TENNESSEE VALLEY AUTHORITY
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SEP 24 1986

Director of Nuclear Reactor Regulation
Attention: Mr. B. Youngblood, Project Director
PWR Project Directorate No. 4
Division of Pressurized Water Reactors (PWR)
Licensing A
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Youngblood:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

IE Inspection Report Nos. 50-327/86-20 and 50-328-86-20, transmitted by letter from J. A. Olshinski to S. A. White dated April 23, 1986, contains unresolved item 50-327/86-20-09 and 50-328/86-09, Containment Isolation Design Pertaining to the Chemical and Volume Control System. By my letter dated May 30, 1986, we submitted information on this issue in response to a telephone call during which NRC had requested additional information on Sequoyah's containment isolation system.

Enclosed is a supplement to this previous submittal reflecting agreements reached in a meeting between TVA and NRC project management and staff on August 13, 1986, and as documented in meeting minutes issued by NRC on August 15, 1986.

Please direct questions you may have concerning this issue to T. S. Andreychek at (615) 870-7470. In addition, please provide TVA with written confirmation of the closeout of this issue upon completion of the Staff's review.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. Gridley

R. Gridley, Director
Nuclear Safety and Licensing

Enclosure
cc: See Page 2

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Director of Nuclear Reactor Regulation

cc (Enclosure):
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ENCLOSURE

REVISED RESPONSE - NRC-OIE INSPECTION REPORT
NOS. 50-327/86-20 AND 50-328/86-20
JOHN A OLSHINSKI'S LETTER TO S. A. WHITE
DATED APRIL 23, 1986

Unresolved Item 50-327/86-20-09 and 50-328/86-20-09

BACKGROUND

IE Inspection Report Nos. 50-327/86-20 and 50-328/86-20 identified an unresolved item (URI) concerning five (5) chemical and volume control system (CVCS) containment penetrations. The penetrations involved are X-16, the normal charging supply, and penetrations X-43A, -43B, -43C, and -43D, the four reactor coolant pump (RCP) seal injection lines. The URI was identified during an Operational Readiness inspection. The issue involves the lack of conformance to the explicit requirements of 10CFR50 Appendix A General Design Criteria (GDC) for containment isolation.

As a result of several telecons between NRC and TVA pertaining to this issue, NRC requested that TVA prepare a submittal to provide full information for all containment penetrations which have isolation schemes differing from those explicitly allowed in GDC 55, 56, and 57, i.e., for those employing alternate isolation schemes found acceptable on other defined bases. A discussion of the design basis for the containment isolation system for SQN was also to be provided as well as clarification of TVA's position at the time of licensing regarding the SQN design relative to the 10CFR50 GDCs. A TVA submittal on this issue dated May 30, 1986, was transmitted to NRC for review.

A meeting was held in Bethesda, Maryland on August 13, 1986, between TVA and NRC to discuss the results of the NRC review pertaining to both the five subject CVCS penetrations and the SQN containment isolation design in general. The submittal was discussed at length with initial and new NRC issues addressed. The principal issues involved the containment isolation design for the five CVCS lines, the designated isolation design for the ECCS lines, and NRC concern over interpretation of submittal statements concerning the "applicable design criteria" for SQN. It was agreed that a revised submittal would be prepared by TVA to differentiate between the design and licensing basis for the containment isolation system for SQN, to provide additional technical basis for the alternate isolation scheme employed at SQN for the RCP seal injection lines, and to redesignate certain remote manual and automatic valves as containment isolation valves. Each redesignated containment isolation valve was to be evaluated for leak testing requirements in accordance with 10CFR50 Appendix J. A subsequent telecon was initiated by NRC on August 21, 1986, in which several additional NRC concerns were identified for TVA investigation and response in the revised submittal.

TVA RESPONSE

The two attachments to this submittal provide the containment isolation design information requested by NRC. Attachment 1 provides clarification of the design and licensing bases for the containment isolation system for SQN and discussion of all penetrations identified by NRC for specific evaluation and response. This includes, but is not limited to, the five subject CVCS penetrations. Attachment 2 provides a revised tabulated listing of pertinent information for SQN containment penetrations, segregating those penetrations for which their design meets the GDCs explicitly (as defined in GDCs 55, 56, and 57) from those for which their design employs alternate isolation schemes which are found acceptable on other defined bases. The two tables providing this information have been resubmitted in entirety from the initial submittal, not just the changes, to provide continuity of the document. Information provided in both attachments reflect understandings and agreements reached in the August 13, 1986 meeting unless otherwise stated.

SUMMARY

The containment isolation system for SQN has employed designs which either meet the requirements of GDC 55, 56, and 57 explicitly or which are found acceptable on other defined bases. In all cases, the designs provide redundant isolation barriers such that any single failure would not result in release of containment atmosphere to the environment. Clarification of the design as presented in this submittal will be incorporated into section 6.2.4 and table 6.2.4-1 of the SQN FSAR during the next annual update, contingent upon NRC approval.

The five subject CVCS penetrations have been evaluated as follows. The normal charging line, after redesignation of an automatic isolation valve as the outboard isolation barrier, meets the explicit requirements of GDC 55. The design of the seal injection lines, with local manual valves and a closed system designated as providing the outboard isolation barrier, meets the requirements of GDC 55 by employing a design found acceptable on other defined bases. This resolution, contingent upon NRC review and approval, should provide adequate basis for closure of the subject URI.

ATTACHMENT 1
CLARIFICATION OF RESPONSE TO NRC QUESTIONS
CONCERNING THE DESIGN AND LICENSING BASIS FOR THE
CONTAINMENT ISOLATION SYSTEM FOR THE
SEQUOYAH NUCLEAR PLANT

As a result of NRC review of TVA's submittal of May 30, 1986, on this subject, NRC requested clarification of the design and licensing basis for the containment isolation system (CIS) for SQN and additional information regarding the design basis for specific penetrations of concern to NRC. The following discussion will address both issues, with reference to the May 30 submittal and subsequent NRC/TVA discussions regarding designs for specific penetrations.

As stated in the previous submittal, the initial design for the CIS for SQN was provided by Westinghouse using their "Systems Standard Design Criteria Nuclear Steam Supply System Containment Isolation," 1.14 Revisions 0 and 1. These documents reflected the requirements of Criterion 53 of the Atomic Energy Commission (AEC) July 1967, "Proposed General Design Criteria for Nuclear Power Plant Construction Permits," which was the applicable regulatory requirement at the time. The AEC General Design Criteria (GDC) 55, 56 and 57 were issued in 1971, and provided more explicit isolation requirements. Revision 2 to the Westinghouse design standard was issued in 1973 to reflect these requirements; however, Westinghouse did not recommend backfit of the design for SQN, as the initial design was considered technically adequate. Both the previous and new design standards provided for redundant isolation such that no single failure would cause release of the containment atmosphere to the environment. The difference in isolation provisions between the two Westinghouse standards, as is germane to this issue, involves the use of a closed system alone outside containment as an isolation barrier. It was believed by TVA that this use of closed systems in the SQN design met the GDCs as an isolation scheme acceptable on other defined basis. Thus, when SQN was licensed in 1980, the licensing basis for the SQN CIS was the 10CFR50 GDCs.

The following provides specific discussion of the original design provisions and bases, indicated NRC concerns, and TVA's reevaluation of the isolation provisions for the five subject CVCS penetrations and for additional specific penetrations or classes of penetrations for which NRC questions have been raised. Specific details for each penetration may be found in Tables 2.1 and 2.2 of attachment 2 to this submittal.

A. Reactor Coolant Pump Seal Water Injection Line
Penetrations X-43A, -43B, -43C, and -43D

The provisions for containment isolation relating to these four lines consist of a check valve inside containment to provide the inboard isolation barrier and a closed seismically qualified, TVA class B system outside containment which is continuously pressurized postaccident by the high head safety

injection pumps. It is desirable for certain transients and accidents that these lines remain in service to protect the reactor coolant pump (RCP) seals and, therefore, these lines are not automatically isolated by an isolation signal. Additionally the system design provides the following features. A second check valve which is not missile protected is provided in series on each line inside containment. Each line has also been provided with a locally operated manual needle valve outside containment. A single supply line feeding the four injection lines passes through an in-service seal water injection filter and can be isolated at the filter outlet with a local manual isolation valve. A line fed from the outlet of a redundant filter and a filter bypass line connects to the in-service filter discharge line, but both sources are normally isolated by local manual valves. The valves may be operated by reach bars extending from the concrete cubicle. (Reference FSAR figure 9.3.4-1 for TVA flow diagram.)

The initial concern of the I&E inspector regarding the design of these lines was the lack of conformance to the explicit requirements of GDC 55, i.e., no automatic isolation valve is provided outside containment. As previously stated, it is desirable to maintain injection flow to the RCPs following certain transients and accidents to protect the RCP seals. Therefore, these lines are not automatically isolated by an accident isolation signal. GDC 55 allows that certain classes of lines may employ alternate isolation schemes (from those explicitly delineated) if found acceptable on some other defined bases. TVA has previously taken credit for the closed system outside containment as providing the outboard isolation barrier. This originated from the initial design philosophy which considered a closed system alone to be an acceptable isolation barrier inside or outside containment. Following review of TVA's May 30, 1986 submittal, NRC indicated use of the closed system alone outside containment did not constitute an acceptable isolation scheme for these penetrations. The available local manual isolation valves were discussed as additional isolation provisions. NRC requested evaluation of the alternate isolation method proposed--check valve inside containment and closed system with local manual valves outside containment--be discussed in detail to ensure adequate provisions exist for isolation of these lines should the need arise postaccident.

Postaccident, these lines will be left in service and will be supplied by the high head safety injection pumps (centrifugal charging pumps) which also provide seal flow and normal charging flow in nonaccident conditions. Under normal, transient and accident conditions, at least one of the centrifugal charging pumps (CCPs) will remain in operation providing ECCS/charging flow/seal flow as required. Therefore, a water seal will be continuously provided on the subject penetrations at a pressure greater than 1.1 Pa to preclude air leakage outside containment through these lines. The closed system piping outside containment meets the requirements for a closed system outside containment as provided in the SQN FSAR Section 6.2.4 and therefore provides a reliable barrier. This piping is leak tested (visual inspection) in accordance with NUREG 0737 position III.D.1.1 and is included in the ASME Section XI in-service pressure test program for SQN. If for some unexpected

reason it becomes necessary or desirable to isolate these lines postaccident, the locally operated manual valves are available. NRC requested use of these valves be evaluated, and either the needle valves or seal injection filter valves be redesignated as outboard containment isolation valves. The results of this evaluation follow.

The seal water injection filter valve (filter outlet) is the preferred method of isolation. The seal injection filter outlet valve is located in a concrete block cubicle on El. 690, approximately 100 feet from the containment wall, but may be operated with a reach bar from outside the cubicle in the auxiliary building general spaces. This valve allows isolation of all lines quickly with a single valve operation (the alternate filter and filter bypass line are normally isolated), and would be accessible postaccident from a dose consideration. The needle valves on the individual injection lines are located in the El. 690 pipechase at SQN, approximately two feet from the containment (shield building) wall, in close proximity to many ECCS injection lines, CVCS lines, and the boron injection tank (BIT). For the design basis accident and when in the recirculation mode, this area would be inaccessible from a dose standpoint. Based upon these considerations, the seal injection filter outlet valves and the filter bypass valve will be redesignated as outboard containment isolation valves.

These redundant isolation provisions--the inboard check valves, the closed system, the water seal, and the seal injection filter isolation valve--provide assurance that no single failure could result in release of containment atmosphere to the environment. Therefore, protection of the health and safety of the public is ensured and this isolation design is considered acceptable on other defined bases as presented above.

The seal water injection filter outlet and bypass valves have been evaluated with reference to testing requirements for containment isolation barriers in accordance with 10CFR50 Appendix J. These valves are not subject to Type C testing, as a water seal is provided on these penetrations postaccident with a guaranteed 30-day water supply and injection pressure greater than 1.1 Pa, even with consideration of a single active failure. This seal system satisfies the provisions of Standard Review Plan (SRP) 6.2.6.

B. Normal Charging Line Penetration X-16

The provisions for containment isolation relating to this line consist of a check valve inside containment to provide the inboard isolation barrier and a closed seismically qualified, TVA class B system which is pressurized continuously postaccident by the high head safety injection pumps (CCPs) to provide the outboard barrier. Additionally, two automatic isolation valves are provided outside containment which isolate on the safety injection (SI) signal.

The initial concern of the I&E inspector regarding the design of this line was that per the SQN FSAR Table 6.2.4-1, TVA did not identify an outboard containment isolation valve as required by GDC 55. TVA has previously taken credit for the closed system outside containment as providing the outboard isolation barrier. This originated from the initial design philosophy which considered a closed system alone to be an acceptable isolation barrier inside or outside containment. The two automatic accident isolation valves were

recognized as system isolation valves, necessary for ECCS purposes, not for containment isolation purposes. While differing from the explicit requirements of GDC 55, the scheme was considered acceptable on an other defined basis, in that redundant isolation capability was provided such that any single failure would not result in release of containment atmosphere to the environment. Following review of TVA's May 30, 1986 submittal, NRC indicated use of the closed system alone outside containment did not constitute an acceptable isolation scheme for this penetration. Use of the available automatic isolation valves was discussed.

As requested by NRC, TVA has redesignated one of the outboard automatic isolation valves (the valve closest to containment) as the outboard containment isolation barrier. This designation will bring the containment isolation design for this penetration into explicit compliance with GDC 55.

The redesignated outboard isolation valve has been evaluated with reference to testing requirements for containment isolation barriers in accordance with 10CFR50 Appendix J. This valve is not subject to Type C testing, as a water seal is provided on this penetration postaccident with a guaranteed 30-day water supply and injection pressure greater than 1.1 Pa, even with consideration of a single active failure. This seal system satisfies the provisions of SRP 6.2.6.

C. Emergency Core Cooling System (ECCS) Lines - Penetrations X-22, -33, -32, -21, -20A, -20B, -17, -108, -109

The basic provisions for containment isolation relating to this class of lines consist of missile protected check valves inside containment on each branch (a small test line branches off each main line inside containment isolated with a normally closed globe valve) and a closed seismically qualified, TVA class B system outside containment. These essential lines must be available postaccident to supply ECCS flow as required and therefore cannot be automatically isolated by an isolation signal. Additional design features are provided for these lines. With one exception, each line has been provided with a remote manual valve outside containment which can be operated from the control room to isolate the line should the need arise postaccident. Additionally, there are other check valves located inside containment in each branch line which are not missile protected.

Following NRC review of the TVA May 30, 1986 submittal, it was noted that TVA did not identify in the submittal Table 2.2 or in the FSAR Table 6.2.4-1 an outboard isolation valve on these lines as required by GDC 55. It was acknowledged that the explicit requirements of GDC 55 could not be met for these lines in that automatic isolation could not be provided; however, NRC stated that the alternate isolation scheme for these lines considered acceptable by NRC on other defined bases was the use of remote manual valves on the seismically qualified ECCS systems. This scheme was identified as the acceptable alternative in the Standard Review Plan 6.2.4. TVA has previously taken credit for the closed systems outside containment as providing the outboard isolation barriers. This originated from initial design philosophy which considered a closed system alone to be an acceptable isolation barrier inside or outside containment. TVA had, therefore, considered this scheme acceptable on other defined bases in that redundant isolation was provided such that any single failure would not result in release of containment atmosphere to the environment.

As requested by NRC, TVA has redesignated the remote manual valves available on the ECCS lines as outboard containment isolation valves. This designation will bring the isolation design for these penetrations into compliance with GDC 55 on the other defined bases designated in SRP 6.2.4. The one exception to the above provisions was discussed with NRC and basis for acceptability provided as follows.

The design features for penetration X-17 at SQN, the RHR pump supply to the loop 1 and 3 hot legs, consist of primary and secondary (missile protected) check valves on the two primary branch lines inside containment, a remote manual motor-operated valve on the single supply line to the branches inside containment, and a closed seismically qualified, TVA Class B system outside containment. (Additionally, inside containment there is a normally closed remote manual valve on a small test line branch off the single supply line and a relief valve on a second branch off the single supply line.) This design deviates from the previously discussed isolation scheme for ECCS lines in that the remote manual valve is located inside containment with the outboard barrier provided by the closed system alone. It is our position that this design is acceptable in that redundant isolation barriers are provided in the form of the check valves, the closed safety system grade piping, and capability for remote manual isolation postaccident if the need should arise. No single failure would result in release of containment atmosphere to the environment. As requested by NRC, TVA has therefore redesignated the inboard remote manual valve as an additional containment isolation valve and believes the design for this penetration meets GDC 55 on other defined bases.

The redesignated remote manual valves for the ECCS lines have been evaluated with reference to testing requirements for containment isolation barriers in accordance with 10CFR50 Appendix J. For the injection line penetrations from the high head and intermediate head safety injection pumps (CCPs and safety injection pumps), a water seal is provided on these penetrations postaccident with a guaranteed 30-day water supply and injection pressure greater than 1.1 Pa, even with consideration of a single active failure. Therefore, these lines are not subject to Type C leak testing.

For the injection line penetrations from the low head safety injection pumps (RHR pumps), a water seal is provided postaccident by operation of both RHR pumps with a guaranteed 30-day water supply and an injection pressure greater than 1.1 Pa.

With a single active failure of an RHR pump, the water seal will not be maintained on the associated penetration(s) during the recirculation mode. However, any leakage past the primary and secondary check valves and the remote manual valve would be into a seismically qualified closed system of safety system grade piping. (Both the primary and secondary check valves are leak tested with water as pressure isolation valves to a requirement of less than or equal to 1 gpm at a nominal RCS pressure of 2235 psig.)

The piping outside containment meets the requirements for a closed system outside containment as presented in section 6.2.4 of the FSAR. There is testing performed which verifies integrity of this piping. This testing includes annual inspections in accordance with NUREG-0737 position III.D.1.1,

in-service pressure testing in accordance with ASME Section XI, and quarterly ASME Section XI pump tests. As the RHR system is a dual purpose system used during normal operation, an additional opportunity is provided to verify system integrity.

Most importantly, these RHR ECCS injection lines must be available to provide water to the core postaccident to prevent fuel damage. The addition of inline block valves to permit leak rate testing in accordance with 10CFR50 Appendix J would reduce the reliability of these lines to perform their primary safety function following a LOCA.

The combination of a water seal system, a qualified closed system, inspection and testing to verify system integrity, and the need for reliable operation of the ECCS system provides the bases for why the low head safety injection penetrations are not subject to Type C leak rate testing.

The redesignated remote manual valves for the UHI lines have been evaluated with reference to testing requirements for containment isolation valves in accordance with 10CFR50 Appendix J. The UHI system is normally filled with water from the accumulator up to the primary check valves going into the reactor head. The differential pressure between the RCS and the UHI system keeps the check valves closed during normal operation. Valves 87-21 and 87-23 (as well as 87-22 and 87-24) are normally open which provides immediate availability of the UHI system when it is needed under accident conditions. When the RCS pressure falls below approximately 1,200 psig, the UHI system begins to discharge into the reactor, and when the accumulator reaches low level, valves 87-21 and 87-23 (as well as 87-22 and 87-24) close, retaining a water seal with pressure much greater than 1.1 Pa on the outboard side of these valves. This water seal and pressure is maintained by the remaining water level in the UHI water accumulator and the pressure acting upon this water head from the UHI gas accumulator (nitrogen blanket). If for some unexpected reason residual pressure in the UHI system decreases, the pressure would, at worst, equalize with pressure inside containment. Any leakage or interaction between containment atmosphere and the UHI system volume would be contained by the closed, seismically qualified, TVA Class B system outside containment.

The above discussion provides basis for why the UHI penetrations are not subject to Type C leak rate testing.

D. Containment Spray and RHR Spray - Penetrations X-48A, -48B, -49A, -49B

The basic provisions for containment isolation relating to these lines consist of missile protected check valves inside containment and a closed seismically qualified, TVA Class B system outside containment. These essential lines must be available postaccident to provide containment depressurization and therefore are not automatically isolated by an isolation signal. As an additional design feature, each line has been provided with a remote manual valve outside containment which can be operated from the control room to isolate the line should the need arise postaccident.

Following NRC review of the TVA May 30, 1986 submittal, it was noted that TVA did not identify in the submittal Table 2.2 or in the FSAR Table 6.2.4-1 an outboard isolation valve on these lines as required by GDC 56. It was

acknowledged that the explicit requirements of GDC 56 could not be met for these lines in that automatic isolation could not be provided; however, NRC stated that the alternate isolation scheme for these lines considered acceptable by NRC on other defined bases was the use of remote manual valves on the seismically qualified systems outside containment. This scheme was identified as the acceptable alternative in the Standard Review Plan 6.2.4. TVA has previously taken credit for this closed system outside containment as providing the outboard isolation barrier. This originated from initial design philosophy which considered a closed system alone to be an acceptable isolation barrier inside or outside containment. TVA had, therefore, considered this scheme acceptable on other defined bases in that redundant isolation was provided such that any single failure would not result in release of containment atmosphere to the environment.

As requested by NRC, TVA has redesignated the available remote manual valves on these spray lines as outboard containment isolation valves. This designation will bring the isolation design for these penetrations into compliance with GDC 56 on other defined bases as endorsed in SRP 6.2.4.

The redesignated remote manual valves for the two containment spray lines have been evaluated with reference to leak testing requirements for containment isolation barriers in accordance with 10CFR50 Appendix J. A water leg is maintained in the riser between the closed remote manual valve and the containment spray ring header under normal operation. The motor-operated gate valves in the containment spray lines are presently leak tested (with water) to verify there is sufficient inventory in the risers to maintain a water seal on the gate valves for 30 days even after shutoff of the containment spray pumps. The water seal ensures there will be no leakage of containment atmosphere to the environment. These provisions are described in FSAR Section 6.2.4.2.1. Additionally, any throughline leakage would be contained within the closed seismically qualified TVA Class B system outside containment.

The redesignated remote manual valves for the two RHR spray lines have also been evaluated with reference to leak testing requirements for containment isolation barriers in accordance with 10CFR50 Appendix J. A water leg is also maintained in the risers for the RHR spray lines under normal operation. The motor-operated remote manual valves are not leak tested to verify water inventory as the RHR pumps are intended to be operated continuously postaccident which would maintain pressure on the system and a water seal on the backside of the remote manual valves. This would additionally prevent loss of the water leg in the riser postaccident. The water seal as provided therefore prevents leakage of containment atmosphere to the environment. Additionally, any throughline leakage would be contained within the closed seismically qualified TVA Class B system outside containment. (See discussion in the previous section (C) on ECCS low head safety injection system lines.)

In consideration of the above, the redesignated remote manual valves in the containment spray and RHR spray lines are not subject to Type C testing.

E. SI Relief Valve Discharge to PRT Penetration X-24

The provisions for containment isolation relating to this penetration consist of a check valve inside containment to provide the inboard isolation barrier and closed seismically qualified, TVA class B systems--safety injection, CVCS,

and containment spray--outside containment to provide the outboard barrier. Relief valves which provide overpressurization protection for the respective systems are located on these systems outside containment and relieve into a discharge header back into containment through the penetration to the PRT.

Questions were raised in the August 21, 1986 telecon held between NRC/TVA concerning the containment isolation design for this penetration. NRC requested the relief valves be redesignated as the outboard containment isolation barrier(s) in addition to the closed systems as opposed to the closed systems alone outside containment. Additionally, the question was raised regarding the different provisions for this line as delineated in the Westinghouse Revision 1 standard and the Revision 2 standard.

As requested by NRC, TVA has redesignated the relief valves as outboard containment isolation barriers in addition to the closed systems. The SQN design for this penetration meets the GDCs on other defined bases. Review of the two Westinghouse design standards and discussions with Westinghouse indicate the Revision 1 design is as reflected in the SQN design described above. The use of the relief valves as containment isolation valves in this application is acceptable as containment pressure is applied in the opposite direction that the valves relieve. The Westinghouse revision 2 standard does not depict this penetration. Westinghouse has explained that as an effort to minimize the number of containment penetrations, the Revision 2 design assumes the relief discharge is not routed back into containment but instead into the CVCS holdup tanks in the auxiliary building.

All of these relief valves are located in closed systems which are pressurized postaccident and are discussed in previous sections of this report. As such, these lines are not subject to Type C leak testing. The discussion of the justification for not leak rate testing these valves is provided in the previous sections on the ECCS, CVCS, and spray systems.

F. Hydrogen Purge Penetration X-40D

Containment isolation for the hydrogen (H_2) purge penetration is provided by a blind flange equipped with double O-ring seals. The flange is located outside containment in the auxiliary building. This isolation scheme has been found acceptable by NRC per Standard Review Plan 6.2.4 Section II.f.

In the August 21, 1986 NRC/TVA telecon, NRC stated that while the isolation scheme is acceptable (from a containment isolation standpoint) for a line that is not used at power or postaccident, use of a blind flange would not be acceptable for a line that would have to be opened to mitigate the consequences of an accident. NRC expressed concern that the provisions of this line for containment isolation could be in conflict with necessary provisions for the H_2 purge system, i.e., meeting the requirements of 10CFR50.44. In response, TVA has reviewed both the isolation provisions for this penetration and the system design requirements per 10CFR50.44. The findings of this review are presented as follows.

Containment H_2 purge capability was initially required by 10CFR50.44(e) to provide a backup to the redundant safety-related hydrogen recombiners which were designed to provide H_2 control following design basis accidents such as a large break LOCA. The design for SQN was reflected in the prelicensing FSAR section 6.2.5 and system approval granted by NRC in section 6.2.5 of the

original SER for SQN. As a result of TMI-2 (NUREG 0737), SQN was required to install an H_2 mitigation system to provide hydrogen control capability for a postulated degraded core event which would result in generation of substantially larger amounts of hydrogen than produced in the design basis LOCA. This system at SQN is composed of igniters that are designed to burn H_2 near the lower flammability limit.

A conflict resulted between the function and operation of the H_2 purge system and the igniter system. The operation of the purge system (preigniters) was based on an assumption of a maximum 5-percent metal-water reaction which would not produce the much larger volumetric quantities of hydrogen that a degraded core event would produce. Emergency procedures required the line to be opened if the hydrogen concentration inside containment exceeded 3 percent by volume. The igniters are designed to handle the hydrogen produced by metal-water reaction involving up to 75 percent of the fuel cladding. Emergency procedures require early initiation of igniter operation in the event of a LOCA, high containment pressure, or degraded core event. The conflict arose where the procedures would have unnecessarily required and resulted in the containment being vented to the environment, albeit through filters, during a degraded core event coincident with igniter operation. As such, TVA concluded that the requirement for operation of the purge system postaccident should be deleted, and the emergency procedures requiring its operation be revised. A description of these changes was provided in Appendix R of TVA's Report of the Safety Evaluation of the Interim Distribution of Ignition System for Sequoyah Unit 1. This report was submitted to NRC in a TVA letter from L. M. Mills to A. Schwencer dated September 2, 1980. Approval of the system changes presented in this report was provided by NRC in SER Supplements 3 and 4 for SQN unit 1 and SER Supplement 5 for SQN unit 2.

In summary, a H_2 purge system was included in the H_2 control system provided for SQN in accordance with the requirements of 10CFR50.44. Use of this system was initially intended as a backup to the fully redundant hydrogen recombiners to be used for control of hydrogen gas produced following a postulated LOCA. As a result of TMI-2 and the potential for a degraded core event, hydrogen igniters were later installed to handle the much larger volume of hydrogen produced by such an event. While the hardware still remains to provide capability for controlled purging, it is not intended to be used at SQN for postaccident hydrogen control. Purging and venting containment to the environment, especially during a degraded core event, is undesirable and unwarranted. The system was never required to be safety grade (beyond containment isolation provisions) and the air supply is nonqualified. Use of this system would unnecessarily result in additional release of containment atmosphere (filtered) to the environment. Therefore, while the system as installed and described in the FSAR has been found acceptable to NRC, it is not intended to be used at SQN under postaccident conditions.

In consideration of the above, the design for penetration X-40D meets the requirements of GDC 56 on other defined basis (per Standard Review Plan 6.2.4) and does not degrade the hydrogen control system for SQN.

A general question was expressed by NRC in the August 21, 1986 telecon concerning other containment penetrations employing blind flanges as the isolation scheme and whether they might be removed with the unit at power or

postaccident. Penetrations at SQN which employ blind flanges as the containment isolation barrier are not intended to be opened postaccident. Additionally, these blind flanges are not removed when containment integrity is required, i.e., are only opened in Modes 5 or 6.

G. Containment Vacuum Relief Penetrations X-111, X-112, X-113

The provision for containment isolation for each of these penetrations consists of two outboard isolation valves in series attached to penetration sleeves extending from the containment shell. The valve closest to containment is a power-operated isolation valve which is actuated by a set of redundant pressure sensors independent of those for other containment isolation valves, and the outer valve is a spring-loaded check valve .

In the NRC/TVA telecon held August 21, 1986, NRC expressed concern over the isolation provisions for these penetrations. The apparent concern was the lack of an isolation valve inside containment and consequences of a break in the "piping" outside containment between the isolation valve and containment shell. It was suggested that a demonstration of this "piping" as "superpipe" (SRP 3.6.2) could serve to resolve their concerns. A discussion of the design and response to NRC concerns is provided as follows.

The three vacuum relief lines are required to relieve pressure from the annulus into primary containment in the event of an inadvertent containment spray or air return fan actuation to prevent unacceptable pressure differentials from existing across the containment shell (see FSAR section 6.2.6). Both valves are located outside containment to allow the valves to be located as close to containment as possible yet provide reasonable access for maintenance, inspection, and testing. The use of this design was specifically identified as an exception to containment isolation design criteria in the FSAR at the time of the plant licensing (see Section 6.2.4).

The first isolation valve outside containment in each line is bolted directly to the containment penetration sleeve. This sleeve is designed and fabricated per the ASME Boiler and Pressure Vessel Code, Section III, Winter 1971 Addenda, subsection NE, and falls under the jurisdictional boundaries of Class MC according to NE-1142. The penetration sleeve between primary containment and the first outer isolation valve is part of the containment vessel. Each electrical penetration and process pipe penetrating containment also has a Class MC sleeve that a penetration assembly is welded into. Active isolation is provided on process lines but not on the Class MC sleeve.

The provisions of Standard Review Plan 3.6.2 are used to provide protection from pipe whip and jet impingement due to a break in a process line as an initiating event. The application of Standard Review Plan 3.6.2 to the integrity of containment sleeves after an LOCA represents an inappropriate use of the criteria.

For the above reasons, TVA believes that the present design of the vacuum relief lines is acceptable on other defined bases and provides redundant isolation capability to ensure protection of the health and safety of the public.

ATTACHMENT 2
REVISED RESPONSE TO NRC QUESTION REGARDING
SPECIFIC DESIGN OF CONTAINMENT PENETRATIONS FOR
SEQUOYAH NUCLEAR PLANT

As a result of NRC review of TVA's previous submittal on this issue of May 30, 1986, TVA is resubmitting a summary of the isolation provisions for all containment penetrations to reflect the results of that NRC review (presented by NRC in a subsequent NRC/TVA meeting and NRC/TVA telecon) as generally discussed in Attachment 1 of this submittal. The design of the containment isolation system for SQN is again being presented in the form of two tables following consideration of the 10CFR50 Appendix A GDC 55, 56, and 57 on a penetration-by-penetration basis. Based on these GDCs and the 10CFR50.2 definition (v) for reactor coolant pressure boundary, we have identified for each penetration: (1) penetration classification (GDC 55, 56, or 57); (2) physical configuration (barrier inside, barrier outside); (3) the applicable FSAR figure (if available); and (4) the other defined bases for acceptability if the isolation scheme does not explicitly meet the GDCs. Supporting description, notes, and/or references are provided as appropriate.

The above information is provided in the form of two tables. Table 2.1 lists the penetrations for which the design correlates with the explicit GDC designated isolation schemes. Table 2.2 lists penetrations for which their design employs alternate isolation schemes which are found acceptable on other defined bases. Only principal process line isolation barriers are identified; penetration branch takeoffs such as vent, drain, and test lines and instrumentation sensing taps are not addressed within the scope of this presentation.

Table 2.1

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 004	Lower Comp. Purge Exh.	56	30-56	30-57	9.4.7-1	
X 005	Instr. Rm. Purge Exh.	56	30-58	30-59	9.4.7-1	
X 006	Upper Comp. Purge Exh.	56	30-50	30-51	9.4.7-1	
X 007	Upper Comp. Purge Exh.	56	30-52	30-53	9.4.7-1	

[1]GDC 55, 56, 57

NOTE-- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X-009A	Upper Comp. Purge Supply	56	30-08	30-07	9.4.7-1	
X-009B	Upper Comp. Purge Supply	56	30-10	30-09	9.4.7-1	
X-010A	Lower Comp. Purge Supply	56	30-15	30-14	9.4.7-1	
X-010B	Lower Comp. Purge Supply	56	30-17	30-16	9.4.7-1	

[1]GDC 55, 56, 57

NOTE-- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Table 2.1

Design Correlates to Explicit
[1]
10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 011	Instr. Rm. Purge Supply	56	30-20	30-19	9.4.7-1	
X 012A	Feedwater (FW)/Aux. Feedwater (AFW)	57	Closed System	3-33, 3-164, 3-164A, 3-174	10.4.7-2 and 10.4.7-12	The FW valve, 3-33, isolates on an SI signal. The AFW valves open to control S/G level on pump start. Remote manual operation available. Do not receive containment isolation signal.
X 012B	Feedwater (FW)	57	Closed System	3-47	10.4.7-2 and 10.4.7-12	Valve automatically isolates on an SI signal. Does not receive a containment isolation signal.
X 012C	Feedwater (FW)	57	Closed System	3-87	10.4.7-2 and 10.4.7-12	See X-012B

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Table 2.1

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 012D	Feedwater (FW)/ Aux. Feedwater (FW)	57	Closed System	3-100, 3-171, 3-171A, 3-175	10.4.7-2 and 10.4.7-12	The FW valve, 3-100, isolates on an SI signal. The AFW valves open to control S/G level on pump start. Remote manual operation available. Do not receive containment isolation signal.
X 014A	Stm. Gen. Blwdn.	57	*Closed System	1-14, 43-58	10.4.8-1	*Valve 1-182 is available.
X 014B	Stm. Gen. Blwdn.	57	*Closed System	1-32, 43-64	10.4.8-1	*Valve 1-184 is available.
X 014C	Stm. Gen. Blwdn.	57	*Closed System	1-25, 43-61	10.4.8-1	*Valve 1-183 is available.

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit
[1]
10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 014D	Stm. Gen. Blwdn	57	*Closed system	1-07, 43-55	10.4.8-1	*Valve 1-181 is available.
X 016	Normal Charging	55	62-543 (CV)	62-90 62-709 (LC) and Closed System	9.3.4-1	Valve 62-90 is an automatic containment isolation valve in that it closes on a Safety Injection signal which generates a Phase A containment isolation signal. Therefore this penetration fully meets GDC 55. See additional discussion for this penetration in Attachment 1 of this document.
X 023	PASF Hot Leg 3 - Train B	55	43-310 (RM)	43-309 (RM)		Valves are closed with power removed during normal operation.
X 025A	Przr. Stm. Sample	55	43-11	43-12		
X 025D	Przr. Liquid Sample	55	43-02	43-03		

[1]GDC 55, 56, 57

NOTE -- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Table 2.1

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 026B	Control Air - Train B	56	Unit 1 32-297 (CV)	32-102 32-295 (LC)	9.3.1-6	
X 026B	Control Air - Train B	56	Unit 2 32-348 (CV)	32-103 32-341 (LC)	9.3.1-6	
X 027C	ILRT	56	52-504 (LC)	52-505 (LC)		
X 029	CCS from RCP Coolers	56	70-89 70-698 (CV)	70-92	U1 9.2.1-2 U2 9.2.1-3	

[1]GDC 55, 56, 57

NOTE -- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit
[1]
10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X-030	Accum. to HU Tank	56	63-71	63-84 63-23	6.3.2-1	
X-034	Control Air - Nonessential	56	Unit 1 32-377 (CV)	32-110 32-375 (LC)	9.3.1-6	
X-034	Control Air - Nonessential	56	Unit 2 32-387 (CV)	32-111 32-385 (LC)	9.3.1-6	
X-039A	N_2 to Accumulators	56	77-868 (CV)	63-64	11.2.2-5	

[1]GDC 55, 56, 57

NOTE -- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 039B	N_2 to PRT	56	77-849 (CV)	68-305	11.2.2-5	
X 040A	Aux. Feedwater	57	Closed System	3-156 3-156A 3-173	10.4.7-12	Valves open to control S/G level on pump start. Remote manual operation available. Do not receive containment isolation signal.
X 040B	Aux. Feedwater	57	Closed System	3-148 3-148A 3-172	10.4.7-12	See X 040A
X 041	Floor Sump Pump Disch.	56	77-127	77-128	9.3.3-1	

[1]GDC 55, 56, 57

NOTE -- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Table 2.1

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 042	Primary Water	56	81-502 (CV)	81-12		
X 044	Seal Water Return	55	62-61 62-639 (CV)	62-63	9.3.4-1	
X 045	RCDT & PRT to Vent Hdr.	56	77-18	77-19 77-20	11.2.2-1	
X 046	RCDT Pump Discharge	56	77-09	77-10 84-511 (LC)	9.3.6-1	

[1]GDC 55, 56, 57

NOTE-- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 047A	Glycol In	56	61-192 61-533 (CV)	61-191		
X 047B	Glycol Out	56	61-194 61-680 (CV)	61-193		
X 050A	RCP Therm. Barr. Return	56	70-87 70-687 (CV)	70-90	9.2.1-2	
X 050B	RCP Therm. Barr. Supply	56	70-679 (CV)	70-134	9.2.1-2	

[1]GDC 55, 56, 57

NOTE-- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X-051	Fire Protection	56	26-1260 (CV)	26-240	9.5.1-10	
X-052	CCS to RCP Oil Coolers	56	70-692 (CV)	70-140	9.2.1-2	
X-056	ERCW Supply to Lower Comp.	56	67-562D (CV)	67-107	9.2.2-3	
X-057	ERCW Return from Lower Comp.	56	67-111 67-575D (CV)	67-112	9.2.2-3	

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Table 2.1

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 058	ERCW Supply to Lower Comp.	56	67-562A (CV)	67-83	9.2.2-3	
X 059	ERCW Return from Lower Comp.	56	67-87 67-575A (CV)	67-88	9.2.2-3	
X 060	ERCW Supply to Lower Comp.	56	67-562B (CV)	67-99	9.2.2-3	
X 061	ERCW Return from Lower Comp.	56	67-103 67-575B (CV)	67-104	9.2.2-3	

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit[1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X-062	ERCW Supply to Lower Comp.	56	67-562C (CV)	67-91	9.2.2-3	
X-063	ERCW Return from Lower Comp.	56	67-95 67-575C (CV)	67-96	9.2.2-3	
X-064	Instr. Rm. Chill Water Return	56	31C-223 31C-752 (CV)	31C-222		
X-065	Instr. Rm. Chill Water Supply	56	31C-225 31C-734 (CV)	31C-224		

[1]GDC 55, 56, 57

NOTE-- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 066	Instr. Rm. Chill Water Return	56	31C-230 31C-715 (CV)	31C-229		
X 067	Instr. Rm. Chill Water Supply	56	31C-232 31C-697 (CV)	31C-231		
X 068	Upper ERCW Supply to Cooler	56	67-580D (CV)	67-141	9.2.2-3	
X 069	Upper ERCW Supply to Cooler	56	67-580A (CV)	67-130	9.2.2-3	

[1]GDC 55, 56, 57

NOTE -- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X-070	Upper ERCW Return from Cooler	56	67-297 67-585B (CV)	67-139	9.2.2-3	
X-071	Upper ERCW Return from Cooler	56	67-296 67-585C (CV)	67-134	9.2.2-3	
X-072	Upper ERCW Return from Cooler	56	67-298 67-585D (CV)	67-142	9.2.2-3	
X-073	Upper ERCW Return from Cooler	56	67-295 67-585A (CV)	67-131	9.2.2-3	

[1]GDC 55, 56, 57

NOTE-- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Table 2.1

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X-074	Upper ERCW Supply	56	67-580B (CV)	67-138	9.2.2-3	
X-075	Upper ERCW Supply	56	67-580C (CV)	67-133	9.2.2-3	
X-076	Service Air	56	U1 33-704 (LC) U2 33-722 (LC)	U1 33-740 (LC) U2 33-739 (LC)		
X-077	Demin. H_2O	56	59-633 (CV)	59-522 (LC) 59-529 (LC)	9.2.3-2	

[1]GDC 55, 56, 57

NOTE -- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X-078	Fire Protection	56	26-1296 (CV)	26-243	9.5.1-10	
X-080	Lower Comp. Press. Relief	56	30-40	30-37	9.4.7-1	
X-081	RCDT to Gas Analyzer	56	77-16	77-17	11.2.2-1	
X-082	Refueling Cavity Pump Suction	56	78-560 (LC)	78-561 (LC)	9.1.3-1	

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Table 2.1

Design Correlates to Explicit 10CFR50 GDC[1] Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 083	Refueling Cavity Pump Discharge	56	78-558 (LC)	78-557 (LC)	9.1.3-1	
X-084A	PRT to Gas Analyzer	56	68-308	68-307		
X-085A	Excess Ltdn. HX to Boron Analyzer	55	43-75	43-77		
X-087B	ILRT P-TAPS	56	52-502 (LC)	52-503 (LC)		

[1]GDC 55, 56, 57

NOTE-- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Table 2.1

Design Correlates to Explicit 10CFR50 GDC[1] Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X-087D	1LRT P-TAPS	56	52-500 (LC)	52-501 (LC)		
X-090	Control Air - Train A	56	Unit 1 32-287 (CV)	32-80 32-285 (LC)	9.3.1-6	
X-090	Control Air - Train A	56	Unit 2 32-358 (CV)	32-81 32-353 (LC)	9.3.1-6	
X-091	PASF Hot Leg 1 - Train A	55	43-251 (RM)	43-250 (RM)		See X-023

[1]GDC 55, 56, 57

NOTE -- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit[1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 093	Accumulator Sample	56	43-34	43-35		
X 094A	Upper Rad. Mon. - Intake	56	90-109	90-107		
X 094B	Upper Rad. Mon. - Intake	56	90-108	90-107		
X 094C	Upper Rad. Mon. - Return	56	90-110	90-111		

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X-095A	Lower Rad. Mon. - Intake	56	90-115	90-113		
X-095B	Lower Rad. Mon. - Intake	56	90-114	90-113		
X-095C	Lower Rad. Mon. - Return	56	90-116	90-117		
X-096C	Hot Leg Sample-Loops 2 and 3	55	43-22	43-23		

[1]GDC 55, 56, 57

NOTE-- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 098	ILRT P-TAPS	56	52-506 (LC)	52-507 (LC)		
X 101	PASF Containment Air Intake - Train B	56	43-319 (RM)	43-318 (RM)		See X-023
X 102	AFW Test Line	57	Closed System	3-351C (LC)		
X 103	PASF Liquid Discharge to Containment	56	43-461 (CV)	43-317 (RM) 43-341 (RM)		See X-023 Note - Applies to outboard valves only.

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 104	AFW Test Line	57	Closed System	3-352C (LC)		
X 106	PASF Air Discharge to Containment	56	43-460 (CV)	43-325 (RM) 43-307 (RM)		See X 023 Note - Applies to outboard valves only.
X 110	UHI Valve Test Line	55	87-7 87-8	87-9	6.3.2-15	
X 114	Glycol Floor Cooling	56	61-122 61-745 (CV)	61-110	6.5.6-2	

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Design Correlates to Explicit [1] 10CFR50 GDC Requirements

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Ref./Notes
X 115	Glycol Floor Cooling	56	61-97 61-692 (CV)	61-96	6.5.6-2	
X 116A	PASF Containment Air Intake - Train A	56	43-288 (RM)	43-287 (RM)		See X-023

[1]GDC 55, 56, 57

NOTE -- Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve

Table 2.2

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 001	Equipment Hatch	56	Hatch	---	6.2.4-12	Double O-Ring provides redundancy for hatch seal.	
X 002A	Personnel Airlock	56	Airlock Door	Airlock Door	6.2.4-13	Two doors, both with double resilient seals and mechanical interlocks.	
X 002B	Personnel Airlock	56	Airlock Door	Airlock Door	6.2.4-13	Two doors, both with double resilient seals and mechanical interlocks.	
X 003	Fuel Transfer Tube	56	Blind Flange	---	6.2.4-14	Double resilient seals provide redundant flange seal.	
X 008	Spare	56	---	---	---	Penetration is a seal-welded spare and is a single passive barrier as is primary containment.	

[1]GDC 55, 56, 57
NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 013A	Main Steam	57	Closed System	1-04, 1-147, 1-15, 1-05, & Safeties (5)	10.3.2-1	The safety relief valves outside containment required to ensure transient and accident condition secondary side heat removal mechanism are acceptable as containment isolation valves. They have setpoints greater than 1.5 Pa as allowed by Standard Review Plan 6.2.4 Section II.g.	
X 013B	Main Steam	57	Closed System	1-11, 1-148, 1-12, and Safeties (5)	10.3.2-1	See X-013A	
X 013C	Main Steam	57	Closed System	1-22, 1-149, 1-23, and Safeties (5)	10.3.2-1	See X-013A	

[1]GDC 55, 56, 57

NOTE -Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X-013D	Main Steam	57	Closed System	1-29, 1-150, 1-16, and 1-30 and Safeties (5)		10.3.2-1	See X-013A
X-015	CVCS Letdown	55	62-72 62-73 62-74 62-662 (RV)	62-77	9.3.4-1	One of the inboard isolation valves is a pressure relief valve, 62-662, which relieves to the PRT. The relief valve is acceptable because containment pressure is acting opposite the direction that the valve relieves, thereby aiding the valve to seat.	
X-017	RHR Return	55	63-172 (RM) 63-640 (CV) 63-643 (CV) 63-158 (RM) 63-637 (RV)	Closed System	5.5.7-1	Remote manual valve 63-172 is located inside containment in series with check valves 63-640 and 63-643. Remote manual valve 63-158 is used for Section XI	See additional discussion of this penetration in Attachment 1 of this document.

[1]GDC 55, 56, 57

NOTE -Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
1
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
						pressure boundary testing and is administratively controlled. Relief valve 63-637 is acceptable because containment pressure is acting opposite the direction that the valve relieves, thereby aiding the valve to seat.	
X 018	Spare	56	---	---	---	See X-008	
X 019A	RHR Sump	56	*	63-72 (RM) and Closed System	6.3.2-1	*Containment Isolation for the RHR sump line penetrations consists of: (1) a closed system outside containment, (2) a containment isolation valve (63-72) outside containment in the auxiliary building which is a controlled leakage structure. This valve is remotely controlled from the main control room.	

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
						This same discussion is given in the FSAR. This isolation scheme is acceptable per SRP 6.2.4 Section II.e and resolution to NCR SQN NEB 8203.	
X 019B	RHR Sump	56	*	63-73 (RM) and Closed System	6.3.2-1	*Containment isolation for for the RHR sump line penetration consists of: (1) a closed system outside containment, (2) a containment isolation valve (63-73) outside containment in the auxiliary building which is a controlled leakage structure. This valve is remotely controlled from the main control room. This same discussion is given in the FSAR. This isolation scheme is acceptable per SRP 6.2.4 Section II.e and resolution to NCR SQN NEB 8203.	

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
1
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 020A	SIS - RHR Pump Discharge - Train B	55	63-633 (CV) 63-635 (CV) 63-112 (RM)	63-94 (RM) and Closed System	6.3.2-1	See SRP 6.2.4 Section II.b for acceptability of outboard remote manual valve. A test line adjoins this line inside containment between the check valves and primary containment. The isolation valve, 63-112, in the test line is remote manually actuated from the main control room. This valve is open for short periods of time during normal operation for the performance of SIS and RHR system venting as described in Technical Specification 4.5.2. Thus, this valve does not automatically close when the containment isolation or safety injection signal is initiated during the venting of the SIS and RHR system. This is accep table because administrative	

[1]GDC 55, 56, 57

NOTE Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
						controls exist in the test documents to assure valve closure after testing and containment integrity is not compromised during testing since flow is being maintained into containment by pump operation.	
X 020B	SIS - RHR Pump Discharge - Train A	55	63-632 (CV) 63-634 (CV) 63-111 (RM)	63-93 (RM) and Closed System	6.3.2-1	See SRP 6.2.4 Section II.b for acceptability of outboard remote manual valve. For discussion of remote manual valve 63-111, see same discussion under X-020A for valve 63-112.	
X 021	SI Pump Discharge to Hot Legs - Train B	55	63-547 (CV) 63-549 (CV) 63-167 (RM)	63-157 (RM) and Closed System	6.3.2-1	See SRP 6.2.4 Section II.b for acceptability of outboard remote manual valve. For discussion of remote manual valve 63-167, see discussion under X-020A for valve 63-112.	

[1]GDC 55, 56, 57

NOTE Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X-022	BIT Charging Pump Discharge	55	63-581 (CV) 63-174 (RM)	63-25 (RM) 63-26 (RM) 63-697 (LC) and Closed System	6.3.2-1	See SRP 6.2.4 Section II.b for acceptability of outboard remote manual valves. For discussion of remote manual valve 63-174, see discussion under X-020A for valve 63-112.	
X 024	SI Relief Valve Discharge	56	68-559 (CV)	62-505 (RV) 72-512 (RV) 72-513 (RV) 63-511 (RV) 63-536 (RV) 63-535 (RV) 63-534 (RV) 63-626 (RV) 63-627 (RV) and Closed System	5.1-1	Relief valves are acceptable because containment pressure is acting opposite the direction that the valve relieves, thereby aiding the valve to seat.	See discussion in Attachment 1 of this document for further information on this penetration.

[1]GDC 55, 56, 57

NOTE--Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Table 2.2

Design Correlates to

10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X-025B	dP Sensor	56	---	*	---	*The containment pressure sensors are located outside of and as close as practical to the containment. The lines and pressure sensors are missile protected and designed to safe shutdown event requirements. These sensors employ redundant bellows as isolation barriers. Design required to permit actuation of equipment necessary to mitigate the consequences of an accident.	
X-025C	Rx Vessel Level	55	*	*	---	*The reactor vessel level indication system (RVLIS) is required postaccident for continual indication of the water level in the reactor vessel. The capillary sensing lines which transmit pressure from the reactor vessel to instruments in the Auxiliary Building are armored and designed to withstand DBE conditions. Any containment isolation	

[1]GDC 55, 56, 57

NOTE Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
						valves installed in the RVLIS capillary lines will jeopardize the performance of the system. For this reason, isolation of these capillary lines is accomplished by a sealed sensor located inside containment and an isolator located outside containment. These devices utilize a type of bellows which transmits pressure while preventing mixing of the fluids on either side of the isolation devices. The capillary line is armored 3/16 inches O.D. stainless steel tubing and is filled with demineralized water and sealed. A postulated shear of this capillary line on either side of the containment would not allow a leak to develop through the containment boundary. This design is described in FSAR Section 6.2.4.3.	

[1]GDC 55, 56, 57
NOTE--Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(Rv) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 026A	dP Sensor	56	---	*	---	*See X-025B	
X 026C	Rx Vessel Level	55	*	*	---	*See X-025C	
X 027A	dP Sensor	56	---	*	---	*See X-025B	
X 027B	dP Sensor	56	---	*	---	*See X-025B	
X 027D	Rx Vessel Level	55	*	*	---	*See X-025C	
X 028	Spare	56	---	---	---	See X-008	
X 031	Spare	56	---	---	---	See X-008	

[1]GDC 55, 56, 57
NOTE--Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X-032	SI Pump Discharge to Hot Legs - Train A	55	63-545 (CV) 63-543 (CV) 63-21 (RM)	63-156 (RM) and Closed System	6.3.2-1	See SRP 6.2.4 Section II.b for acceptability of outboard remote manual valve. For discussion of remote manual valve 63-21, see discussion under X-020A for valve 63-112.	
X-033	SI Pump Discharge	55	63-553 (CV) 63-555 (CV) 63-551 (CV) 63-557 (CV) 63-121 (RM)	63-22 (RM) and Closed System	6.3.2-1	See SRP 6.2.4 Section II.b for acceptability of outboard remote manual valve. For discussion of remote manual valve 63-121, see discussion under X-020A for valve 63-112.	
X-035	CCS from Excess Ltdn. HX	57	Closed System	70-85	9.2.1-2	See X-053	
X-036	Spare	56	---	---	---	See X-008	

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 037	Spare	56	---	---	---	See X-008	
X 038	Spare	56	---	---	---	See X-008	
X 039C	Spare	56	---	---	---	See X-008	
X 039D	Spare	56	---	---	---	See X-008	
X 040C	Spare	56	---	---	---	See X-008	
X 040D	H_2 Purge Supply	56	---	Blind Flange	---	See X-003	See discussion of this penetration in Attachment 1 of this document.

[1]GDC 55, 56, 57
NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 043A	To RCP Seals	55	62-563 (CV)	62-546 62-549 62-550 and Closed System	9.3.4-1	Local manual valves 62-546 and 62-549 are normally closed valves. Valve 62-550 can be isolated when the need to isolate is determined.	Further discussion regarding isolation and meeting the GDC on other defined basis is provided in Attachment 1 of this document.
X 043B	To RCP Seals	55	62-561 (CV)	See X-043A	9.3.4-1	See X-043A	
X 043C	To RCP Seals	55	62-562 (CV)	See X-043A	9.3.4-1	See X-043A	
X 043D	To RCP Seals	55	62-560 (CV)	See X-043A	9.3.4-1	See X-043A	

[1]GDC 55, 56, 57

NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X-048A	Containment Spray	56	72-547 (CV)	72-39 (RM) and Closed System	6.2.2-2	See SRP 6.2.4 Section II.b for acceptability of remote manual valve outside containment.	See further discussion of this penetration in Attachment 1 of this document
X-048B	Containment Spray	56	72-548 (CV)	72-2 (RM) and Closed System	6.2.2-2	See X-048A	See X-048A
X-049A	RHR Spray	56	72-556 (CV)	72-40 (RM) and Closed System	6.2.2-2	See X-048A	See X-048A
X-049B	RHR Spray	56	72-555 (CV)	72-41 (RM) and Closed System	6.2.2-2	See X-048A	See X-048A

[1]GDC 55, 56, 57
NOTE--Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 053	CCS to Excess	57 Ltdn. HX	Closed	70-143 System	9.2.1-2	This penetration directly meets GDC 57 except there is a relief valve, 70-703, on the closed system inside containment. The relief valve is acceptable because containment pressure is acting opposite the direction that the valve relieves, thereby aiding the valve to seat. Penetrations X-053 and X-035 are part of the same loop.	
X 054	Thimble Renewal	56	---	Blind Flange	6.2.4-15	See X-003	Blind flange is never removed except in Mode 5 or 6.
X 055	Spare	56	---	---	---	See X-008	

[1]GDC 55, 56, 57
NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X-079A	Ice Blowing	56	---	Blind Flange	6.2.4-16	See X-003	See X-054
X-079B	Negative Return	56	---	Blind Flange	6.2.4-16	See X-003	See X-054
X-084B	Spare	56	---	---	---	See X-008	
X-084C	Spare	56	---	---	---	See X-008	
X-084D	Spare	56	---	---	---	See X-008	
X-085B	dP Sensor	56	---	*	---	*See X-025B	
X-085C	Spare	56	---	---	---	See X-008	

[1]GDC 55, 56, 57
NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
1
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 085D	Spare	56	---	---	---	See X-008	
X 086A	Rx Vessel Level	55	*	*	---	*See X-025C	
X 086B	Rx Vessel Level	55	*	*	---	*See X-025C	
X 086C	Rx Vessel Level	55	*	*	---	*See X-025C	
X 086D	Spare	56	---	---	---	See X-008	
X 087A	Spare	56	---	---	---	See X-008	
X 087C	Spare	56	---	---	---	See X-008	

[1]GDC 55, 56, 57
NOTE - Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 088	Shutdown Maint. Access	56	---	Blind Flange	---	See X-003	See X-054
X 089	Spare	56	---	---	---	See X-008	
X 092A	H_2 Analyzer	56	43-207 (Auto open on pump start)	Closed System	---	Closed system outside containment provides outer barrier. This line is required postaccident for H_2 monitoring. Penetrations X-092A and X-092B are part of the same closed loop. Valves 43-207 and 43-208 are both located inside containment. H_2 Analyzers discussed in Supplement 2 to SQN's SER.	
X 092B	H_2 Analyzer	56	43-208 (Auto open on pump start)	Closed System	---	See X-092A	
X 096A	Spare	56	---	---	---	See X-008	

[1]GDC 55, 56, 57

NOTE -Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X-096B	Spare	56	---	---	---	See X-008	
X-099	H_2 Analyzer	56	43-202 (Auto open on pump start)	Closed System	---	Closed system outside containment provides outer barrier. This line is required postaccident for H_2 monitoring. Penetrations X-099 and X-100 are part of the same closed system. Valves 43-202 and 43-201 are both located inside containment.	
X-100	H_2 Analyzer	56	43-201 (Auto open on pump start)	Closed System	---	See X-099	
X-105	Spare	56	---	---	---	See X-008	

[1]GDC 55, 56, 57

NOTE--Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 107	RHR Supply	55	74-2 (RM) 74-505 (RV)	Closed System	5.5.7-1	Closed system outside containment provides outer barrier. Valve 74-1 is available in series with containment isolation valve 74-2 and both are normally closed with interlocks to prevent inadvertent opening. The relief valve is acceptable because containment pressure is acting opposite the direction that the valve relieves, thereby aiding the valve to seat.	
X 108	UHI	55	87-562 (CV)	87-21 (RM) and Closed System	6.3.2-15	See SRP 6.2.4 Section II.b for acceptability of remote manual valve outside containment.	
X 109	UHI	55	87-563 (CV)	87-23 (RM) and Closed System	6.3.2-15	See X-108	
X 111	Vacuum Relief	56	--	30-46 30-571 (CV)	9.4.7-1 and 6.2.4-17	The containment vacuum relief system isolation valve is located in series with a vacuum relief (check) valve both outside of con-	See Attachment 1 of this document for further discussion.

[1]GDC 55, 56, 57

NOTE--Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
						tainment. The closing of the isolation valves are actuated by a set of redundant pressure sensors independent of those for other containment isolation valves. The closing is powered by redundant air supplies. The spring- loaded vacuum relief valves are normally closed and have position indicators in the Main Control Room to indicate the open or closed positions. These valves are not considered as simple check valves.	
X-112	Vacuum Relief	56	---	30-47 30-572 (CV)	9.4.7-1 and 6.2.4-17	See X-111	
X-113	Vacuum Relief	56	---	30-48 30-573 (CV)	9.4.7-1 and 6.2.4-17	See X-111	

[1]GDC 55, 56, 57

NOTE Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X-116B	Spare	56	---	---	---	See X-008	
X-116C	Spare	56	---	---	---	See X-008	
X-116D	Spare	56	---	---	---	See X-008	
X-117	Shutdown Maint. Access	56	---	Blind Flange	---	See X-003	See X-054
X-118	Layup Water Treatment	56	---	Blind Flange	---	See X-003	See X-054
X-119	Spare	56	---	---	---	See X-008	
X-120	Spare	56	---	---	---	See X-008	

[1]GDC 55, 56, 57
NOTE Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve

Design Correlates to
[1]
10 CFR 50 GDC on Other Defined Basis

Penetration	Description	Penetration Classification[1]	Inside Barrier(s)	Outside Barrier(s)	FSAR Figure	Other Defined Basis	Ref./Notes
X 120E thru X 170E	Electrical Penetrations	56	Epoxy Seal	Epoxy Seal	---	Standard dual passive epoxy barrier electrical penetration assembly design - pressurized between the seals with N_2.	
X 125E	Spare	56	---	---	---	See X-008	
X 130E	Spare	56	---	---	---	See X-008	
X 155E	Spare	56	---	---	---	See X-008	
X 162E	Spare	56	---	---	---	See X-008	

[1]GDC 55, 56, 57

NOTE -Automatic Power Operated Valve unless otherwise indicated as follows:
(LC) Locked Closed Manual Valve
(RM) Remote Manual Valve
(CV) Check Valve
(RV) Relief Valve