

Table 3.3.5.1-1 (page 3 of 5)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION AD.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. High Pressure Core Flooder-Spray (HPC&F) Subsystems-System					
a. Reactor Vessel Water Level - Low Low, Level 21.5	1,2,3, z(a), y(a)	[4] (b)	B-NA	SR 3.3.5.1.1 SR 3.3.5.1.2 {SR 3.3.5.1.3} SR 3.3.5.1.54 SR 3.3.5.1.65 SR 3.3.5.1.7	$\geq [43.8]$ cm inches
b. Drywell Pressure - High	1,2,3	[4] (b)	B-NA	SR 3.3.5.1.1 SR 3.3.5.1.2 {SR 3.3.5.1.3} SR 3.3.5.1.54 SR 3.3.5.1.65 SR 3.3.5.1.7	$\leq [4.44]$ Kg/cm ² -psig
c. Reactor Vessel Water Level - High, Level 8	1,2,3, z(a), y(a)	[2-4]	C-NA	SR 3.3.5.1.1 SR 3.3.5.1.2 {SR 3.3.5.1.3} SR 3.3.5.1.54 SR 3.3.5.1.6	$\leq [55.7]$ cm inches
d. Condensate Storage Tank Level - Low	1,2,3, z(c), y(c)	[2-4]	D-G	SR 3.3.5.1.1 SR 3.3.5.1.2 {SR 3.3.5.1.3} SR 3.3.5.1.54 SR 3.3.5.1.6	$\geq [4.3]$ cm-inches
e. Suppression Pool Water Level - High	1,2,3	[24]	D-G	SR 3.3.5.1.1 SR 3.3.5.1.2 {SR 3.3.5.1.3} SR 3.3.5.1.54 SR 3.3.5.1.6	$\leq [7.0]$ cm-inches
f. [HPC&F Pump Discharge Pressure - High {Bypass}]	1,2,3, z(a), y(a)	[1]	E	SR 3.3.5.1.4 SR 3.3.5.1.2 {SR 3.3.5.1.3} SR 3.3.5.1.54 SR 3.3.5.1.6	$\geq []$ -psig Kg/cm ²
g. [HPC&F System Flow Rate - Low {Bypass}]	1,2,3, z(a), y(a)	[1]	E	SR 3.3.5.1.4 SR 3.3.5.1.2 {SR 3.3.5.1.3} SR 3.3.5.1.54 SR 3.3.5.1.6	$\geq []$ liters/min gpm and $\leq []$ gpm
h. HPCF Pump Suction Pressure - Low	1,2,3	[1]	E	SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4	$\geq []$ Kg/cm ²
ih. Manual Initiation	1,2,3, z(a), y(a)	[1]	C-E	SR 3.3.5.1.64	NA

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(a) When associated subsystem(s) are required to be OPERABLE.

(b) Also required to initiate the associated [TS required functions]

(c) When HPCS is required to be OPERABLE by LCD 3.5.2, "ECCS - Shutdown," and condensate storage tank water level is not within the limits of SR 3.5.2.2.

BASES (APPLICABLE SAFETY ANALYSIS, LCO, and APPLICABILITY Continued)

3.e. Suppression Pool Water Level-High

Excessively high suppression pool water could result in the loads on the suppression pool exceeding design values should there be a blowdown of the reactor vessel pressure through the S/RVs. Therefore, signals indicating high suppression pool water level are used to transfer the suction source of HPC6F from the CST to the suppression pool to eliminate the possibility of HPC6F continuing to provide additional water from a source outside containment. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes. This Function is implicitly assumed in the accident and transient analyses (which take credit for HPC6F) since the analyses assume that the HPC6F suction source is the suppression pool.

Suppression Pool Water Level-High signals are initiated from two four level transmitters. ~~The logic is arranged such that either transmitter signals and associated trip unit can~~ A high suppression pool level signal from any two of the four transmitters will cause the suppression pool suction valve to open and the CST suction valve to close. The Allowable Value for the Suppression Pool Water Level-High Function is chosen to ensure that HPC6F will be aligned for suction from the suppression pool before the water level reaches the point at which suppression pool design loads would be exceeded.

Two signals (two-out-of-four) ~~channels~~ of from the Suppression Pool Water Level-High Function are only required to be OPERABLE in MODES 1, 2, and 3 when HPC6F is required to be OPERABLE to ensure that no single instrument failure can preclude HPC6F swap to suppression pool source. In MODES 4 and 5, the Function is not required to be OPERABLE since the reactor is depressurized and vessel blowdown, which could cause the design values of the containment to be exceeded, cannot occur. Refer to LCO 3.5.1 for HPC6F Applicability Bases.

3.f.3.g. HPC6F-HPC6 Pump Discharge Pressure-High (Bypass) and HPC6F-HPC6 System Flow Rate-Low (Bypass)

The minimum flow instruments are provided to protect the HPC6F pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow and high pump discharge pressure are sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump or the discharge pressure is low (indicating the HPC6F pump is not operating). The HPC6F System Flow Rate-Low and HPC6F Pump Discharge Pressure-High Functions are assumed to be OPERABLE and capable of closing the minimum flow valve to ensure that the ECCS flow assumed during the transients and accidents analyzed in References 1, 2, and 3 are met. The core cooling function of the ECCS, along with the scram action of

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BASES (APPLICABLE SAFETY ANALYSIS, LCO, and APPLICABILITY Continued)

the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

One flow transmitter and one pressure transmitter are used to detect the HPCF-HPCS System's flow rate and discharge pressure. The logic is arranged such that low flow concurrent with high pump discharge pressure the transmitter causes the minimum flow valve to open, provided the HPCS pump discharge pressure, sensed by another transmitter, is high enough (indicating the pump is operating). The logic will close the minimum flow valve when the setpoints are once the closure setpoint is exceeded. (The valve will also close upon HPCF-HPCS pump discharge pressure decreasing below the setpoint.)

The HPCF-HPCS System Flow Rate-Low and HPCF-HPCS Pump Discharge Pressure-High Allowable Value is high enough to ensure that pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core. The HPCF-HPCS Pump Discharge Pressure-High Allowable Value is set high enough to ensure that the valve will not be open when the pump is not operating.

One channel for each HPCF system of each Function is required to be OPERABLE when the HPCF-HPCS is required to be OPERABLE. Refer to LCO 3.5.1 and LCO 3.5.2 for HPCF-HPCS Applicability Bases.

3.h HPCF Pump Suction Pressure-Low

The HPCF low suction pressure function is provided to protect the pump from damage due to cavitation. If the suction pressure is less than the pump NPSH requirement, the pump start will be inhibited.

The suction pressure data originates in a pressure transmitter and is transmitted to the SLUs via the EMS. The SLU logic is arranged so that Low suction pressure must exist for a specified amount of time before pump start will be inhibited to prevent spurious inhibits due to suction pressure transients. The HPCF low suction pressure signal is automatically reset (i.e. no manual reset needed to remove the pump start inhibit when suction pressure recovers). The HPCF Suction Pressure-Low Function is assumed to be OPERABLE and will not cause a spurious pump start inhibit during the transients and accidents analyzed in References 1, 2, and 3 are met.

The HPCF Suction Pressure-Low Allowable Value are selected to assure that there is sufficient NPSH for the pump and prevent spurious start inhibits due to normal fluctuations in suction pressure.

One channel for each HPCF system is required to be OPERABLE when the HPCF is required to be OPERABLE. Refer to LCO 3.5.1 and LCO 3.5.2 for HPCF Applicability Bases.

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BASES (APPLICABLE SAFETY ANALYSIS, LCO, and APPLICABILITY Continued)

3.3.5.1 Manual Initiation

The Manual Initiation push button channel introduces a signal into the HPCS logic to provide manual initiation capability and is redundant to the automatic protective instrumentation. There is one push button for the each of the HPCS Systems (loop B and loop C). The button collar must be rotated prior to depressing the push button to perform the manual initiation.

The Manual Initiation Function is not assumed in any accident or transient analysis in the ABWR SSAR-FSAR. However, the Function is retained for overall redundancy and diversity of the HPCS function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channel is mechanically actuated based solely on the position of the push button. One channel of the Manual Initiation Function is only required to be OPERABLE when the HPCS System is required to be OPERABLE. Refer to LCO 3.5.1 and LCO 3.5.2 for HPCS Applicability Bases.

Automatic Depressurization System

4.3.5.1 Reactor Vessel Water Level—Low-Low-Low, - Level 1

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, ADS receives

(continued)

BASES (ACTIONS Continued)

24 hours (as allowed by Required Action G.2) is allowed during MODES 4 and 5.

Note 2 states that Required Action G.1 is only applicable for Functions 1.e, 1.d, 2.e, and 2.d. The Required Action is not applicable to Functions 1.g, 2.f, and 3.h (which also require entry into this Condition if a channel in these Functions is inoperable), since they are the Manual Initiation Functions and 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 G.2) is allowed. Required Action G.1 is also not applicable to Function 3.e (which also requires entry into this Condition if a channel in this Function is inoperable), since the loss of one channel results in a loss of the Function (two-out-of-two logic). This loss was considered during the development of Reference 4 and considered acceptable for the 24 hours allowed by Required Action G.2.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action G.1, the Completion Time only begins upon discovery that the same feature in both Divisions (e.g., any Division 1 ECCS and Division 2 ECCS) cannot be automatically initiated due to inoperable channels within the same variable as described in the paragraph above. The 1-hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 4) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would either cause the initiation or would not necessarily result in a safe state for the channel in all events.

F.1, F.2, G.1 and G.2-D.1, D.2.1, and D.2.2

These Required Actions are Required Action D.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped instrument channels for within the same Function results in a complete loss of automatic transfer of the suction from the condensate storage tank to suppression pool for the HPCF and RCIC component initiation capability for the HPCS System. Automatic transfer component initiation capability is considered to be lost if the Required Actions applicable to Functions 2.d, 2.e, 3.d or 3.e are not met within the allowable Completion Time. lost if two Function 3.d channels or two Function 3.e or channels are inoperable and untripped. In this situation (loss of automatic suction swap), the 24 hour allowance of

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BASES (ACTIONS Continued)

~~Required Actions D.2.1 and D.2.2 is not appropriate and the HPCS System the associated features must be declared inoperable within 1 hour after discovery of loss of transfer HPCS initiation capability. As noted, the Required Action is only applicable if the HPCF or RCIC-HPCS pump suction is not aligned to the suppression pool, since, if aligned, the Required Action Function is already performed.~~

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Actions F.1 and G.1-D.1, the Completion Time only begins upon discovery that the automatic transfer capability is deemed inoperable. ~~HPCS System cannot be automatically aligned to the suppression pool due to two inoperable, untripped channels in the same function. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.~~

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable [(Ref. 4)] to permit restoration of any inoperable channel to OPERABLE status. 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 D.2.1 or the suction source must be aligned to the suppression pool which per Required Action D.2.2. Placing the inoperable channel in trip performs the intended function of the channel (shifting the suction source to the suppression pool).~~ Performance of either of these two Required Actions will allow operation to continue. If Required Action F.2 or G.2 D.2.1 or Required Action D.2.2 is performed, measures should be taken to ensure that the HPCF or RCIC-HPCS System piping remains filled with water. ~~Alternately, if it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the HPCS suction piping), Condition H must be entered and its Required Action taken.~~

E.1 and E.2

Required Action E.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the LPCS and LPCI Pump Discharge Flow Low (Bypass) Functions result in redundant automatic initiation capability being lost for the feature(s). For Required Action E.1, the features would be those that are initiated by Functions 1.e, 1.f, and 2.e (e.g., low pressure ECCS). Redundant automatic initiation capability is lost if three of the four channels associated with Functions 1.e, 1.f, and 2.e are inoperable. Since each inoperable channel would have Required Action E.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected low pressure ECCS pump to be declared

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BASES (ACTIONS Continued)

~~to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would not necessarily result in a safe state for the channel in all events.~~

H.1-F.1 and F.2

Required Action H.1-F.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within similar ADS trip system Functions result in automatic initiation capability being lost for the ADS. Automatic initiation capability is considered to be lost if the Required Actions applicable to Functions 4.a or 4.b are not met within the allowable Completion Time. ~~lost if either (a) more than one Function 4.a channel and one Function 5.a channel are inoperable and untripped, (b) one Function 4.b channel and one Function 5.b channel are inoperable and untripped, or (c) one Function 4.d channel and one Function 5.d channel are inoperable and untripped.~~

In this situation (loss of automatic initiation capability), the 96 hour or 8 day allowance, as applicable, of Required Action F.2 is not appropriate, and all the associated ADS valves must be declared inoperable within 1 hour after discovery of loss of ADS initiation capability in both trip systems.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." ~~For Required Action F.1, The Completion Time only begins upon discovery that the ADS cannot be automatically initiated due to inoperable, untripped channels within similar ADS trip system Functions as described in the paragraph above. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.~~

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 8 days has been shown to be acceptable [(Ref. 4)] to permit restoration of any inoperable channel to OPERABLE status ~~if both HPCS and RCIC are OPERABLE. If either HPCS or RCIC is inoperable, the time is shortened to 96 hours. If the status of HPCS or RCIC changes such that the Completion Time changes from 8 days to 96 hours, the 96 hours begins upon discovery of HPCS or RCIC inoperability. However, total time for an inoperable, untripped channel cannot exceed 8 days. If the status of HPCS or RCIC changes such that the Completion Time changes from 96 hours to 8 days, the "time zero" for beginning the 8 day "clock" begins upon discovery of the inoperable, untripped channel. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the~~

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BASES (ACTIONS Continued)

~~tripped condition per Required Action F.2. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. 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 initiation), Condition H must be entered and its Required Action taken.~~

I.1 and I.2

Condition I occurs when any one of the four SLUs within Divisions I, II, or III becomes inoperable. This condition, because of the 2-out-of-2 confirmation of one redundant pair of SLUs before an output initiation is permitted, results in the supporting features of the failed SLU channel becoming unavailable. However, the associated operable SLU channel can be made available by placing the failed channel in "ECCS channel out of service" bypass. The operable channel, although more susceptible to spurious trip, will operate normally in a 1-out-of-1 mode until the failed channel is repaired. The ECCS bypass feature is normally automatic and is implemented by self tests that monitor the inoperable status of the SLU and also provides an alarm output to the operator.

A Completion Time of one hour for placing the inoperable SLU channel in bypass assumes that the operator must use the manual backup to the automatic bypass. The time period is sufficient for the operator to perform the action.

The Completion Time for repair of the inoperable channel provides sufficient time to diagnose and effect repairs. Since plant protection is maintained by redundant and independent ECCS channels, there is no significant contribution to plant risk with an inoperable SLU for the allowed completion time.

J.1

This condition represents the case where the two redundant SLUs supporting the same actuated equipment becomes inoperable. Since only one may be placed in bypass the supported features supported by the SLUs must be declared inoperable.

The Completion time is sufficient for the operator to perform the action and is. there is no significant contribution to plant risk for this time period since plant protection is maintained by redundant and independent ECCS channels.

K.1

With any Required Action and associated Completion Time not met, the associated feature(s) may be incapable of

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