PART B

SURVEILLANCE REQUIREMENTS

FOR THE

FORT ST. VRAIN

PCRV PENETRATION

OVERPRESSURE PROTECTION SYSTEM

1. INTRODUCTION

A review was performed to determine the adequacy of the current surveillance requirements for the circulator and steam generator penetration interspace overpressure protection system. Additional or modified surveillance requirements may be recommended to meet 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.

The review included the documents listed in Section 5 as well as the operating experience of the Fort St. Vrain nuclear generating station.

2. SURVEILLANCE CLASSIFICATION

Two safety functions can be assigned to the system:

- penetration interspace overpressure protection,
- secondary containment for reactor coolant.

The penetration interspaces are pressure vessels designed for PCRV reference pressure (845 psig) and require overpressure protection in case of rupture of one of the high pressure process pipes which run through them. They are normally filled with purified buffer helium at a pressure slightly above reactor coolant pressure to prevent outleakage of contaminated primary helium. That part of the overpressure protection system up to and including the rupture discs is an extension of the secondary closure.

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

The following criteria of Ref. 1 apply to surveillance class S3 systems and components. System testing for operational readiness is demonstrated by testing individual active components. The operational readiness of remote manual valves is to be demonstrated by normal operation or by surveillance testing at least once every five years unless exception can be made according to criteria 3.2.2d or the Code. The safety/relief valves shall be tested at least once every five years. Operational readiness of instrumentation and control circuits shall be demonstrated by surveillance testing. Structural integrity of PCRV penetration pressure boundaries shall be verified by leakage monitoring.

3. OPERATIONAL READINESS

3.1 OPERATIONAL READINESS OF THE SYSTEM

The system consists of six subsystems - one for each of the four circulator penetrations and one for all penetrations of each steam generator. The operational readiness of each subsystem is assured by testing the operational readiness of individual active components, in accordance with criteria 3.1c of Ref. 1.

3.2 OPERATIONAL READINESS OF ACTIVE COMPONENTS

3.2.1 RUPTURE DISCS (M1113 through M1120 and M1101 through M1104)

(a) Current surveillance requirements: None.

(b) Recommended surveillance requirements:
The rupture discs are Fike RKB assemblies (see drawing 91-M-17-0028) which do not have a testable design feature with respect to burst pressure setting. However, the manufacturers instructions caution that the hold-down flange knife blade should be periodically inspected for sharpness; further, it mentions that no dents of any kind are allowed on the rupture discs. Therefore, it is recommended that visual inspection be performed of selected rupture discs and knives, at intervals not to exceed every five years, to verify that the membrane is free of defects and that the knife blade remains sharp.

(c) Proposed ASME Code requirements:
IGV-3620 requires that rupture discs with testable design features be tested in accordance with manufacturer's instructions.

(d) The recommended surveillance meets the proposed ASME code requirements, as specified by criteria 3.2.2c of Ref. 1.

3.2.2 SAFETY VALVES (V1173, V1174, V1179, V1180, V11174 through V11177, V1137 through V1140)

(a) Current surveillance requirements:
Technical specification SR 5.2.1 (b) requires that the lift pressure setting of each safety valve be tested at intervals not to exceed every five years.

3.2.2 (cont.)

(b) Recommended surveillance requirements:
Even though the current surveillance requirements were found to be adequate, it is recommended that a testing schedule be specified, so that for each penetration interspace, one safety valve is tested at intervals of approximately two and a half years.

(c) Proposed ASME Code requirements:
IGV-3511 requires that all safety valves be tested during a five year period and,
IGV-3512 requires that safety valves be tested according to the procedures specified in ASME PTC 25.2 - 1966.

(d) The test procedure has been reviewed against procedure ASME - PTC 25.3 - 1976 which replaces ASME - PTC 25.2 - 1966. No discrepancies have been found. The recommended surveillance requirements meet the proposed ASME Code requirements, as specified by criteria 3.2.2c of Ref. 1.

3.2.3 REMOTE MANUAL MOTORIZED ISOLATION VALVES
(HV11145-1 and 2, HV11146-1 and 2, HV11228-1 and 2, HV11229-1 and 2, HV11163-1 and 2, HV11164-1 and 2)

(a) Current surveillance requirements: None
Even though testing of a safety valve requires that the corresponding isolation valve be closed and verification be made that the isolation valve on the other pressure relief train is open, this could be achieved without having to stroke the valves (i.e. normal operating configuration).

(b) Recommended surveillance requirements:
It is recommended that each isolation valve be exercised at intervals of approximately two and a half years, before testing a safety valve. Checks that the handwheels are locked are to be performed as part of operating procedures which apply to locked or sealed valves. This surveillance satisfies criteria 3.2.2c of Ref. 1.

(c) Proposed ASME Code requirements:
Despite the fact that the isolation valves are used for testing and maintenance only and could be exempt from surveillance, the interlock design is such that, during operation, one of the valves is open while the other one is closed. Consequently, it is required that the closed valve be opened when switching from one overpressure relief train to the other one. This function places the isolation valves in code category B (IGV-2100). In order to prevent inadvertently closing an isolation valve using the handwheel, the handwheels are to be locked (Note 3 on PI-11-4) which also places the valves in category E.

3.2.3 (cont.)

IGV-3410 requires that category B valves be exercised at least every 3 months, when this is practical during plant operation, while observing disc movement on the corresponding position indicators.

IGV-3700 requires that operational checks be performed to verify that each category E valve, in this case the handwheel only, is locked.

(d) Only one overpressure protection train has to be operable at any time (LCO 4.2.7). The interlock allows isolation of one pressure relief train only after the second train is operable. The motorized valves are "fail as is". No change in system configuration is expected, except for testing the system or in case of an incident in the operable train, such as a leaking rupture disc. The overall operation is remote manual and backup is provided with local handwheels. Therefore, the difference as regards the test frequency required by the proposed Code is considered to be justified.

3.2.4 REMOTE MANUAL RUPTURE DISC/SAFETY VALVE INTERSPACE VENT VALVES (HV11193 through HV11196, HV11230 through HV11233, HV11165 through HV11168)

(a) Current surveillance requirements: None.

(b) Recommended surveillance requirements:
These valves are normally closed and fail safe in the closed position. According to criteria 3.2.2d, they are exempt from testing.

(c) Proposed ASME Code requirements:
The function of these valves is to vent the interspace so that the rupture disc burst pressure remains at the set value. The valves are normally closed and fail safe in the closed position. Consequently, these valves fall under Code Category B (IGV-2100) and valve exercising is required every 3 months (IGV-3410).

(d) The interspace pressure is continuously monitored. However, there is no automatic opening of the vent valve to relieve a high pressure. No change in valve position is expected, except when testing the system or in case of incident in the operable pressure relief train, such as a leaking rupture disc. Furthermore, the backup relief train is available in the event the interspace could not be vented. Therefore, the difference as regards the testing required by the proposed Code is considered to be justified.

3.3 OPERATIONAL READINESS OF INSTRUMENTATION AND CONTROLS

3.3.1 RUPTURE DISC/SAFETY VALVE INTERSPACE PRESSURE SWITCH AND ALARM (PS and PAH 11197 through 11200, 11234 through 11237, 11157 through 11160)

(a) Current surveillance requirements:
Technical specification SR 5.2.1.C1 requires monthly functional testing and annual calibration of this instrumentation.

(b) Recommended surveillance requirements:
The current requirements are considered adequate to assure that the rupture disc burst pressure is not degraded by backpressure, and they exceed criteria 3.2.3c and meet criteria 3.2.3e of Ref. 1.

(c) Proposed ASME Code requirements: Not applicable.

3.3.2 REMOTE MANUAL MOTORIZED ISOLATION VALVE CONTROLS, INTERLOCKS AND POSITION INDICATIONS (HS11145, 11146, 11228, 11229, 11163, 11164, associated controls and position indication)

(a) Current surveillance requirements: None.

(b) Recommended surveillance requirements:
It is recommended that the instrumentation and controls, in particular the interlocks, be functionally tested and calibrated when performing the valve test per 3.2.3 above. This surveillance meets criteria 3.2.3d of Ref. 1.

(c) Proposed ASME Code requirements:
IGV 3300 requires that at least one observation be made every two years to confirm that remote valve indications accurately reflect valve operation. The Code is otherwise not applicable to controls and interlocks.

(d) The recommended test frequency is consistent with the overall test frequency of the system and almost the same as the test frequency required by the proposed Code.

4. STRUCTURAL INTEGRITY

4.1 RECOMMENDED SURVEILLANCE REQUIREMENTS

Penetration interspace leakage is monitored continuously and alarmed if above pre-set limits. This leakage monitoring covers the part of the system between the penetration secondary closure and the rupture disc on one train, and the closed isolation valve on the other train. Since any one of the two trains can be operable, it is considered to apply up to both rupture discs. Therefore, this surveillance is considered adequate to assure the integrity of the portion of system which acts as secondary containment. The remaining piping is exempt from testing by criteria 3.3.1c(i) of Ref. 1, since it is only pressurized during testing, which is not expected to degrade its integrity.

4.2 PROPOSED ASME CODE REQUIREMENTS

The part of the system between the secondary penetration closure and the rupture discs is an extension of the secondary closure. Surveillance requirements for ASME Class 2 per subsection IGC are considered applicable. IGC-1221 exempts the system from examination per IGC-1000, due to component function, but IGC-1220 requires visual examination during the system leakage and pressure test required by IGC-5000. IGC-5400 applies to that part of the system extending from the secondary closure to the remote manual motorized isolation valves (i.e. PCRV penetrations and other components not isolable from the PCRV); its requirements are satisfied by IGA-5440 which requires that a test for detection of reactor coolant leakage be conducted after each fueling outage while the reactor is operating at the power level permitted by the Regulatory Authority. IGC-5300 applies to the portions of system piping between the isolation valves and rupture discs, and requires pressure testing and examination for leakage at a pressure not less that 1.2 times the system design pressure.

Differences exist with the test pressure requirement of the Code, on the basis that the portion of system between the isolation valves and the rupture discs is continuously monitored for leakage.

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

5. (cont.)

5. Fort St. Vrain Technical Specifications LCO 4.2.7, SR 5.2.1, SR 5.2.16
6. ASME Code-Section XI, Division 2, Draft
7. ASME - PTC 25.3 - 1976 Performance test code for safety and relief valves
8. Fort St. Vrain Surveillance Procedures SR 5.2.1.b-X, SR 5.2.1-c1-M/A
9. Fort St. Vrain Component drawing 91-M-17-0028