EBASCO SERVICES INCORPORATED
Two World Trade Center New York, N Y 10048

EBASCO

PROGRAM PLAN

PRESERVICE INSPECTION

BYRON UNIT 1

Prepared By R Paillaman

Approved By W Sawicky 10/5/81

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SECTION I

PROGRAM DESCRIPTION

Section I

Program Description

1.0 SCOPE

This document, the Byron PSI Program Plan, addresses those preservice examinations that are to be performed by Ebasco Services Inc. Specifically these examinations include Class 1 and Class 2 systems and components requiring volumetric (including steam generator tubing) surface or VT-1 visual examinations in accordance with ASME Boiler and Pressure Vessel Code*, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1977 Edition and Addenda through and including Summer 1978. Performance of Class 3 examination and visual examinations, other than VT-1, of Class 1 and Class 2 components and pump and valve functional tests in accordance with sections IWP & IWV of the code are not included in Ebasco's scope of work. However, these non-Ebasco scope items are addressed in the Program Plan based on input from Commonwealth Edison Company (CECo).

2.0 IDENTIFICATION OF EXAMINATION REQUIREMENTS

The piping system requiring examination are identified on the Sargent & Lundy piping system flow diagrams of the M1000 series, copies of which are included in Section II of this document. Pertinent data for each line requiring examination is provided in Section II of this document. Also provided in Section II of this document is a list of examinations required for major equipment items and the Inspection Plan for automatic ultrasonic examination of the reactor pressure vessel.

The locating and identification of specific items, such as welds, bolted connections, pipe supports, that require examination was performed using as-built drawings and system walkdowns as described in Section IX of this document.

3.0 INSPECTION ACCESS

The plant design provided by Sargent & Lundy Engineers takes into account, to the extent practical, the inspection access considerations described in IWA-1500 of the Code. A number of problem areas were identified by Sargent & Lundy during the design phase and specific components which require relief from examination requirements are listed in Section III of this document. Exclusions and exceptions that are found to be necessary during actual performance of the preservice inspection, will be incorporated in Section III of this document at the completion of all examinations.

4.0 EXAMINATION EQUIPMENT

A listing of test calibration blocks is provided in section IV of this document. A description of the automated/mechanized test equipment used for reactor pressure vessel and steam generator examination is provided in Section V of this document.

Note: *From this point on the word Code will refer to the ASME Boiler and Pressure Vessel Code, Section XI Rules for Inservice Inspection of Nuclear Power Plant Components, 1977 Edition and Addenda through and including Summer 1978.

5.0 PROCEDURES

Nondestructive examination procedures required for code examinations were developed and are included along with administrative procedures in Section V of this document.

6.0 ORGANIZATION AND QUALITY ASSURANCE

An organization chart showing responsibility and interfacing of Ebasco and Commonwealth Edison personnel is provided in section VI of this document. Also included is a description of the Quality Assurance program in effect for this program.

7.0 SCHEDULE

Two alternatives were offered with regard to the schedule of preservice inspection activities as follows:

Schedule A - Preservice examinations would start after completion of cold hydrostatic testing of systems and components and continue for a period of approximately 100 days.

Schedule B - Except for the vessels, preservice examinations would be performed before cold hydrostatic testing starting in the first quarter of 1981 with completion scheduled for the first quarter of 1982. This schedule (B) was implemented and further information is provided in Section VII of this document.

8.0 RECORDS AND REPORTS

During the course of the preservice examinations records will be maintained in accordance with IWA 6210 of the Code. Further description of the type of records to be maintained is provided in Section VIII of this document.

After completion of all examinations a final inspection report will be prepared using data forms that are included in the nondestructive examinations procedures provided in Section V of this document.

9.0 AS-BUILT DRAWINGS

As a supplement to the preservice examination work scope, Ebasco was given the responsibility to develop as-built drawings for the major components and piping systems that were required to be examined by the Code. The scope of this service is discussed in Section IX of this document.

SECTION II

IDENTIFICATION OF EXAMINATION REQUIREMENTS

Section II

Identification of Examination Requirements

The piping systems requiring examination are identified in Sargent & Lundy piping system flow diagrams of the M1000 series, copies of which are included in this section. Using the system flow diagrams, in conjunction with the Byron Unit 1 piping line list, examination requirements for each piping system by line number, were identified. A tabulation of pipe lines showing their size; operating and design conditions; safety classification; ASME Section XI examination requirements, exemptions and relief requests; and reference drawings, was prepared and is included in this section. A similar tabulation was also prepared listing examination requirements for major equipment items and is included in this section.

Also included in this section is the inspection plan for automatic ultrasonic examination of the reactor pressure vessel. A specific inspection plan for the reactor pressure vessel was developed because of the complexity of this examination and the fact that the examination is in the critical path schedule.

Rockwell International
Energy Systems Group

SUPPORTING DOCUMENT

GO NO.	S.A.N.O.	PAGE 1 OF 23	TOTAL PAGES	REV LTR/CHG NO SEE SUMMARY OF CHG	NUMBER
04453	30000		23	N/C	445TI000001

PROGRAM TITLE

Byron RPV Preservice Inspection

DOCUMENT TITLE

Inspection Plan

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Technical Information	ISI, RPV, NDT

ORIGINAL ISSUE DATE	REL. DATE

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ABSTRACT

This inspection plan describes the examinations to be performed on the Byron I reactor vessel using automated ultrasonic test methods. These will be performed by ESG acting as subcontractor to Ebasco Services Incorporated (Ebasco). The procedures, calibration blocks, and ultrasonic coverage provided is intended to comply with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, 1977 Edition and Addenda through Summer 1978.

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FIGURES

1.0 INSPECTION REQUIREMENTS

The welds to be ultrasonically examined by automated methods are listed in the attached Table 1, along with the applicable code categories, calibration blocks, and NDE procedures. The specific areas expected to be scanned are defined in the attached Figures 1 - 8. The actual areas scanned and any areas not scanned due to obstructions will be documented on the examination reports for the individual welds.

Figure 1 shows the welds to be inspected using automatic ultrasonic equipment. Reference drawings 1 through 6 were used to generate this figure. The weld maps shown in Figures 2 through 8 were generated from reference drawings 7 through 12.

The calibration blocks listed in Table 1 are referenced to Sketch A and reference drawings 13 through 19.

TABLE 1

REACTOR VESSEL PRESERVICE INSPECTION PLAN

-AUTOMATED ULTRASONIC EXAMINATIONS-

PART EXAMINED	CODE CATEGORY	TEST * PROCEDURE NO.	CALIBRATION BLOCK NO.	WELD NO'S.	WELD MAP
SHELL WELDS CIRCUMFERENTIAL	B-A	445ISI000001	9"t x 6"w	WR 34 WR 18	Fig. 5 Fig. 4
LOWER HEAD WELDS	B-A	445ISI000001	5"t x 6"w	WR 16 WR 29	Fig. 2 Fig. 3
SHELL-TO-FLANGE WELD	B-A	445ISI000001	11"t x 6"w	WR 7	Fig. 6
REPAIR WELDS	B-A	TBD	TBD	TBD	
NOZZLE-TO-VESSEL WELDS	B-D	445ISI000002	11"t x 6"w	Outlet Nozzle A " " D " " E " H Inlet Nozzle B " " C " " F " " G	Fig. 8 " " " Fig. 7 " " "
NOZZLE INSIDE RADIUS SECTION	B-D	445ISI000004	11"t x 6"w	Outlet Nozzle A " " D " " E " H Inlet Nozzle B " " C " " F " " G	Fig. 8 " " " Fig. 7 " " "
NOZZLE-TO-SAFE END WELDS	B-F	445ISI000003	Safe End	Outlet Nozzle A " " D " " E " H Inlet Nozzle B " " C " " F " " G	Fig. 8 " " " Fig. 7 " " "

*Typical examination volume is defined for each weld/component geometry in the applicable test procedure.

1.1. REFERENCE DRAWINGS

1. Babcock & Wilcox 145069, Location of Welds For In Service Inspection.
2. Westinghouse 7245D81 Sheet 2 of 9, CAE (As Built) Reactor Vessel Instrumentation Penetration Coordinates and Elevations.
3. Westinghouse 7245D81 Sheet 3 of 9, CAE (As Built) Upper Barrel Seating Surface and Keyways.
4. Westinghouse 7245D81 Sheet 4 of 9, CAE (As Built) Clevis.
5. Westinghouse 7245D81 Sheet 6 of 9, CAE (As Builts) Wall size, inside diameter of outlet nozzle and nozzle orientation.
6. Westinghouse 7245D81 Sheet 5 of 9, CAE (As Built) Support Locations, Radii of outlet nozzle to internals seating surface.
7. Babcock and Wilcox 1096990 Rev. 2, Lower Head CTR Disc.
8. Babcock and Wilcox 1254300 Rev. 2, Lower Head Dutchman Forging.
9. Babcock and Wilcox 1254290 Rev. 1, Lower Shell Forging.
10. Babcock and Wilcox 1254280 Rev. 1, Upper Shell Forging.
11. Babcock and Wilcox 1254290 Rev. 1, Nozzle Belt Forging.
12. Babcock and Wilcox 1096950 Rev. 1, Vessel Flange Forging.
13. Westinghouse 1679096,Sheet 1 of 4, Calibration Block Intermediate Shell.
14. Westinghouse 1679096, Sheet 2 of 4, Calibration Block Closure Head.
15. Westinghouse 1679096, Sheet 3 of 4, Calibration Block Bottom Head.
16. Westinghouse 1679096, Sheet 4 of 4, Calibration Block Upper Shell.
17. Westinghouse T680008, 4 Loop Calibration Block Flange Ligament.
18. Westinghouse Sketch 30, Calibration Block Details Safe End.
19. Westinghouse 1681C46, Calibration Block.
20. Sargeant and Lundy Engineering Drawing M-171 Rev.H
21. Sargeant and Lundy Engineering Drawing M-172 Rev. H

2.0 SUPPORT REQUIREMENTS

2.1 Laydown and Equipment Assembly Areas

A packing list will identify container numbers in the vans used to ship the Rockwell International ISI system. A sequencing sheet and instructions will be provided by the Rockwell crew manager at the Byron site for unloading and laydown of equipment.

2.1.1 Control Room

The laydown area for the control and electronic console peripherals will be gridlines (F) to (J) (Dwg. M-171) and (1) to (2) with portions of (G) to (H) going to line (J) and (F) to (1) going to line (3) (see Fig. 11). Three quarter in. thick plywood must be laid down over the grating in this area to allow sealing of the control room walls to the floor and to provide a barrier to the environment. Outside the control room there will be the two electronic power supplies (2'x4'x 4' high) and Deltec (3' x 2' x 4-1/2' high) with 30' of cable available from the end of the control room. There is a 78' cable from the power supplies to run to the source of 480V 3Ø power. There is available 50' of cable from the end of the control room to the source of 480 V single Ø power.

The packages into this area will be the control console (5' x 11' x 7'high) ~2700 pounds, PaR console (2-1/2' x 4' x 6' high) ~1,500 pounds, tape and disc drives (2-1/2" x 3' x 7' high), printronex teleprinter (3' x 3' x 4' high), four file cabinets 15" x 30" x 4' high) and several various size boxes of supplies and diagnostic equipment.

A control room (see Figure 12) will be built around and over the control consoles, electronic peripherals and file cabinets.

2.1.2 Spares and Repair Room

An area ~ 200 ft^2 is needed for a workbench, tool lockers and spare parts. The area between R2 and R3 was offered and would be suitable with a wire cage enclosure.

2.1.3 Calibration Area

An area near the reactor flange will be required to calibrate and service the ultrasonic transducers. An immersion tank (2' x 5' x 2-1/2 high) will be used to hold the calibration blocks and calibrate transducers. A tool box (2' x 5' x 2-1/2' high) will contain the SWRI accessories and tools. A table area 4' by 8' is needed for layout. A floor space of ~3' x 10' should be contiguous with tank, tool box and table area.

2.1.4 PaR Laydown

The PAR manipulator legs will be in a crate 4' wide by 3'4" high by 12'8" long ~1,500 lbs. This will be moved using the rail car into containment. A crane will be required to remove the crate from the rail car and placed on or near the end of the rail car platform. The top of the box will be removed and the bolts and wood restraints removed from the legs.

The PaR manipulator will be in a crate 23' long 4' wide and 6-1/2' high ~5,000 pounds. This will be moved using the rail car into containment. The crane will be required to remove the crate from the rail car and placed on the end of the rail car platform. The sides and top of the box will be removed and the bolt and wood restraints released from the manipulator and box bottom. The manipulator will be removed from the box bottom and placed on the rail platform. The manipulator is equipped with a trunion and casters to allow ease in uprighting using a crane. Upright the manipulator and remove trunion and casters. The legs will be attached and then the manipulator placed over the reactor flange.

2.2 UTILITIES

2.2.1 Electrical

1 15 Amp 480 Volt 3Ø within 70' of the power supplies.

1 20 Amp 480 Volt 1Ø with 50' of gridline G and 1 or H and 2.

2 20 Amp 220V 1 Ø at the control console room.

4 15 Amp 110V at the control console room.

1 15 Amp 110V at the spares and repair room.

1 15 Amp 110V at the calibration area.

2.2.2 Nitrogen

100 psi dry nitrogen or dry air at the control room.

2.2.3 Self Extinguishing Fire System

A Halon self extinguishing fire system.

2.2.4 Telephones

Two outside telephones are required in the control room.

2.2.5 Drinking Water

2.2.6 Refuse Disposal

2.3 CRAFT SUPPORT

The following craft support will be required.

Electrical

Halon Installers

Fitters

Riggers

Heavy equipment operators

Carpenters

Banders & Craters

2.4 CRANE

Cranes and handling equipment will be required to unload two vans and move to operating areas. In the operating area ready access (within 1 hour) to use the crane is required.

2.5 OFFICE AREA

An office area with a desk with locking drawers and an outside phone.

2.6 EQUIPMENT CONTAINER STORAGE

The following reusable containers require storage out of weather and secure from damage:

a)	The PaR manipulator crate	4'-1/2"wide by 5'6" high by 23' long.
b)	PaR manipula or leg crate	4'-1/2" wide by 3'4" high by 12'8"long.
c)	Portable building crate	5' x 5' high x 11' long.
d)	PaR console skid	4'2" by 10" high by 4'8" long.
e)	Perte & mag tap skid	3'3" by 10" high by 3'8" long.
f)	Computer skid	4'8" by 10" high by 11' long.
g)	Two Printronix skids	2' by 10" high by 3' long.

3.0 CLOTHING

Rockwell International coveralls will be worn by all Rockwell operations personnel in containment. The coveralls are blue and made of durable press 65% Kodel polyester/35% combed cotton fine line twill.

When required plant industrial gloves (305X-10) will be worn. These are made from medium weight bleached jersey material processed to be chloride-free.

Canvas shoe covers will be worn by all Rockwell personnel descending the ladder to the flange of the reactor pressure vessel. The shoe covers are made of of heavy grade B army duct with exerciser closure to Mil spec. C5650A.

4.0 DOCUMENTATION

The results of the examination will be documented in a report which will contain as a minimum:

Equipment Description

Examination Summaries

Procedures

Personnel Certifications

Material Certifications

Equipment Certifications

Equipment Calibrations

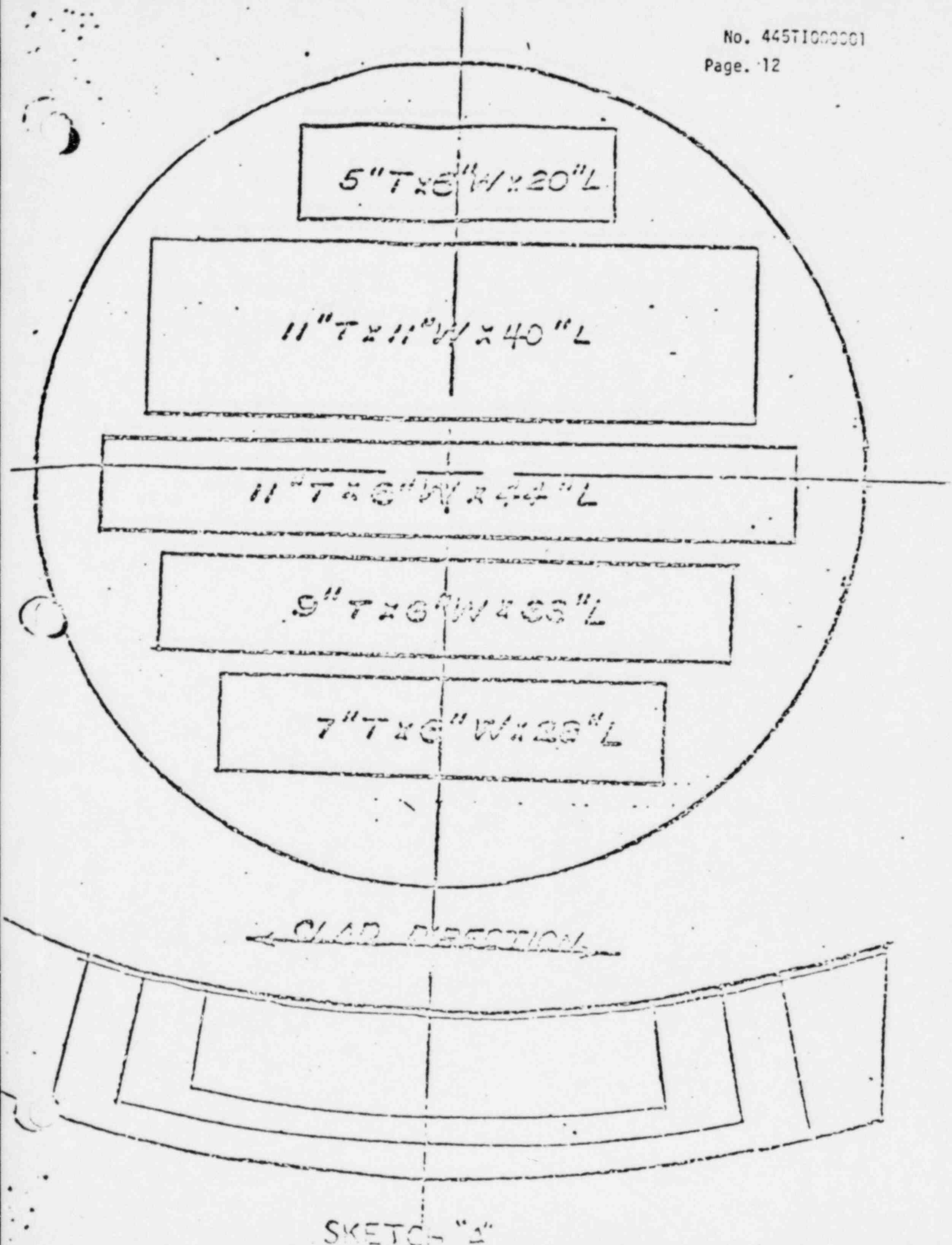
Weld Maps

Summary of reportable indications

Calibration Data

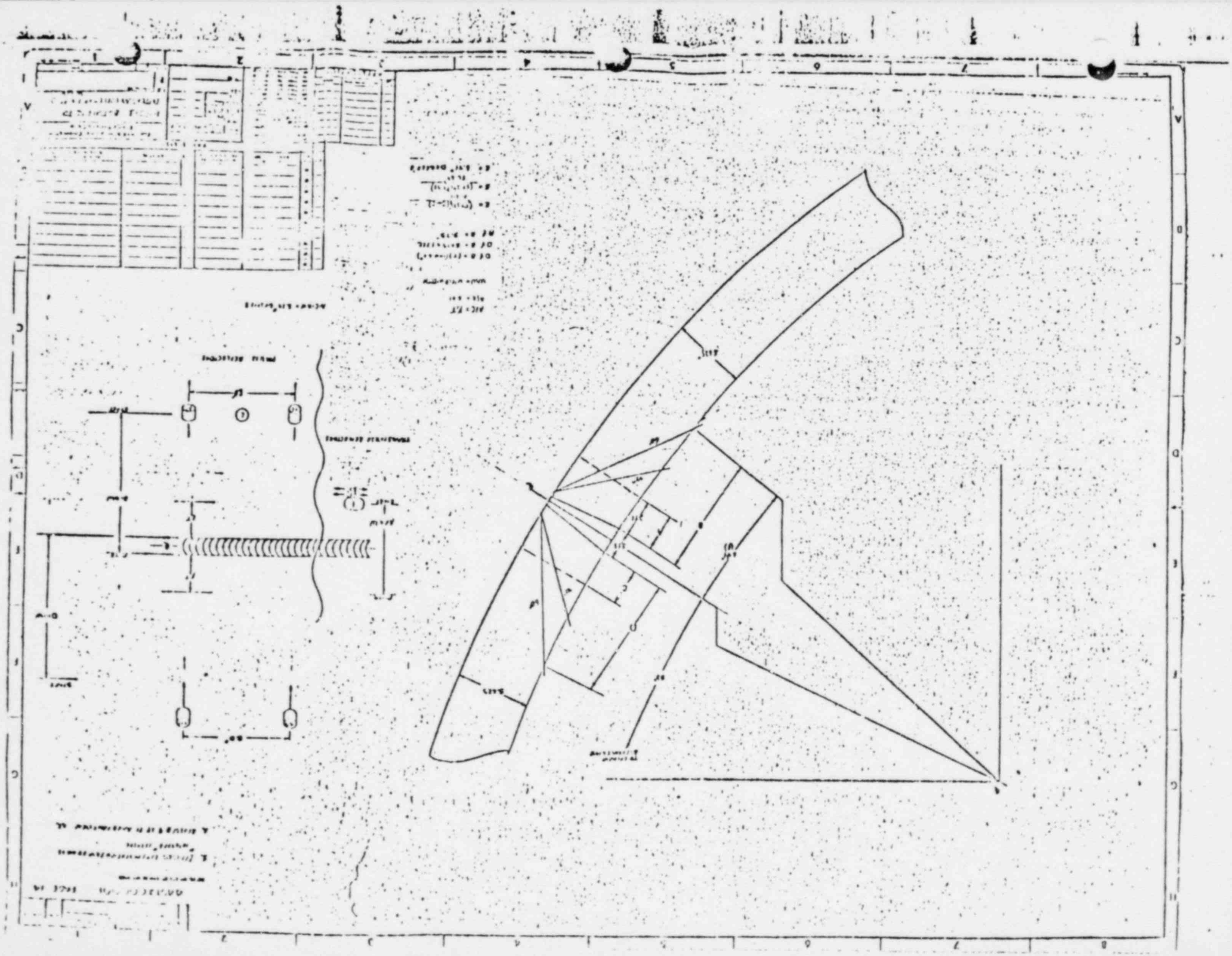
Magnetic Tape Record

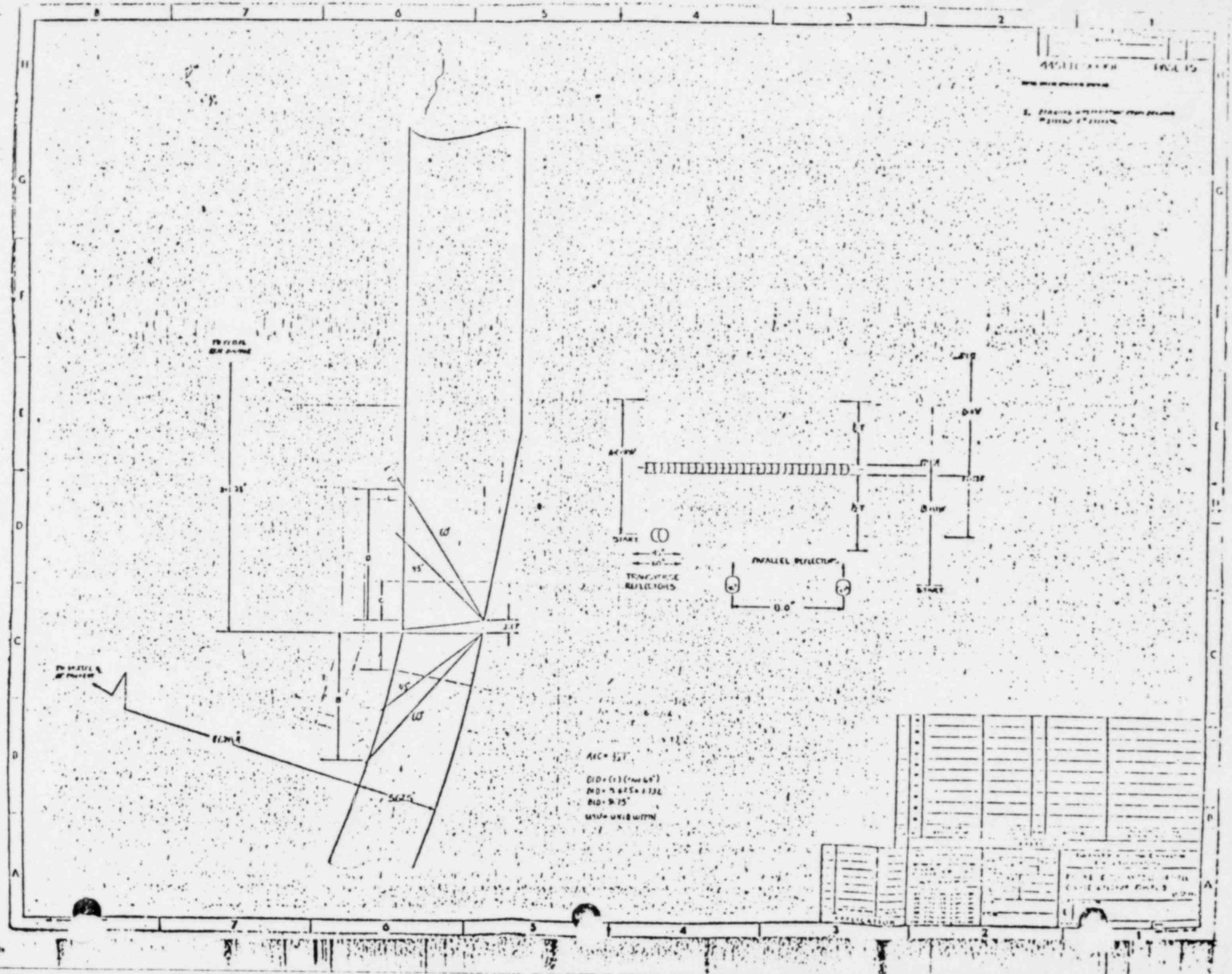
Examination Data


5"T x 8"W x 20"L
11"T x 11"W x 40"L
11"T x 8"W x 44"L
9"T x 8"W x 33"L
7"T x 8"W x 28"L
SLAB DIRECTION

SKETCH "1"

NOZZLE A OUTLET
NOZZLE B OUTLET
NOZZLE C OUTLET
NOZZLE D OUTLET
NOZZLE E OUTLET
NOZZLE F INLET
NOZZLE G INLET
NOZZLE H INLET
WR16
WR29
WR24
WR7

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PARALLEL REFLECTIONS
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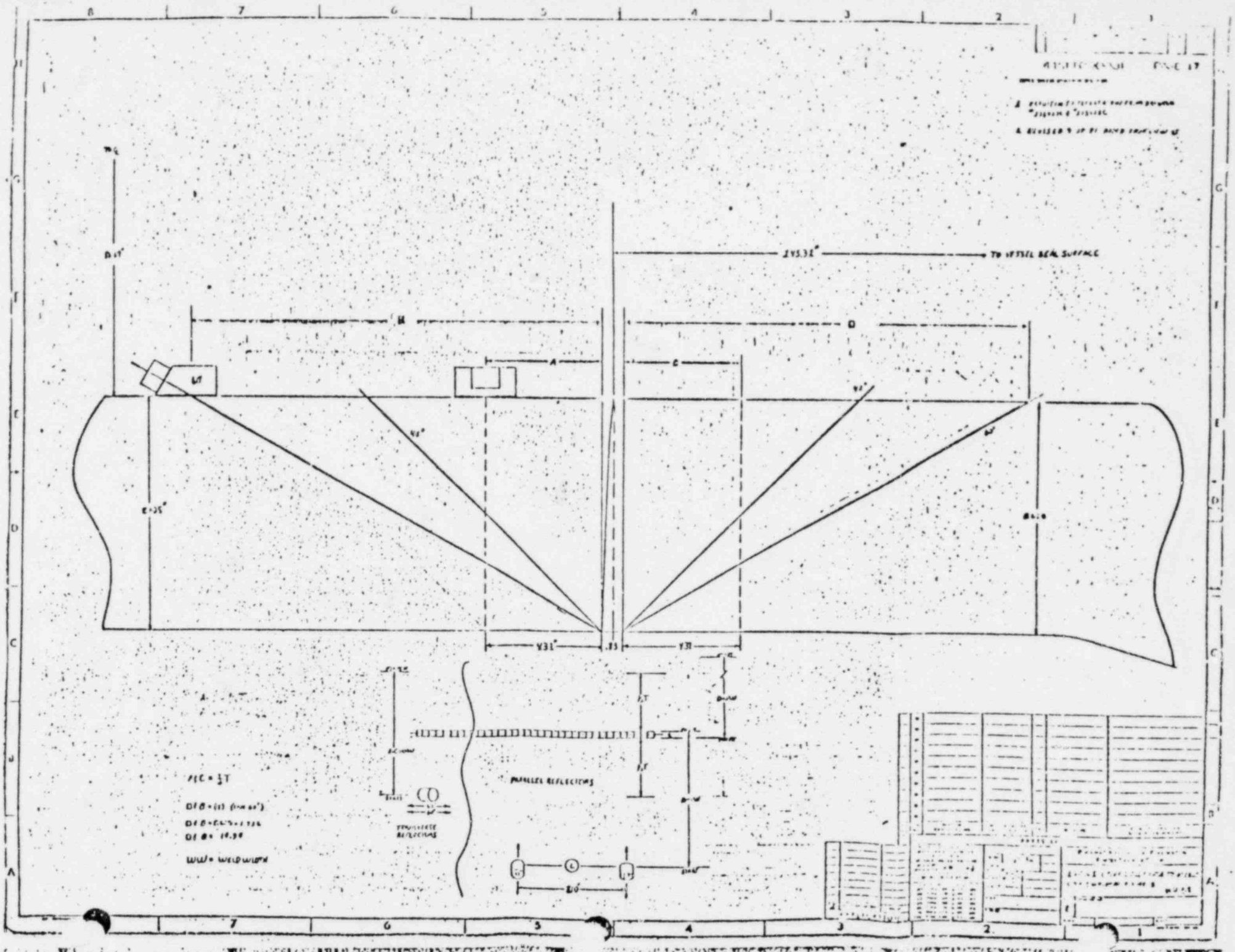
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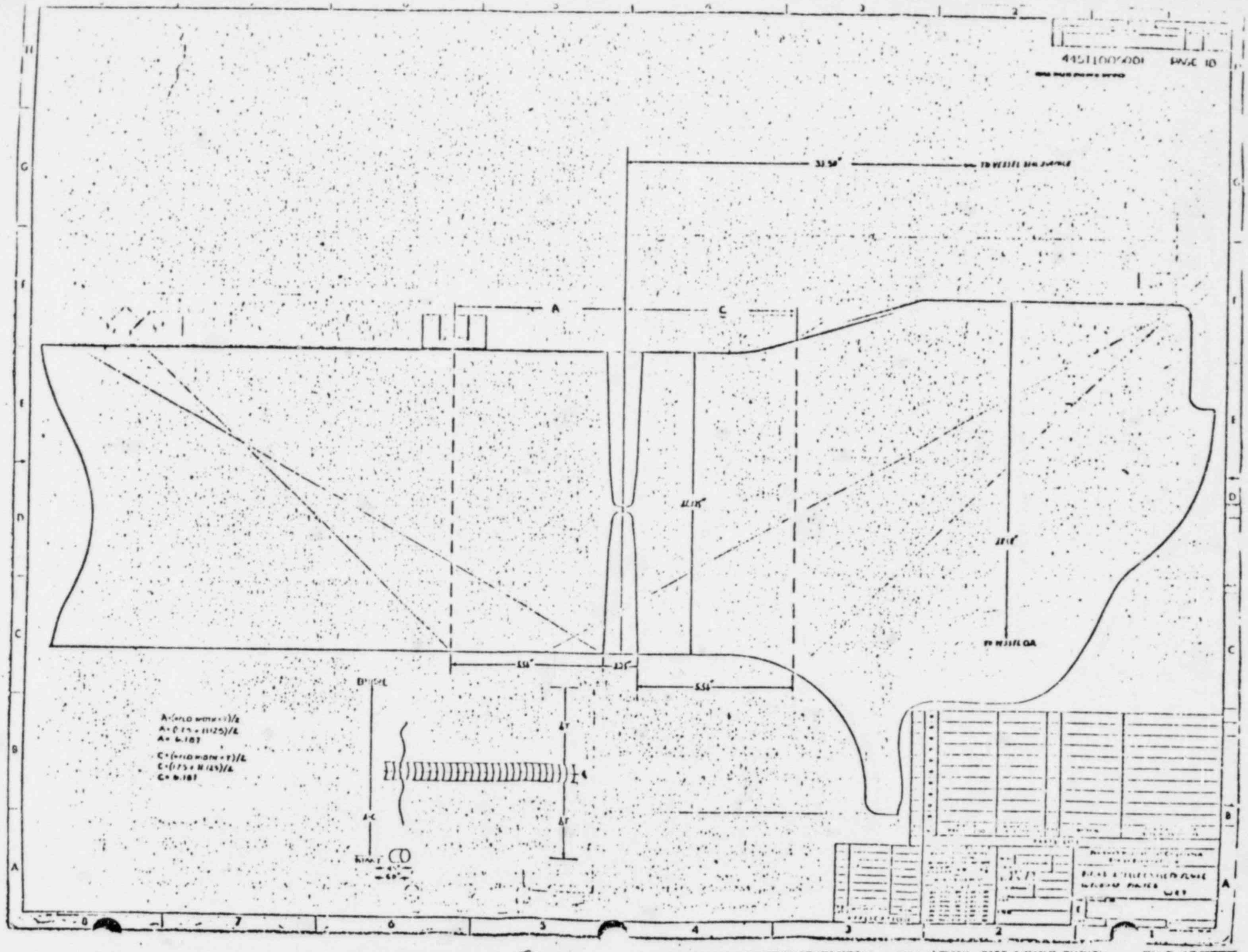
PARALLEL REFLECTIONS
STRAIGHT BEAM REFLECTIONS


A
C
33.50"
TO WESTFIELD
TO WESTFIELD
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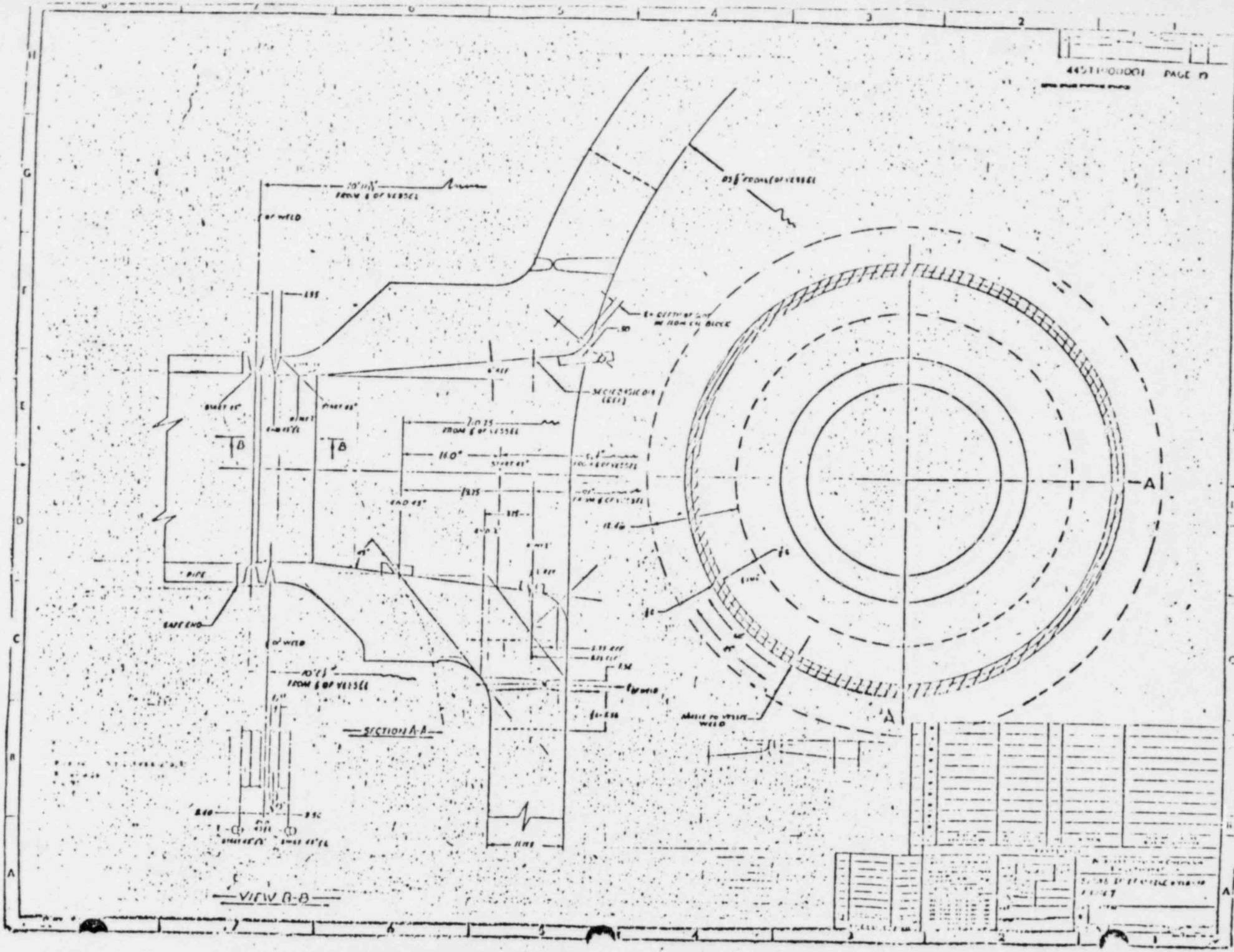
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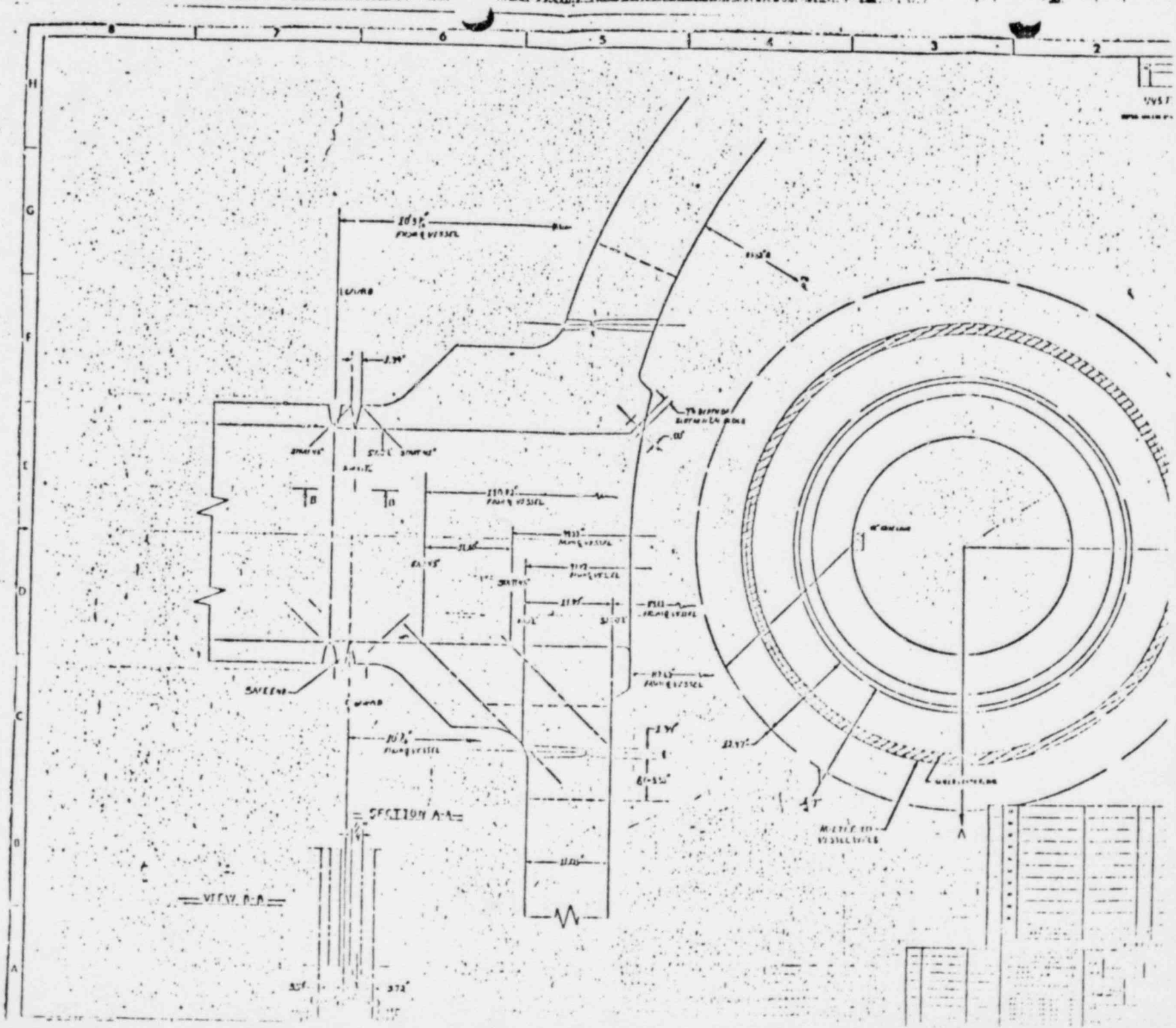
VIEW B-B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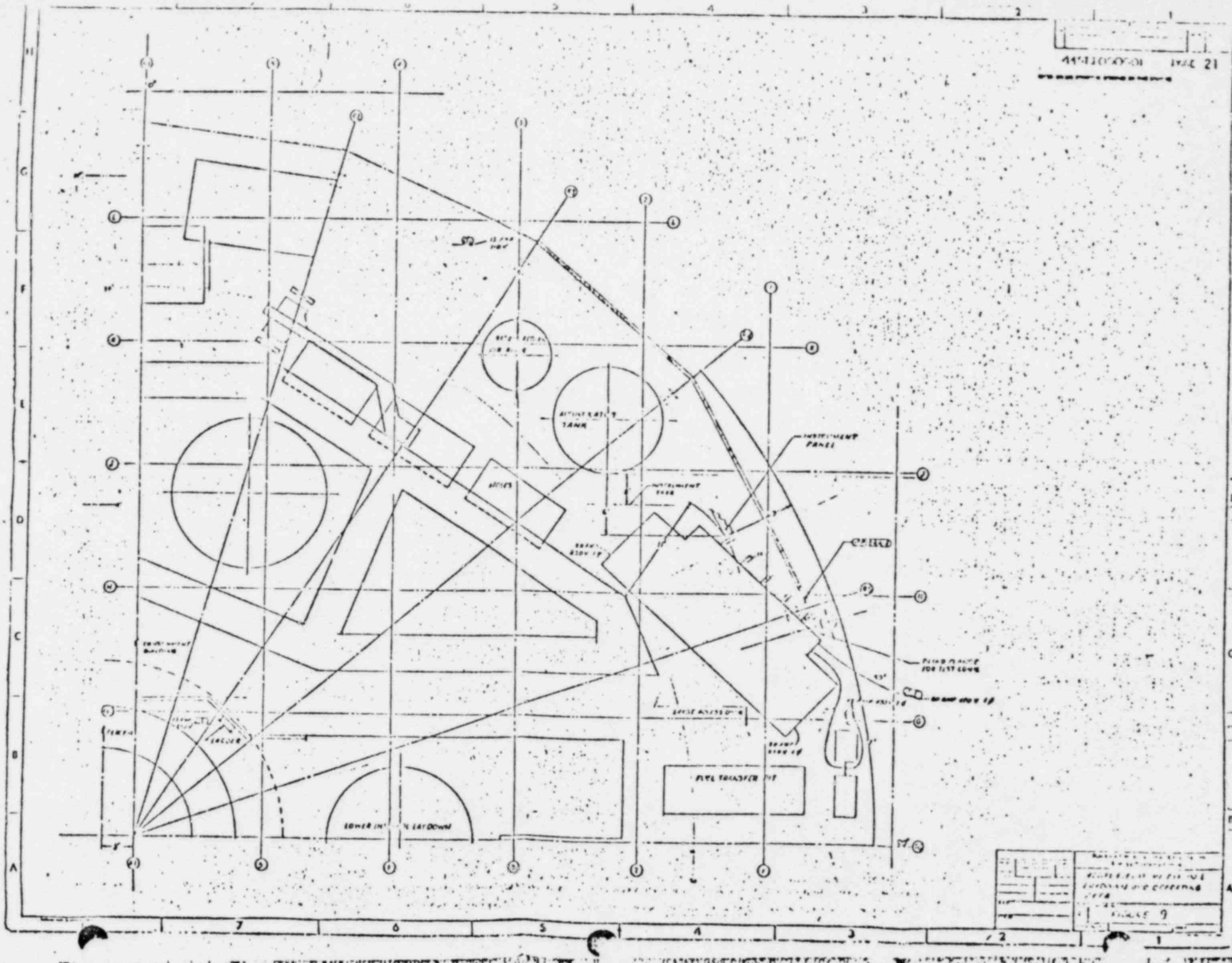
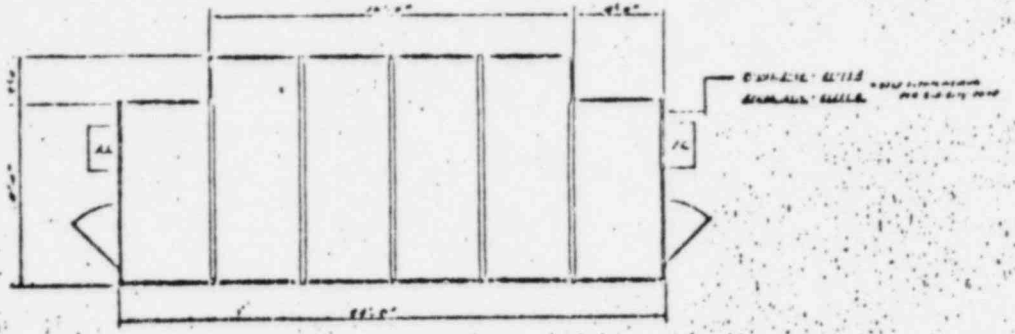

INSTRUMENT PANEL
FUEL TRANSFER PIT
SHEET 9



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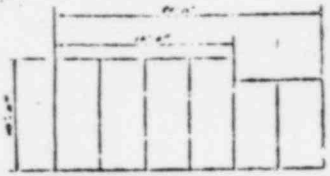

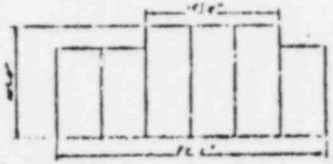

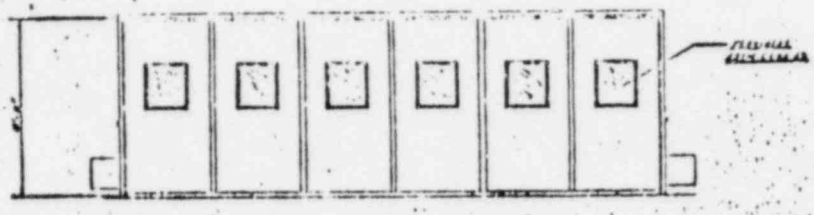

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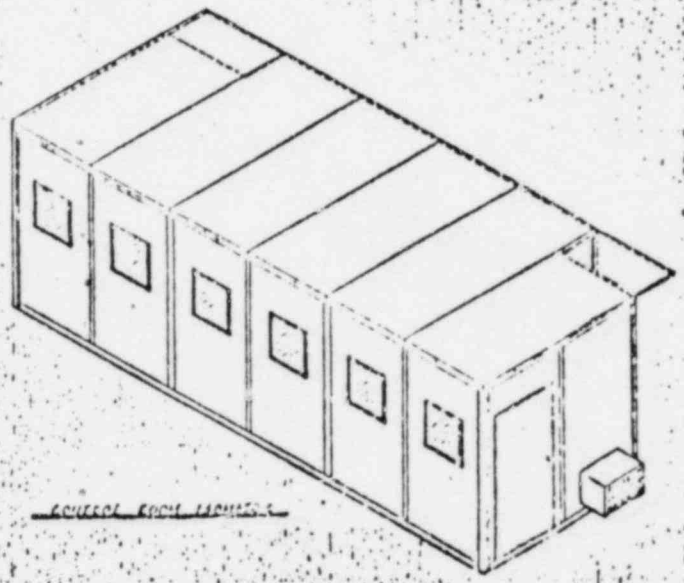

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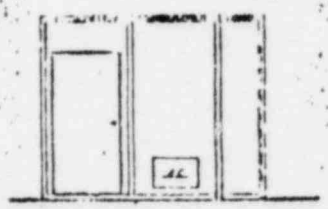

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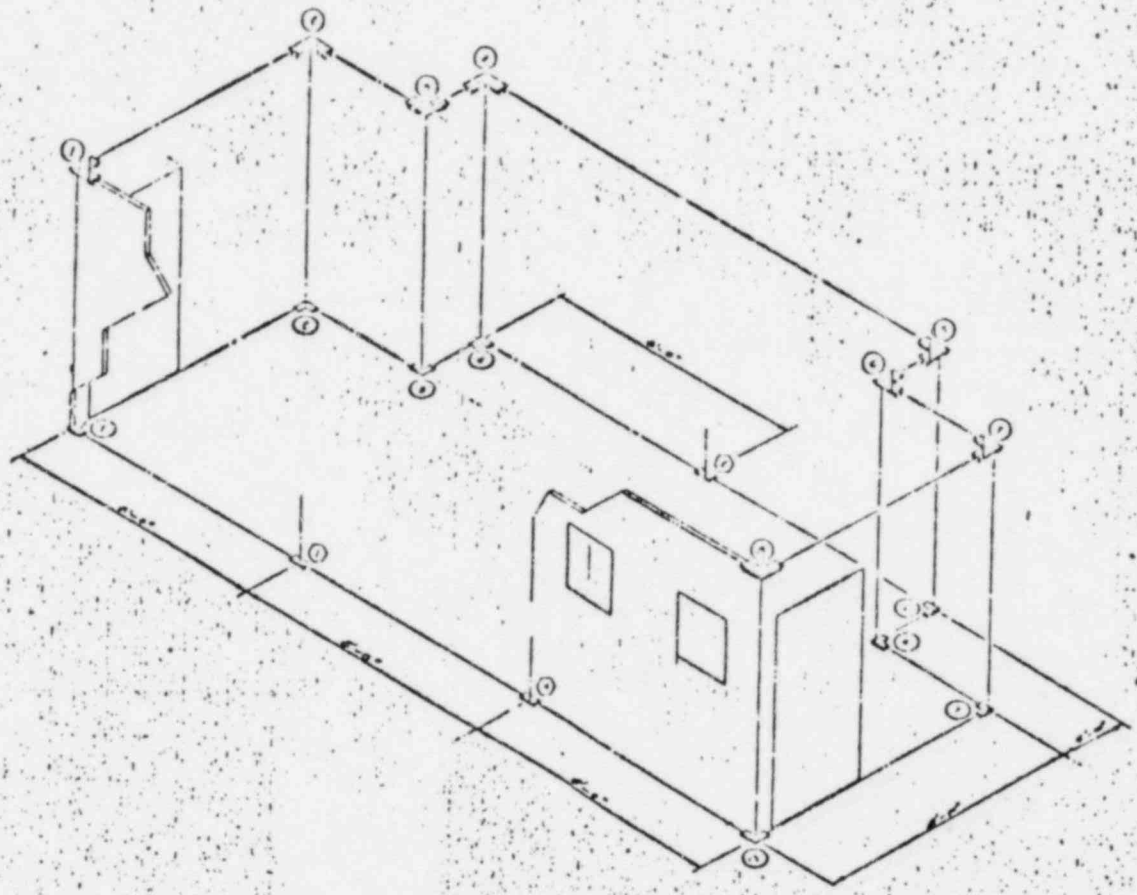

M-1001 SHEET 1 OF 2

DRAWING NO.	M-1001
SHEET 1 OF 2	
DRAWING TITLE	INSERVICE INSPECTION MAIN STEAM
SPECIFICATION	F/L-2807

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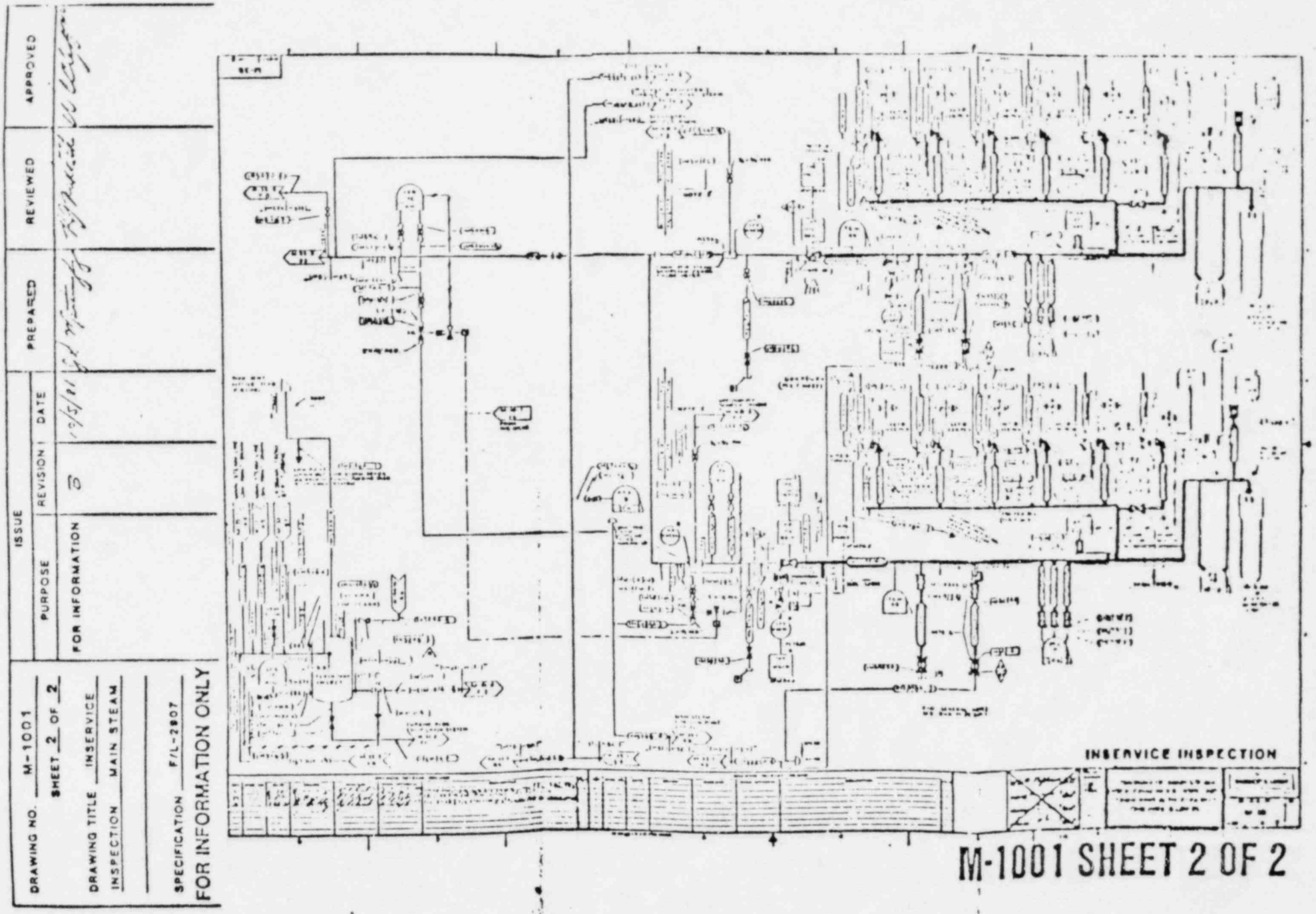
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PREPARED
REVIEWED
APPROVED
FOR INFORMATION
0
10/5/81
DRAWING NO. M-1001
SHEET 2 OF 2
DRAWING TITLE INSERVICE
INSPECTION MAIN STEAM
SPECIFICATION F/L-2807
FOR INFORMATION ONLY
INSERVICE INSPECTION
M-1001 SHEET 2 OF 2

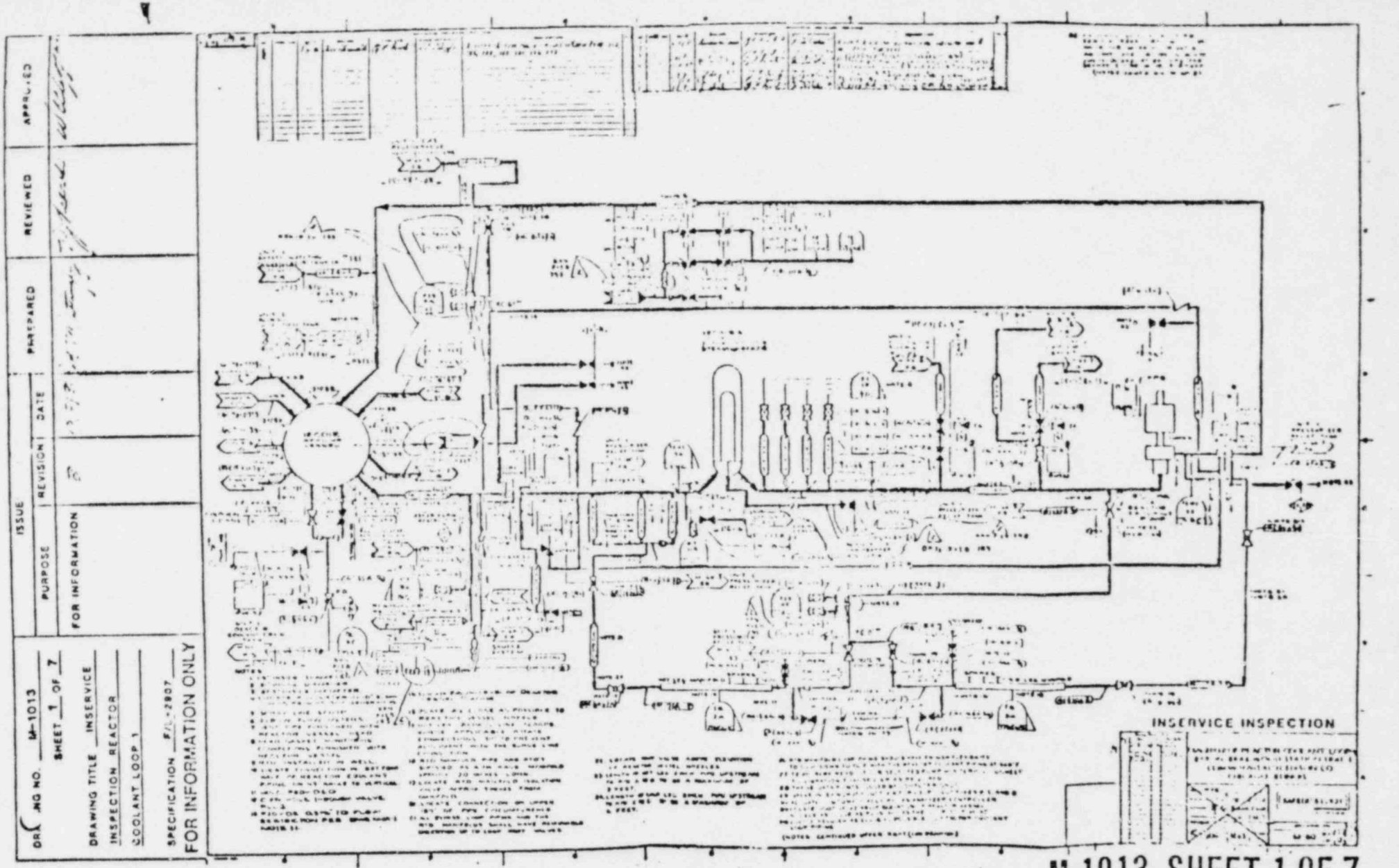
M-1002 SHEET 1 OF 1

INSERVICE INSPECTION

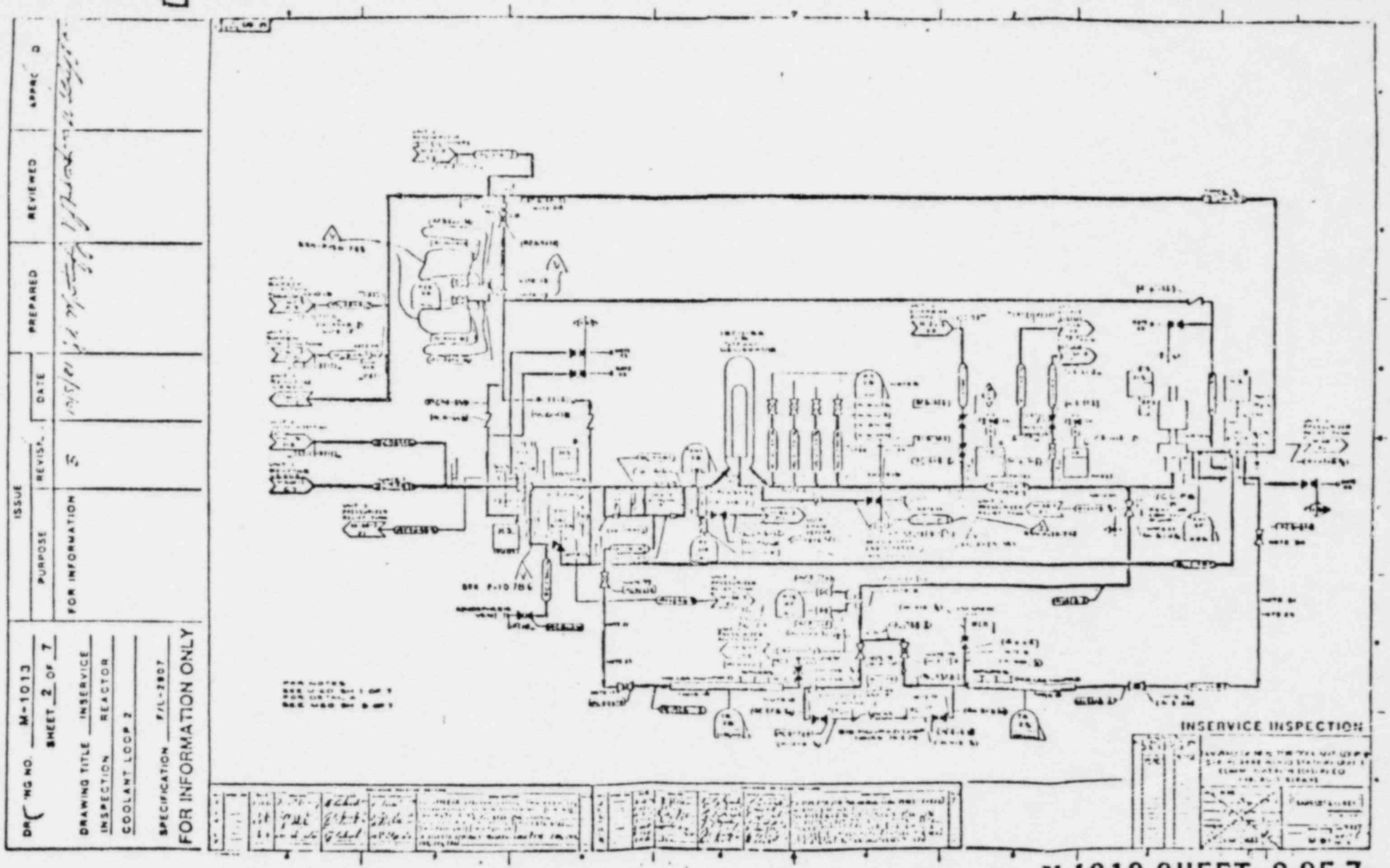
DRAWING NO.	M-1002
	SHEET 1 OF 1
DRAWING TITLE	INSERVICE
	INSPECTION MAIN
	FEEDWATER
SPECIFICATION	F/L-3807

FOR INFORMATION ONLY

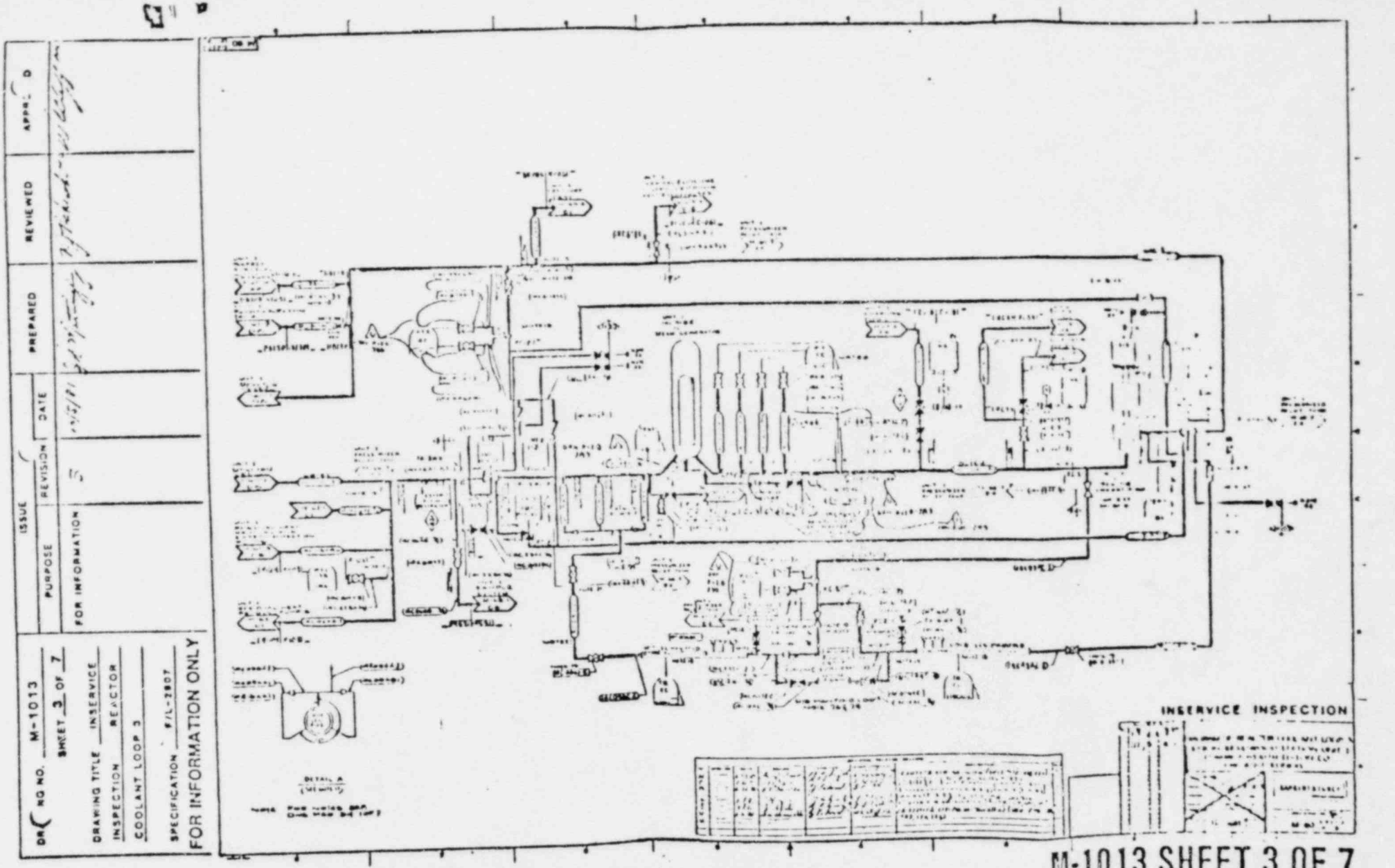
ISSUE	PURPOSE	REVISION	DATE	PREPARED	REVIEWED	APPROVED
	FOR INFORMATION	3	10/21/81	[illegible]	[illegible]	[illegible]



M-1013 SHEET 1 OF 7



M-1013 SHEET 2 OF 7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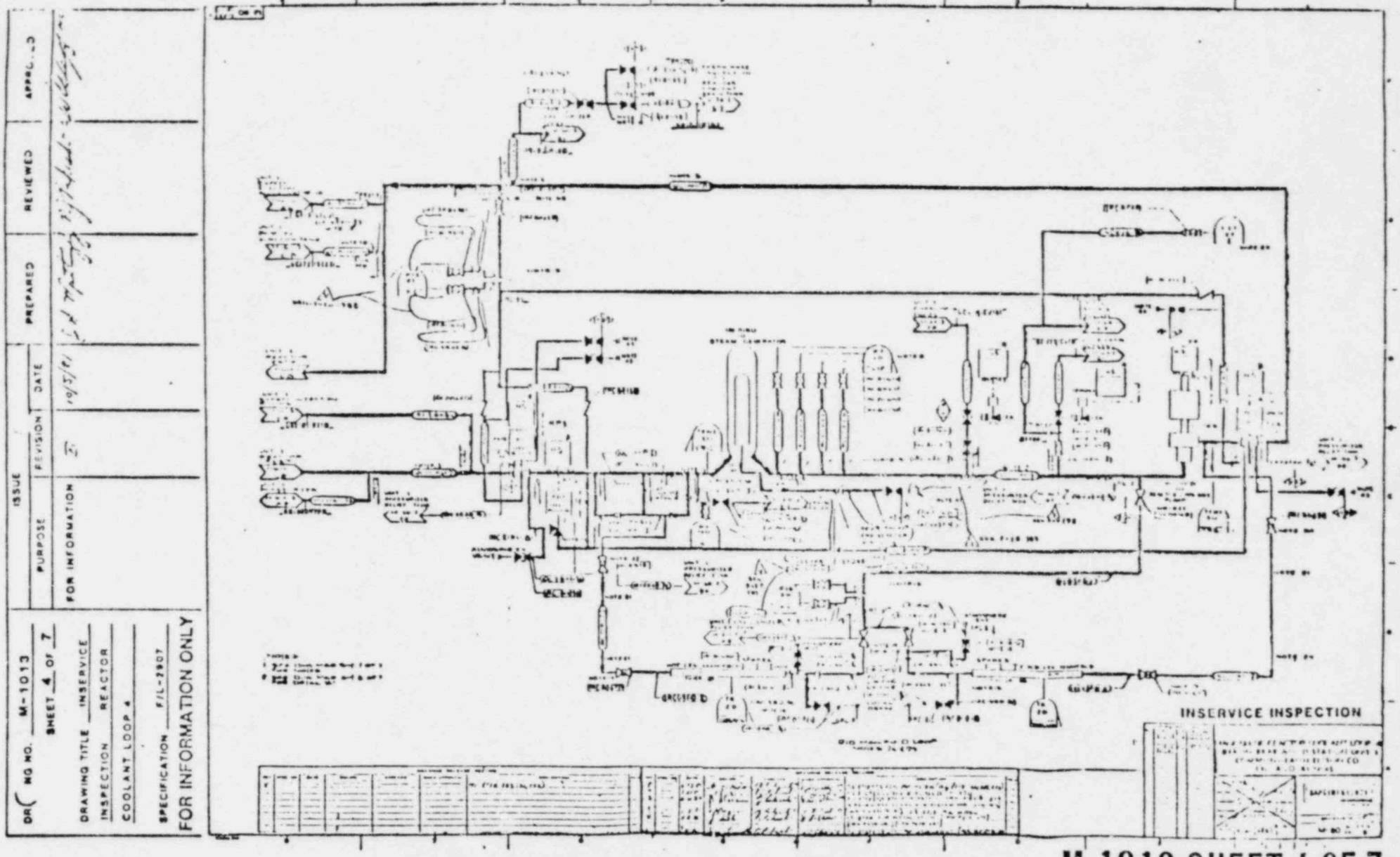
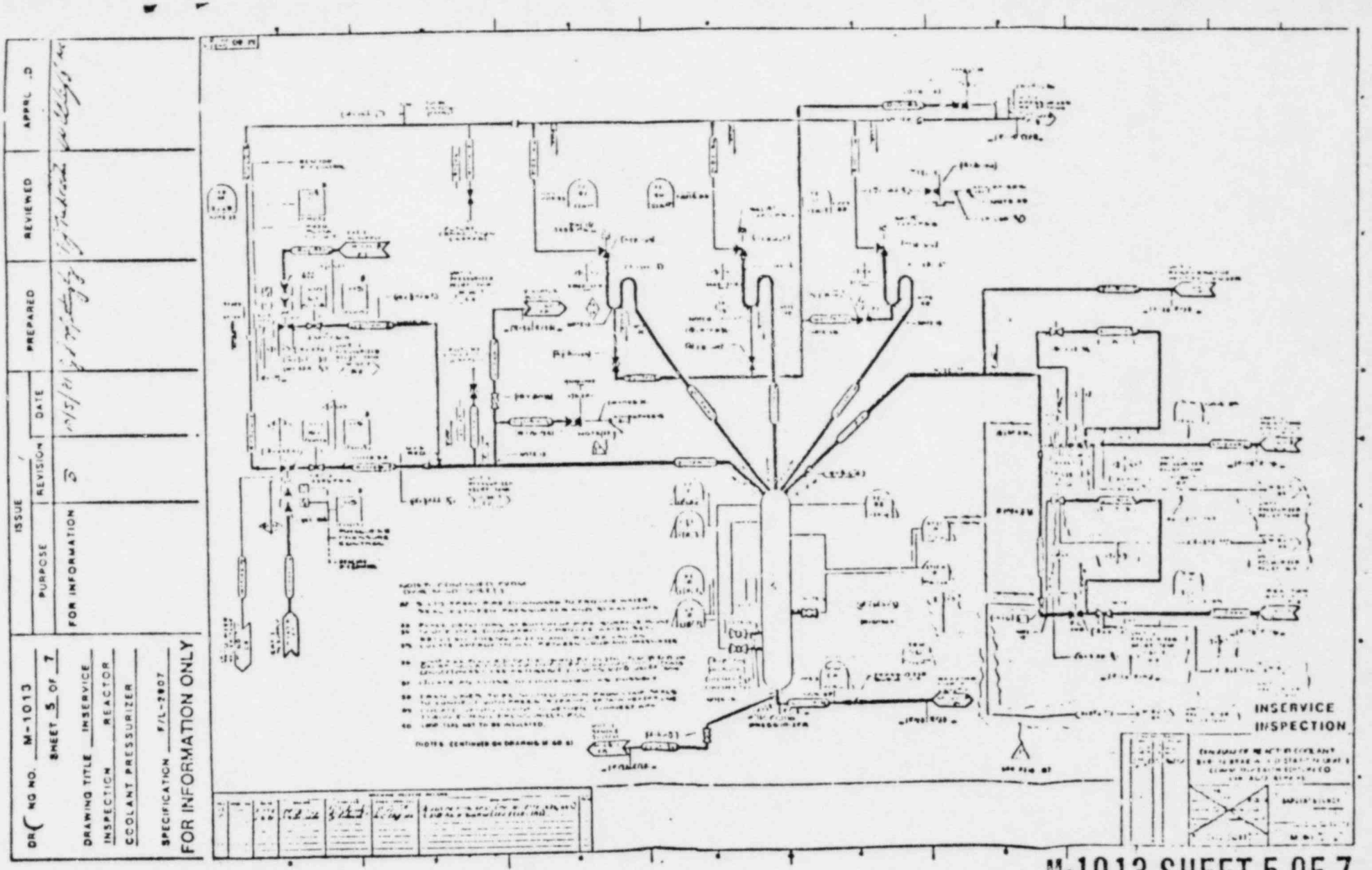
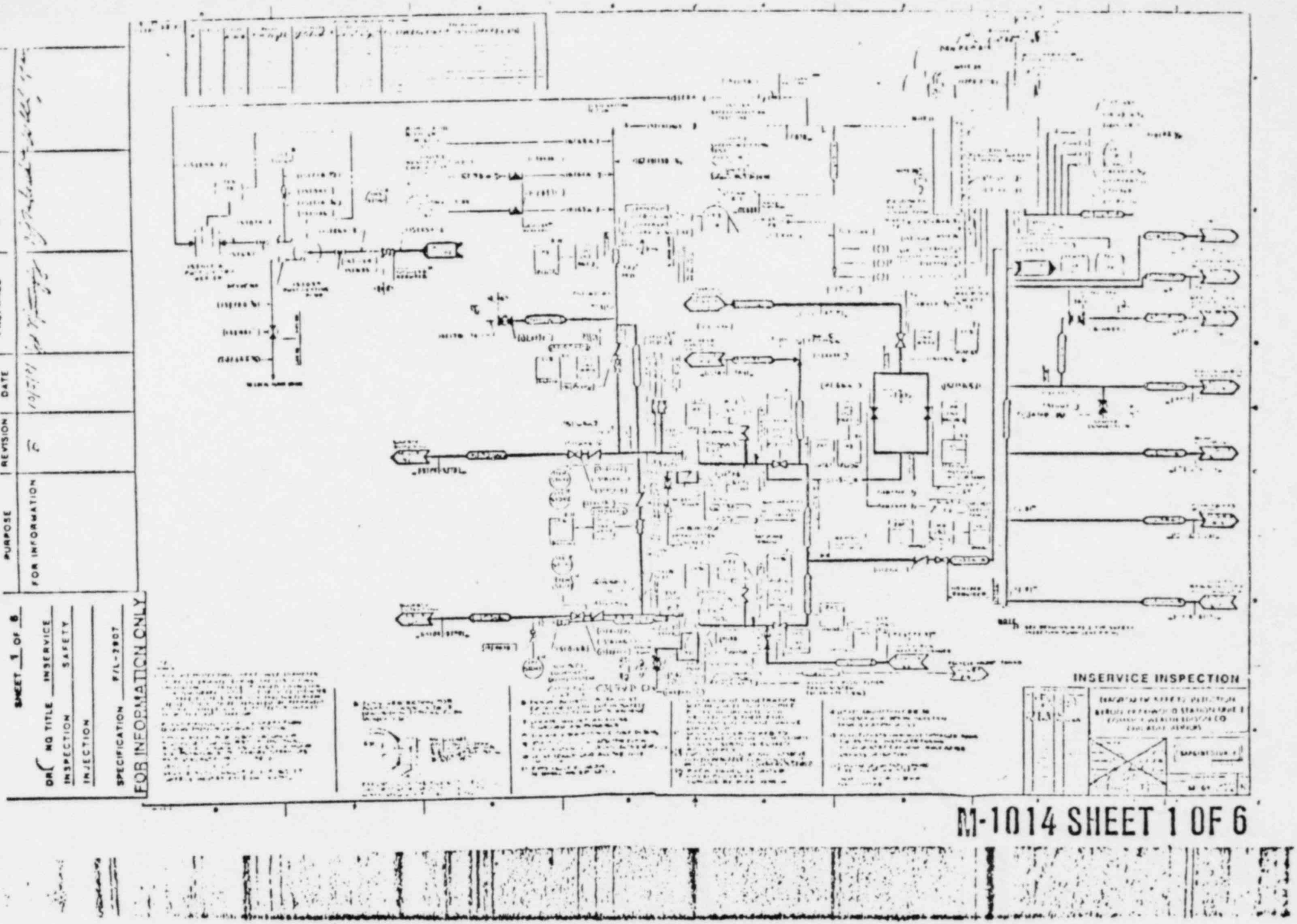
REVISION
PURPOSE
FOR INFORMATION
DR NO. M-1013
SHEET 3 OF 7
DRAWING TITLE INSERVICE INSPECTION REACTOR COOLANT LOOP 3
SPECIFICATION P/L-2807
FOR INFORMATION ONLY
INSERVICE INSPECTION
M-1013 SHEET 3 OF 7



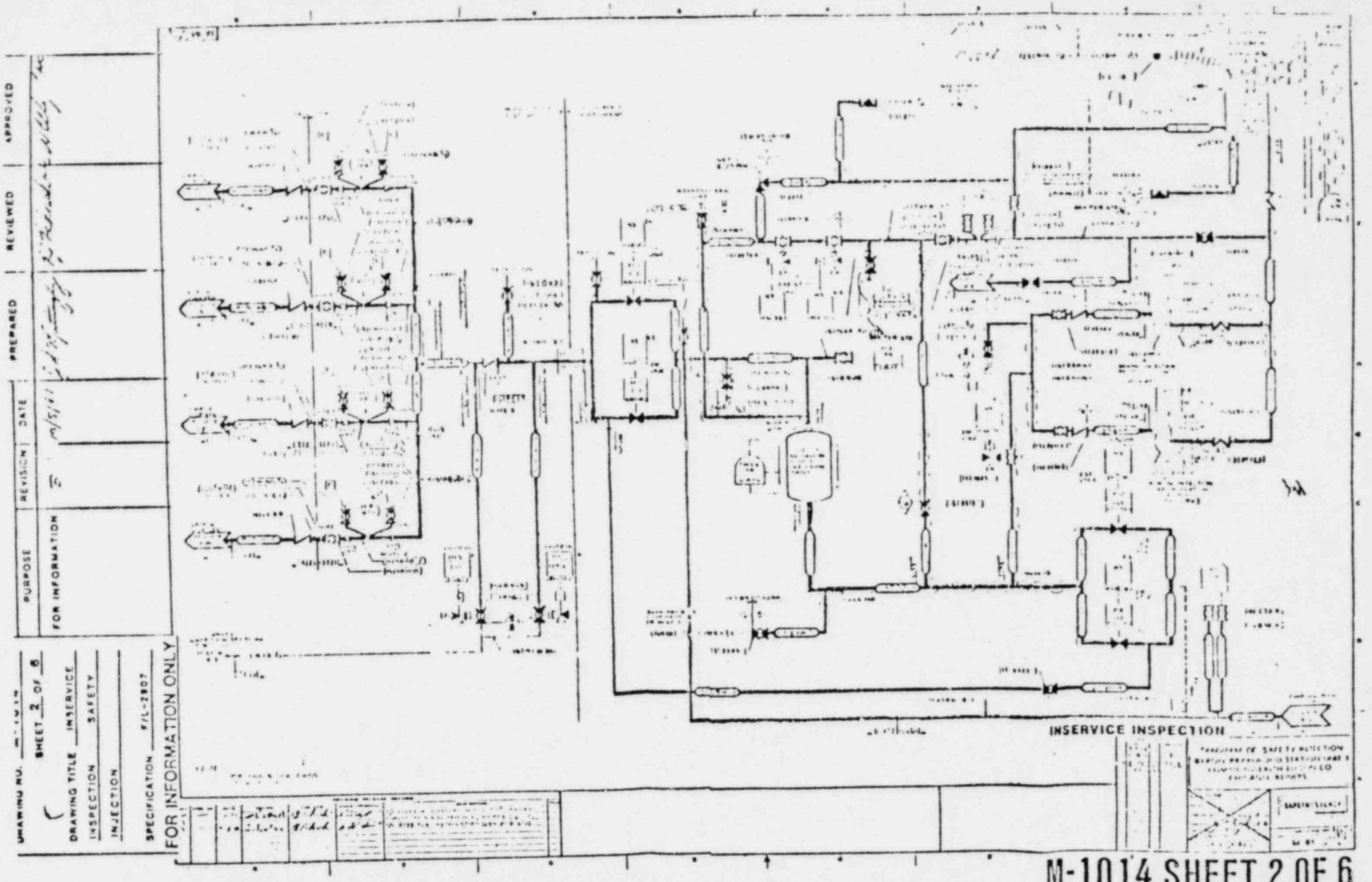
M-1013 SHEET 4 OF 7



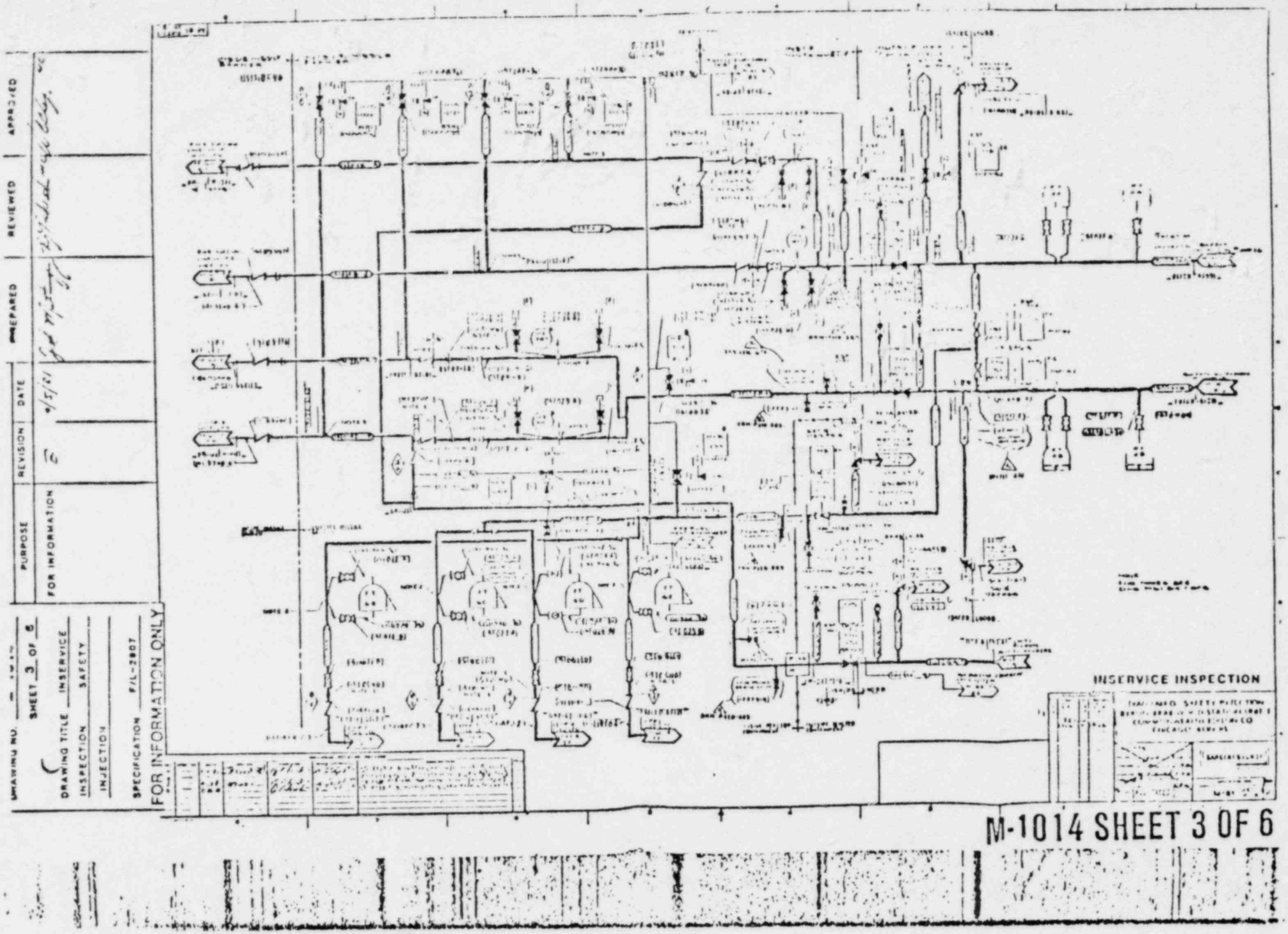
M-1013 SHEET 5 OF 7



M-1014 SHEET 1 OF 6



M-1014 SHEET 2 OF 6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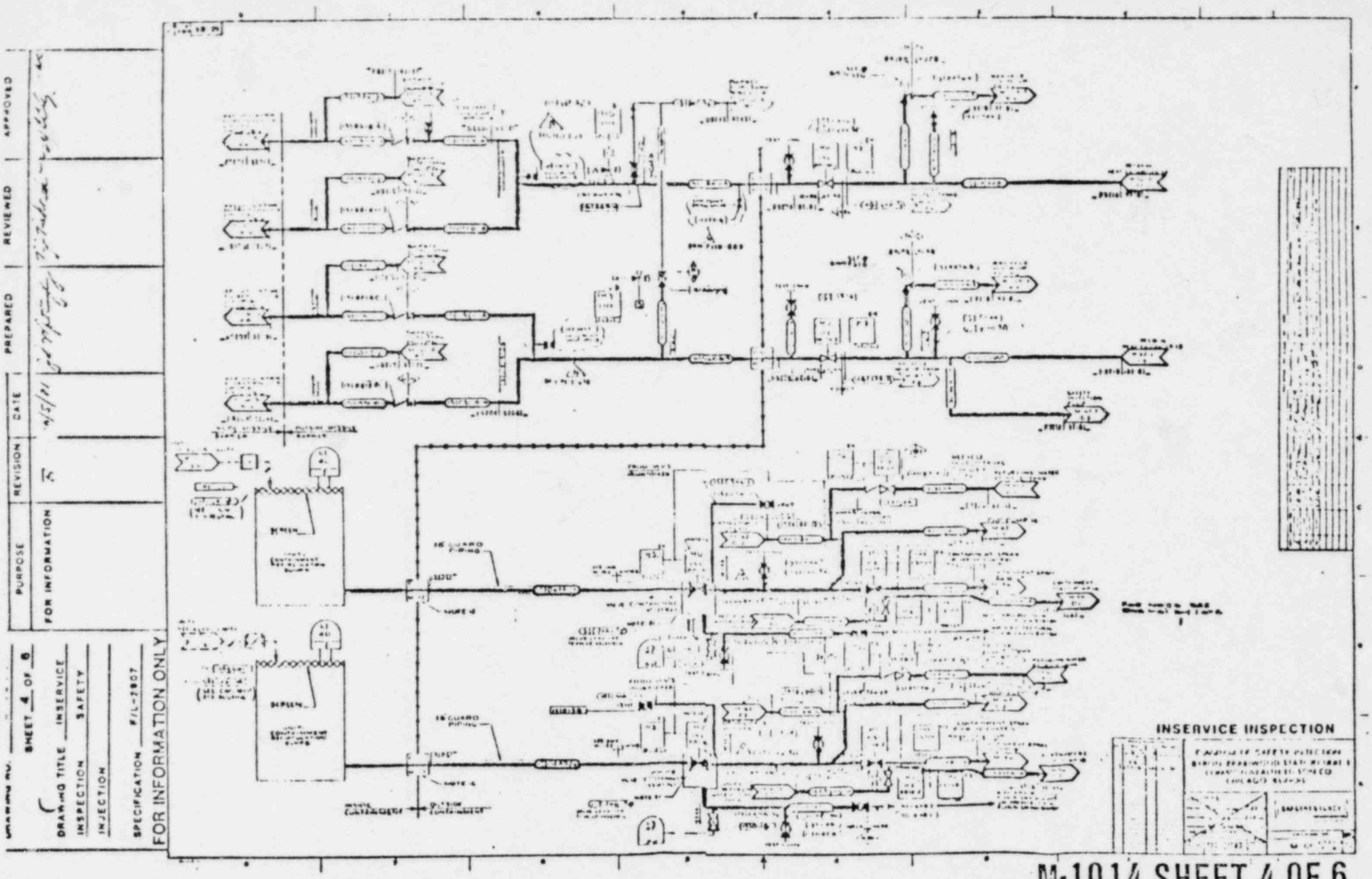
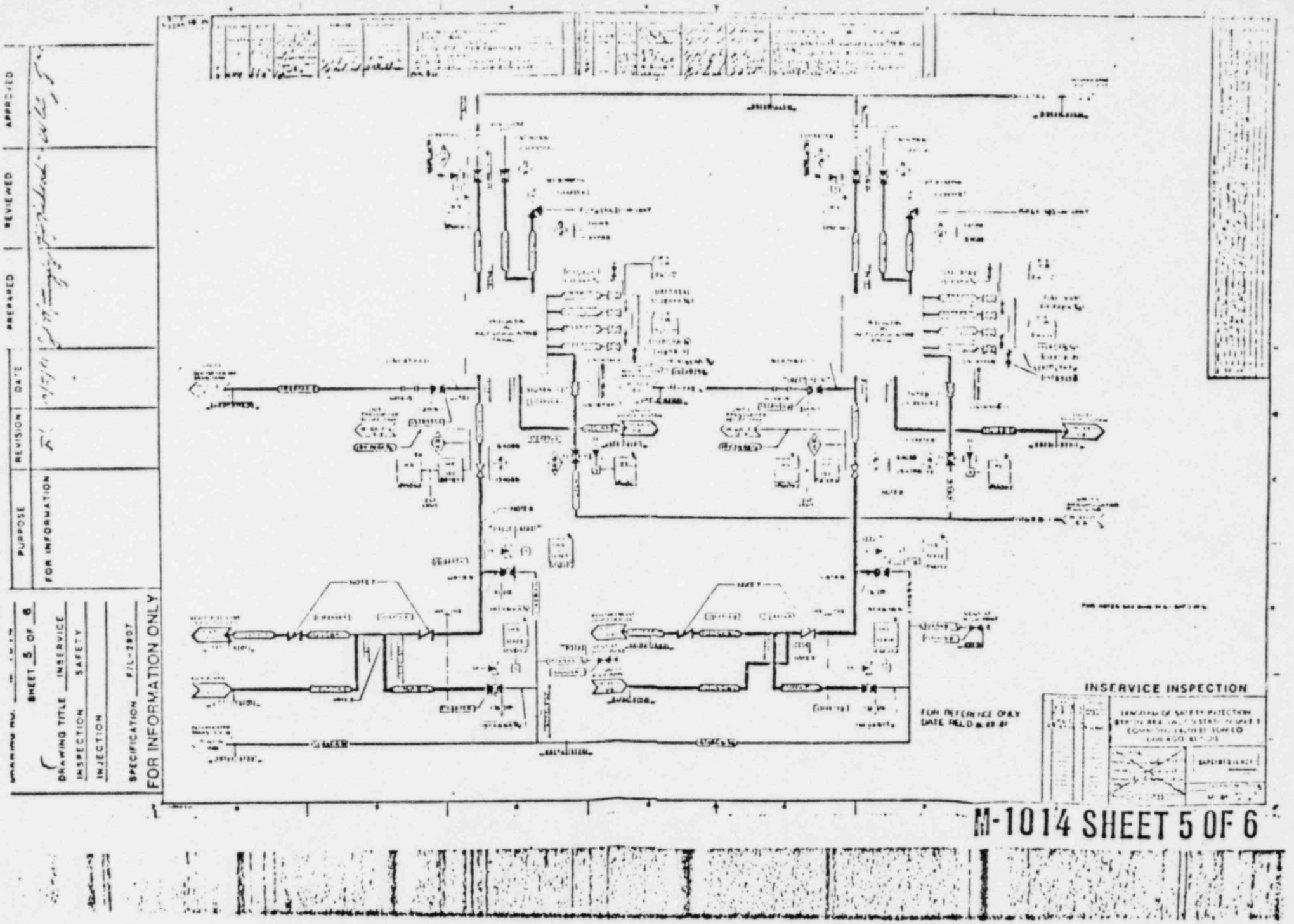
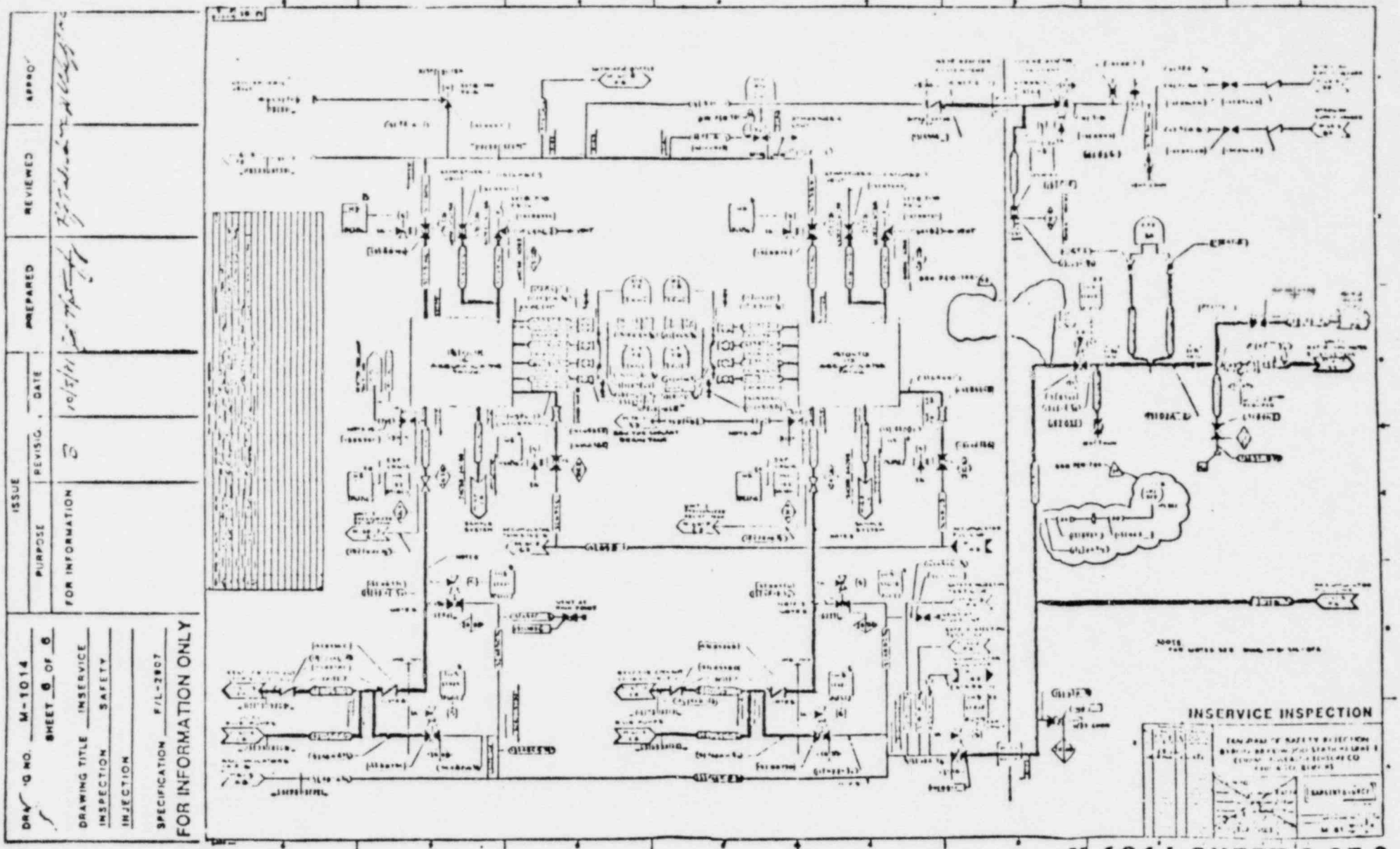
PREPARED
DATE
REVISION
PURPOSE
FOR INFORMATION
DRAWING NO.
SHEET 3 OF 6
DRAWING TITLE INSERVICE
INSPECTION SAFETY
INJECTION
SPECIFICATION F/L-2807
FOR INFORMATION ONLY
INSERVICE INSPECTION
M-1014 SHEET 3 OF 6



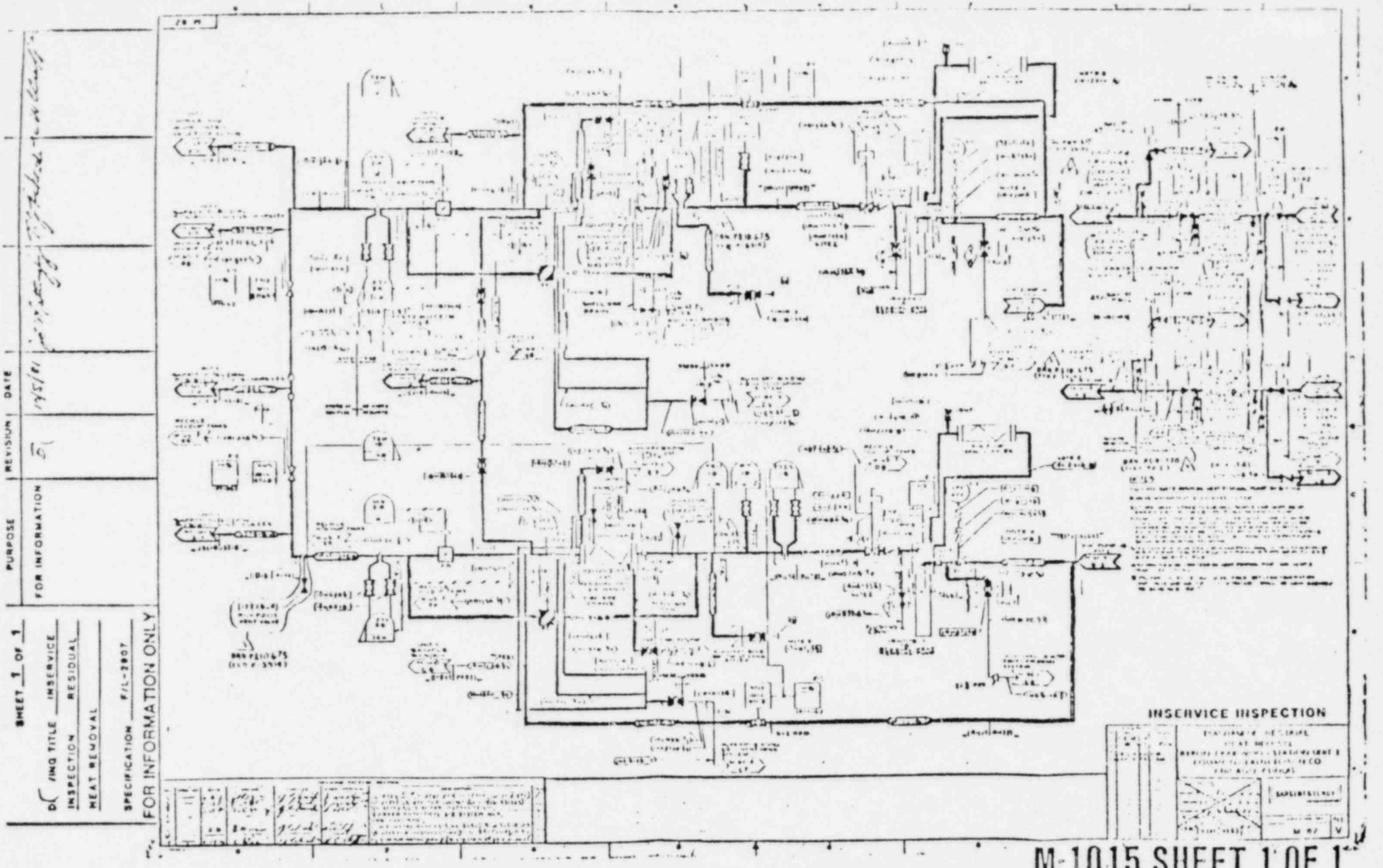
M-1014 SHEET 4 OF 6



M-1014 SHEET 5 OF 6



M-1014 SHEET 6 OF 6



M-1015 SHEET 1 OF 1

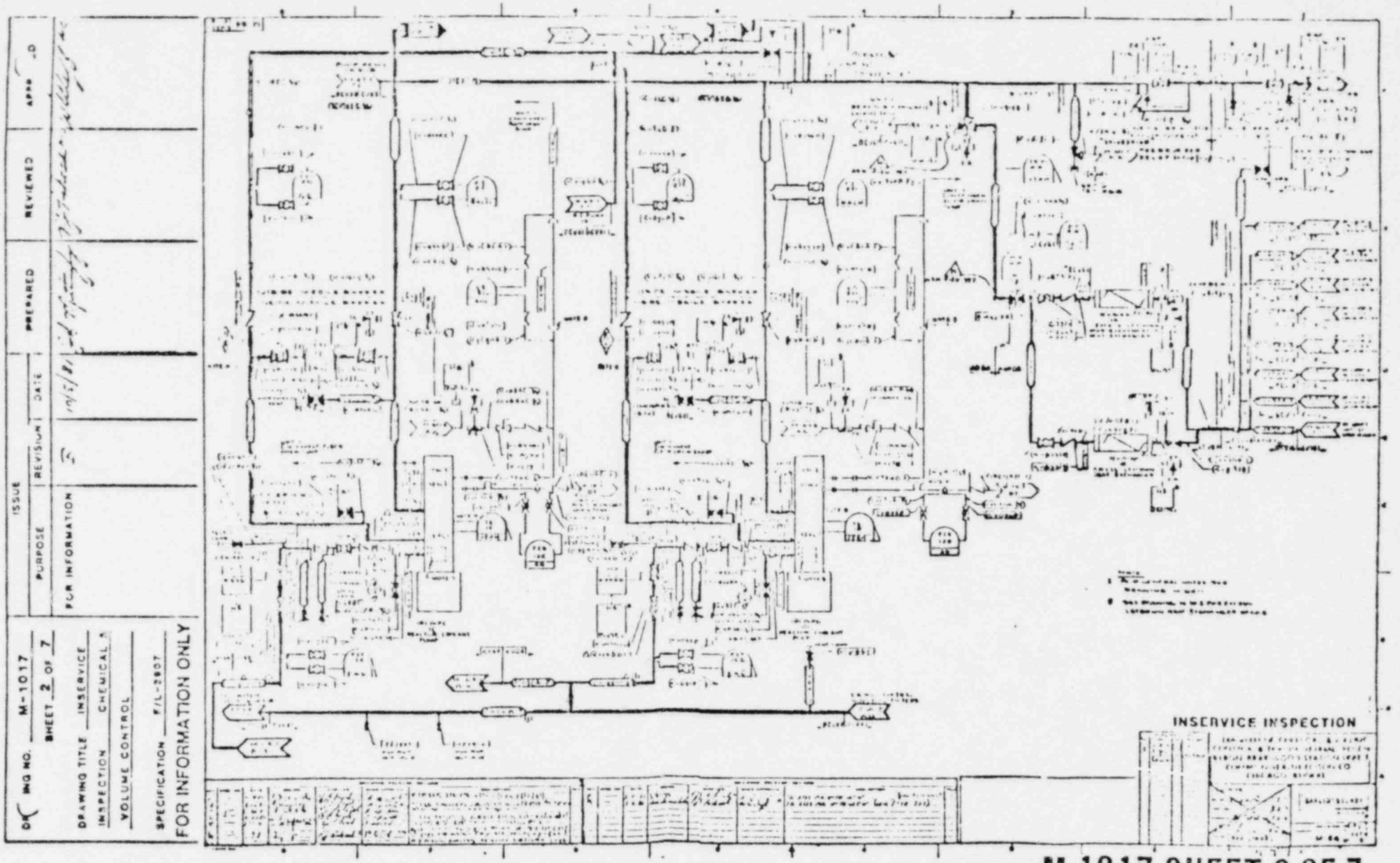
M-1017 SHEET 1 OF 7

INSERVICE INSPECTION

DRAWING NO.	M-1017
SHEET 1 OF 7	
DRAWING TITLE	INSERVICE
INSPECTION	CHEMICAL &
VOLUME CONTROL	
SPECIFICATION	P/L-2807

FOR INFORMATION ONLY

ISSUE			PREPARED	REVIEWED	APPROVED
PURPOSE	REVISION	DATE			
FOR INFORMATION	2	10/2/91			



M-1017 SHEET 2 OF 7

ISSUE				PREPARED	REVIEWED	APPROVED
PURPOSE	REVISION	DATE				
FOR INFORMATION	0	10/5/01				

DRAWING NO. M-1017 SHEET 5 OF 7

DRAWING TITLE INSERVICE

INSPECTION CHEMICAL & VOLUME CONTROL

SPECIFICATION F/L-2807

FOR INFORMATION ONLY

The following list contains the piping systems, Class 1, 2 and 3, covered under the Byron Unit #1 Preservice Program Plan;

System's Code	System	Total # of p'gs.
(AF)	Auxiliary Feedwater	3
(CS)	Containment Spray	4
(CV)	Chemical & Volume Control	21
(FW)	Main Feedwater	6
(MS)	Main Steam	5
(RC)	Reactor Coolant	12
(RH)	Reactor Heat Removal	4
(RY)	Reactor Coolant - Pressurizer	3
(SI)	Safety Injection	17

PRESERVICE PIPING LINE LIST CODES

COLUMN HEADING

A - Indicates first time entry is made

R - Indicates that a change has been made since the previous issue of the list in any of the piping line number data columns

C - Indicates that the piping line number is cleared

LINE NUMBER

1st Character - Refers to unit number

2nd & 3rd Characters-Refers to standard plant system identification code

4th & 5th Characters-Refers to pipe line serial number

6th Characters-Refers to pipe line size, class or design table change

7th Characters-Refers to parallel or duplicate lines

Remaining characters-Refers to nominal piping line diameter

1 AB 01 A A 3"

P&I DIAGRAM

Refers to the piping and instrumentation diagram on which a given line number originates

MAX. OPERATING CONDITIONS

Field 3--Refers to the Max. Operating Pressure (PSIG)

Field 4--Refers to the Max. Operating Temperature (^{o}F)

DESIGNED CONDITION

Field 5--Refers to design pressure

Field 6--Refers to design temperature

These conditions are required for the design of the pipeline and associated hangers and supports

PIPE CL.

This specifies the piping classification (or quality) group of the process pipeline including instrument piping take-offs up to and including the mainline shutoff (root) valve (or excess flow check valve where provided on nuclear units), or to extent shown on the instrument installation detail. Also applies to numbered instrument lines

For nuclear piping, the letters "A", "B" and "C" shall be used to specify Classes 1, 2 and 3 respectively of ASME Sect. III

The letter "D" shall be used to specify all power piping covered by ANSI B31.1

The letter "E" shall be used to specify boiler external piping under the jurisdication of ASME Section I

PIPE CL.	The letter "G" shall be used to specify piping not covered under ASME Section III or ANSI B31.1
PIPE DESIGN TABLE	Specify the applicable "Piping Design Table" relative to ANSI valve rating, piping material, type of joints, pipe schedule, etc., per the project piping design table index
EXAMINATION CATEGORY	Refers to the piping classification in accordance with ASME Section XI 77 Edition through Summer 1978 Addenda Tables: IWB-2500-1 for Class 1(A) IWC-2500-1 for Class 2(B) IWD-2500-1 for Class 3(C)
EXAMINATION METHOD	Refers to the nondestructive examinations methods as stipulated by ASME Section XI Article IWA-2000
CODE EXEMPTION	Refers to components exempt from volumetric and/or surface examination requirements stipulated by Tables IWB-2500-1 and IWC-2500-1
RELIEF REQUEST	Refers to components which based on design limitations requires relief from the examination requirements of ASME Section XI. Components requiring a relief request based on limited access, geometry conditions and/or materials noted during the Preservice operations will be identified in the PSI final report
ISI FLOW DIAGRAM	Refers to Sargent & Lundy ISI flow diagram, M-1000, color coded for ASME Section XI examination boundaries

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PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	AUXILIARY FEEDWATER

SYSTEM	LINE NUMBER		SIZE	P&I DIAGRAM	MAX OPERATING CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
	CODE	SEQUENCE NUMBER			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
			1	2	3	4	5	6	7	8							
	1AF01AA		6.00	M-037-01	100	100	125	100	C	010588	D-A			VT-2			M-1003-01
	1AF01AB		6.00	M-037-01	100	100	125	100	C	010588	D-A			VT-2			M-1003-01
	1AF02AA		6.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02AB		6.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02BA		6.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02BB		6.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02CA		4.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02CB		4.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02CC		4.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02CD		4.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02CE		4.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02CF		4.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02CG		4.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02CH		4.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
	1AF02DA		4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC 1220 c		M-1003-01
	1AF02DB		4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2			M-1003-01
	1AF02DC		4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2			M-1003-01
	1AF02DD		4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2			M-1003-01
	1AF02DE		4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2			M-1003-01
	1AF02DF		4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2			M-1003-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: AUXILIARY FEEDWATER

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS PRESS PSIG	MAX OPERATIONS CONDITIONS TEMP F/HR	DESIGN CONDITIONS PRESS PSIG	DESIGN CONDITIONS TEMP F/HR	PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1 EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1AF020G	4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1003-01
1AF020H	4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1003-01
1AF02EA	4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1003-01
1AF02EB	4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1003-01
1AF02EC	4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1003-01
1AF02ED	4.00	M-037-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1003-01
1AF03AA	6.00	M-037-01	100	100	125	100	C	010588	D-A			VT-2			M-1003-01
1AF03AB	6.00	M-037-01	100	100	125	100	C	010588	D-A			VT-2			M-1003-01
1AF04AA	2.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
1AF04AB	2.00	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
1AF07AA	0.75	M-037-01	100	100	125	100	C	010588	D-A			VT-2			M-1003-01
1AF07BA	0.75	M-037-01	100	100	125	100	C	010588	D-A			VT-2			M-1003-01
1AF08AA	0.75	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
1AF08BA	0.75	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
1AF10AA	0.75	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
1AF10AB	0.75	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
1AF12AA	0.75	M-037-01	100	100	125	100	C	010588	D-A			VT-2			M-1003-01
1AF12AB	0.75	M-037-01	100	100	125	100	C	010588	D-A			VT-2			M-1003-01
1AF13AA	0.75	M-037-01	2080	100	1750	100	C	090788	D-A			VT-2			M-1003-01
1AF13AB	0.75	M-037-01	1830	100	1750	100	C	090788	D-A			VT-2			M-1003-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: AUXILIARY FEEDWATER

REVISION	LINE NUMBER: SYSTEM	LINE NUMBER: SEQUENCE NUMBER	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS: PRESS PSIG (3)	MAX OPERATIONS CONDITIONS: TEMP FAHR (4)	DESIGN CONDITIONS: PRESS PSIG (5)	DESIGN CONDITIONS: TEMP FAHR (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1AF	16AA	2.00	M-037-01	2080	0100	1750	0100	C	0907BB	D-A			VT-2			M-1003-01
	1AF	16AB	2.00	M-037-01	2080	0100	1750	0100	C	0907BB	D-A			VT-2			M-1003-01
	1AF	16B	3.00	M-037-01	2080	0100	1750	0100	C	0907BB	D-A			VT-2			M-1003-01
	1AF	17AA	2.00	M-037-01	2080	0100	1750	0100	C	0907BB	D-A			VT-2			M-1003-01
	1AF	17AB	2.00	M-037-01	2080	0100	1750	0100	C	0907BB	D-A			VT-2			"

Ref. Page

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CONTAINMENT SPRAY

FOLDOUT	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION 74 S'75	RELIEF REQUEST	ISI FLOW DIAGRAM
		1	2	3	4	5	6	7	8							
	1CS01AP	16.00	M-046-01	65	165	75	200	B	01408B	C-F		X				M-1005-01
	1CS01AB	16.00	M-046-01	65	165	75	200	B	01408B	C-F		X				M-1005-01
	1CS02AA	10.00	M-046-01	250	165	275	200	B	03408B	C-F		X			1	M-1005-01
	1CS02AB	10.00	M-046-01	250	165	275	200	B	03408B	C-F		X			1	M-1005-01
	1CS02B	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02C	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02D	4.00	M-046-01	100	165	275	200	B	03408B	C-H			VT-2	1WC1220d	1	M-1005-01
	1CS02E	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02F	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02GA	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02GB	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02H	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02J	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02KA	10.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02KB	10.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02L	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS02M	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	1WC1220a	1	M-1005-01
	1CS03AA	0.75	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	1WC1220d		M-1005-01
	1CS03BA	0.75	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	1WC1220d		M-1005-01
	1CS04AA	0.75	M-046-01	250	165	275	200	B	03408B	C-H			VT-2	1WC1220d		M-1005-01

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PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CONTAINMENT SPRAY

LINE NUMBER			SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
					PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD			CODE EXEMPTION 74 S 75	RELIEF REQUEST	ISI FLOW DIAGRAM
												Volumetric	Surface	Visual			
	1CS048A		0.75	M-046-01	250	165	275	200	B	03408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS05AA		3.00	M-046-01	250	165	275	200	B	03408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS05AB		3.00	M-046-01	250	165	275	200	B	03406B	C-H			VT-2	IWC1220(		M-1005-01
	1CS06AA		6.00	M-046-01	65	165	75	200	B	01408B	C-F		X				M-1005-01
	1CS06AB		6.00	M-046-01	65	165	75	200	B	01406B	C-F		X				M-1005-01
	1CS07AA		1.00	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS07AB		1.00	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	IWC1-20(		M-1005-01
	1CS08AA		1.00	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS08AB		1.00	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS09AA		0.75	M-046-01	250	165	275	200	B	03408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS09AB		0.75	M-046-01	250	165	275	200	B	03408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS10AA		6.00	M-046-01	250	165	275	200	B	03408B	C-F		X				M-1005-01
	1CS10AB		6.00	M-046-01	250	165	275	200	B	03406B	C-F		"				M-1005-01
	1CS11AA		1.00	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS11AB		1.00	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS12AA		3.00	M-046-01	75	120	150	120	B	01406B	C-H			VT-2	IWC1220(		M-1005-01
	1CS12AB		3.00	M-046-01	75	120	150	120	B	01406B	C-H			VT-2	IWC1220(		M-1005-01
	1CS13AA		1.00	M-046-01	10	150	150	150	B	01408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS13AB		1.00	M-046-01	10	150	150	150	B	01408B	C-H			VT-2	IWC1220(		M-1005-01
	1CS14AA		1.00	M-046-01	10	150	150	150	B	01408B	C-H			VT-2	IWC1220(		M-1005-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CONTAINMENT SPRAY

LINE NUMBER	SIZE	P&I DIAGRAM	MAX. OPERATING CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD			CODE EXEMPTION 74 S'75	RELIEF REQUEST	ISI FLOW DIAGRAM
										Volumetric	Surface	Visual			
	1	2	3	4	5	6	7	8							
1CS17AA	1.00	M-046-01	75	120	150	120	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS17AB	1.00	M-046-01	75	120	150	120	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS18AA	3.00	M-046-01	75	120	150	120	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS18AB	3.00	M-046-01	75	120	150	120	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS23AA	14.00	M-061-04	65	165	75	200	B	014OBB	C-F		X				M-1014-04
1CS23AB	14.00	M-061-04	65	165	75	200	B	014OBB	C-F		X				M-1014-04
1CS24AA	2.00	M-046-01	10	150	150	150	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS24BA	2.00	M-046-01	10	150	150	150	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS28AA	10.00	M-046-01	200	165	275	200	B	034OBB	C-F			VT-2	IWC122Cc	1	M-1005-01
1CS28AB	10.00	M-046-01	200	165	275	200	B	034OBB	C-F			VT-2	IWC1220c	1	M-1005-01
1CS30AA	1.00	M-046-01	75	120	150	120	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS30AB	1.00	M-046-01	75	120	150	120	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS32A	1.00	M-046-01	150	120	150	120	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS42B	1.00	M-046-01	50	140	50	140	B	014OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS36AA	0.50	M-046-01	250	165	275	200	B	034OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS36AB	0.50	M-046-01	250	165	275	200	B	034OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS37AA	0.50	M-046-01	250	165	275	200	B	034OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS37AB	0.50	M-046-01	250	165	275	200	B	034OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS38AA	0.50	M-046-01	250	165	275	200	B	034OBB	C-H			VT-2	IWC1220d		M-1005-01
1CS38AB	0.50	M-046-01	250	165	275	200	B	034OBB	C-H			VT-2	IWC1220d		M-1005-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CONTAINMENT SPRAY

Notes	Line Number: System	Line Number: Number	Size (1)	P&I Diagram (2)	Max Operations Conditions: Press PSIG (3)	Max Operations Conditions: Temp FAHR (4)	Design Conditions: Press PSIG (5)	Design Conditions: Temp FAHR (6)	Piping Class (7)	Pipe Design Table (8)	ASME Sec XI Div 1: Exam Cat.	Exam Method: Volumetric	Exam Method: Surface	Exam Method: Visual	Code Exemption	Relief Request	ISI Flow Diagram
	1CS39AA	1.00	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		M-1005-01
	1CS39AB	1.00	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		M-1005-01
	1CS40A	0.75	M-046-01	10	150	150	150	B	014088	C-H			VT-2	IWC1220d		M-1005-01
A	1CS41AA	0.75	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		M-1005-01
A	1CS41AB	0.75	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		M-1005-01
A	1CS42AA	0.50	M-082-01	250	290	275	300	B	034088	C-H			VT-2	IWC1220d		
A	1CS42AB	0.50	M-082-01	250	290	275	300	B	034088	C-H			VT-2	IWC1220d		
A	1CS43AA	0.50	M-082-01	250	290	275	300	B	034088	C-H			VT-2	IWC1220d		
A	1CS43AB	0.50	M-082-01	250	290	275	300	B	034088	C-H			VT-2	IWC1220d		

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

NOTES	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
		1	2	3	4	5	6	7	8							
	1CVA1A	6.00	M-061-01	0075	0140	0075	0140	B	0140BB	C-F			VT-2	IWC1220		M-1014-01
	1CVA3AA	2.00	M-060-01	2350	0552	2485	0650	A	1540BB	B-J		X				M-1013-01
	1CVA3AB	2.00	M-060-01	2385	0552	2485	0650	A	1540BB	B-J		X				M-1013-01
	1CVA3B	2.00	M-064-02	2385	0552	2485	0650	A	1540BB	B-J		X				M-1017-02
	1CVA3C	1.00	M-064-02	2385	0552	2485	0650	A	1540BB	B-P			VT-2	IWB1220		M-1017-02
	1CVA3DA	1.00	M-064-02	2385	0552	2485	0650	A	1540BB	B-P			VT-2	IWB1220		M-1017-02
	1CVA3DB	1.00	M-064-02	2385	0552	2485	0650	A	1540BB	B-P			VT-2	IWB1220		M-1017-02
	1CVA3EA	1.00	M-064-02	2385	0552	2485	0650	B	1540BB	C-H			VT-2	IWC1220		M-1017-02
	1CVA3EB	1.00	M-064-02	2385	0552	2485	0650	B	1540BB	C-H			VT-2	IWC1220		M-1017-02
A	1CVA3FB	2.00	M-064-02	2385	0552	2485	0650	B	1540BB	C-H			VT-2	IWC1220		M-1017-02
	1CVA4AA	1.00	M-064-02	2435	0195	2485	0650	B	1540BB	C-H			VT-2	IWC1220		M-1017-02
	1CVA4AB	1.00	M-064-02	2435	0195	2485	0650	B	1540BB	C-H			VT-2	IWC1220		M-1017-02
	1CVA4B	1.00	M-064-02	0150	0190	0150	0250	B	0140BB	C-H			VT-2	IWC1220		M-1017-02
	1CVA4C	1.00	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220		M-1017-02
	1CVA5AA	2.00	M-060-02	2350	0552	2485	0650	A	1540BB	B-J		X				M-1013-02
	1CVA5AB	2.00	M-060-02	2385	0552	2485	0650	A	1540BB	B-J		X				M-1013-02
	1CVA6AA	2.00	M-064-02	2350	0552	2485	0650	A	1540BB	B-J		X				M-1017-02
	1CVA6AB	2.00	M-064-02	2385	0552	2485	0650	A	1540BB	B-J		X				M-1017-02
	1CVA7AA	2.00	M-064-02	2350	0552	2485	0650	A	1540BB	B-J		X				M-1017-02
	1CVA7AB	2.00	M-064-02	2385	0552	2485	0650	A	1540BB	B-J		X				M-1017-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPING CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
	1CVA8B	0.75	M-064-04	0050	0130	0075	0130	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
	1CVA9A	1.00	M-064-04	0075	0140	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
	1CVB2CA	3.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
	1CVB2CB	3.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
	1CVB3B	2.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
	1CVB4CA	2.00	M-064-06	0285	0115	0300	0140	C	0340CB	D-			VT-2			M-1017-06
	1CVB4CB	2.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
N	1CVB5A	0.75	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2			M-1017-05
	1CVB6CA	1.00	M-064-04	0015	0100	0075	0115	B	0140BB	C-H			VT-2			M-1017-04
	1CVB6CB	1.00	M-064-04	0015	0100	0075	0115	B	0140BB	C-H			VT-2			M-1017-04
	1CVB6D	1.00	M-064-04	0285	0115	0300	0140	B	0140BB	C-H			VT-2			M-1017-04
	1CVB7A	3.00	M-064-05	2235	0557	2485	0650	A	1540BB	B-J		X				M-1017-05
	1CVB7BA	3.00	M-064-05	2235	0557	2485	0650	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
	1CVB7BB	3.00	M-064-05	2235	0557	2485	0650	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
	1CVC2AA	0.75	M-064-01	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-01
	1CVC2BA	0.75	M-064-01	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-01
	1CVC2CA	0.75	M-064-02	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-01
	1CVC2DA	0.75	M-064-02	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-02
	1CVC2EA	0.75	M-064-01	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-01
	1CVC2FA	0.75	M-064-01	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1	1	2	3	4	5	6	7	8							
1CVC2GA	0.75	M-064-02	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-02
1CVC2HA	0.75	M-064-02	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-02
1CVC5AC	0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
1CVC5BC	0.75	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01
1CVC5CC	0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
1CVC5DC	0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
1CVC5EC	0.75	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01
1CVC5FC	0.75	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01
1CVC5GC	0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
1CVC5HC	0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
1CVC9AA	0.75	M-064-02	0150	0190	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
1CVD1AA	0.75	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CVD4AA	2.00	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
1CVD4AB	2.00	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
1CVD4AC	2.00	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
1CVD4BA	2.00	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
1CVD4BB	2.00	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
1CVD4BC	2.00	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
1CVD5AA	0.75	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
1CVD6AA	0.75	M-064-05	0295	0115	0585	0250	B	0540BB	C-H			VT-2	IWC1220c		M-1017-05

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1CVD7AA	0.75	M-064-05	0285	0115	0585	0250	B	064088	C-H			VT-2	IWC1220c		M-1017-05
1CVD7BA	0.75	M-064-05	0285	0115	0585	0250	B	064088	C-H			VT-2	IWC1220c		M-1017-05
1CVD8AA	0.75	M-064-06	0285	0115	0300	0140	C	034088	D-			VT-2			M-1017-06
1CVD8BA	0.75	M-064-06	0285	0115	0300	0140	C	034088	D-			VT-2			M-1017-06
1CVE3AA	0.75	M-064-03	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220c		M-1017-03
1CVE4AA	0.75	M-064-04	0075	0100	0100	0080	C	014088	D-			VT-2			M-1017-04
1CVE4BA	0.75	M-064-04	0075	0100	0100	0080	C	014088	D-			VT-2			M-1017-04
1CVE5AA	2.00	M-064-01	0000	0150	0000	0150	C	014088	D-			VT-2			M-1017-01
1CVE5AB	2.00	M-064-01	0000	0150	0000	0150	C	014088	D-			VT-2			M-1017-01
1CVE5AC	2.00	M-064-02	0000	0150	0000	0150	C	014088	D-			VT-2			M-1017-02
1CVE5AD	2.00	M-064-02	0000	0150	0000	0150	C	014088	D-			VT-2			M-1017-02
1CVE6AA	0.75	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CVE6AB	0.75	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CVE6AC	0.75	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CVE6AD	0.75	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CVE7AA	0.75	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CVE7AB	0.75	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CVE7AC	0.75	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CVE7AD	0.75	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CVE8A	0.75	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1					
			PRESS PSIG	TEMP. FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1	1	2	3	4	5	6	7	8							
1CVE9A	0.75	M-064-02	0095	0160	0150	0250	B	014088	C-H			VT-2	IWC1220(		M-1017-02
1CVF1A	0.75	M-064-02	0095	0160	0150	0250	B	014088	C-H			VT-2	IWC1220(		M-1017-02
1CVF2A	0.75	M-064-03	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220(		M-1017-03
1CVF3A	0.75	M-064-05	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220(		M-1017-05
1CVF4A	0.75	M-064-05	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220(		M-1017-05
1CVF6AA	0.75	M-064-04	0100	0100	0150	0100	B	014088	C-H			VT-2	IWC1220(		M-1017-04
1CVF6BA	0.75	M-064-04	0100	0100	0150	0100	B	014088	C-H			VT-2	IWC1220(		M-1017-04
1CVF7AA	0.75	M-064-04	0085	0160	0150	0155	B	014088	C-H			VT-2	IWC1220(		M-1017-04
1CVF7AB	0.75	M-138-04	0150	0120	0150	0200	C	010588	D-			VT-2			M-1017-04
1CVF8AA	2.00	M-064-04	0085	0160	0150	0155	B	014088	C-H			VT-2	IWC1220(		M-1017-04
1CVF8AB	2.00	M-064-04	0150	0120	0150	0200	C	010588	D-			VT-2			M-1017-04
1CVF9AA	0.75	M-064-05	150	120	150	200	C	010588	D-			VT-2			M-1017-05
1CVF9AB	0.75	M-064-05	150	120	150	200	C	010588	D-			VT-2			M-1017-05
1CVG1AA	2.00	M-064-05	0285	0290	0585	0450	B	064088	C-H			VT-2	IWC1220(		M-1017-05
1CVG1AB	2.00	M-064-05	0285	0290	0585	0450	B	064088	C-H			VT-2	IWC1220(		M-1017-05
1CVG2A	0.75	M-064-05	0285	0115	0300	0140	B	034088	C-H			VT-2	IWC1220(		M-1017-05
1CVG2B	0.375	M-064-05	0285	0115	0300	0140	C	155088	D-			VT-2			M-1017-05
1CVG2C	0.75	M-064-05	0285	0115	0300	0140	C	034088	D-			VT-2			M-1017-05
1CVG3A	0.375	M-064-05	0285	0115	0300	0140	C	155088	D-			VT-2			M-1017-05
1CVG3C	0.75	M-064-05	0285	0115	0300	0140	B	034088	C-H			VT-2	IWC1220(		M-1017-05

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

REMARKS	LINE NUMBER	SIZE	P&I DIAGRAM	MAX. OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
	1CVG4AA	0.75	M-064-03	2550	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVG4BA	0.75	M-064-03	2550	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVG4CA	0.75	M-064-03	2550	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVG4DA	0.75	M-064-03	2550	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVG5AA	0.75	M-070-02	0150	0180	0150	0200	B	0105BB	C-H			VT-2	IWC1220c		
	1CVG5AB	0.75	M-070-02	0150	0180	0150	0200	B	0105BB	C-H			VT-2	IWC1220c		
	1CVG5AC	0.75	M-070-02	0150	0180	0150	0200	B	0105BB	C-H			VT-2	IWC1220c		
	1CVG5AD	0.75	M-070-02	0150	0180	0150	0200	B	0105BB	C-H			VT-2	IWC1220c		
	1CVG6AA	0.75	M-070-02	2600	0517	2735	0550	B	1540BB	C-H			VT-2	IWC1220c		
	1CVG6AB	0.75	M-070-02	2600	0517	2735	0550	B	1540BB	C-H			VT-2	IWC1220c		
	1CVG6AC	0.75	M-070-02	2600	0517	2735	0550	B	1540BB	C-H			VT-2	IWC1220c		
	1CVG6AD	0.75	M-070-02	2600	0517	2735	0550	B	1540BB	C-H			VT-2	IWC1220c		
	1CVG7A	0.75	M-064-03	2600	0130	2800	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVG8AA	1.00	M-064-03	2600	0130	2800	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVG8AB	1.00	M-064-03	2600	0130	2800	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVH3AA	0.75	M-070-02	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		
	1CVH3AB	0.75	M-070-02	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		
	1CVH3AC	0.75	M-070-02	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		
	1CVH3AD	0.75	M-070-02	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		
	1CVH4AA	0.75	M-070-02	2235	557	2485	650	B	1540BB	C-H			VT-2	IWC1220c		

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN

LINE NUMBER		SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
SYSTEM	SEQUENCE NUMBER			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
		1	2	3	4	5	6	7	8							
	1CVH4AB	0.75	M-070-02	2235	557	2485	650	B	1540BB	C-H			VT-2	IWC1220c		
	1CVH4AC	0.75	M-070-02	2235	557	2485	650	B	1540BB	C-H			VT-2	IWC1220c		
	1CVH4AD	0.75	M-070-02	2235	557	2485	650	B	1540BB	C-H			VT-2	IWC1220c		
	1CVH5AA	0.75	M-070-02	2235	557	2485	650	B	1540BB	C-H			VT-2	IWC1220c		
	1CVH5AB	0.75	M-070-02	2235	557	2485	650	B	1540BB	C-H			VT-2	IWC1220c		
	1CVH6AA	0.75	M-082-03	0150	0120	0150	0200	C	0105BB	D-			VT-2			
	1CVH6AB	0.75	M-082-03	0150	0120	0150	0200	C	0105BB	D-			VT-2			
	1CVH7AA	0.75	M-082-03	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		
	1CVH7AB	0.75	M-082-03	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		
	1CVH7AC	0.75	M-082-03	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		
	1CVH8A	2.00	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CVJ3A	3.00	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVJ4A	4.00	M-061-02	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
	1CVJ5A	0.75	M-064-05	0285	0115	0300	0250	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
	1CVJ6A	3.00	M-064-03	0035	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVJ7A	3.00	M-064-03	0085	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
	1CVJ8AA	0.75	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CVJ8AB	0.75	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CVJ8AC	0.75	M-061-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

	LINE NUMBER	SIZE	P&I DIAGRAM	MAX. OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
	1CVJBAD	0.75	M-064-05	0285	0290	0585	0450	B	064088	C-H			VT-2	IWC1220		M-1017-05
	1CVK3A	0.75	M-064-05	0285	0115	0585	0250	B	064088	C-H			VT-2	IWC1220		M-1017-05
	1CVK4A	1.00	M-064-03	0050	0115	0075	0140	B	014088	C-H			VT-2	IWC1220		M-1017-03
	1CVK5A	2.00	M-064-04	0015	0100	0075	0115	B	014088	C-H			VT-2	IWC1220		M-1017-04
	1CVK6A	1.00	M-064-04	0075	0100	0100	0080	C	014CBB	D-			VT-2			M-1017-04
	1CVK7A	1.00	M-064-04	0075	0100	0100	0080	C	014088	D-			VT-2			M-1017-04
	1CVK8A	0.75	M-064-05	0285	0290	0585	0450	B	064088	C-H			VT-2	IWC1220		M-1017-05
	1CVK9A	0.75	M-064-05	0285	0115	0300	0250	B	034088	C-H			VT-2	IWC1220		M-1017-05
	1CVL1A	0.75	M-064-04	0285	0115	0300	0140	B	034088	C-H			VT-2	IWC1220		M-1017-04
	1CVL3A	0.375	M-064-05	0285	0115	0300	0140	C	155988	C-H			VT-2	IWC1220		M-1017-05
	1CVL5AA	0.75	M-064-04	0085	0160	0150	0155	B	014088	C-H			VT-2	IWC1220		M-1017-04
	1CVL5AB	0.75	M-064-04	0150	0120	0150	0200	C	010588	D-			VT-2			M-1017-04
	1CVL6A	0.375	M-064-05	0285	0115	0300	0140	B	155988	C-H			VT-2	IWC1220		M-1017-05
A	1CVL7AA	0.75	M-064-02	0085	0160	0150	0250	B	014088	C-H			VT-2	IWC1220		M-1017-02
A	1CVLBAA	0.75	M-064-01	2560	0130	2735	0130	B	154088	C-H			VT-2	IWC1220		M-1017-01
A	1CVLBAB	0.75	M-064-01	2560	0130	2735	0130	B	154088	C-H			VT-2	IWC1220		M-1017-01
A	1CVLBAC	0.75	M-064-02	2560	0130	2735	0130	B	154088	C-H			VT-2	IWC1220		M-1017-02
A	1CVLBAD	0.75	M-064-02	2560	0130	2735	0130	B	154088	C-H			VT-2	IWC1220		M-1017-02
A	1CVL9A	0.75	M-064-03	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220		M-1017-03
A	1CVM1A	0.75	M-064-03	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220		M-1017-03

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN

REVISION	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
A	1CVM2A	0.75	M-064-05	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01AA	3.00	M-064-05	2235	0290	2485	0450	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01AB	3.00	M-064-05	2235	0290	2485	0450	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01B	3.00	M-064-05	2235	0290	2485	0450	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01CA	3.00	M-064-05	2235	0290	2485	0450	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01CB	3.00	M-064-05	2235	0290	2485	0450	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01CC	3.00	M-064-05	2235	0290	2485	0450	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01DA	3.00	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01DB	3.00	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01DC	3.00	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01E	3.00	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01FA	3.00	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01FB	3.00	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV01G	3.00	M-064-05	0285	0290	0585	0450	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV02AA	3.00	M-064-05	0285	0115	0585	0250	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV02AB	3.00	M-064-05	0285	0115	0585	0250	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV02B	3.00	M-064-05	0285	0115	0585	0250	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV02C	2.00	M-064-05	0285	0115	0585	0250	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV02D	2.00	M-064-05	0285	0115	0300	0250	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
	1CV02E	3.00	M-064-05	0285	0115	0300	0250	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

LINE NUMBER			P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
SYSTEM	SEQUENCE NUMBER	SIZE		PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
		1	2	3	4	5	6	7	8							
1CV02F		2.00	M-064-05	0285	0115	0585	0250	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
1CV02G		2.00	M-064-05	0285	0115	0300	0250	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
1CV02H		3.00	M-064-05	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-05
1CV02JA		3.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
1CV02JB		3.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
1CV03AA		3.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
1CV03AB		3.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
1CV03B		3.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
1CV03C		3.00	M-065-05	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
1CV04B		3.00	M-064-04	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220c		M-1017-04
1CV05A		4.00	M-064-04	0075	0250	0075	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
1CV05B		8.00	M-064-04	0075	0250	0075	0250	B	0140BB	C-F			VT-2	IWC1220b		M-1017-04
1CV05CA		6.00	M-064-03	0075	0250	0075	0200	B	0140BB	C-F			VT-2	IWC1220b		M-1017-03
1CV05CB		6.00	M-064-03	0075	0250	0075	0200	B	0140BB	C-F			VT-2	IWC1220b		M-1017-03
1CV06A		4.00	M-064-03	0075	0250	0075	0200	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
1CV06B		2.00	M-064-03	0075	0250	0075	0200	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
1CV06C		2.00	M-064-03	2600	0115	2800	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CV07A		3.00	M-064-03	2600	0115	2800	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CV08AA		4.00	M-064-03	2600	0130	2800	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CV08BA		4.00	M-064-03	2600	0130	2800	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP. FAHR	PRESS PSIG	TEMP. FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1CV09A	4.00	M-061-02	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1CV09BA	4.00	M-061-02	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1CV09BB	4.00	M-061-02	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1CV09C	1.00	M-061-02	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1CV09D	3.00	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CV09E	3.00	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CV09FA	3.00	M-064-05	2600	0130	2735	0130	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
1CV09FB	3.00	M-064-05	2600	0130	2735	0130	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
1CV10AA	3.00	M-064-05	2550	0517	2710	0550	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
1CV10AB	3.00	M-064-05	2550	0517	2710	0550	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]		M-1017-05
1CV10CA	3.00	M-064-05	2305	0517	2710	0550	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
1CV10CB	3.00	M-064-05	2305	0517	2710	0550	B	1540BB	C-H			VT-2	IWC1220c		M-1017-05
1CV10DA	3.00	M-064-05	2305	0517	2710	0550	A	1540BB	B-J		X				M-1017-05
1CV10DB	3.00	M-064-05	2305	0517	2710	0550	A	1540BB	B-J		X				M-1017-05
1CV12AA	3.00	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CV12AB	3.00	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CV12B	3.00	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CV13AA	2.00	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
1CV13AB	2.00	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03

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PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

ITEM NUMBER: SYSTEM	ITEM NUMBER: ISOMETRIC NUMBER	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS: PRESS PSIG (3)	MAX OPERATIONS CONDITIONS: TEMP FAHR (4)	DESIGN CONDITIONS: PRESS PSIG (5)	DESIGN CONDITIONS: TEMP FAHR (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1CV13B		3.00	M-064-03	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220c		M-1017-03
1CV14AA		2.00	M-064-03	2550	0130	2735	0200	B	154088	C-H			VT-2	IWC1220c		M-1017-03
1CV14AB		2.00	M-064-03	2550	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-03
1CV14B		3.00	M-064-01	2550	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CV14CA		2.00	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CV14CB		2.00	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CV14CC		2.00	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CV14CD		2.00	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CV14DA		1.00	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CV14DB		1.00	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CV14DC		1.00	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CV14DD		1.00	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CV14EA		2.00	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CV14EB		2.00	M-064-01	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-01
1CV14EC		2.00	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CV14ED		2.00	M-064-02	2500	0130	2735	0130	B	154088	C-H			VT-2	IWC1220c		M-1017-02
1CV14FA		2.00	M-064-01	2500	0130	2735	0130	A	154088	B-J		X				M-1017-01
1CV14FB		2.00	M-064-01	2500	0130	2735	0130	A	154088	B-J		X				M-1017-01
1CV14FC		2.00	M-064-02	2500	0130	2735	0130	A	154088	B-J		X				M-1017-02
1CV14FD		2.00	M-064-02	2500	0130	2735	0130	A	154088	B-J		X				M-1017-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

LINE NUMBER: System	LINE NUMBER: Number	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS: PRESS PSIG	MAX OPERATIONS CONDITIONS: TEMP. FAHR.	DESIGN CONDITIONS: PRESS PSIG.	DESIGN CONDITIONS: TEMP FAHR.	PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
		1	2	3	4	5	6	7	8							
	1CV14GA	1.50	M-064-01	2500	0130	2735	0130	A	154088	B-J		X				M-1017-01
	1CV14GB	1.50	M-064-01	2500	0130	2735	0130	A	154088	B-J		X				M-1017-01
	1CV14GC	1.50	M-064-02	2500	0130	2735	0130	A	154088	B-J		X				M-1017-02
	1CV14GD	1.50	M-064-02	2500	0130	2735	0130	A	154088	B-J		X				M-1017-02
	1CV15AA	0.75	M-064-01	2485	0250	2500	0250	A	154088	B-P			VT-2	IWB1220b		M-1017-01
	1CV15AB	0.75	M-064-01	2485	0250	2500	0250	A	154088	B-P			VT-2	IWB1220b		M-1017-01
	1CV15AC	0.75	M-064-02	2485	0250	2500	0250	A	154088	B-P			VT-2	IWB1220b		M-1017-02
	1CV15AD	0.75	M-064-02	2485	0250	2500	0250	A	154088	B-P			VT-2	IWB1220b		M-1017-02
	1CV15BA	0.75	M-064-01	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-01
	1CV15BB	0.75	M-064-01	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-01
	1CV15BC	0.75	M-064-02	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-02
	1CV15BD	0.75	M-064-02	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-02
	1CV15CA	2.00	M-064-01	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-01
	1CV15CB	2.00	M-064-01	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-01
	1CV15CC	2.00	M-064-02	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-02
	1CV15CD	2.00	M-064-02	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-02
	1CV15DA	0.75	M-064-01	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-01
	1CV15DB	0.75	M-064-01	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-01
	1CV15DC	0.75	M-064-02	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-02
	1CV15DD	0.75	M-064-02	2185	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

ITEM NO.	LINE NUMBER: CLASS	LINE NUMBER: SERIAL NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS: PRESS PSIG	MAX OPERATIONS CONDITIONS: TEMP FAHR	DESIGN CONDITIONS: PRESS PSIG	DESIGN CONDITIONS: TEMP FAHR	PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
			1	2	3	4	5	6	7	8							
	1CV15E		0.75	M-064-01	2185	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-01
	1CV15F		0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16B		0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16BA		0.75	M-064-01	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-01
	1CV16BB		0.75	M-064-01	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-01
	1CV16BC		0.75	M-064-02	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16BD		0.75	M-064-02	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16CA		0.75	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01
	1CV16CB		0.75	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01
	1CV16CC		0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16CD		0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16DA		1.50	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01
	1CV16DB		1.50	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01
	1CV16DC		1.50	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16DD		1.50	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16EA		0.75	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01
	1CV16EB		0.75	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01
	1CV16EC		0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16ED		0.75	M-064-02	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-02
	1CV16F		2.00	M-064-01	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

REMARKS	LINE NUMBER: TABLE	LINE NUMBER: SEQUENCE	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS: PRESS PSIG (3)	MAX OPERATIONS CONDITIONS: TEMP °F/HR (4)	DESIGN CONDITIONS: PRESS PSIG (5)	DESIGN CONDITIONS: TEMP °F/HR (6)	CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
		1CV16H	3.00	M-064-03	0095	0160	0150	0160	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
		1CV16J	2.00	M-064-03	0095	0160	0150	0160	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
		1CV17B	2.00	M-064-03	0085	0160	0150	0155	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
		1CV17C	3.00	M-064-03	0085	0160	0150	0155	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
		1CV18A	3.00	M-064-04	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
		1CV18B	4.00	M-064-04	0050	0120	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
		1CV19A	3.00	M-064-05	0285	0290	0585	0150	B	0640BB	C-H			VT-2	IWC1220c		M-1017-05
		1CV20A	2.00	M-064-05	0285	0115	0300	0135	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
		1CV20B	3.00	M-064-04	0075	0115	0075	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
		1CV21A	0.75	M-064-05	0285	0115	0300	0250	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
		1CV22A	3.00	M-064-05	0285	0115	0300	0250	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
		1CV23AA	0.75	M-064-05	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-05
		1CV24AA	1.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
		1CV24AB	1.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
		1CV25A	2.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
		1CV26A	0.75	M-064-05	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
		1CV27A	3.00	M-064-05	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
		1CV28A	0.75	M-064-05	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
		1CV29AA	0.75	M-064-05	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220c		M-1017-05
		1CV30A	3.00	M-064-05	0100	0115	0150	0140	C	0140BB	C-H			VT-2	IWC1220c		M-1017-05

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

ITEM NO.	LINE NUMBER: SYSTEM	LINE NUMBER: SERIAL NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS: PRESS PSIG	MAX OPERATIONS CONDITIONS: TEMP °F/HR	DESIGN CONDITIONS: PRESS PSIG	DESIGN CONDITIONS: TEMP °F/HR	CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
			1	2	3	4	5	6	7	8							
	1CV31A		1.00	M-064-04	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
	1CV32A		0.75	M-064-04	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
	1CV33A		0.75	M-064-04	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-04
	1CV34A		0.75	M-064-03	0075	0250	0075	0250	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV35AA		0.75	M-064-03	0075	0250	0075	0200	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV36A		0.75	M-064-03	2600	0115	2800	0140	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV37A		0.75	M-064-03	2600	0115	2800	0140	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV37B		2.00	M-064-03	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV38AA		0.75	M-064-03	2600	0115	2800	0200	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV39AA		0.75	M-064-03	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV39AB		0.75	M-064-03	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV40AA		0.75	M-064-03	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV40BA		0.75	M-064-03	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV41AA		0.75	M-064-03	2600	0115	2800	0140	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV41BA		0.75	M-064-03	2600	0115	2800	0140	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV42AA		2.00	M-064-03	2600	0115	2800	0140	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV42AB		2.00	M-064-03	2600	0115	2800	0140	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV42BA		3.00	M-064-03	2600	0115	2800	0140	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV42BB		3.00	M-064-03	2600	0115	2800	0140	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03
	1CV42CA		2.00	M-064-03	2600	0115	2800	0140	B	1540BB	C-H			VT-2	IWC1220c		M-1017-03

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

LINE NUMBER			P&I DIAGRAM	MAX. OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
SYSTEM	NUMBER	SIZE		PRESS PSIG	TEMP F&HR	PRESS PSIG	TEMP F&HR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
	1CV42CB	2.00	M-064-03	2600	0115	2800	0140	B	154088	C-H			VT-2	IWC1220c		M-1017-03
	1CV42D	2.00	M-064-03	2600	0115	2800	0140	B	154088	C-H			VT-2	IWC1220c		M-1017-03
	1CV42E	2.00	M-064-03	0085	0115	0150	0140	B	014088	C-H			VT-2	IWC1220c		M-1017-03
	1CV43A	2.00	M-064-03	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220c		M-1017-03
	1CV43BA	2.00	M-060-01	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220c		M-1013-01
	1CV43BB	2.00	M-060-02	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220c		M-1013-02
	1CV43BC	2.00	M-060-03	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220c		M-1013-03
	1CV43BD	2.00	M-060-04	2600	0130	2735	0200	B	154088	C-H			VT-2	IWC1220c		M-1013-04
	1CV44AA	0.75	M-064-05	2305	0517	2710	0550	B	154088	C-H			VT-2	IWC1220c		M-1017-05
	1CV44AB	0.75	M-064-05	2305	0517	2710	0550	B	154088	C-H			VT-2	IWC1220c		M-1017-05
	1CV45A	2.00	M-064-05	2305	0517	2710	0550	B	154088	C-H			VT-2	IWC1220c		M-1017-05
	1CV45B	2.00	M-064-05	2305	0517	2710	0550	A	154088	B-J		X				M-1017-05
	1CV46AA	0.75	M-064-01	2500	0130	2735	0130	A	154088	B-P			VT-2	IWB1220b		M-1017-01
	1CV46AB	0.75	M-064-01	2500	0130	2735	0130	A	154088	B-P			VT-2	IWB1220b		M-1017-01
	1CV46AC	0.75	M-064-02	2500	0130	2735	0130	A	154088	B-P			VT-2	IWB1220b		M-1017-02
	1CV46AD	0.75	M-064-02	2500	0130	2735	0130	A	154088	B-P			VT-2	IWB1220b		M-1017-02
	1CV47AA	0.75	M-064-01	2485	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-01
	1CV47AB	0.75	M-064-01	2485	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-01
	1CV47AC	0.75	M-064-02	2485	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-02
	1CV47AD	0.75	M-064-02	2485	0250	2500	0250	B	154088	C-H			VT-2	IWC1220c		M-1017-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE BEYOND TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1CV48AA	0.75	M-064-01	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220(		M-1017-01
1CV48AB	0.75	M-064-01	2485	0250	2500	0250	B	1540CB	C-H			VT-2	IWC1220(		M-1017-01
1CV48AC	0.75	M-064-02	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220(		M-1017-02
1CV48AD	0.75	M-064-02	2485	0250	2500	0250	B	1540BB	C-H			VT-2	IWC1220(		M-1017-02
1CV49A	2.00	M-064-02	0075	160	0150	250	B	0140BB	C-H			VT-2	IWC1220(		M-1017-02
1CV50AA	0.75	M-064-03	0095	160	0150	250	B	0140BB	C-H			VT-2	IWC1220(		M-1017-03
1CV51AA	0.75	M-064-03	0085	160	0150	250	B	0140BB	C-H			VT-2	IWC1220(		M-1017-03
1CV52A	2.00	M-064-04	0085	0160	0150	0160	B	0140BB	C-H			VT-2	IWC1220(		M-1017-04
1CV52B	3.00	M-064-04	0040	0160	0075	0100	B	0140BB	C-H			VT-2	IWC1220(		M-1017-04
1CV53A	3.00	M-064-04	0085	0160	0150	0160	B	0140BB	C-H			VT-2	IWC1220(		M-1017-04
1CV53A	4.00	M-064-04	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220(		M-1017-04
1CV55A	4.00	M-064-04	0050	0115	0075	0140	B	0140BB	C-H			VT-2	IWC1220(		M-1017-04
1CV55AA	2.00	M-064-06	0285	0115	0300	0140	C	0340BB	C-H			VT-2	IWC1220(		M-1017-06
1CV55AB	3.00	M-064-06	0285	0115	0300	0140	C	0340BB	C-H			VT-2	IWC1220(		M-1017-06
1CV57AA	3.00	M-064-06	0285	0115	0300	0140	C	0340BB	C-H			VT-2	IWC1220(		M-1017-06
1CV57B	3.00	M-064-06	0285	0115	0300	0140	C	0340BB	C-H			VT-2	IWC1220(		M-1017-06
1CV58A	2.00	M-064-06	0285	0115	0300	0140	C	0340BB	C-H			VT-2	IWC1220(		M-1017-06
1CV59A	2.00	M-064-06	0285	0115	0300	0140	C	0340BB	C-H			VT-2	IWC1220(		M-1017-06
1CV60A	2.00	M-064-06	0285	0115	0300	0140	C	0340BB	C-H			VT-2	IWC1220(		M-1017-06
1CV61A	1.00	M-064-06	0285	0115	0300	0140	C	0340BB	C-H			VT-2	IWC1220(		M-1017-06

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP. FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1CV62A	3.00	M-064-06	0285	0115	0300	0140	C	0340BB	D-			VT-2			M-1017-06
1CV63A	0.75	M-064-05	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220		M-1017-05
1CV64A	0.75	M-064-05	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220		M-1017-05
1CV66A	0.75	M-064-05	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220		M-1017-05
1CV67A	3.00	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
1CV68A	0.75	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
1CV68B	0.375	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
1CV69A	0.75	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
1CV70A	0.75	M-064-04	0015	0115	0075	0130	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
1CV70B	0.75	M-064-04	0015	0115	0075	0130	C	0140BB	D-			VT-2			M-1017-04
1CV70C	0.75	M-064-04	0015	0115	0075	0130	C	0140BB	D-			VT-2			M-1017-04
1CV70D	0.25	M-064-04	0015	0115	0075	0130	C	0140BB	D-			VT-2			M-1017-04
1CV72AA	0.75	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220		M-1017-03
1CV72AB	0.75	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220		M-1017-03
1CV73AA	0.75	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220		M-1017-03
1CV73AB	0.75	M-064-03	2600	0130	2735	0200	B	1540BB	C-H			VT-2	IWC1220		M-1017-03
1CV77A	0.75	M-064-03	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220		M-1017-03
1CV78A	0.75	M-064-03	0095	0160	0150	0250	B	0140BB	C-H			VT-2	IWC1220		M-1017-03
1CV79A	2.00	M-064-05	0285	0290	0385	0400	B	0640BB	C-H			VT-2	IWC1220		M-1017-05
1CV80A	3.00	M-064-05	0285	0290	0385	0400	B	0640BB	C-H			VT-2	IWC1220		M-1017-05

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

NOTE	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
		1	2	3	4	5	6	7	8							
	1CV81A	2.00	M-064-04	0075	0100	0100	0080	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
	1CV81B	2.00	M-064-04	0075	0100	0100	0080	C	0140BB	D-			VT-2			M-1017-04
	1CV82A	1.00	M-064-04	0075	0100	0100	0080	C	0140BB	D-			VT-2			M-1017-04
	1CV82B	1.00	M-064-04	0075	0100	0100	0080	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
	1CV83A	2.00	M-064-04	0075	0100	0100	0080	C	0140BB	D-			VT-2			M-1017-04
	1CV83B	1.00	M-064-04	75	100	100	80	C	0140BB	D-			VT-2			M-1017-04
	1CV84A	2.00	M-064-04	0075	0100	0100	0080	C	0140BB	D-			VT-2			M-1017-04
	1CV84B	2.00	M-064-04	0075	0100	0100	0080	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
	1CV85A	2.00	M-064-04	0075	0100	0100	0080	C	0140BB	D-			VT-2			M-1017-04
	1CV88A	0.75	M-064-04	0075	0100	0100	0080	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
	1CV89A	2.00	M-064-04	0075	0100	0100	0080	C	0140BB	D-			VT-2			M-1017-04
	1CV89B	2.00	M-064-04	0285	0115	0300	0140	B	0340BB	C-H			VT-2	IWC1220		M-1017-04
	1CV90B	1.00	M-064-04	0075	0100	0100	0080	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
	1CV93A	0.75	M-064-04	0100	0100	0150	0100	C	0140BB	D-			VT-2			M-1017-04
	1CV94A	2.00	M-064-04	0100	0100	0150	0100	C	0140BB	D-			VT-2			M-1017-04
	1CV94B	2.00	M-064-04	0100	0100	0150	0100	B	0140BB	C-H			VT-2	IWC1220		M-1017-04
	1CV96A	2.00	M-064-04	0100	0100	0150	0100	C	0140BB	D-			VT-2			M-1017-04
B	1CV98A	8.00	M-061-01	0050	0090	0050	0100	B	0140BB	C-F			VT-2	IWC1220		M-1014-01
B	1CV98BA	8.00	M-064-04	0050	0090	0050	0100	B	0140BB	C-F			VT-2	IWC1220		M-1017-04
B	1CV98BB	8.00	M-061-04	0050	0090	0050	0100	B	0140BB	C-F			VT-2	IWC1220		M-1017-04

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CHEMICAL & VOLUME CONTROL/BORON THERMAL REGEN.

Item	Line Number: Class	Line Number: Line Number	Size	P&I Diagram	Max Operations Conditions: Press PSIG	Max Operations Conditions: Temp FAHR	Design Conditions: Press PSIG	Design Conditions: Temp FAHR	Pipe Class	Pipe Design Table	ASME Sec XI Div 1: Exam Cat.	Exam Method: Volumetric	Exam Method: Surface	Exam Method: Visual	Code Exemption	Relief Request	ISI Flow Diagram
			1	2	3	4	5	6	7	8							
	1CV98C		8.00	M-064-04	0050	0090	0075	0100	B	014088	C-F			VT-2	IWC1220b		M-1017-04
	1CV93A		8.00	M-064-04	0075	0140	0075	0140	B	014088	C-F			VT-2	IWC1220b		M-1017-04

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: MAIN FEEDWATER

REVISION	LINE NUMBER: SYSTEM	LINE NUMBER: SEQUENCE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS: PRESS PSIG	MAX OPERATIONS CONDITIONS: TEMP FAHR	DESIGN CONDITIONS: PRESS PSIG	DESIGN CONDITIONS: TEMP FAHR	PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
			1	2	3	4	5	6	7	8							
	1FW03DA		16.00	M-036-01	1185	567	1185	567	B	090588	C-F	X	X				M-1002-01
	1FW03DB		16.00	M-036-01	1185	567	1185	567	B	090588	C-F	X	X				M-1002-01
	1FW03DC		16.00	M-036-01	1185	567	1185	567	B	090588	C-F	X	X				M-1002-01
	1FW03DD		16.00	M-036-01	1185	567	1185	567	B	090588	C-F	X	X				M-1002-01
	1FW06AA		4.00	M-036-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW06AB		4.00	M-036-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW06AC		4.00	M-036-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW06AD		4.00	M-036-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW07AA		0.75	M-036-01	1092	0445	1185	0445	B	154288	C-H			VT-2	IWC1220c		M-1002-01
	1FW07AB		0.75	M-036-01	1092	0445	1185	0445	B	154288	C-H			VT-2	IWC1220c		M-1002-01
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	1185	0445	B	154288	C-H			VT-2	IWC1220c		M-1002-01
	1FW07AD		0.75	M-036-01	1092	0445	1185	0445	B	154288	C-H			VT-2	IWC1220c		M-1002-01
R	1FW13AA		0.50	M2036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW13BA		0.50	M2036-08	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW13CA		0.50	M2036-09	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW13DA		0.50	M2036-10	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW15EA		0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW15FA		0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW15GA		0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW15HA		0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: MAIN FEEDWATER

REMARKS	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
	1FW13JA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		
	1FW13KA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		
	1FW13LA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		
	1FW13MA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		
R	1FW14AA	0.50	M2036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW14BA	0.50	M2036-08	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW14CA	0.50	M2036-09	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW14DA	0.50	M2036-10	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW14EA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW14FA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW14GA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW14HA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW15AA	0.50	M2036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW15BA	0.50	M2036-08	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
A	1FW15CA	0.50	M2036-09	1185	0568	1185	0568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
A	1FW15DA	0.50	M2036-10	1185	0568	1185	0568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW15EA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW15FA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW15GA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW15HA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: MAIN FEEDWATER

REMARKS	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
	1FW74EA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW74FA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW74GA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW74HA	0.75	M-036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW76AA	1.00	M-036-01	1185	567	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW76AB	1.00	M-036-01	1185	567	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW76AC	1.00	M-036-01	1185	567	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
R	1FW76AD	1.00	M-036-01	1185	567	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW81AA	6.00	M-036-01	1855	0445	1750	0445	B	090788	C-F	X	X				M-1002-01
	1FW81AB	6.00	M-036-01	1855	0445	1750	0445	B	090788	C-F	X	X				M-1002-01
	1FW81AC	6.00	M-036-01	1855	0445	1750	0445	B	090788	C-F	X	X				M-1002-01
	1FW81AD	6.00	M-036-01	1855	0445	1750	0445	B	090788	C-F	X	X				M-1002-01
	1FW81BA	6.00	M-036-01	1185	0567	1185	0567	B	090588	C-F	X	X				M-1002-01
	1FW81BB	6.00	M-036-01	1185	0567	1185	0567	B	090588	C-F	X	X				M-1002-01
	1FW81BC	6.00	M-036-01	1185	0567	1185	0567	B	090588	C-F	X	X				M-1002-01
	1FW81BD	6.00	M-036-01	1185	0567	1185	0567	B	090588	C-F	X	X				M-1002-01
	1FW82AA	3.00	M-036-01	1185	0567	1185	0567	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW82AB	3.00	M-036-01	1185	0567	1185	0567	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW82AC	3.00	M-036-01	1185	0567	1185	0567	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW82AD	3.00	M-036-01	1185	0567	1185	0567	B	090588	C-H			VT-2	IWC1220c		M-1002-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: MAIN FEEDWATER

	LINE NUMBER	SIZE	P&I DIAGRAM	MAX. OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1				CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
				PRESS PSIG	TEMP. FAHR.	PRESS PSIG	TEMP. FAHR.			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual			
	1	1	2	3	4	5	6	7	8							
	1FW82BA	3.00	M-036-01	1855	1750	1185	0567	B	090788	C-H			VT-2	IWC1220c		M-1002-01
	1FW82BB	3.00	M-036-01	1855	1750	1185	0567	B	090788	C-H			VT-2	IWC1220c		M-1002-01
	1FW82BC	3.00	M-036-01	1855	1750	1185	0567	B	090788	C-H			VT-2	IWC1220c		M-1002-01
	1FW82BD	3.00	M-036-01	1855	1750	1185	0567	B	090788	C-H			VT-2	IWC1220c		M-1002-01
	1FW86AA	16.00	M-036-01	1855	0445	1750	0445	B	090788	C-F	X	X				M-1002-01
	1FW86AB	16.00	M-036-01	1855	0445	1750	0445	B	090788	C-F	X	X				M-1002-01
	1FW86AC	16.00	M-036-01	1855	0445	1750	0445	B	090788	C-F	X	X				M-1002-01
	1FW86AD	16.00	M-036-01	1855	0445	1750	0445	B	090788	C-F	X	X				M-1002-01
	1FW87BA	3.00	M-036-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW87BB	3.00	M-036-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW87BC	3.00	M-036-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW87BD	3.00	M-036-01	1185	445	1185	445	B	090588	C-H			VT-2	IWC1220c		M-1002-01
	1FW87CA	6.00	M-036-01	1185	445	1185	0567	B	090588	C-F		X				M-1002-01
	1FW87CB	6.00	M-036-01	1185	445	1185	0567	B	090588	C-F		X				M-1002-01
	1FW87CC	6.00	M-036-01	1185	445	1185	0567	B	090588	C-F		X				M-1002-01
	1FW87CD	6.00	M-036-01	1185	445	1185	0567	B	090588	C-F		X				M-1002-01
P	1FW91AA	0.50	M2036-01	1185	0568	1185	0568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
P	1FW91BA	0.50	M-2036-08	1185	0568	1185	0568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
P	1FW91CA	0.50	M2036-09	1185	0568	1185	0568	B	090588	C-H			VT-2	IWC1220c		M-1002-01
P	1FW91DA	0.50	M2036-10	1185	0568	1185	0568	B	090588	C-H			VT-2	IWC1220c		M-1002-01

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PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: MAIN FEEDWATER

REGION	LINE NUMBER: SYSTEM	LINE NUMBER: SEQUENCE NUMBER	SIZE (1)	PAI DIAGRAM (2)	MAX OPERATIONS CONDITIONS: PRESS PSIG (3)	MAX OPERATIONS CONDITIONS: TEMP. FAHR (4)	DESIGN CONDITIONS: PRESS PSIG (5)	DESIGN CONDITIONS: TEMP. FAHR (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
R	1FW91EA		0.75	M-121-01	1185	0568	1185	0568	B	090788	C-H			VT-2	IWC1220c		M-1002-01
R	1FW91FA		0.75	M-121-01	1185	0568	1185	0568	B	090788	C-H			VT-2	IWC1220c		M-1002-01
R	1FW91GA		0.75	M-121-01	1185	0568	1185	0568	B	090788	C-H			VT-2	IWC1220c		M-1002-01
R	1FW91HA		0.75	M-121-01	1185	0568	1185	0568	B	090788	C-H			VT-2	IWC1220c		M-1002-01
A	1FW101AA		0.75	M-036-01	1185	0567	1185	0567	B	090588	C-H			VT-2	IWC1220c		
A	1FW101AB		0.75	M-036-01	1185	0567	1185	0567	B	090588	C-H			VT-2	IWC1220c		
A	1FW101AC		0.75	M-036-01	1185	0567	1185	0567	B	090588	C-H			VT-2	IWC1220c		
A	1FW101AD		0.75	M-036-01	1185	0567	1185	0567	B	090588	C-H			VT-2	IWC1220c		
A	1FW102AA		4.00	M2036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AB		4.00	M2036-08	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AC		4.00	M2036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AD		4.00	M2036-10	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AE		4.00	M2036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AF		4.00	M2036-08	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AG		4.00	M2036-09	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AH		4.00	M2036-10	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AJ		4.00	M2036-01	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AK		4.00	M2036-08	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AL		4.00	M2036-09	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AM		4.00	M2036-10	1185	568	1185	568	B	090588	C-H			VT-2	IWC1220c		See Dwg M-2600

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PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	MAIN FEEDWATER

	LINE NUMBER		SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
	SYSTEM	SEQUENCE			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
			1	2	3	4	5	6	7	8							
A	1FW102AN		4.00	M2036-01	1185	568	1185	568	B	0905BB	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AP		4.00	M2036-08	1185	568	1185	568	B	0905BB	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AQ		4.00	M2036-09	1185	568	1185	563	B	0905BB	C-H			VT-2	IWC1220c		See Dwg M-2600
A	1FW102AR		4.00	M2036-10	1185	568	1185	568	B	0905BB	C-H			VT-2	IWC1220c		See Dwg M-2600

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	MAIN STEAM

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPING CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1	2	3	4	5	6	7	8								
1MS01AA	30.25	M-035-02	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-02
1MS01AB	32.75	M-035-01	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-01
1MS01AC	32.75	M-035-02	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-02
1MS01AD	30.25	M-035-01	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-01
1MS01BA	30.25	M-035-02	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-02
1MS01BB	32.75	M-035-01	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-01
1MS01BC	32.75	M-035-02	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-02
1MS01BD	30.25	M-035-01	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-01
1MS01EA	4.00	M-035-02	1092	557	1185	560	B	0905BB	C-H			VT-2	IWC1220c		M-1001-02
1MS01EB	4.00	M-035-01	1092	557	1185	560	B	0905BB	C-H			VT-2	IWC1220c		M-1001-01
1MS01EC	4.00	M-035-02	1092	557	1185	560	B	0905BB	C-H			VT-2	IWC1220c		M-1001-02
1MS01ED	4.00	M-035-01	1092	557	1185	560	B	0905BB	C-H			VT-2	IWC1220c		M-1001-01
1MS07AA	28.00	M-035-02	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-02
1MS07AB	28.00	M-035-01	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-01
1MS07AC	28.00	M-035-02	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-02
1MS07AD	28.00	M-035-01	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-01
1MS07BA	28.00	M-035-02	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-02
1MS07BB	28.00	M-035-02	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-01
1MS07BC	28.00	M-035-02	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-02
1MS07BD	28.00	M-035-01	1092	557	1185	560	B	0905BB	C-F	X	X				M-1001-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: MAIN STEAM

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1MS08AA	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS08AB	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01
1MS08AC	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS08AD	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01
1MS09AA	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS09AB	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01
1MS09AC	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS09AD	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01
1MS10AA	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS10AB	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01
1MS10AC	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS10AD	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01
1MS11AA	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS11AB	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01
1MS11AC	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS11AD	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01
1MS12AA	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS12AB	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01
1MS12AC	8.00	M-035-02	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-02
1MS12AD	8.00	M-035-01	1092	557	1185	560	B	150SBB	C-F	X	X				M-1001-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	MAIN STEAM

REVISION NO.	LINE NUMBER: SYSTEM	LINE NUMBER: SEQUENCE	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS: PRESS PSIG	MAX OPERATIONS CONDITIONS: TEMP FAHR.	DESIGN CONDITIONS: PRESS PSIG.	DESIGN CONDITIONS: TEMP FAHR.	PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
			1	2	3	4	5	6	7	8							
	MS	13AA	8.00	M-035-02	1092	557	1185	560	B	150588	C-F	X	X				M-1001-02
	MS	13AB	8.00	M-035-01	1092	557	1185	560	B	150588	C-F	X	X				M-1001-01
	MS	13AC	8.00	M-035-02	1092	557	1185	560	B	150588	C-F	X	X				M-1001-02
	MS	13AD	8.00	M-035-01	1092	557	1185	560	B	150588	C-F	X	X				M-1001-01
	MS	20AA	3.00	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	20AB	3.00	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	20AC	3.00	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	20AD	3.00	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	21AA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	21AB	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	21AC	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	21AD	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	68AA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	68AB	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	68AC	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	68AD	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	70AA	0.50	M-035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
	MS	70BA	0.50	M-035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
	MS	70CA	0.50	M-035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
	MS	70DA	0.50	M-035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: MAIN STEAM

REVISION NO.	LINE NUMBER: SYSTEM	LINE NUMBER: SEQUENCE NUMBER	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS: PRESS PSIG (3)	MAX OPERATIONS CONDITIONS: TEMP FAHR (4)	DESIGN CONDITIONS: PRESS PSIG (5)	DESIGN CONDITIONS: TEMP FAHR (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1MS70EA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	1MS70FA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	1MS70GA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	1MS70HA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
R	1MS70JA	0.50	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
R	1MS70KA	0.50	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
R	1MS70LA	0.50	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
R	1MS70MA	0.50	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
	1MS70NA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	1MS70PA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	1MS70QA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	1MS70RA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	1MS71AA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	1MS71BA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	1MS71CA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	1MS71DA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	1MS72AA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	1MS72BA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	1MS72CA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	1MS72DA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: MAIN STEAM

Revision	Line Number: System	Line Number: Number	Size (1)	P&I Diagram (2)	Max Operations Conditions: Press PSIG (3)	Max Operations Conditions: Temp. FAHR. (4)	Design Conditions: Press. PSIG (5)	Design Conditions: Temp. FAHR. (6)	Pipe Class (7)	Pipe Design Table (8)	ASME Sec XI Div 1: Exam Cat.	Exam Method: Volumetric	Exam Method: Surface	Exam Method: Visual	Code Exemption	Relief Request	ISI Flow Diagram
	MS	72EA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	72FA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	72GA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	72HA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	72JA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	72KA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	72LA	0.75	M-035-02	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-02
	MS	72MA	0.75	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	730A	1.50	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
	MS	731A	1.50	M-035-01	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		M-1001-01
A	MS	142AA	4.00	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
A	MS	142AB	4.00	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
A	MS	142AC	4.00	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
A	MS	142AD	4.00	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
A	MS	142AE	4.00	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
A	MS	142AF	4.00	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
A	MS	142AG	4.00	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		
A	MS	142AH	4.00	M2035-03	1092	557	1185	560	B	090588	C-H			VT-2	IWC1220c		

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

ITEM NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1					
			PRESS. PSIG.	TEMP. FAHR.	PRESS. PSIG.	TEMP. FAHR.			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1	2	3	4	5	6	7	8							
1RC01AA	29.00	M-060-01	2385	638	2485	650	A	1540BB	B-J	X	X				M-1013-1
1RC01AB	29.00	M-060-01	2385	638	2485	650	A	1540BB	B-J	X	X				M-1013-02
1RC01AC	29.00	M-060-01	2385	638	2485	650	A	1540BB	B-J	X	X				M-1013-03
1RC01AD	29.00	M-060-01	2385	638	2485	650	A	1540BB	B-J	X	X				M-1013-04
1RC02AA	31.00	M-060-01	2350	586	2485	650	A	1540BB	B-J	X	X				M-1013-01
1RC02AB	31.00	M-060-02	2350	586	2485	650	A	1540BB	B-J	X	X				M-1013-02
1RC02AC	31.00	M-060-03	2350	586	2485	650	A	1540BB	B-J	X	X				M-1013-03
1RC02AD	31.00	M-060-04	2350	586	2485	650	A	1540BB	B-J	X	X				M-1013-04
1RC03AA	27.50	M-060-01	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-01
1RC03AB	27.50	M-060-01	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-02
1RC03AC	27.50	M-060-01	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-03
1RC03AD	27.50	M-060-01	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-04
1RC04AA	12.00	M-060-01	2385	638	2485	650	A	1540BB	B-J	X	X				M-1013-01
1RC04AB	12.00	M-060-03	2385	638	2485	650	A	1540BB	B-J	X	X				M-1013-03
1RC05AA	6.00	M-060-02	2385	638	2485	650	A	1540BB	B-J	X	X				M-1014-03
1RC05AB	6.00	M-060-03	2385	638	2485	650	A	1540BB	B-J	X	X				M-1014-03
1RC06AA	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
1RC06AB	0.75	M-060-03	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-03
1RC07AA	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
1RC08AA	0.75	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

LINE NUMBER	SIZE	P&I DIAGRAM	MAX. OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS. PSIG.	TEMP. FAHR.	PRESS. PSIG.	TEMP. FAHR.		EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1	2	3	4	5	6	7	8							
1RC08AB	0.75	M-060-02	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-02
1RC08AC	0.75	M-060-03	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-03
1RC08AD	0.75	M-060-04	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-04
1RC09AA	1.00	M-060-01	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-01
1RC09AB	1.00	M-060-01	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-01
1RC09AC	1.00	M-060-02	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-02
1RC09AD	1.00	M-060-02	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-02
1RC09AE	1.00	M-060-03	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-03
1RC09AF	1.00	M-060-03	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-03
1RC09AG	1.00	M-060-04	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-04
1RC09AH	1.00	M-060-01	2385	638	2485	650	A 1540BB	B-P			VT-2	IWB1220b		M-1013-04
1RC09BA	2.00	M-060-01	2385	638	2485	650	A 1540BB	B-J		X				M-1013-01
1RC09BB	2.00	M-060-02	2385	638	2485	650	A 1540BB	B-J		X				M-1013-02
1RC09BC	2.00	M-060-03	2385	638	2485	650	A 1540BB	B-J		X				M-1013-03
1RC09BD	2.00	M-060-04	2385	638	2485	650	A 1540BB	B-J		X				M-1013-04
1RC09CA	2.00	M-060-01	2385	638	2485	650	A 1540BB	B-J		X				M-1013-01
1RC09CB	2.00	M-060-02	2385	638	2485	650	A 1540BB	B-J		X				M-1013-02
1RC09CC	2.00	M-060-03	2385	638	2485	650	A 1540BB	B-J		X				M-1013-03
1RC09CD	2.00	M-060-04	2385	638	2485	650	A 1540BB	B-J		X				M-1013-04
1RC09DA	2.00	M-060-01	2385	638	2485	650	A 1540BB	B-J		X				M-1013-01

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PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

NOTES	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		CODE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD			CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
											Volumetric	Surface	Visual			
		1	2	3	4	5	6	7	8							
	1RC03DB	2.00	M-060-02	2385	638	2485	650	A	15408B	B-J		X				M-1013-02
	1RC03DC	2.00	M-060-03	2385	638	2485	650	A	15408B	B-J		X				M-1013-03
	1RC03DD	2.00	M-060-04	2385	638	2485	650	A	15408B	B-J		X				M-1013-04
	1RC03EA	3.00	M-060-01	2385	638	2485	650	A	15408B	B-J		X				M-1013-01
	1RC03EB	3.00	M-060-02	2385	638	2485	650	A	15408B	B-J		X				M-1013-02
	1RC03EC	3.00	M-060-03	2385	638	2485	650	A	15408B	B-J		X				M-1013-03
	1RC03ED	3.00	M-060-04	2385	638	2485	650	A	15408B	B-J		X				M-1013-04
	1RC03FA	3.00	M-060-01	2385	638	2485	650	A	15408B	B-J		X				M-1013-01
	1RC03FB	3.00	M-060-02	2385	638	2485	650	A	15408B	B-J		X				M-1013-02
	1RC03FC	3.00	M-060-03	2385	638	2485	650	A	15408B	B-J		X				M-1013-03
	1RC03FD	3.00	M-060-04	2385	638	2485	650	A	15408B	B-J		X				M-1013-04
	1RC10AA	1.00	M-060-01	2385	638	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-01
	1RC10AB	1.00	M-060-02	2385	638	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-02
	1RC10AC	1.00	M-060-03	2385	638	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-03
	1RC10AD	1.00	M-060-04	2385	638	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-04
	1RC11AA	0.75	M-060-01	2385	638	2485	650	B	15408B	C-H			VT-2	IWC1220c		M-1013-01
	1RC11AB	0.75	M-060-02	2385	638	2485	650	B	15408B	C-H			VT-2	IWC1220c		M-1013-02
	1RC11AC	0.75	M-060-03	2385	638	2485	650	B	15408B	C-H			VT-2	IWC1220c		M-1013-03
	1RC11AD	0.75	M-060-04	2385	638	2485	650	B	15408B	C-H			VT-2	IWC1220c		M-1013-04
A	1RC11BA	0.75	M-060-01	2385	638	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

Section	Line Number	Size	P&I Diagram	Max Operations Conditions		Design Conditions		Code Class	Pipe Design Table	ASME Sec XI Div 1						
				Press. PSIG.	Temp. FAHR.	Press. PSIG.	Temp. FAHR.			Exam Cat.	Exam Method: Volumetric	Exam Method: Surface	Exam Method: Visual	Code Exemption	Relief Request	ISI Flow Diagram
	1	1	2	3	4	5	6	7	8							
A	1RC11BB	0.75	M-060-02	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-02
A	1RC11BC	0.75	M-060-03	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-03
A	1RC11BD	0.75	M-060-04	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-04
	1RC12AA	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC12AB	0.75	M-060-02	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-02
	1RC12AC	0.75	M-060-03	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-03
	1RC12AD	0.75	M-060-04	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-04
A	1RC12BA	0.75	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWC1220c		M-1013-01
A	1RC12BB	0.75	M-060-02	2385	638	2485	650	A	1540BB	B-P			VT-2	IWC1220c		M-1013-02
A	1RC12BC	0.75	M-060-03	2385	638	2485	650	A	1540BB	B-P			VT-2	IWC1220c		M-1013-03
A	1RC12BD	0.75	M-060-04	2385	638	2485	650	A	1540BB	B-P			VT-2	IWC1220c		M-1013-04
	1RC13AA	2.00	M-060-01	2385	638	2485	650	A	1540BB	B-J		X				M-1013-01
	1RC13AB	2.00	M-060-02	2385	638	2485	650	A	1540BB	B-J		X				M-1013-02
	1RC13AC	2.00	M-060-03	2385	638	2485	650	A	1540BB	B-J		X				M-1013-03
	1RC13AD	2.00	M-060-04	2385	638	2485	650	A	1540BB	B-J		X				M-1013-04
	1RC14AA	2.00	M-060-01	2350	586	2485	650	A	1540BB	B-J		X				M-1013-01
	1RC14AB	2.00	M-060-02	2350	586	2485	650	A	1540BB	B-J		X				M-1013-02
	1RC14AC	2.00	M-060-03	2350	586	2485	650	A	1540BB	B-J		X				M-1013-03
	1RC14AD	2.00	M-060-04	2350	586	2485	650	A	1540BB	B-J		X				M-1013-04
	1RC15AA	0.75	M-060-01	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01

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PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	REACTOR COOLANT

	LINE NUMBER			P&I DIAGRAM	MAX. OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPING CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			SIZE		PRESS. PSIG.	TEMP. FAHR.	PRESS. PSIG.	TEMP. FAHR.			EXAM CAT.	EXAM METHOD			CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
												Volumetric	Surface	Visual			
	1		1	2	3	4	5	6	7	8							
	1RC15AB		0.75	M-060-02	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-02
	1RC15AC		0.75	M-060-03	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-03
	1RC15AD		0.75	M-060-04	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-04
	1RC16AA		2.00	M-060-01	2350	586	2485	650	A	1540BB	B-J		X				M-1013-01
	1RC16AB		2.00	M-060-02	2350	586	2485	650	A	1540BB	B-J		X				M-1013-02
	1RC16AC		2.00	M-060-03	2350	586	2485	650	A	1540BB	B-J		X				M-1013-03
	1RC16AD		2.00	M-060-04	2350	586	2485	650	A	1540BB	B-J		X				M-1013-04
	1RC17AA		2.00	M-060-01	2450	586	2485	650	A	1540BB	B-J		X				M-1013-01
	1RC17AB		2.00	M-060-02	2450	586	2485	650	A	1540BB	B-J		X				M-1013-02
	1RC17AC		2.00	M-060-03	2450	586	2485	650	A	1540BB	B-J		X				M-1013-03
	1RC17AD		2.00	M-060-01	2450	586	2485	650	A	1540BB	B-J		X				M-1013-04
	1RC17BA		2.00	M-060-01	2450	586	2485	650	A	1540BB	B-J		X				M-1013-01
	1RC17BB		2.00	M-060-02	2450	586	2485	650	A	1540BB	B-J		X				M-1013-02
	1RC17BC		2.00	M-060-03	2450	586	2485	650	A	1540BB	B-J		X				M-1013-03
	1RC17BD		2.00	M-060-04	2450	586	2485	650	A	1540BB	B-J		X				M-1013-04
	1RC18AA		0.75	M-060-01	2450	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC18AB		0.75	M-060-02	2450	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-02
	1RC18AC		0.75	M-060-03	2450	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-03
	1RC18AD		0.75	M-060-04	2450	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-04
A	1RC19BA		0.75	M-060-01	2450	586	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

Category	Line Number: System	Line Number: Number	Size (1)	P&I Diagram (2)	Max Operations Conditions: Press PSIG (3)	Max Operations Conditions: Temp FAHR (4)	Design Conditions: Press PSIG (5)	Design Conditions: Temp FAHR (6)	Piping Class (7)	Pipe Design Table (8)	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
A	1RC	18BR	0.75	M-060-02	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-02
A	1RC	18BC	0.75	M-060-03	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-03
A	1RC	18BD	0.75	M-060-04	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-04
	1RC	19AA	0.75	M-060-01	2450	586	2485	650	B	15408B	C-H			VT-2	IWC1220c		M-1013-01
	1RC	19AB	0.75	M-060-02	2450	586	2485	650	B	15408B	C-H			VT-2	IWC1220c		M-1013-02
	1RC	19AC	0.75	M-060-03	2450	586	2485	650	B	15408B	C-H			VT-2	IWC1220c		M-1013-03
	1RC	19AD	0.75	M-060-04	2450	586	2485	650	B	15408B	C-H			VT-2	IWC1220c		M-1013-04
A	1RC	19BA	0.75	M-060-01	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-01
A	1RC	19BB	0.75	M-060-02	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-02
A	1RC	19BC	0.75	M-060-03	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-03
A	1RC	19BD	0.75	M-060-04	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-04
	1RC	20AA	0.75	M-060-01	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-01
	1RC	20AB	0.75	M-060-02	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-02
	1RC	20AC	0.75	M-060-03	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-03
	1RC	20AD	0.75	M-060-04	2450	586	2485	650	A	15408B	B-P			VT-2	IWB1220b		M-1013-04
	1RC	21AA	6.00	M-060-01	2450	586	2485	650	A	15408B	B-J	X	X				M-1013-01
	1RC	21AB	6.00	M-060-02	2450	586	2485	650	A	15408B	B-J	X	X				M-1013-02
	1RC	21AC	6.00	M-060-03	2450	586	2485	650	A	15408B	B-J	X	X				M-1013-03
	1RC	21AD	6.00	M-060-04	2450	586	2485	650	A	15408B	B-J	X	X				M-1013-04
	1RC	21BA	6.00	M-060-01	2485	618	2485	650	A	15408B	B-J	X	X				M-1013-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS PRESS PSIG	MAX OPERATIONS CONDITIONS TEMP. FAHR.	DESIGN CONDITIONS PRESS PSIG	DESIGN CONDITIONS TEMP. FAHR.	PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1 EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1	2	3	4	5	6	7	8								
1RC21BB	8.00	M-060-02	2385	638	2485	650	A	1540BB	B-J	X	X				M-1013-02
1RC21BC	8.00	M-060-03	2385	638	2485	650	A	1540BB	B-J	X	X				M-1013-03
1RC21BD	8.00	M-060-04	2385	638	2485	650	A	1540BB	B-J	X	X				M-1013-04
1RC22AA	1.50	M-060-01	2385	638	2485	650	A	1540BB	B-J		X				M-1013-01
1RC22AB	1.50	M-060-02	2385	638	2485	650	A	1540BB	B-J		X				M-1013-02
1RC22AC	1.50	M-060-03	2385	638	2485	650	A	1540BB	B-J		X				M-1013-03
1RC22AD	1.50	M-060-04	2385	638	2485	650	A	1540BB	B-J		X				M-1013-04
1RC23AA	0.75	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	1WB1220b		M-1013-01
1RC23AB	0.75	M-060-02	2385	638	2485	650	A	1540BB	B-P			VT-2	1WB1220b		M-1013-02
1RC23AC	0.75	M-060-03	2385	638	2485	650	A	1540BB	B-P			VT-2	1WB1220b		M-1013-03
1RC23AD	0.75	M-060-04	2385	638	2485	650	A	1540BB	B-P			VT-2	1WB1220b		M-1013-04
1RC24AA	4.00	M-060-04	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-04
1RC24AB	4.00	M-060-03	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-03
1RC25AA	0.75	M-060-05	2450	586	2485	650	B	1540BB	C-H			VT-2	1WC1220c		M-1013-05
1RC25AB	0.75	M-060-05	2450	586	2485	650	B	1540BB	C-H			VT-2	1WC1220c		M-1013-05
1RC26A	2.00	M-060-04	2450	586	2485	650	A	1540BB	B-J		X				M-1013-04
1RC27A	0.75	M-060-04	2450	586	2485	650	B	1540BB	C-H			VT-2	1WC1220c		M-1013-04
1RC28A	3.00	M-060-01	2450	586	2485	650	A	1540BB	B-J		X				M-1013-05
1RC29AA	10.00	M-060-01	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-01
1RC29AB	10.00	M-060-02	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

REMARKS	LINE NUMBER: ISOMETRIC	LINE NUMBER: SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS: PRESS PSIG.	MAX OPERATIONS CONDITIONS: TEMP. FAHR	DESIGN CONDITIONS: PRESS PSIG.	DESIGN CONDITIONS: TEMP. FAHR	PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1RC29AC	10.00	M-060-03	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-03
	1RC29AD	10.00	M-060-04	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-04
	1RC30AA	1.50	M-060-01	2450	586	2485	650	A	1540BB	B-J		X				M-1014-02
	1RC30AB	1.50	M-060-02	2450	586	2485	650	A	1540BB	B-J		X				M-1014-02
	1RC30AC	1.50	M-060-03	2450	586	2485	650	A	1540BB	B-J		X				M-1014-02
	1RC30AD	1.50	M-060-04	2450	586	2485	650	A	1540BB	B-J		X				M-1014-02
	1RC31A	1.00	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-01
	1RC31B	0.50	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-01
	1RC31C	0.50	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-01
	1RC31DA	1.00	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-01
	1RC31DB	1.00	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-01
	1RC31EA	0.50	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-01
	1RC31EB	0.50	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1013-01
R	1RC32AA	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
R	1RC32AB	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC32B	0.375	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC33A	0.375	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC35AA	6.00	M-060-01	2385	638	2485	650	A	1540BB	B-J	X	X				M-1014-03
	1RC35AB	6.00	M-060-01	2385	638	2485	650	A	1540BB	B-J	X	X				M-1014-03
	1RC36A	3.00	M-060-03	2450	586	2485	650	A	1540BB	B-J		X				M-1017-05

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

ITEM NUMBER	LINE NUMBER (SYSTEM, BRANCH, SEQUENCE)	SIZE (1)	P&I DIAGRAM (2)	MAX. OPERATIONS CONDITIONS PRESS PSIG. (3)	MAX. OPERATIONS CONDITIONS TEMP FAHR. (4)	DESIGN CONDITIONS PRESS. PSIG. (5)	DESIGN CONDITIONS TEMP. FAHR. (6)	PIPING CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1 EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1RC37A	3.00	M-060-02	2450	586	2485	650	A	1540BB	B-J		X				M-1017-05
	1RC38AA	0.75	M-060-01	2385	638	2455	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC38AB	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC38BA	0.75	M-060-02	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-02
	1RC38BB	0.75	M-060-02	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-02
	1RC38CA	0.75	M-060-03	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-03
	1RC38CB	0.75	M-060-03	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-03
	1RC38DA	0.75	M-060-04	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-04
	1RC38DB	0.75	M-060-04	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-04
	1RC38EA	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC38EB	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC38FA	0.75	M-060-02	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-02
	1RC38FB	0.75	M-060-02	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-02
	1RC38GA	0.75	M-060-03	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-03
	1RC38GB	0.75	M-060-03	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-03
	1RC38HA	0.75	M-060-04	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-04
	1RC38HB	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-04
	1RC40AA	0.75	M-060-01	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-01
	1RC40CA	0.75	M-060-02	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-02
	1RC40EA	0.75	M-060-03	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-03

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

SYSTEM	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATING CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD			CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
											Volumetric	Surface	Visual			
		1	2	3	4	5	6	7	8							
	1RC40DA	0.75	M-060-04	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-04
	1RC40EA	0.75	M-060-01	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-01
	1RC40FA	0.75	M-060-02	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-02
	1RC40GA	0.75	M-060-03	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-03
	1RC40HA	0.75	M-060-04	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-04
	1RC40JA	0.75	M-060-01	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-01
	1RC40KA	0.75	M-060-02	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-02
	1RC40LA	0.75	M-060-03	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-03
	1RC40MA	0.75	M-060-04	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-04
	1RC40NA	0.75	M-060-01	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-01
	1RC40PA	0.75	M-060-02	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-02
	1RC40QA	0.75	M-060-03	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-03
	1RC40RA	0.75	M-060-04	2350	586	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-04
	1RC42AA	0.75	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-01
	1RC42BA	0.75	M-060-04	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-03
	1RC43AA	2.00	M-060-01	2450	586	2485	650	A	1540BB	B-J		X				M-1013-01
	1RC43AB	2.00	M-060-02	2450	586	2485	650	A	1540BB	B-J		X				M-1013-02
	1RC43AC	2.00	M-060-03	2450	586	2485	650	A	1540BB	B-J		X				M-1013-03
	1RC43AD	2.00	M-060-04	2450	586	2485	650	A	1540BB	B-J		X				M-1013-04
	1RC44AA	1.00	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220(		M-1013-01

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PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1RC44AB	1.00	M-060-01	2385	638	2485	650	B	1540BB	C-H			VT-2	1WC1220c		M-1013-01
1RC45AA	3.00	M-060-01	2450	586	2485	650	A	1540BB	B-J		X				M-1013-01
1RC45AB	3.00	M-060-02	2450	586	2485	650	A	1540BB	B-J		X				M-1013-02
1RC45AC	3.00	M-060-03	2450	586	2485	650	A	1540BB	B-J		X				M-1013-03
1RC45AD	3.00	M-060-04	2450	586	2485	650	A	1540BB	B-J		X				M-1013-04
1RC46AA	3.00	M-060-01	2385	638	2485	650	A	1540BB	B-J		X				M-1013-01
1RC46AB	3.00	M-060-02	2385	638	2485	650	A	1540BB	B-J		X				M-1013-02
1RC46AC	3.00	M-060-03	2385	638	2485	650	A	1540BB	B-J		X				M-1013-03
1RC46AD	3.00	M-060-04	2385	638	2485	650	A	1540BB	B-J		X				M-1013-04
1RC47AA	0.75	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	1WB1220b		M-1013-01
1RC47BA	0.75	M-060-02	2385	638	2485	650	A	1540BB	B-P			VT-2	1WB1220b		M-1013-02
1RC47CA	0.75	M-060-03	2385	638	2485	650	A	1540BB	B-P			VT-2	1WB1220b		M-1013-03
1RC47DA	0.75	M-060-04	2385	638	2485	650	A	1540BB	B-P			VT-2	1WB1220b		M-1013-04
1RC48AA	0.375	M-060-01	2385	638	2485	650	B	1550BB	C-H			VT-2	1WC1220c		M-1013-01
1RC48AB	0.375	M-060-02	2385	638	2485	650	B	1550BB	C-H			VT-2	1WC1220c		M-1013-02
1RC48AC	0.375	M-060-03	2385	638	2485	650	B	1550BB	C-H			VT-2	1WC1220c		M-1013-03
1RC48AD	0.375	M-060-04	2385	638	2485	650	B	1550BB	C-H			VT-2	1WC1220c		M-1013-04
1RC49A	0.75	M-060-01	2350	586	2485	650	B	1540BB	C-H			VT-2	1WC1220c		M-1013-04
1RC52A	0.75	M-060-01	2385	638	2485	650	A	1540BB	B-P			VT-2	1WB1220b		M-1013-01
1RC53AA	2.00	M-060-01	2385	638	2485	650	A	1540BB	B-J		X				M-1013-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT

LINE NUMBER	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS PRESS PSIG (3)	MAX OPERATIONS CONDITIONS TEMP FAHR (4)	DESIGN CONDITIONS PRESS PSIG (5)	DESIGN CONDITIONS TEMP FAHR (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1 EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1RC53BA	2.00	M-060-02	2385	638	2485	650	A	154088	B-J		X				M-1013-02
1RC53CA	2.00	M-060-03	2385	638	2485	650	A	154088	B-J		X				M-1013-03
1RC53DA	2.00	M-060-04	2385	638	2485	650	A	154088	B-J		X				M-1013-04

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	REACTOR HEAT REMOVAL

	LINE NUMBER		SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div I						
	SYSTEM	SEQUENCE NUMBER			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION 74 S'75	RELIEF REQUEST	ISI FLOW DIAGRAM
	1		1	2	3	4	5	6	7	8							
	1RH01AA		12.00	M-062-01	2385	638	2485	650	A	1540BB	B-J	X	X				M-1015-01
	1RH01AB		12.00	M-062-01	2385	638	2485	650	A	1540BB	B-J	X	X				M-1015-01
	1RH01BA		12.00	M-061-04	450	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH01BB		12.00	M-061-04	450	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH01CA		16.00	M-061-04	450	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH01CB		16.00	M-061-04	450	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH02AA		8.00	M-062-01	570	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH02AB		8.00	M-062-01	570	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH03AA		8.00	M-062-01	570	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH03AB		8.00	M-062-01	570	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH04AA		3.00	M-062-01	450	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
	1RH04AB		3.00	M-062-01	450	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
	1RH05AA		0.75	M-062-01	450	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
	1RH05AB		0.75	M-062-01	450	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
	1RH06AA		0.75	M-062-01	450	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
	1RH06BA		0.75	M-062-01	450	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
	1RH07AA		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
	1RH07AB		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
	1RH08AA		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
	1RH08AB		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	REACTOR HEAT REMOVAL

REMARKS	LINE NUMBER: SYSTEM	LINE NUMBER: NUMBER	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS: PRESS PSIG (3)	MAX OPERATIONS CONDITIONS: TEMP FAHR (4)	DESIGN CONDITIONS: PRESS PSIG (5)	DESIGN CONDITIONS: TEMP FAHR (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION 74 S 75	RELIEF REQUEST	ISI FLOW DIAGRAM
	1RH09AA		8.00	M-062-01	570	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH09AB		8.00	M-062-01	570	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH10AA		3.00	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH10AB		3.00	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH10CA		3.00	M-062-01	450	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH10CB		3.00	M-062-01	450	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH11AA		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH11AB		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH12A		8.00	M-062-01	570	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH13AA		2.00	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH13AB		2.00	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH13B		2.00	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH14A		8.00	M-062-01	570	350	600	400	B	0640BB	C-F		X				M-1015-01
	1RH16AA		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH16BA		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH18AA		0.75	M-062-01	150	180	150	200	C	0105BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH18AB		0.75	M-062-01	150	180	150	200	C	0105BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH19AA		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH19AB		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
	1RH19AC		0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR HEAT REMOVAL

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1				CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual			
	1	2	3	4	5	6	7	8					74 S'75		
1RH19AD	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH19AE	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH19AF	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH19BA	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH19BB	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH20AA	0.75	M-062-01	150	180	150	200	C	0105BB	D-C			VT-2			M-1015-01
1RH20AB	0.75	M-062-01	150	180	150	200	C	0105BB	D-C			VT-2			M-1015-01
1RH20AC	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH20AD	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH20AE	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH20AF	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH20AG	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH20AH	0.75	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH22AA	0.50	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH22AB	0.50	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH23AA	0.50	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH23AB	0.50	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH24AA	0.50	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH24AB	0.50	M-062-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220(		M-1015-01
1RH25AA	0.75	M-062-01	2385	638	2485	650	A	1510BB	B-P			VT-2	IWB1220(		M-1015-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR HEAT REMOVAL

NOTATION	LINE NUMBER: SYSTEM	LINE NUMBER: SEQUENCE NUMBER	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS: PRESS PSIG (3)	MAX OPERATIONS CONDITIONS: TEMP °F (4)	DESIGN CONDITIONS: PRESS PSIG (5)	DESIGN CONDITIONS: TEMP °F (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION 74 S 75	RELIEF REQUEST	ISI FLOW DIAGRAM
	1RH25AB		0.75	M-062-01	2385	638	2485	650	A	1540BB	B-P			VT-2	IWB1220b		M-1015-01
A	1RH26AA		0.75	M-062-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220d		M-1015-01
A	1RH26AB		0.75	M-062-01	2385	638	2485	650	B	1540BB	C-H			VT-2	IWC1220d		M-1015-01
A	1RH27AA		0.50	M-082-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
A	1RH27AB		0.50	M-082-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
A	1RH28AA		0.50	M-082-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01
A	1RH28AB		0.50	M-082-01	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220d		M-1015-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT-PRESSURIZER

	LINE NUMBER		SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
	SYSTEM	NUMBER			PRESS PSIG	TEMP FAHR.	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1		1	2	3	4	5	6	7	8							
	1RY	01GA	4.00	M-060-05	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-05
	1RY	01AB	4.00	M-060-05	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-05
	1RY	01B	6.00	M-060-05	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-05
	1RY	01C	4.00	M-060-05	2450	586	2485	650	A	1540BB	B-J	X	X				M-1013-05
	1RY	02A	6.00	M-060-05	2485	653	2485	680	A	1540BB	B-J	X	X				M-1013-05
	1RY	02B	3.00	M-060-05	2485	653	2485	680	A	1540BB	B-J		X				M-1013-05
	1RY	03AA	6.00	M-060-05	2485	653	2485	680	A	1540BB	B-J	X	X				M-1013-05
	1RY	03AB	6.00	M-060-05	2485	653	2485	680	A	1540BB	B-J	X	X				M-1013-05
	1RY	03AC	6.00	M-060-05	2485	653	2485	680	A	1540BB	B-J	X	X				M-1013-05
R	1RY	03BA	6.00	M-060-05	2485	653	2485	680	A	1540BB	B-J	X	X				M-1013-05
R	1RY	03BB	6.00	M-060-05	2485	653	2485	680	A	1540BB	B-J	X	X				M-1013-05
R	1RY	03BC	6.00	M-060-05	2485	653	2485	680	A	1540BB	B-J	X	X				M-1013-05
	1RY	04A	0.75	M-060-05	2335	670	2485	680	B	1540BB	C-H			VT-2	IWC1220c		M-1013-05
	1RY	05A	0.75	M-060-05	2335	670	2485	680	B	1540BB	C-H			VT-2	IWC1220c		M-1013-05
	1RY	06A	3.00	M-060-05	2485	653	2485	680	A	1540BB	B-J		X				M-1013-05
R	1RY	07AA	0.75	M-060-05	2485	653	2485	680	B	1540BB	C-H			VT-2	IWC1220c		M-1013-05
R	1RY	07AB	0.75	M-060-05	2485	653	2485	680	B	1540BB	C-H			VT-2	IWC1220c		M-1013-05
R	1RY	07AC	0.75	M-060-05	2485	653	2485	680	B	1540BB	C-H			VT-2	IWC1220c		M-1013-05
R	1RY	07B	0.75	M-060-05	2485	653	2485	680	B	1540BB	C-H			VT-2	IWC1220c		M-1013-05
	1RY	08AA	0.75	M-060-05	2450	586	2485	650	B	1540BB	C-H			VT-2	IWC1220c		M-1013-05

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT - PRESSURIZER

REMARKS	LINE NUMBER	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS PRESS PSIG (3)	MAX OPERATIONS CONDITIONS TEMP °F/HR (4)	DESIGN CONDITIONS PRESS PSIG (5)	DESIGN CONDITIONS TEMP °F/HR (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1 EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1RY09AR	0.75	M-060-05	2450	586	2485	650	B	1540BB	C-H			VT-2	IWC1220		M-1013-05
	1RY10A	0.75	M-060-05	2485	670	2485	680	B	1540BB	C-H			VT-2	IWC1220		M-1013-05
	1RY11A	14.00	M-060-04	2485	670	2485	680	A	NOTES	B-J	X	X				M-1013-05
R	1RY14C	0.375	M-060-06	50	200	100	340	B	1559BB	C-H			VT-2	IWC1220		
R	1RY15A	0.375	M-060-06	50	200	100	340	C	1559BB	D-A			VT-2			
	1RY18A	2.00	M-060-05	2235	560	2485	650	A	1540BB	B-J		X				M-1013-05
	1RY30C	0.75	M-060-06	100	75	100	100	B	0140BB	C-H			VT-2	IWC1220		
R	1RY32A	3.00	M-060-06	100	75	100	100	B	0140BB	C-H			VT-2	IWC1220		
	1RY34AA	0.75	M-060-05	2485	670	2485	680	B	1540BB	C-H			VT-2	IWC1220		M-1013-05
R	1RY34BA	0.75	M-060-05	2485	670	2485	680	B	1540BB	C-H			VT-2	IWC1220		M-1013-05
R	1RY34CA	0.75	M-060-05	2485	670	2485	680	B	1540BB	C-H			VT-2	IWC1220		M-1013-05
R	1RY34DA	0.75	M-060-05	2485	670	2485	680	B	1540BB	C-H			VT-2	IWC1220		M-1013-05
R	1RY34EA	0.75	M-060-05	2485	670	2485	680	B	1540BB	C-H			VT-2	IWC1220		M-1013-05
R	1RY34FA	0.75	M-060-05	2485	670	2485	680	B	1540BB	C-H			VT-2	IWC1220		M-1013-05
R	1RY40A	0.75	M-060-06	100	75	100	100	B	0140BB	C-H			VT-2	IWC1220		
R	1RY41A	0.75	M-060-06	100	75	100	100	B	0140BB	C-H			VT-2	IWC1220		
R	1RY43A	0.75	M-060-06	100	75	100	100	B	0140BB	C-H			VT-2	IWC1220		
	1RY67CA	1.00	M-060-08	600	120	600	120	C	0607BB	D-A			VT-2			
	1RY67CB	1.00	M-060-08	600	120	600	120	C	0607BB	D-A			VT-2			
	1RY68AA	0.75	M-060-08	600	120	600	120	C	0607BB	D-A			VT-2			

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT - PRESSURIZER

NOTES	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPING CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1				CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual			
		1	2	3	4	5	6	7	8							
	1RY68AB	0.75	M-060-08	600	120	600	120	C	0607BB	D-A			VT-2			
R	1RY68BA	0.75	M-060-08	0100	0120	0100	0120	C	0105BB	D-A			VT-2			
R	1RY68BB	0.75	M-060-08	0100	0120	0100	0120	C	0105BB	D-A			VT-2			
R	1RY69AA	0.75	M-060-08	0100	120	0100	120	C	0105BB	D-A			VT-2			
R	1RY69AB	0.75	M-060-08	0100	120	0100	120	C	0105BB	D-A			VT-2			
	1RY70AA	0.75	M-060-08	600	120	600	120	C	0607BB	D-A			VT-2			
	1RY70BA	0.75	M-060-08	600	120	600	120	C	0607BB	D-A			VT-2			
	1RY71AA	1.00	M-060-08	600	120	600	120	C	0607BB	D-A			VT-2			
	1RY71AB	1.00	M-060-08	600	120	600	120	C	0607BB	D-A			VT-2			
	1RY72A	0.75	M-060-06	100	75	100	100	B	0140BB	C-H			VT-2	IWC1220c		
[illegible]	[illegible]	0.75	M-060-06	50	200	100	340	B	1559BB	C-H			VT-2	IWC1220c		
A	1RY75AA	0.75	M-060-08	0100	0120	0100	0120	C	0105BB	D-A			VT-2			
A	1RY75AB	0.75	M-060-08	0100	0120	0100	0120	C	0105BB	D-A			VT-2			
	1RY76A	2.00	M-060-05	2485	653	2485	680	A	1540BB	B-J		X				M-1013-05
A	1RY80A	0.75	M-060-06	100	75	100	100	B	0140BB	C-H			VT-2	IWC1220c		
A	1RY81A	0.75	M-060-06	100	75	100	100	B	0140BB	C-H			VT-2	IWC1220c		

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PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

LINE NUMBER			P&I DIAGRAM	MAX. OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
										EXAM CAT.	EXAM METHOD			CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
											Volumetric	Surface	Visual			
		1	2	3	4	5	6	7	8							
	0S172A	1.50	M-061-02					C	0140BB	D-			VT-2			M-1014-02
	1S1A3AA	0.75	M-061-06	50	114	2485	200	C	1540BB	D-			VT-2			M-1014-06
	1S1A3AB	0.75	M-061-06	50	114	2485	200	C	1540BB	D-			VT-2			M-1014-06
	1S1A3AD	0.75	M-061-06	50	114	2485	200	C	1540BB	D-			VT-2			M-1014-06
	1S1A3BA	0.75	M-061-06	50	114	2485	200	C	1540BB	D-			VT-2			M-1014-06
	1S1A3BB	0.75	M-061-06	50	114	2485	200	C	1540BB	D-			VT-2			M-1014-06
	1S1A3BD	0.75	M-061-06	50	114	2485	200	C	1540BB	D-			VT-2			M-1014-06
	1S1A4A	8.00	M-061-03	1740	114	2485	300	B	1540BB	C-F	X	X				M-1014-03
	1S1A4B	8.00	M-061-03	1740	114	2485	300	A	1540BB	C-F	X	X				M-1014-03
	1S1A5B	0.75	M-061-01	1740	114	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1S1A6AA	0.75	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
	1S1A6BA	0.75	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
	1S1A6CA	0.75	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
	1S1A6DA	0.75	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
	1S1A7AA	0.75	M-061-01	50	114	50	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-01
	1S1B1A	1.50	M-061-02					C	0140BB							M-1014-02
	1S1B2AA	1.00	M-061-01	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-01
	1S1B2AB	1.00	M-061-01	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-01
	1S1B2AC	1.00	M-061-01	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-01
	1S1B2AD	1.00	M-061-01	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	SAFETY INJECTION

REMARKS	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
	1SIB3A	0.75	M-061-06	700	120	700	300	B	150588	C-H			VT-2	IWC1220c		M-1014-06
	1SIB4AA	0.75	M-061-04	150	150	150	150	B	010588	C-H			VT-2	IWC1220c		M-1014-04
	1SIB4BA	0.75	M-061-04	150	150	150	150	B	010588	C-H			VT-2	IWC1220c		M-1014-04
R	1SIB5AA	0.75	M-061-05	700	120	700	120	B	064088	C-H			VT-2	IWC1220c		M-1014-05
R	1SIB5AB	0.75	M-061-05	700	120	700	120	B	064088	C-H			VT-2	IWC1220c		M-1014-05
A	1SIB5AC	0.75	M-061-06	700	120	700	120	B	064088	C-H			VT-2	IWC1220c		M-1014-06
A	1SIB5AD	0.75	M-061-06	700	120	700	120	B	064088	C-H			VT-2	IWC1220c		M-1014-06
R	1SIB6AA	0.75	M-061-05	700	120	700	120	B	064088	C-H			VT-2	IWC1220c		M-1014-05
R	1SIB6AB	0.75	M-061-05	700	120	700	120	B	064088	C-H			VT-2	IWC1220c		M-1014-05
A	1SIB6AC	0.75	M-061-06	700	120	700	120	B	064088	C-H			VT-2	IWC1220c		M-1014-06
A	1SIB6AD	0.75	M-061-06	700	120	700	120	B	064088	C-H			VT-2	IWC1220c		M-1014-06
	1SIB7AA	1.00	M-061-04	47	150	50	150	B	010588	C-H			VT-2	IWC1220c		M-1014-04
	1SIB7AB	1.00	M-061-04	47	150	50	150	B	010588	C-H			VT-2	IWC1220c		M-1014-04
R	1SIC1A	3.00	M-061-01	50	114	50	200	B	014088	C-H			VT-2	IWC1220c		M-1014-01
R	1SIC2A	6.00	M-061-01	50	114	50	200	B	014088	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3AA	1.00	M2061-01	0700	0120	0700	0300	B	064088	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3BA	1.00	M2061-01	0700	0120	0700	0300	B	064088	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3CA	1.00	M2061-01	0700	0120	0700	0300	B	064088	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3DA	1.00	M2061-01	0700	0120	0700	0300	B	064088	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3EA	1.00	M2061-01	0700	0120	0700	0300	B	064088	C-H			VT-2	IWC1220c		M-1014-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	SAFETY INJECTION

	LINE NUMBER			P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
											EXAM CAT.	EXAM METHOD			CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
					PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR				Volumetric	Surface	Visual			
			1	2	3	4	5	6	7	8							
	1SIC3FA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3GA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3HA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3JA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3KA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3LA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3MA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3NA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3PA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3QA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC3RA		1.00	M2061-01	0700	0120	0700	0300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC5AA		1.00	M-061-04	47	150	50	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-04
	1SIC5AB		1.00	M-061-04	47	150	50	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-04
R	1SIC6A		4.00	M-061-01	50	114	50	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC7AA		0.75	M-061-01	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC7AB		0.75	M-061-01	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-01
	1SIC9A		0.75	M-061-02	2735	300	2735	300	C	1540BB	D-			VT-2			M-1014-02
	1SID1AA		0.75	M-061-04	47	150	50	150	B	0105BB	C-H			VT-2	IWC1220c		M-1014-04
	1SID1AB		0.75	M-061-04	47	150	50	150	B	0105BB	C-H			VT-2	IWC1220c		M-1014-04
	1SID2A		2.00	M-061-06	50	114	2485	200	C	1540BB	D-			VT-2			M-1014-06

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

SYSTEM	LINE NUMBER: UNIT	LINE NUMBER: SEQUENCE NUMBER	SIZE	PRE DIAGRAM	MAX OPERATIONS CONDITIONS: PRESS PSIG	MAX OPERATIONS CONDITIONS: TEMP FAHR	DESIGN CONDITIONS: PRESS PSIG	DESIGN CONDITIONS: TEMP FAHR	PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
			1	2	3	4	5	6	7	8							
	1SI07AA		0.50	M-061-04					B	01058B	C-H			VT-2	IWC1220c		M-1014-04
	1SI07AB		0.50	M-061-04					B	01058B	C-H			VT-2	IWC1220c		M-1014-04
	1SIE1A		0.75	M-061-06	50	114	2485	200	C	15408B	D-			VT-2			M-1014-06
	1SIE2AA		0.75	M-061-02	2735	300	2735	300	C	15408B	D-			VT-2			M-1014-02
	1SIE2AB		0.75	M-061-02	2735	300	2735	300	C	15408B	D-			VT-2			M-1014-02
	1SIE3AA		0.75	M-061-05	700	120	700	300	B	06408B	C-H			VT-2	IWC1220c		M-1014-05
	1SIE3BA		0.75	M-061-05	700	120	700	300	B	06408B	C-H			VT-2	IWC1220c		M-1014-05
	1SIE3CA		0.75	M-061-06	700	120	700	300	B	06408B	C-H			VT-2	IWC1220c		M-1014-06
	1SIE3DA		0.75	M-061-06	700	120	700	300	B	06408B	C-H			VT-2	IWC1220c		M-1014-06
	1SIE4AA		0.75	M-061-05	700	120	700	300	B	06408B	C-H			VT-2	IWC1220c		M-1014-05
	1SIE4BA		0.75	M-061-05	700	120	700	300	B	06408B	C-H			VT-2	IWC1220c		M-1014-05
	1SIE4CA		0.75	M-061-06	700	120	700	300	B	06408B	C-H			VT-2	IWC1220c		M-1014-06
	1SIE4DA		0.75	M-061-06	700	120	700	300	B	06408B	C-H			VT-2	IWC1220c		M-1014-06
R	1SIE5A		2.00	M-061-01	50	114	50	150	B	01408B	C-H			VT-2	IWC1220c		M-1014-01
A	1SIE9AA		0.75	M-082-02	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220c		
A	1SIE9AB		0.75	M-082-02	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220c		
A	1SIE2A		0.75	M-061-02	2735	300	2735	300	B	15408B	C-H			VT-2	IWC1220c		M-1014-02
A	1SIE1A		0.75	M-061-02	2735	300	2735	300	B	15408B	C-H			VT-2	IWC1220c		M-1014-02
A	1SIE4A		0.75	M-061-03	2485	200	2485	300	B	15408B	C-H			VT-2	IWC1220c		M-1014-03
A	1SIE5A		0.75	M-061-03	1740	114	2485	300	B	15408B	C-H			VT-2	IWC1220c		M-1014-03

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP F/DEG	PRESS PSIG	TEMP F/DEG			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
		1	2	3	4	5	6	7	8							
A	1SIF6AA	0.75	M-061-04	2485	200	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-04
A	1SIF6AB	0.75	M-061-04	2485	200	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-04
A	1SIF7AA	0.75	M-061-04	450	165	600	200	B	0640BB	C-H			VT-2	IWC1220c		M-1014-04
A	1SIF7AB	0.75	M-061-04	450	165	600	200	B	0640BB	C-H			VT-2	IWC1220c		M-1014-04
R	1SI01A	8.00	M-061-01	50	114	50	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
R	1SI01B	24.00	M-061-01	50	114	50	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
	1SI02A	8.00	M-061-01	50	114	50	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
	1SI02BA	6.00	M-061-01	220	114	240	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
	1SI02BB	6.00	M-061-01	220	114	240	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
	1SI03AA	4.00	M-061-01	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-01
	[illegible]	[illegible]	M-061-01	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-01
	1SI03BA	4.00	M-061-03	2485	200	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI03BB	4.00	M-061-03	2485	200	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI03CA	2.00	M-061-03	1740	114	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI03CB	2.00	M-061-03	1740	114	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI03DA	2.00	M-061-03	1740	114	2485	300	A	1540BB	B-J		X				M-1014-03
	[illegible]	2.00	M-061-03	1740	114	2485	300	A	1540BB	B-J		X				M-1014-03
	[illegible]	2.00	M-061-03	1740	114	1750	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	[illegible]	2.00	M-061-03	1740	114	1750	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	[illegible]	2.00	M-061-03	1740	114	2485	300	A	1540BB	B-J		X				M-1014-03

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

LINE NUMBER	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS PRESS PSIG (3)	MAX OPERATIONS CONDITIONS TEMP FAHR (4)	DESIGN CONDITIONS PRESS PSIG (5)	DESIGN CONDITIONS TEMP FAHR (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1 EXAM CAT.*	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1SI03FB	2.00	M-051-03	1740	114	2485	300	A	1540BB	B-J		X				M-1014-03
1SI04A	12.00	M-061-03	450	350	600	400	B	0640BB	C-F	X	X				M-1014-03
1SI04B	12.00	M-061-03	1740	114	2485	300	B	1540BB	C-F	X	X				M-1014-03
1SI04C	8.00	M-061-03	1740	114	2485	300	B	1540BB	C-F	X	X				M-1014-03
1SI04D	8.00	M-061-03	1740	114	2485	300	A	1540BB	B-J	X	X				M-1014-04
1SI05AA	8.00	M-061-04	600	350	600	400	B	0640BB	C-F		X				M-1014-04
1SI05AB	8.00	M-061-04	600	350	600	400	B	0640BB	C-F		X				M-1014-04
1SI05BA	8.00	M-061-04	2485	200	2485	400	B	1540BB	C-F	X	X				M-1014-04
1SI05BB	8.00	M-061-04	2485	200	2485	400	B	1540BB	C-F	X	X				M-1014-04
1SI05CA	8.00	M-061-04	2485	200	2485	400	B	1540BB	C-F	X	X				M-1014-04
1SI05CB	8.00	M-061-04	2485	200	2485	400	B	1540BB	C-F	X	X				M-1014-04
1SI05CC	8.00	M-061-04	2485	200	2485	400	B	1540BB	C-F	X	X				M-1014-04
1SI05CD	8.00	M-061-04	2485	200	2485	400	B	1540BB	C-F	X	X				M-1014-04
1SI05DA	6.00	M-061-04	2485	350	2485	400	A	1540BB	B-J	X	X				M-1014-04
1SI05DB	6.00	M-061-04	2485	350	2485	400	A	1540BB	B-J	X	X				M-1014-04
1SI05DC	6.00	M-061-04	2485	350	2485	400	A	1540BB	B-J	X	X				M-1014-04
1SI05DD	6.00	M-061-04	2485	350	2485	400	A	1540BB	B-J	X	X				M-1014-04
1SI06AA	24.00	M-061-01	50	300	150	300	B	NOTES	B-J			VT-2		2	M-1014-04
1SI06AB	24.00	M-061-04	50	300	150	300	B	NOTES	C-F			VT-2		2	M-1014-04
1SI06BA	24.00	M-061-04	450	165	600	200	B	0640BB	C-F	X	X				M-1014-04

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1SI06BB	24.00	M-061-04	450	165	600	200	B	0640BB	C-F	X	X				M-1014-04
1SI07AA	4.00	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220(		M-1014-02
1SI07AB	4.00	M-061-02	2735	300	2735	300	B	1540BB	C-H				IWC1220(		M-1014-02
1SI07B	4.00	M-061-02	2735	300	2735	300	B	1540BB	C-H				IWC1220(		M-1014-02
1SI07C	6.00	M-061-02	2735	300	2735	300	B	1540BB	C-F		X				M-1014-02
1SI08B	4.00	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220(		M-1014-02
1SI08CA	4.00	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220(		M-1014-02
1SI08CB	4.00	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220(		M-1014-02
1SI08D	3.00	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220(		M-1014-02
1SI08E	3.00	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08EA	3.00	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08EB	3.00	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08GA	1.50	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08GB	1.50	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08GC	1.50	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08GD	1.50	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08HA	2.00	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08HB	2.00	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08HC	2.00	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
1SI08HD	2.00	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

	LINE NUMBER		P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
	SYSTEM	SEQUENCE NUMBER	SIZE		PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
			1	2	3	4	5	6	7	8							
	1SI08JA		1.50	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
	1SI08JB		1.50	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
	1SI08JC		1.50	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
	1SI08JD		1.50	M-061-02	2735	300	2735	300	A	1540BB	B-J		X				M-1014-02
	1SI09AA		10.00	M-061-05	700	130	700	300	B	0640BB	C-F		X				M-1014-05
	1SI09AB		10.00	M-061-05	700	130	700	300	B	0640BB	C-F		X				M-1014-05
	1SI09AC		10.00	M-061-06	700	130	700	300	B	0640BB	C-F		X				M-1014-06
	1SI09AD		10.00	M-061-06	700	130	700	300	B	0640BB	C-F		X				M-1014-06
	1SI09BA		10.00	M-061-05	700	350	2485	400	A	1540BB	B-J	X	X				M-1014-05
	1SI09BB		10.00	M-061-05	700	350	2485	400	A	1540BB	B-J	X	X				M-1014-05
	1SI09BC		10.00	M-061-06	700	350	2485	400	A	1540BB	B-J	X	X				M-1014-06
	1SI09BD		10.00	M-061-06	700	350	2485	400	A	1540BB	B-J	X	X				M-1014-06
R	1SI10A		3.00	M-061-01	50	114	50	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-01
	1SI10B		3.00	M-061-01	50	114	50	150	C	0140BB	D-A			VT-2			M-1014-01
	1SI12A		0.75	M-061-01	220	114	240	150	B	0140BB	C-H			VT-2	IWC 1220c		M-1014-01
	1SI12B		0.75	M-061-01	220	114	240	150	B	0140BB	C-H			VT-2	IWC1220b		M-1014-01
	1SI13A		6.00	M-061-01	220	114	240	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
	1SI13B		6.00	M-061-01	220	114	240	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
	1SI13C		6.00	M-061-01	220	114	240	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
	1SI14AA		0.75	M-061-01	220	114	240	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP. FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1SI14AB	0.75	M-061-01	220	114	240	150	B	01408B	C-H			VT-2	IWC1220		M-1014-01
1SI15AA	0.75	M-061-01	220	114	240	150	B	01408B	C-H			VT-2	IWC1220		M-1014-01
1SI15BA	0.75	M-061-01	220	114	240	150	B	01408B	C-H			VT-2	IWC1220		M-1014-01
1SI16AA	1.50	M-061-01	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-01
1SI16AB	1.50	M-061-01	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-01
1SI16BA	3.00	M-061-01	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-01
1SI16BB	3.00	M-061-01	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-01
1SI16CA	1.50	M-061-01	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-01
1SI16CB	1.50	M-061-01	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-01
1SI16D	3.00	M-061-01	1740	114	1750	200	B	15428B	C-H			VT-2	IWC1220		M-1014-01
1SI17A	0.75	M-061-01	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-01
1SI18AA	4.00	M-061-03	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-03
1SI18AB	4.00	M-061-03	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-03
1SI18B	4.00	M-061-03	1740	114	1750	300	B	15428B	C-H			VT-2	IWC1220		M-1014-03
1SI18C	4.00	M-061-03	1740	114	2485	300	B	15408B	C-H			VT-2	IWC1220		M-1014-03
1SI18DA	4.00	M-061-03	1740	114	2485	300	B	15408B	C-H			VT-2	IWC1220		M-1014-03
1SI18DB	4.00	M-061-03	1740	114	2485	300	B	15408B	C-H			VT-2	IWC1220		M-1014-03
1SI18EA	2.00	M-061-03	1740	114	2485	300	B	15408B	C-H			VT-2	IWC1220		M-1014-03
1SI18EB	2.00	M-061-03	1740	114	2485	300	B	15408B	C-H			VT-2	IWC1220		M-1014-03
1SI18EC	2.00	M-061-03	1740	114	2485	300	B	15408B	C-H			VT-2	IWC1220		M-1014-03

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

LINE NUMBER		SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
SYSTEM	NUMBER			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
1SI	18LD	2.00	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03
1SI	18FA	2.00	M-061-03	1740	350	2485	400	A	154088	B-J		X				M-1014-03
1SI	18FB	2.00	M-061-03	1740	350	2485	400	A	154088	B-J		X				M-1014-03
1SI	18FC	2.00	M-061-03	1740	350	2485	400	A	154088	B-J		X				M-1014-03
1SI	18FD	2.00	M-061-03	1740	350	2485	400	A	154088	B-J		X				M-1014-03
1SI	19AA	0.75	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03
1SI	19AB	0.75	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03
1SI	19AC	0.75	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03
1SI	19AD	0.75	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03
1SI	19AE	0.75	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03
1SI	19AF	0.75	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03
1SI	19AG	0.75	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03
1SI	19AH	0.75	M-061-03	1740	114	2485	300	B	154088	C-H				IWC1220c		M-1014-03
1SI	20A	0.75	M-061-03	1740	114	1750	300	B	154288	C-H			VT-2	IWC1220c		M-1014-03
1SI	21A	0.75	M-061-03	1740	114	1750	300	B	154288	C-H			VT-2	IWC1220c		M-1014-03
1SI	22AA	0.75	M-061-03	1740	114	1750	300	B	154288	C-H			VT-2	IWC1220c		M-1014-03
1SI	22AB	0.75	M-061-03	1740	114	1750	300	B	154288	C-H			VT-2	IWC1220c		M-1014-03
1SI	22A	0.75	M-061-03	1740	114	1750	300	B	154288	C-H			VT-2	IWC1220c		M-1014-03
1SI	23	0.75	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03
1SI	24A	0.75	M-061-03	1740	114	2485	300	B	154088	C-H			VT-2	IWC1220c		M-1014-03

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

REVISION	LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
				PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	Surface	Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
	1SI126AA	0.75	M-061-03	1740	114	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI126AB	0.75	M-061-03	1740	114	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI127AA	0.75	M-061-03	1740	114	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI127AB	0.75	M-061-03	1740	114	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
R	1SI128AA	0.75	M-061-03	2485	114	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI128AB	0.75	M-061-03	2485	350	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI129A	0.75	M-061-03	2485	130	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI130AA	0.75	M-061-03	2485	130	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI130AB	0.75	M-061-03	2485	130	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI130AC	0.75	M-061-03	2485	130	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI130AD	0.75	M-061-03	2485	130	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI131AA	0.75	M-061-03	2485	200	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI131AB	0.75	M-061-03	2485	200	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI132A	0.75	M-061-03	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI134A	8.00	M-061-04	570	350	600	400	B	0640BB	C-F		X				M-1014-04
	1SI135AA	2.00	M-061-04	600	350	600	400	B	0640BB	C-H			VT-2	IWC1220c		M-1014-04
	1SI135AB	2.00	M-061-04	600	350	600	400	B	0640BB	C-H			VT-2	IWC1220c		M-1014-04
	1SI136AA	0.75	M-061-04	2485	130	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-04
	1SI136AB	0.75	M-061-04	2485	130	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-04
	1SI137A	1.00	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-04

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

LINE NUMBER	SIZE	P&I DIAGRAM	MAX. OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1SI37B	1.00	M-061-02	2735	300	2735	300	C	1540BB	D-			VT-2			M-1014-02
1SI38A	0.75	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI39A	0.75	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI40A	0.75	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI41A	0.75	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI42A	1.00	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI42B	1.00	M-061-02	2735	300	2735	300	C	1540BB	D-			VT-2			M-1014-02
1SI42C	2.00	M-061-02	2735	300	2735	300	C	1540BB	D-			VT-2			M-1014-02
1SI42D	2.00	M-061-02	50	200	200	200	C	1540BB	D-			VT-2			M-1014-02
1SI42E	1.00	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI43A	0.75	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI43B	1.00	M-061-02	75	165	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI44A	1.00	M-061-02	75	165	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI45A	1.00	M-061-02	20	200	30	225	C	0140BB	D-			VT-2			M-1014-02
1SI46AA	0.75	M-061-02	2670	130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI46AB	0.75	M-061-02	2670	130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI46AC	0.75	M-061-02	2670	130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI46AD	0.75	M-061-02	2670	130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI46AE	0.75	M-061-02	2670	130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI46AF	0.75	M-061-02	2670	130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	SAFETY INJECTION

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1SI46AG	0.75	M-061-02	2670	130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI46AH	0.75	M-061-02	2670	130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI47AA	2.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1SI47AB	2.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1SI47AC	2.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1SI47AD	2.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1SI48AA	0.75	M-061-05	2485	130	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-05
1SI48AB	0.75	M-061-05	2485	130	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-05
1SI48AC	0.75	M-061-06	2485	130	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-06
1SI48AD	0.75	M-061-06	2485	130	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-06
1SI48AE	0.75	M-061-05	2485	350	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-05
1SI48AF	0.75	M-061-05	2485	350	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-05
1SI48AG	0.75	M-061-06	2485	350	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-06
1SI48AH	0.75	M-061-06	2485	350	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-06
1SI49B	0.75	M-061-06	50	114	2485	200	B	1540BB	C-H			VT-2	IWC1220c		M-1014-06
1SI49C	0.75	M-061-06	50	114	2485	200	C	1540BB	D-			VT-2			M-1014-06
1SI50A	0.75	M-061-06	2485	130	2485	200	B	1540BB	C-H			VT-2	IWC1220c		M-1014-06
1SI51A	0.75	M-061-06	2485	130	2485	200	C	1540BB	D-			VT-2			M-1014-06
1SI53AA	14.00	M-061-01	50	114	50	150	F	0140BB	C-F			VT-2	IWC1220b		M-1014-01
1SI53AB	14.00	M-061-01	50	114	50	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON STATION UNIT 1	SAFETY INJECTION

LINE NUMBER			P&I DIAGRAM	MAX OPERATIONS CONDITIONS		DESIGN CONDITIONS		CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
SYSTEM	SEQUENCE NUMBER	SIZE		PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	1	2	3	4	5	6	7	8							
1SI	154A		M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI	155A	0.75	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI	157A	2.00	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI	157BA	2.00	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI	157BB	2.00	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI	157CA	1.00	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI	157CB	1.00	M-061-02	50	200	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI	158AA	1.00	M-061-02	100	200	200	200	C	1540BB	D-			VT-2			M-1014-02
1SI	158AB	1.00	M-061-02	100	200	200	200	C	1540BB	D-			VT-2			M-1014-02
1SI	158BA	1.00	M-061-02	100	200	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI	158BB	1.00	M-061-02	100	200	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI	158C	1.00	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1SI	159AA	1.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1SI	159AB	1.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1SI	159AC	1.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1SI	159AD	1.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1SI	160AA	1.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1SI	160AB	1.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1SI	160AC	1.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1SI	160AD	1.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

LINE NUMBER	SIZE	P&I DIAGRAM	MAX OPERATIONS CONDITIONS PRESS PSIG	MAX OPERATIONS CONDITIONS TEMP FAHR	DESIGN CONDITIONS PRESS PSIG	DESIGN CONDITIONS TEMP FAHR	PIPE CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1 EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8							
1SI61AA	0.75	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-05
1SI61AB	0.75	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-05
1SI61AC	0.75	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-06
1SI61AD	0.75	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-06
1SI67A	0.75	M-061-02	75	165	200	200	C	0140BB	D-			VT-2			M-1014-02
1SI68A	1.00	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220		M-1014-02
1SI69DA	1.00	M-061-05	2485	130	2485	200	B	1540BB	C-H			VT-2	IWC1220		M-1014-05
1SI69DB	1.00	M-061-05	2485	130	2485	200	B	1540BB	C-H			VT-2	IWC1220		M-1014-05
1SI69DC	1.00	M-061-06	2485	130	2485	200	B	1540BB	C-H			VT-2	IWC1220		M-1014-06
1SI69DD	1.00	M-061-06	2485	130	2485	200	B	1540BB	C-H			VT-2	IWC1220		M-1014-06
1SI69EA	1.00	M-061-05	700	0130	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-05
1SI69EB	1.00	M-061-05	700	0130	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-05
1SI69EC	1.00	M-061-06	700	0130	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-06
1SI69ED	1.00	M-061-06	700	0130	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-06
1SI71C	1.00	M-061-06	700	120	700	300	B	1505BB	C-H			VT-2	IWC1220		M-1014-06
1SI73AA	1.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-05
1SI73AB	1.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-05
1SI73AC	1.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-06
1SI73AD	1.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220		M-1014-06
1SI76AA	0.75	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220		M-1014-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

LINE NUMBER: SYSTEM	LINE NUMBER: SEQUENCE NUMBER	SIZE (1)	P&I DIAGRAM (2)	MAX OPERATIONS CONDITIONS: PRESS PSIG (3)	MAX OPERATIONS CONDITIONS: TEMP F/HR (4)	DESIGN CONDITIONS: PRESS PSIG (5)	DESIGN CONDITIONS: TEMP F/HR (6)	PIPE CLASS (7)	PIPE DESIGN TABLE (8)	ASME Sec XI Div 1: EXAM CAT.	EXAM METHOD: Volumetric	EXAM METHOD: Surface	EXAM METHOD: Visual	CODE EXEMPTION	RELIEF REQUEST	ISI FLOW DIAGRAM
1S179AA		0.75	M-061-03	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-03
1S179BA		0.75	M-061-03	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-03
1S179AA		2.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1S179BA		2.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1S179CA		2.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1S179DA		2.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1S179EA		2.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1S179FA		2.00	M-061-05	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1S179GA		2.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1S179HA		2.00	M-061-06	700	120	700	300	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1S179JA		2.00	M-061-05	700	120	700	120	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1S179KA		2.00	M-061-05	700	120	700	120	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1S179LA		2.00	M-061-06	700	120	700	120	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1S179MA		2.00	M-061-06	700	120	700	120	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1S179PA		2.00	M-061-05	700	120	700	120	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1S179QA		2.00	M-061-05	700	120	700	120	B	0640BB	C-H			VT-2	IWC1220c		M-1014-05
1S179RA		2.00	M-061-06	700	120	700	120	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1S179SA		2.00	M-061-06	700	120	700	120	B	0640BB	C-H			VT-2	IWC1220c		M-1014-06
1S180A		0.75	M-061-02	2735	0130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
1S181A		0.75	M-061-02	2735	0130	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: SAFETY INJECTION

	LINE NUMBER			P&I DIAGRAM	MAX OPERATING CONDITIONS		DESIGN CONDITIONS		CLASS	PIPE DESIGN TABLE	ASME Sec XI Div 1						
			SIZE		PRESS PSIG	TEMP FAHR	PRESS PSIG	TEMP FAHR			EXAM CAT.	EXAM METHOD Volumetric	EXAM METHOD Surface	EXAM METHOD Visual	CODE EXEMPTION	RELIEF REQUEST	FSI FLOW DIAGRAM
	1	2	3	4	5	6	7	8									
R	1SI82AA		12.00	M-061-01	50	114	50	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
R	1SI82AB		12.00	M-061-01	50	114	50	150	B	0140BB	C-F			VT-2	IWC1220b		M-1014-01
	1SI82BA		12.00	M-061-04	450	350	600	400	B	0640BB	C-F		X				M-1014-04
	1SI82BB		12.00	M-061-04	450	350	600	400	B	0640BB	C-F		X				M-1014-04
	1SI84A		0.75	M-061-02	2735	300	2735	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-02
	1SI85A		0.75	M-061-03	1740	114	2485	300	B	1540BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI86A		0.75	M-061-03	570	350	600	400	B	0640BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI87A		0.75	M-061-03	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI88AA		0.75	M-061-03	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI88AB		0.75	M-061-03	1740	114	1750	300	B	1542BB	C-H			VT-2	IWC1220c		M-1014-03
	1SI91AA		0.75	M-061-04	600	350	600	400	B	0640BB	C-H			VT-2	IWC1220c		M-1014-04
	1SI91AB		0.75	M-061-04	600	350	600	400	B	0640BB	C-H			VT-2	IWC1220c		M-1014-04
	1SI92A		0.75	M-061-06	2485	350	2485	400	B	1540BB	C-H			VT-2	IWC1220c		M-1014-06
	1SI94A		0.75	M-061-06	50	114	2485	200	C	1540CB	B-			VT-2			M-1014-06
R	1SI99AA		0.75	M-061-01	50	114	50	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-01
R	1SI99BA		0.75	M-061-01	50	114	50	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-01
R	1SI99CA		0.75	M-061-01	50	114	50	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-01
R	1SI99DA		0.75	M-061-01	50	114	50	150	B	0140BB	C-H			VT-2	IWC1220c		M-1014-01

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR PRESSURE VESSEL

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
SHELL TO FLANGE	RPVC-WR7	B-A	AUT					SEE REMARKS	
			MUT						PROC. ISI-UT-S78-10
SHELL TO SHELL	RPVC-WR34	B-A	AUT						
CIRCUMFERENTIAL WELDS									
	RPVC-WR18	B-A	AUT						
	RPVC-WR29	B-A	AUT						
LOWER HEAD TO SHELL	RPVC-WR16	B-A	AUT						
NOZZLE TO VESSEL	RPVN-A	B-D	AUT						
	RPVN-B	B-D	AUT						
	RPVN-C	B-D	AUT						
	RPVN-D	B-D	AUT						
	RPVN-E	B-D	AUT						
	RPVN-F	B-D	AUT						
	RPVN-G	B-D	AUT						

REMARKS: (AUT) AUTOMATED ULTRASONIC EXAMINATIONS FOR THE REACTOR VESSEL INSPECTION PLAN ARE DESCRIBED IN DETAIL ON PDC/FULL INTERNATIONAL'S INSPECTION PLAN DOCUMENT 6457100G001.

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR PRESSURE VESSEL

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
NOZZLE INSIDE RADIUS	RPVN-A	B-D	AUT					SEE REMARKS	
	RPVN-B	B-D	AUT						
	RPVN-C	B-D	AUT						
	RPVN-D	B-D	AUT						
	RPVN-E	B-D	AUT						
	RPVN-F	B-D	AUT						
	RPVN-G	B-D	AUT						
NOZZLE TO SAFE END	RPVS-A	B-F	AUT	X				IRC 01 R	
	RPVS-B	B-F	AUT	X				IRC 01 R	
	RPVS-C	B-F	AUT	X				IRC 01 R	
	RPVS-D	B-F	AUT	X				IRC 01 R	
	RPVS-E	B-F	AUT	X				IRC 01 R	
	RPVS-F	B-F	AUT	X				IRC 01 R	
	RPVS-G	B-F	AUT	X				IRC 01 R	
SAFE END EXTENSION	FW 1	B-J	AUT	X				IRC 01 R	
TO PIPE WELD	FW 12	B-J	AUT	X				IRC 01 R	
	FW 13	B-J	AUT	X				IRC 01 R	
	FW 24	B-J	AUT	X				IRC 01 R	
	FW 25	B-J	AUT	X				IRC 01 R	

REMARKS:

PRESERVICE COMPONENTS

PROGRAM PLAN

OJECT

PILGRIM UNIT 1

SYSTEM IDENTIFICATION

REACTOR PRESSURE VESSEL

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
			UT	PT	VT				
SAFE END EXTENSION	FW 36	B-J	MUT	X				IRC 01 R	
TO PIPE WELD	FW 37	B-J	MUT	X				IRC 01 R	
	FW 38	B-J	MUT	X				IRC 01 R	
RPV INSTRUMENT	RPV-I01	B-E			VT-2			IRC 01 R	
PENETRATION TUBES @LOWER HEAD	-THRU-								
	RPV-I58								
RPV CLOSURE STUDS	RPV-S01	B-G-1	X	X				IRC 01 R	
	-THRU-								
	RPV-S54								
RPV CLOSURE HEAD NUTS	RPV-N01	B-G-1		X				IRC 01 R	
	-THRU-								
	RPV-N54								
RPV CLOSURE WASHERS	RPV-W01				VT-1			IRC 01 R	
	-THRU-								
	RPV-W54								
RPV LIGAMENT AREA		B-G-1	X					FIG. IWB-2500-4	PROC. ISI-UT-S78-10

EMARKS

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR PRESSURE VESSEL CLOSURE HEAD

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
			UT	PT	VT				
CLOSURE HEAD FLANGE CIRCUMFERENTIAL WELD	RVHC-01	B-A	X	X				1RC 01 R	FIG. IWB-2500-5
HEAD DOME CIRCUMFERENTIAL WELD	RVHC-02	B-A	X					1RC 01 R	FIG. IWB-2500-3
CONTROL ROD DRIVE MECHANISM PENETRATIONS (78)	RVH-CRD1 -THRU- RVH-CRD78	B-E			VT-2			1RC 01 R	AWAITING INFORMATION ON WELD DETAILS
CONTROL ROD HOUSING WELDS (78)	CRD-01 -THRU- CRD78	B-O		X		IWB2200		1RC 01 R	AWAITING INFORMATION ON WELD DETAILS
CLOSURE HEAD VENT NOZZLE PENETRATION AND ASSOCIATED PIPING	RVH-N1	B-E			VT-2	IWB1220		1RC 01 R	

REMARKS: EXAMINATION SHALL INCLUDE ESSENTIALLY 100% OF THE WELDS IN THE INSTALLED PRESSURIZER CONTROL ROD DRIVE HOUSING ONLY. (REF. IWB-2500)

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT PUMP IRC 01 PA - LOOP #1

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
Pump casing-internal surfaces	B-L-2			VT-1				
Motor flywheel, high stress region at bore and keyway		X	X	VT-1				Reg. Guide 1.14
Bolting; Stud and Nut #1	B-G-1	X	X	VT-1				
#2	B-G-1	X	X	VT-1				
#3	B-G-1	X	X	VT-1				
#4	B-G-1	X	X	VT-1				
#5	B-G-1	X	X	VT-1				
#6	B-G-1	X	X	VT-1				
#7	B-G-1	X	X	VT-1				
#8	B-G-1	X	X	VT-1				
#9	B-G-1	X	X	VT-1				
#10	B-G-1	X	X	VT-1				
#11	B-G-1	X	X	VT-1				
#12	B-G-1	X	X	VT-1				
#13	B-G-1	X	X	VT-1				
#14	B-G-1	X	X	VT-1				
#15	B-G-1	X	X	VT-1				

REMARKS:

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT PUMP IRC 01 PA - LOOP #1

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
		UT	PT	VT				
Bolting: Stud and Nut #16	B-G-1	X	X	VT-1				
Flange Ligament Areas	B-G-1			VT-1				
Stud Hole Threads	B-G-1			VT-1				

REMARKS

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT PUMP IRC 01 PB - LOOP #2

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
Pump casing-internal surfaces	B-L-2			VT-1				
Motor flywheel, high stress region at bore and keyway		X	X	VT-1				Reg. Guide 1.14
Bolting; Stud and Nut #1	B-G-1	X	X	VT-1				
#2	B-G-1	X	X	VT-1				
#3	B-G-1	X	X	VT-1				
#4	B-G-1	X	X	VT-1				
#5	B-G-1	X	X	VT-1				
#6	B-G-1	X	X	VT-1				
#7	B-G-1	X	X	VT-1				
#8	B-G-1	X	X	VT-1				
#9	B-G-1	X	X	VT-1				
#10	B-G-1	X	X	VT-1				
#11	B-G-1	X	X	VT-1				
#12	B-G-1	X	X	VT-1				
#13	B-G-1	X	X	VT-1				
#14	B-G-1	X	X	VT-1				
#15	B-G-1	X	X	VT-1				

REMARKS

PRESERVICE COMPONENTS

PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT PUMP 1PC 01 PB - LOOP #2

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
		UT	PT	VT				
Bolting; Stud and Nut #16	B-G-1	X	X	VT-1				
Flange Ligament Areas	B-G-1			VT-1				
Stud Hole Threads	B-G-1			VT-1				

REMARKS

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT PUMP IRC 01 PC - LOOP #3

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
Pump casing-internal surfaces	B-L-2			VT-1				
Motor flywheel, high stress-region		X	X	VT-1				Reg. Guide 1.14
at bore and keyway								
Bolting; Stud and Nut #1	B-G-1	X	X	VT-1				
#2	B-G-1	X	X	VT-1				
#3	B-G-1	X	X	VT-1				
#4	B-G-1	X	X	VT-1				
#5	B-G-1	X	X	VT-1				
#6	B-G-1	X	X	VT-1				
#7	B-G-1	X	X	VT-1				
#8	B-G-1	X	X	VT-1				
#9	B-G-1	X	X	VT-1				
#10	B-G-1	X	X	VT-1				
#11	B-G-1	X	X	VT-1				
#12	B-G-1	X	X	VT-1				
#13	B-G-1	X	X	VT-1				
#14	B-G-1	X	X	VT-1				
#15	B-G-1	X	X	VT-1				

REMARKS

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT PUMP IRC 01 PC - LOOP #3

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
		UT	PT	VT				
Bolting; Stud and Nut @16	B-G-1	X	X	VT-1				
Flange Ligament Areas	B-G-1			VT-1				
Stud Hole Threads	B-G-1			VT-1				

REMARKS:

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: REACTOR COOLANT PUMP IRC 01 PD-LOOP #4

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
Pump casing-internal surfaces	B-L-2			VT-1				
Motor flywheel, high stress region at bore and keyway		X	X	VT-1				Reg. Guide 1.14
Bolting; Stud and Nut #1	B-G-1	X	X	VT-1				
#2	B-G-1	X	X	VT-1				
#3	B-G-1	X	X	VT-1				
#4	B-G-1	X	X	VT-1				
#5	B-G-1	X	X	VT-1				
#6	B-G-1	X	X	VT-1				
#7	B-G-1	X	X	VT-1				
#8	B-G-1	X	X	VT-1				
#9	B-G-1	X	X	VT-1				
#10	B-G-1	X	X	VT-1				
#11	B-G-1	X	X	VT-1				
#12	B-G-1	X	X	VT-1				
#13	B-G-1	X	X	VT-1				
#14	B-G-1	X	X	VT-1				
#15	B-G-1	X	X	VT-1				

REMARKS

REACTOR COOLANT PUMP [illegible]

[illegible]	EXAM CAT.	NDE METHOD			CODE [illegible]	REMARKS	REF DRAWINGS	NOTES
		[illegible]	[illegible]	[illegible]				
Bolting; Stud and Nut @16	B-G-1	X	X	VT-1				
Flange Ligament Areas	B-G-1			VT-1				
Stud Hole Threads	B-G-1			VT-1				

REMARKS

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: PRESSURIZER VESSEL NO. 1RY 01 S

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
SUPPORT SKIRT-TO-VESSEL WELD	PS-01	B-H		X				1 RY 01 S	FIG. IWB-2500-13
BOTTOM HEAD-TO-LOWER SHELL	PC-01	B-B	X					1 RY 01 S	FIG. IWB-2500-1
LOWER SHELL LONGITUDINAL WELD	PL-01	B-B	X					1 RY 01 S	FIG. IWB 2500-2
SHELL TO SHELL CIRCUMFERENTIAL WELD	PC-02	B-B	X					1 RY 01 S	FIG. IWB 2500-1
LONGITUDINAL WELD	PL-02	B-B	X					1 RY 01 S	FIG. IWB 2500-2
SHELL-TO-SHELL CIRCUMFERENTIAL	PC-03	B-B	X					1 RY 01 S	FIG. IWB 2500-1
LONGITUDINAL WELD	PL-03	B-B	X					1-RY 01 S	FIG. IWB 2500-2
UPPER SHELL CIRCUMFERENTIAL	PC-04	B-B	X					1 RY 01 S	FIG. IWB 2500-1
UPPER SHELL LONGITUDINAL	PL-04	B-B	X					1 RY 01 S	FIG. IWB 2500-2
UPPER HEAD-TO-SHELL CIRCUMFERENTIAL WELD	PC-05	B-B	X					1 RY 01 S	FIG. IWB 2500-1

REMARKS

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: PRESSURIZER VESSEL NO. 1 RY 01 S

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
SURGE NOZZLE (1 RY 11A14)-TO-	N-01	B-D	X					1 RY 01 S	SEE REMARK #1
BOTTOM HEAD WELD									
SPRAY NOZZLE (1 RY 01 C4)-TO-	N-02	B-D	X					1 RY 01 S	SEE REMARK #1
TOP HEAD WELD									
SAFETY VALVE NOZZLE (1 RY [illegible] A6)	N-03	B-D	X					1 RY 01 S	SEE REMARK #1
TO TOP HEAD WELD									
RELIEF VALVE NOZZLE (1 RY 03 AB6")	N-04	B-D	X					1 RY 01 S	SEE REMARK #1
TO TOP HEAD WELD									
RELIEF VALVE NOZZLE (1 RY 03 AA6")	N-05	B-D	X					1 RY 01 S	SEE REMARK #1
TO TOP HEAD WELD									
RELIEF VALVE NOZZLE (1 RY 03 AC6")	N-06	B-D	X					1 RY 01 S	SEE REMARK # 1
TO TOP HEAD WELD									
MANWAY TO TOP HEAD WELD	N-07	B-D	X					1 RY 01 S	SEE REMARK #1
SUPPORT BRACKET UPPER SHELL	SB-01	B-H		X				1 RY 01 S	FIG. IWB 2500-15

REMARKS:

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: PRESSURIZER VESSEL NO. 1 RY 01 S

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
SUPPORT BRACKET UPPER SHELL	SB-02	B-H		X				1 RY 01 S	FIG. IWB 2500-15
SUPPORT BRACKET UPPER SHELL	SB-03	B-H		X				1 RY 01 S	FIG. IWB 2500-15
SUPPORT BRACKET UPPER SHELL	SB-04	B-H		X				1 RY 01 S	FIG. IWB 2500-15
MANWAY BOLTING (20) BOLTS		B-G-2			VT-1			1 RY 01 S	1½" DIA.
SUPPORT SKIRT FLANGE (24) BOLTS		B-G-2			VT-1			1 RY 01 S	1½" DIA.
INSTRUMENT NOZZLE CPLG	E-1	B-P			VT-2			1 RY 01 S	
	E-2	B-P			VT-2			1 RY 01 S	
	E-3	B-P			VT-2			1 RY 01 S	
	E-4	B-P			VT-2			1 RY 01 S	
	E-5	B-P			VT-2			1 RY 01 S	
	E-6	B-P			VT-2			1 RY 01 S	
	E-7	B-P			VT-2			1 RY 01 S	
	E-8	B-P			VT-2			1 RY 01 S	
		B-E			VT-2			1 RY 01 S	

ELDS AND NOZZLE INSIDE RADIUM SECTION EXAMINATION AND VOLUME COVERAGE PER ASME SECTION XI

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: STEAM GENERATOR NO. IRC 01 BA

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
			UT	PT	VT				
BOTTOM HEAD-TO-CHANNEL HEAD CIRCUMFERENTIAL WELD	SGC-01	B-B	X			-	-	IRC 01 BA	FIG. IWB-2500-6
MAIN SUPPORT PAD @ 31°-30'	S-01	B-H		X				IRC 01 BA	FIG IWB-2500-15
MAIN SUPPORT PAD @ 121°-30'	S-02	B-H		X				IRC 01 BA	FIG. IWB-2500-15
MAIN SUPPORT PAD @ 211°-30'	S-03	B-H		X				IRC 01 BA	FIG. IWB-2500-15
MAIN SUPPORT PAD @ 301°-30'	S-04	B-H		X				IRC 01 BA	FIG. IWB-2500-15
PRIMARY MANWAY - 16 BOLTS	9-A	B-G-2			VT-1			IRC 01 BA	SIZE (1.88"-8 UN)
SECONDARY MANWAY - 16 BOLTS	9-B	B-G-2			VT-1			IRC 01 BA	SIZE (1.88"-8 UN)
100% STEAM GENERATOR TUBING		B-Q	EDDY	CURRENT				-	REG. GUIDE 1.83 REV. 1

REMARKS: CLASS 1

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: STEAM GENERATOR NO. 1 RC 01 BA

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
			UT	PT	VT				
CHANNEL HEAD-TO-STUB BARREL CIRCUMFERENTIAL WELD	SGC-02	C-A	X					1RC 01 BA	FIG IWC-2520-1
STUB BARREL-TO-LOWER SHELL BARELL 'A' CIRC WELD	SGC-03	C-A	X					1RC 01 BA	FIG IWC-2520-1
LOWER SHELL BARREL 'A' TO BARREL 'B' CIRC WELD	SGC-04	C-H			VT-2			1RC 01 BA	
LOWER SHELL BARREL 'B' TO TRANSITION CONE CIRC WELD	SGC-05	C-A	X					1RC 01 BA	FIG IWC-2520-1
CONICAL SHELL-TO-UPPER BARREL 'A' CIRC WELD	SGC-06	C-A	X					1RC 01 BA	FIG IWC-2520-1
UPPER BARREL 'A' TO BARREL 'B' CIRC WELD	SGC-07	C-H			VT-2			1RC 01 BA	
UPPER BARREL 'B' TO UPPER HEAD CIRC WELD	SGC-08	C-A	X					1RC 01 BA	FIG IWC-2520-1

REMARKS: CLASS 2 CIRCUMFERENTIAL WELDS

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: STEAM GENERATOR NO. 1RC 01 BA

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
16" FEEDWATER NOZZLE	SGN-02	C-B	X	X				1RC 01 BA	FIG IWC-2520-4
TO VESSEL STUB BARREL									
32" MAIN STEAM NOZZLE	SGN-03	C-B	X	X				1RC 01 BA	FIG IWC-2520-4
TO VESSEL STUB BARREL									
2" BOTTOM BLOWDOWN	SGN-4A	C-H			VT-2	IWC1220		1RC 01 BA	
NOZZLE PENETRATION									
2" BOTTOM BLOWDOWN	SGN-4B	C-H			VT-2	IWC1220		1RC 01 BA	
NOZZLE PENETRATION									
1" SECONDARY SHELL	SGN-5A	C-H			VT-2	IWC1220		1RC 01 BA	
DRAIN NOZZLE PENETRATION									
1" SECONDARY SHELL	SGN-5B	C-H			VT-2	IWC1220		1RC 01 BA	
DRAIN NOZZLE PENETRATION									
3/4" WIDE RANGE LEVEL	SGN-6A	C-H			VT-2	IWC1220		1RC 01 BA	
TAP NOZZLE PENETRATION									
3/4" WIDE RANGE LEVEL	SGN-6B	C-H			VT-2	IWC1220		1RC 01 BA	
TAP NOZZLE PENETRATION									
2" SAMPLING TAP	SGN-07	C-H			VT-2	IWC1220		1RC 01 BA	
NOZZLE PENETRATION									
3/4" NARROW RANGE LEVEL	SGN-8A	C-H			VT-2	IWC1220		1RC 01 BA	
TAP NOZZLE PENETRATION									

REMARKS: CLASS 2 NOZZLE WELDS

PRESERVICE COMPONENTS
PROGRAM PLAN

OJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: STEAM GENERATOR NO. 1RC 01 BA

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
3/4" NARROW RANGE LEVEL SGN-8B	C-H			VT-2	IWC1220(		1RC 01 BA	
TAP NOZZLE PENETRATION								
SECONDARY MANWAY SGN-10A	C-H			VT-2	NOTES		1RC 01 BA	IWC-2500-1 CAT. C-B
NOZZLE TO UPPER SHELL 'B'								FOOTNOTE #1
SECONDARY MANWAY SGN-10B	C-H			VT-2	NOTES		1RC 01 BA	IWC-2500-1 CAT. C-B
NOZZLE TO UPPER SHELL 'B'								FOOTNOTE #1
2" INSPECTION OPENINGS SGN-11A	C-H			VT-2	IWC1220(		1RC 01 BA	
(VESSEL PENETRATIONS) SGN-11B	C-H			VT-2	IWC1220(		1RC 01 BA	
SGN-11C	C-H			VT-2	IWC1220(		1RC 01 BA	
SGN-11D	C-H			VT-2	IWC1220(		1RC 01 BA	
3/8" PRIMARY HEAD SGN-12	C-H			VT-2	IWC1220(		1RC 01 BA	
DRAIN PENETRATION								
6" AUX. FEEDWATER SGN-13	C-B	X	X				1RC 01 BA	FIG. IWC-2520-4
NOZZLE TO VESSEL								

MARKS

CLASS 2 NOZZLE WELDS

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: STEAM GENERATOR NO. 1 RC 01 BA

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
STUB BARREL LONGITUDINAL WELD	SGL-01	C-H			VT-2			1RC 01 BA	
LOWER SHELL BARREL 'A' LONGITUDINAL WELD	SGL-02	C-H			VT-2			1RC 01 BA	
LOWER SHELL BARREL 'B' LONGITUDINAL WELD	SGL-03	C-H			VT-2			1RC 01 BA	
CONICAL SHELL LONGITUDINAL WELD 058°-30'	SGL-04	C-H			VT-2			1RC 01 BA	
CONICAL SHELL LONGITUDINAL WELD 178°-30	SGL-05	C-H			VT-2			1RC 01 BA	
CONICAL SHELL LONGITUDINAL WELD 298-30'	SGL-06	C-H			VT-2			1RC 01 BA	
UPPER SHELL BARREL 'A' LONGITUDINAL WELD	SGL-07	C-H			VT-2			1RC 01 BA	
UPPER SHELL BARREL 'B' LONGITUDINAL WELD	SGL-08	C-H			VT-2			1RC 01 BA	
UPPER HEAD MERIDIONAL WELD 058°-30'	SGL-09	C-H			VT-2			1RC 01 BA	
UPPER HEAD MERIDIONAL WELD 238°-30'	SGL-10	C-H			VT-2			1RC 01 BA	

REMARKS: CLASS 2 LONGITUDINAL WELDS

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: STEAM GENERATOR NO. IRC 01 BB

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
BOTTOM HEAD-TO-CHANNEL HEAD CIRCUMFERENTIAL WELD	SGC-01	B-B	X			-	-	IRC 01 BB	FIG. IWB-2500-6
MAIN SUPPORT PAD @ 31°-30'	S-01	B-H		X				IRC 01 BB	FIG. IWB-2500-15
MAIN SUPPORT PAD @ 121°-30'	S-02	B-H		X				IRC 01 BB	FIG. IWB-2500-15
MAIN SUPPORT PAD @ 211°-30'	S-03	B-H		X				IRC 01 BB	FIG IWB-2500-15
MAIN SUPPORT PAD @ 301°-30'	S-04	B-H		X				IRC 01 BB	FIG IWB-2500-15
PRIMARY MANWAY - 16 BOLTS	9-A	B-G-2			VT-1			IRC 01 BB	SIZE (1.88"-8 UN)
SECONDARY MANWAY - 16 BOLTS	9-B	B-G-2			VT-1			IRC 01 BB	SIZE (1.88"-8 UN)
100% STEAM GENERATOR TUBING		B-Q	EDDY CURRENT					-	REG. GUIDE 1.83 REV. 1

REMARKS:

CLASS I

CLASS II: Examination of the Class 2 welds/components of steam generator IRC 01 BB are as noted for vessel IRC 01 B, However, in conformance with Table IWC-2500-1 Exam Category C-A Note 3 "In the case of multiple vessels of similar design, size and service (such as steam generators) the required examinations may be limited to one vessel or distributed among the vessels", a VT-2 exam shall be preformed in lieu of volumetric

PRESERVICE COMPONENTS

PROJECT

[illegible] UNIT 1

SYSTEM IDENTIFICATION

STEAM GENERATOR NO. IRC 01 BC

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
BOTTOM HEAD-TO-CHANNEL HEAD CIRCUMFERENTIAL WELD	SCC-01	B-B	X			-	-	IRC 01 BC	FIG. IWB-2500-6
MAIN SUPPORT PAD @ 31°-30'	S-01	B-H		X				IRC 01 BC	FIG. IWB-2500-15
MAIN SUPPORT PAD @ 121°-30'	S-02	B-H		X				IRC 01 BC	FIG. IWB-2500-15
MAIN SUPPORT PAD @ 211°-30'	S-03	B-H		X				IRC 01 BC	FIG. IWB-2500-15
MAIN SUPPORT PAD @ 301°-30'	S-04	B-H		X				IRC 01 BC	FIG. IWB-2500-15
PRIMARY MANWAY - 16 BOLTS	9-A	B-G-2			VT-1			IRC 01 BC	SIZE (1.88"-8 UN)
SECONDARY MANWAY - 16 BOLTS	9-B	B-G-2			VT-1			IRC 01 BC	SIZE (1.88"-8 UN)
100% STEAM GENERATOR TUBING		B-Q	EDDY	CURRENT				-	REG. GUIDE 1.83 REV. 1

REMARKS

CLASS 1

CLASS 2: Examination of the Class 2 welds/components of steam generator IRC 01 BC are as noted for vessel IRC 01 BA. However, in conformance with Table IWC-2500-1 Exam Category C-A Note 3 "In the case of multiple vessels of similar design, size, and service (such as steam generators) the required examinations may be limited to one vessel or distributed among the vessels", a VT-2 exam shall be per-

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: TON UNIT 1

SYSTEM IDENTIFICATION: STEAM GENERATOR NO. IRC 01 BD

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
TOM HEAD-TO-CHANNEL HEAD	SGC-01	B-B	X			-	-	IRC 01 BD	FIG. IWB-2500-6
RCUMFERENTIAL WELD									
IN SUPPORT PAD @ 31°-30'	S-01	B-H		X				IRC 01 BD	FIG. IWB-2500-15
IN SUPPORT PAD @ 121°-30'	S-02	B-H		X				IRC 01 BD	FIG. IWB-2500-15
IN SUPPORT PAD @ 211°-30'	S-03	B-H		X				IRC 01 BD	FIG. IWB-2500-15
IN SUPPORT PAD @ 301°-30'	S-04	B-H		X				IRC 01 BD	FIG. IWB-2500-15
IMARY MANWAY - 16 BOLTS	9-A	B-G-2			VT-1			IRC 01 BD	SIZE (1.88"-8 UN)
CONDARY MANWAY - 16 BOLTS	9-B	B-G-2			VT-1			IRC 01 BD	SIZE (1.88"-8 UN)
00% STEAM GENERATOR TUBING		B-Q	EDDY	CURRENT				-	REG. GUIDE 1.83
									REV. 1

REMARKS

CLASS 1

CLASS 2: Examination of the Class 2 welds/components of steam generator IRC 01 BD are as noted for vessel IRC 01 BA. However, in conformance with Table IWC-2500-1 Exam Category C-A Note 3 "In the case of multiple vessels of similar design, size, and service (such as steam generators) the required examinations may be limited to one vessel or distributed among the vessels", a VT-2 exam shall be per-

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: RESIDUAL HEAT EXCHANGER NO. 1RH 02 AA & AB

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD UT	NDE METHOD PT	NDE METHOD VT	CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
1 RH 02 AA:								1RH 02 AA & AB	
FLANGE CIRCUMFERENTIAL	RHEC-01	C-A	X						FIG. IWC 2520-1
LOWER HEAD CIRCUMFERENTIAL	RHEC-02	C-A	X						FIG IWC 2520-1
SUPPORT SKIRT WELD	RHES-01	C-C		X					FIG. IWC 2520-5
1RH 02 AB								1RH 02 AA & AB	
FLANGE CIRCUMFERENTIAL	RHEC-01	C-A			VT-2				SEE REMARKS
LOWER HEAD CIRCUMFERENTIAL	RHEC-02	C-A			VT-2				SEE REMARKS
SUPPORT SKIRT WELD	RHES-01	C-C			VT-2				SEE REMARKS

REMARKS: EXAMINATION OF THE CLASS 2 WELDS/COMPONENTS OF RESIDUAL HEAT EXCHANGER 1RH02AB ARE AS NOTED FOR VESSEL 1RH02AA. HOWEVER IN CONFORMANCE WITH TABLE IWC-2500-1 EXAM CATEGORY C-A NOTE 3 "IN THE CASE OF MULTIPLE VESSELS OF SIMILAR DESIGN, SIZE, AND SERVICE (SUCH AS HEAT EXCHANGERS) THE REQUIRED EXAMINATIONS MAY BE LIMITED TO ONE VESSEL OR DISTRIBUTED AMONG THE VESSELS", A VT-2 EXAM SHALL BE PERFORMED IN LIEU OF VOLUMETRIC AND/OR SURFACE EXAM.

SECTION III

INSPECTION ACCESS

Section III

Inspection Access

1) Design access problems to be identified by CECo/S&L and relief request generated.

2) Access problems encountered during Preservice Inspection to be identified by Ebasco and incorporated in Program Plan.

SECTION IV

EXAMINATION EQUIPMENT

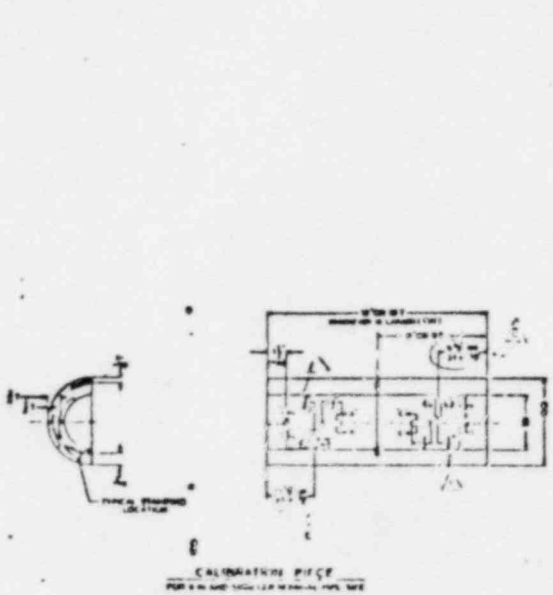
Section IV

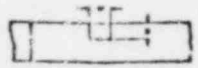
Examination Equipment

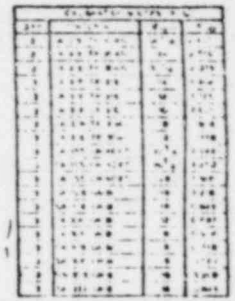
Examination of the reactor pressure vessel pressure retaining welds will be performed using remotely operated ultrasonic equipment. A description of this equipment is provided as part of each automatic ultrasonic examination procedure in Section V of this document.

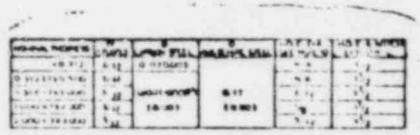
Examination of the steam generator tubing will be performed using remotely operated multi-frequency eddy-current equipment. A description of this equipment is provided as part of eddy current test procedure in Section V of this document.

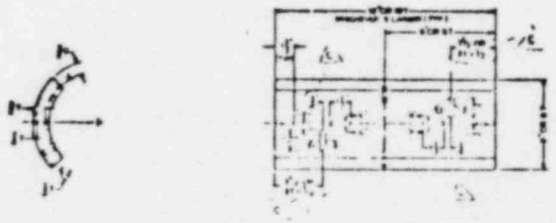
The ultrasonic test calibration blocks and eddy current test standard were fabricated from material in accordance with ASME Section XI requirements, relative to the component to be examined. A listing of calibration blocks is provided in this section along with their fabrication drawings.

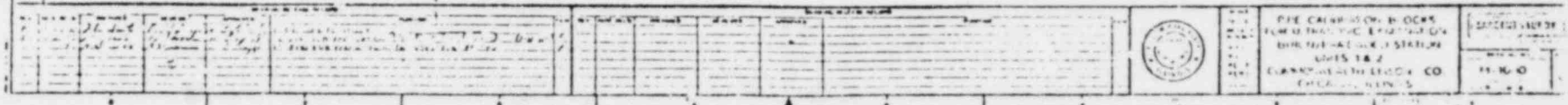












SECTION V

PROCEDURES

Section V

Procedures

A listing of the nondestructive testing procedures required for Code examination are provided in this section. Also, included in the list are some additional procedures that were developed for examination not required by Code, such as wall thickness measurement, locating of welds, verification of geometric anomalies and locating and mapping laminar type discontinuities in seam welded pipe. Copies of all nondestructive testing procedures are included in this section. The procedures for the automatic ultrasonic examination of the reactor pressure vessel welds and eddy current examination of the steam generator tubing provide a description of the mechanized equipment used in these examinations.

A listing of the administrative procedures required for proper implementation and control of the Preservice Inspection program is provided in this section and copies of the procedures are included.

TITLE: CONTROL OF NONDESTRUCTIVE EXAMINATION STATUS

LEGEND: R - INDICATES REVISION

DATE: June 9, 1981

PREPARED BY | REVIEWED BY | APPROVED BY

REPLACES ISSUE OF: June 1, 1981

REV	PREPARED	APPROVED
1		WS

1.0 SCOPE

This procedure provides for control of preservice examinations to assure that the required welds/components are properly examined.

2.0 REFERENCE DOCUMENTS

2.1 Ebasco Nuclear Quality Assurance Program Manual ETR-1001

2.2 ASME Section XI 1977 Edition with addenda through summer 1978.

2.3 ISI Preservice Examination Checklist Form 1338/5-81 (attached)

2.4 Applicable Quality Control Procedures.

3.0 RESPONSIBILITY

The PSI/ISI Site Supervisor shall be responsible for developing and maintaining a checklist to assure each item requiring examination is examined using the proper procedure and calibration block. He will also verify that the items have been properly identified and that the data reports are in conformance with the applicable NDE Procedure and correlate to the Section XI test requirements.

4.0 IMPLEMENTATION OF CHECKLIST

4.1 The PSI/ISI Site Supervisor or his designee, shall implement the preservice inspection checklist on a system by system basis as follows:

(a) Perform a walkdown of the system to verify weld/component location and identification employing drawings provided by CeCo Project Construction Department.

(b) Record weld/component identification in proper space on checklist.

(c) Refer to ASME Section XI to determine examination category of weld/component and record in proper space on checklist.

(d) Based on (c) above indicate on checklist which NDE method are to be employed for examinations.

(e) Determine specific NDE procedure(s) to be used and record procedure number in proper space on checklist.

(f) If examination method is ultrasonic, determine from calibration block list and pipe size the calibration block to be used and record block serial number in proper space on checklist.

(g) After review and approval of inspection data sheet record date completed and data report number in proper space on checklist.

(h) When final isometric drawings are received verify that proper identification has been applied to weld.

(i) Repeat item 4.1 (a) through (h) for welds/components in vessels and other major items such as large pumps and valves which contain pressure retaining welds requiring Section XI NDE examination.

TITLE	LEGEND	DATE
DISTRIBUTION AND CONTROL OF SITE PSI/ISI PROCEDURES, INSTRUCTIONS AND DRAWINGS	R - INDICATES REVISION	July 22, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
			June 9, 1981

REV	PREPARED	APPROVED
2		WS

1.0 SCOPE

The purpose of this procedure is to establish guidelines and delineate methods for the control of all procedures, instructions and drawings for activities affecting quality during the active phase of Preservice examination.

2.0 REFERENCE DOCUMENTS

2.1 Ebasco Nuclear Quality Assurance Program Manual ETR-1001.

2.2 Applicable Quality Control Procedures.

3.0 ATTACHMENT

3.1 Procedure Control Log

3.2 NDE Manual Control Log

3.3 Transmittal of drawings form 403

4.0 RESPONSIBILITY

4.1 It shall be the responsibility of Ebasco's Inservice Inspection Group to prepare, make distribution and control of, procedures and specifications for quality control activities during nondestructive examination in accordance with ASME Section XI.

4.2 It shall be the responsibility of Ebasco Mechanical Design to prepare, and make distribution of Preservice Isometrics drawings.

4.3 It shall be the responsibility of the PSI/ISI Site Supervisor or his designee, for distribution and control of procedures, specifications and drawings at the Byron Site.

5.0 DISTRIBUTION AND CONTROL OF PROCEDURES

5.1 The PSI/ISI Site Supervisor or his designee, shall maintain a Site Procedure Control Log for all procedures and/or specifications employed during preservice examination.

5.2 NDE procedures will be issued to NDE personnel in the form of a NDE Procedure Manual.

5.3 NDE personnel shall be responsible for maintaining the NDE Procedure Manual, and shall sign the Site NDE Procedure Control Log indicating they have received their copies of the NDE Procedure Manual.

5.4 Site revision to procedures shall be initiated by the PSI/ISI Site Supervisor or his designee, the revised procedure shall be re-issued by the ISI Group with Clients approval prior to field implementation.

6.0 DISTRIBUTION AND CONTROL OF PSI DRAWINGS

6.1 The PSI isometrics drawings shall be prepared by the Mechanical Design Dept. and shall be transmitted via speed letter, to the PSI/ISI Site Supervisor or his designee, for review and verification.

6.2 The PSI/ISI Site Supervisor or his designee, shall enter the ISI unique weld/component identification for those weld/components requiring volumetric and/or surface examination, and shall review the drawings for conformance with the as-built condition.

6.3 Marked-up drawings shall be transmitted back to Mechanical Design for resolution of comments and incorporation of ISI designations. Updated drawings shall be transmitted back to the PSI/ISI Site Supervisor or his designee for verification and sign-off of form 403.

6.4 All superseded drawings shall be permanently stamped "superseded" and/or "for information only".

6.5 The Ebasco PSI/ISI Site Supervisor shall maintain a log of the drawings received together with the latest revision. The log shall also indicate status of review e.g. walkdown completed, drawing sent to client for approval, etc.

PROCEDURE CONTROL LOG

PROCEDURE NO._____

Type of Issue:	Prepared by:	Reviewed by:	Approval by:	Issue Date:
Draft				
Prelim.				
Rev. 0				
Rev. 1				
Rev. 2				
Rev. 3				
Re				
Rev. 5				

REMARKS:

Attachment 1

DISTRIBUTION OF
NONDESTRUCTIVE EXAMINATION PROCEDURES
FOR
COMMONWEALTH EDISON

MANUAL NO.	DATE OF ISSUE	ASSIGNEE'S NAME

403/12-76

EBASCO SERVICES INCORPORATED

TRANSMITTAL OF DRAWINGS FOR REVIEW

DISTRIBUTION

White – Attach to individual Drawing/Print (use Photo Copies as required for concurrent review) and route as directed.
Green – To Project Coordinator (info only)
Yellow – To Project Engineer (info only)
Pink – Originator follow-up file

DESIGN SUPERVISOR/SENIOR DESIGN ENGINEER

Prepare separate Transmittal for each drawing or group of subject-related drawings and use only in conjunction with Engineering Procedure E-71 "Processing Drawings for Review and Approval" (for Approval, use Form 403.3).

☐ QA REVIEW
☐ PLOT PLAN & GENERAL ARRANGEMENT REVIEW
☐ AGS REVIEW (concurrent review NOT permitted)

DATE _____
OFS NO. _____
CLIENT _____
PROJECT _____

APPLICABLE DEPARTMENTS/DISCIPLINES FOR ROUTING OR CONCURRENT REVIEW

√ **	NAME(S)	LOCATION	DEPT/DISCIPLINE	REVIEWED BY*** (SIGNATURE)	ADDITIONAL SIGNATURES FOR PLOT PLAN AND QA REVIEW ONLY: SUPERVISING*** ENGINEER	ADDITIONAL SIGNATURES FOR PLOT PLAN AND QA REVIEW ONLY: CHIEF ENGINEER*** DIRECTOR OR MANAGER
			Applied Physics			
			AGSD			
			Buildings - HVAC			
			Buildings - Plumbing			
			Civil			
			Construction			
			Corrosion			
			Electrical			
			Instr & Control			
			Mechanical Consulting			
			Mechanical Nuclear			
			Nuclear Safety Review			
			Project Engineering			
			Quality Assurance Engr			
			Radwaste			
			Risk Management			
			Water Treatment			
			Materials Application			

DRAWING NO.	REV	TITLE	*COMMENTS YES/NO	*COMMENTS DATE	COMMENTS RESOLVED YES/NO	COMMENTS RESOLVED DATE	COMMENTS RESOLVED INITIAL

ATTACH DRAWINGS/PRINTS FOR REVIEW

* If yes, attach marked up print or written comments.

** Check Reviewing Depts per Document Review Instruction Part E-71.

*** Return signed copy of this Form with attachments, if any, (for Departmental Files)

Attachment 3

TITLE: CONTROL OF NONCONFORMANCES AND CORRECTIVE ACTION

LEGEND: R - INDICATES REVISION

DATE: June 10, 1981

PREPARED BY | REVIEWED BY | APPROVED BY

REPLACES ISSUE OF: June 3, 1981

REV	PREPARED	APPROVED
1		

1.0 SCOPE

The purpose of this procedure is to establish guidelines and methods in accordance with project requirements and applicable references to be used for the initiation, processing and resolution of Nonconformance Reports generated by the Ebasco Inservice Inspection Group.

2.0 REFERENCE DOCUMENTS

2.1 Ebasco Nuclear Quality Assurance Program Manual ETR-1001.

2.2 ASME Section XI 1977 Edition with addenda through Summer 1978.

2.3 Ebasco Services Nonconformance Report Form 6009-11/5-77

3.0 RESPONSIBILITY

3.1 It shall be the responsibility of the Ebasco PSI/ISI Site Supervisor, to identify, document, number and verify corrective action of Site Nonconformance Reports pertaining to preservice activities in accordance with the applicable references, the methods and guidelines set forth in this procedure.

4.0 IDENTIFICATION OF NONCONFORMANCES

4.1 The following may be sources of nonconformances:

a. Significant deviations from the requirements of reference 2.1 and 2.2 of this procedure.

b. The use of improper or uncalibrated equipment.

c. The use of unqualified NDE personnel.

d. The use of noncertified materials.

5.0 INITIATION AND PROCESSING OF A NONCONFORMANCE REPORT

5.1 The Ebasco PSI/ISI Site Supervisor or his designee shall issue a Nonconformance Report by completing the applicable portions of Part I of 6009-11/5-77 when a nonconformance is detected. A determination of the nature of the nonconformance shall be made and described in sufficient detail to allow proper evaluation by Commonwealth's Engineering Department. The Nonconformance Form shall then be transmitted by the PSI/ISI Site Supervisor to Commonwealth's Project Construction Department for disposition.

5.2 The PSI/ISI Site Supervisor shall be responsible for indicating in Part III of the Nonconformance Form the necessary work required to satisfy the engineering evaluation/disposition has been completed. This section (Part III) of the Nonconformance will be signed by Site Construction.

5.3 The Ebasco PSI/ISI Site Supervisor shall be responsible for verification of corrective action for each Nonconformance and shall document this activity by completing Part IV of the Nonconformance Report.

6.0 RECORD OF NONCONFORMANCE REPORTS

6.1 The PSI/ISI Site Supervisor shall maintain a log of all Nonconformance Reports issued in order to assure proper and timely correction.

6.2 A copy of the completed Nonconformance Report shall be filed with the applicable PSI test report.

• 6009-11/5-77

EBASCO SERVICES INCORPORATED

QUALITY ASSURANCE

NONCONFORMANCE REPORT

REPORT NO.(1) _____

Distribution:
White • PQAE or Site QA Supervis.
Yellow • Organization recommend... disposition
Pink • Initiator of NCR

INSTRUCTIONS: (See back of form)

...IENT OR PROJECT (2)	DRAWING NO./SPEC NO. (3)
SUPPLIER, CONSTRUCTION QC OR CONTRACTOR (4) / P.O. NO. (5)	
DESCRIPTION OF COMPONENT, PART OR SYSTEM (6)	

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (8)	TITLE/COMPANY	DATE (9)

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11)	TITLE/COMPANY	DATE (12)

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION (13)

IV. CORRECTIVE ACTION (14) ☐ Required ☐ Not Required

V. (15)

☐ ENGINEERING	☐ QUALITY ASSURANCE	☐ CONSTRUCTION	☐ OTHER _____
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE	DATE	DATE	DATE
☐ ACCEPTED ☐ REJECTED ☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED ☐ REJECTED ☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED ☐ REJECTED ☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED ☐ REJECTED ☐ ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION ☐ REQUIRED ☐ NOT REQUIRED (16)

(17) BY _____ SIGNATURE _____ TITLE _____ DATE _____
EBASCO VENDOR QA OR QA ENGINEERING

1029/12-75

QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION

ISI-QC-04
PROCEDURE NO

TITLE	LEGEND	DATE
PRESERVICE INSPECTION RECORDS	R - INDICATES REVISION	December 1, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF	
			June 9, 1981	
			REV 2	PREPARED / APPROVED WS

1.0 SCOPE

This procedure provides guidance and instructions for the permanent storage, maintenance and retrievability of preservice inspection records.

2.0 REFERENCE DOCUMENTS

2.1 Ebasco Nuclear Quality Assurance Program Manual-ETR-1001

2.2 ANSI - N45.2.9

2.3 Applicable Quality Control Procedures

3.0 ATTACHMENT (Appendix 1)

3.1 Filing System Outline for Preservice/Inservice Inspection Records Byron Units 1 & 2

4.0 RESPONSIBILITY

4.1 Ebasco: It shall be the responsibility of Ebasco's Inservice Inspection group to collect, file, temporarily store, and transfer to Commonwealth Edison Company preservice/inservice inspection records.

5.0 TRANSFERRAL AND INDEXING OF RECORDS

5.1 After completion of required analysis of inservice inspection test reports, Ebasco's Inservice Inspection group shall assemble and index preservice inspection records in accordance with the attached filing system outline. The filing system outline shall form the basis for preparation of a detailed checklist used to assure that records are complete at the time of shipment.

6.0 RETENTION/CATEGORY OF INSERVICE INSPECTION

6.1 Quality Assurance Records have been categorized by ANSI 45.2.9 as either lifetime or permanent. Preservice inspection records are considered lifetime and therefore must be retained for the life of the plant.

SARGENT & LUNDY

1. REVIEWED & ACCEPTED

ACTION SHOWN DOES NOT RELIEVE CONTRACTOR FROM HIS OBLIGATIONS UNDER THE CONTRACT

F. A. KOSIK 12/7/81
BY DATE

SPEC. NO F-2907 PROJ. NO 4391-05

TITLE

PRESERVICE INSPECTION RECORDS

LEGEND
R - INDICATES REVISION

DATE
December 1, 1981

REPLACES ISSUE OF
June 9, 1981

REV	PREPARED	APPROVED
2		WS

7.0 CONTROL OF RECORDS AND DOCUMENTS

7.1 To assure proper control of records and documents, a vault shall be provided by Commonwealth Edison Company for the temporary storage of documentation during preservice inspection, until final turnover to Commonwealth Edison Company. During preservice inspection the following controls shall apply:

7.1.1 Access to the vault will be limited to persons requiring information from the files.

7.1.2 No documents or records will be removed from the vault unless signed out or in by the person receiving or returning the file. All records removed will be returned in the same day they were obtained.

7.1.3 Preservice records may be supplemented and/or corrected only if signed and dated by authorized personnel from the organization originating the document.

TITLE
PRESERVICE INSPECTION RECORDS

LEGEND
R - INDICATES REVISION

DATE
December 1, 1981

REPLACES ISSUE OF
June 9, 1981

REV	PREPARED	APPROVED
2		WS

APPENDIX 1
FILING SYSTEM OUTLINE
FOR BYRON UNITS 1 & 2
PRESERVICE INSPECTION RECORDS

1.0 CONTROLLING DOCUMENTS

1.1 Commonwealth Edison Co Spec F2967/L2907 with Addenda 1
1.2 Commonwealth Edison Co P.O. No 238227 with Addendum 1 & 2 and change order 1
1.3 ASME Section XI 1977 Edition & Addenda to S78
1.4 Ebasco Quality Assurance Program Manual-ETR 1001
1.5 Byron Unit 1 Program Plan
1.6 Ebasco Procedure for Training, Examination and Certification of Nondestructive Examination Personnel, NDE 1
1.7 Rockwell International Procedure for Certification of NDE Personnel QAOP N6:02

2.0 IMPLEMENTING DOCUMENTS

2.1 Quality Control Procedures
2.2 Ultrasonic Examination Procedures
2.3 Magnetic Particle Examination Procedure(s)
2.4 Liquid Penetrant Examination Procedure(s)
2.5 Visual Examination Procedure(s)
2.6 Eddy Current Examination Procedure(s)
2.7 Automatic Ultrasonic Examination Procedure(s)
2.8 Sargent & Lundy P&ID M-1000 (Information only)
2.9 Ebasco Piping & Component Isometric Logs
2.10 NDE Procedure Control Log

3.0 CERTIFICATION DOCUMENTS

3.1 Ebasco Personnel NDE Certifications
3.2 Rockwell International Personnel NDE Certifications
3.3 Ebasco UT Equipment Certifications
3.4 Rockwell International UT Equipment Certifications
3.5 Ultrasonic Couplant Material Certifications
3.6 Liquid Penetrant Material Certifications
3.7 Magnetic Particle Material Certifications
3.8 Ultrasonic Test Calibration Block Certifications
3.9 Eddy Current Test Calibration Standard Certifications

4.0 PRESERVICE INSPECTION DATA

- 4.1 RPV AUT Examination Report (by Rockwell)
- 4.2 RPV MUT Examination Report (by Ebasco)
- 4.3 Steam Generators Examination Reports
- 4.4 Steam Generators Eddy Current Reports
- 4.5 Pressurizer Examination Report
- 4.6 Miscellaneous Vessels Reports
- 4.7 Piping Systems Examination Reports
- 4.8 Nonconformances Log
- 4.9 Deficiencies Log

5.0 CORRESPONDENCE

5.1 Contractual

- 5.1.1 CECo to Ebasco
- 5.1.2 Ebasco to CECo

5.2 Administrative

- 5.2.1 CECo to Ebasco
- 5.2.2 Ebasco to CECo

5.3 Technical

- 5.3.1 CECo to Ebasco
- 5.3.2 Ebasco to CECo

5.4 Site Audits

- 5.4.1 CECo
- 5.4.2 Ebasco

TITLE	LEGEND	DATE
Control of Certification of Nondestructive Examination Personnel	R - INDICATES REVISION	May 27, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF

REV	PREPARED	APPROVED
0		WS

1.0 SCOPE

This procedure provides for the control of certifications and certification records for nondestructive examination personnel.

2.0 REFERENCE DOCUMENTS

2.1 Ebasco Nuclear Quality Assurance Program Manual ETR-1001

2.2 Ebasco Services Incorporated Procedure for Training Examination and Certification of Nondestructive Examination Personnel.

3.0 RESPONSIBILITY

3.1 It shall be the responsibility of the Home Office NDE Supervisor to provide and maintain the following:

(a) A nondestructive examination training and certification program in accordance with 2.2 of this procedure.

(b) A list of individuals certified on which is indicated the NDE method and ASNT Level for which the individual is certified; when re-examination is due and when eye examination is due.

(c) The training, experience and examination records for certified individual.

3.1.1 The Home Office NDE Supervisor shall review the list of certified individuals periodically, to assure that all certifications, including eye examinations, are current. He shall notify the individual (or his supervisor) when re-examination is required. This notiification shall be given 30 days prior to the certification expiration date.

3.2 It shall be the responsibility of the PSI/ISI Site Supervisor to request from the Home Office NDE Supervisor copies of the appropriate certification records for those individuals that will be performing nondestructive examinations of the plant site.

4.0 SITE RECORDS

4.1 The PSI/ISI Site Supervisor or his designee, shall review the individual certification package to assure that they are complete and that an individual's certification will not expire while that individual is on site. If such conditions exist he shall immediately notify the Home Office NDE Supervisor so that the condition(s) may be corrected.

4.2 The PSI/ISI Site Supervisor or his designee, shall maintain copies of all NDE personnel certification on site. He shall make copies of these certifications available to Site QA personnel if requested.

TITLE	LEGEND	DATE
CONTROL OF ULTRASONIC TEST CALIBRATION BLOCKS	R - INDICATES REVISION	June 9, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
			May 26, 1981

REV	PREPARED	APPROVED
1		

1.0 SCOPE

This procedure provides instructions and requirements for the handling and permanent storage of ultrasonic test calibration blocks for preservice/inservice inspection at the Byron Nuclear Plant Site.

2.0 REFERENCE DOCUMENT

2.1 Ebasco Nuclear Quality Assurance Program Manual ETR-1001

2.2 ASME Section XI 1977 Edition with Addenda through Summer 1978.

3.0 PROCUREMENT AND RECEIVING INSPECTION

3.1 The ultrasonic test calibration blocks required to perform the ultrasonic examination of the Byron Nuclear Plant shall be procured by Commonwealth Edison Company. The necessary dimensional inspections and material certification reports shall be obtained and reviewed by Commonwealth Edison Company to verify that the calibration blocks conform to Code requirements.

4.0 HANDLING AND SHORT TERM STORAGE

4.1 The Ebasco PSI/ISI Site Supervisor or his designee, shall submit a written request for the calibration blocks he requires for specific examinations. This request shall be in the form of a speed letter addressed to the Commonwealth Edison Company's PSI/ISI Coordinator.

4.2 When the Ebasco PSI/ISI Site Supervisor or his designee, receives the calibration blocks from the storage area he will verify the following:

(a) Identification of blocks comply with the request.
(b) Block test surfaces have not been damaged (e.g. nicked, corroded) to the extent that test calibration is affected.

4.3 If any discrepancies are noted by 4.2 the Ebasco PSI/ISI Site Supervisor or his designee, shall immediately issue a nonconformance report in accordance with Ebasco procedure and shall return the discrepant calibration blocks to storage or tag the blocks as "do not use". Calibration blocks which are found to be nonconforming shall not be used until the nonconformance report has been cleared.

4.4 When calibration blocks are removed from Commonwealth Edison storage they shall be assigned to Ebasco's PSI/ISI Site Supervisor or his designee, who will be required to sign the Commonwealth Edison Control log. The same log must be signed when the blocks are returned.

4.5 Calibration blocks shall be moved to test areas for short term storage and use during preservice/inservice inspections in accordance with appropriate material handling practices. Special action must be taken during handling to prevent any surface abuse, such as nicks or scratches. Carbon steel rigging equipment shall not come in contact with stainless steel blocks.

5.0 LONG TERM STORAGE

5.1 Calibration blocks shall be stored in an environment equivalent to "Level C" as defined in the Ebasco Quality Assurance Manual.

5.2 Appropriate maintenance measures including the application of a metal preservative on carbon steel blocks to prevent rust and corrosion must be employed. The following products have been found to be commercially acceptable for use as a metal preservative for machined surfaces, and are being suggested as a guide.

Product	Manufacturer's Recommended Solvent	Manufacturer
Tectyl 506	Alkali, wash, hot water	Valvoline Oil Company
Tectyl 894	Petroleum solvent	Valvoline Oil Company
Ensis 254	Kerosene	Shell Oil Company
Rust-Veto MP	Alkali, wash, hot water	EF Houghton & Company
Ferrogard	Alkali, wash, hot water	Ronco Laboratories Inc

Any other metal preservatives may be selected, however selection must be easily and quickly removed by a universally available solvent which shall be non-toxic preferably nonflammable and nonirritating.

TITLE

NONDESTRUCTIVE MATERIALS RECEIPT INSPECTION

LEGEND
R - INDICATES REVISION

DATE
September 1, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
	BE Bart.	WJ Sawicki	June 9, 1981

REV	PREPARED	APPROVED
2		WS

1.0 SCOPE

1.1 This procedure provides instructions and requirements for receipt inspection of Nondestructive (NDE) materials supplied by Commonwealth Edison for the use on ASME Section XI examinations.

2.0 REFERENCE DOCUMENTS

2.1 Ebasco Nuclear Quality Assurance Program Manual ETR-1001

3.0 RESPONSIBILITY

3.1 It shall be the responsibility of the PSI/ISI Site Supervisor to assure the use of acceptable materials during nondestructive (NDE) examination in compliance with the requirements stipulated in the applicable NDE Procedure.

3.2 It shall be the responsibility of Commonwealth Edison to supply requested NDE Materials with copies of required certifications.

4.0 MATERIAL REQUISITION

4.1 All NDE materials shall be requested by the PSI/ISI Site Supervisor or his designee, via a Speed Letter requestioning the materials and submitting it to Commonwealth's Construction Department for procurement. The material requisition shall contain sufficient information in order to comply with all the material certification requirements stipulated in the applicable NDE procedure.

5.0 NDE MATERIAL RECEIPT INSPECTION

5.1 To assure the use of acceptable NDE Materials, an Ebasco NDE inspector designated by the PSI/ISI Site Supervisor or his designee, shall perform the following receipt inspection;

The NDE inspector shall verify agreement between the material request Speed Letter and the materials received.

The following shall be verified:

a) Description - requested material(s) (eg; ultrasonic couplant)
b) Quantity - requested number vs received
c) Size(s) - Indicates size (eg: gallon, quart etc)
d) Heat/Lot # or batch number - verify with material(s) received
e) Applicable Specification - Indicates as shown on the material request form (eg: mill standards)
f) Certification - verify that shipment contains copies for all materials. All certifications shall be correlated by verification with materials identification.

5.2 After verification and the material received is/are satisfactory in all respects, the NDE inspector shall sign and date the material requisition Speed Letter. The inspector shall receive a copy of the signed form and copies of all applicable certifications accompanying shipment.

5.3 If not in full conformance with the original material request Speed Letter requirements, such as partial delivery of original quantity requested, the NDE inspector shall indicate in writing on the Speed Letter the reason for the discrepancy.

5.4 For materials found unacceptable, the NDE inspector shall refuse delivery and the materials shall be returned to Commonwealth Edison for resolution together with the materials request Speed Letter.

6.0 DOCUMENT CONTROL

6.1 The PSI/ISI Site Supervisor or his designee shall maintain a file on all NDE Materials employed during NDE inspections, together with copies of the applicable Certifications.

7.0 STORAGE AND CONTROL OF ACCEPTABLE MATERIALS

7.1 All acceptable materials covered by this procedure shall be stored in a lockable cabinet. The environment in the storage cabinet shall not render the materials unusable or hazardous.

7.2 Access to the materials stored in the lockable cabinet shall be under the control of the Ebasco PSI/ISI Site Supervisor, or his designee.

7.3 The Ebasco PSI/ISI Site Supervisor, or his designee shall disburse the required materials to the crew members on an as needed basis.

EBASCO

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

1328/12-75

ISI-QC-08
PROCEDURE NO.

TITLE: Marking and Identification of Components for Inservice Inspections

LEGEND: R - INDICATES REVISION

DATE: September 1, 1981

PREPARED BY | REVIEWED BY | APPROVED BY

REPLACES ISSUE OF: June 10, 1981

REV	PREPARED	APPROVED
2		

1.0 PURPOSE & SCOPE

1.1 This procedure provides instructions and requirements for the permanent weld center line marking of piping systems and vessel weld identification for components requiring inservice inspection in accordance with Section XI of the ASME Boiler and Pressure Vessel Code.

2.0 GENERAL

2.1 To assure adequate performance of inservice inspection and maintain meaningful inservice inspection records, components requiring examination must be permanently marked in a manner adequate to assure traceability of records, conformity and test repeatability.

2.2 It is the responsibility of the PSI/ISI Site Supervisor or his designee to identify the weld center line in piping systems in conjunction with ISI-UT-S78-8.

2.3 The PSI/ISI Site Supervisor or his designee shall verify identification/location of weld/component during final system walk through and shall document verification by signing off on the applicable PSI isometric drawings.

3.0 WELD SEAM MARKING FOR PIPING

3.1 To assure adequate test duplication a permanent zero reference location (Lo) must be established. Recognizing that varied installation configurations exist, and that inspection access space may be limited, zero references shall be established and marked during preservice examination.

Welds being tested shall be marked using a low stress stamp or vibro-etch to indicate the scan starting point and scan direction. The following rules apply for determining and stamping the zero reference location (Lo) on pipe welds. A low stress metal stamp is used to establish a starting reference point (Lo) by marking the weld. The tip of the V should be placed on the weld center line and pointed along the center line in the direction of the examination. Locate the V mark on the weld using one of the rules give in (1) through (8) below. If more than one rule can be applied, the lowest numbered rule shall be used.

1 - For horizontal circumferential pipe welds, the "Lo" location is directly on top of the weld. The "L" dimension is measured clockwise when looking in the direction of flow, as shown in Figure 3.1A item #1.

2 - If a pipe is vertical and the weld is a pipe-to-pipe, use an extension of the centerline of the outside radius of the elbow above the weld.

3 - If, in Rule 2, there is no elbow above the weld, use the outside radius on the elbow below the weld.

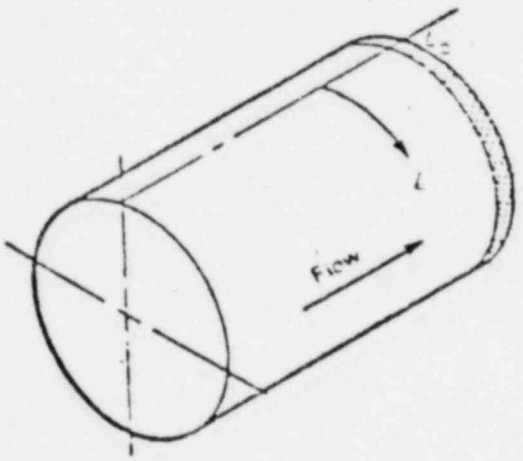
4 - If there is no elbow above or below a vertical weld, choose the most convenient location.

5 - If the pipe is vertical and the weld is pipe-to-elbow, use the outside radius of the elbow for the "Lo" location. The "L" dimension is measured clockwise when looking in the direction of flow.

6 - For saddle-type welds, (sweepolet, weldolet), use the upstream side of the attachment weld and the centerline of the weld parallel to the pipe axis (See Figure 3.1A item #2), Measure "L" clockwise looking at the main pipe.

7 - "Lo" location for longitudinal seam welds in pipe is at the intersection of the longitudinal and circumferential welds. Measure L away from the intersection and parallel to the Longitudinal weld (See Figure 3.1A item #3).

8 - If any of these rules do not apply, details of the method used shall be documented.



3.1A item #1

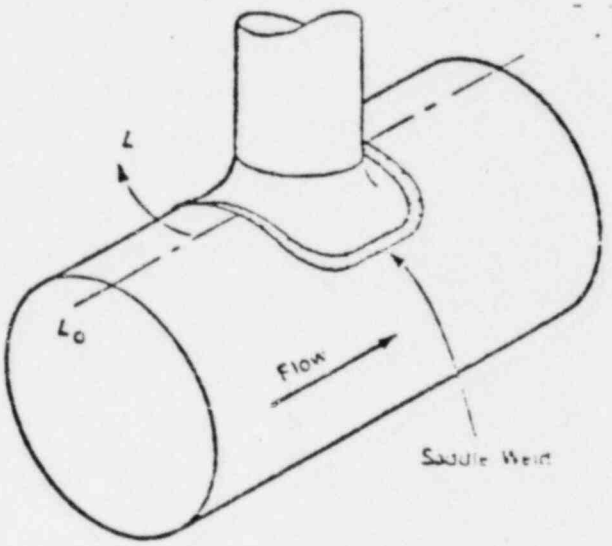


FIG. 3.1A item #2

TITLE: Marking and Identification of Components for Inservice Inspections

LEGEND: R - INDICATES REVISION

DATE: June 10, 1981

REPLACES ISSUE OF: May 26, 1981

REV	PREPARED	APPROVED
1		WJS

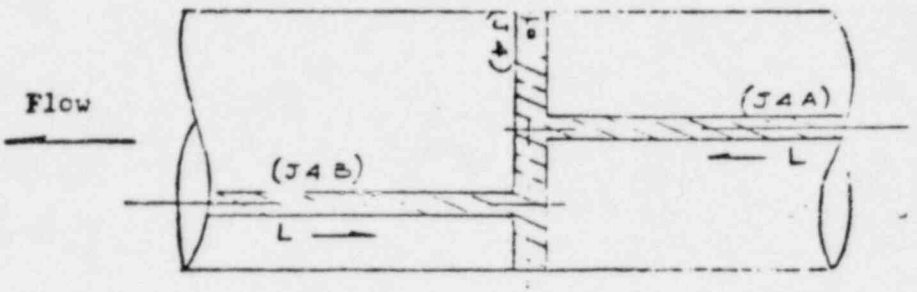


Fig 3.1A item 3

4.0 WELD SEAM IDENTIFICATION FOR VESSELS

4.1 The radiographic area markers stamped on the vessel for ASME Section III radiographic examination requirements shall be used as locational reference points during ultrasonic examination and shall be noted on preservice and inservice inspection reports. The locational system used for automatic inspections for the Reactor Vessel (X and Y coordinates) is provided for by the Rockwell International Computer System.

4.2 Identification of circumferential and longitudinal welds in vessel assigned during fabrication, which appears stamped on the vessel or fabrication isometrics shall be used for preservice and inservice identification. Identification noted on the vessel shall be cross-referenced to shop fabrication and testing records. Any variations noted during this cross-reference shall be noted on the ultrasonic test report.

4.3 Identification of nozzle to vessel welds will be nozzle number and piping system.

4.4 Any other identification information, such as location of columns for automatic inspection and special computer identification code shall be indicated on inspection reports in addition to the original identification.

TITLE	LEGEND	DATE
CONTROL OF NONDESTRUCTIVE TESTING INSTRUMENTS	R - INDICATES REVISION	June 10, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N. Paul	B.J. Burg	W. Sawicky	June 1, 1981

REV	PREPARED	APPROVED
1	NP	WS

1.0 SCOPE

This procedure provides instructions for the control of nondestructive testing instruments during use/storage at the Home Office or site locations. Test instruments covered by this procedure include ultrasonic and eddy-current flaw detection and thickness measurement instruments, magnetic particle equipment and recording devices used in conjunction with these instruments. Also included are the temperature gauges used to verify temperature of components/calibration blocks and equipment used for instrument calibration in-house. This procedure is limited to those nondestructive testing instruments used by the Ebasco ISI Group in the performance of preservice or in-service inspections.

2.0 REFERENCE DOCUMENTS

2.1 Ebasco Nuclear Quality Assurance Program Manual ETR-1001

3.0 ATTACHMENT - Instrument Calibration Log Form

4.0 RESPONSIBILITY

4.1 It shall be the responsibility of the NDE Supervisor to maintain control of nondestructive testing instruments in the Home Office, in accordance with Section 6.0 of this procedure.

4.2 It shall be the responsibility of the PSI/ISI Site Supervisor to maintain control of nondestructive testing instruments at the plant site, in accordance with Section 6.0 of this procedure.

5.0 INSTRUMENT IDENTIFICATION

5.1 All instruments covered by this procedure shall be identified using unique serial numbers permanently affixed to the instrument (either manufacturer's serial number or one assigned by Ebasco Services, Inc).

5.2 All instruments covered by this procedure shall have a calibration tag or sticker attached, showing date current calibration was performed and date next calibration is due.

6.0 INSTRUMENT CALIBRATION

6.1 All instruments covered by this procedure shall be calibrated on an annual basis by the manufacturer, his representative or Ebasco.

6.2 A certificate, documenting the parameters checked and showing serial number of the instrument, date calibrated and signature of the individual responsible for the certificate, shall be provided by the manufacturer, his representative or Ebasco.

7.0 INSTRUMENT CONTROL

7.1 The cognizant supervisor shall maintain a calibration file which will include the certificate provided by Section 5.2 of this procedure in addition to the following information.

(a) Name of instrument
(b) Instrument serial number
(c) Date of last calibration
(d) Name of party performing last calibration
(e) Due date for next calibration

7.2 All instruments when not in use, shall be secured under lock and key by the cognizant supervisor.

7.3 The cognizant supervisor shall develop and maintain a log for issuance and return of all instruments in his control. The log will contain the following information:

(a) Name and serial number of instrument.
(b) Name of individual to which instrument was assigned.
(c) Date on which instrument was assigned.
(d) Date on which instrument is expected to be returned (not to exceed calibration due date).
(e) Calibration due date of instrument.

7.3.1 The cognizant supervisor shall not release for use from his control any instrument that is beyond its calibration due date or any instrument that will be beyond its calibration due date before it is returned to the secured area.

7.3.2 The cognizant supervisor shall review the instrument control log monthly to determine if any instruments require or will soon require recalibration. He will make arrangements for removing such instruments from service to allow for recalibration.

7.3.3 Any instrument that is damaged during use shall be returned to the cognizant supervisor who shall place a "do not use" tag on the instrument. The tag shall remain on the instrument until damage has been repaired and instrument calibration checked and calibration certification issued.

INSTRUMENTS

TYPE	MAKE	MODEL	SERIAL NO.	CALIBRATION: FREQUENCY	CALIBRATION: By (Write I, M or A) See note below	CALIBRATION: CHECK DATE	CALIBRATION: DUE DATE	SIGNED OUT: BY	SIGNED OUT: DATE	RETURN DATE: EXPECTED	RETURN DATE: ACTUAL	PRESENT LOCATION	REMA

I - In house; M - By Manufacturer; A - By other agency authorized by the manufacturer

TITLE: CONTROL OF DEFICIENCY REPORTS

LEGEND: R - INDICATES REVISION

DATE: July 27, 1981

PREPARED BY: [signature] REVIEWED BY: [signature] APPROVED BY: Walter Sawicky

REPLACES ISSUE OF:

REV	PREPARED	APPROVED
0	[signature]	WLS

1.0 SCOPE:

The purpose of this procedure is to establish guidelines and methods for the initiation, and distribution, to C.E. Co. of deficiency reports during pre-service inspection activities at the Byron Nuclear Power Station.

2.0 REFERENCE DOCUMENTS:

2.1 Ebasco Nuclear Quality Assurance Program Manual ETR-1001

2.2 Applicable Quality Control Procedures

3.0 ATTACHMENTS:

3.1 Ebasco Services Inservice Inspection Deficiency Report Form

4.0 RESPONSIBILITY:

4.1 It shall be the responsibility of the Ebasco PSI/ISI Site Supervisor, or his designee, to identify, document, and transmit to CE. Co Project Construction Department deficiency reports pertaining to preservice inspection examinations.

4.2 C.E. Co Project Construction shall be responsible for obtaining the evaluation and dispositioning of reported deficiencies.

4.3 Re-examinations shall be initiated by C.E. Co and be the responsibility of C.E. Co.

5.0 IDENTIFICATION OF DEFICIENCIES

5.1 The PSI/ISI Site Supervisor, or his designee, shall initiate a deficiency report in order to notify the C.E. Co of the following:

a. Notify C.E. Co of all reportable indications revealed during non-destructive examinations.

b. Identify inaccessible components which may require possible re-design and/or relief from NDE requirements.

c. Report deviations from testing of components that do not lend themselves to surface and/or volumetric examination due to their material properties and/or geometrical configurations.

6.0 INITIATION OF A DEFICIENCY REPORT

6.1 The PSI/ISI Site Supervisor, or his designee, shall initiate a deficiency report by completing parts 1 and 2 of the EBasco Services Deficiency Report Form, and attaching a copy of all the applicable non-destructive examination reports. The report shall contain sufficient information such as Fab. ISO drawing numbers equipment ID #, Field Weld #, in order to facilitate C.E.Co with the processing of the deficiency.

6.2 Ebasco shall hand deliver all deficiency reports to C.E. Co Project Construction Department for processing.

7.0 PROCESSING OF DEFICIENCY REPORTS

7.1 C.E. Co Project Construction Department shall process the Ebasco Services Deficiency Reports by completing part 3. If a non-conformance report is then required, C.E. Co shall mark the appropriate box at the bottom of part 3 and shall initiate a non-conformance report in accordance with C.E. Co applicable procedures.

7.2 C.E. Co Project Construction Department shall evaluate the need for re-examination.C.E. Co shall mark part 4.0 on the Ebasco Services Deficiency Report Form N/A. If re-examination has been decmed necessary, C.E. Co shall state so in part 3.0 of the report form.

7.3 After C.E. Co completes their evaluation and disposition they shall return the signed Ebasco Services Inservice Inspection Deficiency Report Form to Ebasco together with a copy (if applicable) of C.E. Co non-conformance report.

7.4 The PSI/ISI Site Supervisor, or his designee, shall be responsible for the completion of the details of re-examination and report such in part 4.0 of the deficiency report.

7.5 The Ebasco PSI/ISI Site Supervisor, or his designee, shall be responsible for verification of corrective action for each deficiency report and shall document this activity by completing part 5.0 of deficiency report form.

8.0 RECORD OF INSPECTION DEFICIENCY REPORTS

8.1 The PSI/ISI Site Supervisor, or his designee, shall maintain a log of all deficiency reports issued in order to assure proper and timely correction.

EBASCO SERVICES INCORPORATED

DISTRIBUTION:
- ISI Site Supervisor
- CECO const.

QUALITY ASSURANCE

INSERVICE INSPECTION DEFICIENCY REPORT FOR BYRON SITE

REPORT NO. _____

INSTRUCTIONS: See Procedure No. ISI-QC-10

CLIENT OR PROJECT		DRAWING NO./PROCEDURE NO.
CONTRACTOR	CONTRACT NO.	
DESCRIPTION OF COMPONENT PART OR SYSTEM		

1. DESCRIPTION OF deficiency (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

NAME AND SIGNATURE OF PERSON REPORTING	TITLE	DATE

2. RECOMMENDED DISPOSITION (Submit Sketch if Applicable)

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION	TITLE	DATE

3. EVALUATION AND DISPOSITION

NAME AND SIGNATURE	TITLE	DATE	☐ NCR REQUIRED	☐ NOT REQUIRED

4. DETAILS OF REEXAMINATION (Submit Sketch if Applicable)

NAME AND SIGNATURE OF PERSON DIRECTING REEXAMINATION	TITLE	DATE

5. VERIFICATION OF DISPOSITION ☐ ACCEPTABLE ☐ UNACCEPTABLE

BY _____ SIGNATURE _____ TITLE _____ DATE _____

TITLE	LEGEND	DATE
Ultrasonic Examination of Class 1 & 2 Piping Welds Joining Similar & Dissimilar Materials	R - INDICATES REVISION	March 18, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES SSLE OF
N Paul	[signature]	Walter Swinney	January 9, 1981

REV	PREPARED	APPROV.
1	N.P	WS

1. SCOPE

1.1 This procedure describes the manual ultrasonic examination of full penetration similar and dissimilar metal Class 1 and 2 piping welds ranging in thickness from 0.2 to 6 inches. This procedure is in accordance with the requirements of ASME Boiler and Pressure Vessel Code Section XI, 1977 up to and including Summer 1978 Addenda.

1.2 The principal objective of examination is the detection, location and evaluation of discontinuities within the weld and adjacent base metal. The weld shall be examined by the angle beam technique from the outside surface of the piping system.

2. APPLICABLE DOCUMENTS, CODES AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein.

2.1.1 ASME Section XI, 1977 up to and including Summer 1978 Addenda

2.1.2 Ebasco Services Incorporated procedure for "Training Examination and Certification of Nondestructive Examination Personnel", NDE 1

2.1.3 SNT-TC-1A, 1975 edition of American Society for Nondestructive Testing

3. PERSONNEL CERTIFICATION

3.1 All personnel performing nondestructive examination shall be certified in accordance with the Ebasco Services Incorporated procedure for "Training Examination and Certification of Nondestructive Examination Personnel" which reflects the guidelines set forth by the scope of SNT-TC-1A.

4. EQUIPMENT

4.1 Instrument

4.1.1 A pulse-echo ultrasonic flaw detection instrument shall be employed. It shall generate, receive, and present on a cathode-ray tube (CRT) screen, pulses in a frequency range from one to five MHz.

4.1.2 The instrument shall be equipped with a stepped gain control calibrated in units of 2 dB or less.

4.1.3 The system performance characteristic of the instrument shall be verified at least once a year.

4.2 Search Unit

4.2.1 Search units may contain either single or dual transducer elements.

4.2.2 The search units shall consist of a transducer and an angle beam wedge. The unit may be comprised of two separate parts or it may be an integral unit.

4.2.3 For general use, the search unit's transducer shall have an active area of not less than 0.04 sq inch nor more than 1.0 sq inch. Under certain circumstances, such as evaluation of indications, other sizes may be employed.

4.2.4 The search unit cable shall be of coaxial type and shall not exceed approximately 30 feet so as not to impair communication between inspection team members.

4.2.5 A nominal beam angle of 45 degrees in the material shall be employed. Other angles may be employed for evaluation of an indication, or where wall thickness, geometric configuration or metallurgical condition impedes effective use of 45 degrees angle beam for examination.

4.2.6 Nominal frequency of 2.25 MHz shall be employed. Other frequencies may be employed if variables, such as production material grain structure, necessitate the use of other frequencies in order to assure penetration or improve resolution.

4.2.7 In general, shear mode of wave propagation shall be used. Refracted longitudinal mode of wave propagation may be used if grain structure or other condition impedes the use of shear wave.

4.2.8 The angle beam wedges shall be within $\pm 3^{\circ}$ of nominal value. This shall be checked on a standard reference block such as IIW or Rompas whenever any doubt arises about the tolerances.

5. COUPLANT

5.1 A client approved couplant, capable of conducting ultrasonic vibrations from the transducer to the examination surface, shall be used.

5.2 The couplant indentification and batch number shall be recorded on the calibration data sheet.

6. EXAMINATION COVERAGE

6.1 Scanning shall be done with an overlapping of each scan at least by 10 percent of the transducer dimension measured perpendicular to the scan path.

7. SEARCH UNIT MOVEMENT

7.1 The rate of search unit movement shall not exceed 6 inches/second unless calibration has been verified at the higher scanning speed.

8. SCANNING SENSITIVITY

8.1 Scanning shall be done at twice (+6 dB) the primary reference level as a minimum but recording of ultrasonic reflectors shall be done at the primary reference level.

9. SURFACE PREPARATION

9.1 The examination surface shall be free of irregularities, loose material, or coatings which interfere with ultrasonic wave transmission.

10. IDENTIFICATION OF EXAMINATION AREAS

10.1 The client shall provide the proper identification system.

11. INSTRUMENT CALIBRATION

11.1 Screen Height Linearity
The ultrasonic instrument shall provide screen height linearity within 5 percent of full range for at least 80 percent of full screen height (FSH) (baseline to maximum calibrated screen points).

11.1.1 The following procedure shall be used for screen height linearity calibration. Position an angle beam or a straight beam search unit in such a way on a calibration block so that echoes can be observed from any two reflectors. Adjust the search unit position to give 2 to 1 ratio of amplitudes between the two echoes, with the larger set at 80 percent of full screen height. Without moving the search unit, adjust sensitivity (gain) to successively

set the larger echo from 100 percent to 20 percent of FSH in 2 dB steps and read the amplitude of the smaller echo at each setting. The reading shall be 50 percent of the larger amplitude, within 5 percent of FSH. The settings and readings shall be estimated to the nearest 1 percent of full screen.

11.2 Amplitude Control Linearity

The ultrasonic instrument shall utilize an amplitude control, accurate over its useful range to ± 20 percent of the nominal amplitude ratio, to allow measurement of indications beyond the linear range of the vertical display on the screen.

11.2.1 The following procedure shall be used for Amplitude Control Linearity Calibration. Position an angle beam or a straight beam search unit in such a way so that an echo from one reflector in a calibration block is peaked on the screen. With the increase and decrease in attenuation shown in the following table, the echo amplitude shall fall within the specified limits. The setting and readings shall be estimated to the nearest 1 percent of full screen.

Indication Set at % of Full Screen	dB Control Change	Indication Limits % of Full Screen
80%	- 6 dB	32 to 48%
80%	- 12 dB	16 to 24%
40%	+ 6 dB	64 to 96%
20%	+ 12 dB	64 to 96%

11.3 The instrument calibration may be performed on any calibration block, including an IIW or Rompas block, and need not be performed with the same search unit used in the next examination.

11.4 The instrument calibration for screen height and amplitude control linearity shall be performed at the beginning of each period of extended use or every three months, whichever is less. This shall also be performed whenever any doubt arises about the instrument's functions. Results shall be recorded on the UT Instrument Calibration Sheet.

12. BASIC CALIBRATION BLOCKS

12.1 The basic calibration blocks shall be made from material of the same nominal diameter and nominal wall thickness or pipe schedule as the pipe to be examined.

12.2 The calibration blocks shall be fabricated from one of the materials specified for the piping joined by the weld.

12.3 Where the examination is to be performed from only one side of the joint, the calibration block material shall be of the same specification as the material on that side of the joint.

12.4 If material of the same specification is not available, material of similar chemical analysis, tensile properties and metallurgical structure may be used.

12.5 The finish on the surfaces of the block shall be representative of the surface finishes of the piping.

12.6 Notches and side drilled holes shall be used to establish the DAC.

12.7 The client shall provide the calibration blocks conforming to ASME Section XI, 1977 up to and including Summer 1978 Addenda.

13. SYSTEM CALIBRATION

13.1 General

13.1.1 Complete ultrasonic examination system calibration, establishing the DAC curve, shall be performed prior to each examination, or series of similar examination.

13.1.2 Calibration shall include the complete ultrasonic examination system. Any change in search units, shoes, couplants, cables, ultrasonic instruments, recording devices, or any other parts of the examination system shall be the cause of calbration check. The original calibration shall be performed on the basic calibration block and calibration checks shall be performed as per Article 13.3 of this procedure.

13.1.3 The maximum calibration indications shall be obtained with the sound beam oriented essentially perpendicular to the axis of the calibration reflector. The centerline of the search unit shall be at least 3/4 inch from the nearest side of the block.

13.1.4 The temperature difference between the examination and calibration block surfaces shall not exceed 25°F (14°C).

13.1.5 Calibration shall be performed from the outside surface of the calibration block.

13.2 Calibration

13.2.1 The examination for reflectors parallel to the weld shall, in general, be performed by a one-half V path from two sides of the weld. If variables, such as those referenced in Section 14.1 of this procedure, prevent the use of one-half V examination, the beam path shall be increased a minimum of one-half until complete examination volume is covered. The examination for reflectors transverse to the weld shall be performed by one-half V path in two directions along the weld. It may also be necessary, particularly in thin wall piping, to increase the examination beam angle.

13.2.2 One-half V Path Technique

Using the 1/4t and 3/4t side drilled holes, establish the sweep range calibration by positioning the hole responses at convenient intervals along the sweep and mark the locations on the screen. The DAC shall be established using the side drilled holes so that the maximum amplitude point is at 80 percent (FSH). Mark the location and amplitude on the screen. Without adjusting the instrument controls, maximize response from the remaining hole and mark its amplitude and location on the screen. Connect the maximum amplitude points with a smooth curve and extrapolate this curve an additional 1/4t to cover full examination range. This curve (DAC) is the primary reference level and recording of ultrasonic reflectors shall be performed at this sensitivity.

Note: For evaluation of indications close to ID surface, establish the sensitivity from the inside diameter (ID) surface notches by setting the indication amplitude at the level of the DAC curve.

13.2.3 Greater Than One-half V Path Technique

Using the required V paths, ie full V, one and one-half V etc, establish the sweep range calibration by positioning responses from the appropriate ID and OD notches at convenient intervals along the sweep and mark notch locations on the screen. The DAC shall be established by setting the maximum response from the one-half V path ID notch to 80 percent (FSH) and mark the location on the screen. Without adjusting the instrument controls, obtain

maximum response from the remaining notch echoes in the test region and mark the locations on the screen. Connect the maximum amplitude points with a smooth curve to form the DAC. This curve is the primary reference level and recording of ultrasonic reflectors shall be performed at this sensitivity.

13.2.4 Electronic DAC: If an electronic distance amplitude correcting device is used, the primary reference response shall be equalized at a nominal 50 percent of full screen height over the distance range to be employed in the examination. (The actual readings representing amplitude and sweep shall be recorded on the calibration data sheet.)

13.2.5 Recording of Calibration Data: Particulars of system calibration shall be recorded on the calibration data sheet.

13.3 Calibration Check

13.3.1 A system calibration check, which is the verification of the instrument sensitivity and sweep range calibration, shall be performed at the start and finish of each examination or series of similar examination, with any change in examination personnel, and at least every 4 hours during an examination. Calibration checks may be performed on either the block used for initial calibration, or a simulator approved by the client.

13.4 Corrective Action

13.4.1 If any point on the DAC curve has descreased 20 percent or 2 dB of its amplitude, all data sheets since the last calibration shall be marked void. A new calibration shall be made and recorded and the voided examination area shall be reexamined.

13.4.2 If any point on the DAC curve has increased more than 20% or 2 dB of its amplitude, recorded indications taken since the last valid calibration or calibration check may be reexamined with the correct calibration and their values changed on the data sheets.

13.4.3 If any point on the DAC curve has moved on the sweep line more than 10 percent of the sweep division reading, correct the sweep range calibration and note the correction of the

examination record. If recordable reflectors are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the voided examination areas shall be reexamined.

14. EXAMINATION

14.1 Reflectors Parallel to the Weld Seam
The angle beam examination for reflectors parallel to the weld shall, in general, be performed by a one-half V path from two sides of the weld.

If variables such as access, weld configuration or wall thickness preclude half V examination, the examination shall be performed by at least a full V path from one side of the weld.

14.2 Reflectors Transverse to the Weld Seam
The angle beam examination for reflectors transverse to the weld shall be performed on the weld crown by one-half V path in two directions along the weld in a single scan path.

14.3 Directions and Extent of Scanning:
Ultrasonic energy shall pass in all the required directions and the extent of scanning shall be such that the ultrasonic beam passes through the entire examination volume as indicated in Figure I of this procedure.

15. AUSTENITIC WELDS

15.1 When both materials involved are austenitic, calibration block shall be fabricated from one of the materials specified for the piping being joined by the weld.

15.2 When one of the materials involved is austenitic and the other is of ferritic, two calibration blocks shall be fabricated - one for the austenitic material and the other for the ferritic material specified for piping being joined by the weld. Examination from austenitic side of the weld shall be performed with austenitic block and examination from the ferritic side of weld shall be performed using the ferritic steel block. For reflectors transverse to the weld, examination shall be performed using the block which is more attenuative (ie higher sensitivity).

15.3 The notch depth for austenitic calibration blocks shall be 10 percent of nominal pipe wall thickness.

16. DATA RECORDING AND EVALUATION

16.1 For each indication that equals or exceeds the reference level, the search unit location and orientation, and the following information, shall be recorded on the Indication Data Sheet.

16.1.1 Peak amplitude as either dB from the reference level, or as a percent of DAC curve, sweep reading to reflector, search unit position, search unit location, sound beam direction

16.1.2 Minimum sweep reading to reflector and position of search unit at reference level amplitude

16.1.3 Maximum sweep reading to reflector and position of search unit at the reference level amplitude

16.1.4 Search unit positions or locations parallel to the reflector at the end points where the reflector amplitude equals the reference level (length of reflector)

16.2 For each indication that exceeds 50 percent of reference level amplitude but does not equal the reference level, the following information shall be recorded on calibration data sheet and or strip chart paper (if used).

16.2.1 Search unit position for peak amplitude

16.2.2 Direction of scan

16.2.3 Peak amplitude as either dB from the reference level, or as a percent of DAC

16.3 Further evaluation of reportable indications to determine disposition and/or the need to make repairs shall be the responsibility of the utility-owner.

17. REPORTS

17.1 A detailed ultrasonic examination report shall be prepared using the applicable report forms provided at the end of this procedure and any additional sketches or photographs as may be applicable. If no reportable indications are detected it shall be so noted on the appropriate report form.

17.2 Data shall be entered, as required for each item in the blank space provided on the calibration data sheet, and if used, on the indication data sheet. Where data is not germane for the specific item the blank space shall be marked N/A to indicate that data is not applicable.

17.3 Prompt (24 hours) notification of reportable indications shall be made to the representative designated by the utility-owner.

TITLE: Ultrasonic Examination of Class 1 & 2 Piping Welds Joining Similar & Dissimilar Materials

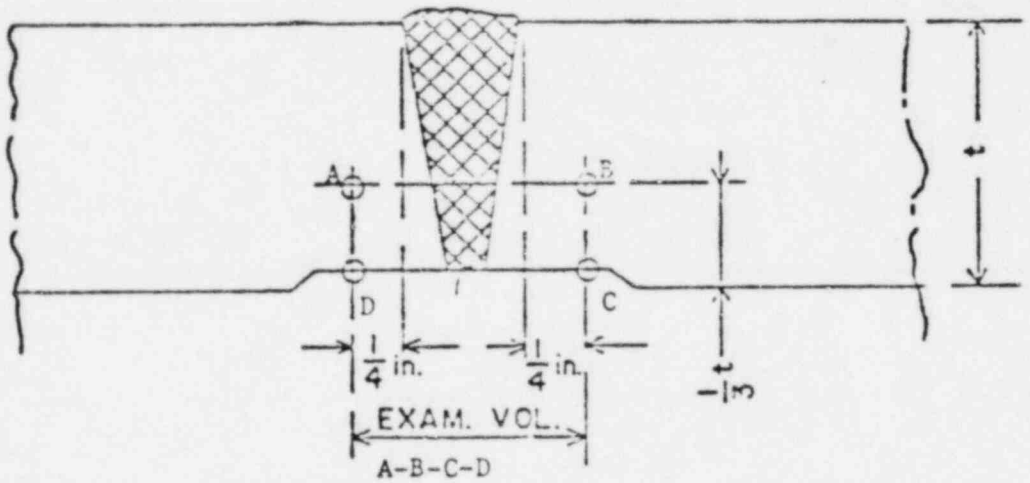
LEGEND: R - INDICATES REVISION

DATE: March 18, 1981

REPLACES ISSUE OF: January 9, 1981

REV	PREPARED	APPROVED
1	NP	WS

FIGURE 1



EXAMINATION VOLUME

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

UT INSTRUMENT CALIBRATION

INSTRUMENT MANUFACTURER _____ PROJECT _____

MODEL _____ SERIAL NO. _____ DATE _____

AMPLITUDE LINEARITY

dB CONTROL CHANGE	ACTUAL dB	SCREEN HEIGHT LARGER INDICATION	SCREEN HEIGHT* SMALLER INDICATION
Initial (0dB)			
+2dB			
0dB			
-2dB			
-4dB			
-6dB			
-8dB			
-10dB			
-12dB			

*Must be 50% of the Larger Amplitude, within ±5% of Full Screen Height

AMPLITUDE CONTROL LINEARITY

INDICATION SET AT % FSH	dB CONTROL CHANGE	INDICATION LIMITS % FSH	ACTUAL % FSH
80	- 6dB	32 to 48	
80	-12dB	16 to 24	
40	+ 6dB	64 to 96	
20	+12dB	64 to 96	

	ACCEPTABLE	
	YES	NO
Amplitude Linearity		
Amplitude Control Linearity		

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

6063A/4-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

CALIBRATION DATA

PROJECT _____

DATA SHEET NO. _____ DATE _____

PROCEDURE ISI-UT- _____ REV ___

COMPONENT OR SYSTEM _____ PIPE OD (IF APPLICABLE) _____

ITEM IDENTIFICATION NO(S). LISTED ON REVERSE SIDE - COMPONENT TEMP _____ EXAM. SURFACE ☐ ID ☐

CALIBRATION BLOCK NO. _____ THICKNESS _____ TEMP _____

SCAN COVERAGE

☐ 0° WHAZ ☐ 0° BASE MATERIAL ☐ AXIAL ☐ CIRCUMFERENTIAL

EQUIPMENT DATA

SEARCH UNIT

Manufacturer _____

Style _____

Serial No. _____

Size _____ Frequency _____

Angle _____ Mode _____

Couplant _____ Batch No. _____

INSTRUMENT

Manufacturer _____ Model _____

Serial No. _____ Coaxial Cable Length _____

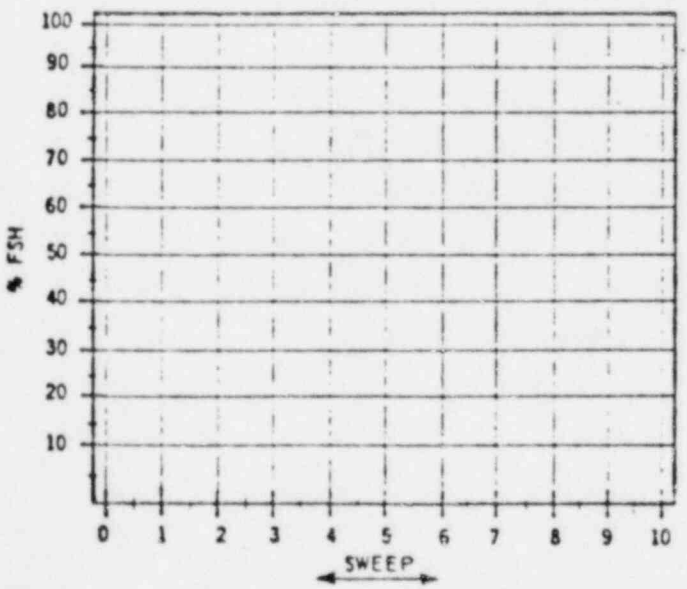
Frequency _____ Reject _____

Rep Rate _____ Damping _____

dB Gain - Coarse _____ Fine _____

Primary Reference Response
Amplitude % Full Screen Height _____

DAC PLOT - TIME _____ AM, PM



NOTE: *When performing examinations where no DAC is required, indicate reference reflector location and amplitude above.*

CALIBRATION CHECKS

	AMPL ± 20% (2dB) OF INITIAL AMPL		SWEEP ± 5% OF INITIAL LOCATION	
TIME	YES	NO	YES	NO

NOTE: *If response above is "NO" refer to Calibration Check section of procedure.*

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

REVIEWED BY _____ DATE _____

ADDITIONAL REMARKS

6059/4.76

EBASCO SERVICES INCORPORATED

QUALITY ASSURANCE ENGINEERING

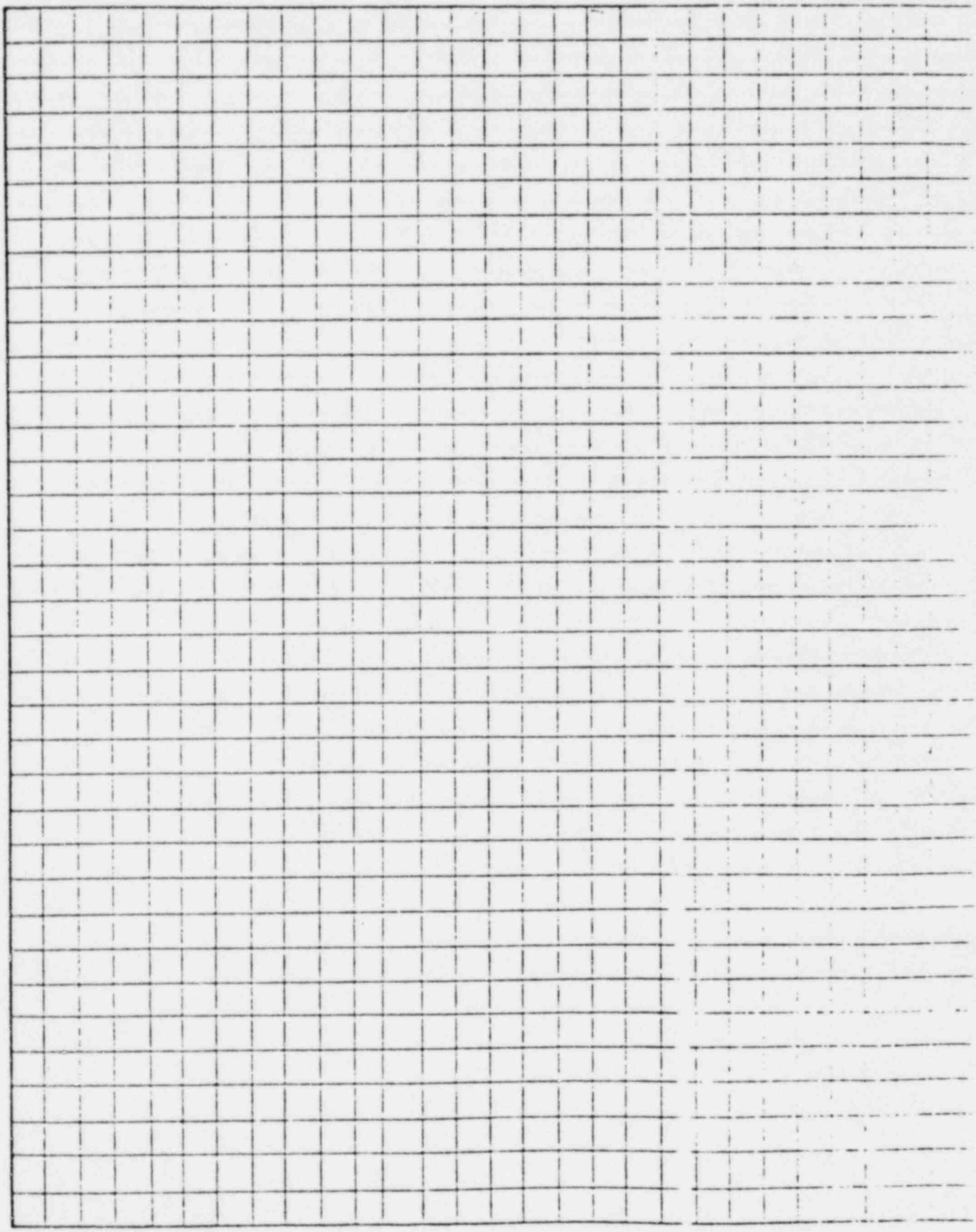
INSERVICE INSPECTION
SKETCH SHEET

LINE NO WELD'S _____

DATE _____

EXAMINER _____

PROJECT _____



6062/5-78

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION
INDICATION DATA

SHEET _____ OF _____

ITEM IDENTIFICATION _____

CALIBRATION DATA SHEET NO. _____

DATA TABULATION

SCAN DIRECTION			INDICATION NO.	EXAM. ON _____ (ADJ WELD) SIDE OF WELD	MAX % DAC	SWEEP READING	SEARCH UNIT EXIT POINT LOCATION		50% DAC OR HALF MAXIMUM AMPLITUDE				STRAIGHT BEAM (CAL ON BACK REFLECTION)	
									MINIMUM		MAXIMUM			
ST. BEAM	CIRCUMFERENTIAL	AXIAL					CIRCUMFERENTIAL (DISTANCE CW OR CCW FROM REFERENCE LINE)	AXIAL (DISTANCE FROM WELD ℄)	SWEEP READING	S.U. POSITION	SWEEP READING	S.U. POSITION	INDICATION AMPLITUDE (% FSH)	BACK REFLECTION AMPLITUDE (% FSH)

RESULTS

INDICATION NO.	LOCATION OF INDICATION		LENGTH	% t		WIDTH (IF LAMINAR)	COMMENTS
	CIRC	AXIAL		DEPTH (IF PLANAR)	DISTANCE FROM SURFACE		

CONTINUATION ATTACHED – ☐ Yes ☐ No

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

1371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-UT-S7S-1

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BYRON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N. Paul	Brian E. Bast	Walter Sawicki 3/18/81

1. Add the following subsections to section 3.0

3.2 A Level I individual may implement written ultrasonic examination instructions under the guidance of a higher level individual. The Level I individual shall not indpendently evaluate or accept the results of the ultrasonic examination.

3.3 In the process of being qualified and certified to at least Level I in the ultrasonic method, an individual shall be considered a Trainee. A Trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a report of test results.

2. Add the following to subsection 4.2.6

The clients Level III shall be notified verbally, within 24 hours, if it was necessary to use test frequencies other than 2.25 MHz.

3. Add the following to subsection 4.2.7

The clients Level III shall be notified verbally, prior to using the refracted longitudinal mode of wave propagation.

4. Add the following to subsection 5.2

Couplant shall be certified to have a total halogen content of 300 PPM or less.

5. Add the following after the fifth sentence of subsection 13.2.2

However, if it is possible to detect the next side drilled hole beyond the 1/2T path, then the response from this hole shall be used to extend the DAC curve beyond the 3/4t hole, rather than extrapolating the curve.

6. Revise the first line of subsection 16.2 to read: For each indication that exceeds 40 per cent of reference level.

TITLE: Ultrasonic Manual Examination of Class 1 & 2 Vessel Welds Including Reactor Pressure Vessel Welds

LEGEND: R - INDICATES REVISION

DATE: March 18, 1981

PREPARED BY: N Paul

REVIEWED BY:

APPROVED BY:

REPLACES ISI OF: January 23, 1981

REV	PREPARED	APPROV.
1	NP	WS

1. SCOPE

1.1 This procedure describes the manual contact ultrasonic examination of full penetration Class 1 and Class 2 vessel welds in ferritic material greater than 2 in. (51 mm) in thickness including reactor vessel welds. This procedure is in accordance with the requirements of ASME Boiler and Pressure Vessel Code Section XI, 1977 up to and including Summer 1978 Addenda.

1.2 The principal objective of examination is the detection, location and evaluation of discontinuities within the weld and adjacent base metal. The weld shall be examined by the straight beam and angle beam technique from the outside surface of the vessel.

2. APPLICABLE DOCUMENTS, CODES AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein.

2.1.1 ASME Section XI, 1977, up to and including Summer 1978 Addenda

2.1.2 Ebasco Services Incorporated procedure for "Training Examination and Certification of Nondestructive Examination Personnel", NDE 1

2.1.3 SNT-TC-1A, 1975 edition of American Society for Nondestructive Testing

2.1.4 ASME Section V, 1977, up to and including Summer 1978 Addenda

3. PERSONNEL CERTIFICATION

3.1 All personnel perfroming nondestructive examination shall be certified in accordance with the Ebasco Service Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel" which reflects the guideline set forth by the scope of SNT-TC-1A.

4. EQUIPMENT

4.1 Instrument

4.1.1 A pulse-echo ultrasonic flaw detection instrument shall be employed. It shall generate, receive, and present on a cathode-ray tube (CRT) screen, pulses in a frequency range from one to five MHz.

4.1.2 The instrument shall be equipped with a stepped gain control calibrated in units of 2 dB or less.

4.1.3 The system performance characteristic of the instrument shall be verified at least once a year.

4.2 Search Unit

4.2.1 Search units may contain either single- or dual-transducer elements.

4.2.2 The angle beam search units shall consist of a transducer and an angle wedge. The unit may be comprised of the two separate parts or it may be an integral unit.

4.2.3 The search unit's transducer shall have an active area of not less than 0.04 sq inch nor more than 1.0 sq inch.

4.2.4 The search unit cable shall be of coaxial type and shall not exceed approximately 30 feet so as not to impair communication between inspection team members.

4.2.5 A beam angle of 45 and 60 degrees in the material shall be employed for angle beam examination. Other angles may be employed for evaluation of an indication, or where wall thickness or geometric configuration or metallurgical condition impedes effective use of 45 and/or 60 degree angle beam of examination.

4.2.6 Nominal frequency of 2.25 MHz shall be employed. Other frequencies may be employed if variables, such as production material grain structure, necessitate the use of other frequencies in order to assure penetration or improve resolution.

4.2.7 In general, shear mode of wave propagation shall be used for angle beam examination. Refracted longitudinal mode of wave propagation may be used if grain structure or other condition impedes the use of shear wave.

4.2.8 The angle beam wedges shall be within $\pm 3^{\circ}$ of nominal value. This shall be checked on a standard reference block such as IIW or Rompas wherever any doubt arises about the tolerances.

5. COUPLANT

5.1 A client approved couplant, capable of conducting ultrasonic vibrations from the transducer to the weld surface, shall be used.

5.2 The couplant identification and batch number shall be recorded on the Calibration Data Sheet.

6. EXAMINATION COVERAGE

6.1 Scanning shall be done with an overlapping of each scan at least by 10 percent of the transducer dimension measured perpendicular to the scan path.

6.2 Whenever feasible, the scanning of the examination volume shall be carried out from both sides of the weld. Where configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination. Angle beam examination shall be done using a one-half V path.

7. SEARCH UNIT MOVEMENT

7.1 The rate of search unit movement shall not exceed 6 inches/second unless calibration has been verified at the higher scanning speed.

8. SCANNING SENSITIVITY

8.1 Scanning shall be done at twice (+ 6 dB) the primary reference level as a minimum but recording of ultrasonic reflectors shall be done at the primary reference level.

9. SURFACE PREPARATION

9.1 The examination surface shall be free of irregularities, loose material, or coatings which interfere with ultrasonic wave transmission.

10. ELECTRONIC DAC

Manual scanning with electronic distance amplitude correction is not permitted.

11. IDENTIFICATION OF EXAMINATION AREAS

11.1 The client shall provide the proper identification system.

12. INSTRUMENT CALIBRATION

12.1 Screen Height Linearity

12.1.1 The ultrasonic instrument shall provide screen height linearity within 5 percent of full range for at least 80 percent of full screen height (FSH)(baseline to maximum calibrated screen points).

12.1.2 The following procedures shall be used for screen height linearity calibration:

(a) Position an angle beam search unit on the reference standard so that indications from both the 1/2 T and 3/4 T holes are visible (other reflectors which provide the 2 to 1 ratio required in (b) may be substituted).

(b) Manipulate search unit to establish a 2 to 1 ratio of amplitudes between the two indications with the larger at 80 percent FSH.

(c) Without moving search unit, adjust sensitivity to run the higher response from approximately 100 percent to 20 percent FSH in 2 dB steps (10 percent if fine control available).

(d) Read and record the relative amplitudes of the two indications to the nearest 1 percent.

(e) If the smaller indication's amplitude is not 50 percent of the larger indication's amplitude, within 5 percent of FSH, the instrument shall not be used for examinations, until corrected.

Note Alternately, for screen height linearity calibration, a straight beam search unit may be used on any calibration block which will provide amplitude differences.

12.2 Amplitude Control Linearity

12.2.1 The ultrasonic instrument shall utilize an amplitude control, accurate over its useful range to ± 20 percent of the nominal amplitude ratio, to allow measurement of indications beyond the linear range of the vertical display on the screen.

12.2.2 The following procedure shall be used for Amplitude Control Linearity Calibration - Position an angle beam or a straight beam search unit in such a way so that an echo from one reflector in a calibration block is peaked on the screen. With the increase and decrease in attenuation shown in the following table, the echo amplitude shall fall within the specified limits. The setting and readings shall be estimated to the nearest 1 percent of full screen.

Indication Set at Percent of Full Screen	dB Control Change	Indication Limits Percent of Full Screen
80%	- 6 dB	32 to 48%
80%	- 12 dB	16 to 24%
40%	+ 6 dB	64 to 96%
20%	+ 12 dB	64 to 96%

12.3 The instrument calibration may be performed on any calibration block, including an IIW or Rompas block, and need not be performed with the same search unit used in the next examination.

12.4 The instrument calibration for screen height and amplitude control linearity shall be performed at the beginning of each period of extended use or every three months, whichever is less. This shall also be performed whenever any doubt arises about the instrument's functions. Results shall be recorded on the UT Instrument Calibration Sheet.

12.5 Beam Spread Measurement

12.5.1 Measurement of beam spread in vertical plane of angle beam search units shall be performed at the beginning of each period of extended use (or every 3 months, whichever is less).

12.5.2 Beam spread shall be performed for each angle beam search unit used for examination and may be performed on any basic calibration block.

12.5.3 Measurements of beam spread in the vertical plane shall be made on the side-drilled hole. The 50 percent DAC amplitude limit of the primary lobe of the beam shall be

plotted by calibrating the beam centerline in accordance with 16.1.2 (a) through (c) and proceeding with the following:

(a) Increase the amplitude of the indications two times (6 dB change) so the curve marked on the screen represents the 50 percent DAC line.

(b) Position for maximum indication from the 1/4 T hole. Move search unit toward the hole until indication equals the 50 percent DAC line. Mark a small number 2 on the indexing strip at the scribe line.

(c) Move search unit away from the hole until indication equals the 50 percent DAC line. Mark a small number 2 on the indexing strip at the scribe line.

(d) Repeat these measurements on the 1/2 and 3/4 T holes marking the positions on the indexing strip with small numbers 4 and 6.

(e) Plot these points on a full-scale drawing of the projected beam path. Positions are plotted with respect to the vertical projection of the front of the search unit; and depths are plotted at 1/4, 1/2, and 3/4 of the thickness equivalent to the 1/8, 2/8, and 3/8 of the vee path.

(f) Draw a straight line through the centerline points and extend the line to the search unit. This indicates the beam centerline point on the search unit. The beam angle may be read with a protractor as the angle between the beam centerline and a perpendicular line to the examination surface such as the search unit front-line projection.

(g) Connect small number points 2, 4 and 6 at the lower edge of the beam and the similar points at the upper edge of the beam. These two lines represent the 50 percent DAC amplitude limits of the beam measured on the side drilled hole. Project the lines to cross and measure the angle between the lines. This is the beam spread angle of the full beam measured at the 50 percent DAC amplitude level on the side-drilled hole.

13. BASIC CALIBRATION BLOCKS

13.1 The material from which the block is fabricated shall be from one of the following:

(a) Nozzle dropout from the component

(b) A component prolongation

(c) Material of the same material specification, product form, and heat treatment as one of the materials being joined

13.2 The finish on the surface of the block shall be representative of the surface finishes of the component.

13.3 Drilled holes in the basic calibration block shall be used to establish the primary reference responses for examination. notches shall also be used, if needed, for evaluation of indications close to surfaces.

13.4 Other particulars related to basic calibration block shall be in agreement with that of Paragraph T-34, Article 4, ASME Section V.

13.5 The client shall provide the calibration blocks conforming to Article 4, ASME Section V up to and including Summer 1978 Addenda.

14. SYSTEM CALIBRATION

14.1 General

14.1.1 Complete ultrasonic examination system calibration, establishing the DAC, shall be performed prior to each examination, or series of similar examination.

14.1.2 In case of angle beam, the maximum calibration indications shall be obtained with the sound beam oriented essentially perpendicular to the axis of the calibration reflector.

14.1.3 The centerline of the search unit shall be at least 1-1/2 in. (38 mm) from the nearest side of the block.

14.1.4 Calibration shall include the complete ultrasonic examination system. Any change in search units, shoes, couplants, cables, ultrasonic instruments, recording devices, or any other parts of the examination system shall be the cause of calibration check. The original calibration shall be performed on the basic calibration block and calibration checks shall be performed as per Article 14.2 of this procedure.

14.1.5 The temperature difference between the examination and calibration block surfaces shall not exceed 25°F (14°C).

14.1.6 Calibration shall be performed from the outside surface of the calibration block.

14.1.7 Particulars of system calibration shall be recorded on calibration data sheet.

14.2 Calibration Check

14.2.1 A system calibration check, which is the verification of the instrument sensitivity and sweep range calibration, shall be performed at the start and finish of each examination or series of similar examination, with any change in examination personnel, and at least every 4 hours during an examination. Calibration checks may be performed on either the block used for initial calibration, or a simulator approved by the client.

14.3 Corrective Action

14.3.1 If any point on the DAC curve has decreased 20 percent or 2 dB of its amplitude, all data sheets since the last calibration check shall be marked void. A new calibration shall be made and recorded and the voided examination area shall be reexamined.

14.3.2 If any point on the DAC curve has increased more than 20 percent or 2 dB of its amplitude, recorded indications taken since the last valid calibration or calibration check may be reexamined with the corrective calibration and that value changed on the data sheets.

14.3.3 If any point on the DAC curve has moved on the sweep line more than 10 percent of the sweep division reading, correct the sweep range calibration and note the correction of the examination record. If recordable reflectors are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the examination voided areas shall be reexamined.

15. STRAIGHT BEAM SCANNING

15.1 For Laminar Reflectors

When scanning for laminar reflectors, two examinations are performed simultaneously with the same calibration described below in 15.1.1. However, the examination volume and acceptance criteria differs as referenced in 15.1.2 and 17.1 respectively.

15.1.1 Calibration: Using the 1/4 t and 3/4 t side-drilled holes, establish the sweep range calibration by positioning the hole responses at the 2nd and 6th major horizontal screen divisions respectively. Also, verify that the response from the 1/2 t hole is at the 4tn horizontal division on the screen. Next, place the search unit on the component under examination. Adjust the sensitivity so that the response from the initial back reflection is at 80 percent (± 5 percent FSH). This is the reference sensitivity used for examination.

Note: When the examination is performed from the tapered surface at a transition in thickness of the component, angle beam longitudinal waves travelling essentially perpendicular to the back surface may be used to maintain the back reflection.

15.1.2 Examination: Examination shall cover the following:

(a) The entire examination volume as indicated in Fig. 4 to 9

Note: This examination is intended for recording laminar reflectors for acceptance.

(b) The base material through which angle beam will travel during angle beam examination

Note: This examination is intended for recording laminar reflectors which might affect the interpretation of angle beam results.

15.2 For Planar Relectors

15.2.1 Calibration: Using the 1/4 t and 3/4 t side drilled holes, establish the sweep range calibration by positioning the hole responses at the 2nd and 6th major horizontal screen divisions respectively. Also, verify that the response from the 1/2 t hole is at the 4th longitudinal division on the screen. The DAC shall be established using the 1/4, 1/2 and 3/4 t holes so that the maximum amplitude point is at 80 percent FSH. Mark the location and amplitude on the screen. Without adjusting the instrument controls maximize responses from the remaining holes and mark the amplitudes and locations on

the screen. Connect the maximum amplitude points with a smooth curve and extrapolate this curve an additional 1/4 t to cover the full examination range. This curve is the primary reference level and recording of ultrasonic reflectors shall be performed at this sensitivity (see Figure 1 for typical DAC).

15.2.2 Examination: The examination shall cover the entire examination volume as indicated in Fig. 4 to 9. Penetration shall be verified by obtaining a reflection from the opposite surface of the material being examined when the two surfaces are parallel.

16. ANGLE BEAM SCANNING

16.1 Calibration

Using the 1/4 t and 3/4 t side drilled holes, establish the sweep range calibration by positioning the hole responses at the 2nd and 6th major horizontal screen division respectively. Also, verify that the response from the 1/2 t hole is at the 4th horizontal division on the screen. The DAC shall be established using the 1/4, 1/2 and 3/4 t holes so that the maximum amplitude point is at 80 percent FSH. Mark the location and amplitude on the screen. Without changing the instument controls maximize responses from the remaining holes and mark the amplitudes and locations on the screen. Connect the maximum amplitude points with a smooth curve and extrapolate this curve an additional 1/4 t to cover the full examination range. This curve is the primary reference level and recording of ultrasonic reflectors shall be performed at this sensitivity (see Figure 2).

16.1.1 Calibration Correction The 45° angle beam shear wave reflects well from a corner reflector. However, mode conversion and redirection occurs to part of beam when a 60° angle beam shear wave hits the same reflector. This problem also exists to a lesser degree throughout the 50° to 70° angle beam shear wave range. This correction is required in order to be equally critical of such an imperfection regardless of the examination beam angle.

(a) Using the same sensitivity established above, position the search unit for maximum amplitude from the square notch on the opposite surface. "X" marks the peak of the indication on the screen near sweep line 8. (Figure 2)

(b) The opposite surface square notch may give an indication 2 to 1 above DAC at 45° and 1/2 DAC at 60°. The square notch in the examination surface will give a low amplitude if detected. Therefore, the indication from the square notch must be considered when evaluating reflectors at the top or bottom surface. (See figure 3A.)

16.1.2 Position Calibration: Position calibration may be used as an aid in locating reflectors and need only be performed for evaluation of indications. However, steps (a) through (c) can also be used for beam spread measurement as performed in 12.5.3 of this procedure. The following measurements may be made with a ruler, scale or marked on an indexing strip.

(a) Position the search unit for maximum response from the 1/4 hole. Place one end of the indexing strip against the front of the search unit, the other end extending in the direction of the beam. Mark the number 2 on the indexing strip at the scribe line which is directly above the hole. (If the search unit covers the scribe line the marks may be made on the side of the search unit.) (Figure 2)

(b) Position the search unit for maximum indications from the 1/2 and 3/4 t holes. Keep the same end of the indexing strip against the front of the search unit. Mark numbers 4 and 6 on the indexing strip at the scribe line.

(c) If possible, position the search unit so that the beam bounces from the opposite surface to the 3/4 hole. Mark the number 10 on the indexing strip at the scribe line.

(d) Position the search unit for the maximum opposite surface notch indication. Mark the number 8 on the indexing strip at the scribe line.

(e) The calibration numbers on the indexing strip indicate the position directly over the reflector in sixteenths of the Vee-path.

(f) The depth from the examination surface to the reflector is T at 8, 3/4 T at 6 and 10, 1/T at 4, 1/4 T at 2, and 0 at 0. Interpolation is possible for smaller increments of depth. This measurement may be corrected by the radius of the hole if the radius is considered significant to the accuracy of reflector's location.

Note: Figure 3B gives an example of above measurements.

16.2 Examination

The examination volume shall be scanned with angle beam search unit directed both at right angles to the weld axis and along the weld axis. Wherever feasible, each examination shall be performed in two directions, ie, approaching the weld from opposite directions and parallel to the weld from opposite directions. These examinations shall be conducted using two beam angles (nominal angles of 45 and 60 degrees) from each direction. The extent of scanning shall be such that ultrasonic beam passes through the entire examination volume as indicated in Fig. 4 to 9.

17. RECORDING EXAMINATION DATA

17.1 Straight Beam Data for Laminar Reflectors

17.1.1 For Interference with Angle Beam Examination: Record all areas which produce indications equal to or greater than the remaining back reflection.

17.1.2 For Acceptance: Record all areas where one or more discontinuities produce a continuous total loss of back reflection accompanied by continuous indications in the same plane.

17.1.3 Data Required: The following data shall be recorded: Sweep reading of laminar reflectors from surface, position from reference line, and location parallel to the reference line for each search unit position giving the recordable extent of the indication, as the "laminar" area is scanned on parallel scan paths.

17.2 Straight and Angle Beam Data for Planar Reflectors

17.2.1 Scope of Recording: Record all reflectors which produce responses as referenced in 17.2.2 except for the following:

(a) Geometric Reflectors: Clad interface and back well reflections need not be recorded.

(b) Surface Reflectors: Record surface reflectors that produce a response equal to or exceeding the reference amplitude established from appropriate surface notch in the calibration block (referenced in 16.1.1 of this procedure).

17.2.2 Reflectors Equal to or Exceeding 50 Percent DAC: For each indication that equals or exceeds 50 percent of the reference level the following information shall be recorded:

(a) Maximum percent of DAC, sweep reading of indication, search unit position, location along the length of the weld, and beam direction

(b) Through-Wall Dimension

(1) For reflectors 50 to 100 percent DAC, the minimum sweep reading and its position and location along the length of the reflector for 50 percent DAC when approaching the reflector from the maximum signal direction

(2) For reflectors 50 to 100 percent DAC, the maximum sweep reading and its position and location along the length of the reflector for 50 percent DAC when moving away from the reflector's maximum signal direction

(3) For reflectors exceeding 100 percent DAC, minimum sweep reading and its position and location along the length of the reflector for 50 percent of the maximum amplitude when approaching the reflector from the maximum signal direction

(4) For reflectors exceeding 100 percent DAC, maximum sweep reading and its position and location along the length of the reflector for 50 percent of the maximum amplitude when moving away from the reflector's maximum signal direction

(c) Length Dimension: The length of the reflector shall be obtained by recording the position and location along the length of weld as determined by 50 percent of DAC for each end of the reflector.

(d) Record all search unit position and location dimensions to the nearest tenth of an inch and obtain data from each successive scan path.

17.3 Further Evaluation

Further evaluation of reportable indications to determine dispostion and/or the need to make repairs shall be the responsibility of the utility-owner.

18. REPORTS

18.1 A detailed ultrasonic examination report shall be prepared using the report form provided at the end of this procedure and any additional sketches or photographs as may be applicable. If no reportable indications are detected it shall be so noted on the report form.

18.2 Prompt (24 hours) notification of reportable indications shall be made to the representative designated by the utility-owner.

18.3 Data shall be entered, as required for each item in the blank space provided on the calibration data sheet, and if used, on the indication data sheet. Where data is not germane for the specific item the blank space shall be marked N/A to indicate that data is not applicable.

TITLE
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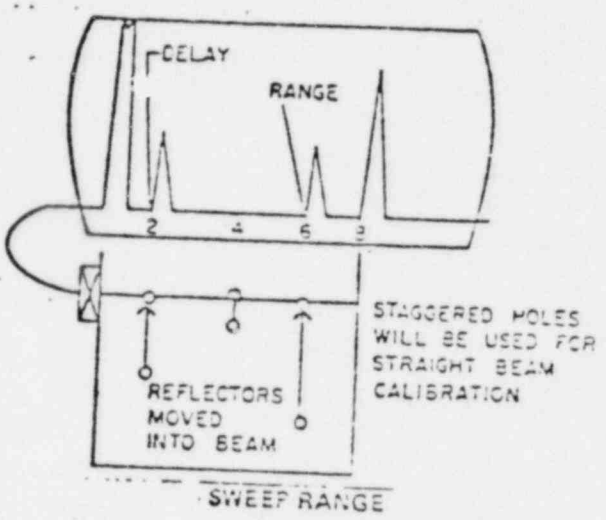
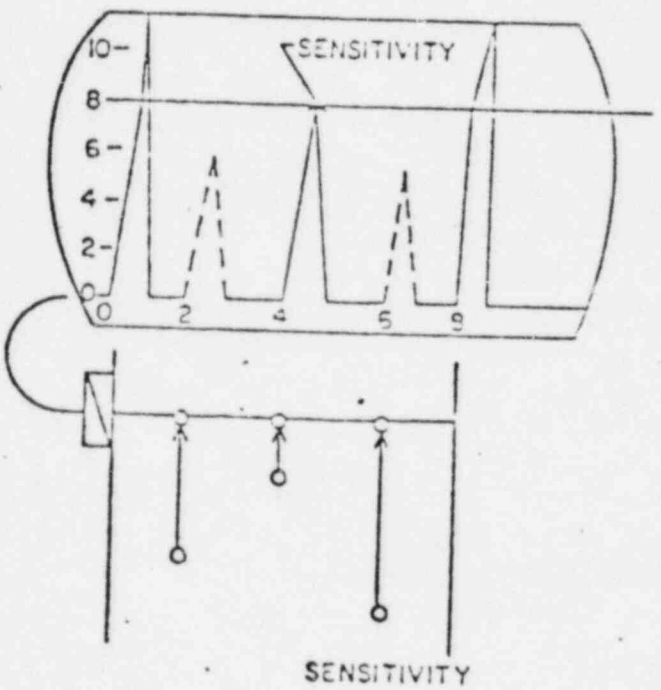
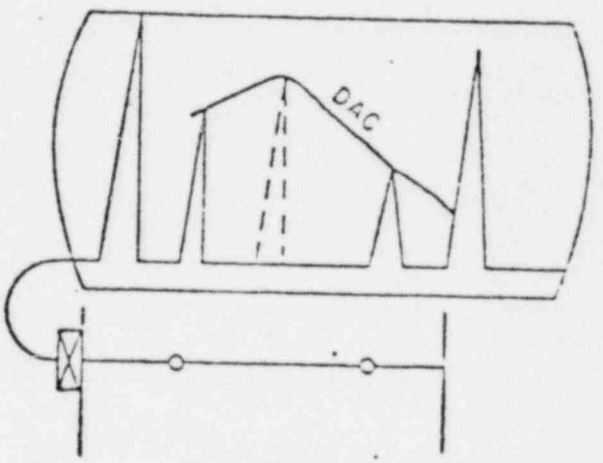




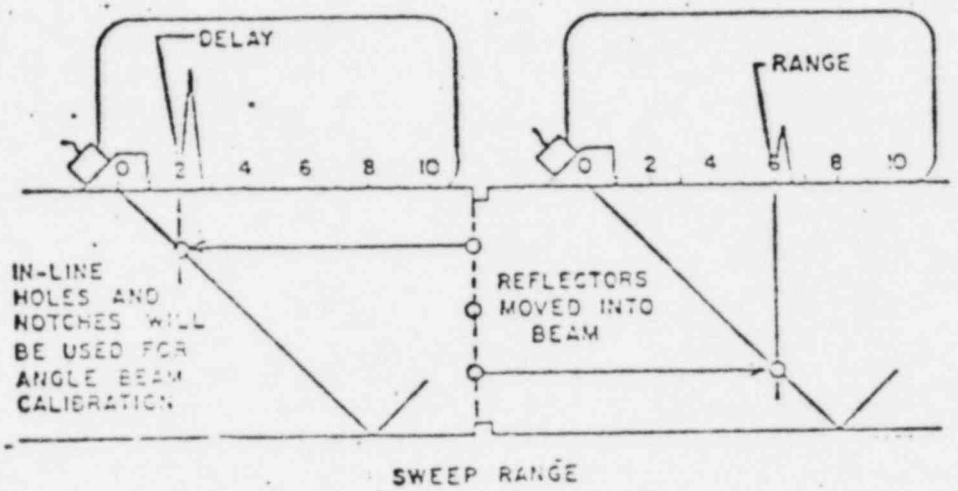
SENSITIVITY



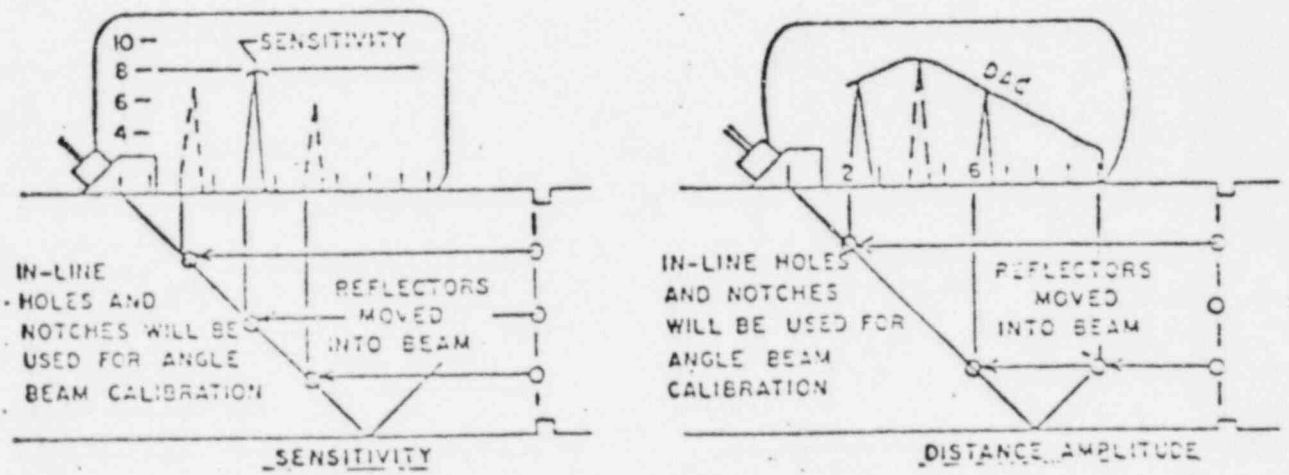
DISTANCE AMPLITUDE

SENSITIVITY

FIGURE 1



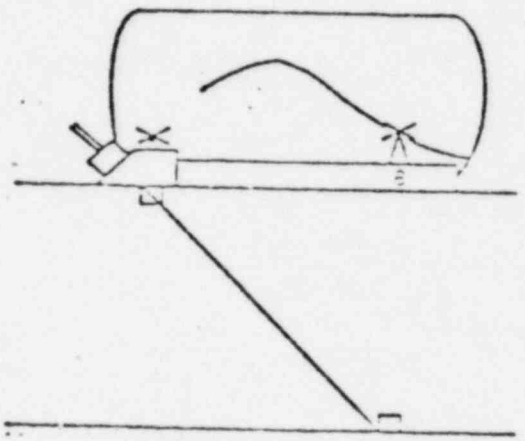
SWEEP RANGE



SENSITIVITY

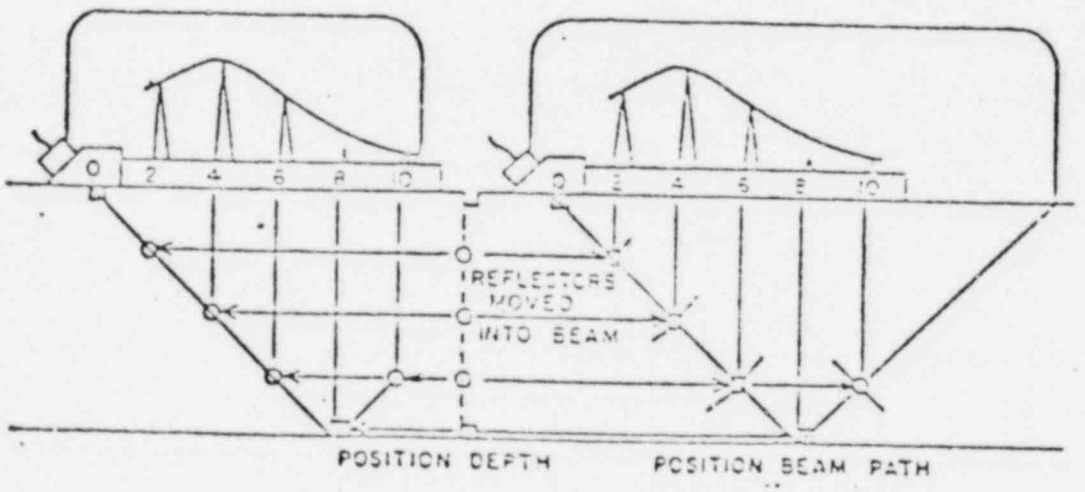
FIGURE 2

FIGURE 3A



PLANAR REFLECTORS

FIGURE 3B



POSITION DEPTH

FIGURE 3

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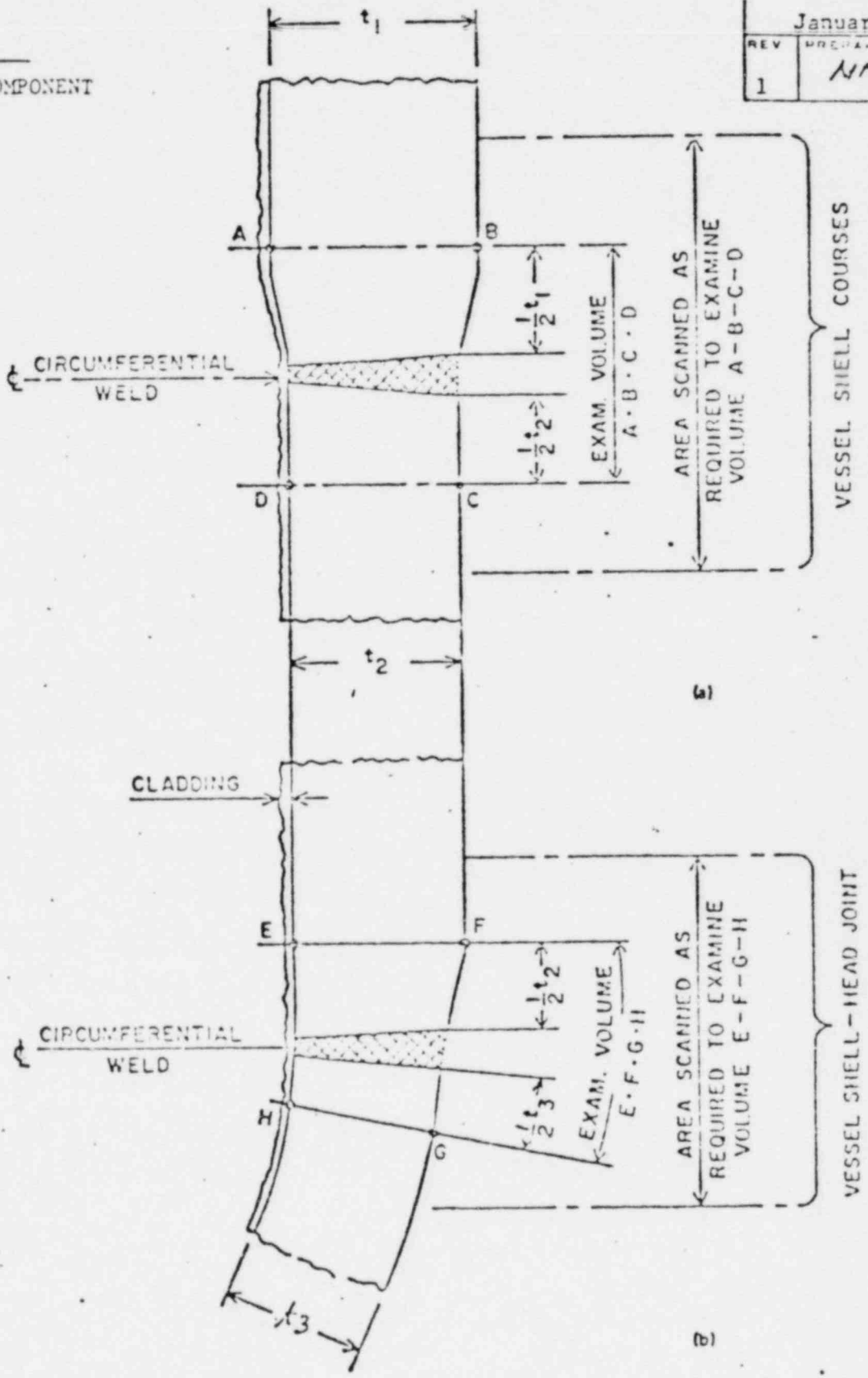
FIGURE 4

CLASS I COMPONENT



VESSEL SHELL CIRCUMFERENTIAL WELD JOINTS

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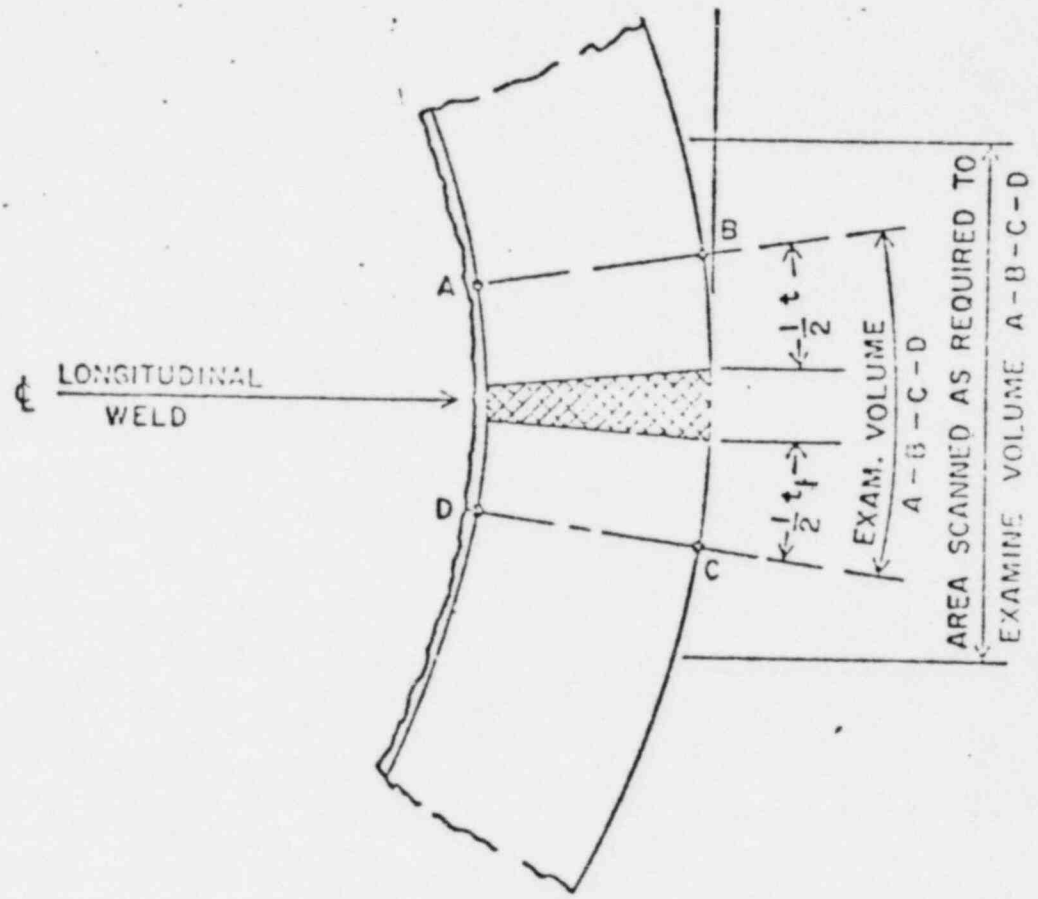
FIGURE 5

CLASS 1 COMPONENT



VESSEL SHELL LONGITUDINAL WELD JOINTS

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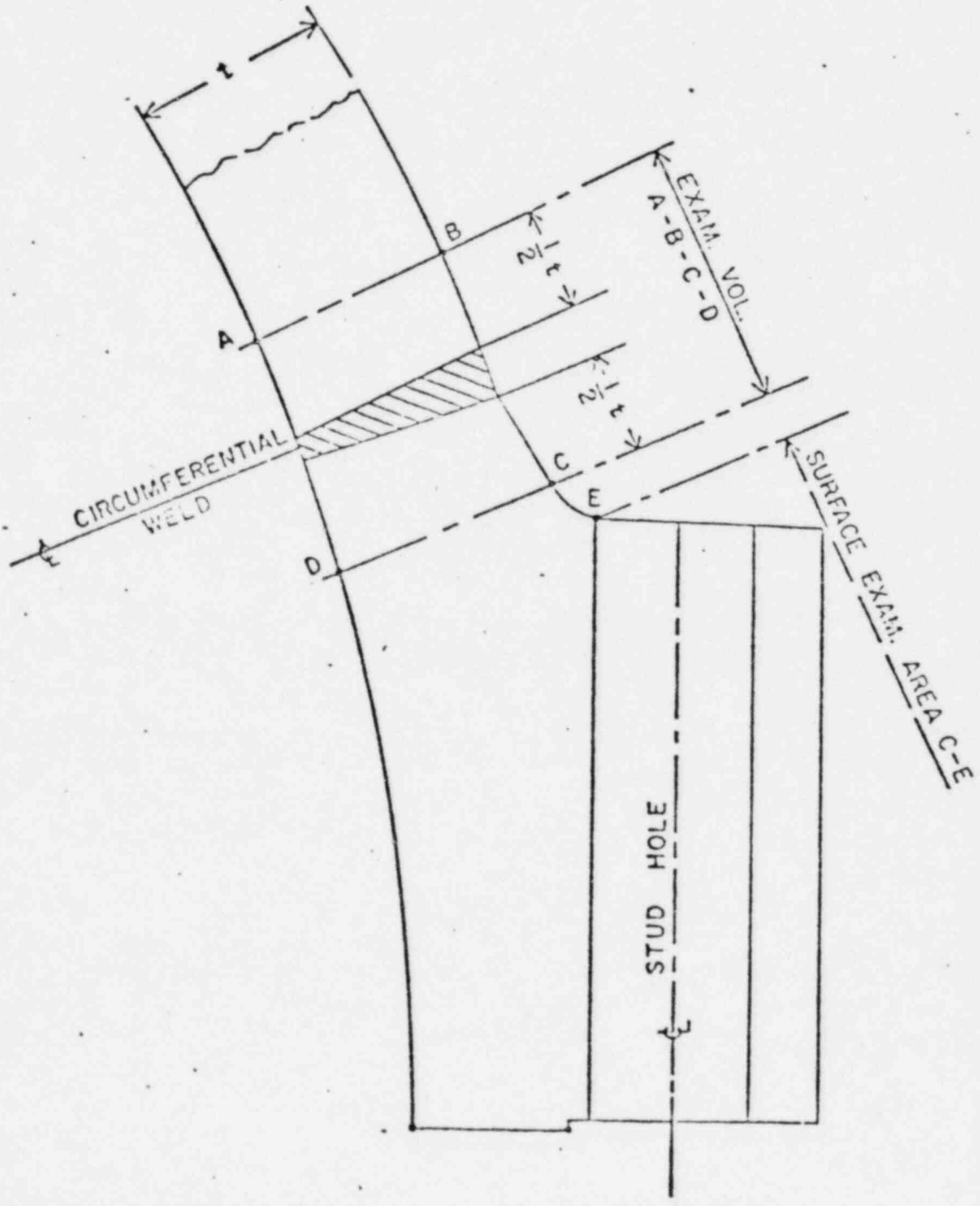
FIGURE 6

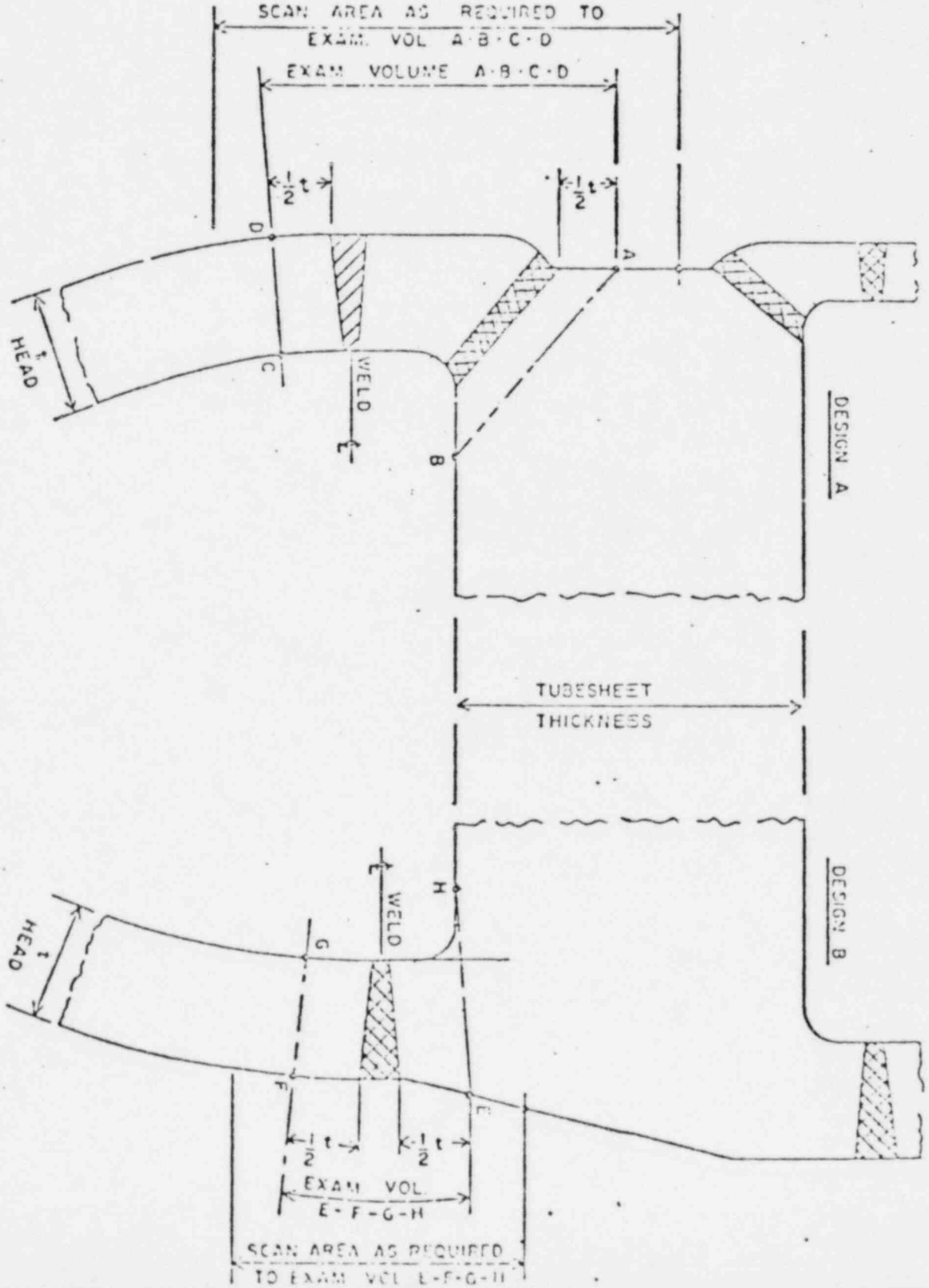
CLASS 1 COMPONENT



HEAD-TO-FLANGE WELD JOINT

FIGURE 7

CLASS 1 COMPONENT



TYPICAL TUBESHEET-TO-HEAD WELD JOINTS

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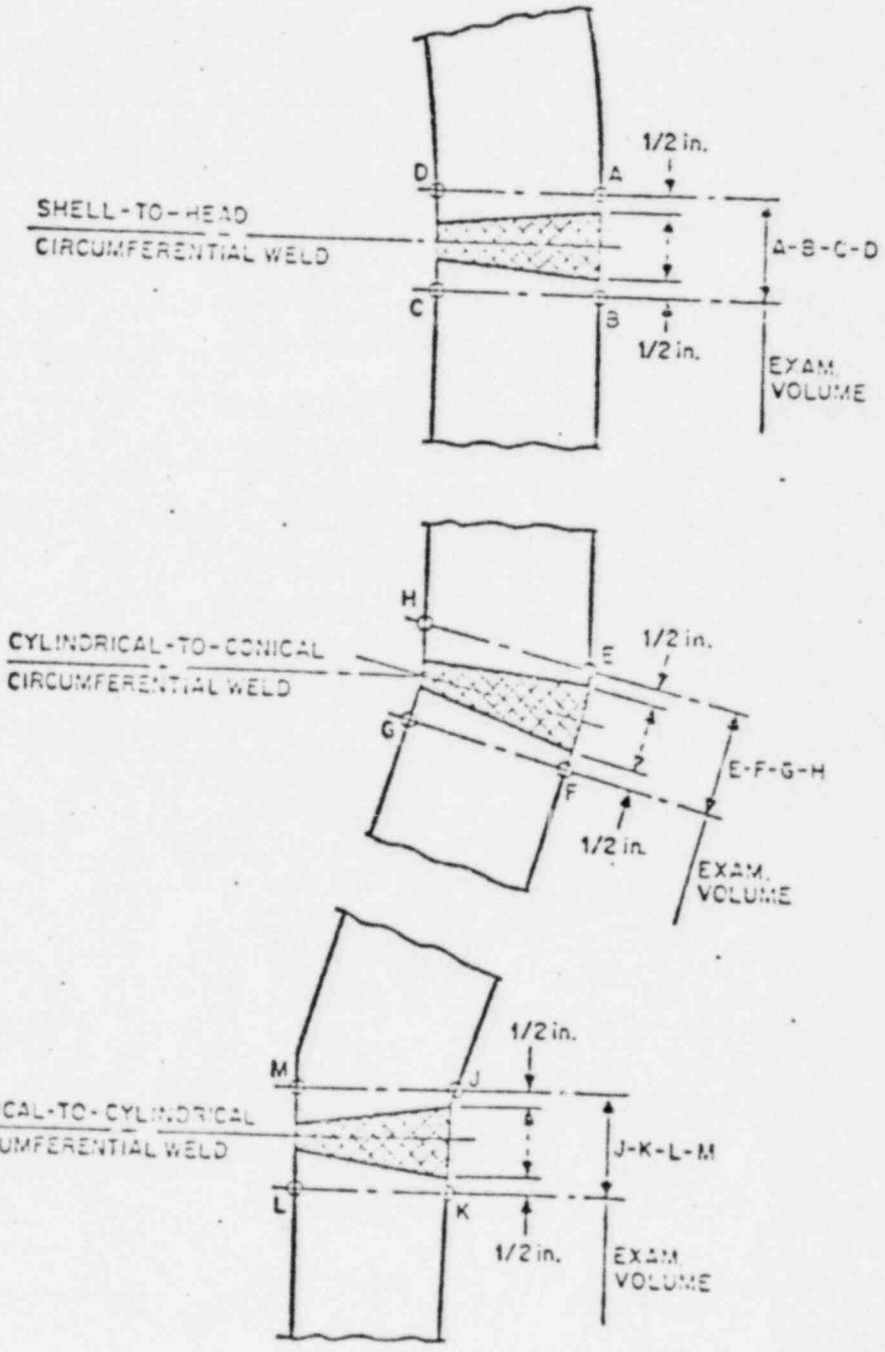
FIGURE 8

CLASS 2 COMPONENTS



. VESSEL CIRCUMFERENTIAL WELDS

TITLE
ULTRASONIC MANUAL EXAMINATION OF CLASS 1 & 2 VESSEL WELDS INCLUDING REACTOR PRESSURE VESSEL WELDS

LEGEND
R - INDICATES REVISION

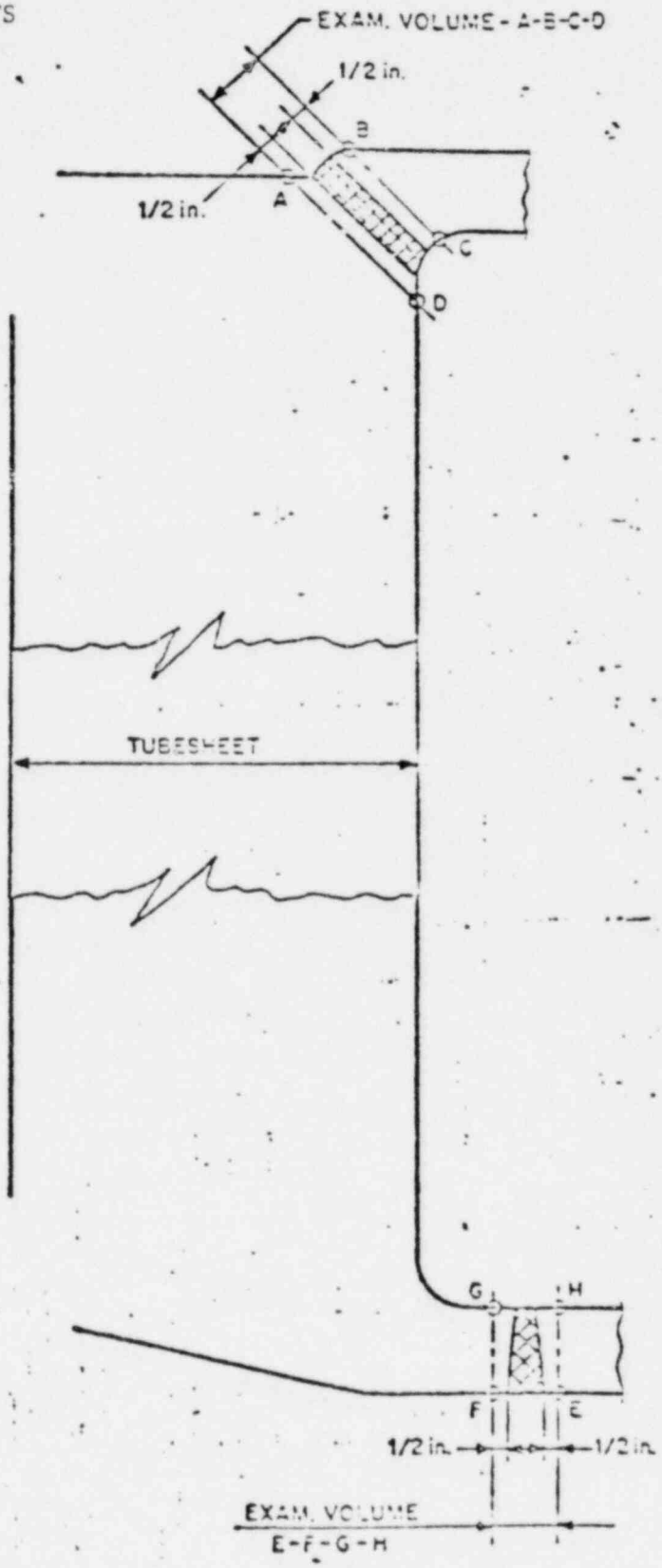
DATE
March 18, 1981

REPLACES ISSUE OF
January 23, 1981

REV	PREPARED	APPROVED
1	NP	WS

FIGURE 9

CLASS 2 COMPONENTS



TYPICAL TUBESHEET-TO-SHELL CIRCUMFERENTIAL WELDS
(STEAM GENERATOR DESIGNS)

6064/5-80

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

UT INSTRUMENT CALIBRATION

INSTRUMENT MANUFACTURER _____ PROJECT _____

MODEL _____ SERIAL NO. _____ DATE _____

AMPLITUDE LINEARITY

dB CONTROL CHANGE	ACTUAL dB	SCREEN HEIGHT LARGER INDICATION	SCREEN HEIGHT* SMALLER INDICATION
Initial (0dB)			
+2dB			
0dB			
-2dB			
-4dB			
-6dB			
-8dB			
-10dB			
-12dB			

*Must be 50% of the Larger Amplitude, within ±5% of Full Screen Height

AMPLITUDE CONTROL LINEARITY

INDICATION SET AT * FSH	dB CONTROL CHANGE	INDICATION LIMITS * FSH	ACTUAL * FSH
80	- 6dB	32 to 48	
80	-12dB	16 to 24	
40	+ 6dB	64 to 96	
20	+12dB	64 to 96	

	ACCEPTABLE	
	YES	NO
Amplitude Linearity		
Amplitude Control Linearity		

EXAMINER(S)

1. _____ TC/IA LEVEL _____

2. _____ TC/IA LEVEL _____

EBASCO SERVICES INCORPORATED

QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION

CALIBRATION DATA

PROJECT _____

DATA SHEET NO. _____ DATE _____

PROCEDURE ISI-UT- _____ REV __

COMPONENT OR SYSTEM _____ PIPE OD (IF APPLICABLE) _____

ITEM IDENTIFICATION NO(S). LISTED ON REVERSE SIDE - COMPONENT TEMP _____ EXAM. SURFACE ☐ ID ☐

CALIBRATION BLOCK NO. _____ THICKNESS _____ TEMP _____

SCAN COVERAGE

☐ 0° WHAZ ☐ 0° BASE MATERIAL ☐ AXIAL ☐ CIRCUMFERENTIAL

EQUIPMENT DATA

SEARCH UNIT

Manufacturer _____

Style _____

Serial No. _____

Size _____ Frequency _____

Angle _____ Mode _____

Couplant _____ Batch No. _____

INSTRUMENT

Manufacturer _____ Model _____

Serial No. _____ Coaxial Cable Length _____

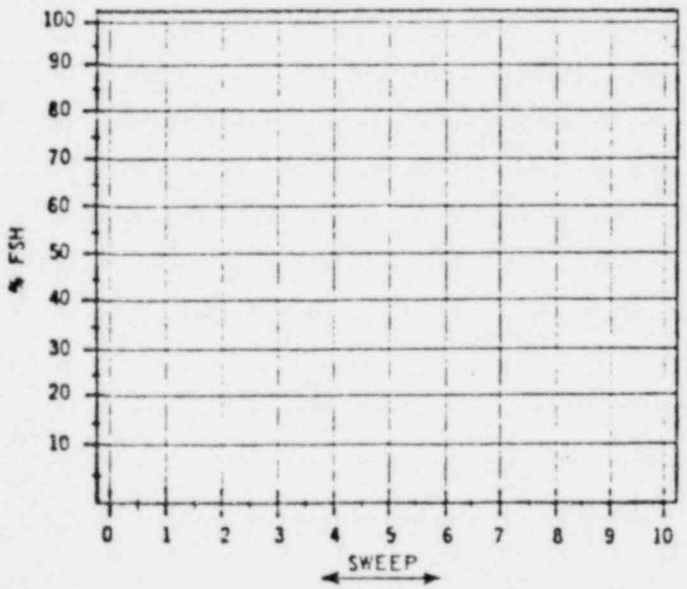
Frequency _____ Reject _____

Rep Rate _____ Damping _____

dB Gain – Coarse _____ Fine _____

Primary Reference Response
Amplitude % Full Screen Height _____

DAC PLOT - TIME _____ AM, PM



NOTE: *When performing examinations where no DAC is required, indicate reference reflector location and amplitude above.*

CALIBRATION CHECKS

	AMPL ± 20% (2dB) OF INITIAL AMPL		SWEEP ± 5% OF INITIAL LOCAT	
TIME	YES	NO	YES	NO

NOTE: *If response above is "NO" refer to Calibration C section of procedure.*

EXAMINER(S)

1. _____ TC-1A LEVEL ___

2. _____ TC-1A LEVEL ___

REVIEWED BY _____ DATE ___

ADDITIONAL REMARKS

*See Remarks Sheet

6062/5-78

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

INDICATION DATA

SHEET _____ OF _____

ITEM IDENTIFICATION _____

CALIBRATION DATA SHEET NO. _____

DATA TABULATION

SCAN DIRECTION			INDICATION NO.	EXAM. ON _____(ADJ WELD) SIDE OF WELD	MAX % DAC	SWEEP READING	SEARCH UNIT EXIT POINT LOCATION		50% DAC OR HALF MAXIMUM AMPLITUDE				STRAIGHT BEAM (CAL ON BACK REFLECTION)	
									MINIMUM		MAXIMUM			
ST. BEAM	CIRCUMFERENTIAL	AXIAL					CIRCUMFERENTIAL (DISTANCE CW OR CCW FROM REFERENCE LINE)	AXIAL (DISTANCE FROM WELD ℄)	SWEEP READING	S.U. POSITION	SWEEP READING	S.U. POSITION	INDICATION AMPLITUDE (% FSH)	BACK REFLECTION AMPLITUDE (% FSH)

RESULTS

INDICATION NO.	LOCATION OF INDICATION		LENGTH	%		WIDTH (IF LAMINAR)	COMMENTS
	CIRC	AXIAL		DEPTH (IF PLANAR)	DISTANCE FROM SURFACE		

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

CONTINUATION ATTACHED – ☐ Yes ☐ No

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____

1371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-UT-S78-2

CLIENT	PROJECT	
COMMONWEALTH EDISON CO.	BYRON UNITS 1 & 2	
PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N. Paul	Brian Ebert	Walter Sawicki 3/18/81

1. Add the following subsections to section 3.0

3.2 A Level I individual may implement written ultrasonic examination instructions under the guidance of a higher level individual. The Level I individual shall not independently evaluate or accept the results of the ultrasonic examination.

3.3 In the process of being qualified and certified to at least Level I in the ultrasonic method, an individual shall be considered a Trainee. A Trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a report of test results.

2. Add the following to subsection 4.2.6

The clients Level III shall be notified verbally, within 24 hours, if it was necessary to use test frequencies other than 2.25 MHz.

3. Add the following to subsection 4.2.7

The clients Level III shall be notified verbally, prior to using the refracted longitudinal mode of wave propagation.

4. Add the following to subsection 5.2

Couplant shall be certified to have a total halogen content of 300 PPM or less.

5. Add the following subsection to section 17.0

17.2.3 Reflectors that exceed 40% DAC:

For reflectors that are greater than 40% of DAC but less than 50% of DAC, data shall be recorded as per 17.2.2(a)

TITLE	LEGEND	DATE
ULTRASONIC EXAMINATION OF CLASS 1 & 2 BOLTS & STUDS	R - INDICATES REVISION	March 20, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N Raup	J Hallman	W J Sawicki	January 26, 1981

REV	PREPARED	APPROVED
1	NP	WJS

1. SCOPE

1.1 This procedure describes the manual contact ultrasonic examination of Class 1 and 2 bolts and studs larger than 2 in. (51 mm) in diameter. This procedure is in accordance with the requirements of ASME Boiler and Pressure Vessel Code, Section XI 1977 up to and including Summer 1978 Addenda.

1.2 The principal object of examination is the detection, location and evaluation of discontinuities in the base material of bolts and studs. The examination shall be carried out by the axial scanning technique employing longitudinal straight beam.

2. APPLICABLE DOCUMENTS, CODES AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein.

2.1.1 ASME Section XI, 1977 up to and including Summer 1978 Addenda

2.1.2 Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel", NDE 1

2.1.3 SNT-TC-1A, 1975 edition of American Society for Nondestructive Testing

2.1.4 ASME Section V, 1977 up to and including Summer 1978 Addenda

3. PERSONNEL CERTIFICATION

3.1 All personnel performing nondestructive examination shall be certified in accordance with the Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel" which reflects the guidelines set forth by the scope of SNT-TC-1A.

4. EQUIPMENT

4.1 Instrument

4.1.1 A pulse-echo ultrasonic flaw detection instrument shall be employed. It shall generate, receive, and present on a cathode-ray tube (CRT) screen, pulses in a frequency range from one to five MHz.

TITLE: ULTRASONIC EXAMINATION OF CLASS 1 & 2 BOLTS & STUDS

LEGEND: R - INDICATES REVISION

DATE: March 20, 1981

REPLACES ISSUE OF: January 26, 1981

REV	PREPARED	APPROVED
1	NP	WJS

4.1.2 The instrument shall be equipped with a stepped gain control calibrated in units of 2 dB or less.

4.1.3 The system performance characteristic of the instrument shall be verified at least once a year.

4.2 Search Unit

4.2.1 Search units may contain either single or dual transducer elements.

4.2.2 Examination shall be performed with a circular transducer element not less than 1/2 in. diameter (12.7 mm) and not greater than 1-1/8 in. diameter (28.6 mm).

4.2.3 The search unit cable shall be of coaxial type and shall not exceed approximately 30 feet, so as not to impair communication between inspection team members.

4.2.4 Nominal frequency of 2.25 MHz shall be employed. Other frequencies may be employed if variables, such as production material grain structure, necessitate the use of other frequencies in order to assure penetration or improve resolution.

5. COUPLANT

5.1 A client-approved couplant, capable of conducting ultrasonic vibrations from the transducer to the weld surface, shall be used.

5.2 The couplant identification and batch number shall be recorded on the calibration data sheet.

6. EXAMINATION COVERAGE

6.1 Scanning shall be done with an overlapping of each scan at least by 10 percent of the transducer dimension measured perpendicular to the scan path.

7. SEARCH UNIT MOVEMENT

7.1 The rate of search unit movement shall not exceed 6 inches/second.

8. SCANNING SENSITIVITY

8.1 Scanning shall be done at twice (6 dB) the primary reference level whenever practicable but recording of ultrasonic reflectors shall be done at the primary reference level.

9. SURFACE PREPARATION

9.1 The examination surface shall be free of irregularities, loose material or coatings which interfere with ultrasonic wave transmission.

10. IDENTIFICATION OF STUDS AND BOLTS

10.1 The client shall provide the proper identification system for studs and bolts.

11. INSTRUMENT CALIBRATION

11.1 Screen Height Linearity: The ultrasonic instrument shall provide screen height linearity within 5 percent of full range for at least 80 percent of Full Screen Height (FSH) (baseline to maximum calibrated screen points).

11.1.1 The following procedure shall be used for screen height linearity calibration. Position an angle beam or a straight beam search unit in such a way on a calibration block so that echoes can be observed from any two reflectors. Adjust the search unit position to give 2 to 1 ratio of amplitudes between the two echoes, with the larger set at 80 percent of full screen height. Without moving the search unit, adjust sensitivity (gain) to successively set the larger echo from 100 percent to 20 percent of FSH in 2 dB steps and read the amplitude of the smaller echo at each setting. The reading shall be 50 percent of the larger amplitude, within 5 percent of FSH. The settings and readings shall be estimated to the nearest 1 percent of full screen.

11.2 Amplitude Control Linearity: The ultrasonic instrument shall utilize an amplitude control, accurate over its useful range to ± 20 percent of the nominal amplitude ratio, to allow measurement of indications beyond the linear range of the vertical display on the screen.

11.2.1 The following procedure shall be used for amplitude control linearity calibration. Position an angle beam or a straight beam search unit in such a way so that an echo from one reflector in a calibration block is peaked on the screen. With the increase and decrease in attenuation shown in the following table, the echo amplitude shall fall within the specified limits. The setting and readings shall be estimated to the nearest 1 percent of full screen.

Indication Set at Percent of Full Screen	dB Control Change	Indication Limits Percent of Full Screen
80%	- 6 dB	32 to 48%
80%	- 12 dB	16 to 24%
40%	+ 6 dB	64 to 96%
20%	+ 12 dB	64 to 96%

11.3 The instrument calibration may be performed on any calibration block, including an IIW or Rompas block, and need not be performed with the same search unit used in the next examination.

11.4 The instrument calibration for screen height and amplitude control linearity shall be performed at the beginning of each period of extended use or every three months, whichever is less. This shall also be performed whenever any doubt arises about the instrument's functions. Results shall be recorded on the UT Instrument Calibration Sheet.

12. BASIC CALIBRATION BAR (Standard)

12.1 Calibration shall be established using a test bar of the same nominal composition and diameter as the component.

12.2 The test bar shall have a minimum of one-half the length of the component being examined.

12.3 A 3/8 in. (10 mm) diameter x 3 in. (76 mm) deep flat bottom hole shall be drilled in one end of the bar and plugged with similar material to full depth.

12.4 The surface finish of the calibration bar shall be representative of the surface finish of the component.

12.5 The client shall provide the basic calibration bars.

13. SYSTEM CALIBRATION

13.1 General

13.1.1 Complete ultrasonic examination system calibration, establishing the DAC curve, shall be performed immediately prior to each examination, or series of similar examination.

13.1.2 Calibration shall include the complete ultrasonic examination system. Any change in search units, couplants, cables, ultrasonic instruments, recording devices, or any other parts of the examination system shall be the cause of calibration check. The original calibration shall be performed on the basic calibration bar and calibration checks shall be performed as per Paragraph 13.3 of this procedure.

13.1.3 The temperature difference between the examination and calibration block surfaces shall not exceed 25°F (14°C).

13.2 Calibration

13.2.1 Perform the sweep calibration in such a way so that the examination volume is presented, using as much of the screen sweep as practicable. Once this is done, place the search unit on the end of the calibration block closest to the calibration reflector. Position the search unit for maximum response from the calibration reflector and adjust the amplitude to 75 to 90 percent full screen height and mark its peak on the screen. Without changing the instrument controls, place the search unit on the opposite end of the calibration bar. Position the search unit for maximum response from the calibration reflector and mark its peak on the screen. Now draw a line connecting the two points and extrapolate the DAC to cover the full examination volume. This line is the primary reference level (DAC).

13.2.2 Electronic DAC: If an electronic distance amplitude correcting device is used, the primary reference response shall be equalized at a nominal 50 percent of full screen height over the distance range to be employed in the examination. The actual readings representing amplitude and sweep shall be recorded on the calibration data sheet.

13.2.3 Recording of Calibration Data: Particulars of system calibration shall be recorded on the calibration data sheet.

13.3 Calibration Check

13.3.1 A system calibration check, which is the verification of the instrument sensitivity and sweep range calibration, shall be performed at the start and finish of each examination or series of similar examination, with any change in examination personnel, and at least every 4 hours during an examination. Calibration checks may be performed on either a basic calibration bar simulator or the bar used for initial calibration.

13.4 Corrective Action

13.4.1 If any point on the DAC curve has decreased 20 percent or 2 dB of its amplitude, all data sheets since the last calibration check shall be marked void. A new calibration shall be made and recorded and the voided examination area shall be reexamined.

13.4.2 If any point on the DAC curve has increased more than 20 percent or 2 dB of its amplitude, recorded indications taken since the last valid calibration check may be reexamined with the correct calibration and that value changed on the data sheet.

13.4.3 If any point on the DAC curve has moved on the sweep line more than 10 percent of the sweep division reading, correct the sweep range calibration and note the correction of the examination record. If recordable reflectors are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the examination areas shall be reexamined.

14. EXAMINATION

14.1 Scanning shall be done on an entire end surface of the stud or bolt. See Figures 1 and 2 as examples.

14.2 If the entire length of the stud or bolt cannot be examined by a single calibration, multiple calibration may be employed using different calibration bars to cover the entire length of the stud or bolt.

15. DATA RECORDING AND EVALUATION

15.1 All reflectors which produce a response greater than 100 percent of the reference level shall be investigated to the extent that the examiner can determine the shape, identity and location of all such reflectors.

15.2 The size of reflectors shall be measured between points which give amplitudes equal to 100 percent of the reference level.

15.3 For each indication that exceeds 50 percent of reference level amplitude but does not exceed the reference level, the search unit position for peak amplitude and the peak amplitude as either dB from reference level, or as a percent of DAC shall be recorded.

15.4 Further evaluation of reportable indications to determine disposition and/or the need to make repairs shall be the responsibility of the utility-owner.

16. REPORTS

16.1 A detailed ultrasonic examination report shall be prepared using report form provided at the end of this procedure and any additional sketches or photographs as may be applicable. If no reportable indications are detected it shall be so noted on the report form.

16.2 Data shall be entered, as required for each item in the blank space provided on the calibration data sheet, and if used on the indication data sheet. Where data is not germane for the specific item the blank space shall be marked N/A to indicate that data is not applicable.

16.3 Prompt (24 hours) notification of reportable indications will be made to the representative designated by the utility-owner.

TITLE
ULTRASONIC EXAMINATION OF CLASS 1 & 2 BOLTS & STUDS

LEGEND
R - INDICATES REVISION

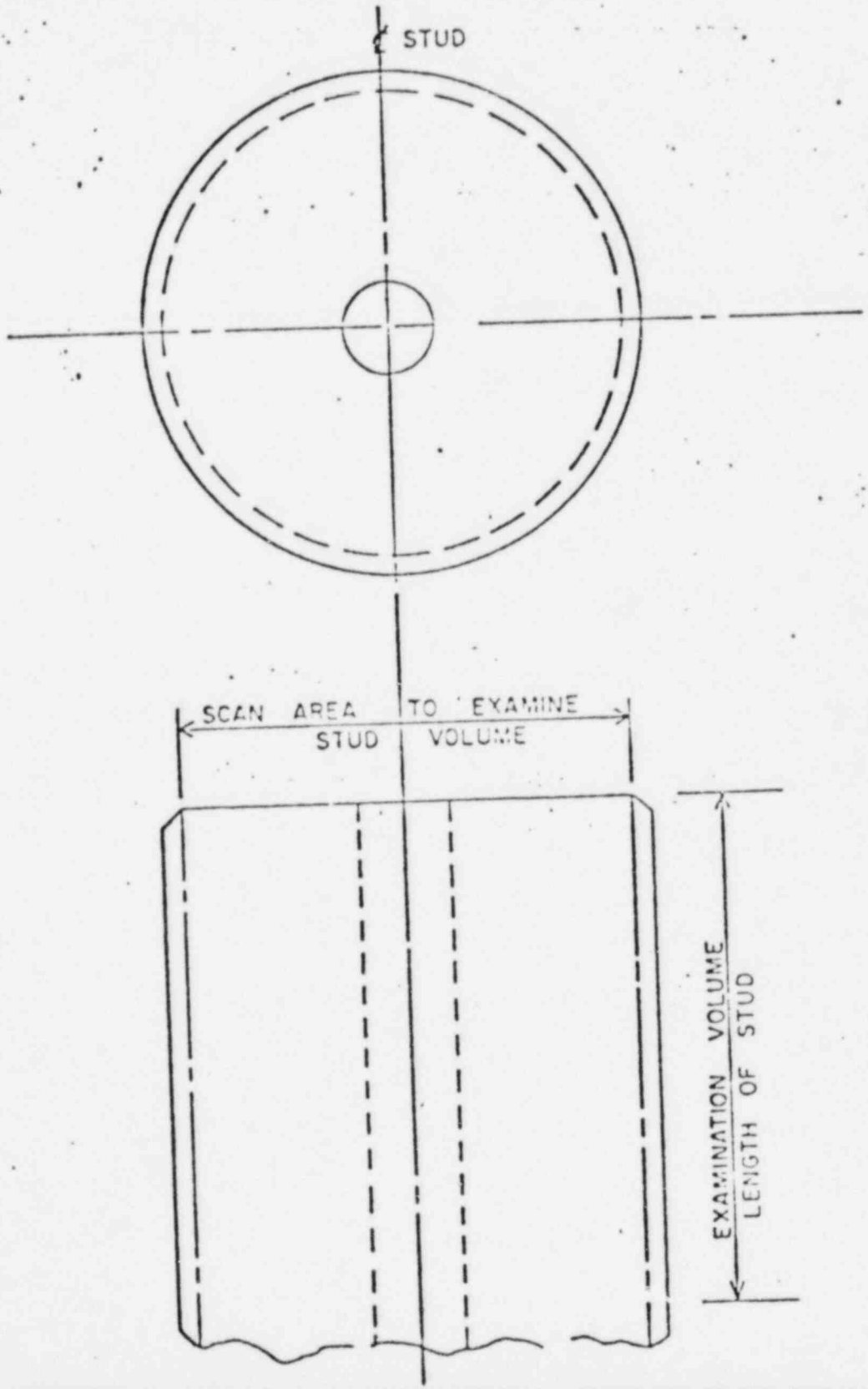
DATE
March 20, 1981

REPLACES ISSUE OF
January 26, 1981

REV	PREPARED	APPROVED
1	NP	WS

FIGURE 1

Class 1 Components
Closure Stud



TITLE

ULTRASONIC EXAMINATION OF CLASS 1 & 2 BOLTS & STUDS

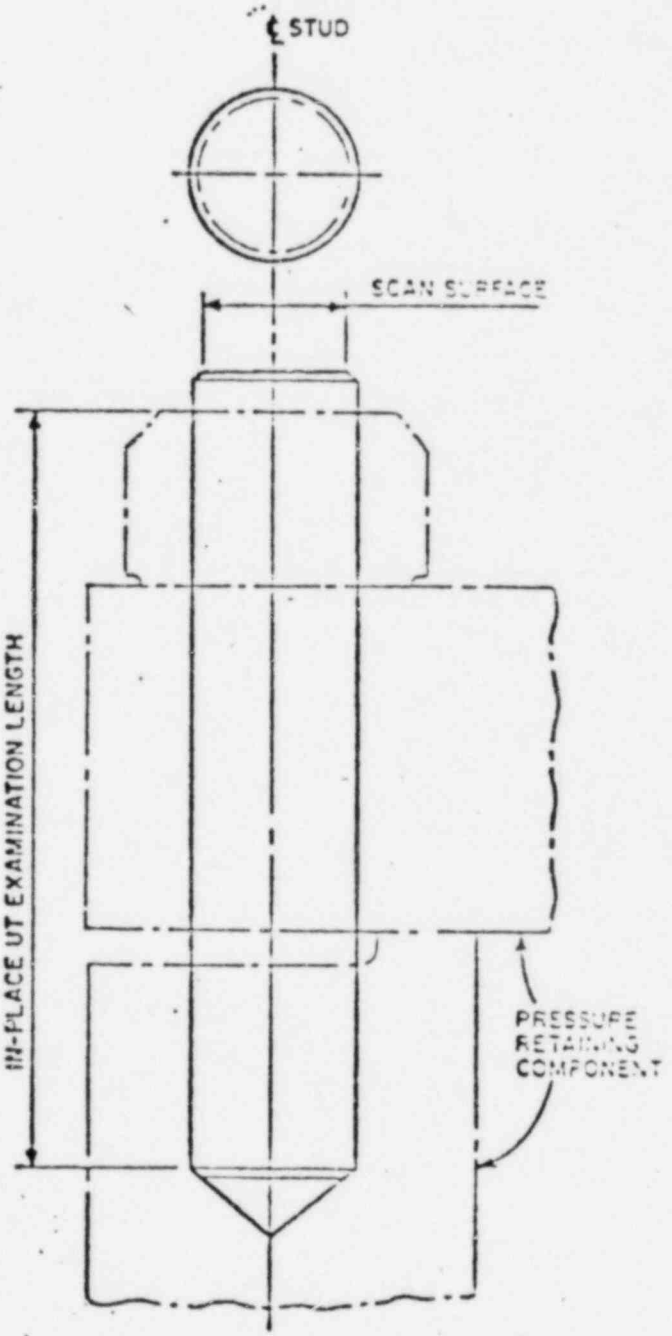
LEGEND
R - INDICATES REVISION

DATE
March 20, 1981
SUPERSEDES REV. OF
January 26, 1981

REV	PREPARED	APPROVED
1	NP	WS

FIGURE 2

Class 2 Components
Pressure Retaining Bolting



8064/5-80

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

UT INSTRUMENT CALIBRATION

INSTRUMENT MANUFACTURER _____ PROJECT _____

MODEL _____ SERIAL NO. _____ DATE _____

AMPLITUDE LINEARITY

dB CONTROL CHANGE	ACTUAL dB	SCREEN HEIGHT LARGER INDICATION	SCREEN HEIGHT* SMALLER INDICATION
Initial (0dB)			
+2dB			
0dB			
-2dB			
-4dB			
-6dB			
-8dB			
-10dB			
-12dB			

*Must be 50% of the Larger Amplitude, within ±5% of Full Screen Height

AMPLITUDE CONTROL LINEARITY

INDICATION SET AT % FSH	dB CONTROL CHANGE	INDICATION LIMITS % FSH	ACTUAL % FSH
80	- 6dB	32 to 48	
80	-12dB	16 to 24	
40	+ 6dB	64 to 96	
20	+12dB	64 to 96	

	ACCEPTABLE	
	YES	NO
Amplitude Linearity		
Amplitude Control Linearity		

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

CALIBRATION DATA

PROJECT _____

DATA SHEET NO. _____ DATE _____

PROCEDURE ISI-UT- _____ REV ____

COMPONENT OR SYSTEM _____ PIPE OD (IF APPLICABLE) _____

ITEM IDENTIFICATION NO(S). LISTED ON REVERSE SIDE - COMPONENT TEMP _____ EXAM. SURFACE ☐ ID ☐ O

CALIBRATION BLOCK NO. _____ THICKNESS _____ TEMP _____

SCAN COVERAGE

☐ 0° WHAZ ☐ 0° BASE MATERIAL ☐ AXIAL ☐ CIRCUMFERENTIAL

EQUIPMENT DATA

SEARCH UNIT

Manufacturer _____

Style _____

Serial No. _____

Size _____ Frequency _____

Angle _____ Mode _____

Couplant _____ Batch No. _____

INSTRUMENT

Manufacturer _____ Model _____

Serial No. _____ Coaxial Cable Length _____

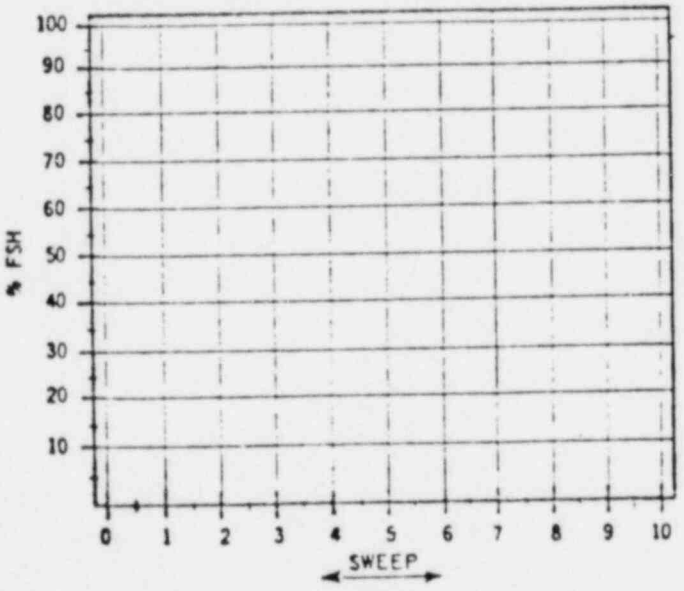
Frequency _____ Reject _____

Rep Rate _____ Damping _____

dB Gain – Coarse _____ Fine _____

Primary Reference Response
Amplitude % Full Screen Height _____

DAC PLOT – TIME _____ AM, PM



NOTE: When performing examinations where no DAC is required, indicate reference reflector location and amplitude above.

CALIBRATION CHECKS

TIME	AMPL ± 20% (2dB) OF INITIAL AMPL		SWEEP ± 5% OF INITIAL LOCATION	
	YES	NO	YES	NO

NOTE: If response above is "NO" refer to Calibration Check section of procedure

EXAMINER(S)

1. _____ TC-1A LEVEL ____

2. _____ TC-1A LEVEL ____

REVIEWED BY _____ DATE ____

ADDITIONAL REMARKS

6062/5-78

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

INDICATION DATA

SHEET _____ OF _____

ITEM IDENTIFICATION _____

CALIBRATION DATA SHEET NO. _____

DATA TABULATION

SCAN DIRECTION			INDICATION NO.	EXAM. ON _____ (ADJ WELD) SIDE OF WELD	MAX % DAC	SWEEP READING	SEARCH UNIT EXIT POINT LOCATION		50% DAC OR HALF MAXIMUM AMPLITUDE				STRAIGHT BEAM (CAL. ON BACK REFLECTION)	
									MINIMUM		MAXIMUM			
ST. BEAM	CIRCUMFERENTIAL	AXIAL					CIRCUMFERENTIAL (DISTANCE CW OR CCW FROM REFERENCE LINE)	AXIAL (DISTANCE FROM WELD ℄)	SWEEP READING	S.U. POSITION	SWEEP READING	S.U. POSITION	INDICATION AMPLITUDE (% FSH)	BACK REFLECTION AMPLITUDE (% FSH)

RESULTS

INDICATION NO.	LOCATION OF INDICATION		LENGTH	% t		WIDTH (IF LAMINAR)	COMMENTS
	CIRC	AXIAL		DEPTH (IF PLANAR)	DISTANCE FROM SURFACE		

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

CONTINUATION ATTACHED – [ ] Yes [ ] No

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____

1371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI UT S78-3

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BYRON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N. Patel	[illegible]	[illegible] 3/20/81

1. Add the following subsections to Section 3.0

3.2 A Level I individual may implement written ultrasonic examination instructions under the guidance of a higher level individual. The Level I individual shall not independently evaluate or accept the results of the ultrasonic examination.

3.3 In the process of being qualified and certified to at least Level I in the ultrasonic method, an individual shall be considered a trainee. A trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a report of test results.

2. Add the following to Subsection 4.2.4

4.2.4 The clients Level III shall be notified verbally, within 24 hours, if it was necessary to use test frequencies other than 2.25 MHz.

3. Revise the whole section 12.0 as follows:

12.0 Basic Calibration Standard

12.1 A calibration standard of at least the same length and of the same diameter and of a material of either the same or greater attenuation as the material to be tested, shall be used.

12.2 The calibration standard shall have a flat bottom hole 3 inches deep and 3/8 inch in diameter, drilled into its bottom face. This hole shall be plugged its full length with a tight-fitting plug of the same standard material ("P" number) as the stud or bolt.

12.3 The surface finish of the calibration standard shall be representative of the surface finish of the component.

12.4 The client shall provide the basic calibration standard.

1371A/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI UT S78-3

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BYRON UNITS 1 & 2

4. Revise the whole Sub-section 13.2 as follows:

13.2 Calibration

13.2.1 The sweep markers shall be calibrated from one of the studs, or bolts being tested by setting the stud length equal to 90% of screen width.

13.2.2 The search unit shall be placed on the end opposite the plugged end of the calibration standard, and the amplitude of the back reflection of the 3/8 inch hole bottom set at 50% of CRT screen height and noted on the calibration form (this is the reference level), along with the sweep position of back reflection.

5. Revise the whole section 15.0 as follows:

15. Data Recording and Evaluation

15.1 Any indication whose amplitude is above the noise level encountered in the particular component shall be the cause for removal of the stud or bolt to verify indications using a surface examination method. These indications shall be recorded on the appropriate data sheet.

6. Use the term "reference level" in place of DAC wherever it occurs in the procedure.

3371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 2 TO ISI PROCEDURE NO. ISI-UT S78-3

CLIENT	PROJECT
COMMONWEALTH EDISON COMPANY	BYRON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N. Paul.	L. A. Hupp	Walter Savinsky 6/10/81

1. Add the following to subsection 5.1

   Couplant shall be certified to have a total halogen content of 300 PPM or less.

TITLE	LEGEND	DATE
Ultrasonic Examination of Flange Ligament Areas of Reactor Vessel	R - INDICATES REVISION	October 12, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N. Paul	J. Cannino	Walter Sawicki	January 21, 1981

REV.	PREPARED	APPROVED
1	NP	WS

1. SCOPE

1.1 This procedure describes the manual contact ultrasonic examination of ligament areas up to a depth of 9 inches around the stud holes in the reactor pressure vessel flange. This procedure is in accordance with the requirements of ASME Boiler and Pressure Vessel Code Section XI, 1977 upto and including summer 1978 addenda.

1.2 The principal object of the examination is the detection, location and evaluation of discontinuities within the ligament area of the reactor vessel flange. The examination shall be performed employing longitudinal straight beam.

2. APPLICABLE DOCUMENTS, CODES AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein.

2.1.1 ASME Section XI, 1977 upto and including summer 1978 addenda.

2.1.2 Ebasco Services Incorporated Procedure for "Training, Examination and Certification of Nondestructive Examination Personnel, N.D.E. 1.

2.1.3 SNT-TC-1A, 1975 edition of American Society for Nondestructive Testing.

2.1.4 ASME Section V, 1977 upto and including summer 1978 addenda.

3. PERSONNEL CERTIFICATION

3.1 All personnel performing nondestructive examination shall be certified in accordance with the Ebasco Service Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel" which reflects the guidelines set forth by the scope of SNT-TC-1A.

4. EQUIPMENT

4.1 Instrument

4.1.1 A pulse-echo ultrasonic flaw detection instrument shall be employed. It shall generate, receive, and present on a cathode-ray tube (CRT) screen, pulses in frequency range from one to five MHz.

TITLE	LEGEND	DATE
Ultrasonic Examination of Flange Ligament Areas of Reactor Vessel	R - INDICATES REVISION	October 12, 1981

REPLACES ISSUE OF: January 21, 1981

REV	PREPARED	APPROVED
1	NP	WS

4.1.2 The instrument shall be equipped with a stepped gain control calibrated in units of 2 dB or less.

4.1.3 The system performance characteristic of the instrument shall be verified at least once a year.

4.2 Search Unit

4.2.1 Search units may contain either single or dual transducer elements.

4.2.2 Search units having a transducer with a maximum active area of 1 in^2 (635mm^2) with 3/4 in. (19 mm) minimum to 1 1/8 in. (29 mm) maximum dimensions shall be used.

4.2.3 The search unit cable shall be of coaxial type and shall not exceed approximately 30 feet so as not to impair communication between inspection team members.

4.2.4 Nominal frequency of 2.25 shall be used. Other frequencies may be employed if variables, such as production material grain structure, necessitate the use of other frequencies in order to assure penetration or improve resolution.

5. COUPLANT

5.1 A client-approved couplant, capable of conducting ultrasonic vibrations from the transducer to the scanning surface, shall be used.

5.2 The couplant identification and batch number shall be recorded on the Calibration Data Sheet.

6. EXAMINATION COVERAGE

6.1 Scanning shall be done with an overlapping of each scan at least by 10% of the transducer dimension measured perpendicular to the scan path.

7. SEARCH UNIT MOVEMENT

7.1 The rate of search unit movement shall not exceed 6 inch/second.

8. SCANNING SENSITIVITY

8.1 Scanning shall be done at twice (+ 6 dB) the primary reference level whenever practicable but recording of ultrasonic reflectors shall be done at the primary reference level.

9. SURFACE PREPARATION

9.1 The examination surface shall be free of irregularities, loose material, or coatings which might interfere with ultrasonic wave transmission.

10. IDENTIFICATION OF LIGAMENT AREAS

10.1 The client shall provide the proper identification system for the ligament areas around the stud holes.

11. INSTRUMENT CALIBRATION

11.1 Screen Height Linearity. The ultrasonic instrument shall provide screen height linearity within 5% of full range for at least 80% of full screen height (FSH) (base line to maximum calibrated screen points).

11.1.1 The following procedure shall be used for screen height linearity calibration. Position an angle beam or a straight beam search unit in such a way on a calibration block so that echoes can be observed from any two reflectors. Adjust the search unit position to give 2 to 1 ratio of amplitudes between the two echoes, with the larger set at 80% of full screen height. Without moving the search unit, adjust sensitivity (gain) to successively set the larger echo from 100% to 20% of FSH in 2 dB steps and read the amplitude of the smaller echo at each setting. The reading shall be 50% of the larger amplitude, within 5% of FSH. The settings and readings shall be estimated to the nearest 1% of full screen.

11.2 Amplitude Control Linearity. The ultrasonic instrument shall utilize an amplitude control, accurate over its useful range to $\pm$ 20% of the nominal amplitude ratio, to allow measurement of indications beyond the linear range of the vertical display on the screen.

11.2.1 The following procedure shall be used for Amplitude Control Linearity Calibration. Position an angle beam or a straight beam search unit in such a way so that an echo from one reflector in a calibration block is peaked on the screen. With the increase and decrease in attenuation shown in the following table, the echo amplitude shall fall within the specified limits. The setting and readings shall be estimated to the nearest 1% of full screen.

Indication Set at % of Full Screen	dB Control Change	Indication Limits % of Full Screen
80%	- 6 dB	32 to 48%
80%	- 12 dB	16 to 24%
40%	+ 6 dB	64 to 96%
20%	+ 12 dB	64 to 96%

11.3 The instrument calibration may be performed on any calibration block, including an IIW or Rompas block, and need not be performed with the same search unit used in next examinations.

11.4 The instrument calibration for screen height and amplitude control linearity shall be performed at the beginning of each period of extended use or every three months, whichever is less. This shall also be performed whenever any doubt arises about instrument's functions. Results shall be recorded on the UT Instrument Calibration Sheet.

12. BASIC CALIBRATION BLOCK

12.1 The material of basic calibration block shall be similar in its acoustic attenuation to the material of reactor pressure vessel flange.

12.2 Side drilled holes shall be used as basic calibration reflectors.

12.3 The finish of the calibration surface of the block shall be representative of the surface finishes of the flange under examination.

12.4 The block provided by the client shall be used.

13. SYSTEM CALIBRATION

13.1 General

13.1.1 Complete ultrasonic examination system calibration, establishing the DAC curve, shall be performed immediately prior to each examination, or series of similar examination.

13.1.2 Calibration shall include the complete ultrasonic examination system. Any change in search units, couplants, cables, ultrasonic instruments, recording devices, or any other parts of the examination system shall be the cause of calibration check. The original calibration shall be performed on the basic calibration block and calibration checks shall be performed as per article 13.3 of this procedure.

13.1.3 The temperature difference between the examination and calibration block surfaces shall not exceed 25°F (14°C).

13.2 Calibration

13.2.1 Using the range and delay controls, perform the sweep calibration in such a way so that the 3 inch and 6 inch metal-path side drilled holes responses appear at 3 and 6 of sweep reading respectively i.e. each major division of the screen equals to one inch of metal-path. Once sweep calibration is done, the DAC shall be established using the same 3 inch and 6 inch metal-path side drilled holes so that the maximum amplitude point is at 80% FSH. Mark the amplitude on the screen.
Without adjusting the instrument controls, maximize response from the other hole and mark the amplitude on the screen. Connect these two points with a straight line and extrapolate this to cover the examination range. This is the primary reference level and recording of ultrasonic reflector shall be performed at this sensitivity.

13.2.2 Electronic DAC: If an electronic distance amplitude correcting device is used, the primary reference response shall be equalized at a nominal 50% of full screen height over the distance range to be employed in the examination. The actual readings representing amplitude and sweep shall be recorded on the Calibration Data Sheet.

13.2.3 Recording of Calibration Data: Particulars of system calibration shall be recorded on Calibration Data Sheet.

13.3 Calibration Check

13.3.1 A system calibration check, which is the verification of the instrument sensitivity and sweep range calibration, shall be performed at the start and finish of each examination or series of similar examination, with any change in examination personnel, and at least every 4 hours during an examination. Calibration checks may be performed on either a basic calibration block simulator or the block used for initial calibration.

13.4 Corrective Action

13.4.1 If any point on the DAC curve has decreased 20% or 2dB of its amplitude, all data sheets since the last calibration check shall be marked void. A new calibration shall be made and recorded and the voided examination area shall be reexamined.

13.4.2 If any point on the DAC curve has increased more than 20% or 2dB of its amplitude, recorded indications taken since the last valid calibration check may be reexamined with the correct calibration and that values changed on the data sheets.

13.4.3 If any point on the DAC curve has moved on the seep line more than 10% of the sweep division reading, correct the sweep range calibration and note the correction of the examination record. If recordable reflectors are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the examination areas shall be reexamined.

14. EXAMINATION

14.1 Scan the flange surface around the threaded holes as shown in figure 1.

15. DATA RECORDING

15.1 All reflectors which produce a response greater than 100% of the reference level shall be investigated to the extent that the examiner can determine the shape, identity, and location of all such reflectors.

15.2 The size of reflectors shall be measured between points which give amplitudes equal to 100% of the reference level.

15.3 For each indication that exceeds 50 percent of reference level amplitude but does not exceed the reference level, the search unit position for peak amplitude and the peak amplitude as either dB from reference level, or as a percent of DAC shall be recorded.

15.4 Further evaluation of reportable indications to determine disposition and/or the need to make repairs shall be the responsibility of the Utility-Owner.

16. REPORTS

16.1 A detailed ultrasonic examination report shall be prepared using applicable report form provided at the end of this procedure and any additional sketches or photographs as may be applicable. If no reportable indications are detected it shall be so noted on the appropriate report form.

16.2 Data shall be entered, as required for each item in the blank space provided on the Calibration Data sheet, and if used on the Indication Data sheet. Where data is not germane for the specific item the blank space shall be marked N/A to indicate that data is not applicable.

16.3 Prompt (24 hours) notification of reportable indications will be made to the representative designated by the utility owners.

TITLE: Ultrasonic Examination of Flange Ligament Areas of Reactor Vessel

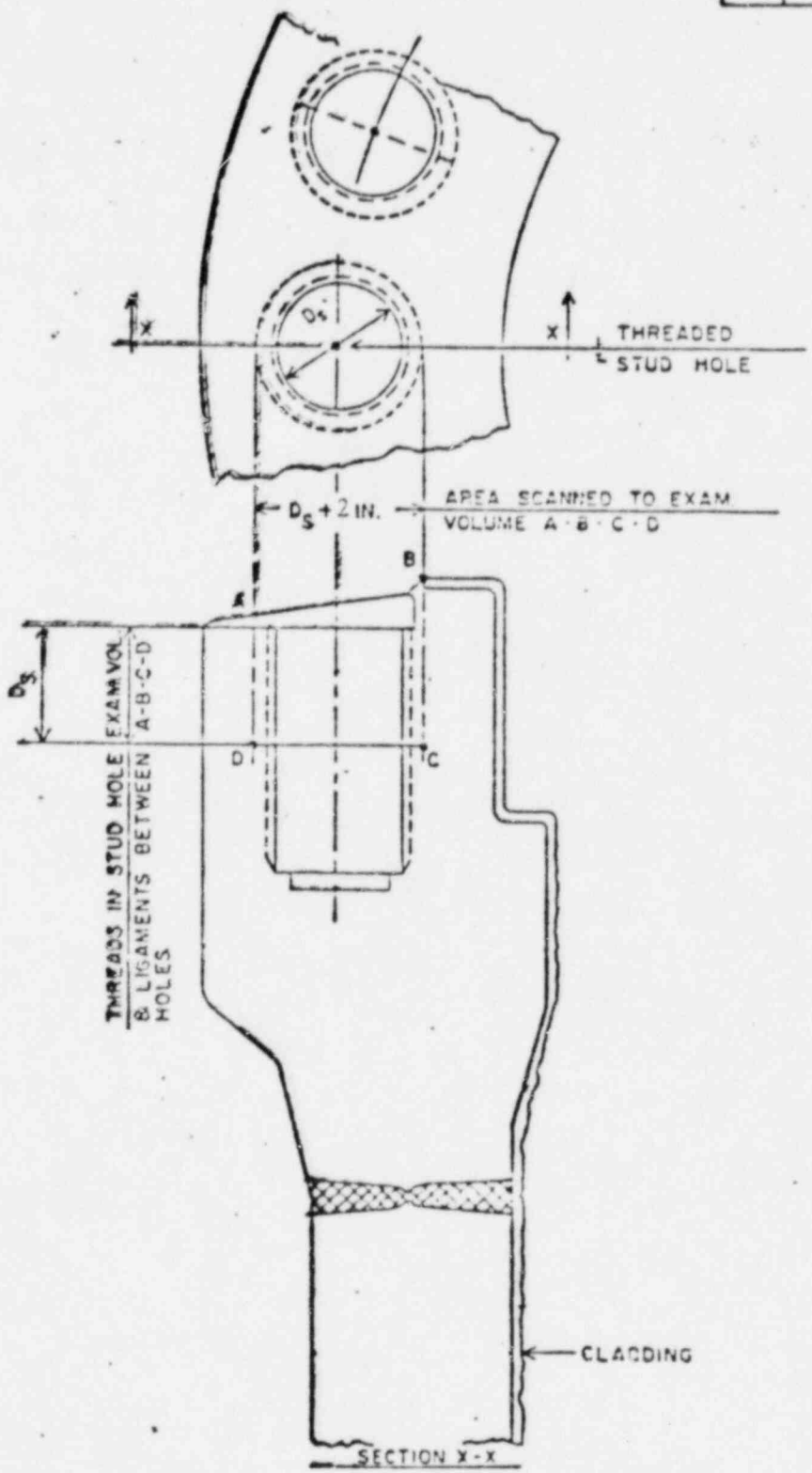
LEGEND: R - INDICATES REVISION

DATE: October 12, 1981

REPLACES ISSUE OF: January 21, 1981

REV	PREPARED	APPROVED
1	NP	WS

FIGURE 1



EXAMINATION VOLUME

6064/5-80

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

UT INSTRUMENT CALIBRATION

INSTRUMENT MANUFACTURER _____ PROJECT _____

MODEL _____ SERIAL NO. _____ DATE _____

AMPLITUDE LINEARITY

dB CONTROL CHANGE	ACTUAL dB	SCREEN HEIGHT LARGER INDICATION	SCREEN HEIGHT* SMALLER INDICATION
Initial (0dB)			
+2dB			
0dB			
-2dB			
-4dB			
-6dB			
-8dB			
-10dB			
-12dB			

*Must be 50% of the Larger Amplitude, within ±5% of Full Screen Height

AMPLITUDE CONTROL LINEARITY

INDICATION SET AT % FSH	dB CONTROL CHANGE	INDICATION LIMITS % FSH	ACTUAL % FSH
80	- 6dB	32 to 48	
80	-12dB	16 to 24	
40	+ 6dB	64 to 96	
20	+12dB	64 to 96	

	ACCEPTABLE	
	YES	NO
Amplitude Linearity		
Amplitude Control Linearity		

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

EBASCO SERVICES INCORPORATED

QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION

CALIBRATION DATA

PROJECT _____

DATA SHEET NO. _____ DATE _____

PROCEDURE ISI-UT- _____ REV _____

COMPONENT OR SYSTEM _____ PIPE OD (IF APPLICABLE) _____

ITEM IDENTIFICATION NO(S). LISTED ON REVERSE SIDE - COMPONENT TEMP _____ EXAM. SURFACE ☐ ID ☐ OD

CALIBRATION BLOCK NO. _____ THICKNESS _____ TEMP _____

SCAN COVERAGE

☐ 0° WHAZ ☐ 0° BASE MATERIAL ☐ AXIAL ☐ CIRCUMFERENTIAL

EQUIPMENT DATA

SEARCH UNIT

Manufacturer _____

Style _____

Serial No. _____

Size _____ Frequency _____

Angle _____ Mode _____

Couplant _____ Batch No. _____

INSTRUMENT

Manufacturer _____ Model _____

Serial No. _____ Coaxial Cable Length _____

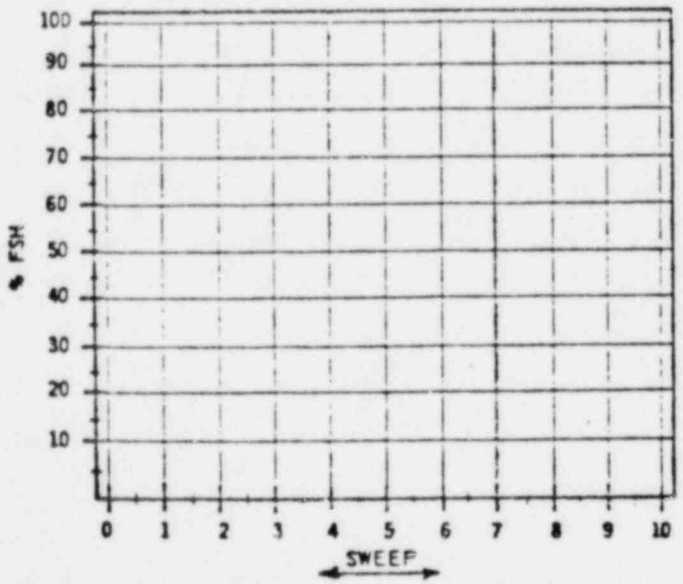
Frequency _____ Reject _____

Rep Rate _____ Damping _____

dB Gain – Coarse _____ _____ Fine _____

Primary Reference Response
Amplitude % Full Screen Height _____

DAC PLOT - TIME _____ AM, PM



NOTE: When performing examinations where no DAC is required, indicate reference reflector location and amplitude above.

CALIBRATION CHECKS

	AMPL ± 20% (2dB) OF INITIAL AMPL		SWEEP ± 5% OF INITIAL LOCATION	
TIME	YES	NO	YES	NO

NOTE: *If response above is "NO" refer to Calibration Check section of procedure.*

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

REVIEWED BY _____ DATE _____

ADDITIONAL REMARKS

6062/8-78

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

INDICATION DATA

SHEET _____ OF _____

ITEM IDENTIFICATION _____

CALIBRATION DATA SHEET NO. _____

DATA TABULATION

SCAN DIRECTION			INDICATION NO.	EXAM. ON _____ (ADJ WELD) SIDE OF WELD	MAX % DAC	SWEEP READING	SEARCH UNIT EXIT POINT LOCATION		50% DAC OR HALF MAXIMUM AMPLITUDE				STRAIGHT BEAM (CAL ON BACK REFLECTION)	
									MINIMUM		MAXIMUM			
ST. BEAM	CIRCUMFERENTIAL	AXIAL					CIRCUMFERENTIAL (DISTANCE CW OR CCW FROM REFERENCE LINE)	AXIAL (DISTANCE FROM WELD ℄)	SWEEP READING	S.U. POSITION	SWEEP READING	S.U. POSITION	INDICATION AMPLITUDE (% FSH)	BACK REFLECTION AMPLITUDE (% FSH)

RESULTS

INDICATION NO.	LOCATION OF INDICATION		LENGTH	% t		WIDTH (IF LAMINAR)	COMMENTS
	CIRC	AXIAL		DEPTH (IF PLANAR)	DISTANCE FROM SURFACE		

EXAMINER(S)

1. _____ LEVEL _____

2. _____ LEVEL _____

REVIEWED _____ DATE _____

CONTINUATION ATTACHED – [ ] Yes [ ] No

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

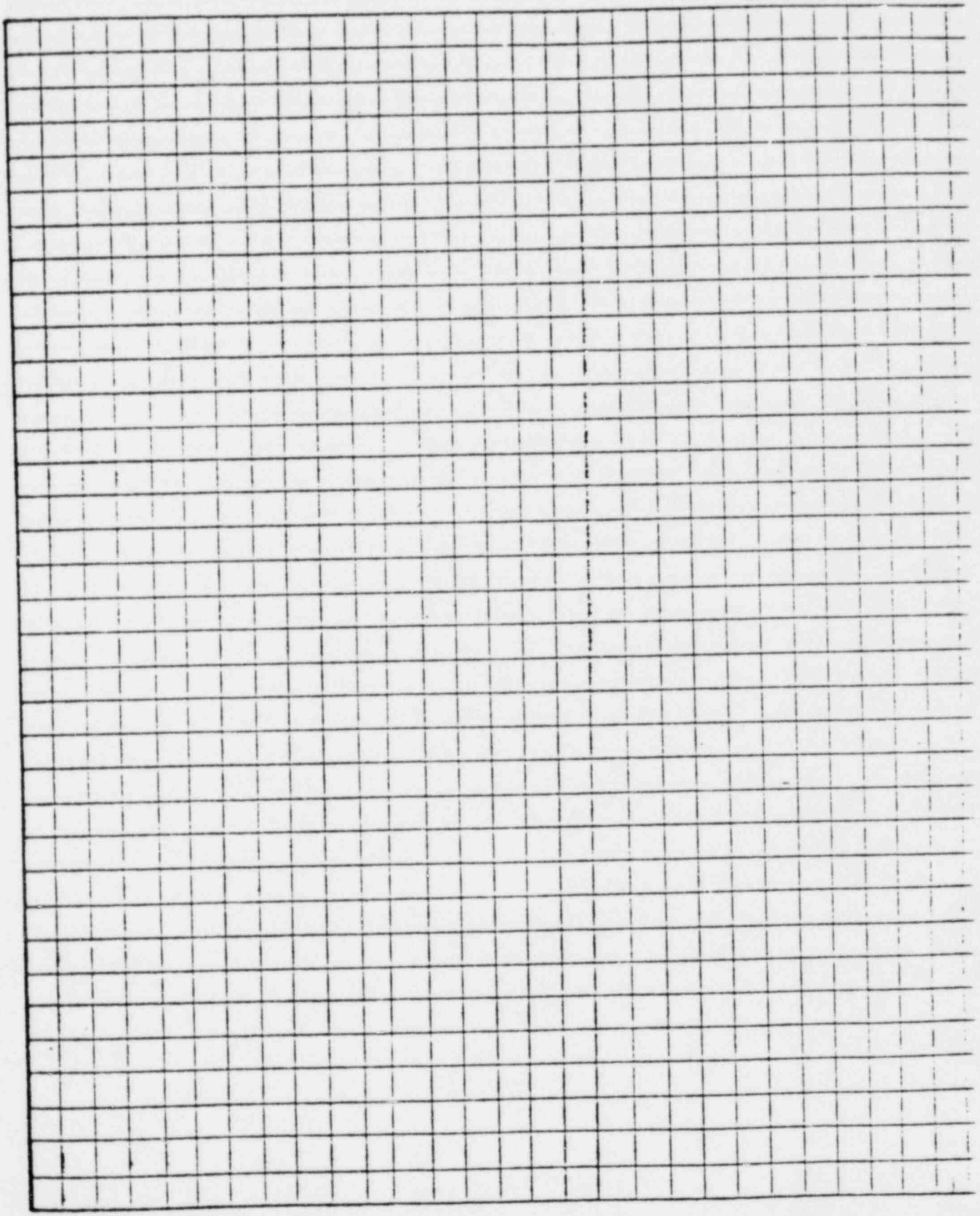
INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____



1371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-UT-S78-4

CLIENT	PROJECT
COMMONWEALTH EDISON COMPANY	BYRON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N Paul	J. Carrizo	Walter Sawicky

1. Add the following subsections to section 3.0

   3.2 A Level I individual may implement written ultrasonic examination instructions under the guidance of a higher level individual. The Level I individual shall not independently evaluate or accept the results of the ultrasonic examination.

   3.3 In the process of being qualified and certified to at least Level I in the ultrasonic method, an individual shall be considered a Trainee. A Trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a report of test results.

2. Add the following to subsection 4.2.4

   The clients Level III shall be notified verbally, within 24 hours, if it was necessary to use test frequencies other than 2.25 MHz.

3. Add the following to section 5

   5.3 Couplant shall be certified to have a total halogen content of 300 PPM or less.

4. Revise the first line of subsection 15.3 to read: For each indication that exceeds 40 percent of reference level

TITLE	LEGEND	DATE
ULTRASONIC STRAIGHT BEAM EXAMINATION	R - INDICATES REVISION	August 14, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N Paul	D.F. Yuscaft	W Sullivan	

REV	PREPARED	APPROVED
0	NP	WS

1. SCOPE

1.1 This procedure describes straight beam ultrasonic pulse-echo method for determining; thickness measurement, detection and location of laminar type discontinuities that may interfere with angle beam examination and locating weld centerline in piping systems. This procedure shall be applicable to both ferritic and austenetic steel.

2. APPLICABLE DOCUMENTS, CODES AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein.

2.1.1 ASME Section XI, 1977 up to and including Summer 1978 Addenda.

2.1.2 Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel", NDE 1.

2.1.3 SNT-TC-1A, 1975 edition of American Society for Nondestructive Testing.

3. PERSONNEL CERTIFICATION

3.1 All personnel performing nondestructive examination shall be certified in accordance with the Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel" which reflects the guidelines set forth by the scope of SNT-TC-1A.

4. EQUIPMENT

4.1 Instrument

4.1.1 A pulse-echo ultrasonic flaw detection instrument shall be employed. It shall generate, receive, and present on a cathode-ray tube (CRT) screen, pulses in a frequency range from one to five MHz.

4.1.2 The instrument shall be equipped with a stepped gain control calibrated in units of 2dB or less.

4.1.3 The system performance characteristic of the instrument shall be verified at least once a year.

4.2 Search Unit

4.2.1 Search units may contain either single or dual transducer elements.

4.2.2 For general use, the search unit's transducer shall have an active area of not less than 0.04 sq.inch nor more than 1.0 sq.inch. Under certain circumstances, such as evaluation of indications, other sizes may be employed.

4.2.3 The search unit cable shall be of coaxial type and shall not exceed approximately 30 feet so as not to impair communications between inspection team members.

4.2.4 Nominal frequency of 2.25 MHz shall be employed. Other frequencies may be employed if variables, such as production material grain structure, necessitate the use of other frequencies in order to assure penetration or improve resolution.

5. COUPLANT

5.1 A client approved couplant, capable of conducting ultrasonic vibrations from the transducer to the examination surface, shall be used.

5.2 The couplant identification and batch number shall be recorded on the calibration data sheet.

6. EXAMINATION COVERAGE

6.1 Scanning shall be done with an overlapping of each scan at least by 10 percent of the transducer dimension measured perpendicular to the scan path.

7. SEARCH UNIT MOVEMENT

7.1 The rate of search unit movement shall not exceed 6 inches/second unless calibration has been verified at the higher scanning speed.

8. SCANNING SENSITIVITY

8.1 Scanning shall be done at twice (+6 dB) the primary reference level as a minimum but recording of ultrasonic reflectors shall be done at the primary reference level. This scanning sensitivity shall be applicable only to the examination for detecting and locating laminar type of discontinuities.

9. SURFACE PREPARATION

9.1 The examination surface shall be free of irregularities, loose material, or coatings which interfere with ultrasonic wave transmission.

10. IDENTIFICATION OF EXAMINATION AREAS

10.1 The client shall provide the proper identification system.

11. INSTRUMENT CALIBRATION

11.1 Screen Height Linearity

The ultrasonic instrument shall provide screen height linearity within 5 percent of full range for at least 80 percent of full screen height (FSH) (baseline to maximum calibrated screen points).

11.1.1 The following procedure shall be used for screen height linearity calibration. Position an angle beam or a straight beam search unit in such a way on a calibration block so that echoes can be observed from any two reflectors. Adjust the search unit position to give 2 to 1 ratio of amplitudes between the two echoes, with the larger set at 80 percent of full screen height. Without moving the search unit, adjust sensitivity (gain) to successively set the larger echo from 100 percent of 20 percent of FSH in 2 dB steps and read the amplitude of the smaller echo at each setting. The reading shall be 50 percent of the larger amplitude, with 5 percent of FSH. The settings and readings shall be estimated to the nearest 1 percent of full screen.

11.2 Amplitude Control Linearity

The ultrasonic instrument shall utilize an amplitude control, accurate over its useful range to ± 20 percent of the nominal amplitude ratio, to allow measurement of indications beyond the linear range of the vertical display on the screen.

11.2.1 The following procedure shall be used for Amplitude Control Linearity Calibration. Position an angle beam or a straight beam search unit in such a way so that an echo from one reflector in a calibration block is peaked on the screen. With the increase and decrease in attenuation shown in the following table, the echo amplitude shall fall within the specified limits. The setting and readings shall be estimated to the nearest 1 percent of full screen.

Indication Set at % of Full Screen	dB Control Change	Indication Limits % of Full Screen
80%	- 6 dB	32 to 48%
80%	- 12 dB	16 to 24%
40%	+ 6 dB	64 to 96%
20%	+ 12 dB	64 to 96%

11.3 The instrument calibration may be performed on any calibration block, including an IIW or Rompas block, and need not be performed with the same search unit used in the next examination.

11.4 The instrument calibration for screen height and amplitude control linearity shall be performed at the beginning of each period of extended use or every three months, whichever is less. This shall also be performed whenever any doubt arises about the instrument's functions. Results shall be recorded on the UT Instrument Calibration Sheet.

12. BASIC CALIBRATION STANDARD

12.1 In general, the IIW block shall be used for initial instrument sweep range calibration.

12.2 A defect free area of the pipe to be examined or the system's calibration standard, supplied by the client, shall be used for setting calibration of the instrument's sensitivity.

13. SYSTEM CALIBRATION

13.1 General

13.1.1 Complete ultrasonic examination system calibration, establishing the sweep range, shall be performed prior to each examination or series of similar examination.

13.1.2 Calibration shall include the complete ultrasonic examination system. Any change in search units, couplants, cables, ultrasonic instruments, recording devices, or any other parts of the examination system shall be the cause of calibration check. The original calibration shall be performed on the calibration block and calibration checks shall be performed as per Article 17. of this procedure.

13.1.3 The temperature difference between the examination and calibration block survaces shall not exceed 25°F (14°C).

14. SWEEP CALIBRATION

14.1 For Thickness of 0.2" to 2.5"

Place the search unit on the one inch thick area of the IIW calibration block. Using the range and delay controls, place the first and 2nd back reflections at the 4th and 8th major horizontal screen divisions respectively. 0 to 10 on the CRT now represents 2.5", use this sweep setting for examining material thickness from 0.2" to 2.5".

14.2 For Thickness Range of 2.0" to 5.0"

Place the search unit on the one inch thick area of the IIW calibration block. Using the range and delay controls, place the 2nd and 4th back reflections at the 4th and 8th major horizontal screen divisions respectively. 0 to 10 on the CRT now represents 5", use this sweep setting for examining thickness from 2.0" to 5.0".

14.3 Once the sweep has been calibrated, the sweep controls of the instrument shall not be disturbed.

14.4 Suitable alternative sweep calibration procedure employing a different sweep range set-up may be employed.

15. SENSITIVITY CALIBRATION

15.1 After setting the instrument's sweep per section 14 of this procedure, adjust the instrument sensitivity employing a defect free area of the part to be examined, so that the first back reflection appears at 80% of full screen height.

16. RECORDING OF CALIBRATION DATA

16.1 Particulars of system calibration shall be recorded on the calibration data sheet.

17. CALIBRATION CHECK

17.1 A system calibration check, which is the verification of the instrument sensitivity and sweep range calibration, shall be performed at the start and finish of each examination or series of similar examination, with any change in examination personnel, and at least every 4 hours during an examination. Calibration checks shall be performed on the same area of initial calibration.

18. CORRECTIVE ACTION

18.1 If the reference point has decreased 20 percent or 2 dB of its amplitude, all data sheets since the last calibration shall be marked void. A new calibration shall be made and recorded and the voided examination area shall be reexamined.

18.2 If the reference point has increased more than 20% or 2 dB of its amplitude, recorded indications taken since the last valid calibration or calibration check may be reexamined with the correct calibration and their values changed on the data sheets.

18.3 If the sweep reading has moved more than 10 percent, correct the sweep range calibration and note the correction of the examination record. If recordable reflectors are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the voided examination areas shall be reexamined.

19. ULTRASONIC THICKNESS MEASUREMENT OF PIPING SYSTEM

19.1 General

Thickness measurement involving circumferential weld, in general, shall be performed at eight points; four points on each side of the weld at approximately 90 degree intervals. Thickness may be reported in metal path increments or in inches as described below.

19.2 Measurement

19.2.1 0.2" to 2.5" - To determine thickness when calibrated in accordance with 14.1.1 multiply actual horizontal screen position of the 1st back reflection times 0.25.

Example: Response from first back is at 3.5 on the sweep.
Thickness = 3.5 x 0.25 = 0.875"

19.2.2 2" to 5" - To determine thickness when calibrated in accordance with 14.1.2 multiply actual horizontal screen position of the 1st back reflection times 0.50.

Example: Response from 1st back is at 5.6 on the sweep.
Thickness = 5.6 x 0.5 = 2.80"

19.2.3 Thickness measurement, involving other than circumferential weld, if required by the client, or if required to determine if an indication found by angle beam examination is caused by a geometric anomaly, shall be performed at suitable locations or at locations indicated by the client.

19.3 Data Recording and Evaluation

19.3.1 All the thickness readings shall be recorded in the report data sheet.

19.3.2 Those readings which do not fall within the range of the pipe schedule shall be reported to the client.

19.3.3 Substantiation of geometric anomalies shall be noted in the remarks section of the report sheet for this procedure and on the data sheet for the angle beam examination.

19.3.4 Further action of the reportable thickness readings shall lie with the utility-owner.

20. ULTRASONIC EXAMINATION FOR LOCATING WELDS IN PIPING SYSTEM

20.1 General

Mainly thickness change and or attenuation change characteristics shall be employed for locating the welds.

First, examine sufficient area of base material adjacent to the suspected weld to get an idea of thickness and attenuation changes associated with the base material. These shall be ascertained by observing the sweep position and amplitude of the back reflections.

Next, start scanning the area including the suspected weld. Scan enough area to be sure that examination has covered the weld. This scanning shall be performed at four locations along the weld. Mark those areas, using a client's approved marker, which give an indication for thickness and or attentuation different from those observed for base material in step 15.1. Make a suitable boundory to include these areas. This boundary shall be the weld boundary. Permanent markings shall be in accordance with Ebasco procedure ISI-QC-08.

It shall be noted that all welds may not respond to above procedure of weld location. An alternate ultrasonic method as detailed in section 20.2 of this procedure may be employed under certain circumstances.

20.2 Alternate Method

It is a well known fact that some ID conditions at or near the weld (such as weld mis-match) are good ultrasonic reflectors in the case of angle beam examination of weld. Such a reflector may be employed in locating the weld with the help of drawings of the piping system specially those pertaining to weld configurations. Procedure No. ISI-UT-S78-1 (Ultrasonic Examination of Class 1 & 2 Piping Welds Joining Similar & Dissimilar Materials) shall be employed to locate such a ID reflector.

21. ULTRASONIC EXAMINATION OF PIPING BASE MATERIAL

21.1 Examination

The area of the base material through which sound will travel during the angle beam examination of the weld shall be completely scanned for the detection and location of laminar type discontinuities on piping systems fabricated from rolled plate.

21.2 Data Recording and Evaluations

21.2.1 Using the applicable report form record all areas which produce an indication from a laminar type discontinuity equal to or greater than the remaining first back reflection.

21.2.2 Further evaluation of reportable indications to determine disposition and/or the need to make repairs shall be the responsibility of the utility-owner.

21.3 Reports

21.3.1 A detailed ultrasonic examination report shall be prepared using the applicable report forms provided at the end of this procedure and any additional sketches or photographs as may be applicable. If no reportable indications are detected it shall be so noted on the appropriate report form.

21.3.2 Data shall be entered, as required for each item in the blank space provided on the calibration data sheet, and if used, on the indication data sheet. Where data is not germane for the specific item the blank space shall be marked N/A to indicate that data is not applicable.

21.3.3 Prompt (24 hours) notification of reportable indications shall be made to the representative designated by the utility-owner.

6064/5-80

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

UT INSTRUMENT CALIBRATION

INSTRUMENT MANUFACTURER _____ PROJECT _____

MODEL _____ SERIAL NO. _____ DATE _____

AMPLITUDE LINEARITY

dB CONTROL CHANGE	ACTUAL dB	SCREEN HEIGHT LARGER INDICATION	SCREEN HEIGHT* SMALLER INDICATION
Initial (0dB)			
+2dB			
0dB			
-2dB			
-4dB			
-6dB			
-8dB			
-10dB			
-12dB			

*Must be 50% of the Larger Amplitude, within ±5% of Full Screen Height

AMPLITUDE CONTROL LINEARITY

INDICATION SET AT % FSH	dB CONTROL CHANGE	INDICATION LIMITS % FSH	ACTUAL % FSH
80	- 6dB	32 to 48	
80	-12dB	16 to 24	
40	+ 6dB	64 to 96	
20	+12dB	64 to 96	

	ACCEPTABLE	
	YES	NO
Amplitude Linearity		
Amplitude Control Linearity		

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

6063A/4-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

CALIBRATION DATA

PROJECT _____

DATA SHEET NO. _____ DATE _____

PROCEDURE ISI-UT- _____ REV _____

COMPONENT OR SYSTEM _____ PIPE OD (IF APPLICABLE) _____

ITEM IDENTIFICATION NO(S). LISTED ON REVERSE SIDE - COMPONENT TEMP _____ EXAM. SURFACE ☐ ID ☐ OD

CALIBRATION BLOCK NO. _____ THICKNESS _____ TEMP _____

SCAN COVERAGE

☐ 0° WHAZ ☐ 0° BASE MATERIAL ☐ AXIAL ☐ CIRCUMFERENTIAL

EQUIPMENT DATA

SEARCH UNIT

Manufacturer _____

Style _____

Serial No. _____

Size _____ Frequency _____

Angle _____ Mode _____

Couplant _____ Batch No. _____

INSTRUMENT

Manufacturer _____ Model _____

Serial No. _____ Coaxial Cable Length _____

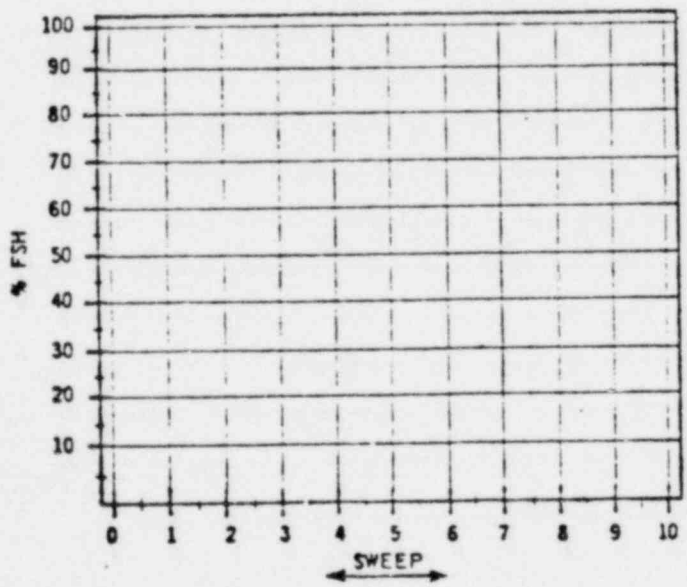
Frequency _____ Reject _____

Rep Rate _____ Damping _____

dB Gain – Coarse _____ Fine _____

Primary Reference Response
Amplitude % Full Screen Height _____

DAC PLOT - TIME _____ AM, PM



NOTE: When performing examinations where no DAC is required, indicate reference reflector location and amplitude above.

CALIBRATION CHECKS

	AMPL ± 20% (2dB) OF INITIAL AMPL		SWEEP ± 5% OF INITIAL LOCATION	
TIME	YES	NO	YES	NO

NOTE: If response above is "NO" refer to Calibration Check section of procedure.

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

REVIEWED BY _____ DATE _____

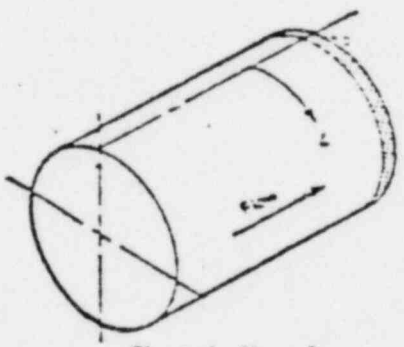
ADDITIONAL REMARKS

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION
REPORT SHEET

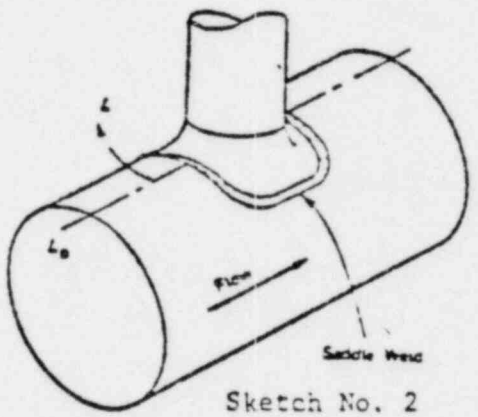
REPORT SHEET NO. _____

DATA SHEET NO. _____

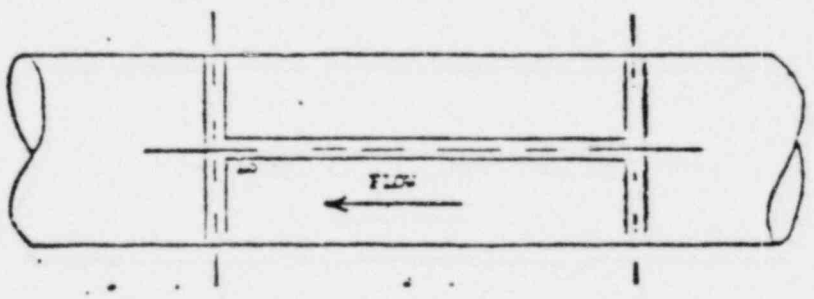
Weld/Component Identification	Side of Weld	Thickness Reading Metal Path — Inches =	Sketch No. (see below)/Explanation Showing Positions of Thickness Reading	Remarks (if any)



Sketch No. 1



Sketch No. 2



Sketch No. 3

6059/4-76

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

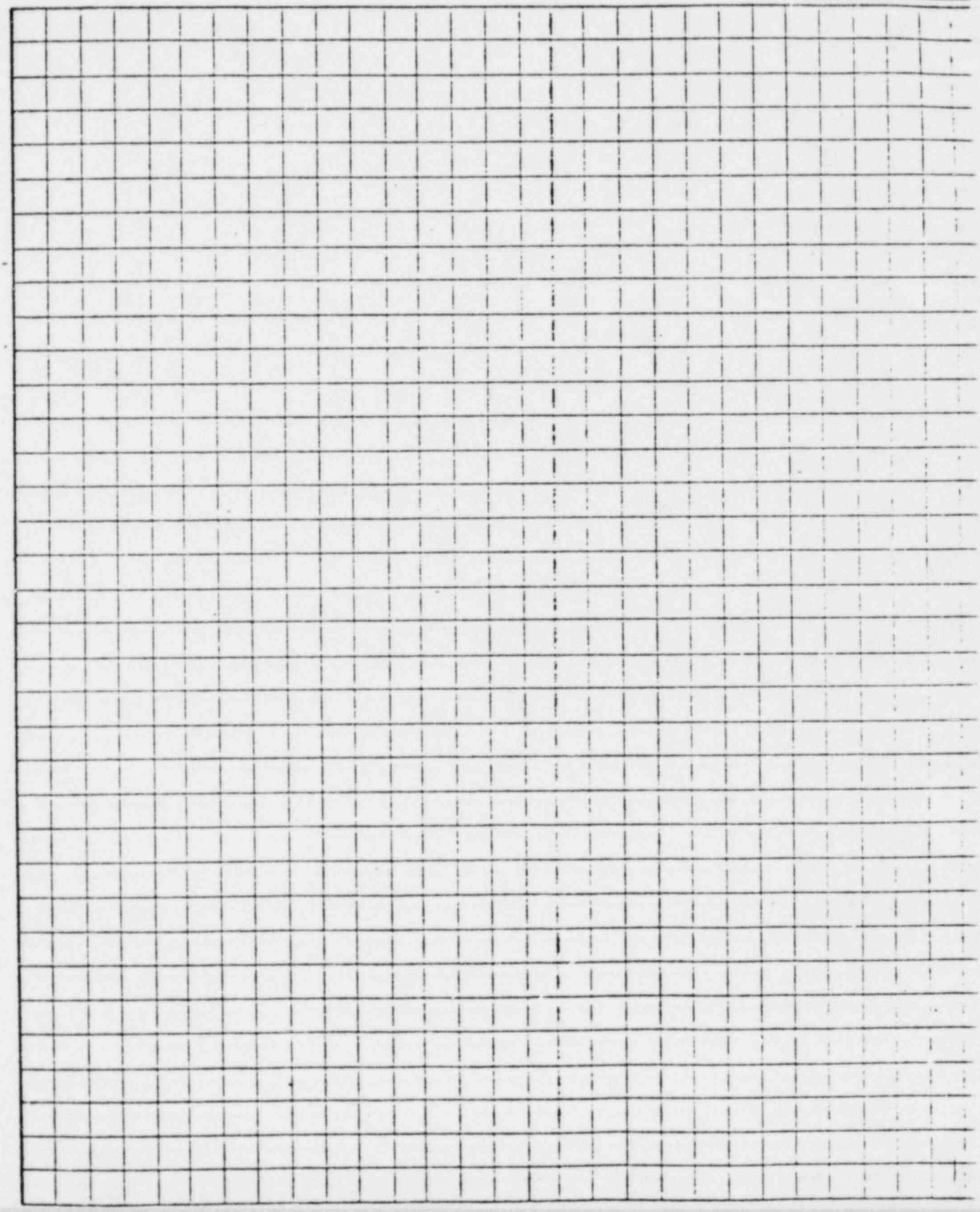
INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____



1371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-UT-S78-8

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BYRON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N. Paul.	D. L. Hayes Jr.	L. Lawicke.

1. Add the following subsections to section 3.0

3.2 In the process of being qualified and certified to at least Level I in the ultrasonic method, an individual shall be considered a Trainee. A Trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a rpeort of test results.

2. Add the following to subsection 5.2

Couplant shall be certified to have a total halogen content of 300 PPM or less.

EBASCO

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

1322/12-78

PROCEDURE NO. ISI-UT-S78-0

TITLE	LEGEND	DATE
STRAIGHT BEAM ULTRASONIC EXAMINATION OF PIPING WELDS	R - INDICATES REVISION	November 2, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N. Paul	D.C. Riggs	Walter Sawicky	August 24, 1981

REV	PREPARED	APPROVED
1	NP	WS

1. SCOPE

1.1 This is a special procedure that describes the manual longitudinal straight beam ultrasonic examination of full penetration similar and dissimilar metal Class 1 and 2 piping welds ranging in thickness from 0.2 to 6 inches. The intent of this special procedure is to furnish a supplementary technique to angle beam examination for those welds which cannot be examined by the angle beam examination from at least one side of the weld employing the Procedure No. ISI-UT-S78-1 "Ultrasonic Examination of Class 1 & 2 Piping Welds Joining Similar & Dissimilar Material".

1.2 The principal objective of examination is the detection, location and evaluation of discontinuities within the weld and adjacent base metal. The weld shall be examined from the outside surface of the piping system.

2. APPLICABLE DOCUMENTS, CODES AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein.

2.1.1 ASME Section XI, 1977 up to and including Summer 1978 Addenda.

2.1.2 ASME Section V, 1977 up to and including Summer 1978 Addenda.

2.1.3 Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel", NDE 1.

2.1.4 SNT-TC-1A, 1975 edition of American Society for Nondestructive Testing.

3. PERSONNEL CERTIFICATION

3.1 All personnel performing nondestructive examination shall be certified in accordance with the Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel" which reflects the guidelines set forth by the scope of SNT-TC-1A.

SARGENT & LUNDY
1. REVIEWED & ACCEPTED
ACTION SHOWN DOES NOT RELIEVE CONTRACTOR FROM HIS OBLIGATIONS UNDER THE CONTRACT.
F. A. KOSIK 11/16/81
BY DATE
SPEC. NO. F-2907 PROJ. NO. 4391-05

TITLE	LEGEND	DATE
STRAIGHT BEAM ULTRASONIC EXAMINATION OF PIPING WELDS	R - INDICATES REVISION	November 2, 1981
		REPLACES ISSUE OF: August 24, 1981

REV	PREPARED	APPROVED
1	MP	WS

4. EQUIPMENT

4.1 Instrument

4.1.1 A pulse-echo ultrasonic flaw detection instrument shall be employed. It shall generate, receive, and present on a cathode-ray tube (CRT) screen, pulses in a frequency range from one to five MHz.

4.1.2 The instrument shall be equipped with a stepped gain control calibrated in units of 2 dB or less.

4.1.3 The system performance characteristic of the instrument shall ber verified at least once a year.

4.2 Search Unit

4.2.1 Search units may contain either single or dual transducer elements.

4.2.2 For general use, the search unit's transducer shall have an active area of not less than 0.04 sq. inch nor more than 1.0 sq. inch. Under certain circumstances, such as evaluation of indications, other sizes may be employed.

4.2.3 The search unit cable shall be of coaxial type and shall not exceed approximately 30 feet so as not to impair communication between inspection team members.

4.2.4 Nominal frequency of 2.25 MHz shall be employed. Other frequencies may be employed if variables, such as production material grain structure, necessitate the use of other frequencies in order to assure penetration or improve resolution.

5. COUPLANT

5.1 A client approved couplant, capable of conducting ultrasonic vibrations from the t ucer to the examination surface, shall be used.

5.2 The couplant identification and batch number shall be recorded on the calibration data sheet.

6. EXAMINATION COVERAGE

6.1 Scanning shall be done with an overlapping of each scan at least by 10 percent of the transducer dimension measured perpendicular to the scan path.

7. SEARCH UNIT MOVEMENT

7.1 The rate of search unit movement shall not exceed 6 inches/second unless calibration has been verified at the higher scanning speed.

8. SCANNING SENSITIVITY

8.1 Scanning shall be done at twice (+6 dB) the primary reference level as a minimum but recording of ultrasonic reflectors shall be done at the primary reference level.

9. SURFACE PREPARATION

9.1 The examination surface shall be free of irregularities, loose material, or coatings which interfere with ultrasonic wave transmission.

10. IDENTIFICATION OF EXAMINATION AREAS

10.1 The client shall provide the proper identification system.

11. INSTRUMENT CALIBRATION

11.1 Screen Height Linearity

The ultrasonic instrument shall provide screen height linearity within 5 percent of full range for at least 80 percent of full screen height (FSH) (baseline to maximum calibrated screen points).

11.1.1 The following procedure shall be used for screen height linearity calibration. Position an angle beam or a straight beam search unit in such a way on a calibration block so that echoes can be observed from any two reflectors. Adjust the search unit position to give 2 to 1 ratio of amplitudes between the two echoes, with the larger set at 80 percent of full screen height. Without moving the search unit, adjust sensitivity (gain) to successively set the larger echo from 100 percent to 20 percent of FSH in 2 dB steps and read the amplitude of the smaller echo at each setting. The reading shall be 50 percent of the larger amplitude, within 5 percent of FSH. The settings and readings shall be estimated to the nearest 1 percent of full screen.

11.2 Amplitude Control Linearity

The ultrasonic instrument shall utilize an amplitude control, accurate over its useful range to ± 20 percent of the nominal amplitude ratio, to allow measurement of indications beyond the linear range of the vertical display on the screen.

11.2.1 The following procedure shall be used for Amplitude Control Linearity Calibration. Position an angle beam or a straight beam search unit in such a way so that an echo from one reflector in a calibration block is peaked on the screen. With the increase and decrease in attenuation shown in the following table, the echo amplitude shall fall within the specified limits. The setting and readings shall be estimated to the nearest 1 percent of full screen.

Indication Set at % of Full Screen	dB Control Change	Indication Limits % of Full Screen
80%	- 6 dB	32 to 48%
80%	- 12 dB	16 to 24%
40%	+ 6 dB	64 to 96%
20%	+ 12 dB	64 to 96%

11.3 The instrument calibration may be performed on any calibration block, including an IIW or Rompas block, and need not be performed with the same search unit used in the next examination.

11.4 The instrument calibration for screen height and amplitude control linearity shall be performed at the beginning of each period of extended use or every three months, whichever is less. This shall also be performed whenever any doubt arises about the instrument's functions. Results shall be recorded on the UT instrument Calibration Sheet.

12. BASIC CALIBRATION BLOCKS

12.1 The basic calibration blocks shall be made from material of the same nominal diameter and nominal wall thickness or pipe schedule as the pipe to be examined.

12.2 The calibration blocks shall be fabricated from one of the materials specified for the piping joined by the weld.

12.3 If material of the same specification is not available, material of similar chemical analysis, tensile properties and metallurgical structure may be used.

12.4 The finish on the surfaces of the block shall be representative of the surface finishes of the piping.

12.5 Side drilled holes shall be used to establish the DAC.

12.6 The client shall provide the calibration blocks conforming to ASME Section XI, 1977 up to and including Summer 1978 Addenda.

13. SYSTEM CALIBRATION

13.1 General

13.1.1 Complete ultrasonic examination system calibration, establishing the DAC curve, shall be performed prior to each examination, or series of similar examination.

13.1.2 Calibration shall include the complete ultrasonic examination system. Any change in search units, shoes, couplants, cables, ultrasonic instruments, recording devices, or any other parts of the examination system shall be the cause of calibration check. The original calibration shall be performed on the basic calibration block and calibration checks shall be performed as per Article 13.3 of this procedure.

13.1.3 The temperature difference between the examination and calibration block surfaces shall not exceed 25°F (14C).

13.1.4 Calibration shall be performed from the outside surface of the calibration block.

13.2 Calibration

13.2.1 Adjust sweep range and delay controls to position the back reflection(s) in the CRT screen as follows:

(a) For material thickness less than one inch place the first and second back reflections at approximately the 4th and 8th major horizontal screen divisions, respectively.

(b) For material thickness one inch and greater place the first back reflection on the CRT screen at any convenient location.

13.2.2 Reference level for material less than one-inch: The following methods for establishing a reference level are acceptable:

(a) If the reflection from the 1/4t hole can be resolved, set its response to 50% of full screen height; this is the reference level.

(b) If the reflection from the 1/4t hole can not be resolved but the reflection from the 3/4t can be resolved, set the response from the 3/4t to 50% of full screen height; this is the reference level.

(c) If neither of the holes can be resolved then set the reflection from the back surface at 50% of full screen height; this is the reference level.

13.2.3 DAC for material one inch thick and over: Set the maximum response from 1/4t hole at 50% of full screen height. Without changing instrument controls, mark the maximum response from the 3/4t hole on CRT. Connect the two points with a straight-line and extend it to cover the examination range. This is the primary response DAC curve.

13.2.4 Electronic DAC: If an electronic distance amplitude correcting device is used, the primary reference response shall be equalized at a nominal 50 percent of full screen height over the distance range to be employed in the examination. (The actual readings representing amplitude and sweep shall be recorded on the calibration data sheet).

13.2.5 Recording of Calibration Data: Particulars of system calibration shallbe recorded on the calibration data sheet.

13.3 Calibration Check

13.3.1 A system calibration check, which is the verification of the instrument sensitivity and sweep range calibration, shall be performed at the start and finish of each examination or series of similar examination, with any change in examination personnel, and at least every 4 hours during an examination. Calibration checks may be performed on either the block used for initial calibration, or a simulator approved by the client.

13.4 Corrective Action

13.4.1 If any point on the DAC curve has decreased 20 percent or 2 dB of its amplitude, all data sheets since the last calibration shall be marked void. A new calibration shall be made and recorded and the voided examination area shall be reexamined.

13.4.2 If any point on the DAC curve has increased more than 20% or 2 dB of its amplitude, recorded indications taken since the last valid calibration or calibration check may be reexamined with the correct calibration and their values changed on the data sheets.

13.4.3 If any point on the DAC curve has moved on the sweep line more than 10 percent of the sweep division reading, correct the sweep range calibration and note the correction of the examination record. If recordable reflectors are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the voided examination areas shall be reexamined.

14. EXAMINATION

14.1 Scan all the accessible areas to cover as much examination volume (figure I) as possible that were inaccessible to regular angle beam examination.

15. DISSIMILAR METAL WELDS

15.1 For dissimilar metal welds, use the block which is more attenuative (i.e. higher sensitivity).

16. DATA RECORDING AND EVALUATION

16.1 For each indication that equals or exceeds the reference level, the search unit location and the following information, shall be recorded on the Indication Data Sheet.

16.1.1 Peak amplitude as either dB from the reference level, or as a percent of DAC curve, sweep reading to reflector, search unit position, search unit location.

16.1.2 Minimum sweep reading to reflector and position of search unit at reference level amplitude.

16.1.3 Maximum sweep reading to reflector and position of search unit at the reference level amplitude.

16.1.4 Search unit positions or locations parallel to the reflector at the end points where the reflector amplitude equals the reference level (length of reflector).

TLE	LEGEND	DATE
STRAIGHT BEAM ULTRASONIC EXAMINATION OF PIPING WELDS	R - INDICATES REVISION	November 2, 1981
		REPLACES ISSUE OF: August 24, 1981

REV	PREPARED	APPROVED
1	NP	WS

16.2 For each indication that exceeds 50 percent of reference level amplitude but does not equal the reference level, the following information shall be recorded on calibration data sheet and or strip chart paper (if used).

16.2.1 Search unit position for peak amplitude.

16.2.2 Peak amplitude as either dB from the reference level, or as a percent of DAC.

16.3 Further evaluation of reportable indications to determine disposition and/or the need to make repairs shall be the responsibility of the utility-owner.

17. REPORTS

17.1 A detailed ultrasonic examination report shall be prepared using the applicable report forms provided at the end of this procedure and any additional sketches or photographs as may be applicable. If no reportable indications are detected it shall be so noted on the appropriate report form.

17.2 Data shall be entered, as required for each item in the blank space provided on the calibration data sheet, and if used, on the indication data sheet. Where data is not germane for the specific item the blank space shall be marked N/A to indicate that data is not applicable.

17.3 Prompt (24 hours) notification of reportable indications shall be made to the representative designated by the utility-owner.

EBASCO

QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

PROCEDURE NO. 1S1-UT-578-9

TITLE
STRAIGHT BEAM ULTRASONIC EXAMINATION OF PIPING WELDS

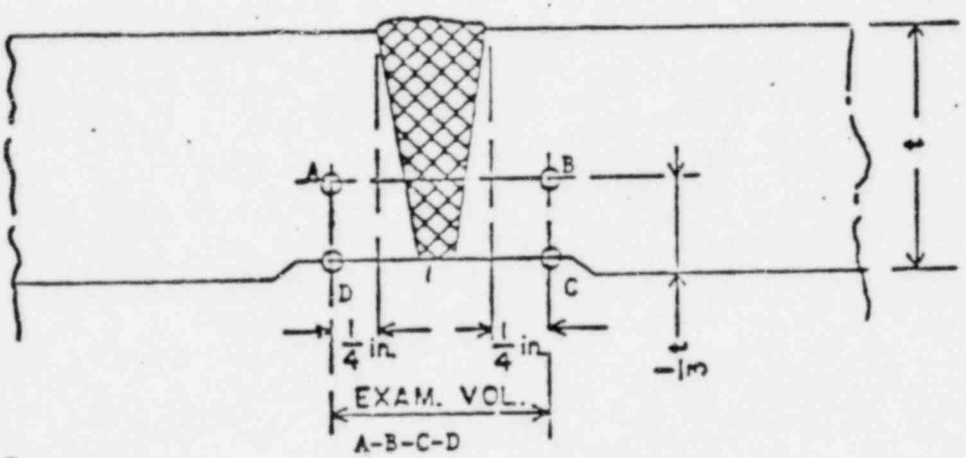
LEGEND
R - INDICATES REVISION

DATE
November 2, 1981

REPLACES ISSUE OF
August 24, 1981

REV	PREPARED	APPROVED
1	NP	WS

FIGURE 1



EXAMINATION VOLUME

6056/5-80

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

UT INSTRUMENT CALIBRATION

INSTRUMENT MANUFACTURER _____ PROJECT _____

MODEL _____ SERIAL NO. _____ DATE _____

AMPLITUDE LINEARITY

dB CONTROL CHANGE	ACTUAL dB	SCREEN HEIGHT LARGER INDICATION	SCREEN HEIGHT* SMALLER INDICATION
Initial (0dB)			
+2dB			
0dB			
-2dB			
-4dB			
-6dB			
-8dB			
-10dB			
-12dB			

*Must be 50% of the Larger Amplitude, within ±5% of Full Screen Height

AMPLITUDE CONTROL LINEARITY

INDICATION SET AT % FSH	dB CONTROL CHANGE	INDICATION LIMITS % FSH	ACTUAL % FSH
80	- 6dB	32 to 48	
80	-12dB	16 to 24	
40	+ 6dB	64 to 96	
20	+12dB	64 to 96	

	ACCEPTABLE	
	YES	NO
Amplitude Linearity		
Amplitude Control Linearity		

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

CALIBRATION DATA

PROJECT _____

DATA SHEET NO. _____ DATE _____

PROCEDURE ISI-UT- _____ REV _____

COMPONENT OR SYSTEM _____ PIPE OD (IF APPLICABLE) _____

ITEM IDENTIFICATION NO(S). LISTED ON REVERSE SIDE - COMPONENT TEMP _____ EXAM. SURFACE ☐ ID ☐ OD

CALIBRATION BLOCK NO. _____ THICKNESS _____ TEMP _____

SCAN COVERAGE

☐ 0° WHAZ ☐ 0° BASE MATERIAL ☐ AXIAL ☐ CIRCUMFERENTIAL

EQUIPMENT DATA

SEARCH UNIT

Manufacturer _____

Style _____

Serial No. _____

Size _____ Frequency _____

Angle _____ Mode _____

Couplant _____ Batch No. _____

INSTRUMENT

Manufacturer _____ Model _____

Serial No. _____ Coaxial Cable Length _____

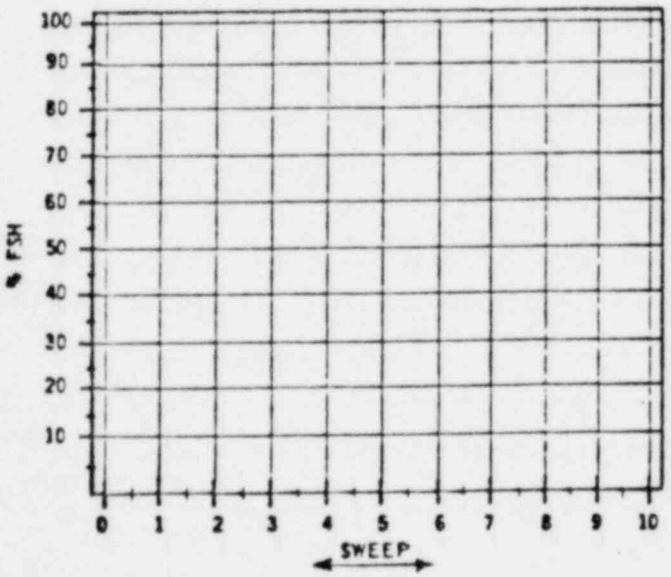
Frequency _____ Reject _____

Rep Rate _____ Damping _____

dB Gain – Coarse _____ Fine _____

Primary Reference Response
Amplitude % Full Screen Height _____

DAC PLOT - TIME _____ AM, PM



NOTE: When performing examinations where no DAC is required, indicate reference reflector location and amplitude above.

CALIBRATION CHECKS

	AMPL ± 20% (2dB) OF INITIAL AMPL		SWEEP ± 5% OF INITIAL LOCATION	
TIME	YES	NO	YES	NO

NOTE: If response above is "NO" refer to Calibration Check section of procedure.

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

REVIEWED BY _____ DATE _____

ADDITIONAL REMARKS

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

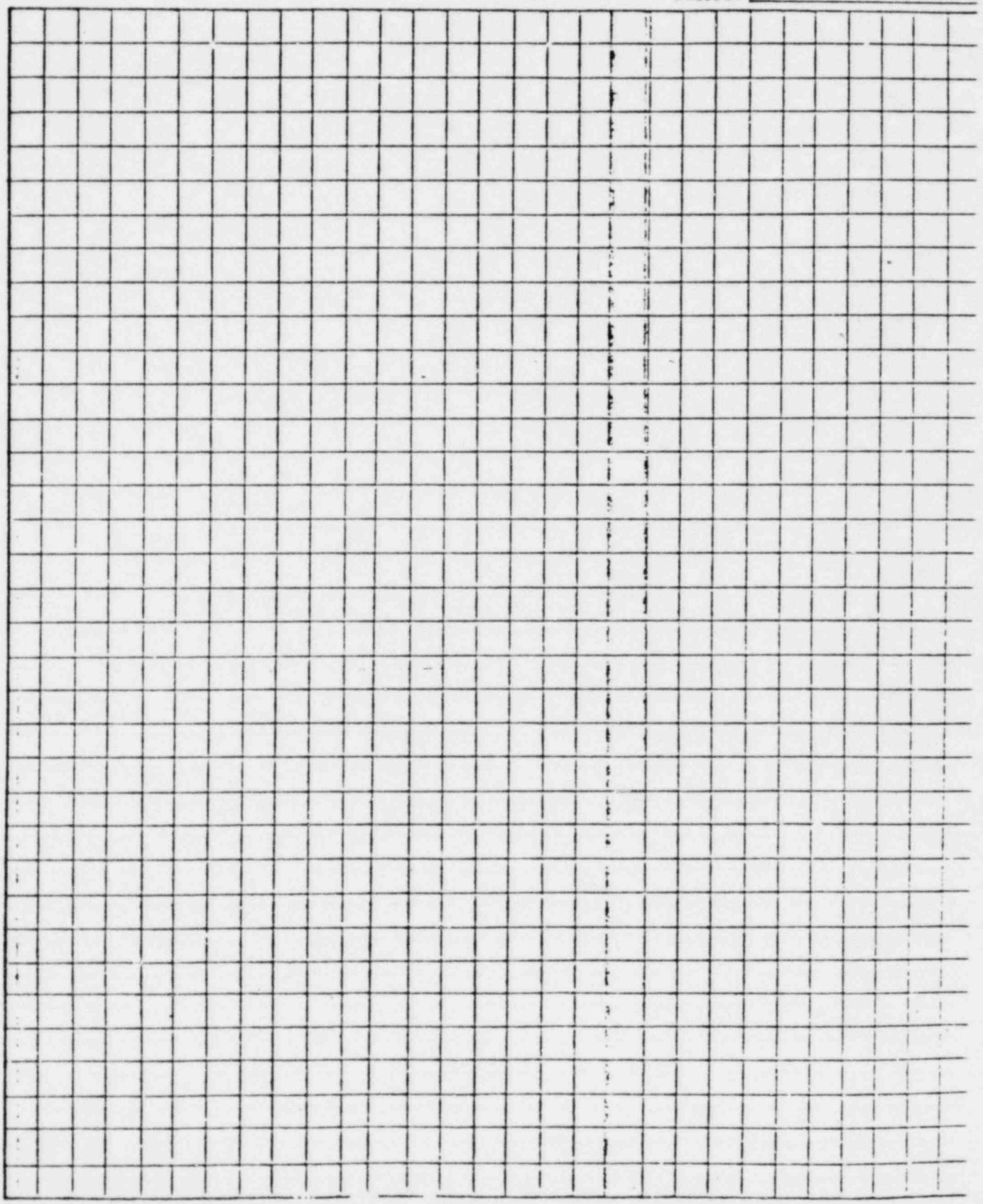
INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____



5062/S-78

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION
INDICATION DATA

SHEET ___ OF ___

ITEM IDENTIFICATION _____

CALIBRATION DATA SHEET NO. _____

DATA TABULATION

SCAN DIRECTION			INDICATION NO.	EXAM. ON _____ (ADJ WELD) SIDE OF WELD	MAX % DAC	SWEEP READING	SEARCH UNIT EXIT POINT LOCATION		50% DAC OR HALF MAXIMUM AMPLITUDE				STRAIGHT BEAM (CAL ON BACK REFLECTION)	
									MINIMUM		MAXIMUM			
ST. BEAM	CIRCUMFERENTIAL	AXIAL					CIRCUMFERENTIAL (DISTANCE CW OR CCW FROM REFERENCE LINE)	AXIAL (DISTANCE FROM WELD ℄)	SWEEP READING	S.U. POSITION	SWEEP READING	S.U. POSITION	INDICATION AMPLITUDE (% FSH)	BACK-REFLECTION AMPLITUDE (% FSH)

RESULTS

INDICATION NO.	LOCATION OF INDICATION		LENGTH	% t		WIDTH (IF LAMINAR)	COMMENTS
	CIRC	AXIAL		DEPTH (IF PLANAR)	DISTANCE FROM SURFACE		

CONTINUATION ATTACHED – ☐ Yes ☐ No

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

REVIEWED BY _____ DATE _____

1371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-UT-S78-9

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BYRON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N. Paul	D. A. Nuzzo	Walter Sawicky

1. Add the following subsections to section 3.0

   3.2 In the process of being qualified and certified to at least Level I in the ultrasonic method, an individual shall be considered a Trainee. A Trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a report of test results.

2. Add the following to subsection 4.2.4

   The clients Level III shall be notified verbally, within 24 hours, if it was necessary to use test frequencies other than 2.25 MHz.

3. Add the following to subsection 5.2

   Couplant shall be certified to have a total halogen content of 300 PPM or less.

4. Revise the first line of subsection 16.2 to read: For each indication that exceeds 40 per cent of reference level.

TITLE	LEGEND	DATE
Ultrasonic Straight Beam Examination of RPV Shell-To-Flange Weld	R - INDICATES REVISION	October 15, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N. Paul	J. Carneiro	Walter Savitsky	

REV	PREPARED	APPROVE
0	NP	WJS

1. SCOPE

1.1 This procedure describes the manual contact straight beam ultrasonic examination of RPV shell-to-flange weld from the top surface of the flange. This procedure is in accordance with the requirements of ASME Boiler and Pressure Vessel Code Section XI, 1977 upto and including Summer 1978 Addenda.

1.2 The principal objective of examination is the detection, location and evaluation of discontinuities within the weld and adjacent base metal.

2. APPLICABLE DOCUMENTS, CODES AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein.

2.1.1 ASME Section XI, 1977, upto and including Summer 1978 Addenda.

2.1.2 Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel", NDE 1.

2.1.3 SNT-TC-1A, 1975 edition of American Society for Nondestructive Testing.

2.1.4 ASME Section V, 1977, upto and including Summer 1978 Addenda.

3. PERSONNEL CERTIFICATION

3.1 All personnel performing nondestructive examination shall be certified in accordance with the Ebasco Service Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel" which reflects the guidelines set forth by the scope of SNT-TC-1A.

4. EQUIPMENT

4.1 Instrument

4.1.1 A pulse-echo ultrasonic flaw detection instrument shall be employed. It shall generate, receive, and present on a cthode-ray tube (CRT) screen, pulses in a frequency range from one to five MHz.

4.1.2 The instrument shall be equipped with a stepped gain control calibrated in units of 2 dB or less.

4.1.3 The system performance characteristic of the instrument shall be verified at least once a year.

4.2 Search Unit

4.2.1 Search units may contain either single-or dual-transducer elements.

4.2.2 The search unit shall have a diameter not less than 1/2 inch and not greater than 3/4 in.

4.2.3 The search unit cable shall be of coaxial type and shall not exceed approximately 30 feet so as not to impair communication between inspection team members.

4.2.4 Nominal frequency of 2.25 MHz shall be employed. Other lower frequencies may be employed if required.

5. COUPLANT

5.1 A client approved couplant, capable of conducting ultrasonic vibrations from the transducer to the weld surface, shall be used.

5.2 The couplant identification and batch number shall be recorded on the Calibration Data Sheet.

6. EXAMINATION COVERAGE

6.1 Scanning shall be done with an overlapping of each scan at least by 10 percent of the transducer dimension measured perpendicular to the scan path.

7. SEARCH UNIT MOVEMENT

7.1 The rate of search unit movement shall not exceed 6 inches/second unless calibration has been verified at the higher scanning speed.

8. SCANNING SENSITIVITY

8.1 Scanning shall be done at twice (+ 6 dB) the primary reference level as a minimum but recording of ultrasonic reflectors shall be done at the primary reference level.

9. SURFACE PREPARATION

9.1 The examination surface shall be free of irregularities, loose material, or coatings which interfere with ultrasonic wave transmission.

10. ELECTRONIC DAC

Manual scanning with electronic distance amplitude correction is not permitted.

11. IDENTIFICATION OF EXAMINATION AREAS

11.1 The client shall provide the proper identification system.

12. INSTRUMENT CALIBRATION

12.1 Screen Height Linearity

12.1.1 The ultrasonic instrument shall provide screen height linearity within 5 percent of full range for at least 80 percent of full screen height (FSH) (baseline to maximum calibrated screen points).

12.1.2 The following procedures shall be used for screen height linearity calibration:

(a) Position an angle beam search unit on a reference standard so that indications from both the 1/2 T and 3/4 T holes are visible (other reflectors which provide the 2 to 1 ratio required in (b) may be substituted).

(b) Manipulate search unit to establish a 2 to 1 ratio of amplitudes between the two indications with the larger at 80 percent FSH.

(c) Without moving search unit, adjust sensitivity to run the higher response from approximately 100 percent to 20 percent FSH in 2 dB steps (10 percent if fine control available).

(d) Read and record the relative amplitudes of the two indications to the nearest 1 percent.

(e) If the smaller indication's amplitude is not 50 percent of the larger indication's amplitude, within 5 percent of FSH, the instrument shall not be used for examinations, until corrected.

Note Alternately, for screen height linearity calibration, a straight beam search unit may be used on any calibration block which will provide amplitude differences.

12.2 Amplitude Control Linearity

12.2.1 The ultrasonic instrument shall utilize an amplitude control, accurate over its useful range to ± 20 percent of the nominal amplitude ratio, to allow measurement of indications beyond the linear range of the vertical display on the screen.

12.2.2 The following procedure shall be used for Amplitude Control Linearity Calibration.- Position an angle beam or a straight beam search unit in such a way so that echo from one reflector in a calibration block is peaked on the screen. With the increase and decrease in attenuation shown in the following table, the echo amplitude shall fall within the specified limits. The setting and readings shall be estimated to the nearest 1 percent of full screen.

Indication Set at Percent of Full Screen	dB Control Change	Indication Limits Percent of Full Screen
80%	- 6 dB	32 to 48%
80%	- 12 dB	16 to 24%
40%	+ 6 dB	64 to 96%
20%	+ 12 dB	64 to 96%

12.3 The instrument calibration may be performed on any calibration block, including an IIW or Rompas block, and need not be performed with the same search unit used in the next examination.

12.4 The instrument calibration for screen height and amplitude control linearity shall be performed at the beginning of each period of extended use or every three months, whichever is less. This shall also be performed whenever any doubt arises about the instrument's functions. Results shall be recorded on the UT Instrument Calibration Sheet.

13. BASIC CALIBRATION BLOCKS

13.1 The material from which the block is fabricated shall be from one of the following:

(a) Nozzle dropout from the component.

(b) A component prolongation

(c) Material of the same material specification, product form, and heat treatment as one of the materials being [illegible].

13.2 The finish on the surface of the block shall be representative of the surface finishes of the component.

13.3 Drilled holes in the basic calibration block shall be used to establish the primary reference responses for examination.

13.4 Other applicable particulars related to basic calibration block shall be in agreement with that of Paragraph T-434, Article [illegible] ASME Section V.

13.5 The block (40 inch in length) provided by the client shall be used.

14. SYSTEM CALIBRATION

14.1 General

14.1.1 Complete ultrasonic examination system calibration establishing the DAC, shall be performed prior to each examination, or series of similar examination.

14.1.2 Calibration shall include the complete ultrasonic examination system. Any change in search units, couplants, cables, ultrasonic instruments, recording devices, or any other parts of the examination system shall be the cause of calibration check. The original calibration shall be performed on the basic calibration block and calibration checks shall be performed as per Article 14.3 of this procedure.

14.1.3 The temperature difference between the examination and calibration block surfaces shall not exceed 25°F (14°C).

14.1.4 The centerline of the search unit shall be at least 1-1/2 in. (38 mm) from the nearest side of the block.

14.2 Calibration

14.2.1 Using the range and delay controls, perform the sweep calibration in such a way so that the 25 inch and 36 inch metal-path side drilled holes responses appear at 5 and 7.2 of sweep reading respectively. Note that the back reflection from the block (with the metal-path of 40 inch) shall appear at 8 i.e. each major division of the screen equals to 5 inches of metal-path. Once sweep calibration is done, position the search unit for the maximum response from the 25 inch deep hole and adjust the amplitude to 80 percent full screen height and mark its peak on the screen. Without changing the instrument controls, position the search unit for the maximum response from the 36 inch deep hole and mark its peak on the screen. Now draw a line connecting the two points and extrapolate the line to cover the examination volume. This is the primary reference level (DAC).

14.2.2 Particulars of system calibration shall be recorded on Calibration Data Sheet.

14.3 Calibration Check

14.3.1 A system calibration check, which is the verification of the instrument sensitivity and sweep range calibration, shall be performed at the start and finish of each examination or series of similar examination, with any change in examination personnel, and at least every 4 hours during an examination. Calibration checks may be performed on either the block used for initial calibration, or a simulator approved by the client.

14.4 Corrective Action

14.4.1 If any point on the DAC curve has decreased 20 percent or 2 dB of its amplitude, all data sheets since the last calibration check shall be marked void. A new calibration shall be made and recorded and the voided examination areas shall be reexamined.

14.4.2 If any point on the DAC curve has increased more than 20 percent or 2 dB of its amplitude, recorded indications taken since the last valid calibration or calibration check may be reevaluated with the corrective calibration and that value changed on the data sheets.

14.4.3 If any point on the DAC curve has moved on the sweep line more than 10 percent of the sweep division reading, correct the sweep range calibration and note the correction of the examination record. If recordable reflectors are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the examination voided areas shall be reexamined.

15. EXAMINATION

15.1 The scanning shall be done from the top surface of the flange covering as much area as possible.

16. RECORDING EXAMINATION DATA

16.1 Record all reflectors which produce responses as outlined below:

16.1.1 Reflectors Equal to or Exceeding 50 Percent DAC: For each indication that equals or exceeds 50 percent of the reference level the following information shall be recorded:

(a) Maximum percent of DAC, sweep reading of indication, search unit position, location along the length of the weld, and beam direction.

(b) Through-Wall Dimension

(1) For reflectors 50 to 100 percent DAC, the minimum sweep reading and its position and location along the length of the reflector for 50 percent DAC when approaching the reflector from the maximum signal direction.

(2) For reflectors 50 to 100 percent DAC, the maximum sweep reading and its position and location along the length of the reflector for 50 percent DAC when moving away from the reflector's maximum signal direction.

(3) For reflectors exceeding 100 percent DAC, minimum sweep reading and its position and location along the length of the reflector for 50 percent of the maximum amplitude when approaching the reflector from the maximum signal direction.

(4) For reflectors exceeding 100 percent DAC, maximum sweep reading and its position and location along the length of the reflector for 50 percent of the maximum amplitude when moving away from the reflector's maximum signal direction.

(c) Length Dimension: The length of the reflector shall be obtained by recording the position and location along the length of weld as determined by 50 percent of DAC for each end of the reflector.

(d) Record all search unit position and location dimensions to the nearest tenth of an inch and obtain data from each successive scan path.

16.2 Further Evaluation

Further evaluation of reportable indications to determine disposition and/or the need to make repairs shall be the responsibility of the utility-owner.

17. REPORTS

17.1 A detailed ultrasonic examination report shall be prepared using the report form provided at the end of this procedure and any additional sketches or photographs as may be applicable. If no reportable indications are detected it shall be so noted on the report form.

17.2 Prompt (24 hours) notification of reportable indications shall be made to the representative designated by the utility-owner.

17.3 Data shall be entered, as required for each item in the blank space provided on the Calibration Data sheet, and if used, on the indication data sheet. Where data is not germane for the specific item the blank space shall be marked N/A to indicate that data is not applicable.

6064/5-80

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

UT INSTRUMENT CALIBRATION

INSTRUMENT MANUFACTURER _____ PROJECT _____

MODEL _____ SERIAL NO. _____ DATE _____

AMPLITUDE LINEARITY

dB CONTROL CHANGE	ACTUAL dB	SCREEN HEIGHT LARGER INDICATION	SCREEN HEIGHT* SMALLER INDICATION
Initial (0dB)			
+2dB			
0dB			
-2dB			
-4dB			
-6dB			
-8dB			
-10dB			
-12dB			

*Must be 50% of the Larger Amplitude, within ±5% of Full Screen Height

AMPLITUDE CONTROL LINEARITY

INDICATION SET AT % FSH	dB CONTROL CHANGE	INDICATION LIMITS % FSH	ACTUAL % FSH
80	- 6dB	32 to 48	
80	-12dB	16 to 24	
40	+ 6dB	64 to 96	
20	+12dB	64 to 96	

	ACCEPTABLE	
	YES	NO
Amplitude Linearity		
Amplitude Control Linearity		

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

CALIBRATION DATA

PROJECT _____ _____

DATA SHEET NO. _____ DATE _____

PROCEDURE ISI-UT- _____ REV _____

COMPONENT OR SYSTEM _____ PIPE OD (IF APPLICABLE) _____

ITEM IDENTIFICATION NO(S). LISTED ON REVERSE SIDE - COMPONENT TEMP _____ EXAM. SURFACE ☐ ID ☐ OD

CALIBRATION BLOCK NO. _____ THICKNESS _____ TEMP _____

SCAN COVERAGE

☐ 0° WHAZ ☐ 0° BASE MATERIAL ☐ AXIAL ☐ CIRCUMFERENTIAL

EQUIPMENT DATA

SEARCH UNIT

Manufacturer _____

Style _____

Serial No. _____

Size _____ Frequency _____

Angle _____ Mode _____

Couplant _____ Batch No. _____

INSTRUMENT

Manufacturer _____ Model _____

Serial No. _____ Coaxial Cable Length _____

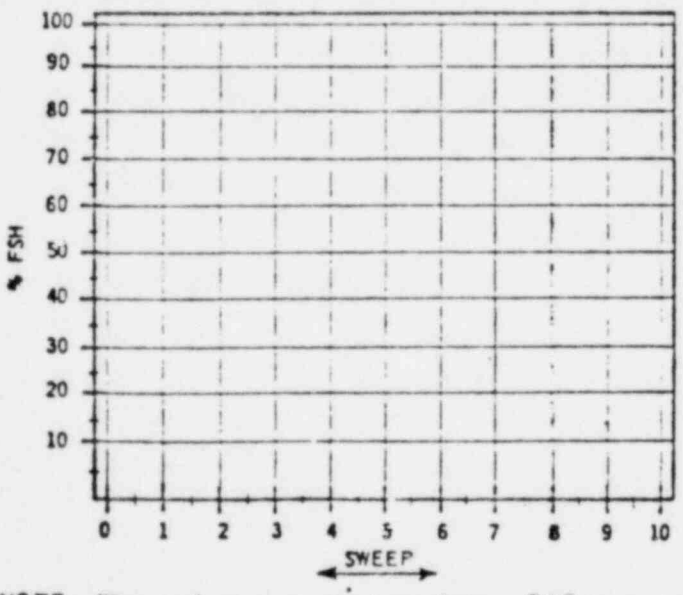
Frequency _____ Reject _____

Rep Rate _____ Damping _____

dB Gain – Coarse _____ Fine _____

Primary Reference Response
Amplitude % Full Screen Height _____

DAC PLOT - TIME _____ AM, PM



NOTE: When performing examinations where no DAC is required, indicate reference reflector location and amplitude above.

CALIBRATION CHECKS

	AMPL ± 20% (2dB) OF INITIAL AMPL		SWEEP WITHIN 10% OF INITIAL CONTROL	
TIME	YES	NO	YES	NO

NOTE: If response above is "NO" refer to Calibration Check section of procedure.

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-1A LEVEL _____

REVIEWED BY _____ DATE _____

ADDITIONAL REMARKS

*See Reverse

6062/5-78

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

INDICATION DATA

SHEET _____ OF _____

ITEM IDENTIFICATION _____

CALIBRATION DATA SHEET NO. _____

DATA TABULATION

SCAN DIRECTION			INDICATION NO.	EXAM. ON _____ (ADJ WELD) SIDE OF WELD	MAX % DAC	SWEEP READING	SEARCH UNIT EXIT POINT LOCATION		50% DAC OR HALF MAXIMUM AMPLITUDE				STRAIGHT BEAM (CAL ON BACK REFLECTION)	
									MINIMUM		MAXIMUM			
ST. BEAM	CIRCUMFERENTIAL	AXIAL					CIRCUMFERENTIAL (DISTANCE CW OR CCW FROM REFERENCE LINE)	AXIAL (DISTANCE FROM WELD ℄)	SWEEP READING	S.U. POSITION	SWEEP READING	S.U. POSITION	INDICATION AMPLITUDE (% FSH)	BACK REFLECTION AMPLITUDE (% FSH)

RESULTS

INDICATION NO.	LOCATION OF INDICATION		LENGTH	% t		WIDTH (IF LAMINAR)	COMMENTS
	CIRC	AXIAL		DEPTH (IF PLANAR)	DISTANCE FROM SURFACE		

CONTINUATION ATTACHED – ☐ Yes ☐ No

EXAMINER(S)

1. _____ TC-1A LEVEL _____

2. _____ TC-[illegible] LEVEL _____

REVIEWED BY _____ DAT[illegible] _____

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____

1371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-UT-S78-10

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BYRON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N Paul	J Carrico	Walter Sawyer

1. Add the following subsections to section 3

   3.2 A Level I individual may implement written ultrasonic examination instructions under the guidance of a higher level individual. The Level I individual shall not independently evaluate or accept the results of the ultrasonic examination.

   3.3 In the process of being qualified and certified to at least Level I in the ultrasonic method, an individual shall be considered a Trainee. A Trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a report of test results.

2. Add the following to subsection 4.2.4

   The clients Level III shall be notified verbally, within 24 hours, if it was necessary to use test frequencies other than 2.25 MHz.

3. Add the following subsection to section 5

   5.3 Couplant shall be certified to have a total halogen content of 300 PPM or less.

4. Add the following subsection to subsection 16.1

   16.1.2 Reflectors that exceed 40% DAC:

   For reflectors that are greater than 40% of DAC but less than 50% of DAC, data shall be recorded as per 16.1.1 (a).

TITLE	LEGEND	DATE
MAGNETIC PARTICLE EXAMINATION OF WELDS & BOLTING	R - INDICATES REVISION	3/16/81

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N. Paul		Walter Sawicky	1/27/81

REV	PREPARED	APPROVED
1	NP	WS

1.0 SCOPE

1.1 This document defines the minimum procedural requirements to be used in performing magnetic particle examination of nuclear power plant components by the magnetic particle method and is structured in accordance with the ASME Boiler and Pressure Code, Section V, Article 7, as set forth in Section XI.

2.0 OBJECTIVE

2.1 The principal objective of the dry magnetic particle method stated herein is for detecting the presence of surface discontinuities in welds and bolting.

3.0 APPLICABLE REFERENCE DOCUMENTS

3.1 The following documents form a part of this procedure to the extent specified herein.

3.1.1 ASME Boiler and Pressure Vessel Code, Section XI, 1977 Edition, Rules for Inservice Inspection of Nuclear Power Plant Components, Summer '78 Addenda

3.1.2 ASME Section V, 1977 Edition Summer '78 Addenda, Article 7, Nondestructive Examination

3.1.3 Ebasco Services Incorporated procedure for "Training, Examination, and Certification of Nondestructive Examination Personnel," NDE 1.

4.0 GENERAL

4.1 Qualification of Personnel

All personnel performing the nondestructive examination shall be certified in accordance with Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel," which reflects the guidelines set forth by the scope of SNT-TC-1A.

SARGENT & LUNDY
1. REVIEWED & ACCEPTED
ACTION SHOWN DOES NOT RELIEVE CONTRACTOR FROM HIS OBLIGATIONS UNDER THE CONTRACT.
F. A. KOSIK 6/30/81
BY DATE
SPEC. NO. E-2407 PROJ NO 439105

5.0 EQUIPMENT

5.1 Magnetizing Equipment - The magnetizing apparatus shall be capable of inducing, in the item under examination, a magnetic field of suitable intensity in the desired direction.

5.2 Alternating current electromagnetic yokes

5.3 Coils - Multiturn coils, normally consisting of 3 to 10 turns looped around the part or section of the part to be examined.

5.4 Magnetic Particle Field Indicator

5.5 Examination medium

5.5.1 Dry particles shall provide adequate contrast with the background of the surface being examined (yellow, black, grey, or red). Magnetic particle examination shall not be done on the surface of parts whose temperature exceeds 600°F.

5.5.2 Wet particles shall provide adequate contrast with the background of the surface being examined (black or red). The temperature of the wet particle suspension and the surface of the part shall not exceed 135°F.

6.0 SURFACE PREPARATION

6.1 Prior to magnetic particle examination, the surface to be examined and all adjacent areas within one inch shall be dry and free of any dirt, grease, rust, scale, oil, or other extraneous material that could obscure surface openings or otherwise interfere with the examination.

6.2 Surface condition as processed, may be suitable provided that there are no surface irregularities to mask indications of unacceptable discontinuities. However, surface preparation by manual wire brushing may be necessary in some cases where surface irregularities would otherwise mask indications of discontinuities.

6.3 Surfaces shall be cleaned, prior to magnetic particle examination, by one or more of the following: detergents, solvents, descaling solutions or paint removers.

7.0 EXAMINATION PROCEDURE

7.1 Time of Examination - Final magnetic particle examination shall be performed when the test item is in the final heat treated, machined or otherwise completed condition.

7.2 Examination Method - Examination shall be performed using the A.C. continuous method; that is, the magnetizing current shall remain on while the particles are being applied to the surface of the test piece and while excess of the particles are being removed.

7.3 Direction of Magnetization - At least two separate examinations shall be carried out on each area. The second examination shall be with the lines of magnetic flux approximately perpendicular to those used for the first examination in that area. A different means of magnetizing may be used for the second examination.

7.4 Magnetization Technique

7.4.1 Yoke Technique

a) Alternating current electromagnetic yokes shall be used.

b) The yoke shall be placed on the component and the current applied.

c) With the current on, the examination medium is applied, excess removed.

d) The weld and heat affected zone/bolting shall then be examined for indications between the poles and for a distance of 3 inches on each side of the yoke.

e) The examination shall be conducted with sufficient overlap to assure 100% coverage.

f) For welds, two separate examinations shall be conducted with the lines of flux perpendicular to each other.

g) For bolting, the lines of flux shall be perpendicular to the lines of flux using the coil techniques.

7.4.2 Coil Technique

a) The following current requirements shall be met for encircling coils:

L/D Ratio	Formula
4 or Greater	$\frac{35,000}{2 + L/D}$ = Ampere Turns
From 2 up to 4 incl.	$\frac{45,000}{L/D}$ = Ampere Turns

Note 1 - For parts with an L/D ratio less than 2, other magnetizing methods shall be used.

Note 2 - The effective field extends 6 inches on either side of the coil.

b) The coil shall encircle the component and placed approximately three (3) inches from the edge of the item; the turns of the coil shall be closely spaced.

c) The correct magnetizing current shall be determined from Paragraph 7.5.1. Current shall remain on while particles are applied.

d) For each size component, the adequacy and direction of the magnetizing force shall be verified on the first item using the magnetic particle field indicator. When a clearly defined line of particles is formed in the desired direction, the magnetizing technique shall be considered adequate.

e) The weld and heat affected zone/bolting shall then be examined for indications.

7.4.3 Direct Contact Technique

a) Magnetization is accomplished by passing current end-to-end through the part to be inspected.

TITLE	LEGEND	DATE
MAGNETIC PARTICLE EXAMINATION OF WELDS & BOLTING	R - INDICATES REVISION	3/16/81

REPLACES ISSUE OF		
1/27/81		
REV	PREPARED	APPROVED
1	NP	WJS

b) The following currents shall be used as a guide. The actual currents used shall be determined using a "magnetic particle field indicator."

Dia.	Current/in. of part dia.
Up to 5.0"	700 to 900 amp/in.
5.0" to 10"	500 to 700 amp/in.
10"	300 to 500 amp/in.

Note: Currents less than those shown in the table may be used provided the adequacy can be shown as stated in 7.4.2d.

8.0 EVALUATION OF INDICATIONS

8.1 All indications shall be evaluated in terms of acceptance standard as stated in Section 9.0 of this procedure.

8.2 Discontinuities at the surface are indicated by the retention of examination medium; however, localized surface irregularities due to machining marks or other surface conditions may produce false or nonrelevant indications.

8.3 Broad areas of particle accumulation which could mask indications of discontinuities are unacceptable, and those areas shall be cleaned and re-examined.

8.4 The indications to be relevant shall have the major dimension greater than 1/16".

9.0 ACCEPTANCE CRITERIA

9.1 Pressure retaining bolting larger than 2 in. diameter (B-G-1)

a) Allowable surface indications shall not exceed the following:

1) Nonaxial indications, 1/4 in. in length.

2) Axial indications, 1 in. in length.

TITLE	LEGEND	DATE
MAGNETIC PARTICLE EXAMINATION OF WELDS & BOLTING	R - INDICATES REVISION	3/16/81

REPLACES ISSUE OF 1/27/81

REV	PREPARED	APPROVED
1	NP	WS

9.2 Pressure retaining welds in piping (B-J)

a) Indications are unacceptable if they exceed the following lengths:

Nominal Wall Thickness	Indication Length - Inches Preservice	Inservice
0.312 or less	1/8	0.2
1.0	3/16	0.3
2.0	1/4	0.6
3.0	1/4	0.8
4.0 and over	1/4	0.8

9.3 Vessel supports (B-H) support members for piping, pumps and valves (B-K-1)

a) Indications are unacceptable if they exceed the following lengths:

Preservice

Nominal Wall Thickness	Indication Length - Inches
0625 to 2.0	3/16
2.0 and over	1/4

Inservice

Nominal Wall Thickness	Indication Length - Inches Inches
.025 to 1.5	0.25
2.0	0.3
3.0	0.45
4.0	0.6
5.0	0.75
6.0 and over	0.9

9.4 Evaluation of indications that exceed the above limits (9.1, 9.2 and 9.3) will be the customer's responsibility.

10.0 DEMAGNETIZATION - Not required

TITLE	LEGEND	DATE
MAGNETIC PARTICLE EXAMINATION OF WELDS & BOLTING	R - INDICATES REVISION	3/16/81

REPLACES ISSUE OF 1/27/81

REV	PREPARED	APPROVED
1	MF	WJS

11.0 POST-TEST CLEANING - All surfaces shall be cleaned so that all magnetic particles are completely removed after testing is completed.

12.0 CALIBRATION

12.1 Each piece of magnetizing equipment shall be calibrated at least once a year, or after each time it has been subjected to major electrical repair, periodic overhaul, or damage.

a) Equipment with ammeters shall be compared to those of a control test meter. Comparative reading shall be taken at a minimum of three levels encompassing the usable range. The unit's meter reading shall not deviate by more than ± 10% of full-scale, relative to the actual current valve as shown by the test meter.

b) A.C. yokes shall be calibrated by determining their minimum lifting power. Each yoke shall have a lifting power of at least 10 lbs at the maximum pole spacing at which it will be used.

13.0 REPORTS

13.1 A magnetic particle examination, shall be prepared and furnished to the client. A standard magnetic particle examination form (attached) will be used unless otherwise specified by the client.

13.2 The report shall include the following information as a minimum.

a) Part identification
b) Examination procedure number
c) Date
d) Examiner's name and certification level
e) Examination results
f) Amperage used and/or coil turns and amperage used
g) Particles (manufacturer name) and color
h) Equipment make, model and serial number

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION
MAGNETIC PARTICLE EXAMINATION REPORT

PROJECT	PROCEDURE	REVISION
	ISI-MT-	

COMPONENT OR SYSTEM

METHOD	MAGNETIZATION TECHNIQUE
☐ DRY ☐ WET	☐ YOKE ☐ COIL ☐ DIRECT CONTACT

EQUIPMENT MANUFACTURER	MODEL

SERIAL NO.	CURRENT TYPE	AMPERAGE	NO. OF COIL TURNS
	☐ AC ☐ DC		

PARTICLES MANUFACTURER	TYPE	COLOR

COMPONENT/WELD	INDICATION		LOCATION OF INDICATION (Use Sketch Sheet if Necessary)	REMARKS
	NONE	LENGTH (INCH)		

EXAMINER	LEVEL	DATE
EXAMINER	LEVEL	DATE
REVIEWED BY		DATE

8059/4.76

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____

1371/3-01

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-MT-S78-1

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BYRON UNIT 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N Paul	Brian E Bard	Walter Sawicki 3/16/81

1. Add the following subsections to section 4.0

4.2 A Level I individual may implement written magnetic particle examination instructions under the guidance of a higher level individual. The Level I individual shall not independently evaluate or accept the results of the magnetic particle examination.

4.3 In the process of being qualified and certified to at least Level I in the magnetic particle method an individual shall be considered a Trainee. A Trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a report of test results.

1371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 2 TO ISI PROCEDURE NO. ISI-MT-S78-1 REV. 1

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BYRON UNIT 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
		4/30/81

Correction to Referenced Paragraph in Section 7.4.2(c)

c. The correct magnetizing current shall be determined from Paragraph 7.4.2(a). Current shall remain on while particles are applied.

Add the following Section 5.5

5.5.3 The following magnetic particle materials, or equivalent shall be used, providing they are approved by the Client:

Magnaflux No. 8	Red Powder
Magnaflux No. 1	Gray Powder
Hoeganaes Ancolor	Yellow Powder
Magnaflux 9C-M	Wet Particles

TITLE	LEGEND	DATE
LIQUID PENETRANT EXAMINATION	R - INDICATES REVISION	10/1/81

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N. Paul	Williams	Walter Sawitzky	3/16/81

REV	PREPARED	APPROVED
2	NP	WS

1.0 SCOPE

1.1 This procedure defines the requirements for color contrast solvent removable liquid penetrant examination of nuclear reactor system components. This procedure is in accordance with the applicable requirements of ASME Boiler and Pressure Vessel Code Section XI, 1977 Edition, Summer '78 Addenda.

2.0 DESCRIPTION OF LIQUID PENETRANT EXAMINATION METHOD

2.1 Liquid penetrant examination is a method of nondestructive examination which provides for the detection of discontinuities which are open to the surface of nonporous ferrous and nonferrous materials.

3.0 CODES AND STANDARDS

3.1 American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code.

3.1.1 Section V, Nondestructive Examination, 1977 Edition, Summer '78 Addenda.

3.1.2 Section XI, Rules for Inservice Inspection of Nuclear Reactor Coolant Systems, 1977 Edition, Summer '78 Addenda.

3.2 American Society for Testing and Materials

3.2.1 ASTM-D129-64 Test for Sulfur in Petroleum Products by the Bomb Method.

3.2.2 ASTM-D808-63 Test for Chlorine in New and Used Petroleum Products by the Bomb Method.

3.3 Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel" NDE 1.

4.0 PENETRANT MATERIALS

4.1 The following solvent removable penetrant materials, or equivalent shall be used.

Magnaflux	SKL-NF/SKL-S Penetrant
	SKC-NF Cleaner
	SKD-NF Developer

SARGENT & LUNDY
1. REVIEWED & ACCEPTED
ACTION SHOWN DOES NOT RELIEVE CONTRACTOR FROM HIS OBLIGATIONS UNDER THE CONTRACT
F. A. KOSIK EI 11/30/81 DATE
SPEC NO. F-2907 PROJ NO. 4391-05

4.2 All penetrant materials shll be accompanied by the manufacturer's certification to ASTM D129-64 and ASTM D808-63, including material batch numbers and actual test results. The total sulfur content of the residue shall not exceed 1% by weight. The total halogen content of the residue shall not exceed 1% by weight.

4.3 All certification records shall be maintained by Ebasco's Quality Assurance Engineering Department and transmitted to the customer before examination.

4.4 Intermixing of penetrant materials from different family groups shall not be permitted.

5.0 NDE PERSONNEL QUALIFICATION

5.1 All personnel performing the nondestructive examinations shall be certified in accordance with Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel," which reflects the guidelines set forth by the scope of SNT-TC-1A.

6.0 SURFACE PREPARATION

6.1 Satisfactory results may be obtained when the surface is in the as-welded, as-rolled, as-cast or as-forged condition, but surface preparation by grinding or machining or other methods may be necessary in some instances where surface irregularities could otherwise mask indications of unacceptable discontinuities.

6.2 Prior to liquid penetrant examination, the surface to be examined and all adjacent areas within at least 1 inch, shall be dry and free of any dirt, grease, lint, scale, welding flux, weld spatter, oil or other extraneous matter that could obscure surface openings or otherwise interfere with the examination.

6.3 Only Client approved cleaning solvents shall be used.

6.4 Blasting with shot or dull sand shall not be used.

6.5 Drying, after cleaning, of the surfaces to be examined shall be accomplished by normal evaporation or with forced hot air, as appropriate. The minimum drying period shall be 5 minutes to ensure that the cleaning solvent has evaporated prior to application of the penetrant.

7.0 PENETRANT APPLICATION

7.1 The surface to be examined shall be thoroughly and uniformly covered with penetrant by dipping, brushing or spraying. If the penetrant is applied by spraying using compressed air type apparatus, filters shall be placed on the upstream side near the air inlet to preclude contamination of the penetrant by oil, water or dirt sediment that may have collected in the lines. Whenever poossible, the penetrant shall be applied to the examination area plus an additonal 1 inch on each side.

7.2 The examination areas shall be kept completely wetted for a minimum of 10 minutes and a maximum of 30. If the penetrant does not wet the surface but tends to pull away, leaving local islands of unwet surfaces, or if the penetrant is allowed to become tacky or dry, the examination area shall be cleaned and reexamined.

7.3 The temperature of the penetrant and the surface of the examination area shall not be below 60°F nor above 125°F throughout the examination period. Local heating or cooling shall be permitted provided the temperatures remain in the range of 60°F to 125°F during the examination. Where it is not possible to comply with these temperature liminations, other temperatures and times may be used, provided the procedures are qualified as described in T-660 of ASME Section V, Article 6.

8.0 EXCESS PENETRANT REMOVAL

8.1 After the penetration time has elapsed, any penetrant remaining on the surface shll be removed, taking care to minimize removal of penetrant from discontinuities. Excess penetrant, insofar as possible, shall be removed by wiping with a cloth or absorbent paper, repeating the operation until most races of penetrant have been removed. The remaining traces shall be removed by wiping the surface lightly with a cloth or absorbent paper moistened with an approved penetrant cleaner. To minimize removal of penetrant from discontinuties, care should be taken to avoid the use of excess penetrant cleaner.

8.2 Flushing the surface with penetrant cleaner, following the application of the penetrant and prior to developing, is prohibited.

9.0 DEVELOPING

9.1 After excess penetrant removal, the cleaner shall be allowed to evaporate for a minimum of 5 minutes and a maximum of 10 minutes prior to application of the developer.

9.2 Immediately prior to application, the nonaqueous wet developer (aerosol can) shall be thoroughly agitated to ensure adequate dispersion of the suspended particles.

9.3 The developer shall be applied in a uniform thin coat by spraying 6 inches approx. from area to be examined, while moving across examination area. Insufficient coating thicknesses may not draw the penetrant out of the discontinuities; conversely, excessive coating thickness may result in pooling and thus mask indications. Any areas of excessive coats or pools of developer shall be cleaned and reexamined.

10.0 EXAMINATION

10.1 Good practice is to observe the surface during the application of the developer to detect the nature of any indications which tend to bleed out profusely. Final interpretation shall be made after allowing the penetrant to bleed out, within 7 to 30 minutes. If the surface to be examined is so large as to preclude complete examination within the prescribed time, only portions of the surface shall be examined at any one time.

10.2 Adequate illumination is required to ensure no loss of the sensitivity in the examination. Lighting requirements shall meet those specified for visual examination in Section XI of the ASME Code.

11.0 EVALUATION OF INDICATIONS

11.1 All indications shall be evaluated in terms of Sections 11.3.1 and 11.3.2 of this procedure.

11.2 Discontinuities at the surface will be indicated by bleeding out of the penetrant. Nonrelevant indications resulting in broad areas of pigmentation which would mask indications of defects are unacceptable and those areas shall be cleaned and re-examined.

11.3 Relevant indications resulting from defects are unacceptable if they exceed the following:

11.3.1 Dissimilar Metal Welds (BF) and Pressure Retaining Welds in Piping (BJ)

(a) Indications in ferritic steels that meet the requirements of NB-2300 and specified minimum yield strength of 50ksi or less at 100°F are unacceptable if they exceed the following lengths:

Nominal Wall Thickness - Inches	Indication Length - Inches Preservice	Inservice
0.312 or less	1/8	0.2
1.0	3/16	0.3
2.0	1/4	0.6
3.0	1/4	0.8
4.0 and over	1/4	0.8

(b) Indications in austentic steels that meet the requirements of minimum yield strength of 35ksi or less at 100°F are unacceptable if they exceed the following lengths:

Nominal Wall Thickness - Inches	Indication Length - Inches Preservice	Inservice
0.312 or less	1/8	0.2
1.0	3/16	0.25
2.0	1/4	0.45
3.0 and over	1/4	0.65

11.3.2 Vessel Supports (B-H), Support Members for Piping, Pumps and Valves (B-K-1)

(a) Indications are unacceptable if they exceed the following lengths:

Nominal Wall Thickness - Inches	Indication Length - Inches Preservice	Inservice
0.65 to 2.0	3/16	0.25
2.0	1/4	0.3
3.0	1/4	0.45
4.0	1/4	0.6
5.0	1/4	0.75
6.0 and over	1/4	0.9

11.4 Evaluation of indications that exceed the above limits 11.3.1 (a) (b) and 11.3.2 (a) will be the customer's responsibility.

12.0 ACCEPTANCE STANDARDS

12.1 Acceptance of indications listed above may be evaluated by a cognizant Level II in accordance with requirements of Section XI of ASME Code, 1977 Edition, Summer '78 Addenda.

13.0 POST-EXAMINATION CLEANING

13.1 After completion of the liquid penetrant examination, all traces of penetrant and developer shall be removed by wetting with an approved solvent and wiping dry with rags. Cleaning will continue until no trace of developer or penetrant is visible on the cleaned surface.

14.0 EXAMINATION RECORDS

14.1 A Liquid Penetrant Materials Examination Report shall be filled out and included as part of the quality records.

15.0 SAFETY PRECAUTIONS

15.1 The safety precautions to be employed shall be in accordance with instructions furnished with the manufacturer's penetrant materials. These instructions may be supplemented by additional safety procedures consistent with existing company policy.

TITLE: LIQUID PENETRANT EXAMINATION

LEGEND: R - INDICATES REVISION

DATE: 10/1/81

REPLACES ISSUE OF: 3/16/81

REV	PREPARED	APPROVED
2	NP	WS

15.2 Trichloroethylene or Perchloroethylene base solutions shall not be used in or near the area of arc welding operations.

16.1 All original data sheets will be turned over to the customer within the period specified by the contract covering the work.

1372-A/441

EBASCO SERVICES INCORPORATED

QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION

LIQUID PENETRANT EXAMINATION REPORT

PROJECT	PROCEDURE ISI-PT-	REVISION
COMPONENT OR SYSTEM		TEMP

MATERIAL	MANUFACTURER	TYPE	BATCH NO.
Penetrant			
Cleaner			
Developer			

COMPONENT/WELD	INDICATION		LOCATION OF INDICATION (Use Sketch Sheet if Necessary)	REMARKS
	NONE	LENGTH (INCH)		

EXAMINER	LEVEL	DATE
EXAMINER	LEVEL	DATE
REVIEWED BY		DATE

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

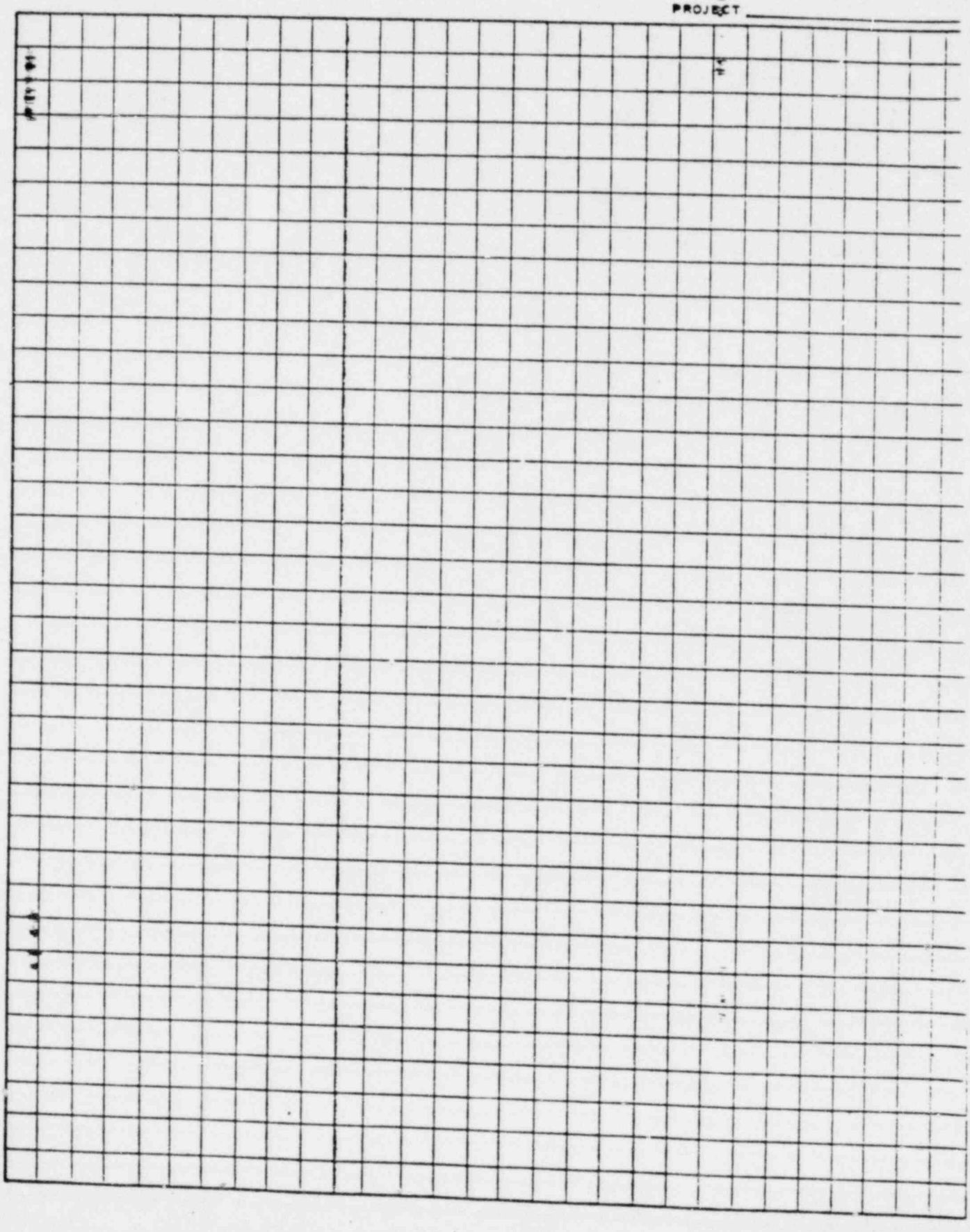
INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____



13?1/5-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-PT-S78-1

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BYRON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N. Paul	Brian E. Bart	Walter Sawicki 3/16/81

1. In subsection 4.2 change 1% to 300 PPM

2. Add the following subsections to section 5.0

5.2 A Level I individual may implement written liquid penetrant examination instructions under the guidance of a higher level individual. The Level I individual shall not independently evaluate or accept the results of the liquid penetrant examination.

5.3 In the process of being qualified and certified to at least Level I in the liquid penetrant method, an individual shall be considered a Trainee. A Trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a report of test results.

10-09-81 ISI PT 5.78-1 REV 1 ADD 2 (1)

I hereby state that I witnessed a PT test on an aluminum test block at 36°F dwell time of 12 minits and the indication was visable, I also witnessed the test at 70°F dwell time of 7 minits and the indication was also visable

Floyd F. Roose
H.S.B.
ANII

1372-A/4-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION

LIQUID PENETRANT EXAMINATION REPORT

PROJECT	PROCEDURE	REVISION
Byron Unit 1	578-1 ISI-PT- add.1	1
COMPONENT OR SYSTEM: PT Comparator block PT-1		TEMP: 70°F

	MANUFACTURER	TYPE	BATCH NO.
Penetrant	SPOTCHECK	SKL-HF/S	810088
Cleaner	"	SKL-NF/ZC-7	81C041
Developer	"	SKD-NF	810082

COMPONENT/WELD	INDICATION: NONE	INDICATION: LENGTH (INCH)	LOCATION OF INDICATION (Use Sketch Sheet if Necessary)	REMARKS
PT-1 Side A				5 min drying Time
			Satisfactory	10 min. dwell Time
			Indications	7 min develop Tim

EXAMINED / EXAMINER: D. P. Manganello — LEVEL: II PT — DATE: 10-9-81

REVIEWED BY — LEVEL — DATE

1372-A/8-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

INSERVICE INSPECTION

LIQUID PENETRANT EXAMINATION REPORT

PROJECT	PROCEDURE	REVISION
Byron Unit 1	S78-1 ISI-PT- add.1	1

COMPONENT OR SYSTEM: PT Comparator block PT-1 — TEMP: 30°F

	MANUFACTURER	TYPE	BATCH NO.
Penetrant	SPOTCHECK	SKL-HF/S	810088
Cleaner	"	SKL-NF/ZC-7	81C041
Developer	"	SKD-NF	810082

COMPONENT/WELD	INDICATION: NONE	INDICATION: LENGTH (INCH)	LOCATION OF INDICATION (Use Sketch Sheet if Necessary)	REMARKS
PT-1 Side B			indications	5 min. drying Time
			Comparable	12 min dwell Time
			To Page 1	7 min develop Time

EXAMINED / EXAMINER	J.P. Margarullo	LEVEL II PT	DATE 10-9-81
EXAMINER		LEVEL	DATE
REVIEWED BY		REPORT NO.	DATE

TITLE: VISUAL EXAMINATION OF BOLTING COMPONENTS

LEGEND: R - INDICATES REVISION

DATE: 3/20/81

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N. Faul	[signature]	[signature]	1/28/81

REV	PREPARED	APPROVED
1	NP	JCH

1.0 SCOPE

This procedure describes the requirements for visual examination of bolting components in accordance with ASME Boiler and Pressure Vessel Code Section XI, 1977 edition and Addenda through Summer 1978. The principal objective of the methods stated herein is the detection and evaluation of areas of distress of bolting components.

2.0 APPLICABLE DOCUMENTS

2.1 ASME Section XI 1977, Summer 1978 Addenda

2.2 Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel," NDE 1

3.0 PERSONNEL CERTIFICATION

All personnel performing visual examinations shall be certified in accordance with Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel," which reflects the guidelines set forth by the scope of SNT-TC-1A.

4.0 TESTING EQUIPMENT

4.1 Visual examination shall be performed using adequate lighting, that is, a light source sufficient to provide good definition and contrast at the surface of the object or part being examined. Color of the light source may be white (incandescent) or any other which will produce the desired definition and contrast.

4.2 Resolution shall be tested by placing an 18 percent neutral gray card or plate containing a black line 1/32 inch in width in the area to be examined. Resolution is considered adequate if this line can be resolved from this background.

5.0 GENERAL

5.1 Direct visual examination may be performed when access is sufficient to place the eye within 24 inches of the surface to be examined and at an angle no less that 30 degrees with the surface to be examined. Mirrors may be used to improve the angle of vision.

6.0 EXAMINATION

6.1 Bolting may be examined either in place under tension, when the connection is disassembled, or when the bolting is removed.

VISUAL EXAMINATION OF BOLTING COMPONENTS

LEGEND	DATE
R - INDICATES REVISION	3/20/81

REPLACES ISSUE OF
1/28/81

REV	PREPARED	APPROVED
1	NP	GCH

6.0 EXAMINATION (Cont'd)

6.2 Bushings, threads, and ligaments in base material of flanges are required to be examined only when the connection is disassembled.

6.3 Examine all surfaces, especially the thread root area (if applicable), for evidence of cracking, galling, mechanical damage or other abnormal conditions.

7.0 REPORTS

7.1 The areas or surfaces exhibiting conditions described in 6.3 shall be reported on Form 6061A/11-76 and brought to the attention of the client for disposition. Sketches (Form 6059/4-76) or photographs may also be used to document surface conditions as applicable. Where areas or parts are found to be acceptable this should be so noted on the report form.

7.2 Prompt (24 hours) notification of reportable indications will be made to the representative designated by the utility-owner.

7.3 A final report shall be prepared, filed, and maintained in accordance with the requirements of Paragraph IWA-6000 of the ASME Code Section XI.

6061A/11-7f

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

VISUAL INSERVICE INSPECTION

DATE _____

EXAMINER _____

PROJECT _____

BOLTING COMPONENT _____

SERIAL NUMBER	IN PLACE	REMOVED	CRACKING	GALLING	MECHANICAL DAMAGE	OTHER ABNORMAL CONDITIONS

ADDITIONAL REMARKS

6059/4-75

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

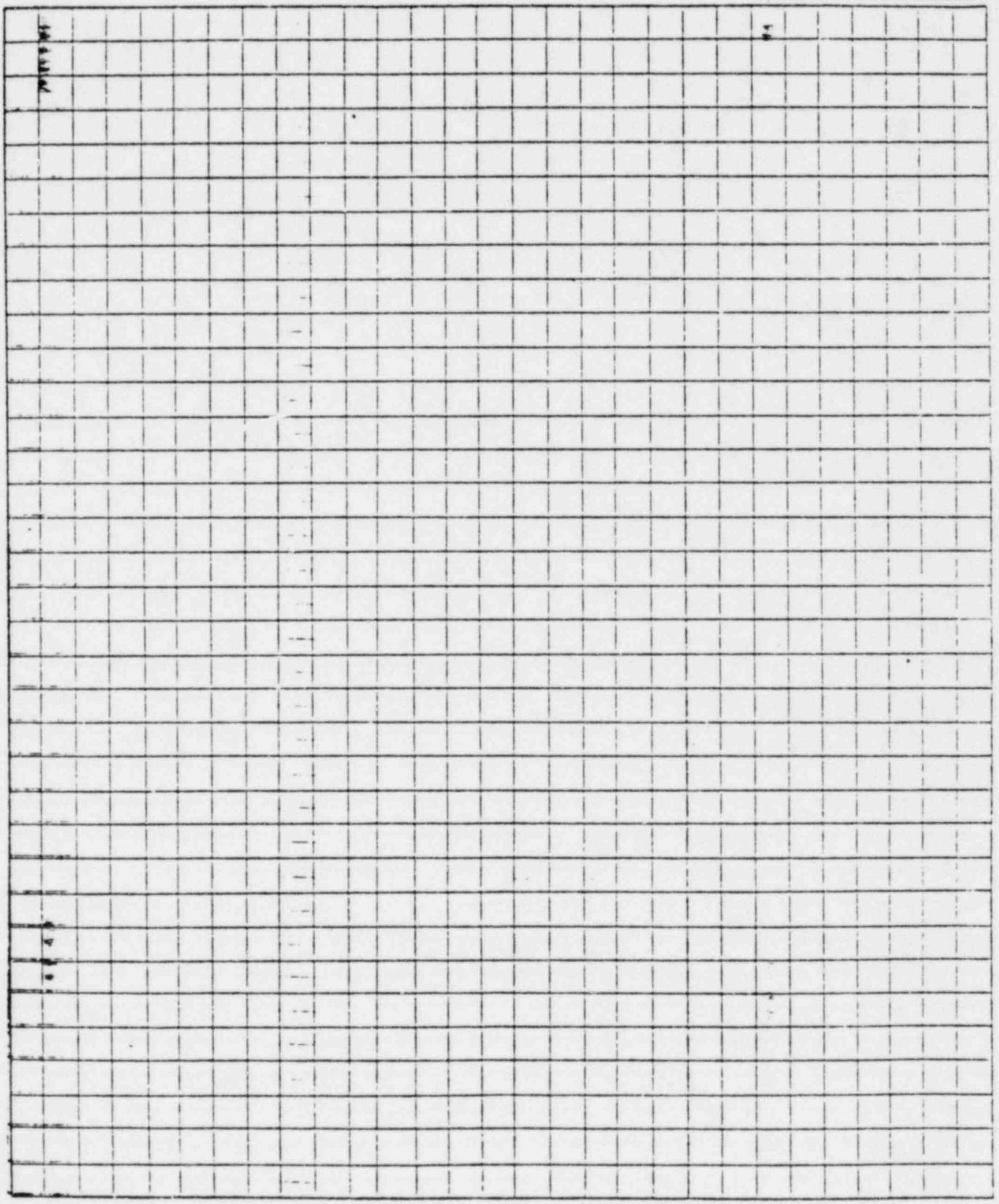
INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____



1371/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-VT 78-2

CLIENT	PROJECT
COMMONWEALTH EDISON CO.	BRYON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N Paul	9/30/81	3-20-81

1. Add the following subsections to section 3.0

   3.1 A Level I individual may implement written visual examination instructions under the guidance of a higher level individual. The Level I individual shall not independently evaluate or accept the results of the visual examination.

   3.2 In the process of being qualified and certified to at least Level I in the visual method, an individual shall be considered a trainee. A trainee shall work along with a certified individual and shall not conduct independently any test, interpret any results of a test, or write a report of test results.

TITLE: MULTIFREQUENCY EDDY CURRENT EXAMINATION OF WESTINGHOUSE STEAM GENERATOR TUBING

LEGEND: R - INDICATES REVISION

DATE: September 21, 1981

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N. Paul		Walter Sawchyn	

REV	PREPARED	APPROVE
0	NP	WS

1. SCOPE

1.1 This procedure describes the multifrequency eddy current examination of Westinghouse nonferromagnetic steam generators tubing. This procedure is in accordance with the requirements of ASME Boiler and Pressure Vessel Code, Section XI, 1977 up to and including Summer 1978 Addenda and USNRC Regulatory Guide 1.83, dated July, 1975.

1.2 The principal objective of examination is to assess the integrity of the tubing and to form a basis for comparison with the results of subsequent examinations.

2. APPLICABLE DOCUMENTS, CODES AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein.

2.1.1 ASME Section XI, 1977 up to and including Summer 1978 Addenda.

2.1.2 USNRC Regulatory Guide 1.83, dated July, 1975.

2.1.3 Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel", NDE 1.

2.1.4 SNT-TC-1A, 1975 edition of American Society for Nondestructive Testing.

3. PERSONNEL CERTIFICATION

3.1 All personnel performing nondestructive examination shall be certified in accordance with the Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel" which reflects the guidelines set forth by the scope of SNT-TC-1A.

3.2 Personnel collecting data shall be qualified to Level I, or higher. Personnel interpreting data shall be qualified to Level II, or higher, specifically for the evaluation of data from nonferromagnetic tubing. Personnel who operate (hand or remote) probe positioner, probe pusher or install equipment in the steam generator, are not required to be certified.

4. EQUIPMENT

4.1 The examination shall be performed utilizing an eddy current instrument capable of operation on a frequency-range from 10 KHz to 990 KHz with coil-probe designed for examination from the inside of the tubes. The inspection performance shall be monitored by the use of an oscilloscope with a phase sensitive display system and recorded for later evaluation on both magnetic tape and strip chart.

4.2 Equipment employed shall be: -

4.2.1 Eddy Current Instruments: Zetec M1Z 12 or equivalent.

4.2.2 Tape Recorders: Zetec HP 3968 AZ or equivalent.

4.2.3 Strip Chart Recorders: Gould 220 or equivalent.

4.2.4 Probes: Zetec 2 Coils Differential or equivalent.

4.3 Probe positioning and feeding shall generally be accomplished by the use of the Zetec remotely operated positioner model SM4 or equivalent and the associated motorized probe pusher-puller.

4.4 Communication shall be provided by the use of a four channel Zetec communications set or equivalent.

4.5 System performance characteristic of Eddy Current Instruments, Tape Recorders, and Strip Chart Recorders shall be verified at least once a year.

5. SURFACE PREPARATION

5.1 Inside diamter of tubes must be clean with no obstructions.

6. IDENTIFICATION OF TUBES

6.1 In general,temporary templates shall be employed for identification of the tubes. Client shall provide the templates.

7. CALIBRATION STANDARD

7.1 The calibration standards shall be manufactured from a length of tubing of the same size and material type as that to be examined in the vessel. The standard shall contain hole and groove as follows.

7.1.1 Through-wall drill hole 0.052 in. (1.3mm) diameter for 3/4 in. (19mm) O.D. tubing and smaller and 0.067 in. (1.7mm) dinmeter for larger tubing.

7.1.2 Flat-bottomed drill hole 5/64 in. (2.0mm) diameter X 80% through from the outer wall surface.

7.1.3 Flat-bottomed drill hole 7/64 in. (2.8mm) diamter X 60% through from the outer tube wall surface.

7.1.4 Flat-bottom drill hole 3/16 in. (4.8mm) diamter X 40% through from the outer tube wall surface.

7.1.5 Four flat-bottomed holes, 3/16 in. (4.8mm) diameter, spaced 90 deg. apart around the tube circumference, 20% through the tube wall.

7.1.6 A 1/16 in. (1.6mm) wide 360 deg. circumferential groove, 20% through from the inner tube wall surface.

7.2 The calibration standard shall be of sufficient length to prevent interference due to end effect, adjacent calibration holes and groove.

7.3 Each standard shall be identified by a serial number and traceable to the tube manufacturer's heat number. Artificial flaw dimensions shall be measured to the nearest 0.003 in. Flaw dimensions and system response to the flaw shall be part of permanent record of the standard.

7.4 The client shall provide the calibration standard.

8. EXAMINATION PREPARATION

8.1 Provision must be made for personnel and equipment entry into, and exist from, the steam generator (i.e. ladders, scaffolds, or staging, platforms, lighting inside and outside the steam generator, 110 volt outlet etc.)

8.2 All probes and equipment to be in contact with the primary coolant surface shall be cleaned, if required, prior to use with the client approved cleaner.

8.3 Welding in the general area around the steam generator shall be minimized during active examination period.

8.4 The tubes selected for examination shall be listed on the "Checkoff Sheet".

8.5 Establish location of control-operation center with consultation with plant personnel.

8.6 Arrange for power distribution at control-operation center.

8.7 Install the communication system control box at the control-operation center.

8.8 Establish communications with headsets between the steam generator(s) and the control-operation center.

8.9 Check the operation of the remotely operated eddy current probe positioner.

8.10 Install the tube sheet templates, when required, on the tube sheet of the steam generator.

8.11 Install remotely operated probe position in channel head of the steam generator.

8.12 Connect power supply-control cable assembly to remotely operated probe positioner.

8.13 Install remotely operated probe pusher-puller near channel head of steam generator with control at control-operation center.

8.14 Ensure that all probe positioner, probe pusher-puller, probe and communication connecting cables are clear of access walkways and secured to any available supports.

9. SET-UP AND CALIBRATION

9.1 Set-up

9.1.1 Using multipin connector, interconnect M1Z-12 tester output to tape recorder input.

9.1.2 Using multipin connector, interconnect tape recorder output to M1Z-12 display.

9.1.3 Mark on strip chart paper/papers channel 1,2,3 & 4. Using BNC coax cables, interconnect the following:

9.1.3.1 Tape recorder channel 1 vertical output to number 1 channel of strip chart recorders.

9.1.3.2 M1Z-12 upper mix vertical output to number 2 channel of strip chart recorders.

9.1.3.3 Tape recorder channel 3 vertical output to number 3 channel of strip chart recorders.

9.1.3.4 M1Z-12 channel 1 horizontal output to number 4 channel of strip chart recorders.

TITLE: MULTIFREQUENCY EDDY CURRENT EXAMINATION OF WESTINGHOUSE STEAM GENERATOR TUBING

LEGEND: R - INDICATES REVISION

DATE: September 21, 19

REPLACES ISSUE OF:

REV	PREPARED	APPRD.
0	NP	WS

9.1.4 Connect multipin-connector and phone connector from OMB (start box) to tape recorder.

9.1.5 Connect the strip chart cables from OMB (start box) to both the strip chart recorders.

9.1.6 Connect probe to probe connection on back of M1Z-12 tester using about 110 feet probe extension coax.

9.1.7 Connect probe to absolute probe connection on back of M1Z-12 using about 110 feet probe extension coax.

9.1.8 Plug all instrument into 110 volt outlet.

9.2 Channel Calibrations

9.2.1 Turn on all instruments and allow 15 minutes warm-up.

9.2.2 Check the horizontal trace alignment on M1Z-12 display. If required, adjust the horizontal trace with the trace adjustment control located on back of M1Z-12 display.

9.2.3 Set the following frequencies, gain and mode on the 4 channels of the M1Z-12 tester.

Channel	Frequency	Mode	Gain
1	400 KHz	Differential	55
2	100 KHz	Differential	30
3	100 KHz	Absolute	40
4	10 KHz	Differential	50

9.2.4 Set 200 mv/div for all the four channels of strip chart recorders. (Turn fine sensitivity control until it clicks in lock position.)

9.2.5 Channel 1 Calibration

9.2.5.1 Insert probe in defect free area of the standard.

9.2.5.2 Press in channel 1 button, turn up intensity, press in store buttons on M1Z-12 display and set V/DIV on 1. All other buttons must be out.

9.2.5.3 Press auto balance on M1Z-12 tester.

9.2.5.4 Check phase of 100% through wall hole signal on M1Z-12 display as probe is pulled through standard. Phase needs adjustment if 100% hole does not go down and to the right when probe is pulled through standard and the probe motion is not horizontal. Estimate the phase angle error and make that direct change using phase controls. Re-check phase to make sure defect signals go down first and probe motion is horizontal. Continue this procedure until phase is correct.

9.2.6 Channel 2 Calibration

9.2.6.1 Insert probe in defect free area of standard.

9.2.6.2 Re-press channel 1 button so it is out and press in channel 2 button on M1Z-12 display.

9.2.6.3 Press auto balance on M1Z-12 tester.

9.2.6.4 Follow the same procedure used in paragraph 9.2.5.4.

9.2.7 Channel 3 Calibration

9.2.7.1 Insert probe in defect free area of standard.

9.2.7.2 Re-press channel 2 button so it is out and press in channel 3 botton on M1Z-12 display.

9.2.7.3 Press auto balance on M1Z-12 tester.

9.2.7.4 Insert probe connected to the absolute probe connection in a defect free area of calibration standard and attach with tape at eddy current control-operation center.

9.2.8 Channel 4 Calibration

9.2.8.1 Insert probe in a defect free area of standard.

9.2.8.2 Re-press channel 3 button so it is out and press channel 4 button on M1Z-12 display.

9.2.8.3 Press auto balance on M1Z-12 tester.

9.2.9 Press in all 4 channel buttons on display. Set display on 2 V/DIV and with probe in defect free area of standard, re-press auto balance. Position all 4 channel dots on screen and as probe is pulled through standard, check for proper display on each channel.

9.2.10 Any one of the channel "Bal" push buttons will balance all channels simultaneously.

9.2.11 The frequency and gain settings mentioned above are rough approximations. Actual frequency and gain settings, used during the calibration, shall be recorded on the "Calibration Sheet".

9.3 Upper Mix Calibration

9.3.1 Remove upper MIZ-12 mixture module and set internal switches at S1, 9 & 10; S2, 7 & 8.

9.3.2 No calibration is required on lower mix.

9.3.3 Set vertical and horizontal gain at 5.0.

9.3.4 Release all buttons on display. Set V/DIV on 1. Press in vertical set.

9.3.5 Pass probe back and forth in defect free area of calibration standard with simulated support signal, or use actual steam generator tube in support area.

9.3.6 As probe is passing back and forth, set upper mix vertical phase until signal is a straight line at approximately 135°.

9.3.7 Release upper mix vertical set and press in upper mix horizontal set.

9.3.8 As probe is passing back and forth under support, set upper, mix horizontal phase until signal is a straight line at approxomately 135°.

9.3.9 Release upper mix horizontal set, press in upper mix output and set both vertical and horizontal gain on upper mix to zero.

9.3.10 As probe is passing back and forth under support, adjust upper mix horizontal gain until signal size is minimized. Repeat procedure with upper mix vertical gain. Repeat these horizontal and vertical gain adjustments until support signal is minimized.

9.3.11 Note the phase angle of signal as the probe past 100% through hole. Adjust out-phase control on upper M1Z-12 mixer for probe motion signal horizontal and initial response of the 100% through wall hole down and to the right lower quadrant of the CRT.

9.4 The strip chart recorder shall be run normally at 5mm/second.

9.5 System Calibration, Frequency of Calibration Checks, Recalibration and Recording

9.5.1 System calibration, which shall be done prior to examination, shall include the complete examination system. Any change of test probe, extension cables, eddy current instrument, recording instruments or any other parts of the examination system shall be cause for re-calibration. Particulars of system calibration shall be recorded on the "Calibration Sheet".

9.5.2 Each reel of tape and its companion roll of chart paper shall contain the following information at the beginning of each side.

9.5.2.1 Name of Owner and Plant site

9.5.2.2 Steam Generator Identification

9.5.2.3 Date of examination

9.5.2.4 Test frequency (Hz) in each channel

9.5.2.5 Reel number and side

9.5.2.6 Calibration Standard identification

9.5.2.7 Operator's name, certification level, and company affiliation

9.5.3 The system calibration shall be verified and the results of the test standard recorded at the beginning and end of each side of magnetic tape, each end of the strip chart roll, and with no more then 4 hr. between the calibrations. Calibration verification shall be recorded on the "Calibration Verification Sheet".

TITLE: MULTIFREQUENCY EDDY CURRENT EXAMINATION OF WESTINGHOUSE STEAM GENERATOR TUBING

LEGEND: R - INDICATES REVISION

DATE: September 21, 1981

REPLACES ISSUE OF:

REV	PREPARED	APPROVED
0	NP	WS

9.5.4 If the equipment is out of calibration, it shall be recalibrated. The recalibration shall be noted on both the magnetic tape and the strip chart. The data interpreter shall determine which tubes, if any, shall be re-inspected.

9.6 Hold the mike button of OMB (start box) down to record voice.

10. EXAMINATION

10.1 After calibration, the probe shall be attached to probe pusher.

10.2 Probe positioning, pushing and pulling normally shall be done by remote control system. If needed, hand operation or a combination of hand and remote operations shall be employed.

10.3 Remote operation for probe positioning, pushing and pulling.

10.3.1 Using the probe pusher, feed the probe through the flexible conduit up to the guide tube of the positioner.

10.3.2 Operate the positioner to locate the probe beneath the tube to be examined.

10.3.3 Using the probe pusher, feed the probe into and up the tube to the extent desired. Normally the extent of insertion can be monitored by reference to signals from tube supports on the CRT.

10.3.4 Record the tube number on the magnetic tube and strip chart.

10.3.5 Start both tape recorder and stirp chart recorder and then withdraw the probe from the tube. Scanning shall be done during the withdrawal operation.

10.3.6 When the probe exits the tube or tube-sheet, stop the probe pusher, magnetic tape recorder and strip chart recorder.

10.4 Hand operation or a combination of hand and remote operations for probe positioning, pushing and pulling.

10.4.1 Follow the sequences from 10.3.1 to 10.3.6 employing either hand operation or remote operation where necessary.

10.4.2 Withdrawal of probe during hand operation shall be with a steady rhythm avoiding jerks.

10.5 During the scan, the operator shall monitor channels 1,2, 3,4 and the upper mix on MIZ-12 display to determine that the equipment is operating properly and calibration has not changed. This also allows the operator to check that the information is being recorded on the tape recorder. Channels 1,2,3, and 4 are displayed on the scope from the playback heads when the tape recorder is recording. The upper mix signal is from the MIZ-12. Therefore, if the tape is recording these signals, the upper mix signal should appear first on the scope followed by channels 1,2,3 and 4 from the tape recorder playback heads. In addition, the operator shall monitor the strip chart recorder and ensure proper recording. It may be noted that signals on channel 2 of strip chart recorder shall appear before the signals on channel 1.

10.6 The operator shall initial each tube examined on the "Checkoff Sheet" after the tube is scanned. If any tube cannot be scanned, the reason shall be noted by the operator on the same "Checkoff Sheet".

10.7 The probe speed during the scan shall not exceed 1 in./sec.

10.8 The number of tubes to be examined and the selection shall be the responsibility of the client.

10.9 Examination of tubes at additional frequencies may be performed to evaluate possible discontinuity indications.

10.10 Crew changes in the middle of a tape shall voice record the change on the magnetic tape and note on the strip chart papers.

11. There may be minor changes specially during set-up, calibration and examination to reflect actual test situations.

12. Data Interpretation and Evaluation

12.1 The strip chart and magnetic tapes shall be reviewed by the data interpreter using information from the initial calibration and multifrequency signal mix. Any flaw indications shall be measured by mechanical or electronic protractor. The angle of the flaw indication shall be compared to a curve (table) developed from the responses of the calibration standard to determine the flaw depth and origin. It may be noted that percent wall loss may be found directly from the pre-programmed memory incorporated in the instrument. All indications equal to or greater than 20% thru wall shall be reported on the "Indication Report Sheet". Report of indication shall include tube identification, depth, origin and axial location of the indicator. Indications resulting from scratches or permeability variations shall be considered non-relevant and need not be reported. In general for dents, only their presence and axial location shall be reported.

12.2 Further evaluation of reportable indications to determine disposition shall be the responsibility of the client.

13. REPORTS

13.1 Detailed ultrasonic examination report shall be prepared, as explained in the procedure, using the applicable report forms provided at the end of this procedure and any additional sketches or photographs as may be applicable.

13.2 Data shall be entered, as required for each item in the blank space provided on the applicable report forms. Where data is not germane for the specific item, the blank space shall be marked N/A to indicate that data is not applicable.

Rough Draft

SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION
EDDY CURRENT EXAMINATION

CHECKOFF SHEET

CHECKOFF SHEET NO: ______

OWNER AND PLANT SITE ______________________ STEAM GENERATOR: ______

AT DATA COLLECTING STATION						AT DATA INTERPRETING STATION				
						REPORTABLE INDICATION		INDICATION REPORT NO.		
ROW	COLUMN	CALIBRATION SHEET NO.	REEL & SIDE NO.	REMARKS (IF ANY)	INITIAL & DATE	YES	NO	SHEET NO.	REMARKS (IF ANY)	INITIAL & DATE

ROUGH DRAFT

FOSTER SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION
EDDY CURRENT EXAMINATION

CALIBRATION SHEET.

CALIBRATION SHEET NO: _____

PROCEDURE NO. ISI-ET- _____ REVISION: _____

OWNER AND PLANT SITE: _____ STEAM GENERATOR: _____

CALIBRATION STANDARD: _____

TYPE OF EXAMINATION: _____ REEL AND SIDE NO: _____ DATE: _____

EDDY CURRENT INSTRUMENT

TYPE OF MODULE/UNIT	INSTRUMENT PARTICULARS: MAKE	MODEL NO	SERIAL NO	INSTRUMENT SETTINGS: FREQUENCY	MODE	GAIN	[illegible]
FREQUENCY, CHANNEL 1							
FREQUENCY, CHANNEL 2							
FREQUENCY, CHANNEL 3							
FREQUENCY, CHANNEL 4							
MIXING, UPPER				N/A	N/A		
MIXING, LOWER				N/A	N/A		
DISPLAY UNIT				N/A	N/A	N/A	N/A

TAPE RECORDER

MAKE: _____ MODEL: _____ SERIAL NO: _____ SPEED: _____

STRIP CHART RECORDER

CHANNEL NO.	INSTRUMENT PARTICULARS: MAKE	MODEL NO	SERIAL NO	INSTRUMENT SETTINGS: SPEED	SENSITIVITY
1					
2					
3					
4					

PROBE

MAKE: _____ MODEL NO: _____ SIZE: _____ PROBE CABLE LENGTH: _____

PROBE PUSHER-PULLER

MAKE: _____ MODEL NO: _____ SERIAL NO: _____ SPEED: _____

CHECK THAT NECESSARY INFORMATION RECORDED ON TAPE AND STRIP CHART ☐

EXAMINER AND LEVEL _____ EXAMINER AND LEVEL: _____

REVIEWED BY AND DATE: _____ [illegible]: _____

REMARKS IF ANY:

DRAFT

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION
EDDY CURRENT EXAMINATION

CALIBRATION VERIFICATION SHEET

CALIBRATION VERIFICATION SHEET NO: ____

OWNER AND PLANT SITE ____________________ STEAM GENERATOR: ________

CALIBRATION SHEET NO	DATE	TIME	STANDARD NO	REEL AND FILE NO	INDEX COUNTER	REASON FOR VERIFICATION	VERIFICATION RECORDED ON TAPE & STRIP CHART	INITIAL

Rough DRAFT

EGAC-0 Idaho National Engineering Laboratory
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION
EDDY CURRENT EXAMINATION
INDICATION REPORTING SHEET

INDICATION REPORTING SHEET NO: _____

OWNER AND PLANT SITE: _____ STEAM GENERATOR: _____

STANDARD TEST FREQUENCY: _____

ROW COLUMN	CHECK-OFF SHEET NO	% TUBE WALL PENETRATION	ORIGIN	DENT	LOCATION	REMARKS (IF ANY)	ANTI-CLOCKWISE

INTERPRETER AND LEVEL _____

REVIEWED BY AND DATE _____ REVIEWED BY AND DATE _____

6059/4-76

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING

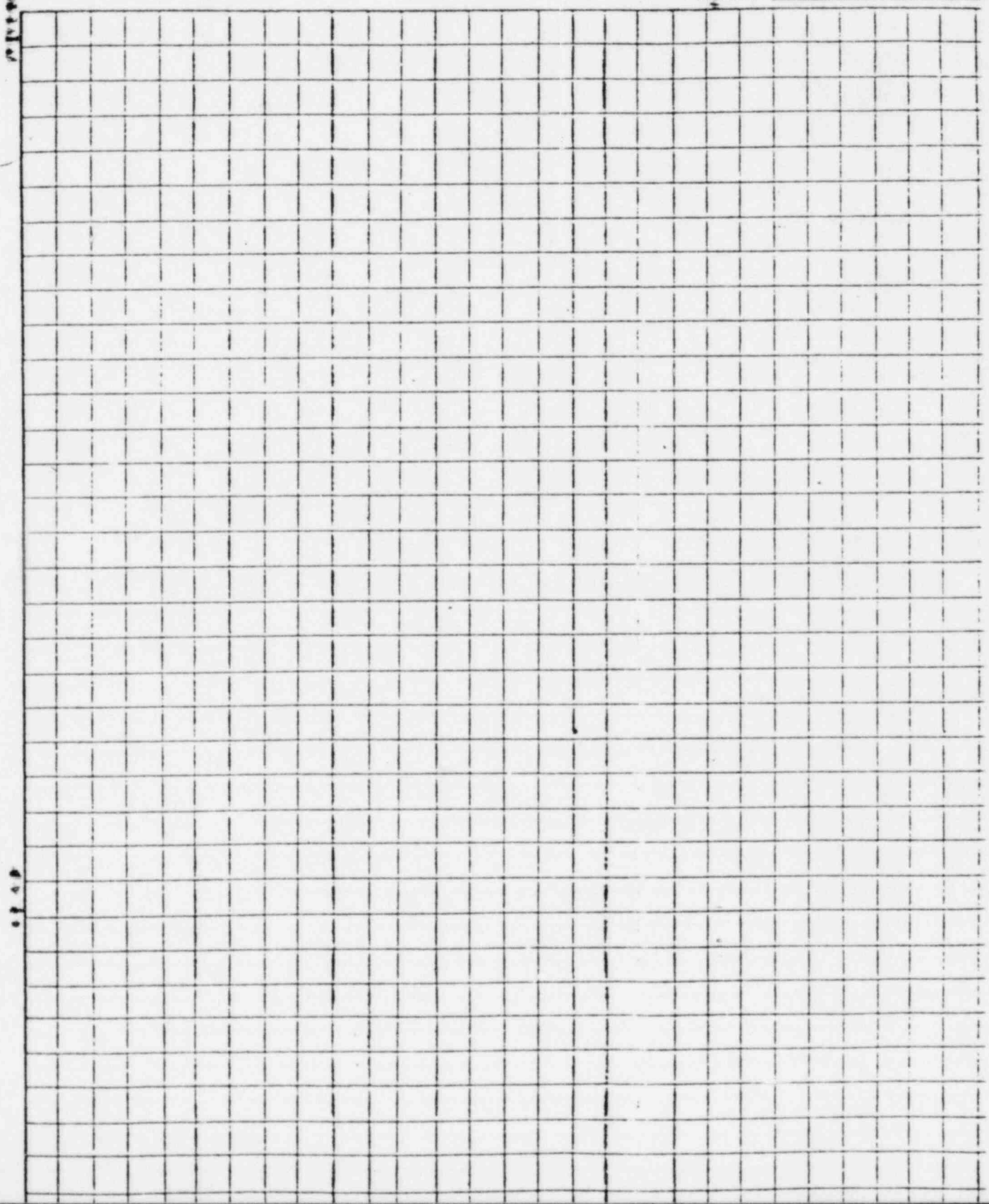
INSERVICE INSPECTION
SKETCH SHEET

LINE AND WELD(S) _____

DATE _____

EXAMINER _____

PROJECT _____



Rockwell International
Energy Systems Group

SUPPORTING DOCUMENT

GO NO	S/A NO	PAGE 1 OF	TOTAL PAGES	REV LTR CHG NO SEE SUMMARY OF CHG	NUMBER
04453	20000	33	35	B	445ISI000001

PROGRAM TITLE

Preservice and Inservice Inspection

DOCUMENT TITLE

Ultrasonic Examination of Reactor (PWR) Vessel Shell (Girth) Welds

DOCUMENT TYPE	KEY NOUNS
Inservice Inspection Procedure	UT, ISI

ORIGINAL ISSUE DATE	REL. DATE
August 27, 1981	10-22-81

APPROVALS DATE 6-31-81

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R Brengle 9/2/81

PREPARED BY/DATE	DEPT	MAIL ADDR
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IR&D PROGRAM? YES ☐ NO ☒
IF YES, ENTER TRA NO.

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ABSTRACT

The procedure described herein shall be used whenever preservice or inservice automated ultrasonic inspections of reactor vessels are to be performed. The provisions contained are in accordance with the requirements for volumetric inspection by the ultrasonic test method as described in ASME Boiler and Pressure Vessel Code Section XI 1977 Edition with Addenda through Summer 1978.

SARGENT & LUNDY
1. REVIEWED & ACCEPTED
ACTION SHOWN DOES NOT RELIEVE CONTRACTOR FROM HIS OBLIGATIONS UNDER THE CONTRACT.
E. A. KOSIK LL 10/28/81 DATE
SPEC. NO. F-2907 PROJ. NO. 4E-71-05

RESERVED FOR PROPRIETARY/LEGAL NOTICES

NOTICE

FORM 734C REV. 12-79

REV	SUMMARY OF CHANGE	APPROVALS AND DATE
A	Page 4 Section 2.2 Added: 5) U. S. Nuclear Regulatory Guide 1.147 Section 2.3 Applicable Documents Was: AI-76-50 Console Operations Manual Is: None Page 18 Section 4.3.1 - "may" now reads "shall"; old 2) now shows as a Note. Pages 27, 28, 29 Corrected typographical errors on figures.	W.R. McCann by [illegible] K Brempke 10-20-81 B.F. Richards 10-21-81 D.A. Kopp 10-22-81 M. Khalessi 10-22-81 P.D. Dat. 10/20/81
B	Revision to implement NRC Regulatory Guide 1.150 to the extent agreed to in telephone conversation of October 20, 1981, with CE Company, S&L, Ebasco, and Rockwell. Page 18 Section 4.2.3 - Frequency of Calibration Procedure now requires amplitude linearity and amplitude control linearity checks within 1 day prior to the examination and within 1 day after completion of the examination. Previously, only a check before the examination was required. Page 15 Revised Figure 3	[illegible] 21 OCT 81 [illegible] 21 OCT 81 K. Brempke 10-21-81 M. Khalessi 10-22-81 D.A. Kopp 10-22-81

REV	SUMMARY OF CHANGE	APPROVALS AND DATE
B	Section 4.3.2 - Beam Spread Measurement Revised to include measurement of beam spread at both 20% and 50% of the DAC. Previously, only measurement of 50% of the DAC was required.	R.C.D. 10/22/81

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CONTENTS

FIGURES

1.0 SCOPE

1.1 The procedure described herein shall be used for automated ultrasonic examination of nuclear vessel girth welds from the inside (clad) surface. The provisions contained are in accordance with the requirements for volumetric examination by the ultrasonic test (UT) method as described in ASME Boiler and Pressure Vessel Code Section XI 1977 Edition with Addenda through Summer 1978.

1.2 This procedure covers both straight beam and angle beam methods using pulse-echo ultrasonic techniques for the examination of welds, heat-affected zones (HAZ), and parent metal.

2.0 APPLICABLE DOCUMENTS, CODES, AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein. In the case of discrepancies between this procedure and the documents of 2.2, the documents of 2.2 (1) shall govern.

2.2 CODES AND STANDARDS

1) American Society of Mechanical Engineers, "ASME Boiler and Pressure Vessel Code," Section XI, and Section V (1977 Edition with Addenda through Summer 1978)
2) QAOP N6.02, ESG's Quality Assurance Operating Procedure; "Qualification and Certification of Nondestructive Testing Personnel" at ESG of Rockwell International.

NOTE: QAOP N6.02 meets the requirements of SNT-TC-1A, 1975 Edition, "Recommended practice for Nondestructive Testing Personnel," published by the American Society for Nondestructive Testing (ASNT).

3) American Society for Testing and Materials, "Ultrasonic Contact Inspection of Weldments," E-164 Latest Revision.
4) Code Case N235
5) "U.S. Nuclear Regulatory Guide 1.147."

2.3 APPLICABLE DOCUMENTS

None

3.0 REQUIREMENTS

3.1 PERSONNEL QUALIFICATIONS

Personnel performing these nondestructive examination operations shall be qualified at least to Level IIA in accordance with Energy Systems Group QAOP N6:02 and in accordance with Section XI of the Boiler and Pressure Vessel Code. The data analysis shall be performed by a Level II, IIA, IIIA, or III UT examiner.

3.1.1 All personnel responsible for the operation of mechanized testing equipment shall be proficient in its setup, calibration, operation, and maintenance.

3.2 EQUIPMENT

3.2.1 Ultrasonic equipment meeting the requirements of ASTM E-164 shall be used.

3.2.2 The ultrasonic instrument shall be capable of generating, receiving, amplifying, and displaying high-frequency electrical pulses at energy levels compatible with the required ultrasonic frequency and examination sensitivity.

3.2.3 Examinations shall be conducted with an ultrasonic, pulsed reflection-type system generating a frequency of 2.25 mHz.

The electronic apparatus shall contain a calibrated attenuator, accurate over its range to ±20 percent or ±2dB* which will allow comparison of indications beyond the viewable portion of the cathode ray tube (CRT) presentation of the instrument.

3.3 CALIBRATION BLOCKS

3.3.1 The automated ultrasonic system (instrument) shall be calibrated on basic blocks containing drilled holes and notches which will serve as calibration

*Whichever is least.

reflectors to establish a primary reference response of the equipment and to construct a distance amplitude correction curve. The size and location of the calibration reflectors shall be consistent with ASME Boiler and Pressure Vessel Code Section V.

3.4 AUTOMATIC INSPECTION SYSTEM DESCRIPTION

3.4.1 Automatic ultrasonic examination of welds is made possible by a system that controls the motion of the ultrasonic transducer and processes the data generated in the examination. The automatic control equipment provides precise location of the transducers with respect to the weld so that reproducible examinations can be performed. This remote control system also facilitates remote operation for inservice examination when radiation levels would limit access to the areas to be examined.

3.4.2 The automatic processing of the data meets the requirements for analysis and documentation of the findings of the examination. The large volume of weld metal to be examined leads to a large amount of data. These data are screened to detect all measurable echoes and evaluated to determine the significance of these echoes. When a reportable indication is detected, sufficient measurements will be performed to characterize it so that proper corrective action can be taken in accordance with Paragraph IWB-3500 of the Code. Fine grid rescans and manual scans of the area will be performed.

3.4.3 The Energy Systems Group (ESG) utilizes a computer-based control and data acquisition system to conduct the automatic examination. In this system, magnetic tapes store both the examination scheme for each weld and the data produced by that examination. This data is in digital form and provides an accurate documentation of the examination and permits comparison of the data received in subsequent examinations.

The equipment consists of a control console and automated ultrasonic device which moves over the weld area. These two units are interconnected by a set of cables which permit transmission of control and data information. The significant components on the device are the drive motors, the position encoders, and the transducers. The console contains the computer and peripheral units that control the device and acquire the data. These components are described in detail in the Console Operations Manual, AI-76-50.

3.4.4 Major system components include the following.

3.4.4.1 Mechanical Control

UT device is driven by precision dc motors. Its position is determined by incremental encoders which return electrical signals to the computer. The computer causes the dc motors to be driven until the actual position corresponds to that required in the examination program. The actual position of the UT device is displayed on the mechanical control panel and is continuously read into the computer so that the ultrasonic data are always uniquely related to the position of the transducer.

3.4.4.2 Ultrasonic Pulsing and Receiving

Ultrasonic transducers perform two tasks: (1) generating an ultrasonic pulse that travels into the metal being examined, and (2) receiving the echoes that are reflected from the front and back surface and from possible flaws in the metal. This operation is controlled by the pulser-receiver, an electronic unit in the control console. Closely associated with this is the distance-amplitude corrector (DAC) which corrects the echo signal for the attenuation of the ultrasonic signal as it passes through the metal.

3.4.4.3 Ultrasonic Signal Processing

All ultrasonic data are converted to digital form for computer processing. Circuitry has been developed to perform this conversion in a manner such that high resolution and good statistical accuracy are preserved. The digitized signal is, in many cases, a better representation of the ultrasonic signal than can be seen on the CRT display. The unit that performs this task is the analog-to-digital converter (transient digitizer). The reflected signal is divided up into increments (volume elements) through the thickness of the material, and each interval is sampled repetitively to obtain a statistical average.

When multiple transducers are used, the signal from each is processed through the transient digitizer so that all of the transducers may be interrogated at each position of the UT device. Each transducer has its own pulser-receiver and DAC to preserve its individual calibration.

The ultrasonic system is capable of detecting cracks in the material thickness planes parallel to and transverse to the weld direction, as well as laminar flaws parallel to the examination surface of the material. The system will also detect such flaw types as lack of fusion, incomplete penetration, inclusion, and porosity.

3.4.4.4 Data Processing and Storage

The computer performs two major tasks. The first is the control of the system. It directs the motion of the UT device through the mechanical control interface, and it controls the pulsing of the ultrasonic transducers for the examination. This control is performed in accordance with a program in the computer. The parameters of the examination are set by the operator working with the computer through a keyboard and graphical display unit. This unit displays printed text as well as graphical data from the computer on the screen of a storage-type cathode ray tube. Permanent hard copies of these data are generated automatically on command. The computer describes the examination program and

asks significant questions on the screen of the display unit. All program inputs and console operations will be performed by a Level II, IIA, IIIA, or III ultrasonic examiner.

The second function is to process and store the data. Small indications which do not require further study (<40% and >20% of DAC)* are recorded on digital magnetic tape and disk. These data are thus available for examination and comparison at subsequent examinations. If a flaw is found which exceeds the alarm set point, 40% DAC, the computer alerts the console operator and displays a summary of all such indications for the current weld being scanned. The UT examiner then can compare the data to calibration standards and display location, dimensions, and magnitude. Indications equal to or greater than 40% DAC will be evaluated as either relevant or nonrelevant indications. Relevant indications are defined as indications that are interpreted to be flaws within the weld metal or weld fusion zone being examined. Indications of 40% DAC or greater (20% screen height) will be evaluated as described in Paragraph 7.0, in compliance with ASME XI IWB 3500.

3.4.5 Transducers

The ultrasonic examination is performed by transmitting an ultrasonic pulse into the material being examined and detecting the reflections from discontinuities that might correspond to flaws. This pulsing is performed repetitively as the transducer is moved over the surface to be examined. The ultrasonic waves are transmitted at various specified angles and wave modes through the material.

(* NOTE: 100% DAC = 50% screen height

The transducer is coupled to the material being examined so that the ultrasonic waves pass to and from the material with as little attenuation as possible. This is accomplished by the vessel being filled with water which couples the transducer to the material. The ESG system uses an assembly of contact transducers mounted on the device to conduct the examinations. A search unit contains transducers oriented at 0^{o}, 45^{o}, and 60^{o}. Search head configurations vary with the type of weld being examined. Typical configurations are shown in Appendix I.

The transducer frequency is 2.25 mHz. Transducers with up to 1.0-in. diameter crystals may be used. The actual size used for each examination is recorded on the ISI Examination Form (Figure 1).

3.4.6 Mechanical Equipment

The equipment necessary to perform remote ultrasonic examinations on the reactor vessel and nozzles are described in this section. Specialized examination devices carry the ultrasonic equipment and are guided by a polar manipulator. The devices are operated remotely from the control and data acquisition system.

All devices utilize two drive motions for scanning. One drive provides movement parallel to the weld being examined; the other drive provides travel normal to the weld. Position sensors (encoders) are utilized to indicate the position of the ultrasonic transducer in cylindrical coordinates.

ENERGY SYSTEMS GROUP
INSERVICE INSPECTION
AUTOMATED ULTRASONIC EXAMINATION OF WELD

U.T. PROCEDURE NO. _____ DATE _____

EXAMINATION ON _____ SIDE OF WELD EXAMINER _____

PROJECT _____

CALIBRATION DATA	INSTRUMENT MFD AND MODEL ATOMICS INTERNATIONAL	WELD IDENTIFICATION	SCAN DIRECTIONS			SERIAL NO.
	TEST FREQUENCY 2.25 MHz	CAL. DATA SHEETS	DAC's	GAIN		SCAN LEVEL
SEARCH UNIT	TYPE	SIZE	FREQUENCY 2.25 MHz	MFG	MFG IDENTIFICATION NO.	WHEEL NO.
	COUPLANT WATER	ANGLE			CALIBRATION BLOCK NO.	CALIBRATION BLOCK TEMPERATURE WITHIN 25°F OF COMPONENT

INDICATION NO.	SCAN DIRECTION	"X" LOCATION FROM "0" MARK (cm)		"Y" LOCATION FROM "0" MARK (cm)		DEPTH (in.)	MAXIMUM SIGNAL AMPLITUDE (% OF DAC)	EXTENT TO 1/2 REF. AMPLITUDE POINTS (cm)		ANGULAR ORIENTATION TO TEST SURFACE (°)
		FROM	TO	FROM	TO			LENGTH	WIDTH	

INTERCONNECTING CABLE LENGTH _____ AMBIENT TEMPERATURE _____ CERTIFIED EXAMINER _____

Figure 1

4.0 CALIBRATION PROCEDURES

4.1 INSTRUMENT CALIBRATION PROCEDURE

Instrument calibration will be required for amplitude linearity, sweep range, sensitivity, distance amplitude correction, position calibration, beam angle, and beam spread in accordance with this procedure and ASME Boiler and Pressure Vessel Code Section V Article 4, 1977 Edition, Summer 1978 Addenda.

4.1.1 Amplitude Linearity Check

4.1.1.1 Requirements

The ultrasonic instrument shall provide linear presentation (within 25% of full screen) for at least 80% of the screen height (sweep line to top screen).

4.1.1.2 Procedure

1) Position an angle beam search unit so that indications can be observed from both the 1/2 and 3/4 T holes in the basic calibration block.
2) Adjust the search unit position to give a 2 to 1 ratio of amplitudes between the two indications (1/2 T to 3/4 T holes), with the larger set at 80% of full screen height.
3) With search unit still, adjust sensitivity to produce from 100% to 20% full screen height in 10% increments (or 2 db steps, if fine control not available).
4) Read and record the small indication at each setting (Figure 2). The reading must be 50% of the larger amplitude, within 5% of full screen height. Also, the settings and readings must be estimated to the nearest 1% of full screen height.

FIGURE 2

Pulser No. _____ Calibration Date
Channel No. _____ Sheet No. ____

Amplitude Linearity Check

Screen Height

db	1/2 T	3/4 T

Acceptable: Yes No

Examiner _____ Date _____

Amplitude Control Linearity Check

% Full Screen	db Change	% Full Screen	Limits
80	-6	_____	32 to 48
80	-12	_____	16 to 24
40	+6	_____	64 to 96
20	+12	_____	64 to 96

Acceptable: Yes No

Examiner _____ Date _____

4.1.2 Amplitude Control Linearity Check

4.1.2.1 Requirements

The ultrasonic instrument shall utilize an amplitude control (accurate over its useful range to ±20% of the nominal amplitude ratio) to allow measurement of indications beyond the linear range of the instrument.

4.1.2.2 Procedure

1) Position an angle beam search unit so the indication from the 1/2 T hole is peaked on the screen, with increases and decreases in attenuation shown below. The indication must fall within the specified limits:

Indication Set at % of Full Screen	db Control Change	Indication Limits, % of Full Screen
80	-6 db*	32 to 48
80	-12 db	16 to 24
40	+6 db	64 to 96
20	+12 db	64 to 96

*Minus denotes decrease in amplitude; plus denotes increase.

NOTE: The settings and readings must be estimated to the nearest 1% of full screen and recorded (Figure 2).

4.1.3 Instrument Calibration Record

4.1.3.1 The results of all instrument calibrations shall be included in the examination record. The form which shall be utilized for this purpose is shown in Figure 3.

DAC CALIBRATION DATA

TRANSDUCER S/N _____

ANGLE _____

DATE _____ TIME _____

CAL BLOCK _____

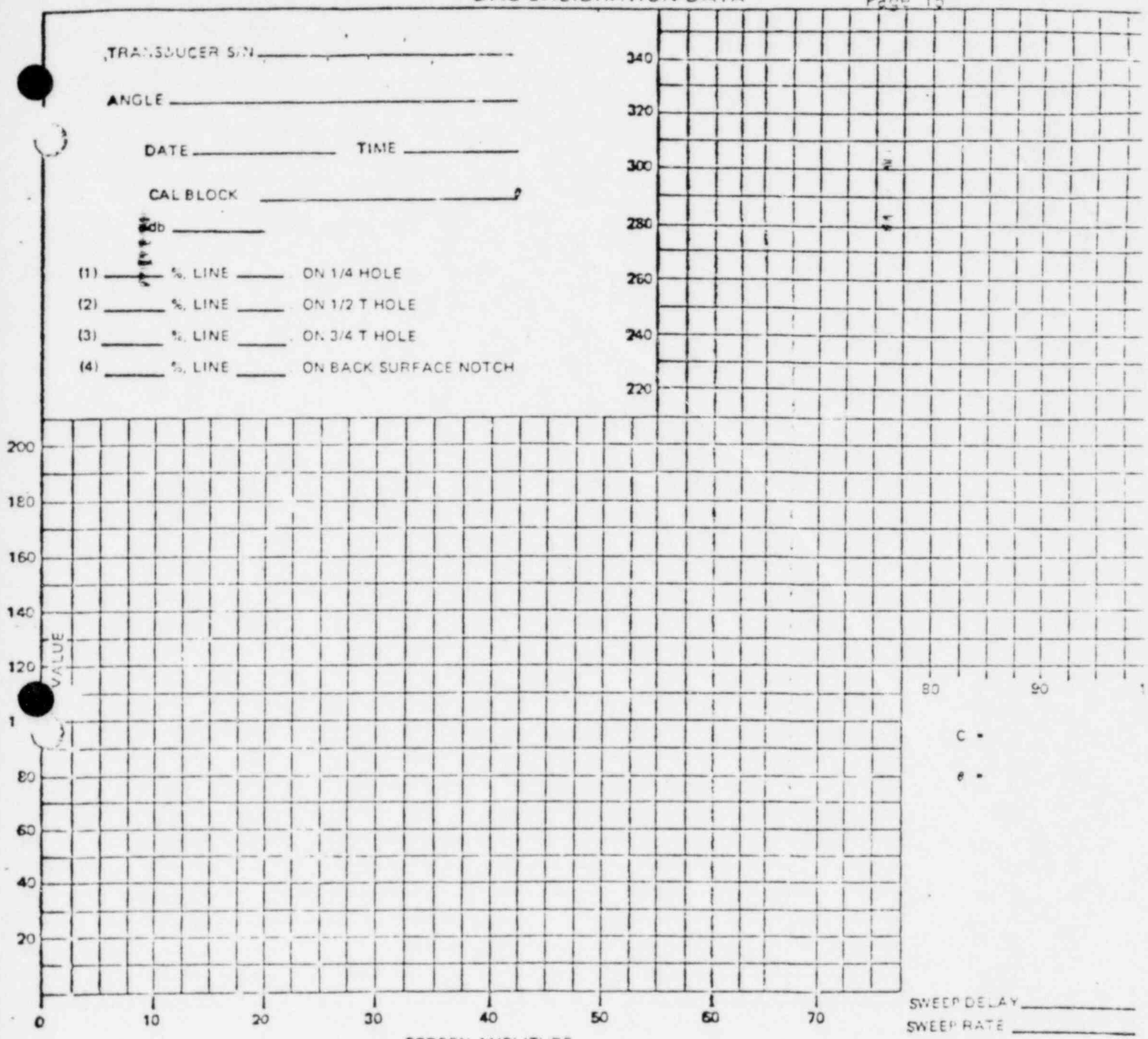
_____db _____

(1) _____ %, LINE _____ ON 1/4 HOLE

(2) _____ %, LINE _____ ON 1/2 T HOLE

(3) _____ %, LINE _____ ON 3/4 T HOLE

(4) _____ %, LINE _____ ON BACK SURFACE NOTCH



SWEEP DELAY _____

SWEEP RATE _____

DATA

SCREEN	ADC VALUE

DAC SETTINGS

CHANNEL NO _____ DELAY _____

PULSER NO _____ SLOPE 1 _____

MODE SW _____ SLOPE 2 _____

SCOPE S/N _____ GAIN 1 _____

DAC SWITCH _____ GAIN 2 _____

SAMPLE INTERVAL _____

FREQUENCY _____ INPUT SENSITIVITY _____

SIGNATURE OF UT EXAMINER _____

CALIB. VERIFIED BY _____ DATE _____ TIME _____

CALIB. VERIFIED BY _____ DATE _____ TIME _____

Figure 3

4.2 EXAMINATION SYSTEM CALIBRATION PROCEDURE

4.2.1 General Requirements

Calibration shall include the complete ultrasonic examination system. Any change in search units, couplants, cables, ultrasonic instruments, or any other parts of the examination system shall be cause for recalibration. The original calibration and rechecks shall be performed on the basic calibration block.

4.2.2 Temperature

The temperature of the basic calibration block shall be within 25°F of the component temperature.

4.2.3 Frequency of Calibration

Complete ultrasonic system calibration will be performed prior to use of the system in each thickness range as defined by Code Section V, Article 4. System calibration will be checked by verifying the DAC curve and sweep range calibration at the start and finish of each examination or every 12 hours and need not coincide with personnel changes. Calibration checks will be made on the calibration block. If any point on the distance-amplitude correction (DAC) curve has changed by more than 20% (2 db) of its amplitude, all data sheets since the last calibration or calibration recheck shall be marked void. A new calibration shall be made and the voided examination areas shall be reexamined. If any point on the distance-amplitude correction (DAC) curve has changed by more than 5% of the sweep division reading, correct the sweep range calibration and note the correction in the examination record. If recordable reflectors (40% DAC) are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the voided examinations shall be repeated. Data from these periodic rechecks will be recorded on the calibration recheck form (Figure 4). Ultrasonic instrument amplitude linearity and amplitude control linearity will be checked once

ENERGY SYSTEMS GROUP
CALIBRATION RECHECK FORM

PAGE ________

DATE TEMP.	TIME	DAC			ORIGINAL AMPL./SWEEP	RECHECK AMPL./SWEEP		CHECKED BY	LEVEL
		NO.	PAGE	OD's		OD's			

Figure 4

within 1 day before starting the examination and within 1 day after completing the examination to verify conformance with the requirements specified in Paragraphs 4.1.1.1 and 4.1.2.1, respectively. One beam spread measurement shall be made on each angle beam transducer used in the ultrasonic system during the examination using a basic calibration block.

4.3 ANGLE BEAM CALIBRATION PROCEDURE

4.3.1 Planar Reflector Correction

The following procedure shall be used to establish a correlation between 45° and 60° angle beam responses from a square back surface notch:

1) Position the search unit for maximum amplitude from the square notch on the opposite surface. Record the response amplitude. Note: The opposite surface square notch may give an indication 2 to 1 above DAC at 45° and 1/2 DAC at 60°. The indications from the square notch will be considered when evaluating reflectors at the opposite surface.

4.3.2 Beam Spread Measurement

Measurements of beam spread in the vertical plane shall be made on the side drilled holes. The transducer position at the 20% and 50% DAC amplitude limit of the primary lobe of the beam shall be used as the position references:

1) Position for maximum indication from the 1/4 T hole (100% of DAC). Move search unit toward the hole until indications equal 20% and 50% of the DAC line. Record the position readings.
2) Move search unit away from the hole 50% and 20% of the DAC line and record the position readings.
3) Repeat and record these measurements on the 1/2 and 3/4 T holes.

4.3.3 Distance-Amplitude Correction

With the electronic distance-amplitude correction (DAC) device, the primary reference response will be equalized at 50% ± 5% of full CRT screen height over the distance range employed in the examination.

4.4 STRAIGHT BEAM CALIBRATION PROCEDURE (PLANAR AND LAMINAR)

The distance-amplitude correction device shall be set such that the primary reference response will be equalized at 50% ± 5% of full CRT screen height over the distance range employed in the examination.

4.5 SWEEP RANGE CALIBRATION (ANGLE AND STRAIGHT BEAMS)

The range of the display scope will be set to allow the complete signal to be monitored for the thickness range being examined. The sweep position for the 1/4, 1/2, and 3/4 T calibration holes responses will be recorded on the calibration form (Figure 3). The calibration of the transient digitizer/ADC transfer function shall be completed per Figure 3 to assure that conversion from the analog signal to digital data is correctly performed. Part of this operation is equivalent to the sweep range calibration described in the ASME Code.

5.0 EXAMINATION PROCEDURES

5.1 REQUIREMENTS

5.1.1 Surface Preparation

The finished contact surfaces shall be free from any roughness that would interfere with free movement of the search unit or impair the transmission of ultrasonic vibrations.

5.2 SCANNING

5.2.1 The volume of base material through which the sound will travel in angle beam examination shall be completely scanned with a straight beam search unit to detect reflectors which might affect interpretation of angle beam results. This is not intended as an acceptance-rejection examination.

5.2.2 The weld shall be examined by moving the search unit parallel and normal to the weld so as to scan the required volume as specified in Appendix II.

5.2.3 Scanning shall be performed at the calibration reference level, since gain setting of electronics distance-amplitude correction is used. Evaluation of discontinuities shall be done with the gain control set at the calibration reference level.

5.2.4 Penetration shall be verified by obtaining a response from the opposite surface of the area being examined.

5.2.5 The examination shall be performed utilizing the designated automated UT device assembly. Each UT device contains multitransducer search units. The multitransducer search is designed to allow examination by 0^{0} longitudinal, 45^{0} shear, and 60^{0} shear angles during the computer-programmed scanning sequences. The necessary couplant is water contained in the vessel. The designation and orientation of the transducers is documented in Appendix I of this procedure.

5.2.6 The extent of scanning shall be defined by the applicable weld coverage figures prepared for the examination and attached as Appendix II to this procedure. A 10% overlap of the transducer scan path shall be maintained. The rate of the search unit movement shall not exceed six inches per second unless calibration is verified at scanning speed.

5.2.7 For detection of reflectors (discontinuities) oriented parallel to the weld, the angle beams shall be aimed normal to the weld. The search units will be manipulated parallel and normal to the weld so that the ultrasonic beams pass through all the weld metal from opposite directions. The adjacent base metal (1/2 t) in the examination volume will be scanned to provide coverage by two angle beams, but need not be examined by both pairs of beams in both directions.

5.2.8 For detection of reflectors (discontinuities) oriented transverse to the weld, the angle beam shall be aimed parallel to the centerline of the weld. The search unit shall be moved along the weld so that the ultrasonic beams pass through all of the weld metal and 1/2 T on both sides of the weld. Scanning will be done in two directions 180^{0} to each other.

5.2.9 For detection of planar and laminar reflectors with 0^{0} beams, the calibration from the side drilled holes, 4.4, will be used. Scanning will include the entire scan area as shown in Appendix II.

6.0 DATA RECORDING

6.1 GENERAL

Permanent records of examination data are compiled on magnetic tape in digital form as previously described. These records include: scan geometry for each mode of examination, metal thickness, volume element dimensions, time delays and offsets, and other appropriate information such as time, data, facility, weld number, and thick/thin option. This is the topography record which is generated for each weld. During the actual examination, a data record is compiled on a disk. Included on this disk are: position information for each volume element, UT response from each volume element, and appropriate documentation such as weld number, component, time, number of channels, transfer function, and calibration factor. All of these data are later transferred to IBM magnetic tapes for archival storage.

In addition to these tapes, hard copies are made of the topographies generated for each weld.

The ISI Examination Form (Figure 1) is completed at the conclusion of each weld examination. Recordable level indications (40% DAC or greater) will be documented or a statement "No recordable level indications" will be entered. The form will be signed by a certified Level II, IIA, IIIA, or III examiner.

6.2 CALIBRATION RECORDS

A Calibration Form (Figure 3) is completed for each calibration performed. Calibration rechecks are noted in the Operations Log and recorded in the Calibration Recheck Form (Figure 4).

6.3 WELD IDENTIFICATION

Scan data for each weld shall be referenced to a known zero reference or bench mark on the vessel and recorded on the data record (Figure 1).

7.0 REPORTING REQUIREMENTS

7.1 The computerized data acquisition system will automatically record the position coordinates, depth in the metal, and signal amplitude of all indications exceeding 40% of the calibration reference level (20% full screen height). The position data coordinates will be recorded in reference to a known zero reference or benchmark on the vessel. All indications within the examination zone will be evaluated in the manual mode by a Level II, IIA, IIIA, or III ultrasonic examiner. For straight beam examinations for planar or laminar reflectors, all indications equal to or greater than 40% of the calibration reference level will be recorded. Reflectors detected outside the examination volume will be recorded as laminar indications. Data shall be obtained at increments no greater than 9/10 of the transducer dimension measured parallel to the scan direction (minimum 10% overlap). Coordinates will be recorded at least to the nearest 0.1-inch or the azimuthal equivalent. Reportable level indications of 40% DAC and greater will be documented using a report form, Figure 1. All reportable indications shall be sized in accordance to the evaluation criteria of the Code, Section V.

7.2 Further evaluation of reportable indications to determine disposition and/or the need to make repairs shall be the responsibility of the utility owner.

7.3 Reporting within 24 hours of the above indications will be limited to the site representative.

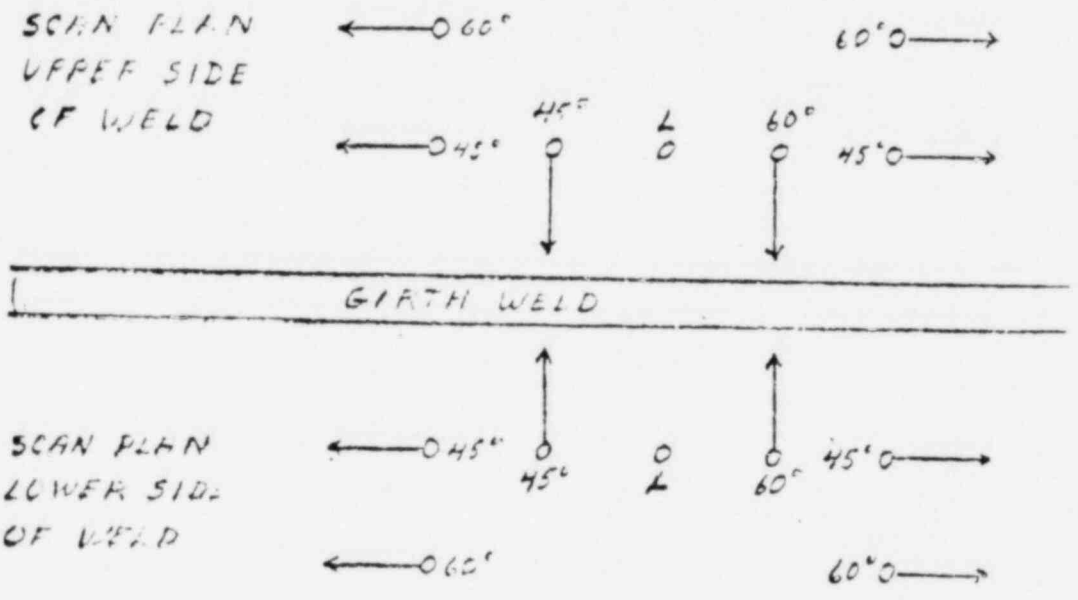
7.4 A final report shall be prepared, filed, and maintained, in accordance with the requirements of Paragraph IWA-6000 of the Code. In addition, weld maps will be included which depict actual UT coverage for each weld examination.

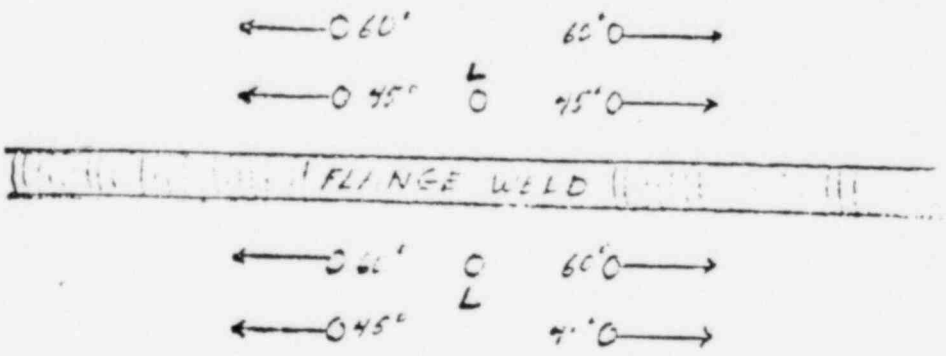
APPENDIX I

TRANSDUCER ORIENTATION

GIRTH (CIRCUMFERENTIAL) SHELL & FLANGE WELDS

TRANSDUCER ORIENTATION

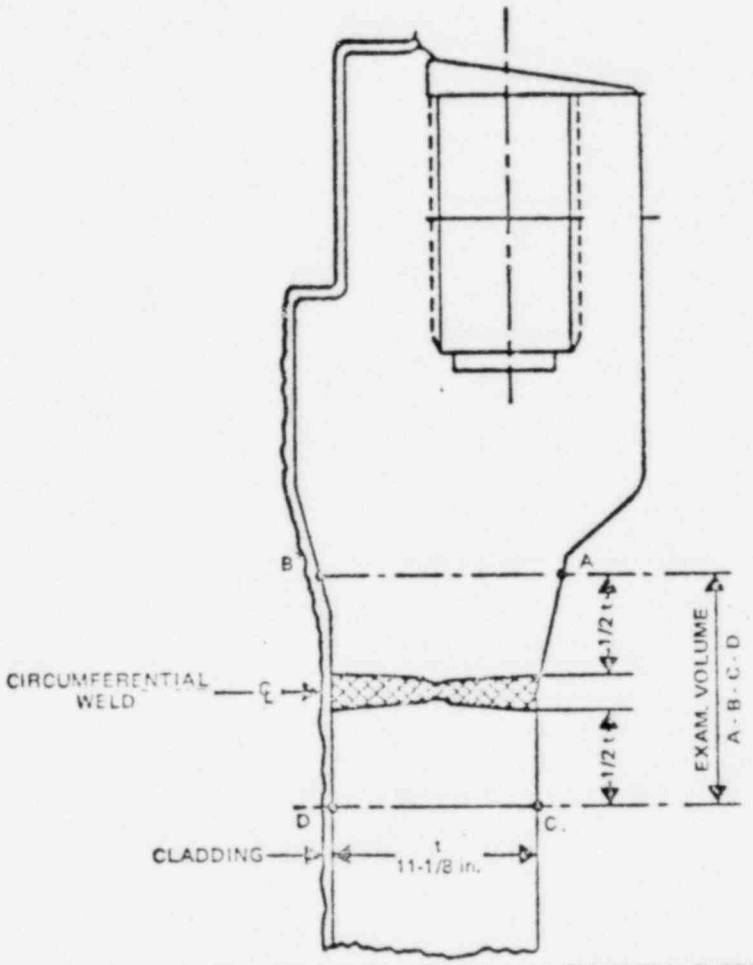




APPENDIX I FIGURE I

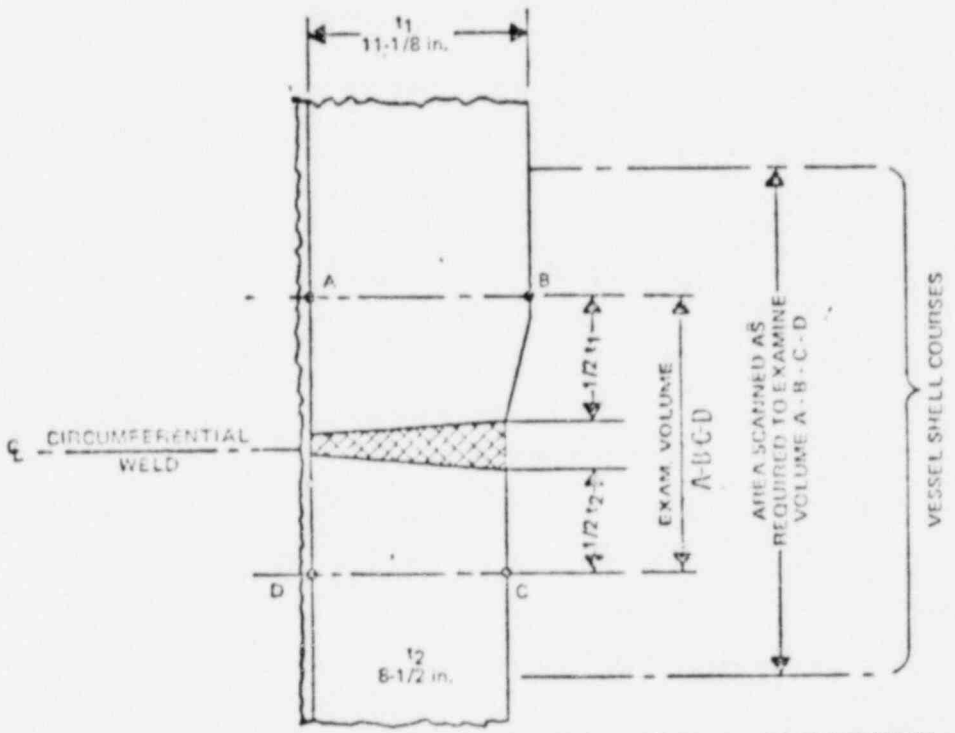
APPENDIX II
WELD MAPS

Typical ultrasonic coverages are shown. Actual dimensions for individual welds or weld segments will be documented in the examination data sheets.



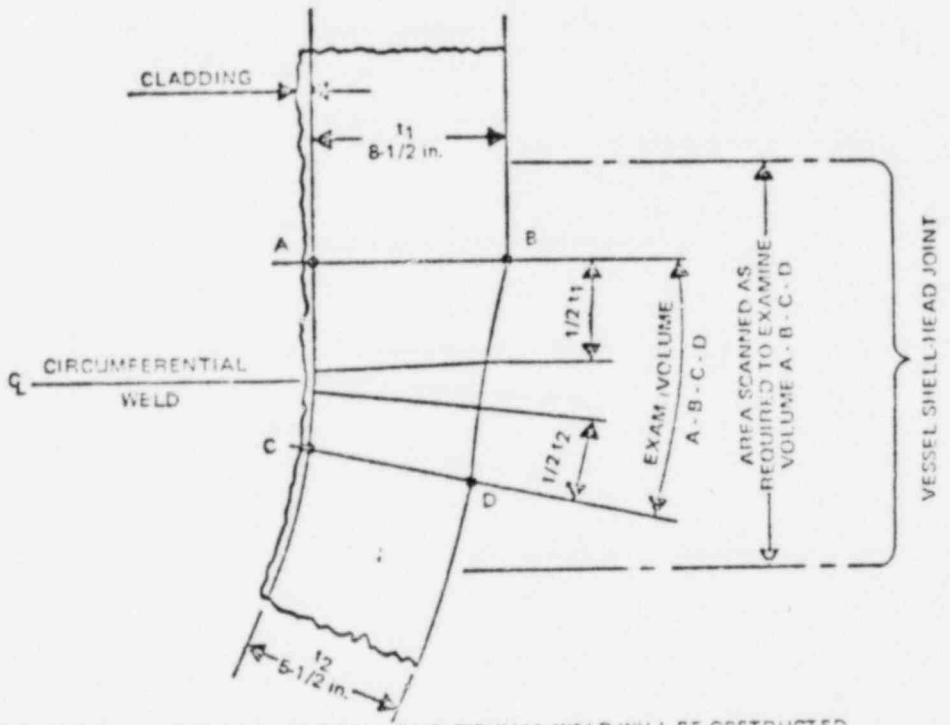
NOTE: SCAN OF FLANGE TO NOZZLE SHEEL COURSE WELD IS FOR TRANSVERSE REFLECTORS ONLY. SCAN PATH ON THE FLANGE SIDE MAY BE OBSTRUCTED BY THE TAPERED TRANSITION IN WALL THICKNESS AT B.

Figure 1. Flange-to-Nozzle Shell Course Weld



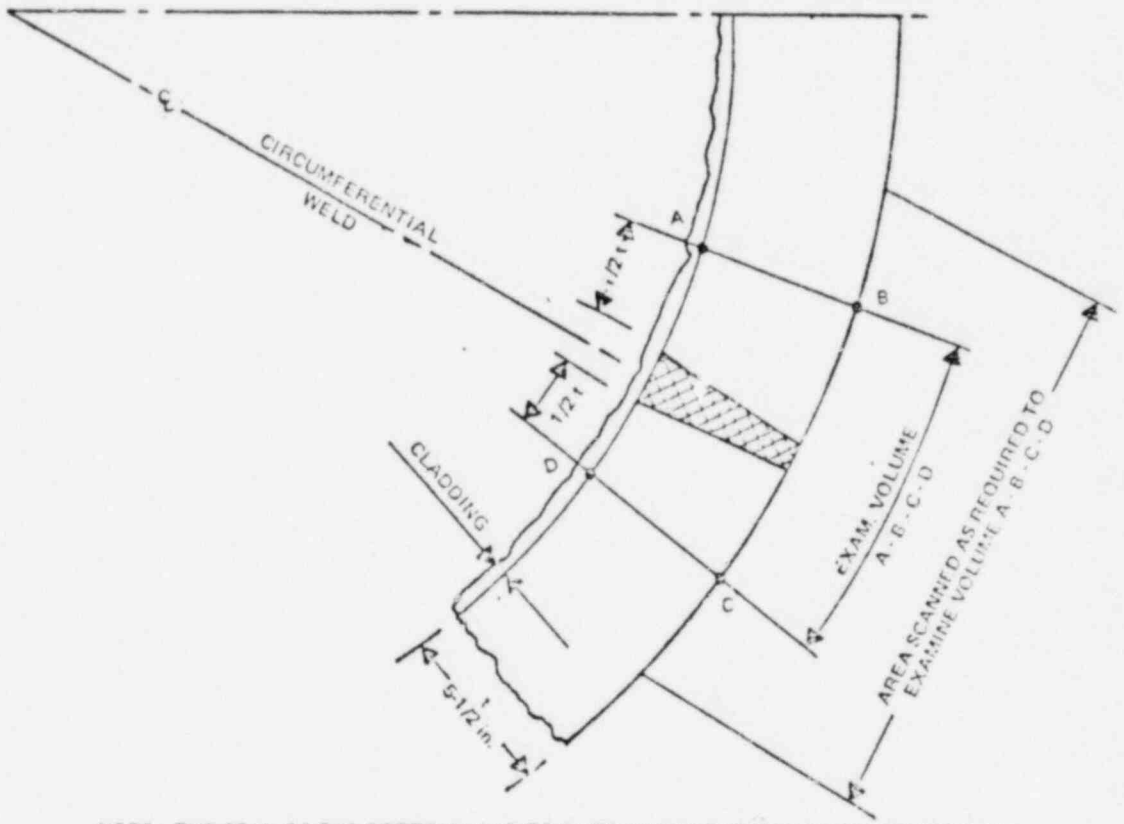
NOTE: THE NOZZLE SHELL COURSE TO UPPER SHELL TRANSITION WELD WILL BE OBSTRUCTED ON THE THICK WALL SIDE BY THE TAPERED TRANSITION IN WALL THICKNESS AT B.

Figure 2. Nozzle Shell Course-to-Upper Shell Weld



NOTE: THE SCAN OF THE LOWER SHELL-TO-DUTCHMAN WELD WILL BE OBSTRUCTED BY THE CORE SUPPORT LUGS ON THE SHELL SIDE.

Figure 3. Lower Shell-to-Dutchman Weld



NOTE: THE SCAN OF THE BOTTOM HEAD-TO-DUTCHMAN WELD MAY BE OBSTRUCTED ON THE HEAD SIDE BY INSTRUMENTATION TUBE EXTENSIONS

Figure 4. Dutchman-to-Bottom Head Circumferential Weld

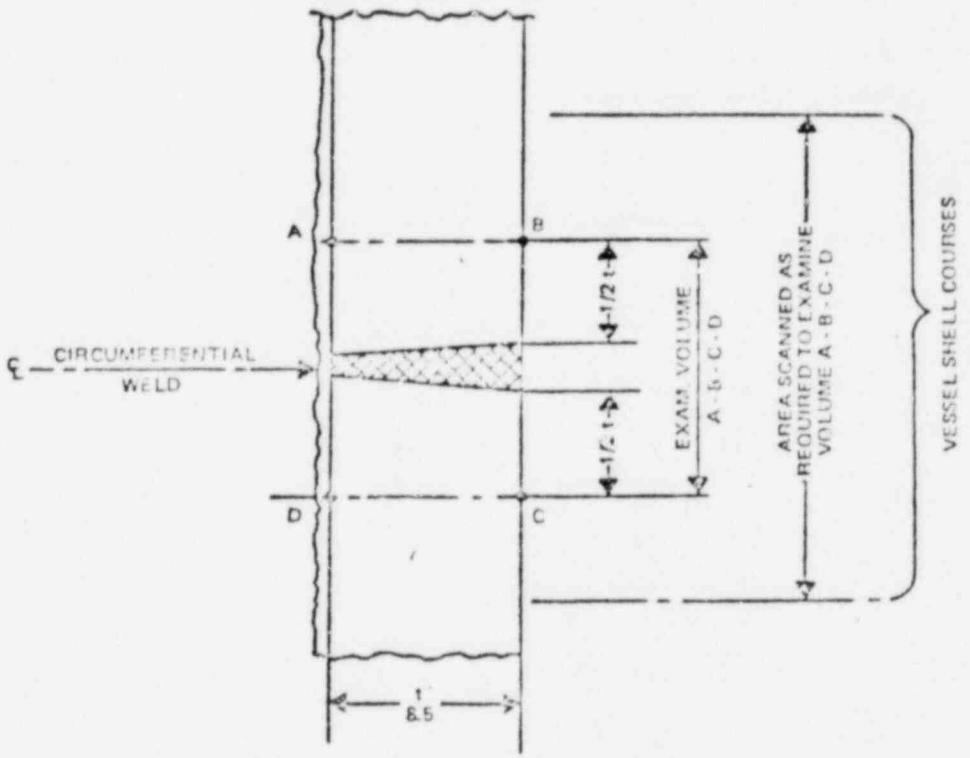


Figure 5. Upper Shell-to-Lower Shell Weld

Rockwell International
Energy Systems Group

SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR CHG NO (SEE SUMMARY OF CHG)	NUMBER
04453	20000	27	28	B	445ISI000002

PROGRAM TITLE
Preservice and Inservice Inspection

DOCUMENT TITLE
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DOCUMENT TYPE
Inservice Inspection Procedure

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ORIGINAL ISSUE DATE
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Level III Examiner Ultrasonics
G. A. King 9/10/81
B. Brengle 9/11/81
M. Khatibzadeh

PREPARED BY/DATE | DEPT | MAIL ADDR
C. D. Richards | 755 | KD45

IR&D PROGRAM? YES ☐ NO ☒
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ABSTRACT

The procedure described herein shall be used whenever preservice or inservice automated ultrasonic inspections of the reactor vessel to nozzle welds are to be performed. The provision contained are in accordance with the requirements for volumetric inspection by the ultrasonic test method as described in ASME Boiler and Pressure Vessel Code Section XI 1977 Edition with Addenda through Summer 1978.

SARGENT & LUNDY
1. REVIEWED & ACCEPTED
ACTION SHOWN DOES NOT RELIEVE CONTRACTOR FROM HIS OBLIGATIONS UNDER THE CONTRACT.
F. A. KOSIK (BY) 10/28/81 (DATE)
SPEC. NO. F-2907 PROJ. NO. 4391-05

RESERVED FOR PROPRIETARY/LEGAL NOTICES

REV	SUMMARY OF CHANGE	APPROVALS AND DATE
A	Page 9, Section 3.4.5 – Deleted sentence on transducer orientation and referred to Figures 5 through 9 per S/L Comment 1. Page 13, Section 4.3.1 – First line was ". . .procedure may be used. . ." is ". . .procedure shall be used. . ." Old 2) now shows as a note per 10/01/81 meeting with CeCo, S&L, Ebasco. Page 16, Section 5.2.5 – dele ted reference to figures in this section in response to S&L Comment 2. Section 5.2.6 – Clarified scanning requirements per S&L Comment 3. Pages 24 and 27 corrected typographical errors. R.D Date	ASK Re Cancelled by Phone 10-20-81 10-20-81 10-20-81 10/20/81
B	Revision to implement NRC Regulatory Guide 1.150 to the extent agreed to in telecon of October 20, 1981, with CECO, S&L, Ebasco, and Rockwell. Page 12, Section 4.2.3 Frequency of Calibration Procedure now requires amplitude linearity and amplitude control linearity checks within 1 day prior to examination and within 1 day after completion of examination. Previously only a check before the examination was required. Page 13, Section 4.3.2 Beam Spread Measurement Revised to include measurement of beam spread at both 20% and 50% of the DAC. Previously only measurement of 50% of the DAC was required. Page 21 Revised Figure 3 R.D Date	10-11-81 10/22/81
10/26 Std. mtl.	Field change mark-ups for loss of couplant on test blocks	

1.0 SCOPE

1.1 The procedure described herein shall be used for automated ultrasonic examination of the reactor pressure vessel, nozzle to vessel welds from the inside (clad) surface. The provisions contained are in accordance with the requirements for volumetric examination by the ultrasonic test (UT) method as described in ASME Boiler and Pressure Vessel Code Section XI 1977 Edition with Addenda through Summer 1978.

1.2 This procedure covers both straight beam and angle beam methods using pulse-echo ultrasonic techniques for the examination of welds, heat-affected zones (HAZ), and parent metal.

2.0 APPLICABLE DOCUMENTS, CODES, AND STANDARDS

2.1 The following documents form a part of this procedure to the extent specified herein. In the case of discrepancies between this procedure and the documents of 2.2,.the documents of 2.2 (1) shall govern.

2.2 CODES AND STANDARDS

1) American Society of Mechanical Engineers, "ASME Boiler and Pressure Vessel Code," Section XI, and Section V (1977 Edition with Addenda through Summer 1978)
2) QAOP N6.02, ESG's Quality Assurance Operating Procedure; "Qualification and Certification of Nondestructive Testing Personnel" at ESG of Rockwell International.

NOTE: QAOP N6.02 meets the requirements of SNT-TC-1A, 1975 Edition, "Recommended practice for Nondestructive Testing Personnel," published by the American Society for Nondestructive Testing (ASNT).

3) American Society for Testing and Materials, "Ultrasonic Contact Inspection of Weldments," E164 Latest Revision.
4) Code Case N235
5) "U.S. Nuclear Regulatory Guide 1.147."

2.3 APPLICABLE DOCUMENTS

None.

3.0 REQUIREMENTS

3.1 PERSONNEL QUALIFICATIONS

Personnel performing these nondestructive examination operations shall be qualified at least to Level IIA in accordance with Energy Systems Group OAOP N6.02 and in accordance with Section XI of the Boiler and Pressure Vessel Code. The data analysis shall be performed by a Level II, IIA, IIIA, or III UT examiner.

3.1.1 All personnel responsible for the operation of mechanized testing equipment shall be proficient in its setup, calibration, operation, and maintenance.

3.2 EQUIPMENT

3.2.1 Ultrasonic equipment meeting the requirements of ASTM E-164 shall be used.

3.2.2 The ultrasonic instrument shall be capable of generating, receiving, amplifying, and displaying high-frequency electrical pulses at energy levels compatible with the required ultrasonic frequency and examination sensitivity.

3.2.3 Examinations shall be conducted with an ultrasonic, pulsed reflection-type system generating a frequency of 2.25 mHz.

The electronic apparatus shall contain a calibrated attenuator, accurate over its range to ±20 percent or ±2dB* which will allow comparison of indications beyond the viewable portion of the cathode ray tube (CRT) presentation of the instrument.

3.3 CALIBRATION BLOCKS

3.3.1 The automated ultrasonic system (instrument) shall be calibrated on basic blocks containing drilled holes and notches which will serve as calibration

*Whichever is least.

reflectors to establish a primary reference response of the equipment and to construct a distance amplitude correction curve. The size and location of the calibration reflectors shall be consistent with ASME Boiler and Pressure Vessel Code Section V, Article 4.

3.4 AUTOMATIC INSPECTION SYSTEM DESCRIPTION

3.4.1 Automatic ultrasonic examination of welds is made possible by a system that controls the motion of the ultrasonic transducer and processes the data generated in the examination. The automatic control equipment provides precise location of the transducers with respect to the weld so that reproducible examinations can be performed. This remote control system also facilitates remote operation for inservice examination when radiation levels would limit access to the areas to be examined.

3.4.2 The automatic processing of the data meets the requirements for analysis and documentation of the findings of the examination. The large volume of weld metal to be examined leads to a large amount of data. These data are screened to detect all measurable echoes and evaluated to determine the significance of these echoes. When a reportable indication is detected, sufficient measurements will be performed to characterize it so that proper corrective action can be taken in accordance with Paragraph IWB-3500 of the Code. Fine grid rescans and manual scans of the area will be performed.

3.4.3 The Energy Systems Group (ESG) utilizes a computer-based control and data acquisition system to conduct the automatic examination. In this system, magnetic tapes store both the examination scheme for each weld and the data produced by that examination. This data is in digital form and provides an accurate documentation of the examination and permits comparison of the data received in subsequent examinations.

The equipment consists of a control console and automated ultrasonic device which moves over the weld area. These two units are interconnected by a set of cables which permit transmission of control and data information. The significant components on the device are the drive motors, the position encoders, and the transducers. The console contains the computer and peripheral units that control the device and acquire the data.

3.4.4 Major system components include the following.

3.4.4.1 Mechanical Control

UT device is driven by precision dc motors. Its position is determined by incremental encoders which return electrical signals to the computer. The computer causes the dc motors to be driven until the actual position corresponds to that required in the examination program. The actual position of the UT device is displayed on the mechanical control panel and is continuously read into the computer so that the ultrasonic data are always uniquely related to the position of the transducer.

3.4.4.2 Ultrasonic Pulsing and Receiving

Ultrasonic transducers perform two tasks: (1) generating an ultrasonic pulse that travels into the metal being examined, and (2) receiving the echoes that are reflected from the front and back surface and from possible flaws in the metal. This operation is controlled by the pulser-receiver, an electronic unit in the control console. Closely associated with this is the distance-amplitude corrector (DAC) which corrects the echo signal for the attenuation of the ultrasonic signal as it passes through the metal.

3.4.4.3 Ultrasonic Signal Processing

All ultrasonic data are converted to digital form for computer processing. Circuitry has been developed to perform this conversion in a manner such that high resolution and good statistical accuracy are preserved. The digitized signal is, in many cases, a better representation of the ultrasonic signal than can be seen on the CRT display. The unit that performs this task is the analog-to-digital converter (transient digitizer). The reflected signal is divided up into increments (volume elements) through the thickness of the material, and each interval is sampled repetitively to obtain a statistical average.

When multiple transducers are used, the signal from each is processed through the transient digitizer so that all of the transducers may be interrogated at each position of the UT device. Each transducer has its own pulser-receiver and DAC to preserve its individual calibration.

The ultrasonic system is capable of detecting cracks in the material thickness planes parallel to and transverse to the weld direction. The system will also detect such flaw types as lack of fusion, incomplete penetration, inclusion, and porosity.

3.4.4.4 Data Processing and Storage

The computer performs two major tasks. The first is the control of the system. It directs the motion of the UT device through the mechanical control interface, and it controls the pulsing of the ultrasonic transducers for the examination. This control is performed in accordance with a program in the computer. The parameters of the examination are set by the operator working with the computer through a keyboard and graphical display unit. This unit displays printed text as well as graphical data from the computer on the screen of a storage-type cathode ray tube. Permanent hard copies of these data are generated automatically on command. The computer describes the examination program and

asks significant questions on the screen of the display unit. All program inputs and console operations will be supervised by a Level II, IIA, IIIA, or III ultrasonic examiner.

The second function is to process and store the data. Small indications which do not require further study (<40% and >20% of DAC)* are recorded in digital form on magnetic tape and disk. These data are thus available for examination and comparison at subsequent examinations. If a flaw is found which exceeds the alarm set point, 40% DAC, the computer alerts the console operator and displays a summary of all such indications for the current weld being scanned. The UT examiner then can compare the data to calibration standards and display location, dimensions, and magnitude. Indications equal to or greater than 40% DAC will be evaluated as either relevant or nonrelevant indications. Relevant indications are defined as indications that are interpreted to be flaws within the weld metal or weld fusion zone being examined. Indications of 40% DAC or greater (20% screen height) will be evaluated as described in Paragraph 7.0, in compliance with ASME XI IWB 3500.

3.4.5 Transducers

The ultrasonic examination is performed by transmitting an ultrasonic pulse into the material being examined and detecting the reflections from discontinuities that might correspond to flaws. This pulsing is performed repetitively as the transducer is moved over the surface to be examined. The ultrasonic waves are transmitted at various specified angles and wave modes through the material.

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* NOTE: 100% DAC = 50% screen height

The transducer is coupled to the material being examined so that the ultrasonic waves pass to and from the material with as little attenuation as possible. This is accomplished by the vessel being filled with water which couples the transducer to the material. The ESG system uses an assembly of contact transducers mounted on the device to conduct the examinations. Search head configurations vary with the type of weld being examined. The ultrasonic coverage and beam angles for the nozzle to vessel weld are shown in Figures 5-9.

The transducer frequency is 2.25 mHz. Transducer with up to 1.0-in. diameter crystals may be used. The actual size used for each examination is recorded on the ISI Examination Form (Figure 1).

3.4.6 Mechanical Equipment

The equipment necessary to perform remote ultrasonic examinations on the reactor vessel and nozzles are described in this section. Specialized examination devices carry the ultrasonic equipment and are guided by a polar manipulator. The devices are operated remotely from the control and data acquisition system.

All devices utilize two drive motions for scanning. One drive provides movement parallel to the weld being examined; the other drive provides travel normal to the weld. Position sensors (encoders) are utilized to indicate the position of the ultrasonic transducer in cylindrical coordinates.

4.0 CALIBRATION PROCEDURES

4.1 INSTRUMENT CALIBRATION PROCEDURE

Instrument calibration will be required for amplitude linearity, sweep range, sensitivity, distance amplitude correction, position calibration, beam angle, and beam spread in accordance with this procedure and ASME Boiler and Pressure Vessel Code Section V, Article 4, 1977 Edition, Summer 1978 Addenda.

4.1.1 Amplitude Linearity Check

4.1.1.1 Requirements

The ultrasonic instrument shall provide linear presentation (within 2% of full screen) for at least 80% of the screen height (sweep line to top screen).

4.1.1.2 Procedure

1) Position an angle beam search unit so that indications can be observed from both the 1/2 and 3/4 T holes in the basic calibration block.
2) Adjust the search unit position to give a 2 to 1 ratio of amplitudes between the two indications (1/2 T to 3/4 T holes), with the larger set at 80% of full screen height.
3) With search unit still, adjust sensitivity to produce from 100% to 20% full screen height in 10% increments (or 2 db steps, if fine control not available).
4) Read and record the small indication at each setting (Figure 2). The reading must be 50% of the larger amplitude, within 5% of full screen height. Also, the settings and readings must be estimated to the nearest 1% of full screen height.

4.1.2 Amplitude Control Linearity Check

4.1.2.1 Requirements

The ultrasonic instrument shall utilize an amplitude control (accurate over its useful range to ±20% of the nominal amplitude ratio) to allow measurement of indications beyond the linear range of the instrument.

4.1.2.2 Procedure

1) Position an angle beam search unit so the indication from the 1/2 T hole is peaked on the screen, with increases and decreases in attenuation shown below. The indication must fall within the specified limits:

Indication Set at % of Full Screen	db Control Change	Indication Limits, % of Full Screen
80	-6 db*	32 to 48
80	-12 db	16 to 24
40	+6 db	64 to 96
20	+12 db	64 to 96

*Minus denotes decrease in amplitude; plus denotes increase.

NOTE: The settings and readings must be estimated to the nearest 1% of full screen and recorded (Figure 2).

4.1.3 Instrument Calibration Record

4.1.3.1 The results of all instrument calibrations shall be included in the examination record. The form which shall be utilized for this purpose is shown in Figure 3.

4.2 EXAMINATION SYSTEM CALIBRATION PROCEDURE

4.2.1 General Requirements

Calibration shall include the complete ultrasonic examination system. Any change in search units, couplants, cables, ultrasonic instruments, or any other parts of the examination system shall be cause for recalibration. The original calibration and rechecks shall be performed on the basic calibration block.

4.2.2 Temperature

The temperature of the basic calibration block shall be within 25°F of the component temperature.

4.2.3 Frequency of Calibration

Complete ultrasonic system calibration will be performed prior to use of the system in each thickness range as defined by Code Section V, Article 4. System calibration will be checked by verifying the DAC curve and sweep range calibration at the start and finish of each examination or every 12 hours and need not coincide with personnel changes. Calibration checks will be made on the calibration block. If any point on the distance-amplitude correction (DAC) curve has changed by more than 20% (2 db) of its amplitude, all data sheets since the last calibration or calibration recheck shall be marked void. A new calibration shall be made and the voided examination areas shall be reexamined. If any point on the distance-amplitude correction (DAC) curve has changed by more than 5% of the sweep division reading, correct the sweep range calibration and note the correction in the examination record. If recordable reflectors (40% DAC) are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the voided examinations shall be repeated. Data from these periodic rechecks will be recorded on the calibration recheck form (Figure 4). Ultrasonic instrument amplitude linearity and amplitude control linearity will be checked once within 1 day before starting the examination and within 1 day after completing the examination to verify

conformance with the requirements specified in Paragraphs 4.1.1.1 and 4.1.2.1, respectively. One beam spread measurement shall be made on each angle beam transducer used in the ultrasonic system during the examination using a basic calibration block.

4.3 ANGLE BEAM CALIBRATION PROCEDURE

4.3.1 Planar Reflector Correction

The following procedure shall be used to establish a correlation between 45^{0} and 60^{0} angle beam responses from a square back surface notch:

1) Position the search unit for maximum amplitude from the square notch on the opposite surface. Record the response amplitude.

Note: (The opposite surface square notch may give an indication 2 to 1 above DAC at 45^{0} and 1/2 DAC at 60^{0}. The indications from the square notch will be considered when evaluating reflectors at the opposite surface.)

4.3.2 Beam Spread Measurement

Measurements of beam spread in the vertical plane shall be made on the side drilled holes. The transducer positions at the 20% and 50% DAC amplitude limit of the primary lobe of the beam shall be used as the position references:

1) Position for maximum indication from the 1/4 T hole (100% of DAC). Move search unit toward the hole until indications equal 20% and 50% of the DAC line. Record the position readings for both indications.
2) Move search unit away from the hole to obtain 50% and 20% of the DAC line and record the position readings.
3) Repeat and record these measurements on the 1/2 and 3/4 T holes.

4.3.3 Distance-Amplitude Correction

With the electronic distance-amplitude correction (DAC) device, the primary reference response will be equalized at 50% ± 5% of full CRT screen height over the distance range employed in the examination.

4.4 STRAIGHT BEAM CALIBRATION PROCEDURE (PLANAR AND LAMINAR)

The distance-amplitude correction device shall be set such that the primary reference response will be equalized at 50% ± 5% of full CRT screen height over the distance range employed in the examination.

4.5 SWEEP RANGE CALIBRATION (ANGLE AND STRAIGHT BEAMS)

The range of the display scope will be set to allow the complete signal to be monitored for the thickness range being examined. The sweep position for the 1/4, 1/2, and 3/4 T calibration holes responses will be recorded on the calibration form (Figure 3). The calibration of the transient digitizer/ADC transfer function shall be completed per Figure 3 to assure that conversion from the analog signal to digital data is correctly performed. Part of this operation is equivalent to the sweep range calibration described in the ASME Code.

5.0 EXAMINATION PROCEDURES

5.1 REQUIREMENTS

5.1.1 Surface Preparation

The finished contact surfaces shall be free from any roughness that would interfere with free movement of the search unit or impair the transmission of ultrasonic vibrations.

5.2 Scanning

5.2.1 The volume of base material through which the sound will travel in angle beam examination shall be completely scanned with a straight beam search unit to detect reflectors which might affect interpretation of angle beam results. This is not intended as an acceptance-rejection examination.

5.2.2 The weld shall be examined by moving the search unit parallel and normal to the weld so as to scan the required volume as specified in Figures 5-9.

5.2.3 Scanning shall be performed at the calibration reference level, since gain setting of electronics distance-amplitude correction is used. Evaluation of discontinuities shall be done with the gain control set at the calibration reference level.

5.2.4 Penetration shall be verified by obtaining a reflection from an opposite surface of the material being examined when the two surfaces are parallel.

5.2.5 The examination shall be performed utilizing the designated automated UT device assembly. Each UT device contains multitransducer search units. The multitransducer search is designed to allow examination by 0° longitudinal, 45° shear, and 60° shear angles during the computer-programmed scanning sequences. The necessary couplant is water contained in the vessel.

5.2.6 The extent of scanning shall be defined by Figures 5-9 of this procedure. A 10% overlap of the transducer scan path shall be maintained. The rate of the search unit movement shall not exceed six inches per second unless calibration is verified at scanning speed.

5.2.7 Detection of reflectors (discontinuities) oriented parallel to the weld, shall be performed from the nozzle bore using longitudinal beam transmission and supplemented with 45° angle-beam transmission. The search units will be manipulated normal to the weld so that the ultrasonic beams pass through all the weld metal, and including the adjacent base metal (1/2 t) in the examination volume both sides of the weld.

5.2.8 For detection of reflectors (discontinuities) oriented transverse to the weld, the angle beam shall be aimed parallel to the centerline of the weld. The search unit shall be moved along the weld so that the ultrasonic beams pass through all of the weld metal and 1/2 T on both sides of the weld. Scanning will be done in two directions 180° to each other.

5.2.9 For detection of planar and laminar reflectors with 0° beams, the calibration from the side drilled holes, 4.4, will be used. Scanning will include the entire scan area as shown in Figures 5-9 of this procedure.

5.2.10 The sound beam path in the vessel shell shall be examined for laminar indications. The nozzle wall shall be examined for planar indications.

6.0 DATA RECORDING

6.1 GENERAL

Permanent records of examination data are compiled on magnetic tape in digital form as previously described. These records include: scan geometry for each mode of examination, metal thickness, volume element dimensions, time delays and offsets, and other appropriate information such as time, data, facility, weld number, and thick/thin option. This is the topography record which is generated for each weld. During the actual examination, a data record is compiled on disk. Included on this disk are: position information for each volume element, UT response from each volume element, and appropriate documentation such as weld number, component, time, number of channels, transfer function, and calibration factor. All of these data are later transferred to IBM magnetic tapes for archival storage.

In addition to these tapes, hard copies are made of the topographies generated for each weld.

The ISI Examination Form (Figure 1) is completed at the conclusion of each weld examination. Recordable level indications (40% DAC or greater) will be documented or a statement "No recordable level indications" will be entered. The form will be signed by a certified Level II, IIA, IIIA, or III examiner.

6.2 CALIBRATION RECORDS

A Calibration Form (Figure 3) is completed for each calibration performed. Calibration rechecks are noted in the Operations Log and recorded in the Calibration Recheck Form (Figure 4).

6.4 WELD IDENTIFICATION

Scan data for each weld shall be referenced to a known zero reference or bench mark on the vessel and recorded on the data record (Figure 1).

7.0 REPORTING REQUIREMENTS

7.1 The computerized data acquisition system will automatically record the position coordinates, depth in the metal, and signal amplitude of all indications exceeding 40% of the calibration reference level (20% full screen height). The position data coordinates will be recorded in reference to a known zero reference or benchmark on the vessel. All indications within the examination zone will be evaluated in the manual mode by a Level II, IIA, IIIA, or III ultrasonic examiner. For straight beam examinations for planar or laminar reflectors, all indications equal to or greater than 40% of the calibration reference level will be recorded. Reflectors detected outside the examination volume will be recorded as laminar indications. Data shall be obtained at increments no greater than 9/10 of the transducer dimension measured parallel to the scan direction (minimum 10% overlap). Coordinates will be recorded at least to the nearest 0.1-inch. Reportable level indications of 40% DAC and greater will be documented using a report form, Figure 1. All reportable indications shall be sized in accordance to the evaluation criteria of the Code, Section V, Article 4.

7.2 Further evaluation of reportable indications to determine disposition and/or the need to make repairs shall be the responsibility of the utility owner.

7.3 Reporting within 24 hours of the above indications will be limited to the site representative.

7.4 A final report shall be prepared, filed, and maintained, in accordance with the requirements of Paragraph IWA-6000 of the Code. In addition, weld maps will be included which depict actual UT coverage for each weld examination.

ENERGY SYSTEMS GROUP
INSERVICE INSPECTION
AUTOMATED ULTRASONIC EXAMINATION OF WELD

U.T. PROCEDURE NO. _____ DATE _____

EXAMINATION ON _____ SIDE OF WELD EXAMINER _____

PROJECT _____

CALIBRATION DATA	INSTRUMENT MFR AND MODEL ATOMICS INTERNATIONAL	WELD IDENTIFICATION	SCAN DIRECTIONS			SERIAL NO.
	TEST FREQUENCY 2.25 MHz	CAL. DATA SHEETS	DAC's	GAIN		SCAN LEVEL
SEARCH UNIT	TYPE	SIZE	FREQUENCY 2.25 MHz	MFG	MFG IDENTIFICATION NO.	WHEEL NO.
	COUPLANT WATER	ANGLE			CALIBRATION BLOCK NO.	CALIBRATION BLOCK TEMPERATURE WITHIN 25°F OF COMPONENT

INDICATION NO.	SCAN DIRECTION	"X" LOCATION FROM "O" MARK (cm)		"Y" LOCATION FROM "O" MARK (cm)		DEPTH (in.)	MAXIMUM SIGNAL AMPLITUDE (% OF DAC)	EXTENT TO 1/2 REF. AMPLITUDE POINTS (cm)		ANGULAR ORIENTATION TO TEST SURFACE (°)
		FROM	TO	FROM	TO			LENGTH	WIDTH	

INTERCONNECTING CABLE LENGTH _____ AMBIENT TEMPERATURE _____ CERTIFIED EXAMINER _____

Figure 1

FIGURE 2

Pulser No. _____
Channel No. _____

Calibration Date
Sheet No. ____

Amplitude Linearity Check

Screen Height

db	1/2 T	3/4 T

Acceptable: Yes No

Examiner _____ Date _____

Amplitude Control Linearity Check

% Full Screen	db Change	% Full Screen	Limits
80	-6	_____	32 to 48
80	-12	_____	16 to 24
40	+6	_____	84 to 96
20	+12	_____	64 to 96

Acceptable: Yes No

Examiner _____ Date _____

DAC CALIBRATION DATA

TRANSDUCER S/N _____

ANGLE _____

DATE _____ TIME _____

CAL BLOCK _____

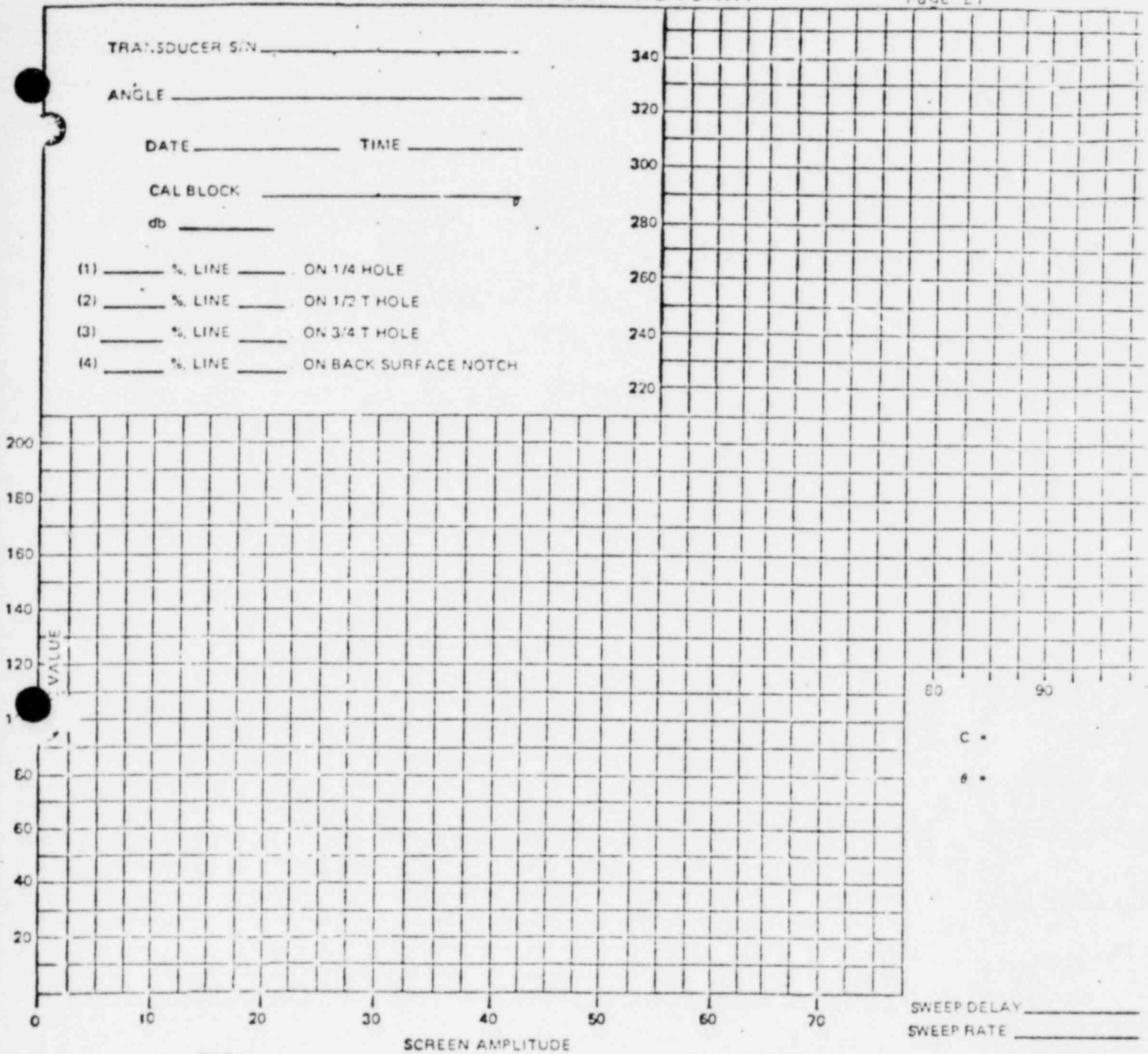
db _____

(1) _____ %, LINE _____ ON 1/4 HOLE

(2) _____ %, LINE _____ ON 1/2 T HOLE

(3) _____ %, LINE _____ ON 3/4 T HOLE

(4) _____ %, LINE _____ ON BACK SURFACE NOTCH



SWEEP DELAY _____

SWEEP RATE _____

DATA

SCREEN	ADC VALUE

DAC SETTINGS

CHANNEL NO _____ DELAY _____

PULSER NO _____ SLOPE 1 _____

MODE SW. _____ SLOPE 2 _____

SCOPE S/N _____ GAIN 1 _____

DAC SWITCH _____ GAIN 2 _____

SAMPLE INTERVAL _____

FREQUENCY _____ INPUT SENSITIVITY _____

SIGNATURE OF UT EXAMINER _____

CALIB. VERIFIED BY _____ DATE _____ TIME _____

CALIB. VERIFIED BY _____ DATE _____ TIME _____

Figure 3

ENERGY SYSTEMS GROUP
CALIBRATION RECHECK FORM

PAGE ________

DATE TEMP.	TIME	DAC			ORIGINAL AMPL./SWEEP	RECHECK AMPL./SWEEP		CHECKED BY	LEVEL
		NO.	PAGE	dB's		dB's			

Figure 4

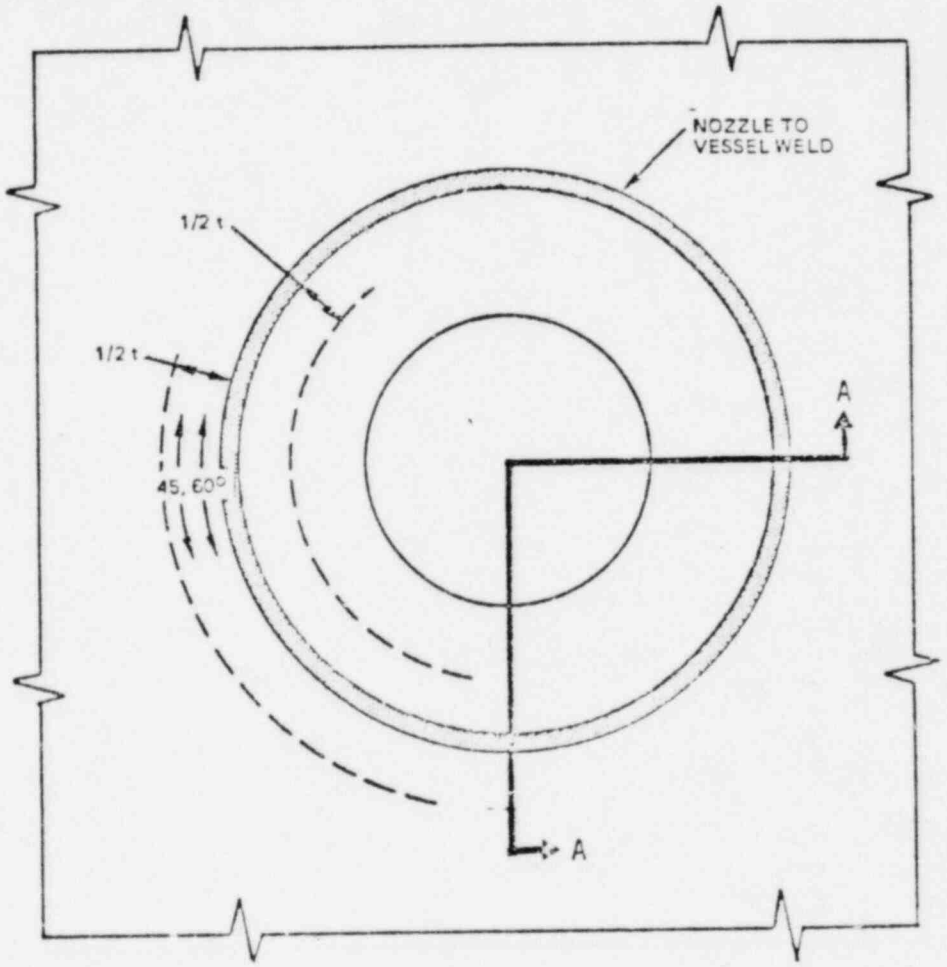
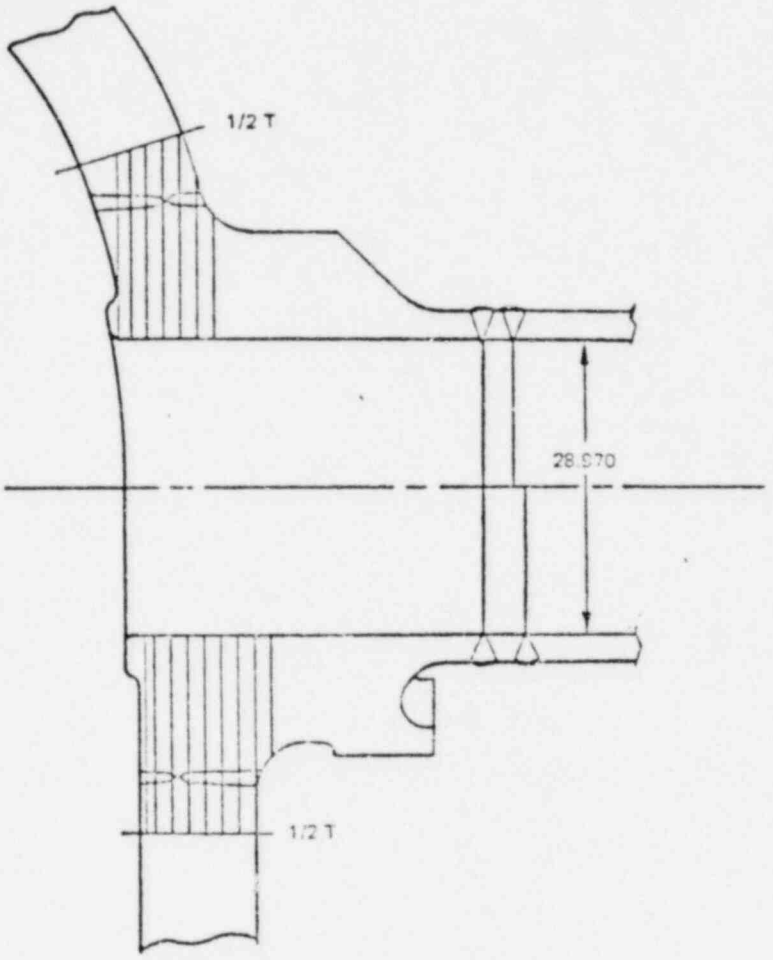
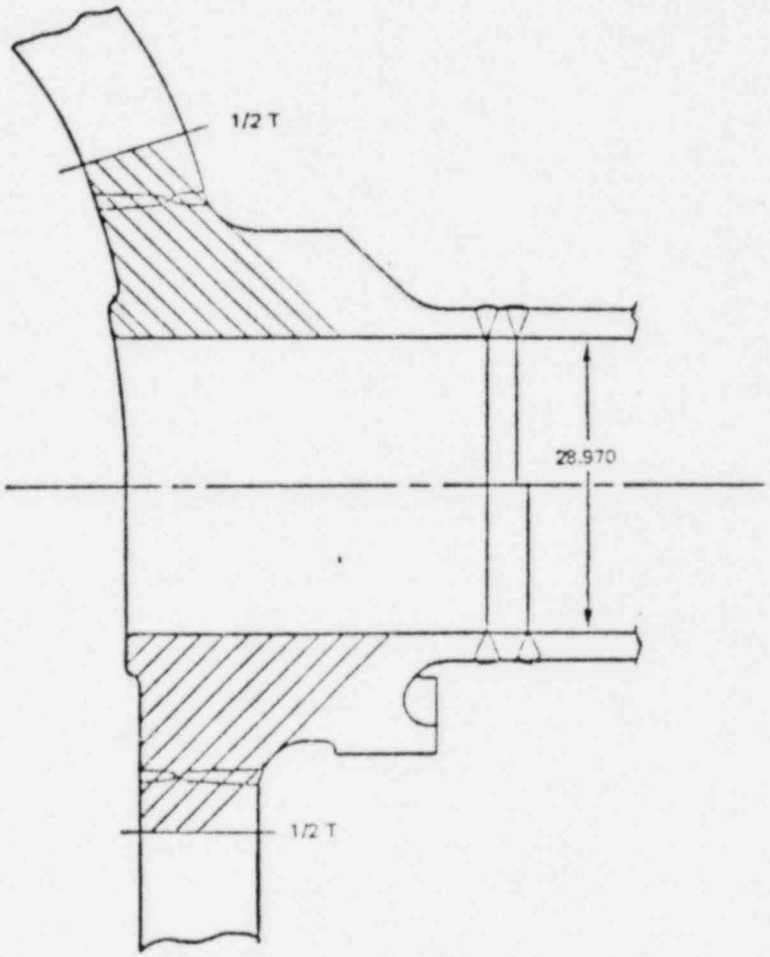


Figure 5. Ultrasonic Coverage of Inlet and Outlet Nozzle Vessel Welds for Transverse Reflectors



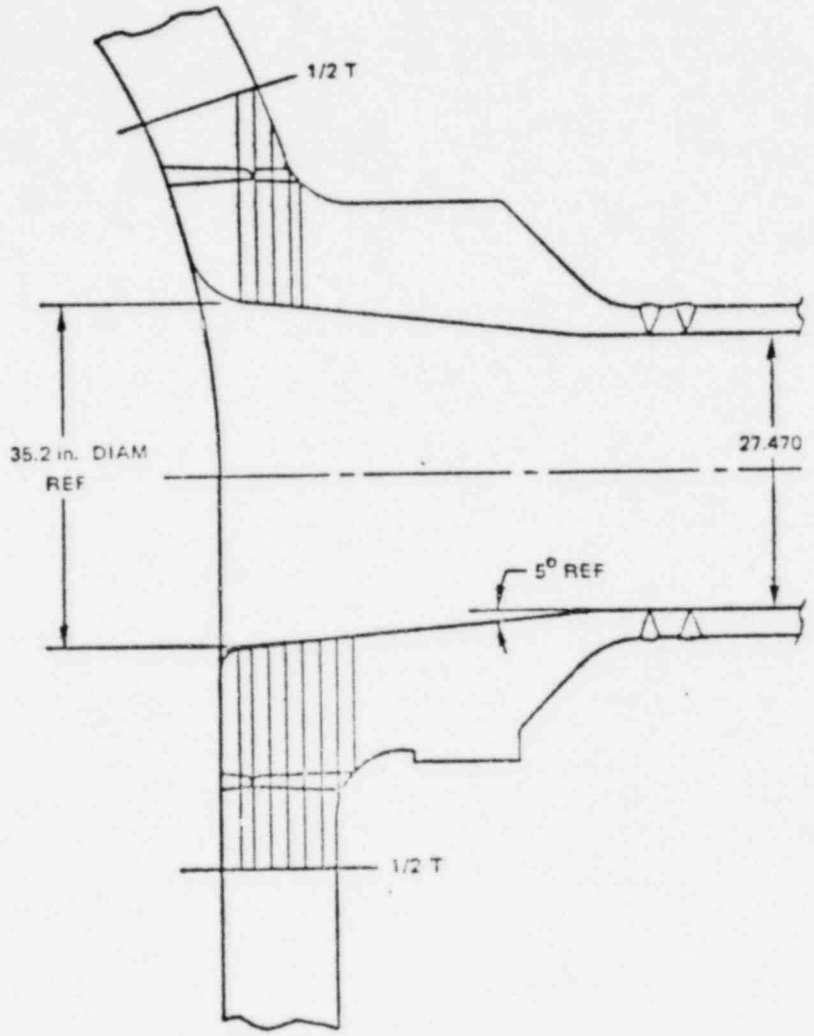
SECTION A-A

Figure 6. Ultrasonic Coverage of Outlet Nozzle to Vessel Weld with Longitudinal Beam for Detection of Parallel Reflectors



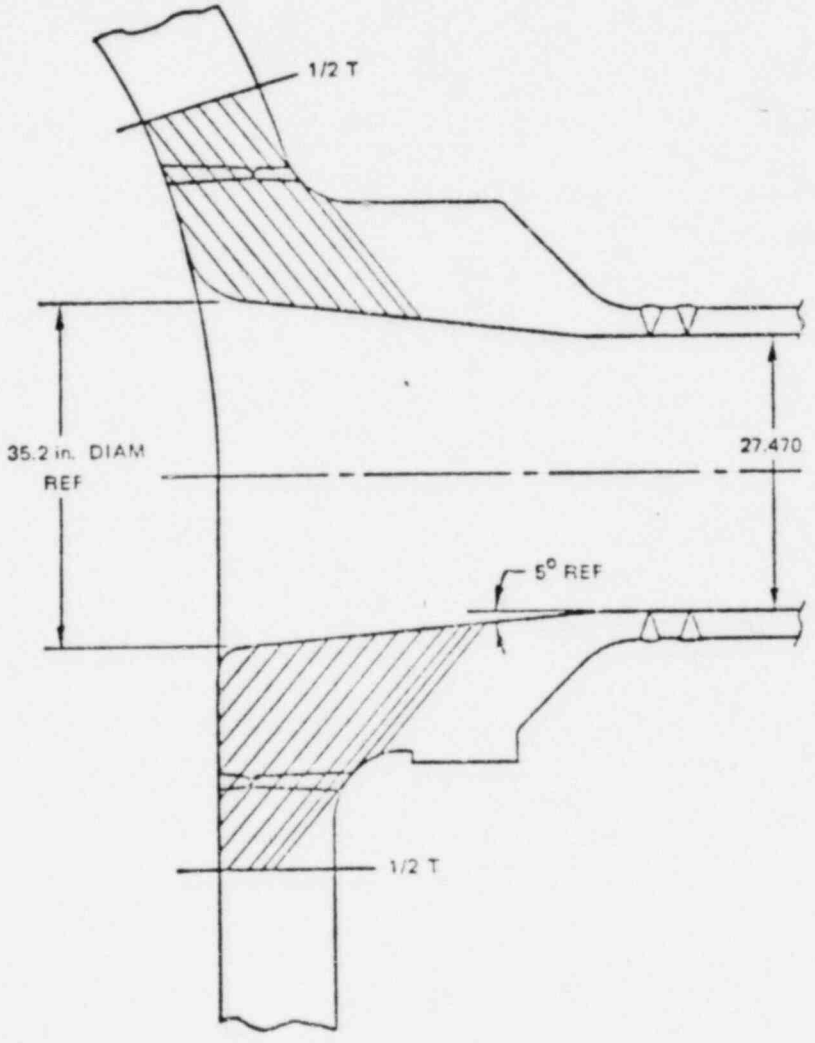
SECTION A-A

Figure 7. Ultrasonic Coverage of Outlet Nozzle to Vessel Weld with 45° beam for Detection of Parallel Reflectors



SECTION A-A

Figure 8. Ultrasonic Coverage of Inlet Nozzle to Vessel Weld with Longitudinal Beam for Detection of Parallel Reflectors



SECTION A-A

Figure 9. Ultrasonic Coverage of Inlet Nozzle to Vessel Weld with 45° Beam for Detection of Parallel Reflectors

Rockwell International
Energy Systems Group

SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO. SEE SUMMARY OF CHG	NUMBER
04452	20000	27	29	B	445ISI000004

PROGRAM TITLE

Preservice and Inservice Inspection

DOCUMENT TITLE

Ultrasonic Examination of Reactor (PWR) Vessel, Nozzle Radius

DOCUMENT TYPE	KEY NOUNS
Inservice Inspection Procedure	ISI, UT

ORIGINAL ISSUE DATE	REL. DATE
August 27, 1981	10-22-81

APPROVALS

Level III Examiner Ultrasonics — DATE 10/20/81

G. A. King 9/16/81

P. Brengle 9/16/81

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IF YES, ENTER TRAN NO.

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731-W.268/bes

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NO ASTERISK: TITLE PAGE/SUMMARY OF CHANGE PAGE ONLY

ABSTRACT

The procedure described herein shall be used to examine the inner radius of reactor pressure vessel nozzles both preservice and inservice. The provisions contained are intended to meet the requirements of the ASME Boiler and Pressure Vessel Code Section XI 1977 Edition with Addenda through Summer 1978 for volumetric examination by the ultrasonic test method.

SARGENT & LUNDY

1. REVIEWED & ACCEPTED

ACTION SHOWN DOES NOT RELIEVE CONTRACTOR FROM HIS OBLIGATIONS UNDER THE CONTRACT.

F. A. KOSIK 10/28/81
BY DATE

SPEC. NO F-2957 PROJ. NO 4391-05

RESERVED FOR PROPRIETARY/LEGAL NOTICES

REV	SUMMARY OF CHANGE	APPROVALS AND DATE
A	Page 10 Section 3.4.5 First paragraph — Deleted last sentence, "The ultrasonic waves are transmitted at an angle of 60 degrees through the material." Second paragraph — Revised to clarify coupling and type of ultrasonic transmission. Third sentence Was: A search unit contains two transducers oriented at 60^0. Is: A search unit contains two transducers, each oriented 30^0 from normal with a 60^0 included angle between the units. Page 19 Section 4.4 Was: ". . . signal to be monitored for the thickness range . . . ." Is: ". . . signal to be monitored." Page 20 Section 5.2.3 Deleted sentence 2, "The search unit is designed to allow examination with a 60^0 shear angle during the computer-programmed scanning sequences." Page 25 Appendix I Deleted 60^0 sound beam in material and added the incident angle of the beam.	W.R. McGinnis by RBS R.B. Crawford 10-20-81 D.L. Richards and TWC 10-20-81 R.A. Kisner 10-20-81 J.L. Richardson 10-20-81 Rel Date 10/20/81

REV	SUMMARY OF CHANGE	APPROVALS AND DATE
B	Revision to implement NRC Regulatory Guide 1.150 to the extent agreed to in telecon of October 20, 1981, with CE Company, S&L, Ebasco, and Rockwell. Page 18 - Frequency of Calibration Procedure now requires amplitude linearity and amplitude control linearity checks within 1 day prior to the examination and within 1 day after completion of the examination. Previously, only a check before the examination was required. Note: Beam spread measurements are not applicable to this procedure. Page 15 Revised Figure 3	C.G. Richardson 21 Oct 81 W.J. McGuire 21 Oct 1981 B. Pierce 10/21/81 M. Kissinger 10-22-81 D.G. Kenny 10-22-81 Pol Date 10/22/81

CONTENTS

FIGURES

1.0 SCOPE

1.1 The procedure described herein shall be used for automated ultrasonic examination of the reactor nozzle inner radius from the inside (clad) surface. The provisions contained are intended to meet the requirements for volumetric examination by the ultrasonic test (UT) method as described in ASME Boiler and Pressure Vessel Code Section XI 1977 Edition with Addenda through Summer 1978.

1.2 This procedure covers the angle beam immersion method using pulse-echo ultrasonic techniques for the examination of the surface area at the midpoint of the nozzle radius.

2.0 APPLICABLE DOCUMENTS, CODES, AND STANDARDS

The following documents form a part of this procedure to the extent specified herein. In the case of discrepancies between this procedure and the documents of 2.1, the documents of 2.1 (1) shall govern.

2.1 CODES AND STANDARDS

1) American Society of Mechanical Engineers, "ASME Boiler and Pressure Vessel Code," Section XI, and Section V (1977 Edition with Addenda through Summer 1978)
2) QAOP N6.02, ESG's Quality Assurance Operating Procedure, "Qualification and Certification of Nondestructive Testing Personnel" at ESG of Rockwell International.

   NOTE: QAOP N6.02 meets the requirements of SNT-TC-1A, 1975 Edition, "Recommended practice for Nondestructive Testing Personnel," published by the American Society for Nondestructive Testing (ASNT).

3) American Society for Testing and Materials, "Ultrasonic Contact Inspection of Weldments," E-164 Latest Revision.
4) Code Case N235
5) U.S. Nuclear Regulatory Guide 1.147.

3.0 REQUIREMENTS

3.1 PERSONNEL QUALIFICATIONS

3.1.1 Personnel performing these ultrasonic examinations shall be qualified at least to Level IIA in accordance with Energy Systems Group QAOP N6.02 and in accordance with Section XI of the Boiler and Pressure Vessel Code. The data analysis shall be performed by a Level II, IIA, IIIA, or III UT examiner.

3.1.2 All personnel responsible for the operation of mechanized testing equipment shall be proficient in its setup, calibration, operation, and maintenance.

3.2 EQUIPMENT

3.2.1 Ultrasonic equipment meeting the requirements of ASTM E-164 shall be used.

3.2.2 The ultrasonic instrument shall be capable of generating, receiving, amplifying, and displaying high-frequency electrical pulses at energy levels compatible with the required ultrasonic frequency and examination sensitivity.

3.2.3 Examinations shall be conducted with an ultrasonic, pulsed reflection-type system generating a frequency of 2.25 mHz.

The electronic apparatus shall contain a calibrated attenuator, accurate over its range to $\pm$20 percent or $\pm$2dB* which will allow comparison of indications beyond the viewable portion of the cathode ray tube (CRT) presentation of the instrument.

3.3 CALIBRATION BLOCKS

3.3.1 The automated ultrasonic system (instrument) shall be calibrated on basic blocks containing drilled holes and notches which will serve as calibration

*Whichever is least.

reflectors to establish a primary reference response of the equipment. The size and location of the calibration reflectors shall be consistent with ASME Boiler and Pressure Vessel Code Section V.

3.4 AUTOMATIC INSPECTION SYSTEM DESCRIPTION

3.4.1 Automatic ultrasonic examination is made possible by a system that controls the motion of the ultrasonic transducer and processes the data generated in the examination. The automatic control equipment provides precise location of the transducers with respect to the nozzle radius so that reproducible examinations can be performed. This remote control system also facilitates remote operation for inservice examination when radiation levels would limit access to the areas to be examined.

3.4.2 The automatic processing of the data meets the requirements for analysis and documentation of the findings of the examination. The data are screened to detect all measurable echoes and evaluated to determine the significance of these echoes. When a reportable indication is detected, sufficient measurements will be performed to characterize it so that proper corrective action can be taken in accordance with Paragraph IWB-3500 of the Code.

3.4.3 The Energy Systems Group (ESG) utilizes a computer-based control and data acquisition system to conduct the automatic examination. In this system, magnetic tapes store both the examination scheme for each nozzle radius and the data produced by that examination. This data is in digital form and provices an accurate documentation of the examination and permits comparison of the data received in subsequent examinations.

The equipment consists of a control console and automated ultrasonic device which moves over the examination area. These two units are interconnected by a set of cables which permit transmission of control and data information. The significant components on the device are the drive motors, the position encoders, and the transducers. The console contains the computer and peripheral units that control the device and acquire the data.

3.4.4 Major system components include the following.

3.4.4.1 Mechanical Control

UT device is driven by precision dc motors. Its position is determined by incremental encoders which return electrical signals to the computer. The computer causes the dc motors to be driven until the actual position corresponds to that required in the examination program. The actual position of the UT device is displayed on the mechanical control panel and is continuously read into the computer so that the ultrasonic data are always uniquely related to the position of the transducer.

3.4.4.2 Ultrasonic Pulsing and Receiving

Ultrasonic transducers perform two tasks: (1) generating an ultrasonic pulse that travels into the metal being examined, and (2) receiving the echoes that are reflected from the front and back surface and from possible flaws in the metal. This operation is controlled by the pulser-receiver, an electronic unit in the control console. Closely associated with this is the distance-amplitude corrector (DAC) which corrects the echo signal for the attenuation of the ultrasonic signal as it passes through the metal.

3.4.4.3 Ultrasonic Signal Processing

All ultrasonic data are converted to digital form for computer processing. Circuitry has been developed to perform this conversion in a manner such that high resolution and good statistical accuracy are preserved. The digitized signal is, in many cases, a better representation of the ultrasonic signal than can be seen on the CRT display. The unit that performs this task is the analog-to-digital converter (transient digitizer). The reflected signal is divided up into increments (volume elements) through the thickness of the material, and each interval is sampled repetitively to obtain a statistical average.

When multiple transducers are used, the signal from each is processed through the transient digitizer so that all of the transducers may be interrogated at each position of the UT device. Each transducer has its own pulser-receiver and DAC to preserve its individual calibration.

3.4.4.4 Data Processing and Storage

The computer performs two major tasks. The first is the control of the system. It directs the motion of the UT device through the mechanical control interface, and it controls the pulsing of the ultrasonic transducers for the examination. This control is performed in accordance with a program in the computer. The parameters of the examination are set by the operator working with the computer through a keyboard and graphical display unit. This unit displays printed text as well as graphical data from the computer on the screen of a storage-type cathode ray tube. Permanent hard copies of these data are generated automatically on command. The computer describes the examination program and asks significant questions on the screen of the display unit. All program inputs and console operations will be performed by trained personnel.

The second function is to process and store the data. Small indications which do not require further study (< 40% and > 20% of the reference level)* are recorded on digital magnetic tape and disk. These data are thus available for examination and comparison at subsequent examinations. If a flaw is found which exceeds the alarm set point, 40% of reference level, the computer alerts the console operator and displays a summary of all such indications for the current area being scanned. The UT examiner then can compare the data to calibration standards and display location, dimensions, and magnitude. Indications equal to or greater than 40% of reference level will be evaluated as either relevant or nonrelevant indications. Relevant indications are defined as indications that are interpreted to be flaws within the area being examined. Indications of 40% of reference level (30% screen height or greater) will be evaluated as described in Paragraph 7.0.

*Reference level = 75% screen height.

3.4.5 Transducers

The ultrasonic examination is performed by transmitting an ultrasonic pulse into the material being examined and detecting the reflections from discontinuities that might correspond to flaws. This pulsing is performed repetitively as the transducer is moved over the surface to be examined.

The transducer is coupled by water to the material being examined. The ESG system uses immersion-type transducers to conduct the examination. A search unit contains two transducers, each oriented 30° from normal with a 60° included angle between the units.

The transducer frequency is 2.25 mHz. Transducers with up to 1.0-in.-diameter crystals may be used. The actual size used for each examination is recorded on the ISI Examination Form (Figure 1).

3.4.6 Mechanical Equipment

The equipment necessary to perform remote ultrasonic examinations on the reactor vessel and nozzles are described in this section. Specialized examination devices carry the ultrasonic equipment and are guided by a polar manipulator. The devices are operated remotely from the control and data acquisition system.

All devices utilize two drive motions for scanning. One drive provides movement circumferentially about the bore of the nozzle being examined; the other drive provides travel across the nozzle radius. Position sensors (encoders) are utilized to indicate the position of the ultrasonic transducer in cylindrical coordinates.

ENERGY SYSTEMS GROUP
INSERVICE INSPECTION
AUTOMATED ULTRASONIC EXAMINATION OF WELD *

U.T. PROCEDURE NO. _____ DATE _____

EXAMINATION ON _____ SIDE OF WELD EXAMINER _____

PROJECT _____

CALIBRATION DATA	INSTRUMENT MFR AND MODEL: ATOMICS INTERNATIONAL	WELD IDENTIFICATION	SCAN DIRECTIONS			SERIAL NO.
	TEST FREQUENCY: 2.25 MHz	CAL. DATA SHEETS	DAC's	GAIN		SCAN LEVEL
SEARCH UNIT	TYPE	SIZE	FREQUENCY: 2.25 MHz	MFG	MFG IDENTIFICATION NO.	WHEEL NO.
	COUPLANT: WATER	ANGLE			CALIBRATION BLOCK NO.	CALIBRATION BLOCK TEMPERATURE WITHIN 25°F OF COMPONENT

INDICATION NO	SCAN DIRECTION	"X" LOCATION FROM "O" MARK (cm)		"Y" LOCATION FROM "O" MARK (cm)		DEPTH (in.)	MAXIMUM SIGNAL AMPLITUDE (% OF DAC)	EXTENT TO 1/2 REF. AMPLITUDE POINTS (cm)		ANGULAR ORIENTATION TO TEST SURFACE (°)
		FROM	TO	FROM	TO			LENGTH	WIDTH	

INTERCONNECTING CABLE LENGTH _____ AMBIENT TEMPERATURE _____ CERTIFIED EXAMINER _____

*This form is standard for all examinations, including welds or base metal.

Figure 1

4.0 CALIBRATION PROCEDURES

4.1 INSTRUMENT CALIBRATION PROCEDURE

Instrument calibration will be required for amplitude linearity, sweep range, sensitivity, position calibration, and beam angle in accordance with this procedure and ASME Boiler and Pressure Vessel Code Section V, Article 4, 1977 Edition, Summer 1978 Addenda.

4.1.1 Amplitude Linearity Check

4.1.1.1 Requirements

The ultrasonic instrument shall provide linear presentation (within 25% of full screen) for at least 80% of the screen height (sweep line to top screen).

4.1.1.2 Procedure

1) Position an angle beam search unit so that indications can be observed from both the 1/2 and 3/4 T holes in a basic calibration block.
2) Adjust the search unit position to give a 2 to 1 ratio of amplitudes between the two indications (1/2 T to 3/4 T holes), with the larger set at 80% of full screen height.
3) With search unit still, adjust sensitivity to produce from 100% to 20% full screen height in 10% increments (or 2 db steps, if fine control not available).
4) Read and record the small indication at each setting (Figure 2). The reading must be 50% of the larger amplitude, within 5% of full screen height. Also, the settings and readings must be estimated to the nearest 1% of full screen height.

FIGURE 2

Pulser No. _____
Channel No. _____

Calibration Data
Sheet No. ____

Amplitude Linearity Check

Screen Height

db	1/2 T	3/4 T

Acceptable: Yes No

Examiner _____ Date _____

Amplitude Control Linearity Check

% Full Screen	db Change	% Full Screen	Limits
80	-6		
80	-12	_____	32 to 48
40	+6	_____	16 to 24
20	+12	_____	64 to 96
		_____	64 to 96

Acceptable: Yes No

Examiner _____ Date _____

4.1.2 Amplitude Control Linearity Check

4.1.2.1 Requirements

The ultrasonic instrument shall utilize an amplitude control (accurate over its useful range to ±20% of the nominal amplitude ratio) to allow measurement of indications beyond the linear range of the instrument.

4.1.2.2 Procedure

1) Position an angle beam search unit so the indication from the 1/2 T hole is peaked on the screen, with increases and decreases in attenuation shown below. The indication must fall within the specified limits:

Indication Set at % of Full Screen	db Control Change	Indication Limits, % of Full Screen
80	-6 db*	32 to 48
80	-12 db	16 to 24
40	+6 db	64 to 96
20	+12 db	64 to 96

*Minus denotes decrease in amplitude; plus denotes increase.

NOTE: The settings and readings must be estimated to the nearest 1% of full screen and recorded (Figure 2).

4.1.3 Instrument Calibration Record

4.1.3.1 The results of all instrument calibrations shall be included in the examination record. The form which shall be utilized for this purpose is shown in Figure 3.

DAC CALIBRATION DATA

TRANSDUCER S/N _____

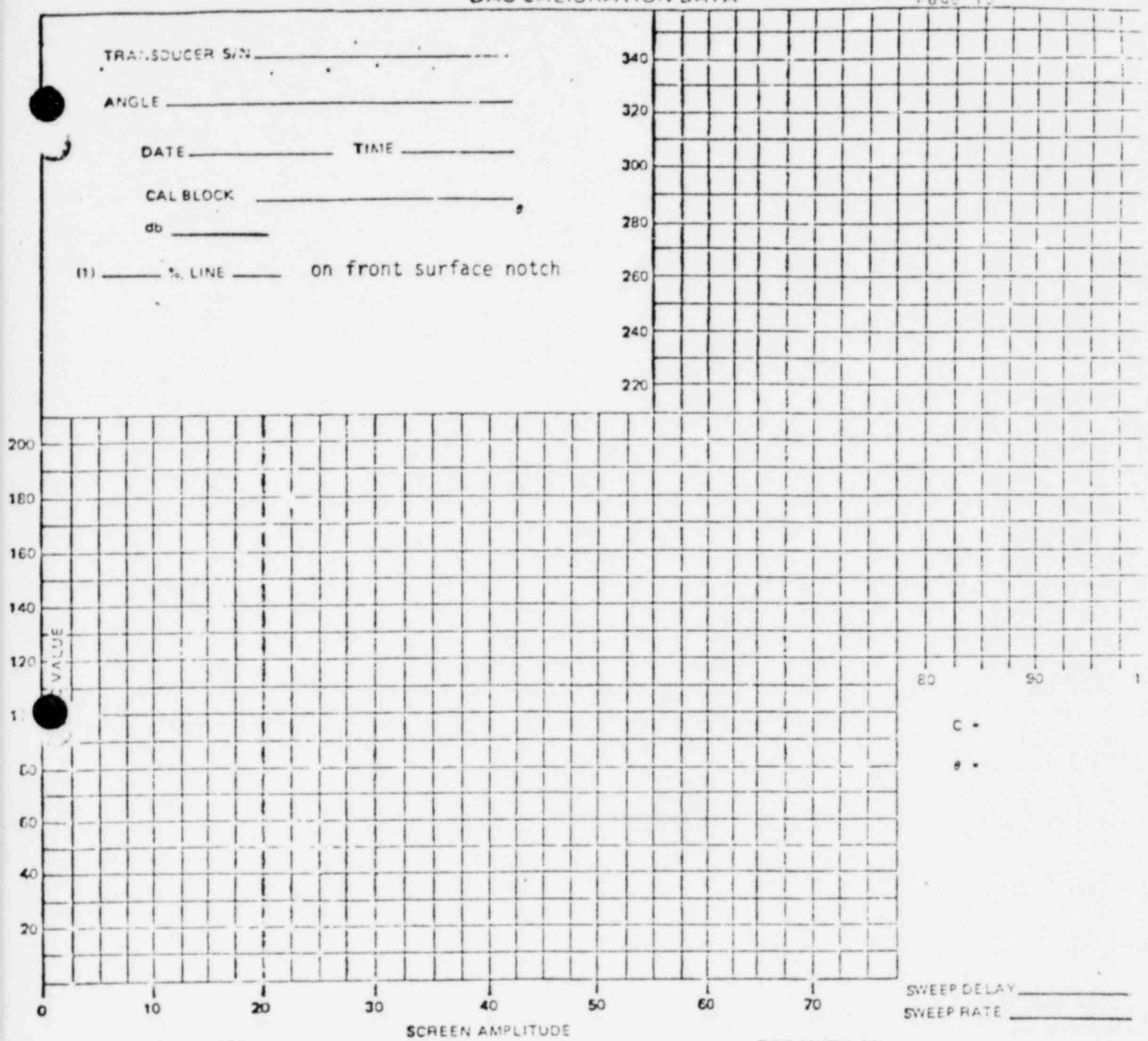
ANGLE _____

DATE _____ TIME _____

CAL BLOCK _____

db _____

(1) _____ % LINE _____ on front surface notch



SWEEP DELAY _____

SWEEP RATE _____

DATA

SCREEN	ADC VALUE

DAC SETTINGS

CHANNEL NO _____ DELAY _____

PULSER NO _____ SLOPE 1 N/A

MODE SW. _____ SLOPE 2 N/A

SCOPE S/N _____ GAIN 1 N/A

DAC SWITCH Off GAIN 2 N/A

SAMPLE INTERVAL _____

FREQUENCY 2.25 MHz INPUT SENSITIVITY _____

SIGNATURE OF UT EXAMINER _____

CALIB VERIFIED BY _____ DATE _____ TIME _____

CALIB VERIFIED BY _____ DATE _____ TIME _____

Figure 3

4.2 EXAMINATION SYSTEM CALIBRATION PROCEDURE

4.2.1 General Requirements

Calibration shall include the complete ultrasonic examination system. Any change in search units, couplants, cables, ultrasonic instruments, or any other parts of the examination system shall be cause for recalibration. The original calibration and rechecks shall be performed on the basic calibration block.

4.2.2 Temperature

The temperature of the basic calibration block shall be within 25°F of the component temperature.

4.2.3 Frequency of Calibration

Complete ultrasonic system calibration will be performed prior to use of the system in each thickness range as defined by Code Section V, Article 4. System calibration will be checked by verifying the reference level signal amplitude and sweep range calibration at the start and finish of each examination or every 12 hours and need not coincide with personnel changes. Calibration checks will be made on the calibration block. If the signal amplitude has changed by more than 20% (2 db), all data sheets since the last calibration or calibration recheck shall be marked void. A new calibration shall be made and the voided examination areas shall be reexamined. If the sweep position has changed by more than 5% of the original sweep division reading, correct the sweep range calibration and note the correction in the examination record. If recordable reflectors (40% of reference level) are noted on the data sheets, those data sheets shall be voided, a new calibration shall be recorded, and the voided examinations shall be repeated. Data from these periodic rechecks will be recorded on the calibration recheck form (Figure 4). Ultrasonic instrument amplitude linearity and amplitude control

ENERGY SYSTEMS GROUP

CALIBRATION RECHECK FORM

PAGE ________

DATE TEMP.	TIME	DAC			ORIGINAL AMPL./SWEEP	RECHECK AMPL./SWEEP		CHECKED BY	LEVEL
		NO.	PAGE	db's		db's			

Figure 4

linearity will be checked once within 1 day before starting the examination and within 1 day after completing the examination to verify conformance with the requirements specified in Paragraphs 4.1.1.1 and 4.1.2.1, respectively.

4.3 ANGLE BEAM CALIBRATION PROCEDURE

4.3.1 Beam Spread Measurement – Not applicable to this procedure.

4.3.2 Reference Level

The instrument gain setting shall be adjusted to give 75% screen height for the peak amplitude position from the slot in the clad side of the calibration block.

4.4 SWEEP RANGE CALIBRATION

The range of the display scope will be set to allow the complete signal to be monitored. The sweep position for the calibration slot response will be recorded on the calibration form (Figure 3). The calibration of the transient digitizer/ADC transfer function shall be completed per Figure 3 to assure that conversion from the analog signal to digital data is correctly performed.

5.0 EXAMINATION PROCEDURES

5.1 REQUIREMENTS

5.1.1 Surface Preparation

The finished surfaces to be scanned shall be free from any roughness that would interfere with or impair the transmission of ultrasonic vibrations.

5.2 SCANNING

5.2.1 The nozzle radius shall be examined by moving the search unit parallel and across the radius so as to scan the volume as specified in Appendix II.

5.2.2 Scanning shall be performed at the calibration reference level. Evaluation of discontinuities shall be done with the gain control set at the calibration reference level.

5.2.3 The examination shall be performed utilizing the designated automated UT device assembly for the nozzle radius. The necessary couplant is water contained in the vessel. The designation and orientation of the transducers is documented in Appendix I of this procedure.

5.2.4 The extent of scanning is defined by the figures attached as Appendix II to this procedure. A 10% overlap of the transducer scan path shall be maintained. The rate of the search unit movement shall not exceed six inches per second unless calibration is verified at scanning speed.

5.2.5 For detection of reflectors (discontinuities) oriented transverse to the radius, the angle beam shall be aimed in a radial direction normal to the nozzle radius. The search unit will be manipulated circumferentially and across the radius so that the ultrasonic beam passes through all examination volume. Scanning will be done in two directions 180 degrees to each other.

6.0 DATA RECORDING

6.1 GENERAL

Permanent records of examination data are compiled on magnetic tape in digital form as previously described. These records include: scan geometry for each mode of examination, metal thickness, volume element dimensions, time delays and offsets, and other appropriate information such as time, data, facility, nozzle number, and thick/thin option. This is the topography record which is generated for each nozzle radius. During the actual examination, a data record is compiled on a disk. Included on this disk are: position information for each volume element, UT response from each volume element, and appropriate documentation such as nozzle number, component, time, number of channels, transfer function, and calibration factor. All of these data are transferred to IBM magnetic tapes for archival storage.

In addition to these tapes, hard copies are made of the topographies generated for each weld.

The ISI Examination Form (Figure 1) is completed at the conclusion of each weld examination. Recordable level indications (40% DAC or greater) will be documented or a statement "No recordable level indications" will be entered. The form will be signed by a certified Level II, IIA, IIIA, or III examiner.

6.2 CALIBRATION RECORDS

A Calibration Form (Figure 3) is completed for each calibration performed. Calibration rechecks are noted in the Operations Log and recorded in the Calibration Recheck Form (Figure 4).

6.3 WELD IDENTIFICATION

Scan data for each nozzle radius shall be referenced to a known zero reference and recorded on the data record (Figure 1).

7.0 REPORTING REQUIREMENTS

7.1 The computerized data acquisition system will automatically record the position coordinates, depth in the metal, and signal amplitude of all indications exceeding 40% of the calibration reference level (30% full screen height). The position data coordinates will be recorded in reference to a known zero reference on the nozzle. All indications within the examination zone will be evaluated in the manual mode by a Level II, IIA, IIIA, or III ultrasonic examiner. Data shall be obtained at increments no greater than 9/10 of the transducer dimension measured parallel to the scan direction (minimum 10% overlap). Coordinates will be recorded at least to the nearest 0.1-inch or the azimuthal equivalent. Reportable level indications, 40% of reference level and greater, will be documented using a report form, Figure 1. All reportable indications shall be sized in accordance to the evaluation criteria of the Code, Section V.

7.2 Further evaluation of reportable indications to determine disposition and/or the need to make repairs shall be the responsibility of the utility owner.

7.3 Reporting within 24 hours of the above indications will be limited to the site representative.

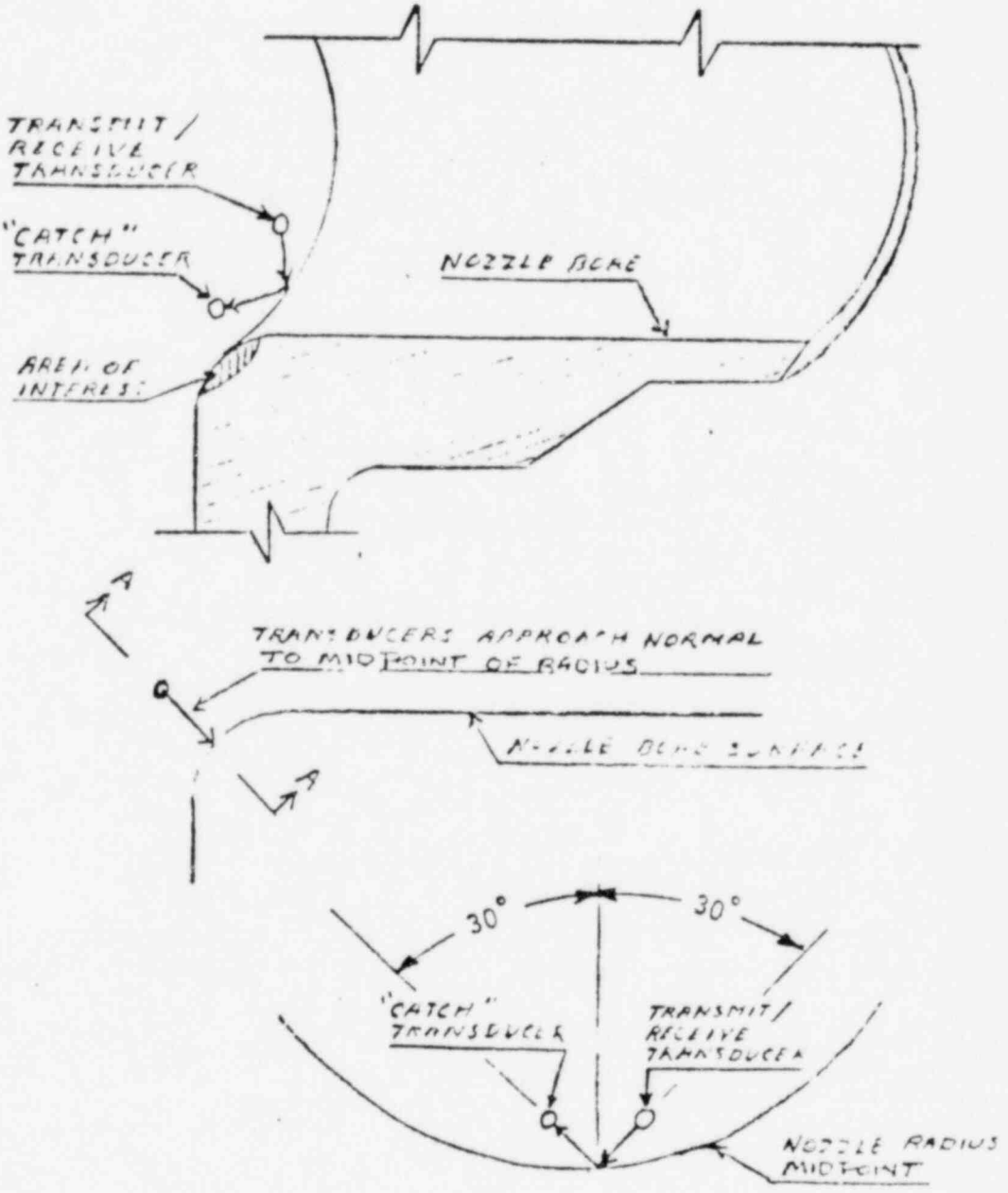
7.4 A final report shall be prepared, filed, and maintained, in accordance with the requirements of Paragraph IWA-6000 of the Code. In addition, maps will be included which depict actual UT coverage for each nozzle radius examination.

APPENDIX I

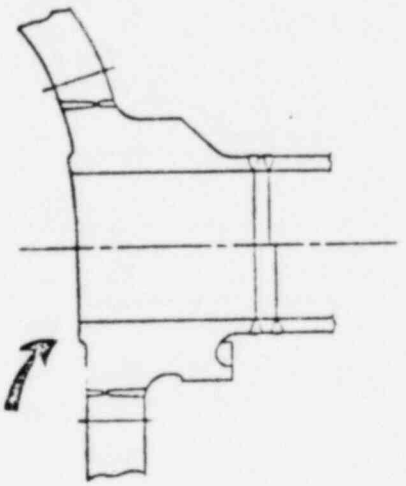
TRANSDUCER ORIENTATION

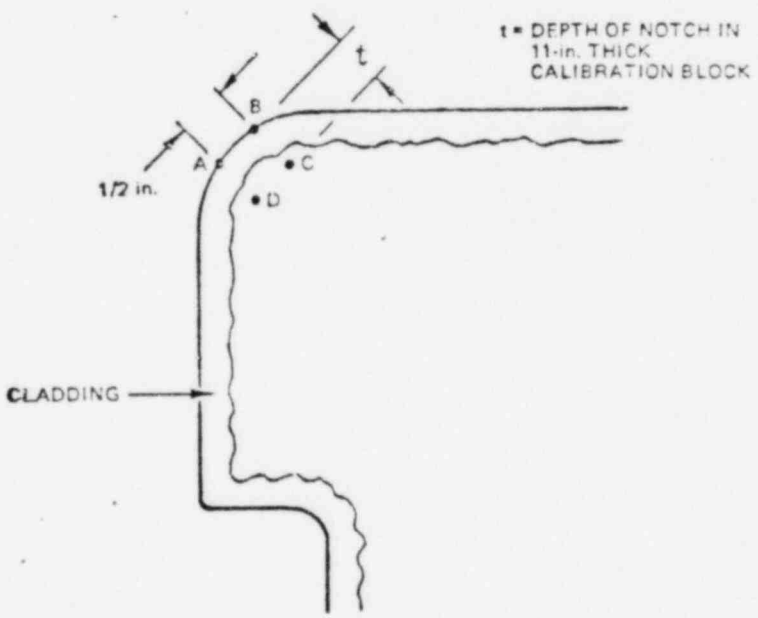
PREPARED BY:	Atomics International Division Rockwell International	PAGE NO 24 OF
CHECKED BY:		REPORT NO AAEISI000004
DATE:		MODEL NO

NOZZLE RADIUS TRANSDUCER ORIENTATION



VIEW A-A

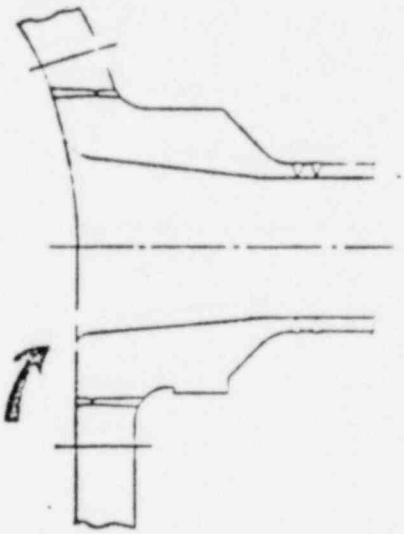


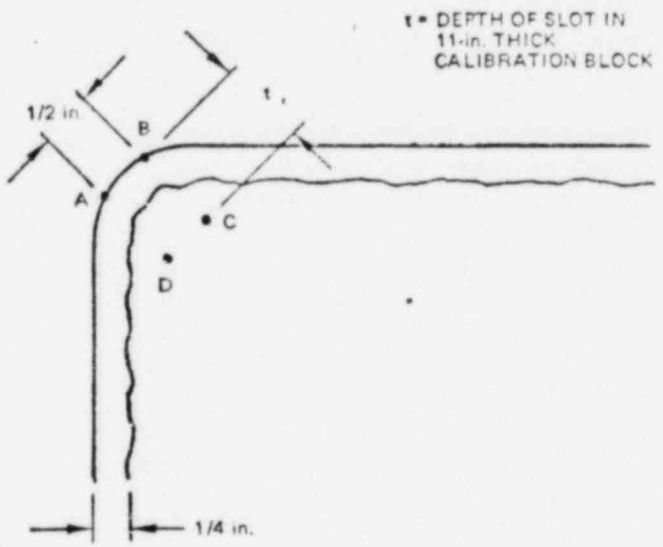


Outlet Nozzle Radius Detail
Ultrasonic Coverage A-B-C-D

APPENDIX II
SCAN MAPS

Typical ultrasonic coverages are shown. Actual dimensions for nozzle radius scans will be documented in the examination data sheets.





Inlet Nozzle Radius Detail
Ultrasonic Coverage A-B-C-D

SECTION VI

ORGANIZATION AND QUALITY ASSURANCE

Section VI

Organization and Quality Assurance

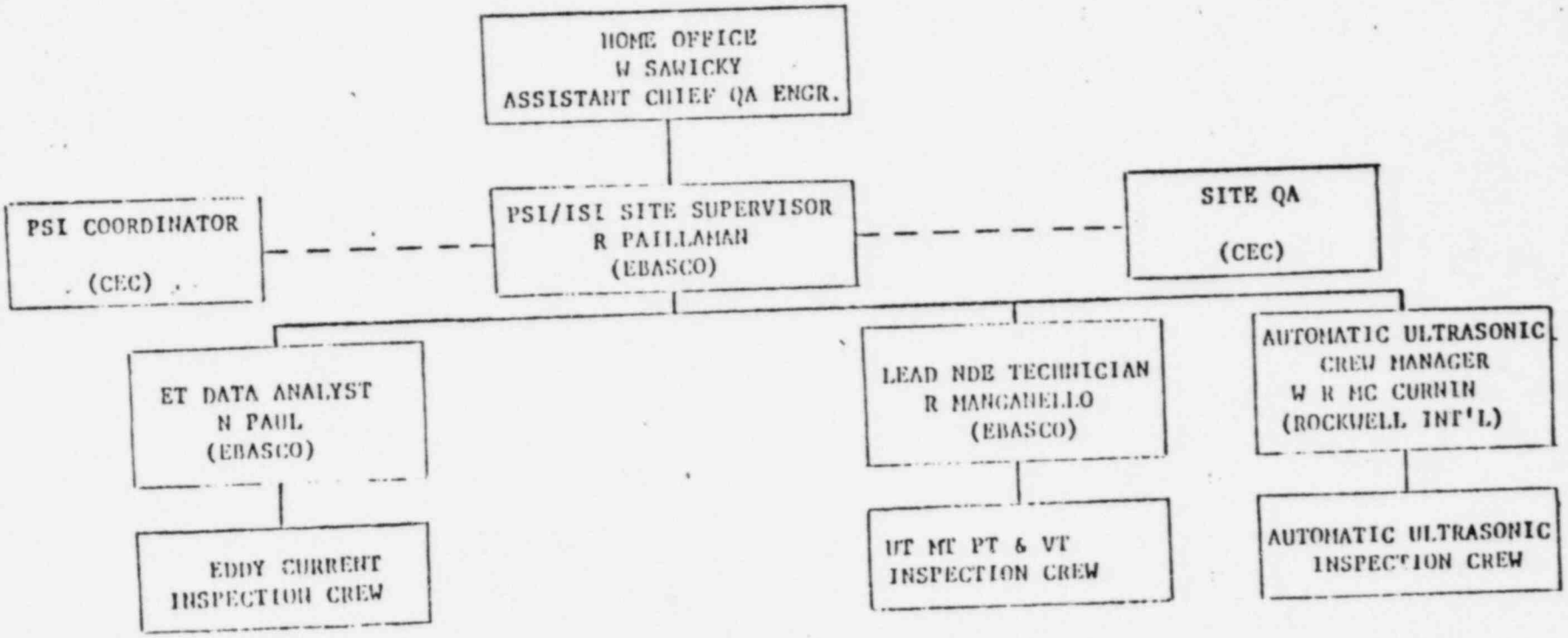
Ebasco Services Inc. is the preservice inspection contractor for this program. Supporting Ebasco in the area of reactor pressure vessel examination, is Rockwell International. Rockwell provides the equipment and crew for the automatic ultrasonic examination of the reactor pressure vessel.

The overall program is under the direction of the Ebasco Assistant Chief QA Engineer for Inservice Inspection and Nondestructive Examination. Site activities including those of Rockwell International are under the direction of the Ebasco Preservice Inspection Site Supervisor. The Ebasco site supervisor interfaces directly with the Commonwealth Edison Preservice Inspection Coordinator to obtain support services for the inspection activities. An organization chart, showing the various interfaces is provided in this section.

The Ebasco Quality Assurance Program Manual, ETR 1001 was approved by Commonwealth Edison for this Preservice Inspection program. However, since ETR1001 addresses all aspects of nuclear plant construction, some of the procedures required by ETR 1001 are not applicable to a Preservice Inspection program and therefore, such procedures have not been included herein.

SITE ORGANIZATION CHART-EBASCO SERVICES

BYRON UNIT 1 PRESERVICE INSPECTION



SECTION VII

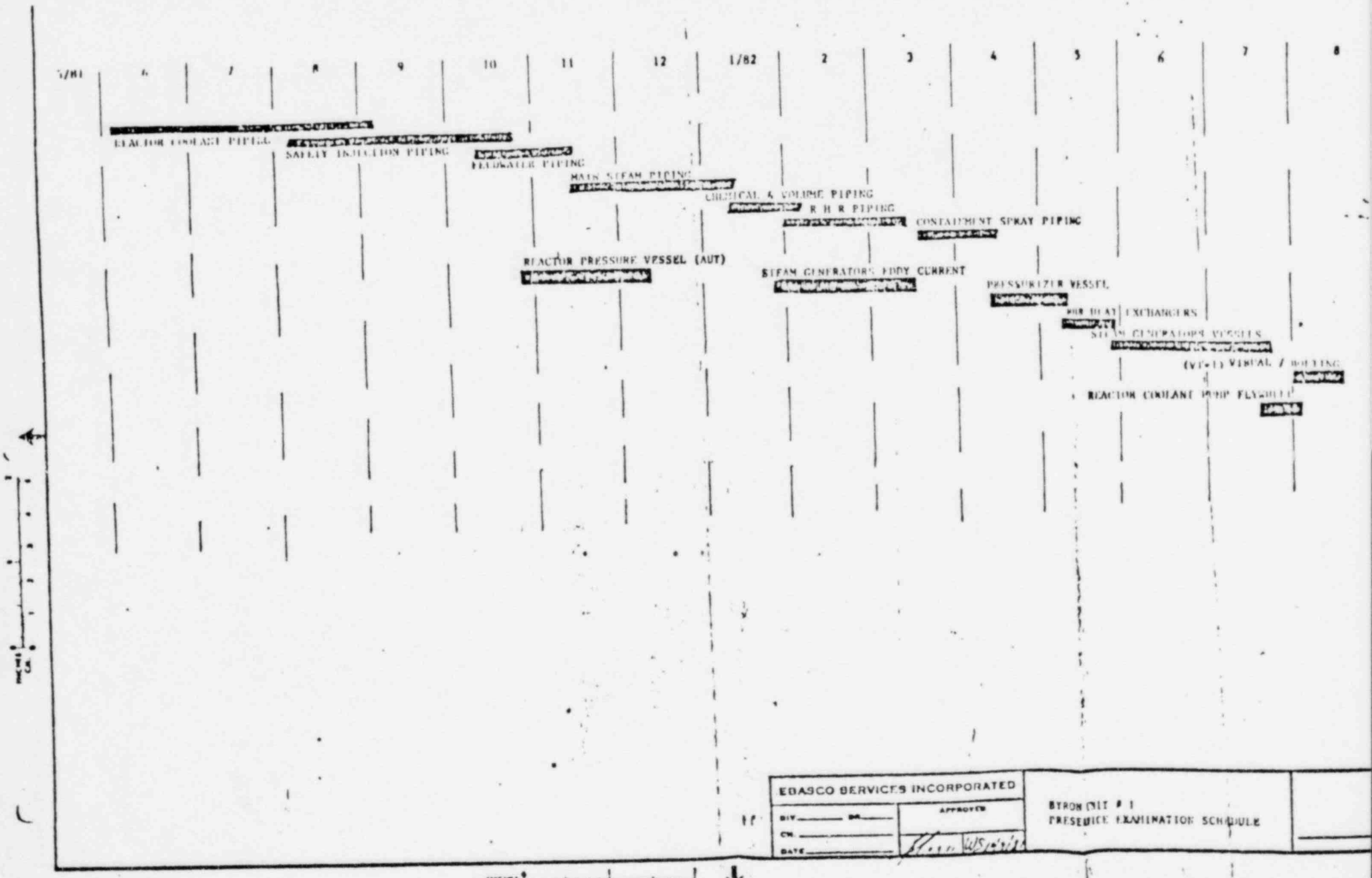
SCHEDULE

Section VII

Schedule

The original schedule call for completing all examinations by April 1, 1982. However, the scope of services has been modified several times and as a result, completion date of examinations has been extended. Also, the unavailability of test calibration blocks required a shift in the examination start dates for the pressurizer and steam generators.

The schedule for examination of major piping systems and major components is provided in this section. It is realized that depending of the actual fuel loading date the schedule for performing the preservice examination may have to be shortened. This can be accomplished by increasing the crew size as required.


5/81
6
7
8
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10
11
12
1/82
2
3
4
5
6
7
8
REACTOR COOLANT PIPING
SAFETY INJECTION PIPING
FEEDWATER PIPING
MAIN STEAM PIPING
CHEMICAL & VOLUME PIPING
R H R PIPING
CONTAINMENT SPRAY PIPING
REACTOR PRESSURE VESSEL (AUT)
STEAM GENERATORS EDDY CURRENT
PRESSURIZER VESSEL
HEAT EXCHANGERS
(VT-1) VISUAL
REACTOR COOLANT PUMP FLYWHEEL
EBASCO SERVICES INCORPORATED
APPROVED
BYRON UNIT # 1
PRESERVICE EXAMINATION SCHEDULE

SECTION VIII

RECORDS AND REPORTS

Section VIII

Records and Reports

In accordance with the requirements of IWA 6210 of the Code and the procedures included in Section V of this document. The following records will be maintained during the course of the preservice examination.

(a) Examination plans and schedules

(b) Reports of examination results

(c) Description of examination methods and procedures

(d) Reports of evaluation of results

(e) Reports of corrective actions, repairs, and replacements

(f) Those items requiring relief from examination requirements

Additional details regarding the content of the preservice inspection record file is provided in Ebasco procedure ISI-QC-04 which is included in Section V of this document.

The final report issued after completion of all preservice examinations, will address those items shown in the report format presented in this section.

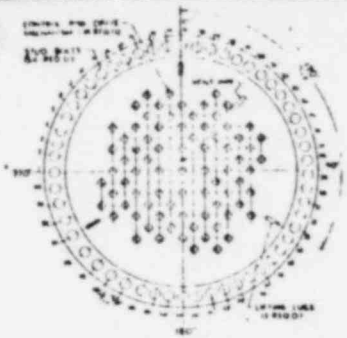
SECTION IX

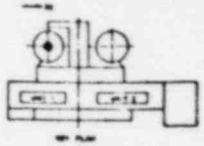
"AS-BUILT" DRAWINGS

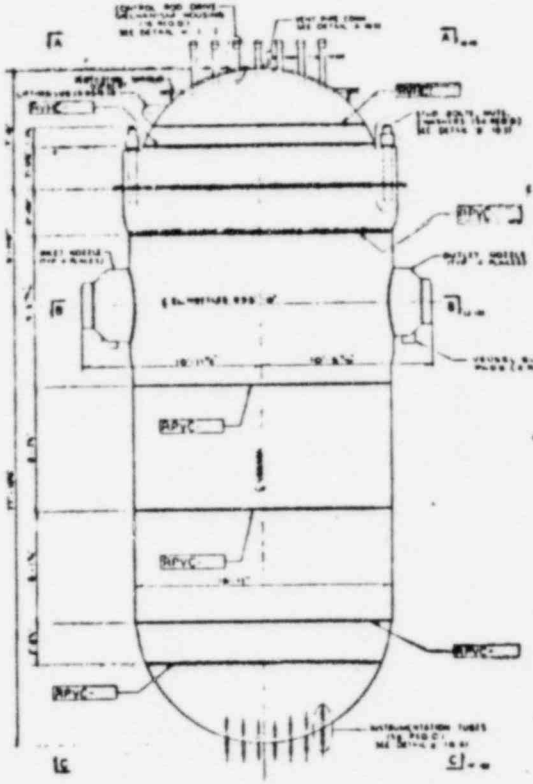
Section IX

"As-Built" Drawings

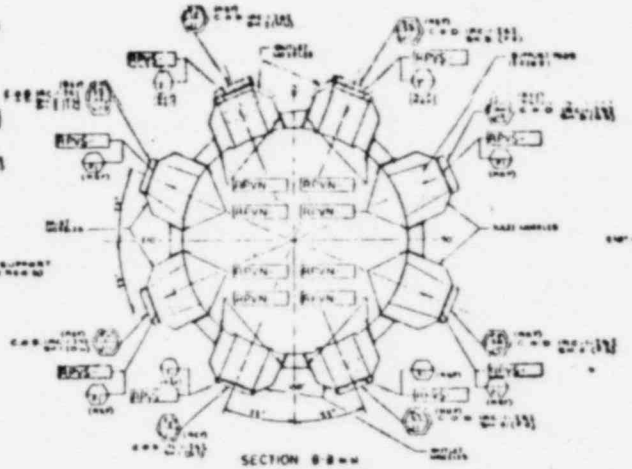
Using these system flow drawings in conjunction with piping isometric, spool piece and spool piece rework drawings provided by CECo/S&L, the preservice inspection crew performs a walkdown of the piping systems to locate specific welds and components requiring drawings showing location and identification of welds and components requiring examination. These drawings also show the unique identification number assigned to each weld along with the original weld numbers obtained from the spool piece or spool piece rework drawings. The correctness of these composite isometric drawings is verified by the Ebasco preservice inspection crew, assuring that the composite isometric drawings reflect the as-built condition of the piping systems at time of preservice inspection. Copies of the "as-built" equipment and isometric drawings are included in this section.

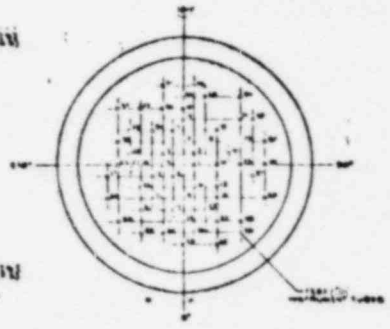


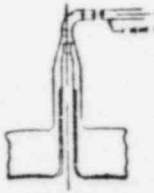


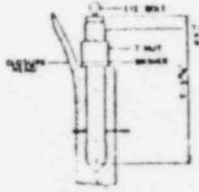


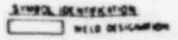
REACTOR PRESSURE VESSEL
NO 1RC01R









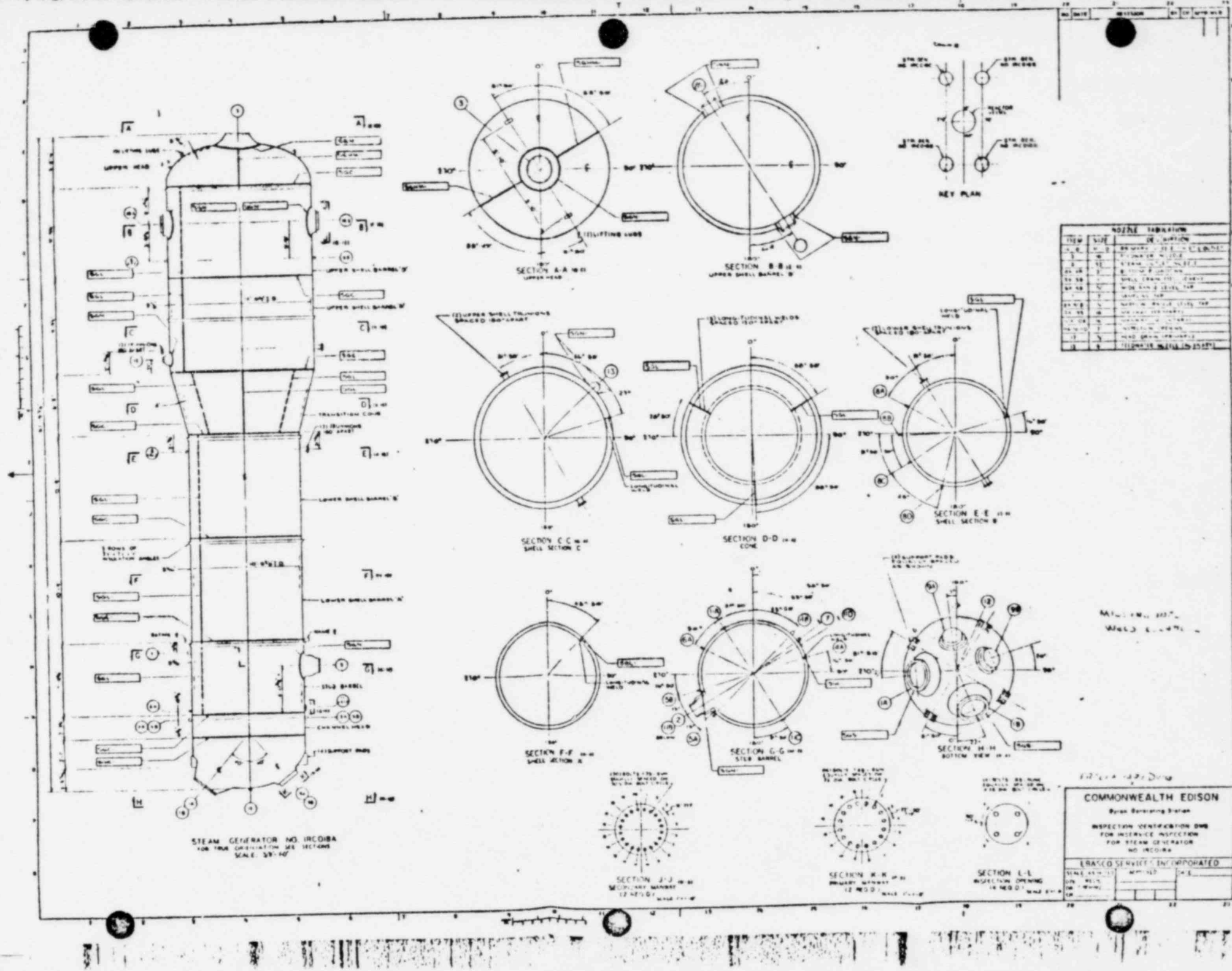


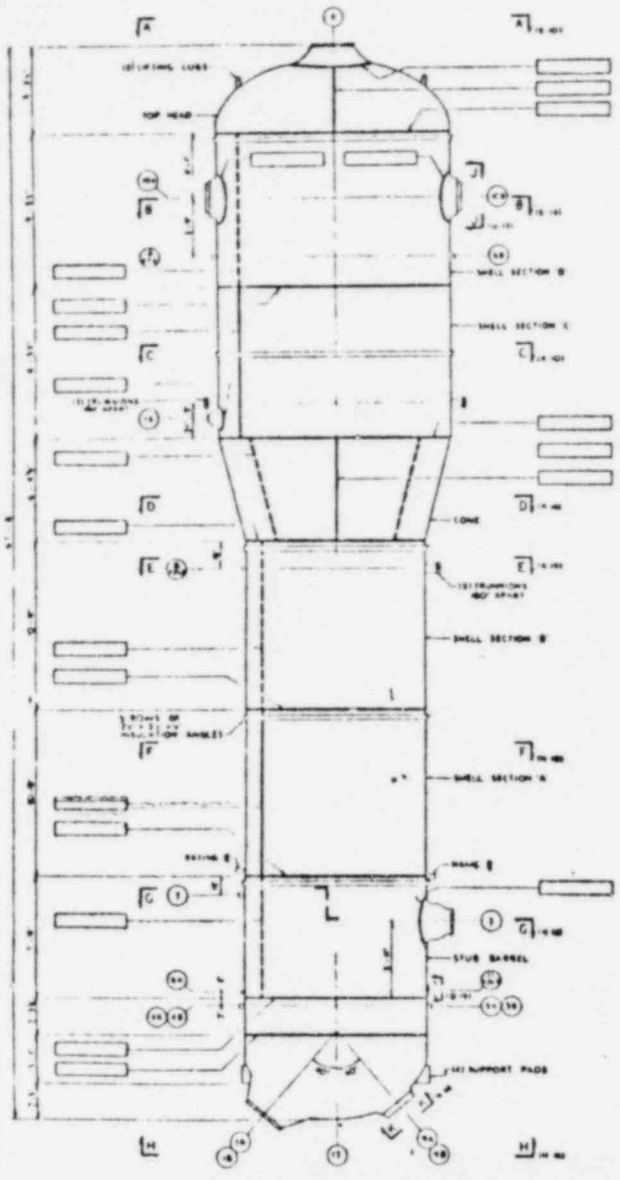
COMMONWEALTH EDISON

Byron Generating Station

INSPECTION IDENTIFICATION DWG
FOR INTERVICE INSPECTION
FOR REACTOR PRESSURE VESSEL
NO 1RC01R

ERAICO SERVICES INCORPORATED


STEAM GENERATOR NO. 1RC01BA
SECTION A-A
SECTION B-B
KEY PLAN
NOZZLE TABULATION
SECTION C-C
SECTION D-D
SECTION E-E
SECTION F-F
SECTION G-G
SECTION H-H
SECTION J-J
SECTION K-K
SECTION L-L
COMMONWEALTH EDISON
Byron Generating Station
INSPECTION VERIFICATION DWG
FOR INSERVICE INSPECTION
FOR STEAM GENERATOR
NO. 1RC01BA
EBASCO SERVICES INCORPORATED



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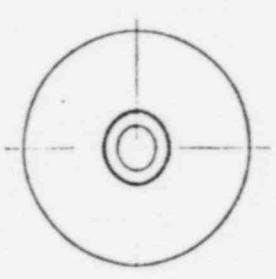

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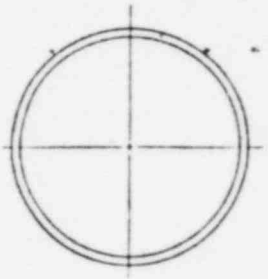

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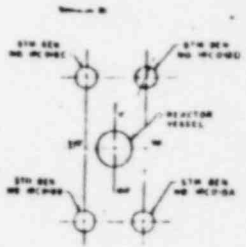

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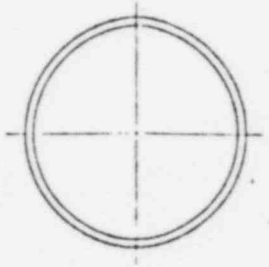

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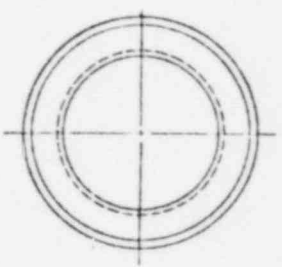

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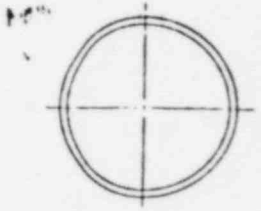

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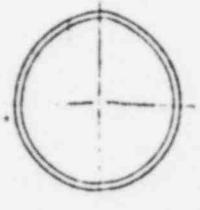
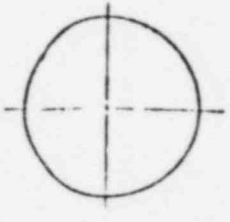
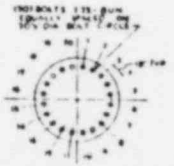


SECTION F-F

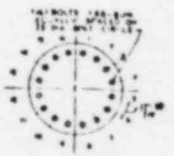
SECTION G-G



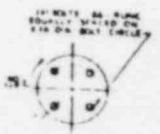
SECTION H-H



SECTION J-J



SECTION K-K



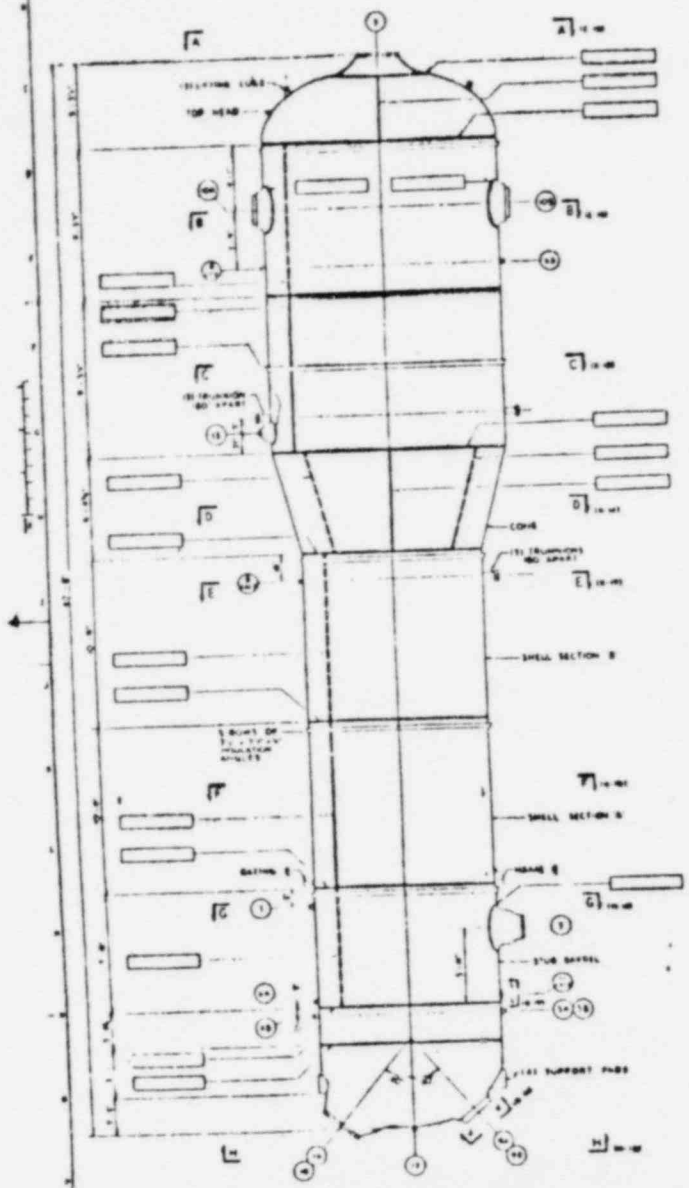
SECTION L-L

COMMONWEALTH EDISON

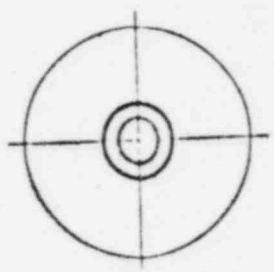
Byron Generating Station

INSPECTION IDENTIFICATION DWG
FOR INSERVICE INSPECTION
FOR STEAM GENERATOR
NO 1RC01B

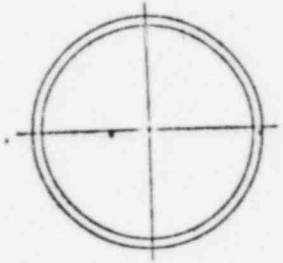
EBASCO SERVICES INCORPORATED



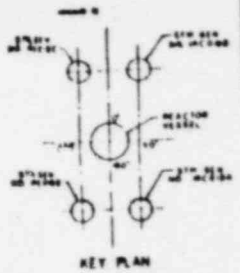
STEAM GENERATOR NO 1RC04EC



SECTION A-A

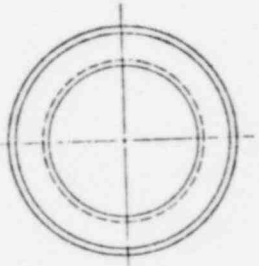


SECTION B-B

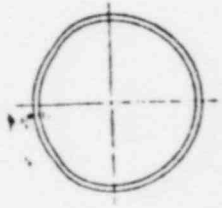


KEY PLAN

SECTION C-C

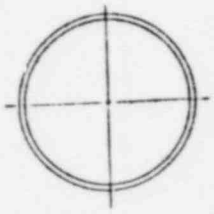


SECTION D-D

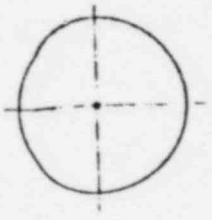


SECTION E-E

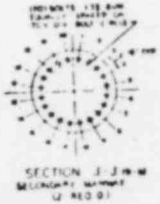
SECTION F-F



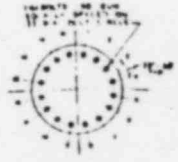
SECTION G-G



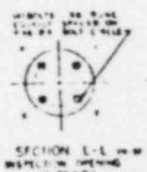
SECTION H-H



SECTION J-J



SECTION K-K



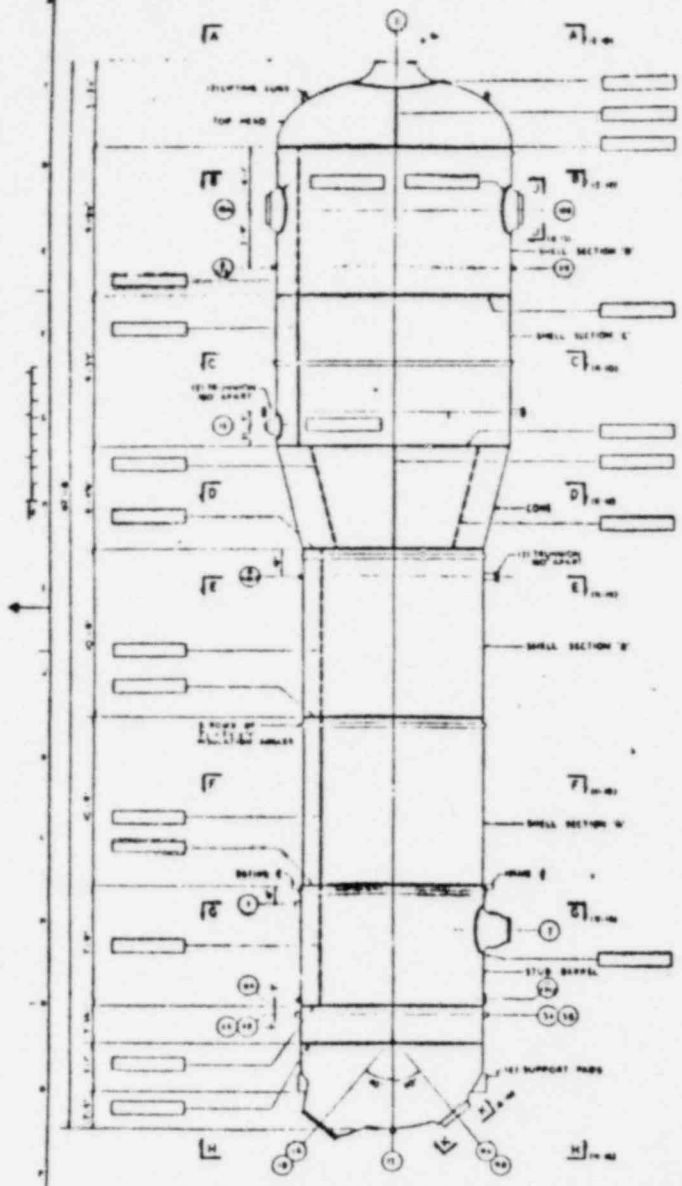
SECTION L-L

COMMONWEALTH EDISON

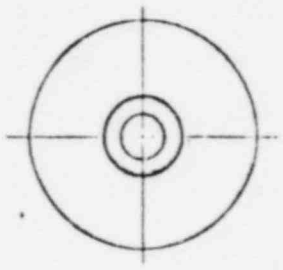
Byron Generating Station

INSPECTION IDENTIFICATION DWG
FOR INSERVICE INSPECTION
FOR STEAM GENERATOR
NO 1RC04EC

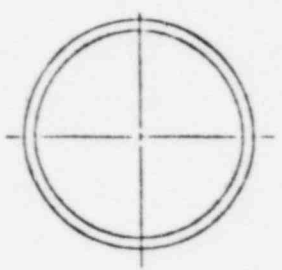
FRASCO SERVICES INCORPORATED



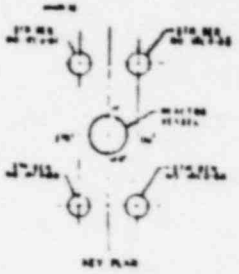
STEAM GENERATOR NO. 1RC04BD
FOR TRUE ORIENTATION SEE SECTIONS
SCALE: 3/8"=1'0"



SECTION A-A
TOP HEAD

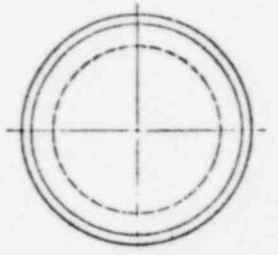


SECTION B-B
SHELL SECTION B

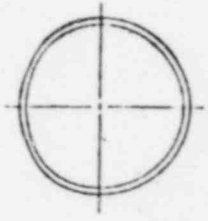


KEY PLAN

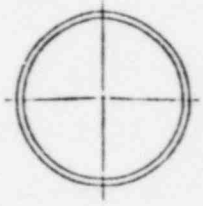
SECTION C-C
SHELL SECTION C



SECTION D-D
CONE

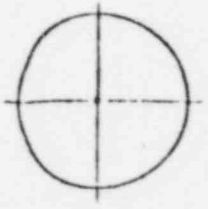


SECTION E-E
SHELL SECTION E

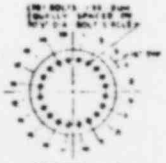


SECTION F-F
SHELL SECTION A

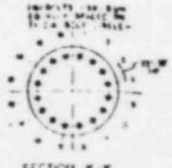
SECTION G-G
STUB BARREL



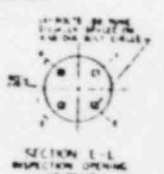
SECTION H-H
BOTTOM VIEW



SECTION J-J
SECONDARY MANWAY
(2 REQ'D)



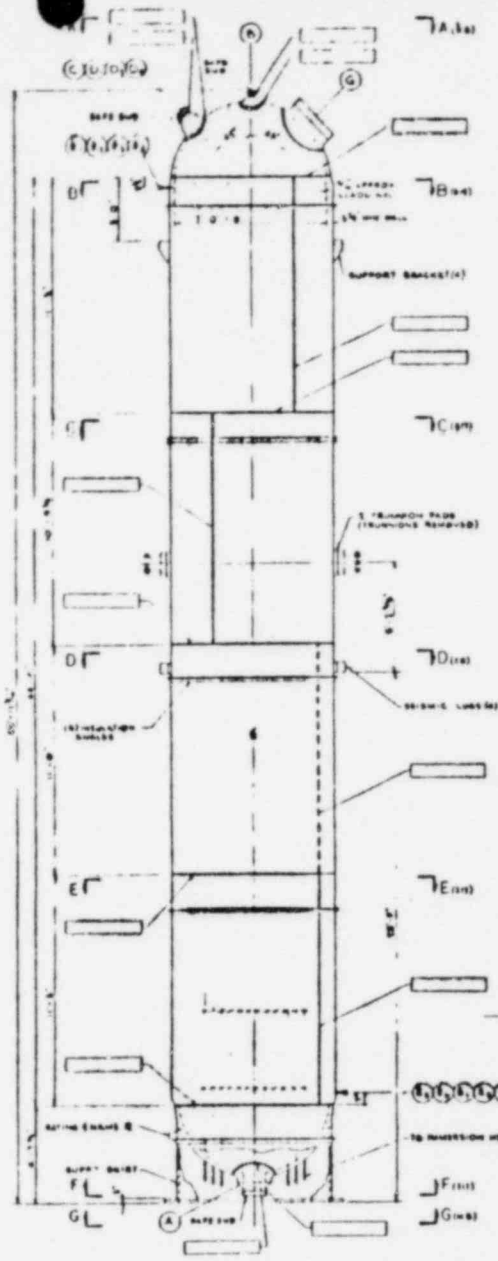
SECTION K-K
PRIMARY MANWAY
(2 REQ'D)



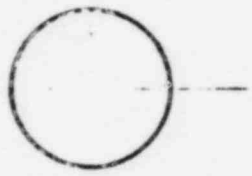
SECTION L-L
INSPECTION OPENING
(4 REQ'D)

COMMONWEALTH EDISON
Byron Generating Station
INSPECTION IDENTIFICATION ONLY
FOR INSERVICE INSPECTION
FOR STEAM GENERATOR
NO 1RC04BD

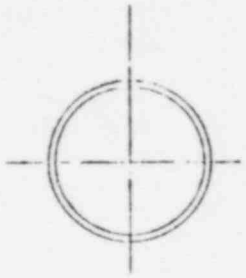
ERASCO SERVICES INCORPORATED



ELEVATION
PRESSURIZER NO IRYOIS
FOR TRUE ORIENTATION SEE PLANS AND SECTIONS

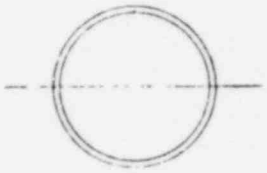


TOP VIEW 'A-A'
UPPER HEAD

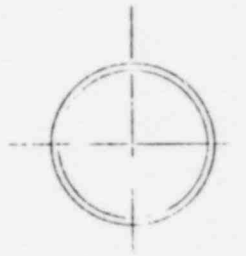


SECTION 'B-B'
SHELL BARREL

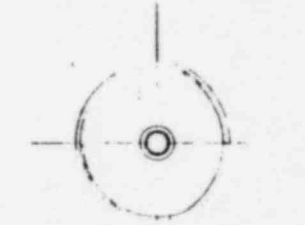
SECTION 'C-C'
SHELL BARREL



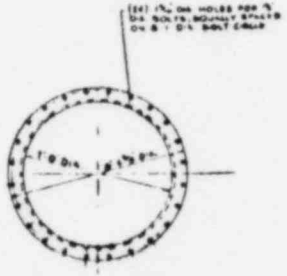
SECTION 'D-D'
SHELL BARREL



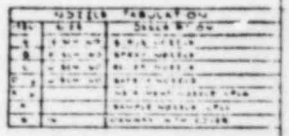
SECTION 'E-E'
SHELL BARREL

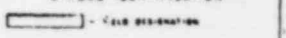


BOTTOM VIEW 'F-F'
LOWER HEAD



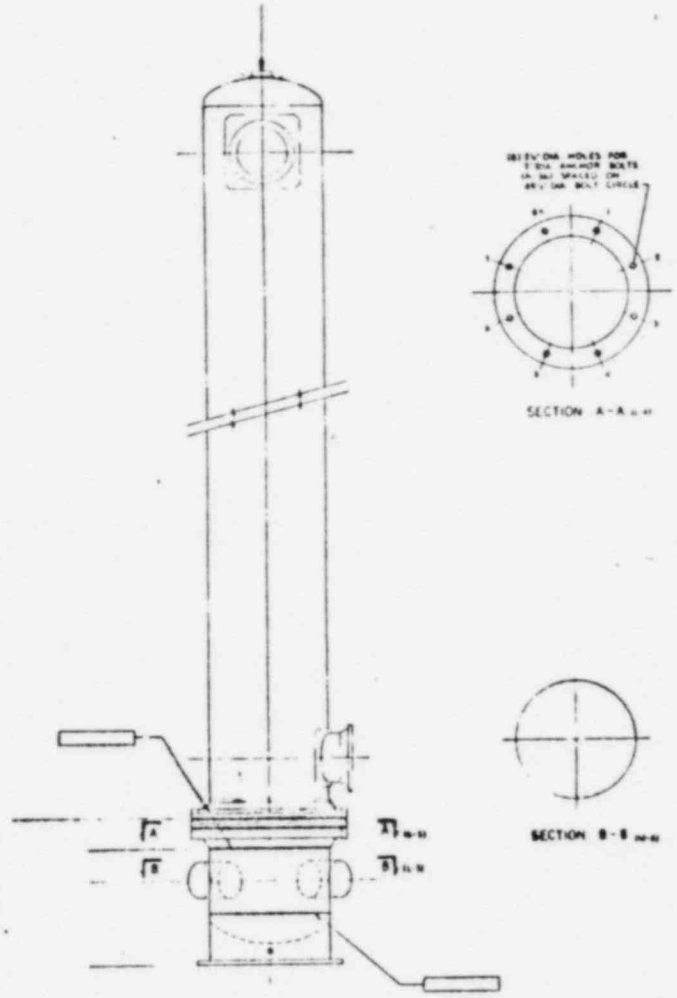
BOTTOM VIEW G-G
SKIRT FLANGE





SYMBOL IDENTIFICATION

COMMONWEALTH EDISON
Byron Generating Station
INSPECTION IDENTIFICATION DWG
FOR INSERVICE INSPECTION
FOR PRESSURIZER NO IRYOIS
ERASCO SERVICES INCORPORATED

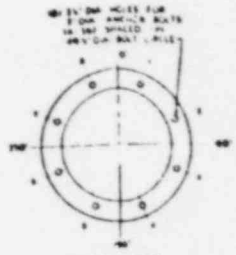


ELEVATION
RESIDUAL HEAT EXCHANGER
NO. 1H11Z2AA

SECTION A-A

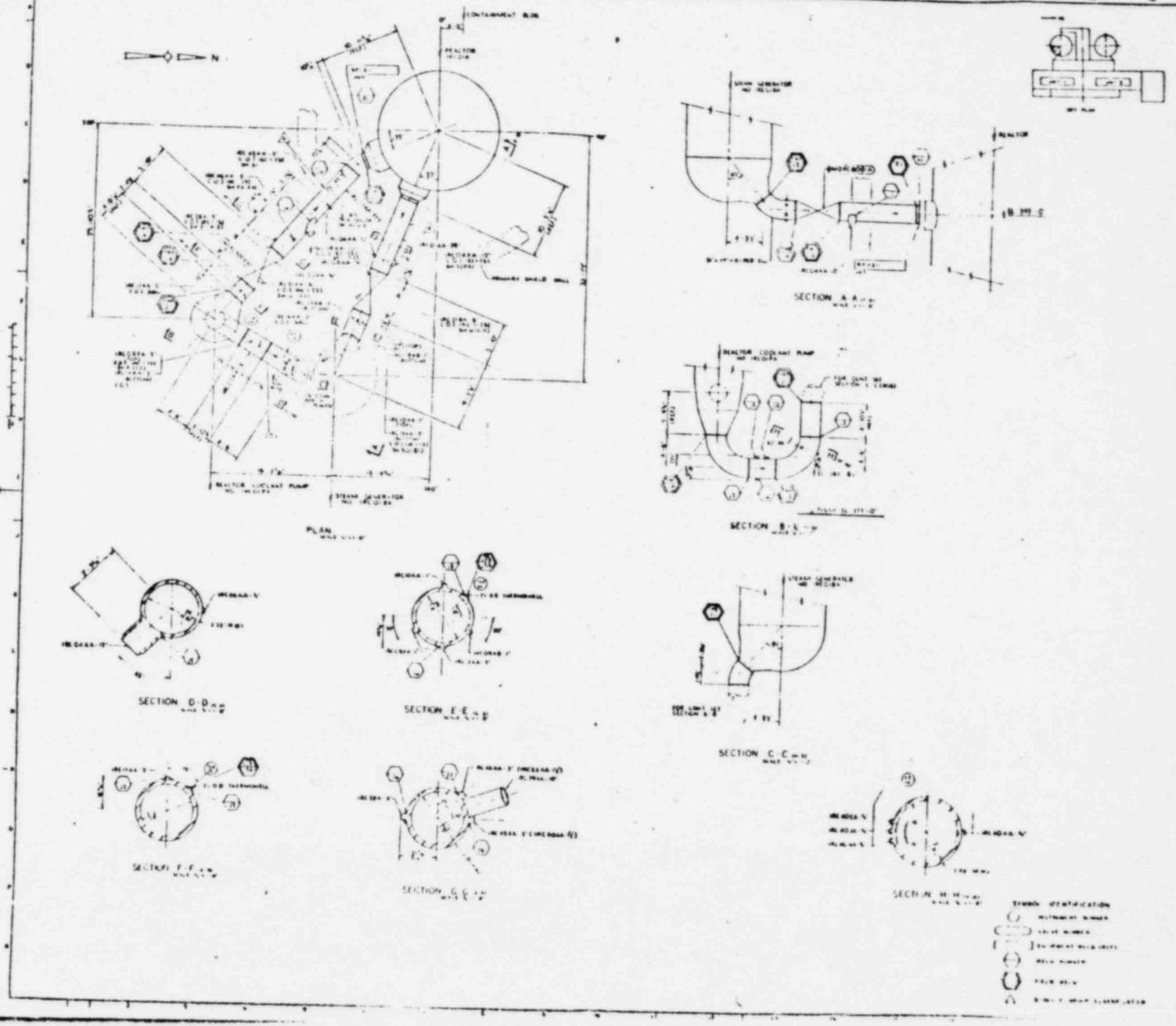
SECTION B-B

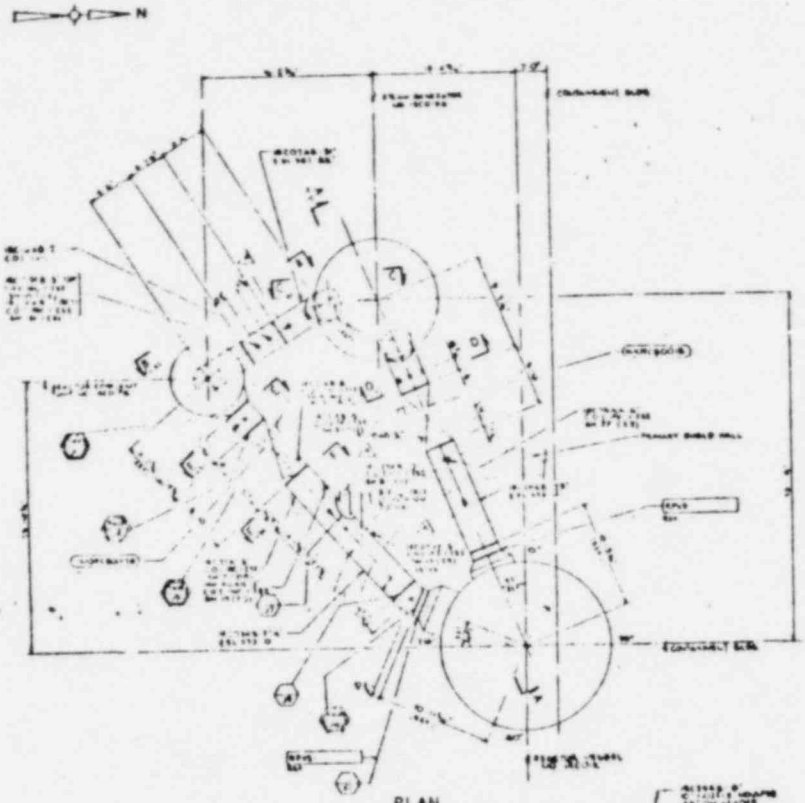
ELEVATION
RESIDUAL HEAT EXCHANGER
NO. 1RH11Z2AB

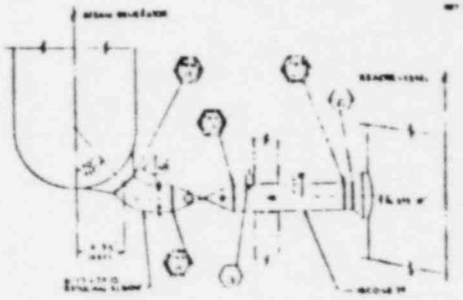


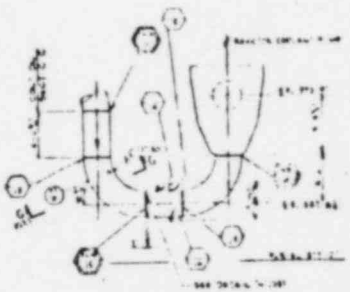
SECTION C-C

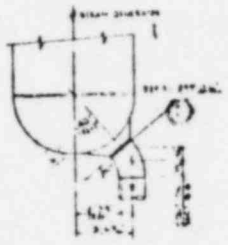
SECTION D-D

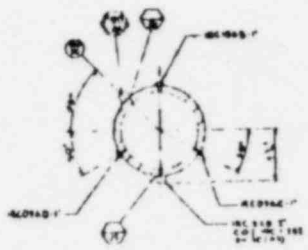

N
PLAN
SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
SECTION F-F
SECTION G-G
SECTION H-H

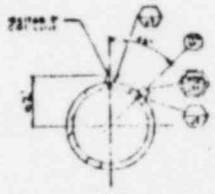


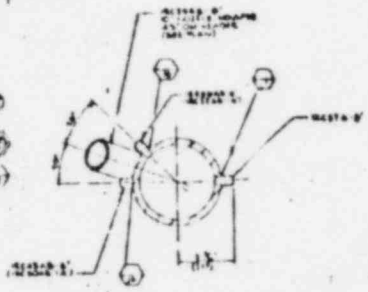


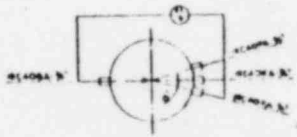


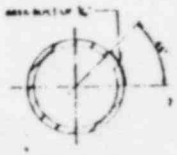


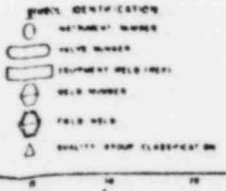












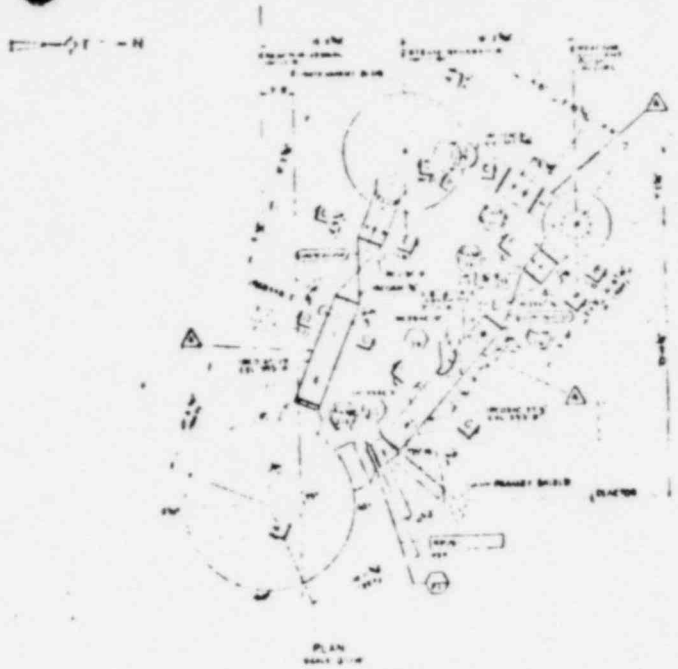
COMMONWEALTH EDISON

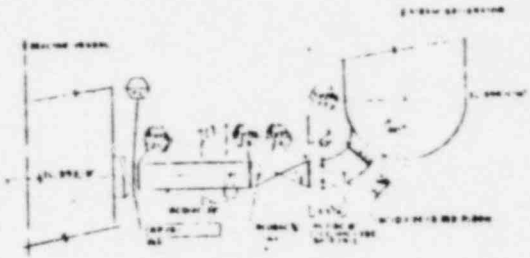
Byron Generating Station

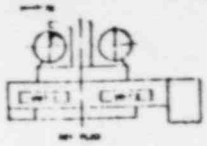
INSPECTION IDENTIFICATION DWG
FOR INSERVICE INSPECTION
OF PRIMARY COOLANT SYSTEM LOOP NO 2
TO STEAM GENERATOR NO 2B/OPB

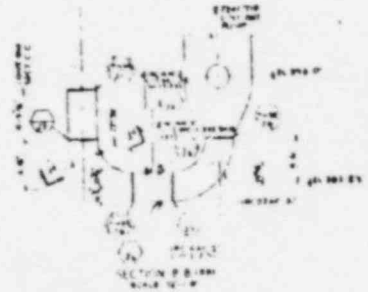
ERASCO SERVICES INCORPORATED

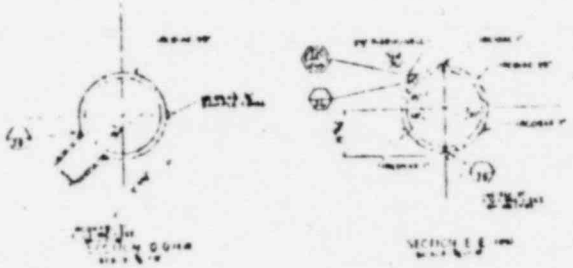
IRC-1 ISI
SH 2 of

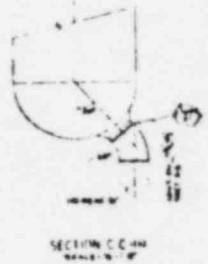


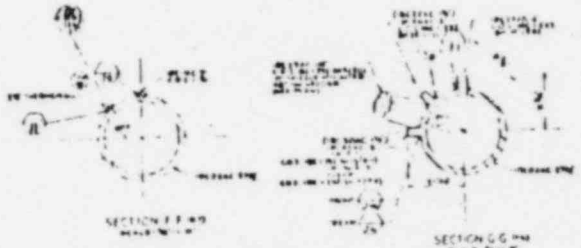


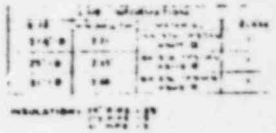












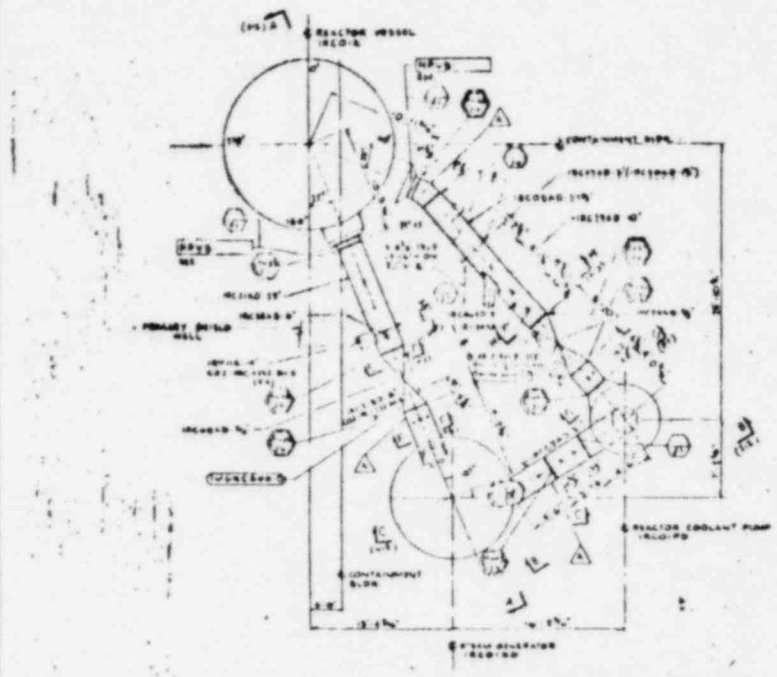
COMMONWEALTH EDISON

Byron Generating Station

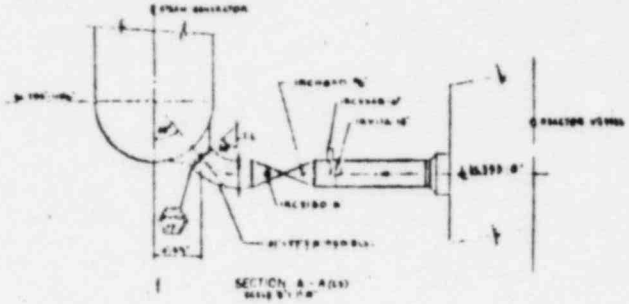
INSPECTION CERTIFICATION DWG
FOR INSERVICE INSPECTION
OF PRIMARY COUPLANT SYSTEM
LOOP 3 TO STEAM GEN NO 1 PUMP

EBASCO SERVICES INCORPORATED

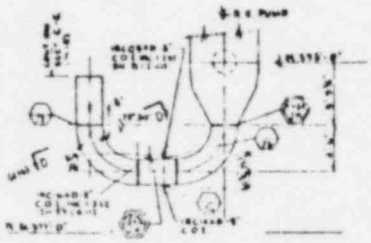
IPC-1-ISI
SH 3 of



PLAN

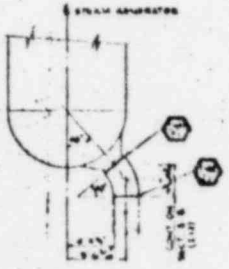


SECTION A - A

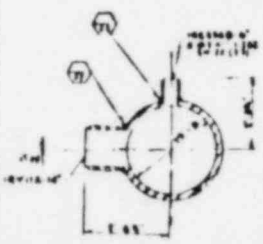


SECTION B - B

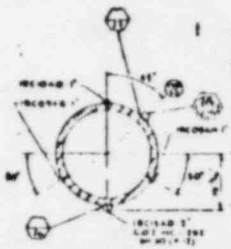
SECTION D - D



SECTION C - C

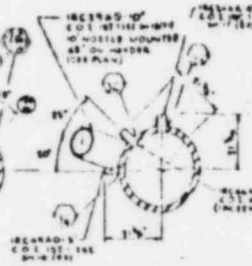


SECTION E - E

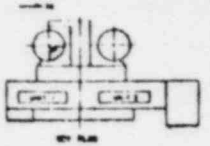


SECTION F - F

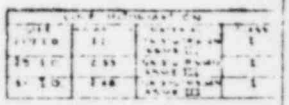
SECTION G - G

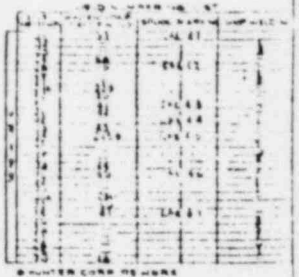


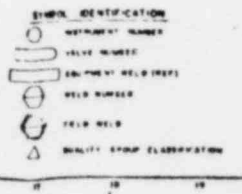
SECTION H - H



VALVE BOLTING







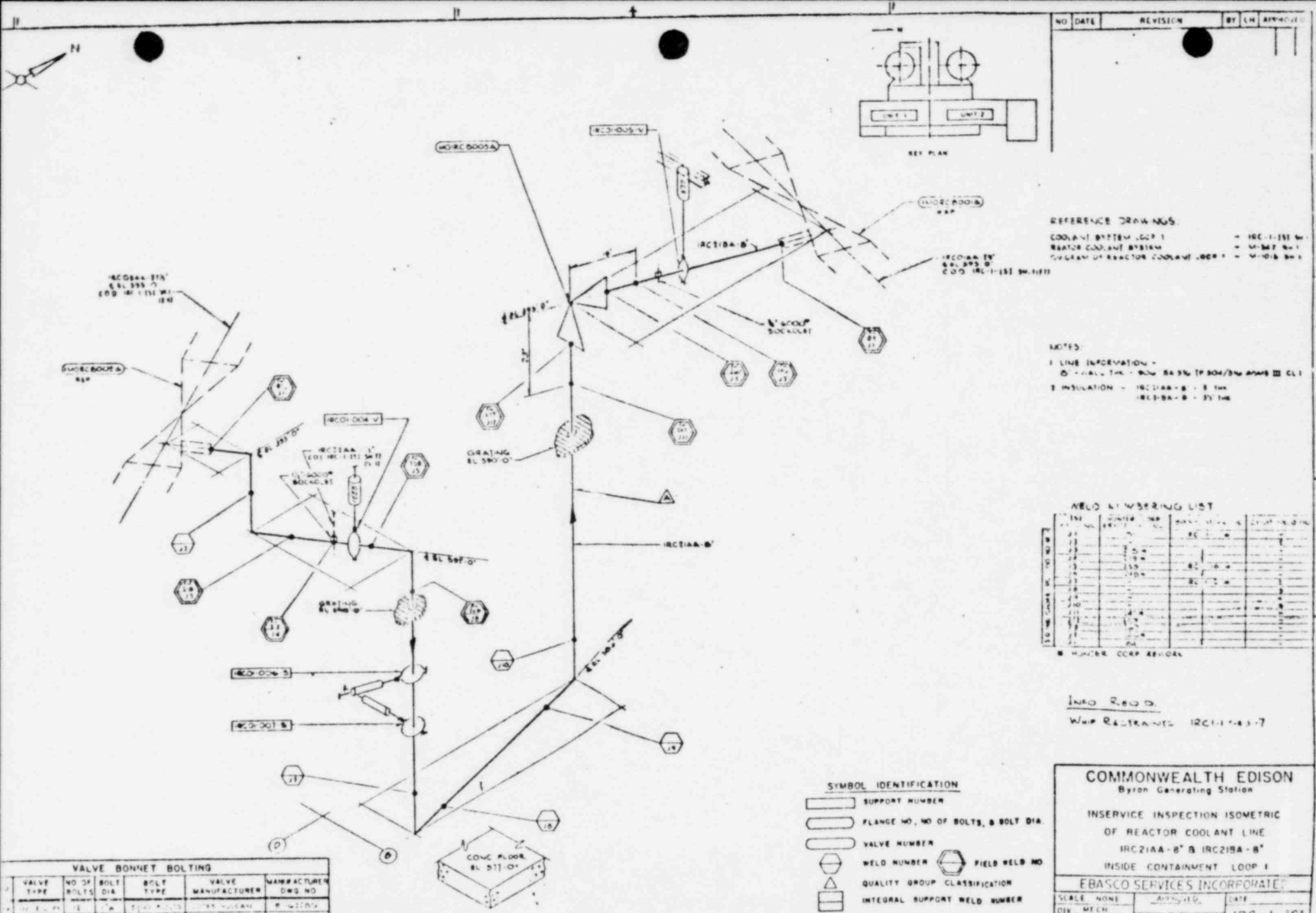
COMMONWEALTH EDISON

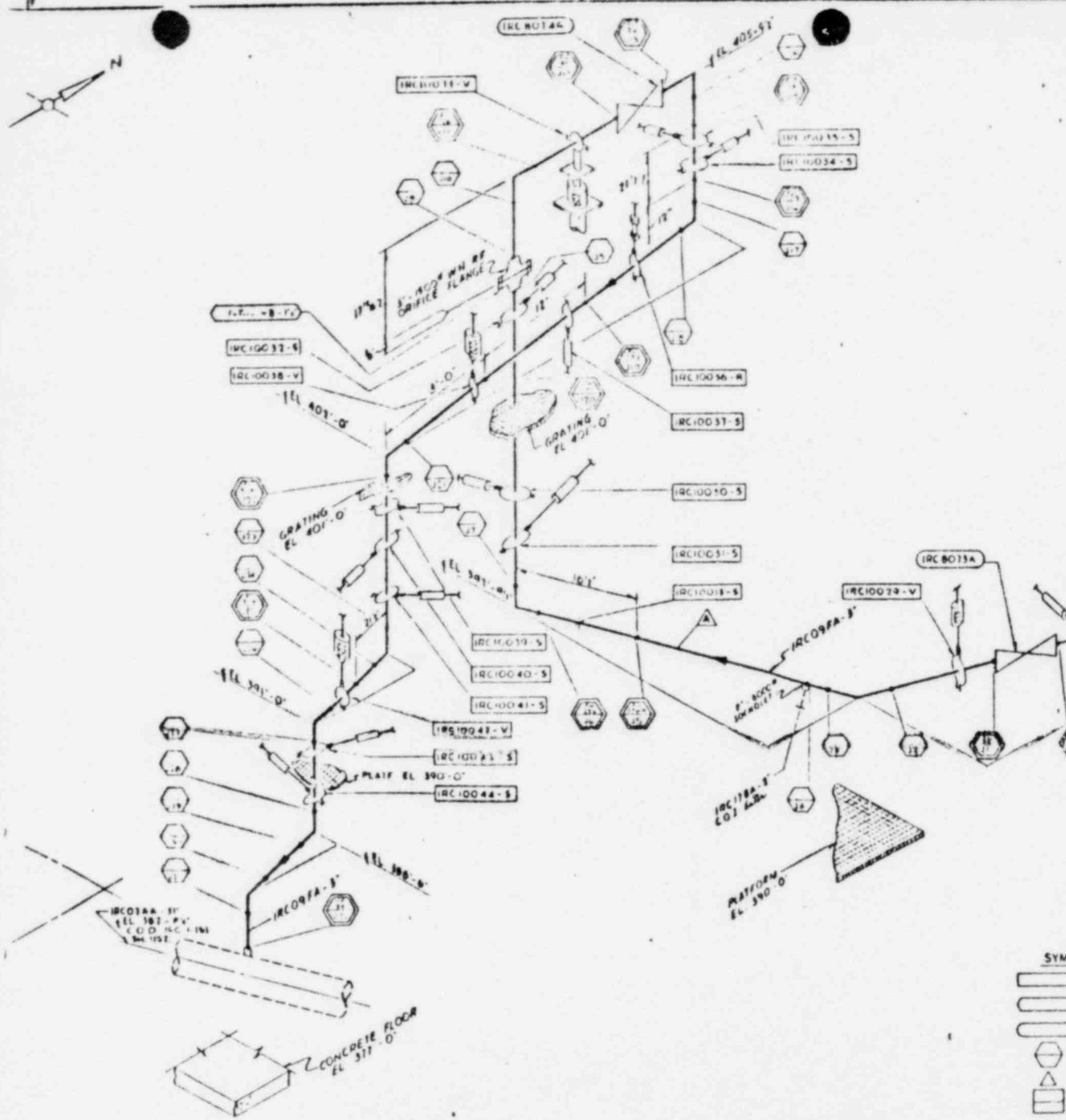
Byron Generating Station

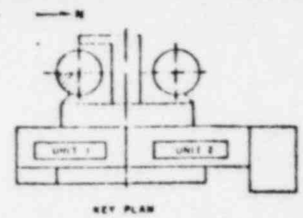
INSPECTION IDENTIFICATION DRG
FOR INSERVICE INSPECTION
OF PRIMARY COOLANT SYSTEM LOOP A
TO STEAM GENERATOR NO (RC01A)

EBASCO SERVICES INCORPORATED

IRC-1151
SH 4 of


KEY PLAN
UNIT 1
UNIT 2
REFERENCE DRAWINGS:
COOLANT SYSTEM LOOP 1 - IRC-1-151 SH 1
REACTOR COOLANT SYSTEM - M-147 SH 1
DIAGRAM OF REACTOR COOLANT LOOP 1 - M-1013 SH 1
NOTES:
1 LINE INFORMATION -
2 INSULATION - IRC21AA-B - 3 THK
IRC21BA-B - 3½" THK
WELD NUMBERING LIST
IRC21AA-B
IRC21BA-B
GRATING EL 390'-0"
CONC FLOOR EL 377'-0"
SYMBOL IDENTIFICATION
SUPPORT NUMBER
FLANGE NO, NO OF BOLTS, & BOLT DIA.
VALVE NUMBER
WELD NUMBER
FIELD WELD NO
QUALITY GROUP CLASSIFICATION
INTEGRAL SUPPORT WELD NUMBER
VALVE BONNET BOLTING
VALVE TYPE
NO OF BOLTS
BOLT DIA
BOLT TYPE
VALVE MANUFACTURER
MANUFACTURER DWG NO
INFO REQ'D.
WHP RETRANS: IRC1-1-83-7
COMMONWEALTH EDISON
Byron Generating Station
INSERVICE INSPECTION ISOMETRIC
OF REACTOR COOLANT LINE
IRC21AA-8" & IRC21BA-8"
INSIDE CONTAINMENT LOOP 1
EBASCO SERVICES INCORPORATED
SCALE NONE
DRN MECH
IRC-1-ISI
SH 6 of





NO	DATE	BY		BY	CH	APPROVED

REFERENCE DRAWINGS

COOLANT SYSTEM LOOP 1 - IRC-1-ISI Sh 1
REACTOR COOLANT SYSTEM - M-547 Sh 8
DIAGRAM OF R.C. SYSTEM - M-1013 Sh 1

NOTES

1. LINE INFORMATION
   3" WALL THK .438" SA 317/SA 376 TP 304/316
   ASME III CL 1
2. INSULATION - 3" THK.

WELD NUMBERING LIST

ISI WELD NO	ERECT F.W. NO	SPOOL MARK NO	SHOP WELD NO
[illegible]	[illegible]	[illegible]	[illegible]

HUNTER CORP. REWORK

SYMBOL IDENTIFICATION

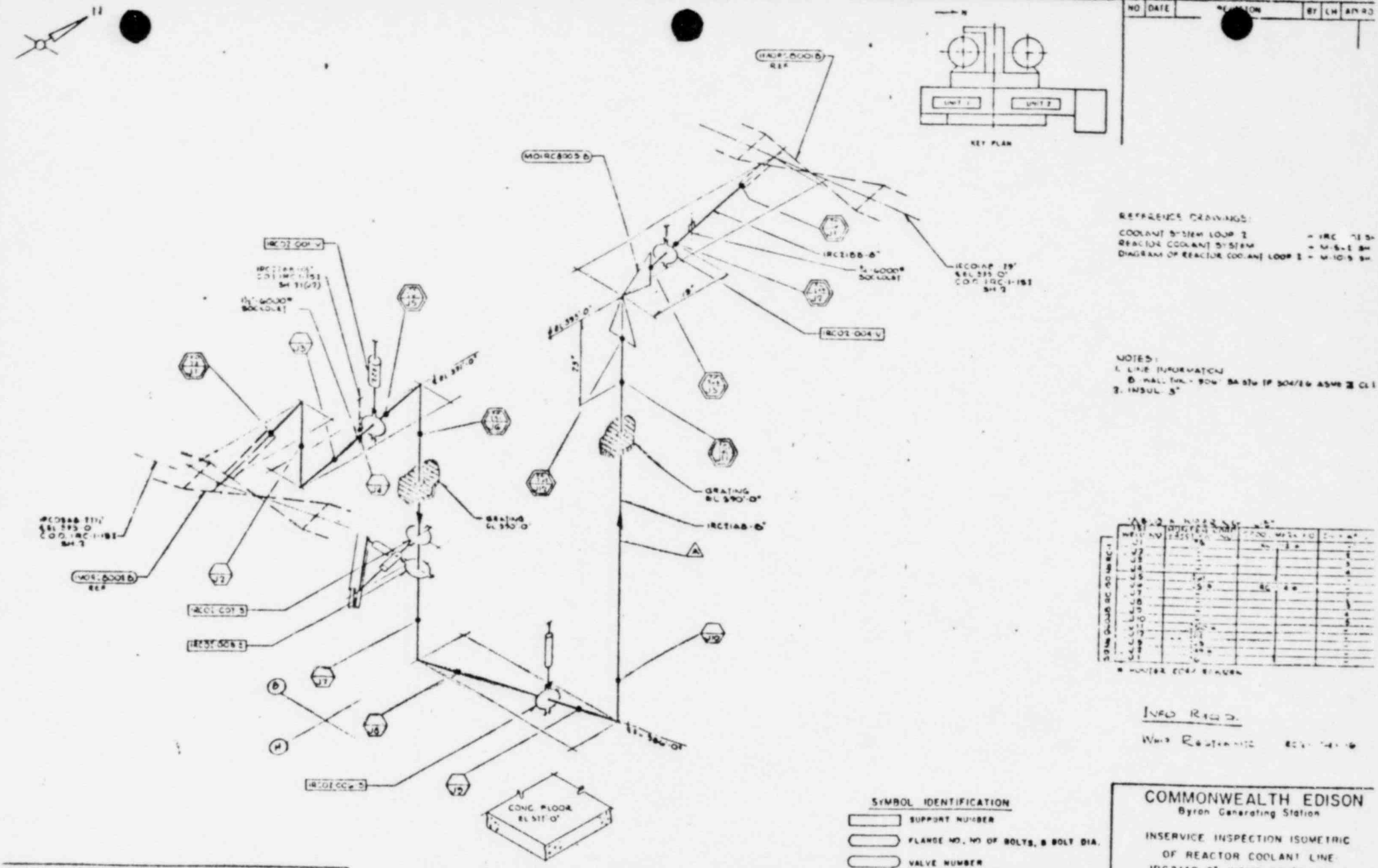
- SUPPORT NUMBER
- FLANGE NO, NO OF BOLTS, & BOLT DIA.
- VALVE NUMBER
- WELD NUMBER / FIELD WELD NO
- QUALITY GROUP CLASSIFICATION
- INTEGRAL SUPPORT WELD NUMBER

COMMONWEALTH EDISON
Byron Generating Station

INSERVICE INSPECTION ISOMETRIC
OF REACTOR COOLANT LINES IRC09FA-3
& IRC09EA-3" INSIDE CONTAINMENT
(LOOP 1)

EBASCO SERVICES INCORPORATED

SCALE NONE | APPROVED
DIV MECH
IRC-1-ISI
SH. 8 of



REFERENCE DRAWINGS:

COOLANT SYSTEM LOOP 2 - IRC 7E SH
REACTOR COOLANT SYSTEM - M-151-E SH
DIAGRAM OF REACTOR COOLANT LOOP 2 - M-1015 SH

NOTES:
1. LINE INFORMATION
2. INSUL. 3"

INFO REQ'D.

VALVE BONNET BOLTING

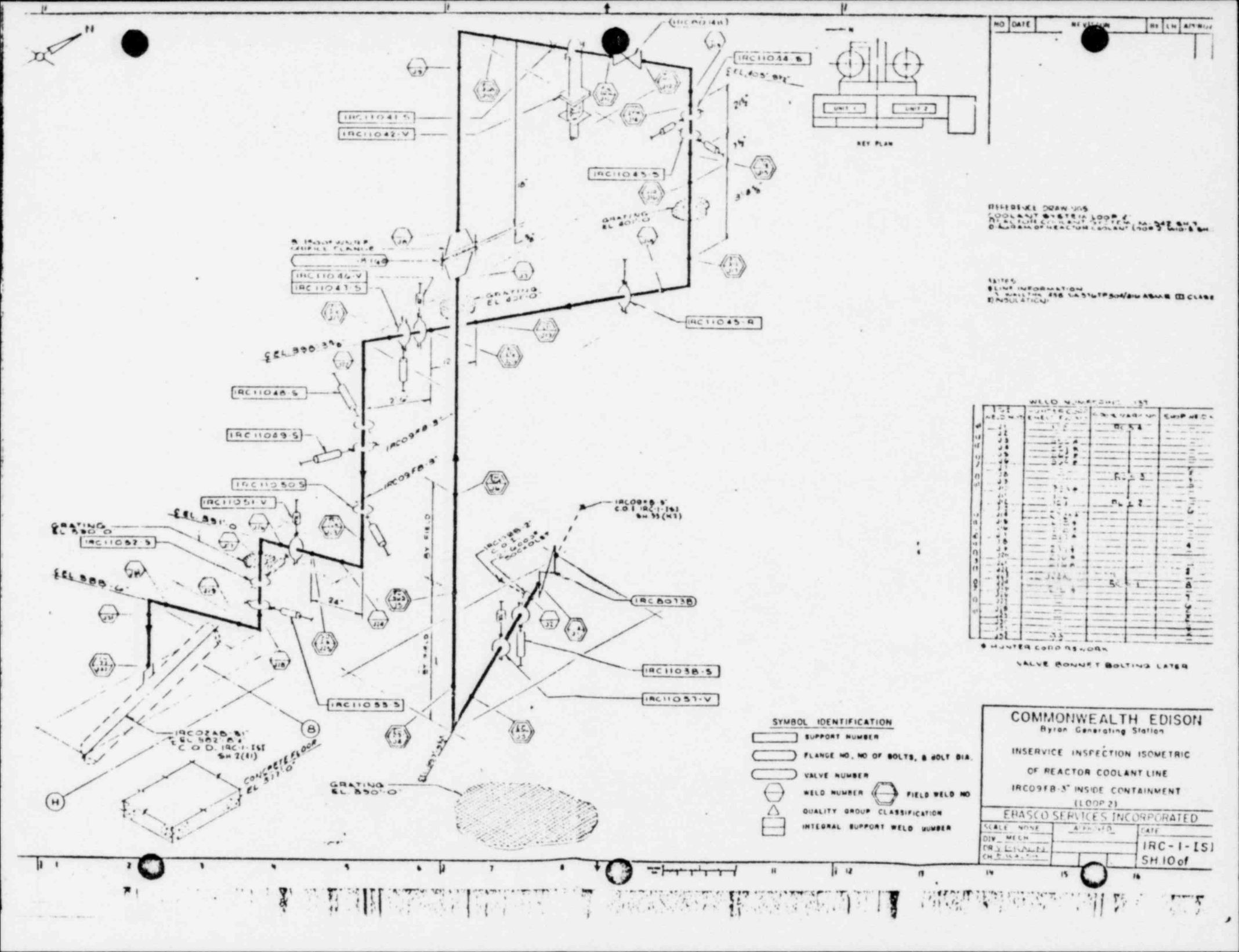
NO	VALVE TYPE	NO OF BOLTS	BOLT DIA	BOLT TYPE	VALVE MANUFACTURER	MANUFACTURER DWG NO

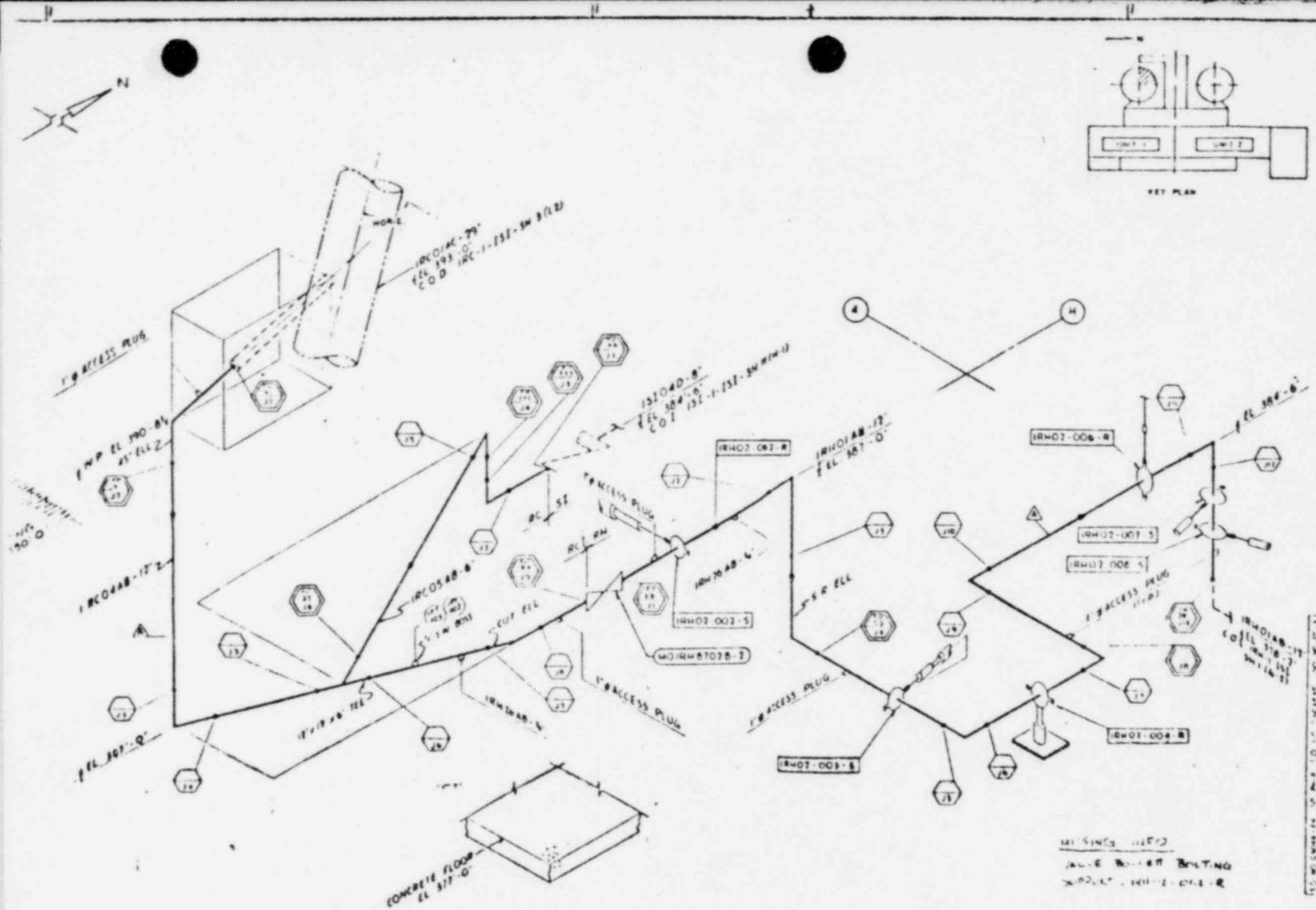
COMMONWEALTH EDISON
Byron Generating Station

INSERVICE INSPECTION ISOMETRIC
OF REACTOR COOLANT LINE
IRC21AB-8" INSIDE CONTAINMENT
(LOOP 2)

EBASCO SERVICES INCORPORATED

SCALE NONE	APPROVED	DATE
DW MECH		IRC-1-1S1
DR		SH 9 of
CH		


IRC11041-S
IRC11042-V
IRC11043-S
IRC11044-S
IRC11045-S
IRC11045-R
IRC11046-V
IRC11047-S
IRC11048-S
IRC11049-S
IRC11050-S
IRC11051-V
IRC11052-S
IRC11055-S
IRC11057-V
IRC11058-S
IRC80138
IRCO28-S"
IRCO29-S"
IRCO30-S"
IRCO28-S" EL 382'-8"
C.O.D. IRC-1-ISI SH 7(R1)
IRCO28-S"
C.O.D. IRC-1-ISI SH 35(R1)
EL 405'-8½"
EL 390'-3½"
EL 391'-0"
EL 388'-6"
GRATING EL 400'-0"
GRATING EL 391'-0"
GRATING EL 390'-0"
CONCRETE FLOOR EL 377'-0"
UNIT 1
UNIT 2
KEY PLAN
REFERENCE DRAWINGS
COOLANT SYSTEM LOOP 2
REACTOR COOLANT SYSTEM M-142 SH 1
DIAGRAM OF REACTOR COOLANT (LOOP 2)
NOTES:
1. WELD INFORMATION
2. WELDING PER SPECIFICATION
3. INSULATION
WELD NUMERIC LIST
* HUNTER CORP AS-WORK
VALVE BONNET BOLTING LATER
SYMBOL IDENTIFICATION
SUPPORT NUMBER
FLANGE NO, NO OF BOLTS, & BOLT DIA.
VALVE NUMBER
WELD NUMBER
FIELD WELD NO
QUALITY GROUP CLASSIFICATION
INTEGRAL SUPPORT WELD NUMBER
NO DATE REVISION BY CH APPROV
COMMONWEALTH EDISON
Byron Generating Station
INSERVICE INSPECTION ISOMETRIC
OF REACTOR COOLANT LINE
IRCO9FB-3" INSIDE CONTAINMENT
(LOOP 2)
ERASCO SERVICES INCORPORATED
SCALE NONE
APPROVED
DATE
DIV. MECH.
DR. ERASCO
CH.
IRC-1-ISI
SH 10 of



KEY PLAN

NO	DATE	REVISION	BY	CH	APPROVED

REFERENCE DRAWINGS

COOLANT SYSTEM LOOP 3	- IRC 1-1SI SH 3
REACTOR COOLANT SYSTEM	- M-547 SH 2
RESIDUAL HEAT REMOVAL SYSTEM	- M-538 SH 1
DIAGRAM OF RC SYSTEM	- M-1015 SH 1
DIAGRAM OF RHR SYSTEM	- M-1015 SH 1

NOTES:
1. LINE INFORMATION
   12" - WALL THK 0.375", SA-376 TP 316 ASME III CL 1
   6" - WALL THK 0.19", SA-376 TP 304/316 ASME III CL
2. INSULATION

WELD NUMBERING LIST

ISI WELD NO.	WELDER STAMP NO.	SPOOL MARK NO.	SHOP WELD NO.

* WATER LOOP WELDER

MISSING DATA

VALVE BONNET BOLTING
1RH02-004-R

SYMBOL IDENTIFICATION

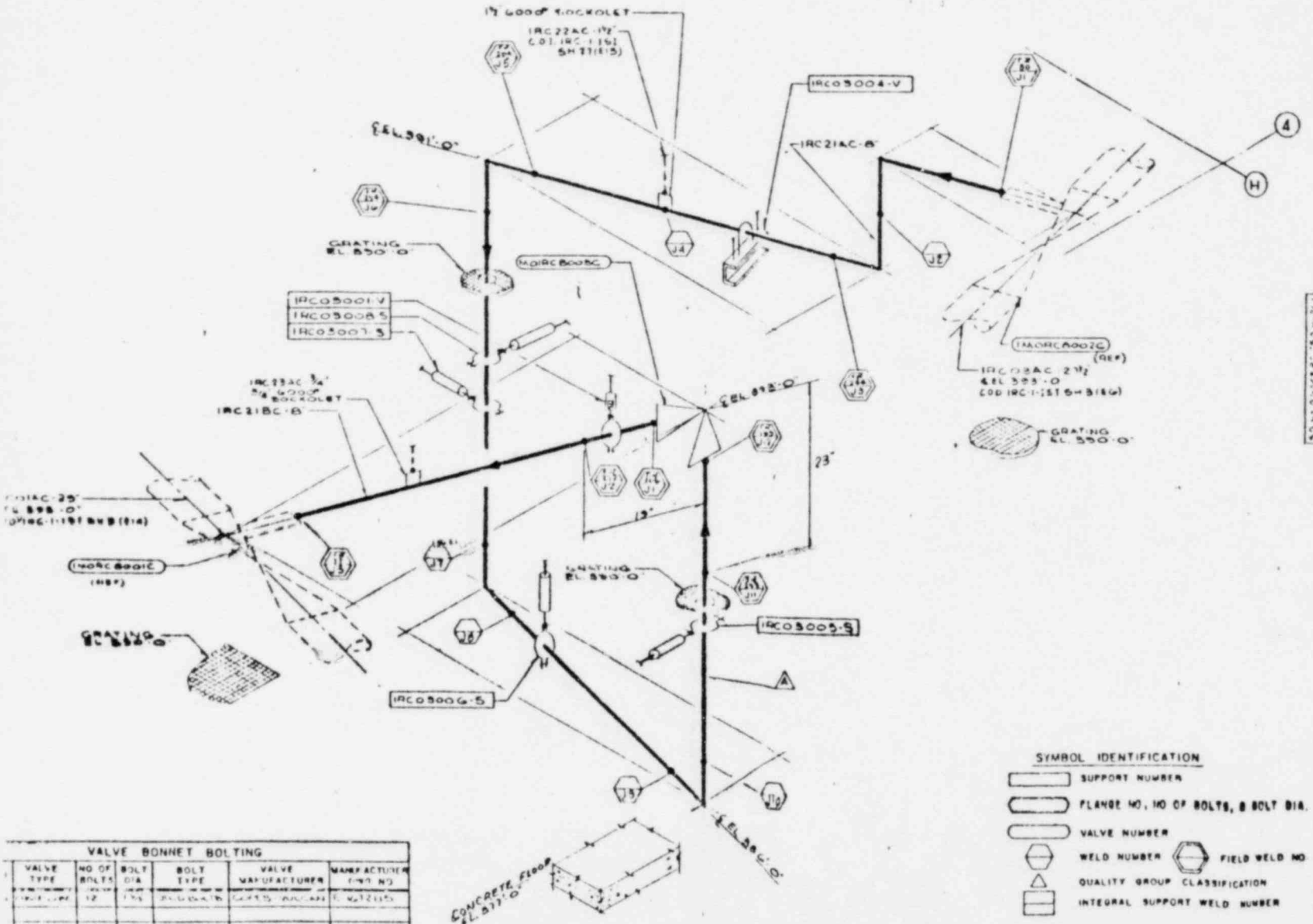
- SUPPORT NUMBER
- FLANGE NO., NO OF BOLTS, & BOLT DIA.
- VALVE NUMBER
- WELD NUMBER / FIELD WELD NO
- QUALITY GROUP CLASSIFICATION
- INTEGRAL SUPPORT WELD NUMBER

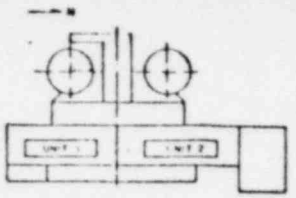
COMMONWEALTH EDISON
Byron Generating Station

INSERVICE INSPECTION ISOMETRIC OF REACTOR COOLANT LINES 1RC04AB-12", 1RC05AB-6" & RESIDUAL HEAT REMOVAL LINE 1RH01AB-12" INSIDE CONTAINMENT
LOOP 31

EBASCO SERVICES INCORPORATED

SCALE NONE	APPROVED	DATE
DES. MECH.		IRC-1-1SI
DR. [illegible]		SH 11of
CH. [illegible]		





KEY PLAN

NO	DATE	REVISION	BY	CH	APPROVED

REFERENCE DRAWINGS
COOLANT SYSTEM, LOOP 3: IRC-1-151 SH 3
REACTOR COOLANT SYSTEM: M-542 SH 1
DIAGRAM OF REACTOR COOLANT LOOP 3 M-553 SH 3

NOTES
① LINE INFORMATION
② WALL THK .906" SA376 TP304/304 NSME III CL-1
INSULATION 8" THK

WELD NUMBERING LIST

WELD NUMBER	HUNTER CORP ERASCO P.O. NO.	SPOOL MARK NO.	SHOP WELD NO
1	8*	RC-3-5	2
2	244		4
3	244		6
4	244*	R-LG	7
5			9
6			11
7	244		
8	244		
9	244		
10	244*		
11	11		

* HUNTER CORP REWORK

WHIP RESTRAINTS IRC8-1 THRU IRC8-6 LATER.

VALVE BONNET BOLTING

VALVE TYPE	NO OF BOLTS	BOLT DIA	BOLT TYPE	VALVE MANUFACTURER	MANUFACTURER DWG NO

SYMBOL IDENTIFICATION

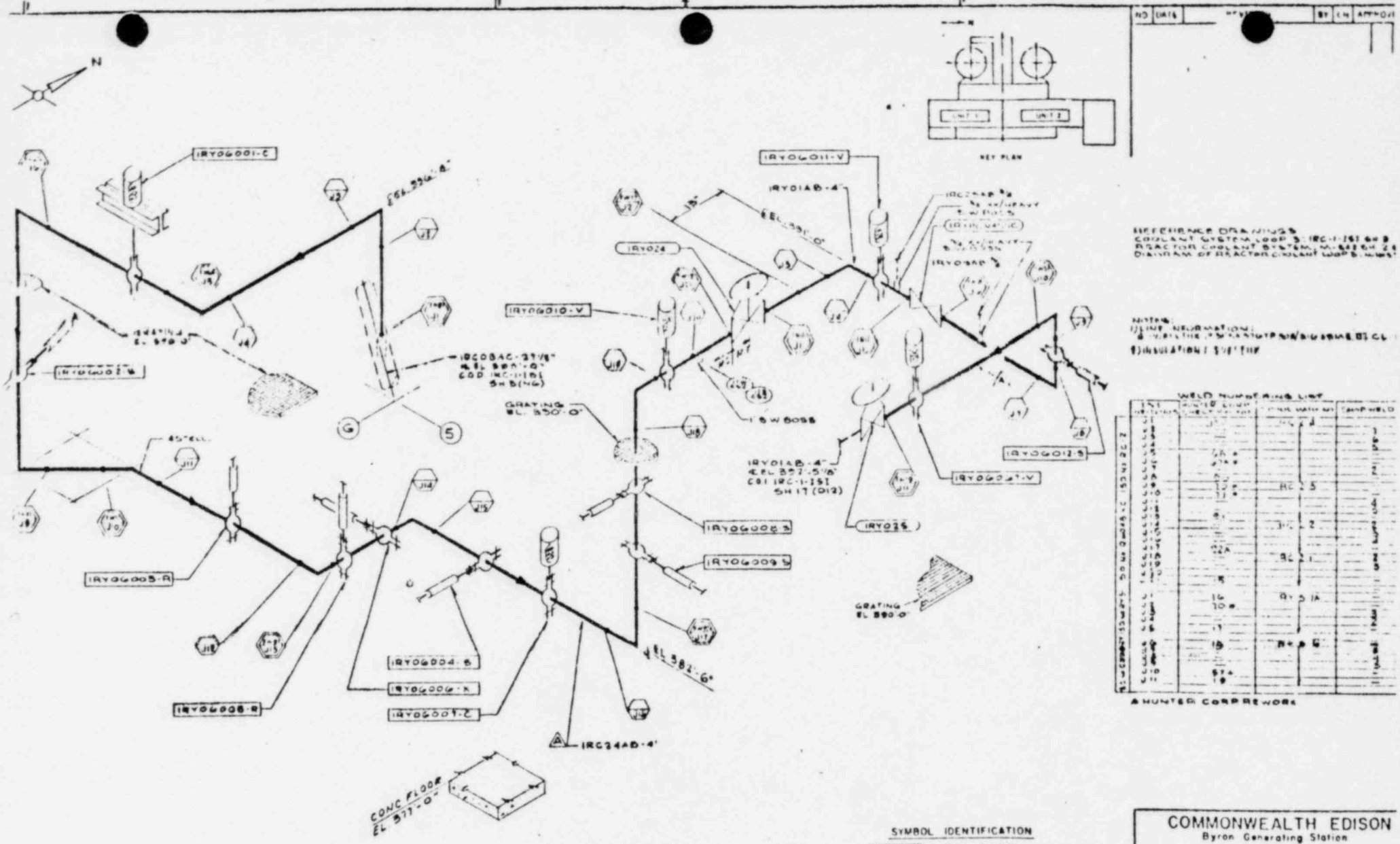
- SUPPORT NUMBER
- FLANGE NO., NO OF BOLTS, & BOLT DIA.
- VALVE NUMBER
- WELD NUMBER — FIELD WELD NO
- QUALITY GROUP CLASSIFICATION
- INTEGRAL SUPPORT WELD NUMBER

COMMONWEALTH EDISON
Byron Generating Station

INSERVICE INSPECTION ISOMETRIC
OF REACTOR COOLANT LINES IRC21AC-8"&
IRC21BC-8" INSIDE CONTAINMENT
(LOOP 3)

ERASCO SERVICES INCORPORATED

SCALE NONE	APPROVED	DATE
DR J.PETERSON		IRC-1-ISI
CH		SH 12 of



REFERENCE DRAWINGS
COOLANT SYSTEM, LOOP 3: IRC-1-151 SH 3
REACTOR COOLANT SYSTEM, MAIN: 822 SH 2
DIAGRAM OF REACTOR COOLANT LOOPS: M-1057

NOTES
1) FOR WELDING INFORMATION SEE THE ITEM NUMBER IN THE SHOP AND FIELD WELD LIST
2) INSULATION 1 1/2" THK

WELD NUMBERING LIST

ITEM NO.	WELD NUMBER	CODE CLASS	WELDED BY
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A HUNTER CORPREWORX

SYMBOL IDENTIFICATION

- SUPPORT NUMBER
- FLANGE NO., NO OF BOLTS, & BOLT DIA.
- VALVE NUMBER
- WELD NUMBER — FIELD WELD NO
- QUALITY GROUP CLASSIFICATION
- INTEGRAL SUPPORT WELD NUMBER

VALVE BONNET BOLTING

VALVE TYPE	NO. OF BOLTS	BOLT DIA	BOLT TYPE	VALVE MANUFACTURER	MANUFACTURER DWG NO
GATE	4	1"	STUD	CRANE-WARNER	4300A1001
GATE	8	1"	STUD	CRANE-WARNER	4300A1001

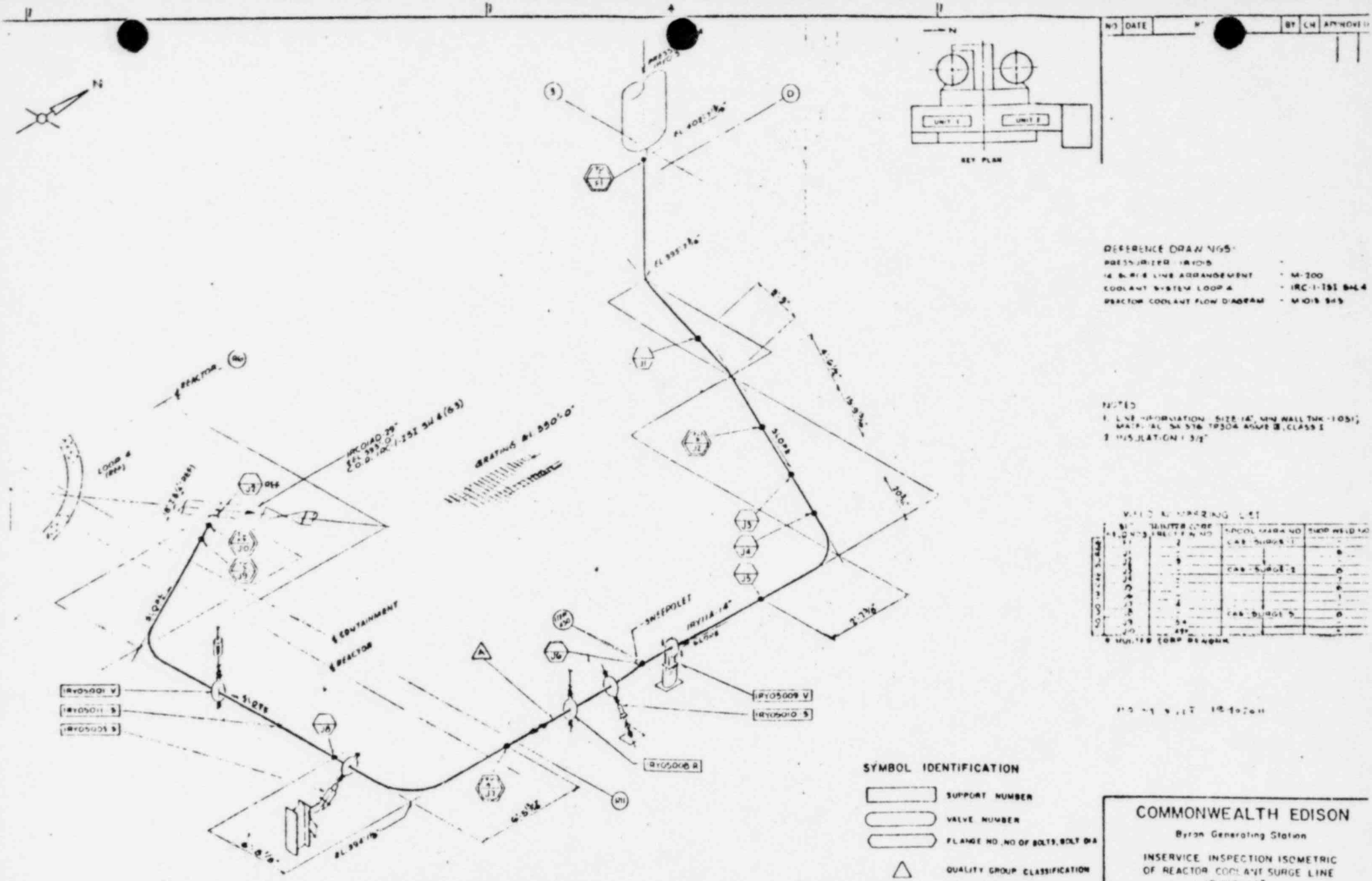
COMMONWEALTH EDISON
Byron Generating Station

INSERVICE INSPECTION ISOMETRIC
OF REACTOR COOLANT LINES-1RC24AB-4"&
1RY01AB-4" INSIDE CONTAINMENT
(LOOP 3)

EBASCO SERVICES INCORPORATED

SCALE NONE | APPROVED | DATE
DIV MECH
DR
CH

IRC-1-IS
SH 14 of



KEY PLAN

NO	DATE		BY	CH	APPROVED

REFERENCE DRAWINGS

PRESSURIZER 1RY05	-
14 SURGE LINE ARRANGEMENT	- M-200
COOLANT SYSTEM LOOP 4	- IRC-1-ISI SH.4
REACTOR COOLANT FLOW DIAGRAM	- M-105 SH.5

NOTES

1. LINE INFORMATION - SIZE 14", MIN WALL THK = 0.531", MATERIAL SA 376 TP304 ASME III, CLASS 1
2. INSULATION = 3"

WELD NUMBERING LIST

WELD NUMBERS	SUBMITTED COMP WELD PLAN NO	PIPE COL MARK NO	SHOP WELD NO
		CAR SURGE 1	
		CAR SURGE 2	
		CAR SURGE 3	

* MULTIPLE COMP DRAWING

SYMBOL IDENTIFICATION

- SUPPORT NUMBER
- VALVE NUMBER
- FLANGE NO, NO OF BOLTS, BOLT DIA
- QUALITY GROUP CLASSIFICATION
- SHOP WELD
- FIELD WELD
- INTEGRAL SUPPORT WELD NUMBER

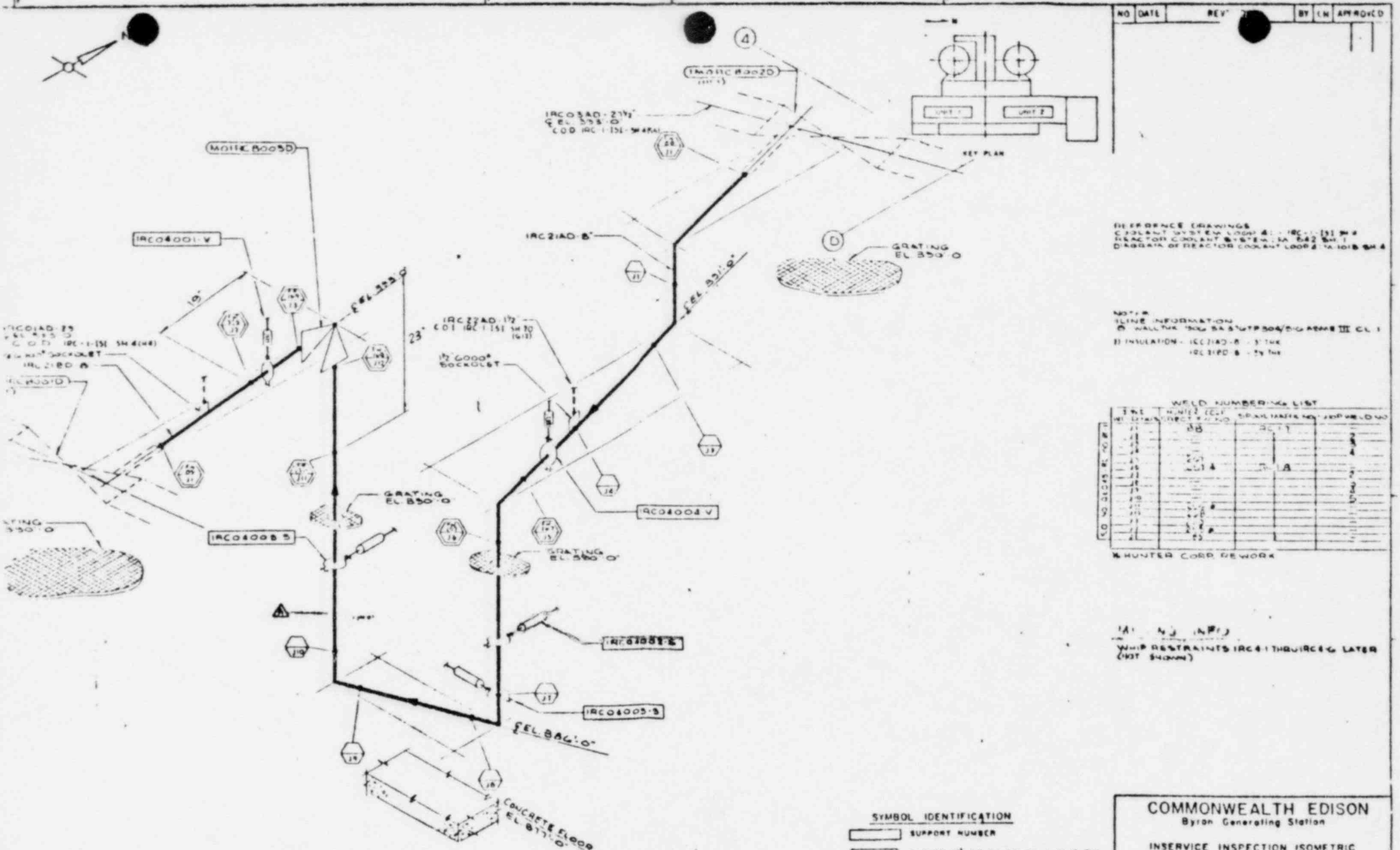
COMMONWEALTH EDISON

Byron Generating Station

INSERVICE INSPECTION ISOMETRIC
OF REACTOR COOLANT SURGE LINE
1RY11A-14"
INSIDE CONTAINMENT

ERASCO SERVICES INCORPORATED

SCALE NONE	APPROVED	DATE
DR		IRC-1-ISI
CH		SH.5 of



NO	DATE	REV	BY	CH	APPROVED

REFERENCE DRAWINGS
COOLANT SYSTEM LOOP 4 - IRC-1-[illegible] SH 4
REACTOR COOLANT SYSTEM - M-842 SH 1
DIAGRAM OF REACTOR COOLANT LOOP 4 - M-101B SH 4

NOTES
LINE INFORMATION
① WALL THK .906 SA-376 TP304/304 ASME III CL 1
② INSULATION - IRC21AD-8" - 3" THK
IRC21BD-8" - 2½ THK

WELD NUMBERING LIST

ISO DRAWING NO.	LINE NO.	HUNTER FIELD WELD NO.	SPOOL PIECE NO.	SPOOL PIECE WELD NO.
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& HUNTER CORP. REWORK

(A) N.J. (NPI)
WHIP RESTRAINTS IRC41 THRU IRC46 LATER (NOT SHOWN)

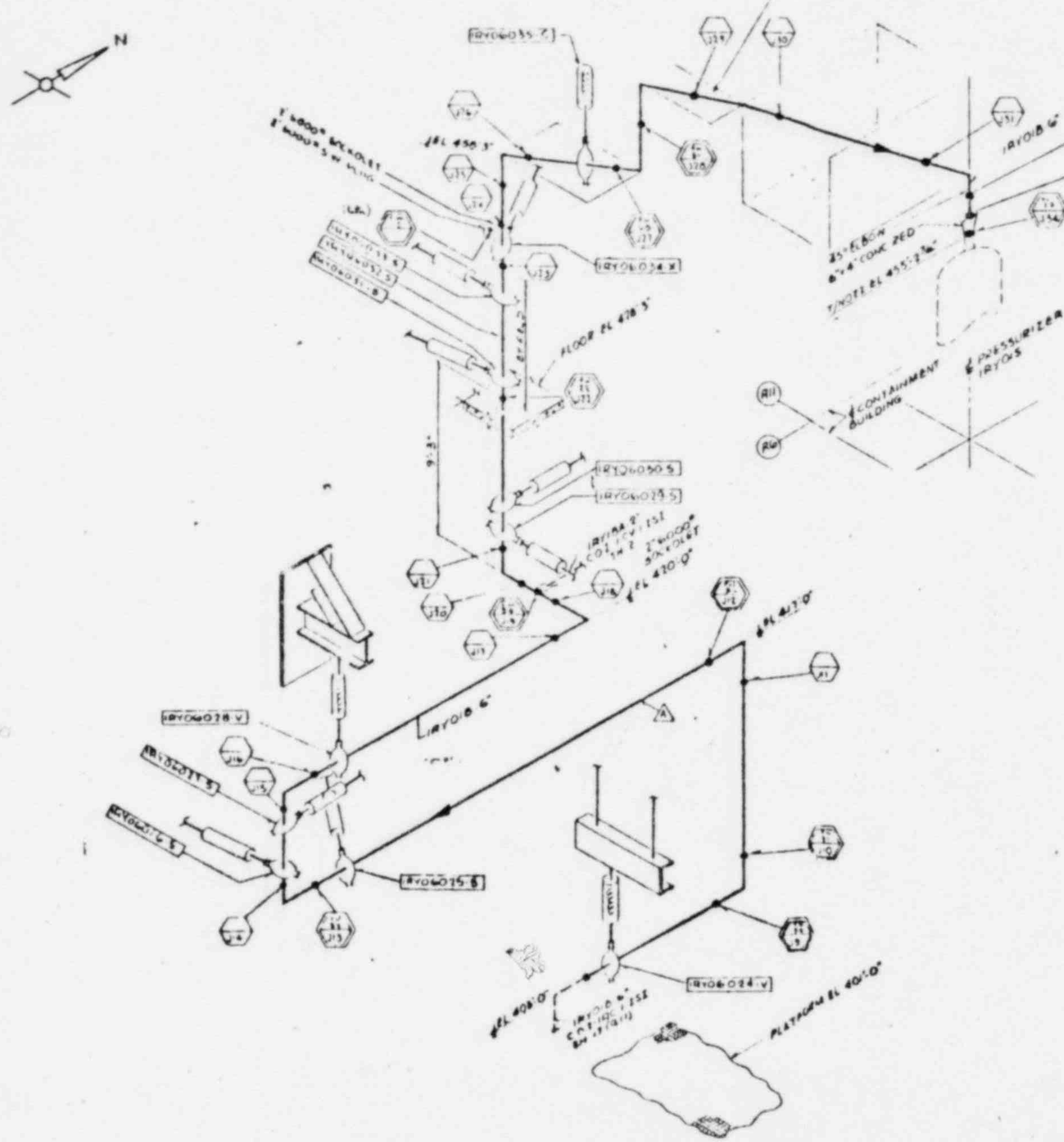
SYMBOL IDENTIFICATION
- SUPPORT NUMBER
- FLANGE NO, NO OF BOLTS, & BOLT DIA
- VALVE NUMBER
- WELD NUMBER — FIELD WELD NO
- QUALITY GROUP CLASSIFICATION
- INTEGRAL SUPPORT WELD NUMBER

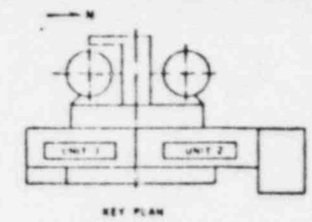
VALVE BONNET BOLTING

VALVE TYPE	NO OF BOLTS	BOLT DIA	BOLT TYPE	VALVE MANUFACTURER	MANUFACTURERS DWG NO
[illegible]	12	[illegible]	STUD BOLTS	[illegible] - VOGAN	E-161285

COMMONWEALTH EDISON
Byron Generating Station
INSERVICE INSPECTION ISOMETRIC
OF REACTOR COOLANT LINES IRC21AD-8"Ⓐ
IRC21BD-8" INSIDE CONTAINMENT
(LOOP 4)
EBASCO SERVICES INCORPORATED

SCALE NONE	APPROVED	DATE
DR		IRC-1-ISI
CH		SH. 15 of





NO	DATE	R	BY	LN	APPROVED

REFERENCE DRAWINGS:
REACTOR COOLANT PRESSURIZER SYSTEM - M547 SH 2
DIAGRAM OF REACTOR COOLANT - M1015 SH 5
PRESSURIZER IRY01S - [illegible]

NOTES:
1. LINE INFORMATION
6" - WALL THK .791" SA376 TP 304/316, ASME III CLASS 1
2. INSULATION: 3" THK

WELD NUMBERING LIST

ISI WELD NOS	WELD ... LINE DIRECTION NO	SPOOL MARK NO	SHOP WELD NO
29	56	RY-5-3	[illegible]
20	[illegible]	RY-5-2	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

* HOUTER CORP. REMOVE

[illegible] IRY06032-S

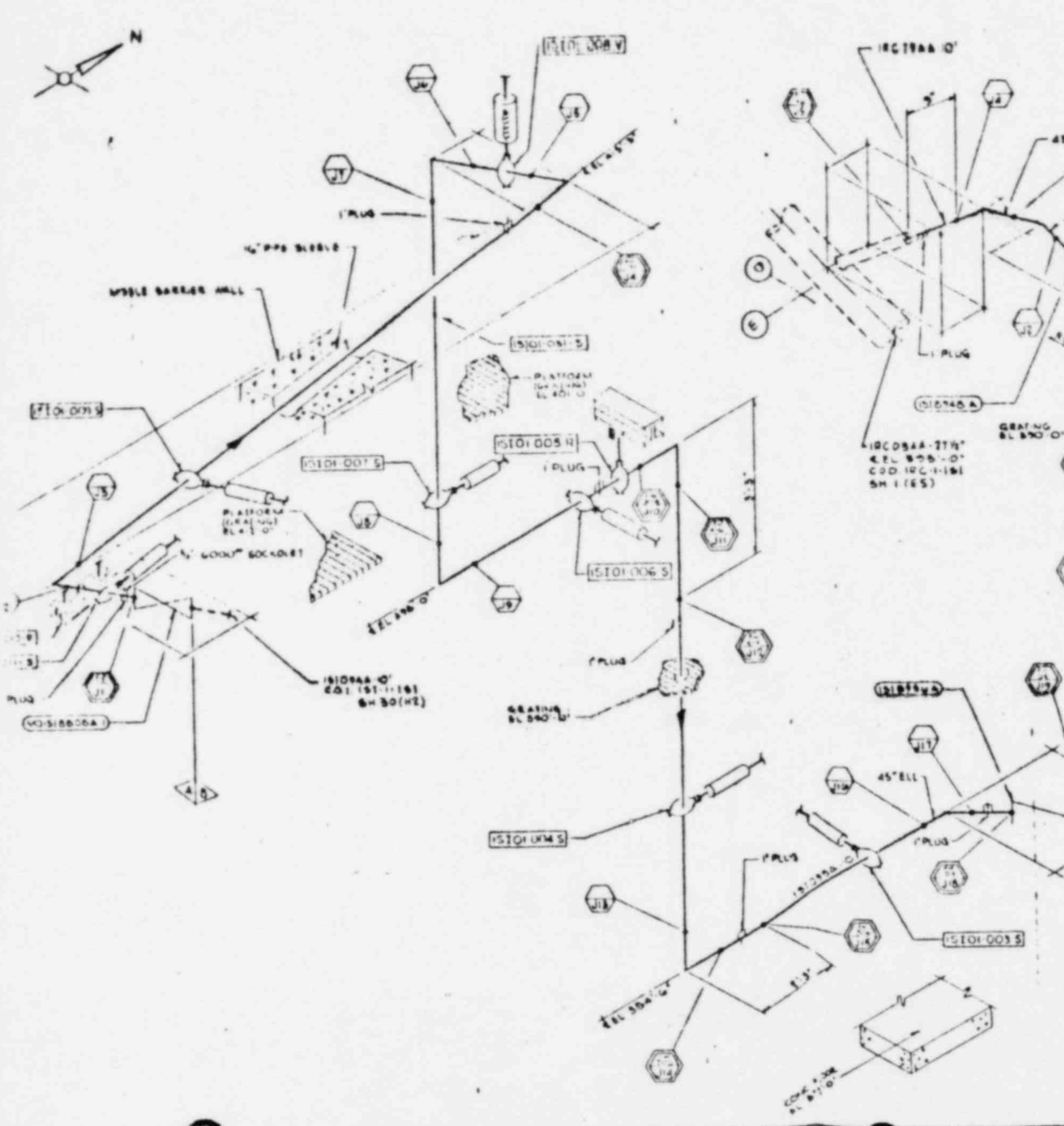
SYMBOL IDENTIFICATION
- SUPPORT NUMBER
- FLANGE NO., NO OF BOLTS, & BOLT DIA.
- VALVE NUMBER
- WELD NUMBER / FIELD WELD NO.
- QUALITY GROUP CLASSIFICATION
- INTEGRAL SUPPORT WELD NUMBER

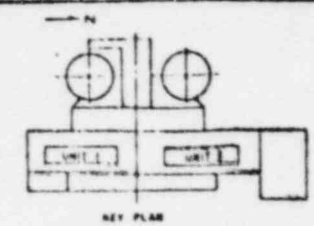
COMMONWEALTH EDISON
Byron Generating Station

INSERVICE INSPECTION ISOMETRIC
OF REACTOR COOLANT LINE
IRY01B-6"
INSIDE CONTAINMENT - LOOP 4

EBASCO SERVICES INCORPORATED

SCALE: NONE
DIV: MECH
IRC-1-ISI
SH. 16 of





REFERENCE DRAWINGS:

COOLANT SYSTEM LOOP 1 — IRC-1-181 SH 1

SAFETY INJECTION SYSTEM — M-... SH 1

DIAGRAM OF SAFETY INJECTION — M-... SH ...

NOTES

1. LINE INFORMATION ...

2. INSULATION - 5" THK (IRC29AA-10" ONLY)

WELD NUMBERING LIST

SYMBOL IDENTIFICATION

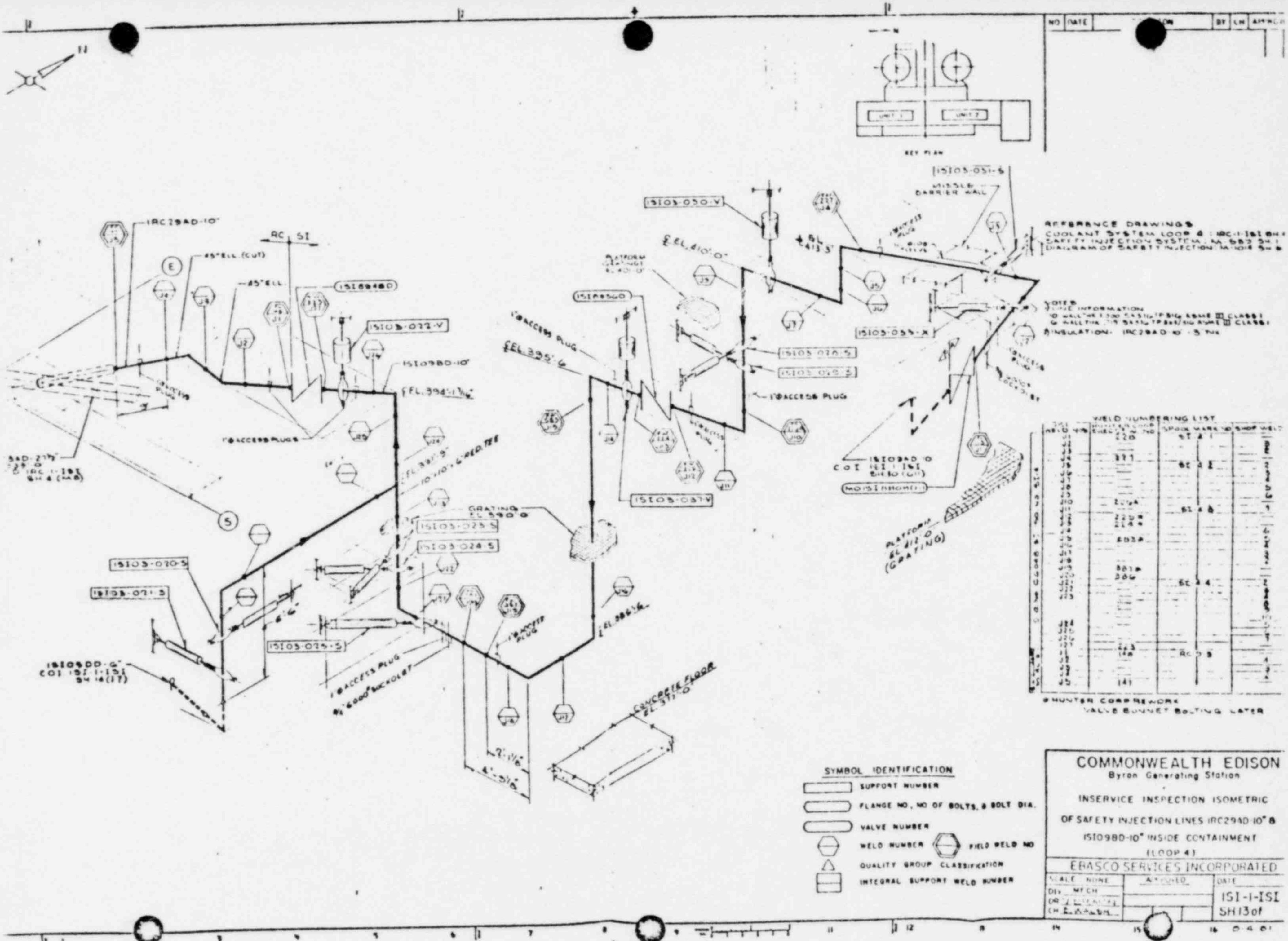
- SUPPORT NUMBER
- FLANGE NO., NO OF BOLTS, & BOLT DIA
- VALVE NUMBER
- WELD NUMBER / FIELD WELD NO
- QUALITY GROUP CLASSIFICATION
- INTEGRAL SUPPORT WELD NUMBER

COMMONWEALTH EDISON
Byron Generating Station

INSERVICE INSPECTION ISOMETRIC
OF SAFETY INJECTION LINES IRC29AA-10"
& 1SI09BA-10" INSIDE CONTAINMENT
(LOOP 1)

EBASCO SERVICES INCORPORATED

SCALE NONE | APPROVED | DATE
DIV MECH
ISI-1-ISI
SH 1 of

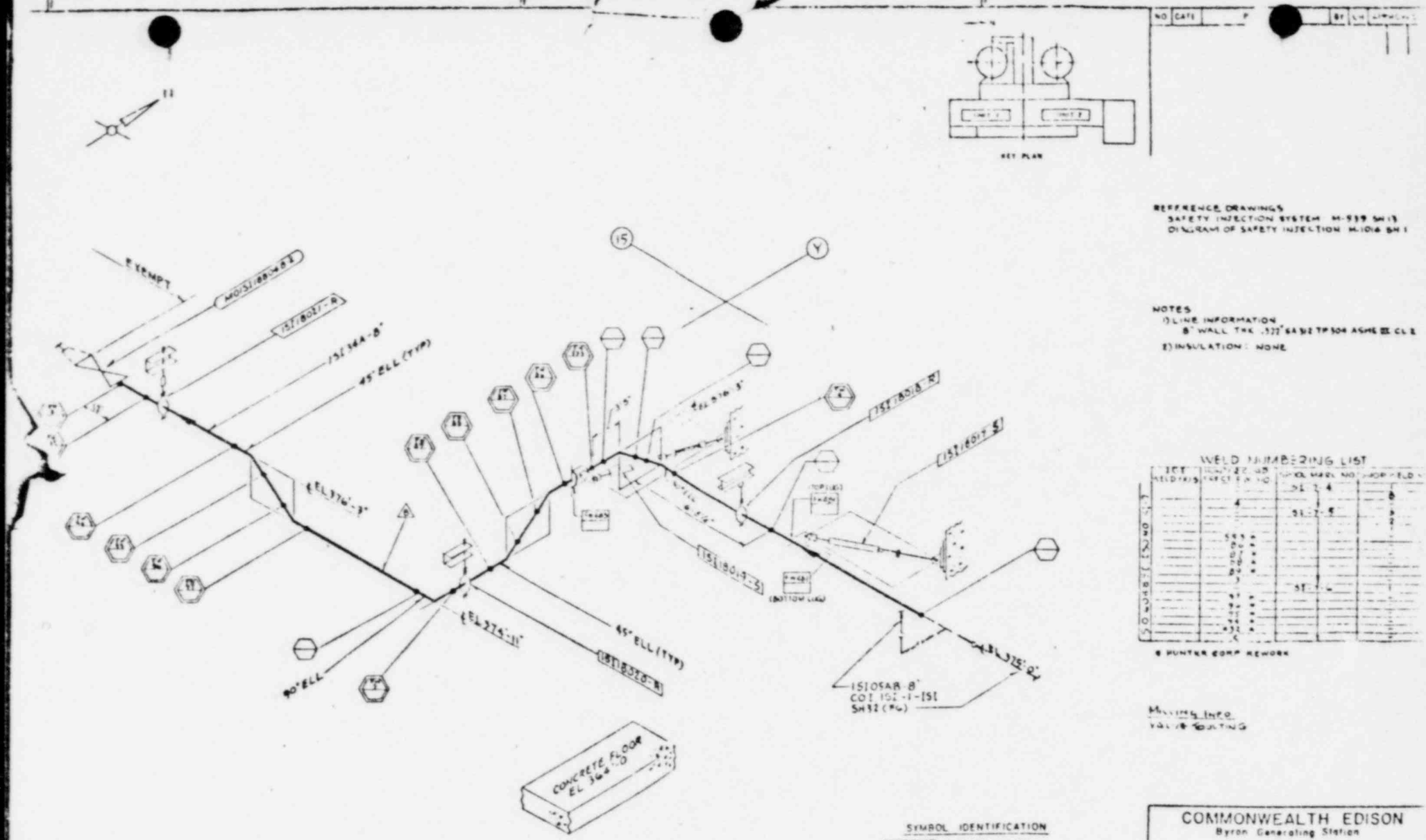


COMMONWEALTH EDISON
Byron Generating Station

INSERVICE INSPECTION ISOMETRIC
OF SAFETY INJECTION LINES 1RC29AD-10" & 1SI09BD-10" INSIDE CONTAINMENT
(LOOP 4)

EBASCO SERVICES INCORPORATED

SCALE NONE
DIV MECH
ISI-1-ISI
SH 13 of


KEY PLAN
REFERENCE DRAWINGS
SAFETY INJECTION SYSTEM M-939 SH 3
DIAGRAM OF SAFETY INJECTION M-1016 SH 1
NOTES
1) LINE INFORMATION
8" WALL THK .322" SA 312 TP 304 ASME III CL 2
2) INSULATION: NONE
WELD NUMBERING LIST
EXEMPT
45° ELL (TYP)
90° ELL
EL 376'-3"
EL 374'-11"
EL 375'-0"
1510SAB-8"
COL 151-1-151
SH 32 (PG)
CONCRETE FLOOR
EL 364'-0"
SYMBOL IDENTIFICATION
SUPPORT NUMBER
FLANGE NO., NO OF BOLTS, & BOLT DIA.
VALVE NUMBER
WELD NUMBER
FIELD WELD NO
QUALITY GROUP CLASSIFICATION
INTEGRAL SUPPORT WELD NUMBER
COMMONWEALTH EDISON
Byron Generating Station
INSERVICE INSPECTION ISOMETRIC
OF SAFETY INJECTION LINE
1513A-8"
AUXILIARY BUILDING
ERASCO SERVICES INCORPORATED
151-1-151
SH 33 of

ATTACHMENT