3.15 AIR TREATMENT SYSTEMS

3.15.1 EMERGENCY CONTROL ROOM AIR TREATMENT SYSTEM

Applicability

Applies to the emergency control room air treatment system and its associated filters.

Objective

To specify minimum availability and efficiency for the emergency control room air treatment system and its associated filters.

Specifications

3.15.1.1 Except as specified in Specification 3.15.1.3 below, both emergency treatment systems, AH-E18A fan and associated filter AH-F3A and AH-E18B fan and associated filter AH-F3B shall be operable at all times, per the requirements of Specification 3.15.1.2 below; when containment integrity is required and when irradiated fuel handling operations are in progress.

3.15.1.2 a. The results of the in-place DOP and halogenated hydrocarbon tests at design flows on HEPA filters and charcoal absorber banks shall show < 0.05% DOP penetration and < 0.05% halogenated hydrocarbon penetration, except that the DOP test will be conducted with prefilters installed.

b. The results of laboratory carbon sample analysis shall show ≥ 95% radioactive methyl iodide decontamination efficiency when tested **in accordance with ASTM D3803-1989** at 30°C, 95% R.H.

c. The fans AH-E18A and B shall each be shown to operate within ± 4000 CFM of design flow (40,000 CFM).

3.15.1.3 From and after the date that one control room air treatment system is made or found to be inoperable for any reason, reactor operation or irradiated fuel handling operations are permissible only during the succeeding 7 days provided the redundant system is verified to be OPERABLE.

3.15.1.4 From the date that both control room air treatment systems are made or found to be inoperable or if the inoperable system of 3.15.1.3 cannot be made operable in 7 days, irradiated fuel handling operations shall be terminated in 2 hours and reactor shutdown shall be initiated and the reactor shall be in cold shutdown within 48 hours.

Bases

The emergency control room air treatment systems AH-E18A and 18B and their associated filters are two independent systems designed to filter the control room atmosphere for intake air and/or for recirculation during control room isolation conditions. The control building is designed to be automatically placed in the recirculation mode upon an RM-A1 high radiation alarm, air tunnel device actuation, ESAS actuation or station blackout condition. The emergency control room air treatment fan and filter AH-E18A or B and AH-F3A or B is designed to be manually started by the operator if a high radiation alarm from RM-A1 is indicated.

Prefilters and high efficiency particulate absolute (HEPA) filters are installed before the charcoal absorbers to prevent clogging of the iodine adsorbers and remove particulate activity. The charcoal adsorbers are installed to reduce the potential intake of radioiodine to the control room. If the efficiencies of the HEPA filters and charcoal adsorbers are as specified, the resulting doses will be less than the allowable levels stated in Criterion 19 of the General Design Criteria for Nuclear Power Plants, Appendix A to 10 CFR Part 50. Operation of the fans significantly different from the design flow will change the removal efficiency of the HEPA filters and charcoal adsorbers.

If one system is found to be inoperable, there is no immediate threat to the control room and reactor operation or refueling may continue for a limited period of time while repairs are being made. If the system cannot be repaired within 7 days, the reactor is shut down and brought to cold shutdown within 48 hours and irradiated fuel handling operations are terminated within 2 hours.

If both systems are found to be inoperable, reactor shutdown shall be initiated and the reactor will be brought to cold shutdown in 48 hours and irradiated fuel handling operations will be stopped within 2 hours.

In-place testing for penetration and system bypass shall be performed in accordance with ANSI N510-1980. Charcoal samples shall be obtained in accordance with ANSI N509-1980. Any HEPA filters found defective shall be replaced with filters qualified according to Regulatory Guide 1.52, Revision 2. Any lot of charcoal adsorber which fails the laboratory test criteria shall be replaced with new adsorbent qualified according toASTM D3803-1989.

Laboratory testing of charcoal samples will be performed in accordance with the methods prescribed by ASTM D3803-1989. Design basis accident analyses assume the carbon adsorber is 90% efficient in its total radioiodine removal. Therefore, using a Safety Factor of 2 (Ref. 3), the acceptance criteria for the laboratory test of carbon adsorber is set at greater than or equal to 95% [(100 – 90) / 2 = 5% penetration].

References

(1) FSAR Section 9.8
(2) FSAR Figure 9-21
(3) **NRC Generic Letter 99-02, dated June 3, 1999.**

3.15.2 REACTOR BUILDING PURGE AIR TREATMENT SYSTEM

Applicability

Applies to the reactor building purge air treatment system and its associated filters.

Objective

To specify minimum availability and efficiency for the reactor building purge air treatment system and its associated filters.

Specification

3.15.2.1 Except as specified in Specification 3.15.2.3 below, the Reactor Building Purge Air Treatment System filter AH-F1 shall be operable as defined by the Specification below at all times when containment integrity is required unless the Reactor Building purge isolation valves are closed.

3.15.2.2 a. The results of the in-place DOP and halogenated hydrocarbon tests at maximum available flows on HEPA filters and charcoal adsorber banks for AH-F1 shall show less than 0.05% DOP penetration and less than 0.05% halogenated hydrocarbon penetration; except that the DOP test will be conducted with prefilters installed.

b. The results of laboratory carbon sample analysis for the reactor building purge system filter carbon shall show greater than or equal to 85% radioactive methyl iodide decontamination efficiency when tested **in accordance with ASTM D3803-1989** at 30°C, 95% R.H.

3.15.2.3 From and after the date that the filter AH-F1 in the reactor building purge system is made or found to be inoperable as defined by Specification 3.15.2.2 above, the Reactor Building purge isolation valves shall be closed until the filter is made operable.

Bases

The Reactor Building Purge Exhaust System (Reference 1) filter AH-F1 while normally used to filter all reactor building exhaust air. It is necessary to demonstrate operability of these filters to assure readiness for service if required to mitigate a fuel handling accident (Reference 2) in the Reactor Building and to assure that 10CFR50 Appendix I limits are met. Reactor Building purging is required to be terminated if the filter is not operable.

High efficiency particulate absolute (HEPA) filters are installed before the charcoal absorbers to prevent clogging of the iodine absorbers for all emergency air treatment systems. The charcoal absorbers are installed to reduce the potential release of radioiodine to the environment. If the efficiencies of the HEPA filters and charcoal adsorbers are as specified, the resulting doses will be less than the 10 CFR 100 guidelines for the Fuel Handling Accident which assumes 90% efficiency for inorganic iodines and 70% efficiency for organic iodines.

The flow through AH-F1 can vary from 0 CFM to 50,000 CFM, the maximum purge flow rate During all modes except COLD SHUTDOWN, the purge valves are limited to no more than 30° open (90° being full open). This provides greater assurance of containment isolation dependability per NUREG 0737 Item II.E.4.2 Attachment 1 Item (2)(a). Makeup air is provided between the filter AH-F1 and the fans AH-E7A and B. (See also T.S. 3.6).

In-place testing for penetration and system bypass shall be performed in accordance with ANSI N510-1980. Charcoal samples shall be obtained in accordance with ANSI N509-1980. Any lot of charcoal adsorber which fails the laboratory test criteria shall be replaced with new adsorbent qualified in accordance with ASTM-D3803-1989.

Laboratory testing of charcoal samples will be performed in accordance with the methods prescribed by ASTM D3803-1989. With the specified efficiencies of the HEPA filters and carbon adsorber, the potential consequences of a Fuel Handling Accident Inside Containment are well within the guidelines of 10 CFR Part 100 (Reference 2). The accident analysis assumes the carbon adsorber is 70% efficient in its total radioiodine removal. Therefore, using a Safety Factor of 2 (Reference 3), the acceptance criteria for the laboratory test of carbon adsorber is set at greater than or equal to 85% [(100 – 70) / 2 = 15% penetration].

References

(1) UFSAR Section 5.3.3 - "Reactor Building Purge System Isolation"

(2) UFSAR Section 14.2.2.1 - "Fuel Handling Accident"

(3) **NRC Generic Letter 99-02, dated June 3, 1999.**

3.15.4 Fuel Handling Building ESF Air Treatment System

Applicability

Applies to the Fuel Handling Building (FHB) ESF Air Treatment System and its associated filters.

Objective

To specify minimum availability and efficiency for the FHB ESF Air Treatment System and its associated filters for irradiated fuel handling operations.

Specifications

3.15.4.1 Prior to fuel movement each refueling outage, two trains shall be operable. One train shall be operating continuously whenever TMI-1 irradiated fuel handling operations in the FHB are in progress.

a. With one train inoperable, irradiated fuel handling operations in the Fuel Handling Building may continue provided the redundant train is operating.

b. With both trains inoperable, handling of irradiated fuel in the Fuel Handling Building shall be suspended until such time that at least one train is operable and operating. Any fuel assembly movement in progress may be completed.

3.15.4.2 A FHB ESF Air Treatment System train is operable when its surveillance requirements are met and:

a. The results of the in-place DOP and halogenated hydrocarbon tests at design flows on HEPA filters and carbon adsorber banks shall show $< 0.05\%$ DOP penetration and $< 0.05\%$ halogenated hydrocarbon penetration.

b. The results of laboratory carbon sample analysis shall show $\geq$ 95% radioactive methyl iodide decontamination efficiency when tested **in accordance with ASTM D3803-1989** at 30°C, 95% R.H.

c. The fans AH-E-137A and B shall each be shown to operate within $\pm$ 10% of design flow (6,000 SCFM).

Bases

Compliance with these specifications satisfies the condition of operation imposed by the Licensing Board as described in NRC's letter dated October 2, 1985, item 1.c.

The FHB ESF Air Treatment System contains, controls, mitigates, monitors and records radiation release resulting from a TMI-1 postulated spent fuel accident in the Fuel Handling Building as described in the FSAR. Offsite doses will be less than the 10 CFR 100 guidelines for accidents analyzed in Chapter 14 (Reference 1).

Bases (Continued)

Normal operation of the FHB ESF Air Treatment System will be during TMI-1 irradiated fuel movements in the Fuel Handling Building. The system includes air filtration and exhaust capacity to ensure that any radioactive release to atmosphere will be filtered and monitored. Effluent radiation monitoring and sampling capability are provided.

The in-plant testing for penetration and system bypass shall be performed in accordance with ANSI N510-1980. Charcoal samples shall be obtained in accordance with ANSI N509-1980. Any HEPA filters found defective shall be replaced with filters qualified according to Regulatory Guide 1.52, Revision 2. Any lot of charcoal adsorber which fails the laboratory test criteria shall be replaced with new adsorbent qualified in accordance with ASTM D3803-1989.

Laboratory testing of charcoal samples will be performed in accordance with the test methods prescribed by ASTM D3803-1989. Testing of charcoal at 95% relative humidity will be required until such time that a surveillance to demonstrate operability of the heaters is incorporated by amendment into the specification. The accident analysis in FSAR Chapter 14 (Reference 1) assumes the charcoal adsorber is 90% efficient in its total radioiodine removal. Therefore, using a Safety Factor of 2 (Ref. 2), the acceptance criteria for the laboratory test of charcoal adsorber is set at greater than or equal to 95% [(100 – 90) / 2 = 5% penetration].

References

(1) UFSAR, Section 14.2.2.1 - "Fuel Handling Accident"
(2) NRC Generic Letter 99-02, dated June 3, 1999.

Bases

Pressure drop across the combined HEPA filters and charcoal adsorbers of less than 6 inches of water at the system design flow rate will indicate that the filters and adsorbers are not clogged by excessive amounts of foreign matter. Pressure drop should be determined at least once per refueling cycle to show system performance capability.

The frequency of tests and sample analysis are necessary to show that the HEPA filters and charcoal adsorbers can perform as evaluated. Tests of the charcoal adsorbers with halogenated hydrocarbon shall be performed in accordance with approved test procedures. Replacement adsorbent should be qualified according to ASTM D3803-1989. The charcoal adsorber efficiency test procedures should allow for the removal of one adsorber tray, emptying of one bed from the tray, mixing the adsorbent thoroughly and obtaining at least two samples. Each sample should be at least two inches in diameter and a length equal to the thickness of the bed. If test results are unacceptable all adsorbent in the system shall be replaced. Tests of the HEPA filters with DOP aerosol shall also be performed in accordance with approved test procedures. Any HEPA filters found defective should be replaced with filters qualified according to Regulatory Guide 1.52 March 1978.

Operation of the system for 10 hours every month will demonstrate operability of the filters and adsorber system and remove excessive moisture built up on the adsorber.

If significant painting, steam, fire or chemical release occurs such that the HEPA filter or charcoal adsorber could become contaminated from the fumes, chemicals or foreign materials, the same tests and sample analysis shall be performed as required for operational use. The determination of significance shall be made by the Vice President-TMI Unit 1.

Demonstration of the automatic initiation of the recirculation mode of operation is necessary to assure system performance capability. Dampers required for control building isolation and recirculation are specified in UFSAR Sections 7.4.5 and 9.8.1.

Bases

Pressure drop across the combined HEPA filters and charcoal adsorbers of less than 6 inches of water at the system design flow rate will indicate that the filters and adsorbers are not clogged by excessive amounts of foreign matter. Pressure drop should be determined at least once every refueling interval to show system performance capability.

The frequency of tests and sample analysis are necessary to show that the HEPA filters and charcoal adsorbers can perform as evaluated. Tests of the charcoal adsorbers with Halogenated hydrocarbon refrigerant shall be performed in accordance with approved test procedures. The charcoal adsorber efficiency test procedures should allow for the removal of one adsorber tray, emptying of one bed from the tray, mixing the adsorbent thoroughly and obtaining at least two samples. Each sample should be at least two inches in diameter and a length equal to the thickness of the bed. If test results are unacceptable all adsorbent in the system should be replaced with an adsorbent qualified according to ASTM D3803-1989. Tests of the HEPA filters with DOP aerosol shall also be performed in accordance with approved test procedures. Any HEPA filters found defective should be replaced with filters qualified according to Regulatory Guide 1.52, March 1978.

Fans AH-E7A & B performance verification is necessary to ensure adequate flow to perform the filter surveillance of T.S. 4.12.2.1 and 4.12.2.3 and can only be demonstrated by running both fans simultaneously. This can only be accomplished when purge valves are note limited to 30° open (i.e., cold shutdown).

Since H_2 purge has been superseded by the installation of H_2 recombiners at TMI-I, the reactor building purge exhaust system no longer is relied upon to serve an operating accident mitigating (i.e. LOCA) function. The retest requirement of T.S. 4.12.2.2a has therefore been changed to reflect the same retest requirements as the auxiliary and fuel handling building ventilation system which similarly serves no operating accident mitigating function.

If significant painting, steam, fire, or chemical release occurs such that the HEPA filter or charcoal adsorber could become contaminated from the fumes, chemicals or foreign material, the same tests and sample analysis shall be performed as required for operational use. The determination of significant shall be made by the Vice President-TMI Unit 1.

References

(1) UFSAR, Section 5.6 - "Ventilation and Purge Systems"

Bases

The FHB ESF Air Treatment System is a system which is normally kept in a "standby" operating status. Tests and sample analysis assure that the HEPA filters and charcoal adsorbers can perform as evaluated. The charcoal adsorber efficiency test procedure should allow for the removal of a sample from one adsorber test canister. Each sample should be at least two inches in diameter and a length equal to the thickness of the bed. The in-place test criteria for activated charcoal will meet the guidelines of ANSI-N510-1980. The laboratory test of charcoal will be performed in accordance with ASTM D3803-1989. If laboratory test results are unacceptable, all adsorbent in the system shall be replaced with an adsorbent qualified in accordance with ASTM D3803-1989. Any HEPA filters found defective will be replaced with filters qualified in accordance with ANSI-N509-1980.

Pressure drop across the entire filtration unit of less than 7.0 inches of water at the system design flow rate will indicate that the filters and adsorbers are not clogged by excessive amounts of foreign matter.

Operation of the system for 10 hours every month will demonstrate operability of the filters and adsorber system and remove excessive moisture buildup on the adsorbers and HEPA filters.

If significant painting, steam, fire, or chemical release occurs such that the HEPA filter or charcoal adsorber could become contaminated from the fumes, chemicals or foreign material, the same tests and sample analysis shall be performed as required for operational movement of irradiated fuel. The determination of what is significant shall be made by the Vice President-TMI Unit 1.