SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ P. O. Box 15830, Sacramento CA 95852-1830, (916) 452-3211
AN ELECTRIC SYSTEM SERVING THE HEART OF CALIFORNIA

SEP 08 1987

GCA 87-554

U. S. Nuclear Regulatory Commission
Attn: J. B. Martin, Regional Administrator
Region V
Office of Inspection and Enforcement
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

DOCKET NO. 50-312
RANCHO SECO NUCLEAR GENERATING STATION
LICENSE NO. DPR-54
SYSTEM FUNCTIONAL TESTING OVERVIEW

Dear Mr. Martin:

As was discussed at our August 25, 1987 meeting, please find attached, the following items for your information:

- Select System Integrated Test Matrix
- System Functional Test Overviews
- System Functional Testing Abstracts

These documents provide an overview of the system testing that is planned to be performed for the restart of Rancho Seco.

The Select System Integrated Test Matrix provides a correlation between the integrated tests and the select systems that will have all or a portion of their functions tested by the integrated test. The System Functional Test Overviews summarize the system functions (test requirement), component testing, system integrated functional testing, and plant integrated functional testing. Lastly, the System Functional Testing Abstracts provide a slightly more detailed review of each of the select (System Status Report-SSR) systems which will:

IE-01

- Define the system functions (from SSR).
- List those system functions that are affected by or affect other systems.
- List those functions that require verification for restart.
- List those functions that do not require verification for Restart with a justification.
- Provide a summary of the system functional tests to be performed with a brief description of the test objectives.

If you have any questions please contact Mr. Jim Shetler of my staff at (916) 452-3211, extension 4154.

Sincerely,

G. Carl Andognini
Chief Executive Officer,
Nuclear

Attachment

cc: F. J. Miraglia, NRR, Bethesda (w/atch)
A. D'Angelo, NRC, Rancho Seco (")
G. Kalman, NRC, Bethesda (")

SELECT SYSTEM
INTEGRATED TEST MATRIX

MAJOR INTEGRATED TESTS	POWER						STEAM				CONTROL				REACTOR				AUXILIARY						HVAC		
	125 NV	125 VV	120 VV	480 VV	4160 VV	600 VV	AFW	ASC	MFW	MSS	OTSG	EFIC	ICS	NNI	RDM	RPS	SFAS	DHS	PLS	RCS	SIM	CCW	EGS	FPS	IAS	NRW	NSW	RWS	CRTSC	NSEB	RHVS
LOSS OF OFFSITE POWER	x	x	x	x	x		x										x	x	x		x		x		x	x	x		x	x	
INTEGRATED SFAS							x					x					x	x	x		x					x	x				
LOSS OF INSTRUMENT AIR							x		x	x		x										x			x						
EFIC FUNCTIONAL							x		x	x		x																			
LOSS OF ICS/NNI POWER							x		x	x	x		x	x					x	x	x	x	x			x	x				
CONDENSER VACUUM PULL							x			x	x																				
INTEGRATED LEAK RATE TEST								x			x							x	x	x	x	x			x		x				
FLOW BALANCE																						x				x	x		x	x	x
SYSTEM FUNCTIONAL - COLD							x		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x
SYSTEM FUNCTIONAL - HOT							x	x	x	x	x	x							x	x	x										
SYSTEM FUNCTIONAL - POWER								x	x			x	x															x			
REACTOR TRIP												x	x			x															
ICS TUNING									x	x	x		x																		

X = COMPLETE OR PARTIAL TEST OF SYSTEM

ATTACHMENT 1

PAGE 1 OF 2

RANCHO SECO RESTART

SSR SYSTEM KEY

SECTION 1: POWER SYSTEMS

120V	- 120 VAC VITAL POWER SYSTEM
125NV	- 125 VDC NON-VITAL POWER SYSTEM
125V	- 125 VDC VITAL POWER SYSTEM
480V	- 480 VAC DISTRIBUTION SYSTEM
4160V	- 4160 VAC DISTRIBUTION SYSTEM
6900V	- 6900 VAC DISTRIBUTION SYSTEM

SECTION 2: STEAM PLANT SYSTEMS

AFW	- AUXILIARY FEEDWATER SYSTEM
ASC	- AUXILIARY STEAM SYSTEM
MFW	- MAIN FEEDWATER SYSTEM
MSS	- MAIN STEAM SYSTEM
OTSG	- ONCE THROUGH STEAM GENERATORS

SECTION 3: CONTROL SYSTEMS

EFIC	- EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM
ICS	- INTEGRATED CONTROL SYSTEM
NNI	- NON-NUCLEAR INSTRUMENTATION
RDM	- RADIATION MONITORING SYSTEM
RPS	- REACTOR PROTECTION SYSTEM
SFS	- SAFETY FEATURES ACTUATION SYSTEM

SECTION 4: REACTOR PLANT SYSTEMS

DHS	- DECAY HEAT REMOVAL SYSTEM
PLS	- PURIFICATION AND LETDOWN SYSTEM
RCS	- REACTOR COOLANT SYSTEM
SIM	- SEAL INJECTION AND MAKEUP SYSTEM

SECTION 5: AUXILIARY SYSTEMS

CCW	- COMPONENT COOLING WATER/TURBINE PLANT COOLING WATER SYSTEMS
EGS	- EMERGENCY DIESEL GENERATOR SYSTEM
FPS	- FIRE PROTECTION SYSTEM
IAS	- INSTRUMENT/SERVICE AIR SYSTEMS
NRW	- NUCLEAR SERVICE RAW WATER SYSTEM
NSW	- NUCLEAR SERVICE COOLING WATER SYSTEM
RSS	- REACTOR SAMPLING SYSTEM

SECTION 6: HVAC SYSTEMS

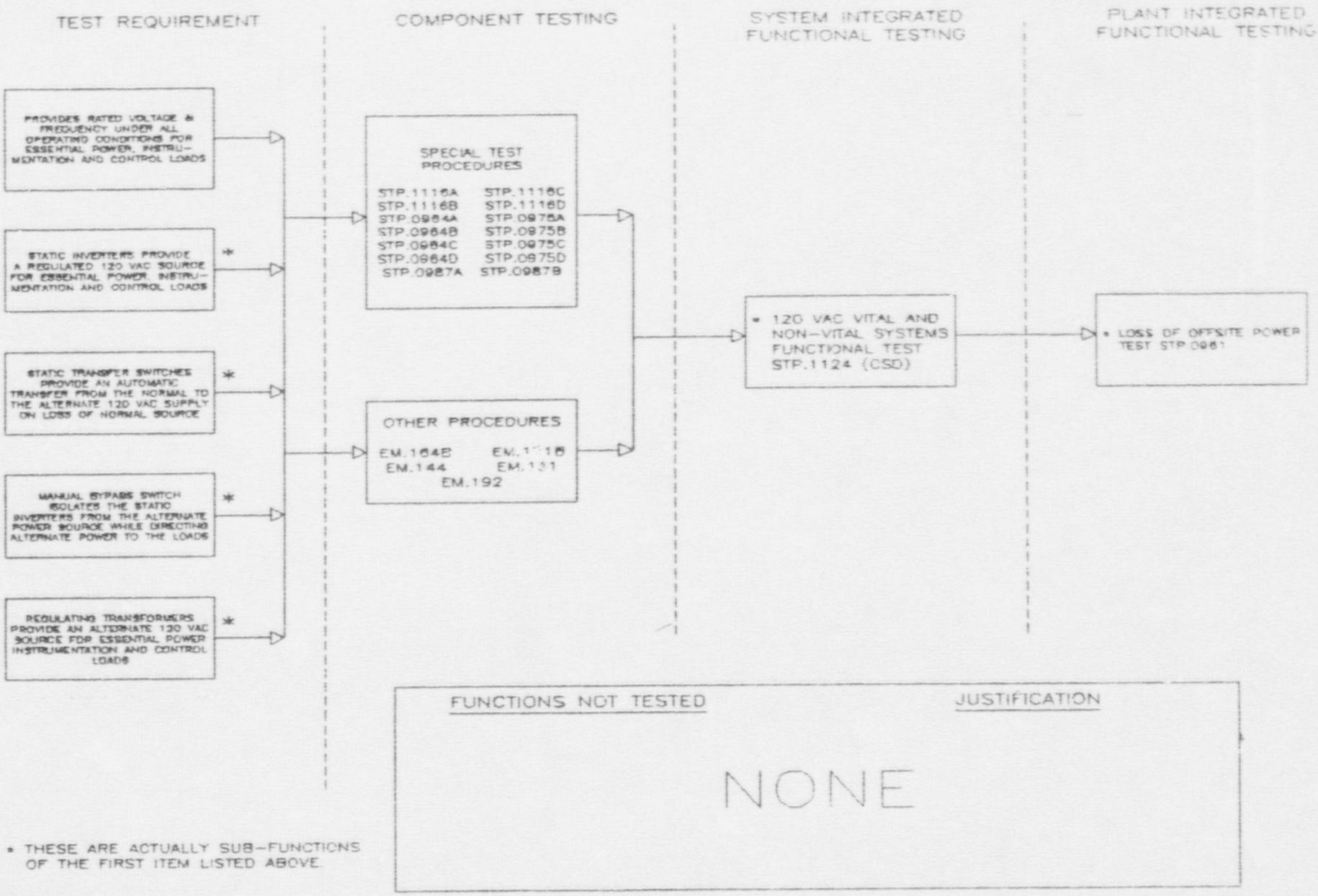
CR/TSC	- CONTROL ROOM/TECHNICAL SUPPORT CENTER HVAC SYSTEM
NSEB	- NUCLEAR SERVICE ELECTRICAL BUILDING ESSENTIAL HVAC SYSTEM
RHVS	- REACTOR BUILDING ATMOSPHERIC SYSTEM

POWER SYSTEMS

SECTION 1

120V	–	120 VAC VITAL POWER SYSTEM
125NV	–	125 VDC NON–VITAL POWER SYSTEM
125V	–	125 VDC VITAL POWER SYSTEM
480V	–	480 VAC DISTRIBUTION SYSTEM
4160V	–	4160 VAC DISTRIBUTION SYSTEM
6900V	–	6900 VAC DISTRIBUTION SYSTEM

120 VAC FUNCTIONAL TEST OVERVIEW (VITAL)

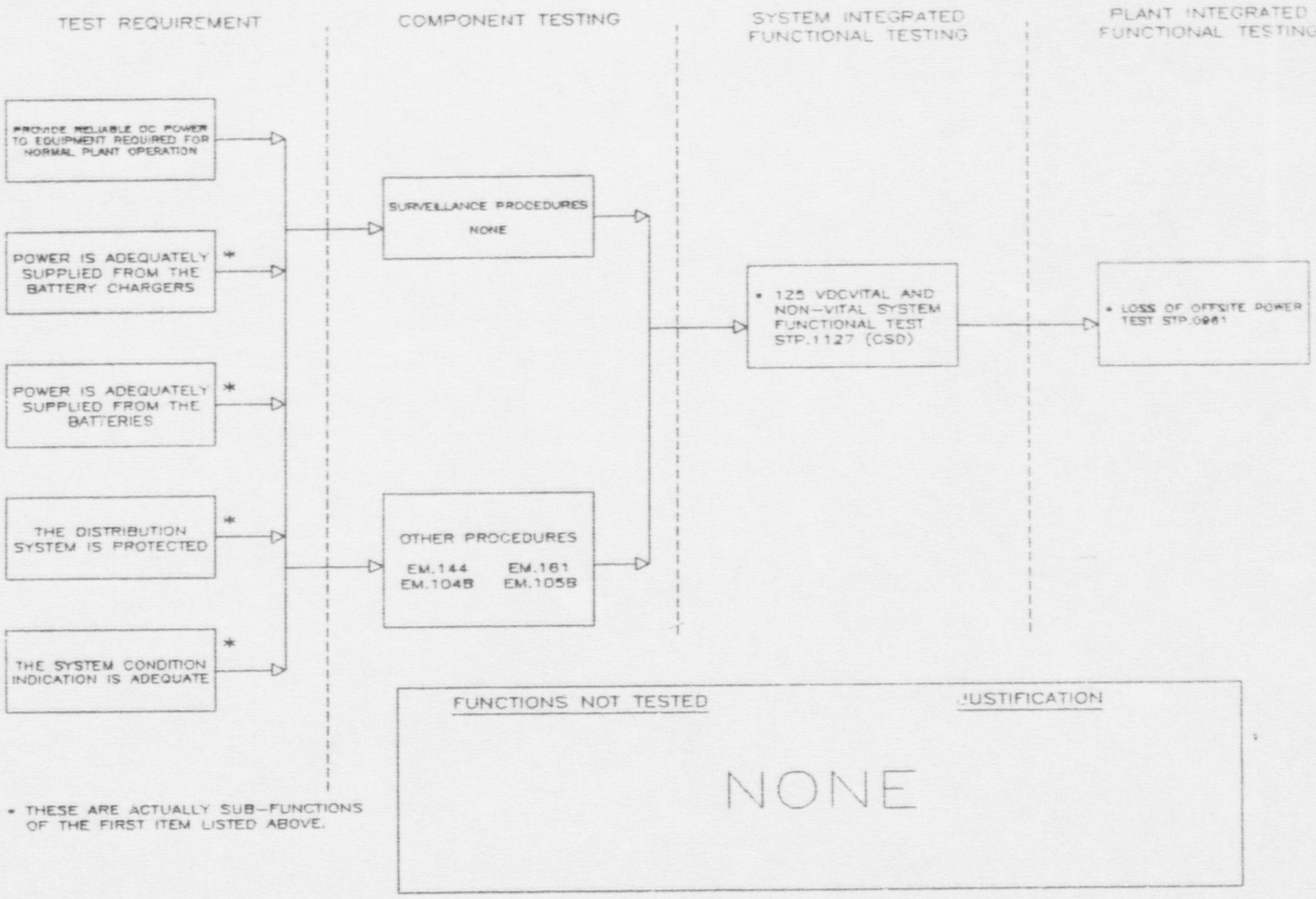


FUNCTIONS NOT TESTED	JUSTIFICATION
NONE	

* THESE ARE ACTUALLY SUB-FUNCTIONS OF THE FIRST ITEM LISTED ABOVE.

ATTACHMENT 2

125 VDC FUNCTIONAL TEST OVERVIEW (NON-VITAL)



ATTACHMENT 2

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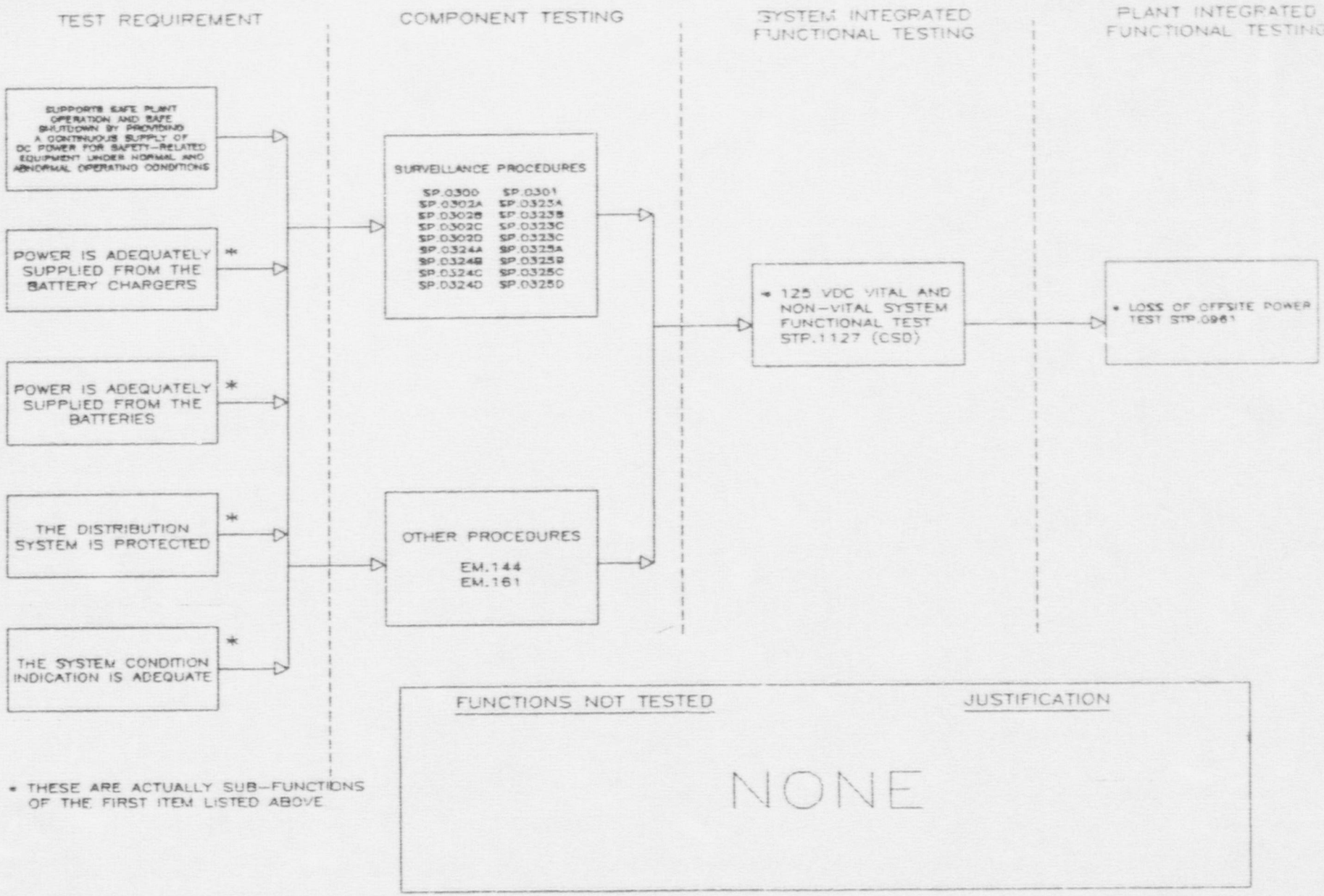
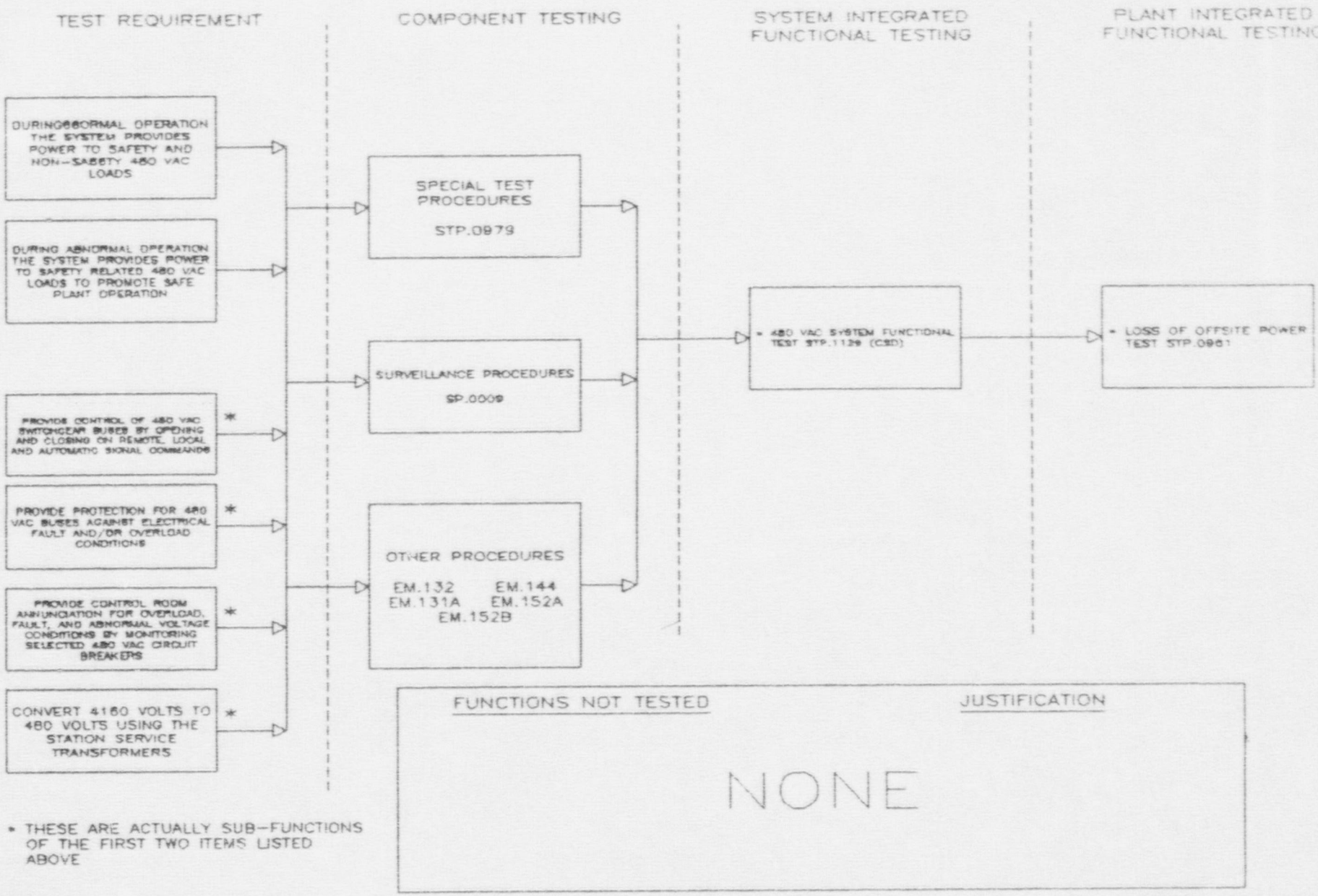
POWER

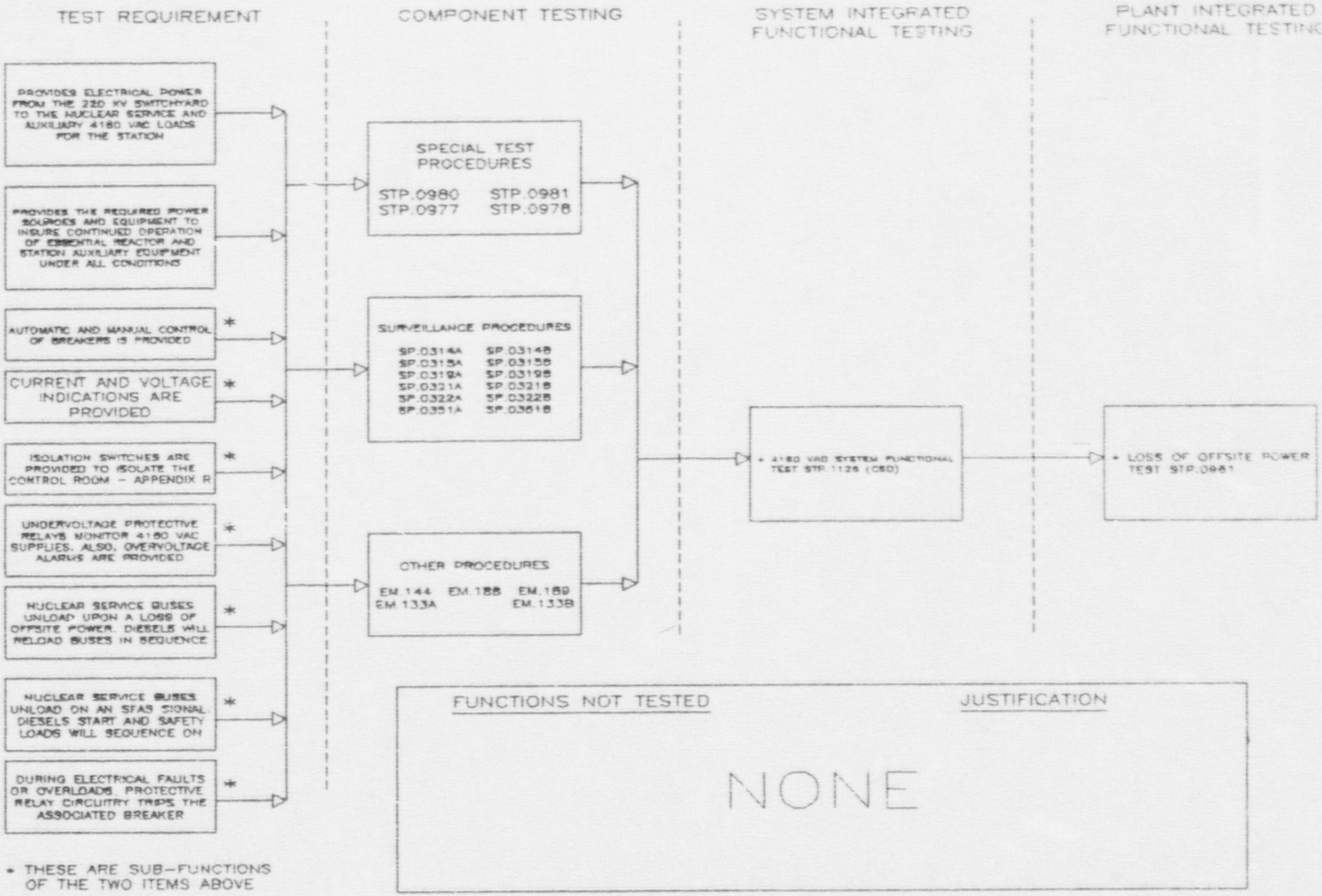
125 VDC FUNCTIONAL TEST OVERVIEW (VITAL)



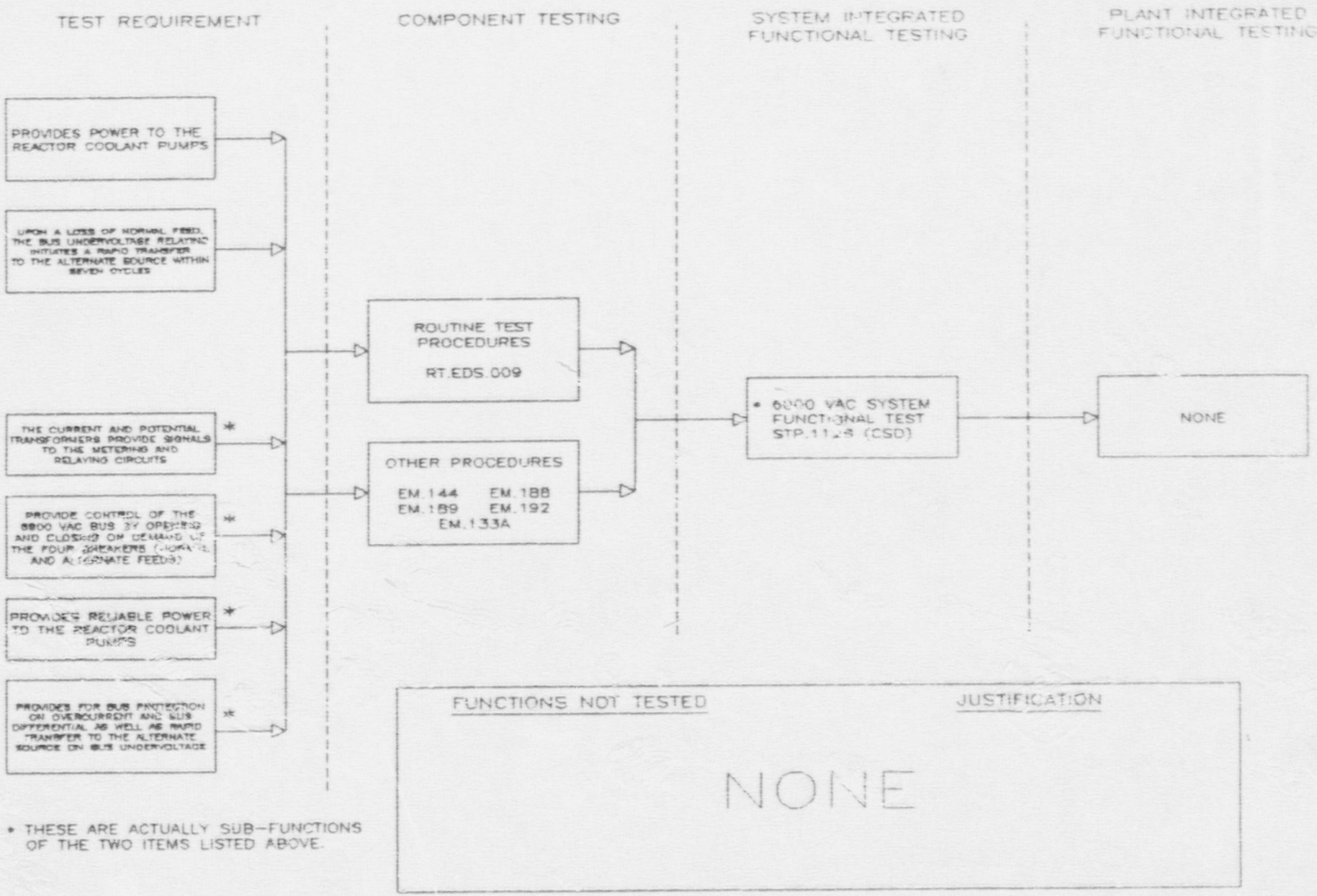
480 VAC FUNCTIONAL TEST OVERVIEW



4160 VAC FUNCTIONAL TEST OVERVIEW



6900 VAC FUNCTIONAL TEST OVERVIEW



SYSTEM FUNCTIONAL TESTING ABSTRACT
120 VAC VITAL POWER SYSTEM

A. SYSTEM FUNCTIONS

The function of the 120 VAC vital power system is to provide rated voltage and frequency under all operating conditions for essential power, instrumentation and control loads. The following subfunctions require testing prior to restart to ensure that all major functions are verified:

1. Static inverters provide a regulated 120 VAC source for essential power, instrument and control loads.

2. Static transfer switches provide an automatic transfer from the normal to the alternate 120 VAC supply on loss of normal source.

3. Manual Bypass Switch isolates the static inverters from the alternate power source while directing alternate power to the loads.

4. Regulating transformers provide an alternate 120 VAC source for essential power instrumentation and control loads.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. Testing of the abnormal operation characteristics will be provided by the Emergency Diesel Generator System tests.

C. FUNCTIONS REQUIRING VERIFICATION

The following functions of 120 VAC Vital Power System are considered important to the safe operation of the plant and therefore require testing prior to restart:

1. Static inverters provide a regulated 120 VAC source for essential power, instrumentation and control loads.

2. Static transfer switches provide an automatic transfer from the normal to the alternate source on loss of normal source.

3. Manual Bypass switches isolate the static inverters from the alternate power source while directing alternate power to the loads.

4. Regulating transformers provide an alternate 120 VAC source for essential power, instrumentation and control loads.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. System Component functions (C.1-4) will be tested during component testing.

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. Overall system operation will be verified during STP.961, "Loss of Offsite Power Test," and STP.1124, "120 VAC Vital and Non-Vital Power System Functional Test."

09-01-87
WP3462B
D-0151B

SYSTEM FUNCTIONAL TESTING ABSTRACT
125VDC NON-VITAL POWER SYSTEM

A. SYSTEM FUNCTIONS

The major function of the 125VDC Non-Vital Power System is to provide reliable DC power to equipment required for normal plant operation.

The following sub-functions require testing prior to restart to ensure that the major function of the system has been verified:

1. Power supplied from battery chargers.
2. Power supplied from batteries.
3. Distribution protection.
4. System condition indication.

B. FUNCTION COVERED BY OTHER SYSTEMS

The system condition indications provided in the control room are covered by the Plant Annunciator System and the Plant Computer System tests.

C. FUNCTIONS REQUIRING VERIFICATION

1. Power supplied from battery chargers.
2. Power supplied from batteries.
3. Distribution protection.
4. System condition indication.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1127, "125 VDC Vital and Non-Vital Power System Functional Test," verifies system sub-functions C.1-4.

2.. STP.961, "Loss of Offsite Power Test," verifies operation of the system during loss of offsite power.

09-01-87
WP3467B
D-0145B

SYSTEM FUNCTIONAL TESTING ABSTRACT
125VDC VITAL POWER SYSTEM

A. SYSTEM FUNCTIONS

The major function of the 125VDC Vital Power System is to support safe plant operation and safe shutdown by providing a continuous supply of DC power for safety-related equipment under normal and abnormal operating conditions.

The following sub-functions require testing prior to restart to ensure that the major function of the system has been verified:

1. Power supplied from battery chargers.
2. Power supplied from batteries.
3. Distribution protection.
4. System condition indication.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

The system condition indications provided in the Control Room are covered by the Plant Annunciator System and the Plant Computer System Tests.

C. FUNCTIONS REQUIRING VERIFICATION

1. Power supplied from battery chargers.
2. Power supplied from batteries.
3. Distribution protection.
4. System condition indication (outside of control room).

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1127, "125 VDC Vital and Non-Vital Power System Functional Test," verifies system subfunctions C.1-4.
2. STP.961, "Loss of Offsite Power Test," verifies operation of the system during loss of offsite power.

09/01/87
WP3449B
D-0098B

SYSTEM FUNCTIONAL TESTING ABSTRACT

480 VAC POWER SYSTEM

A. SYSTEM FUNCTIONS

The two major functions of the 480 Volt system are: 1) during normal plant operation the 480 Volt system provides power to Nuclear Service and Non-Nuclear Service 480 Volt loads; and 2) during abnormal operation, the 480 Volt system provides power to Nuclear Service 480 Volt loads to promote safe plant operation.

The following sub-functions require testing prior to restart to ensure that the two major functions of the system are verified:

1. Provide control of the 480V Switchgear buses by opening and closing on remote, local and automatic signal commands.

2. Provide protection for 480 Volt buses against electrical fault and/or overload conditions.

3. Provide Control Room annunciation for overload, fault, and abnormal voltage conditions by monitoring selected 480 Volt circuit breakers.

4. Convert 4,160 Volts to 480 Volts using the station service transformers.

5. Provide isolation switches for isolating Control Room circuitry, on 3A and 3A2 Switchgear, in accordance with 10CFR50 Appendix R requirements.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. During abnormal operation, the 480 Volt system provides power to Nuclear Service 480 Volt loads to promote safe plant operation.

2. During abnormal operation, the 480 volt system provides power to Nuclear Service 480 volt loads to promote safe plant operation.

   a. Testing of the abnormal operation will be provided by the Emergency Diesel Generator System Testing.

3. During a fire event in the Control Room, the system provides isolation switches on the 3A and 3A2 switchgear to promote safe shutdown of the plant.

   a. Testing of the isolation switch on the 4A204 circuit breaker will be done under the 4160 VAC system (See STP.978).

FUNCTIONS REQUIRING VERIFICATION (Continued)

C. FUNCTIONS REQUIRING VERIFICATION

1. Provide control of the 480V Switchgear buses by opening and closing 480 Volt switchgear bus supply breakers on remote, local and automatic signal commands.

2. Provide protection for 480 Volt buses against electrical fault and/or overload conditions.

3. Provide Control Room annunciation for overload, fault, and abnormal voltage conditions by monitoring selected 480 volt circuit breakers.

4. Convert 4,160 volts to 480 Volts using the station service transformers.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. Individual system subfunctions C.1-4 are tested by STP.1129, "480 VAC System Functional Test."

2. Overall system function is tested by STP.961, "Loss of Offsite Power Test."

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WP3437B
D-0004B

SYSTEM FUNCTIONAL TESTING ABSTRACT
4160V AC POWER SYSTEM

A. SYSTEM FUNCTIONS

The 4160V AC System provides electrical power from the 220KV switchyard to the Nuclear Service and Auxiliary 4160V AC loads for the station. This system, in conjunction with other systems, provides the required power sources and equipment to ensure continued operation of essential reactor and station auxiliary equipment under all conditions as specified in the design basis.

The following subfunctions of the 4160V AC System require testing to maintain a reliable source of power to the 4160V AC vital components, promoting safe plant operation:

1. Automatic and manual control of breakers is provided for the control of electrical power on 4160V switchgear.

2. Current and voltage indications are provided at the 4160V switchgear to provide indication and alarms for operations.

3. Isolation switches are provided for isolating the Control Room circuitry in accordance with Appendix R requirements during an event requiring evacuation of the Control Room.

4. Undervoltage protective relays monitor 4160V supply to assure Technical Specifications are met. Overvoltage alarms are also provided on the Nuclear Service buses.

5. The Nuclear Service buses will unload upon loss of offsite power, the diesel Generators will supply the buses and the loads will be prioritized on the Nuclear Service buses.

6. The Nuclear Service Buses will unload upon SFAS initiation, the diesel generators will start and the loads essential for safe plant operation will be resequenced on the Nuclear Service buses.

7. During an electrical fault or overload, protective relay circuitry will trip the associated breaker on S4A, S4B, S4A2, S4B2, S4E1, S4E2, S4C and S4D.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. None

C. FUNCTIONS REQUIRING VERIFICATION

1. Verify that automatic and manual control of breakers is provided for the control of electrical power on 4160V switchgear S4A, S4B, S4A2, S4B2, S4E1, S4E2, S4C and S4D.

2. Verify that current and voltage indications are provided at the 4160V switchgear to provide indication and alarms for Operations on S4A, S4B, S4A2, S4B2, S4E1, S4E2, S4C and S4D.

3. Verify that isolation switches are provided for isolating the Control Room circuitry in accordance with Appendix R requirements during an event requiring evacuation of the Control Room on S4A and S4A2.

4. Verify that undervoltage protective relays monitor 4160V supply to assure Technical Specifications are met. Overvoltage alarms are also provided on S4A, S4B, S4A2, S4B2.

5. Verify that the Nuclear Service Buses will unload upon loss of offsite power. The Diesel Generators will supply the buses and the loads will be prioritized on S4A, S4B, S4A2 and S4B2.

6. Verify that the Nuclear Service Buses will unload upon SFAS initiation. The diesel generators will start and the loads essential for safe plant operation will be resequenced on S4A, S4B, S4A2 and S4B2.

7. Verify that during an electrical fault or overload, protective relay circuitry trips the associated breaker on S4A, S4B, S4A2, S4B2, S4E1, S4E2, S4C and S4D.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. System functions C.1-4 and C.7 are tested in STP.1126, "4160 VAC System Functional Test," which verifies operation of system controls, logic and component functions.

2. System functions C.5 and C.6 will be tested by STP.961, "Loss of Offsite Power Test."

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WP3448B
D-00978

SYSTEM FUNCTIONAL TESTING ABSTRACT

6900 VAC SYSTEM

A. SYSTEM FUNCTIONS

The 6900 VAC system is designed for the four (4) each 10,000 horsepower Reactor Coolant Pump (RCP) motors. This system is arranged into two bus sections, each feeding two RCP motors. The following subfunctions require testing prior to restart to ensure that the two major functions of the system are verified.

1. The current and potential transformers provide signals to the metering and relaying circuits.

2. Four breakers provide control of the reactor coolant pumps by opening and closing on demand and four breakers provide control of the normal and alternate bus feeds.

3. The 6900 VAC busses provide reliable power to the reactor coolant pumps.

4. The system provides for bus protection on overcurrent and bus differential as well as rapid transfer to the alternate bus feed on bus undervoltage.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

The 6900 VAC system boundary for each interfacing system is defined as follows:

1. 4160 VAC system

   The system boundary is the AUX Transformer #1 side of the 6.9kv breakers feeding buses 6A and 6B. Testing of the breakers and associated control circuits are included. The transformer and associated bus work is covered by the 4160 VAC system testing.

2. Main Generator System

   The system boundary is the AUX Transformer #1 side of the 6.9kv breakers feeding buses 6A and 6B. Testing of the breakers and associated control circuits are included.

   The transformer and associated bus work is covered by the Main Generator System (MGS) testing.

3. Reactor Coolant System

The system boundary is the load side of each 6900 VAC breaker. Testing of the breakers is included. Testing of the breaker control circuits is covered by the Reactor Coolant System (RCS) testing.

C. FUNCTIONS REQUIRING VERIFICATION

1. The potential and current transformers provide signals to the metering and relaying circuits.

2. Four breakers provide control of the reactor coolant pumps by opening and closing on demand and four breakers provide control of the normal and alternate bus feeds.

3. The bus provides reliable power to the reactor coolant pumps. The system provides for bus protection on overcurrent and bus differential as well as rapid transfer to the alternate bus feed on bus undervoltage.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. The system rapid transfer function will be tested by RT-EDS-009, "6900 VAC Rapid Transfer Test," which will be performed in the cold shutdown condition.

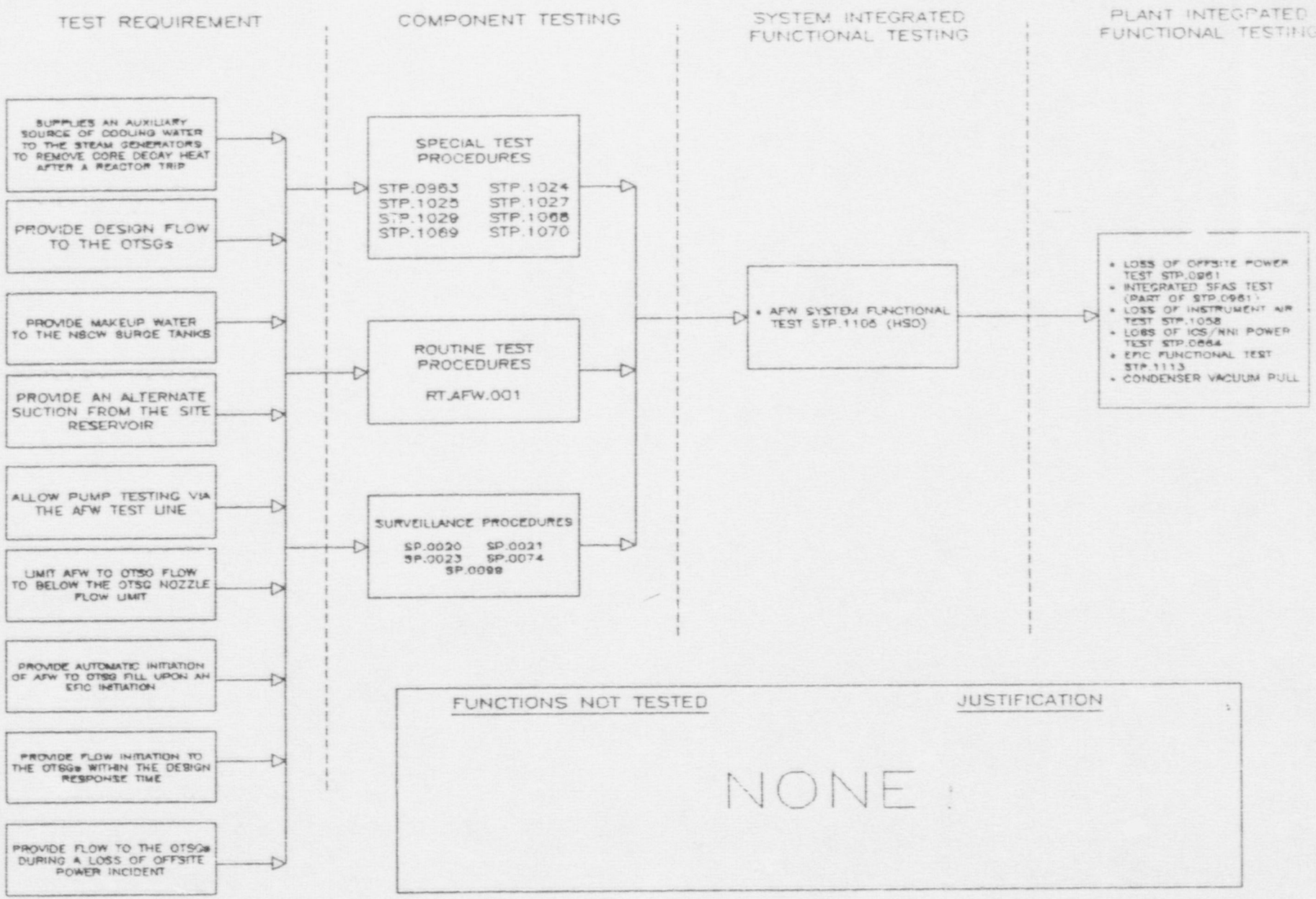
2. STP.1128, "6900 VAC System Functional Test," verifies overall system functional performance.

STEAM PLANT SYSTEMS

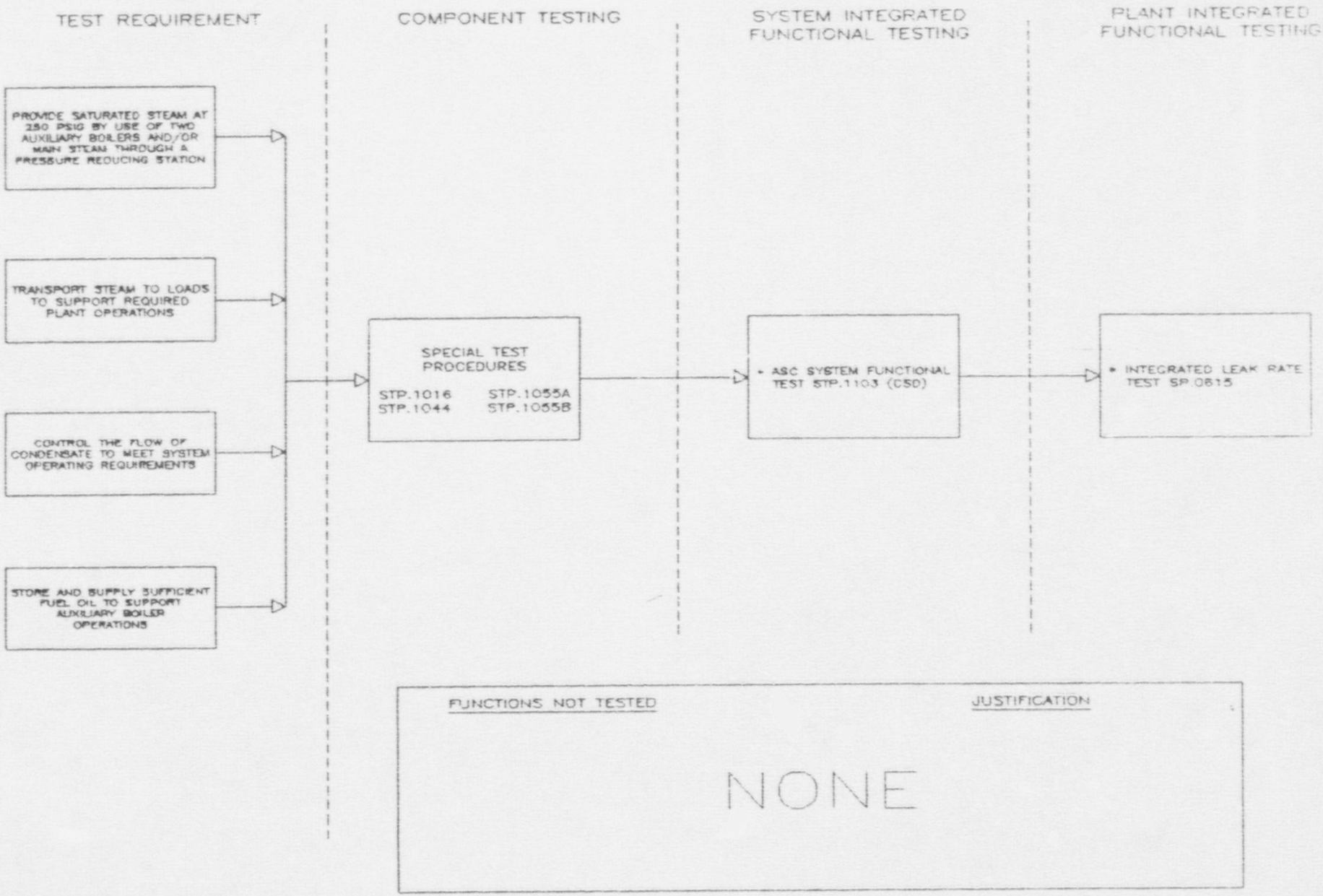
SECTION 2

AFW	–	AUXILIARY FEEDWATER SYSTEM
ASC	–	AUXILIARY STEAM SYSTEM
MFW	–	MAIN FEEDWATER SYSTEM
MSS	–	MAIN STEAM SYSTEM
OTSG	–	ONCE THROUGH STEAM GENERATORS

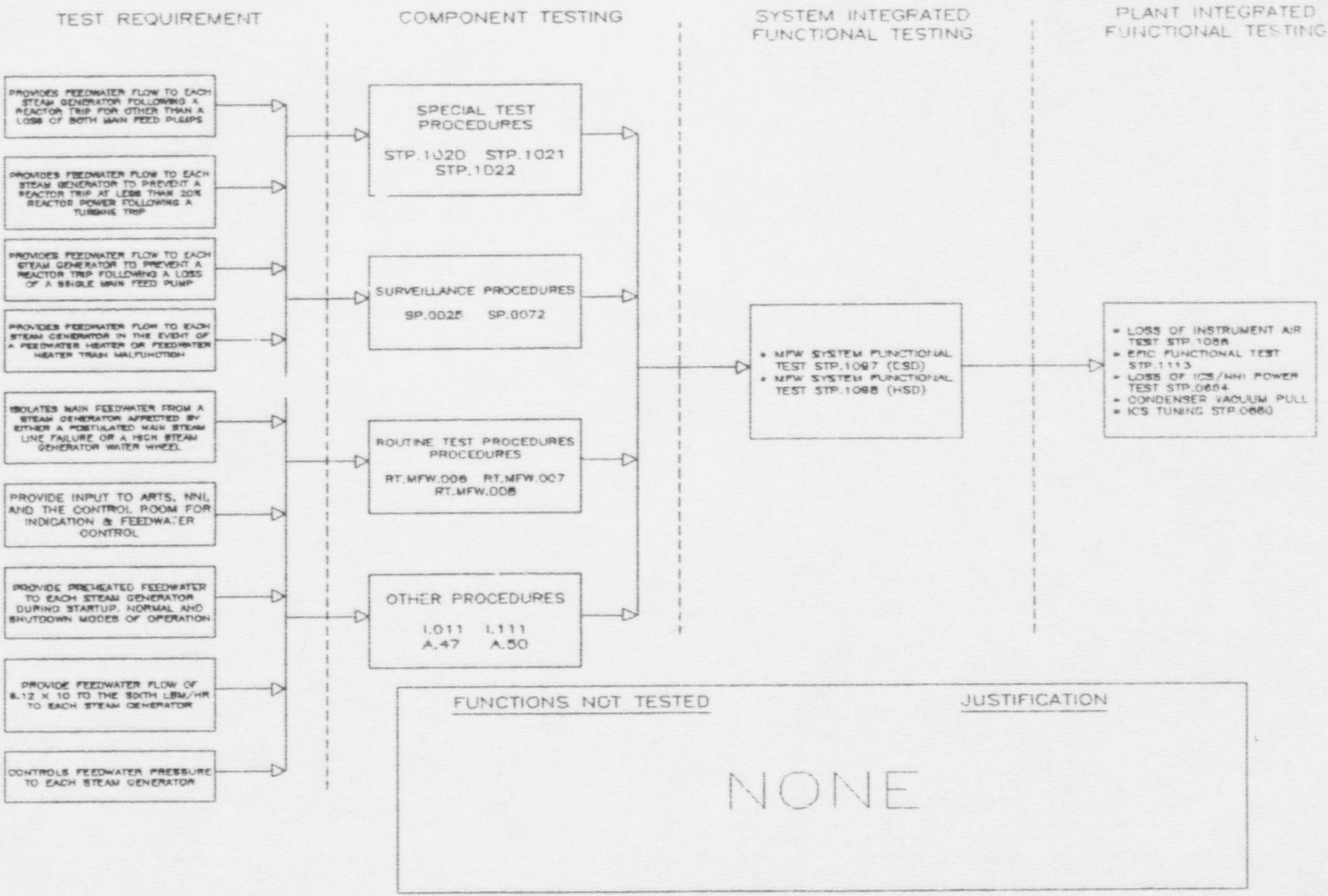
AFW FUNCTIONAL TEST OVERVIEW



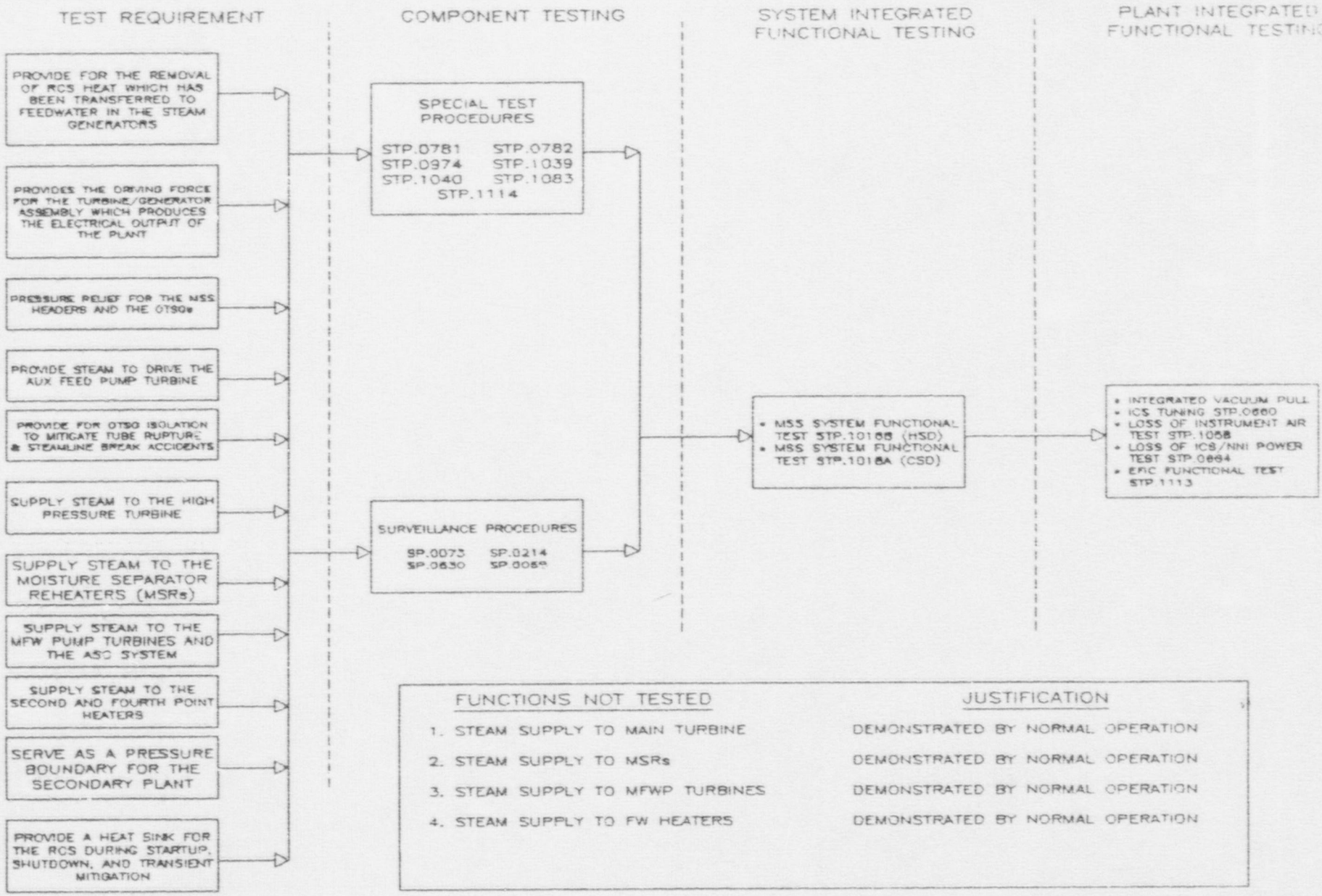
ASC FUNCTIONAL TEST OVERVIEW



MFW FUNCTIONAL TEST OVERVIEW



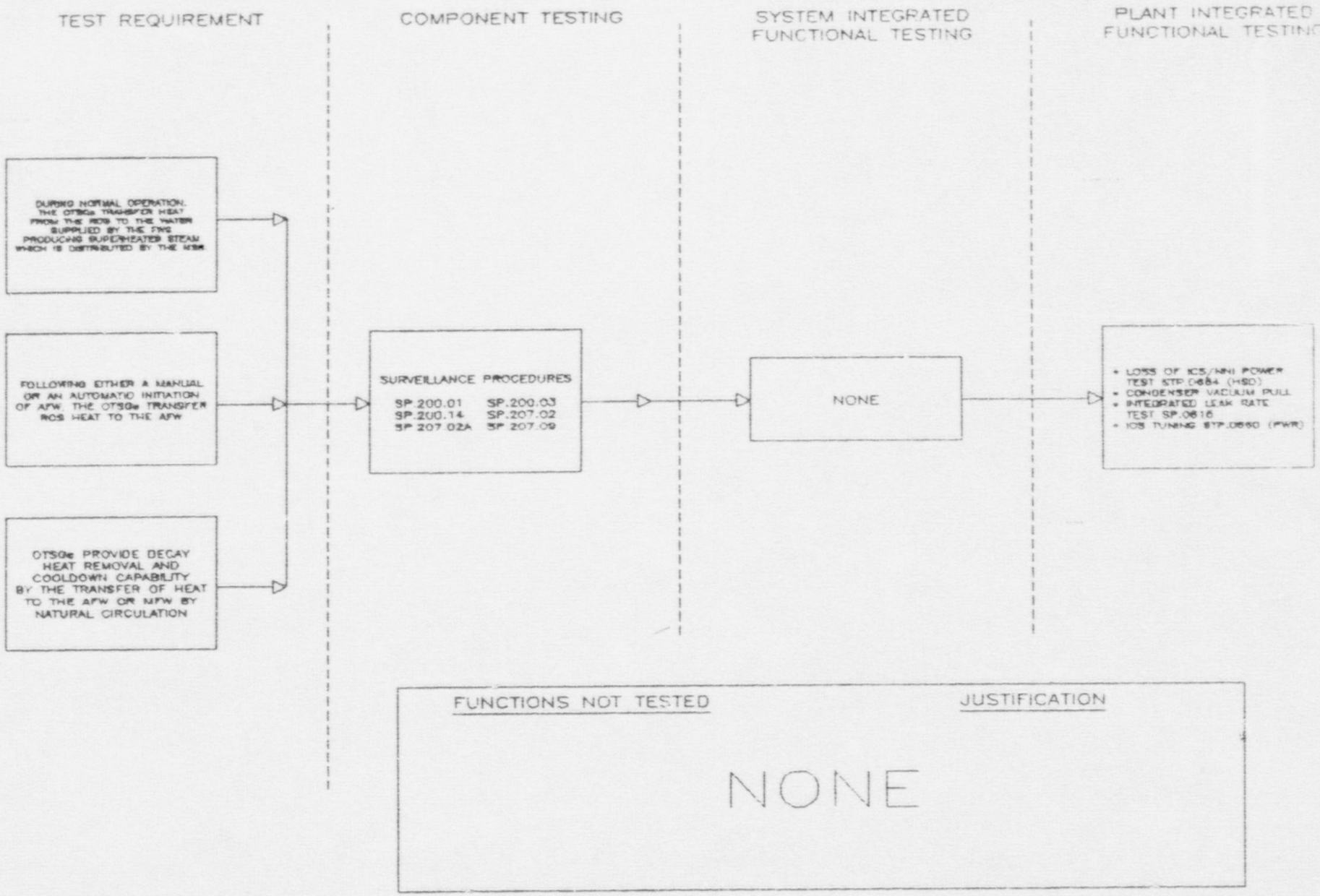
MSS FUNCTIONAL TEST OVERVIEW



FUNCTIONS NOT TESTED	JUSTIFICATION
1. STEAM SUPPLY TO MAIN TURBINE	DEMONSTRATED BY NORMAL OPERATION
2. STEAM SUPPLY TO MSRs	DEMONSTRATED BY NORMAL OPERATION
3. STEAM SUPPLY TO MFWP TURBINES	DEMONSTRATED BY NORMAL OPERATION
4. STEAM SUPPLY TO FW HEATERS	DEMONSTRATED BY NORMAL OPERATION

STEAM PLANT

OTSG FUNCTIONAL TEST OVERVIEW



08-31-87
WP3465B
D-0151B

SYSTEM FUNCTIONAL TESTING ABSTRACT
AUXILIARY FEEDWATER SYSTEM

A. SYSTEM FUNCTIONS

1. The Auxiliary Feedwater System supplies an auxiliary source of cooling water to the steam generators sufficient to remove core decay heat after a reactor trip.

2. Provide an alternate source of makeup water to the NSCW Surge Tanks.

3. Provide an alternate source of water from the site reservoir.

4. Allow pump testing via the AFW test line.

5. Limit AFW to OTSG flow to below the OTSG nozzle flow limit.

6. Provide automatic initiation of AFW to OTSG fill upon an EFIC initiation.

7. Provide flow initiation to the OTSGs within design response time.

8. Provide flow to the OTSGs during a loss of off-site power.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. Automatic EFIC initiation will be performed in the EFIC test program.

2. AFW control logic testing will be performed in the EFIC test program.

C. FUNCTIONS REQUIRING VERIFICATION

1. Required flow to the OTSGs using motor operation with the OTSGs at atmospheric pressure and using motor and turbine operation with the OTSGs at operating pressure.

2. Makeup to the NSCW system from AFW.

3. Capability of the site reservoir suction source piping and valves to provide adequate NPSH requirements for the AFW pumps.

4. Capability of the AFW test line to provide flow indication for AFW pump testing with the condenser at atmospheric pressure.

5. The AFW flow limiters limit flow with the OTSGs at atmospheric pressure and at normal operating pressure.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. Functions A.2-8 will be verified during component testing.

2. STP.1105, "AFW Cold Functional Test", will verify overall system performance prior to plant heatup.

3. AFW system operations during heatup and reactor operations will be tested as part of system integrated tests.

DRAFT DATE
09-01-87
WP3459B
D-0164B

SYSTEM FUNCTIONAL TESTING ABSTRACT
AUXILIARY STEAM SYSTEM

A. SYSTEM FUNCTIONS

1. Provide saturated steam at 250 psig by use of two auxiliary boilers and/or main steam through a pressure reducing station.

2. Transport steam to loads to support required plant operations.

3. Control the flow of condensate to meet system operating requirements.

4. Store and supply sufficient fuel oil to support auxiliary boiler operations.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. None

C. FUNCTIONS REQUIRING VERIFICATION

1. Provide saturated steam at 250 psig by use of the auxiliary boiler and by main steam.

2. Transport steam to loads to support required plant operations.

3. Control the flow of condensate to meet system operating requirements.

4. Store and supply sufficient fuel oil to support auxiliary boiler operations.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. Functions A.1-4 will be individually tested during component testing.

2. STP.1103, "Auxiliary Steam System Functional Test," will verify system logic, controls and interlocks and normal and off-normal operation.

WP3482B/D-0060B

SYSTEM FUNCTIONAL TESTING ABSTRACT

MAIN FEEDWATER SYSTEM

A. SYSTEM FUNCTIONS

1. Provides feedwater flow to each steam generator following a reactor trip for other than a loss of both main feed pumps.

2. Provides feedwater flow to each steam generator to prevent a reactor trip at less than 20% reactor power following a turbine trip.

3. Provides feedwater flow to each steam generator to prevent a reactor trip following a loss of a single main feed pump.

4. Provides feedwater flow to each steam generator in the event of a feedwater heater or feedwater heater train malfunction.

5. Isolates main feedwater from a steam generator affected by either a postulated main steam line failure or high steam generator water wheel.

6. Provides inputs to ARTS, NNI, and the Control Room for indication and feedwater control.

7. Provides preheated feedwater to each steam generator during startup, normal and shutdown modes of operation.

8. Provides feedwater flow of 6.12×10^6 lbm/hr to each steam generator.

9. Controls feedwater pressure to each steam generator.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. The ability to provide feedwater flow to each steam generator following a turbine trip will be verified by performing STP.210.05 "Turbine Mechanical Overspeed Trip Surveillance Test" during HPT system functional testing (function 2).

2. STP.660 "ICS Tuning" will be performed during ICS system functional testing and will aid in verifying functions 2 and 3.

3. The capability of isolating the MFW system from a steam generator will be demonstrated in STP.666 "EFIC Cold Functional Test" during EFIC system functional testing as well as in Item E.I. (function 5)

FUNCTIONS COVERED BY OTHER SYSTEMS (Continued)

4. Providing inputs to ARTS, NNI and the Control Room will be verified by performing I.111 and SP.200.14 during RPS and NNI system functional testing respectively (function 6).

5. Verification that feedwater can be supplied to each steam generator at rated flowrate will be demonstrated utilizing I.011 during NNI System functional testing (function 8).

C. FUNCTIONS REQUIRING VERIFICATION

1. Verify that the system:

   a. Provides feedwater flow to each steam generator following a reactor trip for other than a loss of both main feed pumps.

   b. Provides feedwater flow to each steam generator to prevent a reactor trip following a loss of a single main feed pump.

   c. Provides feedwater flow to each steam generator in the event of a feedwater heater of feedwater heater train malfunction.

   d. Isolates main feedwater from a steam generator affected by a postulated main steam line failure or high steam generator water level.

   e. Provides preheated feedwater to each steam generator during startup, normal, and shutdown modes of operation.

   f. Controls feedwater pressure to each steam generator.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. Individual system functions (A.1,.4,.7,.9) will be tested during component testing.

2. STP.1097 "Feedwater System Cold Functional Testing."

3. STP.1098 "Feedwater System Hot Functional Testing."

SYSTEM FUNCTIONAL TESTING ABSTRACT
MAIN STEAM SYSTEM

A. SYSTEM FUNCTIONS

1. The primary purpose of the MSS is to provide for removal of Reactor Cooling System (RCS) Heat which has been transferred to feedwater in the steam generators. The majority of the steam generated in the steam generators provides the driving force for the turbine/generator assembly, which produces the electrical output of the plant.

2. Pressure relief for the Main Steam Headers and the Once-Through Steam Generators (OTSGs).

3. Provide a steam supply to drive the Auxiliary Feedwater Pump P-318 Turbine.

4. Provide for OTSG Isolation in order to mitigate tube rupture and steamline break accidents.

5. Supply steam to the High Pressure Turbine.

6. Supply steam to the Moisture Separator Reheaters (MSRs).

7. Supply steam to the Main Feedwater Pump Turbines and the Auxiliary Steam System (ASC).

8. Supply steam to the second and fourth point feedwater heaters.

9. Provide a heat sink for the RCS during startup, shutdown, and transient mitigation.

10. Serve as a pressure boundary for the secondary plant.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. The Atmospheric Dump Valve control logic is to be tested under the EFIC system testing program.

2. The Turbine Bypass Valve control logic is to be tested under the ICS system testing program.

3. The ability to supply steam to the Auxiliary Steam System will be tested under the ASC system testing program.

C. FUNCTIONS REQUIRING VERIFICATION

1. Provide for removal of RCS heat to steam generator feedwater and transfer generated steam to the main turbine generator.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. Functions A.2,-3,-4 and -10 are verified during component testing.

2. The ability to supply steam to the High Pressure Turbine is adequately demonstrated by normal plant operation. (Function A.5)

3. The ability to supply steam to the MSRs is adequately demonstrated by normal plant operations. (Function A.6)

4. Steam supply to the Main Feedwater Pump Turbines is adequately demonstrated by normal plant operations. (Function A.7)

5. Steam supply to the Main Feedwater Heaters is adequately demonstrated by normal operations. (Function A.8)

6. Provision of a heat sink for the RCS during startup, shutdown, and transient mitigation is demonstrated during normal plant operations and integrated system testing. (Function A.9)

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. The following testing is scheduled to be performed.

   a. STP.1018A, "Main Steam System Cold Functional Test," will verify system functions, controls, interlocks and logic prior to plant heatup.

   b. STP.1018-B, Main Steam System Hot Functional Test," will verify system functions and performance at hot shutdown conditions prior to reactor startup.

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SYSTEM FUNCTIONAL TEST ABSTRACT
ONCE THROUGH STEAM GENERATORS

A. SYSTEM FUNCTIONS

1. During normal power operation, the Once Through Steam Generators serve to transfer heat from the Reactor Coolant System (RCS) to the water supplied by the Feedwater System (FWS), producing superheated steam which is distributed by the Main Steam System (MSS). Following either a manual or an automatic initiation of Auxiliary Feedwater, the OTSGs transfer RCS heat to the Auxiliary Feedwater. The OTSGs must provide decay heat removal and cooldown capability by the transfer of heat to the Main or Auxiliary Feedwater System by natural circulation.

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. The Once Through Steam Generators (OTSGs) directly interface with the following systems:

   a. Verify that the primary side of the steam generator (upper head, tubes, lower head) just act as a barrier to the release of radioactive material. This function is verified with the Main Steam Supply (MSS) System Testing.

   b. Assure that the steam generator recirculation system provides a means of recirculating the wet lay up water, of sampling that water, and of adding chemicals as required in order to maintain proper chemistry.

C. FUNCTIONS REQUIRING VERIFICATION

1. None

   The OTSGs function as components of the Reactor Coolant and Main Steam Systems. Overall system functions are tested as part of those systems' tests.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF TESTS TO BE PERFORMED

1. None (See C.1)

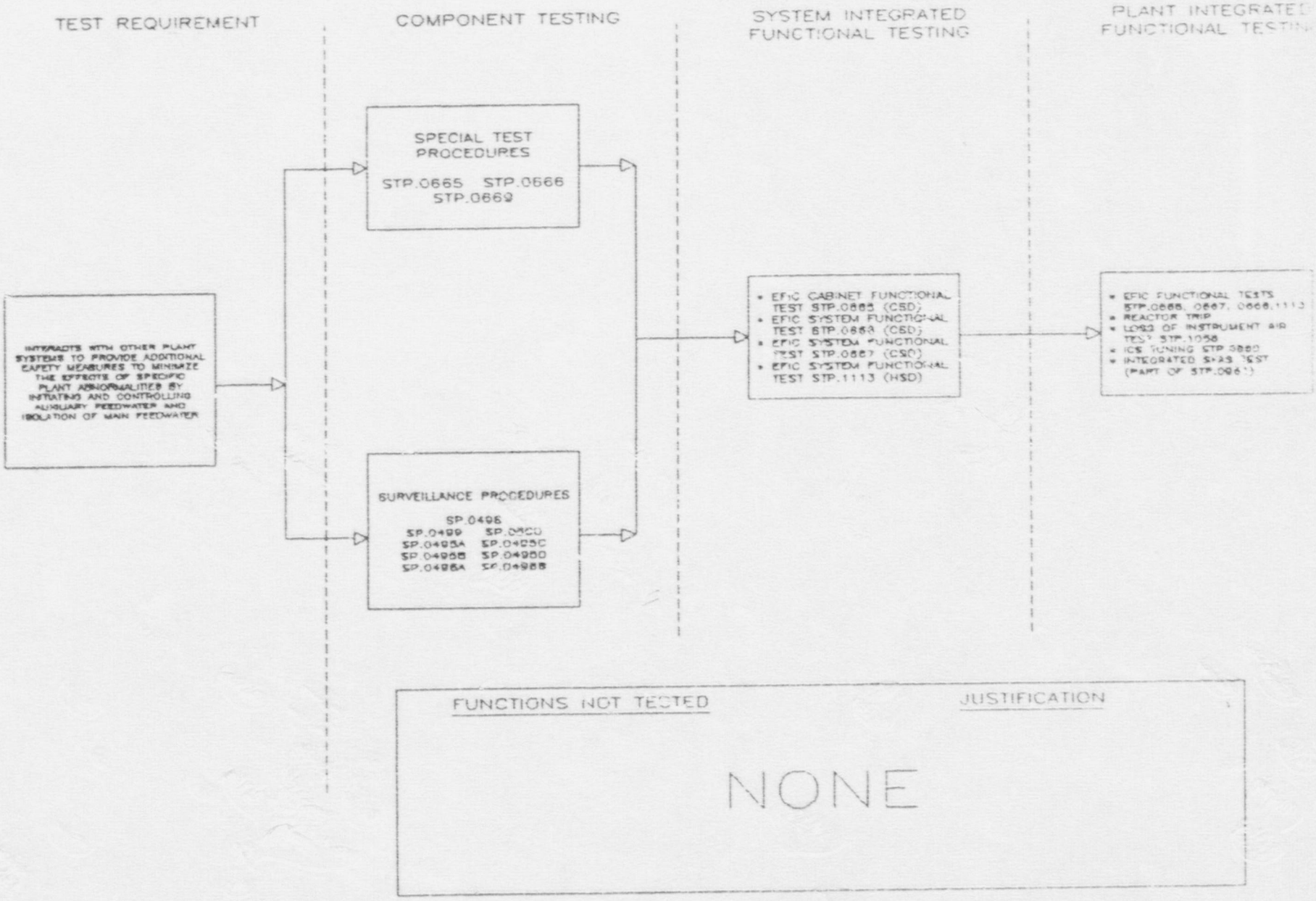
CONTROL SYSTEMS

SECTION 3

EFIC	–	EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM
ICS	–	INTEGRATED CONTROL SYSTEM
NNI	–	NON–NUCLEAR INSTRUMENTATION
RDM	–	RADIATION MONITORING SYSTEM
RPS	–	REACTOR PROTECTION SYSTEM
SFS	–	SAFETY FEATURES ACTUATION SYSTEM

ATTACHMENT 4

EFIC FUNCTIONAL TEST OVERVIEW



CONTROL

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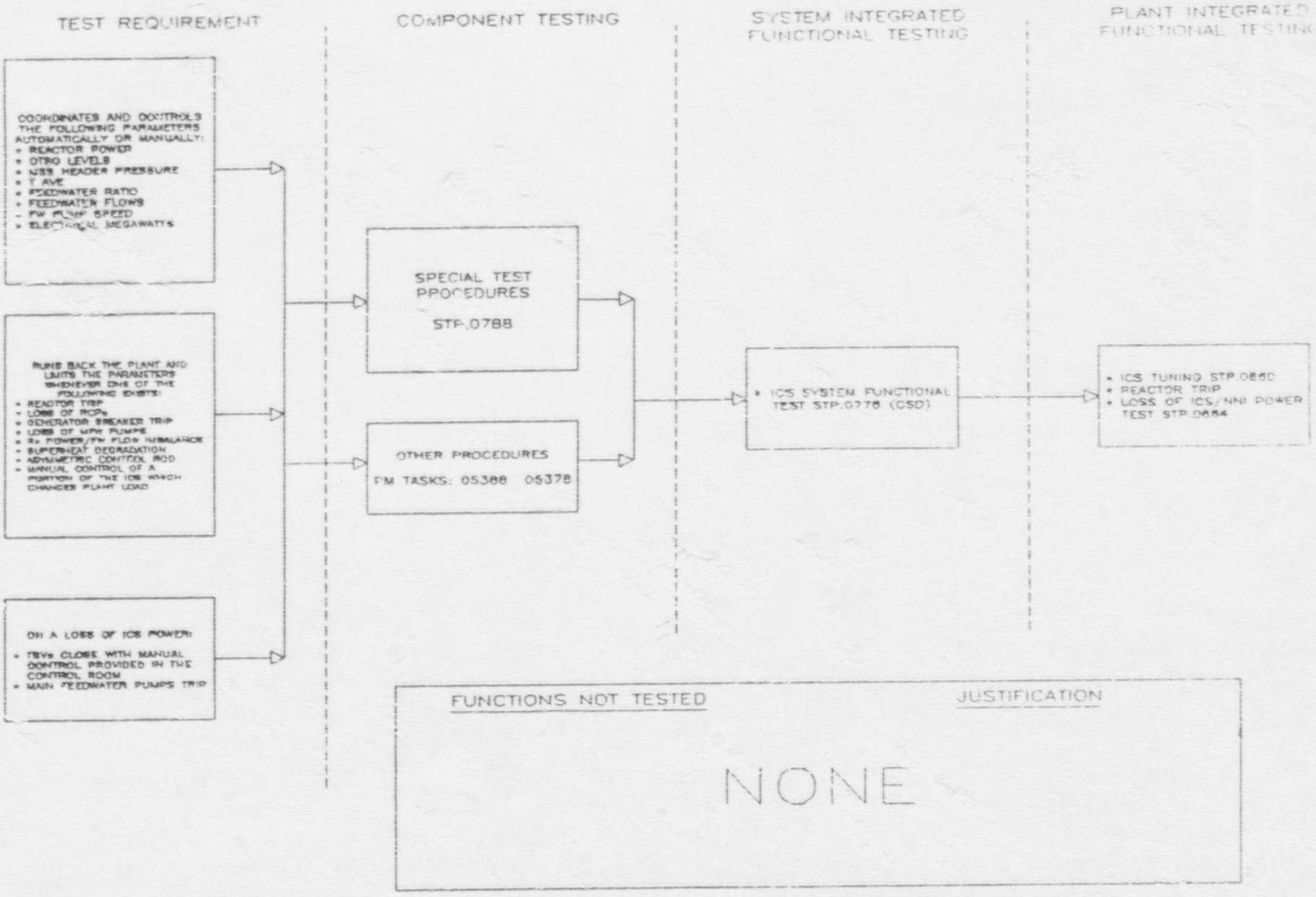
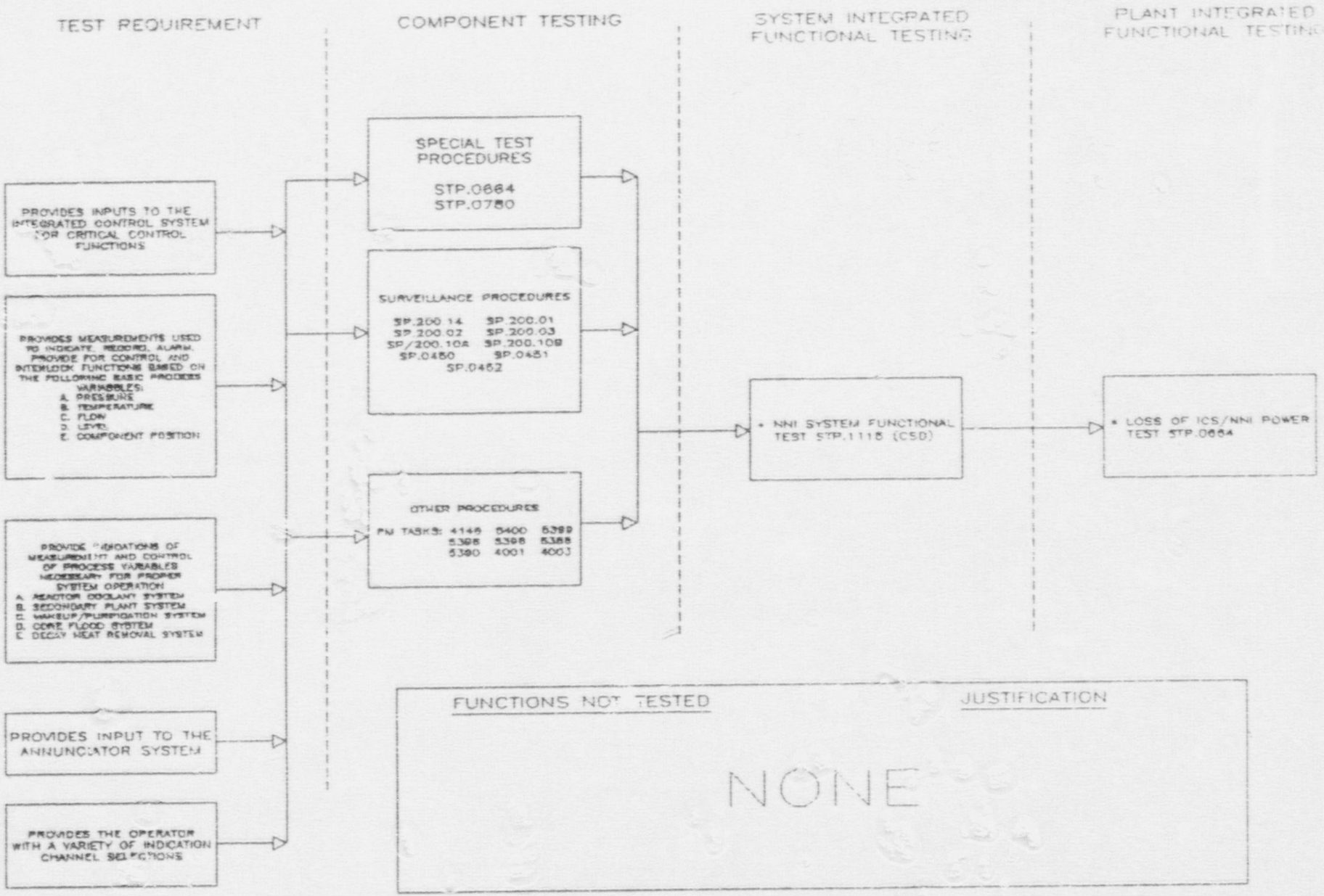
ICS FUNCTIONAL TEST OVERVIEW



NNI FUNCTIONAL TEST OVERVIEW



ATTACHMENT 4

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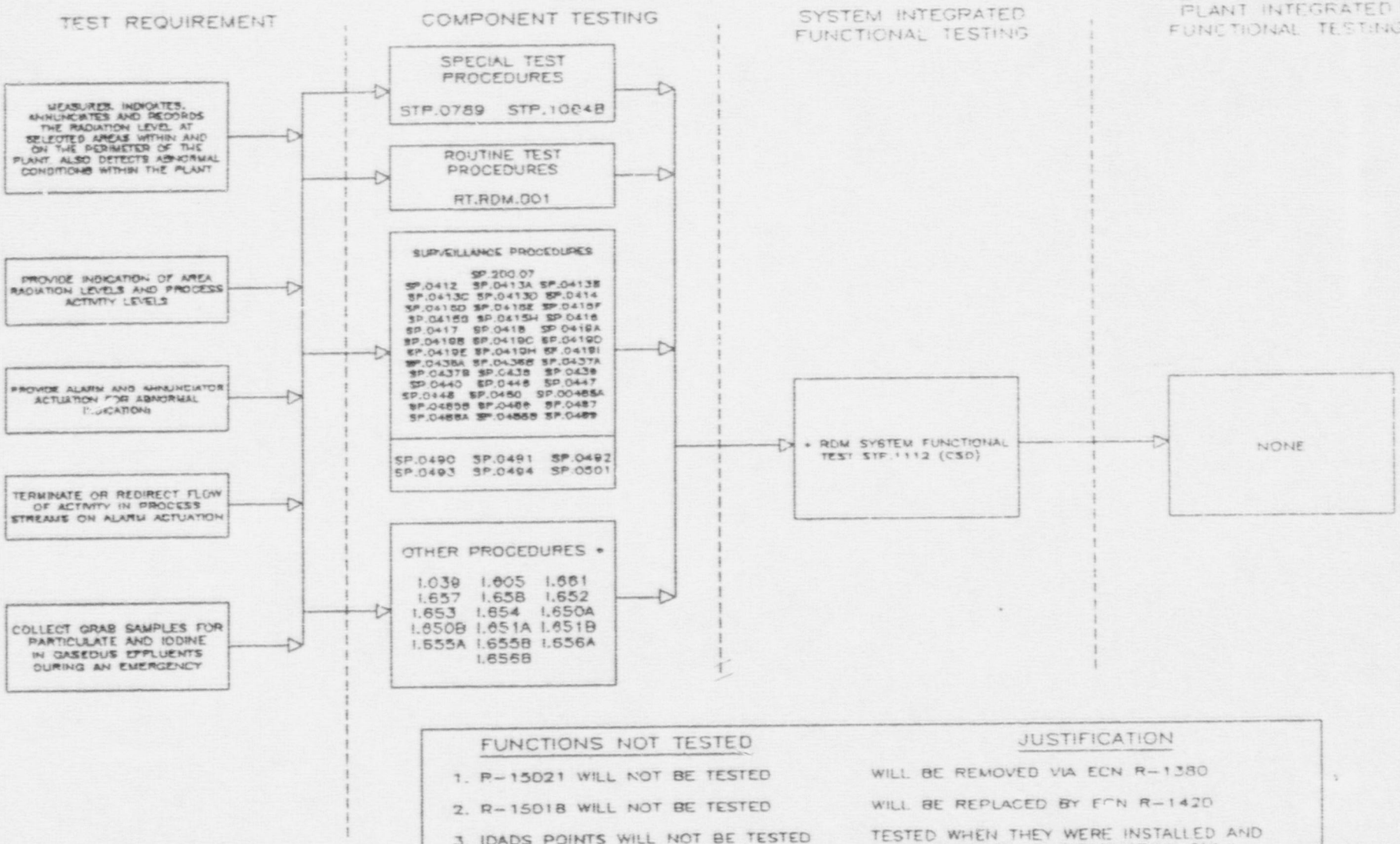
RDM FUNCTIONAL TEST OVERVIEW



FUNCTIONS NOT TESTED	JUSTIFICATION
1. P-15021 WILL NOT BE TESTED	WILL BE REMOVED VIA ECN R-1380
2. R-15018 WILL NOT BE TESTED	WILL BE REPLACED BY ECN R-1420
3. IDADS POINTS WILL NOT BE TESTED	TESTED WHEN THEY WERE INSTALLED AND THEIR FUNCTION IS INFORMATION ONLY

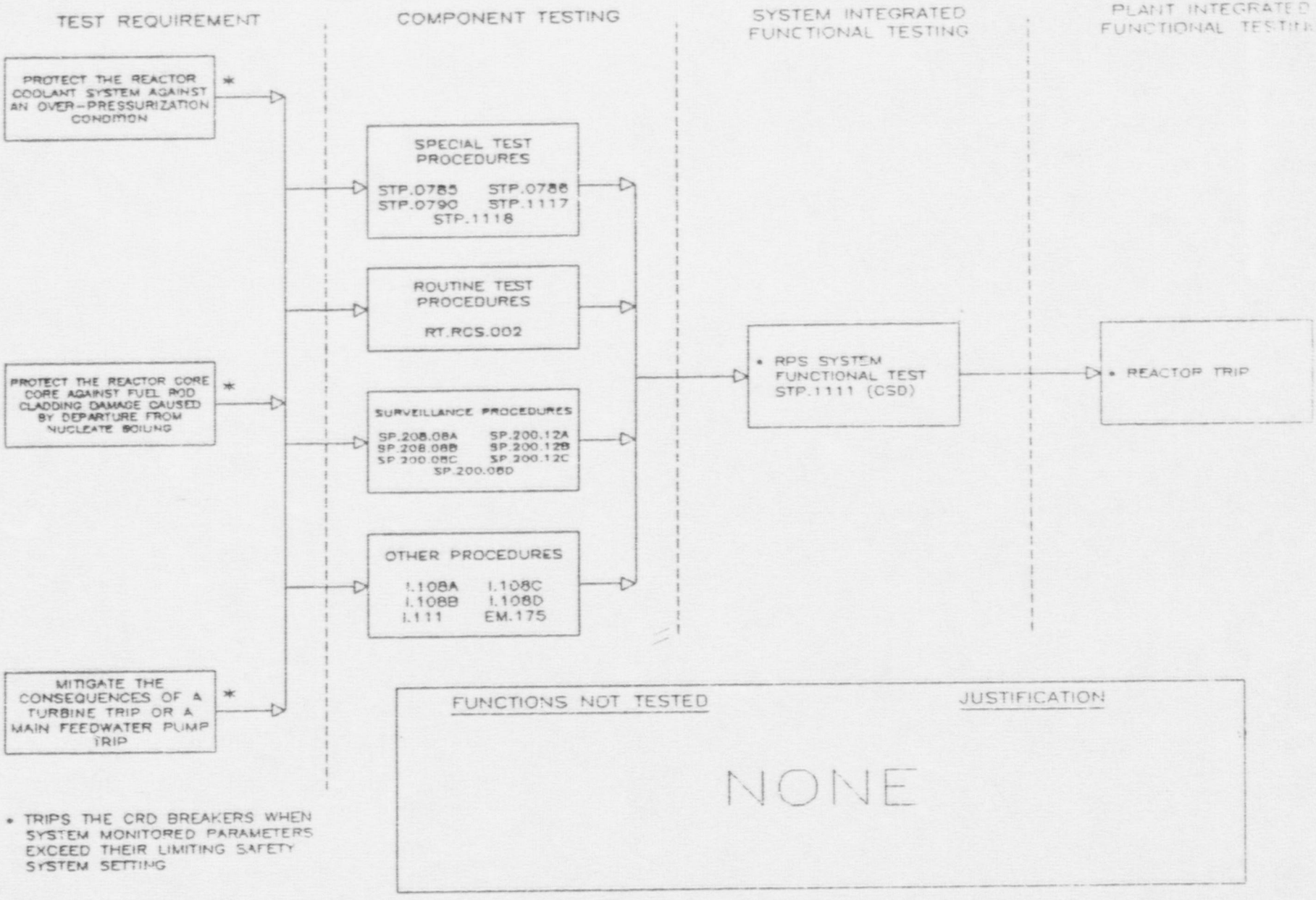
* THE 1.XXX PROCEDURE WILL BE PERFORMED IF THE NEW SP IS NOT AVAILABLE

ATTACHMENT 4

PAGE 2 OF 2

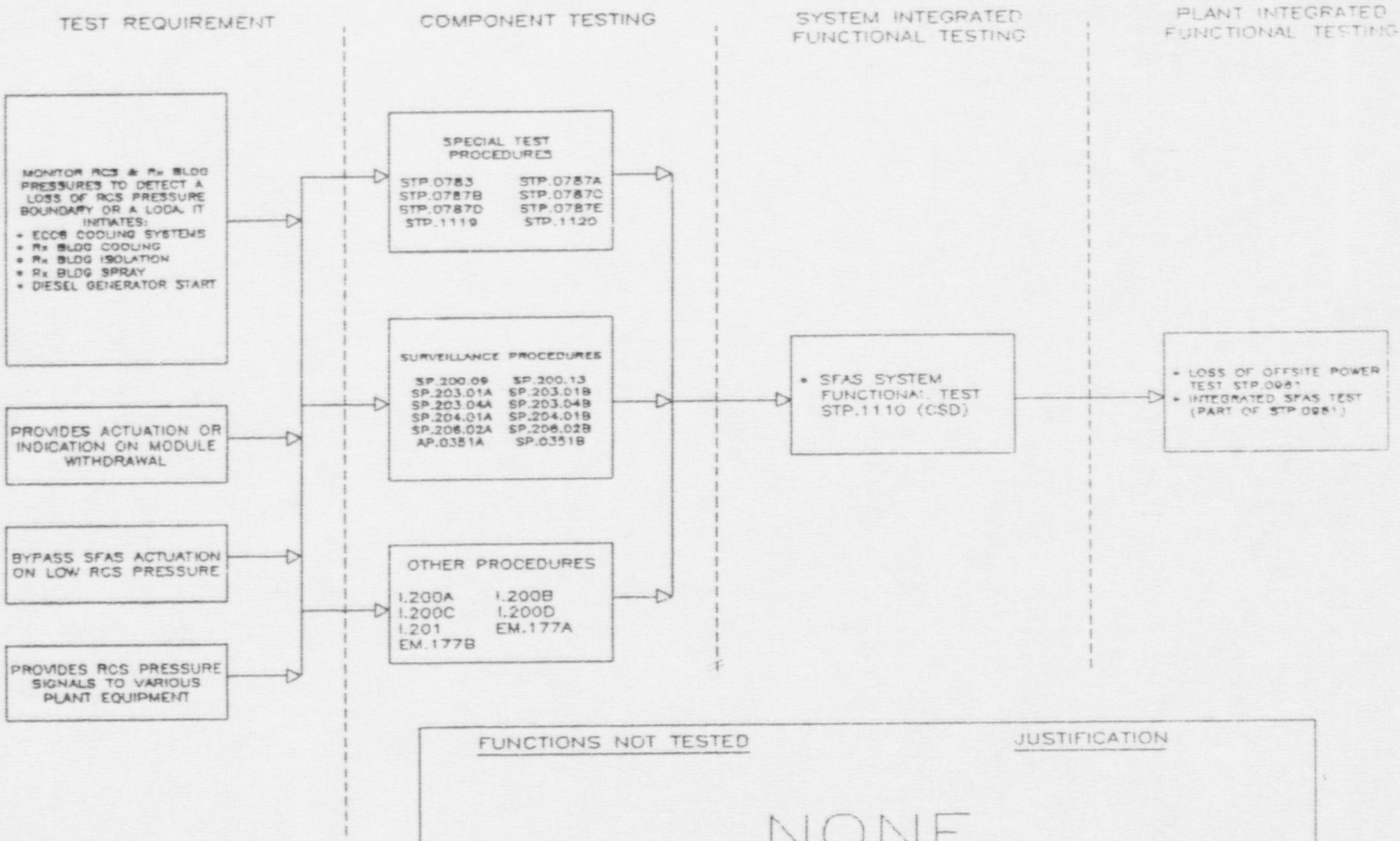
CONTROL

RPS FUNCTIONAL TEST OVERVIEW



ATTACHMENT 4

SFS FUNCTIONAL TEST OVERVIEW



FUNCTIONS NOT TESTED — JUSTIFICATION

NONE

CONTROL

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SYSTEM FUNCTIONAL TESTING ABSTRACT

EMERGENCY FEEDWATER INITIATION AND CONTROL

A. SYSTEM FUNCTIONS

1. Initiation of AFW for:

   a) Safety Features Actuation System (SFAS).

   b) Loss of all four Reactor Coolant Pumps.

   c) Loss of both MFW pumps at >20 percent power.

   d) Manual Initiation and Control of AFW.

   e) OTSG Level.

   f) OTSG Pressure.

2. EFIC provides an automatic control signal to the AFW flow control valves to maintain OTSG level at the appropriate setpoints.

3. EFIC sends close signals to the MFW main and startup flow control valves, the MFW main block valve, and the OTSG MFW isolation valve if the corresponding OTSG pressure falls below 600 psig or level exceeds the main feedwater overfill setpoint (to be determined after startup).

4. EFIC provides main steam overpressure protection by sending control signals to the ADVs on each main steam line.

5. Based on OTSG pressure signals, EFIC provides the necessary signals to isolate AFW flow.

6. EFIC provides H/A control of:

   a) AFW flow control valves.

   b) Atmospheric Dump valves (ADVs).

SYSTEM FUNCTIONS (Continued)

7. EFIC System Bypass Features:

   a) Maintenance Bypass.

   b) Shutdown Bypass

8. The EFIC system also provides analog and/or digital signals to:

   a) Safety Parameter Display System (SPDS).

   b) Interim Data Acquisition and Display System (IDADS).

9. EFIC is initiated when SFAS is manually/automatically initiated.

10. EFIC provides manual isolate switching for Appendix "R" isolation of EFIC Control Room commands which transfers some controls to the Remote Shutdown Panel.

11. EFIC provides rate of level increase control when filling the OTSG to the natural circulation or ECCS level setpoint.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. None

C. FUNCTIONS REQUIRING VERIFICATION

1. Initiation of AFW for:

   a) Safety Features Actuation System (SFAS).

   b) Loss of all four Reactor Coolant Pumps.

   c) Loss of both MFW pumps at >20 percent power.

   d) Manual Initiation and Control of AFW.

   e) OTSG Level.

   f) OTSG Pressure.

FUNCTIONS REQUIRING VERIFICATION (Continued)

2. EFIC provides an automatic control signal to the AFW flow control valves to maintain OTSG level at the appropriate setpoints.

3. EFIC sends close signals to the MFW main and startup flow control valves, the MFW main block valve, and the OTSG MFW isolation valve if the corresponding OTSG pressure falls below 600 psig or level exceeds the main feedwater overfill setpoint (to be determined after startup).

4. EFIC provides main steam overpressure protection by sending control signals to the ADVs on each main steam line.

5. Based on OTSG pressure signals, EFIC provides the necessary signals to isolate AFW flow.

6. EFIC provides H/A control of:

   a) AFW flow control valves.

   b) Atmospheric Dump valves (ADVs).

7. EFIC System Bypass Features:

   a) Maintenance Bypass.

   b) Shutdown Bypass

8. The EFIC system also provides analog and/or digital signals to:

   a) Safety Parameter Display System (SPDS).

   b) Interim Data Acquisition and Display System (IDADS).

9. EFIC is initiated when SFAS is manually/automatically initiated.

10. EFIC provides manual isolate switching for Appendix "R" isolation of EFIC Control Room commands which transfers some controls to the Remote Shutdown Panel.

11. EFIC provides rate of level increase control when filling the OTSG to the natural circulation or ECCS level setpoint.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. Individual system functions (A.1-11) are verified during component testing.

2. STP.665, "EFIC Cabinet Functional Test," to functionally verify the EFIC System internal logic and cabinet interconnections as installed by ECN A-5415E.

3. STP.666, "EFIC Cold Functional Test," to functionally demonstrate the operability of the EFIC system including the interfacing and ancillary systems which make up the MOD 1 design package.

4. STP.667, "EFIC Cold Preoperational Test," to functionally demonstrate the operability of the EFIC system controls and indication under dynamic conditions at cold shutdown.

5. STP.668, "EFIC Post-Startup Test," to functionally demonstrate the operability of the EFIC system controls and indications under moderate and high decay heat conditions in conjunction with a planned reactor shutdown.

6. STP.1113, "EFIC Hot Functional Test," to functionally demonstrate the operability of the EFIC system controls and indications under dynamic conditions of hot shutdown.

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SYSTEM FUNCTIONAL TESTING ABSTRACT
INTEGRATED CONTROL SYSTEM (ICS)

A. SYSTEM FUNCTIONS

1. The Integrated Control System (ICS) coordinates the reactor, steam generator, feedwater and turbine controls for stable operation of the plant. The ICS also provides control actions to runback and limit the plant load demand whenever a condition exists which limits generating capacity, or requires an orderly shutdown.

   The functions of the ICS can be divided into the five subsystems within the ICS, and functions related to ICS power. The five subsystems are:

   a. Unit load demand subsystem (master control)

   b. Integrated master subsystem (turbine control)

   c. Steam generator/feedwater subsystem

   d. Reactor control subsystem

   e. Borate control subsystem

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. None

C. FUNCTIONS REQUIRING VERIFICATION

1. The testing recommended to verify functions of the Integrated Control System (ICS) that are important to safe plant operations (per STP.778 and STP.664) are:

   a. The Unit Load Demand subsystem shall be tested to verify manual and tracking operation, runbacks, load change rates, and load demand limits.

   b. The Integrating Master subsystem shall be tested to verify that it provides manual/automatic controls for steam/reactor demand and turbine bypass valves.

c. The Steam Generator/Feedwater subsystem shall be tested to verify manual/automatic control for feedwater demand, steam generator BTU limits, min. and max. steam generator level, cross-limit, re-ratio feedwater on loss of reactor coolant pumps.

d. Reactor Control subsystem shall be tested to verify manual/auto control for reactor demand, reactor power limits, cross-limits, Neutron Power Blocks Restart of Reactor Coolant Pump, Neutron Error Blocks Transfer of Rod Control to Automatic and Asymmetric Rod Condition Blocks Rod Withdrawal.

e. The Borate Control subsystem shall be tested to verify Annunciation of Rod Position Error and Operation of the Feed and Bleed Permissive.

f. Verify Loss of NNI/ICS Power, Control Actions are provided to place the plant in safe condition.

g. NOTE: STP.660 "Integrated Control System Tuning at Power" will be performed during power escalation. The objective is to verify the ICS provides the best load response to load demands during steady state and transient conditions.

D. FUNCTIONS NOT REQUIRING VERIFICAITON

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. The testing detailed on Attachments 1 through 3 is scheduled to be performed:

a. STP.778, "Integrated Control System Functional Test", verifies the Integrated Control System (ICS) can perform the functions necessary to control the Reactor, the Once-Through Steam Generators, and the Turbine over the plant's full range of power, by simulating inputs to the ICS and observing the system's reactions.

b. STP.664, "Loss of ICS/NNI Power", demonstrates that on a loss of ICS/NNI power, the plant can be controlled in a Hot Shutdown condition.

c. STP.660, "Integrated Control System Tuning at Power", verifies the integrated Control System (ICS) provides the load response to the unit load demand during steady-state and transient conditions by inducing transients, adjusting tuning parameters, observing power escalation, and verifying the calibration of the feedforward function generators.

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WP3445B
D-0145B

SYSTEM FUNCTIONAL TESTING ABSTRACT

NON-NUCLEAR INSTRUMENTATION SYSTEM

A. SYSTEM FUNCTIONS

1. The Non-Nuclear Instrumentation (NNI) provides input signals of process variables for the reactor protection, system regulating, and auxiliary system.

2. Provides inputs to the Integrated Control System (ICS) for critical control functions.

3. The NNI System provides measurements used to indicate, record, alarm, provide for control and interlock functions based on the following five basic process variables.

   a. Pressure

   b. Temperature

   c. Flow

   d. Level

   e. Component position.

4. The NNI provides indications of measurement and control of process variables necessary for proper system operation.

   a. Reactor Coolant System

   b. Secondary Plant System

   c. Makeup and Purification System

   d. Core Flood System

   e. Decay Heat Removal System

5. Provides inputs to the Annunciator Systems.

6. Provides the operator with a variety of indication channel selections.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. The NNI supports a number of operational and safety interlocks to permit or to prevent equipment operation under predetermined process conditions. The contacts associated with the interlocks are tested during NNI testing ensuring loop continuity and proper setpoints. The NNI System directly interfaces with the following systems:

   a. Reactor Coolant System

   b. Makeup and Purification System

   c. Decay Heat Removal System

   d. Secondary Plant System (OTSG, MFW, Turbine)

   e. Core Flood System

   f. Integrated Control System

   g. Annunciator System

2. The NNI System interfaces indirectly with the Safety Features Actuation System (SFAS) and the RPS. The temperature, pressure, and flow signals are used in these systems and are then sent to the NNI System.

3. The systems required to support the NNI System are the Vital Electrical Distribution System and the Non-Vital Electrical Distribution System.

4. Instrument loop calibrations will be performed on all instrument loops associated with the NNI System. The interlocks described in the functional description will be tested.

C. FUNCTIONS REQUIRING VERIFICATION

1. Provides indications for many parameters in the Control Room.

2. Provides input to the ICS System.

3. Provides inputs to the Annunciator System.

4. Supports a number of operational and safety interlocks.

5. Provides the operator with a variety of redundant interfaces which are mainly selector type switches.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1115 - NNI Functional test, to facilitate and document the system testing required to verify that the NNI system is capable of performing its design function.

SYSTEM FUNCTIONAL TESTING ABSTRACT

RADIATION MONITORING SYSTEM

A. SYSTEM FUNCTIONS

1. The Radiation Monitoring System measures, indicates, annunciates, and records the radiation level at selected areas within and on the perimeter of the plant verifying compliance with 10CFR20 and 40CFR190 limits, and detecting abnormal conditions within the plant:

   a. Provide indication of area radiation levels and process activity levels.

   b. Provide alarm and annunciator actuation for abnormal indication.

   c. Terminate or redirect flow of activity in process streams on alarm actuation.

   d. Collect grab samples for particulate and iodine in gaseous effluents during an emergency.

B. FUNCTIONS VERIFIED BY OTHER SYSTEM

1. Radiation Monitoring System inputs to SPDS will be tested as part of the PCS system under STP 789 (Functions 1a. and b.).

2. Control Room Emergency HVAC actuation will be tested as part of the CR/TSC HVAC System (SP.485A and B).

C. FUNCTIONS REQUIRING VERIFICATION

1. Provide indication of area radiation levels and process activity levels.

2. Provide alarm and annunciator actuation for abnormal indication.

3. Terminate or redirect flow of activity in process streams on alarm annunciation.

4. Collect grab samples for particulate and iodine in gaseous effluents during an emergency using RT-RDM-001.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. The following will not be tested:

   a. R-15021 Gland Seal Exhaust Monitor (this monitor is tagged out and will be removed under ECN R-1380.)

   b. R-15018 Spent Fuel Coolant Monitor (This monitor is tagged out and will be replaced under ECN R-1420).

2. Individual system functions will be tested during component testing.

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1112, "Functional Test of Radiation Monitoring System" will be performed to verify proper indication of radiation or activity level for all installed radiation monitors, proper alarm and annunciator actuation for all installed radiation monitors, that control functions are performed (termination of process activity flow) on alarm signal, and the ability to collect grab samples of gaseous effluents during an emergency.

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WP3442B
D-0151B

SYSTEM FUNCTIONAL TESTING ABSTRACT
REACTOR PROTECTION SYSTEM

A. SYSTEM FUNCTIONS

1. The Reactor Protection System (RPS) fulfills the following safety design basis functions by tripping the Control Rod Drive (CRD) breakers when system monitored parameters exceed their Limiting Safety System Settings:

   a. To protect the Reactor Coolant System (RCS) against an over-pressurization condition.

   b. To protect the reactor core against fuel rod cladding damage caused by a departure from nucleate boiling.

   c. To mitigate the consequences (i.e., challenging the EMOV) of a Turbine Trip or Main Feedwater Pump (MFP) Trip.

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. To protect the Reactor Coolant System (RCS) against an over-pressurization condition.

   a. The portions of the instrument channels which supply the RCS pressure signal to the EMOV and Pressurizer Heater control logic and are outside the RPS cabinet are tested as part of the Non-Nuclear Instrumentation (NNI) System.

C. FUNCTIONS REQUIRING VERIFICATION

1. To protect the Reactor Coolant System (RCS) against an over-pressurization condition.

2. To protect the reactor core against fuel rod cladding damage caused by a departure from nucleate boiling.

3. To mitigate the consequences (i.e., challenging the EMOV) of a Turbine Trip or Main Feedwater Pump (MFP) Trip.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.790, "RPS Module Removal Interlock Verification," functionally verifies operability of the critical module interlocks in the RPS cabinets.

2. STP.1111, "RPS Functional Testing," facilitates the system testing required to verify that the RPS is capable of performing its design function of tripping the Control Rod Drive (CRD) breakers when system monitored parameters exceed their Limiting Safety System Setting.

3. STP.795, "RPS Time Response Test," verifies the time response of each RPS Channel.

4. RT-RCS.002, "Refueling Outage Reactor Coolant Pump Failure (Undercurrent) Relay Test,"

   a. Verifies that the Reactor Coolant Pump (RCP) failure (motor undercurrent) relays provide pump trip inputs to the RPS,

   b. That the RCP failure (motor undercurrent) relays provide pump trip inputs to the Integrated Control System (ICS) and,

   c. That the RCP/Safety Injection and Makeup/Component Cooling Water valve interlocks by checking that the auxiliary relays 637XA, XB, XC and XD will energize only if all four RCP motors are not running.

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WP-3443D
D-0151B

SYSTEM FUNCTIONAL TESTING ABSTRACT
SAFETY FEATURES ACTUATION SYSTEMS

A. SYSTEM FUNCTION

1. The plant Safety Features Actuation System (SFAS) monitors Reactor Coolant System (RCS) pressure and Reactor Building (RB) pressure in order to detect a loss in RCS pressure boundary integrity or loss of coolant accident (LOCA). The SFAS initiates actuation signals to the following safety features systems to minimize the severity and mitigate the consequences of a LOCA:

   a. Emergency Core Cooling to ensure fuel integrity.

   b. Reactor Building Cooling, Isolation and spray systems to ensure RB integrity, reduce the driving force for building leakage and remove fission products from the RB atmosphere.

   c. Emergency Diesel Generators to provide redundant power sources to the nuclear service buses.

2. Provides actuation or indication on module withdrawal.

3. Bypass SFAS actuation on low RCS pressure.

4. Provides RCS pressure signals to various plant equipment.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. The Safety Features Actuation System directly interfaces with the following systems:

   a. High Pressure Injection
   b. Low Pressure Injection
   c. Core Flood
   d. Reactor Building Emergency Cooling
   e. Nuclear Service Raw Water
   f. Nuclear Service Cooling Water
   g. Auxiliary Feedwater (EFIC Initiate)
   h. Reactor Building Spray
   i. CR/TSC Emergency HVAC
   j. NSEB Emergency HVAC
   k. Emergency Diesel Generators
   l. Reactor Plant Sampling

B. FUNCTIONS COVERED BY OTHER SYSTEMS (Continued)

m. Purification and Letdown
n. Seal Inject and Makeup
o. Reactor Building Purge
p. Borated Water

2. The Safety Features Actuation System provides RCS pressure signals to the following systems:

a. Non-Nuclear Instrumentation

1. EMOV interlock

2. CFT outlet valve interlock

3. Control Room wide range recorder

b. Reactor Coolant System - Tsat Calculators

c. Decay Heat System - Drop Line Valve Interlock

d. Various Plant Meters

1. Technical Support Center

2. Control Room - boron panel

C. FUNCTIONS REQUIRING VERIFICATION

1. Monitor Reactor Coolant System (RCS) pressure and Reactor Building (RB) pressure.

2. Process the pressure signals and actuate safety features components as required.

3. Initiate Nuclear Service Bus unloading.

4. Provide RCS pressure signals to various plant equipment.

5. Bypass SFAS actuation on low RCS pressure.

6. Provide system status indications.

7. Provide actuation or indication on module withdrawal.

B. FUNCTIONS REQUIRING VERIFICATION (Continued)

8. Provide the capability to manually initiate individual digital channels.

9. Provide the capability for manual control of safety features components following an SFAS actuation.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. Functions A.2-4 will be tested during Component Testing

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP-1110, "SFAS Functional Testing," facilitates the system testing required to verify that the SFS is capable of performing its design functions.

REACTOR PLANT SYSTEMS

SECTION 4

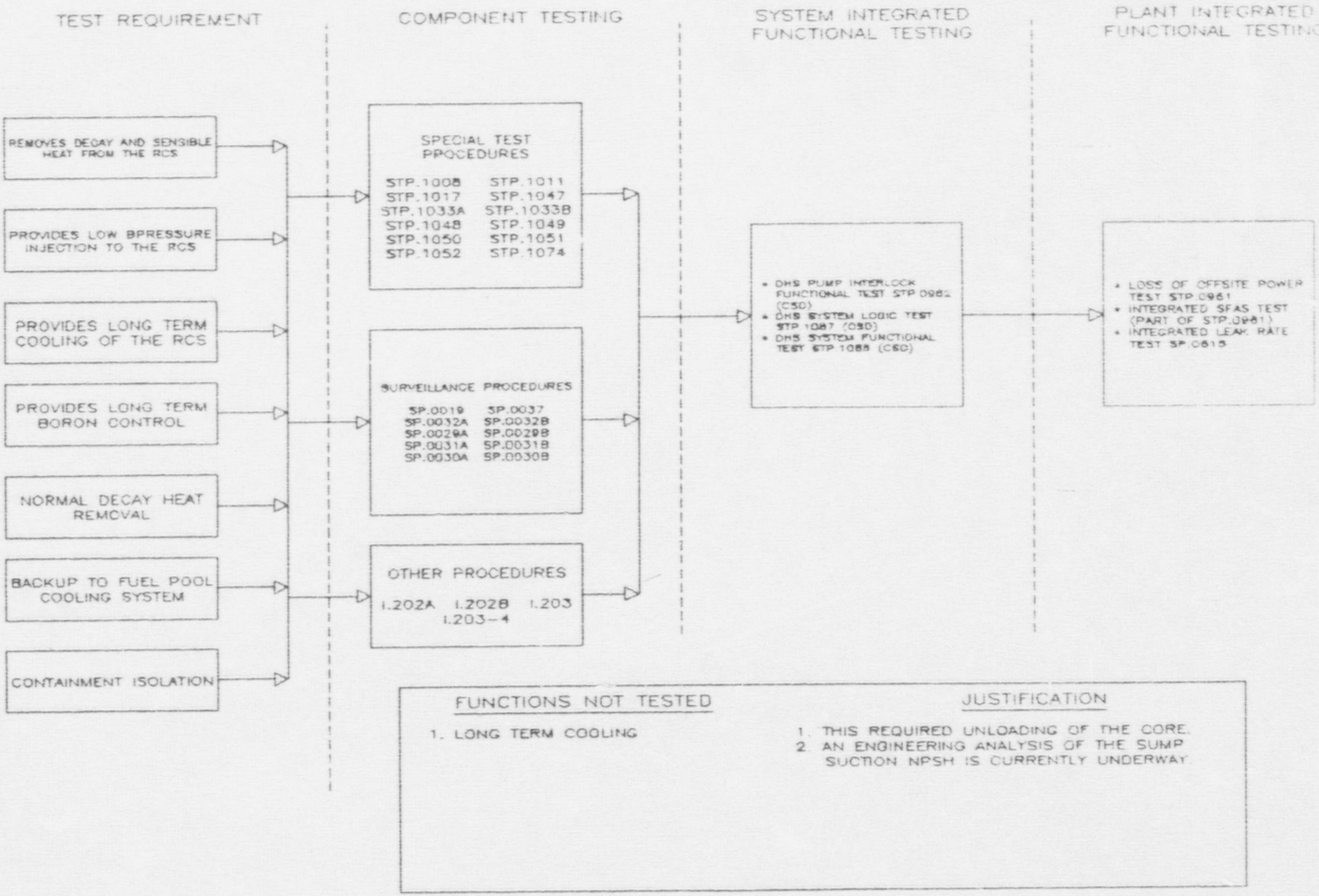
DHS – DECAY HEAT REMOVAL SYSTEM

PLS – PURIFICATION AND LETDOWN SYSTEM

RCS – REACTOR COOLANT SYSTEM

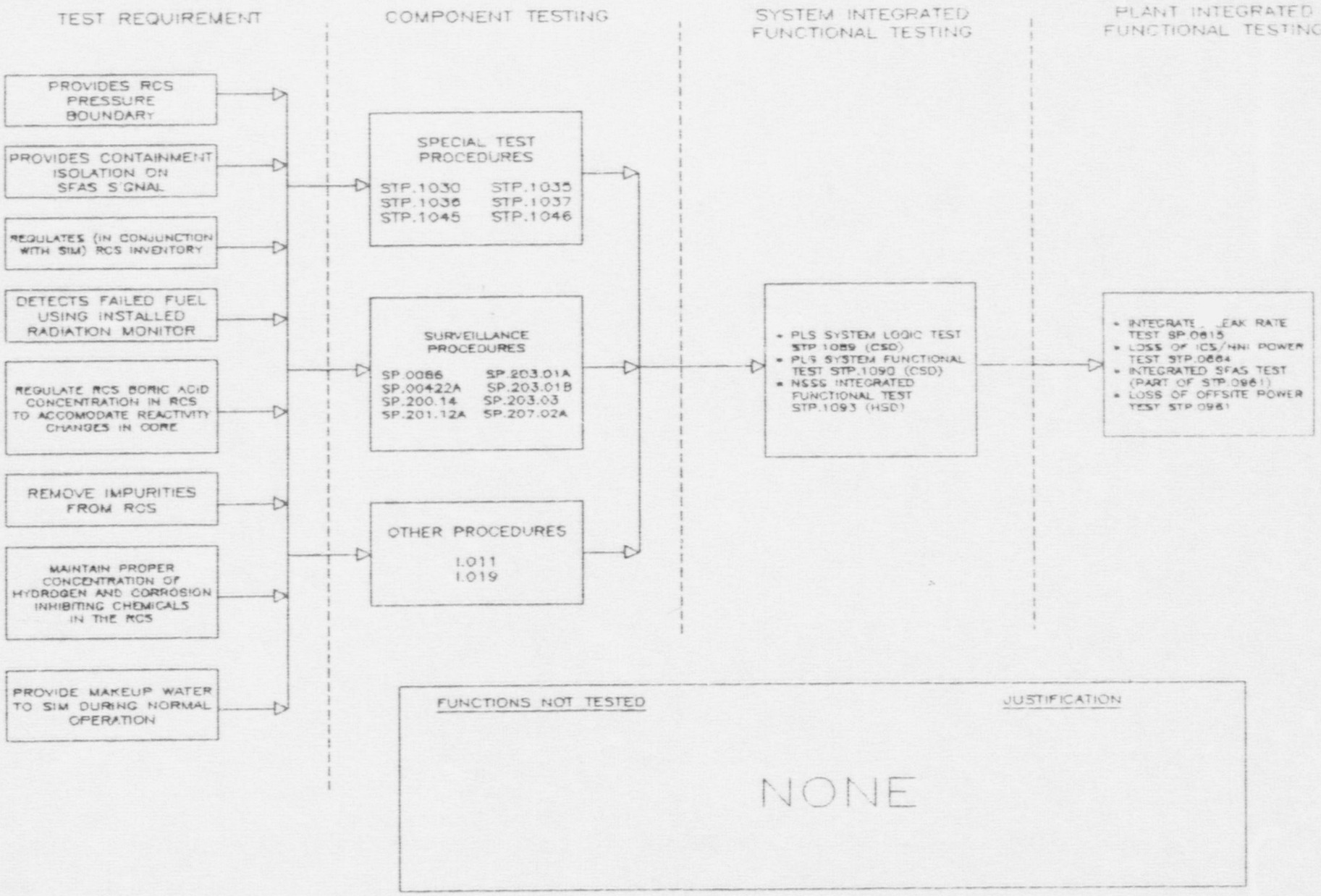
SIM – SEAL INJECTION AND MAKEUP SYSTEM

DHS FUNCTIONAL TEST OVERVIEW



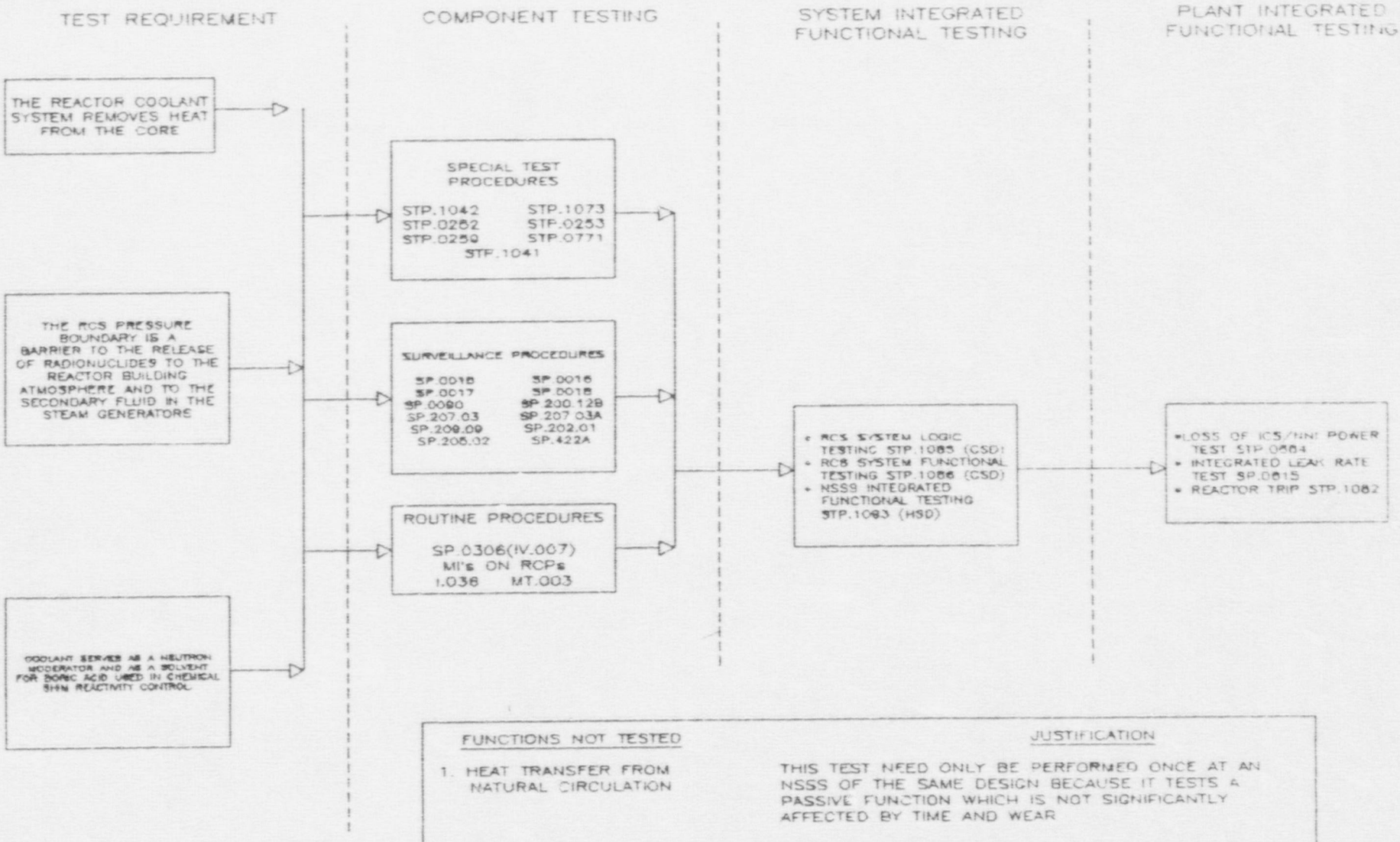
ATTACHMENT 5

PLS FUNCTIONAL TEST OVERVIEW



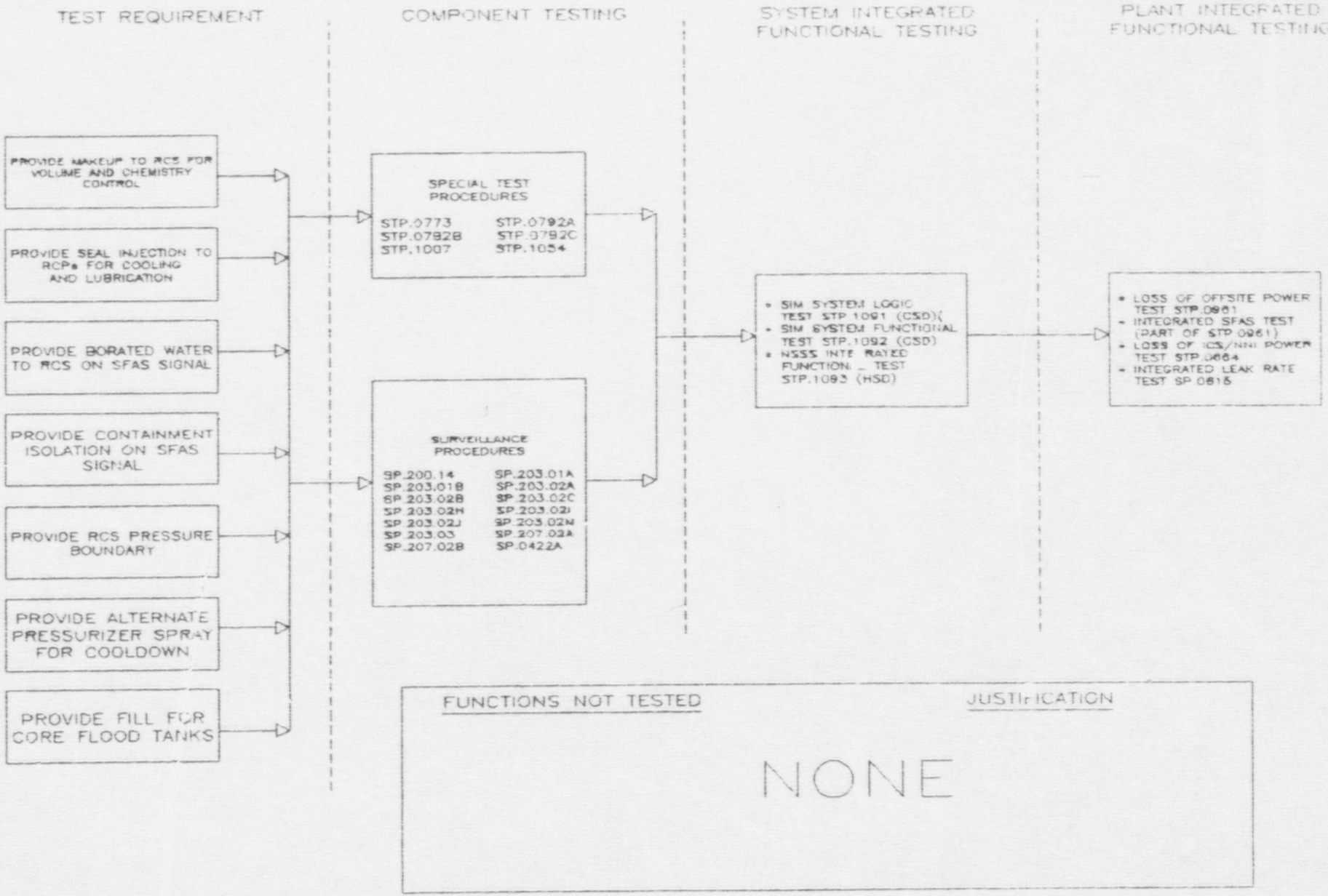
REACTOR PLANT

RCS FUNCTIONAL TEST OVERVIEW



FUNCTIONS NOT TESTED	JUSTIFICATION
1. HEAT TRANSFER FROM NATURAL CIRCULATION	THIS TEST NEED ONLY BE PERFORMED ONCE AT AN NSSS OF THE SAME DESIGN BECAUSE IT TESTS A PASSIVE FUNCTION WHICH IS NOT SIGNIFICANTLY AFFECTED BY TIME AND WEAR
2. REACTOR VENT VALVES	THE REACTOR VESSEL HEAD MUST BE REMOVED FOR THIS TESTING. THERE IS NO REASON TO SUSPECT THAT THE VALVES HAVE DETERIORATED SUCH THAT THEIR FUNCTIONAL ABILITY IS IN QUESTION. (EXEMPTION RECEIVED FROM NRC)

SIM FUNCTIONAL TEST OVERVIEW



09-01-87
WP3479B
D-0060B

SYSTEM FUNCTIONAL TESTING ABSTRACT
DECAY HEAT REMOVAL SYSTEM

A. SYSTEM FUNCTIONS

The Decay Heat Removal System (DHS) provides the following safety and non-safety functions:

1. Low Pressure Injection (ECCS) to the Reactor Coolant System
2. Long Term Cooling of the Reactor Coolant System
3. Long Term Boron Control
4. Normal Decay Heat Removal
5. Backup to Fuel Pool Cooling
6. Containment Isolation

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. The Decay Heat System directly interfaces with the following systems:
   a. Safety Features Actuation System (SFAS)
   b. Emergency Diesel Generator System
   c. Borated Water System

C. FUNCTIONS REQUIRING VERIFICATION

1. All functions listed in "A."

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. Long Term Cooling of the RCS will not be tested since an adequate test of this function requires discharge into an unloaded, uncapped reactor vessel. An engineering analysis of the Reactor Building Sump Suction NPSH is being performed.

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1087, "Decay Heat System Logic Functional Test," will verify the operation of the controls, interlocks and indications for the system functions.

2. STP.1088, "DHS Cold Functional Test," will verify the performance of the Decay Heat System functions prior to heatup.

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D-0003B

SYSTEM FUNCTIONAL TEST ABSTRACT
PURIFICATION AND LETDOWN SYSTEM

A. SYSTEM FUNCTIONS

1. The functions of the Purification and Letdown System (PLS) that are important to safety are as follows.

   a. Provide RCS pressure boundary.

   b. Provide containment isolation on SFAS signal.

   c. Regulate (in conjunction with SIM) RCS inventory.

   d. Regulate boric acid concentration in RCS to accommodate reactivity changes in core.

   e. Detect failed fuel using installed Radiation Monitor.

   f. Remove impurities from RCS.

   g. Maintain proper concentration of hydrogen and corrosion inhibiting chemicals in the RCS.

   h. Provide makeup water to SIM during normal operation.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. Detection of failed fuel using the installed Radiation Monitor will be performed by RDM.

2. Regulation of RCS inventory is covered by testing in RCS, SIM and PLS.

3. Containment isolation provided by SFAS actuation is covered in SFS.

C. FUNCTIONS REQUIRING VERIFICATION

1. Provide RCS pressure boundary.

2. Provide containment isolation on SFAS signal.

3. Remove impurities from the RCS.

FUNCTIONS REQUIRING VERIFICATION (Continued)

4. Regulate boric acid concentration in the RCS to accommodate reactivity changes in the core.

5. Maintain proper concentration of hydrogen and corrosion inhibitive chemicals in the RCS.

6. Provide makeup water to SIM during normal operation.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None.

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1089, "PLS Logic Functional Test," will test system logic, controls and interlocks for the functions listed in Section C.

2. STP.1090, "PLS Cold Functional Test," will test the overall performance of the system.

3. STP.1093, "NSSS Integrated Functional Test," which will verify integrated operation of the PLS, SIM and RCS.

SYSTEM FUNCTIONAL TESTING ABSTRACT
REACTOR COOLANT SYSTEM

A. SYSTEM FUNCTIONS

1. The Reactor Coolant System removes heat from the core. The following subfunctions require verification:

   a. The Reactor Coolant System circulates reactor coolant for heat removal during steady state operation and for any anticipated transient.

   b. The RCS shall remove decay heat from the core via redundant heat removal paths.

   c. Provide a reflocdable volume to cool the reactor core following a LOCA.

2. The RCS pressure boundary is a barrier to the release of radionuclides to the Reactor Building atmosphere and to the secondary fluid in the steam generators. The following subfunctions require verification:

   a. Provide overpressure protection for the pressure boundary at normal operating conditions and at low temperatures (Reactor Vessel Brittle Fracture Limits).

   b. Leakage rate limits and detection.

   c. Coolant activity level limits.

   d. Containment isolation.

3. Reactor Coolant serves as a neutron moderator and as a solvent for acid used in chemical shim reactivity control.

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. Reactor Coolant System inventory control will be verified in SIM, PLS, DHS and CFS Testing.

2. Decay Heat Removal via redundant heat removal paths will be verified in DHS testing.

C. FUNCTIONS REQUIRING VERIFICATION

1. The Reactor Coolant System removes heat from the core.

2. The RCS pressure boundary is a barrier to the release of radionuclides to the reactor building atmosphere and to the secondary fluid in the steam generators.

3. Coolant serves as a neutron moderator and as a solvent for boric acid used in chemical shim reactivity control.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. BASIS FOR FUNCTIONS NOT VERIFIED

a. Heat transfer from natural circulation. (Function A.1.a)

Basis: Heat transfer from natural circulation is a function of steam generator thermal center. This test has not been tested specifically at SMUD, however, it needs to be performed only once at an NSS of the same design because it tests a passive function which is not significantly affected by time and wear. The subfunctions that are required for proper natural circulation are Emergency Pressurizer Heater, Operable Vent Paths (High Point), and Hot Leg Level Indication. These subfunctions will be discussed in their proper sections.

b. Reactor vessel internal vent valves. (Function A.1.c)

Basis: SP.203.10, "Refueling Interval Reactor Internal Vent Valves Surveillance and Inspection Test," exercises the internal vent valves every refueling by applying a force of 400 lbs vertically upward on an exercise lug. This demonstrates the vent valves will be open when exposed to the pressure differential expected during a cold leg break. The reactor vessel head must be removed for testing. There is no reason to suspect that the valves have deteriorated such that their functionality is in question. Relief from the test requirement has been requested since the head will not be removed this outage. Proposed Amendment 145 would waive head removal until May 1989. A favorable response has been verbally indicated from the NRC.

2. Individual system functions are verified during component testing.

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1085, "Reactor Coolant System Logic Functional Test", will test RCS controls, interlocks and indications prior to plant heatup.

2. STP.1086, "Reactor Coolant System Cold Functional Test", will verify overall RCS performance prior to plant heatup.

3. STP.1093, "NSSS Integrated Functional Testing," will verify integrated operation of the RCS, SIM and PLS systems.

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D-0054B

SYSTEM FUNCTIONAL TESTING ABSTRACT
SEAL INJECTION AND MAKEUP SYSTEM

A. SYSTEM FUNCTIONS

1. Provide makeup to RCS for volume and chemistry control.
2. Provide seal injection to RCPs for cooling and lubrication.
3. Provide injection of borated water to RCS for emergency core cooling on SFAS signal.
4. Provide containment isolation on SFAS signal.
5. Provide RCS pressure boundary.
6. Provide alternate pressurizer spray for cooldown and mitigation of boron precipitation.
7. Provide fill for Core Flood Tanks.

B. FUNCTIONS COVERED BY OTHER SYSTEM

1. STP.773, RCP Seal Injection and Seal Return Isolation Valves Interlock Functional Test, part of function 2 and is covered by PLS.
2. SP.203.01A/B, SFAS Digital Channel 1A/B Refueling Test, is part of functions 3 and 4, covered by SFS.

C. FUNCTIONS REQUIRING VERIFICATION

1. All functions listed in section A will be verified prior to Startup.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

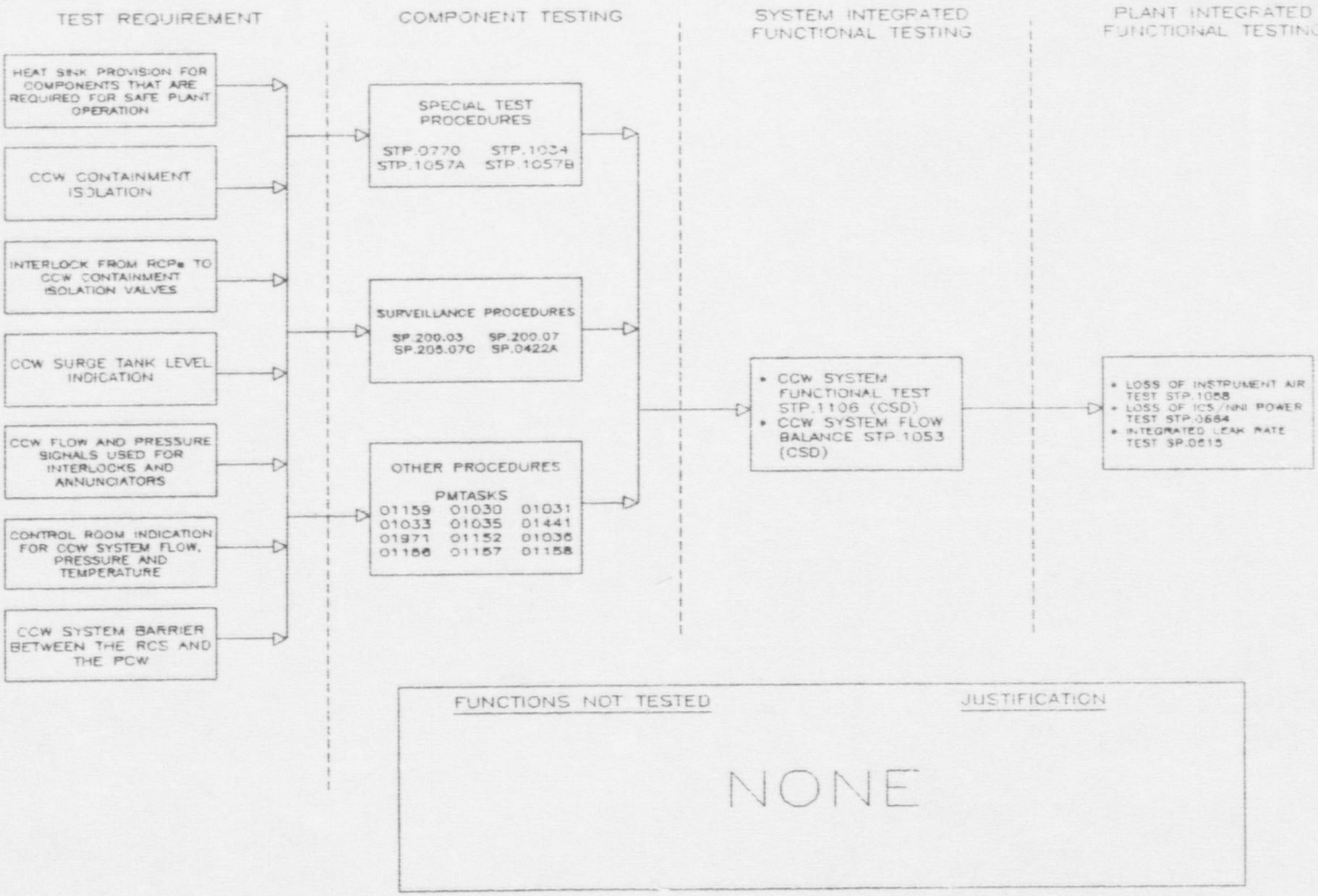
1. STP.1091, "SIM Logic Functional Test," will test controls, interlocks and indications for system functions.
2. STP.1092, "SIM Cold Functional Test," will test overall system performance.
3. STP.1093, "NSSS Integrated Functional Test," which will test integrated operation of the SIM, PLS and RCS systems.

AUXILIARY SYSTEMS

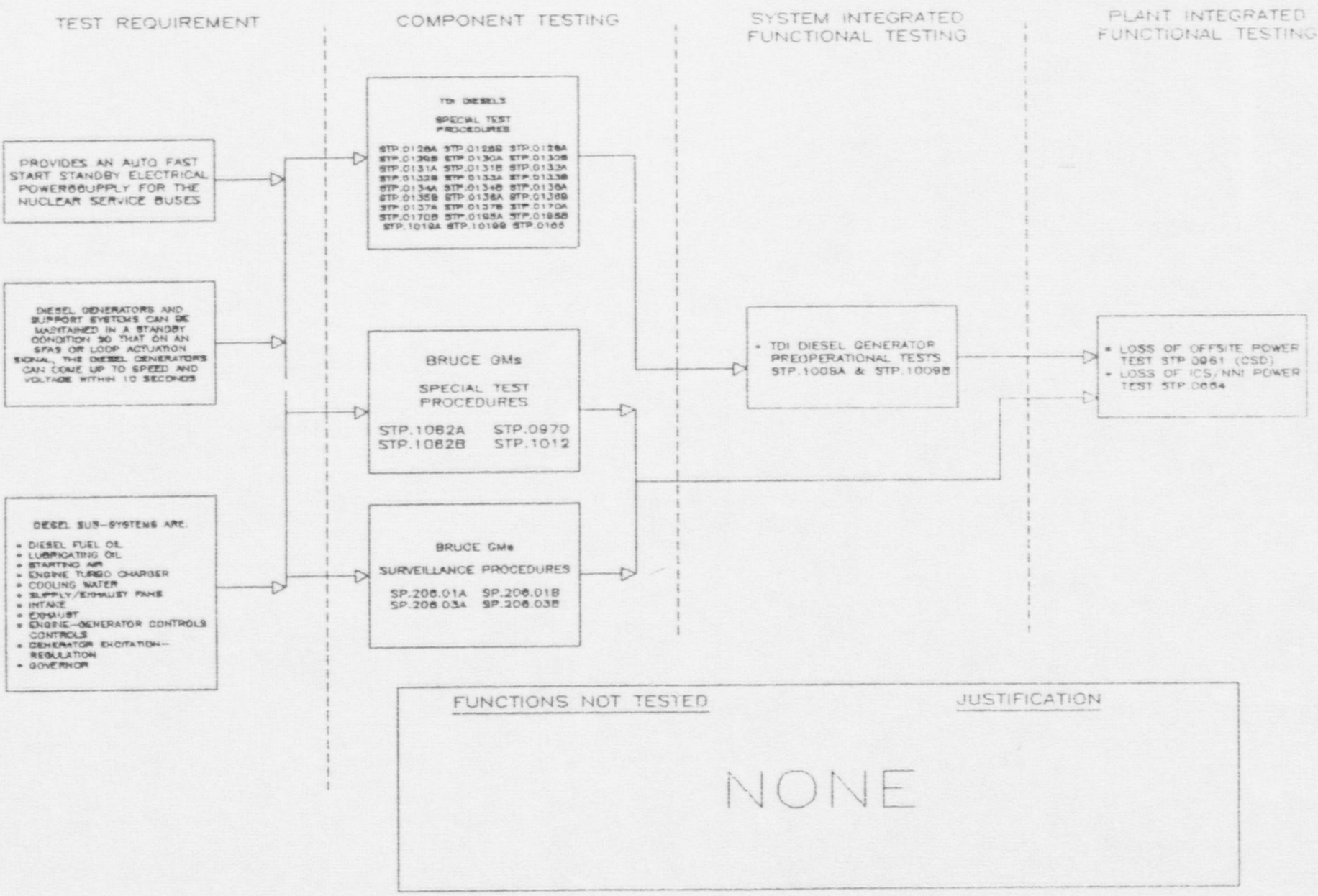
SECTION 5

CCW	–	COMPONENT COOLING WATER/TURBINE PLANT COOLING WATER SYSTEMS
EGS	–	EMERGENCY DIESEL GENERATOR SYSTEM
FPS	–	FIRE PROTECTION SYSTEM
IAS	–	INSTRUMENT/SERVICE AIR SYSTEMS
NRW	–	NUCLEAR SERVICE RAW W4TER SYSTEM
NSW	–	NUCLEAR SERVICE COOLING WATER SYSTEM
RSS	–	REACTOR SAMPLING SYSTEM

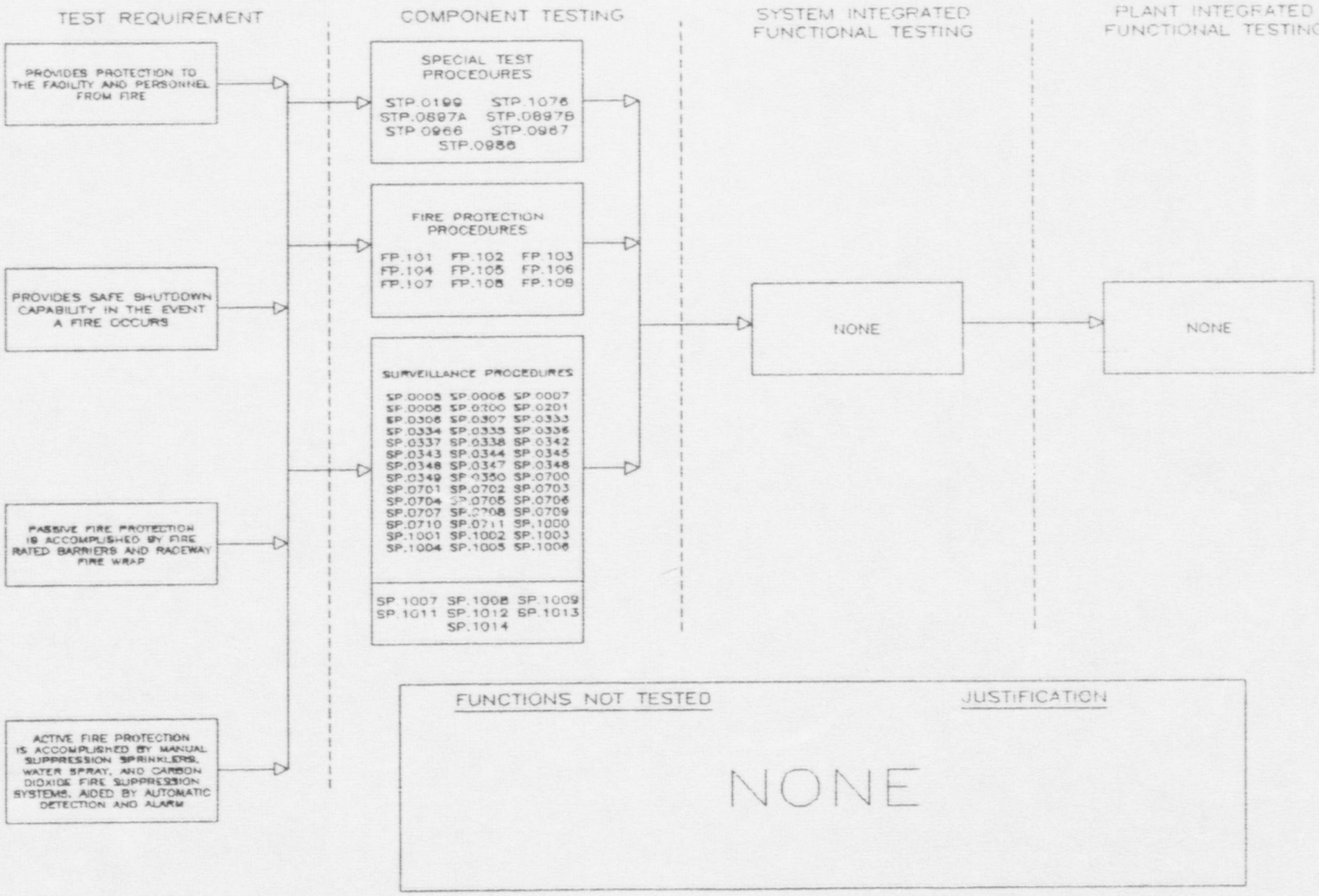
CCW FUNCTIONAL TEST OVERVIEW



EGS FUNCTIONAL TEST OVERVIEW

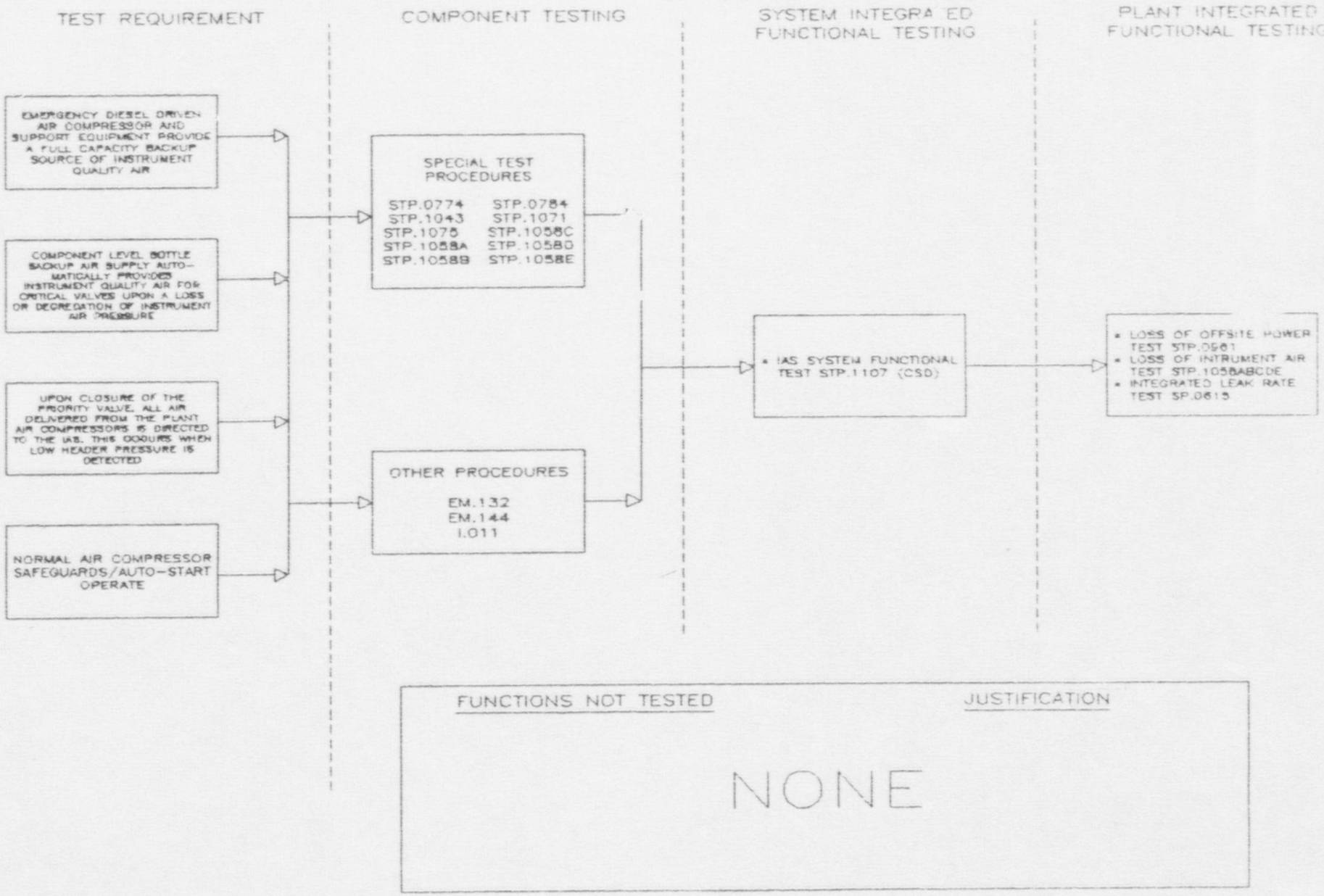


FPS FUNCTIONAL TEST OVERVIEW

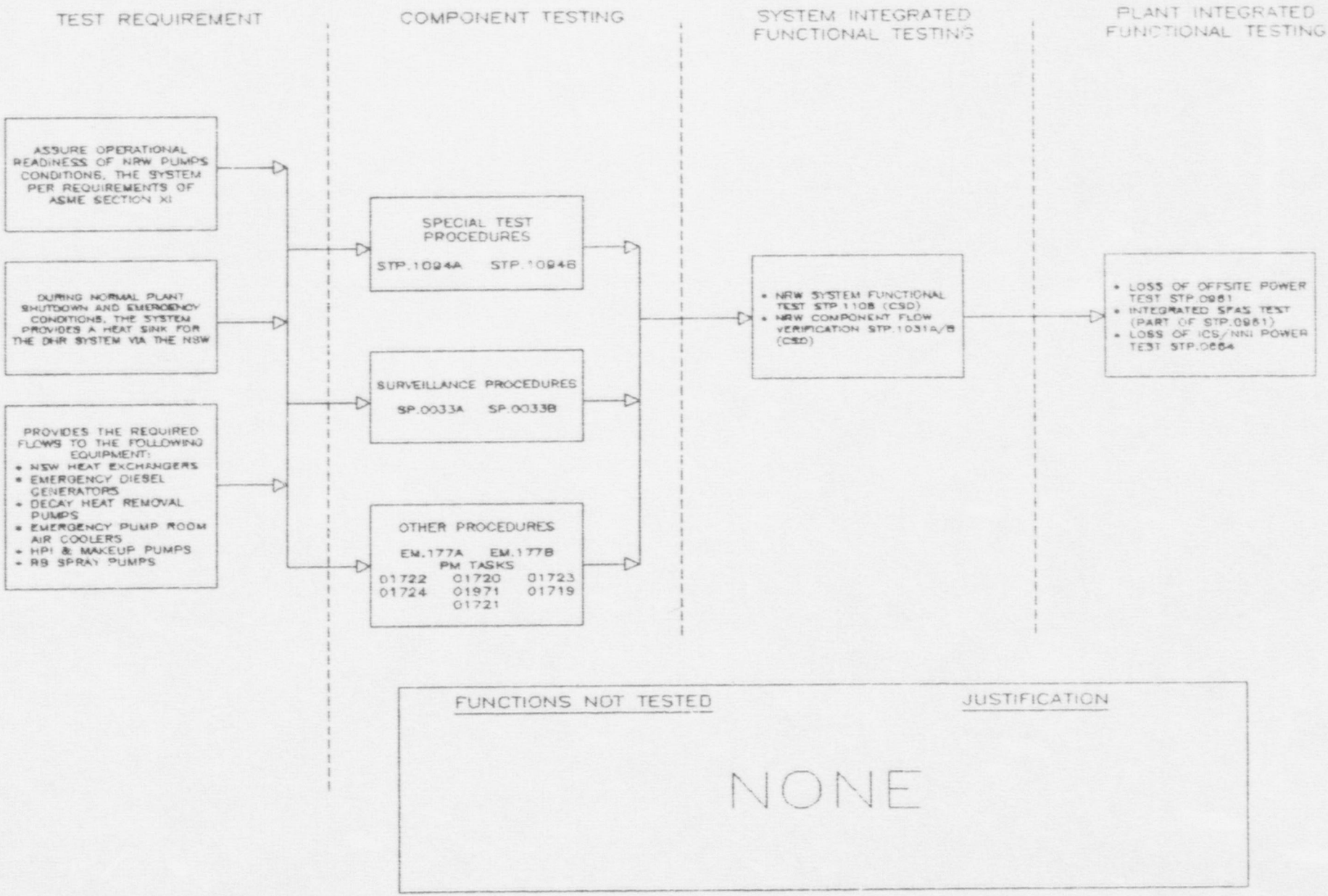


AUXILIARY

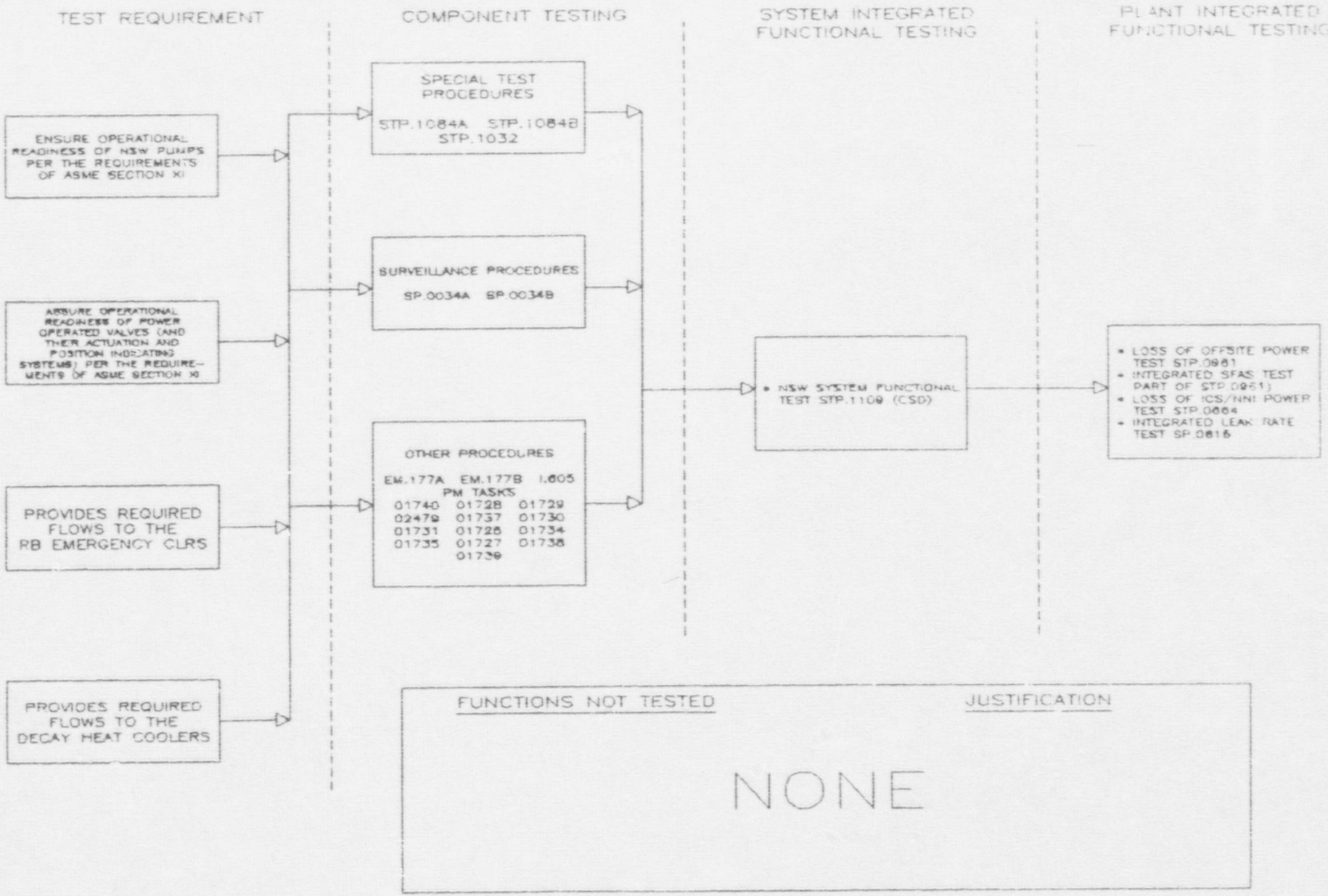
IAS FUNCTIONAL TEST OVERVIEW



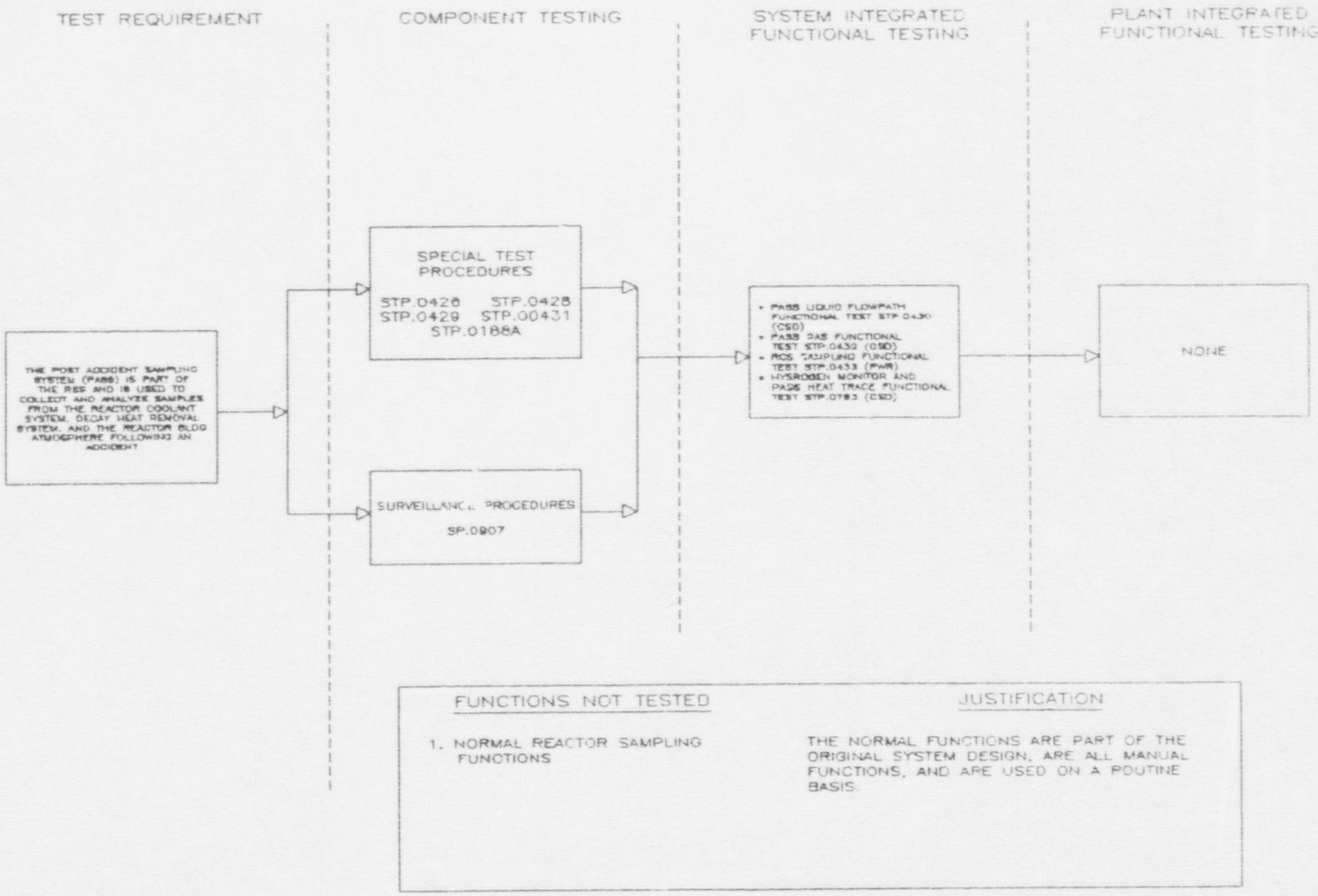
NRW FUNCTIONAL TEST OVERVIEW



NSW FUNCTIONAL TEST OVERVIEW



RSS FUNCTIONAL TEST OVERVIEW



FUNCTIONS NOT TESTED	JUSTIFICATION
1. NORMAL REACTOR SAMPLING FUNCTIONS	THE NORMAL FUNCTIONS ARE PART OF THE ORIGINAL SYSTEM DESIGN, ARE ALL MANUAL FUNCTIONS, AND ARE USED ON A ROUTINE BASIS.

SYSTEM FUNCTIONAL TESTING ABSTRACT
COMPONENT COOLING WATER SYSTEM

A. SYSTEM FUNCTIONS

1. Heat sink provision for components that are required for safe plant operation.

2. CCW containment isolation.

3. Interlock from RCP's to CCW containment isolation valves.

4. CCW surge tank level indication.

5. CCW flow and pressure signals used for interlocks and annunciators.

6. Control Room indication for CCW system flow, pressure and temperature.

7. CCW system barrier between the RCS and the PCW.

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. CCW Containment Isolation Valves are included in SP.422A, and will undergo the LLRT with the PBS System (function 2).

2. SP.205.07C includes all remotely operated Reactor Building Isolation Valves, and will be inspected and stroked with the PBS System, (function 2).

3. Leakage into the CCW System from the RCS System will be detected by performing SP.200.03 and 200.07, covered in the RDM system (function 7).

C. FUNCTIONS REQUIRING VERIFICATION

1. Verify that a heat sink is provided for components which are required to function continuously during plant operation.

2. CCW Containment isolation valves shall be operable (SFV-46014, SFV-46203 and SFV-46204).

3. Valve interlock from RCP to CCW containment isolation.

C. FUNCTIONS REQUIRING VERIFICATION (Continued)

4. Accurate surge tank level indication, automatic makeup control.

5. CCW flow and pressure signals used for interlocks and annunciators operate.

6. Control Room indication for CCW System flow, pressure and temperature must be operable.

7. The CCW System is a barrier between the potentially radioactive Reactor Coolant System (RCS) and the Plant Cooling Water System (PCW).

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. Individual System functions (C.1-7) will be tested during component testing.

E. SUMMARY OF SYSTEM FUNCTIONAL TESTS TO BE PERFORMED

1. STP.1106, "CCW System Cold Functional Test," will verify system interlocks, controls and performance prior to plant heatup.

2. STP.1053, "Component Cooling Water Component Flow Verification," will verify that flow rates to all CCW components are adequate.

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D-0174B

SYSTEM FUNCTIONAL TESTING ABSTRACT
EMERGENCY DIESEL GENERATOR SYSTEM

A. SYSTEM FUNCTION

1. The Emergency Diesel Generator system provides an auto fast start standby electrical power supply for the Nuclear Service Buses. The emergency diesel generators and support systems can be maintained in a standby condition such that on a Safety Features Actuation Signal (SFAS) or Loss of Offsite Power (LOOP) initiation signal, the diesel generator can come up to speed and voltage within 10 seconds.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

The Emergency Diesel Generator System directly interfaces with the following systems.

1. Nuclear Service Raw Water System
2. Fire Protection System
3. Instrument Air System
4. Diesel fuel oil system
5. Safety Features Actuation System
6. Plant Annunciator System
7. Plant Computer System
8. 125 VDC (battery) system
9. 480 VAC Nuclear Service system
10. 4160 VAC Nuclear Service system
11. 220 KV system

C. FUNCTIONS REQUIRING VERIFICATION

1. SFAS initiation causes the diesels to automatically start and accelerate to speed and voltage.

2. Nuclear Service buses remain energized with offsite power on a SFAS initiation and SFAS automatic load sequencing circuitry operates properly.

3. On a Loss of Offsite Power in conjunction with a simulated SFAS initiation, the Nuclear Service busses are de-energized by proper operation of the load shedding circuitry and the diesel generators load through the sequencing circuitry.

4. All automatic diesel generator output breaker trips, except ground overcurrent and generator differential, are automatically blocked with an SFAS initiation signal.

5. On a LOOP and SFAS, Diesel Room CO_2 actuation, fuel oil transfer pump and ventilation fan trip automatic blocking relays are energized.

6. Diesel Generator system, support and interfacing system controls and instrumentation function properly.

D. FUNCTIONS NOT REQUIRING VERIFICATION

None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.961 "Loss of Offsite Power," (LOOP) will verify required functions of the Emergency Diesel Generator Systems for both the Bruce GM and TDI units.

2. STP.1009A and B, "TDI Diesel Generator Preoperational Test," will test the logic, controls, interlocks, starting reliability and operation of the TDI Diesel Generators.

SYSTEM FUNCTIONAL TESTING ABSTRACT
FIRE PROTECTION SYSTEM

A. SYSTEM FUNCTIONS

The Fire Protection System includes active, passive and administrative features to reduce the likelihood of fire occurrence; prompt detection and extinguishment of fires if they do occur; ability to maintain safe shut down if a fire occurs; and prevent the release of a significant amount of radioactive material if a fire occurs.

The Active Fire Protection System features are as follows:

1. Automatic water suppression systems supplied by (2) 100% fire pumps and an underground main header.

2. Manual suppression provided by fire extinguishers and fire hose standpipes for use by the plant Fire Brigade.

3. Automatic gas suppression systems consisting of low pressure CO_2 and Halon 1301 total flooding systems.

4. Automatic fire detection is provided by heat detectors, smoke detectors, flame detectors and duct smoke detectors.

5. The station Automatic Fire Alarm system provides the required interfaces between detection systems and suppression system actuation and annunciation to the Main Control Room. System supervision is also provided by the Alarm system.

The Passive Fire Protection System features are as follows:

1. Rated fire doors in fire barrier walls between redundant safety related cables and equipment.

2. Rated fire dampers in fire barrier walls between redundant safety related cables and equipment.

3. Rated penetration seals in fire barrier walls between redundant safety related cables and equipment.

4. 1 hour and 3 hour rated fire wrap protecting redundant safety related cable trays and conduits.

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

None

C. FUNCTIONS REQUIRING VERIFICATION

1. The Active Fire Protection System features described in Section A (above) are verified on a system or component basis by functional operation of the equipment per approved Surveillance Procedures and Fire Protection Inspection Procedures. Past Modification testing will utilize existing approved procedures where practicable, or special test procedures as necessary.

2. The Passive Fire Protection System features described in Section A (above) are verified acceptable by visual inspection and/or functional test as applicable per approved Surveillance Procedures.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. Fire Protection system features are all subject to periodic testing. In addition, modifications affecting fire protection of a certain zone have been tested on a zone basis. No overall system functional test is planned, due to the nature of the system configuration (zones and individual components).

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. The Fire Protection System is verified and/or tested per approved procedures as required by Technical Specifications.

SYSTEM FUNCTIONAL TESTING ABSTRACT
INSTRUMENT AIR SYSTEM

A. SYSTEM FUNCTIONS

1. Emergency Diesel Driven Air Compressor (DDAC) and support equipment provide a full capacity backup source of instrument quality air.

2. Component Level Bottle Backup Air Supply automatically provides instrument quality air for critical valves upon a loss or degradation of instrument air pressure.

3. Upon closure of the priority valve (PV-90508), all air delivered from the plant air compressors is directed to the IAS. This occurs when low header pressure is detected.

4. Normal Air Compressor Safeguards/Auto-Start operate.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. None

C. FUNCTIONS REQUIRING VERIFICATION

1. Emergency Diesel Driven Air Compressor

2. Component Level Bottle Backup Air Supply to Critical Valves

3. IAS to SAS Priority Valve Operation

4. Normal Air Compressor Auto-Start

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. Individual component functions are verified during component testing.

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1107, "IAS Functional Test," will verify overall operation system functions prior to and during plant heatup.

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SYSTEM FUNCTIONAL TEST ABSTRACT
NUCLEAR SERVICE RAW WATER SYSTEM

A. SYSTEM FUNCTIONS

1. During normal plant shutdown and emergency conditions, the NRW system provides a heat sink for the DHR System, via the NSW system. This is accomplished by supplying 15000 gpm of NRW to the tube side of the NSW Heat Exchanger. The system also provides the required flows to the following components:

   a. NSW Heat Exchangers.

   b. Emergency Diesel Generators.

   c. HPI and MU Pumps.

   d. Decay Heat Removal Pumps.

   e. Emergency Pump Room Air Coolers.

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. None

C. FUNCTIONS REQUIRING VERIFICATION

1. The following specific functions performed by the NRW system during both normal shutdown and emergency conditions, require verification for safe plant operation.

   a. Required flowrates are provided by the NRW system, loops A and B to the components cooled by this system.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1031 A/B, "Nuclear Service Raw Water (NRW) Component Flow Verification," verifies required flow to each component served by the NRW system.

2. STP.1108, "NRW Cold Functional Test," verifies overall system performance prior to heatup.

SYSTEM FUNCTIONAL TEST ABSTRACT
NUCLEAR SERVICE COOLING WATER

A. SYSTEM FUNCTION

1. Provide required flows to components of the NSW System including:

   a. NSW Pumps,

   b. RB Emergency Coolers,

   c. Decay Heat Coolers.

2. Start on SFAS initiation signal.

3. Contain primary coolant in the event of leakage into the NSW.

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. Actuation of all SFAS devices on SFAS digital channels 1A and 1B will be verified during SFS testing.

2. Functional test of unloading and loading of Nuclear Service Bus A, A2, B and Diesel Generators A & B start for SFAS conditions and loss of voltage conditions will be performed during EGS Surveillance Testing.

C. FUNCTIONS REQUIRING VERIFICATION

1. Provide required flows to components of the NSW system.

2. System integrity is verified by periodic surveillance and maintenance testing.

D FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1032, "Nuclear Service Cooling Water (NSW) Component Flow Verification," will verify required flows to components of the NSW System.

2. STP.1109, "NSW Cold Functional Test," will verify system performance prior to plant heatup.

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D-0054B

SYSTEM FUNCTIONAL TESTING ABSTRACT
REACTOR SAMPLING SYSTEM

A. SYSTEM FUNCTION

1. The normal RSS is used to collect fluid samples from the Reactor Coolant System and auxiliary systems for analysis under normal and abnormal conditions. The normal RSS collects fluid samples from the following locations:

   a. Core Flood Tanks

   b. Pressurizer

   c. Purification demineralizer outlet

   d. Letdown cooler outlet

   e. Makeup tank

   f. Decay heat removal cooler outlet

   g. Miscellaneous water hold-up tank

   h. Letdown filter outlet

   i. Makeup filter outlet

2. The Post Accident Sampling System (PASS), a subsystem of the RSS, is used to collect and analyze samples from the reactor coolant system, decay heat removal system, and the Reactor Building atmosphere following an accident.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. The Reactor Sampling System directly interfaces with the following systems:

   a. Reactor Coolant System

   b. Pressurizer Relief Tank

   c. Waste Gas System

   d. Purification and Letdown System

B. FUNCTIONS COVERED BY OTHER SYSTEMS (Continued)

e. Decay Heat Removal System

f. Core Flood System

g. Heating and Ventilation System

h. Plant Air System

i. Component Cooling Water System

j. Demineralized Water System

k. Reactor Coolant Drain System

l. 480 VAC Vital Electrical Distribution System

C. FUNCTIONS REQUIRING VERIFICATION

1. Post Accident Sampling System

a. Collection and analysis of a Reactor Building atmosphere sample.

b. Collection and analysis of a Reactor Coolant System sample.

c. Collection and analysis of a Decay Heat Removal System sample.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. Normal Reactor Sampling System functions

a. The normal functions are part of the original system design, are all manual functions, and are used on a routine basis.

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.430, "Post Accident Sampling System (PASS) Decay Heat System Sample Functional Test"

2. STP.432, "Post Accident Sampling System Gaseous Functional Test"

3. STP.433, "Post Accident Sampling System RCS Sample Functional Test"

4. STP.793, "Hydrogen Monitoring and Post-Accident Sampling System Heat Tracing Functional Test"

HVAC SYSTEMS

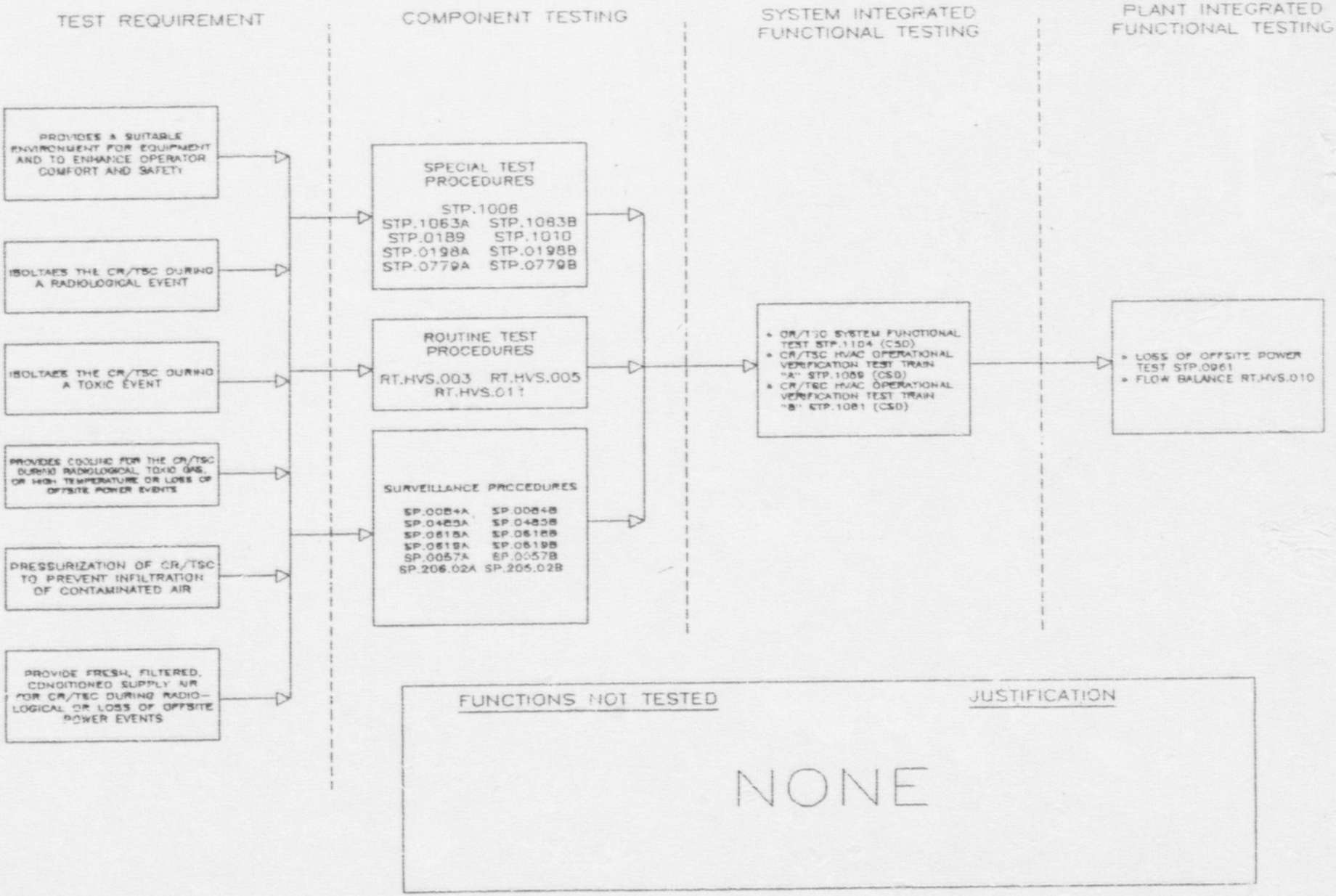
SECTION 6

CR/TSC – CONTROL ROOM/TECHNICAL SUPPORT CENTER HVAC SYSTEMS

NSEB – NUCLEAR SERVICE ELECTRICAL BUILDING ESSENTIAL HVAC SYSTEM

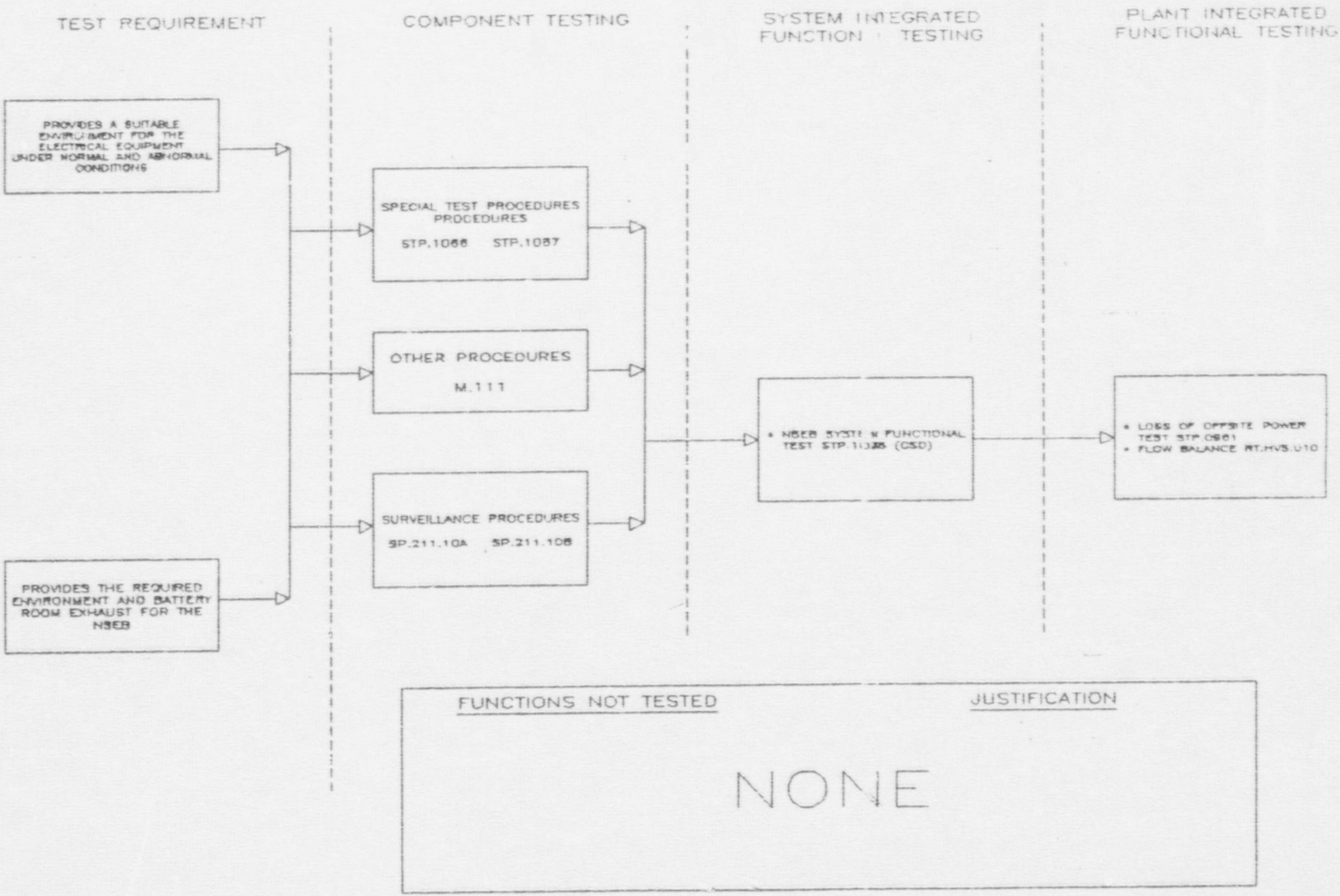
RHVS – REACTOR BUILDING ATMOSPHERIC SYSTEM

CR/TSC FUNCTIONAL TEST OVERVIEW

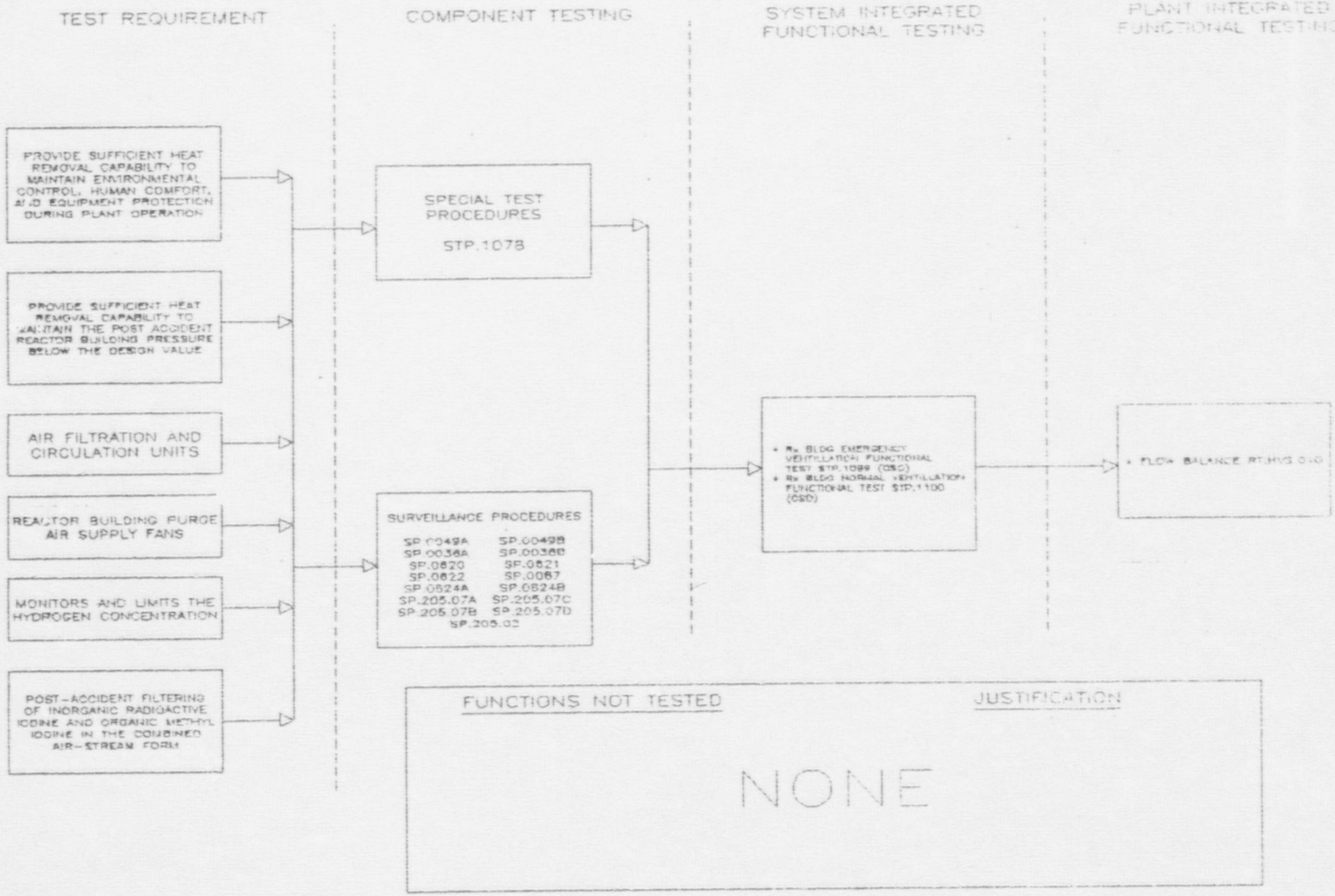


HVAC

NSEB FUNCTIONAL TEST OVERVIEW



RHVS FUNCTIONAL TEST OVERVIEW



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WP3478B
D-0003B

SYSTEM FUNCTIONAL TESTING ABSTRACT
CONTROL ROOM/TECHNICAL SUPPORT CENTER

A. SYSTEM FUNCTIONS

1. The Control Room/Technical Support Center (CR/TSC) essential air conditioning system is designed to provide a suitable environment for equipment and to enhance station operator comfort and safety. The CR/TSC essential air conditioning system is comprised of two 100% capacity redundant trains, with the following functions:

   a. Isolate the CR/TSC during a radiological event.

   b. Isolate the CR/TSC during a toxic event.

   c. Provide cooling for the CR/TSC during radiological, toxic gas, CR high temperature or loss of offsite power events.

   d. Pressurization of CR/TSC to prevent infiltration of contaminated air.

   e. Provide fresh, filtered, conditioned supply air for CR/TSC during radiological or loss of offsite power events.

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. SFAS start of the units on loss of offsite power.

C. FUNCTIONS REQUIRING VERIFICATION

1. Control Room/Technical Support Center isolation during a radiological event.

2. Control Room/Technical Support Center isolation during a toxic event.

3. Cooling for the CR/TSC during radiological, toxic gas, CR high temperature or loss of offsite power events.

4. Pressurizing of CR/TSC to prevent infiltration of contaminated air during radiological events by pressurizing Control Room relative to outside atmosphere.

5. Provide fresh, filtered, conditioned supply air for CR/TSC during radiological and loss of power events by maintaining a flow of 3200 CFM through the essential filtration units.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. Individual component functions are tested during component testing.

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1059, "CR/TSC Refrigeration Operational Verification (Train A)" and STP.1061, "CR/TSC Refrigeration Operational Verification (Train B)", verify provision of ventilation and cooling for radiological, toxic gas, Control Room High Temperature or Loss of Offsite Power conditions.

2. STP.1104, "CR/TSC HVAC Composite Functional Test", verifies system functional performance, interlocks, controls and abnormal operations.

3. STP.961A/B, "Loss of Offsite Power", will also test the units in an emergency operation mode.

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SYSTEM FUNCTIONAL TESTING ABSTRACT
NUCLEAR SERVICE ELECTRICAL BUILDING HVAC

A. SYSTEM FUNCTIONS

The Nuclear Service Electrical Building (NSEB) Heating, Ventilating and Air Conditioning (HVAC) Systems, both normal and essential, are designed to:

1. Provide a suitable environment for the electrical equipment and operators during normal and abnormal conditions.

2. Provide required environment and battery room exhaust for the NSEB.

B. FUNCTIONS VERIFIED BY OTHER SYSTEMS

1. Instrument Air

2. 480 VAC

3. Interim Data Acquisition And Display (IDADS)

C. FUNCTIONS REQUIRING VERIFICATION

1. Heating, ventilating and air conditioning in NSEB.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. None

E. SUMMARY OF SYSTEM FUNCTIONAL TESTS TO BE PERFORMED

1. STP.1066 and STP.1067, "Operational Verification of the Refrigeration System for the Nuclear Service Electrical Building (NSEB) Essential HVAC System, Train A & B," to functionally verify operability of the refrigeration system when energizing Train A or B of the NSEB Essential HVAC System.

2. STP.1096, "Functional Test of the Nuclear Services Electrical Building HVAC System," to verify overall system performance in both normal and off-normal operating modes.

SYSTEM FUNCTIONAL TESTING ABSTRACT
REACTOR BUILDING VENTILATION SYSTEM

A. SYSTEM FUNCTIONS

1. Provide sufficient heat removal capability to maintain environmental control, human comfort and equipment protection during plant operation.

2. Provide sufficient heat removal capability to maintain the post-accident reactor building pressure below the design value.

3. Air filtration and circulation.

4. Reactor building purge.

5. Monitor and limit the hydrogen concentration.

6. Provide post accident filtering of inorganic radioactive iodine and organic methyl iodine in the combined air-stream form.

B. FUNCTIONS COVERED BY OTHER SYSTEMS

1. SP.422A "Refueling Internal Local Component Leak Rate Testing" (function of the Reactor Building purge valves) is covered by the PBS System.

C. FUNCTIONS REQUIRING VERIFICATION

1. The following functions need verification to assure a safe operating plant.

   a. The emergency cooling system circulates the Reactor Building air and provides for removal of heat released during accident conditions.

   b. The RB ventilation system provides air circulation, filtration and cooling for normal operations.

   c. The hydrogen recombiners maintain hydrogen concentrations below 4.0 percent of the Reactor Building total air volume.

   d. Reactor Building purge system provides outside air circulation while providing control of radioactive particulate and gaseous releases.

D. FUNCTIONS NOT REQUIRING VERIFICATION

1. Filter efficiency is verified by individual component testing (SP.211.03A/B, "RB Emergency Filter System Loop A and B").

2. Purge functions are verified by SP.621, "RB Purge Exhaust Filter System."

E. SUMMARY OF SYSTEM FUNCTIONAL TESTING TO BE PERFORMED

1. STP.1099, "Reactor Building Emergency Ventilation Functional Test":

   a. To demonstrate control logic/interlocks response to varying conditions in both manual and automatic modes.

   b. To verify design flow capacity through the cooling coils of each A500 (A-D) unit.

   c. To verify delta T's across cooling coils.

2. STP.1100, "Reactor Building Normal Ventilation Functional Test":

   a. To demonstrate and verify temperature distribution during normal operation of the plant.