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RUSSELL,W.T. Region 1, Ofc of the Director

SUBJECT: Responds to NRC Bulletin 87-001 re thinning of pipe walls in nuclear power plants.

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September 8, 1987

Mr. William T. Russell
Regional Administrator
U.S. Nuclear Regulatory Commission
Region 1
631 Park Avenue
King of Prussia, PA 19406

Subject: Nuclear Regulator Commission Bulletin 87-01
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Russell:

NRC Bulletin 87-01 requested information concerning thinning of pipe walls in nuclear power plants. Our responses to the bulletin are attached.

Very truly yours,

Roger W. Kober

Subscribed and sworn to me on
this 8th day of September 1987

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T. Polich, Ginna Resident
Inspector

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Response to NRC IE Bulletin 87-01

1. Question:

Identify the codes or standards to which the piping was designed and fabricated.

Response:

All safety related and non-safety related piping systems were originally designed and fabricated to the requirements of USAS B31.1 Power Piping Code. Since the original construction, repairs and/or modifications have been made which have been designed and fabricated to later codes, including ASME Section III. Reanalysis of critical safety related piping 2½" and larger was performed under the Seismic Upgrade Program which was reviewed by the NRC under SEP Topic III-6. This program updated the piping analysis basis to criteria consistent with the ANSI 31.1 Code, including Summer 1973 addenda, with some amendments. This code edition remains as the current analysis basis for modifications performed on safety related piping. Non-safety related piping is designed and fabricated in accordance with the appropriate current edition of ANSI B31.1.

2. Question:

Describe the scope and extent of your programs for ensuring that pipe wall thicknesses are not reduced below the minimum allowable thickness. Include in the description the criteria that you have established for:

a. selecting points at which to make thickness measurements
b. determining how frequently to make thickness measurements
c. selecting the methods used to make thickness measurements
d. making replacement/repair decisions

Response:

Although one facet of the pipe wall thickness inspection has been ongoing for more than 10 years, the major portions of the Ginna inspection program have been put into place over the past five years. The various facets of the program were developed in response to either maintenance concerns at the Ginna plant or industry concerns associated with pipe wall thickness degradation. Piping inspections have been performed in areas previously identified as potential problem areas, in areas which had become suspect from inspections or events at other plants, and in areas identified via regulatory information. Information sources used as references were: NRC Bulletins and IE Information Notices, INPO Significant Event Reports or Significant Operating Experience Reports, and industry meetings and contacts.

In the determination of inspection scopes, no attempt was made to selectively inspect isolated fittings. If an area of concern was identified, pipe and fittings subject to that concern were inspected. This methodology included duplicate trains and downstream piping subject to the same operating parameters. One exception to this approach occurred while performing post Surry event inspections in December 1986. In order to provide the earliest possible information, these inspections were performed while the piping was hot. Due to the difficulty in performing "hot" inspections, the examination locations were selectively determined by using engineering judgement while assuring that the most likely areas of wall thinning were included.

For the '87 outage, the scope of systems to be inspected was expanded to cover the majority of the high energy, carbon steel piping systems (including but not limited to FW Heater & MSR Drains, Main Steam and Steam Generator Blowdown). Since the intent of the '87 outage inspection program was to sample as many of these additional systems as practical, engineering judgement was used in selecting a manageable number of components for inspection. For the December '86 and the '87 outage inspections, the dominant criteria for selection of inspection locations was the piping geometry. Based on experience at Ginna and in the industry, closely coupled fittings (such as combinations of tees, elbows, reducers, and fittings downstream of control valves) were considered to be the most likely place for erosion/corrosion to take place.

The frequency of inspections was determined by analysis of the results of data from previous outages. If inspection locations had yielded indications of significant wear, an engineering evaluation was performed to provide a basis for repair/replacement or an increased surveillance at the next scheduled outage.

Except for the turbine steam crossunder piping, which had been visually examined during a crawl-through, wall thickness measurements were made by UT examinations using current industry-accepted techniques at the time of examination.

Repair or replacement decisions prior to the '87 outage were based on an evaluation of the inspection results. For the '87 outage, a Nonconformance Report (NCR) was written for all components which experienced a greater than 30% reduction from nominal wall thickness. The NCR's were formally dispositioned with replacement/repair and further inspection decisions based on the required minimum wall thickness. Disposition of NCR's considered the piping configuration, extent of thinning, individual component service life, importance to safety and any other relevant conditions. If repair was not required, the next required inspection period was specified.

3. Question:

For liquid-phase systems, state specifically whether the following factors have been considered in establishing your criteria for selecting points at which to monitor piping thickness (Item 2a):

a. piping material (e.g., chromium content)
b. piping configuration (e.g., fittings less than 10 pipe diameters apart)
c. pH of water in the system (e.g., pH less than 10)
d. system temperature (e.g., between 190 and 500°F)
e. fluid bulk velocity (e.g., greater than 10 ft/s)
f. oxygen content in the system (e.g., oxygen content less than 50 ppb)

Response:

Prior to the inspections influenced by the Surry pipe failure, the criteria for selection of locations for the wall thickness measurements for liquid-phase systems was the same as that described in Item 2 above. For the inspections performed in December 1986 in response to the Surry incident, an inspection point selection criteria for liquid-phase flow systems was used that accounted for the previous Ginna Station experience and for some of the industry recognized factors affecting erosion/ corrosion. The major factor considered was the piping configuration. From previous Ginna Station and other utility inspection results, tees, elbows, reducers and components downstream of control valves had the highest incidence of degradation. Locations with closely coupled combinations of these fittings were considered to have a greater potential for erosion/corrosion than those fittings having greater than ten diameters of straight pipe between them. Other considerations which led to selection of inspection points were system temperature and fluid bulk velocity.

Inspection points were also chosen which represented a configuration similar to that at Surry or were at a similar point in the system. In addition, the December 1986 inspections included portions of systems with temperatures similar to those at Surry. Since there was limited use of alloy piping materials in the original design of Ginna piping systems, piping material was not a major consideration in the inspection point selection criteria. Based on industry experience and the limited variation of the parameters within the suspect Ginna systems, pH and O_2 content in the system were not given major consideration in selecting inspection points.

These same liquid-phase selection criteria were used to determine the locations for the expanded scope of systems inspected during the !87 refueling outage.

4. Question:

Chronologically list and summarize the results of all inspections that have been performed, which were specifically conducted for the purpose of identifying pipe wall thinning, whether or not pipe wall thinning was discovered, and any other inspections where pipe wall thinning was discovered even though that was not the purpose of that inspection.

a. Briefly describe the inspection program and indicate whether it was specifically intended to measure wall thickness or whether wall thickness measurements were an incidental determination.

b. Describe what piping was examined and how (e.g., describe the inspection instrument(s), test method, reference thickness, locations examined, means for locating measurement point(s) in subsequent inspections).

c. Report thickness measurement results and note those that were identified as unacceptable and why.

d. Describe actions already taken or planned for piping that has been found to have a nonconforming wall thickness. If you have performed a failure analysis, include the results of that analysis. Indicate whether the actions involve repair or replacement, including any change of materials.

Response:

a. Rochester Gas and Electric's inspection program is designed to determine wall loss of carbon steel piping and components. The programmatic effort began in 1983 to specifically take baseline measurements on the pre-separator system. This effort has since expanded as described below. Inspection areas have been determined as described in the response to Question #2. Since the program to date has been "concern" oriented, the following describes the inspection program for the individual areas of interest.

(1) Routine Refueling Outage Inspection of the Turbine Crossunder Piping Between the High Pressure Turbine Sections and the Moisture Separator Reheaters.

This inspection has been a routine maintenance item for approximately the last ten refueling outages. This inspection consists of plant maintenance crews visually examining the pipe interior by crawling through the large diameter piping. The crossover piping has not had any evidence of pipe wall thickness reduction. However, the crossunder piping has had multiple areas of wall thickness degradation

and has been repaired. The procedure for repair consists of marking the areas where wall reduction was clearly evident (gouges, ripples, or depressions) and then making weld repair to bring the reduced areas back to the original wall thickness. No wall thickness measurements were taken during this routine maintenance.

Because of concern provided by a steam leak which developed in one of the expansion joints of a crossunder line, the areas of the pipe that are welded to the expansion diaphragm hinges were UT examined during the '87 refueling outage. The area of the leak was located, cut out, and replaced. To determine the extent of the problem, UT inspections were performed in similar locations on two of the other crossunder lines. These inspections found them to be in good condition. The leak was caused by corrosion resulting from poor geometry under the reinforcement pad and not due to general erosion/ corrosion wear. This area of the joint is not visible during an ID inspection.

The preseparator system was installed in '83 to reduce the moisture content in the crossunders. A 70% removal effectiveness was determined through testing. Subsequent inspections indicate a reduced wear rate.

(2) Turbine Extraction Steam Piping

The extraction steam piping from the high pressure turbine to the feedwater heaters no. 4 and no. 5 was UT examined during the 1983 outage in response to the IE Information Notice 82-22 on the Oconee high pressure turbine exhaust line failure. Excessive wall reduction was found in some elbows, and they were replaced. Based on inspection results, components which had indications of significant wear were re-examined in the subsequent '84, '85, '86 & '87 refueling outages and additional elbows and piping were replaced in the '86 outage. In the '86 refueling outage, the inspection area was expanded to include the extraction steam downcomers from the low pressure turbine in the condenser neck. No unusual wear was observed at that time.

(3) Feedwater Pump Recirculation Piping

The feedwater pump recirculation line to the condenser downstream of the flow control valves has experienced excessive vibration due to suspected flashing. This piping was UT examined during the '86 refueling outage as part of the planned maintenance on the flow control valves and associated piping. Portions

of the piping were found to have excessive wall reduction and were replaced. Portions of the piping were re-examined in the subsequent '87 refueling outage. In the '87 outage a new feedwater pump recirculation/bypass piping arrangement was installed that reduces to acceptable levels the service on the old recirculation control valves to the condenser. This feedwater pump recirculation/bypass line was given a baseline thickness examination during the outage.

(4) Turbine Moisture Separator - Reheater 2nd Pass Drains to Feedwater Heater No. 5

A forced outage occurred in '86 due to the failure of an elbow downstream of the control valve in the drain line from the 2A MSR to the 5B feedwater heater (Ref. LER 86-004). Informal UT readings were taken in other portions of the same line and in similar portions of the duplicate trains which confirmed that this was an isolated situation; it should be noted that the elbow that failed had a significantly shorter length of pipe between it and the upstream control valve than all of the other lines. The failed elbow was replaced with a higher schedule of a chrome alloy material. In the subsequent '87 refueling outage the piping was re-examined and the control valve was relocated further upstream from the elbow. At the same time, the piping downstream of the control valves in the alternate dump lines to the condenser was examined, found to have excessive wall reduction, and was replaced.

(5) Feedwater Pump Suction Piping

In response to the Surry pipe failure in the feedwater pump suction piping, UT examinations were taken in December '86 in geometrically similar portions of the Ginna feedwater piping and in portions of the feedwater heater drain system while the plant was at full power operating temperatures. All of the measurements indicated that the wall thicknesses were greater than 90% of the nominal wall thickness.

(6) 1987 Outage Program Expansion

For the 1987 refueling outage, the piping inspections were expanded in response to the concerns identified regarding the Surry feedwater line break (IEN 86-106). The 299 components selected for UT examination were a combination of those requiring re-examination based on the results of previous inspections and of those systems, especially single phase liquid systems, that had not been suspected of wall

thinning problems prior to the Surry pipe failure. This scope included piping in the Steam Generator Blowdown System, the remainder of the FW Heater Drains and the Moisture Separator-Reheater Drains, including the alternate dump to the condenser. The Main Steam system was added to the scope to include the remaining high energy carbon steel piping system. The Auxiliary Feedwater discharge lines were included because of their critical plant function and moderately severe operating conditions. As a result of the inspections, portions of the Steam Generator Blowdown piping to the blowdown heat exchanger were replaced, along with portions of the Moisture Separator-Reheater drains alternate dump to the condenser. Many components inspected during 1987 have been selected for reinspection during the 1988 outage to trend the erosion/corrosion rate.

b. The piping which was examined is described in "a" above. The method of performing the examinations is as follows.

The first step in the examination process is the removal of insulation, scale and any other materials that might interfere with the transmission of ultrasound. Next, the entire component (elbow, tee, pipe, or reducer) is laid out in grid fashion. Around the circumference of a given component, numbered rings are generated, and along the longitudinal axis lettered columns are generated. The grid size is determined according to the component's diameter. For components equal to or less than 6" in diameter, grid sizes are 1 inch; greater than 6" and less than 12" in diameter, grids are 2 inch; and greater than 12" in diameter, grids are 3 inch. The first ring begins from the centerline of the upstream weld, and its distance from the weld is the same distance as the grid size. For example, if the component has a grid size of 2 inches, the first ring would begin 2 inches downstream from the centerline of the upstream weld. The first data column follows the same rules for the reference location of a weld, typically the outside radius of an elbow, or, top center of a component. When two components are adjacent to each other, such as an elbow and a pipe (both components to be examined), the columns of the upstream component are extrapolated to the downstream component. In the case of a tee, the grids are laid out the same as for a pipe, with some variation. The rings begin on the run of a tee, leaving out the points where the bull (branch) comes out. As the last ring is marked on the run, the next ring is marked on the bull. When there is a change in flow direction or line size, the downstream component at which the flow change occurs will be examined for a distance of 12 inches. The 12 inch distance may alternately be defined in terms of a

given number of component diameters. For a representation of the component layout, refer to the drawings that follow the inspection data in Attachment 1.

After the component grid patterns have been laid out, the intersections of the grids are marked with a paint marker in order to provide locations for current and subsequent examinations. However, due to system temperatures and external surface conditions, the paint marks may not be visible for subsequent examinations. Consequently, a consistent method of component layout pattern is maintained and documented for each component. The following items are included in the component layout documentation: grid size, distance of the first ring from the upstream weld and direction the columns are lettered (clockwise or counterclockwise) in reference to flow in the component.

Once a component has been laid out, thickness readings are taken. The instruments used are the SONIC MARK I and the DMX-1. Transducers with frequencies ranging from 2.25 to 10.0 MHz and with diameters from .25" to .5" are used. The selection of the transducer is determined by the nominal wall and the component's geometry. Calibration is performed for a thickness greater than the nominal thickness expected for a given component. Nominal wall is determined from line specifications and/or previous history of the component.

Thickness readings of the component are then taken by a certified NDE technician, who either dictates the measured data to another technician, or he utilizes a data logger. The data logger can be connected to either the SONIC or the DMX-1. This device stores the thickness readings of one or more components, and the data is later downloaded into a computer.

The next step is the data entry into the computer. When the data is recorded manually the data has to be entered manually, but when the data is recorded via the data logger, then it is entered through a serial interface. Each component has a unique number assigned to it and is referred to as a summary number. This number becomes the file name of the data entered into the computer. Grid profile information, type of component, pipe wall schedule and diameter are entered along with the transducer data.

With this information entered the file is compiled and spread sheets and color plots are generated. The color plot is used as a quick reference tool to locate a potential area of concern for a given component. The colors represent different percentages of the nominal wall remaining. The spread sheet is used for exact

thickness readings for specific grid locations. (Refer to the sample plot and spread sheet that are attached as Attachment 2)

c. Thickness measurement results are reported chronologically in Attachment 1.

d. Actions taken based on thickness measurement results are described in Attachment 1. The "Remarks" column will indicate next to a specific component if it was repaired, replaced or scheduled for further inspection.

5. Question:

Describe any plans either for revising the present or for developing new or additional programs for monitoring pipe wall thickness.

Response:

A significant level of pipe wall thickness inspections have already been made in both single and two phase flow systems as part of the existing Ginna Station program. To date, 501 component UT examinations have been performed, and the results have been recorded and appropriate actions taken. The turbine crossunder piping has been routinely visually examined and repaired as necessary. Beginning with the '87 refueling outage, the procedure for dispositioning non-conforming wall thickness measurements has been more closely controlled by processing a Non-Conformance Report using the plant QA program. The results from previous outages are being entered into the Ginna Station Maintenance In-Service Inspection Program data base system to facilitate identifying, tracking, and scheduling of future inspections.

The existing inspection program will be formalized further for both single and two phase flow systems consistent with the general guidelines of the NUMARC Working Group on Piping Erosion/Corrosion Summary Report dated June 11, 1987. Inspection sample size, inspection methods, acceptance guidelines, and program follow up represent the key areas of the recommended program. The scope of the present program's inspection points will be reviewed and evaluated. Consideration will be given to the need for expanding the number of inspection points and the selection of additional inspection points, if necessary, for single phase flow systems. An analytical computer model recognized by the utility industry will be utilized as a tool for evaluation of the suggested fittings, suggested piping locations, and key parameters identified in the NUMARC summary report (tabulated and included in Attachment 3).

For two phase flow systems, the appropriate portions of the single phase evaluation, previous Ginna Station experience,

and other utility industry recognized evaluation methods will be used. Included in this evaluation will be the determination of the schedule for the completion of the inspections for any additional points and reinspection of the existing points.

Attachment 1

to

NRC IE Bulletin 87-01 Response

(Item 4)

THE FOLLOWING IS A LIST OF COMPONENTS
EXAMINED DURING THE 1983 OUTAGE AT GINNA

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P. HEATER

A. 4 ELBOWS
B. 2 PIPE SECTIONS
C. 1 TEE

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P. HEATER

A. 3 ELBOWS
B. 2 PIPE SECTIONS
C. T TEE

STEAM EXTRACTION TO 5A & 5B H.P. HEATERS

A. 6 ELBOWS
B. 2 TEES

TOTAL COMPONENTS

NOTE: AS PART OF THE ACCEPTANCE OF COMPONENTS BEING USED FOR A NEW PRESEPARATOR SYSTEM, 40 ADDITIONAL COMPONENTS WERE INSPECTED. ALL INSTALLED COMPONENTS MET ALLOWABLE STANDANDS,HOWEVER, NO ATTEMPT WAS MADE TO TRACK SPECIFIC INSPECTION POINTS IN THE RECEIPT INSPECTION TO SPECIFIC LOCATIONS IN THE FINAL INSTALLED MODIFICATION.

RESULTS OF THICKNESS READINGS AT GINNA DURING 1983 OUTAGE

90 – 85% NOMINAL WALL THICKNESS

1 STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
3 STEAM EXTRACTION TO 5A & 5B H.P.H.

80 – 70% NOMINAL WALL THICKNESS

1 STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
2 STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.
1 STEAM EXTRACTION TO 5A & 5B H.P.H.

< 70% NOMINAL WALL THICKNESS

4 STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
2 STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.
2 STEAM EXTRACTION TO 5A & 5B H.P.H.

1983 OUTAGE THICKNESS READINGS AT GINNA STATION

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P.HEATER DRAWING M-21

RG&E TYPE NUMBER	ID NO. OF NOMINAL DRAWING	COMPONENT	PERCENTAGE THICKNESS		REMARKS SUMMARY	PER
301015	1AD	P	90-85			
301025	2AD	P	>90			
301350	33	T	70-65	.580		
301370	35	E	80-70			
301390	37	E	<65	.220		
301410	38	E	<65	.220		
301430	40	E	70-65	.260		

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P.HEATER DRAWING M-22

RG&E [illegible]ER	ID NO. OF NOMINAL DRAWING	COMPONENT	PERCENTAGE THICKNESS		REMARKS SUMMARY	PER
301705	1B.	P	>90			
301715	2B	P	>90			
302070	33	T	80-70			
302090	35	E	80-70			
302130	38	E	<65	.200	REPLACED PRIOR TO END OF OUTAGE	
302140	39	P			REPLACED PRIOR TO END OF OUTAGE	
302150	40	E	<65	.210	REPLACED PRIOR TO END OF OUTAGE	

STEAM EXTRACTION TO 5A & 5B H.P. HEATERS DRAWING M-75

RG&E TYPE NUMBER	ID NO. OF NOMINAL DRAWING	COMPONENT	PERCENTAGE THICKNESS		REMARKS SUMMARY	PER
303090	9	T	90-85			
303110	11	E	>90			
303130	13	E	70-65	.260		
303140	14	E	80-70			
303230	23	T	>90			
303240	24	E	90-85			
303260	26	E	90-85			
[illegible]280	28	E	<65	.240		

THE FOLLOWING IS A LIST OF COMPONENTS
EXAMINED DURING THE 1984 OUTAGE AT GINNA

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P. HEATER

A. 19 ELBOWS
B. 2 PIPE SECTIONS
C. 2 TEES

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P. HEATER

A. 14 ELBOWS
B. 2 PIPE SECTIONS
C. 2 TEES

STEAM EXTRACTION TO 5A & 5B H.P. HEATERS

A. 5 ELBOWS
B. 1 TEES

47 TOTAL COMPONENTS

RESULTS OF THICKNESS READINGS AT GINNA DURING 1984 OUTAGE

90 - 85% NOMINAL WALL THICKNESS

3	STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
5	STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.
2	STEAM EXTRACTION TO 5A & 5B H.P.H.

85 - 80% NOMINAL WALL THICKNESS

4	STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
2	STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.
1	STEAM EXTRACTION TO 5A & 5B H.P.H.

80 - 70% NOMINAL WALL THICKNESS

4	STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
2	STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.
3	STEAM EXTRACTION TO 5A & 5B H.P.H.

70% NOMINAL WALL THICKNESS

2	STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
1	STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.

1984 OUTAGE THICKNESS READINGS AT GINNA STATION

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P.HEATER DRAWING M-21

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
301015	1A	P	85-80	
301020	2	E	>90	
301025	2A	P	85-80	
301030	3	E	80-70	
301050	5	E	>90	
301070	7	E	>90	
301120	11	E	90-85	
301130	12	E	90-85	
301160	15	E	>90	
301180	17	E	>90	
[illegible]230	21	E	90-85	
[illegible]260	24	E	>90	
301280	26	E	>90	
301300	28	E	>90	
301320	30	T	85-80	
301350	33	T	80-70	
301370	35	E	80-70	
301390	37	E	<65 .222	
301410	38	E	<65 ..227	
301430	40	E	80-70	
301470	44	E	>90	
301490	46	E	>90	
301510	48	E	85-80	

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P.HEATER DRAWING M-22

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
301705	1B	P	>90	
301715	2B	P	90-85	
301720	3	E	>90	
301740	5	E	>90	
[illegible]760	7	E	90-85	
[illegible]780	9	E	90-85	
[illegible]800	11	E	>90	
301850	15	E	>90	
301900	19	E	>90	

AM EXTRACTION TO PRESEPARATOR A AND 4A L.P.HEATER DRAWING M-22 CONT.

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
301920	21	E	>90	
301980	26	E	90-85	
302030	30	E	>90	
302050	32	E	>90	
302070	33	T	70-65 .450	
302090	35	E	80-70	
302110	37	T	80-70	
302130	38	E	90-85	
302150	40	E	85-80	

STEAM EXTRACTION TO 5A & 5B H.P. HEATERS DRAWING M-75

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
303090	9	T	80-70	
303110	11	E	90-85	
303130	13	E	90-85	
303140	14	E	80-70	
303260	26	E	80-70	
303280	28	E	85-80	

THE FOLLOWING IS A LIST OF COMPONENTS
EXAMINED DURING THE 1985 OUTAGE AT GINNA

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P. HEATER

A. 4 ELBOWS
B. 2 PIPE SECTIONS

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P. HEATER

A. 4 ELBOWS
B. 2 PIPE SECTIONS

STEAM EXTRACTION TO 5A & 5B H.P. HEATERS

A. 4 ELBOWS

16 TOTAL COMPONENTS

RESULTS OF THICKNESS READINGS AT GINNA DURING 1985 OUTAGE

90 – 85% NOMINAL WALL THICKNESS

2 STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.

85 – 80% NOMINAL WALL THICKNESS

1 STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.
1 STEAM EXTRACTION TO 5A & 5B H.P.H.

80 – 70% NOMINAL WALL THICKNESS

1 STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
2 STEAM EXTRACTION TO 5A & 5B H.P.H.

< 70% NOMINAL WALL THICKNESS

2 STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
STEAM EXTRACTION TO 5A & 5B H.P.H.

1985 OUTAGE THICKNESS READINGS AT GINNA STATION

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P.HEATER DRAWING M-21

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS		REMARKS
301015	1A	P	80-70		
301020	2	E	>90		
301025	2A	P	85-80		
301390	37	E	<65	.225	
301430	40	E	<65	.236	
301440.	41	P	>90		

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P.HEATER DRAWING M-22

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
301705	1B	P	85-80	
301715	2B	P	>90	
301720	3	E	>90	
301900	19	E	>90	
302130	38	E	90-85	
302150	40	E	90-85	

STEAM EXTRACTION TO 5A & 5B H.P. HEATERS DRAWING M-75

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS		REMARKS
303130	13	E	80-70		
303140	14	E	80-70		
303260	26	E	85-80		
303280	28	E	<65	.238	

THE FOLLOWING IS A LIST OF COMPONENTS
EXAMINED DURING THE 1986 OUTAGE AT GINNA

FEEDWATER BYPASS TO CONDENSER (CV-18)

A. 7 ELBOWS
B. 2 REDUCERS
C. 8 PIPE SECTIONS

FEEDWATER BYPASS TO CONDENSER (CV-19)

A. 4 ELBOWS
B. 2 REDUCERS
C. 4 PIPE SECTIONS

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P. HEATER

A. 6 ELBOWS
B. 4 PIPE SECTIONS
C. 1 TEE

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P. HEATER

A. 2 ELBOWS

STEAM EXTRACTION TO 5A & 5B H.P. HEATERS

A. 3 ELBOWS
B. 2 PIPE SECTION
C. 1 TEE

LOW PRESSURE DOWN COMERS

A. 7 PIPE SECTIONS

53 TOTAL COMPONENTS

RESULTS OF THICKNESS READINGS AT GINNA DURING 1986 OUTAGE

90 - 85% NOMINAL WALL THICKNESS

1	FEEDWATER RECIRC CV-18
1	FEEDWATER RECIRC CV-19
3	LOW PRESSURE DOWNCOMER

85 - 80% NOMINAL WALL THICKNESS

2	FEEDWATER RECIRC CV-18
1	FEEDWATER RECIRC CV-19
1	STEAM EXTRACTION TO 5A & 5B H.P.H.
1	LOW PRESSURE DOWNCOMER

80 - 70% NOMINAL WALL THICKNESS

5	FEEDWATER RECIRC CV-18
1	STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
1	STEAM EXTRACTION TO 5A & 5B H.P.H.
1	LOW PRESSURE DOWNCOMER

< 70% NOMINAL WALL THICKNESS

6	FEEDWATER RECIRC CV-18
5	FEEDWATER RECIRC CV-19
1	STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
1	STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.
2	STEAM EXTRACTION TO 5A & 5B H.P.H.
2	LOW PRESSURE DOWNCOMER

1986 OUTAGE THICKNESS READINGS AT GINNA STATION

FEED WATER BYPASS TO CONDENSER (OLD CV-18) DRAWING CV-18

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS		REMARKS
300300	29	R	<65	.212	REPLACED END OF 86 OUTAGE
300310	30	P	<65	.214	REPLACED END OF 86 OUTAGE
300320	31	E	<65	.273	REPLACED END OF 86 OUTAGE
300330	32	P	<65	.186	REPLACED END OF 86 OUTAGE
300340	33	E	<65	.253	REPLACED END OF 86 OUTAGE
300350	34	E	80-70		REPLACED END OF 86 OUTAGE
300360	35	P	85-80		REPLACED END OF 86 OUTAGE
300370	36	E	85-80		REPLACED END OF 86 OUTAGE
300380	37	P	>90		REPLACED END OF 86 OUTAGE
300390	38	E	80-70		REPLACED END OF 86 OUTAGE
300400	39	P	90-85		
300410	40	E	80-70		
300420	41	P	80-70		
300430	42	E	>90		
300440	43	P	70-65	.291	
300450	44	R	>90		
300460	45	P	80-70		

FEED WATER BYPASS TO CONDENSER (OLD CV-19) DRAWING CV-19

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS		REMARKS
300550	9	E	85-80		
300790	33	R	<65	.062	REPLACED END OF 86 OUTAGE
300800	34	E	<65	.088	REPLACED END OF 86 OUTAGE
300810	35	P	<65	.243	REPLACED END OF 86 OUTAGE
300820	36	E	90-85		REPLACED END OF 86 OUTAGE
300830	37	P	>90		REPLACED END OF 86 OUTAGE
300840	38	E	70-65	.284	
300850	39	P	70-65	.284	
300860	40	R	>90		
300870	41	P	>90		

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P.HEATER DRAWING M-21

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
301020	2	E	>90	
301160	15	E	>90	
301350	33	T	80-70	
301370	35	E	70-65 .260	
301380	36	P	>90	
301390	37	E	>90	* , BASELINE
301400	37A	P	>90	* , BASELINE
301410	38	E	>90	* , BASELINE
301420	39	P	>90	* , BASELINE
301430	40	E	>90	* , BASELINE
301440	41	P	>90	

* THESE COMPONENTS WERE REPLACED AT THE BEGINNING OF THE 1986 OUTAGE

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P.HEATER DRAWING M-22

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
301720	3	E	>90	
301900	19	E	>90	

STEAM EXTRACTION TO 5A & 5B H.P. HEATERS DRAWING M-75

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
303090	9	T	70-65 .380	
303130	13	E	<65 .240	
303140	14	E	80-70	
303150	15	P	85-80	
303280	28	E	<65 .239	
303290	29	P	>90	

PRESSURE DOWN COMER

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
DC1A86	A	P	90-85	
DC1B86	B	P	85-80	
DC1C86	C	P	80-70	
DC1D86	D	P	90-85	
DC1E86	E	P	90-85	
DC1F86	F	P	<65	.224
DC1G86	G	P	<65	.131

THE FOLLOWING IS A LIST OF COMPONENTS
EXAMINED DURING DECEMBER 1986 AT GINNA

HEATERS 4A & 4B TO FEEDWATER SUCTION

A. 2 ELBOWS
B. 3 PIPE SECTIONS
C. 2 TEES

FEEDWATER SUCTION TO PUMPS A & B

A. 4 ELBOWS
B. 7 PIPE SECTOINS

5A H.P.H. DRAIN TO 4A L.P.H.

A. 3 TEES

5B H.P.H. DRAIN TO 4B L.P.H.

D 3 TEES

24 TOTAL COMPONENTS

DECEMBER 1986 THICKNESS READINGS AT GINNA STATION

[redacted]ERS 4A & 4B TO FEEDWATER SUCTION

M-5

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
205110	11	T	>90	
205230	23	T	>90	
205250	25	T	>90	
205260	26	P	>90	
205280	28	P	>90	
205310	31	E	>90	
205330	33	E	>90	
205340	34	P	>90	

FEEDWATER SUCTION TO PUMPS A & B

M-6

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
206020	2	P	>90	
[redacted]030	3	E	>90	
[redacted]040	4	P	>90	
206050	5	E	>90	
206060	6	P	>90	
206110	11	P	>90	
206120	12	E	>90	
206140	14	P	>90	
206250	25	P	>90	
206260	26	E	>90	
206270	27	P	>90	

5A H.P.H. DRAIN TO 4A L.P.H.

M-41A

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
290210	21	T	>90	
290230	23	T	>90	
290250	25	T	>90	

5B H.P.H. DRAIN TO 4B L.P.H.

M-41B

[redacted]&E [redacted]MARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
291210	60	T	>90	
291230	62	T	>90	
291250	64	T	>90	

THE FOLLOWING IS A LIST OF COMPONENTS
EXAMINED DURING THE 1987 OUTAGE AT GINNA

MSR 1A & 1B 2ND PASS DRAIN TO 5A H.P.H. & CONDENSER

A. 4 ELBOWS
B. 10 PIPE SECTIONS
C. 3 REDUCERS
D. 9 TEES

MSR 2A & 2B 2ND PASS DRAIN TO 5B H.P.H. & CONDENSER

A. 6 ELBOWS
B. 9 PIPE SECTIONS
C. 3 REDUCERS
D. 6 TEES

1A, 2A, & 3A L.P.H. DRAINS

A. 10 PIPE SECTIONS
B. 1 REDUCER
9 TEES

1B, 2B, & 3B L.P.H. DRAINS

A. 2 ELBOWS
B. 11 PIPE SECTIONS
C. 1 REDUCER
D. 7 TEES

MSR 1A, 1B, 2A & 2B TO HEATER DRAIN TANK

A. 2 ELBOWS
B. 3 PIPE SECTIONS

FEEDWATER PUMP BYPASS

A. 24 ELBOWS
B. 18 PIPE SECTIONS
C. 5 REDUCERS
D. 5 TEES

EDWATER BYPASS TO CONDENSER (CV-18)

A. 11 ELBOWS
B. 2 REDUCERS
C. 11 PIPE SECTIONS

DWATER BYPASS TO CONDENSER (CV-19)

A. 12 ELBOWS
B. 2 REDUCERS
C. 11 PIPE SECTIONS

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P. HEATER

A. 3 ELBOWS
B. 1 TEE

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P. HEATER

A. 3 ELBOWS
B. 1 TEE

STEAM EXTRACTION TO 5A & 5B H.P. HEATERS

A. 5 ELBOWS
B. 1 PIPE SECTION
C. 2 TEES

S/G BLOWDOWN TO BLOWDOWN HEAT EXCHANGER

A. 4 ELBOWS
B. 14 PIPE SECTIONS
C. 4 REDUCERS
D. 2 TEES

* THIS INCLUDES BASELINE ON COMPONENTS THAT WERE REPLACED

S/G BLOWDOWN TO BLOWDOWN TANK HEADER

A. 12 ELBOWS
B. 26 PIPE SECTIONS
C. 2 REDUCERS

PRESEPARATOR A & B DRAIN TO HEATER DRAIN TANK

A. 3 ELBOWS
B. 5 PIPE SECTIONS
C. 1 TEE

AUX. FEEDWATER PUMP A TO F.W. DISCHARGE LINES

A. 1 ELBOW
B. 3 PIPE SECTIONS

AUX. FEEDWATER PUMP B TO F.W. DISCHARGE LINES

A. 1 ELBOW
B. 2 PIPE SECTIONS

TURBINE DRIVEN AUX. FEEDWATER PUMP TO F.W. DISCHARGE LINES

A. 3 PIPE SECTIONS

MAIN STEAM FROM S/G B

A. 1 ELBOW

MAIN STEAM TO TURBINE

A. 1 ELBOW
B. 1 PIPE SECTION

299 TOTAL COMPONENTS

RESULTS OF THICKNESS READINGS AT GINNA DURING 1987 OUTAGE

90 - 85% NOMINAL WALL THICKNESS

1	MSR 1A & 1B 2ND PASS DRAIN TO 5A H.P.H. & CONDENSER
4	MSR 2A & 2B 2ND PASS DRAIN TO 5B H.P.H. & CONDENSER
4	FEEDWATER RECIRC CV-18
3	FEEDWATER RECIRC CV-19
1	STEAM EXTRACTION TO 5A & 5B H.P.H.
3	S/G BLOWDOWN TO BLOWDOWN HEAT EXCHANGER
8	S/G BLOWDOWN TO BLOWDOWN TANK HEADER
2	PRESEPARATOR A & B DRAIN TO HEATER DRAIN TANK
1	AUX F.W. PUMP A TO F.W. DISCHARGE LINES
1	AUX F.W. PUMP B TO F.W. DISCHARGE LINES

85 - 80% NOMINAL WALL THICKNESS

2	MSR 2A & 2B 2ND PASS DRAIN TO 5B H.P.H. & CONDENSER
1	MSR 1A, 1B, 2A & 2B TO HEATER DRAIN TANK
1	STEAM EXTRACTION TO 5A & 5B H.P.H.
2	S/G BLOWDOWN TO BLOWDOWN TANK HEADER
1	TURBINE DRIVE AUX F.W. PUMP TO DISCHARGE LINES

80 - 70% NOMINAL WALL THICKNESS

4	MSR 1A & 1B 2ND PASS DRAIN TO 5A H.P.H. & CONDENSER
2	MSR 2A & 2B 2ND PASS DRAIN TO 5B H.P.H. & CONDENSER
3	FEEDWATER RECIRC CV-18
3	FEEDWATER RECIRC CV-19
1	STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
1	STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.
2	STEAM EXTRACTION TO 5A & 5B H.P.H.
2	S/G BLOWDOWN TO BLOWDOWN HEAT EXCHANGER
1	S/G BLOWDOWN TO BLOWDOWN TANK HEADER

< 70% NOMINAL WALL THICKNESS

2	MSR 1A & 1B 2ND PASS DRAIN TO 5A H.P.H. & CONDENSER
1	MSR 2A & 2B 2ND PASS DRAIN TO 5B H.P.H. & CONDENSER
1	FEEDWATER RECIRC CV-18
1	FEEDWATER RECIRC CV-19
1	STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.
1	STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.
4	STEAM EXTRACTION TO 5A & 5B H.P.H.
1	S/G BLOWDOWN TO BLOWDOWN HEAT EXCHANGER
1	S/G BLOWDOWN TO BLOWDOWN TANK HEADER

1987 OUTAGE THICKNESS READINGS AT BINNA STATION

MSR 1A & 1B 2ND PASS DRAIN TO 5A H.P.H. & CONDESER DRAWING M-12A

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
222230	21A	R	>90	
222240	22	E	>90	REPLACED END OF 87 OUTAGE
222250	23	P	>90	REPLACED END OF 87 OUTAGE
222330	31	R	>90	
222340	32	T	>90	
222350	33	T	>90	
222352	33A	P	>90	
222357	33B	T	>90	
222360	34	P	>90	
222370	35	T	>90	
222380	36	P	>90	
222390	37	T	>90	
222400	38	P	>90	
222410	39	T	>90	
222415	39A	P	>90	
222420	40	T	>90	
222920	90	T	>90	
223020	99	T		NO READINGS WERE TAKEN DUE TO WELD OVERLAY, REPLACED 87 OUTAGE
223030	100	P	80-70	REPLACED END OF 87 OUTAGE
223040	101	E	70-65 (.298)	REPLACED END OF 87 OUTAGE
223050	102	P	90-85	REPLACED END OF 87 OUTAGE
223060	103	E	<65 (.274)	REPLACED END OF 87 OUTAGE
223070	104	P	80-70	REPLACED END OF 87 OUTAGE
223080	105	E	80-70	REEXAMINE DURING 88 OUTAGE
223090	106	P	80-70	REEXAMINE DURING 88 OUTAGE
223095	106A	R	>90	

MSR 2A & 2B 2ND PASS DRAIN TO 5B H.P.H. & CONDENSER DRAWING M-12B

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
222490	47	R	>90	
222500	48	E	80-70	ELBOW WAS REPLACED SUMMER 1986 WITH SCHEDULE 120. LINE SCHEDULE IS 80. REEXAMINE DURING 88 OUTAGE
222510	49	P	>90	
222520	50	E	>90	
222530	51	P	90-85	REEXAMINE DURING 88 OUTAGE
222680	66	T	>90	

2A & 2B 2ND PASS DRAIN TO 5B H.P.H. & CONDENSER DRAWING M-12B CONT.

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
222690	67	T	>90	
222700	68	P	>90	
222710	69	T	>90	
222720	70	P	>90	
222730	71	T	>90	
222800	78	R	>90	
222810	79	E	>90	REPLACED END OF 87 OUTAGE
222820	80	P	90-85	REPLACED END OF 87 OUTAGE
222830	81	T		NO READINGS WERE TAKEN DUE TO WELD OVERLAY, REPLACED 87 OUTAGE
222840	82	P	85-80	REPLACED END OF 87 OUTAGE
222850	83	E	<65 (.254)	REPLACED END OF 87 OUTAGE
222860	84	P	>90	REPLACED END OF 87 OUTAGE
222870	85	E	90-85	REPLACED END OF 87 OUTAGE
222880	86	P	80-70	REPLACED END OF 87 OUTAGE
222890	87	E	85-80	REPLACED END OF 87 OUTAGE
222900	88	P	90-85	REEXAMINE DURING 88 OUTAGE
222905	88A	R	>90	
222910	89	T	>90	

1A, 2A, & 3A, L.P.H. DRAINS DRAWING M-19

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
234180	18	T	>90	
234190	19	P	>90	
234200	20	T	>90	
234210	21	P	>90	
234220	22	T	>90	
234230	23	P	>90	
234240	24	T	>90	
234250	25	P	>90	
234260	26	T	>90	
234270	27	P	>90	
234340	34	R	>90	
234345	34A	P	>90	
234350	35	T	>90	
234355	35A	P	>90	
234370	37	T	>90	
234380	38	P	>90	
234510	51	T	>90	
234520	52	P	>90	
234530	53	T	>90	
234540	54	P	>90	

2B & 3B L.P.H. DRAINS — DRAWING M-20

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
235160	16	P	>90	
235170	17	E	>90	
235180	18	P	>90	
235190	19	E	>90	
235200	20	P	>90	
235210	21	T	>90	
235220	22	P	>90	
235230	23	T	>90	
235240	24	P	>90	
235250	25	T	>90	
235260	26	P	>90	
235325	32A	R	>90	
235330	33	P	>90	
235340	34	T	>90	
235350	35	P	>90	
235370	37	T	>90	
235380	38	P	>90	
235510	51	T	>90	
235520	52	P	>90	
235530	53	T	>90	
235540	54	P	>90	

MSR 1A, 1B, 2A & 2B TO HEATER DRAIN TANK — DRAWING M-33

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
262030	3	E	>90	
262040	4	P	>90	
262055	5A	P	>90	
262060	6	E	>90	
262070	7	P	85-80	REEXAMINE DURING 88 OUTAGE

FEEDWATER PUMP BYPASS — DRAWING M-92

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
281020	2	E	BASELINE	
281030	3	P	BASELINE	
281040	4	E	BASELINE	
281050	5	P	BASELINE	
281060	6	E	BASELINE	
281070	7	P	BASELINE	
281090	9	P	BASELINE	
281110	11	P	BASELINE	

[redacted]DWATER PUMP BYPASS DRAWING M-92 CONTINUED

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
281130	13	R	BASELINE	
281140	14	P	BASELINE	
281150	15	E	BASELINE	
281160	16	P	BASELINE	
281180	18	E	BASELINE	
281190	19	P	BASELINE	
281200	20	E	BASELINE	
281210	21	P	BASELINE	
281230	23	P	BASELINE	
281250	25	P	BASELINE	
281270	27	R	BASELINE	
281280	28	P	BASELINE	
281290	29	R	BASELINE	
281300	30	T	BASELINE	
281310	31	E	BASELINE	
281320	32	T	BASELINE	
281330	33	P	BASELINE	
281340	34	E	BASELINE	
[redacted]350	35	E	BASELINE	
[redacted]360	36	P	BASELINE	
281370	37	E	BASELINE	
281380	38	E	BASELINE	
281390	39	P	BASELINE	
281400	40	E	BASELINE	
281410	41	P	BASELINE	
281420	42	E	BASELINE	
281440	44	E	BASELINE	
281460	46	E	BASELINE	
281480	48	E	BASELINE	
281490	49	E	BASELINE	
281500	50	P	BASELINE	
281520	52	T	BASELINE	
281530	53	R	BASELINE	
281540	54	T	BASELINE	
281560	56	E	BASELINE	
281600	60	E	BASELINE	
281620	62	E	BASELINE	
281640	64	E	BASELINE	
281680	68	T	BASELINE	
281700	70	E	BASELINE	
281730	73	R	BASELINE	
281750	75	E	BASELINE	
281760	76	P	BASELINE	
[redacted]770	77	E	BASELINE	

NOTE: FEEDWATER BYPASS LINE IS A NEW INSTALLATION DONE DURING THE 87 OUTAGE

WATER BYPASS TO CONDENSER (OLD CV-18) DRAWING CV-18

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
300220	22	E	>90	
300230	23	P	>90	
300240	24	E	>90	
300250	25	P	>90	
300260	26	E	90-85	*
300270	27	P	90-85	*
300280	28	E	>90	
300300	29	R	>90	
300310	30	P	>90	
300320	31	E	>90	
300330	32	P	>90	
300340	33	E	>90	
300350	34	E	>90	
300360	35	P	>90	
300370	36	E	>90	
300380	37	P	>90	
300390	38	E	>90	
300400	39	P	80-70	*
300410	40	E	80-70	*
300420	41	P	80-70	*
300430	42	E	>90	
300440	43	P	70-65 (.299)	*
300450	44	R	90-85	*
300460	45	P	90-85	*

* NOTE: IT HAS NOT BEEN DECIDED IF THESE COMPONENTS WILL BE REEXAMINED IN 1988. THE FEEDWATER BYPASS SYSTEM THAT WAS INSTALLED IN 1987 SHOULD TAKE OF THIS EROSION PROBLEM. ALSO THE NEW FEEDWATER BYPASS HAS REPLACED COMPONENTS 1 THROUGH 20

FEED WATER BYPASS TO CONDENSER (OLD CV-19) DRAWING CV-19

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
300480	2	E	>90	
300490	3	P	>90	
300640	18	E	>90	
300650	19	P	>90	
300660	20	E	>90	
300670	21	P	>90	
300680	22	E	>90	
300690	23	P	90-85	*
300700	24	E	>90	
300710	25	P	>90	
300720	26	E	80-70	*

D WATER BYPASS TO CONDENSER (OLD CV-19) DRAWING CV-19 CONTINUED

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
300730	27	P	>90	
300740	28	E	90-85	*
300750	29	P	90-85	*
300760	30	E	>90	
300770	31	E	>90	
300790	33	R	>90	
300800	34	E	>90	
300810	35	P	>90	
300820	36	E	80-70	*
300830	37	P	>90	
300840	38	E	80-70	*
300850	39	P	<65 (.270)	*
300860	40	R	>90	
300870	41	P	>90	

* NOTE: IT HAS NOT BEEN DECIDED IF THESE COMPONENTS WILL BE REEXAMINED IN 1988. THE FEEDWATER BYPASS SYSTEM THAT WAS INSTALLED IN 1987 SHOULD TAKE OF THIS EROSION PROBLEM. ALSO THE NEW FEEDWATER BYPASS HAS REPLACED COMPONENTS 3 THROUGH 16.

STEAM EXTRACTION TO PRESEPARATOR B AND 4B L.P.HEATER DRAWING M-21

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
301020	2	E	>90	
301160	15	E	>90	
301350	33	T	80-70	REEXAMINE DURING 88 OUTAGE
301370	35	E	70-65 (.260)	REEXAMINE DURING 88 OUTAGE

STEAM EXTRACTION TO PRESEPARATOR A AND 4A L.P.HEATER DRAWING M-22

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
301720	3	E	>90	
301900	19	E	>90	
302070	33	T	80-70	REEXAMINE DURING 88 OUTAGE
302090	35	E	<65 (.223)	REEXAMINE DURING 88 OUTAGE

AM EXTRACTION TO 5A & 5B H.P. HEATERS — DRAWING M-75

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
303090	9	T	<65 (.244)	REEXAMINE DURING 88 OUTAGE
303100	10	P	80-70	REEXAMINE DURING 88 OUTAGE
303110	11	E	80-70	REEXAMINE DURING 88 OUTAGE
303130	13	E	<65 (.237)	REEXAMINE DURING 88 OUTAGE
303140	14	E	70-65 (.247)	REEXAMINE DURING 88 OUTAGE
303230	23	T	90-85	REEXAMINE DURING 88 OUTAGE
303240	24	E	85-80	REEXAMINE DURING 88 OUTAGE
303280	28	E	<65 (.232)	REEXAMINE DURING 88 OUTAGE

S/G BLOWDOWN TO BLOWDOWN HEAT EXCHANGER — DRAWING M-87

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
304080	8	P	>90	
304100	10	P	<65 (.120)	*
	10	P	BASELINE	
120	12	P	<65 (.121)	*
	12	P	BASELINE	
304130	13	R	90-85	*
	13	R	BASELINE	
304210	21	P	>90	
304230	23	P	<65 (.115)	*
	23	P	BASELINE	
304240	24	P	80-70	COMPONENT HAS BEEN ELIMINATED
304250	25	T	70-65 (.208)	*
	25	T	BASELINE	
304260	26	P	80-70	*
	26	P	BASELINE	
304270	27	E	>90	
304280	28	P	>90	
304290	29	E	>90	
304300	30	P	>90	
304320	32	E	90-85	REEXAMINE DURING 88 OUTAGE
304330	33	P	>90	
304340	34	R	>90	
304350	35	E	90-85	REEXAMINE DURING 88 OUTAGE
304360	36	R		4 X 10 REDUCER CAN NOT BE PROPERLY LAID OUT, HOWERVER SCAN SHOWS NO SIGN OF WEAR

* THESE COMPONENTS WERE REPLACED DURING 87 OUTAGE AND BASELINE DATA WAS TAKEN

BLOWDOWN LINES - INTERMIDIATE BLDG. DRAWING M-88A

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
304420	2	E		COMPONENT IS A FORGED ELBOW AND CAN NOT BE LAID OUT, HOWEVER SCAN SHOWS MINIMUM WALL OF .180 WILL REEXAMINE DURING 88 OUTAGE
304440	4	E		COMPONENT IS A FORGED ELBOW AND CAN NOT BE LAID OUT, HOWEVER SCAN SHOWS MINIMUM WALL OF .150 WILL REEXAMINE DURING 88 OUTAGE

S/G BLOWDOWN TO BLOWDOWN TANK HEADER DRAWING M-88B

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS		REMARKS
304690	29	P	>90		
304710	31	P	>90		
304730	33	P	>90		
304750	35	P	>90		
304770	37	P	>90		
304790	39	P	80-70		REEXAMINE DURING 88 OUTAGE
304820	42	P	>90		
304840	44	P	>90		
304860	46	R	>90		
304865	46A	E	<65	(.208)	OUTSIDE RADIUS OF ELBOW CAN NOT BE EXAMINED DUE TO RESTRICTIONS, REEXAMINE DURING 88 OUTAGE
304870	47	P	85-80		REEXAMINE DURING 88 OUTAGE
304880	48	E	90-85		REEXAMINE DURING 88 OUTAGE
304890	49	P	>90		
304900	50	E	85-80		REEXAMINE DURING 88 OUTAGE
304920	52	E	90-85		REEXAMINE DURING 88 OUTAGE
304930	53	P	>90		
305220	82	P	>90		
305240	84	P	>90		
305260	86	P	>90		
305280	88	P	>90		
305300	90	P	>90		
305320	92	P	>90		
305340	94	P	>90		
305360	96	P	70-65	(.142)	REEXAMINE DURING 88 OUTAGE
305390	99	P	>90		
305410	101	P	90-85		REEXAMINE DURING 88 OUTAGE
305430	103	R	>90		

BLOWDOWN TO BLOWDOWN TANK HEADER — DRAWING M-88B CONTINUED

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
305440	104	E	70-65 (.229)	OUTSIDE RADIUS OF ELBOW CAN NOT BE EXAMINED DUE TO RESTRICTIONS, REEXAMINE DURING 88 OUTAGE
305450	105	P	>90	
305460	106	E	90-85	REEXAMINE DURING 88 OUTAGE
305470	107	P	90-85	REEXAMINE DURING 88 OUTAGE
305480	108	E	>90	
305490	109	P	90-85	REEXAMINE DURING 88 OUTAGE
305500	110	E	>90	
305510	111	P	>90	
305520	112	E	90-85	REEXAMINE DURING 88 OUTAGE
305540	114	E	>90	
305550	115	P	90-85	REEXAMINE DURING 88 OUTAGE

NOTE: MANY ELBOW COMPONENTS CAN NOT BE EXAMINED DUE TO GEOMETRY. ELBOWS ARE FORGED AND DO NOT LEND THEMSELVES TO LAYOUT OR U.T. SCANNING

SEPARATOR A & B DRAIN TO HEATER DRAIN TANK — DRAWING M-46B

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
328160	16	T	>90	
328240	24	P	>90	UPSTREAM PORTION OF PIPE
328245	24	P	>90	DOWNSTREAM PORTION OF PIPE
328250	25	E	>90	
328260	26	P	>90	
328270	27	E	90-85	REEXAMINE DURING 88 OUTAGE
328280	28	P	>90	
328290	29	E	90-85	REEXAMINE DURNIG 88 OUTAGE
328300	30	P	>90	

AUX. F.W. PUMP A TO F.W. DISCHARGE LINES — DRAWING M-48

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
320240	25	E	90-85	REEXAMINE DURING 88 OUTAGE
320264	26A	P	>90	
320430	43	P	>90	UPSTREAM PORTION OF PIPE
320435	43	P	>90	DOWNSTREAM PORTION OF PIPE

F.W. PUMP B TO F.W. DISCHARGE LINES — DRAWING M-49

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
323200	20	E	>90	
323210	21	P	>90	
323420	42	P	90-85	REEXAMINE DURING 88 OUTAGE

TURBINE DRIVEN AUX F.W. PUMP TO F.W. DISCHARGE LINES — DRAWING-47

RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
327560	56	P	>90	UPSTREAM PORTION OF PIPE
327565	56	P	>90	DOWNSTREAM PORTION OF PIPE
327880	88	P	85-80	REEXAMINE DURING 88 OUTAGE

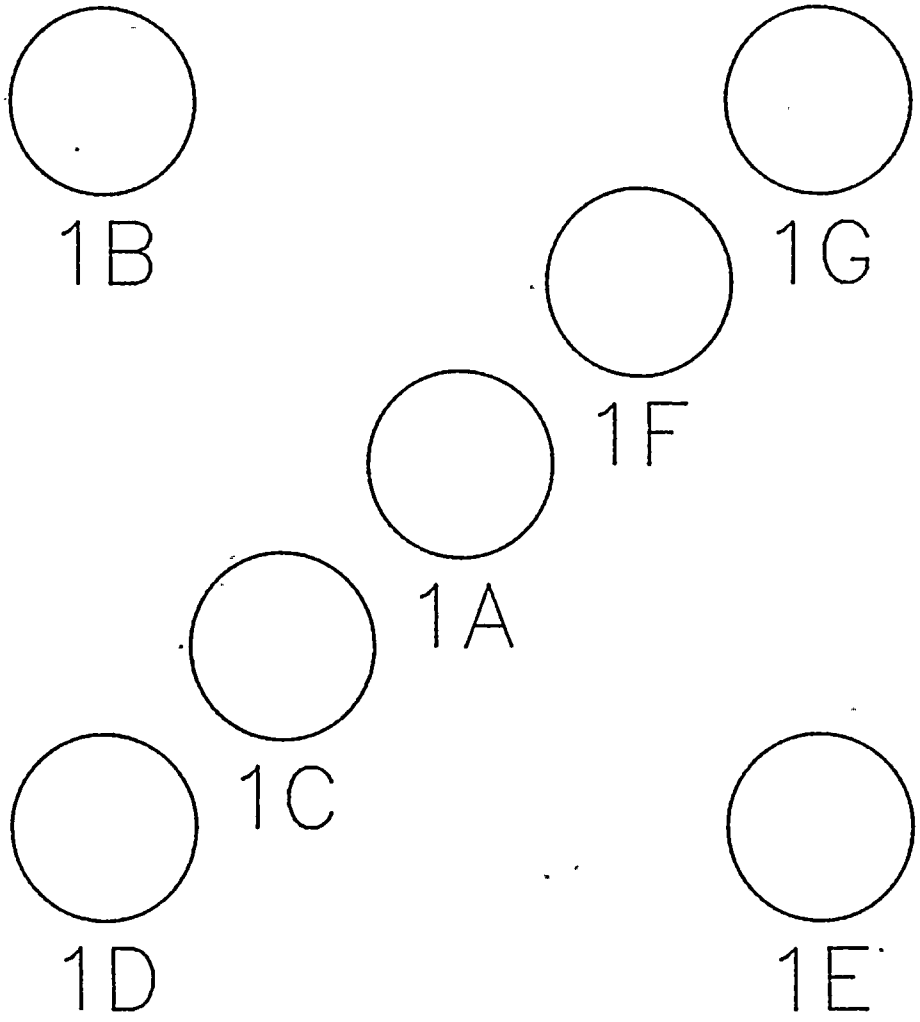
MAIN STEAM FROM S/G A & B — DRAWING M-70

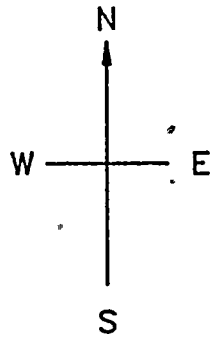
RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
370020	2	E	>90	

MAIN STEAM TO TURBINE — DRAWING M-72

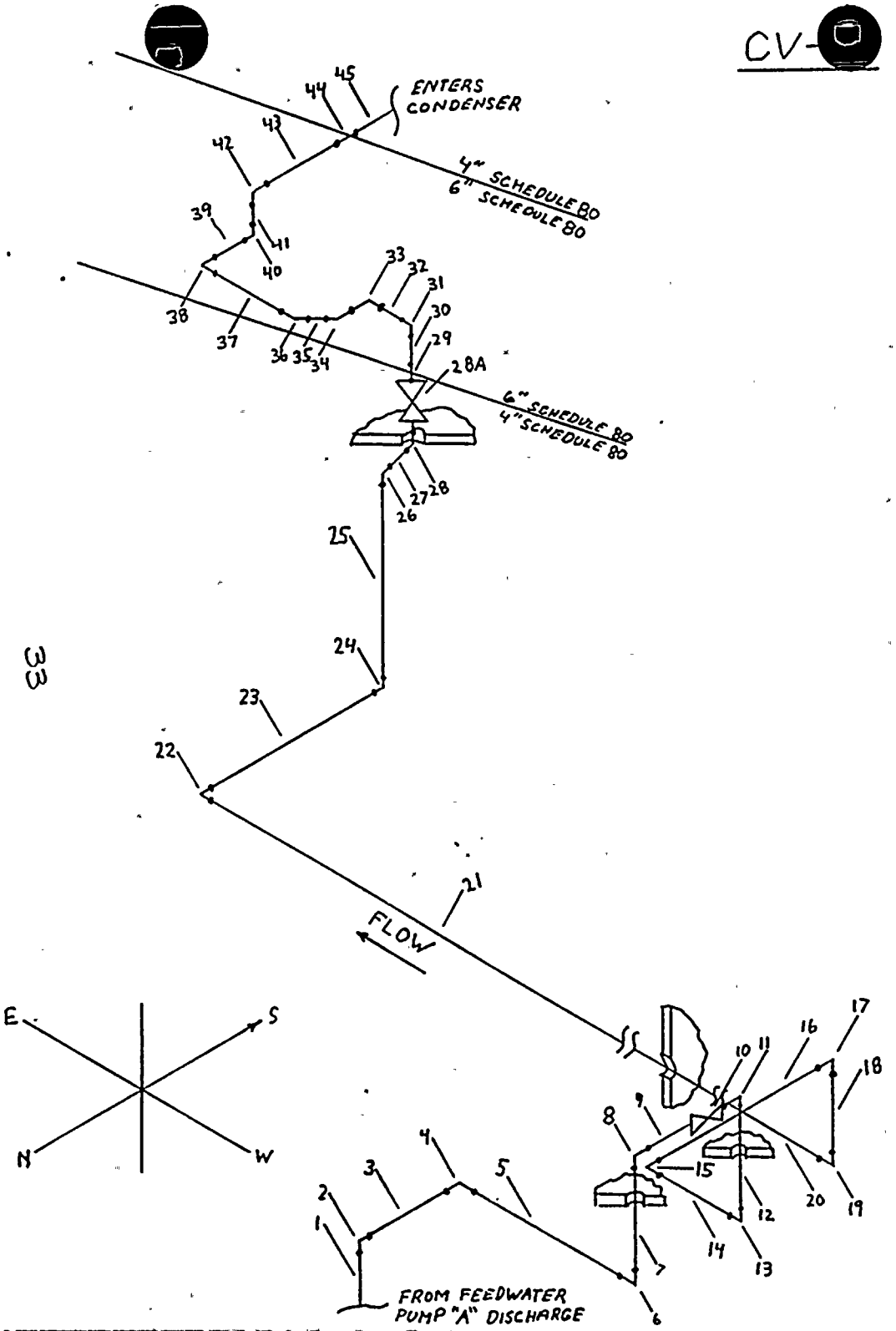
RG&E SUMMARY NUMBER	ID NO. PER DRAWING	COMPONENT TYPE	PERCENTAGE OF NOMINAL THICKNESS	REMARKS
372140	14	E	>90	
372150	15	P	>90	

LOW PRESSURE DOWNCOMERS

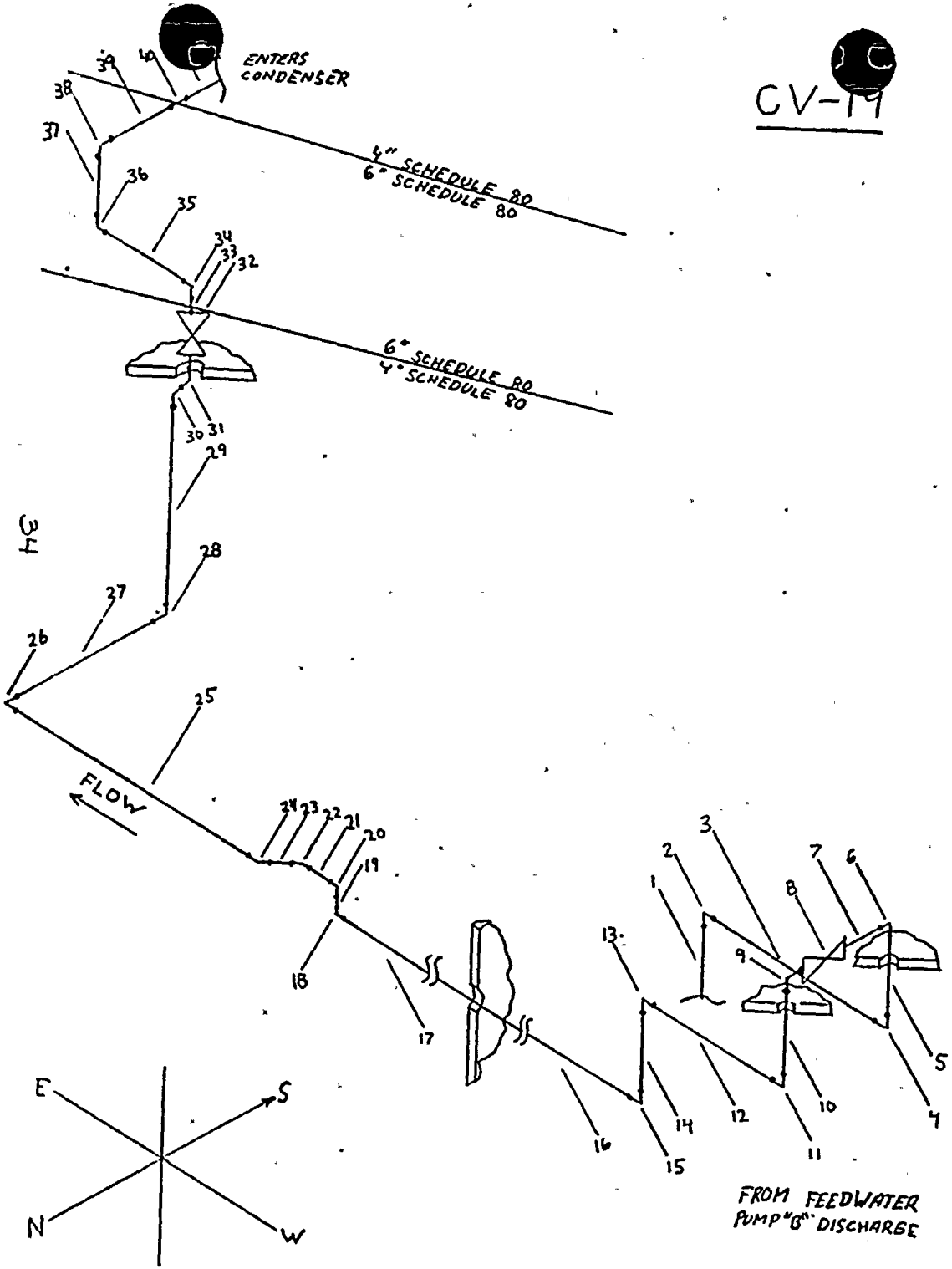




TOP VIEW

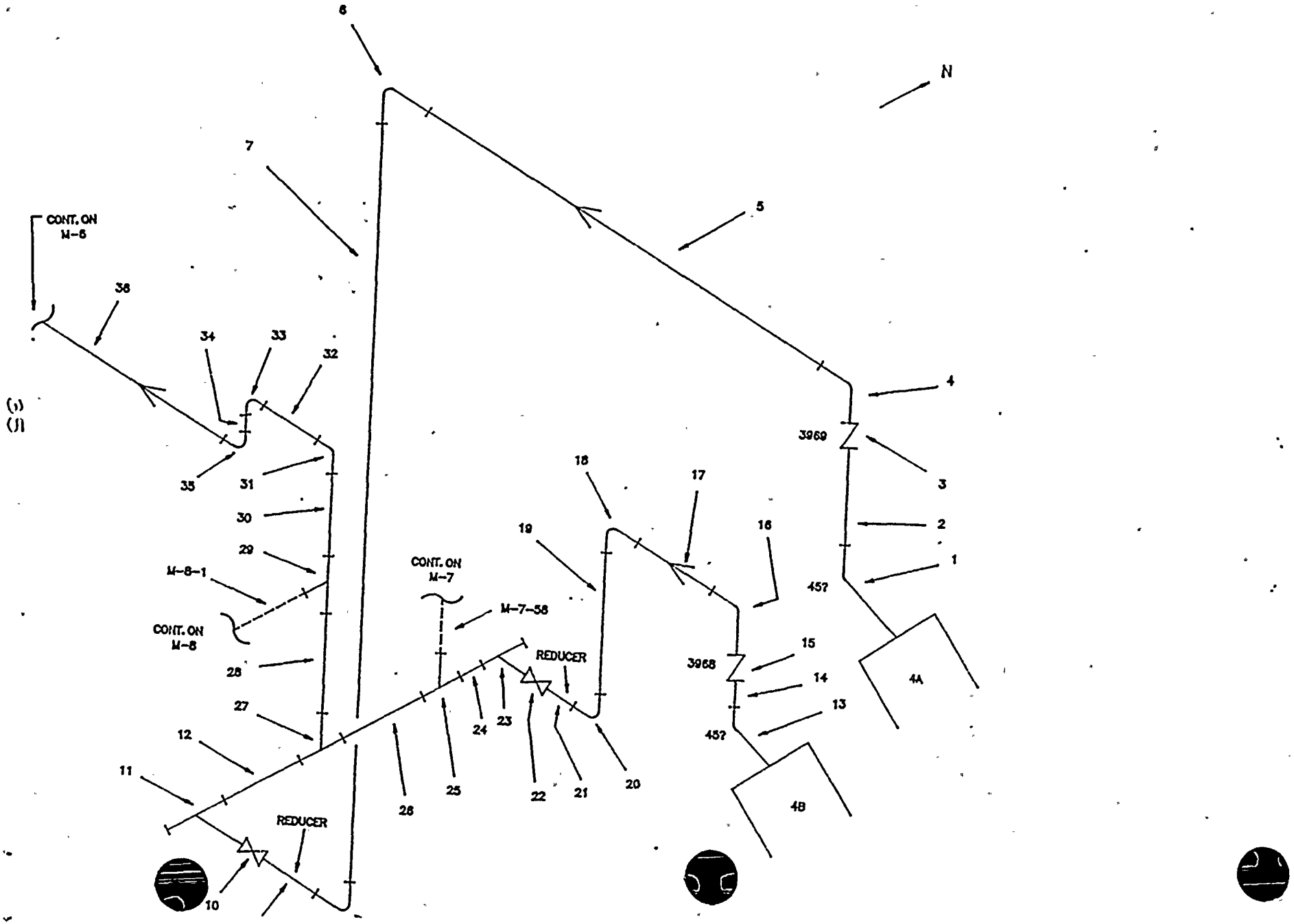


NO.	DESCRIPTION	FILE NAME
1	4' PIPE	300010
2	90 ELBOW	300020
3	6' PIPE	300030
4	90 ELBOW	300040
5	6' PIPE	300050
6	90 ELBOW	300060
7	3' PIPE	300070
8	90 ELBOW	300080
9	2' PIPE	300090
10	VALVE 4061	300100
11	90 ELBOW	300110
12	3' PIPE	300120
13	90 ELBOW	300130
14	4' PIPE	300140
15	90 ELBOW	300150
16	9' PIPE	300160
17	90 ELBOW	300170
18	4' PIPE	300180
19	90 ELBOW	300190
20	27' PIPE	300200
21	51' PIPE	300210
22	90 ELBOW	300220
23	12' PIPE	300230
24	90 ELBOW	300240
25	8' PIPE	300250
26	45 ELBOW	300260
27	1' PIPE	300270
28	45 ELBOW	300280
28A	VALVE 4262	300290
29	4"TO 6"REDUCER	300300
30	2' PIPE	300310
31	45 ELBOW	300320
32	1' PIPE	300330
33	45 ELBOW	300340
34	45 ELBOW	300350
35	1' PIPE	300360
36	45 ELBOW	300370
37	4' PIPE	300380
38	90 ELBOW	300390
39	2' PIPE	300400
40	45 ELBOW	300410
41	1' PIPE	300420
42	45 ELBOW	300430
43	4' PIPE	300440
44	6"TO 4"REDUCER	300450
45	2' PIPE	300460

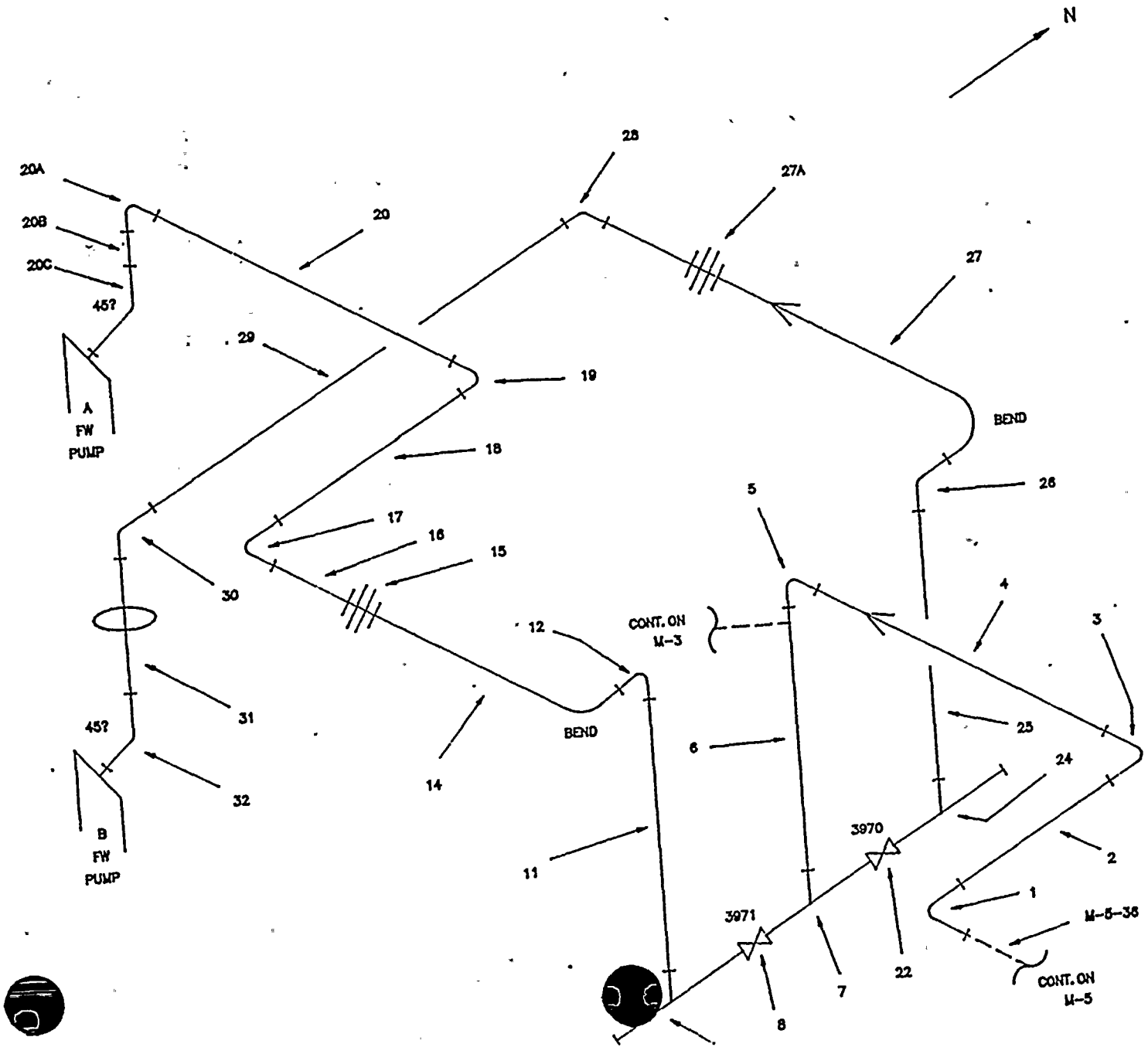


NO.	DESCRIPTION	FILE NAME
1	3' PIPE	300470
2	90 ELBOW	300480
3	8' PIPE	300490
4	90 ELBOW	300500
5	3' PIPE	300510
6	90 ELBOW	300520
7	2' PIPE	300530
8	VALVE 4060	300540
9	90 ELBOW	300550
10	3' PIPE	300560
11	90 ELBOW	300570
12	6' PIPE	300580
13	90 ELBOW	300590
14	4' PIPE	300600
15	90 ELBOW	300610
16	27' PIPE	300620
17	40' PIPE	300630
18	45 ELBOW	300640
19	1' PIPE	300650
20	45 ELBOW	300660
21	1' PIPE	300670
22	45 ELBOW	300680
23	1' PIPE	300690
24	45 ELBOW	300700
25	11' PIPE	300710
26	90 ELBOW	300720
27	10' PIPE	300730
28	90 ELBOW	300740
29	10' PIPE	300750
30	45 ELBOW	300760
31	45 ELBOW	300770
32	VALVE 4363	300780
33	4"TO 6"REDUCER	300790
34	90 ELBOW	300800
35	4' PIPE	300810
36	45 ELBOW	300820
37	3' PIPE	300830
38	45 ELBOW	300840
39	3' PIPE	300850
40	6"TO 4"REDUCER	300860
41	2' PIPE	300870

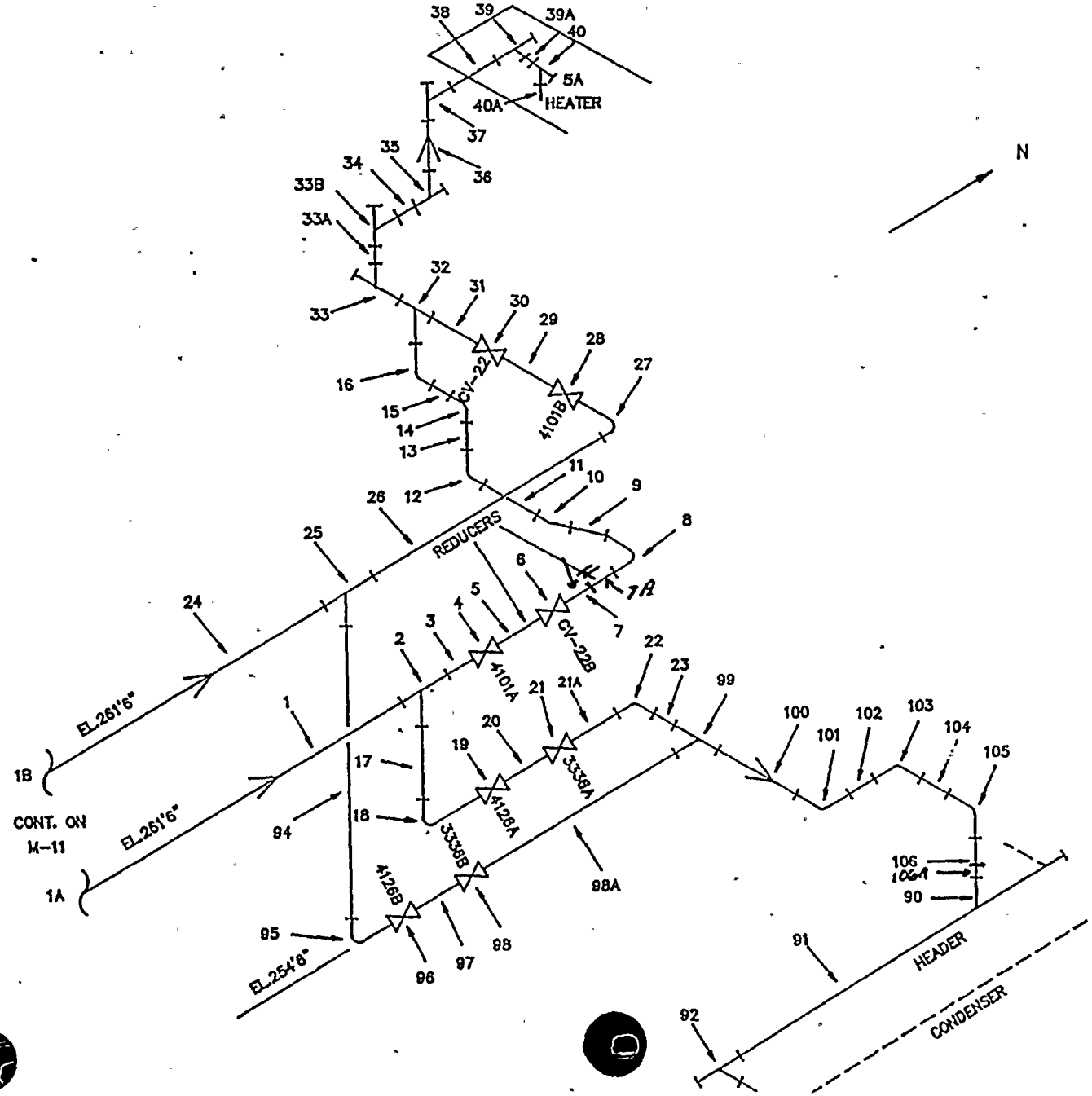
M-5 HEATERS 4A & 4B TO FEEDWATER SUCTION



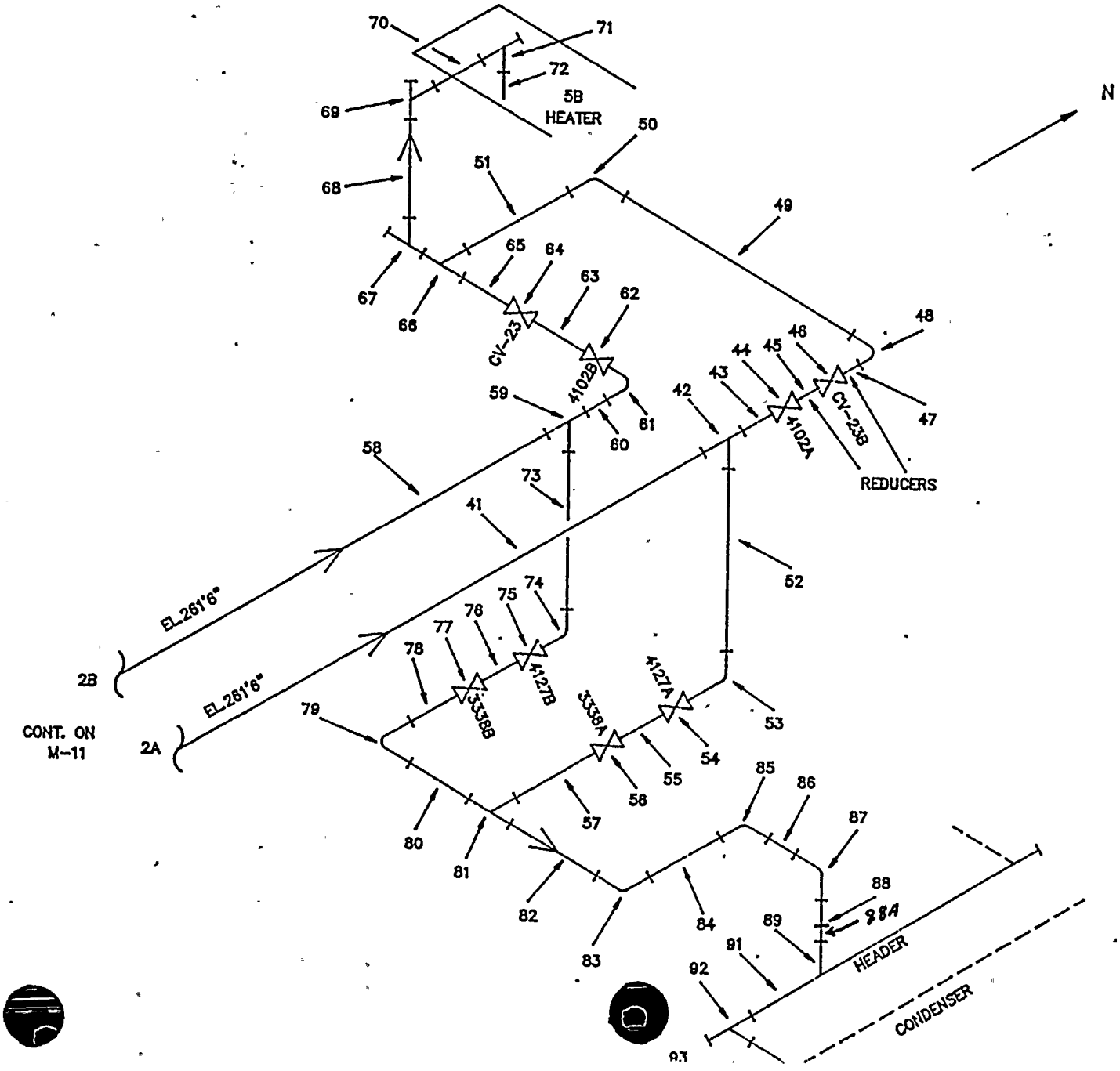
M-6 FEEDWATER SUCTION TO PUMPS A & B



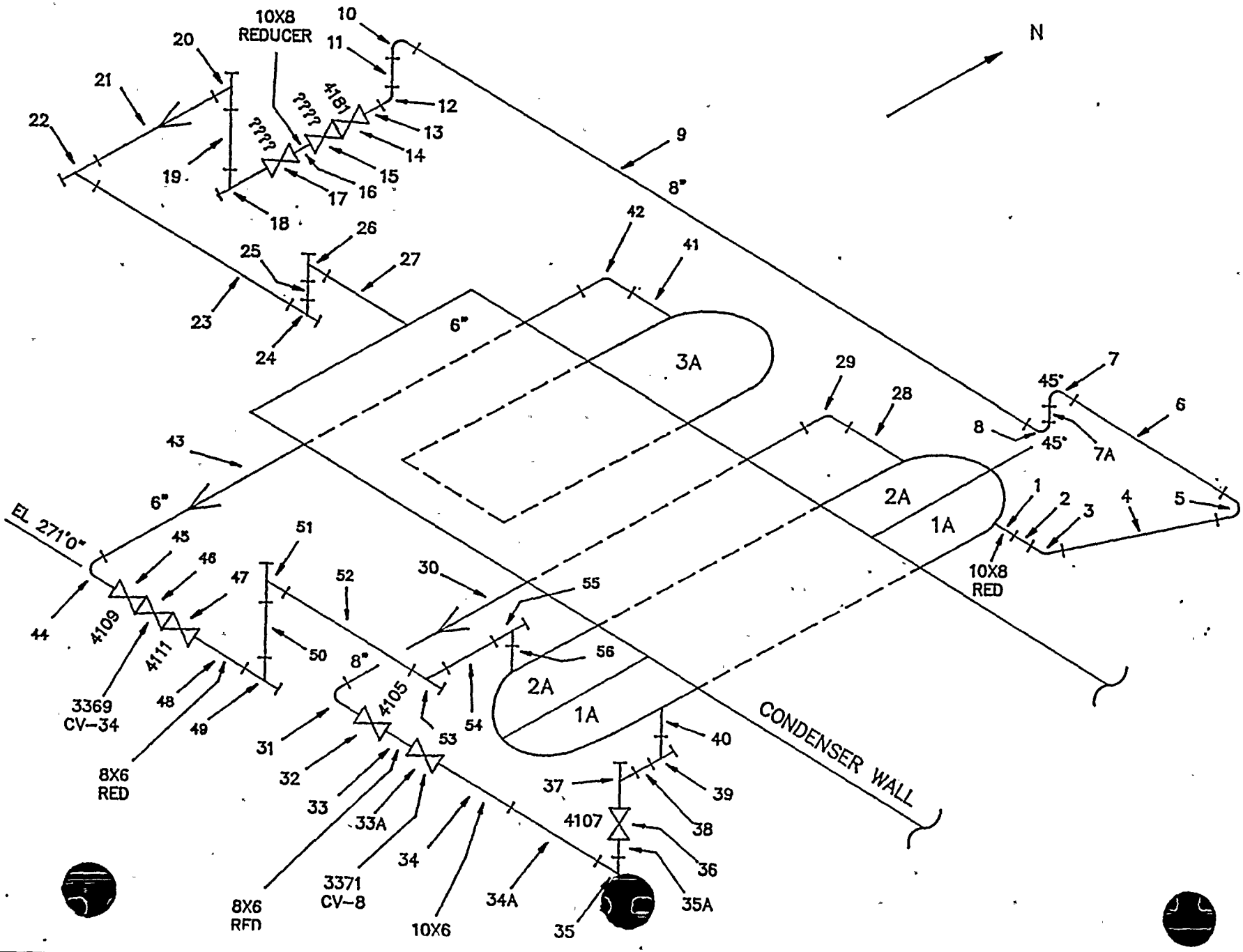
M-12A MSR 1A & 1B 2ND PASS DRAIN TO 5A H.P.H. & CONDENSER



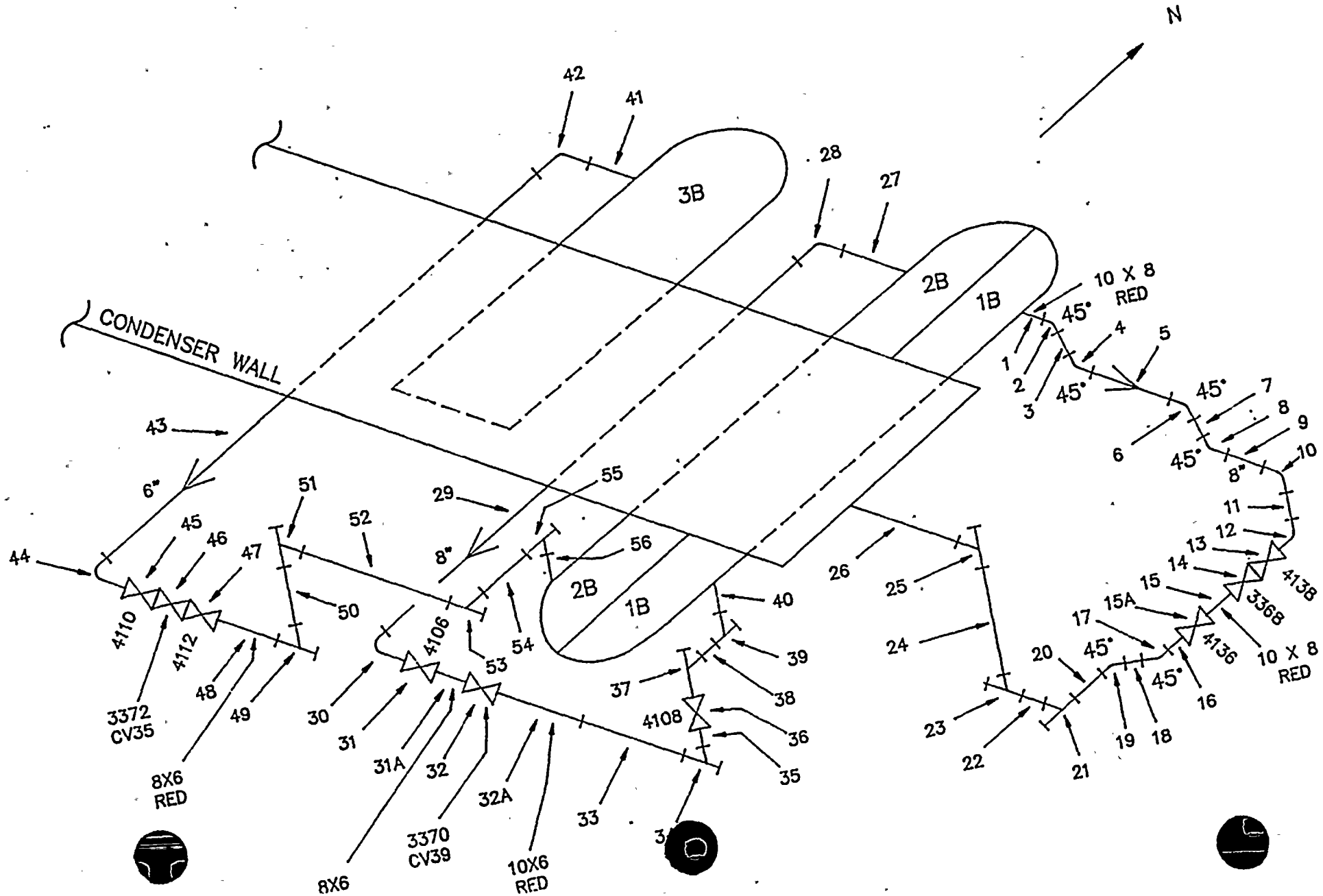
M-12B MSR 2A & 2B 2ND PASS DRAIN TO 5B H.P.H. & CONDENSER



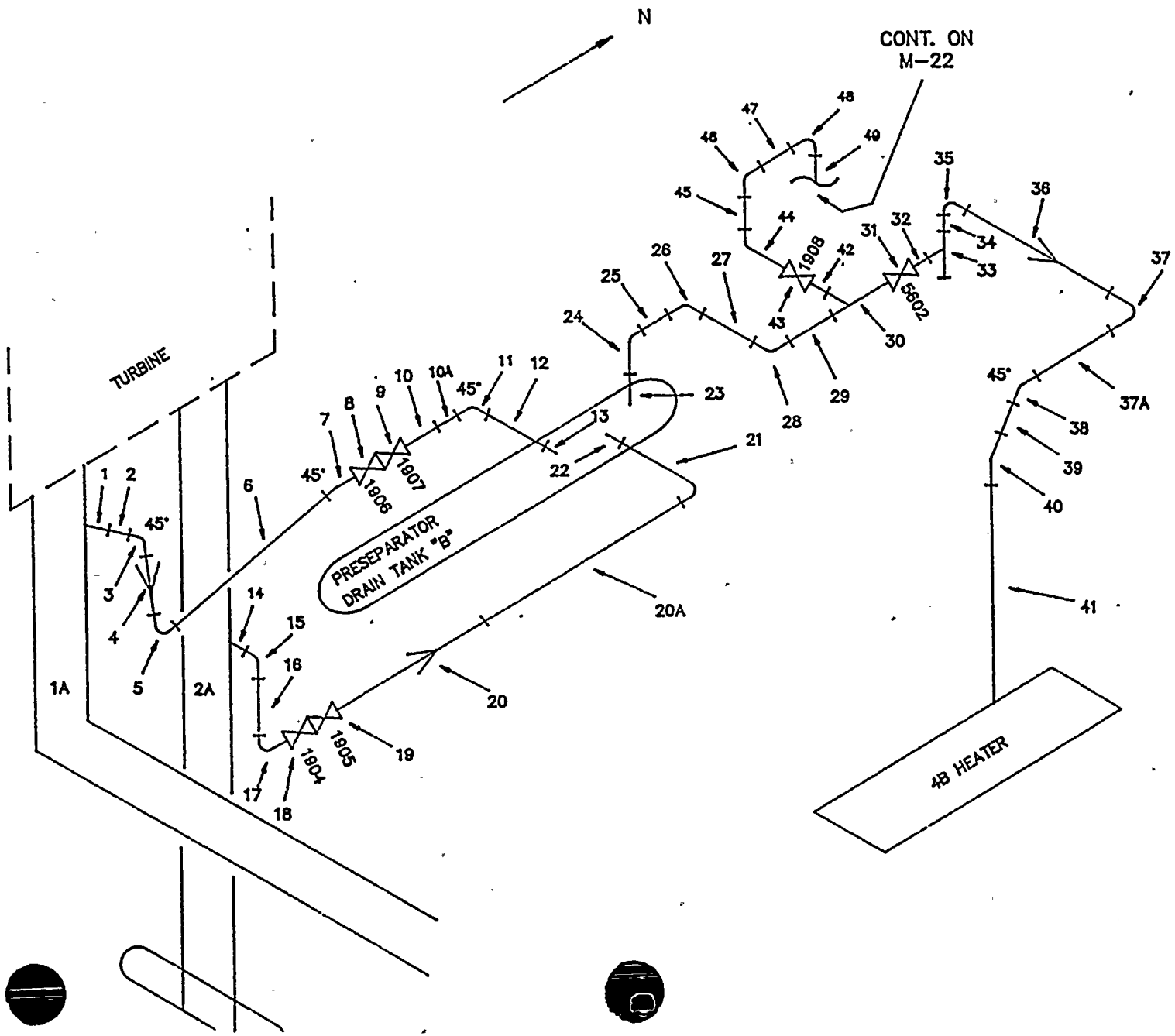
M-19 1A, 2A & 3A L.P.H. DRAINS



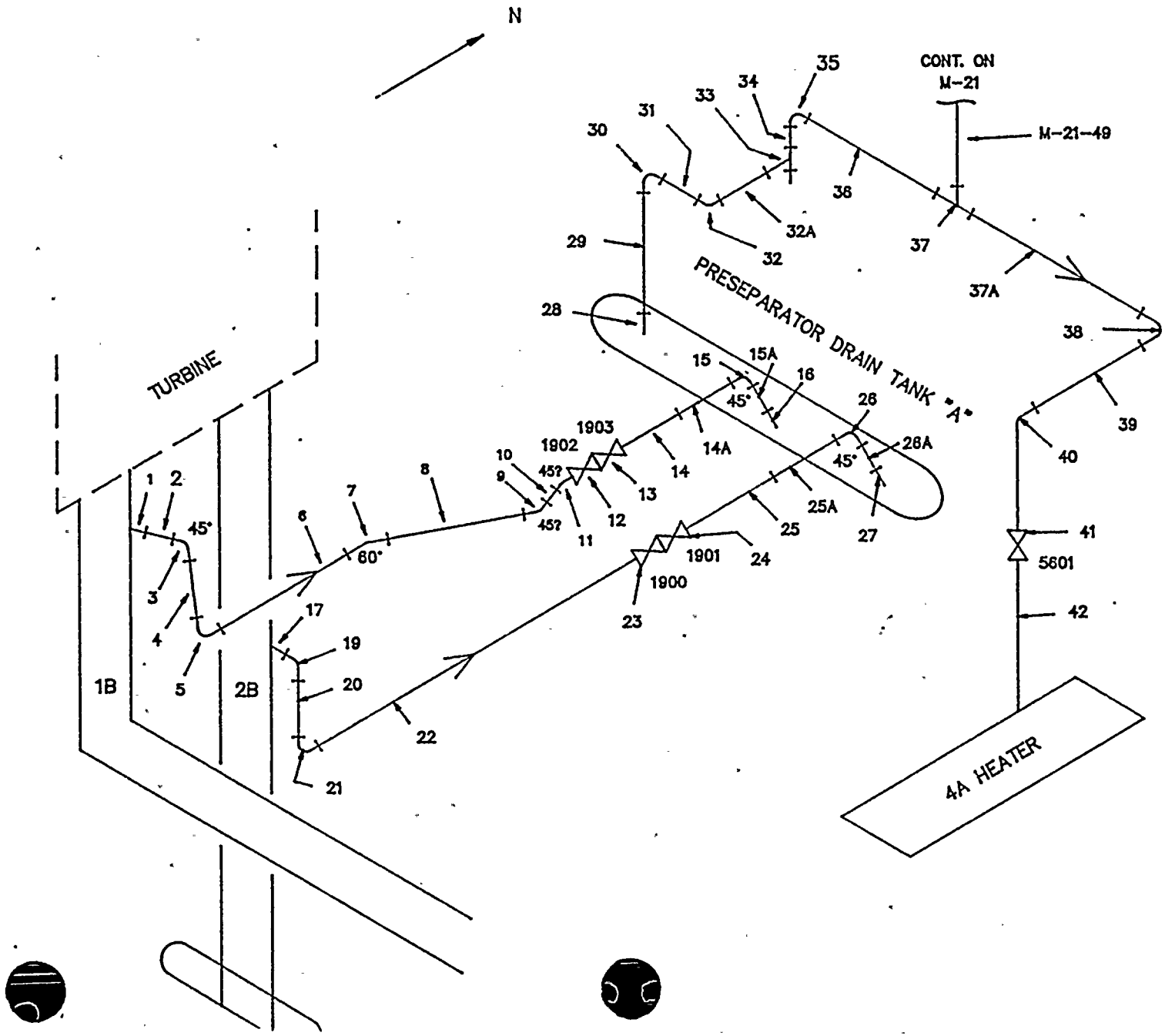
M-20 1B, 2B & 3B L.P.H. DRAINS



M-21 STEAM EXTRACTION TO PRESEPARATOR B & 4B L.P.H.

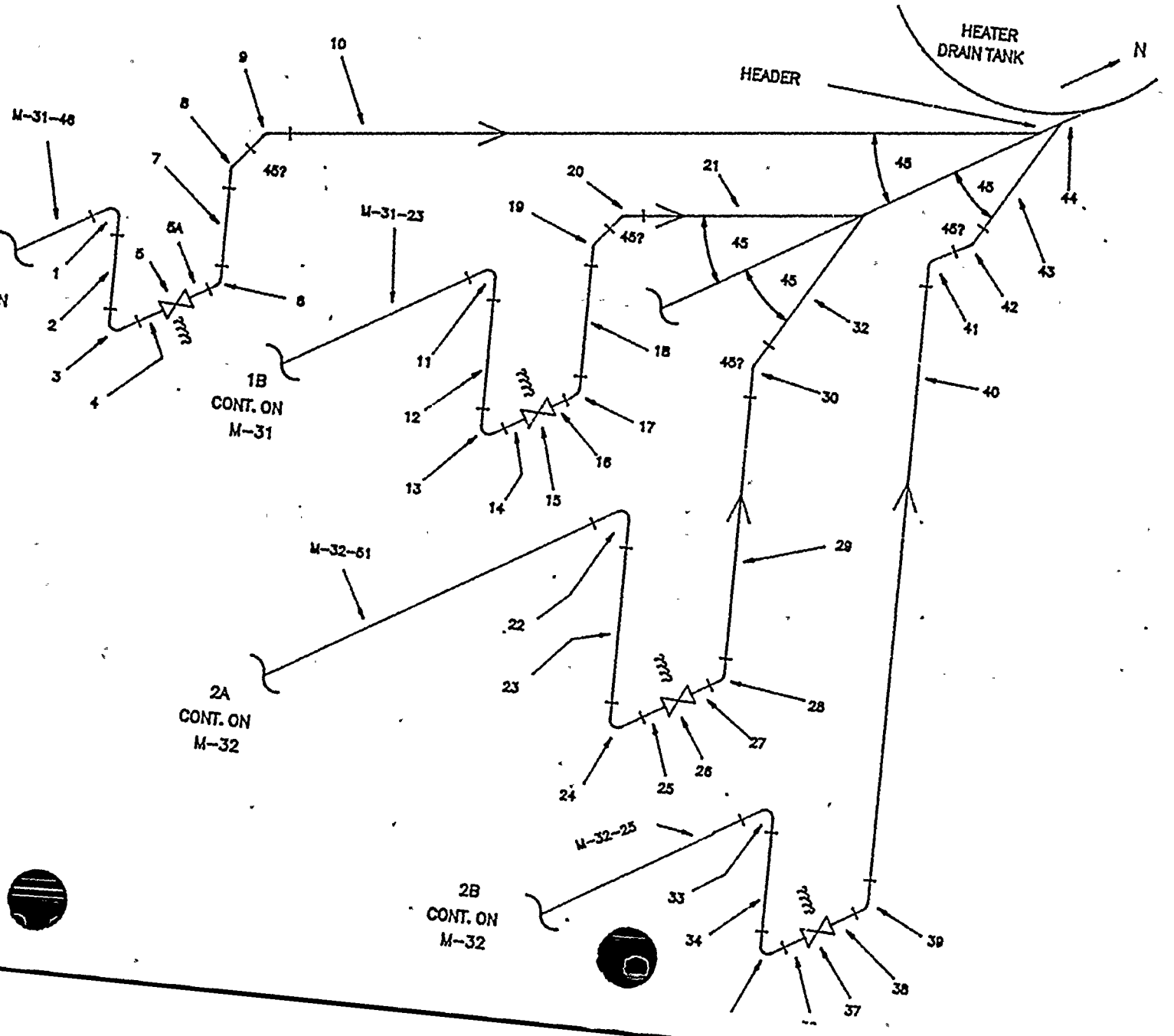


M-22 STEAM EXTRACTION TO PRESEPARATOR A & 4A L.P.H.

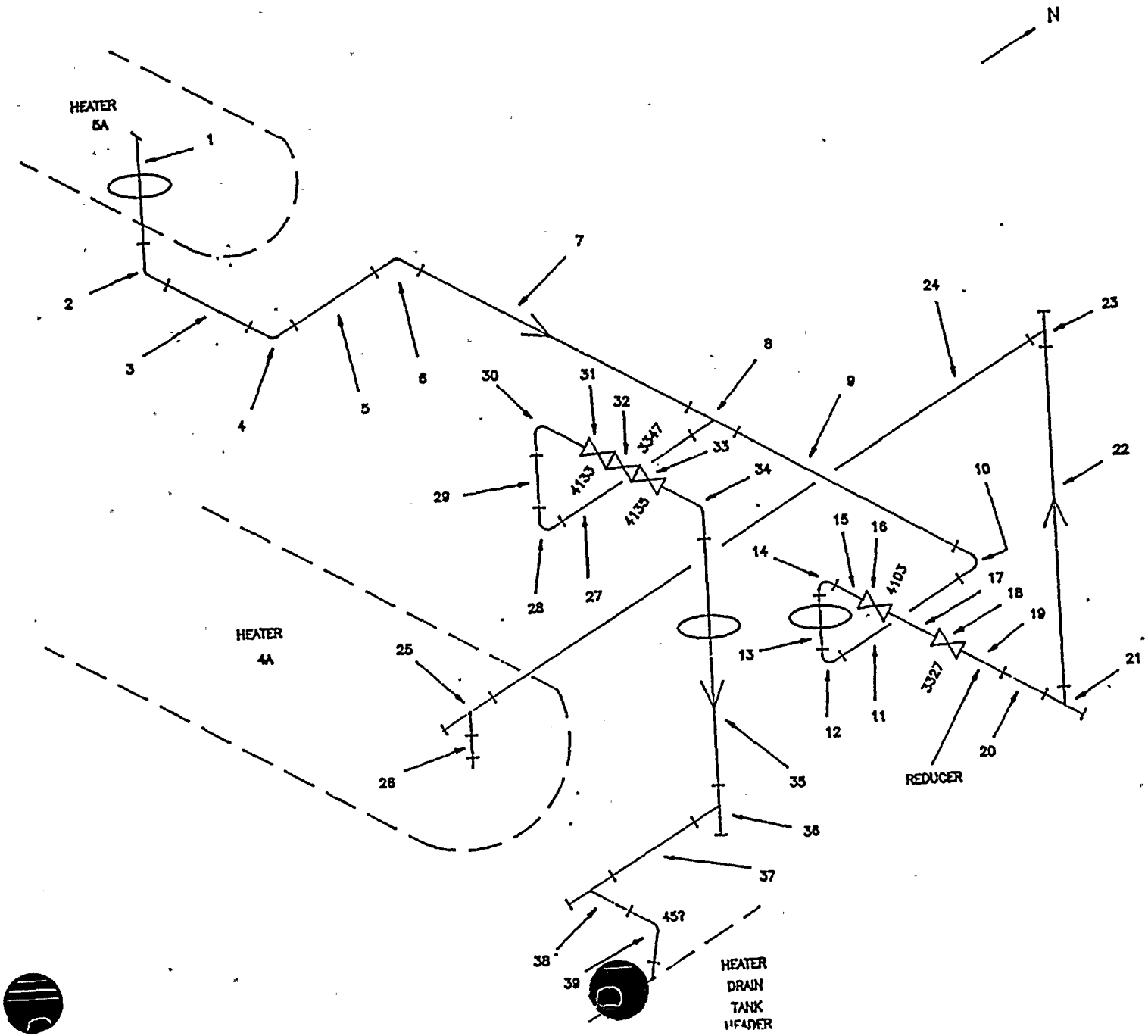


M-33

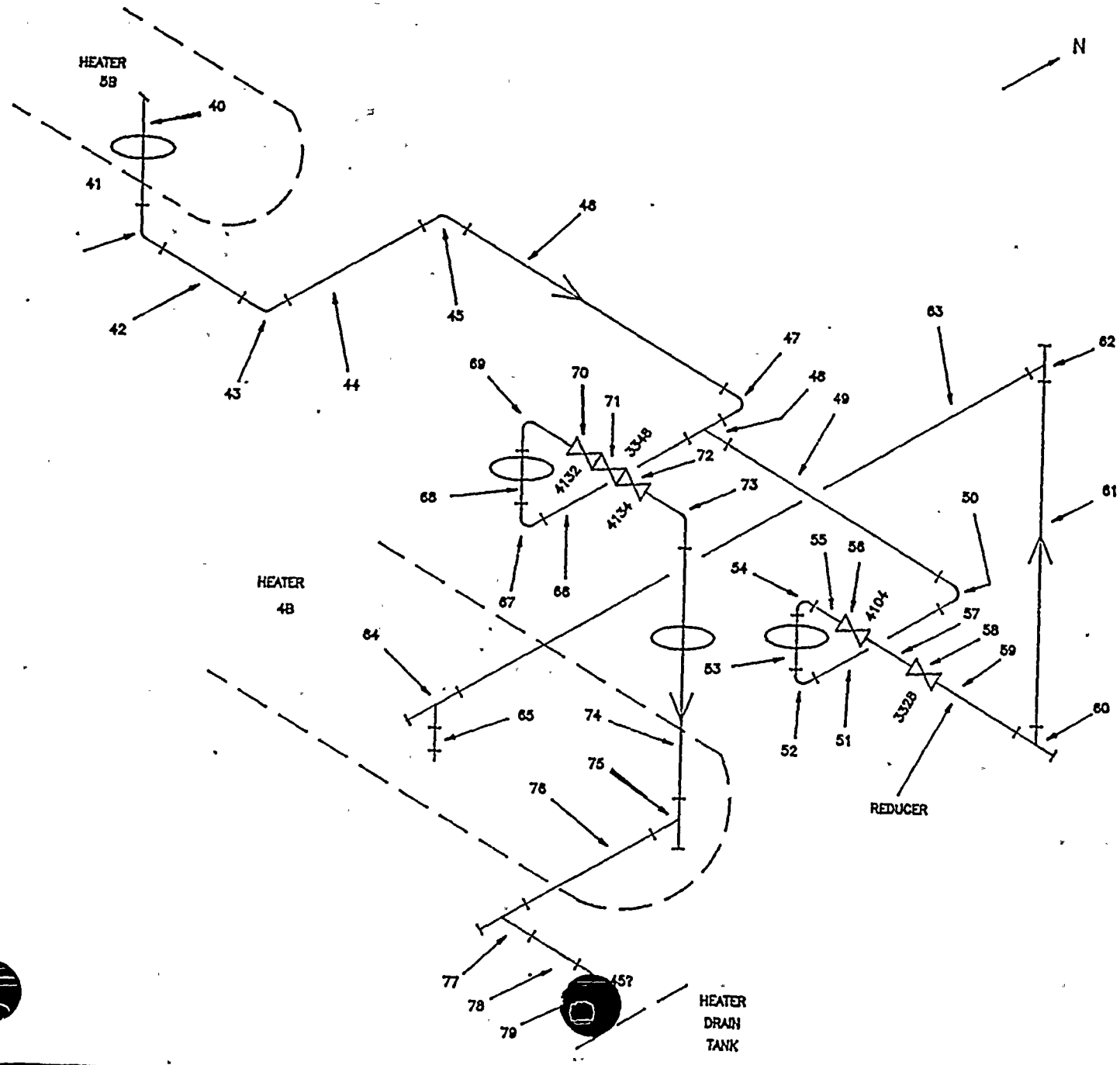
MSR 1A, 1B, 2A & 2B TO HEATER DRAIN TANK



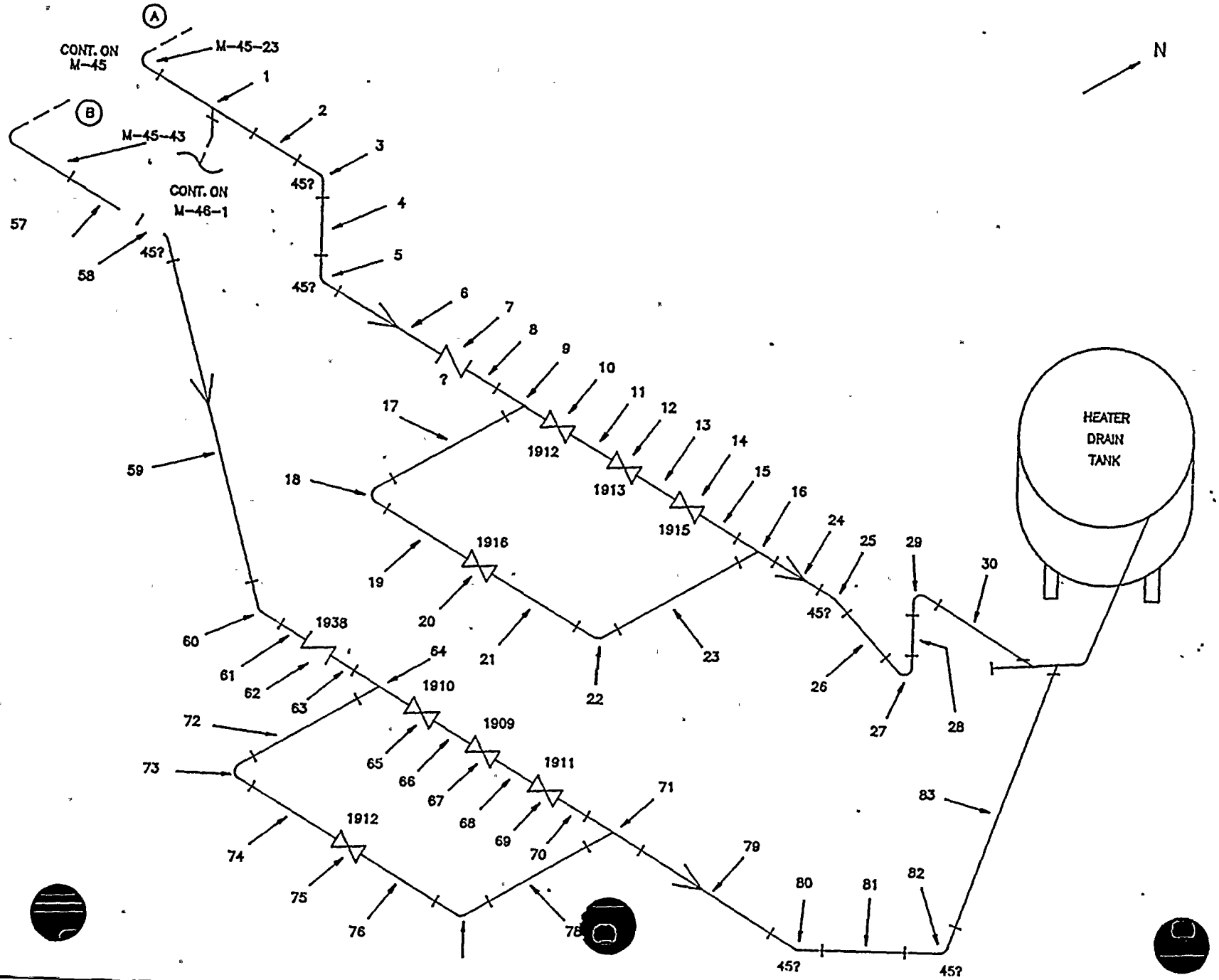
M-41A 5A H.P.H. DRAIN TO 4A L.P.H.



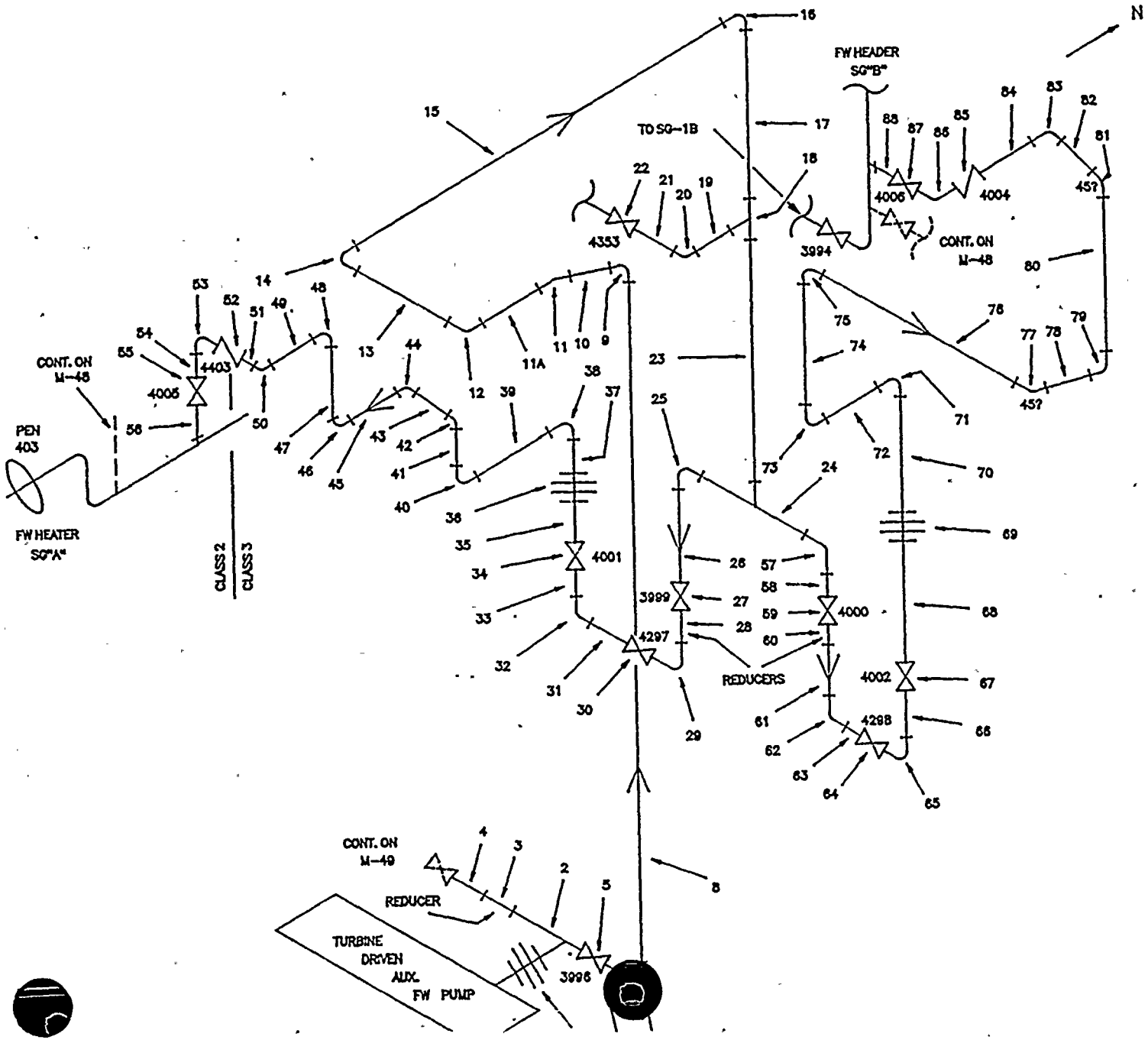
M-41B 5B H.P.H. DRAIN TO 4B L.P.H.



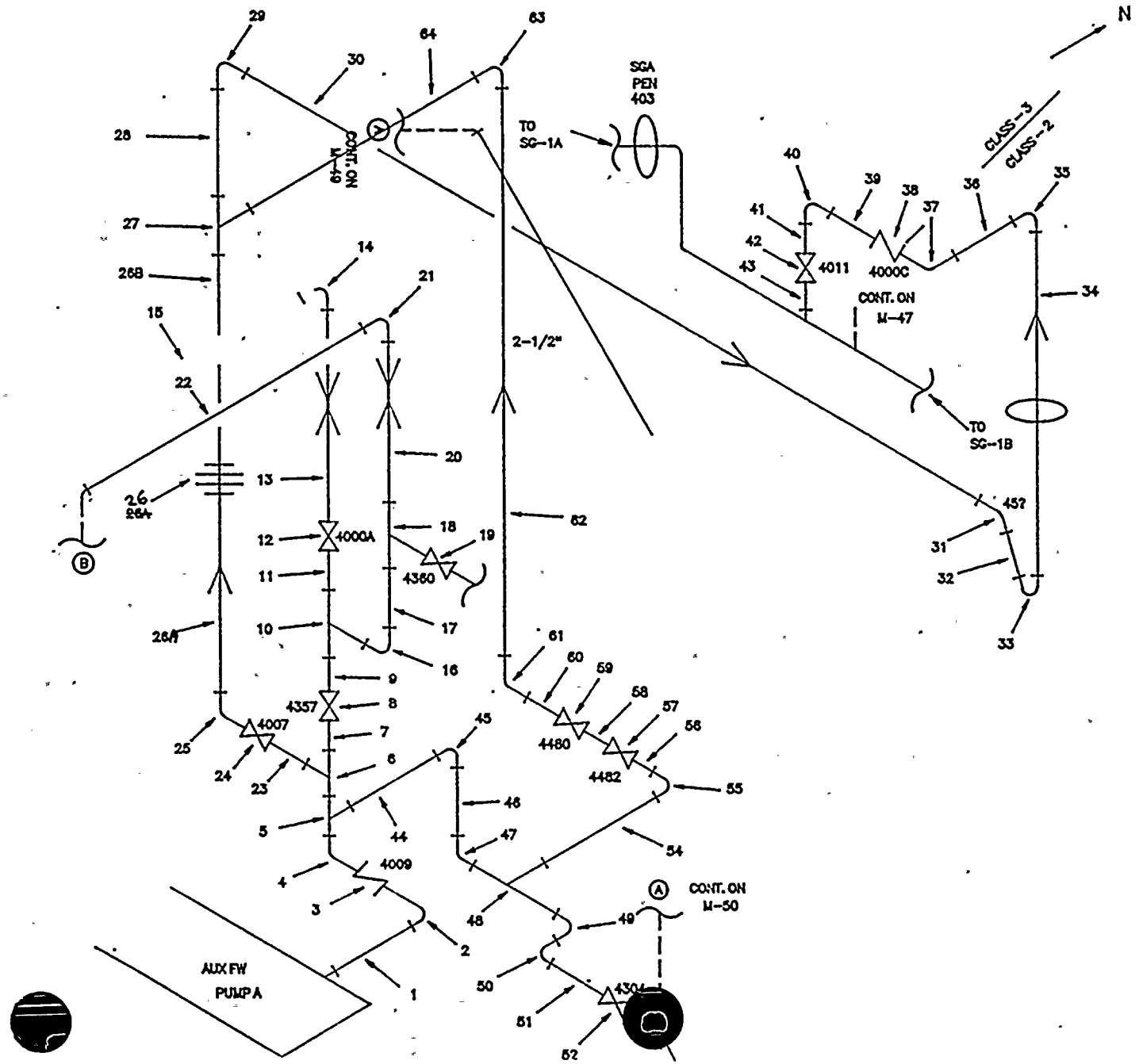
M-46B PRESEPARATOR A & B DRAIN TO HEATER DRAIN TANK



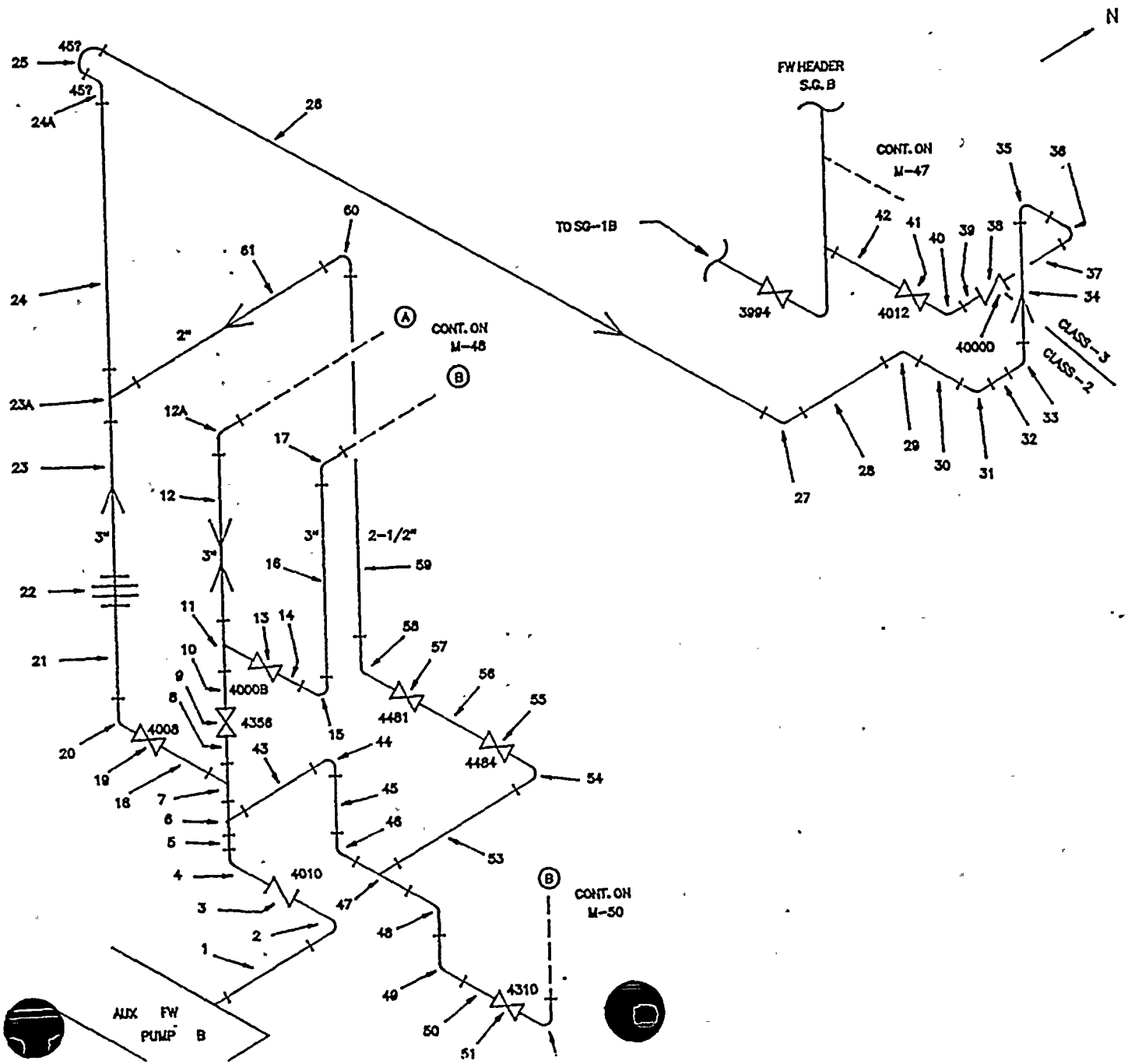
M-47 TURBINE DRIVEN AUX F.W. PUMP TO DISCHARGE LINES



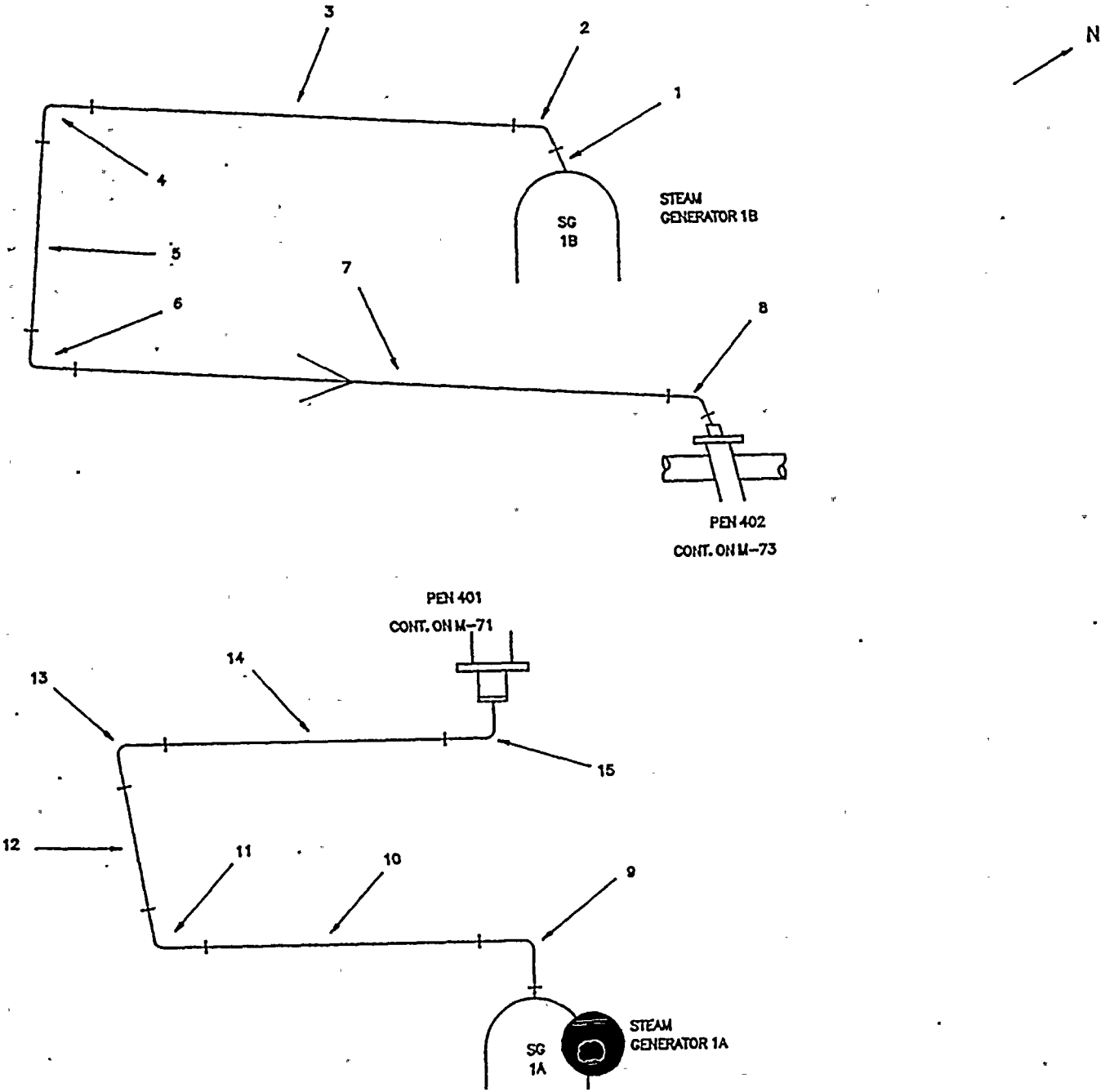
M-48 AUX F.W. PUMP A TO DISCHARGE LINES



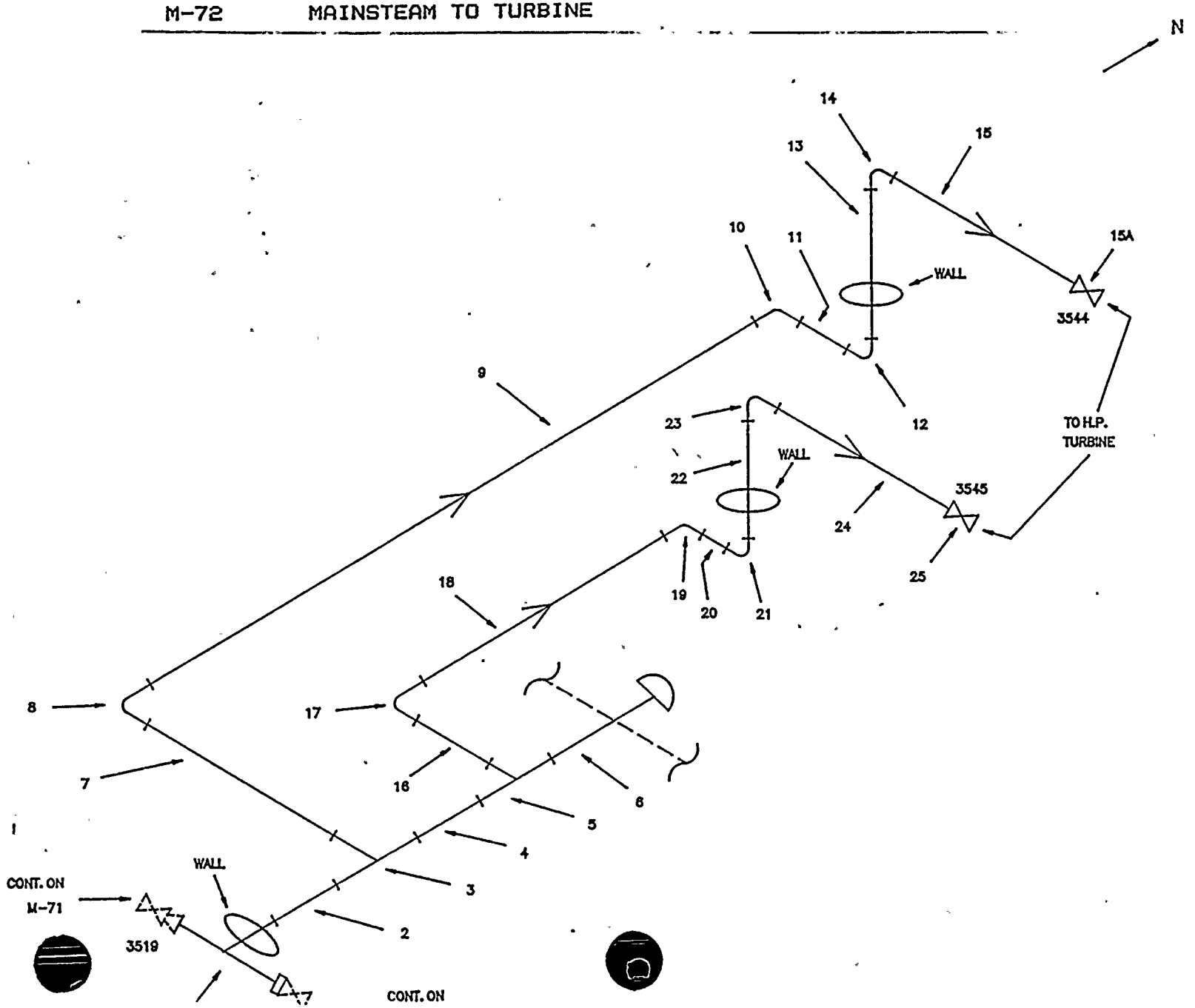
M-49 AUX F.W. PUMP B TO DISCHARGE LINES



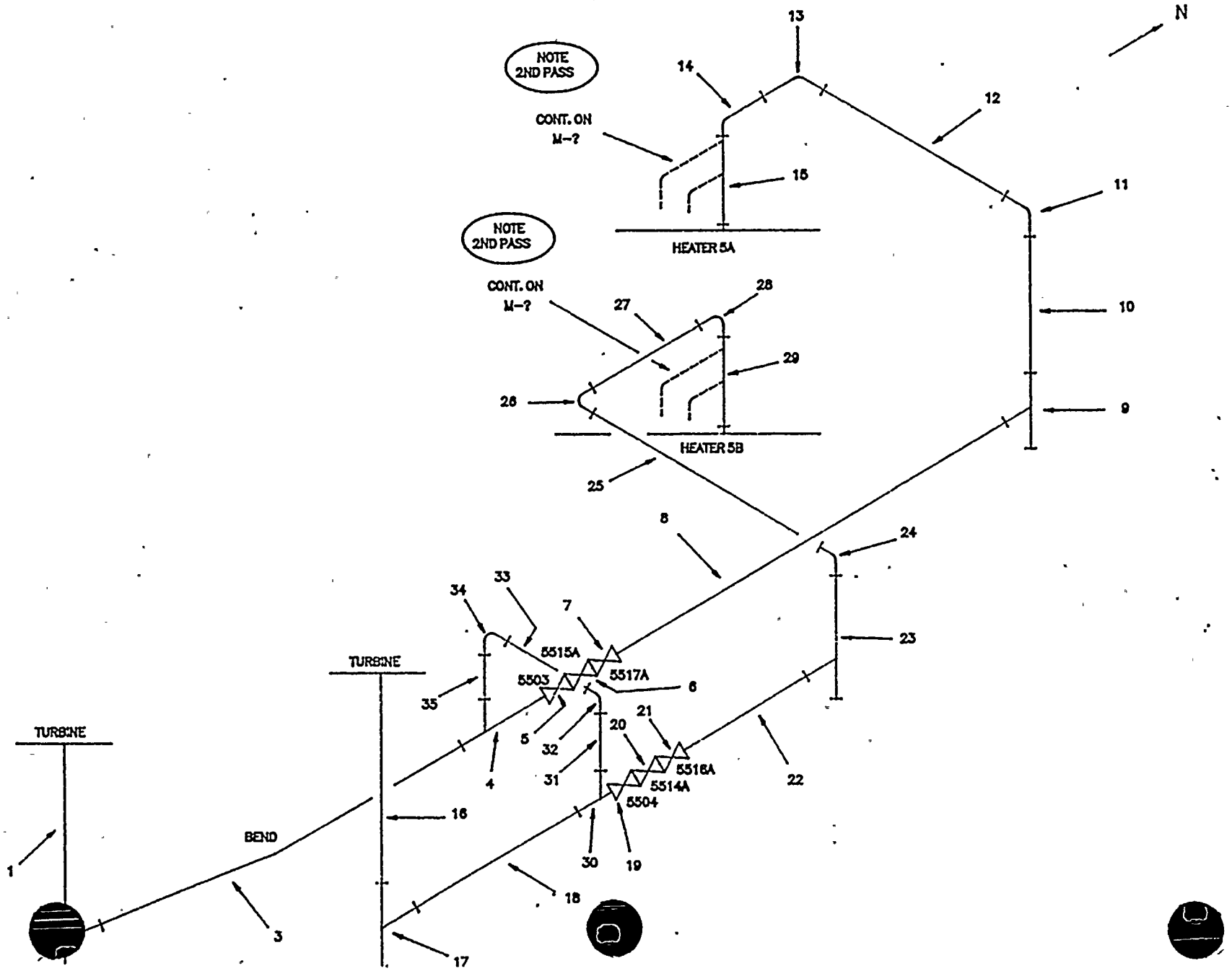
M-70 MAINSTEAM FROM S/G A & B



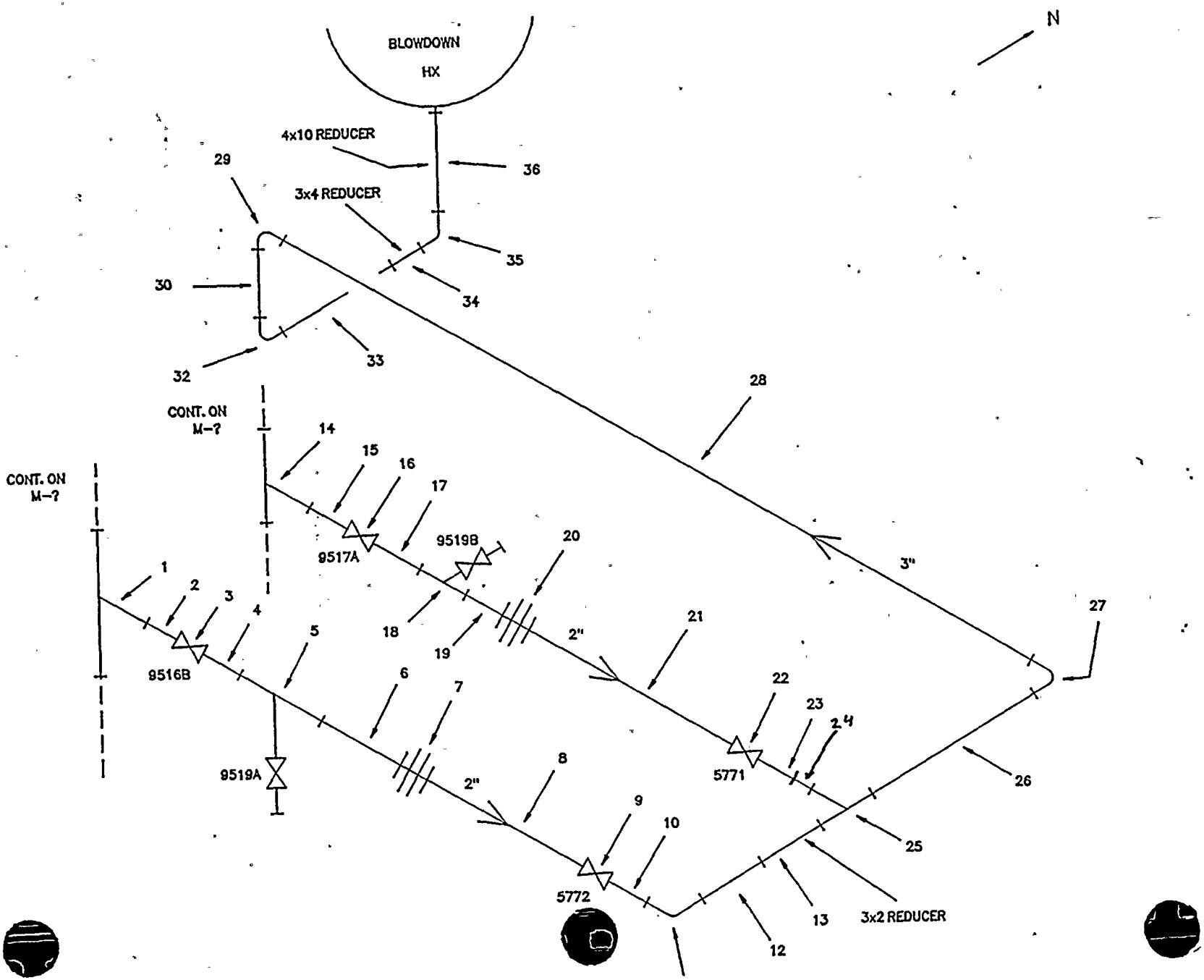
M-72 MAINSTEAM TO TURBINE



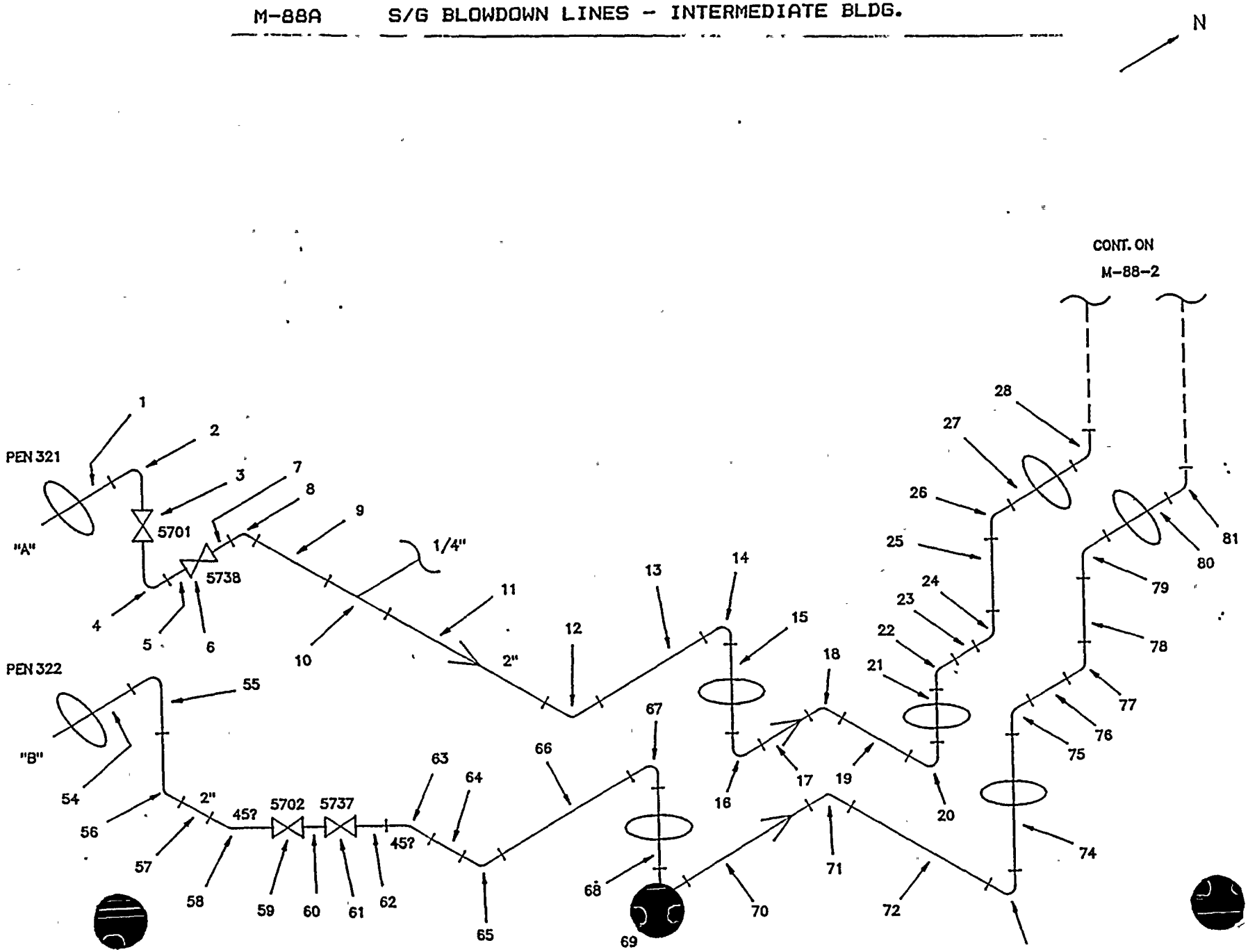
M-75 STEAM EXTRACTION TO 5A & 5B H.P.H.



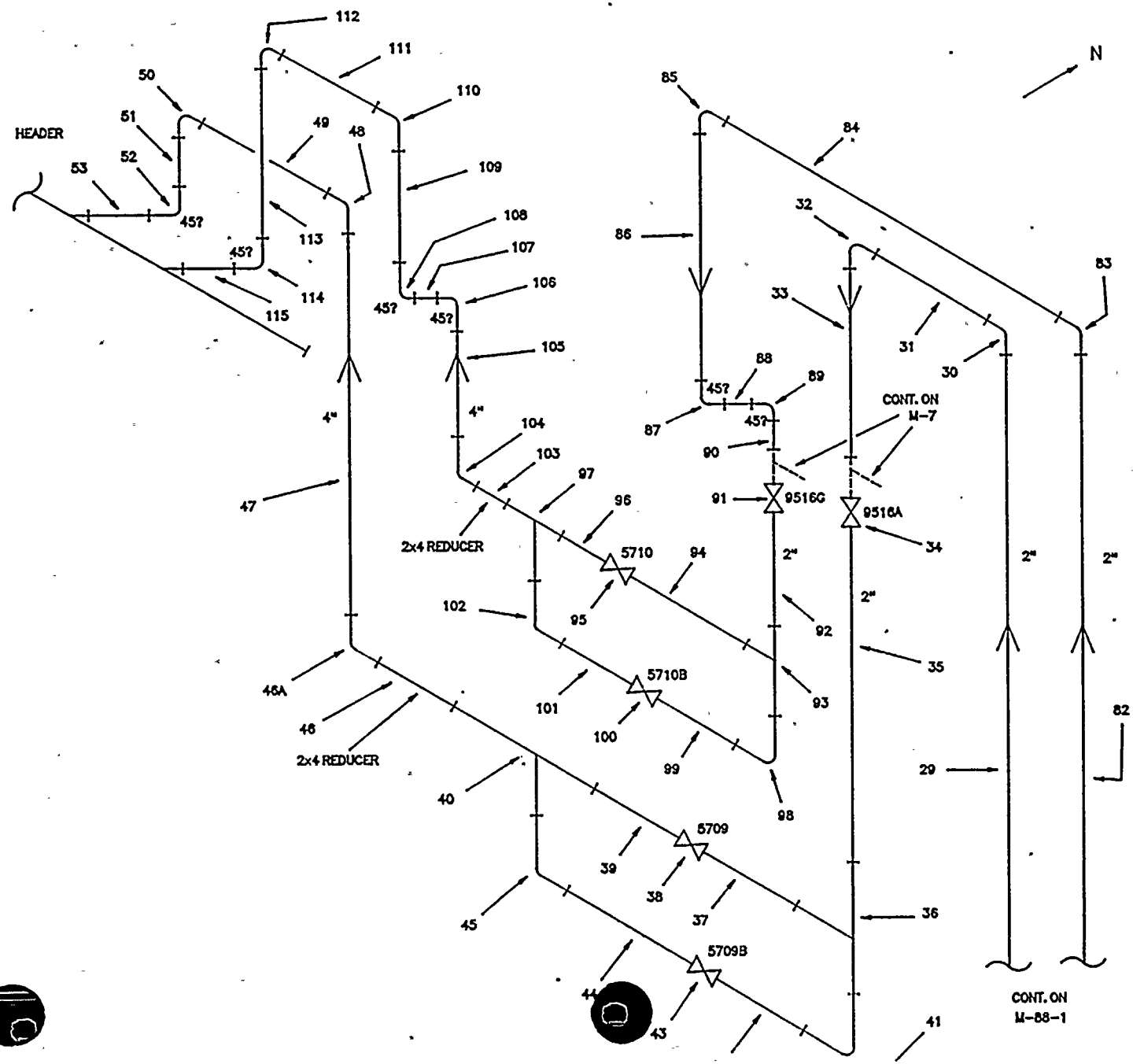
M-87 S/G BLOWDOWN TO BLOWDOWN HEAT EXCHANGER



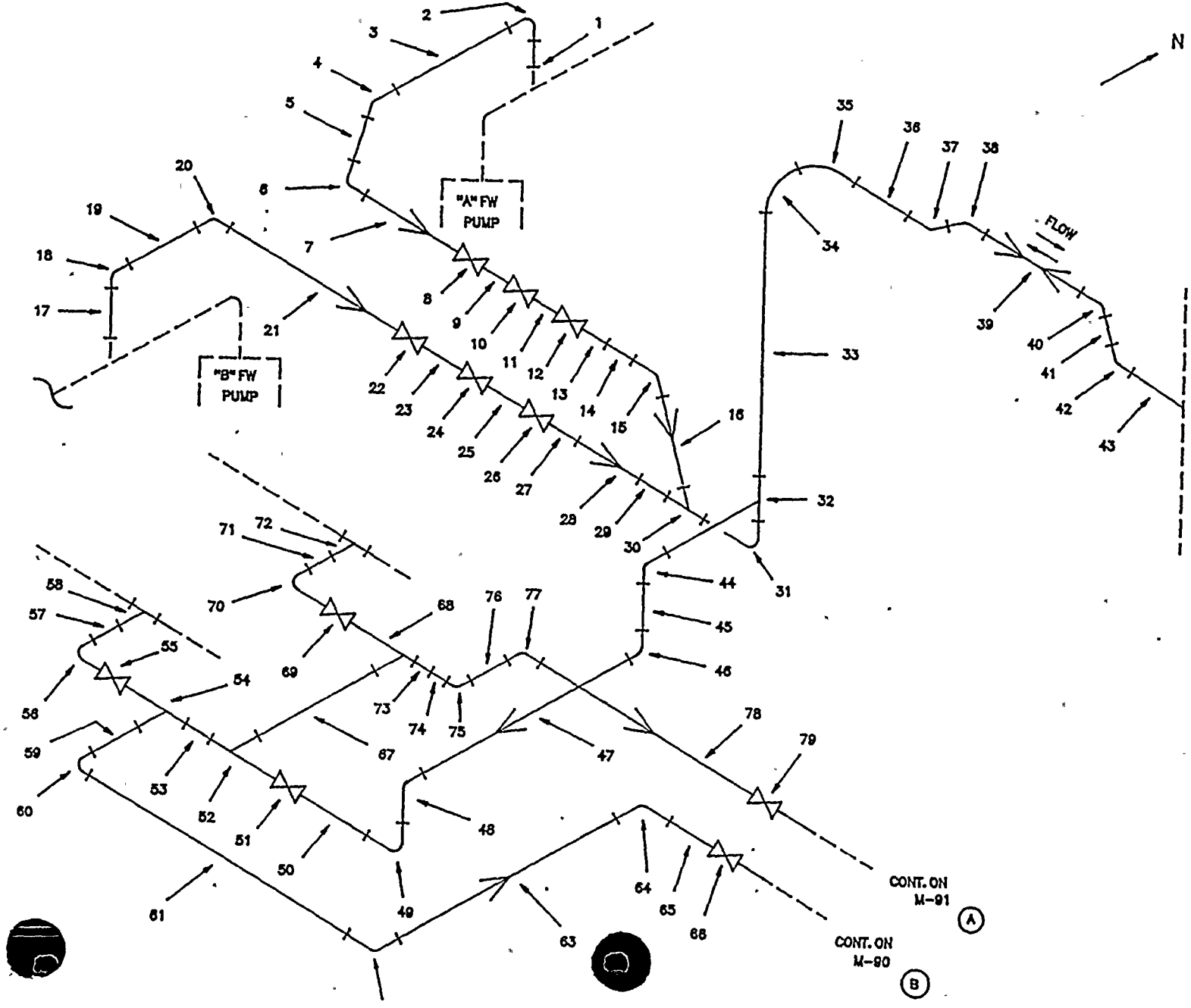
M-88A S/G BLOWDOWN LINES - INTERMEDIATE BLDG.



M-88B S/G BLOWDOWN TO BLOWDOWN TANK HEADER



M-92 FEEDWATER PUMP BYPASS



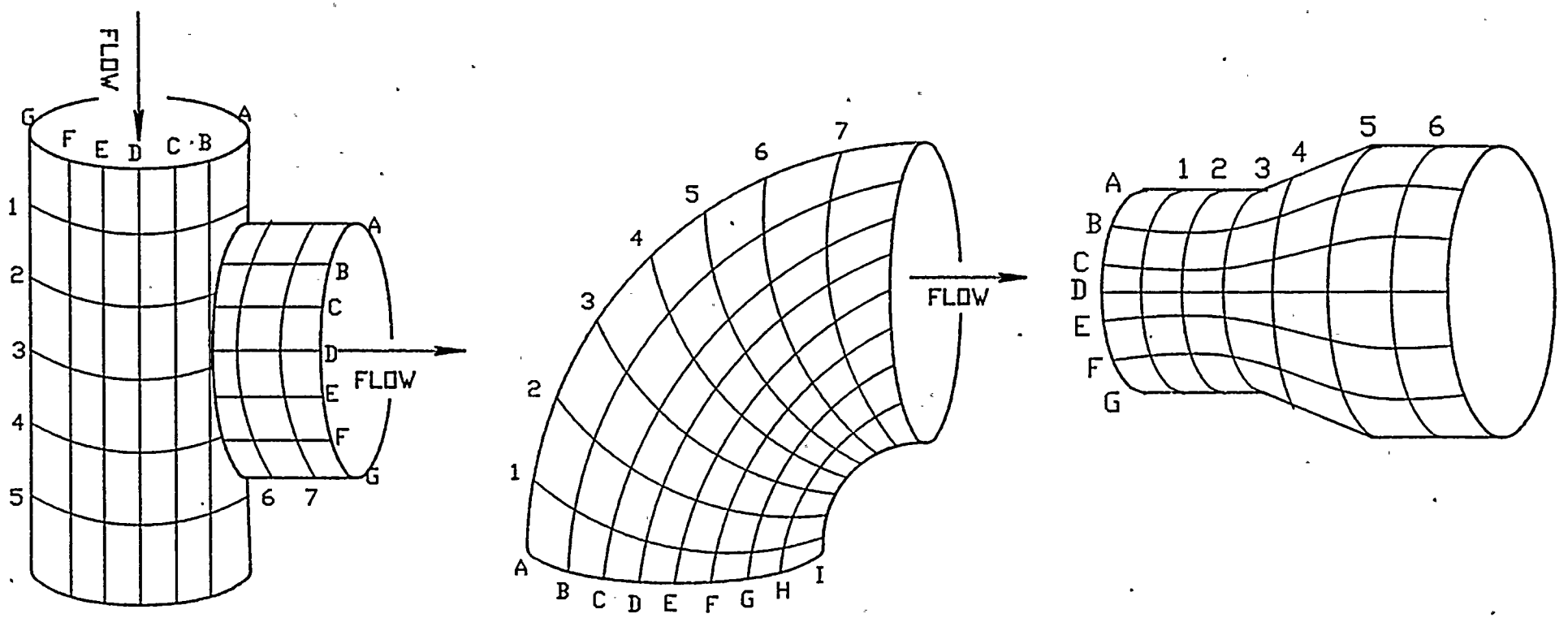
Attachment 2

to

NRC IE Bulletin 87-01 Response

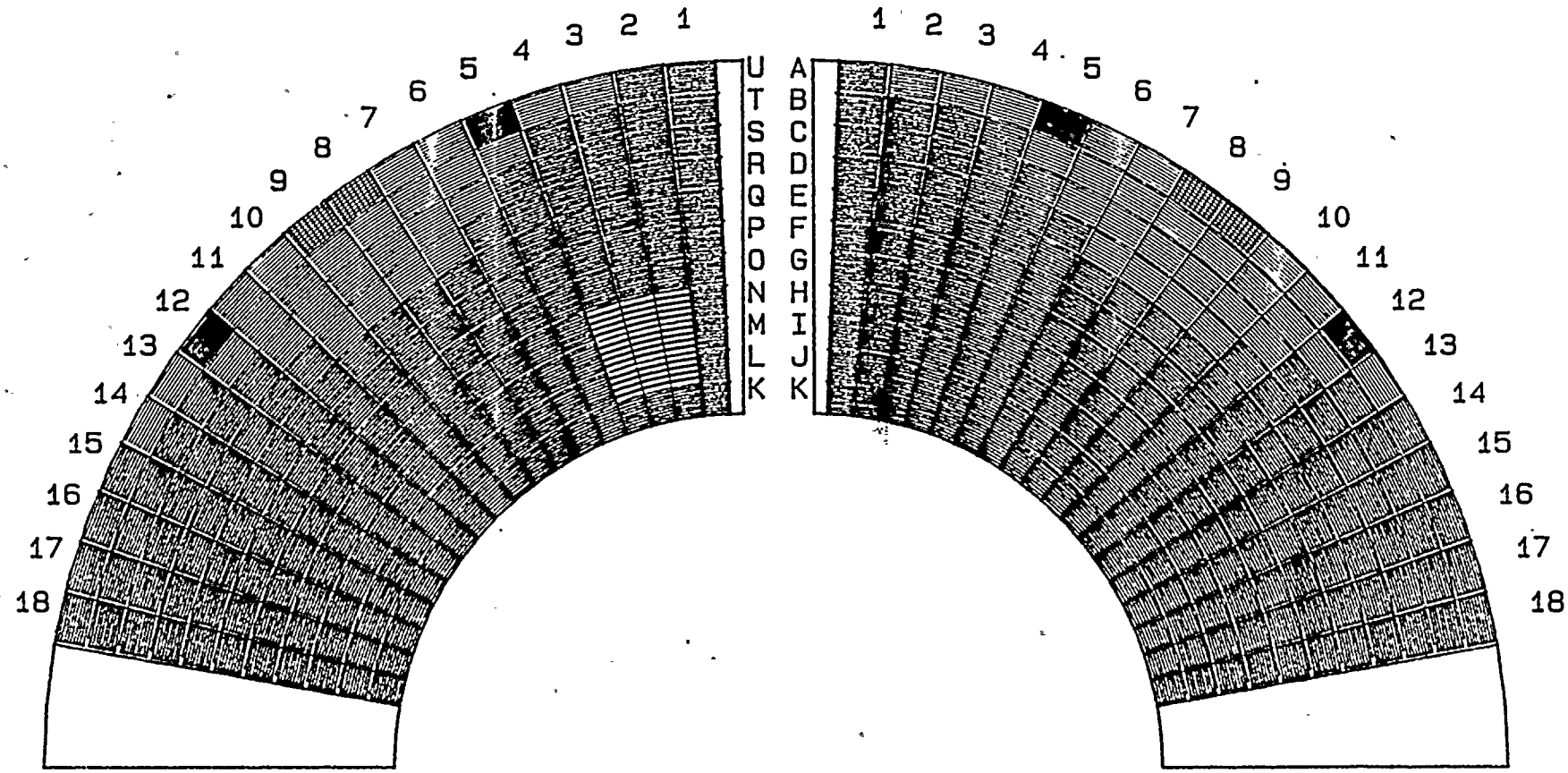
(Ref. Item 4b)

LAYOUT FOR U.T. THICKNESS READINGS



FILE : SAMPLE.PLT
DESCRIPTION: 90 DEGREE ELBOW
SCHEDULE: 80
PIPE OD: 6.625
NOMINAL THICKNESS: .432

REFERENCE: UPSTREAM WELD
LOCATION OF FIRST RING: .5 INCHES
DISTANCE BETWEEN DATA RINGS: 1



FLOW DIRECTION : DOWNSTREAM

INCREMENT DIRECTION : CW

> 90	90 - 85	85 - 80	80 - 70	70 - 65	< 65	RESTRICTION

DATA FILE : SAMPLE.PLT

ELBOW

ELBOW ANGLE : 90

COMPONENT DESCRIPTION : 90 DEGREE ELBOW

SCHEDULE NUMBER : 80

NOMINAL PIPE SIZE : 6
OUTER DIAMETER : 6.625
PIPE THICKNESS : .432

CIRCUMFERENTIAL RANGE : A - U
LENGTH RANGE : 1 - 18
NUMBERS OF TRANSITION RINGS : 1 AND 18

FLOW DIRECTION : DOWNSTREAM

INCREMENT DIRECTION : CW
REFERENCE FROM WHICH RINGS WILL BE MEASURED : UPSTREAM WELD
LOCATION OF FIRST DATA RING (FROM REFERENCE) : .5
DISTANCE BETWEEN DATA RINGS : 1

	1	2	3	4	5	6	7	8	9	10
A	0.4850	0.3820	0.3820	0.3820	0.3610	0.3400	0.2970	0.1540	0.0920	0.2970
B	0.4480	0.4370	0.4340	0.4340	0.3820	0.3820	0.3400	0.2970	0.2970	0.3400
C	0.4190	0.4140	0.4160	0.4190	0.4110	0.3820	0.3820	0.3400	0.3400	0.3820
D	0.4460	0.4230	0.4170	0.4380	0.4130	0.4000	0.3820	0.3820	0.3820	0.3820
E	0.4380	0.4490	0.4550	0.4340	0.4310	0.4240	0.4370	0.4450	0.4620	0.4190
F	0.4760	0.4590	0.4600	0.4690	0.4480	0.4740	0.4580	0.4510	0.4800	0.4710
G	0.4900	0.4780	0.4690	0.4730	0.4620	0.4960	0.4540	0.4790	0.4580	0.4620
H	0.5090	0.4890	0.4900	0.4850	0.4980	0.4520	0.4560	0.4520	0.4570	0.4680
I	0.4930	0.4880	0.4450	0.4640	0.4600	0.4380	0.4440	0.4470	0.4420	0.4460
J	0.4840	0.4840	0.4950	0.4500	0.4450	0.4410	0.4620	0.4430	0.4510	0.4520
K	0.4970	0.4740	0.4750	0.4780	0.4750	0.4730	0.4800	0.4990	0.4920	0.4770
L	0.5240	-1.0000	-1.0000	-1.0000	0.5270	0.5250	0.5000	0.5160	0.5210	0.5090
M	0.5270	-1.0000	-1.0000	-1.0000	0.4880	0.5010	0.4980	0.5000	0.5120	0.5070
N	0.4700	-1.0000	-1.0000	-1.0000	0.4660	0.4540	0.4600	0.4550	0.4720	0.4470
O	0.4820	0.4790	0.4590	0.4620	0.4530	0.4830	0.4580	0.4580	0.4580	0.4570
P	0.4540	0.4440	0.4380	0.4440	0.4650	0.4620	0.4590	0.4570	0.4620	0.4540
Q	0.4540	0.4540	0.4520	0.4380	0.4420	0.4400	0.4580	0.4480	0.4330	0.4350
R	0.4430	0.4250	0.4250	0.4290	0.4370	0.4320	0.3820	0.3820	0.3820	0.3820
S	0.4430	0.4550	0.4180	0.4140	0.4040	0.3820	0.3820	0.3400	0.3400	0.3820
T	0.4400	0.4400	0.4060	0.4180	0.3820	0.3820	0.3400	0.2970	0.2970	0.3400
U	0.4400	0.4230	0.3820	0.3820	0.3610	0.3400	0.2970	0.1540	0.1000	0.2970

	11	12	13	14	15	16	17	18
A	0.3400	0.3610	0.3820	0.4360	0.4270	0.4370	0.4300	0.4420
B	0.3820	0.3820	0.4270	0.4390	0.4330	0.4250	0.4250	0.4260
C	0.3820	0.4080	0.4200	0.4130	0.3970	0.4190	0.3990	0.4150
D	0.4790	0.4160	0.4040	0.4060	0.4150	0.4320	0.4190	0.4340
E	0.4590	0.4190	0.4560	0.4390	0.4520	0.4300	0.4320	0.4360
F	0.4640	0.4540	0.4530	0.5120	0.4980	0.4520	0.4670	0.4390
G	0.4510	0.4470	0.4470	0.4450	0.4530	0.4510	0.4540	0.4420
H	0.4520	0.4470	0.4450	0.4390	0.4400	0.4390	0.4370	0.4360
I	0.4530	0.4760	0.4370	0.4730	0.4430	0.4480	0.4430	0.4240
J	0.4520	0.4420	0.4600	0.4410	0.4480	0.4480	0.4380	0.4430
K	0.4840	0.4820	0.4750	0.5220	0.4780	0.4850	0.4900	0.4940
L	0.5170	0.5100	0.4930	0.5020	0.5110	0.5020	0.5960	0.5070
M	0.4880	0.4920	0.4950	0.4800	0.4840	0.4920	0.5280	0.4850
N	0.4670	0.4650	0.4920	0.4410	0.4550	0.4660	0.5050	0.5260
O	0.4620	0.4620	0.4560	0.4510	0.5140	0.4550	0.5030	0.4540
P	0.4540	0.4540	0.4530	0.4730	0.4780	0.4620	0.5000	0.4660
Q	0.4330	0.4470	0.4540	0.4540	0.4540	0.4560	0.4570	0.4560
R	0.4540	0.4540	0.4650	0.4550	0.4580	0.4570	0.4570	0.4540
S	0.3820	0.4220	0.4620	0.4210	0.4030	0.4270	0.4230	0.4460
T	0.3820	0.3820	0.4110	0.4060	0.4030	0.3990	0.4080	0.4450
U	0.3400	0.3610	0.3820	0.3820	0.4340	0.4540	0.4350	0.4700

Attachment 3

TABLE 1

SUGGESTED FITTINGS

- Closely Coupled Fittings or Configurations
- Entrant Tee, Combining Tee, Splitting Tee
- 90° Elbow
- Reducer/Expander
- Straight Section of Pipe Downstream of:
  - Reducer
  - Flow Control/Throttling Valve
  - Restricting Orifices
  - Multiple Thermowells, etc.

TABLE 2

SUGGESTED PIPING LOCATIONS

- Feedwater Suction
- Feedwater Discharge
- Heater Drain Pump Discharge
- Condensate from FW Heater
- HPCI (BWR)

Attachment 3

TABLE 3

KEY PARAMETERS

- C.S. piping & components — major parameter, chromium content
- pH
- O_2 content
- Fluid temperature
- Local/Bulk flow rate
- Piping product geometry factor
- Joint configurations (backing rings, etc.)

NOTE: Information extracted from EPRI Workshop Information (April 14-15) and EPRI Report NP-3944.