NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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November 30, 1982

Docket No. 50-245
A02831

Mr. Ronald C. Haynes
Regional Administrator
Region I
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

References: (1) I & E Bulletin No. 82-03, Rev. 1, dated October 28, 1982.

(2) W. G. Counsil letter to R. C. Haynes, dated November 5, 1982.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 1
Response to I & E Bulletin No. 82-03, Rev. 1

In Reference (1) Northeast Nuclear Energy Company (NNECO) was requested to take certain actions with respect to the inspection of large-diameter stainless steel recirculation system piping. Of the four action items requested of NNECO, three were addressed in Reference (2). The remaining item is addressed below.

Action Item 4(a):

Submit a description of the sampling plan used or to be used during this outage for UT examinations of recirculation system piping welds and the bases for the plan. The description should:

(1) Provide an isometric drawing of the recirculation system piping showing all the welds, and the number of welds and their location that have been examined or will be examined.

(2) Identify criteria for weld sample selection (e.g., stress rule index, carbon content, high stress location, and their values for each weld examined).

(3) Describe piping material(s), including material type, diameter, and wall thickness.

(4) Estimate the occupational radiation exposure incurred or expected and briefly summarize measures taken to maintain individual and collective exposures as low as reasonably achievable.

IE11

Response:

(1)

Figures 1 through 6 are isometric drawings of the recirculation system piping showing the weld identifications and those welds inspected this outage.

(2)

Table 1, attached, is an IGSCC Susceptibility Matrix for the recirculation system. Weldments were selected based on ASME Sec. XI inservice inspection criteria. The susceptibility matrix was used to ensure that high susceptibility welds were represented in the inspection sample. See item (3).

(3)

Table 2, attached, is a Metallurgical Evaluation Summary for the welds inspected this outage. In addition to material type, diameter, and wall thickness, it also includes carbon content and stress rule index values for each weldment.

(4)

Man rem exposure for preparation and inspection of the recirculation system is given below.

Activity	Exposure (Man-Rem)
Insulation - Removal/Replacement	20
Shield Block- Removal/Replacement	8
Surface Preparation	2
Weld Inspection	10
Total	40 Man-Rem

Northeast Nuclear Energy Company has a program to maintain individual and collective exposures as low as reasonably achievable. The Plant Staff ALARA Coordinator reviews job procedures with the job leader prior to the start of work. Necessary specific engineering controls such as shielding of the riser piping, voice communications, and 12' oscilloscope leads were instituted to minimize occupational exposures during these inspections.

Action Item 4(b):

Submit a summary description of the UT procedures and calibration standards used or to be employed in the examination at the licensee's plant site. This description should include the scanning sensitivity, the evaluation sensitivity and the recording criteria.

Response:

Northeast Utilities Procedure NU-UT-6, "Ultrasonic Examination Procedure for Intergranular Stress Corrosion Crackng (IGSCC)" was used for examination of the recirculation system piping. This procedure employs 45° 2.25 Mhz angle beam shear wave and 5.0 Mhz longitudinal straight beam transducers to examine the area of the weld and 1" on either side of the weld.

Calibration for angle beam examination is accomplished by establishing a distance-amplitude curve (DAC) using calibration standards with ID and OD notches for at least 1½ Vee paths and 3/4T side drilled hole for half Vee or less metal path. Weld examination is done at a scanning sensitivity at least 6db(2X) greater, but no more than 20db greater, than the calibrated reference level. All angle beam indications greater than or equal to 50% DAC, at the calibrated reference level, are recorded and p' ·d.

The inspection personnel are qualified to this procedure using samples containing service-induced IGSCC cracks.

Action Item 4(c):

Submit a summary of the results of any previous inspection of the recirculation system piping welds which used the validated examination methodology as discussed in Action Item 1 of I&E Bulletin No. 82-03.

Response:

Previous inservice inspection of the recirculation system piping utilized different inspection techniques which have not been validated by inspection of the NMP samples at Battelle Memorial Institute.

Action Item 4 (d):

Submit an evaluation of the crack-detection capability of ultrasonic methodology used or planned to be used to examine recirculation system piping welds. This evaluation should result from conducting the demonstration required in Action Item 1 of I&E Bulletin 82-03, and should include a comparison of the service-induced pipe crack sample to those welds actually examined in the licensee's plant in terms of pipe wall thickness and diameter, weld geometry and materials.

Response:

Northeast Utilities procedure for detecting IGSCC in austenitic stainless steel piping was judged acceptable by the NRC Region I inspector, R. McBrearty, at the conclustion of our October 22, 1982 trip to Battelle Memorial Institute. Therefore, the procedure is capable of detecting IGSCC in the Millstone Unit I recirculation system piping.

However, there are significant differences between the the NMP samples and Millstone Unit 1 recirculation system piping which make inspection of the samples more difficult than inspection of our in-plant piping.

Only five samples were available for examination at Battelle. All were from 28" diameter piping, the three safe end to elbow sections are 1.1" thick on the safe end side and 1.3" thick on the elbow side. The remaining two samples are from a pipe to elbow weld that was sectioned within the weld crown on the pipe side, therefore all examination was conducted from the 1.1"thick elbow side of the weld. No information on material, heat treatment, or weld geometry was supplied.

The Millstone Unit 1 recirculation system piping is of Type 304 material, with three basic nominal sizes and thicknesses, 28" x 1.3", 22" x 1.0", and 12" x 0.56". Approximately 40% of the welds in the system are in 28" piping, 20% are in 22" piping and the remainder are in 12" piping. A demonstration of the ability to detect IGSCC should be conducted over the range of sizes, diameters and thicknesses encountered in service. Furnace sensitized safe ends were removed and replaced prior to initial start-up, all fittings, elbows, crosses, etc, are of solution annealed material and all safe ends are welded to pipe. No safe end-to-fitting configuration similar to the NMP samples exists in Millstone Unit 1. Therefore, with no sensitized safe end or fitting materials we would expect any IGSCC to occur in the pipe HAZ material. Their area of concern is inspected from the pipe side and, based on our experience with samples containing service induced cracks, is considerably easier to inspect than the NMP samples.

The weld crowns on the NMP samples are approximately 1.8" axially. Weld crowns on safe end-to-pipe welds at Millstone Unit 1 are approximately 1.3" wide. Our examination procedure requires that ultrasonic search unit wedges be able to perform 1/2 Vee examination of the near side of the weld root fusion zone, with the information available this requirement could not be verified on the NMP samples.

We believe the above responses complete the action required by I & E Bulletin 82-03, Rev. 1 and demonstrate the adequacy of our inservice inspection program. We remain available should the Staff have other concerns on this matter.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil
Senior Vice President

STATE OF CONNECTICUT)
) ss. Berlin
COUNTY OF HARTFORD)

Then personally appeared before me W. G. Counsil, who being duly sworn, did state that he is Senior Vice President of Northeast Nuclear Energy Company, a Licensee herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Licensees herein and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Sheila M. Oates
Notary Public
My Commission Expires March 31, 1986

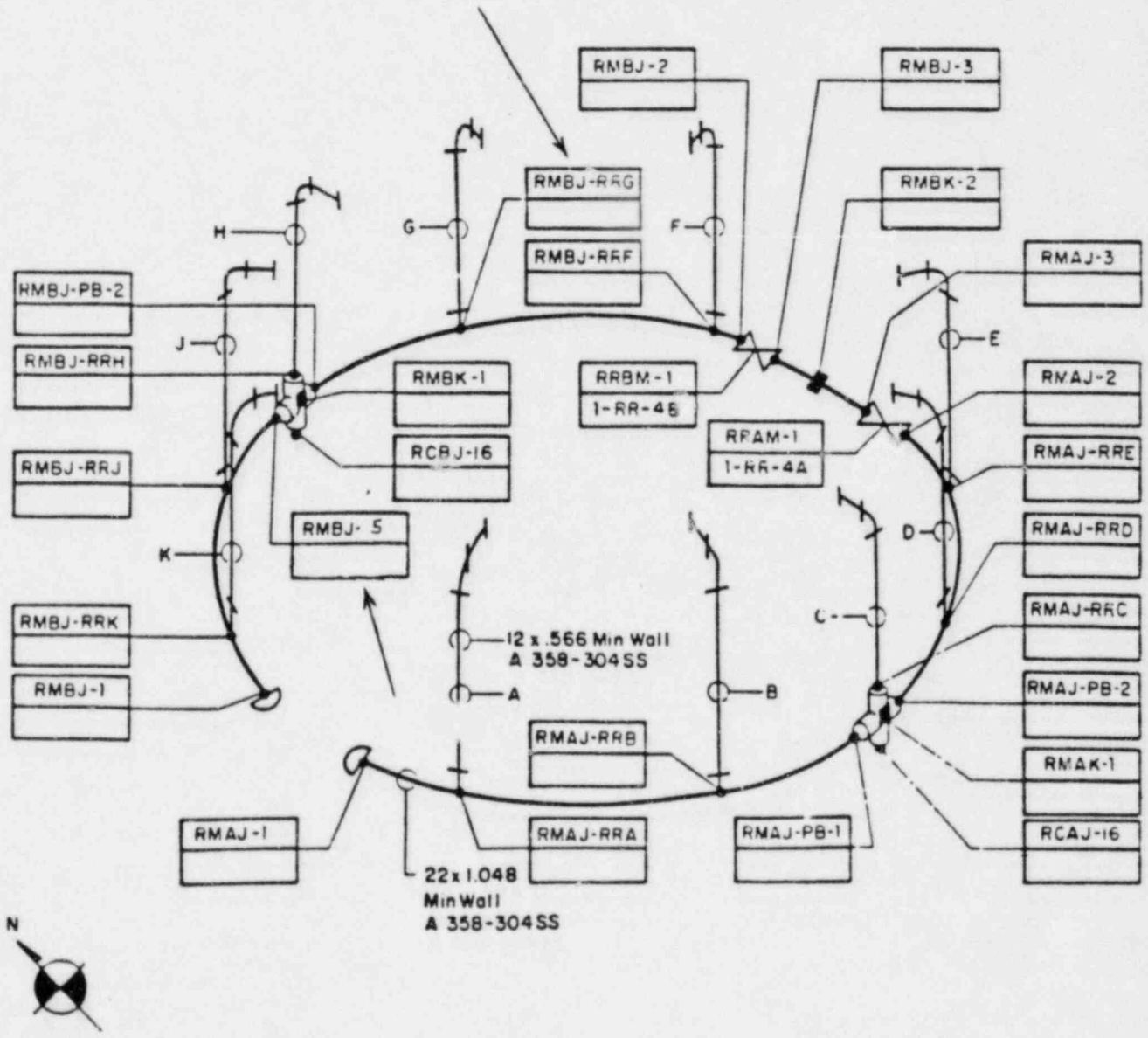
RECIRC. SYSTEM
BMRO-72-IC20

FIGURE 1

NOTE SEE IC-23 FOR RISER DETAILS AND EXAMINATION SCHEDULE

SEE IC-20A FOR HANGER AND RESTRAINT LOCATIONS

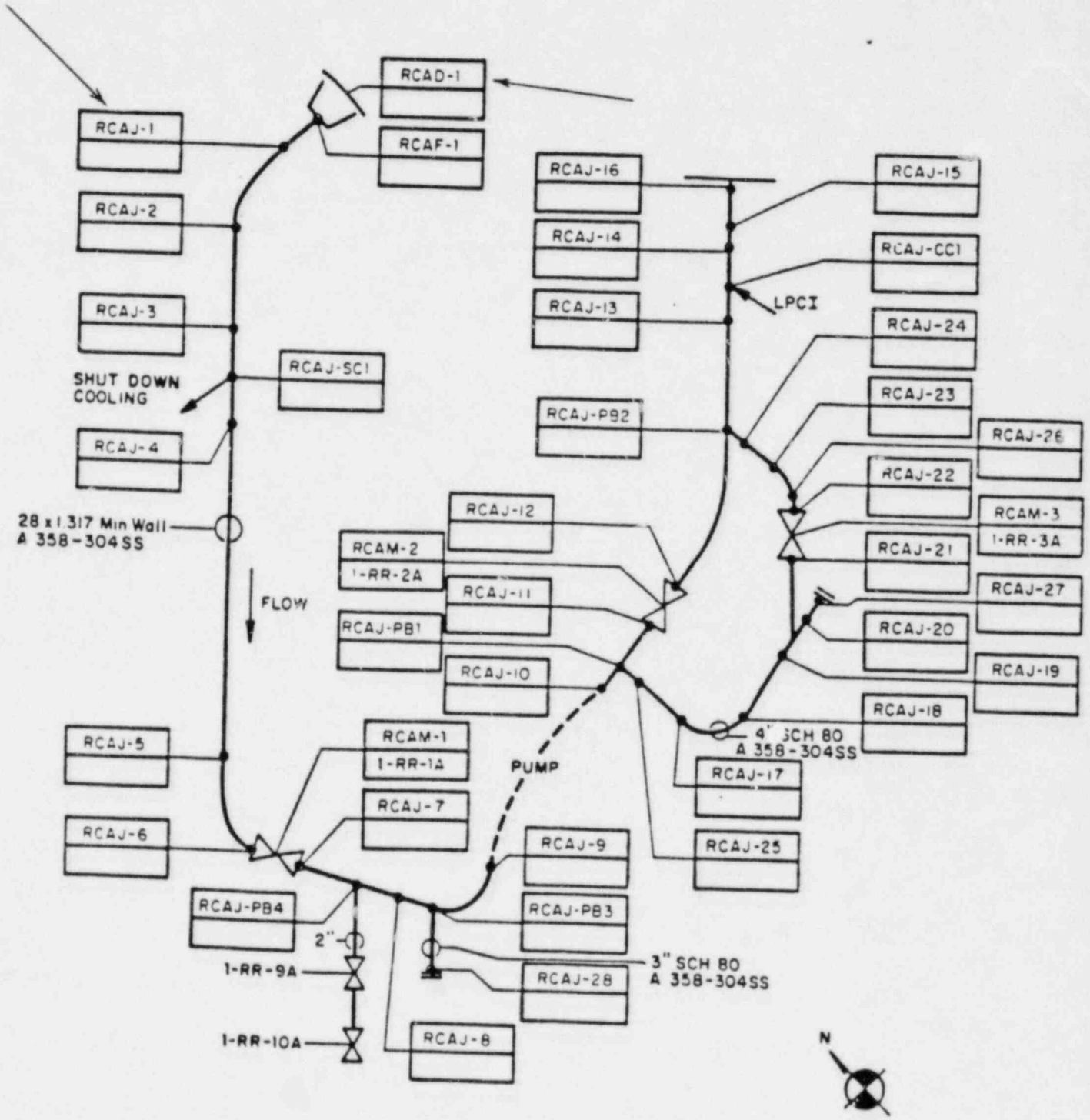
THERE ARE LONGITUDINAL SEAM WELDS IN THIS SYSTEM.



RECIRC. A
CMR072-IC21

NOTE: SEE IC21A FOR HANGER AND RESTRAINT LOCATIONS

FIGURE 2



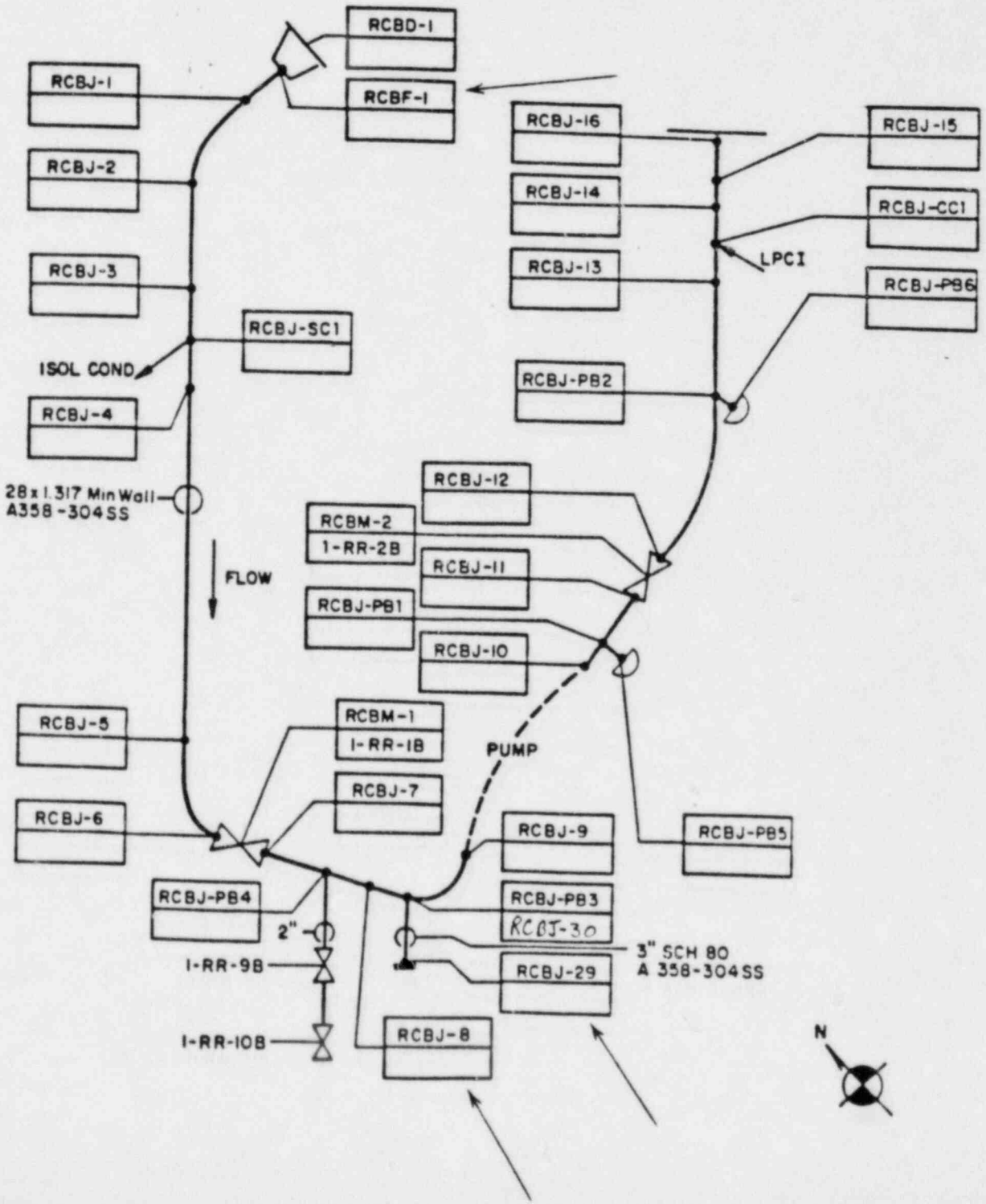
NOTE: THIS DRAWING IS SUPERCEDED BY DWG. NO. IC21B

RECIRC. B
BMR072-IC22B

FIGURE 3

NOTES:

1. THIS DRAWING SUPERCEDES DWG. NO. IC22 DUE TO THE INSTALLATION OF THE NEW LINE.
2. SEE IC22A FOR HANGER AND RESTRAINT LOCATIONS.
3. THERE ARE LONGITUDINAL SEAM WELDS IN THIS SYSTEM.

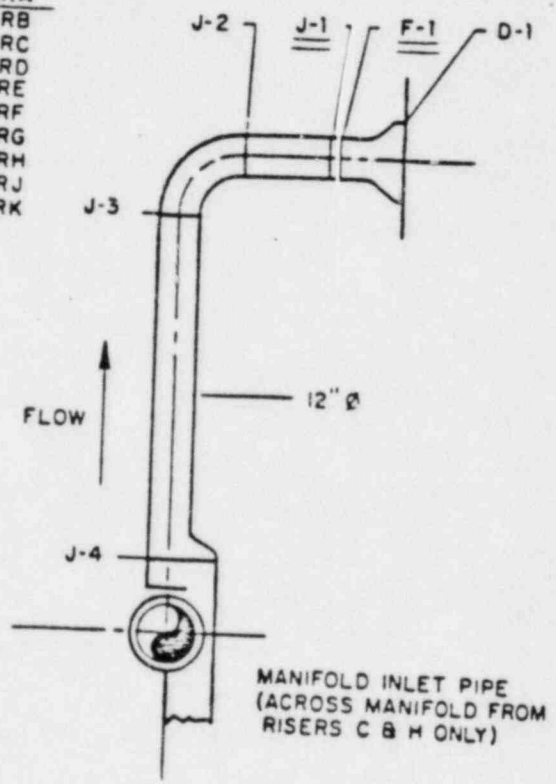


RECIRCULATION RISER (TYPICAL)
BMR072 - IC23

FIGURE 4

TO IDENTIFY WELD, ADD NUMBER FROM SKETCH TO FOLLOWING RISER CODE:

RISER NO	CODE
A	RRA
B	RRB
C	RRC
D	RRD
E	RRE
F	RRF
G	RRG
H	RRH
J	RRJ
K	RRK



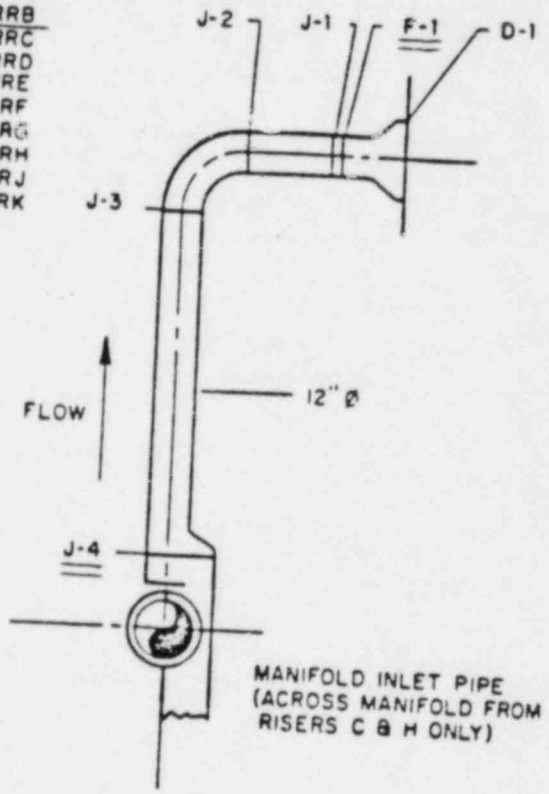
NOTE:
THERE ARE LONGITUDINAL SEAM WELDS IN THIS SYSTEM

RECIRCULATION RISER (TYPICAL)
BMR072 - IC23

FIGURE 5

TO IDENTIFY WELD, ADD NUMBER FROM SKETCH TO FOLLOWING RISER CODE.

RISER NO	CODE
A	RRA
B	RRB
C	RRC
D	RRD
E	RRE
F	RRF
G	RRG
H	RRH
J	RRJ
K	RRK



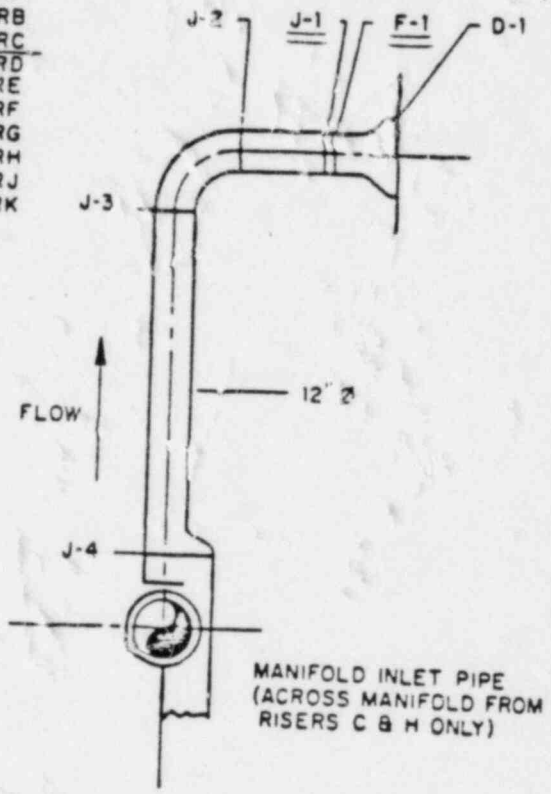
NOTE:
THERE ARE LONGITUDINAL SEAM WELDS IN THIS SYSTEM

RECIRCULATION RISER (TYPICAL)
BMR072-IC23

FIGURE 6

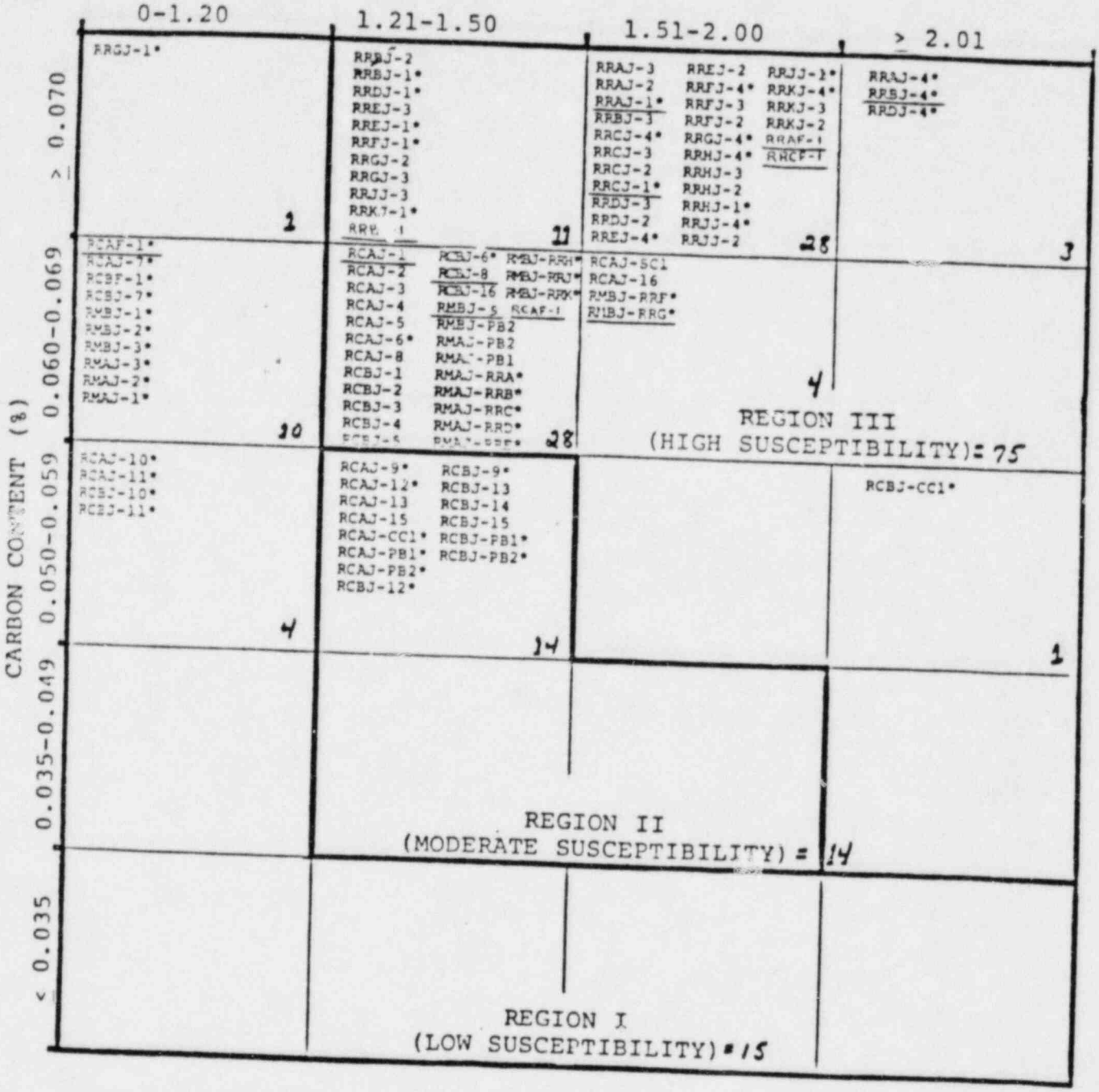
TO IDENTIFY WELD, ADD NUMBER FROM SKETCH TO FOLLOWING RISER CODE:

RISER NO	CODE
A	RRA
B	RRB
C	RRC
D	RRD
E	RRE
F	RRF
G	RRG
H	RRH
J	RRJ
K	RRK



NOTE:
THERE ARE LONGITUDINAL SEAM WELDS IN THIS SYSTEM

STRESS RULE INDEX



NOTES: Since only ranges of carbon content are available for recirculation piping pieces, the carbon content is assumed to be the upper bound of the given range.

Total = 104

* Carbon content known for only one base metal in the joint. Depending on carbon content of the other base metal, position in matrix may stay the same or shift to a higher carbon content.

No carbon content known for the following welds:
RCAJ-PB6(0.95), RCBJ-PB5 0.99), RCBJ-PB6(0.99).

TABLE 1

IGSCC Susceptibility Matrix for the Recirculation System

TABLE 2

METALLURGICAL EVALUATION SUMMARY

MILLSTONE NUCLEAR POWER STATION UNIT 1

WELD NUMBER	DIA. (IN)	WELD TYPE	SHOP OR FIELD WELD	COMPONENT	MATERIAL TYPE & SPECIFICATION	WALL THICKNESS MINIMUM	CARBON CONTENT (%)	STRESS RULE INDEX
				Safe-end	*			
RCAF-1	28	SE-N	FW			1.31		1.08
				Nozzle	Carbon Steel			
				Pipe	A-358 TP304		.05 -.06	
RCAJ-1	28	P-E	SW			1.31		1.38
				Elbow LR 90°	A-403 WP304		.05 -.058	
				22" Ring Header	A-358 TP304		.046 -.064	
RMBJ-RRG	22	HD-Sol	SW			1.04		1.53
				Sweepolet 22" x 12"	A-240 TP304			
				22" Ring Header	A-358 TP304		.046 -.064	
RMBJ-5	22	Hdr-Cr	FW			1.04		1.45
				Cross 28"x28"x22"x22"	A-240 304		.06	
				Sweepolet 22" x 12"	A240 TP304			
RRBJ-4	12	Sol-P	FW			0.566		2.06
				Pipe	A-358 TP304		.052 -.071	
				Pipe	A-403 WP304		.052 -.071	
RRCJ-1	12	P-SE	FW			0.566		1.51
				Safe-end	*			
RRCF-1	12	SE-N				0.566		1.51
				Nozzle	Carbon Steel			

* Material specification not available

TABLE 2

METALLURGICAL EVALUATION SUMMARY

MILLSTONE NUCLEAR POWER STATION UNIT 1

WELD NUMBER	DIA. (IN)	WELD TYPE	SHOP OR FIELD WELD	COMPONENT	MATERIAL TYPE & SPECIFICATION	WALL THICKNESS MINIMUM	CARBON CONTENT (%)	STRESS RULE INDEX
				Pipe	A-358 TP304		.052 -.071	
RRAJ-1	12	P-SE	FW	Safe-end	*	0.566		1.55
RRAF-1	12	SE-N	FW	Nozzle	Carbon Steel	0.566		1.55
RRBF-1	12	N-SE	FW	Safe End	*	0.566		1.31
				Pipe	A-358 T304		.05 .06	
RCBJ-8	28	P-E	FW			1.31		1.48
				Elbow	A 351 CF8M	NA		

* Material specification not available