REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**475-8596**
SRP Section:	**10.04.08 – Steam Generator Blowdown System**
Application Section:	**10.4.8**
Date of RAI Issue:	**05/04/2016**

Question No. 10.04.08-6

The response to RAI 381-8467, Question 10.04.08-1, provided additional information about the containment isolation signals related to the steam generator blowdown system. The response is dated April 2, 2016, ADAMS Accession Number ML16093A018. The response did not provide all of the information the staff needs to complete its review. The staff requests the following additional information:

a. The response proposes listing additional control signals in Tier 1 Table 2.7.1.8-1, but there is no corresponding change proposed for Tier 1 Figure 2.7.1.8-1. Since Figure 2.7.1.8-1 shows the control signals associated with containment isolation valves, provide your plans for revising Figure 2.7.1.8-1 or the basis for not revising it.

b. The response indicates that Tier 2 Chapter 7 intentionally discusses the instrumentation and controls at a higher level and does not describe individual signals. The staff determined that for consistency and clarity, the signals that activate the containment isolation valves should be identified in Chapter 7, especially in the functional diagrams. Please discuss your plans to add this information to the FSAR.

Response – (Rev. 2)

a. DCD Tier 1 Figure 2.7.1.8-1 and ACRONYM AND ABBREVIATION LIST will be revised to include the HRAS and the BFTHHLAS signals as indicated in the Attachment. And the signal lines in DCD Tier 2 Figure 10.4.8-1 will be revised to a dashed line as indicated in the Attachment. In addition, the signal description in DCD Tier 2 Figure 10.4.8-1 will be corrected as indicated in the Attachment.

b. To activate the containment isolation valves (CIVs), following signals are used:

   1. ESFAS (e.g., SIAS, CSAS, CIAS, MSIS, and AFAS) and DPS (e.g., DPS-AFAS) signals

- Each signal is provided to the associated CIV.

2. Process interlock signal

   DCD Tier 2 Chapter 7.3 and 7.8 describe how the ESFAS and DPS signals are generated based on SRP 7.3 and 7.8. However, there is no discussion about how the ESFAS and DPS signals activate each component in DCD Tier 2 Chapter 7. It is not necessary to describe the component logic description in DCD Tier 2 Chapter 7. The detail information to activate each component is described in the related DCD section such as Chapter 10.

   The process interlock signals are also described in the related DCD section such as Chapter 10.

   Section 7.3.1.9 will be revised to state the actuation of CIVs as follows;

   > The CIVs listed in Table 6.2.4-1 are automatically actuated by CIAS, other ESFAS signals (SIAS, CSAS, MSIS, and AFAS), or process interlock signals such as high radiation actuation signal and tank level actuation signal. The process interlock signals are then entered in a logical "Or" with other ESFAS signals for CIVs actuation. The non-safety-related process interlock signals are sent hardwired to the ESF-CCS via fiber optic cable for electrical isolation.

   For example, steam generator blowdown system CIVs 005, 006, 007, and 008 in Figure 2.7.1.8-1 of DCD Tier 1 are actuated by the CIAS, AFAS, MSIS, and DPS-AFAS. However, those CIVs are not related with the SIAS and CSAS.

Impact on DCD

DCD Tier 1, Figure 2.7.1.8-1 and ACRONYM AND ABBREVIATION LIST, DCD Tier 2, Figure 10.4.8-1, and Subsection 7.3.1.9 will be revised as indicated in Attachment.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

BFTHHLAS Blowdown Flash Tank High-high Level Actuation Signal

ACRONYM AND ABBREVIATION LIST

AAC	alternate alternating current
AB	auxiliary building
AC	alternating current
ACC	analysis computer cabinet
ACP	auxiliary charging pump
ACU	air cleaning unit
AFAS	auxiliary feedwater actuation signal
AFW	auxiliary feedwater
AFWS	auxiliary feedwater system
AFWST	auxiliary feedwater storage tank
AHU	air handling unit
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
AOO	anticipated operational occurrence
AOV	air-operated valve
APC	auxiliary process cabinet
ARMS	area radiation monitoring system
ASME	American Society of Mechanical Engineers
ATWS	anticipated transient without scram
BAMP	boric acid makeup pump
BAST	boric acid storage tank
BISI	bypassed and inoperable status indication
BOP	balance of plant
CCF	common cause failure
CCS	component control system
CCW	component cooling water
CCWS	component cooling water system
CEA	control element assembly
CEACP	CEA change platform

HRAS	High Radiation Actuation Signal
FPS	fire protection system
FTS	fuel transfer system
FWCS	feedwater control system
GCB	generator circuit breaker
GDC	general design criteria (of 10 CFR Part 50, Appendix A)
GTG	gas turbine generator
GWMS	gaseous waste management system
HFE	human factors engineering
HJTC	heated junction thermo couple
HSI	human-system interface
HVAC	heating, ventilation, and air conditioning
HVT	holdup volume tank
HX	heat exchanger
I&C	instrumentation and control
ICI	in-core instrumentation
IHA	integrated head assembly
IPS	information processing system
IRWST	in-containment refueling water storage tank
ISV	intermediate stop valve
ITAAC	inspections, tests, analyses, and acceptance criteria
ITP	interface and test processor
IWSS	in-containment water storage system
LBB	leak before break
LC	load center
LCS	local control station
LLHS	light load handling system
LOCA	loss of coolant accident
LOOP	loss of offsite power
LPD	local power density
LPZ	low population zone

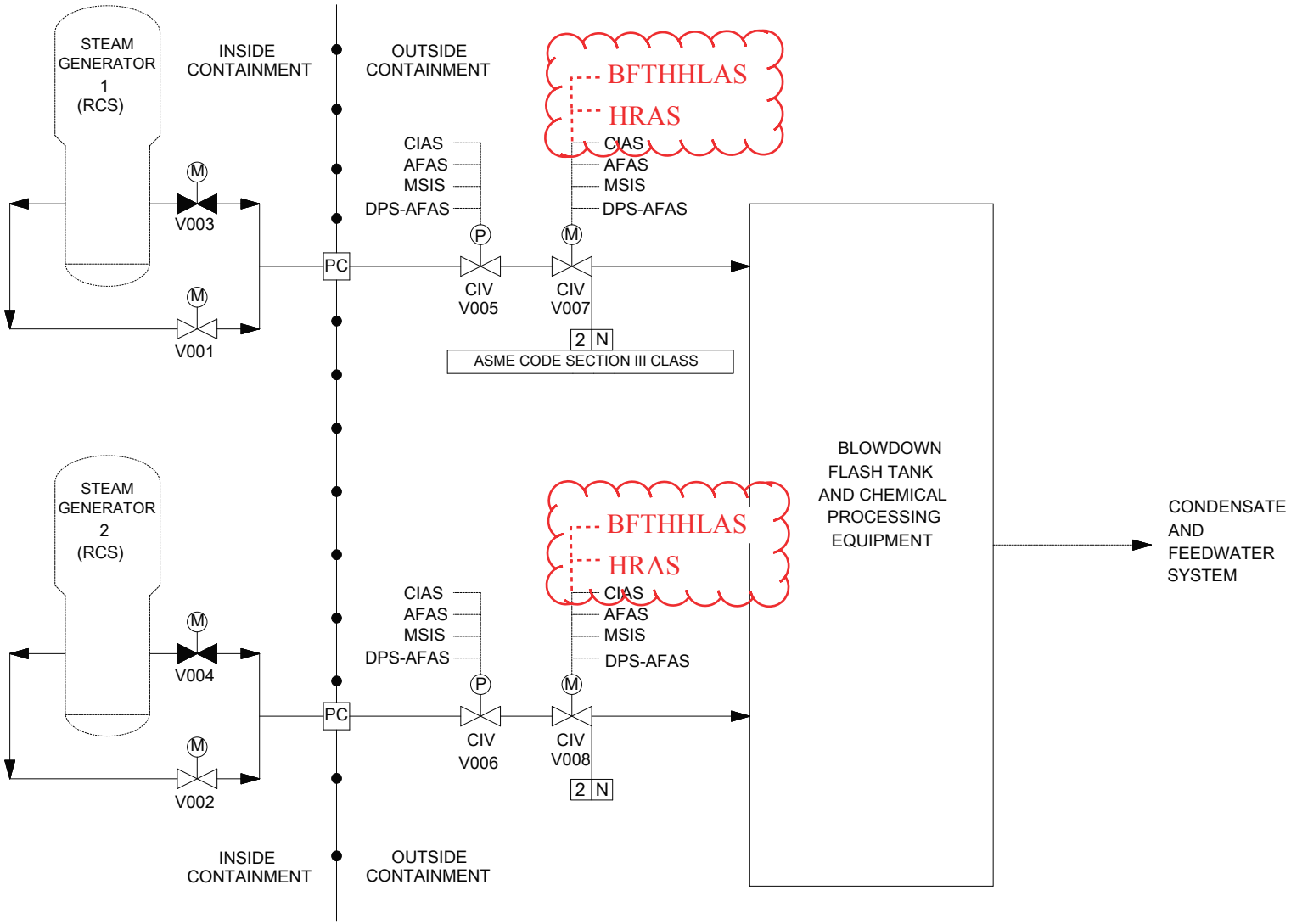

Figure 2.7.1.8-1 Steam Generator Blowdown System

APR1400 DCD TIER 2

RAI 475-8596 - Question 10.4.8-6

RAI 475-8596 - Question 10.4.8-6_Rev.2

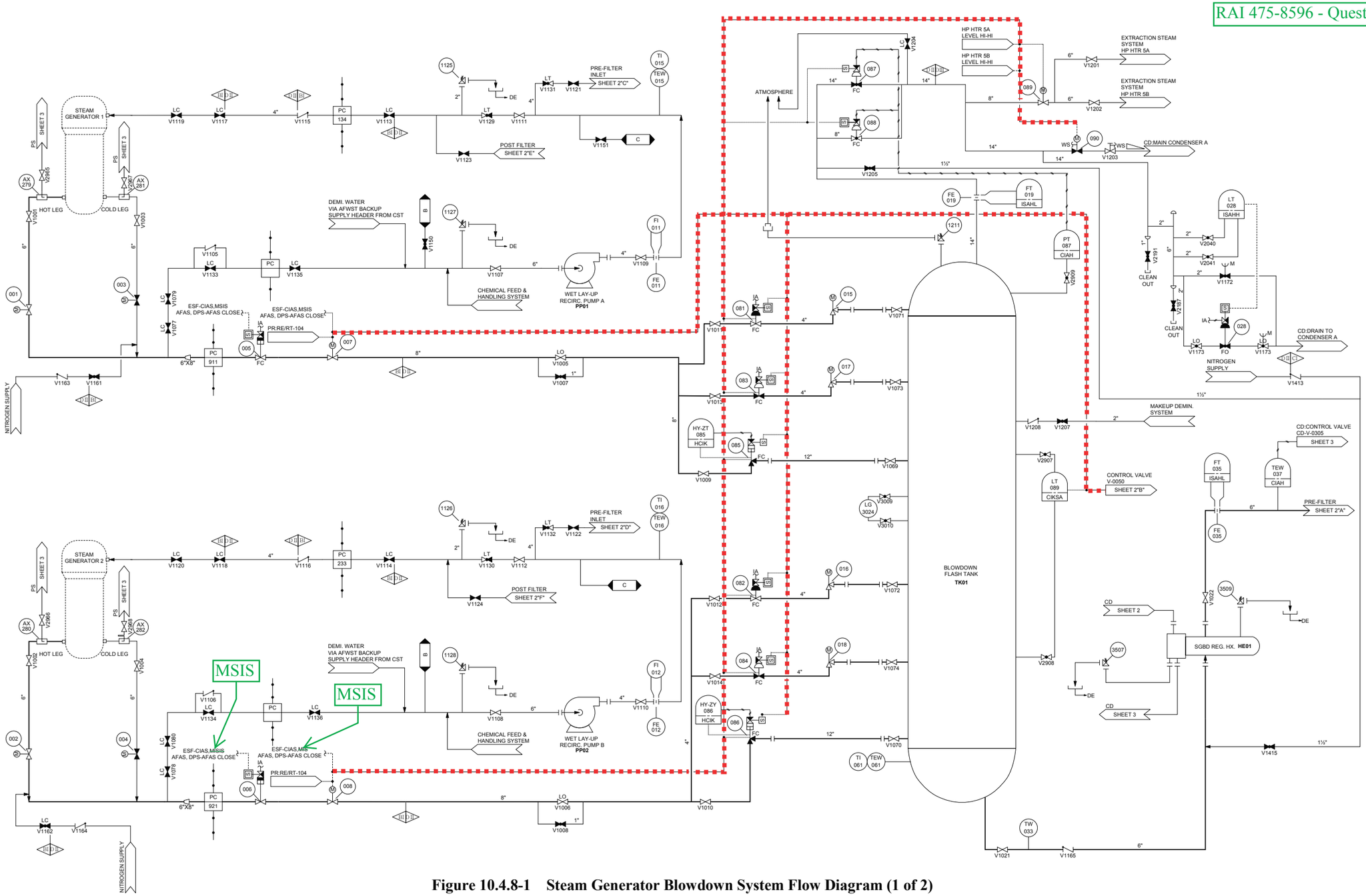

Figure 10.4.8-1 Steam Generator Blowdown System Flow Diagram (1 of 2)

Subsection 6.2.4 contains the description of the containment isolation system (CIS). The actuation system is composed of redundant divisions A and B. The instrumentation and controls of the two divisions are physically and electrically separate and independent so that the loss of one division will not impair the safety function.

The CIS instrumentation and controls are designed for operation during all phases of plant operation. However, the system is removed from service prior to containment leak checking at refueling period intervals in order to prevent undesired system actuation. The removal from service is accomplished in accordance with the procedures prepared by the site operator.

~~The CIS is automatically actuated by a CIAS.~~

Remotely operated (automatic or manual) containment isolation valves (CIVs) are provided with control and indication capability in the MCR. Additionally, a closed position signal of each valve inputs into the IPS, QIAS-P, and QIAS-N for critical function monitoring, which detects unisolated containment penetrations by monitoring the status of valves that are required to close upon a CIAS.

The CIVs listed in Table 6.2.4-1 are automatically actuated by CIAS, other ESFAS signals (SIAS, CSAS, MSIS, and AFAS), ~~and~~ or process interlock signals such as high radiation actuation signal and tank level actuation signal. The process interlock signals are then entered in a logical "Or" with other ESFAS signals for CIVs actuation. The non-safety-related process interlock signals are sent hardwired to the ESF-CCS via fiber optic cable for electrical isolation.

The process information is provided in the MCR, which the operator uses to determine when to isolate the fluid systems.

All systems that provide a path from the containment to the environment (e.g., containment purge and vent systems) have their CIVs closed upon a CIAS.

b. Containment spray system

Subsection 6.5.2 contains the description of the containment spray system (CSS). The CSS is actuated by a CSAS. The containment spray pumps are also actuated by an SIAS. When used in the containment spray configuration, the shutdown cooling pumps are actuated by an SIAS or CSAS.

The actuation system is composed of redundant divisions A and B. The instrumentation and controls of each division are physically and electrically separate and independent. Each division has 100 percent capacity. Therefore, the CSS can sustain the loss of an entire division and still provide its required

~~The CIVs in the CIS are automatically actuated by CIAS and other ESFAS signals (SIAS, CSAS, MSIS, and AFAS) and process interlock signals, which are generated in the individual process systems such as steam generator blowdown systems and etc.~~