. CU-202 Slurry Iso.	Ball	Closed	LN-2
	RS1 V3	1-1/2"	Exch. Col. CU-203 Slurry Iso.	Ball	Closed	LN-2
	RS1 V6	1-1/2"	Resin Slurry Skid Outlet Iso.	Ball	Locked-Closed	LN-2
	RD3 V1	1/2"	Exch. Col. CU-201 Slurry Drain	Ball	Closed	LN-2
	RD3 V2	1/2"	Exch. Col. CU-202 Slurry Drain	Ball	Closed	LN-2
	RD3 V3	1/2"	Exch. Col. CU-203 Slurry Drain	Ball	Closed	LN-2
	RD1 V1	1"	Exch. Column CU-201 Drain	Ball	Closed	LN-2
	RD1 V2	1"	Exch. Column CU-202 Drain	Ball	Closed	LN-2

TABLE 6.1 (Continued)

CHECK	VALVE #	SIZE	DESCRIPTION	TYPE	POSITION	Skid
	RD1 V3	1"	Exch. Column CU-203 Drain	Ball	Closed	LN-2
	RD1 V6	1"	Skid Drain	Ball	Open	LN-2
	RD2 V1	1"	Circ. Pump Suction Line Drain	Ball	Closed	LN-1
	RD2 V2	1"	Heater Drain	Ball	Closed	LN-1
	RD2 V3	1"	Process Out. Drain	Ball	Closed	LN-1
	RD2 V4	1"	Surge Tank Drain	Ball	Closed	LN-1
	RD2 V5	1"	Coupon Holder Drain	Ball	Closed	LN-1
	RD2 V6	1"	Chemical Injection Drain	Ball	Closed	LN-1
	RD2 V7	1"	Sample Sink Check	Check	N/A	LN-1
	RD2 V8	1"	Sample Sink Drain	Ball	Open	LN-1
	HT1 V1	1/2"	Hydrostatic Test Isolation	Ball	Closed	LN-1
	HT2 V1	1/2"	Hydrostatic Test Isolation	Ball	Closed	LN-2

TABLE 6.2

MISCELLANEOUS DECONTAMINATION EQUIPMENT STATUS

STATIC REFERENCE STATE

Equipment	Description	Status
CU-201/202/203	IX Column	Charged with Resin
CU-102	Circulating Pump	Off
CU-104	Main Circuit Cooler	Isolated
CU-105	Electric Heater	Off
CU-204/205	Filters	Isolated
CI-101/	Chemical Injection Vessel	Isolated
Nitrogen Bottle and Regulator	Surge Tank Charging System	Connected and Isolated

TABLE 6.3

VALVE STATUS: SKID LN-4 ELECTRIC HEATER
STATIC REFERENCE STATE

Valve	Size	Description	Type	Status
CU10-V1	3"	Hose Isolation	Ball	Open
CU10-V2	3"	Hose Iso. - Skid 4 End	Ball	Open
CU10-V3	3"	Process Inlet	Ball	Open
CU10-V4	3"	Heater (CU-401) Inlet	Ball	Open
CU10-V5	1/2"	Pressure Indicator (PI-401) Isolation	Globe	Open
CU11-V1	3"	Heater (CU-401) Outlet	Ball	Open
CU11-V2	3"	Heater (CU-401) Bypass	Ball	Closed
CU11-V3	3"	Process Outlet	Ball	Open
CU11-V4	1/2"	Pressure Indicator (PI-402) Isolation	Globe	Open
CV10-V1	1/2"	Process Vent	Globe	Closed
CV12-V1	1/2"	Heater (CU-401) Vent	Globe	Closed
RD10-V1	1"	Heater (CU-401) Drain	Ball	Closed
RD10-V2	1"	Heater (CU-401) Drain Check	Check	---
RD10-V3	1"	Drain Isolation	Ball	Locked/Open
RD10-V4	1"	Vent Pot (CU-402) Drain Check	Check	---
RV10-V1	2"	Heater (CU-401) Relief)	Relief	As Installed

TABLE 6.4

VALVE STATUS: TEMPORARY VALVES
STATIC REFERENCE STATE

CHECK	VALVE #	SIZE	DESCRIPTION	TYPE	POSITION
	V1	3"	RHR Return A - Isolation Skid End	Ball	Open
	V2	3"	RHR Return B - Isolation Skid End	Ball	Open
	V3	3"	RHR Return B - Iso. Process End	Ball	Open
	V4	3"	RHR Return A - Iso. Process End	Ball	Open
	V5	3"	RHR Supply Iso. Skid End	Ball	Open
	V6	3"	RWCU Iso. Skid End	Ball	Open
	V7	3"	RWCU Iso. Process End	Ball	Open
	V8	3"	RHR Supply Iso. - Process End	Ball	Open
	V9	3"	Recirc. Loop A Suction	Ball	Open
	V10	3"	Recirc. Loop B Suction	Ball	Open
	V11	2"	Recirc. Loop A Suction Vent	Ball	Closed
	V12	2"	Recirc. Loop B Suction Vent	Ball	Closed
	V13	2"	Riser JP 1/2 Iso.	Ball	Open
	V14	2"	Riser JP 3/4 Iso.	Ball	Open
	V15	2"	Riser JP 5/6	Ball	Open
	V16	2"	Riser JP 7/8	Ball	Open
	V17	2"	Riser JP 9/10	Ball	Open
	V18	2"	Riser JP 11/12	Ball	Open
	V19	2"	Riser JP 13/14	Ball	Open
	V20	2"	Riser JP 15/16	Ball	Open

TABLE 6.4 continued

CHECK	VALVE #	SIZE	DESCRIPTION	TYPE	POSITION
	V21	2"	Riser JP 17/18	Ball	Open
	V22	2"	Riser JP 19/20	Ball	Open
	V25	3"	Manifold A Iso.	Ball	Open
	V26	3"	Manifold B Iso.	Ball	Open
	V27	2"	RWCU Vent	Ball	Closed
	V28	1"	'A' Manifold Drain	Ball	Closed
	V29	1"	'B' Manifold Drain	Ball	Closed

TABLE 6.4.2

RHR RETURN LOOP 'A' JOINT ARRANGEMENT
DATA SHEET

JOINT ID	COMPONENTS	DATA SHEET COMPLIANCE					REMARKS
		Initial Hookup	ΔT_1	ΔT_2	ΔT_3	ΔT_4	
RHR-R-A-01	X/Valve V1						
RHR-R-A-02	Valve V1/ 50' Hose						
RHR-R-A-03	50' Hose/ X 50' Hose						
RHR-R-A-04	50' Hose/ X Valve (V4)						
RHR-R-A-05	Valve V4/ RHR 'A'						

TABLE 6.4.3

RHR RETURN LOOP 'B' JOINT ARRANGEMENT
DATA SHEET

JOINT ID	COMPONENTS	DATA SHEET COMPLIANCE					REMARKS
		Initial Hookup	ΔT_1	ΔT_2	ΔT_3	ΔT_4	
RHR-R-B-01	X/Valve V2						
RHR-R-B-02	Valve V2/ 50' Hose						
RHR-R-B-03	50' Hose/ Valve V3						
RHR-R-B-04	50' Valve V3/ RHR 'B'						

TABLE 6.4.4

RHR-SUCTION JOINT ARRANGEMENT
DATA SHEET

JOINT ID	COMPONENTS	DATA SHEET COMPLIANCE					REMARKS
		Initial Hookup	ΔT_1	ΔT_2	ΔT_3	ΔT_4	
RHR-S-01	X/Valve V5						
RHR-S-02	Valve V5/ 50' Hose						
RHR-S-03	50' Hose/ X 50' Hose						
RHR-S-04	50' Hose/ X Val[illegible] V8						
RHR-S-05	Valve V[illegible]/ RHR - Suction						

TABLE 6.4.5

JOINT ID	COMPONENTS	DATA SHEET COMPLIANCE					REMARKS
		Initial Hookup	ΔT_1	ΔT_2	ΔT_3	ΔT_4	
LA-01	Valve CU3-V3						
LA-02	Valve CU3-V3/ 50' Hose						
LA-03	50' hose/ 50' hose						
LA-04	50' hose/ 50' hose						
LA-05	50' Hose/ Valve CU3-V4						
LA-06	Valve CU3-V4/ N6A nozzle						

TABLE 6.4.6

NOZZLE N6B JOINT ARRANGEMENT
DATA SHEET

JOINT ID	COMPONENTS	DATA SHEET COMPLIANCE					REMARKS
		Initial Hookup	ΔT_1	ΔT_2	ΔT_3	ΔT_4	
LB-01	X/Valve CU1-V2						
LB-02	Valve CU1-V2/ 50' Hose						
LB-03	50' Hose/ Valve CU1-V1						
LB-04	Valve CU1-V1 /N6B Nozzle						

TABLE 6.4.7

RWCU JOINT ARRANGEMENT
DATA SHEET

JOINT ID	COMPONENTS	DATA SHEET COMPLIANCE					REMARKS
		Initial Hookup	ΔT_1	ΔT_2	ΔT_3	ΔT_4	
RWCU-01	X/Valve V6						
RWCU-02	Valve V6/ 50' hose						
RWCU-03	50' hose/ 50' hose						
RWCU-04	50' hose/ 50' hose						
RWCU-05	50' hose/ 50' hose						
RWCU-06	50' hose/ 50' hose						
RWCU-07	50' hose/ 50' hose						
RWCU-08	Valve V7 RWCU						

TABLE 6.4.8

N2A-N2B MANIFOLD AND JUMPER JOINT ARRANGEMENT
DATA SHEET

JOINT ID	COMPONENTS	DATA SHEET COMPLIANCE					REMARKS
		Initial Hookup	ΔT_1	ΔT_2	ΔT_3	ΔT_4	
NZA-01	Riser/ Valve V17						
NZA-02	Valve V17/ 20' Hose						
MFA-01	20' hose/ 'A' Manifold						
NZA-03	Riser/ Valve V16						
NZA-04	Riser/ Valve V17						
MFA-02	15' hose/ 'A' Manifold						
NZA-05	Riser/ Valve V15						
NZA-06	Valve V15/ 10' hose						
MFA-03	10' hose/ 'A' Manifold						
NZA-07	Riser/ Valve V14						
NZA-08	Valve 14/ 15' hose						
MFA-04	15' hose/ 'A' Manifold						
NZA-09	Riser/ Valve V13						
NZA-10	Valve V13/ 20' hose						
MFA-05	20' hose/ 'A' Manifold						
NZB-01	Riser/ Valve V22						

TABLE 6.4.8 (Continued)

N2A-N2B MANIFOLD AND JUMPER JOINT ARRANGEMENT DATA SHEET

JOINT ID	COMPONENTS	DATA SHEET COMPLIANCE					REMARKS
		Initial Hookup	ΔT_1	ΔT_2	ΔT_3	ΔT_4	
NZB-02	Valve V22/ 20' hose						
MFB-01	20' hose/ 'B' Manifold						
NZB-03	Riser/Valve V21						
NZB-04	Valve V21/ 15' hose						
MFB-02	15' hose/'B' manifold						
NZB-05	Riser/ Valve V20						
NZB-06	Valve V20/ 10' hose						
MFB-03	10' Hose/ 'B' manifold						
N2B-07	Riser/ Valve V19						
N2B-08	Valve V19/ 15' hose						
MFB-04	15' hose/ 'B' manifold						
N2B-09	Riser/ Valve V18						
N2B-10	Valve V18/ 20' hose						
MFB-05	20' hose/ 'B' manifold						
MFA-J-06	'A' manifold/ Valve V25						
MFA-J-07	Valve V25/ 50' hose						
MFB-5-06	50' hose/ Valve V26						
MFB-J-07	Valve V26/ 'B' manifold						

TABLE 6.4.9

N1A-N1B JOINT ARRANGEMENT
DATA SHEET

JOINT ID	COMPONENTS	DATA SHEET COMPLIANCE					REMARKS
		Initial Hookup	ΔT_1	ΔT_2	ΔT_3	ΔT_4	
N1A-01	N1A/ Valve V9						
N1A-02	Valve V9/ 50' hose						
N1B-01	50' hose/ Valve V10						
N1B-02	Valve V10/ N1B						

TABLE 6.5

STATION INSTALLED VALVES
SUCTION SIDE DECONTAMINATION STATUS

Valve Designation	Description	Position
MO-53A	Recirculation Pump A Discharge Iso.	Closed
MO-53B	Recirculation Pump B Discharge Iso.	Closed
MO-43A	Recirculation A Suction Iso.	Open
MO-43B	Recirculation B Suction Iso.	Open
MO-66A	Ring Header A Bypass	Open
MO-66B	Ring Header B Bypass	Open
MO-65A	Ring Header A Cross-Tie	Open
MO-65B	Ring Header B Cross-Tie	Open
POS-81B	RHR Return B Isolation	Open
POS-81A	RHR Return A Isolation	Open
MO-10-18	RHR Supply Isolation	Open
MO12-15	RWCU Suction Isolation	Open
MAN 12-46	RWCU Suction Isolation	Open
MO-12-18	RWCU Supply	Open
	Temporary A Suction Loop Valve	Closed
	Temporary B Suction Loop Valve	Closed

TABLE 6.6

STATION INSTALLED VALVES
DISCHARGE SIDE DECONTAMINATION VALVE STATUS

Valve Designation	Description	Position
MO-53A	Recirculation Pump A Discharge Iso.	Open
MO-53B	Recirculation Pump B Discharge Iso.	Open
MO-43A	Recirculation Pump A Suction Isolation	Closed
MO-43B	Recirculation Pump B Suction Isolation	Closed
MO-66A	Ring Header A Bypass	Open
MO-66B	Ring Header B Bypass	Open
MO-65A	Ring Header A Cross-Tie	Open
MO-65B	Ring Header B Cross-Tie	Open
POS-81B	RHR Return B Isolation	Open
POS-81A	RHR Return A Isolation	Open
MO-10-18	RHR Supply Isolation	Open
MO12-15	RWCU Suction Isolation	Open
MAN12-46	RWCU Suction Isolation	Open
MO-12-18	RWCU Supply	Open
	Temporary A Suction Loop Valve	Closed
	Temporay B Suction Loop Valve	Closed

TABLE 6.7

REAGENT ADDITION CHECK SHEET

SYSTEM BEING DECONTAMINATED:

Time	Date	Chemical Type	Qty.	Concn	Signature

TABLE 6.8

SAMPLING CHECK SHEET

System Being Decontaminated:

Phase of Decontamination:

Sample Quantity:

Sample No.	Date	Time	Sample Location	Signature

TABLE 6.9

RADIATION MONITORING CHECK SHEET

Comments to be Noted Where Necessary

		LOCATION					
DATE	TIME	INLET HOSE	OUTLET HOSE	SAMPLING AREA	ION EXCHANGE COLUMN(S)	GENERAL AREA	SIGNATURE

TABLE 6.10

OPERATIONS LOG SHEET

DATE	TIME	PI-101 (psig)	PI-102 (psig)	PI-103 (psig)	PI-104 (psig)	TI-101 (°F)	FI-101 (GPM)	FI-202 (GPM)

TABLE 6.12

IX (ION EXCHANGE) RESIN LOADING

BATCH	IX LOT	RESIN TYPE	COLUMN NUMBER	DATE	TIME	SIGN-OFF LN/GE

TABLE 6.11

CHEMISTRY MONITORING SCHEDULE

Readings and Analyses	Predecontamination Step	Decontamination: LND-101A Addition, First 2 h.*	Decontamination: LND-101A Addition	Decontamination: LND-101A Removal
pH and conductivity	analyses ⟷ as required	30-min. ⟷ intervals	30-min or 1-h ⟷ intervals	
Temperature	1-h ⟷ intervals			
Dissolved oxygen	analyses as required ⟷ after N_2H_4 addition			
Reagent		analyses ⟷ as required		
Crud	analyses ⟷ as required			
Dissolved metals Dissolved radionuclides	analyses ⟷ as required	30 -min ⟷ intervals	30-min or 1-h ⟷ intervals	
Total Organic Carbon		as required**		

* During the first two hours or the decontamination, more frequent analysis may be performed if conditions permit.

** TOC will be measured when conductivity during cleanup falls below 200 umho/cm and at one hour intervals afterwards.

TABLE 6.13

DECONTAMINATION RADIATION LEVEL READINGS

Point	Point Location	Initial Reading (mR/h)	At End of Decontamination Final Reading (mR/h)	DF
Weighted Harmonic Mean				
- all points				
- suction				
- discharge				

6.18 CHEMICAL AND RADIOCHEMICAL MONITORING DURING DECONTAMINATION

6.18.1 Parameters to be Monitored

Monitor the following parameters during the decontamination:

a) Gross Activity
b) Dissolved Radionuclides
c) Dissolved Metals
d) Conductivity and pH
e) LN_2 Reagent Analysis
f) Fe^{2+} to Total Iron Ratio
g) Crud Sampling
h) Hydrazine
i) Dissolved Oxygen
j) Total Organic Carbon (TOC)

The parameters are listed approximately in the descending order of their importance and frequency in monitoring. With the exception of LN reagent analysis, all parameters are usually routinely monitored at nuclear power stations as part of normal operations.

Install non-active coupons in the equipment autoclave to determine corrosion rates. Install active coupons, cut from a reactor artifact (pipe, flange, gasket etc.), to determine decontamination factors.

Inactive coupons for Peach Bottom will be stainless steels 304, 316L and carbon steel.

6.19 Required Chemicals

6.19.1 Concentrated Acids and Bases (Supplied by Station)

Ammonium hydroxide	NH_4OH
Hydrochloric acid	HCl
Nitric acid	HNO_3
Sulphuric acid	H_2SO_4

6.19.2 **Organic Solvents** (Supplied by Station)

Methanol (OR Ethanol) CH_3OH (CH_3CH_2OH)

6.19.3 **Other Reagents** (Supplied by LN)

Antimony (III) oxide	Sb_2O_3
Buffers (pH 4, 7 and 10)	
Calcium chloride	$CaCl_2$
(or Calcium nitrate	$[Ca(No_3)_2]$
Chemet Test Kit	
(Oxygen low range) 0-100 ppb	
p-dimethylaminobenzaldehyde	$C_9H_{11}NO$
Ethylenediamine tetra acetic acid	$C_{10}H_{16}N_2O_8$
(sodium salts may be used)	
Hydrazine hydrochloride	$N_2H_4.2HCl$
Hydroxylamine hydrochloride	$NH_2OH.HCl$
Iron (II) ammonium sulphate	$Fe(NH_4)_2(SO_4)_2.6H_2O$
Iron (III) sulphate	$Fe_2(SO_4)_3$
(chloride or nitrate salts may be substituted)	
o-phenanthroline	$C_{12}H_8N_1$
Potassium chloride	KCl
Potassium permanganate	$KMnO_4$
Salicylic acid	$C_7H_6O_3$
Sodium acetate	$NaC_2H_3O_2$
Tin (II) chloride	$SnCl_2$

All chemicals supplied by LN under 6.19.3 will be removed by LN upon completion of the job.

6.19.4 **Metal Standard Solutions**
(Supplied by Station)

Metal solutions (1000 ug/ml) are required for the following ions (Fe, Ni, Cr, Zr, Mn, Cu).

6.20 Analysis

6.20.1 Radionuclide Analysis

Radionuclides will be determined by PECo using gamma spectrophotometry. Preferred equipment requirements are a multi-channel analyzer of at least 1024 channels coupled to a GeLi detector. NaI(Tl) detector could be used if required, but resolution is poorer. The energy range of main interest is 0.1 to 2.0 Mev. Computer analysis involving peak identification and printout of concentrations is highly desirable. Equipment of this type is now standard at most nuclear power plants and was used during previous decontaminations at Peachbottom (1982 and 1983). This includes a GeLi detector.

Previous decontamination on Unit 2 RWCU system showed the following major radionuclides:

Radionuclide	Major Emissions (MEV)
Cr-51	0.324
Mn-54	0.835
Co-58	0.81
Co-60	1.17, 1.33
Zn-65	1.11

Cs-137 may also be present in minor quantities. Its emissions at 0.662 Mev will also be measured to meet 10CFR61 requirements.

6.20.2 Direct Current Plasma Jet Analyzer

Analyze following elements, Fe, Ni, Cr, Mn, Zn, Cu, simultaneously, using the direct current plasma jet analyzer.

6.20.3 Conductivity

A multi-range conductivity meter and cell spanning the range 1 umho to 10,000 umho is required. A spare conductivity cell is recommended.

The instrument should be checked using standard potassium chloride solutions. Specific conductances are given below:

Grams KCl/kg of Solution	K in ohm^{-1} cm^{-1} 18°C	25°C
71.1352	0.09784	0.11134
7.4191	0.01117	0.01286
0.7453	0.001221	0.001409

6.20.4 pH

A typical laboratory pH meter (0-14) is required. Sensing electrodes should contain automatic temperature compensation. Readout of solution temperature is a desirable feature.

Instrument should be calibrated using standard buffer solutions (pH 4, 7, and 10).

6.20.5 Ultraviolet/Visible Spectrophotometer

An UV/VIS spectrophotometer is used to measure the absorbance of the following complexes:

Iron (II) and o-phenanthroline at 518 nm

Hydrazine and p-dimethylaminobenzaldehyde at 458 nm

A one (1) cm cell is required but larger cells may be used. A flow through cell is a desirable feature. Absorption maxima should be checked on the instrument in case of possible errors in wavelength settings.

6.20.6 **Total Organic Carbon Analyzer**

A total organic carbon (TOC) analyzer will be used to measure reagent removal during cleanup at the end of the decontamination.

6.20.7 **General Laboratory Equipment**

The following general laboratory support equipment is required:

a) Weighing facility to±0.1 mg (or better).
b) Supply of demineralized water
c) Supply of water and drainage to active sumps
4) stirrers and hot plates
5) Filtration equipment
6) Fume hood

6.21 Laboratory Familiarization

The two London Nuclear chemists (LNDC) shall familiarize themselves with the Peach Bottom laboratory. Familiarization shall consist of the following:

a) Safety procedures for lab (fire, showers, eyewash, chemical cleanup kits etc.).

b) Radiological procedures for lab (radiological zoning, radioactive waste handling procedures, storage of active samples.

c) Layout and storage of glassware and miscellaneous equipment (beakers, flasks, volumetrics, pipettes, kimwipes, marking pencils, weighing boats etc.).

d) Operation and location of common laboratory equipment (balances, stirrers, fume hoods etc.).

Review complete. ______ LNDC/PEC.

6.22 Analytical Equipment Familiarization

The two London Nuclear chemists shall familiarize themselves with the Peach Bottom analytical equipment. Familiarization will be complete when the chemists can operate the following equipment by themselves.

1) Conductivity Meter

2) pH Meter

______ LNDC/PECo

EQUIPMENT FAMILIARIZATION SHOULD TAKE TWO TO FOUR HOURS.

6.23 Preparation of Analytical Solutions

LN shall prepare the following solutions.

6.23.1 Reagents

Required accuracy of these reagents is + 10%. Unless otherwise specified, all reagents are in water.

a) o-phenanthroline
(0.5% wt/Vol in menthanol)

b) Sodium acetate
(2 M)

c) Hydroxylamine hydrochloride
(10% wt/Vol)

d) Salicylic acid
(2% wt/Vol in methanol)

e) Calcium chloride (or calcium nitrate)
(0.05 M)

f) Sulphuric acid
(1 M)

g) p-dimethylaminobenzaldehyde
(4 g to 200 ml CH_3OH and 20 ml concentrated HCl)

THIS COMPOUND IS LIGHT SENSITIVE AND STEPS MUST BE TAKEN TO PROTECT IT FROM THE LIGHT.

h) HCl
(1% conc. acid in water)

i) Descaling solution for stainless steel 304 (Clarke's solution) (1 L 35% HCl
20.0 g Sb_2O_3
50.0 g $SnCl_2$

Preparation of analytical solutions complete.

LNDC/PECo

6.23.2 Standards

Required accuracy of these standards is ± 2%. During the decontamination, parameter trends are more important than absolute values.

a) EDTA
(0.02% wt/Vol)

b) Fe^{3+}
(0.02%)

c) $KMnO_4$
(0.01 N)

DEPENDING ON REAGENT PURITY, THE FORMALITY MAY BE STANDARDIZED AGAINST SODIUM OXALATE OR OXALIC ACID.

d) Ferrous ammonium sulphate
(25 ug/l, to ug/l, 100 ug/l
all in 0.1% LND-101A

e) Metals ions for atomic absorption analysis

To minimize the number of standard solutions, the standards can contain more than one metal ion.

	ug/l	Solution
Iron	10,50,100,150	0.1% LND-101A
Nickel	10,25,50	0.1% LND-101A
Chromium	10,25,50	0.1% LND-101A
Copper	5,10,25	0.1% LND-101A
Manganese	5,10,25	0.1% LND-101A
Zinc	5,10,25	0.1% LND-101A

f) Hydrazine hydrochloride (if required)
(100 mg/l N_2H_4 in 1% HCl)

Preparation of all standards complete. ______ LNDC/PECo

6.24 Sampling Method and Schedule

The sampling points on the decontamination skids are connected to the ion exchange column outlet (usually called "IX out") and to a process line to sample the bulk recirculating reagent (usually called "IX in"). The bulk sample provides information on the process parameters - pH, dissolved metals, and dissolved radionuclides, which indicate the efficiency of the decontamination process. The after ion exchange sample provides information on the efficiency of the ion exchange column in removing dissolved metals and radionuclides, and is used to determine column saturation or "breakthrough".

A recommended sampling schedule is given in Table 6.11. The "as required" frequency will be at the discretion of the LN chemist conducting the decontamination or as requested by PECo chemistry staff or the GE Engineer/Manager. Most samples will be 250 mL. A one-litre sample is required for a crud analysis. All samples will be clearly labeled to indicate the sampling date, time, and location of sampling.

Due to the potentially high specific activity of the samples during the decontamination:

a) Extra care is required in handling solutions; appropriate protective clothing should be worn at all times.

b) All samples should be stored in a suitable shielded area when the analyses are completed.

6.25 Analytical Procedures

The following procedures are used during a decontamination.

All results are:

a) Logged on a laboratory work sheet and initialed by the chemist performing the work.

b) Results on laboratory work sheet are transferred to the decontamination chemistry log book, which is kept in an inactive area. The log and work sheet will be checked and initialed. The work sheets may be destroyed at the end of the decontamination.

c) Plotted on graph paper to show trends.

6.25.1 Gross Activity

All filled sample bottles will be checked for gross gamma activity at the decontamination skid immediately after sampling. A standard gamma (or Beta-gamma) survey meter will be used in, if available, a shielded location such as a lead castel. This analysis will be used as the first indication of activity breakthrough on the cation resin column.

6.25.2 **Dissolved Radionuclide Analysis**

Dissolved radionuclide analyses will be performed on both bulk and after ion exchange column samples. Samples sent to the counting laboratory will be diluted as necessary and analyzed by a multi-channel gamma spectrophotometer equipped with a GeLi detector, or equivalent.

Radionuclide analysis is one of the more important parameters determined and is used to monitor the progress of the decontamination. For these reasons, the samples should be analyzed as soon as possible after arriving in the sample reception area.

All computer printouts of radionuclides must be kept.

6.25.3 **Dissolved Metals by Direct Current Plasma Jet Analyzer**

Reagents

Analytical standards:

Dissolved metals analysis will be performed on both the bulk and after ion exchange column samples during the oxide dissolution phase. Other samples will be analyzed on an "as required" basis. Simultaneous analysis of iron, chromium, nickel, manganese, zinc and copper will be done. Dissolved iron is a critical process parameter and the analysis should be performed as quickly as possible.

6.25.4 Conductivity and pH Measurement

Reagents

The electrical conductivity and pH will be measured for each sample. These measurements will be preformed on Station laboratory calibrated equipment.

Temperature will be recorded on samples during measurements and corrections made if required.

a) Buffers pH4, 7 and 10

b) Conductivity standards.

6.25.5 **LN Reagent Analysis**

a) EDTA Analysis

Reagents

1) 2% salicylic acid in methanol
2) 0.02% Fe^{3+} solution
3) 0.02% EDTA solution

Procedure

1) analyze sample for iron III concentration

2) take a 25 mL aliquot sample

3) add 1 mL salicylic acid solution

If the resulting solution is colorless, follow item (a) below; if the solution is colored (violet), follow item (b) below.

a) titrate the sample with the standard iron III solution until a violet color appears

one mole EDTA reacts with one mole iron III, EDTA concentration equals original iron III concentration plus iron III concentration in titer

b) titrate the sample with the standard EDTA solution until the color changes from violet to colorless.

Original EDTA concentration equals iron III concentration less EDTA concentration added.

b) Oxalate Analysis

Reagents

1) 0.05 M $CaCl_2$
2) dilute NH_4OH
3) 1 M H_2SO_4
4) 0.01 N $KMnO_4$

Procedure

1) take 25 mL aliquot of sample
2) add 50 mL of 0.05 M calcium chloride
3) adjust pH to 7.5-8.0 with NH_4OH
4) let stand 10-15 minutes
5) filter solution
6) wash filter cake with water
7) dissolve filter cake in 1 M H_2SO_4
8) heat solution to at least 60°C
9) titrate with 0.01N $KMnO_4$ until a pink endpoint persists for at least 30 seconds
10) determine the oxalate concentration from a previously determined calibration curve or mL of 0.01N $KMnO_4$ reacts with 0.63 mg $H_2C_2O_4 \cdot 2H_2O$.

6.25.6 Fe^{2+} to Total Iron Ratio

First Fe^{2+} is measured using o-phenanthroline. Next all iron is reduced to the Fe^{2+} state and total iron is measured using o-phenanthroline.

Fe^{3+} concentration is the difference between the two values.

Fe^{2+} Analysis

Reagents

0.5% o-phrenantroline in CH_3 OH

Procedure

a) Accurately pipette an aliquot (of sample solution containing 10 to 100 ug of iron (usually 1 mL of stripping solution).

b) Add a few millilitres of distilled water and 1 mL of 0.5 percent o-phenanthroline, to a 25 mL volumetric flask.

c) Mix and makeup to mark with distilled water, and determine the optical density at 518 nm.

d) Wait 5-10 minutes for color development before making determination.

Total Iron Analysis

Total iron is determined by reducing iron III to iron II with hydroxylamine hydrochloride and anaylzing for iron II.

Reagents

a) 10 wt% hydroxylamine hydrochloride($NH_2OH.HCL$).

b) 2 molar sodium acetate.

c) 0.5 percent o-phenanthroline (in CH_3OH).

Procedure

a) Accurately pipette an aliquot sample solution containing 10 to 100 ug of iron into a 25 mL volumetric flask (usually 1 mL of stripping solution).

b) Add a few millilitres of distilled water and 2 mL of 10 percent hydroxlylamine hydrochloride.

c) Adjust the volume to approximately 10 mL with distilled water and adjust the pH to between 3 and 6 by adding 2 mL of 2 molar sodium acetate.

d) Mix and let stand five to 10 minutes, then add 1 mL of o-phenanthroline.

e) Makeup to mark with distilled water, mix and wait 5 to 10 minutes for color development and determine the optical density at 518 nm.

IF THE ORIGIANL SAMPLE SOLUTION IS COLORED, READ THE SAMPLE AGAINST A BLANK CONSISTING OF THE SAMPLE, PLUS REAGENTS, LESS O-PHENANTHROLINE.

IF SAMPLE SOLUTION IS COLORLESS, A BLANK MAY CONSIST OF WATER, PLUS REAGENTS, PLUS O-PHENANTHROLINE.

6.25.7 Crud Sampling

Water samples will be taken both upstream and downstream of the ion exchange column as per schedule given in Table 6.11.

Selected water samples will be filtered in the laboratory using 0.45-micron filter papers. A standard volume between 500 and 100 mL will be filtered through two identical filter papers back-to-back. The first will retain the crud and the second is to be used as a blank correction for weight loss. If significant crud is present (greater than 0.5 mg/l), it will be analyzed for weight, specific and gross gamma activity, and elemental composition.

All crud filtrates will be analyzed for dissolved metals and dissolved radionuclides.

6.25.8 **Hydrazine** (for passivation treatment only)

Reagents

a) 1000 mg/L N_2H_4 standard in 1% HCl

b) 2% p-dimethylaminobenzaldehyde in methanol-HCl

Procedure

a) The 100 mg/L standard is diluted with 1% concentrated HCl in water to give the followings standards:

10 mg/L, 25 mg/L, 50 mg/L, 100 mg/L.

b) The sample is added as soon as possible to a distilled water solution containing 1% concentrated HCl. This dilution step will bring the concentration within the limits of the standards.

c) Add indicator in the ratio of 1 mL of indicator to 5 mL of standard or diluted unknown. Let stand for a minimum of 10 minutes, but not more than 100 minutes. The solutions are analyzed in a spectrophotometer at 458 nm. The blank used is 1 mL of indicator in 5 mL of 1% HCl.

6.25.9 <u>Dissolved Oxygen</u>

Prior to reagent addition, hydrazine will be added to the coolant to remove dissolved oxygen and to initiate reducing conditions. An oxygen analysis will be performed after hydrazine addition, but before the LND-101A addition to ensure less than 100 ppb O_2 present. A colorimetric method such as the Chemet dissolved oxygen test can be used for these measurements.

THE CHEMET METHOD CANNOT BE USED AFTER LND-101A REAGENT ADDITION.

If the Station has reagents and equipment setup for dissolved oxygen by other means (i.e. such as iodometric, indigo carmine etc.) the normal Station test procedure may be substituted for the Chemet method.

6.25.10 Coupon Procedures

Coupons (1010 carbon steel; 304, 316L stainless steel) will be stored in a dessirator or sealed container before use. All coupon handling must be done using gloves.

Inactive Coupons

a) All coupons must be weighed and measured before installation.

LNDC/PECo

b) A control set of coupons must be kept.

LNDC/PECo

c) Following decontamination, all coupons will be examined and descaled as required.

Reagent Used: Clarke's solution item (i) of 9.6.1

Descaling solution for stainless steel 304

Procedure

1) at ambient temperature, insert 304 stainless steel coupons for up to 30 seconds or until scale is removed

2) rinse and dry

3) perform a blank correction on control specimens

d) All coupons will be weighed after decontamination.

e) Coupons may be gamma scanned and counted after decontamination to note any buildup of activity.

f) Corrosion rate will be calculated using the formula:

$$\text{Corrosion Rate (um/h)} = \frac{10\ M}{t\ p\ A}$$

M = weight lost by coupon during decontamination
p = density of coupon material ($g\ cm^{-3}$)
A = surface area of coupons (cm^2)
t = time coupon exposed to reducing chemistry in hours

For stainless steel 304:

$p = 7.94\ gcm^{-3}$

Radioactive Coupons

a) Radioactive coupons will be both gamma scanned and gross counted before decontamination. Scanning counting and geometries and time must be noted.

LNDC/PECo

b) After decontamination, radioactive coupons will be gamma scanned and counted in the same geometry.

LNDC/PECo

c) Decontamination factor (DF) will be calculated for each coupon.

$$DF = \frac{\text{Radioactivity Before Decontamination}}{\text{Radioactivity After Decontamination}}$$

LNDC/PECo

6.26 Decontamination Termination Decision

The termination of a decontamination is a judgement decision which is made jointly by the PECo, GE Engineer/Manager and LN. The following are all possible imputs to that decision:

a) Decontamination has met required radiation field reduction targets.

b) Chemical and radiological indications that the decon is essentially complete. Some indications of this are:

- significant reduction in radionuclide levels in solution and in radioactivity removal rates
- reduction in radiation fields to background levels

c) Corrosion indications that base metal attack may be occurring. Some indications of this are:

- increases in metal ion concentration
- changes in Fe^{2+} to total iron ratio

d) Project scheduling may dictate terminating the decon at a certain point. After a DF of 3 to 5 is obtained, PECo or GE Engineer/Manager may wish to proceed with other work rather than continue longer with the decontamination and get a higher DF.

e) Operation factors (such as LN or Station equipment performance, need to change resin etc.) may have an impact on the termination decision, particularly after the DF has risen to 3 to 5.

6.27 SAFETY, DOSE CONTROL AND RADIATION MONITORING

6.27.1 General

This section details the procedures required to:

a) Maintain a safe work environment throughout the decontamination.

b) Access the net effect of the decontamination on the recirculation piping, RHR return and supply segments and RWCU system.

c) Monitor and control personnel dose expenditure.

d) Contamination control.

6.27.2 General Safety Procedures

A safe work environment is maintained by regular inspection of all work areas by LN to ensure all unnecessary hazards have been eliminated. All personnel must be aware of the following:

a) Proper clothing to be worn in plant such as hard hats, safety glasses and shoes.

b) Knowledge of station emergency procedures for the working area.

c) Response and notification requirements to any abnormal equipment operation (see Section 11.0).

d) Maintenance of a clean work area.

e) Minimize personnel traffic through work area.

f) Instructions concerning plant procedures and general good practices, as presented in the "General Employee Training", shall be followed.

g) Follow all instructions while handling hazardous materials.

h) Keep personnel informed of potential hazards that may be present during the decontamination.

6.28 Radiation Field Monitoring

In order to assess the effectiveness of the CAN-DECON process, contact radiation field readings will be taken at various locations inside and outside of the drywell area both before and after the decontamination.

6.28.1 **Instrumentation Setup**

Place Gamma meter(s) strategically in the decontamination system, in order to monitor the radiation levels throughout the decontamination, as follows:

a) Place a remote probe between the ion exchange columns, behind the shield wall and located to read at the mid-section of the columns. The probe used must have a meter range of 0 to 100 R/hr. LN will assist during installation to ensure proper location of the probe. The meter must be located in a readily accessible, low dose location.

b) Minimize personnel dose by placing at least two Gamma meters with remote probes at the most active-on-contact spots. Typically, the recirculation pump bowls, ringheader and risers are ideal locations for monitoring the radiation fields.

Location of the probes will be determined at site, after the initial radiation survey has been taken.

c) Monitor the decontamination equipment for localized hot spots and recorded in Table 6.9 to ensure personnel are aware of high dose areas.

d) Monitor the decontamination flow path lines initially 8 to 10 hours after injecting chemical, then regularly every 2 hours. The "*" asterisk points shown in Figure 6.2 are used to give a general estimate of how the decontamination is progressing. Localized hot spots may develop on the decontamination equipment. All data must be recorded in Table 6.9 and personnel made aware of high dose areas.

e) As the regeneration phase of the decontamination reaches completion, take a general survey of 8 to 10 points to give a gross estimate of the DF achieved and to ensure all the "hot spots" have been removed. Continue the decontamination on the recirculation system piping until the hot spots are reduced as much as possible. This may be achieved by adjusting flow rates through pipe sections as instructed by the LN.

6.28.2 **Initial Radiation Survey**

a) Take the initial radiation survey immediately after the system leak test has been completed (see Section 6.9.3).

b) Drywell entry by qualified personnel equipped with the Eberline E-530N meter and shielded probe.

c) Check meter battery operation and calibration data taken.

d) Record information on Radiation Survey Map, Figure 6.2 (protected in plastic) at the predesignated points.

e) Upon completion, transfer data points to Table 6.13, Decontamination Radiation Level Readings, and are kept as an official record.

6.28.3 **Radiation Monitoring**

a) Throughout the decontamination, installed remote probes are read hourly and recorded on the Radiation Monitoring Check Sheet, Table 6.9. This will determine the effectiveness of the process during operation.

6.28.4 **Final Radiation Survey**

a) Take the final radiation survey after the reagent removal step has been completed (Section 6.13.7) prior to draining the system.

b) Use qualified personnel to enter drywell area with the shielded probe and Eberline E-530N meter.

c) Check meter battery operation and calibration date.

d) Record date on the Radiation Survey Map, Figure 6.13 (protected in plastic) at the predesignated points.

e) Transfer date, upon completion, to Table 6.13 and are kept as an official record.

6.28.5 **Evaluation of Decontamination Factors**

London Nuclear determines the Decontamination Factors (DFs) by using the Weighted Harmonic Mean (WHM) method. The WHM is simply the total sum of the "before" readings divided by the total sum of the "after" readings. If discrepancies are encountered such that one or two points influence the end result unrealistically a different approach is used. This avoids giving undue weight to those points having low DFs. A WHM DF will now be calculated for each of several areas or components throughout the system being contaminated.

For a typical recirculation system, these might be: recirculation risers, ring headers, pump area, and main piping. For each of these areas, an average (total divided by number of points) initial and final readings would be calculated and the DF calculated by dividing the average of the initial readings by the average of the final readings.

Calculate the overall DF by taking a single average of these before and after readings and dividing the average before by the average after.

6.29 Personnel Dose and Contamination Control

6.29.1 Personnel dose is controlled in the following manner:

a) All LN staff members are to wear a TLD supplied by LN, TLD and pencil chamber supplied by Station.

b) Strive for ALARA at all times.

c) Routinely check for changing radiation levels around the decontamination equipment.

d) Review radiation survey data sheets taken by HP assigned to area.

6.29.2 All LN staff entering the radiation areas shall read and understand the RWP associated with the decontamination. All necessary protective clothing and dosimetry requirements, as well as special instructions shall be described and followed. A good understanding of the latest survey data will be helpful in minimizing personnel exposures. Any questions on the requirements or special concerns should be resolved with a Station health physics representative.

6.29.3 Carry out personnel contamination control out in the following manner:

a) The required protective clothing is worn as specified on the Station RWP's.

b) Minimize contact with the decontamination equipment. Valve manipulation and sampling are the only occasions normally requiring direct contact.

c) Ensure all spillages are properly cleaned up.

ABNORMAL OPERATIONS

APPENDIX A

ABNORMAL OPERATIONS

The following sections outline potentially abnormal operating conditions which could occur during the CAN-DECON application. Below is a listing of operator response required to ensure personnel safety, to prevent further damage to system components, and/or to permit continued safe system operation. The information is summarized in Table 11-1.

.1 Loss of Temperature Control

a) Failure to Control Rising Temperature

This could occur should the heater temperature controller (CU-204 or TC-401) fail to de-energize. Should the process temperature continue to rise, the LN operator would manually shutoff the heaters. A high temperature cut out switch (CU-203 or TSH-401) will also shutdown the heater at 300°F. The LN operators are able to run the heaters manually with no detrimental effects on the decontamination.

b) Failure to Maintain Temperature

The failure to maintain temperature could be the result of:

1) Inadequate power supply

2) Failure of temperature controller (CU-204, TC-401), or an inadequate power supply would be detected during pre-application testing. This would be corrected by the appropriate support personnel. Failure of the temperature controllers would be handled as in 11.1. by operating the heaters manually. Failure of the 300 Kw LN-4 heater elements would require the backup 300 KW LN-5 heater skid to be shipped. The 150 KW heater will maintain system temperature at 200°F while the 300 KW LN-5 heater is shipped and connected to the system. This would allow the decontamination to proceed out at a slower dissolution rate.

   Failure of the 150 KW heater would slow down the heatup rate; however, process temperature can be maintained at 250°F using the 300 KW heater alone. Spare elements for the 150 KW heater are readily available.

3) Failure of heater elements.

.1.1 Heater Isolate/Drain Procedure

a) Heater CU-105

1) check <u>all</u> heater controls are OFF

2) allow heater to cooldown. Monitor TI-101 until temperature drops below 200°F

3) shut circulating pump CU-102 to OFF

4) close valves CU2-V9 and CU3-V1

5) vent heater by slowly opening valve CV3-V1. Monitor sight glass SG-101

6) open heater drain valve RD2-V2 until all water has drained out

IF PUMP OPERATION IS PERMITTED, THEN IT IS ADVISABLE TO LOWER THE SYSTEM TEMPERATURE. THIS IS ACCOMPLISHED BY USING MAIN COOLER CU-104 AND OPENING VALVES U2-V2, CU2-V6 CU2-V7 AND CLOSING VALVE CU2-V8. ONCE SYSTEM HAS COOLED SUFFICIENTLY, THEN STEPS 11.1.1 (a) THROUGH (f) ARE FOLLOWED.

b) Heater CU-401

Heater CU-401 may be removed from system while pump is operating.

1) open valve CU11-V2 and close CU10-V4 and CU11-V1

2) slowly open vent valves CV10-V1 and CV11-V1. Monitor sight glass SG-401

3) open drain valve RD10-V1 and monitor sight glass SG-402 until all water has been drained

.2 Loss of Circulating Pump

The most likely failure to occur on a centrifugal pump would be a mechanical failure. A complete set of spare parts is available at site. LN operators are trained to trouble shoot and repair the pump as necessary. In the event the pump cannot be repaired, a spare pump is available on short notice.

.2.1 Circulating Pump Isolate/Drain Procedure

a) Close valves CU1-V3, CU1-V4, CU7-V1, CD2-V2, CU2-V3 and CU2-V5.

b) Open valve RD2-V1 and allow pump to depressurize to 0 psig as indicated on PI-101.

c) Loosen drain plug, located in pump bowl and allow pump to completely drain.

.3 Loss of System Fluid

A loss of system fluid can occur through a variety of means; most notably would be:

a) Major leakage from a decontamination system component.

b) Hose failure at fittings or weak spot.

All system components and hoses are pressure tested at twice the maximum operating pressure prior to decontamination startup. All hoses have isolation valves at each end to minimize leakage from a hose failure. In addition, the LN operator hourly inspects all hoses and process piping for leaks.

.4 Loss of Power

Loss of power would essentially shutdown the decontamination system. If the power loss appears to be short lived (less than 10 days to repair) the LN operator will secure the decontamination equipment for the duration of repairs. If the power loss appears to be long term, then an alternate source of power (480V/30A) will be provided by the SP to remove any reagent in the piping.

.5 Slurry Hose Failure

As per 0.3 above, the slurry hose is tested at twice the "dead head" pressure which could be applied through inadvertent valve operation.

During the slurry operation, the line will constantly be monitored (at a safe distance) to verify that there is no leakage. Adequate communication lines will be set up in advance between personnel monitoring the slurry line and the LN equipment operator to respond rapidly to any problem which might occur during the operation.

ABNORMAL OPERATIONS

TABLE 11.1

ABNORMAL CONDITIONS	PRELIMINARY PRECAUTIONS	PRIMARY CONTROL	BACKUP	RECOMMENDED OPERATOR ACTION
11.1 Loss of Temperature Control				
(a) Failure to control rising temperature POSSIBLE CAUSE Failure of Temperature controller CU-204/TC-401	Testing heater control circuits before decon as per operating procedure	Equipment operator available 24 hours taking readings at regular intervals	High temperature cutout switch to trip heaters (CU-203/TSH-401)	Manually switch heater circuits to "OFF" and let system cool down. Continue to circulate. Operate heater manually.
(b) Failure to maintain temperature POSSIBLE CAUSE - Inadequate power supply - Failure of temperature controller CU-204 or TC-401 - Failure of heater elements	Testing heater control circuits before decon as per operating procedure	Equipment operator available 24 hours taking readings at regular intervals	Backup 300 KW heater. Skid available on short notice. 150 KW heater elements available on short notice.	Operate at lower process temperature (200^{0}F) until 300 KW heater is replaced.
11.2. Loss of circulating pump POSSIBLE CAUSE Mechanical failure of circulating pump CU- 104	Functional testing of circulating pump before decon as per operating procedure	Equipment operator available 24 hours taking readings at regular intervals	Manufacturer's recommended spare parts available during decontamination Backup pump available in short notice.	Select pump CU-104 to "OFF" and initiate repairs to circulating pump.
11.3. Loss of system fluid POSSIBLE CAUSE - Major leakage from decontamination system component - Hose failure at fittings or fracture in weak spot	- Leak testing before decon as per operating procedure. - Isolation valves at critical locations to limit leakage	Equipment operator available 24 hours taking readings at regular intervals	Manufacturer's recommended spare parts available during decontamination.	-Select pump Cu-104 to "OFF" and isolate area of leakage -Initiate cleanup and commence repairs as necessary
11.4. Loss of 480/440V power POSSIBLE CAUSE various causes	Testing of circuitry	Station backup power supplies available	Operator	-Secure Decontamination Equ -Investigate cause -Perform necessary repairs -Remove chemicals from system if necessary

PIPE ISOLATION

SPECIAL HOSE COUPLING ASSEMBLY INSTRUCTIONS

PROCEDURE FOR APPLICATION OF BOLT TORQUE ON FLANGED JOINTS

STEP 1. ALIGN COMPONENT PARTS AND CLAMP TOGETHER WITH HOLD DOWN.

STEP 2. LUBRICATE STUD (OR BOLT) THREADS IN AREA OF NUT (OR FORGED RING) ENGAGEMENT, ALSO LUBRICATE FACE OF NUTS (OR BOLT HEAD) USING A SUITABLE LUBRICANT.

STEP 3. INSTALL ALL BOLTS AND NUTS FINGER TIGHT.

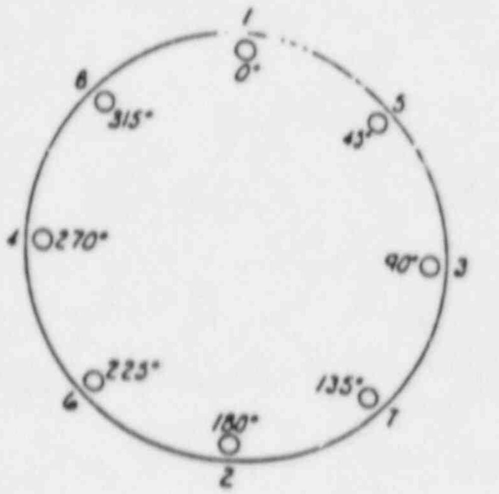
STEP 4. NUMBER BOLTS SO THAT TORQUING REQUIREMENTS CAN BE FOLLOWED.

STEP 5. APPLY TORQUE IN 20% (1/5) STEPS OF REQUIRED FINAL TORQUE, LOADING ALL BOLTS AT EACH STEP BEFORE PROCEEDING TO NEXT STEP.

STEP 6. TIGHTEN BOLTS IN SEQUENTIAL ORDER 0-180°, 90°-270°, 45°-225° & 135°-315° AT EACH STEP UNTIL FINAL TORQUE IS REACHED. -(SEE ATTACHED SKETCHES)

STEP 7. USE ROTATIONAL TIGHTENING UNTIL ALL BOLTS ARE STABLE AT FINAL TORQUE LEVEL. (TWO COMPLETE TIMES AROUND IS USUALLY REQUIRED.) SEE ATTACHED SKETCHES.

BOLT TORQUE PROCEDURE



8-BOLTS

SEQUENCIAL ORDER	ROTATIONAL ORDER
1-2	1
3-4	5
5-6	3
7-8	7
	2
	6
	4
	8

Step 1

If hose end is to be cut prior to coupling installation, place on a bench or other support and secure in place. Wet the knife blade for easier cutting; some types of hose will cut more easily if flexed slightly.

Step 2

Cut hose ends squarely; square ends are necessary to insure the proper alignment and depth of the hose on the coupling shank (nipple).

Step 3

Lubricate the hose and coupling shank for easier insertion; soap and water, or water alone, are recommended lubricants.

Step 4

Do not cut or burn out any of the inner tube to accommodate a coupling shank that is too large; however, countersinking the end of the tube 45° may help to insert the coupling.

Step 5

Do not alter the shank of the coupling; doing so may either reduce some of the holding power or create sharp edges which could puncture the hose tube.

Step 6

Keep hose and coupling shank aligned as they are being pressed together to avoid damaging the hose tube and to assure that they reach full insertion depth; place the coupling in a vise so it can be held securely.

Step 7

Locate clamp(s) over hose barb and tighten. Tighten clamp hex nuts with a wrench or socket. Turn nuts until clamp halves are pulled tight around hose, but leave a litle space between clamp ears for later takeup.

Note: After hose has cycled from hot to cold, retighten all clamp bolts.

Step 8

Do not remove any part of the hose cover (except in accordance with manufacturer's specific coupling instruction). Doing so can expose the reinforcement and shorten the life of the hose.

Step 9

After assembly of couplings, inspect the inside of the hose at the end of the coupling for cuts, tears, folds, or bulges resulting from improper assembly.

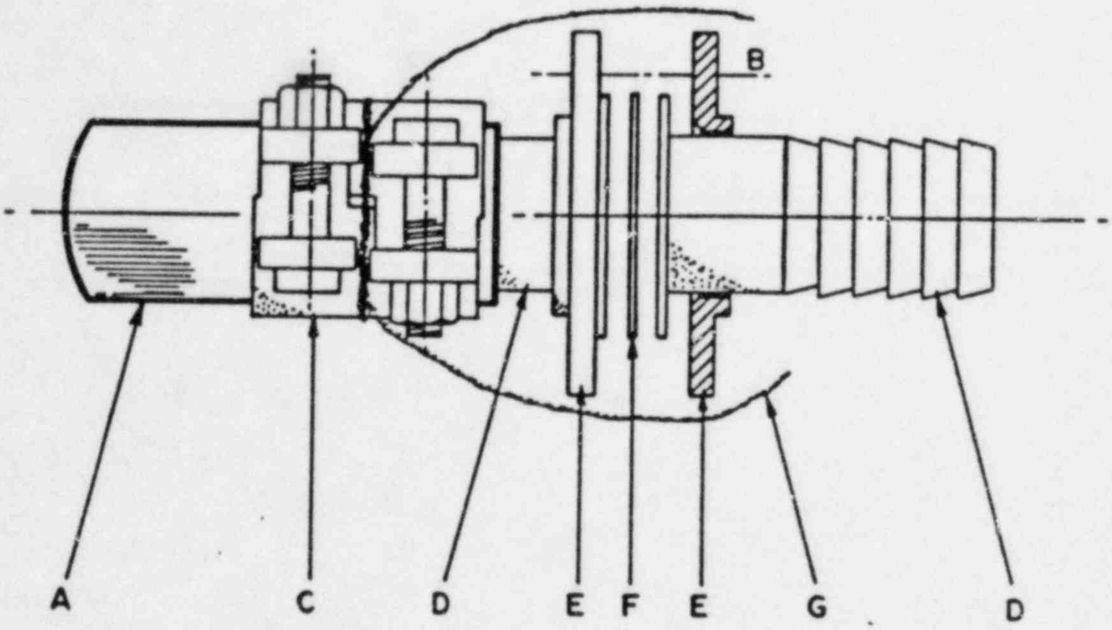
Note: Refer to London Nuclear Procedure for bolting of flanged joints in process systems for interconnection details.

Step 10

Once joint interconnection is complete, install coupling securing wire (see Figure 1, Item G).

FIG. I

HOSE COUPLING



A — HOSE
B — BOLTING (CARBON STEEL)
C — OFFSET INTERLOCKING CLAMPS
D — TURNED BACK HOSE NIPPLE (STAINLESS STEEL)
E — BACKUP FLANGE (CARBON STEEL)
F — SPIRAL WOUND GASKET
G — COUPLING SECURING WIRE

NOTE: USE TWO STRANDS OF 16GA. TIE WIRE (WRAP AROUND CLAMP 'C' THEN PASS TIGHTLY OVER FLANGES 'E' AND SIMILARLY ATTACH TO ADJOINING FITTING.)

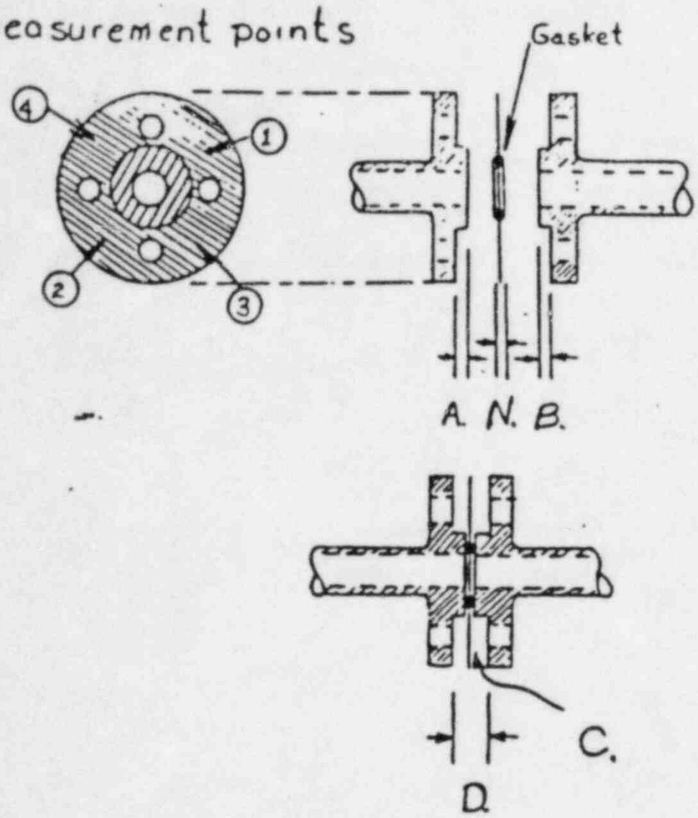
AS BUILT FLANGE JOINT ARRANGEMENT

DATA SHEETS

APPENDIX "D"

Joint I.D. ________

measurement points

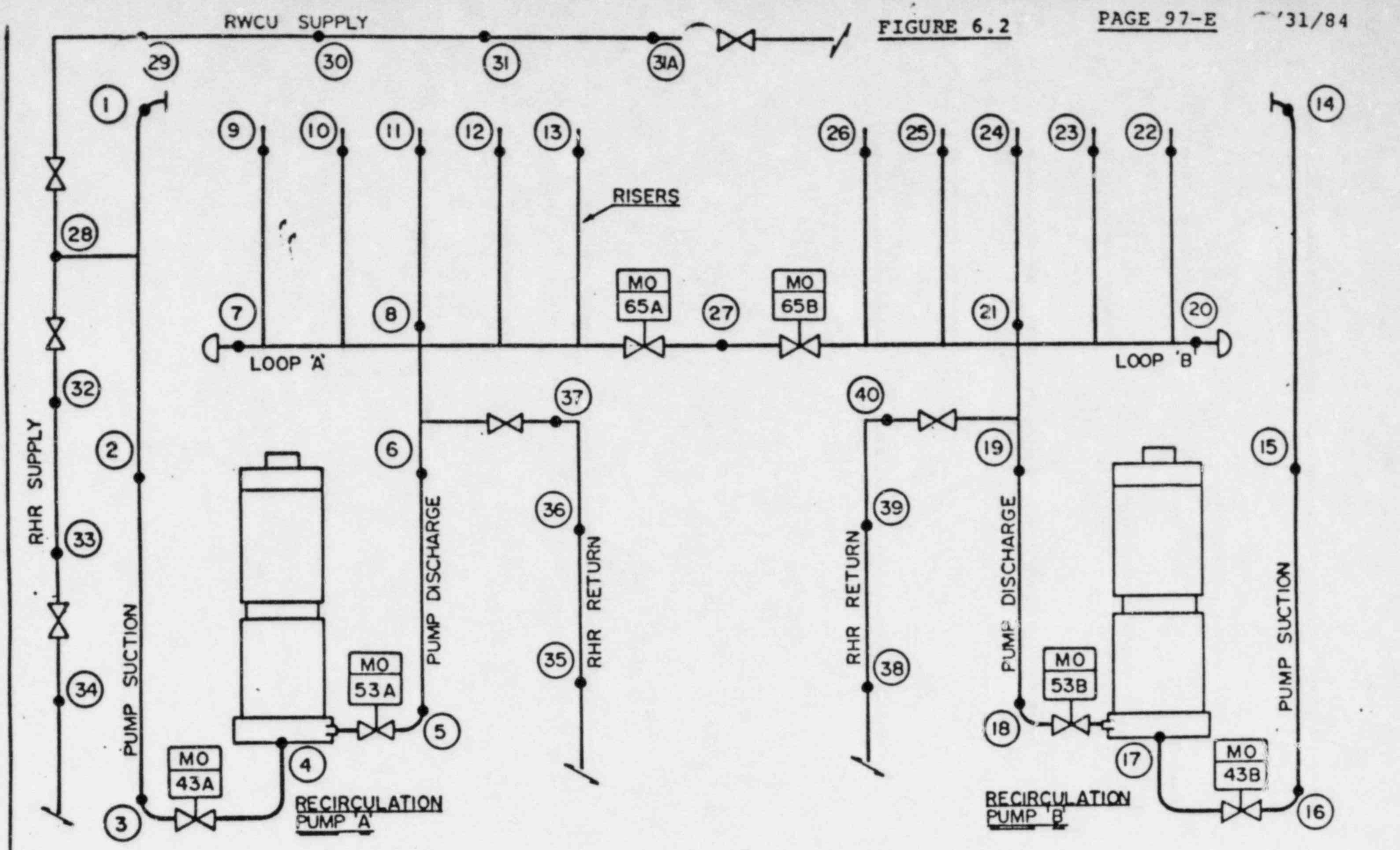


(N) Gasket thickness New ______
(G) Desired gasket compression (Crush) (−) ______ ± ______
C = ______ ± ______

(A) Raised face height
(B) Raised face height
(C) Seated gasket thickness
(D) Torqued flange distance

Formula D - (A+B) = C (measured in thousandths inches)

	D	-	(A	+	B)	=	C	±		Q.A. initial
1	____	-	(____	+	____)	=	____	±	____	____
2	____	-	(____	+	____)	=	____	±	____	____
3	____	-	(____	+	____)	=	____	±	____	____
4	____	-	(____	+	____)	=	____	±	____	____



PEACH BOTTOM UNIT 2

DATE
TIME
SURVEY TAKEN BY

INSTRUMENT SERIAL Nº

NOTES
1. SURVEY POINTS SHOWN ●
2. ADDITIONAL POINTS MAY BE TAKEN
3. ALL POINTS TO BE RECORDED ON TABLE 6·1.

RECIRCULATION, RWCU AND RHR PIPING SURVEY POINTS	DRAWING Nº	RE
LONDON NUCLEAR SERVICES NIAGARA FALLS, NEW YORK	FIG 6·2	C

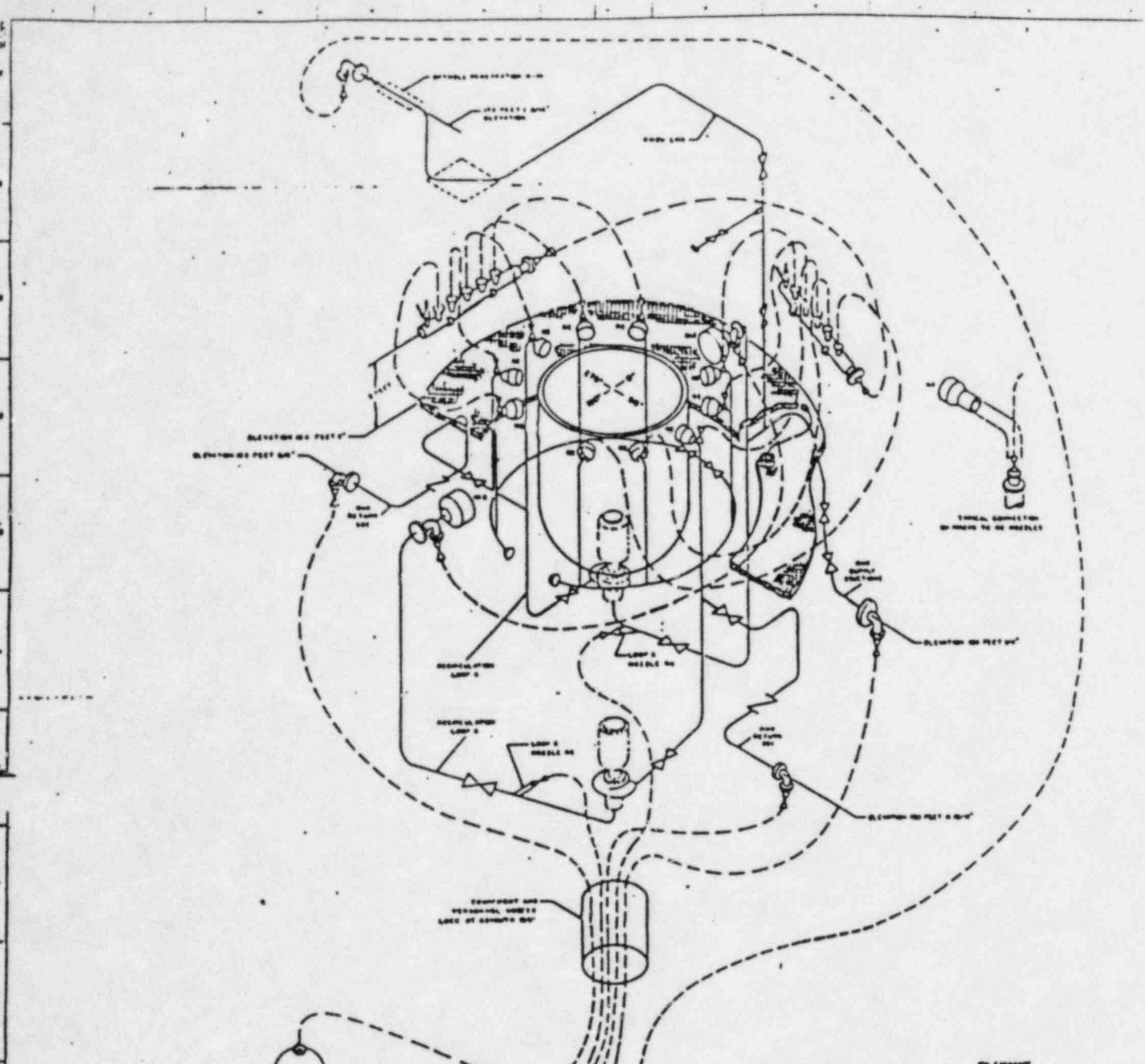


FIGURE 6.3

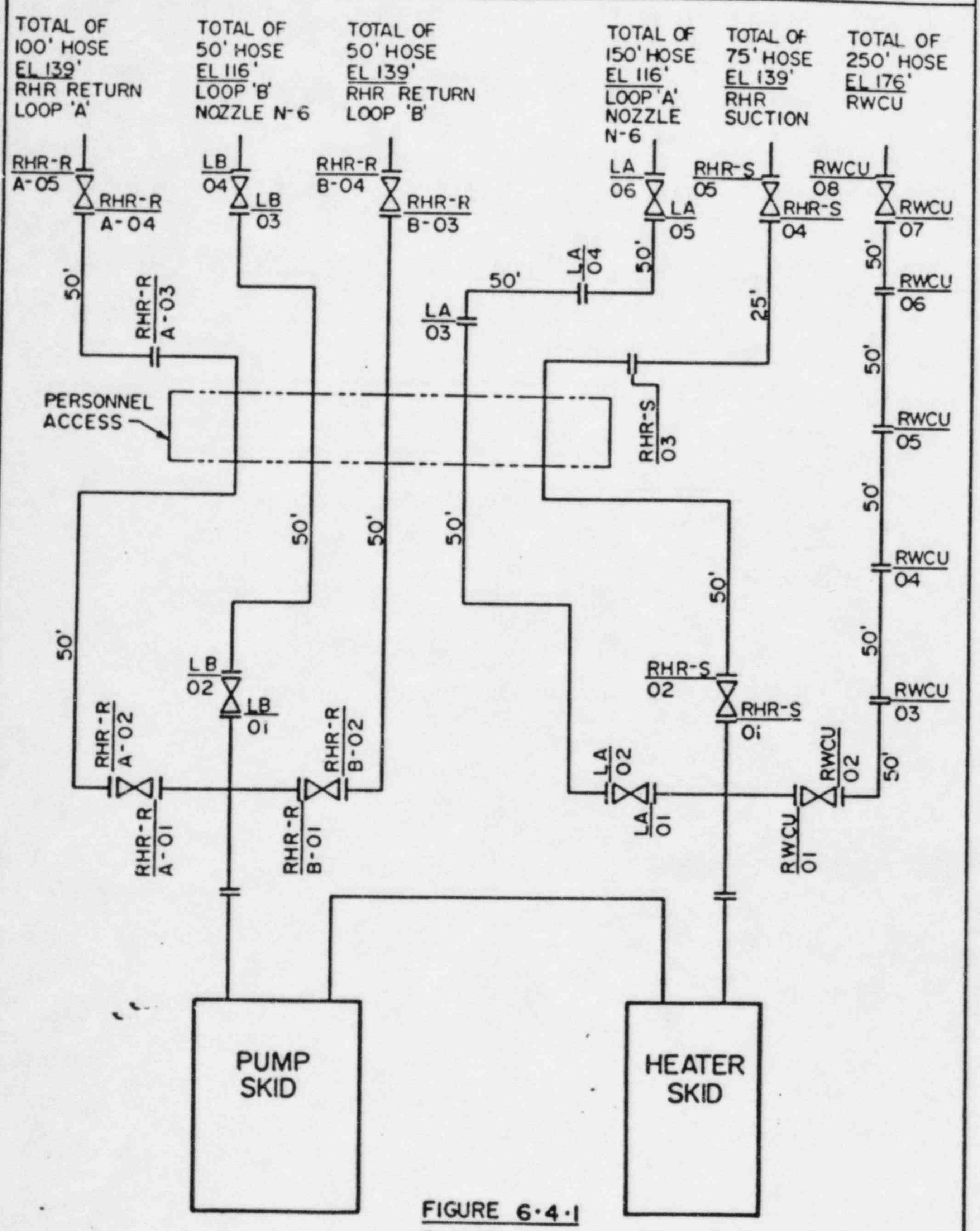


FIGURE 6·4·1
FLANGE JOINT GENERAL ARRANGEMENT

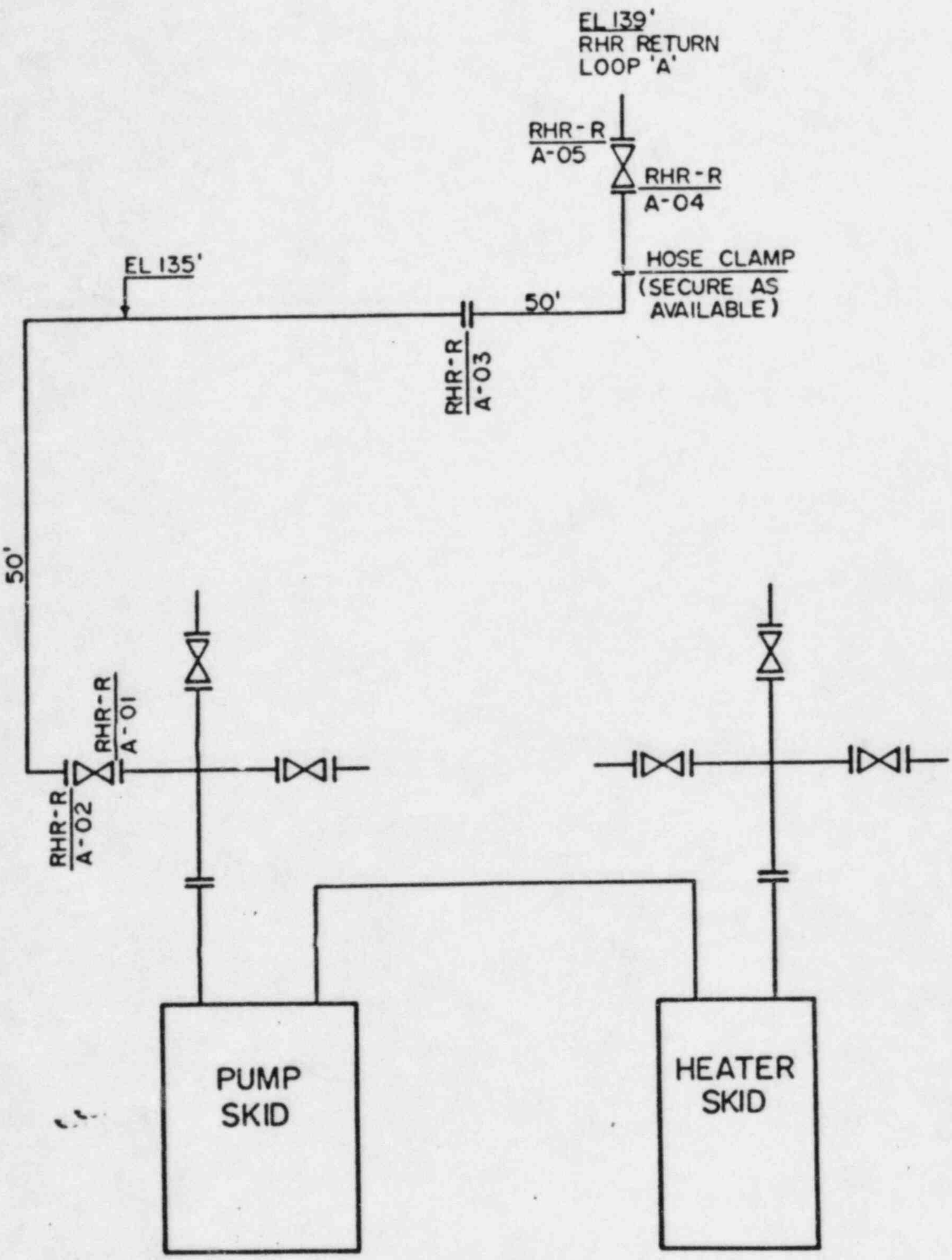


FIGURE 6·4·2
RHR RETURN - LOOP 'A' JOINT ARRANGEMENT

OP-001	FLANGE ARRANGEMENT	Revision -E-	5/31/84	97-G

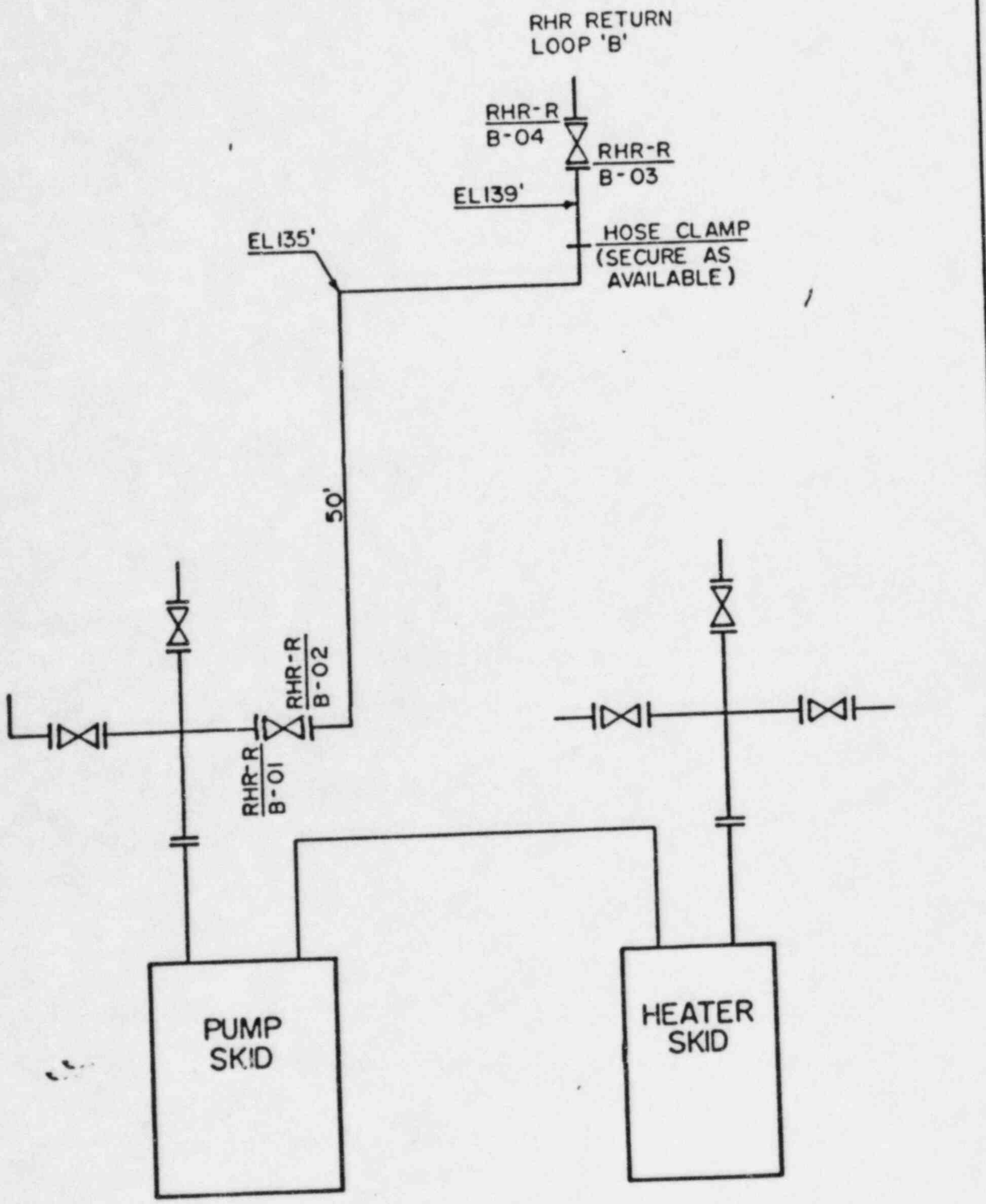


FIGURE 6·4·3
RHR RETURN - LOOP 'B' JOINT ARRANGEMENT

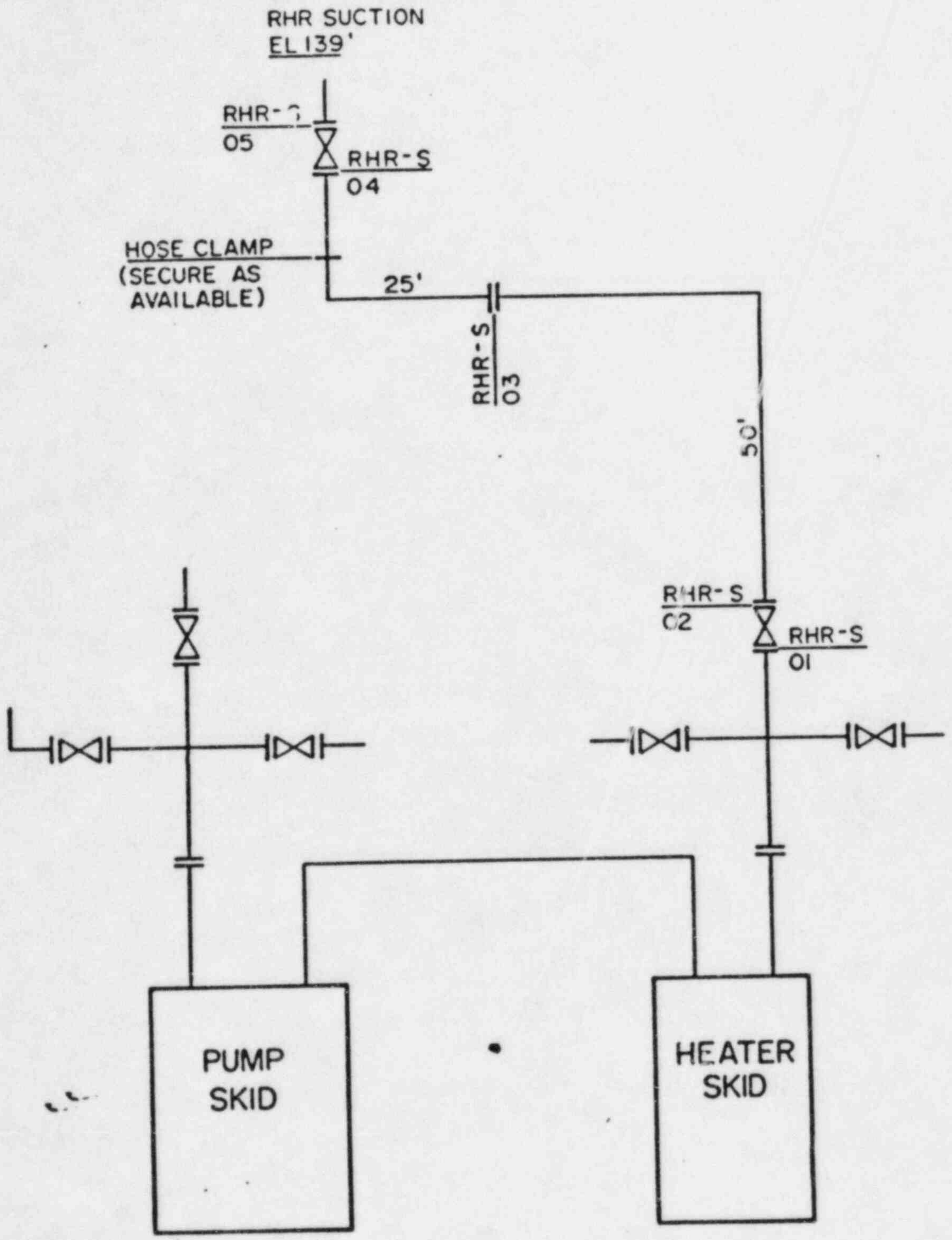


FIGURE 6·4·4
RHR SUCTION JOINT ARRANGEMENT

OP-001	FLANGE JOINT ARRANGEMENT	-E-	5/31/84	97-G

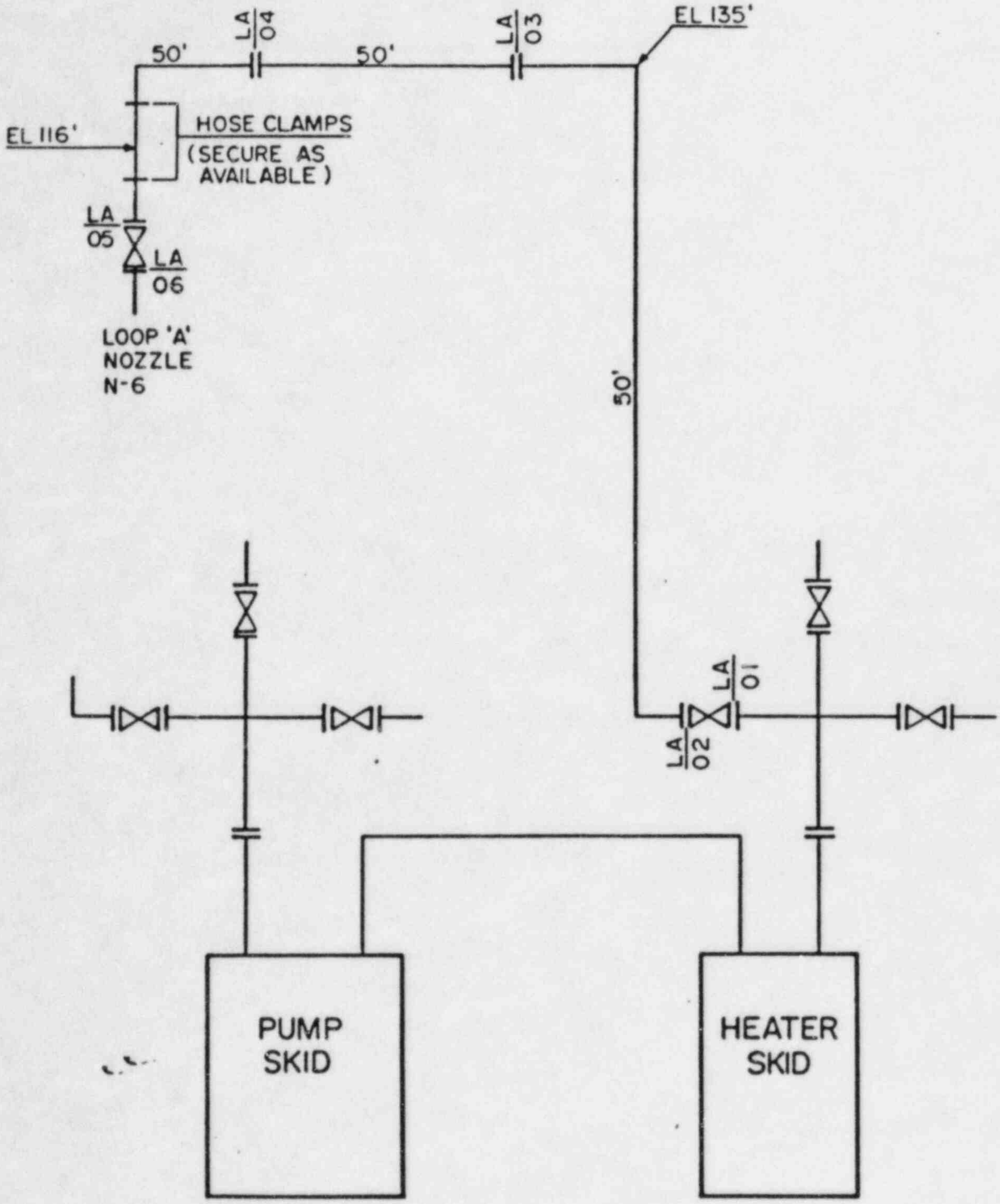


FIGURE 6·4·5
NOZZLE N6A JOINT ARRANGEMENT

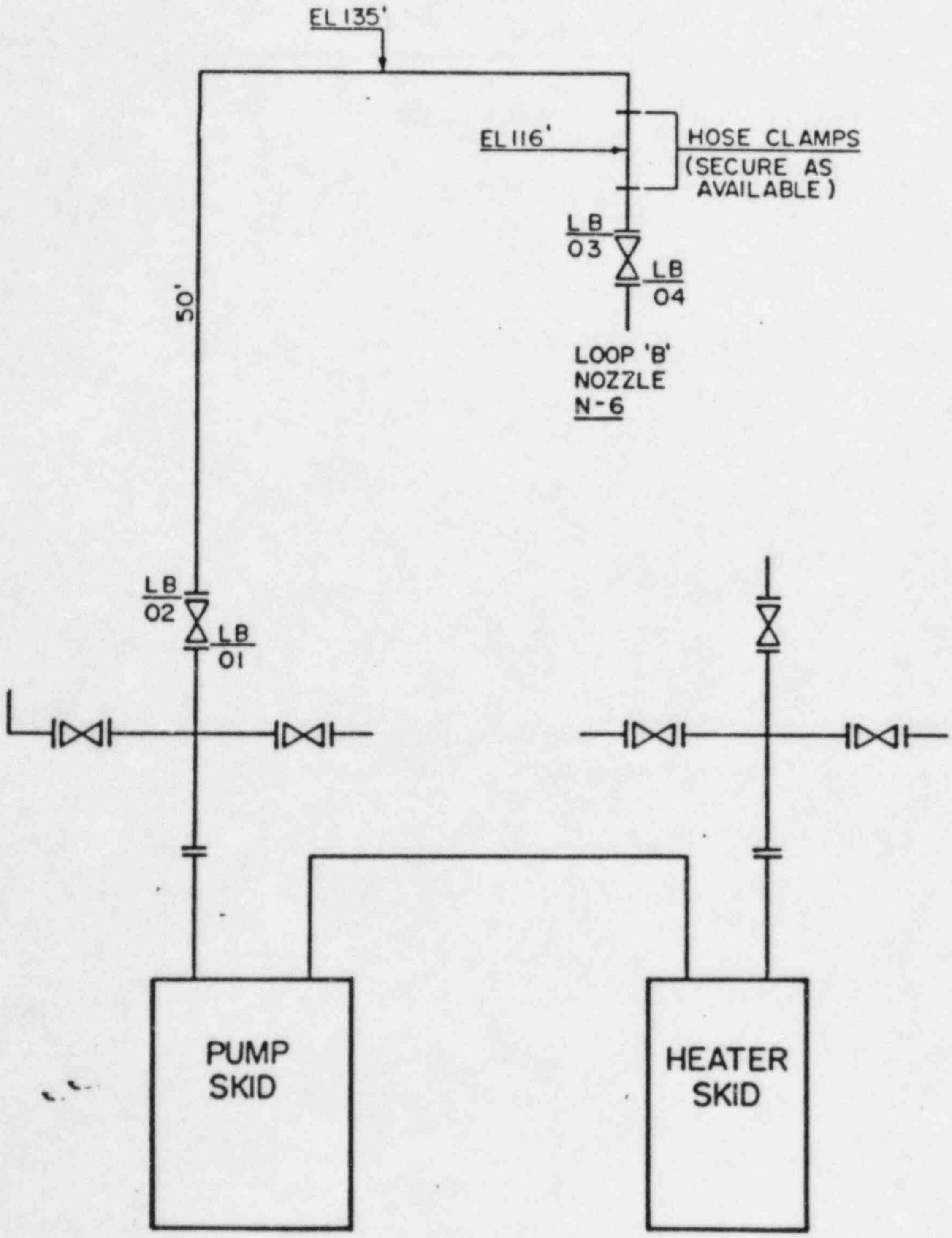


FIGURE 6·4·6
NOZZLE N6B JOINT ARRANGEMENT

OP-001	FLANGE JOINT ARRANGEMENT	-E-	5/31/84	97-G

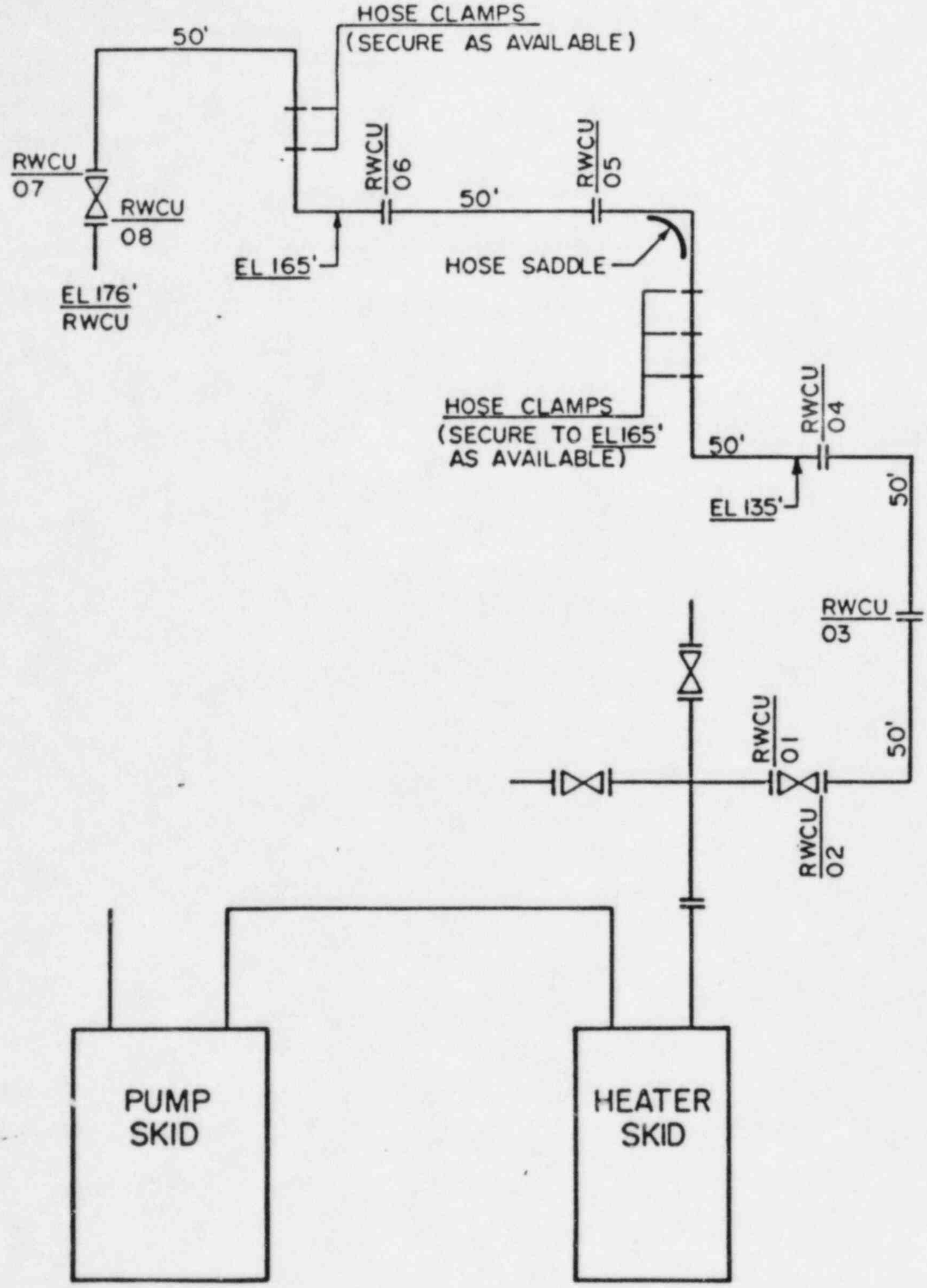


FIGURE 6·4·7
RWCU JOINT ARRANGEMENT

OP-001	FLANGE JOINT ARRANGEMENT	-E-	5/31/84	97-G

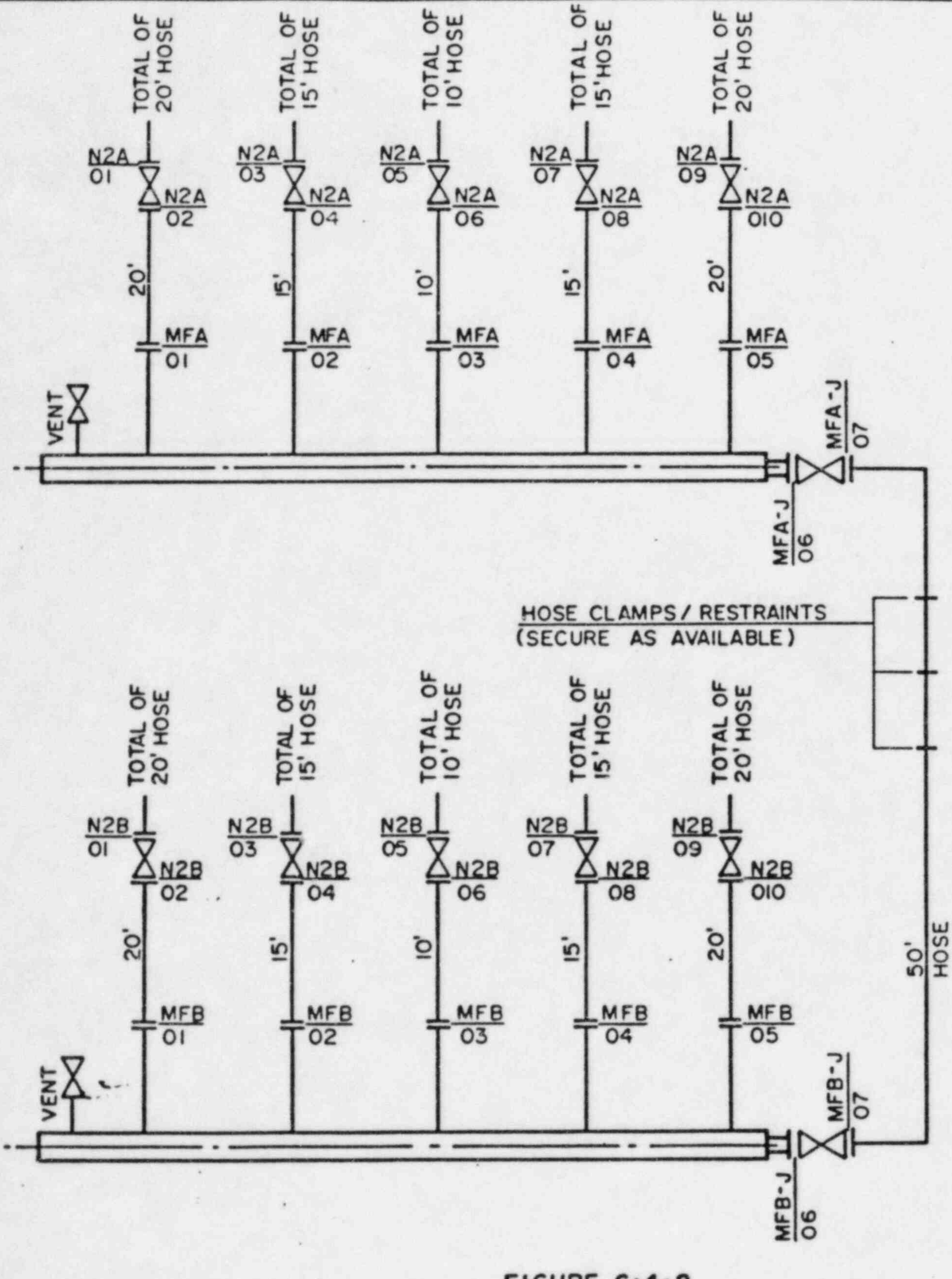


FIGURE 6·4·8
N2A - N2B MANIFOLD AND JUMPER JOINT ARRANGEMENT

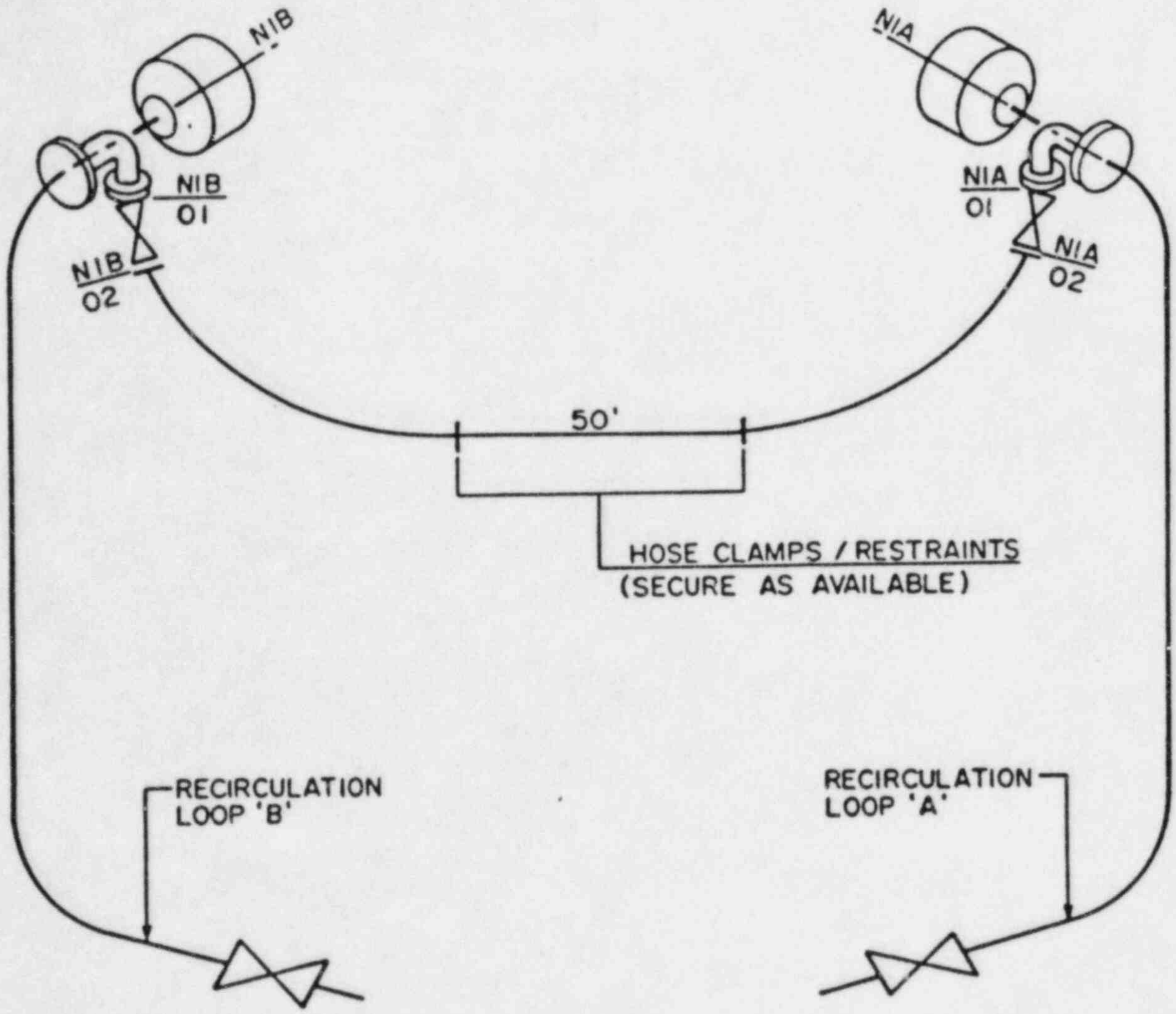
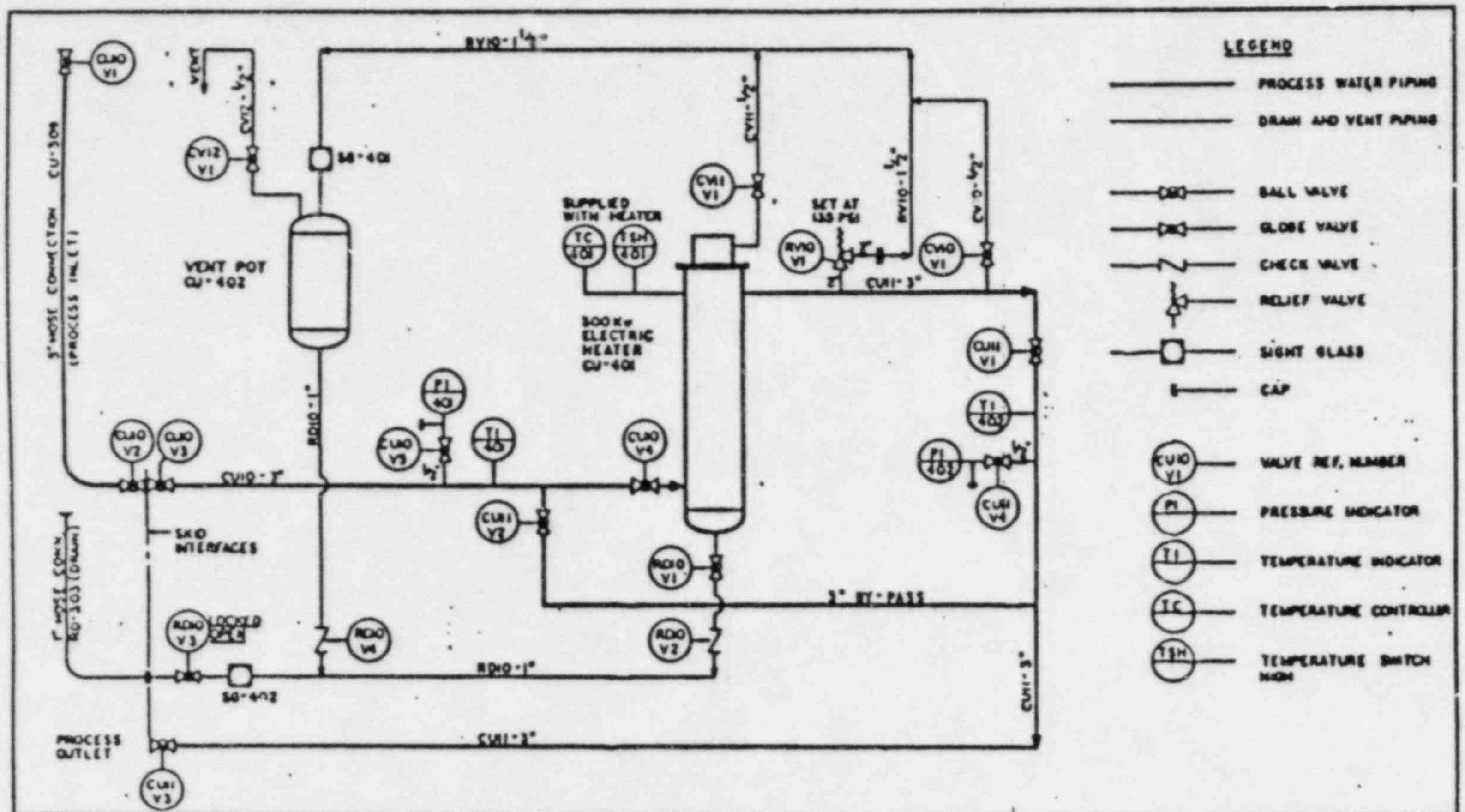


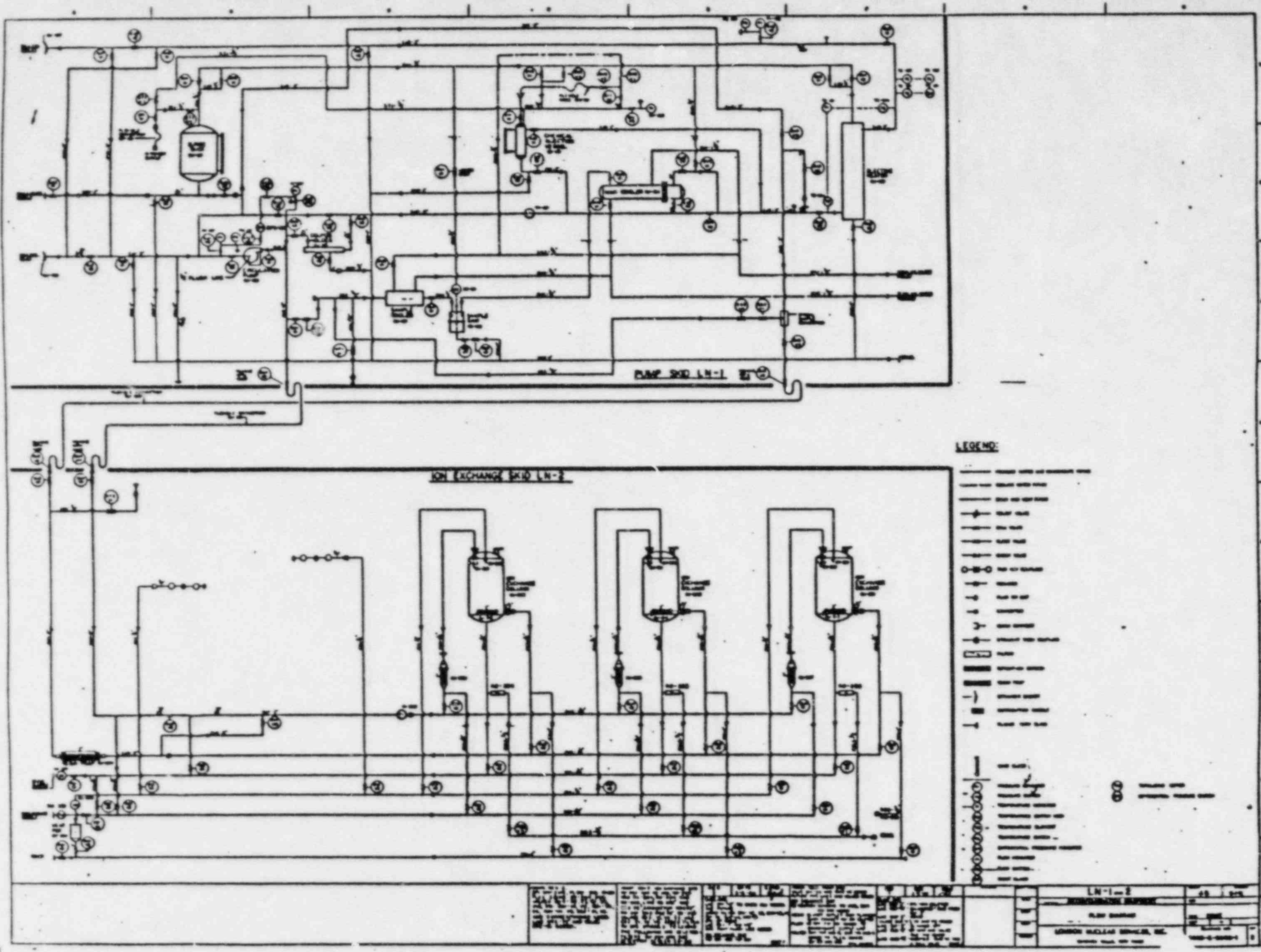
FIGURE 6·4·9
NIA - NIB JOINT ARRANGEMENT



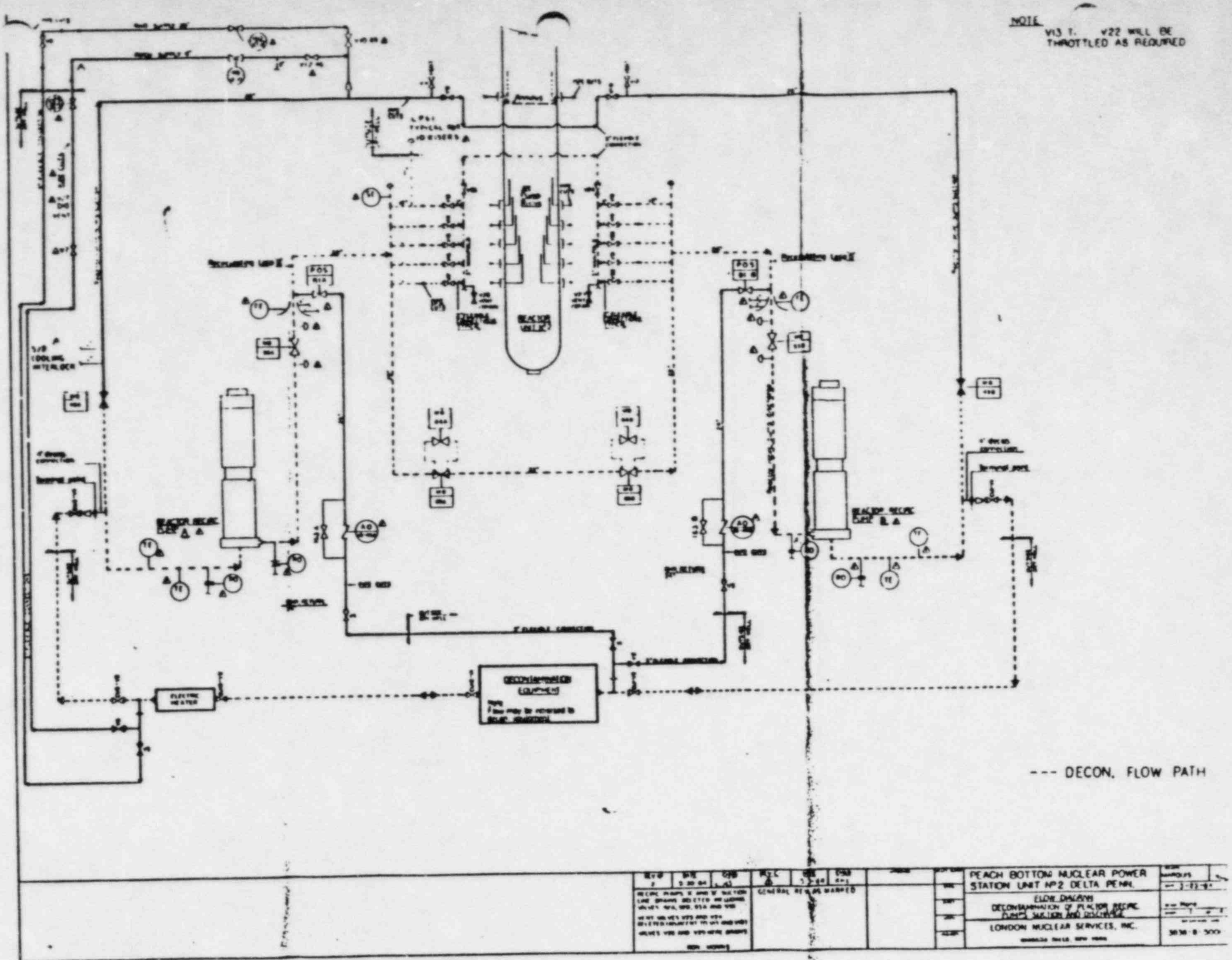
REV	DESCRIPTION
1	LINE CV12-V2 WAS RV11-V2. VALVE CV12-V1 WAS RV11-V1. VALVE RD10-V3 NOW LOCKED OPEN. RON MORRIS 3-12-84 CHK'D DJE

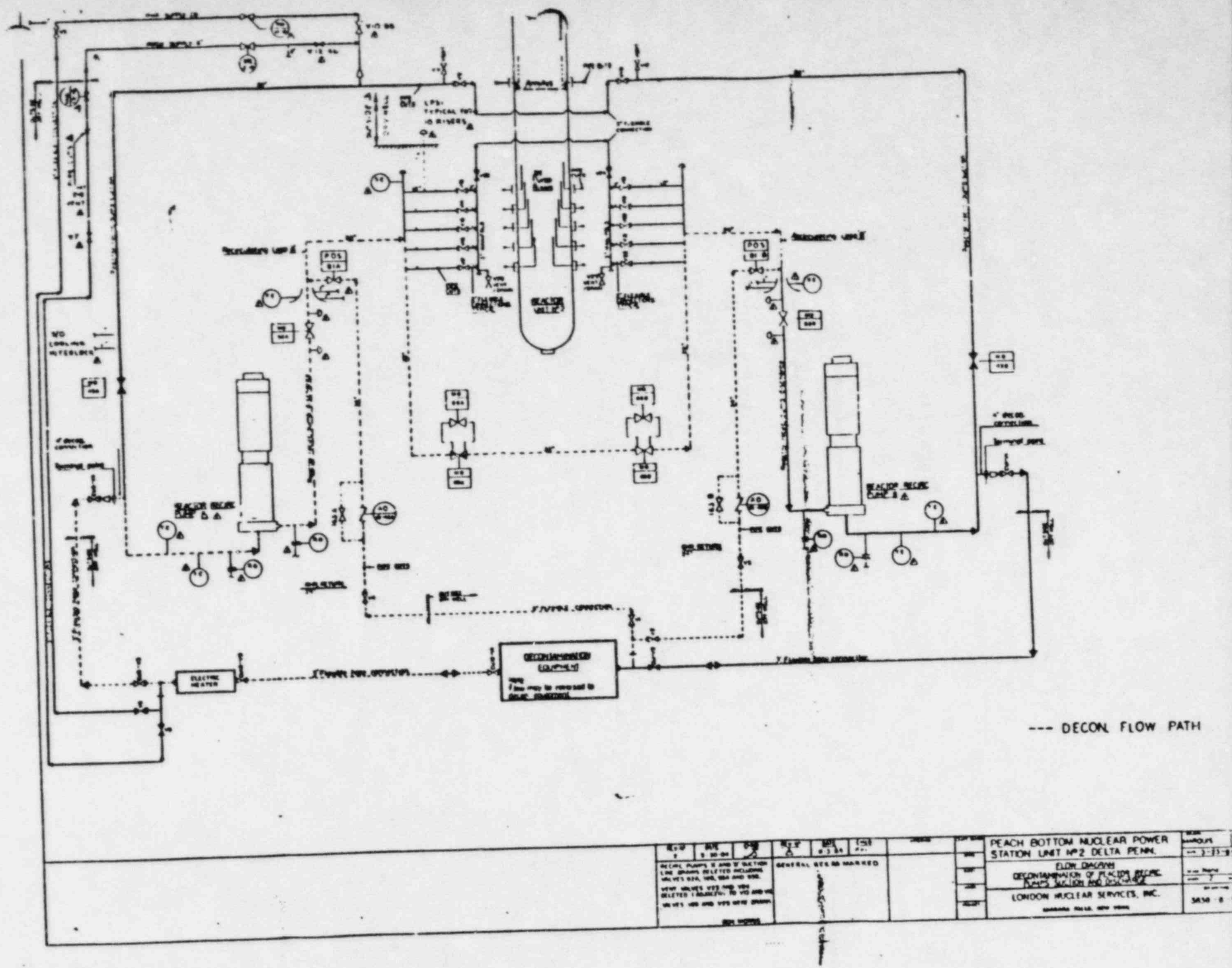
LN-4 AND 5
DECONTAMINATION EQUIPMENT
FLOW DIAGRAM
ELECTRIC HEATER SYSTEM DIAGRAM
LONDON NUCLEAR SERVICES, INC.
NIAGARA FALLS, NEW YORK

DRAWN: RON MORRIS
DATE: 24th JAN 1983
SHEET 1 OF 1
DRAWING NO. 3603-A-5009-1
REV. 1

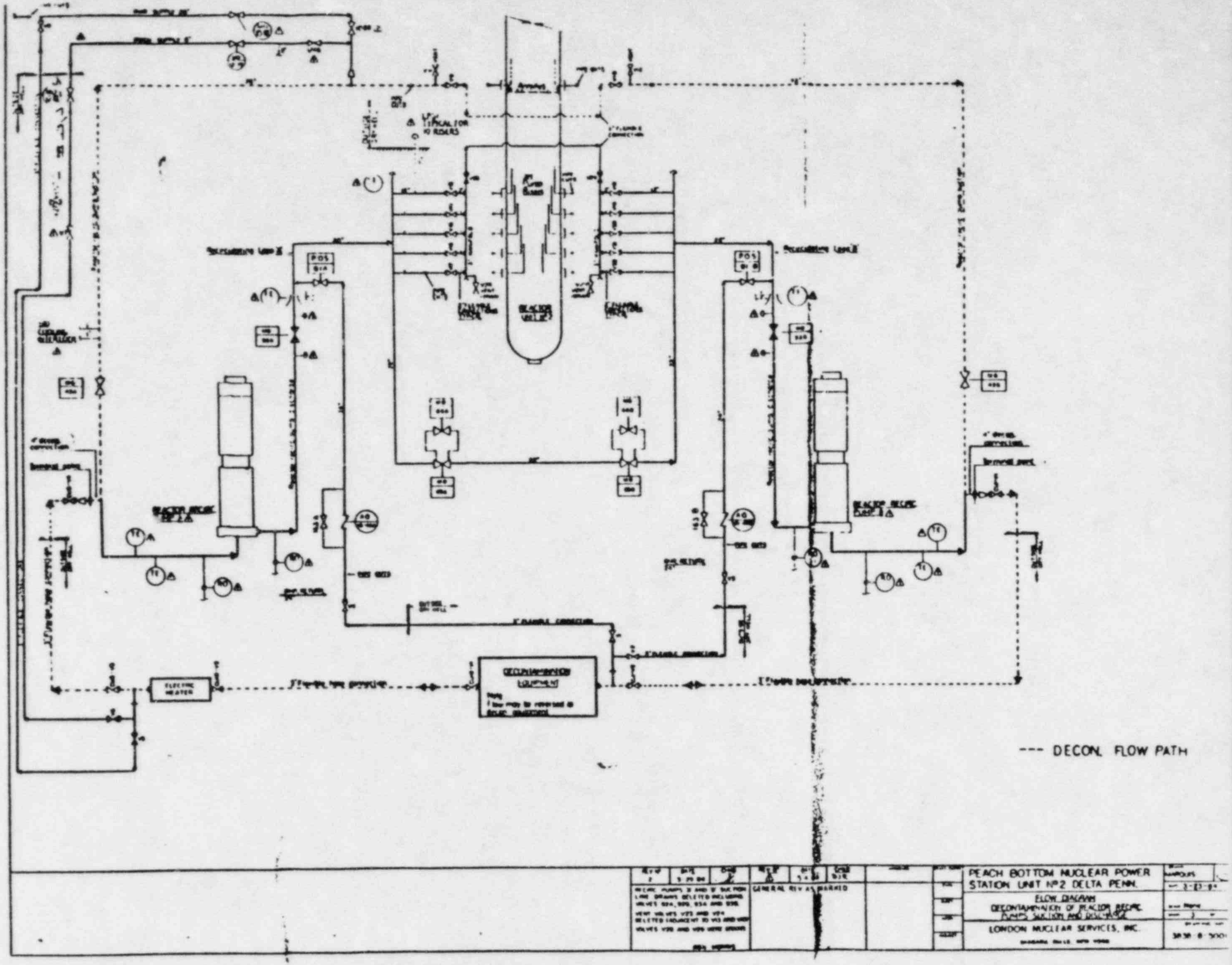


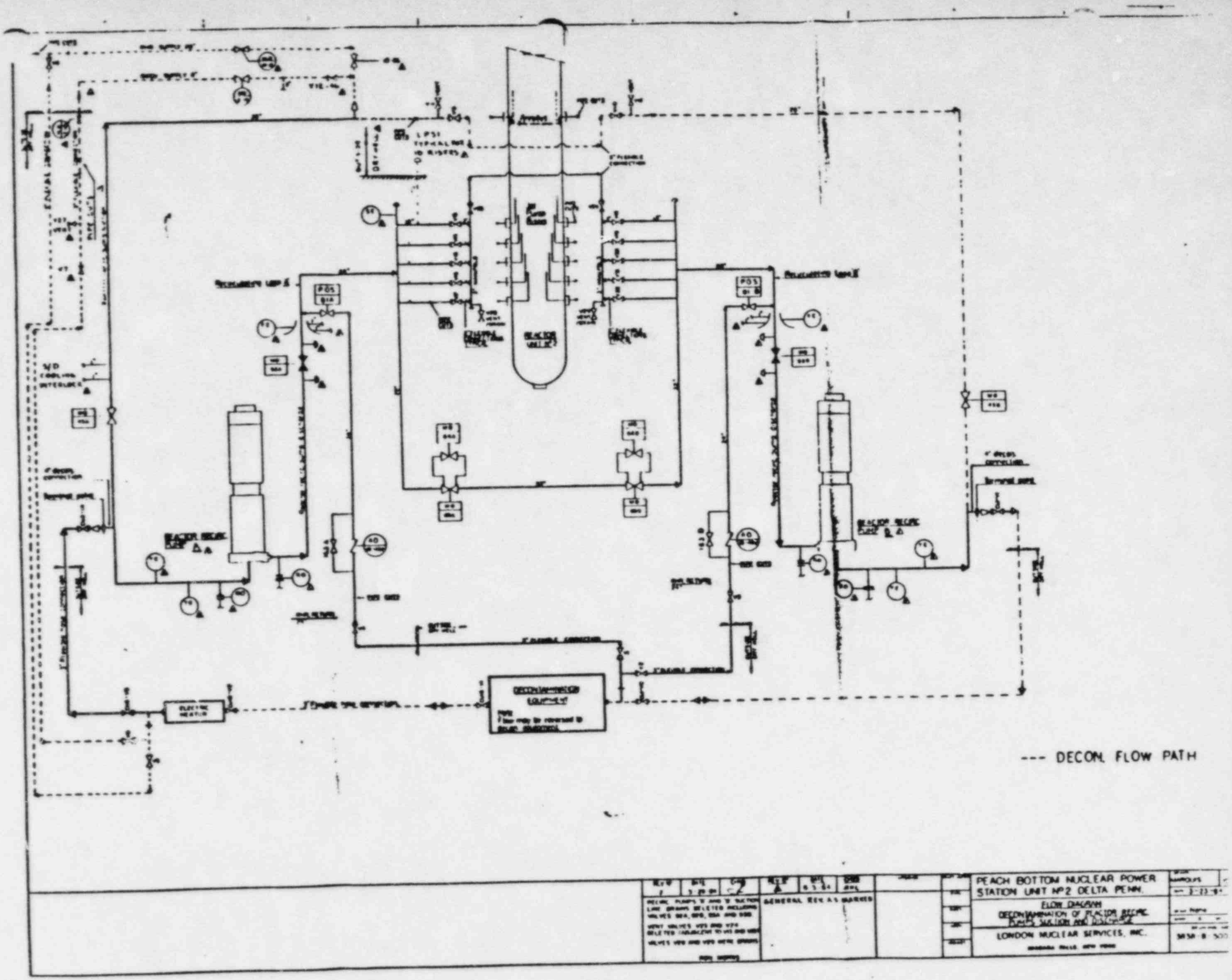
PUMP SKID LN-1
ION EXCHANGE SKID LN-2
LEGEND:
LN-1-2


NOTE
V13 T. V22 WILL BE THROTTLED AS REQUIRED
--- DECON. FLOW PATH
REACTOR VESSEL
REACTOR RECIRC PUMP A
REACTOR RECIRC PUMP B
DECONTAMINATION EQUIPMENT
ELECTRIC HEATER
GENERAL REVISIONS MARKED
PEACH BOTTOM NUCLEAR POWER STATION UNIT Nº2 DELTA PENN.
FLOW DIAGRAM
DECONTAMINATION OF REACTOR RECIRC PUMPS SUCTION AND DISCHARGE
LONDON NUCLEAR SERVICES, INC.
3030-B-300

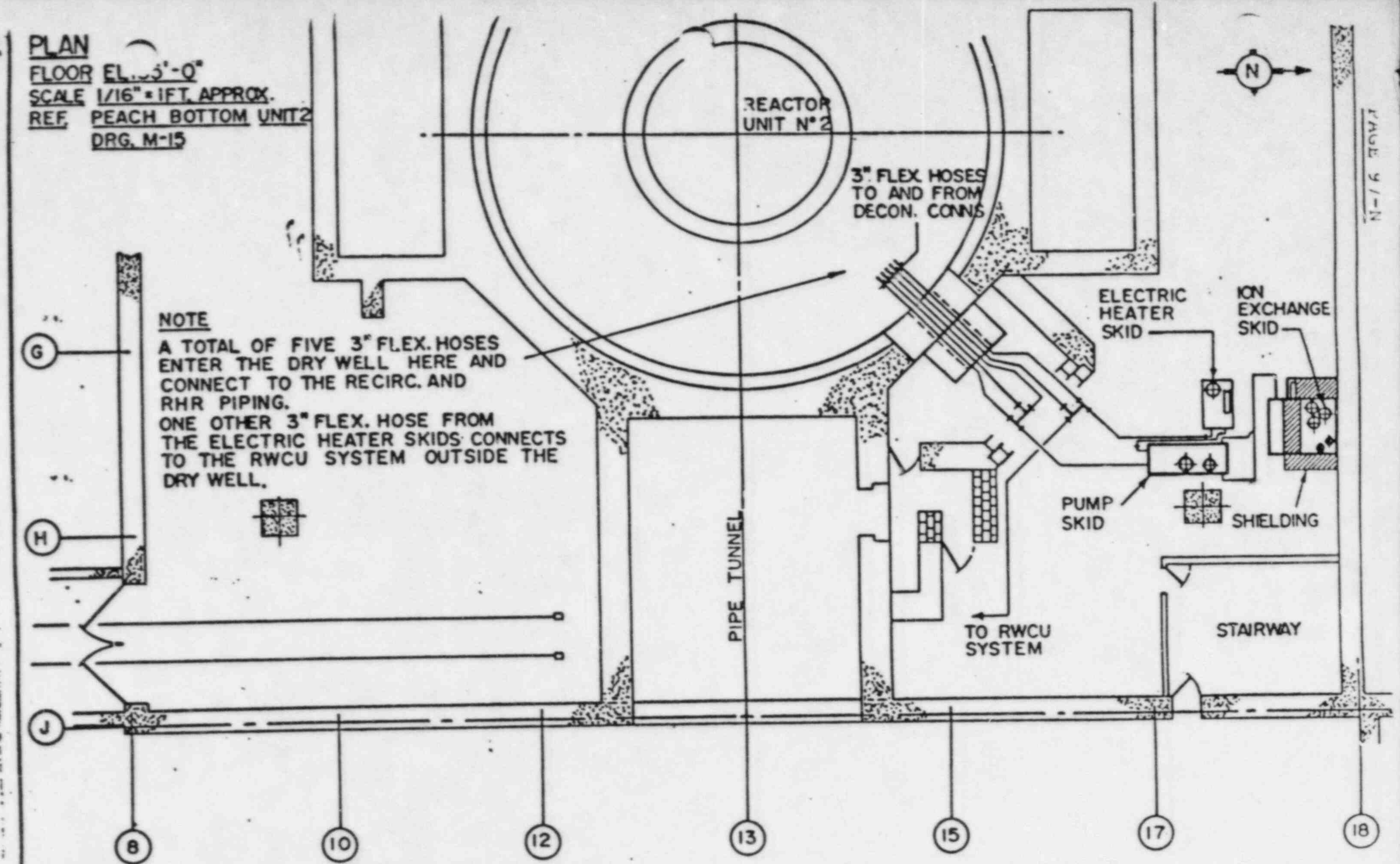


DECONTAMINATION EQUIPMENT
ELECTRIC HEATER
REACTOR VESSEL
--- DECON FLOW PATH
PEACH BOTTOM NUCLEAR POWER STATION UNIT Nº2 DELTA PENN.
FLOW DIAGRAM
LONDON NUCLEAR SERVICES, INC.


--- DECON. FLOW PATH
DECONTAMINATION EQUIPMENT
ELECTRIC HEATER
PEACH BOTTOM NUCLEAR POWER STATION UNIT No2 DELTA PENN.
FLOW DIAGRAM
DECONTAMINATION OF REACTOR RECIRC PUMPS SUCTION AND DISCHARGE
LONDON NUCLEAR SERVICES, INC.
GENERAL REV AS MARKED



DECON. FLOW PATH
DECONTAMINATION EQUIPMENT
ELECTRIC HEATER
REACTOR VESSEL
REACTOR RECIRC PUMP
GENERAL REV AS MARKED
PEACH BOTTOM NUCLEAR POWER STATION UNIT Nº2 DELTA PENN.
FLOW DIAGRAM
DECONTAMINATION OF REACTOR RECIRC PUMPS SUCTION AND DISCHARGE
LONDON NUCLEAR SERVICES, INC.



REV	DESCRIPTION	
1	PUMP SKID AND HEATER RELOCATED RON. MORRIS	

RON. MORRIS

GENERAL EQUIPMENT LOCATION
LONDON NUCLEAR SERVICES
NIAGARA FALLS, NEW YORK

DRAWING N°: 3838-L-2000-1

REV: 1