Commonwealth Edison
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May 24, 1990

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: Dresden Station Units 2 and 3
Supplemental Response to Generic Letter 89-16
NRC Docket Nos. 50-237 and 50-249

References: a) Generic Letter 89-16, Installation of a Hardened Wetwell Vent, dated September 1, 1989.

b) M. Richter (CECo) letter to U.S. NRC, Response to Generic Letter 89-16 for Dresden Station Units 2 and 3, dated October 30, 1989.

c) S. Floyd (BWR Owners' Group) letter to U.S. NRC, dated March 30, 1990.

Dear Sir:

Generic Letter 89-16 (Generic Letter) informed licensees of the NRC's intent to disposition issues related to the Mark I Containment Performance Improvement Program. The Generic Letter encouraged Mark I licensees to voluntarily install a hardened vent under the provision of 10 CFR 50.59 to address risks associated with the TW (loss of decay heat removal) sequence. Commonwealth Edison Company's (CECo) initial response for Dresden Station (Reference (b)) indicated that Units 2 and 3 feature Isolation Condensers capable of mitigating this sequence. A cost estimate for a hardened wetwell vent for Dresden Units 2 and 3 was provided as requested in the Generic Letter. Additionally, CECo committed to provide the rationale for the use of the Isolation Condensers in lieu of hardened vents. This letter provides that rationale, which is based on the following:

1) The existing capability of the Isolation Condenser system to meet or exceed the BWR Owners' Group (BWROG) design criteria for a TW sequence decay heat removal device.

2) The Dresden Units 2 and 3 plant design contains a number of features which make the units inherently less vulnerable to TW sequence events.

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BACKGROUND

NUREG-1150 and SECY 89-017 describe the TW sequence as a transient initiated event beyond the design basis of the plant that results in the loss of long term containment heat removal capabilities. This event is postulated to occur as a result of failure of suppression pool cooling, containment spray cooling, and reactor shutdown cooling through a variety of multiple failures. However, AC power and reactor pressure vessel (RPV) injection capabilities still remain available. Per NUREG/CR-5225, overpressurization conditions caused by continuous heat transfer from the reactor to the containment threaten containment integrity. The capability to utilize available low pressure injection systems is precluded by failure of any air operated Safety and Relief Valves (S/RVs) to adequately relieve vessel pressure to accommodate these systems. For a plant equipped with air operated S/RVs, the S/RVs are assumed to close at high containment pressure since the differential pressure across the S/RV operator may be insufficient to permit the valve to remain open. The presence of a hardened containment vent is assumed to allow pressure relief to indirectly ensure the operation of the available low pressure injection systems. CECo believes that the Isolation Condensers at Dresden Units 2 and 3 address the function of this type of vent.

COMPARISON TO BWROG REQUIREMENTS

The BWROG issued Mark I hardened containment vent design criteria (Reference (c)) that are similar to the design characteristics of the Dresden Units 2 and 3 Isolation Condensers. The Isolation Condensers enable shutdown decay heat removal in the event of failure of other cooling paths, thus providing substantial risk reduction for the TW sequence. The Isolation Condensers provide a self-contained feed and bleed system for removal of reactor decay heat as recommended in NUREG/CR-5225. Each Isolation Condenser System (described in detail in Attachment 1) removes decay heat from the vessel by condensing reactor steam. Reactor vessel inventory is maintained constant and decay heat is vented to atmosphere from the secondary side of the Isolation Condenser heat exchanger without affecting primary containment integrity. A comparison of the Dresden Isolation Condensers' performance with the BWROG Hardened Wetwell Vent Design Criteria is provided below:

Criterion a) The vent shall be sized such that under conditions of 1) constant heat input at a rate equal to one percent (1%) of rated thermal power (unless lower limit justified by analysis for plants with existing hard pipe capability), and 2) containment pressure equal to the primary containment pressure limit (PCPL), the exhaust flow through the vent is sufficient to prevent containment pressure from increasing.

Discussion: The Isolation Condenser provides the capability to remove greater than 1% rated thermal power. The Isolation Condenser's design capability is three percent (3%) of rated thermal power. This heat is transferred to atmosphere and thus avoids substantial containment heatup. Successful operation of the Isolation Condenser precludes the need to consider significant primary containment pressurization.

Criterion b) The hardened vent shall be capable of operating up to the PCPL. It shall not compromise the existing containment design basis.

Discussion: Successful operation of an Isolation Condenser eliminates the challenge to primary containment integrity, thus operation of the Isolation Condenser with respect to the PCPL is not a concern. The Isolation Condenser is currently an aspect of the plant design and thus its use does not compromise the existing containment design basis.

Criterion c) The hardened vent shall be designed to operate during conditions associated with the TW sequence. The need for station blackout venting will be addressed during the IPE.

Discussion: The Isolation Condenser is capable of initiation and operation during the TW sequence previously detailed. Isolation Condenser initiation is via a single DC-powered isolation valve while operation of the Isolation Condenser for the removal of decay heat does not require any power. Makeup paths to the Isolation Condenser consist of separate pathways which are controlled by AC dependent or DC dependent valves. However, makeup pathways may also be manually aligned. The separate makeup paths can be supplied by AC dependent or diesel driven pumps. As previously noted, successful Isolation Condenser operation eliminates the TW sequence.

Criterion d) The hardened vent shall include a means to prevent inadvertent actuation.

Discussion: Inadvertent initiation of the Isolation Condenser does not result in a release of the Primary Containment atmosphere. Inadvertent initiation would not result in adverse consequences to the safety of the plant.

Criterion e) The vent path up to and including the second containment isolation barrier shall be designed consistent with the design basis of the plant.

Discussion The Isolation Condenser design and isolation features are consistent with plant containment isolation design basis requirements. The Isolation Condenser system is located outside of Primary Containment with the exception of the steam supply and condensate return piping. As detailed in Attachment 1, the Isolation Condenser system has redundant isolation capability powered from either AC or DC power sources. The Isolation Condenser is operable with the primary containment isolated, thus no new leakage paths are introduced with the use of the Isolation Condenser relative to a hardened vent.

Criterion f) The hard vent path shall be capable of withstanding, without loss of functional capability, expected venting conditions associated with the TW sequence. The design should preclude possible sources of ignition for combustible gases.

Discussion The Isolation Condenser's design provides for heat transfer at the required 1% of rated thermal power. Isolation Condenser operation is independent of TW sequence characteristics. Its ability to successfully remove heat when required has been proven repeatedly since plant startup. The Isolation Condenser design precludes introduction of new ignition sources since reactor coolant is maintained inside a closed system.

Criterion g) Radiation monitoring shall be provided to alert control room operators of radioactive release during venting.

Discussion The Isolation Condenser has been designed with radiation monitoring capabilities. Radiation monitors provide Control Room operators of potential radioactive release in the event of Isolation Condenser tube rupture.

COMPARISON OF DRESDEN (UNITS 2 AND 3) PLANT DESIGN TO PEACHBOTTOM

Peachbottom Unit 2 was the NUREG-1150 reference Mark I containment plant cited as the basis for consideration of a hardened vent to reduce the TW sequence core melt probability. The design of Dresden Units 2 and 3 contains a number of features which provide greater inherent capability to mitigate the consequences of a TW sequence event. For example, unlike Peachbottom, Dresden is designed with a shutdown cooling system independent of the Low Pressure Coolant Injection System (i.e., not a mode of the typical BWR Residual Heat Removal System). Thus, Dresden Station's decay heat removal systems are further protected from common mode failures of the type that would produce the conditions necessary for a TW sequence event. Dresden Station's RPV depressurization capability rests primarily upon operation of four Electromatic Relief Valves (ERVs) and only one air operated S/RV. Primary containment pressure therefore would not affect operation of the ERVs during a TW scenario. As a result, adequate core cooling with low pressure injection systems is possible without venting primary containment. Because of these features, the overall impact on core melt frequency due to the TW sequence is expected to be substantially less than that of the reference plant without taking credit for system recovery actions during the extended time frame that characterizes the TW sequence. CECo therefore considers the Isolation Condensers installed in Dresden Units 2 and 3, as well as the other diverse decay heat removal systems, to be fully capable of reducing the TW sequence probability such that installation of a hardened wetwell vent is not a cost effective approach to reducing overall reactor risk.

CECo will be performing an Individual Plant Examination (IPE) for Dresden Station to fulfill the requirements of Generic Letter 88-20. Upon completion of the Dresden Station IPE, CECo will review the results of this study with respect to the risk impact associated with the installation of a hardened vent.

Please direct any questions that you may have concerning this response to this office.

Respectfully,

Milton H. Richter

M.H. Richter
Generic Issues Administrator

Attachment 1: Description of Dresden Station Isolation Condenser Systems

cc: A.B. Davis - Regional Administrator, Region III
Senior Resident Inspector - Dresden
P. Eng - NRR Project Manager

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Attachment 1

Description of Dresden Station Isolation Condenser Systems

A. Description of the Isolation Condenser System (using Dresden Unit 3 Isolation Condenser for illustration)

1. Design Basis

a. To be capable of cooling the reactor core when any of the following conditions occur:

(1) the reactor is isolated from the main condenser,

(2) a loss of main condenser vacuum,

(3) a failure of the Turbine Electro Hydraulic Control (EHC) System.

b. Automatic initiation upon determination of main condenser isolation (sustained elevated reactor pressure).

c. Manual initiation for operator control.

d. To be capable of removing decay heat from the reactor without a loss of reactor coolant inventory.

e. To allow for system control to control reactor pressure and subsequent reactor cooldown.

2. Capabilities

a. The Isolation Condenser heat removal capability is 74 MWt. This rate is equivalent to 3% reactor power.

b. The Isolation Condenser is sized to accommodate the continuing decay heat load within 5 minutes of a reactor scram, assuming the maximum theoretical decay heat load.

c. The shell side can be filled with makeup within the following limits:

Level	Volume
Maximum level	23,000 gallons
Normal level	22,500 gallons
Minimum level	11,300 gallons

3. Principles of Operation

The Isolation Condenser relies upon the difference in fluid density between the steam entering the tube bundle and the condensate leaving the tube bundle to provide a driving head to return the condensate to the reactor recirculation system. The Isolation Condenser is located above the core to facilitate this natural circulation flow. Heat is transferred from reactor steam through the tube bundle to the Isolation Condenser shell side fluid (water). The shell side fluid is boiled and exits the Isolation Condenser, and subsequently from the Reactor Building, through a vent to atmosphere (see Figure 1 for steam side details). The closed loop nature of the entire system ensures that no decrease in reactor pressure vessel (RPV) water inventory will occur due to system operation. (Note: a gradual cooldown of the RPV will result in a decrease in RPV water level due to the increased density of the reactor coolant.)

System initiation is caused by the opening of a single safety-related DC-powered valve. No further actions are required for system operation until the shell side water level reaches the minimum value. Shell side makeup is provided to replenish the heat sink from one of several sources (see Figure 2 for shell side makeup details).

4. Remote Operated Valve Operation

a. MO 3-1301-1 and MO 3-1301-4 are normally open primary containment isolation valves that are essential AC-powered and used to isolate the Isolation Condenser if a leak is detected in the Isolation Condenser system. These valves are located inside the primary containment and form the inboard isolation for this system.

b. MO 3-1301-2 is a normally open primary containment isolation valve that is powered from a safety-related 250 VDC source. This valve is used to isolate the system if a leak is detected in the Isolation Condenser system.

c. MO 3-1301-3 is a normally closed primary containment isolation valve that is powered from a safety-related 250 VDC source. This valve is used to isolate the system if a leak is detected in the Isolation Condenser system. This valve is the single valve that allows the Isolation Condenser to be placed into operation. This valve is opened automatically upon elevated reactor pressure (greater than 1070 psig for more than 15 seconds). The valve can also be opened by the operator from the control room or locally at the Isolation Condenser valve room. MO 3-1301-3 may be throttled to control the rate of heat transfer and thus control the rate of reactor depressurization and decay heat removal.

d. MO 3-1301-10 and MO 3-4102 are normally closed safety-related DC-powered valves that are used to line up two of the three makeup water sources to the Isolation Condenser shell side. These valves may be operated remotely from the control room or locally adjacent to the Isolation Condenser.

e. Valves 3-1301-17 and 3-1301-20 are pneumatically operated fail closed valves that are normally open to continuously vent the Isolation Condenser steam inlet side to the main steam system. The feature precludes air binding of the Isolation Condenser which could result in reduced heat transfer. These valves automatically close upon system initiation or system isolation.

f. Valve MO 3-4399-74 provides for Isolation Condenser shell side makeup from the clean demineralized water tank. This valve and its pumping source are powered from non-essential AC sources.

5. Isolation Condenser Leakage and Radiation Monitoring

a. The Isolation Condenser radiation monitoring is designed to detect and warn the operator of a tube leak. This function is accomplished with monitoring of the Isolation Condenser shell side effluent with two channels of gamma radiation monitoring.

b. Each channel of radiation monitoring is powered from one of the Reactor Protection System (RPS) buses. The monitor ranges are 1.0E-2 to 1.0E+3 millirem/hr and 1.0E+0 to 1.0E+6 millirem/hr. The output of each monitor is provided visually to control room operators and annunciated when gross activity in the vent line reaches a preset level. Failure of the monitoring equipment upscale or downscale is also annunciated.

c. Aside from the automatic operating leakage detection methods described in Section B.2.b below, there is local temperature monitoring of the area surrounding the Isolation Condenser.

B. System Operation

1. System Initiation

a. Automatic initiation occurs when reactor pressure has exceeded 1070 psig for more than 15 seconds. The combination of elevated reactor pressure and the time delay provides for indication that the main condenser is isolated or no longer available as a heat sink, and thus, operation of the Isolation Condenser is warranted. The system initiates by the automatic opening of MO 3-1301-3. Valves 3-1301-17 and 3-1301-20 automatically close. No further automatic actions will occur. Reactor steam will then be condensed and returned to the reactor recirculation system while decay heat is rejected to the atmosphere.

b. Manual initiation consists of the control room operator placing the control switch for MO 3-1301-3 in the OPEN position. Valves 3-1301-17 and 3-1301-20 will automatically close. As in the case described above, heat transfer will occur automatically.

2. System Isolation

a. MSIV Closure Signal

A MSIV isolation signal (Group I) will cause the 3-1301-17 and 3-1301-20 valves to close, thus isolating this system from the main steam system. This automatic isolation feature has no effect upon the operation of the Isolation Condenser.

b. Isolation Condenser Leakage Detection Signal

High flowrates through the steam side or condensate side of the Isolation Condenser system may be indicative of a tube rupture or line break. In accordance with general design criteria for systems that connect directly to the reactor vessel that are located outside of primary containment, isolation of the line is accomplished with two sets of redundant system shutoff valves. There are two separate divisions of valves, an inboard set (MO 3-1301-4 and MO 3-1301-1) and an outboard set (MO 3-1301-3 and MO 3-1301-2). Each of these sets is powered from independent power sources such that containment isolation is assured for single failure situations and all design basis accidents.

3. Isolation Condenser Shell Side Makeup Systems

a. Clean Demineralized Water

The preferred makeup source for the Isolation Condenser is clean demineralized water which is an uncontaminated water source. The power for the clean demineralized water pumps is from a non-essential AC source. The clean demineralized tank stores a maximum of 200,000 gallons of water.

b. Fire Main Water

Another alternative is to replenish the shell side of the Isolation Condenser from the fire main system. This system is normally maintained pressurized by the service water system, but is also pressurized by a diesel driven fire pump in emergencies. This system has unlimited makeup potential due to its use of river water. The diesel engine provides assurance that this makeup system will be operable despite loss of normal and emergency AC sources. It should be noted that diesel driven fire pumps are credited with providing for RPV injection in reducing core melt frequency for other severe accidents discussed in NUREG/CR-5225 Addendum 1.

c. Cycled Condensate Water

The condensate recycled from plant operations is stored in the Condensate Storage Tanks. The total amount of storage is 500,000 gallons with 180,000 gallons reserved for Unit 2 and 3 HPCI use. Cycled condensate water may be provided to the Isolation Condenser via the condensate transfer pumps which are powered from essential safety-related AC buses. This water is used as the last alternative for makeup water since it contains some residual amounts of contamination that will be concentrated by the boiling action in the Isolation Condenser.

Dresden Station Isolation Condenser Steam Side Piping and Valves

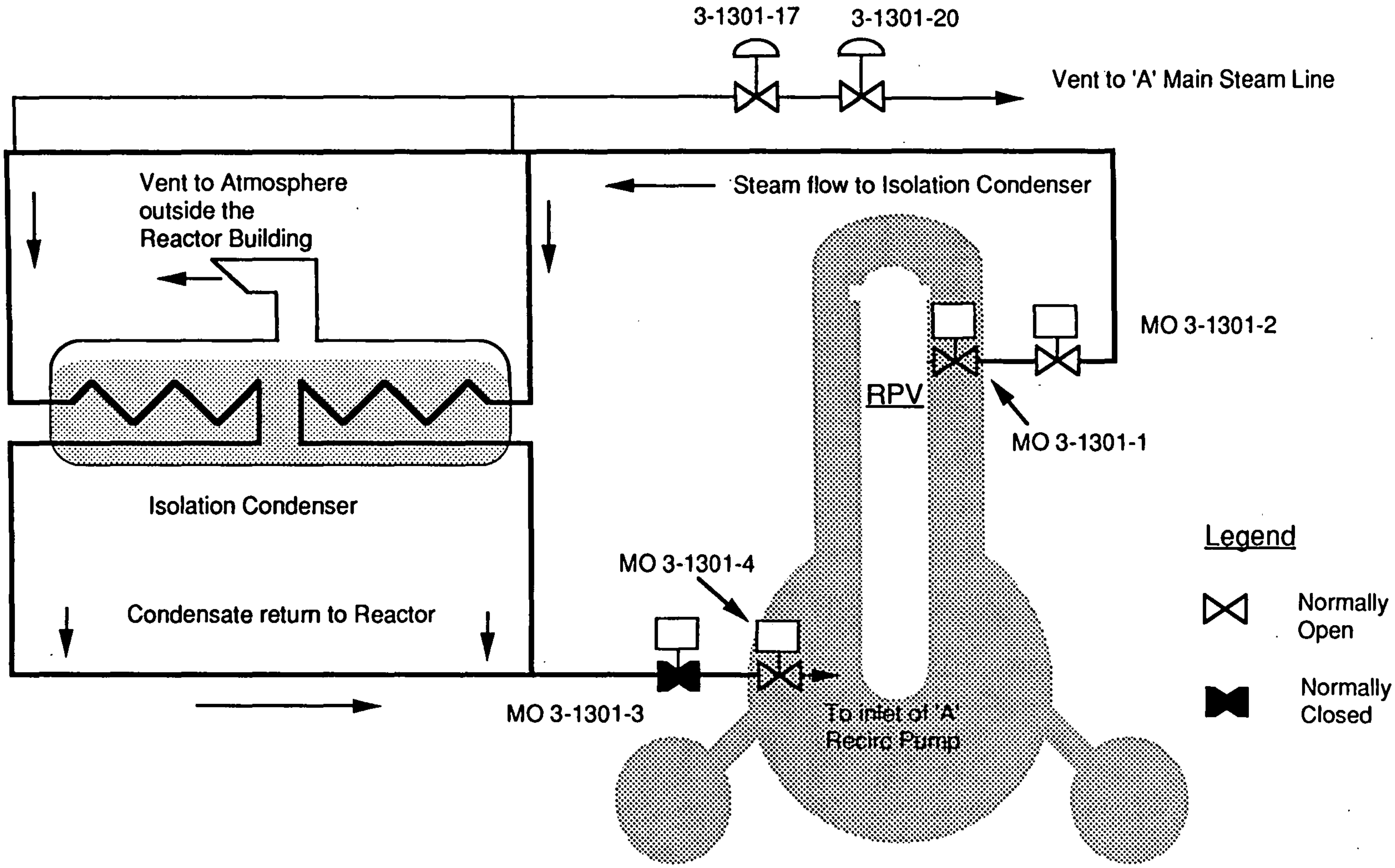

Figure 1

ATTACHMENT 1

Dresden Station Isolation Condenser
Shell Side Makeup Systems

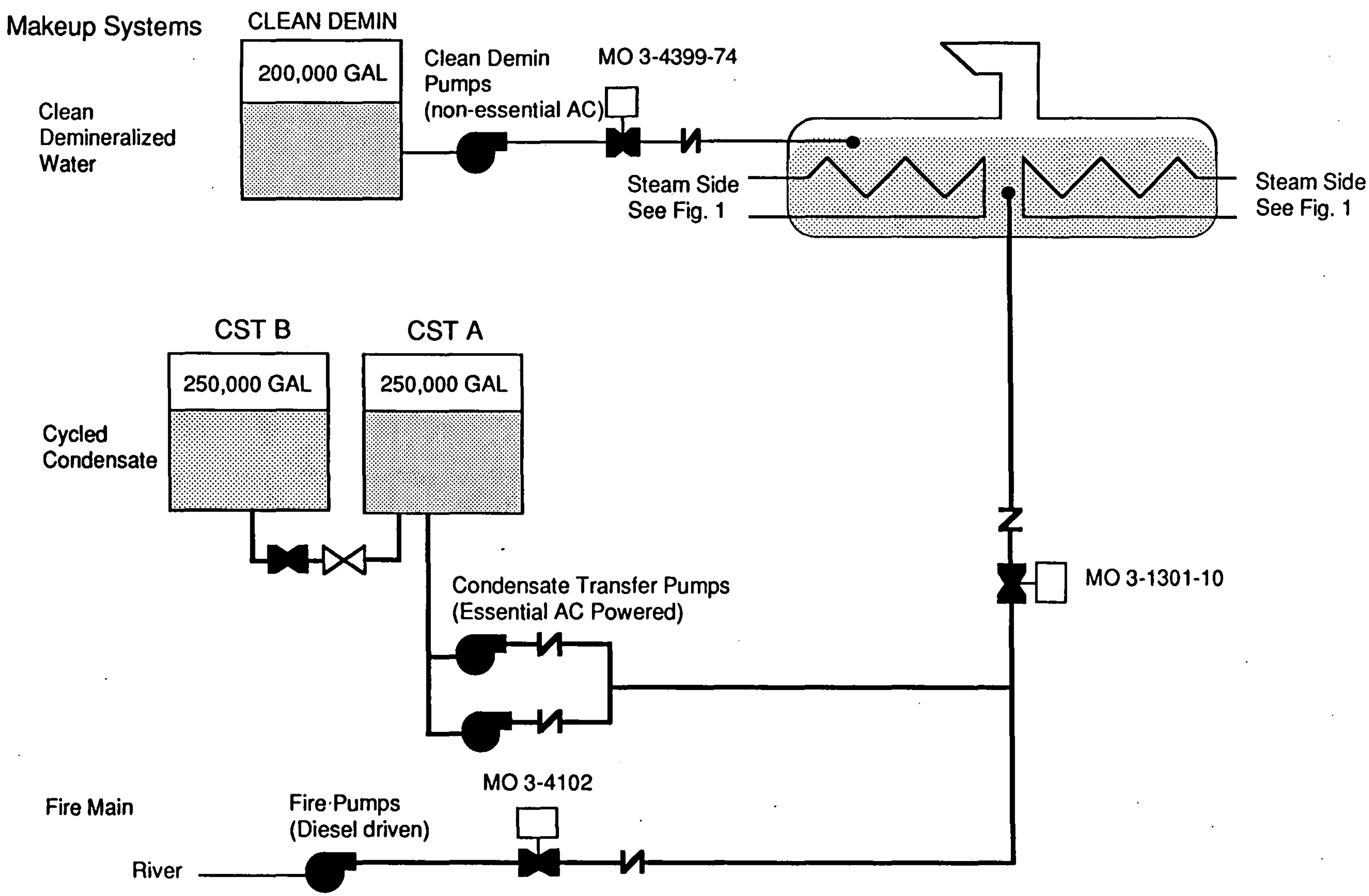

Figure 2

ATTACHMENT 1