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Your ref: Project Number 740
Our ref: DCP/NRC1965

July 27, 2007

Subject: AP1000 COL Standard Technical Report Submittal of APP-GW-GLN-019, Revision 1 (TR 103)

In support of Combined License application pre-application activities, Westinghouse is submitting Revision 1 of AP1000 Standard Combined License Technical Report Number 103. This report identifies and justifies standard changes to the AP1000 Design Control Document (DCD). The changes to the DCD identified in Technical Report 103 are included in the proposed amendment to the AP1000 Design Certification Rule (DCD Revision 16). This report is submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in this report is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

The purpose for submittal of this report was explained in a March 8, 2006 letter from NuStart to the NRC.

Pursuant to 10 CFR 50.30(b), APP-GW-GLN-019, Revision 1, "Fluid System Changes," (Technical Report Number 103), is submitted as Enclosure 1 under the attached Oath of Affirmation. The purpose of this transmittal is to remove incorrect proprietary markings in the Revision 0 report sent on July 5, 2007 under DCP/NRC1944.

It is expected that when the NRC review of Technical Report Number 103 is complete, the changes to the DCD identified in Technical Report 103 will be considered approved generically for COL applicants referencing the AP1000 Design Certification.

Questions or requests for additional information related to content and preparation of this report should be directed to Westinghouse. Please send copies of such questions or requests for additional information to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Westinghouse requests the NRC to provide a schedule for review of the technical report within two weeks of its submittal.

D079
DC63

Very truly yours,

D. J. Hutchings for

A. Sterdis, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Attachment

1. "Oath of Affirmation," dated July 27, 2007

/Enclosure

1. APP-GW-GLN-019, Revision 1, "Fluid System Changes," Technical Report Number 103

cc:	D. Jaffe	-	U.S. NRC	1E	1A
	E. McKenna	-	U.S. NRC	1E	1A
	S. Adams	-	Westinghouse	1E	1A
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	P. Grendys	-	Westinghouse	1E	1A
	P. Hastings	-	Duke Power	1E	1A
	C. Ionescu	-	Progress Energy	1E	1A
	D. Lindgren	-	Westinghouse	1E	1A
	A. Monroe	-	SCANA	1E	1A
	M. Moran	-	Florida Power & Light	1E	1A
	C. Pierce	-	Southern Company	1E	1A
	E. Schmiech	-	Westinghouse	1E	1A
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	G. Bulevich	-	Westinghouse	1E	1A

ATTACHMENT 1

"Oath of Affirmation"

ATTACHMENT 1

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:	)
NuStart Bellefonte COL Project	)
NRC Project Number 740	)

APPLICATION FOR REVIEW OF
"AP1000 GENERAL COMBINED LICENSE INFORMATION"
FOR COL APPLICATION PRE-APPLICATION REVIEW

W. E. Cummins, being duly sworn, states that he is Vice President, Regulatory Affairs & Standardization, for Westinghouse Electric Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission this document; that all statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

W. E. Cummins
Vice President
Regulatory Affairs & Standardization

Subscribed and sworn to
before me this 27th day
of July 2007.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Patricia S. Aston, Notary Public
Murrysville Boro, Westmoreland County
My Commission Expires July 11, 2011
Member, Pennsylvania Association of Notaries

Notary

ENCLOSURE 1

APP-GW-GLN-019, Revision 1

"Fluid System Changes"

Technical Report 103

AP1000 DOCUMENT COVER SHEET

TDC: Permanent File: APY:

RFS#: RFS ITEM #:

AP1000 DOCUMENT NO.	REVISION NO.		ASSIGNED TO
APP-GW-GLN-019	1	Page 1 of 154	W-G. BULEVICH

ALTERNATE DOCUMENT NUMBER: TR 103 WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: AP1000

TITLE: Fluid System Changes

ATTACHMENTS: N/A	DCP #/REV. INCORPORATED IN THIS DOCUMENT REVISION: APP-GW-GEE-043, 044, 053, 054, 065, 068, 076, 078, 093, 098, 122, 124, 126, 145, 151, 157, 165, 172, 189, 191, 193, 196, 199, 209, 212, 214, 218, 231, 242, 247
CALCULATION/ANALYSIS REFERENCE: N/A	

ELECTRONIC FILENAME	ELECTRONIC FILE FORMAT	ELECTRONIC FILE DESCRIPTION
APP-GW-GLN-019 R0	Word	

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Class 3 Documents being transmitted to the NRC require the following two review signatures in lieu of a Form 36.

LEGAL REVIEW	SIGNATURE/DATE
PATENT REVIEW	SIGNATURE/DATE

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ORIGINATOR G. BULEVICH	SIGNATURE/DATE [signature] 7/15/07		
REVIEWERS C. STEUCK	SIGNATURE/DATE [signature] 7/19/07		
VERIFIER C. WATSON	SIGNATURE/DATE [signature] 7/18/07	VERIFICATION METHOD PAGE BY PAGE	
AP1000 RESPONSIBLE MANAGER M. CORLETTI	SIGNATURE* [signature]	APPROVAL DATE 7/24/07	

* Approval of the responsible manager signifies that document is complete, all required reviews are complete, electronic file is attached and document is released for use.

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes

Brief Description of the change (what is being changed and why):

The changes within this Technical Report are a compilation of approved design changes to AP1000 Fluid Systems that have not previously been submitted under individual header. This document is sectioned to identify Fluid System changes that have been approved by the Westinghouse Change Control Board, have not been submitted in previous Technical Reports, and have had a direct impact on the Design Control Document (DCD). Each change will be individually identified within this document and correlated to the description effected within the DCD. The description of these changes will be described within Section II of this document as appropriate. Additionally, it is expected that all the changes described within this document will be incorporated into Rev. 16 of the Design Control Document.

Section II below itemizes each Fluid System Design Change and provides a textural description of the changes. Section III identifies the DCD section(s) affected.

I. APPLICABILITY DETERMINATION

This evaluation is prepared to document that the change described above is a departure from Tier 2 information of the AP1000 Design Control Document (DCD) that may be included in plant specific FSARs without prior NRC approval.

A.	Does the proposed change include a change to:		
	1. Tier 1 of the AP1000 Design Control Document APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a report for NRC review of the changes)
	2. Tier 2* of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a report for NRC review of the changes)
	3. Technical Specification in Chapter 16 of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a report for NRC review of the changes)
B.	Does the proposed change involve:		
	1. Closure of a Combined License Information Item identified in the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a COL item closure report for NRC review.)
	2. Completion of an ITAAC item identified in Tier 1 of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare an ITAAC completion report for NRC review.)

☒ The questions above are answered no, therefore the departure from the DCD in a COL application does not require prior NRC review unless review is required by the criteria of 10 CFR Part 52 Appendix D Section VIII B.5.b. or B.5c

II. TECHNICAL DESCRIPTION AND JUSTIFICATION

A. The following design changes have been incorporated to reconcile discrepencies identified in the Design Control Document. These descrepencies are being resolved to create consistency throughout the document and create a consistent description of the AP1000 Standard Plant. These changes do not result in a change of the design; the purpose of these changes is to accurately represent the design.

1. RNS: Normal Residual Heat Removal System P&ID Changes

Figure 5.4-7 of the AP1000 DCD incorrectly shows the relief valve inlet size as 4" and the outlet size as 6". Figure 5.4-7 has been modified to reflect the current RNS P&ID which represents the relief valve inlet size as 3" and the outlet size as 4".

2. VES: Control Room Emergency Habitability System and P&IDs

AP1000 Control Room Emergency Habitability System (VES) Piping and Instrumentation Diagrams (P&IDs) have been updated to correct line and valve number duplications and inconsistencies present in the current version of the diagrams. The description of the AP1000 VES in the Tier 2 section of the AP1000 DCD includes Figure 6.4-2.. The markup is shown in Section III of this document.

Line Function and Location	Old Line Number	New Line Number
MT09 outlet F-5	T036A	T045A
MT10 outlet F-6	T037A	T046A
MT11 outlet F-6	T038A	T047A
MT12 outlet F-6	T039A	T048A
MT25 outlet C-5	TO366	TO456
MT26 outlet C-6	T037B	TO466
MT27 outlet C-6	T038B	TO476
MT28 outlet C-6	TO396	TO486

Valve Function and Location		Old Valve Number	New Valve Number
Air Bank 1 Relief Valve	H-5	V041A	V040A
Air Bank 2 Relief Valve	F-5	V040A	V041A
Air Bank 3 Relief Valve	E-5	V041B	V040B
Air Bank 4 Relief Valve	C-5	V040B	V041B

3. VBS: Control Logic for VBS fans serving Class 1E Division B&D Electrical Rooms

The control logic for the VBS fans serving the Class 1E Division B & D Electrical Rooms conflict with the control logic shown on the VBS P&ID. The control logic depicted on the VBS Figure 9.4.1-1 (Sheet 4 of 7) of the DCD is changed so that starting the fan in the air handling unit will start the chilled water system associated with that air handling unit.

4. WGS: Simplified Sketch Corrections

The current version of the Gaseous Radwaste System (WGS) simplified sketch shown in the DCD does not accurately depict the current status of the WGS design. The sketch is updated to reflect the current AP1000 WGS design by correcting the valve type for the discharge valve and the moisture separator drain valve, as well as moving the discharge radiation monitor upstream of the discharge valve

5. PMS: QDPS Display Variable Modifications

Table 7.5-1 has been updated to reflect the current AP1000 design. The following modifications have been made to the variables that are displayed on the Quality Data Processing Subsystem (QDPS):

- Display of the status indications (open, closed) of the components actuated by the Reactor Trip System and the ESF System
- Display one WR RCS cold leg temperature per loop
- Display of 38 core exit thermocouples

6. FWS: Startup Feedwater P&ID Changes

The current Startup Feedwater P&ID (AP600 Rev 5) does not reflect the AP1000 startup feedwater control system. It is necessary to eliminate the control function shown on DCD Figure 10.4.7-1 (Sheet 4 of 4), and in DCD section 7.7.1.8.2 for pressure transmitters PT 043-45 because the startup feedwater header pressure is no longer an input to the Startup Feedwater control System. Additionally, the Main Feedwater System also no longer utilizes the main feedwater header pressure or pressure drop across the main feedwater control valve as an input to its control system. Therefore, section 7.7.1.8.1 of the DCD has been revised.

7. SMS: Digital Metal Impact Monitoring System from AP600 to AP1000

The requirement for loose parts monitoring sensors necessitates 4 sensors per collection region rather than 2.

- Attached in Section III are changes to DCD Chapter 4 for the accurate description of the Digital Metal Impact Monitoring System from AP600 to AP1000.

B. The following design changes have been incorporated in order to maintain functional requirements of the AP1000 Standard Plant. The changes are a result of design evolution, identifying adjustments required to maintain the existing design as more detailed information has become available. As stated, these changes do not change system functionality; the changes are being made to update features in order to maintain functional design.

1. PCS: Passive Containment Cooling System (PCS) P&IDs

The Passive Containment Cooling System (PCS) P&ID has been updated to reflect the current PCS design. The recirculation heater has been moved upstream of the chemical addition to accommodate a horizontal heater as opposed to a vertical heater. Also, the piping connection to the heater is now flanged instead of welded. The P&ID has also been modified to show the tank's chemical addition line as an independent connection. The tank has separate connections for the chemical additive and water. The P&ID also showed a connection between lines L029 and L051 when no such connection exists in AP1000. Line L029 actually connects to line L048. Finally, the connecting tees between lines L080 and L064, L046 and L057, and L051

and L048 are misrepresented. These connecting tees have been changed to reflect the current design as shown in Section III.

2. SGS: Changes in MSSV in SGS

Inlet Piping

The MSSV inlet piping has been replaced with a long welding neck, which has an 8 inch inner diameter, to conform with ASME code (Article 7141 section (e)) without having to make any changes to the valve or line size or class.

Changing the inlet piping requires revising the set pressures and relieving capacities of the valve. The valve set pressures are listed in Tech Specs in Table 3.7.1-2, and both the set pressures and relieving capacities are found in the DCD in Table 10.3.2-2. Markups of each table can be found in Section III of this document. The first MSSV set pressure does not change since it is based on system design pressure.

Valve Outlet

ASME code (Article NC-7143 Section III Division I, Subsection NC) specifies that drain lines on safety valves should be located at the low points in the discharge. To avoid condensate accumulation, the drain connected to the discharge piping of the MSSVs between the valve outlet and the elbow has been moved to the discharge of the valve.

3. VAS, VBS, VHS, VTS, VXS: Correction of HVAC Humidifier Reference

The DCD references standard ARI 620 "Self Contained Humidifiers for Residential Applications" in the design of the humidifiers. This is incorrect. The AP1000 uses humidifiers in ducted central air applications; therefore, ARI 640, "Commercial and Industrial Humidifiers" is the correct specification, and has replaced ARI 620.

4. SGS: Steam Generator Feedwater Piping Change

The current AP1000 main feedwater piping was 20" DAB piping from the outlet of the main feedwater isolation valve to the custom reducing elbow which connected the feedwater piping to the Steam Generator nozzle. The custom reducing elbow's size was 20" x 16". The custom reducing elbow has been replaced with a standard 16" DAB short radius elbow so as to meet ASME Section III stress limits.

5. PCS: PCS Changes

The lines APP-PCS-PL-L017 and APP-PCS-PL-L001A have been changed to a single 3 inch line. The reducer has been removed to allow for proper flow of PCS water to the containment shell once the flow measuring/limiting orifice has been tuned.

Pressure indicators 005, 006, 007 and 008 are currently shown as pressure indicators with alarms.. They have been revised to show that they also have a control that opens the containment cooling valves.

6. SFS: Spent Fuel Pool Cooling System Modifications

SFS Pump Common Suction Pipe Size

This change increases the SFS common suction pipe from 6 inch, Sch 40 to 10 inch, Sch 40 from the SFP to the penetration at the SFS pump room. The line is then reduced from 10 inch, Sch 40 pipe to 8 inch, Sch 40 pipe from the pump room penetration to line L001A. The remainder of the SFS suction piping will remain 6 inch, Sch 40.

SFS Pump Common Discharge Pipe Size

This change increases the size of line the SFS pump common discharge line from 6-inch, Sch 40 to 8-inch, Sch 40. This change, combined with the reduced ΔP in the pump suction line, decreases the pump required head.

7. CVS: Control Systems Corrections

The changes affect the Interlock between CVS-PL-V001, 002, 003 and TICA-002. The present P&ID shows an interlock between TICA-002 and three purification isolation valves, CVS-PL-V001, V002 and V003 to protect the demineralizer resin beds from excessive temperature.

A single MOV closure is sufficient for automatic CVS isolation, and therefore, the interlocks between TICA-002 and CVS-PL-V001 and V002 are deleted as marked on the schematic drawing.

Correction of the boric acid tank heaters

For extreme weather conditions the Boric Acid Tank requires 16.6 kw of heat. Two standard heating elements are required to meet this criteria, since the standard heating unit produces either 13.3 kw or 4.43 kw.

Since there are physically two separate heating elements and each will have its own immersion well in the tank, and each will be configured differently, two separate tag numbers are required, as follows:

CVS-EH-01A Boric Acid Storage Tank 13.3 kw Immersion Heater
CVS-EH-01B Boric Acid Storage Tank 4.43 kw Immersion Heater

8. PXS: Differential Pressure Flowmeter for PRHR HX Flow

Ultrasonic flow meters were introduced in the transition to AP1000 to eliminate the permanent pressure loss imposed by the primary element. The measurements are specified as electrical class "C," which requires that the sensors be qualified as IEEE Class 1E, for the harsh containment environment. The principle objective of minimizing permanent pressure loss in the piping system, while meeting IEEE Class 1E requirements, is accomplished by installing an averaging pitot primary element in the PRHR piping, and measuring the developed differential pressure. The changes are outlined in the Section III markup of Figure 6.3-2.

9. PCS: Ultrasonic Level Measurement for PCCWST Narrow-Range

The Passive Containment Cooling Water Storage Tank (PCCWST) level measurement was a single-leg pressure measurement that shared a common tap with the PCCWST wide-range level sensor.

The pressure-based narrow-range level measurement has been eliminated and replaced with an ultrasonic, non-contact level sensor. The ultrasonic level sensor will be wall-mounted inside the PCCWST, above the maximum water level.

Section III contains a markup of changes to DCD Figure 6.2.2-1.

10. CVS: Various CVS P&ID Changes

The control box for the boric acid batching tank should be depicted as local indications and a high temperature shut off should be included. Note 10 on the CVS P&ID for valves V045 and V047 is incorrectly shown as CL. The signal for V059 is shown in the RCS P&ID as a separate signal from the PMS signal.

11. RCS: P&ID Changes for Tag Numbers RCS-TE125 A, B, C,D

In order to properly define the functional requirements for the dual temperature range channels RCS-TE125 A, B, C, D, the I&C systems require the establishment of separate I&C and P&ID database identifiers for each range of RCS-TE125 A, B, C, D.

12. RCS: Misc P&ID Changes

1. DCD Figure 5.1-1 (a simplified sketch of the RCS) incorrectly shows that the CVS purification system originates from cold leg 1A; it has been corrected to show that it originates from cold leg 1B.

2. RCS valve V241 normally closes on a high RCDT pressure signal from the PMS. The valve was a direct solenoid, normally open, fail closed valve. The valve has been changed to a fail closed AOV.

13. PXS: In-service Testing of IRWST Injection Check Valves (V122A,B and V124A,B) Modification

To avoid choked flow in the PXS during in-service testing, two changes have been made.

1. The 2 inch pack-less globe valves, PXS-PL-V126A, V126B, V128A, V128B, V129A and V129B will be specified to be 2 inch y-body pack-less globe valves.

2. The lines PXS-PL-L122A, L122B, L126A, and L126B will be changed from BBB to BTA.

14. CVS: P&ID DP Instrument Changes

Instrument channels 010, 020, and 110 within the CVS are being changed from DP switches (discrete) to DP transmitters such that a continuous signal can be provided to the MCR.

15. RCS: AP1000 Pressurizer Safety Valve Discharge Piping Pressure Rating System

The AP1000 Reactor Coolant System description in the DCD shows the 8-in pressurizer safety relief valve discharge piping as Class BBC. The DCD is revised to show these piping lines to be class EBC, in order to be consistent with expected safety valve backpressure, as well as the required backpressure to discharge the safety valve's rated capacity, and the backpressure required to discharge the safety valve with choked flow at the 10-in rupture disk.

16. SGS: Main Steam Line Condensate Drain Changes

A 1" bypass line, which includes a plug resistant orifice, has been placed around control valves V086 A/B which will allow condensate to be constantly drained to the Turbine Island Drain System (TDS) without need for continually opening / closing the control valve.

The 2" drain line connection (L020A/B) has been relocated as low as reasonable in the 12" pipe stub (L021A/B) to allow for a larger condensate volume collection pot, which will allow for better control of draining when valve V086 A/B must be opened. The level switch that controls this valve is replaced by a level transmitter to make the configuration consistent with the MSS. Using a level transmitter eliminates line L049A/B. The level transmitter also provides continuous indication of the level in the drain pot.

17. SFS: Spent Fuel Racks Designs

The updated storage capacity of the Spent Fuel Storage Racks is 889 locations. Previously, the Spent Fuel Storage Racks capacity was 619 locations. The Spent Fuel Pool Cooling System (SFS) has the capability to cool a fully loaded spent fuel pool under the design basis conditions. The maximum heat load during various

offload conditions has increased as a result of the increased rack capacity. The updated decay heat levels are shown in the markup of DCD section 9.1.

17. VBS: Addition of VBS Heaters and Controls

The VBS HVAC system currently has one heater in each air handler and one pair of temperature sensors to control the temperature in the CSA and MCR areas. The airflow to each space is selected to properly cool each space at the summer design weather conditions. During winter conditions, cooling is required to maintain design conditions in some spaces, including the MCR, some electrical/electronic equipment spaces, and the CSA computer rooms. Since the VBS system as currently configured cannot heat some spaces and cool others simultaneously, additional heaters and temperature sensors are added.

C. The following design changes have been incorporated to further standardize and simplify the AP1000 Standard Plant.

1. Various Systems: AP Flow Orifice Flange Set Standardization

Current flow measurement using orifice flanges are using different installation details. A standard has been selected for all flow orifice flange sets to simplify the I&C specification.

This change standardizes on a single orifice flange installation detail that utilizes raised face ASME B16.36 orifice flanges with the sensing lines attached via the flange taps. The sensing lines and first valves are 3/4" piping components, which is chosen for increased mechanical strength. The sensing line connection at the orifice flange is 3/4" NPT. The 3/4" NPT connection was selected after discussions with various orifice flange vendors

D. Initial wording within the DCD described specific commodities that may change as design finalizes for specific systems. The following changes are incorporated in the DCD to allow flexibility in design, as well as selection of final commodities. These changes do not effect system function.

1. Black Poly Piping

This change has no effect on design function, no effect on analysis method, will not effect the FSER, or effect the Tier 1 information of the DCD.

This change has added the option of black polyethylene plastic piping (High Density Polyethylene) to sections of Tier 2 in the DCD for nonsafety-related systems that contain or convey normally non-radioactive water or air.

As far as application to AP1000 systyems, HDPE may be used for systems and system areas of low pressure and low temperature. Based on manufacturer's recommendations, HDPE will be used in systems with pressures up to 150 psi (1,000 kPa) and temperatures up to 140F (60C) for water services. Pressure and temperature limits for other services shall be based on the hazards involved, but in no application shall they exceed 150 psi (1,000 kPa) and 140F (60C).

The changes to the DCD affect sections 9.2.1.2.2, 9.2.2.3.5, and 9.2.8.2.2. This change affects the write-up for Class D and Class E systems. Class D is constructed to the requirements of ASME B31.1. ASME B31.1 includes Appendix III that provides rules for nonmetallic piping. The impact on the DCD is shown in Section III.

2. Removal of Smart Valves

The inclusion of these valves in AP1000 diagrams and text in the DCD may be perceived as restricting the respective valves design a smart valve.

To provide the necessary design flexibility, the integral instrumentation is replaced with standard in-line instruments within the identified figures of the DCD or removed, and references to valves with internal instrumentation be removed from the DCD text. This replacement does not change the functional or design of any valves or instruments.

The diagrams in question are Figure 9.2.1-1 (Service Water System – APP-SWS-PL-V011 and –V009) and Figure 9.2.7-1 Sheet 2 of 3 (Central Chilled Water System – APP-VWS-PL-V272A/B, and -V261A/B/C/D)

The affected text is located in Sections 9.2.1.5 and 9.2.7.2.2.

3. Spent Resin Transfer Pump Description in DCD

The current AP1000 design identifies a "progressing cavity" positive displacement pump for resin transfer. This pump type was widely recommended and put into use approximately 15 years ago, with initially favorable results. However, as these installed pumps have worn, the increased clearances have started to entrap and grind resin beads. Therefore, in order to provide flexibility in design, the specificity of "progressive cavity" positive displacement pumps is removed from the DCD.

4. Source of Cooling Water for TCS and CMS Heat Exchangers

In order to provide flexibility, the cooling water source for the TCS and CMS HX's has been changed from circulating water to a generic "cooling water" that can be provided by either circulating water and/or raw water make-up to the cooling tower basin.

E. OTHER

1. Spent Fuel Spray

In response to the National Academy of Science study pertaining to the safety/security of the spent fuel storage in nuclear power plants, a spray system is added to the spent fuel pool with two redundant strategically placed spray nozzle headers on opposite sides of the Spent Fuel Pool in order to provide spray water to cool the spent fuel in the event that the Spent Fuel Pool is drained. The cooling water will be delivered to the spray nozzles from either the PCCWST or the FPS. Additionally, Valve 047 has been removed to elimate the risk of inadverantly draining the Spent Fuel Pool.

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

III. DCD MARK-UP

The following pages describe the DCD changes defined in Section II.

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Title: Fluid System Changes

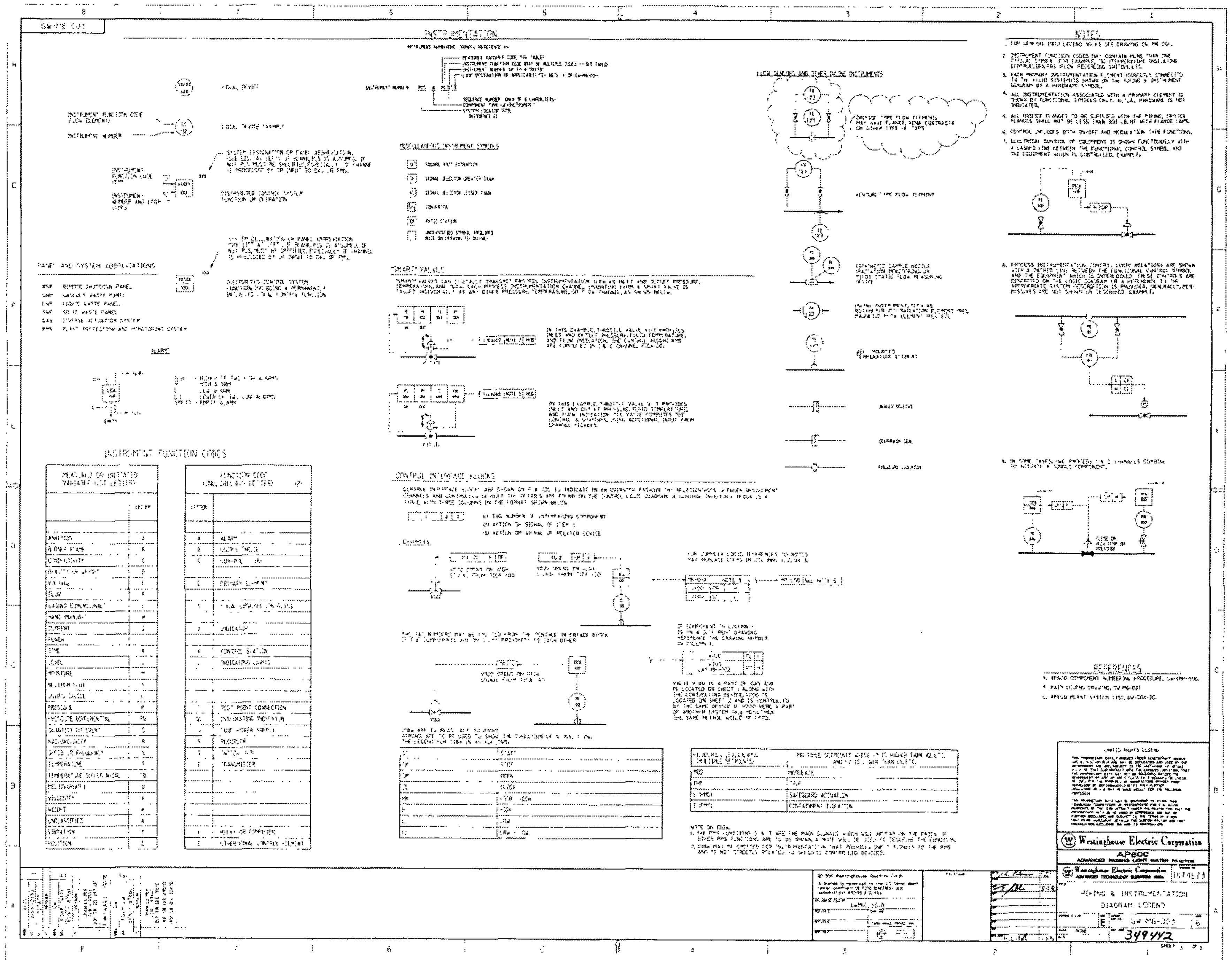

Figure 1.7-2 (Sheet 3 of 3)
Piping and Instrumentation Diagram Legend

TABLE 3.2-3 (SHEET 50 OF 65)

AP1000 CLASSIFICATION OF MECHANICAL AND FLUID SYSTEMS, COMPONENTS, AND EQUIPMENT

Tag Number	Description	AP1000 Class	Seismic Category	Principal Construction Code	Comments
Steam Generator System (Continued)					
SGS-PL-V074B	SG Blowdown Isolation	B	I	ASME III-2	
SGS-PL-V075A	SG Series Blowdown Isolation	C	I	ASME III-3	
SGS-PL-V075B	SG Series Blowdown Isolation	C	I	ASME III-3	
SGS-PL-V084A	SG 1 Nitrogen Sparging Isolation	B	I	ASME III-2	
SGS-PL-V084B	SG 2 Nitrogen Sparging Isolation	B	I	ASME III-2	
SGS-PL-V086A	Steam Line Condensate Drain Control	C	I	ASME III-3	
SGS-PL-V086B	Steam Line Condensate Drain Control	C	I	ASME III-3	
SGS-PL-V093A	Orifice Isolation Valve	C	I	ASME III-3	
SGS-PL-V093B	Orifice Isolation Valve	C	I	ASME III-3	
SGS-PL-V094A	Orifice Cleanout Line Isolation Valve	C	I	ASME III-3	
SGS-PL-V094B	Orifice Cleanout Line Isolation Valve	C	I	ASME III-3	
SGS-PL-V095A	Orifice Isolation Valve	C	I	ASME III-3	
SGS-PL-V095B	Orifice Isolation Valve	C	I	ASME III-3	
SGS-PL-V096A	Steamline Condensate Drain Level Isolation Valve	B	I	ASME III-2	
SGS-PL-V096B	Steamline Condensate Drain Level Isolation Valve	B	I	ASME III-2	
SGS-PL-V097A	Steamline Condensate Drain Level Isolation Valve	B	I	ASME III-2	
SGS-PL-V097B	Steamline Condensate Drain Level Isolation Valve	B	I	ASME III-2	
SGS-PL-V233A	Power Operated Relief Valve	C	I	ASME III-3	
SGS-PL-V233B	Power Operated Relief Valve	C	I	ASME III-3	
SGS-PL-V240A	MSIV Bypass Isolation	B	I	ASME III-2	
SGS-PL-V240B	MSIV Bypass Isolation	B	I	ASME III-2	
SGS-PL-V250A	Main Feedwater Control	C	I	ASME III-3	
SGS-PL-V250B	Main Feedwater Control	C	I	ASME III-3	

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes

TABLE 3.7.1-2 (PAGE 1 OF 1)
MAIN STEAM SAFETY VALVE LIFT SETTINGS

VALVE NUMBER		LIFT SETTING (psig ± 1%)
STEAM GENERATOR		
#1	#2	
V030A	V030B	1185
V031A	V031B	~~1191~~ 1196
V032A	V032B	~~1198~~ 1208
V033A	V033B	~~1204~~ 1219
V034A	V034B	~~1211~~ 1231
V035A	V035B	~~1217~~ 1242

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Table 3.11-1 (Sheet 42 of 45)

ENVIRONMENTALLY QUALIFIED ELECTRICAL AND MECHANICAL EQUIPMENT

Description	AP1000 Tag No.	Envir. Zone (Note 2)	Function (Note 1)	Operating Time Required (Note 5)	Qualification Program (Note 6)
Orifice Isolation Valve	SGS-PL-V093A	5	PB	1 yr	M *
Orifice Isolation Valve	SGS-PL-V093B	5	PB	1 yr	M *
Orifice Cleanout Line Isolation Valve	SGS-PL-V094A	5	PB	1 yr	M *
Orifice Cleanout Line Isolation Valve	SGS-PL-V094B	5	PB	1 yr	M *
Orifice Isolation Valve	SGS-PL-V095A	5	PB	1 yr	M *
Orifice Isolation Valve	SGS-PL-V095B	5	PB	1 yr	M *
Steamline Condensate Drain Level					
Isolation Valve	SGS-PL-V096A	5	PB	1 yr	M *
Steamline Condensate Drain Level					
Isolation Valve	SGS-PL-V096B	5	PB	1 yr	M *
Steamline Condensate Drain Level					
Isolation Valve	SGS-PL-V097A	5	PB	1 yr	M *
Steamline Condensate Drain Level					
Isolation Valve	SGS-PL-V097B	5	PB	1 yr	M *
Startup Feedwater Check Valve	SGS-PL-V256A	5	PB	1 yr	M *
Startup Feedwater Check Valve	SGS-PL-V256B	5	PB	1 yr	M *
MCR Penetration Test Valve	VBS-PL-V160	3	PB	1 yr	M
MCR Penetration Test Valve	VBS-PL-V161	3	PB	1 yr	M
MCR Penetration Test Valve	VBS-PL-V162	3	PB	1 yr	M
Air Delivery Line Pressure Instrument					
Isolation Valve A	VES-PL-V006A	7	PB	1 yr	M
Air Delivery Line Pressure Instrument					
Isolation Valve B	VES-PL-V006B	7	PB	1 yr	M
Temporary Instrument					
Isolation Valve A	VES-PL-V016	7	PB	1 yr	M
Temporary Instrument					
Isolation Valve A	VES-PL-V018	7	PB	1 yr	M
Temporary Instrument					
Isolation Valve B	VES-PL-V019	7	PB	1 yr	M
Temporary Instrument Isolation					
Valve B	VES-PL-V020	7	PB	1 yr	M
Air Tank Isolation Valve A	VES-PL-V024A	7	PB	1 yr	M
Air Tank Isolation Valve B	VES-PL-V024B	7	PB	1 yr	M
Air Tank Isolation Valve A	VES-PL-V025A	7	PB	1 yr	M
Air Tank Isolation Valve B	VES-PL-V025B	7	PB	1 yr	M
Refill Line Isolation Valve	VES-PL-038	7	PB	1 yr	M
DP Instrument Line Isolation Valve A	VES-PL-V043A	3	PB	1 yr	M
DP Instrument Line Isolation Valve B	VES-PL-V043B	3	PB	1 yr	M
Containment Isolation Test Connection	VFS-PL-V001	7	PB	1 yr	M
Containment Isolation Test Connection	VFS-PL-V002	1	PB	1 yr	M *
Containment Isolation Test Connection	VFS-PL-V006	1	PB	1 yr	M *
Containment Isolation Test Connection	VFS-PL-V007	6	PB	1 yr	M
Containment Isolation Test Connection	VFS-PL-V008	6	PB	1 yr	M
Main Equipment Hatch Test					

4.4.6.4 Digital Metal Impact Monitoring System

The digital metal impact monitoring system is a nonsafety-related system that monitors the reactor coolant system for metallic loose parts. It consists of several active instrumentation channels, each comprising a piezoelectric accelerometer (sensor), signal conditioning, and diagnostic equipment. The digital impact monitoring system conforms with Regulatory Guide 1.133.

The digital metal impact monitoring system is designed to detect loose parts that weigh from 0.25 to 30 pounds, and can also detect impact with a kinetic energy of 0.5 foot-pounds on the inside surface of the reactor coolant system pressure boundary within three feet of a sensor.
The digital impact monitoring system consists of several ~~redundant~~ instrumentation channels, each comprised of a piezoelectric accelerometer (sensor), preamplifier, and signal conditioning equipment. The output signal from each accelerometer is amplified by the preamplifier and signal conditioning equipment before it is processed by a discriminator to eliminate noise and signals which are not indicative of loose part impacts. The system starts up and operates automatically.

The system facilitates performance tests, hardware integrity tests, and the recognition, location, replacement, repair and adjustment of malfunctioning components. System startup baseline performance tests are made using various size objects ~~a~~ (hammers) as ~~a~~ tools to ~~simulate an~~ generate calibrated impacts. Additional system online performance testing is performed using special signal injection test modules. These modules simulate impacts and test performance of the signal processing equipment. Hardware integrity tests are also performed to verify equipment operation.

The impact detect algorithm used by the signal processing equipment is designed to minimize the number of false alarms. False impact detection, attributable to normal hydraulic, mechanical and electrical noise, is minimized by a number of techniques including:

- Utilizing a floating level within the impact detection algorithm. The floating level is based on signal levels not characteristic of an impact, and is generally a function of the background noise level.
- Comparing the impact event with the times and type of normally occurring plant operation events received from plant control system, such as a control rod stepping~~, valve motion, pump start ups, and others~~.

- Comparing the number of events detected within a given time interval. ~~For example, a impact occurring more than two times in one minute may be considered as valid, but random impact occurring at sporadic intervals longer than one minute may not be considered as a valid alarm.~~

The sensors of the impact monitoring system are fastened mechanically to the reactor coolant system at potential loose part collection regions including the upper and lower head region of the reactor pressure vessel, and the reactor coolant inlet region of each steam generator. ~~Sensors are mounted in a manner which protects the sensors from mechanical damage, compensates for thermal expansion and provides a constant holding force throughout the operating range, maintains the mounting resonance frequency greater than 17 kHz.~~

The equipment inside the containment is designed to remain functional through an earthquake of a magnitude equal to 50 percent of the calculated–Safe Shutdown Earthquake and normal environments (radiation, vibration, temperature, humidity) anticipated during the operating lifetime. The ~~two~~ instrument channels associated with the ~~redundant~~ sensors at each reactor coolant system location are physically separated from each other starting at the sensor locations to a point in the plant that is always accessible for maintenance during full-power operation.

The digital metal impact monitoring system is calibrated prior to plant startup. Capabilities exist for subsequent periodic online channel checks and channel functional tests and for offline channel calibrations at refueling outages.

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

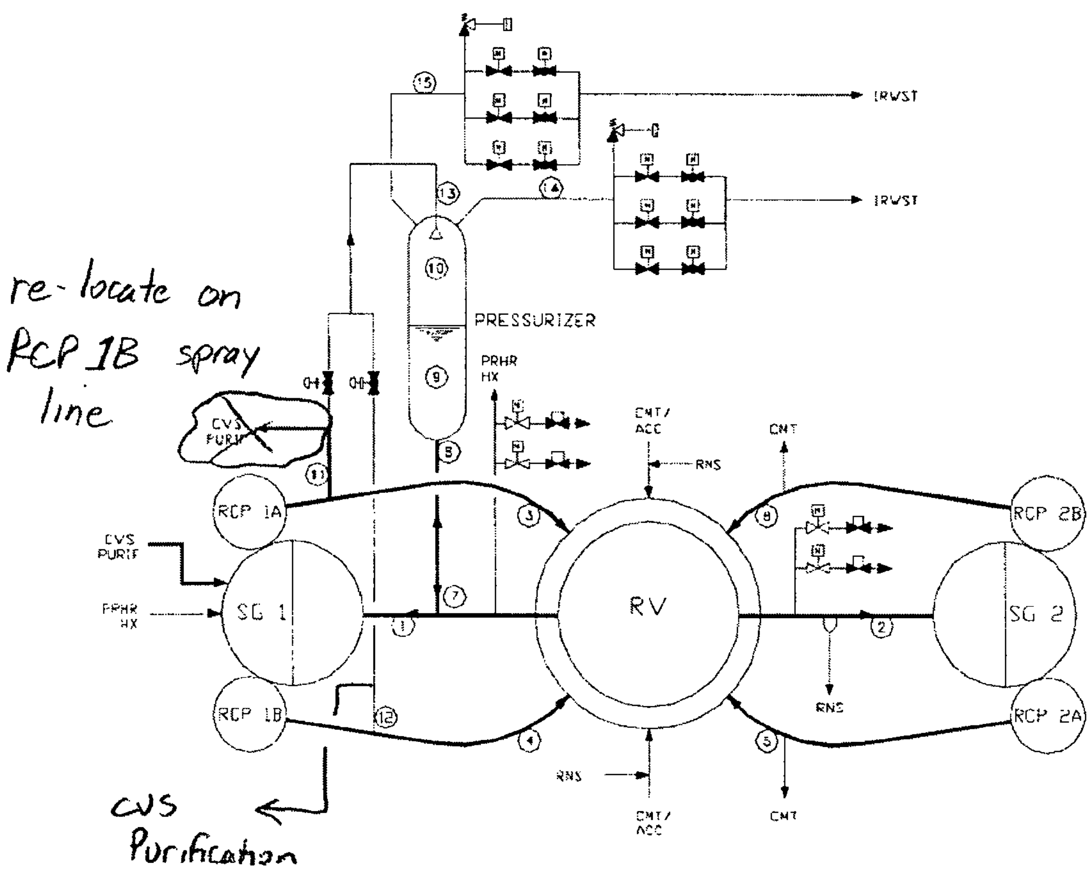
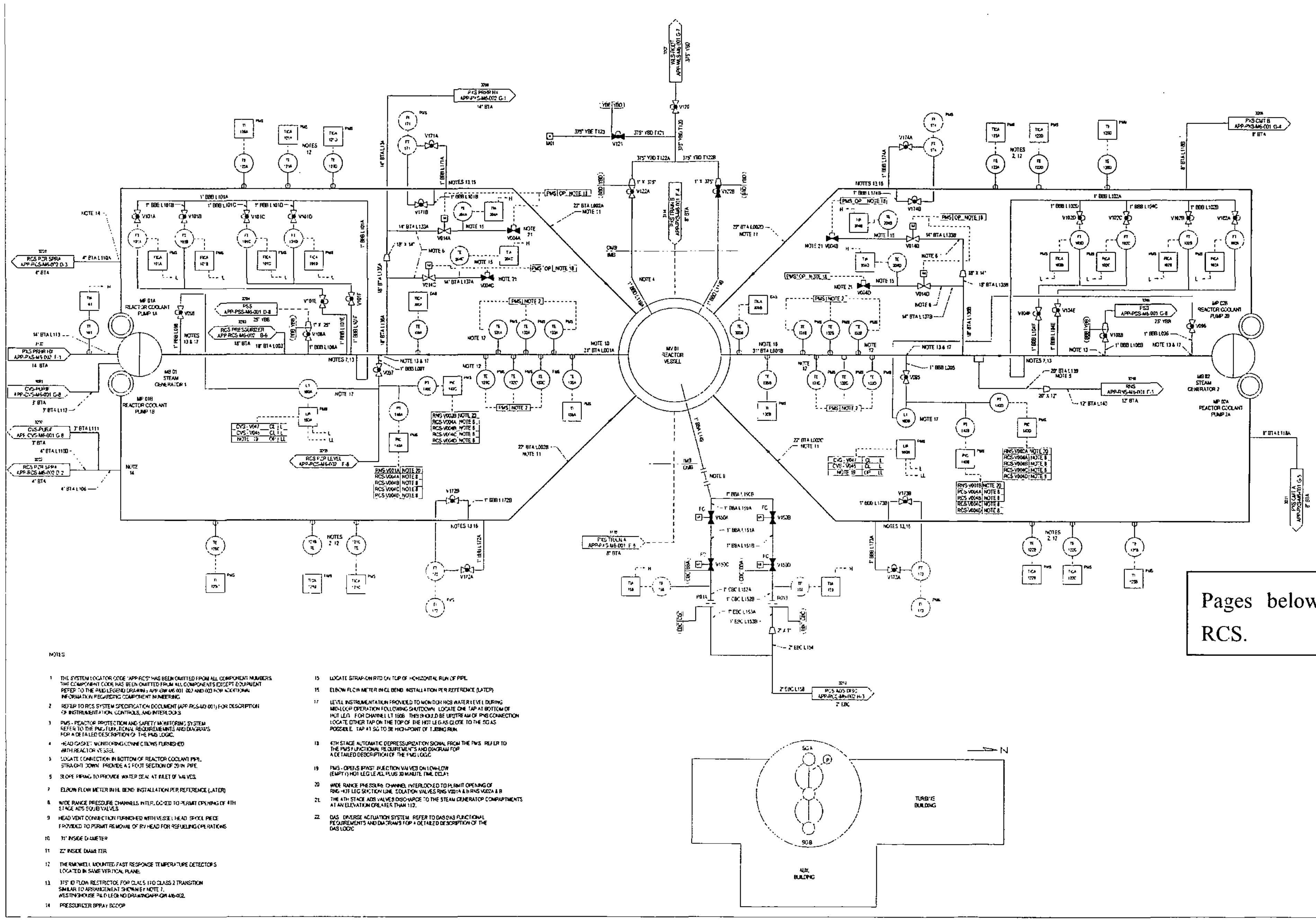


Figure 5.1-1

Reactor Coolant System Schematic Flow Diagram



Pages below shows markup of RCS.

Figure 5.1-5 (Sheet 1 of 3)
Inside Reactor Containment

REV. 15 DCD FIGURE

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

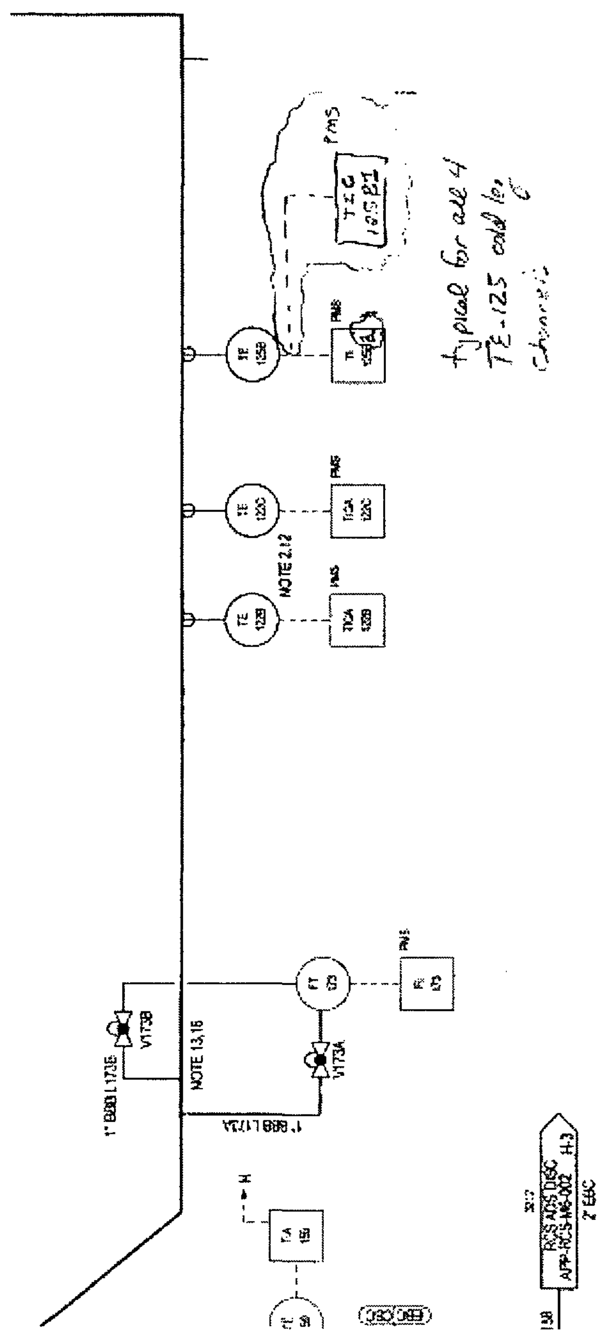


Figure 5.1-5 (Sheet 1 of 3)

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

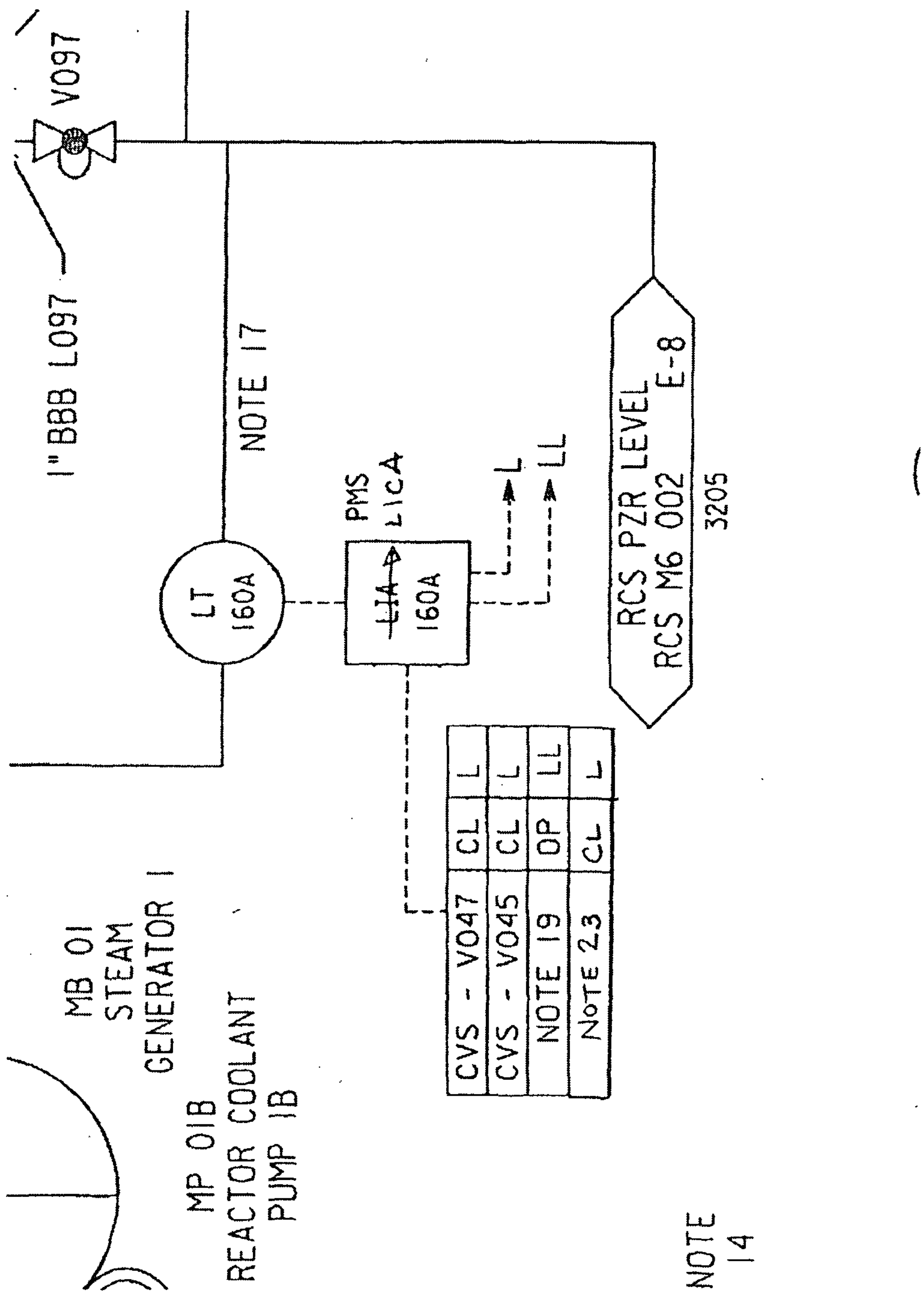


Figure 5.1-5

(Sheet 1 of 3)

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

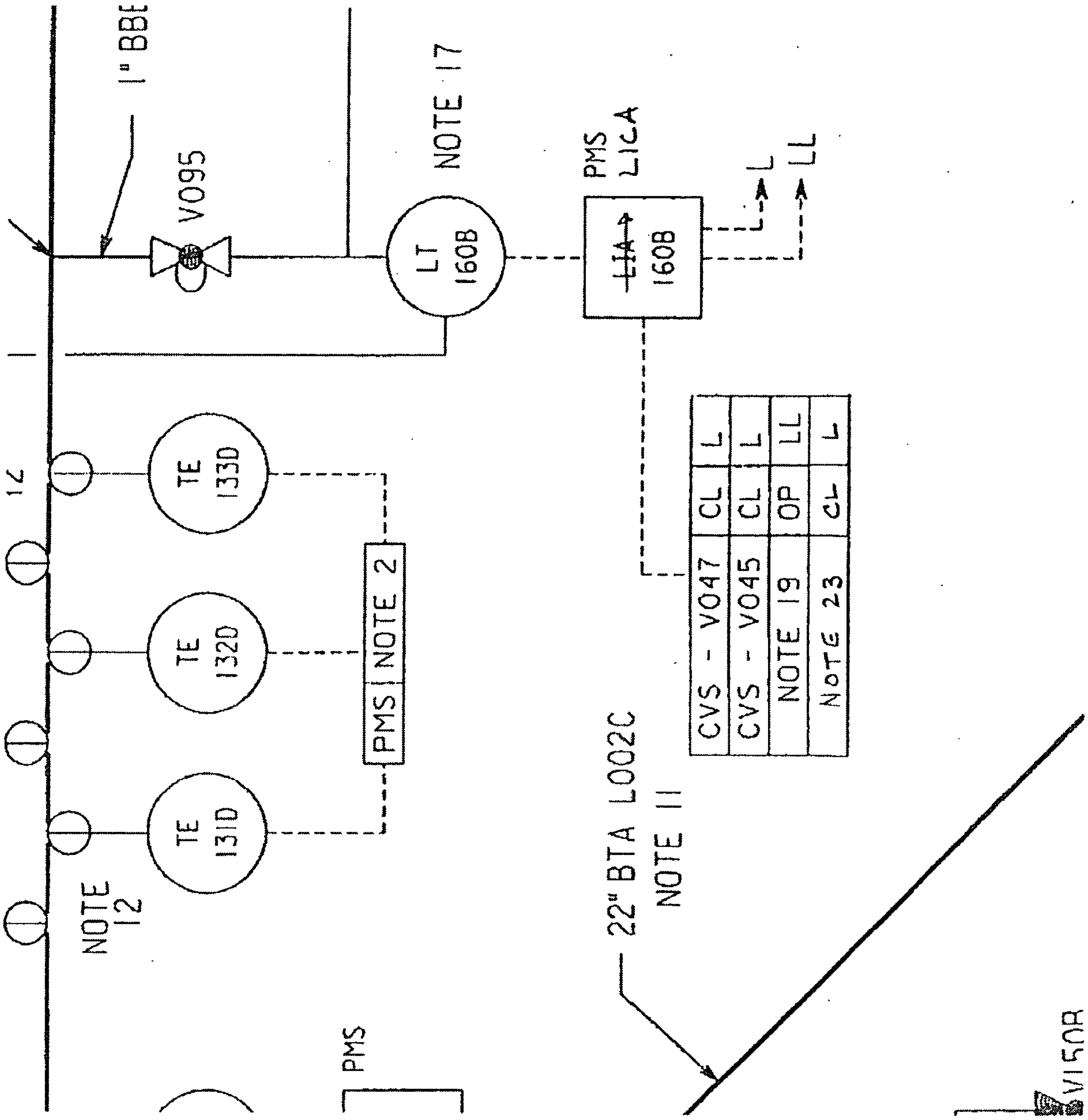


Figure 5.1-5 (Sheet 1 of 3)
Reactor Coolant System
Piping and Instrumentation Diagram

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

NOTES:

1. THE SYSTEM LOCATOR CODE "APP-RCS" HAS BEEN OMITTED FROM ALL COMPONENT NUMBERS. THE COMPONENT CODE HAS BEEN OMITTED FROM ALL COMPONENTS EXCEPT EQUIPMENT. REFER TO THE P&ID LEGEND DRAWING APP-GW M6 001, 002 AND 003 FOR ADDITIONAL INFORMATION REGARDING COMPONENT NUMBERING.
2. REFER TO RCS SYSTEM SPECIFICATION DOCUMENT (APP-RCS-M3-001) FOR DESCRIPTION OF INSTRUMENTATION, CONTROLS, AND INTERLOCKS.
3. PMS - REACTOR PROTECTION AND SAFETY MONITORING SYSTEM REFER TO THE PMS FUNCTIONAL REQUIREMEMNTS AND DIAGRAMS FOR A DETAILED DESCRIPTION OF THE PMS LOGIC.
4. HEAD GASKET MONITORING CONNECTIONS FURNISHED WITH REACTOR VESSEL.
5. LOCATE CONNECTION IN BOTTOM OF REACTOR COOLANT PIPE. STRAIGHT DOWN. PROVIDE A 2 FOOT SECTION OF 20 IN. PIPE.
6. SLOPE PIPING TO PROVIDE WATER SEAL AT INLET OF VALVES.
7. VELOCITY HEAD PROBE INSTALLATION PER REFERENCE (LATER). PROBE INCLUDES INTEGRAL .375" FLOW RESTRICTOR FOR CLASS 1 TO 2 TRANSITION.
8. WIDE RANGE PRESSURE CHANNELS INTERLOCKED TO PERMIT OPENING OF 4TH STAGE ADS SQUIB VALVES.
9. HEAD VENT CONNECTION FURNISHED WITH VESSEL HEAD. SPOOL PIECE PROVIDED TO PERMIT REMOVAL OF RV HEAD FOR REFUELING OPERATIONS.
10. 31" INSIDE DIAMETER.
11. 22" INSIDE DIAMETER.
12. THERMOWELL MOUNTED FAST RESPONSE TEMPERATURE DETECTORS LOCATED IN SAME VERTICAL PLANE.
13. .375" I.D. FLOW RESTRICTOR FOR CLASS 1 TO CLASS 2 TRANSITION SIMILAR TO ARRANGEMENT SHOWN BY NOTE 7, WESTINGHOUSE P&ID LEGEND DRAWING, APP-GW-M6-002.
14. PRESSURIZER SPRAY SCOOP.
15. LOCATE STRAP-ON RTD ON TOP OF HORIZONTAL RUN OF PIPE.
16. LOCATE VELOCITY HEAD PROBE AT LEAST 44 INCHES DOWNSTREAM OF THE PZR SPRAY SCOOP, ORIENTED ON THE OPPOSITE SIDE OF THE SCOOP.
17. LEVEL INSTRUMENTATION PROVIDED TO MONITOR RCS WATER LEVEL DURING MID-LOOP OPERATION FOLLOWING SHUTDOWN. LOCATE ONE TAP AT BOTTOM OF HOT LEG. FOR CHANNEL LT 160B, THIS SHOULD BE UPSTREAM OF RNS CONNECTION. LOCATE OTHER TAP ON THE TOP OF THE HOT LEG AS CLOSE TO THE SG AS POSSIBLE. TAP AT SG TO BE HIGH-POINT OF TUBING RUN.
18. 4th STAGE AUTOMATIC DEPRESSURIZATION SIGNAL FROM THE PMS. REFER TO THE PMS FUNCTIONAL REQUIREMENTS AND DIAGRAM FOR A DETAILED DESCRIPTION OF THE PMS LOGIC.
19. PMS - OPENS IRWST INJECTION VALVES ON LOW-LOW (EMPTY) HOT LEG LEVEL PLUS 30 MINUTE TIME DELAY.
20. WIDE RANGE PRESSURE CHANNEL INTERLOCKED TO PERMIT OPENING OF RNS HOT LEG SUCTION LINE ISOLATION VALVES RNS-V001A & B RNS V002A & B.
21. THE 4th STAGE ADS VALVES DISCHARGE TO THE STEAM GENERATOR COMPARTMENTS AT AN ELEVATION GREATER THAN 110'.
22. DAS - DIVERSE ACTUATION SYSTEM. REFER TO DAS DAS FUNCTIONAL REQUIREMENTS AND DIAGRAMS FOR A DETAILED DESCRIPTION OF THE DAS LOGIC.

23. PLS – Closes CVS-V059 to Isolate Letdown on Low Hot Leg Level During Midloop

Figure 5.1-5 (Sheet 1 of 3)
Reactor Coolant System
Piping and Instrumentation Diagram

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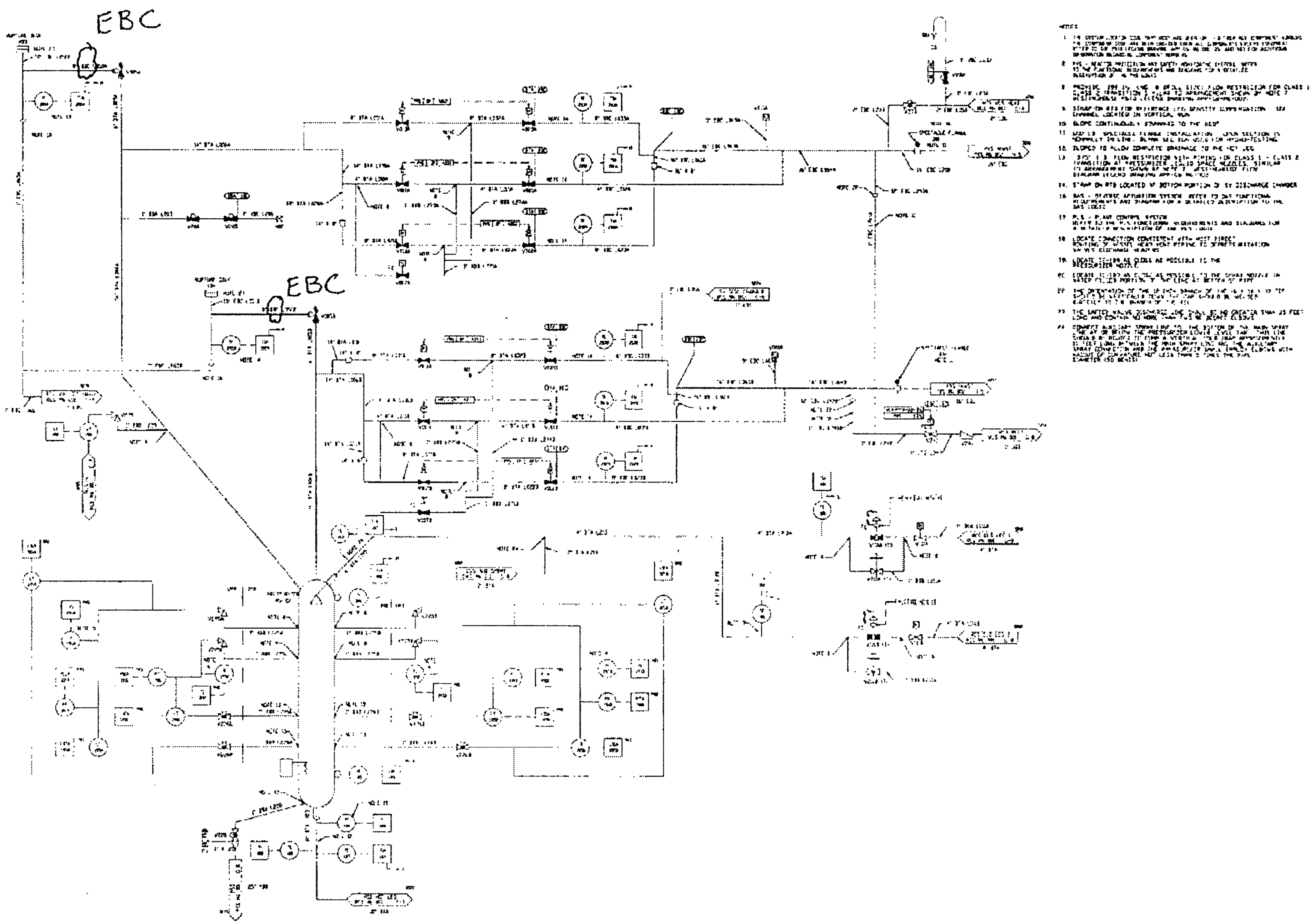
Title: Fluid System Changes



Inside Reactor Containment
Figure 5.1-5 (Sheet 2 of 3)

Reactor Coolant System
Piping and Instrumentation Diagram

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

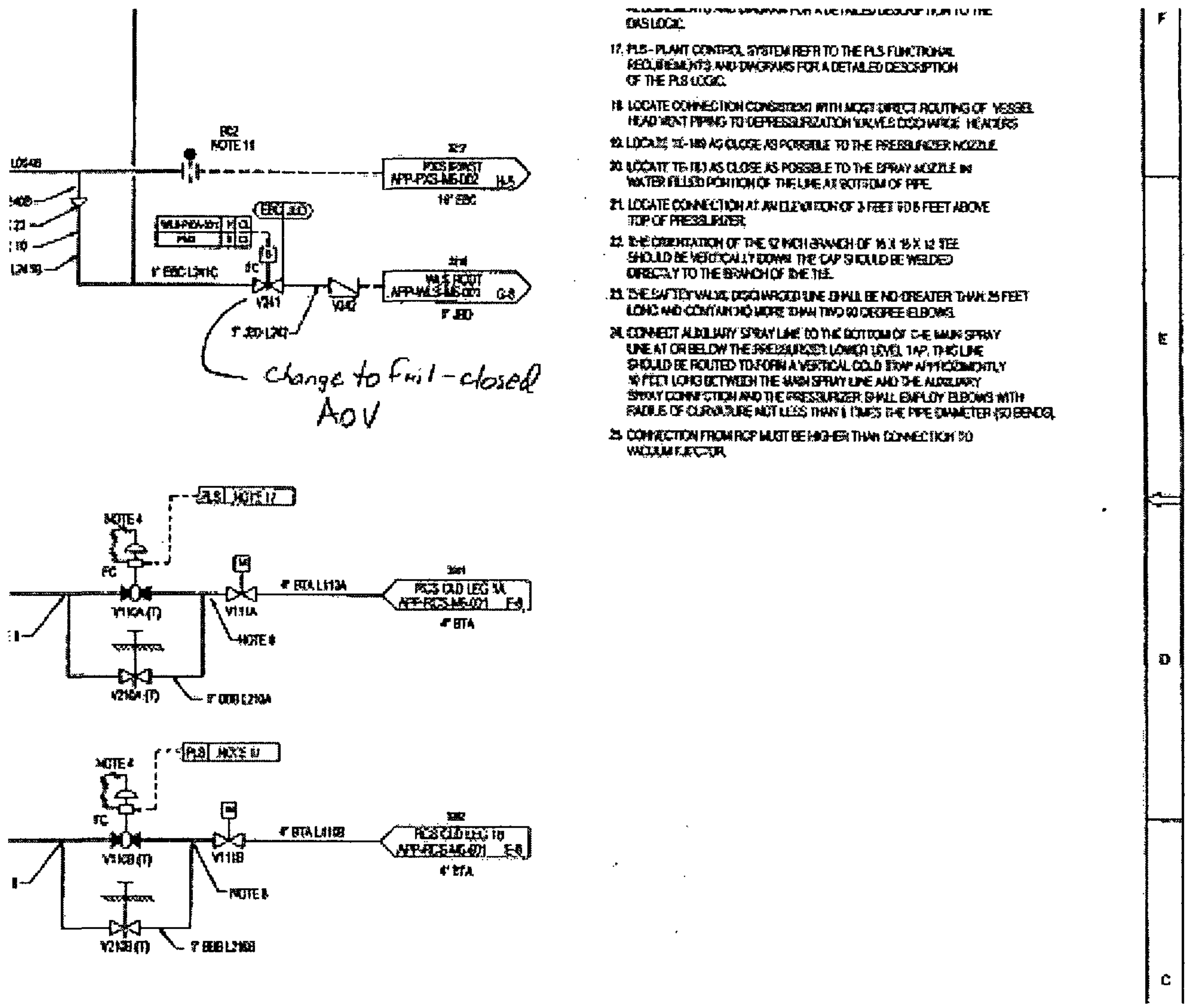


Figure 5.1-5 (Sheet 2 of 3)

Reactor Coolant System

Piping and Instrumentation Diagram

5.4.7.4.2 Plant Cooldown

Once the proper valve alignment has been performed and component cooling water flow has been initiated to both residual heat removal heat exchangers, normal residual heat removal system operation may begin. The pumps are started and the cooldown proceeds. The cooldown rate is controlled by throttling the flow through ~~the bypass around~~ the heat exchanger based on reactor coolant temperature.

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Title: Fluid System Changes

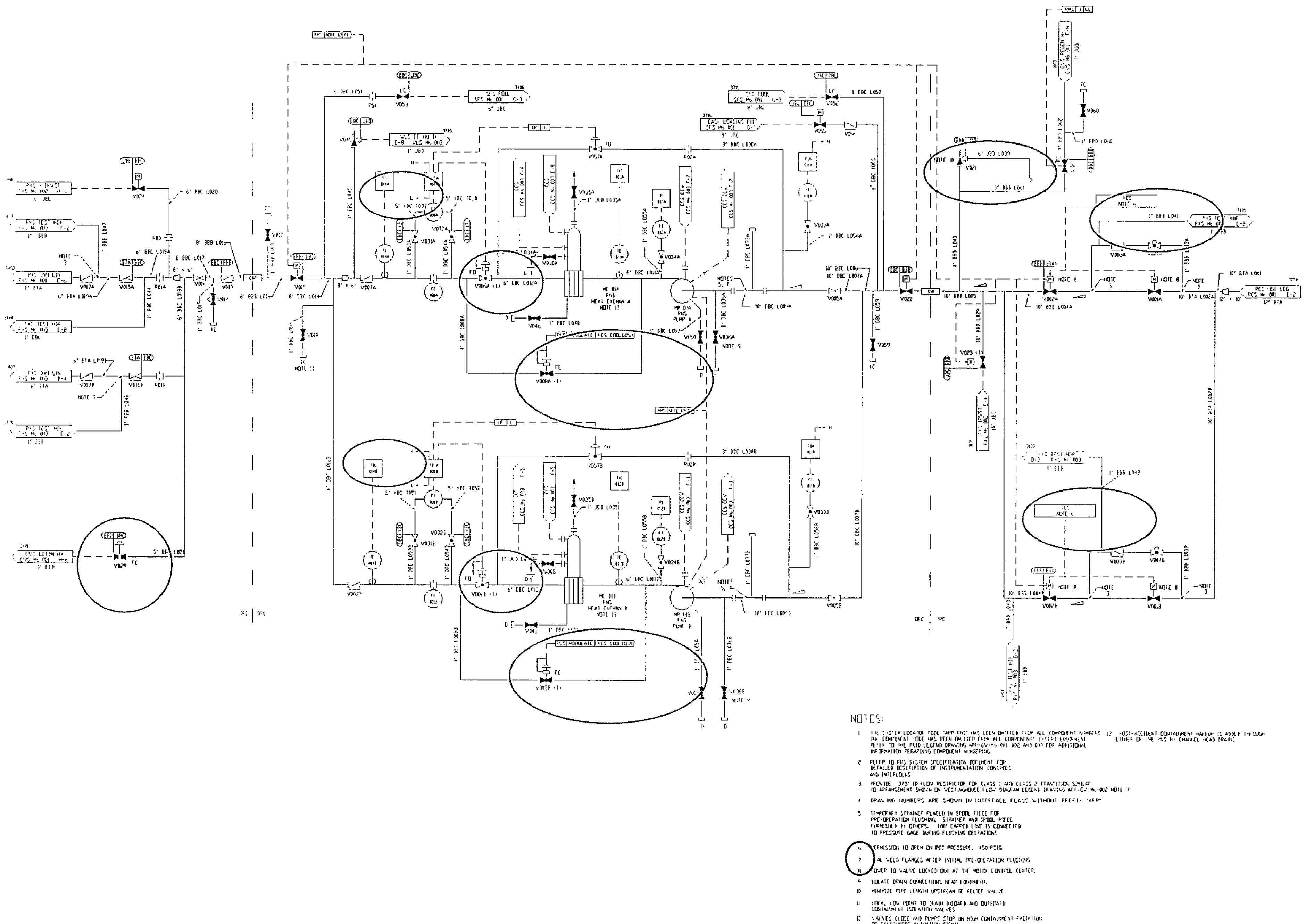


Figure 5.4-7
Normal Residual Heat Removal System
Piping and Instrument Diagram

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

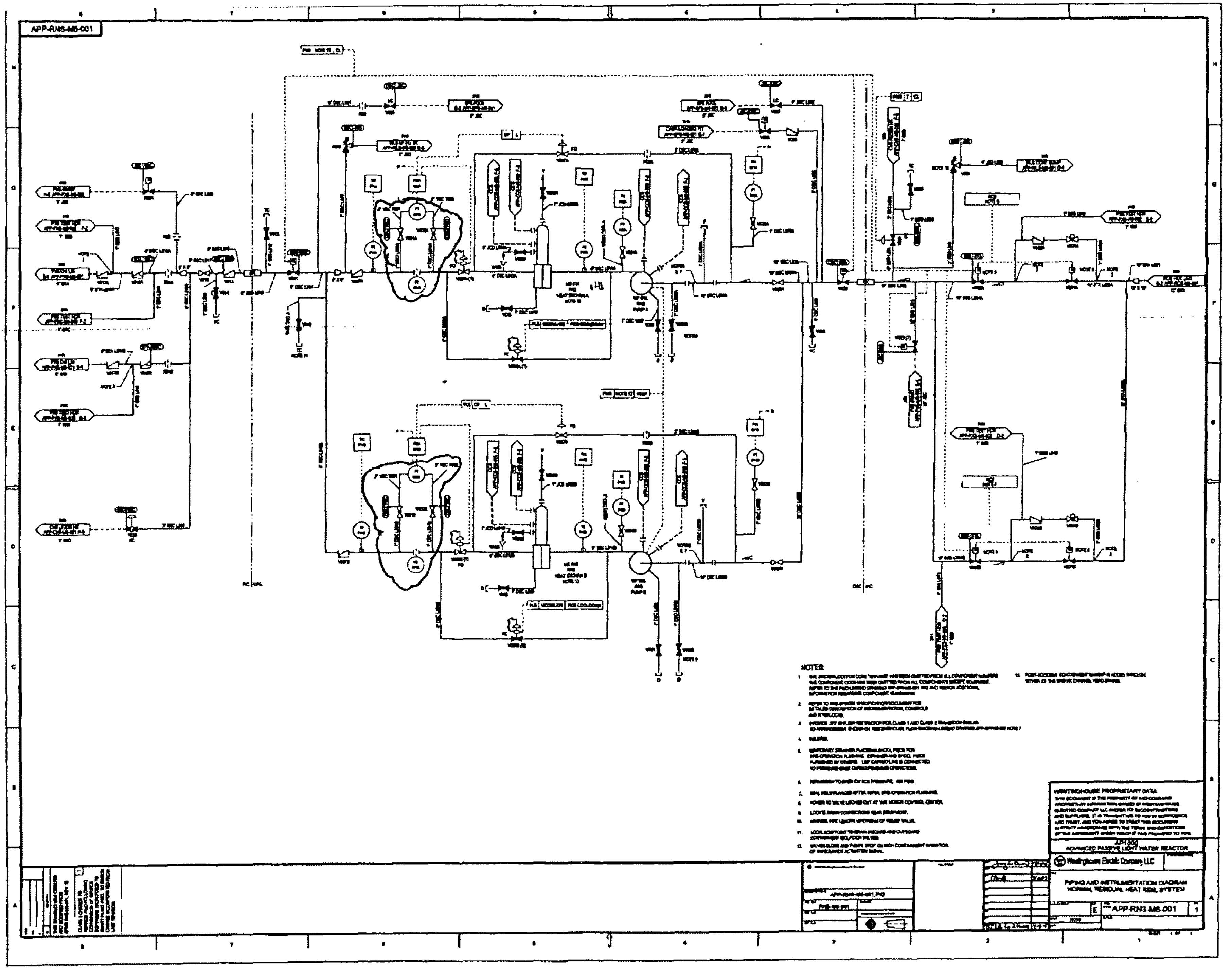


Figure 5.4-7
Normal Residual Heat Removal System
Piping and Instrument Diagram

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

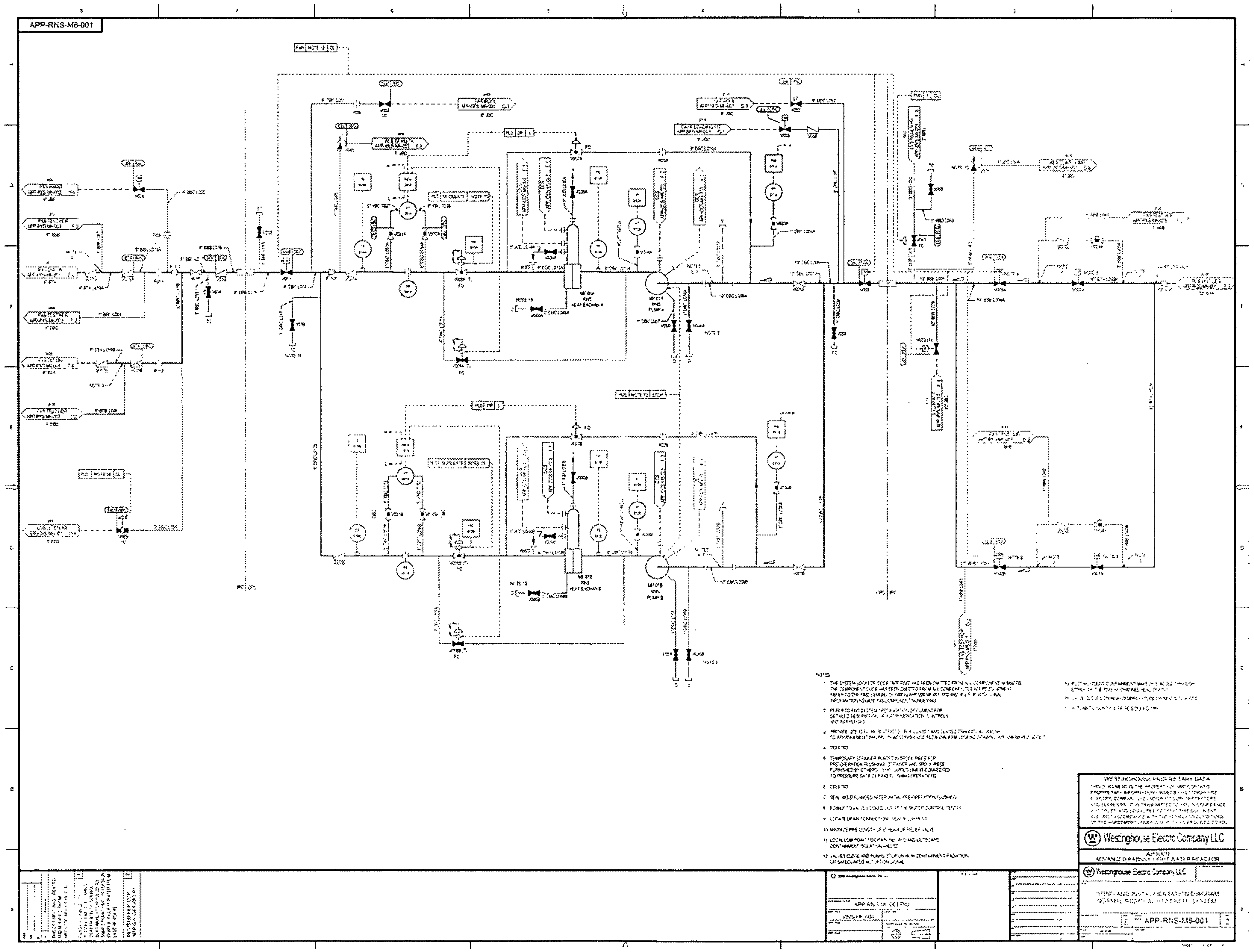


Figure 5.4-7
Revised RNS P&ID

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

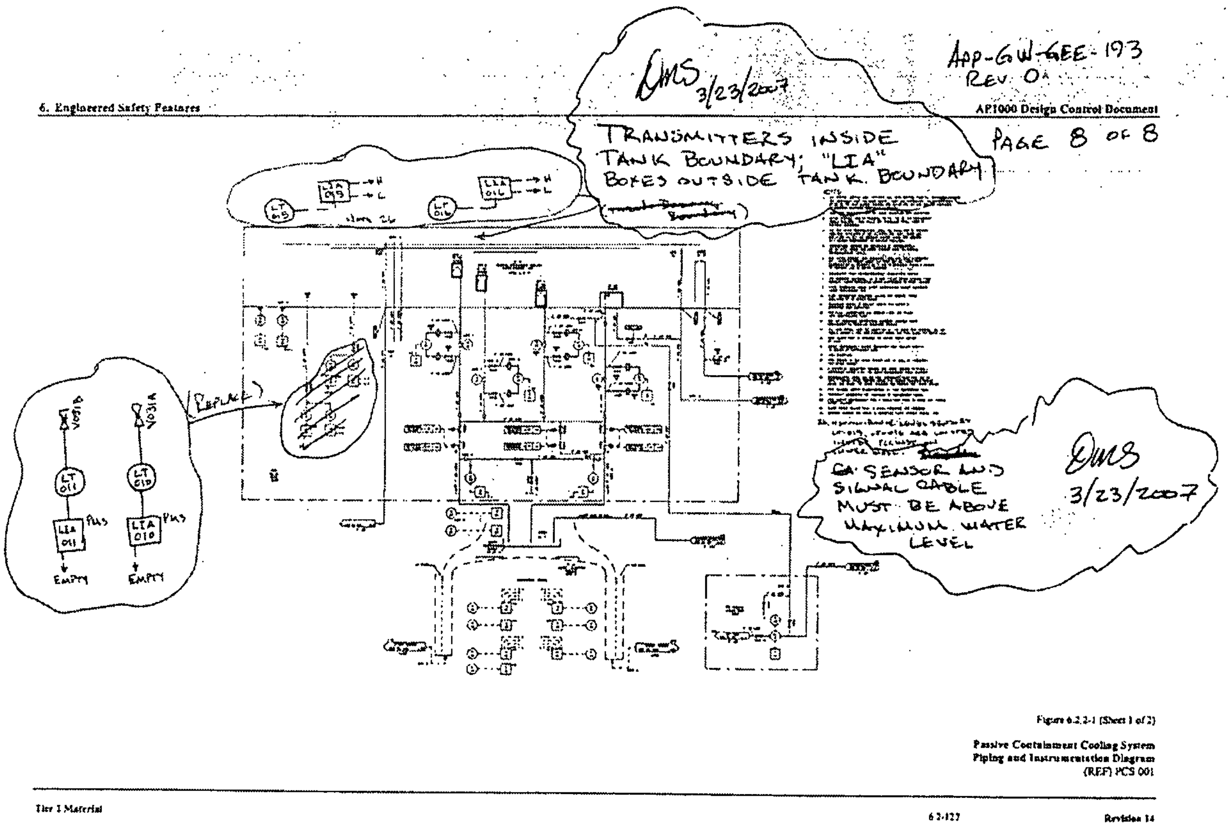


Figure 6.2.2-1 (Sheet 1 of 2)

Passive Containment Cooling System
Piping and Instrumentation Diagram
(REF) PCS 001

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes

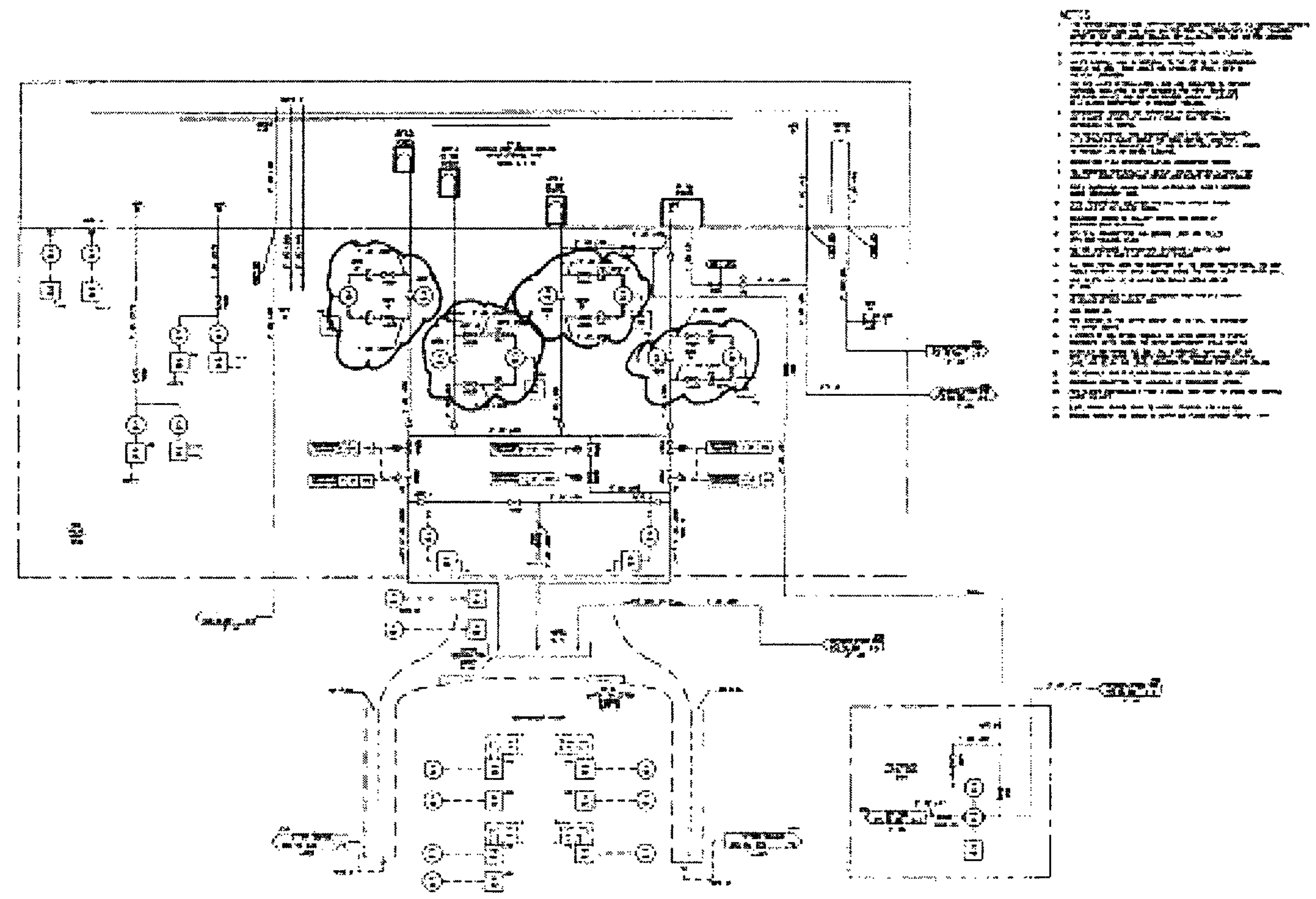


Figure 6.2.2-1 (Sheet 1 of 2)

Passive Containment Cooling System Piping and Instrumentation Diagram
(REF) PCS 001

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

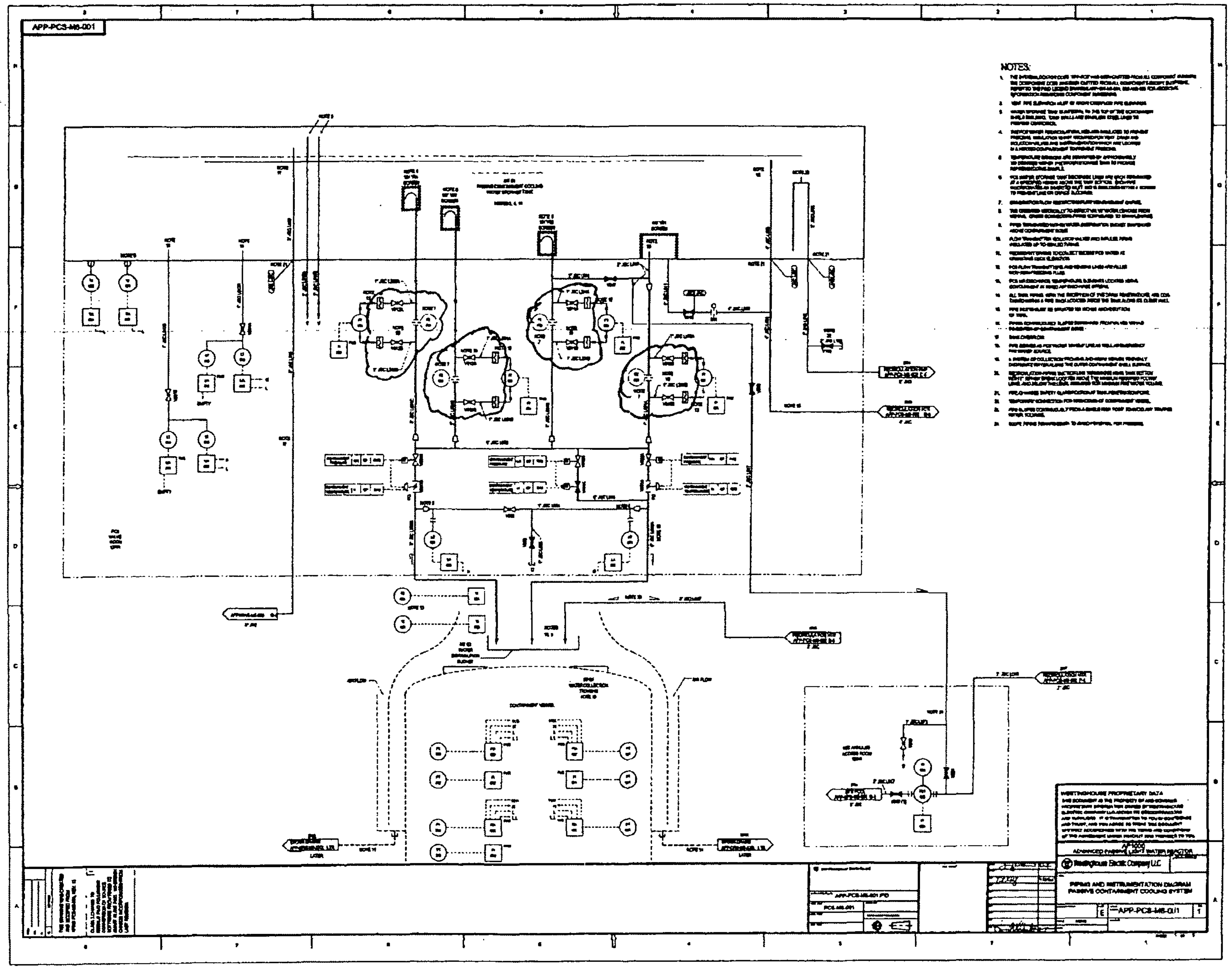


Figure 6.2.2-1 (Sheet 1 of 2)
Passive Containment Cooling System
Piping and Instrumentation Diagram
(REF) PCS 001

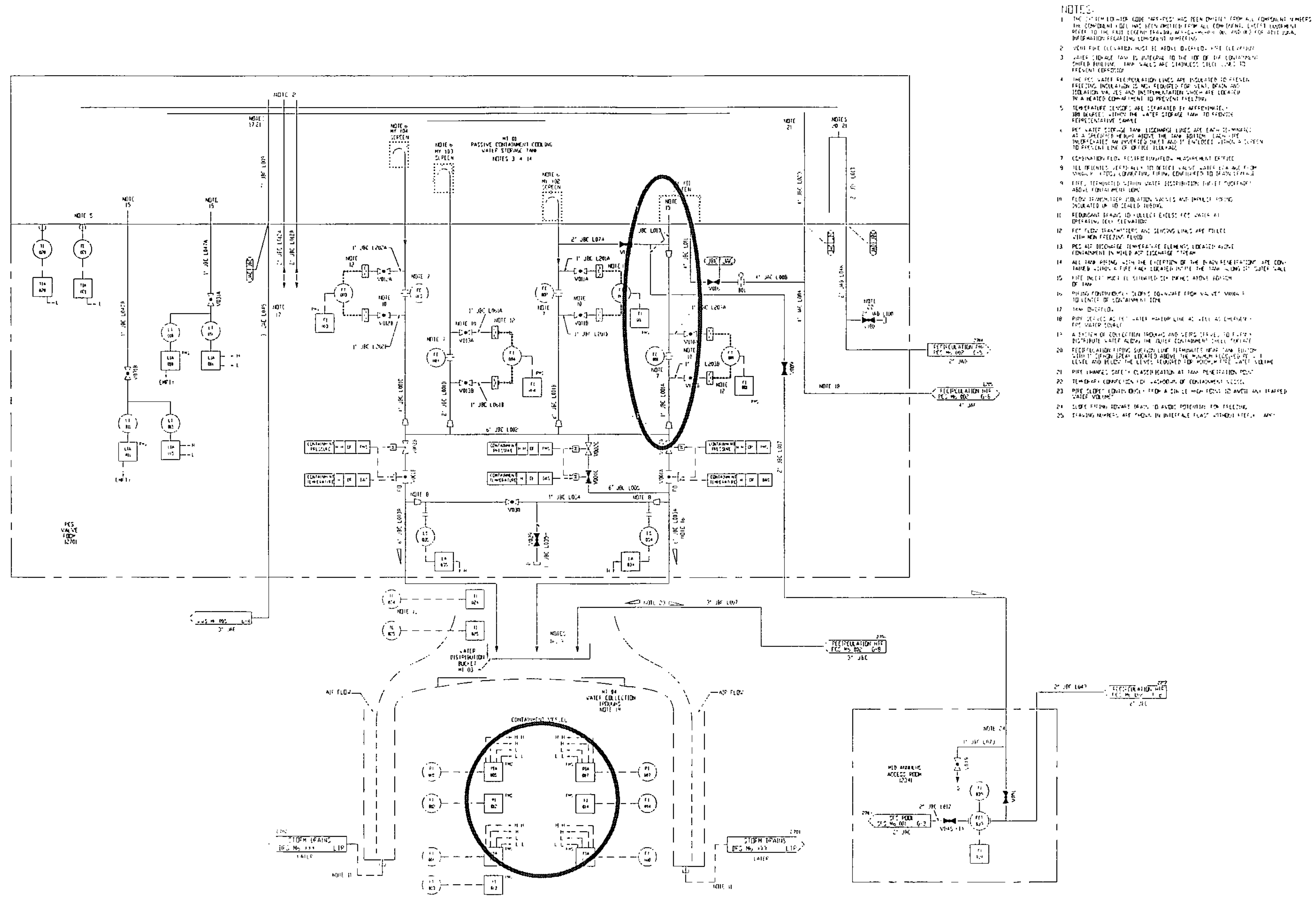


Figure 6.2.2-1 (Sheet 1 of 2)
Passive Containment Cooling System
Piping and Instrumentation Diagram
(REF) PCS 001

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

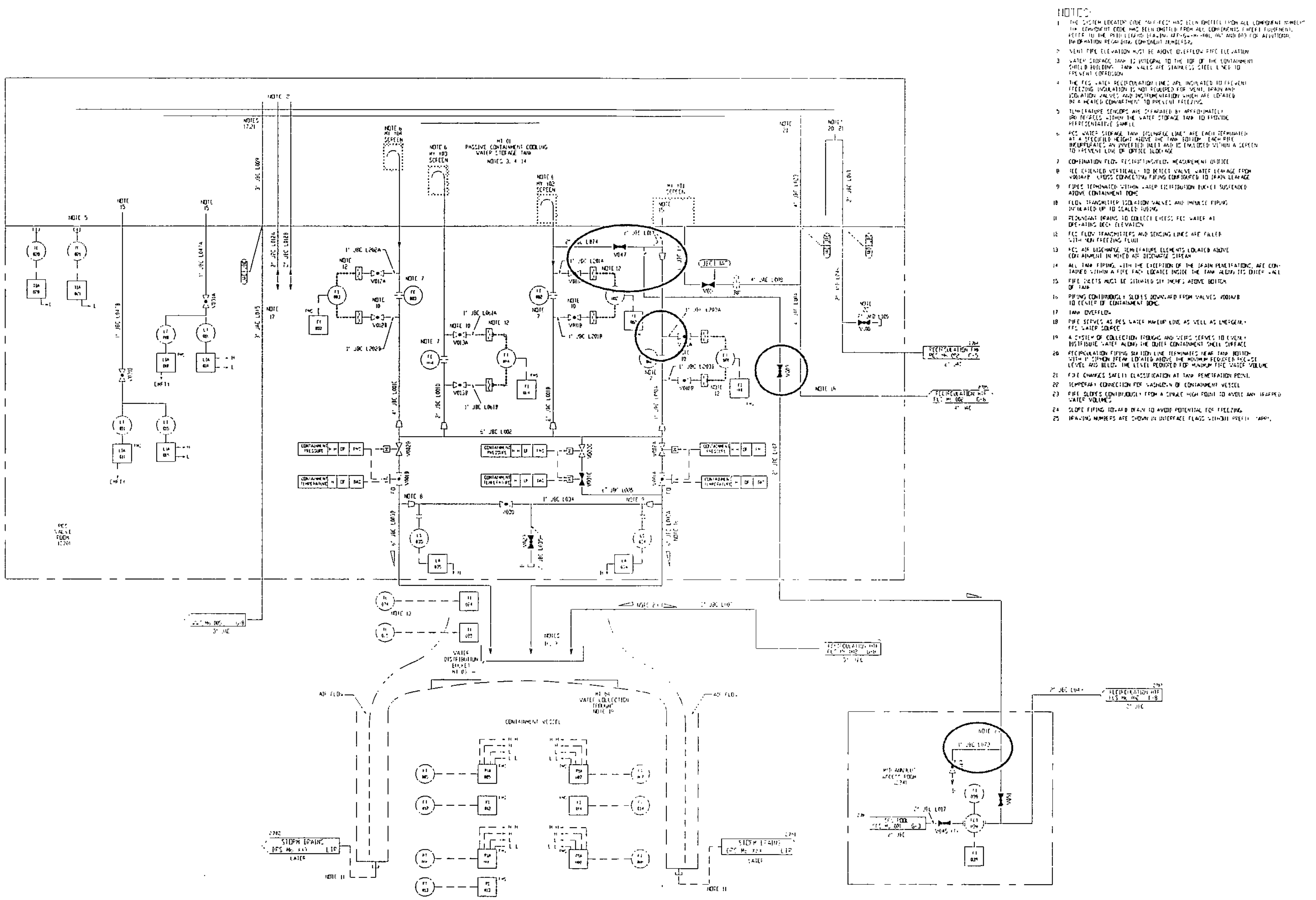
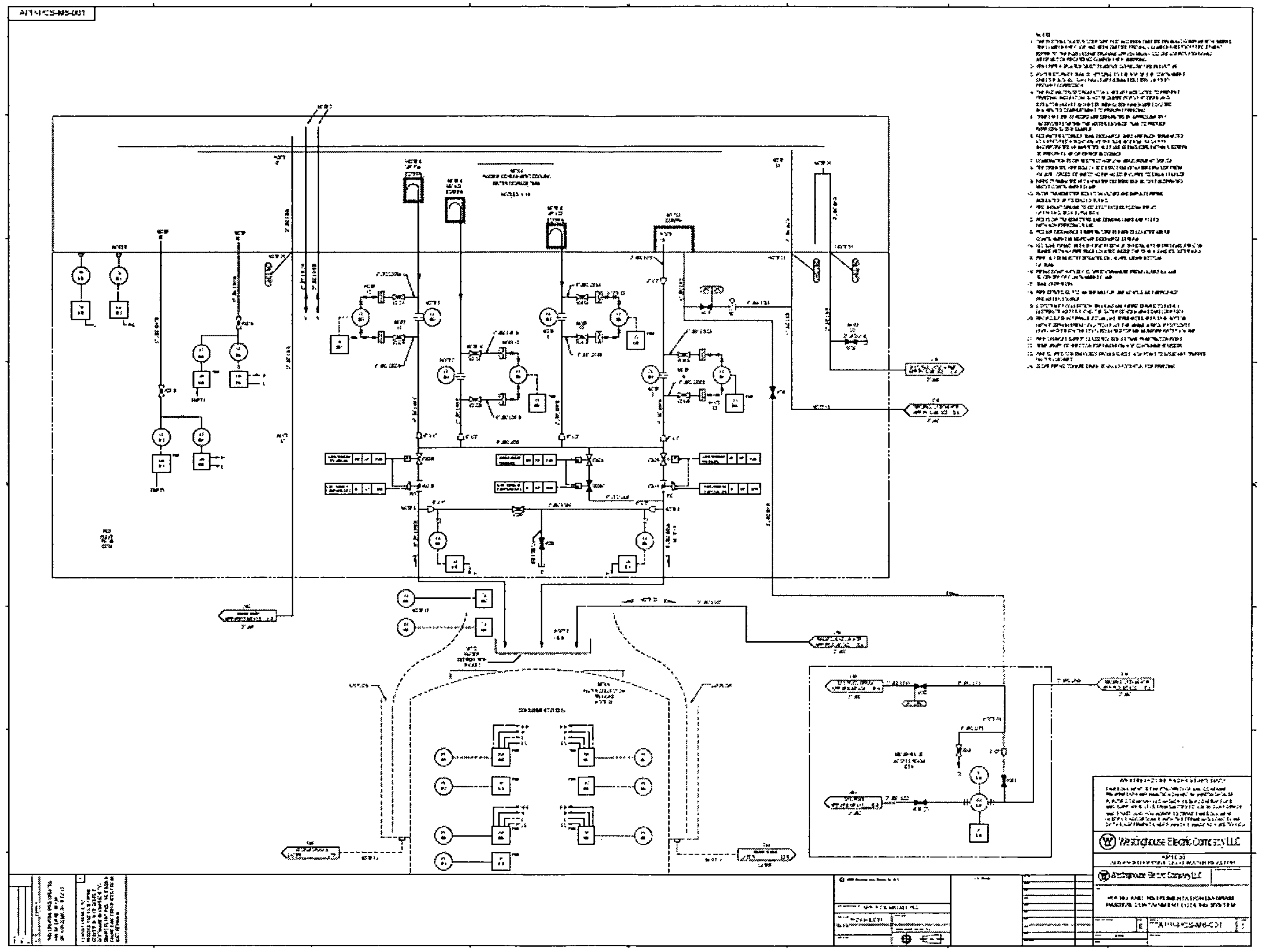


Figure 6.2.2-1 (Sheet 1 of 2)
Passive Containment Cooling System
Piping and Instrumentation Diagram
(REF) PCS 001

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes



REVISED DCD FIGURE

Figure 6.2.2-1 (Sheet 1 of 2)
Passive Containment Cooling System
Piping and Instrumentation Diagram
(REF) PCS

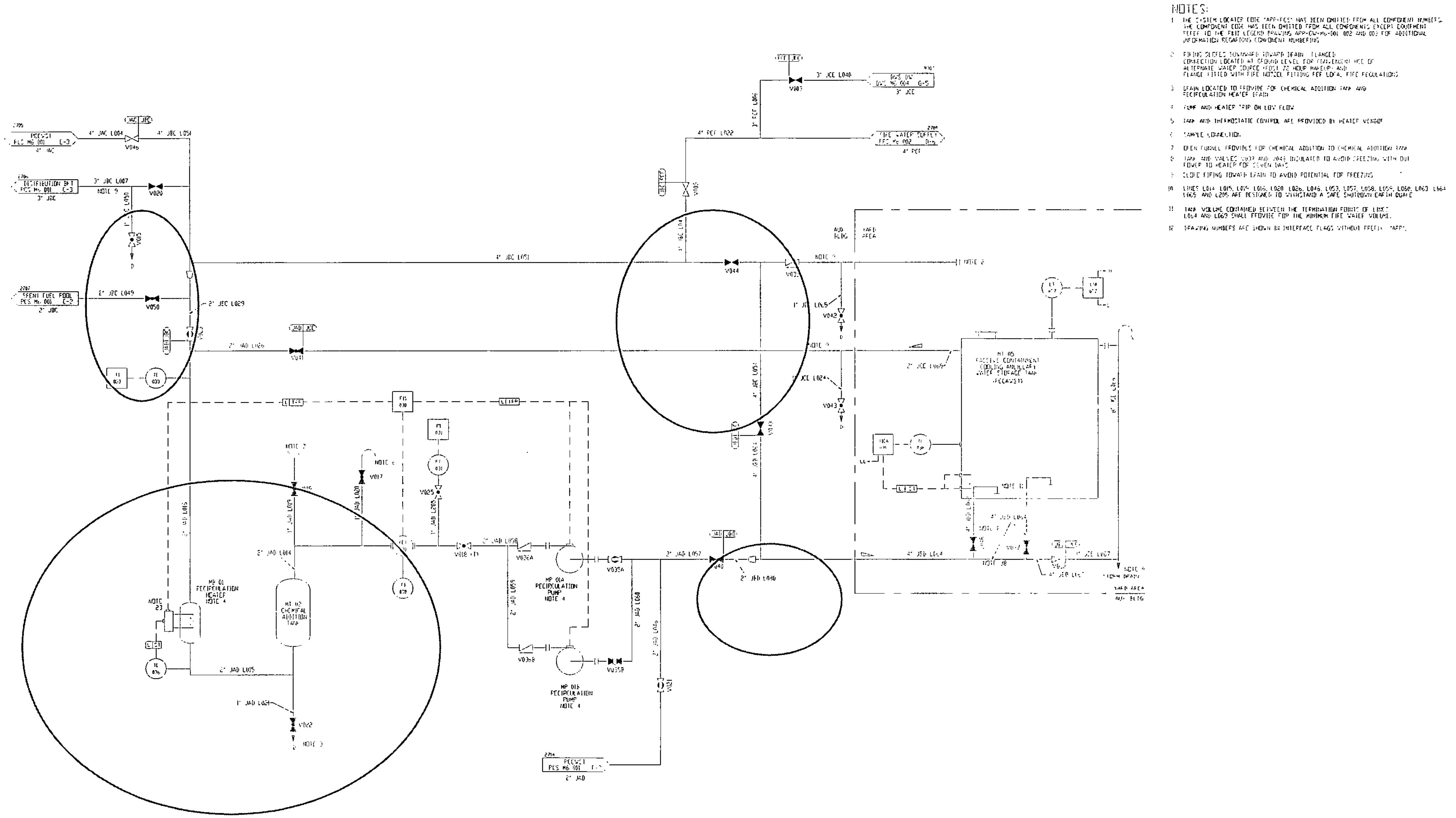


Figure 6.2.2-1 (Sheet 2 of 2)
Passive Containment Cooling System
Piping and Instrumentation Diagram
(REF) PCS 002

REV. 15 DCD FIGURE

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

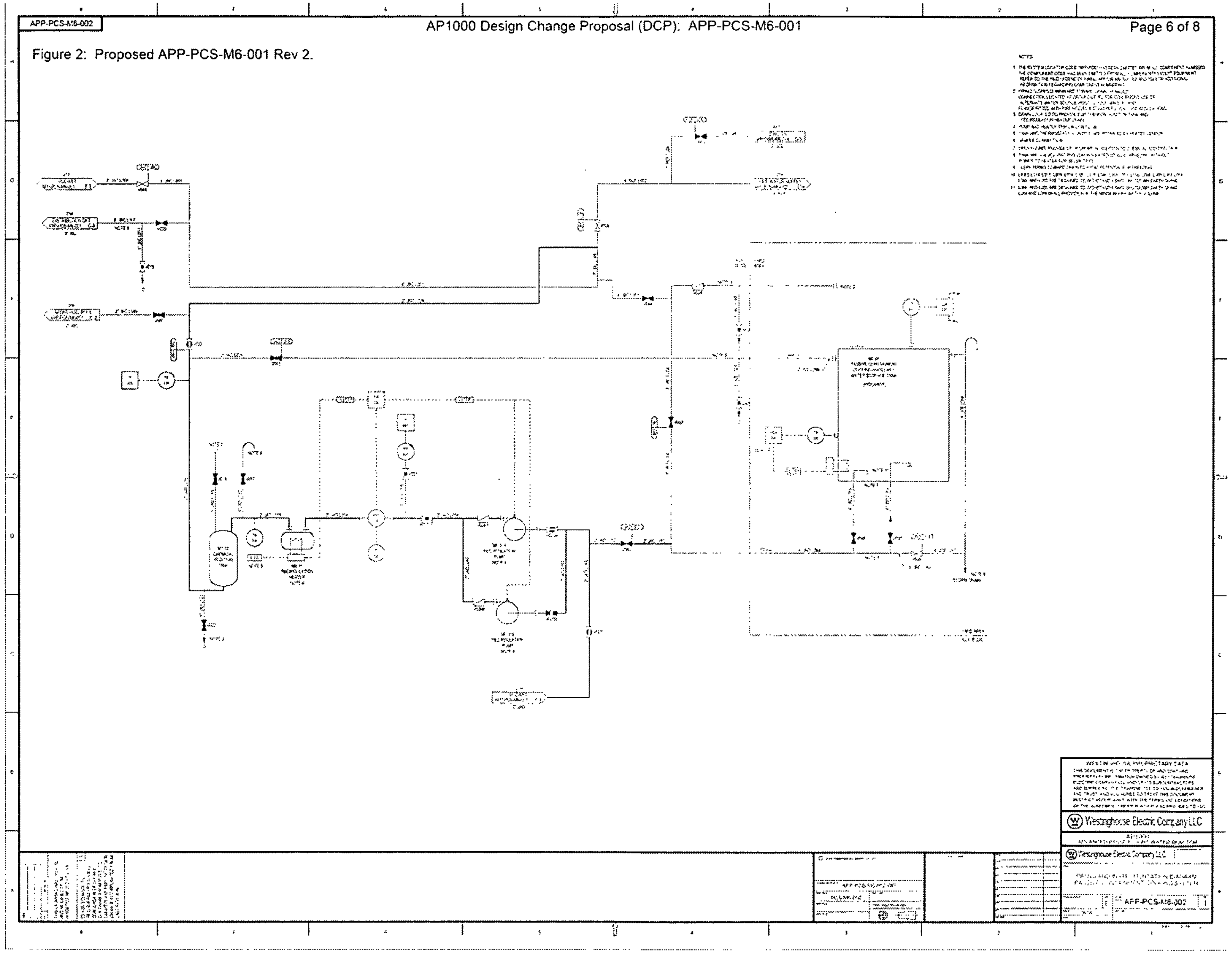


Figure 6.2.2-1 (Sheet 2 of 2)
Passive Containment Cooling System
Piping and Instrumentation Diagram
(REF) PCS 002

REVISED DCD FIGURE

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

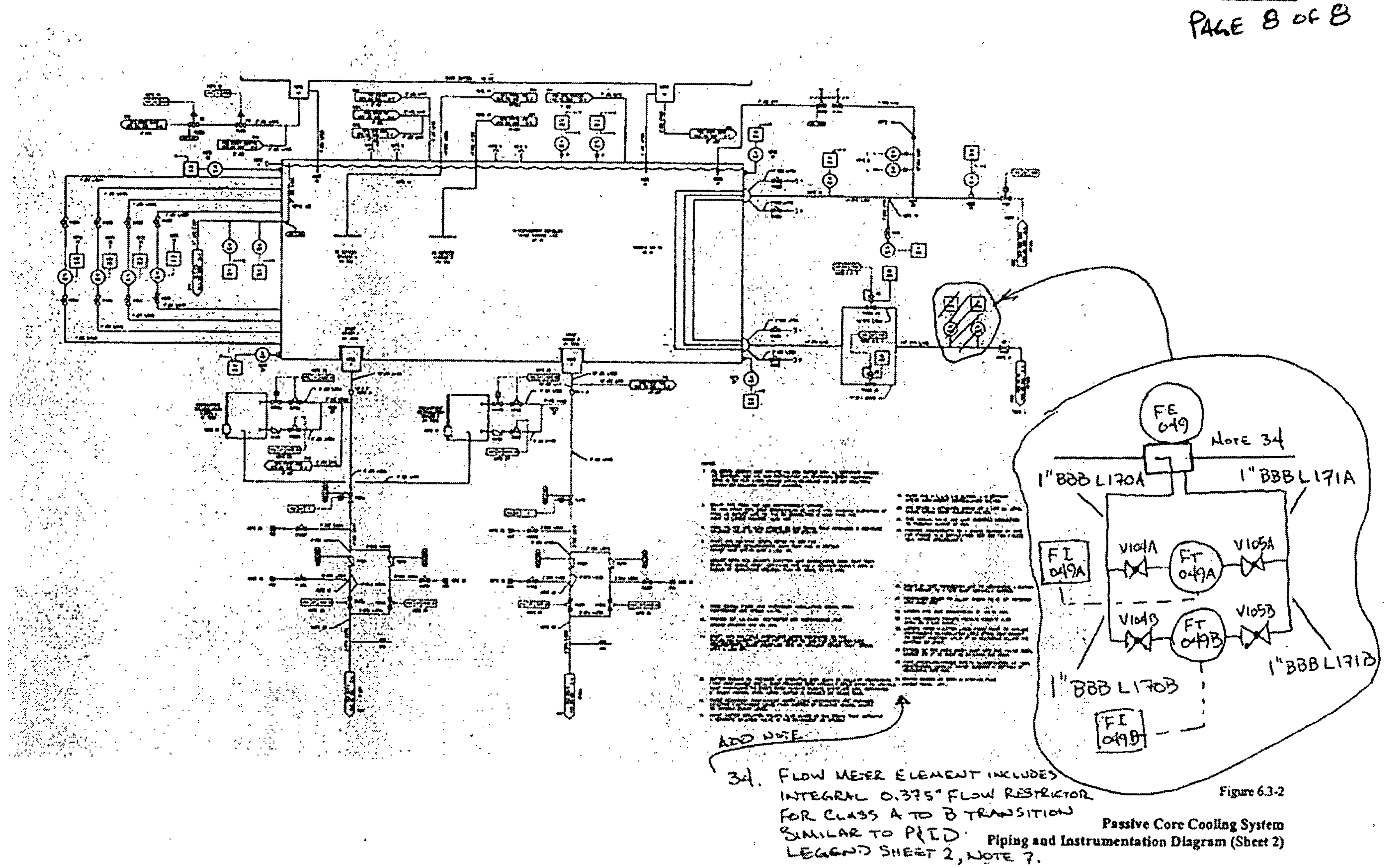


Figure 6.3-2
Passive Core Cooling System
Piping and Instrumentation Diagram (Sheet 2)

Figure 6.3-2
Differential Pressure Flowmeter for PRHR HX Flow

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

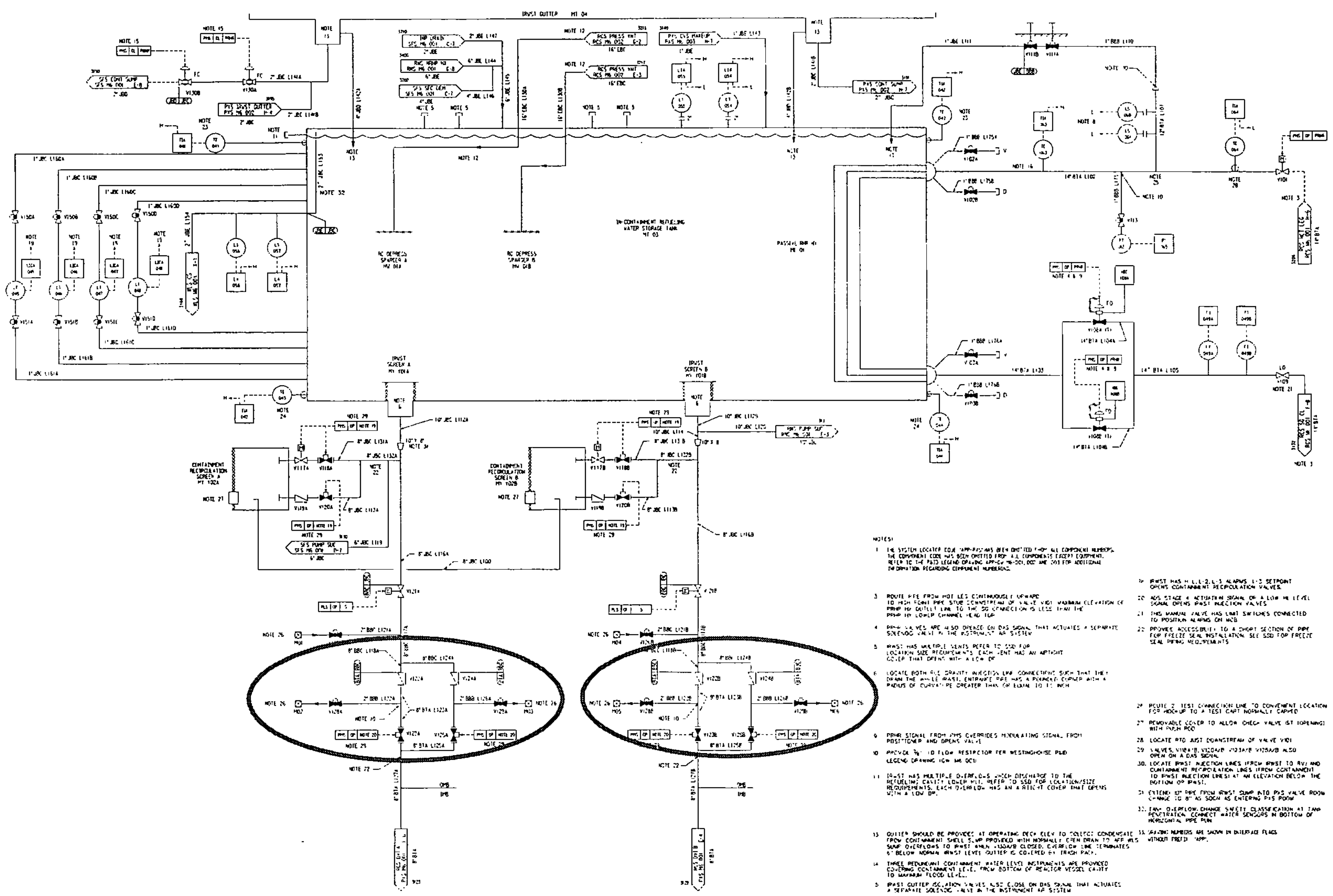


Figure 6.3-2(Sheet 2)
Passive Core Cooling System
Piping and Instrumentation Diagram

REV. 15 DCD FIGURE

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

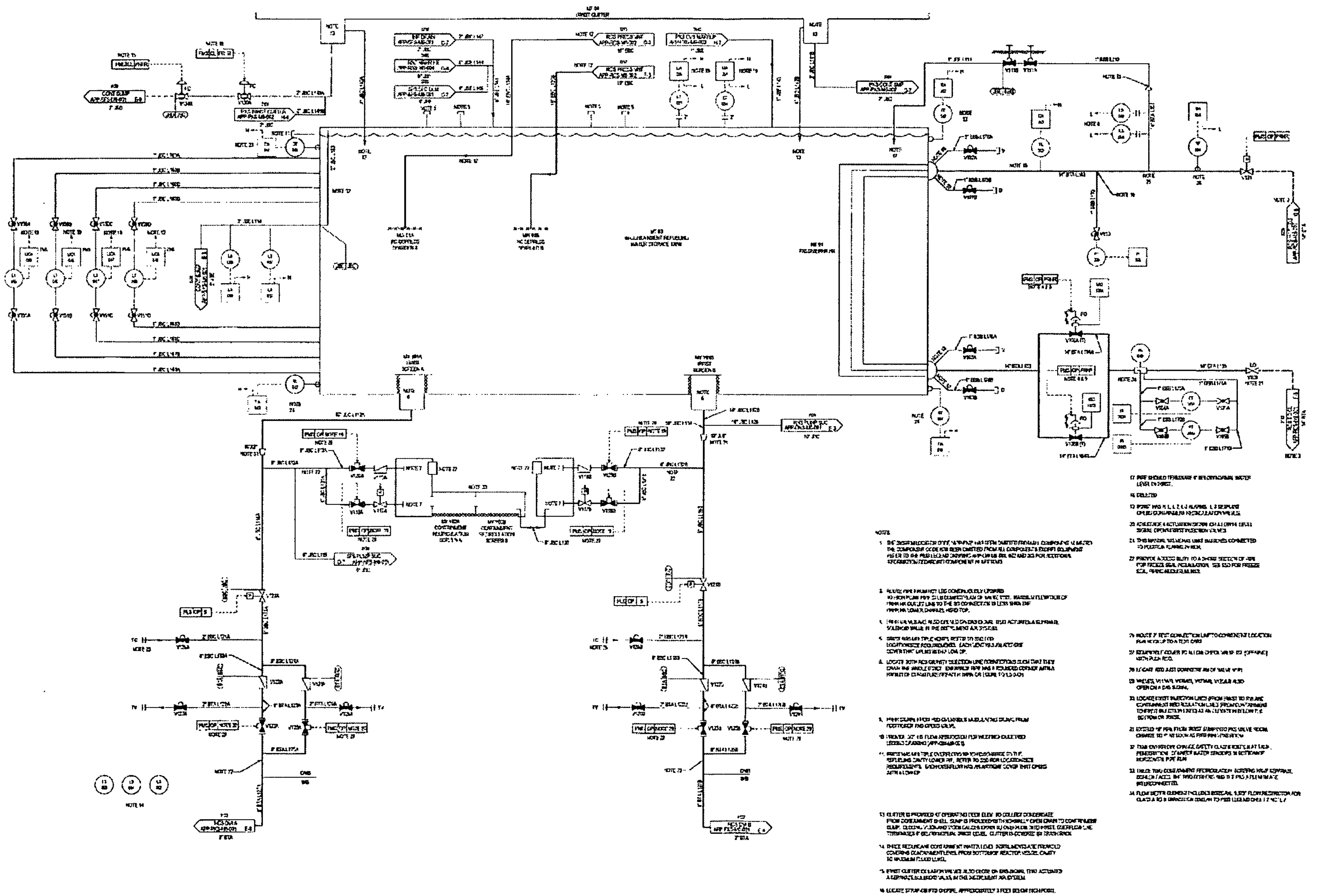


Figure 6.3-2

Passive Core Cooling System
Piping and Instrumentation Diagram (Sheet 2)

REVISED DCD FIGURE

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

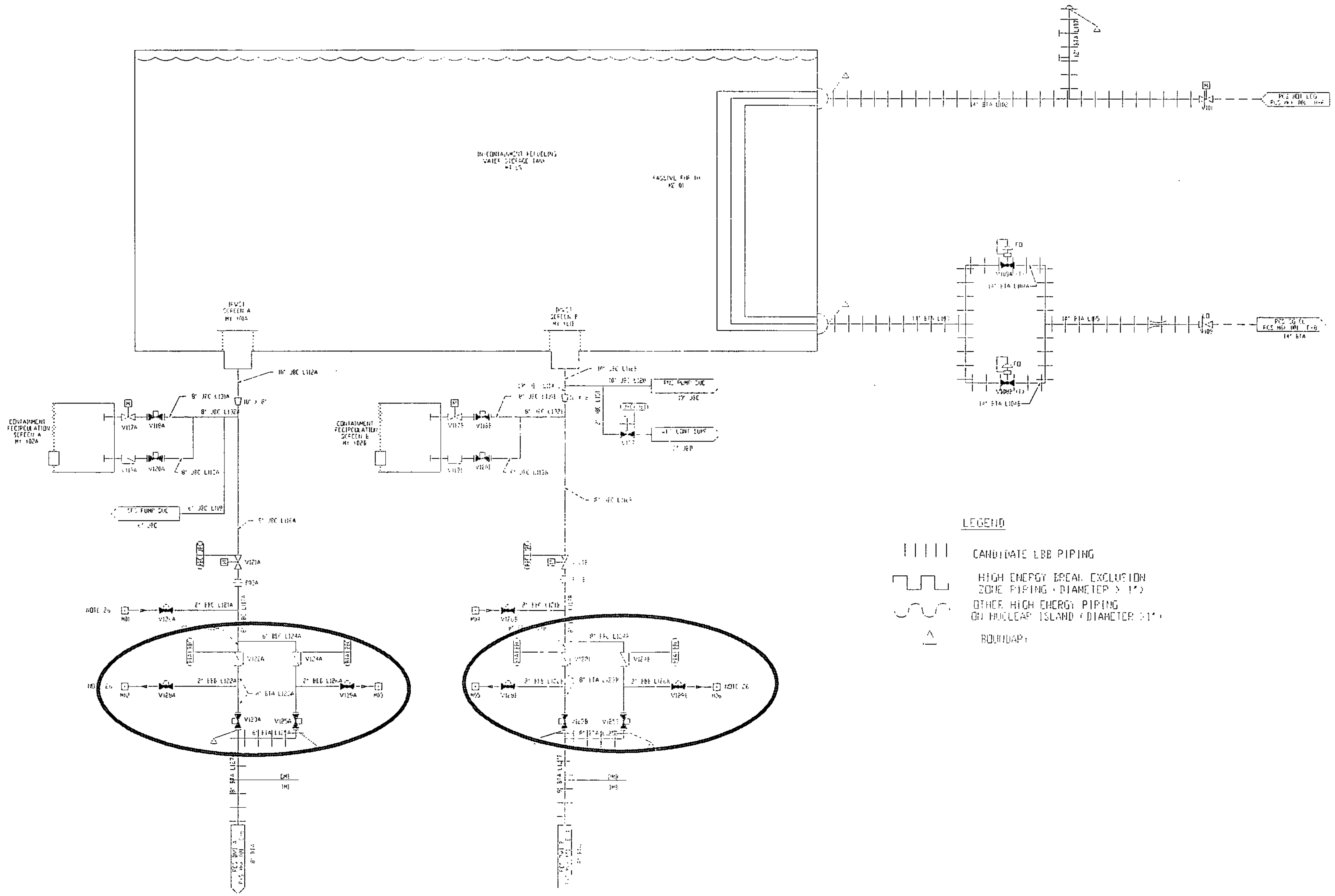


Figure 3E-4 (Sheet 2 of 2)
High Energy Piping – Passive Core Cooling System

REV. 15 DCD FIGURE

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

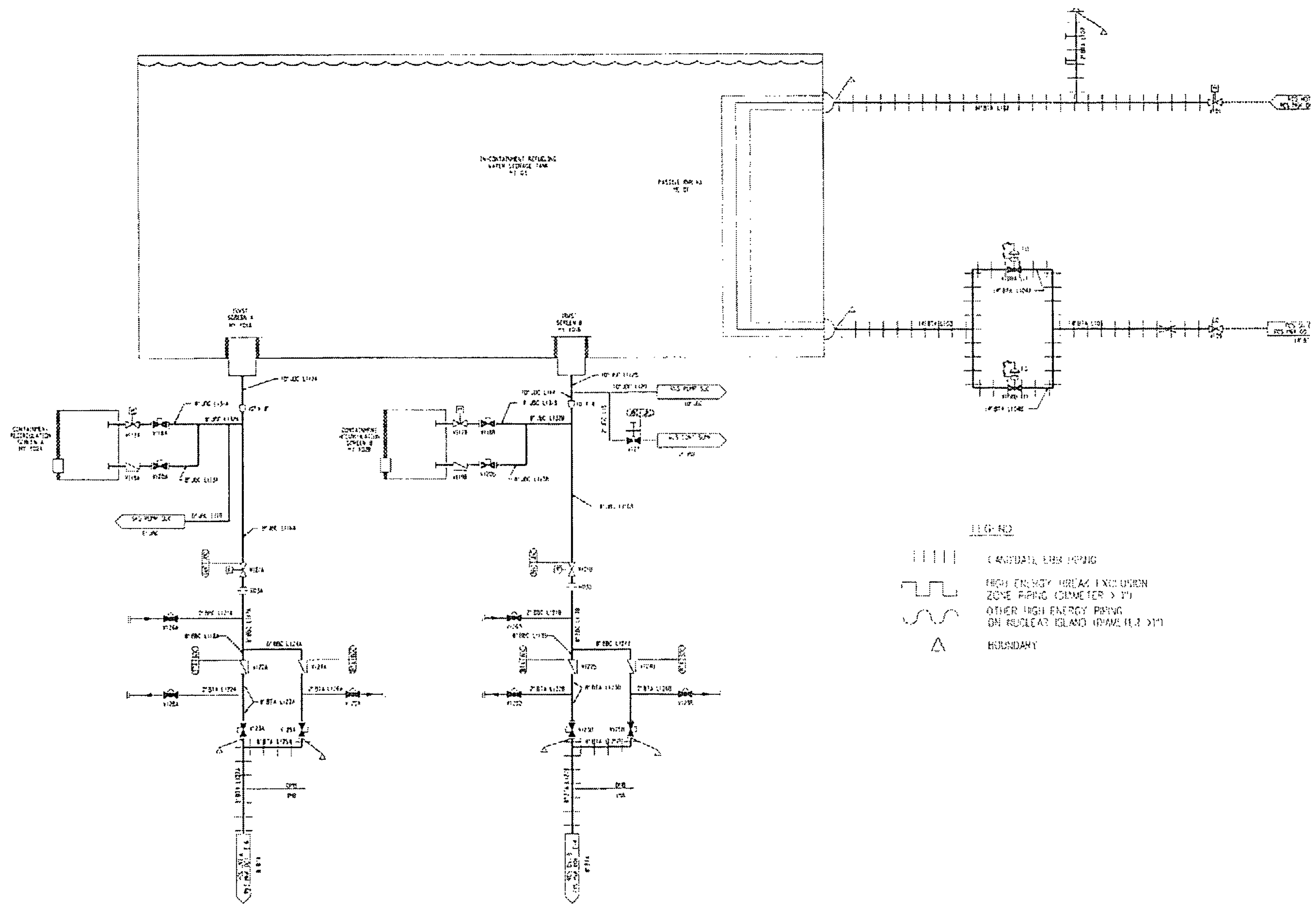


Figure 3E-4 (Sheet 2 of 2)
High Energy Piping – Passive Core Cooling System

REVISED DCD FIGURE

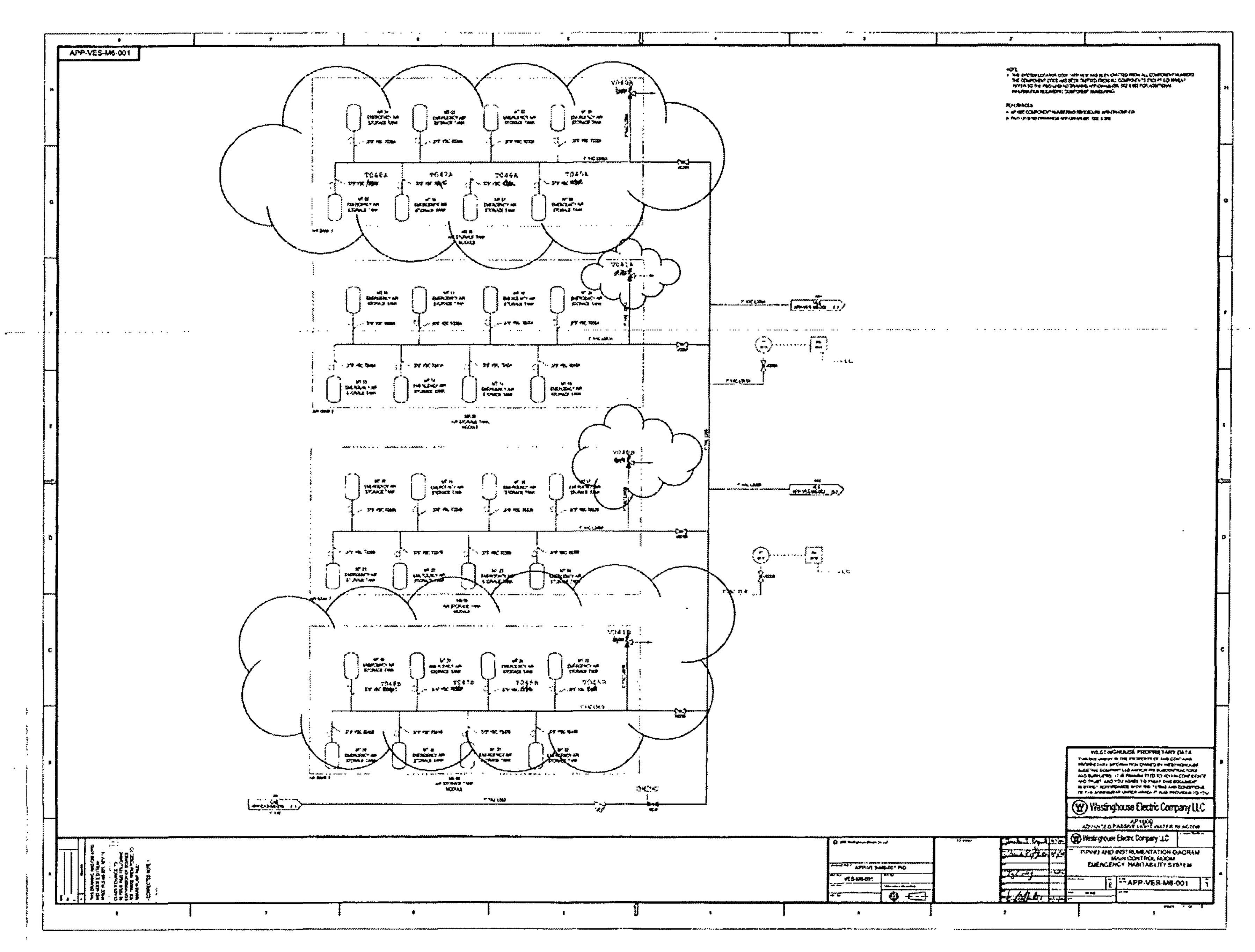


Figure 6.4-2
Piping and Instrumentation Diagram Main Control Room
Emergency Habitability System

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

Table 7.5-1 (Sheet 1 of 12)

POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
RCS pressure	0-3300 psig	B1, B2, D2, C1, F2	Harsh	Yes	3 (Note 4)	1E	Yes	Located inside containment
RCS T_H (Wide Range)	50-700°F	B1, B2, D2, F2	Harsh	Yes	2	1E	Yes	Diverse Measurement: Core exit temperature
RCS T_C (Wide Range)	50-700°F	B1, B2, D2, F2	Harsh	Yes	3 (Note 4)	1E	Yes	
Steam generator water level (wide range)	0-100% of span	D2, F3	Harsh	Yes	1/steam generator	1E	Yes	
Steam generator water level (narrow range)	0-100% of span	D2, F2	Harsh	Yes	1/steam generator	1E	Yes	
Pressurizer level	0-100% of span	B1, D2, F2	Harsh	Yes	3 (Note 4)	1E	Yes	
Pressurizer reference leg temperature	50-420°F	B1, D2	Harsh	Yes	3 (Note 4)	1E	Yes	
Neutron flux	10^{-6}- 200% power	B1	Harsh	Yes	3 (Note 4)	1E	Yes	
Control rod position	0-267 steps	B3, D3	None	None	1/control rod	Non-1E	No	
Containment water level	El. 72 ft. to 110 ft. in discrete steps	B1, C1, F2	Harsh	Yes	3 (Note 4)	1E	Yes	

Table 7.5-1 (Sheet 2 of 12)

POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Core exit temperature	200-2300°F	B1, C1, F2	Harsh	Yes	3/quadrant	1E	Yes	
PRHR HX inlet temperature	50-650°F	D3	None	None	1	Non-1E	No	Primary indication is RCS T_H
PRHR HX outlet temperature	50-500°F	B1, D2	Harsh	Yes	1	1E	Yes	Diverse variable to PRHR flow
PRHR flow	700-3000 gpm	B1, D2, F2	Harsh	Yes	2	1E	Yes	Diverse measurement: PRHR outlet temperature
IRWST water level	0-100% of span	B1, D2, F2	Harsh	Yes	3 (Note 4)	1E	Yes	
RCS subcooling (Note 6)	200°F Sub-cooling to 35°F super heat	B1, F2	Harsh	Yes	2	1E	Yes	Diverse measurement: Core exit temperature & wide range RCS pressure
Passive containment cooling water flow	0-150 gpm	B1, D2	Mild	Yes	1 (Note 1)	1E	Yes	
PCS storage tank water level	5-100% of tank height	B1, D2	Mild	Yes	2	1E	Yes	Diverse measurement: PCS flow
IRWST surface temperature	50-300°F	D3	None	None	1	Non-1E	No	
IRWST bottom temperature	50-300°F	D3	None	None	1	Non-1E	No	
Steam line pressure	0-1200 psig	F2	Harsh/ Mild (Note 8)	Yes	1/steam generator (Note 11)	1E	No	

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Title: Fluid System Changes

Table 7.5-1 (Sheet 3 of 12)

POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Startup feedwater flow	0-1000 gpm	F2	Mild	Yes	1/steam generator (Note 11)	1E	No	
Startup feedwater control valve status	Open/ Closed	D2, F3	Harsh	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
Containment pressure	-5 to 10 psig	B1, C2, D2, F2	Harsh	Yes	3 (Note 4)	1E	Yes	
Containment pressure (extended range)	0 to 240 psig	C1	Harsh	Yes	3 (Note 4)	1E	Yes	
Containment area radiation (high range)	10^0-10^7 R	C1, E2, F2	Harsh	Yes	3 (Note 4)	1E	Yes	
Reactor vessel hot leg water level	0-100% of span	B2, B3	Harsh	Yes	1	1E	Yes	Two instruments are provided
Plant vent radiation level	(Note 3)	C2, E2	Mild	None	1	Non-1E	No	
Remotely operated containment isolation valve status	Open/ Closed	B1, D2	Harsh/mild	Yes	1/valve (Note 7)	1E	Yes	Separate divisions on series valves
Boundary environs radiation	N/A	C3, E3	None	None	N/A	Non-1E	No	Site specific
Hydrogen concentration	0-20%	C3	None	None	1	Non-1E	No	Three instruments are provided

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POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Class 1E dc switchboard voltages	0-150 Vdc	D2	Mild	Yes	1/switchboard	1E	Yes	
Diesel generator status	On/Off	F3	None	None	1/diesel generator	Non-1E	No	
Diesel generator load	0-6000 kW	F3	None	None	1/diesel generator	Non-1E	No	
Voltage for diesel-backed buses	0-8600V	F3	None	None	3/bus	Non-1E	No	
Power supply to diesel-backed buses	On/Off	F3	None	None	1/supply source/bus	Non-1E	No	
RCP bearing water temperature	70-450°F	F3	None	Yes	1/RCP (Note 10)	1E	No	
RCP breaker status	Open/ Closed	D2, F3	Mild	Yes	1/breaker (Note 11)	1E	No	
Reactor trip breaker status	Open/ Closed	D2	Mild	Yes	1/breaker (Note 11)	1E	No	
MCR air storage bottle pressure	0-5000 psig	D2	Mild	None	1	Non-1E	No	Two instruments are provided
Turbine stop valve status	Open/ Closed	D2	None (Note 12)	None	1/valve	Non-1E	No	
Turbine control valve status	Open/ Closed	D2	None (Note 12)	None	1/valve	Non-1E	No	
Pressurizer pressure	1700-2500 psig	B1, D2	Harsh	Yes	3 (Note 4)	1E	Yes	
Pressurizer safety valve status	Open/ Closed	D2	Harsh	None	1/valve	Non-1E	No	
Pressurizer heater power (current)	0-800 amps	F3	None	None	1/group	Non-1E	No	
Steam generator PORV status	Open/ Closed	D2, F3	Harsh	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	

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POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Steam generator PORV block valve status	Open/ Closed	D2, F3	Harsh	Yes	1/valve (Note 7)	1E	Yes	
Steam generator safety valve status	Open/ Closed	D2	Harsh	None	1/valve	Non-1E	No	
Main feedwater isolation valve status	Open/ Closed	D2	Harsh	Yes	1/valve (Note 7)	1E	Yes	
Main feedwater flow	0-9x10^6 lb/hr	F3	None	None	1/feedline	Non-1E	No	
Main feedwater control valve status	Open/ Closed	D2	Harsh	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
Steam generator blowdown isolation valve status	Open/ Closed	D2	Harsh	Yes	1/valve (Note 7)	1E	Yes	
Steam flow	0-9x10^6 lb/hr	F3	None	None	1/steam generator	Non-1E	No	
Main steam line isolation valve status	Open/ Closed	D2, F3	Harsh	Yes	1/valve (Note 7)	1E	Yes	
Main steam line isolation bypass valve status	Open/ Closed	D2	Harsh	Yes	1/valve (Note 7)	1E	Yes	
Main feedwater pump status	On/Off	D2, F3	Mild	None	1/pump	Non-1E	No	
Main to startup feedwater crossover valve status	Open/ Closed	D2, F3	Mild	None	1/valve	Non-1E	No	
Startup feed-water pump status	On/Off	F3	None	None	1/pump	Non-1E	No	
Circulating water pump status	On/Off	F3	None	None	1/pump	Non-1E	No	
Condenser backpressure	0-1 atm	F3	None	None	1	Non-1E	No	

Table 7.5-1 (Sheet 6 of 12)

POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Startup feedwater Isolation valve status	Open/ Closed	D2	Harsh	Yes	1/valve (Note 7)	1E	Yes	
Condenser steam dump valve status	Open/ Closed	D2, F3	Mild	None	1/valve	Non-1E	No	
Condensate storage tank water level	0-100% of span	F3	None	None	1	Non-1E	No	
PCS water storage tank isolation valve status (Non-MOV)	Open/ Closed	D2	Mild	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
PCS water storage tank series isolation valve status (MOV)	Open/ Closed	D2	Mild	Yes	1/valve (Note 7)	1E	Yes	
Containment temperature	32-400°F	D2, F3	Harsh	None	1	Non-1E	No	
CCS surge tank level	0-100% of span	F3	None	None	1	Non-1E	No	
CCS flow	0-15,000 gpm	F3	None	None	1	Non-1E	No	
CCS pump status	On/Off	F3	None	None	1/pump	Non-1E	No	
CCS flow to RNS valve status	Open/ Closed	F3	None	None	1/valve	Non-1E	No	
CCS flow to RCPs valve status	Open/ Closed	F3	None	None	1/valve	Non-1E	No	
CCS pump inlet temperature	50-200°F	F3	None	None	1	Non-1E	No	
CCS heat exchanger outlet temperature	50-130°F	F3	None	None	1	Non-1E	No	
Containment fan cooler status	On/Off	F3	None	None	1/fan	Non-1E	No	

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POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Water-cooled chiller status	On/Off	F3	None	None	1/chiller	Non-1E	No	
Water-cooled chilled water pump status	On/Off	F3	None	None	1/pump	Non-1E	No	
Water-cooled chilled water valve status	Open/ Closed	F3	None	None	1/valve	Non-1E	No	
Spent fuel pool pump flow	0-1500 gpm	F3	None	None	1/pump	Non-1E	No	
Spent fuel pool temperature	50-250°F	F3	None	None	1	Non-1E	No	
Spent fuel pool water level	0-100% of span	D2, F3	Mild	Yes	3 (Note 4)	1E	Yes	
CMT discharge isolation valve status	Open/ Closed	D2	Harsh	~~No~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
CMT inlet isolation valve status	Open/ Closed	D2	Harsh	Yes	1/valve (Note 7)	1E	Yes	
CMT upper water level switch	Above/ Below	D2, F2	Harsh	Yes	1/tank	1E	Yes	
CMT lower water level switch	Above/ Below	D2, F2	Harsh	Yes	1/tank	1E	Yes	
IRWST injection isolation valve (Squib)	Open/ Closed	D2	Harsh	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
IRWST line isolation valve status (MOV)	Open/ Closed	D3	None	None	1/valve	Non-1E	No	
ADS: first, second and third stage valve status	Open/ Closed	D2	Harsh	Yes	1/valve (Note 7)	1E	Yes	

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POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
ADS fourth stage valve status (Non-MOV)	Open/ Closed	D2	Harsh	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
ADS fourth stage valve status (MOV)	Open/ Closed	D2	Harsh	Yes	1/valve (Note 7)	1E	Yes	
PRHR HX inlet isolation valve status	Open/ Closed	D2	Harsh	Yes	1 (Note 7)	1E	Yes	
PRHR HX control valve status	Position	D2	Harsh	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
IRWST gutter bypass isolation valve status	Open/ Closed	D2	Harsh	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
Accumulator pressure	100-800 psig	D2	Harsh	None	1/tank	Non-1E	No	
Accumulator isolation valve status	Open/ Closed	D3	None	None	1/valve	Non-1E	No	
Accumulator vent valve status	Open/ Closed	F3	None	None	1/valve	Non-1E	No	
Pressurizer spray valve status	Open/ Closed	F3	None	None	1/valve	Non-1E	No	
Auxiliary spray line isolation valve status	Open/ Closed	D2, F3	Harsh	~~None~~ Yes	1	~~Non-1E~~ 1E	~~No~~ Yes	
Purification stop valve status	Open/ Closed	D2	Harsh	Yes	1/valve (Note 11)	1E	No	
Containment recirculation isolation valve status (Non-MOV)	Open/ Closed	D2	Harsh	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
Containment recirculation isolation valve status (MOV)	Open/ Closed	D2	Harsh	Yes	1/valve (Note 7)	1E	Yes	

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POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Purification return line stop valve status	Open/ Closed	D2	Harsh	None	1	Non-1E	No	
Boric acid tank level	0-100%	F3	None	None	1	Non-1E	No	
Demineralized water isolation valve status	Open/ Closed	D2	Mild	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
Boric acid flow	0-300 gpm	F3	None	None	1	Non-1E	No	
Makeup blend valve status	Position	F3	None	None	1	Non-1E	No	
Makeup flow	0-300 gpm	F3	None	None	1	Non-1E	No	
Makeup pump status	On/Off	F3	None	None	1/pump	Non-1E	No	
Makeup flow control valve status	Position	F3	None	None	1	Non-1E	No	
Letdown flow	0-250 gpm	F3	None	None	1	Non-1E	No	
RNS hot leg suction isolation valve status	Open/ Closed	D2	Harsh	Yes	1/valve (Note 7)	1E	Yes	
RNS flow	0-3000 gpm	F3	None	None	1/pump	Non-1E	No	

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POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
IRWST to RNS suction valve status	Open/ Closed	B1, F3	Harsh	Yes	1 (Note 7)	1E	Yes	
RNS discharge to IRWST valve status	Open/ Closed	F3	None	None	1/valve	Non-1E	No	
RNS pump status	On/Off	F3	None	None	1/pump	Non-1E	No	
Reactor vessel head vent valve status	Open/ Closed	D2	Harsh	None Yes	1/valve	Non-1E 1E	No Yes	
MCR return air isolation valve status	Open/ Closed	D2, F3	Mild	None Yes	1/valve	Non-1E 1E	No Yes	
MCR toilet exhaust isolation valve status	Open/ Closed	D2	Mild	None Yes	1/valve	Non-1E 1E	No Yes	
MCR supply air isolation valve status	Open/ Closed	D2, F3	Mild	None Yes	1/valve	Non-1E 1E	No Yes	
MCR differential pressure	-1" to +1" wg	D2	Mild	Yes	2	1E	Yes	
MCR air delivery flowrate	0-80 cfm	D2	Mild	Yes	2	1E	Yes	
MCR pressure relief valve status	Open/ Closed	D2	Mild	Yes	1/valve	1E	Yes	

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Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
MCR air delivery isolation valve status	Open/ Closed	D2	Mild	~~None~~ Yes	1/valve	~~Non-1E~~ 1E	~~No~~ Yes	
Instrument air header pressure	0-125 psig	F3	None	None	1	Non-1E	No	
Service water flow	0-10,000 gpm	F3	None	None	1/pump	Non-1E	No	
Service water pump status	On/Off	F3	None	None	1/pump	Non-1E	No	
Service water pump discharge valve status	Open/ Closed	F3	None	None	1/valve	Non-1E	No	
Service water pump discharge temperature	50-150°F	F3	None	None	1/pump	Non-1E	No	
Main control room supply air radiation	Note 5	E3, F3	Mild	Yes	2 (Note 9)	1E	No	
Plant vent air flow	0-110% design flow	E2	Mild	None	1	Non-1E	No	
Turbine island vent discharge radiation level	10^{-6} - 10^{+5} µCi/cc	C2, E2	Mild	None	1	Non-1E	No	
Steam generator blowdown discharge radiation	10^{-6} - 10^{-1} µCi/cc	C2	Mild	None	1	Non-1E	No	
Steam generator blowdown brine radiation level	10^{-6} - 10^{-1} µCi/cc	C2	Mild	None	1	Non-1E	No	

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Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Main steam line radiation level	10^{-1} – 10^{3} µCi/cc	C2, E2	Mild	None	1/line	Non-1E	No	
Technical support center radiation	10^{-1} – 10^{4} mR/hr	E3	None	None	1	Non-1E	No	
Meteorological parameters	N/A	E3	None	None	N/A	Non-1E	No	Site specific
Primary sampling station area radiation level	10^{-1} – 10^{7} mR/hr	E3	None	None	1	Non-1E	No	

DCD Section 7.7.1.8.1

The transition from the low to the high-power control mode is initiated on the basis of the filtered high range feedwater flow signal. The transition point is set at a feedwater flow corresponding to a power at which reliable steam flow indication is expected. The transition point is also low enough to allow effective feedforward control using wide range water level, and to allow feedwater flow indication within the upper limit of the low range feedwater flow measurement. If feedwater flow indication falls below the lower limit of the effective span of the low range feedwater flow measurement, integration (reset) action of the low-power mode feedwater flow controller is inhibited. Tracking is provided to allow a smooth transition between control modes and between manual and automatic control.

~~The feedwater valve lift required to provide the demanded feedwater flow is computed on the basis of the estimated ΔP available across the feedwater control valve, and the C_V characteristic of the valve. This compensation improves the response to changes in system ΔP, such as following the loss of one feedwater pump during high-power operation.~~

A high steam generator water level signal reduces the feedwater flow demand signal and closes the feedwater control valves.

DCD Section 7.7.1.8.2

The startup feedwater control subsystem regulates the flow of feedwater in a manner which is similar to the way (main) feedwater is controlled in the low-power control mode. Feedwater flow is regulated in response to changes in steam generator wide-range water level and PI-compensated steam generator narrow range water level deviation from setpoint. Tracking is provided to allow a smooth transition between control modes and between manual and automatic control.

~~The startup feedwater control valve lift required to provide the demanded startup feedwater flow is computed on the basis of the estimated ΔP available across the startup feedwater control valve, and the C_V characteristic of the valve. This compensation improves the response to changes in system ΔP, such as during plant heatup or cooldown where the steam pressure can change drastically.~~

9.1.3.1.3.1 Partial Core

The spent fuel pool cooling system is designed to remove heat from the spent fuel pool such that the spent fuel pool water temperature will be ≤ 120°F following a partial core fuel shuffle refueling. The system is designed to perform this function based on the following:

- The assumed heat load is based on the decay heat generated by the accumulated maximum number of fuel assemblies stored in the fuel pool ~~for 10 years plus~~, which includes 44% of a core (69~~68~~ assemblies) being placed into the pool beginning at 120 hours after shutdown.

- Both trains of the spent fuel pool cooling system are assumed to be operating.

- The component cooling water system (CCS) supply temperature to the spent fuel pool cooling system heat exchangers is based on a service water system heat sink with a maximum normal ambient design wet bulb temperature as defined in Chapter 2, Table 2-1.

9.1.3.1.3.2 Full Core Off-Load

The AP1000 normal refueling basis heat load is from a full core off-load. The spent fuel pool cooling system is designed to remove heat from the spent fuel pool such that the spent fuel pool water temperature will be ≤ 120°F following a full core off-load based upon a service water heat sink at a maximum normal ambient wet bulb temperature as defined by Chapter 2, Table 2-1. The system is designed to perform this function based on the following:

- The assumed heat load is based on the decay heat generated by the accumulated fuel assemblies stored in the fuel pool for 10 years, plus one full core placed in the pool at 120 hours after shutdown. The time during the plant operating cycle at which the full core off-load occurs is chosen to maximize the required spent fuel pool cooling system heat load.

- The assumed heat load is based on the decay heat generated by the accumulated maximum number of fuel assemblies stored in the fuel pool ~~for ten years~~, plus one full core placed in the pool at 120 hours after shutdown. The time during the plant operating cycle at which the full core off-load occurs is chosen to maximize the required spent fuel pool cooling system heat load.

9.1.3.4.3 Abnormal Conditions

The AP1000 spent fuel pool cooling system is not required to operate to mitigate design basis events. In the event the spent fuel pool cooling system is unavailable, spent fuel cooling is provided by the heat capacity of the water in the pool. Connections to the spent fuel pool are made at an elevation to preclude the possibility of inadvertently draining the water in the pool to an unacceptable level.

In the unlikely event of an extended loss of normal spent fuel pool cooling, the water level will drop. Low spent fuel pool level alarms in the control room will indicate to the operator the need to initiate makeup water to the pool. These alarms are provided from safety-related level instrumentation in the spent fuel pool. With the use of makeup water, the pool level

is maintained above the spent fuel assemblies for at least 7 days. Initial spent fuel pool water level is controlled by technical specifications. During the first 72 hours any required makeup water is supplied from safety related sources. If makeup water beyond the safety related sources is required between 72 hours and 7 days, water from the passive containment cooling system ancillary water storage tank is provided to the spent fuel pool. The amount of makeup required to provide the 7 day capability depends on the decay heat level of the fuel in the spent fuel pool and is provided as follows:

- When the calculated decay heat level in the spent fuel pool is less than ~~2.3~~ 4.6 MWt, no makeup is needed to achieve spent fuel pool cooling for at least 7 days.

- When the calculated decay heat level in the spent fuel pool is greater than or equal to ~~2.3~~ 4.6 MWt and less than or equal to ~~2.8~~ 5.4 MWt, safety related makeup from the cask washdown pit is sufficient to achieve spent fuel pool cooling for at least 7 days. A minimum level of 13.75 feet in the cask washdown pit is provided for this purpose. Availability of the makeup source is controlled by technical specifications.

- When calculated decay heat level in the spent fuel pool is greater than ~~2.8~~ 5.4 MWt makeup from the passive containment cooling water storage tank or passive containment cooling ancillary water storage tank, or combination of the two tanks, is sufficient to achieve spent fuel pool cooling for at least 7 days.

- When the decay heat level in the reactor is less than 9 MW, the passive containment cooling water storage tank is not needed for containment cooling and this water can be used for makeup to the spent fuel pool. This tank provides safety related makeup for at least 72 hours. Between 72 hours and 7 days the tank continues to provide makeup water as required until it is empty. If the passive containment cooling water storage tank empties in less than 7 days, non-safety makeup water can be provided from the passive containment cooling ancillary water storage tank.

- When the decay heat level in the reactor is greater than 9 MW, the water in the passive containment cooling water storage tank is reserved for containment cooling. Safety related spent fuel pool cooling is provided for at least 72 hours from the pool itself and makeup water from the cask washdown pit. After 72 hours, non-safety related makeup can be provided from the passive containment cooling ancillary water storage tank.

- Minimum volume in the passive containment cooling water storage tank for spent fuel pool makeup is 756,700 gallons. Availability of this makeup source for the first 72 hours is controlled by technical specifications. Minimum volume in the passive containment ancillary water storage tank for spent fuel pool makeup is 175,000 gallons.

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Table 9.1-2

SPENT FUEL POOL COOLING AND PURIFICATION SYSTEM DESIGN PARAMETERS

Spent fuel pool storage capacity	~~10 yrs spent fuel plus one core~~ 889 total fuel assemblies
Spent fuel pool water volume (including racks without fuel at water level of 12 inches below the operating deck) (gallons)	191,500
Fuel transfer canal, including gate, water volume (gallons)	64,100
Minimum combined volume of spent fuel pool and fuel transfer canal above fuel to elevation 6 feet below the operating deck) (gallons)	46,700
Minimum volume of the cask washdown pit (gallons)	30,900
Nominal boron concentration of water (ppm)	2,700
Maximum normal refueling case (full core offload) Water temperature with one spent fuel cooling system cooling train and one normal residual heat removal system cooling train in operation (°F)	<140
Maximum emergency core unload case Water temperature with both spent fuel cooling system cooling trains and one normal residual heat removal system cooling train in operation (°F)	<140

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Table 9.1-4

STATION BLACKOUT/SEISMIC EVENT TIMES[1]

Event	Time to Saturation[1] (hours)	Height of Water Above Fuel at 72 Hours[4] (feet)	Height of Water Above Fuel at 7 Days[4] (feet)
Seismic Event[2] –Refueling Power Operation Immediately Following a ~~44% Core (68 Fuel Assemblies)~~ Refueling[7]	~~8.8~~7.8	~~4.6~~2.4	~~4.6~~2.4[6]
Seismic Event[8] – Refueling, Immediately Following ~~a 44% Core (68 Fuel Assemblies)~~ Spent Fuel Region Offload[3][7]	~~6.4~~5.6	8.3[5]	8.3[5]
Seismic Event[8] – Refueling, Emergency Full Core Off-Load[3] Immediately Following ~~a 44% Core (68 Fuel Assemblies)~~ Refueling[7]	~~2.5~~3.1	8.3[5]	8.3[6]

Notes:

1. Times calculated neglect heat losses to the passive heat sinks in the fuel area of the auxiliary building.
2. Seismic event assumes water in the pool is initially drained to the level of the spent fuel pool cooling system connection simultaneous with a station blackout. Fuel cooling water sources are spent fuel pool, fuel transfer canal (including gate), and cask washdown pit for 72 hours. Between 72 hours and 7 days fuel cooling water provided from passive containment cooling system ancillary water storage tank.
3. Fuel movement complete, 150 hours after shutdown.
4. See subsection 9.1.3.5 for minimum water level.
5. Alignment of PCS water storage for supply of makeup water permits maintaining pool level at this elevation. Decay heat in reactor vessel is less that 9 MW, thus no PCS water is required for containment cooling.
6. Alignment of the PCS ancillary water storage tank and initiation of PCS recirculation pumps provide a makeup water supply to maintain this pool level or higher above the top of the fuel.
7. ~~Seismic event assumes water in the pool is initially drained to the level of the spent fuel pool cooling system connection simultaneous with a station blackout. Fuel cooling water sources are spent fuel pool, fuel transfer canal (including gate), cask washdown pit, and passive containment cooling system water storage tank for 72 hours. Between 72 hours and 7 days fuel cooling water provided from passive containment cooling system water storage tank and passive containment cooling system ancillary water storage tank.~~
   The number of fuel assemblies refueled has been conservatively established to include the worst case between an 18-month fuel cycle plus 5 defective fuel assemblies (69 total assemblies or 44% of the core) and a 24-month fuel cycle plus 5 defective fuel assemblies (77 total assemblies or 49% of the core).
8. Seismic event assumes water in the pool is initially drained to the level of the spent fuel pool cooling system connection simultaneous with a station blackout. Fuel cooling water sources are spent fuel pool, fuel transfer canal (including gate), cask washdown pit, and passive containment cooling system water storage tank for 7 days.

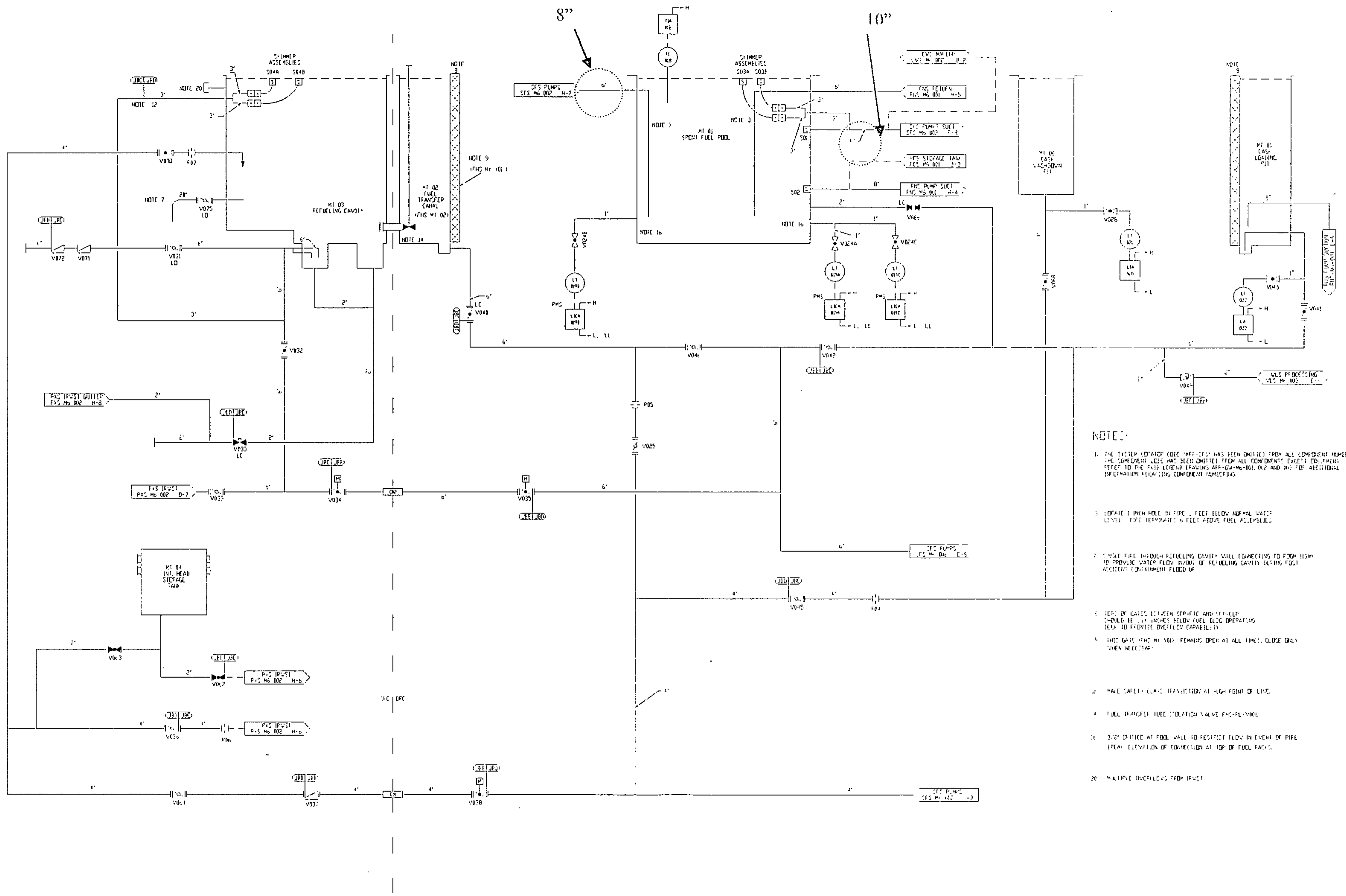

Figure 9.1.6 (Sheet 1 of 2)
SFS Pump Common Suction Pipe (L050) and RCS Engineering Flow Diagram

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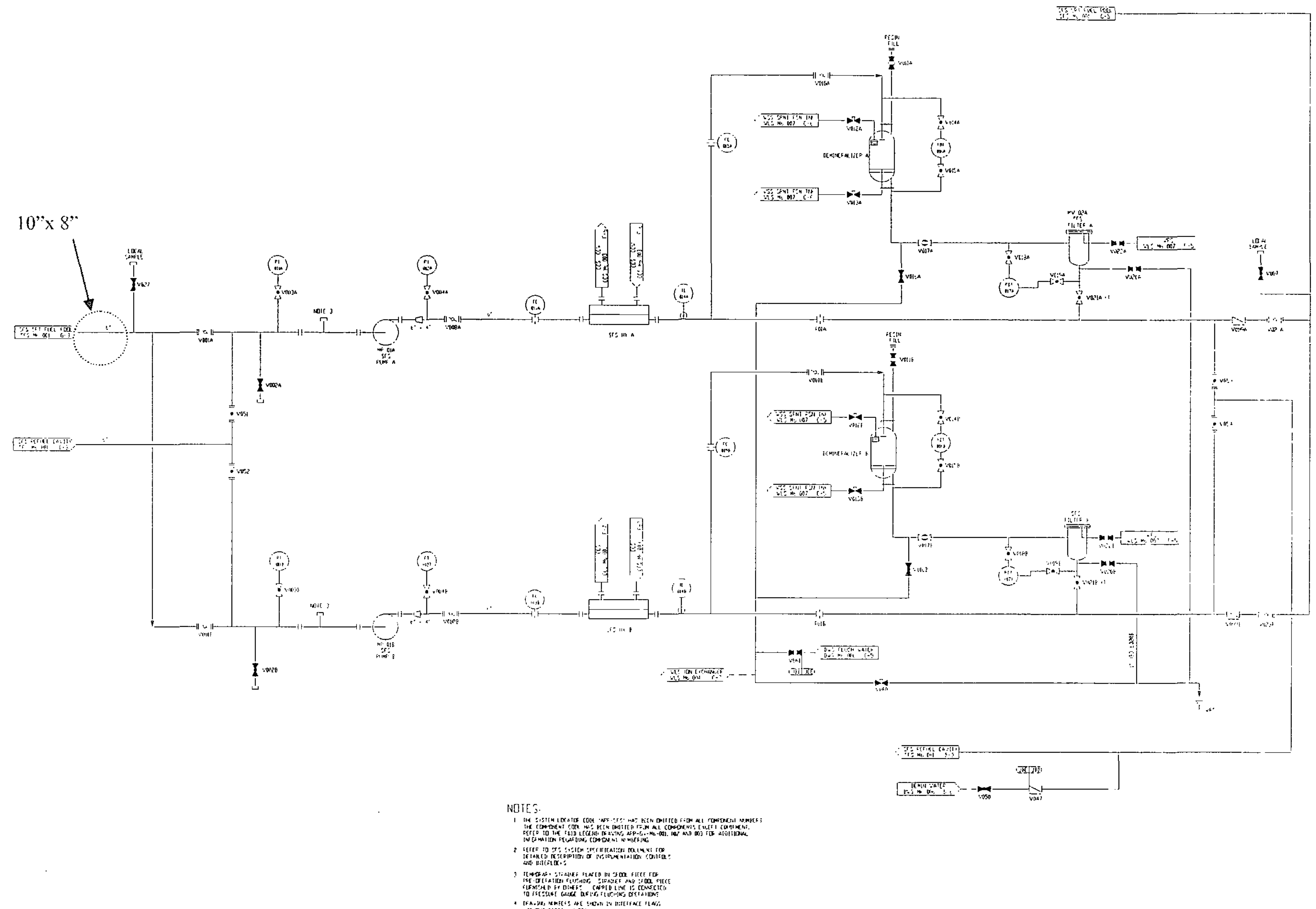

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SFS Pump Common Suction Pipe (L050) and RCS Engineering Flow Diagram

9.2.1.2.2 (Page 9.2-4)

circulating water pipe trench area of the turbine building. The pumps are powered from the normal ac power system and are backed by the standby power source for occurrences of loss of normal ac power. Each pump provides 100 percent of the normal power operation flow requirements and is therefore capable of supporting normal power operation with one pump out of service for maintenance.

The starting logic for the service water pumps requires at least one of the cooling tower valves to be open prior to pump start to provide a flow path through the cooling tower or tower bypass. The pump starting logic also interlocks with the motor operated valve at the discharge of each pump. The pump starts with the discharge valve closed and the valve then opens at a controlled rate to slowly admit water to the system while maintaining pump minimum flow. This feature results in reduced fluid velocities during system start to minimize transient effects that may occur as the system sweeps out air that may be present and obtains a water solid condition.

Piping

Service water piping is made of carbon steel and is designed, fabricated, installed and tested in accordance with ANSI B31.1 Power Piping Code. Cooling water supply and return piping is accessible for inspection and/or wall thickness determination. Nonmetallic piping may be used in accordance with ASME B31.1 and as demonstrated by evaluation. Cooling water supply and return piping that runs in the yard is either routed within trenches or may be inspected from the inside.

The service water system is designed to accommodate transient effects that may be generated by the normal starting and stopping of pumps, opening and closing of valves, or other normal operating events. The system pumps water from the basin at the cooling tower, through piping and equipment, to a high point located at the cooling tower riser; the cooling water is then discharged in a spray fashion above the cooling tower basin. The system arrangement is such that high points in the system piping do not lead to the formation of vapor pressure voids upon loss of system pumping. Therefore, the potential for water hammer due to vapor collapse upon pump start is minimized.

Service Water System Valves

Manual isolation valves upstream and downstream of each component cooling water system heat exchanger can be used to isolate the heat exchanger and associated strainer from the service water system. The upstream valves are also normally used during power operation to align the service water system to the component cooling water heat exchanger in use by blocking flow to the inactive heat exchanger. Manual valves in the cross-connection lines between the two service water trains are normally open during power operation to allow the standby pump or standby cooling tower cell to quickly be placed in service if needed. The cross-connection valves are closed as necessary to isolate portions of the system for maintenance, and are normally closed when the system is configured for plant shutdown cooling with both trains in operation.

A motor operated isolation valve downstream of each pump automatically closes when the associated pump stops and automatically opens when the pump starts. Motor operated isolation valves are also used at the cooling tower to isolate flow to a cell that is inactive or out of service for maintenance. The motor operated valves for each train of service water pumps and cooling.

The component cooling water heat exchangers are plate type heat exchangers. Component cooling water circulates through one side of the heat exchanger while service water circulates through the other side. Component cooling water in the heat exchanger is maintained at a higher pressure than the service water to prevent leakage of service water into the system.

9.2.1.5 Instrument Applications

Pressure indication, with low and high alarms, is provided for the discharge of each service water pump. A low pressure signal automatically starts the standby pump. Flow indication, with low and high alarms, is also provided for each service water pump. Due to the system configuration, pump flow indication can also normally be used to monitor flow through the heat exchanger or heat exchangers in service.

Temperature indication is provided for the service water supply to each component cooling water heat exchanger and for the discharge from each heat exchanger to determine the temperature differential across the heat exchanger. Heat exchanger inlet temperature indication also is used for performance monitoring of the service water cooling tower. Low and high heat exchanger inlet temperature alarms are provided. A high alarm is provided for the outlet temperature from each heat exchanger. Temperature instrumentation is provided for the service water return to each cooling tower cell to automatically control the operation of the associated cell fan.

Differential pressure measurement across each service water strainer is provided and will initiate backwash of the strainer on high differential. A high-high differential pressure alarm across the strainer is provided.

Power actuated valves in the SWS are provided with valve position indication instrumentation. In addition, the tower bypass valves are provided with position indication instrumentation.

Level indication is provided for the cooling tower basin along with high and low level alarms. The basin level signal is also used to control the normal makeup water supply valve to maintain the proper level in the cooling tower basin. ~~Flow indication of cooling tower basin normal makeup is provided using instrumentation internal to the makeup valve.~~

A radiation monitor with a high alarm is provided to monitor the service water blowdown flow for detection of potentially radioactive leakage into the SWS from the component cooling water heat exchangers. Provisions are also available for taking local fluid samples. ~~Flow indication of the blowdown flow is provided using instrumentation internal to the blowdown control valve.~~

9.2.2.3.3 Component Cooling Water Surge Tank

The component cooling water system has a single surge tank. The surge tank accommodates changes in component cooling water volume due to changes in operating temperature. The tank is designed to accommodate a 50 gallons per minute leakage into or out of the system for 30 minutes before any operator action is required.

The tank is a cylindrical, vertical unit constructed of carbon steel.

9.2.2.3.4 Component Cooling Water System Valves

Most of the valves in the component cooling water system are manual valves used to isolate cooling flow from components for which cooling is not required in a given plant operating mode.

Three motor operated isolations valves and a check valve provide containment isolation for the supply and return component cooling water system lines that penetrate the containment barrier.

The motor-operated valves are normally open and are closed upon receipt of a safety injection signal. They are controlled from the main control room and fail as-is.

A motor operated isolation valve is located in the component cooling water discharge line from each reactor coolant pump. These valves, which are normally open, are closed on a high component cooling water flow signal. High flow in the component cooling water discharge line indicates significant reactor coolant leakage from the pump cooling coils or thermal barrier into the component cooling water system. Closing these valves prevents radioactive reactor coolant flow through the component cooling water system.

Relief valves are provided in the cooling water outlet line from each reactor coolant pump. These valves are sized to protect the pump motor cooling jacket (design pressure 150 psig) and the component cooling water piping in the event of a tube rupture in the pump motor cooling coil or thermal barrier. A relief valve in the cooling water outlet line from the letdown heat exchanger also protects the component cooling water piping in the event of a tube rupture in the heat exchanger. Small relief valves are included in the cooling water outlet line from the other components to relieve the volumetric expansion which occurs if the cooling water lines to

the component are isolated and the water temperature rises.

9.2.2.3.5 Piping Requirements

Component cooling water system piping is made of carbon steel. Piping joints and connections are welded, except where flanged connections are required as indicated on the component cooling water system piping and instrumentation diagram (Figure 9.2.2-2). Nonmetallic piping may be used in accordance with ASME B31.1 and as demonstrated by evaluation.

maintained at a higher pressure than the circulating water so leakage of circulating water into the closed cooling water system does not occur. The heat exchangers are constructed of titanium plates with a carbon steel frame.

Valves

Manual isolation valves are provided upstream and downstream of each pump. The pump isolation valves are normally open but may be closed to isolate the non-operating pump and allow maintenance during system operation. Manual isolation valves are provided upstream and downstream of each turbine building closed cooling water heat exchanger. One heat exchanger is isolated from system flow during normal power operation. A manual bypass valve can be opened to bypass flow around the turbine building closed cooling water heat exchangers when necessary to avoid low cooling water supply temperatures.

Flow control valves are provided to restrict or shut off cooling water flow to those cooled components whose function could be impaired by overcooling. The flow control valves are air operated and fail open upon loss of control air or electrical power. An air operated valve is provided to control demineralized makeup water to the surge tank for system filling and for accommodating leakage from the system. The makeup valve fails closed upon loss of control air or electrical power.

Piping

System piping is made of carbon steel. Piping joints and connections are welded, except where flanged connections are used for accessibility and maintenance of components. Nonmetallic piping may be used in accordance with ASME B31.1 and as demonstrated by evaluation.

9.2.7 Central Chilled Water System

...

9.2.7.2.2 Component Description

...

Valves

Isolation valves are provided upstream and downstream of each pump/chiller train. These valves are butterfly valves and are used to isolate a train of the subsystem for maintenance. An interlock is provided between the downstream isolation valve and the pump/chiller controls.

An isolation valve is provided in the line that cross-connects the pump discharge lines in the high capacity subsystem. This manual butterfly valve is normally closed and can be manually aligned to operate the standby chiller with the operating pump of either train.

An air-operated isolation valve and check valve are provided in the chilled water supply and two air-operated isolation valves are provided in the chilled water return line that penetrates containment. The air-operated containment isolation valves automatically close upon receipt of a containment isolation signal. This isolation signal can be bypassed by the MCR operator to be able to restore containment recirculation system cooling with the containment isolated.

Isolation valves are provided at the interconnection with the hot water heating system to provide hot water through the coils of the containment recirculation cooling system for heating during refueling, maintenance, and testing activities under cold weather conditions.

High capacity subsystem temperature control valves are located upstream of each cooling coil or group of coils, except for the containment recirculation cooling system coils. The containment recirculation cooling system coils are provided with three-way modulating valves. These valves bypass chilled water flow around the containment recirculation cooling system coils, as needed, to maintain the temperature within the design conditions. The flow control valves fail open upon loss of control air or electrical power. A pressure control valve is installed on the bypass line around the chiller system to maintain a constant chiller flow rate as the load demand changes. The bypass valve fails closed upon loss of control air or electrical power.

Low capacity subsystem three-way modulating temperature control valves are provided for each group of nuclear island nonradioactive ventilation system cooling coils. These valves bypass chilled water flow around the coils, as needed, to maintain the temperature within the design conditions.

~~The modulating control valves provide process parameters such as flow rate, temperature, and pressure to the plant control system. From this data, the plant control system calculates the required process variables.~~

9.2.8.2.3 System Operation

The turbine building closed cooling water system operates during normal power operation. The system does not operate with a loss of normal ac power.

Startup

The turbine building closed cooling water system is placed in operation during the plant startup sequence after the circulating water system is in operation but prior to the operation of systems that require turbine building closed cooling water flow. The system is filled by the demineralized water transfer and storage system through a fill line to the surge tank. The system is placed in operation by starting one of the pumps.

Normal Operation

During normal operation, one turbine building closed cooling water system pump and two heat exchangers provide cooling to the components listed in Table 9.2.8-1. The other pump is on standby and aligned to start automatically upon low discharge header pressure. During normal operation, leakage from the system will be replaced by makeup from the demineralized water transfer and storage system through the automatic makeup valve. Makeup can be controlled either manually or automatically upon reaching low level in the surge tank.

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Title: Fluid System Changes

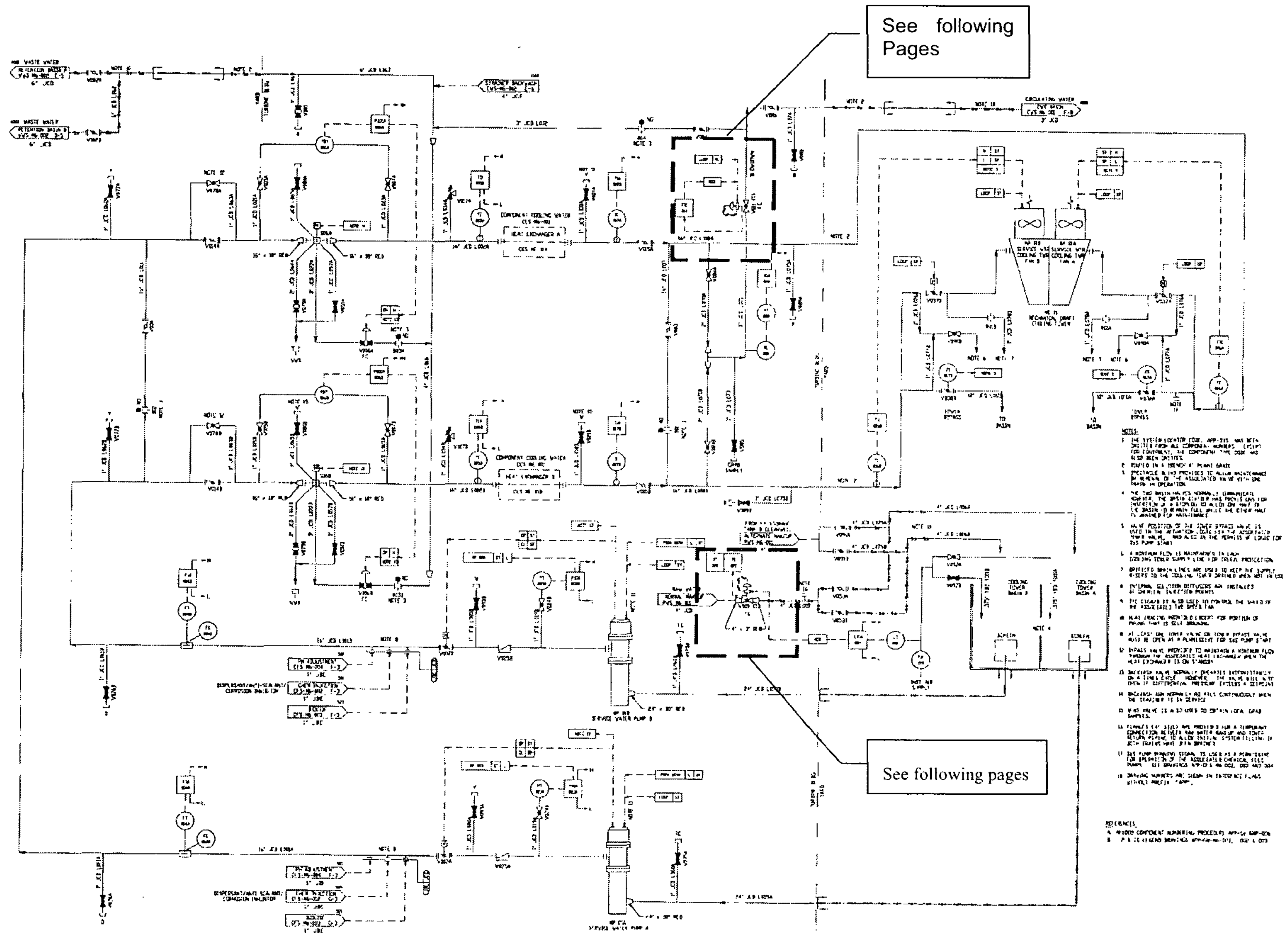

Figure 9.2.1-1
Service Water Systems
Piping and Instrumentation Diagram
(REF) SWS 001

REV. 15 DCD FIGURE

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Title: Fluid System Changes

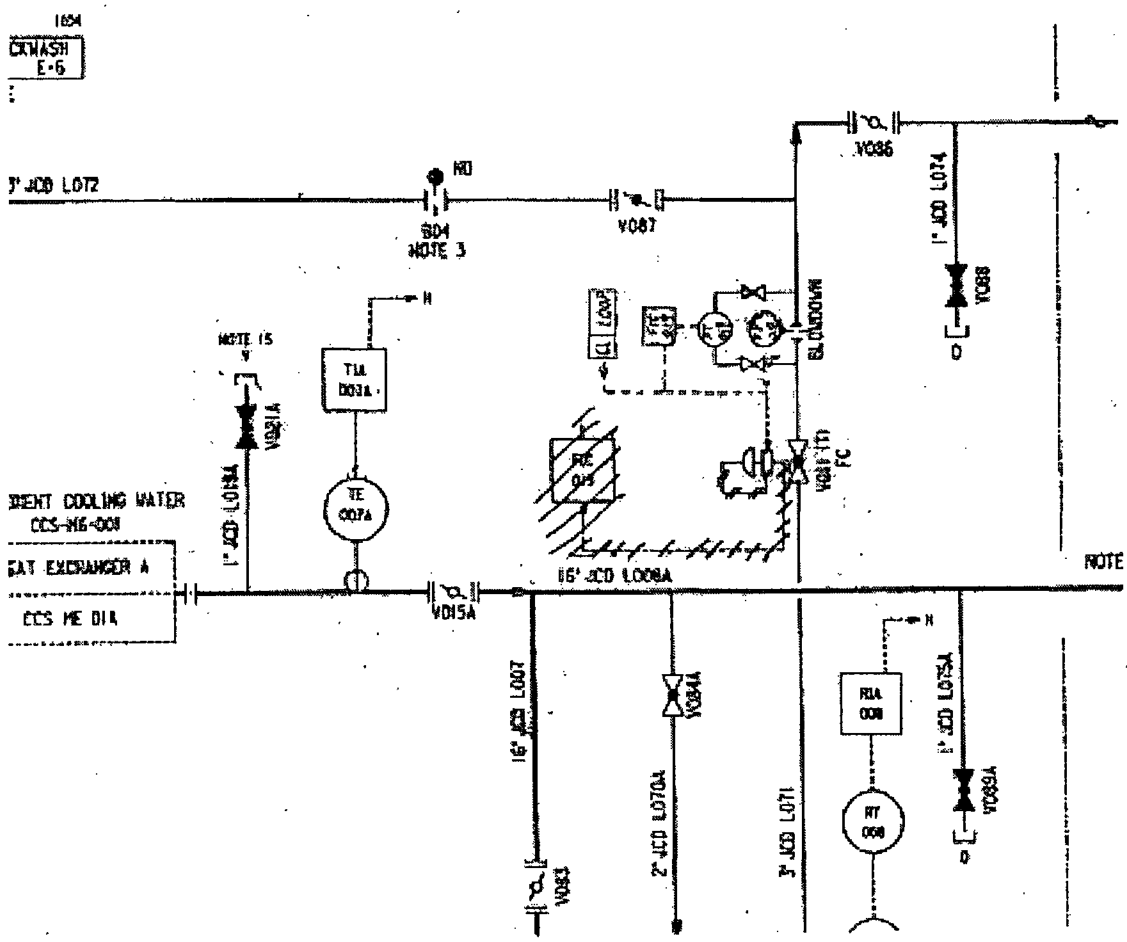

FIGURE 9.2.1-1

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Title: Fluid System Changes

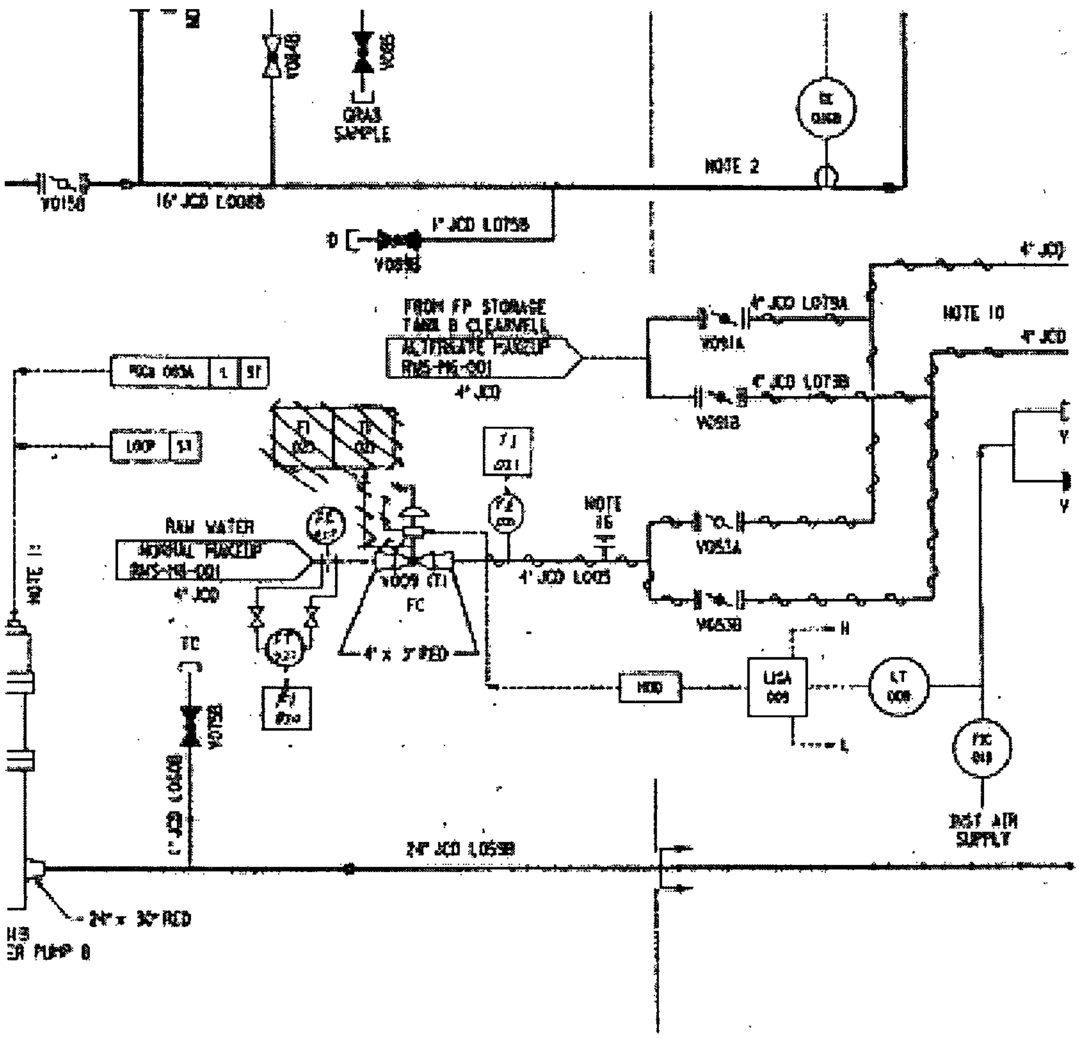

FIGURE 9.2.1-1

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Title: Fluid System Changes

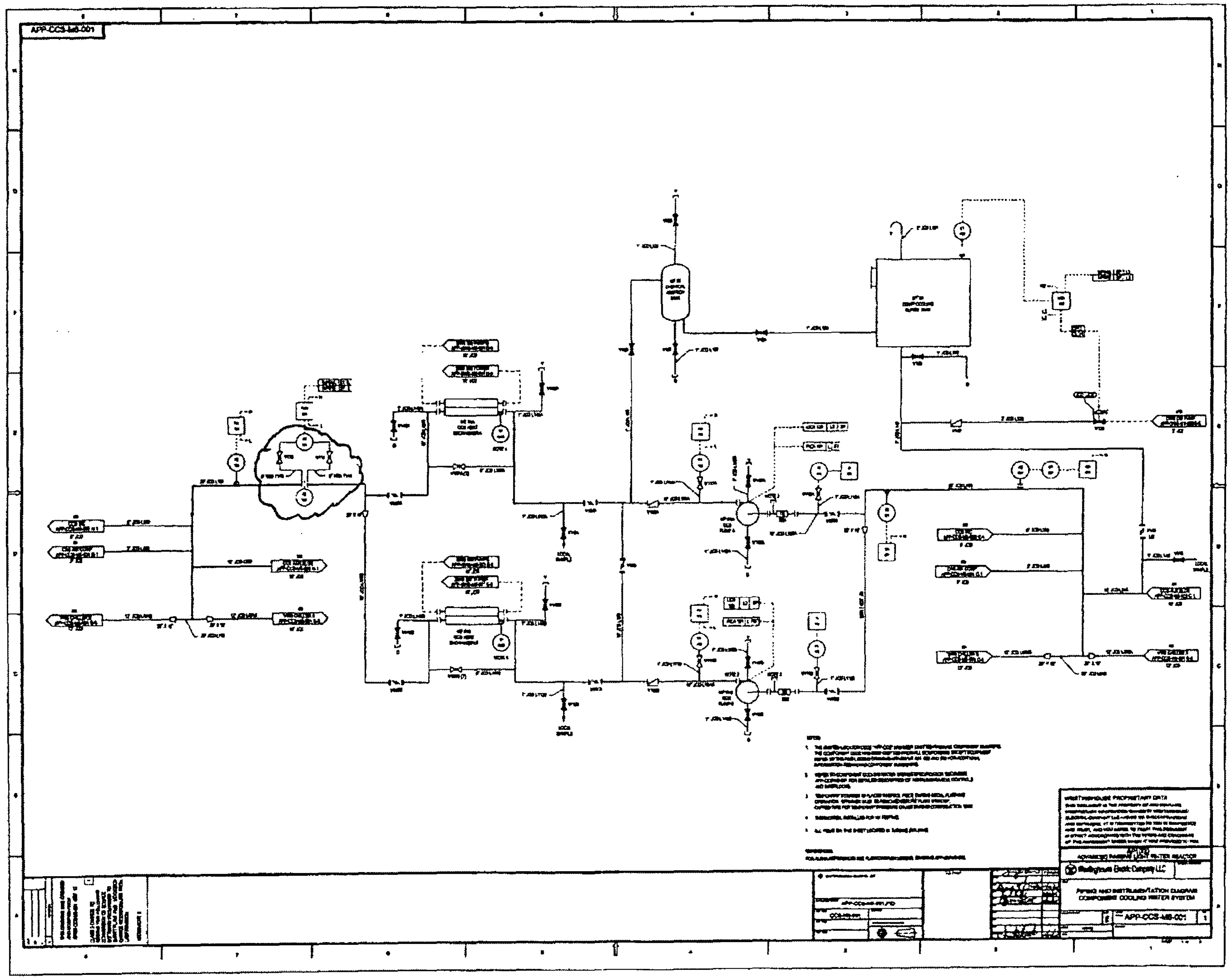


Figure 9.2.2-2 (Sheet 1 of 5)
Component Cooling Water System
Piping and Instrumentation Diagram
(REF CCS 001)

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

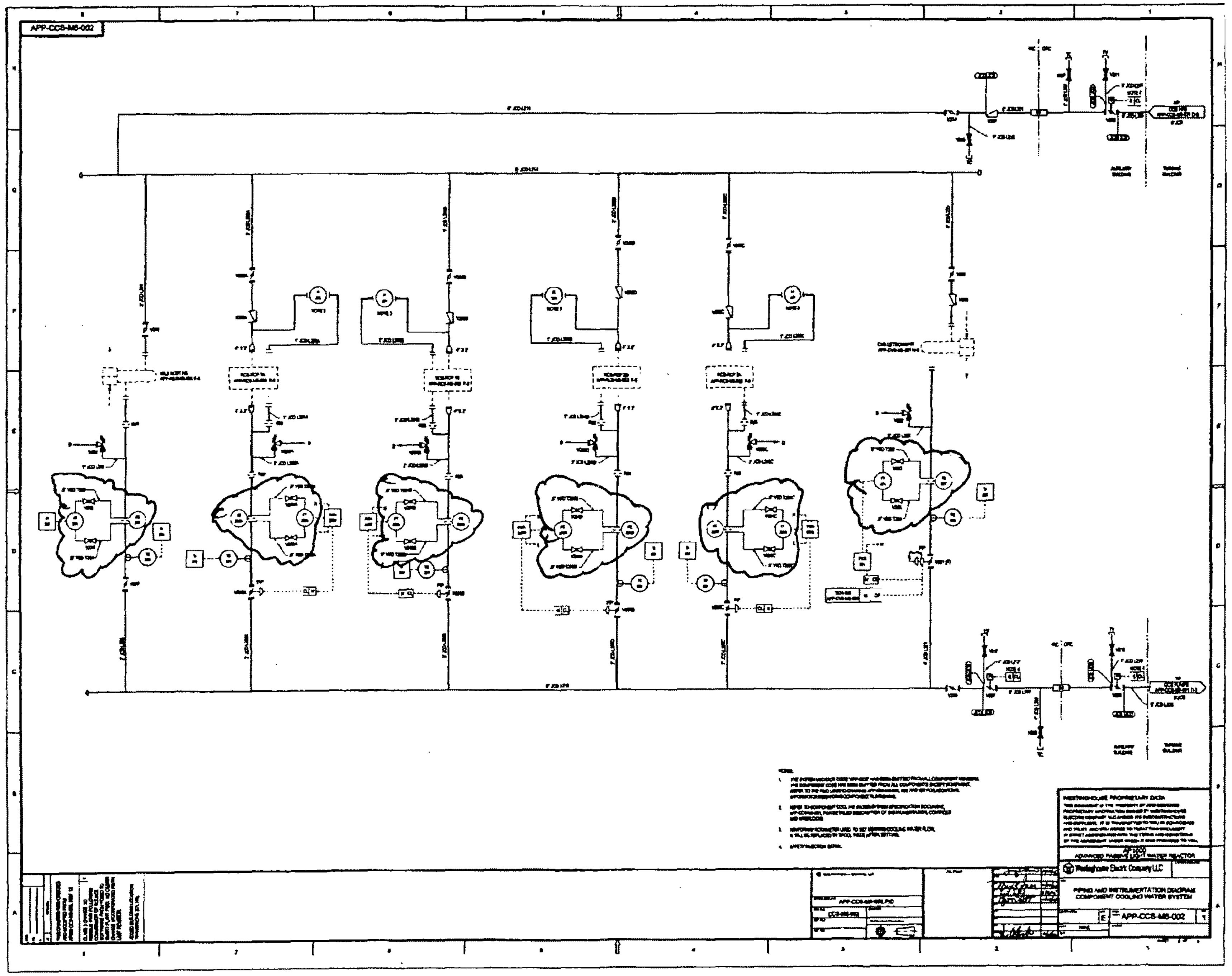


Figure 9.2.2-2 (Sheet 3 of 5)
Component Cooling Water System
Piping and Instrumentation Diagram
(REF) CCS 003

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes

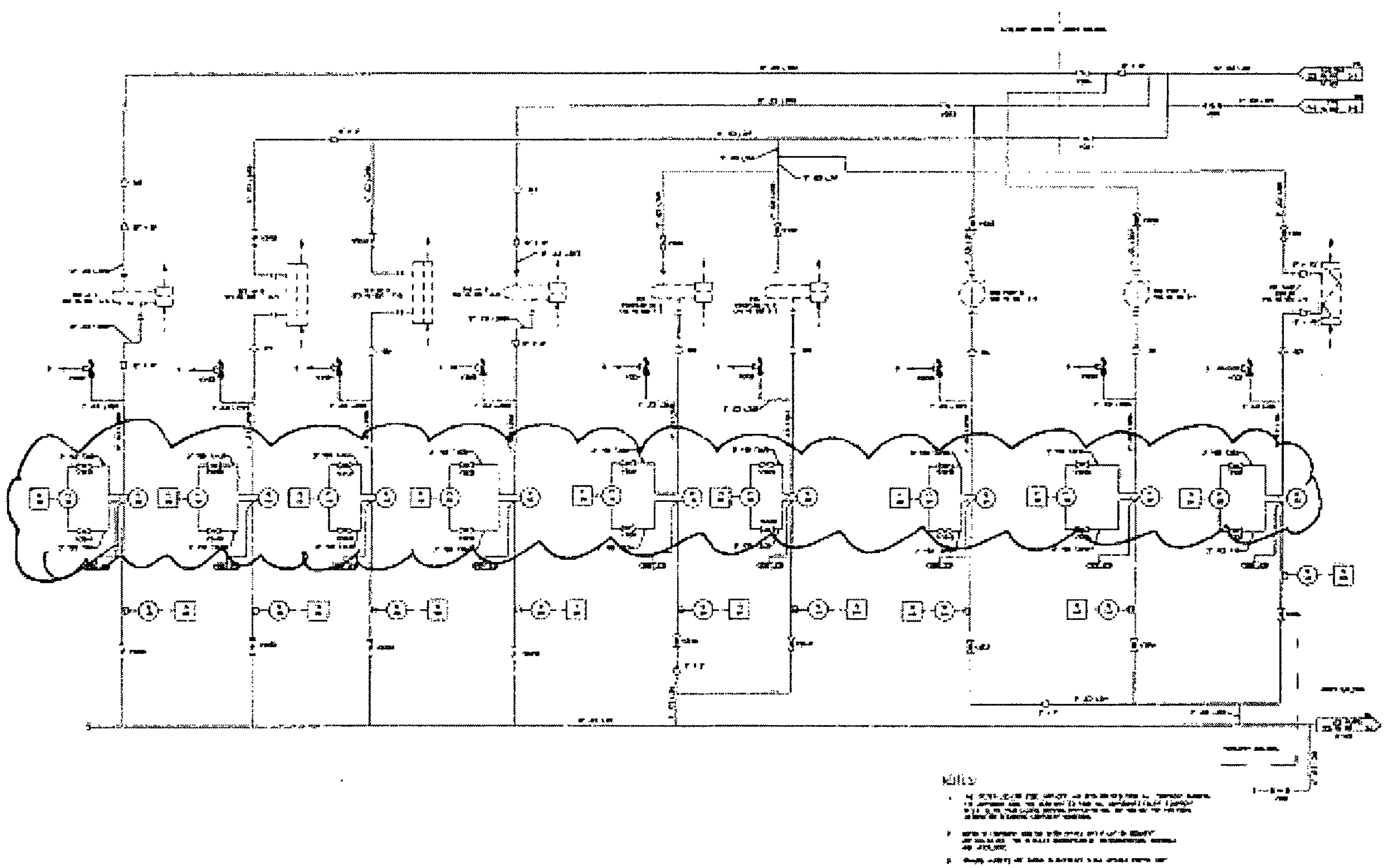
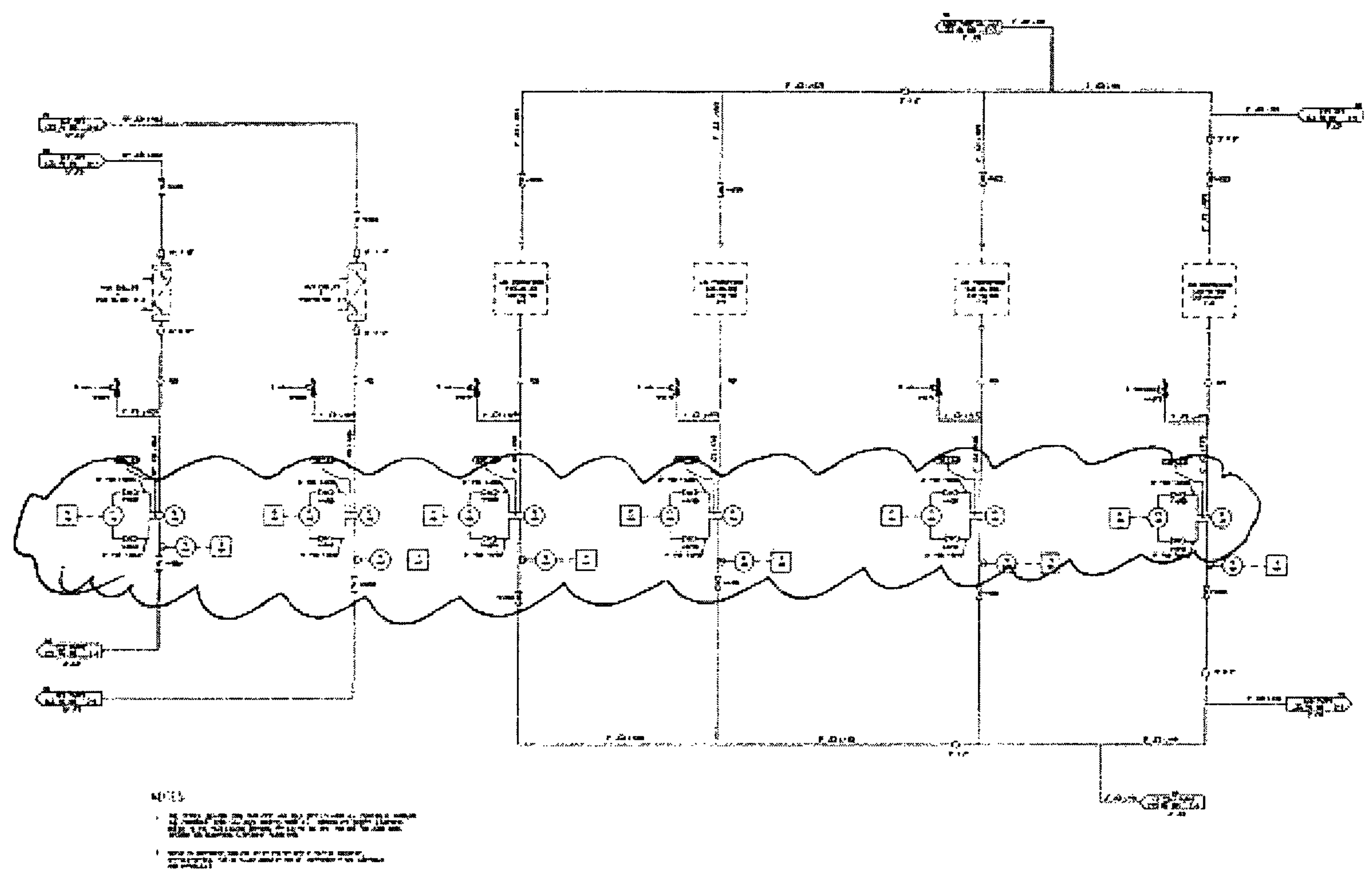


Figure 9.2.2-2 (Sheet 3 of 5)

Component Cooling Water System Piping and Instrumentation Diagram (REF) CCS 003

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes



Inside Turbine Building

Figure 9.2.2-2 (Sheet 4 of 5)

Component Cooling Water System Piping and Instrumentation Diagram (REF) CCS 004

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes

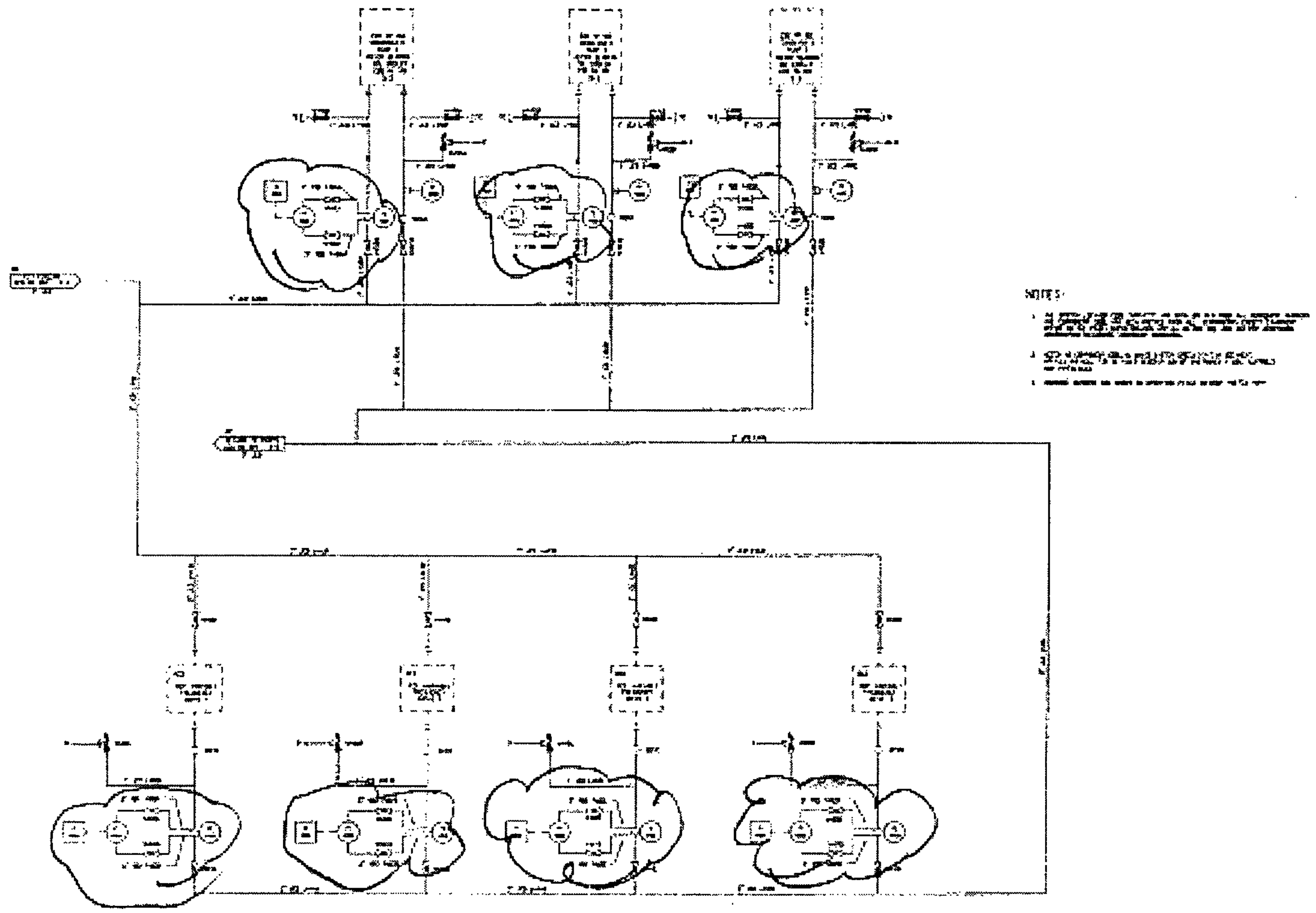
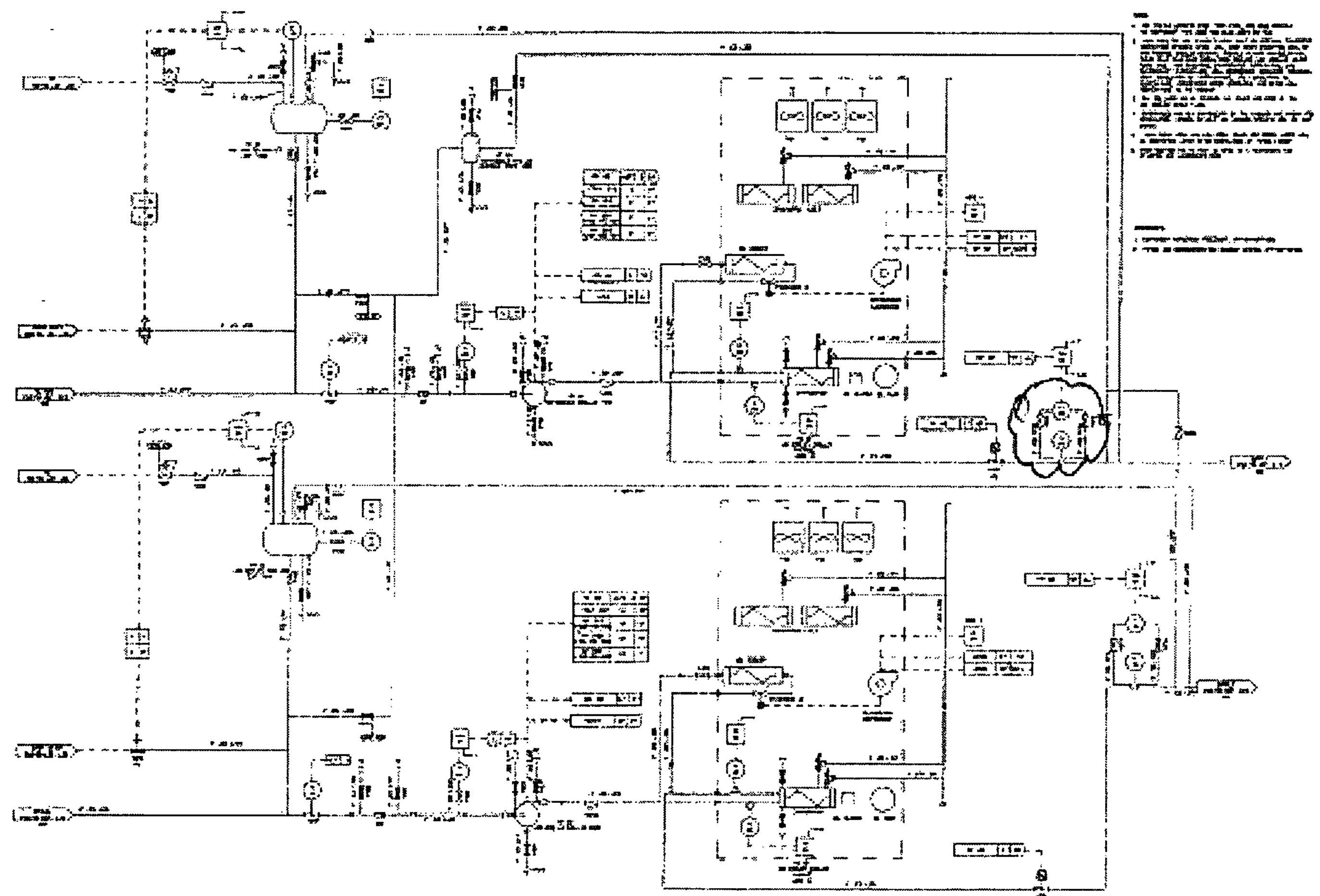


Figure 9.2.2-2 (Sheet 5 of 5)

Component Cooling Water System
Piping and Instrumentation Diagram
(REF) CCS 005

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes



Inside Auxiliary Building

Figure 9.2.7-1 (Sheet 1 of 3)

Central Chilled Water System
Piping and Instrumentation Diagram
(REF) VWS 006

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

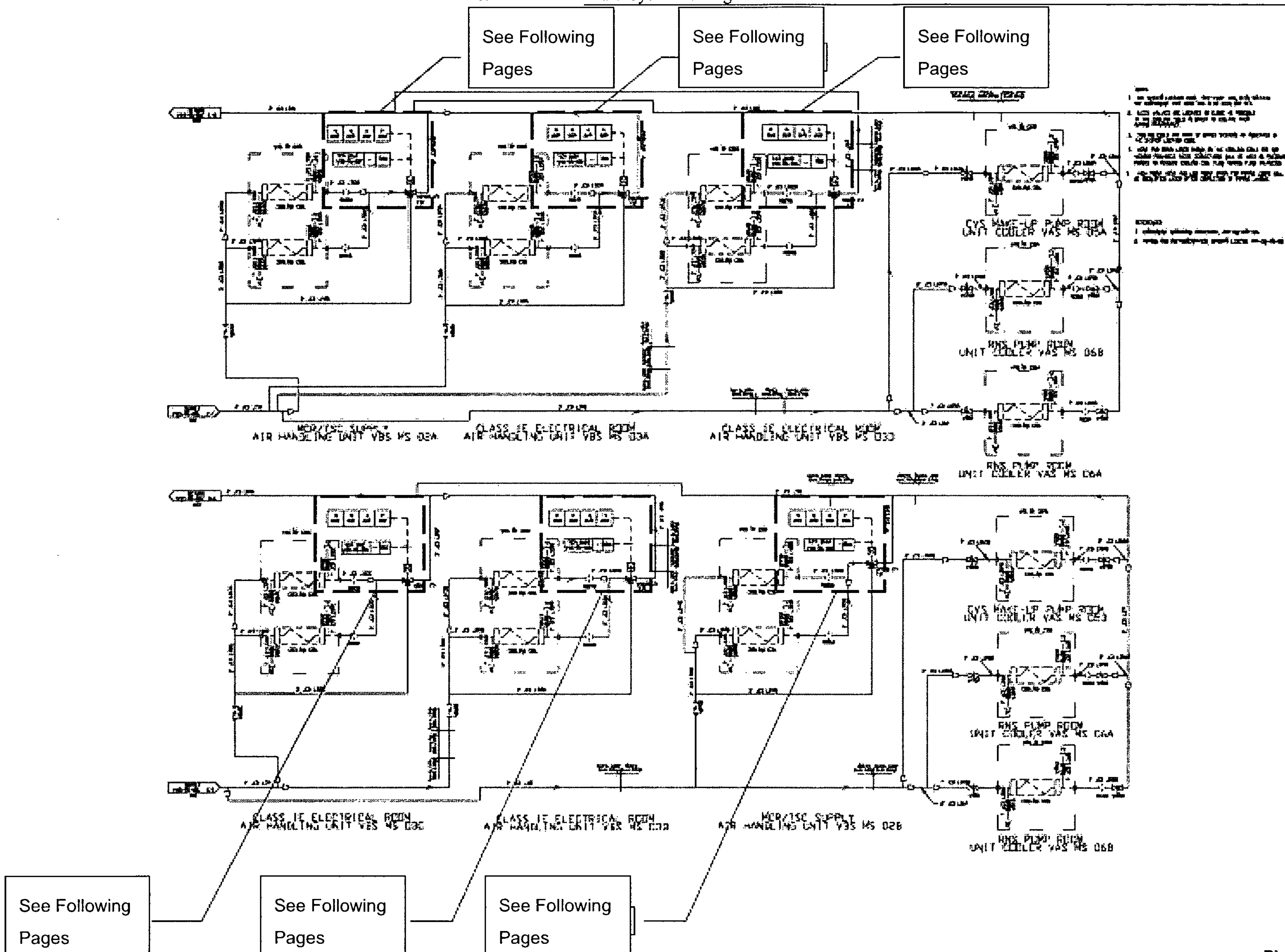


Figure 9.2.7-1 (Sheet 2 of 3)

Central Chilled Water System Piping and Instrumentation Diagram (REF) VWS 007

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

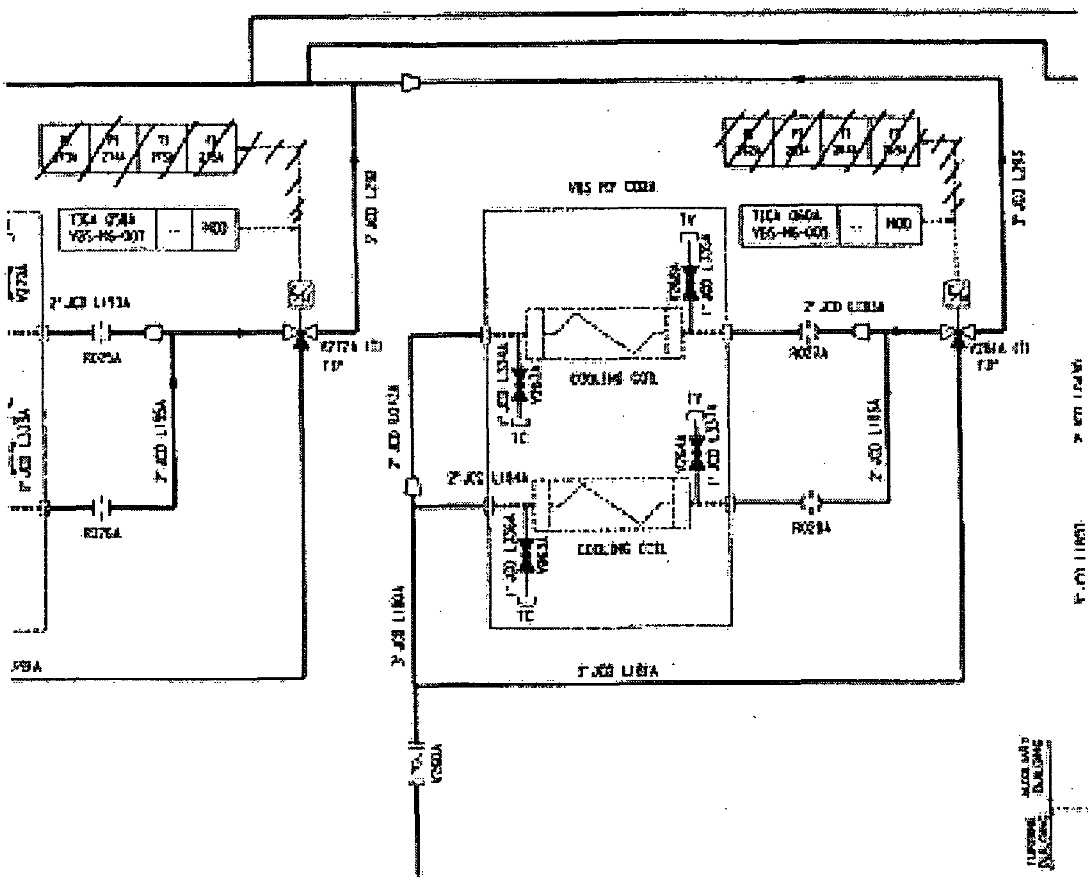


Figure 9.2.7-1

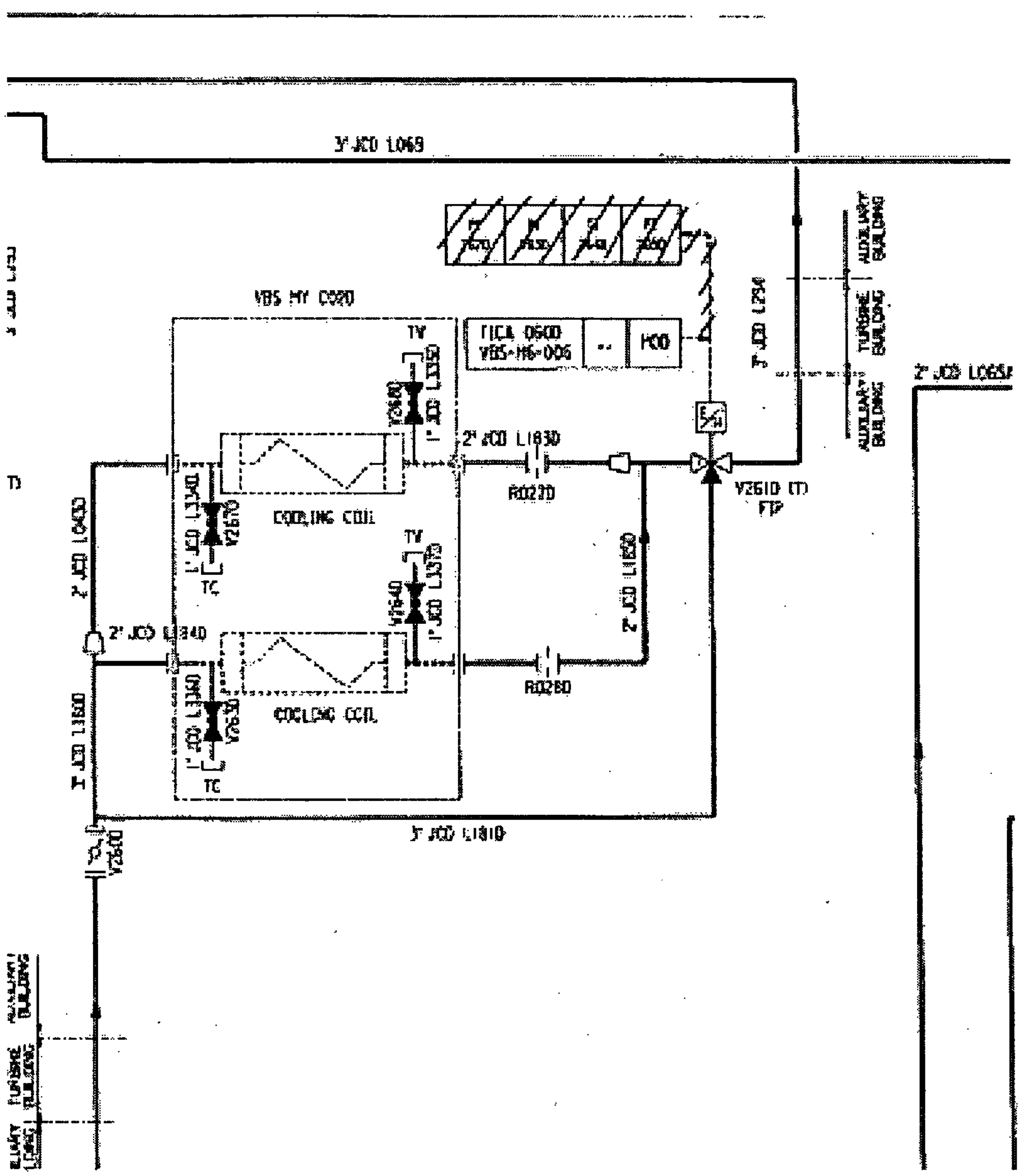

3" JCD L068
VBS MY C020
TY
COOLING COIL
TC
2" JCD L183D
RO27D
V261D
FTP
RO28D
3" JCD L181D
2" JCD L065A
AUXILIARY BUILDING
TURBINE BUILDING

Figure 9.2.7-1

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

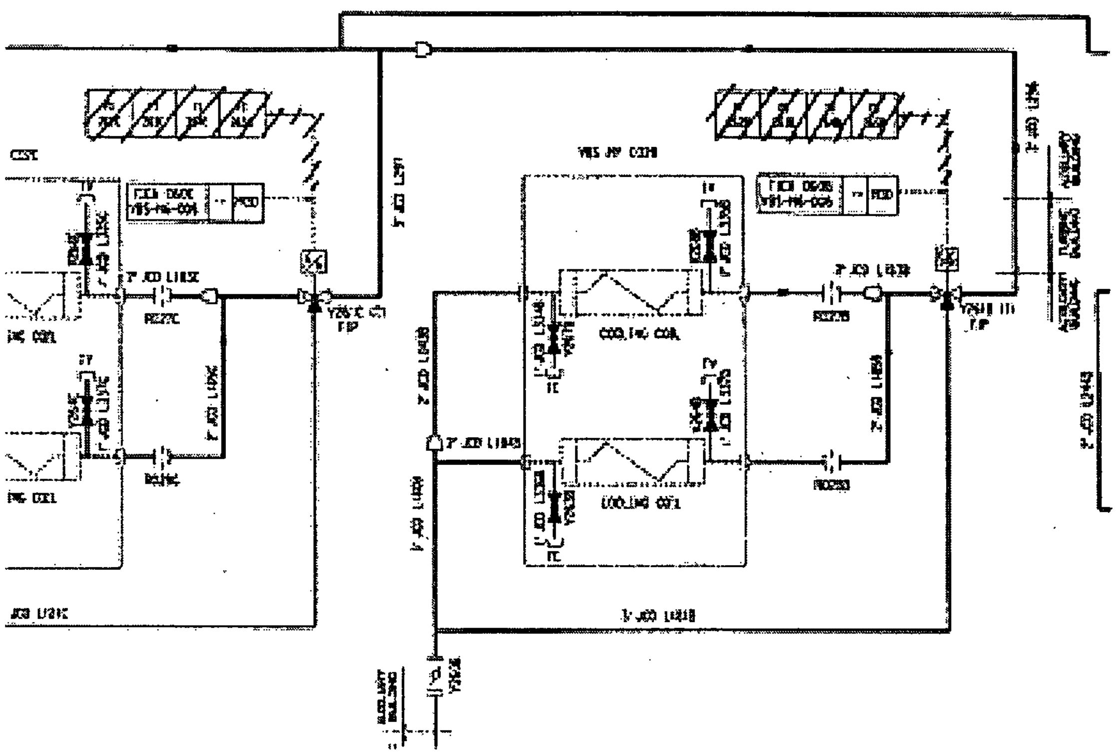


Figure 9.2.7-1

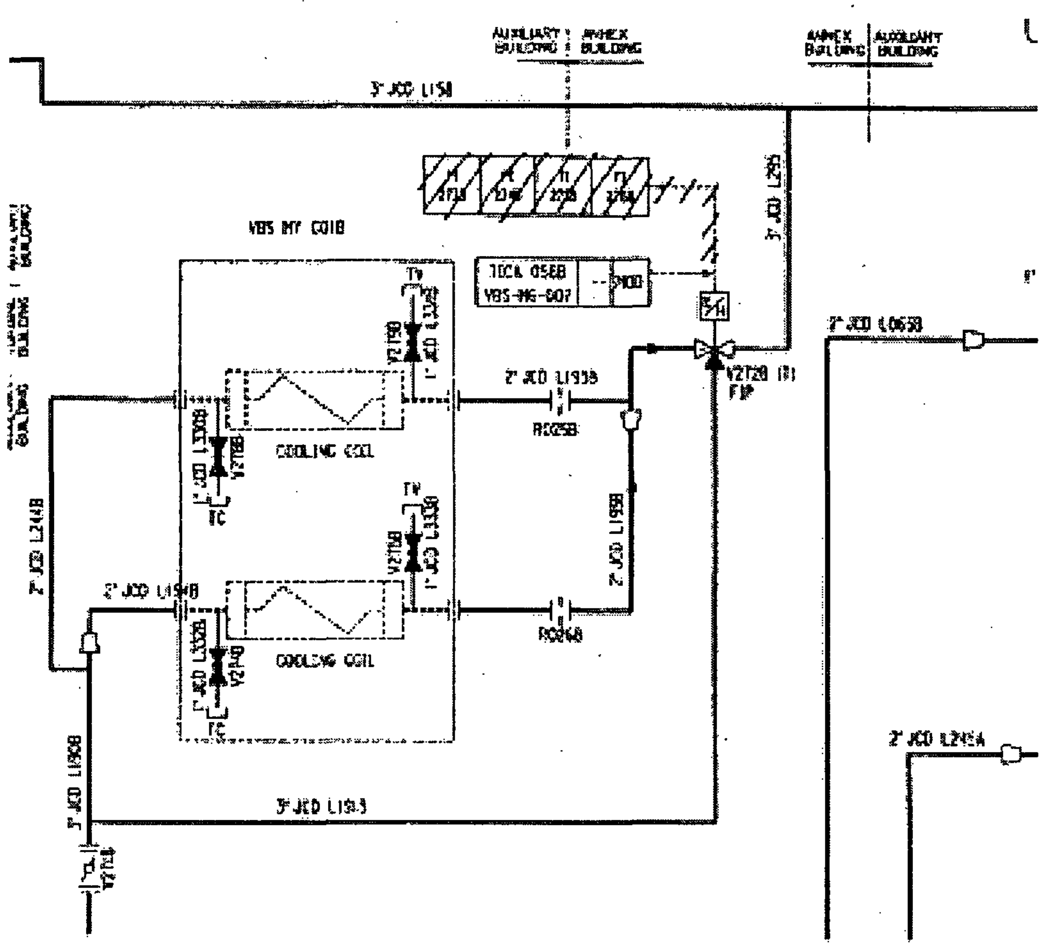


Figure 9.2.7-1

9.2.8 Turbine Building Closed Cooling Water System

The turbine building closed cooling water system (TCS) provides chemically treated, demineralized cooling water for the removal of heat from nonsafety-related heat exchangers in the turbine building and rejects the heat to the [[circulating water system]].

9.2.8.1 Design Basis

9.2.8.1.1 Safety Design Basis

The turbine building closed cooling water system has no safety-related function and therefore has no nuclear safety design basis.

9.2.8.1.2 Power Generation Design Basis

The turbine building closed cooling water system provides corrosion-inhibited, demineralized cooling water to the equipment shown in Table 9.2.8-1 during normal plant operation.

During power operation, the turbine building closed cooling water system provides a continuous supply of cooling water to turbine building equipment at a temperature of ~~95~~ **105**°F or less assuming a [[circulating water]] temperature of ~~90~~ **100**°F or less.

The cooling water is treated with a corrosion inhibitor and uses demineralized water for makeup. The system is equipped with a chemical addition tank to add chemicals to the system.

The heat sink for the turbine building closed cooling water system is the [[circulating water system]]. The heat is transferred to [[circulating water]] through plate type heat exchangers which are components of the turbine building closed cooling water system.

A surge tank is sized to accommodate thermal expansion and contraction of the fluid due to temperature changes in the system.

One of the turbine building closed cooling system pumps or heat exchangers may be unavailable for operation or isolated for maintenance without impairing the function of the system.

The turbine building closed cooling water pumps are provided ac power from the 6900V switchgear bus. The pumps are not required during a loss of normal ac power.

9.2.8.2 System Description

9.2.8.2.1 General Description

Classification of equipment and components is given in Section 3.2. The system consists of two 100-percent capacity pumps, three 50-percent capacity heat exchangers (connected in parallel), one surge tank, one chemical addition tank, and associated piping, valves, controls, and instrumentation. Heat is removed from the turbine building closed cooling water system by the [[circulating water system]] via the heat exchangers.

The pumps take suction from a single return header. Either of the two pumps can operate in conjunction with any two of the three heat exchangers. Discharge flows from the heat exchangers combine into a single supply header. Branch lines then distribute the cooling water to the various coolers in the turbine building. The flow rates to the individual coolers are controlled either by flow restricting orifices or by control valves, according to the requirements of the cooled systems. Individual coolers can be locally isolated, where required, to permit maintenance of the cooler while supplying the remaining components with cooling water. A bypass line with a manual valve is provided around the turbine building closed cooling water system heat exchangers to help avoid overcooling of components during startup/low-load conditions or cold weather operation.

The system is kept full of demineralized water by a surge tank which is located at the highest point in the system. The surge tank connects to the system return header upstream of the pumps. The surge tank accommodates thermal expansion and contraction of cooling water resulting from temperature changes in the system. It also accommodates minor leakage into or out of the system. Water makeup to the surge tank, for initial system filling or to accommodate leakage from the system, is provided by the demineralized water transfer and storage system. The surge tank is vented to the atmosphere.

A line from the pump discharge header back to the pump suction header contains valves and a chemical addition tank to facilitate mixing chemicals into the closed loop system to inhibit corrosion in piping and components.

A turbine building closed cooling water sample is periodically taken and analyzed to verify that water quality is maintained.

9.2.8.2.2 Component Description

Surge Tank

A surge tank accommodates changes in the cooling water volume due to changes in operating temperature. The tank also temporarily accommodates leakage into or out of the system. The tank is constructed of carbon steel.

Chemical Addition Tank

The chemical addition tank is constructed of carbon steel. The tank is normally isolated from the system and is provided with a hinged closure for addition of chemicals.

Pumps

Two pumps are provided. Either pump provides the pumping capacity for circulation of cooling water throughout the system. The pumps are single stage, horizontal, centrifugal pumps, are constructed of carbon steel, and have flanged suction and discharge nozzles. Each pump is driven by an ac powered induction motor.

Heat Exchangers

Three heat exchangers are arranged in a parallel configuration. Two of the heat exchangers are in use during normal power operation and turbine building closed cooling water flow divides between them.

The heat exchangers are plate type heat exchangers. Turbine building closed cooling water circulates through one side of the heat exchanger while [[circulating water]] flows through the other side. During system operation, the turbine building closed cooling water in the heat exchanger is maintained at a higher pressure than the [[circulating water]] so leakage of [[circulating water]] into the closed cooling water system does not occur. The heat exchangers are constructed of titanium plates with a carbon steel frame.

Valves

Manual isolation valves are provided upstream and downstream of each pump. The pump isolation valves are normally open but may be closed to isolate the non-operating pump and allow maintenance during system operation. Manual isolation valves are provided upstream and downstream of each turbine building closed cooling water heat exchanger. One heat exchanger is isolated from system flow during normal power operation. A manual bypass valve can be opened to bypass flow around the turbine building closed cooling water heat exchangers when necessary to avoid low cooling water supply temperatures.

Flow control valves are provided to restrict or shut off cooling water flow to those cooled components whose function could be impaired by overcooling. The flow control valves are air operated and fail open upon loss of control air or electrical power. An air operated valve is provided to control demineralized makeup water to the surge tank for system filling and for accommodating leakage from the system. The makeup valve fails closed upon loss of control air or electrical power.

These two paragraphs were moved from 10.4.5.2.2

A TCS heat exchanger can be taken out of service by closing the inlet isolation valve. Water chemistry in the isolated heat exchanger train is maintained by a continuous flow of circulating water through a small bypass valve around the inlet isolation valve.

Backwashable strainers are provided upstream of each TCS heat exchanger. They are actuated by a timer and have a backup starting sequence initiated by a high differential pressure across each individual strainer. The backwash can be manually activated.

Piping

System piping is made of carbon steel. Piping joints and connections are welded, except where flanged connections are used for accessibility and maintenance of components.

9.2.8.2.3 System Operation

The turbine building closed cooling water system operates during normal power operation. The system does not operate with a loss of normal ac power.

Startup

The turbine building closed cooling water system is placed in operation during the plant startup sequence [[after the circulating water system is in operation but]] prior to the operation of systems that require turbine building closed cooling water flow. The system is filled by the demineralized water transfer and storage system through a fill line to the surge tank. The system is placed in operation by starting one of the pumps.

Normal Operation

During normal operation, one turbine building closed cooling water system pump and two heat exchangers provide cooling to the components listed in Table 9.2.8-1. The other pump is on standby and aligned to start automatically upon low discharge header pressure.

During normal operation, leakage from the system will be replaced by makeup from the demineralized water transfer and storage system through the automatic makeup valve. Makeup can be controlled either manually, or automatically upon reaching low level in the surge tank.

Shutdown

The system is taken out of service during plant shutdown when no longer needed by the components being cooled. The standby pump is taken out of automatic control, and the operating pump is stopped.

9.2.8.3 Safety Evaluation

The turbine building closed cooling water system has no safety-related function and therefore requires no nuclear safety evaluation.

9.2.8.4 Tests and Inspections

Pre-operational testing is described in Chapter 14. The performance, structural, and leaktight integrity of system components is demonstrated by operation of the system.

9.2.8.5 Instrument Applications

Parameters important to system operation are monitored in the main control room. Flow indication is provided for individual cooled components as well as for the total system flow.

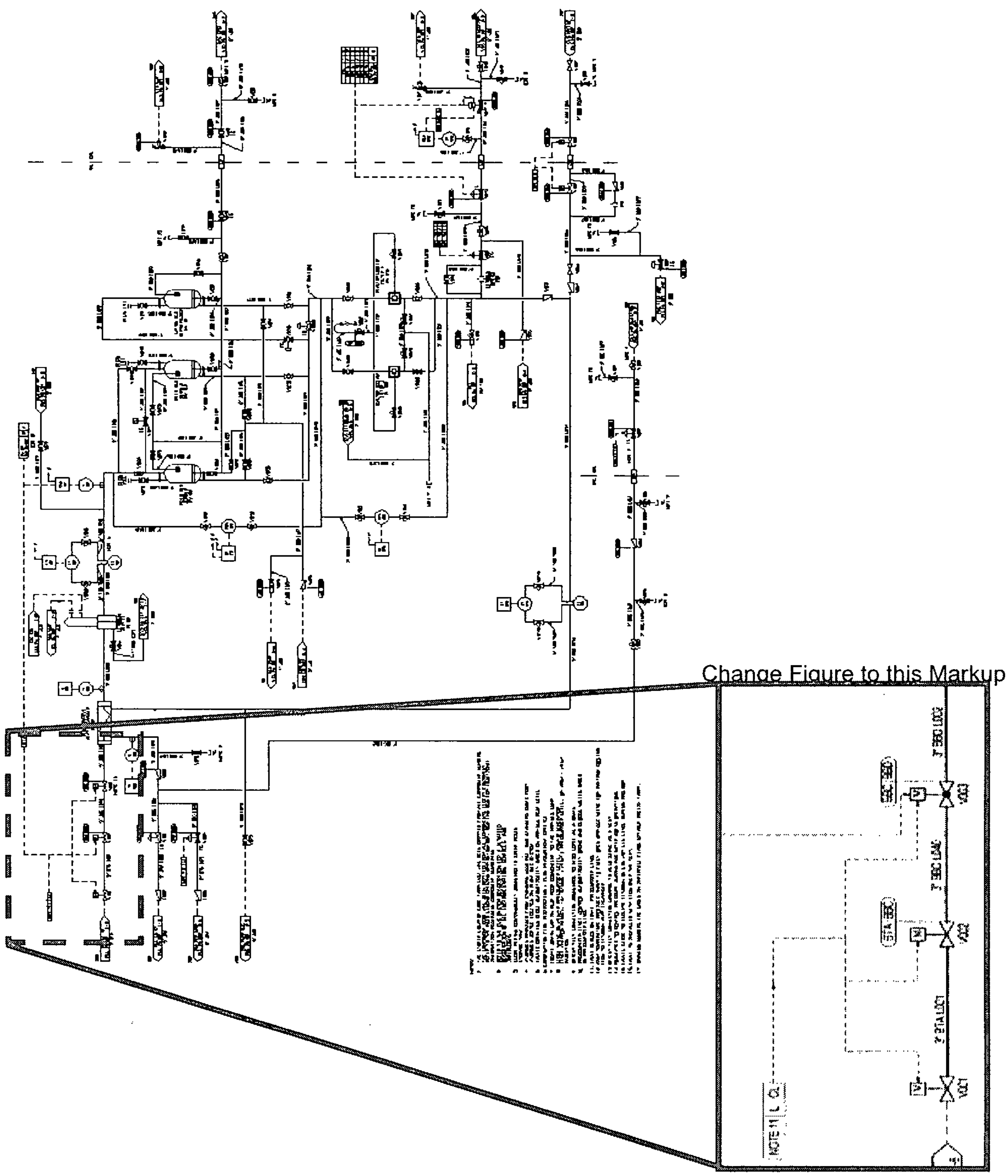
Temperature indication is provided for locations upstream and downstream of the turbine building closed cooling water system heat exchangers. High temperature of the cooling water supply alarms in the main control room. Temperature test points are provided at locations to facilitate thermal performance testing.

Pressure indication is provided for the pump suction and discharge headers. Low pressure at the discharge header automatically starts the standby pump.

Level instrumentation on the surge tank provides level indication and both low- and high-level alarms in the main control room. On low tank level, a valve in the makeup water line automatically actuates to provide makeup flow from the demineralized water transfer and storage system.

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes

Figure 9.3.6-1, Sheet 1 of 2



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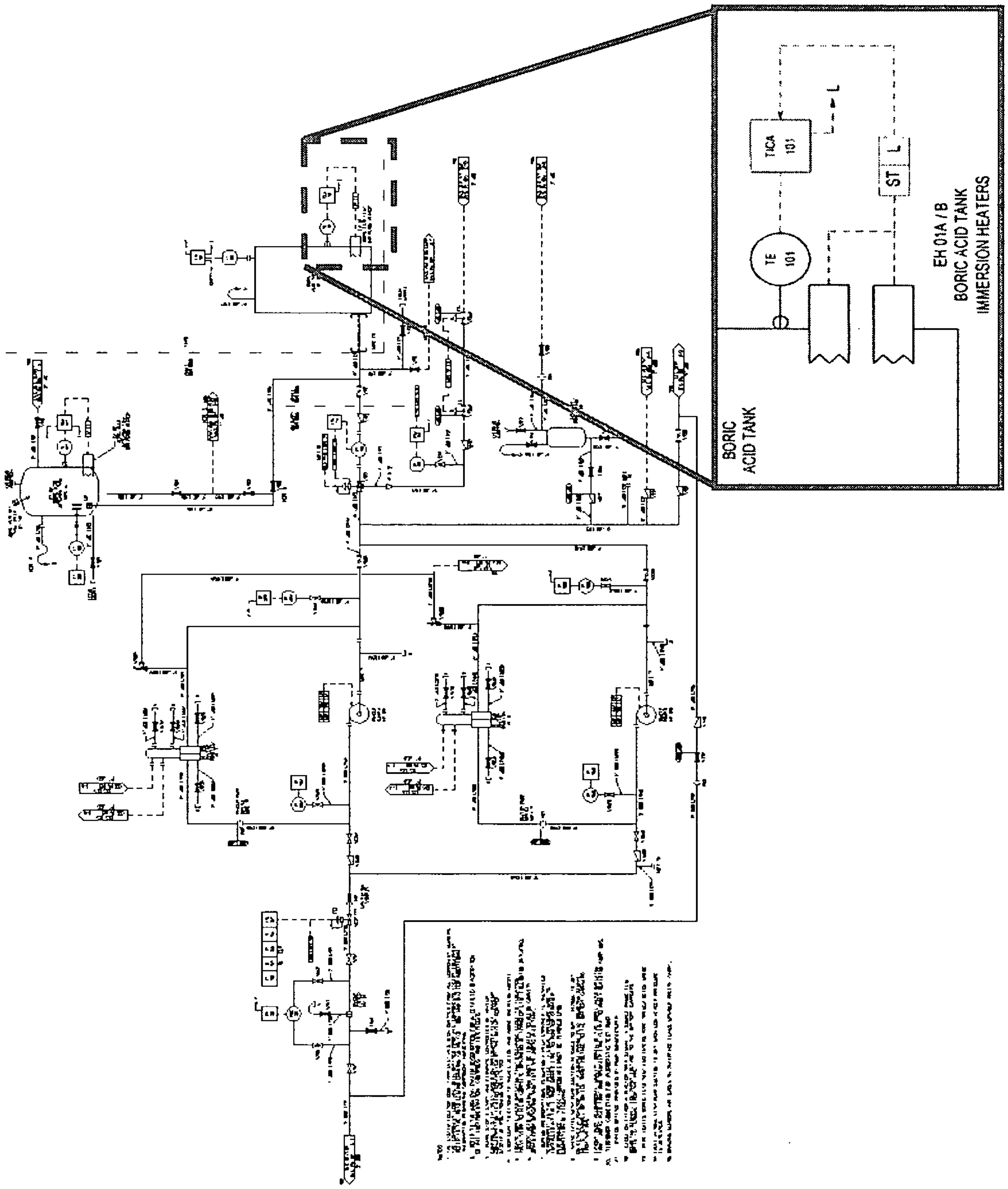
Title: Fluid System Changes

Figure 9.3.6-1, Sheet 2 of 2

Change Figure to this Markup



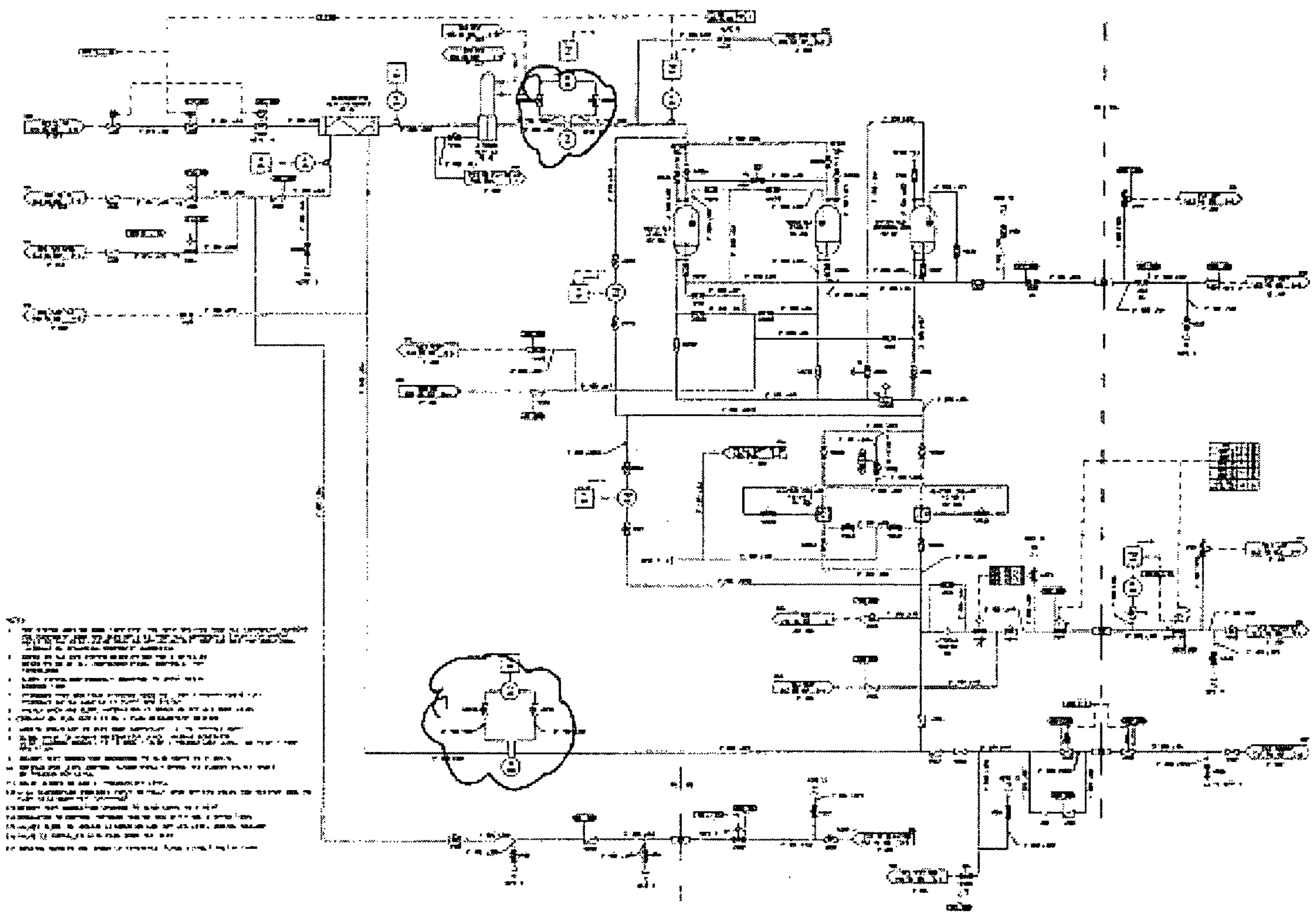


Figure 9.3.6-1 (Sheet 1 of 2)

Chemical and Volume Control System Piping and Instrumentation Diagram (REF) CVS 001

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

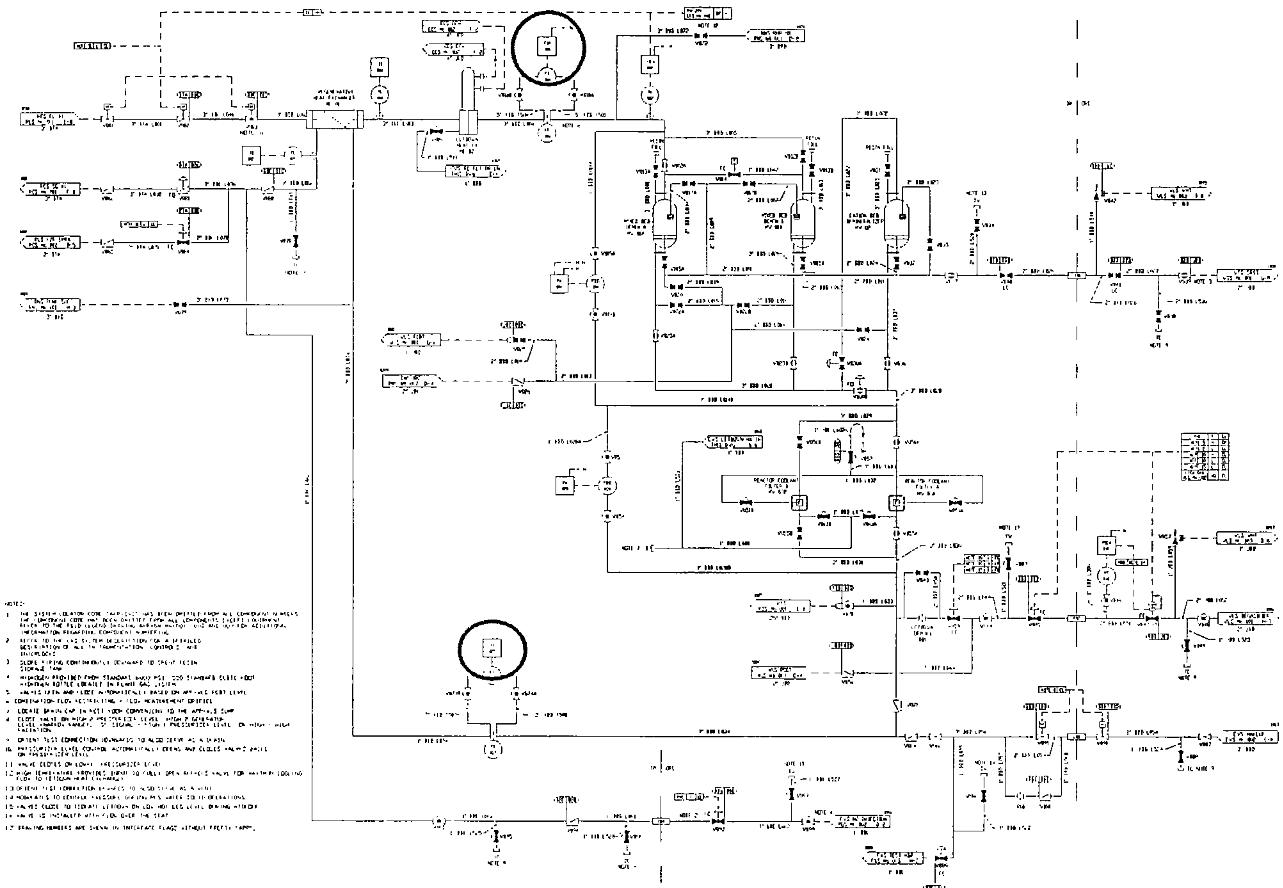


Figure 9.3.6-1 (Sheet 1 of 2)
Chemical and Volume Control
System Piping and Instrumentation Diagram
(REF) CVS 001

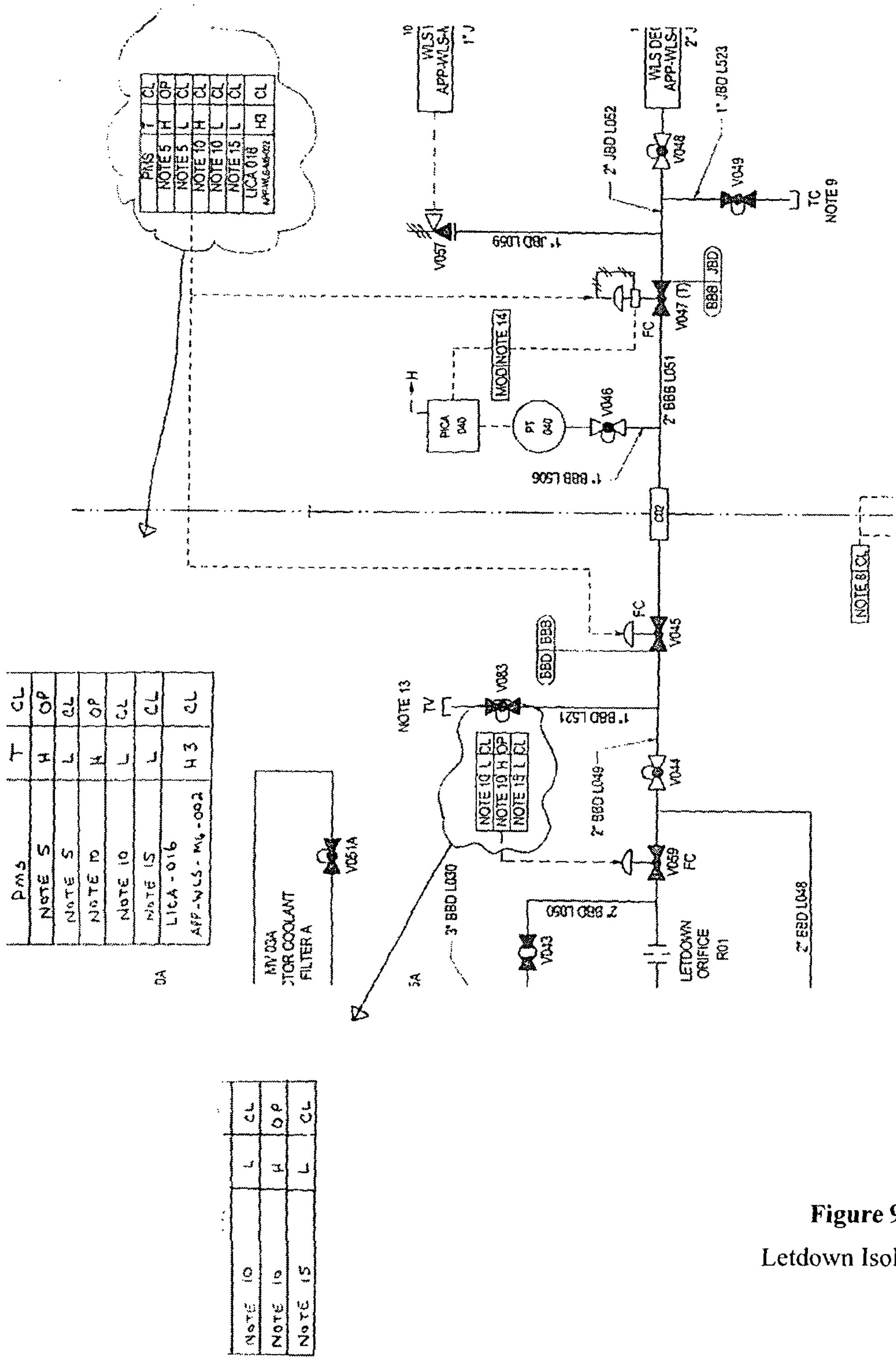


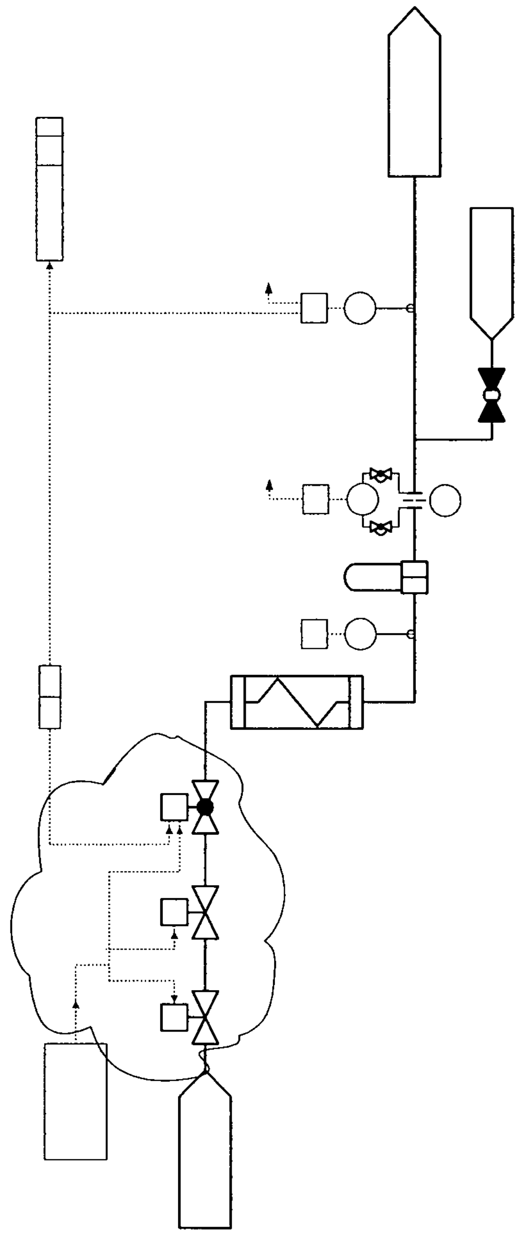
Figure 9.3.6-1 (Sheet 1 of 2)

Letdown Isolation Valve Controls

7. LOCATE DRAIN CAP IN RCDT ROOM CONVENIENT TO THE APP-WLS SUMP.
8. CLOSE VALVE ON HIGH-2 PRESSURIZER LEVEL, HIGH-2 GENERATOR LEVEL (NARROW RANGE), 'S' SIGNAL + HIGH 1 PRESSURIZER LEVEL, OR HIGH - HIGH RADIATION.
9. ORIENT TEST CONNECTION DOWNWARDS TO ALSO SERVE AS A DRAIN.
10. PRESSURIZER LEVEL CONTROL AUTOMATICALLY OPENS AND CLOSES VALVES BASED ON PRESSURIZER LEVEL.
11. VALVE CLOSES ON LOW-1 PRESSURIZER LEVEL.
12. HIGH TEMPERATURE PROVIDES INPUT TO FULLY OPEN APP-CCS VALVE FOR MAXIMUM COOLING FLOW TO LETDOWN HEAT EXCHANGER.
13. ORIENT TEST CONNECTION UPWARDS TO ALSO SERVE AS A VENT.
14. MODULATES TO CONTROL PRESSURE DURING RCS WATER SOLID OPERATIONS.
15. ~~VALVES CLOSE TO ISOLATE LETDOWN ON LOW HOT LEG LEVEL DURING MIDLOOP.~~
16. VALVE IS INSTALLED WITH FLOW OVER THE SEAT.

15. VALVES CLOSE TO ISOLATE LETDOWN ON LOW HOT LEG LEVEL DURING MIDLOOP (SIGNAL FROM LICA 160 A AND B).

Figure 9.3.6-1 (Sheet 1 of 2)



Schematic Drawing to show interlock between TICA-002
and the purification isolation valve CVS-PL-V003

Figure 9.3.6-1 (Sheet 1 of 2)
CVS Control System Corrections

ADDITIONAL MARKUPS ON FOLLOWING PAGES

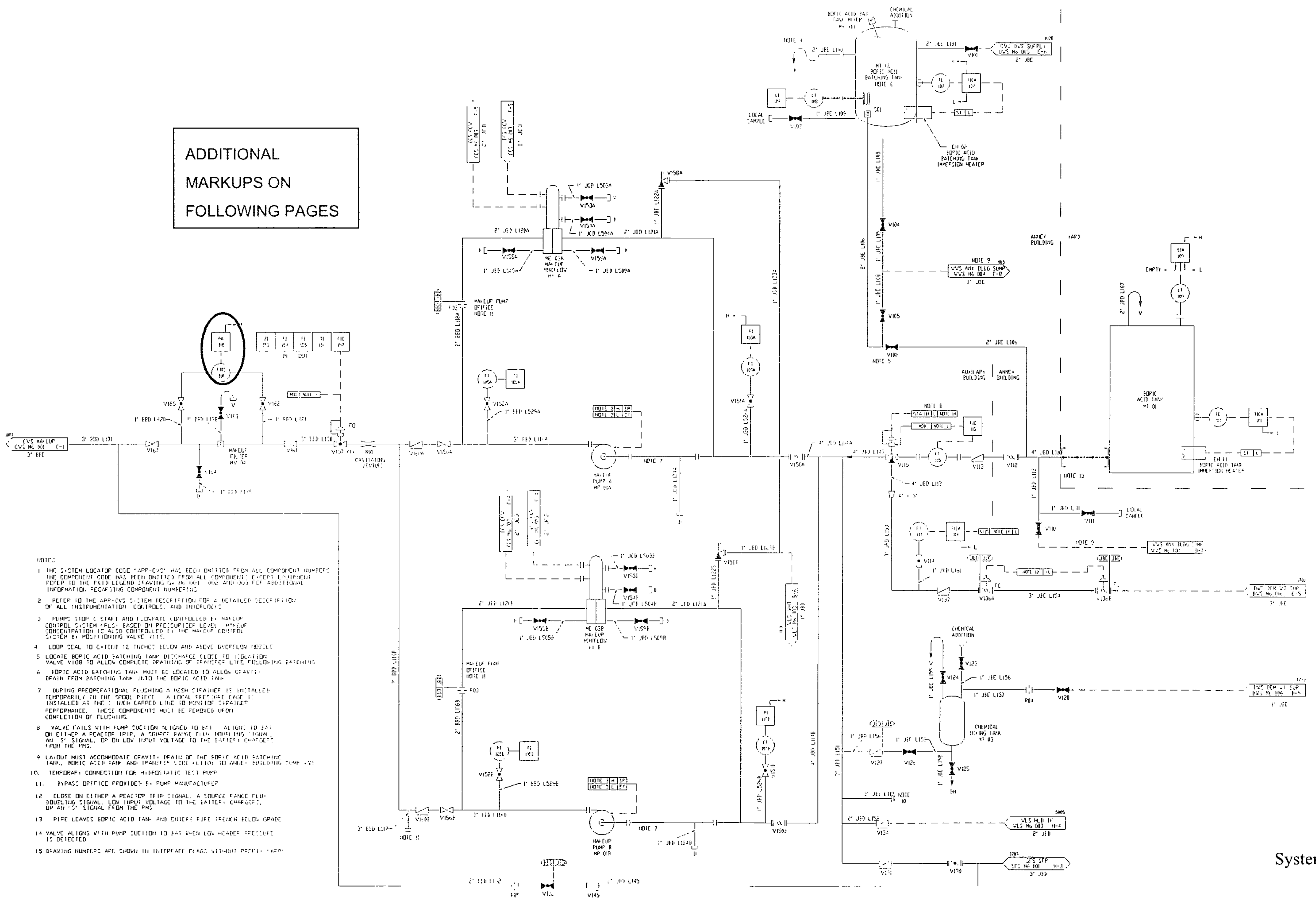


Figure 9.3.6-1 (Sheet 2 of 2)
Chemical and Volume Control
System Piping and Instrumentation Diagram
(REF) CVS 002

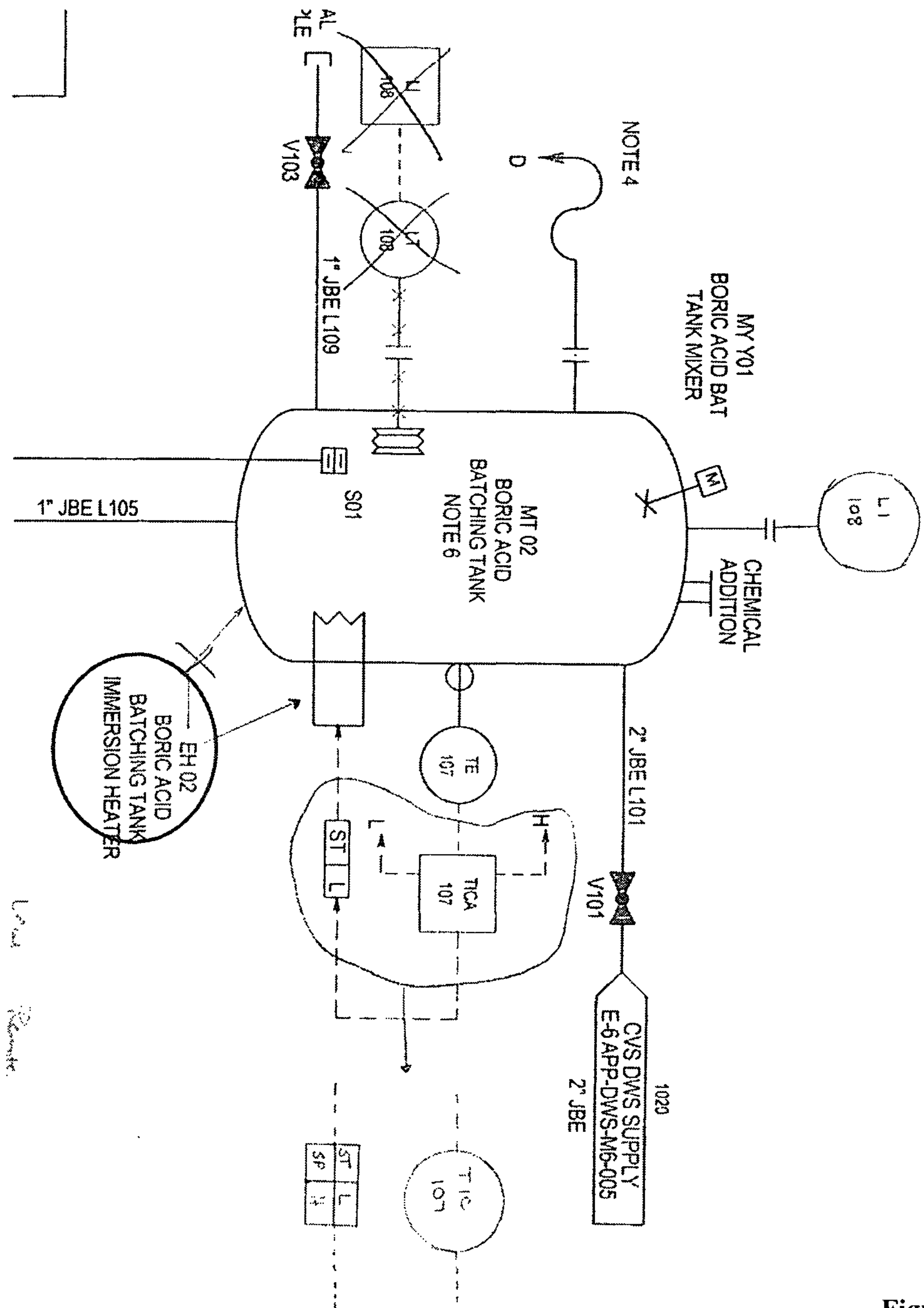


Figure 9.3.6-1 (Sheet 2 of 2)
Batching Tank Heater Control

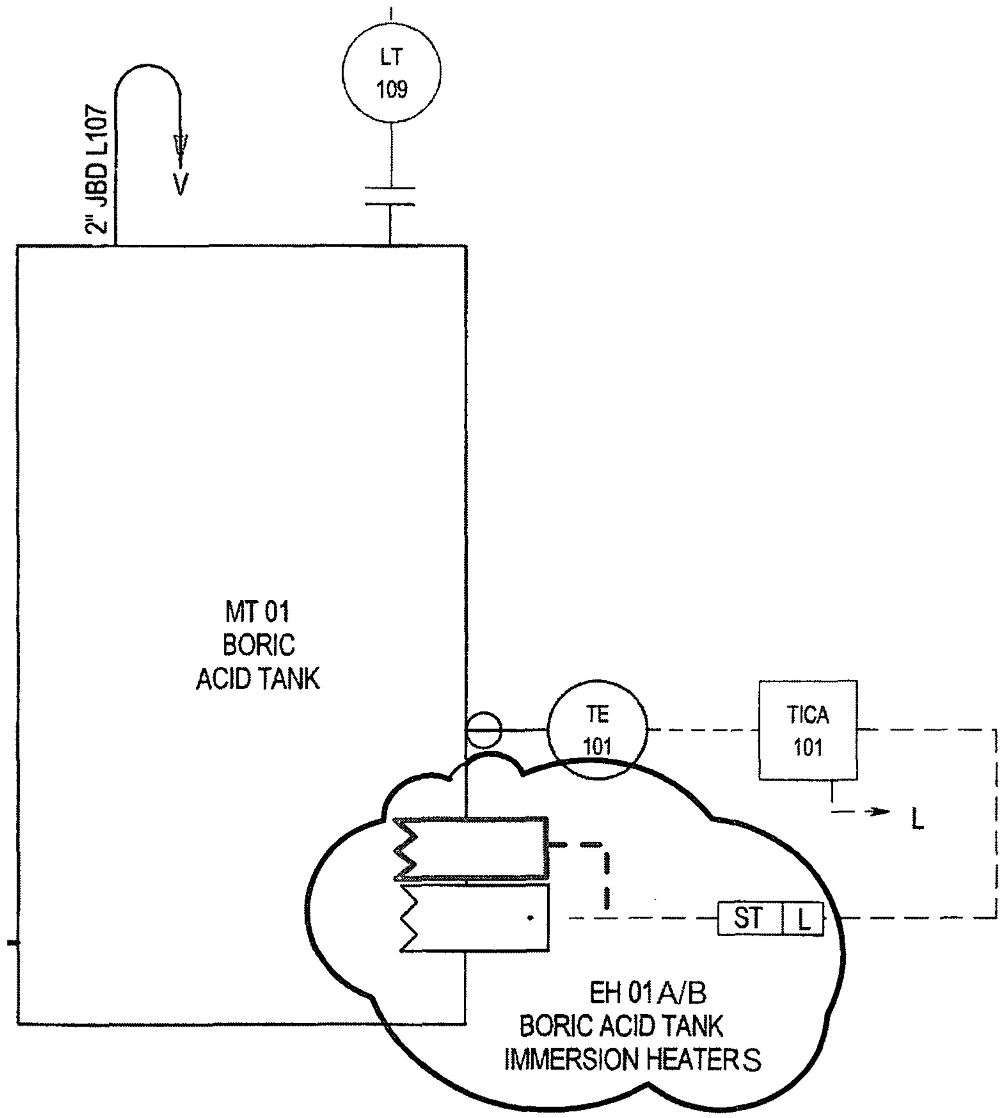


Figure 9.3.6-1 (Sheet 2 of 2)
Chemical and Volume Control
System Piping and Instrumentation Diagram
(REF) CVS 001
Correction of the boric acid tank heaters

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Title: Fluid System Changes

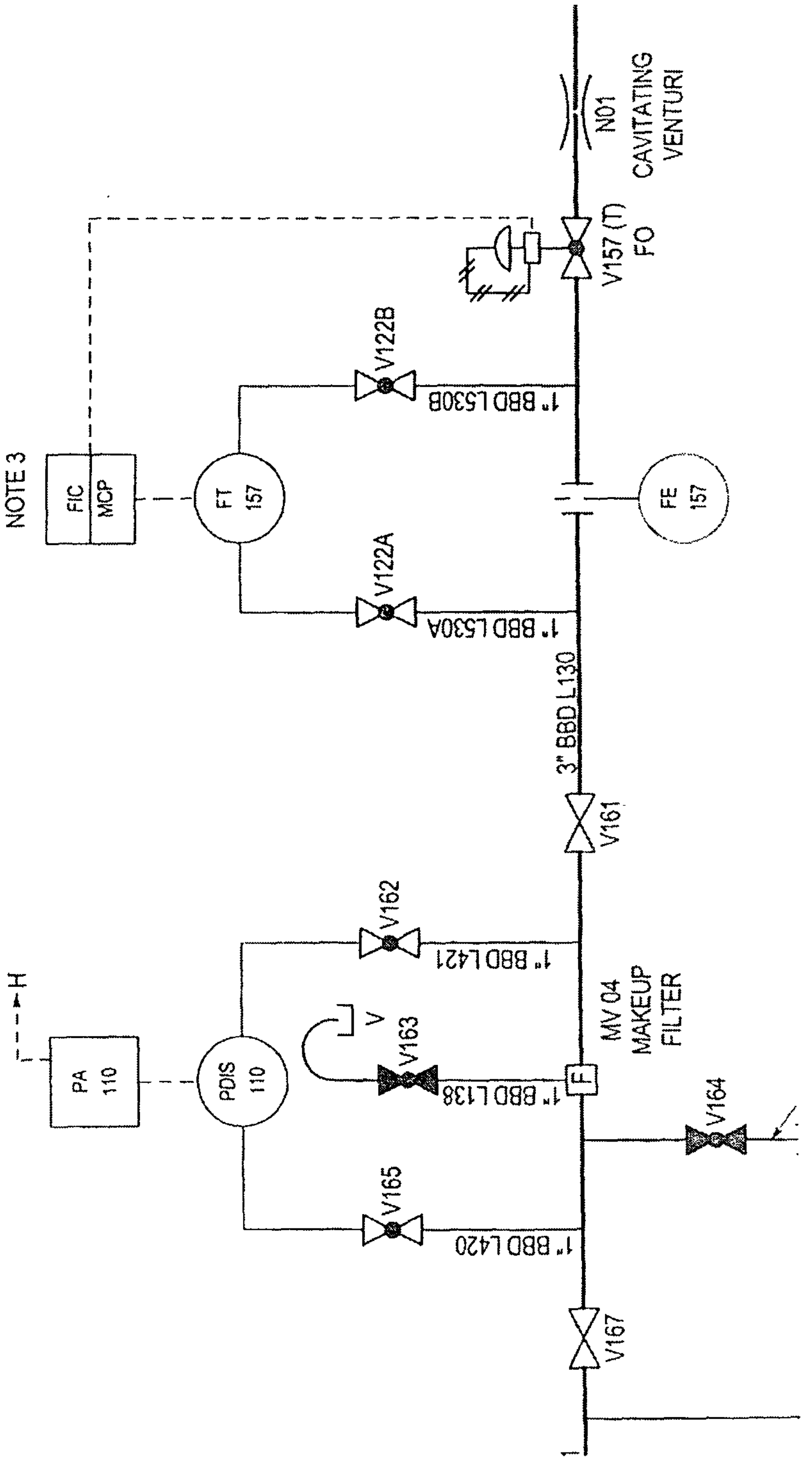

Figure 9.3.6-1 (Sheet 2 of 2)
Makeup Control Valve

Page 9.4-8

Supplemental Air Filtration Units

Each supplemental air filtration unit includes a high efficiency filter bank, an electric heating coil, a charcoal adsorber with upstream HEPA filter bank, a downstream postfilter bank and a fan. The filtration unit configurations, including housing, internal components, ductwork, dampers, fans and controls, and the location of the fans on the filtered side of units are designed, constructed, and tested to meet the applicable performance requirements of ASME AG-1, ASME N509, and ASME N510 (References 36, 2, and 3) to satisfy the guidelines of Regulatory Guide 1.140 (Reference 30).

Low Efficiency Filters, High Efficiency Filters, and Postfilters

The low efficiency filters and high efficiency filters have a rated dust spot efficiency based on ASHRAE 52 and 126 (References 7 and 35). Filter minimum average dust spot efficiency is shown in Table 9.4.1-1 and 9.4.1-2. High efficiency filter performance upstream of HEPA filter banks meet the design requirements of ASME AG-1 (Reference 36), Section FB. Postfilters downstream of the charcoal filters have a minimum DOP efficiency of 95 percent. The filters meet UL 900 (Reference 8) Class I construction criteria.

HEPA Filters

HEPA filters are constructed, qualified, and tested in accordance with UL-586 (Reference 9) and ASME AG-1 (Reference 36), Section FC. Each HEPA filter cell is individually shop tested to verify an efficiency of at least 99.97 percent using a monodisperse 0.3-μm aerosol in accordance with ASME AG-1 (Reference 36), Section TA.

Charcoal Adsorbers

Each charcoal adsorber is designed, constructed, qualified, and tested in accordance with ASME AG-1 (Reference 36), Section FE; and Regulatory Guide 1.40. Each charcoal adsorber is a single assembly with welded construction and 4-inch deep Type III rechargeable adsorber cell, conforming with IE Bulletin 80-03 (Reference 29).

Electric Heating Coils

The electric heating coils are multi-stage fin tubular type. The electric heating coils meet the requirements of UL-1995 (Reference 10). Electric heating coils used in battery rooms meet the requirements of UL 823 (Reference 34) for Class 1 Division I, Group B hazardous locations. The coils for the supplemental air filtration subsystem are constructed, qualified, and tested in accordance with ASME AG-1 (Reference 36), Section CA.

Electric Convection Heaters

The electric convection heaters are of the single-stage or two-stage fin tubular type. The electric unit heaters are UL-listed and meet the requirements of UL-1996 (Reference 26) and the National Electric Code NFPA 70 (Reference 28). Convection heaters meet the requirements of UL 1278 (Reference 40) or UL 1042 (Reference 41). Convection heaters are controlled by an integral temperature sensor or by a temperature sensor located in the space served by the heater.

Electric Unit Heaters

The electric unit heaters are single-stage or two-stage fin tubular type. The electric unit heaters are UL-listed and meet the requirements of UL-1996 (Reference 26) and the National Electrical Code NFPA 70 (Reference 28).

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Cooling Coils

The chilled water cooling coils are counterflow, finned tubular type. The cooling coils are designed and rated in accordance with ASHRAE 33 (Reference 11) and ANSI/ARI 410 (Reference 12).

Humidifiers

The humidifiers are packaged electric steam generator type which converts water to steam and distributes it through the air handling system. The humidifiers are designed and rated in accordance with ARI ~~620~~ 640 (Reference 13).

Isolation Dampers and Valves

Nonsafety-related isolation dampers are bubble tight, single- or parallel-blade type. The isolation dampers have spring return actuators which fail closed on loss of electrical power. The isolation dampers are constructed, qualified, and tested in accordance with ANSI/AMCA 500 (Reference 14) or ASME AG-1 (Reference 36), Section DA.

The main control room pressure boundary penetrations include isolation valves, interconnecting piping, and vent and test connection with manual test valves. The isolation valves are classified as Safety Class C (see subsection 3.2.2.5 and Table 3.2-3) and seismic Category I. Their boundary isolation function will be tested in accordance with ASME N510 (Reference 3).

The main control room pressure boundary isolation valves have electro-hydraulic operators. The valves are designed to fail closed in the event of loss of electrical power. The valves are qualified to shut tight against control room pressure.

Tornado Protection Dampers

The tornado protection dampers are split-wing type and designed to close automatically. The tornado protection dampers are designed against the effect of 300 mph wind.

Shutoff, Balancing and Backdraft Dampers

Multiblade, two-position remotely operated shutoff dampers are parallel-blade type. Multiblade, balancing dampers are opposed-blade type. Backdraft dampers are of the counterbalanced type and are provided to delay smoke migration through ductwork in case of fire. The backdraft dampers meet the Leakage Class II requirements of ASME N509 (Reference 2). Air handling unit and fan shutoff dampers are designed for maximum fan static pressure at shutoff flow and meet the performance requirements in accordance with ANSI/AMCA 500 (Reference 14). The supplemental air filtration subsystem dampers are constructed, qualified, and tested in accordance with ANSI/AMCA 500 or ASME AG-1 (Reference 36), Section DA.

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Combination Fire/Smoke Dampers

Combination fire/smoke dampers are provided at duct penetrations through fire barriers to maintain the fire resistance ratings of the barriers. The combination fire/smoke dampers meet the design, leakage testing, and installation requirements of UL-555S (Reference 25).

Ductwork and Accessories

Ductwork, duct supports, and accessories are constructed of galvanized steel. Ductwork subject to fan shutoff pressures is structurally designed to accommodate fan shutoff pressures. Ductwork, supports, and accessories meet the design and construction requirements of SMACNA Industrial Rectangular and Round Duct Construction Standards (References 16 and 34) and SMACNA HVAC Duct Construction Standards – Metal and Flexible (Reference 17). The supplemental air filtration and main control room/~~technical~~ control support ~~center~~ area HVAC subsystem's ductwork, including the air filtration units and the portion of the ductwork located outside of the main control room envelope, that maintains integrity of the main control room/-~~technical~~

control support ~~center~~ area pressure boundary during conditions of abnormal airborne radioactivity are designed in accordance with ASME AG-1 (Reference 36), Article SA-4500, to provide low leakage components necessary to maintain main control room/~~technical~~ control support ~~center~~ area habitability.

9.4.1.2.3 System Operation

9.4.1.2.3.1 Main Control Room/~~Technical~~ Control Support ~~Center~~ Area HVAC Subsystem

Normal Plant Operation

During normal plant operation, one of the two 100 percent capacity supply air handling units and return/exhaust air fans operates continuously. Outside makeup air supply to the supply air handling units is provided through an outside air intake duct. The outside airflow rate is automatically controlled to maintain the main control room and ~~technical~~ control support ~~center~~ area at a slightly positive pressure with respect to the surrounding areas and the outside environment.
The main control room/~~technical~~ control support ~~center~~ area supply air handling units are sized to provide cooling air for personnel comfort, equipment cooling, and to maintain the main control room emergency habitability passive heat sink below its initial ambient air design temperature. The temperature of the air supplied by each air handling unit is controlled by temperature sensors located in the main control room return air duct and in the computer room B return air duct to maintain the ambient air design temperature within its normal design temperature range by modulating the electric heat or chilled water cooling. Some spaces have convection heaters for temperature control.

The outside air is continuously monitored by smoke monitors located at the outside air intake plenum and the return air is monitored for smoke upstream of the supply air handling units. The supply air to the main control room is continuously monitored for airborne radioactivity while the supplemental air filtration units remain in a standby operating mode.

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The main control room and ~~technical~~ control support ~~center~~ area ventilation supply and return/exhaust ducts can be remotely or manually isolated from the main control room.

If a high concentration of smoke is detected in the outside air intake, an alarm is initiated in the main control room and the main control room/~~technical~~ control support ~~center~~ area HVAC subsystem is manually realigned to the recirculation mode by closing the outside air and toilet exhaust duct isolation valves. The main control room and ~~technical~~ control support ~~center~~ area toilet exhaust fans are tripped upon closure of the isolation valves. The main control room/~~technical~~ control support ~~center~~ areas are not pressurized when operating in the recirculation mode. The main control room/~~technical~~ control support ~~center~~ area HVAC supply air subsystem continues to provide cooling, ventilation, and temperature control to maintain the emergency habitability passive heat sink below its initial ambient air design temperature and maintains the main control room and ~~technical~~ control support ~~center~~ areas within their design temperatures.

In the event of a fire in the main control room or ~~technical~~ control support ~~center~~ area, in response to heat from the fire or upon receipt of a smoke signal from an area smoke detector, the combination fire/smoke dampers close automatically to isolate the fire area. The subsystem continues to provide ventilation/cooling to the unaffected area and maintains the unaffected areas at a slightly positive pressure. The main control room/ ~~technical~~ control support ~~center~~ area HVAC subsystem can be manually realigned to the once-through ventilation mode to supply 100 percent outside air to the unaffected area. Realignment to the once-through ventilation mode minimizes the potential for migration of smoke or hot gas from the fire area to the unaffected area. Smoke and hot gases can be removed from the affected area by reopening the closed combination fire/smoke damper(s) from outside of the affected fire area during the once-through ventilation mode. In the once-through ventilation mode, the outside air intake damper to the air handling unit mixing plenum opens and the return air damper to the air handling unit closes to provide 100 percent outside air to the supply air handling unit. In this mode, the subsystem exhaust air isolation damper opens to exhaust the return air directly to the turbine building vent.

Power is supplied to the main control room/~~technical~~ control support ~~center~~ area HVAC subsystem by the plant ac electrical system. In the event of a loss of the plant ac electrical system, the main control room/ ~~technical~~ control support ~~center~~ area ventilation subsystem can be transferred to the onsite standby diesel

generators. The convection heaters and duct heaters are not transferred to the onsite standby diesel generator.

When complete ac power is lost and the outside air is acceptable radiologically and chemically, MCR habitability is maintained by operating one of the two MCR ancillary fans to supply outside air to the MCR. It is expected that outside air will be acceptable within 72 hours following a radiological release. See subsection 6.4.2.2 for details. The outside air pathway to the ancillary fans is provided through the nonradioactive ventilation system air intake opening located on the roof, the mechanical room at floor elevation 135′-3″, and nonradioactive ventilation system supply duct. Warm air from the MCR is vented to the annex building through stairway S05, into the remote shutdown room and the clean access corridor at elevation 100′-0″. The ancillary fan capacity and air flow rate maintain the MCR environment near the daily average outdoor air temperature. The ancillary fans and flow path are located within the auxiliary building which is a Seismic Category I structure.

Power supply to the ancillary fans is from the respective division B or C regulating transformers which receive power from the ancillary diesel generators. For post-72-hour power supply discussion see subsection 8.3.1.1.1.

9.4.1.2.3.2 Class 1E Electrical Room HVAC Subsystem

The Class 1E electrical room HVAC equipment that serves electrical division A and C equipment is described in this section. The operation of the Class 1E electrical room HVAC equipment that serves electrical division B and D is similar.

Normal Plant Operation

During normal plant operation, one of the redundant supply air handling units, return fans, and battery room exhaust fans operate continuously to provide room temperature control, to maintain the Class 1E electrical room emergency passive heat sink below its initial ambient air temperature, and to purge and prevent build-up of hydrogen gas concentration in the Class 1E Battery Rooms. The temperature of the air supplied by each air handling unit is controlled by temperature sensors located in the return air duct to maintain the room air temperature within the normal design range by modulating electric heating or chilled water cooling. Duct heaters are controlled by temperature sensors located in the space served by the heater.

During normal plant operation, the exhaust airflow from the Class 1E battery rooms is vented directly to the turbine building vent to limit the concentration of hydrogen gas in the rooms to less than 2 percent by volume in accordance with the guidelines of Regulatory Guide 1.128.

The outside makeup air to the supply air handling units is provided through an outside air intake duct. The outside airflow rate is manually balanced during system startup to provide adequate makeup air for the battery room exhaust fans.

The standby supply air handling unit and the corresponding return/exhaust fans are started automatically if one of the following conditions occurs:

- Airflow rate of the operating fan is above or below predetermined set points
- Return air temperature is above or below predetermined setpoints.
- Loss of electrical and/or control power to the operating unit.

Abnormal Plant Operation

The operation of the Class 1E electrical room HVAC subsystem is not affected by the detection of airborne radioactivity in the main control room supply air duct of the main control room/~~technical~~ control support ~~center~~ area HVAC subsystem. During a design basis accident (DBA), if the plant ac electrical system is unavailable, the Class 1E electrical room passive heat sink provides area temperature control. Refer to Section 6.4 for further details.

If a high concentration of smoke is detected in the outside air intake and an alarm is initiated in the main control room, the Class 1E electrical HVAC subsystem(s) can be manually aligned to the recirculation mode by closing the outside air intake damper to the air handling unit mixing plenum. This allows 100 percent room air to return to the supply air subsystem air handling unit. The subsystem continues to provide cooling, ventilation, and temperature control to maintain the areas served by the subsystem(s) within their design temperatures and pressures.

In the event of a fire in a Class 1E electrical room, in response to heat from the fire or upon receipt of a smoke signal from an area smoke detector, the combination fire/smoke dampers close automatically to isolate the fire area. The affected subsystem continues to provide ventilation/cooling to the remaining areas and maintains the remaining areas at a slightly positive pressure. Either or both subsystems can be manually realigned to the

once-through ventilation mode to supply 100 percent outside air to the unaffected areas. Realignment to the once-through ventilation mode minimizes the potential for migration of smoke and hot gases from a non-Class 1E electrical room or a Class 1E electrical room of one division into the Class 1E electrical room of another division. Smoke and hot gases can be removed from the affected areas by reopening the closed combination fire/smoke dampers from outside of the affected fire area during the once-through ventilation mode. In the once-through ventilation mode, the outside air intake damper to the air handling unit mixing plenum opens and the return air damper to the air handling unit closes to allow 100 percent outside air to the supply air handling unit. The subsystem exhaust air isolation damper also opens to exhaust room air directly to the turbine building vent. During a fire, the pressure difference across the doors in stairwells S01 and S02 is maintained in accordance with the guidance of NFPA 92A (Reference 33) by dedicated stairwell pressurization fans.

The power supplies to the Class 1E electrical room HVAC subsystem are provided by the plant ac electrical system and the onsite standby diesel generators. In the event of a loss of the plant ac electrical system, the Class 1E electrical room HVAC subsystem is automatically transferred to the onsite standby diesel generators. The convection heaters and duct heaters are not transferred to the onsite standby diesel generator.

When complete ac power is lost, division B and C instrumentation and control room temperature is maintained by operating their respective ancillary fans (VBS-MA-11 and VBS-MA-12) to supply outside air to the I&C rooms. It is expected that outside air will be supplied within 72 hours following a radiological release. The outside air pathway to the ancillary fans is through the nonradioactive ventilation system outside air intake opening located on the roof, the mechanical room at floor elevation 135′-3″, stairway No. 1 doors at elevation 135′-3″ and 82′-6″, the access corridor at floor elevation 82′-6″, and the divisional battery rooms. The warm air is vented to the annex building through the clean access corridor at elevation 100′-0″. The outside air supply provides cooling and maintains room temperature below the qualification temperature of the I&C equipment. The ancillary fans and flow path are located within the auxiliary building which is a Seismic Category I structure.

Power supply to the ancillary fans is from the respective division B or C regulating transformers which receive power from the ancillary diesel generators. For post-72-hours power supply discussion see subsection 8.3.1.1.1.

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Electric Heating Coils

The electric heating coils are multi-stage fin tubular type. The electric heating coils meet the requirements of UL 1995 (Reference 10).

Electric Unit Heaters

The electric unit heaters are single-stage or two-stage fin tubular type. The electric unit heaters are UL-listed and meet the requirements of UL 1996 (Reference 26) and the National Electric Code NFPA 70 (Reference 28).

Humidifier

The humidifier is a packaged electric steam generator type which converts water to steam and distributes it through the supply duct system. The humidifier is performance rated in accordance with ARI ~~620~~ 640 (Reference 13).

Hot Water Unit Heaters

The hot water unit heaters consist of a fan section and hot water heating coil section factory assembled as a complete and integral unit. The unit heaters are either horizontal discharge or vertical downblast type. The coil ratings are in accordance with ANSI/ARI 410 (Reference 12).

Isolation Dampers

Isolation dampers are bubble tight, single- or parallel-blade type. The isolation dampers have spring return actuators which fail closed on loss-of-electrical power or loss-of-air pressure. The isolation dampers are constructed, qualified and tested in accordance with ANSI/AMCA 500 (Reference 14).

Shutoff, Control, Balancing, and Backdraft Dampers

Multiblade, two-position remotely operated shutoff dampers are parallel-blade type. Multiblade, control and balancing dampers are opposed-blade type. Backdraft dampers are provided to prevent backflow through ventilators, exhaust fans and the valve/piping penetration room air handling units. Air handling unit and fan shutoff dampers are designed for maximum fan static pressure at shutoff flow. Dampers meet the performance requirements of ANSI/AMCA 500 (Reference 14).

Fire Dampers

Fire dampers are provided at duct penetrations through fire barriers to maintain the fire resistance ratings of the barriers. The fire dampers meet the design and installation requirements of UL 555 (Reference 15). Fire dampers are not provided in locations where combination fire/smoke dampers are provided.

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ANSI/AMCA 210 (Reference 4), ANSI/AMCA 211 (Reference 5), and ANSI/AMCA 300 (Reference 6).

Unit Coolers

Each unit cooler consist of a low efficiency filter bank, a chilled water cooling coil bank and a supply fan. The normal residual heat removal system pump room unit coolers have redundant cooling coil banks. The principal construction code is the manufacturer's standard.

Low and High Efficiency Filters

The low efficiency (25 percent) filters and high efficiency (80 percent) filters have a rated dust spot efficiency based on ASHRAE 52 and 126 (References 7 and 35). The filters minimum average dust spot efficiencies for the defense in depth filters are shown in Table 9.4.3-1. The filters meet UL 900 (Reference 8) Class I construction criteria.

Electric Unit Heaters

The electric unit heaters are single-stage or two-stage fin tubular type. The electric unit heater are UL-listed and meet the requirements of UL-1996 (Reference 26) and National Electric Code (Reference 28).

Hot Water Heating Coils

The hot water heating coils are finned tubular type. The outside supply air heating coils are provided with integral face and bypass dampers to prevent freeze damage when modulating the heat output. Coils are performance rated in accordance with ANSI/ARI 410 (Reference 12).

Electric Heating Coils

The electric heating coils are multistage fin tubular type. The electric heating coils meet the requirements of UL 1995 (Reference 10).

Cooling Coils

The chilled water cooling coils are counterflow, finned tubular type. The cooling coils are designed and rated in accordance with ASHRAE 33 (Reference 11) and ANSI/ARI 410 (Reference 12).

Humidifier

The humidifier is a packaged electric steam generator type which converts water to steam and distributes it through the supply duct system. The humidifier is performance rated in accordance with ARI ~~620~~ 640 (Reference 13).

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Shutoff, Control, Balancing, and Backdraft Dampers

Multiblade, two-position remotely operated shutoff dampers are parallel-blade type. Multiblade, control and balancing dampers are opposed-blade type. Backdraft dampers are provided to prevent backflow through shut down fans. Air handling unit and fan shutoff dampers are designed for maximum fan static pressure at shutoff flow. Dampers meet the performance requirements of ANSI/AMCA 500 (Reference 14).

Unit Heaters

Unit heaters are the down-blow type with propeller type fans directly connected to the fan motor. Each unit heater is equipped with a four-way discharge outlet. The coil ratings are in accordance with ANSI/ARI 410 (Reference 12).

Electric Duct Heaters

Electric duct heaters are open grid type. The duct heaters are UL-listed for zero clearance and meet requirements of NFPA 70 (Reference 28).

Humidifiers

A humidifier is a packaged electric steam generator type which converts water to steam and distributes it through the air handling system. The humidifier is designed and rated in accordance with ARI ~~620~~ 640 (Reference 13).

Fire Dampers

Fire dampers are provided at HVAC duct penetrations through fire barriers to maintain fire resistance ratings of the barriers. The fire dampers meet the design and installation requirements of UL-555 (Reference 15) as applicable.

Ductwork and Accessories

Ductwork, duct supports, and accessories are constructed of galvanized steel. Ductwork subject to fan shutoff pressure is structurally designed for fan shutoff pressures. Ductwork, supports and accessories meet the design and construction requirements of SMACNA Rectangular and Round Industrial Duct Construction Standards (References 16 and 34) and SMACNA HVAC Duct Construction Standards – Metal and Flexible (Reference 17).

9.4.9.3 System Operation

9.4.9.3.1 General Area Heating and Ventilation

The general area ventilation system is manually controlled. Roof exhaust ventilators are manually started and stopped as required to satisfy space temperature conditions. Wall louvers located at the ground floor and the two intermediate levels of the turbine building are normally open during ventilation operation. The wall

louvers located at the operating floor are manually opened.

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Supply and Exhaust Air Fans

The supply and exhaust fans are centrifugal type, single width single inlet (SWSI) or double width double inlet (DWDI), with high efficiency wheels and backward inclined blades to produce non-overloading horsepower characteristics. The fans are designed and rated in accordance with ANSI/AMCA 210 (Reference 4), ANSI/AMCA 211 (Reference 5), and ANSI/AMCA 300 (Reference 6).

Low Efficiency Filters and High Efficiency Filters

The low efficiency (25 percent) filters and high efficiency (80 percent) filters have a rated dust spot efficiency based on ASHRAE 52 and 126 (References 7 and 35). The filters meet UL 900 (Reference 8) Class I construction criteria.

Cooling Coils

The chilled water cooling coils are counterflow, finned tubular type. The cooling coils are designed and rated in accordance with ASHRAE 33 (Reference 11) and ANSI/ARI 410 (Reference 12).

Heating Coils

The hot water heating coils are counterflow, finned tubular type. The heating coils are provided with integral face and bypass dampers to prevent freeze damage when modulating heat output. The heating coils are designed and rated in accordance with ASHRAE 33 (Reference 11) and ANSI/ARI 410 (Reference 12).

Humidifier

The humidifier is a packaged electric steam generator type which converts water to steam and distributes it through the air handling system. The humidifier is designed and rated in accordance with ARI ~~620~~ 640 (Reference 13).

Shutoff, Control, Balancing, and Backdraft Dampers

Multiblade, two-position remotely operated shutoff dampers are parallel-blade type. Multiblade, control and balancing dampers are opposed-blade type. Backdraft dampers are provided to prevent backflow through ductwork when operating the machine tools exhaust fan. Air handling unit and fan shutoff dampers are designed for maximum fan static pressure at shutoff flow. Dampers meet the performance requirements of ANSI/AMCA 500 (Reference 14).

Fire Dampers

Fire dampers are provided at duct penetrations through fire barriers to maintain the fire resistance ratings of the barriers. The fire dampers meet the design and installation requirements of UL 555 (Reference 15).

Page 9.4-73

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7. Gravimetric and Dust Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter, ASHRAE 52.1, 1992.
8. "Test Performance of Air-Filter Units," UL-900, 1994.
9. "High-Efficiency, Particular, Air-Filter Units," UL-586, 1996.
10. "Heating and Cooling Equipment," UL 1995, 1995.
11. "Methods of Testing for Rating Forced Circulation Air Cooling and Air Heating Coils," ASHRAE 33-78.
12. "Forced-Circulation Air Cooling and Air Heating Coils," ANSI/ARI 410-91.
13. ~~"Self-Contained Humidifiers," ARI 620-96.~~

"Commercial and Industrial Humidifiers," ARI 640-96

14. “Testing Methods for Louvers, Dampers, and Shutters,” ANSI/AMCA 500-89.
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16. “Rectangular Industrial Duct Construction Standards,” SMACNA, 1980.
17. “HVAC Duct Construction Standards – Metal and Flexible,” SMACNA, 1995.
18. “HVAC Duct Leakage Test Manual,” SMACNA, 1985.
19. “HVAC Systems – Testing, Adjusting, and Balancing,” SMACNA, 1993.
20. Code of Federal Regulations, Title 10, Part 50, Appendix I.
21. Code of Federal Regulations, Title 10, Part 20.
22. “Heat-Stress Management Program for Nuclear Power Plants,” EPRI NP-4453 by Westinghouse Electric Corporation, dated February 1986.
23. Branch Technical Position CSB 6-4 to “Containment Isolation System,” Standard Review Plan 6.2.4 of NUREG-0800 Rev. 2, July 1981.
24. “Military Specification Filter, Particulate, High-Efficiency, Fire Resistant,” MIL-F-51068F.
25. “Leakage Rated Dampers for Use in Smoke Control System,” UL-555S, 1999.
26. “Electric Duct Heaters,” UL-1996, 1996.
27. “Standard for Installation of Air Conditioning and Ventilation Systems,” NFPA 90A, 1999.
28. "National Electrical Code," NFPA 70, 1999.
29. "Loss of Charcoal from Adsorber Cells," IE Bulletin 80-03, 1980.
30. "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmospheric Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," Regulatory Guide (RG) 1.140-2001, Revision 2.
31. "Installation Design and Installation of Large Lead Storage Batteries for Nuclear Power Plants," Regulatory Guide 1.128, Revision 1, October 1978.
32. "Ventilation for Acceptable Indoor Air Quality," ASHRAE Standard 62-1999.
33. NFPA 92A-2000, "Recommended Practice for Smoke Control Systems."
34. "Round Industrial Duct Construction Standards," SMACNA, 1999.
35. "Method of Testing HVAC Air Ducts," ASHRAE 126, 2000.
36. "Code on Nuclear Air and Gas Treatment," ASME/ANSI AG-1-1997.
37. "Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," USNRC Regulatory Guide 1.78, Revision 1, December 2001.

38. "Standard Test Methods for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution," ASTM E741, 2000.

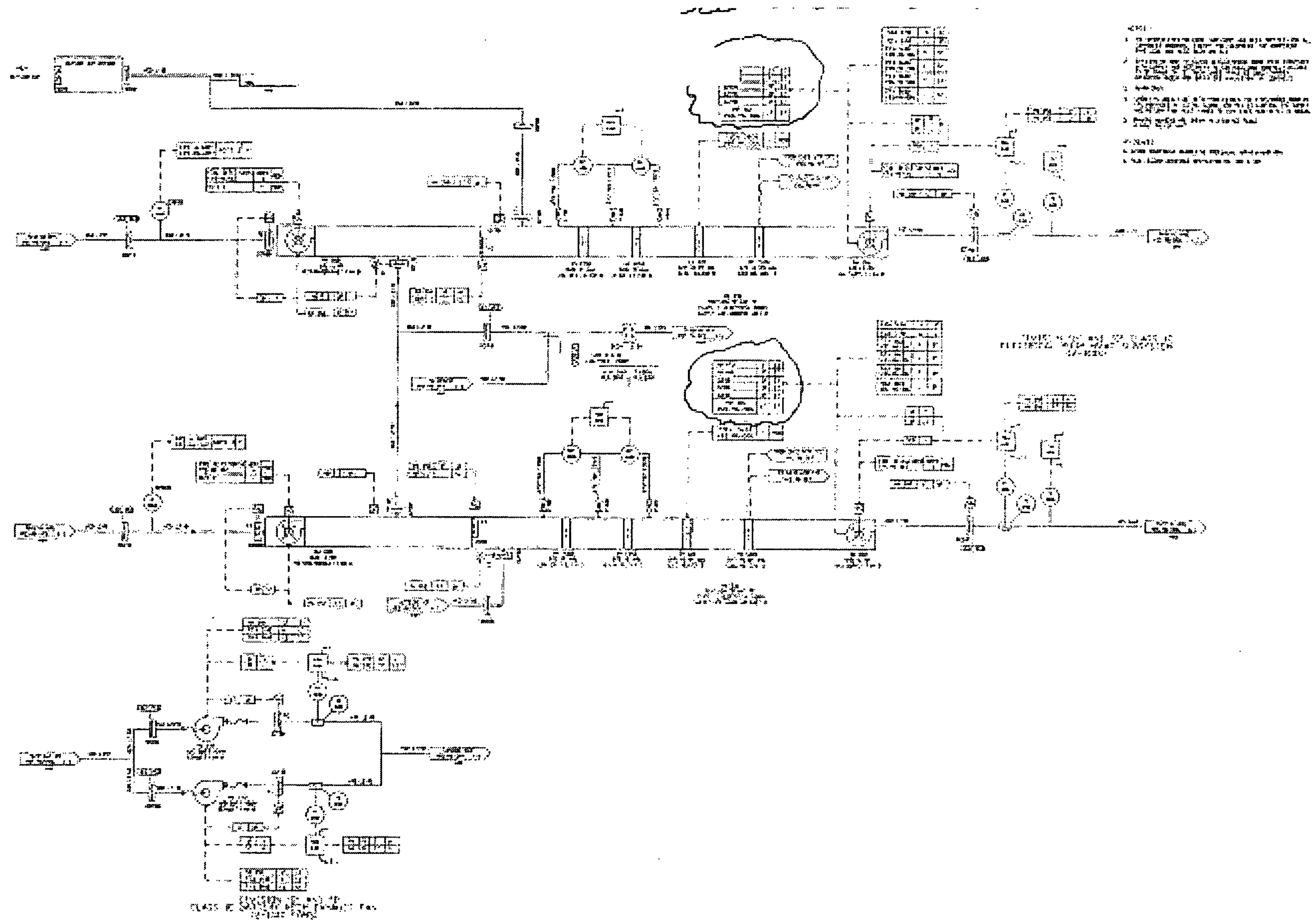
39. Electric Heaters For Use in Hazardous (Classified) Locations, UL 823.

40. Movable and Wall or Ceiling Hung Electrical Room Heaters, UL 1278.

41. Electrical Baseboard Heating Equipment, UL 1042.

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes



Inside Auxiliary Building

Figure 9.4.1-1 (Sheet 4 of 7)

Nuclear Island Non-Radioactive Ventilation System
Piping and Instrumentation Diagram
(REF) VBS 004

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

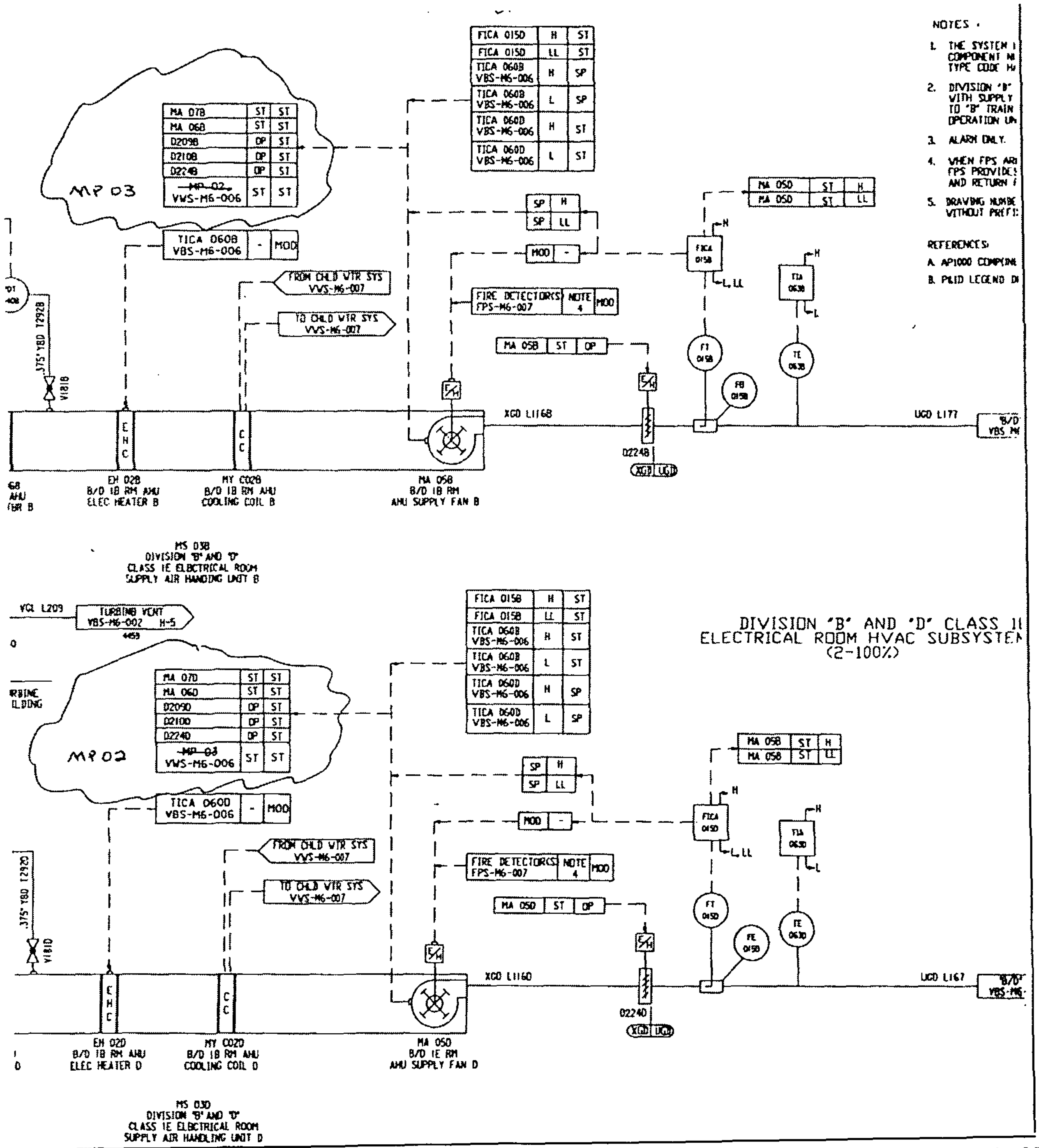


Figure 9.4.1-1 (Sheet 4 of 7)

Nuclear Island Non-Radioactive Ventilation System
Piping and Instrumentation Diagram
(REF) VBS 004

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

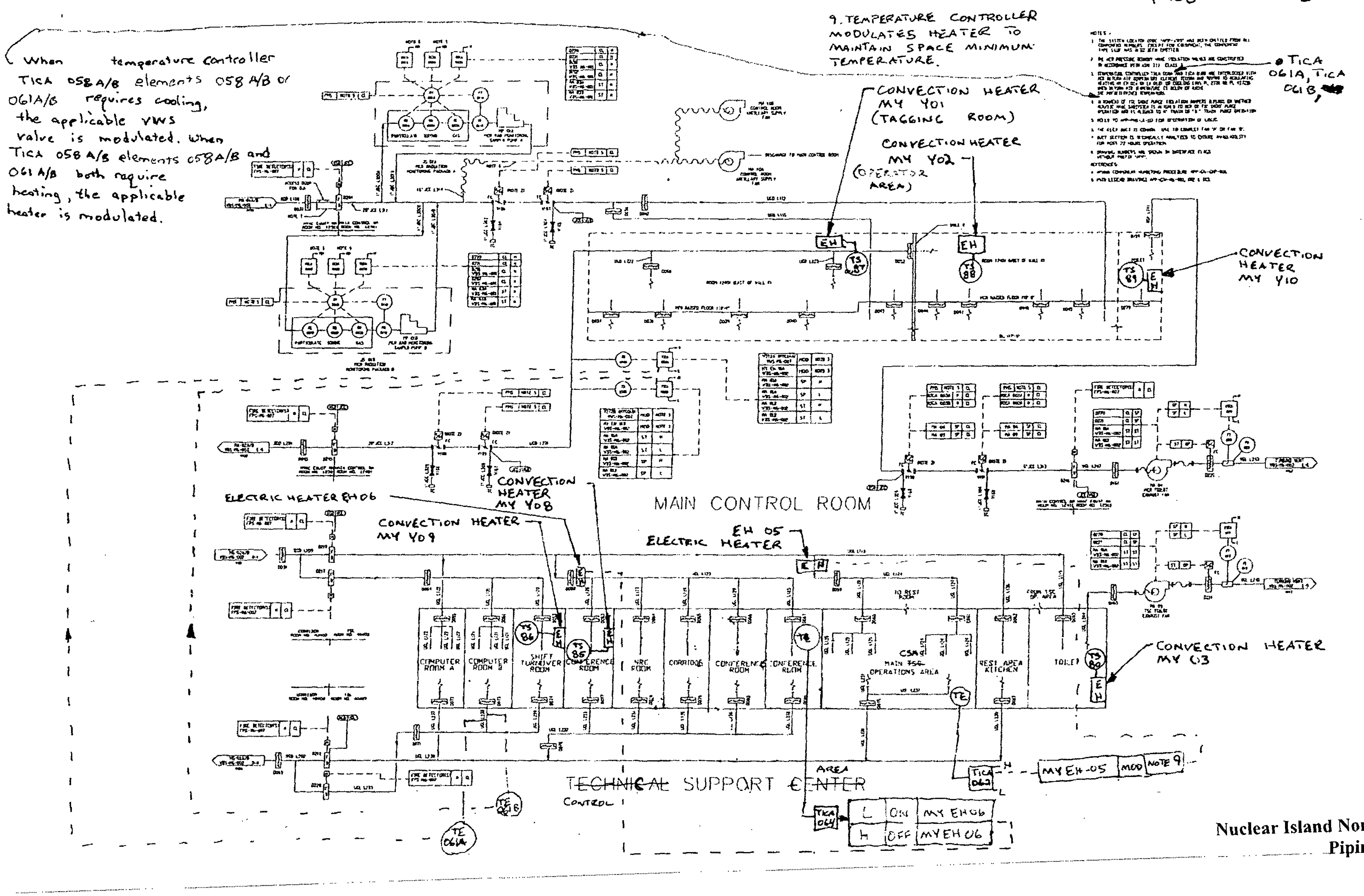


Figure 9.4.1-1 (Sheet 5 of 7)
Nuclear Island Non-Radioactive Ventilation System
Piping and Instrumentation Diagram

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes

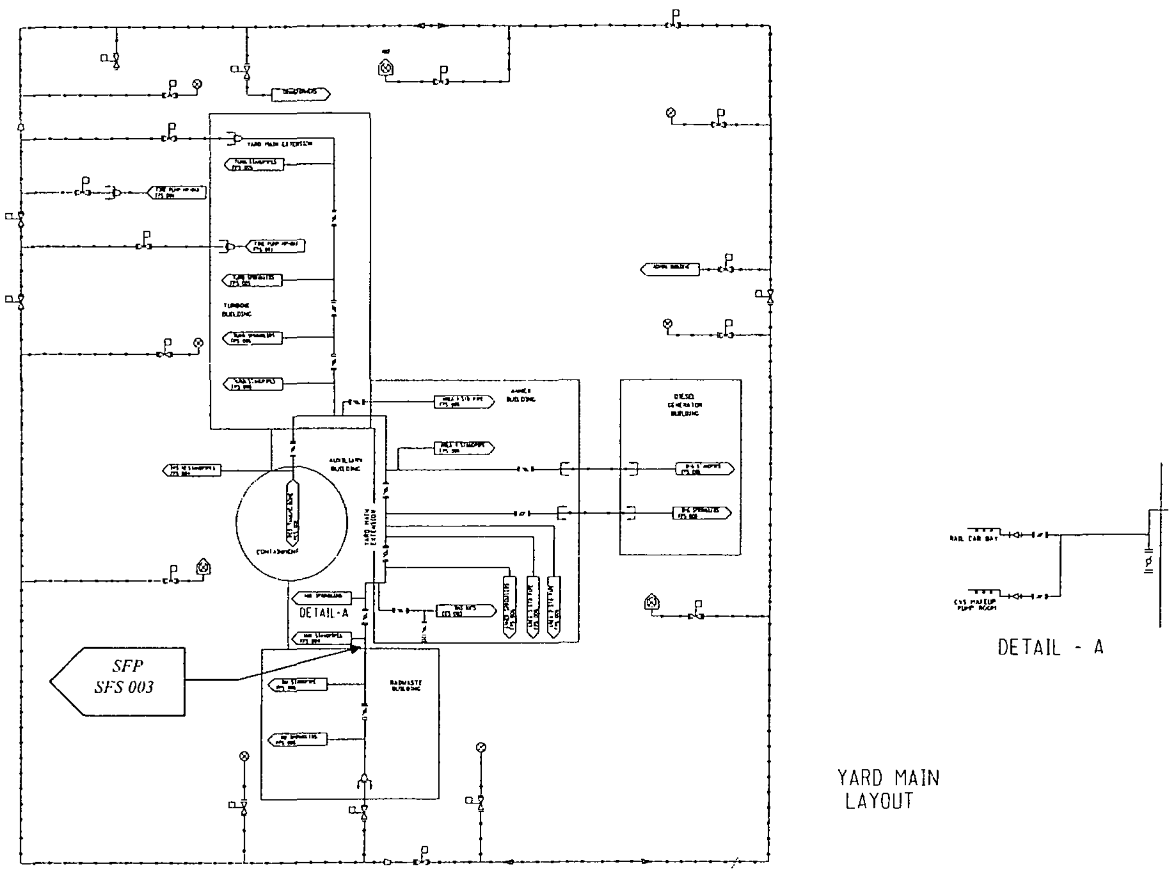


Figure 9.5.1-1 (Sheet 2 of 3)
Fire Protection System
Piping and Instrumentation Diagram
(REF) FPS 002, 004

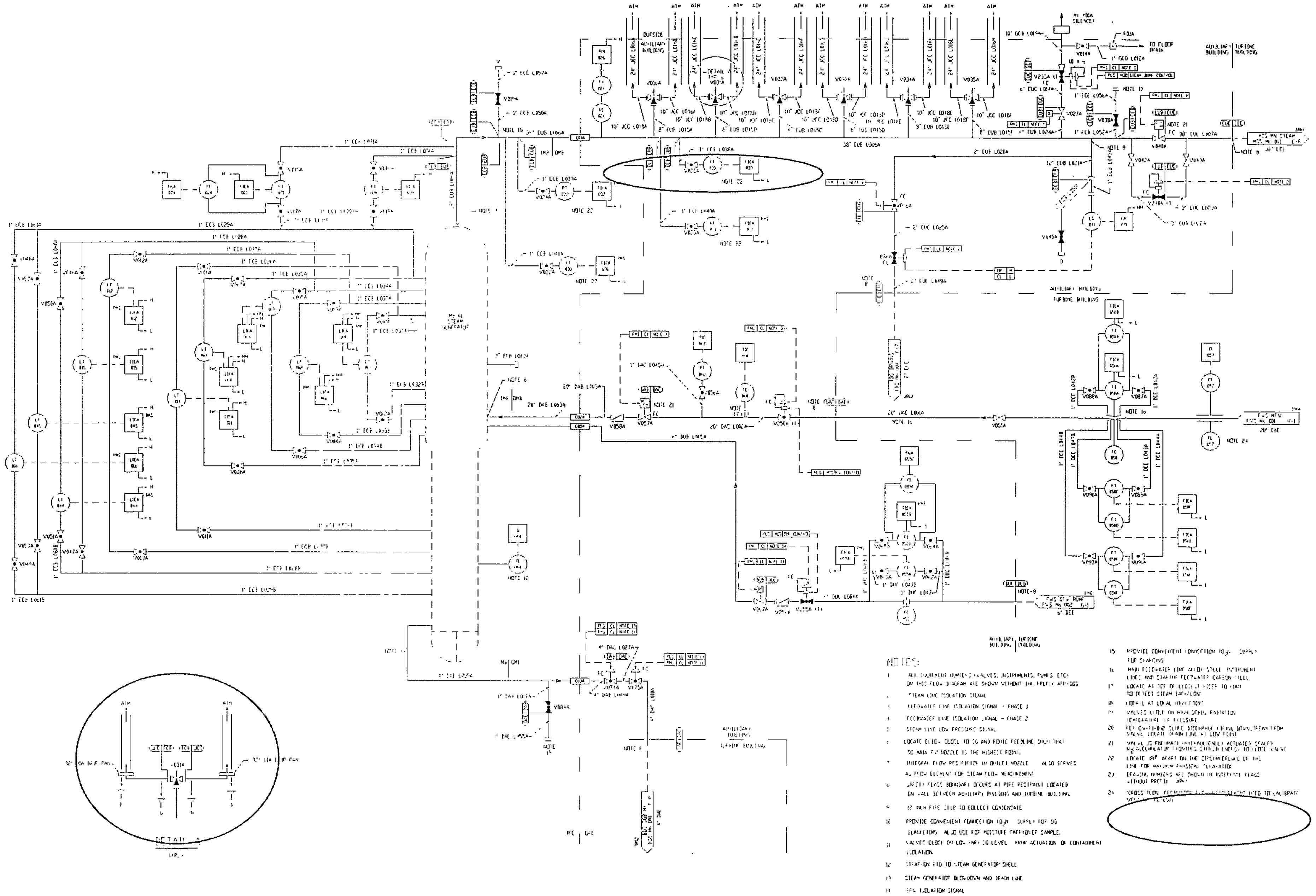


Figure 10.3.2-1 (Sheet 1 of 2)
Main Steam Piping and Instrumentation
Diagram (Safety-Related System)
(REF) SGS 001

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

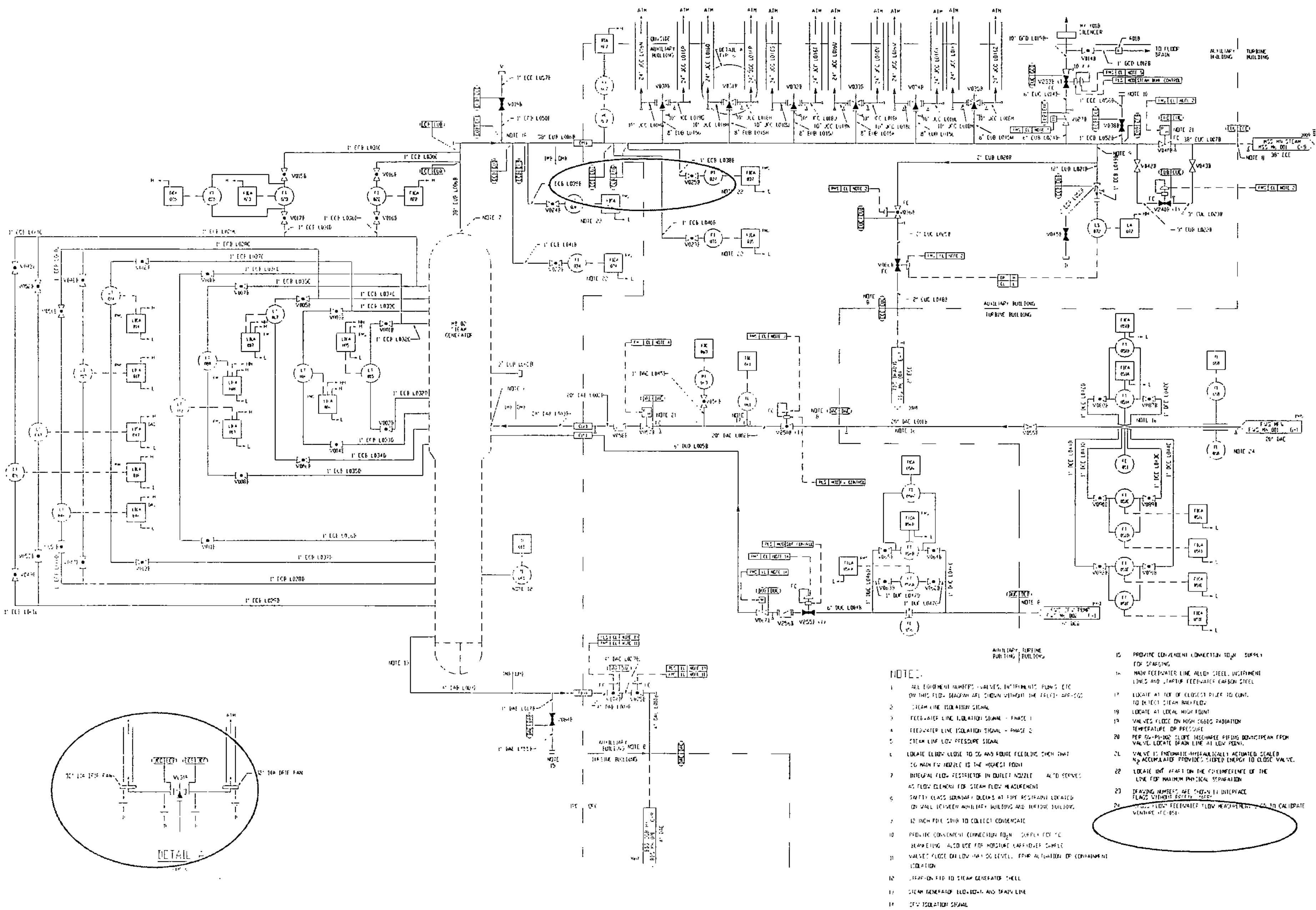


Figure 10.3.2.1 (Sheet 2 of 2)

Main Steam Piping and Instrumentation Diagram (Safety-Related System) (REF) SGS 002

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

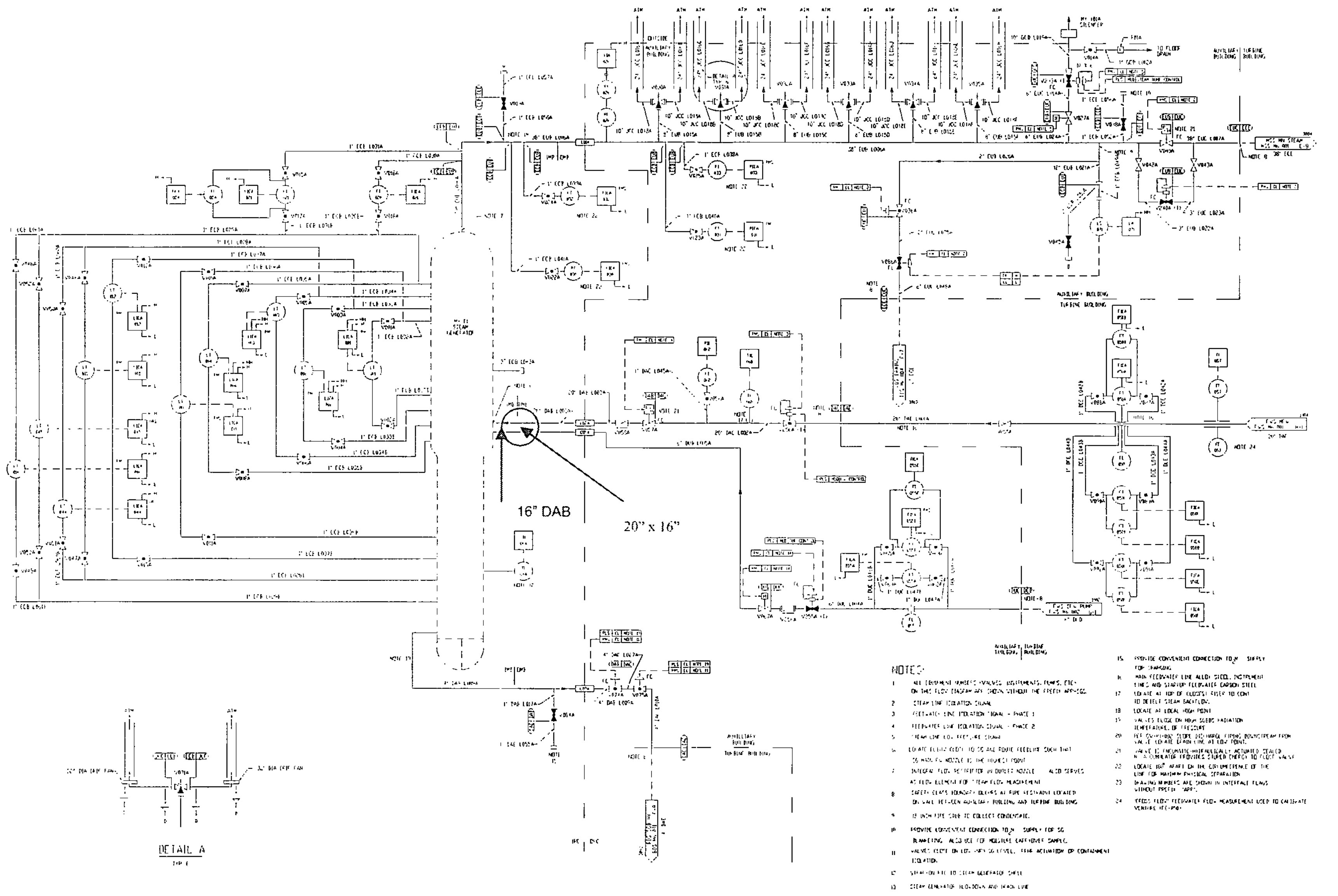


Figure 10.3.2-1
Main Steam Piping and Instrumentation
Diagram (Safety-Related System)
(REF) SGS 001

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

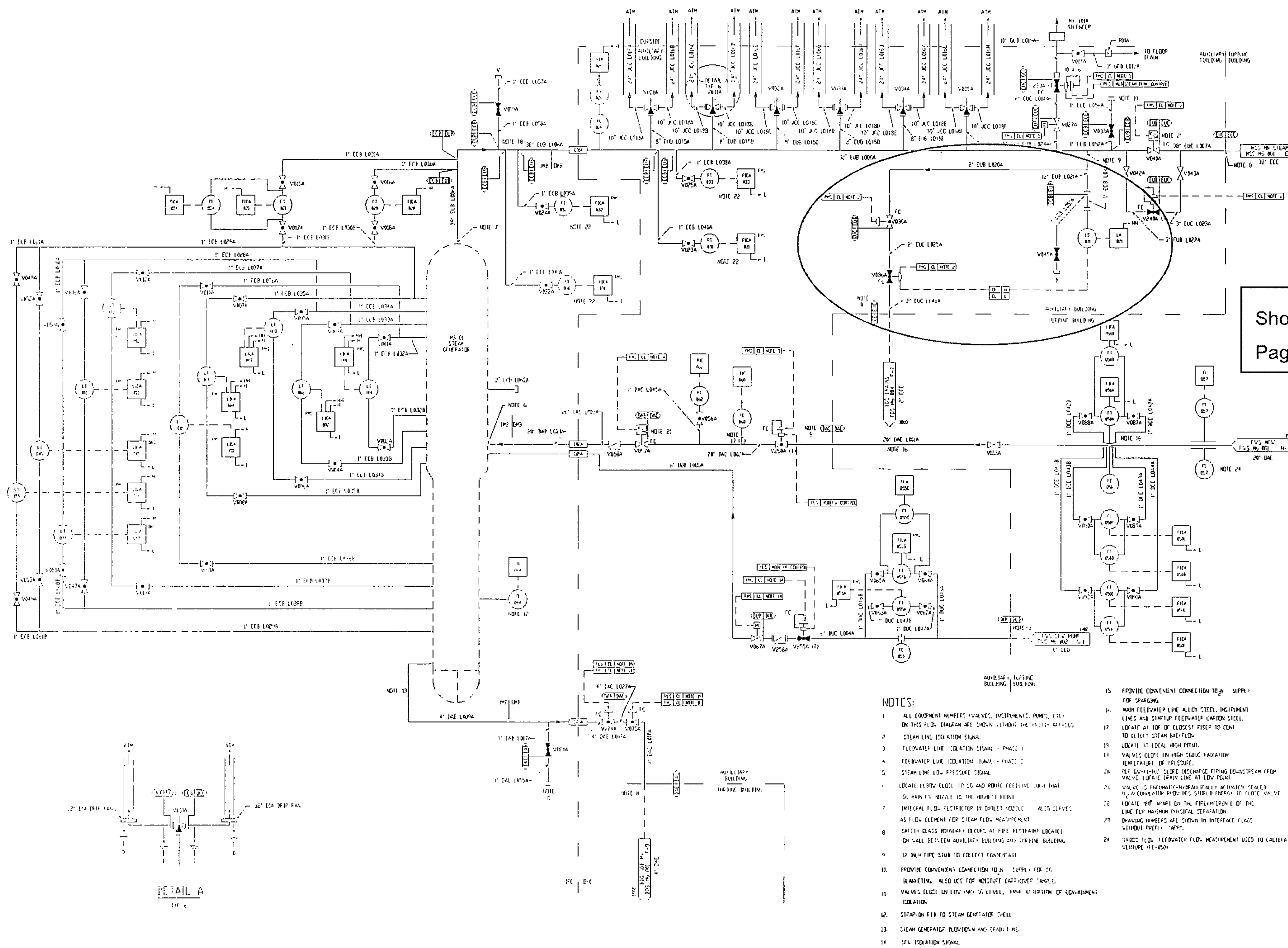


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Figure 10.3.2-1

Main Steam Piping and Instrumentation Diagram (Safety-Related System)

(REF) SGS 001

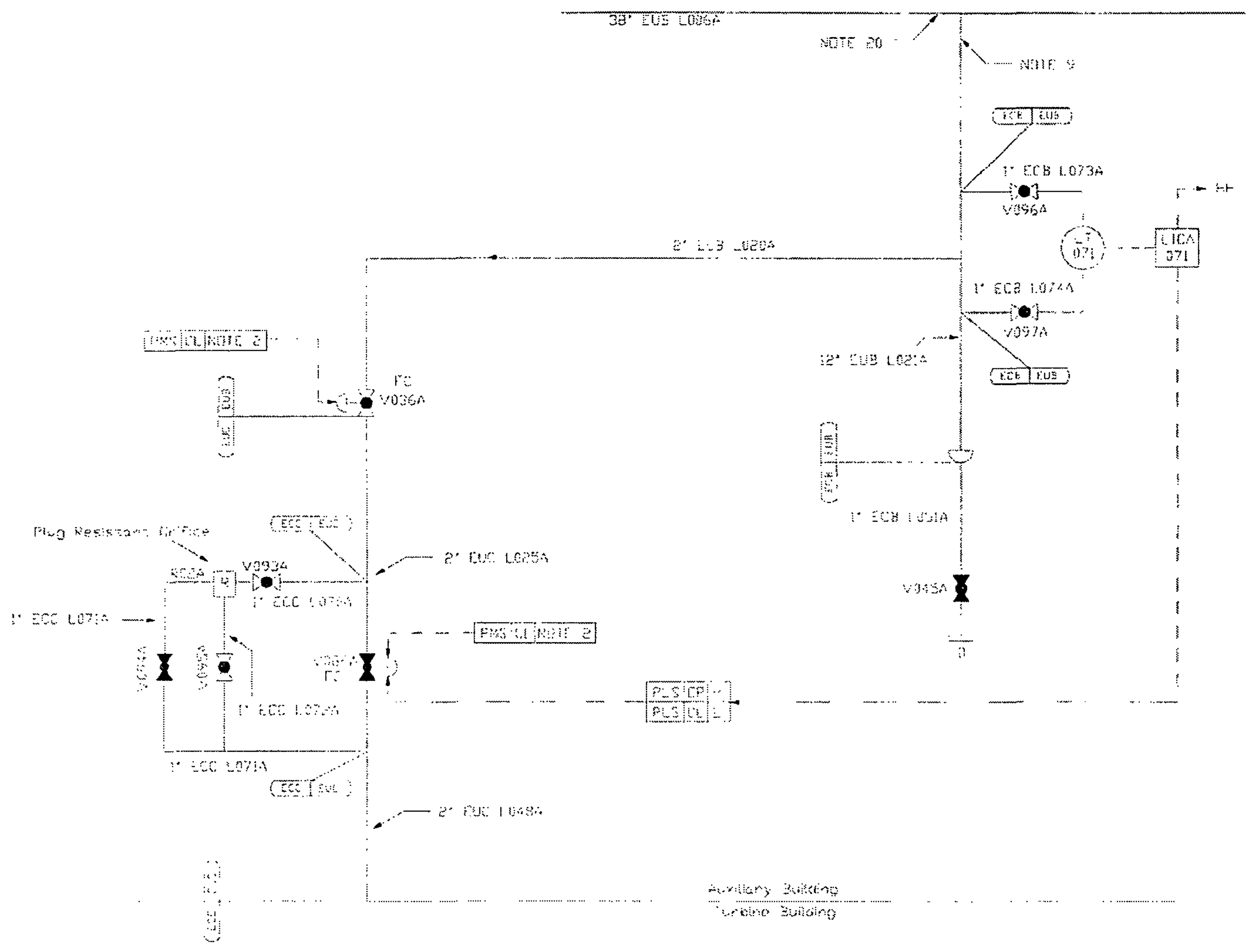


Figure 10.3.2-1 (Condensate Drain)
Main Steam Piping and Instrumentation
Diagram (Safety-Related System)
(REF) SGS 001

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes

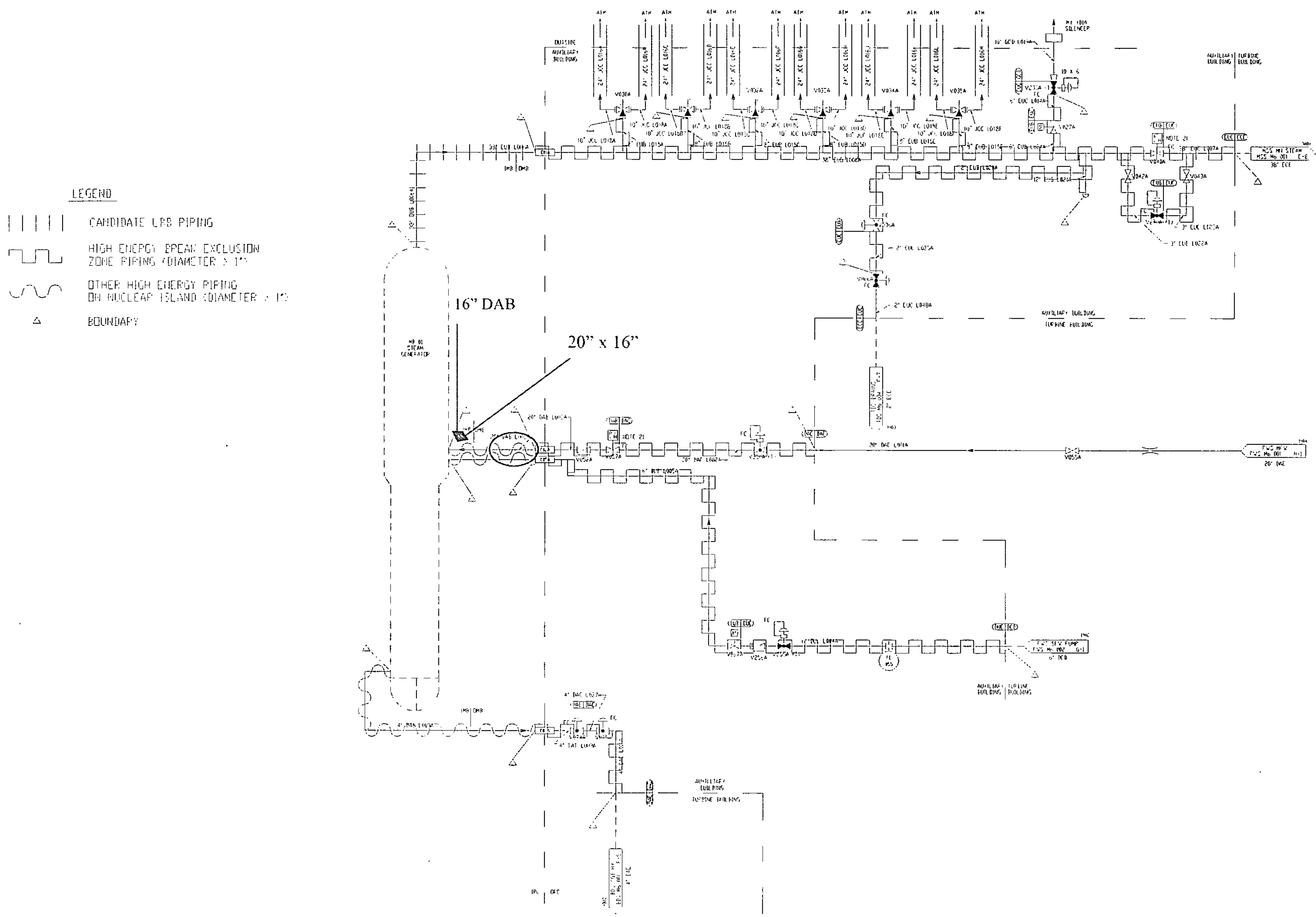


Figure 3E-1

Document Number: APP-GW-GLN-019 **Revision Number:** 1
Title: Fluid System Changes

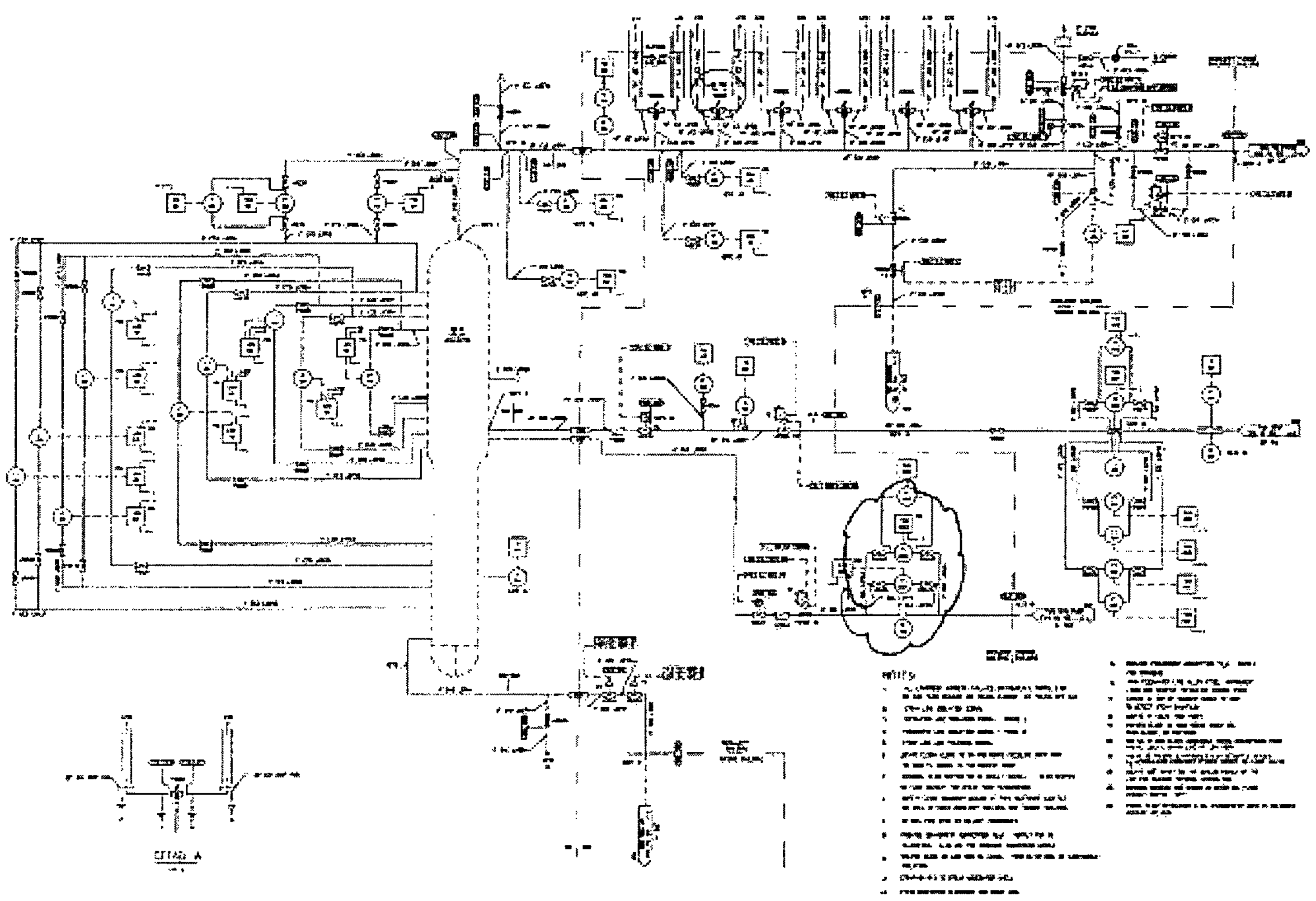


Figure 10.3.2-1 (Sheet 1 of 2)

Main Steam Piping and Instrumentation Diagram (Safety Related System) (REF) SGS 001

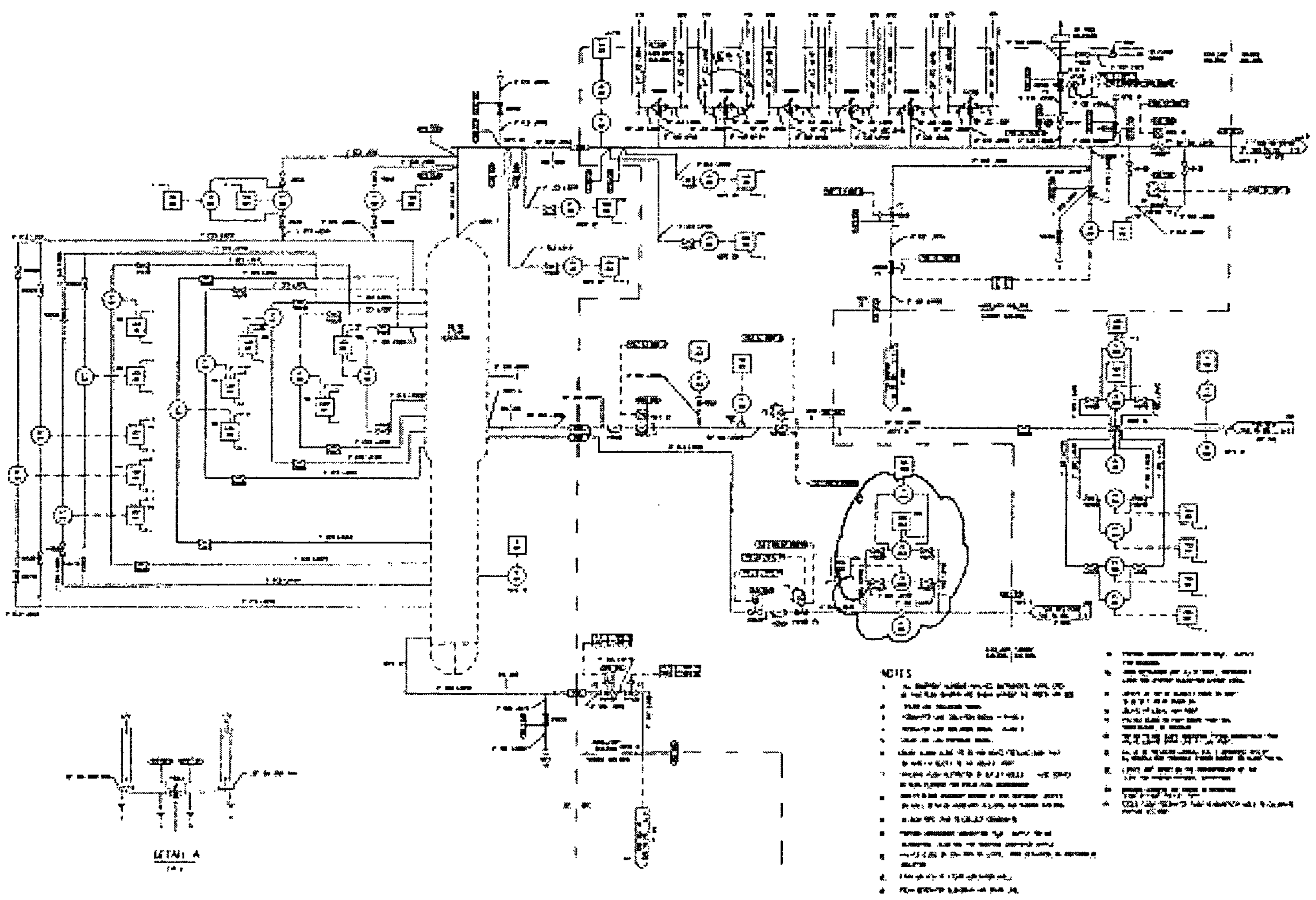
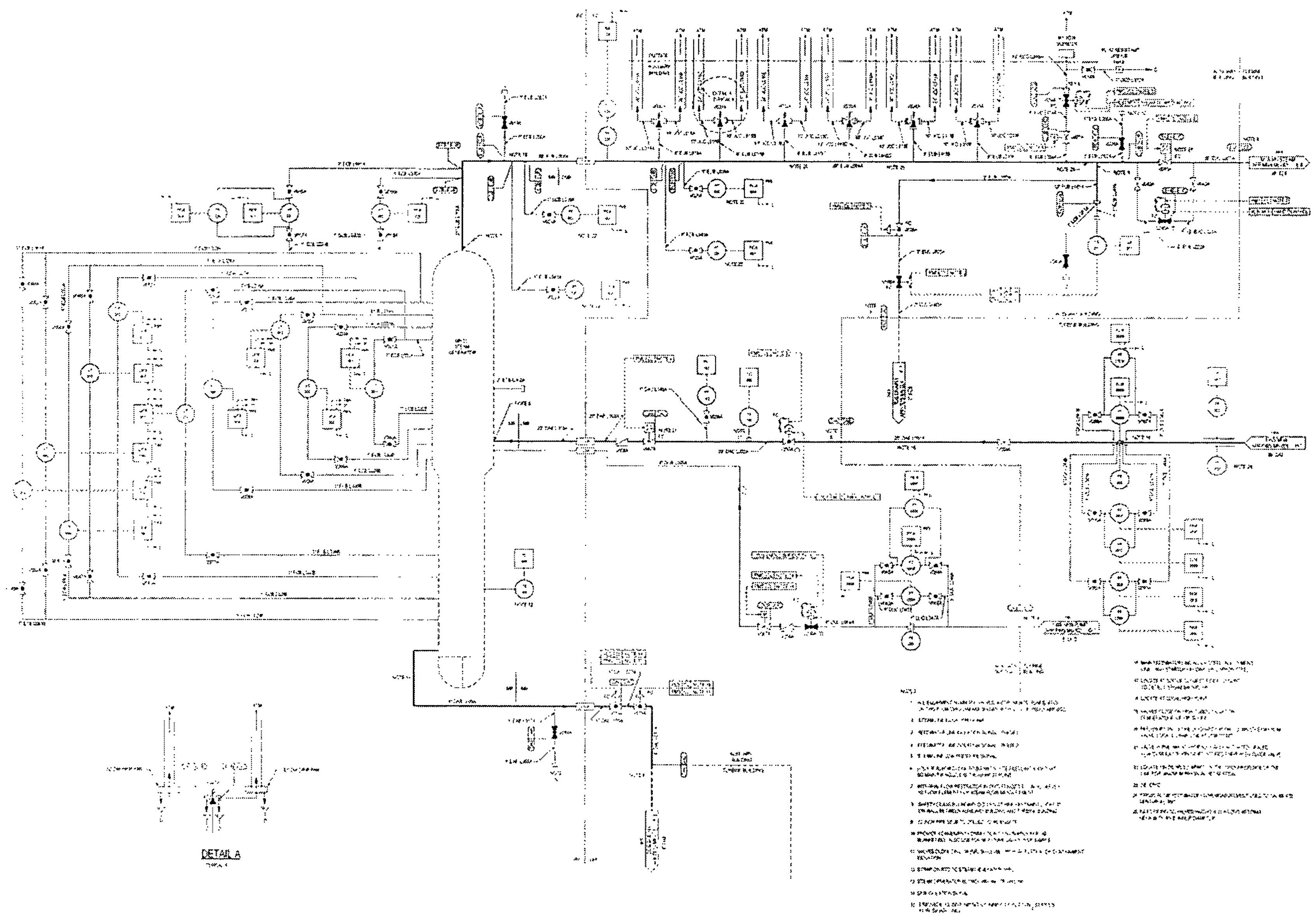


Figure 10.3.2-1 (Sheet 2 of 2)

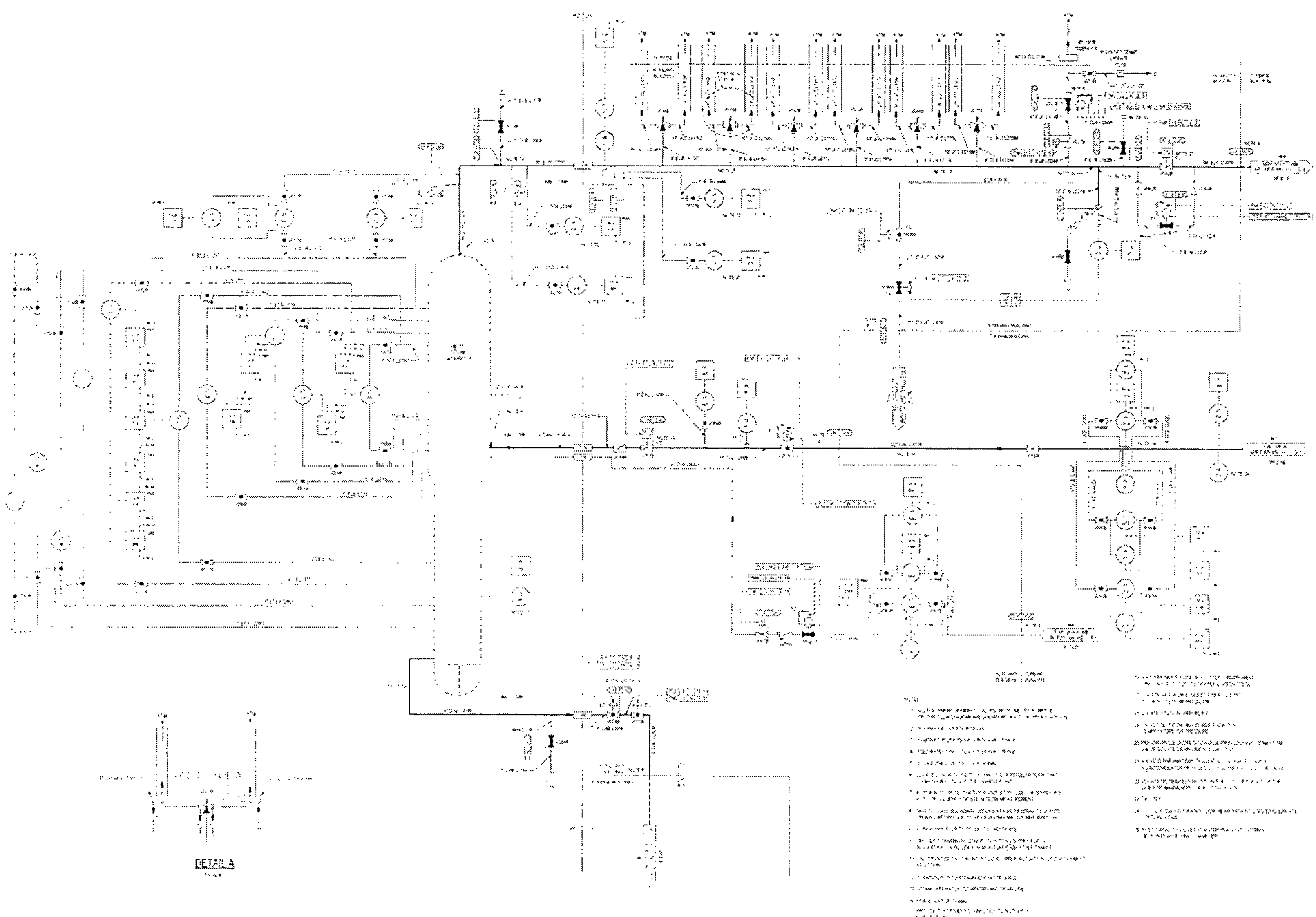
Main Steam Piping and Instrumentation Diagram (Safety Related System) (REF) SGS 002



Revised DCD Figure 10.3.2.1 (Sheet 1 of 2)
Main Steam Piping and Instrumentation
Diagram (Safety-Related System)
(REF) SGS 001

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes



Revised DCD Figure 10.3.2-1 (Sheet 2 of 2)
Main Steam Piping and Instrumentation
Diagram (Safety-Related System)
(REF) SGS 002

Table 10.3.2-2

DESIGN DATA FOR MAIN STEAM SAFETY VALVES

Number per main steam line	6
Total number of valves required per steam line	6
Relieving capacity per valve at 110% of design pressure	~~1,390,000~~ 1,370,000 lb/hr
Relieving capacity per steam line at 110% of design pressure	~~8,340,000~~ 8,240,000 lb/hr
Total relieving capacity, 2 lines at 110% of design pressure	~~16,680,000~~ 16,480,000 lb/hr
Valve size	8 x 2(10)
Design code	ASME Code, Section III, Class 2, seismic Category I

Valve Number	Set Pressure (psig)	Relieving Capacity [a] (lb/hr)
SGS PL V030A(B)	1185	~~1,248,000~~ 1,307,000
SGS PL V031A(B)	~~1191~~ 1196	~~1,254,000~~ 1,319,000
SGS PL V032A(B)	~~1198~~ 1208	~~1,262,000~~ 1,333,000
SGS PL V033A(B)	~~1204~~ 1219	~~1,268,000~~ 1,344,000
SGS PL V034A(B)	~~1211~~ 1231	~~1,275,000~~ 1,357,000
SGS PL V035A(B)	~~1217~~ 1242	~~1,282,000~~ 1,369,000
Total capacity, 2 lines		~~15,178,000~~ 16,058,000

Note:

2 Based on system accumulation pressure of 3%, per Subsection NC-7512 of ASME Code, Section III, Division 1, 1989 Edition, Subsection NC, Class 2 components.

10.4.2.1Main Condenser Evacuation System

Main condenser evacuation is performed by the condenser air removal system (CMS). The system removes noncondensable gases and air from the main condenser during plant startup, cooldown, and normal operation. This action is provided by liquid ring vacuum pumps.

10.4.2.1Design Basis

10.4.2.1.1 Safety Design Basis

The condenser air removal system serves no safety-related function and therefore has no nuclear safety design basis.

10.4.2.1.2 Power Generation Design Basis

- The condenser air removal system removes air and noncondensable gases from the condenser during plant startup, cooldown, and normal operation from the steam side of the three main condenser shells and exhausts them into the atmosphere.
- The system establishes and maintains a vacuum in the condenser during startup and normal operation by the use of liquid ring vacuum pumps.

10.4.2.2System Description

10.4.2.2.1 General Description

Classification of equipment and components is given in Section 3.2.

The air removal system consists of four liquid ring vacuum pumps that remove air and noncondensable gases from the three condenser shells during normal operation and provide condenser hogging during startup. One vacuum pump is provided for each condenser shell, and one pump is provided as a standby. The noncondensable gases, together with a quantity of vapor, are drawn through the air cooler sections of condenser shells to the suction of the vacuum pumps. These noncondensables consist mainly of air, nitrogen, and ammonia. No hydrogen buildup is anticipated in the system (see subsection 10.4.1.3). Dissolved oxygen is present in the condensate and condenser hotwell inventory. Only trace amounts of this oxygen are released in the condenser, and the amounts are negligible compared to the amount of gas and vapor being evacuated by the system. Therefore, the potential for explosive mixtures within the condenser air removal system does not exist.

The [[circulating water system (CWS)]] provides the cooling water for the vacuum pump seal water heat exchangers. The seal water is kept cooler than the saturation temperature in the condenser to maintain satisfactory vacuum pump performance.

The noncondensable gases and vapor mixture discharged to the atmosphere are not normally radioactive. However, it is possible for the mixture to become contaminated in the event of primary-to-secondary system leakage. Air inleakage and noncondensable gases removed from the condenser and discharged by the vacuum pumps are routed to the turbine island vents, drains, and relief system (TDS) and monitored for radioactivity. Upon detection of unacceptable levels of radiation, operating procedures are implemented. A discussion of the radiological aspects of primary-to-secondary leakage, including anticipated release from the system, is included in Chapter 11.

The discharge from the condenser air removal system has a connection for taking local grab samples. Connections also allow the installation of portable, continuous sampling equipment.

Should the condenser air removal system become inoperable, a gradual increase in condenser back pressure would result from the buildup of noncondensable gases. This increase in backpressure would cause a decrease in the turbine cycle efficiency. If the condenser air removal system remains inoperable, condenser backpressure increases to the turbine trip setpoint, and a turbine trip is initiated. Loss of the main condenser vacuum causes a turbine trip but does not close the main steam isolation valves. A loss of condenser vacuum incident is described in subsection 15.2.5.

10.4.2.2.2 Component Description

The liquid ring vacuum pumps are supplied as packaged units. Major components in each package include a vacuum pump, seal water heat exchanger, seal water pump, air/water separator, and exhaust silencer. Seal water is supplied to seal the clearances in the pump and also to condense vapor at the inlet to the pump. Seal water flows through the shell side of the seal water heat exchanger and [[circulating water]] flows through the tube side. Seal water make up is provided by the condensate system (CDS).

Piping and valves are carbon steel. The piping is designed to ANSI B31.1.

10.4.2.2.3 System Operation

During startup operation, air is removed from the condenser by operating three liquid ring vacuum pumps. The fourth pump is on standby.

During normal plant operation, noncondensable gases are removed from the condenser by three vacuum pumps. If one pump trips, the condition is alarmed in the main control room, and the standby pump is started.

10.4.2.3 Safety Evaluation

The condenser air removal system has no safety-related function and therefore requires no nuclear safety evaluation.

10.4.2.4 Tests and Inspections

Testing and inspection of the system is performed prior to plant operation. A performance test is conducted on each pump in accordance with Reference 2. In addition, the pumps are hydrostatically tested.

10.4.2.5 Instrumentation Applications

The effectiveness of the air removal system is indicated by monitoring condenser pressure, using instrumentation described in subsection 10.4.1.5. Vacuum pump status (on/off) is indicated in the main control room, and pump trips are alarmed.

Volumetric flow indication is provided to monitor the quantity of exhausted noncondensable gases.

A radiation detector monitors the discharge of the condenser vacuum pumps through the turbine island vents, drains, and relief system (TDS). The radiation detector is indicated and alarmed. For process and effluent radiological monitoring and sampling systems, refer to Section 11.5.

10.4.5 Circulating Water System

10.4.5.1Design Basis

10.4.5.1.1 Safety Design Basis

The circulating water system (CWS) serves no safety-related function and therefore has no nuclear safety design basis.

10.4.5.1.2 Power Generation Design Basis

The [[circulating water system **and/or make-up water from the raw water system**]] supplies cooling water to remove heat from the main condensers, the turbine building closed cooling water system (TCS) heat exchangers, and the condenser vacuum pump seal water heat exchangers under varying conditions of power plant loading and design weather conditions.

10.4.5.2System Description

10.4.5.2.1 General Description

Classification of components and equipment in the circulating water system is given in Section 3.2. The circulating water system and cooling tower are subject to site specific modification or optimization. The system described here is applicable to a broad range of sites. The Combined License applicant will determine the final system configuration. Table 10.4.5-1 provides circulating water system design data based on a conceptual design.

[[The circulating water system consists of three 33-1/3-percent-capacity circulating water pumps, one hyperbolic natural draft cooling tower, and associated piping, valves, and instrumentation.]]

Makeup water to the CWS is provided by the raw water system (RWS). In addition, water chemistry is controlled by the turbine island chemical feed system (CFS).

10.4.5.2.2 Component Description

Circulating Water Pumps

[[The three circulating water pumps are vertical, wet pit, single-stage, mixed-flow pumps driven by electric motors. The pumps are mounted in an intake structure, which is connected to the

cooling tower by a canal. The three pump discharge lines connect to a]] common header which connects to the two inlet water boxes of the condenser [as well as supplies cooling water to the TCS and condenser vacuum pump seal water heat exchangers]. [[Each pump discharge line has a motor-operated butterfly valve located between the pump discharge and the main header. This permits isolation of one pump for maintenance and allows two-pump operation.]]

[[Cooling Tower]]

[[The cooling tower is site specific with this description provided as a reference design using a hyperbolic natural draft structure. Operation of the cooling tower during conditions that are more restrictive than design conditions may result in higher condenser back pressure.]]

[[The cooling tower has a basin which serves as storage for the circulating water inventory and allows bypassing of the cooling tower during cold weather operations. This basin is connected to the intake of the circulating water pumps by a canal.]]

[[Cooling Tower Makeup and Blowdown]]

The circulating water system makeup is provided by the raw water system. [[Makeup to and blowdown from the circulating water system is controlled by the makeup and blowdown control valves. These valves, along with the turbine island chemical feed system provide chemistry control in the circulating water in order to maintain a noncorrosive, nonscale-forming condition and limit biological growth in circulating water system components.]]

Piping and Valves

[[The underground portions of the circulating water system piping are constructed of concrete pressure piping. The remainder is carbon steel, with an internal coating of a corrosion- resistant compound.]] Motor-operated butterfly valves are provided in each of the circulating water lines at their inlet to and exit from the condenser shell to allow isolation of portions of the condenser. [[Control valves provide regulation of cooling tower blowdown and makeup.]]

The circulating water system is designed to withstand the maximum operating discharge pressure of the circulating water pumps. [[Piping includes the expansion joints, butterfly valves, condenser water boxes, and tube bundles. The piping design pressure is site specific and therefore will be provided by the Combined License applicant (subsection 10.4.12.1).]]

Move these two paragraphs to Section 9.2.8

~~A TCS heat exchanger can be taken out of service by closing the inlet isolation valve. Water chemistry in the isolated heat exchanger train is maintained by a continuous flow of circulating water through a small bypass valve around the inlet isolation valve.~~

~~Backwashable strainers are provided upstream of each TCS heat exchanger. They are actuated by a timer and have a backup starting sequence initiated by a high differential pressure across each individual strainer. The backwash can be manually activated.~~

Circulating Water Chemical Injection

Circulating water chemistry is maintained by the turbine island chemical feed system. Turbine island chemical equipment injects the required chemicals into the circulating water [[downstream of the CWS pumps.]] This maintains a noncorrosive, nonscale-forming condition and limits the biological film formation that reduces the heat transfer rate in the condenser and the heat exchangers supplied by the circulating water system.

The specific chemicals used within the system are determined by the site water conditions and therefore will be provided by the Combined License applicant (subsection 10.4.12). The chemicals can be divided into six categories based upon function: biocide, algaecide, pH adjuster, corrosion inhibitor, scale inhibitor, and a silt dispersant. The pH adjuster, corrosion inhibitor, scale inhibitor, and dispersant are metered into the system continuously or as required to maintain proper concentrations. The biocide application frequency may vary with seasons. [[The algaecide is applied, as necessary, to control algae formation on the cooling tower.]]

Addition of biocide and water treatment chemicals is performed by turbine island chemical feed injection metering pumps and is adjusted as required. [[Chemical concentrations are measured through analysis of grab samples from the CWS.]] Residual chlorine is measured to monitor the effectiveness of the biocide treatment.

[[Chemical injections are interlocked with each circulating water pump to prevent chemical injection when the circulating water pumps are not running.]]

10.4.5.2.3 System Operation

[[The three circulating water pumps take suction from the circulating water intake structure and circulate the water through the TCS, the condenser vacuum pump seal water heat exchangers, and the tube side of the main condenser and back through the piping discharge network to the cooling tower. The natural draft cooling tower cools the circulating water by discharging the water over a network of baffles in the tower. The water then falls through fill material to the basin beneath the tower and, in the process, rejects heat to the atmosphere. Provision is made during cold weather to direct a portion of the circulating water flow into freeze-prevention spray headers on the periphery of the cooling tower. Air flowing through the peripheral spray is thus heated and allows deicing in the central cooling tower spray baffles.]]

[[The flow to the cooling tower can be diverted directly to the basin, bypassing the cooling tower internals. This is accomplished by opening the bypass valve while operating one of the circulating water pumps. The bypass is normally used only during plant startup in cold weather or to maintain circulating water system temperature above 40°F while operating at partial load during periods of cold weather.]]

The raw water system supplies makeup water [[to the cooling tower basin to replace water losses due to evaporation, wind drift, and blowdown. A separate connection is provided between the

RWS and CWS to initially fill the CWS piping. This line connects to the CWS downstream of the CWS pump isolation valves.]]

A condenser tube cleaning system is installed to clean the circulating water side of the main condenser tubes. [[Blowdown from the circulating water system is taken from the discharge of the circulating water system pumps and is discharged to the plant outfall.]]

The circulating water system is used to supply cooling water to the main condenser to condense the steam exhausted from the main turbine. If the [[circulating water pumps, the cooling tower, or the circulating water piping malfunctions such that]] condenser backpressure rises above the maximum allowable value, the main condenser will no longer be able to adequately support unit operation. Cooldown of the reactor may be accomplished by using the power-operated atmospheric steam relief valves or safety valves rather than the turbine bypass system when the condenser is not available.

Passage of condensate from the main condenser into the circulating water system through a condenser tube leak is not possible during power generation operation, since the circulating water system operates at a greater pressure than the condenser.

Turbine building closed cooling water in the TCS heat exchangers is maintained at a higher pressure than the [[circulating water]] to prevent leakage of the [[circulating water]] into the closed cooling water system.

Cooling water to the condenser vacuum pump seal water heat exchangers is supplied from the [[circulating water]] system. Cooling water flow from the [[circulating water]] system is normally maintained through all four heat exchangers to facilitate placing the spare condenser vacuum pump in service. Isolation valves are provided for the condenser vacuum pump seal water heat exchanger cooling water supply lines to facilitate maintenance.

Small circulating water system leaks in the turbine building will drain into the waste water system. Large circulating water system leaks due to pipe failures will be indicated in the control room by a loss of vacuum in the condenser shell. The effects of flooding due to a circulating water system failure, such as the rupture of an expansion joint, will not result in detrimental effects on safety-related equipment since there is no safety-related equipment in the turbine building and the base slab of the turbine building is located at grade elevation. Water from a system rupture will run out of the building through a relief panel in the turbine building west wall before the level could rise high enough to cause damage. Site grading will carry the water away from safety-related buildings.

[[The cooling tower is located so that collapse of the tower has no potential to damage equipment, components, or structures required for safe shutdown of the plant.]]

10.4.5.3Safety Evaluation

The circulating water system has no safety-related function and therefore requires no nuclear safety evaluation.

10.4.5.4Tests and Inspections

Components of the circulating water system are accessible as required for inspection during plant power generation. [[The circulating water pumps are tested in accordance with standards of the Hydraulic Institute.]] Performance, hydrostatic, and leakage tests associated with preinstallation and preoperational testing are performed on the circulating water system. The system performance and structural and leaktight integrity of system components are demonstrated by continuous operation.

10.4.5.5Instrumentation Applications

[[Instrumentation provided indicates the open and closed positions of motor-operated butterfly valves in the circulating water piping. The motor-operated valve at each pump discharge is interlocked with the pump so that the pump trips if the discharge valve fails to reach the full-open position shortly after starting the pump.]]

[[Local grab samples are used to periodically test the circulating water quality to limit harmful effects to the system piping and valves due to improper water chemistry.]]

[[Pressure indication is provided on the circulating water pump discharge lines.]] A differential pressure transmitter is provided between one inlet and outlet branch to the condenser. This differential pressure transmitter is used to determine the frequency of operating the condenser tube cleaning system (CES).

Temperature indication is supplied[[on the common CWS inlet header to the TCS heat exchanger trains]]. This temperature is also representative of the inlet cooling water temperature to the main condenser.

A flow element is provided[[on the common discharge line from the TCS heat exchangers to allow monitoring of the total flow through the TCS heat exchangers]]. Flow measurement for the raw water makeup [[to the cooling tower and for the cooling tower blowdown]] is also provided.

[[Level instrumentation provided in the circulating water pump intake structure activates makeup flow from the RWS to the cooling tower basin when required. Level instrumentation also annunciates a low-water level in the pump structure and a high-water level in the cooling tower basin.]]

The circulating water chemistry is controlled [[by cooling tower blowdown and chemical addition,]] to maintain the circulating water with an acceptable Langelier Index range or an acceptable Stability Index range as provided by the Combined License applicant

(subsection 10.4.12.1). [[The system accomplishes this by regulating the blowdown valve. This regulation causes the tower basin water level to fluctuate. The fluctuation is sensed by a level controller which operates the makeup valve to cooling tower makeup.]]

The control approach is to allow the makeup water to concentrate naturally to its upper limit. Provisions are made to add chemicals for pH control.

The cycles of concentration [[at which the cooling tower is operated]] is dependent on the quality of the cooling tower makeup water. [[Cooling tower blowdown is discharged to the waste water system.]]

Monitoring of the circulating water system is performed through the data display and processing system. Control functions are performed by the plant control system. Appropriate alarms and displays are available in the control room. See Chapter 7.

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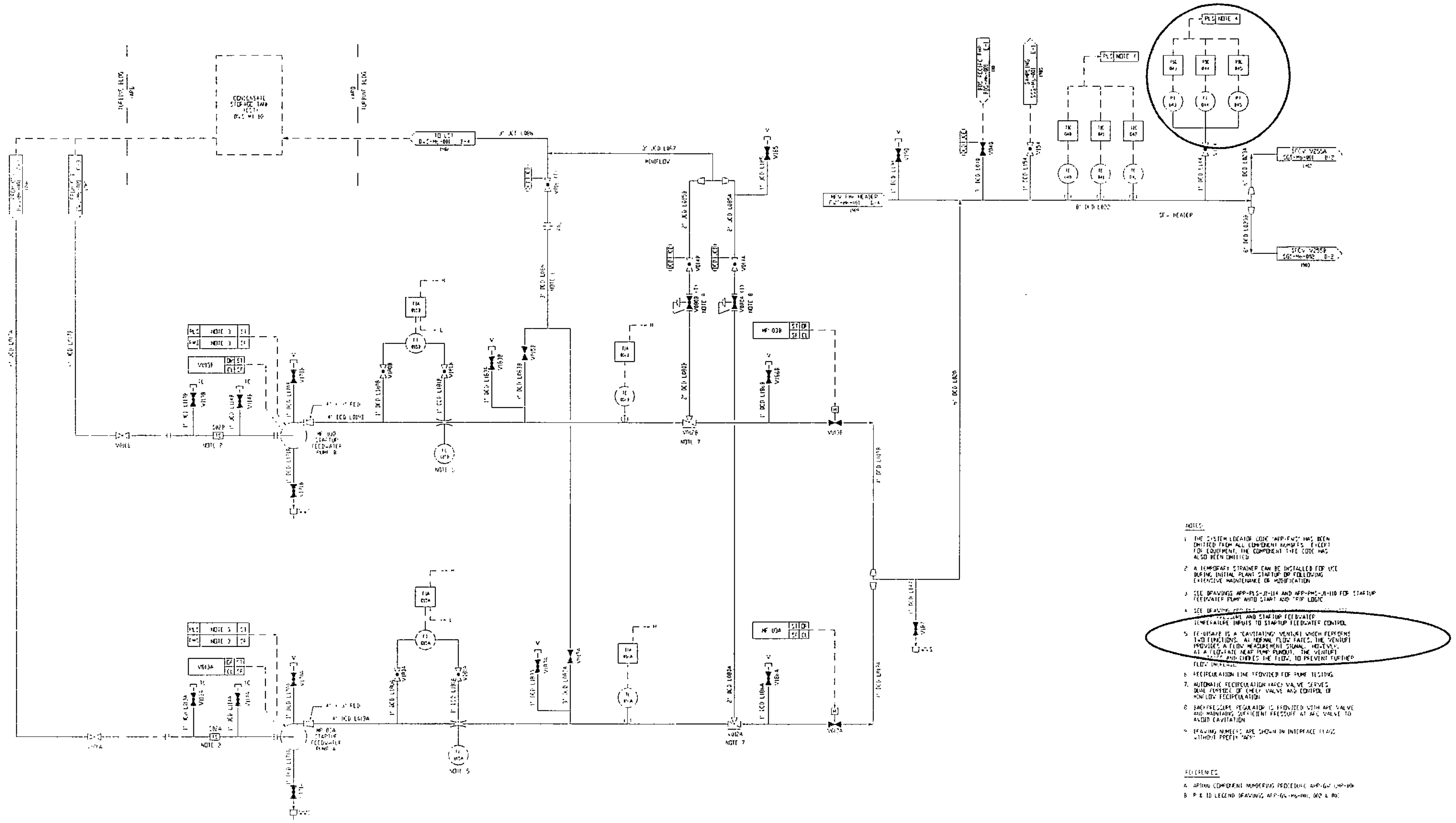
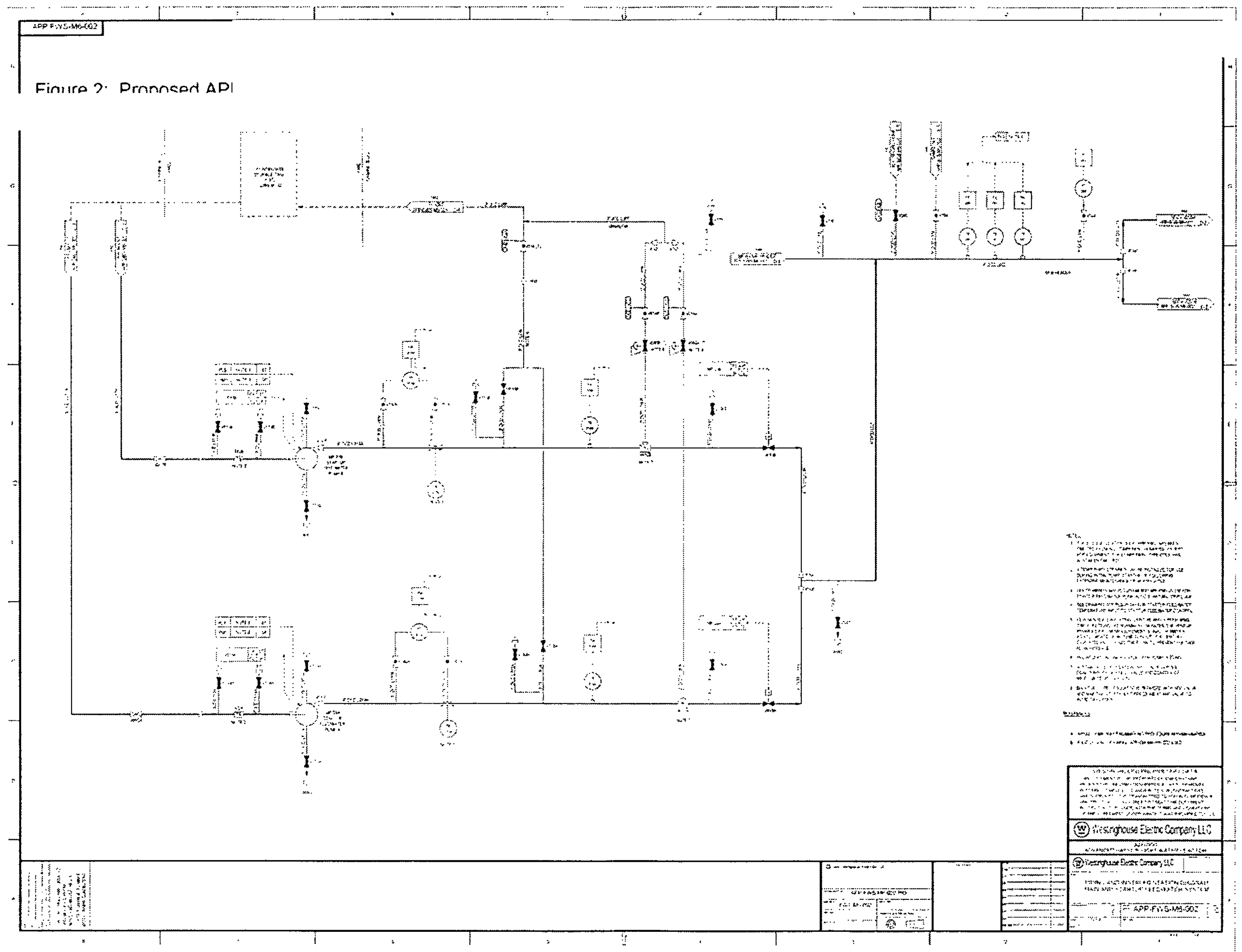


DCD Figure 10.4.7-1 (Sheet 4 of 4)
Startup Feedwater P&ID Changes

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes



Revised DCD Figure 10.4.7-1 (Sheet 4 of 4)
Startup Feedwater P&ID Changes

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Title: Fluid System Changes

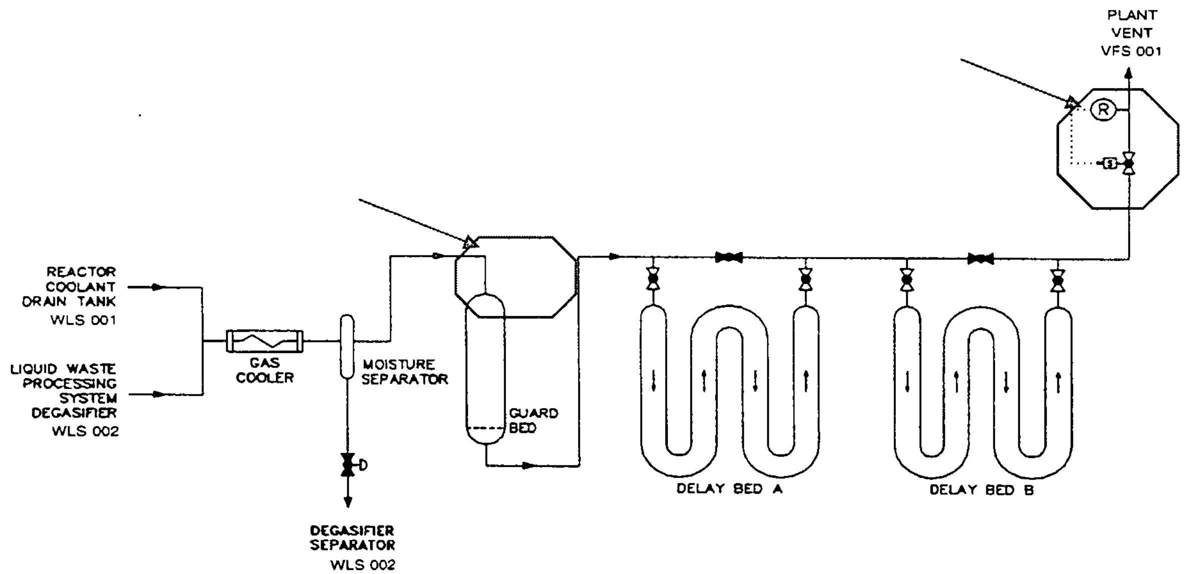
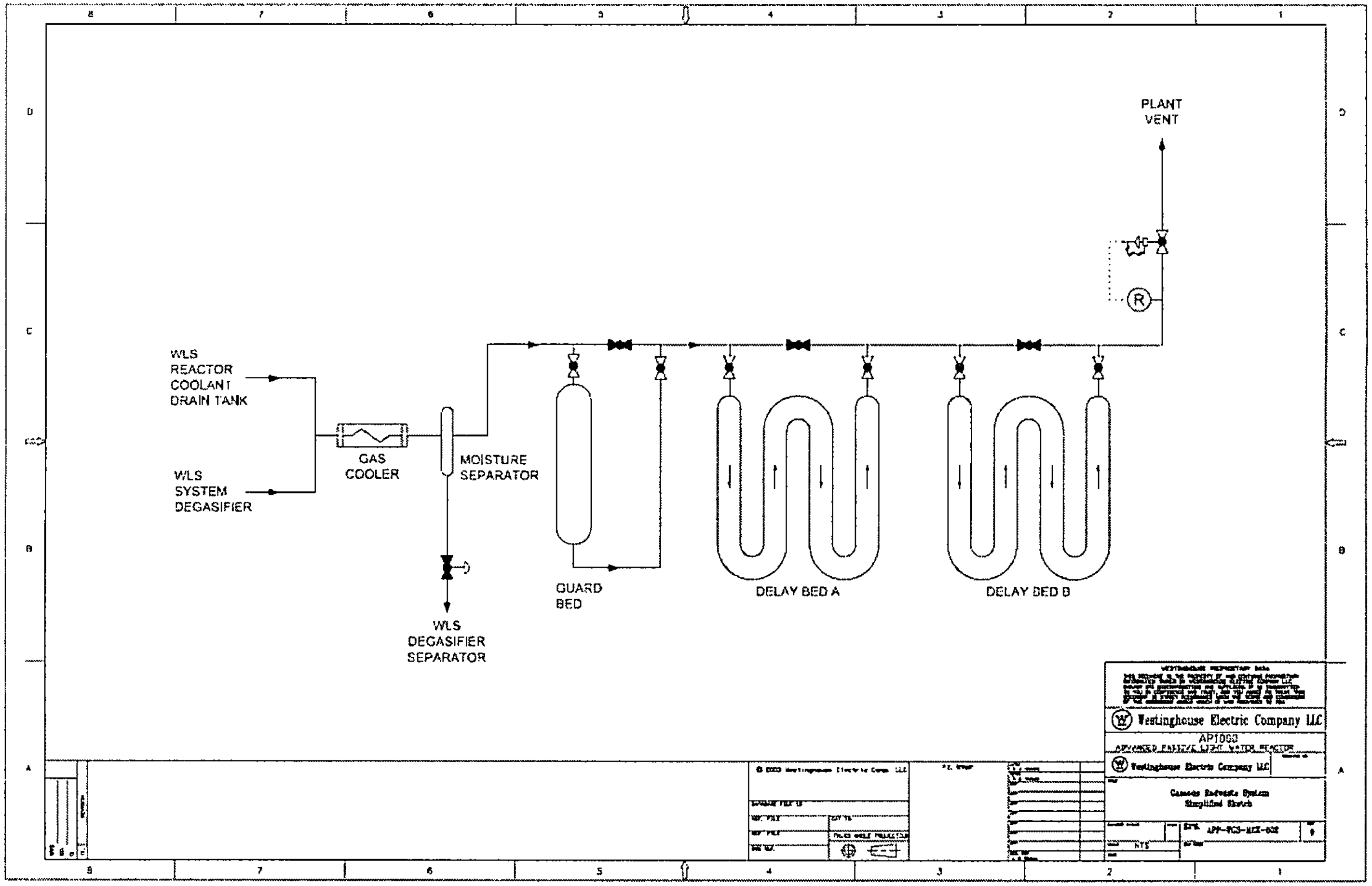


Figure 11.3-1
Gaseous Radwaste System
Piping and Instrumentation Diagram

Document Number: APP-GW-GLN-019 **Revision Number:** 1

Title: Fluid System Changes



Revised Figure 11.3-1

Table 11.4-10 (Sheet 1 of 2)

COMPONENT DATA – SOLID WASTE MANAGEMENT SYSTEM (NOMINAL)

Tanks

Spent resin tank

Number	2
Total volume (ft^3)	300
Type	Vertical, conical bottom, dished top
Design pressure (psig)	15
Design temperature (°F)	150
Material	Stainless steel

Pumps

Resin mixing pump

Number	1
Type	Pneumatic diaphragm
Design pressure (psig)	125
Design temperature (°F)	150
Design flow rate (gpm)	120
Design head (ft)	160
Air supply pressure (psig)	100
Air consumption (scfm)	130
Material	Stainless steel housing, Buna N diaphragms

Resin transfer pump

Number	1
Type	Material Handling Positive Displacement ~~Progressing cavity~~
Design pressure (psig)	125 150
Design temperature (°F)	150
Design flow rate (gpm)	100
Material	Stainless steel housing, ~~internals and rotor,~~ Buna N flexible parts ~~stator liner~~

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Title: Fluid System Changes

IV. REGULATORY IMPACT

A. FSER IMPACT

Provide the impact to the NRC Final Safety Analysis Report (FSER) (NUREG-1712) write-ups. Identify any descriptions or discussions in the FSER that would need to be different due to design changes or evaluation or analysis completion. Address the effect on FSER conclusions.

B. SCREENING QUESTIONS (Check correct response and provide justification for that determination under each response)

1. Does the proposed change involve a change to an SSC that adversely affects a DCD described design function? ☐ YES ☒ NO

2. Does the proposed change involve a change to a procedure that adversely affects how DCD described SSC design functions are performed or controlled? ☐ YES ☒ NO

3. Does the proposed activity involve revising or replacing a DCD described evaluation methodology that is used in establishing the design bases or used in the safety analyses? ☐ YES ☒ NO

4. Does the proposed activity involve a test or experiment not described in the DCD, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the DCD? ☐ YES ☒ NO

C. EVALUATION OF DEPARTURE FROM TIER 2 INFORMATION (Check correct response and provide justification for that determination under each response)

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.b. The questions below address

the criteria of B.5.b.

1. Does the proposed departure result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

2. Does the proposed departure result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety and previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

3. Does the proposed departure Result in more than a minimal increase in the consequences of an accident previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

4. Does the proposed departure result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

5. Does the proposed departure create a possibility for an accident of a different type than any evaluated previously in the plant-specific DCD? ☐ YES ☒ NO

6. Does the proposed departure create a possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously in the plant-specific DCD? ☐ YES ☒ NO

7. Does the proposed departure result in a design basis limit for a fission product barrier as described in the plant-specific DCD being exceeded or altered? ☐ YES ☒ NO

8. Does the proposed departure result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses? ☐ YES ☒ NO

☒ The answers to the evaluation questions above are "NO" and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.b

☐ One or more of the answers to the evaluation questions above are "YES" and the proposed change requires NRC review.

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D. IMPACT ON RESOLUTION OF A SEVERE ACCIDENT ISSUE

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.c. The questions below address the criteria of B.5.c.

1. Does the proposed activity result in an impact to features that mitigate severe accidents. If the answer is Yes answer Questions 2 and 3 below. ☐ YES ☒ NO

2. Is there is a substantial increase in the probability of a severe accident such that a particular severe accident previously reviewed and determined to be not credible could become credible? ☐ YES ☒ NO ☐ N/A

3. Is there is a substantial increase in the consequences to the public of a particular severe accident previously reviewed? ☐ YES ☒ NO ☐ N/A

☒ The answers to the evaluation questions above are "NO" or are not applicable and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.c

☐ One or more of the he answers to the evaluation questions above are "YES" and the proposed change requires NRC review.

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E. SECURITY ASSESSMENT

1. Does the proposed change have an adverse impact on the security assessment of the AP1000? ☐ YES ☒ NO