BEFORE THE UNITED STATES ATOMIC ENERGY COMMISSION

Application of PACIFIC GAS AND ELECTRIC COMPANY for a Class 104b. License to Construct and Operate a Nuclear Reactor as a Part of Unit No. 3 of Its Humboldt Bay Power Plant	Docket No. 50-133 Amendment No. 9

Now comes PACIFIC GAS AND ELECTRIC COMPANY (the Company) and amends its above-numbered application by submitting herewith Amendment No. 9. Part A of this amendment consists of Addendum H to the Preliminary Hazards Summary Report (Exhibit B to said application), and is submitted by the Company in response to the letter dated June 27, 1960 from the Advisory Committee on Reactor Safeguards to the Commission concerning the Humboldt Bay Power Plant.

Sections I and II of Part A, which cover fuel element cladding and control rods, are responsive to the Advisory Committee's comments in the second paragraph of its letter. These sections are submitted herewith merely to bring up to date the portions of the Company's application pertaining thereto.

Section III of Part A is submitted to indicate formally that the Company will install baffle plates in the suppression pool in response to the Advisory Committee's statement at the top of Page 2 of its June 27 letter.

Section IV of Part A, which covers double isolation valves and the shroud for primary system piping, is submitted to incorporate in the record the Company's proposals to meet the recommendations set forth in the next to last paragraph of the Advisory Committee's June 27 letter. In a letter to the Commission dated July 25, 1960 the Advisory Committee has indicated that the Company's proposals meet these recommendations.

Part B of this amendment, the Company's 1959 Annual Report to its stockholders, is submitted herewith to provide more up to date financial information on the Company.

In the event of a conflict the information in this amendment supersedes the information previously submitted.

Subscribed in San Francisco, California, this 5th day of August, 1960.

Respectfully submitted,

PACIFIC GAS AND ELECTRIC COMPANY

By N. R. Sutherland
N. R. Sutherland
President

C. C. Whelchel
C. C. Whelchel
Chief Mechanical Engineer

RICHARD H. PETERSON
FREDERICK W. MIELKE, JR.
PHILIP A. CRANE, JR.
Attorneys for Applicant

By Philip A. Crane, Jr.
Philip A. Crane, Jr.

Subscribed and sworn to before me this 5th day of August, 1960

Rita J. Green, Notary Public in and for the City and County of San Francisco, State of California

My Commission expires July 16, 1963.

PART A
ADDENDUM H

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LIST OF FIGURES

I. FUEL CLADDING

The design for the Humboldt reactor core is based on the use of zircaloy as the cladding material. Recent experience with this material in the Vallecitos Boiling Water Reactor has indicated that there may be a tendency for small cladding imperfections to propagate to large cladding breaks. While this may increase the frequency of reactor shutdowns required for the removal of defective fuel, experience at VBWR also has shown that zircaloy-clad fuel can be safely used in reactor systems which have adequate provisions for off-gas monitoring and system shutdown. Additional experience with zircaloy-clad fuel is being obtained at Dresden, Vallecitos, and other reactors.

Stainless steel can be used instead of zircaloy as the fuel cladding material in the Humboldt reactor. Its use would result in higher enrichment requirements because of greater poisoning effect. If experience should indicate that a shift to stainless steel is desirable, the change will be made.

The provisions described below assure that Humboldt can operate safely without undue hazard to the public or plant personnel even with defects in the fuel cladding, so that safety is assured regardless of cladding material.

Gamma scintillation instruments, installed on continuous sample streams from both the condenser air ejector off-gas flow and total stack flow, provide a continuous record of activity release. An alarm will sound to alert the operator in the event the stack gas approaches an activity level of .2 curie/second. If the radioactivity should reach this level, the off-gas isolation valve at the stack would be closed by the operator. The system provides approximately 15 minutes holdup time between the off-gas activity monitor and the isolation valve. As a further safeguard, this valve would close automatically to prevent the stack gas activity from reaching 2.0 curies/second. With the off-gas isolation valve closed, the plant would be shut down manually, or automatically by means of the "loss of vacuum" scram.

II. CONTROL ROD SYSTEM

The control rod drive for the Humboldt reactor is a locking piston drive. It has behind it the demonstrated performance of the Dresden drives. In addition, it incorporates design improvements that build on the valuable Dresden experience. These design improvements include the elimination of the requirement for a shear pin, the replacement of the Dresden coupling with a new minimum clearance coupling and the use of a more gradual decelerating buffer section which decreases the impact and deceleration loading in the drive and rod system. The prototype drive and coupling for the Humboldt reactor is now being proof tested in San Jose.

The coupling, which is shown in Figure 1, attaches to the drive by the locking pins moving up and out as pressure is supplied to the pins by the spud entering the socket. These pins are forced in behind the spud after the spud enters the socket locking coupling to spud. The force required to engage the coupling on the spud is approximately 1/8 the weight of the control rod, thus whenever the control rod is set in place on top of the drive, the coupling will automatically engage.

The Humboldt drive will be subject to lower control rod drive speeds and scram velocities than the Dresden drives. The following modifications are required for the Humboldt core characteristics:

1. Normal rod speed is 3 inches per second compared to 6 inches per second for Dresden.

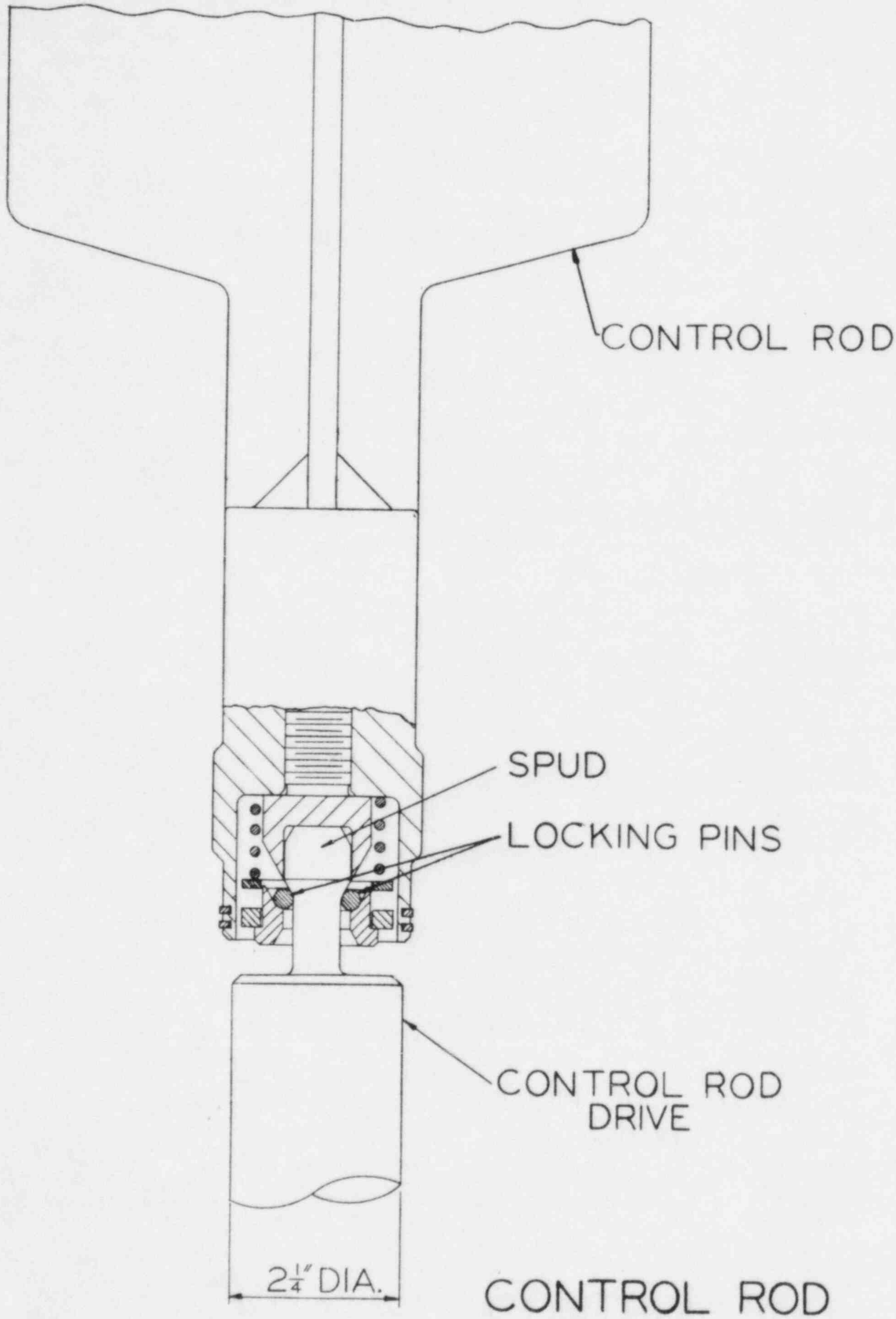
2. Rod stroke is 82 inches compared to 106 inches for Dresden, resulting in lower average scram velocity for same scram time.

3. The drive is stepped in 3 inch increments instead of 8.82 inch for Dresden.

The rod position indication digital readout units give control rod position directly. The numbered steps are projected onto the front surface of position indicators. Each step, 00, 01, --- through step 27 is actuated by the position switch located at 3-inch intervals in the drive. Step 00 and step 27 are identified by different colors, thus providing a method for quick observation of rod "all in" and "all out". The rod selected for movement is also indicated by a special light over the indicator.

The direction switch for controlling the movement of the control rods can only initiate a rod movement of one step. The operator must return the switch to the "off" position prior to moving to the next step. Should the operator desire to move a rod continuously for some distance, an additional control switch is provided. The operator must operate the two switches simultaneously and the movement will be stopped when either switch is released.

The Humboldt reactor vessel and control rod drives incorporate design features to provide long life, improved serviceability and ease of field installation. The drive has a flange located near the top of the drive instead of at



CONTROL ROD COUPLING
FIGURE 1

the bottom as in the case for Dresden. This permits the vessel to be fabricated by the vessel vendor with control rod nozzles ready to receive the control rod drives in the field.

Design improvements in the drive unit include locating the internal check valve in a vertical position in the flange, which permits easy inspection during drive maintenance; and the use of a new improved collet for holding the drive in position. The locking fingers of this collet are individual fingers made from bar stock instead of having all fingers fabricated as a unit from a single cylindrical section. This design change reduces stresses in the spring section of the finger during operation and permits better quality control, thus increasing the collet fingers' reliability.

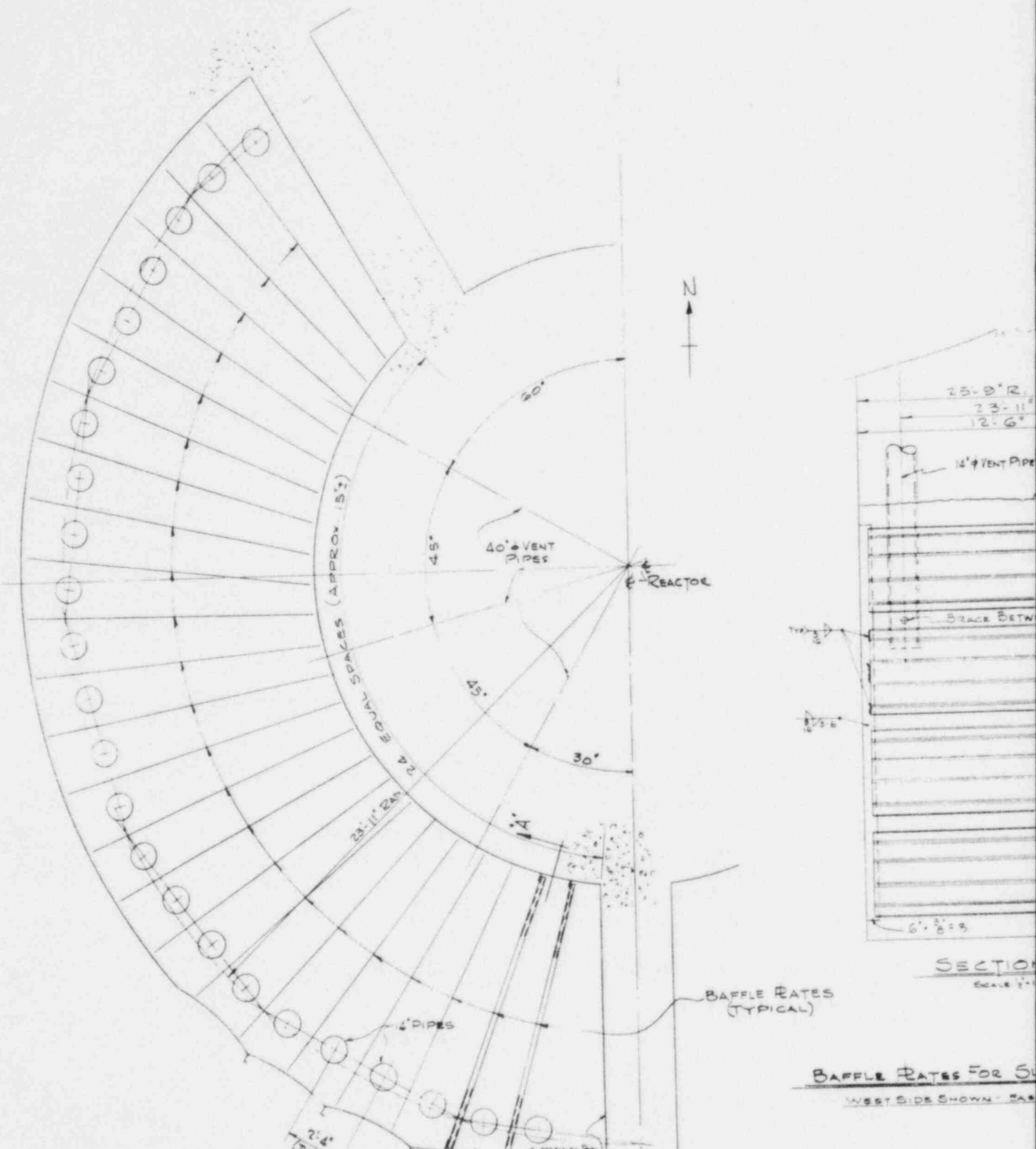
The control rod drive can be removed without removing the reactor vessel head. The drive is disengaged from the rod by driving the rod into overtravel down, after a mechanical stop has been removed from the bottom of the drive (this requires entry into the dry well). The rod half of the coupling, when in the overtravel position, furnishes a seal for the drive penetration so that water can be maintained in the vessel with the drive removed. The drain in the bottom of the drive assembly is used to check for proper back seating before the drive is removed.

The control rod drive hydraulic system includes improvements over the Dresden system. One accumulator is used with two drives instead of three drives as in Dresden. A separate positive displacement pump supplies 40 gpm of reactor feedwater continuously to the 1400 psig hydraulic system. Water from the 1400 psig system maintains the accumulators under this pressure but is reduced to "reactor pressure ≠ 200 psi" for moving drives and for supplying water to the "reactor pressure ≠ 30 psi" system. The "reactor pressure ≠ 30 psi" system is provided for maintaining a cooling flow through the drives. The arrangement provides a continuous flow through both regulators and will provide a system which operates with minimum disturbances when a drive is moved.

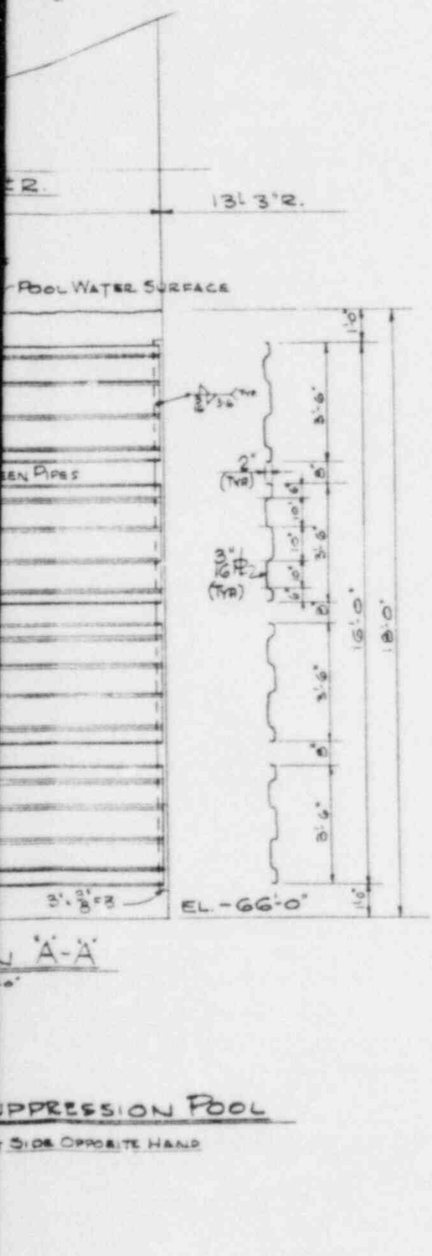
The drive speed is adjusted by orificing the flow to each drive individually; therefore, all rods can be adjusted to move at the same rate, even though there are differences in the leakage rates for the various drives. This makes possible the use of a uniform step control in the drive control system.

III. BAFFLES IN THE SUPPRESSION POOL

Baffles will be installed in the pool between each of the 48-14 inch vent pipes as shown in Figure 2.



N
30°
45°
45°
30°
40'φ VENT PIPES
℄ REACTOR
24 EQUAL SPACES (APPROX. 15°±)
23'-11" RAD.
"A"
"A"
4" PIPES
2'-4" (TYP.)
SUPPRESSION POOL LINER PLATES
BAFFLE PLATES (TYPICAL)
SYMMETRICAL ABOUT ℄
PLAN
25'-9" R.
23'-11"
12'-6"
14'φ VENT PIPE
SPACE BETW
SECTION
BAFFLE PLATES FOR SU
WEST SIDE SHOWN - EAS



BAFFLE PLATES FOR
SUPPRESSION POOL

FIGURE 2

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IV. DOUBLE ISOLATION VALVES AND SHROUD FOR PRIMARY SYSTEM PIPING

Double isolation valves welded in tandem will be located outside the dry well as shown in Figure 3. These valves will be located immediately outside the dry well and the first valve will connect with a shroud tube which is an extension of the dry well.

The Humboldt isolation valves are 900 lb. Class valves of A-216 Grade WCB material. In addition to the exhaustive tests that the manufacturer imposes on valves of this type, additional tests are being specified, such as complete body radiography, magna-fluxing, etc. The valve bodies themselves will be hydro tested at 3250 psi-almost twice the hydro test pressure of the line in which they will be installed.

Double valving is not applied to the hydraulic control rod lines as nothing should be added to these lines that would prevent scramming the reactor. However, even if a break should occur in these one-inch lines, only leakage past the rod drive piston would escape, and this leakage would escape into the area encompassed by the refueling building and would result in no hazards to the public.

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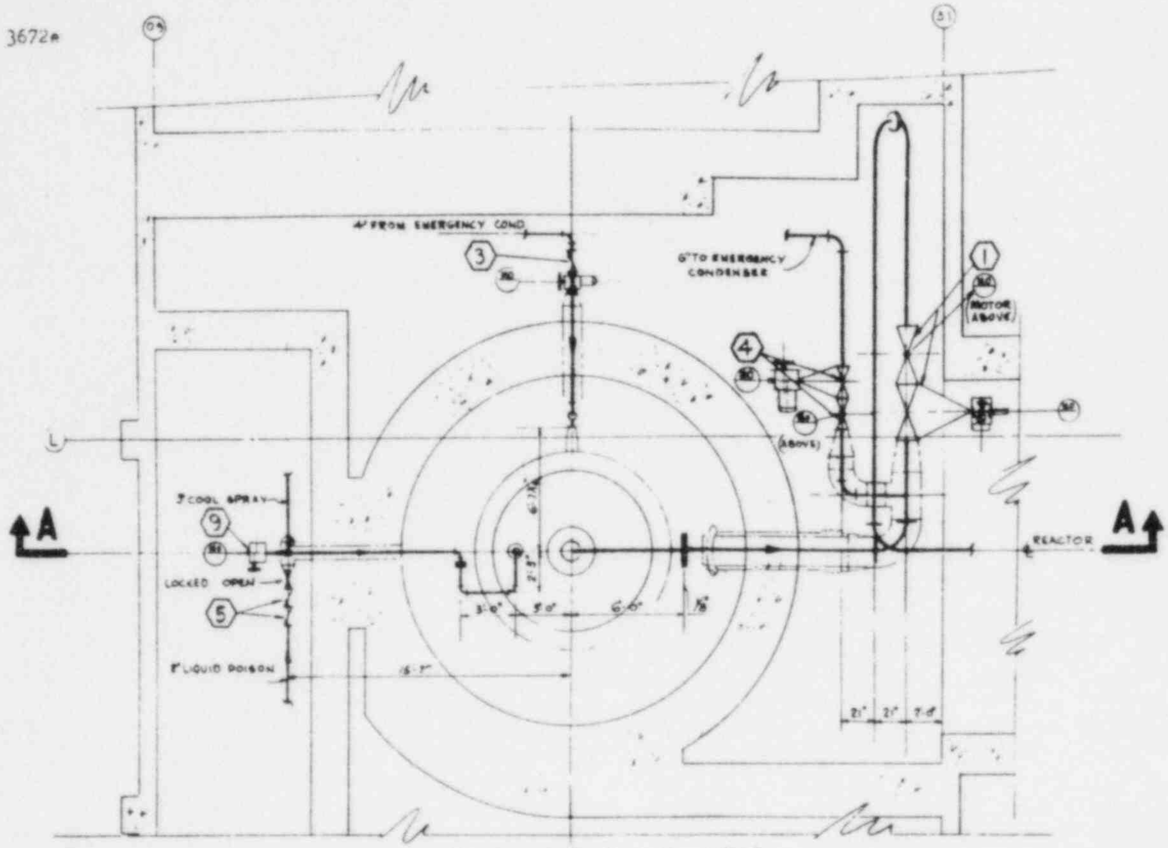
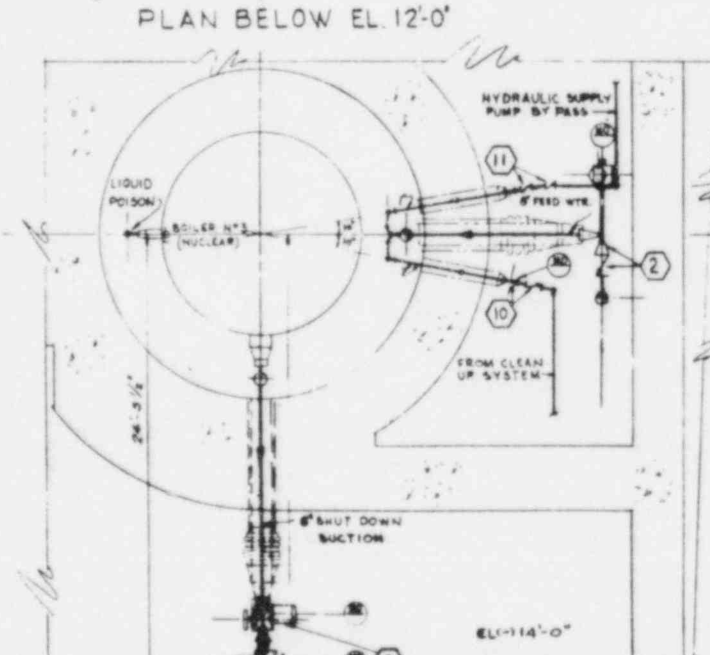
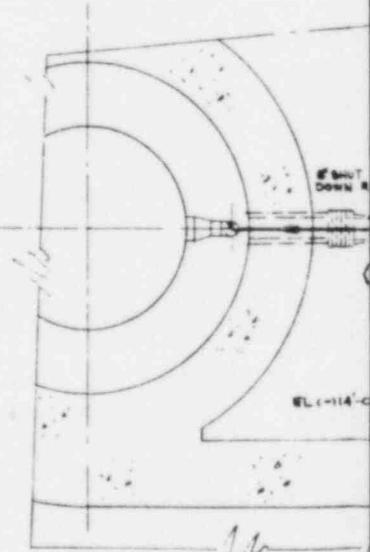


PLAN BELOW EL. 12'-0"



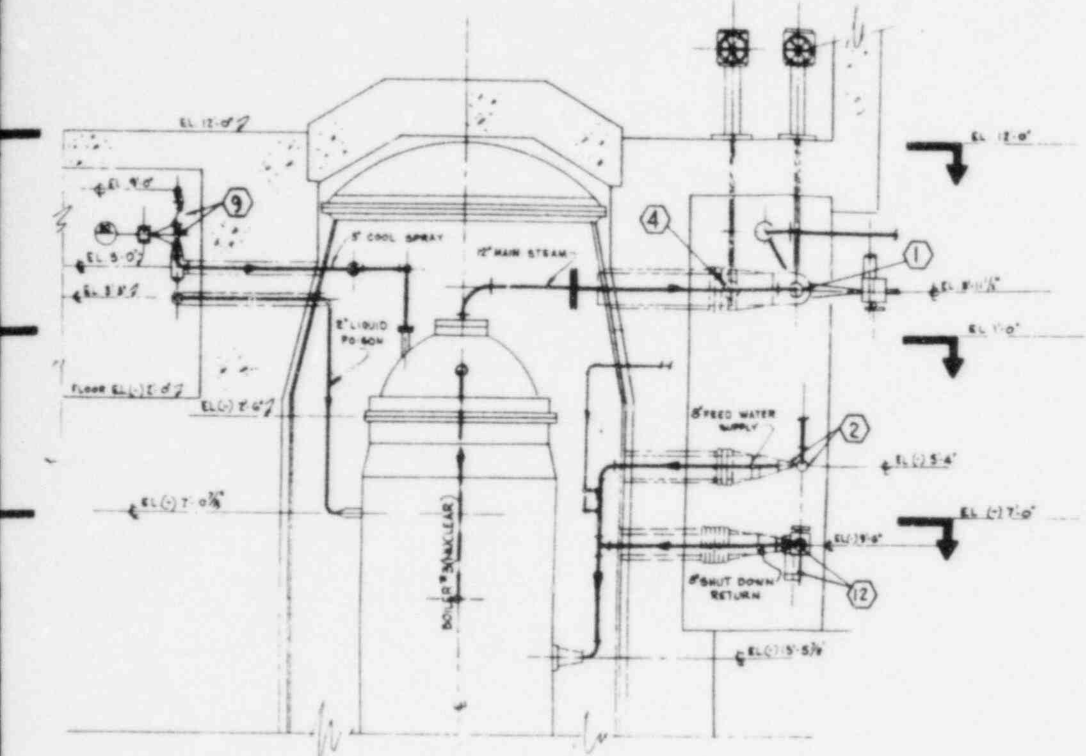
PLAN BELOW EL. 1'-0"



PLAN BELOW EL

N°	SERVICE	N° ISOLAT... VA
1	MAIN STEAM	MOTOR OPERAT
2	FEED WATER	MOTOR OPERAT
3	COND. FROM EMERG. COND	MOTOR OPERAT
4	STEAM TO EMERG. COND.	MOTOR OPERAT
5	LIQUID POISON	CHECK
6	SHUT DOWN SUCTION	MOTOR OPERAT
7	REACTOR DRAIN	MANUAL
8	CLEAN-UP SUCTION	MOTOR OPERAT
9	CORE SPRAY	MOTOR OPERAT
10	CLEAN-UP RETURN	MOTOR OPERAT
11	HYDRAULIC SUPPLY PUMP BY PASS	CHECK
12	SHUT DOWN RETURN	MOTOR OPERA

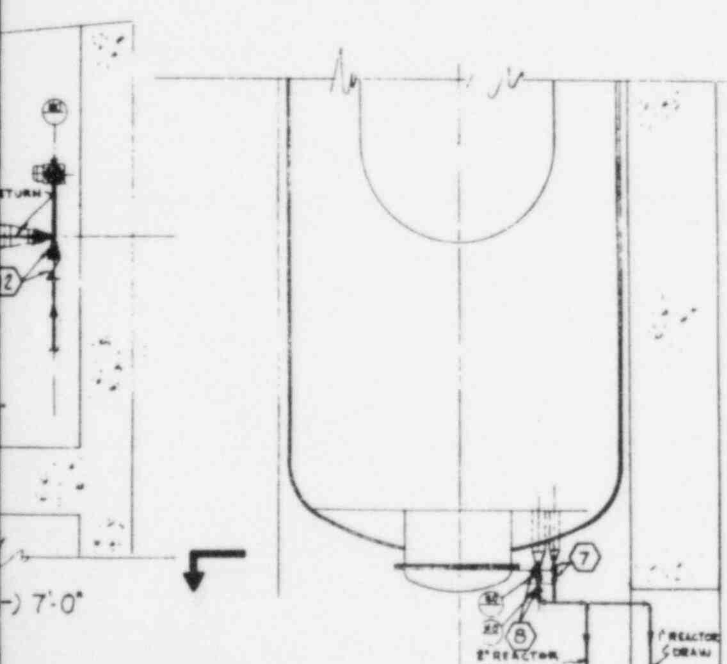
(1) INDICATES VALVE LOCAT

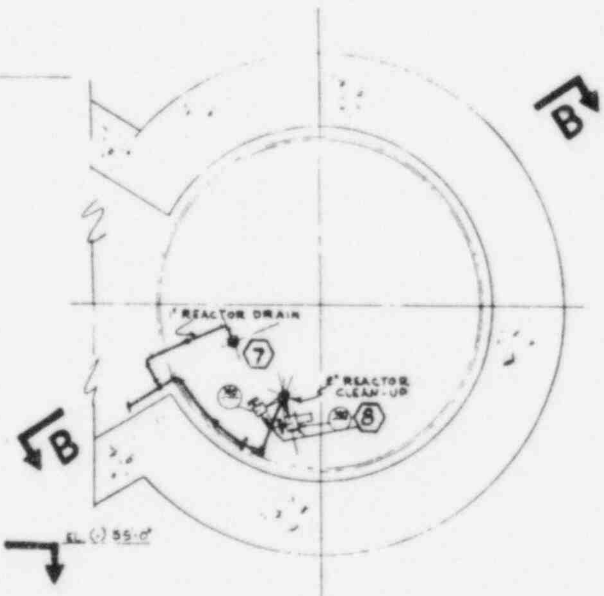


TI
APERTURE
CARD

Also Available On
Aperture Card

SECTION A-A





PLAN BELOW EL(-)55'-0"

...VE	REMARKS	2ND ISOLATION VALVE
...ED	NORMALLY OPEN	MOTOR OPERATED
...ED	NORMALLY OPEN	CHECK
...ED	NORMALLY CLOSED	CHECK
...ED	NORMALLY OPEN	MOTOR OPERATED
	———	CHECK
...ED	NORMALLY CLOSED	MOTOR OPERATED
	NORMALLY CLOSED	MANUAL
...ED	NORMALLY OPEN	MOTOR OPERATED
...ED	NORMALLY CLOSED	CHECK
...D	NORMALLY OPEN	CHECK
	———	CHECK
...TED	NORMALLY CLOSED	CHECK

...ON

SECTION B-B

DOUBLE ISOLATION VALVES
AND SHROUD PIPING
FIGURE 3

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