March 24, 1994

Docket No. 52-002

Mr. C. B. Brinkman, Acting Director
Nuclear Systems Licensing
Combustion Engineering, Inc.
1000 Prospect Hill Road
Windsor, Connecticut 06095-0500

Dear Mr. Brinkman:

SUBJECT: INDEPENDENT QUALITY REVIEW GROUP COMMENTS ON THE ABB-COMBUSTION ENGINEERING (ABB-CE) SYSTEM 80+ CERTIFIED DESIGN MATERIAL (CDM) AND ABB-CE STANDARD SAFETY ANALYSIS REPORT (CESSAR-DC)

An Independent Quality Review Group has reviewed the CDM and the CESSAR-DC, and provided their comments to the staff inspections, tests, analyses, and acceptance criteria (ITAAC) task groups. The ITAAC task groups have reviewed the comments, and those that require action by ABB-CE are contained in the enclosure.

Please incorporate the requested changes into Amendment V of CESSAR-DC and the next revision of the CDM. Please contact either me at (301) 504-1130 or Kris Shembarger at (301) 504-1114 if you have any questions.

Sincerely,
(Original signed by)
Thomas H. Boyce, Project Manager
Standardization Project Directorate
Associate Directorate for Advanced Reactors
and License Renewal
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc w/o enclosure:
See next page

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DATE:	03/24/94	03/23/94	03/23/94

OFFICIAL RECORD COPY: CEIIRG.THB

cc: Mr. C. B. Brinkman, Manager
Washington Nuclear Operations
ABB-Combustion Engineering, Inc.
12300 Twinbrook Parkway, Suite 330
Rockville, Maryland 20852

Mr. Stan Ritterbusch
Nuclear Licensing
ABB-Combustion Engineering
1000 Prospect Hill Road
Post Office Box 500
Windsor, Connecticut 06095-0500

Mr. Sterling Franks
U.S. Department of Energy
NE-42
Washington, D.C. 20585

Mr. Steve Goldberg
Budget Examiner
725 17th Street, N.W.
Washington, D.C. 20503

Mr. Raymond Ng
1776 Eye Street, N.W.
Suite 300
Washington, D.C. 20006

Joseph R. Egan, Esquire
Shaw, Pittman, Potts & Trowbridge
2300 N Street, N.W.
Washington, D.C. 20037-1128

Mr. Regis A. Matzie, Vice President
Nuclear Systems Development
ABB-Combustion Engineering, Inc.
1000 Prospect Hill Road
Post Office Box 500
Windsor, Connecticut 06095-0500

Mr. Victor G. Snell, Director
Safety and Licensing
AECL Technologies
9210 Corporate Boulevard
Suite 410
Rockville, Maryland 20850

CE 80+ ITAAC Independent Review Comments

ITAAC No. GENERAL

No.	Comments	Cat.	Resolution
1	description.		
2	CESSAR Fig. 1.7-1, Table 4 should include Note 18 as one of the references because this note describes safety class 4.	1	Agree - Pass to ABB-CE
3	Cl n ... information would be provided by the COL applicant.		
4	The CDM figures do not show all valves designated as "active" in CESSAR Table 3.9-15. Criteria for selecting active valves for inclusion in figures should be stated and applied consistently on all figures.	1	Agree - pass to ABB-CE
5	CESSAR (Chapter 11) and CDM (2.9.4) use the words "control room" to refer to the MCR or the Radwaste Building control room. Consistent terminology such as "Main Control Room" or "Radwaste Building Control Room" as appropriate should be used.		Agree - pass to ABB-CE

By: S.Malur (504-2963)

Resolved by: LYONS

Enclosure

ITAAC No. GENERAL

No.	Comments	Cat.	Resolution
6	Verification of independence between Class 1E channels is not consistently covered in all system CDMs. For example, CDM 2.6.3 and 2.9.4 explicitly state this requirement in the Design Description and require its verification in an ITAAC. The other CDMs do not.	1	[illegible]

By: S.Malur (504-2963)

Resolved by: Lyons

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.3.1 (Reactor Coolant System)

No.	Comments	Cat.	Resolution
1	General comment: Use "ASME Code, Class 1" or "ASME Code, Section III, Class 1" consistently throughout the CDM instead of "ASME Class 1" when referring to ASME Code, Section III, Class 1 components. Same comments apply to Class 2 or 3 components.	1	SEE OTHER RESPONSE
2	a. The design life of the RV and the reactor coolant pressure boundary should be mentioned in the CDM. b. Has the staff verified the acceptability of the predicted USE value throughout the life of the RV beltline materials?	1	SEE OTHER RESPONSE
3	The requirement that the RCP rotating inertia be such that adequate core cooling is maintained when electrical power to the RCP is disconnected should be stated. Slowing the pump flow coastdown does not necessarily assure adequate core cooling unless certain minimum flowrate (and pressure) is met.	1	Agree - Send to ARB-CE
4	State the criteria for the minimum base metal thickness or the minimum thickness value. The existing sentence (page 2, 1st para) needs revision.	1	SEE OTHER RESPONSE
X			

Resolved by: [illegible]

ITAAC No. 2.3.2 (Shutdown Cooling System)

No.	Comments	Cat.	Resolution
1	CESSAR Figure 6.3.2-1A shows that SIAS or CSAS starts the SCS pumps. However, CDM Fig. 2.3.2-1 shows only the CSAS signal.	1	Agree - Send to ABB-CE
2	The heat removal capability of 1.38×10^6 Btu/hr for the SCS heat exchanger stated in the acceptance criteria for ITAAC 2a. appears very low for the expected delta-T. The method of arriving at this number stated in the acceptance criteria is also incorrect unless the unit is changed to Btu/(hr).(deg F).	1	Agree - Send to ABB-CE
3	General comment on all systems: There is no requirement for testing operability of equipment that are operable from the Remote Shutdown Panel (RSP) similar to testing from the MCR (for example, ITAAC 9b.). An ITAAC similar to 9b. should be included for testing from RSP either in each applicable system or in 2.12.2 Remote Shutdown Room.	1	Agree - Send to ABB-CE

Resolved by: LYONS

2/1

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.4.1 (Safety Depressurization System)

No.	Comments	Cat.	Resolution
1	Design Description and ITAAC # 5c. state that alarms shown on Figure 2.4.1-1 are provided in the MCR. But the figure does not show any alarms.	1	Agree - Pass to ABB-CE
2	The temperature indicators on the PZR safety valve discharge lines should be shown on Fig. 2.4.1-1.	1	Agree Pass to ABB-CE
3	The acceptance criteria in ITAAC 2 is only applicable to the pressurizer vent portion of the RCGVS according to Chapter 6.7.1.2.1 of CESSAR. A different criteria for the RVUH vent portion is given in the CESSAR. This should be reconciled.	1	Agree - Pass to ABB-CE

Resolved by: [illegible]

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.4.4 (Safety Injection System)

No.	Comments	Cat.	Resolution
X			
2	The safety-related portion of the nitrogen cover gas piping and valves and the fill line to the SIT should be shown on Fig.2.4.4-1.	1	Agree - Pass to ABB-CE
3	ITAAC 2 should include verification of the minimum volume in the SIT used as input parameter for CESSAR Chapter 6 analysis. Also, the SIT low level alarm setpoint should be verified to assure that the required min. volume is available in the tank.	1	Agree - Pass to ABB-CE
4	The SI pump differential pressures in ITAAC 2 acceptance criteria could not be found in CESSAR 6.3. The required flows at the DVI nozzle pressures used in the DBA analysis (for example, selected data points from CESSAR Table 6.3.3.3-1 or Table 6.3.2-5) should be specified as acceptance criteria. Specifying pump differential pressures without stating the limits on as-built system hydraulic resistance is incomplete.	1	Agree - Pass to ABB-CE
5	Active valves such as, SIT fill and drain valves, mini-flow line check valves, and SIT fill line containment isolation valves are not shown on Fig. 2.4.4-1	1	Agree - Pass to ABB-CE

Resolved by: [illegible]

CE 80+ ITAAC Independent Review Comments

ITAAC No. 1.3 Figure Legend

No.	Comments	Cat.	Resolution
1	Symbol is listed as a diaphragm operator. However, symbol is used throughout the CDM to generically show all types of pneumatic operators, including pneumatic diaphragm operators. Suggest deleting the diaphragm symbol from CDM section 1.3.	1	Agree [illegible]

By: Sam Malur 504-2963

Resolved by: Lyons

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.1.3 CCW Heat Exchanger Structures

No.	Comments	Cat.	Resolution
1	The Design Criteria (CESSAR Appendix 3.8B, Section 7.2.4, Page 3.8B-36) indicates that the North-South (long direction) walls are 4 foot walls while the Drawing (Fig. 1.2 - 25) shows that their thicknesses are 2 ft..	1	Agree. ABB-CE needs to clarify what is the thickness of the N-S walls of the CCW building.

S1A

By: Hai-Boh Wang 504-2958

Resolved by: S. Ali

7.2.3 LOADS AND LOAD COMBINATIONS

The Component Cooling Water Heat Exchanger Structure is evaluated for the loads and load combinations specified in Sections 3.8A.5.1 and 3.8A.5.2, respectively, for Seismic Category I concrete structures.

The major loadings affecting the design of the structure are dead loads (i.e., self weight and equipment weight from the CCW heat exchangers), temperature, static and dynamic lateral soil and ground water pressures, wind loads, earthquake loads, and tornado loads.

The critical load combinations are equations 5.2.2.1(a), 5.2.2.1(d), and 5.2.2.2(a) of Section 3.8A.5.2, i.e.,

$$U = 1.4D + 1.7L$$

$$U = 0.75\,(1.4D + 1.7F + 1.7L + 1.7H + 1.7T_o + 1.7R_o)$$

$$U = D + F + L + H + T_o + R_o + E'$$

7.2.4 ANALYSES AND RESULTS

The reinforced concrete members of Seismic Category I structures are designed to the criteria specified in ACI 349 and NRC Regulatory Guide 1.142, except as modified by Appendix 3.8A (see 3.8A.6.2). In general, symmetrical reinforcing steel (i.e., the same area and configuration on opposite faces of members), is provided except in local areas. Concrete joints shall be detailed in accordance with the criteria specified in ACI 318, Chapter 21 (see Section 3.8A.6.2.1.1.1 and Section 6.0 of this appendix).

Foundation Mat:

The primary reinforcing for the four-foot thick foundation mat consists of a rectangular grid of #9 at 10 inches each way/each face, [i.e., 1.20 in^2/ft].

No transverse shear reinforcing is required.

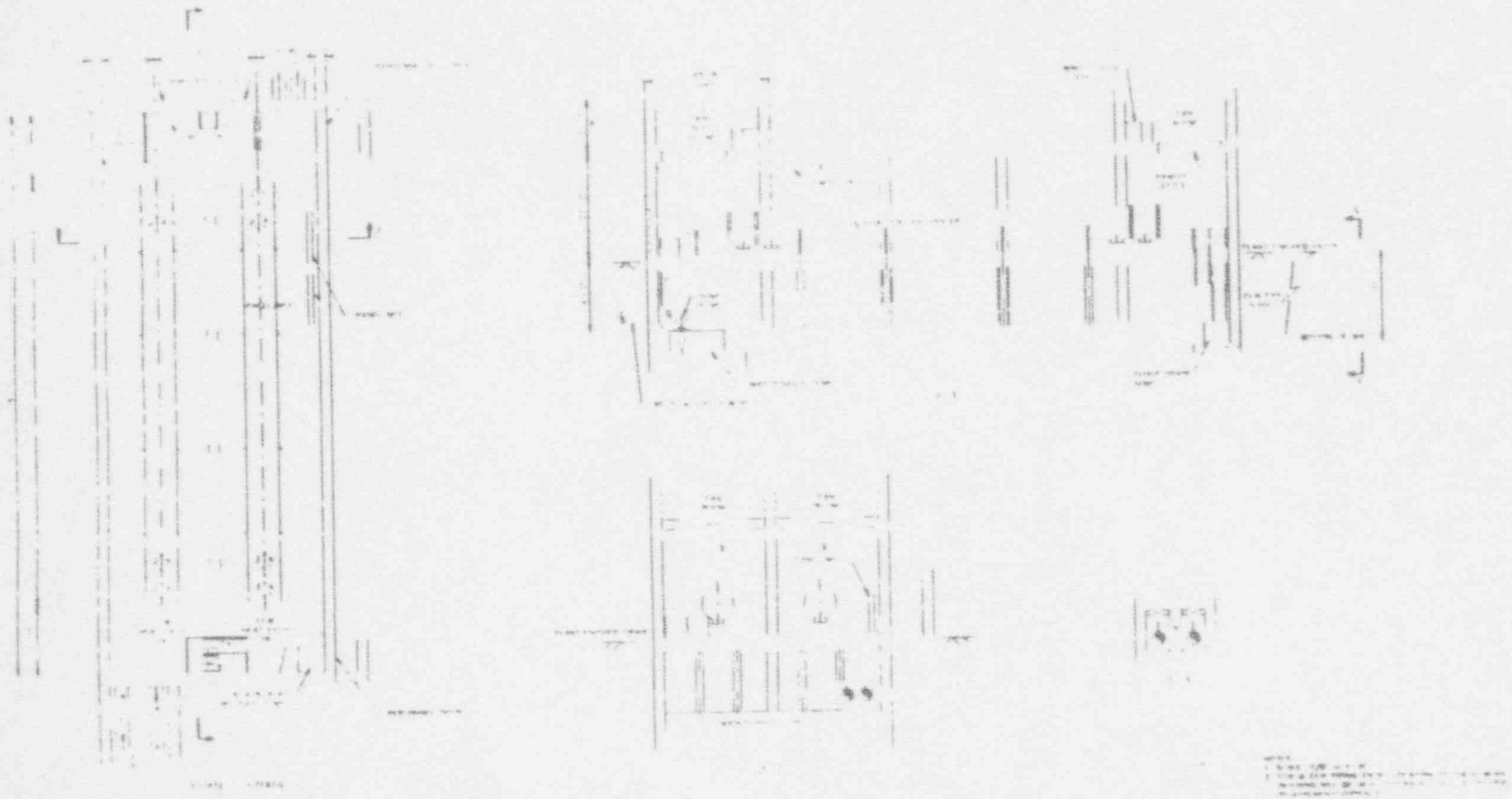
East and West Walls:

The primary reinforcing for these two-foot thick walls consists of a rectangular grid of #11 at 6 inches each way/each face, [i.e., 3.12 in^2/ft].

No transverse shear reinforcing is required.

North and South Walls:

The primary reinforcing for these four-foot thick walls consists of a rectangular grid of #11 at 6 inches vertically each face and #11 at 10 inches horizontally, [i.e., 3.12 in^2/ft and 1.87 in^2/ft, respectively].



Amendment T
November 15, 1993

SYSTEM 80+™

GENERAL ARRANGEMENT
CCW HEAT EXCHANGER STRUCTURE

Figure 1.2-25

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.1.6 Reactor Vessel Internals (RVI)

Hou

No.	Comments	Cat.	Resolution
1	See attached pages for comments.	1	Agree.

By: George Y. Cha
02/11/1994

Resolved by: Shou-Nien Hou

2.1.6 REACTOR VESSEL INTERNALS

Design Description

The Reactor Vessel Internals consist of a Core Support Barrel (CSB) Assembly and an Upper Guide Structure (UGS) Assembly.

The Basic Configurations of the CSB and the UGS are as shown on Figures 2.1.6-1 and 2.1.6-2, respectively. The Reactor Vessel Internals are safety-related.

Dimensions of the core support barrel and the upper guide structure assembly are listed in Table 2.1.6-1.

The ~~Core Support Barrel (CSB)~~ assembly is suspended from the reactor vessel flange. The CSB assembly provides support and location positioning for the fuel assembly lower end fittings. The CSB assembly contains structural elements that provide an instrumentation guide path from the lower vessel, and hydraulic flow paths through the vessel from the inlet nozzles to the upper end of the fuel assemblies.

The core barrel assembly contains a grid structure which supports the core and provides flow distribution from the lower plenum region to the bottom of the fuel assemblies. The core shroud is part of the CSB assembly and provides an envelope to direct the primary coolant flow through the core. Instrument nozzles in the grid structure provide a guide path for in-core instruments from the reactor vessel lower head to the fuel assemblies.

The ~~Upper Guide Structure (UGS)~~ assembly is supported by the CSB upper flange and extends into the CSB assembly to engage the top of the fuel assemblies. The UGS assembly provides an insertion path for the control element assemblies (CEA). The UGS assembly contains structural elements which provide both a guide path and lateral support for the upper portion of the control element assemblies and extension shafts in the reactor vessel upper plenum region. The UGS assembly also provides guide paths for heated junction thermocouple (HJTC) assemblies.

The CSB and UGS assemblies are designed and constructed in accordance with ASME Code Section III Subsection NG requirements and are classified Seismic Category I. The reactor vessel internals maintain their integrity during normal operation, transients, and during SSE and design basis accident conditions not eliminated by leak-before-break evaluations. The material of construction for the CSB and UGS components is austenitic stainless steel with the exception of the Holdown Ring, which is made of martensitic stainless steel. Cobalt base material, if used, is used only for hardsurfacing of wear parts.

The Reactor Vessel Internals withstand the effects of flow induced vibration caused by the operation of the reactor coolant pumps.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.1.6-1 specifies the inspections, tests, analyses and associated acceptance criteria for the Reactor Vessel Internals.

2.1.6-2

TABLE 2.1.6-2

REACTOR VESSEL INTERNALS
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Reactor Vessel Internals is as shown on Figures 2.1.6-1 and 2.1.6-2.	1. Inspection of the as-built Reactor Vessel Internals will be conducted.	1. For the components and equipment shown on Figures 2.1.6-1 and 2.1.6-2, the as-built Reactor Vessel Internals conform with the Basic Configuration.
2. The Core Support Barrel and Upper Guide Structure are designed and constructed in accordance with ASME Code Section III Subsection NG requirements and are qualified Seismic Category I.	2. Inspection will be performed of the ASME Code Section III required Owner's Review of the ASME Design Report Document.	2. The completed ASME Code Section III required Owner's Review of the ASME Design Report Document exists.
3. The Reactor Vessel Internals withstand the effects of flow induced vibration caused by operation of the reactor coolant pumps.	3.a) Testing will be performed to subject the Reactor Vessel Internals to flow induced vibration. Pre- and post-test visual inspection will be performed on the Reactor Vessel Internals.	3.a) Testing and inspection results demonstrate that the Reactor Vessel Internals retain their integrity.
	3.b) A vibration type test will be conducted on the prototype reactor vessel internals.	3.b) A vibration type test report exists and concludes that the prototype reactor vessel internals retain their integrity and have no loose parts as a result of the test.

USE LOWER CASE "D" OR DELETE "DOCUMENT".

PAGE 4 OF 4

ITAAC No. 2.1.7 In-core Instrument (ICI) Guide Tube

No.	Comments	Cat.	Resolution
1	CDM Table 2.1.7-1 should be supplemented with appropriate ITAAC (similar to 2.3.1-1, item 10b for Class 1) verifications to confirm ASME Section III Class 1 items shown on figure 2.1.7-1 are designed and constructed properly.	1	Agree. ITAAC should specify that inspection for the existence of ASME design reports will be performed.
2	See attached mark-up pages.	3	Agree.

Hou

Hou

By: George Cha

Resolved by: S. Hou

[redacted]

TABLE 2.1.7-1

IN-CORE INSTRUMENT GUIDE TUBE SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration for the ICI Guide Tube System is as shown on Figure 2.1.7-1.	1. Inspection of the as-built ICI Guide Tube System configuration will be conducted.	1. For the components and equipment shown on Figure 2.1.7-1, the as-built ICI Guide Tube System conforms with the Basic Configuration.
2. The ICI guide tubes and seal housings retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those portions of the ICI Guide Tube System required to be pressure tested by the ASME Code Section III.	2. The results of the pressure test of ASME Code Section III components of the ICI guide tubes and seal housings conform with the pressure testing acceptance criteria in ASME Code Section III. ~~Subsection NB.~~

delete for consistency w/ ITAAC 2.3.1-1

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.3.3 RCS Component Supports

SNH

No.	Comments	Cat.	Resolution
1	CDM figure 2.3.3-1 provides no details on the base plate slots as described in the design description. Revise ITAAC item 3 to verify the basic configuration conforms with the "design description" which includes both text and figures.	1	Agree. Figure 2.3.3-1 should add configuration of the base plate. However, revision of ITAAC item 3 is not needed because the change assures conformance with the "design description".

S Hou 3/23/94

By: Hai-Boh Wang 504-2958

Resolved by: S. Hou

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.4.2 Annulus Ventilation system

No.	Comments	Cat.	Resolution
1	In CESSAR section 6.2.3.3, page 6.2-42, paragraph 4. absorber should be adsorber.	3	Agree
2	The grille on the CESSAR Figure 6.2.3-1 is not connected to the system duct.	3	Agree
3	From Acceptance Criteria 3, a 110 sec time requirement is identified. What is the basis and w^h^ere is it discussed in the CESSAR.	1	AGREE CESSAR Section 14.2.12.1.109 has 110 sec for - 0.5 in. water gauge, which is not consistent with this ITAAC. The applicant should revise CESSAR to make it consistent.
4	Ar fc i: .		

By: Phillip Ray

Resolved by: Cy Li

The system has no containment penetrations.

The system is 100% redundant, although ducting inside the annulus is shared.

The system has complete electrical separation between the two redundant trains. Each train is powered by its respective Class 1E Emergency Diesel Generator.

The Annulus Ventilation System is an engineered safety feature and is credited in analyzing the consequences of design basis accidents. No credit has been taken for the carbon absorbers in analyzing the consequences of a design basis accidents.

6.2.3.4 Inspection and Testing Requirements

Test and inspections will be performed to assure and demonstrate the capability of components and the system to perform the assigned function in accordance with design criteria. Bypass leak paths will be tested by local leak rate tests as defined in Appendix J of 10 CFR 50.

6.2.3.4.1 Manufacturer Testing

The manufacturer will be required to verify by appropriate tests the following:

A. High Efficiency Filters:

Testing in compliance with Regulatory Guide 1.52. HEPA filters will be tested for efficiency, initially at the factory and at the USNRC Quality Assurance Station in accordance with MIL-STD-282.

B. Fan:

Certified head and flow characteristics.

6.2.3.4.2 System Testing and Inspection

Operational testing will be performed prior to initial startup to demonstrate proper functioning of the system. Testing will include the following:

A. Leak tightness of components and system to be in accordance with ASME N510.

B. System functional test (flow, vacuum pressure)

C. HEPA filter efficiency test.

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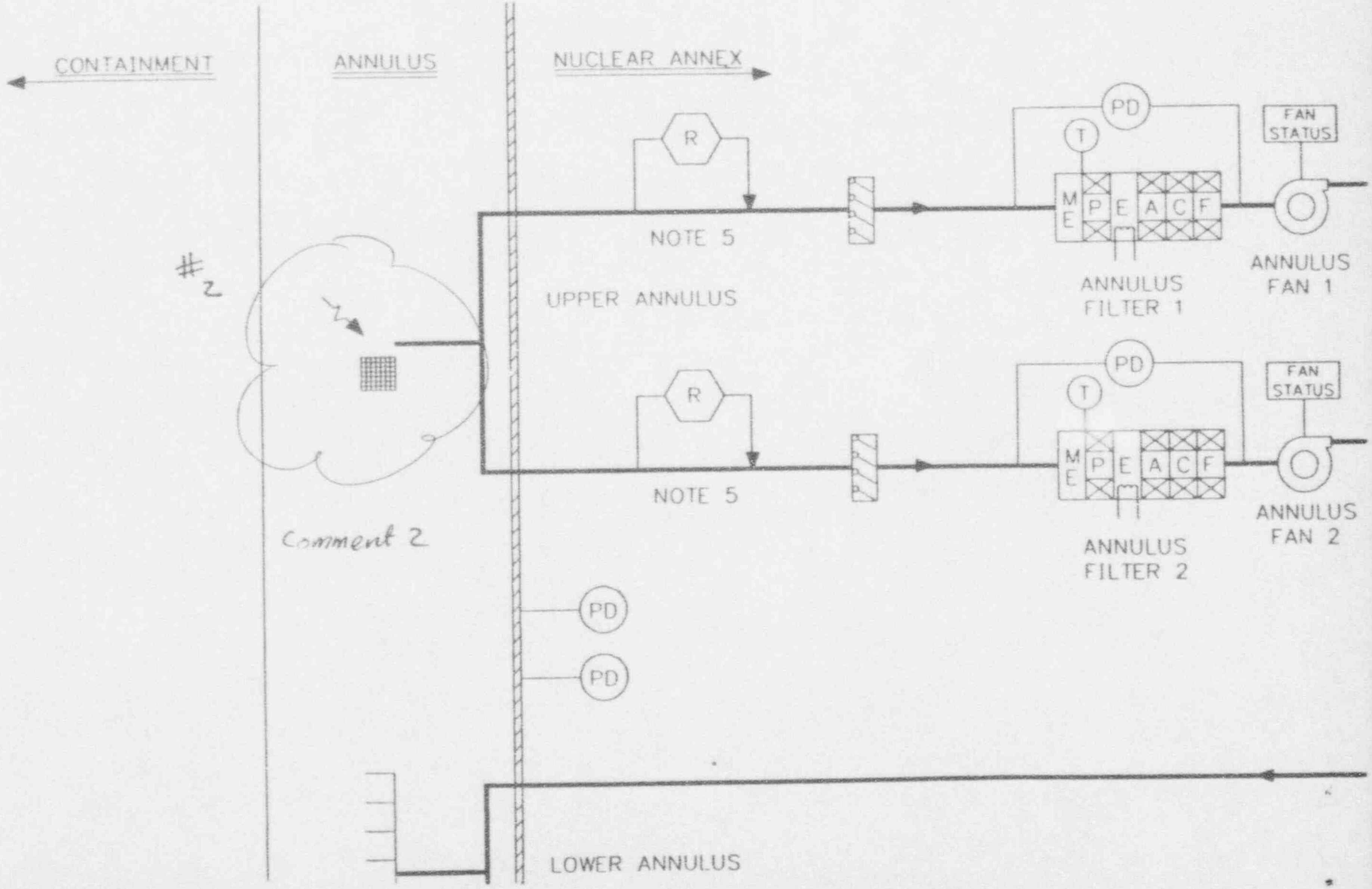

TABLE 2.4.2-1

ANNULUS VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the AVS is as shown on Figure 2.4.2-1.	1. Inspection of the as-built AVS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.2-1, the as-built AVS conforms with the Basic Configuration.
2. Each AVS filtration unit removes particulate matter.	2. Testing and analysis will be performed on each AVS filtration unit to determine filter efficiency.	2. The AVS filter efficiency is greater than or equal to ≥99% for particulate matter greater than 0.3 microns.
3. Each Division has dampers to modulate exhaust air to maintain negative pressure within the annulus relative to atmosphere when the AVS is in operation.	3. Testing will be performed on each Division to measure annulus pressure during AVS operation.	3. The AVS achieves a negative pressure in the annulus greater than or equal to 0.25 inches water gauge relative to atmosphere within 110 seconds. #3
4.a) Safety-related AVS components are powered from their respective Class 1E Division.	4.a) Testing will be performed on the AVS system by providing a test signal in only one Class 1E Division at a time.	4.a) Within the AVS, a test signal exists only at the equipment powered from the Class 1E Division under test.
4.b) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the AVS.	4.b) Inspection of the as-installed Class 1E Divisions in the AVS will be performed.	4.b) Physical separation exists between Class 1E Divisions in the AVS. Separation exists between Class 1E Divisions and non-Class 1E equipment in the AVS.
5. Active components of the two Divisions of the AVS are physically separated.	5. Inspection of the as-built mechanical Divisions will be performed.	5. The active components of the two mechanical Divisions of the AVS are separated by a Divisional wall or a fire barrier.

E. Essential equipment, fans, dampers and ductwork will be manufactured in accordance with the ASME/ANSI AG-1-1988 Standards.

F. Ductwork conforms to HVAC Duct Construction Standards - Metal and Flexible (SMACNA), 1985.

G. High efficiency particulate air (HEPA) filters conform to ERDA-76-21 "Nuclear Air Cleaning Handbook."

H. Carbon filter media, Nuclear Grade as defined by The Institute for Environmental Sciences.

I. RG 1.52, Design, Testing and Maintenance for Post Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants.

J. RG 1.140, Design, Maintenance and Testing Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants.

6.2.3.2 System Description

Two redundant ventilation systems are provided as shown in Figure 6.2.3-1. Each system consists of a fan, a filter train, associated ductwork, dampers, and controls as necessary to accomplish the design function. Each filter train consists of a moisture eliminator, electrical heater, prefilter, an absolute filter, a carbon filter, and a post filter.

The two annulus ventilation systems share one duct in the upper portion of the annulus and one duct in the lower portion of the annulus. Therefore, there is one common duct in the upper annulus and one common duct in the lower annulus for both systems. The evaluations of the upper and lower distribution ducts will be given at a later date.

These distribution ducts contain grilles for annulus air intake and exhaust. The grilles of the upper distribution ducts draw air in from the annulus. This air passes through the moisture eliminator and the filter train before reaching the suction of the ventilation fan. The fan directs air either to the unit vent or both the unit vent and the lower annulus distribution duct. The grilles of the lower distribution ring expel air into the annulus.

The system is required to achieve a negative pressure in the annulus greater than or equal to 0.25 inches of water gauge. The system will discharge sufficient air from the annulus to the unit vent to create a negative pressure of approximately -0.5 in. water gauge with respect to the outside atmosphere after a LOCA. The annulus ventilation distribution ducts permit the mixing of in-leakage in as large a volume as possible.

14.2.12.1.109 Annulus Ventilation System Test

1.0 OBJECTIVE

1.1 To demonstrate the capability of the Annulus Ventilation System to produce and maintain a negative pressure in the annulus following a LOCA and to minimize the release of radioisotopes following a LOCA by recirculating a large volume of filtered annulus air relative to the volume discharged for negative pressure maintenance.

2.0 PREREQUISITES

2.1 Construction activities on the containment wall and shield wall are complete with all penetrations sealed in place.

2.2 Construction activities on the Annulus Ventilation System have been completed.

2.3 Annulus Ventilation System instrumentation has been calibrated.

2.4 Support systems required for operation of the Annulus Ventilation System are complete and operational.

2.5 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify all control logic, including response to ESFAS.

3.2 Verify the proper operation, failure mode, stroking speed, and position indication of control valves and dampers.

3.3 Demonstrate that the Annulus Ventilation System will achieve a negative pressure in the Annulus, of -0.5 in. water guage within 110 seconds of actuation.

Resolution #3

3.4 Verify the proper operation of all protective devices, controls, interlocks, instrumentation, and alarms.

3.5 Verify design air flow for normal and emergency operation.

3.6 Perform filter and carbon adsorber efficiency test.

CE80+ ITAAC Independent Review Comments

ITAAC No. 2.4.3 Combustible Gas Control In Containment

No.	Comments	Cat.	Resolution
1.	ITAAC item #5 requires connection of the hydrogen recombiner units to the Containment Hydrogen Recombiner System; however, the CDM does not contain this. Section 6.2.5.2.1 of the CESSAR DC gives a description of the connection. This needs to be added to the design description.	2	Agree
2.	ITAAC item #7 states that, "forty hydrogen igniters to be powered by one Division of Class IE power sources...." CESSAR DC sections 6.2.5.1.2 (b) and 6.2.5.2.2.3 requires thirty four hydrogen igniters per Division of power. Amendment U, Dec. 31, 1993 updated the change; however, the ITAAC was not	1	AGREE. CLARIFY SSAR + CDM AS SHOWN

By: Serita Sanders 504-2956

Resolved by: [illegible signature]

TABLE 2.4.3-1(Continued)

COMBUSTIBLE GAS CONTROL SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Hydrogen recombiner units can be connected to the CHRS.	5. Testing to connect hydrogen recombiner units will be performed.	5. Hydrogen recombiner units can be connected.
6. At least 80 hydrogen igniters are provided.	6. Inspection for the number and location of igniters will be performed.	6. At least 80 hydrogen igniters are provided. The igniters are generally located as shown in Figures 2.4.3-2 through 2.4.3-6.
7. Forty hydrogen igniters are powered by one Division of Class 1E power sources, of which at least 17 can be powered by the Class 1E batteries. Forty hydrogen igniters are powered by the other Division of Class 1E power sources, of which at least 17 can be powered by the Class 1E batteries.	7. Testing will be performed to determine number of igniters that can be energized from each Division of Class 1E power sources, including the number that can be energized from each Division of Class 1E batteries.	7. At least 40 hydrogen igniters are powered from each Division of Class 1E power sources. At least 17 igniters (of each Division) can be powered from ~~each Division of~~ Class 1E batteries.

ITAAC No. 2.4.5 Containment Isolation System (CIS)

No.	Comments	Cat.	Resolution
1			
2			
3			Figure 10.4.9-1.1, which is adequate.
4	Table 2.4.5-2 Items 13, 14, 15, 16 listed the check valves with "Note 4" which signifies a code class break. P&ID Figure 6.3.2-1C does not show such code class break. Suggest to delete Note 4.	1	Agree. ITAAC should be consistent with CESSAR. However, don't delete Note 4. Delete only the portion that is not consistent.
5	Table 2.4.5-2 Items 17 & 18 are Arrangement 11 which showed the inside containment isolation valves as ASME Section III Code Class 2, whereas CESSAR Fig 6.3.2-1C showed the same valves as Code Class 1 valves. Please resolve discrepancy.	1	Agree

By: George Y. Cha
02/07/1994

Resolved by: [signature]

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.4.5 Containment Isolation System (CIS)

No.	Comments	Cat.	Resolution
6	Table 2.4.5-2 Items 19 & 20 corresponding to Figure 2.4.5-1 Arrangement 2: the inside containment check valve is shown as ASME Section III Code Class 2 whereas CESSAR Figure 6.3.2-1C is showing Code Class 1. Please resolve this discrepancy.	1	Agree
7	Intentionally Blank.		
8	Table 2.4.5-2 Item 52 corresponds to CESSAR Table 6.2.4-1 Item 57, which is identified as a part of CESSAR Figure 9.3.2-1. This item cannot be located on the above figure.	1	Agree
9	CESSAR Table 6.2.4-1 Item 53 is shown as "INTENTIONALLY BLANK", whereas on Figure 9.3.2-1 its the Containment Penetration between valves SS-235 and SS-236.	1	Agree
10	Table 2.4.5-2 Items 53 to 58 inclusive corresponding to CESSAR Table 6.2.4-1 Items 58 to 63 inclusive need a drawing/figure reference, currently none is available. Furthermore, valves SS-220 to SS-227 inclusive can be found on CESSAR Figure 9.3.2-1 but are not associated with any containment penetrations. Please resolve this confusion.	1	Agree

By: George Y. Cha
02/11/1994

Resolved by: [signature]

ITAAC No. 2.4.5 Containment Isolation System (CIS)

No.	Comment		
11	See attached pages 17 to 19 for typos.	1	Agree on pages 17 & 18. Disagree on page 19.
12	Table 2.4.5-2: A) Item 90, this is Item 36 of CESSAR Table 6.2.4-1, and Containment Penetration 99 of Figure 6.8-3. B) Item 91, this is Item 38 of CESSAR Table 6.2.4-1, and Containment Penetration 98 of Figure 9.3.4-1 sh 2 of 4. Please resolve these discrepancies.	1	Agree
13	Table 2.4.5-2 item numbers corresponded to the Containment Penetration Numbers similar to CESSAR Table 6.2.4-1 up to and included Item 35. Item numbers greater than 35 are no longer in agreement. The deviation of higher numbers must be resolved so that the correspondence is reestablished for all of the CDM item numbers to penetration numbers.	1	Agree
14	A statement of purpose for Table 2.4.5-2 in the text portion of the CDM similar to that of Figure 2.4.5-1 and Table 2.4.5-1 is needed.	1	Agree

By: George Y. Cha
02/11/1994

Resolved by: [illegible signature]

PAGES 4-~~8~~7 of 21

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PAGE 8 OF 21

TABLE 2.4.5-2 (Continued)

Item No	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
9	Motor-Driven EFW Pump #1 Discharge	2	No	
	Remotely Operated Check Valve			—
10	Motor-Driven EFW Pump #2 Discharge	2	No	
	Remotely Operated Check Valve			—
11	Steam-Driven EFW Pump #1 Discharge	2	No	
	Remotely Operated Check Valve			—
12	Steam-Driven EFW Pump #2 Discharge	2	No	
	Remotely Operated Check Valve			—
13	Safety Injection Pump #4 Discharge	2	No	
	Remotely Operated Check Valve (Note 4)			—
14	Safety Injection Pump #2 Discharge	14	No	
	Remotely Operated			—
	Remotely Operated Check Valve (Note 4)			—
	Remotely Operated			—
15	Safety Injection Pump #3 Discharge	2	No	
	Remotely Operated Check Valve (Note 4)			—

COMMENT 4

TABLE 2.4.__ (Continued)

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
16	Safety Injection Pump #1 Discharge	14	No	
	Remotely Operated			-
	Remotely Operated			-
	Check Valve (Note 4)			-
	Remotely Operated			-
17	SCS Pump #2 Suction	11	No	
	Remotely Operated			-
	Relief Valve			-
	Remotely Operated			-
18	SCS Pump #1 Suction	11	No	
	Remotely Operated			-
	Relief Valve			-
	Remotely Operated			-
19	Hot Leg Injection Loop #2	2	No	
	Remotely Operated			-
	Check Valve			-
20	Hot Leg Injection Loop #1	2	No	
	Remotely Operated			-
	Check Valve			-
21	Containment Spray Pump #2 Discharge	2	No	
	Remotely Operated			-
	Check Valve			-
22	Containment Spray Pump #1 Discharge	2	No	
	Remotely Operated			-
	Check Valve			-

COMMENT 4

COMMENT 5

COMMENT 6

PAGE 9 OF 21

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
86	Division 1 Hydrogen Recombiner Discharge to Containment	2	Yes	
	Remotely Operated			60 sec
	Check Valve			–
87	Division 2 Hydrogen Recombiner Discharge to Containment	2	Yes	
	Remotely Operated			60 sec
	Check Valve			–
88	Steam Generator Wet Layup Recirculation Return to Steam Generator #1	4	No	
	Manual Valve			–
	Check Valve			–
89	Steam Generator Wet Layup Recirculation Return to Steam Generator #2	4	No	
	Manual Valve			–
	Check Valve			–
90	SI IRWST Boron Recovery Supply to CVCS	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
91	CVCS IRWST Boron Recovery Return	2	Yes	
	Remotely Operated			60 sec
	Check Valve			–

NOTES:

1. Valve arrangements are in accordance with the Containment Isolation valve configurations shown on Figure 2.4.5-1.
2. Paragraph Number 3 of the General Provisions (Section 1.2) applies to Containment Isolation valves which receive a CIAS.
3. A dash (–) denotes NOT APPLICABLE
4. Not a containment isolation valve; shown only to establish ASME Code Section III class break location.

Comment 4

PAGE 10 of 21

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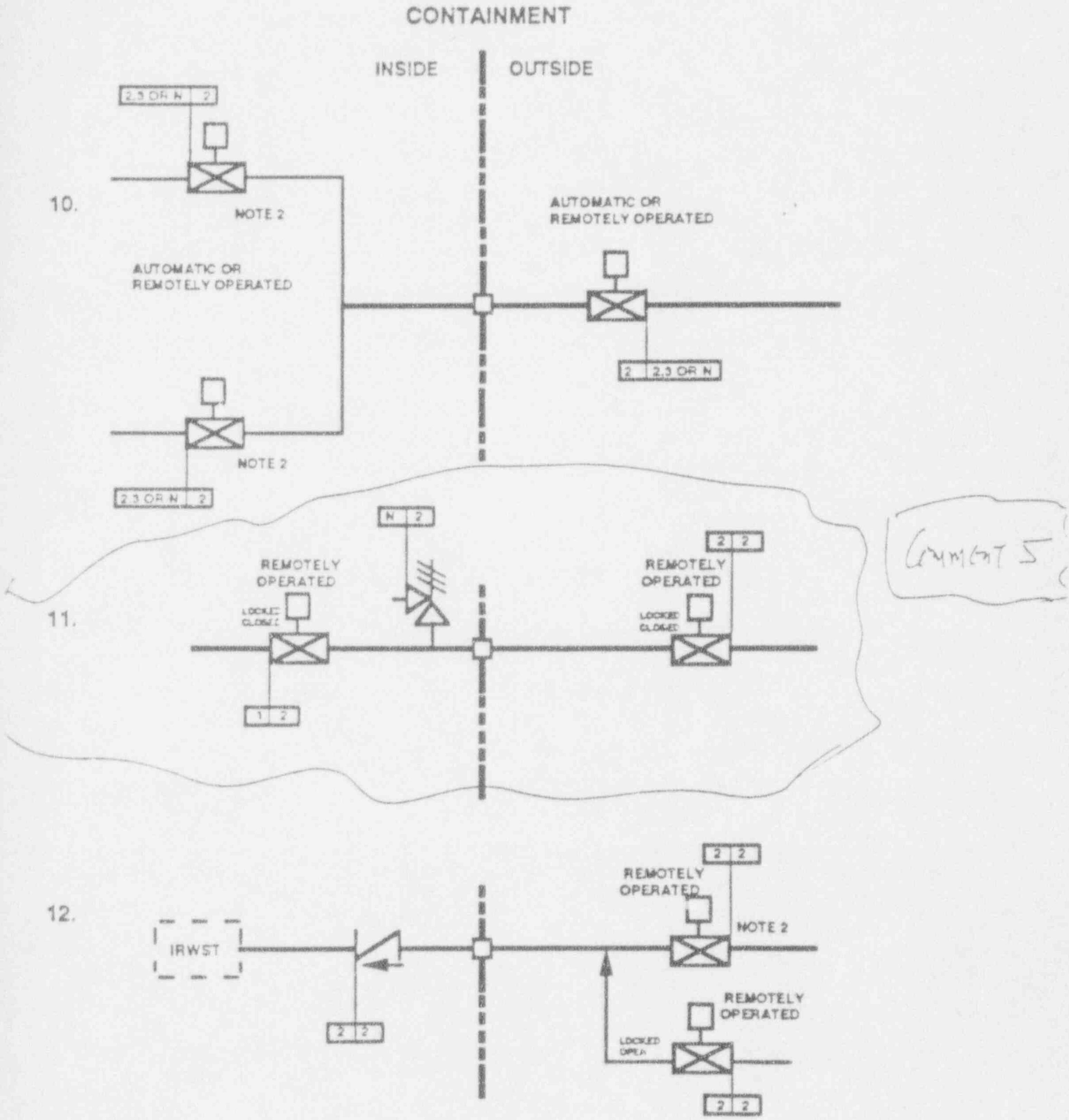

FIGURE 2.4.5-1 (PAGE 3 OF 4)
CONTAINMENT ISOLATION VALVE CONFIGURATION

SYSTEM 80+™

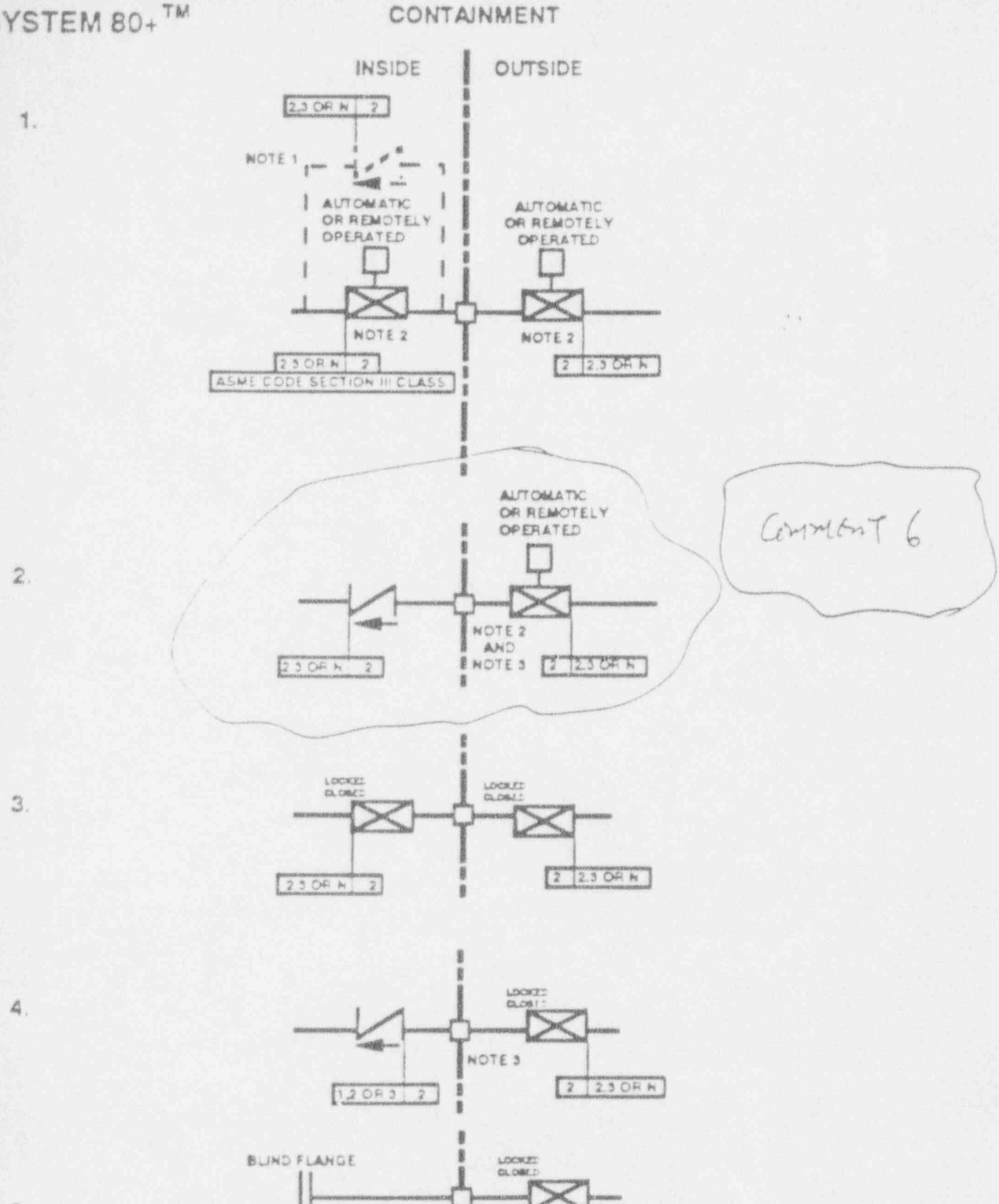

FIGURE 2.4.5-1 (PAGE 1 OF 4)
CONTAINMENT ISOLATION VALVE CONFIGURATION

FIGURE 6.3.2-1C

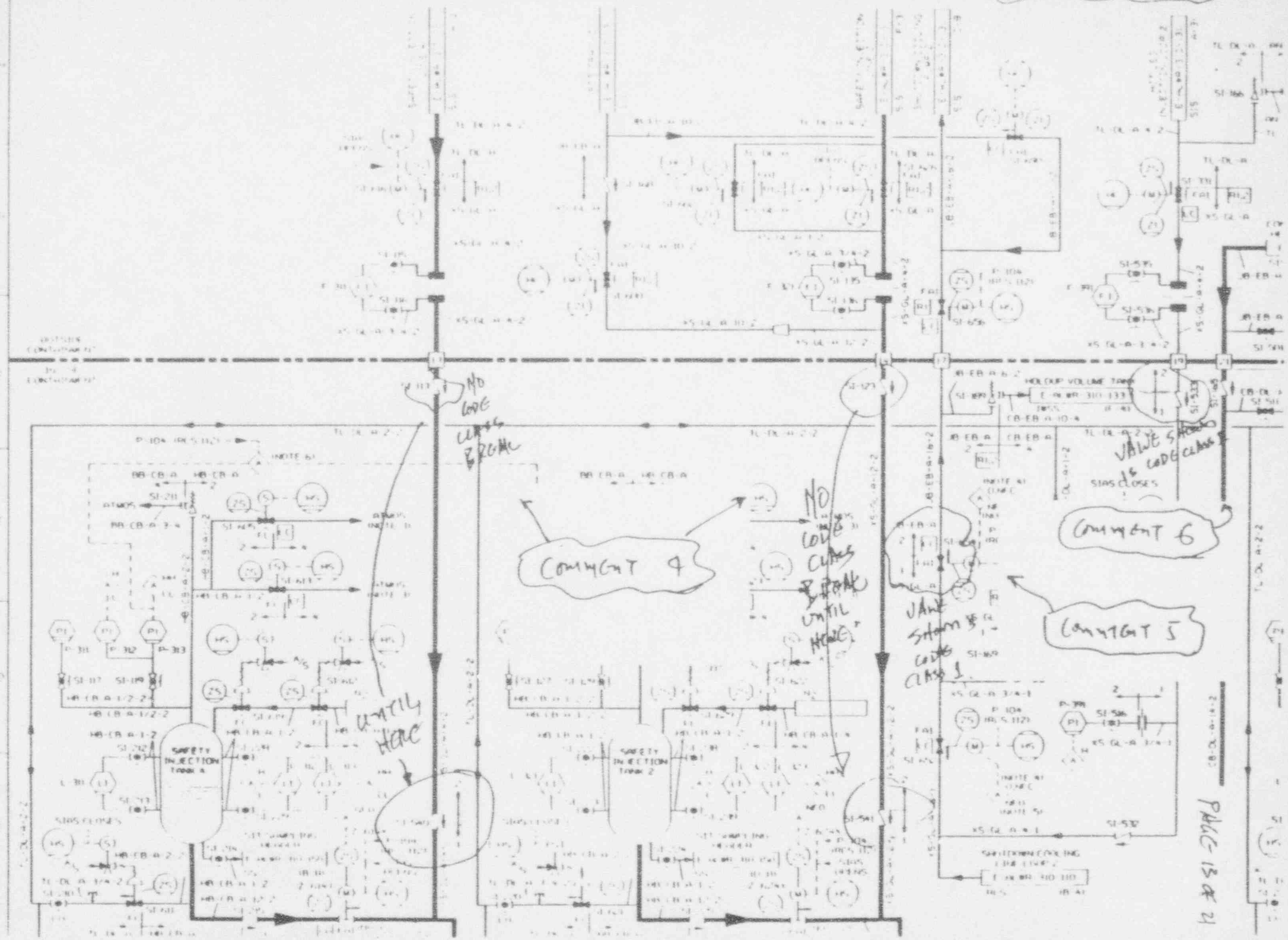

FIGURE 6.3.2-1C

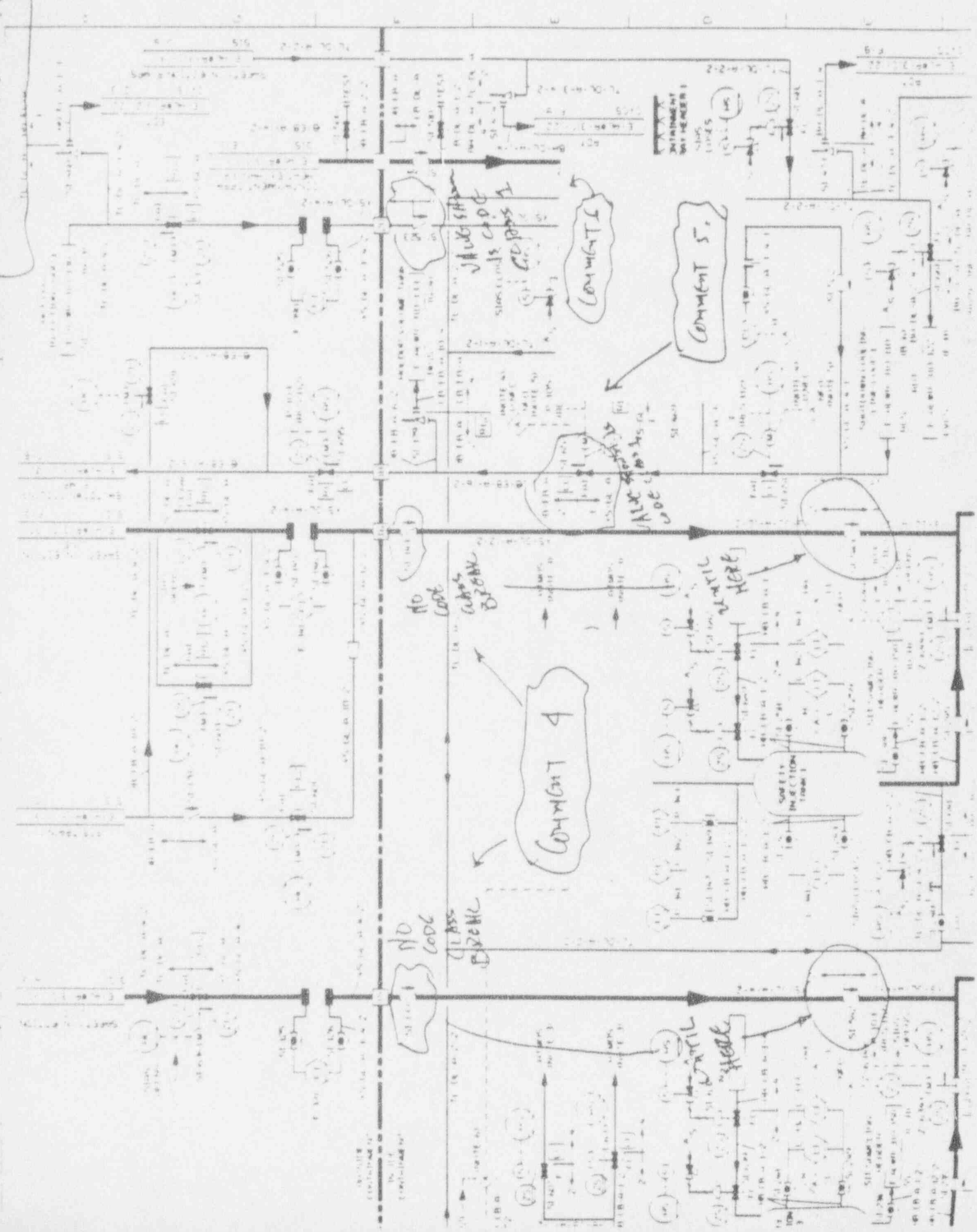

TABLE 6.2.4-1 (Cont'd)

(Sheet 8 of 18)

CONTAINMENT ISOLATION VALVE AND ACTUATOR DATA

Item No.	Service	Valve No.	Figure No.	(Note 10) Valve Type	Location Relative to Containment	Flow Direction Relative to Containment	(Note 1) Valve Arrangement (ODC)	(Note 8) Valve Position Normal	Fail Safe	Shutdown	Accident	(Note 4) Actuator Type	(Note 2) Actuation Signal	(Note 3) Type	Vent and Drain for Type-A Test	(Note 6) Type-C Test	Justification for Not Testing	(Note 17) Essential/Nonessential
60	Refueling Pool Cleanup Suction Line	PC-288 PC-287	9.1-3	Packless Packless	Outside Inside	Out	21 (58)	LC LC	- -	O/C O/C	LC LC	HW HW	- -	M M	Yes	Yes	-	Nonessential
61	Refueling Pool Cleanup Return Header	PC-291 PC-292	9.1-3	Packless Packless	Outside Inside	In	21 (58)	LC LC	- -	O/C O/C	LC LC	HW HW	- -	M M	Yes	Yes	-	Nonessential
62	Fuel Transfer Tube Quick Closure Hatch	-	-	DBLE Seal Bl. Flange	Inside	None	23 (N/A)	C	-	C	C	-	-	M	No	No	Note 10	Nonessential
63	Intentionally Blank																	
64	Pressurizer Liquid Sample Line	SS-201 SS-204	9.3.2-1	Globe* Globe*					C C	C C	C C	S S	CIAS CIAS	A,R,M A,R,M	Yes	Yes	-	Nonessential
65	Pressurizer Steam Space Sample Line	SS-202 SS-206	9.3.2-1	Globe* Globe*					C C	C C	C C	S S	CIAS CIAS	A,R,M A,R,M	Yes	Yes	-	Nonessential
66	Hot Leg Sample Line	SS-200 SS-203	9.3.2-1	Globe* Globe*					C C	C C	C C	S S	CIAS CIAS	A,R,M A,R,M	Yes	Yes	-	Nonessential
67	Holdup Volume Tank Sample Line	SS-208 SS-210 SS-211	9.3.2-1	Globe* Globe* Globe*					C C C	C C C	C C C	S S S	CIAS CIAS CIAS	A,R,M A,R,M A,R,M	Yes	Yes	-	Nonessential
68	Steam Generator #1 Cold Leg Sample	SC-218 SC-206	-	Globe* Globe*	Inside		(57)	O	C C	C C	C C	S S	MSIS/EFAS/AFAS MSIS/EFAS/AFAS	A,R,M A,R,M	No	No	Note 7	Nonessential
69	Steam Generator #1 Hot Leg Sample	SC-228 SC-211	-	Globe* Globe*	Outside Inside	Out	27 (57)	O O	C C	C C	C C	S S	MSIS/EFAS/AFAS MSIS/EFAS/AFAS	A,R,M A,R,M	No	No	Note 7	Nonessential
70	Steam Generator #1 Downcomer Sample	SC-221 SC-220	-	Globe* Globe*	Outside Inside	Out	27 (57)	O O	C C	C C	C C	S S	MSIS/EFAS/AFAS MSIS/EFAS/AFAS	A,R,M A,R,M	No	No	Note 7	Nonessential

* Maximum valve closure time on CIAS is 60 sec.

COMMENT 9

COMMENT 8

TO 63

COMMENT 10

Amendment U
December 31, 1993

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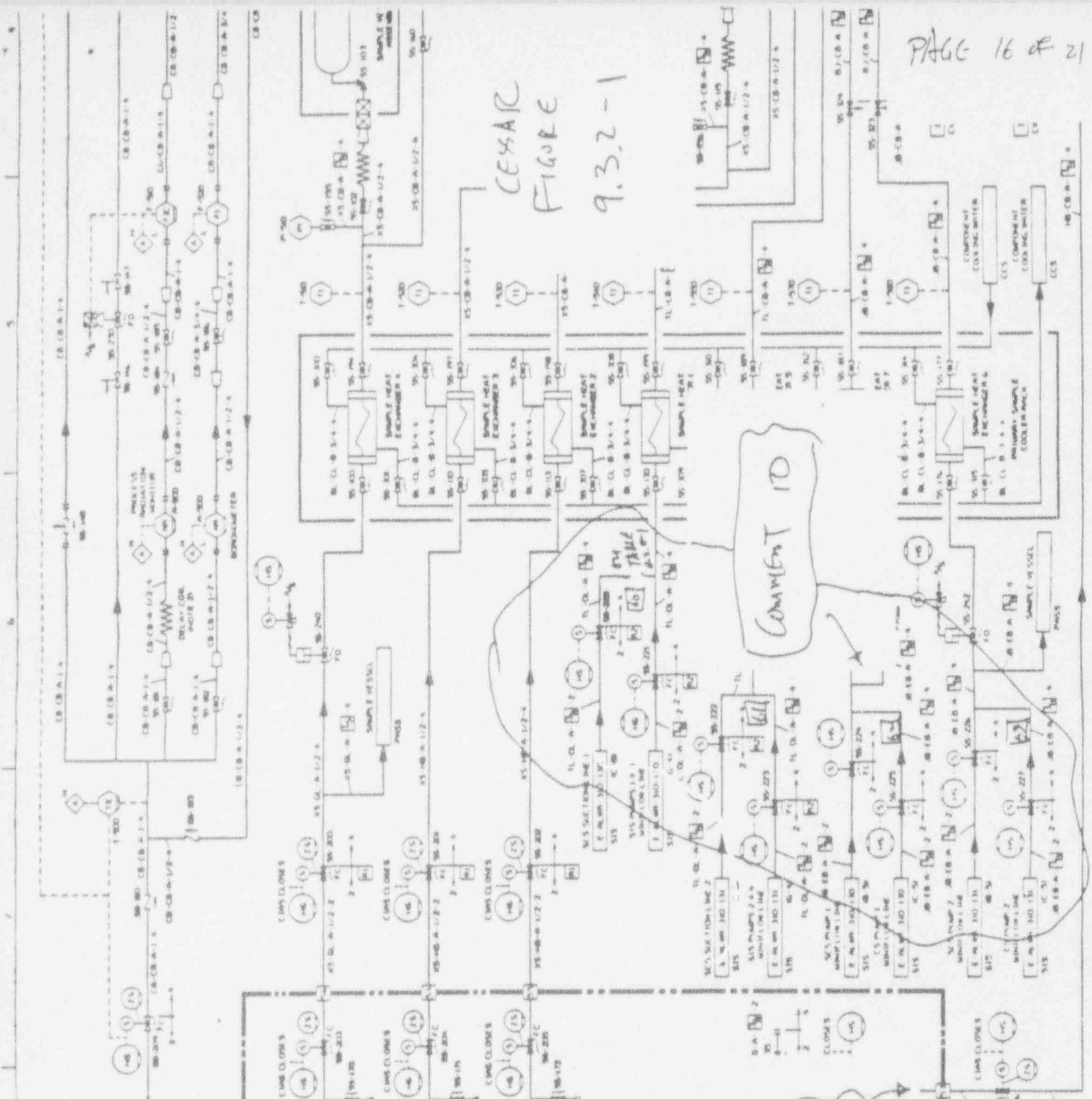
CESAR FIGURE 9.3.2-1
COMMENT 10
COMMENT 9

TABLE 2.4.. (Continued)

Item No.	Service	(Note 1) Valve Arrangement	(Note 2) Closes On CIAS (Yes, No)	(Note 3) Maximum Valve Closure Time on CIAS
54	Steam Generator #1 Hot Leg Sample	1	No	
	Remotely Operated			–
	Remotely Operated			–
55	Steam Generator #1 Downcomer Sample	1	No	
	Remotely Operated			–
	Remotely Operated			–
56	Steam Generator #2 Cold Leg Sample	1	[illegible]	
	Remotely Operated			[illegible]
	Remotely Operated			[illegible]
57	Steam Generator #2 Hot Leg Sample	1	[illegible]	
	Remotely Operated			[illegible]
	Remotely Operated			[illegible]
58	Steam Generator #2 Downcomer Sample	1	[illegible]	
	Remotely Operated			[illegible]
	Remotely Operated			–
59	High Volume Containment Purge System Supply #1	1	No	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
60	High Volume Containment Purge System Supply #2	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec
61	High Volume Containment Purge System Exhaust #1	1	Yes	
	Remotely Operated			60 sec
	Remotely Operated			60 sec

COMMENT 11

THESE TWO PARAMETERS MUST AGREE.

PAGE 17 OF 21

TABLE 6.2.4-1 (Cont'd)

(Sheet 12 of 15)

CONTAINMENT ISOLATION VALVE AND ACTUATOR DATA

Item No.	Service	Valve No.	Figure No.	(Note 16) Valve Type	Location Relative to Containment	Flow Direction Relative to Containment	(Note 1) Valve Arrangement (GDC)	(Note 5) Valve Position Normal	Fail Safe	Shutdown	Accident	(Note 4) Actuator Type	(Note 2) Actuation Signal	(Note 3) Type	Vent and Drain for Type A Test	(Note 6) Type C Test	Justification for Not Testing	(Note 17) Essential/ Nonessential
90	Personnel Airlock #2 Equalization Line			Check Check	Outside Inside	None	(N/A)	C C		C C	C C				Yes	Yes	-	N.A.
91	Containment Sump Pump Discharge Line			Gate* Gate*	Outside Inside	Out	14 (56)	O O	AI AI	O O	C C	P P	CIAS/HRAS CIAS/HRAS	A,R,M A,R,M	Yes	Yes	-	Nonessential
92	Containment Ventilation Units Condensate Drain Header			Gate* Gate* Check	Outside Inside Inside	Out	16 (56)	O O C	AI AI	O O C	C C C	E E	CIAS/HRAS CIAS/HRAS	A,R,M A,R,M	Yes	Yes		Nonessential
93	Reactor Drain Tank Gas Space to GWMS			Globe* Globe*	Outside Inside	In/Out	25 (56)	O O	AI AI	O O	C C	E E	CIAS CIAS	A,R,M A,R,M	Yes	Yes	-	Nonessential
94	Decontamination Line			Globe Globe	Outside Inside	In	21 (56)	LC LC		LC LC	LC LC	HW HW		M M	Yes	Yes		Nonessential
95	Division 1 Hydrogen Recombiner Suction from Containment		6.2.5-1	Globe* Globe*	Outside Inside	Out	23 (56)	C C	AI AI	C C	O/C O/C	E E	CIAS CIAS	A,R,M A,R,M	Yes	Yes	-	Essential
96	Division 2 Hydrogen Recombiner Suction from Containment		6.2.5-1	Globe* Globe*	Outside Inside	Out	23 (56)	C C	AI AI	C C	O/C O/C	E E	CIAS CIAS	A,R,M A,R,M	Yes	Yes		Essential
97	Division 1 Hydrogen Recombiner Discharge to Containment		6.2.65-1	Globe* Check	Outside Inside	In	4 (56)	C C	AI	C C	O/C O/C	E	CIAS CIAS	A,R,M	Yes	Yes		Essential
98	Division 2 Hydrogen Recombiner Discharge to Containment		6.2.5-1	Globe* Check	Outside Inside	In	4 (56)	C C	AI	C C	O/C O/C	E	CIAS CIAS	A,R,M	Yes	Yes	-	Essential

* Maximum valve closure time on CIAS is 60 sec.

CHANGE TO 6.2.5-1

COMMENT 11

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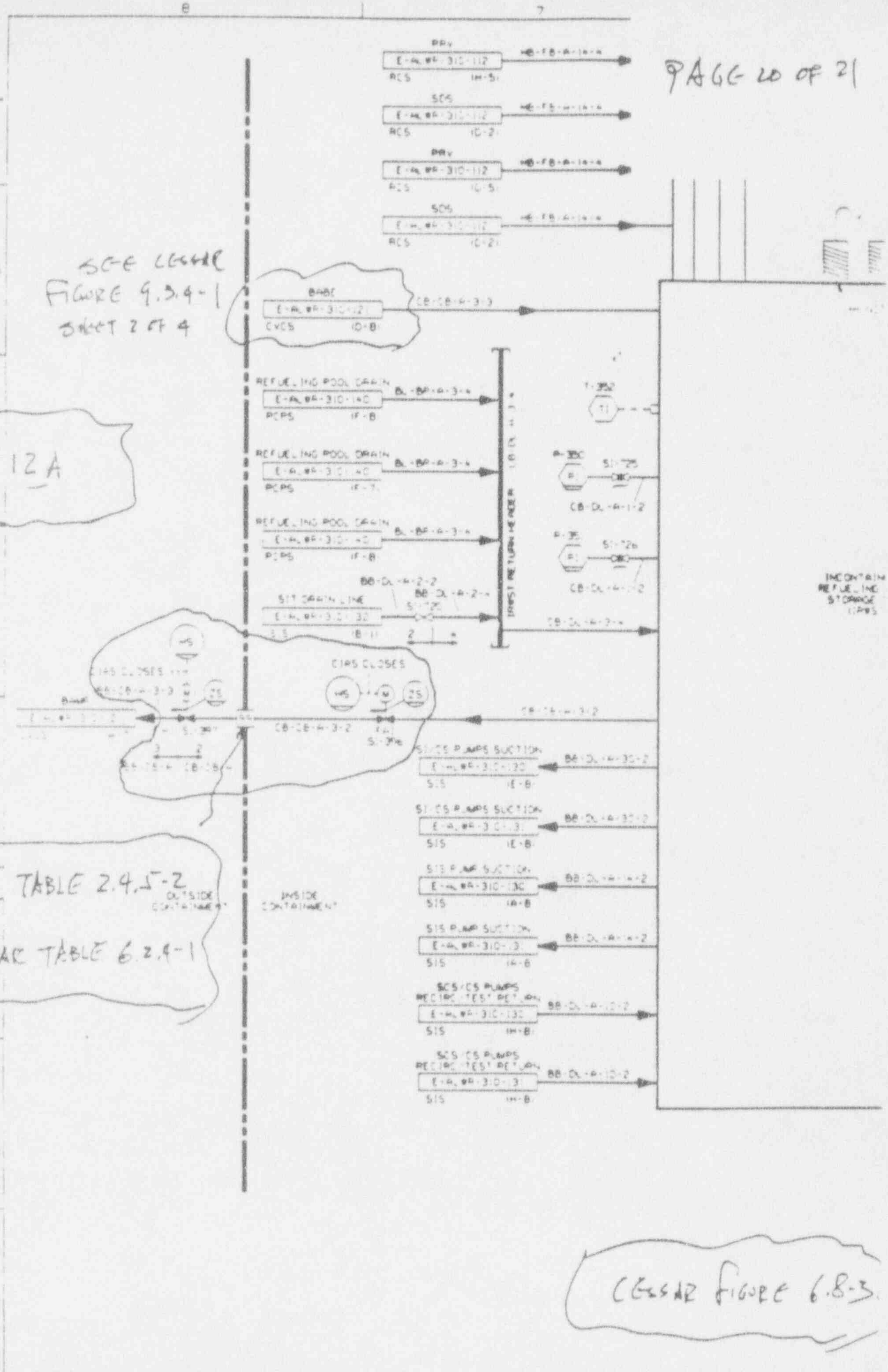


SEE CESSAR FIGURE 9.3.4-1 SHEET 2 OF 4

COMMENT 12A

ITEM 92 CDM TABLE 2.4.5-2

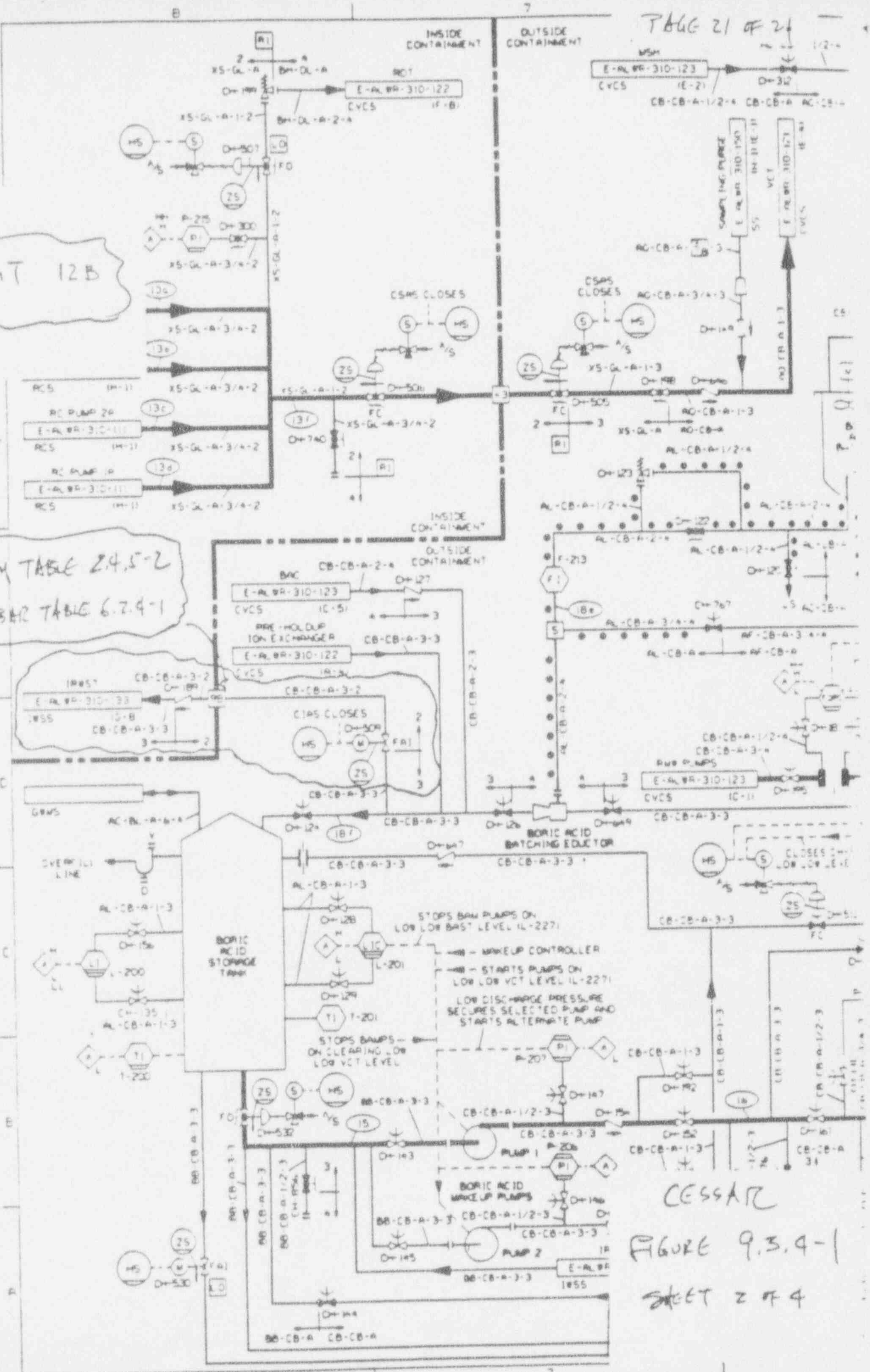
ITEM 36 CESSAR TABLE 6.2.4-1

CESSAR FIGURE 6.8-3

COMMENT 12B

ITEM 91 CDM TABLE 2.4.5-2

ITEM 38 CESSAR TABLE 6.2.4-1



CESSAR

FIGURE 9.3.4-1

SHEET 2 of 4

C. L

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.4.6 Containment Spray System (CSS)

No.	Comments	Cat.	Resolution
1	Page 2, 6th paragraph and Figure 2.4.6-1 showed that "The CSS pumps are started upon receipt of a containment spray actuation signal (CSAS),---.", whereas in various CESSAR sections (6.5.1.1, 7.3.1.1.10.2, 7.3.2.2.1) and P&ID Figure 6.3.2-1 showed that "The containment spray pumps starts upon the receipt of a Safety Injection Actuation Signal (SIAS) or a Containment Spray Actuation Signal (CSAS)." Please resolve this discrepancy.	1	[illegible]
2	Page 2 paragraph 7 discussed MOVs with active safety function. Does this statement apply to all MOVs of Figure 2.4.6-1? Please confirm.	1	Yes. AGREE

By: George Y. Cha
01/21/1994

Resolved by: [illegible]

CE80+ ITAAC Independent Review Comments

ITAAC N.2.5.1 Reactor Protection System

No.	Comments	Cat.	Resolution
1	Figure 2.5.1-2, "PPS Interconnection" does not clearly specify 2 coincidence/bistable processors per channel. See 2.5.1, Pg 1 (attached).	1	AGREE - PASS TO APP[illegible]
2	Page 1 of design description states that the Interface and Test processor communicates with the bistable trip processors and coincidence processors. Figure 2.5.1-2 indicates that the ITP communicates with the Core protection calculator, control room and remote shutdown panels, ESF-CS, maintenance and test panel and the initiation logics. The design description should be clarified. See Figure 2.5.1-2 (attached).	1	
3	Page 2 of CDM states that EMI qualification is applied to equipment with known EMI susceptibility based on operating environment and/or inherent design characteristics. How is "known susceptibility" to be determined? Suggest revising statement to: EMI qualification is applied for equipment based on the operating environment and/or inherent design characteristics. See also CE SSAR 7.2.1.2 Design Bases (attached).	1	
4	Page 2 states that a site survey will be performed upon completion of system installation. This should be clarified to state whether this is a control room or plant wide survey. A commitment to update/review the EMI map based on equipment or environmental changes would be appropriate to include in the design description (external and internal to the plant).	2	
5	Deleted		
6	Page 3. Item c references a graded approach to software development based on relative importance to safety. The details of this need to be amplified in the CESSAR (i.e guiding industry standards, applicability to RPS)	2	

7	Page 3. Commercial dedication (software/hardware) acceptance criteria may be interpreted as less rigorous than that specified for PPS. See Page 2, Items a and b. Clarification is needed as to whether the reference to commercial grade software is limited only to the software required for system development (programming language, operating system)? The reference to PPS software also needs clarification (see attached).	2	[illegible]
8	Page 3. Setpoint methodology Item b references design basis events, instrument accuracy and drift. Design description (and CESSAR) should be augmented to include a commitment for measurement and test equipment accuracy (confirmation that setpoint assumptions reflect actual plant surveillance M&TE practices).	2	
9	Page 6. First sentence add abbreviation to "reactor trip switchgear" (RTSG) or (RTSS) to be consistent with Figure 2.5.1-1, and 2.5.1-2. See CE SSAR 7.2.1.1, 2nd paragraph (attached).	3	
10	Figure 2.5.1-2. The figure indicates that communication between the CPC and the ITP and ITP to coincidence processors is in only one direction. Is this correct? Core protection calculator output is unclear (drafting error). The coincidence processors (Figure 2.5.1-2) indicate two output paths. What is the distinction between the two? (it appears that the initiation logic block should be split to represent ESF logic in the figure and be consistent with Figure 2.5.1-3. In Figure 2.5.1.-1 the RTSG is shown feeding the CEDMCS. Figure 2.5.1-2 states CEDMS. The design description references the CEDM system (see Page 5, last paragraph)? System notations are not consistent. (see attached)	1	
11	CE SSAR 7.1.2.2. Page 7.1-2 lists Reactor Trip switchgear System (RTSS) the CDM lists Reactor Trip Switchgear (RTSG). See 2.5.1, Page 6, first paragraph. (attached-see 9 above) These should be made consistent.	1	
12	CE SSAR 7.1.2.15. List conformance to RG 1.11. This should be Safety Guide 11.	3	
13	CE SSAR 7.1.2.15, Safety Guide 11. The containment pressure transmitters and instrument lines located outside of containment are considered part of containment. This is an exception to the safety guide and should be justified. Suggest Section "B" of the safety guide. Instrument lines are field run and designed. An ITAAC verification should be considered (see attached).	1	
14	CE SSAR 7.1.2.22, Conformance to RE 1.62. This section paraphrases the RG but does not specify manual initiation at the "system level" as discussed in the RG. (see attached) This aspect should be addressed.	1	

15	CE SSAR 7.2.1.1, states that the fourth channel is a spare while maintaining a two out of three system. Is the CE80+ to be licensed as a 3 channel plant? Will a channel be allowed to be in bypass indefinitely? Is this supported by analysis? FMEA? Do the TS surveillance AOTS and surveillance intervals reflect the above? Please clarify. Also see 7.2.1.1.7 and TS 3.3.2 attached.	1	[illegible]
16	Typos - See attached.	3	
17	CE SSAR 7.2.1.1.8, Page 7.2-27 states that alternate bistable trips are available should the initial trip function fail (functional diversity). This is accomplished by assuring that backup trips are not processed through the same PPS processor or bistable processor. There should be an ITAAC entry for this design feature. See 7.2.1.18 attached.	2	
18	TS surveillance requirements need to be revised to specify the allowed outage time for surveillance (channel functional test or calibration) TS Table 3.3.2-1.	2	
19	CE SSAR 7.2.1.1.9.2, Page 7.2-31. Automatic bistable testing states that the test task removes the test signal before the initiation circuit timer runs out. It is also stated that should the test input signal not be removed by the automatic test the timing logic built into the bistable trip logic will remove it. The action of the test circuit is not clear. Is the bistable timing logic designed to run out before the initiation circuit timer? Can the initiation circuit respond to a test signal should the test input signal not be removed? Is spurious actuation possible? Can the bistable be locked out during testing such that the bistable cannot respond to a valid input signal? The CESSAR needs to be clarified accordingly.	2	
20	CE SSAR 7.2.1.1.9.8, Item B, references on-line spectral analysis for measuring analog sensor response time. What is the justification and bases for this test methodology? (See attached). This reference should be considered for inclusion in the CESSAR.	2	
21	Revise the design description as-marked to be consistent with Technical Specification description of trip setpoints.	1	

By: Cliff Doutt

Resolved by: ______________________

2.5.1 PLANT PROTECTION SYSTEM

Design Description

The Plant Protection System (PPS) is a safety related instrumentation and control system which initiates reactor trip, and actuation of engineered safety features in response to plant conditions monitored by process instrumentation. Initiation signals from the PPS logic are sent to the reactor trip switchgear and to the Engineered Safety Features - Component Control System (ESF-CCS) to actuate protective functions.

The PPS is located in the nuclear island structures.

The Basic Configuration of the PPS is as shown on Figure 2.5.1-1.

The PPS and the electrical equipment that initiate reactor trip or engineered safety feature actuation are classified Seismic Category I.

The PPS uses sensors, transmitters, signal conditioning equipment, and digital equipment which performs the calculations and logic to generate protective function initiation signals.

The PPS features and equipment are software programmable processors, that operate with fixed sequenced program execution, and fixed memory allocation tables. There are two bistable processors per channel which provide separate trip paths where multiple sensors are available to detect the same transient.

1 There are two coincidence processors per channel each providing a local coincidence logic (LCL) for each assigned bistable trip function. Each coincidence processor has dedicated remote multiplexing from each bistable processor.

The Interface and Test Processor (ITP) communicates with the bistable trip processors, and coincidence processors. Separation is provided between protective (safety critical) PPS processing functions and auxiliary functions of man-machine interfaces, data communications, and automatic testing.

Data communication networks support the transmission of safety critical data on a continuous cyclical basis independent of plant transients.

The PPS equipment is classified Class 1E.

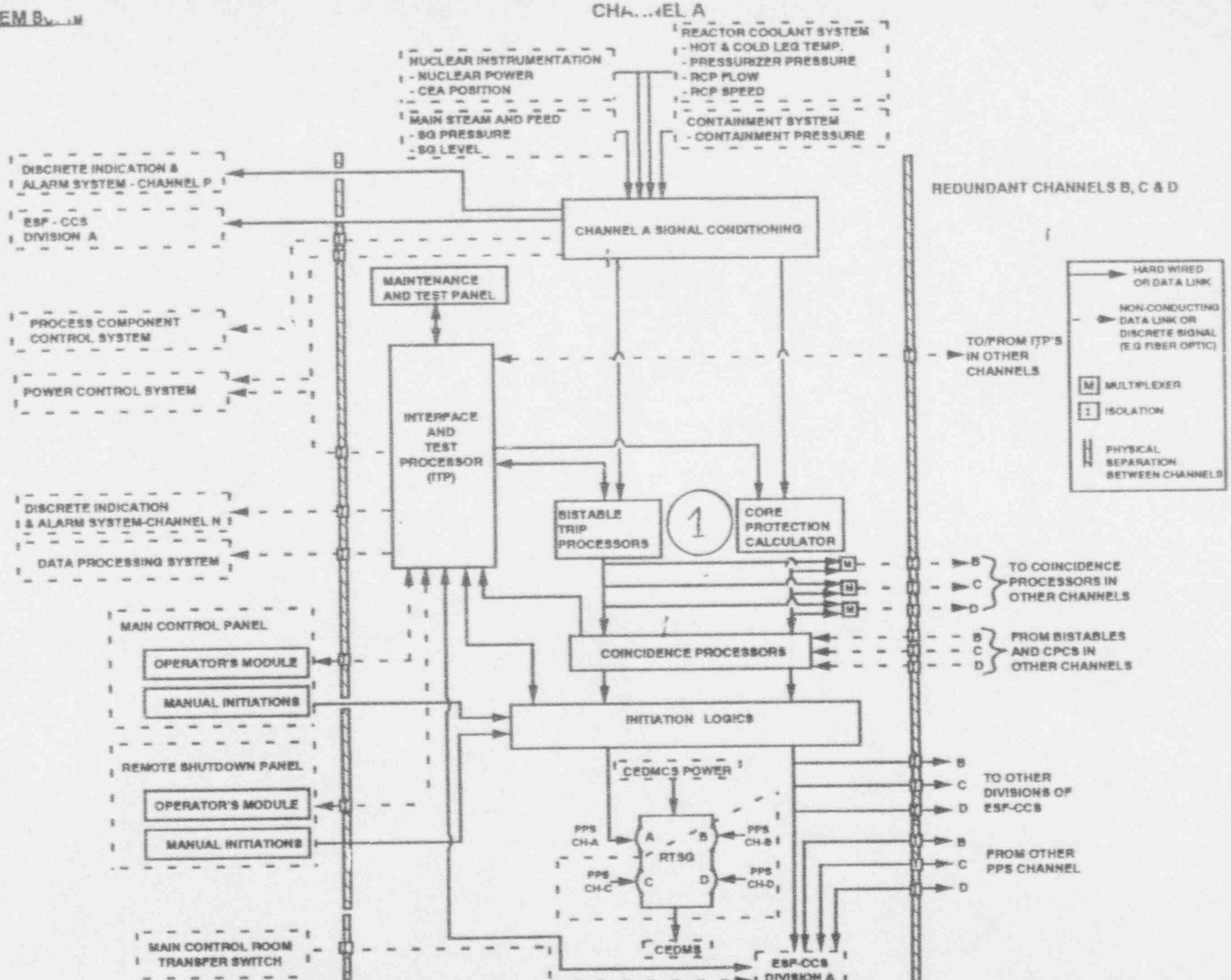


FIGURE 2.5.1-2
PLANT PROTECTION SYSTEM INTERCONNECTIONS

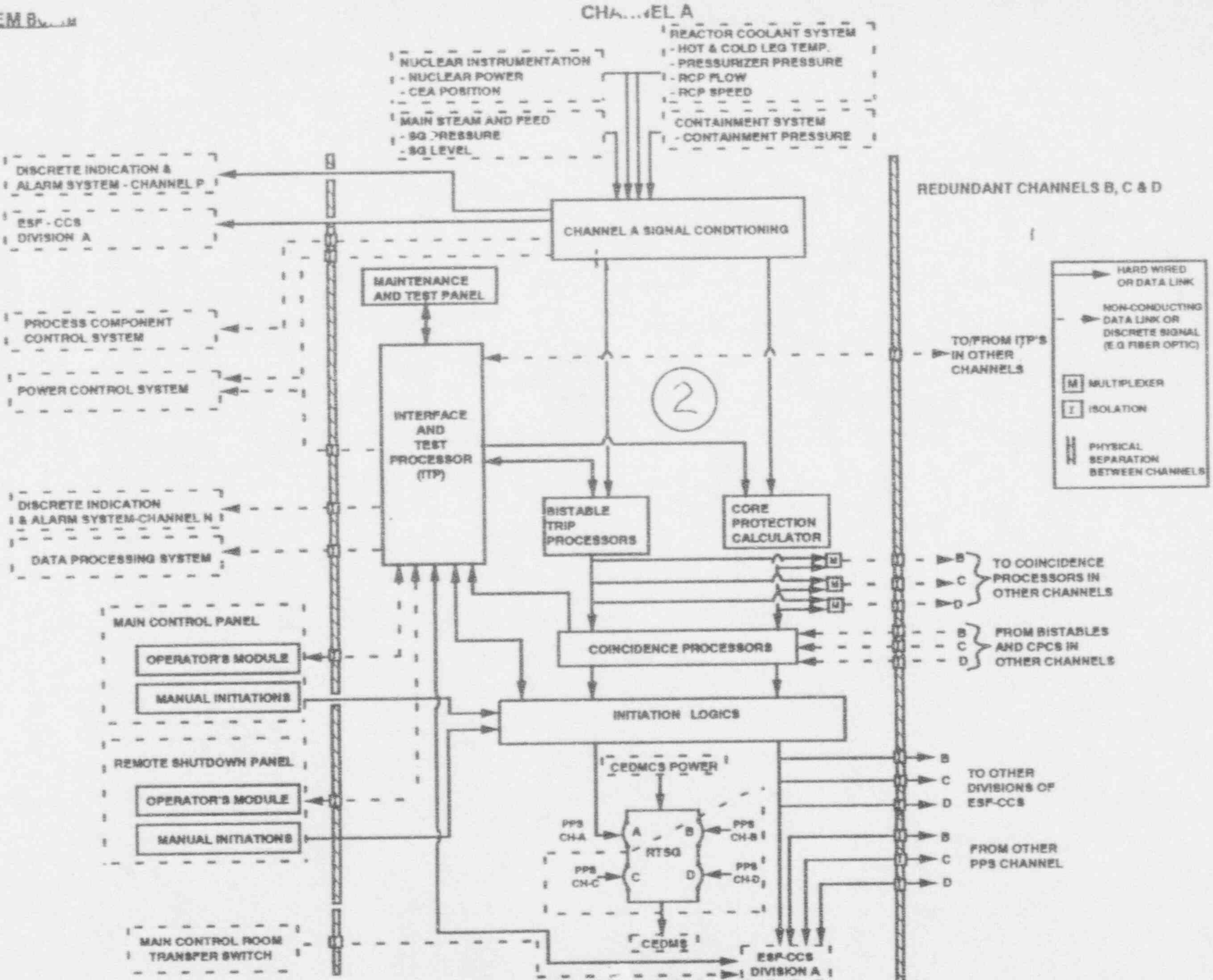


FIGURE 2.5.1-2
PLANT PROTECTION SYSTEM INTERCONNECTIONS

12-31-93

2.5.1 PLANT PROTECTION SYSTEM

Design Description

The Plant Protection System (PPS) is a safety related instrumentation and control system which initiates reactor trip, and actuation of engineered safety features in response to plant conditions monitored by process instrumentation. Initiation signals from the PPS logic are sent to the reactor trip switchgear and to the Engineered Safety Features - Component Control System (ESF-CCS) to actuate protective functions.

The PPS is located in the nuclear island structures.

The Basic Configuration of the PPS is as shown on Figure 2.5.1-1.

The PPS and the electrical equipment that initiate reactor trip or engineered safety feature actuation are classified Seismic Category I.

The PPS uses sensors, transmitters, signal conditioning equipment, and digital equipment which performs the calculations and logic to generate protective function initiation signals.

The PPS features and equipment are software programmable processors, that operate with fixed sequenced program execution, and fixed memory allocation tables. There are two bistable processors per channel which provide separate trip paths where multiple sensors are available to detect the same transient.

There are two coincidence processors per channel each providing a local coincidence logic (LCL) for each assigned bistable trip function. Each coincidence processor has dedicated remote multiplexing from each bistable processor.

(2) The Interface and Test Processor (ITP) communicates with the bistable trip processors, and coincidence processors. Separation is provided between protective (safety critical) PPS processing functions and auxiliary functions of man-machine interfaces, data communications, and automatic testing.

Data communication networks support the transmission of safety critical data on a continuous cyclical basis independent of plant transients.

The PPS equipment is classified Class 1E.

The reactor protective system sensor response times, reactor trip delay times, and analysis setpoints used in Chapter 15 are representative of the manner in which the RPS and associated instrumentation will operate. These quantities are used in the transient analysis documented in Chapter 15. Note that the reactor trip delay times shown in Chapter 15 do not include the sensor response times. Actual RPS equipment uncertainties, response times and reactor trip delay times are obtained from calculations and tests performed on the RPS and associated instrumentation. The verified system uncertainties are factored into all RPS settings and/or setpoints to assure that the system adequately performs its intended function when the errors and uncertainties combine in an adverse manner.

J. All system components are qualified for environmental and seismic conditions in accordance with IEEE Standard 323-1983, and IEEE Standard 344-1987. Compliance is addressed in Sections 3.10 and 3.11, respectively. In addition, the system is capable of performing its intended function under the most degraded conditions of the energy supply, as addressed in Section 8.3.

K. System components with known susceptibility are qualified according to an established plan for electromagnetic compatibility (EMC) that requires the equipment to function properly when subjected to electrical surges, electromagnetic interference (EMI), electrostatic discharge (ESD) and radio frequency interference (RFI). EMI qualification is performed in accordance with applicable requirements of MIL-STD-461C, 1986 (Sections RS03, RS02, CS01, CS02 and CS06), "Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference." Radiated and conducted EMI envelopes are established for qualification. A site-specific EMI survey is then performed to ensure that system exposure to EMI is within qualification envelope limits.

3

L. The RPS is considered a vital system. Vital instrumentation cabinet doors are locked and equipped with "door open" alarms. Refer to Chapter 13, Appendix 13A for additional details.

7.2.1.3 System Drawings

The RPS MCBDs, signal logics, block diagrams, and test circuit block diagrams are shown in Figures 7.2-1 through 7.2-30.

7.2.2 ANALYSIS

7.2.2.1 Introduction

The RPS is designed to provide the following protective functions:

An environmental qualification program assures the PPS equipment is able to perform its intended safety function for the time needed to be functional, under its design environmental conditions. The environmental conditions, bounded by applicable design basis events, are: temperature, pressure, humidity, chemical effects, radiation, aging, seismic events, submergence, power supply voltage & frequency variations, electromagnetic compatibility and synergistic effects which may have a significant effect on equipment performance. The environmental qualification of PPS equipment is achieved via tests, analyses or a combination of analyses and tests.

EMI qualification is applied for equipment with known EMI susceptibility based on operating environment and/or inherent design characteristics.

The PPS is qualified according to an established plan for Electromagnetic Compatibility (EMC).

The qualification plan requires the equipment to function properly when subjected to the expected operational electrical surges, electromagnetic interference (EMI), electrostatic discharge (ESD), and radio frequency interference (RFI).

The equipment to be tested will be configured for intended service conditions.

A site survey is performed upon completion of system installation to characterize the installed EMI environment.

PPS software is designed, tested, installed and maintained using a process which:

a. Defines the organization, responsibilities, and software quality assurance activities for the software engineering life cycle that provides for:

- establishment of plans and methodologies
- specification of functional, system and software requirements and standards, identification of safety critical requirements
- design and development of software
- software module, unit and system testing practices
- installation and checkout practices
- reporting and correction of software defects during operation

b. Specifies requirements for:

- software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action
- software configuration management, historical records of software, and control of software changes

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b. Specifies requirements for:

- software management, documentation requirements, standards, review requirements, and procedures for problem reporting and corrective action
- software configuration management, historical records of software, and control of software changes

(6)

- verification & validation, and requirements for reviewer independence

c. Incorporates a graded approach according to the software's relative importance to safety.

The use of commercial grade computer hardware and software items in the PPS is accomplished through a process that has:

- requirements for supplier design control, configuration management, problem reporting and change control;
- review of product performance;
- receipt acceptance of the commercial grade item;
- final acceptance, based on equipment qualification and software validation in the integrated system.

Setpoints for initiation of PPS safety-related functions are determined using methodologies which have the following characteristics:

a) Requirements that the design basis analytical limits, data, assumptions, and methods used as the bases for selection of trip setpoints are specified and documented.

b) Instrumentation accuracies, drift and the effects of design basis transients are accounted for in the determination of setpoints.

c) The method utilized for combining the various uncertainty values is specified.

d) Identifies required pre-operational and surveillance testing.

e) Identifies performance requirements for replacement of setpoint related instrumentation.

f) The setpoint calculations are consistent with the physical configuration of the instrumentation.

Reactor Trip Initiation Function

Process instrumentation, the Plant Protection Calculators (PPCs), the Core Protection Calculators (CPCs) and the reactor trip switchgear function to initiate an automatic reactor trip. The process instrumentation provides sensor data input to the PPS which monitors the following plant conditions to provide a reactor trip:

Reactor Power - High
Reactor Coolant System Pressure - Low or High
Steam Generator Water Level - Low or High

An environmental qualification program assures the PPS equipment is able to perform its intended safety function for the time needed to be functional, under its design environmental conditions. The environmental conditions, bounded by applicable design basis events, are: temperature, pressure, humidity, chemical effects, radiation, aging, seismic events, submergence, power supply voltage & frequency variations, electromagnetic compatibility and synergistic effects which may have a significant effect on equipment performance. The environmental qualification of PPS equipment is achieved via tests, analyses or a combination of analyses and tests.

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The PPS is qualified according to an established plan for Electromagnetic Compatibility (EMC).

The qualification plan requires the equipment to function properly when subjected to the expected operational electrical surges, electromagnetic interference (EMI), electrostatic discharge (ESD), and radio frequency interference (RFI).

The equipment to be tested will be configured for intended service conditions.

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- specification of functional, system and software requirements and standards, identification of safety critical requirements
- design and development of software
- software module, unit and system testing practices
- installation and checkout practices
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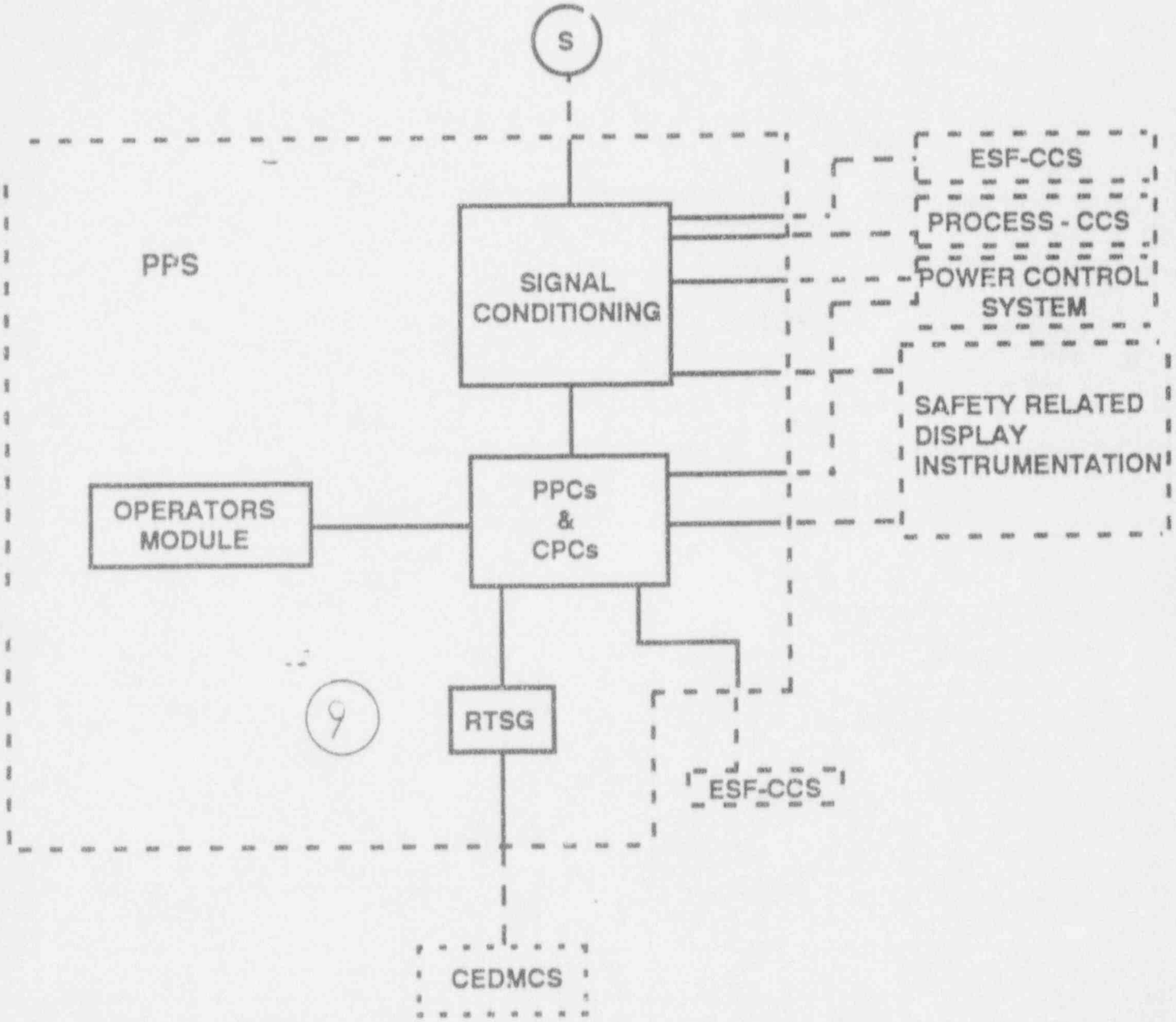

NOTES:

1. PPS EQUIPMENT SHOWN ON THE FIGURE IS CLASS 1E.
2. PPS EQUIPMENT IS POWERED FROM CLASS 1E SUPPLIES.
3. EACH PPS CHANNEL (4 IN NUMBER) IS POWERED FROM A SEPARATE CLASS 1E BUS.

FIGURE 2.5.1-1
PPS CONFIGURATION

7.2 REACTOR PROTECTIVE SYSTEM

7.2.1 DESCRIPTION

7.2.1.1 System Description

The Reactor Protective System (RPS) portion of the Plant Protection System (PPS) (as shown on Figure 7.2-1) is a vital system which consists of sensors, calculators, logic, and other equipment necessary to monitor selected plant conditions and to effect reliable and rapid reactor shutdown (reactor trip) if monitored conditions approach specified safety system settings. The system's functions are to protect the core fuel design limits and Reactor Coolant System (RCS) pressure boundary for Anticipated Operational Occurrences, and also to provide assistance in mitigating the consequences of accidents. Four measurement channels with electrical and physical separation are provided for each parameter used in the direct generation of trip signals, with the exception of Control Element Assembly (CEA) position which is a two channel measurement.

The Reactor Protective System (RPS) portion of the PPS includes the following functions: bistable trip, local coincidence logic, reactor trip initiation logic and automatic testing of PPS logic. The bistable trip processors generate trips based on the measurement channel digitized value exceeding a digital setpoint. The bistable trip processors provide their trip signals to the coincidence processors located in the four redundant PPS channels. The coincidence processors evaluate the local coincidence logic based on the state of the four like trip signals and their respective bypasses. The coincidence signals are used in the generation of the Reactor Trip Switchgear System (RTSS) or Engineered Safety Features-Component Control System (ESF-CCS) initiation. Software is developed and tested for the above processors, as stated in Section 7.1. A coincidence of two-out-of-four like trip signals is required to generate a reactor trip signal. The fourth channel is provided as a spare and allows bypassing of one channel while maintaining a two-out-of-three system.

The NPX80+ Plant Protection System (PPS) has four pairs of cabinets housing the Plant Protection Calculator (PPC). Each pair of cabinets is located in a separate equipment room and contains the bistable processors, coincidence processors and interface hardware of one of the four PPS safety channels designated A, B, C and D.

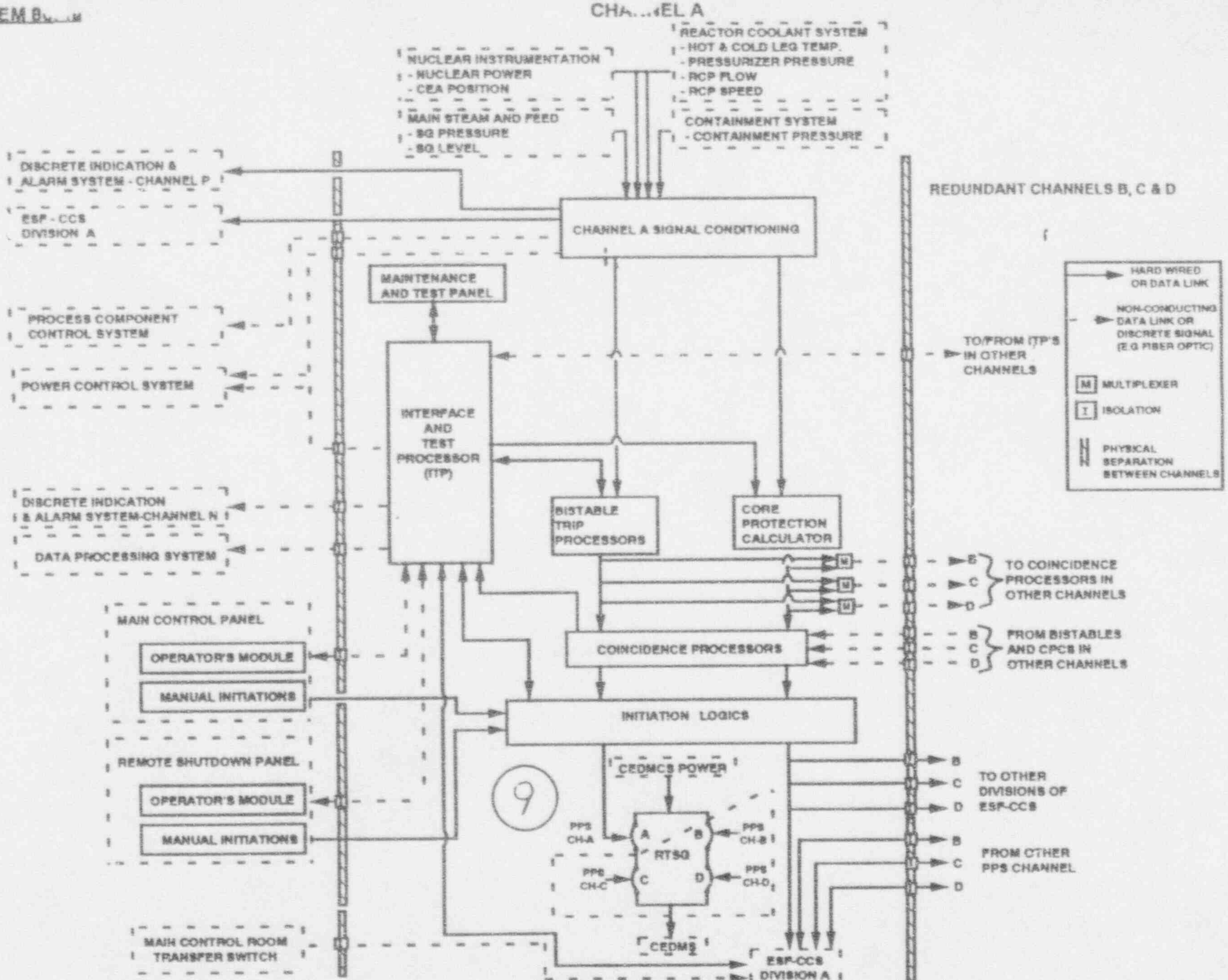

FIGURE 2.5.1-2
PLANT PROTECTION SYSTEM INTERCONNECTIONS

(RISC) →

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The reactor trip switchgear can be tripped manually from the Main Control Room or the Remote Shutdown Room. The manual reactor trip uses hardwired circuits which are independent of the PPS bistable and coincidence processors. Once a reactor trip has been initiated, the breakers in the reactor trip switchgear latch open.

Upon coincidence of two like signals indicating a condition for generating an ESFAS, the ESF initiation logic transmits the respective initiation signal to the ESF-CCS.

The PPS interfaces in the Main Control Room allow for manual activation of each of the ESF initiating signals input to the ESF-CCS. The PPS interfaces in the Remote Shutdown Room allow for manual activation of the initiating signals for Main Steam Isolation. Manual activation of these initiating signals is independent of the PPS bistable and coincidence processors.

The PPS operator's modules at the Main Control Room, the Remote Shutdown Room and at the maintenance and test panel allow operators to enter trip channel bypasses, operating bypasses, and variable setpoint resets. These modules provide indication of bypass status and bistable trip and pre-trip status.

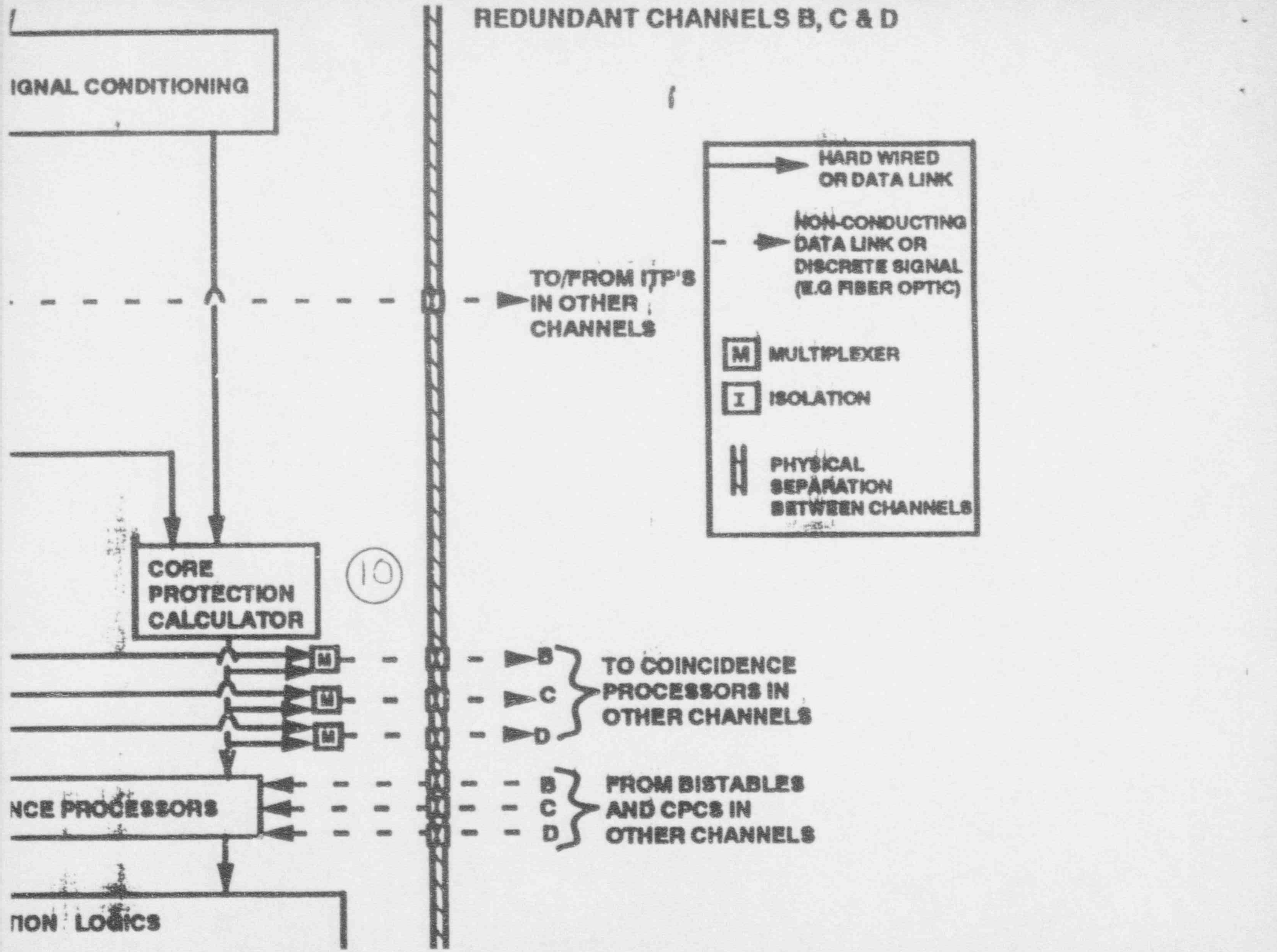
Manual control capability for the PPS is transferred from the Main Control Room to the Remote Shutdown Room upon actuation of the Master Transfer Switches via signals from the ESF-CCS for all control functions except reactor trip. The manual reactor trip switches are active in both locations at all times. Provision for transferring PPS control capability back to the Main Control Room is provided at the maintenance and test panel.

Loss of power to, or disconnection of a reactor trip path component in a PPC or CPC will cause a trip initiating state to be detected in a downstream component in that channel.

Periodic testing to verify operability of the PPS can be performed with the reactor at power or when shutdown without interfering with the protective function of the system. Overlap in individual tests assures that all functions are tested from sensor input through to the actuation of a reactor trip circuit breaker and to the generation of protection function initiation signals provided to the ESF-CCS.

The ITP monitors the on-line continuous automatic PPC and CPC hardware testing and performs on-line periodic automatic software logic functional testing of PPS logic.

Where automatic testing is implemented in the PPS, it does not degrade the capability of the PPS to perform its protective function. Indication of the automatic test system status and test results are provided to the operator via the Interface and Test Processor interface to the DIAS and DPS.


REDUNDANT CHANNELS B, C & D
IGNAL CONDITIONING
TO/FROM ITP'S IN OTHER CHANNELS
HARD WIRED OR DATA LINK
NON-CONDUCTING DATA LINK OR DISCRETE SIGNAL (E.G FIBER OPTIC)
M MULTIPLEXER
I ISOLATION
PHYSICAL SEPARATION BETWEEN CHANNELS
CORE PROTECTION CALCULATOR
10
B
C
D
TO COINCIDENCE PROCESSORS IN OTHER CHANNELS
NCE PROCESSORS
B
C
D
FROM BISTABLES AND CPCS IN OTHER CHANNELS
TION LOGICS

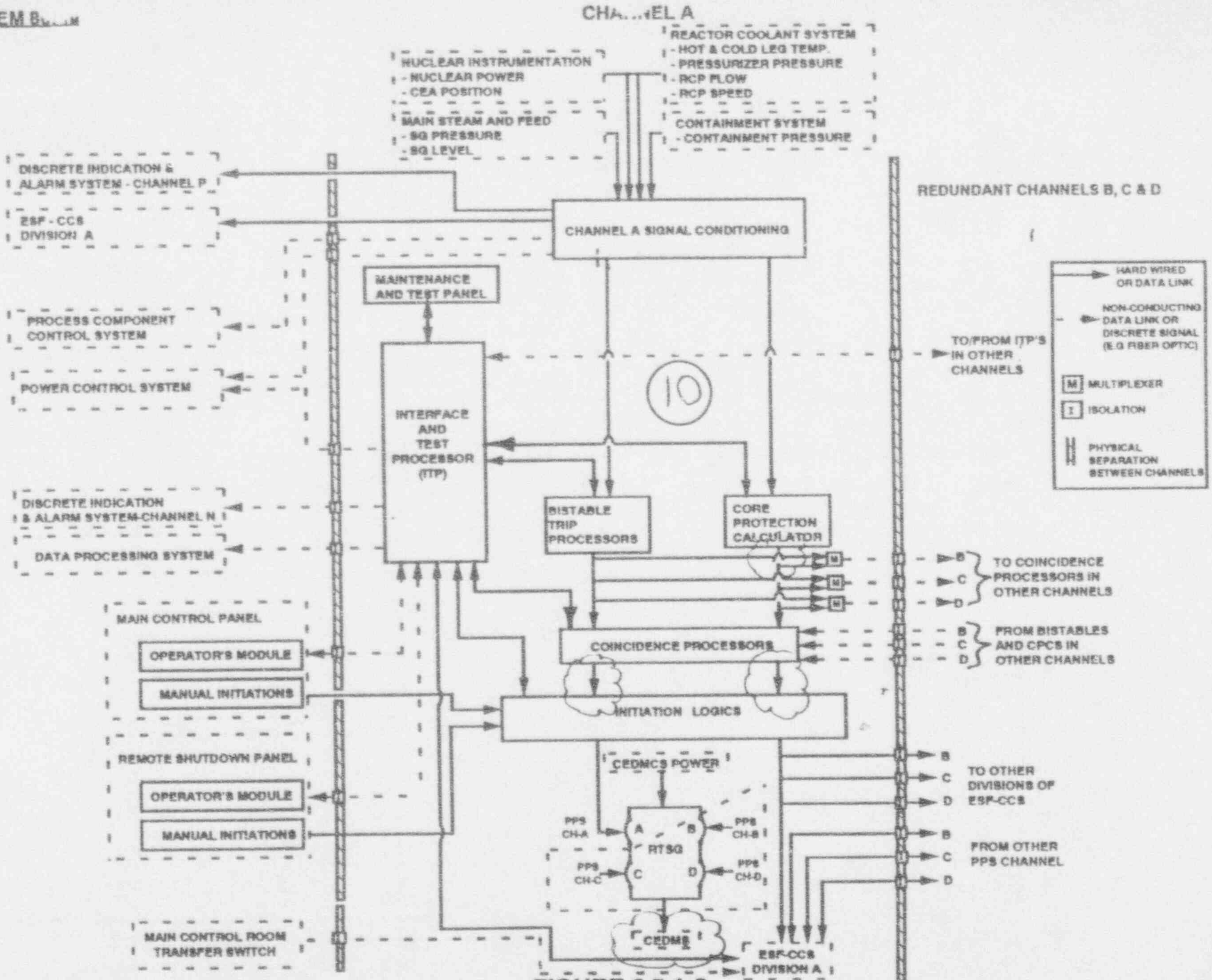
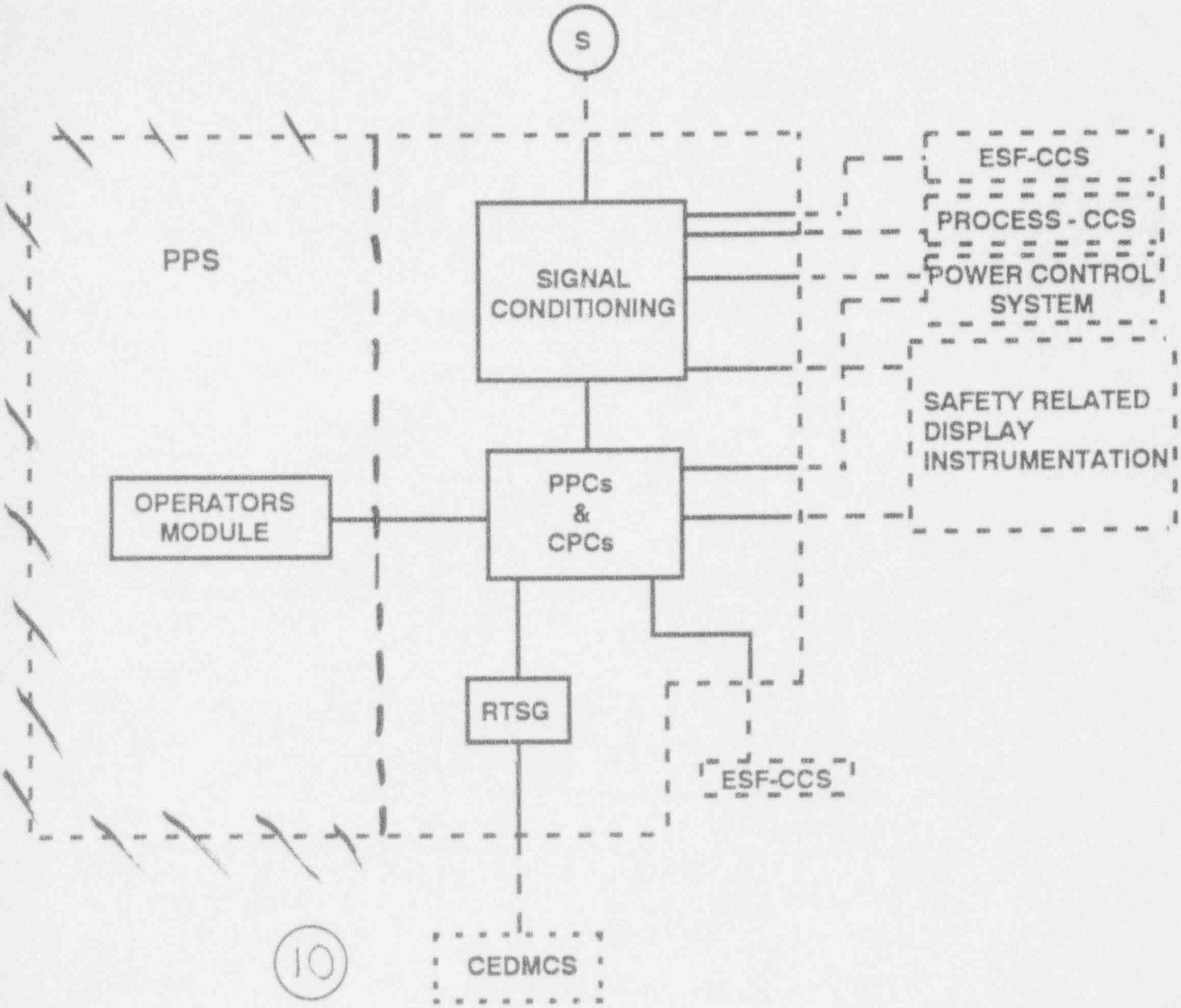


FIGURE 2.5.1-2
PLANT PROTECTION SYSTEM INTERCONNECTIONS



NOTES:

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2. PPS EQUIPMENT IS POWERED FROM CLASS 1E SUPPLIES.
3. EACH PPS CHANNEL (4 IN NUMBER) IS POWERED FROM A SEPARATE CLASS 1E BUS.

FIGURE 2.5.1-1
PPS CONFIGURATION

Initiation Logic
Reactor Trip Switchgear
Interface and Test Processor
Operator's Modules
Switches for Manual Activation of Reactor Trip Signals
Switches for Manual Activation of ESF Initiating Signals

Figure 2.5.1-2 shows the plant systems in which process instrumentation is implemented for generation of the sensor signal input to the PPS. Limit logic for process-value to setpoint comparison is implemented in bistable processors in each channel. The bistable processors generate trip signals based on the channel digitized value exceeding a digital setpoint. The PPS maintenance and test panels provide the capability for trip limit setpoint changes. Limit logic for calculated departure from nucleate boiling ratio and high linear heat generation rate are implemented in each channel in a section of the PPS referred to as the Core Protection Calculator (CPC).

The trip output signals of the bistable processors and the CPC in each channel are sent to the local coincidence logic processors in all four PPS channels. Therefore, for each trip condition, the local coincidence logic processor in each channel receives four trip signals, one from its associated bistable processors or CPC from within the channel, and one from the equivalent bistable processors or CPC located in each of the other three redundant channels. The coincidence processors evaluate the local coincidence logic based on the state of the four like trip signals and their respective bypasses. A coincidence of any two like trip signals is required to generate a reactor trip or ESF initiation signal.

Operating bypasses are implemented in the PPS to provide for the bypass of trip functions which are plant mode specific. These bypasses are manually activated. The PPS automatically removes an operating bypass if the plant approaches conditions for which the associated trip function is designed to provide protection. Bistable trip channel bypasses allow one channel of the bistable inputs to the coincidence processors to be bypassed for each trip function. This converts the local coincidence logic to two-out-of-three coincidence for each trip function for which a bistable trip channel bypass is initiated. For each trip function, the PPS allows only one bistable trip channel to be bypassed at a time.

Upon coincidence of two like signals indicating one of the conditions for reactor trip, the PPS logic initiates actuation of a channel of the reactor trip switchgear. As shown on Figure 2.5.1-2, actuation of a selective two single channels of the reactor trip switchgear is required to cause a reactor trip. The reactor trip switchgear breakers interrupt power to the Control Element Drive Mechanism (CEDM) coils, allowing all Control Element Assemblies to drop into the core by gravity.

10

SAFETY GUIDE 11

INSTRUMENT LINES PENETRATING PRIMARY REACTOR CONTAINMENT

A. Introduction

General Design Criteria 55 and 56 require that each line that penetrates primary reactor containment and is part of the reactor coolant pressure boundary or that is connected directly to the containment atmosphere have one automatic valve inside and one automatic valve outside containment "unless it can be demonstrated that the design is acceptable on some other defined basis." This guide describes a suitable basis which may be used to implement General Design Criteria 55 and 56 for demonstrating the acceptability of a particular group of these lines, namely, instrument lines.

B. Discussion

Valving provided for each instrument line penetrating or connected to primary reactor containment must reflect the importance of two safety functions: (1) the function the line performs and (2) the need to maintain containment leaktight integrity. The probability of achieving the first function is enhanced by inclusion of fewer valves (e.g., one rather than two), whereas that of the second function is enhanced by additional valves.

In the event of a rupture of any component in the instrument line outside primary containment, it is important to assure that the integrity and functional performance of secondary containment and its associated filtration systems are maintained. It is also desirable to keep the rate and extent of coolant loss from the ruptured component within the capability of reactor coolant makeup system. The probability of such a rupture is considered to be sufficiently high that the calculated offsite exposures that might result from such a single failure during normal operation should be substantially below the guidelines of 10 CFR 100.

The rate of coolant loss from an instrument line rupture outside containment can be reduced by including flow restrictions, such as orifices, in the instrument line. The flow restrictions should be sized to reduce this rate of coolant loss to the extent practical without adversely affecting the capability of the connected instruments to perform their functions. In particular, it must be assured that the response time of the instruments does not become unacceptably long because of such flow restrictions and that the flow restrictions will not become plugged. It is also desirable that flow restrictions in the instrument line be located as close as practical to where the instrument line connects to the reactor coolant system.

If the conditions of the two preceding paragraphs are satisfied, an acceptable capability for isolating instrument lines penetrating or connected to primary reactor containment can be provided by a single isolation valve capable of automatic operation (no dependence on operator actions) or capable of remote operation by the operator in the control room or another appropriate location. A self actuated excess flow check valve is acceptable as an automatically operated valve if it has the other features needed for this service. It is desirable that the isolation valve be located outside containment for greater accessibility. For power operated valves, which may provide a safety function in either the open or closed position, on balance, greater safety will be afforded by designing this valve to remain "as-is" (usually open) if power is lost.

(12)

(13)

Elimination of the isolation valve inside containment makes it important that there be a high degree of assurance that the piping from the containment up to and including the outside valve retain its integrity during normal reactor operation and under accident conditions. This assurance can be provided by locating the valve as close to containment as practical, by adopting a conservative approach in the design of this section of piping, by suitable quality assurance provisions, and by suitable visual inservice inspections. Performing inservice inspections should not increase the probability of damaging the instrument lines. In addition, provisions may be needed to protect against accidental damage of lines and to assure that failures of one line will not induce failure of any other line by pipe whip, missiles, or some other mechanism.

Sufficient experience with valves of a similar type should be available to assure a high probability that the valve will not close when the instrument line is intact and its safety function is required, but that it will close if the instrument line is ruptured downstream. In the event of a rupture downstream of the valve, the valve should close automatically or be capable of being closed during normal reactor operation and under accident conditions. In addition, the valve should reopen automatically or be capable of being reopened readily under the conditions that prevail when reopening is appropriate. It should not be necessary to break a line to reopen a closed valve.

It is desirable to have valve status (opened or closed indicated in the control room because without such an indication, a valve may be closed and the effectiveness of the instrument impaired for long periods of time. For remotely operable valves, the operator needs sufficient information regarding the status of the valve and the condition of the line so that he can take proper, timely actions.

Lines connected to instruments that are part of the protection system are extensions of that system and should satisfy the requirements for redundancy, independence, and testability for the protection system, to assure that the protective function will be accomplished.

Lines connected only to instruments that are not part of the protection system need not meet the requirements of the protection system. For these lines, the assurance that isolation can be effected when required is of greater importance to safety than the capability of the connected instrument function; therefore, more extensive valving is acceptable.

(12) C. Regulatory Position

(13) To implement General Design Criteria 55 and 56 for instrument lines penetrating or connected to primary reactor containment:

1. *Sensing lines for instruments that are part of the protection system:*
   a. Should satisfy the requirements for redundancy, independence, and testability of the protection system.
   b. Should be sized or orificed to assure that in the event of a postulated failure of the piping or of any component (including the postulated rupture of any valve body) in the line outside primary reactor containment during normal reactor operation, (1) the leakage is reduced to the maximum extent practical consistent with other safety requirements, (2) the rate and extent of coolant loss are within the capability of the reactor coolant makeup system, (3) the integrity and functional performance of secondary containment, if provided, and associated safety systems (e.g., filters, standby gas treatment system) will be maintained, and (4) the potential offsite exposure will be substantially below the guidelines of 10 CFR 100.
   c. Should be provided with an isolation valve capable of automatic operation [1] or remote operation from the control room or from another appropriate location, and located in the line outside the containment as close to the containment as practical. There should be a high degree of assurance that this valve (1) will not close accidentally during normal reactor operation, (2) will close or be closed if the instrument line integrity outside containment is lost during normal reactor operation or under accident conditions, and (3) will reopen or can be reopened under the conditions that would prevail when valve reopening is appropriate. Power-operated valves should remain as-is upon loss of power. The status (opened or closed) of all such isolation valves should be indicated in the control room. If a remotely operable valve is provided, sufficient information should be available in the control room or other appropriate location

[1] A self-actuated excess flow check valve is acceptable as an automatically operated valve provided it has all other features specified in the guide.

credible failures on the non-1E side of the isolation device will affect the PPS side and that independence of the PPS is not jeopardized.

7.1.2.11 Conformance to IEEE 387-1984

Conformance to IEEE 387-1984 , "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," as criteria in the design of these systems is discussed in Sections 8.3.1, and 9.5.4 through 9.5.8.

7.1.2.12 Conformance to IEEE 450-1980

Conformance to IEEE 450-1980, "IEEE Recommended Practice for Large Lead Storage Batteries for Generating Stations and Substations," as criteria in the design of these systems is discussed in Chapter 8.

7.1.2.13 Conformance to IEEE 603-1980, as Augmented by Regulatory Guide 1.153

The safety systems such as PPS, ESF-CCS and RTSS conform to the requirements of IEEE 603-1980, "Standard Criteria for Safety Systems for Nuclear Power Generating Stations," as augmented by Regulatory Guide 1.153, "Criteria for Power, Instrumentation, and Control Portion of Safety Systems." For descriptions of conformances, refer to Sections 7.1.2.2, 7.1.2.3, 7.1.2.5, 7.1.2.7, 7.1.2.9 and 7.1.2.10.

7.1.2.14 Comparison of Design with Regulatory Guide 1.6

See Chapter 8.

7.1.2.15 Conformance to Regulatory Guide 1.11

Guidelines for instrument lines which penetrate primary reactor containment, and which are part of the reactor coolant pressure boundary or are connected directly to the containment atmosphere do not apply, since there are no lines which fall into this category. Containment pressure is monitored by four redundant pressure transmitters located outside of containment which monitor containment atmosphere. The lines both inside and outside containment are kept as short as possible. These lines and the transmitter diaphragm are considered an extension of the containment building. No other instrument lines penetrate reactor containment.

remote operator's modules located in the control room. In addition, the status of each bypass is provided to the plant Data Processing System.

7.1.2.21.3 ESF Components Inoperable

The bypassed and/or inoperable condition of ESF components is monitored by the ESF-CCS, as described in Section 7.3. ESF-CCS status outputs are provided to the Data Processing System (DPS) which processes logic to indicate at the system level, the bypassing, inoperability or deliberate inducing of inoperability of an ESF system. The DPS also provides status information at the component level. The operator has the ability to activate each ESF system level bypass indicator manually in the control room. Inoperable indication is shown on the DPS CRTs, Integrated Process Status Overview (IPSO) panel and Discrete Indication and Alarm System (DIAS) alarm tiles as further described in Sections 7.7.1.4 and 7.7.1.5.

7.1.2.22 Conformance to Regulatory Guide 1.62

Manual initiation of the RPS is described in Sections 7.2.1.1.1.11 and 7.2.2.3.2. Manual initiation of the ESFAS is described in Section 7.3.2.3.2. Conformance to Regulatory Guide 1.62, "Manual Initiation of Protective Actions," is as follows:

A. Each of the above systems can be manually actuated.

(14) B. Manual initiation of a protective action causes the same actions to be performed by the protection system as would be performed if the protection system had been initiated by automatic action.

C. Manual switches are located in the control room, ESF-CCS and at the RTSS for use by the operators. Some ESF functions also have manual actuation at the Remote Shutdown Panel.

D. The amount of equipment common to the manual and automatic initiation paths is kept to a minimum, usually just the actuation devices. No single credible failure in the manual, automatic, or common portions of the protective system will prevent initiation of a protective action by manual or automatic means.

E. Manual initiation requires a minimum of equipment consistent with the needs of A, B, C, and D above.

F. Once initiated, manual protective action will go to completion.

U.S. ATOMIC ENERGY COMMISSION

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

October 1973

(14)

REGULATORY GUIDE 1.62

MANUAL INITIATION OF PROTECTIVE ACTIONS

A. INTRODUCTION

Paragraph (h), "Protection Systems," of § 50.55a, "Codes and Standards," of 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that protection systems meet the requirements set forth in the Institute of Electrical and Electronics Engineers "Criteria for Nuclear Power Plant Protection Systems" (IEEE 279)[1]. Section 4.17, "Manual Initiation," of IEEE Std 279-1971 requires that protection systems include means for manual initiation of each protective action at the system level and that the single-failure criterion as set forth in Section 4.2 of IEEE 279 be met. This guide describes a method acceptable to the AEC Regulatory staff for complying with the requirements of Section 4.17 of IEEE Std 279-1971 for including the means for manual initiation of protective actions. This guide applies to all types of nuclear power plants. The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

B. DISCUSSION

Section 4.17 of IEEE Std 279-1971 includes among its requirements the following: (1) manual initiation of each protective action shall be provided at the system level, (2) no single failure shall prevent initiation of protective action, and (3) manual initiation shall depend upon the operation of a minimum of equipment.

It has been contended that in order to meet the requirement of a minimum of operating equipment, manual initiation at the system level could be achieved by the actuation of the several individual manual switches of the protection system components. However, the actuation of the several individual manual switches does not take into account the performance of other actions essential in system-level initiation such as starting auxiliary or supporting systems, sending signals to appropriate valve-actuating mechanisms to assure correct valve position, or providing required action-sequencing functions and any required interlocks.

C. REGULATORY POSITION

1. Means should be provided for manual initiation of each protective action (e.g., reactor trip, containment isolation) at the system level, regardless of whether means are also provided to initiate the protective action at the component or channel level (e.g., individual control rod, individual isolation valve).

2. Manual initiation of a protective action at the system level should perform all actions performed by automatic initiation such as starting auxiliary or supporting systems, sending signals to appropriate valve-actuating mechanisms to assure correct valve position, and providing the required action-sequencing functions and interlocks.

3. The switches for manual initiation of protective actions at the system level should be located in the control room and be easily accessible to the operator so that action can be taken in an expeditious manner.

4. The amount of equipment common to both manual and automatic initiation should be kept to a minimum. It is preferable to limit such common equipment to the final actuation devices and the actuated equipment. However, action-sequencing functions and interlocks (of Position 2) associated with the final actuation devices and actuated equipment may be common if individual manual initiation at the component or channel level is provided in the control room. No single failure within

[1] Copies may be obtained from the Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, N.Y. 10017.

the manual, automatic, or common portions of the protection system should prevent initiation of protective action by manual or automatic means.

5. Manual initiation of protective actions should depend on the operation of a minimum of equipment, consistent with 1, 2, 3, and 4 above.

6. Manual initiation of protective action at the system level should be so designed that once initiated, it will go to completion as required in Section 4.16 of IEEE Std 279-1971.

3.3 INSTRUMENTATION

3.3.2 Reactor Protective System (RPS) Instrumentation - Shutdown

LCO 3.3.2 Four RPS TRIP CHANNELS and operating bypass removal CHANNELS for each Function in Table 3.3.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.2-1

-----NOTES-----

1. Separate Condition entry is allowed for each RPS Function.

2. If a CHANNEL is placed in bypass, continued operation with the CHANNEL in the bypassed condition for the Completion Time specified by Required Action A.2 or C.2.2 shall be reviewed in accordance with Specification [5.5.1.2.e].

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one automatic RPS TRIP CHANNEL inoperable.	A.1 Place CHANNEL in bypass or trip. AND A.2 Restore CHANNEL to OPERABLE status.	1 hour 15 Prior to entering MODE 2 following next MODE 5 entry
B. One or more functions with two automatic RPS TRIP CHANNELS inoperable.	-----NOTE----- LCO 3.0.4 is not applicable. ---------- B.1 Place one CHANNEL in bypass and place the other in trip.	1 hour

(Continued)

7.2.1.1.7 Redundancy

Redundant features of the RPS include:

A. Four independent channels, from process sensor through and including channel trip bistables. The CEA position input is from two independent channels.

B. Four redundant sets of local coincidence logics, each set performs a full two-out-of-four trip function.

C. Four initiation circuits, including four control logic paths and four sets of two initiation relays (shunt trip and undervoltage).

D. Two pairs of manual trip pushbuttons with either pair being sufficient to cause a reactor trip.

E. AC power for the system from four separate vital instrument buses. DC power for the trip switchgear circuit breakers control logic is provided from four separate battery systems, as described in Chapter 8.

The result of the redundant features is a system that meets the single failure criterion, can be tested during reactor operation, and can be shifted to two-out-of-three coincidence logic until the next time the unit is in Mode 5 if necessary.

The benefit of a system that includes four independent and redundant channels is that the system can be operated, if need be, with up to two channels out of service (one bypassed and another tripped) and still meet the single failure criterion. The only operating restriction while in this condition (effectively one-out-of-two logic) is that no provision is made to bypass another channel for periodic testing or maintenance. The system logic must be restored to at least a three operating channel condition prior to removing another channel for maintenance. (See Technical Specifications for the RPS.)

7.2.1.1.8 Diversity

The system is designed to eliminate credible multiple channel failures originating from a common cause. The failure modes of redundant channels and the conditions of operation that are common to them have been considered in the design to assure that a predictable common failure mode does not exist. The design provides reasonable assurance that:

7.2 REACTOR PROTECTIVE SYSTEM

7.2.1 DESCRIPTION

7.2.1.1 System Description

The Reactor Protective System (RPS) portion of the Plant Protection System (PPS) (as shown on Figure 7.2-1) is a vital system which consists of sensors, calculators, logic, and other equipment necessary to monitor selected plant conditions and to effect reliable and rapid reactor shutdown (reactor trip) if monitored conditions approach specified safety system settings. The system's functions are to protect the core fuel design limits and Reactor Coolant System (RCS) pressure boundary for Anticipated Operational Occurrences, and also to provide assistance in mitigating the consequences of accidents. Four measurement channels with electrical and physical separation are provided for each parameter used in the direct generation of trip signals, with the exception of Control Element Assembly (CEA) position which is a two channel measurement.

The Reactor Protective System (RPS) portion of the PPS includes the following functions: bistable trip, local coincidence logic, reactor trip initiation logic and automatic testing of PPS logic. The bistable trip processors generate trips based on the measurement channel digitized value exceeding a digital setpoint. The bistable trip processors provide their trip signals to the coincidence processors located in the four redundant PPS channels. The coincidence processors evaluate the local coincidence logic based on the state of the four like trip signals and their respective bypasses. The coincidence signals are used in the generation of the Reactor Trip Switchgear System (RTSS) or Engineered Safety Features-Component Control System (ESF-CCS) initiation. Software is developed and tested for the above processors, as stated in Section 7.1. A coincidence of two-out-of-four like trip signals is required to generate a reactor trip signal. The fourth channel is provided as a spare and allows bypassing of one channel while maintaining a two-out-of-three system.

The NPX80+ Plant Protection System (PPS) has four pairs of cabinets housing the Plant Protection Calculator (PPC). Each pair of cabinets is located in a separate equipment room and contains the bistable processors, coincidence processors and interface hardware of one of the four PPS safety channels designated A, B, C and D.

The design is based upon the use of Programmable Logic Controller (PLC) type equipment in each safety channel. All protective channel process loop inputs, protective channel trip functions, and the 2/4 Logic Matrix functions will be processed within the PLC's in that safety channel.

The reactor trip signal deenergizes the Control Element Drive Mechanism (CEDM) coils, allowing all CEAs to drop into the core.

PPS interfaces (RPS and ESFAS) for functions, such as operator interaction, alarm annunciation and testing (manual and automatic), are shown on Figure 7.2-2.

The local and main control room PPS operator's module (one per channel) provides for entering trip channel bypasses, operating bypasses, and variable setpoint resets. These modules also provide indication of status of bypasses, operating bypasses, bistable trip and pre-trip. The local operator module provides the man-machine interface during manual testing of bistable trip functions not tested automatically.

The main control room (MCR) panels provide means to manually initiate engineered safeguards.

The Remote Shutdown Panel (RSP) provides selected functions needed for safe shutdown and cooldown, as described in Section 7.4.

Each PPS channel cabinet contains a manual transfer switch that enables the RSP or MCR for PPS channel functions that are common to both.

The Interface and Testing Processor (ITP), one per channel, consists of a data bus and three functional blocks: i.e., two gatewaty blocks and one test/bypass block, as shown in Figure 7.2-17. Gateway #1 interfaces to: the PPS Operators Module at the RSP; the Data Processing System, to provide selected PPS and CEAC channel status and test results information; and the CEAC, to retrieve status information. Gateway #2 interfaces to: the PPS Operators Module at the MCR; the Discrete Indication and Alarm System, to provide selected PPS and TLC channel status and test results information; the TLC, to retrieve status information; and the Power Control System, to retrieve status information. The test and bypass processor performs automatic on-line and manual testing of the PPC, processes the bypass logic and interfaces to the ITP's in other PPS channels via the data bus interfaces to the bistable processors and coincidence processors. A data bus bridge interfaces to the ESF-CCS.

A. The monitored variables provide adequate information during design basis events (design basis events are listed in Sections 7.2.2.1.1 and 7.2.2.1.2).

B. The equipment can perform as required.

C. The interactions of protective actions, control actions and the environmental changes that cause, or are caused by the design basis events do not prevent the mitigation of the consequences of the event.

D. The system will not be made inoperable by the inadvertent actions of operating and maintenance personnel.

E. There are alternate bistable trips available to provide the reactor trip function, should the initial trip function used in the safety analysis be disabled. This is accomplished by
17 distributing the systems protective functions between two processors within each of the redundant PPS cabinets, such that a degree of functional diversity is achieved. As depicted on Figure 7.2-12 bistable trip and local coincidence logic functions are not implemented together in the same processors.

In addition, the bistable trip functions are further distributed between the bistable processors within a redundant PPS cabinet. The distribution assignment is based on a review of the safety analysis transients, such that when multiple trips are available to mitigate the transient, they are assigned between two separate bistable trip logic processors. This diversity improves the availability of the system to handle a transient.

F. Plant protection is augmented through the use of a separate and diverse Alternate Protection System as described in Section 7.7.1.1.11.

G. Both the RPS and Process-CCS which includes the Alternate Protection System utilize two different design types, thereby eliminating those hardware and software design common causes which may make them both inoperable.

To elaborate on this philosophy, Table 7.2-6 defines all critical safety functions and identifies the plant systems available to maintain those functions (i.e., success paths) and the I&C systems that control them.

It is noted that the availability of System 80+ non-safety systems is significantly improved when compared to previous licensed designs due to the addition of battery-backed power

TABLE 3.3.2-1

REACTOR PROTECTION INSTRUMENTATION - SHUTDOWN

	Function	Applicable Modes or Other Specified Conditions	Surveillance Requirements	Allowable Value
1.	Logarithmic Power Level - High[b]	3[a], 4[a], 5[a]	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6 SR 3.3.2.7 SR 3.3.2.8	≤ [0.018] % RTP
2.	Steam Generator Pressure #1 - Low[c]	3[a]	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.4 SR 3.3.2.6 SR 3.3.2.7 SR 3.3.2.8	≥ [843 psia]
3.	Steam Generator Pressure #2 - Low[c]	3[a]	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.4 SR 3.3.2.6 SR 3.3.2.7 SR 3.3.2.8	≥ [843 psia]
4.	Reactor Coolant Flow - Low[d]	3[a], 4[a], 5[a]	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.4 SR 3.3.2.6 SR 3.3.2.7 SR 3.3.2.8	Rate: [*] psi/sec Floor: [*] psid Step: [*] psi
5.	Local Power Density - High[e]	3[a], 4[a], 5[a]	SR 3.3.2.1 SR 3.3.2.2 SR 3.3.2.3 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6 SR 3.3.2.7 SR 3.3.2.8	≤ [21.0] kw/ft
6.	Departure from Nucleate Boiling Ratio - Low[e]	3[a], 4[a], 5[a]	SR 3.3.2.1 SR 3.3.2.2 SR 3.3.2.3 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6 SR 3.3.2.7 SR 3.3.2.8	≥ [1.24]

(a) With any Reactor Trip Circuit Breakers (RTCBs) closed and any Control Element Assembly capable of being withdrawn.

(b) Trip may be bypassed when THERMAL POWER is > [1E-4] RTP. Operating bypass shall be automatically removed when THERMAL POWER is ≤ [1E-4]% RTP. Trip may be manually bypassed during physics testing pursuant to LCO [3.4.17] "RCS Loops - Test Exceptions".

(c) The Steam Generator Pressure - Low trip setpoint may be manually decreased as steam generator pressure is reduced, provided the margin between steam generator pressure and the setpoint is maintained at ≤ 200 psi. The setpoint shall be increased automatically as steam generator pressure is increased.

(d) The Reactor Coolant Flow - Low trip setpoints may be manually adjusted when THERMAL POWER is < 10^{-4}%.

(e) Trip may be bypassed when THERMAL POWER is < [1E-4]% RTP. Operating bypass shall be automatically removed when THERMAL POWER is ≥ [1E-4]% RTP. During testing pursuant to LCO 3.4.17, trip may be bypassed below [5%] RTP. Operating bypass shall be automatically removed when THERMAL POWER is > [5%] RTP.

* Value to be determined by system detail design.

(19)

1. The test task removes the test signal before the initiation circuit time delay can respond.

2. Any test input signal not removed by the automatic test will be removed by the timing logic built into the bistable trip logic. The actual measurement channel signal is not affected by this function; its input into the bistable is thus assured at all times.

B. Manual Bistable Testing

Manual testing of the bistable logic functions can be performed to verify proper bistable logic functions not tested automatically.

The testing is accomplished by varying the input signal up to or down to the trip setpoint level on one bistable logic function at a time.

Varying the input signal is accomplished by the test function in the manual mode, via instructions entered at the maintenance and test panel. Testing is interlocked so that it can be used in only one channel at a time. The test signal is digitally displayed at the maintenance and test panel along with the bistable's trip status.

The interlock assures the manual bistable testing can only be used in one channel at a time. The interlock is satisfied when trip channel bypasses from the 4 protective channels for the selected bistable are true. This places the selected bistables LCLs in a two-out-of-three coincidence. Because a test signal can be less conservative than the process input applied during manual bistable testing, the bistable trip output is forced into a tripped state while the momentary trip test switch is active. Deactivating the switch or changing the trip channel bypass status will remove the test input voltage and forced trip.

C. Manual Testing of Variable Setpoint with Automatic Rate Limiting

Manual testing of bistables that utilize this type of setpoint verifies that:

1. The setpoint tracks the input signal both for increasing and decreasing signals.

B. Bistable Trip Channel Bypass Testing

A description of testing bistable trip channel bypasses is included as part of the local coincidence logic testing described in Section 7.2.1.1.9.4.

7.2.1.1.9.8 **Response Time Tests**

Response time testing of the complete Reactor Protective System, is accomplished by the combined use of portable field installed test equipment and test features provided as part of the PPS test function.

Measurement Channel Response Time Tests, which include portions of the system (such as cables and sensors) may be conducted on a system basis or an overlapping subsystem basis.

Methods which are used to conduct these tests include:

A. Perturbation and monitoring of plant parameters - either during operation or while shutdown. This method is applicable to RTDs (monitored following a plant trip), reactor coolant pump speed sensors (monitored following turn-off of pump), and CEA position reed switches (monitored during CEA motion).

20 B. On-line power spectral density analysis. This method would be applicable to analog sensors.

C. Off-line injection of step or ramp changes for RPS inputs. This method would be applicable to sensors (via special pressure test rigs, hot oil baths or hot sand boxes) or electronics and logic (via special electrical test boxes).

D. The test function in the course of its normal testing implicitly verifies that the response time of the PPS is less than a known upper limit. The upper limit is bounded by the bistable logic processor execution time (fixed) plus the coincidence processor execution time (fixed) plus the worst case skew time due to the asychronous operation of the processor. An independent timer monitors the fixed execution time and provides overrun status. The test function reads this status and will annunciate a failure.

E. Operation and monitoring of actuated devices. This method would be applicable to the CEDMs, including their control logic and switchgear.

Steam Generator Pressure - Low
Containment Pressure - High
Reactor Coolant Flow - Low
Departure from Nucleate Boiling Ratio - Low
Linear Heat Generation Rate - High

Setpoints for initiation of a reactor trip are installed for each monitored condition to provide for initiation of a reactor trip prior to exceeding reactor fuel thermal limits and the Reactor Coolant System pressure boundary limits for anticipated operational occurrences. If a monitored condition ~~exceeds~~ reaches its setpoint, the PPS automatically actuates the reactor trip switchgear. (21)

Engineered Safety Features Initiation Function

Process instrumentation, the PPCs, the ESF-CCS, motor starters and other actuated devices function to initiate the engineered safety feature systems. The process instrumentation provides sensor data input to the PPCs, which monitor the following plant conditions to initiate the engineered safety features systems.

Pressurizer Pressure - Low
Steam Generator Water Level - Low or High
Steam Generator Pressure - Low
Containment Pressure - High

If a monitored condition ~~exceeds~~ reaches its setpoint, the PPCs automatically generate one or more of the following Engineered Safety Feature Actuation Signals (ESFAS). (21)

Safety Injection Actuation Signal
Containment Isolation Signal
Containment Spray Actuation Signal
Main Steam Isolation Signal
Emergency Feedwater Actuation Signals

These initiating signals are provided to the ESF-CCS, which responds by actuating the engineered safety feature systems.

Elements Of The PPS

The PPS is divided into four redundant channels. The following elements, depicted in Figures 2.5.1-2 and 2.5.1-3, are included in each channel of the PPS:

Process Instrumentation
Signal Conditioning Equipment
Limit Logic (PPC Bistables and CPCs)
Local Coincidence Logic

Initiation Logic
Reactor Trip Switchgear
Interface and Test Processor
Operator's Modules
Switches for Manual Activation of Reactor Trip Signals
Switches for Manual Activation of ESF Initiating Signals

Figure 2.5.1-2 shows the plant systems in which process instrumentation is implemented for generation of the sensor signal input to the PPS. Limit logic for process-value to setpoint comparison is implemented in bistable processors in each channel. The bistable processors generate trip signals based on the channel digitized value ~~exceeding~~ a digital setpoint. The PPS maintenance and test panels provide the capability for trip limit setpoint changes. Limit logic for calculated departure from nucleate boiling ratio and high linear heat generation rate are implemented in each channel in a section of the PPS referred to as the Core Protection Calculator (CPC).

The trip output signals of the bistable processors and the CPC in each channel are sent to the local coincidence logic processors in all four PPS channels. Therefore, for each trip condition, the local coincidence logic processor in each channel receives four trip signals, one from its associated bistable processors or CPC from within the channel, and one from the equivalent bistable processors or CPC located in each of the other three redundant channels. The coincidence processors evaluate the local coincidence logic based on the state of the four like trip signals and their respective bypasses. A coincidence of any two like trip signals is required to generate a reactor trip or ESF initiation signal.

Operating bypasses are implemented in the PPS to provide for the bypass of trip functions which are plant mode specific. These bypasses are manually activated. The PPS automatically removes an operating bypass if the plant approaches conditions for which the associated trip function is designed to provide protection. Bistable trip channel bypasses allow one channel of the bistable inputs to the coincidence processors to be bypassed for each trip function. This converts the local coincidence logic to two-out-of-three coincidence for each trip function for which a bistable trip channel bypass is initiated. For each trip function, the PPS allows only one bistable trip channel to be bypassed at a time.

Upon coincidence of two like signals indicating one of the conditions for reactor trip, the PPS logic initiates actuation of a channel of the reactor trip switchgear. As shown on Figure 2.5.1-2, actuation of a selective two single channels of the reactor trip switchgear is required to cause a reactor trip. The reactor trip switchgear breakers interrupt power to the Control Element Drive Mechanism (CEDM) coils, allowing all Control Element Assemblies to drop into the core by gravity.

CE80+ ITAAC Independent Review Comments

ITAAC N.2.5.2 Engineered Safety Features-Component Control System

No.	Comments	Cat.	Resolution
1	Page 1 of the DCM states that for components of the ESF-CCS EMI qualification is applied for equipment with known EMI susceptibility based on operating environment and/or inherent design characteristics. Describe how "known susceptibility" is to be determined? Revise statement to "EMI qualification is applied for equipment based on operating environment, inherent design characteristics and anticipated operating occurrences." See question 3 PPS and CESSAR 7.3.1.2 page 7.3-33 fifth paragraph.	1	AGREE - PA[illegible] ACB[illegible]
2	The DCM states that a site survey will be performed upon system installation to characterize the installed EMI environment. Define the scope of the survey. A commitment to update the survey based on plant modification and/or environmental (external and internal to the plant). Describe what actions are to be taken should the site survey indicate that the EMI equipment qualification is inadequate.	2	
3	The DCM does not list the ESF-CCS initiation signals from the PPS	1	
4	Page 3 CDM. The ESF-CCS control capability for non-ESF systems does not list control complex ventilation system. This system is listed in the ITAAC.	1	
5	Page 3 CDM the ESF is stated as providing control capability for listed safety related systems. In addition the ITAAC references status indication capability (see ITAAC item 8), add this to the CDM.	1	
6	The CDM material indicates that the ESF-CCS integrates ESF initiation and diesel generator load sequencing. Is this consolidation is addressed within the TS? For example: If the load sequencer is inoperative is the DG inoperable and the ESF-CCS? If the ESF-CCS be declared inoperable will the load sequencer and DSG be inoperable as well?	1	

7	deleted		
8	Page 4 DCM references diverse manual actuation switches as an alternate means for manual actuation of ESF components. The DCM should also reference that High level manual control is also available in all four divisions to be consistent with ITAAC item 12	1	AGR - PA - ALL - 3
9	Page 5 DCM references a graded approach to software development based on relative importance to safety. Where is this approach reflected in a standard (GDC 1?) Where would a graded approach to software development be applicable to RPS? See also ITAAC item 20	2	
10	Page 5 DCM Commercial dedication (software/hardware) dedication process appears less rigorous than that specified for the ESF-CCS specifically. Is the reference to commercial grade software intended to be limited to software required for system development (programming language, operating system)? The reference to commercial dedication of ESF-CCS software is unclear. See also ITAAC item 22	2	
11	Page 6 CDM Item b should add process measurement accuracies, environmental effects, response time and test equipment accuracy. Additionally a new item (G) should be added for test equipment accuracy and calibration (control of MTE) and that the "allowable tolerance" or "leave alone zone" components are defined (uncertainty terms). See also ITAAC Item 19	2	
12	Figure 2.5.2.1 and 2.5..2.2 list outputs ESF-CCS as ESF components only. The DCM material referenced "non-ESF" and additional safety related components. See page 3 of the CDM. Revise the figure to reflect the CDM description.	1	
13	ITAAC item 6 The acceptance criteria 6.b states that ESF initiation signals that satisfy the selective 2 out of 4 logic result in actuation signals to related system components. This should read PPS initiation signals .... result in ESF actuation signals.... to reflect the CDM description.	1	
14	ITAAC item 7, Acceptance criteria 7b. Same as 13 above. Additionally, references the control complex ventilation system as actuated by the ESF-CCS. This system is not listed in the CDM material. See page CDM page 3 and question 4 above.	1	
15	ITAAC 10b The emergency feedwater actuation signal is listed for steam generator 1 and steam generator 2. This is inconsistent with the ESF initiation signals listed elsewhere in the ITAAC/DCM (lists emergency feedwater actuation) but consistent with the TS functional units and the CESSAR.	1	

16	ITAAC 14.a The master transfer switches and the ESF-CCS maintenance test panel(transfer) appear to be located in the same fire zone. Is this acceptable per App "R" requirements? See APP. "R" III-G	2	[illegible]
17	Section 7.3.1.1 states that the ESF functions are assigned such that the effect of a single group failure to selected ESF functions in a given division. This functional diversity approach is not discussed in the CDM material.	1	
18	The "General Design Criteria" in the CESSAR Section 7.3.2.3, page 7.3-38 is inconsistent with the standard review plan criteria. Specifically, the SRP lists GDC-19 and 29 but is not listed in the CESSAR. GDCs 1, 16, 34, 35, 37, 38, 40, 41, 43, 44 and 46 are listed in the CESSAR but not applicable per the SRP. Revise the CESSAR or discuss the basis for the discrepancy.	3	
19	Typographical error, Figure 7.3-13b, should read "contactor"	3	

By: Cliff Doutt

Resolved by: ____________________

CE80+ ITAAC Independent Review Comments

ITAAC N.2.5.3 Discrete Indication and Alarm System

No.	Comments	Cat.	Resolution
1	ITAAC item 10 DIAS/DPS software development process is not described in the CDM. The software methodology listed is described in the PPS and ESFAS ITAACs for safety related software. Is the DIAS and DPS software to be developed with the above methodology or is the above intended for the PAMI system.	1	ACPTD - PASS TO ABB-CE
2	The above ITAAC references a graded approach to software development. See previous comments regarding PPS and ESFAS ITAACs	2	
3	DCM states that EMI qualification is applies to equipment with known EMI susceptibility based on operating environment and/or inherent design characteristics. How is known equipment susceptabilty determined? The DCM states that a site survey will be performed after installation to characterize the EMI environment. The site survey requirement is not listed in the ITAAC. Will emissions testing also be performed? To what standard?	1	
4	ITAAC 18 describes commercial dedication of software. Is this applicable to DIAS and DPS only or just post accident monitoring (PAMI)? If applicable to PAMI it should be stated that commercial dedication is applicable to system development (programming language, operating system) only.	1	
5	The DCM and ITAAC state that the DIAS displays and processors are designed for room ambient temperatures and humidity environmental conditions. The CESSAR 7.5.2.5, page 7.5-18 states that the temperature and humidity qualification exceeds the most severe equipment environment by a design margin. Clarify the CESSAR to indicate that listed temperature and humidity qualification applies to the PAMI system and not the DIAS or DPS portions of post accident monitoring.	1	

6	Typographical error- CESSAR, page 7.5-18 first paragraph repeats "channel up to the...". See page 7.5-17 last paragraph.	3	AGREE - PA [illegible] APP [illegible]
7	The CDM material indicates that communication provided to the DIAS-P are diverse from the communication software used in the plant protection system (PPS) and the engineered safety features-component control system. From Figures 2.5.3.1 and 2.5.3.2 and the DCM material it is unclear how diverse communication is implemented between the protection system and DIAS-P and PAMI and PAMI to DIAS-P, DIAS channel N, and DPS. Additionally, communication link depicted for protection system SC-A and B to the DIAS channel P displays should be shown hardwired. See Figure 7.5-1 CESSAR. Clarification needed.	1	
8	The DCM states that on a loss of electrical power the DIAS display will result in a blank screen, inactive running indicator or bad data symbol. Provide a description of the diagnostics and system alarms (error detection and diagnostics) available to inform the operator/maintenance of annunciator failures or problems beyond that discussed in the CDM for power supply failure. (see unrecognized loss of annunciators IN 93-47)	1	
9	Are the display rates for the DIAS adequate to provide information to the operator in a timely manner based on expected operational occurrences (transients). This is not discussed in the CDM.	1	
10			

By: Cliff Doutt

ITAAC No. 2.5.4 PCS/P-CCS

No.	Comments	Cat.	Resolution
1	PCS/P-CCS System provides various functions which include the display of safety-related variables, the required interfacing logic circuitry for safety related control circuits, the actuation of alternate reactor trips & turbine trips, etc but since it is functionally classified as non-safety related and the presentation is so nebulous, the paramount question seems to be why it is included in the design certification material? Any subsequent questions are dependent on the response to this question. However, if it is decided to allow it to remain in certified material, then the writeup in Section 2.5.4 in regard to the actual bounds and limitations of this system should be made much more clearer.	1	[illegible]
2	The level of detail provided in Figure 2.5.4-1 does not seem to warrant the satisfactory completion of ITAAC # 1 with any degree of confidence since the bounds and internals of the system are so vaguely defined. (see general comment on basic configuration)	1	
3	All control interfaces should be more clearly defined since the SAR does not provide any specific information as to what they consist of generically but addresses this particular point in the vague writeups/sketches of the affected subsystems which comprise the PCS/P-CCS System. Define these interfaces with enough detail so as to determine whether their failure has any impact on the affected safety related systems.	1	

By: Edmund A. Kleh

Resolved by: ________________

ITAAC No. 2.5.4 - PCS/P-CCS

No.	Comments	Cat.	Resolution
4	ITAAC No. 4 should be performed actually by injecting test signals into the affected circuits instead of verification of design documentation.	1	AGREE - [illegible]
5	ITAAC No. 5 does not appear to be actually simulating the function of this system in regard to signal validation and also determining the particular sensor that is either bypassed/failed.	1	
6	ITAAC No. 6 should also verify that the MCR displays can not be reset utilizing the master transfer switches at the MCR exits.	1	
7	ITAAC Nos. 9.a) and 9.b) try to verify that isolation devices are installed between this system and the affected systems with which it interfaces. However to accomplish this task the number of inputs from each subsystem which require individual isolation devices should be identified either in the certified material or the SAR since the applicable sketches lack the required detail.	1	

By: Edmund A. Klut

Resolved by: ____________

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.6.1 AC Electrical Power Distribution System

Page ___ of ___

No.	Comments	Cat.	Resolution
1			
2			
3	DD and ITAAC 24 need to be revised as shown in the attached mark-up.	1	Agree DD and DC should add "transformers". AC not to changed
4			
5	DD needs to be revised to show controls and displays provided in the MCR for EPDS. Appropriate ITAAC needs to be provided to verify this.	1	Agree CE needs to revise or justify how controls and displays are covered.

No.	Comments	Cat.	Resolution
6	The same list of abbreviations/acronyms are shown in pages Viii and IX of CESSAR, Chapter 8. One of the pages needs to be deleted.	1	Agree Send -SSAR comment

By: R. Mathew

Resolved by: D. Thatcher

Class 1E EPDS cables and raceways are identified according to their Class 1E Division. Class 1E EPDS cables are routed in Seismic Category I structures and in their respective raceways.

Class 1E equipment is not prevented from performing its safety functions by harmonic distortion waveforms.

The EPDS supplies an operating voltage at the terminals of the Class 1E equipment which is within the equipment's voltage tolerance limits.

Class 1E equipment is protected from degraded voltage conditions.

An electrical grounding system is provided for (1) instrumentation, control, and computer systems, (2) electrical equipment (switchgear, motors, distribution panels), and (3) mechanical equipment (fuel and chemical tanks). Lightning protection systems are provided for buildings and for structures located outside of the buildings. Each grounding system and lightning protection system is separately grounded to the plant ground grid.

Class 1E equipment is classified as Seismic Category I.

There are no automatic connections between Class 1E Divisions.

Interface Requirements

The offsite system shall consist of a minimum of two independent offsite transmission circuits from the transmission system.

The offsite transmission circuits shall be sized to supply their load requirements, during all design operating modes, of their respective Class 1E divisions and non-Class 1E loads.

The UMT and RATs shall be connected to independent switching stations. Switching stations and their circuit breakers shall be sized to supply their load requirements and be rated to interrupt fault currents.

Voltage variations of the transmission system shall not cause voltage variations at the loads of more than plus or minus 10% of the loads' nominal voltage rating.

The normal steady-state frequency of the offsite system shall be within plus or minus 2 Hertz of 60 Hertz during recoverable periods of system instability.

The transmission system does not subject the reactor coolant pumps to sustained frequency decays of greater than 3 Hertz per second.

Each switchyard shall have two redundant and independent 125V DC power systems to provide 125V DC power for all relaying, controls, and monitoring equipment in the switchyards.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.6.1-1 specifies the inspections, tests, analysis, and associated acceptance criteria for the AC Electrical Power Distribution System.

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9. EPDS medium voltage switchgear, low voltage switchgear and their respective transformers, MCCs, and MCC feeder and load circuit breakers are sized to supply their load requirements.	9.a) Analysis for the as-built EPDS to determine load requirements will be performed.	9.a) Analysis for the as-built EPDS exists and concludes that the capacities of the Class 1E medium voltage switchgear, low voltage switchgear and their respective transformers, MCCs, and MCC feeder and load circuit breakers, as determined by their nameplate ratings, exceed their analyzed load requirements.
	9.b) Testing of the as-built Class 1E ~~medium voltage and low voltage switchgear, and MCCs and their respective load circuit breakers~~ will be performed by operating connected Class 1E loads in the ranges of 9% to 10% above and 9% to 10% below design voltage.	9.b) Connected Class 1E loads operate in the ranges of 9% to 10% above and 9% to 10% below design voltage.
10.a) EPDS medium voltage switchgear, low voltage switchgear and their respective transformers, and MCCs are rated to withstand fault currents for the time required to clear the fault from its power source.	10.a) Analysis for the as-built EPDS to determine fault currents will be performed.	10.a) Analysis for the as-built EPDS exists and concludes that the current capacities of the Class 1E medium voltage switchgear, low voltage switchgear and their respective transformers, and MCCs exceed their analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analyses, to clear the fault from its power source.

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10.b) The GCB, medium voltage switchgear, low voltage switchgear, and MCC feeder and load circuit breakers are rated to interrupt fault currents.	10.b) Analysis for the as-built EPDS to determine fault currents will be performed.	10.b) Analysis for the as-built EPDS exists and concludes that the analyzed fault currents do not exceed the GCB and Class 1E medium voltage switchgear, low voltage switchgear, and MCC feeder and load circuit breakers interrupt capacities, as determined by their nameplate ratings.
11. EPDS interrupting devices (circuit breakers and fuses) are coordinated so that the circuit interrupter closest to the fault is designed to open before other devices.	11. Analysis for the as-built EPDS to determine circuit interrupting device coordination will be performed.	11. Analysis for the as-built EPDS exists and concludes that the analyzed Class 1E circuit interrupter closest to the analyzed fault will open before other devices.
12. Instrumentation and control power for Class 1E Divisional medium voltage switchgear and low voltage switchgear is supplied from the Class 1E DC power system in the same Division.	12. Testing of the as-built Class 1E medium and low voltage switchgear will be conducted by providing a test signal in only one Class 1E Division at a time.	12. A test signal exists in only the circuit under test.
13. The GCB is equipped with redundant trip devices which are supplied from separate non-Class 1E DC power systems.	13. Testing of the as-built GCB will be conducted by providing a test signal in only one trip circuit at a time.	13. A test signal exists in only the circuit under test.
14. EPDS cables and buses are sized to supply their load requirements.	14. Analysis for the as-built EPDS cables and buses will be performed.	14. Analysis for the as-built EPDS exists and concludes that Class 1E cables and bus capacities, as determined by cable and bus ratings, exceed their analyzed load requirements.

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
15. EPDS cables and buses are rated to withstand fault currents for the time required to clear the fault from its power source.	15. Analysis for the as-built EPDS to determine fault currents will be performed.	15. Analysis for the as-built EPDS exists and concludes that Class 1E cables and buses will withstand the analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analyses, to clear the analyzed faults from their power sources.
16. For the EPDS, Class 1E power is supplied by two independent Class 1E Divisions. Independence is maintained between Class 1E Divisions/Channel, and between Class 1E Divisions and non-Class 1E equipment.	16.a) Testing on the as-built EPDS will be performed by providing a test signal in only one Class 1E Division/Channel at a time.	16.a) A test signal exists in only the Class 1E Division/Channel under test in the EPDS.
	16.b) Inspection of the as-built EPDS Class 1E Divisions/Channels will be conducted.	16.b) In the EPDS, physical separation or electrical isolation exists between Class 1E Divisions. Physical separation or electrical isolation exists between Class 1E Channels. Physical separation or electrical isolation exists between these Class 1E Divisions/Channels and non-Class 1E equipment. Raceways containing Class 1E cables do not contain non-Class 1E cables.
17. Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are identified according to their Class 1E Division. [redacted]	17. Inspection of the as-built EPDS Class 1E medium voltage switchgear, low voltage switchgear, and MCCs will be conducted.	17. As-built Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are identified according to their Class 1E Division[redacted]

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
18. Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are located in Seismic Category I structures and in their respective Divisional areas.	18. Inspections of the as-built Class 1E medium voltage switchgear, low voltage switchgear, and MCCs will be conducted.	18. As-built Class 1E medium voltage switchgear, low voltage switchgear, and MCCs are located in Seismic Category I structures and in their respective Divisional areas.
19. Class 1E EPDS cables and raceways are identified according to their Class 1E Division.	19. Inspection of the as-built Class 1E EPDS Divisional cables and raceways will be conducted.	19. As-built EPDS cables and raceways are identified according to their Class 1E Division.
20. Class 1E Division/Channel cables are routed in Seismic Category I structures and in their respective raceways.	20. Inspection of the as-built EPDS Division/Channel cables and raceways will be conducted.	20. As-built Class 1E Division/Channel cables are routed in Seismic Category I structures and in their respective Division/Channel raceways.
21. Class 1E equipment is not prevented from performing its safety functions by harmonic distortion waveforms.	21. Analysis for the as-built EPDS to determine harmonic distortions will be performed.	21. Analysis for the as-built EPDS exists and concludes that harmonic distortion waveforms do not exceed 5 percent voltage distortion on the Class 1E EPDS.
22. The EPDS supplies an operating voltage at the terminals of the Class 1E equipment which is within the equipment's voltage tolerance limits.	22.a) Analysis for the as-built EPDS to determine voltage drops will be performed. b. Tests of the as-built Class 1E EPD System will be performed by operating connected Class 1E loads at the analyzed minimum voltage.	22.a) Analysis for the as-built EPDS exists and concludes that the analyzed operating voltage supplied at the terminals of the Class 1E equipment is within the equipment's voltage tolerance limits, as determined by their nameplate ratings. b. Connected Class 1E loads operate at the analyzed minimum voltage as determined by the voltage drop analyses.

TABLE 2.6.1-1 (Continued)

AC ELECTRICAL POWER DISTRIBUTION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
23. Class 1E equipment is protected from degraded voltage conditions.	23.a) Analysis for the as-built EPDS to determine the trip conditions for degraded voltage conditions will be performed.	23.a) Analysis for the as-built EPDS exists and concludes that the Class 1E preferred offsite power feeder breakers to the Class 1E medium voltage switchgear will trip before Class 1E loads experience degraded voltage conditions exceeding those voltage conditions for which the Class 1E equipment is qualified.
	23.b) Testing for each as-built Class 1E medium voltage switchgear will be conducted by providing a simulated degraded voltage signal.	23.b) As-built Class 1E feeder breakers from preferred offsite power to the Class 1E medium voltage switchgear trip when a degraded voltage conditions exists.
24. An electrical grounding system is provided for (1) instrumentation, control, and computer systems, (2) electrical equipment (switchgear, motors, distribution panels, and motors), and (3) mechanical equipment (fuel and chemical tanks). Lightning protection systems are provided for major plant structures, transformers and equipment located outside buildings. Each grounding system and lightning protection system is separately grounded to the plant ground grid.	24. Inspection of the plant grounding and lightning protection systems will be performed.	24. The as-built EPDS instrumentation, control, and computer grounding system, electrical equipment and mechanical equipment grounding system, and lightning protection systems provided for buildings and for structures and transformers located outside of the buildings, are separately grounded to the plant ground grid.
25. There are no automatic connections between Class 1E Divisions.	25. Inspections of the as-built Class 1E Divisions will be conducted.	25. There are no automatic connections between Class 1E Divisions.

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ITAAC No. 2.6.2 EDG/Mechanical Auxiliaries

No.	Comments	Cat.	Resolution
1	Design description mark-ups attached. The DD should acknowledge existence of safety-related/Seismic Category 1 non-ASME EDG auxiliary systems (ANSI, CLASS) and ensure associated ITAAC verification is performed.	1	AGREE
2	Add a statement to the design description to reflect operation of the fuel oil gravity feed and operation of the fuel oil transfer valve. Add an appropriate ITAAC test verification.	2	[illegible]
3	s : a p E i a f [illegible]		
4	Add standard ITAAC verification for ASME component pressure boundary integrity for ASME components in auxiliary systems.	1	AGREE
5	SSAR mark-up attached.	3	AGREE Except the "Building Sump Pump" is covered in ITAAC 2.7.15

No REPRESENTATIVE [illegible] WAS AVAILABLE.

By: Bob Gramm 504-1010

Resolved by: J. [illegible]

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.6.2 Emergency Diesel Generator System

No.	Comments	Cat.	Resolution
6	Design Description (page 1, last par.) needs to be revised to include EDG load shedding features during loss of power or sustained bus under voltage condition (Refer CESSAR Section 8.3.1.1.4.6) and the time required for EDGs to be connected to the bus (≤ 20 Seconds). ITAAC 10 needs to be revised to verify this.	1	Send to CE - see attached
7	Design Description (page 2, para. 2) needs to be revised to include EDG load shedding features during loss of power and concurrent DBA condition (SIAS/CSAS/EFAS). ITAAC 12 needs to be revised to verify this.	1	Send to CE - see attached
8			
9	and the		

Check

Same

Note

No.	Comments	Cat.	Resolution
10	The acceptance criteria for ITA 10 show +/- 10 % tolerance for voltage and +/- 2% tolerance for frequency for the EDGs to automatically connect to its respective buses in < 20 seconds. What is the basis for providing the above tolerances when the EDGs are required to attain rated voltage and frequency in $\leq$ 20 seconds?	1	Agree AC to change to - see attached -
11			

✓ Note

By: R. Mathew

Resolved by: D. Thatcher

2.6.2 EMERGENCY DIESEL GENERATOR SYSTEM

DESIGN DESCRIPTION

The Emergency Diesel Generator (EDG) System is a safety-related system which has two diesel generators and their respective fuel oil, lube oil, engine cooling, starting air, and air intake and exhaust support systems. One EDG is connectable to the two Class 1E buses of an Electrical Power Distribution System (EPDS) Class 1E Division and the other EDG is connectable to the two Class 1E buses of the other EPDS Class 1E Division.

Each EDG and its support systems are physically separated from the other EDG and its support systems, and are located in physically separate areas of the Nuclear Island Structures. Portions of the EDG support systems which perform the safety function of starting and operating the EDG are classified ASME Code Class 3. The EDG generators are classified Class 1E. Class 1E equipment is classified Seismic Category I. The EDG engine and ASME Code Class 3 portions of its respective support systems are classified Seismic Category I.

The diesel fuel storage tanks for each of the two EDGs are located in physically separate diesel fuel storage structures. The underground fuel oil piping from each diesel fuel storage structure to its respective EDG day tank is classified Seismic Category I. Divisional separation is established by pipe routing and use of the Divisional wall.

The EDGs are sized to supply their load demands following a design basis accident which requires use of emergency power.

Each EDG has fuel storage capacity to provide fuel to its EDG for a period of no less than 7 days with the EDG supplying the power requirements for the most limiting design basis accident.

The starting air system receiver tanks of each EDG have a combined air capacity for 5 starts of the EDG without replenishing air to the receiver tanks.

The EDG combustion air intakes are separated from the EDG exhaust ducts.

Electrical independence is provided between Class 1E Divisions and between the Class 1E Divisions and non-Class 1E equipment.

A loss of power to a Class 1E bus initiates an automatic start of the respective EDG and automatic connection to the Class 1E buses in the affected Division. Following attainment of rated voltage and frequency, the EDG automatically connects to its respective Divisional buses. After the EDG connects to its respective buses, the non-accident loads are automatically sequenced onto the buses.

Each EDG receives an automatic start signal in response to a safety injection actuation signal (SIAS), a containment spray actuation signal (CSAS), or an emergency feedwater actuation signal (EFAS). An EDG does not automatically connect to its Divisional Class 1E buses, if the Divisional Class 1E buses are energized.

For a loss-of-power to a Class 1E medium voltage safety bus condition concurrent with a Design Basis Accident condition (SIAS/CSAS/EFAS), each EDG automatically starts. Following attainment of rated voltage and frequency, the EDG automatically connects to its respective buses, and loads are sequenced onto the buses.

When operating in a test mode, an EDG is capable of responding to an automatic start signal.

Displays of EDG voltage, amperage, frequency, watts, and vars instrumentation exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to manually start and stop each EDG. Controls exist at each EDG local control panel to manually start and stop its respective EDG. After starting, the DG remains in a standby mode, unless a LOOP signal exists

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.6.2-1 specifies the inspections, tests, analyses and associated acceptance criteria for the Emergency Diesel Generator System.

DGs start, attain rated (required) voltage and frequency, and are ready to load in ≤ 20 seconds after receiving an automatic or manual start signal

If ≤ 20 sec is left in ITAAC 10 & 12 then statement needs to be in the CDM as attached

ACTIONS (Continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time not met. OR One or more DGs with diesel fuel oil, lube oil, or starting air subsystem not within limits for reasons other than Conditions A, B, C, D, or E.	F.1 Declare associated DG inoperable.	Immediately

45800 per CESSAR

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.3.1	Verify each fuel storage tank contains ≥ [*] gallons of fuel.	31 days
SR 3.8.3.2	Verify lubricating oil inventory is ≥ [500] gallons.	31 days
SR 3.8.3.3	Verify fuel oil properties of new and stored fuel oil are tested in accordance with, and maintained within, the limits of The Diesel Fuel Oil Testing Program.	In accordance with the Diesel Fuel Oil Testing Program.
SR 3.8.3.4	Verify each DG air start receiver pressure is ≥ [225] psig.	31 days
SR 3.8.3.5	Check for and remove accumulated water from each fuel oil storage tank.	31 days
SR 3.8.3.6	For each fuel oil storage tank: a. Drain the fuel oil; b. Remove the sediment; and c. Clean the tank.	10 years

Not in CESSAR

* Value to be determined by system detail design.

9.5.4.5 Instrumentation Application

Each diesel generator engine is provided with sufficient instrumentation to monitor the operation of the fuel oil system. All alarms are separately annunciated on the local diesel engine control panel which also signals a general diesel trouble alarm in the control room. The fuel oil system is provided with the following instrumentation and alarms:

A. Fuel oil storage tanks

1. Low level and high level annunciators.

2. Technical specification low-low level alarm.

3. Level indication, 0-100%.

4. The capability for use of a stick gauge or similar means to measure the actual fuel oil level.

B. Fuel oil recirculation filter

1. Inlet and outlet pressure indication.

C. Fuel oil day tank

1. Fuel oil transfer valve control.

2. High level alarm.

3. Low level alarm.

4. Level indication.

D. Fuel oil strainers (Engine-driven pump and motor-driven booster pump)

1. High differential pressure alarm - Alerts the operator to take corrective action by manually switching over to the alternate clean strainer.

2. Inlet and outlet pressure indication.

The COL Applicant will make available for NRC review, information on Diesel Generator Engine Fuel Oil System calibration frequencies.

move to page 9.5-57

E. Fuel oil filter

1. High differential pressure alarm - Alerts the operator to take corrective action by manually switching over to the alternate clean filter.

2. Differential pressure indication.

3. Outlet pressure indication.

4. Low fuel oil pressure alarm.

F. Day tank retaining wall

1. High and low level drain valve and lube oil transfer pump control.

2. High-high level alarm.

* insert text

TABLE 2.6.2-1

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the EDG System is as described in the Design Description (Section 2.6.2).	1. Inspection of the as-built EDG System will be conducted.	1. The as-built EDG System conforms with the Basic Configuration as described in the Design Description (Section 2.6.2).
2. Each EDG and its support systems are physically separated from the other EDG and its support systems, and are located in physically separate areas of the nuclear island structures.	2. Inspection of the as-built EDGs and EDG support systems will be performed.	2. The two EDGs and their respective support systems are located on opposite sides of the nuclear island structures and are separated by the Divisional wall.
3. The diesel fuel storage tanks for each of the two EDGs are located in physically separate (Seismic Category I) diesel fuel storage structures.	3. Inspection of the as-built diesel fuel storage tank structures will be performed.	3. The diesel fuel storage tanks for one EDG are located in a different structure from the diesel fuel storage tanks for the other EDG.
4. The fuel oil piping from each diesel fuel storage structure to its respective EDG day tank is classified Seismic Category I. Divisional separation is established by pipe routing and use of the Divisional wall.	4. Inspection of the as-built piping from each diesel fuel storage structure to its respective EDG day tank will be performed.	4. The as-built fuel oil piping from each diesel fuel storage structure to its respective EDG day tank is classified Seismic Category I. Divisional separation is established by pipe routing and use of the Divisional wall.
5. The EDGs are sized to supply their load demands following a design basis accident which requires use of emergency power.	5. Analysis to determine EDG load demand, based on the as-built EDG load profile, will be performed.	5. Analysis for the as-built EDGs exists and concludes that the EDGs' capacities exceed, as determined by their name-plate ratings, their load demand following a design basis accident which requires the use of emergency power.

TABLE 2.6.2-1 (Continued)

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. A loss-of-power to a Class 1E medium voltage safety bus automatically starts its respective EDG. Following attainment of rated voltage and frequency, the EDG automatically connects to its respective Divisional buses. After the EDG connects to its respective buses, the non-accident loads are automatically sequenced onto the buses.	10. Testing for the actuation and connection of each EDG will be performed using a signal that simulates a loss-of-power.	10. As-built EDGs automatically start on receiving a loss-of-power signal, attain rated voltage (± 10%) and rated frequency (± 2%) in ≤ 20 seconds, automatically connect to their respective Divisional buses, and their non-accident loads are sequenced onto the buses.
11. Each EDG receives an automatic start signal in response to a safety injection actuation signal (SIAS), a containment spray actuation signal (CSAS), or an emergency feedwater actuation signal (EFAS). An EDG does not automatically connect to its Divisional buses, if the Divisional Class 1E buses are energized.	11. Testing for the actuation of each EDG will be performed using signals that simulate a SIAS, a CSAS, and a EFAS.	11. Each EDG receives a start signal in response to each of the following simulated signals; a SIAS, a CSAS, and a EFAS, but does not automatically connect to its Divisional buses, if the Divisional buses are energized.

TABLE 2.6.2-1 (Continued)

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
12. For a loss-of-power to a Class 1E medium voltage safety bus condition concurrent with a Design Basis Accident condition (SIAS/CSAS/EFAS), each EDG automatically starts. Following attainment of rated voltage and frequency, the EDG automatically connects to its respective buses and loads are sequenced onto the buses.	12. Testing on the as-built EDG Systems will be performed by providing simulated SIAS/CSAS/EFAS and loss-of-power signals.	12. In the as-built EDG Systems, when SIAS/CSAS/EFAS and loss-of-power signals exist, the EDG automatically starts, attains rated voltage and frequency and is connected to its Divisional buses within 20 seconds. Following connection, the automatic load sequence begins. Upon application of each load, the voltage on these buses does not drop more than 20% measured at the buses. Frequency is restored to within 2% of nominal, and voltage is restored to within 10% of nominal within 60% of each load sequence time interval. The SI, CS, and EFW loads are sequenced onto the buses in ≤ 40 seconds total time from initiating SIAS/CSAS/EFAS.
13. When operating in a test mode, an EDG is capable of responding to an automatic start signal.	13. Testing will be performed with each EDG in a test mode configuration. An automatic start signal will be simulated.	13. When operating in a test mode, each EDG resets to its automatic control mode upon receipt of a simulated automatic start signal.

TABLE 2.6.2-1 EMERGENCY DIESEL GENERATOR SYSTEM

Acceptance Criteria

No. 10 As-built EDGs automatically start on receiving a LOOP signal and attain a voltage and frequency in ≤ 20 seconds which will assure an operating voltage and frequency at the terminals of the Class 1E equipment that is within the equipment's tolerance limits, automatically connects to their respective divisional bus, and sequence their non-accident loads onto the bus.

TABLE 2.6.2-1 (Continued)

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
12. For a loss-of-power to a Class 1E medium voltage safety bus condition concurrent with a Design Basis Accident condition (SIAS/CSAS/EFAS), each EDG automatically starts. Following attainment of rated voltage and frequency, the EDG automatically connects to its respective buses and loads are sequenced onto the buses.	12. Testing on the as-built EDG Systems will be performed by providing simulated SIAS/CSAS/EFAS and loss-of-power signals. load shedding occurs	12. In the as-built EDG Systems, when SIAS/CSAS/EFAS and loss-of-power signals exist, the EDG automatically starts, attains rated voltage and frequency and is connected to its Divisional buses within 20 seconds. Following connection, the automatic load sequence begins. Upon application of each load, the voltage on these buses does not drop more than 20% measured at the buses. Frequency is restored to within 2% of nominal, and voltage is restored to within 10% of nominal within 60% of each load sequence time interval. The SI, CS, and EFW loads are sequenced onto the buses in ≤ 40 seconds total time from initiating SIAS/CSAS/EFAS.
13. When operating in a test mode, an EDG is capable of responding to an automatic start signal.	13. Testing will be performed with each EDG in a test mode configuration. An automatic start signal will be simulated.	13. When operating in a test mode, each EDG resets to its automatic control mode upon receipt of a simulated automatic start signal.

TABLE 2.6.2-1 (Continued)

EMERGENCY DIESEL GENERATOR SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14.a) Displays of EDG voltage, amperage, frequency, watts, and vars instrumentation exist in the MCR or can be retrieved there.	14.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	14.a) Displays of the EDG instrumentation indicating voltage, amperage, frequency, watts and vars exist in the MCR or can be retrieved there.
14.b) Controls exist in the MCR to manually start and stop each EDG. Controls exist at each EDG local control panel to manually start and stop its respective EDG. After starting, the EDG remains in a standby mode, unless a LOOP signal exists.	14.b) Testing will be performed using the EDG controls in the MCR and EDG local control panels, without a LOOP signal	14.b) EDG controls exist in the MCR To manually start and stop each EDG. Controls exist at each EDG local control panel to manually start and stop its respective EDG.

4/14 D+T

J. Mcbride ?

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.6.3 AC Instrumentation and Control Power System and DC Power System

No.	Comments	Cat.	Resolution
1	Where is the legend provided for electrical symbols used in the CESSAR?	1	Send to CE AGREE
2	Design Description needs to be revised to show Design commitment 3.	1	Send CE AGREE
3	CESSAR figures 8.3.2-1 and 8.3.2-2 show inverter power sources and regulated power supplies are connected in parallel via normally closed breakers for ESF-CCS and Process- CCS panels. Is there any interlock to prevent paralleling? Needs clarification.	1	Send to CE AGREE
4	Design Description, page 1, para. 5, states that "Each Class 1E ACI&C power supply is a constant voltage constant frequency inverter power supply unit." This information is not shown in Design Commitment 2. Design Commitment 2 and ITAAC need to be revised.	1	Send to CE AGREE
5	No ITAAC entry is provided to verify Design Description, page 1, para. 5, which states that the "alternate power source is a voltage regulating device which is supplied from the same ac power source as battery charger----."	1	Send to CE AGREE

? – Note

No.	Comments	Cat.	Resolution
6	No ITAAC entry is provided to verify Design Description, page 1, para. 6, which states that "Each Class 1E power supply unit is sychronized, in both frequency and phase-------."	1	Send to CE AGREE (Resolution of Comment 2 should resolve this comment)
7	Design Description needs to revised to show Design Commitment 15.	1	Send to CE AGREE (See attached)
8	Design Commitment 4 needs to be revised as shown in the attachment to be consistent with the Design Description.	1	Send to CE AGREE
9	a. Determine whether the test described in ITA 19b can be performed before fuel load? b. If this test can be performed as written, then the acceptance criteria should be revised to verify the capacities of DC equipment such as battery charger, MCCs and DC distribution panels to operate the connected loads.	1	CE to revise ITA AGREE to include test with voltage analyses. (see attached)
10	Design Description needs to be revised to show Design Commitment 27.	1	Send to CE AGREE
11	An ITAAC entry is needed to verify Class 1E DC Power System alarms and displays shown in page 3, last paragraph of the Design Description.	1	Send to CE AGREE

No.	Comments	Cat.	Resolution

By: R. Mathew

Resolved by: D. [illegible signature]

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. Each Class 1E inverter power supply unit is sized to provide ~~output~~ power to its respective distribution ~~panel~~ loads.	4. Analyses for each as-built Class 1E inverter power supply unit to determine the power requirements of its loads will be performed.	4. Analyses for each as-built Class 1E inverter power supply unit exist and conclude that each inverter power supply unit's capacity, as determined by its nameplate rating, exceeds its analyzed load requirements.
5. Class 1E inverter power supply units and their respective distribution panels are identified according to their Class 1E Division/Channel and are located in Seismic Category I structures and in their respective Division/Channel areas.	5. Inspection of the as-built Class 1E inverter power supply units and their respective distribution panels will be conducted.	5. The as-built Class 1E inverter power supply units and their respective distribution panels are identified according to their Class 1E Division/Channel and are located in Seismic Category I structures and in their Division/Channel areas.
6. In the Class 1E AC I&C Power System, independence is provided between Class 1E Divisions. Independence is provided between Class 1E Channels. Independence is provided between Class 1E Divisions/Channels and non-Class 1E equipment.	6.a) Testing on the Class 1E AC I&C Power System will be conducted by providing a test signal in only one Class 1E Division/Channel at a time.	6.a) A test signal exists only in the Class 1E Division/Channel under test in the Class 1E AC I&C Power System.
	6.b) Inspection of the as-built Class 1E Divisions/Channels in the Class 1E AC Power System will be conducted.	6.b) In the Class 1E AC I&C Power System, physical separation or electrical isolation exists between the Class 1E Divisions/Channels. Physical separation or electrical isolation exists between these Class 1E Divisions/Channels and non-Class 1E equipment. Raceways containing Class 1E cables do not contain non-Class 1E cables.

BASES

BACKGROUND (Continued)

If power were lost from either UAT, undervoltage relays would sense this condition. The electrical system would then attempt to transfer to the backup preferred power source (the associated RAT). The transfer to the associated RAT will occur on the permanent non-safety bus affected. If power is not available from the backup preferred source, the DG is automatically used to power the associated emergency buses. The DGs start automatically on a Safety Injection Actuation Signal (SIAS) or on a loss of voltage (LOV) on the respective emergency buses. Even though the DGs are started on SIAS, they will not power the emergency buses unless both preferred offsite sources of power are unavailable. The DG automatically ties to its buses on a LOV condition on that bus with offsite power unavailable.

A

In the event of a loss of preferred power, the ESF electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a loss of coolant accident (LOCA).

Certain required unit loads are returned to service in a predetermined sequence in order to prevent overloading the DG in the process. Within [1] minute after the initiating signal is received, all loads needed to recover the unit or maintain it in a safe condition are returned to service.

In accordance with Regulatory Guide 1.9 (Ref. 2), diesel generators 1 and 2 have [6067] kW continuous and [6674] kW two-hour load ratings.

The diesel generators are rated at 4160 volts, three phase, 60 Hz, and are capable of attaining rated frequency and voltage within twenty seconds after receipt of a start signal (Ref. 3).

required

The ESF systems which are powered from divisional power sources are listed in Reference 3.

APPLICABLE SAFETY ANALYSES

The initial conditions of design basis transient and accident analyses in CESSAR-DC Chapters 6 (Ref. 4) and 15 (Ref. 5) assume ESF systems are OPERABLE. The AC Power System is designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These design limits are discussed in more detail in the Bases for LCO Sections 3.2 (Power Distribution Limits), 3.4 (Reactor Coolant System), and 3.6 (Containment Systems).

A
3.8-2

Following the trip of offsite power, [a sequencer / an undervoltage signal] strips nonpermanent loads from the ESF bus. When the DG is tied to the ESF bus, loads are then sequentially connected to its respective ESF bus by the automatic load sequencer. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the DG by automatic load application

B
3.8-3

Qualified offsite circuits are those that are described in CESSAR-DC and are part of the licensing basis for the unit.

Each offsite circuit must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the ESF buses

required

C
3.8.3

Therefore, the AC Power system has a total of four (4) qualified circuits between the offsite transmission network and the onsite Class 1E AC Distribution System. Two circuits per division.

BASES

LCO (Continued)

Inoperable AC sources do not necessarily result in inoperable components (which are designed to receive power from that source) unless specifically directed by Required Actions (refer to LCO 3.0.7).

Each DG must be capable of starting, accelerating to ~~rated~~ required speed and voltage, and connecting to its respective ESF bus on detection of bus undervoltage. This will be accomplished within 20 seconds. Each DG must also be capable of accepting required loads within the assumed loading sequence intervals, and continue to operate until offsite power can be restored to the ESF buses. These capabilities are required to be met from a variety of initial conditions such as DG in standby with the engine hot, DG in standby with the engine at ambient conditions, and DG operating in a parallel test mode. Proper sequencing of loads, including tripping of nonessential loads, is a required function for DG OPERABILITY.

Certain diesel generator support systems are addressed in other LCOs. During inoperabilities in these support systems, inoperable diesel generators do not necessarily result unless specifically directed by Required Actions. This is in accordance with LCO 3.0.7.

APPLICABILITY

The AC Power Sources and sequencers are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

1. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of anticipated operational occurrences or abnormal transients; and

2. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

AC Power Source requirements for MODES 5 and 6 are addressed in LCO 3.8.2, AC Sources - Shutdown.

ACTIONS

A.1, A.2, and A.3

With one of the required offsite circuits inoperable, sufficient offsite power is available from the other required offsite circuit to ensure that the unit can be maintained in a safe shutdown condition following a design basis transient or accident. Even failure of the remaining required offsite circuit will not jeopardize a safe shutdown of the unit because of the redundant standby diesel generator. However, since system reliability is degraded below the LCO requirements, a time limit on continued operation is imposed. To ensure

BASES

SURVEILLANCE REQUIREMENTS (Continued)

Where the SRs discussed herein specify voltage and frequency tolerances, the following is applicable. The minimum steady state output voltage of [3740] V is 90% of the nominal 4160 V output voltage. This value, which is specified in ANSI C84.1-1982 (Ref. 6), allows for voltage drop to the terminals of 4000 V motors whose minimum operating voltage is specified as 90% or 3600 V. It also allows for voltage drops to motors and other equipment down through the 120 V level where minimum operating voltage is also usually specified as 80% of name plate rating. The specified maximum steady state output voltage of [4756] V is equal to the maximum operating voltage specified for 4000 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 4000 V motors is no more than the maximum rated operating voltages. The specified minimum and maximum frequencies of the DG are 58.8 Hz and 61.2 Hz, respectively. These values are equal to ± 2% of the 60 Hz nominal frequency and are derived from the recommendations given in Regulatory Guide 1.9 (Ref. 2).

SR 3.8.1.1

This Surveillance Requirement assures proper circuit continuity for the offsite AC power supply to distribution network and availability of offsite AC power. The breaker alignment verifies that each breaker is in its correct position to ensure distribution buses and loads are connected to their preferred power source and independence of offsite circuits is maintained. The seven-day Frequency is adequate since breaker position is not likely to change without the operator being aware of it and because status is displayed in the control room.

SR 3.8.1.2 and SR 3.8.1.7

These surveillances help to ensure the availability of the standby power supply to mitigate design basis transients and accidents and maintain the unit in safe shutdown conditions. To minimize the wear on moving parts that do not get lubricated when the engine is not running, these SRs are modified by a Note (Note 2 for SR 3.8.1.2) to indicate that all DG starts for these Surveillances may be preceded by an engine prelube period and followed by a warmup period prior to loading by an engine prelube period. For the purpose of this testing, the diesel generators shall be started from standby conditions. Standby conditions in this case means the diesel engine coolant and oil are being continuously circulated and temperature maintained consistent with manufacturer recommendations.

In order to reduce stress and wear on diesel engines, some manufacturers recommend a modified start in which the starting speed of DGs is limited, warmup is limited to this lower speed, and the DGs are gradually accelerated to synchronous speed prior to loading. This is the intent of Note 3, which is only applicable when such modified start procedures are recommended by the manufacturer.

BASES

SURVEILLANCE REQUIREMENTS (Continued)

SR 3.8.1.1~~1~~2

As required by Regulatory Guide 1.108 (Ref. 11), this Surveillance demonstrates the as-designed operation of the standby power sources during loss of the preferred offsite power source. This test verifies all actions encountered from the loss of offsite power including shedding of the non-essential loads and energization of the emergency buses and respective loads from the diesel generator. It further demonstrates the capability of the diesel generator to automatically achieve the required voltage and frequency within the specified time.

The diesel generator automatic start time of 20 seconds is derived from requirements of the accident analysis to respond to a design basis large break LOCA. The minimum steady state output voltage of [3744] volts is 90% of the nominal 4160 volt output voltage. This value, which is specified in ANSI C84.1-1982, allows for voltage drops down to the terminals of 4000 volt ~~rated~~ motors whose minimum operating voltage is specified as 90% or 3600 volts. It also allows for voltage drops to motors and other equipment down through the 120 volt level where minimum operating voltage is also usually specified as 90% of nameplate ~~rating~~. | OK | OK

The specified maximum steady state output voltage of [4576] volts is equal to the maximum operating voltage specified for 4000 volt ~~rated~~ motors (+ 10% of motor nameplate ~~rating~~ of 4000 volts). It ensures that for a lightly loaded distribution system the voltage at the terminals of 4000 volt motors will be no more than the maximum ~~rated~~ operating voltages. | OK | OK | OK

The specified minimum and maximum steady state output frequency of the diesel generator is 58.8 Hz and 61.2 Hz, respectively. This is equal to ± 2% of the 60 Hz nominal frequency and is derived from the recommendations given in Regulatory Guide 1.9 (Ref. 2) that the frequency should be restored to within 2% of nominal following a load sequence step. The surveillance should be continued for a minimum of five minutes in order to demonstrate all starting transients have decayed and stability has been achieved.

For the purpose of this SR, the diesel generators shall be started from standby conditions. Standby conditions in this case means the diesel engine coolant and oil are being continuously circulated and temperature maintained consistent with manufacturer recommendations.

The requirement to verify the connection and power supply of permanent and auto-connected loads is intended to satisfactorily show the relationship of these loads to the DG loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For

SURVEILLANCE REQUIREMENTS (Continued)

This Surveillance is modified by three Notes. The first Note requires that this Surveillance be performed within five minutes of shutting down the diesel generator after it has operated for ≥ two hours at fully loaded conditions and allows momentary transients due to changing bus loads to not invalidate the test. The two-hour time limit is based on the manufacturer's recommendation for achieving hot conditions. The second Note permits an engine prelube period prior to diesel generator starting to minimize wear on moving parts which are not lubricated unless the engine is operating. Note 3 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.16

As required by Regulatory Guide 1.108 (Ref. 11), this Surveillance assures that the manual synchronization and load transfer from the diesel generator to the offsite power source can be made and the diesel generator can be returned to ready-to-load status when offsite power is restored. It also ensures that the auto-start logic is reset to allow the diesel generator to reload if a subsequent loss of offsite power occurs. The diesel generator is considered to be in ready-to-load status when the diesel generator is at rated speed and voltage, the output breaker is open and can receive an auto-close signal on bus undervoltage, and the load sequence timers are reset.

The Frequency of [18 months] is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 11) and takes into consideration plant conditions required to perform the Surveillance.

This SR is modified by two Notes. The reason for Note 1 is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.17

Demonstration of the test mode override ensures that the diesel generator availability under accident conditions will not be compromised as the result of testing. Interlocks to the LOCA sensing circuits cause the diesel generator to automatically reset to ready-to-load operation if a LOCA actuation signal is received during operation in the test mode. Ready-to-load operation is defined as the diesel generator running at rated speed and voltage with the diesel generator output breaker open. These provisions for automatic switchover are required by IEEE-308 (Ref. 14).

The requirement to automatically energize the emergency loads with offsite power is essentially identical to that of SR 3.8.1.12. The intent in the requirement associated with SR 3.8.1.17.b is to show that the emergency loading was not affected by the DG

SURVEILLANCE REQUIREMENTS (Continued)

operation in test mode. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the emergency loads to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The [18 month] Frequency is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(8); takes into consideration unit conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by two Notes. The reason for Note 1 is that performing Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

As required by Regulatory Guide 1.108 (Ref. 11), each diesel generator is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. Under accident conditions, prior to connecting the diesel generators to their appropriate bus, all loads are shed except load center feeders and those motor control centers which feed Class 1E loads (referred to as permanently-connected loads). Upon reaching 90% ~~rated~~ voltage and frequency, the diesel generators are then connected to their respective bus. Loads are then sequentially connected to the bus by the automatic load sequencer. The sequencing logic controls the permissive and starting signals to motor breakers so as to prevent overloading the diesel generators due to high motor starting currents. The 10% load sequence time interval tolerance ensures sufficient time exists for the diesel generator to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 4 provides a summary of the automatic loading of ESF buses.

The Frequency of [18 month] is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 11), and takes into consideration plant conditions required to perform the Surveillance and is intended to be consistent with expected fuel cycle lengths.

This Surveillance is modified by two Notes. The first Note prohibits performance of this Surveillance in MODE 1, 2, 3, or 4. Performance of this test requires the inoperability of certain ESF equipment and has the potential to perturb the electrical distribution system which would challenge continued steady-state operation. The second Note acknowledges that credit may be taken for unplanned events that satisfy this SR.

APPLICABLE SAFETY ANALYSES (Continued)

shutdown modes based on:

a. The fact that time in an outage is limited. This is a risk prudent goal as well as a utility economic consideration.

b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operating MODE analyses, or both.

c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems.

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODE 1, 2, 3, and 4 OPERABILITY requirements) with systems assumed to function during an event.

In the event of an accident during shutdown, this LCO ensures the capability to support systems necessary to avoid immediate difficulty, assuming either a loss of all offsite power or a loss of all onsite diesel generator (DG) power.

The AC sources satisfy Criterion 3 of the NRC Policy Statement.

LCO

One offsite circuit capable of supplying the onsite Class 1E power distribution subsystem(s) of LCO 3.8.10, "Distribution Systems — Shutdown," ensures that all required loads are powered from offsite power. An OPERABLE DG, associated with a distribution system train required to be OPERABLE by LCO 3.8.10, ensures a diverse power source is available to provide electrical power support, assuming a loss of the offsite circuit. Together, OPERABILITY of the required offsite circuit and DG ensures the availability of sufficient AC sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and reactor vessel draindown).

The qualified offsite circuit must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the Engineered Safety Feature (ESF) bus(es). Qualified offsite circuits are those that are described in the CESSAR-DC and are part of the licensing basis for the unit.

Inoperable AC Sources do not necessarily result in inoperable components (which are designed to receive power from that source) unless specifically directed by Required Actions (refer to LCO 3.0.7).

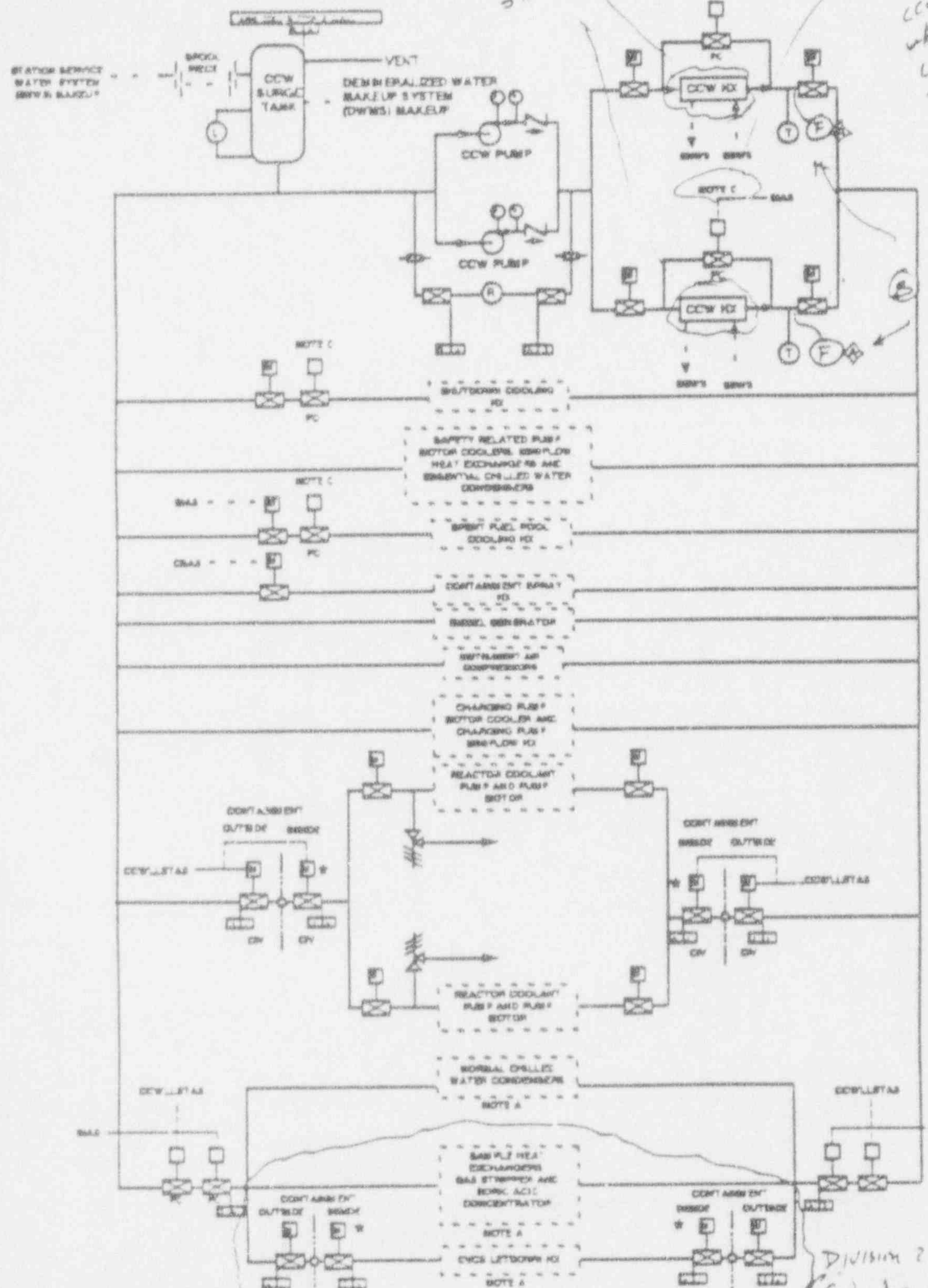
The DG must be capable of starting, accelerating to rated speed and voltage, connecting to its respective ESF bus on detection of bus undervoltage, and accepting required loads.

SYSTEM 80+™

(D) CCW HX are single pass shell + tube type with the CCW flow on the shell side.

(A) These "note" are incorrect. These valves modulate CCW bypass flow to maintain a relatively constant CCW outlet temperature. They are temperature control valves.

(B) Table 2.17.1-1 included a CCW HX outlet flow annunciator



Division 2 only!

(C) A single figure cannot represent both Divisions 1 + 2 since these non-safety related loads are associated with Division 2 only.

NOTES

A. ASSIGNMENT OF THE NON-SAFETY RELATED CCWS HEAT REMOVAL LOADS TO THEIR RESPECTIVE CCWS DIVISION IS DEPENDENT UPON THE LOCATION OF COMPONENTS ASSOCIATED WITH THOSE LOADS.

* SAFETY RELATED COMPONENTS AND EQUIPMENT SHOWN ON THE FIGURE ARE POWERED FROM THEIR RESPECTIVE CLASS 1E DIVISION.

C. DS VALVE IS FOR FLOW CONTROL. OPEN/CLOSE OPERATION FROM THE MAIN CONTROL ROOM IS NOT REQUIRED.

☆ EQUIPMENT FOR WHICH PARAGRAPH NUMBER D (OF THE "VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.

d. A note should be added to discuss the temperature

FIGURE 2.7.6-1
COMPONENT COOLING WATER SYSTEM
(ONE OF TWO DIVISIONS)

12-31-93

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM

Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
19. The Class 1E DC Power System MCCs, DC distribution panels, disconnect switches, circuit breakers, and fuses are sized to supply their load requirements.	19.a) Analysis for the as-built Class 1E DC Power System electrical distribution system to determine the capacities of the battery, battery charger, MCCs, DC distribution panels, disconnect switches, circuit breakers, and fuses will be performed.	19.a) Analysis for the as-built Class 1E DC Power System exists and concludes that the capacities of MCCs, DC distribution panels, disconnect switches, circuit breakers, and fuses, as determined by their nameplate ratings, exceed their analyzed load requirements.
	19.b) Testing of the as-built Class 1E battery, battery charger, DC distribution panels, MCCs, and system circuit breakers, disconnect switches, and fuses will be conducted by operating connected Class 1E loads at less than or equal to minimum allowable voltage and at greater than or equal to the maximum battery charging voltage.	19.b) Connected as-built Class 1E loads operate at less than or equal to the minimum allowable battery voltage and at greater than or equal to the maximum charging voltage.
20.a) The Class 1E batteries, battery chargers, DC distribution panels, MCCs, and disconnect switches are rated to withstand fault currents for the time required to clear the fault from its power source.	20.a) Analysis for the as-built Class 1E DC Power System to determine fault currents will be performed.	20.a) Analysis for the as-built Class 1E DC Power System exists and concludes that the capacities of the as-built Class 1E batteries, battery chargers, DC distribution panels, MCCs, and disconnect switches current capacities exceed their analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analyses, to clear the fault from its power source.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM

Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
23. Class 1E DC Power System cables are rated to withstand fault currents for the time required to clear the fault from its power source.	23. Analysis for the as-built Class 1E DC Power System to determine fault currents will be performed	23. Analysis for the as-built Class 1E DC Power System exists and concludes that the Class 1E DC electrical distribution system cables will withstand the analyzed fault currents for the time required, as determined by the circuit interrupting device coordination analysis, to clear the fault from its power source.
24. The Class 1E DC Power System supplies an operating voltage at the terminals of the Class 1E equipment which is within the equipment's voltage tolerance limits.	24.a) Analysis for the as-built Class 1E DC Power System to determine system voltage drops will be performed. b) Testing of the as-built Class 1E DC Power System ~~battery, battery chargers, DC distribution panels, MCCs, and system circuit breakers, disconnect switches, and fuses~~ will be conducted by operating connected Class 1E loads at less than or equal to minimum allowable voltage and at greater than or equal to the maximum battery charging voltage.	24. a) Analysis for the as-built Class 1E DC Power System exists and concludes that the analyzed operating voltage supplied at the terminals of the Class 1E equipment is within the equipment's voltage tolerance limits, as determined by their nameplate ratings. b) Connected as-built Class 1E loads operate at less than or equal to the minimum allowable battery voltage and at greater than or equal to the maximum charging voltage.
25. Each Class 1E battery is located in a Seismic Category I structure and in its respective Division/Channel battery room.	25. Inspection of the as-built Class 1E batteries will be conducted.	25. Each Class 1E battery is located in a Seismic Category I structure and in its respective Division/Channel battery room.
26. Class 1E DC Power System distribution panels and MCC's are identified according to their Class 1E Division/Channel	26. Inspection of the as-built Class 1E DC distribution panels and MCCs will be conducted.	26. Class 1E DC Power System distribution panels and MCCs are identified according to their Class 1E Division/Channel.

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM

Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13. The Class 1E AC I&C Power System supplies an operating voltage at the terminals of the Class 1E utilization equipment which is within the utilization equipment's voltage tolerance limits.	13. Analysis for the as-built Class 1E AC I&C Power System to determine voltage drops will be performed.	13. Analysis for the as-built Class 1E AC I&C Power System voltage drops exists and concludes that the analyzed operating voltage supplied at the terminals of the Class 1E equipment is within the equipment's voltage tolerance limits, as determined by their nameplate ratings.
14. Class 1E AC I&C Power System cables and raceways are identified according to their Class 1E Division/Channel. Class 1E cables are routed in Seismic Category I structures and in their respective Division or Channel raceways.	14. Inspection of the as-built Class 1E AC Power System cables and raceways will be conducted.	14. As-built Class 1E AC Power System cables and raceways are identified according to their Class 1E Division/Channel. Class 1E Divisional/Channel cables are routed in Seismic Category I structures and in their respective Division/Channel raceways.
15. Each Class 1E battery is provided with a normal battery charger supplied alternating current (AC) from a MCC in the same Class 1E Division as the battery.	15. Inspections of the as-built Class 1E DC Power System will be conducted.	15. Each Class 1E battery is provided with a normal battery charger supplied alternating current (AC) from a MCC in the same Class 1E Division as the battery.

Comment #7 Include in DD.

ITAAC #13 inconsistent with ITAAC #24 Voltage Drops is left out of Acceptance criteria Also 2.6.1-1, ITAAC 22

TABLE 2.6.3-1 (Continued)

AC INSTRUMENTATION AND CONTROL POWER SYSTEM AND DC POWER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
27. Class 1E DC Power System cables are identified according to their Class 1E Division/Channel.	27. Inspection of the as-built Class 1E DC Power System cables will be conducted.	27. As-built Class 1E DC Power System cables are identified according to their Class 1E Division/Channel.
28. Class 1E Division/Channel cables are routed in Seismic Category I structures in their respective Division/Channel raceways.	28. Inspection of the as-built Class 1E DC Power System cables and raceways will be conducted.	28. Class 1E Division/Channel cables are routed in Seismic Category I structures in their respective Division/Channel raceways.
29. In the Class 1E DC Power System, independence is provided between Class 1E Divisions. Independence is provided between Class 1E Channels. Independence is provided between Class 1E Divisions/Channels and non-Class 1E equipment.	29.a) Testing will be conducted on the as-built Class 1E DC Power System by providing a test signal in only one Class 1E Division/Channel at a time.	29.a) A test signal exists in only the Class 1E Division/Channel under test in the Class 1E DC Power System.
	29.b) Inspection of the as-built Class 1E DC Power System will be conducted.	29.b) In the as-built Class 1E DC Power System, physical separation or electrical isolation exists between Class 1E Divisions/Channels. Physical separation or electrical isolation exists between these Class 1E Divisions/Channels and non-Class 1E equipment. Raceways containing Class 1E cables do not contain non-Class 1E cables.
30 MCR alarms and displays provided for the Class 1E DC Power System are as defined in Section 2.6.3.	30 Inspections will be conducted on the alarms and displays for the Class 1E DC Power System.	30 Alarms and displays exist or can be retrieved in the MCR as defined in Section 2.6.3.

included in TDD moved 10

moved 11

DFT

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.6.4 Containment Electrical Penetration

No.	Comments	Cat.	Resolution
1	Design description and ITAAC need to be revised as shown in the attached mark-up.	2	AGREE Send CE - revise words on "current greater than continuous current rating"

By: R. Mathew

Resolved by: D Thatcher

2.6.4 CONTAINMENT ELECTRICAL PENETRATION ASSEMBLIES

DESIGN DESCRIPTION

Containment Electrical Penetration Assemblies are provided for electrical cables passing through the primary containment.

Containment Electrical Penetration Assemblies are classified as Seismic Category I.

Class 1E Division Containment Electrical Penetration Assemblies only contain cables of one Class 1E Division, and Class 1E Channel Containment Electrical Penetration Assemblies only contain cables of one Class 1E Channel.

Independence is provided between Division Containment Electrical Penetrations Assemblies. Independence is provided between Channel Containment Electrical Penetration Assemblies. Independence is provided between Containment Electrical Penetration Assemblies containing Class 1E cables and Containment Electrical Penetration Assemblies containing non-Class 1E cables.

Containment Electrical Penetration Assemblies are protected against ~~overcurrents~~ currents that are greater than its continuous current rating

Containment Electrical Penetration Assemblies are equipment for which paragraph number (3) of the "Verification for Basic Configuration for Systems" of the General Provisions (Section 1.2) applies.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.6.4-1 specifies the inspections, tests, analyses and associated acceptance criteria for the Containment Electrical Penetration Assemblies.

CONTAINMENT ELECTRICAL PENETRATION ASSEMBLIES
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. Containment Electrical Penetration Assemblies are protected against overcurrents that are greater than the continuous rating.	4. Analysis for the as-built Containment Electrical Penetration Assemblies will be performed.	4. Analysis exists for the as-built Containment Electrical Penetration Assemblies and concludes either (1) that the maximum overcurrent of the circuits does not exceed the continuous rating of the Containment Electrical Penetration Assembly, or (2) that the circuits have redundant overcurrent protection devices in series and that the redundant overcurrent devices are coordinated with the Containment Electrical Penetration Assembly's rated short circuit thermal capacity data and prevent overcurrent from exceeding the continuous current rating of the Containment Electrical Penetration Assembly.

CE SYSTEM 80+ITAAC Independent Review Comments

ITAAC No. 2.6.5 Alternate AC Source

No.	Comments	Cat.	Resolution
1			
2			
3			
4			
5			
6	ITAAC #4 needs to be revised to include verification of AAC source starting from the control room.	2	Sent to CE (see attached)

By: R. Mathew

Resolved by: [illegible]

TABLE 2.6.5-1

ALTERNATE AC SOURCE
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the AAC is as described in the Design Description (Section 2.6.5).	1. Inspection of the as-built AAC will be conducted.	1. The as-built AAC conforms with the Basic Configuration as described in the Design Description (Section 2.6.5).
2. The AAC can supply power to:	2. Testing on the as-built AAC will be conducted by connecting the AAC to:	2. The as-built AAC can supply power to:
a) the non-Class 1E permanent non-safety buses; or	a) the non-Class 1E permanent non-safety buses; and then	a) the non-Class 1E permanent non-safety buses; or
b) to a Class 1E Division through its associated non-Class 1E permanent non-safety bus.	b) to a Class 1E Division through its associated non-Class 1E permanent non-safety bus.	b) to a Class 1E Division through its associated non-Class 1E permanent non-safety bus.
3. The load capacity of the AAC is at least as large as the capacity of an EDG.	3. Inspection of the as-built AAC and EDGs will be conducted.	3. The as-built AAC load capacity is at least as large as the capacity of an EDG as determined by the AAC and EDG nameplate ratings.
4. The AAC displays and controls identified in the Design Description (Section 2.6.5) exist in the MCR or can be retrieved there.	4. Inspection of the MCR will be conducted.	4. AAC displays and controls identified in the Design Description (Section 2.6.5) exist or can be retrieved there. in the MCR comment 6

[illegible]

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.1 New Fuel Racks

No.	Comments	Cat.	Resolution
1	The design description states the racks are anchored to embedments. Supporting details could not be found in ~~either~~ section 9.1 of the CESSAR. The CESSAR should be appropriately supplemented.	3	[illegible]
2	The design description states there will be an initial storage for at least 121 new fuel assemblies (minimum value specified) whereas the CESSAR 9.1.1.3.1.3 states the criticality safety margins are maintained by limiting the capacity to 121 assemblies (a maximum value), please clarify.	3	[illegible]

By: Bob Gramm 504-1010

Resolved by: [illegible]

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.2 Spent Fuel Racks

No.	Comments	Cat.	Resolution
1	Add the following statement to the design description: "Piping penetrations to the spent fuel pool are located to maintain a minimum level of water above the spent fuel pool." CESSAR 9.1.2.2.1 specifies that penetrations are at least 10 feet above the top of fuel assemblies.	1	[illegible]
2	Revise the design description as marked-up. Neither Nuclear Island or spent fuel cooling CDM material address these aspects.	1	[illegible]
3	CESSAR sections 9.1.2 and 9.1.2.3.4 state that the spent fuel storage is for "up to" 907 assemblies (a maximum) where the design description states "at least" 907 assemblies (a minimum). These descriptions should be consistent.	3	[illegible]
4	Revise the SFP (2.7.3) design description to ensure siphonic draining of pool is precluded.	1	[illegible]

Resolved by: [illegible]

By: Bob Gramm 504-1010

[illegible]

CE ITAAC Independent Review Comments

ITAAC No. 2.7.3 Pool Cooling and Purification System (PCPS)   Page 1 of 1

No.	Comments	Cat.	Resolution
1	Figure 2.7.3-1: Reverse the flow directions of the CCWS to the SPF heat exchangers to counter-flow; to be consistent with P&ID 9.1-3 and Figure Legend page 3.	1	[illegible]

By: George Y. Cha
01/21/1994

Resolved by: [illegible]

2.7.2 SPENT FUEL STORAGE RACKS

Design Description

The Spent Fuel Storage Racks provide an initial on-site storage for at least 907 spent fuel assemblies. The Spent Fuel Storage Racks are safety-related.

The Spent Fuel Storage Racks are located in the nuclear island structures in the spent fuel pool.

The Spent Fuel Storage Racks are free standing structures that support and protect spent fuel assemblies. The Spent Fuel Storage Racks maintain the effective neutron multiplication factor less than the required criticality limits during normal operation and postulated accident conditions.

The Spent Fuel Storage Racks are designed and fabricated in accordance with ASME Code Section III, Subsection NF, Class 3 Component Supports requirements.

The Spent Fuel Storage Racks are designed to accommodate design basis loads and load combinations including the effects of impact of fuel assemblies on the racks and the impact due to postulated fuel handling accidents without losing the structural capability to maintain the fuel in a non-critical configuration.

, spent fuel rack support system, and spent fuel pool liner

The Spent Fuel Racks are classified Seismic Category I.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Spent Fuel Storage Racks.

BURTON

2.7.3 POOL COOLING AND PURIFICATION SYSTEM

Design Description

The Pool Cooling and Purification System (PCPS) consists of a spent fuel pool cooling system (SFPCS) and a pool purification system. The SFPCS removes heat generated by the stored spent fuel assemblies in the spent fuel pool water. The pool purification system pumps spent fuel pool water, refueling pool water, and fuel transfer canal water through filters and ion exchangers.

The Basic Configuration of the PCPS is as shown on Figure 2.7.3-1. The SFPCS is safety-related and the pool purification system is non-safety-related.

The PCPS is located in the reactor building and nuclear annex.

The SFPCS has two Divisions, each with a spent fuel pool (SFP) pump, a SFP heat exchanger, and associated valves, piping, controls, and instrumentation. A cross-connect line with isolation valves between the SFP pump discharge lines is provided to allow either pump to be used with either heat exchanger.

Each SFPCS Division has the heat removal capacity to prevent boiling in the spent fuel pool with a full core offload of fuel assemblies and a ten year inventory of stored irradiated fuel. Heat from the spent fuel pool is transferred to the component cooling water system (CCWS) in the spent fuel pool cooling heat exchangers.

The PCPS includes provisions to prevent gravity and siphonic draining of the spent fuel pool and refueling pool. x

The ASME Code Section III Class for the PCPS pressure retaining components shown on Figure 2.7.3-1 is as depicted on the figure.

Safety-related equipment shown on Figure 2.7.3-1 is classified Seismic Category I.

Displays of the PCPS instrumentation shown on Figure 2.7.3-1 are available as noted on the Figure.

Controls exist in the main control room (MCR) to start and stop the spent fuel pool cooling pumps.

PCPS alarms shown on Figure 2.7.3-1 are provided as shown on the Figure.

Water is supplied to each SFPCS pump at a pressure greater than the pump's required net positive suction head (NPSH).

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.5 Station Service Water System (SSWS)   Page 1 of 2

No.	Comments	Cat.	Resolution
1	Active valves as delineated in CESSAR Section 9.2.1.2.1.8 and Table 9.2.1-3 are SSW strainer backwash MOVs (there are six MOVs per strainer, and 2 strainers per division), these are not included in the CDM. Also CDM Section 2.7.5 page 2 1st paragraph discussed MOVs with active safety function but without any reference to a specific application, i.e. is this paragraph applicable to the MOVs as shown on Figure 2.7.5-1, but are not identified in CESSAR as "active"? Please clarify.	1	Agree - pass to ARB-CE
2	CDM 2.7.5 page 2 under Interface Requirements: A) It was stated that "The UHS is capable of dissipating a heat load of at least 143*10⁶ Btu/hr during the initial phase of a DBA." ~~Please provide derivation, the basis for this number.~~ B) CESSAR section 9.2.1.2.2.5 Emergency Operation and Ultimate Heat Sink section 9.2.5.2 System Description 3rd paragraph required the UHS to operate for a nominal 30 days "without any blowdown for salinity control". This requirement is not in the CDM. C) CESSAR section 9.2.5.1.3 stated that "The UHS shall meet Seismic Category I requirements." This requirement is not in the CDM.	1	A. Agree - pass to ARB-CE. CESSAR Table 9.2.2-3 shows the total heat load for the CCWS to be 134.2 and 131.7 x10⁶ BTU/hr for Divisions 1 & 2 respectively. Resolve this discrepancy. B & C. Disagree. These requirements do not need to be in Tier 1. The system will be reviewed in its entirety at COL application, since out of scope; can not be addressed in system CDM.
3			

J. LYONS

No.	Comments	Cat.	Resolution
4	CESSAR comments: A) Section 9.2.1.5.3 D4 stated "SSW radiation monitors 1 and 2 low outlet flows." Is this statement correct? B) Table 9.2.1-3 sh 1 of 2: the last entry "SW-200" belongs to Division 2 which is on Sh 2 of 2. C) Table 18.5.4-1 sh 4 of 4 (also CDM Table 2.12.1-1) used "SSW HX" whereas CESSAR section 9.2 and CDM 2.7.5 used CCW HX to describe the same component.	1	Agree - Pass to ABB-CE
5			

By: George Y. Cha
01/27/1994

Resolved by: Lyons

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.6 Component Cooling Water System (CCWS)   Page 1 of 2

No.	Comments	Cat.	Resolution
1			
2	CESSAR Table 9.2.2-5: valve CC-130 is a CIV, and is currently listed as ASME Section III Code Class 3, whereas CIVs are Code Class 2 in accordance with CDM Section 2.4.5.	1	Agree - Pass to ABB-CE
3	In the Refueling Mode, the letdown HX receives CCW flow in accordance with CDM Table 2.7.6-1 page 2, and CESSAR section 9.2.2.2.2.4 implied the same. Whereas CESSAR Table 9.2.2-3 sh 11 of 16 showed that the CCW flow is zero. Please resolve this discrepancy.	1	Agree - Pass to ABB-CE

J. LYONS

No.	Comments	Cat.	Resolution
4	Comments on CESSAR: A) Section 9.2.2.2.1.9K-missing last digit of valve CC-24(?). B) Containment penetration numbers TO/FROM the Letdown HX:30,31; TO/FROM RCP 1A,1B:32,33; TO/FROM RCP 2A,2B:34,35 have been identified in CESSAR Table 6.2.4-1 sh 6 of 15. These penetration numbers are not on the respective sheets of Figure 9.2.2-1.	1	Agreed - Pass to ABB-CE.

By: George Y. Cha
02/02/1994

Resolved by: Lyons

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.8 Condensate Storage System

No.	Comments	Cat.	Resolution
1	Figure 2.7.8-1 showed a gate valve with an unspecified operator. CESSAR Figure 9.2.6-1 showed a diaphragm operated globe valve controlling the tank level from signals generated by a level transmitter. Please resolve this discrepancy.	1	Agree - Pass to [illegible]-CF.

By: George Y. Cha
01/28/1994

Resolved by: Lyons

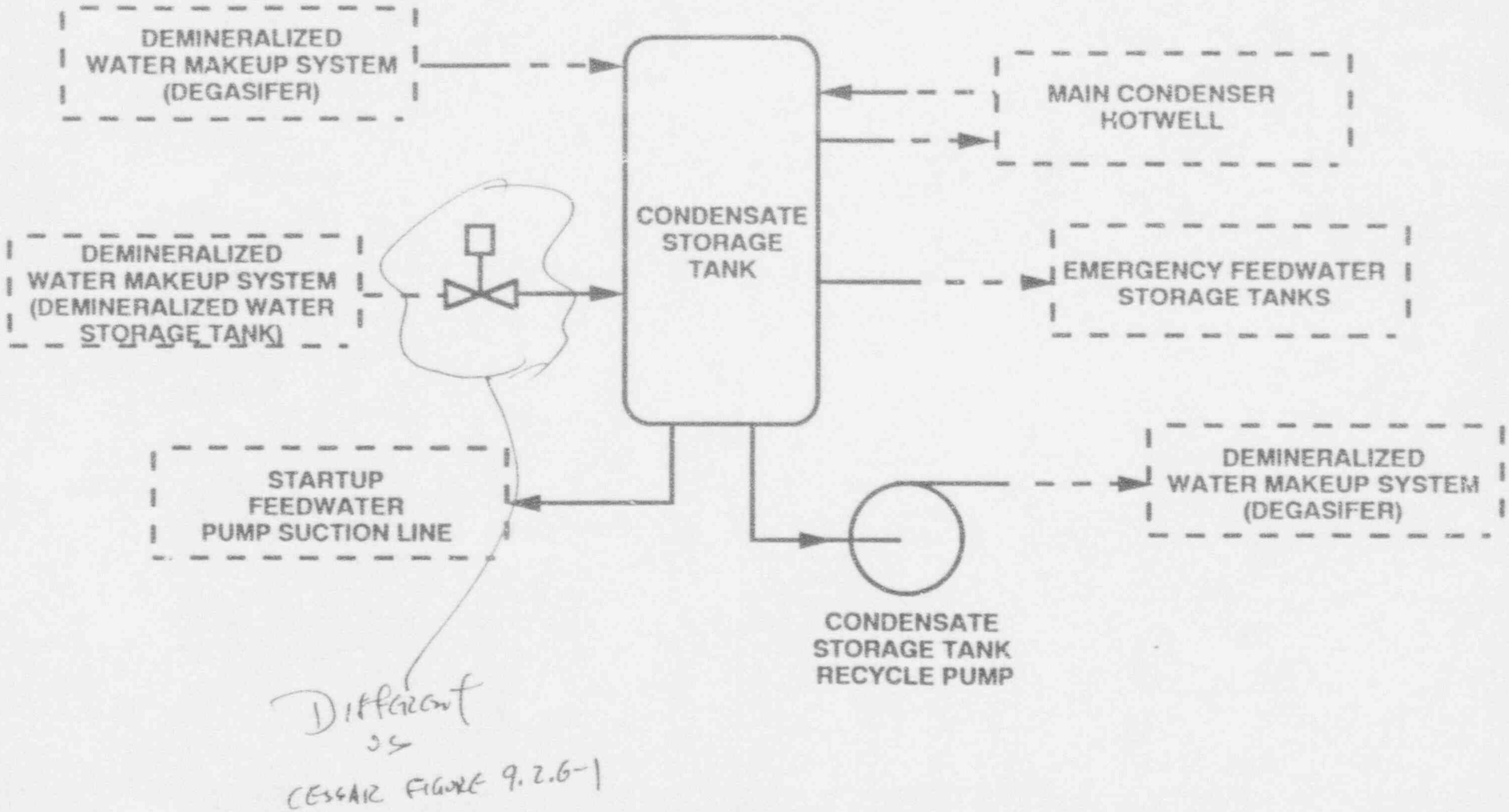
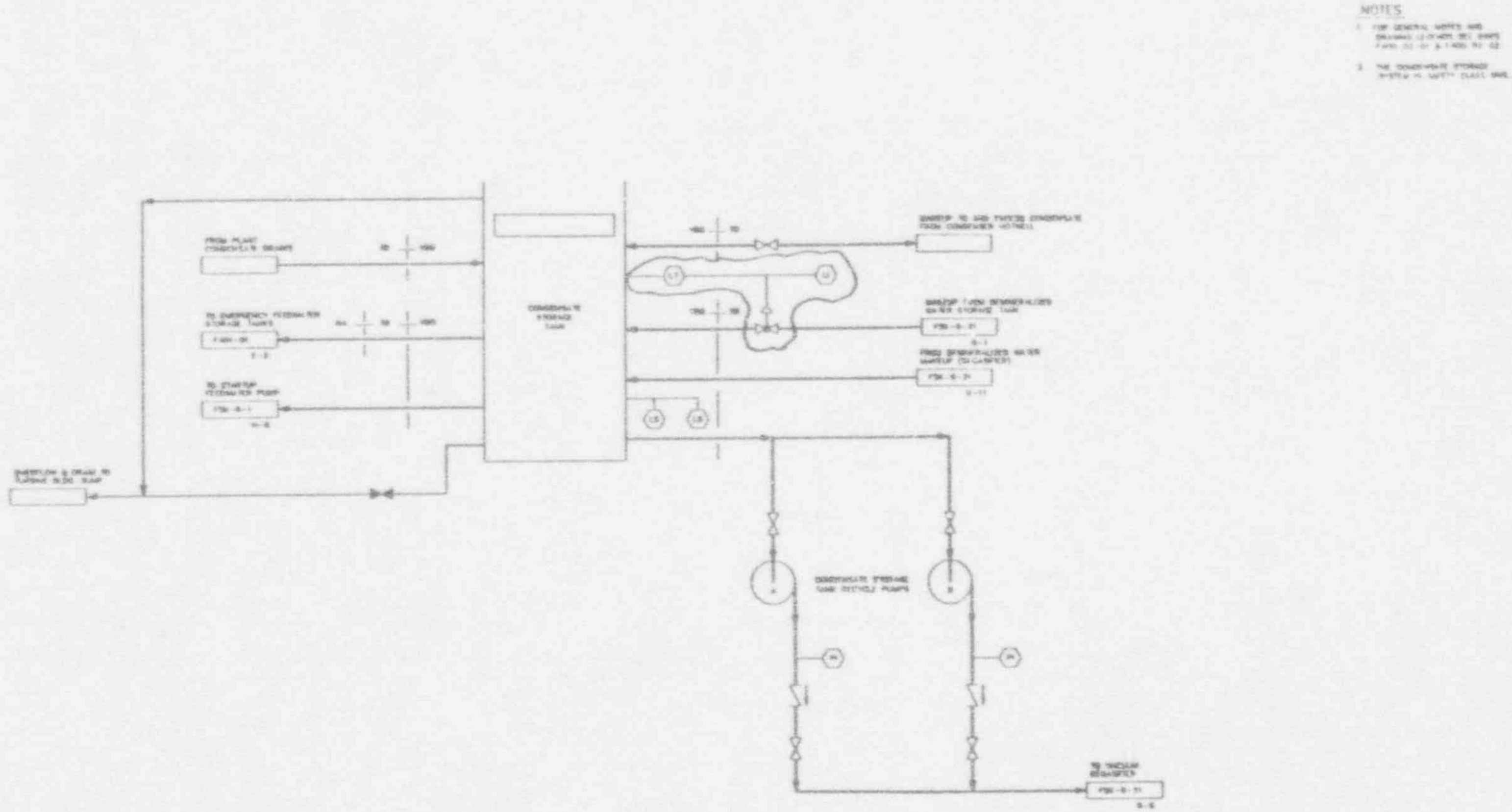


FIGURE 2.7.8-1
CONDENSATE STORAGE SYSTEM

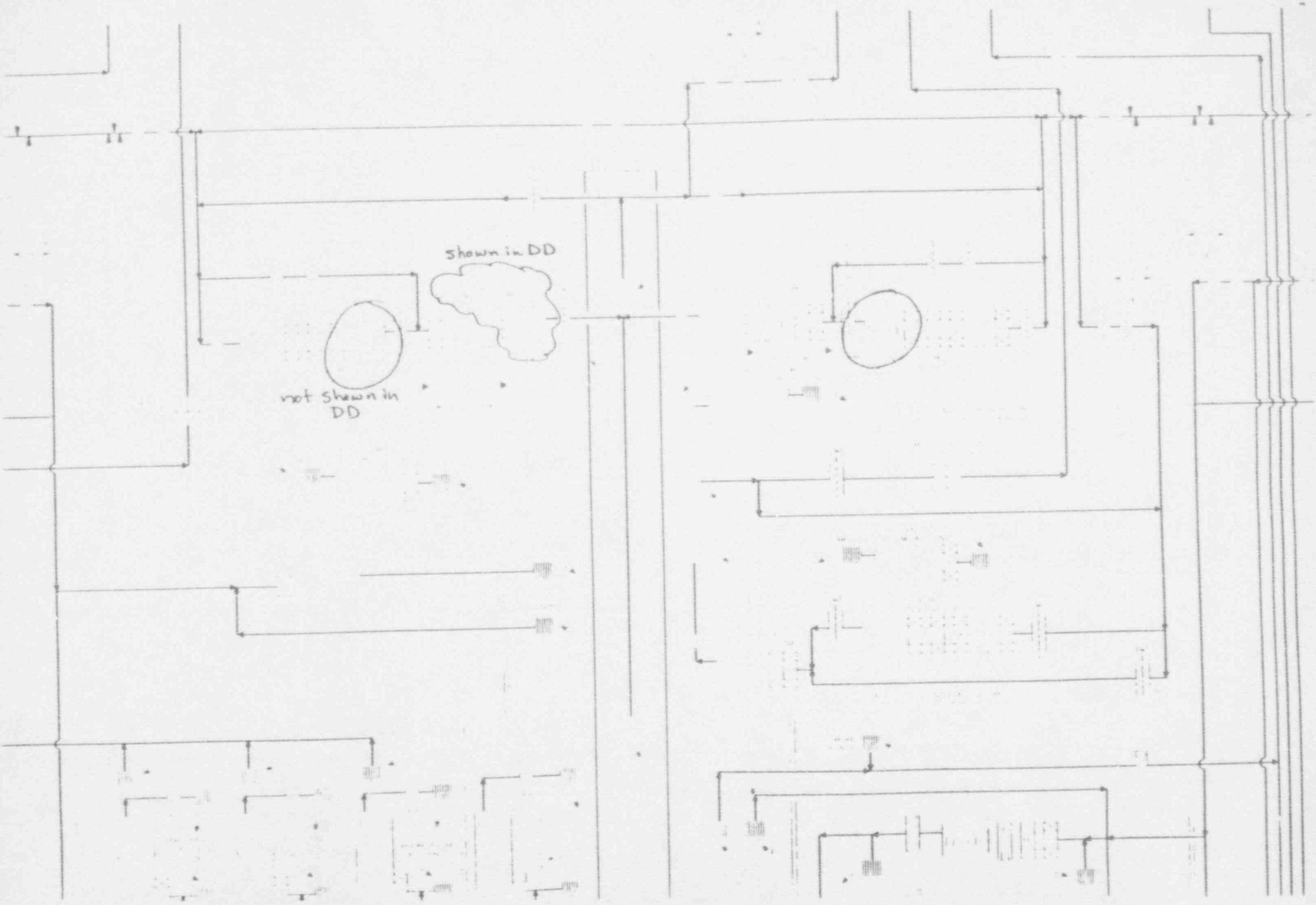


Amendment Q
June 30, 1993

SYSTEM 80+™

CONDENSATE STORAGE SYSTEM

Figure 9.2.6-1


Shown in DD
not shown in DD

CE80+ ITAAC Independent Review Comments

ITAAC No. 2.7.9 Process Sampling System

No.	Comments	Cat.	Resolution
1.	ITAAC item #4 is not covered in the Design Description.	1	Agree The following statement should be added to the Design Description: "Check valves shown on Figure 2.7.9-1 will operate at ~~pressure~~ all system pressure, flow and temperature conditions."
2.			
3.			

KIP

KIP

KIP

By: Serita Sanders 504-2956

Resolved by: K Laczewski

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.11 Turbine Building Cooling Water System (TBCWS)   Page 1 of 1

No.	Comments	Cat.	Resolution
1	On Figure 2.7.11-1, show the TBCWS HX as counter-flow type to be consistent with the HX legend of page 1.3-3.	1	Agree - pass to ABB-CE

By: George Y. Cha
01/28/1994

Resolved by: Lyons

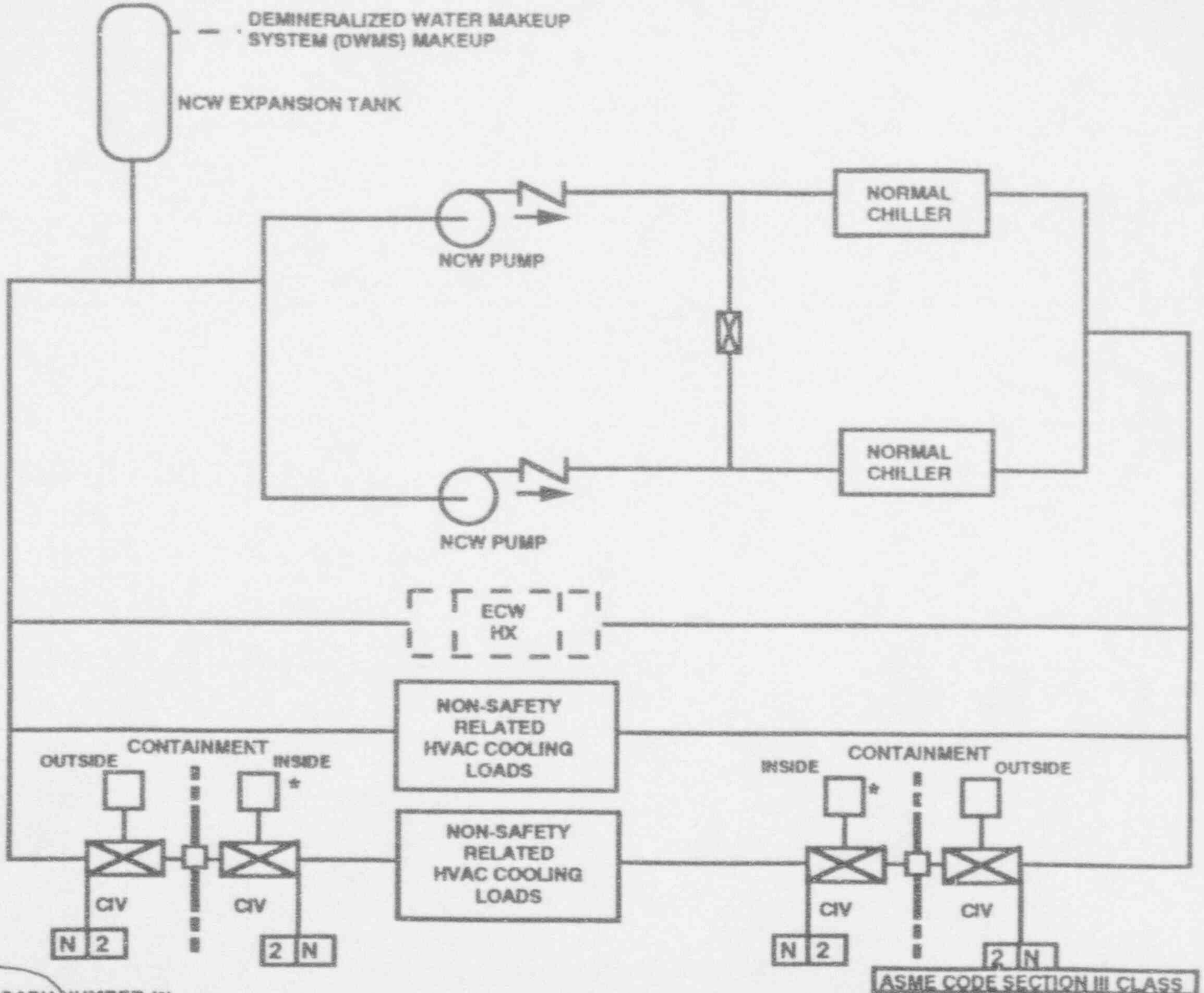
CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.13 Normal Chilled Water System

No.	Comments	Cat.	Resolution
1	See attached mark-up.	3	Agree - Pass to ABB-CE

By: Phillip Ray

Resolved by: Lyons



NOTE:

* EQUIPMENT FOR WHICH PARAGAPH NUMBER (3) OF THE "VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.

FIGURE 2.7.13-1
NORMAL CHILLED WATER SYSTEM
(ONE OF TWO DIVISIONS)

12-31-93

CE SYSTEM 80+ ITAAC Independent Review Comments

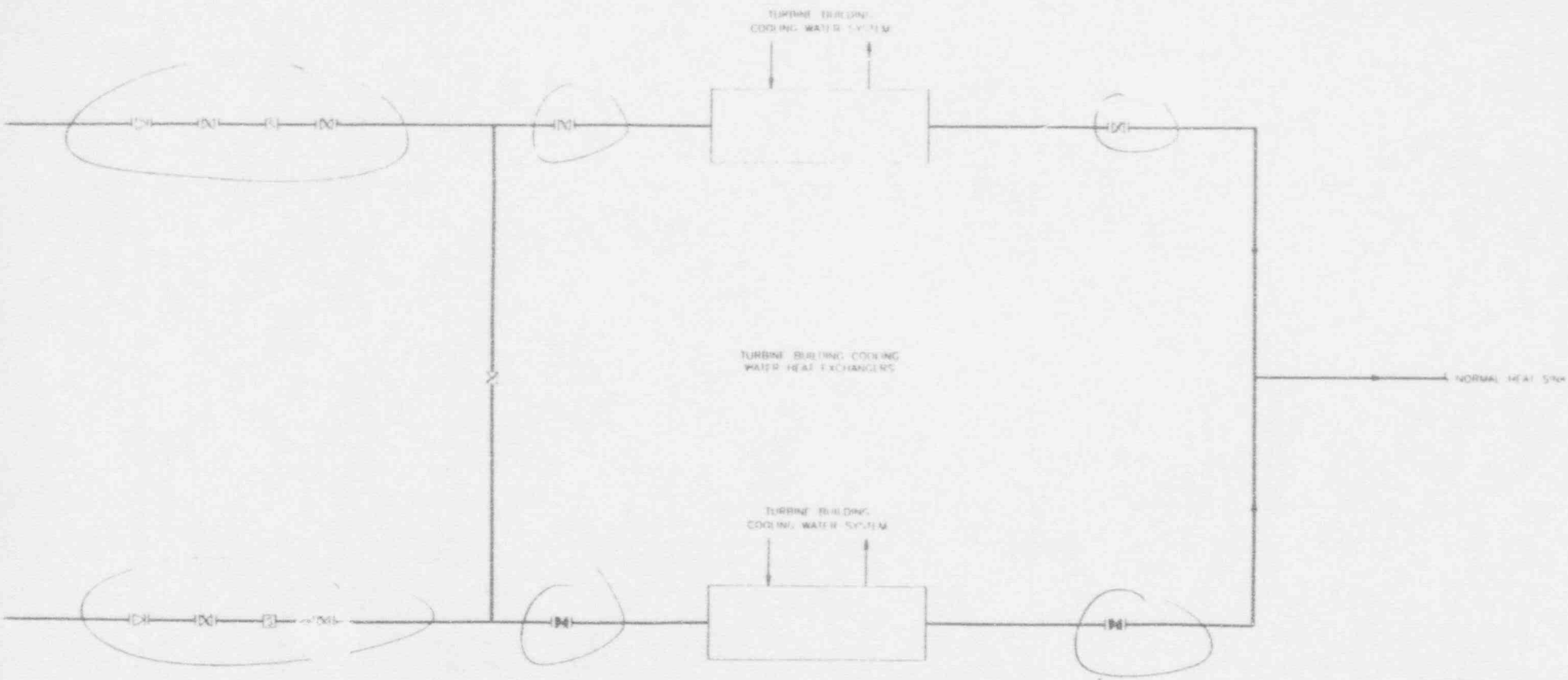
ITAAC No. 2.7.14 Turbine Building Service Water System (TBSWS)   Page 1 of 1

No.	Comments	Cat.	Resolution
1	CESSAR Figure 9.2.10-1 used valve symbols that are not defined in accordance with the symbols and legends of Figures 1.7-1 and 1.7-2. Please clarify.	1	Agree - pass to ABB-CE.

By: George Y. Cha
01/28/1994

Resolved by: Lyons

NOTES:
1. THIS DRAWING ILLUSTRATES A TYPICAL TRAIN. THE FINAL DETAIL CONFIGURATION OF THE DESIGN WILL BE MODIFIED TO SITE REQUIREMENTS.



VALVE SYMBOLS NOT IN LEGEND.

CESSAR FIGURE 9.2.10-1

SYSTEM 80

SEGALA

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.15 Equipment and Floor Drainage

No.	Comments	Cat.	Resolution
1	The system design bases (CESSAR 9.3.3.1) requires that the EFDS be capable of preventing a backflow of water that might exist from maximum flood levels resulting from external or system leakage to areas of the plant containing safety-related equipment. This should be added to the CDM design description.	1	AGREE

By: Serita Sanders 504-2956

Resolved by: J. SEGALA

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.16 (CVCS)

No.	Comments	Cat.	Resolution
1	Fig. 2.7.16-1: Note 1 should include ASME Section III, Class 3, components as safety-related items to be consistent with CESSAR Table 3.2-1 which lists CVCS components such as, volume control tank, charging pumps, seal injection heat exchanger, and valves as Safety Class 3.	1	Agree.
2			

HLB

KIP

By S.Malur (504-2963)

Resolved by: H.Brammer / K.Parczewski

KHAYAL

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.17 Control Complex Ventilation System

No.	Comments	Cat.	Resolution
1	CESSAR section 9.4.1.2, page 9.4-6 paragraph 1 absorber should be adsorber.	3	AGREE.
2			
3			
4			
5	Acceptance Criteria 8~~, listed as the first Acceptance Criteria 9,~~ does not use the 1/8" of water for the pressurization requirement as indicated in the CESSAR section 9.4.1.2, page 9.4-6 paragraph 4.	1	NO ACTION NEEDED EXCEPT TYPO. ERROR "9" WHICH SHOULD BE "8". ~~TSC IS NON-SAFETY RELATED.~~ TSC PRESSURIZATION TO [illegible] 1/8-INCH WG IS DESCRIBED IN TIER 2 AND [illegible]

By: Phillip Ray

Resolved by: J. KHAYAL

9.4.1.2 System Description

The main control room air-conditioning system consists of two Divisions. Each Division has an outside air intake, louver, tornado damper, dampers, filtration unit, an air conditioning unit with fan, ducting, instrumentation and controls. Each redundant air conditioning unit consists of filter, safety-related chilled water coil for heat removal, electric heating coil and fan for air circulation. Each of the filtration units consists of prefilter, electric heater, absolute (HEPA) filter, carbon absorber, post filter (HEPA) and fan along with ducts and valves and related instrumentation. Chilled water is supplied from the Essential Chilled Water System.

During normal operation, return air from the control room is mixed with a small quantity of outside air for ventilation, is filtered and conditioned in the control room air-conditioning unit, and is delivered to the control room through supply ductwork. Duct-mounted heating coils and humidification equipment provide final adjustments to the control room temperature and humidity for maintaining normal comfort conditions.

Each air inlet structure is provided with redundant radiation monitoring devices and a smoke detector. The designated MCR filtration units and ventilation fan start automatically on a Safety Injection Actuation Signal (SIAS) or high radiation signal. Upon failure of the designated filtration unit, the redundant filtration unit starts automatically. The MCR filtration unit filters particulates and potential radioactive iodines from a portion of the return air, and delivers the filtered air to the inlet of the main air-conditioning unit.

The Technical Support Center air-conditioning system consists of an air-handling unit, return air and smoke purge fans, and an emergency filter unit. The TSC is maintained at 1/8" water gauge positive pressure with respect to adjacent areas during post-accident conditions. A common supply air header and common outside air intake dampers are shared by the TSC and the control room to protect the TSC from the contaminants in the outside air intakes. The TSC can be isolated from the Main Control Room by using manual controls. The TSC is automatically isolated if control room pressurization falls below its design value.

The TSC is provided with shielding protection from direct radiation from an external radioactive cloud and internal radioactive sources. The combined effect of all radiation protection measures is designed to be adequate to limit the overall calculated radiation exposure to the personnel inside the TSC to the requirements of GDC 19. The computer room air-conditioning system consists of two 100% air-conditioning units and associated fans. Both the Technical Support Center and computer room air-handling systems are non-safety and non-seismic.

The safety-related and non-safety related battery rooms have hydrogen detection devices to monitor hydrogen concentration.

Indication of high radioactivity and toxic gas at outside air intakes is provided in control room.

Each Control Room Intake is provided with redundant, Seismic Category I, Class 1E, safety related radiation monitors. The CR air intake radiation monitors are located outside (upstream) of the Main CR intake dampers so that they can continue to monitor the air immediately outside the intakes to support the automatic selection capability. Upon detection of high radiation at either Control Room Intake or upon receipt of ta Safety Injection Actuation Signal (SIAS), component control logic will automatically divert the control room air intake and recirculation air flows to pass through the designated Control Room Filtration Unit. Upon failure of the designated filtration unit to start, the redundant filtration unit will start automatically. At the same time, component control logic will isolate the Control Room Intake which has the greater radiation level and block the isolation of the Control Room Intake which has the lesser radiation level. These automatic features ensure that positive pressurization of the Control Room is maintained by uninterrupted pressurization air flow via the lesser contaminated Control Room Intake. Also, automatic selection logic is provided to continuously monitor and compare the radiation levels at both Control Room Intakes and effect Control Room Intake isolation damper realignments as needed so that the lesser contaminated Control Room Intake supplies pressurization air to the Control Room, even if radiation levels change. In addition, component control logic will ensure that the Control Room Intake isolation damper with the lesser radiation level is opened before the Control Room Intake isolation damper with the greater radiation level is closed. In the event of alignment failure, the operator is alerted by a Control Room alarm so that manual actions may be taken.

9.4.2 FUEL BUILDING VENTILATION SYSTEM

9.4.2.1 Design Basis

The Fuel Building Ventilation System is designed to:

A. Maintain a suitable environment for the operation, maintenance, and testing of equipment.

B. Maintain a suitable access and working environment for personnel.

TABLE 2.7.17-1 (Continued)

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. Each MCR filtration unit and the TSC filtration unit remove particulate matter and iodine.	6. Testing and analysis will be performed on each MCR filtration unit and the TSC filtration unit to determine filter efficiencies.	6. The MCR and TSC filter efficiencies are greater than or equal to 95% for all forms of non-particulate iodine and greater than or equal to 99% for particulate matter greater than 0.3 micron.
7. The MCR is maintained at a positive pressure with respect to the adjacent areas.	7. Testing and analysis will be performed on the MCRACS.	7. The MCR is pressurized to at least 0.125 inches of water gauge relative to the adjacent areas with outside air supply no more than 2000 CFM.
8. The TSC can be pressurized with respect to the adjacent areas.	8. Testing will be performed on the TSC.	9. The TSC can be maintained at a positive pressure with respect to the adjacent areas.
9. The designated MCR filtration unit starts automatically and the MCR air conditioning unit starts or continues to operate, if running, on receipt of a safety injection actuation signal (SIAS) or a high radiation signal. In addition, the dampers in the MCR circulation lines and the bypass lines reposition to establish the flow path through the MCR filtration units.	9. Testing will be performed on the MCR filtration units, MCR air conditioning units, and dampers using a signal that simulates a safety injection actuation signal (SIAS). The testing will be repeated for a signal that simulates a high radiation signal.	9. The MCR filtration units and MCR air conditioning units start on receipt of a signal that simulates a SIAS,or a signal that simulates high radiation,and dampers reposition to establish the flow path through the MCR filtration units.

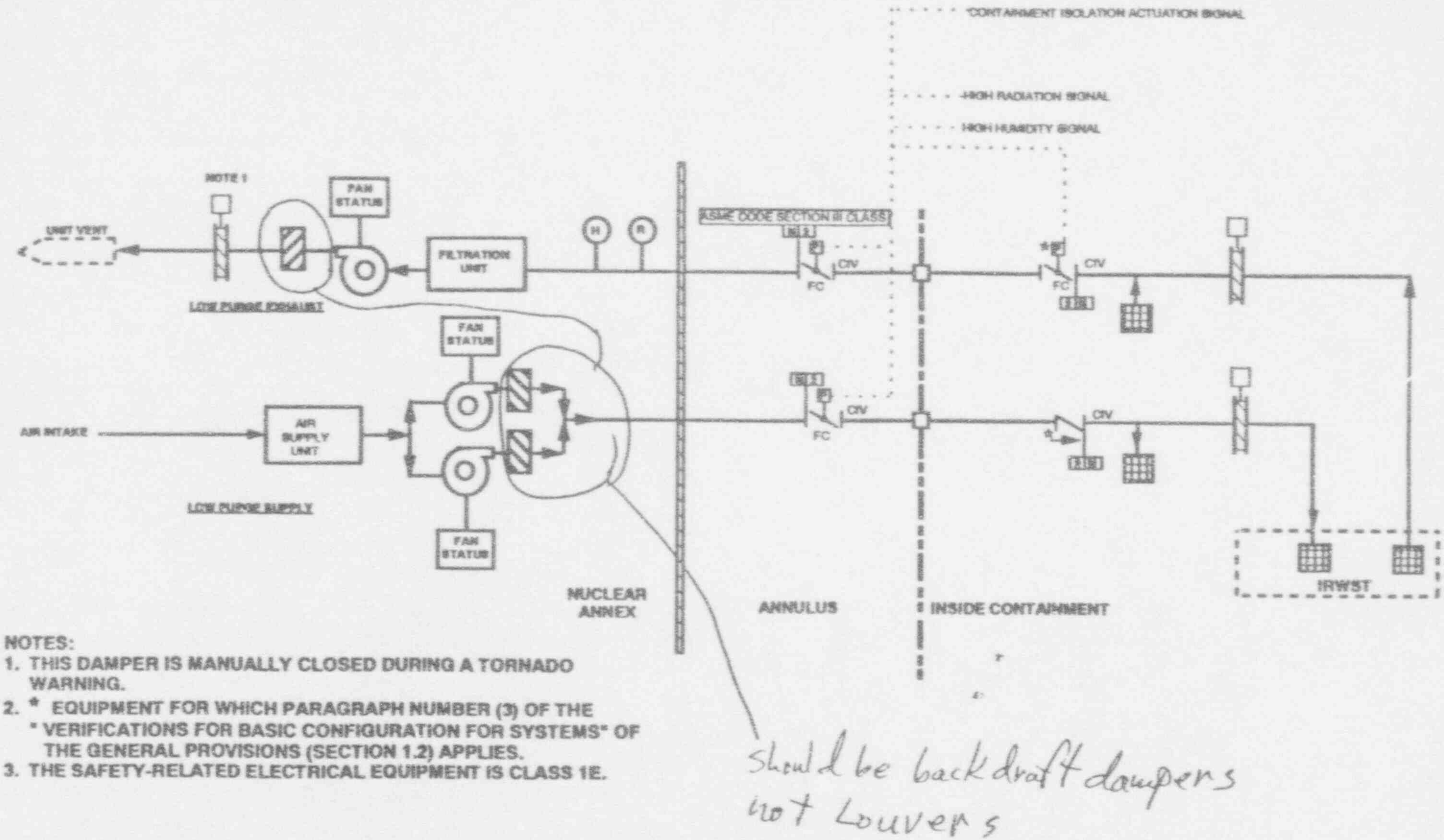
CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.21 Containment Purge Ventilation System

No.	Comments	Cat.	Resolution
1	Figure 2.7.21-1 and -2 should have back draft dampers on the discharge side of fans. CESSAR figure 9.4.6.		AGREE. FIGURE 2.7.21-1 AND -2 SHOULD SHOW CORRECT SYMBOLS FOR BACK DRAFT DAMPERS.

By: Phillip Ray

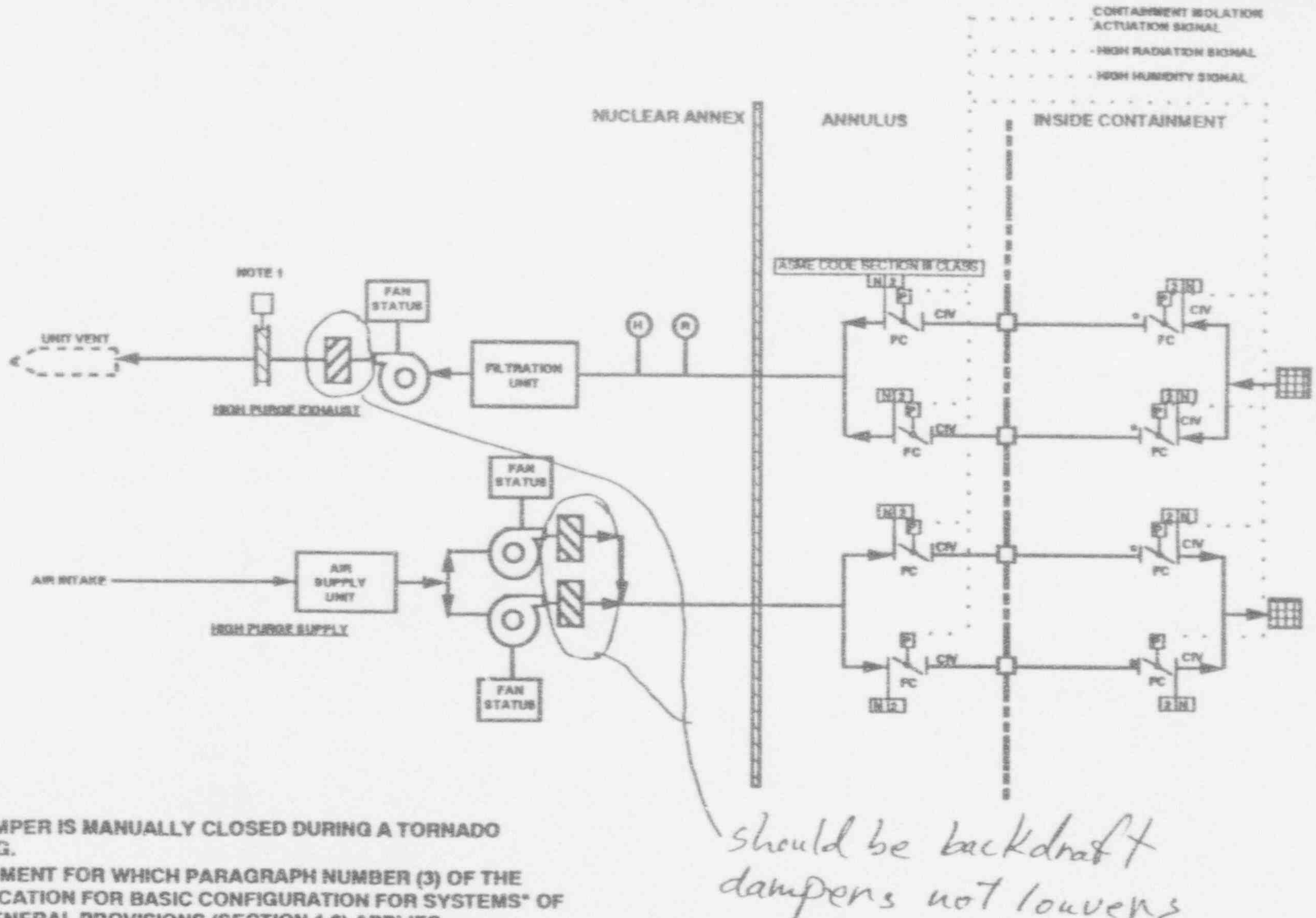
Resolved by: J. RAVAL



NOTES:

1. THIS DAMPER IS MANUALLY CLOSED DURING A TORNADO WARNING.
2. * EQUIPMENT FOR WHICH PARAGRAPH NUMBER (3) OF THE "VERIFICATIONS FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
3. THE SAFETY-RELATED ELECTRICAL EQUIPMENT IS CLASS 1E.

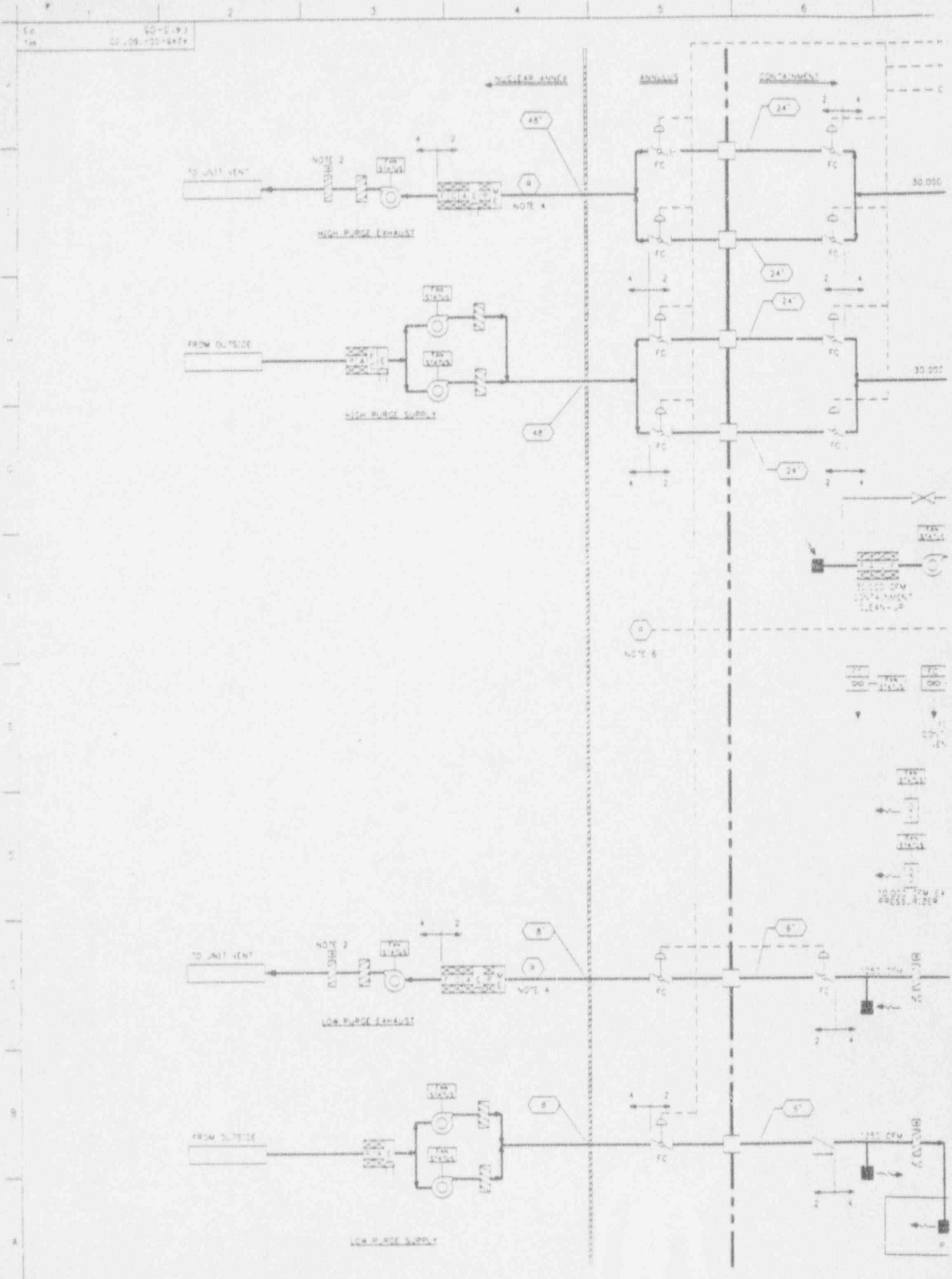
FIGURE 2.7.21-1
CONTAINMENT PURGE VENTILATION SYSTEM (LOW PURGE)



NOTES:

1. THIS DAMPER IS MANUALLY CLOSED DURING A TORNADO WARNING.
2. * EQUIPMENT FOR WHICH PARAGRAPH NUMBER (3) OF THE "VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.
3. THE SAFETY-RELATED ELECTRICAL EQUIPMENT IS CLASS 1E.

FIGURE 2.7.21-2
CONTAINMENT PURGE VENTILATION SYSTEM (HIGH PURGE)



FILENAME F41305

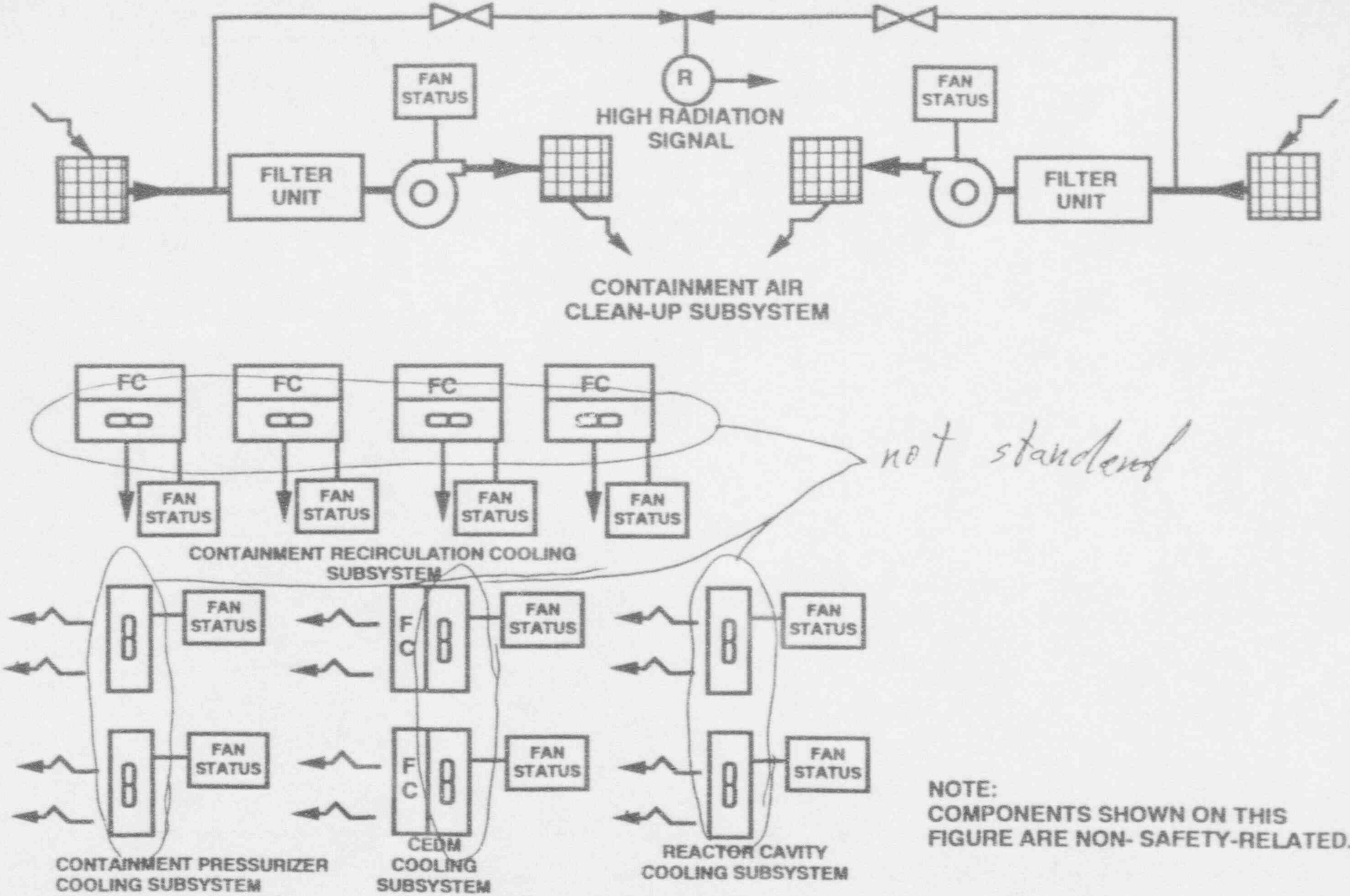
CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.22 Containment Cooling and Ventilation System

No.	Comments	Cat.	Resolution
1	Figure 2.7.22-1 does not use the standard fan symbol.		Reply: CDM AND TIER 2 FIGURES ARE IDENTICAL. THERE IS NO SYMBOL FOR "FAN COIL UNIT" OR "RECIRCULATION UNIT" WITHOUT COIL(S).
			ADDITIONALLY, THESE UNITS ARE NON-SAFETY RELATED. HOWEVER, FOR UNIFORMITY OF SYMBOLS, NEW SYMBOL SHOULD BE ADDED FOR "FAN-COIL UNIT" SHOWING
			COIL(S) AND FAN IN CDM'S LEGENDS AND CESSAR-DC FIGURE 9.4.1.

By: Phillip Ray

Resolved by: [illegible]



NOTE:
COMPONENTS SHOWN ON THIS FIGURE ARE NON- SAFETY-RELATED.

FIGURE 2.7.22-1
CONTAINMENT COOLING AND VENTILATION SYSTEM

12-31-93

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.23 Nuclear Annex Ventilation

No.	Comments	Cat.	Resolution
1			
2	Paragraphs 2 and 7 of the design description appear to be duplicative, this information needs to be stated in a more clear and coherent manner.	1	DELETE PARAGRAPH 7 OF CDM ITEM 2.7.23. NO OTHER CHANGES NEEDED.

By: Phil Ray

Resolved by: J. RAVAL

2.7.23 NUCLEAR ANNEX VENTILATION SYSTEM

Design Description

The Nuclear Annex Ventilation System (NAVS) provides ventilation, cooling and heating to the nuclear annex and is located inside the nuclear annex. The exhaust and supply fans can be used for smoke removal.

The safety-related component cooling water system pump rooms and essential chilled water system pump and chiller rooms are cooled by the Essential Chilled Water System recirculating units.

The Basic Configuration of the NAVS is as shown on Figures 2.7.23-1 and 2.7.23-2. The NAVS is a non-safety-related system.

The NAVS has two Divisions. Each Division of the NAVS has a filtration unit, fans, ductwork, instrumentation, and controls.

Each division of the NAVS maintains its Division of the nuclear annex at a negative pressure relative to the outside atmosphere.

The two mechanical Divisions of the NAVS are physically separated.

The safety-related component cooling water system (CCWS) pump rooms and essential chilled water system pump and chilled rooms are cooled by the essential chilled water system recirculating units.

Displays of the NAVS instrumentation shown on Figures 2.7.23-1 and 2.7.23-2 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the NAVS filtration units and fans, and to open and close those power operated dampers shown on Figures 2.7.23-1 and 2.7.23-2.

In response to a high radiation signal, the filtration unit bypass dampers close and the filtration unit dampers open to route exhaust air through the filtration units.

The exhaust and supply fans can be used for smoke removal.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.23-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Nuclear Annex Ventilation System.

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.24 (Fire Protection System)

No.	Comments	Cat.	Resolution
1	This section covers only the fire protection water supply and distribution system. The criteria and commitments related to ~~achieving safe shutdown following a fire,~~ passive fire mitigating features, ~~and support systems~~ are not discussed. ~~anywhere in the CDM.~~	2 ABB-CE	Pass to ABB-CE. Section 2.1.1, Nuclear Island Structures shows 3 hour fire walls on figure, but they are not discussed in DD or verified explicitly in ITAAC (like GE did). Also, the use of mineral insulated cables inside containment as fire barriers and the fire rating of containment electrical penetrations have not been addressed.

By: S.Malur (504-2963)

Resolved by: Holmes

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.26 Lighting System

No.	Comments	Cat.	Resolution
1	Design Description needs to be revised as shown in the attached mark-up.	1	Send to CE (AGREE) (See attached)
2	ITAAC entry is needed to verify that "the security lighting system provides illumination in isolation zones and outdoor areas within the plant protected perimeter." Refer 3rd para. of design description.	1	Send to CE (AGREE)
3	CESSAR Section 9.5.3 refers to standby non-safety AAC source as combustion turbines instead of gas turbines. The above CESSAR section needs to be revised to be consistent with SSAR fig. 8.3.1-1 and CESSAR Section 8.3.3.1.1.5	1	(AGREE) (already changing SSAR)
4			
5	Design commitment #4 states that "Class 1E DC self-contained battery operated lighting units are provided with a minimum 8 hour capacity." ITAAC does not verify this requirement as written. ITAAC #4 needs to be revised to include tests to verify the minimum 8 hour capacity of the batteries.	1	Inspection is adequate. No test needed. (CE to split ITAAC 4) Send to CE (AGREE

No.	Comments	Cat.	Resolution	
6	The CESSAR Section 9.5.3 needs to be revised to show the separation and independent requirements of the lighting circuits.	2	Send CE -see attached (Accept)	Note
7	ITAAC #4 needs editorial change as shown in the attached mark-up.	1	Send to CE - edit (Accept)	

By: R. Mathew

Resolved by: Thatcher

2.7.26 LIGHTING SYSTEM

Design Description

The Lighting System is a non-safety-related system that is used to provide illumination at locations in the plant and on the plant site. The Lighting System has a normal lighting system, a security lighting system, and an emergency lighting system.

The normal lighting system provides general illumination at locations in the plant.

The security lighting system provides illumination in isolation zones and outdoor areas within the plant protected perimeter. The security lighting system is powered from the permanent non-safety buses.

The Emergency Lighting System consists of conventional AC fixtures fed from Class 1E AC power sources and DC self contained battery operated lighting units. Class 1E DC self contained battery operated lighting units are provided with rechargeable batteries with a minimum 8 hour capacity. Class 1E DC self contained battery operated lighting units are supplied AC power from the same power source as the normal lighting system in the area in which they are located.

The emergency lighting system provides illumination in the vital areas that include the main control room (MCR), the technical support center, the operations support center, the remote shutdown room, and the stairway which provides access from the MCR to the remote shutdown room.

Emergency lighting in the MCR is provided such that at least two circuits of lighting fixtures are powered from different Class 1E Divisions. The emergency lighting in the MCR maintains minimum illumination levels in the MCR during emergency conditions including station blackout. The emergency lighting installations which serve the MCR are designed to remain operational following a design basis earthquake.

Lighting circuits which are connected to a Class 1E power source are treated as associated Class 1E circuits.

Class 1E equipment is classified as Seismic Category I.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.26-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Lighting System.

TABLE 2.7.26-1 (Continued)

LIGHTING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. Class 1E DC self contained battery operated lighting units are provided with rechargeable batteries with a minimum 8 hour capacity. Class 1E DC self contained battery operated lighting units are supplied AC power from the same power source as the normal lighting system in the area in which they are located.	4. a Inspection of the as-built Class 1E DC self contained battery operated lighting units will be conducted. 4b Testing will be conducted by provide a test signal on electrical divisions that supply power to the normal lighting system. PROVIDING Comment 5 Comment 7	4. a Class 1E DC self contained battery operated lighting units are provided with rechargeable batteries with a minimum 8 hour capacity. 4b Class 1E DC self contained battery operated lighting units are supplied AC power from the same power source as the normal lighting system in the area in which they are located. Class 1E DC self contained battery operated lighting units are turned on when the normal lighting system in the area in which they are located is lost.
5. Emergency lighting in the MCR is provided such that at least two circuits of lighting fixtures are powered from different Class 1E Divisions.	5. Testing will be performed on the emergency lighting system in the MCR by providing a test signal in only one Class 1E Division at a time.	5. Within the MCR emergency lighting system, a test signal exists only at the equipment powered from the Class 1E Division under test.
6. The emergency lighting in the MCR maintains minimum illumination levels in the MCR during emergency conditions including station blackout.	6. Testing of the emergency lighting system will be performed under simulated station blackout conditions.	6. Under simulated station blackout conditions, the emergency lighting system in the MCR maintains illumination levels greater than or equal to 10 foot-candles.
7. Lighting circuits which are connected to a Class 1E power source are treated as associated Class 1E circuits.	7. Inspection of the associated Class 1E lighting circuits will be conducted.	7. The as-built associated Class 1E lighting circuits are identified as associated Class 1E circuits.

LIGHTING SYSTEM 2.7.26

Add To Design Description and Provide ITAACs

1. Paragraph #6 after associated Class 1E circuits add: Independence is provided between Class 1E divisions and also between Class 1E divisions and non-Class 1E equipment.

2. Class 1E or associated Class 1E lighting distribution system equipment is identified according to its Class 1E division and is located in Seismic Category 1 Structures, and in its respective divisional areas.

3. Class 1E or associated Class 1E lighting system cables and raceways are identified according to their Class 1E division. Class 1E or associated Class 1E lighting system cables are routed in their respective divisional raceways and in Seismic Category 1 Structures.

ADDITIONS FOR CESSAR LIGHTING 9.5.3

1. The criteria for the physical identification of lighting cables and circuits are consistent with the criteria for physical identification and separation of Class 1E and non-Class 1E cables and circuits as described in IEEE-384 and Regulatory Guide 1.75, which are part of CESSAR, Chapter 8, Electrical Power Systems.

2. On page 9.5-48, Amendment T, paragraph #6 after associated Class 1E circuits add Independence is provided between Class 1E divisions and also between Class 1E divisions and non-Class 1E equipment.

3. Class 1E or associated Class 1E lighting distribution system equipment is identified according to its Class 1E division and is located in Seismic Category 1 Structures, and in its respective divisional areas.

4. Class 1E or associated Class 1E lighting system cables and raceways are identified according to their Class 1E division. Class 1E or associated Class 1E lighting system cables are routed in their respective divisional raceways and in Seismic Category 1 Structures.

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.7.8 Condensate Storage System

No.	Comments	Cat.	Resolution
1	Figure 2.7.8-1 showed a gate valve with an unspecified operator. CESSAR Figure 9.2.6-1 showed a diaphragm operated globe valve controlling the tank level from signals generated by a level transmitter. Please resolve this discrepancy.	1	[illegible]

By: George Y. Cha
01/28/1994

Resolved by: Lyons

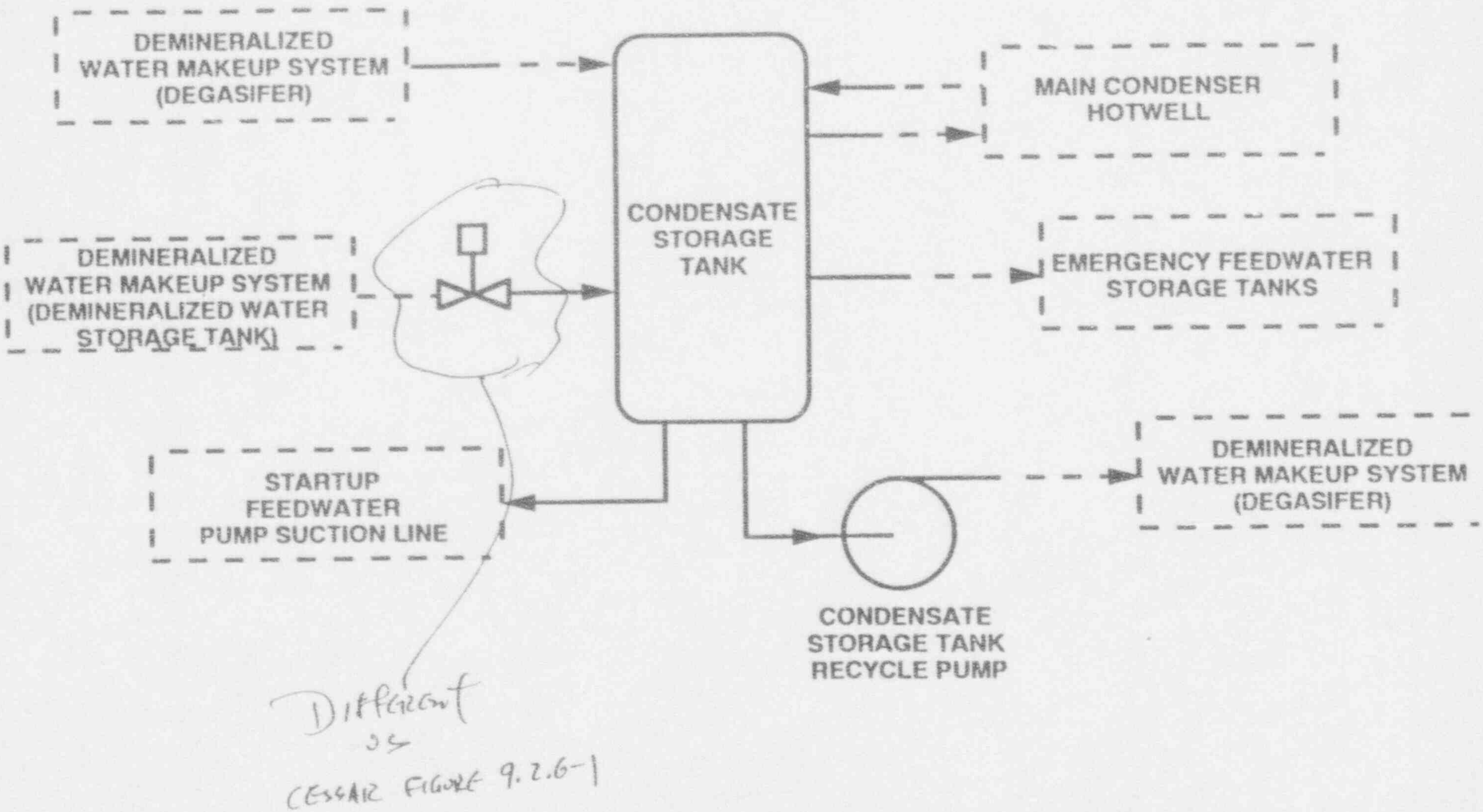


FIGURE 2.7.8-1
CONDENSATE STORAGE SYSTEM

12-31-93

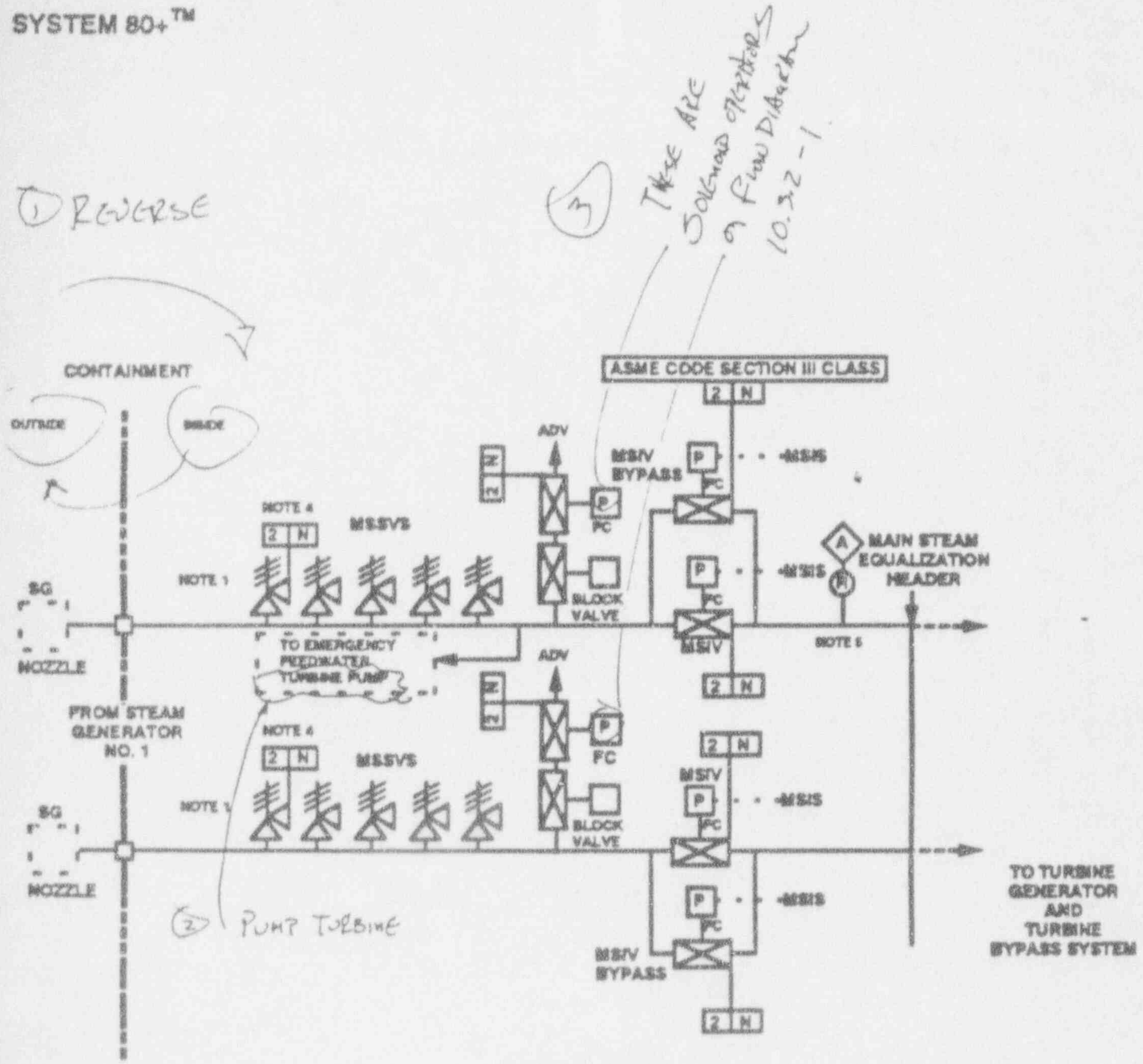
CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.8.2 Main Steam Supply System

No.	Comments	Cat.	Resolution
1	See attached figure mark-up.	1	AGREE.

By: George Cha 504-2981

Resolved by: [illegible]



NOTE:

1. NOT LESS THAN 5 MSSV WILL BE INSTALLED FOR EACH STEAMLINE.
2. ASME CODE SECTION III CLASS COMPONENTS SHOWN ON THE FIGURE ARE SAFETY-RELATED.
3. SAFETY-RELATED ELECTRICAL COMPONENTS AND EQUIPMENT SHOWN IN THIS FIGURE ARE CLASS 1E.
4. THE ASME CODE SECTION III CLASS BREAK OCCURS AT THE DISCHARGE OF EACH MSSV.
5. PRIMARY TO SECONDARY LEAKAGE MONITOR IS NOT SAFETY- RELATED

FIGURE 2.8.2-1
MAIN STEAM SUPPLY SYSTEM
(ARRANGEMENT SHOWN FOR ONE STEAM GENERATOR)

12-31-93

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.8.4 Main Condenser Evacuation System

No.	Comments	Cat.	Resolution
1	See attached page for comments.	1	See Revised Markup for CESSAR-DC Revision. AGREE

By: George Y. Cha
02/02/1994

Resolved by: V. SAYAL

PAGE 2 of 2

10.4.2 MAIN CONDENSER EVACUATION SYSTEM

10.4.2.1 Design Bases

The Main Condenser Evacuation System is designed to:

A. Remove air and other noncondensible gases from the condenser.

B. Maintain adequate condenser vacuum for proper turbine operation during startup and normal operation.

The system is designed to prevent uncontrolled release of radioactive material to the environment in accordance with 10CFR50, Appendix A, General Design Criteria (GDC) 60 and 64. System components conform to the requirements of Regulatory Guides 1.26 and 1.28 and Heat Exchange Institute (HEI) "Standards for Steam Surface Condensers." |

10.4.2.2 System Description

and interconnecting piping

The Main Condenser Evacuation System is shown in Figure 10.4.2-1. |

The Main Condenser Evacuation System consists of four skid mounted vacuum pumps which are used to pull a vacuum on the main condenser. The vacuum pumps are used for both hogging and holdings modes of condenser operation. ~~The condenser evacuation system consists of four packaged/skid mounted vacuum pump units and interconnecting piping.~~ Normally three vacuum pump units are in operation. The fourth pump unit is utilized as a maintenance spare. The vacuum pump units have two modes of operation, a hogging mode and a holding mode. The hogging mode is used to reduce the condenser pressure from atmospheric to approximately 5 to 10 in. Hg. absolute. The holding mode is used when these pressures are reached to reduce the condenser pressure to its operating value and then maintain the condenser operating pressure and provide deration capabilities during normal plant operations.

deaeration

The condenser evacuation system design provides a normally operating vacuum pump unit for each of the three condenser pressure zones and a common maintenance spare. Each operating vacuum pump unit is aligned to take suction from one of the three condenser pressure zones through two connections on the condenser shell. The normally operating vacuum pumps withdraw the air and noncondensible gases from the condenser shell, compress and discharge them through an individual line from the discharge nozzle of each vacuum pump unit to a common header routed to the unit vent.

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.8.5 Turbine Bypass System

No.	Comments	Cat.	Resolution
1	Add acronym (SBCS) to the Abbreviation List of Section 1.3.	1	DELETE ACRONYM (SBCS) FROM CDM. AGREE
2	!		
3	T E C –		
4	CESSAR section 10.4.4.4 2nd paragraph: Replace "Turbine Bypass Control System (TBCS)" with "Steam Bypass Control System", and (TBCS) WITH (SBCS).	1	AGREE. CESSAR-DC SECTION 10.4.4.4, 2nd PARAGRAPH, 3rd LINE ON PAGE 10.4-14 SHOULD STATE "STEAM BYPASS CONTROL SYSTEM (SBCS)" NOT "TURBINE BYPASS CONTROL SYSTEM (TBCS)."

CDM 2.5.

SUB-

FCDM 2.8.5

By: George Y. Cha
02/03/1994

Resolved by: J. Kaval

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.8.6 Condensate and Feedwater Systems

No.	Comments	Cat.	
			AGREE
1	Section 2.8.6 page 2 4th paragraph and Table 2.8.6-1 item 7 discussed ITAAC of MOVs with active safety function. According to CESSAR Table 3.9-15, none of the MOVs of Figure 2.8.6-1B belong in the "Active" category. Please provide rationale for the MOV discussion.	3	MOVs SHOWN IN FIGURE 2.8.6-1B ARE FEEDWATER REGULATING AND BYPASS VALVES ONLY. CDM AND ITAAC
			ITEM 7 IN TABLE 2.8.6-1 SHOULD BE REVISED TO DELETE "ACTIVE FUNCTION"
			REFERENCE OR DELETE ABOVE ITEM 7 ENTIRELY AND REVISE DD OF CDM ACCORDINGLY SINCE THESE
			MOVs ARE NOT SAFETY RELATED.

By: George Y. Cha
02/04/1994

Resolved by: J. FAYAL

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.8.7 Steam Generator Blowdown

Parczewski

No.	Comments	Cat.	Resolution
1	CDM 8th paragraph and Table 2.8.7-1, item 4 should be supplemented with a statement that the valves also close upon receipt of a containment isolation actuation signal (CIAS) as described in CDM table 2.4.5-2 (item 65/66) and CESSAR sections 10.4.8.1F and 10.4.8.3.	1 Agree	Design Description, Fig. 2.8.7-1 and Item 4 of Table 2.8.7-1 in Paragraph 2.8.7 of CDM should be modified by including a requirement that the containment isolation valve close upon receipt of a Containment Isolation Actuation Signal (CIAS)

By: George Cha

Resolved by: K. Parczewski

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.8.8 (Emergency Feedwater System)

No.	Comments	Cat.	Resolution
1			
2			
3			
4	Fig. 2.8.8-1: Add symbols for alarms for the EFWST level instruments. They are more important than the temperature alarms.	1	AGREE.
5			
6			

By: S.Malur (504-2963)

Resolved by: [illegible]

10 ~ [illegible]

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.9.1 Liquid Waste Management (Rad Prot aspects)

No.	Comments	Cat.	Resolution
1	Markup for CESSAR Sections 11.1 & 11.2 are attached.	1	Agree with the Markup. Some of the markup already communicated to ABB-CE.
2			

JC.

Offered By: Dean Chaney, R-V (510)975-0229 (2/22/94) Resolved by: ____________

TABLE 11.1.1-3

TRITIUM ACTIVATION REACTIONS

	Reaction	Threshold Energy (MeV)	Cross Section [a]
1)	^{10}B (n, 2α)T	1.0	4.20(+1)mb[b]
2)	^{7}Li (n, nα)T	3.9	3.85(+2)mb
3)	^{6}Li (n, α) T	Thermal	9.45(+2) barns
4)	D (n, γ)T	Thermal	5.50(-1)mb
5)	^{11}B (n, T)^{9}Be	10.4	1.50(+1)mb

NOTES: (a) Threshold cross sections are from References 7 and 8. These are spectrum - averaged for neutrons of energy greater than indicated threshold energy.

(b) Number in parentheses denotes power of ten.

liquid effluent in the unrestricted area are within 10 CFR 20, Appendix B, Table ~~II~~ 2, Column 2 ~~maximum~~ permissible concentrations.

B. The system must contribute to meeting the performance design objectives in that it should not interfere with the normal station operation including anticipated operational occurrences.

The LWMS is a non-nuclear safety related system. It has no accident mitigation functions. The LWMS is designed in accordance with requirements in ANSI/ANS 55.2 and Regulatory Guide 1.143. This includes the following features:

1. The LWMS is designed with sufficient redundancy to tolerate a single major component failure and process radioactive liquid waste during normal operation, including anticipated occurrences.

2. The LWMS is designed with sufficient storage capacity and redundancy to accommodate an increase in demand during normal operation of the plant.

C. Releases of radioactive materials to the environment must be controlled and monitored in accordance with 10 CFR 50, Appendix A (General Design Criteria 60, 61 and 64).

The release of liquid waste requires an operator action. Prior to release through the plant discharge, radioactive liquid waste is sampled. The LWMS is also provided with a radiation monitor which monitors in the discharge line downstream from the Waste Monitor Tanks. In the event that the concentration of the discharge may exceed 10 CFR 20 limits, the radiation monitor would terminate the discharge. Section 11.5, Radiation Monitoring System, provides a detailed discussion regarding the radiation monitoring for the LWMS.

D. Accidental releases of radioactive materials from a single component of the LWMS must not result in offsite doses which exceed the guidelines of 10 CFR 20, Section 20.1301.

The LWMS and the Radwaste Building are designed so there is no liquid release to the environment due to a LWMS failure or leak. In addition, the LWMS is designed so that there is no possibility of gravity or syphon flow from the LWMS to the environment. This precludes an inadvertent release of radioactive liquid to the environment by this mechanism.

11.2.6.1 Release Points

All discharges from the LWMS subsystems of detectable radioactivity are made through a common discharge header. The LWMS is designed with the capability to simultaneously discharge any or all of the radioactive liquid waste water from the LWMS subsystems' collection and/or waste monitor tanks and the condensate cleanup system neutralization tanks, as appropriate, through a single dedicated discharge point. The setpoints on each of the discharge lines will be determined and coordinated by the COL Applicant, as discussed in Section 11.5. The determination of the setpoints of the LWMS discharge radiation monitor, located downstream of the last possible point of input of radioactive liquid effluent from the respective LWMS collection or waste monitor tanks and radiation monitor located downstream of the condensate cleanup system neutralization tanks discharge, will be provided by the COL Applicant. The COL Applicant will develop the setpoints for radiation monitors on each of the discharge lines at the common plant discharge header for radioactive liquid effluents. Development of these setpoints is discussed in Section 11.5. All releases are monitored prior to dilution and discharge. Complete mixing of liquid waste with the dilution flow prior to discharge is assured by combining the two flows well upstream of the respective discharge point.

11.2.6.2 Dilution Factors

The dedicated liquid waste dilution flow can vary depending on the number of Liquid Waste Dilution Pumps that are operating. For the purpose of dose evaluations, an average dilution of 100 CFS is assumed for all release points for potentially radioactive liquid effluent. The 10 CFR 50, Appendix I analysis for the liquid pathways is based on a dilution flow of 100 cfs. This dilution flow may be comprised of dilution flow provided by the following sources as determined by the COL Applicant:

a. dilution pumps,
b. cooling tower blowdown, and/or
c. site specific dilution flow parameters (e.g., site specific hydrology);

but the discharge point is assumed to be located on a receiving water such that no significant recirculation occurs between the dilution flow intake and discharge.

The rate of radioactive liquid discharges will be based on the available dilution and concentrations of 10 CFR 20, Appendix B, Table ~~II~~ 2 – Column 2 X

C. Results and Conclusions

The concentration of the liquid effluents at the plant discharge is shown in Table 11.2-5. The resultant concentration at the plant discharge is less than the Effluents Concentrations specified in 10 CFR 20, Appendix B of Sections 20.1001 - 20.2402, Table 2, Column 2 ~~guidelines~~.

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.9.1 Liquid Waste Management (mechanical aspects)

No.	Comments	Cat.	Resolution
1	Mark-up for design description and ITAAC ~~is~~ attached. (Partial agreement)	~~1~~	Agree with design description and ITAAC Table 2.9.1-1 mark-up. Marked-up further ITAAC design description. Agree only with one mark-up of ITAAC Fig. 2.9.1-1. Added one input to low level waste subsystem (For explanation see below)
2	Editorial SSAR mark-up attached.	3	Agree with editorial SSAR mark-up. Added one more editorial SSAR markup. ABB-CE has previously indicated that the added markup relating to laundry & hot shower wastes will be incorporated in the CESSAR-DC revision.

Explanation of Resolution of Comment 1

1. Containment cooler condenser drains are already shown in Fig. 2.9.1-1. The figure shows that these can be ~~either~~ discharged with or without processing by the low level waste subsystem. Also, the figure shows that these go through the two motor operated containment isolation valves. ~~So, there is no need to~~
2. The check valve is not credited as a containment isolation valve. So it need not be shown as a CIV.
3. It is insignificant whether one calls nuclear annex floor drains or nuclear annex floor sumps. Actually, in the figure it is called nuclear annex radioactive floor drain sumps. The shortened form of the above, i.e., nuclear annex floor drains is probably ~~a~~ the best choice.
4. BAC CVCS addition is alright.
5. Neutralization tank discharge which contains condensate demineralizer regeneration wastes can be an additional input to the low-level waste subsystem. This will occur only if the discharge is found to be radioactive. Therefore, this additional optional input to the low-level waste subsystem has been added in Figure 2.9.1-1. This additional input is a result of very recent changes to LWMS proposed by ABB-CE.

By: Bob Gramm 504-1010

Resolved by: __________

The condensate cleanup system has neutralization tanks to collect condensate demineralizer regeneration wastes. The discharge from the tanks is monitored for radioactivity. Although not normally radioactive, this discharge can be diverted to the low level waste subsystem. The tank levels are monitored by level instrumentation.

2.9.1 LIQUID WASTE MANAGEMENT SYSTEM

Design Description

The Liquid Waste Management System (LWMS) is used to collect, segregate, store, process, sample, and monitor radioactive liquid waste. The LWMS is non-safety-related with the exception of the containment isolation valves and piping in between covered in Section 2.4.5.

The LWMS is located in the radwaste building.

The Basic Configuration of the LWMS is as shown on Figure 2.9.1-1.

The LWMS has four subsystems which process radioactive or potentially radioactive liquid waste. These four subsystems segregate liquid waste into high level waste, low level waste, laundry and hot shower/chemical waste, and the containment cooler condensate waste.

The high level waste subsystem has filters, demineralizers, provisions for batch sampling, and piping for recirculation of liquid waste for further processing.

The low level waste subsystem has filters, demineralizers, provisions for batch sampling, and piping for recirculation of liquid waste for further processing.

The laundry and hot shower/chemical waste subsystem has filters, demineralizers, provisions for batch sampling, and piping for ~~transfer of laundry and hot shower/chemical wastes to the low level waste subsystem~~ recirculation of liquid waste for further processing.

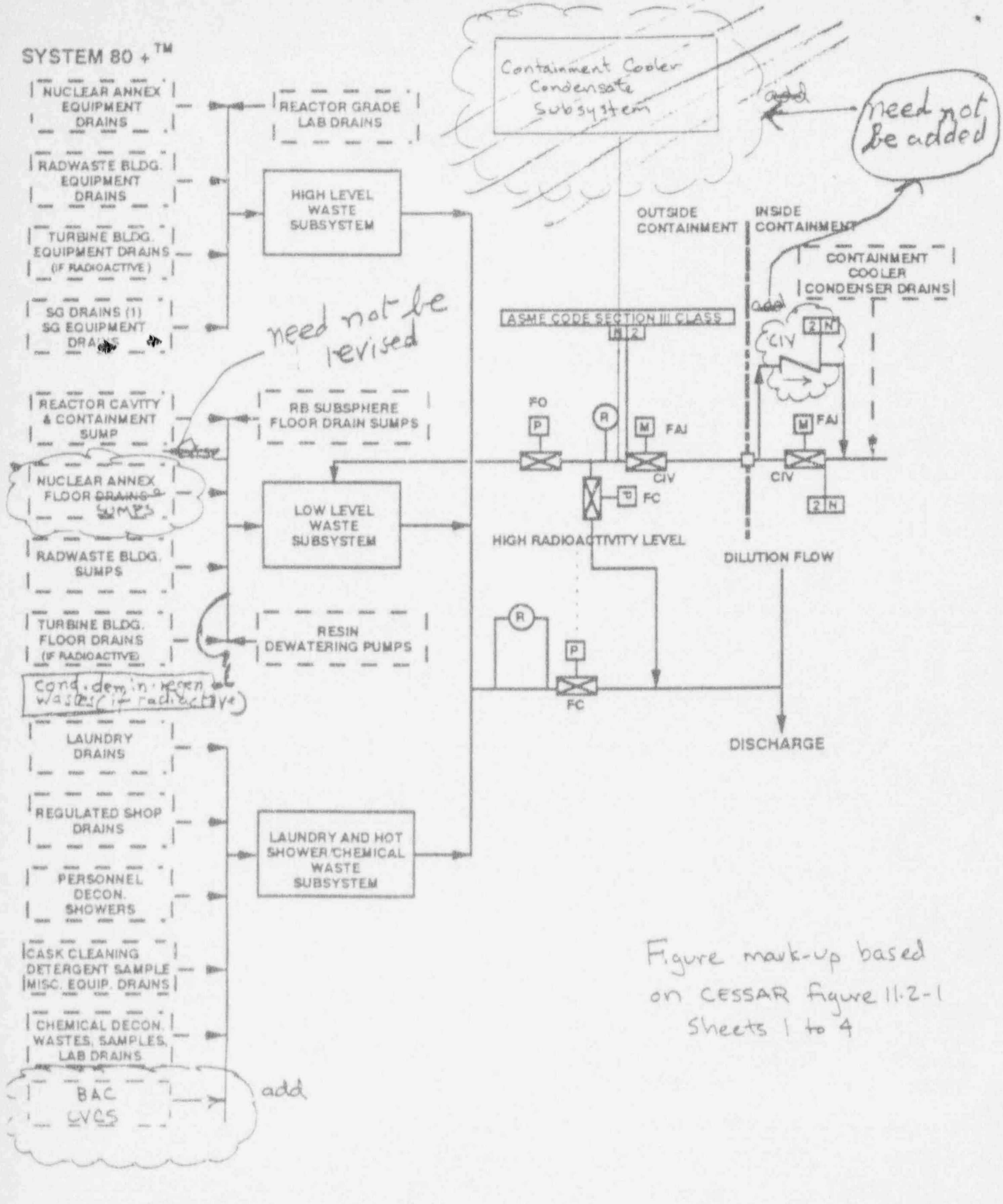
The containment cooler condensate subsystem has tanks to collect containment cooler condensate. The discharge from the tanks is monitored for radioactivity. Although not normally radioactive, this discharge can be diverted to the low level waste subsystem. The containment cooler condensate tank levels and discharge flow are also monitored by level and flow instrumentation.

The LWMS subsystems have collection and storage capacity to process waste volumes expected during normal operation and from anticipated operational occurrences.

Displays of the LWMS instrumentation shown on Figure 2.9.1-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to open and close the power operated valves shown on Figure 2.9.1-1. X

The valves with the response position indicated on Figure 2.9.1-1 change position to X



NOTE
STEAM GENERATOR DRAINS MAY BE ROUTED TO EITHER HIGH LEVEL WASTE OR LOW LEVEL WASTE DEPENDING ON SAMPLE ANALYSIS

FIGURE 2.9.1-1
LIQUID WASTE MANAGEMENT SYSTEM

12-31-93

TABLE 2.9.1-1

LIQUID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the Liquid Waste Management System (LWMS) is as shown on Figure 2.9.1-1.	1. Inspection of the as-built LWMS configuration will be conducted.	1. For the components and equipment shown on Figure 2.9.1-1, the as-built LWMS conforms with the Basic Configuration.
2. The ASME Code Section III LWMS components shown on Figure 2.9.1-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those components of the LWMS required to be pressure tested by ASME Code Section III.	2. The results of the pressure test of the ASME Code Section III components of the LWMS conform with the pressure testing acceptance criteria in ASME Code Section III.
3. The LWMS subsystems have collection and storage capacity to process waste volumes expected during normal operation and from anticipated operational occurrences.	3. Analysis of the as-built LWMS subsystems' processing capability will be performed.	3. An analysis exists which concludes the LWMS subsystems have collection and storage capacity to process waste volumes expected during normal operation and from anticipated operational occurrences.
4. Displays of the LWMS instrumentation shown on Figure 2.9.1-1 exist in the MCR or can be retrieved there.	4. Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	4. Displays of the instrumentation shown on Figure 2.9.1-1 exist in the MCR or can be retrieved there.
5. Controls exist in the MCR to open and close the power operated valve shown on Figure 2.9.1-1.	5. Testing will be performed using the LWMS controls in the MCR.	5. LWMS controls in the MCR operate to open and close the power operated valve shown on Figure 2.9.1-1.

TABLE 2.9.1-1 (Continued)

LIQUID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. The valve with the response position indicated on Figure 2.9.1-1 changes position to that indicated on the Figure upon loss of motive power.	6. Testing of loss of motive power to ~~this~~ valve will be performed.	6. This valve changes position to the position indicated on Figure 2.9.1-1 upon loss of motive power.
7. The radioactivity monitor provides a signal to terminate LWMS discharge when a specified radioactivity level is reached.	7. Testing of the as-built LWMS discharge controls will be performed using a signal which simulates radioactivity levels.	7. LWMS discharge is terminated in response to a signal simulating that the radioactivity level in the waste discharge line has reached a specified limit.

reasonably achievable offsite dose objectives. The dilution flow is provided by four centrifugal pumps. The pumps are sized such that any two pumps can provide a minimum of 100 CFS dilution flow to facilitate LWMS discharges.

11.2.2.2.8 Containment Cooler Condensate Tank

Two containment cooler condensate tanks are provided. The containment cooler condensate tank discharge will normally be routed to Industrial Waste Discharge since typically this stream has low activity. The capability to process this stream for processing as liquid waste will be provided.

The CCTs are fabricated of stainless steel.

11.2.2.2.9 Condensate Cleanup System Waste

The radioactive liquid waste water generated during regeneration of the condensate cleanup system polishers is collected in the neutralization tanks located in the Turbine Building. The contents of the neutralization tanks typically require no further processing and are discharged directly to the environment through a single designated discharge point. The neutralization tanks will be sampled prior to release.

Separate piping is provided room the neutralization tanks, which are located in the Turbine Building, to a common plant discharge header. A radiation monitor is provided downstream of the neutralization tank. Upon a receipt of radiation signal above the monitor setpoint, the discharge from the neutralization tanks will be terminated automatically. The operator would then sample the contents of the neutralization tanks and manually divert flow, as necessary based on the sampling results, to the Floor Drain Tank for processing in the low level waste subsystem of the LWMS prior to release to the environment.

A dike is provided around the neutralization tanks designed to be of sufficient height to contain maximum expected liquid inventory in these tanks. A dry sump is also provided to collect any spillage from the neutralization and route it to the LWMS for processing. Curbing and floor drains are provided in the regeneration area. This is discussed in Section 10.4.6.

11.2.2.2.10 Laundry and Hot Shower Tank

The laundry and hot shower waste subsystem is designed to provide the capability to terminate the discharge upon detection of high radiation in the discharge. The operator would then sample the detergent waste collection tank contents and manually divert flow to the low level subsystem for processing, as necessary, based on sampling results. Similarly, the condensate cooler tank discharge would be automatically terminated upon receipt of

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.9.2 Gaseous Waste Management System - GWMS (Rad Prot aspects)

No.	Comments	Cat.	Resolution
1	In Design Criteria # 7 the word "terminal" should be changed to "terminate." A markup copy of the ITAAC is attached.	1	Agree.
2	A markup of the CESSAR Sect. 11.3) is attached. A consistent way to state the amount of fuel cladding defects needs to be establish, at least four different phrases were noted in the CESSAR, i.e., failed fuel rate, failed fuel, failed fuel defect, and failed fuel fraction, etc.	1	Agree 1 percent failed fuel can be consistently noted (By this it is meant that 1 percent of the operating fission product core inventory gets into the RCS.)
			It is however noted that ABB-CE has analyzed the waste gas processing system failure correctly and in accordance with applicable SRP 11.3, Branch Tech. Position.

J.C.

Offered By: Dean Chaney, R-V (510)975-0229 (2/22/94) Resolved by: ______________

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6″

1

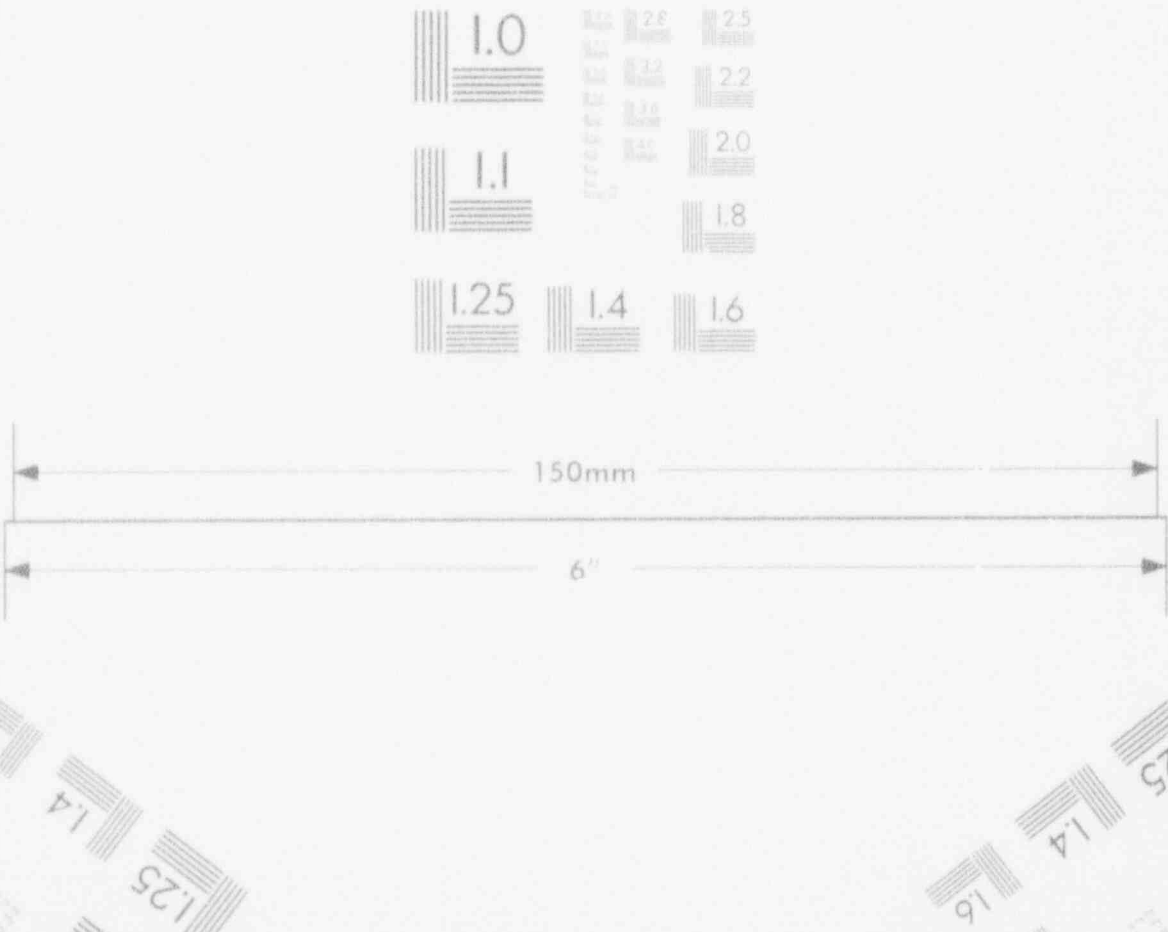
IMAGE EVALUATION TEST TARGET (MT-3)

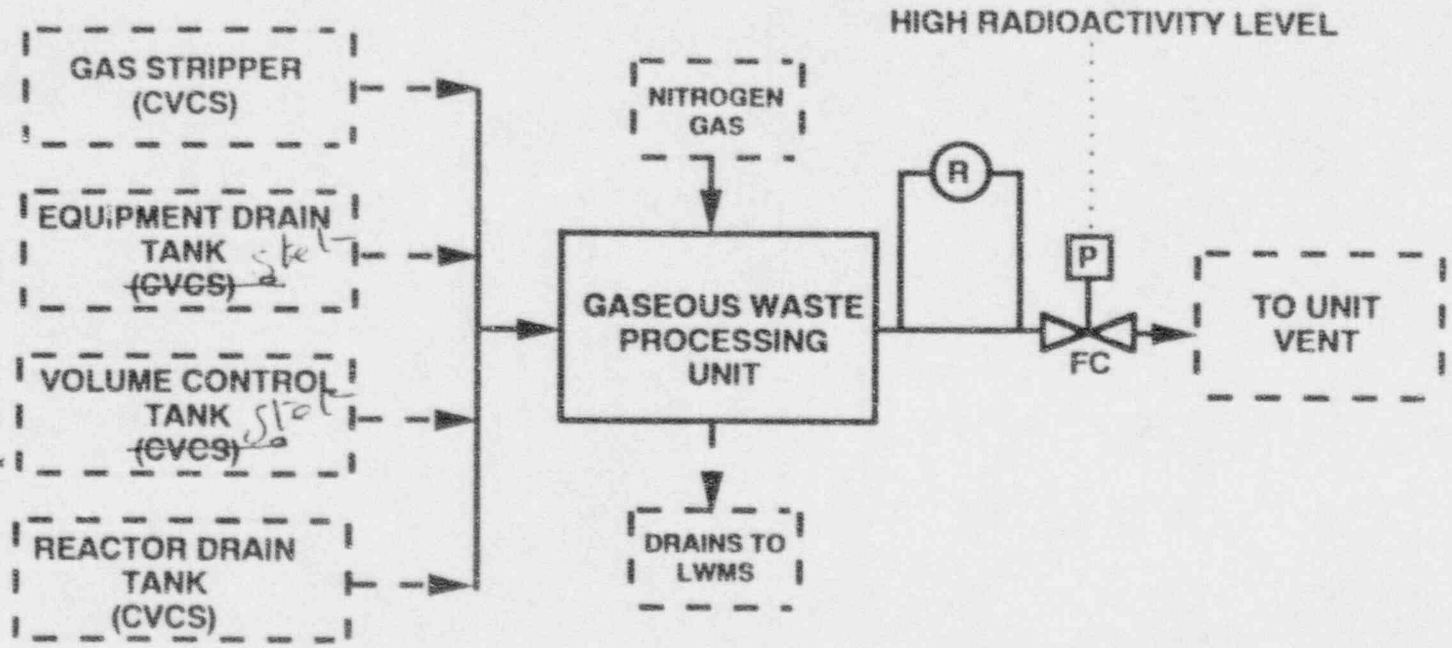
150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)





See CESSAR-DC Section 9.3.4, Which describes the CVCS. JC.

FIGURE 2.9.2-1
GASEOUS WASTE MANAGEMENT SYSTEM

11.3 GASEOUS WASTE MANAGEMENT SYSTEM

11.3.1 DESIGN BASES

11.3.1.1 Criteria and Evaluation

The GWMS is designed in accordance with the acceptance criteria defined in the Standard Review Plan, Section 11.3. The design criteria are the following:

A. Effluents normally released to unrestricted areas must meet the limiting requirements of 10 CFR 20 and meet the ALARA objectives of 10 CFR 50, Appendix I.

The GWMS continuously discharges effluent. Table 11.3-4 provides an estimate of the annual airborne effluent releases (Ci/yr) based on results from PWR-GALE. Assumptions used to calculate the annual release rate are discussed in Section 11.3.6. This estimated annual release rate is used to calculate the estimated annual dose to the maximum exposed individual. These results are listed in Table 11.3-5. This analysis assures that effluents during normal operation and anticipated operational occurrences meet 10 CFR 50, Appendix I objectives.

The GWMS is designed to ensure that normal releases to unrestricted areas are within 10 CFR 20, Appendix B of Sections 20.1001-20.2402, Table 2, Column 1 effluent concentrations based on the design basis source term. Section 11.3.8 provides a detailed discussion regarding the methodology used to calculate the concentration of the effluent at the Exclusion Area Boundary. The results of this analysis assure that the concentration of the effluent are within 10 CFR 20, Appendix B, of Sections 20.1001-20.2402 Table 2, Column 1 ~~Effluent Concentrations~~ limits.

B. The system must contribute to meeting the performance design objectives in that it should not interfere with normal station operation including anticipated operational occurrences.

The GWMS is a non-nuclear safety related system. It has no accident mitigation functions. The GWMS is designed in accordance with the guidance ~~requirements~~ in ANSI/ANS 55.4, Regulatory Guide 1.143 and 1.140. This includes the following features:

1. The GWMS is designed to preclude a buildup of an explosive mixture of hydrogen and oxygen which could impact the operation of the plant.

2. The GWMS is designed with sufficient capacity and redundancy to accommodate an increase in demand during normal operation of the plant.

C. Releases of radioactive materials to the environment must be controlled and monitored in accordance with 10 CFR 50, Appendix A (General Design Criteria 60, 61 and 64).

The GWMS is provided with radiation monitors which monitor the discharge from the charcoal adsorber beds upstream of the discharge to the Nuclear Annex Ventilation System. The GWMS discharge is automatically isolated if the discharge limit (10 CFR 20, Section~~s~~ ~~20.1001-20.2402~~ 20.1301) will be exceeded. Section 11.5, Radiation Monitoring System, provides a detailed discussion regarding the radiation monitoring for the GWMS.

The COL Applicant will provide the operational setpoint for the termination of the gaseous waste management system discharge to the environment in the plant-specific offsite dose calculation manual (ODCM). This setpoint is based on the instantaneous dose rates in unrestricted areas due to the release of radioactive materials released via gaseous effluent. This setpoint ensures that the instantaneous dose rates offsite are less than the following:

Nobles Gases	500 mrem/yr total body; 3000 mrem/yr skin
Others	1500 mrem/yr to any organ

D. Accidental releases of radioactive materials from a single component of the GWMS must not result in offsite doses which exceed the ~~guidelines~~ dose limits of 10 CFR 20, Section 20.1301.

Section 11.3.7 provides a discussion of the analysis of a single component failure of the GWMS. The methodology used in this analysis is in accordance with Branch Technical ESTB-11-5 for the design basis source term. The results of this analysis confirm that the dose consequence of a single failure of a GWMS component is within the ~~guidelines~~ dose limits of 10 CFR 20, Section 20.1301.

E. The system must also contribute to meeting the occupational exposure design objective by keeping operation and maintenance exposure ALARA.

The GWMS is designed in accordance with guidance provided in Regulatory Guide 8.8, ANSI/ANS-55.4, and Regulatory Guide 1.143 and 1.140. This ensures that the GWMS will meet ALARA objectives.

F. Protection will be provided to gaseous waste handling and treatment systems from the effects of an explosive mixture of hydrogen and oxygen in accordance with 10 CFR 50, Appendix A (General Design Criteria 3).

11.3.1.2 Codes and Standards

The GWMS is designed in accordance with the guidance of Regulatory Guide 1.143 from applicable regulatory positions (C.2, C.4, C.5 and C.6). These include:

A. The GWMS is designed and tested in accordance with regulatory position C.2 of Regulatory Guide 1.143.

1. The GWMS is designed and tested to the codes and standards listed in Table 1 supplemented by regulatory positions C.2.1.2 and C.4 of Regulatory Guide 1.143.

2. Materials used for pressure retaining portions of the GWMS are designed in accordance with requirements specified in Section II of the ASME Boiler and Pressure Vessel Code. Materials used in the GWMS are compatible with the chemical, physical, and radioactive environment during normal and anticipated operating conditions. Malleable, wrought, or cast iron and plastics are not used in the GWMS.

   The GWMS is designed to preclude the buildup of an explosive mixture of hydrogen and oxygen. Gas analyzers are provided to monitor the concentration of hydrogen and oxygen in the GWMS. Alarms are provided locally in the Nuclear Annex and in the main control room to high alarm on 1% oxygen concentration.

3. The Nuclear Annex houses the charcoal adsorber beds, which delay the release of radioactive gaseous waste from GWMS. The foundations and walls of structures housing the GWMS are designed to meet the requirements specified in regulatory position C.5. The Nuclear Annex is designed as a seismic Category I building and is designed to withstand a plant Safe Shutdown Earthquake (SSE).

B. The GWMS is designed and tested in accordance with regulatory position C.4 of the Regulatory Guide 1.143.

1. The GWMS is housed in the Nuclear Annex. The GWMS is designed to control leakage. In addition, sufficient space is provided to facilitate access, operation, inspection, testing, and maintenance to maintain personnel exposures ALARA in accordance with Regulatory Guide 8.8 guidelines.

2. A quality assurance (QA) program will be applied with the provisions as specified in regulatory position C.6 of Regulatory Guide 1.143.

or dry the charcoal. A charcoal guard bed is provided upstream of the adsorber beds to protect the beds from contamination and excessive moisture. The guard bed can be bypassed or purged and dried with nitrogen or reloaded if contaminated.

11.3.2.2.2 Cooler Condenser

A cooler condenser provides reduced temperature and reduces the moisture content of the gases. The cooling water supply comes from the chilled water system. The condenser is designed to take inlet gas flow of 8 SCFM of saturated water vapor at the maximum design temperature and discharge gases at 45°F.

11.3.2.2.3 Piping and Valves

Drain lines and valves are sized and continuously sloped to minimize the potential for plugging. Valves are of the packless metal diaphragm type and have bellows sealed stems to minimize leakage. All loop seals vent to a controlled vent system and equipment drains are closed or provided with loop seals to limit the escape of radioactive gases. The GWMS consists of welded piping to the greatest extent practicable. Flanged joints are kept to a minimum.

11.3.3 SAFETY EVALUATION

The GWMS has no plant safe shutdown or accident mitigation function. It is demonstrated in Section 15.7 that accidental releases, when evaluated on a conservative basis, are not expected to exceed the dose limits of 10 CFR 20.

11.3.4 INSPECTION AND TESTING REQUIREMENTS

The GWMS is tested to leak rate limits specified in ANSI/ANS 55.4. The sum of the leak rates from all individual components located within a zone does not exceed the zone totals in ANSI/ANS 55.4.

11.3.5 INSTRUMENTATION REQUIREMENTS

Table 11.3-3 provides a list of instrumentation for the GWMS. Additionally hydrogen detectors are provided in compartments containing off-gas systems under pressure and where hydrogen leakage may occur. Detection of hydrogen causes the GWMS to automatically shutdown. Normally, upon reaching a high level setpoint, an alarm annunciates. Instrumentation in contact with process streams is designed to minimize the potential for explosion. Manual override capability of automatic controls is provided where necessary to maintain system operability. For the equipment operated manually, remote manual hand switches with status lights are provided for all frequently operated valves and components. See Section 11.5.1.2.2 for description of Radiation Monitoring Systems interfaces with the Main Control Room.

The accident is described as an unexpected and uncontrolled release of radioactive Xenon and Krypton gases from the GWMS resulting from an inadvertent bypass of the main decay portion of the charcoal adsorber beds. It is assumed to take as long as 2 hours to isolate or terminate the release.

11.3.7.2 Analysis of Effects and Consequences

A. Bases

The bases for the estimated maximum offsite concentration of the gaseous effluent resulting from a leak or failure of the GWMS are as follows:

1. The design basis airborne effluent source term is based on 1% failed fuel rate in accordance with the Standard Review Plan Branch Technical Position (BTP) ESTB 11-5. The BTP ESTB 11-5 method adds the accident induced charcoal unit bypass leakage to the source term for normal operation; both accident source contributions are calculated based on a 1% failed fuel rate assumption.

Is it "Failed Fuel Rate" or Failed Fuel, or Failed Fuel Source Term or Failed Fuel Fraction? or Fuel Cladding Defects!

2. In the absence of site specific meteorological data and site Exclusion Area Boundary (EAB) information, the short-term 2-hour accident atmospheric dispersion factor, corresponding to a distance of approximately 0.5 miles from the station vent, is assumed to be 1.00×10^{-3} s/m^3. This is consistent with the dilution factors provided in Section 2.3.

3. The sum of total estimated annual airborne effluent releases and the expected airborne effluent releases associated with the zero minute decay case are calculated by PWR-GALE and are multiplied by an isotope specific multiplication factor. This multiplication factor is calculated by the division of the 1% failed fuel RCS equilibrium concentration, calculated using the Combustion Engineering DAMSAM computer code and presented in Table 11.1.1-9, by the RCS equilibrium concentration calculated using PWR-GALE presented in Table 11.1.1-2, for each isotope.

4. For isotopes with a 1% failed fuel rate calculated concentration which is less than PWR-GALE results, the PWR-GALE concentration is used for conservatism. It is assumed that differences in the methodology used to calculate the reactor coolant concentrations are responsible for any differences observed in isotopic concentrations.

5. Particulates and radioiodines are assumed to be removed by pretreatment, gas separation, and intermediate radwaste treatment equipment. Therefore, only the whole body dose is calculated in this analysis.

B. Methodology

To calculate the release of noble gases from the GWMS, the source term is based on the output from the computer code DAMSAM computer code. This code is used to calculate the reactor coolant equilibrium concentration with continuous degassing based on 1% failed fuel fraction in accordance with Standard Review Plan Section 11.3. The resulting reactor coolant equilibrium concentration is divided by the reactor coolant concentration determined by PWR-GALE, using NUREG-0017, Revision 1 methodology, to yield a multiplication factor for each isotope. The total release of gaseous effluent for the zero minute decay case is calculated using PWR-GALE with BTP ESTB 11-5 alterations. The zero minute decay case releases are added to the normal operation source term and the sum for each radionuclide is multiplied by the multiplication factor, the 2-hour accident atmospheric dispersion factor, the total body dose factor, and a conversion factor to calculate whole body dose.

The methodology used to calculate the dose consequences for a GWMS failure, which is consistent with BTP ESTB 11-5, is as follows:

$$D=\sum K(i)\times Q(i)\times\frac{X}{Q}\times 7.25$$

Where: D = whole body dose (mrem)

K(i) = the total-body dose factor given in Table B-1 of Regulatory Guide 1.109 for the ith isotope (mrem-m^3/pCi/yr)

Q(i) = the noble gas nuclide accident release rate for the ith isotope (Ci/yr for 2 hours)

$$Q(i)=[R(i)_{Norm}+R(i)_0]\times MF(i)$$

$R(i)_{norm}$ = annual estimated airborne release rate for normal operation (Ci/yr) (Table 11.3-4)

$R(i)_0$ = annual estimate airborne release rate for zero minute decay case (Ci/yr)

MF = Multiplication Factor

$$MF = \frac{RCS(i)_{DAMSAM}}{RCS(i)_{GALE}}$$

X/Q = short-term 2-hour accident atmospheric dispersion factor at EAB (sec/m^3) = 1.00×10^{-3} (Section 2.3)

7.25 = conversion factor for 2 hour release ($pCi\text{-}yr^2/Ci\text{-}event\text{-}sec$)

C. Results and Conclusions

The calculated whole body dose at the exclusion area boundary is 49.3 mrem which is within the 500 mrem acceptance criterion specified in Standard Review Plan Section 11.3.

11.3.8 CONCENTRATION OF NORMAL EFFLUENTS

The Gaseous Waste Management System (GWMS) processes gaseous waste through a charcoal delay system which holds up noble gases and allows them to decay prior to release. The concentration at the exclusion area boundary during normal operation, including anticipated operating occurrences, was analyzed to verify it is less than 10 CFR 20, Appendix B, Table II, Column 1.

11.3.8.1 Analysis of Effects and Consequences

A. Bases

The bases for the estimated concentration of effluent are as follows:

1. The GWMS continuously discharges at a uniform rate at the design basis source term.

2. The design basis airborne effluent source term is based on 1% failed fuel rate in accordance with the Standard Review Plan Section 11.3. It is assumed that the Reactor Coolant System (RCS) is continuously degassed by the CVCS during normal operating conditions. The reactor coolant equilibrium concentration is calculated using the Combustion Engineering DAMSAM computer code and is presented in Table 11.1.1-9.

3. In the absence of site specific meteorological data and site Exclusion Area Boundary (EAB) information, the long-term annual average atmospheric dispersion factor, corresponding to a distance of approximately 0.5 miles from the station vent, is assumed to be $7.2x10^{-5}$ s/m^3. This is consistent with the dilution factors assumed in Section 11.3.6.3.

4. The total estimated annual airborne effluent releases are multiplied by an isotope specific multiplication factor. This multiplication factor is calculated by the division of the 1% failed fuel RCS equilibrium concentration, calculated by the Combustion Engineering DAMSAM computer code, by the RCS equilibrium concentration, calculated using PWR-GALE, presented in Table 11.1.1-2, for each isotope.

   For isotopes with a 1% failed fuel rate calculated concentration which is less than PWR-GALE results, the PWR-GALE concentration is used for conservatism. It is assumed that differences in the methodology used to calculate the reactor coolant concentrations are responsible for any differences observed in isotopic concentrations.

5. Since DAMSAM does not calculate the concentration of tritium, the maximum calculated concentration of 1.00 μCi/gm is assumed for the 1% failed fuel source term for conservatism.

6. Since DAMSAM does not calculate the concentration of corrosion products, the PWR-GALE numbers are used. The concentration of these radionuclides should not be affected by the fraction of fuel defects.

B. Methodology

To calculate the concentration at the exclusion area boundary, the source term is based on the output from the computer code DAMSAM computer code. This code is used to calculate the reactor coolant equilibrium concentration with continuous degassing based on 1% failed fuel fraction in accordance with Standard Review Plan Section 11.3. The resulting reactor coolant equilibrium concentration is divided by the reactor coolant concentration determined by PWR-GALE, using NUREG-0017, Revision 1 methodology, to yield a multiplication factor for each isotope. The total annual release rate of gaseous effluent is multiplied by the multiplication factor and the average atmospheric dispersion factor to calculate the annual average concentration of the gaseous effluent at the exclusion area boundary. This

C. Results and Conclusions

The concentration of the gaseous effluents at the EAB is shown in Table 11.3-5. The resultant concentration at the EAB is within the ~~Maximum Permissible~~ Concentrations specified in 10 CFR 20, Appendix B of Sections 20.1001-20.2402, Table 2, Column 1 ~~guidelines~~.

allowed effluent

TABLE 2.9.2-1 (Continued)

GASEOUS WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The radioactivity monitor provides a signal to ~~terminal~~ terminate GWMS discharge when a specified radioactivity level is reached.	7. Testing of the as-built GWMS discharge controls will be performed using a signal which simulates radioactivity levels.	7. GWMS discharge is terminated when the simulated radioactivity level in the discharge waste line reaches a specified limit.

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.9.3 Solid Waste Management Sys (Rad Prot aspects) Page

No.	Comments	Cat.	Resolution
1			No action necessary
2 (no action needed)	... e.g., HEPA filters.		... will be preferable to gas.
3 (Section should be changed)	In addition to other editorial comments, the statement in Section 11.4.7, paragraph D, is totally in error when used in reference to a "restricted or unrestricted" area. This statement should be changed to conform with the requirements of 10 CFR Part 20.1301 concerning dose limits for the public. A markup for CESSAR Section 11.4.1 is attached.	1	~~will be preferable to gas. However, conformance has to be demonstrated with 10CFR20, Section 1302 for SWMS. This Section, in turn, refers to gaseous effluents & liquid effluents. Therefore, though the usage is not strictly correct, it does not warrant revision~~
Resolution for Comment 3: (1) Item D of CESSAR-DC Section 11.4.7 need not be changed. This deals with the dose rate for occupational workers only. 10CFR20.1201(a)(1)(i) limits this dose to 5 rem/yr. Staff has interpreted this as allowing unrestricted			

occupancy in the subject area (by this it is meant 40 hrs/wk for 50 weeks/yr) when

Offered By: Dean Chaney, R-V (510)975-0229 (2/22/94) Resolved by: ____

the dose rate is 2.5 mrem/hour. 10CFR20.1301(a) deals only with individual members of general public. (2) Do not agree with the comment = not applicable to Section 11.4.4. However, current write-up should be changed as indicated in the new markup. SWMS operation should conform with 10CFR20 limits for gaseous and liquid effluents resulting from SWMS operation. All other markups ok.

AGREE ONLY WITH EDITORIAL CHANGES ATTACHED

DISAGREE

in Tables 11.4-2 and 11.4-3, respectively. Table 11.4-4 lists the estimated burial volume and activity estimates for the various solid waste types that will be shipped for disposal from the System 80+. Radionuclide specific activities for each waste type are provided in Table 11.4-5.

11.4.4 SAFETY EVALUATION

The SWMS has no safe shutdown or accident mitigation function. Finally, accidental releases from this system, will not exceed the limits of 10 CFR 20, Sections 20.1001-20.2402 of Appendix B, Table 2, Column 2. Accidental releases due to a major component failure or SWMS leak will be contained in the Radwaste Building.

11.4.5 INSPECTION AND TESTING REQUIREMENTS

A Process Control Program appropriate to assure that the SWMS is operating as intended is developed prior to fuel loading. Procedures for each phase of system operation including resin transfer and batching help ensure that design objectives are met. Emphasis is placed on verifying instrumentation and remote functions important to these design objectives.

11.4.6 INSTRUMENTATION REQUIREMENTS

Instrumentation and indications important to the Design Basis of the SWMS are as follows:

A. Level Indicators

High level indication will be provided to prevent overflow of tanks during fill and resin transfer/sluice operations. These indications will be read in the radwaste control room. Also, video observation of all fill processes is included.

Densitometers are provided on the spent resin storage tanks and used to verify correct resin-to-water ratio when a batch of bead resin is to be solidified.

B. Flow and Pressure Indicators

Pump discharge flow and suction metering as well as pump discharge pressure indication will be provided to properly control the bed transfer process.

C. Radiation Monitoring

Area radiation monitors will be provided as discussed in Section 11.5.

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.9.4 Process and Effluent Rad Mon & Sampling Sys - PERMSS (Rad Prot Aspects) Page 1 of 2

No.	Comments	Cat.	Resolution
1	It is noted that the CESSAR refers to this system as the Radiation Monitoring System (RMS) and at times as the PERMSS. Consistency should be established. A markup of CESSAR Section 11.5 is attached.	1 AGREE	Agree. However, it is not considered absolutely necessary.
2	The first paragraph in the DD is an inaccurate description of the system's capabilities. The third paragraph is superfluous but gives a better description of the PERMASS/RMS capabilities. A markup of the DD/ITAAC is attached.	1 DISAGREE	
3	ITAAC Design Commitment 8.b (channel separations) were not given any inspections/tests or acceptance criteria to meet.	1 AGREE	Agree. (under area rad monit...)
4	Certain TSC (CESSAR Sect. 13.3.3.1.6) & EOF (CESSAR Sect. 13.3.3.2.5) monitors were not listed in the Table 2.9.4-2 of the DD/ITAAC. Also, the CVCS gas stripper "Effluent" monitor referenced in CESSAR Sections 9.3.4.5.5.1 and 14.2.12.1.20 is not listed in the Table. Recommend that all CESSAR referenced process, area, and effluent monitors be placed in the DD/ITAAC Table 2.9.4-2. A DD/ITAAC markup is provided.	1 DISAGREE	
5	ITAAC #5 uses the word "exceeds" to determine if a monitor trips when it is suppose to. The monitor should trip when it "reaches" the set point, not some time after it exceeds that point. A markup of the ITAAC is attached. Agree	1 AGREE	

Offered By: Dean Chaney, R-V (510)975-0229 (2/22/94) Resolved by:

TABLE 2.9.4-1 (Continued)

PROCESS AND EFFLUENT RADIOLOGICAL MONITORING AND SAMPLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8.a) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the PERMSS.	8.a) Inspection of the as-installed Class 1E Divisions of the PERMSS will be performed.	8.a) Physical separation exists between Class 1E Divisions in the PERMSS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the PERMSS.
8.b) Independence is also provided between Class 1E Channels and between Class 1E Channels and non-Class 1E equipment in the PERMSS.	X	X

TABLE 2.9.4-1 (Continued)

PROCESS AND EFFLUENT RADIOLOGICAL MONITORING AND SAMPLING SYSTEM

Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Each safety-related area radiation monitor channel monitors the radiation level in its assigned area, and indicates its respective Main Control Room (MCR) alarm and local audible and visual alarm (if provided) when the radiation level ~~exceeds~~ reaches a preset ~~level~~ limit.	5. Testing of each channel of the safety-related area radiation monitors will be conducted using simulated input signals.	5. MCR and local alarms are initiated when the simulated radiation level ~~exceeds a~~ reaches preset limit.
6. The following PERMSS safety-related instrumentation shall be provided: a. control room intake radiation monitor (2/intake), b. high range containment area radiation monitor (2), c. containment atmosphere radiation monitor (particulate channel only), d. primary coolant loop radiation monitors (2).	6. Inspection of the as-built system will be conducted.	6. The as-built PERMSS conforms with the design description.
7. The PERMSS safety-related instrumentation (the control room intake radiation monitors, high range containment area radiation monitors, containment atmosphere radiation monitor (particulate channel), and the primary coolant loop radiation monitors) are classified Seismic Category I.	7. Seismic analyses of the as-built PERMSS safety-related instrumentation will be performed.	7. An analysis report exists which concludes that the PERMSS safety-related instrumentation (the control room intake radiation monitors, high range containment area radiation monitors, containment atmosphere radiation monitor (particulate channel), and the primary coolant loop radiation monitors) are classified Seismic Category I.

CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 2.10 Technical Support Center - TSC (Rad Prot aspects)

No.	Comments	Cat.	Resolution
1			
2	covered under ITAAC 2.9.4		
3	A markup of the CESSAR Sect. 13.3 is attached.	AGREE	

Offered By: Dean Chaney, R-V (510)975-0229 (2/22/94) Resolved by: RLE 3/9/94

talk to Ed

3 1

13.3.3.1.6 Habitability

TSC personnel are protected from radiological hazards, including direct radiation and airborne radioactivity from in-plant sources under accident conditions, to the same degree as control room personnel, so far as the maximum permissible radiation exposure is concerned while the TSC is habitable. Applicable criteria are specified in General Design Criterion 19, Standard Review Plan 6.4, and NUREG-0737, "Clarification of TMI Action Plan Requirements," Item II.B.2.

To ensure adequate radiological protection of TSC personnel, radiation monitoring systems are provided in the TSC. These systems continuously indicate radiation dose rates and airborne radioactivity concentrations inside the TSC while it is in use during an emergency. These monitoring systems shall include local alarms with trip levels set to provide early warning to TSC personnel of adverse conditions that may affect the habitability of the TSC. Detectors are able to distinguish the presence or absence of radioiodines at concentrations as low as 10^{-7} microcuries/cc.

If the TSC becomes uninhabitable, the TSC plant management function can be performed in the control room. Reference Section 6.4 TSC for habitability details. Control Building HVAC is discussed in Section 9.4.1.

13.3.3.1.7 Communications

The TSC is the primary onsite communications center for the nuclear power plant during an emergency. It has reliable voice communications to the control room, the OSC, the emergency operations facility (EOF), and the NRC. The primary functions of this voice communication system are plant management communications and the immediate exchange of information on plant status and operations. Provisions for communications with State and local operations centers are provided in the TSC to provide early notification and recommendations to offsite authorities prior to activation of the EOF.

The TSC voice communications facilities includes means for reliable primary and backup communication. The TSC voice communications will include private telephones, commercial telephones, radio networks, and intercommunication systems as appropriate to accomplish the TSC functions during emergency operating conditions. The licensee provides a means for TSC telephone access to commercial telephone common-carrier services that may be susceptible to loss of power during emergencies. The licensee ensures that spare commercial telephone lines to the plant are available for use by the TSC during emergencies.

ITAAC No. 2.12.1 (Main Control Room) (system aspects)

No.	Comments	Cat.	Resolution
1	It should also be stated (IN THE DESIGN DESCRIPTION) that I&C not listed in the table that are required for the safe operation of the plant are included in the individual system descriptions.	1	AGREE. CE SHOULD ALSO ANNOTATE THE MINIMUM INVENTORY LIST TO IDENTIFY SPECIFIC I&C THAT ARE CLASS 1E, AS GE DID.
2			

By: S.Malur (504-2963)

Resolved by: ______

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.12.1 Main Control Room (human factors aspects)

No.	Comments	Cat.	Resolution
1	The design description defines the functional organization of the MCR. The ITAAC do not address the functional organization of the MCR. Consider deleting the functional organization description as it may be premature to define it prior to design validation.	2	
2	Design commitment 1 states "The Basic Configuration of the MCR is as shown on Figure 2.12.1-1." Figure 2.12.1-1 does not provide sufficient information to define the relative position and distances between the MCR components and equipment to ensure adequate the MCR components and equipment to ensure adequate visibility and workspace consistent with analyses discussed in SSAR section 18.6.5.	1	
3			

By: D. Desauiniers [illegible]

[illegible] by: ______________

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.12.1 Main Control Room

No.	Comments	Cat.	Resolution
4	Design commitment 2, column 2, states that an availability verification inspection of the as-built MCR will be performed. The inspection is inadequately defined. Provide additional detail to ensure an inspection consistent with that described in SSAR section 18.9.1.	1	
5	Design commitment 3, column 3. Typo - Change the word "used" to "use."	3	
6	Design commitment 3, column 2 states that a suitability inspection against verification criteria will be performed. The inspection and criteria are inadequately defined. The suitability inspection and verification criteria should be defined consistent with SSAR section 18.9.2 to ensure an adequate suitability verification is conducted.	1	

By: D. Desaulniers (504-1043)

Resolved by: ___________________

ITAAC No. 2.12.1 Main Control Room

No.	Comments	Cat.	Resolution
7			
8	Design commitment 4, column 2 states that testing and analysis will be performed against validation criteria. The validation criteria are not defined in any manner. It is not possible to assess the appropriateness and adequacy of the criteria. The validation criteria should be defined consistent with validation objectives described in SSAR section 18.9.3.1		
9	Design commitment 4, column 2 indicates that the validation facility will dynamically represent the operating characteristics and responses of the System 80+ design. It is not clear that interface dynamics are considered part of System 80+ design. The validation facility should represent the MCR interface dynamics of the System 80+ design.		

By: D. Desaulniers (504-1043)

Resolved by: ____________

From G Galletti, x1631
HHFB

#	Status	Recommendation
comment 2.12.1 (1.sys)	pass on to CE only the 2nd portion of this comment. We do not put the basis for CDD material in ITAAC. Already in SSAR. AGREE + DISAGREE	comment on stating that "I&C not listed in the minimum list which is important for individual system operation is included in specific system descriptions" should be passed on to CE. Additionally as was done with GE, CE should annotate the minimum inventory list to identify specific I&C that are class 1-E.
comment 2.12.1 (1.hf)	pass on to CE AGREE	provide additional commitment to ensure as-built is verified to conform to CDD functional organization description.

necessary for CDD.

#	Status	Recommendation
comment 2.12.2 (3.hf)	pass on to CE AGREE	revise ITAAC to state that the I&C identified in Table 2.12.1-1 is a "minimum list" and that the MCR makes available ann. displays, and controls to operate the plant and maintain plant safety.

comment 2.12.1 (4.hf)	pass on to CE AGREE	Provide additional description in ITAAC to ensure inspection is consistent with SSAR description. Attempt to revise wording to more specifically "point" to SSAR description or clarify what is intended in availability verification inspection.
comment 2.12.1 (5.hf)	pass on to CE AGREE	fix typo.
comment 2.12.1 (6.hf)	pass on to CE AGREE	provide additional description for suitability verification as suggested in comment 2.12.1 (4.hf) above.
comment 2.12.1 (8.hf)	pass on to CE AGREE	Validation criteria are addressed in SSAR, however a stronger correspondence between the SSAR validation criteria and the "validation criteria" described in the ITAAC should be considered.
comment 2.12.1 (9.hf)	pass on to CE AGREE	Consider bolstering the definition of dynamic testing and analysis to specifically include the "interface" dynamics.

CE 80+ ITAAC Independent Review Comments

ITAAC No. 2.12.2 (Remote Shutdown Room) (systems aspects)

No.	Comments	Cat.	Resolution
1	The RSR controls and displays are required to be hard-wired. This should be stated.	1	
2			
3			
4	[illegible] should be verified by ITAAC.		
5	It should be stated that the Remote Shutdown Panel is safety-related and Class IE, or the portions of the RSR which are safety-related and Class IE should be described. The 4th paragraph does not do this.	1	

By: S.Malur (504-2963)

Resolved by: ______________

comment 2.12.2 (5.sys)	pass on to CE AGREE	the issue is already covered in Section 2.5.2 of CDD, however as was the case with GE the table of I&C was annotated to identify Class 1-E equipment. CE should annotate the inventory to identify specific 1-E equipment
comment 2.12.2 (1.hf)	pass on to CE AGREE	revise ITAAC to state that the I&C identified in Table 2.12.2-1 is a "minimum list" and that the RSR makes available ann. displays, and controls to achieve and maintain safe shutdown conditions.
comment 2.12.2 (2.hf)	pass on to CE [illegible]	Provide additional description in ITAAC to ensure inspection is consistent with SSAR description. Attempt to revise wording to more specifically "point" to SSAR description or clarify what is intended in availability verification inspection.
comment 2.12.2 (3.hf)	pass on to CE AGREE	provide additional description for suitability verification as suggested in comment 2.12.2 (2.hf) above.

ITAAC No. 2.12.2 Remote Shutdown Room (human factors aspects)

No.	Comments	Cat.	Resolution
1	The design description states that "The RSR makes available the annunciators, displays, and controls to achieve and maintain prompt shutdown . . . including at least those . . . identified in Table 2.12.2-1." (Emphasis added) Design commitment 2 is to make available only those in Table 2.12.2-1. The design commitment should be revised to indicate that the RSR makes available the annunciators, etc. to achieve and maintain prompt shutdown etc. Identify Table 2.12.2-1 as a minimum list.	I	
2	Design commitment 2, column 2, states that an availability verification inspection of the as-built RSR will be performed. The inspection is inadequately defined. Additional detail should be provided to ensure an inspection consistent with that described in SSAR section 18.9.1.	I	
3	Design commitment 3, column 2 states that a suitability inspection against verification criteria will be performed. The inspection and criteria are inadequately defined. The suitability inspection and verification criteria should be defined consistent with SSAR section 18.9.2 to ensure an adequate suitability verification is conducted.	I	

By: D. Desaulniers (504-1043)

Resolved by: ____________________

ITAAC No. 2.12.2 Remote Shutdown Room

No.	Comments	Cat.	Resolution
4	shutdown conditions.		
5	Design commitment 4, column 2 states that testing and analysis will be performed against validation criteria. The validation criteria are not defined in any manner. It is not possible to assess the appropriateness and adequacy of the criteria. The validation criteria should be defined consistent with validation objectives described in SSAR section 18.9.3.1	1	

By: D. Desaulniers (504-1043)

Resolved by: ______

ITAAC No. 2.12.2 Remote Shutdown Room

No.	Comments	Cat.	Resolution
6	Design commitment 4, column 2 indicates that the validation facility will dynamically represent the operating characteristics and responses of the System 80+ design. It is not clear that interface dynamics are considered part of System 80+ design. The validation facility should represent the MCR interface dynamics of the System 80+ design.	1	

By: D. Desaulniers (504-1043)

Resolved by: ____________________

comment 2.12.2 (5.hf)	pass on to CE AGREE	Validation criteria are addressed in SSAR, however a stronger correspondence between the SSAR validation criteria and the "validation criteria" described in the ITAAC should be considered.
comment 2.12.2 (6.hf)	pass on to CE AGREE	Considered bolstering the definition of dynamic testing and analysis to specifically include the "interface" dynamics.

CE 80+ ITAAC Independent Review Comments

ITAAC No. 3.1 (Piping Design)

No.	Comments	Cat.	Resolution
1	Page 1: Add "Code, Section I'I," after ASME in the first sentence.	1	Partially agree. Add "Code" (not "Section III"). However, the Abbreviation List needs to define "ASME" and to clarify that the ASME Code is the Boiler & Pressure Vessel Code.
2	Add a definition for Seismic Category II piping.	1	Agree.
3			

By: S.Malur (504-2963)

Resolved by: D. Terao
504-3317

DT
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CE SYSTEM 80+ ITAAC Independent Review Comments

ITAAC No. 3.2 Radiation Protection

No.	Comments	Cat.	Resolution
1	The DD does not properly address what type of exposure the plant is designed for. A markup copy of the DD/ITAAC is attached.	1 Acpt	We accept comment, although it is minor and we could live with current words. ACCEPT
2			
3			
4			

Offered By: Dean Chaney, R-V (510)975-0229 (2/22/94) Resolved by: Rich Emch 3/9/94

talk to Charlie & Rogers

CE 80+ ITAAC Independent Review Comments

ITAAC No. 5.0 Site Parameters

TAC

No.	Comments	Cat.	Resolution
1	As this section does not have an ITAAC, revise the site parameters text to include the following (equivalent to section 4.0) "An application for a combined license (COL) that references the System 80+ Certified Design must describe how the actual site location characteristics are bounded by the site parameters."	2	Agree However, the wording should be revised to state, "An applicant selecting a site for the construction of the System 80+ Certified Design shall describe how the actual site location characteristics are bounded by the site parameters."

By: Hai-Boh Wang 504-2958

Resolved by: D. Terao / T Cheng