PLANT SYSTEMS

ULTIMATE HEAT SINK

LIMITING CONDITION FOR OPERATION

3.7.1.3 The ultimate heat sink consisting of two separate ~~and redundant~~ spray ponds ~~and standby service water systems~~ shall be OPERABLE with:

DELETE

DELETE

a. A minimum water level at elevation 432 ft 9 in. Mean Sea Level, USGS datum, and

b. A water temperature of less than or equal to 77°F.

c. A maximum average sediment depth of less than or equal to 0.5 ft on the floors of the spray ponds.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, 3, 4, 5, and *.

ACTION:

With the requirements of the above specification not satisfied:

a. In OPERATIONAL CONDITION 1, 2, or 3, be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours.

b. In OPERATIONAL CONDITION 4 or 5, declare the SW system inoperable and take the ACTION required by Specification 3.7.1.1.

c. In OPERATIONAL CONDITION *, declare the SW system(s) associated with the inoperable spray pond(s) inoperable and take the ACTION required by Specification 3.7.1.1. The provisions of Specification 3.0.3 are not applicable.

d. With the average sediment depth of either of the spray ponds greater than or equal to 0.5 ft but less than 1.0 ft, the ponds shall be cleaned within 30 days to reduce the average sediment depth to less than or equal to 0.1 ft.

SURVEILLANCE REQUIREMENTS

4.7.1.3 The ultimate heat sink shall be determined OPERABLE at least once per:

a. 24 hours by verifying the water temperature and water level to be within their limits.

b. 92 days by verifying that the average sediment depth in each of the spray ponds is less than or equal to 0.5 ft.

* When handling irradiated fuel in the secondary containment.

ATTACHMENT I

Safety Evaluation of Standby Service Water Cross-Connection

In order to allow for infrequent maintenance of submerged steel structural supports and piping in the ultimate heat sink (UHS) spray ponds, it is necessary that we drain the ponds one at a time during a refueling outage. The present system design results in the service water (SW) pumps taking suction on one pond, providing cooling water to plant room coolers and essential equipment, returning cooling water to the other pond for spray cooling, and returning water to the pump suction in the first pond via a 30 inch siphon. This mode of operation precludes draining of a pond for maintenance. A design change is planned that will allow the return of water to the pond from which it was drawn. The change involves the cross connection of the return piping via a removable spool piece, and the blockage of the siphon with inflatable plugs. One pond can be drained with this cross connection capability in place.

The safety implications of the cross connection focus in four areas: 1) redundancy requirements of the SW system, 2) UHS water inventory requirements, 3) UHS cooling water temperature limitations, and 4) severe natural phenomena.

Redundancy Requirements

The intended use of the cross connection is only during the "star" mode defined in the Technical Specifications, that is, with the reactor shut down, in refueling mode, with the vessel head off and cavity flooded at least 22 feet above the vessel flange. In this mode the technical specifications require only that one SW division be operable, and that alternate means be shown to be available within one hour if that division is lost.

With one spray pond drained and the siphon plugged with inflatable plugs, it is possible to restore the division associated with the drained pond in a very short time. The water level in the full pond is above the highest point of the siphon, so flow will proceed automatically through the siphon if the inflatable plugs are deflated. Since the siphon plugs can be deflated from the edge of the pond, that flow can be established quickly. Within one hour the previously inoperable division could be brought on line.

UHS Water Inventory

With one pond drained, the water inventory is approximately half of that normally available. However, the severe heat loads associated with the design basis accident can not occur in the refueling mode and considerably less water is required. An evaluation[1] was done to determine the length of time the water in one pond would last if cooling were required without makeup and without offsite power.[2] Heat loads associated with previously analyzed accidents were used including diesel generators, decay heat from the core, decay heat from the fuel pool, and from auxiliaries (room coolers, etc.). Design basis drift loss and leakage were assumed. The results of our evaluation indicate that the water inventory of one pond would last over 22 days.

While the normal 30 day inventory requirement is not met in this mode of operation, the probability of significant radioactive release is extremely small with the plant shut down in the refueling mode. We would have free movement about the site and have documented experience that with freedom of movement, makeup water can be provided. For example, temporary pipe lines from the river have, in the past, been installed in about 3 days. In addition, one tower makeup pump (12,500 gpm each) can be powered by emergency diesels if piping remains intact.

The 22 day inventory provides adequate time to provide makeup via temporary or installed systems. Long term cooling water supply can be assured.

UHS Cooling Water Temperature

The safety analyses reported in the FSAR[2] were performed under the worst case meteorological conditions and using severe heat loads associated with a design basis accident. In providing the cross-connection during refueling and draining one pond, we have not diminished the heat dissipation capability of the system. Heat dissipation in the sprays is a function of flow rate and meteorological conditions, and the worst case analysis for cooling water temperatures reported in the FSAR used one SW division operable. The effect of the reduction in inventory is a more rapid response to heat load changes. Since the plant is not undergoing a rapid transient accident in the case we are evaluating here, the importance of the response time is minimal. The heat loads are relatively stable during the cross connection operation which will be several days after shutdown.

Long term plant heat loads during refueling are bounded by those reported in the FSAR[2] for the accident case, and temperature of cooling water would therefore be the same or lower.

Our conclusion is that the maximum temperature reported in the FSAR is bounding for the intended use of the SW cross connection.

Severe Natural Phenomena

The major natural phenomena affecting the UHS spray ponds are earthquakes and tornados. If an SSE were to occur during cross-connection use, the operable SW division would continue to serve the plant and the emergency diesel generators. Makeup from the river would potentially be lost due to loss of the Seismic Category II pipe line, but the previous evaluations indicate cooling would continue. Temporary lines could be installed in the 22 days cooling that the inventory would provide. If a tornado were to damage the spray headers or remove some water, the emergency diesel power connection to the tower makeup pumps on the river would assure sufficient cool river water to provide essentially once through cooling, the same as described in the FSAR[2].

Conclusion

It is our conclusion from the evaluation performed that the cross connection meets safety requirements and that it can be installed when the plant is in refueling mode "star" as described in the Technical Specifications.

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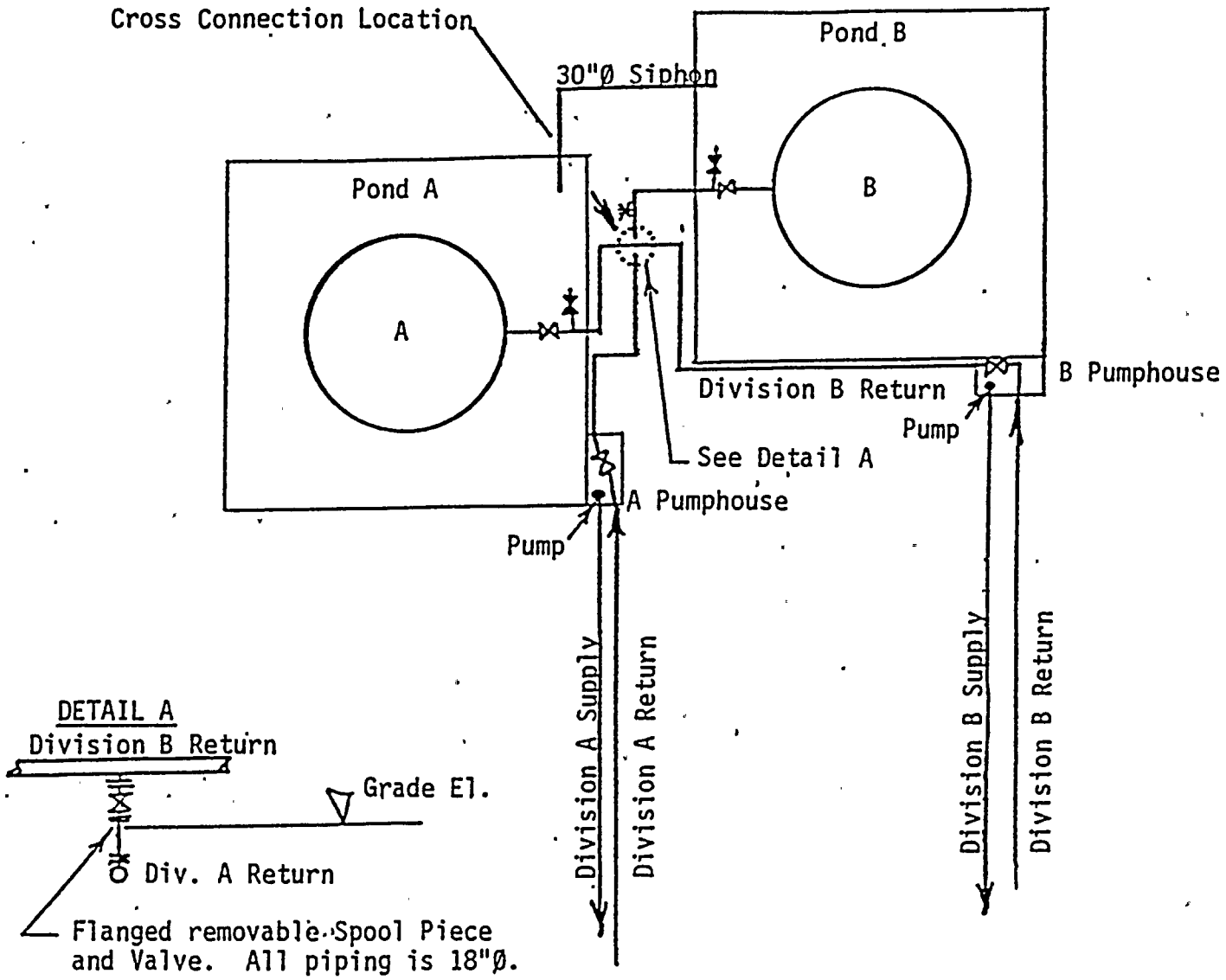
[1] Supply System Calculation ME-02-85-75 - "Evaluation of SSW Cross Connection"

[2] FSAR Section 9.2.5

ATTACHMENT II

Standby Service Water Flow Paths



NOTE: Normally spool piece cross connection and valve are removed and connections to return line are blind flanged. During outage when draining a pond (plant in mode "*") the spool piece may be installed to allow aligning valves so B return can go to B pond and vice versa for A.

* Division A Return runs underground between ponds.