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50-323 Diablo Canyon Nuclear Power Plant, Unit 2, Pacific Ga 05000323
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CRANE,P.A. Pacific Gas & Electric Co.
RECIP.NAME RECIPIENT AFFILIATION
STOLZ,J.F. Light Water Reactors Branch 1

SUBJECT: Forwards addl info re refueling water storage tank capacity in response to 790720 request.FSAR commitments & Tech Specs limit is 350,000 gallons.Possiblity for 2% error exists in indication of tank level.

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March 20, 1980

Mr. John F. Stolz, Chief
Light Water Reactors Branch No. 1
Division of Project Management
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Docket No. 50-275
Docket No. 50-323
Diablo Canyon Units 1 & 2

Dear Mr. Stolz:

The attached material is submitted in response to your July 20, 1979 request for additional information regarding the Refueling Water Storage Tank (RWST) capacity.

Kindly acknowledge receipt of the above material on the enclosed copy of this letter and return it to me in the enclosed addressed envelope.

Very truly yours,

Philip A. Crane, Jr.

Attachment (40)

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ENCLOSURE 2

DIABLO CANYON, UNITS 1 & 2

REQUEST FOR ADDITIONAL INFORMATION

Provide the sizing design basis for the RWST including the following specific information:

Question 1: Design Allowances for RWST

1a. Injection requirements (LOCA)

Answer: The FSAR commitment and the Technical Specification limit is 350,000 gallons.

1b. Instrumentation error

Answer: There is a possible two percent error in the indication of tank level. The surveillance test procedure subtracts two percent of full scale from the indicated level to allow for this possible error. The high level, low level, and low-low level alarms each have a possible one percent error.

1c. Working allowance

Answer: The working allowance between the nominal high level alarm and the nominal technical specification minimum level is 68,000 gallons. Subtracting two percent of full scale to allow for possible instrument error (see answer to 1b.), the working allowance between the nominal high level alarm and the surveillance limit is 59,000 gallons. If, in addition, all instruments were at maximum error in the direction of reducing the working allowance, the indicated allowance would remain 59,000 gallons but the actual allowance would be reduced to 45,000 gallons.

1d. Transfer allowance

Answer: We calculate that the safety injection pumps and the charging pumps together may pump 11,600 gallons during the transfer period.

1e. Single failure allowance

Answer: The limiting single failure described for Seabrook does not pertain to Diablo Canyon. The RHR pump trip is automatic at

1e. (Continued)

Answer: low tank level by two out of three logic. The limiting single active failure is that an RHR pump motor controller would fail to operate when it received the trip signal. Should this happen, the operator would go to the motor control center and stop the motor. During this time, it is estimated that about 17,500 gallons would be pumped from the RWST by the RHR pump.

1f. Unusable volume

Answer: The design unused volume is 45,000 gallons. This is the volume below the nominal low-low alarm level. The volume below the invert of the nozzle to the emergency core cooling pump suction is 19,600 gallons.

Question 2: Show that there is sufficient capacity to prevent formation of a vortex and entrapment of air into RWST piping. Reference a test demonstrating sufficient tank capacity to prevent vortex formation while pumps continue to take suction on the RWST. Test considerations should include the most limiting single failure (e.g. no manual actions). Provide the total tank capacity and tank dimensions, include a dimensioned schematic drawing of tank and connecting pipes.

Answer: There is sufficient capacity in the tank to prevent vortex formation or entrapment of air. The tank low-low level alarm has been set so that even in the case of worst instrument error, water level will not fall below the top of the vortex preventing cage. This cage has been designed by a consultant on the basis of full scale tests of pump suction flows. The tests showed that this design will prevent the formation of vortexes and the resulting entrainment of air, as long as the water level does not fall below the level of the vortex cage.

The tank is forty feet in inside diameter and 52'-6" high to the roof line. This is a total volume of 492,000 gallons. There is an eight inch overflow connection 51'-8" above the tank floor so the practical total tank capacity is 484,000 gallons. The high level alarm is set 49'-11" above the tank floor giving a full tank total volume of 468,000 gallons. A dimensioned schematic drawing of the tank is attached.

Question 3: Specify what the remaining usable RWST capacity is after switchover from injection to recirculation operating mode. Specify the capacity remaining following normal transfer and transfer with single failure. Provide the technical specification's required volume in RWST both in usable volume and type and error of instrumentation that senses the volume and type and error of instrumentation that informs the operator of technical specification violation. Provide the set point for instrumentation to inform operator of such a violation.

Answer: The remaining usable RWST capacity after a normal switchover from injection to recirculation following a LOCA would be 78,000 gallons. With the single failure discussed in answer 1e., the remaining usable capacity would be reduced to 60,000 gallons. The Technical Specification required volume in the RWST is 400,000 gallons total contained. This number was determined on the basis of an usable volume of 350,000 gallons. The instrumentation which would inform the operator of a Technical Specification violation would be the tank level indication, which is of the differential pressure type and will have an error no greater than two percent of full scale. As mentioned in the answer to question 1b., the maximum instrument error is allowed for in the surveillance test procedure.

Question 4: Provide the time available and the time required to complete the necessary action at each alarm set point in RWST. Justify the basis for the shortest times in terms of the worst single failure for both small (where high pressure injection pumps are of major importance) and large breaks. How much time remains at low-low level alarm if no operator action has been completed? What is the procedure if this point has been reached?

Answer: When the high level alarm set point is reached, the operator is instructed to terminate flow into the tank. The time required has not been determined. The time available will depend upon the source(s) of water. Failure to respond will have no safety implications since the tank overflow line is considerably larger than the fill line.

When the low level alarm set point is reached, assuming that safety injection is in progress following a LOCA, the RHR pumps are tripped automatically and the operators begin a sequence of manual change-over to sump recirculation. This changeover sequence is presented in detail in Table 6.3-4A of the FSAR and calls for a series of actions requiring eight minutes forty-five seconds to complete. This sequence was demonstrated during plant startup testing and was accomplished during the test in six minutes sixteen seconds. The times given in Table 6.3-4A are determined on the basis of the greatest possible flows, that is the LOCA is assumed to be so large that pump flows are limited by pipe friction only and not reduced by reactor coolant system pressure.

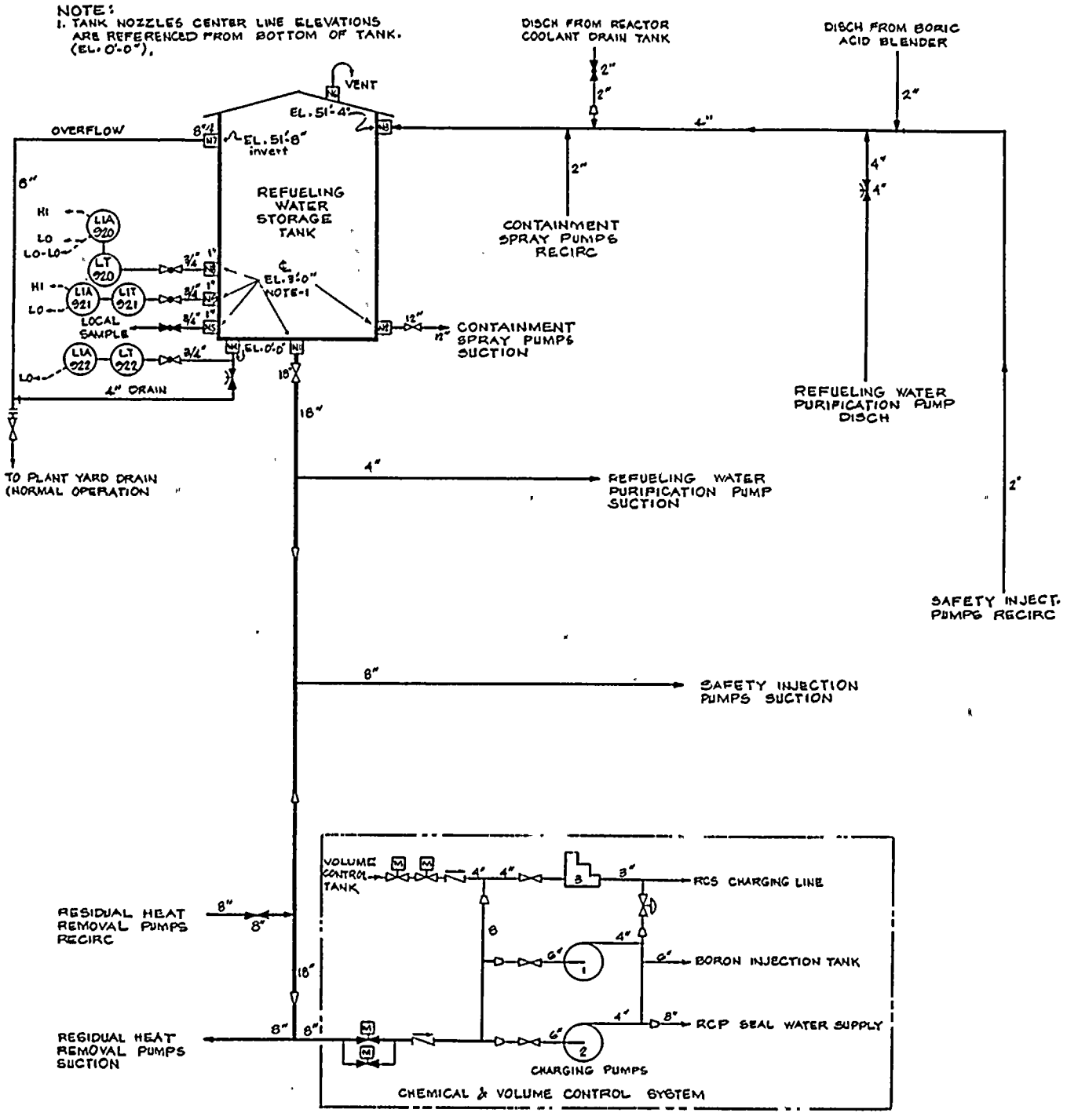
When the low-low level alarm set point is reached, the containment spray pumps are tripped. The sequence, also presented in FSAR Table 6.3-4A, is expected to take thirty-five seconds. During test demonstration, it was accomplished in twenty-five seconds.

The limiting single active failure is discussed under Question 1e. and would result in a maximum calculated unplanned flow of 17,500 gallons from a RHR pump at the low level point following a large break. Following a small break, the ECCS pump flow would be much lower and a delay in the changeover resulting from a single failure

would have less effect. For example, following a large break, a flow of 224,000 gallons would occur in the first seventeen minutes and the low level alarm level would be reached. Following the worst case small break LOCA identified in Section 15.3 of the FSAR, it is estimated that only 15,000 gallons would be drawn from the tank in the same time period. The worst single failure following low-low level would be the failure of a motor-operated valve to open from a RHR pump, now operating on recirculation, to the spray header. There are parallel trains to perform this function. The failure of a pump to trip at low-low level would have no consequences since only the containment spray pumps would be drawing from the tank at that time, and they would have no assigned function after that time.

At low-low level, if no operator action had been completed since the occurrence of the LOCA, nearly three minutes of ECCS flow would remain before 0 percent indicated level and approximately one minute more would remain before the calculated tank level would reach the invert of the ECCS pumps nozzle. The procedure, if this point were reached, would be to trip all the pumps drawing on the tank and realign them to the recirculation mode. This question, however, is not pertinent to Diablo Canyon since both the FSAR and the operating procedures call for operator action to perform the switchover to recirculation when low level (not low-low level) is reached.

As a general comment on these staff questions, we would point out that the basic function of the refueling water storage tank following a postulated LOCA is to provide sufficient water for emergency core cooling. If tank low level has not been reached, there will be water available for this purpose in the tank. If tank low level has been reached, there will be water available for this purpose in the containment sump and on the containment floor. Although we intend to follow the procedures described, we do not believe that any variances from the precise times and gallon quantities discussed in this request for information which might be encountered in actual practice would have any degrading affect on the capability of the tank to perform its safety function.



PIPING SCHEMATIC
REFUELING WATER STORAGE TANK
DIABLO CANYON