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March 23, 1981

U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region V
Suite 202, Walnut Creek Plaza
1990 North California Boulevard
Walnut Creek, California 94596

Attention: R. H. Engelken, Director

Gentlemen:

Subject: Docket No. 50-206
IE Bulletin No. 80-24
Prevention of Damage Due to Water Leakage Inside Containment
San Onofre Nuclear Generating Station
Unit 1

By letter dated November 21, 1980, you forwarded IE Bulletin No. 80-24 for our action. IE Bulletin No. 80-24 requires that a written report be submitted, signed under oath or affirmation, within 45 days. Our letter dated December 31, 1980, deferred our reply until March 1, 1981. Subsequently, our letter dated March 3, 1981, further delayed the reply until March 20, 1981.

Submitted herewith as Enclosure 1 is the information requested by IE Bulletin No. 80-24. The organization of the information contained in Enclosure 1 corresponds to that enumerated in the subject IE Bulletin.

The preparation and review of the report required by the subject IE Bulletin has expended approximately 360 manhours, exclusive of administrative and clerical functions. Corrective actions to comply with this IE Bulletin will require an estimated additional 80 manhours of technical and engineering classifications.

If you have any questions concerning this matter, please contact me.

Subscribed on this 23 day of March, 1981.

By J G Haynes
J. G. Haynes

OFFICIAL SEAL
AGNES CRABTREE
NOTARY PUBLIC - CALIFORNIA
PRINCIPAL OFFICE IN
LOS ANGELES COUNTY
My Commission Exp. Aug. 27, 1982

Subscribed and sworn to before me this 23rd day of March, 1981.

Agnes Crabtree
Notary Public in and for the County of Los Angeles, State of California

Q

cc: Director, Office of Inspection and Enforcement

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Enclosure 1

Report in Response to IE Bulletin No. 80-24,
"Prevention of Damage Due to Water Leakage Inside Containment"

Item 1

Provide a summary description of all open cooling water systems present inside containment.

Response:

The service water system is the only open system inside containment, because its water supply is the service water reservoir. The use of service water in the containment is very limited. The nine service water hose stations are normally closed and opened manually when they are used. This allows the operator to examine the valve on completion of use and inspect to make sure it is not leaking when closed. The bearing lubrication water to the reactor sump pump and recirculation pumps is used only when the pumps are operating. This is accomplished by using solenoid actuated valves that open the service water line to the pump when it is operating. See Attachment 1 for further information. It should be noted that flow of water into containment via the service water system is an infrequent occurrence because the hose stations are normally closed, the recirculation pumps are not used, and the reactor sump pumps are operated infrequently.

Item 1(a)

Mode of operation during routine reactor operation and in response to a LOCA.

Response:

The containment isolation valves of the service water system remain open during normal operation and are closed in response to a LOCA condition. Bearing lubrication for each recirculation pump is provided by a system internal to the pump during a LOCA condition. The reactor sump pump is neither used nor required in a LOCA condition.

Item 1(b)

Source of water and typical chemical content of water.

Response:

Water for the service water system is supplied by the service water reservoir. See Attachment 1(b) for the chemical analysis of the water.

Item 1(c)

Materials used in piping.

Response:

A complete description of the piping specification, size, ASTM number, operating temperature and pressure may be found in Attachment 1(c).

Item 1(d)(e)

Experience with system leakage. History and type of repairs to coolers and piping systems (i.e., replacement, weld, braze, etc.).

Response:

In order to respond to this item, the service water system in the containment was researched using the applicable P&ID's, system descriptions, and cognizant personnel at San Onofre Unit 1. The investigation of leaks inside the containment was done using the maintenance records, the station incident reports, and contacts with the watch engineers and reactor operators. These records and interviews reveal only one report of leakage of the service water system inside containment.

On February 4, 1977, a Request for Equipment Repair for the west sphere sump pump was originated due to water leaking through the solenoid valve. At that time San Onofre Unit 1 was down for a scheduled refueling outage. The repair was completed on March 14, 1977 by cleaning out the solenoid valve. The originator of the Request for Equipment Repair recalls the following: The sphere sump pump usually operates about once every two to seven days, and any operation which occurs more frequently than every two days will alert the watch engineer to investigate. In this instance, the sphere sump pump operated about every four hours, which is estimated to be a leak rate through the valve of two gallons per minute. After the repair in 1977, this has happened once or twice; in each case, the leak was stopped by closing the associated containment isolation valve. Upon opening the containment isolation valve, the problem in the solenoid valve had corrected itself. During the current outage, the sphere sump pumps were replaced with pumps that do not require a water supply for bearing lubrication. The valves are shut and tagged to remain so. Thus, this type of problem has been eliminated for the sphere sump pumps.

No record of any other leak of the service water system inside containment has been found.

Item 1(f)

Provisions for isolating portions of the system inside containment in the event of leakage including vulnerability of those isolation provisions to single failure.

Response:

The service water system has two containment isolation valves, one inside (CV-537) and one outside (CV-115), which are powered by F-train and G-train, respectively, to insure against a single failure. Both valves close on containment isolation.

Item 1(g)

Provisions for testing isolation valves in accordance with Appendix J to 10 CFR 50.

Response:

Containment isolation valves CV-115 and CV-537 are included in the containment penetration leak rate testing program implemented at San Onofre Unit 1 as described in our letter of April 21, 1976 on the subject of "Containment Leakage Testing," from K. P. Baskin to Robert A. Purple.

Item 1(h)

Instrumentation (pressure, dew point, flow, radiation detection, etc.) and procedures in place to detect leakage.

Response:

Since the service water system is non-radioactive and is a cold water system, leakage into the containment would have little effect on instrumentation which detects pressure, humidity, or radioactivity. Instrumentation used to detect leakage into a sump would be effective in this situation. Sump level instruments are described in the response to Item 2.

Item 1(i)

Provisions to detect radioactive contamination in service water discharge from containment.

Response:

The service water system does not have a return or discharge line out of containment. When the service water hose stations are used, or when pump bearing lubrication is used, the discharge water will be directed to the sphere sump, where it mixes with water collected by floor drains and other drains. Discharge water from the sphere sump is directed to the decontamination drain tank in the Radwaste System. During power operation, the sphere sump pump operates about every two to seven days, but the reactor sump pump rarely operates.

Item 2

The several parts of Item 2 are prefaced by the statement, "For plants with open cooling water systems inside containment take the following actions:"

Item 2.a

Verify existence or provide redundant means of detecting and promptly alerting control room opertors of a significant accumulation of water in containment (including the reactor vessel pit if present).

Response:

The containment sphere has two sumps, the reactor sump and the sphere sump, both located inside the secondary shield. The reactor cavity (reactor pit) drains by gravity through a pipe to the reactor sump. The reactor sump pump starts and stops on signal from level switch LS-81. The reactor sump has a high level alarm actuated by LS-35. The reactor sump pump discharge is piped to the sphere sump. The sphere sump pump starts and stops on signal from LS-80. The sphere sump has a high level alarm actuated by LS-82. In compliance with Section II.F.1(5) of NUREG-0737, continuous indication of containment water level (including sphere sump level) will be installed. The actual date of installation will depend upon the delivery date of the level instruments.

Item 2.b

Verify existence or provide positive means for control room operators to determine flow from containment sump(s) used to collect and remove water from containment.

Response:

Level switches LS-81, LS-35, LS-80, and LS-82 are annunciated in the main control room. Sphere sump level indicators are designed as separate and redundant instruments, including power supplies, for indication in the main control room. Since the sphere sump pump operates on a fairly regular basis, these methods may be used to provide positive means for control room operators to determine flow from the sphere sump; however, since the reactor sump pump rarely, if ever, is required to operate, positive means to determine flow from the reactor sump do not appear to be feasible.

Item 2.c

Verify or establish at least monthly surveillance procedures, with appropriate operating limitations, to assure plant operators have at least two methods of determining water level in each location where water may accumulate. The surveillance procedures shall assure that at least one method to remove water from each such location is available during power operation. In the event either the detection or removal systems become inoperable, it is recommended that continued power operation be limited to seven days and added surveillance measures be instituted.

Response:

Surveillance of the operability of level switches LS-81, LS-35, LS-80 and LS-82 or sump level indicators would require manual elevation of the float associated with each respective instrument. Because the sumps are located at elevation minus 10'-0" and the only access is through the "B" steam generator compartment, ALARA considerations do not permit personnel entry into the steam generator compartment during power operation. Therefore, it is not possible to conduct surveillance on the sump level switches during power operation.

With respect to surveillance to assure that at least one method to remove water from each location is available during power operation, judging by conceptual engineering, this is feasible for the sphere sump, but not for the reactor sump or the reactor cavity. As indicated in our response to Item 2b, the sphere sump pump operates on a fairly regular basis, so an increase or decrease in frequency of operation can be detected; however, the reactor sump pump does not normally operate, there is usually no accumulation of water in the reactor sump, and the reactor sump pump (being dry) cannot be tested manually. Thus, surveillance procedures for the reactor sump pump are not possible.

The third location where water may accumulate, although there is no history of such accumulation, is the reactor cavity. The reactor cavity contains no instrumentation and no pumps; additionally, there is no way to perform visual surveillance, certainly not at power and with great difficulty during shutdown.

In light of the above information and because of the layout of the service water system inside containment, the sphere sump level instrumentation and sphere sump pump operation are sufficient capability to detect and remove any water leakage in the containment. The pipe routing of the service water system is such that all the piping is outside the primary shield and below the operating deck (elevation 42'-0"), except for four one-inch risers for service water hose connections which extend about three feet above the operating deck. Any leaks which might occur in the service water system would not be collected in the reactor sump or the reactor cavity. First, for the piping outside the primary shield and below the operating deck, any leaking water would be collected in the sphere sump. Second, for the risers above the operating deck, should a leak occur, the curbing around the refueling cavity is designed to prevent leakage into the cavity, and the water would drain to the sphere sump. Therefore, leakage from the service water system will be collected in the sphere sump. Since there are two independent level indications (pump start and high level alarm) as well as two sphere sump pumps, this redundancy will provide sufficient assurance that any service water leaks will be detected and removed from the sphere sump.

Item 2.d

Review leakage detection systems and procedures and provide or verify ability to promptly detect water leakage in containment, and to isolate the leaking components or system. Periodic containment entry to inspect for leakage should be considered.

Response:

Leakage detection systems for the sumps have been described in Items 2a, 2b, and 2c. Procedures will be developed to maintain a continuous record of sump pump operation for the purpose of identifying trends. These procedures will be effective prior to return to power operation.

Item 2.e

Beginning within 10 days of the date of this bulletin, whenever the reactor is operating and until the measures described in (a) through (d) above are implemented, conduct interim surveillance measures. The measures shall include where practical (considering containment atmosphere and ALARA considerations) a periodic containment inspection or remote visual surveillance to check for water leakage. If containment entry is impractical during operation, perform a containment inspection for water leakage at the first plant shutdown for any reason subsequent to receipt of this bulletin.

Response:

This item is not applicable since San Onofre Unit 1 has been in cold shutdown with continuous containment access since before the issuance of IE Bulletin No. 80-24.

Item 2.f

Establish procedures to notify the NRC of any service water system leaks within containment via a special licensee event report (24 hours with written report in 14 days) as a degradation of a containment boundary.

Response

Procedures to notify the NRC of leaks in the service water system inside containment via a special licensee event report as a degradation of a containment boundary will be developed and placed in effect prior to return to power operations.

Item 3

For plants with closed cooling water systems inside containment provide a summary of experiences with cooling water system leakage into containment.

Response:

See Attachment 3, "Summary of Experiences With Closed Cooling Water Systems Leakage Into Containment."

ATTACHMENT 1

SUMMARY DESCRIPTION OF SERVICE WATER SYSTEM

OPEN SYSTEM

SERVICE WATER SYSTEM

FUNCTION

The Service Water System supplies water from the reservoir to service water outlets throughout the Station. The system also supplies water to the Domestic Water System and other equipment.

DRAWING REFERENCE

568776	Miscellaneous Water System, P&ID

DESIGN CRITERIA

SYSTEM

The service water system provides service water at a capacity of 15 gpm and a pressure of 35 to 65 psig to service water outlets throughout the Station, supplies 50 gpm of seal water flow to each mechanical vacuum pump during Station startup, and provides 60 gpm for the Domestic Water System.

The service water system enters the containment sphere at penetration No. A-11. It has two containment isolation valves CV-115 and CV-537, outside and inside respectively, and powered by diverse power supplies. The valves are open during normal plant operation and closed in response to a LOCA condition. There are nine service waterhose stations inside containment that are closed by a manual valve. The service water system can also supply bearing lubricating water to all sump pumps through the actuation of a corresponding solenoid valve.

SERVICE WATERHOSE STATIONS

4 @ 42' Deck
2 @ 22'-4" Deck
3 @ -10' Deck

SERVICE WATER OUTLETS TO SUMP PUMPS FOR BEARING LUBRICATION

	Pump No.	Actuating Solenoid Valve
Recirculation Pumps	G-45A	SV-37
	G-45B	SV-38
[1]Sphere Sump Pumps	G-21A	SV-73
	G-21B	SV-36
Reactor Sump Pump	G-39	SV-71

COMPONENTS

Service Water Pumps (G-17A and G-17B)

Capacity per pump at design pressure	300 gpm
Design differential pressure	47 psi
NPSH required	26 feet (11.3 psi)

OPERATION

One service water pump is normally in operation maintaining a system pressure 70 psig with the second pump automatically started by pressure switch PS-48 and PS-49 if the service water header pressure drops to 35 psig. An alarm will annunciate upon automatic starting of the second pump. The pump switches and alarms are on the vertical board in the control room.

The Service Water System pressurizes the Fire Protection System when the fire system is not in use.

[1]Service water lines to the Sphere Sump Pumps are currently valved off and tagged to remain in the off position. This is because new pumps have been installed that do not require bearing lubrication.

ATTACHMENT 1(b)

CHEMICAL ANALYSIS OF SERVICE WATER

SONGS Service Water Analysis

Date	01-26-79	04-13-79
Calcium (as $CaCO_3$), ppm	159	180
Magnesium (as $CaCO_3$), ppm	101	90
Sodium (as $CaCO_3$), ppm	153	160
Potassium (as $CaCO_3$), ppm	4	4
	417	434
Bicarbonate Alkalinity (as $CaCO_3$), ppm	101	114
Chloride (as $CaCO_3$), ppm	111	118
Sulfate (as $CaCO_3$), ppm	161	197
Nitrate (as $CaCO_3$), ppm	1	0.4
Orthophosphate (as $CaCO_3$), ppm	2	3
	376	432
Iron, ppm	0.1	0.07
Copper, ppm	0.00	0.09
Manganese, ppm	0.01	0.01
Silica, ppm	9.2	8.2
pH	7.8	8.1
Conductivity, μmhos	835	878
Turbidity, NTU	1	2

ATTACHMENT 1(c)

MATERIALS USED IN SERVICE WATER PIPING

Line Number	Service	Spec	Size	ASTM	SCH	Thermal Insulation	Max. Oper. Press. PSIG	Max. Oper. Temp °F
730	Line 817, plant service water header to reactor deck elevation 42'-0"	KN KN	1" 2"	A-106-B A-106-B	40 40	— —	90 90	AMB AMB
731	Line 730 (plant service water header) to reactor deck elevation 42'-0"	KN	1"	A-106-B	40	—	90	AMB
732	Line 730 (plant service water header) to reactor building elevation (-) 10'-0"	KN	1"	A-106-B	40	—	90	AMB
733	Line 730 (plant service water header) to reactor building elevation (-) 10'-0"	KN	1"	A-106-8	40	—	90	AMB
811	Service water reservior D-5 to service water pump G-17B	KN KN	8' 4"	A-53-B	40	— —	40	AMB AMB
812	Line 811 to service water pump G-17A	KN	4"	A-53-B	40	—	40	AMB
813	Line 811 to fire pump G11	KN	8"	A-53-B	40	—	40	AMB
817	Service water pump G-17A to plant serice water header	KN	3"	A-53-B	40	—	90	AMB
885	Line 730 to sphere sump pump G-21 (Dwg. M20-565772)	KN KN	2" 3/4"	A-106-8 A-106-8	40 40	— —	90 90	120 120
886	Line 730 to reactor sump pump G-39 (Dwg. M20-568872)	KN	3/4"	A-106-8	40	—	90	120
8000	Line 730, plant service water header to reactor deck elevation 22'-4"	KN	1"	A-106-8	40	—	90	AMB
8001	Line 730, plant service water header to reactor deck	KN	1"	A-106-8	40	—	90	AMB
8011	Line 730, header to reactor deck, elevation 42'-0"	KN	1"	A-106-8	40	—	90	AMB
8012	Line 730, header to reactor deck, elevation 41'-0"	KN	1"	A-106-8	40	—	90	AMB
8013	Line 730, header to reactor deck, elevation (-) 10'-0"	KN	1"	A-106-8	40	—	90	AMB