

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.6.1

Primary Containment Isolation Instrumentation

MARKUP OF NUREG-1433, REVISION 1, BASES

B 3.3 INSTRUMENTATION

B 3.3.6.1 Primary Containment Isolation Instrumentation

BASES

BACKGROUND

The primary containment isolation instrumentation automatically initiates closure of appropriate primary containment isolation valves (PCIVs). The function of the PCIVs, in combination with other accident mitigation systems, is to limit fission product release during and following postulated Design Basis Accidents (DBAs). Primary containment isolation within the time limits specified for those isolation valves designed to close automatically ensures that the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for a DBA.

PAI

logic circuits

The isolation instrumentation includes the sensors, relays, and switches that are necessary to cause initiation of primary containment and reactor coolant pressure boundary (RCPB) isolation. Most channels include electronic equipment (e.g., trip units) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel output relay actuates, which then outputs a primary containment isolation signal to the isolation logic. Functional diversity is provided by monitoring a wide range of independent parameters. The input parameters to the isolation logics are

DBI

Insert BK6D-1

(a) reactor vessel water level, (b) area ambient and differential temperatures, (c) main steam line (MSL) flow measurement, (d) Standby Liquid Control (SLC) System initiation, (e) condenser vacuum, (f) main steam line pressure, (g) high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) steam line flow, (h) drywell radiation and pressure, (i) HPCI and RCIC steam line pressure, (j) HPCI and RCIC turbine exhaust diaphragm pressure, (k) reactor water cleanup (RWCU) differential flow, and (l) reactor steam dome pressure. Redundant sensor input signals from each parameter are provided for initiation of isolation. The only exception is SLC System initiation. In addition, manual isolation of the logics is provided.

CLBI

Primary containment isolation instrumentation has inputs to the trip logic of the isolation functions listed below.

(continued)

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(a) reactor vessel water level, (b) main steam line (MSL) pressure, (c) MSL flow, (d) condenser vacuum, (e) main steam tunnel area temperatures, (f) main steam tunnel radiation, (g) drywell pressure, (h) containment radiation, (i) reactor building exhaust radiation, (j) high pressure coolant injection HPCI and reactor core isolation cooling (RCIC) steam line flow, (k) HPCI and RCIC steam line pressure, (l) HPCI and RCIC turbine exhaust diaphragm pressure, (m) HPCI and RCIC area temperatures, (n) reactor water cleanup (RWCU) area temperature, (o) Standby Liquid Control (SLC) System initiation, and (p) reactor pressure.

1A

BASES

BACKGROUND
(continued)

1. Main Steam Line Isolation

Most MSL Isolation Functions receive inputs from four channels. The outputs from these channels are combined in a one-out-of-two taken twice logic to initiate isolation of all main steam isolation valves (MSIVs). The outputs from the same channels are arranged into two two-out-of-two logic trip systems to isolate all MSL drain valves. ~~Each~~ MSL drain line has two isolation valves with one two-out-of-two logic system associated with each valve.

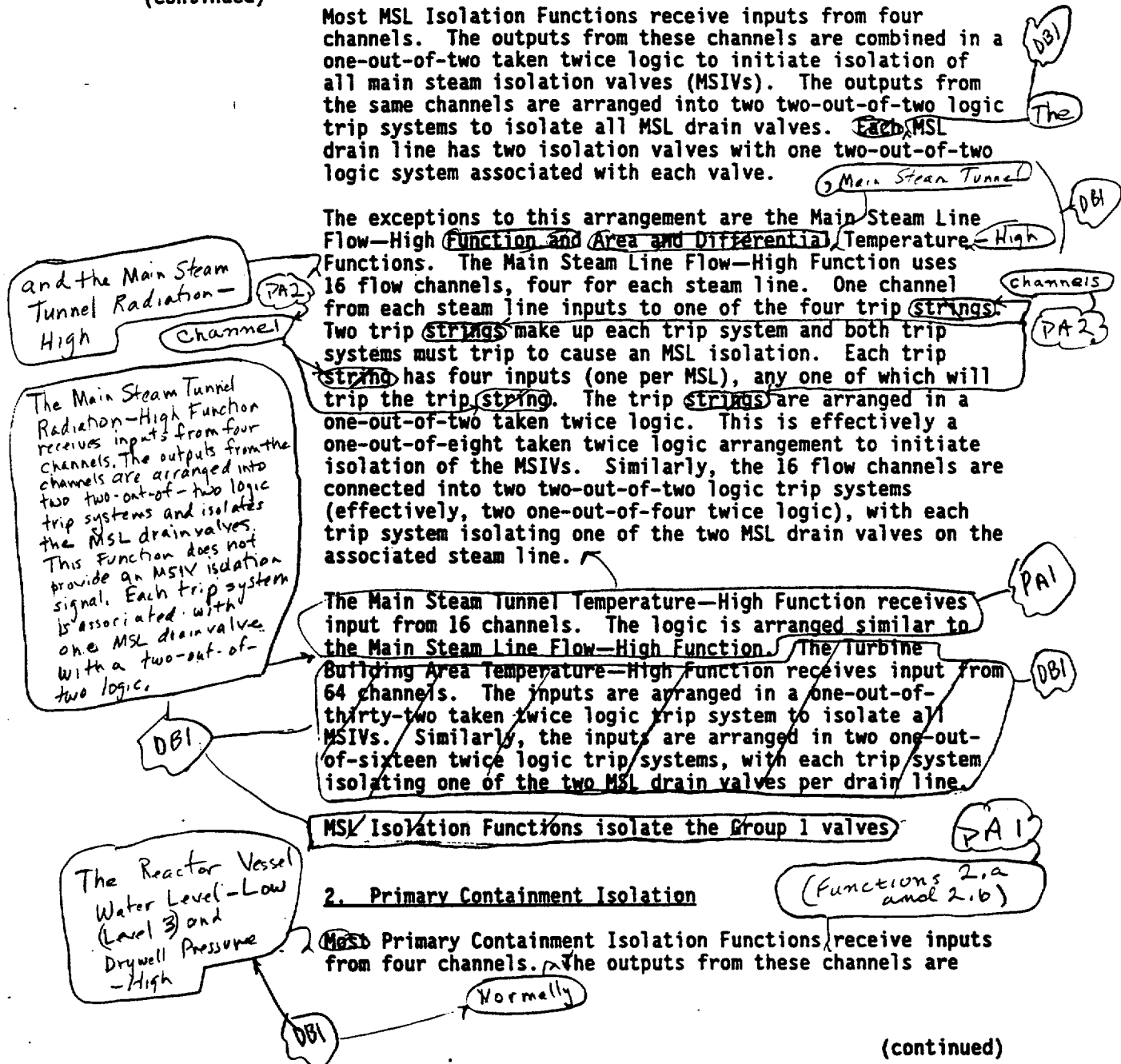
The exceptions to this arrangement are the Main Steam Line Flow-High ~~Function and Area and Differential~~ Temperature-High Functions. The Main Steam Line Flow-High Function uses 16 flow channels, four for each steam line. One channel from each steam line inputs to one of the four trip strings. Two trip strings make up each trip system and both trip systems must trip to cause an MSL isolation. Each trip string has four inputs (one per MSL), any one of which will trip the trip string. The trip strings are arranged in a one-out-of-two taken twice logic. This is effectively a one-out-of-eight taken twice logic arrangement to initiate isolation of the MSIVs. Similarly, the 16 flow channels are connected into two two-out-of-two logic trip systems (effectively, two one-out-of-four twice logic), with each trip system isolating one of the two MSL drain valves on the associated steam line.

The Main Steam Tunnel Temperature-High Function receives input from 16 channels. The logic is arranged similar to the Main Steam Line Flow-High Function. The Turbine Building Area Temperature-High Function receives input from 64 channels. The inputs are arranged in a one-out-of-thirty-two taken twice logic trip system to isolate all MSIVs. Similarly, the inputs are arranged in two one-out-of-sixteen twice logic trip systems, with each trip system isolating one of the two MSL drain valves per drain line.

MSI Isolation Functions isolate the Group 1 valves

2. Primary Containment Isolation

Most Primary Containment Isolation Functions receive inputs from four channels. The outputs from these channels are



(continued)

BASES

BACKGROUND

2. Primary Containment Isolation (continued)

arranged into two two-out-of-two logic trip systems. One trip system initiates isolation of all inboard primary containment isolation valves, while the other trip system initiates isolation of all outboard primary containment isolation valves. Each logic closes one of the two valves on each penetration, so that operation of either logic isolates the penetration.

INSERT BK60-3

INSERT BK60-4

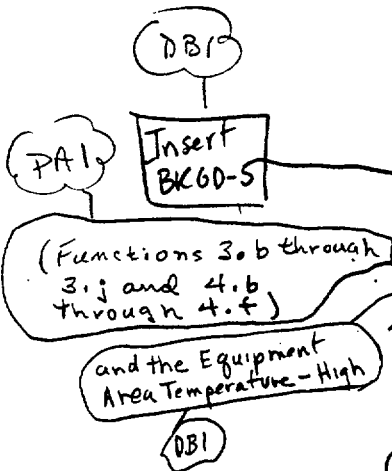
The exception to this arrangement is the Drywell Radiation-High Function. This Function has two channels, whose outputs are arranged in two one-out-of-one logic trip systems. Each trip system isolates one valve per associated penetration, similar to the two-out-of-two logic described above.

Primary Containment Isolation Drywell Pressure-High and Reactor Vessel Water Level-Low, Level 3 Functions isolate the Group 2, 6, 7, 10, and 12 valves. Reactor Building and Refueling Floor Exhaust Radiation-High Functions isolate the Group 6, 10, and 12 valves. Primary Containment Isolation Drywell Radiation-High Function isolates the containment purge and vent valves.

3. 4. High Pressure Coolant Injection System Isolation and Reactor Core Isolation Cooling System Isolation

Most Functions that isolate HPCI and RCIC receive input from two channels, with each channel in one trip system using a one-out-of-one logic. Each of the two trip systems in each isolation group is connected to one of the two valves on each associated penetration.

The exceptions are the HPCI and RCIC Turbine Exhaust Diaphragm Pressure-High, and Steam Supply Line Pressure-Low Functions. These Functions receive inputs from four turbine exhaust diaphragm pressure and four steam supply pressure channels for each system. The outputs from the turbine exhaust diaphragm pressure and steam supply pressure channels are each connected to two two-out-of-two trip systems. Each trip system isolates one valve per associated penetration.



Insert BK60-6

(continued)

INSERT BKGD-3

DBI

The exception to this arrangement for the Reactor Vessel Water Level-Low (Level 3) and Drywell Pressure-High Functions (Functions 2.g and 2.h) are with certain penetration flow paths (i.e., hydrogen/oxygen sample supply and return valves, and gaseous/particulate sample supply and return valves). For these penetration flow paths only one logic trip system closes two valves in each flow path as noted by footnote (b) to Table 3.3.6.1-1. The design is acceptable since it helps ensure post-accident sampling capability is maintained. The remainder of the penetration flow paths isolated by the Reactor Vessel Water Level-Low (Level 3) and Drywell Pressure-High Functions (Functions 2.a and 2.b) are extensive and are identified in Reference 1.

INSERT BKGD-4

DBI

The Containment Radiation-High Function (Function 2.c) includes two channels, whose outputs are arranged in two one-out-of-one logic trip systems. Each trip system isolates one valve per associated penetration, so that operation of either logic isolates the penetration. The penetration flow paths isolated by this Function include the drywell and suppression chamber vent and purge valves.

The Reactor Building Exhaust Radiation-High Function (Function 2.d) includes two channels, whose outputs are arranged in two one-out-of-one logic trip systems. Each trip system normally isolates one valve per associated penetration, so that operation of either logic isolates the penetration. The exception to this arrangement for the Reactor Building Exhaust Radiation-High Function (Function 2.i) are with certain penetration flow paths (i.e., hydrogen/oxygen sample supply and return valves, and gaseous/particulate sample supply and return valves). In these penetration flow paths, both valves are isolated by the same logic trip system, as noted by footnote (b) to Table 3.3.6.1-1. The design is acceptable since it helps ensure post-accident sampling capability is maintained. The penetration flow paths isolated by the Reactor Building Exhaust Radiation-High Function are extensive and are identified in Reference 1.

The Reactor Vessel Water-Low Low Low (Level 1) and the Main Steam Tunnel Radiation-High Functions (Functions 2.e and 2.f) both have four channels, whose outputs are arranged into two two-out-of-two logic trip systems for each Function. One trip system initiates isolation of the associated inboard isolation valves, while the other trip system initiates the isolation of the associated outboard valves. The penetration flow path isolated by these Functions is the recirculation loop sample valves.

(DBI)

INSERT BKGD-5

Each trip system for HPCI and RCIC closes the associated steam supply valves. Each HPCI trip system closes the associated pump suction isolation valve. One HPCI trip system and both RCIC trip systems will also initiate a turbine trip which in turn closes the main pump minimum flow isolation valve and pump discharge to reactor isolation valve.

(DBI)

INSERT BKGD-6

The output of each equipment area temperature channel is connected to one trip system so that any channel will trip its associated trip system. This arrangement is consistent with all other area temperature Functions, in that any channel will trip its associated trip system.

BASES

BACKGROUND

3. 4. High Pressure Coolant Injection System Isolation and Reactor Core Isolation Cooling System Isolation (continued)

DBI HPCI and RCIC Functions isolate the Group 3, 4, 8, and 9 valves.

DBI unless otherwise noted

5. Reactor Water Cleanup System Isolation

PA1
S (Functions S.e and S.f)
(Function S.d)
providing input to
PA1
S (Functions S.a, S.b and S.c)

PA2
3) and Drywell Pressure - High
The Reactor Vessel Water Level - Low (Level 3) Isolation Function receives input from four reactor vessel water level channels. The outputs from the reactor vessel water level channels are connected into two two-out-of-two trip systems. The Differential Flow - High and SLC System Initiation Functions receive input from two channels, with each channel to one trip system. Using a one-out-of-one logic. The Area Temperature - High Function receives input from eight temperature monitors, three to each trip system. The Area Ventilation Differential Temperature - High Function receives input from six differential temperature monitors, three in each trip system. These are configured so that any one input will trip the associated trip system. Each of the two trip systems is connected to one of the two valves on each RWCU penetration.

for each function

Insert Function 5-1
Insert Function 5-2
RWCU functions isolate the Group 5 valves.

DBI unless otherwise noted
Only one channel input is required to be OPERABLE for a trip system to be considered OPERABLE.

6. Shutdown Cooling System Isolation

PA2
The Reactor Vessel Water Level - Low, (Level 3) Function receives input from four reactor vessel water level channels. The outputs from the reactor vessel water level channels are connected to two two-out-of-two trip systems. The Reactor Vessel Pressure - High Function receives input from two channels, with each channel to one trip system using a one-out-of-one logic. Each of the two trip systems is connected to one of the two valves on each shutdown cooling penetration.

providing input into each

Shutdown Cooling System Isolation Functions isolate the Group 11 valves.

Each of the two trip systems is connected to one of the two valves on the RHR shutdown cooling pump suction penetration and on one of the two inboard LPCI injection valves if in shutdown cooling mode.

pump suction

75TF-306, R2

(continued)

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7. Traversing Incore Probe System Isolation

INSERT FUNCTION 7-1

TAB

DBI INSERT Function 5-1

Any channel will initiate the trip logic. The Function is initiated by placing the SLC System initiation switch in any position other than stop (start system A or start system B). Therefore, a channel is defined as the circuitry required to trip the trip logic when the switch is in position start system A or start system B.

DBI INSERT FUNCTION 5-2

and only one trip system is connected to the RWCU return penetration outboard valve. The trip system associated with the SLC System Initiation Function is connected to the outboard RWCU suction valve and the outboard RWCU return penetration valve.

1 (F)
1 (F)

TAS INSERT FUNCTION 7-1

The Reactor Vessel Water Level - Low Level 3 Isolation Function receives input from two reactor vessel water level channels. The outputs from the reactor vessel water level channels are connected into one two-out-of-two logic trip system. The Drywell Pressure - High Isolation function receives input from two drywell pressure channels. The outputs from the drywell pressure channels are connected into one two-out-of-two logic trip system.

(PAL)

When either Isolation Function actuates, the TIP drive mechanisms will withdraw the TIPs, if inserted, and close the inboard TIP system isolation ball valves when the TIPs are fully withdrawn. The outboard TIP system isolation valves are manual shear valves.

TIP System Isolation Functions isolate Group [x] valves (inboard isolation ball valves).

(DBI)

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BASES (continued)

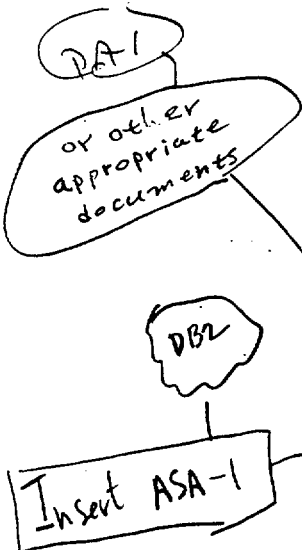
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LCO, and
APPLICABILITY

The isolation signals generated by the primary containment isolation instrumentation are implicitly assumed in the safety analyses of References (2) and (3) to initiate closure of valves to limit offsite doses. Refer to LCO 3.6.1.3, "Primary Containment Isolation Valves (PCIVs)," Applicable Safety Analyses Bases for more detail of the safety analyses. 16 CFR 50.36 (c)(2)(ii) (R3.4) x1

Primary containment isolation instrumentation satisfies Criterion 3 of ~~the NRC Policy Statement~~. Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

The OPERABILITY of the primary containment instrumentation is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.6.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints within the specified Allowable Values, where appropriate. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time, where appropriate.

Allowable Values are specified for each Primary Containment Isolation Function specified in the Table. Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the setpoints do not exceed the Allowable Value between CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytic limits, corrected for calibration, process, and some of the instrument errors. The trip setpoints are then determined accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation



(continued)

DB2 INSERT ASA-1

The Trip setpoints are derived from the analytical limits and account for all worst case instrumentation uncertainties as appropriate (e.g., drift, process effects, calibration uncertainties, and severe environmental errors (for channels that must function in harsh environments as defined by 10 CFR 50.49)). The trip setpoints derived in this manner provide adequate protection because all expected uncertainties are accounted for. The Allowable Values are then derived from the trip setpoints by accounting for normal effects that would be seen during periodic surveillance or calibration. These effects are instrumentation uncertainties observed during normal operation (e.g., drift and calibration uncertainties).

RAI 3.3.6.1-2

BASES

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(continued)

uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

DB2

Certain Emergency Core Cooling Systems (ECCS) and RCIC valves (e.g., minimum flow) also serve the dual function of automatic PCIVs. The signals that isolate these valves are also associated with the automatic initiation of the ECCS and RCIC. The instrumentation requirements and ACTIONS associated with these signals are addressed in LCO 3.3.5.1, "Emergency Core Cooling Systems (ECCS) Instrumentation," and LCO 3.3.5.2, "Reactor Core Isolation Cooling (RCIC) System Instrumentation," and are not included in this LCO.

In general, the individual Functions are required to be OPERABLE in MODES 1, 2, and 3 consistent with the Applicability for LCO 3.6.1.1, "Primary Containment." Functions that have different Applicabilities are discussed below in the individual Functions discussion.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Main Steam Line Isolation

1.a. Reactor Vessel Water Level—Low Low Low_g Level 1

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of the MSIVs and other interfaces with the reactor vessel occurs to prevent offsite dose limits from being exceeded. The Reactor Vessel Water Level—Low Low Low_g Level 1 Function is one of the many Functions assumed to be OPERABLE and capable of providing isolation signals. The Reactor Vessel Water Level—Low Low Low_g Level 1 Function associated with isolation is assumed in the analysis of the recirculation line break (Ref. (1)). The isolation of the MSLs on Level 1 supports actions to ensure that offsite dose limits are not exceeded for a DBA.

PA2

PA2

DB1

Reactor vessel water level signals are initiated from four level transmitters that sense the difference between the

(continued)

BASES

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SAFETY ANALYSES,
LCO, and
APPLICABILITY

1.a. Reactor Vessel Water Level—Low Low Low Level 1
(continued)

pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level—Low Low Low Level 1 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level—Low Low Low Level 1 Allowable Value is chosen to be the same as the ECCS Level 1 Allowable Value (LCO 3.3.5.1) to ensure that the MSIs isolate on a potential loss of coolant accident (LOCA) to prevent offsite doses from exceeding 10 CFR 100 limits.

This Function isolates the GROUP valves.

1.b. Main Steam Line Pressure—Low

Low MSL pressure indicates that there may be a problem with the turbine pressure regulation, which could result in a low reactor vessel water level condition and the RPV cooling down more than 100°F/hr if the pressure loss is allowed to continue. The Main Steam Line Pressure—Low Function is directly assumed in the analysis of the pressure regulator failure (Ref. 2). For this event, the closure of the MSIVs ensures that the RPV temperature change limit (100°F/hr) is not reached. In addition, this Function supports actions to ensure that Safety Limit 2.1.1.1 is not exceeded. (This Function closes the MSIVs prior to pressure decreasing below 785 psig, which results in a scram due to MSIV closure, thus reducing reactor power to < 25% RTP.)

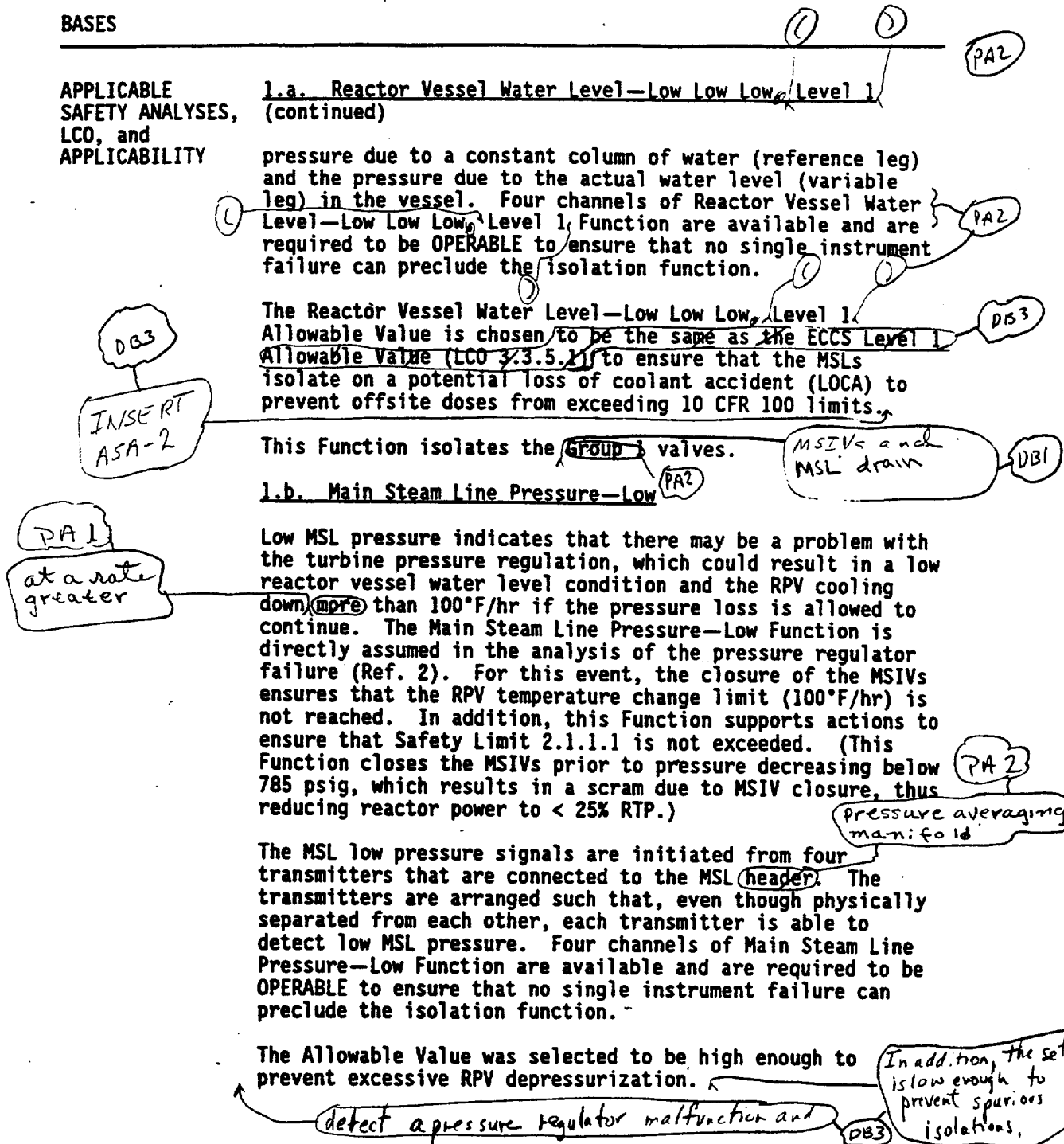
The MSL low pressure signals are initiated from four transmitters that are connected to the MSL header. The transmitters are arranged such that, even though physically separated from each other, each transmitter is able to detect low MSL pressure. Four channels of Main Steam Line Pressure—Low Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value was selected to be high enough to prevent excessive RPV depressurization.

detect a pressure regulator malfunction and

In addition, the setting is low enough to prevent spurious isolations.

(continued)



DB3

INSERT ASA-2

In addition, the setting is low enough to allow the removal of heat from the reactor for a predetermined time following a scram, prevent isolation on a partial loss of feedwater and to reduce challenges to the safety/relief valves (S/RVs). The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 13).

BASES

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1.b. Main Steam Line Pressure—Low (continued)

The Main Steam Line Pressure—Low Function is only required to be OPERABLE in MODE 1 since this is when the assumed transient can occur (Ref. 2).

MSIVs and MSL drain

This Function isolates the Group 1 valves.

DB1

1.c. Main Steam Line Flow—High

PA2

Main Steam Line Flow—High is provided to detect a break of the MSL and to initiate closure of the MSIVs. If the steam were allowed to continue flowing out of the break, the reactor would depressurize and the core could uncover. If the RPV water level decreases too far, fuel damage could occur. Therefore, the isolation is initiated on high flow to prevent or minimize core damage. The Main Steam Line Flow—High Function is directly assumed in the analysis of the main steam line break (MSLB) (Ref. 4). The isolation action, along with the scram function of the Reactor Protection System (RPS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46 and offsite doses do not exceed the 10 CFR 100 limits.

DB1
3

The MSL flow signals are initiated from 16 transmitters that are connected to the four MSLs. The transmitters are arranged such that, even though physically separated from each other, all four connected to one MSL would be able to detect the high flow. Four channels of Main Steam Line Flow—High Function for each unisolated MSL (two channels per trip system) are available and are required to be OPERABLE so that no single instrument failure will preclude detecting a break in any individual MSL.

The Allowable Value is chosen to ensure that offsite dose limits are not exceeded due to the break.

MSIVs and MSL drain

This Function isolates the Group 1 valves.

DB1

1.d. Condenser Vacuum—Low

PA2

The Condenser Vacuum—Low Function is provided to prevent overpressurization of the main condenser in the event of a loss of the main condenser vacuum. Since the integrity of the condenser is an assumption in offsite dose calculations, the Condenser Vacuum—Low Function is assumed to be OPERABLE

(continued)

The Function is automatically bypassed when the reactor mode switch is not in the run position

DB1

INSERT
ASA-3

DB3

INSERT ASA-3

DB3

In addition, the setting is high enough to permit the isolation of one main steam line at reduced power without causing an automatic isolation of the steam lines yet low enough to permit early detection of a gross steam line break.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

1.d. Condenser Vacuum—Low (continued)

and capable of initiating closure of the MSIVs. The closure of the MSIVs is initiated to prevent the addition of steam that would lead to additional condenser pressurization and possible rupture of the diaphragm installed to protect the turbine exhaust hood, thereby preventing a potential radiation leakage path following an accident.

Condenser vacuum pressure signals are derived from four pressure transmitters that sense the pressure in the condenser. Four channels of Condenser Vacuum—Low Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

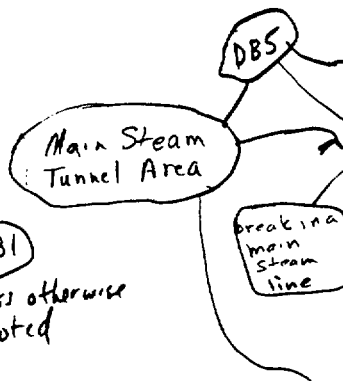
This Function is automatically bypassed when the reactor mode switch is not in the run position and

The Allowable Value is chosen to prevent damage to the condenser due to pressurization, thereby ensuring its integrity for offsite dose analysis. As noted (footnote (a) to Table 3.3.6.1-1), the channels are not required to be OPERABLE in MODES 2 and 3 when all turbine stop valves (TSVs) are closed, since the potential for condenser overpressurization is minimized. Switches are provided to manually bypass the channels when all TSVs are closed.

This Function isolates the Group D valves.

MSIVs and MSL drain DB1

i.e. Area and Differential Temperature—High



Area and differential temperature is provided to detect a leak in the RCPB and provides diversity to the high flow instrumentation. The isolation occurs when a very small leak has occurred. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. However, credit for these instruments is not taken in any transient or accident analysis in the FSAR, since bounding analyses are performed for large breaks, such as MSLBs.

Insert ASA-4 DB3 PAZ

Area temperature signals are initiated from thermocouples located in the area being monitored. Sixteen channels of Main Steam Tunnel Temperature—High Function and 64 channels of Turbine Building Area Temperature—High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. Each function has one temperature element.

resistance temperature detectors (RTDs)

(continued)

Insert ASA-4

DBI

High temperature in the main steam tunnel outside the primary containment could indicate a break in a main steam line. The automatic closure of the MSIVs and MSL drains, prevents excessive loss of reactor coolant and the release of significant amounts of radioactive material from the reactor coolant pressure boundary.

BASES

Main Steam Tunnel Area Temperature - High

DB1

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

l.e. (l.f., l.g. Area and Differential Temperature - High
(continued)

DB5

Eight thermocouples provide input to the Differential Temperature - High Function. The output of these thermocouples is used to determine the differential temperature. Each channel consists of a differential temperature instrument that receives inputs from thermocouples that are located in the inlet and outlet of the area cooling system for a total of four available channels.

DB3
high enough above the temperature expected during power operations to avoid spurious isolation, yet low enough to provide early indication of a steam line break

The ambient and differential temperature monitoring Allowable Value is chosen to detect a leak equivalent to between 1% and 10% rated steam flow.

DB1

MSIVs and MSL drain

These Functions isolate the Group 1 valves.

Insert Function hf

DB4

l.h. Manual Initiation

PA2

The Manual Initiation push button channels introduce signals into the MSL isolation logic that are redundant to the automatic protective instrumentation and provide manual isolation capability. There is no specific FSAR safety analysis that takes credit for this Function. It is retained for the overall redundancy and diversity of the isolation function as required by the NRC in the plant licensing basis.

CLB1

There are two push buttons for the logic, one manual initiation push button per trip system. There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

Two channels of Manual Initiation Function are available and are required to be OPERABLE in MODES 1, 2, and 3, since these are the MODES in which the MSL isolation automatic Functions are required to be OPERABLE.

(continued)

INSERT Function 1.f

DB4

1.f. Main Steam Tunnel Radiation-High

The Main Steam Tunnel Radiation-High isolation signal has been removed from the MSIV isolation logic circuitry (Ref. 1); however, this isolation Function has been retained for the MSL drains valves (and other valves discussed under 2.f) to ensure that the assumptions utilized to determine that acceptable offsite doses resulting from a control rod drop accident (CRDA) are maintained.

Main Steam Tunnel Radiation-High signals are generated from four radiation elements and associated monitors, which are located near the main steam lines in the steam tunnel. Four instrumentation channels of the Main Steam Line Radiation-High Function are available and required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value was selected to be low enough that a high radiation trip results from the fission products released in the CRDA. In addition, the setting is adjusted high enough above the background radiation level in the vicinity of the main steam lines so that spurious trips are avoided at rated power. As noted (Footnote (e) to Table 3.3.6.1-1), the channels are only required to be OPERABLE in MODES 1 and 2 with THERMAL POWER is $\leq 10\%$. When THERMAL POWER is $> 10\%$ RTP, there is no possible control rod configuration that results in a control rod worth that could exceed the fuel damage limit during a CRDA (Refer to the Bases for Function 2 (Rod Worth Minimizer) of LCO 3.3.2.1, "Control Rod Block Instrumentation)). In MODES 3 and 4, all control rods are required to be inserted into the core; therefore, a CRDA cannot occur. In MODE 5, since only a single control rod can be withdrawn from a core cell containing fuel assemblies, adequate SDM ensures that the consequences of a CRDA are acceptable, since the reactor will be subcritical.

This Function isolates the MSL drain valves.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Primary Containment Isolation

2.a. Reactor Vessel Water Level—Low Level 3

Low RPV water level indicates that the capability to cool the fuel may be threatened. The valves whose penetrations communicate with the primary containment are isolated to limit the release of fission products. The isolation of the primary containment on Level 3 supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Reactor Vessel Water Level—Low Level 3 Function associated with isolation is implicitly assumed in the FSAR analysis as these leakage paths are assumed to be isolated post LOCA.

Reactor Vessel Water Level—Low Level 3 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level—Low Level 3 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level—Low Level 3 Allowable Value was chosen to be the same as the RPS Level 3 scram Allowable Value (LCO 3.3.1.1), since isolation of these valves is not critical to orderly plant shutdown.

This Function isolates the Group 2, 6, 20, and 12 valves.

2.b. Drywell Pressure—High

High drywell pressure can indicate a break in the RCPB inside the primary containment. The isolation of some of the primary containment isolation valves on high drywell pressure supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Drywell Pressure—High Function, associated with isolation of the primary containment, is implicitly assumed in the FSAR accident analysis as these leakage paths are assumed to be isolated post LOCA.

High drywell pressure signals are initiated from pressure transmitters that sense the pressure in the drywell. Four

(continued)

DB4
Insert 2.g

DB3
Insert Function 2.a(1)

DB4
DB3
2.h
Insert Function 2.a(2)

DB4 For Function 2.b)

PAZ
DB4
For Function 2.a

DB1
listed in Reference 1

INSERT Function 2.g

DB4

For Function 2.g, two channels of Reactor Vessel Water Level - Low (Level 3) are required to be OPERABLE for each hydrogen/oxygen and gaseous/particulate sample supply and return penetration to ensure these penetrations can be isolated.

INSERT Function 2.a (1)

DB3

selected to initiate isolation at the earliest indication of a possible break in the RCPB. However, the setting is adjusted far enough to avoid spurious isolation. The Allowable value is

Insert Function 2.a (2)

DB3

The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 13).

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2h DB4

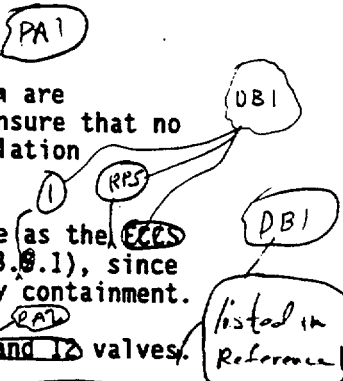
2.b. Drywell Pressure—High (continued)

channels of Drywell Pressure—High ~~per function~~ are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. A Insert function 2.w

DB3
to be as low as possible without inducing spurious trips. The Allowable Value is chosen

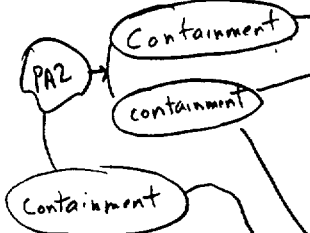
The Allowable Value was selected to be the same as the ~~CCS~~ Drywell Pressure—High Allowable Value (LCO 3.3.6.1), since this may be indicative of a LOCA inside primary containment.

This Function isolates the Group 2, 6, 7, 10, and 12 valves.



2.c. Drywell Radiation—High

High ~~drywell~~ radiation indicates possible gross failure of the fuel cladding. Therefore, when ~~Drywell~~ Radiation—High is detected, an isolation is initiated to limit the release of fission products. However, this Function is not assumed in any accident or transient analysis in the FSAR because other leakage paths (e.g., MSIVs) are more limiting.



However, the setting is high enough to avoid spurious isolation.

The ~~drywell~~ radiation signals are initiated from radiation detectors that are located in the drywell. Two channels of ~~Drywell~~ Radiation—High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value is low enough to promptly detect gross failures in the fuel cladding.

This Function isolates the containment vent and purge valves.

2.d. 2.e. Reactor Building and Refueling Floor Exhaust Radiation—High

High ~~secondary containment~~ exhaust radiation is an indication of possible gross failure of the fuel cladding. The release may have originated from the primary containment due to a break in the RCPB. When Exhaust Radiation—High is detected, valves whose penetrations communicate with the primary containment atmosphere are isolated to limit the release of fission products. Additionally, the Refueling Floor Exhaust Radiation—High Function is assumed to

2.i DB4

DB1

However this Function is not assumed in any accident or transient analysis in the FSAR because other leakage paths (e.g., MSIVs) are more limiting.



(continued)

DBY

INSERT Function 2.h

For Function 2.h, two channels of Drywell Pressure-High are required to be OPERABLE for each hydrogen/oxygen and gaseous/particulate sample supply and return penetration to ensure these penetrations can be isolated.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

2.d. (2.e) Reactor Building and Refueling Floor Exhaust Radiation—High (continued)

initiate isolation of the primary containment during a fuel handling accident (Ref. 2).

The Exhaust Radiation—High signals are initiated from radiation detectors that are located on the ventilation exhaust piping coming from the reactor building and the refueling floor zones, respectively. The signal from each detector is input to an individual monitor whose trip outputs are assigned to an isolation channel. Four channels of Reactor Building Exhaust—High Function and four channels of Refueling Floor Exhaust—High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are chosen to promptly detect gross failure of the fuel cladding. The setting is high enough to avoid spurious isolations.

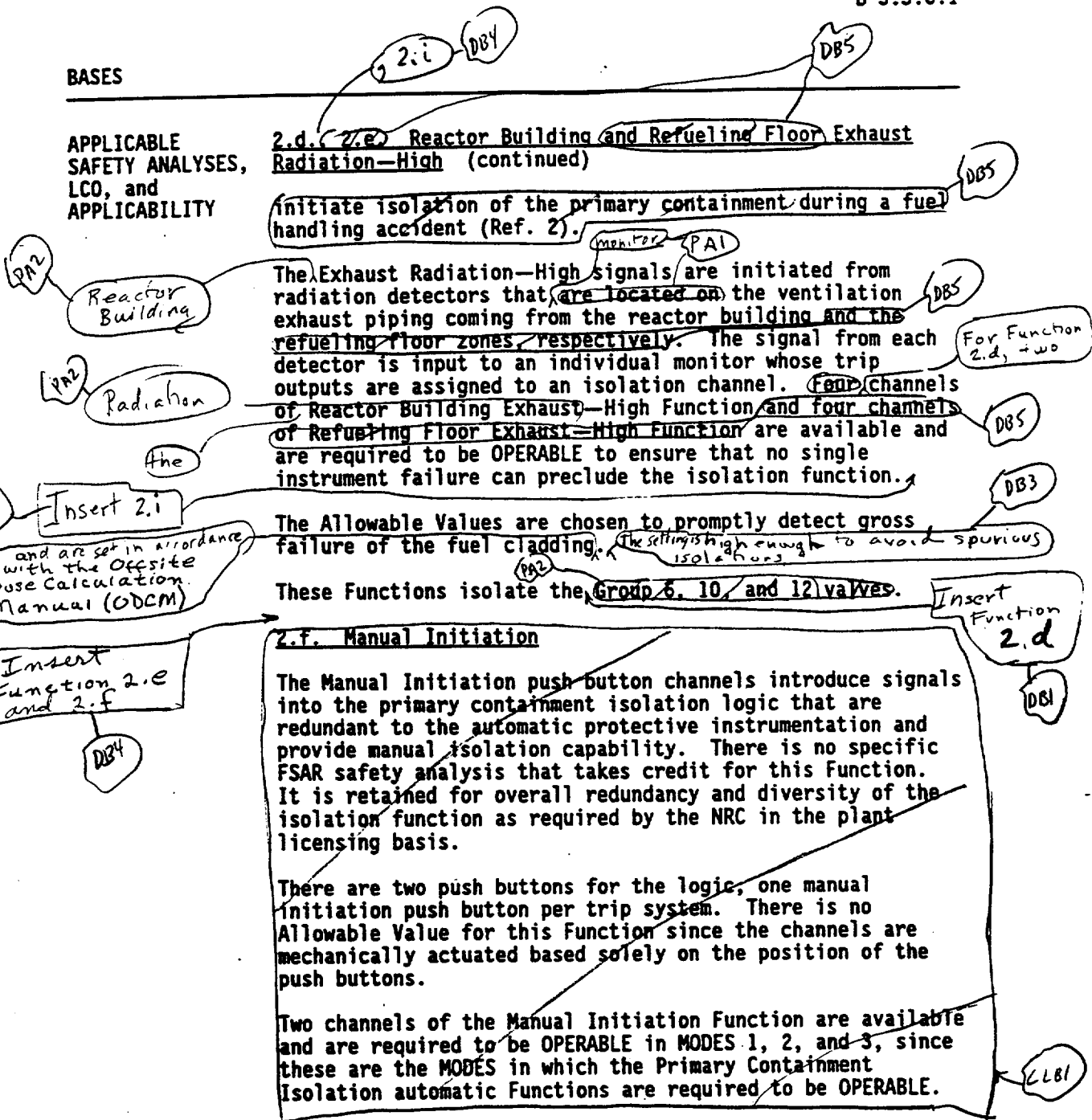
These Functions isolate the Group 6, 10, and 12 valves.

2.f. Manual Initiation

The Manual Initiation push button channels introduce signals into the primary containment isolation logic that are redundant to the automatic protective instrumentation and provide manual isolation capability. There is no specific FSAR safety analysis that takes credit for this Function. It is retained for overall redundancy and diversity of the isolation function as required by the NRC in the plant licensing basis.

There are two push buttons for the logic, one manual initiation push button per trip system. There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

Two channels of the Manual Initiation Function are available and are required to be OPERABLE in MODES 1, 2, and 3, since these are the MODES in which the Primary Containment Isolation automatic Functions are required to be OPERABLE.



(continued)

DB4

INSERT Function 2.i

For Function 2.i, one channel of Reactor Building Exhaust Radiation-High is required to be OPERABLE for each hydrogen/oxygen and gaseous/particulate sample supply and return penetration to ensure these penetrations can be isolated.

DB1

INSERT Function 2.d

drywell and suppression chamber vent and purge valves, hydrogen/oxygen sample and return valves, and gaseous/particulate sample and return valves as well as other valves listed in Reference 1.

DB4

INSERT Functions 2.e and 2.f

2.e. Reactor Vessel Water Level - Low Low Low (Level 1)

Low reactor vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of the recirculation loop sample valves occurs to prevent offsite dose limits from being exceeded. The Reactor Vessel Water Level - Low Low Low (Level 1) Function is one of the many Functions assumed to be OPERABLE and capable of providing isolation signals. The Reactor Vessel Water Level - Low Low Low (Level 1) Function associated with isolation is assumed in the analysis of the recirculation line break (Ref. 3). The isolation of the recirculation loop sample valves on Level 1 supports actions to ensure that offsite dose limits are not exceeded for a DBA.

Reactor vessel water level signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low Low (Level 1) Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level - Low Low Low (Level 1) Allowable Value is chosen to ensure that the recirculation loop sample valves close on a potential loss of coolant accident (LOCA) to prevent offsite doses from exceeding 10 CFR 100 limits. The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 13).

This Function isolates the recirculation loop sample valves.

DB4

INSERT Functions 2.e and 2.f (continued)

2.f. Main Steam Tunnel Radiation-High

The Main Steam Tunnel Radiation-High isolation signal has been removed from the MSIV isolation logic circuitry (Ref. 1); however, this isolation Function has been retained for the recirculation loop sample valves to ensure that the assumptions utilized to determine that acceptable offsite doses resulting from a CRDA are maintained.

Main Steam Tunnel Radiation-High signals are generated from four radiation elements and associated monitors, which are located near the main steam lines in the steam tunnel. Four instrumentation channels of the Main Steam Tunnel Radiation-High Function are available and required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value was selected to be low enough that a high radiation trip results from the fission products released in the design basis CRDA. In addition, the setting is adjusted high enough above the background radiation level in the vicinity of the main steam lines so that spurious trips are avoided at rated power. As noted (footnote (e) to Table 3.3.6.1-1), the channels are only required to be OPERABLE in MODES 1 and 2 with THERMAL POWER is $\leq 10\%$. When THERMAL POWER is $> 10\%$ RTP, there is no possible control rod configuration that results in a control rod worth that could exceed the fuel damage limit during a CRDA (Refer to the Bases for Function 2 (Rod Worth Minimizer) of LCO 3.3.2.1). In MODES 3 and 4, all control rods are required to be inserted into the core; therefore, a CRDA cannot occur. In MODE 5, since only a single control rod can be withdrawn from a core cell containing fuel assemblies, adequate SDM ensures that the consequences of a CRDA are acceptable, since the reactor will be subcritical.

This Function isolates the recirculation loop sample valves.

BASES

APPLICABLE
SAFETY ANALYSES,
LCO, and
APPLICABILITY
(continued)

High Pressure Coolant Injection and Reactor Core Isolation
Cooling Systems Isolation

3.a., 4.a. HPCI and RCIC Steam Line Flow—High

Steam Line Flow—High Functions are provided to detect a break of the RCIC or HPCI steam lines and initiate closure of the steam line isolation valves of the appropriate system. If the steam is allowed to continue flowing out of the break, the reactor will depressurize and the core can uncover. Therefore, the isolations are initiated on high flow to prevent or minimize core damage. The isolation action, along with the scram function of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. Specific credit for these Functions is not assumed in any FSAR accident analyses since the bounding analysis is performed for large breaks such as recirculation and MSL breaks. However, these instruments prevent the RCIC or HPCI steam line breaks from becoming bounding.

U

PAL

The HPCI and RCIC Steam Line Flow—High signals are initiated from transmitters (two for HPCI and two for RCIC) that are connected to the system steam lines. Two channels of both HPCI and RCIC Steam Line Flow—High Functions are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

DB3

DB3
a timely detection of a turbine steam line break so

The Allowable Values are chosen to be low enough to ensure that the trip occurs to prevent fuel damage and maintains the MSLB event as the bounding event.

The setting is adjusted high enough to avoid spurious isolations during HPCI and RCIC startups

These Functions isolate the Group 3 and 4 valves, as appropriate. *as listed in Reference*

PAL

spurious isolations during HPCI and RCIC startups

DB1

3.b., 4.b. HPCI and RCIC Steam Supply Line Pressure—Low

Low ~~MSL~~ pressure indicates that the pressure of the steam in the HPCI or RCIC turbine may be too low to continue operation of the associated system's turbine. These isolations are for equipment protection and are not assumed in any transient or accident analysis in the FSAR. However, they also provide a diverse signal to indicate a possible system break. These instruments are included in Technical Specifications (TS) because of the potential for risk due to

steam
PAL

PAL

U

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

3.b., 4.b. HPCI and RCIC Steam Supply Line Pressure—Low (continued)

possible failure of the instruments preventing HPCI and RCIC initiations (Ref. 3). (S) (DB1) (X1)

The HPCI and RCIC Steam Supply Line Pressure—Low signals are initiated from transmitters (four for HPCI and four for RCIC) that are connected to the system steam line. Four channels of both HPCI and RCIC Steam Supply Line Pressure—Low Functions are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. (DB3) and low enough to ensure HPCI and RCIC Systems Remain OPERABLE

The Allowable Values are selected to be high enough to prevent damage to the system's turbine. (PA2)

These Functions isolate the Group 3 and 4 valves, as appropriate. (as listed in Reference) (DB1)

3.c., 4.c. HPCI and RCIC Turbine Exhaust Diaphragm Pressure—High

DB3
Insert FUNCTION 3.c, 4.c

High turbine exhaust diaphragm pressure indicates that the pressure may be too high to continue operation of the associated system's turbine. That is, one of two exhaust diaphragms has ruptured and pressure is reaching turbine casing pressure limits. These isolations are for equipment protection and are not assumed in any transient or accident analysis in the FSAR. These instruments are included in the TS because of the potential for risk due to possible failure of the instruments preventing HPCI and RCIC initiations (Ref. 3). (S) (DB1) (X1)

PA2
U

The HPCI and RCIC Turbine Exhaust Diaphragm Pressure—High signals are initiated from ~~transmitters~~ switches (four for HPCI and four for RCIC) that are connected to the area between the rupture diaphragms on each system's turbine exhaust line. Four channels of both HPCI and RCIC Turbine Exhaust Diaphragm Pressure—High Functions are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. (DB1)

The Allowable Values are high enough to prevent damage to the system's turbine. (DB3)

low pressure components in the turbine exhaust pathway. The settings are adjusted low enough to avoid isolation of the systems turbine (continued)

INSERT Function 3.c. 4.c

DB3

could indicate that the turbine rotor is not turning, or there is a broken turbine blading or shrouding, thus allowing reactor pressure to act on the turbine exhaust line. The system is isolated to prevent overpressurization of the turbine exhaust line

BASES

APPLICABLE
SAFETY ANALYSES,
LCO, and
APPLICABILITY

3.c., 4.c. HPCI and RCIC Turbine Exhaust Diaphragm Pressure—High (continued)

These Functions isolate the Group 3 and 4 valves, as appropriate, *as listed in Reference 1*

PA2

DB1

3.d., 4.d. Drywell Pressure—High

High drywell pressure can indicate a break in the RCPB. The HPCI and RCIC isolation of the turbine exhaust is provided to prevent communication with the drywell when high drywell pressure exists. A potential leakage path exists via the turbine exhaust. The isolation is delayed until the system becomes unavailable for injection (i.e., low steam line pressure). The isolation of the HPCI and RCIC turbine exhaust by Drywell Pressure—High is indirectly assumed in the FSAR accident analysis because the turbine exhaust leakage path is not assumed to contribute to offsite doses.

High drywell pressure signals are initiated from pressure transmitters that sense the pressure in the drywell. Two channels of both HPCI and RCIC Drywell Pressure—High Functions are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value was selected to be the same as the ECCS Drywell Pressure—High Allowable Value (LCO 3.3.5.1), since this is indicative of a LOCA inside primary containment.

This Function isolates the Group 8 and 9 valves.

DB5

HPCI and RCIC

PA1

3.g

3.d.

3.e., 3.f., 3.h., 3.i., 4.e., 4.g., 4.h., 4.i., 4.j. Area and Differential Temperature—High

Area and differential temperatures are provided to detect a leak from the associated system steam piping. The isolation occurs when a very small leak has occurred and is diverse to the high flow instrumentation. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks.

DBY

DB5

PA2

HPCI and RCIC

PA1

(continued)

Primary Containment Isolation Instrumentation
B 3.3.6.1

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY



3.e., 3.f., 3.h., 3.i., 4.e., 4.g., 4.h., 4.i., 4.j. Area and Differential Temperature—High (continued)

Area and Differential Temperature—High signals are initiated from thermocouples that are appropriately located to protect the system that is being monitored. Two instruments monitor each area. Two channels for each HPCI and RCIC Area and Differential Temperature—High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

for a total of 16 channels for HPCI and 8 channels for RCIC

Eight thermocouples provide input to the Area Ventilation Differential Temperature—High Function. The output of these thermocouples is used to determine the differential temperature. Each channel consists of a differential temperature instrument that receives inputs from thermocouples that are located in the inlet and outlet of the area cooling system for a total of four available channels (two for RCIC and two for HPCI).

high enough above normal operating levels to avoid spurious operation but

The Allowable Values are set low enough to detect a leak equivalent to 25 gpm.

These Functions isolate the Group 3 and 4 valves, as appropriate.

3.g., 4.f. Suppression Pool Area Temperature—Time Delay Relay

The Suppression Pool Area Temperature—Time Delay Relays are provided to allow all the other systems that may be leaking into the pool area (as indicated by the high temperature) to be isolated before HPCI and/or RCIC are automatically isolated. This ensures maximum HPCI and RCIC System operation by preventing isolations due to leaks in other systems. These Functions are not assumed in any FSAR transient or accident analysis.

There are four time delay relays (two for HPCI and two for RCIC). Two channels each for both HPCI and RCIC Suppression Pool Area Temperature—Time Delay Relay Functions are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

(continued)

BASES

APPLICABLE
SAFETY ANALYSES,
LCO, and
APPLICABILITY

3.g., 4.f. Suppression Pool Area Temperature—Time Delay Relay (continued)

The Allowable Values are based on maximizing the availability of the HPCI and RCIC systems. That is, they provide sufficient time to isolate all other potential leakage sources in the suppression pool area before HPCI and RCIC are isolated. DBS

These Functions isolate the Group 3 and 4 valves, as appropriate.

3.i., 4.k. Manual Initiation

The Manual Initiation push button channels introduce signals into the HPCI and RCIC systems' isolation logics that are redundant to the automatic protective instrumentation and provide manual isolation capability. There is no specific FSAR safety analysis that takes credit for these Functions. They are retained for overall redundancy and diversity of the isolation function as required by the NRC in the plant licensing basis. CLB1

There are two push buttons for each of the logics (HPCI and RCIC), one manual initiation push button per trip system. There is no Allowable Value for these Functions, since the channels are mechanically actuated based solely on the position of the push buttons.

Two channels of both HPCI and RCIC Manual Initiation Functions are available and are required to be OPERABLE in MODES 1, 2, and 3 since these are the MODES in which the HPCI and RCIC systems' Isolation automatic Functions are required to be OPERABLE.

(RWC4) - PA2

Reactor Water Cleanup System Isolation 1A

5.a. Differential Flow—High DBS

The high differential flow signal is provided to detect a break in the RWCU System. This will detect leaks in the RWCU System when area or differential temperature would not provide detection (i.e., a cold leg break). Should the reactor coolant continue to flow out of the break, offsite dose limits may be exceeded. Therefore, isolation of the

(continued)

BASES

APPLICABLE
SAFETY ANALYSES,
LCO, and
APPLICABILITY

5.a. Differential Flow—High (continued)

RWCU System is initiated when high differential flow is sensed to prevent exceeding offsite doses. A time delay is provided to prevent spurious trips during most RWCU operational transients. This Function is not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as MSLBs.

DBS

The high differential flow signals are initiated from transmitters that are connected to the inlet (from the reactor vessel) and outlets (to condenser and feedwater) of the RWCU System. The outputs of the transmitters are compared (in a common summer) and the resulting output is sent to two high flow trip units. If the difference between the inlet and outlet flow is too large, each trip unit generates an isolation signal. Two channels of Differential Flow—High Function are available and are required to be OPERABLE to ensure that no single instrument failure downstream of the common summer can preclude the isolation function.

The Differential Flow—High Allowable Value ensures that a break of the RWCU piping is detected.

This Function isolates the Group 5 valves.

a

5.b. 5.c. Area and Area Ventilation Differential Temperature—High

b S.C

RWCU PA2

DBY
DBS

RWCU area and area ventilation differential temperatures are provided to detect a leak from the RWCU System. The isolation occurs even when very small leaks have occurred and is diverse to the high differential flow instrumentation for the hot portions of the RWCU System. If the small leak continues without isolation, offsite dose limits may be reached. Credit for these instruments is not taken in any transient or accident analysis in the FSAR, since bounding analyses are performed for large breaks such as recirculation or MSL breaks.

DBS

DBS

PA2

area

PA2

E: 7 LF

DBI

Area and area ventilation differential temperature signals are initiated from temperature elements that are located in the room that is being monitored. Six thermocouples provide input to the Area Temperature—High Function (two per area). Eight channels are required to be OPERABLE to ensure that no

Eight

DBI

or room

PA2

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

a b and 5.c RWC PA2
 5.b.. 5.d. Area and Area Ventilation Differential Temperature—High (continued) DB4 DB5

single instrument failure can preclude the isolation function.

Twelve thermocouples provide input to the Area Ventilation Differential Temperature—High Function. The output of these thermocouples is used to determine the differential temperature. Each channel consists of a differential temperature instrument that receives inputs from thermocouples that are located in the inlet and outlet of the area cooling system and for a total of six available channels (two per area). Six channels are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. DB5

DB3
 High enough to avoid spurious isolation yet

The Area and Area Ventilation Differential Temperature—High Allowable Values are set low enough to detect a leak equivalent to 25 gpm. DB3

Provide timely detection and isolation of a break in the RWC System

These Functions isolate the Group 5 valves. DB1

5.d. SLC System Initiation

both Area suction valves and the return Control room

IS
 The RWC isolation

The isolation of the RWC System is required when the SLC System has been initiated to prevent dilution and removal of the boron solution by the RWC System (Ref. 6). SLC SYSTEM initiation signals are initiated from the two SLC pump start signals. DB1 unless otherwise noted

is in any position other than stop

There is no Allowable Value associated with this Function since the channels are mechanically actuated based solely on the position of the SLC System initiation switch. (start system A or start system B)

Two channels (one from each pump) of the SLC System Initiation Function are available and are required to be OPERABLE only in MODES 1 and 2, since these are the only MODES where the reactor can be critical, and these MODES are consistent with the Applicability for the SLC System (LCO 3.1.7). suction

F

As noted (footnote (a) to Table 3.3.6.1-1), this Function is only required to close one of the RWC isolation valves since the signals only provide input into one of the two trip systems. and one return isolation valve

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

5.e. Reactor Vessel Water Level—Low Level

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of some interfaces with the reactor vessel occurs to isolate the potential sources of a break. The isolation of the RWCU System on Level 2 supports actions to ensure that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. The Reactor Vessel Water Level—Low Level Function associated with RWCU isolation is not directly assumed in the FSAR safety analyses because the RWCU System line break is bounded by breaks of larger systems (recirculation and MSL breaks are more limiting).

Reactor Vessel Water Level—Low Level signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level—Low Level Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level—Low Level Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level—Low Level Allowable Value (LCO 3.3.6.1), since the capability to cool the fuel may be threatened.

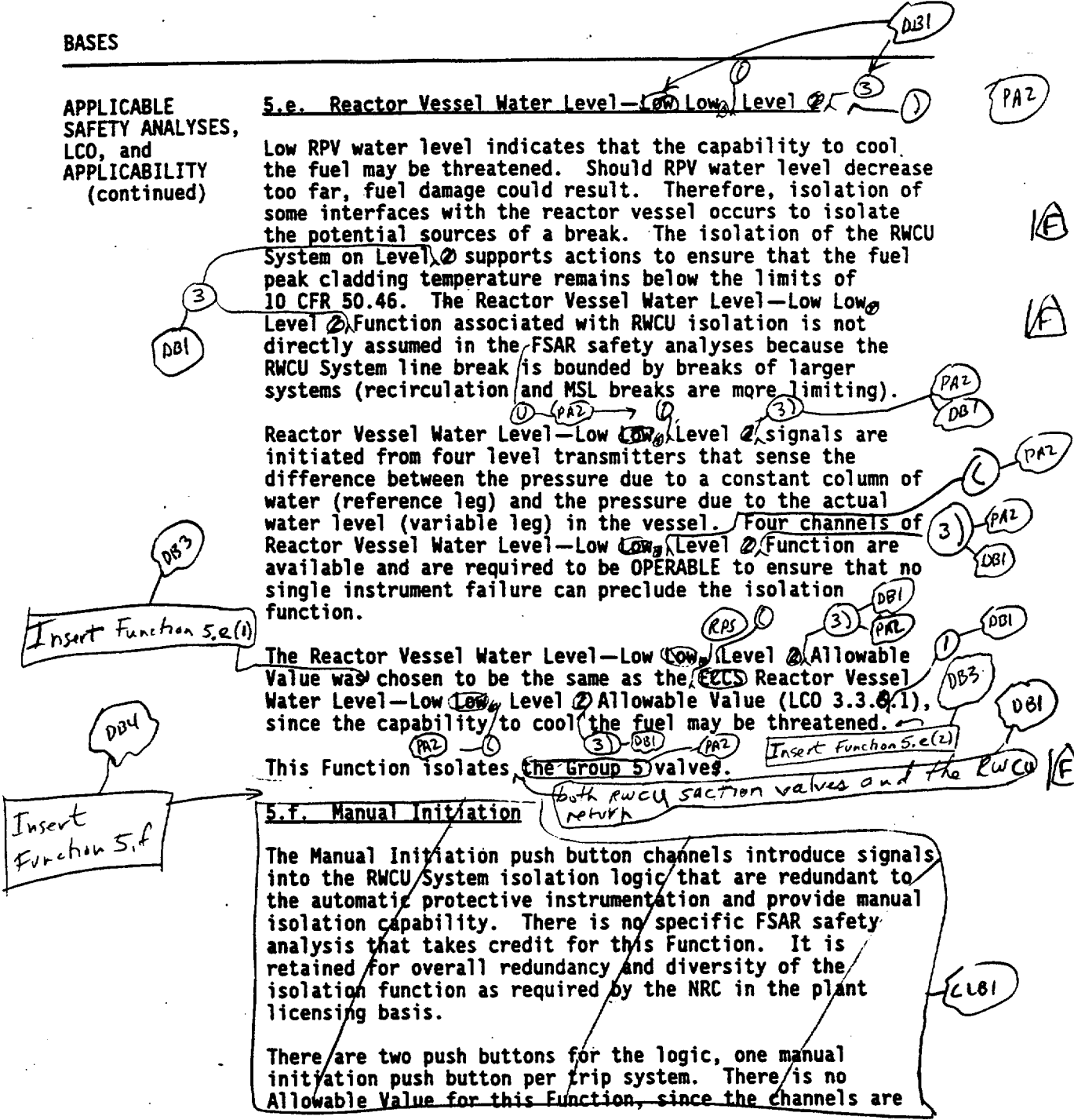
This Function isolates the Group 5 valves. *both RWCU section valves and the RWCU network*

5.f. Manual Initiation

The Manual Initiation push button channels introduce signals into the RWCU System isolation logic that are redundant to the automatic protective instrumentation and provide manual isolation capability. There is no specific FSAR safety analysis that takes credit for this function. It is retained for overall redundancy and diversity of the isolation function as required by the NRC in the plant licensing basis.

There are two push buttons for the logic, one manual initiation push button per trip system. There is no Allowable Value for this Function, since the channels are

(continued)



DB3

INSERT Function 5.e (1)

selected to initiate isolation at the earliest indication of a possible break in the RCPB. However, the setting is adjusted far enough to avoid spurious isolation. The Allowable Value is

DB3

Insert Function 5.e (2)

The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 13).

DB4

INSERT Function 5.f

5.f. Drywell Pressure-High

High drywell pressure can indicate a break in the RCPB inside the primary containment. The isolation of some of the primary containment isolation valves on high drywell pressure supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Drywell Pressure-High Function, associated with isolation of the primary containment, is implicitly assumed in the UFSAR accident analysis as these leakage paths are assumed to be isolated post LOCA.

High drywell pressure signals are initiated from pressure transmitters that sense the pressure in the drywell. Four channels of Drywell Pressure-High are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value was selected to be as low as possible without inducing spurious trips. The Allowable Value is chosen to be the same as the RPS Drywell Pressure-High Allowable Value (LCO 3.3.1.1), since this may be indicative of a LOCA inside primary containment.

This Function isolates both RWC suction valves and one RWC return valve.

U

U

AE

BASES

APPLICABLE
SAFETY ANALYSES,
LCO, and
APPLICABILITY

5.f. Manual Initiation (continued)

mechanically actuated based solely on the position of the push buttons.

Two channels of the Manual Initiation Function are available and are required to be OPERABLE in MODES 1, 2, and 3 since these are the MODES in which the RWCU System Isolation automatic Functions are required to be OPERABLE.

CLBI

Shutdown Cooling System Isolation

6.a. Reactor Steam Dome Pressure—High

The Reactor ~~Steam Dome~~ Pressure—High Function is provided to isolate the shutdown cooling portion of the Residual Heat Removal (RHR) System. This interlock is provided only for equipment protection to prevent an intersystem LOCA scenario, and credit for the interlock is not assumed in the accident or transient analysis in the FSAR.

The Reactor ~~Steam Dome~~ Pressure—High signals are initiated from two transmitters that are connected to different taps on the RPV. Two channels of Reactor ~~Steam Dome~~ Pressure—High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. The Function is only required to be OPERABLE in MODES 1, 2, and 3, since these are the only MODES in which the reactor can be pressurized; thus, equipment protection is needed. The Allowable Value was chosen to be low enough to protect the system equipment from overpressurization.

This Function isolates the Group 1 valves.

6.b. Reactor Vessel Water Level—Low, Level 3

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of some reactor vessel interfaces occurs to begin isolating the potential sources of a break. The Reactor Vessel Water Level—Low, Level 3 Function associated with RHR Shutdown Cooling System isolation is not directly assumed in safety analyses because a break of the RHR Shutdown Cooling System

PA2

PA1

Function

DB1

pressure switcher

U PA2

PA2

PA1

on reactor recirculation pump B suction line

both RHR Shutdown cooling pump suction

DB1

DB1

Insert Function 6.a

DB1

PA2

(continued)

DBI

INSERT FUNCTION 6.a

Each switch provides input to each trip system. However, only one channel input is required to be OPERABLE for a trip system to be considered OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

6.b. Reactor Vessel Water Level—Low, Level 3 (continued)

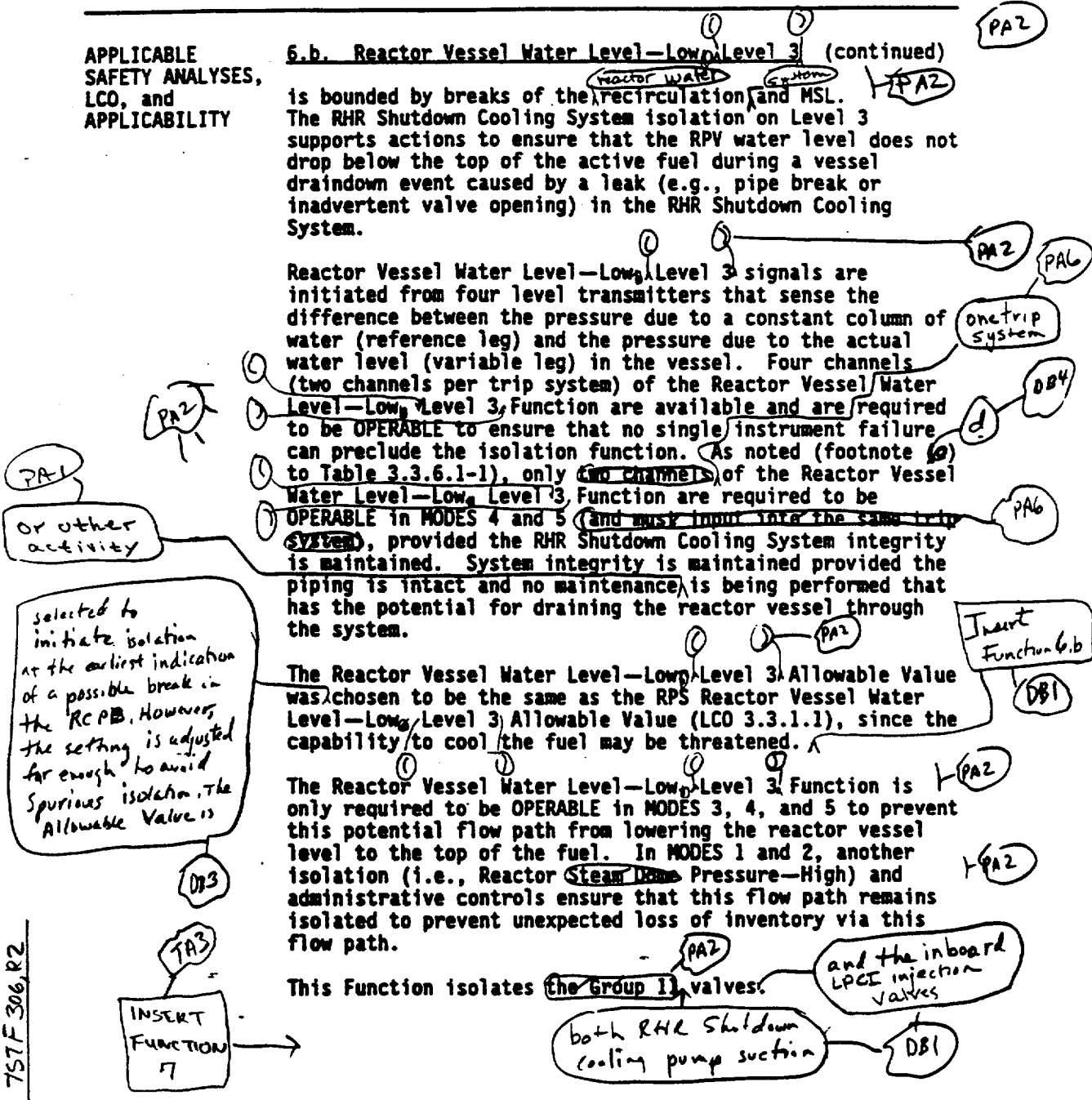
is bounded by breaks of the recirculation and MSL. The RHR Shutdown Cooling System isolation on Level 3 supports actions to ensure that the RPV water level does not drop below the top of the active fuel during a vessel draindown event caused by a leak (e.g., pipe break or inadvertent valve opening) in the RHR Shutdown Cooling System.

Reactor Vessel Water Level—Low, Level 3 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels (two channels per trip system) of the Reactor Vessel Water Level—Low, Level 3, Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. As noted (footnote to Table 3.3.6.1-1), only two channels of the Reactor Vessel Water Level—Low, Level 3, Function are required to be OPERABLE in MODES 4 and 5 (and must input into the same trip system), provided the RHR Shutdown Cooling System integrity is maintained. System integrity is maintained provided the piping is intact and no maintenance is being performed that has the potential for draining the reactor vessel through the system.

The Reactor Vessel Water Level—Low, Level 3 Allowable Value was chosen to be the same as the RPS Reactor Vessel Water Level—Low, Level 3 Allowable Value (LCO 3.3.1.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level—Low, Level 3 Function is only required to be OPERABLE in MODES 3, 4, and 5 to prevent this potential flow path from lowering the reactor vessel level to the top of the fuel. In MODES 1 and 2, another isolation (i.e., Reactor Steam Drum Pressure—High) and administrative controls ensure that this flow path remains isolated to prevent unexpected loss of inventory via this flow path.

This Function isolates the Group I valves, and the inboard LPCI injection valves both RHR Shutdown cooling pump suction



(continued)

DBI

INSERT FUNCTION 6.b

The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 13).

TA3

INSERT FUNCTION 7

Traversing Incore Probe System Isolation

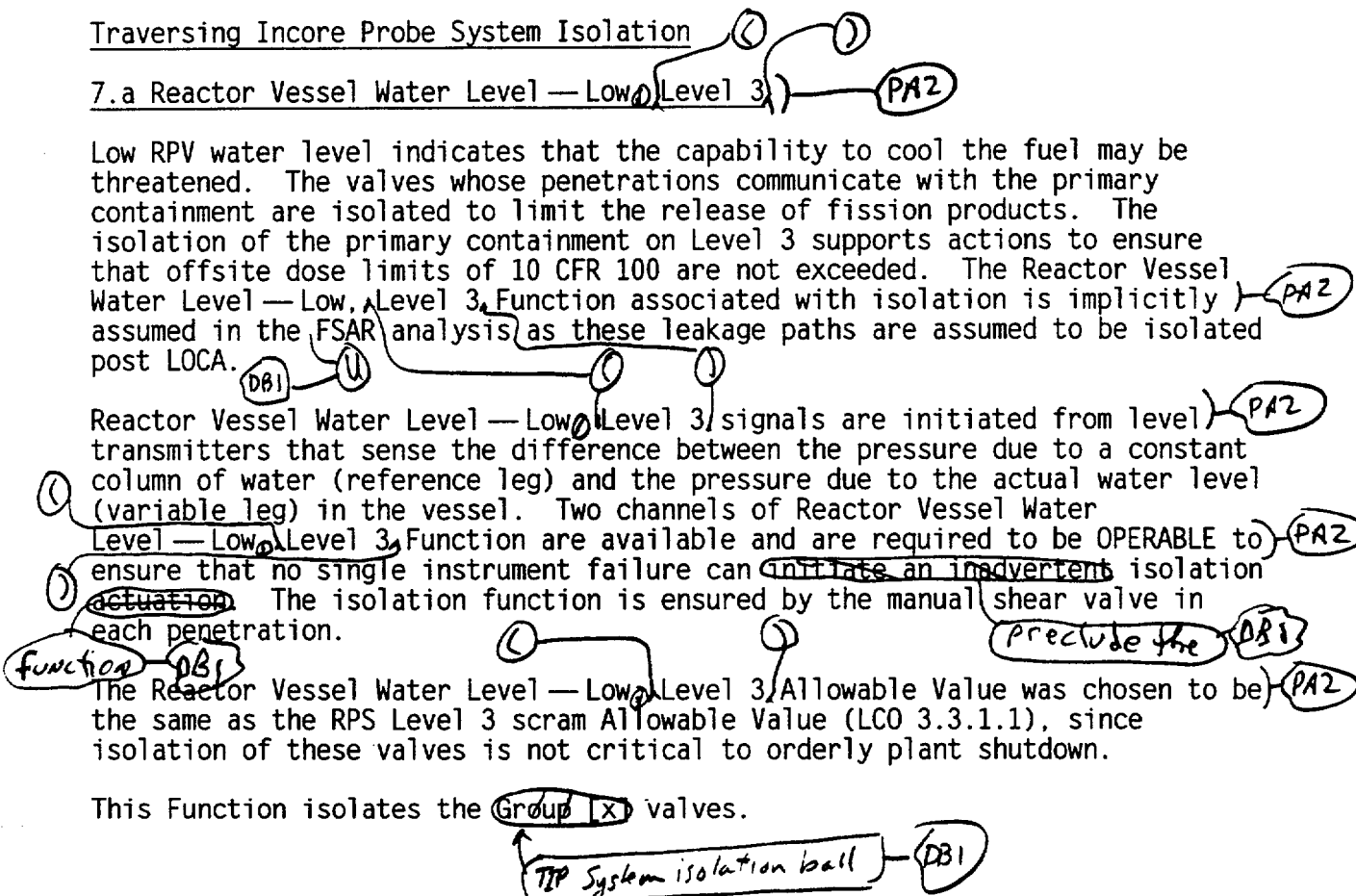
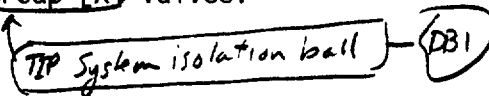
7.a Reactor Vessel Water Level — Low Level 3

Low RPV water level indicates that the capability to cool the fuel may be threatened. The valves whose penetrations communicate with the primary containment are isolated to limit the release of fission products. The isolation of the primary containment on Level 3 supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Reactor Vessel Water Level — Low Level 3 Function associated with isolation is implicitly assumed in the FSAR analysis as these leakage paths are assumed to be isolated post LOCA.

Reactor Vessel Water Level — Low Level 3 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Two channels of Reactor Vessel Water Level — Low Level 3 Function are available and are required to be OPERABLE to ensure that no single instrument failure can initiate an inadvertent isolation actuation. The isolation function is ensured by the manual shear valve in each penetration.

The Reactor Vessel Water Level — Low Level 3 Allowable Value was chosen to be the same as the RPS Level 3 scram Allowable Value (LCO 3.3.1.1), since isolation of these valves is not critical to orderly plant shutdown.

This Function isolates the Group X valves.



TSF 306 R2

TA3

INSERT FUNCTION 7 (continued)

7.b Drywell Pressure—High

High drywell pressure can indicate a break in the RCPB inside the primary containment. The isolation of some of the primary containment isolation valves on high drywell pressure supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Drywell Pressure - High Function, associated with isolation of the primary containment, is implicitly assumed in the FSAR accident analysis as these leakage paths are assumed to be isolated post LOCA.

DBI

High drywell pressure signals are initiated from pressure transmitters that sense the pressure in the drywell. Two channels of Drywell Pressure—High per Function are available and are required to be OPERABLE to ensure that no single instrument failure can initiate an inadvertent actuation. The isolation function is ensured by the manual shear valve in each penetration.

~~Preclude the isolation function~~

RPS

DBI

The Allowable Value was selected to be the same as the ECCS Drywell Pressure—High Allowable Value (LCO 3.3.0.1), since this may be indicative of a LOCA inside primary containment.

This Function isolates the Group (X) valves.

DBI

TIP System isolation ball

TSTF 306 R 2

BASES (continued)

ACTIONS

Reviewer's Note: Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use the times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

PA4

TSTF 306 R2

TAB
Insert
Actions 1

PA1

Note has been provided to modify the ACTIONS related to primary containment isolation instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable primary containment isolation instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable primary containment isolation instrumentation channel.

DB1

TSTF 306 R2

2.g, 2.h, 5.e, 5.f

DB1

2.a and 2.b

A.1

Because of the diversity of sensors available to provide isolation signals and the redundancy of the isolation design, an allowable out of service time of 12 hours for Functions 2.a, 2.b, and 6.b and 24 hours for Functions other than Functions 2.a, 2.b, and 6.b has been shown to be acceptable (Refs. 5 and 6) to permit restoration of any inoperable channel to OPERABLE status. This out of service time is only acceptable provided the associated Function is still maintaining isolation capability (refer to Required Action B.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action A.1. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue with no further restrictions. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an isolation), Condition C must be entered and its Required Action taken.

2.g, 2.h, 5.e, 5.f

DB1

PA3

(continued)

TAS

INSERT ACTIONS 1

The ACTIONS are modified by two Notes. Note 1 allows penetration flow path(s) to be unisolated intermittently under administrative controls. These controls consist of stationing a dedicated operator at the controls of the valve, who is in continuous communication with the control room. In this way, the penetration can be rapidly isolated when a need for primary containment isolation is indicated.

TSF 306 R2

BASES

ACTIONS
(continued)

B.1

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same function result in redundant automatic isolation capability being lost for the associated penetration flow path(s). The MSL Isolation Functions are considered to be maintaining isolation capability when sufficient channels are OPERABLE or in trip, such that both trip systems will generate a trip signal from the given Function on a valid signal. The other isolation functions are considered to be maintaining isolation capability when sufficient channels are OPERABLE or in trip, such that one trip system will generate a trip signal from the given Function on a valid signal. This ensures that one of the ~~two~~ PCIVs in the associated penetration flow path can receive an isolation signal from the given Function. For Functions 1.a, 1.b, 1.d, and 1.f, this would require both trip systems to have one channel OPERABLE or in trip. For Function 1.c, this would require both trip systems to have one channel, associated with each MSL, OPERABLE or in trip. For Functions 1.e and 1.g, each function consists of channels that monitor several locations within a given area (e.g., different locations within the main steam tunnel area). Therefore, this would require both trip systems to have one channel per location OPERABLE or in trip. For Functions 2.a, 2.b, 2.d, 2.e, 3.b, 3.c, 4.b, 4.c, 5.e, 5.f, and 6.b, this would require one trip system to have two channels, each OPERABLE or in trip. For Functions 2.c, 3.a, 3.d, 3.e, 3.f, 3.g, 3.h, 3.i, 4.a, 4.d, 4.e, 4.f, 4.g, 4.h, 4.j, 4.k, 5.a, 5.c, and 6.a, this would require one trip system to have one channel OPERABLE or in trip. For Functions 5.b and 5.d, each function consists of channels that monitor several different locations. Therefore, this would require one channel per location to be OPERABLE or in trip (the channels are not required to be in the same trip system). The Condition does not include the Manual Initiation Functions (Functions 1.h, 2.d, 3.j, 4.k, and 5.f), since they are not assumed in any accident or transient analysis. Thus, a total loss of manual initiation capability for 24 hours (as allowed by Required Action A.1) is allowed.

(associated with MSIV isolation)

DBI

(or the associated trip system in trip)

at least

(associated with MSIV isolation)

four areas are monitored by four channels

(associated with MSIV isolation)

Insert ACTION B.1-1

2.f

2.d

3.j, 4.f and 5.b

CSBI

two

Insert ACTION B.1-2

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 1 hour Completion Time is acceptable because it minimizes

(continued)

DBI

INSERT ACTION B.1-1

For Functions 1.a, 1.b and 1.d (associated with MSL drain isolation) this would require one trip system to have two channels, each OPERABLE or in trip. For Function 1.c (associated with MSL drain isolation) this will require one trip system to have two channels, associated with each MSL, each OPERABLE or in trip. For Function 1.e this would require one trip system to have two channels, associated with each main steam tunnel area, each to be OPERABLE or in trip. For Functions 2.g, 2.h and 2.i, as noted by footnote (b) to Table 3.3.6.1-1, there is only one trip system provided for each associated penetration. For these penetrations (i.e., hydrogen/oxygen sample and return, and gaseous/particulate sample supply and return) and for Functions 2.g and 2.h, this will require both channels to be OPERABLE or in trip in order to close at least one valve. For Function 2.i, this will require one channel to be OPERABLE or in trip in order to isolate at least one valve.

DBI

INSERT ACTION B.1-2

For Function 5.d, this would require that with the SLC initiation switch in start system A or B the associated valve will close. For Functions 7.a and 7.b the logic is arranged in one trip system, therefore this would require both channels to be OPERABLE or in trip, or the manual shear valves to be OPERABLE.

TSTF-306

BASES

ACTIONS

B.1 (continued)

risk while allowing time for restoration or tripping of channels.

C.1

Required Action C.1 directs entry into the appropriate Condition referenced in Table 3.3.6.1-1. The applicable Condition specified in Table 3.3.6.1-1 is Function and MODE or other specified condition dependent and may change as the Required Action of a previous Condition is completed. Each time an inoperable channel has not met any Required Action of Condition A or B and the associated Completion Time has expired, Condition C will be entered for that channel and provides for transfer to the appropriate subsequent Condition.

D.1, D.2.1, and D.2.2

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by placing the plant in at least MODE 3 within 12 hours and in MODE 4 within 36 hours (Required Actions D.2.1 and D.2.2). Alternately, the associated MSLs may be isolated (Required Action D.1), and, if allowed (i.e., plant safety analysis allows operation with an MSL isolated), operation with that MSL isolated may continue. Isolating the affected MSL accomplishes the safety function of the inoperable channel. The Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

PA1
one

E.1

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by placing the plant in at least MODE 2 within 8 hours.

8-CLDS

(continued)

BASES

ACTIONS

E.1 (continued)

8 CLBB

The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 2 from full power conditions in an orderly manner and without challenging plant systems.

F.1

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, plant operations may continue if the affected penetration flow path(s) is isolated. Isolating the affected penetration flow path(s) accomplishes the safety function of the inoperable channels.

For the RWCU Area and Area Ventilation Differential Temperature—High Functions, the affected penetration flow path(s) may be considered isolated by isolating only that portion of the system in the associated room monitored by the inoperable channel. That is, if the RWCU pump room A area channel is inoperable, the pump room A area can be isolated while allowing continued RWCU operation utilizing the B RWCU pump. For the RWCU Differential Flow—High Function, if the flow element/transmitter monitoring RWCU flow to radwaste and condensate is the only portion of the channel inoperable, then the affected penetration flow path(s) may be considered isolated by isolating the RWCU return to radwaste and condensate.

DB1

Alternately, if it is not desired to isolate the affected penetration flow path(s) (e.g., as in the case where isolating the penetration flow path(s) could result in a reactor scram), Condition H must be entered and its Required Actions taken.

The 1 hour Completion Time is acceptable because it minimizes risk while allowing sufficient time for plant operations personnel to isolate the affected penetration flow path(s).

G.1

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, plant operations

(continued)

1 STS 306 91

TA3
Insert 6.1

BASES

ACTIONS

G.1 (continued)

LCBI
the penetrations associated with

may continue if the affected penetration flow path(s) is isolated. Isolating the affected penetration flow path(s) accomplishes the safety function of the inoperable channels. The 24 hour Completion Time is acceptable due to the fact that these Functions (Manual Initiation) are not assumed in any accident or transient analysis in the FSAR.

Alternately, if it is not desired to isolate the affected penetration flow path(s) (e.g., as in the case where isolating the penetration flow path(s) could result in a reactor scram), Condition H must be entered and its Required Actions taken.

DBI

H.1 and H.2

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, or any Required Action of Condition F or G is not met and the associated Completion Time has expired, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by placing the plant in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

TSTF 306, R2

I.1 and I.2

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the associated SLC subsystem(s) is declared inoperable or the RWC System is isolated. Since this Function is required to ensure that the SLC System performs its intended function, sufficient remedial measures are provided by declaring the associated SLC subsystems inoperable or isolating the RWC System.

PA6

The 1 hour Completion Time is acceptable because it minimizes risk while allowing sufficient time for personnel to isolate the RWC System.

IA
IA
IA

(continued)

TAB

(LBI)

INSERT G.1

Or, in the case of the TIP system isolation, the TIP system penetration is a small bore (approx 1/2 inch), its isolation in a design basis event (with loss of offsite power) would be via the manually operated shear valves, and the ability to manually isolate by either the normal isolation valve or the shear valve is unaffected by the inoperable instrumentation.

are

(LBI)

7.5TF-306

BASES

ACTIONS
(continued)

J.1 and J.2

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the associated penetration flow path should be closed. However, if the shutdown cooling function is needed to provide core cooling, these Required Actions allow the penetration flow path to remain unisolated provided action is immediately initiated to restore the channel to OPERABLE status or to isolate the RHR Shutdown Cooling System (i.e., provide alternate decay heat removal capabilities so the penetration flow path can be isolated). Actions must continue until the channel is restored to OPERABLE status or the RHR Shutdown Cooling System is isolated.

TSTF 306/R2

PA4

SURVEILLANCE REQUIREMENTS

Reviewer's Note: Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

As noted at the beginning of the SRs, the SRs for each Primary Containment Isolation instrumentation Function are found in the SRs column of Table 3.3.6.1-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Refs. 4 and 6) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the PCIVs will isolate the penetration flow path(s) when necessary.

TSTF 306/R2

CLB2
or 6 hours for Functions 2.g, 2.h, 2.i, 7.a, and 7.b

Insert SR NOTE

CLB2

DBI XI

SR 3.3.6.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A

(continued)

C LB2

INSERT SR Note

For Functions 2.g, 2.h and 2.i this allowance is permitted since the associated penetration flow path(s) involve sample lines which form a closed system with the primary containment atmosphere. For Function 7.a and 7.b this is permitted since the associated penetrations can be manually isolated if needed.

TSF-306R2

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.3.6.1.1 (continued)

CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

PAI
Channel

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.6.1.2 and SR 3.3.6.1.5

CLB3

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function.

TFF-205
R3

TAI
Insert
SR 3.3.6.1.2

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The 92 day Frequency of SR 3.3.6.1.2 is based on the reliability analysis described in References 6 and 7. The 184 day Frequency of SR 3.3.6.1.5 is based on engineering judgment and the reliability of the components (time delay relays exhibit minimal drift).

CLB3

PBI
KI

(continued)

TAI

INSERT SR 3.3.6.1.2

A successful test of the required contacts(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

TSF-205 R3

BASES

SURVEILLANCE REQUIREMENTS
(continued)

SR 3.3.6.1.4

Calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.6.1-1. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is not beyond the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than that accounted for in the appropriate setpoint methodology.

The Frequency of 92 days is based on the reliability analysis of References 5 and 6.

operating experience that demonstrates this equipment to be reliable.

SR 3.3.6.1.4 AND SR 3.3.6.1.6

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

The Frequency of SR 3.3.6.1.6 is based on the assumption of a 92 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequency of SR 3.3.6.1.6 is based on the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.6.1.7

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required isolation logic for a specific channel. The system functional testing performed on PCIVs in LCO 3.6.1.3 overlaps this Surveillance to provide complete testing of the assumed safety function. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the

While this Surveillance can be performed with the reactor at power for some functions,

(continued)

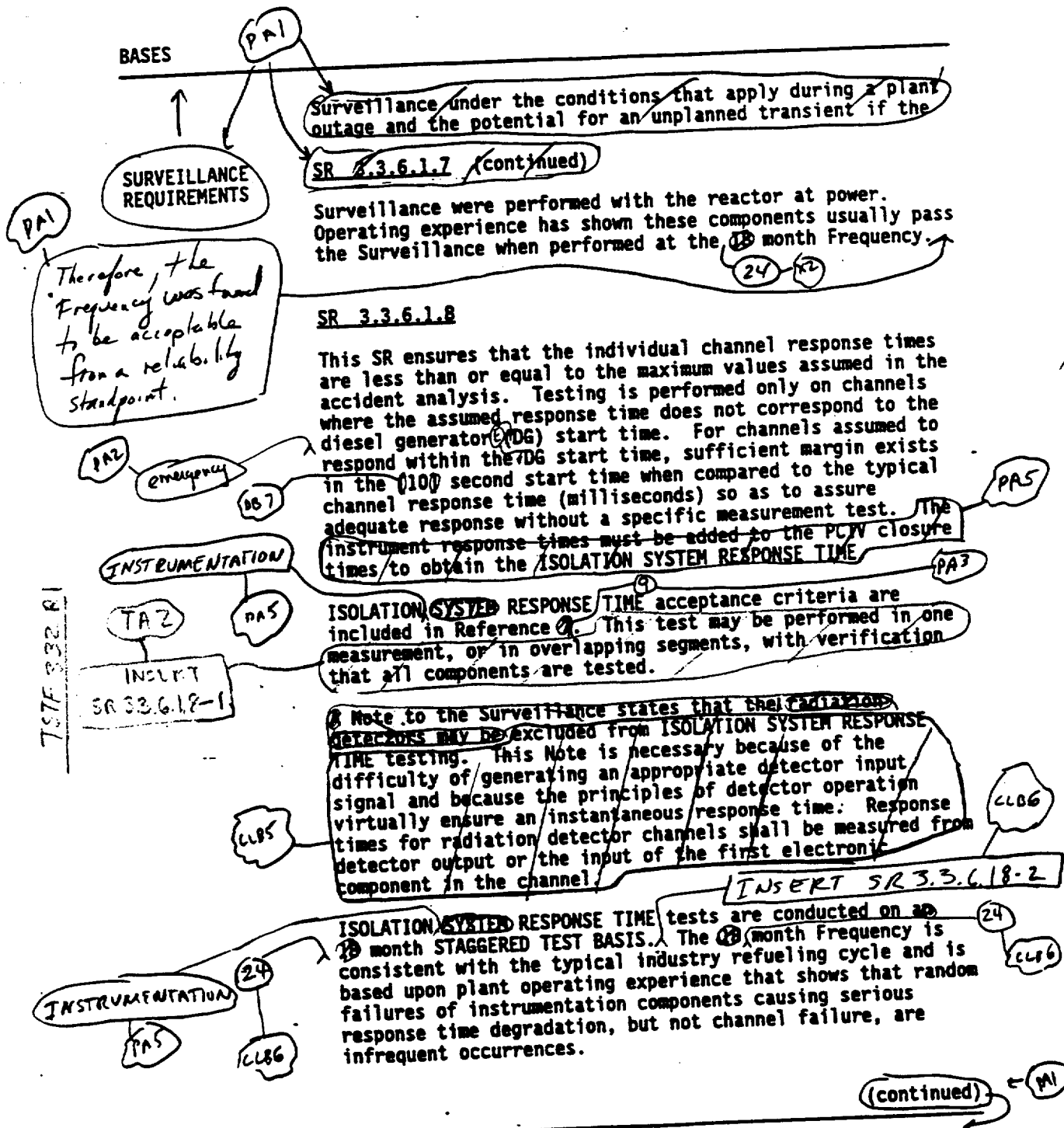
CLB4

DB6

INSERT SR 3.3.6.1.5

SR 3.3.6.1.6 however is only a calibration of the radiation detectors using a standard radiation source. As noted for SR 3.3.6.1.3, the main steam tunnel radiation detectors are excluded from CHANNEL CALIBRATION due to ALARA reasons (when the plant is operating, the radiation detectors are generally in a high radiation area; the steam tunnel). This exclusion is acceptable because the radiation detectors are passive devices, with minimal drift. The radiation detectors are calibrated in accordance with SR 3.3.6.1.6 on a 24 month Frequency. The CHANNEL CALIBRATION of the remaining portions of the channel (SR 3.3.6.1.3) are performed using a standard current source.

Reactor Vessel Water Level-Low Low Low (Level 1), Main Steam Line Pressure-Low and Main Steam Line Flow-High Function sensors (Functions 1.a, 1.b, and 1.c, respectively) are excluded from ISOLATION INSTRUMENTATION RESPONSE TIME testing (Ref. 11). However, during the CHANNEL CALIBRATION of these sensors, a response check must be performed to ensure adequate response. This testing is required by Reference 11. Personnel involved in this testing must have been trained in response to Reference 12 to ensure that they are aware of the consequences of instrument response time degradation. This response check must be performed by placing a fast ramp or a step change into the input of each required sensor. The personnel must monitor the input and output of the associated sensor so that simultaneous monitoring and verification may be accomplished.



TAZ

INSERT SR 3.3.6.1.8-1

ISOLATION SYSTEM RESPONSE TIME may be verified by actual response time measurements in any series of sequential, overlapping, or total channel measurements. However, the sensors for Functions 1.a, 1.b, and 1.c are allowed to be excluded from specific ISOLATION SYSTEM RESPONSE TIME measurement if the conditions of Reference 8 are satisfied. If these conditions are satisfied, sensor response time may be allocated based on either assumed design sensor response time or the manufacturer's stated design response time. When the requirements of Reference 8 are not satisfied, sensor response time must be measured. Furthermore, measurement of the instrument loops response time for Functions 1.a, 1.b, and 1.c is not required if the conditions of Reference 9 are satisfied. For all other Functions, the measurement of instrument loop response times may be excluded if the conditions of Reference 8 are satisfied.

DBI

10

CLB4

10 DBI

TSFK-332

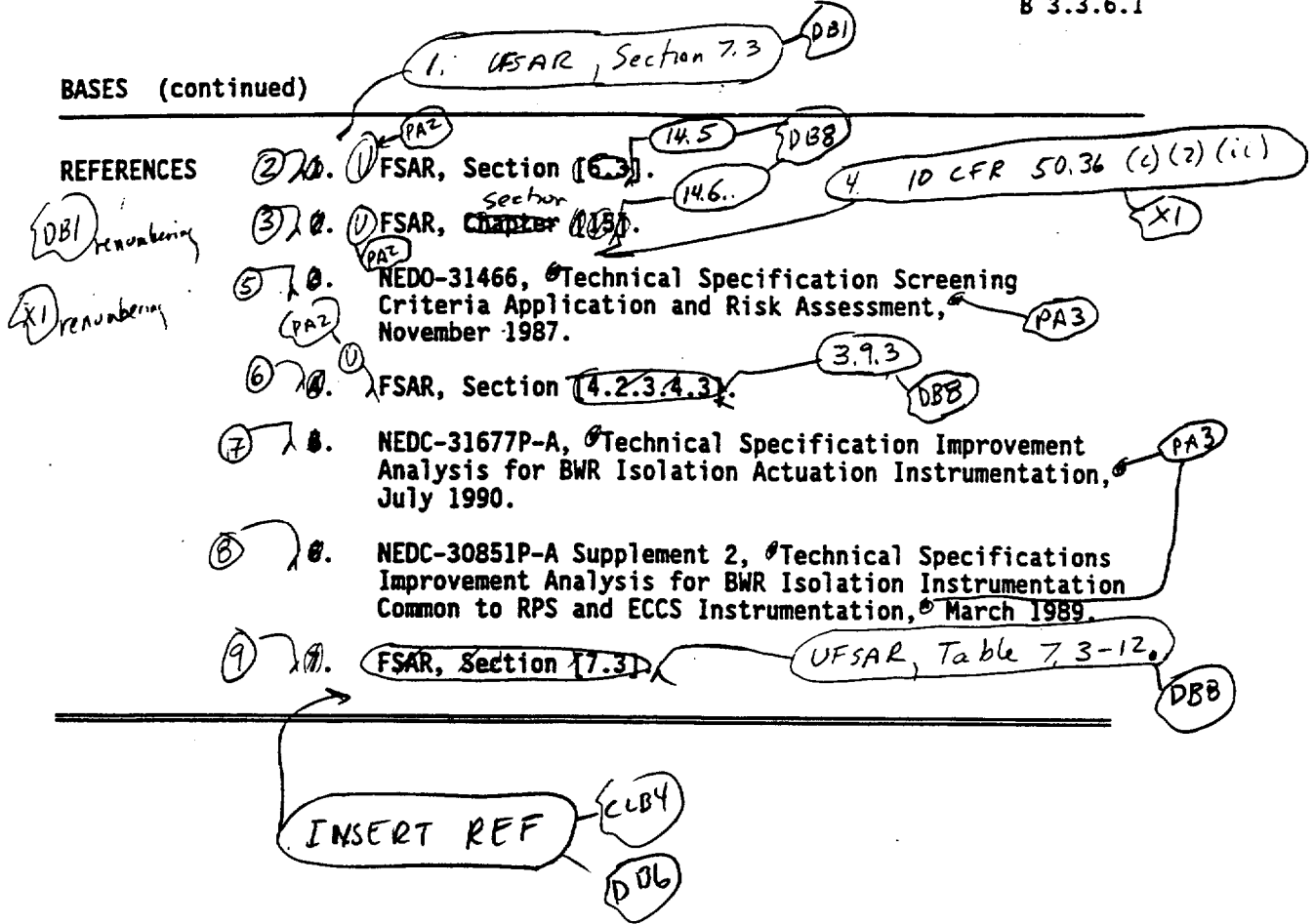
CLB6

INSERT SR 3.3.6.1.8-2

A Note requires STAGGERED TEST BASIS Frequency to be determined based on 2 channels. This will ensure that all required channels are tested during two Surveillance Frequency intervals. For Functions 1.a and 1.b, two channels must be tested during each test, while for Function 1.c, eight channels must be tested.

TSFK-332

BASES (continued)



INSERT REF

ELBY

DB6

10. NEDO-32291-A, System Analyses for the Elimination of Selected Response Time Testing, October 1995
11. NRC letter dated October 28, 1996, Issuance of Amendment 235 to Facility Operating License DPR-59 for James A. FitzPatrick Nuclear Power Plant.
12. NRC Bulletin 90-01, Supplement 1, Loss of Fill-Oil in Transmitters Manufactured by Rosemount, December 1992.
13. Drawing 11825-5.01-15D, Rev. D, Reactor Assembly Nuclear Boiler, (GE Drawing 919D690BD).

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.6.1

Primary Containment Isolation Instrumentation

**JUSTIFICATION FOR DIFFERENCES (JFDs)
FROM NUREG-1433, REVISION 1, BASES**

JUSTIFICATION FOR DIFFERENCES FROM NUREG-1433, REVISION 1
ITS BASES: 3.3.6.1 - PRIMARY CONTAINMENT ISOLATION INSTRUMENTATION

RETENTION OF EXISTING REQUIREMENT (CLB)

- CLB1 This change deletes the Main Steam Line Isolation Manual Initiation Function, PCI Manual Initiation Function, HPCI Manual Initiation, RCIC Manual Initiation and RWCU System Manual Initiation. These Functions are not currently required by the JAFNPP licensing basis and are not credited in the safety analysis. The Bases has been modified, as required to remove any references to these Manual Initiation Functions. However, ACTION G is retained for ITS use with Functions 7.a and 7.b on ITS Table 3.3.6.1.
- CLB2 The allowance in ITS 3.3.6.1 Surveillance Note 2 has been revised in accordance with License Amendment 227 to allow Functions 2.g and 7.a (Reactor Vessel Water Level-Low (Level 3) and 2.h and 7.b (Drywell Pressure-High) to not maintain isolation capability during the performance of a required Surveillance. Function 2.i (Reactor Building Exhaust Radiation-High) has been provided with the same allowance since certain penetrations will lose isolation capability when one channel is not Operable. The allowance is acceptable since the associated penetration flow paths(s) involve sample lines which form part of a closed system with the primary containment atmosphere or in the case of TIP System penetrations the manual shear valve is available for manual isolation.
- CLB3 This change deletes the ISTS SR 3.3.6.1.5 184 day Channel Functional Test from the Surveillance Requirements in ITS 3.3.6.1, "Primary Containment Isolation Instrumentation." None of the Primary Containment Isolation Instrumentation require a 184 day Channel Functional Test. This change is based on the current JAFNPP licensing basis. Subsequent Surveillances are renumbered, as required.
- CLB4 The ISOLATION INSTRUMENTATION RESPONSE TIME TEST has been revised to exclude the sensor response time as reflected in the Bases to SR 3.3.6.1.8. This allowance was approved in Technical Specification License Amendment 235. The Bases of SR 3.3.6.1.5 and SR 3.3.6.1.8 have been revised to reflect the allowances of this Amendment.
- CLB5 These ISOLATION RESPONSE TIME surveillance test has been deleted for certain Function since the EDG response time is much greater. The Bases of SR 3.3.6.1.8 has been revised to eliminate reference to testing of radiation detectors since these channels are not required to be tested.
- CLB6 The Bases has been revised consistent with Specification to ensure all required Functions are tested for ISOLATION INSTRUMENTATION RESPONSE TIME within two surveillance intervals. In addition, the SR Frequency

EA 3.3.6.1-9
TST-306

TST-332

JUSTIFICATION FOR DIFFERENCES FROM NUREG-1433, REVISION 1
ITS BASES: 3.3.6.1 - PRIMARY CONTAINMENT ISOLATION INSTRUMENTATION

RETENTION OF EXISTING REQUIREMENT (CLB)

CLB6 (continued)

has been changed from 18 to 24 months consistent with the current Frequency in CTS 4.2.A.

CLB7 The ISTS SR 3.3.6.1.3 bracketed Surveillance Frequency has been changed from 92 days to 184 days to be consistent with the frequency in CTS Table 4.2-1 Note 15 and approved in JAFNPP Technical Specification Amendment No. 89. The Surveillance has been renumbered as SR 3.3.6.1.4 and subsequent Surveillances have been renumbered, as required. The Bases has been modified to reflect these changes.

CLB8 The Completion Time associated with ITS 3.3.6.1 Required Action E.1 (Be in MODE 2) has been extended from 6 hours to 8 hours. This proposed Completion Time is consistent with CTS Table 3.2-1 Note 3.B, however the default mode has been modified as discussed in L15. The proposed time of 8 hours is considered reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant systems. The Bases has been modified to reflect these changes.

PLANT-SPECIFIC WORDING PREFERENCE OR MINOR EDITORIAL IMPROVEMENT (PA)

PA1 Editorial change made with no change in intent.

PA2 Changes have been made (additions, deletions, and/or changes to the NUREG) to reflect the plant specific nomenclature.

PA3 The quotations used in the Bases References have been removed. The Writer's Guide does not require the use of quotations.

PA4 Reviewer's Note (or reviewer's type of note) has been deleted. This information is for the NRC reviewer to be keyed in to what is needed to meet this requirement. This is not meant to be retained in the final version of the plant specific submittal.

PA5 The Definition of ISOLATION SYSTEM RESPONSE TIME has been changed in accordance with the changes made to the ITS 1.0. The Bases of SR 3.3.6.1.8 has been revised to reflect these changes.

PA6 Changes have been made (additions, deletions, and/or changes to the NUREG) to reflect the wording in the Specification.

JUSTIFICATION FOR DIFFERENCES FROM NUREG-1433, REVISION 1
ITS BASES: 3.3.6.1 - PRIMARY CONTAINMENT ISOLATION INSTRUMENTATION

PLANT-SPECIFIC DIFFERENCE IN THE DESIGN (DB)

- DB1 Changes have been made (additions, deletions, and/or changes to the NUREG) to reflect the plant specific design. Subsequent References have been renumbered, as required.
- DB2 The description of the setpoint calculation methodology has been revised to reflect the plant specific methodology.
- DB3 Changes have been made (additions, deletions, and/or changes to the NUREG) to reflect the plant safety analysis description.
- DB4 The following ITS 3.3.6.1 Functions have been added since they are required by design and current licensing basis: Main Steam Tunnel Radiation-High (1.f and 2.f); Function 2.e, Reactor Vessel Water Level-Low Low Low (Level 1); Functions 3.f, 3.g, 3.h, 3.i, 3.j (Area Temperatures associated with HPCI Isolation); Function 4.d, RCIC Steam Line Penetration (Drywell Entrance) Area Temperature-High; Function 5.a, Suction Line Penetration Area Temperature-High; Function 5.c, RWC Heat Exchanger Area Temperature-High; and Function 5.f, Drywell Pressure-High. In addition, Functions 2.g, 2.h, and 2.i have been added for those Functions which include only one trip system to certain penetration flow paths to simplify the Required Actions. Note (b) was added to Table 3.3.6.1-1 to identify these Functions. Subsequent Notes have been renumbered, where applicable. Subsequent Functions have been renumbered, as required. The Bases has been modified as required to reflect these changes.
- DB5 This change deletes various ITS Functions from the Table 3.3.6.1-1 since they are not included in the design: Function 1.f, Main Steam Tunnel Differential Temperature-High; Function 1.g, Turbine Building Area Temperature-High; Function 2.e, Refueling Floor Exhaust Radiation-High; Functions 3.d and 4.d, Drywell Pressure-High; Relays; Function 3.g and 4.f, HPCI and RCIC Suppression Pool Area Temperature-Time Delay Relays; Functions 3.h and 4.g, HPCI and RCIC Suppression Pool Area Differential Temperature-High; Function 3.i and 4.h, Emergency Area Cooler Temperature-High; Function 4.j, RCIC Equipment Room Differential Temperature-High; Function 5.a, Differential Flow-High and Function 5.c, Area Ventilation Differential Temperature-High. Subsequent Functions have been renumbered, as required. The Bases has been modified as required to reflect these changes.
- DB6 SR 3.3.6.1.6 has been added to calibrate the radiation detector of Functions 1.f and 2.f (Main Steam Tunnel Radiation-High) consistent with the current allowances in CTS Table 4.2-1. The remaining portion of the channels will be calibrated in accordance with SR 3.3.6.1.3.

JUSTIFICATION FOR DIFFERENCES FROM NUREG-1433, REVISION 1
ITS BASES: 3.3.6.1 - PRIMARY CONTAINMENT ISOLATION INSTRUMENTATION

PLANT-SPECIFIC DIFFERENCE IN THE DESIGN (DB)

DB6 (continued)

These allowances are consistent with the setpoint calculation methodology for these Functions. The Bases has been revised to reflect these changes.

DB7 The brackets have been removed and the plant specific value incorporated.

DB8 The plant specific References have been incorporated.

DIFFERENCE BASED ON AN APPROVED TRAVELER (TA)

TA1 The changes presented in Technical Specification Task Force (TSTF) Technical Specification Change Traveler number 205, Revision 3 have been incorporated into the revised Improved Technical Specifications.

TSTF
205 R3

TA2 The changes presented in Technical Specification Task Force (TSTF) Technical Specification Change Traveler number 332, Revision 1 have been incorporated into the revised Improved Technical Specifications. Certain changes associated with this traveler have not been incorporated as Supplement 1 to NEDO-32291-A has not been adopted for the JAFNPP.

TSTF
332 R1

TA3 The changes presented in Technical Specification Task Force (TSTF) Technical Specification Change Traveler number 306, Revision 2 have been incorporated into the revised Improved Technical Specifications.

TSTF
306 R2

DIFFERENCE BASED ON A SUBMITTED, BUT PENDING TRAVELER (TP)

None

DIFFERENCE FOR ANY REASON OTHER THAN THE ABOVE (X)

X1 NUREG-1433, Revision 1, Bases reference to "the NRC Policy Statement" has been replaced with 10 CFR 50.36(c)(2)(ii), in accordance with 60 FR 36953 effective August 18, 1995. Subsequent References have been renumbered, as required.

X2 The Frequency in ITS SR 3.3.6.1.7 (the LOGIC SYSTEM FUNCTIONAL TEST) and the 18 month surveillance extended to 24 months as justified in L13. This Frequency is consistent with the JAFNPP fuel cycle.

JAFNPP

IMPROVED STANDARD TECHNICAL SPECIFICATIONS (ISTS) CONVERSION

ITS: 3.3.6.1

Primary Containment Isolation Instrumentation

**RETYPE PROPOSED IMPROVED TECHNICAL
SPECIFICATIONS (ITS) AND BASES**

3.3 INSTRUMENTATION

3.3.6.1 Primary Containment Isolation Instrumentation

LC0 3.3.6.1 The primary containment isolation instrumentation for each Function in Table 3.3.6.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.6.1-1.

ACTIONS

- NOTES-----
1. Penetration flow paths may be unisolated intermittently under administrative controls.
 2. Separate Condition entry is allowed for each channel.
-

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable.	A.1 Place channel in trip.	12 hours for Functions 2.a, 2.b, 2.g, 2.h, 5.e, 5.f, 6.b, 7.a and 7.b <u>AND</u> 24 hours for Functions other than Functions 2.a, 2.b, 2.g, 2.h, 5.e, 5.f, 6.b, 7.a and 7.b
B. One or more Functions with isolation capability not maintained.	B.1 Restore isolation capability.	1 hour

(continued)

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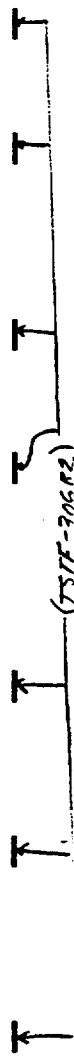
ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Enter the Condition referenced in Table 3.3.6.1-1 for the channel.	Immediately
D. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	D.1 Isolate associated main steam line (MSL).	12 hours
	<u>OR</u>	
	D.2.1 Be in MODE 3.	12 hours
	<u>AND</u>	
	D.2.2 Be in MODE 4.	36 hours
E. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	E.1 Be in MODE 2.	8 hours
F. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	F.1 Isolate the affected penetration flow path(s).	1 hour
G. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	G.1 Isolate the affected penetration flow path(s).	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>H. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.</p> <p><u>OR</u></p> <p>Required Action and associated Completion Time for Condition F or G not met.</p>	<p>H.1 Be in MODE 3.</p> <p><u>AND</u></p> <p>H.2 Be in MODE 4.</p>	<p>12 hours</p> <p>36 hours</p>
<p>I. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.</p>	<p>I.1 Declare associated standby liquid control subsystem (SLC) inoperable.</p> <p><u>OR</u></p> <p>I.2 Isolate the Reactor Water Cleanup System.</p>	<p>1 hour</p> <p>1 hour</p>
<p>J. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.</p>	<p>J.1 Initiate action to restore channel to OPERABLE status.</p> <p><u>OR</u></p> <p>J.2 Initiate action to isolate the Residual Heat Removal (RHR) Shutdown Cooling System.</p>	<p>Immediately</p> <p>Immediately</p>



SURVEILLANCE REQUIREMENTS

- NOTES-----
1. Refer to Table 3.3.6.1-1 to determine which SRs apply for each Primary Containment Isolation Function.
 2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours provided the associated Function maintains isolation capability; and (b) 6 hours for Functions 2.g, 2.h, 2.i, 7.a, and 7.b.
-

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SURVEILLANCE	FREQUENCY
SR 3.3.6.1.1 Perform CHANNEL CHECK.	12 hours
SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.6.1.3 -----NOTE----- For Functions 1.f and 2.f, radiation detectors are excluded. ----- Perform CHANNEL CALIBRATION.	92 days
SR 3.3.6.1.4 Calibrate the trip units.	184 days
SR 3.3.6.1.5 Perform CHANNEL CALIBRATION.	24 months
SR 3.3.6.1.6 Calibrate the radiation detectors.	24 months
SR 3.3.6.1.7 Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.3.6.1.8 NOTE..... "n" equals 2 channels for the purpose of determining the STAGGERED TEST BASIS Frequency. Verify the ISOLATION INSTRUMENTATION RESPONSE TIME is within limits.</p>	<p>24 months on a STAGGERED TEST BASIS</p>

TSF-332 R1

Primary Containment Isolation Instrumentation
3.3.6.1

Table 3.3.6.1-1 (page 1 of 6)
Primary Containment Isolation Instrumentation

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FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Main Steam Line Isolation					
a. Reactor Vessel Water Level - Low Low Low (Level 1)	1,2,3	2	D	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7 SR 3.3.6.1.8	≥ 18 inches
b. Main Steam Line Pressure - Low	1	2	E	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7 SR 3.3.6.1.8	≥ 825 psig
c. Main Steam Line Flow - High	1,2,3	2 per MSL	D	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7 SR 3.3.6.1.8	≤ 125.9 psid
d. Condenser Vacuum - Low	1, 2(a), 3(a)	2	D	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≥ 8 inches Hg vacuum
e. Main Steam Tunnel Area Temperature - High	1,2,3	8	D	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 195°F
f. Main Steam Tunnel Radiation - High	1(e), 2(e)	2	F	SR 3.3.6.1.1 SR 3.3.6.1.3 SR 3.3.6.1.6 SR 3.3.6.1.7	≤ 3 times Normal Full Power Background

IA

IA

IA

(continued)

(a) With any turbine stop valve not closed.
(e) With THERMAL POWER ≤ 10% RTP.

Primary Containment Isolation Instrumentation
3.3.6.1

Table 3.3.6.1-1 (page 2 of 6)
Primary Containment Isolation Instrumentation

TSTF-306 R2

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Primary Containment Isolation					
a. Reactor Vessel Water Level - Low (Level 3)	1.2.3	2	H	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≥ 177 inches
b. Drywell Pressure - High	1.2.3	2	H	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 2.7 psig
c. Containment Radiation - High	1.2.3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 450 R/hr
d. Reactor Building (RB) Exhaust Radiation - High	1.2.3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.3 SR 3.3.6.1.7	≤ 24,800 cpm
e. Reactor Vessel Water Level - Low Low Low (Level 1)	1.2.3	2	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≥ 18 inches
f. Main Steam Tunnel Radiation - High	1 ^(e) , 2 ^(e)	2	F	SR 3.3.6.1.1 SR 3.3.6.1.3 SR 3.3.6.1.6 SR 3.3.6.1.7	≤ 3 times Normal Full Power Background
g. Reactor Vessel Water Level - Low (Level 3)	1.2.3	2 ^(b)	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≥ 177 inches
h. Drywell Pressure - High	1.2.3	2 ^(b)	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 2.7 psig
i. RB Exhaust Radiation - High	1.2.3	1 ^(b)	F	SR 3.3.6.1.1 SR 3.3.6.1.3 SR 3.3.6.1.7	≤ 24,800 cpm

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(b) Only one trip system provided for each associated penetration.
(e) With THERMAL POWER ≤ 10% RTP.

Primary Containment Isolation Instrumentation
3.3.6.1

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Table 3.3.6.1-1 (page 3 of 6)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. High Pressure Coolant Injection (HPCI) System Isolation					
a. HPCI Steam Line Flow - High	1,2,3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 168.24 inches of water dP
b. HPCI Steam Supply Line Pressure - Low	1,2,3	2	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≥ 61 psig and ≤ 90 psig
c. HPCI Turbine Exhaust Diaphragm Pressure - High	1,2,3	2	F	SR 3.3.6.1.3 SR 3.3.6.1.7	≤ 9.9 psig
d. HPCI Steam Line Penetration (Drywell Entrance) Area Temperature - High	1,2,3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 160°F
e. HPCI Steam Line Torus Room Area Temperature - High	1,2,3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 160°F
f. RHR Heat Exchanger A Area Temperature - High	1,2,3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 170°F
g. RHR Heat Exchanger B Area Temperature - High	1,2,3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 170°F
h. RB Southwest Area of Elevation 272' Temperature - High	1,2,3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 144°F
i. RB Southeast Area of Elevation 272' Temperature - High	1,2,3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 144°F

(continued)

Primary Containment Isolation Instrumentation
3.3.6.1

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Table 3.3.6.1-1 (page 4 of 6)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. HPCI System Isolation (continued)					
j. HPCI Equipment Area Temperature - High	1.2.3	2	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 144°F
4. Reactor Core Isolation Cooling (RCIC) System Isolation					
a. RCIC Steam Line Flow - High	1.2.3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 272.26 inches of water dP
b. RCIC Steam Supply Line Pressure - Low	1.2.3	2	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≥ 58 psig and ≤ 93 psig
c. RCIC Turbine Exhaust Diaphragm Pressure - High	1.2.3	2	F	SR 3.3.6.1.3 SR 3.3.6.1.7	≤ 5 psig
d. RCIC Steam Line Penetration (Drywell Entrance) Area Temperature - High	1.2.3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 160°F
e. RCIC Steam Line Torus Room Area Temperature - High	1.2.3	1	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 160°F
f. RCIC Equipment Area Temperature - High	1.2.3	2	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 144°F

(continued)

Primary Containment Isolation Instrumentation
3.3.6.1

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Table 3.3.6.1-1 (page 5 of 6)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
5. Reactor Water Cleanup (RWCU) System Isolation					
a. RWCU Suction Line Penetration Area Temperature - High	1.2.3	1	F	SR 3.3.6.1.3 SR 3.3.6.1.7	≤ 143.98°F
b. RWCU Pump Area Temperature - High					
Pump A	1.2.3	1	F	SR 3.3.6.1.3 SR 3.3.6.1.7	≤ 164.98°F
Pump B	1.2.3	1	F	SR 3.3.6.1.3 SR 3.3.6.1.7	≤ 174.98°F
c. RWCU Heat Exchanger Room Area Temperature - High	1.2.3	1	F	SR 3.3.6.1.3 SR 3.3.6.1.7	≤ 154.98°F
d. SLC System Initiation	1.2	2 ^(c)	I	SR 3.3.6.1.7	NA
e. Reactor Vessel Water Level - Low (Level 3)	1.2.3	2	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≥ 177 inches
f. Drywell Pressure - High	1.2.3	2	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 2.7 psig
6. Shutdown Cooling System Isolation					
a. Reactor Pressure - High	1.2.3	1	F	SR 3.3.6.1.3 SR 3.3.6.1.7	≤ 74 psig
b. Reactor Vessel Water Level - Low (Level 3)	3.4.5	2 ^(d)	J	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≥ 177 inches

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(continued)

- (c) SLC System Initiation only inputs into one of the two trip systems and only isolates one valve in the RWCU suction and return line.
- (d) Only one trip system required in MODES 4 and 5 when RHR Shutdown Cooling System integrity maintained.

IF

Primary Containment Isolation Instrumentation
3.3.6.1

Table 3.3.6.1-1 (page 6 of 6)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
7. Traversing Incore Probe System Isolation					
a. Reactor Vessel Water Level - Low (Level 3)	1,2,3	2	G	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≥ 177 inches
b. Drywell Pressure - High	1,2,3	2	G	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.5 SR 3.3.6.1.7	≤ 2.7 psig

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B 3.3 INSTRUMENTATION

B 3.3.6.1 Primary Containment Isolation Instrumentation

BASES

BACKGROUND

The primary containment isolation instrumentation automatically initiates closure of appropriate primary containment isolation valves (PCIVs). The function of the PCIVs, in combination with other accident mitigation systems, is to limit fission product release during and following postulated Design Basis Accidents (DBAs). Primary containment isolation within the time limits specified for those isolation valves designed to close automatically ensures that the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for a DBA.

The isolation instrumentation includes the sensors, logic circuits, relays, and switches that are necessary to cause initiation of primary containment and reactor coolant pressure boundary (RCPB) isolation. Most channels include electronic equipment (e.g., trip units) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel output relay actuates, which then outputs a primary containment isolation signal to the isolation logic. Functional diversity is provided by monitoring a wide range of independent parameters. The input parameters to the isolation logics are (a) reactor vessel water level, (b) main steam line (MSL) pressure, (c) MSL flow, (d) condenser vacuum, (e) main steam tunnel area temperatures, (f) main steam tunnel radiation, (g) drywell pressure, (h) containment radiation, (i) reactor building exhaust radiation, (j) high pressure coolant injection HPCI and reactor core isolation cooling (RCIC) steam line flow, (k) HPCI and RCIC steam line pressure, (l) HPCI and RCIC turbine exhaust diaphragm pressure, (m) HPCI and RCIC area temperatures, (n) reactor water cleanup (RWCU) area temperature, (o) Standby Liquid Control (SLC) System initiation, and (p) reactor pressure. Redundant sensor input signals from each parameter are provided for initiation of isolation. The only exception is SLC System initiation.

Primary containment isolation instrumentation has inputs to the trip logic of the isolation functions listed below.

(continued)

BASES

BACKGROUND
(continued)

1. Main Steam Line Isolation

Most MSL Isolation Functions receive inputs from four channels. The outputs from these channels are combined in a one-out-of-two taken twice logic to initiate isolation of all main steam isolation valves (MSIVs). The outputs from the same channels are arranged into two two-out-of-two logic trip systems to isolate all MSL drain valves. The MSL drain line has two isolation valves with one two-out-of-two logic system associated with each valve.

The exceptions to this arrangement are the Main Steam Line Flow-High, Main Steam Tunnel Temperature-High and the Main Steam Tunnel Radiation-High Functions. The Main Steam Line Flow-High Function uses 16 flow channels, four for each steam line. One channel from each steam line inputs to one of the four trip channels. Two trip channels make up each trip system and both trip systems must trip to cause an MSL isolation. Each trip channel has four inputs (one per MSL), any one of which will trip the trip channel. The trip channels are arranged in a one-out-of-two taken twice logic. This is effectively a one-out-of-eight taken twice logic arrangement to initiate isolation of the MSIVs. Similarly, the 16 flow channels are connected into two two-out-of-two logic trip systems (effectively, two one-out-of-four twice logic), with each trip system isolating one of the two MSL drain valves on the associated steam line. The Main Steam Tunnel Temperature-High Function receives input from 16 channels. The logic is arranged similar to the Main Steam Line Flow-High Function. The Main Steam Tunnel Radiation-High Function receives inputs from four channels. The outputs from the channels are arranged into two two-out-of-two logic trip systems and isolates the MSL drain valves. This Function does not provide an MSIV isolation signal. Each trip system is associated with one MSL drain valve with a two-out-of-two logic.

2. Primary Containment Isolation

The Reactor Vessel Water Level-Low (Level 3) and Drywell Pressure-High Primary Containment Isolation Functions (Functions 2.a and 2.b) receive inputs from four channels. Normally the outputs from these channels are arranged into two two-out-of-two logic trip systems. One trip system

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2. Primary Containment Isolation (continued)

initiates isolation of all inboard primary containment isolation valves, while the other trip system initiates isolation of all outboard primary containment isolation valves. Each logic closes one of the two valves on each penetration, so that operation of either logic isolates the penetration. The exception to this arrangement for the Reactor Vessel Water Level-Low (Level 3) and Drywell Pressure-High Functions (Functions 2.g and 2.h) are with certain penetration flow paths (i.e., hydrogen/oxygen sample supply and return valves, and gaseous/particulate sample supply and return valves). For these penetration flow paths only one logic trip system closes two valves in each flow path as noted by footnote (b) to Table 3.3.6.1-1. The design is acceptable since it helps ensure post-accident sampling capability is maintained. The remainder of the penetration flow paths isolated by the Reactor Vessel Water Level-Low (Level 3) and Drywell Pressure-High Functions (Functions 2.a and 2.b) are extensive and are identified in Reference 1.

The Containment Radiation-High Function (Function 2.c) includes two channels, whose outputs are arranged in two one-out-of-one logic trip systems. Each trip system isolates one valve per associated penetration, so that operation of either logic isolates the penetration. The penetration flow paths isolated by this Function include the drywell and suppression chamber vent and purge valves.

The Reactor Building Exhaust Radiation-High Function (Function 2.d) includes two channels, whose outputs are arranged in two one-out-of-one logic trip systems. Each trip system normally isolates one valve per associated penetration, so that operation of either logic isolates the penetration. The exception to this arrangement for the Reactor Building Exhaust Radiation-High Function (Function 2.i) are with certain penetration flow paths (i.e., hydrogen/oxygen sample supply and return valves, and gaseous/particulate sample supply and return valves). In these penetration flow paths, both valves are isolated by the same logic trip system, as noted by footnote (b) to Table 3.3.6.1-1. The design is acceptable since it helps ensure post-accident sampling capability is maintained. The penetration flow paths isolated by the Reactor Building

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2. Primary Containment Isolation (continued)

Exhaust Radiation-High Function are extensive and are identified in Reference 1. The Reactor Vessel Water-Low Low Low (Level 1) and the Main Steam Line Radiation-High Functions (Functions 2.e and 2.f) both have four channels, whose outputs are arranged into two two-out-of-two logic trip systems for each Function. One trip system initiates isolation of the associated inboard isolation valves, while the other trip system initiates the isolation of the associated outboard valves. The penetration flow path isolated by these Functions is the recirculation loop sample valves.

3. 4. High Pressure Coolant Injection System Isolation and Reactor Core Isolation Cooling System Isolation

Most Functions that isolate HPCI and RCIC receive input from two channels, with each channel in one trip system using a one-out-of-one logic. Each trip system for HPCI and RCIC closes the associated steam supply valves. Each HPCI trip system closes the associated pump suction isolation valve. One HPCI trip system and both RCIC trip systems will also initiate a turbine trip which in turn closes the main pump minimum flow isolation valve and pump discharge to reactor isolation valve.

The exceptions are the HPCI and RCIC Turbine Exhaust Diaphragm Pressure-High, Steam Supply Line Pressure-Low, and the Equipment Area Temperature-High Functions (Functions 3.b through 3.j and 4.b through 4.f). These Functions receive inputs from four channels. The outputs from the turbine exhaust diaphragm pressure and steam supply pressure channels are each connected to two two-out-of-two trip systems. The output of each equipment area temperature channel is connected to one trip system so that any channel will trip its associated trip system. This arrangement is consistent with all other area temperature Functions, in that any channel will trip its associated trip system.

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5. Reactor Water Cleanup System Isolation

The Reactor Vessel Water Level-Low (Level 3) and Drywell Pressure-High Isolation Functions (Functions 5.e and 5.f) receive input from four channels. The outputs from these channels are connected into two two-out-of-two trip systems for each function. The SLC System Initiation Function (Function 5.d) receives input from two channels, with both channels providing input to one trip system. Any channel will initiate the trip logic. The Function is initiated by placing the SLC System initiation switch in any position other than stop (start system A or start system B). Therefore, a channel is defined as the circuitry required to trip the trip logic when the switch is in position start system A or start system B. The Area Temperature-High Functions (Functions 5.a, 5.b and 5.c) receive input from eight temperature monitors, four to each trip system. These are configured so that any one input will trip the associated trip system. Each of the two trip systems is connected to one of the two valves on the RWCU suction penetration and only one trip system is connected to the RWCU return penetration outboard valve. The trip system associated with the SLC System Initiation Function is connected to the outboard RWCU suction valve and the outboard RWCU return penetration valve.

1A
1A
1A

6. Shutdown Cooling System Isolation

The Reactor Vessel Water Level-Low (Level 3) Function (Function 6.b) receives input from four reactor water level channels. The outputs from the reactor vessel water level channels are connected to two two-out-of-two trip systems. Each of the two trip systems is connected to one of the two valves on the RHR shutdown cooling pump suction penetration and on one of the two inboard LPCI injection valves if in shutdown cooling mode. The Reactor Pressure-High Function (Function 6.a) receives input from two channels, with each channel providing input into each trip system using a one-out-of-two logic. However, only one channel input is required to be OPERABLE for a trip system to be considered OPERABLE. Each of the two trip systems is connected to one of the two valves on the shutdown cooling pump suction penetration.

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7. Traversing Incore Probe System Isolation

The Reactor Vessel Water Level—Low, Level 3 Isolation Function receives input from two reactor vessel level channels. The outputs from the reactor vessel water level channels are connected into one two-out-of-two logic trip system. The Drywell Pressure—High Isolation function receives input from two drywell pressure channels. The outputs from the drywell pressure channels are connected into one two-out-of-two logic trip system.

When either Isolation Function actuates, the TIP drive mechanisms will withdraw the TIPs, if inserted, and close the inboard TIP system isolation ball valves when the TIPs are fully withdrawn. The outboard TIP system isolation valves are manual shear valves.

TIP System Isolation Functions isolate the inboard isolation ball valves.

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The isolation signals generated by the primary containment isolation instrumentation are implicitly assumed in the safety analyses of References 2 and 3 to initiate closure of valves to limit offsite doses. Refer to LCO 3.6.1.3, "Primary Containment Isolation Valves (PCIVs)," Applicable Safety Analyses Bases for more detail of the safety analyses.

Primary containment isolation instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 4). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

The OPERABILITY of the primary containment instrumentation is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.6.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints within the specified Allowable Values, where appropriate. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time, where appropriate.

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Allowable Values are specified for each Primary Containment Isolation Function specified in the Table. Nominal trip setpoints are specified in the setpoint calculations. The nominal setpoints are selected to ensure that the setpoints do not exceed the Allowable Value between CHANNEL CALIBRATIONS. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable. Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis or other appropriate documents. The trip setpoints are derived from the analytical limits and account for all worst case instrumentation uncertainties as appropriate (e.g., drift, process effects, calibration uncertainties, and severe environmental errors (for channels that must function in harsh environments as defined by 10 CFR 50.49)). The trip setpoints derived in this manner provide adequate protection because all expected uncertainties are accounted for. The Allowable Values are then derived from the trip setpoints by accounting for normal effects that would be seen during periodic surveillance or calibration. These effects are instrumentation uncertainties observed during normal operation (e.g., drift and calibration uncertainties).

Certain Emergency Core Cooling Systems (ECCS) and RCIC valves (e.g., minimum flow) also serve the dual function of automatic PCIVs. The signals that isolate these valves are also associated with the automatic initiation of the ECCS and RCIC. The instrumentation requirements and ACTIONS associated with these signals are addressed in LCO 3.3.5.1, "Emergency Core Cooling Systems (ECCS) Instrumentation," and LCO 3.3.5.2, "Reactor Core Isolation Cooling (RCIC) System Instrumentation," and are not included in this LCO.

In general, the individual Functions are required to be OPERABLE in MODES 1, 2, and 3 consistent with the Applicability for LCO 3.6.1.1, "Primary Containment." Functions that have different Applicabilities are discussed below in the individual Functions discussion.

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The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Main Steam Line Isolation

1.a. Reactor Vessel Water Level - Low Low Low (Level 1)

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of the MSIVs and other interfaces with the reactor vessel occurs to prevent offsite dose limits from being exceeded. The Reactor Vessel Water Level - Low Low Low (Level 1) Function is one of the many Functions assumed to be OPERABLE and capable of providing isolation signals. The Reactor Vessel Water Level - Low Low Low (Level 1) Function associated with isolation is assumed in the analysis of the recirculation line break (Ref. 2). The isolation of the MSLs on Level 1 supports actions to ensure that offsite dose limits are not exceeded for a DBA. Reactor vessel water level signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low Low (Level 1) Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level - Low Low Low (Level 1) Allowable Value is chosen to ensure that the MSLs isolate on a potential loss of coolant accident (LOCA) to prevent offsite doses from exceeding 10 CFR 100 limits. In addition, the setting is low enough to allow the removal of heat from the reactor for a predetermined time following a scram, prevent isolation or a partial loss of feedwater and to reduce challenges to the safety/relief valves (S/RVs). The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 13).

This Function isolates the MSIVs and MSL drain valves.

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1.b. Main Steam Line Pressure - Low

Low MSL pressure indicates that there may be a problem with the turbine pressure regulation, which could result in a low reactor vessel water level condition and the RPV cooling down at a rate greater than 100°F/hr if the pressure loss is allowed to continue. The Main Steam Line Pressure-Low Function is directly assumed in the analysis of the pressure regulator failure (Ref. 3). For this event, the closure of the MSIVs ensures that the RPV temperature change limit (100°F/hr) is not reached. In addition, this Function supports actions to ensure that Safety Limit 2.1.1.1 is not exceeded. (This Function closes the MSIVs prior to pressure decreasing below 785 psig, which results in a scram due to MSIV closure, thus reducing reactor power to < 25% RTP.)

The MSL low pressure signals are initiated from four transmitters that are connected to the MSL pressure averaging manifold. The transmitters are arranged such that, even though physically separated from each other, each transmitter is able to detect low MSL pressure. Four channels of Main Steam Line Pressure-Low Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value was selected high enough to detect a pressure regulator malfunction and prevent excessive RPV depressurization. In addition, the setting is low enough to prevent spurious isolations.

The Main Steam Line Pressure-Low Function is only required to be OPERABLE in MODE 1 since this is when the assumed transient can occur (Ref. 2). This Function is automatically bypassed when the reactor mode switch is not in the run position.

This Function isolates the MSIVs and MSL drain valves.

1.c. Main Steam Line Flow - High

Main Steam Line Flow-High is provided to detect a break of the MSL and to initiate closure of the MSIVs. If the steam were allowed to continue flowing out of the break, the reactor would depressurize and the core could uncover. If

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1.c. Main Steam Line Flow-High (continued)

the RPV water level decreases too far, fuel damage could occur. Therefore, the isolation is initiated on high flow to prevent or minimize core damage. The Main Steam Line Flow-High Function is directly assumed in the analysis of the main steam line break (MSLB) (Ref. 3). The isolation action, along with the scram function of the Reactor Protection System (RPS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46 and offsite doses do not exceed the 10 CFR 100 limits.

The MSL flow signals are initiated from 16 transmitters that are connected to the four MSLs. The transmitters are arranged such that, even though physically separated from each other, all four connected to one MSL would be able to detect the high flow. Four channels of Main Steam Line Flow-High Function for each unisolated MSL (two channels per trip system) are available and are required to be OPERABLE so that no single instrument failure will preclude detecting a break in any individual MSL.

The Allowable Value is chosen to ensure that offsite dose limits are not exceeded due to the break. In addition, the setting is high enough to permit the isolation of one main steam line at reduced power without causing an automatic isolation of the steam lines yet low enough to permit early detection of a gross steam line break.

This Function isolates the MSIVs and MSL drain valves.

1.d. Condenser Vacuum-Low

The Condenser Vacuum-Low Function is provided to prevent overpressurization of the main condenser in the event of a loss of the main condenser vacuum. Since the integrity of the condenser is an assumption in offsite dose calculations, the Condenser Vacuum-Low Function is assumed to be OPERABLE and capable of initiating closure of the MSIVs. The closure of the MSIVs is initiated to prevent the addition of steam that would lead to additional condenser pressurization and possible rupture of the diaphragm installed to protect the turbine exhaust hood, thereby preventing a potential radiation leakage path following an accident.

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1.d. Condenser Vacuum-Low (continued)

Condenser vacuum pressure signals are derived from four pressure transmitters that sense the pressure in the condenser. Four channels of Condenser Vacuum-Low Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value is chosen to prevent damage to the condenser due to pressurization, thereby ensuring its integrity for offsite dose analysis. As noted (footnote (a) to Table 3.3.6.1-1), the channels are not required to be OPERABLE in MODES 2 and 3 when all turbine stop valves (TSVs) are closed, since the potential for condenser overpressurization is minimized. The Function is automatically bypassed when the reactor mode switch is not in the run position and when all TSVs are closed.

This Function isolates the MSIVs and MSL drain valves.

1.e. Main Steam Tunnel Area Temperature-High

Main Steam Tunnel Area temperature is provided to detect abreak in a main steam line and provides diversity to the high flow instrumentation. High temperature in the main steam tunnel outside the primary containment could indicate a break in a main steam line. The automatic closure of the MSIVs and MSL drains, prevents excessive loss of reactor coolant and the release of significant amounts of radioactive material from the reactor coolant pressure boundary. The isolation occurs when a very small leak has occurred. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. However, credit for these instruments is not taken in any transient or accident analysis in the UFSAR, since bounding analyses are performed for large breaks, such as MSLBs.

Main Steam Tunnel Area temperature signals are initiated from resistance temperature detectors (RTDs) located in the area being monitored. Sixteen channels of Main Steam Tunnel Temperature-High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

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1.e. Main Steam Tunnel Area Temperature-High (continued)

The Allowable Value is chosen high enough above the temperature expected during power operations to avoid spurious isolation, yet low enough to provide early indication of a steam line break.

These Functions isolate the MSIVs and MSL drain valves.

1.f. Main Steam Tunnel Radiation-High

The Main Steam Tunnel Radiation-High isolation signal has been removed from the MSIV isolation logic circuitry (Ref. 1); however, this isolation Function has been retained for the MSL drains valves (and other valves discussed under 2.f) to ensure that the assumptions utilized to determine that acceptable offsite doses resulting from a control rod drop accident (CRDA) are maintained.

Main Steam Tunnel Radiation-High signals are generated from four radiation elements and associated monitors, which are located near the main steam lines in the steam tunnel. Four instrumentation channels of the Main Steam Line Radiation-High Function are available and required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value was selected to be low enough that a high radiation trip results from the fission products released in the CRDA. In addition, the setting is adjusted high enough above the background radiation level in the vicinity of the main steam lines so that spurious trips are avoided at rated power. As noted (footnote (e) to Table 3.3.6.1-1), the channels are only required to be OPERABLE in MODES 1 and 2 with THERMAL POWER is $\leq 10\%$. When THERMAL POWER is $> 10\%$ RTP, there is no possible control rod configuration that results in a control rod worth that could exceed the fuel damage limit during a CRDA (Refer to the Bases for Function 2 (Rod Worth Minimizer) of LCO 3.3.2.1, "Control Rod Block Instrumentation"). In MODES 3 and 4, all control rods are required to be inserted into the core; therefore, a CRDA cannot occur. In MODE 5, since only a single control rod can be withdrawn from a core cell containing fuel assemblies, adequate SDM ensures that the consequences of a CRDA are acceptable, since the reactor will be subcritical.

This Function isolates the MSL drain valves.

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Primary Containment Isolation

2.a., 2.g. Reactor Vessel Water Level-Low (Level 3)

Low RPV water level indicates that the capability to cool the fuel may be threatened. The valves whose penetrations communicate with the primary containment are isolated to limit the release of fission products. The isolation of the primary containment on Level 3 supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Reactor Vessel Water Level-Low (Level 3) Function associated with isolation is implicitly assumed in the UFSAR analysis as these leakage paths are assumed to be isolated post LOCA.

Reactor Vessel Water Level-Low (Level 3) signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. For Function 2.a, four channels of Reactor Vessel Water Level-Low (Level 3) Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. For Function 2.g, two channels of Reactor Vessel Water Level-Low (Level 3) are required to be OPERABLE for each hydrogen/oxygen and gaseous/particulate sample supply and return penetration to ensure these penetrations can be isolated.

The Reactor Vessel Water Level-Low (Level 3) Allowable Value was selected to initiate isolation at the earliest indication of a possible break in the RCPB. However, the setting is adjusted far enough to avoid spurious isolation. The Allowable Value is chosen to be the same as the RPS Level 3 scram Allowable Value (LCO 3.3.1.1), since isolation of these valves is not critical to orderly plant shutdown. The Allowable Value is referenced from a level of water 352.56 inches above the lowest point in the inside bottom of the reactor pressure vessel and also corresponds to the top of a 144 inch fuel column (Ref. 13).

This Function isolates the valves listed in Reference 1.

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2.b., 2.h. Drywell Pressure-High

High drywell pressure can indicate a break in the RCPB Primary containment. The isolation of some of the primary containment isolation valves on high drywell pressure supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Drywell Pressure-High Function, associated with isolation of the primary containment, is implicitly assumed in the UFSAR accident analysis as these leakage paths are assumed to be isolated post LOCA.

High drywell pressure signals are initiated from pressure transmitters that sense the pressure in the drywell. For Function 2.b, four channels of Drywell Pressure-High are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. For Function 2.h, two channels of Drywell Pressure-High are required to be OPERABLE for each hydrogen/oxygen and gaseous/particulate sample supply and return penetration to ensure these penetrations can be isolated.

The Allowable Value was selected to be as low as possible without inducing spurious trips. The Allowable Value is chosen to be the same as the RPS Drywell Pressure-High Allowable Value (LCO 3.3.1.1), since this may be indicative of a LOCA inside primary containment.

This Function isolates the valves listed in Reference 1.

2.c. Containment Radiation-High

High containment radiation indicates possible gross failure of the fuel cladding. Therefore, when Containment Radiation-High is detected, an isolation is initiated to limit the release of fission products. However, this Function is not assumed in any accident or transient analysis in the UFSAR because other leakage paths (e.g., MSIVs) are more limiting.

The containment radiation signals are initiated from radiation detectors that are located in the drywell. Two channels of Containment Radiation-High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

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2.c. Containment Radiation-High (continued)

The Allowable Value is low enough to promptly detect gross failures in the fuel cladding. However, the setting is high enough to avoid spurious isolation.

This Function isolates the containment vent and purge valves.

2.d., 2.i. Reactor Building Exhaust Radiation-High

High reactor building exhaust radiation is an indication of possible gross failure of the fuel cladding. The release may have originated from the primary containment due to a break in the RCPB. When Reactor Building Exhaust Radiation-High is detected, valves whose penetrations communicate with the primary containment atmosphere are isolated to limit the release of fission products. However, this Function is not assumed in any accident or transient analysis in the UFSAR because other leakage paths (e.g., MSIVs) are more limiting.

The Reactor Building Exhaust Radiation-High signals are initiated from radiation detectors that monitor the ventilation exhaust piping coming from the reactor building. The signal from each detector is input to an individual monitor whose trip outputs are assigned to an isolation channel. For Function 2.d, two channels of the Reactor Building Exhaust Radiation-High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. For Function 2.i, one channel of Reactor Building Exhaust Radiation-High is required to be OPERABLE for each hydrogen/oxygen and gaseous/particulate sample supply and return penetration to ensure these penetrations can be isolated.

The Allowable Values are chosen to promptly detect gross failure of the fuel cladding and are set in accordance with the Offsite Dose Calculation Manual (ODCM). The setting is high enough to avoid spurious isolations.

These Functions isolate the drywell and suppression chamber vent and purge valves, hydrogen/oxygen sample and return valves, and gaseous/particulate sample and return valves as well as other valves listed in Reference 1.

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2.e. Reactor Vessel Water Level - Low Low Low (Level 1)

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of the recirculation loop sample valves occurs to prevent offsite dose limits from being exceeded. The Reactor Vessel Water Level - Low Low Low (Level 1) Function is one of the many Functions assumed to be OPERABLE and capable of providing isolation signals. The Reactor Vessel Water Level - Low Low Low (Level 1) Function associated with isolation is assumed in the analysis of the recirculation line break (Ref. 3). The isolation of the recirculation loop sample valves on Level 1 supports actions to ensure that offsite dose limits are not exceeded for a DBA.

Reactor vessel water level signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low Low (Level 1) Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level - Low Low Low (Level 1) Allowable Value is chosen to ensure that the recirculation loop sample valves close on a potential loss of coolant accident (LOCA) to prevent offsite doses from exceeding 10 CFR 100 limits. The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 13).

This Function isolates the recirculation loop sample valves.

2.f. Main Steam Tunnel Radiation - High

The Main Steam Tunnel Radiation-High isolation signal has been removed from the MSIV isolation logic circuitry (Ref. 1); however, this isolation Function has been retained for the recirculation loop sample valves to ensure that the assumptions utilized to determine that acceptable offsite doses resulting from a CRDA are maintained.

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2.f. Main Steam Tunnel Radiation-High (continued)

Main Steam Tunnel Radiation-High signals are generated from four radiation elements and associated monitors, which are located near the main steam lines in the steam tunnel. Four Instrumentation channels of the Main Steam Tunnel Radiation-High Function are available and required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Value was selected to be low enough that a high radiation trip results from the fission products released in the Design Basis CRDA. In addition, the setting is adjusted high enough above the background radiation level in the vicinity of the main steam lines so that spurious trips are avoided at rated power. As noted (footnote (e) to Table 3.3.6.1-1), the channels are only required to be OPERABLE in MODES 1 and 2 with THERMAL POWER is $\leq 10\%$. When THERMAL POWER is $> 10\%$ RTP, there is no possible control rod configuration that results in a control rod worth that could exceed the fuel damage limit during a CRDA (Refer to the Bases for Function 2 (Rod Worth Minimizer) of LCO 3.3.2.1). In MODES 3 and 4, all control rods are required to be inserted into the core; therefore, a CRDA cannot occur. In MODE 5, since only a single control rod can be withdrawn from a core cell containing fuel assemblies, adequate SDM ensures that the consequences of a CRDA are acceptable, since the reactor will be subcritical.

This Function isolates the recirculation loop sample valves.

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3.a., 4.a. HPCI and RCIC Steam Line Flow-High

Steam Line Flow-High Functions are provided to detect a break of the RCIC or HPCI steam lines and initiate closure of the steam line isolation valves of the appropriate system. If the steam is allowed to continue flowing out of the break, the reactor will depressurize and the core can uncover. Therefore, the isolations are initiated on high flow to prevent or minimize core damage. The isolation action, along with the scram function of the RPS, ensures

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3.a., 4.a. HPCI and RCIC Steam Line Flow-High (continued)

that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. Specific credit for these Functions is not assumed in any UFSAR accident analyses since the bounding analysis is performed for large breaks such as recirculation and MSL breaks. However, these instruments prevent the RCIC or HPCI steam line breaks from becoming bounding.

The HPCI and RCIC Steam Line Flow-High signals are initiated from transmitters (two for HPCI and two for RCIC) that are connected to the system steam lines. Two channels of both HPCI and RCIC Steam Line Flow-High Functions are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are chosen to be low enough to ensure a timely detection of a turbine steam line break so that the trip occurs to prevent fuel damage and maintains the MSLB event as the bounding event. The setting is adjusted high enough to avoid spurious isolations during HPCI and RCIC startups.

These Functions isolate the valves, as appropriate, as listed in Reference 1.

3.b., 4.b. HPCI and RCIC Steam Supply Line Pressure-Low

Low steam pressure indicates that the pressure of the steam in the HPCI or RCIC turbine may be too low to continue operation of the associated system's turbine. These isolations are for equipment protection and are not assumed in any transient or accident analysis in the UFSAR.

However, they also provide a diverse signal to indicate a possible system break. These instruments are included in Technical Specifications (TS) because of the potential for risk due to possible failure of the instruments preventing HPCI and RCIC initiations (Ref. 5).

The HPCI and RCIC Steam Supply Line Pressure-Low signals are initiated from transmitters (four for HPCI and four for RCIC) that are connected to the system steam line. Four channels of both HPCI and RCIC Steam Supply Line

(continued)

BASES

APPLICABLE
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3.b., 4.b. HPCI and RCIC Steam Supply Line Pressure-Low
(continued)

Pressure-Low Functions are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. The Allowable Values are selected to be high enough to prevent damage to the system's turbine and low enough to ensure HPCI and RCIC Systems remain OPERABLE.

These Functions isolate the valves, as appropriate, as listed in Reference 1.

3.c., 4.c. HPCI and RCIC Turbine Exhaust Diaphragm
Pressure-High

High turbine exhaust diaphragm pressure could indicate that the turbine rotor is not turning, or there is a broken turbine blading or shrouding, thus allowing reactor pressure to act on the turbine exhaust line. The system is isolated to prevent overpressurization of the turbine exhaust line. These isolations are for equipment protection and are not assumed in any transient or accident analysis in the UFSAR. These instruments are included in the TS because of the potential for risk due to possible failure of the instruments preventing HPCI and RCIC initiations (Ref. 5).

The HPCI and RCIC Turbine Exhaust Diaphragm Pressure-High signals are initiated from switches (four for HPCI and four for RCIC) that are connected to the area between the rupture diaphragms on each system's turbine exhaust line. Four channels of both HPCI and RCIC Turbine Exhaust Diaphragm Pressure-High Functions are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are high enough to prevent damage to low pressure components in the turbine exhaust pathway. The settings are adjusted low enough to avoid isolation of the system's turbine.

These Functions isolate the valves, as appropriate, as listed in Reference 1.

(continued)

BASES

APPLICABLE
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(continued)

3.d., 3.e., 3.f., 3.g., 3.h., 3.i., 3.j., 4.d., 4.e., 4.f.
HPCI and RCIC Area Temperature-High

HPCI and RCIC Area temperatures are provided to detect a leak from the associated system steam piping. The isolation occurs when a very small leak has occurred and is diverse to the high flow instrumentation. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. These Functions are not assumed in any UFSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks.

Area Temperature-High signals are initiated from resistance temperature detectors (RTDs) that are appropriately located to protect the system that is being monitored. Two instruments monitor each area for a total of 16 channels for HPCI and 8 channels for RCIC. All channels for each HPCI and RCIC Area Temperature-High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are set high enough above normal operating levels to avoid spurious operation but low enough to provide timely detection of a steam leak.

These Functions isolate the valves, as appropriate, as listed in Reference 1.

Reactor Water Cleanup (RWCU) System Isolation
5.a., 5.b., and 5.c. RWCU Area Temperatures-High

RWCU area temperatures are provided to detect a leak from the RWCU System. The isolation occurs even when very small leaks have occurred. If the small leak continues without isolation, offsite dose limits may be reached. Credit for these instruments is not taken in any transient or accident analysis in the UFSAR, since bounding analyses are performed for large breaks such as recirculation or MSL breaks.

Area temperature signals are initiated from temperature elements that are located in the area that is being monitored. Eight thermocouples provide input to the Area Temperature-High Functions (two per area or room). Eight channels are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation

(continued)

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5.a., 5.b., and 5.c. RWCU Area Temperatures - High
(continued)

function. The Area Temperature - High Allowable Values are set high enough to avoid spurious isolation yet low enough to provide timely detection and isolation of a break in the RWCU System.

These Functions isolates both RWCU suction valves and the return valve.

5.d. SLC System Initiation

The isolation of the RWCU System is required when the SLC System has been initiated to prevent dilution and removal of the boron solution by the RWCU System (Ref. 6). The RWCU isolation signal is initiated when the control room SLC initiation switch is in any position other than stop.

There is no Allowable Value associated with this Function since the channels are mechanically actuated based solely on the position of the SLC System initiation switch.

Two channels (start system A or start system B) of the SLC System Initiation Function are available and are required to be OPERABLE only in MODES 1 and 2, since these are the only MODES where the reactor can be critical, and these MODES are consistent with the Applicability for the SLC System (LCO 3.1.7).

As noted (footnote (c) to Table 3.3.6.1-1), this Function is only required to close one of the RWCU suction isolation valves and one return isolation valve since the signals only provide input into one of the two trip systems.

5.e. Reactor Vessel Water Level - Low (Level 3)



Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of some interfaces with the reactor vessel occurs to isolate the potential sources of a break. The isolation of the RWCU System on Level 3 supports actions to ensure that the fuel peak cladding temperature remains below the limits of

(continued)

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5.e. Reactor Vessel Water Level - Low (Level 3)
(continued)

10 CFR 50.46. The Reactor Vessel Water Level - Low (Level 3) Function associated with RWCU isolation is not directly assumed in the UFSAR safety analyses because the RWCU System line break is bounded by breaks of larger systems (recirculation and MSL breaks are more limiting). | 
| 

Reactor Vessel Water Level - Low (Level 3) signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low (Level 3) Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level - Low (Level 3) Allowable Value was selected to initiate isolation at the earliest indication of a possible break in the RCPB. However, the setting is adjusted far enough to avoid spurious isolation. The Allowable Value is chosen to be the same as the RPS Reactor Vessel Water Level - Low (Level 3) Allowable Value (LCO 3.3.1.1), since the capability to cool the fuel may be threatened. The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 13).

This Function isolates both RWCU suction valves and the RWCU return valve. | 

5.f. Drywell Pressure - High

High drywell pressure can indicate a break in the RCPB inside the primary containment. The isolation of some of the primary containment isolation valves on high drywell pressure supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Drywell Pressure - High Function, associated with isolation of the primary containment, is implicitly assumed in the UFSAR accident analysis as these leakage paths are assumed to be isolated post LOCA.

(continued)

BASES

APPLICABLE
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5.f. Drywell Pressure-High
(continued)

High drywell pressure signals are initiated from pressure transmitters that sense the pressure in the drywell. Four channels of Drywell Pressure-High are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable value was selected to be as low as possible without inducing spurious trips. The Allowable Value is chosen to be the same as the RPS Drywell Pressure-High Allowable Value (LCO 3.3.1.1), since this may be indicative of a LOCA inside primary containment.

This Function isolates both RWCU suction valves and one RWCU return valve. | 

6.a. Reactor Pressure-High

The Reactor Pressure-High Function is provided to isolate the shutdown cooling portion of the Residual Heat Removal (RHR) System. This interlock Function is provided only for equipment protection to prevent an intersystem LOCA scenario, and credit for the interlock is not assumed in the accident or transient analysis in the UFSAR.

The Reactor Pressure-High signals are initiated from two pressure switches that are connected to different taps on reactor recirculation pump B suction line. Each switch provides input to each trip system. However, only one channel input is required to be OPERABLE for a trip system to be considered OPERABLE. Two channels of Reactor Pressure-High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. The Function is only required to be OPERABLE in MODES 1, 2, and 3, since these are the only MODES in which the reactor can be pressurized; thus, equipment protection is needed.

The Allowable Value was chosen to be low enough to protect the system equipment from overpressurization.

This Function isolates both RHR shutdown cooling pump suction valves.

(continued)

BASES

APPLICABLE
SAFETY ANALYSES,
LCO, and
APPLICABILITY
(continued)

6.b. Reactor Vessel Water Level - Low (Level 3)

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of some reactor vessel interfaces occurs to begin isolating the potential sources of a break. The Reactor Vessel Water Level - Low (Level 3) Function associated with RHR Shutdown Cooling System isolation is not directly assumed in safety analyses because a break of the RHR Shutdown Cooling System is bounded by breaks of the reactor water recirculation system and MSL. The RHR Shutdown Cooling System isolation on Level 3 supports actions to ensure that the RPV water level does not drop below the top of the active fuel during a vessel draindown event caused by a leak (e.g., pipe break or inadvertent valve opening) in the RHR Shutdown Cooling System.

Reactor Vessel Water Level - Low (Level 3) signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels (two channels per trip system) of the Reactor Vessel Water Level - Low (Level 3) Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. As noted (footnote (d) to Table 3.3.6.1-1), only one trip system of the Reactor Vessel Water Level - Low (Level 3) Function are required to be OPERABLE in MODES 4 and 5, provided the RHR Shutdown Cooling System integrity is maintained. System integrity is maintained provided the piping is intact and no maintenance or other activity is being performed that has the potential for draining the reactor vessel through the system.

The Reactor Vessel Water Level - Low (Level 3) Allowable Value was selected to initiate isolation at the earliest indication of a possible break in the RCPB. However, the setting is adjusted far enough to avoid spurious isolation. The Allowable Value is chosen to be the same as the RPS Reactor Vessel Water Level - Low (Level 3) Allowable Value (LCO 3.3.1.1), since the capability to cool the fuel may be threatened. The Allowable Value is the water level above a zero reference level which is 352.56 inches above the lowest point inside the RPV and is also at the top of a 144 inch fuel column (Ref. 13).

(continued)

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6.b. Reactor Vessel Water Level-Low (Level 3)
(continued)

The Reactor Vessel Water Level-Low (Level 3) Function is only required to be OPERABLE in MODES 3, 4, and 5 to prevent this potential flow path from lowering the reactor vessel level to the top of the fuel. In MODES 1 and 2, another isolation (i.e., Reactor Pressure-High) and administrative controls ensure that this flow path remains isolated to prevent unexpected loss of inventory via this flow path.

This Function isolates both RHR shutdown cooling pump suction valves and the inboard LPCI injection valves.

Traversing Incore Probe System Isolation

7.a. Reactor Vessel Water Level-Low (Level 3)

Low RPV water level indicates that the capability to cool the fuel may be threatened. The valves whose penetrations communicate with the primary containment are isolated to limit the release of fission products. The isolation of the primary containment on Level 3 supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Reactor Vessel Water Level-Low (Level 3) Function associated with isolation is implicitly assumed in the UFSAR analysis as these leakage paths are assumed to be isolated post LOCA.

Reactor Vessel Water Level-Low (Level 3) signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Two channels of Reactor Vessel Water Level-Low (Level 3) Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. The isolation function is ensured by the manual shear valve in each penetration.

The Reactor Vessel Water Level-Low (Level 3) Allowable Value was chosen to be the same as the RPS Level 3 scram Allowable Value (LCO 3.3.1.1), since isolation of these valves is not critical to orderly plant shutdown.

This Function isolates the TIP System isolation ball valves.

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BASES

APPLICABLE
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LCO, and
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(continued)

7.b. Drywell Pressure - High

High drywell pressure can indicate a break in the RCPB inside the primary containment. The isolation of some of the primary containment isolation valves on high drywell pressure supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Drywell Pressure-High Function, associated with isolation of the primary containment, is implicitly assumed in the UFSAR accident analysis as these leakage paths are assumed to be isolated post LOCA.

High drywell pressure signals are initiated from pressure transmitters that sense the pressure in the drywell. Two channels of Drywell Pressure-High are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. The isolation function is ensured by the manual shear valve in each penetration.

The Allowable Value was selected to be as low as possible without inducing spurious trips. The Allowable Value is chosen to be the same as the RPS Drywell Pressure-High Allowable Value (LCO 3.3.1.1), since this may be indicative of a LOCA inside primary containment.

This Function isolates the TIP System isolation ball valves.

ACTIONS

The ACTIONS are modified by two Notes. Note 1 allows penetration flow path(s) to be unisolated intermittently under administrative controls. These controls consist of stationing a dedicated operator at the controls of the valve, who is in continuous communication with the control room. In this way, the penetration can be rapidly isolated when a need for primary containment isolation is indicated. Note 2 has been provided to modify the ACTIONS related to primary containment isolation instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure,

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(continued)

with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable primary containment isolation instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable primary containment isolation instrumentation channel.

A.1

Because of the diversity of sensors available to provide isolation signals and the redundancy of the isolation design, an allowable out of service time of 12 hours for Functions 2.a, 2.b, 2.g, 2.h, 5.e, 5.f, 6.b, 7.a and 7.b and 24 hours for Functions other than Functions 2.a, 2.b, 2.g, 2.h, 5.e, 5.f, 6.b, 7.a and 7.b has been shown to be acceptable (Refs. 6 and 7) to permit restoration of any inoperable channel to OPERABLE status. This out of service time is only acceptable provided the associated Function is still maintaining isolation capability (refer to Required Action B.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action A.1. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue with no further restrictions. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an isolation), Condition C must be entered and its Required Action taken.

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B.1

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in redundant isolation capability being lost for the associated penetration flow path(s). The MSL, Isolation Functions (associated with MSIV isolation) are considered to be maintaining isolation capability when sufficient channels are OPERABLE or in trip (or the associated trip system in trip), such that both trip systems will generate a trip signal from the given Function on a valid signal. The other

(continued)

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ACTIONS
(continued)

isolation functions are considered to be maintaining isolation capability when sufficient channels are OPERABLE or in trip, such that one trip system will generate a trip signal from the given Function on a valid signal. This ensures that at least one of the PCIVs in the associated penetration flow path can receive an isolation signal from the given Function. For Functions 1.a, 1.b, and 1.d (associated with MSIV isolation), this would require both trip systems to have one channel OPERABLE or in trip. For Function 1.c (associated with MSIV isolation), this would require both trip systems to have one channel, associated with each MSL, OPERABLE or in trip. For Function 1.e, four areas are monitored by four channels (e.g., different locations within the main steam tunnel area). Therefore, this would require both trip systems to have one channel per location OPERABLE or in trip (associated with MSIV isolation). For Functions 1.a, 1.b and 1.d (associated with MSL drain isolation) this would require one trip system to have two channels, each OPERABLE or in trip. For Function 1.c (associated with MSL drain isolation) this will require one trip system to have two channels, associated with each MSL, each OPERABLE or in trip. For Function 1.e this would require one trip system to have two channels, associated with each main steam tunnel area, each to be OPERABLE or in trip. For Functions 2.g, 2.h and 2.i, as noted by footnote (b) to Table 3.3.6.1-1, there is only one trip system provided for each associated penetration. For these penetrations (i.e., hydrogen/oxygen sample and return, and gaseous/particulate sample supply and return) and for Functions 2.g and 2.h, this will require both channels to be OPERABLE or in trip in order to close at least one valve. For Function 2.i, this will require one channel to be OPERABLE or in trip in order to isolate at least one valve. For Functions 2.a, 2.b, 2.e, 2.f, 3.b, 3.c, 4.b, 4.c, 5.e, 5.f, and 6.b, this would require one trip system to have two channels, each OPERABLE or in trip. For Functions 2.c, 2.d, 3.a, 3.d, 3.e, 3.f, 3.g, 3.h, 3.i, 4.a, 4.d, 4.e, 5.a, 5.c, and 6.a, this would require one trip system to have one channel OPERABLE or in trip. For Functions 3.j, 4.f, and 5.b each Function consists of channels that monitor two different locations. Therefore, this would require one channel per location to be OPERABLE or in trip (the channels are not required to be in the same trip system). For Function 5.d, this would require that with the switch in start system A or B the associated valve will close. For Function 7.a and 7.b the logic is arranged in one trip system, therefore this would require both channels to be OPERABLE or in trip, or the manual shear valves to be OPERABLE.

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(continued)

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

C.1

Required Action C.1 directs entry into the appropriate Condition referenced in Table 3.3.6.1-1. The applicable Condition specified in Table 3.3.6.1-1 is Function and MODE or other specified condition dependent and may change as the Required Action of a previous Condition is completed. Each time an inoperable channel has not met any Required Action of Condition A or B and the associated Completion Time has expired, Condition C will be entered for that channel and provides for transfer to the appropriate subsequent Condition.

D.1, D.2.1, and D.2.2

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by placing the plant in at least MODE 3 within 12 hours and in MODE 4 within 36 hours (Required Actions D.2.1 and D.2.2). Alternately, the associated MSLs may be isolated (Required Action D.1), and, if allowed (i.e., plant safety analysis allows operation with one MSL isolated), operation with that MSL isolated may continue. Isolating the affected MSL accomplishes the safety function of the inoperable channel. The Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

E.1

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the plant must be placed in a MODE or other specified condition in which

(continued)

BASES

ACTIONS

E.1 (continued)

the LCO does not apply. This is done by placing the plant in at least MODE 2 within 8 hours.

The allowed Completion Time of 8 hours is reasonable, based on operating experience, to reach MODE 2 from full power conditions in an orderly manner and without challenging plant systems.

F.1

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, plant operations may continue if the affected penetration flow path(s) is isolated. Isolating the affected penetration flow path(s) accomplishes the safety function of the inoperable channels. Alternately, if it is not desired to isolate the affected penetration flow path(s) (e.g., as in the case where isolating the penetration flow path(s) could result in a reactor scram), Condition H must be entered and its Required Actions taken. The 1 hour Completion Time is acceptable because it minimizes risk while allowing sufficient time for plant operations personnel to isolate the affected penetration flow path(s).

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G.1

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, plant operations may continue if the affected penetration flow path(s) is isolated. Isolating the affected penetration flow path(s) accomplishes the safety function of the inoperable channels. The 24 hour Completion Time is acceptable due to the fact the penetrations associated with these Functions (TIP System penetration) are a small bore (approx 1/2 inch), its isolation in a design basis event (with loss of offsite power) would be via the manually operated shear valves, and the ability to manually isolate by either the normal isolation valve or the shear valve is unaffected by the inoperable instrumentation.

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ACTIONS
(continued)

H.1 and H.2

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, or any Required Action of Condition F or G is not met and the associated Completion Time has expired, the plant must be placed in a MODE or other specified condition in which the LCO does not apply. This is done by placing the plant in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

I.1 and I.2

If the channel is not restored to OPERABLE status within the allowed Completion Time, the associated SLC subsystem is declared inoperable or the RWCU System is isolated. Since this Function is required to ensure that the SLC System performs its intended function, sufficient remedial measures are provided by declaring the associated SLC subsystems inoperable or isolating the RWCU System.

The 1 hour Completion Time is acceptable because it minimizes risk while allowing sufficient time for personnel to isolate the RWCU System.

J.1 and J.2

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the associated penetration flow path should be closed. However, if the shutdown cooling function is needed to provide core cooling, these Required Actions allow the penetration flow path to remain unisolated provided action is immediately initiated to restore the channel to OPERABLE status or to isolate the RHR Shutdown Cooling System (i.e., provide alternate decay heat removal capabilities so the penetration flow path can be isolated). Actions must continue until the channel is restored to OPERABLE status or the RHR Shutdown Cooling System is isolated.

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SURVEILLANCE
REQUIREMENTS

As noted (Note 1) at the beginning of the SRs, the SRs for each Primary Containment Isolation instrumentation Function are found in the SRs column of Table 3.3.6.1-1.

The Surveillances are modified by Note 2 to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains trip capability or 6 hours for Functions 2.g, 2.h, 2.i, 7.a, and 7.b. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Refs. 7 and 8) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the PCIVs will isolate the penetration flow path(s) when necessary. For Functions 2.g, 2.h and 2.i this allowance is permitted since the associated penetration flow path(s) involve sample lines which form a closed system with the primary containment atmosphere. For Functions 7.a and 7.b this is permitted since the associated penetrations can be manually isolated if needed.

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SR 3.3.6.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

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SURVEILLANCE
REQUIREMENTS

SR 3.3.6.1.1 (continued)

Channel agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.6.1.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contacts(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The 92 day Frequency of SR 3.3.6.1.2 is based on the reliability analysis described in References 7 and 8.

SR 3.3.6.1.3, SR 3.3.6.1.5, and SR 3.3.6.1.6

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology. SR 3.3.6.1.6 however is only a calibration of the radiation detectors using a standard radiation source.

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REQUIREMENTS

SR 3.3.6.1.3, SR 3.3.6.1.5, and SR 3.3.6.1.6 (continued)

As noted for SR 3.3.6.1.3, the main steam tunnel radiation detectors are excluded from CHANNEL CALIBRATION due to ALARA reasons (when the plant is operating, the radiation detectors are generally in a high radiation area; the steam tunnel). This exclusion is acceptable because the radiation detectors are passive devices, with minimal drift. The radiation detectors are calibrated in accordance with SR 3.3.6.1.6 on a 24 month Frequency. The CHANNEL CALIBRATION of the remaining portions of the channel (SR 3.3.6.1.3) are performed using a standard current source.

Reactor Vessel Water Level-Low Low Low (Level 1), Main Steam Line Pressure-Low and Main Steam Line Flow-High Function sensors (Functions 1.a, 1.b, and 1.c, respectively) are excluded from ISOLATION INSTRUMENTATION RESPONSE TIME testing (Ref. 11). However, during the CHANNEL CALIBRATION of these sensors, a response check must be performed to ensure adequate response. This testing is required by Reference 11. Personnel involved in this testing must have been trained in response to Reference 12 to ensure that they are aware of the consequences of instrument response time degradation. This response check must be performed by placing a fast ramp or a step change into the input of each required sensor. The personnel must monitor the input and output of the associated sensor so that simultaneous monitoring and verification may be accomplished.

The Frequency of SR 3.3.6.1.3 is based on the assumption of a 92 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis. The Frequencies of SR 3.3.6.1.5 and SR 3.3.6.1.6 are based on the assumption of an 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.6.1.4

Calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.6.1-1. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but

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SR 3.3.6.1.4 (continued)

is not beyond the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than that accounted for in the appropriate setpoint methodology.

The Frequency of 184 days is based on operating experience that demonstrates this equipment to be reliable.

SR 3.3.6.1.7

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required isolation logic for a specific channel. The system functional testing performed on PCIVs in LCO 3.6.1.3 overlaps this Surveillance to provide complete testing of the assumed safety function. While this Surveillance can be performed with the reactor at power for some Functions, the 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the 24 month Frequency. Therefore, the Frequency was found to be acceptable from a reliability standpoint.

SR 3.3.6.1.8

This SR ensures that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis. Testing is performed only on channels where the assumed response time does not correspond to the emergency diesel generator (EDG) start time. For channels assumed to respond within the EDG start time, sufficient margin exists in the 10 second start time when compared to the typical channel response time (milliseconds) so as to assure adequate response without a specific measurement test.

ISOLATION INSTRUMENTATION RESPONSE TIME acceptance criteria are included in Reference 9. ISOLATION SYSTEM RESPONSE TIME may be verified by actual response time measurements in any

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SR 3.3.6.1.8 (continued)

series of sequential, overlapping, or total channel measurements. However, the sensors for Functions 1.a, 1.b, and 1.c are allowed to be excluded from specific ISOLATION SYSTEM RESPONSE TIME measurement if the conditions of Reference 10 are satisfied. If these conditions are satisfied, sensor response time may be allocated based on either assumed design sensor response time or the manufacturer's stated design response time. When the requirements of Reference 10 are not satisfied, sensor response time must be measured. For all other Functions, the measurement of instrument loop response times may be excluded if the conditions of Reference 10 are satisfied.

ISOLATION INSTRUMENTATION RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASIS. A Note requires STAGGERED TEST BASIS Frequency to be determined based on 2 channels. This will ensure that all required channels are tested during two Surveillance Frequency intervals. For

Functions 1.a and 1.b, two channels must be tested during each test, while for Function 1.c, eight channels must be tested. The 24 month Frequency is consistent with the typical industry refueling cycle and is based upon plant operating experience that shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

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REFERENCES

1. UFSAR, Section 7.3.
2. UFSAR, Section 14.5.
3. UFSAR, Section 14.6.
4. 10 CFR 50.36(c)(2)(ii).
5. NEDO-31466, Technical Specification Screening Criteria Application and Risk Assessment, November 1987.
6. UFSAR, Section 3.9.3.

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7. NEDC-31677P-A, Technical Specification Improvement Analysis for BWR Isolation Actuation Instrumentation, July 1990.
 8. NEDC-30851P-A, Supplement 2, Technical Specifications Improvement Analysis For BWR Isolation Instrumentation Common To RPS And ECCS Instrumentation, March 1989.
 9. UFSAR, Table 7.3-12.
 10. NEDO-32291-A, System Analyses For the Elimination of Selected Response Time Testing Requirements, October 1995.
 11. NRC letter dated October 28, 1996, Issuance of Amendment 235 of Facility Operating License DPR-59 for James A. FitzPatrick Nuclear Power Plant.
 12. NRC Bulletin 90-01, Supplement 1, Loss of Fill-Oil in Transmitters Manufactured by Rosemount, December 1992.
 13. Drawing 11825-5.01-15D, Rev. D, Reactor Assembly Nuclear Boiler, (GE Drawing 919D690BD).
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