Enclosure (2) to
P-80218

FORT ST. VRAIN

INSERVICE INSPECTION AND TESTING PROGRAM

SURVEILLANCE REQUIREMENTS REVIEW

FOR THE

REACTOR AUXILIARY COOLING WATER SYSTEMS

- Circulating Water System (41)
- Service Water System (42)
- Fire Protection-Firewater Supply System (45)
- Reactor Plant Cooling Water System (46)
- Purification Cooling Water System (47)

EE-46-0004 Rev. 1
June 24, 1980

8007280652

REPORT EE-46-0004

FORT ST. VRAIN INSERVICE INSPECTION AND TESTING PROGRAM

SURVEILLANCE REQUIREMENTS REVIEW FOR THE REACTOR AUXILIARY COOLING WATER SYSTEMS

1. INTRODUCTION

A review was performed of the current surveillance requirements for the reactor auxiliary cooling water systems, i.e., the circulating water system (41), the service water system (42), the fire protection system-firewater supply section (45), the reactor plant cooling water system (46), and the purification cooling water system (47). As a result of this review, additional or modified surveillance requirements may have been recommended to meet the criteria established for the Fort St. Vrain inservice inspection and testing program which has been presented to the Nuclear Regulatory Commission and which are specified in Ref. 1. The review included the reference documents listed in section 5 of this report, and in particular the proposed ASME Code Section XI, Division 2, Draft. An explanation is provided when the current and recommended surveillance differ from the proposed Code requirements. The review also included the operating experience with the equipment at the plant.

The fire fighting portion of the fire protection - firewater system will be discussed in a separate report covering the whole fire protection system.

Equipment supports and radiation monitoring instruments are also excluded from the scope of this review, since their surveillance requirements will be reviewed in separate reports.

2. SURVEILLANCE CLASSIFICATION

2.1 SYSTEM FUNCTIONS

All the reactor auxiliary cooling water systems, except the fire protection-firewater supply system, are used during normal operation to remove heat from plant components and transfer it to the heat sink. In addition to their normal function, part of the systems under consideration are used to perform one or several safety functions as described below.

(a) Emergency core cooling

a.1 - Alternate cooling method (ACM): This method of operation is used to cope with the consequences of a permanent loss of forced circulation accident. It is postulated that this accident could be the result of a generalized fire in the congested cable areas which has disabled all the emergency power supplies. Only equipment with an alternate power supply from the ACM diesel generator is available to cope with the consequences of such an accident. The following parts of the reactor auxiliary cooling water systems are used for alternate cooling method operation:

- that part of the purification cooling water system which cools the helium purification coolers, to allow depressurization of the reactor through the helium purification system;
- that part of the reactor plant cooling water system used to assure residual heat removal through the liner cooling system, after redistribution of the cooling water flow from areas of lesser to areas of higher heat loads than during normal operation, and after pressurizing the system to maintain subcooling while allowing operation at higher temperatures than normal;
- that part of the service water system required to cool the reactor plant cooling water system; those parts of the service water system and reactor plant cooling water system which cool the purification cooling water system and the high temperature filter adsorbers (after connection of removable spool pieces); that part of the service water system used to return the cooling water flow from non-operating users to the service water cooling tower;
- that part of the circulating water system used for service water makeup from the storage ponds.

The above plant equipment provides for residual heat removal from the core. Under the postulated accident conditions, the firewater supply system is used for fire fighting, and firewater makeup and service water makeup is obtained

2.1 (cont.)

from the circulating water makeup system. Interconnections are provided so that the firewater could replace service water and reactor plant cooling water and be used as a backup for residual heat removal. However, due to the redundancy of the equipment items used for residual heat removal, and since it is desirable to maintain good quality reactor plant cooling water for long term cooling to prevent fouling of the liner cooling tubes, it is considered preferable not to assign a residual heat removal function to the firewater system for ACM operation.

a.2 - Safe shutdown cooling method: Following a design basis seismic event, where all non safety class I equipment is presumed to have failed, parts of the reactor auxiliary cooling water systems are required to operate to allow safe shutdown cooling of the plant, as described below:

- that part of the fire protection system which supplies firewater to the emergency feedwater and emergency condensate headers for residual heat removal using the steam generators, and for operating the helium circulators on water turbine drive;
- those parts of the reactor plant cooling water system and of the purification cooling water system used to cool the essential plant components required to operate to perform safe shutdown cooling, including isolation of the presumably failed non safety class I portions of the system which might prevent adequate cooling water flow to the essential users;
- that part of the service water system required to supply service water for cooling the two systems in the item above;
- that part of the circulating water makeup system used for firewater and service water makeup from the storage basins.

(b) Secondary containment: Portions of the reactor plant cooling water system and the purification cooling water system piping and valves function as secondary containment following a leak or a rupture in the PCRV liner or in heat exchangers which contain reactor coolant.

(c) Loss of offsite power and turbine trip: Parts of the circulating water system are used under such emergency conditions to remove heat from the condenser. Parts of the service water system are used to remove heat from other plant equipment required to remain operational under such circumstances.

(d) Loss of the main condenser: Part of the service water system, including the decay heat removal exchanger, can be used for residual heat removal in case of loss of cooling capability of the main condenser.

2.1 (cont.)

(e) Monitoring: Instrumentation is provided in the PCRV liner cooling loops which allows monitoring of PCRV thermal barrier performance. Instrumentation is provided in the circulating water system which monitors the blowdown flow to verify that an adequate dilution capacity exists for release of plant effluents. Additional monitoring of the cooling water systems themselves will be discussed as appropriate in this report.

2.2 SURVEILLANCE CLASSIFICATION

Based upon their functions, as described above, the components of the cooling water systems have been assigned to surveillance classes as outlined hereafter.

(a) Active equipment items, which, amongst other functions, participate in residual heat removal during ACM operation, are assigned to surveillance class S1 in accordance with criteria 2.1a, 2.2a, and 2.3a of Ref. 1.

(b) Active equipment items, not previously assigned to surveillance class S1, which amongst other functions, participate in safe shutdown cooling, are assigned to surveillance class S2 in accordance with criteria 2.1b, 2.2b and 2.3a of Ref. 1.

(c) Active equipment items, not previously assigned to surveillance class S1 or S2, and passive equipment items which are used for emergency core cooling or which have a secondary containment function are assigned to surveillance class S3 in accordance with criteria 2.1c, 2.2c and 2.3b of Ref. 1.

(d) Other non safety class I equipment items, not already assigned to a surveillance class, which have at least one of the functions listed under items (c) through (e) of paragraph 2.1 above, are assigned to surveillance class S4 in accordance with criteria 2.1d, 2.2d and 2.3c of Ref. 1.

Major equipment items are listed in table 1 with their assigned surveillance class.

2.3 APPLICABLE SURVEILLANCE CRITERIA

The criteria of Ref. 1 are considered applicable when making the surveillance review of the cooling water systems. These criteria, which concern operational readiness of systems, active components, and instrumentation and controls, as well as structural integrity are summarized in tables 2 through 5 hereafter. The following additional criteria are also considered in the review, and apply to locally actuated manual valves:

2.3 (cont.)

Criteria 3.2.2(e): The operational readiness of locally actuated manual valves assigned to surveillance class S1 or S2, which require actuation to allow the safety function to be adequately performed, shall be demonstrated by surveillance testing at least once every year to assure that such valve is capable of moving to the required position.

TABLE 1

SURVEILLANCE CLASSIFICATION OF MAJOR REACTOR AUXILIARY COOLING WATER SYSTEM EQUIPMENT ITEMS

Designation	Surv. Class	Equipment
SYSTEM 41		CIRCULATING WATER SYSTEM
C4105X and C4106X	S4	Emergency power supplied main cooling tower fans
C41--x	N/A	Other main cooling tower fans
E4101	N/A	Main condenser
E4103	N/A	Main cooling tower
P4101 and P4102	N/A	43 percent circulating water pumps
P4103 and P4104	S4	7 percent circulating water pumps (emergency power supplied)
P4115, P4116	N/A	Travelling screen wash water pumps
P4117A, P4117B	N/A	South Platte river circulating water makeup pumps
P4118A, P4118B	S1	Storage basin circulating water makeup pumps
P4118C	N/A	Storage basin circulating water makeup pump
P4119A, P4119B	N/A	St. Vrain creek circulating water makeup pumps
W4103, W4104	N/A	Circulating water settling basins
W4105, W4106	S3	Circulating water storage basins
SYSTEM 42		SERVICE WATER SYSTEM
C4201X, C4202X	S1	Service water cooling tower fans
E4201	S3	Service water cooling tower
E4202	S4	Decay heat removal exchanger
F4201	S3	Service water strainer
P4201, P4202	S1	Service water pumps
P4202S	S2	Service water pump
P4203, P4204	S1	Service water return pumps
P4204S	S4	Service water return pump
P4212 thru P4217	N/A	Well pumps
SYSTEM 45		FIREWATER SYSTEM
P4501	S2	Fire water pump
P4501S	S2	Emergency firewater pump
SYSTEM 46		REACTOR PLANT COOLING WATER SYSTEM
A4601, A4602	S3	Cooling water demineralizers
E4601 --- E4604	S3	Cooling water heat exchangers
F4601, F4602	S3	Cooling water filters
P4601, P4601S	S1	Cooling water pumps
P4602, P4602S	S1	Cooling water pumps
T4601, T4602	S3	Cooling water surge tanks
SYSTEM 47		PURIFICATION COOLING WATER SYSTEM
E4701, E4702	S3	Purification cooling water exchangers
P4701, P4702	S1	Purification cooling water pumps
T4701, T4702	S3	Purification cooling water expansion tanks

TABLE 2

CRITERIA FOR SURVEILLANCE CLASS S1 EQUIPMENT

OPERATIONAL READINESS OF THE SYSTEM (criteria 3.1a, 3.1d, 3.1e, 3.1f)

- Normal operation or testing at a frequency consistent with the highest active component test frequency (to the maximum extent with reactor at power) to demonstrate system performance and availability of emergency power sources.

OPERATIONAL READINESS OF PUMPS AND COMPRESSORS (criteria 3.2.1a)

- Normal operation or testing at a frequency and according to rules based on Code requirements.

OPERATIONAL READINESS OF VALVES HAVING AN ACTIVE SAFETY FUNCTION (criteria 3.2.2a, 3.2.2d)

- For all the valves, normal operation or testing at a frequency and according to rules based on Code requirements.
- Valves which do not operate can be tested to the requirements of surveillance class S2 if, during reactor operation, they are in the position required to perform their safety function. If they are also fail safe in that position, they need not be tested. Valves need not be tested if allowed by the Code.

OPERATIONAL READINESS OF INSTRUMENTATION AND CONTROLS (criteria 3.2.3a, 3.2.3d, 3.2.3e)

- Functional test, at least once each month for monitoring of active functions or at least once each quarter for monitoring of passive functions.
- Calibration, once each year.
- Valve instrumentation and controls, according to valve testing.

TABLE 2 (cont.)

STRUCTURAL INTEGRITY

- Does not apply to surveillance class S1 which deals only with active safety functions.

NOTES: (1) "Code" means the Draft ASME Code, Section XI, Division 2.

(2) Criteria are referenced as numbered in EE-SR-0001.

TABLE 3

CRITERIA FOR SURVEILLANCE CLASS S2 EQUIPMENT

OPERATIONAL READINESS OF THE SYSTEM (criteria 3.1b, 3.1d, 3.1e, 3.1f)

- Normal operation or testing at a frequency consistent with the highest active component test frequency (reactor at power or shutdown, pressurized or depressurized) to demonstrate availability and operability of the system.

OPERATIONAL READINESS OF PUMPS AND COMPRESSORS (criteria 3.2.1b)

- Normal operation or testing at least once each quarter, according to rules based on Code requirements.

OPERATIONAL READINESS OF VALVES HAVING AN ACTIVE SAFETY FUNCTION (criteria 3.2.2b, 3.2.2d)

- Safety/relief valves, rupture discs and automatic isolation valves, normal operation or testing at frequency and according to rules based on Code requirements.
- Remote manual isolation valves and check valves, normal operation or testing at least once a year, according to rules based on Code requirements.
- Valves which do not operate can be tested to the requirements of surveillance class S3 if, during reactor operation, they are in the position required to perform their safety function. If they are also fail safe in that position, they need not be tested. Valves need not be tested if allowed by the Code.

OPERATIONAL READINESS OF INSTRUMENTATION AND CONTROLS (criteria 3.2.3b, 3.2.3d, 3.2.3e)

- Functional test, at least quarterly for monitoring of active functions or at least once each year for monitoring of passive functions.
- Calibration, once each year.
- Valve instrumentation and controls, according to valve testing.

TABLE 4

CRITERIA FOR SURVEILLANCE CLASS S3 EQUIPMENT

OPERATIONAL READINESS OF THE SYSTEM (criteria 3.1c, 3.1d, 3.1e, 3.1f)

- Normal operation or testing individual active components at their respective test frequency.

OPERATIONAL READINESS OF PUMPS AND COMPRESSORS (criteria 3.2.1c)

- Normal operation or startup test at least once each quarter.

OPERATIONAL READINESS OF VALVES HAVING AN ACTIVE SAFETY FUNCTION (criteria 3.2.2c, 3.2.2d)

- Safety/relief valves and rupture discs, testing at frequency and according to rules based on Code requirements.
- Automatic isolation valves, normal operation or testing at least once a year, according to rules based on Code requirements.
- Remote manual isolation valves and check valves, normal operation or testing at least once every five years, according to rules based on Code requirements.
- Valves need not be tested, if, during reactor operation they are in the position required to perform their safety function <u>and</u> also are fail safe in that position, or as allowed by the Code.

OPERATIONAL READINESS OF INSTRUMENTATION AND CONTROLS (criteria 3.2.3c, 3.2.3d, 3.2.3e)

- Functional test, at least once each year.
- Calibration, once each year.
- Valve instrumentation and control, according to valve testing.

TABLE 5

CRITERIA FOR SURVEILLANCE CLASS S4 EQUIPMENT

OPERATIONAL READINESS OF THE SYSTEM (criteria 3.1c, 3.1d, 3.1e, 3.1f)

- Normal operation or testing individual active components at their respective test frequency.

OPERATIONAL READINESS OF PUMPS AND COMPRESSORS (criteria 3.2.1c)

- Normal operation or startup test at least once each quarter.

OPERATIONAL READINESS OF VALVES HAVING AN ACTIVE SAFETY FUNCTION (criteria 3.2.2c, 3.2.2d)

- Safety/relief valves and rupture discs, testing at frequency and according to rules based on Code requirements.
- Automatic isolation valves, normal operation or testing at least once a year, according to rules based on Code requirements.
- Remote manual isolation valves and check valves, normal operation or testing at least once every five years, according to rules based on Code requirements.
- Valves need not be tested, if, during reactor operation they are in the position required to perform their safety function <u>and</u> also are fail safe in that position, or as allowed by the Code.

OPERATIONAL READINESS OF INSTRUMENTATION AND CONTROLS (criteria 3.2.3c, 3.2.3d, 3.2.3e)

- Functional test, at least once each year.
- Calibration, once each year.
- Valve instrumentation and control, according to valve testing

STRUCTURAL INTEGRITY (criteria 3.3.1a, 3.3.1b, 3.3.1c)

- Continuous leakage monitoring and/or alarm during plant operation, <u>or</u> examination for leakage of accessible portions, at least once every five years, at or near normal operating pressure <u>unless</u> operating conditions not expected to degrade integrity (compared to design conditions) <u>or unless</u> failure does not prevent safety function <u>and</u> satisfies 10CFR20 limits with no additional failure <u>and</u> satisfies 10CFR100 limits with one additional single active or passive failure.

BOLTING (criteria 3.3.2d)

- Visual examination of major safety class 1 equipment items which are frequently disassembled, when such item is disassembled or reassembled, if such examination has not already been performed during the refueling cycle.

NOTES: (1) "Code" means the Draft ASME Code, Section XI, Division 2.

(2) Criteria are referenced as numbered in EE-SR-0001.

3. OPERATIONAL READINESS

3.1 OPERATIONAL READINESS OF THE SYSTEMS

Most parts of the reactor auxiliary cooling water systems are used during normal plant operation at power and during shutdown.

For those parts of system assigned to surveillance class S1, overall system performance is verified by normal operation. Availability of the emergency power sources (from the ACM diesel generator) is verified by testing in accordance with technical specifications SR 5.2.20 and SR 5.2.21. The surveillance requirements of SR 5.2.20, which apply to the ACM diesel generator, will be reviewed in a separate report. However, not all the redundant active components may be operating, and ACM operation also requires manual valve actuation. Surveillance to demonstrate the operational readiness of these components provides additional assurance to demonstrate the operational readiness of the system.

There are heat exchangers used for residual heat removal in case of ACM operation. These heat exchangers placed in series are: the liner cooling tubes, where the residual heat is transferred from the core to the reactor plant cooling water; the reactor plant cooling water heat exchangers, where the heat is transferred to the service water; and the service water cooling tower, where the heat is transferred to the atmosphere. The thermal hydraulic system characteristics (i.e. heat load, flow, temperature level) during operation at power are adequate to demonstrate the capability of the system to remove the heat load under accident conditions, since all heat exchangers are normally in operation. Fouling of the PCRV liner cooling tubes is not expected to occur in excess of design conditions, since water quality is of condensate grade with adequate chemistry control and permanent filtration. This fact has been confirmed when cleaning the reactor plant cooling water heat exchangers; no indication of abnormal fouling was found on the reactor plant cooling water side. However, an appreciable amount of fouling was found on the service water side of the heat exchangers. It should be noted that fouling, even in excess of the design value, would not prevent residual heat removal. Such fouling, resulting in a reduced overall heat transfer coefficient, would yield an increase of the reactor plant cooling water temperature level until an equilibrium is reached when the increase in heat exchanger mean temperature differential compensates for any decrease in heat transfer coefficient. There is margin, built in the design of the reactor plant cooling water system, to increase the surge tank coverpressure from 30 psig (required by the accident conditions) up to 125 psig (safety valve set pressure) and thereby, to allow operation of the system at higher temperature than predicted by up to about

3.1 (cont.)

$70^{\circ}F$, which is an ample margin to compensate for loss of thermal efficiency of the heat exchangers. During operation of the plant at power, it would take an increase of only about 10F of the average water temperature to raise the system mean outlet water temperature to the 120F limit of LCO 4.2.15. This general reactor plant cooling water temperature increase of about 10F is small when compared to the 70F temperature increase which still would be acceptable under accident conditions while assuring adequate subcooling to prevent boiling.

The design heat transfer capacity of the service water cooling tower is very large (81.7×10^6 BTU/h) when compared to the duty expected during ACM operation (21.6×10^6 BTU/h), and still adequate when considering that only one of the two cooling tower fans at full speed is emergency power supplied by the ACM diesel generator. It should be further noted that residual heat removal under ACM operation could also be performed without using the service water cooling tower; there is an adequate service water makeup flow available to operate the service water system as a once through system, as is the case for safe shutdown cooling, when the makeup water consumption is greater than for ACM operation.

Therefore, normal operation is also adequate to demonstrate the operational readiness of the systems to remove their assigned residual heat load under ACM operation.

For those parts of system assigned to surveillance class S2, normal operation is again adequate to demonstrate the operational readiness of the system. As above, surveillance to demonstrate the operational readiness of active components not normally in operation provides further assurance of the operational readiness of the system.

Normal operation and active component surveillance is also adequate to demonstrate the operational readiness of the parts of systems assigned to surveillance class S3 or S4.

In particular, the decay heat removal exchanger is regularly used at each refueling shutdown, when heat load is representative of the accident heat load in case of loss of condenser capability. Fouling is less of a concern for this heat exchanger than it was for the reactor plant cooling water heat exchangers, since service water flows on the tube side, at high velocity when the heat exchanger is in service, and the design fouling factors on the service water side is twice as large as for the reactor plant cooling water heat exchangers.

Further, the operational readiness of the systems to perform their safety functions is also assured by compliance with the requirements of technical specifications LCO 4.2.4, LCO 4.2.5, LCO 4.2.6, LCO 4.2.13, LCO 4.3.5 and LCO 4.10.5. These limiting conditions of operation specify the minimum equipment required to be operable or in operation (as applicable), during plant operation at power, so that the safety functions can be performed.

3.2 OPERATIONAL READINESS OF PUMPS AND FANS

a) Current surveillance requirements:

Technical specification SR 5.2.10 currently requires that the engine driven fire pump (emergency firewater pump P4501S) be functionally tested once a week. A proposed revision to technical specification SR 5.2.10 (see Ref. 12) requires that each firewater pump be functionally tested monthly.

Further, testing of the ACM diesel generator and transfer switches per SR 5.2.20 and SR 5.2.21, also results in operating each pump and fan which may be used under the ACM mode of operation. This concerns the pumps and fans assigned to surveillance class S1, listed in table 1, and also the motor driven fire water pump (P4501).

b) Recommended surveillance requirements:

b.(1) ACM and safe shutdown cooling pumps and fans (P4118A/B, C4201X, C4202X, P4201, P4202, P4202S, P4203, P4204, P4501, P4501S, P4601, P4601S, P4602, P4602S, P4701, P4702)

During normal plant operation, one or two of the three storage basin circulating water makeup pumps, and two of the three service water pumps and service water return pumps are in operation to supply cooling water. The motor driven fire water pump operates intermittently to restore the required water inventory in the firewater storage tank to compensate for normal usage. The engine driven emergency firewater pump does not normally operate. One of the two reactor plant cooling water pumps in each loop and one of the two purification cooling water pumps are normally operating to circulate cooling water to the PCRV and helium purification components. The second purification cooling water pump operates periodically for additional cooling when a helium purification train is being regenerated or when the reactor is being depressurized. Both two speed service water cooling tower fans operate normally at either speed depending on the ambient air temperature.

For ACM cooling in the event of a loss of forced circulation accident, one circulating water makeup pump, one service water supply pump and one return pump, one high speed service water cooling tower fan, one reactor plant cooling water pump per loop and one purification cooling water pump are required to be in operation powered from the ACM diesel generator.

3.2b (cont.)

For safe shutdown cooling following a seismic event, one circulating water makeup pump, one service water supply pump, one firewater pump, and one reactor plant cooling water pump are required to be in operation powered from a standby diesel generator.

Criteria 3.2.1a of reference 1 requires that the operational readiness of pumps (and fans) assigned to surveillance class S1 be demonstrated by normal operation or by monthly surveillance testing for those pumps (and fans), not normally in operation, according to rules and requirements based on the Draft ASME Code, Section XI, Division 2. Criteria 3.1d requires that for components normally in operation, characteristic data be recorded to meet the intent of the surveillance requirements at the frequency which would otherwise be required for testing. The only difference for pumps assigned to surveillance class S2, is that the test frequency, for those which do normally operate, is quarterly, as per criteria 3.2.1b of reference 1.

Even though their use for ACM operation is desirable, the service water return pumps and the service water cooling tower fans are not essential, since the service water system could be operating as a once through system, as outlined in paragraph 3.1 above. ACM operation does not rely on the performance of these components, and their operability is demonstrated by normal operation. Therefore, no surveillance testing is recommended for the service water return pumps and service water cooling tower fans.

The rules for pump testing, outlined in paragraph (c) hereafter, require plant documentation to show that each pump was operated at least at the specified test frequency at reference conditions and that quantities characteristic of their hydraulic and mechanical performance be measured or observed, as applicable, recorded and analyzed.

For the fixed speed type pumps under consideration, the two parameters characteristic of hydraulic performance are volumetric flow and pump head (pump differential pressure). Instrumentation is provided to measure directly or to determine indirectly the head of each pump. Instrumentation is also provided to measure the flow of the storage basin circulating water makeup pumps, and of the reactor plant cooling water pumps. The flowrate of the firewater pump and emergency firewater pump is measured semi-annually to satisfy insurance requirements. This test, however, requires special preparation and equipment attached.To meet the recommended test frequency, the firewater pump flows can also be determined by measuring the time required to fill a specified volume in the firewater storage tank. There is no practical means to determine the flowrate of the purification cooling water pumps; however, monitoring helium purification cooler helium outlet temperature is considered an acceptable means of verifying the adequacy of the system

3.2b (cont.)

performance and hence the hydraulic performance of the pumps. There are currently no practical ways of measuring the flow of the service water pumps.

In this case, however, monitoring of system performance is not a valid indicator of individual pump performance, due to the complexity and variability of system operation. Because of the importance assigned to their safety function, it is considered necessary to provide the capability for measuring service water pump flows. The required instrumentation will be provided as part of the implementation program if these recommendations are accepted.

The parameters characteristic of pump mechanical performance are vibration amplitude and bearing temperature. It is recommended that vibration amplitude be measured, using portable instruments, each time that pump performance is verified, and that bearing temperature be measured, also using portable instruments, once each year, if such measurements are practical.

None of the applicable technical specifications provide for pump performance monitoring. It is therefore recommended that surveillance requirements be included in the plant technical specifications to monitor the hydraulic performance of the storage basin circulating water makeup pumps, the service water pumps, the reactor plant cooling water pumps, and the purification cooling water pumps once every month and the hydraulic performance of the firewater pump and emergency firewater pump once each quarter. In addition, at the above specified frequency, pump vibration amplitude should be measured and once a year pump bearing temperature should be measured when such measurements are practical to perform.

b.(2) Miscellaneous pumps and fans (P4103, P4104, C4105X C4106X, P4204S)

In the case of loss of offsite power and turbine trip, the automatic sequencing programmer energizes pumps and fans in the reactor auxiliary cooling water systems from the standby generators. Most of these pumps and fans are also used for ACM or safe shutdown cooling and their operational readiness was discussed in b.(1) above. For this incident, one of the 7% circulating water pumps, one of the ½ speed

3.2b (cont.)

essential main cooling tower fans and the standby service water return pump can also be energized; therefore they have been assigned to surveillance class S4.

Criteria 3.2.1c of reference 1 requires a quarterly startup test if the pump (or fan) did not operate during such a time interval. Surveillance procedure SR 5.6.1 simulates a loss of outside power and turbine trip to verify operation of the standby generators and load sequencers. Each of the miscellaneous pumps and fans discussed above are energized once each year from this power source. These pumps and fans are also used during normal operation, at least part of the year; the 7% circulating water pumps and the ½ speed main cooling tower fans are also used for normal shutdown operations. This combination of intermittent normal operation and annual surveillance testing is considered adequate to demonstrate their operational readiness and meets the intent of criteria 3.2.1c. No other surveillance testing is recommended.

c) Proposed ASME Code requirements:

The proposed Code requirements are intended to detect hydraulic and/or mechanical changes which may occur in pumps. The test requirements are governed by Article IGP-3000. The inservice tests are to be conducted at nominal motor nameplate speed for pumps with constant speed drive. The resistance of the system is to be varied until either the differential pressure or the flow equals a predetermined reference value. The test frequency is nominally once each month (IGP-3400). During each test, pump inlet pressure, differential pressure, flow rate, and vibration amplitude are to be measured and compared to their respective reference value. Proper lubricant level or pressure is to be observed. Once a year, bearing temperature is to be measured. Table IGP-3100-2 defines deviation ranges between measured and reference values to be considered as "acceptable range", "alert range" or "required action range". These ranges apply to pump pressure differential, flow and vibration amplitude. Pump inlet pressure and bearing temperature are to be within limits specified by the Owner. Paragraph IGP-3230 states that if deviations fall within the "alert range", the frequency of testing is to be doubled until the cause of the deviation is determined and the condition corrected; if deviations fall within the "required action range", the pump is to be declared inoperative and the condition corrected. Pumps that are operated more frequently than every month need not be run or stopped for a special test, provided plant documentation shows each such pump was operated at least once every month at the reference conditions and the quantities specified were measured, observed, recorded and analyzed.

3.2 (cont.)

d) The recommended surveillance meets the proposed Code requirements for the pumps assigned to surveillance class S1 and S2, insofar as practical consistent with the current plant design. A difference exists with the proposed Code requirements for the miscellaneous pumps assigned to surveillance class S4 which is justified by the fact that normal operation is sufficient to verify the performance of these pumps which have only a minor safety function and are not safety-related(i.e., not safety class I).

3.3 OPERATIONAL READINESS OF VALVES

3.3.1 POWER OPERATED VALVES

a) Current surveillance requirements:

Technical Specification SR 5.3.4 governs the testing of those valves which are pneumatically, hydraulically, or electrically operated and are required for actuation of the safe shutdown cooling mode of operation. It requires that those valves be tested twice annually, with a testing interval ranging from 4 to 8 months. In the review report for secondary system surveillance, reference 3, it was recommended that the test frequency be annual, or at the next scheduled shutdown, if the test was not performed during the previous year.

b) Recommended surveillance requirements:

b.(1) ACM Valves

There are no power operated valves in the reactor auxiliary cooling water systems which are controlled automatically or remote manually for operation with the ACM Diesel generator. Some power operated valves can be used when the standby diesel generator or the normal power supply are available in case of a permanent loss of forced circulation accident. However, since the capability must exist to operate these valves manually, no surveillance is recommended for these valves, in addition to that discussed in paragraph 3.3.4-b(1) of this report, which covers manual valves.

b.(2) Safe Shutdown Cooling Valves

Isolation Valves (HV4153, HV4221-1 thru -3, HV4225, HV4257)

For safe shutdown cooling, the service water cooling tower is assumed to have collapsed, and the service water system functions as a once through system with the return water being spilled to yard drains after use. The normal service water makeup from the wells is not safety-related and therefore makeup water must be supplied by the storage basin circulating water makeup pumps. This is achieved by opening the normally closed tower makeup cross-connect valve HV4153 remote manually from the control room.

To prevent a loss of service water supply through non-safety class I pipes, which are assumed to have ruptured, remote manual valves HV4225 and HV4257, which are normally open, must be closed to isolate the decay heat exchanger and the turbine plant non-essential header. In addition, if the circulating water system were being used to supply the service water system through remote manual valve HV4221-2 (interlocked with HV4221-1 and HV4221-3), it also would have to be closed. The interlock operates so that the return line to the service water cooling tower is closed (HV4221-3) when the circulating water system is used as a backup for the service water system (circulating water supplied thru HV4221-2 and returned thru HV4221-1). The interlock assures that at least one of the two return valves (HV4221-1 or HV4221-3) is open to provide a flow path for the service water to the yard drains.

3.3.1 (cont.)

The test frequency recommended for power operated safe shutdown cooling valves in paragraph (a) above is adequate to demonstrate the operational readiness of these remote manual isolation valves in accordance with criteria 3.2.2(b) of reference 1. Of these valves, only testing of HV4257 is currently performed per surveillance procedure SR5.3.4. It is therefore recommended that valves HV4153, HV4221-1 thru HV4221-3, and HV4225 be included in the surveillance procedure governed by technical specification SR5.3.4. No new or revised technical specifications are required for these isolation valves.

<u>Control Valves</u> (LCV4107, LCV4218-1, LCV4218-3; PCV4256, PCV4266; TCV4234, TCV4235, TCV4267 thru TCV4270, TCV4274; TV4637, TV4637-1, TV4638, TV4638-1, TV46209, TV46210)

The control valves identified above are required to operate for safe shutdown cooling. Makeup to the firewater pump pit and to the service water pump pit is controlled as during normal operation by LCV4107, LCV4218-1 and 4218-3 since their control circuits are safety class I. It is noted, however, that during normal operation, the makeup flow to the service water system is less than during safe shutdown cooling and that LCV4218-3 may not operate. Therefore, this valve will require testing to demonstrate its operational readiness. Similarly, the cooling water temperature to the instrument air compressors is controlled as during normal operation by TCV4234, TCV4235 and TCV4274, since their control circuits are also safety class I. These level and temperature control valves can be exempt from testing because normal operation is adequate to demonstrate their operational readiness in accordance with criteria 3.2.2(b) of reference 1.

The cooling water temperature to the standby diesel generators is controlled by TCV 4267 thru TCV4270. Backup firewater cooling pressure to the standby diesel generators is controlled by PCV4256 and PCV 4266 so that cooling is uninterrupted if service water pressure drops too low. Since these valves do not normally operate, they will require testing to demonstrate their operational readiness.

PCRV liner cooling water temperature is controlled by TV4637, TV4637-1, TV4638 and TV4638-1 in the service water return lines from the reactor plant cooling water heat exchangers. These valves are used during normal operation, but their control circuits are not safety class I. For safe shutdown cooling, these valves can be locally controlled using the air set in the instrument air lines at the valve actuator. In addition, the bypass valves, V46151 and V46152, can also be used as a backup to control the service water flow locally. Therefore, no testing is recommended for the temperature control valves. Temperature control valves TV46209 and TV46210 provide for mixing warm liner cooling water with the normal supply to control the inlet temperature to the PCRV top penetration subheaders. Plant operation has demonstrated that such

3.3.1 (cont.)

mixing is not required so that these valves are normally closed and, since they are also fail safe in the closed position (which is the position required for safe shutdown cooling), they can be exempt from testing in accordance with criteria 3.2.2(d) of reference 1.

The test frequency recommended for power operated safe shutdown cooling valves in paragraph (a) above is adequate to demonstrate the operational readiness of the control valves which require testing. For these valves (LCV4218-3, PCV4256, PCV4266 and TCV4267 thru TCV4270), loss of their control function is not critical since they are fail safe in a position which allows safe shutdown cooling. Surveillance procedure SR5.3.4 currently provides for testing pressure control valves PCV4256 and PCV4266. Testing of the standby diesel generators per technical specification SR5.6.1 provides for weekly operation of temperature control valves TCV4267 thru TCV4270. Therefore, it is recommended that level control valve LCV4218-3 be included in the surveillance procedure governed by technical specification SR5.3.4. No new or revised technical specifications are required for these control valves.

b.(3) <u>Containment isolation valves</u> (HV46237-1 and -2 thru HV46266-1 and -2, HV46267-1 thru HV46267-3, HV46268-1 and -2, HV46269-1 thru-4, HV46270-1 thru -4, HV46271-1 thru -3, HV46272-1 thru-3, HV46356 thru HV46359; HV4704-1 thru-4, HV4705-1 thru -4, PV4708, PV4709)

Automatic isolation valves in the reactor auxiliary cooling water systems are used as secondary containment boundaries and therefore are assigned to surveillance class S3. There are no such valves in the circulating water system, service water system, or the firewater portion of the fire protection system. In the reactor plant cooling water system, such valves are provided to isolate each subheader of the PCRV liner cooling water system in the case of simultaneous tube and liner failure. All subheader block valves in one loop are automatically isolated upon a high pressure signal in that loop, which would occur if the PCRV is pressurized. When the PCRV is depressurized, an individual subheader may be automatically isolated upon a low flow signal in that subheader. None of the system 46 valves listed above have position indication. Since they are fail safe in the open position, each valve has a manual override which allows its operation locally. There are also containment boundary valves in the purification cooling water system (HV4704-1 through -4, HV4705-1 through -4) even though the system is entirely designed for PCRV reference

3.3.1 (cont.)

pressure. A high pressure signal in the water return line from a helium purification cooler automatically isolates the cooling water lines and the purification train. In order to prevent spurious isolation of the helium purification system in case of overpressurization of the expansion tanks, an automatic isolation valve (PV4708, PV4709) closes the cover gas supply line to the tank at a pressure less than that which automatically isolates the purification system.

It is recommended that the isolation function of these valves be tested about annually, in accordance with criteria 3.2.2c of Ref. 1 for automatic isolation valves, when the reactor is shutdown in order not to disrupt plant operation.

b.(4) <u>Miscellaneous automatic and remote manual isolation valves</u> (HV4108 through HV4110, HV4133)

In case of loss of offsite power and turbine trip, the automatic sequence programmer isolates the non emergency power supplied cells of the main cooling tower by closing HV4133. Further, the circulating pump discharge valves (HV4108 through HV4110) have to be closed for those pumps which do not operate, to prevent the circulating water from flowing back to the pump pit rather than to the users required to operate. These valves are used during normal plant shutdown, at a frequency which satisfies the testing requirements. Furthermore, HV4133 is tested per technical specification SR 5.6.1. Therefore, no surveillance is recommended for these valves.

The other automatic and remote manual valves in the reactor auxiliary cooling water systems have no safety functions, and no surveillance is recommended for these valves.

c) Proposed ASME Code requirements:

Seat leakage is not important for any of the valves under review. Therefore, only the proposed Code requirements applicable to Category B valves were considered. Paragraph IGV-3300 requires that valves with remote position indicators be visually observed to confirm that the remote valve indications accurately reflect valve operation. Paragraph IGV-3411 requires that the valves be exercised at least every 3 months. However, paragraph IGV-3412 allows valve exercising during each cold shutdown, when a valve cannot be exercised during plant operation, and requires part-stroke exercising during plant operation if practical. Paragraph IGV-3415 requires that, when practical, valves with fail safe actuators be tested by :erving their operation upon loss of actuator power.

d) The recommended surveillance generally meets the proposed Code requirements. A difference exist in the test frequency, which is justified by the backups available to perform the safety functions.

3.3.2 SAFETY VALVES (P4501 and P4501S safety valves, V4599; V4601, V4602, V46141 through V46144, V46205 V46206 V46295, V46300, V46305, V46309, V46359, V46360, V46363, V46364, V46378, V46379, V46382 V46383, V46386, V46387, V46413 through V46419, V46438 throughV46443, V46468 through V46474, V46520 through V46537, V46592, V46593, V46655, V46656, V46803 through V46806, V46811, V46812, V46980-4 through V46987-4, V46990-4 through V46999-4, V461503 through V461509; V4730, V4731, V4757, V4758)

a) Current surveillance requirements: None.

b) Recommended surveillance requirements:

Criteria 3.3.2 (a,b and c) of Ref. 1 require that safety valves be tested at a frequency and according to rules based on the proposed Code requirements. It is therefore recommended that each of the safety valves, which protect the integrity of those parts of the reactor cooling water systems required to perform a safety function, be tested at least once every five years. When practical, the testing should be scheduled, so that valves of the same type, operating under similar conditions, are tested at different times during the surveillance interval, thus providing additional assurance with regard to the reliability of the overpressure protection throughout the interval.

c) Proposed ASME Code requirements:

Paragraph IGV-3511 requires that each safety valve be tested at least once every five years and provides the rules for scheduling safety valve testing within this time interval.

d) The recommended surveillance meets the proposed Code requirements.

3.3.3 CHECK VALVES

a) Current surveillance requirements:

None. However, after performing the review of the secondary coolant system, surveillance requirements have been recommended for testing the normally closed check valves which are required to open for actuation of the safe shutdown cooling mode of operation when such testing is practical (technical specification SR5.3.4).

3.3.3 (cont.)

b) Recommended surveillance requirements:

Check valves in the reactor auxiliary cooling water systems are required to open to allow cooling water flow for ACM or safe shutdown cooling, or to close to prevent cooling water from flowing through an undesired path. A review was performed of the importance of individual check valve function and of the feasibility of testing them to meet the criteria of ref. 1.

b.(1) Pump discharge check valves (V41125 through V41127, V41264, V41272, V41273; V42201 through V42203, V4275 through V4277, V4291; V4625 through V4628; V4706, V4707)

Check valves are located at the discharge of the storage basin circulating water makeup pumps (V41125 through V41127 for the normal makeup line, and V41264, V41272, V41273 for the backup line). Only the normal makeup line is required for ACM or safe shutdown cooling. In this line, the check valve at the discharge of the operating makeup pump is required to open while the other two are required to close to prevent the water from flowing back to the pump pit. Normal operation is adequate to demonstrate the operational readiness of these check valves to function in the required position. In addition, a manual valve is provided in series with each check valve, which can be used as a backup if a check valve were to fail to close.

The same considerations apply to the check valves installed at the service water pump discharge (V42201 through V42203), at the service water return pump discharge and return header (V4275 through V4277 and V4291), at the reactor plant cooling water pump discharge (V4625 through V4628), and at the purification cooling water pump discharge (V4706, V4707), with the only difference being that the latter ones (V4706, V4707) are manual stop check valves. Therefore, no testing is recommended for any of the pump discharge check valves.

b.(2) Backup component cooling check valves (V42351 through V42355, V42395, V42813 through V42816; V45224, V45811 through V45814; V4689, V4690, V46101, V46102, V46111, V46112, V46129 through V46132, V46161 through V46164, V46171, V46172, V46480, V46481, V46590, V46591, V46808)

Check valves are installed in the cooling lines to components which are provided with backup cooling supplies. The normal supply would be either service water or reactor plant cooling water backed up by circulating water and/or firewater.

3.3.3 (cont.)

For ACM or safe shutdown cooling only the normal supply is required. The check valve in the normal supply line is then required to open or remain open, while the check valves in the backup supply lines should close or remain closed. Therefore, system operation in its normal configuration is adequate to demonstrate the operational readiness of these check valves. Further, each check valve has a manual isolation valve in series, which can be used as a backup in case of failure of a check valve to close. No testing is recommended for any of the backup component cooling check valves.

b.(3) Liner cooling subheader check valves (V46432 through V46437, V46594 through V46600, V46645 through V46654, V46701 through V46723, V46757 through V46768, V46793 through V46802, V46813, V46814, V46821, V46822, V461460 through V461463, V461755 through V461761)

Check valves in the PCRV liner cooling water section of the reactor plant cooling water system are required to remain open to allow the flow of cooling water as during normal operation. The check valves in the subheader supply lines are backup isolation devices with a containment function in case of liner and cooling water tube failure with the reactor pressurized. If the subheader supply line were not isolated in such a case, the pump discharge would be momentarily pressurized, while the pressure at pump suction would be limited by the surge tank safety valve set pressure. The cooling water flow might then be interrupted until the pressure has equalized throughout the system. In case of ACM operation, there is no automatic closing of the subheader block valves, so that the isolation function would be performed by the subheader inlet check valve until the block valves can be closed using the manual override. The interruption of cooling water flow is also terminated when the reactor is depressurized following a permanent loss of forced circulation since water will start leaking into the reactor. With the reactor depressurized, the inlet check valves have no backup isolation function. The temporary loss of water cooling to the PCRV has been analyzed (FSAR Appendix D, section D.2.3) and it has been demonstrated that it was an acceptable condition, provided that liner cooling is resumed within 30 hours from initiation of the loss of forced circulation accident. PCRV depressurization is completed well within this time limit.

The check valves in the subheader return lines limit the loss of water from the system in case of liner and cooling tube failure with the reactor depressurized, if the automatic isolation of that subheader did not occur. The consequences of a failure of the check valve to close would only be minor.

3.3.3 (cont.)

The operator would be warned of an increase in reactor pressure and can arbitrarily isolate one liner cooling loop (manually, in case of ACM operation) and investigate leakage in that loop while monitoring reactor pressure. If reactor pressure still increases, the operator can resume operation of the isolated loop and shutdown the other one.

Therefore, the backup isolation function of the PCRV liner cooling system subheader check valves is not considered critical and, since there are no practical means of testing these check valves, they can also be exempt from testing.

b.(4) Firewater supply check valves (V4501, V4502, V4513, V4569, V4575)

In the firewater portion of the fire protection system, there is a check valve at each pump discharge. The one at the firewater pump discharge (V4502) is exercised during normal operation when the pump provides makeup water to the firewater storage tank. The one at the emergency firewater pump discharge (V4501) is exercised when testing the pump in accordance with technical specification SR5.2.10. Check valve V4569, on the firewater supply header, and check valve V4575, which provide an alternate firewater supply path through the outdoor fire hydrant ring header, are also exercised during normal operation of the system. Check valve V4513, in the storage tank supply line, is a boundary valve between safety class 1 and safety class 2 plant equipment, and it is required to close when the firewater pumps are used for safe shutdown cooling following a seismic event. This check valve is supposed to close during normal operation when the firewater pump supplies water to the storage tank. However, due to the operation of the level controls, a verification should be made once a year that the check valve actually closes, by observing that there is no makeup of firewater to the storage tank when the tank level control valve (LCV4501) is closed. Since this is the only check valve for which surveillance is being recommended, a separate technical specification is not considered warranted at this time. Rather, PSC will include this monitoring requirement in the technical specifications for the fire protection system valves, which will be covered in a separate report.

c) Proposed ASME Code requirements:

Paragraph IGV-3521 requires that check valves be generally exercised at least once every 3 months or, if not practical, at each cold shutdown.

d) The differences between the recommendation not to test the check valves and the proposed Code requirements are considered justified by the reasons outlined under item (b) above.

3.3.4 MANUAL ISOLATION VALVES

a) Current surveillance requirements:

Technical specification SR 5.2.21 requires that those pneumatically and electrically operated valves, that must be manually positioned to implement the ACM, be tested twice annually, with a testing interval ranging from 4 to 8 months.

b) Recommended surveillance requirements:

b.(1) ACM Manual Valves (HV4153, V41302; HV4225, HV4221-1 through V4221-3, HV4257, V4290; HV4669 V4670, V46151, V46152, HV4622 through HV46234, V46601, V46602, V46605, V46606; HV4704-1 through HV4704-4, HV4705-1 through HV4705-4)

Implementation of ACM operation requires manual operation of valves in the reactor auxiliary cooling water systems, since no emergency power is provided for that purpose by the ACM diesel generator. Such valve actuation is necessary: to open the path for service water makeup from the circulating water system (HV4153 manual override, or its redundant bypass valve V41302); to align the helium purification cooler, used to depressurize the PCRV, with the purification cooling water loop in operation on ACM power supply (manual override for valves HV4704-1 through -4 and HV4705-1 through -4); to redistribute the PCRV liner cooling water flow, from regions where the heat load is expected to be less than during normal operation, to regions where the heat load is expected to be higher (manual override of HV46227 through HV46234); to increase the coverpressure in the reactor plant cooling water system surge tanks so that adequate subcooling can be maintained while allowing a water temperature increase (manual override of HV4669 and HV4670); to reopen the service water flow path from the reactor plant cooling water heat exchangers (V46151, V46152), since the pneumatic temperature control valves are fail safe in the closed position; to admit reactor plant cooling water to the helium purification high temperature filter absorbers, once the spool pieces have been installed (V46601, V46602, V46605, V46606); to prevent service water from flowing to users which do not operate under ACM conditions, if it were to prevent an adequate service water flow to those users required to operate (manual override of HV4225, HV4257, HV4221-1, HV4221-2); to reestablish the service water flow to the service water cooling tower (manual override of HV4221-3); and to reestablish a service water cooling water blowdown flow (V4290), necessary for long term cooling, since the blowdown flow control valve FCV4210 is fail safe in the closed position.

Surveillance procedure SR 5.2.21SA, applicable to the ACM valves, has been reviewed. As required by technical specification SR 5.2.21, only the manual override of pneumatically and electrically operated valves are tested. It is recommended that technical specification SR 5.2.21, and the corresponding surveillance procedure, be modified to include the other manual valves listed above. The current semi-annual testing frequency exceeds the annual testing frequency of criteria 3.2.2e as specified in section 2.3 of this report. It is recommended that the test frequency be modified accordingly, since it is not expected that the ability to manually actuate these valves will degrade significantly over a one year period. Some valves may not be tested during operation of the plant at power, since it might disrupt the cooling of equipment which is used during normal operation. It is therefore recommended that testing be performed at the next scheduled plant shutdown if these valves have not been tested during the previous year.

The valves used to redistribute the PCRV liner cooling water flow are to be brought from their normal operating position, to a preset position, determined so that the flow in the several subheaders is sufficient to remove the expected heat load. As part of the plant preventative maintenance program, a verification is made at each refueling shutdown that the preset redistribute position of these valves is adequate, and that the flow in each subheader is within prescribed limits. Therefore, no additional surveillance is recommended to calibrate the redistribute position of these valves.

b.(2) <u>Safe Shutdown Cooling Manual Valves</u> (V211570, V211573; V4130, V4132, V41903; V4234, V4256, V4264, V42141 through V42143, V42183 through V42185, V42397; V4525, V4530, V4531, V4533, V4541, V4542, V4544, V4545, V4548, V4550 through V4553, V4555, V4571, V4594, V45198, V45199, V45203, V45223, V45616, V45817; V46181, V46182, V46185, V46186, V46226, V46227, V46281, V46338, V46612, V46614, V461514, V461516, V461535, V461536, V461555, V461557, V461744, HV4736-1 through -4)

Manual valves are required to be opened to establish the firewater supply to the emergency feedwater and emergency condensate headers (V45223, V4525), and to the firewater booster pumps (V211570, V211573).

In case of a safe shutdown earthquake, which could require implementation of the safe shutdown cooling method of operation, it is postulated that all the non safety class I portions of the plant have failed. In certain cases, only manual valves are available to isolate the presumably failed portions of the system. Valves belonging to this category were identified and are used: to isolate the firewater pump pit from the main cooling tower basin (V4130, V4132); to isolate the firewater pit makeup water line from the main cooling tower blowdown line (V41903); to isolate the emergency service water makeup from the normal service water makeup (V42183, V42184, V42185 : to isolate the service water pump pit from the service water cooling tower basin (V42141, V42142, V42143);to isolate the service water supply to the

3.3.4b (cont.)

HVAC system (V42397); to isolate the service water and firewater supply lines to the emergency diesel generators from non safety class I users, since failure of the pipe leading to these users could cause a leakage larger than their normal consumption due to the loss of hydrodynamic resistance (V4234, V4256, V4264, V4594); to isolate the firewater header from non safety class I firewater risers and from the firewater storage tank (V4530, V4531, V4533, V4541, V4542, V4544, V4545, V4548, V4550 through V4553, V4555, V4571, V45198, V45199, V45203, V45616, V45817); to isolate the reactor plant cooling water auxiliary loop from non safety class I users (V46185, V46186, V46226, V46227); to isolate the service water supply header in reactor plant cooling water system from non safety class I equipment (V46281, V46614, V461516, V461744); to prevent flooding inside the reactor building (V46181, V46182, V46338, V46612, V461514, V461535, V461536, V461555, V461557); to isolate non safety class I equipment from the purification cooling water system (manual override of HV4736-1 through -4).

It is recommended that technical specification SR 5.3.4, which governs the surveillance of safe shutdown cooling valves, be modified to include a requirement for testing the above manual valves about once annually, to meet criteria 3.2.2e. Since valve testing may disrupt normal plant operation, it is recommended that such testing be performed at the next scheduled plant shutdown, if it was not performed during the previous year.

Some valves, even though they belong in this category, need not be tested, since they are normally in the position required by the safety function. Examples of such valves are : V41147 on the return line of the storage basin circulating water makeup pumps; V42105, V42106 on the service water strainer backwash lines; V4216, V4231, V4260, V4266, V42114, on bypass lines supplying service water to non essential users; V45106 used for backup firewater supply; V45896, V45901, V45905, V45909 used to supply firewater to firewater nozzles; V46256, V46259, V46262, V46265, V46658, V46660, used for backup circulating water supply. Actuation of these valves to change the system configuration would be sufficient evidence of operational readiness of these valves, should it be required to return them to the normal position in case of an accident, since it is not expected that the plant would operate for any length of time in that configuration.

Other valves in the above category are exempt from testing due to their small size. Examples of such valves are V4239, V42374, V42390, V42817, which all branch off the essential turbine plant service water header (L4253); V4214 and V4227, which branch off the main service water header (L42190); instrument valves, etc.

3.3.4b (cont.)

b.(3) Other Manual Valves

The other manual valves have not been assigned a safety function for which testing is required in accordance with criteria 3.2.2e. Therefore no testing is recommended for these valves.

c) Proposed ASME Code requirements:

The manual valves under the scope of this review are category B valves (IGV-2100) for which seat leakage is inconsequential for the fulfillment of their function. These valves are required to be exercised every 3 months (IGV-3411), unless such testing is not practical, in which case the valves are required to be exercised during each cold shutdown and part stroke exercised during normal operation (IGV-3412).

d) The difference between the recommended test frequency and the proposed Code test frequency is justified by the fact that manual valves are not expected to degrade over a year period to an extent which might prevent their actuation. The recommended surveillance otherwise meets the proposed Code requirement for testing valves required to be actuated to perform a safety function.

3.4 OPERATIONAL READINESS OF INSTRUMENTATION AND CONTROLS

a) Current surveillance requirements:

Technical specification SR 5.2.10 requires that the instruments and controls associated with the emergency (engine driven) firewater pump be functionally tested monthly and calibrated annually.

The revised technical specifications SR 5.2.10 and SR 5.2.24 (Ref 12) also require the same surveillance for the motor driven firewater pump and the storage basin circulating water makeup pumps. In addition, the revised technical specification SR 5.2.24 also requires that the minimum storage basin (makeup pond) inventory be verified daily, and that the pond level instrumentation be functionally tested monthly and calibrated annually.

Technical specifications SR 5.4.4 and SR 5.4.5 specify the surveillance requirements for monthly functional tests and annual calibrations of reactor plant cooling water system instrumentation which monitors and alarms subheader flow and outlet water temperature, and individual tube outlet temperature.

b) Recommended surveillance requirements:

b.(1) I & C used during ACM operation (Local Indicators)

The ACM diesel generator does not supply emergency power to instrumentation and controls of the reactor auxiliary cooling water systems. Only self actuating instruments are used under such conditions to monitor ACM operation. Local pressure indicators are used to monitor adequate pump operation (PI-4102-1 and -2; PI-4214, PI-4215; PI-4663, PI-4664, PI-46334, PI-46335, PI-46349, PI-46351, PI-46353, PI-46355; PI-4717, PI-4718). Local flow and temperature indicators are used to monitor system thermal hydraulic performance (FIS-4611, FIS-4612, FI-4639, FI-4640, FIS-4645, FI-4649, FI-4650, TI-4633, TI-4634, TI-4641, TI-4642, TI-4647, TI-4648, TI-4661, TI-4662, TI-46146, TI-46147; TI-46150 through TI-46159; TI-46174 through TI-46193, TI-46274, TI-46277, TI-46328, TI-46330, TI-46332, TI-46334; TI-4712, TI-4713).

Local pressure indicators (PI-4665, PI-4666), are used to monitor the pressure in the reactor plant cooling water surge tanks, and, together with subheader water outlet temperature, to verify that there is adequate subcooling to prevent boiling.

Surveillance procedure SR 5.4.4-M/5.4.4-Al provides for an annual calibration of the PCRV liner cooling system subheader outlet temperature instruments, and for a monthly check of their temperature readings (TI-46146, TI-46147, TI-46150 through TI-46159, TI-46174 through TI-46193, TI-46328, TI-46330, TI-46332, TI-46334). This surveillance is considered adequate. The pressure indicators used to monitor pump operation will be checked each time the performance of a pump is verified, which is also considered adequate. An annual calibration is recommended for these instruments.

3.4 (cont.)

In accordance with criteria 3.2.3a and 3.2.3e of Ref. 1 for surveillance class S1, it is recommended that the remaining local pressure, flow and temperature indicators which can be used to monitor ACM operation be checked quarterly and calibrated annually.

b.(2) I & C used for safe shutdown cooling

Certain instrumentation and controls in the reactor auxiliary cooling water systems are required to remain functional either during and after, or only following a design basis earthquake for safe shutdown cooling of the reactor. Some of these instruments are provided with an active function and are used: to control the water level in the firewater pump pit (LT-4107-1 and -2, HS4107, LIC-4107); to control the water level in the service water pump pit (LT-4218, LIC-4218-1); to control the temperature of essential equipment (TET-4234, TET-4235, TET-4274, TE/TIC/TSV-4267 through -4270);to control the backup firewater supply pressure to the service water system (PIC-4256, PS/HSV/PIC-4266); to automatically start the firewater pumps (PS/PSLL/LSLL-4504, PS-4504-1, LS-4504-2); to shut off automatically the reactor plant cooling water pumps in case of low water level in the surge tanks (LSL-4607 and -4608).

The water level control circuits are used during normal operation. The temperature control circuits are used either during normal operation, or when the standby diesel generators are tested. These are considered adequate functional tests, and they meet the required test frequency of criteria 3.2.3b of Ref. 1.

The backup firewater supply pressure control circuits are functionally tested when the operational readiness of the pressure control valves is verified per technical specification SR 5.3.4. Even though the annual frequency does not meet the required quarterly test frequency of criteria 3.2.3b, it is considered adequate since this is a backup supply and since manual valves can also be used to backup the control valves. Level switch LS-4504-2 automatically starts the firewater pump during normal operation, which is an adequate functional test.

There is currently no functional test of the reactor plant cooling water surge tank low level switches. Their function is essentially equipment protection, for which an annual functional test is adequate to meet criteria 3.2.3b for instrumentation which monitors a passive function.

Since the above instruments have adequate functional tests, it is recommended that they be calibrated annually to meet criteria 3.2.3e of Ref. 1.

3.4b (cont.)

PS/PSLL/LSLL-4504 and PS-4504-1 are functionally tested monthly and calibrated annually in accordance with technical specification SR 5.2.10, which satisfies criteria 3.2.3b of Ref. 1. No further surveillance is recommended for these instruments.

Other instruments, provided with a passive monitoring function, are used: to monitor the reactor plant cooling water temperature at the inlet to and at the outlet from the PCRV liner cooling system (TE-4637-1 and -3, TT/TI-4637, TT/TI-4637-1, TM-4637; TE-4638-1 and -3, TT/TI-4638, TT/TI-4638-1, TM-4638). These instruments are used during normal operation as part of the PCRV liner cooling water temperature control circuit, which is any adequate functional test.

In accordance with criteria 3.2.3b and 3.2.3e of Ref. 1, it is recommended that the above instrumentation be calibrated annually.

b.(3) I & C used for isolating secondary containment

Instrumentation and controls perform automatic actions to isolate parts of the PCRV liner cooling water system or of the purification cooling water system, in case of a failure in the primary boundary between reactor coolant and the auxiliary cooling water system.

When the reactor is pressurized, leakage of high pressure primary helium into the system results in a pressure increase which, upon reaching a predetermined threshold, generates automatic signals to isolate all the subheaders in the affected PCRV liner cooling water loop (PSH/PAH-46225 and -46226) or to isolate the affected helium purification cooler and helium purification train (PSH/PAH-4726 and -4727). Another pressure switch prevents spurious isolation of the helium purification coolers, resulting in total loss of helium purification, in case of accidental overpressurization of the purification cooling water expansion tanks (PSH-4708 and -4709). After a PCRV liner cooling water loop has been isolated, the affected subheader can be identified from the individual subheader high pressure alarms (PS/PAH-46235 through -46270, PSH-46381 through -46387).

In case of a loss of forced circulation accident, when the liner cooling water flow has been remote manually redistributed and the reactor is depressurized, water would leak from the PCRV liner cooling tubes into the primary system, resulting in a low flow in the affected outlet subheader. The subheader flow transmitters (FT-46132, FT-46133, FT-46136 through FT-46145, FT-46160 through FT-46174, FT-46176, FT-46194 through FT-46199, FT-46304, FT-46305) are continuously scanned, and the scanner (XS-46132) generates an automatic isolation signal (FSL-46237 through FSL-46272) for the affected subheader, should the flow drop below the corresponding redistribute mode set point.

3.4b (cont.)

Switching from normal to redistribute mode of operation (HS-46227 and HS-46228) also transfers the automatic isolation function to reactor plant cooling water surge tank low level switches (LT/LSL-4605 and -4606), which would isolate all the subheaders in the affected loop. The flow scanner is also used to verify compliance with the requirements of technical specification LCO 4.2.14 and detect that there is flow blockage in cooling tubes of any particular subheader. For that purpose, a normal mode set point is provided in the flow scanner for each subheader, and an alarm is actuated should the flow decrease below normal in any subheader.

Criteria 3.2.3c and 3.2.3e of Ref. 1, require that the above instruments and automatic actions be functionally tested and calibrated annually.

Technical specification SR 5.4.5 requires that 1/6 of the PCRV liner cooling system subheader flow transmitters be calibrated every year. Surveillance procedure SR 5.4.5-A2 accomplishes this by replacing the turbine flowmeter with one that has been pre-calibrated. The sampling method and frequency are considered acceptable, provided that the six year drift of the flowmeter is compatible with the required accuracy of the flow measurement. Experience to date does not allow a positive conclusion in this regard, and additional investigation may be required to confirm the actual loss of accuracy. This however, is not critical, since the flow scanner does not have an important safety function. Since the loop, in which the flowmeters are to be replaced, may have to be shutdown and drained, which in turn may require the reactor to be shutdown to comply with LCO 4.2.14, it is recommended that some operational flexibility be added to technical specification SR 5.4.5 to allow the flowmeters to be replaced at the next scheduled plant shutdown.

A functional test of the flow scanner and normal mode flow alarms is performed monthly per surveillance procedure SR 5.4.5-M, which exceeds the criteria of Ref. 1. Each time this procedure is performed, all the normal mode low flow setpoints are verified. The scanner itself is calibrated annually per surveillance procedure SR 5.4.5-A1. The surveillance procedures do not provide for testing automatic subheader isolation or verifying the redistribute mode setpoints. It is recommended that such requirements be added to the technical specifications, as well as a requirement to calibrate the remaining instruments. The automatic subheader isolation test should be performed when the reactor is shutdown, in conjunction with the surveillance test for the containment isolation valves recommended in paragraph 3.3.1 (b.3) above.

3.4b (cont.)

b.(4) Instrumentation used for monitoring

o <u>PCRV liner cooling water system temperature</u>

The outlet temperature of the individual PCRV liner cooling tubes (TE-46200-1 through -72, TE-46201-1 through -42, TE-46202-1 through -24, TE-46203-1 through -16 and -18, TE-46204-1 through -24, TE-46205-1 through -100, TE-46206-1 through -130, TE-46207-1 through -58, TE-46208-1 through -42, TE-46328-1 through -26) are continuously scanned (XS-46201), and alarmed (TSH/TAH-46201) if found above a preset value. The temperature scanner also checks the water inlet temperature to the PCRV liner cooling system (TE-4637-2, TE-4638-2, TE-46209-1, TE-46210-1). When combined with the information provided by the flow scanner (XS-46132), discussed in paragraph b.3 above, the temperature scanner provides information about the integrity of the thermal barrier, as discussed in Ref. 2. The information provided by the temperature scanner is also used to determine which tube in a particular subheader could experience flow blockage, after a low flow is alarmed by the flow scanner in that subheader.

Technical specification SR 5.4.4 requires that 97 liner cooling tube outlet thermocouples be calibrated annually. The thermocouples are chosen so that between 16 percent and 21 percent of the total in each subheader are calibrated each year. This is a representative number of thermocouples, which makes the scheduling acceptable, considering further that the thermocouples do not operate under stringent conditions. The temperature scanner itself is calibrated annually. As stated in Ref. 2, it is recommended that the water inlet temperature instruments, which are checked monthly also be calibrated annually to allow accurate heat balances for monitoring the integrity of the thermal barrier. The surveillance requirements of technical specification SR 5.4.4 are otherwise considered adequate since they meet criteria 3.2.3c and 3.2.3e of Ref. 1.

o <u>Compliance with limiting conditions of operation</u>

Some instrumentation, not covered in the above review, is used to verify compliance with the technical specification limiting conditions of operation. This is the case, in particular, of the circulating water makeup pump pit level indicators, which can also be used to monitor the water level in the storage basins (LT/LAL-4102-1 and -2; LI-4102-1, -2 and -3; LR-4102). This level instrument can also be used to determine the makeup pump inlet pressure, and subsequently the pump pressure differential. The makeup pump flow is measured on the makeup line to the firewater pump pit (FT/FM-4101-2, FR-4101) and is needed to verify makeup pump performance. The firewater pump pit level instruments are used to verify firewater pump performance and the operability of the pump pit required by LCO 4.2.6 (LSHL/LAHL-4107, LS-4107-1 and -2, LALL-4107). The main cooling tower blowdown flow (FT/FM/FR-4101-1; FIS/FAL-4101-2) is monitored to verify compliance with LCO 4.8.2 with regard

3.4b (cont.)

to liquid effluent release. It is recommended that these instruments be functionally tested and calibrated annually. It is also recommended that the amount of silt which may have deposited in the circulating water storage basins be measured, so that the actual water inventory can be determined to comply with the requirements of LCO 4.3.5. Such verification should be scheduled at the same interval as that recommended for surveillance of the storage basin structural integrity, as outlined in paragraph 4.2 of this report.

o System structural integrity

Part of the instrumentation discussed so far can be used to monitor system structural integrity. However, additional instrumentation may have to be used as discussed in section 4 hereafter. Such instrumentation includes the reactor plant cooling water surge tank and purification cooling water expansion tank level instruments and alarms (LS/LAHL-4605 and -4606; LIS/LAL-4706 and -4707). It is recommended that these instruments be calibrated annually, in accordance with criteria 3.2.3e of Ref. 1.

b.(5) Pumps, fans and valves instrumentation and controls

Instrumentation and controls for the pumps, fans and valves are used either during normal operation, or when performing surveillance of this equipment, which is adequate as functional test. It is recommended that the instrumentation provided to monitor or control these components be calibrated annually.

b.(6) Miscellaneous instruments and controls

The other instruments and controls do not participate in a safety function. Therefore, no surveillance is recommended.

c) Proposed ASME Code requirements: Not applicable.

4. STRUCTURAL INTEGRITY

4.1 SYSTEMS

a) Current surveillance requirements: None.

b) Recommended surveillance requirements:

Among the reactor auxiliary cooling water systems in the scope of this review, two are closed loop systems (the reactor plant cooling water system and the purification cooling water system). Both systems use condensate grade water, for which it

4.1 (cont.)

has been demonstrated that the corrosion rate was within acceptable limits. A DOE sponsored program was implemented at the plant to that effect, which enabled PSC to determine that the current water chemistry control scheme is adequate to maintain the corrosion rate well within the design value. The results of this program have been previously reported to NRC. The service water which cools these systems is at a lower pressure than the water in the systems themselves, so that there is no concern that service water might leak into these systems and induce corrosion. The systems operate at low pressure and temperature, and the operating conditions are much less severe than the design conditions; no phenomenon has been identified which might raise a concern with respect to the structural integrity of these systems. Further, surge tank level instrumentation continuously monitors the systems for leakage, since makeup is accomplished manually. The parts of system which may funct as secondary containment are also continuously monitored by pressure instruments which generate automatic containment isolation actions in case of loss of structural integrity, as outlined in paragraph 3.4.b3 above. Further, any leakage is likely to be noticed by the plant operators during their daily routine inspections of the plant, since there is no restriction for access during operation at power. Continuous leakage monitoring during plant operation satisfies criteria 3.3.1a of Ref. 1 for demonstrating the structural integrity of the reactor plant cooling water system and of the purification cooling water system. Therefore, no other surveillance is recommended.

Similar considerations apply to the firewater supply portion of the fire protection system. However, there may be normal usage of firewater, and the makeup to the firewater storage tank is automatic. Since the startup of the firewater pump is alarmed in the control roon, and because the operator will have to manually shutdown the pump, the plant operator will be alerted to leaks in the system by a high frequency of pump startups. Further, when the emergency firewater pump is tested, the firewater storage tank is at its nominal inventory, so that there is no flow and the system is pressurized to the pump head at zero flow. This pressure exceeds slightly the system design pressure which is the same as the safety valve set pressure, so that the system is pressurized at design pressure about once a week. Such leakage monitoring and pressure testing are considered adequate to meet criteria 3.3.1a of Ref. 1 and no further surveillance is recommended for the firewater portion of the fire fighting system.

There are no practical ways to monitor leakage of the open loop systems (circulating water makeup system and service water system). Within the plant itself, leakage will be detected by operators performing daily routine inspections, since, as

4.1 (cont.)

already mentioned, there are no restrictions for access during operation. Significant leakage in the inaccessible outside parts of the systems would also likely be noticed since they would probably disturb normal system operation and they would also result in some kind of local flooding. The systems operate at low temperature and pressure in a range which would not affect structural integrity, compared to design conditions. General corrosion would be the only area of concern since water chemistry control may fluctuate. However, it is not expected that general corrosion would degrade structural integrity of these systems to a point which might prevent them from performing their safety functions. As part of the plant water chemistry control program, corrosion probes have been installed in the circulating water system and in the service water system. These probes are monitored periodically to assess the adequacy of the chemistry control and verify that there are no unacceptable corrosion rates. It should be noted that corrosion would principally affect the heat exchanger shells where the corrosion allowance available may not be as large as in the rest of the systems. Therefore, it is recommended that corrosion monitoring continue to be performed as part of plant water chemistry control program; no further surveillance is recommended for the circulating water system and the service water system.

c) Proposed ASME Code requirements:

The inspection and test requirements of subsection IGD would apply to those parts of the reactor auxiliary cooling water systems which do not have a secondary containment function among their safety functions. Paragraph IGD-2600 requires that a system examination be conducted during each inspection period for evidence of leakage, structural distress, or corrosion, when the system is undergoing an inservice test, a component functional test, or a system pressure test. In case of buried components, a pressure test can be performed in lieu of a visual examination. Paragraph IGD-5210 requires that the components be pressure tested at 1.10 times design pressure, and examined for leakage at the end of each inspection interval (10 years per IGA-2400). Open ended portions of a system extending to the first shutoff valve may be exempted from pressure testing.

The inspection and test requirements of subsection IGC would apply to the portions of system which may act as secondary boundaries. Paragraph IGC-2510 requires that fluid system components be pressure tested, at 1.25 times the design pressure, and examined for leakage at or near the end of each inspection interval. Paragraphs IGC-2520 and IGC-2600 require that the components be non-destructively examined for defects as specified in tables IGC-2500-1 and IGC-2600-1: volumetric examination of 50 percent of certain pressure retaining weld joints (category C-G); visual examination of all pressure retaining bolting 1 inch in diameter and larger, and surface or volumetric examination of 10 percent of the bolting in each joint (category C-D). These examinations are required to be scheduled on

4.1 (cont.)

a periodic basis during the 10 year inspection interval. However, examination of bushings, threads and ligaments in the base material of flanges are required only when a bolted connection is disassembled for other reasons.

d) The differences between the recommended surveillance and the proposed Code requirements are justified by the considerations outlined in paragraph (b) above.

4.2 STORAGE BASINS

a) Current surveillance requirements: None.

b) Recommended surveillance requirements:

The storage basins provide the ultimate safety class 1 source of cooling water used for safe shutdown cooling, and for service water makeup in case of a permanent loss of forced circulation accident, including ACM operation.

The storage basins are shallow reservoirs, installed at a location where a natural dip exists, so that the water level is essentially at the natural grade level, except in the northwest part of the west storage basin where the natural grade level is only two feet above the bottom of the basin. Where required, a compact fill provides embankments for the storage basins. These embankments are designed with a 1:3 external slope and a 1:4 internal slope. The internal slope and bottom is lined with a 3 ft. thick clay layer. The top of the embankment is lined with concrete. The height of the embankment is only 5 ft. above grade level, except on the west and north sides of the west storage basin where it gradually increases to about 18 feet. A settling basin is provided north of each storage basin, so that two embankments separate the storage basins from the grade level, on the north side.

Regulatory Guide 1.127 (Rev. 1, March 1978) - Inspection of water structures associated with nuclear power plants - has been reviewed. It requires that inservice inspection be performed at periodic intervals, not to exceed 5 years, to check the condition of these structures and evaluate their structural safety and operational adequacy. The onsite inspection program addresses the concrete structures, the embankment structures, the spillway structures and outlet works, the reservoirs, the intake and discharge structures, the safety and performance instrumentation, as well as operation and maintenance features, and post construction changes.

The storage basins have only minor concrete structures. Survey markers (brass caps) have been installed to allow a determination of significant changes in alignment or settlement of the

4.2 (cont.)

embankments which might be detrimental to the structural integrity of the storage basins. In accordance with R.G. 1.127, it is recommended that alignment and settlement of the storage basins embankments be verified at least once every five years, since no noticeable changes have occured since they were built, more than eight years ago.

It is recommended that the embankments and water structures, (i.e. spillways and outflows) be examined at the same interval, for abnormal erosion, cracks, seepage, leakage, accumulation of silt or debris, as applicable, which might indicate a deterioration of the storage basins.

c) Proposed ASME Code requirements: Not applicable. However, the requirements of Regulatory Guide 1.127 are considered applicable as outlined in paragraph (b) above.

d) The recommended surveillance meets the requirements of Regulatory Guide 1.127.

5. LIST OF REFERENCES

References:

(1) PSC report EE-SR-0001: Surveillance inspection and test criteria for the Fort St. Vrain nuclear generating station.

(2) PSC report EE-11-0003: Fort St. Vrain inservice inspection and testing program. Surveillance requirements review for the PCRV internals. (Part A - PCRV thermal barrier).

(3) PSC report EE-22-0002: Fort St. Vrain inservice inspection and testing program. Surveillance requirements review for the secondary coolant system.

(4) Fort St. Vrain FSAR. Sections 5.9, 5.12, 5.13, 6.2, 9.7, 9.8, 10.3.9, 14.10, Appendix D.

(5) FSV technical specifications: LCO 4.2.4, LCO 4.2.5, LCO 4.2.6, LCO 4.2.13, LCO 4.2.14, LCO 4.2.15, LCO 4.3.5, LCO 4.10.5; SR 5.2.10, SR 5.2.21, SR 5.3.4, SR 5.4.4, SR 5.4.5, SR 5.6.1.

(6) FSV surveillance procedures: SR 5.2.10-A; SR 5.2.10-M, SR 5.2.10-W; SR 5.2.21-SA; SR 5.3.4-SA/5.3.3C-A, SR 5.4.4-M/ 5.4.4-A1, SR 5.4.4-A2; SR 5.4.5-A1, SR 5.4.5-A2, SR 5.4.5-M, SR 5.6.1-SA.

(7) FSV system diagrams: PI-41-1 through -3; PI-42-1 through -3, PI-42-6; PI-45, PI-45-2, PI-45-6; PI-46-1 through -10; PI-47; SR 6-1 sheets 43 through 52, sheets 61 through 65, sheets 81 through 84.

(8) FSV system electrical diagrams: E-1203, E-1204, E-1205

(9) FSV design criteria and system descriptions: SD-41, SD-42, SD-45, SD-46, SD-47, SD-48.

(10) Draft ASME Code, Section XI, Division 2.

(11) PSC letter Ref. P-76006, R.F. Walker to R.P.Denise - "Fort St. Vrain Alternate Cooling Method", dated January 19, 1976.

(12) PSC letter Ref. P-79170, C.K. Miller to W.P. Gammill dated August 13, 1979.