THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

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MURRAY R. EDELMAN
VICE PRESIDENT
NUCLEAR

August 30, 1985
PY-CEI/NRR-0295 L

Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Perry Nuclear Power Plant
Docket Nos. 50-440; 50-441
Feedwater Isolation Valve
Testing (Question 480.50)

Dear Mr. Youngblood:

In your letter dated December 21, 1983 and in subsequent discussions with your staff CEI was requested to justify leak testing of the subject valves with water. The attachment to this letter summarizes the redundant and independent means of keeping feedwater piping filled with water post-LOCA, and the results of the requested analyses of the system response to a LOCA (RETRAN).

The feedwater lines were eliminated as a potential air bypass leakage path by incorporating the Feedwater Leakage Control System (FW-LCS) design in July 1980. In May 1981, we placed an order for replacement feedwater isolation valves. Based on an acceptable FW-LCS design, CEI specified the valves to seal against water pressure. This system design and valve leakage testing with water were accepted for Perry by the NRC staff as reflected in SSER 2 dated January 1983. CEI has installed the new valves and FW-LCS.

The decision to seal water leakage had an important impact on isolation valve design. The Perry design, which is a check valve, was also designed to minimize water hammer. As further discussed in the attachment, the resulting valve design is substantially different from the original (and more typical) design. It reduces piping loads from feedwater pump trip, and improves system reliability under expected plant operating conditions.

Since the Perry feedwater isolation valves were designed and approved for containing water leakage, the staff more recently has required further justification to test with water. Preliminary test results show the valves will provide an adequate seal against water. Extensive modifications to the valve would be required to enable it to seal against air. These modifications will unnecessarily complicate operation of the plant and possibly cause a safety problem, with no corresponding benefit to public health and safety.

8509040088 850830
PDR ADOCK 05000440
E PDR

/Bool Aperture Card Dist
1/1 Drawings To: G. Stefano

The attachment establishes the basis for the CEI position , previously accepted by the staff, that feedwater lines should be leak tested with water. In the event this issue is escalated to a backfit appeal, this letter summarizes CEI's technical position and determination of compliance with existing regulations.

Please call if you have any questions.

Very truly yours,

Murray R. Edelman
Vice President
Nuclear Group

MRE:njc

Attachment

cc: Jay Silberg, Esq.
John Stefano (2)
J. Grobe

480.50 With regard to CEI's containment leakage test program as presented in FSAR Table 6.2 - 40, provide a discussion on each of the following:

a. CEI has indicated that the feedwater leakage control system (FWLCS) would provide post-accident sealing of both feedwater lines, thus precluding the need to perform Type C leak tests of the feedwater isolation valves with air. The Perry FWLCS is similar, if not identical, to the Grand Gulf FWLCS. At this time, MP&L (Grand Gulf) has not demonstrated satisfactorily that drywell leakage does not exist through the feedwater isolation valves in the first hour of the postulated event (i.e. time to manually activate FWLCS plus the time to fill the feedwater line). Therefore, the staff has required MP&L to Type C leak test these valves with air. Similarly, the staff will require CEI's feedwater isolation valves to be leak tested with air or demonstrate why these valves should not be tested with air.

Response

Perry Feedwater - Leakage Control System Description

The FW-LCS (Feedwater-Leakage Control System) consists of two independent subsystems (see FSAR 6.9) designed to eliminate through line leakage in the feedwater piping by providing a positive seal between the isolation valves. The outboard subsystem supplies sealing water on the downstream side of the outboard motor operated gate valve and the inboard subsystem supplies sealing water on the downstream side of the outboard containment isolation check valve.

Following a LOCA, the FW-LCS is manually initiated from the control room. The operator first verifies feedwater unavailability through low feedwater pressure (approximately 30 psig), then closes the outboard motor operated gate valves with the keylock switches, and opens the motor operated FW-LCS valves from the control room. Sealing water is provided from the suppression pool through the RHR & LPCS Waterleg Pump System. Since the source of sealing water is the suppression pool, a 30 day water supply is assured.

When the FW-LCS is initiated following a LOCA, there should be no demand for keep-fill water in the RHR and LPCS systems since these systems will be operating. Therefore, the Waterleg Pump System should be totally dedicated to provide sealing water to the FW-LCS. Single pump capacity will be approximately 24 GPM allowing for the waterleg pump recirculation flow of 10 GPM.

In the case of a LOCA where the feedwater lines remain water filled, static head pressure and the feedwater check valve disc weight force the feedwater check valves to close. Initiation of the FW-LCS pressurizes the volumes between the inboard and outboard isolation check valves and between the outboard isolation check valve and the motor operated gate valve.

Since the waterleg pumps operate at a pressure higher than the static head pressure, leakage is into the reactor vessel. Any leakage through the motor operated gate valve has been accounted for through NUREG 0737 (Closed System Leak Testing) testing and added to the water bypass allowable.

In the case where the feedwater lines do not remain completely water-filled, the feedwater system can be operated to ensure positive pressurization up to the gate valve, and thus leakage is into the reactor vessel. FW-LCS will be initiated and begin to fill the volumes between the inboard and outboard isolation check valves and between the outboard isolation check valve and motor operated gate valve. The weight of the check valve discs, and no upstream pressure, will force the check valves to close. When the volumes fill up, the pressure will increase until the weight of the disc is overcome. At this point, the disc will lift (at approximately 2.25 psig) and leakage into the vessel will occur. As the pressure is relieved, the disc will re-seat until pressure builds up again and the disc lifts. This process will continue throughout the duration of the LOCA event.

Feedwater System Operation Post-LOCA

Refer to attached figures of the condensate and feedwater systems.

The feedwater system will not be completely drained since the system will be intact and operating initially post-LOCA.

The Perry design includes a backup feedwater flow path through a motor-driven pump. When the turbine-driven feed pumps lose driving steam and trip on vessel level 2 post-LOCA, flow is automatically diverted through the motor-driven pump. The motor-driven feed pump and/or the feedwater booster pumps will continue to pump water into containment post-LOCA.

The pumps will continue to operate for about 10 minutes before the feedwater booster pumps trip on low water level. During this time, no extraction heating is available and cold water from the condenser hotwell is being pumped into the vessel which cools down the feedwater and the piping. When feedwater flow is finally stopped, feedwater flashing is not expected to occur. Therefore, a significant voiding of the piping is not expected.

Feedwater System Leak Integrity

Since very little voiding is expected, a conservative approach to evaluate the FW-LCS would be to assume one feedwater line is completely drained. Fill time in this case would be approximately 18 minutes. If a divisional failure is assumed, only one waterleg pump would be avaiable for filling the feedwater line. Under these conditions, calculations show it would take approximately 36 minutes to fill and maintain a feedwater seal.

During the filling process for the case of a feedwater line break inside the drywell air leakage bypassing the containment through valve stems is eliminated for the following reasons:

1. Feedwater Isolation Check Valves

   Stem leakage is not considered a leakage source because the stem is not exposed to the environment (refer to drawing 40-1012-1). The valve stem & disc are totally enclosed within the valve body and bonnet. Therefore, motion between the stem & bonnet will not result in bypass leakage. The bonnet is flanged and gasketed. The flange is tightened down to allow zero leakage at feedwater pressure and would not leak at the post LOCA drywell pressure (peak and steady state).

2. Outboard Motor Operated Gate Valves.

   Stem leakage is eliminated by a series of seals and packings (refer to drawing 40-763-7) between the valve body, bonnet and stem. These mechanical joints are tightened down to seal against feedwater pressure(approximately 1000 psig). Since these valves are not operated frequently (function is isolation for long term LOCA leakage control), there should be no deterioration in the seals and packing which would be the case if the valve is cycled frequently. Air leakage at peak drywell pressure (22.1 psig, 1.8 seconds post LOCA) and lower long term drywell pressure (approximately 9.8 psig, 33 minutes post-LOCA) would not provide enough driving force to cause leakage past the stem.

Based on the conservative assumptions listed above, the FW-LCS will provide an adequate seal within one hour following a LOCA. If a loss of off-site power is assumed at this time, the FW-LCS will maintain the volume of water between the inboard isolation check valve and the outboard motor operated gate valve. During this one hour, operation of the feedwater system will maintain a system pressure higher than the containment pressure thus assuring water leakage into the vessel.

<u>RETRAN Analysis</u>

Feedwater system response to a LOCA was analyzed using the RETRAN 02 MOD 3 computer code. These calculations were performed to determine certain response characteristics of the feedwater system and do not represent a realistic basis for design. No substantive conclusions can be drawn concerning the reliability or integrity of the feedwater system. These results only contribute to understanding characteristics of the system which affect post-LOCA leakage.

The RETRAN analysis modeled the guillotine rupture of a feedwater line inside the drywell concurrent with a Loss of Offsite Power (loss of all feed pumps). The model included piping between the feed pumps and the break. Computer output shows that initial blowdown and boil-off result in depletion of all feedwater liquid in about 3 minutes after the LOCA. After the initial 3 minutes, stored heat in the pipe walls maintains vapor pressure in the piping higher than drywell pressure for 20 minutes (resulting in net flow into the drywell). At 20 minutes post-LOCA, the FW-LCS is initiated.

RETRAN results show that the piping is totally filled with liquid in 44 minutes after FW-LCS initiation. The 44 minute time assumes a divisional failure in the FW-LCS. During the fill time, almost all flow is either into the drywell or into the volume being cooled by incoming FW-LCS water.

With the exception of a 1 minute period shortly after FW-LCS initiation, there is no leakage past the motor-operated valves B21F065A & B into non-safety feedwater piping during the time the feedwater lines fill with liquid.

Availability of Condensate and Feedwater Systems Post-Accident

Based on the high integrity of the piping and the ability to withstand single pump failures, there is a high degree of assurance that the condensate and feedwater systems will be available post-accident.

The feedwater system from the reactor vessel through the outboard containment isolation check valve is classified as Safety Class 1 Seismic Category I; the pipe and valves and other pressure containing parts of this line are designed and built in accordance with ASME Section III. From the outboard containment isolation check valve to the motor-operated gate valve the system is classified as Safety Class 2 Seismic Category I. Those portions of the feedwater piping that are Safety Class 2 are designed to meet the requirements of NB-2300, NB-2332 and NC-2310 of Section III of the ASME Boiler and Pressure Vessel Code.

All other feedwater and condensate lines and pressure retaining parts are designed to ANSI B31.1. All stress levels in the piping are below the ANSI B31.1 allowables.

Except for flanges at some equipment requiring removal for maintenance, all piping connections are welded. The systems are designed to be leak tight at normal operating pressures. Because operating pressures are much higher than the pressures existing in the piping post-LOCA when the reactor vessel is depressurized, leakage out of the lines post-LOCA is not expected.

All feedwater and condensate pumps have backup pumps. The feedwater booster pump backup will automatically start on a trip of another booster pump, ensuring positive pressure is maintained in the feedwater lines.

Extremely Low Probabilities of Failure and Release

The probability of a full circumferential large line break is extremely small. If a pipe failed it would just crack or split enough to relieve stresses. This less severe failure would not result in a rapid depressurization of the feed lines. The pipes would remain water filled; once the feedwater leakage control system was initiated, it would inject into an already water-filled volume.

Even if an earthquate occurred concurrent with the LOCA and LOOP, the non-safety piping would most likely maintain its integrity. A recent study of actual piping performance during earthquakes states that "The performance of large and small bore welded steel piping studied in several recent domestic and foreign earthquakes has been excellent. Very few, if any, failures have been reported due to inertial loads." (NUREG-1061 Vol.2)

Further, the basic source term for offsite dose calculations is extremely conservative in itself. Even if a large circumferential line break concurrent with loss of offsite power did occur, iodine escaping through the feedwater containment isolation valves would be largely contained by the feedwater and condensate piping. Both plate-out on pipe walls and scrubbing through pockets of water existing in the lines would significantly decrease any radiation that could escape to the environment. There is considerable conservatism in the assumption that source term is instantaneously released to containment, which is recognized in Regulatory Guide 1.96.

Feedwater Isolation Check Valve Design

Refer to the enclosed valve drawing 40-1012-1.

The feedwater isolation check valve is an anti-water hammer lift check type, designed to seal against water pressure.

The anti-water hammer design was specified to minimize the forces resulting from check valve closure due to a feedwater line break outside containment. The moving portion of the valve consists of a disk, tube and piston. As the valve closes, water from below the piston is forced out of a cavity above the dash plate. The water is forced through the small annular space between the dash plate opening and the tube. The small annular space acts as a flow restrictor, resulting in the necessary damping.

The valve sealing surfaces were designed to seal against water. Water was specified as the leakage medium after we incorporated a Feedwater Leakage Control System which would ensure a long-term safety-related water seal. The disk and seat mating surfaces are hard-faced. The hard seats provide an appropriate barrier to water leakage. Also, the width of the seat results in bearing stresses suitable for sealing against water.

Designing a check valve for reliable BWR feedwater service is not entirely consistent with designing for air leak integrity. In fact, design provisions for air leak can aggravate seat erosion, reduce reliability and may introduce a new small break LOCA mode.

For example, one way to seal against air at peak containment pressure would be to reduce the width of the valve seat. Reduction in seat width may have an adverse affect on safety. Severe erosion of the smaller seat during normal operation could result in excessive water leakage during normal plant transients (feedwater pump trip) and a potential safety problem.

Another way to design a check valve to normally handle water and still pass an air leakage test would be to incorporate a soft seat. Operating conditions (local flow velocities, temperatures and radiation) challenge soft seat material integrity. Degradation of the soft seat may also result in excessive leakage and a potential safety problem.

In conclusion, the Perry feedwater isolation check valves have been designed to maintain system integrity during all plant transients that result in reverse feedwater flow. Under these conditions, the valves should be designed and tested to minimize water leakage.

Regulatory Compliance

As established in the second supplement to the Perry Safety Evaluation Report, Section 6.2, (a) the feedwater lines do not constitute air bypass leakage paths because of adequate design provisions for water sealing, and (b) 10CFR50 Appendix J/Type C leakage testing with water was acceptable because a dedicated feedwater leakage control system was provided for these lines. The basis for this determination is also consistent with applicable parts of the Standard Review Plan (NUREG-0800) as further discussed below.

In an April 18, 1982 memorandum from H. R. Denton to the NRR staff, the standard review plan (SRP) was described as "the most definitive basis available" for verifying NRC's design criteria and design guidelines for an "acceptable level of safety" for light water reactor facility reviews.

SRP 6.2.6, "Containment Leakage Testing," establishes that water leakage testing of the Perry feedwater valves is permissible under the following conditions- which are satisfied as described below:

1. The feedwater line is not a potential air leak path. Above discussions of feedwater system operation, leak integrity and availability supplement the earlier NRC finding that FW-LCS design meets applicable criteria for redundancy, missile protection and temperature/pressure rating (see also design criteria in Regulatory Guide 1.96).

2. A liquid inventory is available to maintain a water seal during the post-accident period. The above discussion substantiating a 30 day water seal again supplements the earlier NRC finding that the FWLCS design is acceptable.

3. Limits for liquid leakage are assigned to feedwater isolation valves based on analysis (reported in PY-CEI/NRR-0259L).

Branch Technical Position CSB 6-3 further establishes that determination of bypass leakage rate should be done in a realistic manner considering design limitiations, and references design criteria in Regulatory Guide 1.96 as applicable to water sealing systems such as the FW-LCS. The Perry FW-LCS meets the content of these criteria. * Regulatory Guide 1.96 also confirms that sufficient credit can be taken for delay in transport of radioactivity to assume no release during the first 20 minutes post-LOCA, (in manually-initiated main steam line isolation valve leakage control systems). Application of comparable assumptions would further reduce feedwater bypass leakage.

Conclusion

As determined by the NRC in SSER 2, January 1983, and by the above comparision to the Standard Review Plan criteria, the Perry feedwater lines should accordingly be Type C tested with water. This conclusion is further substantiated by the preceding technical evaluation of the following key points:

- Compliance with R.G. 1.96 design criteria,
- Limited voiding of the feedwater lines,
- A highly reliable feedwater system which could maintain another positive water seal outboard of the gate valve, combined with
- Low probability of catastrophic feedwater line failure concurrent with a LOOP,
- Isolation valve design for leak integrity under realistic operating as well as conservative accident conditions, which avoids potential new failure modes,
- Inherent conservatisms in offsite dose calculation and insignificant consequences of a release

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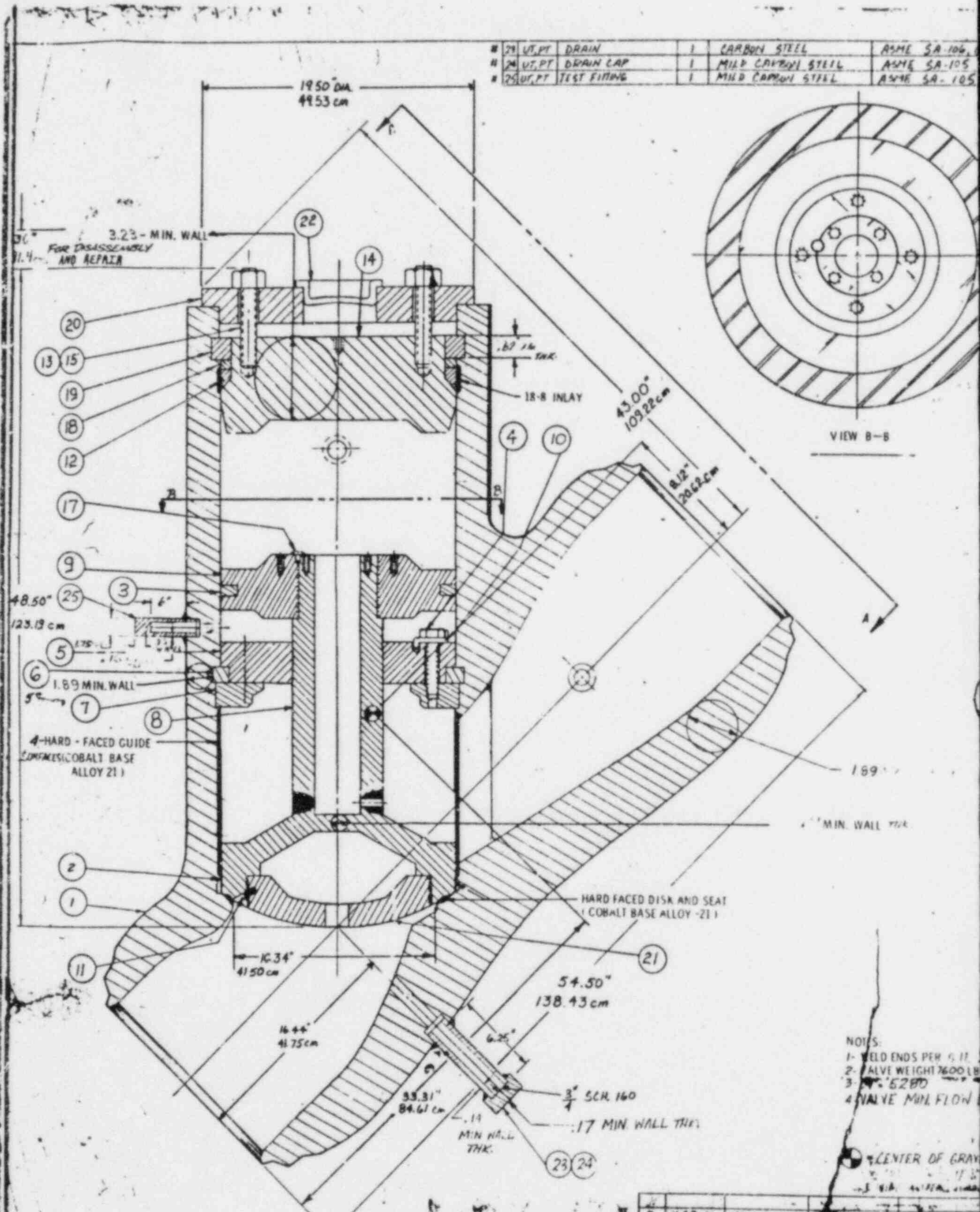
Regulatory Guide 1.96 Revision 1 (JUNE 1976) Paragraphs C-1 through C-10: Seismic Category 1, Applicable Quality Group Standards, protection against missiles/pipe whip/jet force/design-basis environment, single failure criterion/no adverse effects on feedwater system, LOCA with coincident LOOP/function for duration of accident requiring containment integrity, designed to permit actuation within 20 minutes, I&C designed to ESF standards, and control interlocks for overpressure protection.


23 UT,PT DRAIN 1 CARBON STEEL ASME SA-106
24 UT,PT DRAIN CAP 1 MILD CARBON STEEL ASME SA-105
25 UT,PT TEST FITTING 1 MILD CARBON STEEL ASME SA-105
19.50" DIA.
49.53 cm
3.23 - MIN. WALL
FOR DISASSEMBLY AND REPAIR
18-8 INLAY
43.00"
109.22 cm
8.12"
20.62 cm
VIEW B-B
48.50"
123.19 cm
1.89 MIN. WALL
4-HARD - FACED GUIDE
(COBALT BASE ALLOY 21)
MIN. WALL THK.
HARD FACED DISK AND SEAT
(COBALT BASE ALLOY -21)
16.34"
41.50 cm
54.50"
138.43 cm
16.44"
41.75 cm
6.25"
3/4" SCH. 160
33.31"
84.61 cm
.17 MIN. WALL THK.
MIN WALL THK.
NOTES:
1- WELD ENDS PER
2- VALVE WEIGHT 7600 LB
3- 5280
4- VALVE MIN FLOW
CENTER OF GRAVITY
B
A
12-23-81
10-2-81

LIST OF MATERIALS

ORDER DATE: 5-4-81

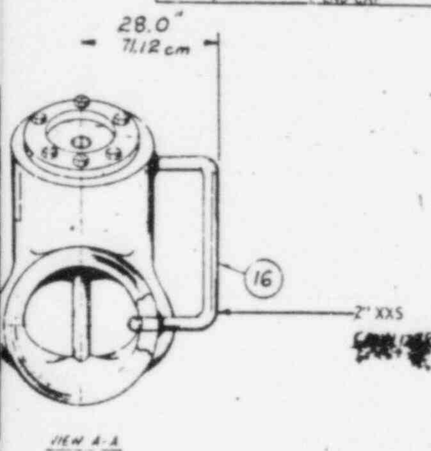
QUANTITIES ARE FOR ONE VALVE

WHERE ASME & ASTM SPECIFICATIONS ARE INDICATED THE LATEST REVISION APPLIES.

	ITEM NO.	NDT	DESCRIPTION	QTY	MATERIAL	SPECIFICATION ●	ROCKWELL [illegible]
*	1	PT MT RT CT	BODY	1	CAST CARBON STEEL	ASME SA-216 GR. WCC	01025
*	2	PT MT UT CT	DISK	1	CARBON STEEL FORGING	ASME SA-105	01112
	3		PISTON RING	1	DUCTILE IRON	ASTM A-439 TYPE D-3	05500
	4		BOLT	16	ALLOY STEEL	ASTM A-193 GR. B-7	20003
•	5		DASH PLATE	1	CARBON STEEL FORGING	ASTM A-105	01111
•	6		RETAINER RING	1	STAINLESS STEEL	ASTM A-182 GR F6A, CL4	02161
•	7		RING LOWER LOCKING	1	CARBON STEEL	ASTM A-515 GR.-70	01150
•	8		TUBE	1	CARBON STEEL PIPE	ASTM A-106 GR. B	01181
•	9		PISTON	1	CARBON STEEL FORGING	ASTM A-105	01111
	10		TAB WASHER	16	STEEL	COMMERCIAL	59999
	11		PIN	1	CARBON STEEL FORGING	ASTM A-105	01111
	12		PRESSURE SEAL GASKET	1	CARBON STEEL-SILVER PL	AISI 1005-1010	05101/01150
	13		HEX NUT	6	CARBON STEEL CD. PL.	ASTM A-194 GR.-2H	01270/[illegible]
*	14	MT UT CT	PRESSURE SEAL COVER	1	CARBON STEEL FORGING	ASME SA-105	01112
	15		STUD	6	ALLOY STEEL CD. PL.	ASTM A-193 GR.-B7	20003/20024
*	16	PT, UT	EQUALIZER	1	CARBON STEEL	ASME SA-106 GR. B	01181
	17		LOCKING PIN	1	CARBON STEEL FORGING	ASTM A-105	01111
	18		SPACER RING	1	ALLOY STEEL	ASTM A-668 GR.-4140 CL. L	02353
*	19	PT, UT	GASKET RETAINER	1	SUPER ALLOY	ASME SA-638 GR.-660T2	02921
	20		COVER RETAINER	1	CARBON STEEL	ASTM A-515 GR.-70	01150
	21		DEFLECTOR PLATE	1	CARBON STEEL FORGING	ASTM A-105	01111
	22		END CAP	1	STEEL	COMMERCIAL	55555

PT - LIQUID PENETRANT TEST
MT - MAGNETIC PARTICLE TEST
CT - CHARPY IMPACT TEST
* - PRESSURE RETAINING PARTS
● DENOTES CRITICAL PARTS

UT - ULTRASONIC TEST
HT - HEAT TREAT
RT - RADIOGRAPHY TEST



Also Available On Aperture Card

TI APERTURE CARD

CUSTOMER: CLEVELAND ELEC[illegible] CO.
CUSTOMER P.O. NO.: [illegible]
USER: SAME, [illegible] PLANT
UNITS 1 & 2, [illegible]
TAG NO: [illegible]

THE CLEVELAND ELECTRIC ILLUMINATING CO.
Perry Nuclear Power Plant Units 1 & 2
☒ APPROVED
☐ APPROVED AS NOTED
☐ RETURNED FOR CORRECTION
1-5-82

ASME SECTION III 1974 EDITION THROUGH WINTER 1975 ADDENDA, NUCLEAR CLASS 1

ANSI B 16.34 - 1977 EDITION STANDARD
STD. CLASS 900
2250 PSI AT [illegible]

Rockwell International

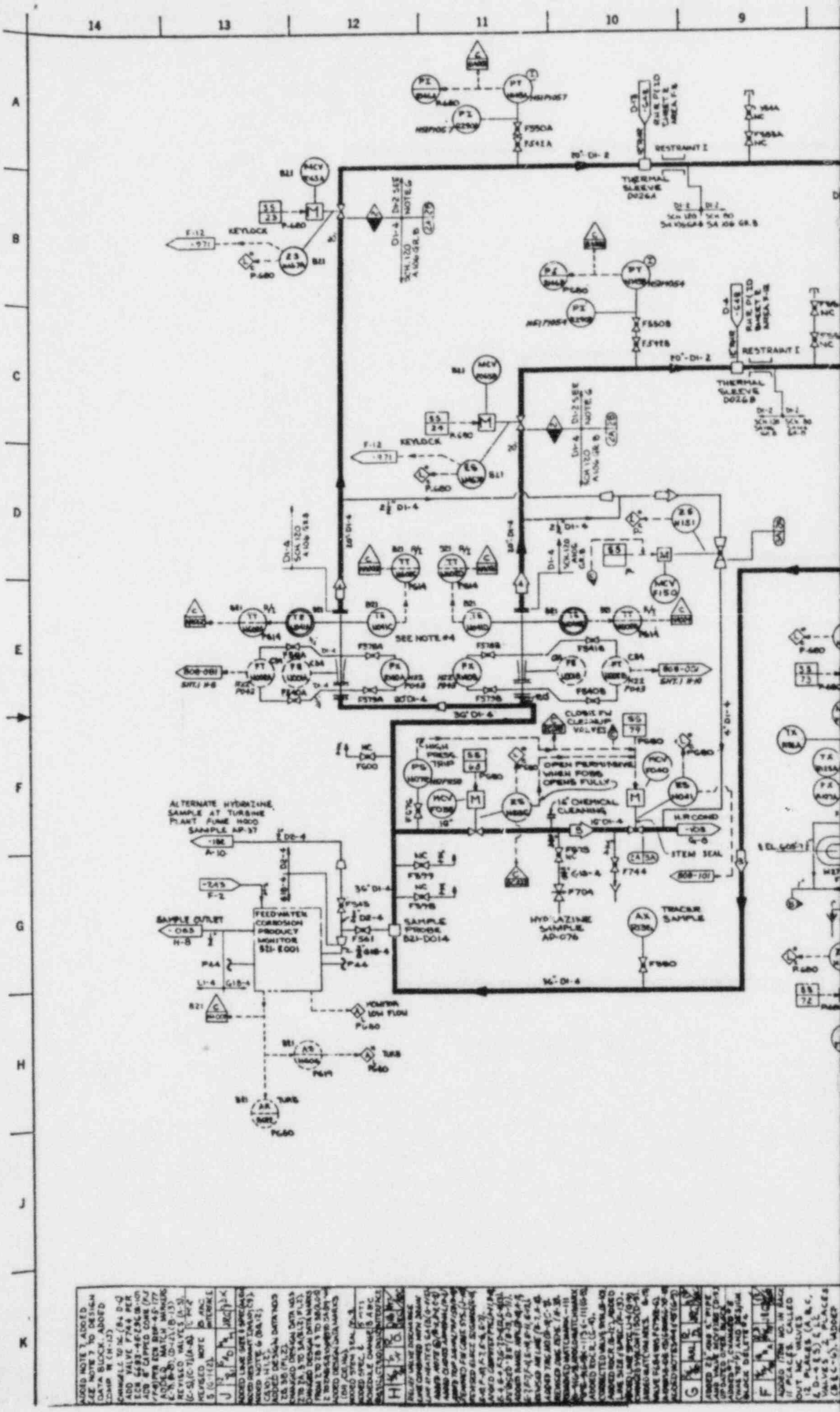
Flow Control Division

EDWARD FLITE FLOW DASH POT CHECK VALVE GENERAL ASSEMBLY
SIZE 20-24 FIG. 7592 (MCC) JNGTY

DESIGN ENG'R | PE MANAGER | QA MANAGER | DRAWN | ENG'R

DWG NO. 081-24101-01

8509040088-01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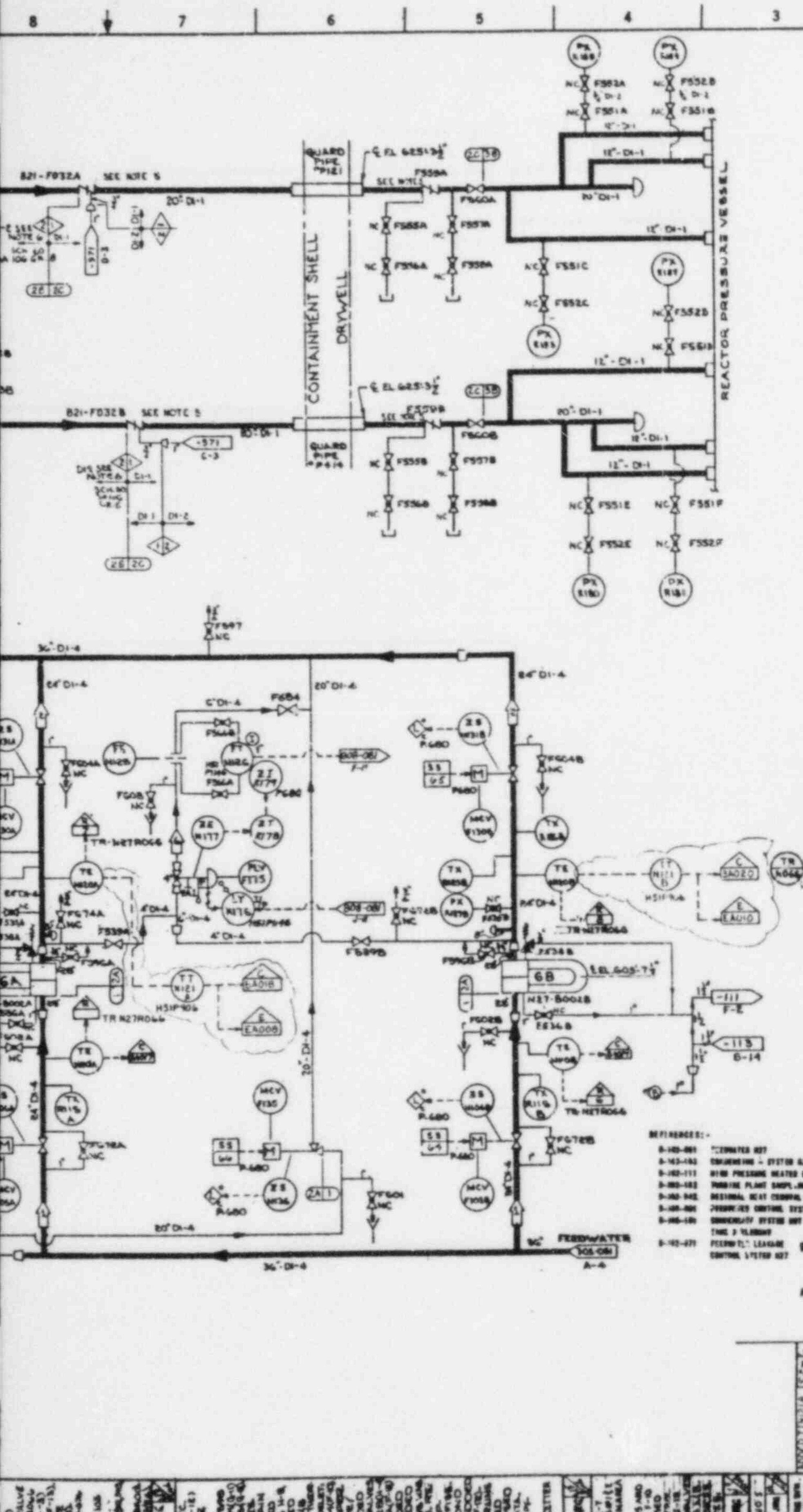
KEYLOCK
THERMAL SLEEVE D026A
RESTRAINT I
THERMAL SLEEVE D026B
RESTRAINT I
SEE NOTE #4
CLOSES FW CLEANUP VALVES
HIGH PRESS. TRIP
OPEN PERMISSIVE WHEN F065 OPENS FULLY
14" CHEMICAL CLEANING
STEM SEAL
ALTERNATE HYDRAZINE SAMPLE AT TURBINE PLANT FUME HOOD SAMPLE AP-37
SAMPLE OUTLET
FEEDWATER CORROSION PRODUCT MONITOR B21-E001
SAMPLE PROBE B21-D014
HYDRAZINE SAMPLE AP-076
TRACER SAMPLE
MONITOR LOW FLOW



OPERATING DATA (VWO)

⬡	PSIA	GPM	F	BY	REMARKS	REV
1	1187	17840	370	[illegible]		1
2	1113	17840	424	[illegible]		1
3	1113	35680	424	[illegible]		1
4	1100	17840	424	[illegible]		1
5	250	2,000	125	[illegible]	START-UP	2
6	986	600	125	[illegible]	START-UP	1
7	250	400	125	[illegible]	START-UP	1

Also Available On Aperture Card

TI APERTURE CARD

DESIGN DATA

⬡	NORMAL *		UPSET			BY	CK'D	REMARKS	REV
	PSIG	F	PSIG	F	TIME				
1	1500	400	1500	400		[illegible]	[illegible]		1
2A	1500	450	1500	450		[illegible]	[illegible]		L
2B	1250	550	1500	950	[illegible]	[illegible]	[illegible]		1
2C	1250	575	1500	515		TCL	MTS		[illegible]
3A	50	150	30	150		[illegible]	[illegible]		0
3B	1250	575	1250	575		TCL	MTS		1

* SEE NOTE 7

NOTES:-

1. ALL PANELS AND RACKS ARE PREFIXED [illegible], UNLESS OTHERWISE NOTED.
2. ALL INSTRUMENTS AND CONTROLS ARE PREFIXED [illegible], UNLESS OTHERWISE NOTED.
3. PIPING DRAINS ARE 1" AND PIPING VENTS ARE 3/4", UNLESS OTHERWISE SPECIFIED.
4. TWO SETS OF PRESSURE TAPS ARE PROVIDED ON EACH FEEDWATER FLOW METER SECTION. PROCESS INSTRUMENT PIPING/TUBING SHALL BE RUN FROM BOTH SETS OF TAPS WITH ONE SET PERMANENTLY CONNECTED TO THE FEEDWATER FLOW TRANSMITTERS AND THE ALTERNATE SET TERMINATING ADJACENT TO THE FLOW TRANSMITTERS COMPLETE WITH BLOWDOWN, INSTRUMENT SHUTOFF, AND EQUALIZING VALVE MANIFOLD TO FACILITATE IN-SERVICE MONITORING OF FLOW ELEMENT CALIBRATION UTILIZING EITHER SET OF PRESSURE TAPS.
5. CONTROLLED CLOSURE [illegible] LIFT CHECK VALVES.
6. CLASS 2 PIPING MUST MEET TESTING REQUIREMENTS OF ASME III, NB-2300.
7. THE DATA IN THE NORMAL COLUMN ARE THE SYSTEM DESIGN CONDITIONS.

REFERENCES:-

- [illegible] FEEDWATER N27
- [illegible] CONDENSING - SYSTEM N21
- [illegible] HIGH PRESSURE HEATER DRAINS AND VENTS N25
- [illegible] TURBINE PLANT SAMPLING SYSTEM P32
- [illegible] RESIDUAL HEAT REMOVAL E12
- [illegible] FEEDWATER CONTROL SYSTEM C34
- [illegible] [illegible]
- [illegible] FEEDWATER LEAKAGE CONTROL SYSTEM N27

DRAWING UNDER DESIGN REVISION CONTROL AS OF REVISION L

NUCLEAR SAFETY RELATED

Rev. L — E. I. Turk 8/9/83

N/A

Rev. L — [illegible] 7-29-83

	CONSTRUCTION
	LIMITED CONSTRUCTION: AS NOTED
	PRELIMINARY NOT FOR CONSTRUCTION
	BIDDING PURPOSES
[illegible]	VALVE REF. ISSUE (REV. D)
DATE	RELEASED FOR

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

PERRY NUCLEAR POWER PLANT — UNIT 1

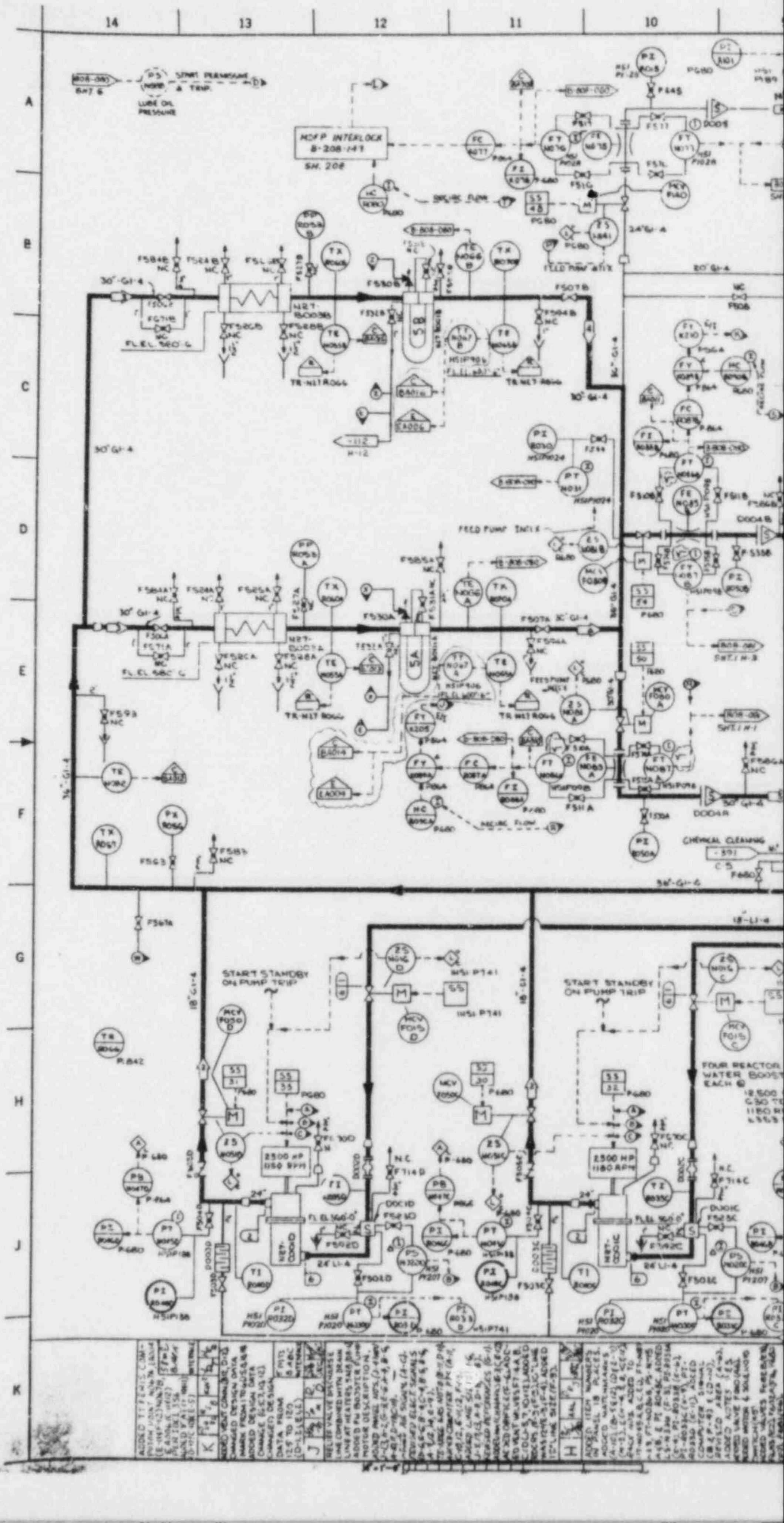
PIPING — SYSTEM DIAGRAM N27

FEEDWATER

GILBERT ASSOCIATES, INC. ENGINEERS AND CONSULTANTS

04 4549 D-302-082 L

8509040088-02



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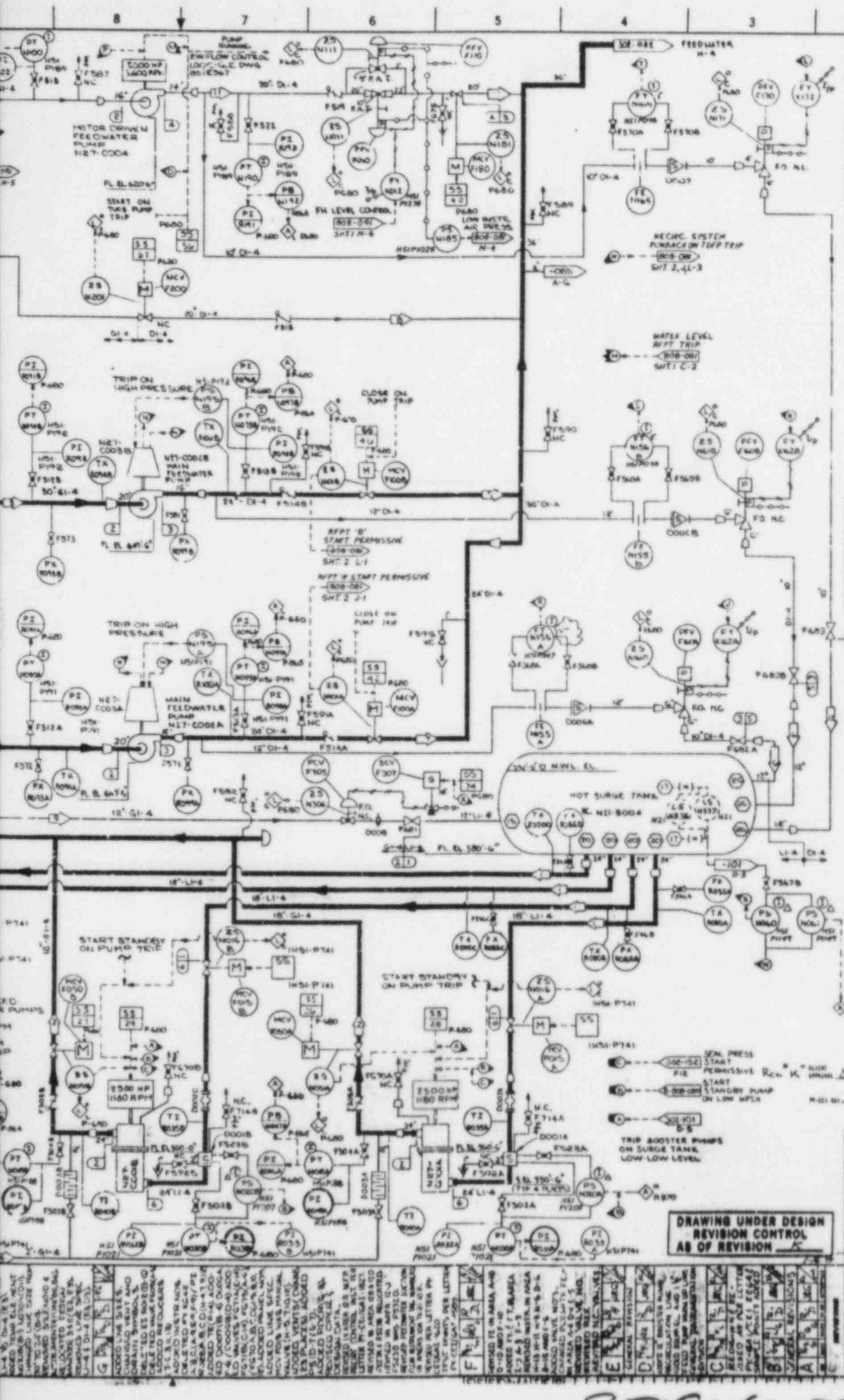
MDFP INTERLOCK
8-208-147
SH. 208
START PERMISSIVE & TRIP
LUBE OIL PRESSURE
30"-GI-4
FEED PUMP
CHEMICAL CLEANING
START STANDBY ON PUMP TRIP
START STANDBY ON PUMP TRIP
2500 HP 1180 RPM
2500 HP 1180 RPM
FOUR REACTOR
WATER BOOST
EACH
24" LI-4
18"-LI-4



Also Available On Aperture Card

TI APERTURE CARD

OPERATING DATA (VWO)

⇨	PSIA	GPM	F	BY	REMARKS	REV
1	108	11948	328			1
2	56.3	11948	329			1
3	145	17930	319			1
4	215	17930	369			1
5	292	17930	369			1
6	10	7000	125		START-UP	1
7	1127	17850	310			1
8	280	7500	75		FIRST START-UP	1
9	280	5000	125		START-UP	1
10	298	8300	369			1
11	1120	18270	370		UPSET CONDITION	1
12	1085	18270	370		UPSET CONDITION	1
13	10	3600	125		RFP START-UP	1
14	500	25	329			1
15						
16						
17						

DESIGN DATA

P	NORMAL		UPSET			BY		REMARKS	REV
	PSIG	°F	PSIG	°F	TIME				
1	120	350	120	350					1
2	500	400	500	400					1
3	1500	400	1500	400					1
4	1540	400	1540	400					1
5	120	400	120	400					
6	145	450	145	450					1

NOTES:-

REFERENCES:-

CONSTRUCTION
LIMITED CONSTRUCTION: AS NOTED
PRELIMINARY NOT FOR CONSTRUCTION
BIDDING PURPOSES

DATE	RELEASED FOR	ENGR

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

PERRY NUCLEAR POWER PLANT

PIPING — SYSTEM DIAGRAM

FEEDWATER

GILBERT ASSOCIATES, INC.

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