TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

5N 157B Lookout Place

JUN 10 1988

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) APPENDIX R - RESPONSE TO REQUEST FOR INFORMATION

Provided in enclosure 1 is revision 9 to the SQN 10 CFR 50, Appendix R, shutdown logic calculation. The calculation is being provided as requested by the NRC staff during the March 9, 1988 public meeting held in Rockville, Maryland, and in accordance with TVA's letter to NRC dated April 13, 1988. This calculation was originally committed to be sent to NRC by April 25, 1988, in the April 13, 1988 letter. Extensions to the commitment due date have been coordinated with the staff.

Unit 2 plant configuration and associated Appendix R documentation reflect this revision to the shutdown logic calculation except where interim compensatory measures exist. However, unit 1 is currently in a verification phase. The verification of unit 1 to revision 9 of the shutdown logic is currently scheduled for completion by July 11, 1988. Modifications identified during the verification process will be complete before unit 1 restart except where interim compensatory measures may exist.

Enclosure 2 is a listing of commitments made by this letter.

If you have any questions, please telephone M. R. Harding at (615) 870-6422.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. Gridley, Director
Nuclear Licensing and
Regulatory Affairs

cc: See page 2

A006
1/1

U.S. Nuclear Regulatory Commission

JUN 10 1988

Enclosure
cc (Enclosure):
Mr. K. P. Barr, Acting Assistant Director
for Inspection Programs
TVA Projects Division
U.S. Nuclear Regulatory Commission
Region II
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Sequoyah Resident Inspector
Sequoyah Nuclear Plant
2600 Igou Ferry Road
Soddy Daisy, Tennessee 37379

ENCLOSURE 1

Equipment required for safe shutdown in accordance with
10 CFR 50, Appendix R (SQN-SQS4-0127, revision 9) (B25 880429 821)

TVA 10697 (DNE-QA-6-86) DNE CALCULATIONS **QA Record** 2.2>

Title EQUIPMENT REQUIRED FOR SAFE SHUTDOWN PER 10CFR50 APPENDIX R				**Plant/Unit** SQN 1&2
Preparing Organization ~~NEB~~ DNE/NTB/SQS2	**KEY NOUNS** (Consult RIMS Descriptors List) FIRE PROTECTION, SAFE SHUTDOWN, APPENDIX R			
Branch/Project Identifiers SQN-SQS4-127	Each time these calculations are issued, preparers must ensure that the original (R0) RIMS accession number is filled in.			
	Rev	(for RIMS' use)		RIMS ACCESSION NUMBER
	R0	841002H0001		NEB 840913 222
Applicable Design Document(s) SQN-DC-V-24.0 EN DES SEP 84-10	R7	870722A0006		B45 870714 426
	R8	880229E0012 (228)		B25 880212 822
SAR Section(s) N/A **UNID System(s)** N/A	R9	INFORMATION ONLY		B25 880429 821

Revision 0	R8	R9	R10	Safety-related? Yes (x) No ( )
ECN No. (or Indicate Not Applicable)	N/A	N/A		**Statement of Problem**
Prepared: David L. Wallace	Robert Edlund	[illegible] 4/28/88		Determine the functions and sets of equipment required for safe shutdown of Sequoyah Nuclear Plant under postulated fire conditions as defined by 10CFR50, Appendix R
Checked: John H. Platfoot	R. J. Clark	RClark/ra 4/29/88		
Reviewed: A. P. Bianco	D G Renfro	DG Renfro/ra 4/29/88		
Approved: H. E. McConnell	VA Bianco	VA Bianco		
Date: 9-13-84	2/12/88	4/29/88		
USE FORM TVA 10534 IF MORE SPACE REQUIRED — List all pages added by this revision	Various	Various		
List all pages deleted by this revision	Various	Various		
List all pages changed by this revision	All	Various		

ABSTRACT <These calculations contains an unverified assumption(s) that must be verified later: U2 Yes ( ) No (x)> Rev 4/12/88 Rev 4/12/88 U1 Yes (x) No ( )>

This calculation defines the functions and sets of equipment within NTB's scope of responsibility which are required to achieve safe shutdown in accordance with 10CFR50, Appendix R Sections III.G and L. The analysis developed a safe shutdown logic diagram which identified all functions and which served as a basis for a more detailed analysis. The results include: (1) a tabulation of components which must operate to satisfy the safe shutdown paths via this logic diagram, and (2) a tabulation of required operator actions.

( ) Microfilm and store calculations in RIMS Service Center
(x) Microfilm and return calculations to: Dave Renfro

Microfilm and destroy. ( )
Address: W10 A52 C-K

cc: RIMS, SL 26 C-K
V. A. Bianco, DNE DSC-A030, Sequoyah

3447F/JMS

TVA 10697 (DNE-CA-6-86) DNE CALCULATIONS QA Record

Title: EQUIPMENT REQUIRED FOR SAFE SHUTDOWN DURING A DESIGN BASIS FIRE		Plant/Unit: SQN 1&2
Preparing Organization	KEY NOUNS (Consult RIMS Descriptors List): FIRE PROTECTION	
Branch/Project Identifiers: SQN-SQS4-127	Each time these calculations are issued, preparers must ensure that the original (RO) RIMS accession number is filled in.	
	Rev (for RIMS' use): RO 841002H0001	RIMS ACCESSION NUMBER: NEB 840913 222
Applicable Design Document(s): EM DES SEP 84-10	R7	B45 '87 0714 426
	R	
SAR Section(s): N/A; UNID System(s): N/A	R	

Revision 0	R7	R8	R9
ECN No. (or Indicate Not Applicable)	[illegible]		
Prepared: David L. Wallace	[signature]		
Checked: John H. Platfoot	[signature]		
Reviewed: A. P. Bianco	[signature]		
Approved: H. E. McConnell	[signature]		
Date: 9-13-84	7/13/87		
FORM 10534 List all pages added by this revision			
IF MORE SPACE REQUIRED List all pages deleted by this revision			
List all pages changed by this revision			

Safety-related? Yes (x) No ( )

Statement of Problem

Evaluate the ability of SQN to achieve a saf shutdown during a fire consistent with the requirements of Appendix R of 10CRF50.

ABSTRACT [These calculations contain an unverified assumption(s) that must be verified later. Yes (x) No ( )]

This calculation defined a design basis fire consistent with Appendix R of 10CFR50. It defines boundary conditions which must be met to achieve safe shutdown and performs an analysis within these boundaries to demonstrate safe shutdown capability. The analysis developed a safe shutdown logic diagram which identified all functions required and which served as a basis for more detailed analysis. Results are presented as requirements and include: (1) a tabulation of components which must operate, including components which must not spuriously operate to satisfy safe shutdown paths via this logic diagram, (2) a tabulation of required operator actions, and (3) generic requirements which contained factors that must be considered in future analyses.

( ) Microfilm and store calculations in RIMS Service Center
(X) Microfilm and return calculations to: DAVE RENFRO
Microfilm and destroy. ( )
Address: W10A52 C-K

cc: RIMS, SL 26 C-K
H. L. Jones, DNE DSC-MOU3, SQN

DNEI-51900

Form TVA 10887 REN DES 1-84

EN DES CALCULATIONS

TITLE Equipment Required for Safe Shutdown per 10CFR50 Appendix R	PLANT/UNIT Sequoyah 1 and 2
PREPARING ORGANIZATION OE/NEB/OSG-7	KEY NOUNS (Consult MEDS CIS DESCRIPTORS LIST) Fire Protection
BRANCH/PROJECT IDENTIFIERS N/A	Each time these calculations are issued, preparers must ensure that the original (PRIOR MEDS accession number is listed in. Rev (for MEDS' use) MEDS accession number
	R0 841002 H 0001 (19) NEB 840913222
APPLICABLE DESIGN DOCUMENT(S) EN DES-SEP 84-10 EN DES-EP 3.03	R1 850315C0002 (15) B45 '850308 218
	R2 850517K0008 (16) B45 '850514 218
EAR SECTION(S) N/A / UNID SYSTEM(S) N/A	R3 860627C0002 (17) B25 860624 300

	Revision 0	Revision 1	Revision 2	Revision 3
ECN NUMBER (Enter "N/A" if there is no ECN)	N/A	N/A	N/A	N/A
PREPARED	[illegible]	David L. Wallace	David L. Wallace	Robert A. Ellison
CHECKED	T H P	Robert C. Goforth	Robert C. Goforth	D L Wallace/for
SUBMITTED	[illegible]	Arthur Bianco	Arthur Bianco	A Bianco
DATE	9-[illegible]-84	3-11-85	5-14-85	6-3-85
APPROVED	[illegible]	J E McConnell	J E McConnell Appendix C	[illegible]
Use Form TVA 10834 if more room required: Last all pages added by this revision.				See revision log
Use Form TVA 10834 if more room required: Last all pages deleted by this revision				See revision log
Use Form TVA 10834 if more room required: Last all pages changed by this revision		Revised 1, Appendix A Appendix B	1, Enclosure 1 Appendix B	See revision log

STATEMENT OF PROBLEM

Determine the functions and sets of equipment required for safe shutdown of Sequoyah Nuclear Plant under postulated fire conditions.

ABSTRACT

The keyed blocks on the Sequoyah Nuclear Plant Safe Shutdown Logic Diagram are expanded by developing smaller logic diagrams which identify the subsystem(s) and/or components required to provide the function in the keyed block. The keyed logic diagrams are then used to compile lists of equipment which may be required to achieve and maintain safe shutdown under postulated fire conditions.

For each key, a spurious list is generated which contains the equipment where spurious actuation would defeat the function provided by the key.

☐ Continuation sheet(s) used

☐ Microfilm and store calculation in MEDS Service Center — Microfilm and destroy ☐

☒ Microfilm and return calculation to D. L. Wallace — Address [illegible]

Form TVA 10887 (EN DES 1-84)

EN DES CALCULATIONS

TITLE: Equipment Required for Safe Shutdown per 10CFR50 Appendix R	PLANT/UNIT: Sequoyah 1 and 2
PREPARING ORGANIZATION: OE-NEB-NSA7	KEY NOUNS (Consult MEDS CIS DESCRIPTORS LIST): Fire Protection
BRANCH/PROJECT IDENTIFIERS: N/A	Each time these calculations are revised, preparers must ensure that the original (PROI MEDS accession number is noted on. Rev (for MEDS use) / MEDS accession number
APPLICABLE DESIGN DOCUMENT(S): EN DES-SEP 84-10; EN DES-EP 3.03	R0 841002H0001 NEB 840913 222 (FH)
	R1 841019A0003 NEB 841017 219 (125)
	R2 841113E0035 NEB 841113 219 (FH)
SAR SECTION(S): N/A; UNID SYSTEM(S): N/A	R3 841212F0013 NEB 841210 220 (FH)

	Revision 0	Revision 1	Revision 2	Revision 3
ECN NUMBER (Enter "N/A" if there is no ECN)	N/A	N/A	N/A	N/A
PREPARED	David L. Wallace	David L. Wallace	David L. Wallace	David L. Wallace
CHECKED	John H. Plotkot	Roberta C. Roberts	Roberta C. Roberts	Roberta C. Roberts
SUBMITTED	Anthony P. Brown	B. K. Williams	B. K. Williams	B. K. Williams
DATE	9-13-84	10-17-84	11-13-84	12-10-84
APPROVED	H. E. McConnell	H. E. McConnell	H. E. McConnell	H. E. McConnell
Use form TVA 10834 if more room required: List all pages added by this revision.		Appendix A	Appendix B (Key 2 figures/more 2)	See revision log
List all pages deleted by this revision.		See revision log	See revision log	See revision log
List all pages changed by this revision.		ii, 2, 3, 5, 8 Enclosure 1	(i), 1, 2, 3, 4, 5 / Appendix A Enclosure 2	Enclosure 1 Appendix A Enclosure 2

STATEMENT OF PROBLEM

Determine the functions and sets of equipment required for safe shutdown of Sequoyah Nuclear Plant under postulated fire conditions.

ABSTRACT

The keyed blocks on the Sequoyah Nuclear Plant Safe Shutdown Logic Diagrams are expanded by developing smaller logic diagrams which identify the subsystem(s) and/or components required to provide the function in the keyed block. The keyed logic diagrams are then used to compile lists of equipment which may be required to achieve and maintain safe shutdown under postulated fire conditions.

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☐ Continuation sheet(s) used

☐ Microfilm and store calculation in MEDS Service Center — Microfilm and destroy ☐

☒ Microfilm and return calculation to D. L. Wallace — Address W10A91

CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM

SQN-SQS4-127 — Calculation No.

9 — Revision

Method of design verification (independent review) used (check method used):

1. Design Review ✓
2. Alternate Calculation
3. Qualification Test

Justification (explain below):

Method 1: In the design review method, justify the technical adequacy of the calculation and explain how the adequacy was verified (calculation is similar to another, based on accepted handbook methods, appropriate sensitivity studies included for confidence, etc.).

Method 2: In the alternate calculation method, identify the pages where the alternate calculation has been included in the calculation package and explain why this method is adequate.

Method 3: In the qualification test method, identify the QA documented source(s) where testing adequately demonstrates the adequacy of this calculation and explain.

Based on my review of the revised pages of the subject calculation, appropriate software and other backup documentation, I believe this calculation demonstrates a suitable method and scope to the determination of timing and sets of equipment required to safe shutdown of Sequoyah Nuclear Plant under postulated fire conditions as defined in 10 CFR 50, Appendix R. The method used in this calculation is similar to that used by other utilities to meet 10 CFR 50, Appendix R requirements. And, in some cases the scope of this calculation exceeds the scope of other utilities applicable documents to protect equipment deemed necessary required for safe shutdown.

Design Verifier
(Independent Reviewer)

4/29/88
Date

Concurrence Sheet for SQN-SQS4-127 R9

4/29/88

J. H. Sullivan, PORS

4-29-88

J. T. Springfield, OPS

4724F/JMS

TVA

Title: EQUIPMENT REQUIRED FOR SAFE SHUTDOWN		REVISION LOG SQN-SQS4-0127
Revision No.	Description of Revision	Date Approved
8	Revision 8 incorporates changes recommended by the Appendix R Resolution Team (reference Final Report - B45 880120 251). Changes include: 1. Title of calculation revised. 2. "Statement of Problem" and "Abstract" rewritten. 3. General rewrite of calculation and various key diagrams to reflect scope as defined in Section 1.0. 4. Appendix D revised to delete previous contents and add instrumentation list for the MCR. 5. Restructuring of Shutdown Logic Diagram. 6. New components added between this revision and revision 6 are denoted with an "*" in Appendix C.	2-12-88
9	Revision 9 incorporates the following changes: 1. Additional reference documents included 2. Revised Shutdown Logic (SDL) Figure 1 to add Letdown Capability (Key 48) to achieve Hot Standby. 3. Revised Key 24 to add manual valves located in the Hot Sample Room. This changes Key 24 Appendix A & B. 4. Revised Key 28 for editorial changes and revised the Key 28 SDL diagram (A103) 5. Revised Key 37 to incorporate changes mandated by Reference 11.13. This resulted in changes to Key 37B, 37H, 37J, 37K, 37M, 37O and 37P. Required changes to Key 37 Appendix A & B. 6. Revised Key 48 entirely to include normal, excess, and alternate letdown paths.	4/29/88

Prepared by/Date R a Edlem 2/10/88

Checked by/Date R. L. Clark/RAE 2/12/8

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Prepared by/Date RC Edlund 2/10/88

Checked by/Date R L Clark/RAC 2/12/8

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FIGURES

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R L Clark 2/10/88

1.0 Purpose and Scope

The purpose of this calculation is to define the safety functions and sets of equipment required to achieve and maintain safe shutdown of Sequoyah Nuclear Plant under postulated fire conditions as defined by 10CFR50, Appendix R Sections III.G and L (Facility Operating License DPR-79).

Rev 2/10/88 ~~The scope of this document is limited to those areas of NTBs responsibility as previously defined in EN DES-SEP 84-10, Safe Shutdown Analysis for Postulated Fires at Sequoyah Nuclear Plant. This SEP has now been retired.~~

2.0 User Guide

Due to the complexity of this document, this section on user guide was deemed necessary.

This calculation is divided into six parts. The first is a preamble consisting of the numbered sections of the document which establishes general requirements and the basis for the calculation, including the shutdown logic used. It is followed by five appendices which develop and support these requirements.

Appendix A to this calculation provides a comprehensive listing of all components and their required configuration (i.e., open, close, must operate, etc.) and system lineup positions necessary to achieve the specific key functions. It also identifies spurious actuations which must be prevented. The basis for the spurious actuation list is supported by sketches illustrating selected flow paths. Components on the spurious list are easily located on the sketches by an item number which is identified in the basis for spurious list. This item number is shown on the sketches within a triangle symbol.

Appendix B to this calculation discusses (in tabular form) the actions required by the operator to support this analysis (see assumption 3.6). The control station where the operator is expected to take these actions is mentioned in this appendix.

Appendix C can be considered as the index of all components discussed in Appendix A. It (1) contains a complete listing and brief description of components; (2) identifies the key used for these components in Appendix A and B ; (3) references the flow, control or logic diagrams where these components can be found; and (4) identifies the item numbers used when these components are discussed in the basis provided for the spurious actuation list and sketches.

Appendix D contains a minimum listing of instrumentation needed for monitoring safe shutdown from the main control room.

Prepared by/Date R a Edlund 2/10/88

Checked by/Date R. L Clark 2/10/88

Appendix E provides the listing of components and instruments needed as a minimum for monitoring safe shutdown from outside the main control room in the event of a postulated fire.

3.0 Assumptions

(1) Both units may be operating in any mode when a fire is postulated. This is a baseline assumption chosen to be consistent with Appendix R requirements (Section III.G.a and b) and TVA's intended operation of the plant.

(2) No design basis events except the loss of offsite power are considered concurrent with a postulated fire. (It is assured by the requirements of section 4.1 of this document.)

(3) The latest revisions of the DNE drawings and documents are assumed to reflect the plant configuration. This is an unverified assumption for unit 1 only. It will be verified after the restart of SQN unit 2 during cycle 4. For unit 2 and common systems this has been verified by reviewing the as-constructed drawings.

(4) The A-train ERCW cooling water supplies the A-train CCS heat exchangers. The same is assumed for the B train lineup. (This is verified via Design Criteria SQN-DC-V-7.4 - ERCW System).

(6) Operations has instructions (e.g., SOI-26.2) that incorporate requirements relative to operator actions which are necessary to support this analysis (e.g., contents of Appendix B). This assumption is considered verified by virtue of the fact that this calculation has been coordinated with Operations prior to issue.

(7) Except for a non-mechanistic loss of offsite power, there are no failures other than those which can be demonstrated to be effects of a postulated fire.

(8) For shutdown logic diagram Key 6 the flow characteristics of valves FCV-63-25, 26, 39, or 40 (any one) are suitable for short term (72 hours) use as throttle valve. This has been verified by QIR SQP-87-452.

(9) Operation of the main steam valve vault ventilation system is not required during a postulated fire. This assumption has been verified by QIR NEB87295.

(10) The information found in Key 37 provided by VAC input and reference calculation NEB 850115 235, is assumed to be valid and correct. This assumption has been verified by QIR NEB87295.

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R L Clark 2/10/88

4.0 General Requirements

Appendix R to 10CFR50 (reference 11.1) requires that one path of systems necessary to achieve and maintain hot standby condition be free from fire damage and that systems required to achieve cold shutdown can be repaired within 72 hours unless specific deviations have been approved by the NRC. References 11.2 through 11.6 provide further clarification of the requirements presented in Sections III.G and III.L of Appendix R.

4.1 Accidents

It is required that a fire shall not result in a design basis accident (condition III or IV event) as defined by chapter 15 of the FSAR because mitigation of such accident is beyond the scope of this Appendix R analysis, i.e., equipment and safety functions appropriate for accident mitigation. In addition, this calculation implicitly takes credit for compliance with Section III.0 of Appendix R in that a fire around the reactor coolant pumps does not result in seal damage and a subsequent LOCA (reference NRC approval of deviations for oil collection system-L44 860606 620).

4.2 Pneumatic Systems

In general, no distinction is made in this document as to the energy source which is used to accomplish the function under consideration. However, since the most common energy source is electrical, explicit mention is being made in regard to pneumatic systems. The integrity of air headers could be lost during a fire due to failure of soldered fittings and elastomers in various devices. (This situation is analogous to electrical circuits with common power supplies, i.e., Type I associated circuits.) The resulting pneumatic system failure effect (e.g., unavailability of pneumatic power when required, and spurious operation of pneumatic valves) must be considered.

4.3 Instrument Sense Lines

Fire effects upon instrument sense lines have the potential to render the instrument inoperable. If credit is being taken for any instrument to function or not to spuriously malfunction to satisfy the requirements of this document, then any fire effects upon the sense line for that instrument must be evaluated. Specific requirements are contained in SQN-DC-V-24.0.

4.4 Electrical Support

Fire effects upon electrical end devices shall not preclude the availability of the electrical power distribution system needed to support the requirements of this document. Note, detailed listing of electrical power distribution systems components (motor control centers, switchgears, distribution panels, etc.) necessary to support the requirements of this calculation is considered to be outside the scope of this document and will be addressed by the Electrical Engineering Branch (reference Electrical Equipment Block Diagrams - SQP 841210 006).

Prepared by/Date R A Edlow 2/10/8

Checked by/Date R. J. Clark

4.5 Design Implementation

Methods of demonstrating compliance with the requirements of this document are beyond its scope and are implemented by design criteria such as SQN-DC-V-24.0.

4.6 Containment Isolation

Containment isolation is not required by sections III.G, J, L, and O of Appendix R because the limiting consequences for compliance with Appendix R include precluding fuel clad damage and maintaining reactor coolant pressure integrity in the event of a postulated fire.

4.7 Fire Control

These aspects are outside the scope of this calculation and are addressed in SQN-DC-V-7.5 and SQN-DC-V-7.6.

5.0 Requirements for Equipment Which Must Operate To Assure Safe Shutdown

5.1 General Discussion of Shutdown Logic

It is required that a safe shutdown be achievable in the face of any equipment failure that can be directly or indirectly caused by a postulated fire. This calculation contains a shutdown logic diagram (Figure 1) which defines the plant conditions that must be met to achieve a safe shutdown of Sequoyah Nuclear Plant following a postulated fire. The safe shutdown of Sequoyah via these conditions will assure that the plant is first brought to the hot standby condition and then with the initiation of long-term heat removal and the necessary environmental controls to the cold shutdown condition.

The shutdown logic diagram and the associated keys serve as the basis for the list of components described in Appendix A, C and E which must operate to achieve safe shutdown. The shutdown logic diagram permits use of any operable component which can be powered by an onsite source to accomplish required functions without regard for their qualification. The diagram permits loss of components which are required to mitigate design basis accidents (this is the basis for requirement 4.1). Single failures of required components need not be considered to determine a success path. All systems and components used for safe shutdown shall be capable of performing this intended function without exceeding their design limits.

5.2 Discussion of Specific Conditions Required for Hot Standby

To achieve hot standby, a total of 8 conditions must be simultaneously met.

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

Condition

RCS Inventory Control
Secondary Side Pressure Control
Initial Reactivity Control
Environmental Control
Steam Generator Inventory Control
Secondary Side Isolation
Onsite Electrical Supply
Operator Integrity

The inability to fully meet any one of these conditions will render the plant incapable of achieving and maintaining hot standby.

5.3 Discussion of Specific Conditions Required for Cold Shutdown

Having achieved hot standby, the plant can achieve cold shutdown by satisfying the following three conditions:

Environmental Control
Long Term Heat Removal
Long Term Reactivity Control

5.4 Monitoring Capability

Appendix D summarizes the minimum list of instruments that are necessary to ensure safe shutdown from the MCR in the event of a fire.

6.0 Requirements for Equipment Which Must Not Spuriously Actuate to Assure Validity of Safe Shutdown Analysis

An analysis of the effects of Type II* associated circuits should be performed for those keys where spurious activity would preclude the basis of the safe shutdown logic diagram (as represented by Figure 1). The components whose spurious actuation could prevent a safe shutdown were those that (1) are in-line valves in required flow paths (2) could divert flow from a required flow path or (3) defeat the intent of the keyed functions where applicable.

As part of the review, a spurious safety injection signal, phase A containment isolation signal and phase B containment isolation signal ~~must be~~ were reviewed to ensure that they do not cause equipment to operate or realign and defeat a safety function. RA 2/10/88

The components whose spurious actuation would adversely affect the plant are listed in Appendix A. This appendix also provides sketches illustrating all in-line valves which could divert flow.

In evaluating the need for protection of circuits to preclude the various spurious actuation items listed in Appendix A consideration shall be given to the sensitivity of those circuits to fire induced spurious actuations. All spurious actuations that are considered by EEB to be credible (Reference _____) in a single fire and that could prevent safe shutdown as defined in Appendix A shall be precluded.

RA 2/14/88

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

* See references 11.2 and 11.3 for requirements for Type I and III associated circuits. These requirements are outside the scope of this document.

7.0 Section 7.0 has been deleted. The procedural requirements previously contained in this section are outside the scope of this calculation (Reference ___). BZS880210101 Rev 2/10/88

8.0 Section 8.0 has been deleted. The operational requirements previously contained in this section are outside the scope of this calculation (Reference ___). BZS880210101 Rev 2/10/88

9.0 Auxiliary Control Room Requirements

For fires inside the control building, instruments located in the MCR may be lost, and evacuation to the auxiliary control room may be necessary. Under these circumstances, the instruments listed in Appendix E shall be physically separated and electrically isolated from fire effects in the control building such that safe shutdown from the auxiliary control room is assured. In addition, a path of equipment from Appendix A shall be operable (manual or automatic operation) and prevented from spurious operation.

10.0 Regulatory Responsiveness

IE Information Notice 84-09--Lessons Learned From NRCs Inspection of Fire Protection Safe Shutdown Systems, Revision 1 dated March 7, 1984--included the RCS cold leg temperature and the condensate storage (CST) tank level in its listing of minimum monitoring capabilities needed to achieve a safe shutdown from the auxiliary control room. Rev 2/12/88

The absence of RCS cold leg temperature monitoring is considered to be justified because during a reactor coolant system cooldown from the ACR, the steam generator pressure will be adjusted to the desired corresponding T_{cold} temperature using steam generator PORV controller. If a cooldown is in process, T_{hot} can be used just as well as T_{cold} to determine cooldown rate since delta "T" will remain relatively constant. Therefore, the accuracy in reading the steam generator pressure indicator will have minimal effects on the cooldown rates since the steam generator pressure is adjusted from the PORV controller. The steam generator pressure indication can be used to verify the set point on the PORV controller and to determine T_{cold}. (Reference: NRC Approval of T_{Cold} Instrumentation for ACR Deviation Request - L44 861010 079).

The absence of CST level indication is justified because CST level indication is functionally not needed in the ACR. The absence of this instrumentation would in no way affect the ability of the operator to achieve a safe shutdown. The CST has been sized to provide adequate water for most cooldowns. Because it is possible, however, that this water source could be exhausted during a prolonged cooldown, the capability exists to switchover auxiliary feedwater pump suction to the Essential Raw Cooling Water System. Per reference 11.9, local monitoring of AFW pump suction pressure will ensure that manual switchover is accomplished (also reference SOI-26.2).

11.0 References

11.1 10CFR50 Appendix R

11.2 Generic Letter 81-12, February 20, 1981

11.3 Clarification Letter of Generic Letter 81-12, April-May 1983

11.4 SECY 83-269, July 5, 1983

11.5 IE Notice 84-09, February 13, 1984

11.6 Branch Technical Position CMEB 9.5-1

11.7 Reference Deleted

11.8 DET-NEB Calculation: "Emergency Lighting Requirements for Main and Auxiliary Control Room Lighting During Upset Conditions" R2 (SQN-OSG7-026) (B45 880210 430)

11.9 AOI-27, Revision 6, Control Room Inaccessibility

11.10 Essential Raw Cooling Water System Design Criteria, SQN-DC-V-7.4

11.11 Volume 2, Table 7, Sequoyah Nuclear Performance Plan

11.12 Reference Deleted

11.13 DET-NEB Calculation: "10CFR50, Appendix R, Heating, Ventilation and Air Conditioning Review" TI-ECS-95 (R3), (B45 880321 236)

11.14 SQN-DC-V-24.0, "Fire Protection for Appendix R Requirements" R2

11.15 QIR SQP-SQN-88-259, Revision 0, "Availability of Offsite Power 72 Hours Following an Appendix R Fire (B25 880312 074) R9

11.16 QIR SQP-SQN-88-361, Revision 0, "Lower Compartment Temperature for Appendix R" (B25 880409 003)

Prepared by/Date DAH 4-21-88

Checked by/Date RLC/Rau 4/29/88

11.0 References (Continued)

11.17 QIR SQP-SQN-88-275, Revision 1, "Heating Effects on Aux Bldg Transformer Room Electrical Equipment During an Appendix R Event" (B25 880317 103)

11.18 QIR SQP-SQN-88-319, Revision 0, "Lower Compartment Temperature for Appendix R" (B25 880325 018) R9

11.19 QIR SQP-SQN-88-355, Revision 0, "Lower Compartment Temperature for Appendix R" (B25 880408 028)

11.20 QIR NTB-SQN-88-107, Revision 0, "Lower Containment Temperature for Appendix R" (B45 880415 252)

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

11.15 The following SQN DNE drawings were used to generate component lists for unit 1.

47W801-1	R25	47W848-1	R14	47W610-67-6	R8
47W801-2	R23	47W848-2	R8	47W610-63-1	R14
47W803-1	R17	47W848-2	R8	47W610-68-1	R15
47W803-2	R25	47W848-3	R5	47W610-68-2	R14
47W809-1	R23	47W848-8	R12	47W610-68-3	R17
47W809-2	R5	47W848-9	R10	47W610-68-4	R20
47W809-5	R8	47W848-12	R9	47W610-68-5	R19
47W810-1	R13	47W851-1	R17	47W610-68-6	R11
47W811-1	R23	47W859-1	R12	47W610-68-7	R7
47W811-2	R13	47W859-2	R17	47W611-62-3	R5
47W812-1	R11	47W859-3	R18	47W611-62-4	R11
47W813-1	R21	47W859-4	R7	47W611-63-2	R9
47W819-1	R21	47W866-1	R24	47W611-63-4	R6
47W830-4	R18	47W610-1-1	R16	47W611-63-8	R2
47W845-1	R19	47W610-1-2	R14	47W611-68-3	R9
47W845-2	R19	47W610-3-1	R16	47W611-99-7	R7
47W845-3	R18	47W610-3-2	R16	47W611-99-2	R5
47W845-4	R19	47W610-3-3	R12	47W611-99-6	R8
47W845-5	R9	47W610-62-2	R16		
47W846-1	R18	47W610-62-3	R10		

11.16 The following SQN As-Constructed drawings were used to verify component lists for unit 2.

47W801-1	R20	47W846-1	R16	47W610-62-3	R10
47W801-2	R23	47W848-1	R14	47W610-63-1	R13
47W803-1	R18	47W848-2	R5	47W610-67-6	R8
47W803-2	R25	47W848-3	R5	47W610-68-1	R12
47W809-1	R24	47W848-8	R15	47W610-68-2	R11
47W809-2	R4	47W848-9	R9	47W610-68-3	R10
47W809-5	R8	47W848-12	R9	47W610-68-4	R22
47W810-1	R13	47W851-1	R16	47W610-68-5	R22
47W811-1	R27	47W859-1	R14	47W610-68-6	R11
47W811-2	R10	47W859-2	R17	47W610-68-7	R8
47W812-1	R11	47W859-3	R18	47W611-62-3	R5
47W813-1	R26	47W859-4	R7	47W611-62-4	R13
47W819-1	R20	47W866-1	R24	47W611-63-2	R9
47W830-4	R19	47W610-1-1	R17	47W611-63-4	R6
47W845-1	R19	47W610-1-2	R14	47W611-63-8	R2
47W845-2	R17	47W610-3-1	R17	47W611-68-3	R9
47W845-3	R14	47W610-3-2	R17	47W611-99-7	R7
47W845-4	R24	47W610-3-3	R12	47W611-99-2	R5
47W845-5	R7	47W610-62-2	R19	47W611-99-6	R8

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

12.0 Background Information

12.1 10CFR50, Appendix R

12.2 EN DES-SEP 84-10, Safe Shutdown Analysis for Postulated Fires at Sequoyah Nuclear Plant

12.3 NEP 3.1 Calculations, R1, DNE INTERIM ORDER FOR NEP-3.1 (B05 871119 500)

12.4 Sequoyah Nuclear Plant 10CFR50, Appendix R - Fire Protection Submittal, October 1981.

12.5 AOI-10; Loss of Control Air, R13

12.6 AOI-12; Loss of Containment Integrity, R6

12.7 AOI-13; Loss of Essential Raw Cooling Water, R10

12.8 AOI-14; Loss of RHR Shutdown Cooling, R8

12.9 AOI-15; Loss of Component Cooling Water, R9

12.10 AOI-18; Malfunction of Pressurizer Pressure Control System, R8

12.11 AOI-20; Malfunction of Pressurizer Level Control System, R7

12.12 AOI-21; Loss of 125V dc Vital Battery Boards*

12.13 AOI-25; Loss of 120V ac Vital Instrument Power Boards*

12.14 AOI-26; Loss of Control Room Annunciators, R1

12.15 AOI-27; Control Room Inaccessibility, R9

12.16 SQN-DC-V-2.17; Remote Shutdown Criteria From Locations Outside the Main Control Room, R0

12.17 SQN-DC-V-10.7; 10CFR50, Appendix R, Type II Items, R0

12.18 SQN-DC-V-24.0; Sequoyah Nuclear Plant General Design Criteria for Fire Protection for Appendix R Requirements, R2

12.19 SQN-DC-V-11.2; Non-Class 1E Direct Current Power Distribution Systems Compliance With 10CFR50, Appendix R, R0

12.20 AOI-30; Plant Fires, R5

12.21 SOI-26.2; Fire Interaction Manual, R6

* 8 Procedures with varying revision levels - no influence on calculation

Prepared by/Date RA Edlund 2/10/89

Checked by/Date R. S. Clark 2/10/89

12.0 Background Information (continued)

12.22 10CFR50, Appendix R NRC Correspondence

Inspection of safe shutdown capability and associated fire protection features	A02 840625 002
TVA intentions to correct APP R	A27 840807 010
Confirmation of action - SQN Units 1 & 2	A02 840817 011
TVA response to COA letter	A27 840821 016
Meeting summary	A02 840827 012
Monthly status report	L44 840920 801
Coatings on IEEE-383 qualified Cables	L44 841918 800
Monthly status report	L44 841015 800
Confirmation of action	NEB 840913 605
Shutdown logic submittal	L44 840917 803
Monthly status report	L44 841109 806
Inspection report 50-327, 328/84-31	NEB 841121 604
Inspection of compliance with Appendix R	NEB 841219 601
Appendix R deviation requests	L44 841218 800
Information requested by NRC 12/12/84	L44 841227 800
Final report required by COA letter	L44 841221 804
Additional deviation requests and fire door update	L44 850111 800
Confirmation of action receipt of final report	NEB 850206 607
Revision to deviation request #15	L44 850304 805
Enforcement conference of 02/28/85	A02 850320 009
Report #'S 50-327, 328/85-01	A02 850403 009

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

12.0 Background Information (continued)

12.22 10CFR50, Appendix R NRC Correspondence

SQN position on internal conduit sealing	L44 850412 808
Removal of ERCW and DG bldg firewatches	L44 850805 805
ERCW and DG bldg deviation request and firewatch removal	L44 850903 268
Report #'S 50-327, 328/85-37	L44 851127 389
Completion of modifications associated with deviation requests	L44 851129 802
Removal of firewatches	L44 860220 804
Revised emergency lighting commitment	L44 860305 812
RCS cold leg temp indication for ACR	L44 860319805
RCS cold leg temp indication for ACR	L44 860502 807
Approval of deviation requests	L44 860606 620
Inspection report #'S 50-327, 328/86-40	A02 860813 001
Approval of T_{cold} instrumentation for ACR deviation request	L44 861010 079
Appendix R status update	L44 861107 803
Notice of violation (inspection report #'S 50-327, 328/86-66)	A02 870121 005
Modifications associated with deviation requests	L44 870116 802
SQN modifications associated with deviation requests	A02 870303 018

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

13.0 Notes for SLDs (Figures 1 through 12)

(1) _____ Solid lines are used for paths leading to the Hot Standby and Cold Shutdown Conditions. The logic diagrams will require analysis to assure that all required conditions can be realized during a fire. The criteria for acceptability is as follows: Given a fire which effects any function on the diagram, the required condition must be capable of being reached either via a parallel redundant or diverse path which is physically separated or protected from the fire or by virtue of the fact that the function may be considered immune to fire damage (e.g., the refueling water storage tank). Any deviations must be approved by the NRC.

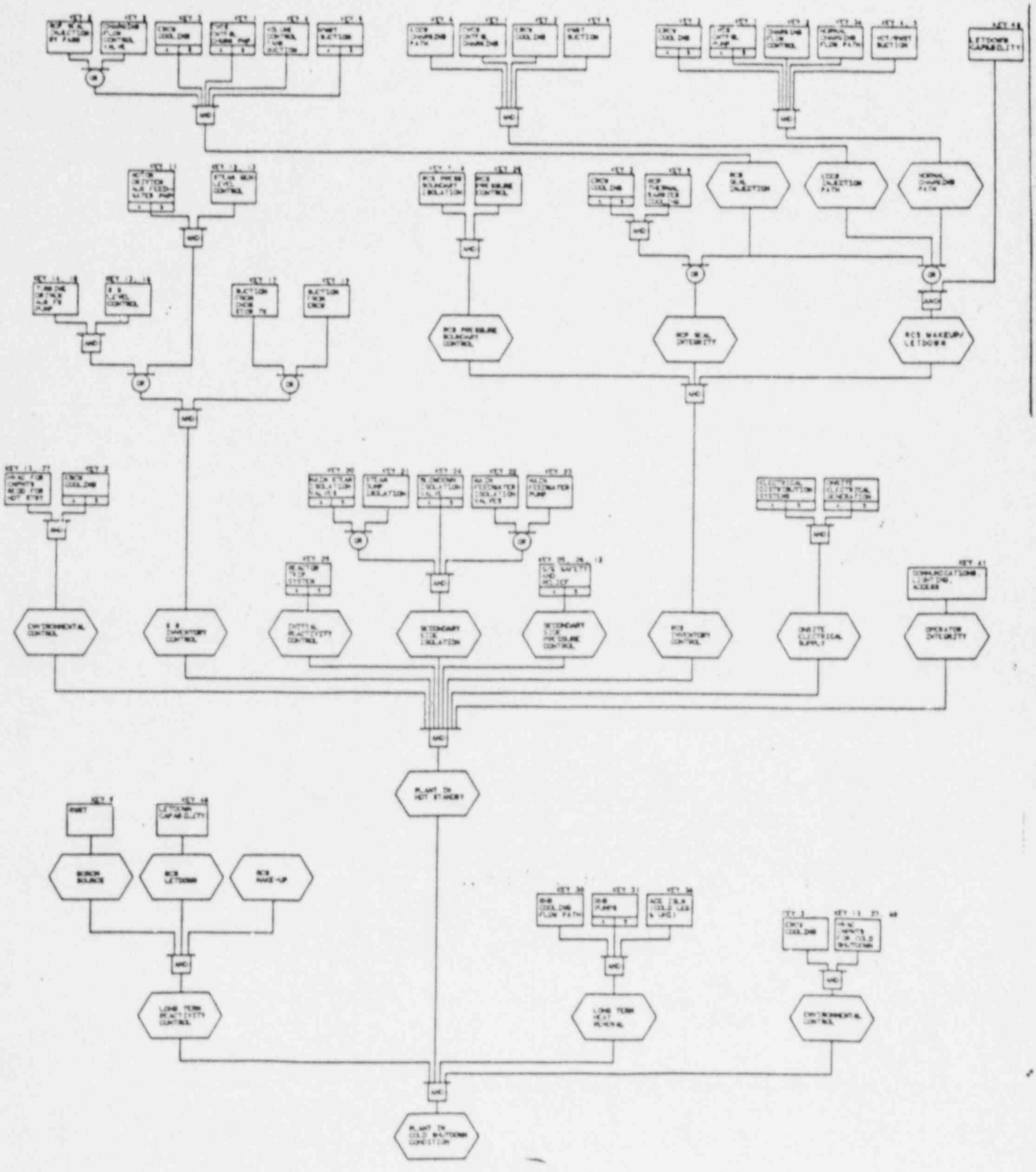
(2) Blocks denoted with an A and B subscripts are trained. Redundancy is provided for this block.

(3) Key components are located in Appendix A.

(4) Spurious components are listed by item number and discussed in Appendix A and C.

CHECKED BY/DATE KLC/Rev 4/29/88

SQN-SQS4-127



APPENDIX R SAFE SHUTDOWN LOGIC DIAGRAM

FIGURE 1

sheet 13

Prepared by/Date R A Ellen 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A

KEY COMPONENTS REQUIRED FOR SAFE SHUTDOWN UNDER FIRE CONDITIONS

SQN-SQS4-0127

Prepared by/Date R a Edlund 2/10/88

Checked by/Date R.L. Clark 2/10/88

APPENDIX A

SEQUOYAH NUCLEAR PLANT

KEY 1

Availability of CVCS Centrifugal Charging Pump

This key requires that a centrifugal charging pump (CCP) be available to provide RCS makeup water while achieving and maintaining safe shutdown. To ensure that a CCP is operable, the supporting components and subsystems are required. The CCP auxiliary lube oil pump must provide pump lubrication for startup of the pump. However, if the lube oil pump (or its associated circuitry) is damaged by fire, the switch bypassing the oil pump must be used to start the CCP. The pump room cooler and its control circuitry must operate. The component cooling system (CCS) is required for pump cooling.

This key is organized as follows:

Item 1 - Functional logic diagram for CCP operability.
Item 2 - Tabulation of components which must be operable.
ITem 3 - Tabulation of spurious actuation which must be prevented. This item is organized as follows:
- (1) Tabulation of spurious actuation for unit 1, path 1
- (2) Basis for unit 1, path 1 items
- (3) Simplified flow diagram for unit 1, path 1
- (4) Tabulation of spurious action for unit 2, path 1
- (5) Basis for unit 2, path 1 items
- (6) Simplified flow diagram for unit 2, path 1
- (7) Tabulation of spurious actions for unit 1 and 2, path 2
- (8) Basis for units 1 and 2, path 2 items
- (9) Simplified flow diagram for units 1 and 2, path 2

Item 4 - Notes as used in items 1 through 3 above.

Operator actions required to support this key are contained in Appendix B.

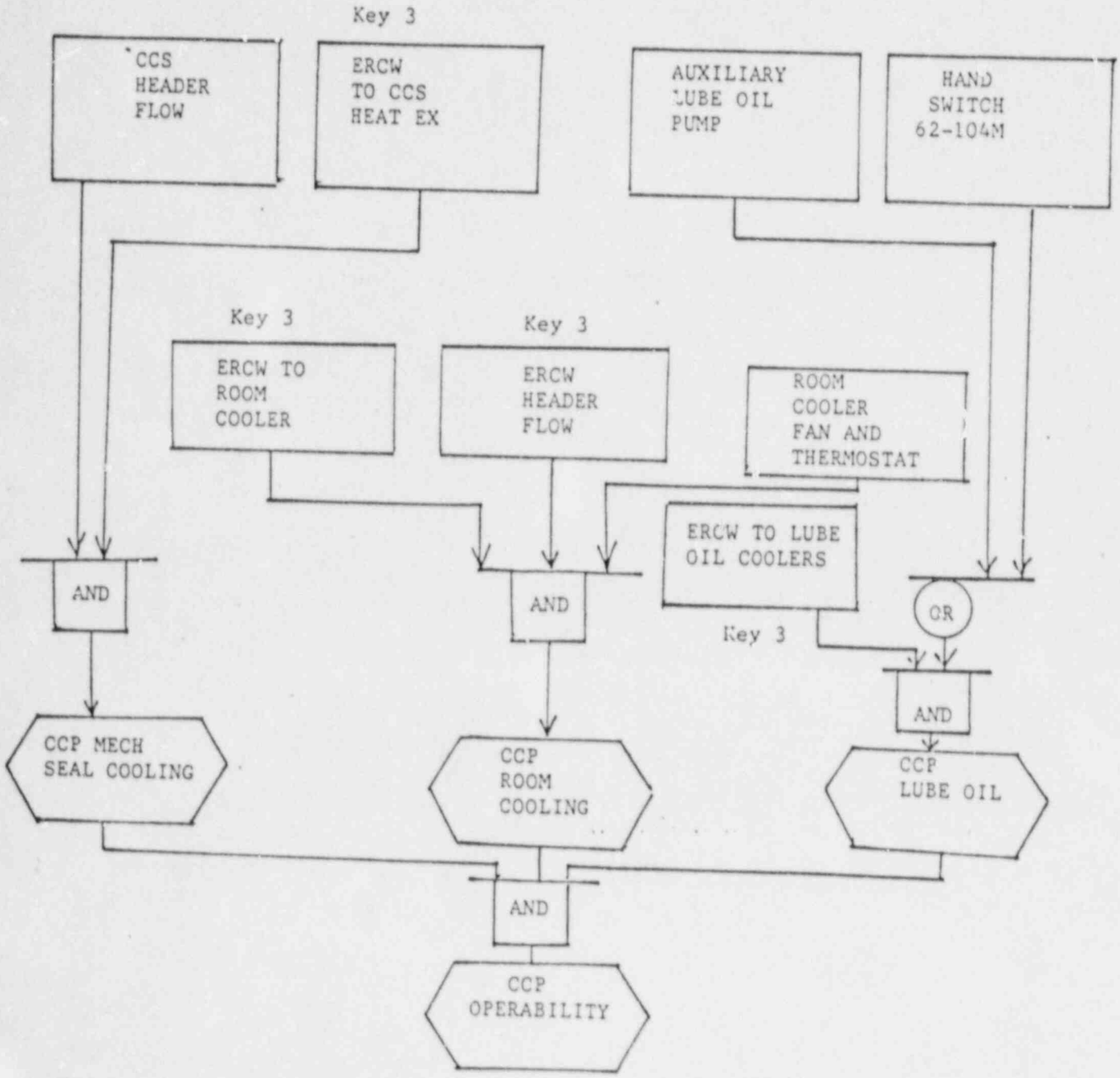
EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

CCP OPERABILITY LOGIC



3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A

SEQUOYAH NUCLEAR PLANT
KEY 1 (Operation List)

Path 1

Component		Requirement	Basis
Centrifugal Charging Pump (CCP) A-A		Must Operate	Self Evident
CCP Auxiliary Lube Oil Pump A-A (Note 12)		Must Operate	CCP Lube Oil
CCP Pump Room Cooler Fan A-A		Must Operate	Room Cooling
Instrument Loop 30-183 (for fan control) (Note 13)		Must Operate	Room Cooling
CCS Pump A-A)	Either one	Must Operate	CCP Seal Cooling
CCS Pump B-B) (Note 8)		Must Operate	CCP Seal Cooling
0-FCV-70-197 (Unit 1 Only) (Note 9,14,15)	Either	Must Close	CCP Seal Cooling
0-FCV-70-198 (Unit 1 Only) (Note 9,14,15)	one	Must Close	CCP Seal Cooling

ERCW supports CCP mechanical seal cooling, CCP room cooling, and CCP lube oil coolers.

Path 2

CCP B-B	Must Operate	Self Evident
CCP Auxiliary Lube Oil Pump B-B (Note 12)	Must Operate	CCP Lube Oil
CCP Pump Room Cooler Fan B-B	Must Operate	Room Cooling
Instrument Loop 30-182 (for fan control) (Note 13)	Must Operate	Room Cooling
CCS Pump C-S (Note 10)	Must Operate	CCP Seal Cooling

ERCW cooling for CCS heat exchangers C is provided by normal supply header 2B or alternate ERCW header 1A. For alignment see Key 3.

Note for information only:

According to Westinghouse report NS-RAT-PLRA-87-059, the charging pumps will still function properly without CCS mechanical seal cooling. Thus, future revisions to this calculation may consider the deletion of the requirement for component cooling to the seals. At the present time, however, this report is only applicable to the IPE analysis, and additional information would be required from Westinghouse. (Reference letter TVA-87-625)

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX A - KEY 1

SPURIOUS LIST FOR
UNIT 1, PATH 1

For Unit 1, if Path 1 is used, the following spurious actions must be prevented:

Unit 1

* 1-FCV-70-156))	(Note 11) Any one	Must Not Open
** 1-VLV-70-545A)		Must be Closed
** 1-VLV-70-546A)		Must be Closed
1-FCV-70-8 (Note 4)		Must Not Close
1-FCV-70-9) (Note 4)	Either one	Must Not Open
1-FCV-70-10) (Note 4)		Must Not Open
1-FCV-70-2 (Note 4)		Must Not Close
0-FCV-70-34 (Note 4)	(if CCS Pump 1B-B is used)	Must Not Close
1-FCV-70-25 (Note 4)		Must Not Close
1-FCV-70-64) (Note 4)	Either one	Must Not Open
1-FCV-70-74) (Note 4)		Must Not Open
1-FCV-70-26) (Note 4)	Either one	Must Not Open
1-FCV-70-27) (Note 4)		Must Not Open
1-FCV-70-13) (Note 4)	Either one	Must Not Open
1-FCV-70-23) (Note 4)		Must Not Open
0-FCV-67-478 (Note 4)		Must Not Close
* 1-FCV-67-146	(Reference deviation L44 860606 620)	Must Not Close
1-FCV-62-98 (Note 4)		Must Not Close
1-FCV-62-99 (Note 4)		Must Not Close
ERCW Header 2A) Either one		Must Be Available
ERCW Header 1B)		(See Key 3)

*Handwheel operation acceptable
**Manual valve not subject to spurious actions

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

APPENDIX A - KEY 1
Basis for Spurious List
For Unit 1, Path 1

Item*	Component	Basis
1	1-FCV-70-156 1-VLV-70-545A 1-VLV-70-546A	Inadvertent opening of FCV-70-156 valve will open up a major flowpath. This would depress the heat removal capability of the CCS heat exchanger A and consequently result in inadequate heat removal from the CCP 1A-A mechanical seal heat exchanger. The heat removal capability of the CCS heat exchanger will not be affected if any of the manual valves, 1-VLV-70-545A or 1-VLV-70-546A are closed.
2	1-FCV-70-8	Spurious closure of this valve will isolate CCS heat exchanger A, thus terminating the heat removal of CCP pump 1A-A mechanical seal heat exchanger.
3	1-FCV-70-9 1-FCV-70-10	At least one of these valves must remain closed to prevent CCS crossover to the B Header. The inability to maintain at least one of these valves closed will challenge the ability of the CCS to remove heat from CCP 1A-A, mechanical seal heat exchanger.
4	1-FCV-70-2	Closure of this valve results in same consequence as that for item 2. But it will also prevent cooling of the spent fuel pit and thermal barrier booster pumps.
5	1-FCV-70-34	This valve must not be closed because it will isolate suction flow to the CCS pump 1B-B. Thus, heat removal of the CCP pump 1A-A mechanical seal heat exchanger will be terminated (note, provided pump 1A-A is not operable).
6	1-FCV-70-25	This valve must not close because it will isolate CCS heat exchanger A, and consequently result in the termination of cooling to the unit 1 normal loads, which includes the CCP mechanical seals and the spent fuel pit.
7	1-FCV-70-64 1-FCV-70-74	At least one of these valves must remain closed to prevent flow diversion. Flow diversion would result in inadequate suction to CCS pumps 1A-A and 1B-B, thus potential pump damage. Subsequently, heat removal of 1A-A mechanical seal heat exchanger challenged.

*Item number references to simplified flow diagram and also Appendix C.

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Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A

8	1-FCV-70-23 1-FCV-70-13	At least one of these valves must remain closed to prevent flow diversion. Flow diversion will result in inadequate component cooling flow to CCS A heat exchanger and CCP 1A-A mechanical seal heat exchanger. Thus, potential damage to CCP pump 1A-A.
9	1-FCV-67-146 0-FCV-67-478	Both of these valves must remain open to ensure adequate heat removal from component cooling system train A equipment. Closure of any one of these valves will result in inability to remove heat from CCP 1A-A.
10	ERCW Supply Headers 2A and 1B	See spurious list in Key 3.
(10a)	1-FCV-62-98 1-FCV-62-99	Spurious closure of any one of these valves may result in loss of recirculation flow with subsequent damage to CCP 1A-A.

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

APPENDIX A

COMPONENT COOLING TO CCP 1A-A
MECHANICAL SEAL HEAT EXCHANGER

FLOW DIAGRAM-LATER

- Item numbers which are discussed in the basis for spurious list.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX A - KEY 1

SPURIOUS LIST FOR
UNIT 2, PATH 1

* 2-FCV-70-156) (Note 1)	Any one	Must Not Open
** 2-VLV-70-545A)		Must be Closed
** 2-VLV-70-546A)		Must be Closed
2-FCV-70-15. (Note 4)		Must Not Close
2-FCV-70-195) (Note 4)	Either one	Must Not Open
2-FCV-70-196) (Note 4)		Must Not Open
2-FCV-70-2 (Note 4)		Must Not Close
0-FCV-70-39 (Note 4) (if CCS Pump 2B-B is used)		Must Not Close
2-FCV-70-16 (Note 4)		Must Not Close
2-FCV-70-76) (Note 4)	Either one	Must Not Open
2-FCV-70-78) (Note 4)		Must Not Open
2-FCV-70-28) (Note 4)	Either one	Must Not Open
2-FCV-70-29) (Note 4)		Must Not Open
2-FCV-70-14) (Note 4)	Either one	Must Not Open
2-FCV-70-18) (Note 4)		Must Not Open
0-FCV-70-193 (Note 2, 14)		Must Not Open
0-FCV-70-194 (Note 2, 14)		Must Not Open
2-FCV-62-98 (Note 4)		Must Not Close
2-FCV-62-99 (Note 4)		Must Not Close
* 2-FCV-67-146	(Reference deviation approval L44 860606 620)	Must Not Close
ERCW Header 2A)	Either one	Must Be Available (See Key 3)
ERCW Header 1B)		

*Handwheel operation acceptable
**Manual valve not subject to spurious actions

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX A - KEY 1

Basis for Spurious List
For Unit 2, Path 1

Item*	Components	Basis
12	2-FCV-70-15	This valve must not close, because it will isolate component cooling system heat exchanger B. This would terminate heat removal to the centrifugal charging pump B mechanical seal heat exchanger and other unit 2 train A supplied equipment.
13	2-FCV-70-195 2-FCV-70-196	At least one of these valves must remain closed to prevent flow diversion. Flow diversion would challenge the ability of the component cooling heat exchanger B to remove heat from centrifugal charging pump 2A-A mechanical seal heat exchanger and other unit 2 train A supplied equipment.
14	2-FCV-70-193 0-FCV-70-194	Same as item 13.
15	2-FCV-70-2	Same as item 12.
16	2-FCV-70-156 2-VLV-70-545A 2-VLV-70-546A	Same as item 13. The heat removal capability of the CCS heat exchanger 2A1/2A2 will not be affected if either manual valve 2-VLV-70-545A or 2-VLV-70-546A are closed.
17	FCV-70-28 FCV-70-29	At least one of these valves must remain closed to prevent flow diversion. Flow diversion would result in inadequate flow through CCS heat exchanger B. Thus, the ability to remove heat from CCP pump 2A-A mechanical seal heat exchanger will be challenged.
18	FCV-70-14 FCV-70-18	Same as item 17.
19	FCV-70-16	Spurious closure of this valve would terminate component cooling flow to CCS heat exchanger B. Thus, cooling of CCP pump mechanical seal heat exchanger 2A-A would be terminated.

*Item number references to simplified flow diagram and Appendix C.

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A - KEY 1

Basis for Spurious List
Unit 2, Path 1

Item	Components	Basis
20	FCV-70-76 FCV-70-78	At least one of these valves must remain closed to prevent flow diversion. Flow diversion could result in potential damage to CCS pumps 2B-B and 2A-A.
21	FCV-70-39	If pump 2A-A is the only pump used in supplying required unit 2 loads this valve must not close. Closure of this valve isolates suction to CCS 2A-A mechanical seal.
22	2-FCV-67-146	Closure of this valve will isolate CCS heat exchanger B. Thus, cooling of CCP mechanical seal heat exchanger, 2A-A will be challenged.
22a	ERCW Supply Header 2A and 1B	See spurious list for Key 3

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A

UNIT 2 KEY 1
COMPONENT COOLING TO CCP MECHANICAL SEAL
HEAT EXCHANGER 2A-A

FLOW DIAGRAM-LATER

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A - KEY 1
Spurious List for
Units 1 and 2, Path 2

If Path 2 is used, then the following spurious actions must be prevented:

Units 1 and 2		
0-FCV-70-12 (Note 4)		Must Not Close
FCV-70-3 (Note 4)		Must Not Close
1-FCV-70-9) (Note 4)	Either one	Must Not Open
1-FCV-70-10) (Note 4)		Must Not Open
2-FCV-70-195) (Note 4)	Either one	Must Not Open
2-FCV-70-196) (Note 4)		Must Not Open
FCV-70-75 (Note 4)		Must Not Close
1-FCV-70-64) (Note 4)	Either one	Must Not Open
1-FCV-70-74) (Note 4)		Must Not Open
1-FCV-70-26) (Note 4)	Either one	Must Not Open
1-FCV-70-27) (Note 4)		Must Not Open
1-FCV-70-13) (Note 4)	Either one	Must Not Open
1-FCV-70-23) (Note 4)		Must Not Open
2-FCV-70-76) (Note 4)	Either one	Must Not Open
2-FCV-70-78) (Note 4)		Must Not Open
2-FCV-70-28) (Note 4)	Either one	Must Not Open
2-FCV-70-29) (Note 4)		Must Not Open
2-FCV-70-14) (Note 4)	Either one	Must Not Open
2-FCV-70-18) (Note 4)		Must Not Open
0-FCV-70-22 (Note 4)		Must Not Close
*** 0-FCV-67-151)	Either One	Must Not Close
** 0-FCV-67-152)		
ERCW Header 2B)	Either One	Must Be Available
ERCW Header 1A)		(See Key 3)
FCV-70-153 (Note 3)	Any one	Must Not Open
* VLV-70-545B		Must be Closed
* VLV-70-546B		Must be Closed

*Manual valves not subject to spurious actions

**Handwheel operation acceptable

***Power has been removed to 0-FCV-67-151, handwheel operation acceptable

Prepared by/Date RA Edlem 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX A - KEY 1
Basis for Spurious List
Units 1 and 2, Path 2

Item	Component(s)	Basis
23	1-FCV-70-64 1-FCV-70-74	At least one of these valves must remain closed to prevent flow diversion. Flow diversion could result in potential damage to C-S CCS pump. Thus, this would challenge ability of CCS HTX C to remove heat from 1B-B and 2B-B mechanical seal heat exchangers.
24	FCV-70-76 FCV-70-78	Same as item 23
25	FCV-70-26 FCV-70-27	At least one of these valves must remain closed to prevent flow diversion. Flow diversion would result in inadequate flow volume through CCS Heat Exchanger C. Thus, the ability to remove heat from CCP 1B-B, 2B-B mechanical seal heat exchangers, spent fuel pit, and other train B required loads would be challenged.
26	FCV-70-28 FCV-70-29	Same as item 25
27	FCV-70-22	Spurious closure of this valve would isolate component cooling flow to CCS HTX C. This would terminate CCS heat removal of train B equipment, for both Uts 1 & 2.
28	FCV-70-23 FCV-70-13	Same as item 25
29	FCV-70-14 FCV-70-18	Same as item 25
30	FCV-70-12	Spurious closure of this valve would terminate cooling flow to CCP mechanical seal heat exchangers 1B-B, 2B-B and other train B supplied components. Also, potential damage to heat exchanger tubes may occur.

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX A

31	FCV-70-9 FCV-70-10	At least one of these valves must remain closed to prevent flow diversion. Flow diversion would challenge ability of components cooling system to remove heat from 1B-B centrifugal charging pump mechanical seal heat exchanger.
32	FCV-70-195 FCV-70-196	Same as item 31, except that, the ability to remove heat from 2B-B mechanical seal heat exchanger and other train B Header 2B loads would be challenged.
33	1-FCV-70-3	Spurious closure of this valve would isolate component cooling flow to CCP 1B-B seal heat exchanger.
34	2-FCV-70-3	Same as item 33, but terminate cooling flow to CCP 2B-B mechanical seal heat exchanger.
35	FCV-67-151 FCV-67-152	At least one of these valves must be open to prevent isolation of ERCW flow through the C-CCS heat exchanger.
36	1-FCV-70-153 2-FCV-70-153	Spurious actuation of these valves will result in flow diversion. Flow diversion would result in inadequate flow to the B CCP mechanical seal heat exchangers.
37	1-FCV-70-75 2-FCV-70-75	Closure of these valves will isolate flow from tne train B CCP mechanical seal heat exchangers.
	ERCW Header 2B ERCW Header 1A	See Key 3.

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A

UNITS 1 & 2, (KEY 1)
Component Cooling to CCP
Mechanical Seal Heat Exchangers 1B-B and 2B-B

FLOW DIAGRAM-LATER

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A

SEQUOYAH NUCLEAR PLANT
KEY 1 (Notes)

Note 1: If this valve spuriously opens, component cooling water pumps 2A-A and 2B-B both must be operable or spent fuel pit cooling via CCS heat exchanger B must be isolated if manual valves 2-545A or 2-546A are not closed. If the component cooling water system temperature exceeds the system limits, some of the larger non-safety loads (such as the gas stripper and boric acid evaporator package) must be isolated.

Note 2: If both of these valves open, component cooling water pumps 2A-A and 2B-B both must be operable.

Note 3: Either the unit 1 valve or the unit 2 valve may spuriously open without affecting this path's operability. Manual isolation is acceptable.

Note 4: A design change has been made under ECN-L6258 to remove power from this valve.

Note 5: A design change has been made under ECN-L6258 to remove control air from this valve. Valve fails in the open position.

Note 6: A design change has been made under ECN-L6258 to open this valve and remove power from it.

Note 7: A design change has been made under ECN-L6258 to close this valve and remove power from it.

Note 8: If CCS pump B-B is used, equipment associated with supplying B-train power will have to be evaluated.

Note 9: If neither 0-FCV-70-197 nor 0-FCV-70-198 close, component cooling water pumps 1A-A and 1B-B both must be operable.

Note 10: CCS pump 1B-B or 2B-B can be used as a substitute if the appropriate valves are realigned. If needed, the possible valve realignments can be provided.

Note 11: If this valve spuriously opens, component cooling water pumps 1A-A and 1B-B both must be operable or spent fuel pit cooling via CCS heat exchanger A must be isolated if manual valves 1-545A or 1-546A are not closed. If the component cooling water system temperature exceeds the system operating limits, some of the larger non-safety loads (such as the gas stripper and boric acid evaporator package) must be isolated.

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A

Note 12: The lube oil pump must be operable or the handswitch (HS-62-1-4M) bypassing the oil pump must be used for the CCP start.

Note 13: Fan will start on high room temperature or pump start signal.

Note 14: If neither valve can be protected from spuriously opening and the requirements of note 9 (for key 1, path 1) and the requirements of note 3 (for key 1, unit 2) cannot be met, then the following must be accomplished.

* FCV-70-40	Any one	Must close
* FCV-70-11		Must close
* 0-70-529A		Must be closed
OR		
*FCV-70-41	Any one	Must close
*FCV-70-1		Must close
* 0-70-529B		Must be closed
OR		
* 1-70-531		Must be closed

*Handwheel operation is acceptable for these valves.

Note 15: If these valves close an alternate path to cool the spent fuel pool must be initiated prior to pool boiling (10 hours is the minimum time for boiling at maximum heat load conditions). Spent fuel pool cooling is not addressed further in this document since it is not required by Appendix R.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 2

CHARGING FLOW CONTROL VALVE AND BYPASSES

This key establishes the flow through the normal charging path. It requires that one of three valves in the discharge piping from the Centrifugal charging pumps be open to provide the first portion of the normal charging flow and seal injection. This key's components are required if the normal charging flowpath is used for RCS makeup (see Key 34 for alignment) and/or if RCP seal injection is used to maintain RCP seal integrity and/or RCS make-up. There are no spurious actuations associated with this key. If credit is being taken for RCP seal injection as the method for RCS make-up on Figure 1, an injection flow rate of 34 gpm is required to support a cooldown rate of 25°F/hour. The cooldown rate will vary with the injection rate.

Instrument Loop F-62-93	Any set	Must Operate
FCV-62-93		Must ~~Be Open~~ Operate RLC 2/10/88
Control Air		Must Be Available
*VLV-62-534		Must Be Opened
*VLV-62-533		Must Be Closed
*VLV-62-526		Must Be Opened
*VLV-62-527		Must Be Closed
Instrument Loop L-68-320	Any One	Must Operate
Instrument Loop L-68-335		Must Operate
Instrument Loop L-68-339		Must Operate

*Handwheel operated valves.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

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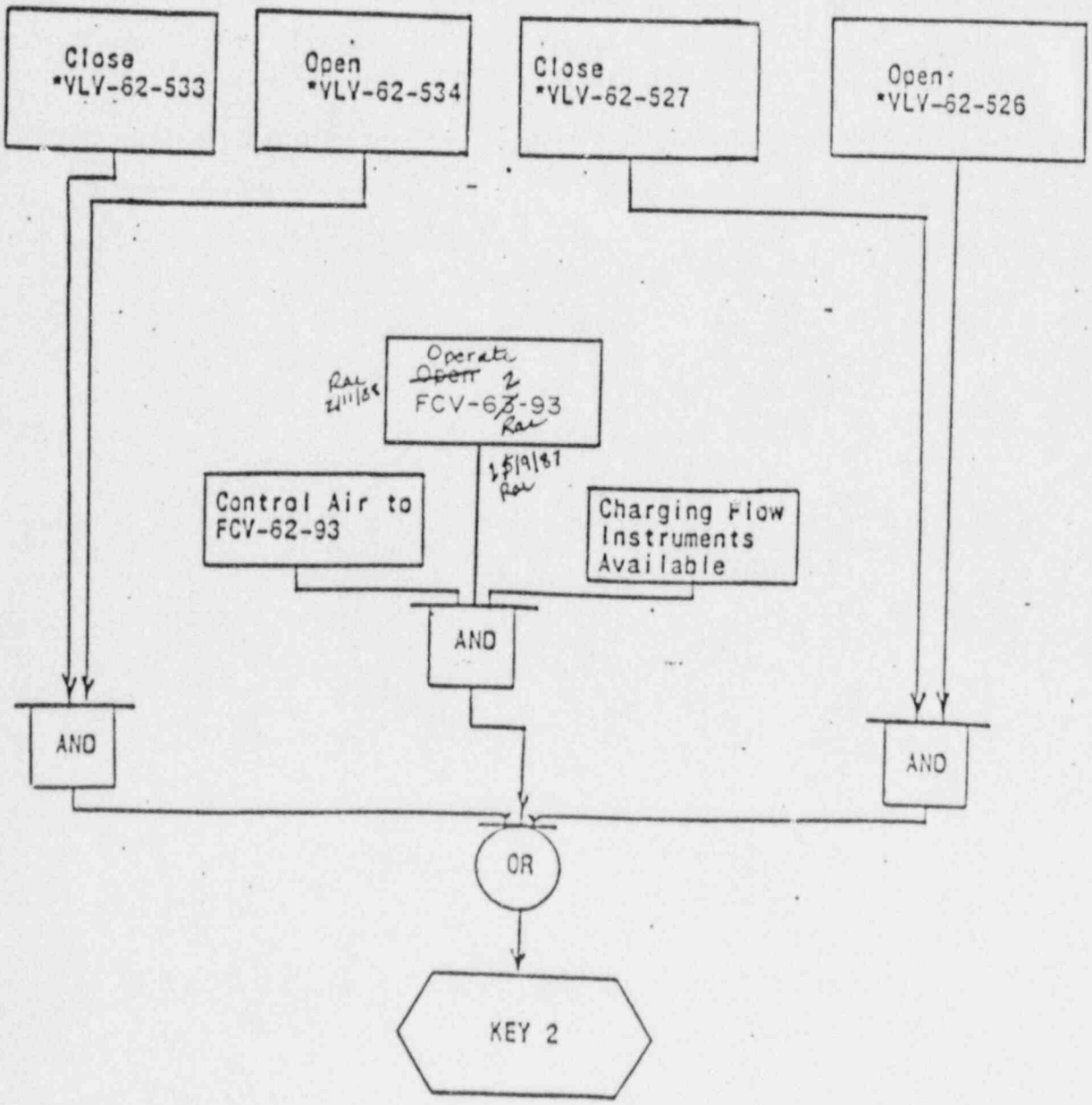
SEQUOYAH NUCLEAR PLANT

KEY 2

CHARGING FLOW CONTROL VALVE AND BYPASSES



* Handwheel-operated Valves

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 3

ERCW COOLING

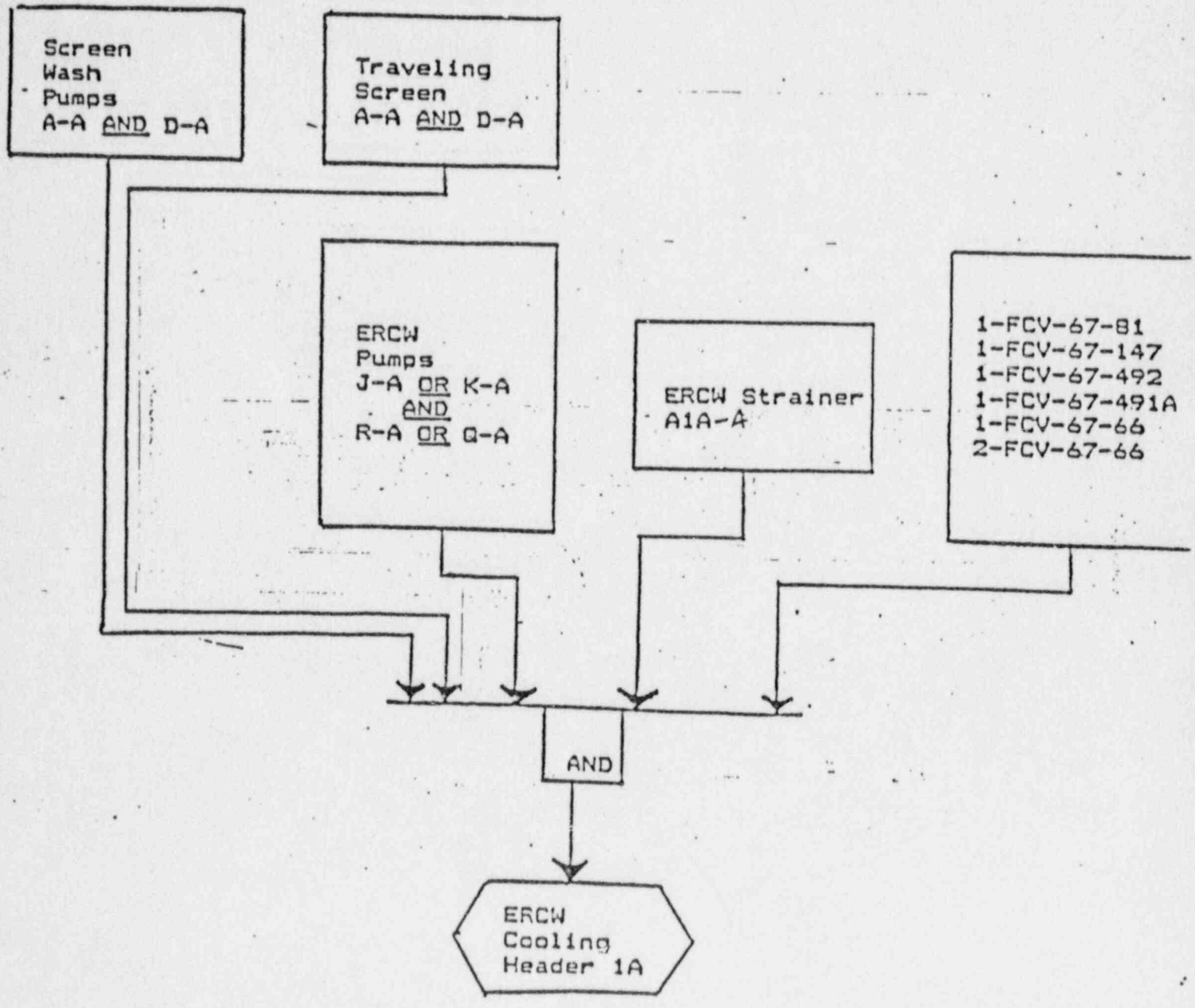
This key contains the main line equipment necessary to supply ERCW cooling water for those functions on the shutdown logic diagram which require it for operation. The normal cooling water supply to the CCS heat exchangers A, B, and C shall be from ERCW headers 2A, 2A and 2B respectively. The piping system is set up such that alternate alignment is permitted to those heat exchangers from headers 1B, 1B and 1A respectively. Additional ERCW system components are contained with keys 1, 9, 13, 19, 37 and 40.

This key is organized by header, 1A, 2A, 1B, 2B. The section for each header consist of (1) a functional logic diagram, (2) a tabulation of features which must operate, (3) a tabulation of spurious actuations which must be prevented, (4) basis for spurious actuate items, and (5) simplified flow sketches of the header.

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT
KEY 3
ERCW COOLING HEADER 1A



EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

KEY 3 - ERCW HEADER 1A

ERCW Header 1A (operation list)

ERCW Pump J-A) Either One		Must Operate
ERCW Pump K-A)		Must Operate
SCREEN WASH PUMP A-A		Must Operate
TRAVELING SCREEN A-A**		Must Operate
ERCW Pump Q-A) Either One		Must Operate
ERCW Pump R-A)		Must Operate
SCREEN WASH PUMP D-A		Must Operate
Traveling Screen D-A**		Must Operate
ERCW Strainer A1A-A		Must Operate
1-FCV-67-491A (Strainer Flush)		Must be Operable
1-FCV-67-66 (Diesel Cooling)		Must be Operable
2-FCV-67-66 (Diesel Cooling)		Must be Operable

**Screens to be visually inspected and manually backwashed per SOI-67.1

ERCW Header 1A (Spurious List)

*1-FCV-67-81	(1A Header Isolation)		Must Not Close
*1-FCV-67-147	(1A/2A Header X-tie)		Must Not Open
*1-FCV-67-492	(Strainer A1A-A Inlet)		Must Not Close
1-FCV-67-125 (Note 1)	(CS HX Isolation)	Either One	Must Not Open
1-FCV-67-126 (Note 1)	(CS HX Isolation)		Must Not Open
*1-FCV-67-127	(Vital HVAC)		Must Not Close
**1-FCV-67-168	(Vital HVAC)		Must Not Close
1-FCV-67-491D	Strainer Flush)		Must Not Open
*0-FCV-67-12	(Discharge Header Isolation)		Must Not Close
*0-FCV-67-364	(Discharge Header Isolation)		Must Not Close

*Power has been removed per ECN L6258
**Control air has been removed; valve to remain permanently open.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

Basis for ERCW Header 1A Spurious List

Item	Component	Basis
133	1-FCV-67-66 2-FCV-67-66	Spurious closure of these valves will terminate ERCW cooling to diesel generators
134	1-FCV-67-125 1-FCV-67-126	At least one of these valves must remain closed to prevent partial flow diversion. Thus, depending on the loads the heat removal of the A CCS heat exchanger will be challenged.
135	1-FCV-67-127	Closure of this valve will terminate flow to the 1A centrifugal charging pump room and oil coolers, the RHR 1A pump room cooler and the service air compressor. (See keys 1, 13 and 40).
137	1-FCV-67-491A	Improper operation of this valve may prevent effective operation of A1A-A strainer.
138	1-FCV-67-491D	Spurious opening of this valve will divert a portion of the header 1A cooling water supply from the CCS A heat exchanger. Consequently, the heat removal capability of the A CCS heat exchanger may be challenged.
139	0-FCV-67-12 0-FCV-67-364	These are train A ERCW discharge header valves. Their closure will result in the loss of the ultimate heat sink and consequently result in ERCW train A being inoperable.
	1-FCV-67-168	CCP room cooler A supply control valve. Power has been disconnected to this valve.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

KEY 3

ERCW COOLING HEADER 1A

FLOW DIAGRAM-LATER

3446F/JMS

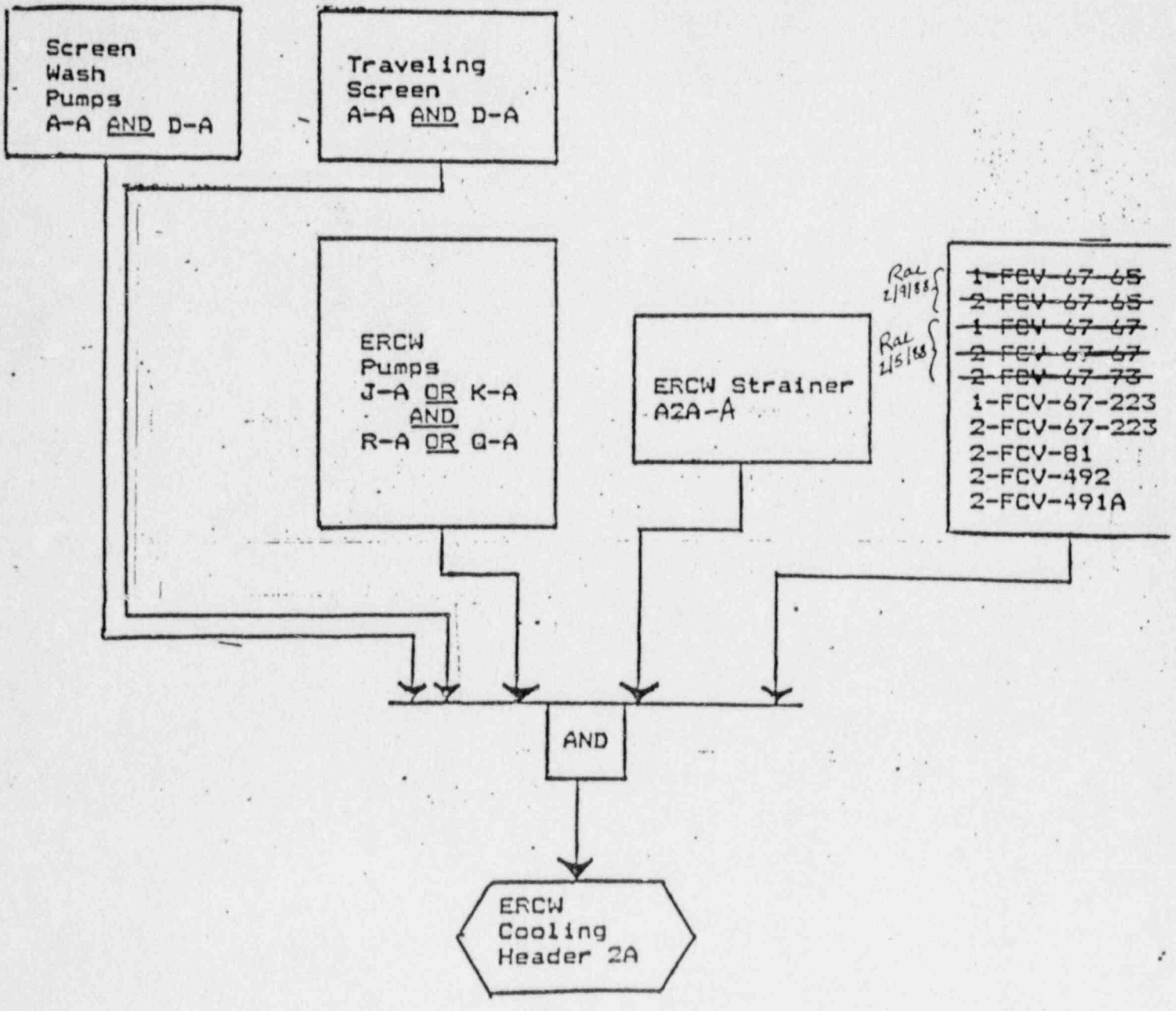
Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 3

ERCW COOLING HEADER 2A



EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

KEY 3 ERCW HEADER 2A

ERCW Header 2A (operation list)

ERCW Pump J-A) Either One	Must Operate
ERCW Pump K-A)	Must Operate
SCREEN WASH PUMP A-A	Must Operate
Traveling Screen A-A*	Must Operate
ERCW Pump Q-A) Either One	Must Operate
ERCW Pump R-A)	Must Operate
SCREEN WASH PUMP D-A*	Must Operate
Traveling Screen D-A	Must Operate
ERCW Strainer A2A-A	Must Operate
2-FCV-67-491A (Strainer Flush)	Must be Operable

*Screens to be visually inspected and manually backwashed per SOI-67.1

ERCW Header 2A (Spurious List)

*2-FCV-67-81	(2A Header Isolation)		Must not close
*1-FCV-67-223	(2A/1B X-tie)		Must not close
*2-FCV-67-223	(2A/1B X-tie)		Must not close
*2-FCV-67-492	(Strainer A2A-A Inlet)		Must not close
2-FCV-67-125	(CS HX Isolation)	Either One	Must Not Open
2-FCV-67-126	(CS HX Isolation)		Must Not Open
2-FCV-67-491D	(Strainer Flush)		Must Not Open
*2-FCV-67-127	(Vital HVAC)		Must Not Close
**2-FCV-67-168	(Vital HVAC)		Must Not Close
*0-FCV-67-12	(Discharge Header Isolation)		Must Not Close
*0-FCV-67-364	(Discharge Header Isolation)		Must Not Close

Note: Alternate alignment available from ERCW Header 1B

*Power has been removed per ECN L6258.

**Control air has been removed; valve to remain permanently open

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

Basis for ERCW Header 2A Spurious List

Item	Component	Basis
37	1&2-FCV-67-223	Spurious closure of these valves will interrupt cooling of CCS Heat Exchanger A & B. Depending on loads, potential heat exchanger tube damage.
38	2-FCV-67-168	Spurious closure of these valves will terminate ERCW flow to CCP 2A-A room cooler.
39	2-FCV-67-492	Spurious closure of this valve will isolate ERCW Header 2A-A. Thus, the CCS heat exchangers will lose its heat removal capability and subsequently cause damage to CCP A-A.
40	2-FCV-67-81	Same as item 39.
41	2-FCV-67-125 2-FCV-67-126	At least one of these valves must remain closed to prevent ERCW flow diversion. Depending on the load, inadequate heat removal of A and B heat exchangers may occur.
42	0-FCV-67-364 0-FCV-67-12	These are train A ERCW header valves, their closure will result in the loss of the ultimate heat sink and subsequently cause ERCW train A to become inoperable.
43	2-FCV-67-491D	Spurious opening of this valve will divert a portion of the normal cooling water supply for the CCS Heat Exchangers A and B to the ultimate heat sink. Consequently, the heat removal capability of the CCS Heat Exchanger will be challenged.
140	2-FCV-67-491A	Improper operation of this valve may prevent effective operation of strainer A2A-A.
141	2-FCV-67-127	Closure of this valve will terminate flow to the 2A centrifugal charging pump room and oil coolers and the RHR 2A pump room cooler. (See keys 1 and 40.)

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

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Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/89

KEY 3
ERCW COOLING HEADER 2A

FLOW DIAGRAM-LATER

3446F/JMS

SQN-SQS4-0127

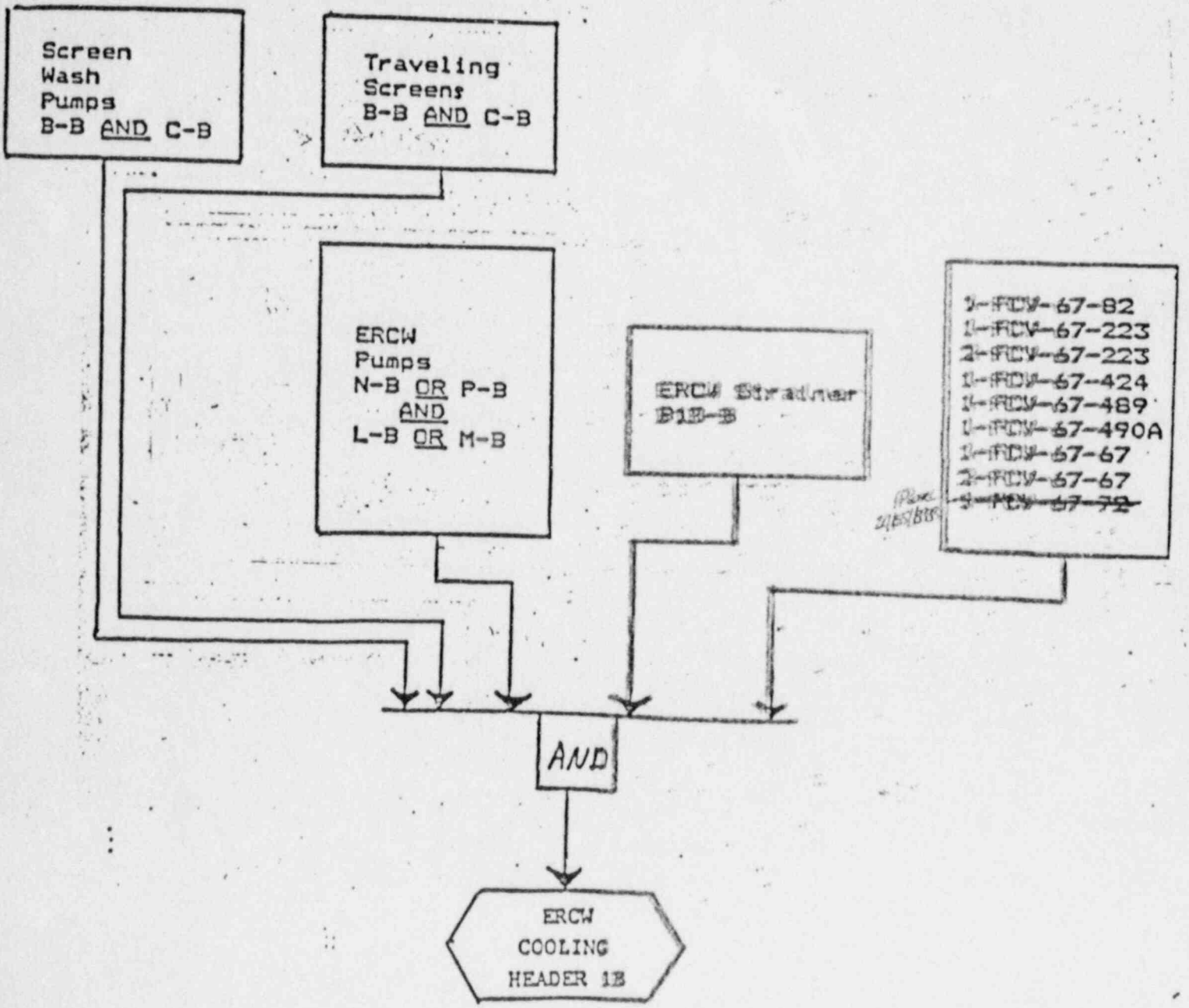
Prepared by/Date RA Edlem 2/10/88

Checked by/Date R.J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 3

ERCW COOLING HEADER 1B



EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RAEdmund 2/10/88

Checked by/Date R.J. Clark 2/10/88

KEY 3 - ERCW Header 1B

ERCW Header 1B Operation List

ERCW Pump L-B) Either One		Must Operate
ERCW Pump M-B)		Must Operate
SCREEN WASH PUMP B-B		Must Operate
Traveling Screen B-B*		Must Operate
ERCW Pump N-B) Either One		Must Operate
ERCW Pump P-B)		Must Operate
SCREEN WASH PUMP C-B		Must Operate
Traveling Screen C-B*		Must Operate
ERCW Strainer B1B-B		Must Operate
1-FCV-67-490A (Strainer Flush)		Must be Operable
1-FCV-67-67 (Diesel Cooling)		Must be Operable
2-FCV-67-67 (Diesel Cooling)		Must be Operable

*Screens to be visually inspected and manually backwashed per SOI-67.1

ERCW Header 1B Spurious List

*1-FCV-67-82 (Header Isolation)		Must Not Close
*1-FCV-67-424 (Supply to CCS HX)		Must Open
*1-FCV-67-223 (1B/2A X-tie)		Must Not Close
*2-FCV-67-223 (1B/2A X-tie)		Must Not Close
*1-FCV-67-489 (Strainer Inlet)		Must Not Close
1-FCV-67-123 (CS HX)	Either One	Must Not Open
1-FCV-67-124 (CS HX)		Must Not Open
1-FCV-67-490D (Strainer Flush)		Must Not Open
*1-FCV-67-128 (Vital HVAC)		Must Not Close
**1-FCV-67-170 (Vital HVAC)		Must Not Close
*0-FCV-67-14 (Discharge Header Isolation)		Must Not Close
*0-FCV-67-365 (Discharge Header Isolation)		Must Not Close

*Power has been removed per ECN L6258.

**Control air has been removed; valve to remain permanently open.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

ERCW Spurious List Header 1B

Item	Component	Basis
45	1-FCV-67-489	Spurious closure of this valve will isolate header 1B of ERCW flow.
46	1-FCV-67-82	Same as item 45
47	1-FCV-67-123 1-FCV-67-124	Same as item 58 but flow diversion through containment spray heat exchanger 1B.
48	1-FCV-67-490D	Same as item 52
49	1-FCV-67-424	If header 1B is aligned to provide the cooling requirements of header 2A, the spurious closure of this valve would defeat this purpose. Thus, ERCW cooling to CCS A 2A1 and 2A2 heat exchangers would be terminated as well as other header 2A dependent components.
50	1-FCV-67-223 2-FCV-67-223	Header 1B is the alternate header to the normal supply header 2A. If this header is utilized and 1-FCV-67-424 is open, the spurious closure of any one of these valves will isolate ERCW cooling flow to the 2A1 and 2A2 heat exchangers and other components requiring header 2A.
51	0-FCV-67-14 0-FCV-67-365	Spurious closure of any one of these valves will isolate the ultimate heat sink for the CCS heat exchangers and various unit 1 and 2 ESF loads.
142	1&2-FCV-67-67	Spurious closure of these valves will terminate ERCW flow to the diesel generators.
143	1-FCV-67-490A	Improper operation of this valve may prevent effective operation of strainer B1B.
144	1-FCV-67-128	Closure of this valve will terminate flow to the station air compressor 1B, auxiliary room space cooler, and RHR 1B pump room cooler (see keys 13 and 40).

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/89

SEQUOYAH NUCLEAR PLANT

KEY 3

ERCW COOLING HEADER 1B

FLOW DIAGRAM- LATER

- Item numbers which are discussed in the basis for spurious list.

3446F/JMS

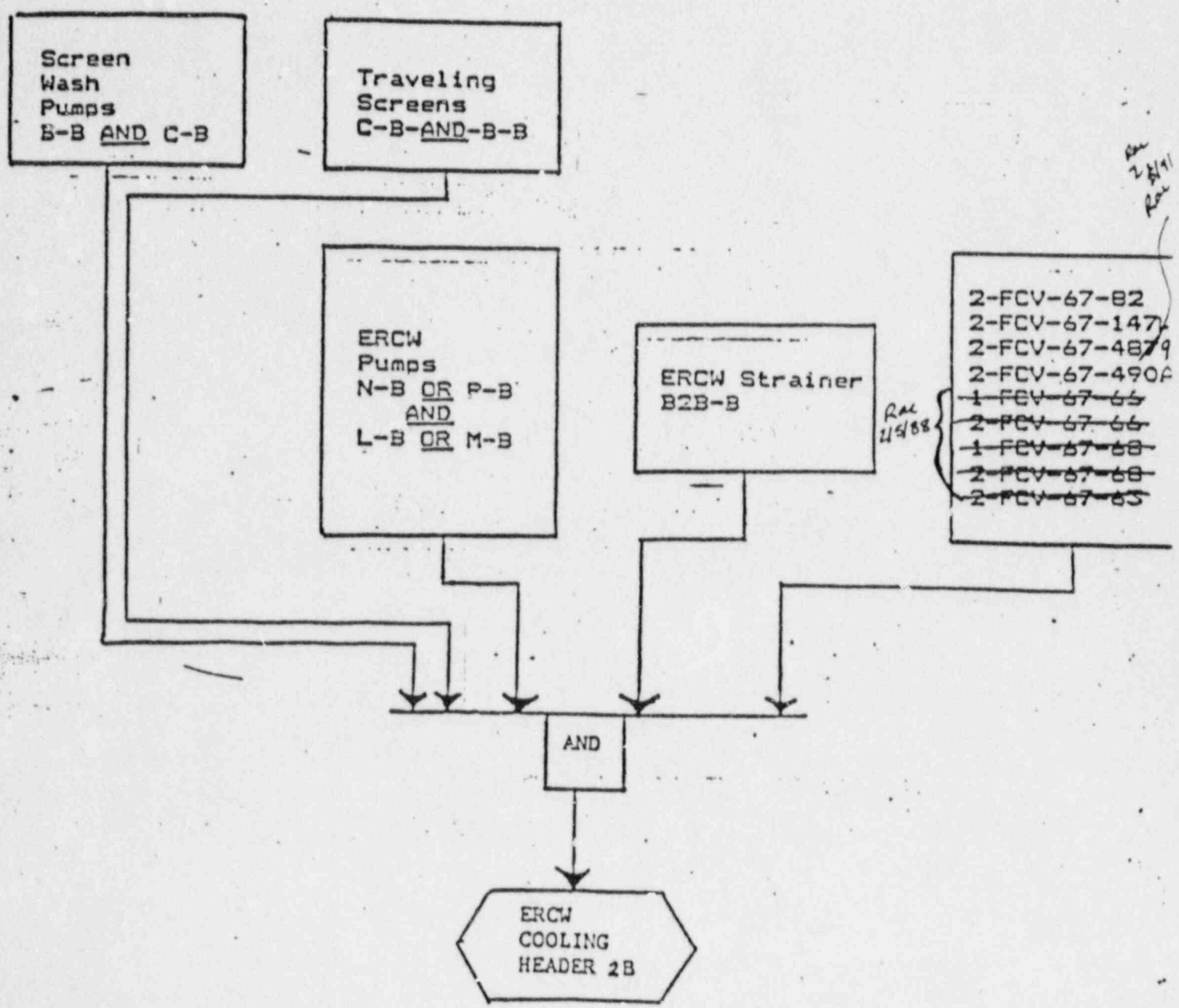
Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 3

ERCW HEADER 2B



EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R. T. Clark 2/10/88

KEY 3 - ERCW HEADER 2B (Alternat alignment available from ERCW Header 1A)

ERCW Header 2B (operation list)

ERCW Pump L-B) Either One			Must Operate
ERCW Pump M-B)			Must Operate
SCREEN WASH PUMP B-B			Must Operate
Traveling Screen B-B*			Must Operate
ERCW Pump N-B) Either One			Must Operate
ERCW Pump P-B)			Must Operate
SCREEN WASH PUMP C-B			Must Operate
Traveling Screen C-B*			Must Operate
ERCW Strainer B2B-B			Must Operate
2-FCV-67-490A	(Strainer Flush)		Must be Operable

*Screens to be visually inspected and manually backwashed per SOI-67.1.

ERCW Header 2B Spurious List

*1&2-FCV-67-82	(Header Isolation)		Must Not Close
*2-FCV-67-147	(1A/2B X-tie)		Must Not Close
*2-FCV-67-489	(Strainer Inlet)		Must Not Close
2-FCV-67-123	(CS HX)	Either One	Must Not Open
2-FCV-67-124	(CS HX)		Must Not Open
*2-FCV-67-128	(Vital HVAC)		Must Not Close
**2-FCV-67-170	(Vital HVAC)		Must No Close
2-FCV-67-490D	(Strainer Flush)		Must Not Open
*0-FCV-67-14	(Discharge Header Isolation)		Must Not Close
*0-FCV-67-365	(Discharge Header Isolation)		Must Not Close

*Power has been removed per ECN L6258.

**Control air has been removed; valve is permanently open

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

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Basis for ERCW Header 2B Spurious List

Item	Component	Basis
52	2-FCV-67-490D	Spurious opening of this valve would divert a portion of the normal ERCW cooling supply for CCS heat exchanger C-S to the ultimate heat sink. Consequently, the heat removal capability of the CCS heat exchanger C would be challenged.
53	2-FCV-67-489	When path 2 of key 1 is used this valve must not close. Spurious closure of this valve will isolate the normal ERCW supply header flow to CCS heat exchanger C.
54	2-FCV-67-82	Same as item 53
55	2-FCV-67-147	Spurious closure of this valve will terminate ERCW cooling to CCS C heat exchanger.
56	FCV-67-14	Spurious closure of this valve will isolate ERCW flow from the C CCS heat exchanger. Thus heat removal of CCP mechanical seal heat exchangers 2B-B and 1B-B will be terminated.
57	0-FCV-67-365	Same as 54 above
58	2-FCV-67-123 2-FCV-67-124	If one of these valves fails to remain closed then flow diversion would follow path through 2B containment spray heat exchanger.
59	2-FCV-67-170	See Key 1 Operation list.
148	2-FCV-67-128	Spurious closure of this valve will terminate ERCW cooling to aux control air compressor, CCP room cooler, CCP oil cooler and RHR room cooler (see Keys 1, 13 and 40).
149	2-FCV-67-170	Spurious closure terminates ERCW cooling to 2B CCP room cooler (see Key 1).

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

151	2-FCV-67-490A	Improper operation of this valve may cause strainer B2B-B to function effectively.

Note 1: The ERCW headers spurious lists contain the containment spray (CS) heat exchangers isolation valves (1&2-FCV-67-123, -124, -125, -126). Per the spurious lists, these valves are required to stay closed, isolating flow through all CS heat exchangers. It is acceptable, however, for one CS heat exchanger (per path used) to have cooling flow (i.e., CS heat exchanger 1A can have flow through it provided heat exchanger 2A is isolated. The same is true for Train B).

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R.A. Ellard 2/10/88

Checked by/Date R.J. Clark 2/10/88

ERCW HEADER 2B

FLOW DIAGRAM-LATER

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.T. Clark 2/10/89

SEQUOYAH NUCLEAR PLANT
KEY 4
Volume Control Tank Suction

This key requires that the volume control tank (VCT) be aligned to provide a short term water source for RCS makeup and for RCP seal injection. The VCT is suitable only as the short term water source. However, the VCT discharge valves are normally open. Therefore, this source is immediately available.

This source is required only until suction from the RWST (key 5) is provided. Until this time both isolation valves must be prevented from spuriously closing. When the RWST is aligned to provide pump suction (through LCV-62-135 or LCV-62-136), then the VCT must be isolated or depressurized within 24 hours to prevent the hydrogen cover gas from entering the charging line (reference NEB 841022 220).

If the alternate path is used for aligning the RWST for CCP suction (key 5, path 2), then the VCT must be isolated or depressurized immediately (reference NEB 841022 220).

(Operation and Spurious List)

*LCV-62-132 *LCV-62-133	Either One	Must Not Close Until Key 5 Has Been Established
	Both	Must Not Open After Key 5 Has Been Established
Level Control Loop 62-129A (for LS-62-129B) and Loop 62-130A (for LS-62-130B)		Must Not Cause the Closure of LCV-62-132 or -133 Until Key 5 Has Been Established
**Level Control Loop 62-129A (for LI-62-129)		Must Operate

*Short term water source. In the event of a fire in an area that will affect these valves or associated circuitry, the operator should remove power from both valves (open breakers at MOV board) or switch over to the RWST.

**In the event of a fire, the VCT level indication should be closely monitored. If the indication does not function properly (i.e., if 0% or 100% level is indicated or erratic level indication occurs), the operator should immediately switch over to the RWST or promptly stop the operating centrifugal charging pump(s) until the RWST can be aligned.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/89

Basis for Key 4 Spurious List

Item	Component	Basis
60	LCV-62-132 LCV-62-133	Spurious closure of <u>any one</u> of these valves prior to establishment of suction from the RWST could result in the loss of suction to the CCP. Spurious opening of both of these valves after Key 5 has been established could cause hydrogen binding of the CCPs.

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

Key 5

RWST SUCTION

The long-term water source for RCS makeup and RCP seal injection (if used) is the RWST. It may be aligned by opening either FCV-62-135 or FCV-62-136. The VCT will continue to supply makeup water for a sufficient time after letdown lines are isolated that credit may be taken for handwheel operation of these valves. These valves, however, are not adequately separated, and one postulated fire may render both valves inoperable. Therefore, an alternate path is provided through the inlet piping for the SI pumps and back to the inlet to the CCPs. If this flowpath is used, one of two inline valves, FCV-63-6 or FCV-63-7 and FCV-63-5 and -47, must be opened. Sufficient NPSH is provided for the CCPs based upon the EN DES Calculation NEB 841022 220.

This key also identifies the equipment whose spurious operation would divert flow from the RCS makeup flow path. This includes preventing the containment spray and RHR spray systems from actuating.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

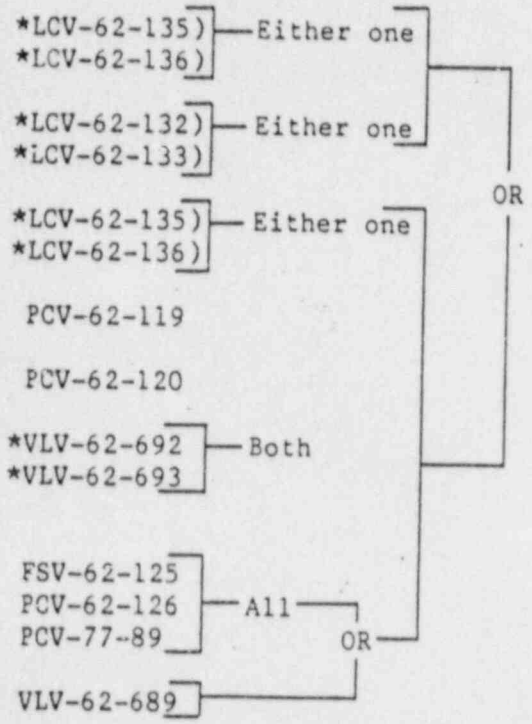
SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT
KEY 5 (Operation List)

Path 1



Must open to access the RWST and not spuriously close

Must close to isolate the VCT

Must open to access the RWST

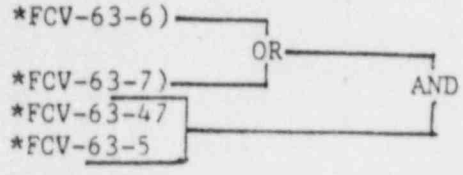
Must not fail to open to prevent over-pressurization of the VCT

Must be closed to isolate VCT from nitrogen and hydrogen supply headers

Must be opened within 24 hrs to depressurize the VCT

Note: For Path 1, if LCV-62-132 or LCV-62-133 are not closed or if the VCT pressure is greater than 17.03 psig in 24 hours, or 15.91 psig in 36 hours, or 12.56 psig in 72 hours, then the RHR system must be available, the RCS temperature below 200°F, and the CCP stopped. (This note not applicable to Path 2.)

Path 2



Must open and not spuriously close (CCP suction from SIS)

*LCV-62-132) Either one
*LCV-62-133)

Must close to isolate the VCT

*Handwheel operation acceptable. Handwheel operation must be used to close LCV-62-132 or LCV-62-133 if power has been removed from them (see Key 4).

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 5 (Spurious List)

Associated with both Path 1 and Path 2

Associated with Path 2

FCV-63-5	Must not close
FCV-63-47	Must not close

If RHR pump A-A starts due to a spurious ESFAS signal:

*FCV-72-40, -41	Must not open
FCV-74-12	Must open

If RHR pump B-B starts due to a spurious ESFAS signal:

*FCV-72-41, -40	Must not open
FCV-74-24	Must open

If CS pump A-A starts due to a spurious ESFAS signal:

*FCV-72-39	Must Remain Operable

If CS pump B-B starts due to a spurious ESFAS signal:

*FCV-72-2	Must Remain Operable

If either of the ECCS sump suction valves (FCV-63-72 or FCV-63-73) cannot be protected and spuriously open then FCV-63-1 must be closed, and FCV-72-20 and FCV-72-23 must remain closed to prevent RWST water backflow into the sump. Then FCV-63-72 and -73 must be manually closed before cooldown (approximately 72 hours).

*If these valves open, they must be reclosed by the operator or the pump must be stopped. Handwheel operation acceptable if the pump can be stopped.

SQN-SQS4-0127

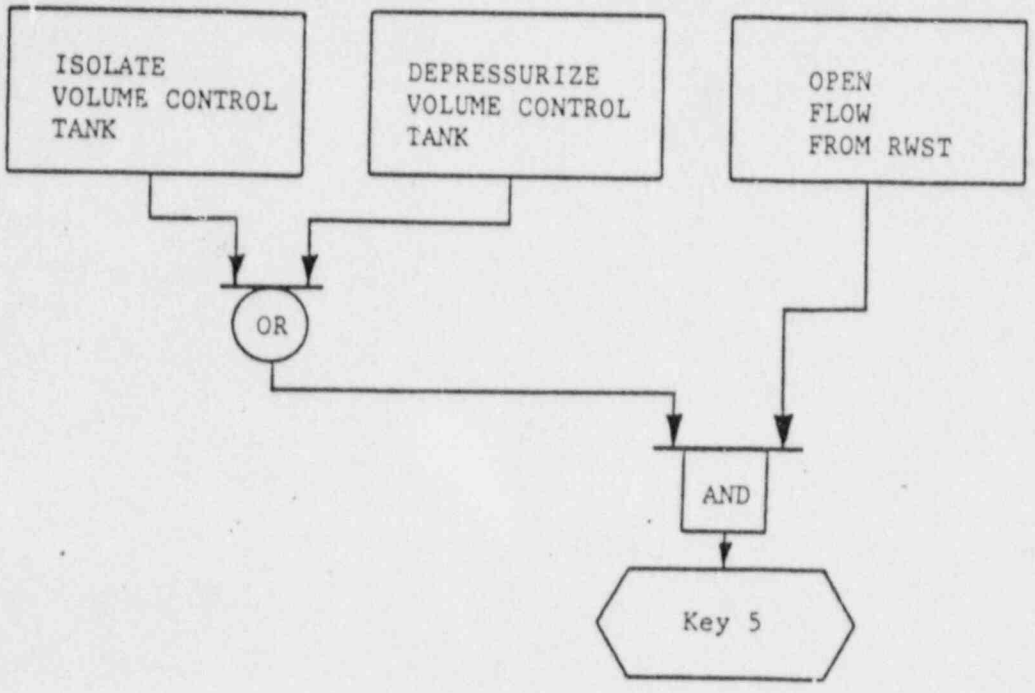
Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.L. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 5

RWST Suction



SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 5

RWST Suction

Basis for Spurious List

Item	Component	Basis
61	FCV-63-5, -6, -7 FCV-63-47	If path 2 is used, spurious closure of any one of these valves would isolate the required makeup flow from the RWST to the RCS and injection to RCP seals.
62	FCV-72-40, -41	If RHR pump A-A spuriously starts, inadvertent opening of these valves would divert a portion of the makeup flow to RHR spray nozzles. Makeup to the RCS may be inadequate.
63	FCV-72-41, -40	If RHR pump B-B spuriously starts, same as item 62.
64	CS Pump A-A	If this pump spuriously starts and valve FCV-72-39 is not closed, flow diversion will occur. Thus, makeup flow to the RCS and seal injection may be inadequate.
65	CS Pump B-B	If this pump spuriously starts and valve FCV-72-2 is not closed, flow diversion will occur, thus, same as item 64.
67	FCV-63-72 FCV-63-73	Spurious opening of any one of these valves will result in flow diversion to the containment sump. Thus, same as item 64.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Ellen 2/10/88

Checked by/Date R. J. Clark 2/10/88

KEY 5

(RWST SUCTION PATH 2)

FLOW DIAGRAM - LATER

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date P. J. Clark 2/10/88

KEYS 4 AND 5 (VCT AND RWST SUCTION)

FLOW DIAGRAM-LATER

3446F/JMS

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Hart 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 6

ECCS CHARGING PATH

The ECCS flow path is the safety-grade path for RCS makeup. It may be used if the normal charging path becomes isolated. To provide the flowpath an inlet and an outlet valve for the boron injection tank (BIT) must be opened. One of these valves will be required to be manually controlled (open or closed) to throttle the flow to the RCS.** (Manual control to throttle will require communication with MCR).

(Operation List)

*FCV-63-25) *FCV-63-26)	Either One	Must Open/Remain Operable
*FCV-63-39) *FCV-63-40)	Either One	Must Open/Remain Operable
FCV-63-41) FCV-63-42) VLV-63-574)	Any One	Must Close

* An inlet valve and an outlet valve to the BIT must open and one of these will be required to throttle the flow to the RCS.

** These valves may be throttled for 72 hours (reference Section 3.0, assumption 8).

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

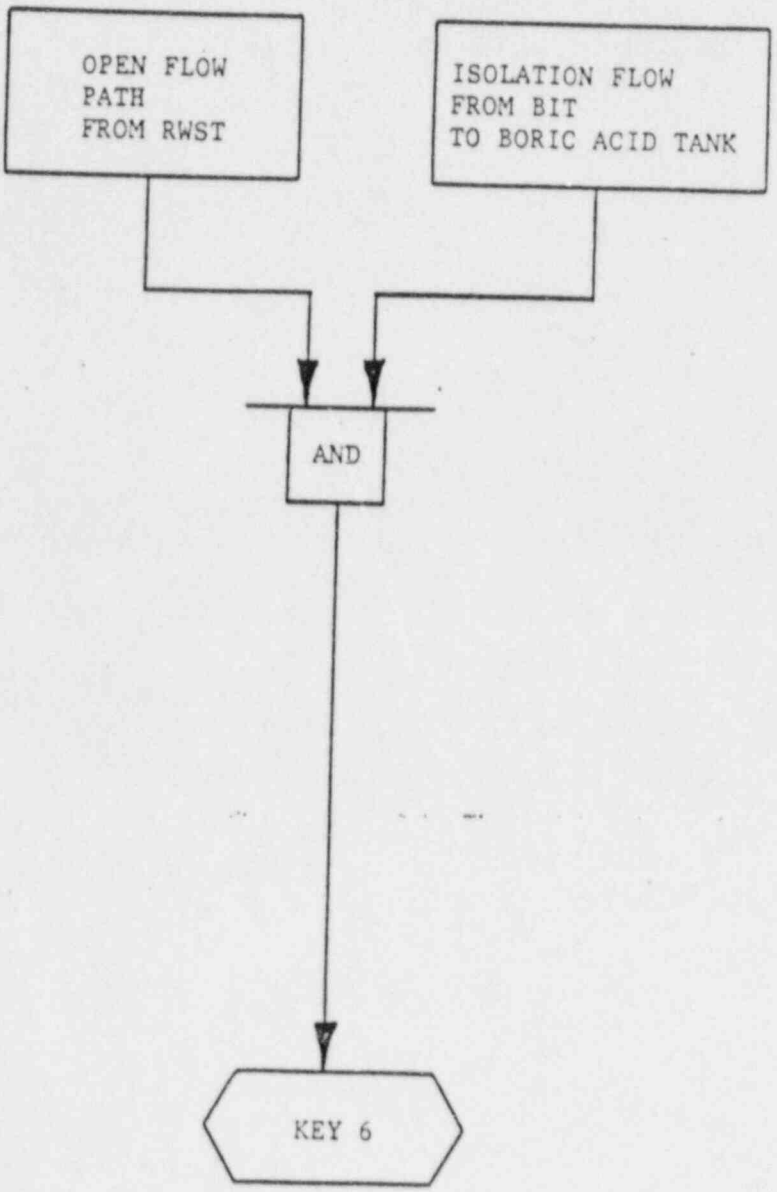
Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 6

ECCS CHARGING PATH



3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT
KEY 7
RCS PRESSURE BOUNDARY ISOLATION

If the components required for the normal letdown path are rendered inoperable due to fire, closure of FCV-62-69, FCV-62-70, or all three of the regenerative heat exchanger outlet valves will be required to ensure RCS pressure boundary integrity.

In all cases the RHR letdown line must remain isolated until the RHR system is required for bringing the plant to cold shutdown.

The RVHVS solenoid valves and pressurizer PORVS must remain closed or their associated block valves capable of being closed to prevent the depressurization of the RCS.

Operation List

FCV-62-69) Either One		Must Be Capable of Closure
FCV-62-70)		Must Be Capable of Closure
	OR	
FCV-62-72		Must Be Capable of Closure
FCV-62-73		Must Be Capable of Closure
FCV-62-74		Must Be Capable of Closure

Spurious List

*PCV-68-334	If PCV-68-344 should spuriously open, then FCV-68-333 must be capable of closing.
*PCV-68-340A	If PCV-68-340A should spuriously open, then FCV-68-332 must be capable of closing.

FCV-74-1) Either One		Must Remain Closed
FCV-74-2)		Must Remain Closed
FSV-68-394)		Must Not Open
FSV-68-395)		Must Not Open
	OR	
FSV-68-396)		Must Not Open
FSV-68-397)		Must Not Open

*See key 28 for instructions if FCV-68-334 or PCV-68-340A spuriously open.

Note: If RCP seal injection is used for RCP seal integrity , the RCS seal injection can also be used for pressurizer level control. The RHR system must be available within 15 hours to continue the cooldown to cold shutdown and stop seal injection if normal or excess letdown is not available.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

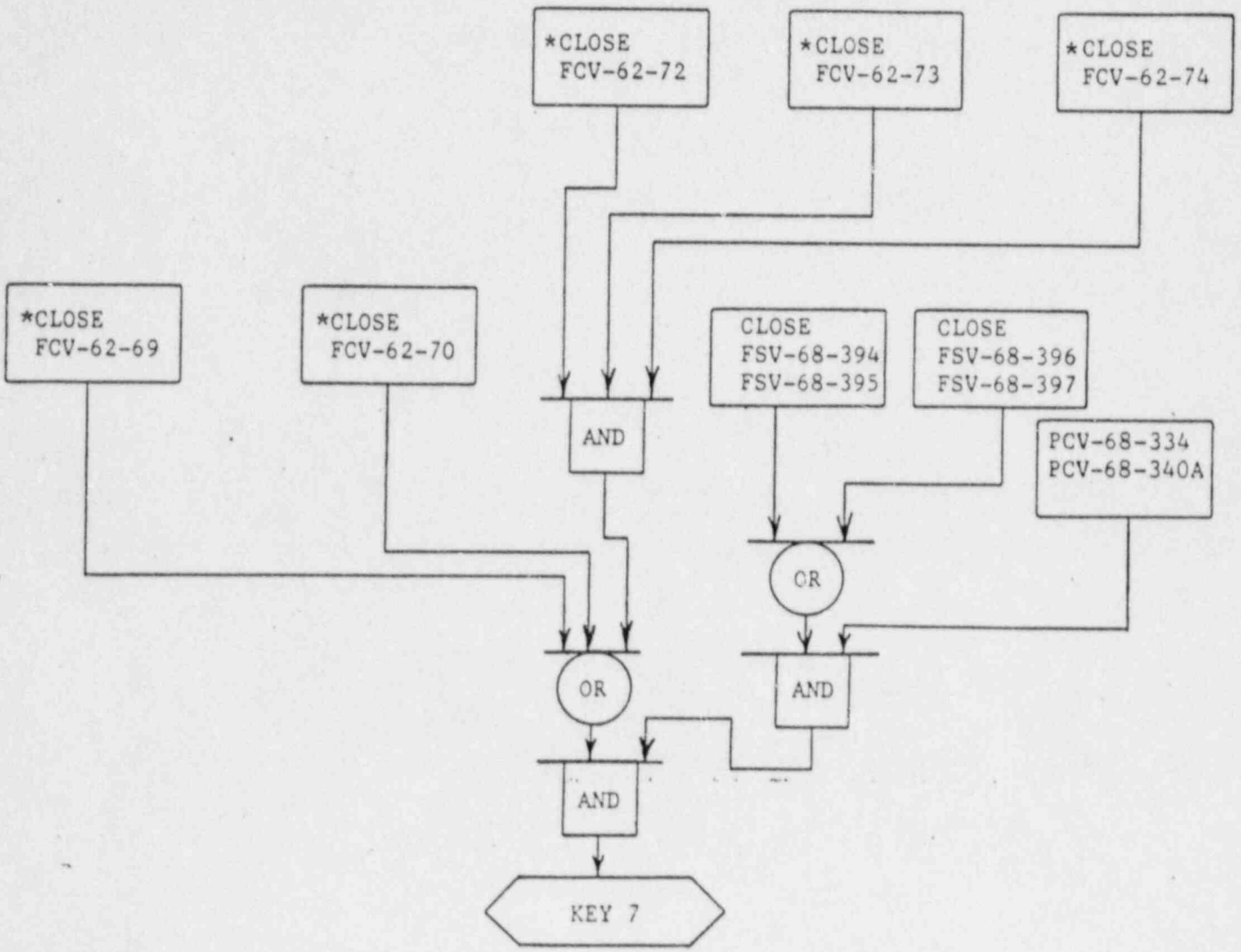
Prepared by/Date RA Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 7

RCS PRESSURE BOUNDARY ISOLATION



*These valves are required to be closed only if the normal letdown path is rendered inoperable due to a fire.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

Basis for Key 7 Spurious List

RCS Pressure Boundary Isolation

Item	Component	Basis
68	FCV-74-1 FCV-74-2	These valves are in series and required to be opened during the RHR cooldown of the RCS. If at least one of these valves fail to remain closed prior to RHR heat removal, rapid depressurization due to loss of RCS inventory would occur. Thus, a LOCA would exist. Note these valves are a integral part of the RCS pressure boundary.
69	PCV-68-334	This valve constitutes part of the RCS pressure boundary. Spurious opening of this valve would result in a small break LOCA which is isolable via closure of valve FCV-68-333.
70	PCV-68-340A	Same as item 69 however the small break LOCA would be isolable via valve FCV-68-332.
71	FSV-68-396 FSV-68-397	These are reactor vessel vent isolation valves which are in parallel and constitutes an integral portion of the RCS pressure boundary.
72	FSV-68-394 FSV-68-395	Same as item 71.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

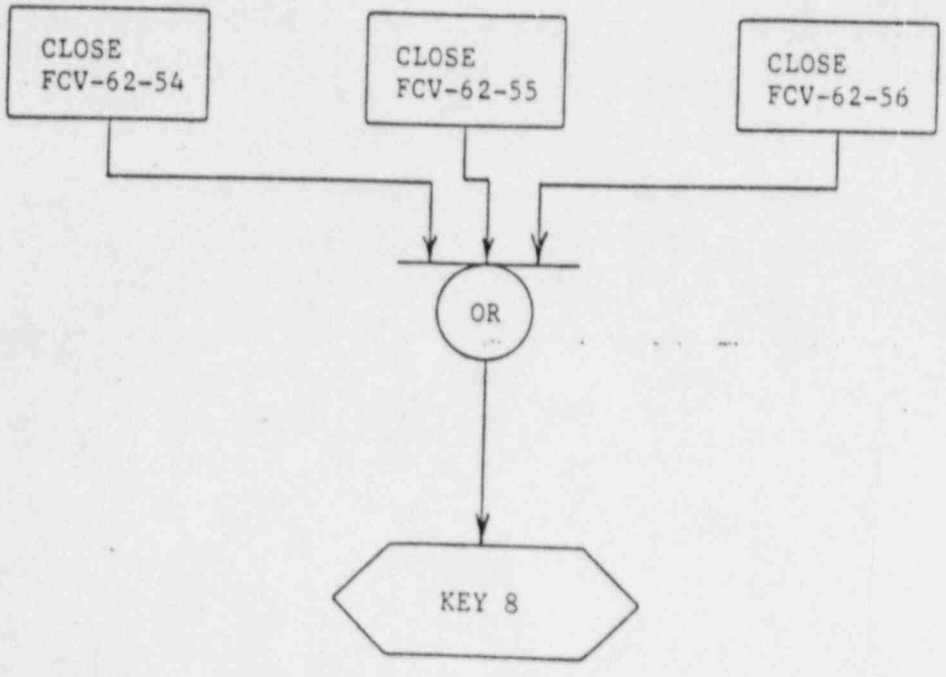
KEY 8

RCS Pressure Boundary Isolation

In the event that the circuitry controlling the letdown lines are rendered inoperable due to a fire, the excess letdown lines must be isolated by closing FCV-62-54, FCV62-55, or FCV-62-56 to further ensure RCS pressure boundary control.

(Operation List)

FCV-62-54)	Any One	Must Be Capable of Closing
FCV-62-55)		Must Be Capable of Closing
FCV-62-56)		Must Be Capable of Closing



3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 9

RCP THERMAL BARRIER COOLING

If RCP seal integrity is not provided by seal injection, thermal barrier cooling may be used in its place. The CCS is required to supply water to the thermal barrier booster pumps and the ERCW system is required for the CCS heat exchangers.

Operation List

RCP Thermal Barrier Booster Pump A-A) Either One	Must Operate
*RCP Thermal Barrier Booster Pump B-B)	Must Operate
CCS Pump A-A) Either One	Must Operate ERCW cooling provided by normal supply header 2A or alternate ERCW header 1B. For alignment see Key 3.
*CCS Pump B-B)	
0-FCV-70-197 (Unit 1 Only) Either One	Must Close OR (CCS Pumps A-A AND B-B must be operable)
0-FCV-70-198 (Unit 1 Only) (Note 9 & 14 of Key 1)	
0-FCV-70-193 (Unit 2 only) Either One	Must Close OR (CCS Pumps A-A AND B-B Must be Operable)
0-FCV-70-194 (Unit 2 only) (Note 9 &14 of Key 1)	

This key is organized as follows; (1) tabulation of features which must operate, (2) a functional logic diagram, (3) spurious actual tabulation, basis list, and simplified flow diagram for unit 1, and (4) spurious actuation tabulation, basis list, and simplified flow diagram for unit 2.

*If B-pumps are used, equipment associated with supplying B-train power will have to be evaluated.

3446F/JMS

SQN-SQS4-0127

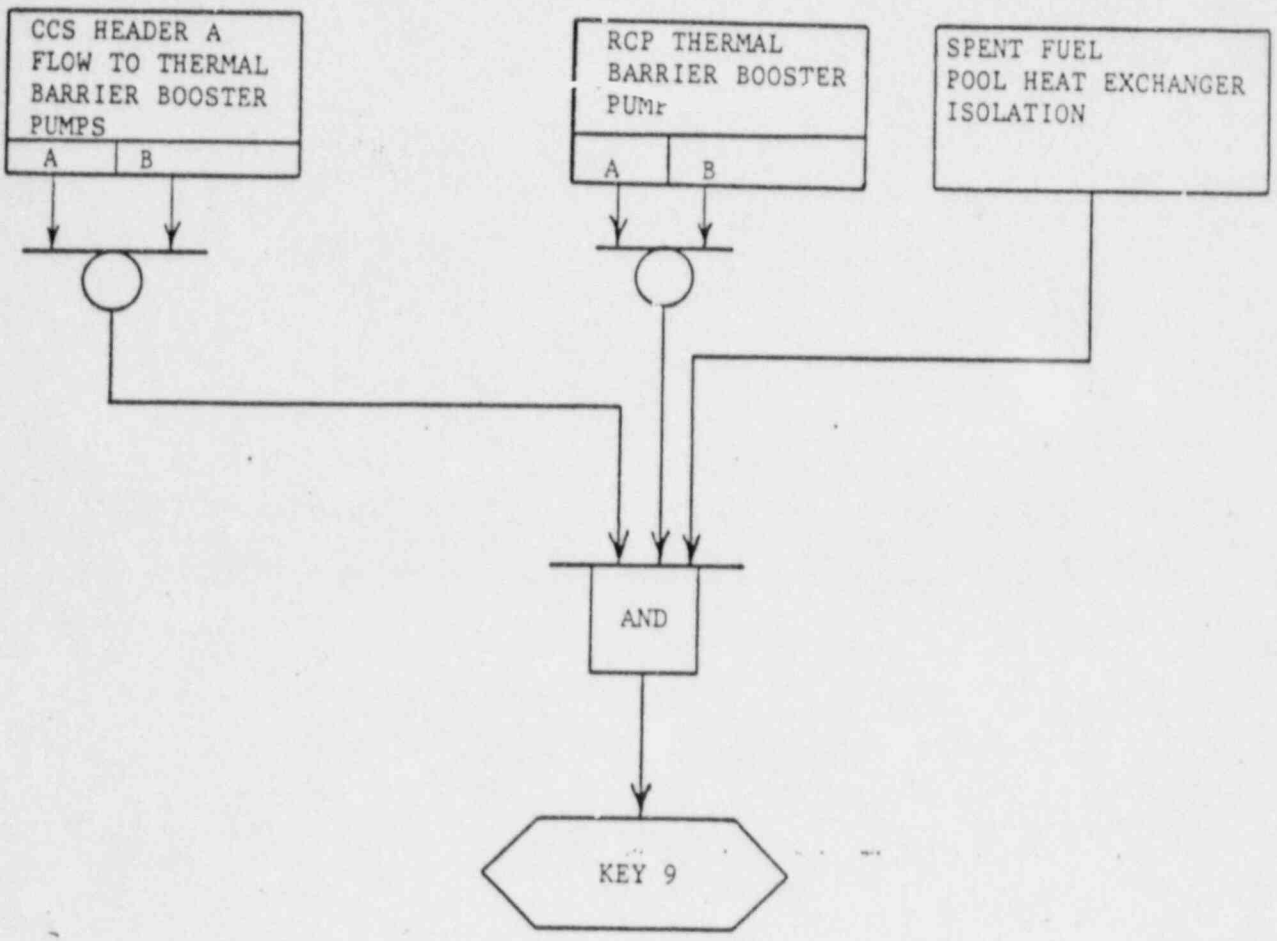
Prepared by/Date RA Edlow 2/10/88

Checked by/Date R. J. Clark 2/10/89

SEQUOYAH NUCLEAR PLANT

KEY 9

THERMAL BARRIER COOLING



* If B-pumps are used, additional equipment associated with supplying B-train power will have to be evaluated.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 9

Unit 1 Spurious List

1-FCV-70-133 (Note 1)	Must Not Close/Remain Operable
1-FCV-70-134 (Note 1)	Must Not Close/Remain Operable
1-FCV-70-87 (Note 1)	Must Not Close/Remain Operable
1-FCV-70-90 (Note 1)	Must Not Close/Remain Operable
0-FCV-70-34 (Note 2) (if CCS pump 1B-B is used)	Must Not Close
1-FCV-70-25 (Note 2)	Must Not Close
1-FCV-70-8 (Note 2)	Must Not Close
1-FCV-70-9) (Note 2) Either one	Must Not Open
1-FCV-70-10) (Note 2)	Must Not Open
1-FCV-70-4 (Note 2)	Must Not Close
0-FCV-67-478 (Note 2)	Must Not Close
1-FCV-70-156) Any one	Must Not Open
1-VLV--70-545A	Must Be Closed
1-VLV-70-546A	Must Be Closed
0-FCV-67-14 (Note 2)	Must Not Close
0-FCV-67-365 (Note 2)	Must Not Close
1-FCV-70-13) (Note 2) Either one	Must Not Open
1-FCV-70-23) (Note 2)	Must Not Open
1-FCV-70-26) (Note 2) Either one	Must Not Open
1-FCV-70-27) (Note 2)	Must Not Open
1-FCV-70-64) (Note 2) Either one	Must Not Open
1-FCV-70-74) (Note 2)	Must Not Open
1-FCV-67-146	Must Not Close
Spurious actuation associated with ERCW Header 2A or ERCW Header 1B (which ever one is being used)	Must be precluded (see Key 3)

Note 1: These valves will close upon a spurious phase B containment isolation signal. They will be required to be reopened.

Note 2: A design change has been made under ECN-L6258 to remove power from this valve.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

Basis for Key 9 - Unit 1, Spurious List

Item	Component	Basis
73	1-FCV-70-133 1-FCV-70-134	Spurious closure of any one of these valves will isolate header CCS flow to the RCP thermal barriers. If the RCP seal injection is not provided by seal injection closure of this valve will result in RCP seal damage, resulting in a LOCA.
74	1-FCV-70-87 1-FCV-70-90	Spurious closure of any one of these valves will isolate header CCS flow to the RCP thermal barriers. If the RCP seal injection is not provided by seal injection closure of this valve will result in RCP seal damage, resulting in a LOCA.
75	0-FCV-70-34	Spurious closure of this valve is only a problem if CCS pump 1B-B is the only pump used. Thus, loss of heat removal mechanism to RCP thermal barriers.
76	1-FCV-70-25	Spurious closure of this valve will isolate train A component cooling flow to the RCP thermal barriers.
77	1-FCV-70-8	Spurious closure of this valve results in loss of train A component cooling to thermal barriers. Note CCS heat exchanger A is isolated.
78	1-FCV-70-9 1-FCV-70-10	At least one of these valves must remain closed to prevent flow diversion. If seal injection is required via thermal barriers, reduced fluid volume may result in loss of seal injection due to damaged RCP seals.
79	1-FCV-70-4	Same as that for item 77.
80	0-FCV-67-478	Spurious closure of this valve will terminate ERCW flow to CCS HTX A.
81	1-FCV-70-156	Spurious opening of this valve will result in partial flow diversion. If seal injection is required by thermal barrier cooling, ability to remove heat may be challenged.
82	ERCW Header 2A ERCW Header 1B	See spurious list for Key 3.

3446F/JMS

Prepared by/Date R A Edmonds 2/10/88

Checked by/Date R. F. Clark 2/10/88

Item	Component	Basis
83	2-FCV-67-146	Closure of this valve will isolate CCS heat exchangers 2A1 and 2A2. Thus, heat removal from thermal barrier may be challenged resulting in failure of RCP seal, and consequently LOCA.
84	1-FCV-70-13 1-FCV-70-23 1-FCV-70-26 1-FCV-70-27	Same as that for item 78.
85	1-FCV-70-64 1-FCV-70-74	Flow diversion resulting in inadequate flow to CCS pumps 1A-A and 1B-B.
86	1-FCV-67-146	Spurious closure of this valve isolates ERCW flow out of CCS A heat exchanger. Thus, if thermal barrier cooling is required for seal integrity, RCP seal integrity may be lost and consequently resulting in LOCA.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/89

Checked by/Date R. F. Clark 2/10/89

SEQUOYAH NUCLEAR PLANT

KEY 9

THERMAL BARRIER COOLING - UNIT 1

FLOW DIAGRAM-LATER

- Item numbers which are discussed in the basis for spurious list.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RAEdlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 9

Unit 2 Spurious List

2-FCV-70-133 (Note 1)		Must Not Close/Remain Operable
2-FCV-70-134 (Note 1)		Must Not Close/Remain Operable
2-FCV-70-87 (Note 1)		Must Not Close/Remain Operable
2-FCV-70-90 (Note 1)		Must Not Close/Remain Operable
0-FCV-70-39 (Note 2) (if CCS pump 2B-B is used)		Must Not Close
2-FCV-70-16 (Note 2)		Must Not Close
2-FCV-70-15 (Note 2)		Must Not Close
2-FCV-70-4 (Note 2)		Must Not Close
2-FCV-70-195) (Note 2)	Either one	Must Not Open
2-FCV-70-196) (Note 2)		Must Not Open
2-FCV-70-156)	Any one	Must Not Open
2-VLV-70-545A		Must Be Closed
2-VLV-70-546A		Must Be Closed
2-FCV-70-14) (Note 2)	Either one	Must Not Open
2-FCV-70-18) (Note 2)		Must Not Open
2-FCV-70-76) (Note 2)	Either one	Must Not Open
2-FCV-70-78) (Note 2)		Must Not Open
2-FCV-70-28) (Note 2)	Either one	Must Not Open
2-FCV-70-29) (Note 14, Key 1)		Must Not Open
0-FCV-70-193 (Note 14, Key 1)		Must Not Open
0-FCV-70-194 (Note 14, Key 1)		Must Not Open
2-FCV-67-146		

Spurious actuation associated with ERCW header 1B or 2A (which ever one is being used) — Must be precluded (See Key 5)

Note 1: These valves will close upon a spurious phase B containment isolation signal. They will be required to be reopened.

Note 2: A design change has been made under ECN-16158 to remove power from this valve.

EQUIP..ENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Ellen 2/10/88

Checked by/Date R. J. Clark 2/10/88

Basis for Spurious List - Unit 2

Item	Component	Basis
87	2-FCV-70-133 2-FCV-70-134 2-FCV-70-4 2-FCV-70-15 2-FCV-70-16	Spurious closure of any one of these valves will isolate component cooling to the RCP thermal barriers. RCS seal integrity will be challenged if seal cooling is required via RCP thermal barriers.
88	2-FCV-70-87 2-FCV-70-90	Spurious closure of any one of these valves will isolate the CCS flow from the RCP thermal barriers.
89	0-FCV-70-39	If only the CCS pump 2B-B is used same as item 88.
90	2-FCV-70-195 2-FCV-70-196	At least one of these valves must remain closed to prevent flow diversion. Flow diversion may result in inadequate flow through the RCP thermal barriers.
91	0 2-FCV-70-193 0-FCV-70-194	Same as item 90.
92	2-FCV-70-14 2-FCV-70-18	Same as item 90.
93	2-FCV-70-76 2-FCV-70-78	At least one of these valves must remain closed to prevent flow diversion. If FCV-70-39 is isolated and pump 2A-A is providing flow, flow diversion will not occur. Flow diversion will result in inadequate flow to the thermal barrier coolers.
94	2-FCV-70-29 2-FCV-70-28	Same as item 90.

Rev 2/19/88 Rev

3446F/JMJ

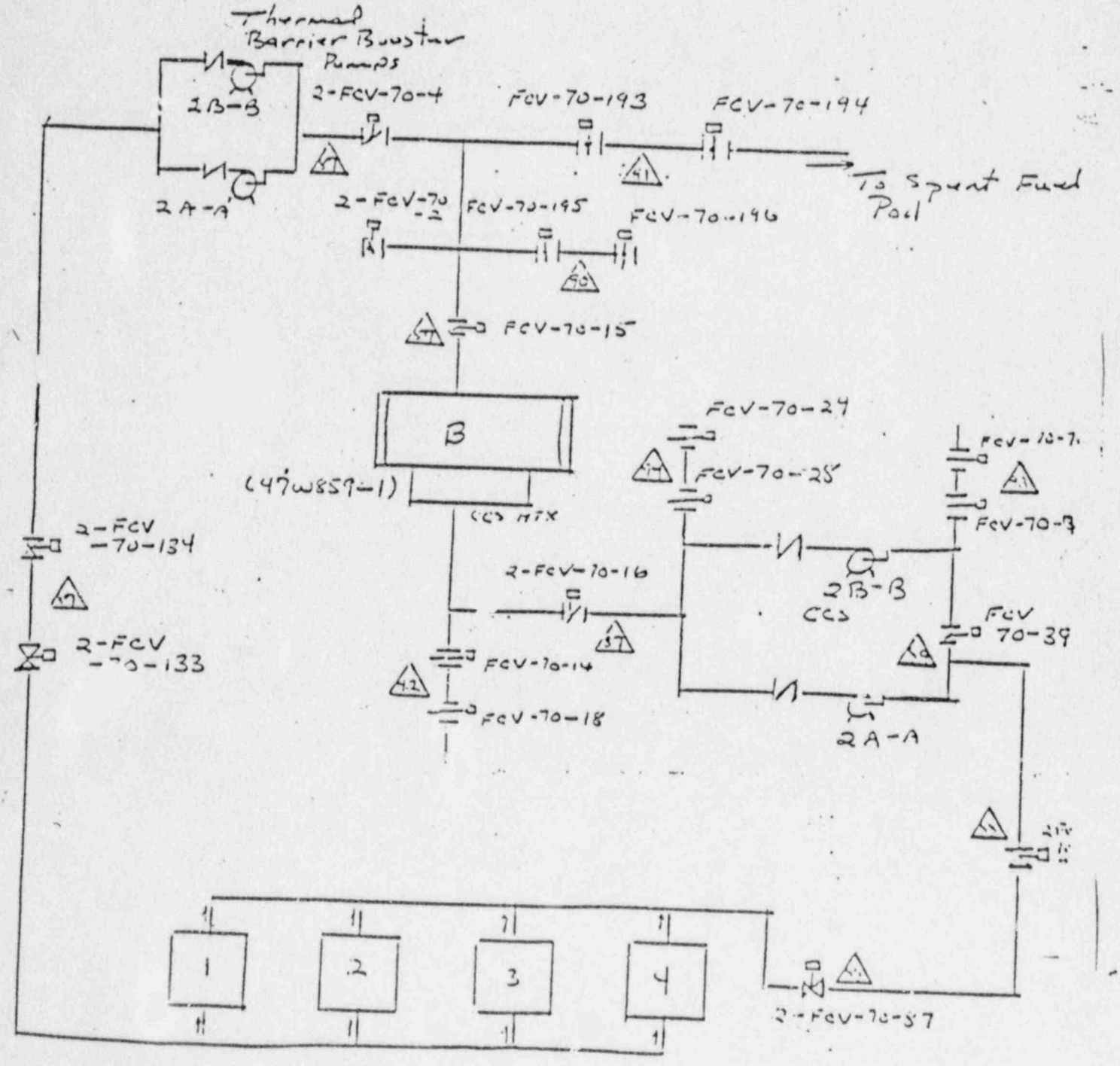
EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

REACTOR COOLANT PUMP
THERMAL BARRIER COOLING - UNIT 2
KEY 9



EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 11

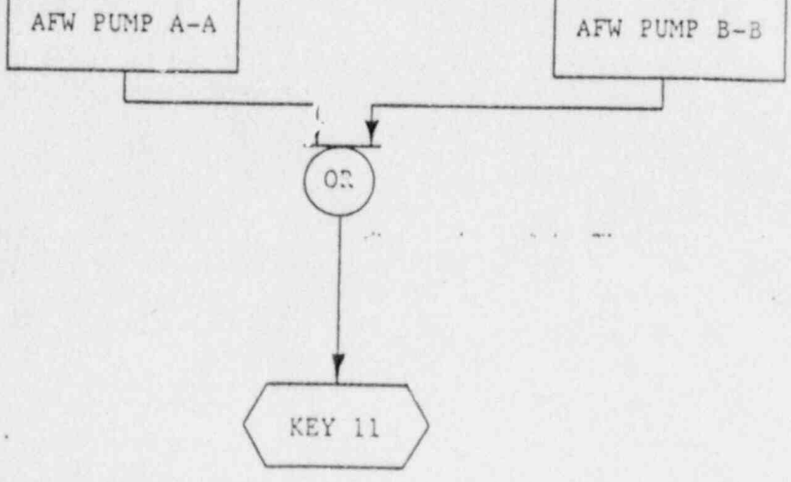
MOTOR DRIVEN AUX FEEDWATER PUMP

A motor driven auxiliary feedwater (AFW) pump along with the corresponding steam generator (SG) level control components (key 12) may be used to provide SG inventory control. Any of these pumps or the turbine driven AFW pump (keys 14 and 15) may be used for this function.

(Operation List)

*AFW pump A-A	Either One	Must Operate
*AFW pump B-B		Must Operate

*Pump used must supply the SGs being used for cooldown.



3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J Clark 2/10/88

SEQUOYAH NUCLEAR PLANT
KEY 12
STEAM GENERATOR LEVEL CONTROL

The components listed in this key are only required if the motor driven AFW pumps (key 11) are used to provide flow to the SGs. The SG level may be controlled automatically or manually. Automatic level control consist of automatic control of the LCVs. This requires control air (key 13) for the valve controller. Manual control consists of on/off operation of the AFW pump or throttling the flow to the SGs with manual valves. To monitor the SG levels, level indicators are required. (Refer to SOI-3.2, R30, section D.2, for manually throttling of valves to control SG level using the AFW system).

(Operation and Spurious List)

Path 1

Automatic Level Control	
PS-3-164	Must Not Cause LCV to Close
Loop L-3-164 (for LI-3-164 and LCV control)	Must Operate
LSV-3-164	Must Operate
LCV-3-164	Must Operate
PS-3-156	Must Not Cause LCV to Close
Loop L-3-156 (for LI-3-156 and LCV control)	Must Operate
LSV-3-156	Must Operate
LCV-3-156	Must Operate
Control Air Supply, Path 1 (See Key 13)	Must Operate
OR	
Manual Level Control* ~~Loop L-3-38 (for LI-3-38) (sense lines traced)~~	
Loop L-3-43 (for LR-3-43P1) (Any one) RAE 2/11/88	Must Operate
Loop L-3-164 (for LI-3-164)	Must Operate
Loop L-3-39 (for LI-3-39)	Must Operate
LCV-3-164**	Must Not Close
Loop L-3-56 (for LR-3-43P2) (Any one) RAE 2/11/88	Must Operate
Loop L-3-156 (for LI-3-156)	Must Operate
Loop L-3-52 (for LI-3-52) ~~for LI-3-51~~	Must Operate
LCV-3-156** ~~Loop L-3-51 (sense lines traced)~~	Must Not Close

*Manual control consists of on/off operation of the AFW pump (Key 11) or manually throttling the following valves:

3-836 or 3-828 Either one (SG 1)

3-835 or 3-827) Either one (SG 2)

** Local operation acceptable.

In lieu of the above LIs, Loops L-3-38 (for LI-3-38) and L-3-51 (for LI-3-51) may be utilized for fires inside containment that affect sense lines as detailed in B29 880120 001.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Ellum 2/10/88

Checked by/Date R. T. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT
KEY 12
(Operation and Spurious List)

Path 2

Automatic Level Control		
PS-3-148		Must Not Cause LCV to Close
Loop L-3-148 (for LI-3-148 and LCV control)		Must Operate
LSV-3-148		Must Operate
LCV-3-148		Must Operate
PS-3-171		Must Not Cause LCV to Close
Loop L-3-171 (for LI-3-171 and LCV control)		Must Operate
LSV-3-171		Must Operate
LCV-3-171		Must Operate
Control Air Supply, Path 2 (See Key 13)		Must Operate
	OR	
Manual Level Control* ~~Loop L-3-93 (sense lines traced)~~		
Loop L-3-98 (for LR-3-98P1)	(Any one) Rev 2/11/88	Must Operate
Loop L-3-148 (for LI-3-148)		Must Operate
Loop L-3-94 (for LI-3-94)		Must Operate
LCV-3-148**		Must Not Close
Loop L-3-111 (for LR-3-98P2)	(Any one)	Must Operate
Loop L-3-171 (for LI-3-171)		Must Operate
Loop L-3-107 (for LI-3-107)	Rev 2/11/88	Must Operate
LCV-3-171** ~~Loop L-3-106 (sense lines traced)~~		Must Not Close

*Manual control consists of on/off operation of the AFW pump (Key 11) or manually throttling the following valves:

3-834 or 3-826 Either one (SG 3)
3-837 or 3-829 Either one (SG 4)

** Local operation acceptable.

In lieu of the above LIs, Loops L-3-93 (for LI-3-93) and L-3-106 (for LI-3-106) may be utilized for fires inside containment that affect sense lines as described in B29 880120 001.

3446F/JMS

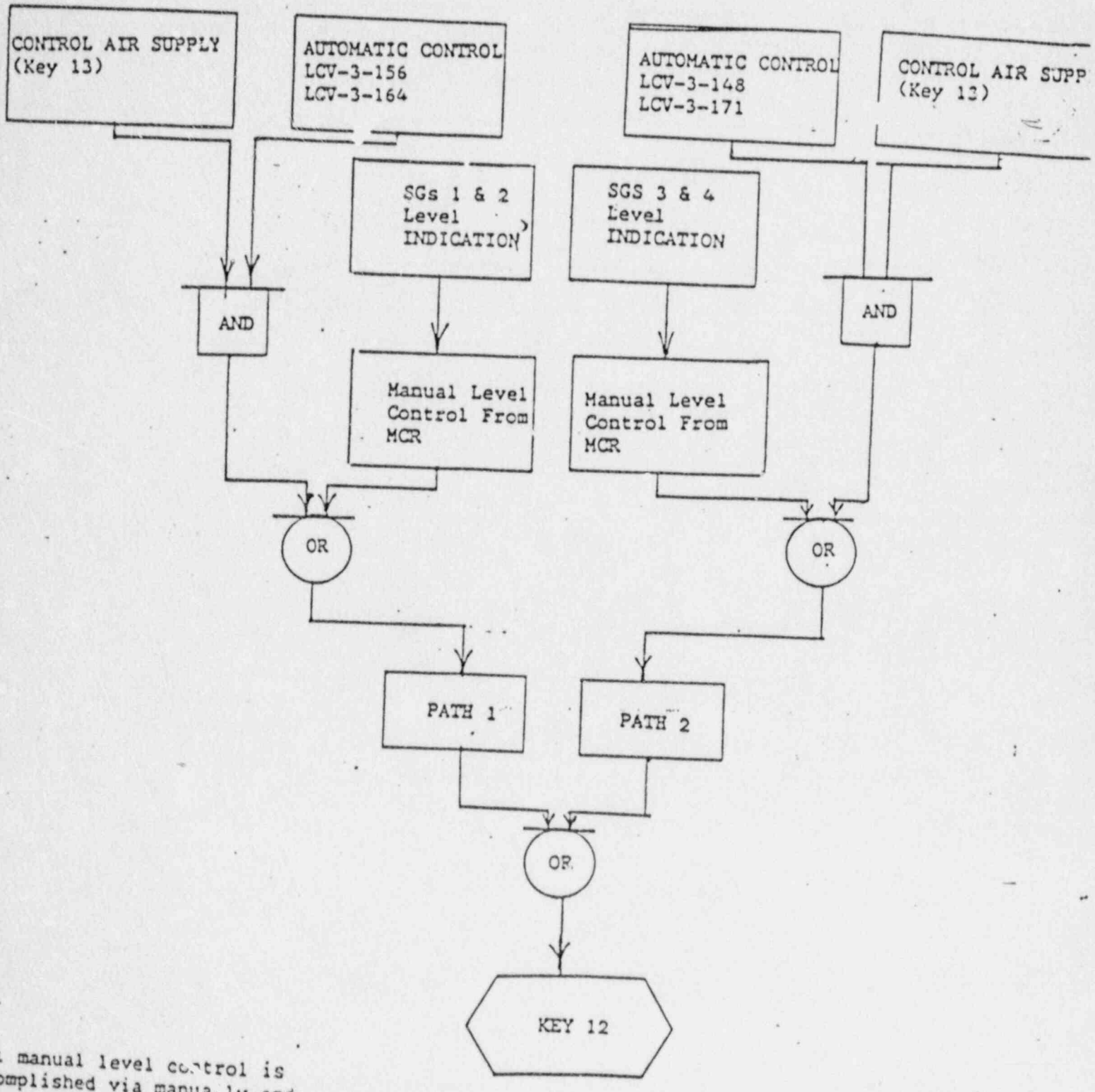
EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

KEY 12
STEAM GENERATOR LEVEL CONTROL



~~If manual level control is accomplished via manually and throttling valves, primary and backup communication with control should be assured.~~ Rae 2/10/88

ALS1

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

Basis for Key 12 Spurious List

Item	Component	Basis
95	1&2-LCV-3-164	When path 1 is being used (train A, electric driven pump), this valve must be operable to control the AFW flow to steam generator no. 1. Spurious closure of this valve may result in low steam generator level.
96	1&2-LCV-3-156	Same as item 95 except that steam generator no. 2 may be affected.
97	1&2-LCV-3-171	When path 1 is being used (train B, electric driven pump) same as item 95 except applies to steam generator no. 4.
98	1&2-LCV-3-148	Same as item 99, but applies to SG no. 3.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

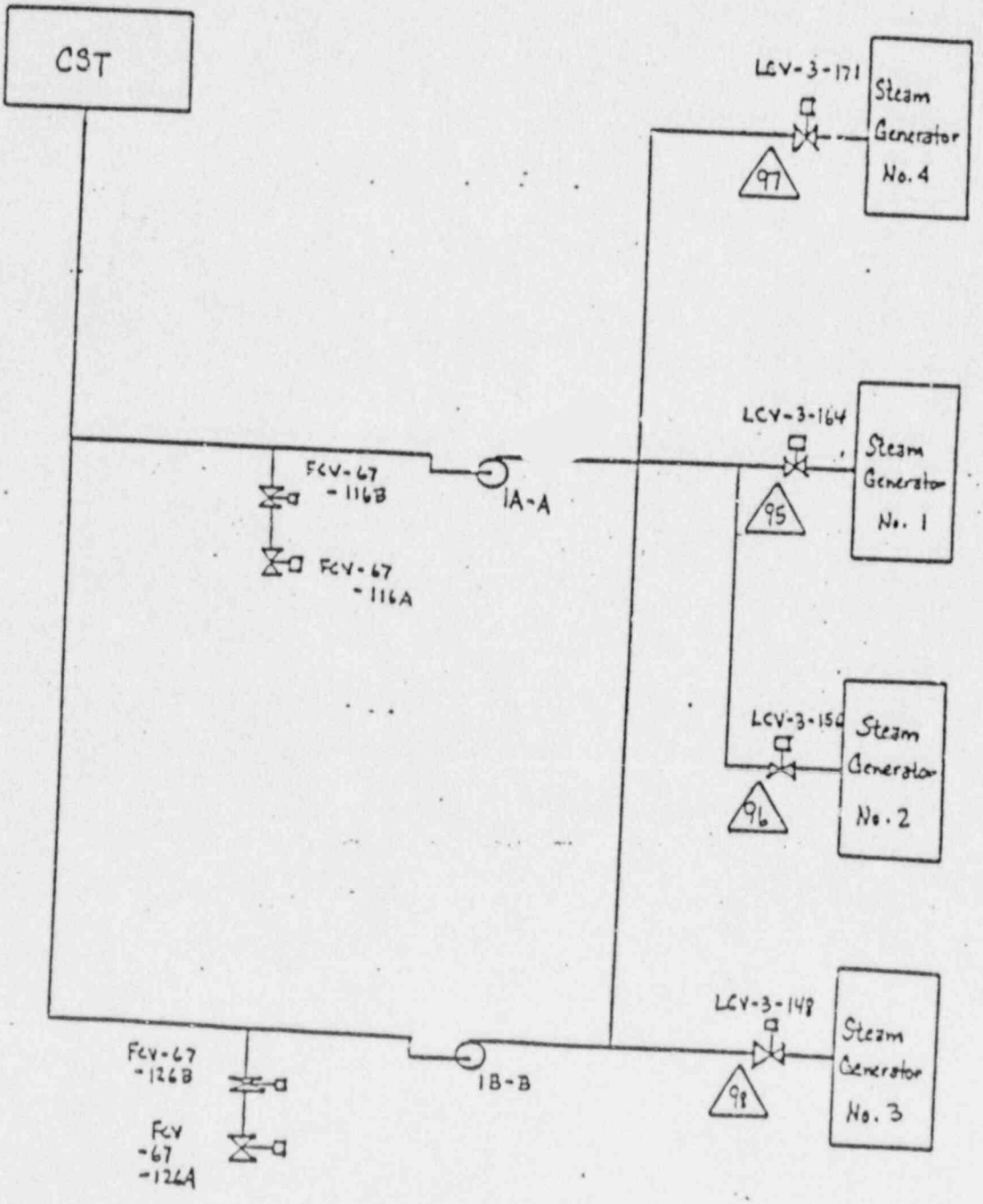
SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

STEAM GENERATOR LEVEL CONTROL

KEY 12



Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. T. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

Key 13

CONTROL AIR

This key contains the equipment necessary to supply control air for the following features on the shutdown logic diagram: steam generator level control valves, automatic control (keys 12, & 16), and SG PORVs (Key 26), and various dampers and valves required for HVAC (key 37)

Path 1 contains the components required for auxiliary air compressor A which provides control air supply to header A. Path 2 contains the equipment for air supply header B.

Specific equipment in this calculation that utilizes control air may be manually operated - see individual keys for details.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Ellum 2/10/88

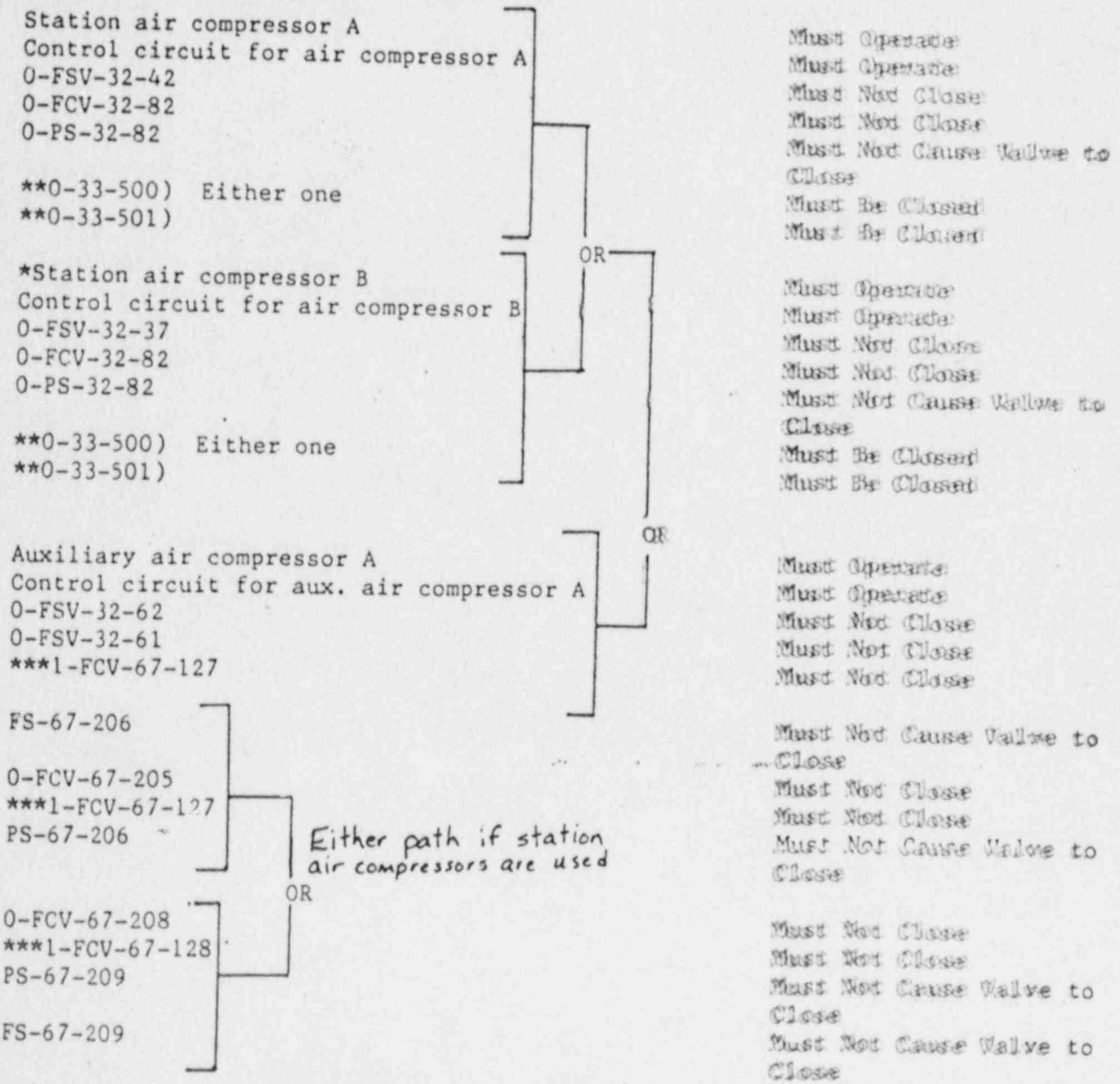
Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 13

(Operation and Spurious)

Control Air Supply Path 1



* This is a B-train compressor. If it is used, equipment associated with electrical B-train power will have to be evaluated.

** Handwheel operation acceptable.

***A design change has been made under ECN-L6258 to remove power from this valve.

Special Note: See general requirements section 4.2.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 13

(Operation and Spurious)

Control Air Supply Path 2

*Station air compressor A	Must Operate
Control circuit for air compressor A	Must Operate
0-FSV-32-42	Must Not Close
0-FCV-32-85	Must Not Close
0-PS-32-85	Must Not Cause Valve to Close
**0-33-500) Either one	Must Be Closed
**0-33-501)	Must Be Closed
OR	
Station air compressor B	Must Operate
Control circuit for air compressor B	Must Operate
0-FSV-32-37	Must Not Close
0-FCV-32-85	Must Not Close
0-PS-32-85	Must Not Cause Valve to Close
**0-VLV-33-500). Either one	Must Be Closed
**0-VLV-33-501)	Must Be Closed
OR	
Auxiliary air compressor B	Must Operate
Control circuit for auxiliary air compressor B	Must Operate
0-FSV-32-88	Must Not Close
0-FSV-32-87	Must Not Close
***2-FCV-67-128	Must Not Close
FS-67-206	Must Not Cause Valve To Close
0-FCV-67-205	Must Not Close
***1-FCV-67-127	Must Not Close
PS-67-206	Must Not Cause Valve To Close
Either path if station air compressors are used.	
OR	
0-FCV-67-208	Must Not Close
***1-FCV-67-128	Must Not Close
PS-67-209	Must Not Cause Valve To Close
FS-67-209	Must Not Cause Valve To Close

*This is a A-train compressor. If it is used, equipment associated with A-train power will have to be evaluated.
**Handwheel operation acceptable.
***A design change has been made under ECN-L6258 to remove power from this valve.

Special Note: See general requirements section 4.2. 3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

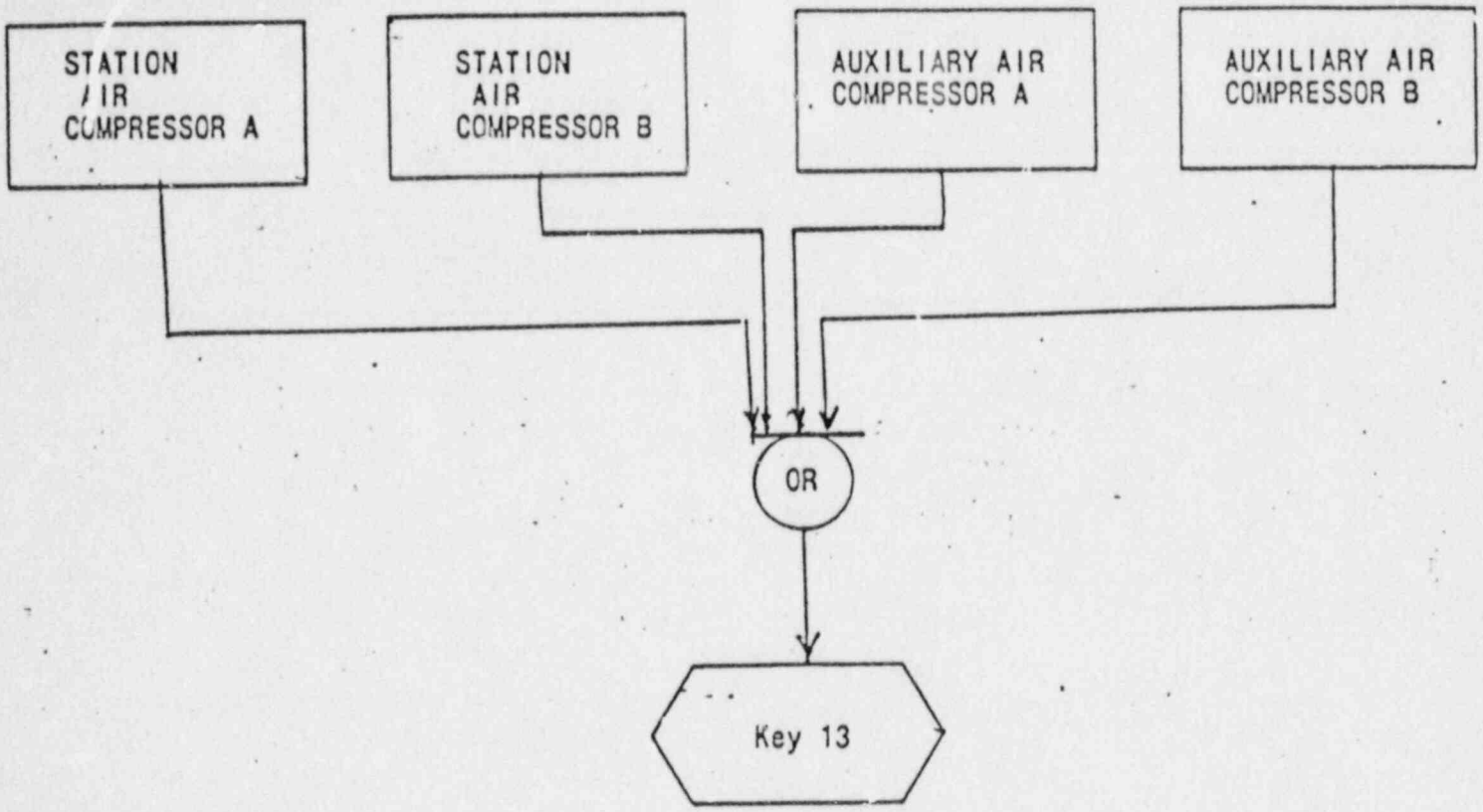
Prepared by/Date R A Edlund 2/10/8.

Checked by/Date R. J. Clark 2/10/85

SEQUOYAH NUCLEAR PLANT

KEY 13

CONTROL AIR



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Prepared by/Date R A Edlund 2/10/88

Checked by/Date L. A. Clark 2/10/89

Basis for Spurious List
KEY 13

Control Air

Item	Component	Basis
99	N/A	Not Used
100	O-FSV-32-42	Spurious closure of this valve would terminate ERCW cooling flow to the intercooler for compressor A.
101	O-FCV-32-82	Spurious closure of this valve would isolate the control air system from train A auxiliary control air. Depending upon the loads serviced at the time, this may result in low header pressure, with the resulting Auxiliary Air Compressor picking up load.
102	N/A	Not Used
103	O-FCV-32-37	Same as item 100 but applies to compressor B
104	O-FCV-67-205	Spurious closure of this valve will isolate ERCW flow from header 1A to the station air compressors.
105	1-FCV-67-127	Spurious closure of this valve will isolate ERCW flow from header 1A to Auxiliary Control Air Compressor.
106	O-FCV-67-208	Same as item 104 but for header 1B.
107	1-FCV-67-128	Same as item 105 but for header 1B.
108	Auxiliary Air Compressor A	The Auxiliary Control Air Compressor is started whenever system pressure falls to 80 lb/in^2g. Failure of this compressor to operate will require the compressor for the other unit to pick up the load. Depending on the load services at the time, this may result in low header pressure.
109	FSV-32-62	Spurious closure of this valve will cause the Auxiliary Air Compressor A to fail. Therefore same as item 108.
110	FSV-32-61	Spurious closure of this valve will isolate ERCW cooling water to auxiliary control air compressor.

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

Basis for Spurious List
KEY 13

Control Air

Item	Component	Basis
111	FCV-32-85	Same as item 101 but for train B.
112	FSV-32-87	Same as item 110.
113	FSV-32-88	Same as item 109.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RAEdlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 14 AND 15

AUX FEEDWATER SUPPLY TO STEAM GENERATOR FROM TDAFW

The turbine driven AFW pump may be used to supply feedwater for SG inventory control. If this pump is used (as opposed to a motor driven pump, key 11), the SG level control valves (key 16) corresponding to the two loops being used for cooldown must be operable.

For pump operation, a steam supply from SG 1 or 4 must be available. In addition, the turbine trip and throttle valve and governor valve must be operable.

(Operation and Spurious List)

AFW Pump Turbine A-S	Must Operate
Instrument Loop P-3-138A ~~and B~~ RAE 2/11/88	Must Operate
Instrument Loop F-3-142	Must Operate
Instrument Loop FIC-46-57	Must Operate
Instrument Loop SC-46-57	Must Operate
Turbine-Driven Aux Feedwater Pump A-S	Must Operate
FCV-1-51	Must Operate
FCV-1-52	Must Operate
*FCV-1-17	Must Not Close
*FCV-1-18	Must Not Close
*FCV-1-15 OR *FCV-1-16	Must ~~Not Close~~ Operate RBC 2/10/88
	Must Operate

* Handwheel operation acceptable.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

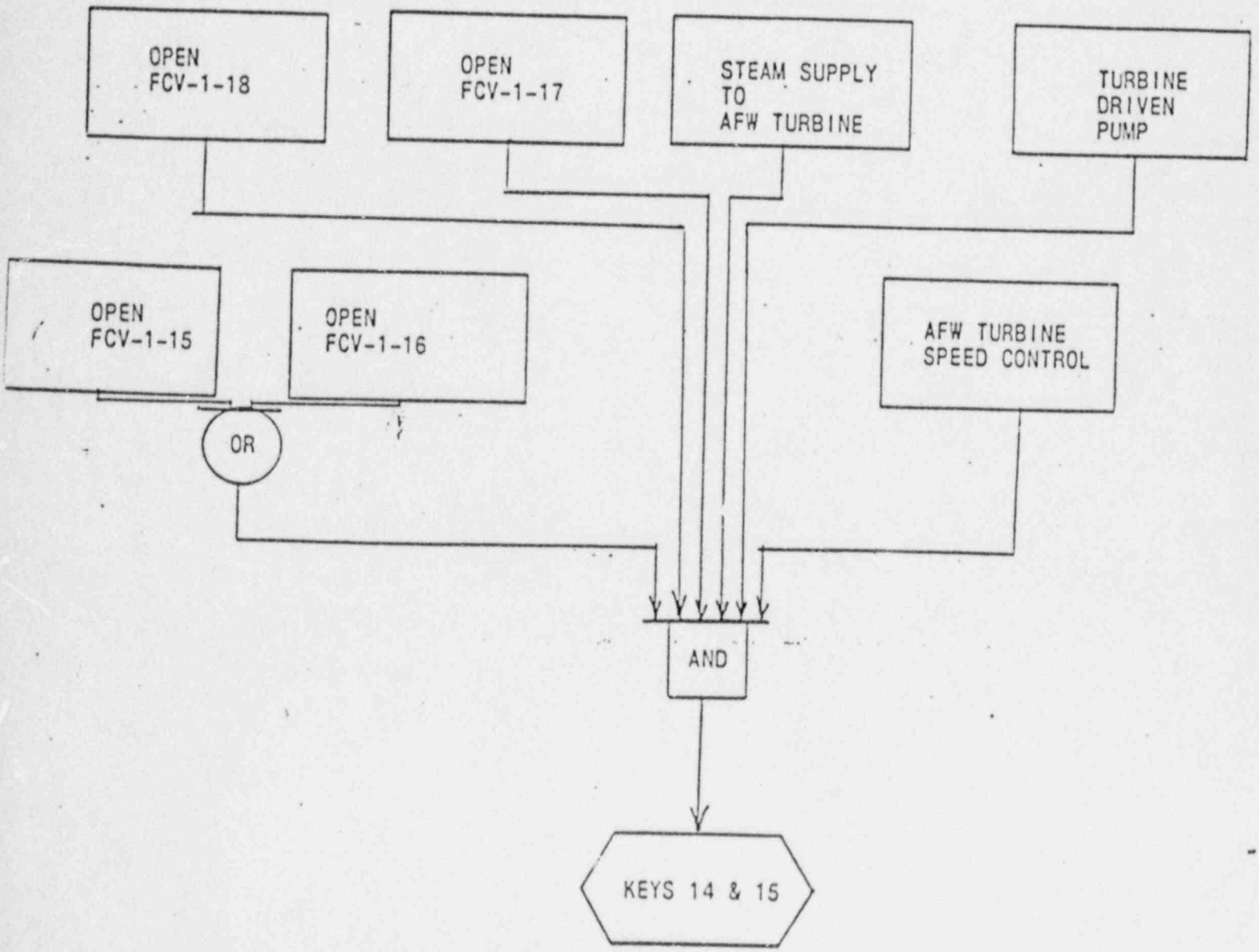
Prepared by/Date R A Edlund 2/10/88

Checked by/Date R J Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 14 and 15

AFW SUPPLY TO S.G FROM TDAFW PUMPS



EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

Basis for TDAFW Spurious List

KEYS 14 and 15

114	FCV-1-51	Spurious actuation of this valve will affect the operation of the turbine driven Auxiliary Feedwater Pump.
115	FCV-1-17 FCV-1-18	Spurious closure of any of these valves will terminate steam flow to the Auxiliary Feedwater Pump turbine stop valves. Thus, same result as item 113.
116	FCV-1-15	Spurious closure of this valve will terminate steam flow from SG No. 1 to the AFW pump turbine stop valve.
117	FCV-1-16	Same as item 116 but for SG No. 4
118	Turbine Driven AFW Pump A-S	Inappropriate functioning due to spurious initiation on pump failure could result in the inability to control steam generator level inventory.
152	P-3-138A ~~P-3-138B~~ RAE 2/11/88 F-3-142 FIC-46-57 SC-46-57	the auxiliary feedpump turbine (AFPT) speed control circuitry must be functional to ensure the availability for the AFPT to supply feedwater flow.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

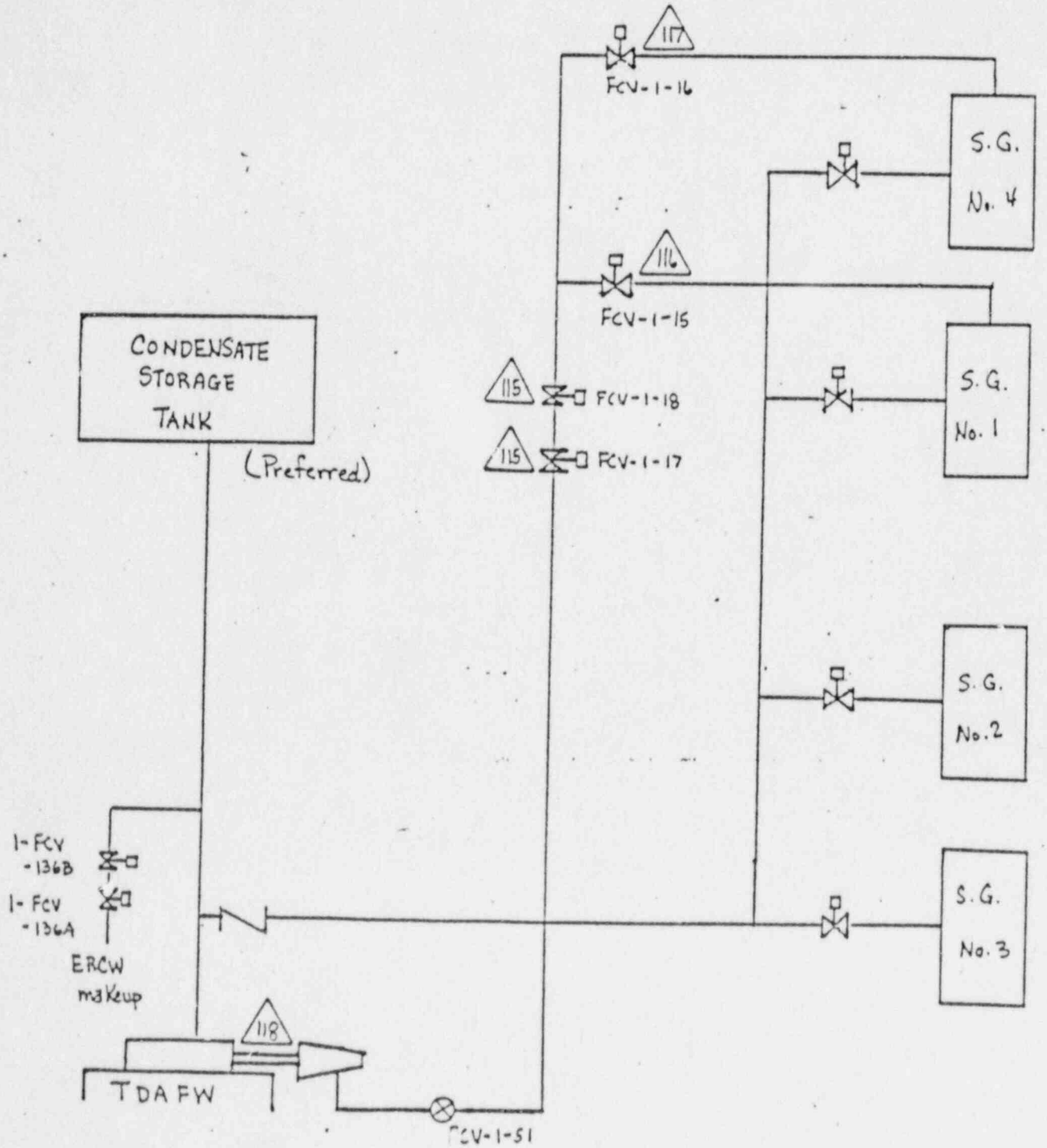
SQN-SQS4-0127

Prepared by/Date R A Ellwanger 2/10/88

Checked by/Date R. J. Clark 2/10/88

TURBINE DRIVEN AFW PUMP

KEY 14 & 15



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EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 16
Steam Generator Level Control

If the turbine driven AFW pump is used to supply feedwater to the SGs, the two level control valves corresponding to the loops being used for cooldown must be operable. The valves may be controlled automatically or manually. Automatic control requires control air (key 13) for the valve controller. Manual control consists of handwheel operation of the ICV. The manual method of maintaining SG level requires monitoring in the MCR with level indicators. (Reference SOI-3.2, R30, section 2 for throttling AFW level control valves.)

3046F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

Key 16

Operation and Spurious List

Path 1

Automatic Level Control	
LCV-3-172	Must Operate
LSV-3-172	Must De-energize to Modulate LCV
Instrument Loop L-3-172 (for LCV control)	Must Operate
Instrument Loop P-3-138A (for LCV control)	Must Operate
PS-3-140A	Must Not Cause Valve to Close
PS-3-140B	Must Not Cause Valve to Close
LCV-3-175	Must Operate
LSV-3-175	Must Deenergize to Modulate LCV
Instrument Loop L-3-175 (for LCV control)	Must Operate
Instrument Loop P-3-138A (for LCV control)	Must Operate
PS-3-165A	Must Not Cause Valve to Close
PS-3-165B	Must Not Cause Valve to Close
Control Air Supply, Path 1 (see Key 13)	Must Operate
OR	
Manual Level Control	
*LCV-3-172 ~~Loop L-3-93 (sense lines traced)~~ Rev 2/11/88	Must Operate
Instrument Loop L-3-98 (for LR-3-98P1) (Any one)	Must Operate
Instrument Loop L-3-172 (for LI-3-172)	Must Operate
Instrument Loop L-3-94 (for LI-3-94)	Must Operate
*LCV-3-175 ~~Loop L-3-106 (sense lines traced)~~ Rev 2/11/88	Must Operate
Instrument Loop L-3-111 (for LR-3-98P2) (Any one)	Must Operate
Instrument Loop L-3-175 (for LI-3-175)	Must Operate
Instrument Loop L-3-107 (for LI-3-107)	Must Operate

* Handwheel operation acceptable.

In lieu of the above LIs, Loops L-3-93 (for LI-3-93) and L-3-106 (for LI-3-106) may be utilized for fires inside containment that affect sense lines as detailed in B29 880120 001.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

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Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.L. Hall 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 16

(Operation and Spurious List)

Path 2

Automatic Level Control	
LCV-3-173	Must Operate
LSV-3-173	Must Deenergize to Modulate LCV
Instrument Loop L-3-173 (for LCV control)	Must Operate
Instrument Loop P-3-138B (for LCV control)	Must Operate
PS-3-150A	Must Not Cause Valve to Close
PS-3-150B	Must Not Cause Valve to Close
LCV-3-174	Must Operate
LSV-3-174	Must Deenergize to Modulate LCV
Instrument Loop L-3-174 (for LCV control)	Must Operate
Instrument Loop P-3-138B (for LCV control)	Must Operate
PS-3-160A	Must Not Cause Valve to Close
PS-3-160B	Must Not Cause Valve to Close
Control Air Supply, Path 2 (see Key 13)	Must Operate
OR	
Manual Level Control	
*LCV-3-173 ~~Loop L-3-51 (sense lines traced)~~ Rai 2/11/88	Must Operate
Instrument Loop L-3-56 (for LR-3-43P2) (Any one)	Must Operate
Instrument Loop L-3-173 (for LI-3-173)	Must Operate
Instrument Loop L-3-52 (for LI-3-52)	Must Operate
*LCV-3-174 ~~Loop L-3-38 (sense lines traced)~~ Rai 2/11/88	Must Operate
Instrument Loop L-3-43 (for LR-3-43P1) (Any one)	Must Operate
Instrument Loop L-3-17' (for LI-3-174)	Must Operate
Instrument Loop L-3-39 (for LI-3-39)	Must Operate

* Handwheel operation acceptable.

In lieu of the above LIs, Loops L-3-38 (for LI-3-38) and L-3-51 (for LI-3-5 may be utilized for fires inside containment that affect sense lines as detailed in B29 880120 001.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

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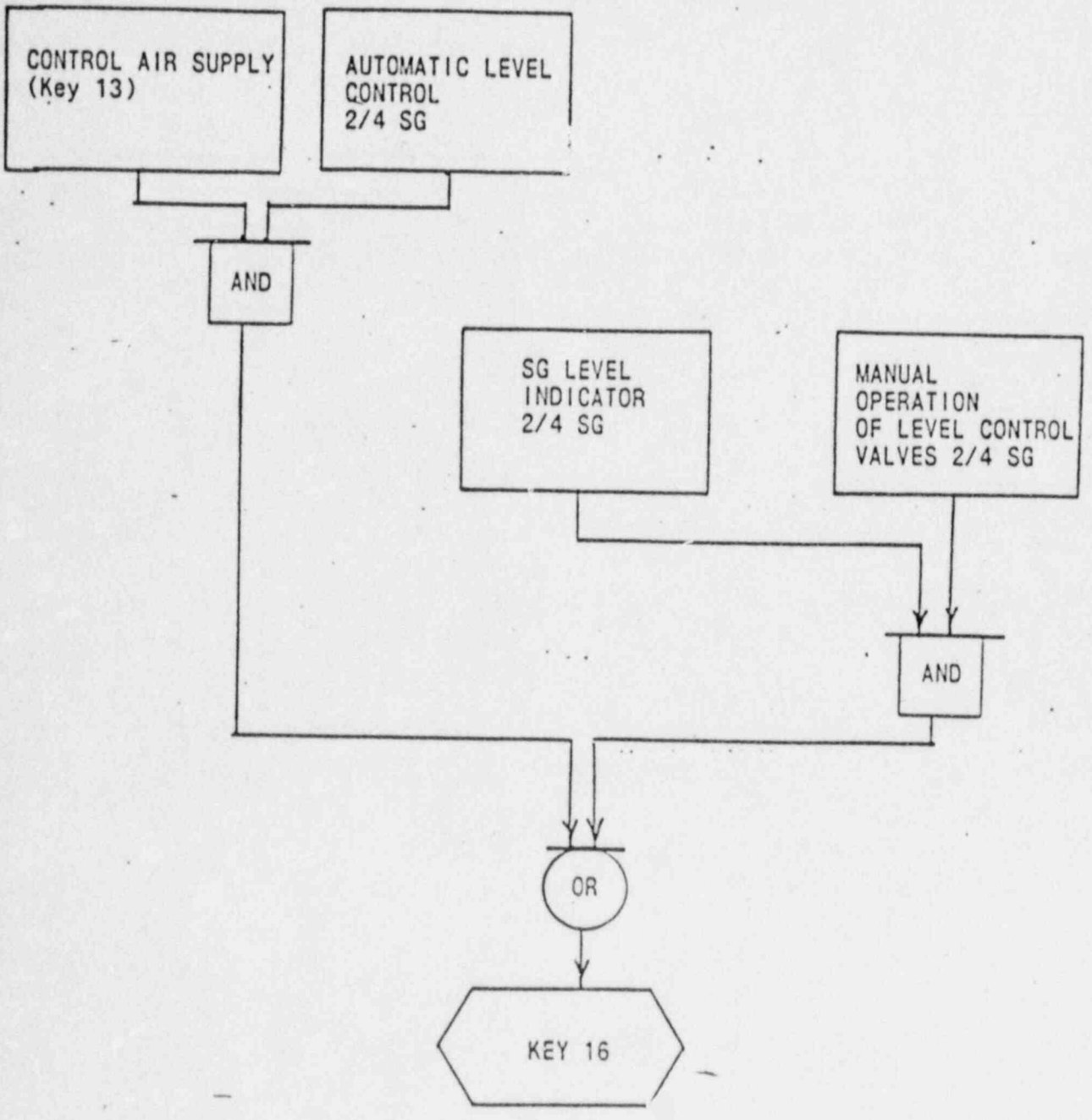
Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 16

STEAM GENERATOR LEVEL CONTROL



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Prepared by/Date R A Ellen 2/10/88

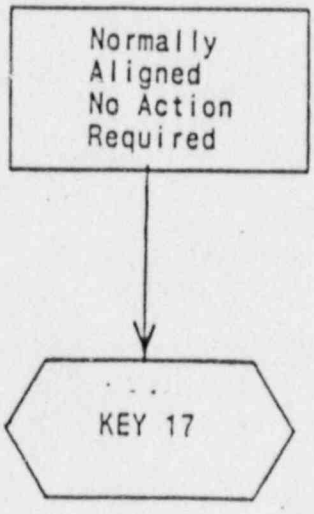
Checked by/Date R. L. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

Key 17

SUCTION FROM CONDENSATE STORAGE TANK

In order to provide SG level control, a supply of feedwater is required for the AFW system. The initial supply is the condensate storage [illegible]. It is normally aligned and no components are required to function [illegible] is key.



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Checked by/Date R. J. Clark 2/10/89

SEQUOYAH NUCLEAR PLANT

Key 19

SUCTION FROM ERCW

After the CST (key 17) has reached its low level, the suction for the AFW system must be switched to the ERCW system. The valves corresponding to the pump being used to supply ERCW to the SGs must be opened. The qualified water supply to the MDAFW pumps is from the discharge headers in the ERCW system. Therefore, a flow path in the ERCW system must be provided to the discharge header which supplies the pump in operation. Suction for the turbine driven AFW pump may be taken from either the A or B ERCW supply header.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

KEY 19 - SUCTION FROM ERCW

Operation and Spurious List

Path 1

1-FCV-67-223 (Note 1)	Must Not Close
2-FCV-67-223 (Note 1)	Must Not Close
1-FCV-67-424 (Note 2)	Must Not Open
1-FCV-67-478 (Note 3)	Must not close
If Motor Driven AFW Pump A-A Is Used:	
*FCV-3-116A	Must open
*FCV-3-116B	Must open
If Turbine Driven AFW Pump is Used:	
*FCV-3-136A	Must open
*FCV-3-136B	Must open

Path 2

2-FCV-67-147 (Note 3)	Must not close
If Motor Driven AFW Pump B-B Is Used:	
*FCV-3-126A	Must Open
*FCV-3-126B	Must Open
If Turbine Driven AFW Pump is Used:	
*FCV-3-179A	Must Open
*FCV-3-179B	Must Open

* Handwheel operation acceptable.

Note 1: A design change has been made under ECN-L6258 to open this valve and remove power.

Note 2: A design change has been made under ECN-L6258 to close this valve and remove power.

Note 3: A design change has been made under ECN-L6258 to remove power from this valve.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

Special Note: The ERCW headers spurious lists contain the containment spray (CS) heat exchangers isolation valves (1&2-FCV-67-123, -124, -125, -126). Per the spurious lists, these valves are required to stay closed, isolating flow through all CS heat exchangers. It is acceptable, however, for one CS heat exchanger (per path used) to have cooling flow (i.e., CS heat exchanger 1A can have flow through it provided heat exchanger 2A is isolated. The same is true for Train B).

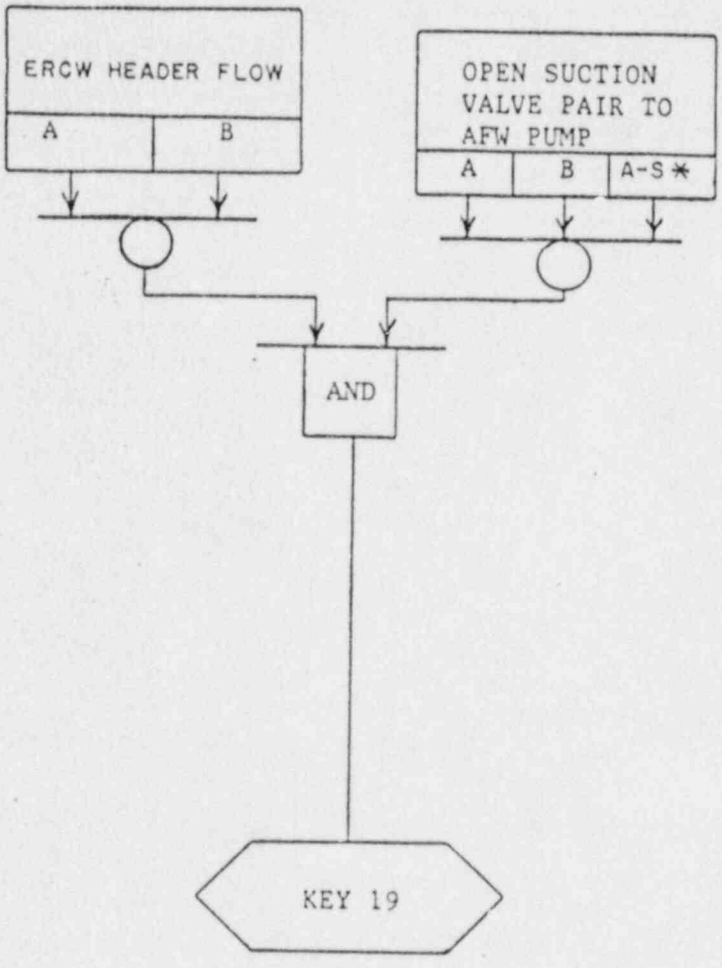
SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

KEY 19

SUCTION FROM ERCW



* Note the turbine driven pump can be associated with either train A or B.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Ellmore 2/10/88

Checked by/Date R.J. Clark 2/10/88

KEY 20 Main Steam Isolation

Secondary side isolation will be required if a loss of offsite power occurs, or a fire damages the control circuitry of the steam dumps or main feedwater system. In either case, the main steam supply to the turbines must be isolated. This key provides the preferred method of main steam isolation. This requires closing the main steam isolation valves and ensuring that the main steam isolation bypass valves are closed. The plant can then be cooled down by the PORVS.

FCV-1-147		Must Close
FCV-1-4		Must Close
FSV-1-4A	Either one	Must Deenergize
FSV-1-4B		Must Deenergize
FSV-1-4D	Either set of two	Must Deenergize
FSV-1-4E		Must Deenergize
FSV-1-4G		Must Deenergize
FSV-1-4H		Must Deenergize
FCV-1-148		Must Close
FCV-1-11		Must Close
FSV-1-11A	Either one	Must Deenergize
FSV-1-11B		Must Deenergize
FSV-1-11D	Either set of two	Must Deenergize
FSV-1-11E		Must Deenergize
FSV-1-11G		Must Deenergize
FSV-1-11H		Must Deenergize
FCV-1-149		Must Close
FCV-1-22		Must Close
FSV-1-22A	Either one	Must Deenergize
FSV-1-22B		Must Deenergize
FSV-1-22D	Either set of two	Must Deenergize
FSV-1-22E		Must Deenergize
FSV-1-22G		Must Deenergize
FSV-1-22H		Must Deenergize
FCV-1-150		Must Close

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. T. Clark 2/10/88

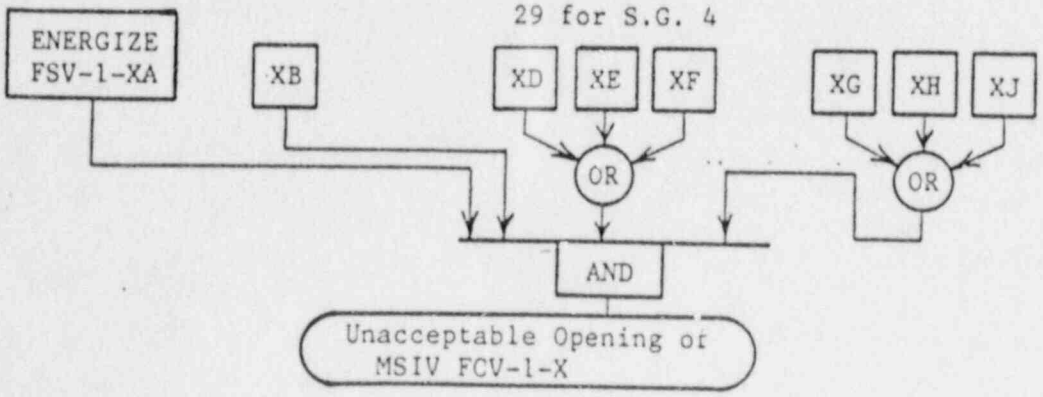
SEQUOYAH NUCLEAR PLANT
Key 20

FCV-1-29		Must Close
FSV-1-29A)	Either one	Must Deenergize
FSV-1-29B)		Must Deenergize
FSV-1-29D)	Either set of two	Must Deenergize
FSV-1-29E)		Must Deenergize
FSV-1-29G)		Must Deenergize
FSV-1-29H)		Must Deenergize
FSV-1-4F AND FSV-1-4J FSV-1-11F AND FSV-1-11J FSV-1-22F AND FSV-1-22J FSV-1-29F AND FSV-1-29J		Prior to closing the MSIV none of the groups of 2 solencid valves may spuriously energize (This would block the air vent paths and prevent closure of the associated MSIV.)

The following set of spurious operations must not occur:

ALL ENERGIZED
FSV-1-XA AND FSV-1-XB AND (FSV-1-XD OR FSV-1-XE OR FSV-1-XF) AND (FSV-1-XG OR FSV-1-XH OR FSV-1-XJ)

X = 4 for S.G. 1
11 for S.G. 2
22 for S.G. 3
29 for S.G. 4



NOTE: In the event a fire in the MCR the operator must pull the fuses in the control cir or FCV-1-147, -148, -149, -150 to prevent possible spurious ope these valves. Also, the FSV-1-147, -148, -149, -150 must not spuriousl ergize. Spurious energization would open FCV-1-147, -148, -149, and -15

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

Key 21

STEAM LOAD ISOLATION

If the main steam isolation and bypass valves (key 20) cannot be closed, the steam load may be isolated by closing the main steam dump valves, the main turbine trip and stop valves, the main feedwater pump turbine trip and throttle valves, and the MSR 2nd stage reheater isolation and bypass valves. These valves are air operated valves and will close on loss of power.

FCV-1-77	Must Close
FCV-1-72	Must Close
FCV-1-284	Must Close
FCV-1-297	Must Close
FCV-1-298	Must Close
FCV-1-275	Must Close
FCV-1-277	Must Close
FCV-1-279	Must Close
FCV-1-75	Must Close
FCV-1-84	Must Close
FCV-1-91	Must Close
FCV-1-98	Must Close

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 21 (Operation List)

FCV-1-103	Must Close
FCV-1-104	Must Close
FCV-1-105	Must Close
FCV-1-106	Must Close
FCV-1-107	Must Close
FCV-1-108	Must Close
FCV-1-109	Must Close
FCV-1-110	Must Close
FCV-1-111	Must Close
FCV-1-112	Must Close
FCV-1-113	Must Close
FCV-1-114	Must Close
FCV-1-61) Either one	Must Close
FCV-1-62)	Must Close
FCV-1-64) Either one	Must Close
FCV-1-65)	Must Close
FCV-1-67) Either one	Must Close
FCV-1-68)	Must Close
FCV-1-70) Either one	Must Close
FCV-1-71)	Must Close
FCV-1-36) Either one	Must Close
FCV-1-37)	Must Close
FCV-1-43) Either one	Must Close
FCV-1-44)	Must Close

Note: No spurious list is required for this key.

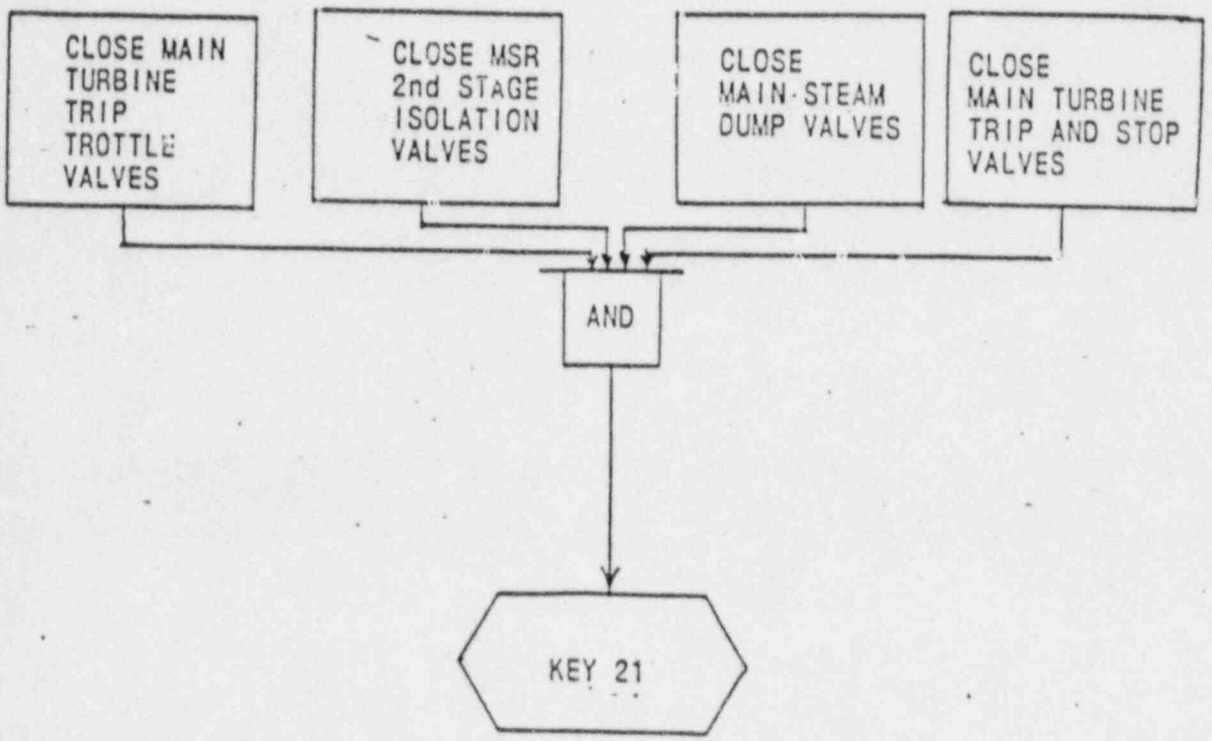
Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/89

SEQUOYAH NUCLEAR PLANT

STEAM LOAD ISOLATION

KEY 21



EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

KEY 22

FEEDWATER ISOLATION

Secondary side isolation will be required if a loss of offsite power occurs or, if the circuitry controlling the main feedwater supply is damaged due to a fire. Termination of main feedwater supply can be accomplished by either closing feedwater valves or tripping the main feedwater pumps (key 23). This key requires closure of a feedwater isolation valve or a feedwater control valve in the feed to each SG. In addition, a feedwater bypass isolation valve for each SG must be verified to be closed.

(Must Operate)

FCV-3-35) Both FCV-3-35A)	OR	Must Close
FCV-3-33		
FCV-3-48) Both FCV-3-48A)	OR	Must Close
FCV-3-47		
FCV-3-90) Both FCV-3-90A)	OR	Must Close
FCV-3-87		
FCV-3-103) Both FCV-3-103A)	OR	Must Close
FCV-3-100		

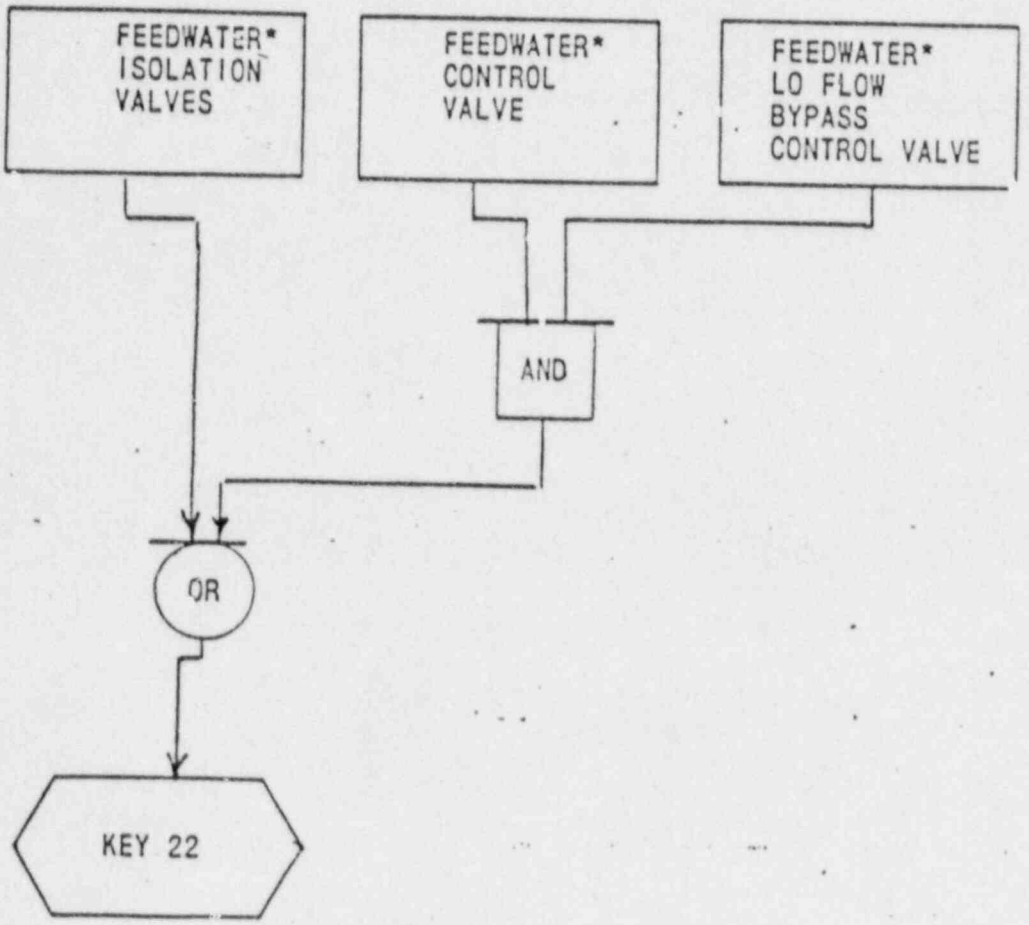
3446F/JMS

Prepared by/Date R A Edlin Jr 2/10/8

Checked by/Date R. J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

KEY 22



* All four steam generators must be isolated. It is acceptable to use different success paths for different steam generators.

SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R.T. Clark 2/10/88

KEY 23
FEEDWATER PUMP TURBINE

The main feedwater supply may be isolated by tripping the main feedwater pumps. This key or key 22 is required for secondary side isolation. Tripping the main feedwater pump requires closure of main feedwater pump turbine stop valves or control valves.

(Operation List)

FCV-1-36) Either one FCV-1-37)	Must Close
FCV-1-38) Either one FCV-1-39)	Must Close
FCV-1-43) Either one FCV-1-44)	Must Close
FCV-1-45) Either one FCV-1-46)	Must Close

Note: If both paths A & B of Key 20 (main steam isolation) are achieved, Key 23 will automatically be achieved.

No spurious list is required for this key.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

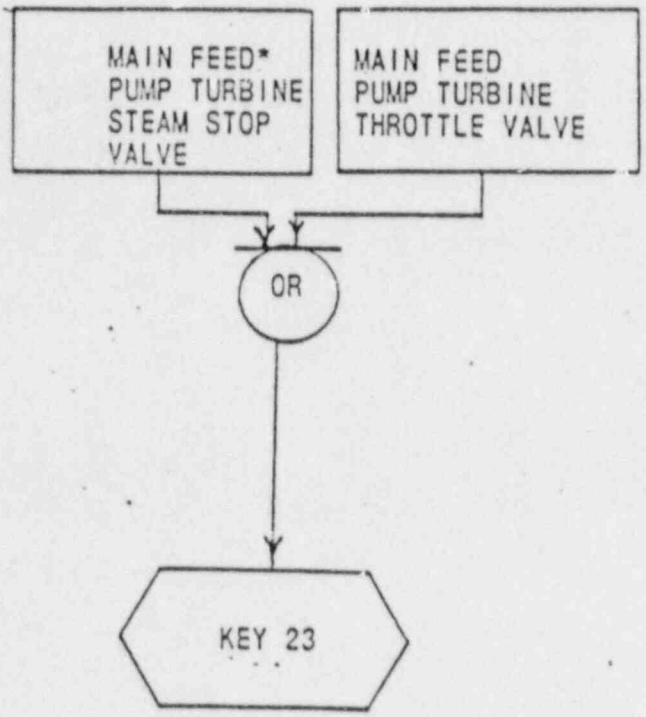
SQN-SQS4-0127

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

MAIN FEEDWATER PUMP

KEY 23



* Steam supply must be terminated to both feed pump turbines.

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date DH 4-7-88

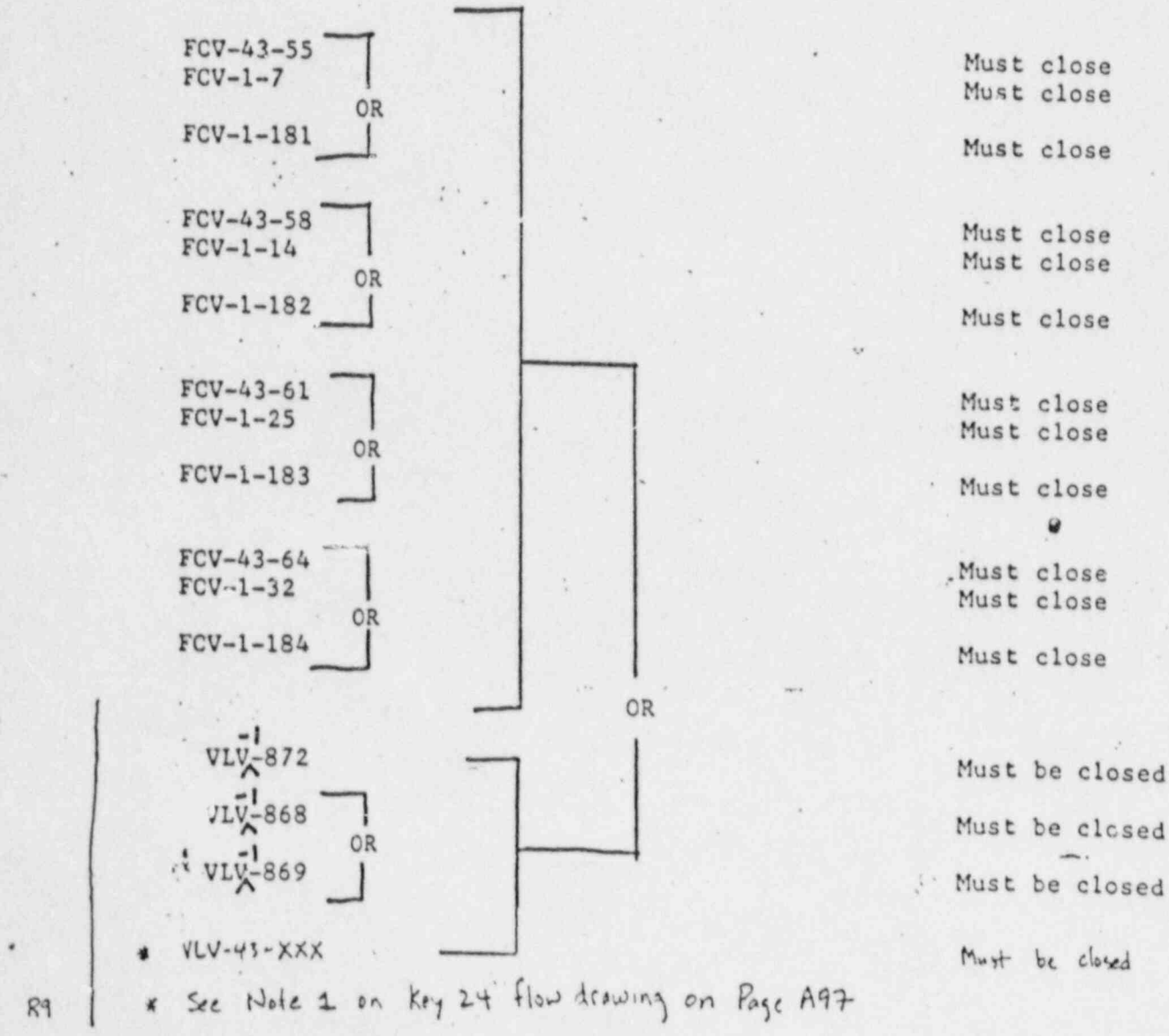
Checked by/Date RLC/Rac 4/19/88

KEY 24

S/G BLOWDOWN ISOLATION

To provide S/G blowdown isolation requires terminating blowdown flow from each steam generator and also assuring valves associated with the SG drain lines are also closed.

(Operation List)



R9 * See Note 1 on Key 24 flow drawing on Page A97

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

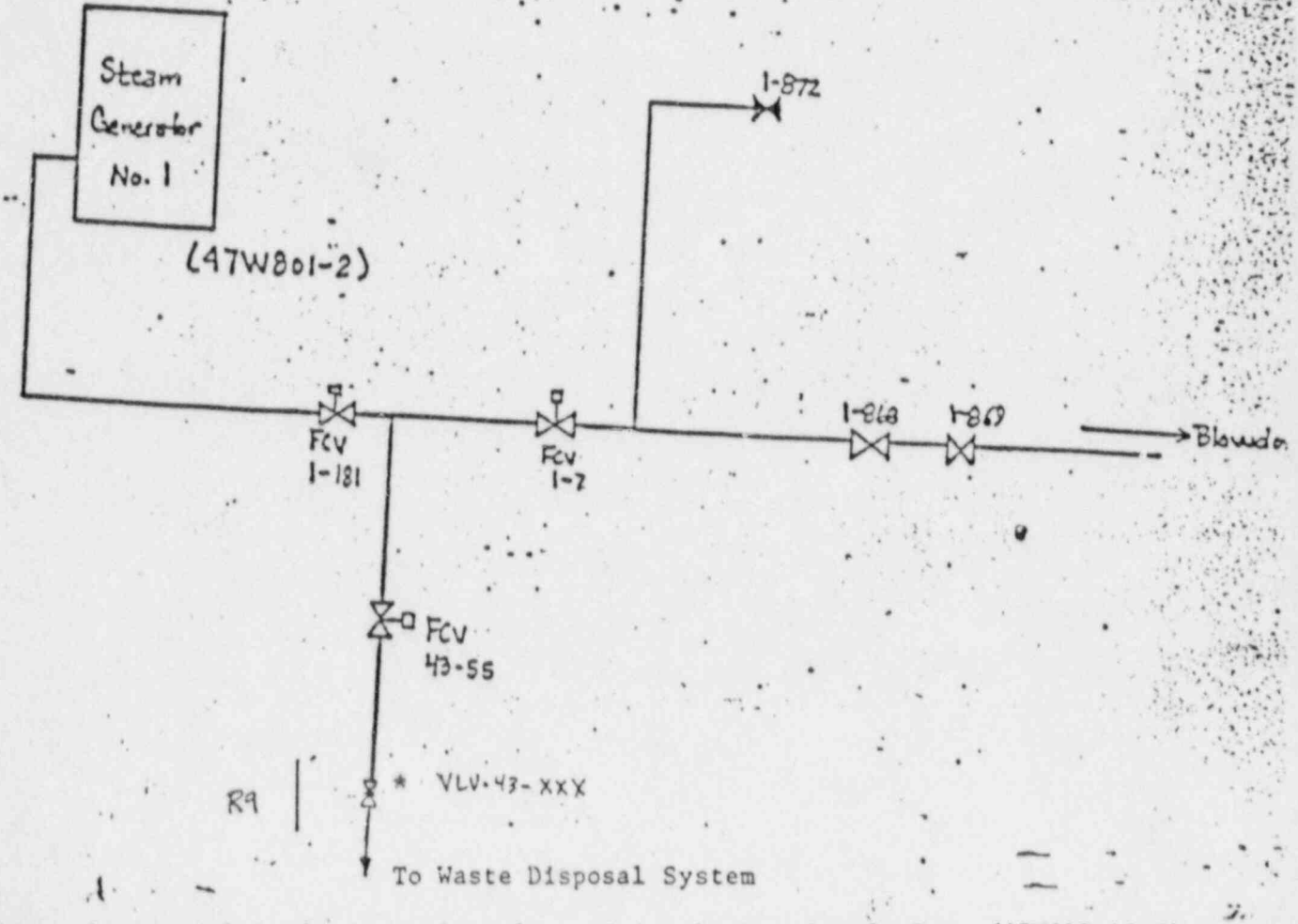
SQN-SQS4-0127

Prepared by/Date DAH 4-7-88

Checked by/Date RLC/Ra 4/27/88

SEQUOYAH NUCLEAR PLANT

KEY 24



R9 * Note 1 - Manual isolation valves located in the Hot Sample Room (47W610-43-5) must be closed should FCV-43-55, -58, -61, or -64 fail to close. (SG Sample Isolation Valves associated with 1-4 SG respectively)

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT

*KEY 25

The secondary safety valves and secondary relief valves (key 26) are required to provide secondary side pressure control. For each of the two SGs being used for cooldown, the set of safety valves must be operable to provide short term pressure control.

Operation List

1-VLV-001-522		Must Operate
1-VLV-001-523		Must Operate
1-VLV-001-524	SG1	Must Operate
1-VLV-001-525		Must Operate
1-VLV-001-526		Must Operate
1-VLV-001-517		Must Operate
1-VLV-001-518		Must Operate
1-VLV-001-519	SG2	Must Operate
1-VLV-001-520		Must Operate
1-VLV-001-521		Must Operate
1-VLV-001-512		Must Operate
1-VLV-001-513		Must Operate
1-VLV-001-514	SG3	Must Operate
1-VLV-001-515		Must Operate
1-VLV-001-516		Must Operate
1-VLV-001-527		Must Operate
1-VLV-001-528		Must Operate
1-VLV-001-529	SG4	Must Operate
1-VLV-001-530		Must Operate
1-VLV-001-531		Must Operate

Spurious List

**PCV-1-5	Must Not Open
**PCV-1-12	Must Not Open
**PCV-1-23	Must Not Open
**PCV-1-30	Must Not Open

*All valves, for any two SGs being used for cooldown, must be operable. Operability assured by valve design.

**If secondary side depressurization occurs, the operator must place the SG PORV handswitches in the "closed" position.

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

Prepared by/Date R A Ellmore 2/10/88

Checked by/Date R. T. Clark 2/10/88

SEQUOYAH NUCLEAR PLANT
KEY 26
SECONDARY RELIEF VALVES

The secondary relief valves are required for long-term, secondary side pressure control and for cooldown. The valves are separated such that two valves will be accessible for manual handwheel operation. The secondary side pressure is monitored in the MCR for each of the two loops being used for cooldown.

The two valves which are chosen to operate must correspond to the two loops being used for cooldown. The other two valves must not spuriously open.

(Operation List)

PCV-1-5) PCV-1-12) PCV-1-23) PCV-1-30)	Two required	Must operate

For manual operation of the valves, any one of the three pressure indicators is required for each of the two loops being used for cooldown.

Instrument loop P-1-2A (for PI-1-2A)	Any one	Must operate
Instrument loop P-1-2B (for PI-1-2B)		Must operate
Instrument loop P-1-5 (for PI-1-5)		Must operate
Instrument loop P-1-9A (for PI-1-9A)	Any one	Must operate
Instrument loop P-1-9B (for PI-1-9B)		Must operate
Instrument loop P-1-12 (for PI-1-12)		Must operate
Instrument loop P-1-20A (for PI-1-20A)	Any one	Must operate
Instrument loop P-1-20B (for PI-1-20B)		Must operate
Instrument loop P-1-23 (for PI-1-23)		Must operate
Instrument loop P-1-27A (for PI-1-27A)	Any one	Must operate
Instrument loop P-1-27B (for PI-1-27B)		Must operate
Instrument loop P-1-30 (for PI-1-30)		Must operate

3446F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

SQN-SQS4-0127

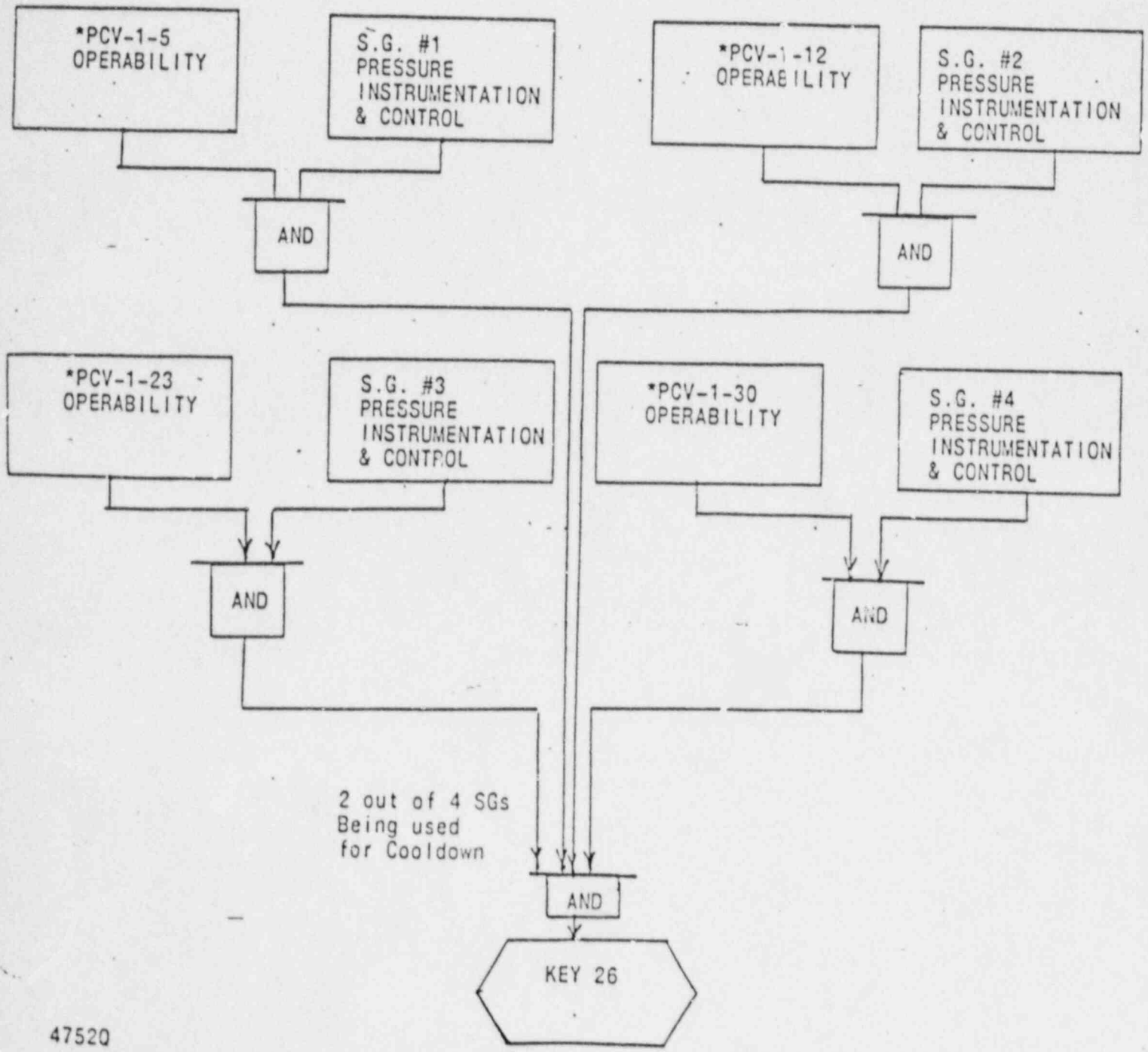
Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX A

KEY 26

SECONDARY RELIEF VALVES



47520

Prepared by/Date DAH 7-19-88

Checked by/Date RLC/Rev 4/29/88

APPENDIX A

SEQUOYAH NUCLEAR PLANT

Key 28

RCS PRESSURE CONTROL

In the event that the pressurizer heaters are lost, Sequoyah Nuclear Plant Special Startup Test No. 3, "Natural Circulation with loss of Pressurizer Heaters," determined that natural circulation conditions and saturation margin could be developed and maintained under the degraded condition of loss of all pressurizer heaters. Furthermore, the depressurization rate over the testing period was approximately 100 psig/hr. A 10 percent increase in pressurizer level would result in a greater than 100 psig pressure increase. Therefore charging the RCS to control pressure via level can be used in lieu of pressurizer heaters. Hence, the pressurizer heaters are not required for safe shutdown.

Additional backup for the validity of Special Startup Test No. 3 is provided by an analysis performed by Westinghouse for the St. Lucie event of 1980. The results of this analysis shows that for a 25°F/hour cooldown the pressure decay was 120 psi/hour and for a 50°F/hour cooldown the pressure decay was 200 psi/hour. The pressurizer heaters were <u>not</u> modeled in the analysis. (NEB 810501 301)

R9

If the ability to depressurize the RCS using pressurizer sprays and PORVs is lost, reference 11.20 determined that the RCS could be depressurized to the RHR cut-in point by alternately filling and draining the pressurizer. For this reason, the keys associated with make-up (keys 1, 2, 4, 5, 6, and 34) and letdown (Key 48) are included, since this method can be used as an alternate method of depressurizing the RCS.

Prepared by/Date DAH 4-11-88

Checked by/Date RLC Rev 4/29/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 28

Instrumentation

One cold and one hot leg temperature indicators are required for each of the two loops being used for cooldown. R9

Instrument Loop T-68-1 (for TR-68-1P001)	Two Loops required	Must operate
Instrument Loop T-68-18 (for TR-68-1P002)		Must operate
Instrument Loop T-68-41 (for TR-68-24P002)		Must operate
Instrument Loop T-68-24 (for TR-68-24P001)		Must operate
Instrument Loop T-68-43 (for TR-68-43P001)		Must operate
Instrument Loop T-68-60 (for TR-68-43P002)		Must operate
Instrument Loop T-68-65 (for TR-68-65P001)		Must operate
Instrument Loop T-68-83 (for TR-68-68P002)		Must operate
Instrument Loop P-68-69 (for PR-68-69)	Any one	Must operate
Instrument Loop P-68-66 (for PI-68-66A)		Must operate
Instrument Loop P-68-342C (for PI-68-342A)		Must operate

Spurious List

*FCV-68-332 (Block Valve)	Must operate
OR	OR
*PCV-68-340A (PORV)	Must not open
*FCV-68-333 (Block Valve)	Must operate
OR	OR
*PCV-68-334 (PORV)	Must not open
PCV-68-340B (Note 1)	Must operate
PCV-68-340D (Note 1)	Must operate

Note 1: If PCV-68-340B spuriously opens, trip RCP No. 2. If PCV-68-340D spuriously opens, trip RCP No. 1

* For events inside or outside containment, the operator must be capable of closing either of these valves in both paths (remotely from the MCR) if there is an excessive pressure decrease in the RCS. If this occurs, the PORV and the block valve handswitches must be placed in the closed position to prevent spurious opening due to the automatic pressure control circuits (e.g., PT-68-322, -323, -334, and -340).

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

Prepared by/Date DAH 4-29-88

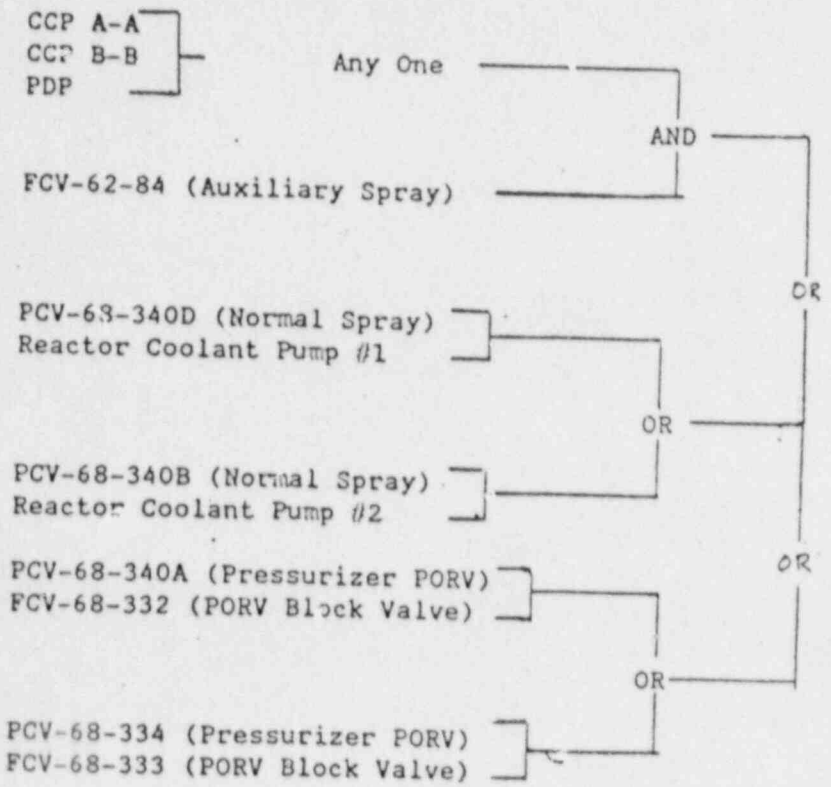
SQN-SQS4-0127

Checked by/Date RLC/RAL 4/29/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 28

Operational List

Preferred Flow Paths



Must Operate
Must Operate
Must Operate

Must Operate

Must Operate
Must Be Available

Must Operate
Must Be Available

Must Operate
Must Operate

Must Operate
Must Operate

R9

Alternate Flow Path

RCS ~~Makeup/Letdown~~ Letdown DAH 4-29-88
RCS ~~Letdown~~ Makeup DAH 4-29-88

Key 48
Key 1, 2, 4, 5, 6, and 34

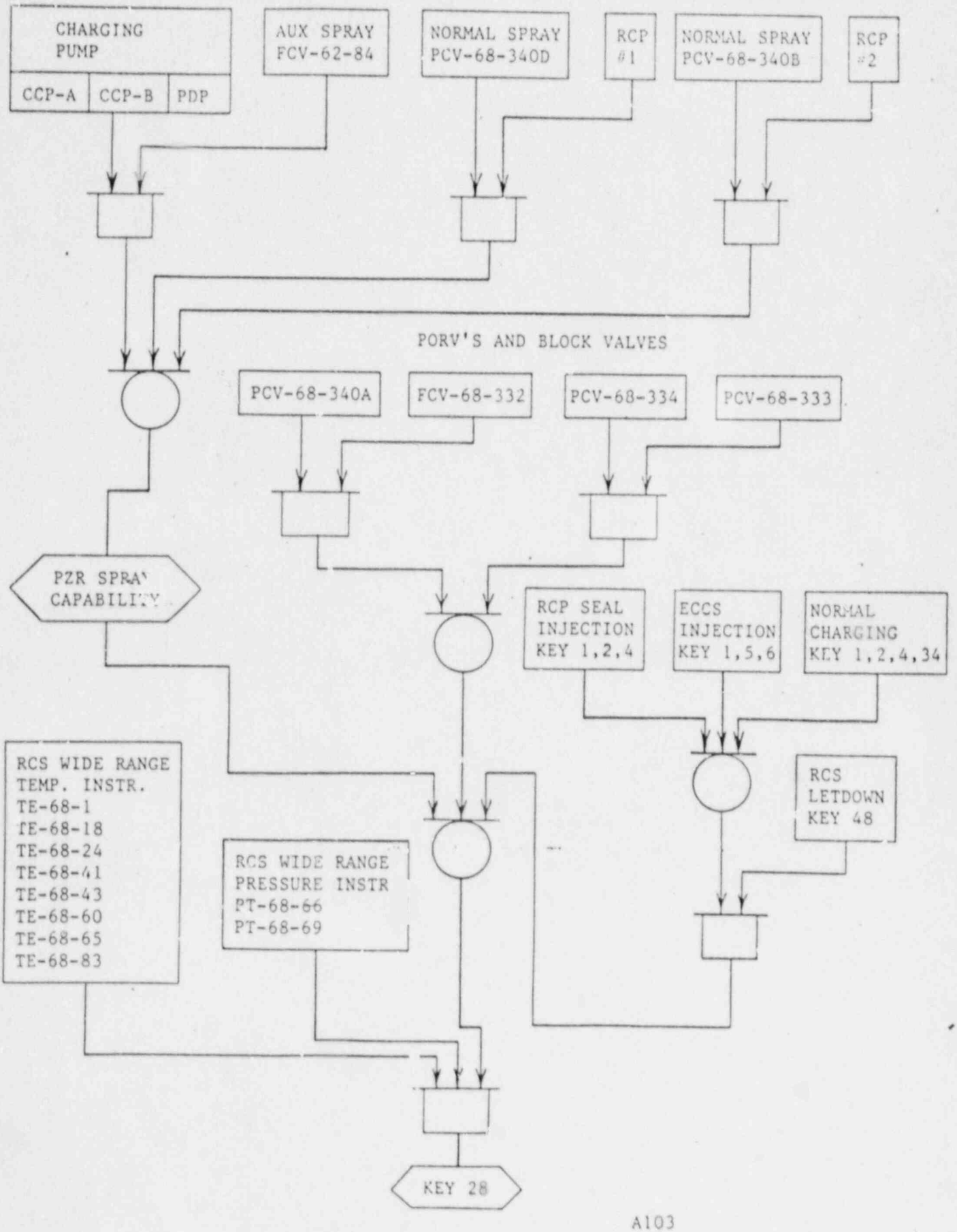
3489F/JMS

KEY 28

Prepared by/Date DAH 4-21-88

Reviewed by/Date RLC/Rau 4/29/88

SQN-SQS4-127



R9

APPENDIX A

Basis for Spurious List

Key 28

Item	Component	Basis
	Loop-T-68-1 Loop-T-68-18 Loop-T-68-41 Loop-T-68-24 Loop-T-68-43 Loop-T-68-60 Loop-T-68-65 Loop-T-68-83	Simultaneous failure of two or more loops is highly unlikely. However, if 3 out of 4 were to spuriously fail, the operator would have no indication of temperature (i.e., Tavg).
121	PCV-68-340A FCV-68-332	The pressurizer power relief and block valve are in series and constitutes an integral portion of the RCS pressure boundary. If one of these valves were to spuriously open ~~while~~ and the other ~~were open~~ could not be closed a LOCA would result. Rac 2/11/88
122	PCV-68-334 FCV-68-333	The pressurizer power relief and block valve are in series and constitutes an integral portion of the RCS pressure boundary. If one of these valves were to spuriously open ~~while~~ and the other ~~were open~~ could not be closed a LOCA would result. Rac 2/11/88
123	PCV-68-340B PCV-68-340D	A spurious actuation resulting in the failure of the pressurizer spray valves to close will result in a depressurization transient.

Prepared by/Date R A Elliott 2/10/

Checked by/Date R. J. Clark 2/10/8

APPENDIX A

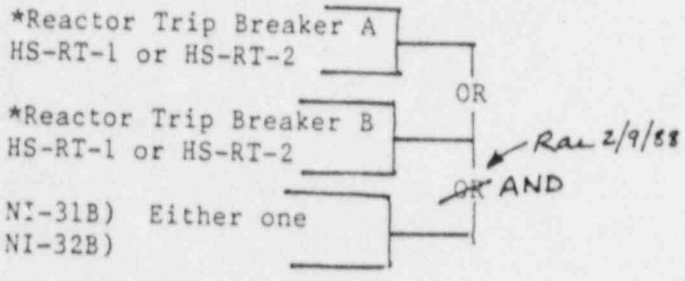
SEQUOYAH NUCLEAR PLANT
KEY 28
RCS PRESSURE CONTROL

FLOW DIAGRAM-LATER

APPENDIX A
Key 29
REACTOR TRIP

Reactor trip breaker A or B may be tripped by the handswitches in the MCR. Also, the reactor may be tripped using the motor-generator set breaker A or B. The reactor trip itself provides sufficient initial reactivity control. Until a letdown path is established, RCS makeup should be limited to seal injection. The makeup boron concentration must be greater than or equal to the RWST boron concentration. This will ensure subcriticality during cooldown to 200°F and an RHR letdown path is established for long term reactivity control per key 48 (reference SOI 26.3).

(Operation List)



Must Trip

Must Trip

Must Operate
Must Operate

The reactor can be manually shut down from the main control room, or if the fire damages the reactor trip breakers, the reactor can be manually shut down by de-energizing the control rod drive motor-generators. There are four paths to trip the reactor. For each of two trains, there is a shunt trip path and an undervoltage trip path. The shunt trip path trips the reactor by energizing the shunt trip coil in the reactor trip switchgear through a handswitch contact in the main control room. The undervoltage trip path trips the reactor by de-energizing the undervoltage trip coil in the reactor trip switchgear through a handswitch contact in the main control room. For an undervoltage trip path to fail, a perfect short to another power source must occur. For a shunt trip path to fail, the path must open without shorting. It is therefore considered incredible that all four paths will fail in the specific manner to disable each respective path, particularly in light of the fact that the trip handswitches in the main control room each utilize all four paths simultaneously when placed in the TRIP position. In addition, the reactor may be tripped locally at the reactor trip switchgear and the motor-generator set supply breaker. Procedure FR-S.1, "ATWS", covers operator actions that may be required in the highly unlikely event that all four paths fail in the manual trip circuits. The reactor protection system will not be specifically protected from fire damage. The fail-safe design of the reactor protection system and diversity of input signals which can detect a given event provide additional protection should an event occur before the operator could manually insert the control rods. The input signal cables are run in conduit which makes them less susceptible to fire damage. Fires which occur in the control building which are more threatening to the reactor protection system are fires for which the operator will manually insert the rods quickly to allow evacuation of the main control room.

APPENDIX A

* If these reactor trip breakers or handswitches are damaged due to a fire, the reactor may be tripped using the motor-generator breakers.

Prepared by/Date RA Edlund 2/10/88

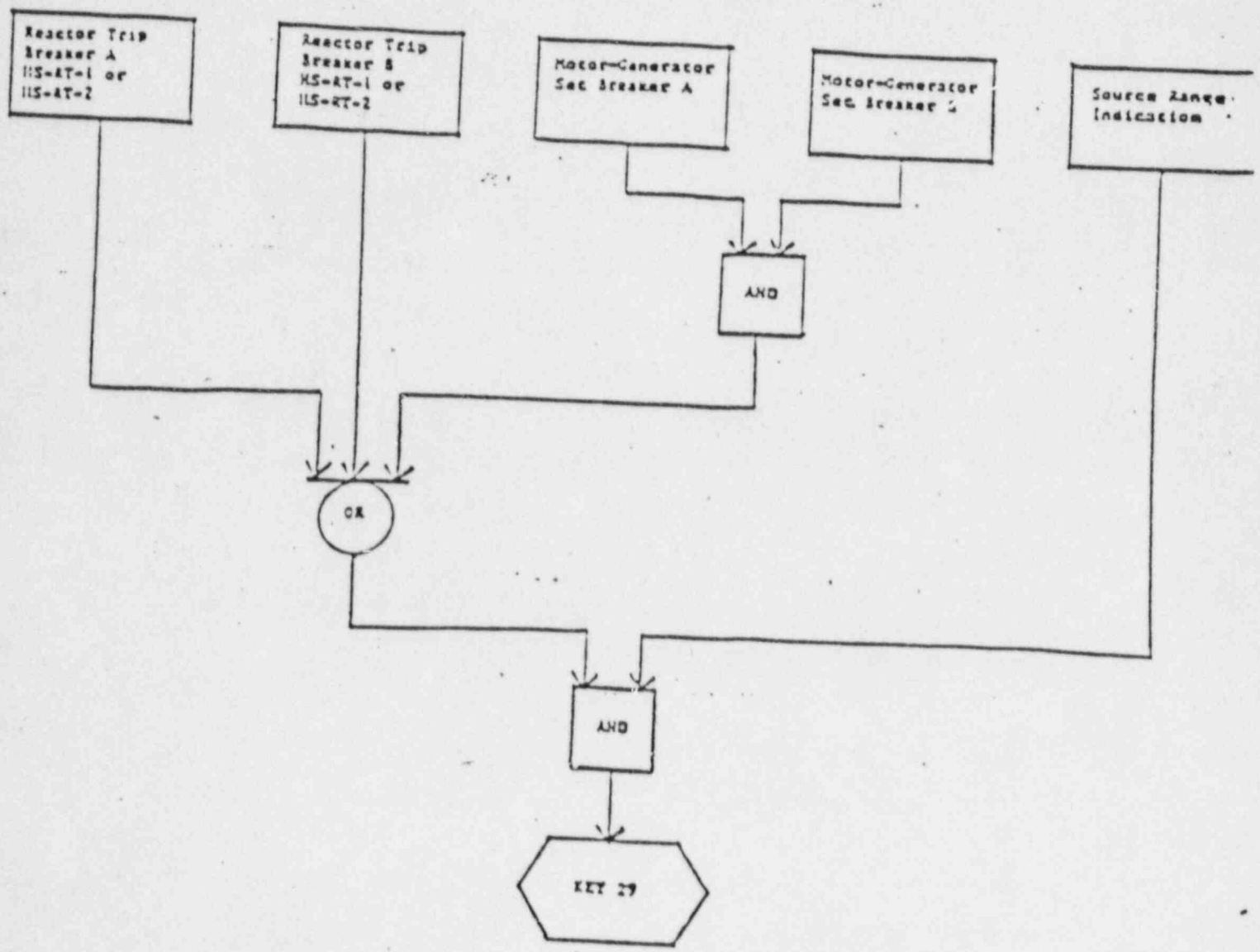
Checked by/Date R. J. Clark 2/10/88

APPENDIX A

SEQUOYAH NUCLEAR PLANT

Key 29

REACTOR TRIP



Prepared by/Date RA Edwards 2/10/

Checked by/Date R.J. Clark 2/10/88

APPENDIX A
KEY 30 - RHR SHUTDOWN COOLING FLOW PATH

The RHR system is required for long-term heat removal while bringing the plant to cold shutdown. This key identifies the flow path needed for circulation of RCS system. Handwheel operation of all valves required to provide the flow path is acceptable. In addition, verification of flow rates can be done locally using pump suction and discharge pressure and a pump curve or utilizing flow indicators.

(Operation and Spurious List)

FCV-74-1	Must open
FCV-74-2	Must open
*FCV-74-32	Must open
FCV-63-172	Must not open
Path 1	
FCV-72-40, 41	Must not open
FCV-63-8	Must not open
HVC-74-36	Must operate
FCV-63-72	Must not open
FCV-63-93	Must not close
FCV-74-16	Must remain open
FCV-74-3	Must not close
FCV-74-33	Must not close
**FCV-74-12	Must open
FCV-74-35	Must close
FI-63-91	(See option note above)
Path 2	
FCV-72-41, -40	Must not open
FCV-63-11	Must not open
FCV-74-21	Must not close
FCV-74-28	Must remain open
FCV-63-94	Must not close
FCV-63-73	Must not open
FCV-74-35	Must not close
HCV-74-37	Must operate
**FCV-74-24	Must open
FCV-74-33	Must close
FI-63-92	(See option note above)

Note: Local and/or handwheel operation of all valves acceptable. Once valves are in proper position, the power should be removed to prevent spurious operation. ~~If FCV-63-172 spuriously opens, it should be reclosed at external the MOV board. to containment within 72 hours.~~ can

RAE 2/10/88

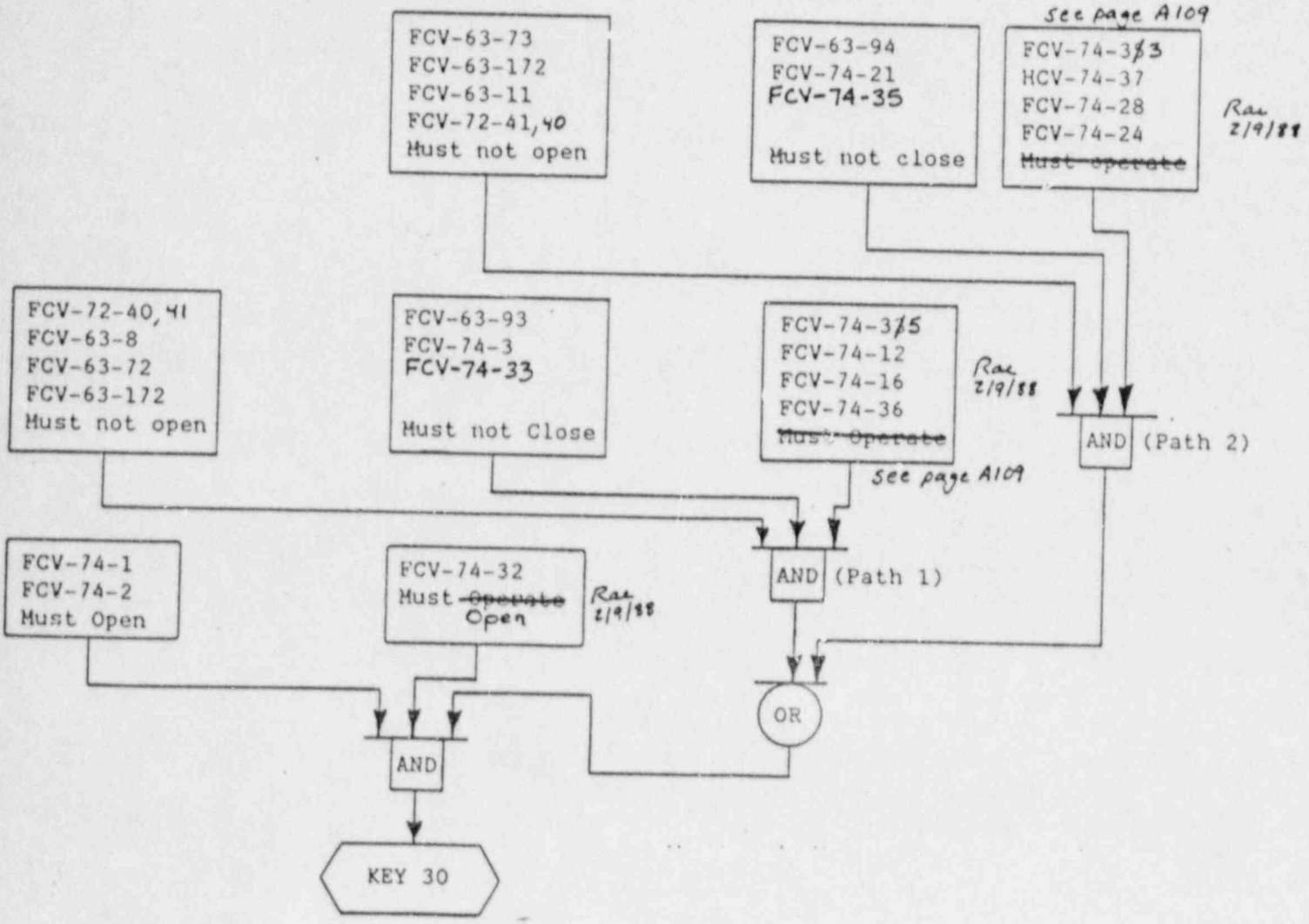
* If valve is incapable of being used to throttle bypass flow around the heat exchangers due to fire effects, HCV-74-36 (path 1) or HCV-74-37 (path 2) can be used as a throttle valve.

** If miniflow valves are inoperable due to fire effects, the operator must ensure a flow path to the RCS via the heat exchanger bypass prior to pump start.

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. L. Clark 2/10/88

APPENDIX A



Prepared by/Date R A Edlund 2/1

Checked by/Date R. L. Clark 2/10/1

APPENDIX A
Key 30

Item	Component	Basis
124	FCV-63-93	Spurious closure of this valve during RHR cooldown will terminate RHR flow to Loops 2 & 3. Thus, the RHR cooldown path to loops 1 and 4 will be affected.
125	FCV-74-16 FCV-74-28 (Path 2)	Same as item 124 heat removal capability from path 1 will be terminated.
126	FCV-74-3 FCV-74-21 (Path 2)	Same as item 124. If this were only heat removal path, reactor vessel temperature would start to rise.
127	FCV-63-172 FCV-74-33 (for train B FCV-74-35)	Failure of these valves to maintain their required position will result in inability to maintain RHR cocldown path.
128	FCV-63-72 FCV-63-73	Spurious opening of these valves must be avoided to prevent draining the RWST to the containment sump and to prevent potential RHR pump cavitation during plant cooldown.

APPENDIX A
SEQUOYAH NUCLEAR PLANT

Key 31

RHR PUMPS

- long-term heat removal, one RHR pump and cooling to the associated heat ex. nger are required. The CCS is required to provide cooling water to the RHR p. l cooler and to the RHR heat exchanger. The ERCW system is needed to supply cooling water to the CCS heat exchanger.

Component cooling and ERCW must be provided to assure RHR cooling requirements are satisfied. The same CCS and ERCW components used to achieve and maintain hot standby may be used for RHR system cooling while taking the plant to cold shutdown.

To ensure sufficient heat removal when using only one CCS pump for CCS header A, the following nonessential loads must be isolated.

Non-Regenerative Letdown Heat Exchanger
Spent Fuel Pit Heat Exchanger
Gas Stripper and Boric Acid Evaporator Package

If the train B CCS header is used for RHR cooling, the condensate demineralizer waste evaporator (CDWE) building must be isolated.

Operation List

Path 1

RHR pump A-A	Must operate
*FCV-70-156	Must open
0-FCV-70-197) Either one (Note 1) 0-FCV-70-198)	Must close

Path 2

RHR pump B-B	Must operate
*FCV-70-153	Must open

*Handwheel operation acceptable.

Prepared by/Date RA Edlund 2/10

Checked by/Date R.S. Clark 2/10/.

APPENDIX A
SEQUOYAH NUCLEAR PLANT

KEY 31 - RHR Pumps

Unit 1 Nonessential Loads***

*0-VLV-70-637) Either one	Must be closed
*0-VLV-70-661)	Must be closed
*0-VLV-70-587) Either one	Must be closed
*0-VLV-70-574)	Must be closed
*0-VLV-70-636) Either one	Must be closed
*0-VLV-70-601)	Must be closed

Unit 2 Nonessential Loads***

*0-VLV-70-637) Either one	Must be closed
*0-VLV-70-661)	Must be closed
*0-VLV-70-587) Either one	Must be closed
*0-VLV-70-574)	Must be closed
0-FCV-70-193) Either one (Note 1)	Must not open
0-FCV-70-194)	Must not open

Note 1: If neither valve can be protected from spuriously opening, the following must be accomplished:

*FCV-70-40		Must close
*FCV-70-11	Any one	Must close
*0-70-529A		Must be closed
*FCV-70-41		Must close
*FCV-70-1	Any one	Must close
*0-70-529B		Must be closed
*1-70-531	OR	Must be closed

*Handwheel operation acceptable.

***See discussion on need isolate nonessential loads at start of this key.

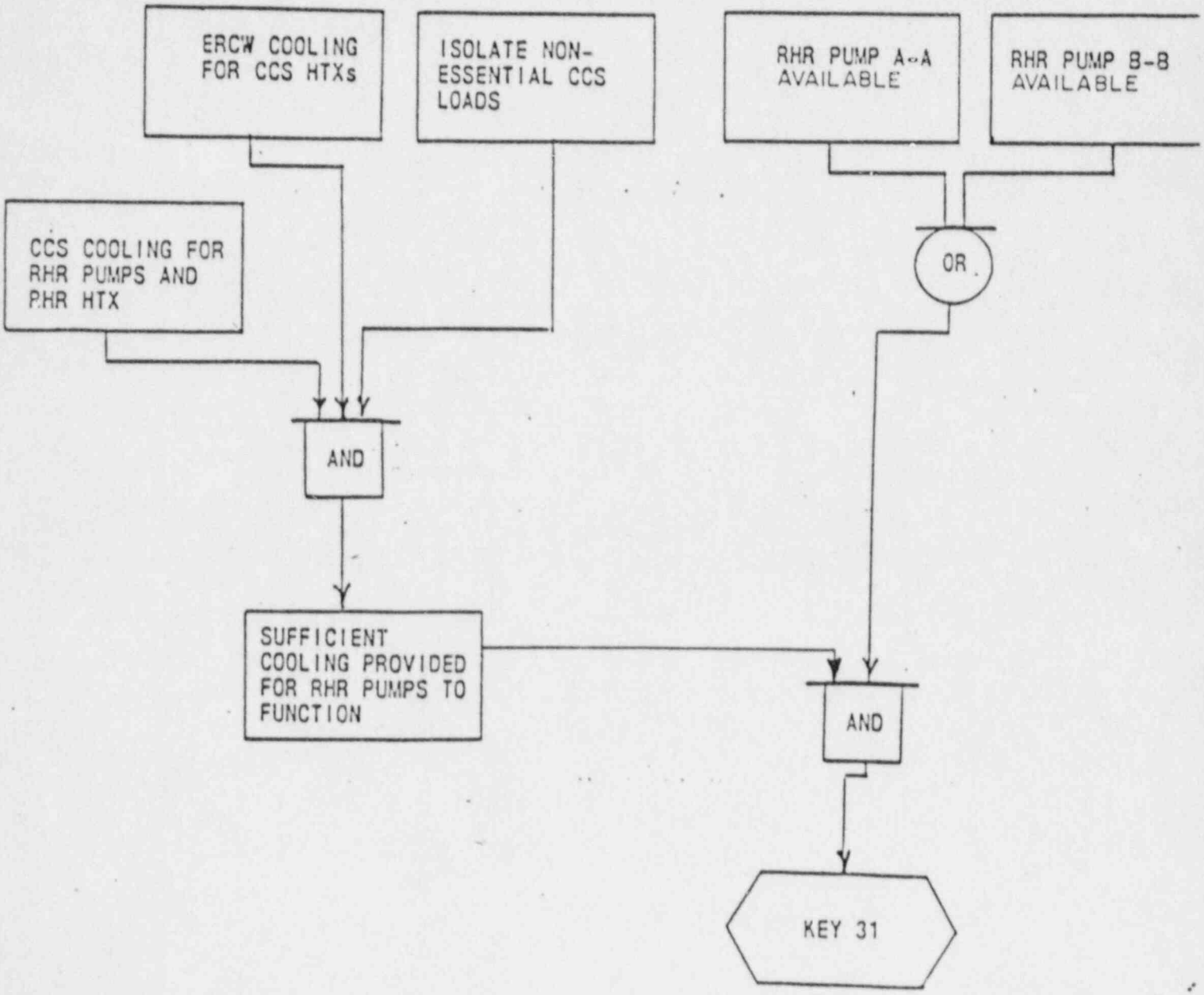
EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
DURING A DESIGN BASIS FIRE

SQN-SQS4-0127

Prepared by/Date RAEllard 2/1

Checked by/Date R.L. Clark 2/10

APPENDIX A



Prepared by/Date RA Eldred 2/10/8

Checked by/Date R.J. Clark 2/10/8

APPENDIX A
SEQUOYAH NUCLEAR PLANT

KEY 34

NORMAL CHARGING PATH

The normal charging path is aligned during power operation. If the normal flow control valve (key 2), FCV-62-93, is not available to throttle the charging flow, then the manual globe valves 62-526 and 62-534 can be manually controlled to throttle the flow.

Normal charging may be provided to the cold leg of loop 1 or the cold leg of loop 4. Since either path may be in use, both paths must be shown to be available at any time.

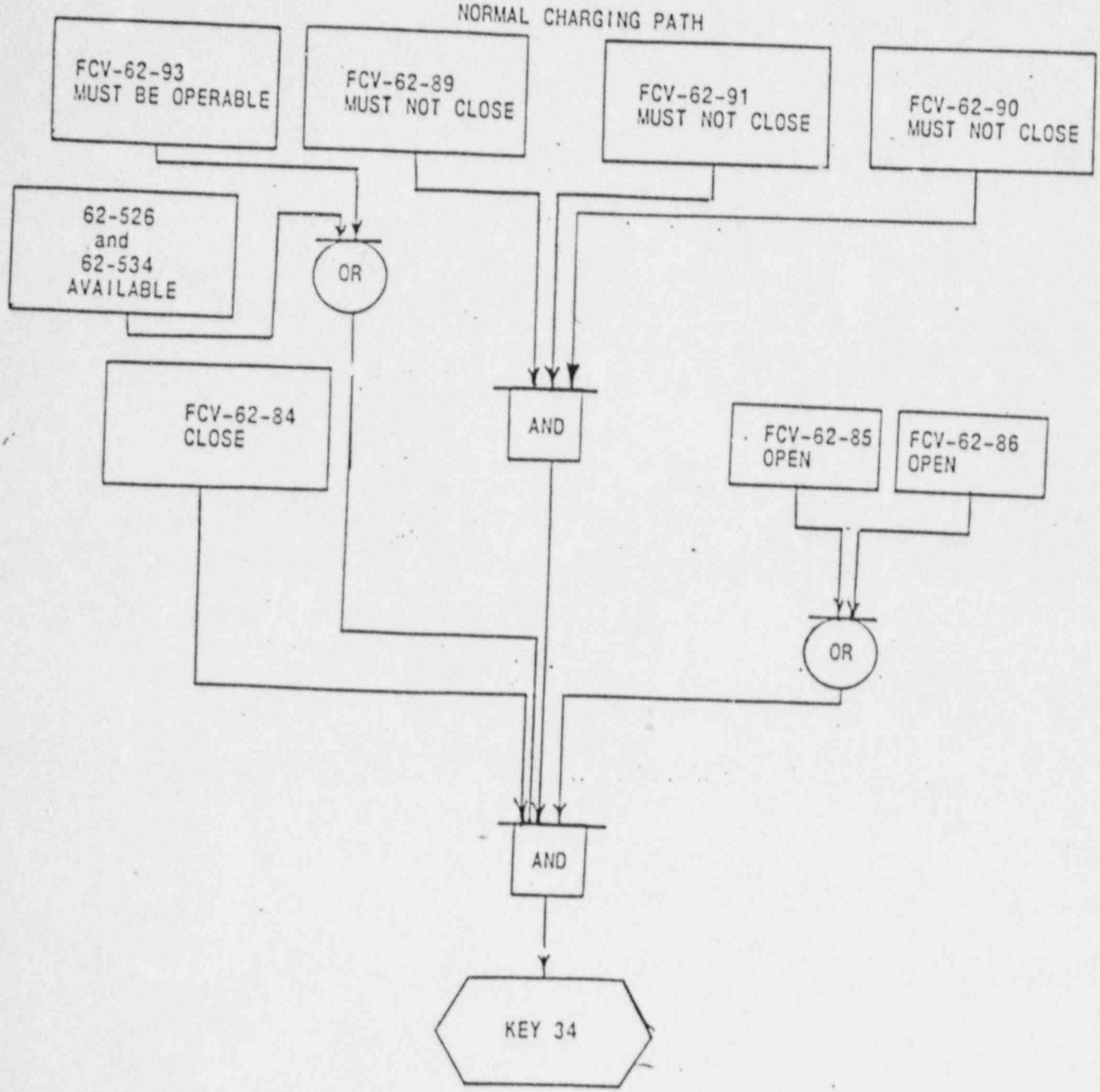
(Operation and Spurious List)

FCV-62-90	Must Not Close/Remain Operable
FCV-62-91	Must Not Close/Remain Operable
FCV-62-84	Must Not Open
FCV-62-85 OR FCV-62-86	Must Be Operable Must Be Operable
FCV-62-89	Must Not Close (Fails open)
FCV-62-93 OR VLV-62-526 VLV-62-534	Must Be Operable Must Be Operable Must Be Operable

APPENDIX A
SEQUOYAH NUCLEAR PLANT

KEY 34

NORMAL CHARGING PATH



APPENDIX A
Key 34

Item	Component	Basis
129	FCV-62-90 FCV-62-91 FCV-62-89 FCV-62-93	Any one valve will isolate makeup to the RCS if it spuriously closes.
130	FCV-62-86	This is an alternate charging path which must remain open if FCV-62-85 is closed.
131	FCV-62-84	Spurous opening of this valve would result in diversion of portion of charging flow. Thus level control in RCS may be affected
131a	FCV-62-85	Spurious closure of this valve will isolate the normal charging path.

* If FCV-62-89 should spuriously close manual bypass valve 62-538 can be used to reestablished normal makeup to RCS.

Prepared by/Date RAEdlund 2/10/88

Checked by/Date R. T. Clark 2/10/88

APPENDIX A

NORMAL CHARGING PATH

KEY 34

FLOW DIAGRAM-LATER

Prepared by/Date R A Clark 2/10

SQN-SQS4-0127

Checked by/Date R.A Clark 2/10/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT

KEY 36

ACCUMULATOR ISOLATION

As the RCS depressurizes while the plant is brought to cold shutdown, the UHI and the cold leg accumulators must be isolated. This requires closure of the UHI isolation gag valves and the cold leg accumulator isolation valves. If the accumulators cannot be isolated, they must be depressurized by venting the cover gas.

Operation List

UHI System:

87-550	Either one	Must Open (depressurize tank)
87-552)		Must Open (depressurize tank)

OR

FCV-87-21)	Either one	Must Close
FCV-87-22)		Must Close

AND

FCV-87-23)	Either one	Must Close
FCV-87-24)		Must Close

Note: Local Closure of all UHI valves acceptable.

SIS Cold Leg Accumulators:

FCV-63-63	Accumulator No. 4 Vent	All must open to depressurize accumulators
FCV-63-87	Accumulator No. 3 Vent	
FCV-63-107	Accumulator No. 2 Vent	
FCV-63-127	Accumulator No. 1 Vent	

AND

FCV-63-65	Accumulators common vent	Must open ~~AND~~ OR Rac 2/10/88 Rac 2/10/88

FCV-63-67	Accumulator No. 4 Isolation Valve	All must close to isolate accumulators
FCV-63-80	Accumulator No. 3 Isolation Valve	
FCV-63-98	Accumulator No. 2 Isolation Valve	
FCV-63-118	Accumulator No. 1 Isolation Valve	

NOTE: Prior to the RCS pressure dropping below ~~150~~ 100 Rac 2/10/88 psig, the cold leg accumulators must be either isolated or vented to prevent nitrogen intrusion into the RCS. Manual operation of these valves is acceptable ~~and possible~~ inside containment. Rac 2/10/88
(Reference SQN-SQS4-0149 R0, B45 871223 427)

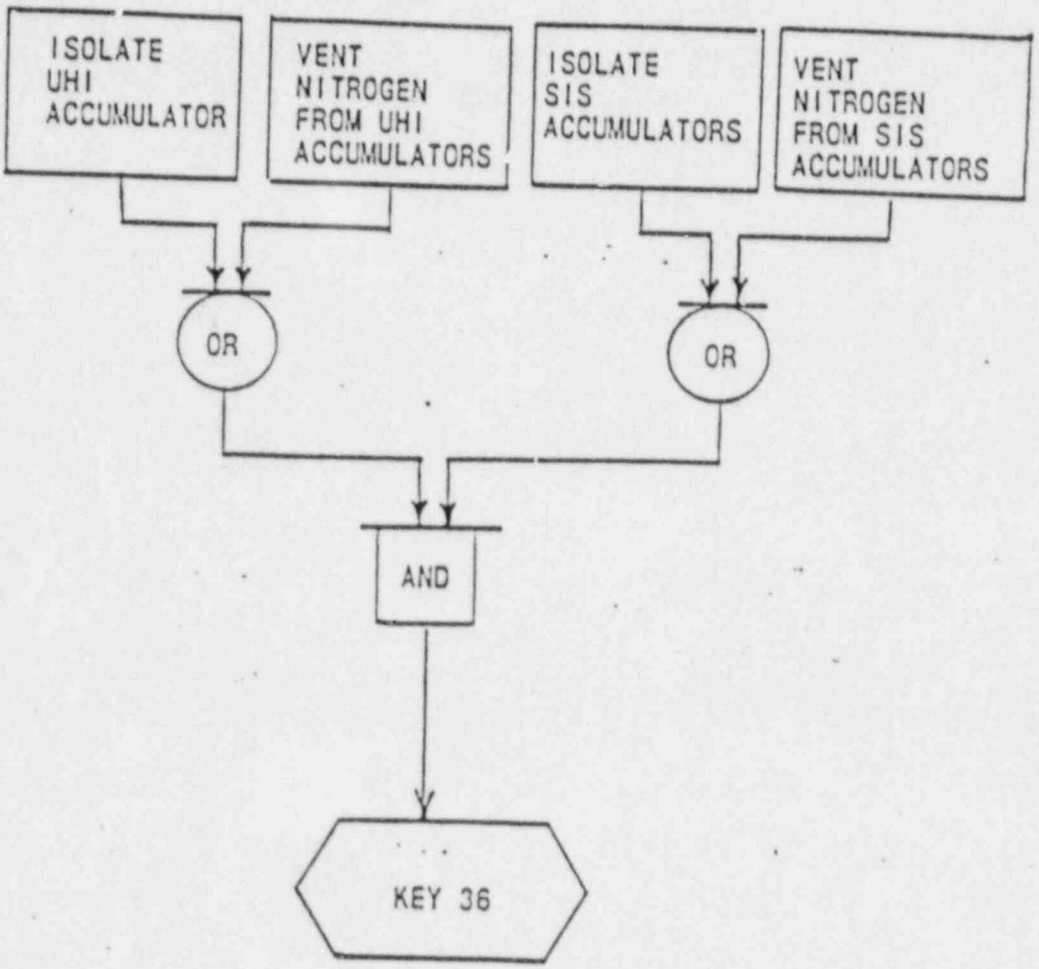
A119

Per TI-ANL-174, containment air temperatures are at 130°F ~~at~~ after 48 hours. Rac 2/11/88

3489F/JMS

APPENDIX A

KEY 36 - ACCUMULATOR ISOLATION



Prepared by/Date DAH 4-29-88

Checked by/Date RLC/RAM 4/29/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT

KEY 37

HVAC FOR COMPONENTS REQUIRED FOR HOT STANDBY AND COLD SHUTDOWN

This key contains the HVAC equipment required to achieve and maintain hot standby. Refer to Key 40 for additional components required to take the plant to cold shutdown.

Reference 11.13 determined that HVAC is required for an Appendix R scenario in the following areas.:

Main control room air-conditioning
Diesel generator building ventilation
Turbine-driven auxiliary feedwater (TDAFW) pump room ventilation
Centrigual charging pump room coolers
Residual heat removal (RHR) pump room coolers (Key 40)
480 V transformer room ventilation
Auxiliary building (AB) elevation 690' general floor air cooling (Key 370)

Reference 11.13 determined that, due to heat build-up in the following spaces (Elevation 690' penetration rooms, Auxiliary instrument room, and Pressurizer heater transformer room) during the first 72 hours of an Appendix R event, the designed cooling system or an equivalent system (i.e., temporary or general area ventilation) may be required after 72 hours. However, per reference 11.15, it should be noted that: "The 72 hour period allows sufficient time to restore offsite power, provide portable fans, or make repairs to HVAC equipment for longer term room cooling. Specific repair or corrective action procedures are not (emphasis added) required for actions beyond this period." 129

Reference 11.13 also determined that the following HVAC systems are not required to support an Appendix R scenario plant shutdown:

Steam valve vault ventilation
6.9 kV shutdown board room air-conditioning
480 V board room and battery room air-conditioning
Cable spreading room ventilation
Essential raw cooling water (ERCW) pumping station ventilation
Containment and containment instrument room cooling
Component cooling system (CCS) and Spent fuel pit cooling (SFPC) pump coolers
Pipe chase coolers

Prepared by/Date RA Eddins 2/10/87

Checked by/Date R. L. Clark 2/10/87

APPENDIX A
SEQUOYAH NUCLEAR PLANT

KEY 37A

HVAC Appendix R Review
Main Control Room Air Conditioning

Operation List

This set must operate or the set on the following page must operate.

A/C U A-A	Must run
FCO 31A-20	Must open
FSV 31A-20	Must de-energize
*FCO 31A-176	Must modulate
*Loop 31A-176	Must function
TCV 31A-47 & instrument loop	Must function
TCV 31A-48 & instrument loop	Must function
TCV 31A-49 & instrument loop	Must function
TCV 31A-50 & instrument loop	Must function
FSV 31A-22A	Must energize
FSV 31A-22B	Must energize
*Loop 31A-22	Must function
HS 31A-20A	Must function
HS 31A-20B	Must function
*Loop 31A-52	Must function
Loop 31A-136	Must function
Loop 31A-172	Must function
Loop 31A-134	Must function
Loop 31A-133	Must function
Loop 31A-132	Must function
Loop 31A-131	Must function
Loop 31A-130	Must function
Loop 31A-129	Musy function
Loop 31A-128	Must function
Loop 31A-127	Must function
Loop 31A-126	Must function

*Control air required for this function.

Manual control of these dampers can be taken to control main control room temperature in the event control air is not available.

APPENDIX A
SEQUOYAH NUCLEAR PLANT

KEY 37A

HVAC Appendix R Review
Main Control Room Air Conditioning

Operation List

This set must operate or the set on the preceding page must operate.

A/C U B-B	Must run
FCO 31A-23	Must open
FSV 31A-23	Must de-energize
*FCO 31A-177	Must modulate
*Loop 31A-177	Must function
TCV 31A-65 & loop	Must function
TCV 31A-66 & loop	Must function
TCV 31A-67 & loop	Must function
TCV 31A-68 & loop	Must function
FSV 31A-39A	Must energize
FSV 31A-39B	Must energize
*Loop 31A-39	Must function
HS 31A-23A	Must function
HS 31A-23B	Must function
*Loop 31A-70	Must function
Loop 31A-151	Must function
Loop 31A-173	Must function
Loop 31A-149	Must function
Loop 31A-148	Must function
Loop 31A-147	Must function
Loop 31A-146	Must function
Loop 31A-145	Must function
Loop 31A-144	Must function
Loop 31A-143	Must function
Loop 31A-142	Must function
Loop 31A-141	Must function

*Control air required for this function.

Manual control of these dampers valve can be taken to control main control room temperature in the event control air is not available.

Prepared by/Date Ra Ellen 2/10

Checked by/Date R.J. Clark 2/10/87

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37A
HVAC Appendix R Review
Main Control Room Air Conditioning

Path 1 (ERCW Header 1A)*

0-TCV-67-197** Must Not Close

Path 2 (ERCW Header 1B)*

0-TCV-67-201** Must Not Close

*See Key 3 for ERCW cooling lineup.

**Manually operated valves

Prepared by/Date DAH 4-29-89

Checked by/Date RLC/Rev 4/29/89

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37B
HVAC Appendix R Review
Aux Inst Rooms Air Conditioning
(Using Elec Board Room AHUs)

Operation List

For the Auxiliary Instrument Room, reference 11.13 determined that heat build-up due to a loss of cooling may necessitate that the designed cooling system (or an equivalent system) be reestablished after 72 hours from the start of the event. Therefore, local operator action may be required. However, reference 11.15 states that since sufficient time is available for repairs, specific procedures (pre-planned actions) are not required. 29

Prepared by/Date RA Eklund 2/10/88

Checked by/Date R. L. Clark 2/10/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT
HVAC Appendix R Review
KEY 37C
Diesel Generator Building Ventilation

Operation and Spurious List

Diesel Generator Room 1A-A

FCO-30-443	
Elec. Panel/Gen. Fan	Must Open
	Must Operate
Exhaust Fan 1	
HS-30-447B	Must Operate
HS-30-447C	Must Operate
FCO-30-447	Must Operate
	Must Operate
AND	
Exhaust Fan 2	
HS-30-451C	Must Operate
HS-30-451B	Must Operate
FCO-30-451	Must Operate
	Must Operate

Electrical Board Room Unit 1A-1

Elec. Bd. Rm. Ex. Fan	Must Operate
FCO-30-459	Must Open
HS-30-459C	Must Operate
HS-30-459B	Must Operate

The following instruments should not spuriously operate

TS-30-451B) A spurious low temperature signal would shut down the diesel
TS-30-447B) room fans.

For both the electrical board room and diesel generator room, a spurious CO_2 initiation signal should not occur. This would shut down the fans.

FCOs are motor operated.

Prepared by/Date R A Edlund 2/10/8

Checked by/Date R. J. Clark 2/10/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT
HVAC Appendix R Review
KEY 37C
Diesel Generator Building Ventilation

Operation and Spurious List

Diesel Generator Room 2A-A

FCO-30-444	
Elec. Panel/Gen. Fan	Must Open
	Must Operate
Exhaust Fan 1	
HS-30-448B	Must Operate
HS-30-448C	Must Operate
FCO-30-448	Must Operate
	Must Operate
AND	
Exhaust Fan 2	
HS-30-452B	Must Operate
HS-30-452C	Must Operate
FCO-30-452	Must Operate
	Must Operate

Electrical Board Room Unit 2A-A

Elec. Bd. Rm. Ex. Fan	Must Operate
FCO-30-460	Must Open
HS-30-460B	Must Operate
HS-30-460C	Must Operate

The following instruments should not spuriously operate

TS-30-448B)
TS-30-452B) A spurious low temperature signal would shut down the diesel room fans.

For both the electrical board room and diesel generator room, a spurious CO_2 initiation signal should not occur. This would shut down the fans.

FCOs are motor operated.

Prepared by/Date R A Edlund 2/10/87

Checked by/Date R. T. Clark 2/10/87

APPENDIX A
SEQUOYAH NUCLEAR PLANT
HVAC Appendix R Review
KEY 37C
Diesel Generator Building Ventilation

Operation and Spurious List

Diesel Generator Room 1B-B

FCO-30-445	Must Open
Elec. Panel/Gen. Fan	Must Operate
Exhaust Fan 1	Must Operate
HS-30-449B	Must Operate
HS-30-449C	Must Operate
FCO-30-449	Must Operate
AND	
Exhaust Fan 2	Must Operate
HS-30-453B	Must Operate
HS-30-453C	Must Operate
FCO-30-453	Must Operate

Electrical Board Room Unit 1B-B

Elec. Bd. Rm. Ex. Fan	Must Operate
FCO-30-461	Must Open
HS-30-461B	Must Operate
HS-30-461C	Must Operate

The following instruments should not spuriously operate

TS-30-453B) A spurious low temperature would shut down the diesel
TS-30-449B) room fans.

For both the electrical board room and diesel generator room, a spurious CO_2 initiation signal should not occur. This would shut down the fans.

FCOs are motor operated.

APPENDIX A
SEQUOYAH NUCLEAR PLANT
HVAC Appendix R Review
KEY 37C
Diesel Generator Building Ventilation

Operation and Spurious List

Diesel Generator Room 2B-B

FCO-30-446	Must Open
Elec. Panel/Gen. Fan	Must Operate
Exhaust Fan 1	Must Operate
HS-30-450B	Must Operate
HS-30-450C	Must Operate
FCO-30-450	Must Operate
AND	
Exhaust Fan 2	Must Operate
HS-30-454B	Must Operate
HS-30-454C	Must Operate
FCO-30-454	Must Operate

Electrical Board Room Unit 2B-B

Elec. Bd. Rm. Ex. Fan	Must Operate
FCO-30-462	Must Open
HS-30-462B	Must Operate
HS-30-462C	Must Operate

The following instruments should not spuriously operate

TS-30-450B)
TS-30-454B) A spurious low temperature signal would shut down the diesel room fans.

For both the electrical board room and diesel generator room, a spurious CO_2 initiation signal should not occur. This would shut down the fans.

FCOs are motor operated.

References: 47W866-9 (R8)
47W611-30-7 (R7)

APPENDIX A
SEQUOYAH NUCLEAR PLANT
HVAC Appendix R Review
KEY 37D
Steam Valve Vault Ventilation System

KEY 37D

Operation of the main steam valve vault ventilation system is not required during the Appendix R scenario. This was a joint decision between Main Kitchell, John Platfoot, Bobby Williams, and Emerson Rudacille made on August 10, 1984. The decision was reached after it was pointed out that (1) the ventilation system is not safety related, and (2) components located in the steam valve vault required for shutdown are qualified for a main steam line break environment, a more severe criteria than loss of ventilation.

Prepared by/Date R A Edlund 2/10

Checked by/Date R. L. Clark 2/10/8

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37E

Shutdown Board Room Air Conditioning
Elevation 734
Equipment Needed for Plant Shutdown Following a Fire

Per reference 11.13, cooling is not required for this area.

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37F
480V Board Rooms and Battery Rooms Air Conditioning
El 749

Per reference 11.13, cooling is not required for either the 480V Board Rooms 1A, 2A, 1B, 2B, nor for Battery Rooms I, II, III and IV.

Note local operator action is required to validate assumptions made in reference 11.13 (see Appendix B of this document).

Prepared by/Date R.A. Edwards 2/10/

Checked by/Date R. L. Clark 2/10/81

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37G
10CFR Appendix R HVAC Review
Cable Spreading Room

A requirement for the use of ventilation for plant shutdown is not foreseen for the cable spreading room as reviewed according to Appendix R guidelines. However, the following points are worth mentioning:

1. The spreading room supply and exhaust fans are not safety-related and are not required for shutdown, even during LOCA or HELB conditions. They are powered from 480V reactor vent boards 1A-A and 1B-B (drawing 45W760-31-7). Those boards are load shed in the event of an accident. (The board can, however, be loaded on the diesels later if desired.)

2. The cooling load in the spreading room is approximately 127,000 Btu/hr, a large portion being lights.

3. There is no vital heat-sensitive equipment or instrumentation located in the spreading room. It is expected that it could get fairly warm in the spreading room with no adverse affects.

4. If plant personnel decide to ventilate the spreading room after a fire, it could be accomplished in several different ways. If the supply fan and one exhaust fan are available these could be used, provided in-line dampers are opened either remotely or manually. Secondly, if the single supply fan isn't available, it's possible to ventilate the room with one exhaust fan (if usable) and by opening the door into the stairwell at the opposite end of the room. Of course, portable fans could also be used.

5. To minimize heat buildup in the room during nonventilation periods, the lights, which produce a significant amount of heat, could be turned off.

The fans are not required for shutdown, although there are several methods available to ventilate the spreading room, if desired.

Prepared by/Date DAH 4-29-88

Checked by/Date RLC/nan 4/29/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37H
PRESSURIZER HEATER TRANSFORMER ROOM (EL 759)
10CFR50 APPENDIX R REVIEW

The pressurizer heaters are not required for safe shutdown - see key 28. However, because other essential equipment (see reference 11.17) required for safe shutdown is located in the Pressurizer Heater Transformer Room, reference 11.13 determined that heat build-up due to loss of cooling may necessitate that the designed cooling system (or an equivalent system) be re-established after 72 hours from the start of the event.

Therefore, local operator action may be required. However, reference 11.15 states since sufficient time is available for repairs, specific procedures (pre-planned actions) are not required.

R9

APPENDIX A

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APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37I
ERCW Pumping Station
Drawing Ref: 37W900-3R6, -4R3

Per reference 11.13, cooling is not required for this area.

Prepared by/Date DAH 4-11-88

Checked by/Date RLC/RAM 4/29/8

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37J
Appendix R Review
Containment Cooling System

A temperature profile for lower containment has been developed assuming no containment cooling is available and assuming RCS blowdown (from the PORV's or RVHV's) to the PRT (reference 11.18). The mass and energy released to containment following blowout of the PRT rupture disks will produce an environment more severe than has been previously analyzed (excluding a HELB).

MEB and EEB have provided documentation (references 11.15 and 11.19) that all Appendix R equipment inside containment is qualified or fails in the position required for safe shutdown. Additionally, this documentation substantiated that several components were not "qualified" for the temperature excursion. For example, TM-68-1C, -24C, -43C, and -65C are not required except for fires inside the Control Building which require evacuation to the auxiliary control room; FSV-68-303 is not required for Appendix R. 29

In summary, containment cooling is not required for Appendix R.

Prepared by/Date DAH 4-21-88

Checked by/Date RLC/RAL 4/29/8

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37K
480V TRANSFORMER ROOM VENTILATION
EL 749 AUX BLDG

Reference 11.13 has determined, if ventilation is lost to one of the transformer rooms (due to a fire outside of the room) temporary ventilation at a rate of 5000 cfm of outside air must be supplied to that room. This measure must be taken within 5 hours (for rooms 1A and 2B) and within 10 hours (for rooms 1B and 2A) from the start of the event. Additionally, the common board transformers in rooms 1A and 2B must be load shed at one-half hour into the event. R9

Note local operator action is needed to validate assumptions made in Reference 11.13 (see Appendix B of this document).

Prepared by/Date RA Edlund 2/10/88

Checked by/Date D. J. Clark 2/10/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37L
APPENDIX R REVIEW
CONTAINMENT INSTRUMENT ROOM
COOLING SYSTEM

Per reference 11.13, cooling is not required for this area.

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37M
PENETRATION ROOM COOLERS

For the Elevation 690' Penetration Room, reference 11.13 determined that heat build-up due to a loss of cooling may necessitate that the designed cooling system (or an equivalent system) be re-established 72 hours from the start of the event. R9

Therefore, local operator actions may be required. However, Reference 11.15 states since sufficient time is available for repairs, specific procedures (pre-planned actions) are not required.

Prepared by/Date R A Edlund 2/10/

Checked by/Date R. J. Clark 2/10/88

APPENDIX A
KEY 37N
TURBINE DRIVEN AUXILIARY FEEDWATER PUMP ROOM (TDAFWP)
UNIT 1, EL 669

Operation List

DC Powered TDAFW Pump Room Exhaust Fan	Must Operate
1-HS-30-214	Must Operate
1-TS-30-214	Must Operate

Note: 1. The DC powered fan is connected to the vital batteries and is connected to the same power source to which the TDAFW pump controls are connected. The DC fan will start upon pump start or upon high room temperature.

2. There is an AC powered fan available for cooling. However, this fan cannot be loaded onto the diesels.

3. There are no items considered for spurious operation of the ventilation cooling for this space.

References: 47W866-2 R29
47W611-30-6 R14
47W610-30-6 R14

Prepared by/Date RA Edlund 2/10/

Checked by/Date R.L. Clark 2/10/9.

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37N
TURBINE DRIVEN AUXILIARY FEEDWATER PUMP ROOM (TDAFWP)
UNIT 2, EL 669

Operation List

DC Powered TDAFW Pump Room Exhaust Fan	Must Operate
2-HS-30-214	Must Operate
2-TS-30-214	Must Operate

Note: 1. The DC powered fan is connected to the vital batteries and is connected to the same power source to which the TDAFW pump controls are connected. The DC fan will start upon pump start or upon high room temperature.

2. There is an AC powered fan available for cooling. ...wever, this fan cannot be loaded onto the diesels.

3. There are no items considered for spurious operation of the ventilation cooling for this space.

References: 47W866-11 R19
47W611-30-6 R14
47W610-30-6 R14

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

Prepared by/Date DAH 4-14-88

SQN-SQS4-0127

Checked by/Date RLC/RAL 4/29/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37 O
BORIC ACID TRANSFER PUMPS & AFW
PUMPS COOLERS AND CCS & AFW PUMP COOLERS

Reference 11.13 determined that only one of the four auxiliary building elevation 690' general floor area coolers (CCS & AFW pump space coolers and the AFW & Boric Acid Transfer pump space coolers) are required to operate for an Appendix R event.

This analysis is based upon one train of pumps (AFW & CCS) not being used after one-half hour into the event. That is, the analysis assumes only one AFW and two CCS pumps are running one-half hour after losing the HVAC equipment.

Note local operator action is needed to validate assumptions made in Reference 11.13 (see Appendix B of this document).

R9

CCS/AFW pump space cooler 1A-A *1-FCV-67-162	one out of four space coolers	Must Operate
CCS/AFW pump space cooler 1B-B *1-FCV-67-164		Must Operate
BA/AFW pump space cooler 2A-A *2-FCV-67-217		Must Operate
BA/AFW pump space cooler 2B-B *2-FCV-67-219		Must Operate

*Manual operation is acceptable

3489F/JMS

Prepared by/Date DAH 4-21-88

Checked by/Date RLC/RAN 4/29/88

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37 P
CCS AND SPENT FUEL PUMP SPACE COOLERS (EL 714')

R9

Reference 11.13 determined that cooling is not required for this area based upon operator actions described in Appendix B.

Prepared by/Date RALdlm 2/10.

Checked by/Date R.T. Clark 2/10/.

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37R
CHARGING PUMP COOLERS (EL 669)

Charging pump room cooling is included in Key 1.

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 37S
AIR SUPPLY FOR HVAC

The components required for suppling control air to the HVAC equipment are listed in Key 13. Control Air Supply, Path 1, is required for all train A air-operated equipment unless manual control is available. Control Air Supply, Path 2, is required for all train B air-operated equipment unless manual control is available.

APPENDIX A
SEQUOYAH NUCLEAR PLANT
KEY 40
RHR PUMP COOLERS (EL 653)

When taking the plant from hot standby to cold shutdown, the only additional HVAC function required is RHR pump room cooling. This is supplied by the RHR pump room cooler with cooling water from the ERCW system.

Operation List

RHR Pump 1A Cooling	
RHR cooler fan 1A-A	Must Operate
*Instrument loop 1-TS-30-175	Must Operate
**1-FCV-67-188	Must Open
RHR Pump 1B Cooling	
RHR cooler fan 1B-B	Must Operate
*Instrument loop 1-TS-30-176	Must Operate
**1-FCV-67-190	Must Open
RHR Pump 2A Cooling	
RHR cooler fan 2A-A	Must Operate
*Instrument loop 2-TS-30-175	Must Operate
**2-FCV-67-188	Must Open
RHR Pump 2B Cooling	
RHR cooler fan 2B-B	Must Operate
*Instrument loop 2-TS-30-176	Must Operate
**2-FCV-67-190	Must Open

*Fan motor control loop
**A design change has been made under ECN-L6258 to remove air from this valve. Valve has been failed in the open position.

Prepared by/Date R A Edlund 2/10/89

Checked by/Date R L Clark 2/10/89

APPENDIX A
SEQUOYAH NUCLEAR PLANT

KEY 41

Key 41: Operator Integrity

Communications capability: see reference 11.14.

Lighting: see reference 11.8 and 11.14. (This establishes the requirements to implement 10CFR50 Appendix R, III.J.)

Access Control: Security systems and other door locking devices must not operate or fail to operate in a fashion that would prevent access by fire brigade or operators. Reference calculation EEB 841010 912.

Prepared by/Date DAH 4-19-89

Checked by/Date RLC/RAM 4/29/89

APPENDIX A

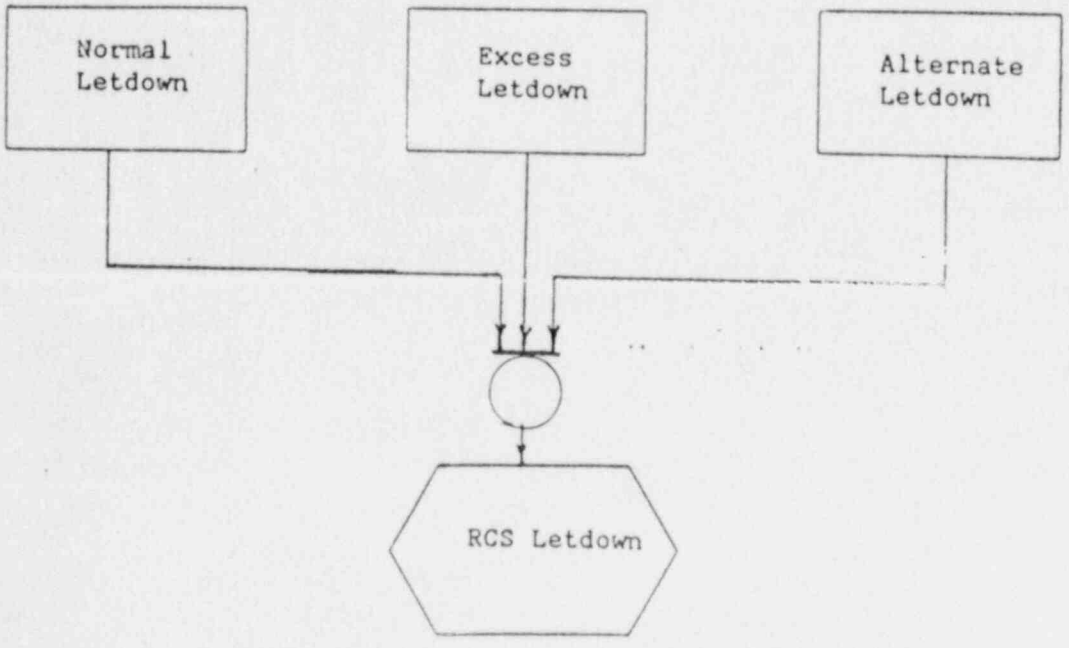
KEY 48

RCS LETDOWN CAPABILITY

Reactor coolant system (RCS) makeup and letdown paths are used to control inventory by varying charging and letdown flow respectively. The components required for RCS makeup are defined in Keys 1, 2, 4, 5, 6, and 34. Along with inventory control, the makeup/letdown paths are also used to provide long term reactivity control by boration.

The availability of one of three paths (i.e., normal, excess, or alternate letdown) will also provide an alternative means of depressurizing the RCS (see Key 28 and Appendix B).

89



A149 Rev 11-88

Prepared by/Date DAH 4-29-88

Checked by/Date RLC/RAM 4/29/88

APPENDIX A

KEY 48
RCS LETDOWN CAPABILITY

1) Normal Letdown

During the first 72 hours following an Appendix R fire, the operator can control RCS inventory, boration, and pressure by using the flow path defined by the following equipment:

FCV-62-69		Open
FCV-62-70		Open
FCV-62-72)		Must operate
FCV-62-73)	Any one	Must operate
FCV-62-74)		Must operate
Normal Charging (Key 1,2,4,5 & 34)		Must be available
*FCV-62-77)		Close
VLV-62-723)	Either one	Close
RV-62-662		Must operate

R9

The above flow path can be used to control RCS pressure from 2235 psig to 600 psig. To depressurize the RCS from 600 psig to the RHR cut-in point (380 psig), two methods are available:

Method I

The RCS will depressurize from 600 psig to the RHR cut-in point due to cooldown caused by ambient heat losses and decreasing core decay heat. This method requires that all RCS make-up including RCP seal injection be terminated (i.e., securing the charging pump). However, this approach requires the thermal barrier heat exchangers and all supporting equipment be available to protect the RCP seals. RCS letdown through the RCP seals to the PRT will enhance depressurization by draining the pressurizer. The flow path utilizing this option is defined by the following equipment:

*FCV-62-61)		Close
*FCV-62-63)	OR	Close
VLV-62-715)		Close
RV-62-636		Operate
Thermal Barrier Heat Exchanger (Key 9)		Must be available

*Manual operation is acceptable.

APPENDIX A

KEY 48
RCS LETDOWN CAPABILITY

Method II

The RCS can also be depressurized from 600 psig to the RHR cut-in point (using the pressurizer filling and draining process) by using the flow path defined by the following equipment:

FCV-62-69		Open
FCV-62-70		Open
FCV-62-72)		Must Operate
FCV-62-73)	Any One	Must Operate
FCV-62-74)		Must Operate
Normal Charging (Key 1, 2, 4, 5, & 34)		Must be available
*FCV-62-77		Open
PCV-62-81		Must Operate
	OR	
VLV-62-672		Must Operate
*LCV-62-118		Open
CCS to Letdown HX (Either CCS Pump A or B & *TCV-70-192)		Must be available

2) Excess Letdown

If normal letdown is not available, the operator can elect to use the excess letdown path as defined by the following equipment:

Method I:

FCV-62-54	Open
FCV-62-55	Open
FCV-62-56	Open
FCV-62-59	Open
*FCV-62-61	Open
*FCV-62-63	Open
CCS to Excess Letdown HX (CCS Pump A or B, *FCV-70-85, & *FCV-70-143)	Must be available
CCS to Seal Water HX (CCS Pump A or B)	Must be available

* Manual operation is acceptable.

R9

Prepared by/Date DAH 4-24-00
Checked by/Date RLC/RM 4/2

Appendix A
Key 48
RCS Letdown Capability

2) Excess Letdown (continued)

Method II:

FCV-62-54		Open
FCV-62-55		Open
FCV-62-56		Open
FCV-62-59		Open
*FCV-62-61	Any one	Close
*FCV-62-63		Close
FCV-62-715		Close
RV-62-636		Must Operate
CCS to Excess Letdown Heat Exchanger (CCS pump A or B, FCV-70-85,* FCV-70-143*)		Must be Available

*Manual operation is acceptable.

Prepared by/Date DAH 4-21-88

Checked by/Date RLC/RAH 4/29/88

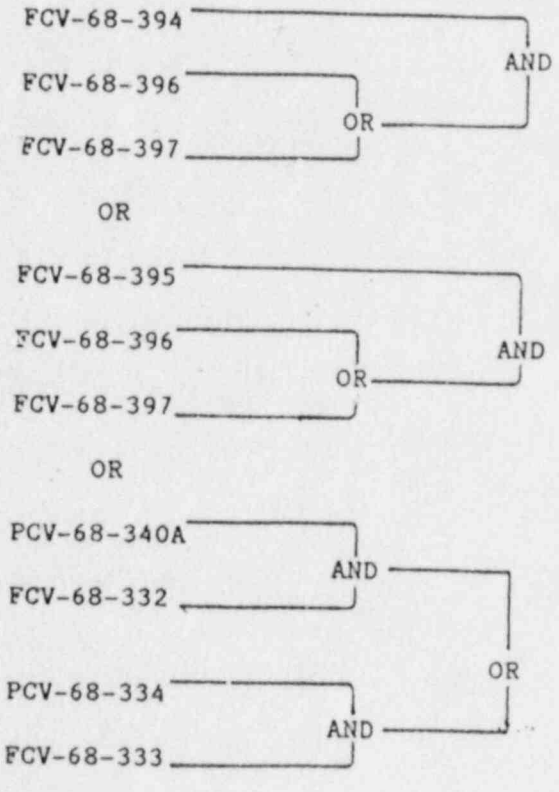
APPENDIX A

KEY 48 (Continued)

RCS LETDOWN CAPABILITY

3) Alternate Letdown

In the event the normal and excess letdown paths are not available, the following path can be used to control RCS pressure and/or inventory by filling and draining the pressurizer.



Must open
Must operate
Must operate

Must open
Must operate
Must operate

Must operate
Must open

Must operate
Must open

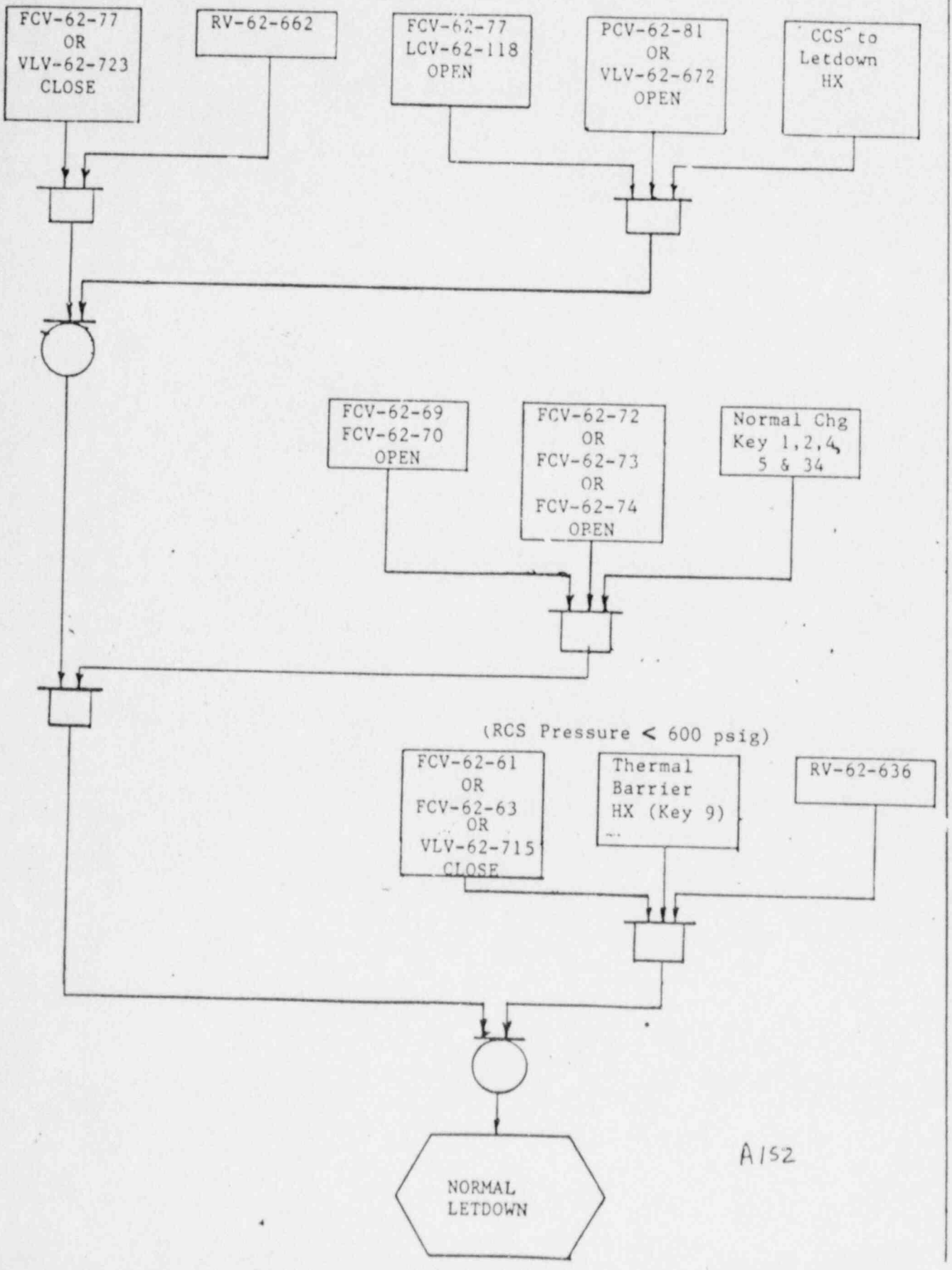
R9

SQN-SQS4-127

Prepared by/Date DAH 4-24-88
Reviewdd by/Date RLC/RLC 4/29/88

NORMAL LETDOWN

(RCS Pressure ≥ 600 psig)



R9

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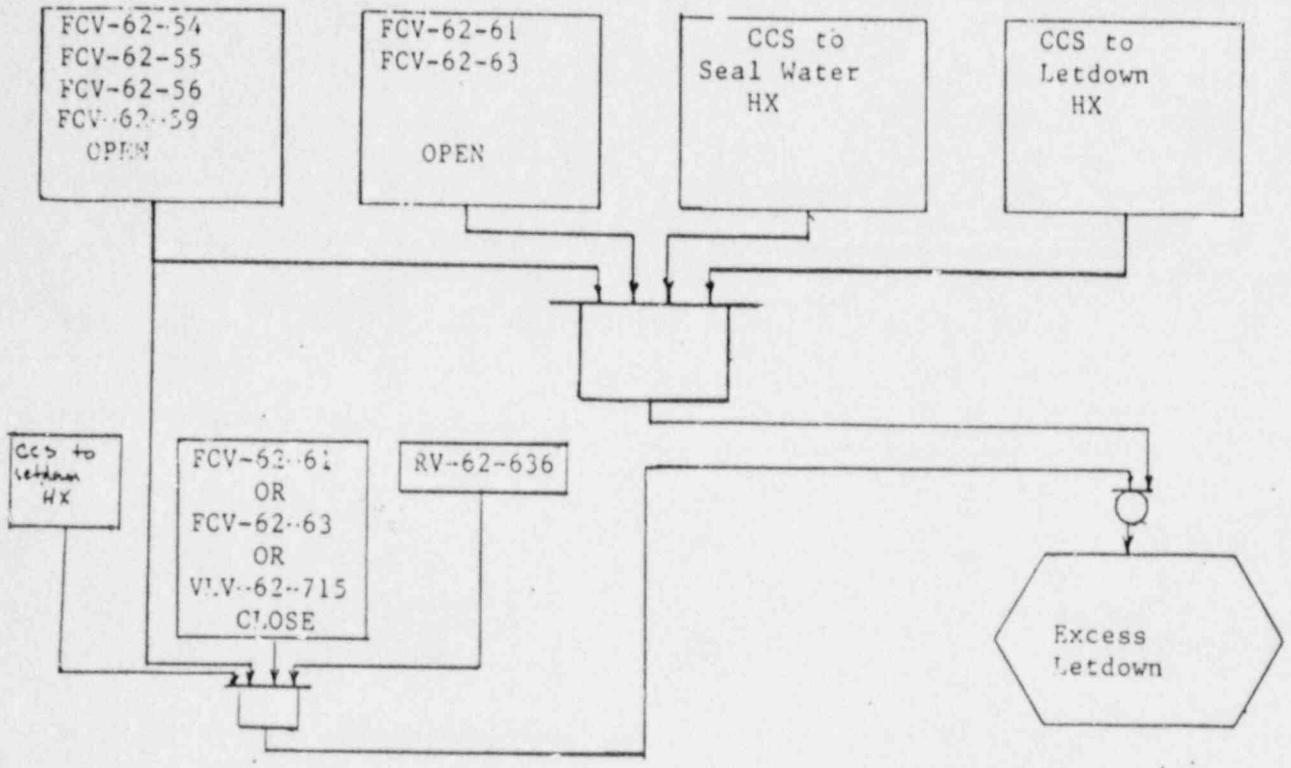
SQN-SQS4-127

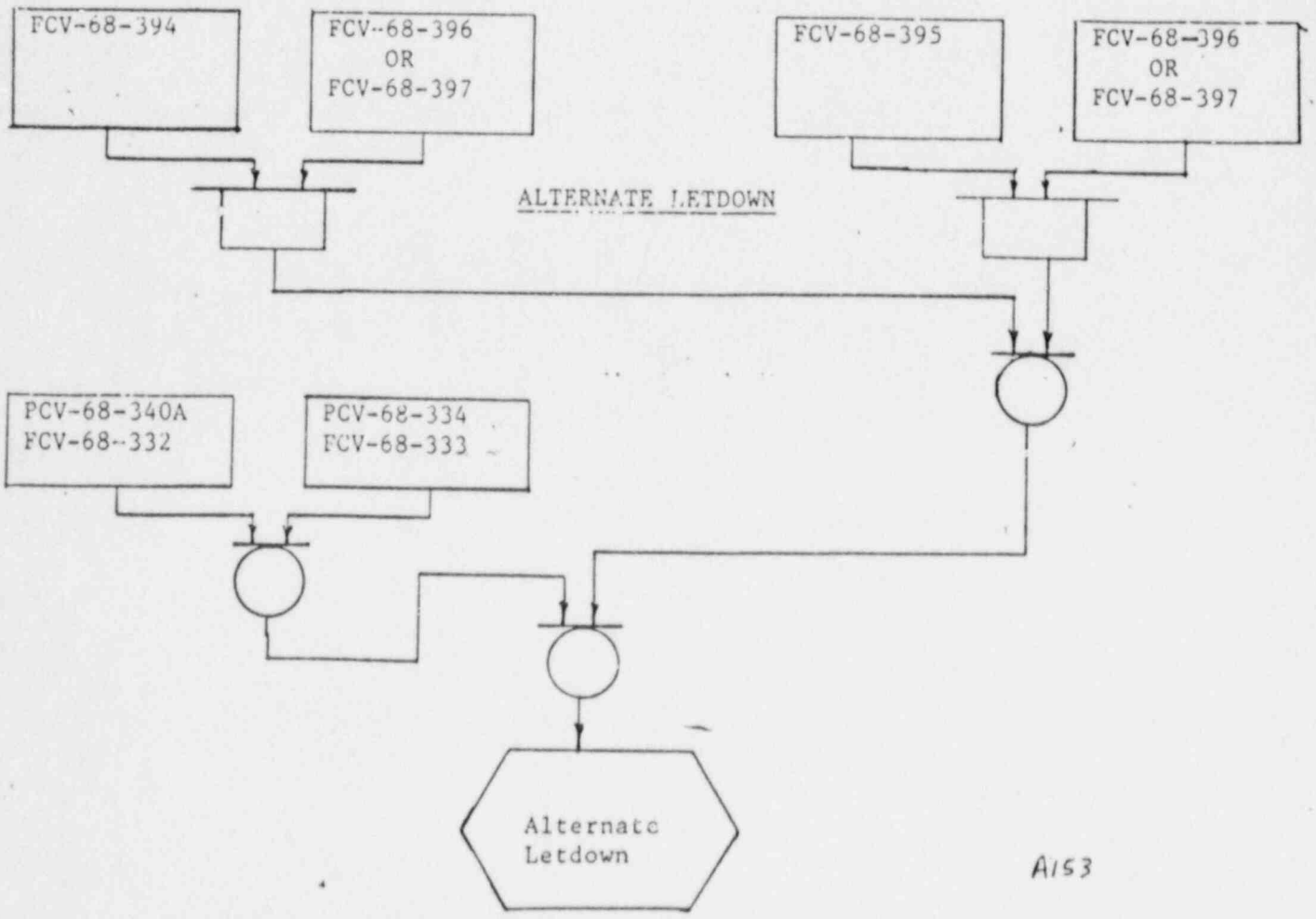
Prepared by/Date DAH 4-21-88
Reviewed by/Date [illegible] 4/21/88

EXCESS LETDOWN



R9

ALTERNATE LETDOWN



A153

APPENDIX B

OPERATOR ACTIONS

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
1 (path 1 Unit 1)	Cent chg. pump A-A	Control room	Assure pump running. If not running start pump. If pump fails to start, then use bypass for auxiliary oil pump.
1 (path 2) Unit 1)	Cent chg. pump B-B	Control room	Assure pump running. If not running start pump. If pump fails to start, then use bypass for auxiliary oil pump.
2	VLV-62-534* / VLV-62-533	Plant	If seal injection or the normal charging path is used for RCS makeup, one of these valves* must be open. If valve 534 is opened, valve 533 must be closed. If valve 526 is opened, valve 527 must be closed.
	OR.		
	VLV-62-526* / VLV-62-527	Plant	
	OR		
	FCV-62-93*	Control room	
	Instrument Loops 68-320, -325, -339	Control room	In the event of fire, the pressurizer level indication should be closely monitored.
3	ERCW header 1A and 2A	Pumping Station	Manually clean traveling screens per SOI-67.1 Verify flow using local discharge pressure and pump curve
3	ERCW header 1B and 2B	Pumping Station	Manually clean traveling screens per SOI-67.1 Verify flow using local discharge pressure and pump curve
4	LCV-62-132 OR LCV-62-133	Plant or Control room	One must be closed to ensure flow from the RWST. Handwheel operation acceptable. Note, however, that neither of these may be closed until key 5 has been established. In the event of a fire in an area that will effect these valves or associated circuitry, the operator should remove power from both valves (by opening breakers at the MOV board) or switch over to the RWST.
	L1-62-129	Control room	In the event of a fire, the VCT level indication should be closely monitored. If the indication does not function properly (i.e., if 0% or 100% level is indicated, or erratic level indication occurs) the operator should promptly switch over to the RWST or promptly stop the operating CCP until switchover is achieved. Reactor should be tripped. The VCT must also be isolated in the longer term by closing its outlet valves or depressurizing the VCT within 24 hours.

Prepared by/Date R.A. Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
5 (path 1 specific)	LCV-62-135 OR LCV-62-136	Plant or control room	Open for CCP suction from RWST. Handwheel operation acceptable. In the event of a fire in an area that will affect these valves or associated circuitry, the operator should remove power from the valve in the flowpath being used (by opening breakers at the MOV board) to prevent spurious closure.
	LCV-62-132 OR LCV-62-133	Plant or control room	Close to isolate VCT. Handwheel operation acceptable. Handwheel must be used to close these if power has been removed from them (see operator actions for Key 4).
	OR		
	LCV-62-135 OR LCV-62-136	Plant or Control room	Open for CCP suction from RWST. Handwheel operation acceptable.
	FSV-62-125	Control room	Open to depressurize VCT.
	PCV-62-126	Plant	
	PCV-77-89	Plant	
	OR		
	VLV-62-689	Plant	
	VLV-62-692 VLV-62-693	Plant Plant	Close to isolate nitrogen and hydrogen supply headers, respectively.

Note: If LCV-62-132 or -133 are not closed or if the VCT is greater than 17.03 psig in 24 hours, 15.91 psig in 36 hours, or 12.56 psig in 72 hours, then the RHR system must be available, the RCS temperature below 200°F, and the CCP stopped.

5 (path 2 specific)	FCV-63-6 OR FCV-63-7 FCV-63-47 FCV-63-5	Plant or control room	Open for alternate CCP suction from RWST. Handwheel operation acceptable. Once open, the operator should remove power from each of the valves in the flowpath to prevent spurious closure.
	LCV-62-132 OR LCV-62-133	Plant or Control room	Close to isolate VCT. Handwheel operation acceptable. Handwheel must be used to close these if power has been removed from them. (See operator actions for Key 4).

3445F/JMS

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
5 (both paths)	Containment spray Pump A-A OR FCV-72-39	Control room Control room	If spurious Phase B isolation signal is generated, stop CS pump or close valve.
	Containment spray Pump B-B OR FCV-72-2	Control room Control room	If spurious Phase B isolation signal is generated, stop CS pump or close valve.
	RHR Pump A-A	Control room	Stop pump if it spuriously starts.
	FCV-74-12	Control room	Verify open if RHR pump A-A sp ously starts.
	FCV-74-24	Control room	Verify open if RHR pump B-B spuriously starts.
	FCV-63-1	Control room	Close to prevent RWST water backflow into the sump if FCV-63-72 and FCV-63-73 cannot be protected from spuriously opening. If this occurs, FCV-63-72 and FCV-63-73 must be manually closed before cooldown.
	RHR Pump B-B	Control room	Stop pump if it spuriously starts.
6	FCV-63-25 OR FCV-63-26	Control room Control room	Open one of these valves to provide ECCS charging path (through BIT) to the reactor vessel.
	FCV-63-39 OR FCV-63-40	Control room Control room	Open one of these valves to provide ECCS charging path (through BIT) to the reactor vessel.
	FCV-63-41 OR FCV-63-42 OR VLV-63-574	Control room Control room Plant	Close any one to prevent diverting flow from charging path and back to the Boric Acid Tanks.
	FCV-63-25 FCV-63-26 FCV-63-39 FCV-63-40	Plant	Throttle any as required to maintain RCS pressurizer level.

3445F/JMS

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component		Area of Action	Comment
7	FCV-62-69 OR FCV-62-70		Control room; Control room	Close either to isolate letdown flow as required.
	FCV-62-72		Control room	Close whichever valve(s) is open to isolate letdown flow as required.
	FCV-62-73		Control room	
	FCV-62-74		Control room	
	1&2-FSV-68-394		125V vital Battery Board I, Panel 4	To preclude spurious opening of these valves pull fuses as identified in AOI-27A, Rev 6, page 3 of 9
	1&2-FSV-68-395			
	1&2-FSV-68-396			
	1&2-FSV-68-397			
8	FCV-62-54 OR FCV-62-55 OR FCV-62-56		Control room; Control room; Control room	Close any one (if all open) to isolate letdown path.
9	1-FCV-70-133	Unit 1	Control room	A spurious Phase B containment isolation signal will close these valves. They must be reopened for cooling water to thermal barrier.
	1-FCV-70-134		Control room	
	1-FCV-70-87		Control room	
	1-FCV-70-90		Control room	
	2-FCV-70-133	Unit 2	Control room	A spurious Phase B containment isolation signal will close these valves. They must be reopened for cooling water to thermal barrier.
	2-FCV-70-134		Control room	
	2-FCV-70-87		Control room	
	2-FCV-70-90		Control room	
	1-VLV-70-545A OR 1-VLV-70-546A		Plant; Plant	Must be closed if 1-FCV-70-156 spuriously opens.
	2-VLV-70-545A OR 2-VLV-70-546A		Plant; Plant	Must be closed if 2-FCV-70-156 spuriously opens.

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. T. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
9	0-FCV-67-197 OR 0-FCV-67-198 OR 1-70-531 OR 0-FCV-70-40 OR 0-FCV-70-11 OR 0-70-529A OR 0-FCV-70-41 OR 0-FCV-70-1 OR 0-70-529B	Control room OR Control room OR Plant OR Control room OR Control room OR Plant OR Control room OR Control room OR Plant	Must be closed to isolate spent fuel pool heat exchangers if both CCS pumps 1A-A and 1B-B are not available.
	0-FCV-70-40 OR 0-FCV-70-11 OR 0-70-529A OR 0-FCV-70-41 OR 0-FCV-70-1 OR 0-70-529B OR 1-70-531	Control room OR Control room OR Plant OR Control room OR Control room OR Plant OR Plant	Must be closed if both 0-FCV-70-193 and 0-FCV-70-194 open and both CCS pumps 2A-A and 2B-B are not available. ~~(See note above for closing 0-FCV-70-197, -198.)~~ RAE 2/11/88
10	N/A	N/A	No operator action required.
11	AFW pump A-A OR AFW pump B-B	Control room	Verify one pump running and flowpath available. If manual control is chosen for SG level, on/off operation of the pump is required, or manual throttling of the level control valves listed in the operator actions list for Key 12. Refer to SOI-3.2, R30 for manual throttling of valves to control SG level using the AFW system.
12	Manual valve 3-828 OR Manual valve 3-836	Plant OR Plant	If path 1 automatic level control is used for SG 1 level control, throttle one of these valves, or cycle the AFW pump on/off to maintain level. (See operator actions list for Key 11.) Refer to SOI-3.2, R30, Section D2, for manual throttling of valves to control SG level using the AFW system.

3445F/JMS

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
12 (Cont.)	Manual valve 3-827 OR Manual valve 3-835	Plant	If path 1 automatic level control is used for SG 2 level control, throttle one of these valves, or cycle the AFW pump on/off to maintain level. (See operator actions list for Key 11.) Refer to SOI-3.2, R30, Section D2, for manual throttling of valves to control SG level using the AFW system.
	Manual valve 3-826 OR Manual valve 3-834	Plant	If path 2 automatic level control is used for SG 3 level control, throttle one of these valves, or cycle the AFW pump on/off to maintain level. (See operator actions list for Key 11.) Refer to SOI-3.2, R30, Section D2, for manual throttling of valves to control SG level using the AFW system.
	Manual valve 3-829 OR Manual valve 3-837	Plant	If path 2 automatic level control is used for SG 4 level control, throttle one of these valves, or cycle the AFW pump on/off to maintain level. (See operator actions list for Key 11.) Refer to SOI-3.2, R30, Section D2, for manual throttling of valves to control SG level using the AFW system.
13 (path 1)	Station air compressor A OR Station air compressor B	Plant	Must manually load compressor on diesels if aux air compressor not used.
13 (path 2)	Station air compressor A OR Station air compressor B	Plant	Must manually load compressor on diesels if aux air compressor not used.

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
14 & 15	Turbine driven aux feedwater pump A-S	Control room	Verify pump running and flowpath available.
16 (auto control, path 1 and 2)	Station air compressor A OR Station air compressor B		Must manually load compressor on diesel if auxiliary air compressor is not used.
16 (manual control, path 1)	LCV-3-172 LCV-3-175	Plant or control room	Manual control consists of remote operation from control room or handwheel operation in plant (SG level). Refer to SOI-3.2, R30, Section D2, for manual throttling of valves to control SG level using the AFW system.
16 (manual control, path 2)	LCV-3-173 LCV-3-174	Plant or control room	Manual control consists of remote operation from control room or handwheel operation in plant (SG level). Refer to SOI-3.2, R30, Section D2, for manual throttling of valves to control SG level using the AFW system.
17	N/A	N/A	No operator action.
19 (path 1)	ERCW headers 1A and 2A (operation lists)		Manually clean screens per SOI-67.1 Verify flow using local discharge pressure and pump curve

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R.L Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
	FCV-3-116A FCV-3-116B	Plant or control room	Open for motor-driven AFW pump A-A suction from ERCW after exhausting condensate storage tank. Handwheel operation acceptable.
	OR		
	FCV-3-136A FCV-3-136B	Plant or control room	Open for turbine-driven AFW pump suction from ERCW after exhausting condensate storage tank. Handwheel operation acceptable.
19 (path 2)	ERCW headers 1B and 2B (operation lists)		Manually clean screens per SOI-67.1 Verify flow using local discharge pressure and pump curve.
19	FCV-3-126A FCV-3-126B	Plant or control room	Open for motor-driven AFW pump B-B suction from ERCW after exhausting condensate storage tank. Handwheel operation acceptable.
	OR		
	FCV-3-179A FCV-3-179B	Plant or control room	Open for turbine-driven AFW pump B-B suction from ERCW after exhausting condensate storage tank. Handwheel operation acceptable.
20	Control Power fuses Fn FCV-1-147, -148, -149, -150	Plant	In the event of a fire in the MCR, the operator must pull the fuses in the control circuits for FCV-1-147, -148, -149, -150 to prevent possible spurious opening of these valves.
21			Verify steam load isolation.
22			Verify main feedwater isolation.
23			Verify main feedwater pumps isolated.

3445F/JMS

Prepared by/Date DH 4-19-89

Checked by/Date RLC/RAL 4/29/89

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
24	VLV-1-872	Plant	Verify blowdown isolation or manually close these valves.
	VLV-1-868 OR VLV-1-869	Plant	
	VLV-43-XXX	Plant	Verify FCV-43-55, -58, -61, or -64 closed or manually close isolation valves in the Hot Sample Room (47610-43-5) (SG sample isolation valves).
25	PCV-1-5 PCV-1-12 PCV-1-23 PCV-1-30	Control Room	If secondary side depressurization occurs, operator must place the S/G PORV handswitch in CLOSED position.
26	PCV-1-5 (SG 1) PCV-1-12 (SG 2) PCV-1-23 (SG 3) PCV-1-30 (SG 4)	Control room	Remote or local control of any two required (must be to the same two SGs which are being used for cooldown).
28			IF all pressurizer heaters are lost, THEN refer to AOI-18 for cooldown instructions.
	PCV-68-340A FCV-68-332 PCV-68-334 FCV-68-333	Control room	Place respective handswitch in "closed" position if there is an excessive pressure decrease in the RCS.
	RCP No. 1	Control room	Trip if PCV-68-340D spuriously open
	RCP No. 2	Control room	Trip if PCV-68-340B spuriously open

3445F/JMS

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
29	Reactor trip breaker A (HS-RT-1 or HS-RT-2)	Control room	Manually trip reactor if required.
	OR		
	Reactor trip breaker B (HS-RT-1 or HS-RT-2)	Control room	
	OR		
	M-G set breaker A	Plant	Manually trip reactor with one of these breakers if fire damages the reactor trip breakers.
	AND		
	M-G set breaker B	Plant	
30	FCV-74-1 FCV-74-2	Control room or plant	Align flow path for RHR cooling

3445F/JMS

Prepared by/Date K A Liddell 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
30	FCV-74-32	Plant	Open to bypass flow around RHR heat exchangers. Use HCV-74-36 or HCV-74-37 if needed to throttle flow.
	FCV-63-172	Plant	If valve spuriously opens, it must be reclosed, ~~from local MOV board.~~ RAC 2/11/88
30 (path 1)	FCV-72-40, -41 FCV-63-8 HCV-74-36 FCV-63-72 FCV-63-93 FCV-74-16 FCV-74-3 FCV-74-33 FCV-74-12	Plant	An RHR flow path must be established and sufficient flow verified locally using pump suction and discharge pressure and pump curve OR flow indication.
30 (path 2)	FCV-72-41, -40 FCV-63-11 FCV-74-21 FCV-74-28 FCV-63-94 FCV-63-73 FCV-74-35 HCV-74-37 FCV-74-24	Plant	See comment for path 1.

Prepared by/Date T.A. Edwards 2/10/88

Checked by/Date R.J. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
31 (path 1)	RHR pump A-A	Control room	Start pump for cooldown to cold shutdown, or stop pump if started on spurious SI signal.
	FCV-70-156	Control room or plant	Open valve for cooling water flow through RHR heat exchanger. Handwheel operation acceptable.
	0-FCV-70-197 OR 0-FCV-70-198	Control room or plant	
	FCV-70-40 OR FCV-70-11 OR 0-VLV-70-529A	Control room or plant	
	FCV-70-41 OR FCV-70-1 OR 0-70-529B	Control room or plant	Close to isolate spent fuel pool heat exchangers.
	1-70-531	Plant	
	1-VLV-70-637 OR 1-VLV-70-661	Plant	
	1-VLV-70-587 OR 1-VLV-70-574	Plant	Close to isolate nonessential loads.
	0-VLV-70-636 OR 0-ISOL-70-601	Plant	

3445F/JMS

Prepared by/Date R A Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX B
OPERATOR ACTIONS

Key	Component	Area of Action	Comment
31 (unit 2, path 1)	2-VLV-70-637 OR 2-VLV-70-661	Plant	
	2-VLV-70-587 OR 2-VLV-70-574	Plant	Close to isolate nonessential loads.
	FCV-70-40 OR FCV-70-11 OR 0-70-529A	Control room or plant	Close to isolate spent fuel pool heat exchangers if 0-FCV-70-193 and 0-FCV-70-194 cannot be protected from spuriously opening.
	FCV-70-41 OR FCV-70-1 OR 0-70-529B	Control room or plant	
	1-70-531	Plant	
31 (path 2)	RHR pump B-B	Control room	Start pump for cooldown to cold shutdown, or stop pump if started on spurious SI signal.
	FCV-70-153	Control room or plant	Open valve for cooling water flow through RHR heat exchanger. Handwheel operation acceptable.
34	FCV-62-90	Control Room	These valves will close upon a spurious SI signal. They will be required to be reopened.
	FCV-62-91	Control Room	
	VLV-62-526 OR VLV-62-534	Plant	Requires dedicated operator if desired to use valves for throttling

3445F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

Prepared by/Date DAH 4-29-88

Checked by/Date RLC/RAS 4/29/88

SQN-SQS4-0127

APPENDIX B

OPERATOR ACTIONS

Key	Component	Area of Action	Comment
36	FCV-63-63 FCV-63-87 FCV-63-107 FCV-63-127 AND FCV-63-65 OR FCV-63-67 FCV-63-80 FCV-63-98 FCV-63-118	Plant or Control Room Plant or Control Room Plant or Control Room	Prior to RCS pressure dropping below ~~150~~ 100 psig, either the accumulators must be isolated or depressurized by venting the nitrogen cover gas. Local operation is acceptable. ~~Conditions inside containment would not preclude access.~~ DAH 4-29-88 (Ref SQN-SQS4-0149 Rev 0 845 871123 Y27
36	VLV-87-550 OR VLV-87-552	Plant	Must open to depressurize UHI gas accumulator if UHI isolation valves do not close. R9

3445F/JMS

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
PER 10CFR50 APPENDIX R

Prepared by/Date DAH 4-29-88

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SQN-SQS4-0127

APPENDIX B

Key	Component	Area of Action	Comment	
37A - Main Control Room Air Conditioning	ERCW header 1A (operation list) ERCW header 1B (operation list)		Manually clean traveling screens per SOI-67.1. Verify flow using local discharge pressure and pump curve. Manually clean traveling screens per SOI-67.1. Verify flow using local discharge pressure and pump curve.	
	FCO-31A-176 FCO-31A-20 FCO-31A-177 FCO-31A-23		Manual control of these HVAC dampers can be taken to control MCR temperature	
37B - Aux Inst Room Air Conditioning	Auxiliary instrument room lighting HVAC		In order to reduce the cooling load in these rooms, normal lighting must be turned out as soon as possible, leaving only low wattage supplementary lighting. Due to heat build-up, cooling must be restored after 72 hours by use of temporary ventilation or the designed cooling system repaired, but reference 11.15 states specific pre-planned actions are not required.	R9
37C - Diesel Generator Bldg Ventilation			No operator actions required for this key.	
37D - Steam Valve Vault Ventilation Sys			No operator actions required for this key.	
37F - 480V Board and Battery Boards Air Conditioning	Room Lighting		In order to reduce the cooling load in these rooms, normal room lighting must be turned out as soon as possible, leaving only low wattage supplementary lighting.	R9
37G - Cable Spreading Room			No operator actions required for this key.	
37H - Pressurizer Heater Transformer Room	HVAC		Temporary or general ventilation must be operational within 72 hours after the start of the event due to heat build-up, but reference 11.15 states specific pre-planned actions are not required.	R9
37J Containment Cooling			No operator action is required for this key.	

3445F/JMS

Prepared by/Date DAH 4-29-86

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APPENDIX B

OPERATOR ACTIONS

Key	Component	Area of Action	Comment
37K - 480V Transformer Room	Room 1A & 2B	Plant	5000 cfm of outside air must be supplied to the room within 5 hours. Common board transformer must be load shed at one-half hour into the event.
	Room 1B & 2A	Plant	5000 cfm of outside air must be supplied to the room within 10 hours.
37O - AFW and BA Transfer; CCS and AFW pump coolers	Room Lighting AFW & CCS		In order to reduce the cooling load in these rooms, normal room lighting must be turned out as soon as possible leaving only low wattage supplementary lighting. Secure all but one AFW pump and two CCS pumps by one-half hour after losing HVAC.
37M Penetration Room Cooler	HVAC		Ele. 690' penetration room cooling or adequate ventilation must be operational after 72 hours from the start of the event, but reference 11.15 states specific pre-planned actions are not required.
37P CCS & SFP Space Cooler (El. 714)	Room Lighting		In order to reduce the cooling load in these rooms, normal room lighting must be turned out as soon as possible leaving only low wattage supplementary lighting.
37N - TDAFWP Room Cooler			No operator actions required for this key.
37R - Charging Pump Coolers (el 669)			No operator actions required for this key.
37S - Air Supply for HVAC			No operator actions required for this key.
40- ERCW to RHR Pump Room Coolers	N/A	N/A	No operator Action required.

3445F/JMS

Prepared by/Date DAH 4-29-88

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APPENDIX B

48-RCS Letdown Capability	Normal Letdown	MCR	The primary purpose for RCS letdown is to control RCS inventory. However, if the pressurizer sprays and PORVs are not available normal, excess, and alternate letdown can be used to depressurize the RCS. Per reference 11.20, two methods are available to the operator to depressurize the RCS. Method I: The first method is to maintain pressurizer level at 25% of full scale using the above letdown paths and let ambient heat losses depressurize the RCS to the RHR cut-in point. Method II: If Method I is unacceptable, the RCS can be depressurized at a faster rate by using the above letdown paths to alternately fill and drain the pressurizer. This method has the effect of transporting mass and energy from the pressurizer to the RCS where it can be rejected. If this method of depressurizing the RCS is used, the following criteria must be satisfied: RS 1. Pressurizer indicated level must remain between 20% and 80% of full scale. 2. RCS pressure must not exceed 2335 psig (PORV setpoint). 3. RCS temperature and pressure cooldown limits shall comply with Tech. Spec. 3.4.9.1. 4. Pressurizer cooldown limits shall comply with Tech. Spec. 3.4.9.2. 5. RCS subcooling margin shall be $\geq$ 40°F. Note: RCS subcooling margin should be as high as possible without violating the Tech Spec conditions given in Items 3 and 4 above. Refer to Key 48 in Appendix A for operator ~~cue~~ actions. Rae 4/29/88
	Excess Letdown	MCR	
	Alternate Letdown	MCR	

APPENDIX C

* Items in this Appendix denoted with an "*" are components added between revisions 6 and 8 (i.e., new components).

** CAUTION. This appendix is nothing more than an index to assist the user in locating specific requirements in the document. Since these specific requirements are often complex, they are expressed in Appendix A using conditional logic statements which tie the requirement to operability of other components. The reader is cautioned that the listing of a component in this appendix should not be considered as a requirement for that component without first consulting the appropriate shutdown path in Appendix A.

DKR 2/10/88 Note: The Item Numbers in parenthesis and listed in this Appendix are unverified and are not to be used with Revision 8 of this calculation. This Appendix does not list instrumentation found in Appendix ~~D and~~ E.

Ray 2/11/88

Prepared by/Date D. F. Clapp 2/10/88

Checked by/Date R A Edlund 2/10/88

APPENDIX C

Shutdown Logic Component List
Main Steam (1)

Component	Key (Item)	Reference Drawing	Description
1&2-PI-1-2A	26	47W610-1-1	Main Steam Pressure Indication - Loop 1
1&2-PI-1-2B	26	47W610-1-1	Main Steam Pressure Indication - Loop 1
1&2-FCV-1-4	20	47W801-1	MSIV - Loop 1
1&2-FSV-1-4A	20	47W610-1-1	Loop 1 MSIV Air Supply Solenoid
1&2-FSV-1-4B	20	47W610-1-1	Loop 1 MSIV Air Supply Solenoid
1&2-FSV-1-4D	20	47W610-1-1	Loop 1 MSIV Air Vent Solenoid
1&2-FSV-1-4E	20	47W610-1-1	Loop 1 MSIV Air Vent Solenoid
1&2-FSV-1-4F	20	47W610-1-1	Loop 1 MSIV Test Solenoid
1&2-FSV-1-4G	20	47W610-1-1	Loop 1 MSIV Air Vent Solenoid
1&2-FSV-1-4H	20	47W610-1-1	Loop 1 MSIV Air Vent Solenoid
1&2-FSV-1-4J	20	47W610-1-1	Loop 1 MSIV Test Solenoid
1&2-P-1-5	26	47W610-1-1	Loop 1 Atmospheric Relief Valve Control
1&2-PCV-1-5	26	47W801-1	Loop 1 Atmospheric Relief Valve
1&2-FCV-1-7	24	47W801-2	Steam Generator 1 Blowdown Isolation Valve
1&2-P-1-9A	26	47W610-1-1	Main Steam Pressure Indication Loop 2
1&2-P-1-9B	26	47W610-1-1	Main Steam Pressure - Indication Loop 2
1&2-FCV-1-11	20	47W801-1	MSIV - Loop 2
1&2-FSV-1-11A	20	47W610-1-1	Loop 2 MSIV Air Supply Solenoid
1&2-FSV-1-11B	20	47W610-1-1	Loop 2 MSIV Air Supply Solenoid
1&2-FSV-1-11D	20	47W610-1-1	Loop 2 MSIV Air Vent Solenoid
1&2-FSV-1-11E	20	47W610-1-1	Loop 2 MSIV Air Vent Solenoid
1&2-FSV-1-11F	20	47W610-1-1	Loop 2 MSIV Test Solenoid
1&2-FSV-1-11G	20	47W610-1-1	Loop 2 MSIV Air Vent Solenoid
1&2-FSV-1-11H	20	47W610-1-1	Loop 2 MSIV Air Vent Solenoid
1&2-FSV-1-11J	20	47W610-1-1	Loop 2 MSIV Test Solenoid

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Checked by/Date RA Edlund 2/10/88

APPENDIX C

Shutdown Logic Component List
Main Steam (1) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-P-1-12	26	47W610-1-1	Loop 2 Atmospheric Relief Valve Control
1&2-PCV-1-12	26	47W801-1	Loop 2 Atmospheric Relief Valve Control
1&2-FCV-1-14	24	47W801-2	SG 2 Blowdown Isolation Valve
1&2-FCV-1-15	14,15 (116)	47W803-2	AFPT Steam Supply from SG No. 1
1&2-FCV-1-16	14,15 (117)	47W803-2	AFPT Supply from SG No. 4
1&2-FCV-1-17	14,15 (115)	47W803-2	Steam Flow Isolation to AFPT
1&2-FCV-1-18	14,15 (115)	47W803-2	Steam Flow Isolation to AFPT
1&2-P-1-20A	26	47W610-1-2	Main Steam Pressure Indication Loop 3
1&2-P-1-20B	26	47W610-1-2	Main Steam Pressure Indication Loop 3
1&2-FCV-1-22	20	47W801-1	MSIV - Loop 3
1&2-FSV-1-22A	20	47W610-1-2	Loop 3 MSIV Air Supply Solenoid
1&2-FSV-1-22B	20	47W610-1-2	Loop 3 MSIV Air Supply Solenoid
1&2-FSV-1-22D	20	47W610-1-2	Loop 3 MSIV Air Vent Solenoid
1&2-FSV-1-22E	20	47W610-1-2	Loop 3 MSIV Air Vent Solenoid
1&2-FSV-1-22F	20	47W610-1-2	Loop 3 MSIV Test Solenoid
1&2-FSV-1-22G	20	47W610-1-2	Loop 3 MSIV Air Vent Solenoid
1&2-FSV-1-22H	20	47W610-1-1	Loop 3 MSIV Air Vent Solenoid
1&2-FSV-1-22J	20	47W510-1-2	Loop 3 MSIV Test Solenoid
1&2-P-1-23	26	47W610-1-2	Loop 3 Main Steam Pressure Indication
1&2-PCV-1-23	26	47W801-1	Loop 3 Atmospheric Relief Valve
1&2-FCV-1-25	24	47W801-2	Steam Generator 3 Blowdown Isolation Valve

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Checked by/Date R.A. Edlund 2/10/88

APPENDIX C

Shutdown Logic Component List
Main Steam (1) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-P-1-27A	26	47W610-1-2	Loop 4 Main Steam Pressure Indication
1&2-P-1-27B	26	47W610-1-2	Loop 4 Main Steam Pressure Indication
1&2-FCV-1-29	20	47W801-1	MSIV - Loop 4
1&2-FSV-1-29A	20	47W610-1-2	Loop 4 MSIV Air Supply Solenoid
1&2-FSV-1-29B	20	47W610-1-2	Loop 4 MSIV Air Supply Solenoid
1&2-FSV-1-29D	20	47W610-1-2	Loop 4 MSIV Air Vent Solenoid
1&2-FSV-1-29E	20	47W610-1-2	Loop 4 MSIV Air Vent Solenoid
1&2-FSV-1-29F	20	47W610-1-2	Loop 4 MSIV Test Solenoid
1&2-FSV-1-29G	20	47W610-1-2	Loop 4 MSIV Air Vent Solenoid
1&2-FSV-1-29H	20	47W610-1-2	Loop 4 MSIV Air Vent Solenoid
1&2-FSV-1-29J	20	47W610-1-2	Loop 4 MSIV Test Solenoid
1&2-P-1-30	26	47W610-1-2	Loop 4 Main Steam Pressure Indication
1&2-PCV-1-30	26	47W801-1	Loop 4 Atmospheric Relief Valve
1&2-FCV-1-32	24	47W801-2	SG 4 Blowdown Isolation Valve
1&2-FCV-1-36	21,23	47W801-1	High Pressure Stop Valve to MFPT A
1&2-FCV-1-37	21,23	47W801-1	High Pressure Control Valve to MFPT A
1&2-FCV-1-38	23	47W801-1	Low Pressure Control Valve to MFPT A
1&2-FCV-1-39	23	47W801-1	Low Pressure Stop Valve to MFPT A
1&2-FCV-1-43	21,23	47W801-1	High Pressure Stop Valve to MFPT B
1&2-FCV-1-44	21,23	47W801-1	High Pressure Control Valve to MFPT B
1&2-FCV-1-45	23	47W801-1	Low Pressure Control Valve to MFPT B
1&2-FCV-1-46	23	47W801-1	Low Pressure Stop Valve to MFPT B
1&2-FCV-1-51	14,15 (114)	47W803-2	AFPT Trip & Throttle Valve
1&2-FCV-1-52	14,15	47W610-1-1	AFPT Governor Valve
1&2-FCV-1-61	21	47W801-1	Main Steam Stop and Control Valve to High Pressure Turbine

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APPENDIX C

Shutdown Logic Component List
Main Steam (1) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-1-62	21	47W801-1	Main Steam Stop and Control Valve to High Pressure Turbine
1&2-FCV-1-64	21	47W801-1	Main Steam Stop and Control Valve to High Pressure Turbine
1&2-FCV-1-65	21	47W801-1	Main Steam Stop and Control Valve to High Pressure Turbine
1&2-FCV-1-67	21	47W801-1	Main Steam Stop and Control Valve to High Pressure Turbine
1&2-FCV-1-68	21	47W801-1	Main Steam Stop and Control Valve to High Pressure Turbine
1&2-FCV-1-70	21	47W801-1	Main Steam Stop and Control Valve to High Pressure Turbine
1&2-FCV-1-71	21	47W801-1	Main Steam Stop and Control Valve to High Pressure Turbine
1&2-FCV-1-75	21	47W801-1	Main Steam to MSR A2
1&2-FCV-1-77	21	47W801-1	Main Steam to MSR B2
1&2-FCV-1-79	21	47W801-1	Main Steam to MSR C2
1&2-FCV-1-84	21	47W801-1	Main Steam to MSR A1
1&2-FCV-1-91	21	47W801-1	Main Steam to MSR B1
1&2-FCV-1-98	21	47W801-1	Main Steam to MSR C1
1&2-FCV-1-103	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-104	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-105	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-106	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-107	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-108	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-109	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-110	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-111	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-112	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-113	21	47W801-1	Main Steam Dump Valve
1&2-FCV-1-114	21	47W801-1	Main Steam Dump Valve

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APPENDIX C

Main Steam (1) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-1-147	20	47W801-1	MSIV Bypass Valve
1&2-FCV-1-148	20	47W801-1	MSIV Bypass Valve
1&2-FCV-1-149	20	47W801-1	MSIV Bypass Valve
1&2-FCV-1-150	20	47W801-1	MSIV Bypass Valve
1&2-FCV-1-181	24	47W801-2	SG 1 Blowdown Containment Isolation Valve
1&2-FCV-1-182	24	47W801-2	SG 2 Blowdown Containment Isolation Valve
1&2-FCV-1-183	24	47W801-2	SG 3 Blowdown Containment Isolation Valve
1&2-FCV-1-184	24	47W801-2	SG 4 Blowdown Containment Isolation Valve
1&2-FCV-1-275	21	47W801-1	MSR A2 Low Power Bypass Valve
1&2-FCV-1-277	21	47W801-1	MSR B2 Low Power Bypass Valve
1&2-FCV-1-279	21	47W801-1	MSR C2 Low Power Bypass Valve
1&2-FCV-1-284	21	47W801-1	MSR A1 Low Power Bypass Valve
1&2-FCV-1-291	21	47W801-1	MSR B1 Low Power Bypass Valve
1&2-FCV-1-298	21	47W801-1	MSR C1 Low Power Bypass Valve
1-VLV-1-512	25	47W801-1	Main Steam Safety Valve from SG 3
1-VLV-1-513	25	47W801-1	Main Steam Safety Valve from SG 3
1-VLV-1-514	25	47W801-1	Main Steam Safety Valve from SG 3
1-VLV-1-515	25	47W801-1	Main Steam Safety Valve from SG 3
1-VLV-1-516	25	47W801-1	Main Steam Safety Valve from SG 3
1-VLV-1-517	25	47W801-1	Main Steam Safety Valve from SG 2
1-VLV-1-518	25	47W801-1	Main Steam Safety Valve from SG 2
1-VLV-1-519	25	47W801-1	Main Steam Safety Valve from SG 2
1-VLV-1-520	25	47W801-1	Main Steam Safety Valve from SG 2
1-VLV-1-521	25	47W801-1	Main Steam Safety Valve from SG 2
1-VLV-1-522	25	47W801-1	Main Steam Safety Valve from SG 1
1-VLV-1-523	25	47W801-1	Main Steam Safety Valve from SG 1
1-VLV-1-524	25	47W801-1	Main Steam Safety Valve from SG 1
1-VLV-1-525	25	47W801-1	Main Steam Safety Valve from SG 1
1-VLV-1-526	25	47W801-1	Main Steam Safety Valve from SG 1
1-VLV-1-527	25	47W801-1	Main Steam Safety Valve from SG 1
1-VLV-1-528	25	47W801-1	Main Steam Safety Valve from SG 4
1-VLV-1-529	25	47W801-1	Main Steam Safety Valve from SG 4
1-VLV-1-530	25	47W801-1	Main Steam Safety Valve from SG 4
1-VLV-1-531	25	47W801-1	Main Steam Safety Valve from SG 4
1-VLV-1-868	24	47W801-2	SG Blowdown Heat Exchanger Isolation Valve
1-VLV-1-869	24	47W801-2	SG Blowdown Heat Exchanger Isolation Valve
1-VLV-1-872	24	47W801-2	SG Draindown Isolation Valve

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APPENDIX C

Main & Auxiliary Feedwater (3)

Component	Key (Item)	Reference Drawing	Description
AFW motor-driven pump A-A	11	47W803-2	Motor Driven Auxiliary Feedwater Pump
AFW motor-driven pump B-B	11	47W803-2	Motor Driven Auxiliary Feedwater Pump
AFW turbine driven Pump A-S	14&15	47W803-2	Turbine Driven Auxiliary Feedwater Pump
1&2-FCV-3-33	22	47W803-1	SG 1 Main Feedwater Isolation Valve
1&2-FCV-3-35	22	47W803-1	SG 1 Main Feedwater Control Valve
1&2-FCV-3-35A	22	47W610-3-1	Feedwater Low Load Bypass to SG 1
1&2-L-3-39	12,16	47W610-3-1	SG No. 1 NR Level Loop
1&2-L-3-43	12,16	47W610-3-1	SG No. 1 WR Level Loop
1&2-FCV-3-47	22	47W803-1	SG 2 MFW Isolation Valve
1&2-FCV-3-48	22	47W803-1	SG 2 MFW Control Valve
1&2-FCV-3-48A	22	47W610-3-1	Feedwater Low Load Bypass to SG 2
1&2-L-3-52	12,16	47W610-3-1	SG 2 NR Level Loop
1&2-L-3-56	12,16	47W610-3-1	SG 2 WR Level Loop
1&2-FCV-3-87	22	47W803-1	SG 3 MFW Isolation Valve
1&2-FCV-3-90	22	47W803-1	SG 3 MFW Control Valve
1&2-FCV-3-90A	22	47W610-3-2	Feedwater Low Load Bypass to SG 3
1&2-L-3-94	12,16	47W610-3-2	SG 3 NR Level Loop
1&2-L-3-98	12,16	47W610-3-2	SG 3 WR Level Loop
1&2-FCV-3-100	22	47W803-1	SG 4 MFW Isolation Valve
1&2-FCV-3-103	22	47W803-1	SG 4 MFW Isolation Valve
1&2-FCV-3-103A	22	47W610-3-2	Feedwater Low Load Bypass to SG 4
1&2-L-3-107	12,16	47W610-3-2	SG 4 NR Level Loop
1&2-L-3-111	12,16	47W610-3-2	SG 4 WR Level Loop
1&2-FCV-3-116A	19	47W803-2	ERCW Header A Isolation Valve
1&2-FCV-3-116B	19	47W803-2	ERCW Header A Isolation Valve

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APPENDIX C

Main & Auxiliary Feedwater (3)

Component	(Item)	Key Reference Drawing	Description
1&2-FCV-3-126A	19	47W803-2	ERCW Header B Isolation Valve
1&2-FCV-3-126B	19	47W803-2	ERCW Header B Isolation Valve
1&2-FCV-3-136A	19	47W803-2	ERCW Header A Isolation Valve
1&2-FCV-3-136B	19	47W803-2	ERCW Header A Isolation Valve
1&2-P-3-138A	14,15,16	47W610-3-3	Turbine Driven AFW Pump Outlet Pressure
1&2-P-3-138B ~~1&2-P-3-138B~~	16 ~~14,15,16~~	47W610-3-3 ~~47W610-3-3~~	~~Turbine Driven AFW Pump Outlet Pressure~~ Rac 2/11/88
1&2-P-3-140A	16	47W610-3-3	AFW Pipe Break Detection Loop 3
1&2-P-3-140B	16	47W610-3-3	AFW Pipe Break Detection Loop 3
1&2-F-3-142	14,15 (152)	47W610-3-3	TDAFWP Flow Loop
1&2-L-3-148	12	47W610-3-3	SG 3 Level Loop
1&2-LSV-3-148	12	47W610-3-3	Solenoid for Loop 3 MDAF WP Level Control Valve
1&2-LCV-3-148	12(98)	47W610-3-3	SG 3 MDAF WP Level Control Valve
1&2-P-3-148	12	47W610-3-3	SG 3 Level Bypass Pressure Switch Loop
1&2-P-3-150A	16	47W610-3-3	AFW Pipe Break Detection Loop 2
1&2-P-3-150B	16	47W610-3-3	AFW Pipe Break Detection Loop 2
1&2-L-3-156	12	47W610-3-3	SG 2 Level Loop
1&2-LCV-3-156	12(96)	47W610-3-3	SG 2 MDAFWP Level Control Valve
1&2-LSV-3-156	12	47W610-3-3	Solenoid for Loop MDAFWP Level Control Valve
1&2-P-3-156	12	47W610-3-3	SG 2 Level Bypass Switch Loop
1&2-P-3-160A	16	47W610-3-3	AFW Pipe Break Detection Loop No. 1
1&2-P-3-160B	16	47W610-3-3	AFW Pipe Break Detection Loop No. 1
1&2-L-3-164	12	47W610-3-3	SG 1 Level Loop

APPENDIX C

Main & Auxiliary Feedwater (3) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-LSV-3-164	12	47W610-3-3	Solenoid for Loop 1 MDAF WP Level Control Valve
1&2-LCV-3-164	12(95)	47W610-3-3	SG 1 MDAF WP Level Control Valve
1&2-P-3-164	12	47W610-3-3	SG 1 Level Bypass Pressure Switch Loop
1&2-P-3-165A	16	47W610-3-3	AFW Pipe Break Detection Loop No. 4
1&2-P-3-165B	16	47W610-3-3	AFW Pipe Break Detection Loop No. 4
1&2-L-3-171	12	47W610-3-3	SG Level Loop 4
1&2-LCV-3-171	12(97)	47W610-3-3	SG 4 MDAF WP Level Control Valve
1&2-LSV-3-171	12	47W610-3-3	Solenoid for Loop 4 MDAF WP Level Control Valve
1&2-P-3-171	12	47W610-3-3	SG 4 Level Bypass Pressure Switch Loop
1&2-L-3-172	16	47W610-3-3	SG 3 Level Loop
1&2-LCV-3-172	16	47W610-3-3	SG 3 TDAF WP Level Control Valve
1&2-LSV-3-172	16	47W610-3-3	Solenoid for Loop 3 TDAF WP Feed Reg Valve
1&2-L-3-173	16	47W610-3-3	SG 2 Level Loop
1&2-LCV-3-173	16	47W610-3-3	SG 2 TDAF WP Level Control Valve
1&2-LSV-3-173	16	47W610-3-3	Solenoid for Loop 2 TDAF WP Level Control Valve
1&2-L-3-174	16	47W610-3-3	SG 1 Level Loop
1&2-LSV-3-174	16	47W610-3-3	Solenoid for Loop 1 TDAF WP Level Control Valve
1&2-LCV-3-174	16	47W610-3-3	SG 1 TDAF WP Level Control Valve
1&2-L-3-175	16		SG 4 Level Control Loop
1&2-LCV-3-175	16	47W610-3-3	SG 4 TDAF WP Level Control Valve
1&2-LSV-3-175	16	47W610-3-3	Solenoid for Loop 4 TDAF WP Level Control Valve
1&2-FCV-3-179A	19	47W610-3-3	ERCW Header B Isolation Valve

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APPENDIX C

Main & Auxiliary Feedwater (3) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-3-179B	19	47W610-3-3	ERCW Header B Isolation Valve
1&2-VLV-3-826	12	47W803-2	Manual Isolation of Auxiliary Feedwater Pump B-B to SG 3
1,2-VLV-3-827	12	47W803-2	Manual Isolation of Auxiliary Feedwater Pump A-A to SG 2
1,2-VLV-3-828	12	47W803-2	Manual Isolation of Auxiliary Feedwater Pump A-A to SG 1
1,2-VLV-3-829	12	47W803-2	Manual Isolation of Auxiliary Feedwater Pump B-B to SG 4
1,2-VLV-3-834	12	47W803-2	Manual Isolation of Auxiliary Feedwater Pump B-B to SG 3
1,2-VLV-3-835	12	47W803-2	Manual Isolation of Auxiliary Feedwater Pump A-A to SG 2
1,2-VLV-3-836	12	47W803-2	Manual Isolation of Auxiliary Feedwater Pump 1A-A to SG 1
1,2-VLV-3-837	12	47W803-2	Manual Isolation of Auxiliary Feedwater Pump 1B-B to SG 4

Ventilation (30)**

Component	Key (Item)	Reference Drawing	Description
1&2-T-30-175	40	47W866-8	RHR Pump Room Coolers Temperature Loop
1&2-T-30-176	40	47W866-8	RHR Pump Room Coolers Temperature Loop
1,2-T-30-182	1	47W866-8	CCP Rm Clr Temp Control Loop
1,2-T-30-183	1	47W866-8	CCP Rm Clr Temp Control Loop
1,2-TS-30-214	37N	47W610-30	Turbine Driven Auxiliary Feedwater Pump Room Vent Fan Temp Switch
1,2-HS-30-214	37N	47W610-30	Turbine Driven Auxiliary Feedwater Pump Room Vent Fan Handswitch

** Note system 30 components associated with Key 10 are contained in reference 11.7.

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Ventilation (30)** (Continued)

Component	Key (Item)	Reference Drawing	Description
1-FCO-30-443	37C	47W866-9 R11	DG Building Intake Damper
2-FCO-30-444	37C	47W866-9 R11	DG Building Intake Damper
1-FCO-30-445	37C	47W866-9 R11	DG Building Intake Damper
2-FCO-30-446	37C	47W866-9 R11	DG Building Intake Damper
1-FCO-30-447	37C	47W866-9 R11	DG Building Exhaust Damper
HS-30-447B	37C	47W866-9 R11	DG Building Exhaust Fan Handswitch
1-TS-30-447B	37C	47W866-9 R11	DG Building Exhaust Temperature Switch
2-TS-30-447B	37C	47W866-9 R11	DG Building Exhaust Temperature Switch
HS-30-447C	37C	47W866-9 R11	DG Building Exhaust Fan Handswitch
2-FCO-30-448	37C	47W866-9 R11	DG Building Exhaust Damper
2-TS-30-448B	37C	47W866-9 R11	DG Building Exhaust Temperature Switch
HS-30-448B	37C	47W866-9	DG Building Exhaust Fan Handswitch
HS-30-448C	37C	47W866-9	DG Building Exhaust Fan Handswitch
2-FCO-30-449	37C	47W866-9 R11	DG Building Exhaust Damper
2-TS-30-449B	37C	47W866-9	DG Building Exhaust Temperature Switch
HS-30-449B	37C	47W866-9	DG Building Exhaust Fan Handswitch
HS-30-449C	37C	47W866-9	DG Building Exhaust Fan Handswitch
2-FCO-30-450	37C	47W866-9 R11	DG Building Exhaust Damper
HS-30-450B	37C	47W866-9	DG Building Exhaust Fan Handswitch
HS-30-450C	37C	47W866-9 R11	DG Building Exhaust Fan Handswitch
2-TS-30-450B	37C	47W866-9 R11	DG Building Exhaust Temperature Switch
FCO-30-451	37C	47W866-9	DG Building Exhaust Damper
2-TS-30-451B	37C	47W866-9 R11	DG Building Exhaust Temperature Switch
HS-30-451B	37C	47W866-9 R11	DG Building Exhaust Fan Handswitch
HS-30-451C	37C	47W866-9 R11	DG Building Exhaust Fan Handswitch

** Note system 30 components associated with Key 10 are contained in reference 11.7.

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Ventilation (30) (Continued)**

Component	Key (Item)	Reference Drawing	Description
2-TS-30-452B	37C	47W866-9	DG Building Exhaust Temperature Switch
FCO-30-452	37C	47W866-9	DG Building Exhaust Damper
HS-30-452B	37C	47W866-9	DG Building Exhaust Fan Handswitch
HS-30-452C	37C	47W866-9	DG Building Exhaust Fan Handswitch
1-FCO-30-453	37C	47W866-9	DG Building Exhaust Damper
1-TS-30-453B	37C	47W866-9	DG Building Exhaust Temperature Switch
HS-30-453B	37C	47W866-9	DG Building Exhaust Temperature Fan Handswitch
HS-30-453C	37C	47W866-9	DG Building Exhaust Temperature Fan Handswitch
2-FCO-30-454	37C	47W866-9	DG Building Exhaust Damper Switch
HS-30-454B	37C	47W866-9	DG Building Exhaust Fan Handswitch
2-TS-30-454B	37C	47W866-9	DG Building Exhaust Temperature Switch
HS-30-454C	37C	47W866-9	DG Building Exhaust Fan Handswitch
1-FCO-30-459	37C	47W866-9	DG Electric Board Room Exhaust Damper
HS-30-459B	37C	47W866-9	DG Electric Board Room Exhaust Fan Handswitch
HS-30-459C	37C	47W866-9	DG Electric Board Room Exhaust Fan Handswitch
2-FCO-30-460	37C	47W866-9	DG Electric Board Room Exhaust Damper
HS-30-460B	37C	47W866-9	DG Electric Board Room Exhaust Fan Handswitch
HS-30-460C	37C	47W866-9	DG Electric Board Room Exhaust Fan Handswitch
1-FCO-30-461	37C	47W866-9	DG Electric Board Room Exhaust Damper
HS-30-461B	37C	47W866-9	DG Electric Board Room Exhaust Fan Handswitch
HS-30-461C	37C	47W866-9	DG Electric Board Room Exhaust Fan Handswitch
2-FCO-30-462	37C	47W866-9	DG Electric Board Room Exhaust Damper
HS-30-462B	37C	47W866-9	DG Electric Board Room Exhaust Fan Handswitch
HS-30-462C	37C	47W866-9	DG Electric Board Room Exhaust Fan Handswitch

** Note system 30 components associated with Key 10 are contained in reference 11.7

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APPENDIX C

Ventilation (30) (Continued)**

Component	Key (Item)	Reference Drawing	Description
Elec Panel/ Gen Fan	37C	47W866-9	DG Room 1A-A, 2A-A, 1B-B, 2B-B
Elec Board Room Exhaust Fan	37C	47W866-9	Electrical Board Room Unit 1A-A, 2A-A, 1B-B, 2B-B
Exhaust Fan 1	37C	47W866-9	Diesel Generator Room Exhaust Fan
Exhaust Fan 2	37C	47W866-9	Diesel Generator Room Exhaust Fan
DC Powered TDAFW Pump Room Exhaust Fan	37N	47W866-11	Emergency Exhaust Fan
RHR Pump 1A Cooling	40		
RHR Pump 1B Cooling	40		
RHR Pump 2A Cooling	40		
RHR Pump 2B Cooling	40		
RHR Pump Room Cooler Fans 1A-A,1B-B, 2A-A,2B-B	40		

A/C (Cooling & Heating) (31)

Component	Key (Item)	Reference Drawing	Description
HS-31A-20A	37A	47W867-2	MCR Air Handling Unit Handswitch
HS-31A-20B	37A	47W867-2	MCR Air Handling Unit Handswitch
0-FCO-31A-20	37A	47W867-2	MCR Air Handling Unit Inlet Damper
0-FSV-31A-20	37A	47W867-2	MCR Air Handling Unit Solenoid Valve
0-T-31A-22	37A	47W867-2	MCR AHU Temperature Control Loop
0-FSV-31A-22A	37A	47W867-2	MCR AHU Cooling Fluid Solenoid Valve
0-FSV-31A-22B	37A	47W867-2	MCR AHU Cooling Fluid Solenoid Valve

** Note system 30 components associated with Key 10 are contained in reference 11.7.

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A/C (Cooling & Heating) (31) Continued

Component	(Item)	Key Drawing	Reference	Description
0-FCO-31A-23		37A	47W867-2	MCR AHU Inlet Damper
0-FSV-31A-23		37A	47W867-2	MCR AHU Solenoid Valve
HS-31A-23A		37A	47W867-2	MCR Air Handling Unit Handswitch
HS-31A-23B		37A	47W867-2	MCR Air Handling Unit Handswitch
0-T-31A-39		37A	47W867-2	MCR AHU Temperature Control Loop
0-FSV-31A-39A		37A	47W867-2	MCR AHU Cooling Fluid Solenoid Valve
0-FSV-31A-39B		37A	47W867-2	MCR AHU Cooling Fluid Solenoid Valve
0-TCV-31A-47&Loop		37A	47W867-2	MCR AHU Cooling Fluid Control
0-TCV-31A-48	"	37A	47W867-2	MCR AHU Cooling Fluid Control
0-TCV-31A-49	"	37A	47W867-2	MCR AHU Cooling Fluid Control
0-TCV-31A-50	"	37A	47W867-2	MCR AHU Cooling Fluid Control

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A/C (Cooling & Heating) (31) (Continued)

Component	Key (Item)	Reference Drawing	Description
0-T-31A-52	37A	47W867-2	MCR AHU Air Controls
0-TCV-31A-65 & Loop	37A	47W867-2	MCR AHU Cooling Fluid Control
0-TCV-31A-66 & Loop	37A	47W867-2	MCR AHU Cooling Fluid Control
0-TCV-31A-67 & Loop	37A	47W867-2	MCR AHU Cooling Fluid Control
0-TCV-31A-68 & Loop	37A	47W867-2	MCR AHU Cooling Fluid Control
0-T-31A-70	37A	47W867-4	MCR AHU Air Control
0-P-31A-126	37A	47W867-4	MCR AHU Condensing Unit Pressure Control
0-P-31A-127	37A	47W867-4	MCR AHU Condensing Unit Pressure Control
0-T-31A-128	37A	47W867-4	MCR AHU Condensing Unit Temperature Control
0-T-31A-129	37A	47W867-4	MCR AHU Condensing Unit Temperature Control
0-LG-31A-130	37A	47W867-4	MCR AHU Condensing Unit Oil Sump Level Glass
Loop 31A-131	37A	47W867-4	MCR AHU Condensing Unit A-A
0-T-31A-132	37A	47W867-4	MCR AHU Condensing Unit Oil Pump Motor Temperature
0-T-31A-133	37A	47W867-4	Oil Cooler MCR AHU Condensing Unit Control
Loop 31A-134	37A	47W867-4	MCR AHU Condensing Unit A-A
0-ET-31A-136	37A	47W867-4	MCR AHU Condensing Unit Liquid Pressure
0-P-31A-141	37A	47W867-4	MCR AHU Condensing Unit Liquid Pressure
0-P-31A-142	37A	47W867-4	MCR AHU Condensing Unit Liquid Pressure
0-T-31A-143	37A	47W867-4	MCR AHU Condensing Unit Temperature Controls
0-T-31A-144	37A	47W867-4	MCR AHU Condensing Unit Temperature Controls
0-LG-31A-145	37A	47W867-4	MCR AHU Condensing Unit Oil Sump Level Glass
Loop 31A-146	37A	47W867-4	MCR AHU Condensing Unit B-B
0-T-31A-147	37A	47W867-4	MCR AHU Condensing Unit Oil Pump Motor Temperature
0-T-31A-148	37A	47W867-4	Oil Cooler MCR AHU Condensing Unit Control
0-ET-31A-151	37A	47W867-4	MCR AHU Condensing Unit Comp. Mtr. Power Supply
Loop 31A-143	37A	47W867-4	MCR AHU Condensing Unit B-B

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A/C (Cooling & Heating) (31) (Continued)

Component	Key (Item)	Reference Drawing	Description
O-P-31A-172	37A	47W867-4	MCR AHU Condensing Unit Liquid Pressure
O-P-31A-173	37A	47W867-4	MCR AHU Condensing Unit Liquid Pressure
O-FCO-31A-176	37A	47W867-2	MCR AHU Inlet Damper
O-T-31A-176	37A	47W867-2	MCR AHU Inlet Damper Control
O-FCO-31A-177	37A	47W867-2	MCR AHU Inlet Damper
O-T-31A-177	37A	47W867-2	MCR AHU Inlet Damper Control
A/C U A-A	37A	47W867-2	MCR Air Conditioning Unit
A/C U B-B	37A	47W867-2	MCR Air Conditioning Unit
~~*Steam Supply Valve on AHU~~	~~37A~~	~~N/A~~	~~MCR Humidity Control~~

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Control Air (32)

Component	Key (Item)	Reference Drawing	Description
O-FSV-32-37	13	47W845-5	Station Air Compressor B Coolant Water Inlet Valve
O-FSV-32-42	13(100)	47W845-5	Station Air Compressor A Coolant Water Inlet Valve
O-FSV-32-61	13(110)	47W845-6	Auxiliary Air Compressor A-A Cooling Water Inlet
O-FSV-32-62	13(109)	47W848-1	Auxiliary Air Compressor A-A Unloader Valve
O-FCV-32-82	13(101)	47W848-1	Auxiliary Air Compressor A-A Auxiliary Building Isolation
O-PS-32-82	13	47W848-1	Auxiliary Air Compressor A-A Auxiliary Building Isolation Control
O-FCV-32-85	13(111)	47W848-1	Auxiliary Air Compressor B-B Auxiliary Building Isolation Valve
O-PS-32-85	13	47W848-1	Auxiliary Air Compressor B-B Auxiliary Building Isolation Control
O-FSV-32-87	13(112)	47W848-1	Auxiliary Air Compressor B-B Auxiliary Building Isolation

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Control Air (32) (Continued)

Component	Key (Item)	Reference Drawing	Description
0-FSV-32-88	13(113)	47W848-1	Auxiliary Air Compressor B-B Unloader Valve
Station Air Compressor A	13(99)	47W846-1	Compressor
Station Air Compressor B	13(102)	47W846-1	Compressor
Aux Air Compressor A	13	47W846-1	Compressor
Aux Air Compressor B	13	47W846-1	Compressor
Control Air Supply Path 1	12, 16	47W846-1	
Control Air Supply Path 2	12, 16	47W846-1	
Control Circuit for Air Comp A	13	47W846-1	
Control Circuit for Air Comp B	13	47W846-1	
Control Circuit for Aux Air Comp A	13	47W848-1	
Control Circuit for Aux Air Comp B	13	47W848-1	

Service Air (33)

Component	Key (Item)	Reference Drawing	Description
0-VLV-33-500	13	47W846-1	Station Air to Control Air Manual Isolation
0-VLV-33-501	13	47W846-1	Station Air to Control Air Manual Isolation

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APPENDIX C

Sample System (43)

Component	Key (Item)	Reference Drawing	Description
*1&2-FCV-43-55	24	47W611-1-3	Sample Line Cooler Isolation
*1&2-FCV-43-58	24	47W611-1-3	Sample Line Cooler Isolation
*1&2-FCV-43-61	24	47W611-1-3	Sample Line Cooler Isolation
*1&2-FCV-43-64	24	47W611-1-3	Sample Line Cooler Isolation

Feedwater Control System (46)

Component	Key (Item)	Reference Drawing	Description
Loop FIC-46-57	14, 15 (152)	47W610-46-1	TDAF WP Flow Control
Loop SC-46-57	14, 15 (152)	47W610-46-1	TDAF WP Speed Control

Chemical and Volume Control System (62)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-62-54	8	47W809-1	Excess Letdown Isolation Valve
1&2-FCV-62-55	8	47W809-1	Excess Letdown Isolation Valve
1&2-FCV-62-56	8	47W809-1	Excess Letdown Isolation Valve
1&2-FCV-62-69	7	47W809-1	RCS Loop 3 Letdown Flow Valve
1&2-FCV-62-70	7	47W809-1	RCS Loop 3 Letdown Flow Valve
1&2-FCV-62-72	7	47W809-1	Regen Heat Exchanger Letdown Isolation Valve
1&2-FCV-62-73	7	47W809-1	Regen Heat Exchanger Letdown Isolation Valve
1&2-FCV-62-74	7	47W809-1	Regen Heat Exchanger Letdown Isolation Valve

APPENDIX C

Chemical and Volume Control System (62) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-62-84	34(131)	47W809-1	Auxiliary Spray Isolation Valve
1&2-FCV-62-85	34(131a)	47W809-1	Normal charging Isolation Valve
1&2-FCV-62-86	34(130)	47W809-1	Alternate Charging Isolation Valve
1&2-FCV-62-89	34(129)	47W809-1	Charging Flow Control Valve
1&2-FCV-62-90	34(129)	47W809-1	Charging Flow Isolation Valve
1&2-FCV-62-91	34(129)	47W809-1	Charging Flow Isolation Valve
1&2-FCV-62-93	2,34 (129)	47W809-1	Charging Header Flow Control Valve
1-FCV-62-98	1(10a)	47W809-1	Centrifugal Charging Pump Minimum Flow Isolation Valve
2-FCV-62-98	1	47W809-1	Centrifugal Charging Pump Minimum Flow Isolation Valve
1-FCV-62-99	1(10a)	47W809-1	Centrifugal Charging Pump Isolation Valve
2-FCV-62-99	1	47W809-1	Centrifugal Charging Pump Isolation Valve
PCV-62-119	5	47W809-1	VCT Isolation From Nitrogen
PCV-62-120	5	47W809-1	VCT Isolation From Hydrogen
FSV-62-125	5	47W809-1	VCT Vent Isolation
PCV-62-126	5	47W809-1	VCT Vent Isolation
1&2-L-62-129A	4,5	47W809-1	VCT Level Loop
1&2-L-62-130A	4,5	47W809-1	VCT Level Loop
1&2-LCV-62-132	4(60),5	47W809-1	VCT Outlet Isolation Valve
1&2-LCV-62-133	4(60),5	47W809-1	VCT Outlet Isolation Valve
1&2-LCV-62-135	4,5(60)	47W809-1	Charging Pump Flow from RWST
1&2-LCV-62-136	4,5(60)	47W809-1	Charging Pump Flow from RWST
1&2-FCV-62-77	48	47W809-1	Normal Letdown Isolation Valve
1&2-PCV-62-81	48	47W809-1	VCT Letdown Pressure Control Valve
VLV-62-672	48	47W809-1	PCV by-pass valve
1&2-TCV-62-79	48	47W809-1	VCT Letdown Temp. Control Valve
1&2-FCV-62-59	48	47W809-1	Excess Letdown Three-way Valve
1&2-FCV-62-61	48	47W809-1	Excess Letdown Isolation Valve
1&2-FCV-62-63	48	47W809-1	Excess Letdown Isolation Valve

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APPENDIX C

Chemical and Volume Control System (62) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-VLV-62-526	2,34	47W809-1	Charging Flow Manual Bypass Valve
1&2-VLV-62-527	2	47W809-1	CCP A Manual Isolation to Charging
1&2-VLV-62-533	2	47W809-1	B Manual Isolation to Charging
1&2-VLV-62-534	2,34	47W809-1	Charging Flow Manual Bypass Valve
VLV-62-538	34	47W809-1	RCS Makeup Manual FCV Bypass
VLV-62-689	5	47W809-1	VCT Gas Sample Manual Isolation
VLV-62-692	5	47W809-1	Manual VCT Isolation From Nitrogen
VLV-62-693	5	47W809-1	Manual VCT Isolation From Hydrogen
1&2-Centrifugal Charging Pump A-A	1	47W809-1	See Appendix A, Key 1
1&2-Centrifugal Charging Pump B-B	1	47W809-1	See Appendix A, Key 1
1&2 CCP Room Cooler Fan A-A	1	47W809-1	See Appendix A, Key 1
CCP Room Cooler Fan B-B	1		
CCP Aux Lube Oil Pump A-A	1	47W610-62-2	Oil Supply for CCP A
CCP Aux Lube Oil Pump B-B	1	47W610-62-2	Oil Supply for CCP B
1&2-LCV-62-118	48	47W809-1	VCT Level Control Valve
1&2-RV-62-662	48	47W809-1	Normal Letdown to PRT
1&2-VLV-62-723	48	47W809-1	Normal Letdown Header Isolation Valve
1&2-RV-62-636	48	47W809-1	Excess Letdown Relief Valve to PRT
1&2-VLV-62-715	48	47W809-1	Excess Letdown Header Isolation Valve

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APPENDIX C

Safety Injection System (63)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-63-1	5	47W811-1	RWST to RHR Pump Flow Control
1&2-FCV-63-5	4,5(61)	47W811-1	RWST to SIS Pump Flow Control
1&2-FCV-63-6	4,5	47W811-1	SIS Pump Inlet to CVCS Charging Pump
1&2-FCV-63-7	4,5	47W811-1	SIS Pump Inlet to CVCS Charging Pump
*1&2-FCV-63-8	30	47W811-1	RHR Pump Supply to CCPs Flow Control
*1&2-FCV-63-11	30	47W811-1	RHRP Outlet to SIP Inlet Isolation Valve
1&2-FCV-63-25	6	47W811-1	SIS Boron Injection Tank Shutoff
1&2-FCV-63-26	6	47W811-1	SIS Boron Injection Tank Shutoff
1&2-FCV-63-39	6	47W811-1	SIS Boron Injection Tank Shutoff
1&2-FCV-63-40	6	47W811-1	SIS Boron Injection Tank Shutoff
1&2-FCV-63-41	6	47W811-1	SIS Boron Injection Tank to CVCS Boric Acid Tank
1&2-FCV-63-42	6	47W811-1	SIS Boron Injection Tank to CVCS Boric Acid Tank
1&2-FCV-63-47	4,5(61)	47W811-1	SIS Pump 1A-A Inlet Valve
*FCV-63-63	36	47W811-1	AT No. 4 Nitrogen Isolation Valve
*FCV-63-65	36	47W811-1	AT No. 4 Nitrogen Vent Valve
*FCV-63-67	36	47W811-1	AT No. 4 Flow Isolation Valve
*FCV-63-71	48	47W811-1	Inboard CIV to CVCS Holdup Tank
1&2-FCV-63-72	5(64), 30(128)	47W811-1	Containment Sump Flow Isolation Valve
1&2-FCV-63-73	5(64), 30(128)	47W811-1	Containment Sump Flow Isolation Valve
*FCV-63-80	36	47W811-1	AT No. 3 Flow Isolation Valve
*FCV-63-84	48	47W811-1	Outboard CIV to CVCS Holdup Tank
*FCV-63-87	36	47W811-1	AT No. 3 Nitrogen Isolation Valve
1&2-FCV-63-93	30(124)	47W811-1	RHR Pump A-A Discharge to Cold Leg 2 & 3

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APPENDIX C

Safety Injection System (63) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-63-94	30	47W811-1	RHR Pump B-B Discharge to Cold Leg 1 & 4
*FCV-63-98	36	47W811-1	AT No. 2 Flow Isolation Valve
*FCV-63-107	36	47W811-1	AT No. 2 Nitrogen Isolation Valve
*FCV-63-111	48	47W811-1	RHR CL Injection Cross Connect Flow Control
*FCV-63-112	48	47W811-1	RHR CL Injection Cross Connect Flow Control
*FCV-63-118	36	47W811-1	AT No. 1 Flow Isolation Valve
*FCV-63-127	36	47W811-1	AT No. 1 Nitrogen Isolation Valve
1&2-FCV-63-172	30(127)	47W811-1	RHR Hot Leg Injection Isolation Valve
1&2-VLV-63-574	6	47W811-1	Boron Injection Tank Outlet Valve to Boric Acid and CVCS Holdup Tanks

Essential Raw Cooling Water (67)

Component	Key (Item)	Reference Drawing	Description
0-FCV-67-12	3(139,142)	47W845-1	ERCW Header A Return Discharge Canal Shutoff Valve
0-FCV-67-14	3(51,56),9	47W845-1	ERCW Header A Return Discharge Canal Shutoff Valve
1&2-FCV-67-66	3(133,147)	47W845-1	DG Heat Exchanger Isolation Valve
1-FCV-67-162	370	47W845-6	CCS & AFW Pump Space Cooler Isol. Valve
1-FCV-67-164	370	47W845-6	CCS & AFW Pump Space Cooler Isol. Valve
2-FCV-67-217	370	47W845-4	BA & AFW Pump Space Cooler Isol. Valve R9
2-FCV-67-219	370	47W845-4	BA & AFW Pump Space Cooler Isol. Valve

APPENDIX C

Essential Raw Cooling Water (67) (Continued)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-67-67	3(44,142)	47W845-1	DG Hx Isolation Valve
1-FCV-67-81	3	47W845-2	Auxiliary Building ERCW Supply Header 1A Isolation Valve
2-FCV-67-81	3(40)	47W845-2	Auxiliary Building ERCW Supply Header 2A Isolation Valve
1-FCV-67-82	3(46)	47W845-2	Auxiliary Building ERCW Supply Header 1B Isolation Valve
2-FCV-67-82	3(54)	47W845-2	Auxiliary Building ERCW Supply Header 2B Isolation Valve
1-FCV-67-123	3(47),19	47W845-2	Containment Spray Heat Exchanger 1B Supply Control Valve
2-FCV-67-123	3(58),19	47W845-2	Containment Spray Heat Exchanger 2B Supply Control Valve
1-FCV-67-124	3(47),19	47W845-2	Containment Spray Heat Exchanger 1B Discharge Valve
2-FCV-67-124	3(58),19	47W845-2	Containment Spray Heat Exchanger 2B Discharge Valve
1-FCV-67-125	3(134), 19	47W845-2	Containment Spray Heat Exchanger 1A Supply Control Valve
2-FCV-67-125	3(41),19	47W845-2	Containment Spray Heat Exchanger 2A Supply Control Valve
1-FCV-67-126	3(134),19	47W845-2	Containment Spray Heat Exchanger 1A Discharge Valve
2-FCV-67-126	3(41),19	47W845-2	Containment Spray Heat Exchanger 2A Discharge Valve
1-FCV-67-127	3,13 (105.135)	47W845-2	Supply Valve for ERCW Flow to Air Conditioning Equipment 1A, and Service Air Compressor
2-FCV-67-127	3(141)	47W845-2	Supply Valve for ERCW Flow to Air Conditioning Equipment 2A

APPENDIX C

Essential Raw Cooling Water (67) (Continued)

Component	Key (Item)	Reference Drawing	Description
1-FCV-67-128	3,13(107, 144)	47W845-2	Supply Valve for ERCW Flow to Air Conditioning Equipment 1B, and Service Air Compressor
2-FCV-67-128	3(148),13	47W845-2	Supply Valve for ERCW Flow to Air Conditioning Equipment 2B
1-FCV-67-146	1(9), 9(83)	47W845-2	Component Cooling System Heat Exchanger A Discharge Control Valve
2-FCV-67-146	1(22),9 (86)	47W845-2	Component Cooling System Heat Exchanger B Discharge Control Valve
1-FCV-67-147	3	47W845-2	Cross Connect Valve, Main Supply Control Header 1A
2-FCV-67-147	3(55),19	47W845-2	Cross Connect Valve, Main Supply Header 2B
0-FCV-67-151	1(35)	47W845-2	Component Cooling System Heat Exchanger C Discharge Control Valve
0-FCV-67-152	1(35)	47W845-2	Component Cooling System Heat Exchanger C Discharge Control Valve
1-FCV-67-168	3	47W845-6	Supply Valve for ERCW Flow to Centrifugal Charging Pump Room Cooler 1A
2-FCV-67-168	3(38)	47W845-4	Supply Valve for ERCW Flow to Centrifugal Charging Pump Room Cooler 2A
1-FCV-67-170	3	47W845-6	Supply Valve for ERCW Flow to Centrifugal Charging Pump Room Cooler 1B
2-FCV-67-170	3(59,149)	47W845-4	Supply Valve for ERCW Flow to Centrifugal Charging Pump Room Cooler 2B
1-FCV-67-188	40	47W845-6	Supply Valve for ERCW Flow to RHR Pump Room Cooler 1A
2-FCV-67-188	40	47W845-4	Supply Valve for ERCW Flow to RHR Pump Room Cooler 2A
1-FCV-67-190	40	47W845-6	Supply Valve for ERCW Flow to RHR Pump Room Cooler 1B
2-FCV-67-190	40	47W845-4	Supply Valve for ERCW Flow to RHR Pump Room Cooler 2B

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APPENDIX C

Essential Raw Cooling Water (67) (Continued)

Component	Key (Item)	Reference Drawing	Description
0-TCV-67-197	37A	47W845-6	MCR A/C Discharge Isolation
0-TCV-67-201	37A	47W845-6	MCR A/C Discharge Isolation
0-FCV-67-205	13(104)	47W845-5	Station Service and Control Air Compressor Supply Header A Isolation Valve
*FS-67-206	13	47W610-67-5	ERCW to Station Air Comp Train A
*PS-67-206	13	47W610-67-5	ERCW to Station Air Comp Train A
0-FCV-67-208	13(106)	47W845-5	Station Service and Control Air Compressor Supply Header 1B Isolation Valve
*FS-67-209	13	47W610-67-5	ERCW to Station Air Comp Train B
*PS-67-209	13	47W610-67-5	ERCW to Station Air Comp Train B
1&2-FCV-67-223	3(37,50), 19	47W845-2	Supply Header 1B to Header 2A Isolation Valve
0-FCV-67-364	3(42,139)	47W845-1	Header A Return Discharge Canal Shutoff Valve
0-FCV-67-365	3(51,57), 9	47W845-1	Header A Return Discharge Canal Shutoff Valve
1-FCV-67-424	3(49), 19	47W845-2	ERCW to Component Cooling Water HTX Header 1B
0-FCV-67-478	1,9(80),19	47W845-2	Supply Valve ERCW to Component Coolant Heat Exchanger A
1-FCV-67-489	3(45)	47W845-5	ERCW Strainer B1B-B Isolation Valve
2-FCV-67-489	3(53)	47W845-5	ERCW Strainer B2B-B Isolation Valve
1&2-FCV-67-490A	3(53)	47W845-5	Strainer B Backwash Isolation Valve
1&2-FCV-67-490D	3(48,52)	47W845-5	Strainer B Backwash Isolation Valve
1&2-FCV-67-491A	3(137)	47W845-5	Strainer A Backwash Isolation Valve
1&2-FCV-67-491D	3(43,138)	47W845-5	Strainer A Backwash Isolation Valve
1-FCV-67-492	3	47W845-5	ERCW Strainer A1A-A Isolation Valve
2-FCV-67-492	3(39)		ERCW Strainer A2A-A Isolation Valve

APPENDIX C

Essential Raw Cooling Water (67) (Continued)

Component	Key (Item)	Reference Drawing	Description
ERCW Pump J-A	3	47W845-5	Delivers ERCW Cooling to Header 1A
ERCW Pump K-A	3	47W845-5	Delivers ERCW Cooling to Header 1A
ERCW Pump Q-A	3	47W845-5	Delivers ERCW Cooling to Header 2A
ERCW Pump R-A	3	47W845-5	Delivers ERCW Cooling to Header 2A
ERCW Pump L-B	3	47W845-5	Delivers ERCW Cooling to Header 1B
ERCW Pump M-B	3	47W845-5	Delivers ERCW Cooling to Header 1B
ERCW Pump N-B	3	47W845-5	Delivers ERCW Cooling to Header 2B
ERCW Pump P-B	3	47W845-5	Delivers ERCW Cooling to Header 2B
ERCW Strainer A1A-A	3	47W845-5	Strainer for ERCW Header 1A
ERCW Strainer A2A-A	3	47W845-5	Strainer for ERCW Header 2A
ERCW Strainer B1B-B	3	47W845-5	Strainer for ERCW Header 1B
ERCW Strainer B2B-B	3	47W845-5	Strainer for ERCW Header 2B
ERCW Header 2A&1B	1(10,22a), 3,9(82)	47W845-5	
ERCW Header 2B&1A	1(37),3	47W845-5	
*Screen Wash Pump A-A	3	47W845-5	
*Screen Wash Pump B-B	3	47W845-5	
*Screen Wash Pump C-B	3	47W845-5	
*Screen Wash Pump D-A	3	47W845-5	
*Traveling Screen A-A	3	47W845-5	
*Traveling Screen B-B	3	47W845-5	
*Traveling Screen C-B	3	47W845-5	
*Traveling Screen D-A	3	47W845-5	

EQUIPMENT REQUIRED FOR SAFE SHUTDOWN
DURING A DESIGN BASIS FIRE

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APPENDIX C

Reactor Coolant (68)

Component	Key (Item)	Reference Drawing	Description
1&2-T-68-1	28(119)	47W610-68-1	Loop 1 Hot Leg Temperature Indicator
1&2-T-68-18	28(119)	47W610-68-1	Loop 1 Cold Leg Temperature Indicator
1&2-T-68-24	23(119)	47W610-68-2	Loop 2 Hot Leg Temperature Indicator
1&2-T-68-41	28(119)	47W610-68-2	Loop 2 Cold Leg Temperature Indicator
1&2-T-68-43	28(119)	47W610-68-3	Loop 3 Hot Leg Temperature Indicator
1&2-T-68-60	28(119)	47W610-68-3	Loop 3 Cold Leg Temperature Indicator
1&2-T-68-65	28(119)	47W610-68-4	Loop 4 Hot Leg Temperature Indicator
1&2-P-68-66	28	47W610-68-7	RCS Pressure Loop for PI-68-66A
1&2-P-68-69	28	47W610-68-7	RCS Pressure Loop for PR-68-69
1&2-T-68-83	28(119)	47W610-68-4	Loop 4 Cold Leg Temperature Indicator
1&2-L-68-320	2	47W610-68-5	Pressurizer Level Loop
~~P-68-323~~	~~28~~	~~47W813-1~~	~~RCS PRZ Pressure Loop~~
~~P-68-334~~	~~28~~	~~47W813-1~~	~~RCS PRZ Pressure Loop~~
1&2-FCV-68-332	28(121)	47W813-1	Pressurizer Relief Block Valve
1&2-FCV-68-333	28(122)	47W813-1	Pressurizer Relief Block Valve
1,2-PCV-68-334	7(69), 28(122)	47W813-1	Pressurizer PORV
1&2-L-68-335	2	47W610-68-5	RCS Pressurizer Water Level
1&2-L-68-339	2	47W610-68-5	RCS Pressurizer Water Level
~~P-68-340~~	~~26~~	~~47W813-1~~	~~RCS PRZ Pressure Loop~~
1&2-PCV-68-340A	7(70), 28(121)	47W813-1	Pressurizer PORV
1&2-PCV-68-340B	28(123)	47W813-1	Pressurizer Spray Valve
1,2-PCV-68-340D	28	47W813-1	Pressurizer Spray Valve
Loop-1&2-P-68-342C	28	47W610-68-5	Pressurizer Pressure Instrument Loop for PI-68-342A
~~1~~1&2-FSV-68-394	7(71)	47W813-1	Reactor Vessel Head Vent Isolation Valve
~~1~~1&2-FSV-68-395	7(72)	47W813-1	Reactor Vessel Head Vent Isolation Valve
1&2-FSV-68-396	7(71)	47W813-1	Reactor Vessel Head Vent Throttle Valve
1&2-FSV-68-397	7(71,72)	47W813-1	Reactor Vessel Head Vent Throttle Valve

APPENDIX C

Component Cooling Water System (70)

Component	Key (Item)	Reference Drawing	Description
0-FCV-70-1	1,31	47W859-1	SFPCS HX B Outlet Isolation Valve
1&2-FCV-70-2	1(4,15)	47W859-1	RHR HTX A Inlet Valve
1&2-FCV-70-3	1(33,34)	47W859-1	RHR HTX B Inlet Valve
1&2-FCV-70-4	9(79, 87)	47W859-1	Miscellaneous Equipment Header Inlet Valve
1-FCV-70-8	1(2), 9(77)	47W859-1	CCS HTX A, Outlet Isolation Valve
1-FCV-70-9	1(3,31) 9(78)	47W859-1	CCS HTX A & C, Outlet Isolation Valve
1-FCV-70-10	1(3,31) 9(78)	47W859-1	CCS HTX A & C, Outlet Isolation Valve
0-FCV-70-11	1,31	47W859-1	SFPCS Hx A Outlet Isolation Valve
0-FCV-70-12	1(30)	47W859-1	CCS HTX C Outlet Isolation Valve
1-FCV-70-13	1(8,28), 9(84)	47W859-1	CCS HTX A & C Inlet Isolation Valve
2-FCV-70-14	1(18,29) 9(92)	47859-1	CCS HTX B & C Inlet Isolation Valve
2-FCV-70-15	1(12), 9(87)	47W859-1	CCS HTX B Outlet Isolation Valve
2-FCV-70-16	1(19), 9(87)		CCS Hx B Inlet Isolation Valve
2-FCV-70-18	1(18,29) 9(92)	47W859-1	CCS HTX B & C Inlet Isolation Valve
0-FCV-70-22	1(27)	47W859-1	CCS HTX C Inlet Isolation Valve
1-FCV-70-23	1(8,28), 9(84)	47W859-1	CCS HTX A & C Inlet Isolation Valve
1-FCV-70-25	1(6), 9(76)	47W859-1	CCS HTX A Inlet Valve
1-FCV-70-26	1(25), 9(84)	47W859-1	CCS Pumps 1A-A and 1B-B to C-S Outlet Isolation Valve
1-FCV-70-27	1(25), 9(84)	47W85901	CCS Pumps 1A-A and 1B-B to C-S Outlet Isolation Valve
2-FCV-70-28	1(17,26) 9(94)	47W859-1	CCS Pump 2A-A and 2B-B to C-S Outlet
2-FCV-70-29	1(17,26) 9(94)	47W859-1	CCS Pump 2A-A and 2B-B to C-S Outlet Isolation Valve
0-FCV-70-34	1(5), 9(75)	47W859-1	CCS Pump 1A-A to 1B-B Inlet Isolation Valve
0-FCV-70-39	1(21), 9(89)	47W859-1	CCS Pump 2A-A to 2B-B Inlet Isolation Valve
0-FCV-70-40	1,31	47W859-1	SFPCS Hx A Inlet Isolation Valve
0-FCV-70-41	1,31	47W859-1	SFPCS Hx B Inlet Isolation Valve

APPENDIX C

Component Cooling Water System (70) (Continued)

Component	Key (Item)	Reference Drawing	Description
1-FCV-70-64	1(7,23) 9(85)	47W859-1	CCS Pumps 1A-A and 1B-B to C-S Inlet Isolation Valve
1-FCV-70-74	1(7,23) 9(85)	47W859-1	CCS Pumps 1A-A and 1B-B to C-S Inlet Isolation Valve
1&2-FCV-70-75	1(37)	47W859-1	RHR Heat Exchanger B Return Header Isolation Valve
2-FCV-70-76	1(20,24) 9(93)	47W859-1	CCS Pumps 2A-A and 2B-B to C-S Inlet Isolation Valve
2-FCV-70-78	1(20,24) 9(93)	47W859-1	CCS Pumps 2A-A and 2B-B to C-S Inlet Isolation Valve
1&2-FCV-70-87	9(74,88)	47W859-2,3	Reactor Coolant Pump Thermal Barrier Return Isolation Valve
1&2-FCV-70-90	9(74,88)	47W859-2,3	Reactor Coolant Pump Thermal Barrier Return ISOL Valve
1&2-FCV-70-133	9(73,87)	47W859-2,3	Reactor Coolant Pump Thermal Barrier Coolant Isolation Valve
1&2-FCV-70-134	9(73,87)	47W859-2,3	Reactor Coolant Pump Thermal Barrier Coolant Isolation Valve
1&2-FCV-70-153	1(36),31	47W859-4	RHR Heat Exchanger B Outlet Valve
1&2-FCV-70-156	1(1,16) 9(81),31	47W859-4	RHR Heat Exchanger A Outlet Valve
0-FCV-70-193	1(14), 9(91), 31	47W859-1	SFPCS Heat Exchanger A & B Inlet Valve
1&2-FCV-70-85	48	47W859-2,3	CCS to Excess Letdown HX
1&2-FCV-70-143	48	47W859-2,3	CCS to Excess Letdown HX
1&2-TCV-70-192	48	47W859-2,3	CCS to Letdown HX

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Prepared by/Date DKR 2/10/88

Checked by/Date RAEdlund 2/10/88

APPENDIX C

Component Cooling Water System (70) (Continued)

Component	Key (Item)	Reference Drawing	Description
0-FCV-70-194	1(14), 9(91), 31	47W859-1	SFPCS Heat Exchanger A & B Inlet Valve
2-FCV-70-195	1(13,32) 9(90)	47W859-1	CCS HTX B & C Outlet Isolation Valve
2-FCV-70-196	1(13,32) 9(90)	47W859-1	CCS HTX B & C Outlet Isolation
0-FCV-70-197	1,31,9	47W859-1	SFPCS HTX Supply Header Valve
0-VLV-70-529A	1,31	47W859-1	SFPCS HTX A Outlet Manual Isolation Valve
0-VLV-70-529B	1,31	47W859-1	SFPCS HTX B Outlet Manual Isolation Valve
1-VLV-70-531	1,31	47W859-1	SFPCS HTX Return Manual Isolation Valve
0-FCV-70-198	1,9,31	47W859-1	SFPCS HTX Supply Header Valve
1&2-VLV-70-545A	1(1,16),9	47W859-4	RHR A Inlet Isolation Valve
1&2-VLV-70-545B	1	47W859-4	RHR B Inlet Isolation Valve
1&2-VLV-70-546A	1(1,16),9	47W859-4	RHR HTX A Outlet Valve
1&2-VLV-70-546B	1	47W859-4	RHR HTX 1A-A Outlet Valve
0-VLV-70-574	31	47W859-2&3	Non Regen Letdown HTX Manual Inlet
0-VLV-70-587	31	47W859-1&2	Non Regen Letdown HTX Manual Outlet
0-VLV-70-601	31	47W859-2	Comp Cooling to ERCW Manual Isolation Outlet
0-VLV-70-636	31	47W859-2	ERCW Cooling to CCS Inlet
0-VLV-70-637	31	47W859-2,3	BAE&GS Inlet Isolation Valve
0-VLV-70-661	31	47W859-2,3	BAE&GS Outlet Isolation Valve
CCS Pump B-B	1,9	47W859-1	
CCS Pump A-A	1,9	47W859-1	
CCS Pump C-S	1,9	47W859-1	
RCP Thermal Barrier			
Booster Pump A-A	9	47W859-2	
Booster Pump A-A	9	47W859-2	
Booster Pump B-B	9	47W859-2	

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APPENDIX C

Containment Spray (72)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-72-2	4,5(63)	47W812-1	Containment Spray Header B Isolation Valve
1&2-FCV-72-20	5	47W812-1	Containment Sump Isolation to CSPs
1&2-FCV-72-23	5	47W812-1	Containment Sump Isolation to CSPs
1&2-FCV-72-39	4,5(63)	47W812-1	Containment Spray Header A Isolation Valve
1&2-FCV-72-40	4,5(62), 30	47W812-1	RHR Spray Header A Isolation Valve
1&2-FCV-72-41	4,5(62), 30	47W812-1	RHR Spray Header B Isolation Valve
CS Pump A-A	4,5(63)	47W812-1	
CS Pump B-B	4,5(63)	47W812-1	

Residual Heat Removal (74)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-74-1	7(68),30	47W810-1	RHR System Isolation Valve
1&2-FCV-74-2	7(68),30	47W810-1	RHR System Isolation Valve
1&2-FCV-74-3	30(126)	47W810-1	RHR Pump A-A Inlet Flow Control Valve
*1&2-FCV-74-12	5,30	47W810-1	RHR Pump A-A Min Flow Valve
1&2-FCV-74-16	30(125)	47W810-1	RHR HTX A Outlet Flow Control Valve
1&2-FCV-74-21	30(126)	47W810-1	RHR B-B Pump B-B Inlet Flow Control Valve
*1&2-FCV-74-24	5	47W810-1	RHR Pump B-B Mini Flow Valve
1&2-FCV-74-28	30(125)	47W810-1	RHR HTX B Outlet Flow Control Valve
*1&2-FCV-74-32	30	47W810-1	RHR HTX Bypass Flow Control Valve
1&2-FCV-74-33	30(127)	47W810-1	RHR HTX A Bypass Valve
1&2-FCV-74-35	30(127)	47W810-1	RHR HTX B Bypass Valve
*1&2-HCV-74-36	30	47W810-1	RHR HTX A Bypass Valve
*1&2-HCV-74-37	30	47W810-1	RHR HTX B Bypass Valve
*1&2-VLV-74-542	48	47W810-1	RHR HX Tube Drain Manual Isolation
*1&2-VLV-74-546	48	47W810-1	RHR HX Tube Drain Manual Isolation
RHR Pump A-A	31,4,5 (62)		
RHR Pump B-B	31,4,5 (62)		

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APPENDIX C

Waste Disposal System (77) ~~***~~ RAE 2/11/88

Component	Key (Item)	Reference Drawing	Description
PCV-77-89	5	47W830-4	Waste Gas Compressor Isolation From VCT Vent Path

~~*** Note system 77 components associated with containment integrity are contained in reference 11.7~~ RAE 2/11/88

Upper Head Injection (87)

Component	Key (Item)	Reference Drawing	Description
1&2-FCV-87-21	36	47W811-2	Accumulator to Rx Vessel Head Isolation Valve
1&2-FCV-87-22	36	47W811-2	Accumulator to Rx Vessel Head Isolation Valve
1&2-FCV-87-23	36	47W811-2	Accumulator to Rx Vessel Head Isolation Valve
1&2-FCV-87-24	36	47W811-2	Accumulator to Rx Vessel Head Isolation Valve
1,2-VLV-87-550	36	47W811-2	UHI Gas Header Manual Vent
1,2-VLV-87-552	36	47W811-2	UHI Gas Accumulator Truck Fill

Reactor Protection System (99)

Component	Key (Item)	Reference Drawing	Description
HS-RT-1 or HS-RT-2	29	47W611-99-1	
NI-31B	29		
NI-32B	29		
Reactor Trip Breaker A	29	47W611-99-1	
Reactor Trip Breaker B	29	47W611-99-1	
*Rod Drive Motor Generator Set Breaker A&B	29	47W611-99-1	

* Indicates equipment/components that have been added since revision 6 of this calculation.

Prepared by/Date R A Edlund 2/10/

Checked by/Date R. J. Clark 2/10/83

APPENDIX D

Prepared by/Date R A Edlund 2/10/

Checked by/Date R. L. Clark 2/10/88

APPENDIX D

APPENDIX D - INSTRUMENTATION LIST FOR MAIN CONTROL ROOM

Indicator			Description
LI-68-339			Pressurizer Water Level
LI-68-320	One of three		Pressurizer Water Level
LI-68-335A			Pressurizer Water Level
PI-68-342A			RCS WR Pressure
PI-68-66A	One of three		RCS WR Pressure
PR-68-69			RCS WR Pressure
PI-1-2A	Either one	Two Loops Required	SG-1 Steam Press
PI-1-2B			SG-1 Steam Press
PI-1-9A	Either one		SG-2 Steam Press
PI-1-9B			SG-2 Steam Press
PI-1-20A	Either one		SG-3 Steam Press
PI-1-20B			SG-3 Steam Press
PI-1-27A	Either one		SG-4 Steam Press
PI-1-27B			SG-4 Steam Press
LR-3-43			
LI-3-174			
LI-3-164			
LI-3-38*	Either one		SG-1 NR Level
LI-3-39			SG-1 NR Level
LR-3-48			
LI-3-156			
LI-3-173			
LI-3-51*	Either one		SG-2 NR Level
LI-3-52			SG-2 NR Level
LR-3-98			
LI-3-172			
LI-3-148			
LI-3-93*	Either one		SG-3 NR Level
LI-3-94			SG-3 NR Level
LR-3-98			
LI-3-175			
LI-3-171			
LI-3-106*	Either one		SG-4 NR Level
LI-3-107			SG-4 NR Level

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Checked by/Date R.J. Clark 2/10/88

APPENDIX D

APPENDIX D - INSTRUMENTATION LIST FOR MAIN CONTROL ROOM

Indicator		Description
TR-68-1 (Pen 1)	Two loops required	RCS Loop 1 Hot Leg
TR-68-1 (Pen 2)		RCS Loop 1 Cold Leg
TR-68-24 (Pen 1)		RCS Loop 2 Hot Leg
TR-68-24 (Pen 2)		RCS Loop 2 Cold Leg
TR-68-43 (Pen 1)		RCS Loop 3 Hot Leg
TR-68-43 (Pen 2)		RCS Loop 3 Cold Leg
TR-68-65 (Pen 1)		RCS Loop 4 Hot Leg
TR-68-65 (Pen 2)		RCS Loop 4 Cold Leg

Source Range Flux Monitor

NI-92-31B	Either one
NI-92-32B	

Condensate Storage Tank Level

1.	LI-2-230A	Either one for Tank A (Note 1)
2.	LI-2-230D	
3.	LI-2-233A	Either one for Tank B (Note 1)
4.	LI-2-233D	

Chemical and Volume Control

1.	LI-62-129 (Tank Level-VCT)	Note 2
2.	FI-62-93A (Charging Flow)	Note 3

Note 1: If MCR indication is not available, local monitoring of tank level or AFW suction pressure is acceptable

Note 2: Refer to key 4 for actions if this level indication is not available.

Note 3: This indicator is only required if the ~~using FCV-62-93~~ normal charging path RLC 2/12/88 is chosen in key 2.

*Denotes steam generator level transmitters whose sense lines have been verified as ~~having adequate separation.~~ being unaffected by a fire inside containment (B29 880120 001). Only the sense lines are Appendix R equipment (i.e., the cabling was not evaluated). RLC 2/11/88

APPENDIX E

Prepared by/Date RA Edlund 2/10/88

Checked by/Date R. J. Clark 2/10/88

APPENDIX E

Appendix E - Instrumentation List for Auxiliary Control Room:

Pressurizer Pressure and Level

Level

1. LI-68-325C Either one
2. LI-68-326C

Pressure

1. PI-68-336C
2. PI-68-337C One of three
3. PI-68-342C

Reactor Coolant Hot Leg Temperature

1. TI-68-1C (Loop 1)
2. TI-68-24C (Loop 2)
3. TI-68-43C (Loop 3)
4. TI-68-65C (Loop 4)

All four loops ~~Any two loops used for cooldown~~ Rae 2/11/88

Steam Generator Pressure and Level

Pressure

1. PI-1-1C (Loop 1)
2. PI-1-8C (Loop 2)
3. PI-1-19C (Loop 3)
4. PI-1-26C (Loop 4)

All four loops ~~Any two loops used for cooldown~~ Rae 2/11/88

Level

1. LI-3-164C (Loop 1)
2. LI-3-156C (Loop 2)
3. LI-3-148C (Loop 3)
4. LI-3-171C (Loop 4)

All four loops ~~Any two loops used for cooldown~~ Rae 2/11/88

Source Range Flux Monitor

1. RI-90-210

Level Indication for Tanks

Volume Control Tank

1. LI-62-129C

Prepared by/Date R A Edlund 2/10/8

Checked by/Date R. J. Clark 2/10/88

APPENDIX E

Appendix E - Instrumentation List for Auxiliary Control Room:

Diagnostic Instrumentation for Shutdown Systems

Auxiliary Feedwater System

1. FI-3-163C (Loop 1)
2. FI-3-155C (Loop 2)
3. FI-3-147C (Loop 3)
4. FI-3-170C (Loop 4)
5. FI-3-142C (Aux FPT Disch)

All four loops
~~Any two loops used for cooldown~~ RAE 2/11/88

Chemical and Volume Control Tank

1. TI-62-80C (Ltdn Ht Exch Outlet)
2. PI-62-92C (Chg Hdr Press)
3. FI-62-93C (Chg Hdr Flow)
4. FI-62-137C (Emer Boration)

Safety Injection System

1. FI-63-91C (RHR Pmp A-A to RCS 2&3 CL) Either one
2. FI-63-92C (RHR Pmp B-B to RCS 1&4 CL)

Essential Raw Cooling Water

1. FI-67-61C (ERCW Supply Hdr A) Either one
2. FI-67-62C (ERCW Supply Hdr B)

Residual Heat Removal

1. TI-74-38C (RHR Htx A Outlet Temp) Either one
2. TI-74-40C (RHR Htx B Outlet Temp)

ENCLOSURE 2

List of Commitments

1. The verification of unit 1 to revision 9 of the Appendix R shutdown logic is currently scheduled for completion by July 11, 1988.

2. Modifications identified during the verification of unit 1 to the Appendix R shutdown logic calculation will be completed before unit 1 restart except where interim compensatory measures may exist.