PART C

SURVEILLANCE REQUIREMENTS

FOR THE

FORT ST. VRAIN

PCRV PENETRATION INTERSPACE PRESSURIZATION SYSTEM

PCRV PENETRATION PURGE GAS SYSTEM

CORE SUPPORT FLOOR AND COLUMN VENT SYSTEM

1. INTRODUCTION

A review was performed of the current surveillance requirements for the PCRV penetration interspace pressurization system, penetration purge gas system and core support floor and column vent system. Additional or modified surveillance requirements may be recommended to comply with the criteria established for the Fort St. Vrain inservice inspection and testing program as outlined in Ref. 1.

For each item, the applicable proposed ASME Code requirements (Section XI, Division 2, Draft) are identified and an explanation is given when the recommended surveillance differs from the proposed code requirements.

A review has been performed of the documents listed in Section 5 as well as of the operating experience of the Fort St. Vrain Nuclear Generating Station.

2. SURVEILLANCE CLASSIFICATION

2.1 The function of the PCRV penetration pressurization system is to supply purified helium to the several penetrations at a pressure slightly higher than reactor coolant pressure and thus prevent outleakage of radioactive reactor coolant.

The system also monitors primary and secondary closure integrity. Buffer helium flow, pressure and pressure differential with respect to primary pressure are monitored, and automatic isolation of individual penetration groups is initiated upon a high flow signal. In case of failure of a primary closure, parts of the system would act as secondary containment, which is the only safety function of the system.

With due consideration to the above safety functions and the criteria of Ref.1, the parts of the system required to perform the safety function have been assigned to surveillance class S3.

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2.2 The penetration purge gas system function is to supply purified helium purge gas to the refueling penetrations and high temperature filter absorber penetrations.

The system portion between the remote manual isolation valve or second check valve and the penetrations acts as

2.2 (cont.)

secondary containment, which is its only safety function. Accordingly, that part of the system is assigned to surveillance class S3.

2.3 The core support floor and column vent system routes effluents to the waste treatment systems. The system portion between the remote manual isolation valve and the penetrations acts as secondary containment which is its only safety function. Accordingly, that part of the system is assigned to surveillance class S3.

2.4 The above systems only include valves and piping assigned to surveillance class S3. The following criteria per Ref. 1 apply to these components. System operational readiness is demonstrated by testing individual active componen Operational readiness of the valves shall be demonstrated by normal operation or by surveillance testing to exercise those valves which do not normally operate, and remote manual valves once every five years, unless valves are exempt from testing per criteria 3.2.2d.

The operational readiness of instrumentation and control circuits shall be demonstrated by surveillance testing, with generally a calibration test and a functional test to be performed at least once a year. Structural integrity of the PCRV penetrations shall be verified by leakage monitoring. Structural integrity of all accessible safety related piping system pressure boundaries shall be verified by examination for leakage once each year when the system is at or near normal working pressure, unless criteria 3.3.1c allow exemption from testing.

3. OPERATIONAL READINESS

3.1 OPERATIONAL READINESS OF THE SYSTEM

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The penetration overpressurization system is in permanent operation as required by LCO 4.2.7c to maintain the interspaces between primary and secondary closures at a pressure greater than primary system pressure with purified helium gas, when the PCRV is pressurized above 100 psia. The only automatic actions are achieved by

3.1 (cont.)

individual components, the operational readiness of which is to be tested.

There are no automatic safety actions performed by the other two systems.

However, with respect to the penetration pressurization system, technical specification SR 5.2.16 currently requires that the PCRV primary and secondary closure leakage be determined once per month, or as soon as practicable after an increase in pressurization gas flow is alarmed.

The operating experience with respect to penetration closure leakage has been reviewed, as it appears in the results of leakage tests performed to this date. The review has indicated that the current frequency required for routine determination of closure leakage is overly restrictive, for the reasons outlined hereafter.

The test results show the closures to be leak tight and that there has been no signs of slow degradation of closure leak tightness. Leakage, which has been experienced, has occured rather quickly and the leakage exceeded the total flow alarm set point. Therefore, it is considered that the total pressurization gas flow alarm is the primary instrumentation to be relied upon, together with the high flow isolations, to continuously monitor the leak tightness of the penetration closures and to assure overall compliance with the requirements of LCO 4.2.9. The determination of leakage (if any) allows the leak to be located (in which penetration group, primary or secondary) and to assess the seriousness of the problem after a high pressurization flow is alarmed, or, when performed on a routine basis, the determination of leakage would be a preventive measure to avoid exceeding the total flow alarm set point. It should be emphasized that the maximum allowable secondary leak rate provides a high degree of conservatism when compared to the maximum allowable primary leak rate, since under all circumstances (except if a secondary closure were disassembled or had failed while the reactor is at normal pressure) the leakage of primary coolant to the environment would be limited by the leak-rate of the secondary closure to a value well below the safety limit implied by LCO 4.2.9.

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It is therefore recommended that the frequency of the routine leakage determination, required by technical specification SR 5.2.16, be modified from monthly to quarterly, such a frequency being adequate to further demonstrate that penetration closure leakage remains within the allowable limits of LCO 4.2.9.

Further, it has been noted that an increase in pressurization gas flow can be anticipated during plant operating

3.1 (cont.)

transients which yield a change in primary coolant pressure and subsequently in penetration pressurization gas pressure. Even though this is only a temporary and anticipated flow, it may happen to be large enough to be alarmed and technical specification SR 5.2.16 would require that the leak-rates be determined. It is recommended that technical specification SR 5.2.16 be modified to address only unanticipated increases in pressurization gas flow.

3.2 OPERATIONAL READINESS OF ACTIVE COMPONENTS

3.2.1 REMOTELY ACTUATED ISOLATION VALVES (HV1128, HV1195, HV11250 HV11260, HV11251, HV11264, HV11151, HV11152, HV11169 through HV11172)

(a) Current surveillance requirements:

In addition to determination of leakage, discussed in paragraph 3.1 above, technical specification SR 5.2.16 requires that instrumentation, including alarms and high flow isolation, be functionally tested monthly and calibrated annually. These tests imply that all the above valves, except HV11250, HV11260 and HV1195, are full stroke exercised every month. Valve HV11250 is used at each refueling shutdown.

(b) Recommended surveillance requirements:

Normal operation and test requirements exceed criteria 3.2.2c and are adequate to assure operational readiness of all the automatic and remote manual isolation valves except HV11260 and HV1195. It is recommended that verification be made once a year that the position indications accurately reflect actual valve position by observing disc motion. It is recommended that HV11260 and HV1195, as well as their controls, position indications and fail safe operation, be tested at least once every five years. The recommended surveillance meets criteria 3.2.2c and 3.2.3d of Ref. 1.

(c) Proposed ASME Code requirements: 1960 01

The isolation valves fall under code category B (IGV-2100) for which seat leakage in the closed position is inconsequential for fulfillment of their function. IGV-3300 requires valves with remote position indication, which during plant operation are inaccessible for direct observation, to be visually observed at least as frequently as scheduled refueling outages, to confirm that remote valve indications accurately reflect valve operation. IGV-3415 requires fail safe operation of the valves to be tested at least at each cold shutdown.

3.2.1 (cont.)

(d) The recommended surveillance requirements meet or exceed the proposed ASME Code requirements.

3.2.2 CHECK VALVES (V11249, V11288, V11289, V11296, V11297 V11501 through V11537, V11351 through V11387)

(a) Current Surveillance Requirements: None.

(b) Recommended surveillance requirements:

Check valve V11249 does not have an active safety function since it is used only at shutdown and startup when pressurization is performed from helium storage, and is backed up by an isolation valve (HV1128). Therefore, no surveillance is required for this check valve. The other check valves prevent backflow of primary coolant in case of loss of purge flow or line break. V11296 and V11297 assure redundancy of check valves placed in the HTFA penetrations and it is recommended that they be tested at least once every five years. The other check valves are part of the penetrations and not accessible during operation. Further, there are no practical means of observing check valve operation with the valve in place. Leakage of a check valve does not constitute a safety hazard of significant consequences. It is recommended that, when a penetration is open for maintenance or refueling, the check valves be removed and tested to assure their ability to close and perform their isolation function, if the check valves have not been tested in the last five years.

(c) Proposed ASME Code requirements:

Paragraph IGV-3520 requires testing the check valves every 3 months or, if not practical, at each cold shutdown.

(d) Differences exist with the proposed Code requirements since a backup isolation is provided in series with each check valve and since most check valves are not accessible.

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3.3 OPERATIONAL READINESS OF INSTRUMENTATION AND CONTROLS

3.3.1 MONITORING OF PRESSURE DIFFERENTIAL BETWEEN PURIFIED HELIUM HEADER AND PRIMARY COOLANT SYSTEM

3.3.1 (cont.)

(a) Current surveillance requirements:

Technical specification SR 5.2.15 requires that instrumentation be functionally tested once every month and calibrated annually.

(b) Recommended surveillance requirements:

The review of the surveillance procedure SR 5.2.15-M and SR 5.2.15-A has determined that the surveillance is limited to PDIS/PDAH-11251, PDIS/PDAH-11261 and PDT/PDR-11226. It should be extended to PDS/PAL-11226 which alarms a low pressure differential between the buffer helium header and the reactor cavity. The current surveillance otherwise exceeds criteria 3.2.3c of Ref. 1.

(c) Proposed ASME Code requirements: Not applicable.

3.3.2 MONITORING OF PRESSURIZATION GAS FLOWS

(a) Current surveillance requirements:

Technical specification SR 5.2.16 requires that the instrumentation monitoring PCRV penetration closure interspace pressurization gas flows, including alarms and high flow isolation, be functionally tested monthly and calibrated annually.

(b) Recommended surveillance requirements:

The review of the surveillance procedures SR 5.2.16b-M and SR 5.2.16b-A has shown the adequacy of the requirements of SR 5.2.16 to assure sensing and alarming any change in pressurization gas flow. The current surveillance exceeds criteria 3.2.3c of Ref. 1.

(c) Proposed ASME code requirements: Not applicable.

3.3.3 CORE SUPPORT FLOOR AND CORE SUPPORT FLOOR COLUMN MONITORING (PS/PAH1194, LIS/LAH1193, MIT1193)

(a) Current surveillance requirements: None.

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(b) Recommended surveillance requirements:

This instrumentation monitors leakage of primary coolant,and water leakage from the cooling tubes, into the core support floor or columns. It is therefore recommended, in accordance with criteria 3.2.3c of Ref. 1, that this instrumentation be functionally tested and calibrated annually.

(c) Proposed ASME Code requirements: Not applicable.

3.3.4 OTHER INSTRUMENTATION AND CONTROLS

(a) Current surveillance requirements: None.

(b) Recommended surveillance requirements:

There are no safety functions or limiting conditions of operation involved. Therefore, no surveillance is required.

(c) Proposed ASME Code requirements: Not applicable.

4. STRUCTURAL INTEGRITY

(a) Current surveillance requirements: None.

(b) Recommended surveillance requirements:

The structural integrity of those parts of the system designated as Safety Class I which may act as secondary containment is assured by design. Failure of such a small diameter pipe does not constitute a safety hazard of significance. Further, the pipe sections are not subjected to operational conditions which may raise a concern with respect to degradation of their structural integrity. Therefore, no inspection, pressure testing or examination for leakage is required, in accordance with criteria 3.3.1c(ii) of Ref. 1.

(c) Proposed ASME Code requirements:

The surveillance requirements of subsection IGC apply to the safety related piping which is considered as ASME Code Class 2, due to its function as a containment boundary. Paragraph IGC-1221 exempts this piping from volumetric and surface examination, due to component function. However, paragraph IGC-1220 requires that visual examination be performed during the system leakage and pressure test required by IGC-5000. This piping can be considered as a system portion non isolable from the PCRV, for which article IGC-5400 applies; its requirements are satisfied provided that one of the following be performed: an overpressure test, or an examination, or a detection of reactor coolant leakage at power after each fueling outage.

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(d) The penetration pressurization system is monitored for leakage, in application of SR 5.2.16. Therefore, the code requirements are exceeded for this system. The surveillance requirements for the remaining pipe sections differ from the proposed code requirements on the basis discussed in paragraph (b).

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. Fort St. Vrain FSAR, Section 5.8
3. Fort St. Vrain System Description SD-11-6
4. PI-11-1 through PI-11-5 and PI-23-4
5. Fort St. Vrain Technical Specifications LCO 4.2.7, LCO 4.2.9, SR 5.2.15, SR 5.2.16
6. Fort St. Vrain Surveillance Procedures SR 5.2.15-M, SR 5.2.15-A, SR 5.2.16a-M, SR 5.2.16b-M, SR 5.2.16b-A
7. ASME Code, Section XI, Division 2, Draft