Consumers Power
POWERING MICHIGAN'S PROGRESS
Big Rock Point Nuclear Plant, 10269 US-31 North, Charlevoix, MI 49720

William L Beckman
Plant Manager

September 28, 1992

Nuclear Regulatory Commiss[illegible]
Document Control Desk
Washington, DC 20555

DOCKET 50-155 - LICENSE DPR-6 - BIG ROCK POINT PLANT -
RESPONSE TO GENERIC LETTER 92-04, "RESOLUTION TO THE ISSUES RELATED TO REACTOR VESSEL WATER LEVEL INSTRUMENTATION IN BWRs PURSUANT TO 10 CFR 50.54(F)

NRC Generic Letter 92-04 dated August 19, 1992 requested a plant specific evaluation to the items discussed in the letter and that a response be provided by September 27, 1992. The attachment to this letter provides our evaluation of the concerns.

As described in the attachment and the BWR Owners group Report, "BWR Reactor Vessel Water Level Instrumentation", Rev 1, August 1992, the Big Rock Point (BRP) design does not use cold leg RPV water level instrumentation. Four (4) Yarway level measurement channels are utilized for RPV instrumentation, which have not been determined to be affected by the phenomenon discussed in the Generic Letter.

In the attachment to this letter, an effort has been made in the response to each requested action to explain the differences in design and the plant specific aspects of this issue even though the BRP level instrumentation is not considered in the BWROG analyses.

As a result of our evaluation of the Generic Letter and BWROG report, additional corrective actions, including hardware changes are not considered appropriate. No further actions are planned at this time.

W L Beckman

William L Beckman
Plant Manager

CC: Administrator, Region III, USNRC
NRC Resident Inspector - Big Rock Point

Attachment

A001 1/1

CONSUMERS POWER COMPANY

Big Rock Point Plant
Docket 50-155 - License DPR-06

RESPONSE TO GENERIC LETTER 92-04 DATED AUGUST 19, 1992

At the request of the Commission and pursuant to the Atomic Energy Act of 1954 and the Energy Reorganization Act of 1974, as amended, and the Commission's Rules and Regulations thereunder, Consumers Power Company submits our response to NRC Generic Letter 92-04 dated August 19, 1992, entitled "RESOLUTION OF THE ISSUES RELATED TO REACTOR VESSEL WATER LEVEL INSTRUMENTATION IN BWRs PURSUANT TO 10 CFR 50.54(F)".

CONSUMERS POWER COMPANY

To the best of my knowledge, information and belief, the contents of this submittal are truthful and complete.

BY: David P. Hoffman

David P Hoffman
Vice President - Nuclear Operations Department

Sworn and subscribed to before me this 25th day of September 1992.

Beverly Ann Avery

Notary Public

Jackson County, Michigan

(Seal)

BEVERLY ANN AVERY
NOTARY PUBLIC - JACKSON COUNTY, MI
MY COMMISSION EXPIRES 12-1-92

My commission expires

ATTACHMENT

Consumers Power Company
Big Rock Point Plant
Docket 50-155

RESPONSE TO GENERIC LETTER 92-04

September 28, 1992

Background

The U.S. Nuclear Regulatory Commission (NRC) issued Information Notice No. 92-54 on July 24, 1992, to alert all holders of operating licenses or construction permits for nuclear power reactors to potential inaccuracies in reactor vessel water level indication during and after rapid depressurization events, based initially on a licensee event report documenting pressurizer level instrument inaccuracies in a pressurized water reactor (PWR). It was concluded that the inaccuracies resulted from noncondensible gases collecting in the condensing pots of the instrument reference legs.

The root causes for the accumulation of noncondensible gases in the condensing pots were established as 1) the instrument lines sloped upward from the pressurizer to the condensing pots, and 2) a restricting orifice in each instrument line prevented the free flow of steam and noncondensible gases between the vessel and the condensing pots.

Further, the licensee notified the NRC on July 15, 1992, that BWR level instrumentation may not provide accurate indication following a rapid depressurization event as a consequence of the expulsion of water from the reference leg due to release of noncondensible gases in the instrument reference leg. In a conference call with the licensee on July 21, 1992, the licensee stated that the Yarway level measurement instrumentation which provides the automatic actuation of safety systems would not be affected.

On July 29, 1992, the NRC staff held a public meeting with the Regulatory Response Group (RRG) of the Boiling Water Reactor Owners Group (BWROG) to discuss the effect of inaccuracies in the reactor vessel level instrumentation systems in BWRs. Analyses presented at this meeting by BWROG, and its consultant, General Electric Company (GE), indicated that significant errors in level indication can occur as a result of degassing the instrument reference leg if noncondensible gas is dissolved in the reference leg and if the reactor abruptly depressurizes below 450 psig.

Based on the BWROG analyses and selected Design Basis Accident (DBA) scenarios which lead to a lowering of the reactor vessel water level, the staff concluded "that automatic safety systems will be actuated at pressures well above 450 psig, even for postulated worst-case noncondensible gas concentrations in the reference legs." In addition, the BWROG analyses provided a discussion of diverse signals which would also initiate Emergency Core Cooling (ECCS) for reactor water level lowering events; review by the staff concluded that "the ECCS would be initiated by diverse signals as analyzed by the BWROG."

Further discussion centered upon the use of plant instrumentation required for long term actions, utilizing not only reactor water level instrumentation but other indications such as containment pressure, containment temperature, and containment humidity to determine accident mitigation strategies; reduced error in the indicated level due to gradual depressurization; level reference leg column configuration; system leakage and geometry contributions to the generation of noncondensible gases; the unlikelihood of common mode, common magnitude level indication errors; and, the use of emergency procedures to combat situations such as indeterminate reactor vessel water level.

Upon the staff's review and assessment of the information provided by the BWROG, the staff concluded that interim plant operation was acceptable based on the following:

"1) the level instrumentation is expected to initiate safety systems prior to a significant depressurization of the reactor;
2) emergency procedures which are currently in place in conjunction with operator training are expected to result in adequate operator actions; and
3) an abrupt depressurization event resulting in a common mode, common magnitude level indication error is unlikely."

However, the staff considers potential water level instrumentation inaccuracies an important issue because level instrumentation provides input to safety and control functions for all modes of reactor operation. The staff requests that the BWROG analyses be reviewed promptly by all

BWR licensees, since the analyses are of a generic nature and the magnitude of possible errors depend strongly upon plant-specific factors such as leakage and geometry.

Big Rock Point Plant Level Instrumentation

The Big Rock Point Plant incorporates separate level measurement systems for both the steam drum and the reactor vessel as shown in Figure 1. Each end of the steam drum is equipped with a Yarway constant head chamber and Bailey level element (used for steam drum level feedwater control only) as shown on Figure 3 and Drawings 0740A40471 and 0740A40472; the reactor vessel is equipped with four (4) Yarway constant head chambers as shown on Figure 2 and Drawing 0740B40708 Sh 1 and a wide range level transmitter (LT-IA39 provides level indication only during shutdown and refueling conditions) as shown on Drawing 0740B40505. The Yarway level elements provide level sensing for associated protective actions at Big Rock Point Plant.

The steam drum level instrumentation (Yarways) provide coverage for 60" of the 78" diameter of the steam drum. Trip levels associated with the steam drum are based on the distance below steam drum centerline. Actions which can be initiated by low steam drum level signals are:

1) Simultaneous low readings at trip level (8" below steam drum centerline) on two level switches (on opposite ends of the steam drum) initiates a reactor scram.
2) Simultaneous low readings at trip level (17 inches below steam drum centerline) on two of four sensors initiates the Reactor Depressurization System.

The significance of function 1) above, is that it serves as an anticipatory signal to scram the reactor upon sensing a reduction in primary coolant system inventory; function 2) initiates the 120 second time delay and turns on the ECCS supply (ie, fire pumps) to enable reactor depressurization in conjunction with low reactor water level (if sensed at the end of the time delay). The Yarway element located on the east end of the steam drum also provides drum level sensing for the remote level indication in the Auxiliary Shutdown Building.

The reactor vessel Yarway level instrumentation is narrow range (ie, 18 inches); trip level associated with level sensors/transmitters utilizing these level sensors is at Elevation 610'6" or 2'9" above the top of active fuel (TAF). Actions which can be initiated by low reactor water level signals are:

1) Simultaneous low readings at trip level on two level switches (on opposing level taps) initiates a reactor scram.
2) Low reactor vessel level in conjunction with low steam drum level activates the Reactor Depressurization System.
3) Low reactor vessel level in conjunction with low reactor pressure (≤200 psi) activates core spray.

The significance of function 1) above, is that it serves as a shutdown mechanism in the event of a loss-of-coolant accident (LOCA), function 2) guarantees that emergency core cooling (ECCS) will be functional whenever the water inventory is reduced for any reason and, function 3) activates the low-pressure ECCS injection.

The Yarway elements in use at Big Rock Point Plant have been modified by removal of the temperature compensation (References 1 and 2) to eliminate the possibility of the reference leg flashing upon depressurization of the primary system. Further improvements were made to provide upgraded

level monitoring which, in essence, enables temperature control of the Yarway reference legs to stabilize the density of the water and ensure maximum accuracy during power operation at 1350 psia, 582° F. (Reference 3)

BWROG Analyses Review

In a letter dated August 28, 1992, the BWR Owner Group provided the NRC a report; GENE-770-15-0692, Re' ., BWR Reactor Vessel Water Level Instrumentation, to dress the concerns of the subject Generic Letter. Attac..ent 2, "Generic Applicability of This Report's Safety Analysis" of this document, discusses the applicability of the safety analysis contained in this report to various models of BWRs. This attachment further states in the closing sentence, "Because the operating BWR/1 (Big Rock Point implied) does not use cold leg RPV water level instrumentation, there is no need to include that plant design under this report's safety assessment."

Big Rock Point Review

Yarway constant head chambers of the type employed at Big Rock Point Plant are considered "hot" reference leg instruments and do not exhibit the characteristics noted with "cold" reference leg instruments employed at later model BWRs. This is primarily due to the following factors:

1) The Big Rock Point Plant design utilizes a standpipe type measuring system with the piping from the lower elevation tap sloping upward to the standpipe and variable leg; the piping from the top of the constant head chamber slopes upward from the constant head chamber and standpipe to the upper elevation tap. This design permits the level assembly to be "self-venting" and eliminate the possibility of noncondensible gas accumulation.

2) The level sensing lines from the level elements to the differential pressure level instruments are closely coupled within the same environment and cold reference legs are not used. A downward slope of the sensing lines prevents the accumulation of air or gas.

3) Potential level instrument errors discussed in information letters (References 4 and 5) issued by General Electric Nuclear Energy have been analyzed for the Big Rock Point level systems. These errors included drywell temperature effects; degraded insulation; filling of reference lines; leakage; and potential biases in level measurement resulting from drywell temperature effects, reactor pressure vessel (RPV) thermal expansion, and sensing line compressed

water density versus saturated water density. Analysis has determined that a small conservative bias of 0.169 inches in level measurement occurs when the reactor is at operating pressure due to downward thermal growth of the reactor vessel.

Generic Letter 92-04 Requested Actions

1. In light of potential errors resulting from the effects of noncondensible gas, each licensee should determine:

   a. The impact of potential level indication errors on automatic safety system response during all licensing basis transients and accidents;

      Response

      Modifications consisting of temperature compensation removal and controlled heating of the reference legs (References 1,2 and 3) have been performed to the Yarway elements to eliminate the possibility of flashing during all licensing basis transients and accidents; analysis (Reference 2) has concluded that automatic safety system response will occur as designed.

   b. The impact of potential level indication errors on operator's short and long term actions during and after all licensing basis accidents and transients;

      Response

      System depressurization on the Yarway level elements can cause flashing of the variable leg, as this leg is essentially at reactor saturation temperature. The reference leg can be considered essentially intact, even though a minor boiling away of the steam-water interface in the constant head chamber may occur. In this case, the net effect will be to increase the differential pressure, creating a low level signal on the connected instrumentation, and providing system tripping as required.

      In regard to the steam drum, system depressurization on the Bailey level elements can cause flashing of both the variable leg and the reference leg as both legs are essentially at saturation temperature. Flashing of both legs will, in effect, reduce the differential pressure creating a false, high level indication on the feedwater control system instruments. For this reason, the plant procedures contain precautionary statements warning operations personnel that the Bailey instrumentation will go full scale upon rapid depressurization and operations

personnel are instructed to take manual control of the feedwater flow.

For long term actions, specific calibration curves for the Yarway level elements are provided in the Technical Data Book, Volume 15 of the Big Rock Point Manual, Section 15.5.F, for varying conditions of both primary system pressure and ambient temperature, as the level elements are not automatically compensated for these variances.

Specific operator training on the effects of potential level indication errors is found in the following lesson plans:

- BNA-16, Advanced System Training Lesson Plan, Feedwater System
- BXG-03, Continued Licensed Operator Simulator Exercise Guide

c. The impact of potential level indication errors on operator actions prescribed in emergency operating procedures or other affected procedures not covered in (b).

Response

Precautions regarding potential level indicating errors are provided in the following emergency operating procedure:

- Emergency Operating Procedure EIP-7, Appendix 7, Precaution #4

2. Based upon the results of (1) above, each licensee should notify the NRC of short term actions taken, such as:

a. Periodic monitoring of level instrumentation system leakage; and,

Response

Indicated levels of both the steam drum and reactor vessel are compared and the condition logged on the control room log sheet each shift (ie, every eight hours). This has been the practice at Big Rock Point Plant for several years.

Due to the differences in design compared to later model BWRs, the level readings for each major component (steam drum or reactor vessel) are not identical; however, in each case, there are at least two level indicators monitoring the same parameter.

For example, the east and west ends of the steam drum may not be the same level due to differences in feedwater flow or reactor recirculation flow which creates a steam drum tilt. In the case of the reactor vessel, piping configuration differences (as shown on drawing 0740B40708) between the east and west Yarway level elements also create minor differences in level indication during power operation. Once established at a consistent power level, any deviation from the normal reading would be readily apparent during the shift observation and comparison. Periodic monitoring of level instrumentation as currently performed is more than adequate to ensure early detection of level indication anomalies.

In regard to instrument maintenance, all Yarway level reference lines are backfilled with demineralized water and vented following surveillance testing (ie, instrument calibration).

b. Implementation of procedures and operator training to assure that potential level errors will not result in improper operator actions.

Response

As stated in the response to (1.b) and (2.a) above, procedures, operator training and shift comparisons are in place that address potential level errors; additional procedures and operator training are not deemed necessary.

3. Each licensee should provide its plans and schedule for corrective actions, including any proposed hardware modifications necessary to ensure the level instrumentation system design is of high functional reliability for long term operation. Since this instrumentation plays an important role in plant safety and is required for both normal and accident conditions, the staff recommends that each utility implement its longer term actions to assure a level instrumentation system of high functional reliability at the first opportunity but prior to starting up after the next refueling outage commencing 3 months after the date of this letter.

Response

This Generic Letter addresses potential errors resulting from the effects of noncondensible gas which occur in the "cold leg" type of level instrumentation systems found in present day BWRs. Big Rock Point Plant does not use the "cold leg" type instruments; rather, Yarway

constant head chamber level elements are utilized for level instrumentation associated with safety systems. As discussed earlier, Yarway level elements are not considered susceptible to the accumulation of noncondensible gases.

Based on our review of the BWROG analyses and the discussion provided above in the response to each requested action, additional corrective action, including proposed hardware changes is not considered appropriate for Big Rock Point Plant.

References:

1. Letter, USNRC to Consumers Power Company dated 11/2/79, Amendment No. 31 to Facility Operating License No. DPR-6 for the Big Rock Point Plant
2. Letter, USNRC to Consumers Power Company dated 9/16/80, Amendment No. 34 to Facility Operating License No. DPR-6 for the Big Rock Point Plant
3. Letter, Consumers Power Company to Director, NRR dated 9/18/80, DOCKET 50-155 - LICENSE DPR-6 - BIG ROCK POINT PLANT - STEAM DRUM/REACTOR VESSEL LEVEL INSTRUMENTATION: SUBMITTAL OF DESIGN DESCRIPTION
4. General Electric Company Service Information Letter (SIL) No. 470, dated 9/16/88, "REACTOR WATER LEVEL MISMATCHES"
5. General Electric Company Service Information Letter (SIL) No. 470, Supplement 1, dated 4/20/89, "REACTOR WATER LEVEL MEASUREMENTS"

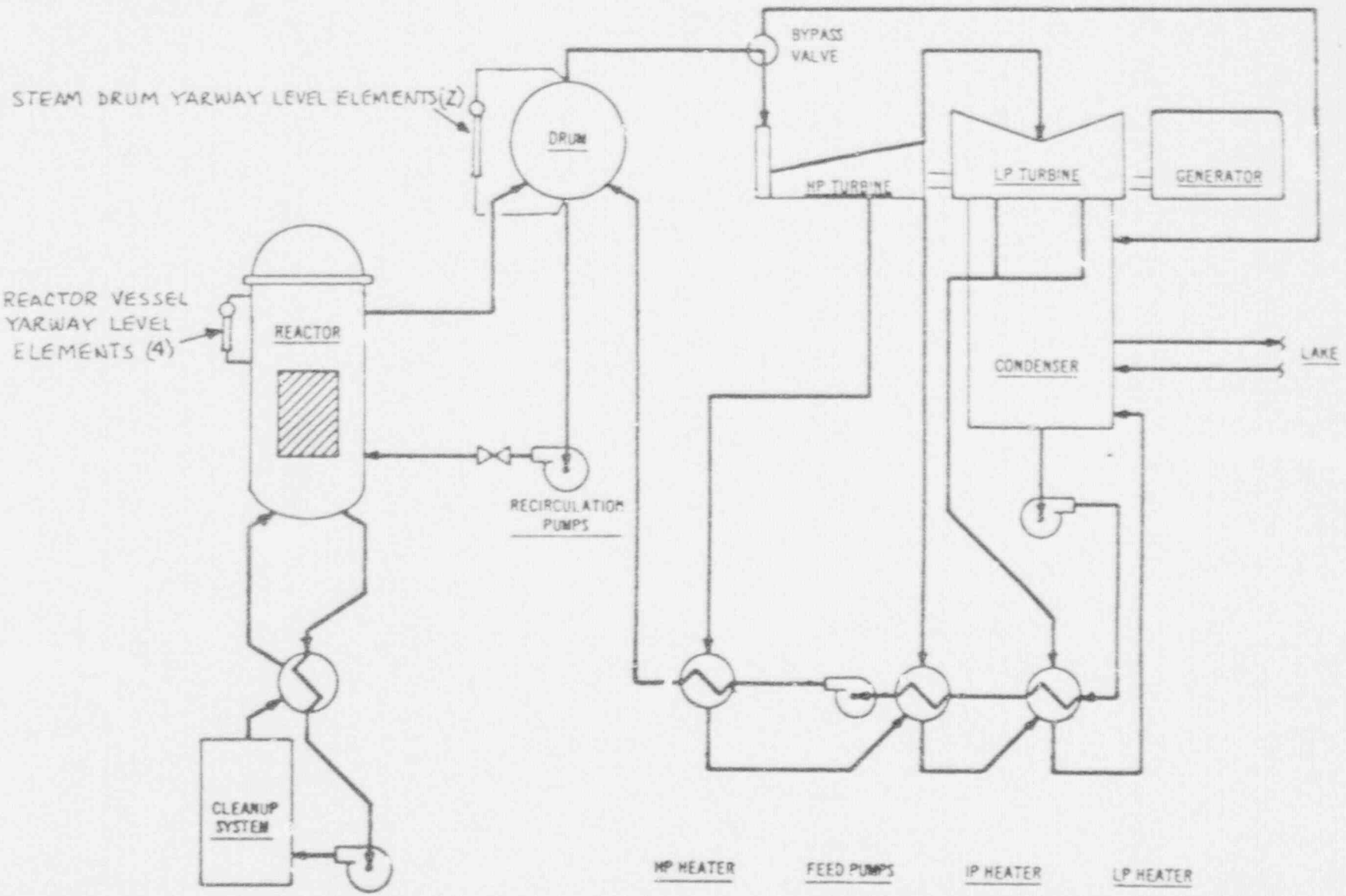
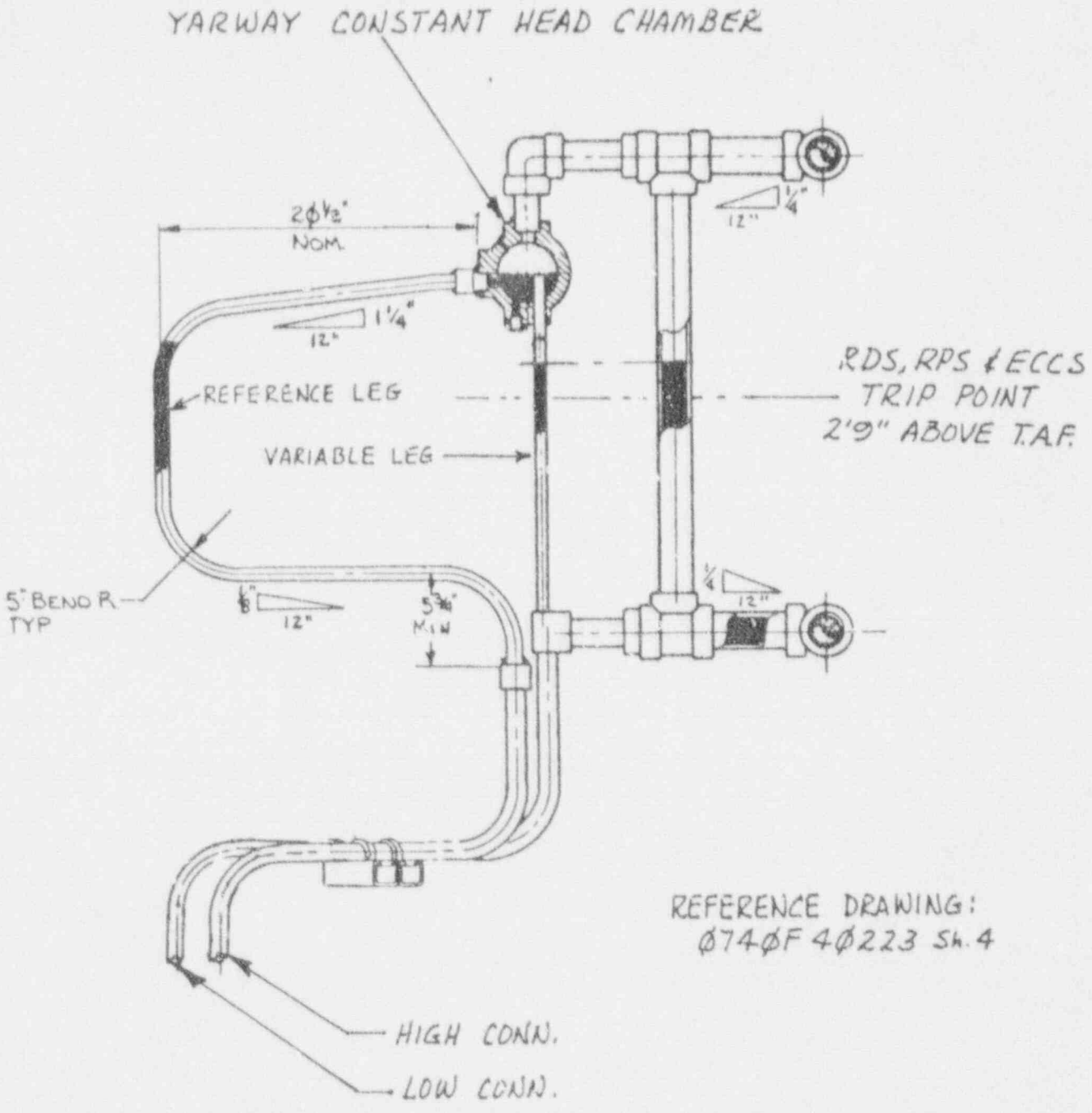


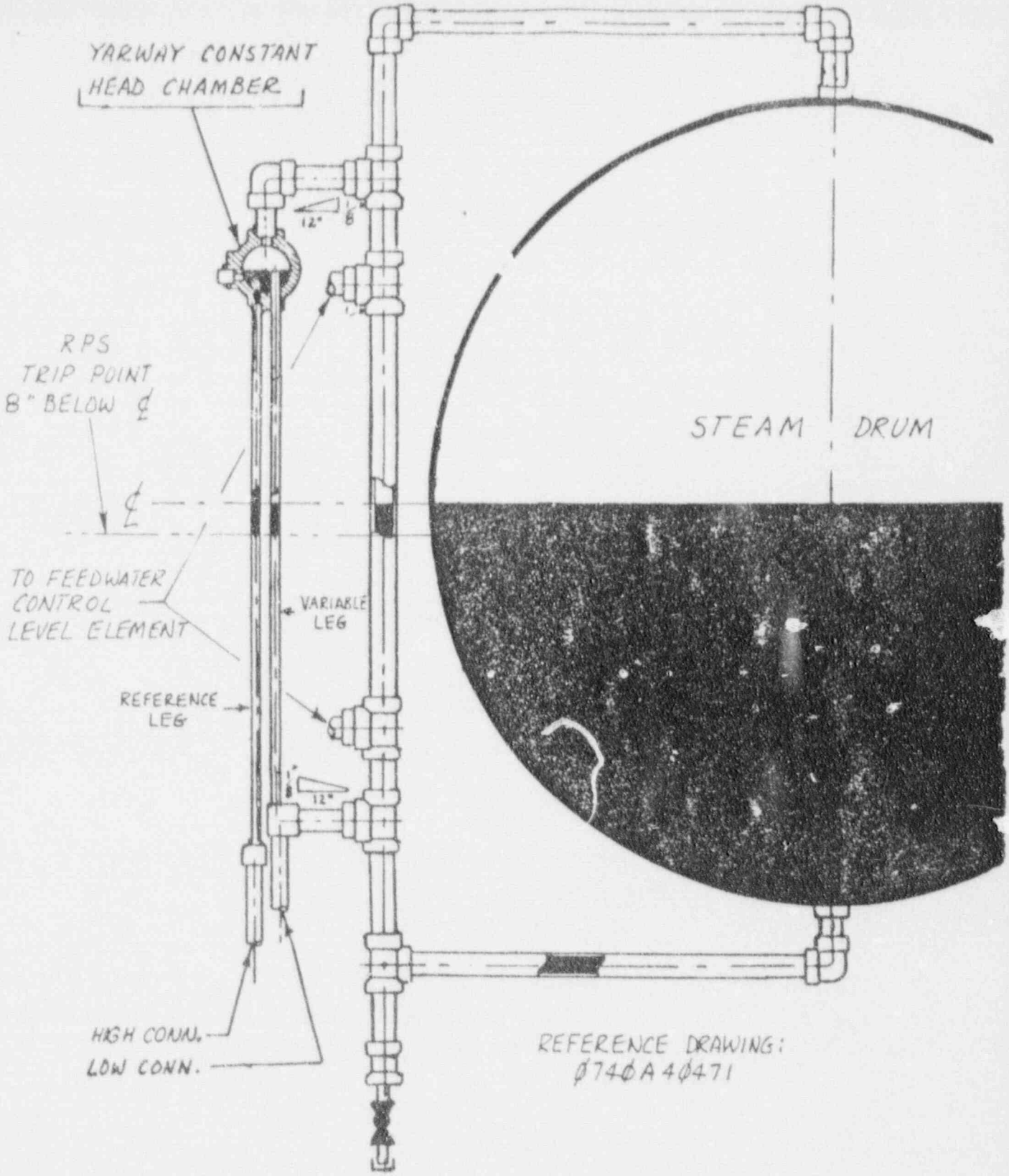
FIGURE 1

FUNCTIONAL DIAGRAM
BIG ROCK POINT NUCLEAR POWER PLANT



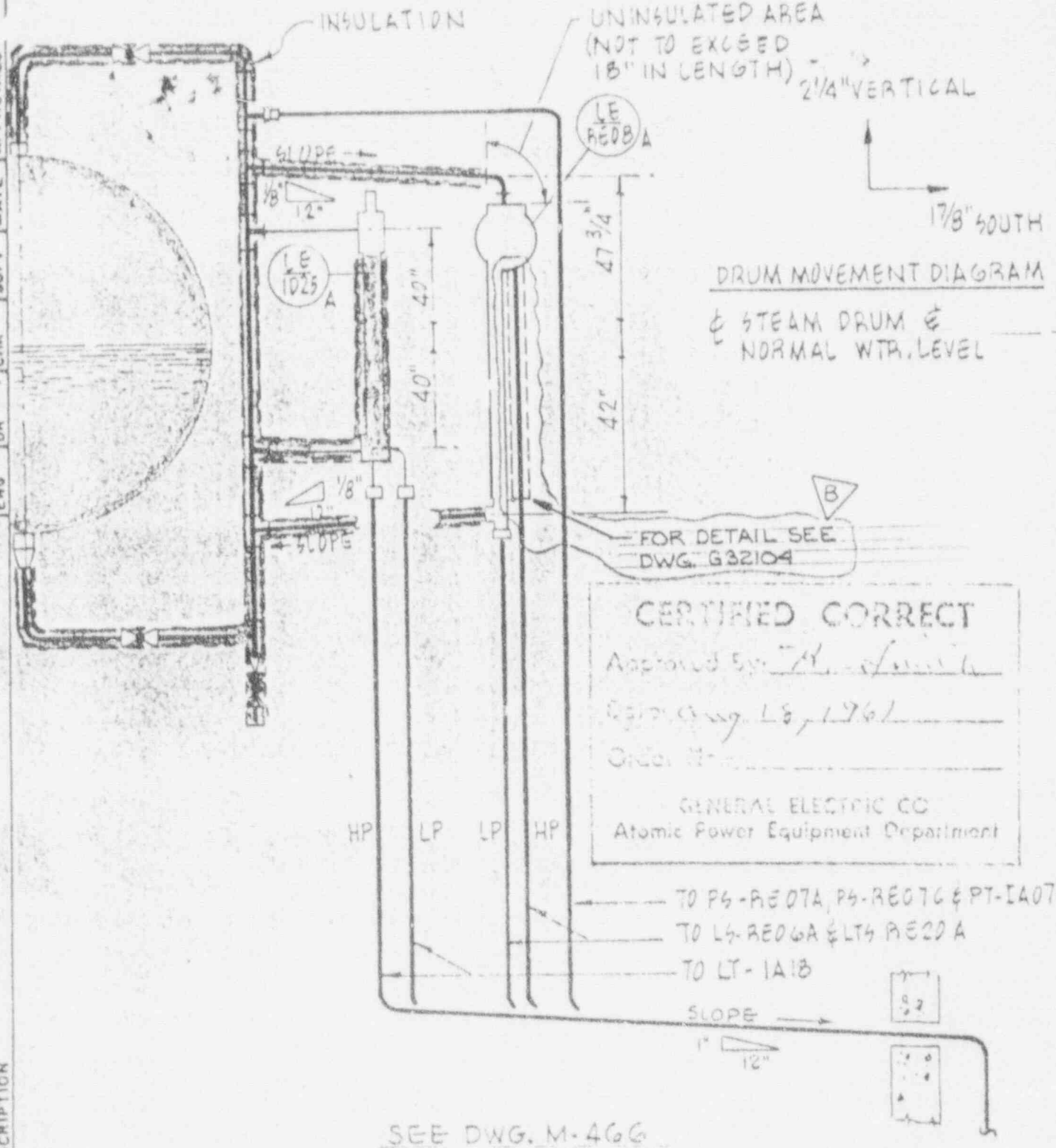
REACTOR VESSEL LEVEL ELEMENT

FIGURE 2



STEAM DRUM LEVEL ELEMENT

FIGURE 3



LTR	DESCRIPTION	ENG	DR	CHK	SUPV	MATL	APPROVALS	DATE
0	ISSUED FOR CONSTRUCTION	JRY	RGB	CJV				10-6-81
A	CHANGED DWG. NO.		R.P					1-4-82
B	REVISED PER FC 497							9-17-84

ERC

BECHTEL CORPORATION
POWER AND INDUSTRIAL DIVISION

INSTR. PIPING STANDARD - INSULATION FOR STM. DRUM LEVEL EQUALIZING COL. LE-1025A & LE RE08A

BIG ROCK POINT PLANT

JOB NO 3159

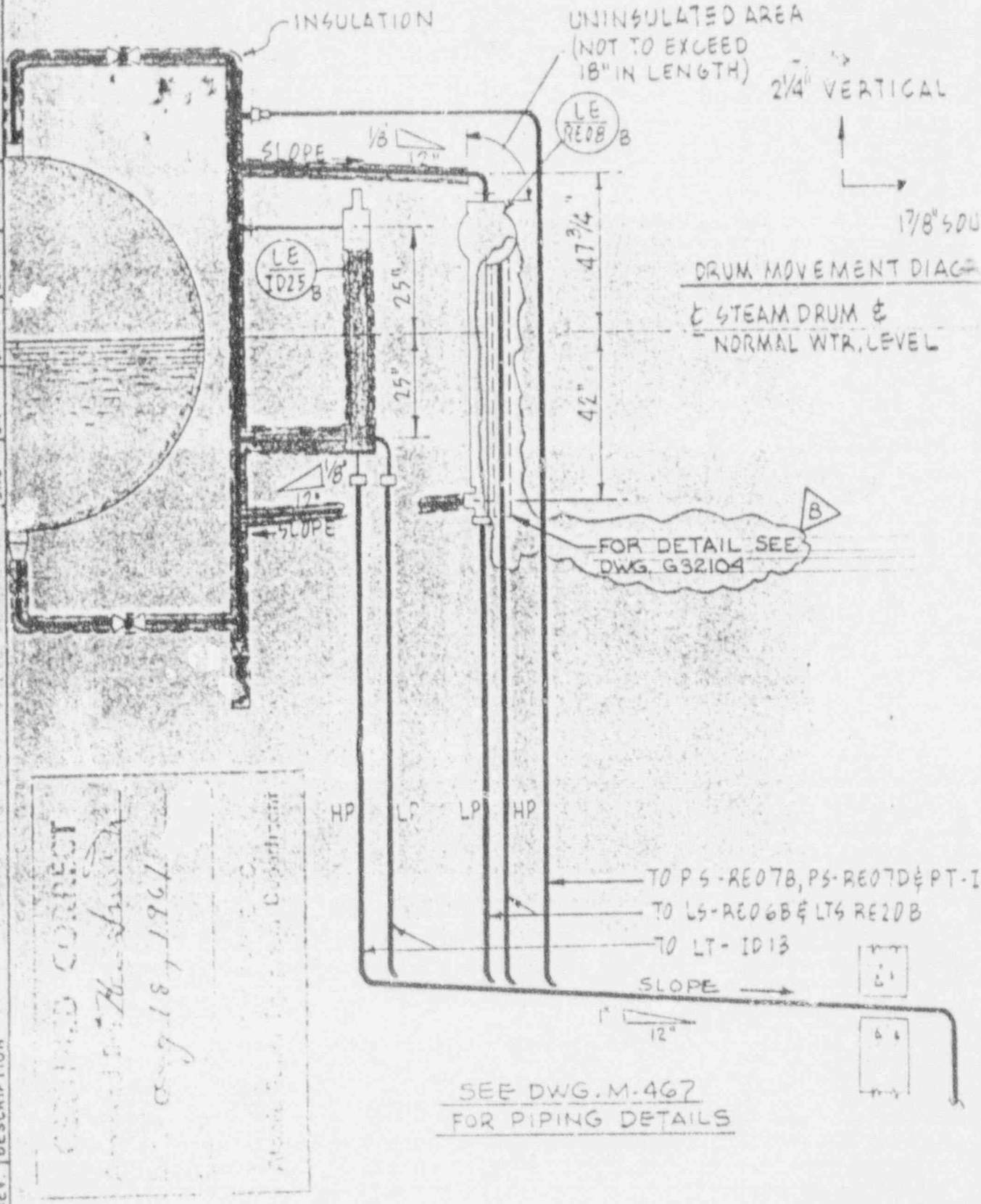
FORMER DWG. NO. M-471

NEW 0740A40471

SHEET 1

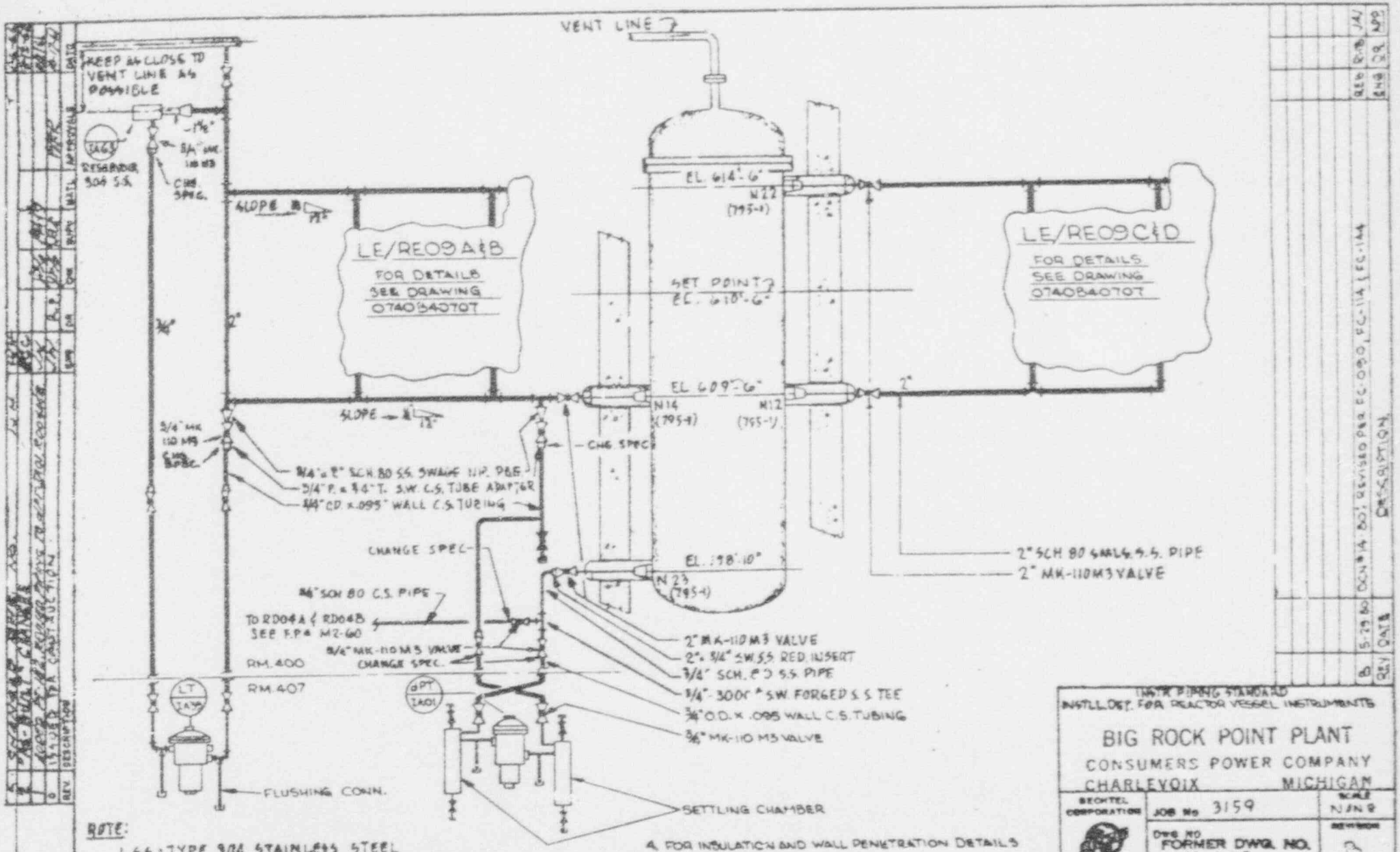
REV B

G-221-E 4-14-58



REV.	DESCRIPTION	DR	CHK	SUPV	MATL	APPROVALS	DATE
B	REVISED PER EC 497	R.P.					10-5-61
A	CHANGED DWG. NO.						4-6-61
0	ISSUED FOR CONSTRUCTION						10-17-60

G-231-E 4-14-59	BECHTEL CORPORATION POWER AND INDUSTRIAL DIVISION	INSTR. PIPING STANDARD - INSULATION FOR STM. DRUM LEVEL EQUALIZING COL. LE-ID25B & LE RE08B	JOB NO 3159
		BIG [illegible] POINT PLANT	FORMER DWG. NO. M-472
		[illegible]	NEW 0740A40472 SHEET 1
			REV. B



NOTE:

1. S.S. = TYPE 304 STAINLESS STEEL
2. FOR PIPING LAYOUT TO FIRST BLOCK VALVE SEE DWG. M-218
3. FOR NOZZLE LOCATION SEE BECHTEL DWG. F.P. M2-2 & M2-18
4. FOR INSULATION AND WALL PENETRATION DETAILS SEE DWG. 0740B40473

INSTR. PIPING STANDARD INSTLL. DET. FOR REACTOR VESSEL INSTRUMENTS

BIG ROCK POINT PLANT

CONSUMERS POWER COMPANY

CHARLEVOIX MICHIGAN

BECHTEL CORPORATION — POWER AND INDUSTRIAL DIVISION

JOB No 3159

SCALE NONE

DWG NO FORMER DWG. NO. M-505

NEW 0740B40505

REVISION B

REV	DATE	DESCRIPTION
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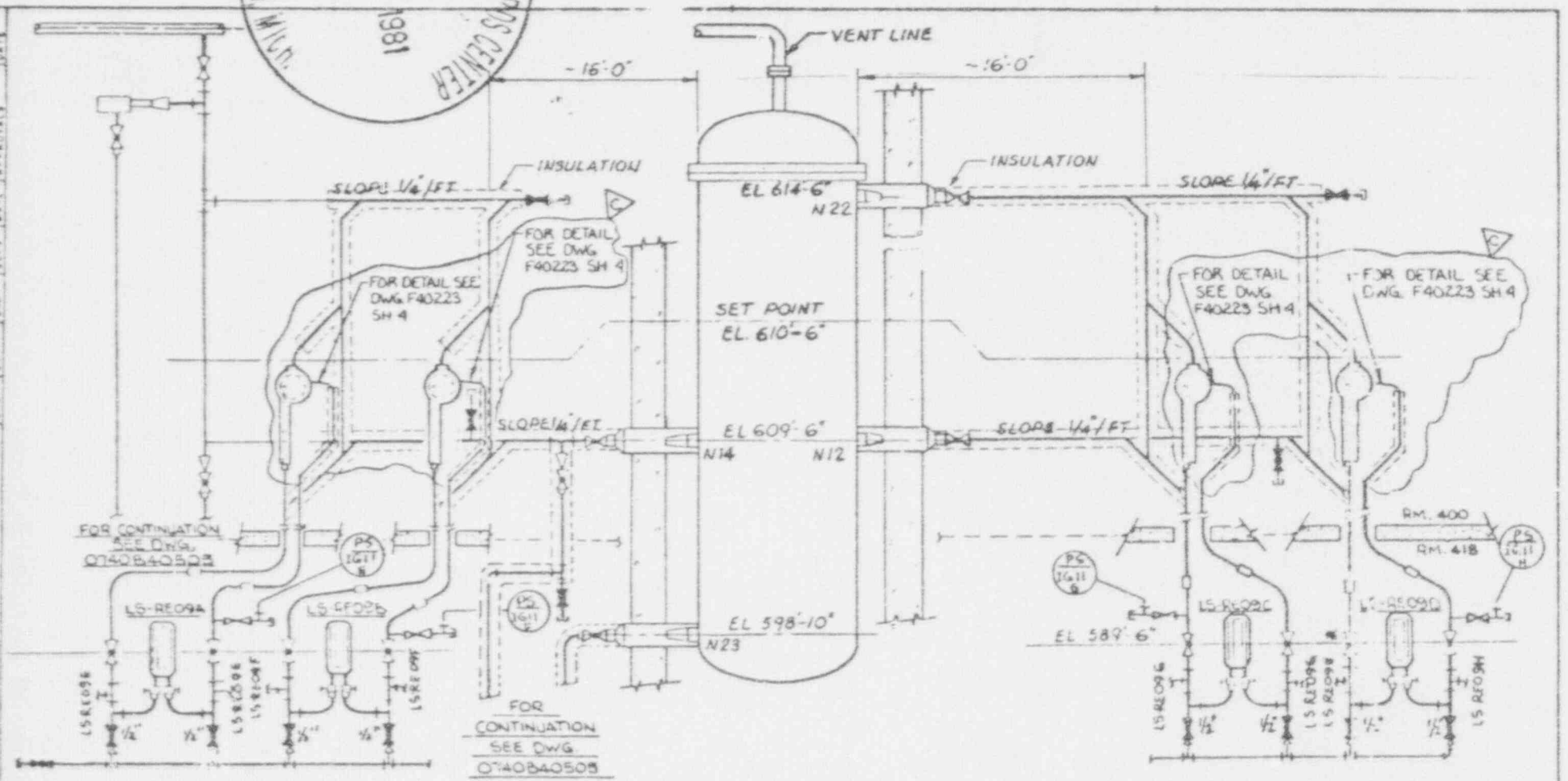

SEE DWG. 0740B40707 FOR PIPING DETAILS

INSTRUMENT PIPING STANDARD-INSULATION FOR INST. LE-RE098, LE-RE098F, LE-RE098G & LE-RE098

BIG ROCK POINT PLANT
CONSUMERS POWER COMPANY
CHARLEVOIX MICHIGAN

BECHTEL POWER AND INDUSTRIAL DIVISION

JOB NO 8093

SCALE NONE

DWG NO FORMER DWG. NO. M-708
NEW 0740B40708, Sht 1

REVISION C

REV	DATE	DESCRIPTION	ENG	DS	APD
C	10-5-81	REVISED PER PC-497	JRY	PGB	CJV