

## B 3.7 PLANT SYSTEMS

### B 3.7.3 Main Feedwater Isolation Valves (MFIVs), Main Feedwater Control Valves (MFCVs), MFCV's Bypass Valves and Main Feedwater (MFW) to Auxiliary Feedwater (AFW) Nozzle Bypass Valves (MFW/AFW NBVs)

## BASES

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**BACKGROUND** The MFIVs isolate main feedwater (MFW) flow to the secondary side of the steam generators following a high energy line break (HELB). The safety related function of the MFCVs is to provide the second isolation of MFW flow to the secondary side of the steam generators following an HELB. Closure of the MFIVs (CF 26, 28, 30, and 35), MFCVs (CF 17, 20, 23, and 32) and MFCV's bypass valves (CF 104, 105, 106, and 107), and MFW/AFW NBVs (CF 126, 127, 128, and 129) terminates flow to the steam generators, terminating the event for feedwater line breaks (FWLBs) occurring upstream of the MFIVs or MFCVs. The consequences of events occurring in the main steam lines or in the MFW lines downstream from the MFIVs will be mitigated by their closure. Closure of the MFIVs, MFCVs and MFCV's bypass valves or MFW/AFW NBVs, effectively terminates the addition of feedwater to an affected steam generator, limiting the mass and energy release for steam line breaks (SLBs) or FWLBs inside containment, and reducing the cooldown effects for SLBs.

The MFIVs, MFCVs, and MFCV's bypass valves, and MFW/AFW NBVs isolate the nonsafety related portions from the safety related portions of the system. In the event of a secondary side pipe rupture inside containment, the valves limit the quantity of high energy fluid that enters containment through the break, and provide a pressure boundary for the controlled addition of AFW to the intact loops.

One MFIV, one MFCV, one MFCV's bypass valve, and one MFW/AFW NBV are located on each MFW line, outside containment. The MFIVs and MFCVs are located on different supply lines from the AFW injection line so that AFW may be supplied to the steam generators following MFIV or MFCV closure. The piping volume from these valves to the steam generators must be accounted for in calculating mass and energy releases, and refilled prior to AFW reaching the steam generator following either an SLB or FWLB.

The MFIVs, MFCVs, MFCV's bypass valves, and MFW/AFW NBVs close on receipt of a safety injection signal,  $T_{avg}$ —Low coincident with reactor trip (P-4), or steam generator water level—high high signal. They may also be actuated manually. The check valve outside containment

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### BACKGROUND (continued)

prevents multiple steam generator blowdown and overcooling in the event of a nonsafety related pipe failure or faulted steam generator concurrent with a single failure of a MFIV on an otherwise intact steam generator. A description of the MFIVs and MFCVs is found in the UFSAR, Section 10.4.7 (Ref. 1).

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**APPLICABLE SAFETY ANALYSES** The design basis of the MFIVs and MFCVs is established by the analyses for the large SLB. It is also influenced by the accident analysis for the large FWLB. Closure of the MFIVs, MFCVs and MFCV's bypass valves, or MFW/AFW NBVs, may also be relied on to terminate an SLB for core response analysis and excess feedwater event upon the receipt of a steam generator water level—high high signal or a feedwater isolation signal on high steam generator level.

Failure of a MFIV, MFCV, MFCV's bypass valve, or MFW/AFW NBV to close following an SLB or FWLB can result in additional mass and energy being delivered to the steam generators, contributing to cooldown. This failure also results in additional mass and energy releases following an SLB or FWLB event.

The MFIVs and MFCVs satisfy Criterion 3 of 10 CFR 50.36 (Ref. 2).

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### LCO

This LCO ensures that the MFIVs, MFCVs, MFCV's bypass valves, and MFW/AFW NBVs will isolate MFW flow to the steam generators, following an FWLB or main steam line break. These valves will also isolate the nonsafety related portions from the safety related portions of the system.

This LCO requires that four MFIVs, four MFCVs, four MFCV's bypass valves, and four MFW/AFW NBVs be OPERABLE. The MFIVs, MFCVs, MFCV's bypass valves, and MFW/AFW NBVs are considered OPERABLE when isolation times are within limits and they close on an isolation actuation signal.

Failure to meet the LCO requirements can result in additional mass and energy being released to containment following an SLB or FWLB inside containment. If a feedwater isolation signal on high steam generator level is relied on to terminate an excess feedwater flow event, failure to meet the LCO may result in the introduction of water into the main steam lines.

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**APPLICABILITY** The MFIVs, MFCVs, MFCV's bypass valves, and MFW/AFW NBVs must be OPERABLE whenever there is significant mass and energy in the Reactor Coolant System and steam generators. This ensures that, in the event of an HELB, a single failure cannot result in the blowdown of more than one steam generator. In MODES 1, 2, and 3, the MFIVs, MFCVs, MFCV's bypass valves, and MFW/AFW NBVs are required to be OPERABLE to limit the amount of available fluid that could be added to containment in the case of a secondary system pipe break inside containment. When the valves are closed and de-activated or isolated by a closed manual valve, they are already performing their safety function.

In MODES 4, 5, and 6, steam generator energy is low. Therefore, the MFIVs, MFCVs, MFCV's bypass valves, and MFW/AFW NBVs are normally closed since MFW is not required.

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**ACTIONS** The ACTIONS table is modified by a Note indicating that separate Condition entry is allowed for each valve.

A.1 and A.2

With one MFIV in one or more flow paths inoperable, action must be taken to restore the affected valves to OPERABLE status, or to close or isolate inoperable affected valves within 72 hours by use of a closed and de-activated automatic valve, a closed manual valve, or blind flange. When these valves are closed or isolated, they are performing their required safety function.

The 72 hour Completion Time takes into account the redundancy afforded by the remaining OPERABLE valves and the low probability of an event occurring during this time period that would require isolation of the MFW flow paths. The 72 hour Completion Time is reasonable, based on operating experience.

Inoperable MFIVs that are closed or isolated must be verified on a periodic basis that they are closed or isolated. This is necessary to ensure that the assumptions in the safety analysis remain valid. The 7 day Completion Time is reasonable, based on engineering judgment, in view of valve status indications available in the control room, and other administrative controls, to ensure that these valves are closed or isolated.

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ACTIONS (continued)

B.1 and B.2

With one MFCV in one or more flow paths inoperable, action must be taken to restore the affected valves to OPERABLE status, or to close or isolate inoperable affected valves within 72 hours by use of a closed and de-activated automatic valve, a closed manual valve, or blind flange. When these valves are closed or isolated, they are performing their required safety function.

The 72 hour Completion Time takes into account the redundancy afforded by the remaining OPERABLE valves and the low probability of an event occurring during this time period that would require isolation of the MFW flow paths. The 72 hour Completion Time is reasonable, based on operating experience.

Inoperable MFCVs, that are closed or isolated, must be verified on a periodic basis that they are closed or isolated. This is necessary to ensure that the assumptions in the safety analysis remain valid. The 7 day Completion Time is reasonable, based on engineering judgment, in view of valve status indications available in the control room, and other administrative controls to ensure that the valves are closed or isolated.

C.1 and C.2

With one MFCV's bypass valve or MFW/AFW NBV in one or more flow paths inoperable, action must be taken to restore the affected valves to OPERABLE status, or to close or isolate inoperable affected valves within 72 hours by use of a closed and de-activated automatic valve, a closed manual valve, or blind flange. When these valves are closed or isolated, they are performing their required safety function.

The 72 hour Completion Time takes into account the redundancy afforded by the remaining OPERABLE valves and the low probability of an event occurring during this time period that would require isolation of the MFW flow paths. The 72 hour Completion Time is reasonable, based on operating experience.

Inoperable MFCV's bypass valves or MFW/AFW NBVs that are closed or isolated must be verified on a periodic basis that they are closed or isolated. This is necessary to ensure that the assumptions in the safety analysis remain valid. The 7 day Completion Time is reasonable, based on engineering judgment, in view of valve status indications available in the control room, and other administrative controls, to ensure that these valves are closed or isolated.

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ACTIONS (continued)

D.1

With two inoperable valves in the same flow path, there may be no redundant system to operate automatically and perform the required safety function. Under these conditions, affected valves in each flow path must be restored to OPERABLE status, or the affected flow path isolated within 8 hours. This action returns the system to the condition where at least one valve in each flow path is performing the required safety function. The 8 hour Completion Time is reasonable, based on operating experience, to complete the actions required to close the MFIV or MFCV, or otherwise isolate the affected flow path.

E.1 and E.2

If the MFIV(s), MFCV(s), MFCV's bypass valve(s), and MFW/AFW NBV(s) cannot be restored to OPERABLE status, or closed, or isolated within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

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SURVEILLANCE  
REQUIREMENTS

SR 3.7.3.1

This SR verifies that the closure time of each MFIV, MFCV, MFCV's bypass valve, and MFW/AFW NBV is  $\leq 10$  seconds on an actual or simulated actuation signal. The MFIV and MFCV closure times are assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a refueling outage. These valves should not be tested at power since even a part stroke exercise increases the risk of a valve closure with the unit generating power. This is consistent with the ASME OM Code (Ref. 3) quarterly stroke requirements during operation in MODES 1 and 2.

The Frequency for this SR is in accordance with the Inservice Testing Program.

BASES

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- REFERENCES
1. UFSAR, Section 10.4.7.
  2. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).
  3. ASME Code for Operation and Maintenance of Nuclear Power Plants.