82-03-26

Commonwealth Edison Company

Byron Unit 1

Preservice Inspection

NDE Program Supplement

TABLE OF CONTENTS

Part I

REVISIONS TO EBASCO NDE PROGRAM PLAN

The Preservice Inspection Program Plan developed by EBASCO Services, Incorporated for Byron Unit 1 has been reviewed by Commonwealth Edison Company. As a result of this review, several sections will be revised. Following are those revised sections that will be incorporated into Revision 1 of the program plan. Note that Procedure No. 445000003 Rev. 0 has been deleted from the program plan since it was never approved or used during the reactor vessel examination. The ultrasonic examination of the safe end-to-nozzle welds and the safe end-to-pipe welds will be performed manually by EBASCO. As the examinations continue at Byron, additional changes in the plan may be necessary. The changes will be incorporated into later revisions of the program plan.

TABLE OF CONTENTS

VOLUME 2

SECTION I

PROGRAM DESCRIPTION

Section I

Program Description

1.0 SCOPE

This document, the Byron Unit 1 Preservice Inspection (PSI) Program Plan, addresses those preservice examinations that are to be performed by Ebasco Services Inc. for Commonwealth Edison Company (CECo). 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 examinations, visual examinations (other than VT-1, of Class 1 and Class 2 components), pump and valve functional tests and snubber functional tests will be performed by CECo.

2.0 IDENTIFICATION OF EXAMINATION REQUIREMENTS

The piping systems requiring examination are identified on the Sargent and 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 (i.e. pumps, vessels, heat exchangers) and the Inspection Plan for automatic ultrasonic examination of the reactor pressure vessel.

The locating and identification of specific items, such welds, bolted connections, pipe supports, that require examination were 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 and Lundy Engineers takes into account, to the extent practical, the inspection access considerations described in IWA-1500 of the Code. Specific components which require relief from examination requirments as determined during the performance of the Preservice Inspection will be incorporated into Section III of this document upon completion of all examinations.

4.0 EXAMINATION EQUIPMENT

A listing of test calibration blocks will be 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 could 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 are included in the scope of this document. The drawings will be incorporated into Section IX of this document upon completion of all examinations.

SECTION II

IDENTIFICATION OF EXAMINATION REQUIREMENTS

The following list contains the ASME Section III Class 1 and 2 piping systems covered under the Byron Unit #1 Preservice Program Plan:

System's Code	System	Total # of pages.
(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

Note: * The CS System is exempt from Code Section XI examination requirements per articles IWC-1220 (a) and IWC-1220 (b) of the 1974 Edition Summer 1975 Addenda of the Code. However, an augumented Preservice examination was conducted on the CS System piping up to the outermost containment isolation valve (as indicated in the Preservice Piping Line List).

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 Volumetric	Surface	Visual	CODE EXEMPTION 74 S'75	RELIEF REQUEST	ISI FLOW DIAGRAM
1	1	2	3	4	5	6	7	8							
1CS01AP	16.00	M-046-01	65	165	75	200	B	01408B	C-F		X				
1CS01AB	16.00	M-046-01	65	165	75	200	B	01408B	C-F		X				
1CS02AA	10.00	M-046-01	250	165	275	200	B	03408B	C-F		X				
1CS02AB	10.00	M-046-01	250	165	275	200	B	03408B	C-F		X				
1CS02B	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02C	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02D	4.00	M-046-01	100	165	275	200	B	03408B	C-H			VT-2	IWC1220d		
1CS02E	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02F	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02GA	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02GB	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02H	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02J	6.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02KA	10.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02KB	10.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02L	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS02M	8.00	M-046-01	100	165	275	200	B	03408B	C-F			VT-2	IWC1220a		
1CS03AA	0.75	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	IWC1220d		
1CS03BA	0.75	M-046-01	65	165	75	200	B	01408B	C-H			VT-2	IWC1220d		
1CS01AA	0.75	M-046-01	250	165	275	200	B	03408B	C-H			VT-2	IWC1220d		

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 Volumetric	Surface	Visual	CODE EXEMPTION /4 S '75	RELIEF REQUEST	ISI FLOW DIAGRAM
	1	2	3	4	5	6	7	8								
1CS04BA	0.75	M-046-01	250	165	275	200	B	034008B	C-H			VT-2	IWC1220(			
1CS05AA	3.00	M-046-01	250	165	275	200	B	034008B	C-H			VT-2	IWC1220(			
1CS05AB	3.00	M-046-01	250	165	275	200	B	034008B	C-H			VT-2	IWC1220(			
1CS06AA	6.00	M-046-01	65	165	75	200	B	014008B	C-F		X					
1CS06AB	6.00	M-046-01	65	165	75	200	B	014008B	C-F		X					
1CS07AA	1.00	M-046-01	65	165	75	200	B	014008B	C-H			VT-2	IWC1220(			
1CS07AB	1.00	M-046-01	65	165	75	200	B	014008B	C-H			VT-2	IWC1-20(			
1CS08AA	1.00	M-046-01	65	165	75	200	B	014008B	C-H			VT-2	IWC1220(			
1CS08AB	1.00	M-046-01	65	165	75	200	B	014008B	C-H			VT-2	IWC1220(			
1CS09AA	0.75	M-046-01	250	165	275	200	B	034008B	C-H			VT-2	IWC1220(			
1CS09AB	0.75	M-046-01	250	165	275	200	B	034008B	C-H			VT-2	IWC1220(			
1CS10AA	6.00	M-046-01	250	165	275	200	B	034008B	C-F		X					
1CS10AB	6.00	M-046-01	250	165	275	200	B	034008B	C-F		X					
1CS11AA	1.00	M-046-01	65	165	75	200	B	014008B	C-H			VT-2	IWC1220(			
1CS11AB	1.00	M-046-01	65	165	75	200	B	014008B	C-H			VT-2	IWC1220(			
1CS12AA	3.00	M-046-01	75	120	150	120	B	034008B	C-H			VT-2	IWC1220(			
1CS12AB	3.00	M-046-01	75	120	150	120	B	034008B	C-H			VT-2	IWC1220(			
1CS13A	1.00	M-046-01	10	150	150	150	B	014008B	C-H			VT-2	IWC1220(			
1CS14A	1.00	M-046-01	10	150	150	150	B	014008B	C-H			VT-2	IWC1220(			
1CS16A	1.00	M-046-01	10	150	150	150	B	014008B	C-H			VT-2	IWC1220(			

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CONTAINMENT SPRAY

LINE NUMBER: System	LINE NUMBER: Number	SIZE	P&I DIAGRAM	MAX. OPERATING CONDITIONS: PRESS PSIG	MAX. OPERATING CONDITIONS: TEMP. FAHR.	DESIGN CONDITIONS: PRESS PSIG	DESIGN CONDITIONS: TEMP. FAHR.	PIPING CLASS	PIPE DESIGN TABLE	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
		1	2	3	4	5	6	7	8							
1CS17AA		1.00	M-046-01	75	120	150	120	B	014088	C-H			VT-2	IWC1220d		
1CS17AB		1.00	M-046-01	75	120	150	120	B	014088	C-H			VT-2	IWC1220d		
1CS18AA		3.00	M-046-01	75	120	150	120	B	014088	C-H			VT-2	IWC1220d		
1CS18AB		3.00	M-046-01	75	120	150	120	B	014088	C-H			VT-2	IWC1220d		
1CS23AA		14.00	M-061-04	65	165	75	200	B	014088	C-F		X				
1CS23AB		14.00	M-061-04	65	165	75	200	B	014088	C-F		X				
1CS24AA		2.00	M-046-01	10	150	150	150	B	014088	C-H			VT-2	IWC1220d		
1CS24AB		2.00	M-046-01	10	150	150	150	B	014088	C-H			VT-2	IWC1220d		
1CS28AA		10.00	M-046-01	200	165	275	200	B	034088	C-F			VT-2	IWC1220d		
1CS28AB		10.00	M-046-01	200	165	275	200	B	034088	C-F			VT-2	IWC1220d		
1CS30AA		1.00	M-046-01	75	120	150	120	B	014088	C-H			VT-2	IWC1220d		
1CS30AB		1.00	M-046-01	75	120	150	120	B	014088	C-H			VT-2	IWC1220d		
1CS32A		1.00	M-046-01	150	120	150	120	B	014088	C-H			VT-2	IWC1220d		
1CS32B		1.00	M-046-01	50	140	50	140	B	014088	C-H			VT-2	IWC1220d		
1CS36AA		0.50	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		
1CS36AB		0.50	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		
1CS37AA		0.50	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		
1CS37AB		0.50	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		
1CS38AA		0.50	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		
1CS38AB		0.50	M-046-01	250	165	275	200	B	034088	C-H			VT-2	IWC1220d		

PRESERVICE PIPING SYSTEMS
PROGRAM PLAN

PROJECT: BYRON STATION UNIT 1

SYSTEM IDENTIFICATION: CONTAINMENT SPRAY

Notes	Line Number	Size	P&I Diagram	Max Operations Conditions Press PSIG	Max Operations Conditions Temp FAHR	Design Conditions Press PSIG	Design Conditions Temp FAHR	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							
	1CS39AA	1.00	M-046-01	250	165	275	200	B	034088	C-H			VT-2	1WC1220d		
	1CS39AB	1.00	M-046-01	250	165	275	200	B	034088	C-H			VT-2	1WC1220d		
	1CS40A	0.75	M-046-01	10	150	150	150	B	014088	C-H			VT-2	1WC1220d		
A	1CS41AA	0.75	M-046-01	250	165	275	200	B	034088	C-H			VT-2	1WC1220J		
A	1CS41AB	0.75	M-046-01	250	165	275	200	B	034088	C-H			VT-2	1WC1220d		
A	1CS42AA	0.50	M-082-01	250	290	275	300	B	034088	C-H			VT-2	1WC1220d		
A	1CS42AB	0.50	M-082-01	250	290	275	300	B	034088	C-H			VT-2	1WC1220d		
A	1CS43AA	0.50	M-082-01	250	290	275	300	B	034088	C-H			VT-2	1WC1220d		
A	1CS43AB	0.50	M-082-01	250	290	275	300	B	034088	C-H			VT-2	1WC1220d		

4 S 75

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: ACCUMULATOR TANK NO. ISI 04T-A

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
			UT	PT	VT				
Bottom Head-To-Shell Circumferential Weld	ATC-01	C-A	X					ISI 04T-A	Fig IWC-2520-1
Upper Head-To-Shell Circumferential Weld	ATC-02	C-A	X					ISI 04T-A	Fig IWC-2520-1
Skirt Support Weld	ATS-01	C-C		X				ISI 04T-A	Fig IWC-2520-5
Outlet Nozzle-To-Vessel Weld	ATN-01	C-B	X	X				ISI 04T-A	Fig IWC-2520-4

REMARKS.

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: ACCUMULATOR TANK NO. ISI 04T-B

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
			UT	PT	VT				
Bottom Head-To-Shell Circumferential Weld	ATC-01	C-A			VT-2			ISI-04T-B	See Remarks
Upper Head-To-Shell Circumferential Weld	ATC-02	C-A			VT-2			ISI-04T-B	See Remarks
Skirt Support Weld	ATS-01	C-C			VT-2			ISI-04T-B	See Remarks
Outlet Nozzle-To-Vessel Weld		C-B			VT-2			ISI-04T-B	See Remarks

REMARKS: Examination of Accumulator Tank ISI 04T-B are as noted for Tank ISI-04T-A. 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, the required examination may be limited to one vessel or distributed among the vessels," only VT-2 shall be performed for ISI-04T-B.

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: ACCUMULATOR TANK NO. ISI 04T-C

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-Shell Circumferential Weld	ATC-01	C-A			VT-2			ISI-04T-C	See Remarks
Upper Head-To-Shell Circumferential Weld	ATC-02	C-A			VT-2			ISI-04T-C	See Remarks
Skirt Support Weld	ATS-01	C-C			VT-2			ISI-04T-C	See Remarks
Outlet Nozzle-To-Vessel Weld		C-B			VT-2			ISI-04T-C	See Remarks

REMARKS: Examination of Accumulator Tank ISI 04T-C are as noted for Tank ISI-04T-A. 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, the required examination may be limited to one vessel or distributed among the vessels," only VT-2 shall be performed for ISI-04T-C.

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT	SYSTEM IDENTIFICATION
BYRON UNIT 1	ACCUMULATOR TANK NO. ISI 04T-D

WELD OR ITEM IDENTIFICATION		EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
			UT	PT	VT				
Bottom Head-To-Shell	ATC-01	C-A			VT-2			ISI-04T-D	See Remarks
Circumferential Weld									
Upper Head-To-Shell	ATC-02	C-A			VT-2			ISI-04T-D	See Remarks
Circumferential Weld									
Skirt Support Weld	ATS-01	C-C			VT-2			ISI-04T-D	See Remarks
Outlet Nozzle-To-Vessel Weld		C-B			VT-2			ISI-04T-D	See Remarks

REMARKS: Examination of Accumulator Tank ISI 04T-D are as noted for Tank ISI-04T-A. 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, the required examination may be limited to one vessel or distributed among the vessels," only VT-2 shall be performed for ISI-04T-D.

SECTION III

INSPECTION ACCESS

Section III

Inspection Access

Access problems encountered during Preservice Inspection will be identified by Ebasco and incorporated in the program plan when examinations are completed.

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 along with their fabrication drawings will be incorporated in the program plan when examinations are complete.

SECTION V
PROCEDURES

TITLE	LEGEND	DATE
Marking and Identification of Components for Inservice Inspections	R - INDICATES REVISION	January 12, 1982

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
	N Paul	Walter Sawicky	September 1, 1981

REV	PREPARED	APPROVED
3		WS

1.0 PURPOSE & SCOPE

1.1 This procedure provides instructions for the identification and marking of 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 preservice inspection records, components requiring examination shall be identified 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 welds/component requiring preservice examination.

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

3.0 WELD REFERENCE MARKING FOR PIPING SYSTEMS

3.1 In order to assure adequate test duplication for welds requiring volumetric examination, 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 with a "V" using a low stress stamp or vibro-etch to indicate the scan starting point and scan direction. The Client shall provide two sets of low stress stamps. These sets shall be segregated such that stamps used on carbon steel are not employed on stainless steel systems.

The following rules apply for determining and stamping the zero reference location (Lo) on pipe welds. A low stress metal stamp shall be used to indicate the starting reference point (Lo) by marking the weld with a "V". 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 given 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.

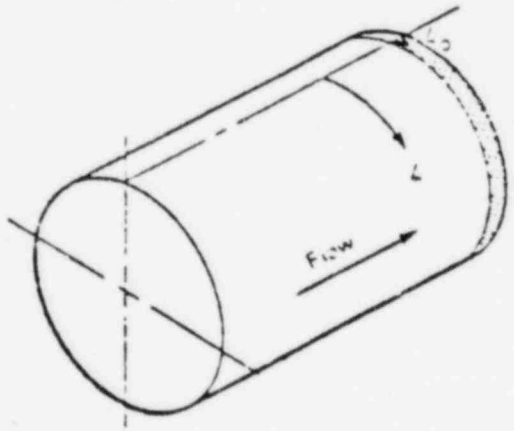
4 - If there is no elbow above or below a vertical weld, choose the most convenient location.

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

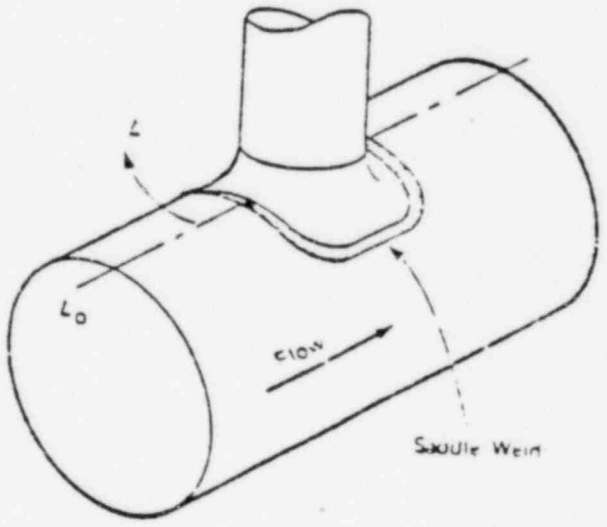


FIG. 3.1A item #2

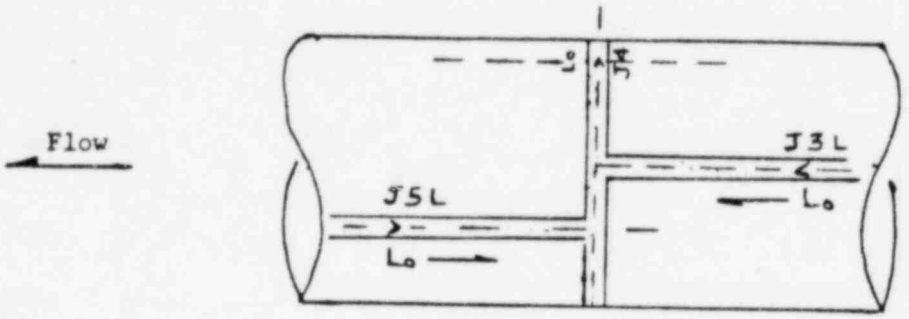


FIG. 3.1A Item #3

Note: For measuring the Lo reference marking on Class 1 and 2 piping systems with longitudinal seams. The distance between the Lo marking and the intersecting circumferential weld is as follows:

1. Class 1 - at least a pipe-diameter but no more than 12 in.
2. Class 2 - 2.5T

4.0 IDENTIFICATION OF FULL PENETRATION PIPING WELDS

4.1 In order to identify individual weld seams for inservice inspection a unique designation must be added to the original fabrication identification. This designation shall be alpha-numeric and shall be indicated on isometric drawings together with the original fabrication identification. The designation shall be stamped on the piping system at the vicinity of the weld's reference centerline and direction of scan "V" stamp.

4.2 The alpha-numeric systems to be used consists of the letter designations assigned by Section XI to examination categories, the number designation is determined by sequentially numbering welds in the direction of flow. For systems originating at vessels, numbering shall be starting with the nozzle safe-end to pipe weld. The following examples are given.

Line #	Sec. XI Weld Cat.	Fabrication Weld ID	ISI ID
IRY 11A 14	BF	FW 23	F1
IRY 11A 14	BJ	SW 17	J4
IRY 11A 14	BJ	SW 18	J5L
IRC 01 AD 29	BK1	None	K2

Pressurizer Surge line #IRY 11A 14 shown above, F1 is the first surge line dissimilar metal weld connecting to the pressurizer vessel. J4 is the fourth surge line similar metal weld, J5L is a longitudinal seam intersecting J4. K2 is the second integrally welded attachment to the Reactor Coolant system line #IRC 01 AD 29.

5.0 WELD SEAM IDENTIFICATION FOR VESSELS

5.1 The radiographic area markers stamped on the vessel for ASME Section III radiographic examination 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 is provided in the RPV Inspection Program Plan.

5.2 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.

5.3 Identification of nozzle to vessel welds shall employ the nozzle's number and reference the applicable piping system line number.

5.4 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 fabrication identification.

6.0 BOLTING IDENTIFICATION

6.1 Identification for bolts, studs and nuts for components requiring examination shall follow the numbers and sequence of the applicable PSI isometric contained in the PSI Program Plan.

7.0 STEAM GENERATORS TUBE IDENTIFICATION

7.1 All eddy current test data shall correlate to the steam generator tube sheet template supplied by the client.

7,2 The tube sheet templates shall identify row and column for each steam generator tube.

7.3 The tube sheet template shall identify inlet or outlet side for the specific steam generator.

TITLE	LEGEND	DATE
MULTIFREQUENCY EDDY CURRENT EXAMINATION OF WESTINGHOUSE STEAM GENERATOR TUBING	R - INDICATES REVISION	February 2, 1982

PREPARED BY	REVIEWED BY	APPROVED BY	REPLACES ISSUE OF
N. Ruf		Walter Sawicky	December 30, 1981

REV	PREPARED	APPROVED
2	NF	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.

1.2 The principal objective of examination is to assess the integrity of the entire accessible and interpretable length 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 ASME Section V, 1977, Winter 1979

2.1.3 Ebasco Services Incorporated procedure for "Training, Examination and Certification of Nondestructive Examination Personnel", NDE 1.2

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. Manual pulling of probe during examination, when needed, shall be performed by a Level I or higher.

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 Differrential or equivalent.

4.3 Data interpretation shall be performed employing the following equipment :

4.3.1 Zetec M1Z-12 Display or equivalent.

4.3.2 Zetec Tape Recorder HP 3968 AZ or equivalent.

4.3.3 Zetec Vector Analyzer DM-3VA or equivalent.

4.4 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.

4.5 Zetec MIZ 12 Remote Amplifier System (RAS), when required.

4.6 System performance characteristic of Eddy Current Instruments, Tape Recorders, and Strip Chart Recorders shall be verified as per the requirements of ASME Section XI, 1977 through Summer 78 addenda, Article IV-3100 at least once a year. Equipments shall meet the requirements of ASME Section V, 1977 Winter 78 addenda Article 8, Appendix I.

5. SURFACE PREPARATION

5.1 Inside diameter 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) diameter 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) diameter X 60% through from the outer tube wall surface.

7.1.4 Flat-bottom drill hole 3/16 in. (4.8mm) diameter 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.

7.1.7 Sample support ring (if available).
Note: Either sample support ring or the actual tube support may be used for calibration.

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 be 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 Establish location of control-operation center with consultation with plant personnel.

8.5 Arrange for power distribution at control-operation center.

8.6 Install the communication system control box at the control-operation center.

8.7 Establish communications with headsets between the steam generator(s) and the control-operation center.

8.8 Check the operation of the remotely operated eddy current probe positioner.

8.9 Install the tube sheet templates, when required, on the tube sheet of the steam generator.

8.10 Install remotely operated probe position in channel head of the steam generator.

8.11 Connect power supply-control cable assembly to remotely operated probe positioner.

8.12 Install remotely operated probe pusher-puller near channel head of steam generator with control at control-operation center.

8.13 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 M1Z-12 upper mix vertical output to number 1 channel of strip chart recorders.

9.1.3.2 Tape recorder channel 1 vertical output to number 2 channel of strip chart recorder.

9.1.3.3 M1Z-12 channel 4 vertical output to number 3 channel of strip chart recorders.

9.1.3.4 Tape recorder channel 1 horizontal output to number 4 channel of the strip chart recorders.

TITLE	LEGEND	DATE
MULTIFREQUENCY EDDY CURRENT EXAMINATION OF WESTINGHOUSE STEAM GENERATOR TUBING	R - INDICATES REVISION	February 2, 1982
		REPLACES ISSUE OF: December 30, 1981

REV	PREPARED	APPROVED
2	NF	WS

9.1.4 Connect multipin-connector and phone connector from OMB to tape recorder.

9.1.5 Connect the strip chart cables from OMB 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 or remote amplifier system.

9.1.7 Connect probe to absolute probe connection on back of M1Z-12 using about 110 feet probe extension coax or remote amplifier system.

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	550 KHz	Differential	55
2	140 KHz	Differential	30
3	10 KHz	Differential	50
4	100 KHz	Absolute	40

Note: 10 KHz differential examination shall be employed for detection of the extent of sludge formation on the tube plate.

9.2.4 Frequencies shall be within $\pm$ 5% of the listed values.

9.2.5 The gains listed are for examples only. Actual gains, used during the calibration, shall be recorded on the magnetic tape and strip chart recorders.

9.2.6 Set 200 mv/div for all the four channels of strip chart recorders. (Turn fine sensitivity control until it clicks in lock position.)

9.2.7 Channel 1 Calibration

9.2.7.1 Insert probe in defect free area of the standard.

9.2.7.2 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.

9.2.7.3 Press auto balance on MIZ-12 tester.

9.2.7.4 Check phase of 100% through wall signal on MIZ-12 display as the probe is pulled through the standard. Set phase so that 100% through wall hole signal goes to the right first as probe is pulled through the standard and signal is horizontal. Note phase setting and add 40°. Standard hole signal should now be at 40° and go down first when probe is pulled through the standard.

9.2.7.5 Amplitude of signal from 100% hole must exceed 50% full screen height during calibration. If signal is less than 50% full screen height, adjust sensitivity upwards until signal exceeds 50% full screen height.

9.2.7.6 Obtain the support ring signal and note the amplitude.

9.2.8 Channel 2 Calibration

9.2.8.1 Insert probe in defect free area of the standard.

9.2.8.2 Re-press channel 1 button so it is out and press in channel 2 button on MIZ-12 display.

9.2.8.3 Press auto balance on MIZ-12 tester.

9.2.8.4 Follow same procedure used in paragraph 9.2.7.4.

9.2.8.5 Obtain support ring signal.

9.2.8.6 Amplitude of the support ring signal from channel 2 must be within 1/2 volt peak to peak of the amplitude of the support ring signal from channel 1. If signal is not the correct amplitude, adjust sensitivity of channel 2 up or down until signal amplitude is correct.

9.2.9 Channel 3 Calibration

9.2.9.1 Insert probe in defect-free area of standard.

9.2.9.2 Re-press channel 2 button so it is out and press in channel 3 button on MIZ-12 display.

9.2.9.3 Check phase of signal from support. Signal should be vertical and go down first as probe is pulled through standard. If support signal does not go down first and is not vertical, estimate phase angle error and make that direct change using phase controls. Re-check to see if phase is correct after adjustment. Continue adjustment until phase is correct.

9.2.9.4 Amplitude of signal from the support must exceed 50% full screen height during calibration. If signal is less than 50% full screen height, adjust sensitivity upwards until signal exceeds 50% full screen height.

9.2.10 Channel 4 Calibration

9.2.10.1 Insert probe connected to absolute probe connection in a defect free area of calibration standard and attach with tape.

9.2.10.2 Insert test probe in defect free area of calibration standard.

9.2.10.3 Re-press channel 3 button so it is out and press in channel 4 button on M1Z-12 display.

9.2.10.4 Press auto balance on M1Z-12 tester.

9.2.10.5 Check phase of 100% through wall hole signal on M1Z-12 display as probe is pulled through standard. 100% through wall hole signal should go up and probe motion should be horizontal. If phase is incorrect, estimate correction and adjust phase controls. Re-check phase to make sure defect goes up and probe motion is horizontal. Continue this procedure until phase is correct.

9.2.10.6 The absolute data may be used to evaluate possible discontinuities in the bend areas of the tubes. In no case should the signal be saturated in these areas during examination. If signal is saturated, reduce gain until signal is not saturated and re-calibrate the system.

9.2.10.7 Since the overall system employs the differential method, the CRT presentation for the absolute channel will not be as shown in figure IV-3300-2 of Appendix IV .

9.2.11 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.

9.2.12 Any one of the channel "Bal" push buttons will balance all channels simultaneously. Any change in gain requires rebalancing.

9.3 Upper Mix Calibration

9.3.1 Remove upper M1Z-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 horizontal mix phase until signal is a straight line at approximately 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 as small as possible.

TITLE	LEGEND	DATE
MULTIFREQUENCY EDDY CURRENT EXAMINATION OF WESTINGHOUSE STEAM GENERATOR TUBING	R - INDICATES REVISION	February 2, 1982

REPLACES ISSUE OF: December 30, 1981

REV	PREPARED	APPROVED
2	MF	WS

9.3.11 Note the phase angle of signal as the probe past 100% through hole. Adjust out-phase control on upper MIZ-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 The recording speed of magnetic tape recorder shall be 3 3/4 inches/second.

9.6 System Calibration, Frequency of Calibration Checks, Recalibration and Recording

9.6.1 System calibration 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. System calibration including the recording of results of the test standard shall be done at the beginning of each magnetic tape and strip chart. The following particulars of system calibration shall be recorded on the magnetic tape and strip chart recorders.

9.6.1.1 Tube material, outside diameter and wall thickness.

9.6.1.2 Eddy current instrument make, model, serial number of each frequency module, phase and sensitivity of all frequencies.

9.6.1.3 Display make, model and serial number.

9.6.1.4 Tape recorder make, model and serial number.

9.6.1.5 Strip chart recorders, makes, model numbers, serial numbers, speeds and sensitivities in all channels.

9.6.1.6 Probe make, model and size.

9.6.1.7 Calibration standard serial number.

9.6.1.8 Operator name and certification level.

9.6.1.9 Date and time of calibration.

9.6.1 10 Remote amplifier Make, Model and Serial #.

9.6.2 At the beginning of each magnetic tape and strip chart, the following information shall be recorded.

9.6.2.1 Name of Owner

9.6.2.2 Plant site

9.6.2.3 Steam Generator Identification

9.6.2.4 Date of examination

9.6.2.5 Test frequency (KHz)

9.6.2.6 Reel number

9.6.2.7 Calibration Standard identification

9.6.2.8 Operator's name, certification level, and company affiliation

9.6.2.9 Side of examination (inlet or outlet side)

9.6.3 The system calibration shall be verified and the results of the test standard recorded at the end of each magnetic tape and strip chart roll, and with no more than 4 hr. between the calibration.

9.6.4 If the equipment is out of calibration, it shall be re-calibrated. 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 reinspected.

9.6.5 Calibration shallbe done in two steps.

Step 1 - Run the test standard and record signals.
Step 2 - Using support ring run for about 15 seconds to record about 30 signals.

9.7 Hold the mike button of OMB 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 entire tube length. 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 tape and strip chart.

10.3.5 Start both tape recorder and strip 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 Withdrawal of probe during hand operation shall be with a steady rhythm avoiding jerks.

10.5 During the scan, operator shall set display on 2V/Div. and monitor channels 1, 2, 3 and 4 on MIZ-12 display to determine equipment is operating properly and calibration has not changed. This allows operator to check recording on tape recorder. Presentation on screen when tape recorder is on "record" is from the play back heads of the tape recorder.

In addition, the operator shall monitor the strip chart recorders for proper signals. The tape recorder will pass through signals to the strip chart recorders without the tape being recorded. Therefore, the signals on the 2 strip chart recorders are set up so one signal on each strip chart recorder is coming directly from the tape recorder. If the tape recorder is recording, the 2 signals on each strip chart will be slightly displaced from each other. This must be checked continuously as this is the only assurance you have that the tape recorder is recording.

10.6 The probe speed during the scan shall not exceed 14 in./sec. Verification of scan speed shall be performed before and after the entire examination.

10.7 Examination of tubes at additional frequencies may be performed to evaluate possible discontinuity indications.

10.8 "Checkoff Sheet" shall be used by the both operator and data interpreter. Operator shall list the tubes that could not be tested in the regular run but shall be tested later and data interpreter shall list the tubes that require re-testing.

11. DATA INTERPRETATION AND EVALUATION

11.1 The strip chart and magnetic tapes shall be reviewed by the data interpreter.

11.2 A data evaluation curve, table or equivalent method to relate phase angle to depth of wall penetration shall be used to interpret signals.

11.3 Evaluation shall be made of any recorded indication. Indications resulting from the presence of scratches or permeability variations shall be considered as nonrelevant and need not be reported.

11.4 Indications of tube wall penetration shall be evaluated and depth of penetration shall be determined. Those indications showing 20% or more through wall penetration shall be reported on the "Indication Report Sheet" with their axial locations along the length of the tube.

11.5 The presence of dents and their axial locations shall be reported.

11.6 Further evaluation of reportable indications to determine disposition shall be the responsibility of the client.

12. REPORTS

12.1 Detailed eddy current 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.

12.2 Data shall be entered, as required foreach 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.

12.3 The final data package shall consist of magnetic tapes, strip chart rolls, calibration standards and reports showing reportable indications. The final data package shall identify tubes or extent of tube-length that could not be examined due to access-problem.

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION
EDDY CURRENT EXAMINATION
CHECKOFF SHEET

CHECKOFF SHEET NO. ____________

(ER AND PLANT SITE ____________________________

STEAM GENERATOR ____________

ROW	COLUMN	REEL NO. AND SIDE	OPERATOR'S INITIAL	REMARKS (IF ANY)

EBASCO SERVICES INCORPORATED
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	REEL NO. AND SIDE	% TUBE WALL PENETRATION	ORIGIN	OTHER (MENTION TYPE)	LOCATION	REMARKS (IF ANY)

INTERPRETER AND LEVEL ______________ DATE ____________ REVIEWED BY AND DATE ______________

RMEABILITY CHANGE	PC	DISTORTED SIGNAL	DS	NO TEST	NT
.D. CHATTER	IC	DENT	DT		
TUBE NOISE	TN	PLUGGED	PLG		

Ebasco Services Incorporated_____

Owner_____Plant Site_____

Component Identification_____

Date_____Test Frequency_____

Reel_____Side_____

Cal. Standard S/N_____

Operator and Level_____

Examination From_____

Start (R&C)_____STOP(R&C)_____

At the beginning on strip chart & tape. Also record the signals from the standard & simulated tube sheet ring.

Multi-Frequency Calibration

E.C. Instrument Zetec Model M1Z 12 S/N_____

CH #1 S/N_____Freq_____ Phase_____Gain_____

CH #2 S/N_____Freq_____ Phase_____Gain_____

CH #3 S/N_____Freq_____ Phase_____Gain_____

CH #4 S/N_____Freq_____ Phase_____Gain_____

Upper Mix S/N_____Lower Mix S/N_____

V Phase_____V Phase_____

H Phase_____H Phase_____

V Gain_____V Gain_____

H Gain_____H Gain_____

Out Phase_____Out Phase_____

Display Zetec Model M1Z 12 S/N_____

Tape Recorder Zetec Model HP 3968AZ S/N_____

Strip Chart Recorder Brush Model 220 S/N_____

Speed _____CH #1 Sens_____CH #2 Sens_____

Strip Chart Recorder Brush Model 220 S/N_____

Speed_____CH #3 Sens_____CH 4 Sens_____

Material_____Dia_____Thickness_____

Cal Std S/N_____Procedure # and Rev_____

Probe Zetec Model_____Size_____Cable Length_____

Operator & Level_____Date & Time_____

sheet 1 of 2

Calibration Verification

Date_____ Time_____

Verification Accepted ☐ Not Accepted ☐

Operator & Level_____

At the end & for 4 hrs. requirement on strip chart & tape. Also record the signals from standard.

1271/3-81

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE ENGINEERING
INSERVICE INSPECTION

ADDENDA NO. 1 TO ISI PROCEDURE NO. ISI-ET-S78-1

CLIENT	PROJECT
COMMONWEALTH EDISON COMPANY	BYRON UNITS 1 & 2

PREPARED BY	REVIEWED BY	APPROVED BY AND DATE
N Faul	[signature]	Walter Sawicky 12/30/81

1. Add the following subsections to section 3.0

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

3.4 In the process of being qualified and certified to at least Level I in the eddy current 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.

Part II

ADDITIONAL DESCRIPTION OF PRESERVICE INSPECTION PROGRAM

The following narratives are being provided per request of the NRC Staff after a review of the draft PSI Program plan in a public meeting held on January 5, 1982:

a. Applicable Code Editions and Code Exemptions for Byron Unit 1 Preservice Inspection

b. Preservice Examination Class 1 and 2 Sample Selection

c. Ultrasonic Examination of Class 1 and 2 Austenitic Piping Welds

d. Identification and Documentation of Relief Requests.

e. Augmented ISI for High Energy Fluid System Piping

APPLICABLE CODE EDITIONS AND CODE EXEMPTIONS FOR BYRON UNIT 1 PRESERVICE INSPECTION

In accordance with the requirements of 10CFR50.55a, the 1977 edition of ASME Code Section XI with addenda through the Summer, 1978 Addenda has been applied to the Byron Unit 1 Preservice Inspection (PSI) effort subject to the following modification: For appropriate Code Class 2 pipe welds in the Residual Heat Removal System, Emergency Core Cooling Systems, the Containment Spray System, the 1974 Edition of ASME Code Section XI with addenda through the Summer 1975 Edition of Addenda has been applied for the selection of piping welds to be examined (extent of examination); all other inspection requirements and inspection techniques are in accordance with the 1977 Edition with addenda through Summer, 1978.

Appropriate ASME Section III Code Classes and identification of system boundaries were accomplished during plant design. Certain of the Code Class 1 and 2 components were exempted from nondestructive examination requirements in accordance with standard Code Section XI exemptions (Articles IWB, IWC-1220) with the exception of control of fluid chemistry, which was not used. Specifically, the exemptions which were used are as follows:

ASME Code Section XI, 1977 Edition

Code Class 1:	IWB-1220 (b) IWB-1220 (c)
Code Class 2:	IWC-1220 (b) IWC-1220 (c)

ASME Code Section XI, 1974 Edition (ECCS, RHR, CS Systems)

Code Class 2:	IWC-1220 (a) IWC-1220 (b) IWC-1220 (d)

PRESERVICE EXAMINATION

CLASS 1 AND 2 SAMPLE SELECTION

In conformance with paragraph IWB-2200, preservice examination of Class 1 components includes 100% of the pressure retaining welds, except in those components exempted from examination by paragraph IWB-1220(a), (b) and (c). The preservice examination of Class 2 piping includes 100% of the pressure retaining welds, except for those components exempted by IWC-1220(a), (b) and (c). Preservice examination of Class 2 pressure vessels conforms with Table IWC-2500-1 Examination Category C-A, Note (3); "In the case of multiple vessels of similar design, size and service (such as steam generators, heat exchangers) the required examination may be limited to one vessel or distributed among the vessels." The eddy current preservice examination of the steam generator tubes includes 100% of all the tubes in all four vessels.

ULTRASONIC EXAMINATION OF CLASS 1 AND CLASS 2 AUSTENITIC PIPING WELDS

The Preservice Inspection Program (PSI) procedures for Byron Unit 1 utilize Appendix III Supplement 7 of Section XI for the ultrasonic examination of austenitic piping welds in lieu of Article 5 of Section V. We feel that this is perfectly justified by the footnote to paragraph III - 1100(c) which refers to Supplement 7 of Appendix III for dissimilar metal welds and austenitic steels. Furthermore, Article 5 of Section V states that the examination procedures in that article may be improved by modifications or supplements when examining such welds.

The modifications permitted by Supplement 7 address beam angle, depth of calibration notches, and physical restrictions to the weld examination. In the examination of austenitic piping welds at Byron 1, a 45 degree beam angle was used. This angle has proven to be the most effective in covering the required examination volume and providing meaningful results. In cases where variables such as weld preparation, weld crown width or physical interference were encountered, the scanning path was increased to full or 1 1/2 V path rather than altering the beam angle. Concerning calibration notches the 10% notch is specified by this supplement as the basic calibration reflector for austenitic pipe welds. The calibration blocks for Byron 1 have such notches. However, the notches were used for calibration only in axial scans. In circumferential scans the side-drilled holes were used as the calibration reflector.

In the case of the dissimilar metal welds between the primary coolant nozzles and the austenitic safe-ends; the welds between half of these safe-ends and the wrought austenitic pipe; and the welds between the other half of these safe-ends and the cast austenitic elbows, mock-ups will be used that faithfully replicate the weld joints involved. The mock-ups will have calibration reflectors that yield sensitivity levels equivalent to or superior to the sensitivity levels of the calibration piece for equivalent pipe. The pipe to safe-end mock up is completed and the safe-end to cast elbow mock-up is now being made. Ultrasonic work on the first mock-up has led us to have a special search unit made which is still being built. Preliminary experiments on the cast elbow material appears to rule out any UT examination from the elbow side of an elbow-to-pipe or elbow-to-safe-end weld, but there is hope that we may still be able to cover the required inspection volume of the weld by coming through the weld from the pipe side. We will not know whether this hope can be realized until the second mock-up is completed.

ULTRASONIC EXAMINATION OF CLASS 1 AND CLASS 2 AUSTENITIC PIPING WELDS (con't)

In the examination of Class 1 and 2 piping welds joining similar and dissimilar material, any indication 40 percent of DAC or greater was recorded and evaluated by a Level II or Level III examiner. In addition, any crack-like indication or lack-of-fusion, regardless of amplitude was also recorded and evaluated. We feel that this procedure satisfies code requirements and provides for a more than adequate examination. Any corrective action required as a result of the evaluation of any indication will be taken by us.

IDENTIFICATION AND DOCUMENTATION OF RELIEF REQUESTS

During the preservice inspection (PSI) activities performed on Byron Unit 1, any examination which does not conform to the requirements of ASME Section XI due to limited access, geometry and/or material make-up, etc., will be documented and incorporated into the program plan as a relief request. Potential relief requests are identified by the PSI contractor (EBASCO) by the issuance of a deficiency report in conformance with EBASCO procedure no. ISI-QC-10, "Control of Deficiency Reports". This deficiency report is presented to the Commonwealth Edison Station Construction Department (SCD) at the Byron site where it is evaluated for resolution by the PSI Coordinator. If the deficiency can be resolved in the field, the PSI Coordinator will initiate the appropriate actions to do so. On the other hand, if a design change is necessary, the PSI Coordinator will generate and transmit a Nonconformance Report to the Byron Project Engineering Department (PED). PED will then, with aid of Sargent and Lundy, determine if a design change can be made to resolve the deficiency. If no resolution can be made, the item will become a relief request. Relief requests with supporting technical justification will be incorporated into the program plan on a periodic basis as they are identified and as examinations are completed. If there is no delay in the examination schedule, all relief requests will be identified by September 1, 1982.

AUGMENTED ISI FOR HIGH ENERGY FLUID SYSTEM PIPING

This subject will be addressed at a later date after it is discussed in detail with the Materials Engineering Branch.

BYRON I

REACTOR PRESSURE VESSEL PRESERVICE INSPECTION SUMMARY

An automated ultrasonic examination of the Byron I reactor pressure vessel was performed in October and November 1981 by Rockwell International. All the examinations were monitored by Authorized Nuclear Inservice Inspectors (ANII) from the Hartford Steam Boiler Inspection and Insurance Company. All examinations were conducted in accordance with ASME Section XI, 1977 Edition, with addenda through summer 1978.

The reactor pressure vessel, including the lower head, contained five circumferential welds and eight nozzle-to-vessel welds, which were examined using the ultrasonic method. One-in.-diam, 2.25-MHz transducers operating in the pulse-echo mode were used for all weld examinations. Some obstructions were encountered which prevented 100% coverage of some welds. All areas that were not examined due to physical obstructions were documented and will be included in the final report. The capability to effectively detect defects near the front and back surfaces of the component will be estimated and also included in the final report.

Examination coverage of the pressure vessel beltline welds and adjacent base metal (WR34 and WR18) was 100% of the weld length. The flange-to-nozzle shell course weld, WR7, was manually examined for parallel reflectors from the flange surface by Ebasco Services. Rockwell conducted an automated examination for transverse reflectors from the vessel wall. Coverage of the WR7 weld for both parallel and transverse reflectors was 100%. In the transverse scan of WR7, the flange taper prevented full 1/2T coverage of the adjacent base metal on the top side of the weld. The six core barrel locating lugs near WR29 prevented 100% coverage of the weld and adjacent base metal from the top side of the weld in the lug area. One-hundred percent coverage of the WR29 weld and adjacent base metal was achieved from the bottom side. The examination of WR16, the bottom disk-to-dutchman weld, was obstructed by the BMI tubes which prevented 100% coverage of the weld and adjacent base metal.

Eight nozzles were examined. Examination of the nozzle-to-vessel welds for parallel reflectors was performed from the nozzle bores. A 0° longitudinal beam transducer was used which was supplemented by a 45° shear transducer to give 100% coverage of the areas that could not be examined by 0° beam because of nozzle geometry. The inner radii of the nozzles were examined using a reflected longitudinal wave technique. The examination for transverse reflectors was performed from the ID surface of the vessel. Coverage was 100% for the inlet nozzles. The outlet nozzle integral extension obstructed examination of some of the adjacent base metal near the bore of the outlet nozzles.

A number of point indications >20% and <100% of the distance amplitude correction (DAC) were found. One laminar-type indication was detected on WR16. The indication was oriented at 0° (parallel to the surface), 4.2 in. from the ID surface. The indication was approximately 0.9 in. long and 0.4 in. wide.

bes:1/1

PART IV

COMMONWEALTH EDISON COMPANY WORK SCOPE

In the Preservice Inspection Program for Byron Unit 1 Commonwealth Edison (CECo) will perform Class 3 examinations, visual examinations (other than VT-1 of Class 1 and 2 components), pump and valve functional tests and snubber functional tests. With the VT-2 visual examinations outlined in the EBASCO program, the following tables define CECo's scope of work. Details of the pump, valve and snubber functional tests are provided under separate cover.

PRESERVICE COMPONENTS PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: All Class 1 System

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
		UT	PT	VT				
All Component Supports for Piping, Pumps and Valves of greater than 1 inch nominal pipe size.	B-K-2			VT-3		Yes		Relief only applies to Components 1 inch Nominal Pipe Size Smaller.
All Mechanical and Hydraulic Snubbers, Constant Load and Spring type Supports for Piping, Pumps and Valves of greater than 1 inch nominal pipe size	B-K-2			VT-4		Yes		

REMARKS:

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: All Class 1 Systems

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
		UT	PT	VT				
All Pressure Retaining Components	B-P			VT-2				System Leakage Test Only (System Hydro Test Not Required per IWA-5215)

REMARKS:

PRESERVICE COMPONENTS PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: All Class 2 Systems

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
		UT	PT	VT				
All component Supports for Non-Exempt Vessels Piping, Pumps and Valves	C-C &C-E			VT-3				
All Mechanical and Hydraulic Snubbers, Constant Load and Spring - Type Supports for Non-Exempt Vessels Piping, Pumps and Valves	C-C &C-E			VT-4				Augmented Pre-Service Snubber Program per Answers to FSAR Questions 110.37 and 110.63 Also Applies

REMARKS:

PRESERVICE COMPONENTS PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: All Class 2 Systems

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
		UT	PT	VT				
All Pressure Retaining Components	C-H			VT-2				System Leakage Test, Only (System Hydro Test not required per IWA-5215)

REMARKS:

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: All Class 3 Systems

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
		UT	PT	VT				
All Pressure Retaining Components	D-A			VT-2				System Leakage Test Only (System Hydro Test Not Required per IWA-5215)
	D-B & D-C							
All Component Supports and Restraints for Components Exceeding 4 inch Nominal Pipe Size	D-A			VT-3				
	D-B							
	D-C							
All Mechanical and Hydraulic Snubbers, Spring-Loaded and Supports for Components Exceeding 4 inch Nominal Pipe Size	D-A			VT-4				Augmented Pre-Servi Snubber Program per Answer to FSAR Ques tions 110.37 and 110.63 also applies
	D-B & D-C							

REMARKS:

PRESERVICE COMPONENTS
PROGRAM PLAN

PROJECT: BYRON UNIT 1

SYSTEM IDENTIFICATION: Reactor Vessel Interior and Core Support Structures

WELD OR ITEM IDENTIFICATION	EXAM CAT.	NDE METHOD			CODE EXEMPT	RELIEF REQ	REF DRAWING	NOTES
		UT	PT	VT				
Reactor Vessel Interior	B-N-1			VT-3				
Accessible Areas								
Reactor Vessel Core Support Structures Accessible Welds	B-N-3			VT-3				

REMARKS:

Color-Coded Flow Diagrams

These diagrams contain lines subject to "volumetric and surface" or "surface only" examination. The color-coded designations are as follows:

GREEN - Volumetric and Surface Examination

RED - Surface Examination

BLUE - Visual Examination

No color-coded flow diagrams have been issued for the Auxiliary Feedwater, and all Class 3 systems. These systems require "visual only" examination. Therefore, the following drawings are not included in the color-coded set:

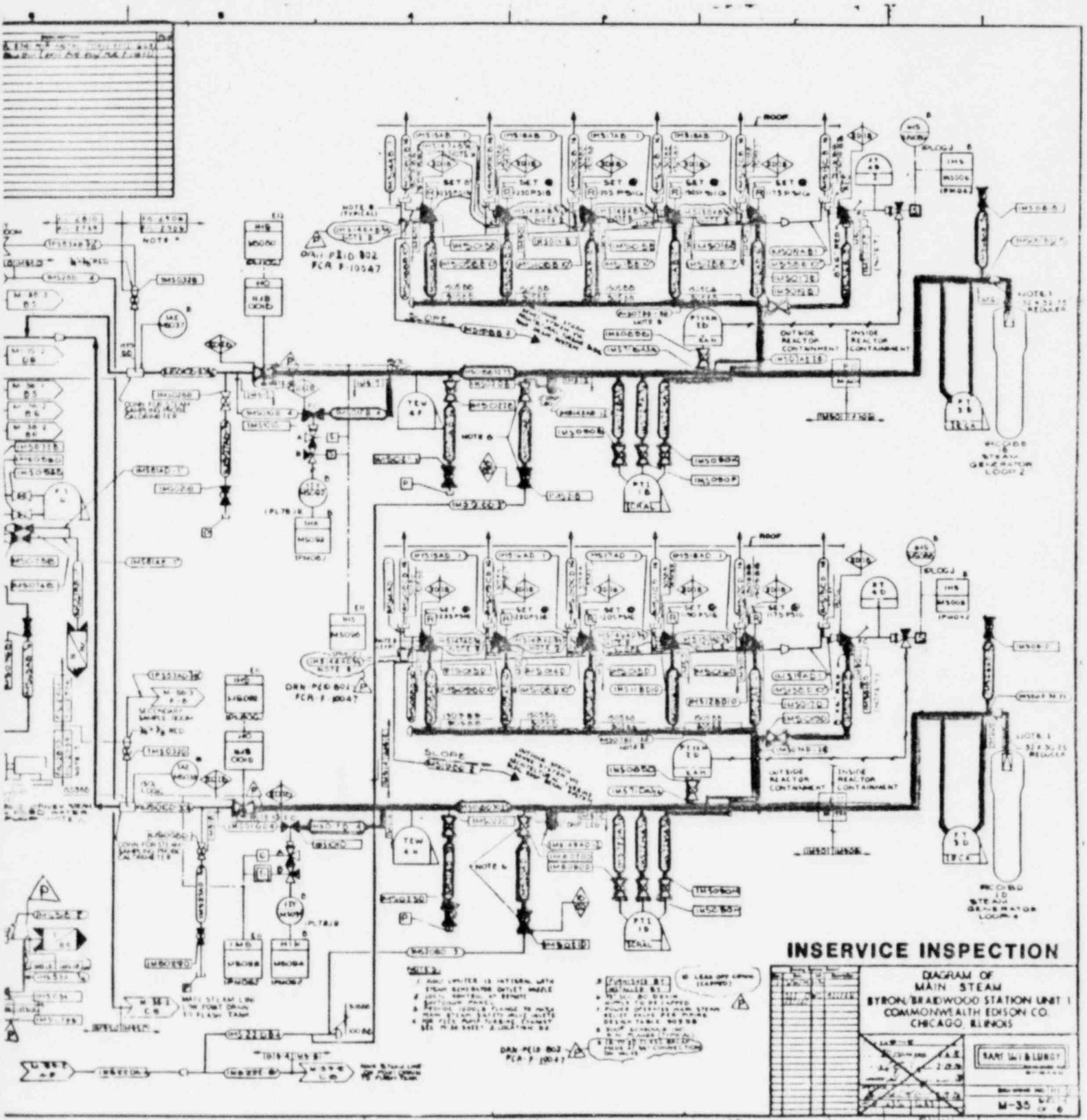
M-1003-01

M-1005-01

M-1017-03

M-1017-04

M-1017-06



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M-1001 SHEET 1 OF 2

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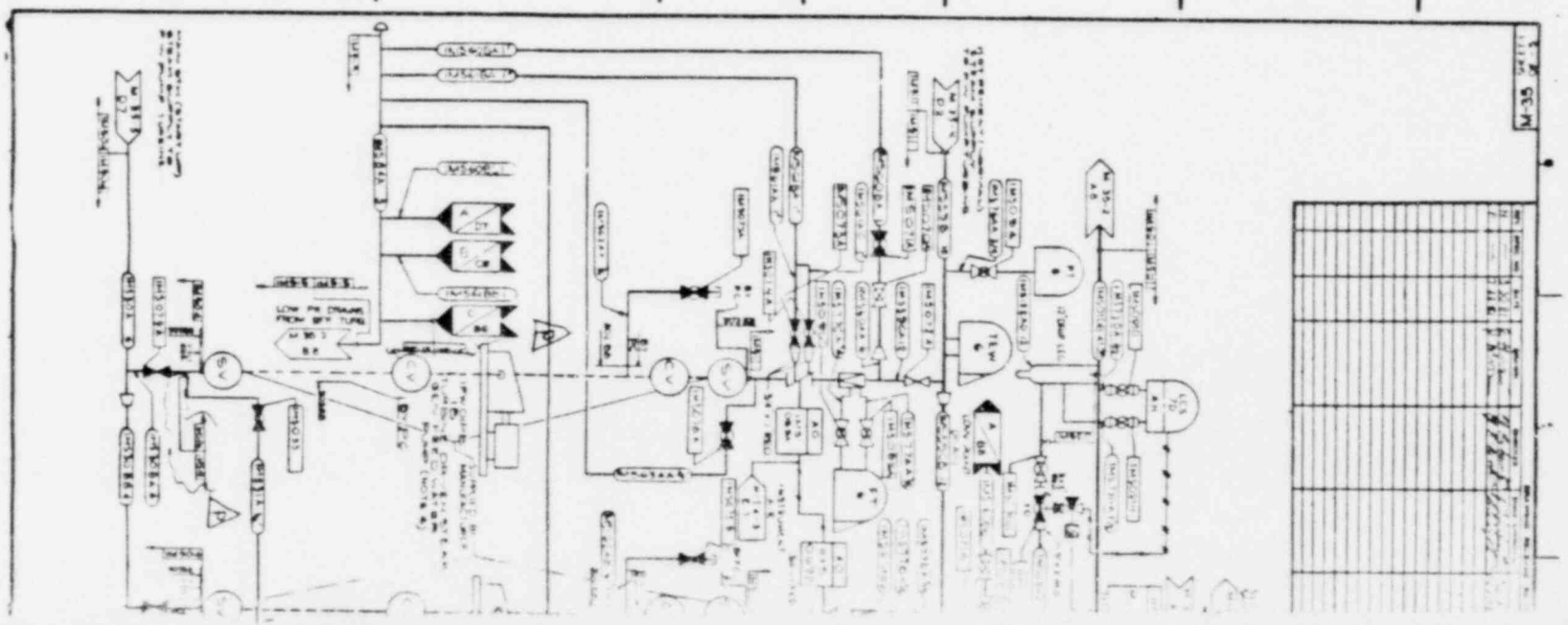

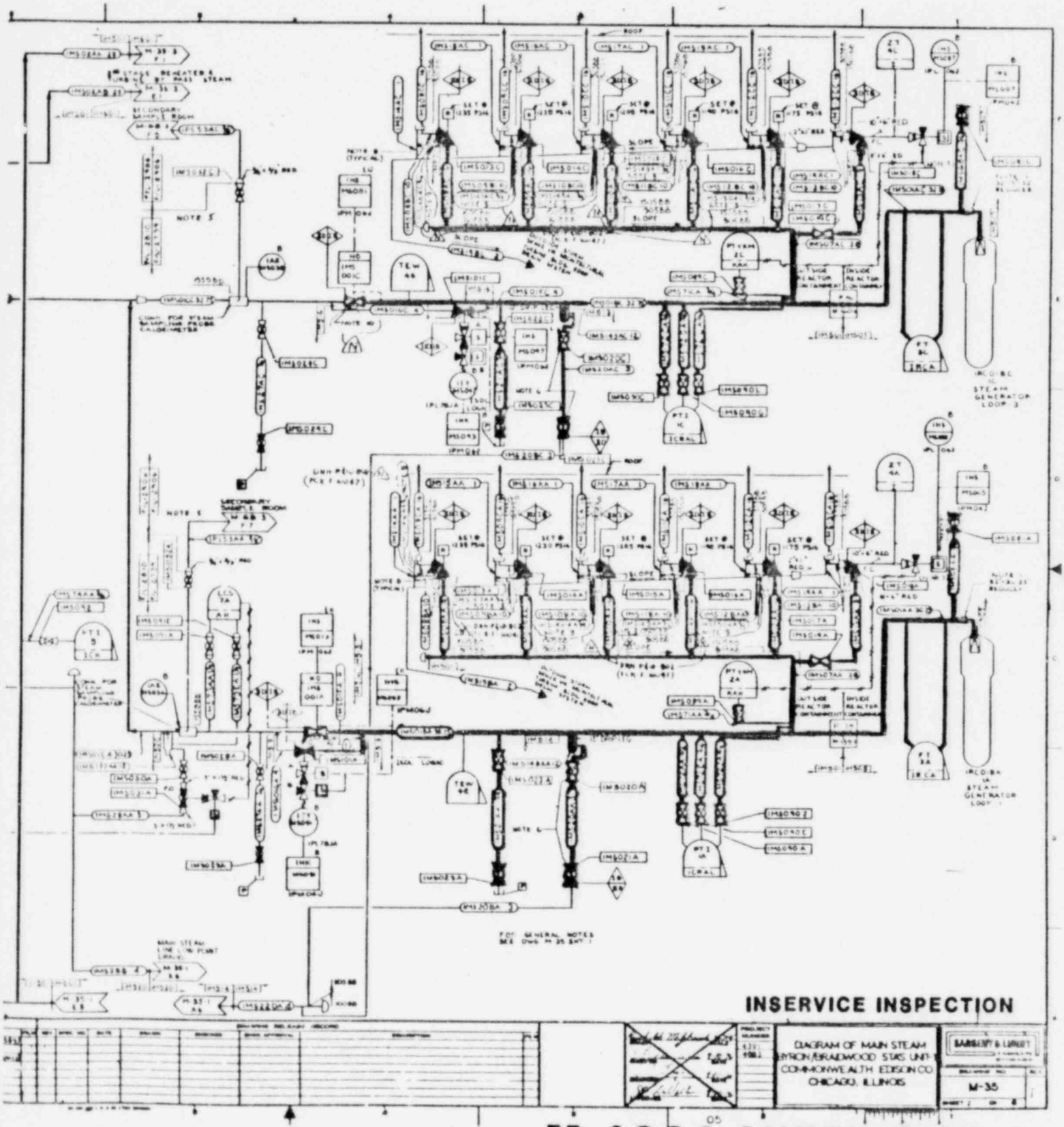

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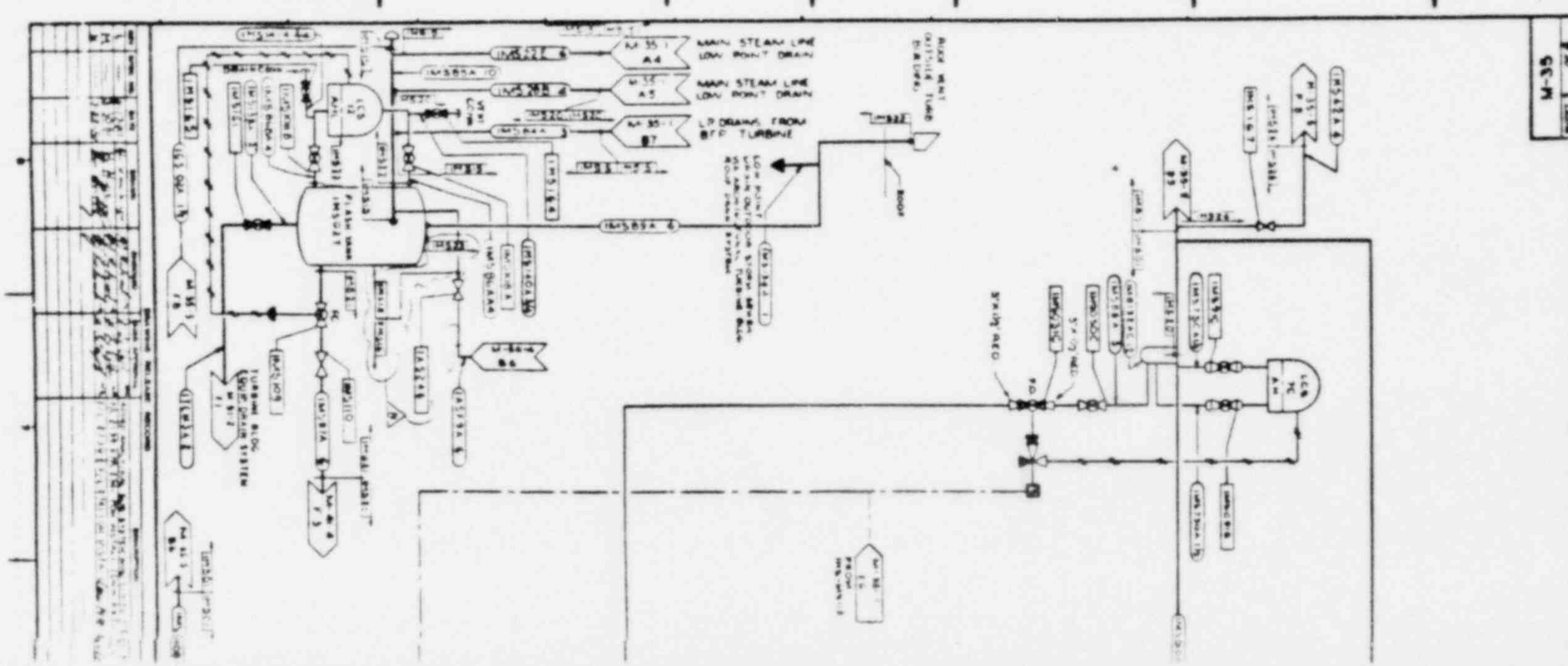

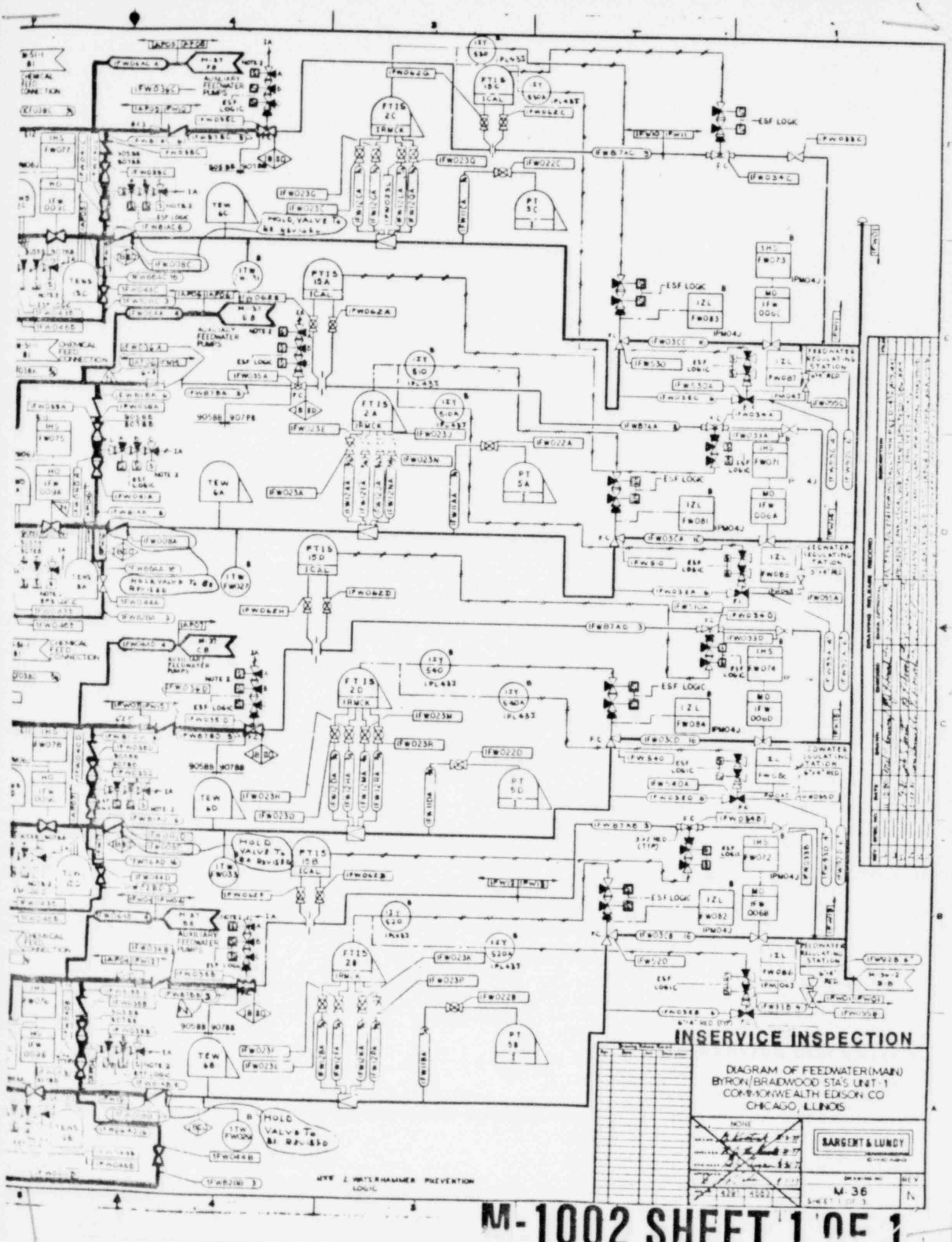

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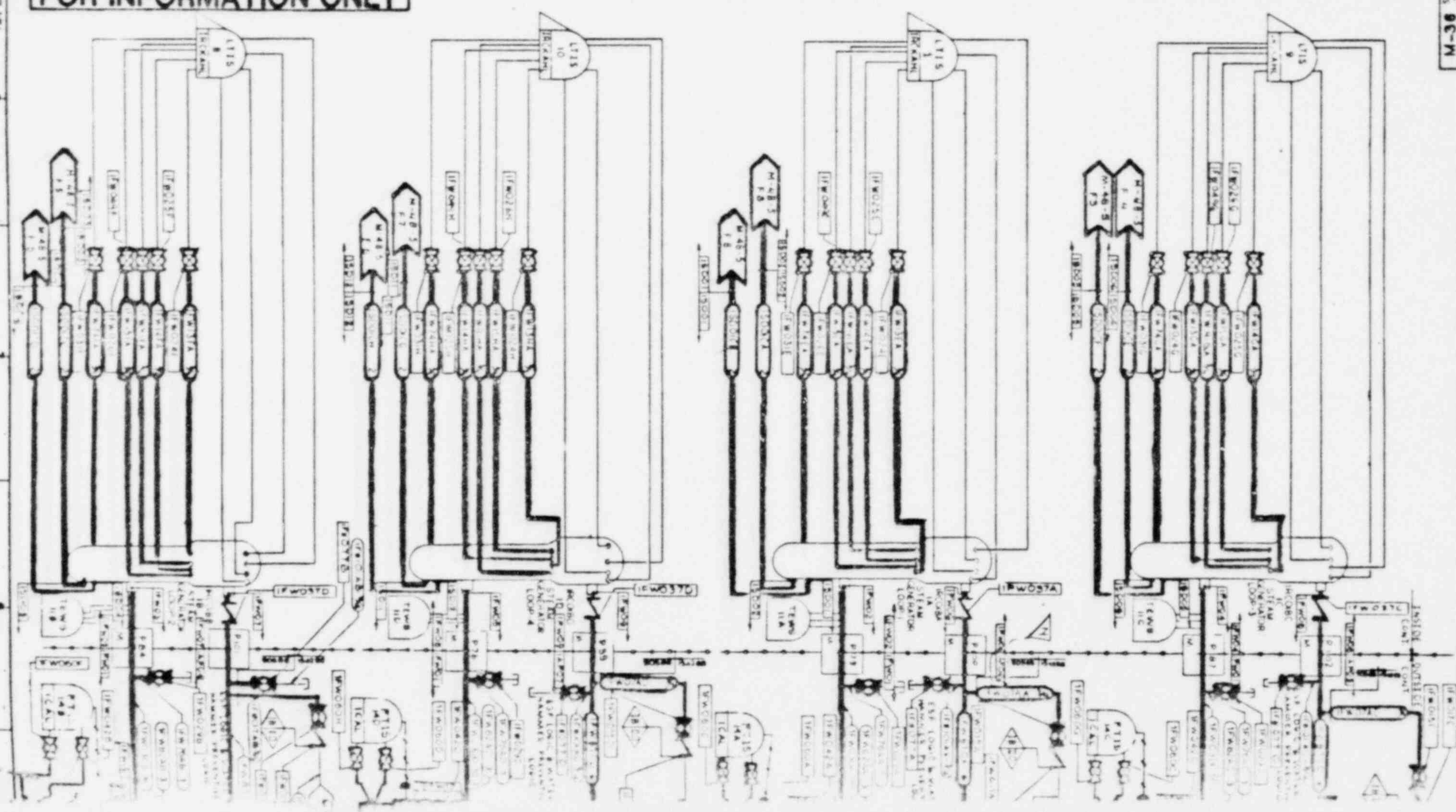

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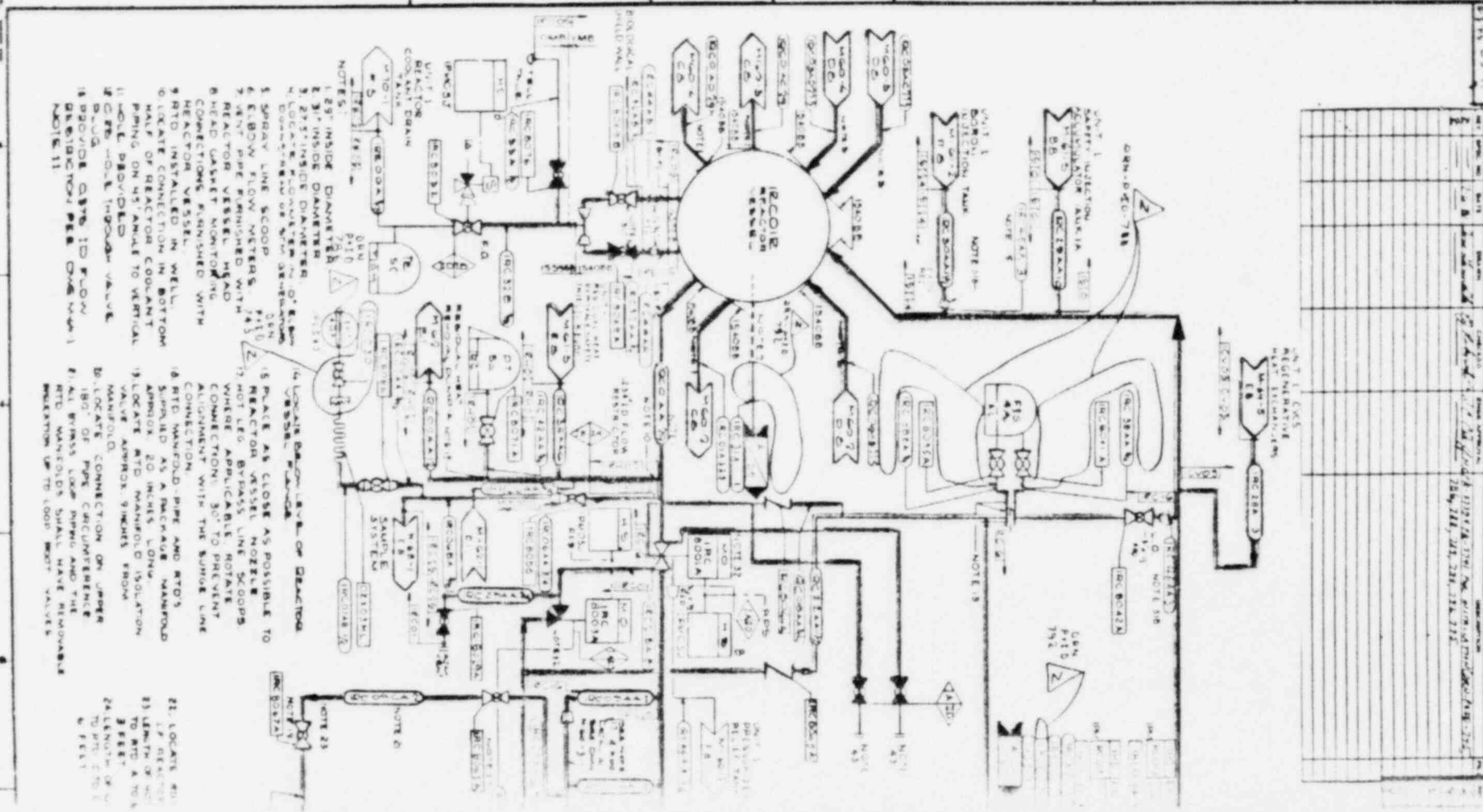

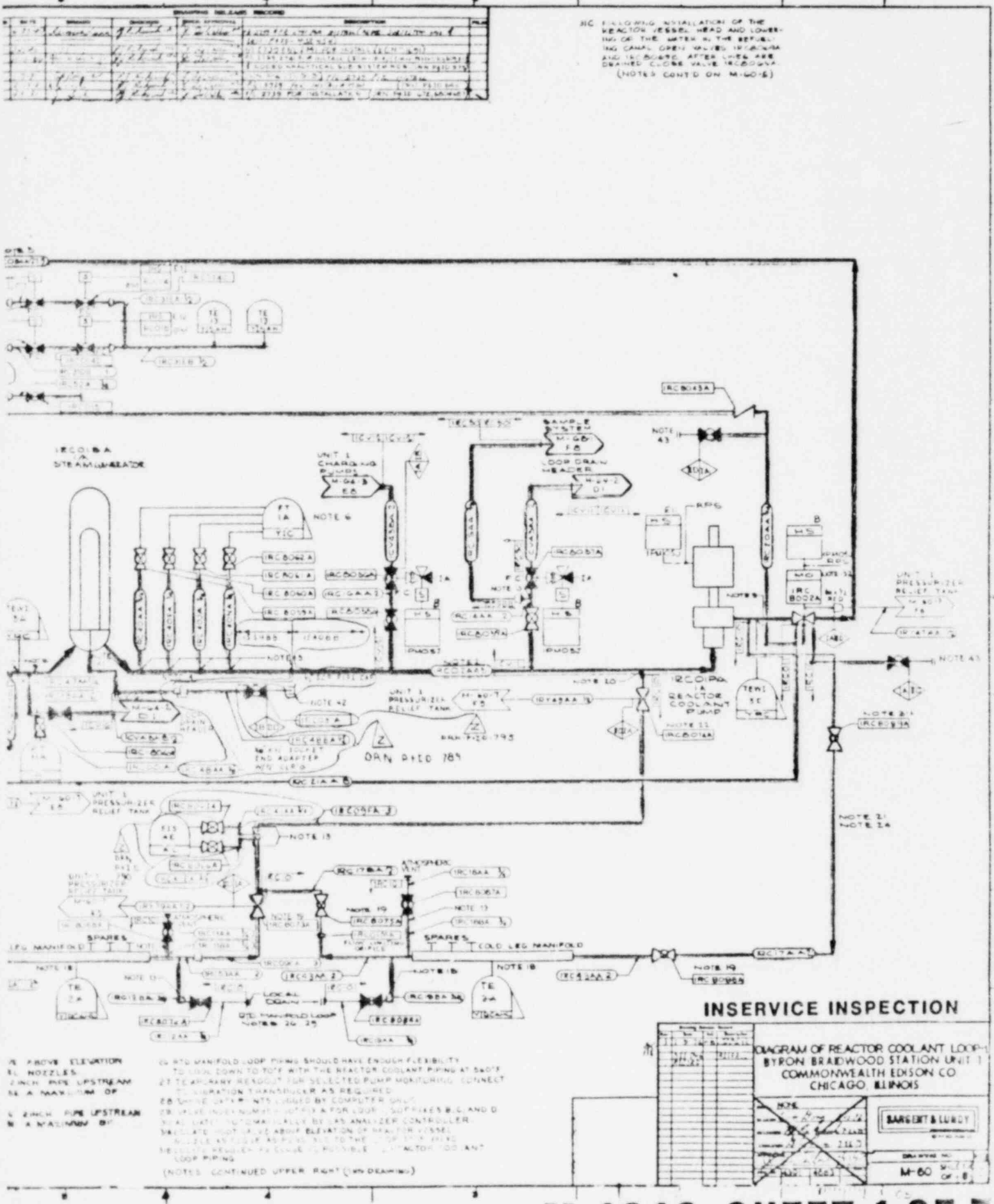
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BYRON BRAIDWOOD STATION UNIT 1
COMMONWEALTH EDISON CO
CHICAGO, ILLINOIS
SARGENT & LUNDY
M-60
M-1013 SHEET 1 OF 7

DRAWING NO. M-1013

SHEET 2 OF 7

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INSPECTION REACTOR

COOLANT LOOP 2

SPECIFICATION F/L-2907

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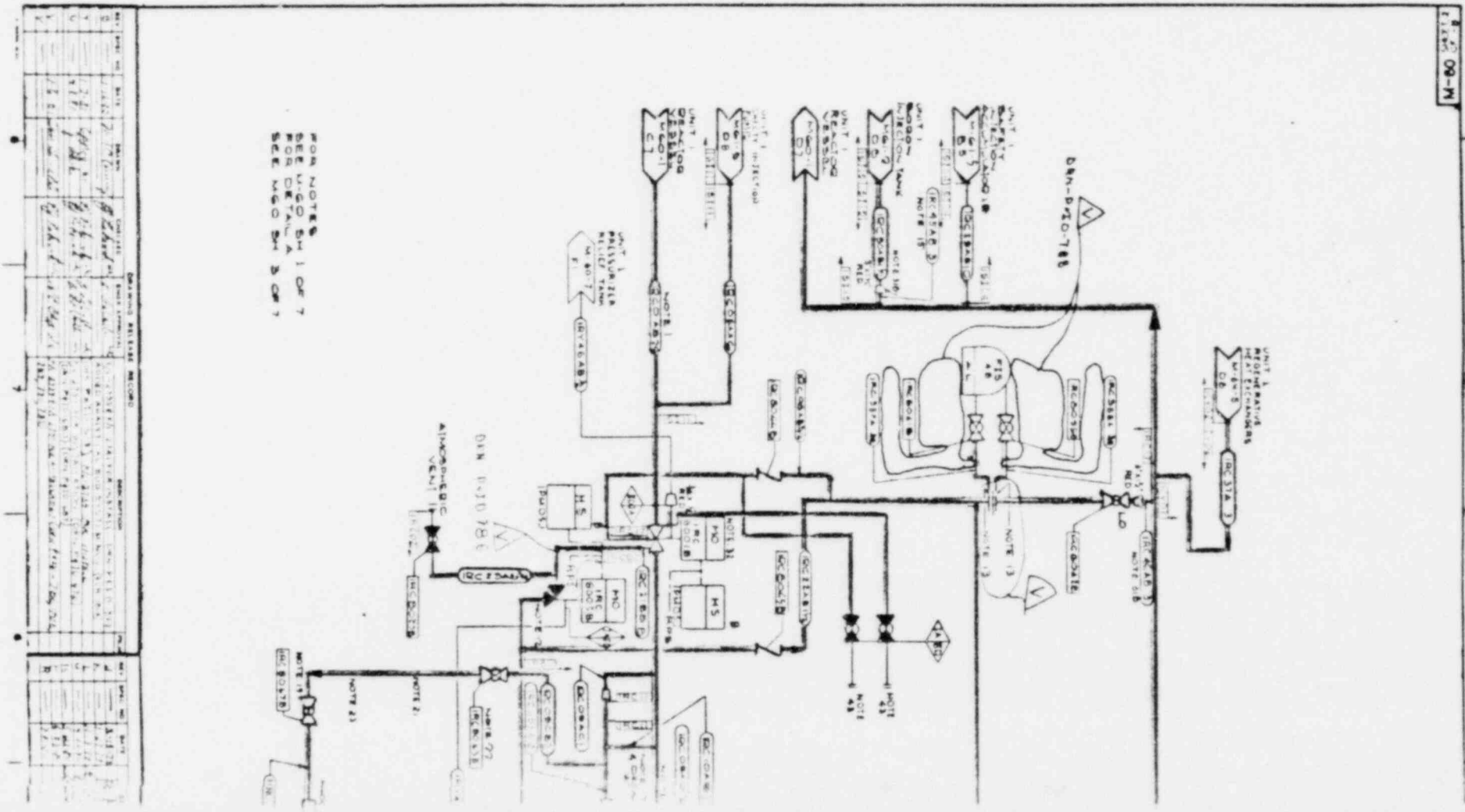

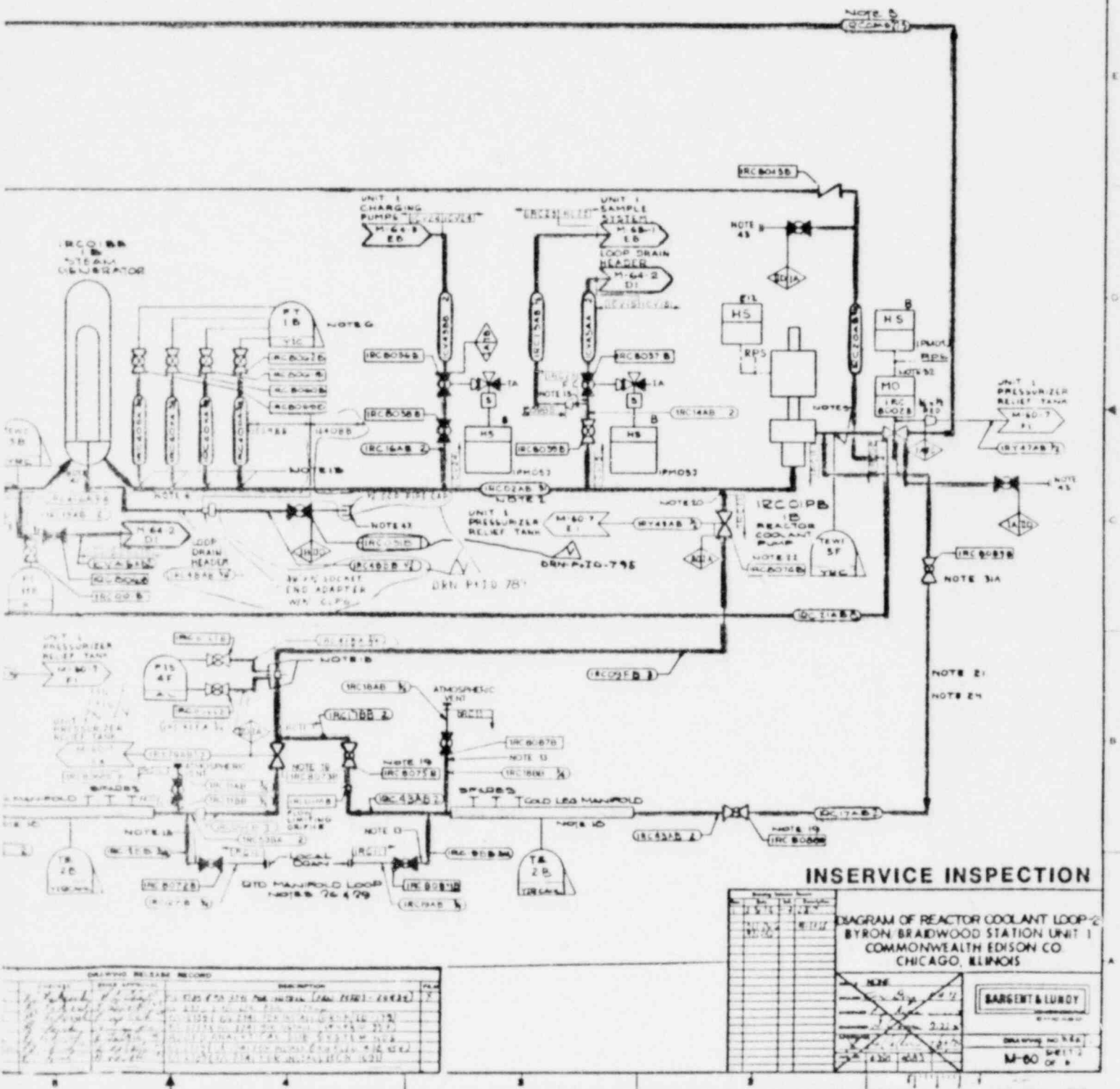

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BYRON, BRAIDWOOD STATION UNIT 1
COMMONWEALTH EDISON CO.
CHICAGO, ILLINOIS

SARGENT & LUNDY

M-60 SHEET 2 OF 7

M-1013 SHEET 2 OF 7

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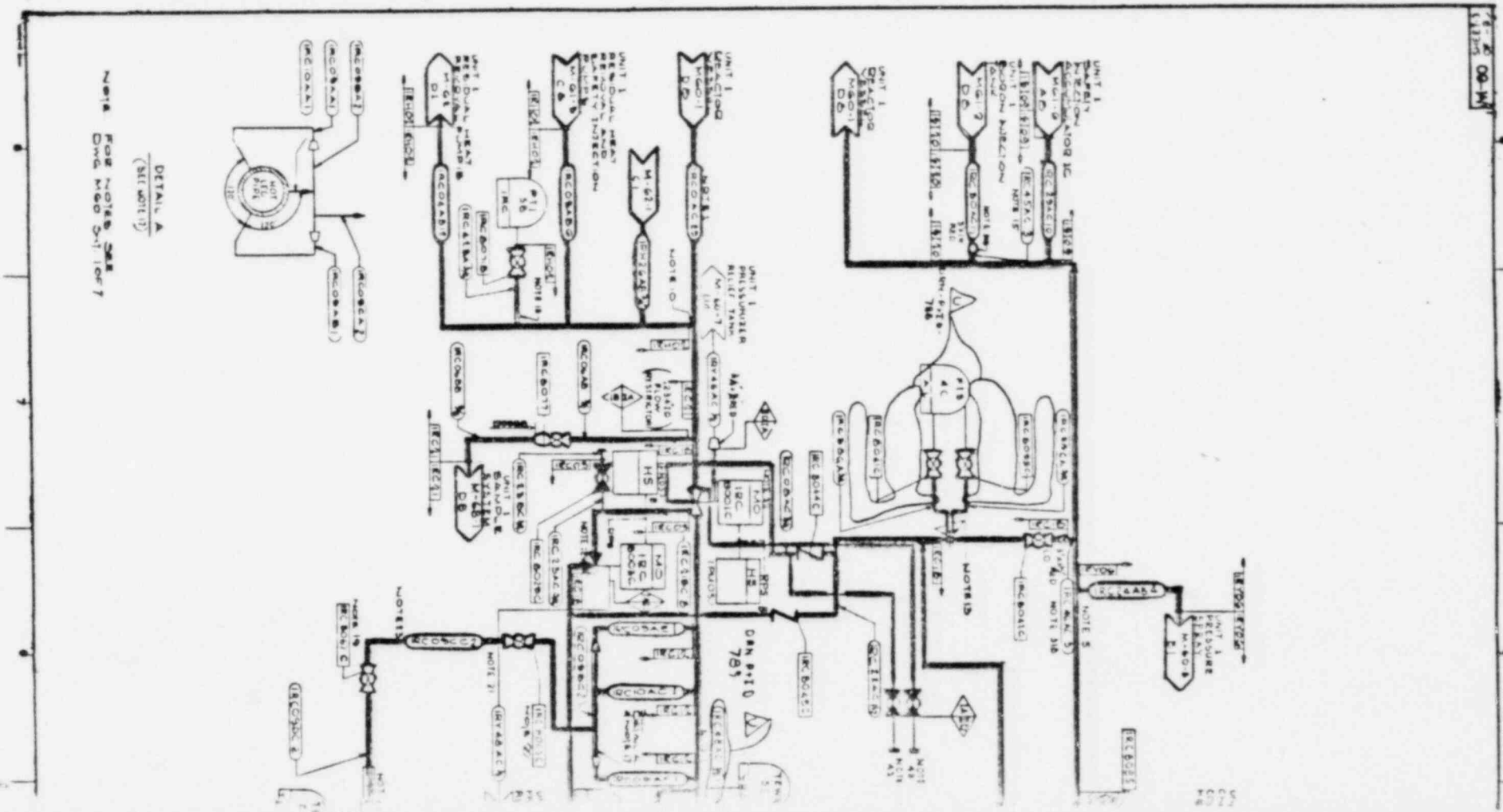

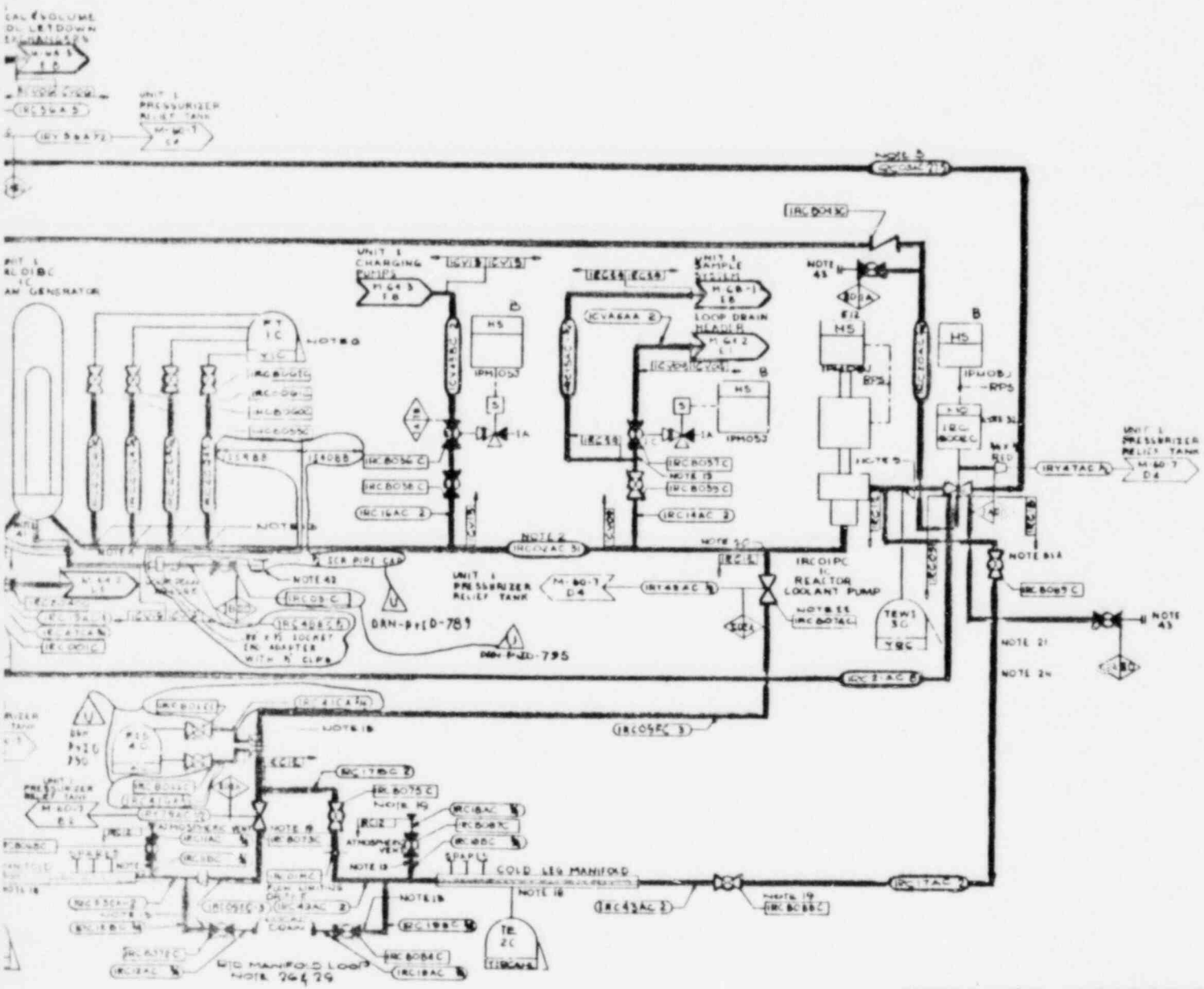

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BYRON/BRAIDWOOD STATION UNIT 1
COMMONWEALTH EDISON CO.
CHICAGO, ILLINOIS

BARGER & LUNDY

M-80 SHEET 3 OF 8

M-1013 SHEET 3 OF 7

DRAWING NO. M-1013

SHEET 4 OF 7

DRAWING TITLE INSERVICE INSPECTION REACTOR COOLANT LOOP 4

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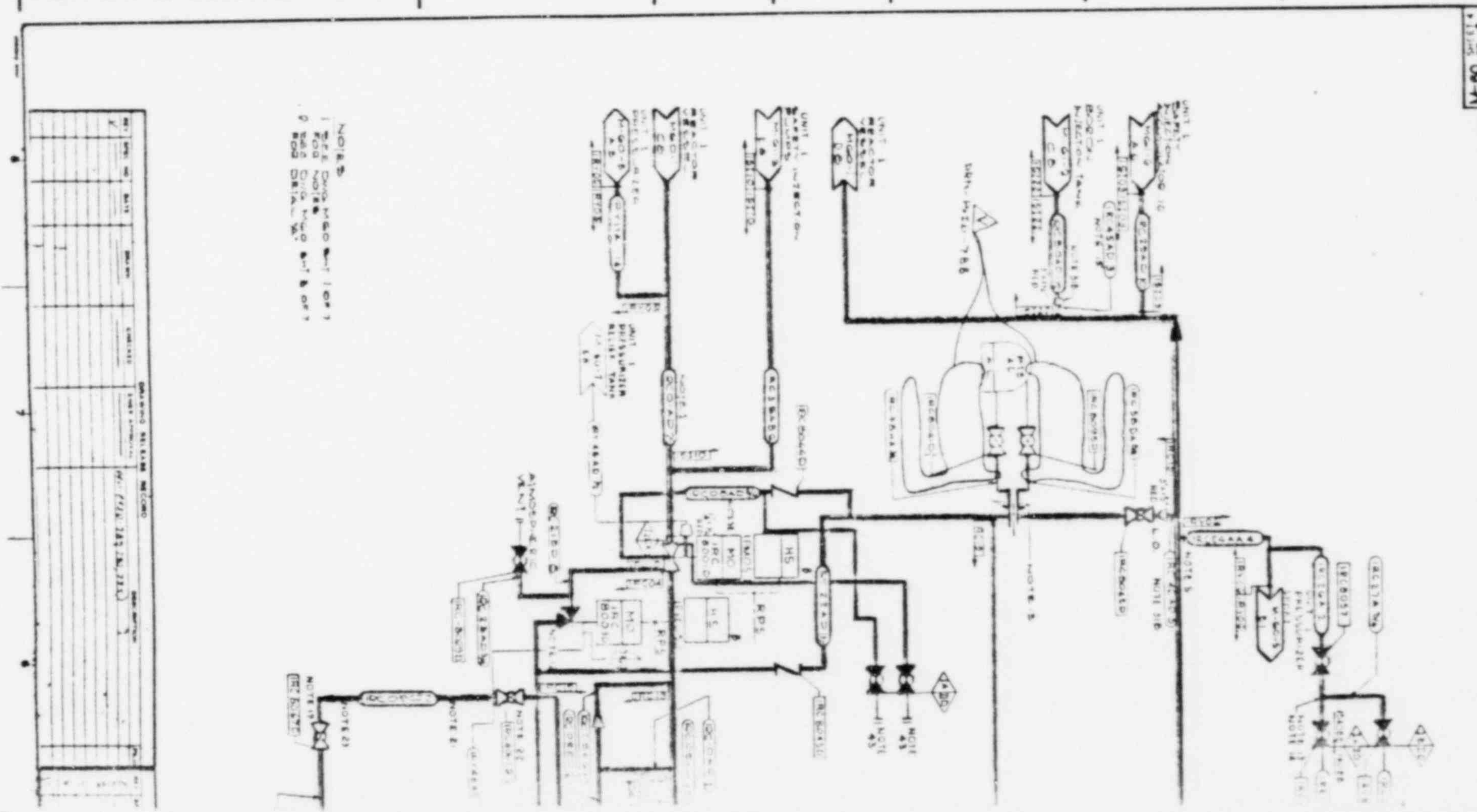

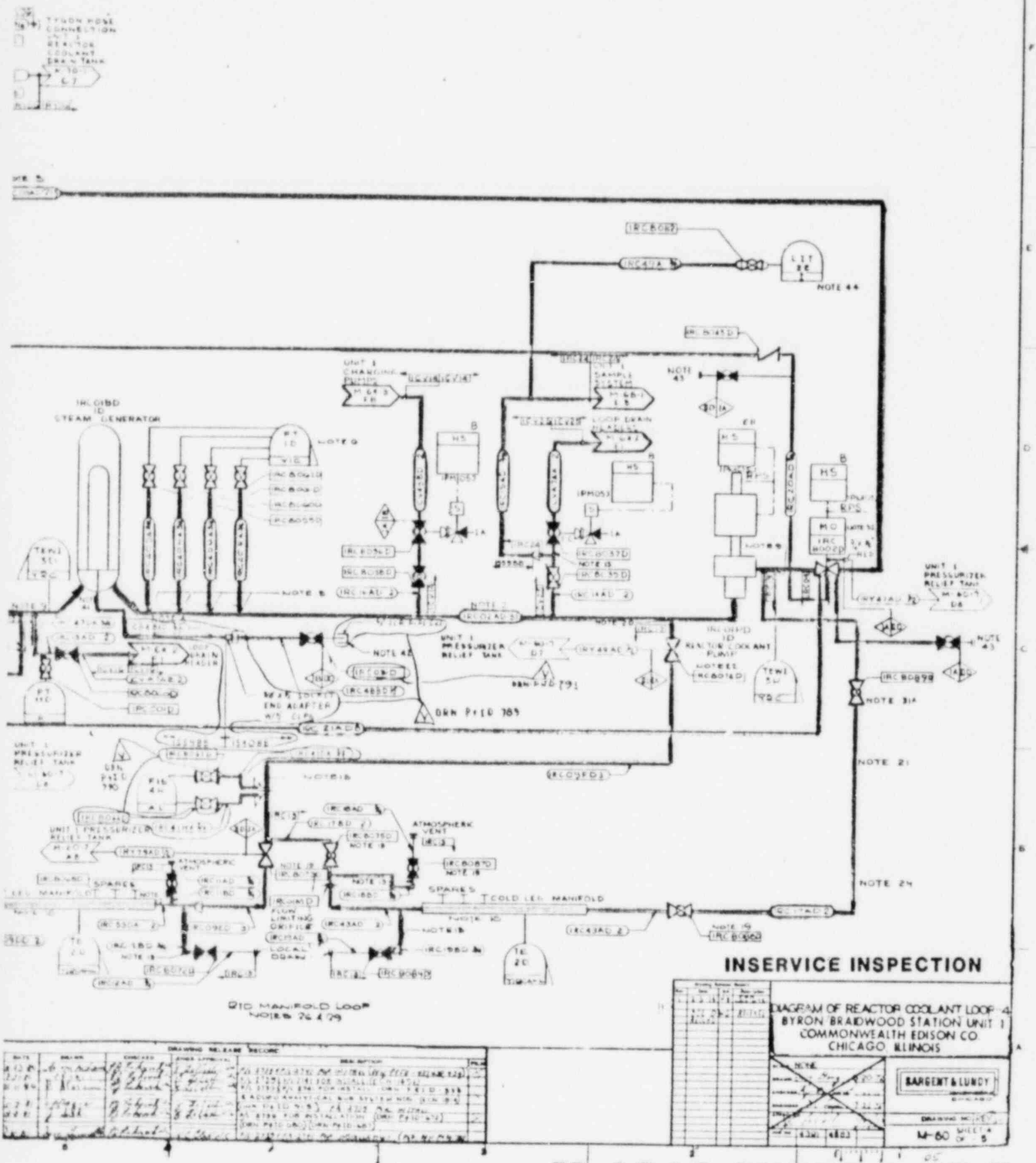
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BYRON BRAIDWOOD STATION UNIT 1
COMMONWEALTH EDISON CO
CHICAGO ILLINOIS
BARGENT & LUNDY
M-60
M-1013 SHEET 4 OF 7

DRAWING NO. M-1013	ISSUE			PREPARED	REVIEWED	APPROVED
SHEET 5 OF 7	PURPOSE	REVISION	DATE			
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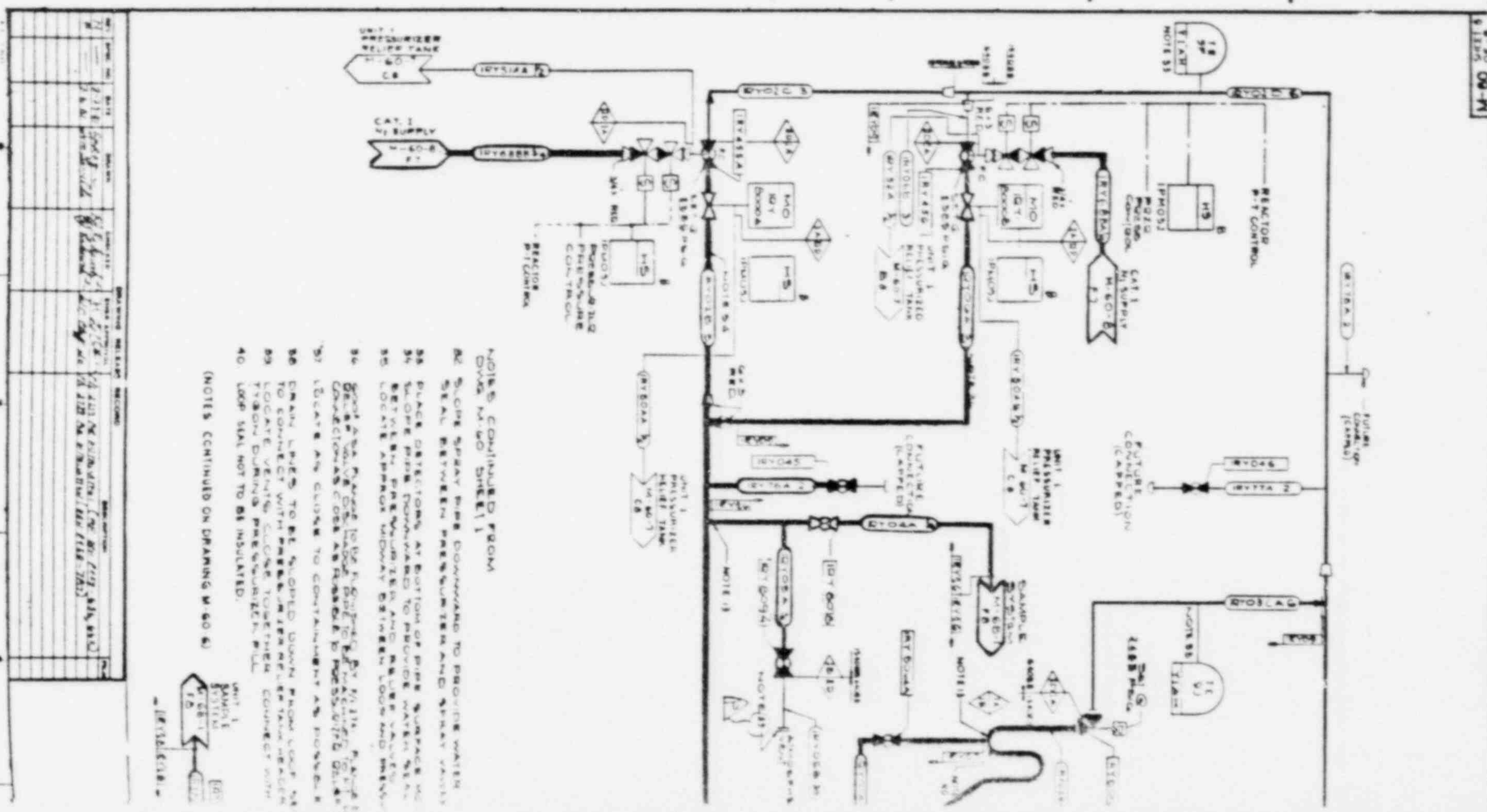

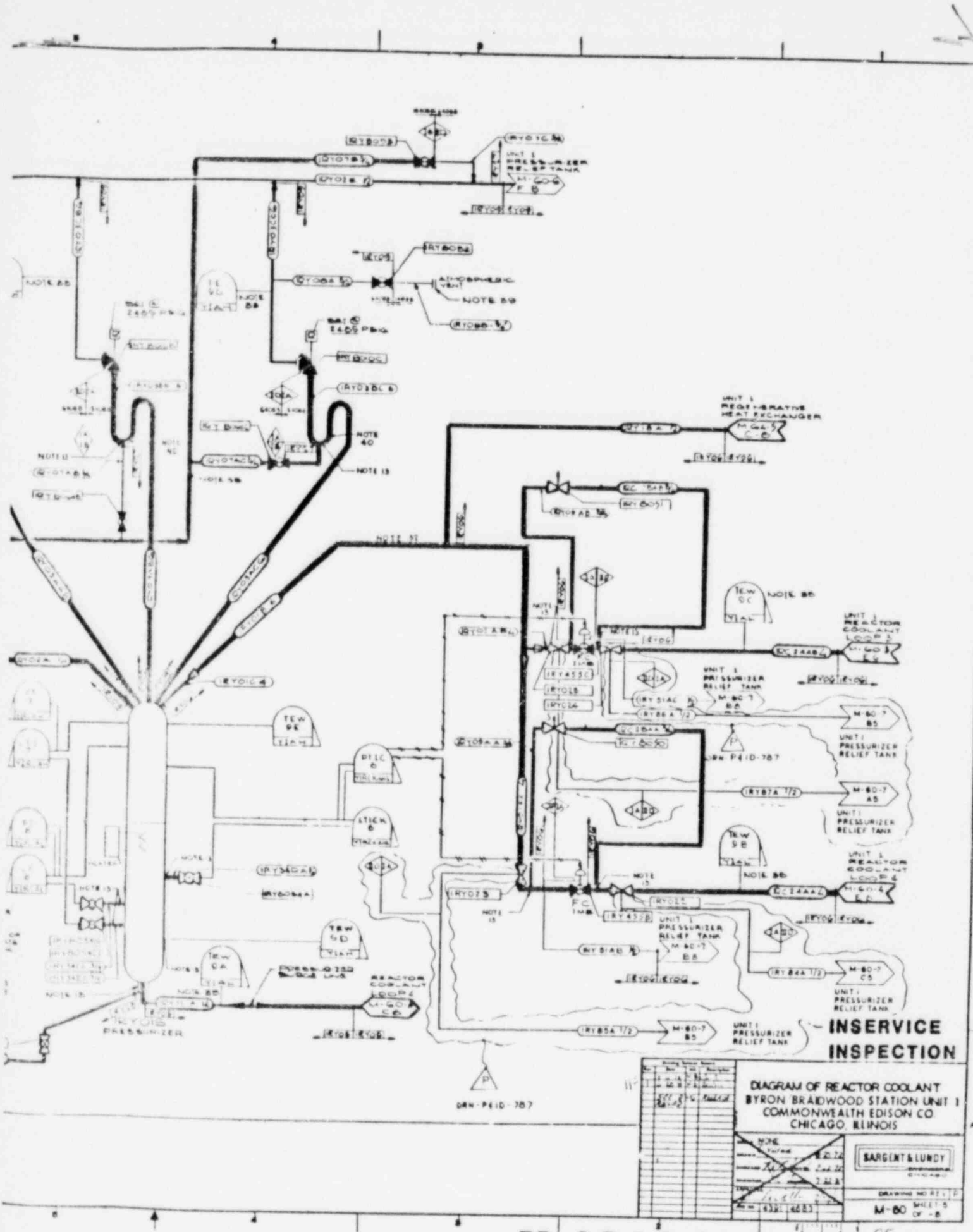

M-1013 SHEET 5 OF 7

DRAWING NO. M-1014

SHEET 1 OF 6

DRAWING TITLE INSERVICE

INSPECTION SAFETY

INJECTION

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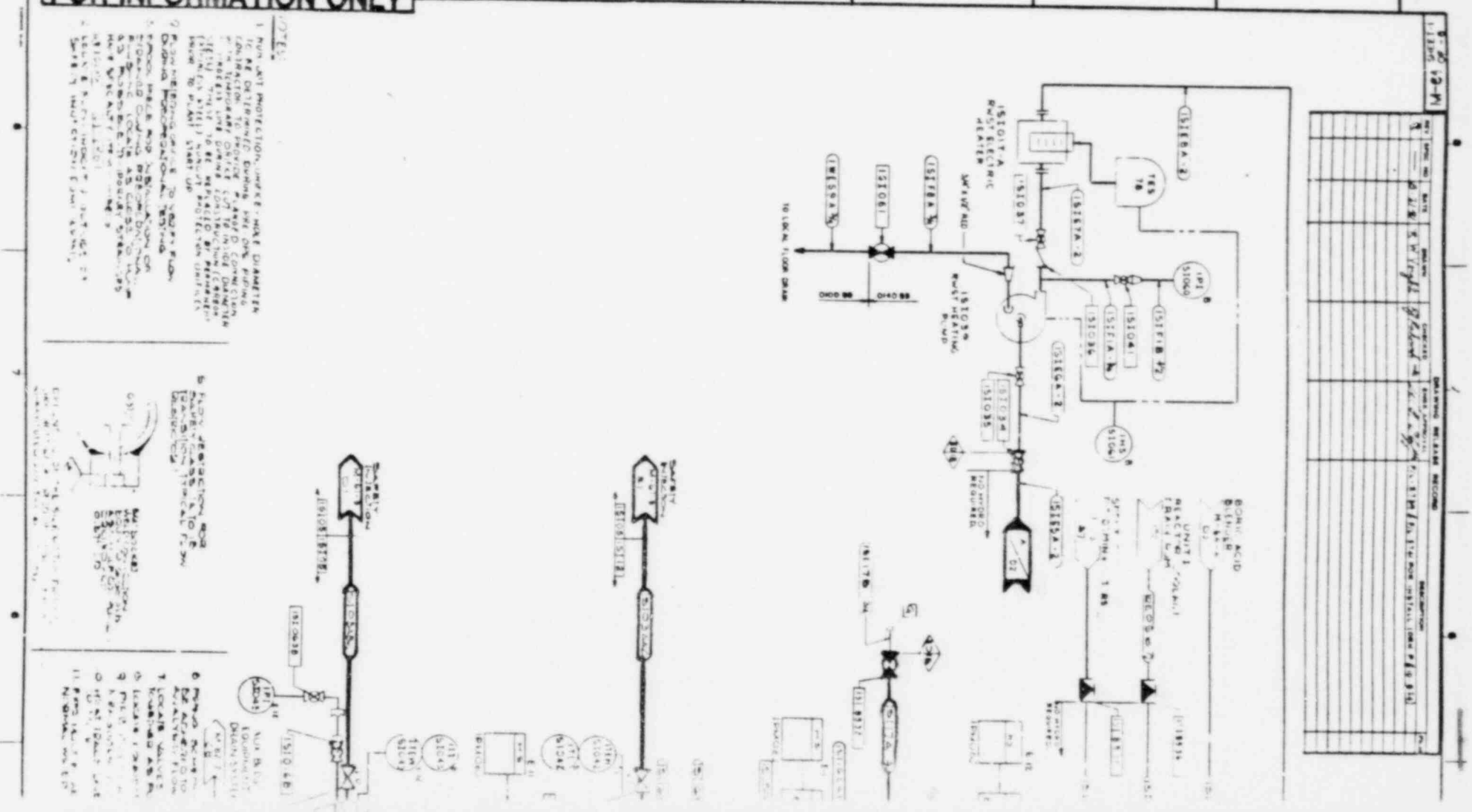

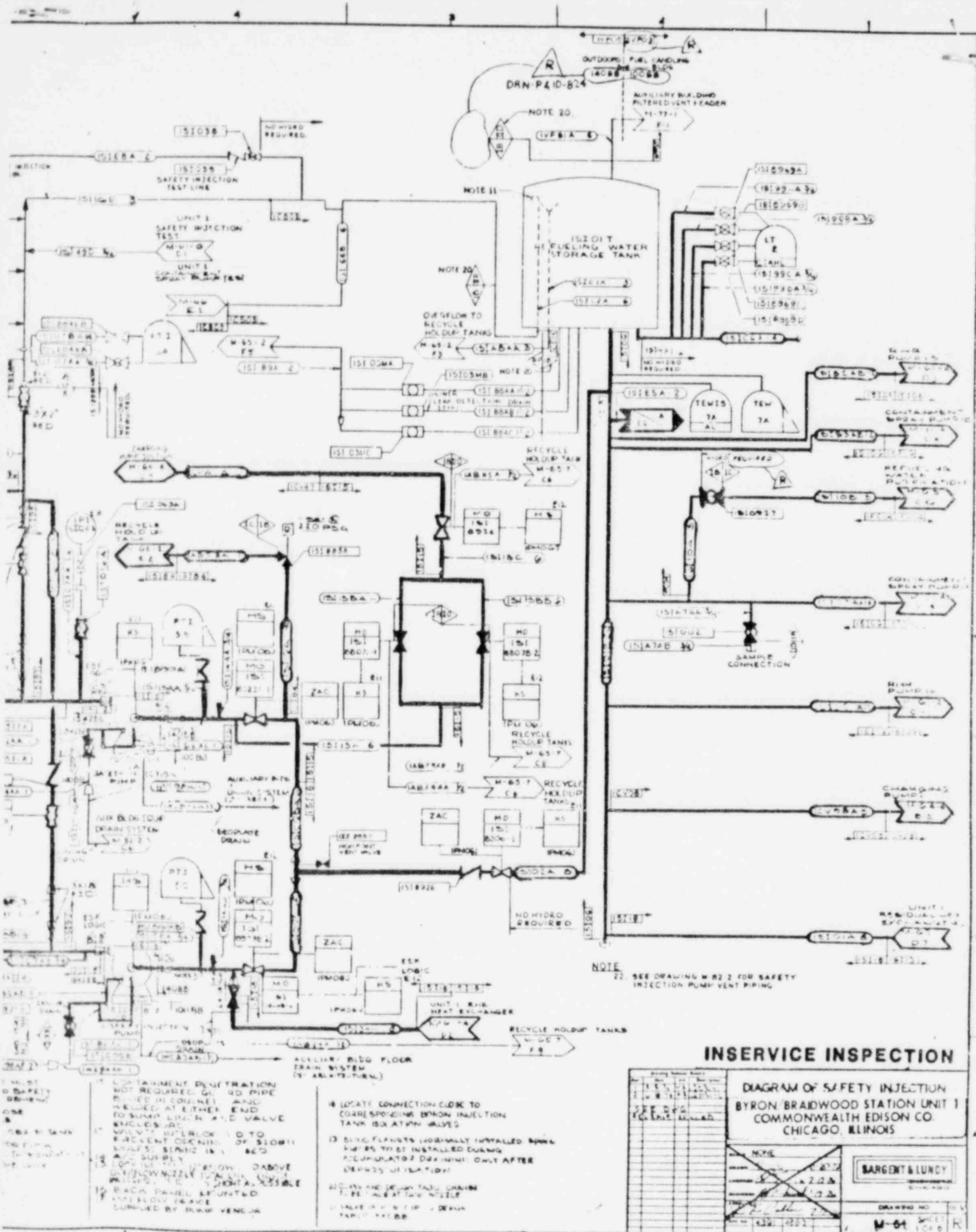

M-1014 SHEET 1 OF 6

DRAWING NO. M-1014

SHEET 2 OF 6

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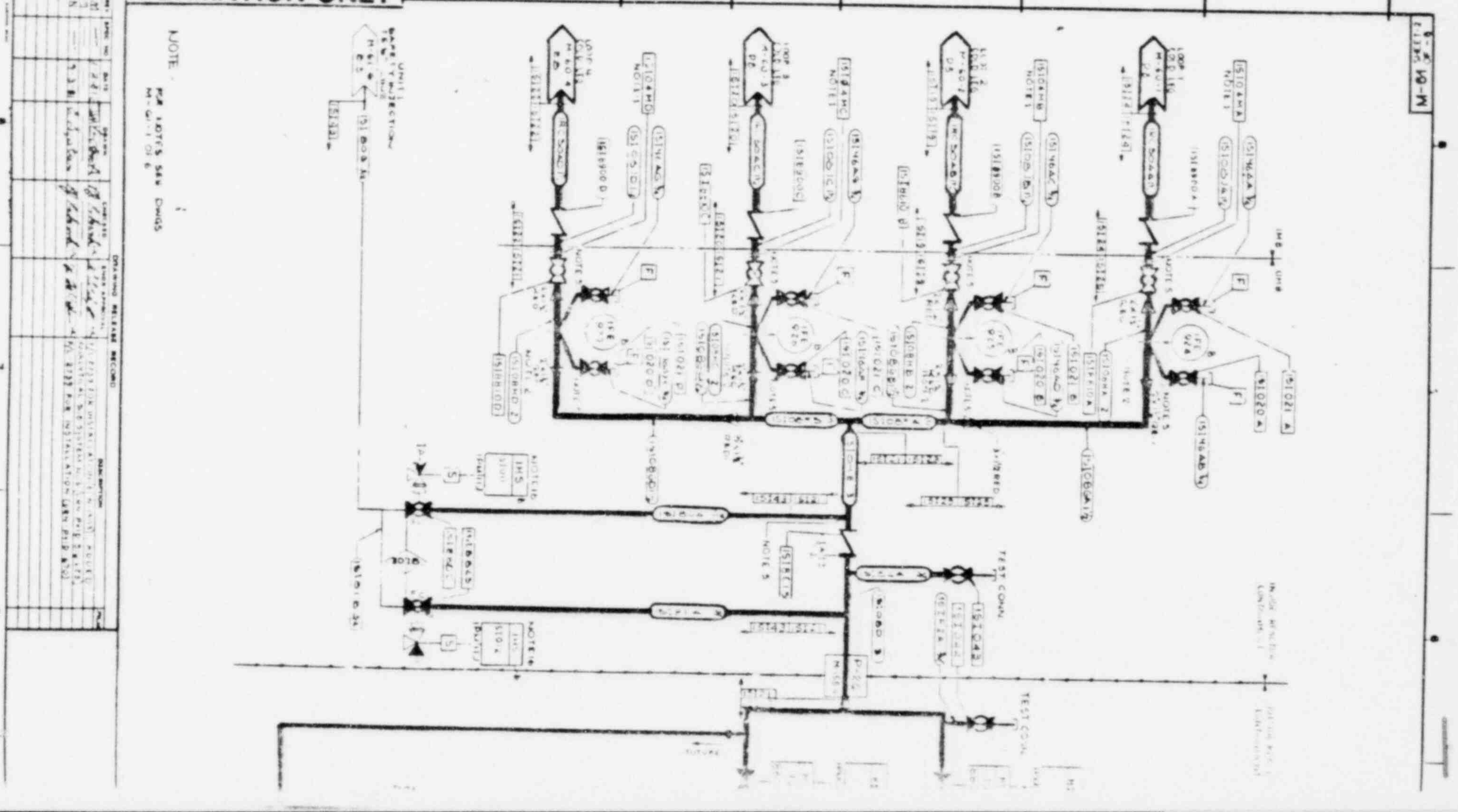

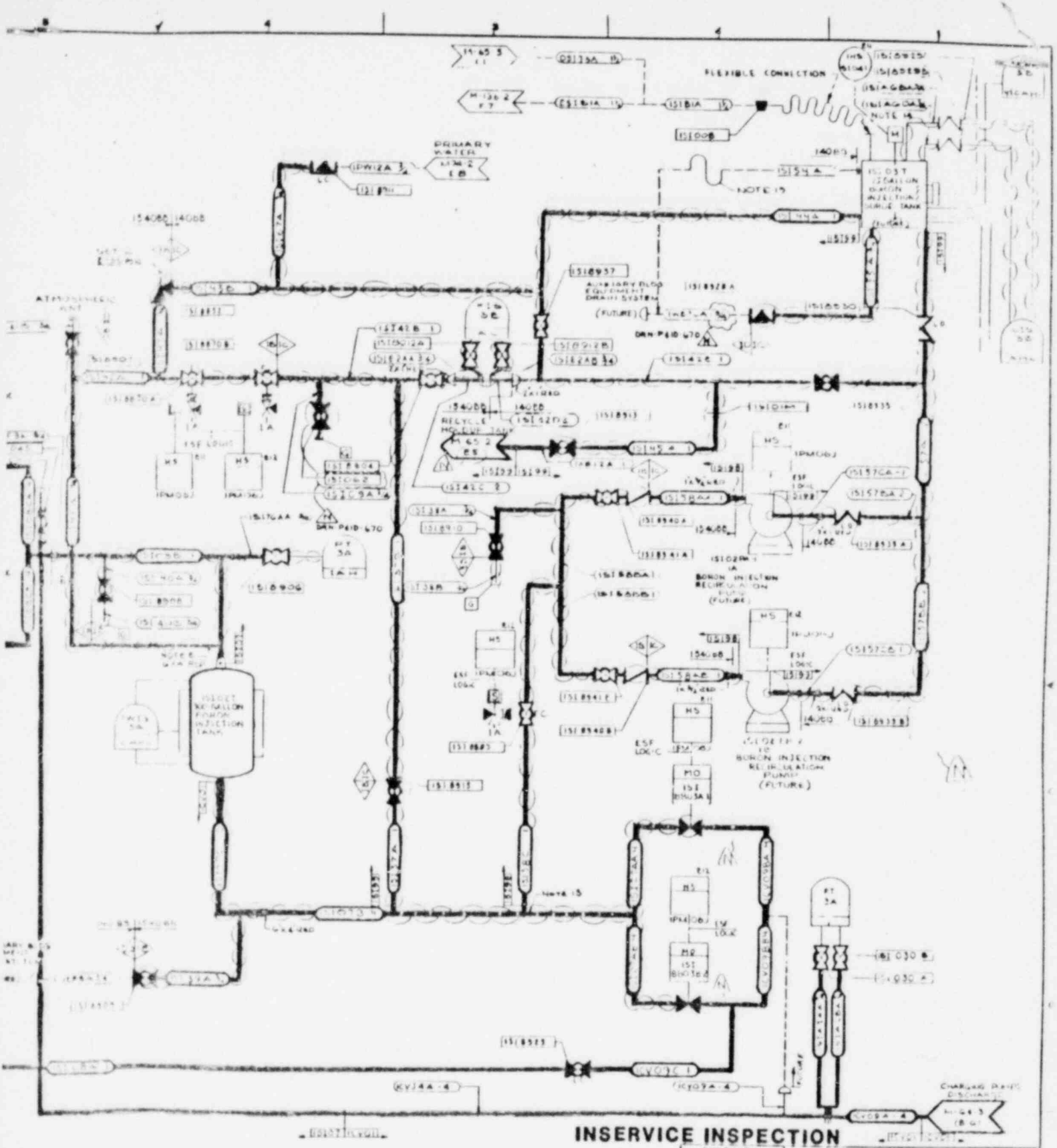

DIAGRAM OF SAFETY INJECTION
BYRON BRAIDWOOD STATION UNIT 1
COMMONWEALTH EDISON CO.
CHICAGO, ILLINOIS

SARGENT & LUNDY

M-61

M-1014 SHEET 2 OF 6

DRAWING NO. M-1014

SHEET 3 OF 6

DRAWING TITLE INSERVICE INSPECTION SAFETY INJECTION

SPECIFICATION F/L-2907

FOR INFORMATION ONLY

ISSUE			PREPARED	REVIEWED	APPROVED
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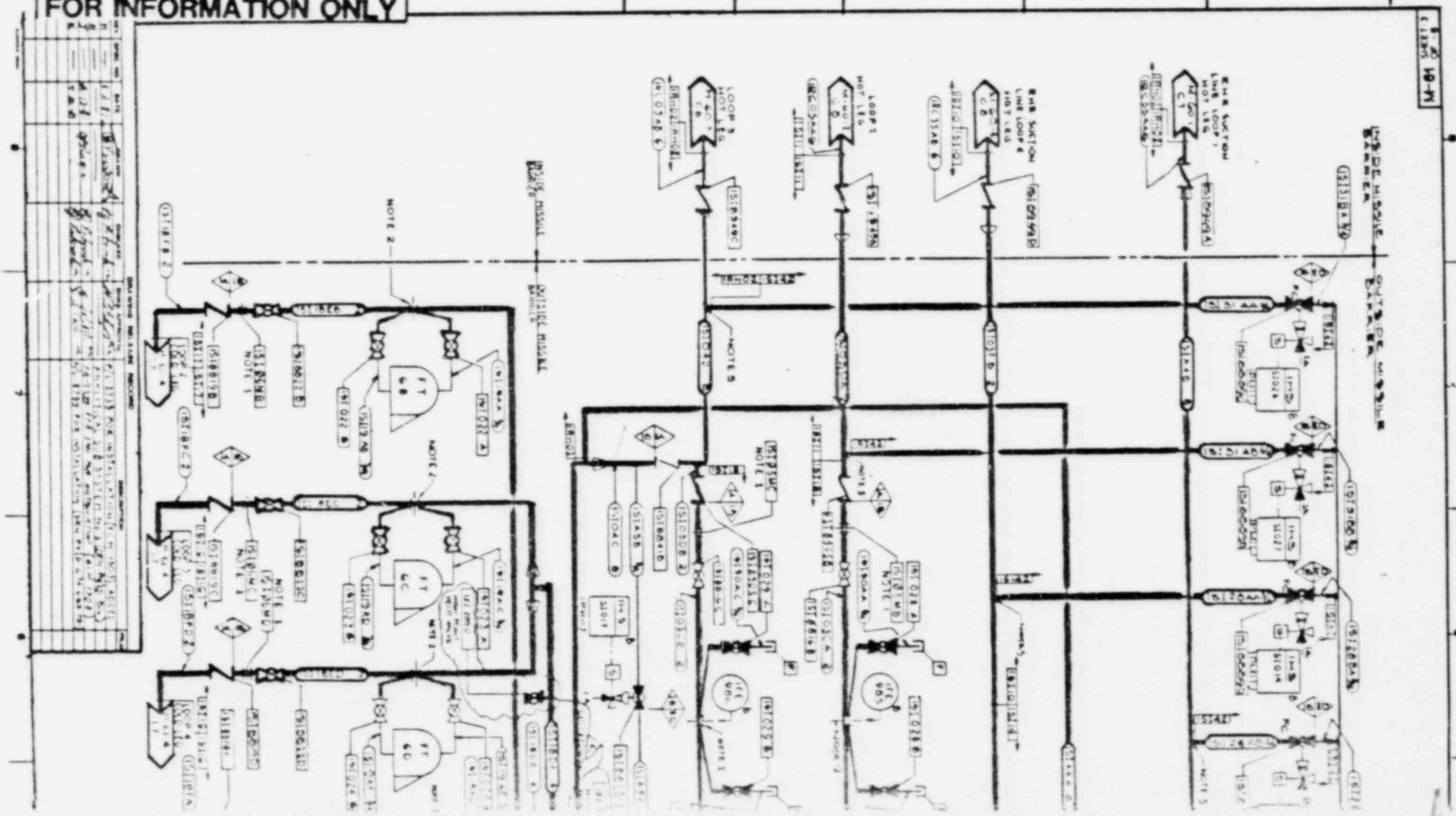

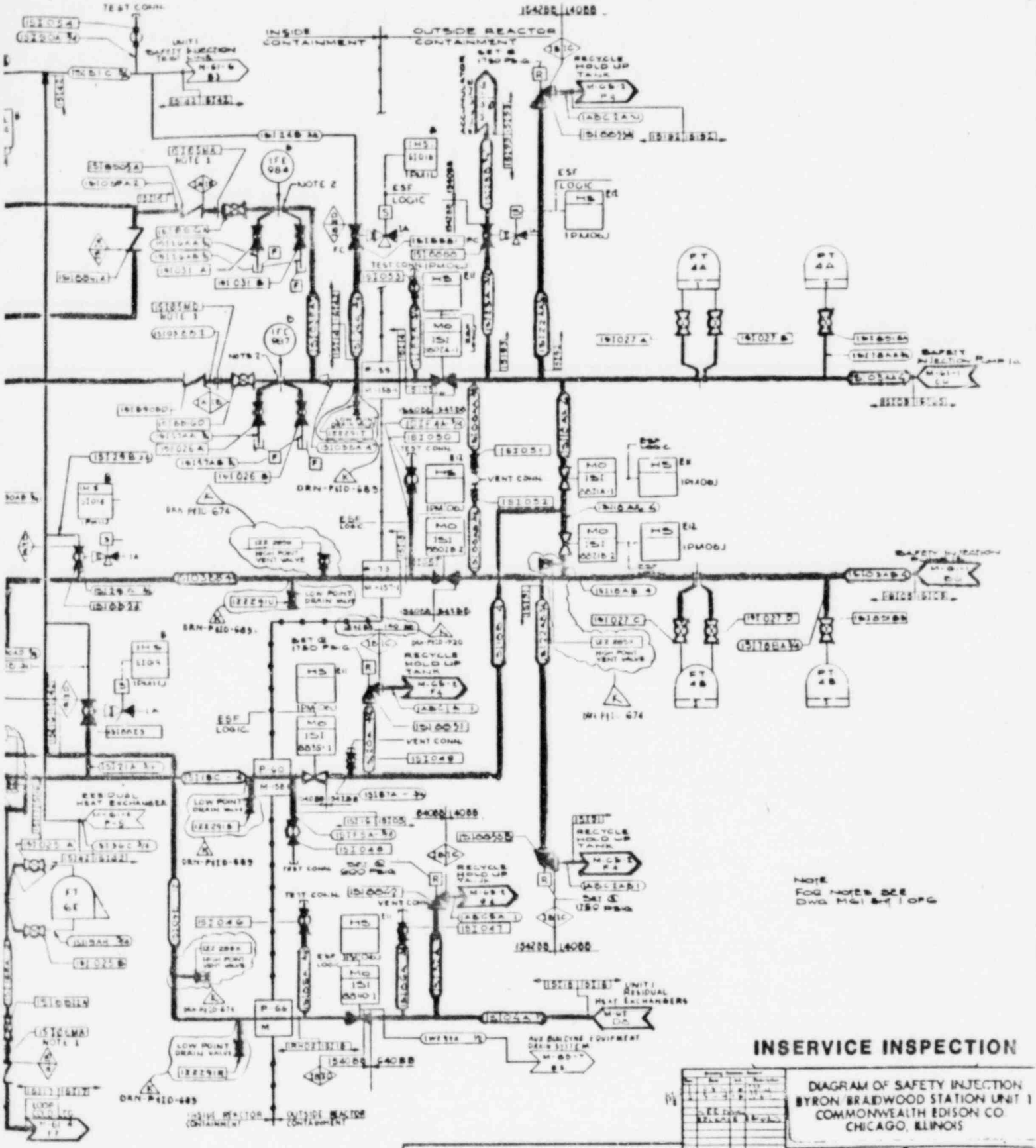

INSERVICE INSPECTION

DIAGRAM OF SAFETY INJECTION
BYRON/BRAIDWOOD STATION UNIT 1
COMMONWEALTH EDISON CO.
CHICAGO, ILLINOIS

BARGER & LUNDY

M-61

M-1014 SHEET 3 OF 6

DRAWING NO. M-1014

SHEET 4 OF 6

DRAWING TITLE INSERVICE INSPECTION SAFETY INJECTION

SPECIFICATION F/L-2907

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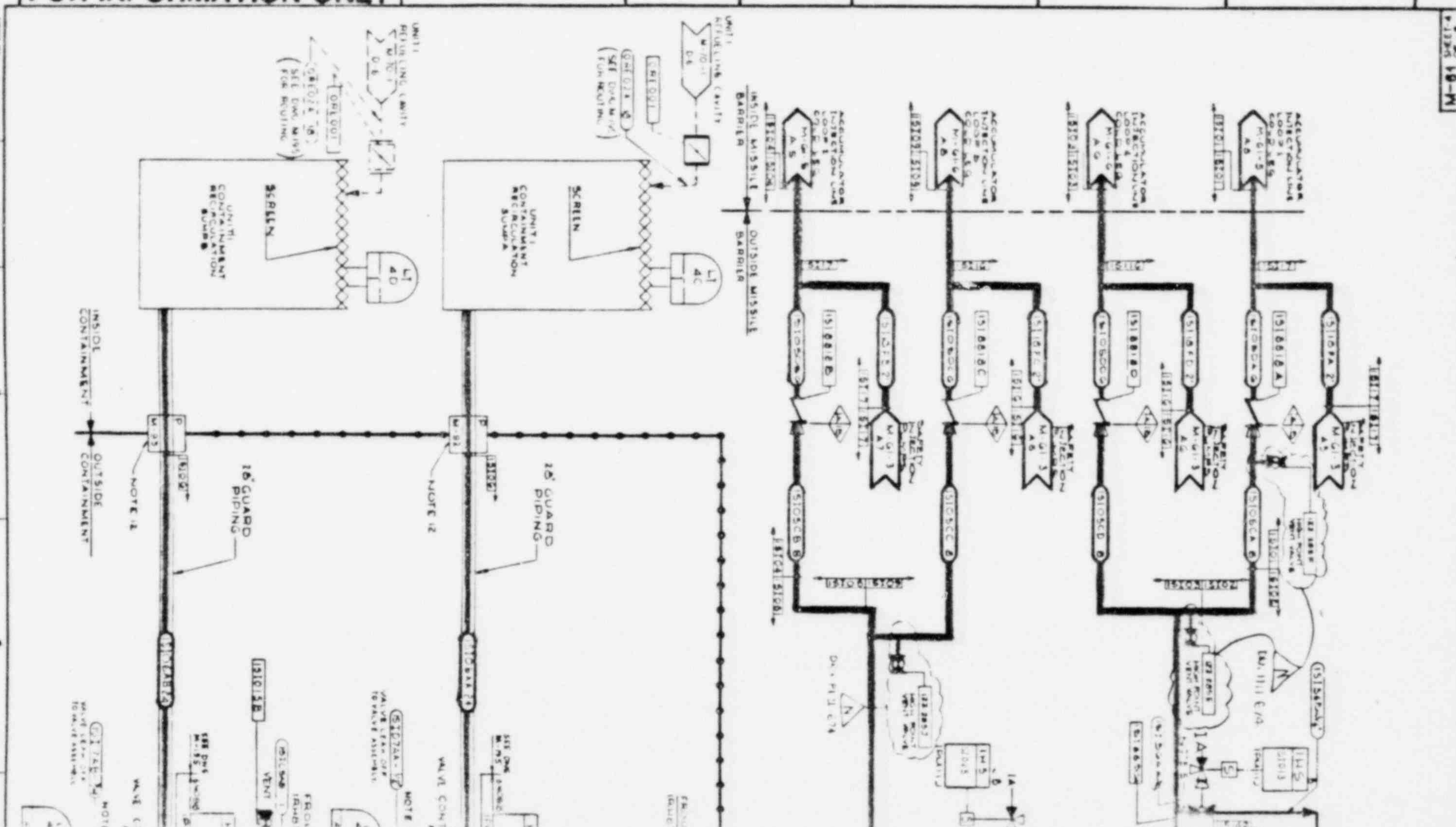
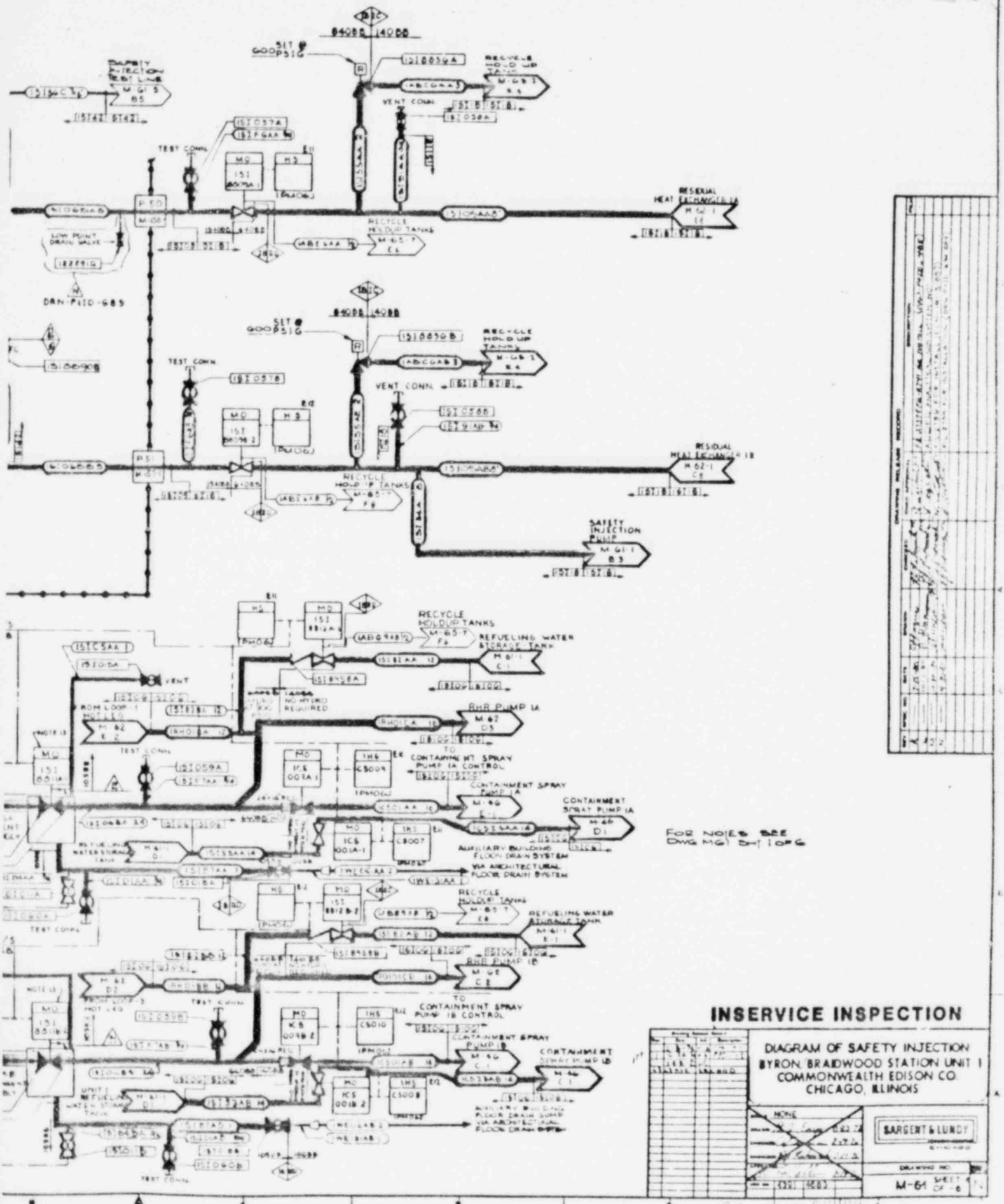




INSERVICE INSPECTION

DIAGRAM OF SAFETY INJECTION
BYRON, BRAIDWOOD STATION UNIT 1
COMMONWEALTH EDISON CO.
CHICAGO, ILLINOIS

NONE

SARGENT & LUNDY

M-61 SHEET 4 OF 6

M-1014 SHEET 4 OF 6

DRAWING NO. M-1014

SHEET 5 OF 6

DRAWING TITLE INSERVICE

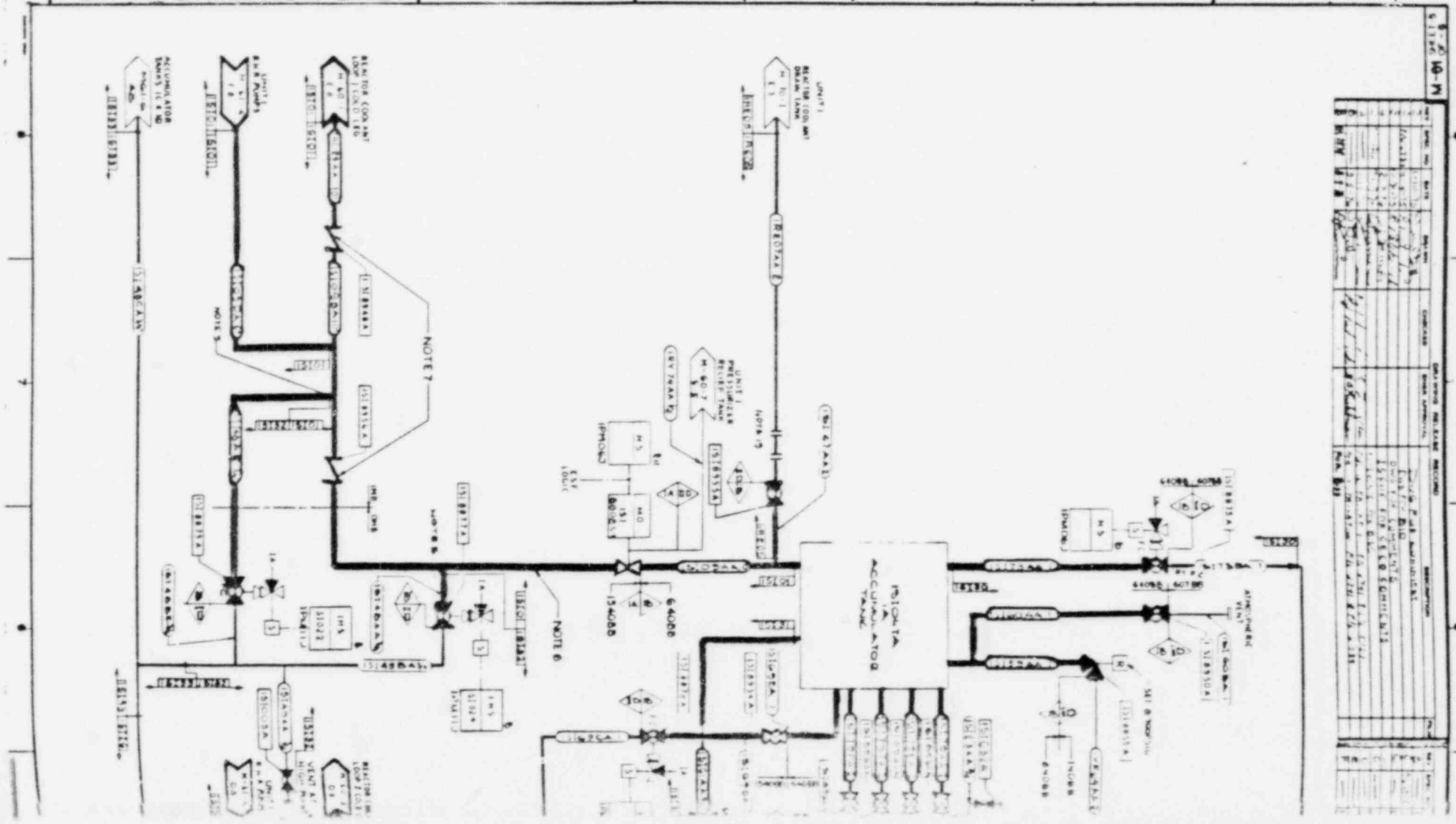
INSPECTION SAFETY

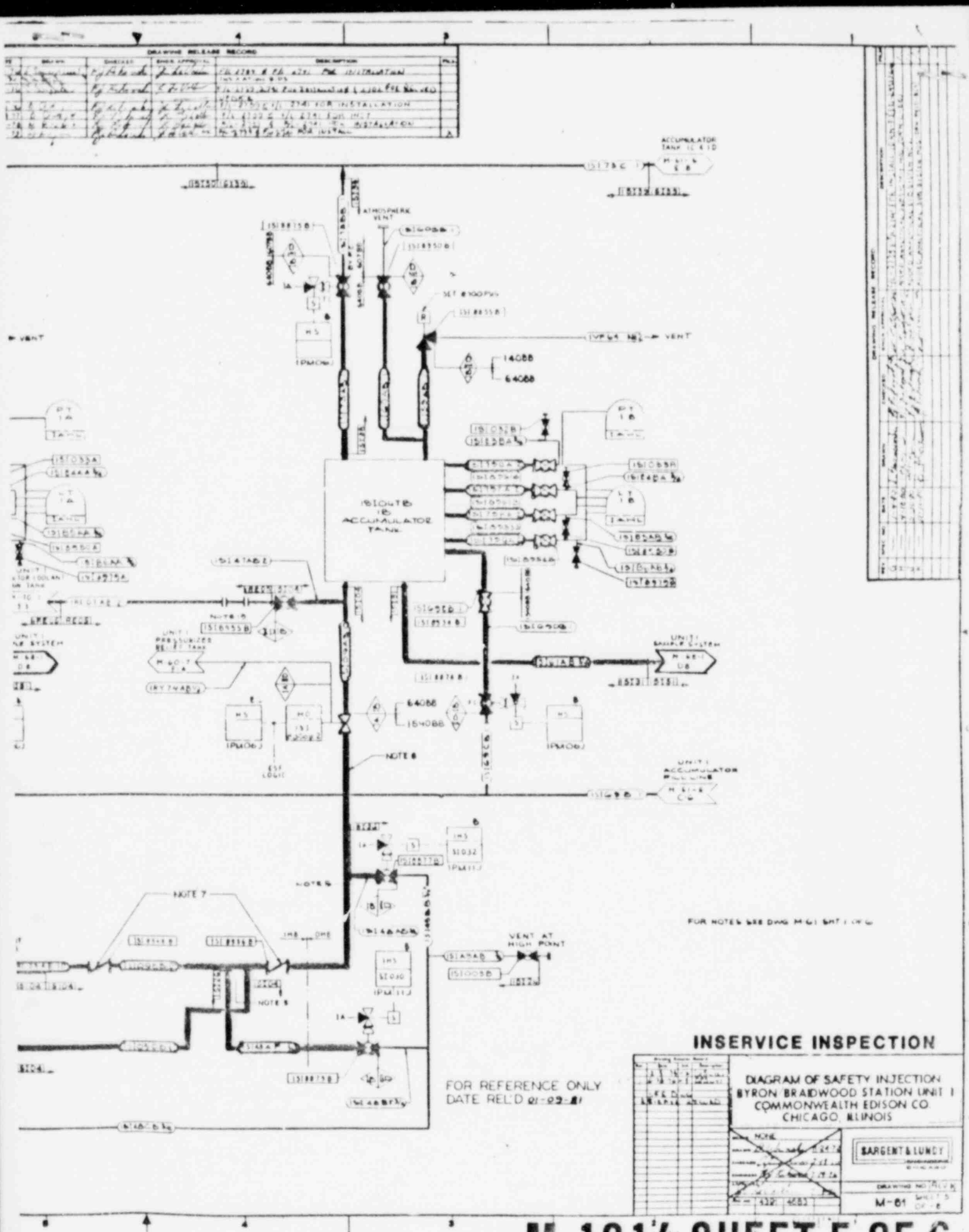
INJECTION

SPECIFICATION F/L-2807

FOR INFORMATION ONLY

ISSUE			PREPARED	REVIEWED	APPROVED
PURPOSE	REVISION	DATE			
FOR INFORMATION	B	10/5/81	J.S. Mattingly	F.J. Redmond Jr.	W.C. Jeffs NC





M-1014 SHEET 5 OF 6

DRAWING NO. M-1014

SHEET 6 OF 6

DRAWING TITLE INSERVICE

INSPECTION SAFETY

INJECTION

SPECIFICATION F/L-2907

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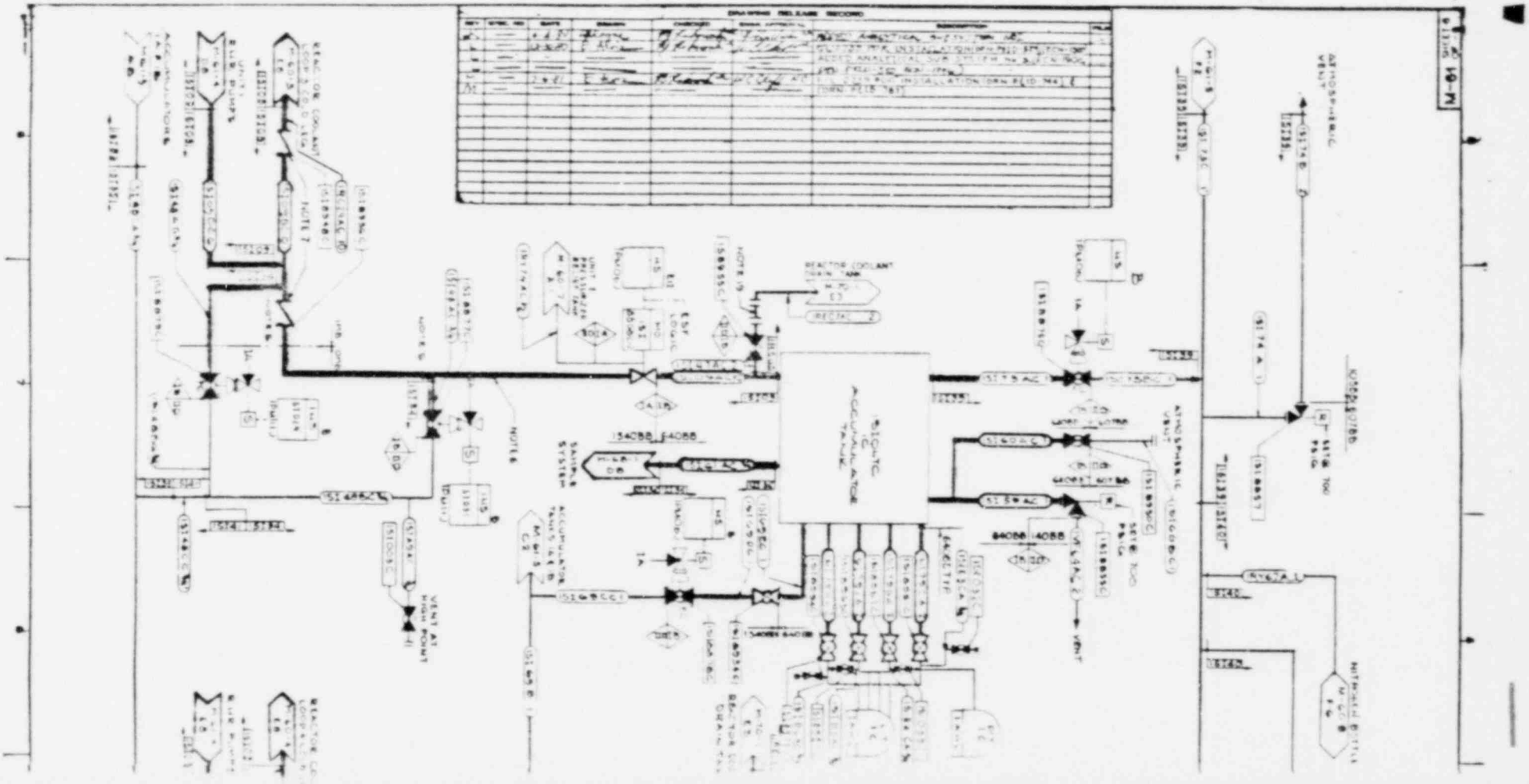
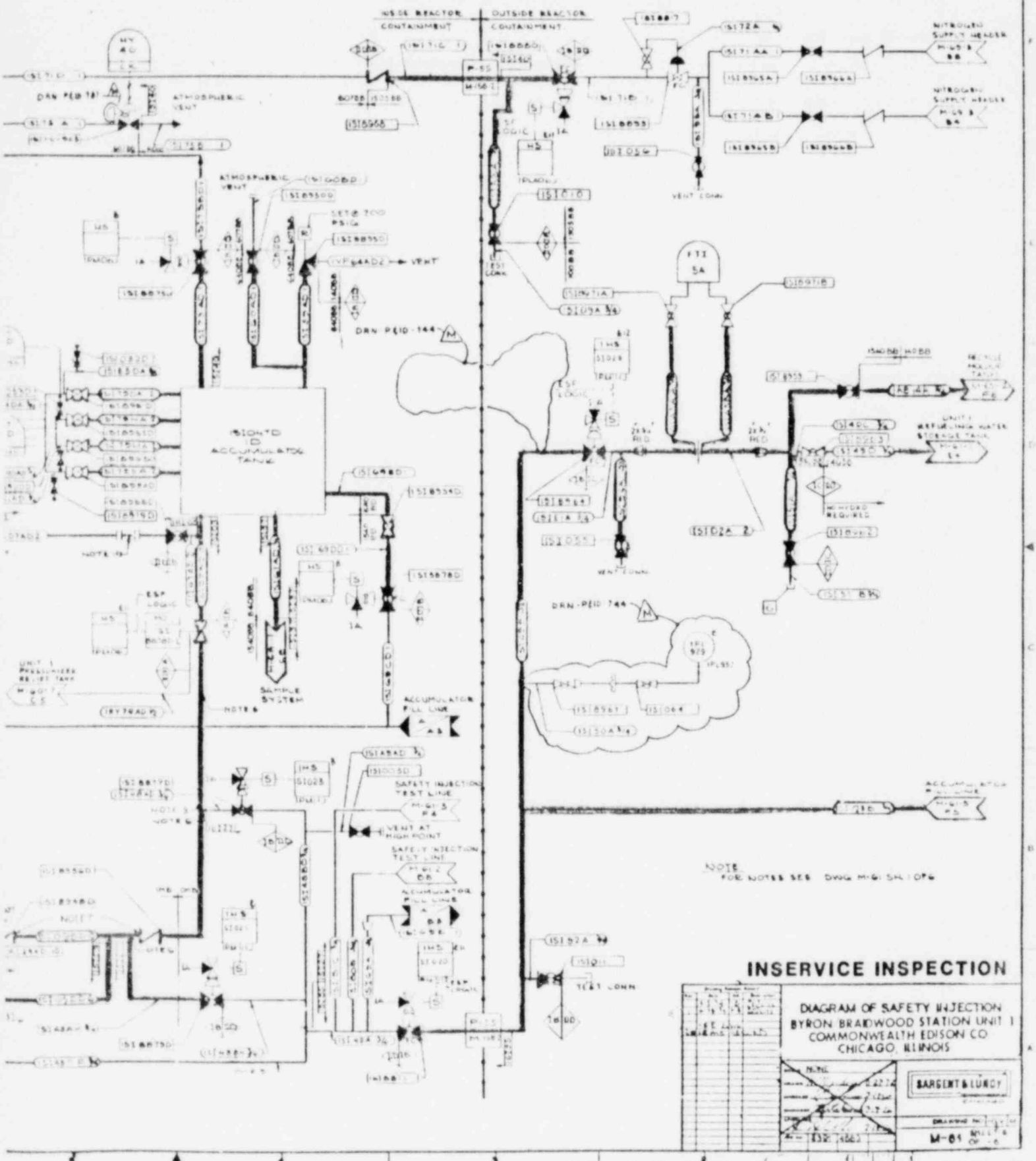
ISSUE			PREPARED	REVIEWED	APPROVED
PURPOSE	REVISION	DATE			
FOR INFORMATION	B	10/5/81			





INSERVICE INSPECTION

DIAGRAM OF SAFETY INJECTION
BYRON BRAIDWOOD STATION UNIT 1
COMMONWEALTH EDISON CO
CHICAGO, ILLINOIS

SARGENT & LUNDY

M-61

M-1014 SHEET 6 OF 6

DRAWING NO. M-1015 SHEET 1 OF 1	ISSUE			PREPARED	REVIEWED	APPROVED
	PURPOSE	REVISION	DATE			
DRAWING TITLE INSERVICE INSPECTION RESIDUAL HEAT REMOVAL SPECIFICATION F/L-2907	FOR INFORMATION	B	10/5/81	J.S. Mattingly	R.J. Lehnoski	W.L. Clapp

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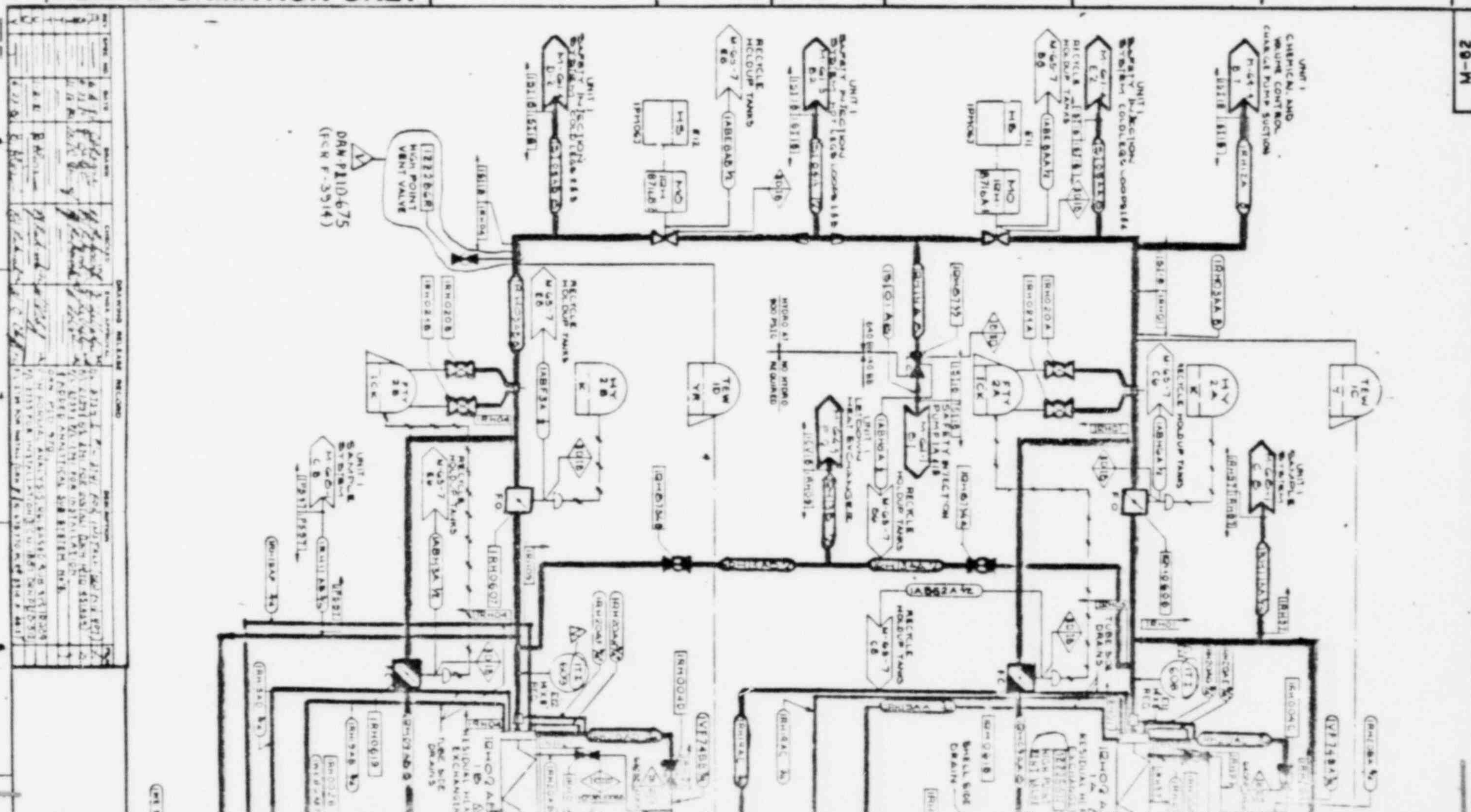
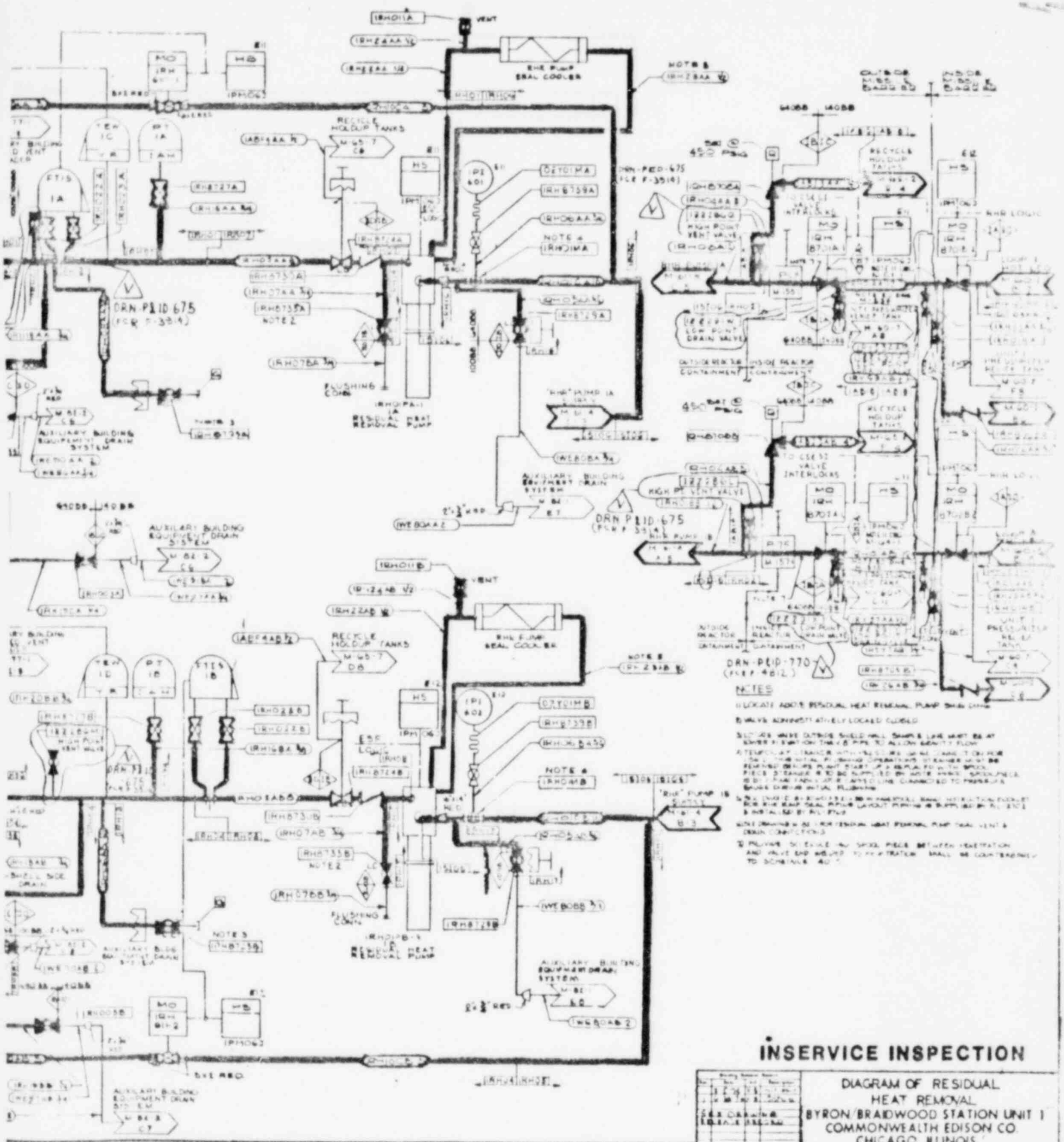
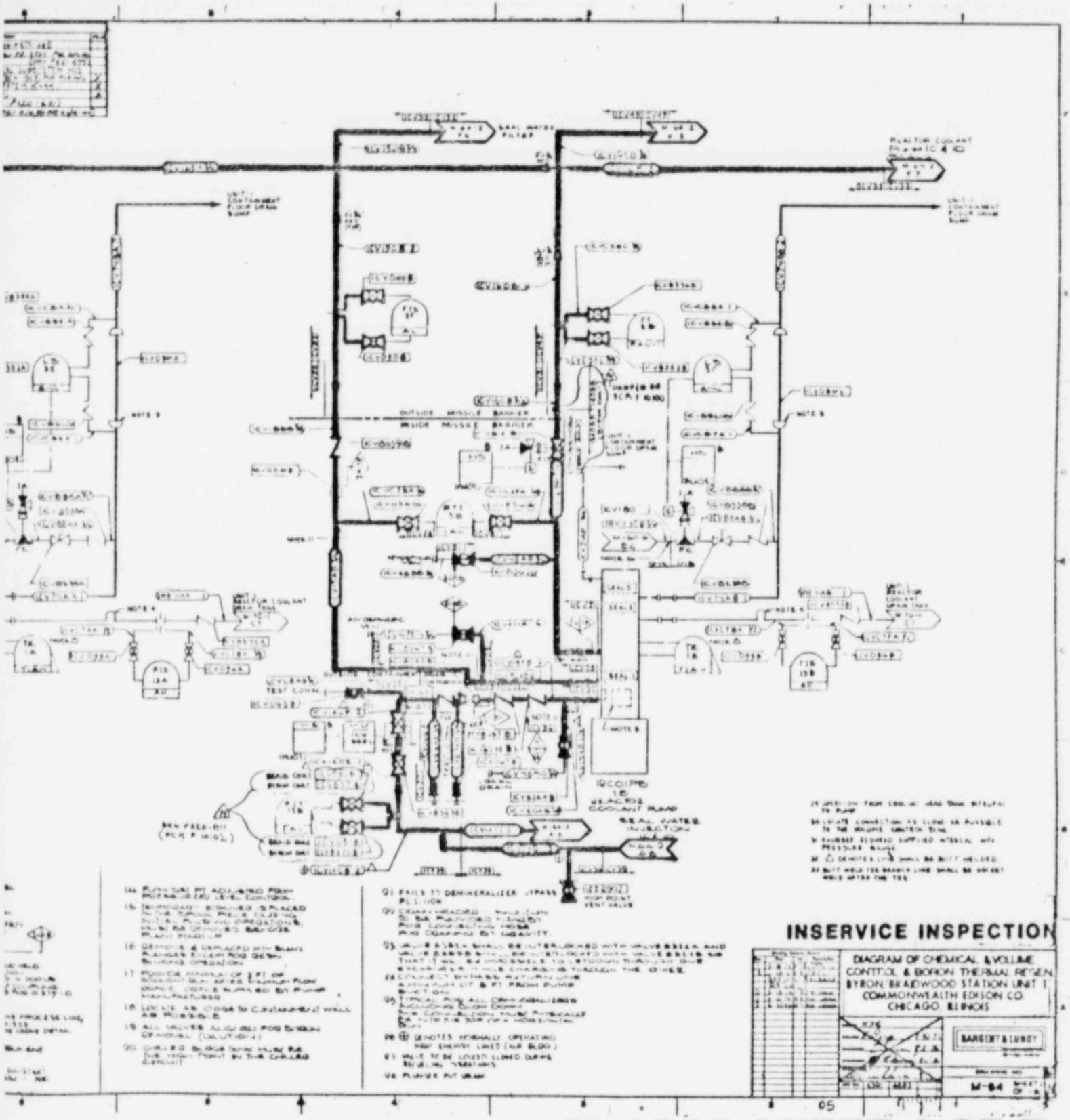




M-1015 SHEET 1 OF 1



M-1017 SHEET 1 OF 7

DRAWING NO. M-1017

SHEET 1 OF 7

DRAWING TITLE INSERVICE INSPECTION CHEMICAL & VOLUME CONTROL

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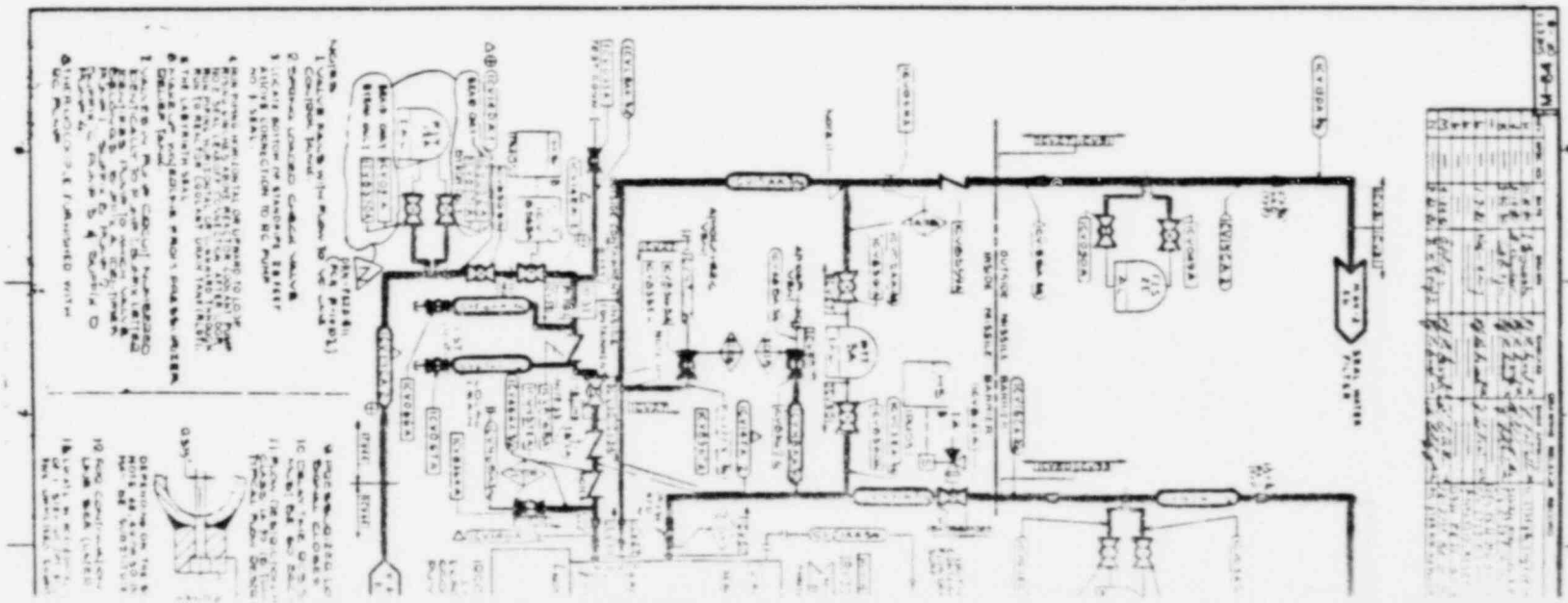
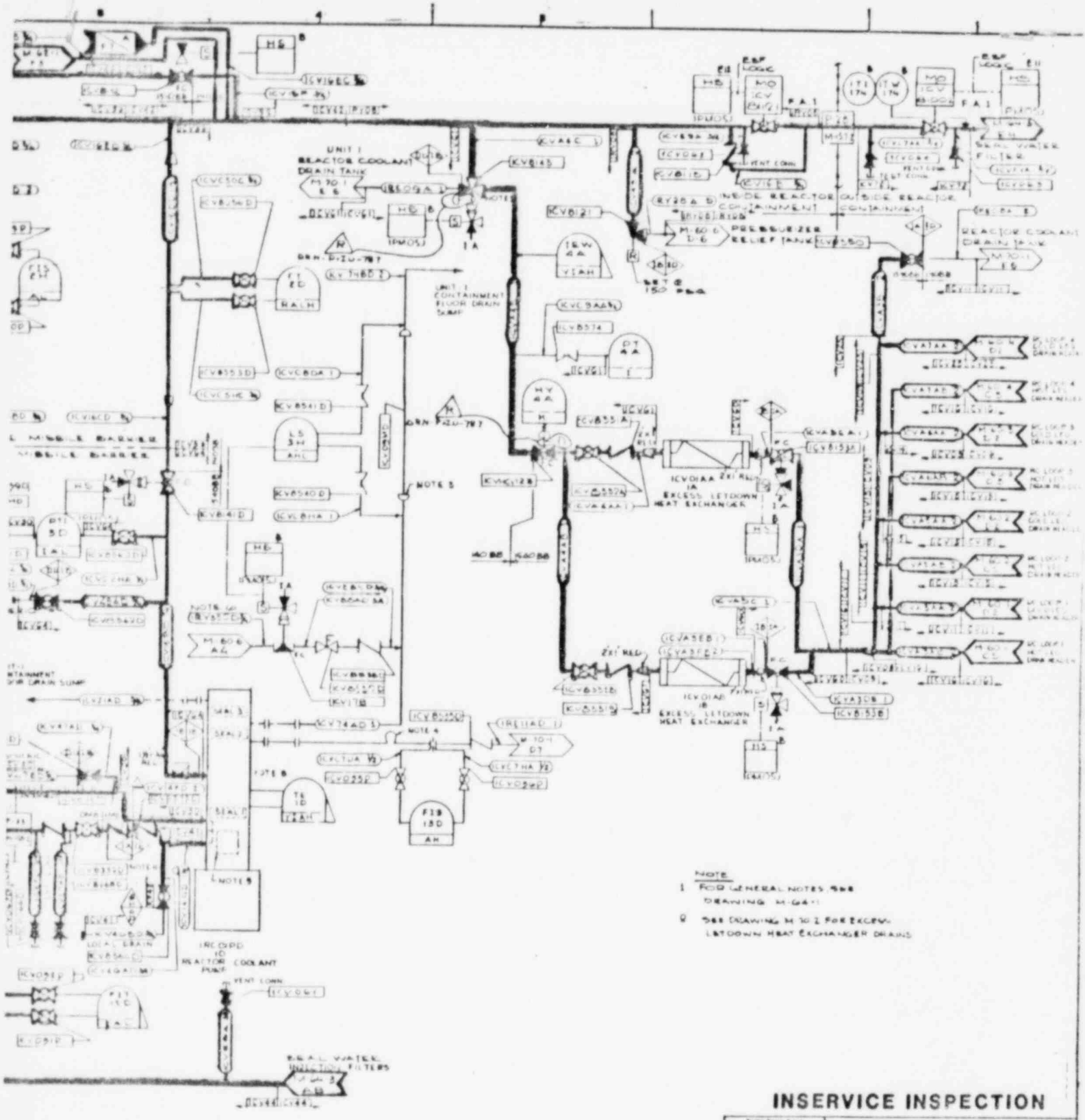
FOR INFORMATION	B	10/5/81	J S Wattingly	R J Fedorchak	W C Goff NC





INSERVICE INSPECTION

DIAGRAM OF CHEMICAL & VOLUME CONTROL & BORON THERMAL REGEN BYRON/BRAIDWOOD STATION UNIT 1 COMMONWEALTH EDISON CO. CHICAGO, ILLINOIS

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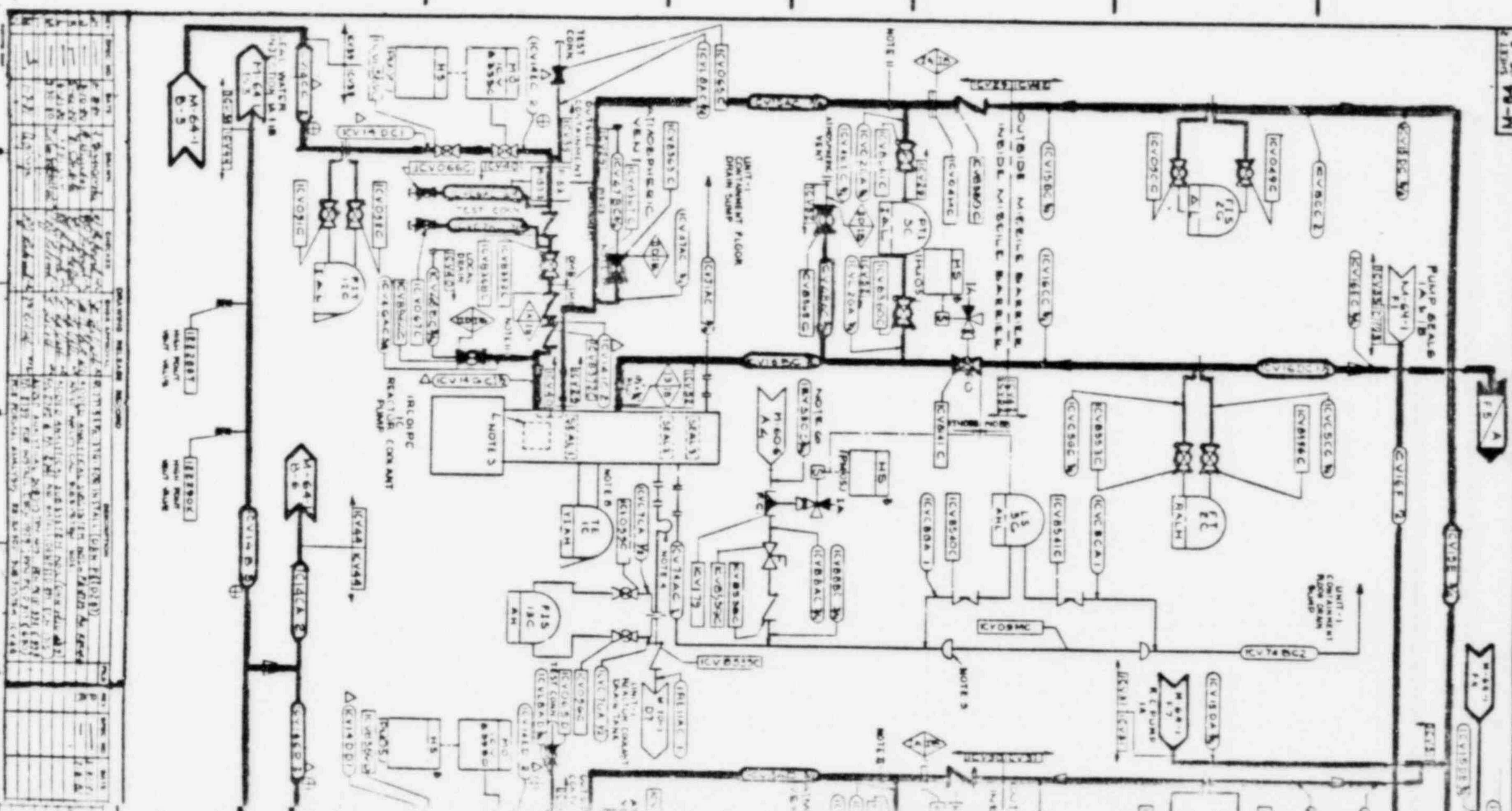
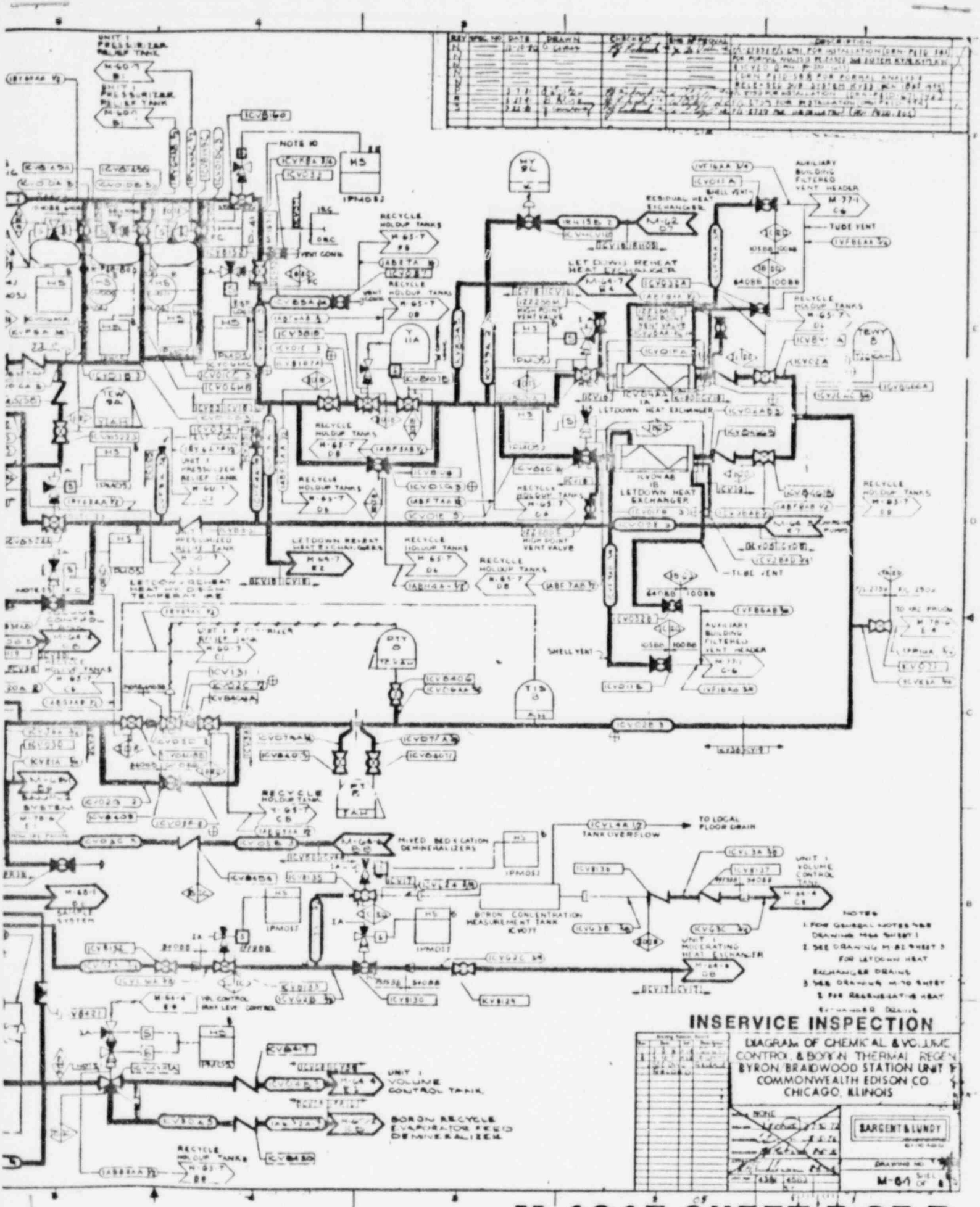
M-64

M-1017 SHEET 2 OF 7

	ISSUE			PREPARED	REVIEWED	APPROVED
DRAWING NO. M-1017 SHEET 2 OF 7	PURPOSE	REVISION	DATE			
DRAWING TITLE INSERVICE INSPECTION CHEMICAL & VOLUME CONTROL SPECIFICATION F/L-2907 **FOR INFORMATION ONLY**	FOR INFORMATION	B	10/5/81	J S Mattingly	RJ Rakosnik	W Wells





M-1017 SHEET 5 OF 7

DRAWING NO. M-1017

SHEET 5 OF 7

DRAWING TITLE INSERVICE INSPECTION CHEMICAL & VOLUME CONTROL

SPECIFICATION F/L-2907

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FOR INFORMATION	B	10/5/81	J.A. Mattingly	R.J. Rakowski	W.C. Jeffers