SUPPLEMENTAL 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.:	**160-8174**
SRP Section:	**09.03.04 – Chemical and Volume Control System (PWR) (Including Boron Recovery System)**
Application Section:	**SRP 9.3.4**
Date of RAI Issue:	**02/25/2016**

Question No. 09.03.04-2

In the response to RAI 160-8174, Question 09.03.04-2 the applicant provided information regarding why the charging line remains un-isolated during a DBA. The staff understands that the charging system can be used to reduce unnecessary challenges to the SIS during certain accidents; however, the charging system is a non-safety related system and does not directly support a safety related system. GDC 55 requires an outboard automatic isolation valve that takes the position of greater safety, and a normally open valve, whose active safety function is to close, but fails as-is does not strictly meet the requirements of GDC 55. The staff asks the applicant to clarify if the charging system is an ESF system and justify why the part of SRP 6.2.4 Acceptance Criteria 10 about isolation valves which are allowed to remain open applies to the charging system. The staff asks the applicant to clarify what it means to have a normally open valve fail as-is on loss of power and whose active safety function is to close. Furthermore, the staff asks the applicant to justify why the active safety function of closing is satisfied by a valve that is normally open and fails as-is on a loss of motive power.

a. The staff notes from RAI 160-8174, Question 09.03.04-5 that the applicant has again stated CV-509 fails as-is on loss of motive power, but the active safety function is to close. The staff needs clarification on how this is accomplished when the valve is open.

b. The staff notes a similar issue with CV-255, Seal Injection Containment Isolation Valve.

Response

GDC 55 allows exemption from the application of its requirement by specifying the following description: “unless it can be demonstrated that the containment isolation provisions for a specific class of lines, such as instrument lines, are acceptable on some other defined basis.” SRP 6.2.4, “Containment Isolation System,” Acceptance Criteria 10 includes the following

sentence: “For engineered safety feature or engineered safety feature-related systems, isolation valves in the lines may remain open or be opened.”

While the flow in the letdown line goes out of the containment, the flow in the charging line goes into the containment. During a design basis accident such as LOCA, the letdown line is isolated, but the charging line is not isolated automatically. This is helpful in maintaining the reactor coolant inventory in the reactor (function similar to an engineered safety feature system) by injecting the borated water into the RCS with an available charging pump. This function of the charging line under an accident condition satisfies the intent of SRP 6.2.4 Acceptance Criteria 10. So, CV-524 does not receive a CIAS but remains open during an accident. Refer to Response to GDC 55 described in DCD Tier 2, Section 3.1.48. In addition, CV-524 can be closed remote-manually in the main control room by the operator, and this is the active safety function of this valve.

Supplemental Response

The charging system is not an ESF system because it is not required to perform the safety functions of accident mitigation and safe shutdown during an accident (see DCD Tier 2 Section 9.3.4.2.9.4). However, since the function of injecting the borated water into the RCS with an available charging pump during an accident is similar to that of the ESF system (safety injection system), SRP 6.2.4 Acceptance Criteria 10 can be applied and it is considered that CV-524 meets the “INTENT” of this criteria.

The active safety function of CV-524 is to close. But having CV-524 fail as-is (i.e., open) is advantageous to accident mitigation, because the charging flow can be maintained (especially, the auxiliary charging pump can be powered from the alternate alternating current source during station blackout) in case that the loss of motive power occurs while CV-524 opens. That meets the intent of GDC 55(to provide greater safety).

The check valve CV-747 installed in the charging line inside the containment can prevent the flow from going out from the containment. That meets SRP 6.2.4, Acceptance Criteria 10: “For lines equipped with motor-operated valves, a loss of actuating power leaves the affected valve in the "as-is" position, which may be the open position; however, redundant isolation barriers ensure that the isolation function for the line is satisfied.” Thus CV-524 does not need to be closed on loss of motive power.

a. The check valve CV-189 installed in the IRWST makeup line inside the containment can prevent the flow from going out from the containment. That meets SRP 6.2.4, Acceptance Criteria 10 stated above. Thus CV-509 does not need to be closed on loss of motive power, the same as CV-524 stated above.

b. Because it is advantageous to the RCP seal integrity and accident mitigation to provide the seal injection flow to the RCPs, CV-255 is not automatically closed but remains open during an accident. That meets the intent of GDC 55(to provide greater safety). The check valve CV-835 installed in the RCP seal injection line inside the containment can prevent the flow from going out from the containment. That meets SRP 6.2.4,

Acceptance Criteria 10 stated above. Thus CV-255 does not need to be closed on loss of motive power, the same as CV-524 stated above.

CV-524, CV-509 and CV-255 are powered from Class 1E power source (see DCD Tier 1, Table 2.4.6-2).

Impact on DCD

There is no impact on the DCD.

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 Reports.

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Question No. 09.03.04-6

In regards to the applicant's response to RAI 160-8174, Question 09.03.04-6, the applicant provided a satisfactory response regarding updating Tier 1 to be consistent with Tier 2 for valve CV-362. During the staff's review of the Attachment to Question 09.03.04-6, the staff noted that CV-340 of DCD Tier 1, Figure 2.4.6-1 is also inconsistent with DCD Tier 2, Figure 9.3.4-1. The staff would like to discuss with the applicant a means for correcting this inconsistency and determining if other inconsistencies like this are in the applicant's DCD.

Response

As shown in DCD Tier 2, Figure 9.3.4-1, CV-362 is locked closed during normal operation. DCD Tier 1, Figure 2.4.6-1 will be revised to make consistent with DCD Tier 2 information.

Supplemental Response

CV-340 is a normally open valve. DCD Tier 2, Figure 9.3.4-1 (Sheet 1 of 7) will be revised as shown in Attachment 1. But because CV-340 is not subject to CVCS ITAAC (not included in DCD Tier 1, Table 2.4.6-2), the detailed information on the valve such as the locking status does not need to be shown in DCD Tier 1, Figure 2.4.6-1.

In addition, CV-507 is a locked-open valve and DCD Tier 1, Figure 2.4.6-1 will be revised to clearly show that. There are no additional inconsistencies between DCD Tier 1, Figure 2.4.6-1 and DCD Tier 2, Figure 9.3.4-1.

CV-362 is a containment isolation valve and included in the 8th item (All CVCS containment isolation valves) of DCD Tier 1, Table 2.4.6-1. For clarification, the list of CVCS containment isolation valves will be added in the note of this table. In addition, CV-507 will be added in

DCD Tier 1, Table 2.4.6-1 because it is installed in the branch of the RCP controlled bleedoff line.

Impact on DCD

DCD Tier 2 Figure 9.3.4-1 will be revised as presented in Attachment 1.
DCD Tier 1 Table 2.4.6-1 and Figure 2.4.6-1 will be revised as presented in Attachment 2.

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 Reports.

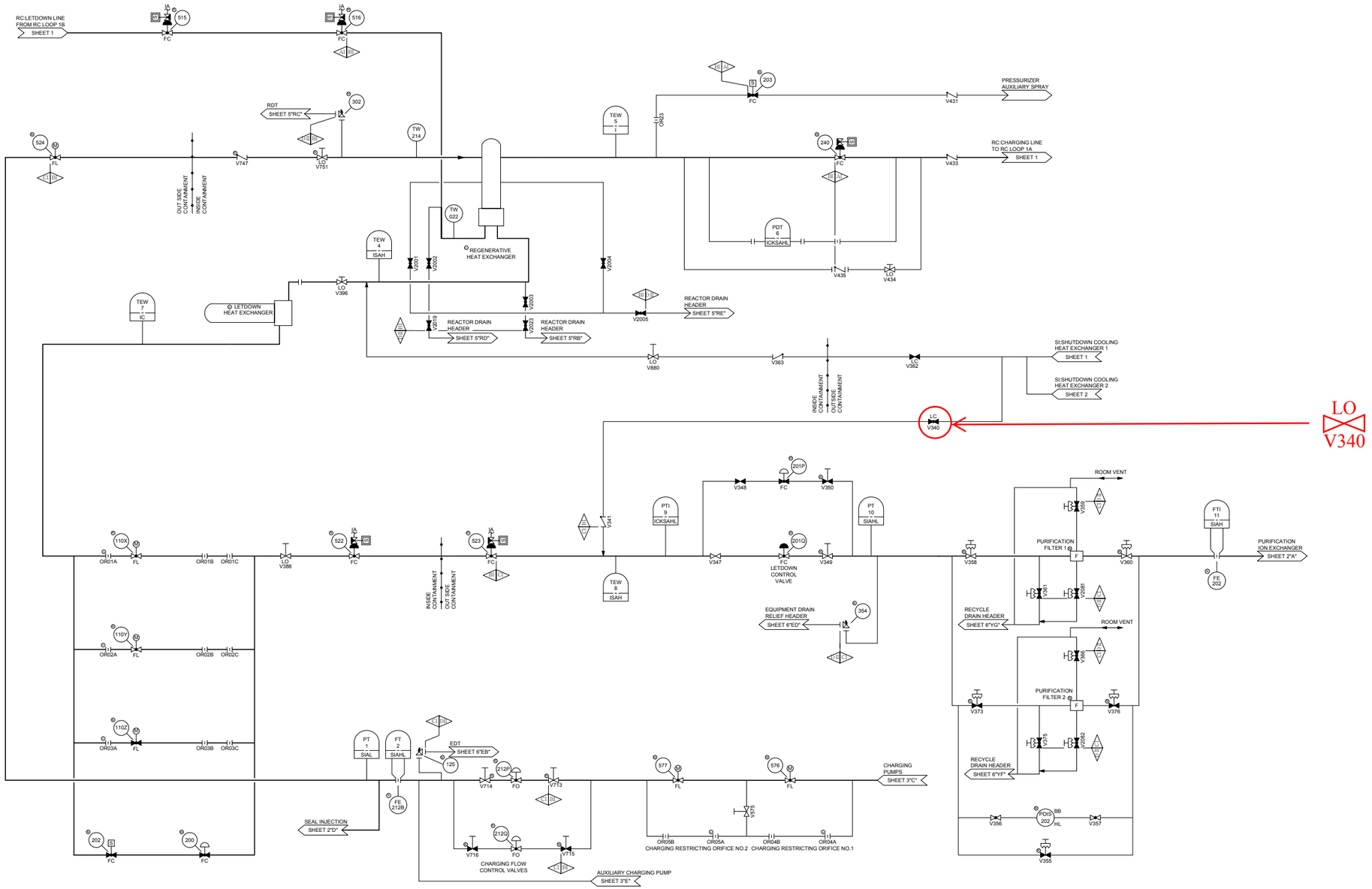

Figure 9.3.4-1 Chemical and Volume Control System Flow Diagram (1 of 7)

Table 2.4.6-1 (1 of 2)

Chemical and Volume Control System Equipment and Piping Characteristics

Equipment and Piping Name	Location	ASME Section III Class	Seismic Category
Regenerative heat exchanger	Containment	2	I
Letdown heat exchanger	Containment	2	I
Volume control tank	Auxiliary building	3	I
Charging pumps and auxiliary charging pump	Auxiliary building	3	I
Charging pump mini-flow heat exchanger	Auxiliary building	3	I
Letdown piping and valves from RCS to and including valve CV-516 prior to regenerative heat exchanger	Containment	1	I
Letdown piping and valves from and excluding valve CV-516 to and excluding valves CV-522 downstream to letdown heat exchanger	Containment (1)	2	I
All CVCS containment isolation valves and piping between the valves	Containment and Auxiliary building	2	I
Letdown piping and valves from and excluding valve CV-523 to and including valves CV-520, CV-521, CV-413, CV-421, and CV-422 prior to purification ion exchanger	Auxiliary building	3	I
Letdown piping and valves from and including valve CV-415 downstream to letdown strainer to and including volume control tank	Auxiliary building	3	I
RCP seal CBO piping and valves from 4 RCP's to and excluding valve CV-506	Containment (including CV-507)	2	I
RCP seal CBO piping and valves from and excluding valve CV-505 to and excluding volume control tank	Auxiliary building	3	I
RCP seal injection piping and valves from seal injection tee to and excluding valve CV-255 downstream to seal injection filter	Auxiliary building	3	I
RCP seal injection piping and valves from and excluding valve CV-835 to and excluding valves CV-787/802/807/812	Containment	2	I
RCP seal injection piping and valves from and including valves CV-787/802/807/812 to 4 RCP's	Containment	1	I
Charging piping and valves from and excluding volume control tank to and excluding valve CV-524	Auxiliary building	2/3	I

Table 2.4.6-1 (2 of 2)

Equipment and Piping Name	Location	ASME Section III Class	Seismic Category
Charging piping and valves from and excluding valve CV-747 prior to regenerative heat exchanger to and excluding valve CV-240	Containment	2	I
Charging piping and valves from and including valve CV-240 to RCS	Containment	1	I
Auxiliary spray piping and valves from and including valve CV-203 to the penetration into the RCS	Containment	1	I
Boric acid makeup piping and valves from and including boric acid storage tank to and excluding charging pumps/volume control tank	Auxiliary building	3	I

(1) The CVCS containment isolation valves are as follows: CV-189, CV-255, CV-362, CV-363, CV-494, CV-505, CV-506, CV-509, CV-522, CV-523, CV-524, CV-560, CV-561, CV-580, CV-747, and CV-835.

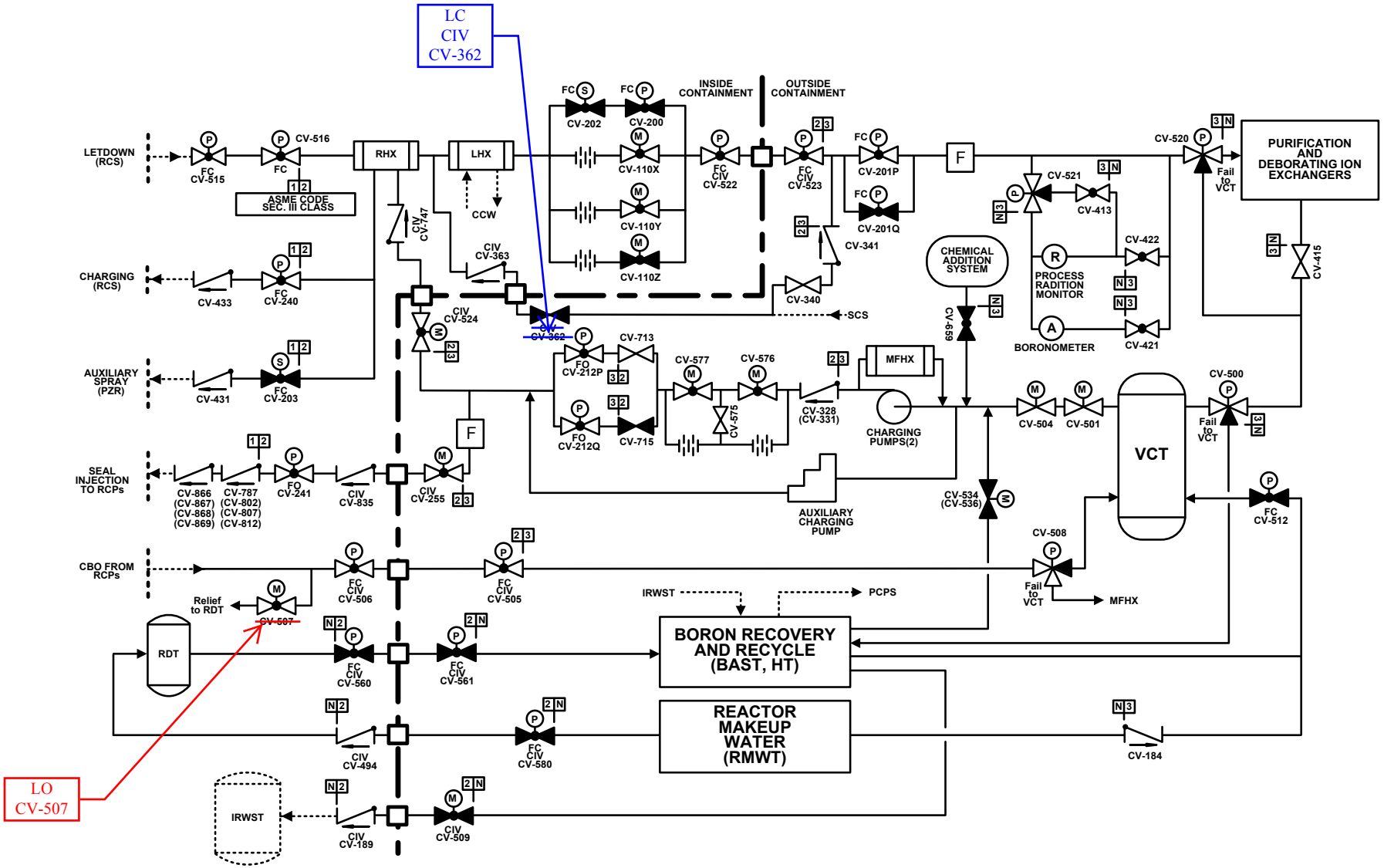

Figure 2.4.6-1 Chemical and Volume Control System