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SECTION 1

PROCEDURE TITLE AND NUMBER
SFRCS System procedure SP 1105.16

REASON FOR CHANGE
To incorporate the changes due to FCR 81-178 Rev A Supp 2.

CHANGE
See Attached sheets

IS PROCEDURE REVISION REQUIRED Yes ☒ No ☐ If no, this modification is valid until _____

PREPARED BY T R Staley	DATE 3-29-85
APPROVED BY T R Staley	DATE 3-29-85
APPROVED BY D. Lemmon	DATE 3/29/85
SUBMITTED BY (Section Head) D D Lee	DATE 3-30-85
RECOMMENDED BY (SRB Chairman)	DATE APR 3 1985
QA APPROVED BY (Manager of Quality Assurance) N/A	DATE
APPROVED BY (Station Superintendent)	DATE APR 3 1985

deenergize to actuate their associated equipment, they also turn out a light on the front of the cabinet when in the tripped state.

Each input to SFRCS cabinet has a test switch & light so that a trip of that input can be initiated for testing purposes.

The outputs from the SFRCS are contacts from the output relays. These contacts are in the control circuits for the SFRCS actuated equipment (see Enclosure 2 for listing of actuated equipment). Most components require two SFRCS channels to trip to actuate. Components 1-1 OTSG side require both channels 1 and 3; components on 1-2 OTSG side require channels 2 and 4. (See Enclosure 2) Certain Solenoid Valves (atm. vents, MSIV bypasses, Steam Generator Blowdown, and MS warmup drains)are 1/2 channels to shut. 11

There is a block feature associated with the low steam pressure and Hi S/G Lvl trip: to prevent the system from actuating on cooldown, each channel has a "block" pushbutton on C5721 and on SFRCS cabinet. When steam pressure reaches 650 psig (2/2 switches per channel) a block permissive light is received on C5721 along with annunciator and computer alarms. When the block button is pushed, the channel will not trip (on low steam pressure or Hi S/G Lvl) and a MS LP trip block lite is actuated on C5721 as well as annunciator and computer alarms. On a heatup the block signal is automatically removed when either of the 650 psig pressure switches resets. 11

There is another block which is utilized on cooldown; this is in the form of contacts from the decay heat system suction valves from the RCS (DH11 and 12) which will block the open circuit on the main steam to aux. feed pump valves (MS 106 and 107). This prevents the SFRCS from opening these valves when all reactor coolant pumps are secured on shutdown. This "block" is automatically removed when the decay heat system is secured on startup. 11

~~MS 106A and MS 107A will also open on cooldown when all 4 RCP's are secured. Since the decay heat interlock (block) function does not prevent this, MS 106A and MS 107A opening must be defeated by racking out their supply breakers.~~

1.2.3 System Logic (Refer to Enclosure 2 for logic in

open. The action provided by these valves defeats AFPT 1-1 from being controlled by LT-SP9B3 (46" H_2O) and aligns LT-SP9A4 to control at the higher level (50" H_2O). Aux feed pump 1-2 will control on LT-SP9A3 and AFPT 1-2 governor will be run to low speed stop.

In this configuration S/G 1-2 level will be controlled at 50" H_2O by AFPT 1-1.

4. The SFRCS will automatically reset once the trip condition on the input is removed. None of the valves, however, will return to their original position until operated individually from the control room. The Main Feedwater Control Valves SP 6B/6A, must be reset at their local Reset buttons. Startup Feedwater Valves SP7A and SP7B may be blocked and reset from the back of the Control Room.

5. As shown on Enclosure 2, most of the valves on the 1-1 side are actuated by Channels 1 and 3; most of the valves on the 1-2 side are actuated by Channels 2 and 4. The following are exceptions: 11

   a. MS 100 and MS 101 - each of these valves will shut when Channels 1 and 3 OR 2 and 4 trip. There are 5 actuation solenoids on each MSIV. On MS 101 for example, 2 solenoids are actuated by Channels 1 and 3, and the remaining 3 are actuated by Channels 2 and 4. MS 101 will not shut as long as one solenoid from each set is energized.

   b. SP 6B and SP 6A - Main feed control valves. The valve in the 1-1 feed line - SP 6B - shuts when Channel 2 and 4 trip; SP 6A shuts when Channel 1 and 3 shut.

   c. Startup Feedwater Valves SP7A and SP7B may be reset and/or blocked from the Control Room at local control stations NRS60AB, NRS60BB, NRS60CB and NRS60DB.

   ~~d. MS 106A and MS 107A will open in conjunction with MS 106 and MS 107 when the SFRCS trips on the following signals:~~ 11

      ~~Hi/Lo level S/G 1-1 or 1-2~~

~~Hi ΔP S/G 1-1 or 1-2~~
~~Loss of all 4 RCP's~~

~~If the situation arises in that we have low steam pressure in both MS 106A and MS 107A will not reclose automatically, but may be closed manually.~~

6. As shown on Enclosure 2, the following valves are 1/2 to trip, i.e., Channel 1 or 3; Channel 2 or 4:

Channels 1/3	Channels 2/4	
MS 101-1	MS 100-1	MSIV Bypass
MS 394	MS 375	MS Drain
ICS 11B	ICS 11A	Atm. Vent
MS 611	MS 603	S/G Blowdown

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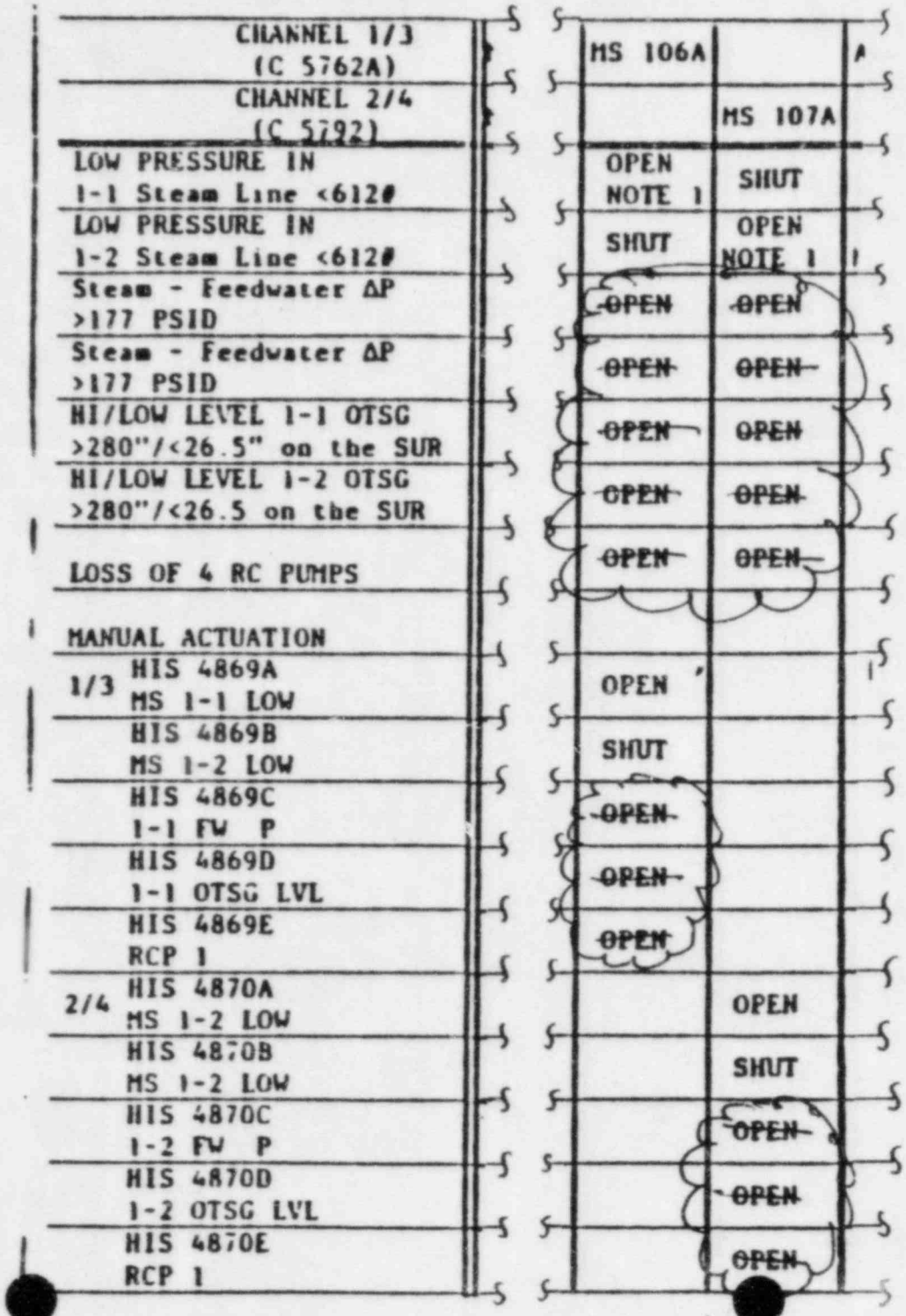
7. Besides being actuated automatically, the SFRCS may be manually actuated in two ways:

   a. Each input device (PS, PDS, LSLL, etc.) has a test button on the input buffer card in the SFRCS cabinets (see Enclosure 1). Pushing one of these buttons will have the same effect as the input device reaching its setpoint. Keep in mind that tripping one input device will trip its associated channel in the appropriate trip function. For example: if S8 in channel #1 (refer to Enclosure #1) is pushed, channel #1 will trip on the high >177 psid SG pressure to FW pressure ΔP function. Using Enclosure #2 "Steam and Feedwater Rupture Control Actuation" note that no valves, except for those which are 1 out of 2 logic will trip. Note that these test pushbuttons are mainly for "Testing" purposes only.

   b. There are ten manual actuation switches on the panel C-5721 in the control room. Each switch is an HIS type with a red "TRIPPED" light and "Trip/Off" pushbuttons. The "TRIP" pushbutton is of the maintained contact type so that when it is pushed, it will stay in the "tripped" position until the "OFF" button is pushed. The switch arrangement on panel C-5721 is as follows:

      CAUTION: The low steam line pressure inputs are not in the same configuration

Pg 23
Enclosure 2
Pg 1 of 2.



	CHANNEL 1/3 (C 5762A)	CHANNEL 2/4 (C 5792)	MS 106A	MS 107A	
	LOW PRESSURE IN 1-1 Steam Line <612#		OPEN NOTE 1	SHUT	
	LOW PRESSURE IN 1-2 Steam Line <612#		SHUT	OPEN NOTE 1	
	Steam - Feedwater ΔP >177 PSID		~~OPEN~~	~~OPEN~~	
	Steam - Feedwater ΔP >177 PSID		~~OPEN~~	~~OPEN~~	
	HI/LOW LEVEL 1-1 OTSG >280"/<26.5" on the SUR		~~OPEN~~	~~OPEN~~	
	HI/LOW LEVEL 1-2 OTSG >280"/<26.5 on the SUR		~~OPEN~~	~~OPEN~~	
	LOSS OF 4 RC PUMPS		~~OPEN~~	~~OPEN~~	
	MANUAL ACTUATION				
1/3	HIS 4869A MS 1-1 LOW		OPEN		
	HIS 4869B MS 1-2 LOW		SHUT		
	HIS 4869C 1-1 FW P		~~OPEN~~		
	HIS 4869D 1-1 OTSG LVL		~~OPEN~~		
	HIS 4869E RCP 1		~~OPEN~~		
2/4	HIS 4870A MS 1-2 LOW			OPEN	
	HIS 4870B MS 1-2 LOW			SHUT	
	HIS 4870C 1-2 FW P			~~OPEN~~	
	HIS 4870D 1-2 OTSG LVL			~~OPEN~~	
	HIS 4870E RCP 1			~~OPEN~~	

COMPONENT	OUTPUT RELAY	ACTION TO DISABLE	ACTION TAKEN (IF ANY)	VERIFIED	RESTORED PHASE II VER.	RESTORED PHASE III IND. VER.
MS 101 (2/2 x 2)	101A 103A 602C 602F 604C 604F	1. Shut Vlv OR 2. Jumper *				
MS 100 (2/2 x 2)	102A 104A 601C 601F 603C 603F	1. Shut Vlv, OR 2. Jumper *				
MS 106 (2/2)	201A Shut 203A 301C 303C Open	Open Breaker D135 (D1NA)				
MS 107 (2/2)	202A Shut 204A 302C 304C Open	Open Breaker BF 1124 (F11A)				
MS 106A (2/2)	~~901A 301E~~ Shut ~~903A 303E~~ ~~B01A 401A~~ ~~B03A 403A~~ Open	Open Breaker BE 1271 (E12B)				
MS 107A (2/2)	~~902A 302E~~ Shut ~~903A 304E~~ ~~B02A 402A~~ ~~B04A 404A~~ Open	Open Breaker BF 1188 (F11B)				
AF 3870 (2/2)	201B Shut 203B 301D 303D Open	Open Breaker D107 (D1PA)				
AF 3872 (2/2)	202B Shut 204B 302D 304D Open	Open Breaker BF 1262 (F12B)				
AF 3869 (2/2)	301F Shut 303F 401B 403B Open	Open Breaker BE 1146 (E11E)				
AF 3871 (2/2)	302F Shut 304F 402B 404B Open	Open Breaker BF 1201 (F12A)				

See NOTE on Page 5 of 5

Davis-Besse Nuclear Power Station

Unit No. 1

System Procedure SP 1105.16

Steam and Feedwater Rupture Control System Operating Procedure

NUCLEAR SAFETY RELATED

Record of Approval and Changes

Prepared By T. Lehman, T. Poremski, D. Ricci — 5/5/76 (Date)

Submitted By Terry D. Murray (Section Head) — 5/12/76 (Date)

Recommended By Jack Evans (SRB Chairman) — 9/14/76 (Date)

QA Approved NA (Quality Assurance Director) — (Date)

Approved By Jack Evans (Plant Manager) — 9/14/76 (Date)

Revision No.	SRB Recommendation	Date	QA Approved	Date	Plant Manager Approval	Date
11	[signature]	DEC 12 1984	NA		[signature]	1/17/85

1. PURPOSE

1.1 To detail the procedures necessary to perform the following operations associated with the Steam and Feedwater Rupture Control System (SFRCS).

	Section
SFRCS Energization and Initialization for Plant Startup	4
Deenergization of an SFRCS Channel (During Power Operations)	5
SFRCS Operations during plant shutdown	6
Abnormal Operations	7

1.2 Discussion

1.2.1 General

The steam and feedwater rupture control system (SFRCS) is an automatic system designed to protect against the following accidents:

1. Main steam rupture, either upstream or downstream of main steam isolation valve (MSIV). This accident, if allowed to proceed, could rapidly blow down both steam generators, resulting in a rapid RCS cooldown and therefore a rapid reactivity insertion under certain core conditions. To prevent this, SFRCS senses low main steam pressure and automatically initiates auxiliary feedwater.

2. Main feed rupture. If on the steam generator side of the feed check valve, this is approximately the same accident as the steam rupture; on the feedwater side of the feed check valve this results in a total loss of feedwater (see c).

3. Loss of all main feedwater. This (as well as the above accident) could resultin boiling both steam generators dry. If this happened, there would be no steam available for running auxiliary feed pumps to remove decay heat. To prevent this, SFRCS senses the loss of feedwater and automatically initiates auxiliary feedwater.

The SFRCS, upon indication of any of the above accidents, will isolate main steam and feedwater to the steam generators and start the auxiliary feed system. This rapidly isolates the affected steam generator(s) by stopping main feed to it and isolating steam from

11

deenergize to actuate their associated equipment, they also turn out a light on the front of the cabinet when in the tripped state.

Each input to SFRCS cabinet has a test switch & light so that a trip of that input can be initiated for testing purposes.

The outputs from the SFRCS are contacts from the output relays. These contacts are in the control circuits for the SFRCS actuated equipment (see Enclosure 2 for listing of actuated equipment). Most components require two SFRCS channels to trip to actuate. Components 1-1 OTSG side require both channels 1 and 3; components on 1-2 OTSG side require channels 2 and 4. (See Enclosure 2) Certain Solenoid Valves (atm. vents, MSIV bypasses, Steam Generator Blowdown, and MS warmup drains)are 1/2 channels to shut. 11

There is a block feature associated with the low steam pressure and Hi S/G Lvl trip: to prevent the system from actuating on cooldown, each channel has a "block" pushbutton on C5721 and on SFRCS cabinet. When steam pressure reaches 650 psig (2/2 switches per channel) a block permissive light is received on C5721 along with annunciator and computer alarms. When the block button is pushed, the channel will not trip (on low steam pressure or Hi S/G Lvl) and a MS LP trip block lite is actuated on C5721 as well as annunciator and computer alarms. On a heatup the block signal is automatically removed when either of the 650 psig pressure switches resets. 11 11 11

There is another block which is utilized on cooldown; this is in the form of contacts from the decay heat system suction valves from the RCS (DH11 and 12) which will block the open circuit on the main steam to aux. feed pump valves (MS 106 and 107). This prevents the SFRCS from opening these valves when all reactor coolant pumps are secured on shutdown. This "block" is automatically removed when the decay heat system is secured on startup.

MS 106A and MS 107A will also open on cooldown when all 4 RCP's are secured. Since the decay heat interlock (block) function does not prevent this, MS 106A and MS 107A opening must be defeated by racking out their supply breakers. 11

1.2.3 System Logic (Refer to Enclosure 2 for logic in

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2. Main feed rupture. If on the steam generator side of the feed check valve, this is approximately the same accident as the steam rupture; on the feedwater side of the feed check valve this results in a total loss of feedwater (see c).

3. Loss of all main feedwater. This (as well as the above accident) could resultin boiling both steam generators dry. If this happened, there would be no steam available for running auxiliary feed pumps to remove decay heat. To prevent this, SFRCS senses the loss of feedwater and automatically initiates auxiliary feedwater.

The SFRCS, upon indication of any of the above accidents, will isolate main steam and feedwater to the steam generators and start the auxiliary feed system. This rapidly isolates the affected steam generator(s) by stopping main feed to it and isolating steam from

11

it. Auxiliary feed is initiated to keep steam available for cooldown. Once this is accomplished, the operator will have time to complete the shutdown and begin a cooldown in an orderly manner.

4. Loss of 4 reactor coolant pumps. This results in loss of primary flow and therefore auxiliary feed is needed to establish natural circulation flow. The SFRCS will sense loss of 4 RC Pumps and automatically initiate auxiliary feedwater.

1.2.2 Functional Description (refer to Enclosures 1 and 2)

The SFRCS is divided for redundancy, diversity, and testability into four channels. Channels 1 and 3 (basically OTSG 1-1) are located in a Cabinet in the Control Room, Channels 2 and 4 (basically OTSG 1-2) are in another. In one cabinet, one channel has an AC power supply, the other a DC supply.

Channel	Cabinet	Power Supply	Breaker
1	C5762A	Y1	21
2	C5792	Y2	21
3	C5762A	D1P	11
4	C5792	D2P	11

Each channel receives the following inputs (See Enclosure 1 for list of input devices).

1. Six pressure switches - 2 from each steam line set at 612 ± 20 psig decreasing and 2 on one steam line (1-1 for ch. 1/3; 1-2 for ch. 2/4) set at 650 ±10 psig increasing.

11| 2. Two feed-steam ΔP switches, one from each loop (See Enclosure 1 for sensing points) set at 177 ±20 psid steam higher than feedwater.

11| 3. Four Hi & Lo level bistables, two from each steam generator set at 280" for Hi Lvl Trip and 26.5" for Low Lvl Trip indicated on the startup range.

4. A contact from RCP pump power sensing circuit; contact opens on loss of all four RCP. (See E52B, sheet 49)

The SFRCS cabinets consist basically of an AC and a DC power supply, input buffer, logic modules, and
11| output relays. The output relays (in most instances)

deenergize to actuate their associated equipment, they also turn out a light on the front of the cabinet when in the tripped state.

Each input to SFRCS cabinet has a test switch & light so that a trip of that input can be initiated for testing purposes.

The outputs from the SFRCS are contacts from the output relays. These contacts are in the control circuits for the SFRCS actuated equipment (see Enclosure 2 for listing of actuated equipment). Most components require two SFRCS channels to trip to actuate. Components 1-1 OTSG side require both channels 1 and 3; components on 1-2 OTSG side require channels 2 and 4. (See Enclosure 2) Certain Solenoid Valves (atm. vents, MSIV bypasses, Steam Generator Blowdown, and MS warmup drains)are 1/2 channels to shut. 11

There is a block feature associated with the low steam pressure and Hi S/G Lvl trip: to prevent the system from actuating on cooldown, each channel has a "block" pushbutton on C5721 and on SFRCS cabinet. When steam pressure reaches 650 psig (2/2 switches per channel) a block permissive light is received on C5721 along with annunciator and computer alarms. When the block button is pushed, the channel will not trip (on low steam pressure or Hi S/G Lvl) and a MS LP trip block lite is actuated on C5721 as well as annunciator and computer alarms. On a heatup the block signal is automatically removed when either of the 650 psig pressure switches resets. 11 11 11

There is another block which is utilized on cool-down; this is in the form of contacts from the decay heat system suction valves from the RCS (DH11 and 12) which will block the open circuit on the main steam to aux. feed pump valves (MS 106 and 107). This prevents the SFRCS from opening these valves when all reactor coolant pumps are secured on shut-down. This "block" is automatically removed when the decay heat system is secured on startup.

MS 106A and MS 107A will also open on cooldown when all 4 RCP's are secured. Since the decay heat interlock (block) function does not prevent this, MS 106A and MS 107A opening must be defeated by racking out their supply breakers. 11

1.2.3 System Logic (Refer to Enclosure 2 for logic in

tabular form. M-050 & M-051 and E-18 are the Bechtel Logic Diagrams.)

1. The following will trip one channel of the SFRCS:

   a. 1/2 Steam Pressure Switches <612 psig; two switches are on 1-1 steam line; two are on 1-2 steam line. (See Enclosure 1.)

   b. 1/2 Steam-feed differential pressure switches >177 psid steam greater than feedwater. One PDS is on 1-1 feed-steam line; one is on 1-2 feed-steam line (See Enclosure 1).

11| c. 1/2 OTSG low level switches <26.5" indicated S/U range. One switch is on 1-1 OTSG: One is on 1-2. (See Enclosure 1)

11| d. 1/2 OTSG Hi Lvl Trip >280" H_20 as indicated on S/U range. One Hi Trip bistable for each OTSG. SFRCS monitored level S/U range is 0 to 385" H_20.

   e. Loss of 4 RC Pumps.

2. The response of the actuated components depends on the type of trip: (Refer to Enclosure 2)

   a. On low steam pressure on one steam line, steam feedwater are isolated to and from each steam generator. In addition, both auxiliary feed pumps are aligned to take steam from and to feed the steam generator which is above 612 psig.

      If both steam generators go below 612 psig, steam and feedwater is isolated to and from each steam generator and no auxiliary feedwater is initiated.

      If any other trip (such as low steam generator level) accompanies a low steam pressure trip, the valves will align per low steam pressure trip logic.

11| b. On high feed-steam dp or Hi/low OTSG level on one steam generator, feed and steam are isolated to and from both OTSG's and each auxiliary feed pump is aligned to feed its own steam generator.

c. On loss of all four RC pumps, neither feed nor steam is isolated; each auxiliary feed pump is aligned to its respective steam generator.

11 d. On all of the above events, the turbine and ARTS is tripped by the SFRCS. This results in a Rx trip.

3. The auxiliary feed pump governor control switch in the control room has 2 positions:

Auto-essential (SFRCS)

Manual

NOTE: The Mode Selector Switch still has an ICS position which is not to be used.

In the auto-essential position, a SFRCS trip will position the governor to control OTSG levels
11 at 46" inches on S/U range. If an SFAS Incident
11 Level 2 exists, then the governor will control at 124" on the S/U range.

NOTE: This can be blocked after the SFAS Incident Level 2 trip has occurred to allow control at the Low Level, however, administratively this is NOT permitted.

In manual the auxiliary feed pump is controlled by the operator with the Raise-Lower switch on C5709. This "Auto-Essential" speed control circuit receives a signal from the S/U range level for the appropriate steam generator. When each steam generator is being fed from its respective auxiliary feed pump, 1-1 S/U level controls speed on 1-1 auxiliary feed pump, 1-2 S/U level controls speed on 1-2 auxiliary feed pump. If both feed pumps are feeding one steam generator, they will be controlled by the S/U level on the steam generator being fed.

11 If there is an SFAS and a SFRCS trip, the S/G level will be controlled at 128" H_2O.

The level selection is determined by which aux feedwater supply valve is opened.

For example if S/G 1-1 has a low pressure trip AF-3870 will remain closed and AF-3869 will

11 open. The action provided by these valves defeats AFPT 1-1 from being controlled by LT-SP9B3 (46" H_2O) and aligns LT-SP9A4 to control at the higher level (50" H_2O). Aux feed pump 1-2 will control on LT-SP9A3 and AFPT 1-2 governor will be run to low speed stop.

In this configuration S/G 1-2 level will be controlled at 50" H_2O by AFPT 1-1.

4. The SFRCS will automatically reset once the trip condition on the input is removed. None of the valves, however, will return to their original position until operated individually from the control room. The Main Feedwater Control Valves SP 6B/6A, must be reset at their local Reset buttons. Startup Feedwater Valves SP7A and SP7B may be blocked and reset from the back of the Control Room.

5. As shown on Enclosure 2, most of the valves on the 1-1 side are actuated by Channels 1 and 3;
11 most of the valves on the 1-2 side are actuated by Channels 2 and 4. The following are exceptions:

   a. MS 100 and MS 101 - each of these valves will shut when Channels 1 and 3 OR 2 and 4 trip. There are 5 actuation solenoids on each MSIV. On MS 101 for example, 2 solenoids are actuated by Channels 1 and 3, and the remaining 3 are actuated by Channels 2 and 4. MS 101 will not shut as long as one solenoid from each set is energized.

   b. SP 6B and SP 6A - Main feed control valves. The valve in the 1-1 feed line - SP 6B - shuts when Channel 2 and 4 trip; SP 6A shuts when Channel 1 and 3 shut.

   c. Startup Feedwater Valves SP7A and SP7B may be reset and/or blocked from the Control Room at local control stations NRS60AB, NRS60BB, NRS60CB and NRS60DB.

11 d. MS 106A and MS 107A will open in conjunction with MS 106 and MS 107 when the SFRCS trips on the following signals:

      Hi/Lo level S/G 1-1 or 1-2

Hi ΔP S/G 1-1 or 1-2
Loss of all 4 RCP's

If the situation arises in that we have low steam pressure in both MS 106A and MS 107A will not reclose automatically, but may be closed manually.

6. As shown on Enclosure 2, the following valves are 1/2 to trip, i.e., Channel 1 or 3; Channel 2 or 4:

Channels 1/3	Channels 2/4	
MS 101-1	MS 100-1	MSIV Bypass
MS 394	MS 375	MS Drain
ICS 11B	ICS 11A	Atm. Vent
MS 611	MS 603	S/G Blowdown

7. Besides being actuated automatically, the SFRCS may be manually actuated in two ways:

a. Each input device (PS, PDS, LSLL, etc.) has a test button on the input buffer card in the SFRCS cabinets (see Enclosure 1). Pushing one of these buttons will have the same effect as the input device reaching its setpoint. Keep in mind that tripping one input device will trip its associated channel in the appropriate trip function. For example: if S8 in channel #1 (refer to Enclosure #1) is pushed, channel #1 will trip on the high >177 psid SG pressure to FW pressure ΔP function. Using Enclosure #2 "Steam and Feedwater Rupture Control Actuation" note that no valves, except for those which are 1 out of 2 logic will trip. Note that these test pushbuttons are mainly for "Testing" purposes only.

b. There are ten manual actuation switches on the panel C-5721 in the control room. Each switch is an HIS type with a red "TRIPPED" light and "Trip/Off" pushbuttons. The "TRIP" pushbutton is of the maintained contact type so that when it is pushed, it will stay in the "tripped" position until the "OFF" button is pushed. The switch arrangement on panel C-5721 is as follows:

CAUTION: The low steam line pressure inputs are not in the same configuration

in Channels 1 & 3 as Channel 2 & 4. This is indicated in the manual trip switch alignment shown below.

For example if we wish to initiate a manual trip for "Low Steam Pressure 1-1" in both SFRCS actuation channels, we must depress HIS 4869A for SFRCS CH 1 and HIS 4870B for SFRCS CH 2.

Trip switches are diagonal from one another as indicated below.

		Channels 1&3	Channels 2&4		
SG 1-1 Low Stm Press	HIS 4869A	Tripped Trip | Off	Tripped Trip | Off	HIS 4870A	SG 1-2 Low Stm Press
SG 1-2 Low Stm Press	HIS 4869B	Tripped Trip | Off	Tripped Trip | Off	HIS 4870B	SG 1-1 Low Stm Press
SG 1-1 FW ΔP	HIS 4869C	Tripped Trip | Off	Tripped Trip | Off	HIS 4870C	SG 1-2 FW Δ P
SG 1-1 Hi/Low Level	HIS 4869D	Tripped Trip | Off	Tripped Trip | Off	HIS 4870D	SG 1-2 Hi/Low Level
Loss of RCPS	HIS 4869E	Tripped Trip | Off	Tripped Trip | Off	HIS 4870E	Loss of RCPS

The HIS-4869 switch series is for channels 1 and 3. The HIS 4870 series is for channels 2 and 4. Pushing any "Trip" button will trip its associated channels for the designated trip function. Forexample: HIS 4869C is pushed, channels 1 and 3 will trip in the "High FW-STM Δ P" function. Refering to Enclosure #2 provides a list of valves which will actuate and the position they assume.

Unlike the Reactor Protective System and the Safety Features Actuation System, these manual trip buttons for the SFRCS are in series with the system input signal coming from the detector. This switch placement causes the channels to react as though an actual trip conditioned as sensed by the detector exists.

8. On C5721 are four "BLOCK" switches:

CH. 1	CH. 3	CH. 2	CH. 4
BLOCK / R A	BLOCK / R A	BLOCK / R A	BLOCK / R A
HIS 101B	HIS 101C	HIS 100B	HIS 100C

When 2/2 650 psig pressure switches (decreasing) actuate, the red "BLOCK PERMISSIVE" alarm will light. The operator will push the "BLOCK" button 11| which will block the low, steam pressure and Hi S/G Lvl trip and light the amber "BLOCKED" light.

9. The following alarms are actuated by the SFRCS:

ALARM	ID NO.	COMPUTER	ANNUN.	SOURCE
MS Iso Valve Trouble	Q681, 688	Yes	No	N_2 accum 1200 psig, or one solenoid in trip position.
11| SG 1 (2) Lo Press/Hi Lvl Trip Blkd	Q693, 692	Yes	Yes	One or more channels blocked.
MS LP Trip	P681, 680	Yes	Yes	LP Trip on one Channel.
11| SG 1 (2) Lo Press/Hi Lvl Trip Blk Prmt	P685, 684	Yes	Yes	Two Channels 650#.
FW-SG dP trip	P671, 672	Yes	Yes	FW-SG Trip on one channel.
11| OTSG High/Low Level Trip	L886, 896	Yes	Yes	OTSG High/Low Level trip on one channel.
RCP Mntr Trip	Q774	Yes	Yes	Loss of all four RCP's.
SFRCS Full Trip	Q963	Yes	Yes	Full trip from Channels 1/3 or 2/4.

1.2.4 System Operation

In order to understand the operation of the SFRCS System, perhaps it is best to follow the various system actions under several accident conditions. The following cases will be considered:

1. Steam rupture

2. Feed rupture

3. Loss of feed pumps

4. Loss of 4 RCP

Enclosures 1 and 2 should be used as an aid to understanding the description. All discussions assume 100% FP operation at start. Some non-SFRCS actions are considered to aid in understanding the transient.

1. Steam rupture - Assume I-1 steam line shears downstream of MSIV. Steam pressure will rapidly drop. When either side reaches 612 psig, all four channels will trip, isolating steam and feed for both steam generators. (See Enclosure 2 for specific valves.) The MSIV takes five seconds to shut, the MF isolation valve 15 seconds. Both steam lines will probably drop below 612 psig, therefore auxiliary feed will not start until one steam generator recovers to above 612 psig it will align as described in Section 3 to feed the high pressure steam generator with both auxiliary feed pumps. The SFRCS will trip the turbine and the ARTS. The reactor will trip due to ARTS trip. 11

2. Feed rupture - Assume 1-1 feedwater line shears upstream of the feed check valve. Feed pressure will rapidly drop (since our feed headers are cross-connected, both will drop). When either feed header drops to 177 psig less than OTSG pressure, the SFRCS will trip, the steam and feedwater valves on both sides and align the auxiliary feed pumps to their steam generator (1-1 to 1-1; 1-2 to 1-2). The SFRCS will trip the ARTS. The ARTS will trip the reactor. 11

3. Feed Pump Trip - Assume both main feed pumps trip. The SFRCS will trip on steam to feed ΔP >177 psig. The feed-steam ΔP trip on each steam generator will actuate due to loss of feed header pressure. The CRDM Bkrs (A&B) and ARTS will trip the turbine and reactor. Loss of both MFPT's will trip the ARTS also. 11

4. Loss of 4 RCP - If all four RC Pumps trip, the ARTS and turbine will trip. The SFRCS will initiate auxiliary feed as described in Section 3. 11

11 NOTE: The RCP monitoring system should be viewed as an independent safety system whose output contacts provide trip inputs to the EHC, RPS and SFRCS.

5. System Testing

11 a. Inputs: Each input device (pressure switch, level switch, etc.) de-energizes a series of relays in the SFRCS cabinet which opens a contacts in the trip logic. Each of these
11 output relays can also be de-energized by a test button located on the input buffer cards, this will turn out a lights in the cabinet. This, of course, will trip one channel in many cases; the SFRCS components will then be in a 1 out of 1 to trip mode; the 1/2 components will be tripped.

11 b. Outputs: Each output relay, except those for the alarms, has a status light which will go out when the relay is de-energized. Thus, when an input is tested and the channel trips, the associated output relays can be monitored for proper actuation.

2. LIMITATIONS AND PRECAUTIONS

2.1 During plant cooldown, to prevent a SFRCS trip:

11 1. Block the main steam line low pressure Hi OSTG Lvl trip between 650 and 612 psig.

2. Place the Startup Feedwater Pump in operation prior to removing the last Main Feedwater Pump from service.

3. Ensure both decay heat normal suction valves DH-11 and DH-12 are fully open before the last RCP is tripped.

4. Maintain Steam Generator level above 35 indicated inches of level in SUR.

2.2 Should it ever be necessary to de-energize an SFRCS channel, prior to de-energizing, the Reactor Operators, Shift Supervisor
11 and Supervising Operator must visually verify that there is not a trip present in any other SFRCS channel then consult Enclosure 2 and Attachment 1, System Trip Logic and Trip Channel Identification to determine which valves will open or close when that channel is de-energized and they must take the necessary steps to prevent inadvertant system actuation. De-energization of channel trips everything on that channel. Only valves having a

11| 1 out of 1 logic will trip. The associated ARTS channel must be placed in TTBP for the SFRCS parameter.

2.3 Whenever a channel is de-energized, the output relays in that channel are in the tripped condition. For this reason, testing or maintenance on the complementary channel (e.g. 1 and 3 or 2 and 4) cannot be performed as a trip would occur and system actuation would take place.

Note that among other things, the following will de-energize an SFRCS channel:

1. De-energizing D1P, D2P, Y1, or Y2.

2. Performing dead transfer on essential DC Distribution Panels.

(TS) 2.4 D-B Technical Specifications 3.3.2.2.

3. REFERENCES

(TS) 3.1 Davis-Besse Unit 1 Technical Specification para. 3.3.2.2

11| 3.2 USAR 7.4.1.3

3.3 SFAS/SFRCS Instrumentation Manual TM-19 Consolidated Controls Co.

3.4 AD 1803 Safety Tagging

3.5 SFRCS Logic Diagrams Bechtel P&ID Drawing M-050, M-051, E-18

3.6 Station Shutdown and Cooldown Procedure, PP 1102.10

3.7 Station Startup Procedure, PP 1102.02

11| 3.8 Automated Industries Inc. (ARTS)

4. SFRCS ENERGIZATION AND INITIALIZATION FOR PLANT STARTUP

4.1 Prerequisites

_____4.1.1 Essential instrument AC and DC distribution panels are energized for each channel.

SFRCS Channel	Distribution Panel
1	Y-1 (AC)
2	Y-2 (AC)
3	D1P (DC)
4	D2P (DC)

_____ 4.1.2 The Shift Supervisor has given permission to energize the SFRCS cabinets and/or the SGLI cabinets and has issued SFRCS and/or SGLI cabinet door keys as appropriate.

4.2 Procedure

4.2.1 Verify that the AC and DC power supply input switches in the SFRCS and/or SGLI cabinets are "OFF" for each channel.

Channel 1_____ Channel 3_____ SFRCS Cabinet C5762A

Channel 2_____ Channel 4_____ SFRCS Cabinet C5792

SGLI Channel 1_____ SGLI Cabinet C5736
SGLI Channel 2_____ SGLI Cabinet C5737
SGLI Channel 3_____ SGLI Cabinet C5738
SGLI Channel 4_____ SGLI Cabinet C5739

4.2.2 Clear tags from and "close" the appropriate SFRCS and/or SGLI source breaker at its essential distribution panel.

	SFRCS Chan	Distribution Panel	Breaker
_____	1	Y1	Y1-21
_____	2	Y2	Y2-12
_____	3	D1P	D1P-11
_____	4	D2P	D2P-11

	SGLI Chan	Distribution Panel	Breaker
_____	1	Y1	Y1-15
_____	2	Y2	Y2-15
_____	3	D1P	D1P-17
_____	4	D2P	D2P-17

4.2.3 Turn the power input switch on each SFRCS power supply to the ON position.

Verify that both 48V and 15V "Power on" lights are lit.

Cabinet		48V	15V		48V	15V
C-5762A	Ch 1	_____	_____	Ch 3	_____	_____
C-5792	Ch 2	_____	_____	Ch 4	_____	_____

11 4.2.4 Prior to energizing any SGLIC cabinet remove all power supply fuses, turn power switch on, then replace fuses one at a time.

4.2.5 To energize the SGLI cabinets, perform steps 4.2.5.1 through 4.2.5.4.

1. Open the FRONT Cabinet door to the respective SGLI Cabinet.

2. Turn the power switch "ON" located in the inside center of the SGLI Cabinet.

SGLI Channel	Cabinet
1	C5736
2	C5737
3	C5738
4	C5739

3. Verify all four power supply indicators on the front panel indicate "ON" for the respective SGLI Cabinet.

SGLI Channel	Cabinet	Power Supply Status
1	C5736	"ALL ON"
2	C5737	"ALL ON"
3	C5738	"ALL ON"
4	C5739	"ALL ON"

4. Close and lock FRONT cabinet doors.

11| 5. If Steam Generator Level is greater than the low level and less than hi level trip bistable setpoint, verify that L10 and L11 input buffer lamps in the same SFRCS Channel are on.

11|

_____4.2.6 If main steam pressure is less than 612 psi: Verify the low pressure trip logics and the 650 psi low steam pressure block permit logics are tripped. (Lights out at SFRCS cab.)

	Trip	Permit		Trip	Permit
Ch 1	_____	_____	Ch 3	_____	_____
Ch 2	_____	_____	Ch 4	_____	_____

NOTE: Verification is performed by visual inspection of the SFRCS input lights L1 through L6 on the input buffer cards for each channel. (Refer to Enclosure 1)

Verify the "MN STM LINE LOW PRESS TRIP" annunciator windows for Channel #1 and Channel #2 have alarmed.

____4.2.7 To initialize the SFRCS (e.g. Remove the low steam pressure trip and block it) perform the following for each channel at the SFRCS cabinets.

1. Press and hold S-14 the "Initial Bypass" pushbutton, then,

2. Press S-7, the "Block" pushbutton.

3. Release both S-7 and S-14.

NOTE: Switches are located on the SFRCS cabinets on input buffer cards. Enclosure 1 shows switch labeling, its function and the detector which it corresponds to.

Ch 1_____ Ch 3_____

Ch 2_____ Ch 4_____

11 ____4.2.8 Verify "MS LP/Hi Lvl Trip Blocked" amber lights on HIS 101B, HIS 101C, HIS 100B and HIS 100C on C5721 are "on".

____4.2.9 Verify that all input instrumentation (Enclosure 1) is in service.

____4.2.10 Verify that all disabled outputs have been restored per Attachment 1 (except for Auxiliary Feedwater Valves marked * which are covered by PP 1102.02 - Plant Startup).

Independently Verified_____Date_____

____4.2.11 Verify that input test light status in SFRCS Cabinets agrees with plant conditions. Light status for cold shutdown, all RC Pumps OFF, Steam generators filled is as follows:

INPUT TEST LIGHT (Enclosure 1)	STATUS	
L 1	OFF	_____
L 2	OFF	_____
L 3	OFF	_____
L 4	OFF	_____
L 5	OFF	_____
L 6	OFF	_____
L 7	ON	_____
L 8	ON	_____
L 9	ON	_____

INPUT TEST LIGHT (Enclosure 1)	STATUS	
L 10	ON	_____
L 11	ON	_____
L 12	OFF	_____
L 13	ON	_____
L 14	ON	_____
11| L 15	OFF	Spare

4.2.12 Verify output relay status as follows:

CH. 1	CH. 3	CH. 2	CH. 4	STATUS	
101A	103A	102A	104A	ON	_____
201A	203A	202A	204A	ON	_____
201B	203B	202B	204B	ON	_____
201C	203C	202C	204C	ON	_____
301A	303A	302A	304A	OUT	_____
301B	303B	302B	304B	OUT	_____
301C	303C	302C	304C	OUT	_____
301D	303D	302D	304D	OUT	_____
11| 901A	903A	902A	904A	ON	_____
301F	303F	302F	304F	OUT	_____
11| 801A	803A	802A	804A	OUT	_____
401B	403B	402B	404B	ON	_____
11| 601A	603A	602A	604A	ON	_____
601G	603G	602G	604G	ON	_____
601H	603H	602H	604H	ON	_____
601J	603J	602J	604J	ON	_____
601B	603B	602B	604B	ON	_____
601C	603C	602C	604C	ON	_____
601D	603D	602D	604D	ON	_____
601E	603E	602E	604E	ON	_____
601F	603F	602F	604F	ON	_____
60AA	60CA	60BA	60DA	ON	_____
60AB	60CB	60BB	60DB	ON	_____
60AC	60CC	60BC	60DC	ON	_____
71AA	71CA	71BA	71DA	ON	_____
72AA	72CA	72BA	72DA	ON	_____
73AA	73CA	73BA	73DA	ON	_____

_____4.2.13 Place HAND/AUTO Station(s) for Main & S/U Feedwater Valves associated with the Channel(s) which have been tripped in HAND and adjust "POSITION" Signal to that corresponding to valve position. Reset Main Feedwater Valves by pushing RESET button by the valves. Shift valves to AUTO as desired. Reset Startup Feedwater Valves in accordance with Step 7.2 of this procedure.

4.2.14 Return the SFRCS door keys to the Shift Supervisor.

11 _____4.2.15 If the ARTS was placed in TTBP return to the position as determined by the Shift Supervisor.

Section 4 completed by_____Date_____

5. DE-ENERGIZE AN SFRCS CHANNEL (DURING POWER OPERATIONS)

5.1 Prerequisites

_____5.1.1 A situation exists requiring that an SFRCS Channel must be tripped or de-energized.

_____5.1.2 There are no existing trips on the remaining 3 channels. Verified by all the output relay lights for the remaining channels being lit.

11 NOTE: There should be no RPS, SFAS or ARTS testing in progress during the time that any SFRCS Channels are being tested or de-energized.

_____5.1.3 The Shift Supervisor, Supervising Operator and Reactor Operator have determined from Attachment 1 which valves having a 1 out of 2 logic will close when that Channel trips.

11 _____5.1.4 Place the associated ARTS channel in TTBS for the SFRCS channel.

SFRCS CH		ARTS CH	
	1		1_____
	2		2_____
	3		3_____
	4		4_____

_____5.1.5 Prior to performing, this procedure must be read and understood by the Shift Supervisor, Supervising Operator and Reactor Operators.

_____5.1.6 The Limits and Precautions have been reviewed.

5.2 Procedure

NOTE: When one Channel of SFRCS is tripped, the valves which are 1/2 trip will normally be shut at power.

_____5.2.1 Proceed with deenergizing the appropriate SFRCS Channel. If the SFRCS channel is to be de-energized at the breaker, refer to Section 4 for breaker number and location.

11

NOTE: Deenergizing SFRCS Channel 1 and 2 by way of the ON/OFF switch or channel breaker

will deenergize all relay status lights in the appropriate cabinet. To verify complimentary channel operability observe the Input Buffer Lamps on the complimentary channel are illuminated.

11| _____5.2.2 Return to Section 4 for re-energization.

_____5.2.3 After testing is complete and the channel is re-energized ensure the channel is reset by observing appropriate relay status lamps are "ON" for plant conditions.

Section 5 completed by_____Date_____

6. SFRCS OPERATIONS DURING PLANT SHUTDOWN AND COOLDOWN

6.1 Prerequisites

_____6.1.1 The plant is being Shutdown and cooled down according to Plant Shutdown and Cooldown Procedure, SP 1102.10.

6.2 Procedure During Cooldown (These steps are covered in SP 1102.10)

11| _____6.2.1 Upon receipt of the "Main Steam Line Low Pressure/Hi Lvl Block Permit" alarms (one for each channel) depress the low steam pressure blocks switches HIS-101B, HIS-101C, HIS-100B and HIS-100C on Panel C5721. The
11| "Main Steam Line Low Pressure/Hi Lvl Trip Blocked" annunciator alarms should sound and light.

_____6.2.2 Place the SUFP in service prior to tripping the MFPT. This acton prevents a FW-Steam dP trip.

_____6.2.3 Place the DH System in operation and, after Tav 280°F, disable motor operated valves in the auxiliary feed system per SP 1102.10. This action prevents a loss of all RCP trip upon securing the last RC Pump.

6.3 Action to be taken if SFRCS Channel(s) are to be tripped or deenergized during Shutdown.

_____6.3.1 SFRCS Channels may need to be tripped or deenergized for testing or maintenance during plant shutdown. In order to prevent or predict valve operation, the Shift Supervisor shall consult Enclosure 2 and Attachment 1 and complete Attachment 1 for any outputs which need to be disabled.

NOTE: The SFRCS must be in operation as defined by TS 3.3.2.2 with all outputs operable prior to exceeding 280°F Tav.

_____6.3.2 Restore all outputs to operable status prior to startup by completing RESTORED column on Attachment 1.

11| Section 6 completed by_____Date_____

7. ABNORMAL OPERATION

7.1 Action to be taken after an SFRCS trip.

7.1.1 It is NOT possible to provide detailed steps to cover all possible trip situations (failure of instruments, actual casualty, etc.). The following general statements apply:

1. The SFRCS will remain tripped as long as the trip situation exists. For example, on loss of feedwater the system will remain tripped as long as feed header pressure is greater than 177 psid less than steam pressure.

2. It is NOT possible to operate any SFRCS valve remotely with the SFRCS in the tripped state, with the exception of the Atmospheric Vent Valves, the Feedwater Stop Valves, Startup Feedwater Valves and the S/G Blowdown Vlvs. All other valves will require manual control.

11|

3. Once the trip situation has been cleared, the SFRCS will automatically reset, and valves may then be operated at will.

4. In a trip situation, the first action to regain control should be to clear the trip situation (Restore feed header pressure, raise steam generator level, start a RC pump, etc.).

5. If the trip situation cannot be cleared (such as an actual steam rupture upstream of MSIV) it will normally be necessary to make a cooldown using auxiliary feedwater and controlling the atmospheric vents manually.

6. If so desired to feed utilizing the SUFP and maintaining atmospheric vent valve control during an SFRCS trip condition, the Startup Feedwater Valves, the S/G Blowdown Valves, the Main Feedwater Stop Valves, and Atmospheric Vent Valves can be blocked to override the SFRCS trip signal to these valves.

7.2 Action to be taken to Reset Startup Feedwater valves SP7A and SP7B after an SFRCS trip.

NOTE: In order to gain control of the Startup Feedwater Valves, the SFRCS signal must be blocked (if present) and the reset button must be pushed per the following steps.

_____7.2.1 The SFRCS Channels provide trip and reset functions in conjunction with the following local stations.

Channel 1 - NRS60AB
Channel 2 - NRS60BB
Channel 3 - NRS60CB
Channel 4 - NRS60DB

_____7.2.2 If the SFRCS Channels are not reset and it is desired to open SP7A/7B, depress the "BLOCK" button at the respective local station NRS60AB, BB, CB, DB located on the back wall in the control room next to the cabinet C5736, then proceed to 7.2.3.

_____7.2.3 Once the SFRCS trips signals have cleared - or the local stations have been "BLOCKED", reset SP7A/7B by depressing the "RESET" button at the respective local control station NRS60AB, BB, CB, DB - determined by whichever reset light is "OFF".

NOTE: If the STARTUP FEEDWATER VALVE TRIP signals were blocked and the SFRCS trip signals have cleared, the BLOCK functions will automatically clear, however should a subsequent SFRCS trip occur and it is still desired to maintain SP7A/7B "OPEN" the above procedure will have to be repeated.

9

7.3 Actions to be taken to Operate Atmospheric Vent Valves ICS11A (ICS11B) during an SFRCS trip.

_____7.3.1 At HIS ICS11C (HIS ICS11D) depress BLOCK button. Verify "SFRCS BLOCK". Light ILICS11 (ILICS11) is on.

NOTE: If an SFAS Incident Level 2 exists at the same time that the SFRCS is tripped, depress BLOCK button HIS ICS11C (HIS ICS11D) will block both the SFRCS signal and the SFAS signal.

_____7.3.2 Verify the demand for ICS-11B (ICS-11A) is zero and the Hand/Auto Station is in hand.

_____7.3.3 At HIS ICS11B (HIS ICS11A) depress the Auto Button. ICS11B (ICS11A) may now be controlled as desired.

NOTE: Atmospheric Vent Valves ICS11A and ICS11B should not be operated without steam to prevent damage to the valves.

7.4 Actions to be taken to Reset Main Feedwater Stop Valves FW 601 (FW 612) after an SFRCS trip.

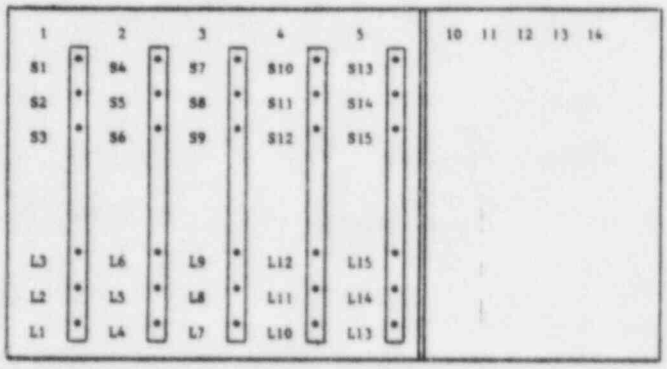
_____7.4.1 At HIS 601 (HIS 612) depress BLOCK button HIS 601A (HIS 612A).

NOTE: This will enable the Valves FW 601 (FW 612) to be operated as desired.

11 7.5 Action to be taken to reset S/G Blowdown Vlvs MS 603 (MS 611) after an SFRCS 1/2 trip (or full trip).

_____7.5.1 At HIS 603 (HIS 611) depress block button HIS 603B (HIS 611B) and verify the amber block light is lit. This will enable the valves MS 603 (MS 611) to be operated as desired.

Section 7 completed by_____Date_____



SFRCS Input Switches/Lights

(Lights go out when test switch is depressed or input device actuates)

Input Buffer Cards (In SFRCS Cabinets)

Switch and Light	OTSG Detector Location	Detectors		OTSG Detector Location	Detectors		Function	
		Chan 1	Chan 3		Chan 2	Chan 4		
S1/L1	1-1	PS-3689A	PS-3689E	1-2	PS-3687A	PS-3687E	The switch when pressed simulates a <612 psi trip.	The light when lit signifies a >612 psi signal, when out, a trip signal.
S2/L2	1-1	PS-3689B	PS-3689F	1-2	PS-3687B	PS-3687F	The switch when pressed simulates a <612 psi trip.	The light when lit signifies a >612 psi signal, when out, a trip signal.
S3/L3	1-2	PS-3689C	PS-3689G	1-1	PS-3687C	PS-3687G	The switch when pressed simulates a <612 psi trip.	The light when lit signifies a >612 psi signal, when out, a trip signal.
S4/L4	1-2	PS-3689D	PS-3689H	1-1	PS-3687D	PS-3687H	The switch when pressed simulates a <612 psi trip.	The light when lit signifies a >612 psi signal, when out, a trip signal.
S5/L5	1-1	PS-3689E	PS-3689M	1-2	PS-3687E	PS-3687M	The switch when pressed simulates a <650 psi block permit.	The light when lit signifies a >650 psi signal, when out, a <650 psi block permit.
S6/L6	1-1	PS-3689L	PS-3689N	1-2	PS-3687L	PS-3687N	The switch when pressed simulates a <650 psi block permit.	The light when lit signifies a >650 psi signal, when out, a <650 psi block permit.
S7/L7	---	Block	Block	---	Block	Block		
S8/L8	1	PDS-2686A	PDS-2686A	2	PDS-2687A	PDS-2687A	The switch when pressed simulates a >177 psid between SG & MW Feedwater.	The light when lit signifies a <177 psid signal, when out, a >177 psid trip signal.
S9/L9	2	PDS-2685C	PDS-2685D	1	PDS-2686C	PDS-2686D	The switch when pressed simulates a >177 psid between SG & MW Feedwater.	The light when lit signifies a <177 psid signal, when out, a >177 psid trip signal.
S10/L10	1	LSL SP9B1	LSL SP9B2	2	LSL SP9A1	LSL SP9A2	The switch when pressed simulates a SG level of <26.5 above tube sheet or >280".	The light when lit signifies a SG level of >26.5 above tube sheet or <280".
S11/L11	2	LSL SP9A3	LSL SP9A4	1	LSL SP9B3	LSL SP9B4	The switch when pressed simulates a SG level of <26.5 above tube sheet or >280"	The light when lit signifies a SG level of >26.5 above tube sheet or <280".
S12/L12	---	Loss of 4 RCPs	Loss of 4 RCPs	---	Loss of 4 RCPs	Loss of 4 RCPs		
	---			---				
S16/L16	---	Initial Bypass	Initial Bypass	---	Initial Bypass	Initial Bypass	Manual block for [illegible]	

SFRCS Input Switches/Lights

TABLE 1

STEAM-FEEDWATER RUPTURE CONTROL SYSTEM ACTUATION

CHANNEL 1/3 (C 5702A) / CHANNEL 2/4 (C 5702)	MS 101 / MS 101	MS 100 / MS 100	MS101-1 NOTE 3	MS100-1 NOTE 3	MS 394 NOTE 3	MS 175 NOTE 3	ICS 118 NOTE 3	ICS 118A NOTE 3	FW 612	FW 601	FW 780	FW 799	SP 78	SP 7A NOTE 3	SP 6A	SP 6B	MS 106	MS 107	MS 106A	MS 107A	AF3870	AF3872	MS 611 NOTE 3	MS 603 NOTE 3
LOW PRESSURE IN 1-1 Steam Line <612#	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	OPEN NOTE 1	OPEN NOTE 1	SHUT	SHUT	OPEN NOTE 1	SHUT	SHUT
LOW PRESSURE IN 1-2 Steam Line <612#	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	OPEN NOTE 1	SHUT	SHUT	OPEN NOTE 1	OPEN NOTE 1	SHUT	SHUT	SHUT
Steam - Feedwater ΔP >177 PSID	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	SHUT	SHUT
Steam - Feedwater ΔP >177 PSID	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	SHUT	SHUT
HI/LOW LEVEL 1-1 OTSG >280"/<26.5" on the SUR	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	SHUT	SHUT
HI/LOW LEVEL 1-2 OTSG >280"/<26.5 on the SUR	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	SHUT	SHUT
LOSS OF 4 RC PUMPS																	OPEN NOTE 2	OPEN NOTE 2	OPEN	OPEN	OPEN	OPEN		
MANUAL ACTUATION																								
1/3 RIS 4869A MS 1-1 LOW	SHUT	SHUT	SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		OPEN		SHUT		SHUT	SHUT
RIS 4869B MS 1-2 LOW	SHUT	SHUT	SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		OPEN		SHUT		OPEN		SHUT	SHUT
RIS 4869C 1-1 FW P	SHUT	SHUT	SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		OPEN		OPEN		OPEN		SHUT	SHUT
RIS 4869D 1-1 OTSG LVL	SHUT	SHUT	SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		OPEN		OPEN		OPEN		SHUT	SHUT
RIS 4869E RCP 1																	OPEN		OPEN		OPEN			
2/4 RIS 4870A MS 1-2 LOW	SHUT	SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		OPEN		SHUT	SHUT	SHUT
RIS 4870B MS 1-2 LOW	SHUT	SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		OPEN		SHUT		OPEN	SHUT	SHUT
RIS 4870C 1-2 FW P	SHUT	SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		OPEN		OPEN		OPEN	SHUT	SHUT
RIS 4870D 1-2 OTSG LVL	SHUT	SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		SHUT		OPEN		OPEN		OPEN	SHUT	SHUT
RIS 4870E RCP 1																		OPEN		OPEN		OPEN		

NOTES:

1. If both main steam lines are 612#, these valves shut.
2. These valves will not open if DH 11 & DH 12 (DH suction from RCS) are open.
3. These valves are 1/2 channels to trip; all others are 2/2.
4. These valves will close only if a previous trip did not open them.

A LOW PRESSURE MODE WILL ALWAYS PREDOMINATE

TABLE 1 (CONTINUED)

CHANNEL 1/3 (C 57628) / CHANNEL 2/4 (C 57923)	AF 3869	AF 3831	AF 598	AF 599	1-1 AFP GOV / 1-2 AFP GOV	TURBINE	TURBINE	P 681 MS LOW	1686 MS LOW	P 671 FW-dp	P 673 FW-dp	L 886 OTSG LO	L 896 OTSG LO	Q 774 LOSS OF RCP	P 685 BLK PERM	P 684 BLK PERM	Q 693 BLOCKED	Q 692 BLOCKED	Q 963 SFRCS FULL TRIP	Q 737 ARTS TRIP			
LOW PRESSURE 1-1 Steam Line <812	OPEN NOTE 1	SHUT			FULL SPEED / FULL SPEED	TRIP	TRIP	ALARM	ALARM										ALARM	TRIP			
LOW PRESSURE 1-2 Steam Line <812	SHUT	OPEN NOTE 1	OPEN		FULL SPEED / FULL SPEED	TRIP	TRIP	ALARM	ALARM										ALARM	TRIP			
STM-FW ΔP 1-1 HIGH >177 PSID	SHUT	SHUT	OPEN		FULL SPEED / FULL SPEED	TRIP	TRIP			ALARM	ALARM								ALARM	TRIP			
STM-FW ΔP 1-2 HIGH >177 PSID	SHUT	SHUT	OPEN	OPEN	FULL SPEED / FULL SPEED	TRIP	TRIP			ALARM	ALARM								ALARM	TRIP			
HI/LOW LEVEL 1-1 OTSG >280"/<26.5" ON TRE OR	SHUT	SHUT	OPEN	OPEN	FULL SPEED / FULL SPEED	TRIP	TRIP					ALARM	ALARM						ALARM	TRIP			
HI/LOW LEVEL 1-2 OTSG >280"/<26.5" ON TRE OR	SHUT	SHUT	OPEN	OPEN	FULL SPEED / FULL SPEED	TRIP	TRIP					ALARM	ALARM						ALARM	TRIP			
LOSS OF 4 RC PUMPS	SHUT	SHUT	OPEN	OPEN	FULL SPEED / FULL SPEED	TRIP	TRIP							ALARM					ALARM				
LOSS OF BOTH MN FEED PUMP & SU FEED PUMP	SHUT	SHUT	OPEN	OPEN															ALARM				
MANUAL ACTUATION																							
1/3 HIS 4864A MS 1-1 LOW	OPEN				FULL SPEED /		TRIP		ALARM										ALARM	TRIP			
HIS 4864B MS 1-2 LOW	SHUT		OPEN		FULL SPEED /		TRIP		ALARM										ALARM	TRIP			
HIS 4864C 1-1 FW P	SHUT		OPEN		FULL SPEED /		TRIP				ALARM								ALARM	TRIP			
HIS 4864D 1-1 OTSG LVL	SHUT		OPEN		FULL SPEED /		TRIP					ALARM							ALARM	TRIP			
HIS 4864E RCP 1	SHUT		OPEN		FULL SPEED /		TRIP						ALARM						ALARM				
2/4 HIS 4870A MS 1-2 LOW		OPEN			/ FULL SPEED		TRIP		ALARM										ALARM	TRIP			
HIS 4870B MS 1-1 LOW		SHUT		OPEN	/ FULL SPEED		TRIP		ALARM										ALARM	TRIP			
HIS 4870C 1-2 FW P		SHUT		OPEN	/ FULL SPEED		TRIP				ALARM								ALARM	TRIP			
HIS 4870D 1-2 OTSG LVL		SHUT		OPEN	/ FULL SPEED		TRIP						ALARM						ALARM	TRIP			
HIS 4870E RCP 1		SHUT		OPEN	/ FULL SPEED		TRIP							ALARM					ALARM				
BLOCK STATUS																							
1-1 STM LINE/HI LVL 650 & NOT BLOCKED OR TRIPPED															BLOCK PERM								
1-2 STM LINE/HI LVL 650 & NOT BLOCKED OR TRIPPED																BLOCK PERM							
OR 1-1 STM PRESS/HI LVL TRIP BLOCKED																	BLOCKED						
OR 1-2 STM PRESS/HI LVL TRIP BLOCKED																		BLOCKED					

Enclosure 2
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SFRCS VALVE LOGIC, VALVE FUNCTION AND OUTPUT RELAY NUMBER

VALVE	CHANNEL	RELAY NO.	FUNCTION	LOGIC	REMARKS
MS 101	1	RCS-101A	Deenergize	2/2	NOTE: Channel 1 is
	3	RCS-103A	Deenergize		fed from Y1
MS 101	2	RCS-602C	Deenergize	2/2	
	4	RCS-604C	Deenergize		
MS 101	2	RCS-602F	Deenergize	2/2	
	4	RCS-604F	Deenergize		
MS 101-1	1	RCS-601A	Deenergize	1/2	
	3	RCS-601A	Deenergize		
MS 100	2	RCS-102A	Deenergize	2/2	NOTE: Channel 2 is
	4	RCS-104A	Deenergize		fed from Y2
MS 100	1	RCS-601C	Deenergize	2/2	
	3	RCS-603C	Deenergize		
MS 100	1	RCS-601F	Deenergize	2/2	
	3	RCS-603F	Deenergize		
MS 100-1	2	RCS-602A	Deenergize	1/2	
	4	RCS-604A	Deenergize		
MS 106	1	RCS-201A	Close	2/2	NOTE: Channel 3 is
	3	RCS-203A	Close		fed from D1P
MS 106	1	RCS-301C	Open	2/2	
	3	RCS-303C	Open		
11 MS 106A	1	RCS-901A	Close	2/2	
	3	RCS-903A	Close		
MS 106A	1	RCS-801A	Open	2/2	
	3	RCS-803A	Open		
MS 107	2	RCS-202A	Close	2/2	
	4	RCS-204A	Close		
MS 107	2	RCS-302C	Open	2/2	
	4	RCS-304C	Open		
11 MS 107A	2	RCS-902A	Close	2/2	
	4	RCS-904A	Close		
MS 107A	2	RCS-802A	Open	2/2	
	4	RCS-804A	Open		
AF 3870	1	RCS-201B	Close	2/2	NOTE: Channel 4 is
	3	RCS-203B	Close		fed from D2P
AF 3870	1	RCS-301D	Open	2/2	
	3	RCS-303D	Open		
AF 3872	2	RCS-202B	Close	2/2	
	4	RCS-204B	Close		
AF 3872	2	RCS-302D	Open	2/2	
	4	RCS-304D	Open		
AF 3871	2	RCS-302F	Close	2/2	
	4	RCS-304F	Close		
AF 3871	2	RCS-402B	Open	2/2	
	4	RCS-404B	Open		
AF 3869	1	RCS-301F	Close	2/2	
	3	RCS-303F	Close		

SFRCS VALVE LOGIC, VALVE FUNCTION AND OUTPUT RELAY NUMBER

	VALVE	CHANNEL	RELAY NO.	FUNCTION	LOGIC	REMARKS
11	MS 611	1	RCS-601G	Close	1/2	
		3	RCS-603G	Close		
	MS 603	2	RCS-602G	Close	1/2	
		4	RCS-604G	Close		
	AF 3869	1	RCS-401B	Open	2/2	
		3	RCS-403B	Open		
11	AF 608	1	RCS-301A	Open	1/2	This valve has two
		3	RCS-303A	Open	2/2	controllers, both of
	AF 608	1	RCS-301B	Open	1/2	which are required
		3	RCS-303B	Open		to operate the valve
	AF 608	1	RCS-201C	Close	2/2	
		3	RCS-203C	Close		
	AF 599	2	RCS-302A	Open	1/2	This valve has two
		4	RCS-302B	Open	2/2	controllers, both of
	AF 599	2	RCS-302B	Open	1/2	which are required
		4	RCS-304B	Open		to operate the valve
	AF 599	2	RCS-202C	Close	2/2	
		4	RCS-204C	Close		
	SP 6A	1	RCS-60AA	Deenergize	2/2	
		3	RCS-60CA	Deenergize		
	SP 6B	2	RCS-60BA	Deenergize	2/2	
		4	RCS-60DA	Deenergize		
	SP 7B	1/3	RCS-60AB &	Deenergize	2/2	
	AND	OR	RCS-60CB	Deenergize		
	SP 7A	2/4	RCS-60BB &	Deenergize	2/2	
			RCS-60DB	Deenergize		
	FW 780	1	RCS-60AC	Close	2/2	
		3	RCS-60CC	Close		
	FW 779	2	RCS-60BC	Close	2/2	
		4	RCS-60DC	Close		
	ICS 11A	2	RCS-602B	Deenergize	1/2	
		4	RCS-604B	Deenergize		
	ICS 11B	1	RCS-601B	Deenergize	1/2	
		3	RCS-603B	Deenergize		
	MS 394	1	RCS-601D	Deenergize	1/2	
		3	RCS-601D	Deenergize		
	MS 375	2	RCS-602D	Deenergize	1/2	
		4	RCS-604D	Deenergize		
	FW 601	2	RCS-602E	Close	2/2	
		4	RCS-604E	Close		
	FW 612	1	RCS-601E	Close	2/2	
		3	RCS-603E	Close		
	Turbine	1	RCS-71AA	Trip	2/2	Mn Steam Line 1 Low
	Trip	3	RCS-71CA	Trip		Press
	Turbine	2	RCS-71BA	Trip	2/2	Mn Steam Line 2 Lo
	Trip	4	RCS-71DA	Trip		Press

SFRCS VALVE LOGIC, VALVE FUNCTION AND OUTPUT RELAY NUMBER

	VALVE	CHANNEL	RELAY NO.	FUNCTION	LOGIC	REMARKS
	Turbine	1	RCS-72AA	Trip	2/2	SG1 Press 177 PSID
11	Trip	3	RCS-72CA	Trip		>Mn FW1 Press
	Turbine	2	RCS-72BA	Trip	2/2	SG2 Press 177 PSID
11	Trip	4	RCS-72DA	Trip		>Mn FW2 Press
	Turbine	1	RCS-73AA	Trip	2/2	Stm Gen 1 Low Level
	Trip	3	RCS-73CA	Trip		
	Turbine	2	RCS-73BA	Trip	2/2	Stm Gen 2 Low Level
	Trip	4	RCS-73DA	Trip		
11	ARTS Trip	1	RCS-601J	Trip	1/1	1/5 Trip on all ARTS CH's
	ARTS Trip	2	RCS-602J	Trip	1/1	1/5 Trip on all ARTS CH's
	ARTS Trip	3	RCS-603J	Trip	1/1	1/5 Trip on all ARTS CH's
	ARTS Trip	4	RCS-604J	Trip	1/1	1/5 Trip on all ARTS CH's

DISABLING SFRCS OUTPUTS

1. De-energizing or tripping one channel in an SFRCS Cabinet will trip only those valves listed as 1/2 logic and will place a 1/5 trip in all ARTS channels.

2. De-energizing or tripping both channels (either 1&3 or 2&4) in an SFRCS Cabinet will trip all valves actuated by the actuation Ch #1 or 2.

3. This will trip the turb. and ARTS will trip the reactor. Prior to de-energizing or tripping a SFRCS Channel, the Shift Supervisor will determine which steps are needed on this Attachment. The completed attachment will be retained for returning the system to service. Disable the components as required on this attachment and record in the appropriate block what has been done.

(TS) 4. Refer to Davis-Besse Technical Specifications 3.3.2.2 and 3.7.1.2 for requirements when a portion of SFRCS or Auxiliary Feedwater System is disabled. Refer to 3.6.3.1 for requirements when a containment isolation valve is out of service.

5. Refer to table in Step 4.2.10 for correlation of relay numbers to SFRCS Channel.

6. The valves marked * are disabled during cooldown per PP 1102.10 - Plant Shutdown & Cooldown and enabled on heatup per PP 1102.02 - Plant Startup.

COMPONENT	OUTPUT RELAY	ACTION TO DISABLE	ACTION TAKEN (IF ANY)	VERIFIED	RESTORED PHASE II VER.	RESTORED PHASE III IND. VER.
MS 101 (2/2 x 2)	101A 103A 602C 602F 604C 604F	1. Shut Vlv OR 2. Jumper *				
MS 100 (2/2 x 2)	102A 104A 601C 601F 603C 603F	1. Shut Vlv, OR 2. Jumper *				
MS 106 (2/2)	201A 203A Shut 301C 303C Open	Open Breaker D135 (D1NA)				
MS 107 (2/2)	202A 204A Shut 302C 304C Open	Open Breaker BF 1124 (F11A)				
MS 106A (2/2)	301E 313E Shut 401A 403A Open	Open Breaker BE 1271 (E12B)				
MS 107A (2/2)	302E 304E Shut 402A 404A Open	Open Breaker BF 1188 (F11B)				
AF 3870 (2/2)	201B 203B Shut 301D 303D Open	Open Breaker D107 (D1PA)				
AF 3872 (2/2)	202B 204B Shut 302D 304D Open	Open Breaker BF 1262 (F12B)				
AF 3869 (2/2)	301F 303F Shut 401B 403B Open	Open Breaker BE 1146 (E11E)				
AF 3871 (2/2)	302F 304F Shut 402B 404B Open	Open Breaker BF 1201 (F12A)				

See NOTE on Page 5 of 5

COMPONENT	OUTPUT RELAY	ACTION TO DISABLE	ACTION TAKEN (IF ANY)	VERIFIED	RESTORED PHASE II VER.	RESTORED PHASE III IND. VER.
AF 608 (2/2)	201C Shut 203C 301A 303A 301B Vent 303B Close	Open Breaker BE 1160 (E11C)				
AF 599 (2/2)	202C Shut 204C 302A Open 304A 302B 304B	Open Breaker BF 1118 (F11A)				
SP 6A (2/2)	60AA 60CA	1. Shut Vlvs, OR 2. Place Vlvs on hand jacks				
SP 6B (2/2)	60BA 60DA	1. Shut Vlvs, OR 2. Place vlvs on hand jacks				
SP 7A (2/2)	60BB 60DB 60AB 60CB	1. Shut Vlvs, OR 2. Place Vlvs on hand jacks				
SP 7B (2/2)	60AB 60CB 60BB 60DB	1. Shut vlvs, OR 2. Place vlvs on hand jacks				
FW 780 (2/2)	60AC 60CC	Open Breaker BE 3213 (E32A)				
FW 779 (2/2)	60BC 60DC	Open Breaker BF 3261 (F32A)				
MS 101A (1/2)	601A 603A	1. Shut Vlv, OR 2. Jumper contacts on TB 4 in C5762A, Term 9 to 13				
MS 100A (1/2)	602A 604A	1. Shut Vlv, OR 2. Jumper contacts on TB 4 in C5792 term 9 to 13				
ICS 11B (1/2)	601B 603B	1. Shut Vlv				
ICS 11A (1/2)	602B 604B	1. Shut Vlv				

COMPONENT	OUTPUT RELAY	ACTION TO DISABLE	ACTION TAKEN (IF ANY)	VERIFIED	RESTORED PHASE II VER.	RESTORED PHASE III IND. VER.
MS 394 (1/2)	601D 603D	1. Shut Vlv				
MS 375 (1/2)	602D 604D	1. Shut Vlv				
FW 612 (2/2)	601E 603E	1. Shut Vlv, OR 2. Open Breaker BE 1155 (E11C)				
FW 601 (2/2)	602E 604E	1. Shut Vlv, OR 2. Open Breaker BF 1117 (E11D)				
Turbine Trip	71AA 71CA 71BA 71DA	1. Trip Turbine, OR 2. Jumper contacts for Channel to to be tripped				
Turbine Trip (2/2)	72AA 72CA 72BA 72DA 73AA 73CA 73BA 73DA	1. Trip Turbine, OR 2. Jumper contacts for Channel to be tripped In C5762A TB13 TERM 6 to TB 15 TERM 7 In C5792 TB 13 TERM 6 to TB 15 TERM 7				
HV 611 (1/2)	601G 603G	1. Shut Valve				
HV 603 (1/2)	602G 604G	1. Shut Valve				
ARTS Trip (2/4)	601J 602J 603J 604J	CRP Breakers Tripped or place all 4 ARTS Channels in Test Trip Bypass for SFRCS				

Disable MS 101, MS 100 trip by jumpering in

C5762A	TB 39, Term 3,4	Verified_____	Independently Verified_____
	TB 39, Term 6,7	Verified_____	Independently Verified_____
	TB 6, Term 6,7	Verified_____	Independently Verified_____
	TB 8, Term 9,10	Verified_____	Independently Verified_____
	TB 6, Term 9,10	Verified_____	Independently Verified_____
	TB 8, Term 12,13	Verified_____	Independently Verified_____

C5792	TB 39, Term 3,4	Verified_____	Independently Verified_____
	TB 39, Term 6,7	Verified_____	Independently Verified_____
	TB 6, Term 6,7	Verified_____	Independently Verified_____
	TB 8, Term 9,10	Verified_____	Independently Verified_____
	TB 6, Term 9,10	Verified_____	Independently Verified_____
	TB 8, Term 12,13	Verified_____	Independently Verified_____

NOTE: The below listed relays are (spares):

601H 602H
603H 604H

END