ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Tuesday, September 14, 2010 4:25 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (AREVA); ROMINE Judy (AREVA); BENNETT Kathy (AREVA); KOWALSKI David (AREVA); CONNELL Kevin (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 417, FSARCh. 9, Supplement 2
Attachments: RAI 417 Supplement 2 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a technically correct and complete response to six of the eight questions in RAI No. 417 and a schedule for the remaining questions, on August 13, 2010. Supplement 1 response to RAI No. 417 was sent on August 31, 2010 to provide a revised schedule.

The attached file, "RAI 417 Supplement 2 Response US EPR DC.pdf" provides a technically correct and complete response to one of the two questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 417 Question 09.02.02-120.

The following table indicates the respective pages in the response document, "RAI 417 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 417 — 09.02.02-120	2	3

The schedule for a technically correct and complete response to the remaining question remains the same and is provided below.

Question #	Response Date
RAI 417 — 09.02.02-118	September 24, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Tuesday, August 31, 2010 11:05 AM
To: 'Tesfaye, Getachew'

Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 417, FSARCh. 9, Supplement 1

Getachew,

AREVA NP Inc. provided a technically correct and complete response to six of the eight questions in RAI No. 417 and a schedule for the remaining questions, on August 13, 2010. Since responses to the remaining questions are being processed, a revised schedule is provided in this email.

The schedule for technically correct and complete responses to the remaining questions is provided below.

Question #	Response Date
RAI 417 — 09.02.02-118	September 24, 2010
RAI 417 — 09.02.02-120	September 14, 2010

Sincerely,

Martin (Marty) C. Bryan
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From: BRYAN Martin (External RS/NB)
Sent: Friday, August 13, 2010 12:41 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 417, FSARCh. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 417 Response US EPR DC.pdf" provides a technically correct and complete response to six of the eight questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 417 Questions 09.02.02-115, 09.02.02-116, 09.02.02-117, 09.02.02-119, 09.02.02-121 and 09.02.02-122.

The following table indicates the respective pages in the response document, "RAI 417 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 417 — 09.02.02-115	2	3
RAI 417 — 09.02.02-116	4	4
RAI 417 — 09.02.02-117	5	5
RAI 417 — 09.02.02-118	6	6
RAI 417 — 09.02.02-119	7	7
RAI 417 — 09.02.02-120	8	8
RAI 417 — 09.02.02-121	9	11
RAI 417 — 09.02.02-122	12	13

A complete answer is not provided for two of the questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 417 — 09.02.02-118	August 31, 2010
RAI 417 — 09.02.02-120	August 31, 2010

Sincerely,

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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, July 14, 2010 1:34 PM
To: ZZ-DL-A-USEPR-DL
Cc: Wheeler, Larry; Lee, Samuel; Segala, John; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 417(4741), FSARCh. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on June 8, 2010, and discussed with your staff on June 29, 2010.   No changes were made to the draft RAI as a result of that discussion.   The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 2004

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Response to

Request for Additional Information No. 417(4741), Supplement 2

7/14/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.02 - Reactor Auxiliary Cooling Water Systems
Application Section: 9.2.2

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

Question 09.02.02-120:

Follow-up to RAI 334, Question 9.2.2-75 and RAI 174, Question 9.2.2-29:

Part (c)- In Part (c) of follow-up RAI 9.2.2-75 to RAI 9.2.2-29 the staff asked the applicant to add a discussion to FSAR Tier 2 Section 9.2.2 relative to the intended use of common header manual isolation valves (e.g. 20/30KAA30 AA013 and AA014 for 1b and 2b common header). The staff also requested the applicant to include a discussion in the RAI response of potential Technical Specifications that may apply if these valves must be closed during power operation. In response to RAI 334 Supplement 1, the applicant stated that these valves were provided only for maintenance isolation purpose to provide the capability for isolation of a common headers (1b or 2b) while still maintaining flow to the Safety Chilled Water System (SCWS).

However, the staff review noted that the applicant's response did not address the potential applicability of Technical Specifications (TS) when the valves are closed (e.g. note A-1 of TS 3.7.7) and no FSAR text markup of Section 9.2.2 was included. The staff noted that closure of these valves would prevent automatic train switchover of the 1b or 2b headers to the opposite pump and the plant would then be forced to shutdown since the 1b or 2b header would be isolated to the reactor coolant pumps for two pumps. Accordingly, the staff considers the capability provided by these valves of sufficient importance to warrant a description in the FSAR Tier 2 Section 9.2.2. The staff also requests that the applicant explain what is meant by the portion of the response that states "This configuration confirms the availability of the safety chillers during normal plant operation when only two CCWS trains are operating."

In summary, the applicant should address the following:

a) The applicant should address the meaning of: "This configuration confirms the availability of the safety chillers during normal plant operation when only two CCWS trains are operating."

b) Since credit is taken for these manual valves to isolate either the 1b or 2b header and provide CCWS flow to the SCWS to maintain operability, this should be discussed in the FSAR in Section 9.2.2.

c) For manual valves 20/30KAA30 AA013 and AA014 for the 1b and 2b common headers, which are required to be manually closed (for example, during maintenance conditions) to maintain system operability, testing should be included that these valves are able to be closed and provide proper isolation.

d) The applicant should include a discussion of potential Technical Specifications that may apply if these valves must be closed in the applicable TS modes.

e) The applicant should explain (from RAI 9.2.2-29) the equalizing of runtimes of each CCWS pump by the closing of these maintenance valves.

Response to Question 09.02.02-120:

a) Valves KAA20/30 AA013 and AA014 are manual isolation valves that are normally open in each component cooling water system (CCWS) operating mode. These valves are intended for use only when the common header requires isolation for maintenance and the water-cooled safety chilled water system (SCWS) Divisions 2 and 3 are required for operation. Closing these manual isolation valves for common header maintenance allows the operator the option of supplying CCWS flow to Division 2 of the SCWS via the CCWS Train 2 pump, and Division 3 of the SCWS via the CCWS Train 3 pump. Note that Divisions 1 and 4 of the SCWS are air-cooled while Divisions 2 and 3 are water-cooled, with the supply provided from the common B portions of each CCWS common header. For Division 2 or 3 of the SCWS to require CCWS flow, while the CCWS common header is isolated for maintenance, both air-cooled divisions of SCWS would also have to be out of service. Valves KAA20/30 AA013/014 are closed only during plant shutdown (e.g., Modes 5 and 6) for maintenance activities on the 1B or 2B headers, where the water-cooled divisions of the SCWS are needed.

These manual isolation valves do not confirm the availability of the safety chillers during normal plant operation when only two CCWS trains are operating. If only two CCWS trains are operating, and those two trains supply the same common header, these manual isolation valves give the operator the option of supplying the SCWS division from one of the two available CCWS trains. During normal operations, the SCWS is supplied from the common B header along with other common loads. These manual isolation valves provide the operator with an additional option to isolate and supply the common B header from one train and supply the SCWS water cooled division from the other available CCWS train.

Due to limited use of these valves, U.S. EPR FSAR Tier 2, Table 3.9.6-2—Inservice Valve Testing Program Requirements will be revised to include these valves, specifying exercise testing in five year intervals.

b) U.S. EPR FSAR Tier 2, Section 9.2.2 will be revised to reflect the information in the response to Part a of this question.

c) These valves are not required to maintain CCWS operability. These valves are intended to provide the operators with the option to provide CCWS cooling to the water-cooled divisions of the SCWS in the event that a CCWS common header is isolated for maintenance and both air-cooled divisions of SCWS are out of service.

d) Refer to the response to Part a of this question. There are no Technical Specifications that are applicable during closure of these valves while in Modes 5 and 6.

e) Refer to the response to Parts a and d of this question.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 3.9.6-2 and Section 9.2.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 3.9.6-2—Inservice Valve Testing Program Requirements
(Sheet 48 of 97)

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
30KAA40AA032	Quick Closing Valve for KAA40 to Common2A	BF	HO	3	A	A	O/C	ET ST LT PI	Q Q 2Y 2Y	
30KAA40AA033	Quick Closing Valve for Common2A to KAA40	BF	HO	3	A	A	O/C	ET ST LT PI	Q Q 2Y 2Y	
30KAA40AA112	Bypass Control Valve for KAA40 AC001	BF	MO	3	A	A	O/C	ET ST LT PI	Q Q 2Y 2Y	
30KAA42AA005	CCW Isolation Valve for LHSI HX 4	BF	MO	3	A	A	O	ET ST LT PI	Q Q 2Y 2Y	
30KAA42AA012	Check Valve Downstream LHSI HX 40	CK	SA	3	C	A	O	ET	Q	
30KAA20AA013	Common 1.B Supply Manual Isolation Valve	BF	MA	3	B	A	O/C	ET	5Y	
30KAA20AA014	Common 1.B Return Manual Isolation Valve	BF	MA	3	B	A	O/C	ET	5Y	
30KAA30AA013	Common 2.B Supply Manual Isolation Valve	BF	MA	3	B	A	O/C	ET	5Y	

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Table 3.9.6-2—Inservice Valve Testing Program Requirements
(Sheet 49 of 97)

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
30KAA30AA014	Common 2.B Return Manual Isolation Valve	BF	MA	3	B	A	O/C	ET	5Y	
30KAB10AA192	RV Downstream Common 1B	RV	SA	3	C	A	O/C	ET LT	10Y 10Y	
30KAB80AA015	Supply Isolation Operational Chilled Water Users	BF	HO	3	A	A	C	ET ST LT PI	Q Q 2Y 2Y	
30KAB80AA016	Supply Isolation Operational Chilled Water Users	BF	HO	3	A	A	C	ET ST LT PI	Q Q 2Y 2Y	
30KAB80AA019	Return Isolation Operational Chilled Water Users	BF	HO	3	A	A	C	ET ST LT PI	Q Q 2Y 2Y	
30KAB80AA020	Return Common 1B	CK	SA	3	C	A	C	ET	Q	
30KAB30AA049	RCP Thermal Barrier 1 and 2 Supply Outside CIV	GT	MO	2	A	A	C	ET ST LT PI	Q Q 2Y 2Y	LT per 10 CFR 50, Appendix J
30KAB30AA050	Supply Thermal Barrier 1 and 2 Inside CIV	CK	SA	2	A/C	A	C	ET LT PI	CS RF 2Y	LT per 10 CFR 50, Appendix J

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- Designed to permit appropriate periodic pressure and functional testing to make sure of (1) the structural and leak-tight integrity of its components, (2) the operability and the performance of the active components of the system, and (3) the operability of the system as a whole and, under conditions as close to the design as practical, the performance of the full operational sequence that brings the system into operation for reactor shutdown and for loss of coolant accidents (LOCA), including operation of applicable portions of the protection system and the transfer between normal and emergency power sources (GDC 46).

- Designed to permit isolation of lines that penetrate the primary containment to maximize containment isolation integrity (GDC 57).

- Designed to provide acceptable performance for all environments anticipated under normal, testing, and design basis conditions in compliance with the requirements of 10 CFR 50.49.

- Supplied by highly reliable and diverse power and control systems in conformance with the guidance of RG 1.32.

- Provides cooling to the thermal barrier of the reactor coolant pump (RCP) seals during all plant operating modes when the RCPs are running. (Thermal barrier cooling does not isolate due to an accident signal.)

The non-safety-related dedicated CCWS train is available on demand, in the unlikely event of a severe accident, to cool the SAHRS.

9.2.2.2 System Description

9.2.2.2.1 General Description

The CCWS design complies with applicable industry codes and standards, and regulatory requirements, commensurate with the function of each of the safety-related components.
As such, the CCWS components are fabricated, installed, and maintained in compliance with:

- ASME Boiler and Pressure Vessel (BPV) Code Section III, (Reference 1) Class 2 and 3 components.

- ASME Power Piping Code B31.1 (Reference 2).

- ASME BPV Code Section VIII, (Reference 3) non-safety-related components.

- Electrical redundancy and separation as specified in IEEE Std 603 (Reference 4).

- Seismic Category I and important-to-safety components as defined in RG 1.29.

- Environmental qualification as specified in 10 CFR 50.49.

The CCWS is a four train system configured to allow sharing of operational and safety-related users among the trains during normal operation, while always maintaining train separation with rapid isolation capability of the non-safety-related users in the event of an accident. The trains form pairs; trains 1 and 2 form one pair, and trains 3 and 4 the other pair. During normal operation, one or both trains in each associated pair can be in operation to cool the two common sets of users. Depending on the system user requirements, heat loads, and flow rates, and depending on the existing plant operating condition, the CCWS may have two, three, or all four trains in operation. System design parameters and flow requirements are listed in Table 9.2.2-1—CCWS Design Parameters and Table 9.2.2-2—CCWS User Requirements Summary.

Trains may be added or dropped as necessary to maintain the CCWS HX outlet temperature above the minimum required and below the maximum allowed and maintain the individual CCWS pump steady-state operating flow between the minimum required and the maximum allowed values. Idle CCWS trains are available and isolated from the common headers to provide safety injection system (SIS) availability if necessary. Maintenance on a CCWS train during power operation is possible.

During normal operation and design basis events, the CCWS provides the cooling function for the safety injection system/residual heat removal system (SIS/RHRS) and the safety chilled water system (SCWS) of divisions 2 and 3. The CCWS also transfers decay heat from the fuel pool cooling system (FPCS) whenever fuel is stored in the spent fuel pool. The CCWS additionally cools the thermal barriers of the RCP seals during all plant operating modes when the RCPs are running. Upon receipt of a containment isolation signal, the CCWS responds to protect the integrity of the containment pressure boundary.

During normal operation the temperature at the outlet of the CCWS heat exchanger must be greater than 59°F and lower than 100.4°F. During a DBA, CCWS heat exchanger outlet temperature must be lower than 113°F.

The expected CCWS pump suction temperatures for the various operational alignments are enveloped by a temperature of 190°F. The 190°F temperature is conservatively based on CCWS heat exchanger DBA inlet temperature (181°F) plus margin. The 181°F inlet temperature results from a maximum allowed CCWS heat exchanger outlet temperature 113°F for DBA conditions.

The CCWS flow rate is automatically controlled for those users which have been determined to have a limited operating temperature range for support of stable operation, while less temperature-sensitive users remain at a fixed flow resistance during all operating conditions. These fixed flow rates are adjusted once during plant commissioning with the system in its most demanding flow configuration (system flow balancing), and is reaffirmed regularly throughout the plant life by periodic surveillance, to make sure there is adequate required user flow for all operating conditions. It is not expected that the CCWS flow balance will require adjustment after the initial flow balance has been established.

For the accident analysis it is assumed that one CCWS train is unavailable due to maintenance or other activity and a second train fails to perform its function, leaving only two trains available for the event. Upon receipt of a safety injection and containment isolation Stage 1 actuation, the reactor protection system starts the CCWS pumps and opens the low head safety injection/residual heat removal (LHSI/RHR) isolation valves (CCWS flow to the LHSI/RHR HXs and LHSI pump coolers in trains 2 and 3) of the trains not initially in operation. The non-safety-related common users outside of the RB and the containment ventilation and reactor coolant drain tank (RCDT) cooler inside the RB are isolated. A subsequent containment isolation Stage 2 signal isolates the RCP and CVCS loads inside the RB except for the RCP seals thermal barrier coolers.

For the analysis, the accident is assumed to occur with coincident loss of offsite power (LOOP). The loss of one train is assumed to occur due to single failure, the most limiting of which is loss of one electrical division. This loss also results in the incidental loss of the associated emergency core cooling system (ECCS) and ESWS trains. This sequence is detailed in Chapter 15. Throughout accident mitigation and recovery, one of the remaining available CCWS trains cools the LHSI/RHR HX and the other provides additional cooling to the remaining safety loads, with both CCWS trains cooled by their associated ESWS trains.

Leaks in the CCWS, either in or out, will be apparent from various indications, and must be promptly isolated for repair or other corrective action. For instance, leakage of reactor coolant into the CCWS from an RHR HX tube, RCP seal thermal barrier, or other source is identified by increased activity in the CCWS fluid as detected by a continuous monitor or routine sampling, and is also indicated by an unexpected increasing level in the surge tank. The RCP thermal barrier leakage is detected by indication of a high outlet flow from the barrier or an elevated return temperature (or both). The operational pressure gradient of the cooling chain makes in-leakage of service water unlikely. Out-leakage from the system is indicated by an unexpected decrease in surge tank level, indicated by a noticeable increase in automatic makeup flow, visible leakage in the accessible areas or change in reactor coolant chemistry identified during routine sampling. For significant out-leakage from the CCWS, a rapid drop of the CCW level in the corresponding surge tank would trigger automatic inhibition of common users transfer of that train on sufficiently low level, and subsequent isolation of the common header upon reaching the low level isolation setpoint. This conserves the system capacity to cool the safety-related SIS users directly associated with the CCWS train. The system configuration also enables all such leaks to be readily isolated to prevent release of radioactive fluid, excessive dilution or chemical contamination of the reactor coolant.

CCWS equipment that provides cooling to the SIS/RHRS; spent fuel pool; reactor coolant pump (RCP), including the thermal barrier; safety chillers; and equipment which performs a containment isolation function is classified Seismic Category I. This equipment is located in buildings designed to Seismic Category I requirements.

CCWS users, which are not classified Seismic Category I, can be isolated by Seismic Category I fast-acting isolation valves in case of external hazards.

The Seismic Category I fast-acting isolation valves for non-safety-related CCWS users are hydraulically operated and designed to close in less than 10 seconds. The CCWS common header switchover valves are also fast-acting hydraulically operated valves with a closure time of less than 10 seconds. These switchover valves can be used to isolate the common headers to conserve the system capacity to cool the safety-related SIS users directly associated with the CCWS train. The common header switchover valves (KAA10/20/30/40 AA006/010/032/033) will be designed to fail "as-is" on loss of power to the hydraulic pilot circuit while the isolation valves (KAB50 AA001/004/006 and KAB80 AA015/016/019) for the non-safety-related CCWS users will be designed to fail "closed" on loss of power to the hydraulic pilot circuit.

The four separate, independently powered safety cooling trains of the CCWS, combined with high standards for system design, installation and maintenance, provides assurance that the system will fulfill its safety-related function under the most demanding postulated conditions in spite of its most limiting credible single failure.

During severe accidents, containment heat is removed by the dedicated cooling chain, consisting of the SAHRS, dedicated CCWS, and dedicated ESWS. This dedicated CCWS train is normally in standby operation and is manually started if needed. In case of loss of the dedicated CCWS or ESWS division, the SAHRS cooling chain is lost. This condition is outside the DBA. The dedicated CCWS train supports beyond design basis accident mitigation, and is ~~normally fed from offsite power~~powered by Class 1E electrical Division 4 and is capable of being supplied by the onsite electrical power supplies that are backed by an EDG or SBO diesel generator.

Each physically separated CCWS safety-related train includes:

- A main system pump fitted with a recirculation line and pump motor cooling line.
- An HX, cooled by ESWS, with a parallel flow bypass line with control valve to maintain CCW minimum temperature during cold weather and low-load operation.

- A concrete, steel lined surge tank connected to the pump suction line with sufficient capacity to compensate for CCWS normal leaks or component draining.
- A sampling line with continuous radiation monitor.
- A chemical additive supply line.
- Isolation valves to separate the safety-related train from the common load set.

Each CCWS safety-related train supplies cooling to its respective CCWS and medium head safety injection (MHSI) pumps and motors and associated LHSI/RHR HXs, and trains 2 and 3 cool their respective LHSI pumps and motors. The LHSI pumps and motors of trains 1 and 4 are cooled by the SCWS.

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The SCWS chillers for divisions 2 and 3 are supplied by CCWS trains 1 or 2, and 3 or 4, respectively. The piping branch that supplies the SCWS Divisions 2 and 3 is installed between the hydraulically operated common header switchover valve and a manual isolation valve. These manual isolation valves (KAA20/30 AA013/014) are normally open in each CCWS operating mode. These valves are closed only during plant shutdown for maintenance activities on the 1.B and 2.B headers. For operational conveniences, this allows the water-cooled SCWS to be operated. These valves are equipped with position indication in the MCR to notify operators when the valves are closed. This enables continuous availability of the safety chillers during testing or CCWS common header maintenance activity and allows for equitable distribution of operating time for each of the CCWS safety-related trains. The CCWS safety-related trains are shown in Figure 9.2.2-1—Component Cooling Water System Trains 1 through 4.

The non-safety-related operational loads are supplied by two separate isolable headers designated common 1 and common 2. Common 1 may be aligned for service from either safety-related trains 1 or 2, and common 2 may be aligned to safety-related trains 3 or 4. Each common header branches into subheaders further designated "a" and "b" (i.e., common 1.a, 1.b, 2.a, and 2.b). Headers 1.a and 2.a, which cool FPCS trains 1 and 2, respectively, are separate from the other operational loads to provide continued cooling of the spent fuel. Headers 1.b and 2.b cool the remaining operational CCWS loads. Each of the common b-loops is isolable from the associated safety train by two fast-acting hydraulic valves, one installed in each train supply line and the other in the return line.

Common 1.b or 2.b headers cool multiple loads throughout the plant. The loads for each (b) header are summarized in Table 9.2.2-3—CCWS Common Header Users.

RCP 1, 2, 3 and 4 thermal barriers are capable of being cooled from either common header.