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Risk-Informed Evaluation of Extensions to Containment Isolation Valve Completion Times

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AOT	Allowed Outage Time
AOV	Air-Operated Valve
CDF	Core Damage Frequency
CCF	Common Cause Failure
CCP	Centrifugal Charging Pump
CIV	Containment Isolation Valve
CT	Completion Time
DBA	Design Basis Accident
IC	Inside Containment
ICLERP	Incremental Conditional Large Early Release Probability
LCO	Limiting Condition for Operation
LERF	Large Early Release Frequency
LOCA	Loss of Coolant Accident
MOV	Motor-Operated Valve
NRC	Nuclear Regulatory Commission
OC	Outside Containment
PRA	Probabilistic Risk Analysis
RCS	Reactor Coolant System
RG	Regulatory Guide
RHR	Residual Heat Removal
RI	Risk-Informed
SG	Steam Generator
SI	Safety Injection
SOV	Solenoid-Operated Valves
SRV	Safety Relief Valve
WCGS	Wolf Creek Generating Station
WOG	Westinghouse Owners Group

IDENTIFICATION OF REVISIONS

This WCAP revision is required to address two issues that were identified from the NRC's review of the document. The NRC provided RAIs to the WOG via the NRC letter from D. Holland (NRC) to G. Bischoff (Westinghouse), "Request for Additional Information – WCAP-15791-P, 'Risk-Informed Evaluation of Extensions to Containment Isolation Valve Completion Times'", (TAC No. MB5751), dated July 3, 2003. The two issues were identified in RAI 2 and RAI 11.

RAI 2: The topical report (TR) references a deterministic evaluation approach to determine the minimum penetration size that will result in a large release from containment atmosphere. The TR concludes that penetration pipe size diameters of 5", 6", and 3" can be screened out for sub-atmospheric, ice condenser, and dry ambient containment types. This result seems counter-intuitive since for the same volumetric leak rate (%/day) a smaller containment should have a similar hole size. Also, these sizes are significantly larger that the 1" and 2" diameter line size criteria typically used in the methodologies to identify penetrations whose failures could result in a large early release.

Please provide the following:

2.a An assessment of the impact of a line size screening criteria similar to the containment penetration screening criteria used in a typical probabilistic risk assessment (PRA) (e.g., a 2" line diameter). This should include an estimate of the number and types of lines in the size range between 2" and 6".

2.b Provide the details of the calculations performed to determine the pipe size screening criteria for one of the containment types. Explain how choked flow considerations are accounted for in the calculation.

2.c If a PRA-type screening criteria is not adopted, please provide the results of offsite consequence calculations demonstrating that early health effects would not occur given a severe accident with containment breach sizes equivalent to the screening criteria proposed in the TR.

The following was provided in response to RAIs 2.b and 2.c.

> "Following several detailed discussions with the Staff's reviewers of this WCAP on offsite consequences associated with containment hole sizes, the WOG decided to default to a 2 inch hole size limitation to define the threshold for a large release, instead of further pursuing a hole size based on an alternate large release criteria. The 2 inch hole size has been used for screening in development of containment isolation PRA models and is acceptable to the NRC. Due to this change in the approach to set the minimum penetration size that will result in a large release, a detailed response will not be provided to this RAI. However, as a result of the large release criteria change, the impacted CIVs will be re-analyzed via the probabilistic approach with the results provided in a revision to WCAP-15791."

RAI 11: CDF_T is stated to include internal events only. Please discuss considerations for external events including CDF_T and LERF. See Table 8.1 of the TR.

The following was provided as part of the response to this RAI.

> "The analysis included the total CDF (CDF_T) from internal events. In addition, to analyze systems that are closed inside or outside containment, the analysis considered the CDF from seismic events as discussed in Section 8.2.2 of the WCAP. For the generic analysis, the CDF_T is 7.8E-05/yr. To ensure the CDF_T adequately covers both internal and external events, this value will be increased to 1E-04/yr. The generic probabilistic risk analysis will be re-done using a CDF_T value of 1E-04/yr. The new Completion Times will be provided in a revision to the WCAP."
>
> "With regard to the plant specific analysis for WCGS, only the internal event CDF value was used for CDF_T. The plant specific probabilistic risk analysis for the CIVs greater than 2 inches will be re-done using a CDF_T of 1E-04/yr. The new Completion Times will be provided in a revision to the WCAP."

The following provides a summary of the revisions to the WCAP to address these changes.

Revision	Location	Description
0	NA	Original Issue
1	Table 8-1	The input parameter "Internal event core damage frequency" was changed to "At-power internal & external event core damage frequency". The value 7.80E-05 was changed to 1.0E-04. In the Reference column, the comment "See note 6" was added.
1	Section 8.2.1	Note 6 was added.
1	Section 8.2.2.1	The calculations and results were changed to reflect the change in CDF_T from 7.8E-05/yr to 1.0E-04/yr.
1	Section 8.2.2.2	The calculations and results were changed to reflect the change in CDF_T from 7.8E-05/yr to 1.0E-04/yr.
1	Section 8.2.2.3	The calculations and results were changed to reflect the change in CDF_T from 7.8E-05/yr to 1.0E-04/yr.
1	Section 8.2.2.4	The calculations and results were changed to reflect the change in CDF_T from 7.8E-05/yr to 1.0E-04/yr.
1	Section 8.2.3.1	The calculations and results were changed to reflect the change in CDF_T from 7.8E-05/yr to 1.0E-04/yr.
1	Section 8.2.3.2	The calculations and results were changed to reflect the change in CDF_T from 7.8E-05/yr to 1.0E-04/yr.
1	Section 8.2.4.1	The calculations and results were changed to reflect the change in CDF_T from 7.8E-05/yr to 1.0E-04/yr.
1	Section 8.2.4.2	The calculations and results were changed to reflect the change in CDF_T from 7.8E-05/yr to 1.0E-04/yr.

Revision	Location	Description
1	Section 8.3	Revised to address the change in approach to determine the containment hole size that will result in a large release.
1	Section 8.3.1	Deleted this section
1	Table 8-5	Deleted this table
1	Section 8.3.2	Deleted this section
1	Table 8-6	Re-numbered Table 8-6 to Table 8-5
1	Section 9	Several minor editorial changes to reflect the new approach to the containment hole size that will result in a large release.
1	Section 9.1	Revised Step 4 to reflect the new approach to the containment hole size that will result in a large release.
1	Table 9-1a	The generic analysis core damage frequency value of 7.80E-05 was changed to 1.0E-04.
1	Table 9-1d	Deleted this table
1	Table 9-1e	Re-numbered to Table 9-1e to Table 9-1d
1	Section 9.2	Text revised to reflect the revised results.
1	Table 9-3	Percentage of CIVs updated to reflect revised results.
1	Table 9-2	Revised the appropriate "Grouping Explanations" and CTs to reflect the revised analysis.
1	Figure 9-1	Replaced Figure 9-1 with Table 9-3 that provides a summary of the revised results.
1	Section 10	Revised the text to reflect the new approach to the containment hole size that will result in a large release.
1	Section 10.1	Deleted the first two paragraphs that discussed calculating a plant specific containment hole size that will result in a large release.
1	Table 10-1	Revised Table 10-1 to reflect the results of the revised plant specific analysis. The table also has a revised form.
1	Section 10.2	Updated the summary of results (percentage CIVs with an increased CT).
1	Table 10-2	Percentage of CIVs updated to reflect revised results.
1	Figure 10-1	Replaced Figure 10-1 with Table 10-2 that provides a summary of the revised results.
1	Section 11	Revised the first bullet to reflect the new approach to the containment hole size that will result in a large release. Updated the fourth and fifth bullets with revised results (percentage CIVs with an increased CT).
1	Appendix A	Removed Marked up Technical Specifications and Bases. Added TSTF-446, Rev. 1
1	Appendix D	Updated the "Completion Time (CT) Category Number" and the "Justified CT" information to reflect the revised analysis and results.
1	Appendix E	Deleted this Appendix (provides similar information as Appendix D)

EXECUTIVE SUMMARY

Plant Technical Specifications are issued by the U.S. NRC to ensure that safe nuclear power plant operation is maintained within the assumptions and the conditions of the plant safety analysis reports (SAR). One part of the Technical Specifications specify the Completion Times (CTs). These are the times in which remedial actions must be taken in the event that the minimum set of safety system requirements consistent with the plant SAR are not met. The Westinghouse Owners Group (WOG) has undertaken a number of programs focused on improving Technical Specification requirements including CTs. One program is focused on extending the CT for the containment penetration isolation valves (CIVs) from 4 hours to 7 days. The motivation for this is to provide sufficient time for plant personnel to address CIV inoperability and to perform preventive maintenance activities on the CIVs during power operation.

Containment penetration types included in this analysis are for systems that are connected to the containment atmosphere, connected to the reactor coolant system, and connected to the steam generators. Consideration is given to penetration flow paths associated with open and closed systems, for multiple CIVs, and for maintenance activities on the CIVs that inhibit the valves from functioning as a pressure boundary and for activities that allow the valves to retain their pressure boundary functionality.

The approach used in this program applies both deterministic and probabilistic evaluations. A deterministic approach is used to determine the minimum containment hole size that will result in a large release from the containment atmosphere. Penetration flow paths connected to the containment atmosphere smaller than this minimum size are allowed the 7 day CT. All other penetrations are evaluated on a probabilistic basis to demonstrate a CT of 7 days is acceptable or to determine an appropriate CT. The probabilistic evaluation is consistent with the U.S. NRC's approach for using probabilistic risk assessment in risk-informed decisions on plant-specific changes to the current licensing basis. This approach is discussed in Regulatory Guides 1.174 and 1.177. The risk measures of importance are the impact of the CT extension on large early release frequency and incremental conditional large early release probability.

This program evaluated the impact of extending the 4 hour CT on a generic basis. Conservative analysis input parameters were used to ensure the results are applicable to all WOG plants. Utilities that implement these CT changes must demonstrate that the generic analysis is applicable to their plant by showing that the input parameters are representative of or conservative for their plant. A plant specific implementation of the generic analysis is provided for the Wolf Creek Generating Station (WCGS). Utilities that want to extend the CTs beyond those justified by the generic analysis can substitute plant specific values in place of the generic input parameters and recalculate the risk measures. This has also been completed for the WCGS.

The results show that a CT extension to 7 days can be justified for a majority of the CIVs for the WCGS. For those CIVs where the full 7 day extension could not be justified, many can be extended to at least 12 hours and there were only a very small number of CIVs where an extension could not be justified.

1 INTRODUCTION

The purpose of this program is to provide the technical justification for extending the Completion Time (CT), also referred to as the allowed outage time (AOT), from 4 hours to 168 hours (7 days) (for isolation valves that cannot demonstrate acceptable results for 168 hours, shorter times are considered and evaluated), for the following Technical Specification requirement:

LCO 3.6.3, Containment Isolation Valves (CIVs), NUREG 1431, Rev. 2

- Condition A, One or more penetration flow paths with one CIV inoperable (only applicable to penetration flow paths with two [or more] CIVs).
  Required Action A1: Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

- Condition C, One or more penetration flow paths with one CIV inoperable (only applicable to penetration flow paths with only one CIV and a closed system).
  Required Action C1: Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.

The current CTs are generally insufficient to respond to CIV inoperability and perform preventive maintenance activities at-power.

The approach used in this program applies both deterministic and probabilistic evaluations. A deterministic approach is used to determine the minimum containment hole size that will result in a large release from the containment atmosphere. Penetration flow paths connected to the containment atmosphere smaller than this size are allowed a CT of 7 days. All other penetrations are evaluated on a probabilistic basis to demonstrate that a CT of 7 days is acceptable, or to determine an appropriate CT. The probabilistic evaluation is consistent with the Nuclear Regulatory Commission's (NRC) approach for using probabilistic risk assessment (PRA) in risk-informed (RI) decisions on plant-specific changes to the current licensing basis. This approach is discussed in Regulatory Guide 1.174 ("An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Reference 1) and Regulatory Guide 1.177 ("An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," Reference 2). The approach addresses, as documented in this report, the impact on defense-in-depth and the impact on safety margins, as well as an evaluation of the impact on risk. The risk evaluation considers the three-tiered approach as presented by the NRC in Reg. Guide 1.177. Tier 1, PRA Capability and Insights, assessed the impact of the proposed Completion Time change on large early release frequency (LERF) and incremental conditional large early release probability (ICLERP). The impact of the change on core damage frequency (CDF) and incremental conditional core damage probability (ICCDP) were not evaluated since containment isolation is a function that impacts containment response to an event and not the ability of the plant design to prevent or mitigate core damage. Tier 2, Avoidance of Risk-Significant Plant Configurations, considered potential risk-significant plant operating configurations. Tier 3, Risk-Informed Plant Configuration Control and Management, will be addressed on a plant specific basis when the Technical Specification Completion Time change is implemented by each utility consistent with their Maintenance Rule program.

This program used an approach that evaluated the impact of the CT on a generic basis. Conservative analysis input parameters were used in the analysis to ensure that the results are applicable to all domestic WOG plants. Utilities that implement this CT change will need to demonstrate that the analysis is applicable to their plant by demonstrating that the input parameters are representative of, or conservative for their plant. A plant specific implementation of the generic analysis is provided for the Wolf Creek Generating Station (WCGS) in Section 9. Utilities can substitute plant specific values in place of the generic input parameters and recalculate the risk measures that in some cases will result in longer CTs. This is provided for WCGS in Section 10.

Penetration types included in this analysis are systems that connect directly to the containment atmosphere, connect directly to the reactor coolant system (RCS), and connect directly to the steam generators (SGs). Consideration is given to penetration flow paths with multiple isolation valves and penetration flow paths with single isolation valves with a closed system. Consideration is also given to maintenance activities on the isolation valves that inhibit the CIVs from functioning as a pressure boundary and also activities that allow the CIVs to retain their pressure boundary functionality.

The Technical Specification conditions will be eliminated that distinguish between penetration flow paths that contain two or more CIVs and penetration flow paths that contain one CIV and a closed system. Also, two conditions will be added to address maintenance activities that impact the CIV pressure boundary; one when the pressure boundary is intact and one when it is not intact.
See Appendix A: Marked up Technical Specifications and Bases.

The Westinghouse Owners Group (WOG) is evaluating these changes as part of a larger program considering changes to a number of Technical Specification CTs. CT extensions are also being considered for a number of fluid systems, and AC and DC power systems.

2 TECHNICAL SPECIFICATIONS

The relevant Technical Specifications for the containment isolation valves from NUREG-1431, Rev. 2 (Improved Standard Technical Specifications) for Westinghouse plants follow.

3.6 CONTAINMENT SYSTEMS

3.6.3 Containment Isolation Valves (Atmospheric, Subatmospheric, Ice Condenser, and Dual)

LCO 3.6.3 *Each containment isolation valve shall be OPERABLE.*

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

- NOTES -

1. Penetration flow path(s) [except for [42] inch purge valve flow paths] may be unisolated intermittently under administrative controls.
2. Separate Condition entry is allowed for each penetration flow path.
3. Enter applicable Conditions and Required Actions for systems made inoperable by containment isolation valves.
4. Enter applicable Conditions and Required Actions of LCO 3.6.1, "Containment," when isolation valve leakage results in exceeding the overall containment leakage rate acceptance criteria.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ---------- **- NOTE -** Only applicable to penetration flow paths with two [or more] containment isolation valves. ---------- One or more penetration flow paths with one containment isolation valve inoperable [for reasons other than Condition[s] D [and E]].	A.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured. AND	4 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.2 ---------- - NOTES - 1. Isolation devices in high radiation areas may be verified by use of administrative means. 2. Isolation devices that are locked, sealed, or otherwise secured may be verified by use of administrative means. ---------- Verify the affected penetration flow path is isolated.	Once per 31 days for isolation devices outside containment AND Prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days for isolation devices inside containment

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. ---------- **- NOTE -** Only applicable to penetration flow paths with two [or more] containment isolation valves. ---------- One or more penetration flow paths with two [or more] containment isolation valves inoperable [for reasons other than Condition[s] D [and E]].	B.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.	1 hour
C. ---------- **- NOTE -** Only applicable to penetration flow paths with only one containment isolation valve and a closed system. ---------- One or more penetration flow paths with one containment isolation valve inoperable.	C.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange. AND	72 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	C.2	---------- - NOTES - 1. Isolation devices in high radiation areas may be verified by use of administrative means. 2. Isolation devices that are locked, sealed, or otherwise secured may be verified by use of administrative means. ---------- Verify the affected penetration flow path is isolated.	Once per 31 days
D. [One or more shield building bypass leakage [or purge valve leakage] not within limit.	D.1	Restore leakage within limit.	4 hours for shield building bypass leakage AND 24 hours for purge valve leakage]
E. [One or more penetration flow paths with one or more containment purge valves not within purge valve leakage limits.	E.1 AND	Isolate the affected penetration flow path by use of at least one [closed and de-activated automatic valve, closed manual valve, or blind flange].	24 hours

BASES

ACTIONS (continued)

The ACTIONS are further modified by a third Note, which ensures appropriate remedial actions are taken, if necessary, if the affected systems are rendered inoperable by an inoperable containment isolation valve.

In the event the isolation valve leakage results in exceeding the overall containment leakage rate, Note 4 directs entry into the applicable Conditions and Required Actions of LCO 3.6.1.

A.1 and A.2

In the event one containment isolation valve in one or more penetration flow paths is inoperable, [except for purge valve or shield building bypass leakage not within limit], the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic containment isolation valve, a closed manual valve, a blind flange, and a check valve with flow through the valve secured. For a penetration flow path isolated in accordance with Required Action A.1, the device used to isolate the penetration should be the closest available one to containment. Required Action A.1 must be completed within 4 hours. The 4 hour Completion Time is reasonable, considering the time required to isolate the penetration and the relative importance of supporting containment OPERABILITY during MODES 1, 2, 3, and 4.

For affected penetration flow paths that cannot be restored to OPERABLE status within the 4 hour Completion Time and that have been isolated in accordance with Required Action A.1, the affected penetration flow paths must be verified to be isolated on a periodic basis. This is necessary to ensure that containment penetrations required to be isolated following an accident and no longer capable of being automatically isolated will be in the isolation position should an event occur. This Required Action does not require any testing or device manipulation. Rather, it involves verification, through a system walkdown, that those isolation devices outside containment and capable of being mispositioned are in the correct position. The Completion Time of "once per 31 days for isolation devices outside containment" is appropriate considering the fact that the devices are operated under administrative controls and the probability of their misalignment is low. For the isolation devices inside containment, the time period specified as "prior to entering MODE 4 from MODE 5 if not performed within the

BASES

ACTIONS (continued)

previous 92 days" is based on engineering judgment and is considered reasonable in view of the inaccessibility of the isolation devices and other administrative controls that will ensure that isolation device misalignment is an unlikely possibility.

Condition A has been modified by a Note indicating that this Condition is only applicable to those penetration flow paths with two [or more] containment isolation valves. For penetration flow paths with only one containment isolation valve and a closed system, Condition C provides the appropriate actions.

Required Action A.2 is modified by two Notes. Note 1 applies to isolation devices located in high radiation areas and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Note 2 applies to isolation devices that are locked, sealed, or otherwise secured in position and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since the function of locking, sealing, or securing components is to ensure that these devices are not inadvertently repositioned. Therefore, the probability of misalignment of these devices once they have been verified to be in the proper position, is small.

B.1

With two [or more] containment isolation valves in one or more penetration flow paths inoperable, [except for purge valve or shield building bypass leakage not within limit,] the affected penetration flow path must be isolated within 1 hour. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. The 1 hour Completion Time is consistent with the ACTIONS of LCO 3.6.1. In the event the affected penetration is isolated in accordance with Required Action B.1, the affected penetration must be verified to be isolated on a periodic basis per Required Action A.2, which remains in effect. This periodic verification is necessary to assure leak tightness of containment and that penetrations requiring isolation following an accident are isolated. The Completion Time of once per 31 days for verifying each affected penetration flow path is isolated is appropriate considering the fact that the valves are operated under administrative control and the probability of their misalignment is low.

BASES

ACTIONS (continued)

Condition B is modified by a Note indicating this Condition is only applicable to penetration flow paths with two [or more] containment isolation valves. Condition A of this LCO addresses the condition of one containment isolation valve inoperable in this type of penetration flow path.

C.1 and C.2

With one or more penetration flow paths with one containment isolation valve inoperable, the inoperable valve flow path must be restored to OPERABLE status or the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. A check valve may not be used to isolate the affected penetration flow path. Required Action C.1 must be completed within the 72 hour Completion Time. The specified time period is reasonable considering the relative stability of the closed system (hence, reliability) to act as a penetration isolation boundary and the relative importance of maintaining containment integrity during MODES 1, 2, 3, and 4. In the event the affected penetration flow path is isolated in accordance with Required Action C.1, the affected penetration flow path must be verified to be isolated on a periodic basis. This periodic verification is necessary to assure leak tightness of containment and that containment penetrations requiring isolation following an accident are isolated. The Completion Time of once per 31 days for verifying that each affected penetration flow path is isolated is appropriate because the valves are operated under administrative controls and the probability of their misalignment is low.

Condition C is modified by a Note indicating that this Condition is only applicable to those penetration flow paths with only one containment isolation valve and a closed system. The closed system must meet the requirements of Ref. 3. This Note is necessary since this Condition is written to specifically address those penetration flow paths in a closed system.

Required Action C.2 is modified by two Notes. Note 1 applies to valves and blind flanges located in high radiation areas and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Note 2 applies to isolation devices that are locked, sealed, or otherwise secured in position and allows these devices

BASES

ACTIONS (continued)

to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since the function of locking, sealing, or securing components is to ensure that these devices are not inadvertently repositioned. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position, is small.

[D.1

With the shield building bypass leakage rate (SR 3.6.3.11) [or purge valve leakage rate (SR 3.6.3.7)] not within limit, the assumptions of the safety analyses are not met. Therefore, the leakage must be restored to within limit. Restoration can be accomplished by isolating the penetration(s) that caused the limit to be exceeded by use of one closed and de-activated automatic valve, closed manual valve, or blind flange. When a penetration is isolated the leakage rate for the isolated penetration is assumed to be the actual pathway leakage through the isolation device. If two isolation devices are used to isolate the penetration, the leakage rate is assumed to be the lesser actual pathway leakage of the two devices. The 4 hour Completion Time for shield building bypass leakage is reasonable considering the time required to restore the leakage by isolating the penetration(s) and the relative importance of secondary containment bypass leakage to the overall containment function. [The 24 hour Completion time for purge valve leakage is acceptable considering the purge valves remain closed so that a gross breach of the containment does not exist.]

- REVIEWER'S NOTE -

[The bracketed options provided in ACTION D reflect options in plant design and options in adopting the associated leakage rate Surveillances.

The options (in both ACTION D and ACTION E) for purge valve leakage, are based primarily on the design - if leakage rates can be measured separately for each purge valve, ACTION E is intended to apply. This would be required to be able to implement Required Action E.3. Should the design allow only for leak testing both purge valves simultaneously, then the Completion Time for ACTION D should include the "24 hours for purge valve leakage" and ACTION E should be eliminated.]]

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3 NEED FOR COMPLETION TIME CHANGE

As discussed in Regulatory Guide 1.177 acceptable reasons for requesting Technical Specification changes fall into one or more of the following categories:

Improvement to operational safety: A change to the Tech Specs can be made due to reductions in the plant risk or a reduction in the occupational exposure of plant personnel in complying with the Tech Spec requirements.

Consistency with risk basis in regulatory requirements: Tech Spec requirements can be changed to reflect improved design features in a plant or to reflect equipment reliability improvements that make a previous requirement unnecessarily stringent or ineffective. Tech Specs may be changed to establish consistently based requirements across the industry or across an industry group.

Reduce unnecessary burdens: The change may be requested to reduce unnecessary burdens in complying with current Tech Spec requirements, based on operating history of the plant or the industry in general. This includes extending completion times: 1) that are too short to complete repairs when components fail with the plant at-power, 2) to complete additional maintenance activities at-power to reduce plant down time, and 3) provide increased flexibility to plant operators.

The CT extensions in this WCAP are requested primarily to provide an improvement to operational safety, reduce unnecessary burden and provide a more consistent risk basis in regulatory requirements. In addition, the assumption that shutting the plant down is the safest course of action is not always valid and depending on the component or system of interest, it may be safer to complete component repairs at power. During shutdown, the transfer from auxiliary feedwater (AFW) to the residual heat removal (RHR) system represents an increased risk level due to system alignment changes that could lead to loss of inventory events. This transition can be avoided by completing the repair at-power. Potential risks associated with plant shutdown need to be considered when determining an appropriate course of action. Extended CTs enable this shutdown risk to be averted.

With regard to the regulatory basis consistency, CIVs are typically not as risk significant as many other plant safety systems and components. Often these other systems more important to risk have CTs that are longer than the CTs for CIVs. Shorter CTs should be imposed on systems or components that are considered to be highly risk significant. Containment penetrations do not rely on single valves to perform their isolation function, but are designed with multiple isolation valves or involve a closed system. A four hour CT is too restrictive and potentially forces plant operators to focus on CIV inoperability ahead of other inoperabilities that may be more risk significant, but have longer CTs.

There are situations where a potential plant shutdown or a plant transient can be avoided, if sufficient time was available to perform corrective maintenance on an inoperable CIV. The following examples demonstrate that the current 4 hour CIV CT is insufficient to perform corrective maintenance on an inoperable CIV.

A plant was performing a quarterly surveillance test that involved stroking a Component Cooling Water CIV. This CIV is located in a common loop that provides cooling to essential containment loads such as the RCP motor air coolers, the RCP upper and lower bearing cooler, and the excess letdown heat

exchanger. During the performance of the test, the Component Cooling Water CIV was taken to the closed position and failed to fully close. The valve was declared inoperable, and TS 3.6.3 Required Action A.1 was entered with a 4 hour CT to either a) restore the valve to Operable status, b) isolate the affected penetration flow path, or c) initiate a plant shutdown. The troubleshooting of the problem involved a containment entry to visually inspect the torque switch and wiring. During the troubleshooting of the torque switch and wiring, the valve was taken to the open position and then to the closed position. This time, the valve fully closed. The closure of the Component Cooling Water CIV was completed with just 9 minutes remaining on the Required Action A.1 Completion Time of 4 hours. Troubleshooting and repair of the valve continued, and the valve was restored to Operable status in an additional 28 hours. A plant shutdown was not required, however, isolating the penetration flow path within the required 4 hours could have resulted in an unnecessary plant transient. The current 4 hour CT was barely enough time to perform the initial troubleshooting of the problem, and was insufficient to complete the repair, which took another 28 hours.

Some of the sample line relief valves may open, and remain opened during plant sampling operations. The flow path can be isolated with the current CT of 4 hours, however the relief valve cannot be repaired within the 4 hour CT. If a plant conservatively chooses not to utilize the Note in TS 3.6.3 that allows penetration flow paths to be unisolated intermittently under administrative controls, the valve will remain closed for the entire cycle, until it can be repaired during an outage. An entry into containment may be required to obtain plant samples locally. The containment entry involves additional dose to the plant personnel obtaining the sample, and a personnel hazard in obtaining the sample from a high-pressure source. If a longer CT were available, then the valve could be repaired, allowing samples to be obtained from the sampling panel.

A plant performs a local leak rate test (LLRT) on the containment purge valves every six months. Both valves are tested at the same time due to the configuration of the valves. If the LLRT is failed, both valves are assumed to fail, since there is no way to determine which valve failed. A large blind flange would be used to isolate the penetration, since there is no other way to isolate the penetration. A 4 hour CT is not sufficient to install and test the blind flange, and therefore a plant shutdown would be required. A longer CT would allow the blind flange to be installed and tested.

Another example where the current 4 hour CT was insufficient to perform a repair was associated with a leaking feedwater header vent and drain valve. The repair of the leaking valve involved capping the end of the pipe. The evaluation of the repair involved determining the pressure rating of the piping, to determine the pressure rating of the cap to be installed. The end of the pipe had to be modified to install the cap. The current CT of 4 hours was not enough time to perform the design evaluation and to perform the repair.

4 TECHNICAL SPECIFICATION CHANGE REQUEST

The analysis in this report provides the justification for extending the Completion Times of Tech Spec 3.6.3 in NUREG-1431, Rev. 2 for the Required Actions associated with the following conditions:

- Condition A, One or more penetration flow paths with one containment isolation valve inoperable [for reasons other that Condition[s] D [and E]].

- Required Action A.1, Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

  Evaluate increasing the CT from 4 hours to 7 days.

- Condition C, One or more penetration flow paths with one containment isolation valve inoperable.

- Required Action C.1, Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.

  Evaluate increasing the CT from 72 hours to 7 days.

Note that a CT extension to 7 days is the objective of this analysis for both conditions A and C. CTs less than 7 days will be proposed if necessary to meet the risk acceptance criteria provided in Regulatory Guides 1.174 and 1.177.

5 DESIGN BASIS REQUIREMENTS AND IMPACT

The following discusses the design basis requirements and the impact of the proposed CT extensions on these requirements. This discussion is taken from the basis of Tech Spec 3.6.3 in NUREG-1431, Rev. 2, (Reference 3).

The CIVs form part of the containment pressure boundary and provide a means for fluid penetrations not serving accident consequence limiting systems to be provided with two isolation barriers that are closed on a containment isolation signal. The isolation devices are either passive or active (automatic). Manual valves, de-activated automatic valves secured in their closed position (including check valves with flow through the valve secured), blind flanges, and closed systems are considered passive devices. Check valves, or other automatic valves designed to close without operator action following an accident, are considered active devices. Two barriers in series are provided for each penetration so that no single credible failure or malfunction of an active component can result in a loss of isolation or leakage that exceeds limits assumed in the safety analyses. One of these barriers may be a closed system. These barriers (typically containment isolation valves) make up the Containment Isolation System.

Automatic isolation signals are produced during accident conditions. Containment Phase "A" isolation occurs upon receipt of a safety injection signal. Phase "A" isolation signal isolates nonessential process lines in order to minimize leakage of fission product radioactivity. Containment Phase "B" isolation occurs upon receipt of a containment pressure High-High signal and isolates the remaining process lines, except systems required for accident mitigation. In addition to the isolation signals listed above, the purge and exhaust valves receive an isolation signal on a containment high radiation condition. As a result, the containment isolation valves (and blind flanges) help ensure that the containment atmosphere will be isolated from the environment in the event of a release of fission product radioactivity to the containment atmosphere as a result of a Design Basis Accident (DBA).

The OPERABILITY requirements for containment isolation valves help ensure that containment is isolated within the time limits assumed in the safety analysis. Therefore, the OPERABILITY requirements provide assurance that the containment function assumed in the safety analysis will be maintained.

The containment isolation valve Limiting Condition for Operation (LCO) was derived from the assumptions related to minimizing the loss of reactor coolant inventory and establishing the containment boundary during major accidents. As part of the containment boundary, containment isolation valve OPERABILITY supports leak tightness of the containment. Therefore, the safety analysis of any event requiring isolation of containment is applicable to this LCO.

The DBAs that result in a release of radioactive material within containment are a loss of coolant accident and a rod ejection accident. In the analysis for each of these accidents, it is assumed that containment isolation valves are either closed or function to close within the required isolation time following event initiation. This ensures that potential paths to the environment through containment isolation valves are minimized.

The normally closed isolation valves are considered OPERABLE when manual valves are closed, automatic valves are de-activated and secured in their closed position, blind flanges are in place, and closed systems are intact.

Required Action A.1 This action requires that with one CIV in one or more penetration flow paths inoperable [except for purge valve or shield building bypass leakage not within limit], the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic CIV, a closed manual valve, a blind flange, and a check valve with flow through the valve secured.

Required Action C.1 This action requires that with one or more penetration flow paths with one CIV inoperable, the inoperable valve flow path must be restored to OPERABLE status or the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. A check valve may not be used to isolate the affected penetration flow path. Condition C is modified by a Note indicating that this Condition is only applicable to those penetration flow paths with only one containment isolation valve and a closed system.

Completion Time Increase Impact on Design Basis Requirements

This CT change does not impact the design basis requirements of the containment isolation system. The design of the containment isolation valves is not impacted by this change. The design will continue to provide sufficient capability, redundancy, and reliability to ensure the containment is isolated when required and design basis radioactive release limits are not exceeded. The operability of the containment isolation system will remain consistent with the assumptions of the safety analysis.

6 SYSTEM DESCRIPTION

The CIVs are used to isolate containment penetration flow paths. Typically there is one CIV inside and one CIV outside each penetration that performs this function. Depending on the purpose of the system, the CIVs may be normally open or closed. Systems can be closed or open inside and outside of containment. An open system inside containment is one that is directly connected to the containment atmosphere. An open system outside containment is one that is directly connected to the outside environment. A closed system inside containment is one that is not directly connected to the containment atmosphere and may consist of only a run of pipe inside containment. A closed system outside containment has no direct connection to the outside environment. Closed systems, either inside or outside containment, may not have an associated CIV.

There are a number of different types of penetration configurations depending on the system of interest. Details of these penetrations are provided in Section 8 along with the analysis for each penetration. In general, the following penetration types are evaluated in this analysis. The grouping nomenclature used in this analysis is also provided.

Class I: Penetrations with flow paths to the containment atmosphere

- Group IA: Flow paths connected directly to the containment atmosphere and the outside environment (open/open penetration type)
- Group IB: Flow paths closed inside containment and connected directly to the outside environment (closed/open penetration type)
- Group IC: Flow paths connected directly to the containment atmosphere and closed outside containment (open/closed penetration type)
- Group ID: Flow paths closed inside containment and closed outside containment (closed/closed penetration type)

Class II: Penetrations with flow paths to the RCS

- Group IIA: Standby flow paths
- Group IIB: Normally operating flow paths

Class III: Penetrations with flow paths to the SGs

- Group IIIA: Flow paths connected to the SG secondary side and open to the outside environment
- Group IIIB: Flow paths connected to the SG secondary side and closed to the outside environment

7 IMPACT ON DEFENSE-IN-DEPTH AND SAFETY MARGINS

In addition to discussing the impact of the changes on plant risk, as presented in Section 8, the traditional engineering considerations need to be addressed. These include defense-in-depth and safety margins. The fundamental safety principles on which the plant design is based cannot be compromised. Design basis accidents are used to develop the plant design. These are a combination of postulated challenges and failure events that are used in the plant design to demonstrate safe plant response. Defense-in-depth, the single failure criterion, and adequate safety margins may be impacted by the proposed change and consideration needs to be given to these elements.

7.1 IMPACT ON DEFENSE-IN-DEPTH

The proposed change needs to meet the defense-in-depth principle which consists of a number of elements. These elements and the impact of the proposed change on each follow:

- A reasonable balance among prevention of core damage, prevention of containment failure, and consequence mitigation is preserved.

  The CIVs are part of the plant design to primarily ensure containment integrity following an accident. By closing the CIVs, inventory required to cool the core is also maintained. The CIVs are not included in the plant design for consequence mitigation. Therefore, the proposed CT change for the CIVs has a negligible impact on CDF, no direct impact on consequence mitigation, and only a small impact on LERF as discussed in Section 8. This change does not significantly degrade the ability of one barrier to fission product release and compensate with an improvement of another. The balance between prevention of core damage and prevention of containment failure and consequence mitigation is maintained. Furthermore, no new accident or transients are introduced with the requested change and the likelihood of an accident or transient is not impacted.

- Over-reliance on programmatic activities to compensate for weaknesses in plant design.

  The plant design will not be modified with this proposed change. All safety systems, including the CIVs, will still function in the same manner with the same reliability, and there will be no additional reliance on additional systems, procedures, or operator actions. The calculated risk increase for the CT changes is very small and additional control processes are not required to be put into place to compensate for any risk increase.

- System redundancy, independence, and diversity are maintained commensurate with the expected frequency and consequences of challenges to the system.

  There is no impact on the redundancy, independence, or diversity of the CIVs or on the ability of the plant to isolate containment penetrations with diverse systems. The redundant and diverse containment isolation designs will not be changed. The CIVs are reliable components and will remain reliable after these proposed changes.

- Defenses against potential common cause failures are maintained and the potential for introduction of new common cause failure mechanisms is assessed.

  Defenses against common cause failures are maintained. The completion time extensions requested are not significantly increased such that any new common cause failure mechanisms would occur. In addition, the operating environment for these components remains the same, therefore, new common cause failures modes are not expected. The number, design, and types of valves used for containment isolation remain the same with these changes so the containment isolation system maintains the potential against common cause failures.

- Independence of barriers is not degraded.

  The barriers protecting the public and the independence of these barriers are maintained. It is not expected that multiple systems will be out of service simultaneously during the extended CTs that could lead to degradation of these barriers, and an increase in risk to the public. In addition, the extended CTs do not provide a mechanism that degrades the independence of the barriers; fuel cladding, reactor coolant system, and containment.

- Defenses against human errors are maintained.

  No new operator actions related to the CT extensions are required to maintain plant safety. No changes to current operating, maintenance, or test procedures are required due to these changes. The increase in CTs provides additional time to complete troubleshooting, and test and repair activities which will lead to improved operator and maintenance personnel performance, resulting in reduced system re-alignment and restoration errors.

7.2 IMPACT ON SAFETY MARGINS

The safety analysis acceptance criteria as stated in the FSAR are not impacted by this change. Redundant and diverse, containment isolation valves, where applicable, and closed systems will be maintained. The proposed changes will not allow plant operation in a configuration outside the design basis. Isolation of all containment penetrations will remain single failure proof. CIV operation and testing requirements and containment leakage requirements are not impacted by this change. There is no impact on safety margins.

8 GENERIC ASSESSMENT OF IMPACT ON RISK

This section presents the analysis and assumptions used to determine the impact on plant risk of increasing the Completion Times specified in Section 4. This section addresses the three tiered approach to the evaluation of risk-informed Technical Specification changes. The three tiered approach is defined in Regulatory Guide 1.177. The first tier, discussed in Sections 8.1 to 8.3, addresses PSA insights and includes the risk analyses to support the CT change. The second tier, which addresses avoidance of risk-significant plant configurations, is discussed in Section 8.4. The third tier, which addresses risk-informed plant configuration control and management, is covered by each utility's Maintenance Rule Program and is discussed in Section 8.5.

8.1 TIER 1: APPROACH TO THE EVALUATION

The Tier 1 analysis provides the impact of the CT changes on the ICLERP and LERF. Since the CIVs are used to maintain containment integrity, any change to their availability will directly impact releases from containment following a core damage event. The impact of these changes on CDF, and as measured by the change in CDF and ICCDP values, is not important since this impact would be a secondary effect related to a long-term loss of inventory for core cooling.

The approach used in this program applies both deterministic and probabilistic evaluations. A deterministic approach is used to determine the minimum containment hole size that will result in a large release from the containment atmosphere. Penetration flow paths connected to the containment atmosphere smaller than this size are allowed a CT of 7 days. The minimum hole size is determined for large dry, subatmospheric, and ice condenser containment types. All other penetrations are evaluated on a probabilistic basis to demonstrate if a CT of 7 days is acceptable or to determine an appropriate lesser CT. The probabilistic evaluation is consistent with the Nuclear Regulatory Commission's (NRC) approach for using PRA in RI decisions on plant-specific changes to the current licensing basis. This approach is discussed in Regulatory Guides 1.174 and 1.177.

Both the deterministic and probabilistic analyses were completed on a generic basis. Input parameters used in the analyses were picked based on the most conservative plant design or plant design parameters available, that is, the set of design parameters that results in the most conservative results (shortest CT). Application of the generic analysis on a plant specific basis requires each utility implementing this change to demonstrate that their plant is within the bounds of the analysis. This process is demonstrated for WCGS in Section 9. Plant specific calculations for WCGS are discussed in Section 10 to determine additional benefits from such analysis.

The following types of containment penetration flow paths are evaluated:

- Penetration flow paths connected to the containment atmosphere
- Penetration flow paths connected to the RCS
- Penetration flow paths connected to the SGs

Details of these evaluations are provided in the following sections.

8.2 PROBABILISTIC EVALUATION OF THE CONTAINMENT PENETRATIONS

The probabilistic evaluation involves the calculation of the ICLERP and ΔLERF for each type of CIV penetration identified in Sections 8.2.2 through 8.2.4. Through finding acceptable ICLERP and ΔLERF values per Regulatory Guides 1.177 and 1.174 (less than 5.0E-08 and 1.0E-07, respectively), the maximum CTs were determined. For those penetrations that could not be justified to the target 7 day CT, shorter CTs were evaluated at 72, 48, 24, 12, and 8 hours.

The ICLERP is defined in Regulatory Guide 1.177 as:

- ICLERP = [(conditional LERF with the subject equipment out of service) – (baseline LERF with nominal expected equipment unavailabilities)] x duration of a single CT under consideration

The ICLERP was found for each penetration with the assumption that one CIV within the penetration is in maintenance. If there was more than one CIV within the penetration, the calculation was performed as many times as there are valves because any one of those valves could be in maintenance.

For the ΔLERF calculations, a fault tree analysis using the Westinghouse tool WesSAGE (Reference 7) was performed to evaluate all combinations of non-isolated penetration possibilities for each penetration. Non-isolations can be a result of valve failure as well as a valve being in maintenance. This was done for the current 4 hour CT and the proposed 168 hour CT or lesser times as necessary to meet the 1.0E-07/yr ΔLERF criteria. The increase in the probability of failing to isolate the penetration was then multiplied by the CDF to find the final ΔLERF.

The specific calculations for the ICLERPs and ΔLERFs for the CIVs vary from penetration to penetration. The variations are dependent upon the conditions and configurations of the penetration. Sections 8.2.2 through 8.2.4 provide the calculations for each penetration and the applicable assumptions. Diagrams are also provided in these sections.

For generic applicability, a large variety of possible containment penetrations flow paths were identified, including connections to containment atmosphere, the RCS and the SGs. Different valve types (SOVs, MOVs, AOVs, check valves, and SRVs) and valve positioning (normally open or normally closed) were taken into account for each penetration type. Common cause due to valves within a flow path being of the same valve type and performing a similar function was also included. In addition, unavailability due to maintenance of the CIVs was included in the analysis.

The following lists the general assumptions used for this generic study. The assumptions reflect a conservative approach in effort of making this analysis generically applicable.

General Assumptions:

1. Only one valve within a single containment penetration can be in maintenance at a time.

2. Maintenance on a valve can be conducted in one of two ways: a) the valve is in maintenance such that it is still intact and capable of maintaining its pressure boundary function or b) the valve is in

maintenance such that it is not intact and is not capable of maintaining its pressure barrier function.

3. Before maintenance or repair is started on one CIV, it is assumed that the other CIVs within the penetration are checked to ensure they are in their proper positions. This assumption eliminates the need to include the probability that the operable valves were mis-positioned or transferred to the wrong position since they were last checked.

4. When there are two or more valves of the same valve type in the same position (open or closed) within a penetration, common cause failures are included in the ICLERP and ΔLERF calculations. That is, given that one CIV is out of service for repair, the second (operable) CIV of the same valve type has a dependent failure probability involving the common cause beta factor (for a case where there are two valves of the same type). For a case where there are three valves of the same type, the dependent failure probability involves the gamma factor. The Multiple Greek Letter common cause methodology was used in this analysis.

5. For two or more valves of the same 'valve type', differences in manufacturers are assumed to be irrelevant.

6. All containment penetrations analyzed in the generic study, with the exception of RCS and SG connections, are assumed to have a pipe diameter greater than the threshold value for a large release from the deterministic evaluation of containment hole size (see Section 8.3). Any pipe not directly connected to the RCS or SG with a diameter less than the large release threshold value is of insufficient size to provide a large release. Therefore, any CIV in a penetration not connected to the RCS or SGs with a size less than this threshold defaults to a CT of 168 hours.

   For a plant specific application of this analysis, it is expected that the plant will use the vent diameter threshold value provided in Section 8.3, to identify the penetrations that default to 168 hours.

7. The generic analysis calculates CTs for penetration configurations that can contain diverse CIV types including MOVs, AOVs, SOVs, check valves, and SRVs. For the generic analysis of penetrations with two or more normally open CIVs, a large number of valve combinations would need to be considered. To simplify the analysis, all CIVs in the penetration being analyzed were assumed to be the same type. Common cause failure contributions were included for penetrations that actually contain the same type of CIVs.

   For plant specific application of the generic analysis for penetrations with different CIV types, base the CT on the CIV in the penetration with the highest failure rate. This approach is conservative because the highest failure probability of all the valve types within the penetration is chosen. It also provides simplistic generic applicability without complicating the penetration groups with a large number of possible valve type configurations. See Guidelines A and B of Step 5 of Section 9.1 for a more detailed description of the application of this assumption.

8. The penetration configurations of this analysis were developed to be as generic as possible. Some of the configurations may not necessarily exist within all plants, and/or some of the maintenance

situations may or may not be viable for all plants. For plant implementation of this generic analysis, it is expected that the utilities will determine the applicability of the CT in practice.

8.2.1 Analysis Input Parameters

The majority of the inputs used in this analysis were obtained from plant PRA data. In an effort to make the analysis as generic as possible, the most limiting (e.g., highest failure rate) values were chosen from a plant-to-plant comparison. Therefore, variations in data from plant-to-plant are all covered under the inputs used in this analysis.

Table 8-1 provides a summary of the important parameters used in this analysis as well as the nomenclature used in the calculations.

Other variables that were used throughout the calculations are as follows:

P_{f1} = probability of penetration not isolated with no CT extension
P_{f2} = probability of penetration not isolated with CT extension
CCF_{to} = common cause failure of valve transferring open
CCF_{ftc} = common cause failure of valve failing to close

Table 8-1 Input Parameters

Input	Variable	Value	Reference
Proposed allowed outage time [hours]	CT	168	given
Current allowed outage time [hours]	CT	4	given
At-power internal and external event core damage frequency [per year]	CDF_T	1.0E-04	See note 6
Core damage frequency due to SGTR [per year]	CDF_{SGTR}	9.44E-06	Reference 4
Core damage frequency due to seismic event [per year]	CDF_{seis}	4.41E-05	utility input
Probability that valve fails to close for an SOV [per demand]	P_{ftc}	1.81E-02	Reference 4
Probability that valve fails to close for an MOV [per demand]	P_{ftc}	1.09E-02	Reference 4
Probability that valve fails to close for an AOV [per demand]	P_{ftc}	1.81E-02	Reference 4
Probability that valve fails to close for a check valve [per demand]	P_{ftc}	3.44E-03	Reference 4
Probability that valve fails to close for an SRV [per demand]	P_{ftc}	2.50E-02	Reference 4
Probability that valve spuriously transfers open with CT extension (168 hrs) for all valve types [per demand]	P_{to}	1.68E-04	See note 1
Probability that valve spuriously transfers open with current CT (4 hrs) for all valve types [per demand]	P_{topre}	4.00E-06	See note 1
Beta factor failure probability due to valve failing to close for an SOV	$beta_{ftc}$	0.1	Reference 4
Beta factor failure probability due to valve failing to close for an MOV	$beta_{ftc}$	0.088	Reference 4
Beta factor failure probability due to valve failing to close for an AOV	$beta_{ftc}$	0.1	Reference 4
Beta factor failure probability due to valve failing to close for an check valve	$beta_{ftc}$	0.1	Reference 4
Beta factor failure probability due to valve failing to close for an SRV	$beta_{ftc}$	0.22	Reference 4
Beta factor failure probability due to valve spuriously transferring open for all valve types	$beta_{to}$	0.1	Reference 5
Gamma factor failure probability due to valve spuriously transferring open for all valve types	$gamma_{to}$	0.5	Reference 5
Seismic pipe break probability for non-seismically qualified pipe	PB_{seis}	1	See note 2

Table 8-1 Input Parameters (cont.)			
Input	**Variable**	**Value**	**Reference**
Random pipe break probability	PB_{random}	1.10E-03	See note 3
Probability that valve is unavailable due to corrective maintenance with current CT (4 hrs) [per demand]	P_{m1}	4.57E-05	See note 4
Probability that valve is unavailable due to maintenance with CT extension (168 hrs) [per demand]	P_{m2}	1.92E-03	See note 4
Probability that extra valve is unavailable due to maintenance (assume extra valve currently has 72 hour CT) [per demand]	P_{mE}	8.22E-04	See note 5

Note 1: For all normally closed valves, it is assumed that there is the probability of the valve spuriously transferring open. For all normally open valves, it is assumed that the valves have the probability of a) failing to close and b) spuriously transferring open after it has closed. The "Advanced Light Water Reactor Utility Requirements Document" (Reference 5) lists some probabilities of motor and air operated valves spuriously transferring open, which are 1.0E-07/hr and 2.0E-07/hr respectively. It also states that the reverse leakage probability for a check valve is 1.0E-06/hr. For this analysis, a value of 1.00E-06/hr for a valve spuriously transferring open per hour was chosen as an upper bound for the CIV CT calculations. This value represents the most conservative failure probability and applies to all valve types. To find the probability that the valve spuriously transfers open with a CT extension (P_{to}), 1.00E-06 per hour was multiplied by the 168 hour CT to get 1.68E-04 per demand. To find P_{topre}, 1.00E-06 per hour * 4 hours = 4.00E-06 per demand.

Note 2: It is assumed that if a seismic event were to occur, all non-seismically qualified piping will fail, making the failure probability 1. Excluded are those sections of pipe between the isolation valve and the containment wall which is part of the break exclusion zone. The piping in these areas is more robust than the piping outside the break exclusion zone. Therefore, it is assumed that the probability of this piping failing randomly or due to seismic events is much lower than the piping outside the exclusion zone and is of no consequence to this analysis.

Note 3: From WCAP-14572, Rev. 1-NP-A, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," (Reference 6), Table 3.5-3 provides example pipe failure probabilities. The range of large leak probabilities is from 4.55E-02 to 1.52E-05 for a 40 year lifetime. Conservatively, the CIV analysis considers the largest failure probability. Therefore the yearly pipe break frequency is assumed to be 4.55E-02 divided by 40 years (1.1E-03 per year). Note that the values for small leaks are not used since these represent leaks that are too small to result in significant (large) release from containment. Although these values represent breaks on a segment basis, this value is applied to piping that runs from the CIV to the next valve in place that could be used to isolate the penetration or to the closed system inside or outside containment.

Note 4: The CIV corrective maintenance frequency is derived from the highest valve failure rate used in this analysis which is approximately 2E-02 per demand, meaning the component is expected to fail every 50 actuations [(1) / (2E-02) = 50]. Each CIV is tested quarterly, and in addition it is assumed that there is one miscellaneous CIV actuation per year. Therefore, total CIV actuations per year are 5. Dividing 50 actuations per failure by 5 actuations per year gives 10 years per failure, or a corrective maintenance frequency of 0.1 per year. Therefore, the probability that a CIV is unavailable due to maintenance is:

- with the CT extension to 168 hours (P_{m2}) is 1.92E-03 [0.1/yr * 168 hours/ 8760 hours/year]
- with the current CT of 4 hours (P_{m1}) is 4.57E-05 [0.1/yr * 4 hours/ 8760 hours/year].

Regardless of the CT, it is assumed that the maintenance requires the entire length of the CT and is completed within that time.

Note 5: In the ΔLERF calculations the probability of the "extra valve" being in maintenance remains constant for all CTs. The "extra valve" is another valve in the penetration that is not considered a CIV but can aid in the isolation of the penetration. This extra valve, or valves, is mainly recognized in the RCS connection penetrations. It is assumed that the CT on all valves that are not considered CIVs is 72 hours. Therefore the probability that an extra valve is disabled due to maintenance (P_{mE}) is the maintenance frequency multiplied by 72 hours [8.2E-04 = 0.1 * 72 hours/ 8760 hours/year].

Note 6: The value of 1E-04/yr is used for the total at-power internal and external event CDF. This is based on the acceptance guidelines in Reg. Guide 1.174 (Reference 1), Section 2.2.4, that indicates the plant total CDF should be less than 1E-04/yr if changes to a plant's licensing basis are made that can result in a small increase in plant risk.

8.2.2 Class I: Penetration Flow Paths Connected to the Containment Atmosphere

The ICLERP and ΔLERF calculations for each Class I penetration are in Sections 8.2.2.1 through 8.2.2.4. Also provided are the key assumptions and diagrams of each penetration type being analyzed. The ICLERPs were found by simple hand calculations while the ΔLERF calculations were done with the aid of the Westinghouse-developed fault tree analysis program WesSAGE. Note, the calculations are done first with a CT of 168 hours. If the ICLERP or ΔLERF value at this CT does not meet the acceptance guidelines in Regulatory Guides 1.174 and 1.177, the analysis was repeated for values of 72, 48, 24, 12, or 8 hours to determine an appropriate CT.

These calculations are provided in this WCAP for a representative number of penetration configurations. Detailed analyses were completed for all penetration configurations. Those not provided followed the approach demonstrated in the sample calculations. The sample calculations shown below reflect only valve failure probabilities for SOVs.

For penetrations connected to containment atmosphere there are three potential means to get a large release, which are the major components of the ICLERP and ΔLERF calculations:

- Probability of 'Non Seismic CDF Release' (release due to internal event CDF): For systems that are considered 'open systems' inside and outside containment, meaning there is a direct connection to containment atmosphere and the outside environment, it is assumed that if a core

damage event occurs and the penetration isolation fails, then there is an open release path from inside containment (containment atmosphere) to the outside environment.

Example: core damage occurs due to internal event, the isolation valves fail (spuriously open or fail to close); direct release path into the outside environment.

Required inputs: CDF_T, valve failure probability, CT

- Probability of 'Random Pipe Break CDF Release' (releases due to internal event CDF plus random pipe break): For systems that are considered 'open systems' on one side of containment and closed (an actual closed loop) on the opposite side, it is assumed that if a core damage event occurs, and then a random pipe break were to occur causing the closed system to become open, and the CIVs were to fail, then an open path through containment would exist.

  Example: core damage occurs due to internal event, random pipe break occurs inside containment (in the closed system), the isolation valves fail; direct release path from the now open connection of containment atmosphere to the outside environment.

  Required inputs: CDF_T, PB_{random}, valve failure probability, CT

- Probability of 'Seismic CDF Release': For systems that are considered 'closed systems' on one or both sides of containment, it is assumed that if a core damage event occurs due to a seismic event, all closed loop piping fails both inside and outside containment, creating an open system connection both inside and outside containment (thus, the probability of a pipe break due to a seismic event equals one; $PB_{seis} = 1$). It is assumed that if CIV failure were to occur in addition to this, then an open path through containment would exist.

  Example: core damage occurs due to a seismic event, pipe breaks occur also due to the seismic event, the isolation valves fail; direct release path through the now open systems both inside and outside containment.

  Required inputs: CDF_{seis}, PB_{seis}, valve failure probability, CT

Assumption: It is assumed that in the case where there are closed systems both inside and outside containment, that the probability of a random pipe break occurring both inside and outside containment simultaneously is very small and not a significant contributor, therefore it is excluded from the analysis.

Table 8-2 provides a summary of all the generic containment penetrations evaluated. This summary provides a penetration diagram and description as well as the accepted CT for each type of maintenance activity and CIV type. Sample calculations are provided in Sections 8.2.2.1 – 8.2.2.4.

Table 8-2 Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

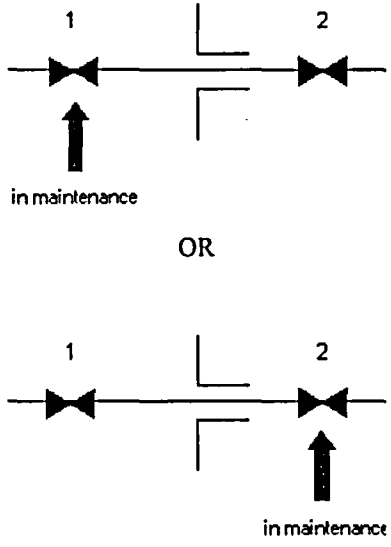
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
1. Group I,A (see Section 8.2.2.1)	2 valves - normally closed - same valve type	CIV IC or OC is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	24

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

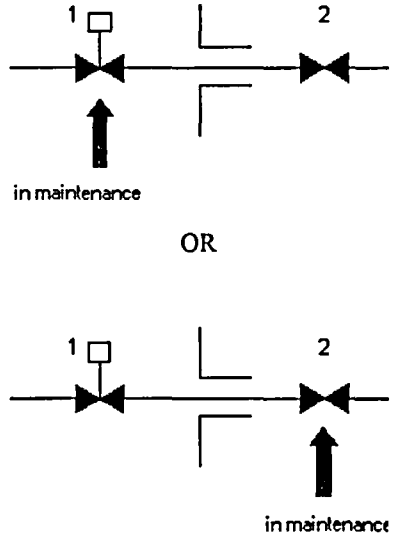
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
2. Group I,A (see Section 8.2.2.1)	2 valves - normally closed - different valve type	CIV IC or CIV is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	168

Table 8-2 (cont.) Generic Summary: Class 1 -- Penetration Flow Paths Connected to Containment Atmosphere

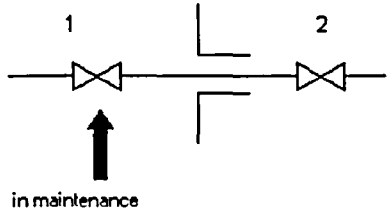
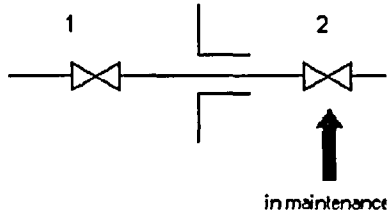
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
3. Group I,A (see Section 8.2.2.1)	2 valves - normally open - same valve type	CIV IC or OC is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):	 OR 	SOV MOV AOV Check SRV	24 24 24 24 12

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

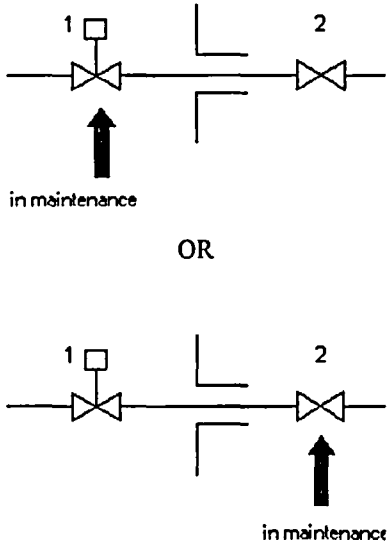
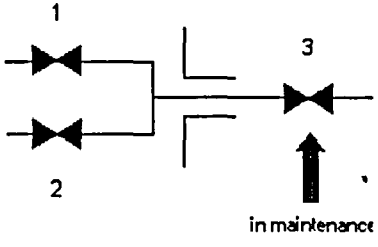
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
4. Group I,A (see Section 8.2.2.1)	2 valves - normally open - different valve type	CIV IC or OC is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	168 168 168 168 168
5. Group I,A (see Section 8.2.2.1)	2 valves IC or OC in parallel, normally closed - 1 valve OC or IC, normally closed - same valve type	CIV opposite from CIVs in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	12

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

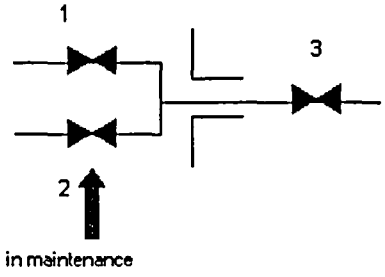
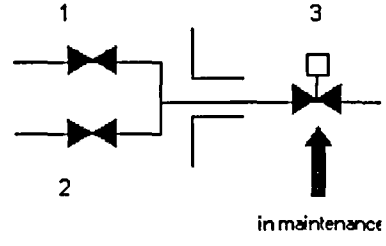
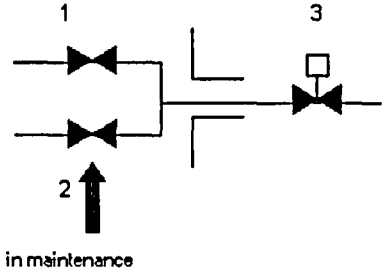
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		either CIV in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	24
6. Group I,A (see Section 8.2.2.1)	2 valves IC or OC in parallel, normally closed - 1 valve OC or IC, normally closed - different valve type	CIV opposite from CIVs in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	168
		either CIV in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	168

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

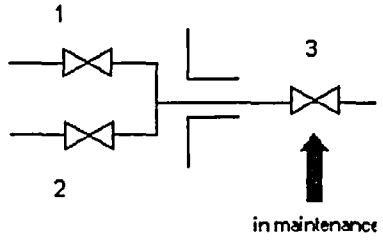
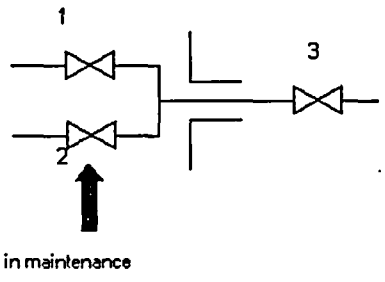
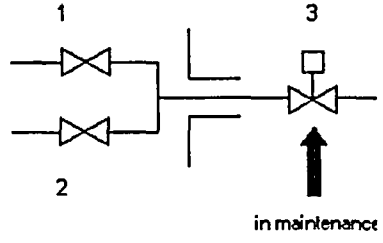
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
7. Group I,A (see Section 8.2.2.1)	2 valves IC or OC in parallel, normally open - 1 valve OC or IC, normally open - same valve type	CIV opposite from CIVs in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	12 12 12 12 8
		either CIV in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	24 24 24 24 12
8. Group I,A (see Section 8.2.2.1)	2 valves IC or OC in parallel, normally open - 1 valve OC or IC, normally open - different valve type	CIV opposite from CIVs in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	72 168 72 168 72

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

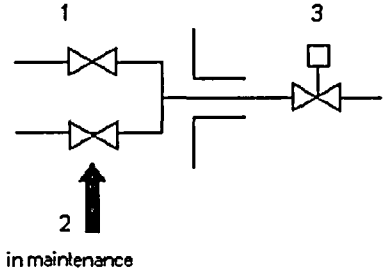
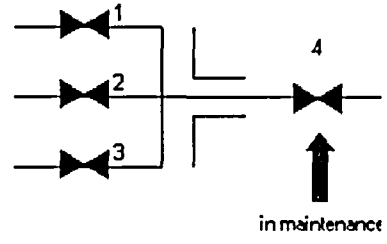
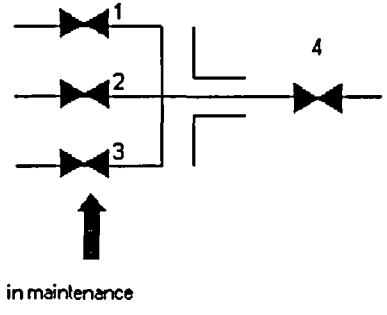
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		either CIV in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	168 168 168 168 168
9. Group I,A (see Section 8.2.2.1)	3 valves IC or OC in parallel, normally closed - 1 valve OC or IC, normally closed - same valve type	CIV opposite from CIVs in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	12
		any CIV in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	24

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

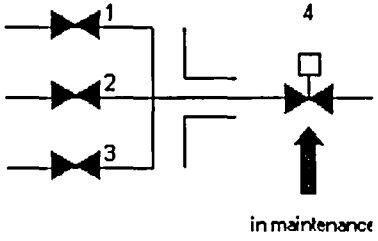
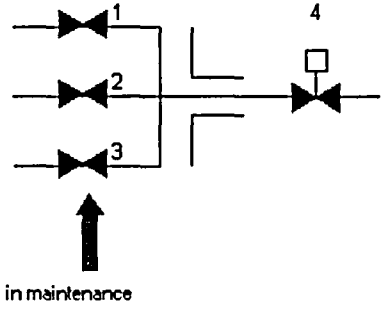
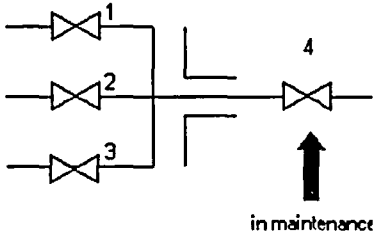
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
10. Group I,A (see Section 8.2.2.1)	3 valves IC or OC in parallel, normally closed - 1 valve OC or IC, normally closed - different valve type	CIV opposite from CIVs in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	168
		either CIV in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	168
11. Group I,A (see Section 8.2.2.1)	3 valves IC or OC in parallel, normally open - 1 valve OC or IC, normally open - same valve type	CIV opposite from CIVs in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	12 12 12 12 4

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

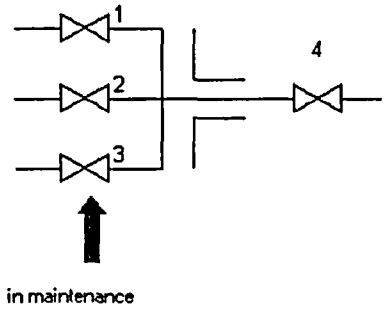
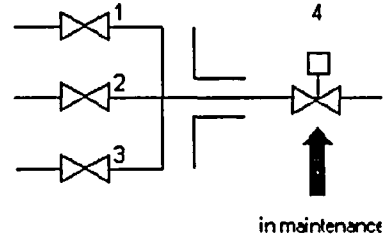
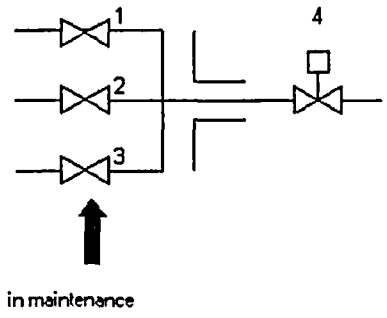
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		any CIV in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	24 24 24 24 12
12. Group I,A (see Section 8.2.2.1)	3 valves IC or OC in parallel, normally open - 1 valve OC or IC, normally open - different valve type	CIV opposite from CIVs in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	72 72 72 168 72
		any CIV in parallel is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	168 168 168 168 72

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

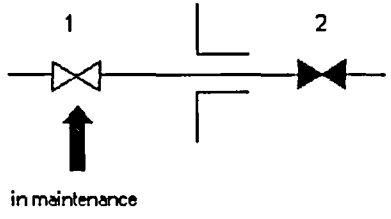
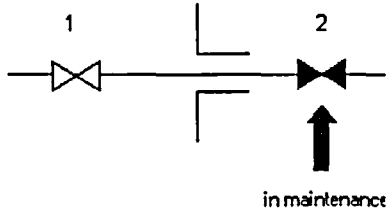
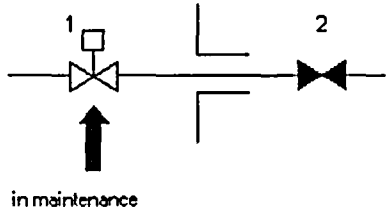
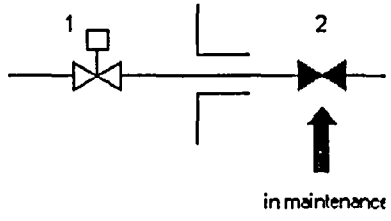
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
13. Group I,A (see Section 8.2.2.1)	2 valves - 1 normally closed, 1 normally open - same valve type	CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless):		SOV MOV AOV Check SRV	168 168 168 168 168
		CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check SRV	168 168 168 168 168
14 Group I,A (see Section 8.2.2.1)	2 valves - 1 normally closed, 1 normally open - different valve type	CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless):		SOV MOV AOV Check SRV	168 168 168 168 168
		CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check SRV	168 168 168 168 168

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

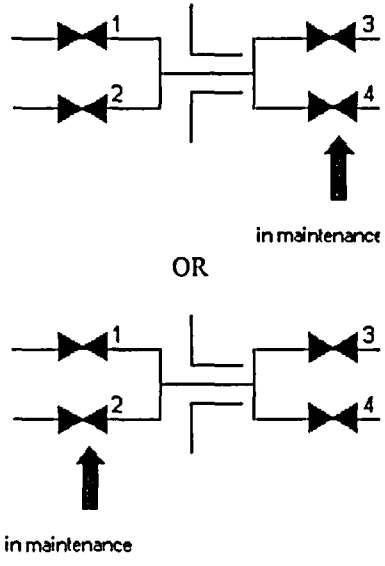
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
15. Group I,A (see Section 8.2.2.1)	2 valves IC in parallel, normally closed - 2 valves OC in parallel, normally closed - all same valve types	either CIV IC or either CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		all	12

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

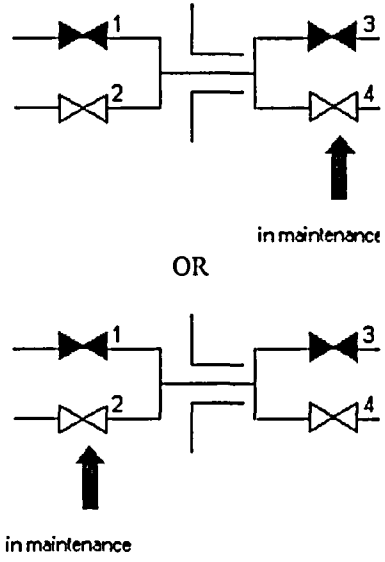
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
16. Group I,A (see Section 8.2.2.1)	2 valves IC in parallel, 1 normally closed, 1 normally open - 2 valves OC in parallel, 1 normally closed, 1 normally open - all same valve types	either open CIV IC or OC is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	24 24 24 24 12

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

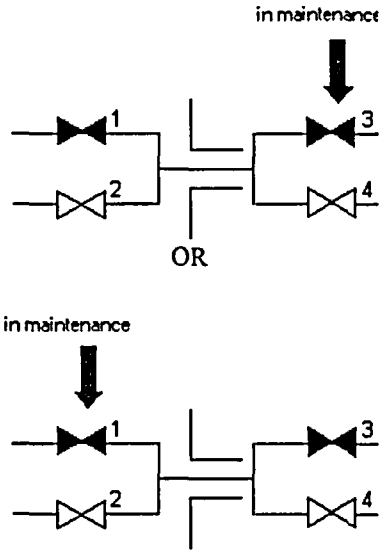
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		either closed CIV IC or OC is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):		SOV MOV AOV Check SRV	24 24 24 24 24

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

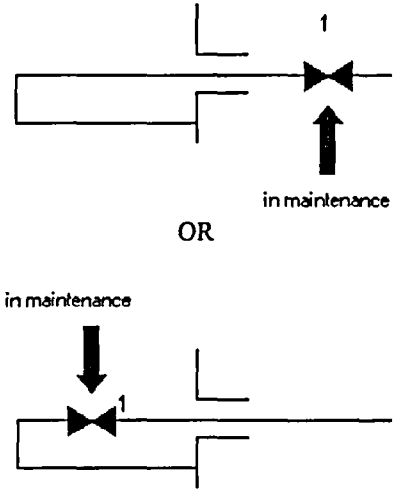
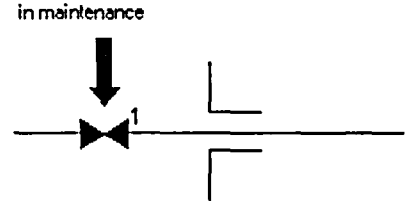
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
1. Group I,B (see Section 8.2.2.2)	1 valve - normally closed	CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR CIV is IC and is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	8
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	4

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

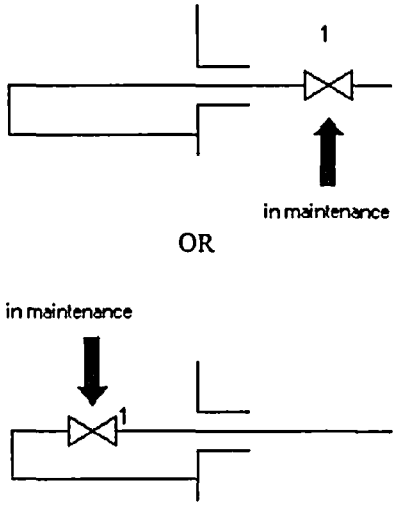
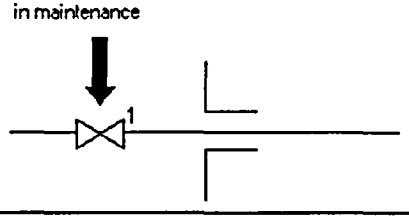
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
2. Group I,B (see Section 8.2.2.2)	1 valve - normally open	CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR CIV is IC and is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check SRV	8 8 8 8 8
		CIV is IC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check SRV	4 4 4 4 4

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

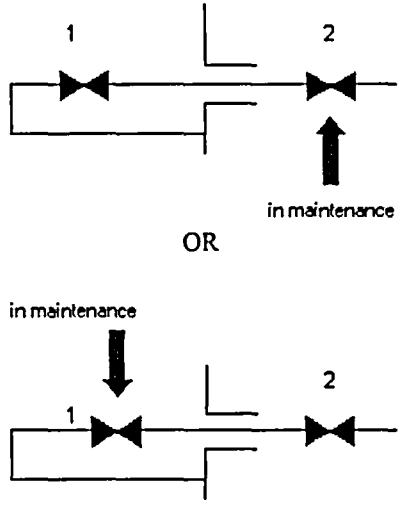
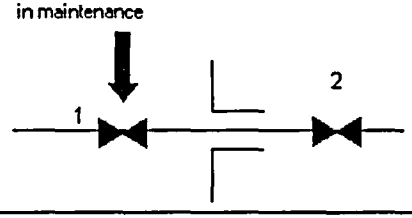
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
3. Group I,B (see Section 8.2.2.2)	2 valves - normally closed - same valve type	CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	72
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	24

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

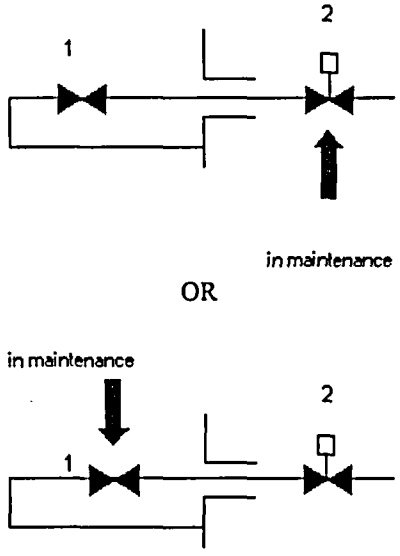
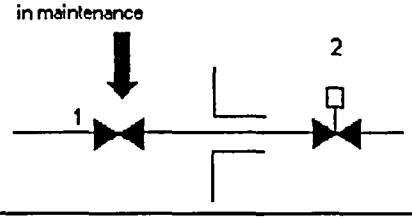
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
4. Group I,B (see Section 8.2.2.2)	2 valves - normally closed - different valve type	CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	168
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	168

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

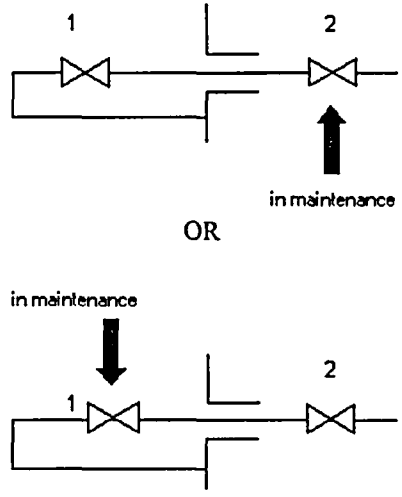
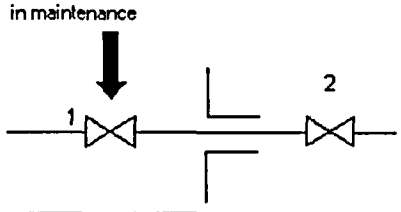
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
5. Group I,B (see Section 8.2.2.2)	2 valves - normally open - same valve type	CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check SRV	72 72 72 72 24
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check SRV	24 24 24 24 12

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

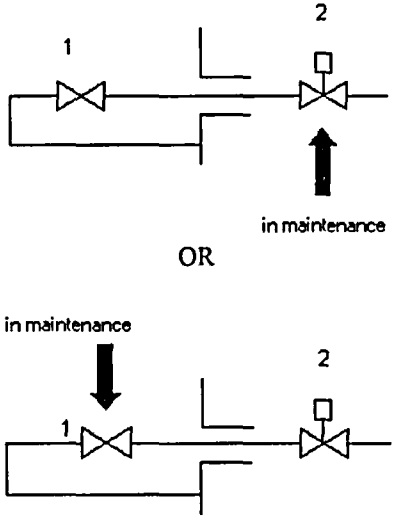
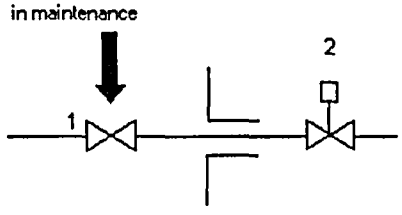
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
6. Group I,B (see Section 8.2.2.2)	2 valves - normally open - different valve type	CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check SRV	168 168 168 168 168
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check SRV	168 168 168 168 168

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

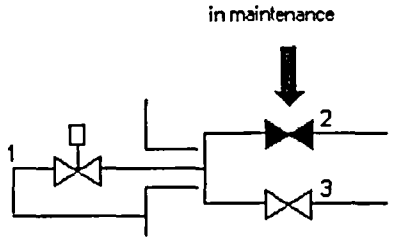
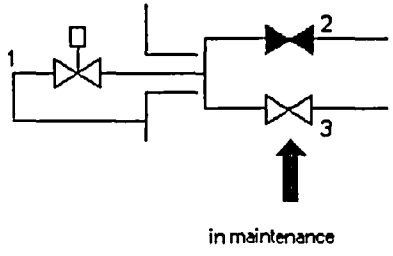
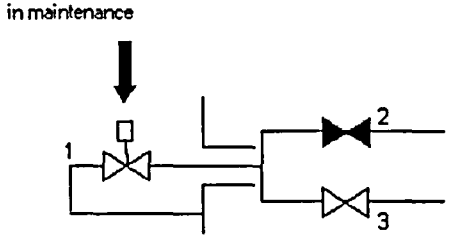
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
7. Group I,B (see Section 8.2.2.2)	2 valves OC in parallel, 1 normally closed, 1 normally open, same valve types - 1 valve IC, normally open, different valve type from the valves OC	closed CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check SRV	168 168 168 168 168
		open CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check SRV	168 168 168 168 168
		CIV IC is in maintenance such that pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check SRV	168 168 168 168 168

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

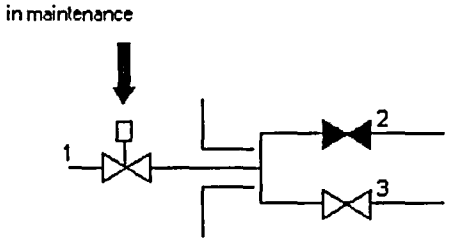
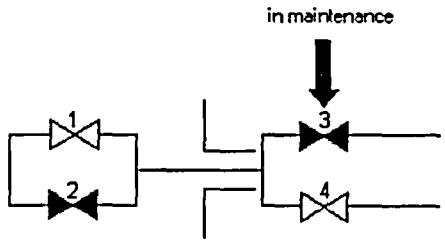
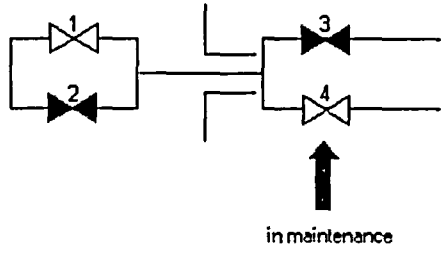
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV IC is in maintenance such that pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check SRV	168 168 168 168 168
8. Group I,B (see Section 8.2.2.2)	2 valves OC in parallel, 1 normally closed, 1 normally open - 2 valves IC in parallel, 1 normally closed, 1 normally open - all same valve types	closed CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check SRV	72 72 72 72 72
		open CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check SRV	72 72 72 72 24

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

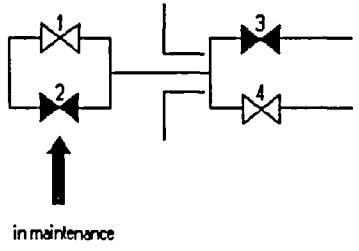
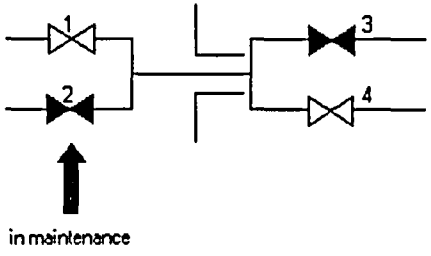
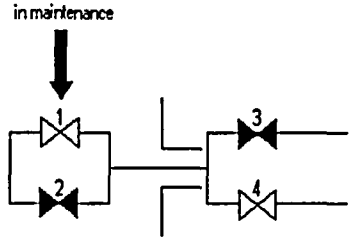
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		closed CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check SRV	72 72 72 72 72
		closed CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check SRV	24 24 24 24 24
		open CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check SRV	72 72 72 72 24

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

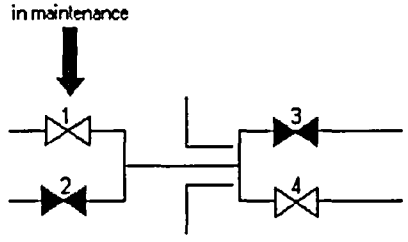
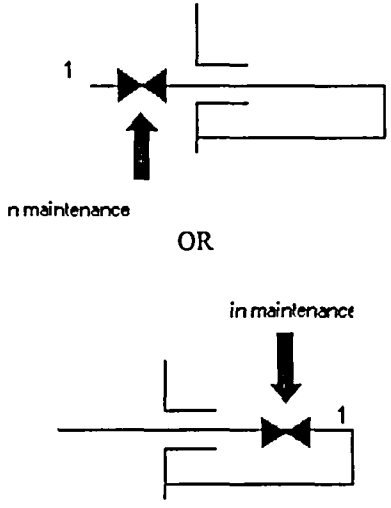
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		open CIV IC is in maintenance such that the pressure boundary is NOT maintained (still closed system IC):		SOV MOV AOV Check SRV	24 24 24 24 12
1. Group I,C (see Section 8.2.2.3)	1 valve - normally closed	CIV is IC and is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless): OR CIV is OC and is in maintenance such that the pressure boundary is maintained (still closed system OC):		all	8

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

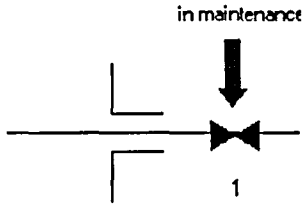
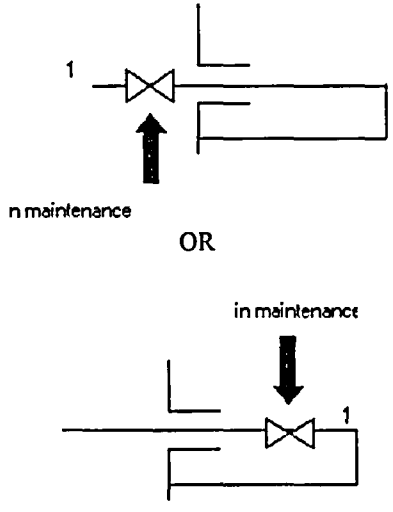
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV is OC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		all	4
2. Group I,C (see Section 8.2.2.3)	1 valve - normally open	CIV is IC and is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless): OR CIV is OC and is in maintenance such that the pressure boundary is maintained (still closed system OC):		SOV MOV AOV Check SRV	8 8 8 8 8

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

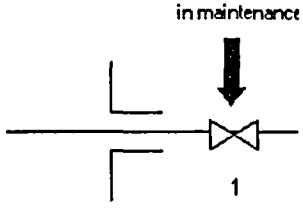
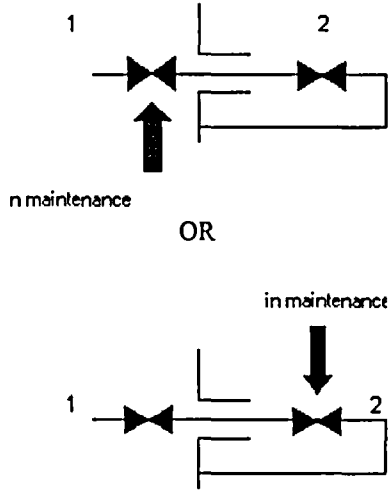
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV is OC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		SOV MOV AOV Check SRV	4 4 4 4 4
3. Group I,C (see Section 8.2.2.3)	2 valves - normally closed - same valve type	CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless): OR CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):		all	72

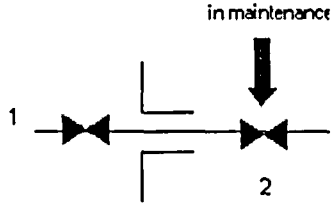
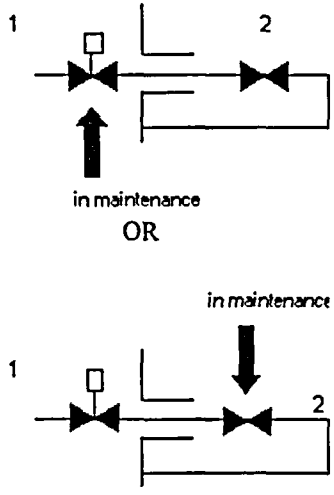
Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere					
Calculation Number and Group	**Penetration Description**	**Maintenance Description**	**Diagram**	**Valve Type Assumption (see assumption 7 of Section 8.2)**	**Justified CT (hours)**
		CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		all	24
4. Group I,C (see Section 8.2.2.3)	2 valves - normally closed - different valve type	CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless): OR CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):		all	168

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

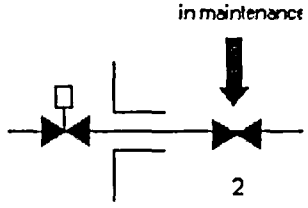
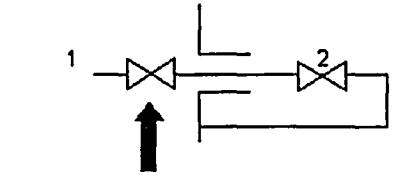
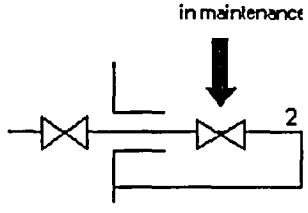
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		all	168
5. Group I,C (see Section 8.2.2.3)	2 valves - normally open - same valve type	CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless): OR CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):	 OR 	SOV MOV AOV Check SRV	72 72 72 72 24

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

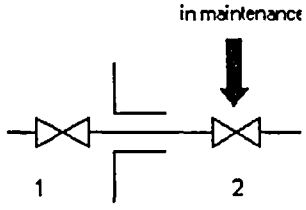
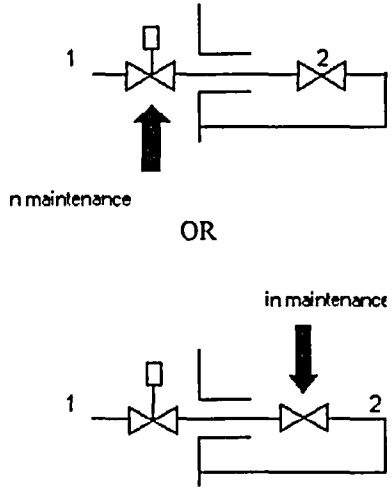
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		SOV MOV AOV Check SRV	24 24 24 24 12
6. Group I,C (see Section 8.2.2.3)	2 valves - normally open - different valve type	CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless): OR CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):		SOV MOV AOV Check SRV	168 168 168 168 168

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

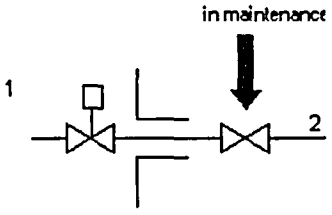
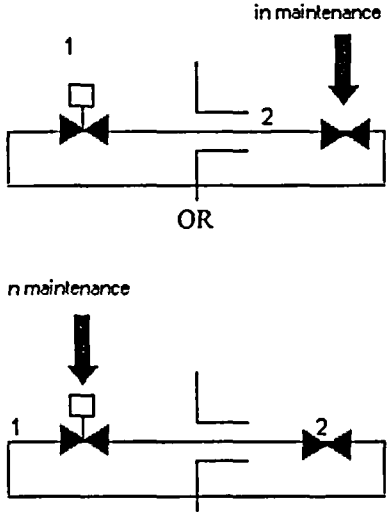
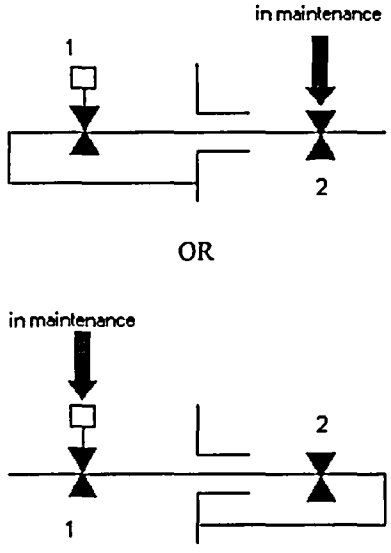
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		SOV MOV AOV Check SRV	168 168 168 168 168
1. Group I,D (see Section 8.2.2.4)	2 valves - normally closed - different valve type	CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC): OR CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	168

Table 8-2 (cont.) Generic Summary: Class 1 – Penetration Flow Paths Connected to Containment Atmosphere

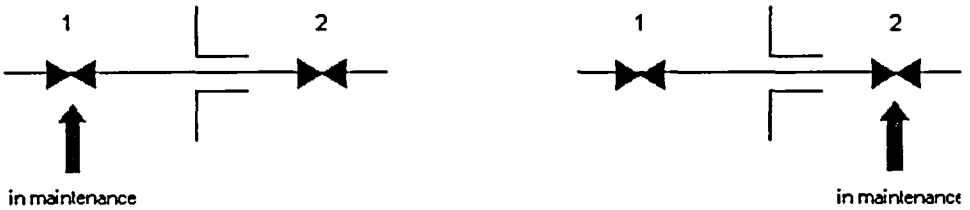
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC): OR CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	168

8.2.2.1 Group IA: Flow paths connected directly to the containment atmosphere and the outside environment

Calculation Number 1, Group I,A - 2 valves - normally closed - same valve type (see Table 8-2)

- CIV IC or OC is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):

OR



Key modeling details:

a,c

[

]

a,c

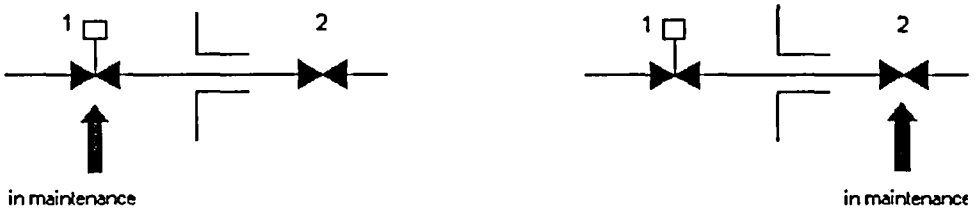
[ ]

FINAL CT EXTENSION for valves 1 or 2, for any valve type: 24 hours (limited by ICLERP)

Calculation Number 2, Group I,A - 2 valves - normally closed - different valve type (see Table 8-2)

- CIV IC or CIV is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):

OR



Key modeling details:

a,c

[ ]

a,c

[

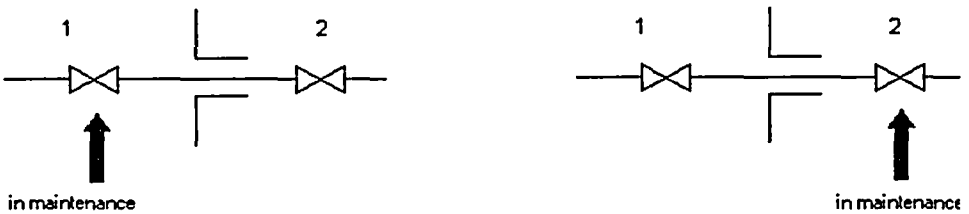
]

FINAL CT EXTENSION for valves 1 or 2, for any valve type: 168 hours

Calculation Number 3, Group I,A - 2 valves - normally open - same valve type (see Table 8-2)

- CIV IC or OC is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):

OR



Key modeling details:

a,c

[

]

a,c

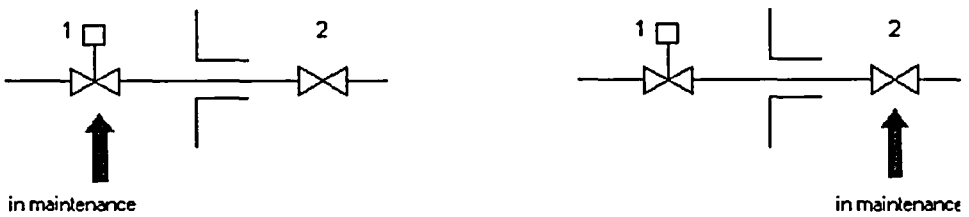
[ ]

FINAL CT EXTENSION for valves 1 or 2, for SOV type: 24 hours (limited by ICLERP)

Calculation Number 4, Group I,A - 2 valves - normally open - different valve type (see Table 8-2)

- CIV IC or OC is in maintenance such that the pressure boundary is or is not maintained (open system IC and OC regardless):

OR



Key modeling details:

a,c

[ ]

a,c

[

]

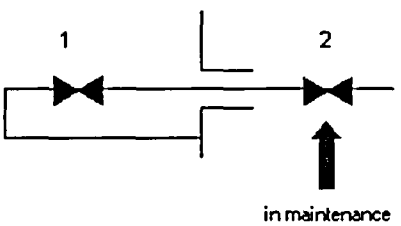
FINAL CT EXTENSION for valves 1 or 2, for SOV type: 168 hours

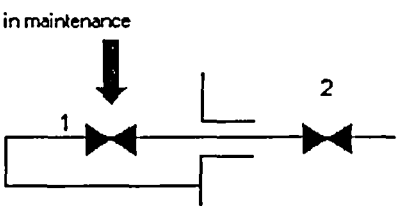
8.2.2.2 Group IB: Flow paths closed inside containment and connected directly to the outside environment

Calculation Number 3, Group I,B - 2 valves - normally closed - same valve type (see Table 8-2)

- CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR
  CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):

OR





Key modeling details:

a,c

[

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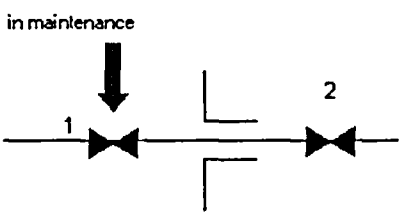
a,c

FINAL CT EXTENSION for valves 2 or 1, for any valve type: 72 hours (limited by ICLERP)

- CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

[

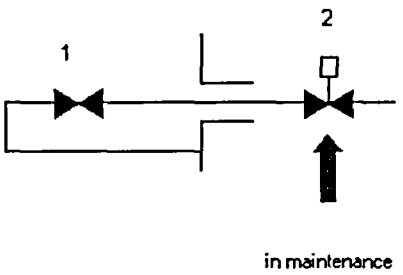
]

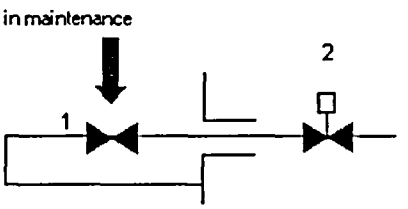
FINAL CT EXTENSION for valve 1, for any valve type: 24 hours, (limited by ICLERP)

Calculation Number 4, Group I,B - 2 valves - normally closed - different valve type (see Table 8-2)

- CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR
  CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):

OR





Key modeling details:

a,c

[

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a,c

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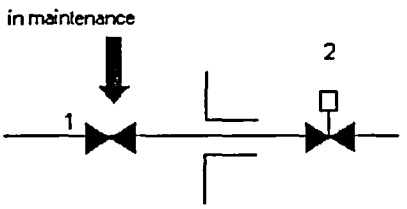
FINAL CT EXTENSION for valves 2 or 1, for any valve type: 168 hours

- CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

[

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a,c

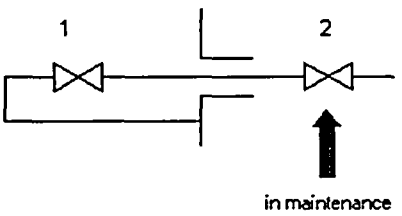
[ ]

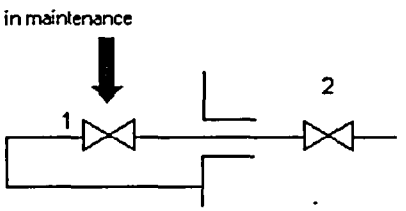
FINAL CT EXTENSION for valve 1, for any valve type: 168 hours.

Calculation Number 5, Group I,B - 2 valves - normally open - same valve type (see Table 8-2)

- CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR
  CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):

OR





Key modeling details:

a,c

[ ]

a,c

[

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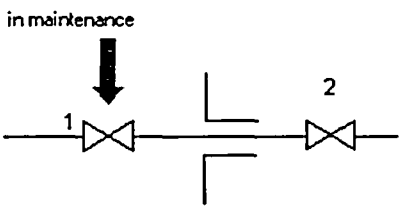
FINAL CT EXTENSION for valves 2 or 1, for SOV type: 72 hours (limited by ICLERP)

- CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

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a,c

[

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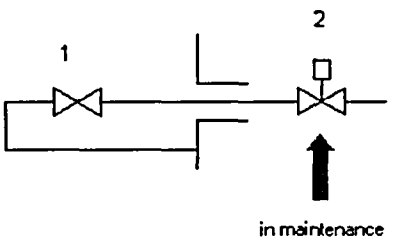
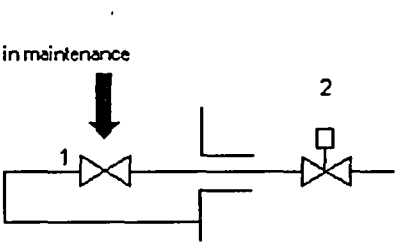
FINAL CT EXTENSION for valve 1, for SOV type: 24 hours, (limited by ICLERP)

Calculation Number 6, Group I,B - 2 valves - normally open - different valve type (see Table 8-2)

- CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless): OR
  CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):

OR





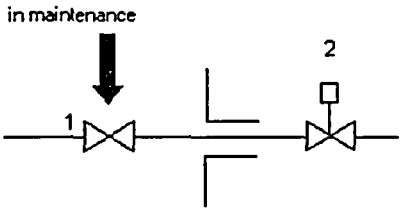
Key modeling details:

a,c

[ ]

FINAL CT EXTENSION for valves 2 or 1, for SOV type: 168 hours

- CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

[

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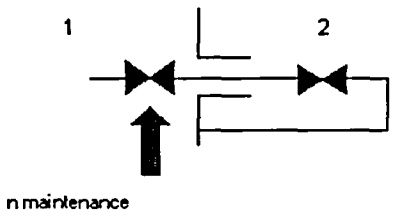
FINAL CT EXTENSION for valve 1, for SOV type: 168 hours

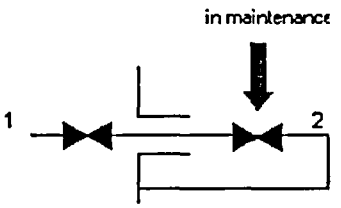
8.2.2.3 Group IC: Flow paths connected directly to the containment atmosphere and closed outside containment

Calculation Number 3, Group I,C - 2 valves - normally closed - same valve type (see Table 8-2)

- CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless):
  CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):

OR





Key modeling details:

a,c

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a,c

[

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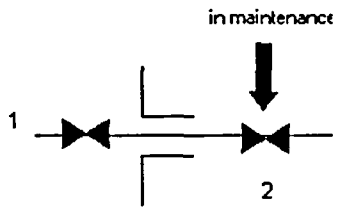
FINAL CT EXTENSION for valves 1 or 2, for any valve type: 72 hours (limited by ICLERP)

- CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):



Key modeling details:

a,c

[

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a,c

[

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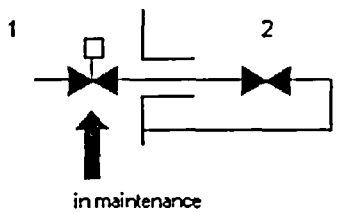
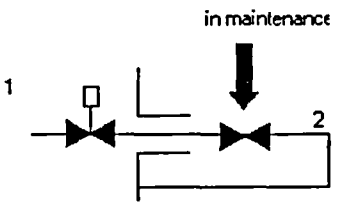
FINAL CT EXTENSION for valve 2, assuming any valve type: 24 hours, (limited by ICLERP)

Calculation Number 4, Group I,C - 2 valves - normally closed - different valve type (see Table 8-2)

- CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless): OR
  CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):

OR





Key modeling details:

a,c

[

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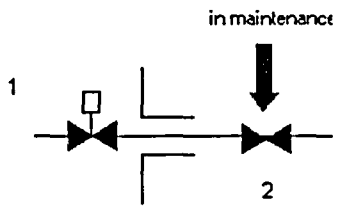
a,c

[ ]

FINAL CT EXTENSION for valves 1 or 2, for any valve type: 168 hours

- CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):



Key modeling details:

a,c

[ ]

a,c

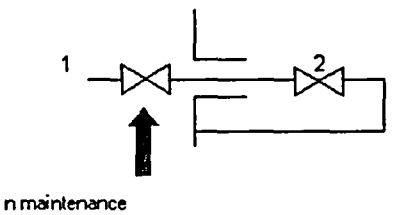
[ ]

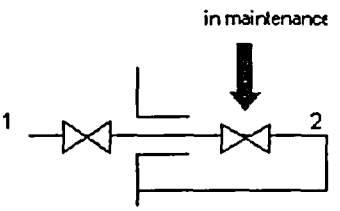
FINAL CT EXTENSION for valve 2, for any valve type: 168 hours.

Calculation Number 5, Group I,C - 2 valves - normally open - same valve type (see Table 8-2)

- CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless): OR
  CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):

OR





Key modeling details:

a,c

[

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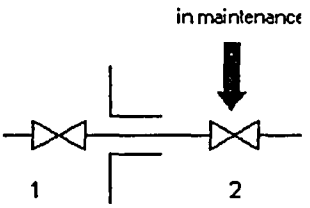
FINAL CT EXTENSION for valves 1 or 2, for SOV type: 72 hours (limited by ICLERP)

- CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):



Key modeling details:

a,c

[

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a,c

[

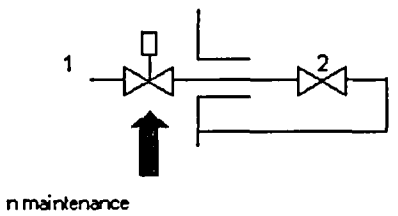
]

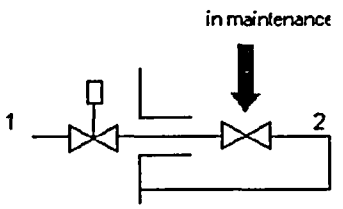
FINAL CT EXTENSION for valve 2, for SOV type: 24 hours, (limited by ICLERP)

Calculation Number 6, Group I,C - 2 valves - normally open - different valve type (see Table 8-2)

- CIV IC is in maintenance such that the pressure boundary is or is not maintained (open system IC regardless): OR
  CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):

OR





Key modeling details:

a,c

[

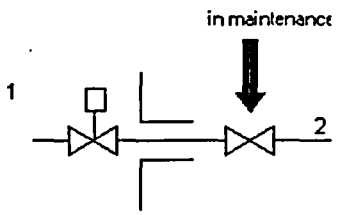
]

a,c

[ ]

FINAL CT EXTENSION for valves 1 or 2, for SOV type: 168 hours

- CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):



Key modeling details:

a,c

[ ]

a,c

[

]

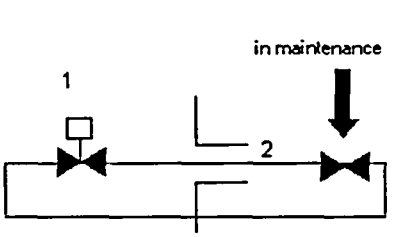
FINAL CT EXTENSION for valve 2, for SOV type: 168 hours

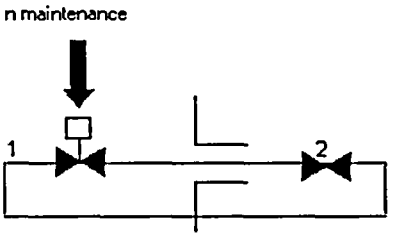
8.2.2.4 Group ID: Flow paths closed inside containment and closed outside containment

Calculation Number 1, Group I,D - 2 valves - normally closed - different valve type (see Table 8-2)

- CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC): OR
  CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):

OR





Key modeling details:

a,c

[

]

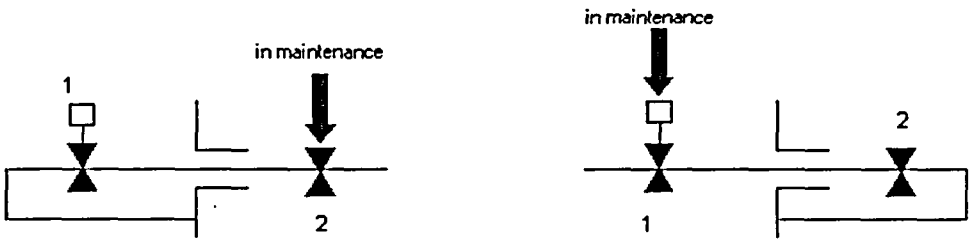
a,c

[ ]

FINAL CT EXTENSION for valves 2 or 1, for any type: 168 hours

- CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC): OR
  CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):

OR



Key modeling details:

a,c

FINAL CT EXTENSION for valves 2 or 1, for any type: 168 hours

8.2.3 Class II: Penetration Flow Paths Connected to the RCS

Class II represents those penetrations that are connected to the RCS. Section 8.2.3.1 contains the ICLERP and ΔLERF sample calculations for those RCS systems that are standby, and Section 8.2.3.2 contains the sample calculations for the normally operating systems.

The key assumptions and diagrams are shown for each penetration analyzed. The calculations were done similar to the calculations for the containment atmosphere connections in Section 8.2.2. That is, the calculations are done first with a CT of 168 hours and if the ICLERP or ΔLERF value at this CT does not meet the criteria in Regulatory Guides 1.174 and 1.177, the ICLERP and/or ΔLERF were recalculated at

72, 48, 24, 12, or 8 hour CTs until the criteria were met. The sample calculations provided in Sections 8.2.3.1 and 8.2.3.2 reflect only valve failure probabilities for SOVs. These calculations are provided for a representative number of penetration configurations. Detailed analyses were completed for all penetration configurations. Those not provided followed the approach demonstrated in the sample calculations. Table 8-3 summarizes the Class II results which contain calculations for all valve types (SOVs, MOVs, AOVs, check valves, and SRVs as appropriate).

For penetrations connected to the RCS there are four potential means to get a large release. These are:

- Probability of 'ISLOCA Release': For all systems that are connected to the RCS and open outside containment, it is assumed that if the CIVs fail (CIV failure is the initiating event), an interfacing systems LOCA would occur, resulting in core damage and a release due to containment bypass.

  Example: isolation valves fail, core damage results; direct release path from RCS to outside environment.

  Required input: valve failure probability

- Probability of 'Non Seismic CDF Release' (release due to internal event CDF): For systems that are connected to the RCS and open outside containment, it is assumed that if a core damage event occurs and penetration isolation fails, then there is an open release path from the RCS to the outside environment.

  Example: core damage occurs, the isolation valves fail (spuriously open or fail to close); direct release path into the outside environment.

  Required input: CDF_T, valve failure probability, CT

- Probability of 'Random Pipe Break CDF Release' (releases due to internal event CDF plus random pipe break): For systems connected to the RCS and open outside containment, it is assumed that if a core damage event occurs, and then a random pipe break were to occur inside containment causing the system inside to no longer be connected to the RCS, and the CIVs were to fail, then an open path through containment would exist.

  Example: core damage occurs, random pipe break occurs inside containment, the isolation valves fail; direct release path from inside containment to the outside environment.

  Required input: CDF_T, PB_{random}, valve failure probability, CT

- Probability of 'Seismic CDF Release': For systems connected to the RCS and open outside containment, it is assumed that if a core damage event occurs due to a seismic event, all closed loop piping fails both inside and outside containment, creating an open system connection both inside and outside containment. It is assumed that if CIV failure were to occur in addition to this, then an open path through containment would exist.

Example: core damage due to a seismic event occurs, pipe breaks occur also due to the seismic event, the isolation valves fail; direct release path through the now open systems both inside and outside containment.

Required input: CDF_{seis}, PB_{seis}, valve failure probability, CT

Assumptions

- For all standby systems (not running during normal operation), the system is considered 'closed' inside containment and not actively connected to the RCS if there is a closed valve between the RCS and the inside containment CIV. The system is considered 'closed' outside containment if there is an extra closed valve before the outside containment CIV, and if the piping from the RCS to the extra closed valve outside containment is qualified for high RCS pressures. See Figure 8-1.

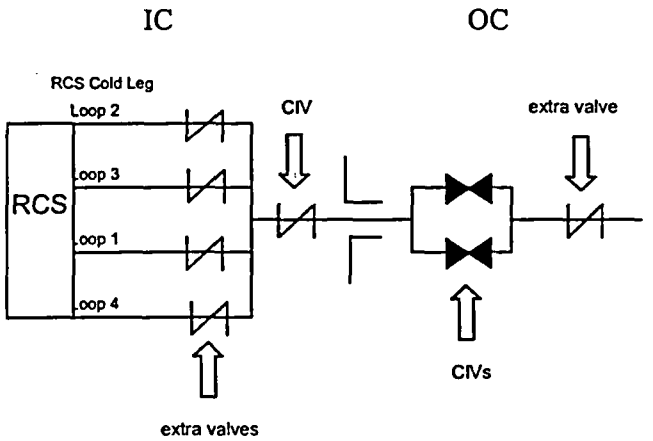


Figure 8-1 Closed System Inside and Outside Containment

- In the case in which there is a closed system both inside and outside containment, such as that shown above in Figure 8-1, the probability of a non-seismic and/or ISLOCA CDF release is extremely small, and thus neglected, due to the large number of normally closed valves available to isolate the penetration. Also, the probability of a random pipe break occurring inside and outside containment simultaneously, causing both closed systems inside and outside to become open, is very small and is also neglected. All piping between the RCS and the extra closed valve outside containment must be qualified for high RCS pressures.

- For RCS connections, during seismic and random pipe breaks, it is assumed that the piping fails between the CIV and the extra valve. The portion of piping between the CIV and the containment wall is part of the break exclusion zone (as explained in Note 2 of Table 8-1), and therefore is assumed to remain intact while other piping fails. This assumption eliminates crediting the 'extra valves' to isolate the penetration.

- Lines connected to the RCS 3/8" in diameter or less are within the makeup capability of plant's charging systems, and therefore, are not considered small LOCAs or potential containment bypass pathways.

- For all RCS connections, in which there are two valves of the same type (usually check valves), in series inside containment, before the RCS, common cause failure does not apply because the valves are operating under different conditions. The valve closer to the RCS is subject to a higher pressure than the valve downstream of it.

- For the 'probability of an ISLOCA Release' portion of the ΔLERF calculations, when there is a normally open valve in the penetration (such as in group II-A, calculations 6 and 7) the open valve is not credited in the calculation. When assessing ISLOCA, the initiating event is the frequency of the closed valves within the path of release spuriously transferring open or rupturing, thus creating a flow path directly from the RCS to the outside atmosphere.

- For all RCS connections that are normally operating, the probability of an ISLOCA release is not considered because the valves are already open and flow is occurring.

Table 8-3 Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

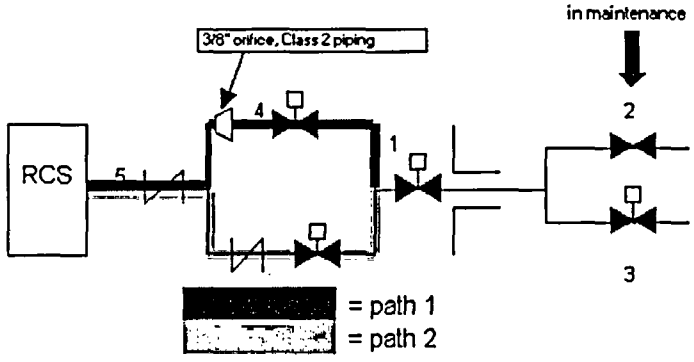
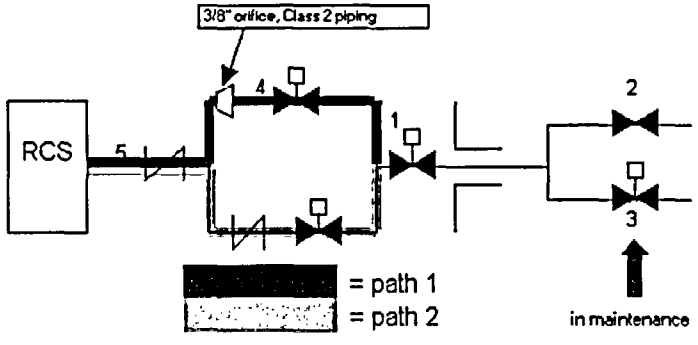
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
1. Group II,A (see Section 8.2.3.1)	ECCS Test Line Return - High Pressure Coolant Injection System: • 2 valves OC in parallel, normally closed, different valve types - 1 valve IC, normally closed - orifice between RCS and IC CIV 3/8" or less diameter (The valve IC has additional normally closed valves between it and the RCS, Note: path 2 is eliminated)	'different type' CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		all	168
		'same type' CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		all	168

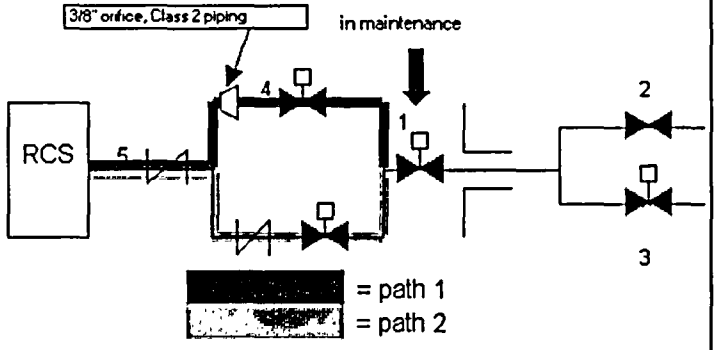
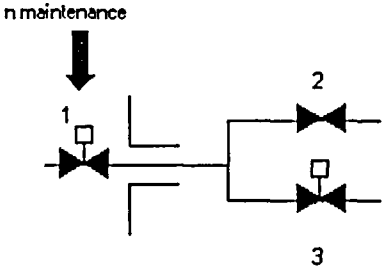
Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS					
Calculation Number and Group	**Penetration Description**	**Maintenance Description**	**Diagram**	**Valve Type Assumption (see assumption 7 of Section 8.2)**	**Justified CT (hours)**
		CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	168
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	24

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

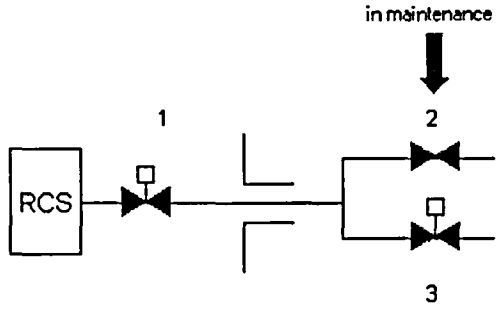
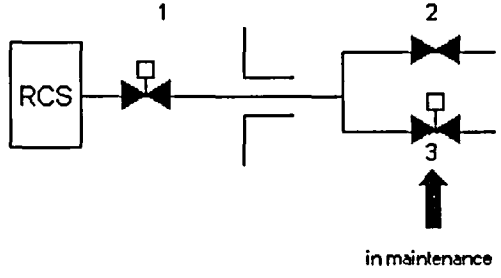
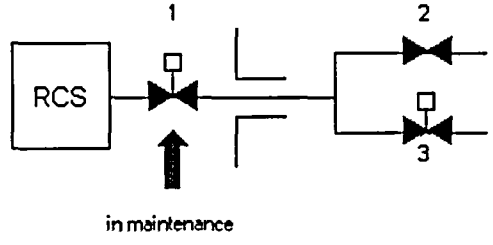
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
2. Group II,A (see Section 8.2.3.1)	Pressurizer Vapor Sample Line: • 2 valves OC in parallel, normally closed, different valve types - 1 valve IC, normally closed - 3/8" or less piping diameter	'different type' CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		all	168
		'same type' CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		all	24
		CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	24

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

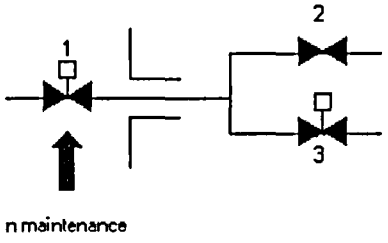
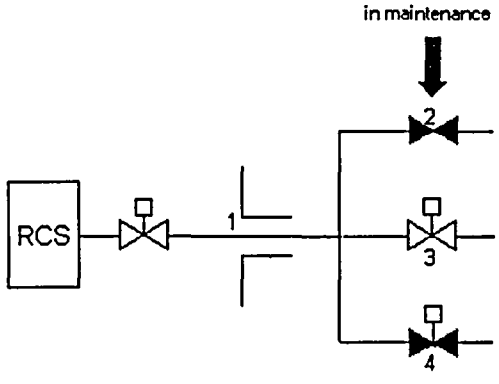
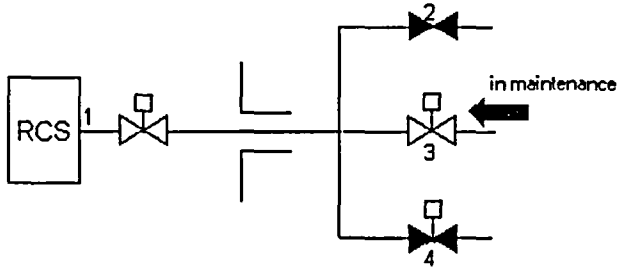
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	24
3. Group II,A (see Section 8.2.3.1)	Pressurizer Liquid Sample Line: • 3 valves OC in parallel, 2 normally closed, 1 normally open - 1 valve IC normally open - 3/8" or less piping diameter	either of the closed CIVs OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check	168 168 168 168
		open CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check	24 24 24 24

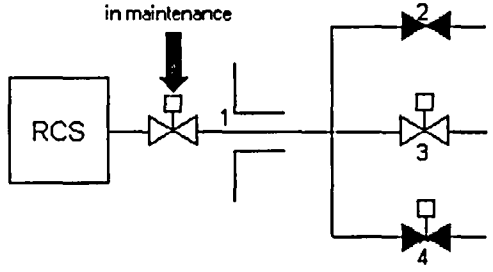
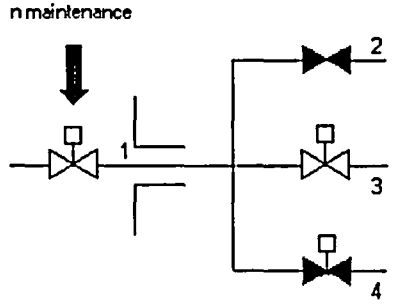
Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS					
Calculation Number and Group	**Penetration Description**	**Maintenance Description**	**Diagram**	**Valve Type Assumption (see assumption 7 of Section 8.2)**	**Justified CT (hours)**
		open CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check	24 24 24 24
		open CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check	24 24 24 24

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

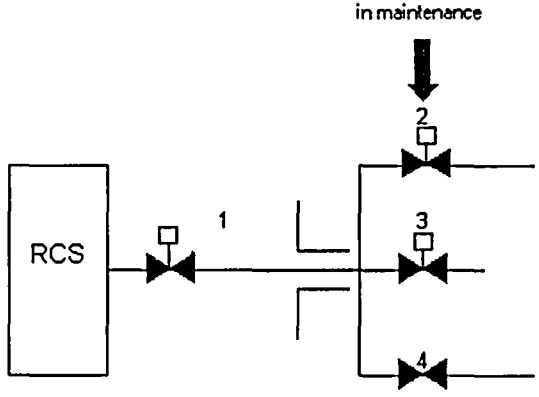
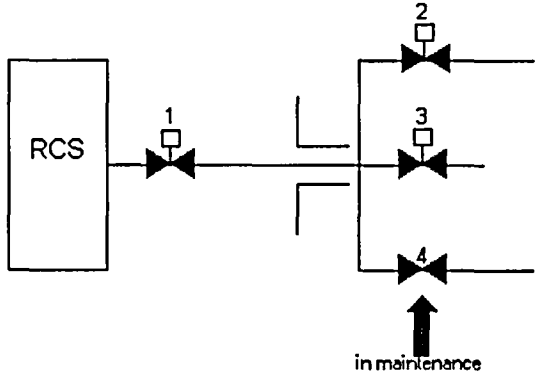
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
4. Group II,A (see Section 8.2.3.1)	Post Accident Sample Line: • 3 valves OC in parallel, normally closed, different valve types - 1 valve IC, normally closed 3/8" or less piping diameter	either 'same type' CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		all	168
		'different type' CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		all	168

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

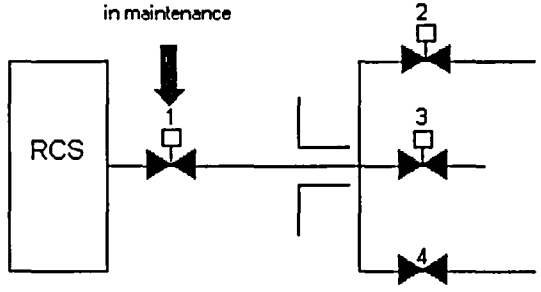
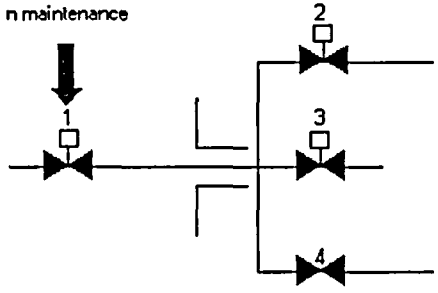
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	12
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	12

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

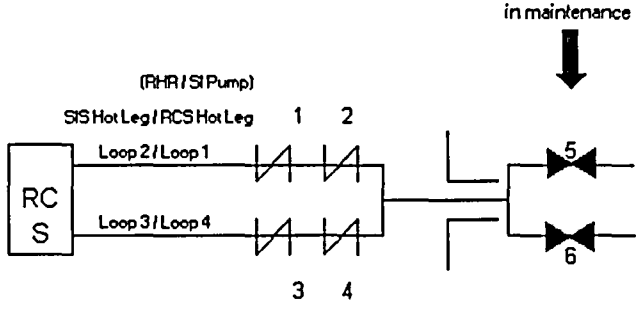
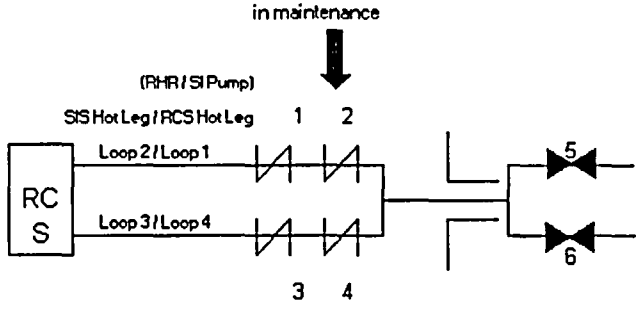
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
5. Group II,A (see Section 8.2.3.1)	Residual Heat Removal System (Low Head) - Hot Leg Injection, Recirc to Hot Leg: OR Safety Injection Pump (Intermediate Head) - Hot Leg Injection, Recirc to Hot Leg: • 2 valves IC in parallel, normally closed - 2 valve OC in parallel, normally closed - different valve types (Each check valve IC has a normally closed check valve in series with it)	either CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		all	72
		either CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	72

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

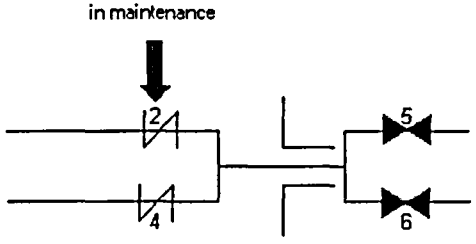
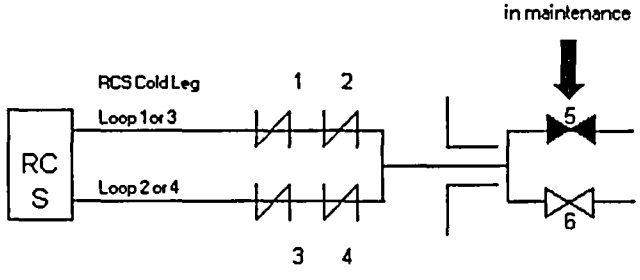
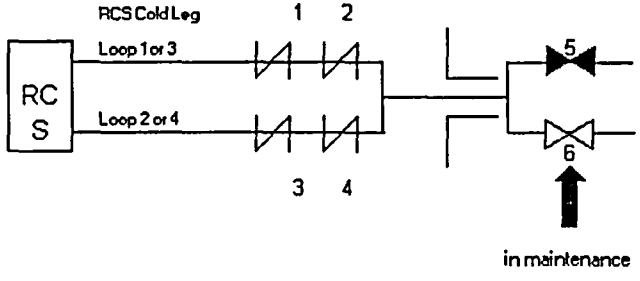
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		either CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	168
6. Group II,A (see Section 8.2.3.1)	Residual Heat Removal System (Low Head) - Cold Leg Injection, Recirc to Cold Leg: • 2 valves IC in parallel, normally closed - 2 valves OC in parallel, 1 normally closed, 1 normally open - different valve types (Each check valve IC has a normally closed check valve in series with it)	the closed CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check	4 4 4 4
		the open CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check	4 4 4 4

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

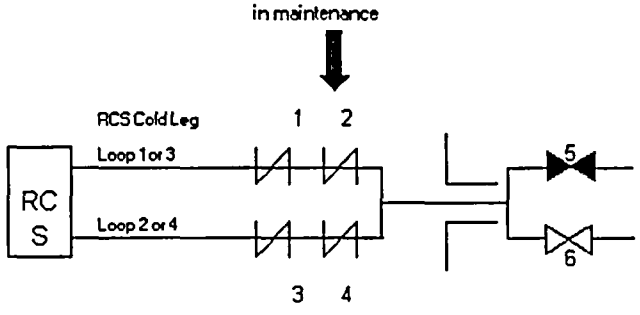
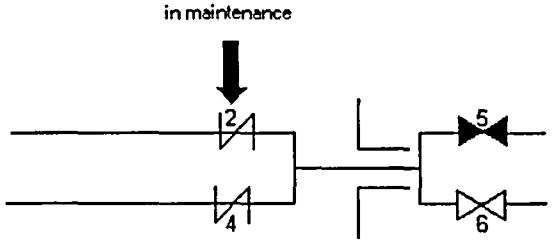
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		either CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check	4 4 4 4
		either CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check	4 4 4 4

Table 8-3 (cont.) **Generic Summary: Class II – Penetration Flow Paths Connected to the RCS**

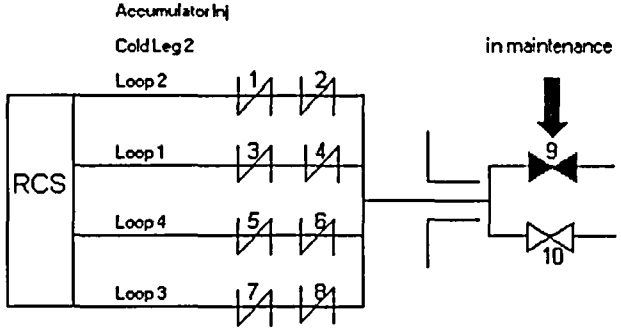
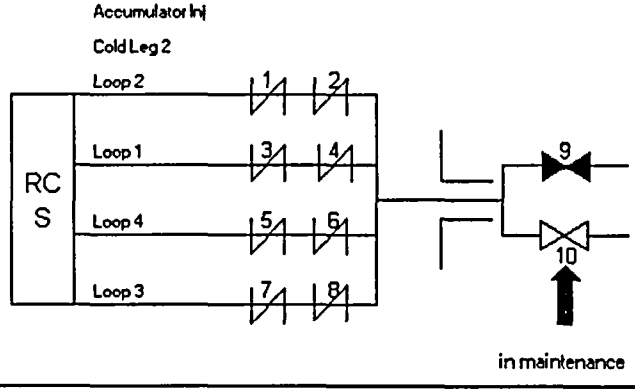
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
7. Group II,A (see Section 8.2.3.1)	Safety Injection Pump (intermediate head) - Cold Leg Injection, Recirc to Cold Leg: • 4 valves IC in parallel, normally closed - 2 valve OC in parallel, 1 normally closed, 1 normally open - different valve type (Each check valve IC has a normally closed check valve in series with it)	closed CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check	4 4 4 4
		open CIV OC is in maintenance such that the pressure boundary is or is not maintained (closed system OC regardless):		SOV MOV AOV Check	4 4 4 4

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

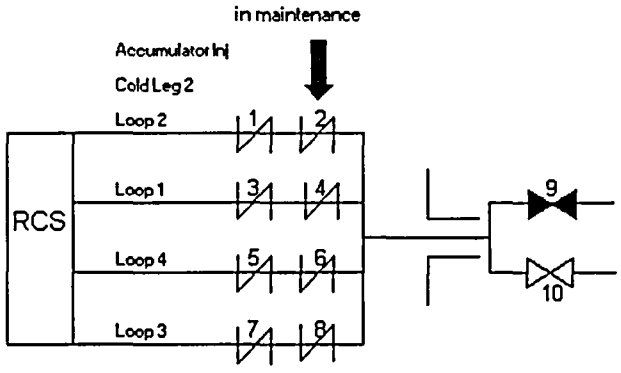
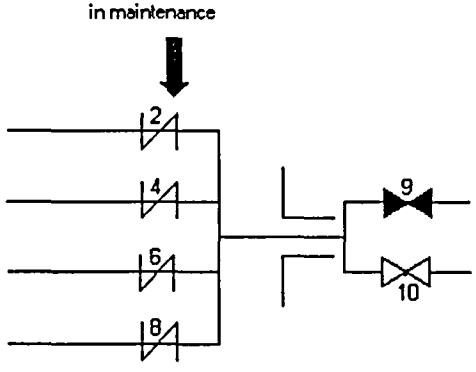
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		any CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check	4 4 4 4
		any CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check	4 4 4 4

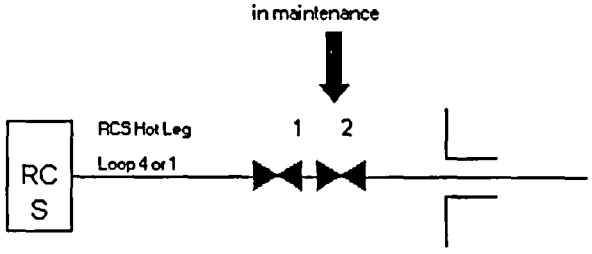
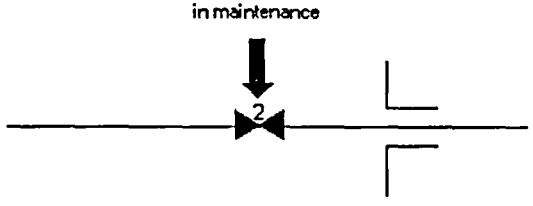
Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS					
Calculation Number and Group	**Penetration Description**	**Maintenance Description**	**Diagram**	**Valve Type Assumption (see assumption 7 of Section 8.2)**	**Justified CT (hours)**
8. Group II,A (see Section 8.2.3.1)	Residual Heat Removal System (Low Head) - Hot Leg to RHR Pumps, RHR Shutdown Lines: • 1 valve IC, normally closed (The valve IC has another normally closed valve in series with it)	CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	4
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	4

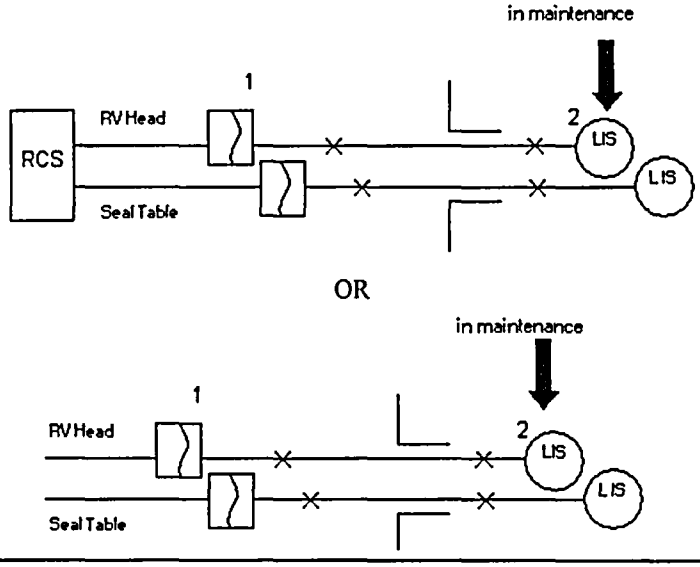
Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS					
Calculation Number and Group	**Penetration Description**	**Maintenance Description**	**Diagram**	**Valve Type Assumption (see assumption 7 of Section 8.2)**	**Justified CT (hours)**
9. Group II,A (see Section 8.2.3.1)	RVLIS Sample Line - Reactor Coolant System: • Hydraulic Sensors IC, LIS's OC	either LIS OC is in maintenance such that the pressure boundary is or is not maintained:		LISs	168

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

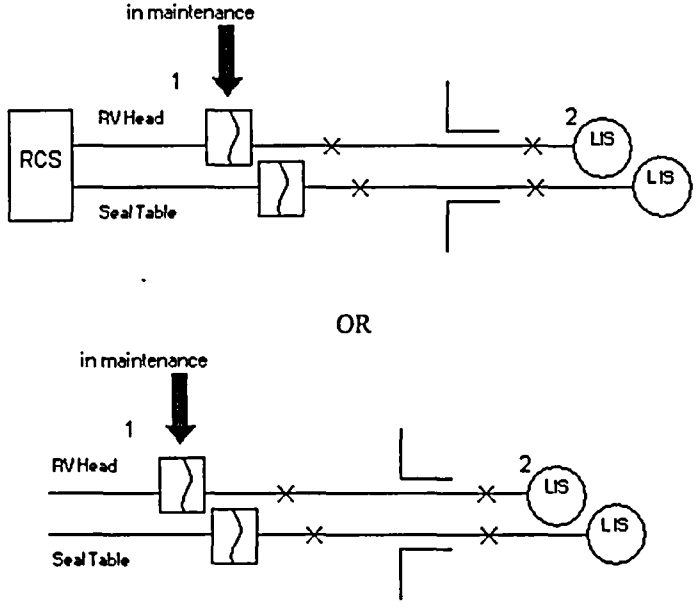
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		either sensor IC is in maintenance such that the pressure boundary is or is not maintained:		sensors	168

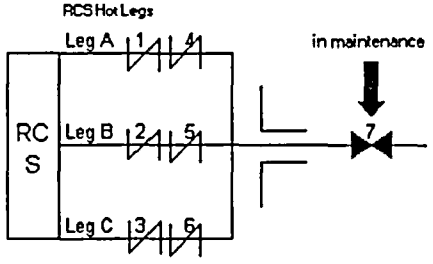
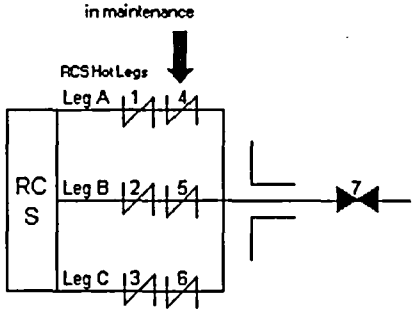
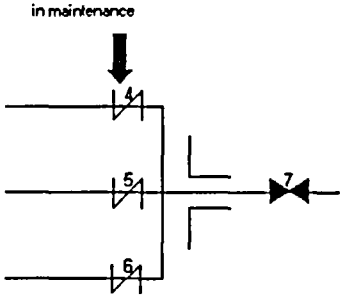
Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS					
Calculation Number and Group	**Penetration Description**	**Maintenance Description**	**Diagram**	**Valve Type Assumption (see assumption 7 of Section 8.2)**	**Justified CT (hours)**
10. Group II,A (see Section 8.2.3.1)	Centrifugal Charging Pumps (High Head) - Recirc to Hot Legs: • 3 valves of same type IC in parallel, normally closed - 1 valve OC, normally closed - valves IC different type from those OC (Each check valve IC has a normally closed check valve in series with it)	the CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		all	72
		any CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	168
		any CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	168

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

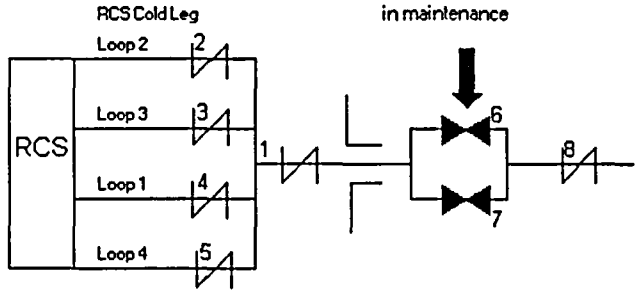
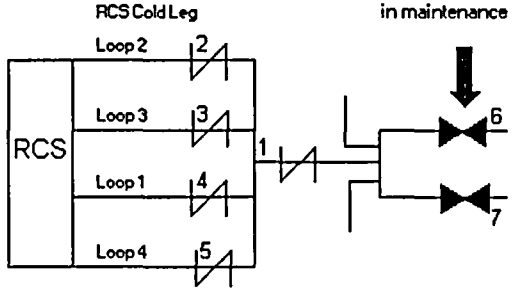
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
11. Group II,A (see Section 8.2.3.1)	Centrifugal Charging Pumps (High Head) - Cold Leg Injection, Recirc to Cold Legs: • 1 valve IC, normally closed - 2 valves of same valve type OC in parallel, both normally closed - valve IC different type from those OC (The check valve IC has 4 parallel normally closed check valves in series with it) (The valves OC have another normally closed check valve in series with them)	either CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):		all	168
		either CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		all	168

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

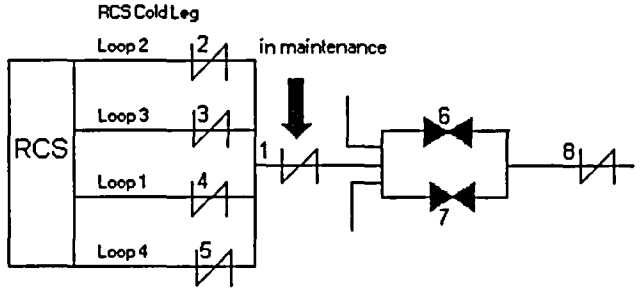
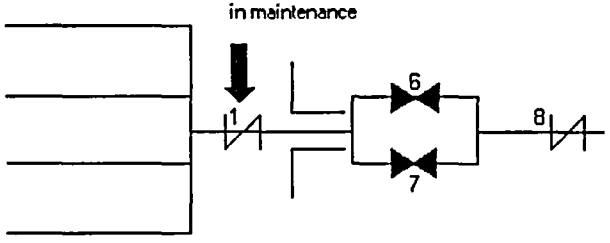
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	168
		CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	168

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

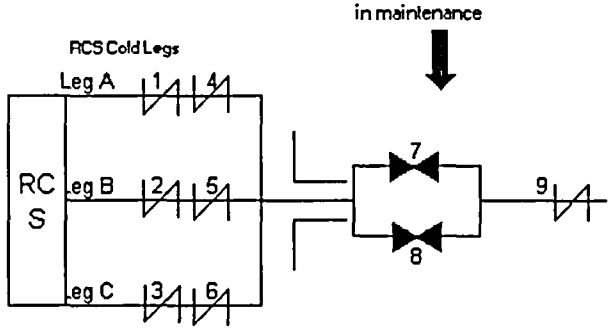
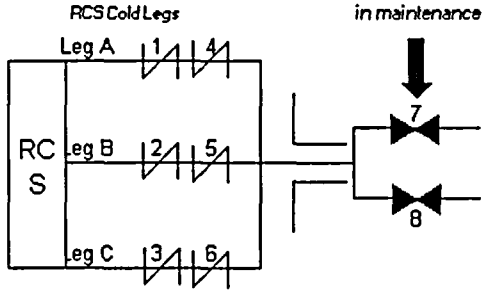
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
12. Group II,A (see Section 8.2.3.1)	Centrifugal Charging Pumps (High Head) - Injection to Cold Legs, Recirc to Cold Legs: • 3 valves of same type IC in parallel, normally closed - 2 valves of same valve type OC in parallel, normally closed - valves IC different type from those OC (Each check valve IC has a normally closed check valve in series with it) (The valves OC have another normally closed check valve in series with them)	either CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):		all	168
		either CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		all	168

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

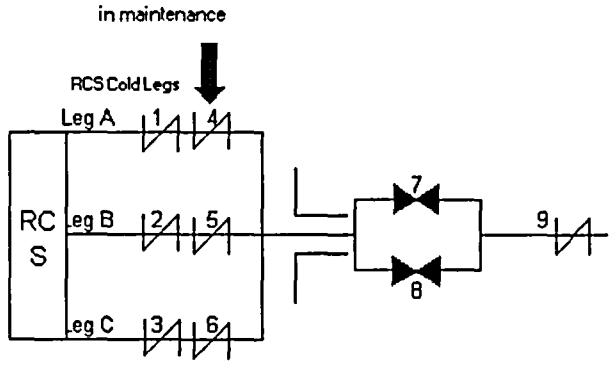
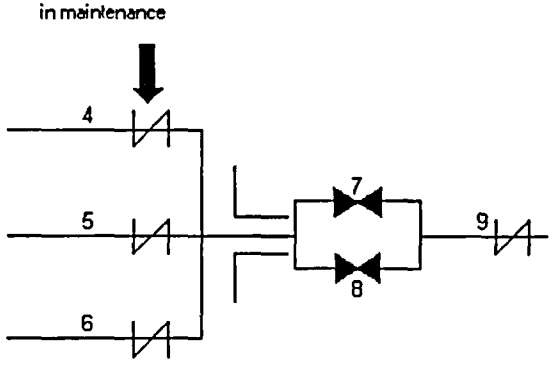
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		any CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	168
		any CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	168

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

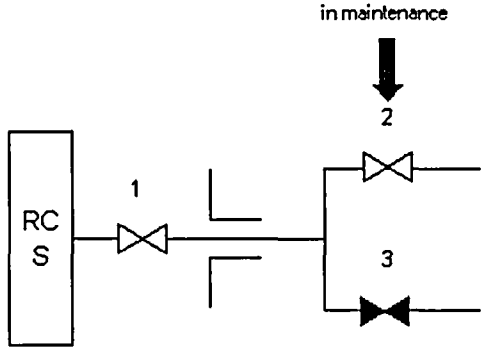
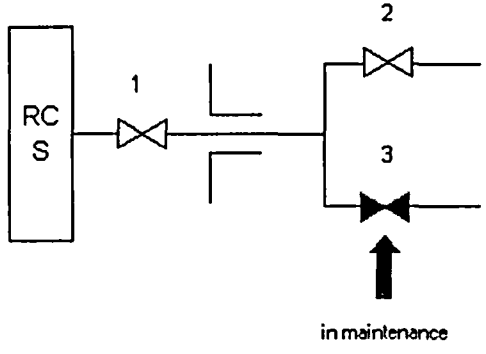
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
1. Group II,B (see Section 8.2.3.2)	Chemical & Volume Control System - Normal Letdown Legs: • 1 valve IC, normally open - 2 valves OC, 1 normally open, 1 normally closed - same valve type	the open CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check	24 24 24 24
		the closed CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check	72 168 72 168

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

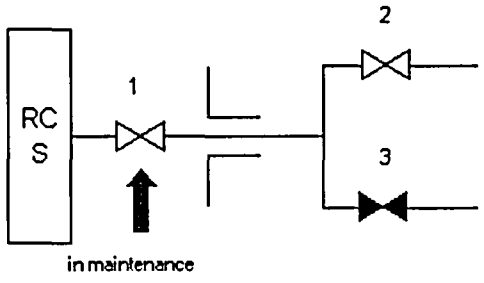
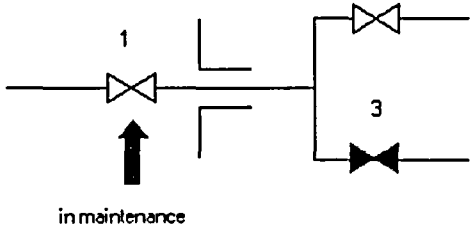
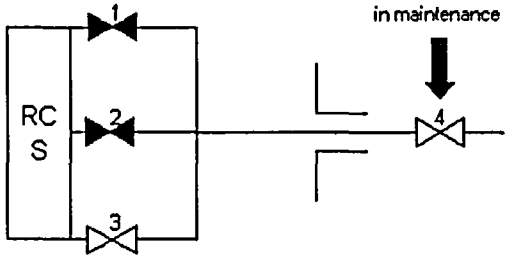
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		the open CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check	24 24 24 24
		the open CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check	24 24 24 24
2. Group II,B (see Section 8.2.3.2)	Chemical & Volume Control System – Reactor Coolant to Letdown Heat Exchanger: • 3 valves IC, 1 normally open, 2 normally closed - 1 valve OC, normally open - all same valve type	the CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):		SOV MOV AOV Check	24 24 24 24

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

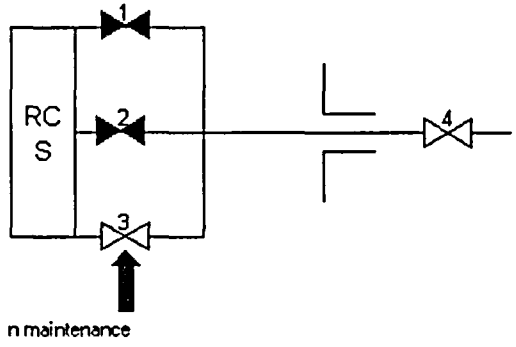
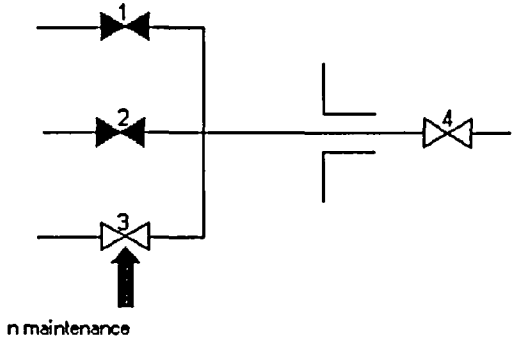
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		the open CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check	24 24 24 24
		the open CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check	24 24 24 24

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

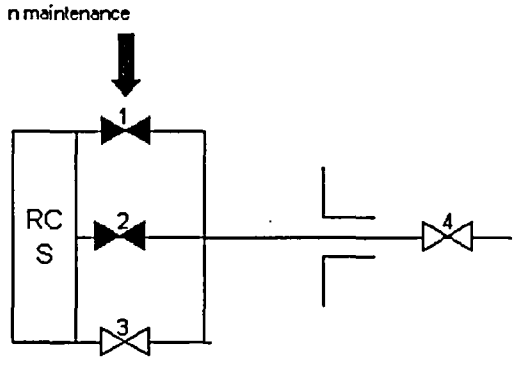
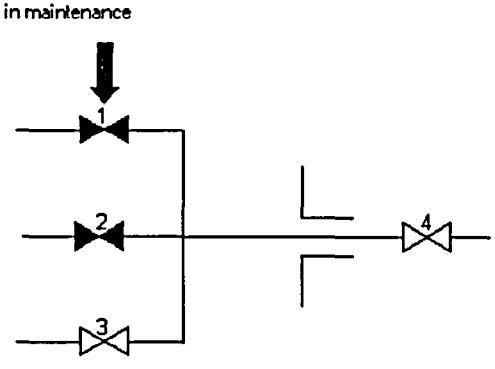
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
		either of the closed CIVs IC are in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check	72 168 72 168
		either of the closed CIVs IC are in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check	168 168 168 168

Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS

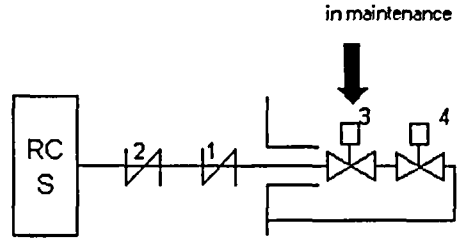
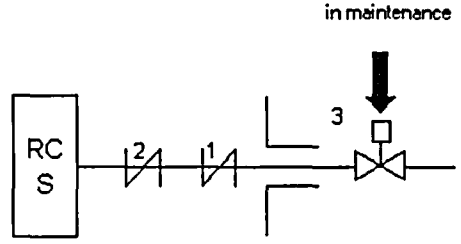
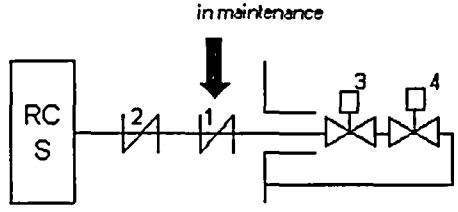
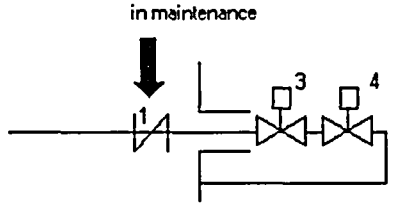
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
3. Group II,B (see Section 8.2.3.2)	Chemical & Volume Control System - Charging Line: • 1 CIV IC normally open - 1 CIV OC, normally open - different valve types (The normally open check valve IC has another normally open check valve in series between it and the RCS) (The normally open CIV OC has another normally open valve downstream of it, same valve type)	the CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):		SOV MOV AOV Check	168 168 168 168
		the CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		SOV MOV AOV Check	168 168 168 168
		the CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check	168 168 168 168

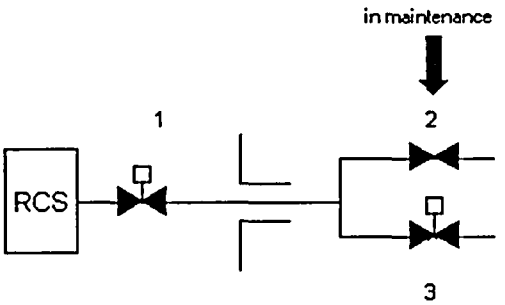
Table 8-3 (cont.) Generic Summary: Class II – Penetration Flow Paths Connected to the RCS					
Calculation Number and Group	**Penetration Description**	**Maintenance Description**	**Diagram**	**Valve Type Assumption (see assumption 7 of Section 8.2)**	**Justified CT (hours)**
		the CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check	168 168 168 168

8.2.3.1 Group IIA: Standby system flow paths

Calculation Number 2, Group II,A - Pressurizer Vapor Sample Line (see Table 8-3)

2 valves OC in parallel, normally closed, different valve types - 1 valve IC, normally closed - 3/8" or less piping diameter

- 'different type' CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):



Key modeling details:

a,c

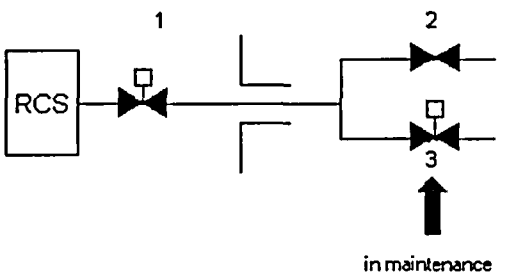
[ ]

a,c

[ ]

FINAL CT EXTENSION for valve 2, for any valve type: 168 hours

- 'same type' CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):



Key modeling details:

a,c

[ ]

a,c

[

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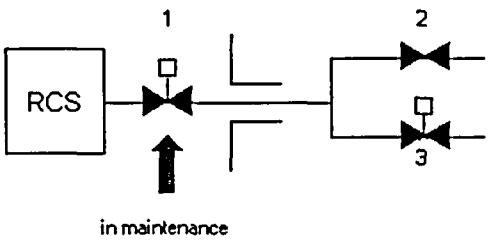
FINAL CT EXTENSION for valve 3, for any valve type: 24 hours, (limited by ICLERP)

- CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):



Key modeling details:

a,c

[

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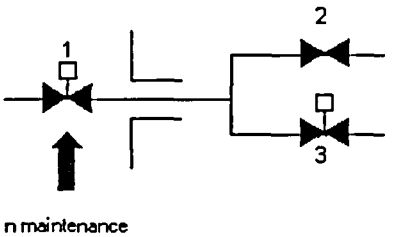
FINAL CT EXTENSION for valve 1, for any valve type: 24 hours, (limited by ICLERP)

- CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

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a,c

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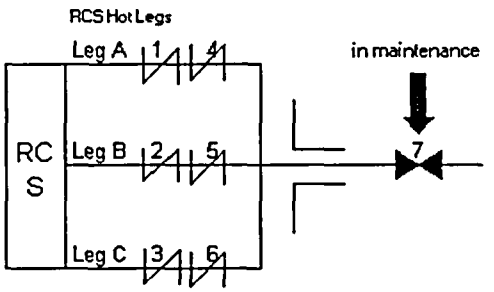
FINAL CT EXTENSION for valve 1, for any valve type: 24 hours, (limited by ICLERP)

NOTE: Since this penetration is no longer connected to the RCS, and because its line size is extremely small, when utilities do a plant implementation of the generic analysis (as demonstrated in Section 9 with WCGS), and apply the appropriate threshold line size value at which a LER will not occur (as specified in Table 8-5 of Section 8.3), this penetration will be justified for a 168 hour CT.

Calculation Number 10, Group II,A - Centrifugal Charging Pumps (High Head): Recirc to Hot Legs (see Table 8-3)

3 valves of same type IC in parallel, normally closed - 1 valve OC, normally closed - valves IC different type from those OC
(Each check valve IC has a normally closed check valve in series with it)

- the CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):



Key modeling details:

a,c

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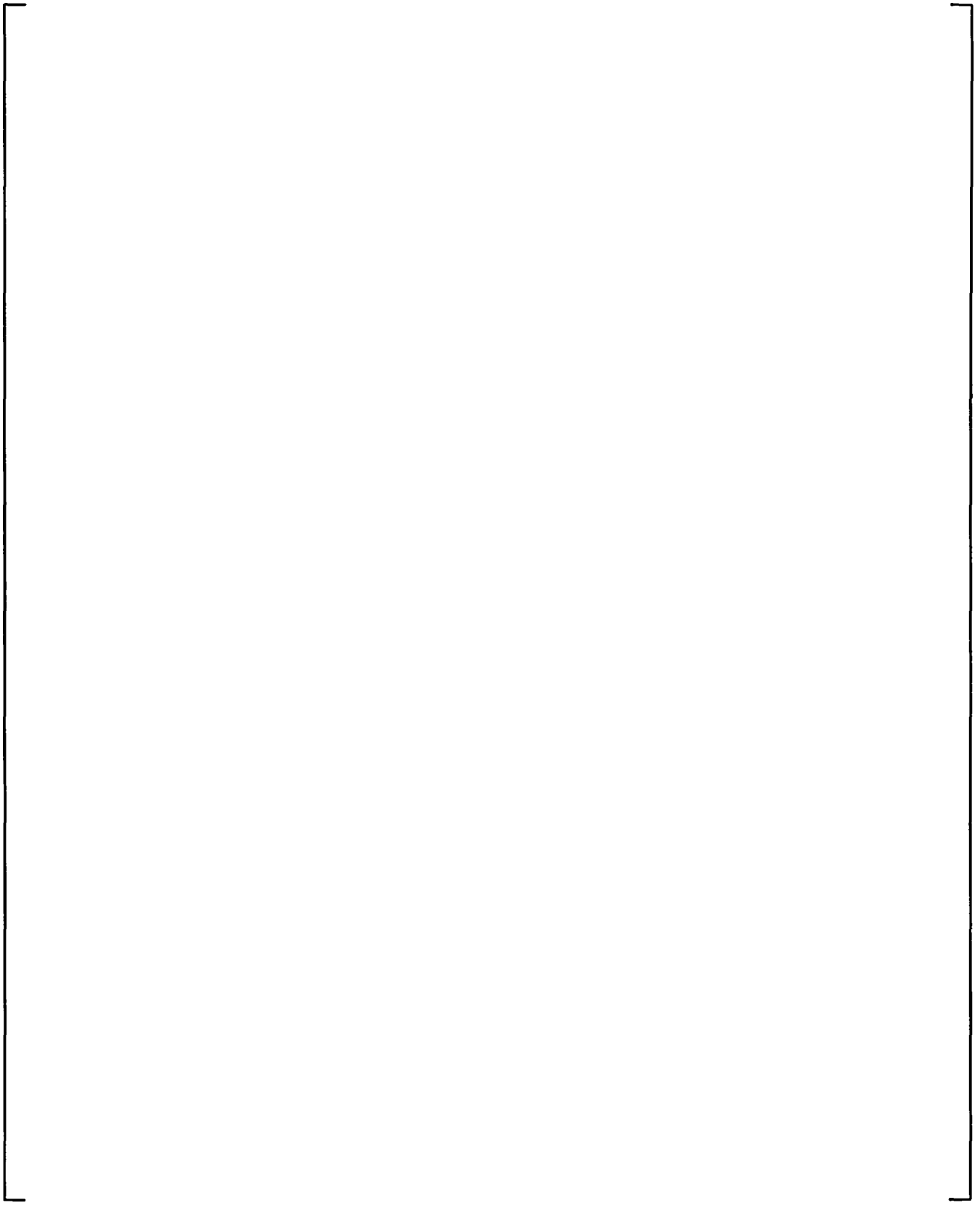
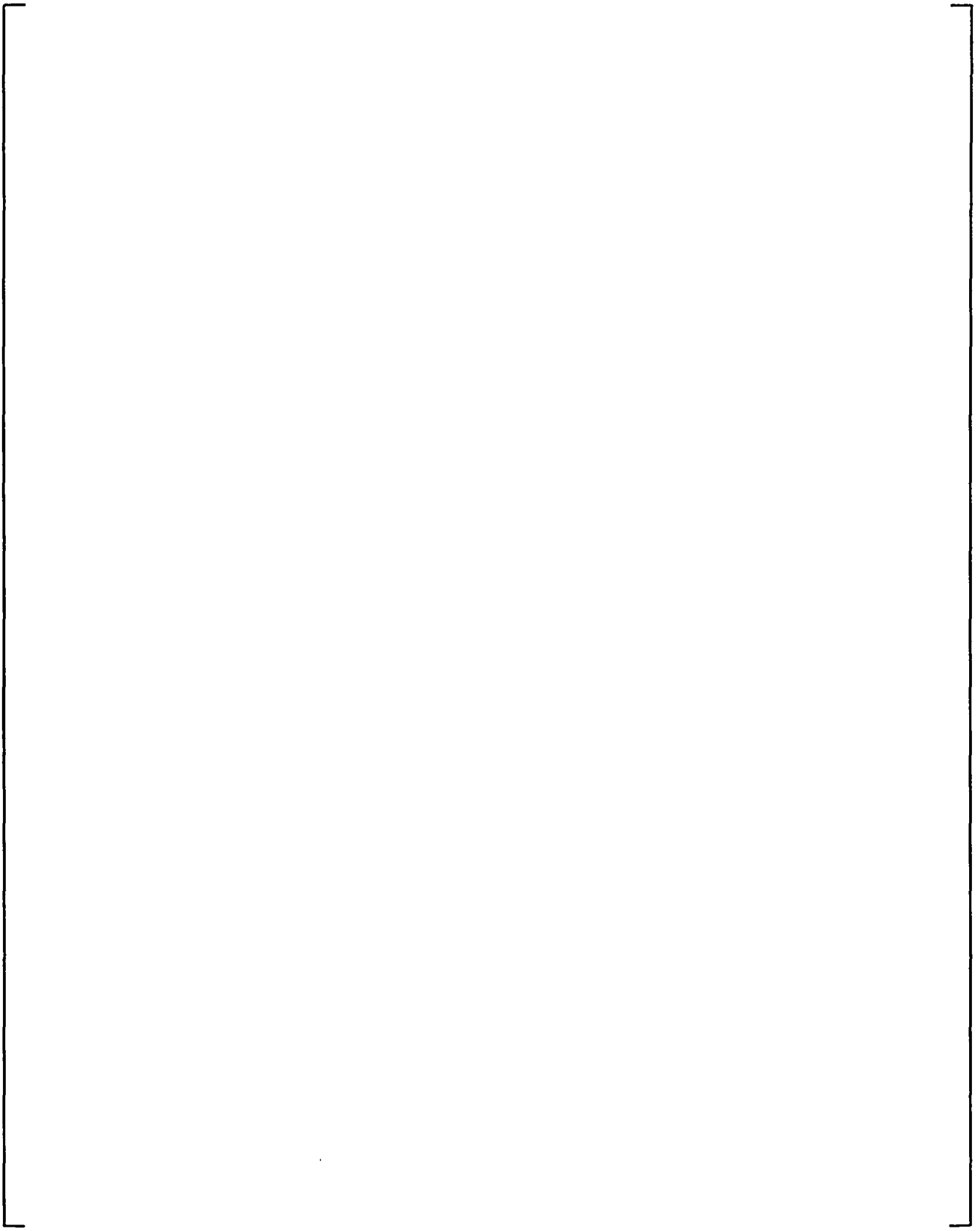
a,c



a,c

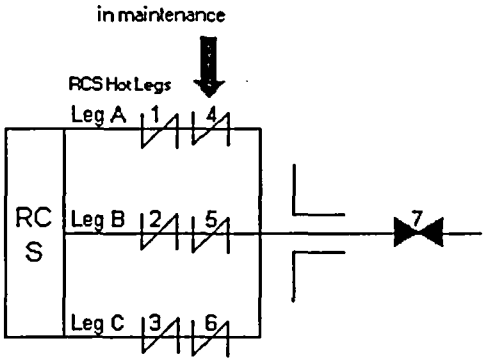


a,c

[ ]

FINAL CT EXTENSION for valve 7, for any valve type: 72 hours, (limited by ICLERP)

- any CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):



Key modeling details:

a,c

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a,c

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a,c

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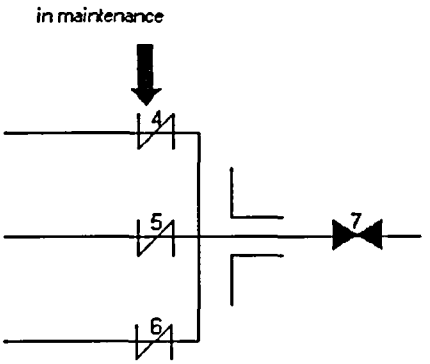
FINAL CT EXTENSION for valves 4, 5 or 6, for any valve type: 168 hours

- any CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

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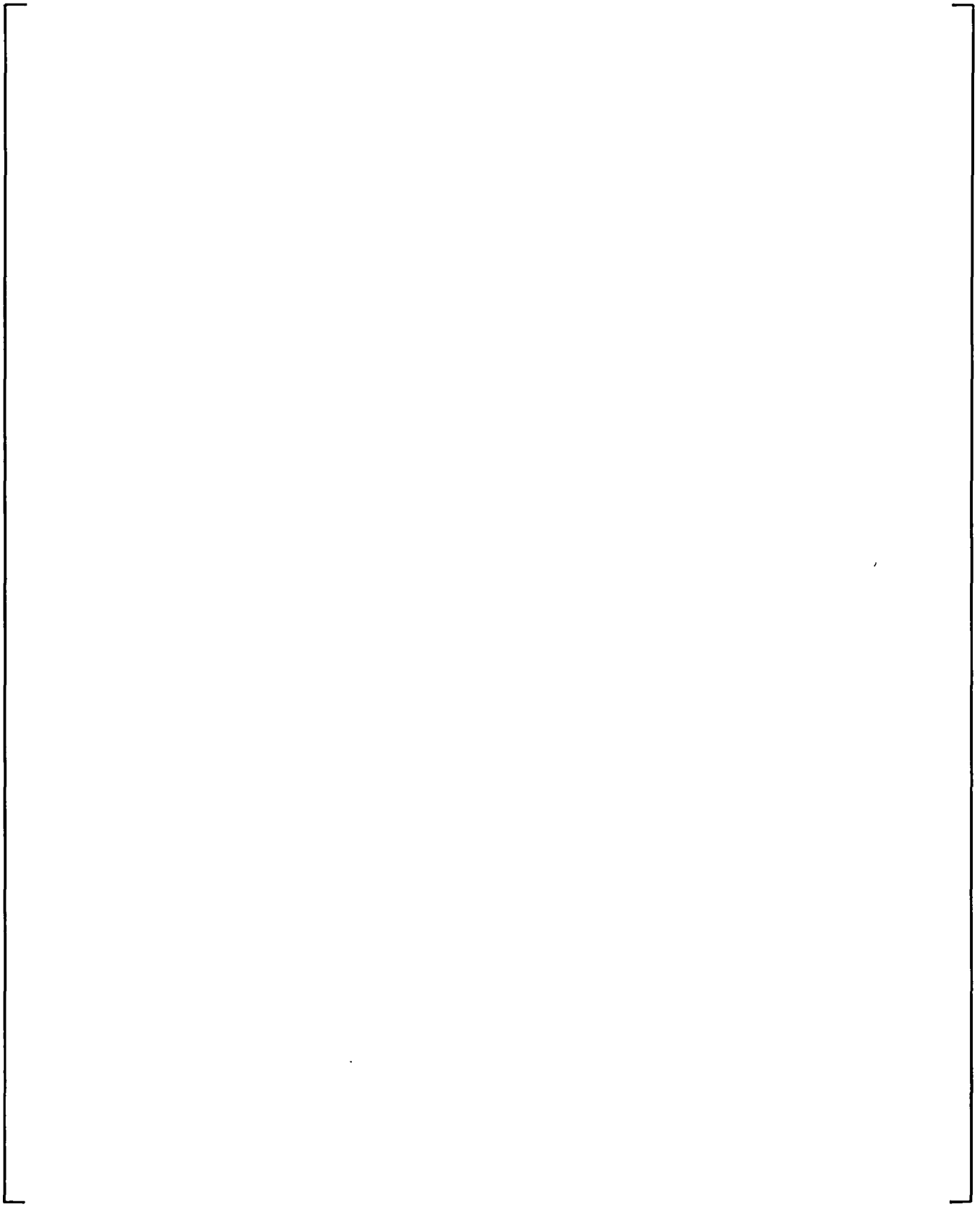
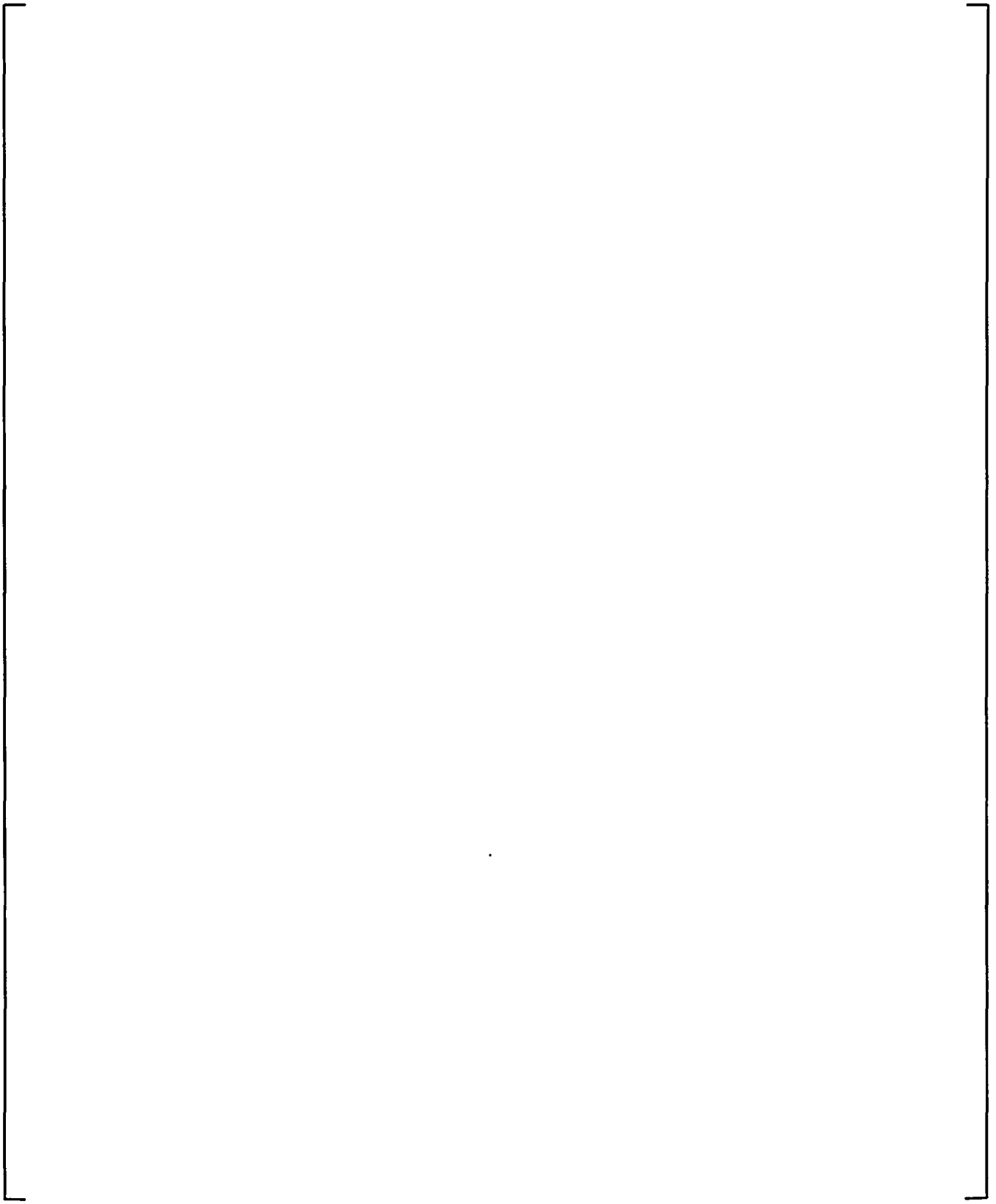
a,c



a,c



a,c

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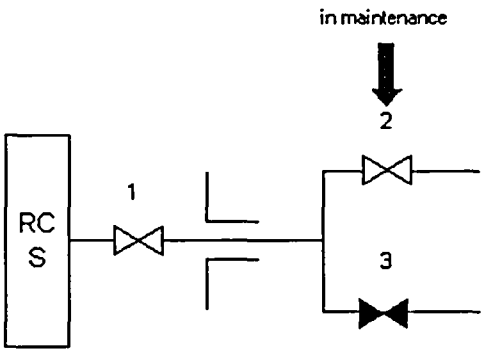
FINAL CT EXTENSION for valves 4, 5 or 6, for any valve type: 168 hours

8.2.3.2 Group IIB: Normally operating system flow paths

Calculation Number 1, Group II,B - Chemical & Volume Control System: Normal Letdown Legs (see Table 8-3)

1 valve IC, normally open - 2 valves OC, 1 normally open, 1 normally closed - same valve type

- the open CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):



Key modeling details:

a,c

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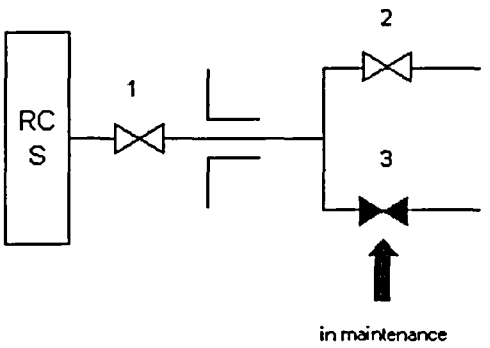
a,c

FINAL CT EXTENSION for valve 2, for SOV type: 24 hours (limited by ICLERP)

- the closed CIV OC is in maintenance such that the pressure boundary is or is not maintained (open system OC regardless):



Key modeling details:

a,c

[

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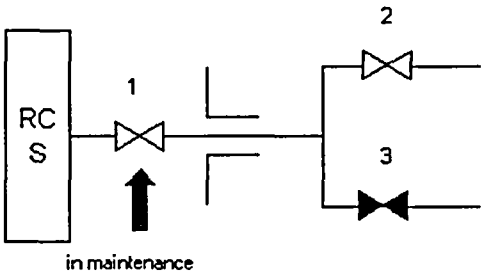
a,c

[ ]

FINAL CT EXTENSION for valve 3, for SOV type: 72 hours (limited by ICLERP)

- the open CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):



Key modeling details:

a,c

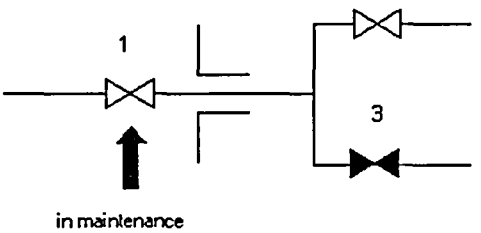
[ ]

a,c

[ ]

FINAL CT EXTENSION for valve 1, for SOV type: 24 hours, (limited by ICLERP)

- the open CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

[ ]

a,c

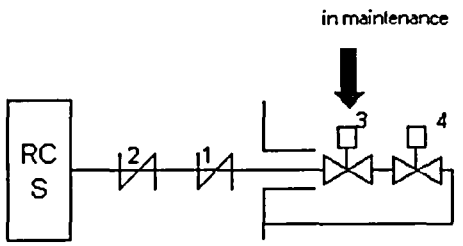
[ ]

FINAL CT EXTENSION for valve 1, for SOV type: 24 hours, (limited by ICLERP)

Calculation Number 3, Group II,B - Chemical & Volume Control System: Charging Line (see Table 8-3)

1 CIV IC normally open - 1 CIV OC, normally open - different valve types
(The normally open check valve IC has another normally open check valve in series between it and the RCS)
(The normally open CIV OC has another normally open valve downstream of it, same valve type)

- the CIV OC is in maintenance such that the pressure boundary is maintained (still closed system OC):



Key modeling details:

a,c

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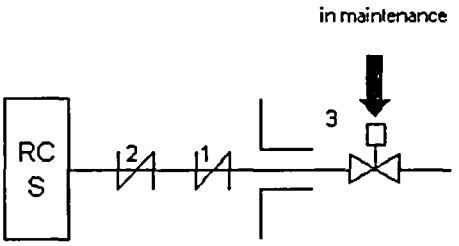
FINAL CT EXTENSION for valve 3, for SOV type: 168 hours

- the CIV OC is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):



Key modeling details:

a,c

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a,c

[

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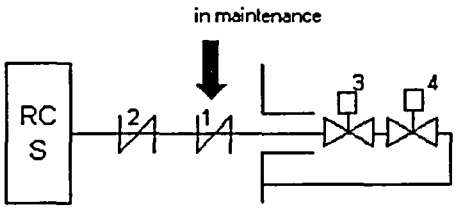
FINAL CT EXTENSION for valve 3, for SOV type: 168 hours

- the CIV IC is in maintenance such that the pressure boundary is maintained (still closed system IC):



Key modeling details:

a,c

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a,c

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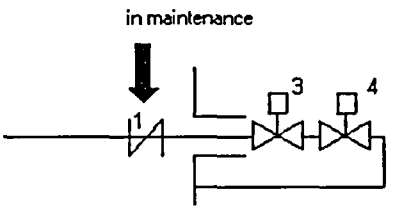
FINAL CT EXTENSION for valve 1, for SOV type: 168 hours

- the CIV IC is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

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a,c

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FINAL CT EXTENSION for valve 1, for SOV type: 168 hours

8.2.4 Class III: Penetration Flow Paths Connected to the SGs

Class III represents those penetrations that are connected to the Steam Generator Secondary Side. The ICLERP and ΔLERF calculations for steam generator connections that are open to the outside environment are in Section 8.2.4.1. The calculations for the steam generator connections that are closed to the outside environment are in Section 8.2.4.2.

Similar to Sections 8.2.2 and 8.2.3 (Class I and Class II penetrations), assumptions and diagrams are shown for each penetration analyzed. The methodology in the calculations is also consistent with Classes I and II such that the calculations are done first with a CT of 168 hours. If the ICLERP or ΔLERF value at this CT does not meet the criteria in Regulatory Guides 1.174 and 1.177, the ICLERP and ΔLERF values were recalculated at lesser CTs. The sample calculations provided in Sections 8.2.4.1 and 8.2.4.2 reflect only valve failure probabilities for SOVs. Table 8-4 summarizes the Class III results which contain calculations for all valve types (SOVs, MOVs, AOVs, check valves, and SRVs, as appropriate).

For penetrations with systems connected to the SG secondary side there are four potential means to get a large release. These are:

- Probability of 'SGTR CDF Release': For systems that are connected to the steam generator secondary side and open to the outside atmosphere, it is assumed that if a core damage event due to Steam Generator Tube Rupture (SGTR) occurs and the CIVs, for SG-related penetrations, fail to isolate, then there is a release path between the SG, and the outside environment. It is acknowledged that in many cases the rupture SG tube will also provide a release path. This analysis conservatively assumes that isolation of penetrations connected to the SG secondary side is also required.

  Example: core damage due to SGTR occurs, the isolation valves fail (spuriously open or fail to close); direct release path into the outside environment.

  Required input: CDF_{SGTR}, valve failure, CT

- Probability of 'Random Pipe Break CDF Release' (releases due to internal event CDF plus random pipe break): For systems connected to the SG and open outside containment, it is assumed that if a core damage event occurs, and then a random pipe break were to occur inside containment causing the system inside to no longer be connected to the SG, and the CIVs were to fail, then an open path through containment would exist.

  Example: core damage occurs, random pipe break occurs inside containment, the isolation valves fail; direct release path from inside containment to the outside environment.

  Required input: CDF_T, PB_{random}, valve failure, CT

- Probability of 'Seismic CDF Release': For systems connected to the SG and open or closed outside containment, it is assumed that if a core damage event occurs due to a seismic event, all closed loop piping fails both inside and outside containment, creating an open system connection both inside and outside containment. It is assumed that if CIV failure were to occur in addition to this, then an open path through containment would exist.

  Example: core damage due to a seismic event occurs, pipe breaks occur also due to the seismic event, the isolation valves fail; direct release path through the now open systems both inside and outside containment.

  Required input: CDF_{seis}, PB_{seis}, valve failure, CT

- Probability of 'SGTR with a Random Pipe Break Release': For systems connected to the SG and a closed (an actual closed loop) outside containment, a random pipe break occurring in the closed loop outside containment after a SGTR with CIV failure provides a direct path of release into the outside environment.

  Example: core damage due to SGTR occurs, the isolation valves fail (spuriously open or fail to close); a random pipe break occurs outside containment; direct release path into the outside environment.

  Required input: CDF_{SGTR}, PB_{random}, CT

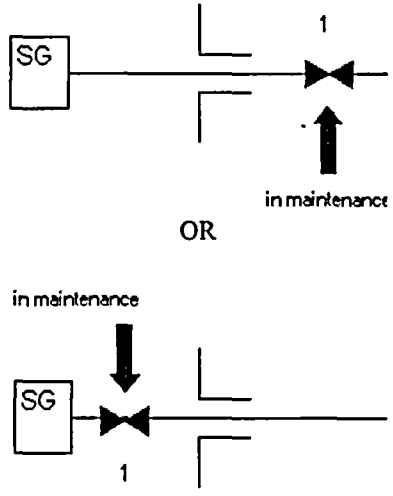
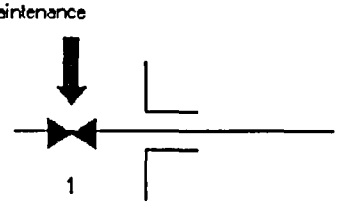
Table 8-4 Generic Summary: Class III – Penetration Flow Paths Connected to the SGs					
Calculation Number and Group	**Penetration Description**	**Maintenance Description**	**Diagram**	**Valve Type Assumption** (see assumption 7 of Section 8.2)	**Justified CT** (hours)
1. Group III,A (see Section 8.2.4.1)	1 valve - normally closed	CIV is OC and is in maintenance (open system OC regardless): OR CIV is IC and is in maintenance such that the pressure boundary is maintained (still closed system IC):		all	8
		CIV is IC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		all	4

Table 8-4 (cont.) Generic Summary: Class III – Penetration Flow Paths Connected to the SGs

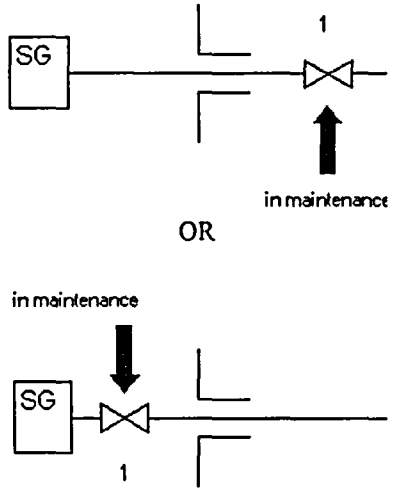
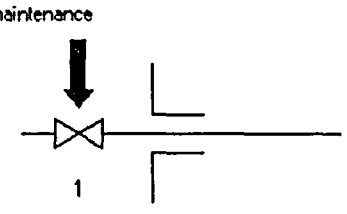
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
2. Group III,A (see Section 8.2.4.1)	1 valve - normally open	CIV is OC and is in maintenance (open system OC regardless): OR CIV is IC and is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check SRV	8 8 8 8 8
		CIV is IC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check SRV	4 4 4 4 4

Table 8-4 (cont.) Generic Summary: Class III – Penetration Flow Paths Connected to the SGs

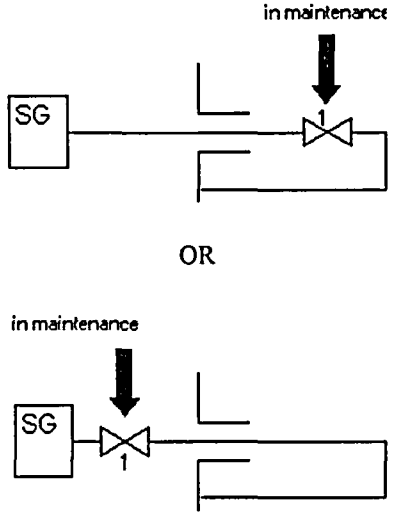
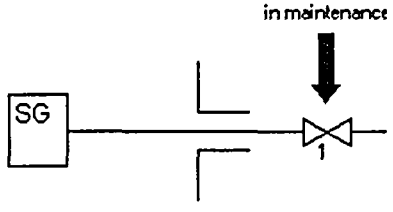
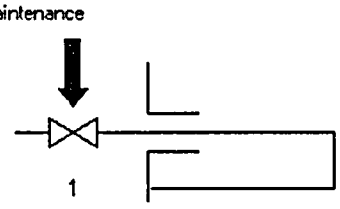
Calculation Number and Group	Penetration Description	Maintenance Description	Diagram	Valve Type Assumption (see assumption 7 of Section 8.2)	Justified CT (hours)
1. Group III,B (see Section 8.2.4.2)	1 valve - normally open	CIV is OC and is in maintenance such that the pressure boundary is maintained (still closed system OC): OR CIV is IC and is in maintenance such that the pressure boundary is maintained (still closed system IC):		SOV MOV AOV Check SRV	8 8 8 8 8
		CIV is OC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):		SOV MOV AOV Check SRV	8 8 8 8 8

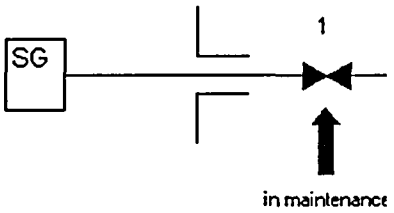
Table 8-4 (cont.) Generic Summary: Class III – Penetration Flow Paths Connected to the SGs					
Calculation Number and Group	**Penetration Description**	**Maintenance Description**	**Diagram**	**Valve Type Assumption** (see assumption 7 of Section 8.2)	**Justified CT** (hours)
		CIV is IC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):		SOV MOV AOV Check SRV	8 8 8 8 8

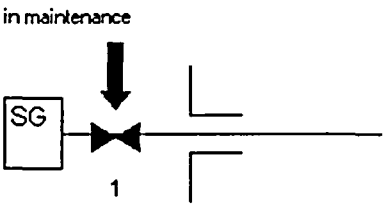
8.2.4.1 Group IIIA: Flow paths connected to the SG secondary side and open to the outside environment

Calculation Number 1, Group III,A - 1 valve - normally closed (see Table 8-4)

- CIV is OC and is in maintenance (open system OC regardless): OR
  CIV is IC and is in maintenance such that the pressure boundary is maintained (still closed system IC):

OR





Key modeling details:

a,c

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a,c

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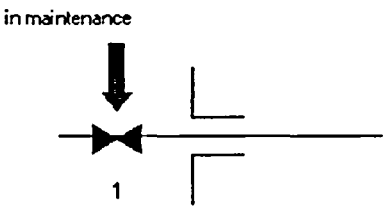
FINAL CT EXTENSION for valve 1, for any valve type: 8 hours (limited by ICLERP)

- CIV is IC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

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a,c

[

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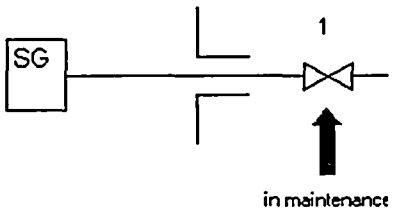
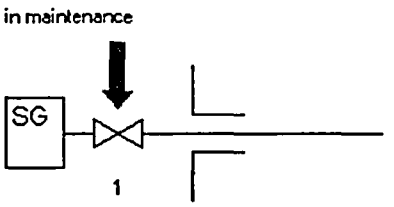
FINAL CT EXTENSION for valve 1, for any valve type: 4 hours, no extension, (limited by ICLERP)

Calculation Number 2, Group III,A - 1 valve - normally open (see Table 8-4)

- CIV is OC and is in maintenance (open system OC regardless): OR
  CIV is IC and is in maintenance such that the pressure boundary is maintained (still closed system IC):

OR





Key modeling details:

a,c

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a,c

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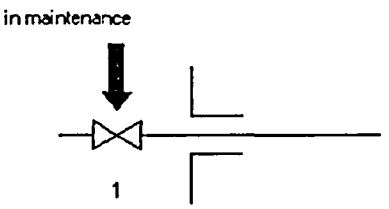
FINAL CT EXTENSION for valve 1, for SOV type: 8 hours (limited by ICLERP)

- CIV is IC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

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a,c

[ ]

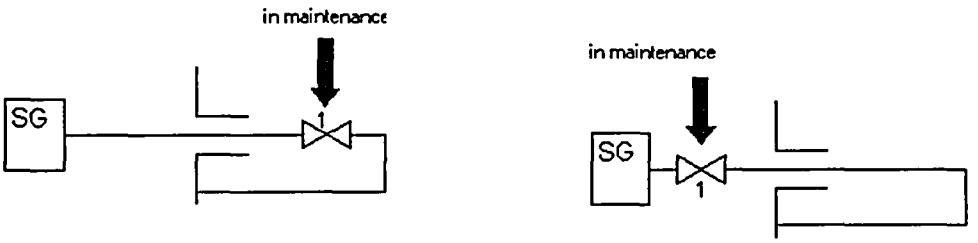
FINAL CT EXTENSION for valve 1, for SOV type: 4 hours, no extension, (limited by ICLERP)

8.2.4.2 Group IIIB: Flow paths connected to the SG secondary side and closed to the outside environment

Calculation Number 1, Group III,B - 1 valve - normally open (see Table 8-4)

- CIV is OC and is in maintenance such that the pressure boundary is maintained (still closed system OC): OR
  CIV is IC and is in maintenance such that the pressure boundary is maintained (still closed system IC):

OR



Key modeling details:

a,c

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a,c

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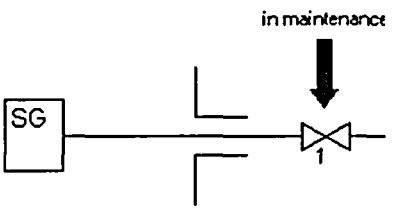
FINAL CT EXTENSION for valve 1, for SOV type: 8 hours (limited by ICLERP)

- CIV is OC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system OC):



Key modeling details:

a,c

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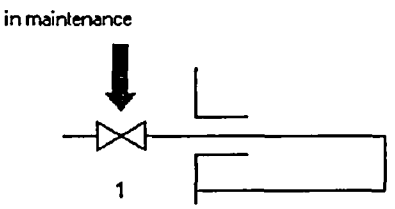
a,c

[ ]

FINAL CT EXTENSION for valve 1, for SOV type: 8 hours (limited by ICLERP)

- CIV is IC and is in maintenance such that the pressure boundary is NOT maintained (becomes open system IC):



Key modeling details:

a,c

[ ]

a,c

[ ]

FINAL CT EXTENSION for valve 1, for SOV type: 8 hours (limited by ICLERP)

8.3 DETERMINISTIC EVALUATION OF CONTAINMENT HOLE SIZE

This section provides the evaluation to determine the minimum containment hole size that will result in a large release. Penetration flow paths connected to the containment atmosphere (this excludes all RCS and SG connections) that have piping diameters smaller than this minimum threshold value are assumed of insufficient size to result in a large release. These penetrations automatically default to the 7 day CT and no detailed probabilistic analysis is required.

A large release was initially defined as a pathway of sufficient size to release the contents of the containment (i.e., one volume change) within one hour. This criteria is provided in the EPRI PSA Applications Guide (Reference 8). The vent diameter, or containment hole size, was calculated that met this criteria. For this program, all releases are considered early. Based on this criteria, the minimum containment hole sizes required for a large release are provided in Table 8-5 for each containment type.

As discussed in the section "Identification of Revisions", the NRC provided RAIs related to the minimum containment hole size required for a large release. Several detailed discussions were held with the Staff reviewers on the subject. The Staff did not agree with the definition that was used for a large release (one containment volume per hour) and felt the criteria used in previous studies was more appropriate. In previous studies, a 2 inch containment hole size has been used for screening in the development of containment isolation PRA models. Based on these discussions, the WOG agreed to apply a 2 inch containment hole size to define the threshold for a large release for all three containment types, that is, it is assumed that a hole size of > 2 inches can result in a large release.

Table 8-5 Containment Hole Size Results

Containment Type	Volume, V (ft^3)	Vent diameter / Pipe Size (in)
sub-atmospheric	[ ] a,c	[ ] a,c
ice condenser	[ ]	[ ]
Large dry containment	[ ]	[ ]

8.4 TIER 2: AVOIDANCE OF RISK-SIGNIFICANT PLANT CONDITIONS

The objective of the second tier, which is applicable to CT extensions, is to provide reasonable assurance that risk-significant plant equipment outage configurations will not occur when equipment is out of service. If risk-significant configurations do occur, then enhancements to Technical Specifications or procedures, such as limiting unavailability of backup systems, increased surveillance frequencies, or upgrading procedures or training, can be made that avoid, limit, or lessen the importance of these configurations.

The containment isolation valves form part of the containment barrier limiting releases to the environment. Other containment systems, such as the containment cooling system and containment spray system, also function to mitigate releases to the environment, but by different mechanisms. These other systems typically are used to preserve containment integrity by limiting containment pressure increase or to remove radioactive material from the containment atmosphere. The containment cooling and

containment spray systems are generally not considered backup to the containment isolation function. Given that containment isolation has failed, releases from containment are independent of the success or failure of containment cooling. The containment is already breached and containment pressure limitation is no longer an issue. On the other hand if containment isolation has failed, then containment sprays could be a factor in limiting releases via their scrubbing effect. This would be of limited benefit, because a large portion of the core damage sequences in which containment spray was functional at the time of the initiating event do not have effective scrubbing by sprays at the time of fission product release to the containment. Thus, efforts taken to assure the availability of containment spray when containment isolation may be impaired, do little to assure that containment spray will be effective in reducing releases if a core damage accident occurs. Also, when analyzed on a realistic basis, only a small fraction of the core damage sequences with containment isolation failures would result in fission product releases that are risk significant. Therefore, no Tier 2 limitations need to be imposed.

8.5 TIER 3: RISK-INFORMED PLANT CONFIGURATION CONTROL AND MANAGEMENT

The objective of the third-tier is to ensure that the risk impact of out-of-service equipment is evaluated prior to performing any maintenance activity. As stated in RG-1.174, "a viable program would be one that is able to uncover risk-significant plant equipment outage configurations as they evolve during real-time, normal plant operation." The third-tier requirement is an extension of the second-tier requirement, but addresses the limitation of not being able to identify all possible risk-significant plant configurations in the second-tier evaluation.

Addressing third-tier requirements is outside the scope of this document. This will be addressed on a utility specific basis when the changes in this WCAP are implemented at each plant and will be addressed through each plant's Maintenance Rule Program (A.4 requirement).

9 LEAD PLANT APPLICATION OF THE GENERIC ANALYSIS

This section presents the analysis and assumptions used in the lead plant application of the generic assessment discussed in Section 8.

The lead plant for this analysis was the Wolf Creek Generating Station (WCGS). The lead plant application provided insight on how to fine tune the generic assessment so that it can be applied to all plants straightforwardly, provides an example application of the generic analysis, and provides a useful guidance tool for other utilities wanting to implement the change. Also, the final percentage of WCGS CIVs that can be justified for an extended CT are provided.

The implementation involved identifying all of WCGS's containment isolation penetrations, using the 2-inch containment hole size critiera of Section 8.3 to identify the 'small lines' (that are automatically justified to 168 hour CTs), matching the remaining penetrations up with the corresponding generic penetrations listed in Sections 8.2.2 through 8.2.4, and determining the final CTs for each CIV. The steps that were followed for WCGS are documented in Section 9.1. The steps are also the methodology that any other utility wanting to implement the change would need to follow.

9.1 IMPLEMENTATION PROCEDURE

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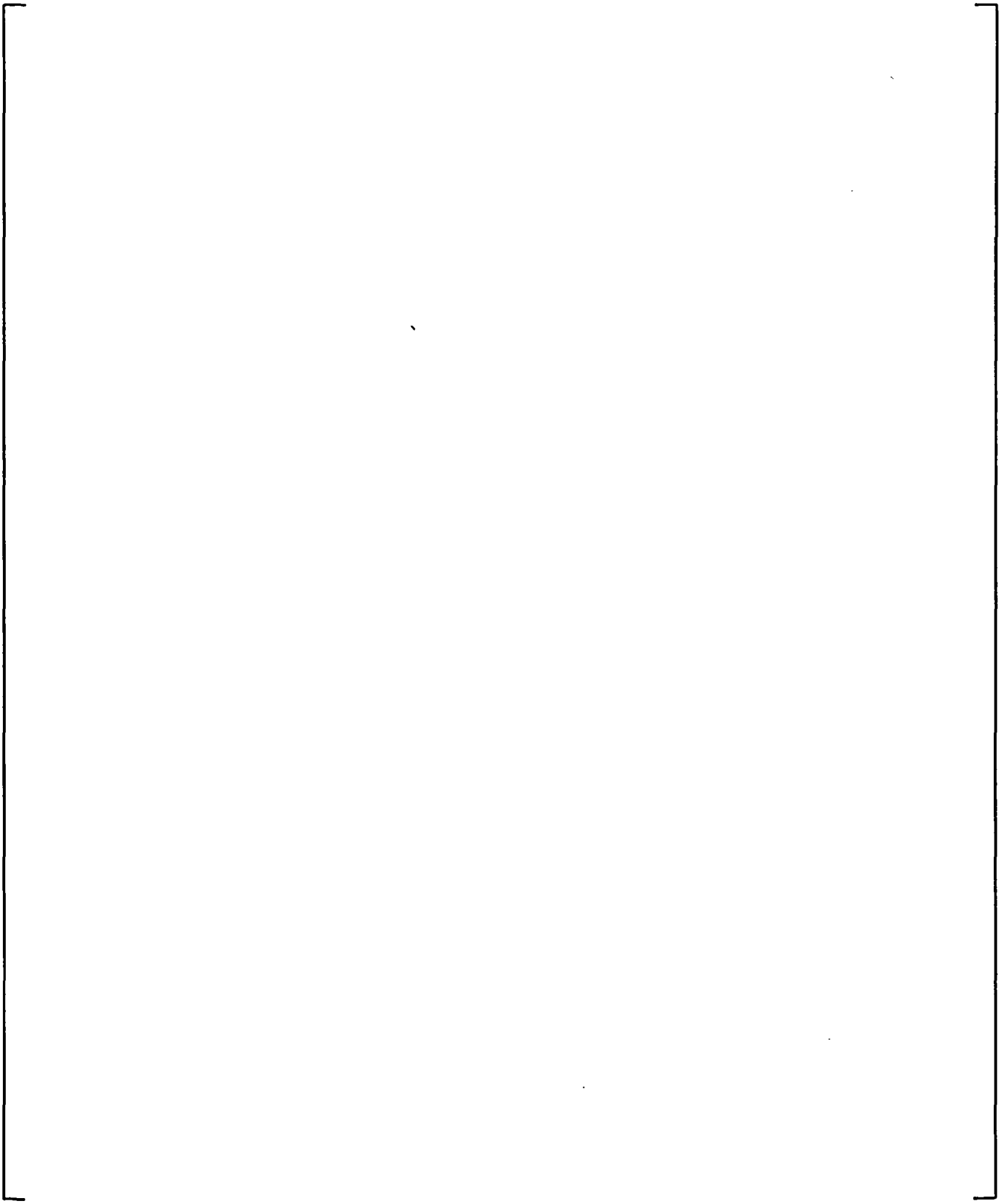

Table 9-1a Core Damage Frequency Inputs		
	Generic Analysis	WCGS
Total Core Damage Frequency [per year]: CDF_T	1.0E-04	5.48E-05[1]
Core Damage Frequency due to Seismic Event [per year]: CDF_{scis}	4.41E-05	see note 2

Note 1: This value is the total internal event, at-power, core damage frequency. The internal and external at-power CDF total is expected to be <1.0E-04/yr.

Note 2: The generic core damage frequency due to a seismic event (CDF_{scis}) per year was obtained from direct plant input for the program. Since WCGS has not performed a seismic-PRA, they do not have the relevant seismic information and the conservative value in the generic analysis is assumed to be appropriate.

Note 3: CDF due to SGTR is not provided since WCGS has no containment penetrations from the SGs due to their containment boundary definition.

Table 9-1b Valve Failure Probabilities, Pftc, (per demand)			
Valve Type	Failure Mode	Generic Analysis	WCGS[4]
SOV	fail to close	1.81E-02	2.00E-03
MOV	fail to close	1.09E-02	6.15E-03
AOV	fail to close	1.81E-02	2.00E-03
Check	fail to reseat	3.44E-03	1.00E-03
SRV	fail to reseat	2.50E-02	3.00E-03

Note 4: The valve failure probabilities were obtained from plant PRA data.

Table 9-1c Beta and Gamma Factors		
Valve Type	Generic Analysis due to valve failing to close, $beta_{ftc}$:	WCGS[5] due to valve failing to close, $beta_{ftc}$:
SOV	0.1	0.08
MOV	0.088	0.038
AOV	0.1	0.08
Check	0.1	0.06
SRV	0.22	0.051
	Due to valve transferring open, $beta_{to}$:	**Due to valve transferring open, $beta_{to}$:**
all valve types	0.1	0.1
	Due to valve transferring open, $gamma_{to}$:	**Due to valve transferring open, $gamma_{to}$:**
all valve types	0.5	0.5

Note 5: The beta factors for valves failing to close were obtained from plant PRA data. The gamma and beta factors for valves transferring open were taken from the "Advanced Light Water Reactor Utility Requirements Document" (Reference 5).

Table 9-1d Assumed Inputs	
PB_{scis} = Seismic Pipe Break Probability for Non-Seismically Qualified Pipe	1
FPB_{random} = Random Pipe Break Frequency (per year)	1.10E-03
	for all valve types:
P_{to} = Probability that Valve Spuriously Transfers Open (per hour)	1.00E-06
m = Corrective Maintenance Frequency (per year) (per valve)	1.00E-01
P_{mE} = Probability that Extra Valve is Disabled due to Maintenance (per demand) [assume extra valve currently has 72 hour CT]	8.22E-04

9.2 RESULTS

Table 9-3 below displays the cumulative percentages of justified CTs for this WCGS CIV CT extension study. This shows that 70% of all WCGS's CIVs are justified for a CT extension to a full 168 hours, or 7 days. Ninety-three percent of those penetrations are justified to a CT of at least 8 hours. Table 9-2 provides a detailed description of each WCGS CIV, how they were grouped, and the final CTs.

Table 9-3 Cumulative Percentages of CIV Completion Time Extensions Application of the Generic Results to the Wolf Creek Generating Station

Completion Time (hours)	Percentage of CIVs
8	93%
12	91%
24	88%
48	80%
72	80%
168	70%

Table 9-2 WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-1 to P-12	-	-	-	-	-	-	-
P-13	ENHV-07		I,C #1	System pressure boundary maintained System pressure boundary compromised	8 hrs 4 hrs	168 hrs 168 hrs	8 hrs 4 hrs
P-14	EJHV-8811B		I,C #1	System pressure boundary maintained System pressure boundary compromised	8 hrs 4 hrs	168 hrs 168 hrs	8 hrs 4 hrs
	EJHV-24		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJHV-26		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJV-189		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-15	EJHV-8811A	[redacted]	I,C #1	System pressure boundary maintained System pressure boundary compromised	8 hrs 4 hrs	168 hrs 168 hrs	8 hrs 4 hrs
	EJHV-23		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJHV-25		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJV-187		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-16	ENHV-01		I,C #1	System pressure boundary maintained System pressure boundary compromised	8 hrs 4 hrs	168 hrs 168 hrs	8 hrs 4 hrs
P-21	EJHCV-8825		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJHV-8840	[redacted]	II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EJV-056	[ ]	II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
	EJV-124		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJV-122		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJV-118,120		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJV-175,6,7,8	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EJ-8841A	[ ]	II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 168 hrs	168 hrs 168 hrs	72 hrs 168 hrs
	EJ-8841B		II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 168 hrs	168 hrs 168 hrs	72 hrs 168 hrs
P-22	BBHV-8351B		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BBV-354	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	BBV-246		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BBV148		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-23	BGHV-8160		II,B #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	BGV-363		II,B #1	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
	BGHV-8152		II,B #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs
P-24	BGHV-8112		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	BGV-135		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BGHV-8100		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BGV-457		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-25	BLHV-8047	[ ]	I,A #4	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BLV-054		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BL-8046		I,A #4	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-26	HBHV-7176		I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 24 hrs	168 hrs 168 hrs	72 hrs 24 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	HBHV-7136		I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
	HBV-419		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-27	EJHV-8809B		II,A #6	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	4 hrs 4 hrs	4 hrs 4 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EJV-058	[ ]	II,A #6	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	4 hrs 4 hrs	4 hrs 4 hrs
	EJHCV-8890B		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJV-086		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJV-088,090		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EP-8818C	[ ]	II,A #6	System pressure boundary maintained System pressure boundary compromised	4 hrs 168 hrs	4 hrs 4 hrs	4 hrs 4 hrs
	EJV-179, 180, 181,182		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EP-8818D		II,A #6	System pressure boundary maintained System pressure boundary compromised	4 hrs 168 hrs	4 hrs 4 hrs	4 hrs 4 hrs
	EJV-166		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-28	EFHV-32	[redacted]	I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
	EFHV-34	[redacted]	I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 24 hrs	168 hrs 168 hrs	72 hrs 24 hrs
	EFV-278	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-29	EFHV-46	[redacted]	I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 24 hrs	168 hrs 168 hrs	72 hrs 24 hrs
	EFV-279	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EFHV-50	[ ]	I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
P-30	KAFV-29		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	KAV-218		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	KAV-204		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-32	LFFV-95	[ ]	I,A #14 or I,A #4 if valve 96 is open	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	LFFV-96	[ ]	I,A #14 or I,A #4 if valve 96 is open	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	LFV-093		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-34	GPV-010		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	Flanges		I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-39	BBHV-8351C	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BBV-356		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BBV-247		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	BBV-178	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-40	BBHV-8351D	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BBV-358	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	BBV-248		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BBV-208		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-41	BBHV-8351A		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	BBV-352	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BBV-245		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BBV-118		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-43	HDV-016		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation [a,c]	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	HDV-023		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	HDV-017		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-44	HBHV-7126		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	HBHV-7150		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	HBV-420	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-45	EPV-046	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EPV-043	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EPHV-8880	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-48	EMHV-8802B	[redacted]	II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EMHV-8824	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	**168 hrs** **168 hrs**
	EMV-003		II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 168 hrs	168 hrs 168 hrs	**72 hrs** **168 hrs**
	EMV-004		II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 168 hrs	168 hrs 168 hrs	**72 hrs** **168 hrs**

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EMV-060, 061, 063,064 EMV-217, 169	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-170,172		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-059		II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
P-49	EMHV-8835		II,A #7	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	4 hrs 4 hrs	4 hrs 4 hrs
	EMHV-8823	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EPV-020	[	II,A #7	System pressure boundary maintained System pressure boundary compromised	4 hrs 168 hrs	4 hrs 168 hrs	4 hrs 168 hrs
	EPV-010	]	II,A #7	System pressure boundary maintained System pressure boundary compromised	4 hrs 168 hrs	4 hrs 168 hrs	4 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EPV-040		II,A #7	System pressure boundary maintained System pressure boundary compromised	4 hrs 168 hrs	4 hrs 168 hrs	4 hrs 168 hrs
	EPV-030		II,A #7	System pressure boundary maintained System pressure boundary compromised	4 hrs 168 hrs	4 hrs 168 hrs	4 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EMV-067		II,A #7	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	4 hrs 4 hrs	4 hrs 4 hrs
	EMV-068 thru EMV-075		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-218 EMV-162 thru EMV-168		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-51	GPV-011		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GPV-012		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	Flanges		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-52	EJHV-8701B	[redacted]	II,A #8 & I,C #23	System pressure boundary maintained System pressure boundary compromised	4 hrs 8 hrs	4 hrs 168 hrs	4 hrs 8 hrs
	EJ-8708B	[redacted]	I,C #23	System pressure boundary maintained System pressure boundary compromised	8 hrs 8 hrs	168 hrs 168 hrs	8 hrs 8 hrs
P-53	ECV-084		I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs
	ECV-085		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	ECV-083		I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-54	ECV-087	[redacted]	I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs
	ECV-086		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	ECV-088		I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs
P-55	ECV-095		I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs
	ECV-094		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	ECV-096		I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-56	GSHV-9	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-8		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSV-032		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-56	GSHV-38		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-39		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSV-058		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-57	SJHV-131		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	SJHV-132		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	SJV-111		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	SJV-114		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-58	EMV-006		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-182		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-123		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EMHV-8888		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-59	N/A		II,A #9	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-62	BBHV-8026		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BBHV-8027		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-63	KAV-118		I,A #2	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	KAV-163		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	KAV-039		I,A #2	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-64	SJHV-128	[ ]	II,A #4	System pressure boundary maintained System pressure boundary compromised	12 hrs 168 hrs	168 hrs 168 hrs	12 hrs 168 hrs
	SJHV-129		II,A #4	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	SJHV-130		II,A #4	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	SJV-106		II,A #4	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-65	GSHV-20		I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	GSHV-21		I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs
	GSV-041		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-66	ENHV-12		I,C #4	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	ENV-080		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	ENV-017		I,C #4	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-67	KCHV-253		I,A #2	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	KCV-478		I,A #2	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	KCV-431		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-69	SJHV-12		II,A #2	System pressure boundary maintained System pressure boundary compromised	24 hrs 168 hrs	168 hrs 168 hrs	24 hrs 168 hrs
	SJHV-13		II,A #2	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs
	SJV-071		II,A #2	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-71	EFHV-31	[	I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
	EFV-276		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EFHV-33		I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 24 hrs	168 hrs 168 hrs	72 hrs 24 hrs
P-73	EFHV-45		I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 24 hrs	168 hrs 168 hrs	72 hrs 24 hrs
	EFV-277	]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EFHV-49	[ ]	I,B #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
P-74	EGHV-58		I,B #7	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EGV-090		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EGV-204	[ ]	I,B #7	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EGHV-127	[redacted]	I,B #7	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-75	EGHV-60		I,B #8	System pressure boundary maintained System pressure boundary compromised	72 hrs 24 hrs	168 hrs 168 hrs	72 hrs 24 hrs
	EG-V372		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EGHV-59		I,B #8	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EGHV-131	[ ]	I,B #8	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
	EGHV-130		I,B #8	System pressure boundary maintained System pressure boundary compromised	72 hrs 24 hrs	168 hrs 168 hrs	72 hrs 24 hrs
P-76	EGHV-62		I,B #8	System pressure boundary maintained System pressure boundary compromised	72 hrs 24 hrs	168 hrs 168 hrs	72 hrs 24 hrs
	EGV-371		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EGHV-61		I,B #8	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
	EGHV-132		I,B #8	System pressure boundary maintained System pressure boundary compromised	72 hrs 24 hrs	168 hrs 168 hrs	72 hrs 24 hrs
	EGHV-133		I,B #8	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-78	BMV-045	[ ]	I,A #1	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	**24 hrs** **24 hrs**
	BMV-302		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	**168 hrs** **168 hrs**
	BMV-046		small line	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	**24 hrs** **24 hrs**

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-79	EJHV-8701A		II,A #8 & I,C #23	System pressure boundary maintained System pressure boundary compromised	4 hrs 8 hrs	4 hrs 168 hrs	4 hrs 8 hrs
	EJ8708A		I,C #23	System pressure boundary maintained System pressure boundary compromised	8 hrs 8 hrs	168 hrs 168 hrs	8 hrs 8 hrs
	EJV-154		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-80	BGHV-8105		II,B #3	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	BGV-342		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	BG8381	[ ]	II,B #3	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-82	EJHV-8809A		II,A #6	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	4 hrs 4 hrs	4 hrs 4 hrs
	EJV-054		II,A #6	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	4 hrs 4 hrs	4 hrs 4 hrs
	EP8818A		II,A #6	System pressure boundary maintained System pressure boundary compromised	4 hrs 168 hrs	4 hrs 4 hrs	4 hrs 4 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EP8818B		II,A #6	System pressure boundary maintained System pressure boundary compromised	4 hrs 168 hrs	4 hrs 4 hrs	4 hrs 4 hrs
	EJHCV-8890A		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJV-134, V-136		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EJV-132		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EJV-171, EJV-172, EJV-173, EJV-174		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-83 to P-86	-		-	-	-	-	-
P-87	EMHV-8802A		II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
	EMHV-8881		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-001		II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 168 hrs	168 hrs 168 hrs	72 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EMV-002		II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 168 hrs	168 hrs 168 hrs	72 hrs 168 hrs
	EMV-052, V-053, V-055, V-056, V-184, V-185		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-051		II,A #5	System pressure boundary maintained System pressure boundary compromised	72 hrs 72 hrs	168 hrs 168 hrs	72 hrs 72 hrs
	EMV-186, V-187		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-88	EMHV-8801A	[ ]	II,A #11	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMHV-8801B		II,A #11	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-077		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMHV-8843		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-8815	[ ]	II,A #11	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	EMV-151	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-89	ENHV-06		I,C #4	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	ENV-076		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	ENV-013		I,C #4	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-91	N/A	[ ]	II,A #9	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-92	EMHV-8964	[redacted]	II,A #1	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-153	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMHV-8871	[redacted]	II,A #1	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	EMV-038	[redacted]	II,A #1	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-93	SJHV-5	[ ]	II,A #3	System pressure boundary maintained System pressure boundary compromised	24 hrs 168 hrs	168 hrs 168 hrs	24 hrs 168 hrs
	SJHV-6		II,A #3	System pressure boundary maintained System pressure boundary compromised	24 hrs 24 hrs	168 hrs 168 hrs	24 hrs 24 hrs
	SJV-069		II,A #3	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	SJHV-127		II,A #3	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-95	SJHV-18		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	SJHV-19		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	SJV-066		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-97	GSHV-18		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-17		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSV-036		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-97	GSHV-33		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-34		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSV-052		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-98	KBV-001	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	KBV-002		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-99	GSHV-3		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-4		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-5		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSV-029		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-99	GSHV-36		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-37		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-101	GSHV-12		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-13		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-14		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSV-033		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-101	GSHV-31		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSHV-32		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
	GSV-050		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
P-103	Pressure Transmitter		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation [a,c]	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-104	Pressure Transmitter	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
E-256	Pressure Transmitter	[redacted]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	168 hrs 168 hrs
V-160	GTHZ-9	[redacted]	I,A #15 or I,A #16 if valves are open	System pressure boundary maintained System pressure boundary compromised or if valve is open: System pressure boundary maintained System pressure boundary compromised	12 hrs 12 hrs or: 24 hrs 24 hrs	168 hrs 168 hrs or: 168 hrs 168 hrs	12 hrs 12 hrs or: 24 hrs 24 hrs
	GTHZ-8	[redacted]	I,A #15 or I,A #16 if valves are open	System pressure boundary maintained System pressure boundary compromised or if valve is open: System pressure boundary maintained System pressure boundary compromised	12 hrs 12 hrs or: 24 hrs 24 hrs	168 hrs 168 hrs or: 168 hrs 168 hrs	12 hrs 12 hrs or: 24 hrs 24 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis							
Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	GTHZ-12	[ ]	I,A #15 or I,A #16 if valves are open	System pressure boundary maintained System pressure boundary compromised or if valve is open: System pressure boundary maintained System pressure boundary compromised	12 hrs 12 hrs or: 24 hrs 24 hrs	168 hrs 168 hrs or: 168 hrs 168 hrs	**12 hrs** **12 hrs** **or:** **24 hrs** **24 hrs**
	GTHZ-11		I,A #15 or I,A #16 if valves are open	System pressure boundary maintained System pressure boundary compromised or if valve is open: System pressure boundary maintained System pressure boundary compromised	12 hrs 12 hrs or: 24 hrs 24 hrs	168 hrs 168 hrs or: 168 hrs 168 hrs	**12 hrs** **12 hrs** **or:** **24 hrs** **24 hrs**
	GTV0223		small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	**168 hrs** **168 hrs**

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
V-161	GTHZ-7	[ ]	I,A #15 or I,A #16 if valves are open	System pressure boundary maintained System pressure boundary compromised or if valve is open: System pressure boundary maintained System pressure boundary compromised	12 hrs 12 hrs or: 24 hrs 24 hrs	168 hrs 168 hrs or: 168 hrs 168 hrs	12 hrs 12 hrs or: 24 hrs 24 hrs
	GTHZ-5	[ ]	I,A #15 or I,A #16 if valves are open	System pressure boundary maintained System pressure boundary compromised or if valve is open: System pressure boundary maintained System pressure boundary compromised	12 hrs 12 hrs or: 24 hrs 24 hrs	168 hrs 168 hrs or: 168 hrs 168 hrs	12 hrs 12 hrs or: 24 hrs 24 hrs
	GTHZ-4	[ ]	I,A #15 or I,A #16 if valves are open	System pressure boundary maintained System pressure boundary compromised or if valve is open: System pressure boundary maintained System pressure boundary compromised	12 hrs 12 hrs or: 24 hrs 24 hrs	168 hrs 168 hrs or: 168 hrs 168 hrs	12 hrs 12 hrs or: 24 hrs 24 hrs

Table 9-2 (cont.) WCGS Containment Isolation Valve CT Results – Application of Generic Analysis

Penetration #	Valve	Grouping Explanation a,c	Group & Calc #	Maintenance Activity Type	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
	GTHZ-6	[ ]	I,A #15 or I,A #16 if valves are open	System pressure boundary maintained System pressure boundary compromised or if valve is open: System pressure boundary maintained System pressure boundary compromised	12 hrs 12 hrs or: 24 hrs 24 hrs	168 hrs 168 hrs or: 168 hrs 168 hrs	**12 hrs** **12 hrs** **or:** **24 hrs** **24 hrs**
	GTV0222	[ ]	small line	System pressure boundary maintained System pressure boundary compromised	168 hrs 168 hrs	168 hrs 168 hrs	**168 hrs** **168 hrs**

10 PLANT SPECIFIC ANALYSIS

This section documents the plant specific analysis that was done for WCGS.

The plant specific study involved taking WCGS-specific parameters and implementing them into the generic probabilistic evaluation of Section 8.2 to get actual WCGS-specific results. The purpose of this study was to determine how many more of WCGS's CIVs could be justified for longer CT relaxations in addition to those justified under the generic analysis. The generic analysis was a conservative assessment, and therefore, applicable to all Westinghouse Owner's Group plants, including WCGS. A plant specific application will result in additional CT improvements. Note that the threshold containment hole size, for penetrations from the containment atmosphere to the outside environment, that can provide a large release remained at 2 inches. That is, containment hole sizes greater than 2 inches can result in a large release and hole sizes of 2 inches or less cannot.

First, the WCGS CIVs that were unable to meet the full 168 hour CT extension under the generic analysis were identified (see Table 9-2 of Section 9). Next, the necessary input parameters relative to WCGS were obtained and the analysis of Sections 8.2 and 8.3 was repeated using the WCGS specific parameters. Re-doing the analysis plant specifically made it possible to determine whether or not longer CTs could be justified for WCGS.

The re-analysis involved re-calculation of ICLERPs and ΔLERFs (see the methodology of Section 8.2) using WCGS specific parameters for those penetrations that could not be justified to the full 168 hour CT under the application of the generic analysis of Section 9.

The methodology, terminology and assumptions that were applicable in the generic analysis (of Sections 8.2 and 8.3) are all applicable to this WCGS specific analysis. The only difference is that WCGS input parameters are used, rather than generic parameters. The WCGS input parameters are listed in Tables 9-1a through 9-1d. Since WCGS does not quantify all external events, the value for CDF_T was set to 1.0E-04/yr.

10.1 CALCULATIONS

The ICLERP and/or ΔLERF (depending on which was more limiting) was re-calculated with the WCGS-specific input parameters of Tables 9-1a, 9-1b, 9-1c, and 9-1d for the CIVs with CTs less than 168 hrs. The inputs were used in the appropriate ICLERP and ΔLERF equations discussed in Sections 8.2.2 through 8.2.4. Similar to Step 5 of Section 9.1, Guidelines A and B had to be followed when choosing which valve type to assume for the penetration, however this time, Guidelines A and B are Wolf-Creek specific.

a,c

a,c

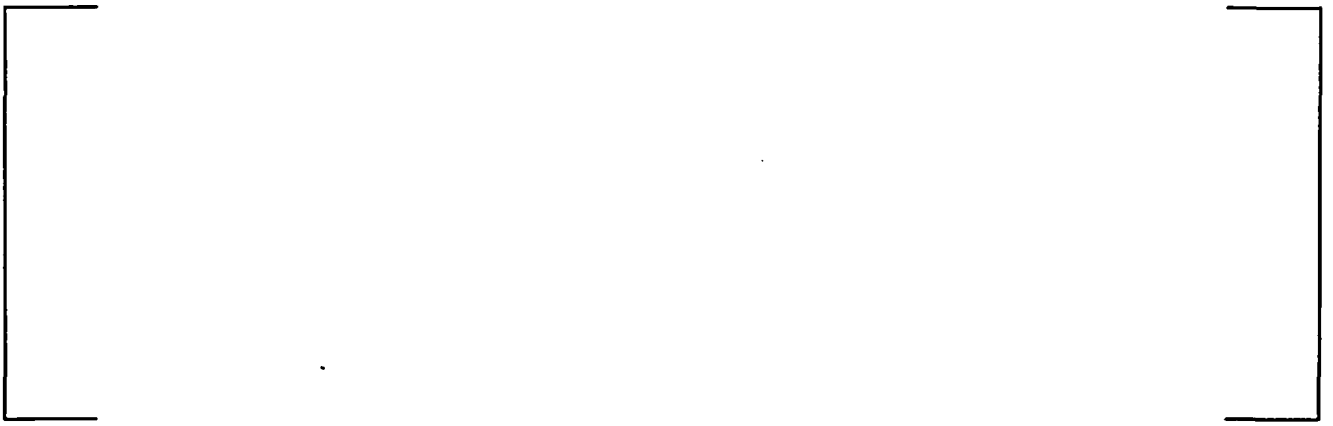

Table 10-1 summarizes those CIVs that could not meet the full 168 hour CT under the application of the generic analysis. It identifies which CIVs received longer CTs due to the plant specific probabilistic re-evaluation. Note, not all CIVs were able to be justified for longer CTs due to failure probability and/or penetration configuration.

Table 10-1 Re-Calculated Completion Times for the Plant Specific Analysis (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-13: ENHV-07	[redacted]	I,C #23	System pressure boundary maintained	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr
			System pressure boundary compromised	4 hr	168 hr	4 hr	4 hr	168 hr	4 hr
P-14: EJHV-8811B		I,C #23	System pressure boundary maintained	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr
			System pressure boundary compromised	4 hr	168 hr	4 hr	4 hr	168 hr	4 hr
P-15: EJHV-8811A		I,C #23	System pressure boundary maintained	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr
			System pressure boundary compromised	4 hr	168 hr	4 hr	4 hr	168 hr	4 hr
P-16: ENHV-01		I,C #23	System pressure boundary maintained	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr
			System pressure boundary compromised	4 hr	168 hr	4 hr	4 hr	168 hr	4 hr
P-21: EJHV-8840		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
P-21: EJV-056		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-21: EJ-8841A		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-21: EJ-8841B		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-23: BGHV-8160		II,B #39	System pressure boundary maintained	24 hr	168 hr	24 hrs	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hrs	48 hr	168 hr	48 hr
P-23: BGV-363		II,B #39	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
P-23: BGHV-8152		II,B #39	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-26: HBHV-7176		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
P-26: HBHV-7136		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
P-27: EJHV-8809B		II,A #33	System pressure boundary maintained	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
			System pressure boundary compromised	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
P-27: EJV-058		II,A #33	System pressure boundary maintained	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
			System pressure boundary compromised	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
P-27: EP-8818C		II,A #33	System pressure boundary maintained	4 hr	4 hr	4 hr	8 hr	4 hr	4 hr
			System pressure boundary compromised	168 hr	4 hr	4 hr	168 hr	4 hr	4 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-27: EP-8818D		II,A #33	System pressure boundary maintained	4 hr	4 hr	4 hr	8 hr	4 hr	4 hr
			System pressure boundary compromised	168 hr	4 hr	4 hr	168 hr	4 hr	4 hr
P-28: EFHV-32		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
P-28: EFHV-34		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	72 hr	168 hr	72 hr
P-29: EFHV-46		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	72 hr	168 hr	72 hr
P-29: EFHV-50		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-34: Flanges	[ ]	I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-48: EMHV-8802B		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
P-48: EMV-003		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-48: EMV-004		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis**
(only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-48: EMV-059		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
P-49: EMHV-8835		II,A #34	System pressure boundary maintained	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
			System pressure boundary compromised	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
P-49: EPV-020		II,A #34	System pressure boundary maintained	4 hr	4 hr	4 hr	8 hr	4 hr	4 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-49: EPV-010		II,A #34	System pressure boundary maintained	4 hr	4 hr	4 hr	8 hr	4 hr	4 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-49: EPV-040		II,A #34	System pressure boundary maintained	4 hr	4 hr	4 hr	8 hr	4 hr	4 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-49: EPV-030		II,A #34	System pressure boundary maintained	4 hr	4 hr	4 hr	8 hr	4 hr	4 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-49: EMV-067		II,A #34	System pressure boundary maintained	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
			System pressure boundary compromised	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-52: EJHV-8701B		II,A #35 & I,C #23	System pressure boundary maintained	4 hr	4 hr	4 hr	4 hr	4 hr	4 hr
			System pressure boundary compromised	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr
P-52: EJ-8708B		I,C #23	System pressure boundary maintained	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr
			System pressure boundary compromised	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr
P-53: ECV-084		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-53: ECV-083		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-54: ECV-087		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-54: ECV-088		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-55: ECV-095		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-55: ECV-096		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-64: SJHV-128		II,A #31	System pressure boundary maintained	12 hr	168 hr	12 hr	12 hr	168 hr	12 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-65: GSHV-20		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-65: GSHV-21		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis**
(only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-69: SJHV-12		II,A #30a	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-69: SJHV-13		II,A #30a	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-71: EFHV-31		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
P-71: EFHV-33		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	72 hr	168 hr	72 hr
P-73: EFHV-45		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	72 hr	168 hr	72 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis**
(only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-73: EFHV-49		I,B #20	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
P-75: EGHV-60		I,B #22a	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	72 hr	168 hr	72 hr
P-75: EGHV-59		I,B #22a	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
P-75: EGHV-131		I,B #22a	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis**
(only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-75: EGHV-130		I,B #22a	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-76: EGHV-62		I,B #22a	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	72 hr	168 hr	72 hr
P-76: EGHV-61		I,B #22a	System pressure boundary maintained	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	168 hr	168 hr	168 hr
P-76: EGHV-132		I,B #22a	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis**
(only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-76: EGHV-133		I,B #22a	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
P-78: BMV-045		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-78: BMV-046		I,A #1	System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
P-79: EJHV-8701A		II,A #35 & I,C #23	System pressure boundary maintained	4 hr	4 hr	4 hr	4 hr	4 hr	4 hr
			System pressure boundary compromised	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-79: EJ8708A		I,C #23	System pressure boundary maintained	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr
			System pressure boundary compromised	8 hr	168 hr	8 hr	8 hr	168 hr	8 hr
P-82: EJHV-8809A		II,A #33	System pressure boundary maintained	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
			System pressure boundary compromised	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
P-82: EJV-054		II,A #33	System pressure boundary maintained	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
			System pressure boundary compromised	72 hr	4 hr	4 hr	72 hr	4 hr	4 hr
P-82: EP8818A		II,A #33	System pressure boundary maintained	4 hr	4 hr	4 hr	8 hr	4 hr	4 hr
			System pressure boundary compromised	168 hr	4 hr	4 hr	168 hr	4 hr	4 hr
P-82: EP8818B		II,A #33	System pressure boundary maintained	4 hr	4 hr	4 hr	8 hr	4 hr	4 hr
			System pressure boundary compromised	168 hr	4 hr	4 hr	168 hr	4 hr	4 hr
P-87: EMHV-8802A		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-87: EMV-001		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-87: EMV-002		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr
P-87: EMV-051		II,A #32	System pressure boundary maintained	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
			System pressure boundary compromised	72 hr	168 hr	72 hr	72 hr	168 hr	72 hr
P-93: SJHV-5		II,A #30b	System pressure boundary maintained	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
			System pressure boundary compromised	168 hr	168 hr	168 hr	168 hr	168 hr	168 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis**
(only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
P-93: SJHV-6		II,A #30b	System pressure boundary maintained	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
V-160: GTHZ-9		I,A #15 or I,A #15a if valves are open	System pressure boundary maintained	12 hr	168 hr	12 hr	12 hr	168 hr	12 hr
			System pressure boundary compromised or if valve is open:	12 hr or:	168 hr or:	12 hr or:	12 hr or:	168 hr or:	12 hr or:
			System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
V-160: GTHZ-8		I,A #15 or I,A #15a if valves are open	System pressure boundary maintained	12 hr	168 hr	12 hrs	12 hr	168 hr	12 hr
			System pressure boundary compromised or if valve is open:	12 hr or:	168 hr or:	12 hrs or:	12 hr or:	168 hr or:	12 hr or:
			System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis** (only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
V-160: GTHZ-12		I,A #15 or I,A #15a if valves are open	System pressure boundary maintained	12 hr	168 hr	12 hr	12 hr	168 hr	12 hr
			System pressure boundary compromised or if valve is open:	12 hr or:	168 hr or:	12 hr or:	12 hr or:	168 hr or:	12 hr or:
			System pressure boundary maintained	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
V-160: GTHZ-11		I,A #15 or I,A #15a if valves are open	System pressure boundary maintained	12 hr	168 hr	12 hr	12 hr	168 hr	12 hr
			System pressure boundary compromised or if valve is open:	12 hr or:	168 hr or:	12 hr or:	12 hr or:	168 hr or:	12 hr or:
			System pressure boundary maintained	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
V-161: GTHZ-7		I,A #15 or I,A #15a if valves are open	System pressure boundary maintained	12 hr	168 hr	12 hr	12 hr	168 hr	12 hr
			System pressure boundary compromised or if valve is open:	12 hr or:	168 hr or:	12 hr or:	12 hr or:	168 hr or:	12 hr or:
			System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr

Table 10-1 (cont.) **Re-Calculated Completion Times for the Plant Specific Analysis**
(only for the CIVs with a CT less than 168 hrs from the application of the generic results)

Penetration: Valve ID	Grouping Explanation (from Table 9-2) a,c	Group & Calc #	Maintenance Activity Type	Based on Application of Generic Results			Based on Application of Wolf Creek Results		
				ICLERP @ CT:	ΔLERF @ CT:	Justified CT	ICLERP @ CT:	ΔLERF @ CT:	Justified CT
V-161: GTIIZ-5		I,A #15 or I,A #15a if valves are open	System pressure boundary maintained	12 hr	168 hr	12 hr	12 hr	168 hr	12 hr
			System pressure boundary compromised or if valve is open:	12 hr	168 hr	12 hr	12 hr	168 hr	12 hr
				or:	or:	or:	or:	or:	or:
			System pressure boundary maintained	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
V-161: GTHZ-4		I,A #15 or I,A #15a if valves are open	System pressure boundary maintained	12 hr	168 hr	12 hrs	12 hr	168 hr	12 hr
			System pressure boundary compromised or if valve is open:	12 hr	168 hr	12 hrs	12 hr	168 hr	12 hr
				or:	or:	or:	or:	or:	or:
			System pressure boundary maintained	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	48 hr	168 hr	48 hr
V-161: GTIIZ-6		I,A #15 or I,A #15a if valves are open	System pressure boundary maintained	12 hr	168 hr	12 hr	12 hr	168 hr	12 hr
			System pressure boundary compromised or if valve is open:	12 hr	168 hr	12 hr	12 hr	168 hr	12 hr
				or:	or:	or:	or:	or:	or:
			System pressure boundary maintained	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr
			System pressure boundary compromised	24 hr	168 hr	24 hr	24 hr	168 hr	24 hr

10.2 RESULTS

The WCGS-specific analysis resulted in additional extended CTs for their CIVs than the generic application. This is related to the conservative nature of the generic analysis that is applicable to all Westinghouse NSSS plants, that used the most limiting values. Table 10-2 displays the comparison of using the plant specific approach of Section 10 to the generic approach performed in the lead plant study of Section 9. It can be seen that out of all of WCGS's containment isolation valves, 74% of them can be justified for the full 168 hour CT under this plant specific analysis, which is a 4% increase from the generic analysis results.

Table 10-2 Cumulative Percentages of CIV Completion Time Extensions Generic Results vs. Plant Specific Results as Applied to the Wolf Creek Generating Station

Completion Time (hours)	Percentage of CIVs Generic Results	Percentage of CIVs Plant Specific Results
8	93%	94%
12	91%	92%
24	88%	88%
48	80%	82%
72	80%	81%
168	70%	74%

11 CONCLUSIONS

Through a risk-informed evaluation of Completion Time extensions for containment isolation valves that is consistent with NRC acceptance criteria, the following conclusions are drawn:

- Through the considerations discussed in Section 8.3, a threshold containment hole size greater than 2 inches was identified as the point a large release could occur. Containment holes sizes less than or equal to 2 inches in diameter will not produce a large release. This is applicable to penetrations from the containment atmosphere to the outside environment. The CTs for CIVs in penetrations less than or equal to 2 inches default to 168 hours.

- Through the probabilistic approach of Section 8.2, generic penetration configurations were evaluated for acceptable CTs. Based on this, the completion times for the generic listing of containment isolation valves should be increased to the values provided in Tables 8-2, 8-3, and 8-4. The completion time extensions account for valves of various types with different methods of maintenance. The ICLERP and ΔLERF for each penetration at the proposed CT extensions meet the acceptance criteria of Regulatory Guides of 1.174 and 1.177.

- The lead plant application of the generic analysis of Section 9 demonstrates a) that the analysis is applicable and beneficial to utilities; 70% of all of WCGS's CIVs were justified to the full 7 day completion time, and b) the process to follow for utility implementation.

- The plant specific analysis of Section 10 illustrates that the generic analysis is conservative and longer CTs can be achieved on a plant-specific basis. Performing the plant specific analysis with WCGS resulted in 74% of their CIVs being justified to the full completion time of 7 days, a 4% increase from the generic application.

12 REFERENCES

1. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," July 1998.

2. Regulatory Guide 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," August 1998.

3. "Standard Technical Specifications, Westinghouse Plants," U.S. NRC, NUREG-1431, Vol. 1, Rev. 2.

4. Information obtained from plant specific PRA databases for WOG plants.

5. "Advanced Light Water Reactor Utility Requirements Document," Volume II, ALWR Evolutionary Plant, Chapter 1, Appendix A, PRA Key Assumptions and Groundrules, Rev. 5, issued December 1992.

6. "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," WCAP-14572, Rev. 1-NP-A.

7. WesSAGE, Version 1.0 for Microsoft Windows.

8. "EPRI PSA Applications Guide," EPRI TR-105396, Project 3200-12, Final Report, August 1995.