NRC-00-091

NMC
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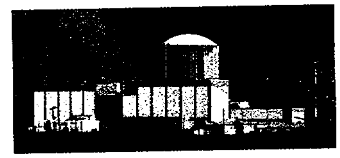
Kewaunee Nuclear Power Plant
N490, State Highway 42
Kewaunee, WI 54216-9511
920-388-2560

Operated by
Nuclear Management Company, LLC



November 27, 2000

10 CFR 50.73

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

Ladies/Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Reportable Occurrence 2000-010-01

In accordance with the requirements of 10 CFR 50.73, "Licensee Event Report System," the attached Licensee Event Report (LER) for reportable occurrence 2000-010-01 is being submitted. This report does not contain any new commitments.

Sincerely,

Kenneth H. Weinhauer
Assistant Site Vice President

RDS

Attach.

cc - INPO Records Center
US NRC Senior Resident Inspector
US NRC, Region III

IE22

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(6-1998)

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Kewaunee Nuclear Power Plant	05000305	1 OF 10

TITLE (4)
Testing and Evaluation Determine the Service Water System has a Lower Design Basis Temperature Than Previously Believed

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
06	12	2000	2000	– 010 –	01	11	27	2000	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	0	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)	0		20.2203(a)(1)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
			20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
			20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Roy D. Scott – Senior Shift Technical Advisor	920-388-8638

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On June 12, 2000, during the review of service water system testing performed during the 2000 refueling outage, it was determined that both emergency diesel generators were out of service for a short period of time in 1991 due to elevated lake temperatures. Additionally, both trains of local area fan coil units located on the fan floor and mezzanine levels in the auxiliary building were out of service at separate times. The fan coil units maintain post accident environmental conditions to ensure safety related equipment located in these areas remain operable.

Prior to commencing power operation after refueling, compensatory actions were taken to ensure operability of all equipment. After the outage, design changes were implemented to increase the SW flow to safety related components. Additional design changes are being evaluated to further increase the flow to the emergency diesel generators. These modifications are scheduled for the 2001 refueling outage.

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Kewaunee Nuclear Power Plant	05000305	2000	010	01	2 of 10

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DESCRIPTION OF EVENT

On June 12, 2000, during the review of service water system testing performed during the 2000 refueling outage, it was determined that both emergency diesel generators were out of service for a short period of time in 1991 due to elevated lake temperatures. Additionally, both trains of local area fan coil units located on the fan floor and mezzanine levels in the auxiliary building were out of service at separate times. The fan coil units maintain post accident environmental conditions to ensure safety related equipment located in these areas remain operable.

The original design of the service water system (SW) [BI] assumed a single train (two pumps [P] per train) provided sufficient safeguards cooling during a design basis accident assuming an inlet temperature of 66° F. During an internal audit in 1990, it was determined that lake temperature had exceeded 66° F in the past. Questions arose as to the basis for this temperature. Testing and an evaluation performed in 1990 and 1991 demonstrated that an inlet temperature of 80° F was acceptable. This testing involved placing each service water train in its design bases accident line-up separately. This was consistent with the Updated Safety Analysis Report (USAR) assumption that the worst case single failure was a loss of an entire train.

During the 1999-2000 operating cycle it was identified that the backpressure caused by common discharge piping [PSP] reduced service water flow through serviced components when both trains were operating. To gain a better understanding of this phenomenon, to address other questions concerning the service water system performance, and to obtain data to develop a service water flow model, additional testing was scheduled for the 2000 refueling outage. Unlike the previous tests and evaluations, a loss of a single train was not assumed to be the worst case. The test and evaluation during the 2000 outage included the affects on service water flow and pressure due to:

1) Failures of single components and not a whole train,
2) Back pressure caused by common discharge piping,
3) Plugging of service water pump discharge strainers [FLT],

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Kewaunee Nuclear Power Plant	05000305	2000	010	01	3 of 10

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

4) Failure of containment fan coil unit [FCU] discharge throttle valves [V] to fully open, and

5) The effects of component cooling water heat exchanger [HX] control valves failing open (refer to Fig. 1).

Each emergency diesel [DG] jacket water cooler is supplied by its associated train of service water. These separate trains of service water discharge into a common header after exiting the jacket water coolers (refer to Fig. 2). During the 1990 and 1991 tests, the cooler in the train not under test had no flow established. This line-up maximized flow through the train under test but did not reflect reduced flow associated with a backpressure. This reduced flow would have caused elevated diesel generator jacket water temperature under design basis accident conditions with a service water inlet temperature of 80° F. Calculations determined that during accident conditions, assuming measured fouling factors, both diesels remained operable as long as service water inlet temperature remained less than or equal to 75.7° F. Because the elevated jacket water temperature was not within the parameters supplied by the diesel generator manufacturer, the diesel generators were conservatively assumed to be out of service whenever lake temperature exceeded 75.7° F. This occurred on August 8, 1991 from 19:21 hours to 20:11 hours.

All of the local area fan coil units are also supplied by separate trains of service water and discharge into a common header. The testing performed in 1990 and 1991 did not include service water flow to the fan coil units in the opposite train. Like the emergency diesel generators, there is a backpressure effect of having both trains of service water supplying the fan coil units which have common discharge piping. Additional complications occur with the local area fan coil units because the air side of the units also discharge into a common air duct [DUCT]. This causes a reduction in air flow similar to that found for common service water discharge piping. Analysis of the fan coil units was performed using test data that simulated various failures.

The analysis determined that two sets of local area fan coil units experience significant reduction in flow as a result of increased backpressure due to sharing a common discharge. These fan coil units are located on the fan floor and mezzanine levels of the auxiliary building.

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Kewaunee Nuclear Power Plant	05000305	2000	010	01	4 of 10

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

For the fan floor fan coil units, a failure of cooling water to one train while both trains are running was found to be worst case. This occurs because airflow is reduced due to a backpressure in the air duct and service water is supplied to only one unit (refer to Fig. 3). Analysis revealed that the fan floor fan coil units would not have removed the required heat load on several occasions because of high lake water temperature and assuming a failure of the service water supply valve to one train. Based on historical service water temperature data, both fan floor fan coil units have been out of service 11 times since 1990. The maximum time both fan coil units were out of service was 36 hours on August 22 to August 23, 1995.

The mezzanine area fan coil units do not have a control valve in the service water supply line like the fan floor area fan coil units (refer to Fig. 4). Therefore, a failure of one fan with both trains of service water available is the worst case for these units. Analysis revealed that the mezzanine area fan coil units would not have removed the required heat load on three occasions because of high lake water temperature and assuming a fan failure. Both mezzanine fan coil units have been out of service three times since 1990. The worst case was for eight hours and 47 minutes, which occurred on August 17, 1995 from 14:32 hours to 23:19 hours.

The testing performed this outage also revealed that the margin on containment fan coil units and component cooling water heat exchangers were less than expected. The containment fan coil units are used to reduce containment pressure following a design basis accident. Containment fan coil units [BK] were re-analyzed at a reduced flow and found to have adequate heat removal.

CAUSE OF THE EVENT:

This event was caused by a failure to recognize a design interaction during original plant construction and the assumption that a loss of a whole train was a limiting failure. When the plant was built, the designers did not anticipate that backpressure from opposite trains components would negatively affect flow. Due to the length of time since plant design, we can not determine if they did not realize the potential for this effect or if they did not consider it part of the plants design basis to have both trains operating post accident. Previous testing failed to identify this vulnerability because each service water train was tested separately, as assumed in the design basis. Therefore the backpressure effect was not observed.

ANALYSIS OF THE EVENT:

This event is being reported in accordance with 10CFR50.73(a)(2)(ii)(B), as a condition that was outside of the design basis of the plant. Contrary to the design basis of the plant both diesel generators were out of service for approximately 50 minutes. This event was also reported in accordance with 10CFR50.72(b)(2)(i) and 10CFR50.72(b)(2)(iii)(D) at 9:15 CST on June 12, 2000.

Kewaunee's probabilistic risk assessment (PRA) was reviewed to determine the significance of this event. The analysis found an increase in the core damage frequency of 1.8E-07 as a result of both diesels being inoperable for 50 minutes.

It is important to note that both diesels would only be inoperable if both started to mitigate an event. If only one diesel started, there would be no flow reduction due to backpressure in the common discharge because the non-operating diesel would not be discharging into the common header. Furthermore, although the diesel generator coolers are the same model, there is difference in their performance. Therefore, if design basis event had occurred and both diesels started, an alarm on the B diesel would have been expected to come in first, the calculated maximum allowable service water temperature for diesel generator B was 71.7 degrees F. Therefore, the operators would shutdown this diesel first. Once the B diesel was shutdown, the backpressure effect would be eliminated. Therefore the actual increase in core damage frequency would be less than calculated.

CORRECTIVE ACTIONS:

1) Administrative actions were taken to declare the affected equipment inoperable when lake temperature is greater than 73° F. An annunciator to alert the Operators when lake temperature exceeded 73° F was installed to aid the operators in diagnosing high lake temperatures. These actions were relaxed after

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Kewaunee Nuclear Power Plant	05000305	2000	010	01	6 of 10

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

changes were made to the fan coil units and service water to the component cooling water heat exchangers, see corrective action 2, 5, 6 and 7. Currently a limitation exists at 77 degrees at which time the Operator is instructed to remove a diesel generator from service, see corrective action 8. The alarm setpoint is 76.2 degrees to provide warning to the Operators of increasing service water temperature.

2) The air filters were removed on the Auxiliary Building mezzanine fan coil units to increase airflow.

3) A temporary change (TCR) was implemented to fail open the train A strainer backwash valves. The backwash valves flush debris from the strainers when differential pressure across the strainers reaches a predetermined value. Placing the strainers in continuous backwash prevents a high differential pressure from developing in case of instrument failure. A high differential pressure would reduce the margin on the containment fan coil units. When the design change to add margin was completed (see corrective action 5), this temporary change was removed.

4) Administrative action was taken to ensure that service water to the turbine building is supplied by the B train of service water. Train A of service has less margin due to supplying spent fuel pool cooling and other components at a higher elevations. Because only one train of service water can supply the turbine header at a time, having it supplied by train B ensures sufficient flow to train A safeguards equipment. Analysis has shown that train B has sufficient margin to supply the turbine header and its associated safeguards components. When the design change to add margin to the containment fan coil units was completed (see corrective action 5), this temporary change was removed.

5) To add margin to the containment fan coil units, a design change was performed to change the safety injection signal to the component cooling water heat exchanger (HX) SW outlet valves. Each component cooling HX has two SW outlet valves; a throttle valve used for normal operation and a motor operated gate valve that opens on a safety injection signal (Fig. 1). Testing has demonstrated that for immediate emergency operation, the throttle valve provides sufficient cooling to safeguard components. The gate valve would be required for plant cool down during containment sump recirculation. Previously, the gate valve received an open signal and the throttle valve's position was temperature controlled. The design change results in the throttle valve opening at the start of the

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Kewaunee Nuclear Power Plant	05000305	2000	010	01	7 of 10

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

accident with the gate valve closed. The gate valve can be opened as required when containment sump recirculation is started. This adds margin to the containment fan coil units while maintaining sufficient flow through the heat exchangers for immediate emergency loads. The increase in service water pressure is required to ensure maximum heat removal without flashing in the service water lines during maximum containment temperature. Containment temperature will have been reduced significantly by the time containment sump recirculation is required allowing the gate valve to be opened without flashing in the service water lines.

6) The service water discharge piping for the mezzanine fan coil units was split. This will eliminate the backpressure effect thereby increasing service water flow to both units.

7) A temporary design change was implemented to fail open the inlet valves to the fan floor fan coil units. A permanent design change is being implemented to remove these valves.

8) A design change will be implemented at the next refueling outage, which will split the discharge header of the diesel generator cooler outlet. This will remove the backpressure effect and allow removing the final administrative action (corrective action 1).

ADDITIONAL INFORMATION:

Similar Events:

None

Equipment Failures:

None

Other Information:

None.

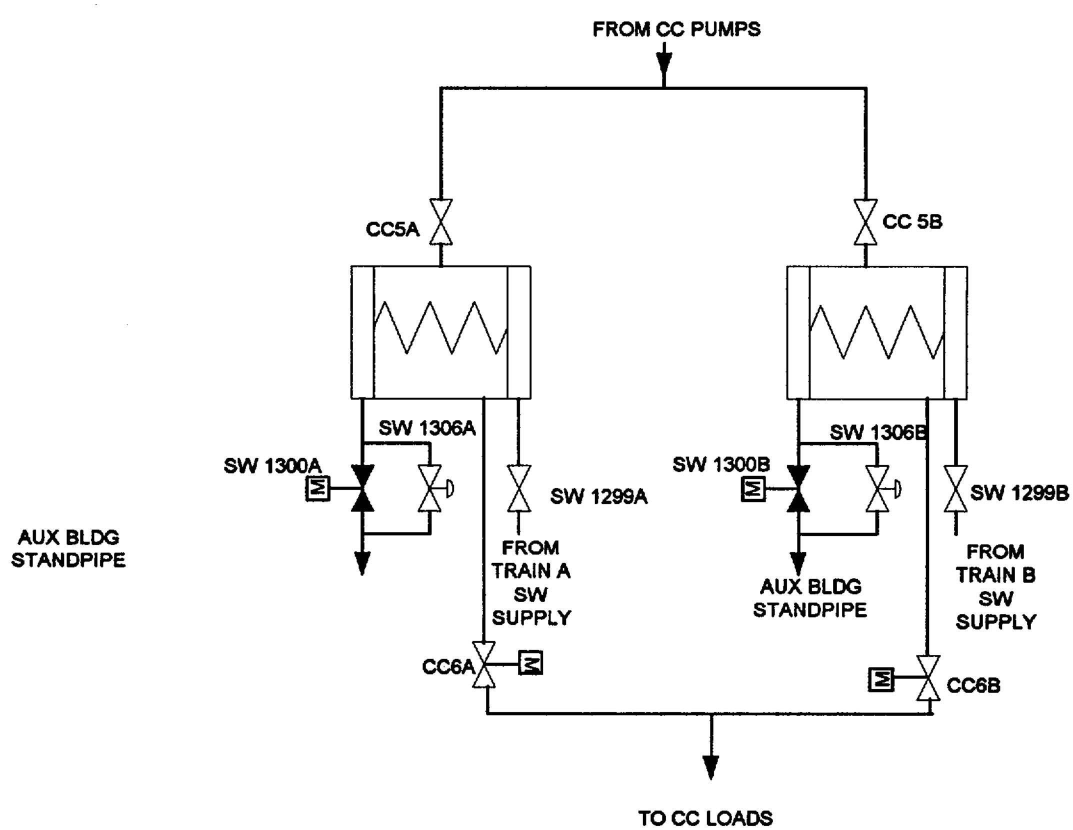
LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Kewaunee Nuclear Power Plant	05000305	2000	010	01	8 of 10

TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

SERVICE WATER TO
COMPONENT COOLING
WATER HEAT EXCHANGERS

Figure 1



LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Kewaunee Nuclear Power Plant	05000305	2000	010	01	9 of 10

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

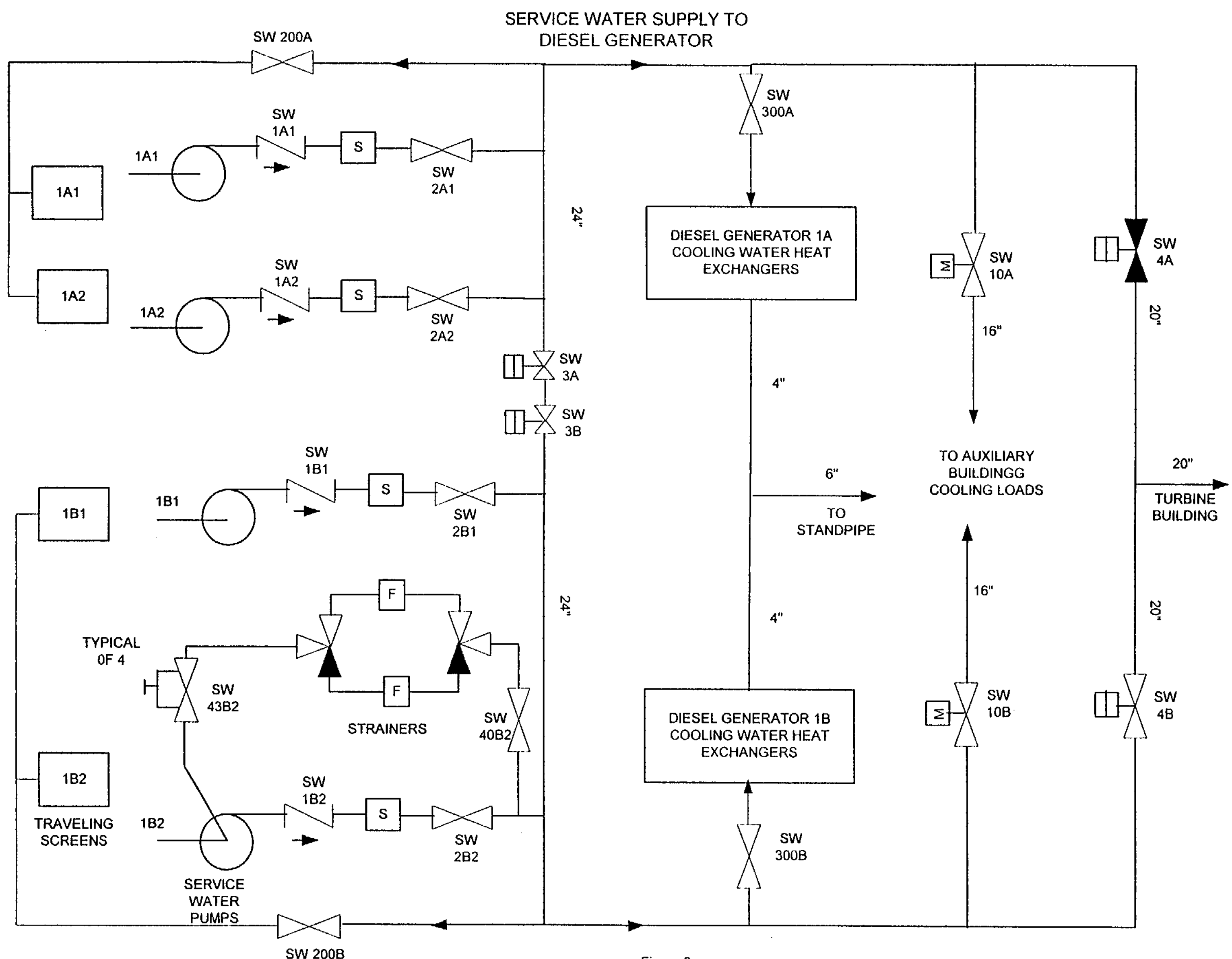


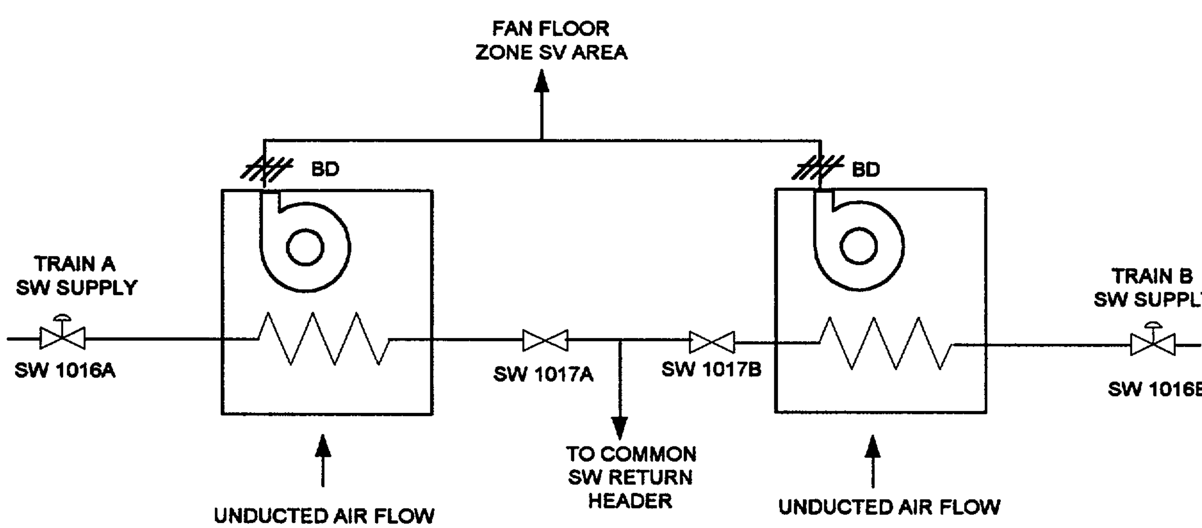
Figure 2

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Kewaunee Nuclear Power Plant	05000305	2000	010	01	10 of 10

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

SERVICE WATER SUPPLY TO AUXILIARY BUILDING FAN FLOOR FAN COIL UNITS

Figure 3



SERVICE WATER SUPPLY TO AUXILIARY BUILDING MEZZANINE FAN COIL UNITS

Figure 4