U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

6.5.1 ESF ATMOSPHERE CLEANUP SYSTEMS

REVIEW RESPONSIBILITIES

Primary - ~~Effluent Treatment Systems Branch (ETSB)~~Plant Systems Branch (SPLB)[1]

Secondary - ~~None~~Emergency Preparedness and Radiation Protection Branch (PERB)[2]

I. AREAS OF REVIEW

This review addresses engineered safety feature (ESF) atmosphere cleanup systems designed for fission product removal in postaccident environments. These systems generally include primary systems, such as in-containment recirculation, and secondary systems, such as standby gas treatment systems and emergency or postaccident air-cleaning systems for the fuel-handling building, control room, shield building, and areas containing ESF components.[3]

At the construction permit (CP) stage of review, ~~ETSB~~SPLB[4] reviews the information in the applicant's safety analysis report (SAR) in the areas listed below. At the operating license (OL) stage, the ~~ETSB~~SPLB[5] review consists of confirming the design accepted at the CP stage and evaluating the adequacy of the applicant's technical specifications in these areas. For each ESF atmosphere cleanup system,[6] the specific ~~ETSB~~SPLB[7] review areas are as follows:

1. ~~The engineered safety feature (ESF) atmosphere cleanup systems designed for fission product removal in post-accident environments. These generally include primary systems, such as in-containment recirculation, and secondary systems, such as standby gas treatment systems and emergency or post accident air cleaning systems for the fuel handling building, control room, shield building and areas containing engineered safety feature components.~~[8]

~~2~~1. The system design, design objectives, and design criteria. The ~~ETSB~~SPLB[9] reviews the methods of operation and the factors that could influence the filtration capabilities of the system, e.g., system interfaces and potential bypass routes. The components included in each ~~atmospheric~~atmosphere[10] cleanup system and the seismic design category of each system are reviewed. Redundancy of the atmosphere cleanup systems, the physical separation of the redundant trains, and the volumetric airflow rate of each train are reviewed.

~~3~~2. The environmental design criteria, the design pressure and pressure differential, relative humidity, maximum and minimum temperature, and radiation source term.

~~4~~3. The component design criteria, qualification requirements, and qualification testing of heaters, demisters, prefilters, and high-efficiency particulate air (HEPA) filters, design requirements of the filter and adsorber mounting frames, system filter and adsorber housings, and water drains, the adsorbent used for removal of gaseous iodines (in the preliminary safety analysis report, PSAR), the physical properties of the adsorbent, and the design of the adsorber section of the filter trains (in the final safety analysis report, FSAR). Provisions to inhibit offdesign temperatures in the adsorber section and the design criteria of the system fans or blowers, ductwork, and housings are also reviewed.

~~5~~4. Design provisions incorporated in the equipment and features to facilitate operation and maintenance. The design of doors to the filter housings, the spacing of components, alignment and support of filter elements, the spacing of filter elements in the same bank, design of test probes, and provisions for adequate lighting in the filter housing are also reviewed.

~~6~~5. The design criteria for inplace testing of the airflow distribution to the HEPA filters, dioctyl phthalate (DOP) testing of the HEPA filter sections, and gaseous halogenated hydrocarbon refrigerant bypass leak testing of the activated carbon adsorber section.

~~7~~6. The laboratory test criteria for the activated carbon adsorbent, qualification and batch tests, provisions for obtaining representative adsorbent samples for laboratory testing in order to estimate the amount of penetration of the system adsorbent throughout its service life (PSAR), and the provisions and conditions for each field and laboratory test (FSAR).

Review Interfaces[11]

1. The SPLB performs related reviews as part of its primary review responsibility under the SRP sections indicated:

   a. The SPLB reviews control room habitability systems as part of its primary review responsibility for SRP Section 6.4.

   b. The SPLB reviews the control room area ventilation system as part of its primary responsibility for SRP Section 9.4.1.

c. The SPLB reviews the spent fuel pool area ventilation system as part of its primary review responsibility for SRP Section 9.4.2.

d. The SPLB reviews the auxiliary and radwaste area ventilation system as part of its primary review responsibility for SRP Section 9.4.3.

e. The SPLB reviews the ventilation systems for areas housing engineered safety features as part of its primary review responsibility for SRP Section 9.4.5.[12]

f. The SPLB reviews the qualification of essential power or electrical control cables associated with the ESF atmosphere cleanup system as part of its primary responsibility for SRP Section 3.11.[13]

2. The review of the ESF atmosphere cleanup systems also involves review evaluations performed by other branches. The conclusions from ~~their~~ other branch[14] evaluations are used by SPLB to complete the overall evaluation of the facility. ~~ETSB~~ SPLB[15] will coordinate other branches' evaluations that interface with the overall review of the system, as follows:[16]

a. The Containment Systems and Severe Accidents Branch (SCSB) reviews the secondary containment accident mitigation systems as part of its primary review responsibility for SRP Section 6.2.3.[17]

b. ~~the Structural Engineering Branch (SEB)~~The Civil Engineering and Geosciences Branch (ECGB)[18] determines the acceptability of the design analyses, procedures, and criteria used to establish the ability of seismic Category I structures housing the systems[19] and supporting systems to withstand the effects of natural phenomena such as the safe shutdown earthquake (SSE), probable maximum flood (PMF), and tornado missiles as part of its primary review responsibility for SRP Sections 3.3.1, 3.3.2, 3.5.3, 3.7.1 through 3.7.4, 3.8.4, and 3.8.5.

c. The Mechanical Engineering Branch ~~(MEB)~~ (EMEB)[20] determines the acceptability of the seismic and quality group classifications for system components as part of its primary review responsibility for SRP Sections 3.2.1 and 3.2.2.

d. The review~~s~~[21] for technical specifications ~~and Quality Assurance are~~is coordinated and performed by the ~~Licensing Guidance Branch~~Technical Specifications Branch (TSB)[22] ~~and the Quality Assurance Branch (QAB)~~ as part of ~~their~~its primary review responsibility for SRP Section~~s~~ 16.0 ~~and 17.0, respectively~~.

e. The review for quality assurance is coordinated and performed by the Quality Assurance and Maintenance Branch (HQMB) as part of its primary review responsibility for SRP Chapter 17.[23]

f. The ~~Instrumentation and Control Systems Branch (ICSB)~~Instrumentation and Controls Branch (HICB)[24] ~~and Power Systems Branch (PSB)~~[25] reviews the associated instrumentation ~~including the power supply and electrical distribution systems~~ as part of ~~their~~its primary review responsibility for SRP Sections 7.3~~,~~ and 7.5~~, and 8.2~~.

g. The Electrical Engineering Branch (EELB) reviews the power supply and electrical distribution systems as part of its primary review responsibility for SRP Section 8.2.[26]

h. The ~~Accident Evaluation Branch (AEB)~~Emergency Preparedness and Radiation Protection Branch (PERB)[27] calculates the doses that could result as a consequence of postulated accidents as part of its ~~primary~~[28] review responsibility for SRP Sections 6.4, 6.5.2 through 6.5.4, 15.1.5, 15.4.8, 15.4.9, 15.6.2 through 15.6.5, 15.7.4, 15.7.5, and 15.8.[29] Upon request, ~~AEB~~ PERB[30] will calculate filter loadings of all the iodine isotopes under accident conditions to enable ~~ETSB~~SPLB[31] to complete its overall evaluation of the ESF atmosphere cleanup systems.

~~The Equipment Qualification Branch (EQB) reviews the qualification of essential power or electrical control cables associated with the ESF atmosphere cleanup system as part of its primary responsibility for SRP Section 3.11.~~[32]

For those areas of review identified above as ~~being reviewed as part of~~ the primary ~~review~~ responsibility of other branches, ~~the~~ acceptance criteria ~~necessary for the review~~ and ~~their~~ methods of application are contained in the referenced SRP sections ~~of the corresponding primary branch~~.[33]

II. ACCEPTANCE CRITERIA

The installed ESF atmosphere cleanup systems are ~~is~~[34] needed to mitigate the consequences of postulated accidents by removing from the atmosphere radioactive material that may be released in the event of an accident. ~~ETSB~~SPLB[35] acceptance criteria for the ESF atmosphere cleanup systems are based on meeting the relevant requirements of the following regulations:

A. General Design Criterion 19 (GDC 19)[36] as it relates to systems being designed for habitability of the control room under accident and loss-of-coolant accident (LOCA)[37] conditions.

B. General Design Criterion 41 (GDC 41)[38] as it relates to the design of systems to be used for containment atmosphere cleanup following postulated accidents, and to control releases to the environment.

C. General Design Criterion 42 (GDC 42)[39] ~~and General Design Criterion 43~~[40] as ~~they~~it relates to the inspection ~~and testing~~ of containment ESF atmosphere cleanup systems.

D. General Design Criterion 43 (GDC 43) as it relates to the testing of containment ESF atmosphere cleanup systems.[41]

~~D~~E.[42] General Design Criterion 61 (GDC 61)[43] as it relates to the design of systems for radioactivity control under normal and postulated accident conditions.

~~E~~F. General Design Criterion 64 (GDC 64)[44] as it relates to monitoring radioactive releases under normal, anticipated operational occurrences, and postulated accident conditions from ESF atmosphere cleanup systems.

Technical Rationale[45]

The technical rationale for application of these acceptance criteria to reviewing ESF atmosphere cleanup systems is discussed in the following paragraphs:[46]

1. Compliance with GDC 19 requires radiation protection of the control room to ensure that access and occupancy under accident conditions, including LOCAs, will not result in radiation exposures in excess of the specified limit.

   GDC 19 applies to this section because control room radiation protection under accident conditions may require an ESF atmosphere cleanup system.

   Meeting this criterion provides assurance that personnel needed to monitor and control an accident will be able to perform those functions effectively.[47]

2. Compliance with GDC 41 requires systems to control fission products that may be released into the reactor containment, thereby reducing the concentration of fission products released to the environment after an accident. GDC 41 also includes redundancy and reliability requirements for such systems.

   GDC 41 applies to this section because control of fission products released from the containment after an accident may require an ESF atmosphere cleanup system.

   Meeting this criterion provides assurance that offsite radiation doses resulting from an accident will be within regulatory limits.[48]

3. Compliance with GDC 42 requires that containment atmosphere cleanup systems be designed to accommodate periodic inspection of important components such as filter frames, ducts, and piping.

   GDC 42 applies to this section because the containment atmosphere cleanup system may be an ESF.

Meeting this criterion provides assurance that the equipment necessary to mitigate the consequences of an accident will maintain its functional capability.[49]

4. Compliance with GDC 43 requires that containment atmosphere cleanup systems be designed to accommodate periodic pressure and functional testing.

   GDC 42 applies to this section because the containment atmosphere cleanup system may be an ESF.

   Meeting this criterion provides assurance that the equipment necessary to mitigate an accident will maintain its functional capability.[50]

5. Compliance with GDC 61 requires that fuel storage and handling, radioactive waste, and other systems that may contain radioactive material be designed to ensure adequate safety under normal and postulated accident conditions. These systems shall be designed with appropriate containment, confinement, and filtering systems.

   GDC 61 applies to this section because attainment of the objectives for postulated accident conditions may require an ESF atmosphere cleanup system.

   Meeting this criterion provides assurance that offsite doses of radiation resulting from accident conditions will not exceed regulatory limits.[51]

6. Compliance with GDC 64 requires monitoring the reactor containment atmosphere, spaces containing components for recirculation of LOCA fluids, effluent discharge paths, and the plant environs to detect radioactivity that may be released from normal operations (including anticipated operational occurrences) and postulated accidents.

   GDC 64 applies to this section because the ESF atmosphere cleanup systems are used to control releases of radioactivity from postulated accidents. The review ensures that means are provided to monitor releases.

   Meeting this criterion provides assurance that offsite doses of radiation resulting from accident conditions will not exceed regulatory limits and that releases will be adequately documented.[52]

Relevant requirements of the Commission's regulations identified above are met by using the regulatory positions contained in Regulatory Guide 1.52[53] as it relates to the design testing and maintenance of ESF atmosphere cleanup system air filtration and adsorption units.

~~Specific criteria necessary to meet the relevant requirements of the Commission's regulations are as follows:~~[54]

~~The ESF atmosphere cleanup systems should be designed so that they can operate after a design basis accident (DBA) and can retain radioactive material after a DBA. The system should have provisions to prefilter air, remove moisture and meet the Regulatory Guide 1.52 requirements for charcoal adsorption. The systems should be redundant, be designed to Seismic Category I~~

~~requirements, be able to actuate automatically, and be limited to an air flow rate of approximately 30,000 cfm.~~

~~Design of instrumentation for ESF atmosphere cleanup systems should conform to the guidelines of Regulatory Guide 1.52 and to the recommendations of ANSI N509. Minimum instrumentation, readout, recording, and alarm provisions for ESF atmosphere cleanup systems are given in Table 6.5.1-1 of this SRP section.~~

~~Environmental design guidelines for acceptability are based on the conditions following a DBA. Radiation source terms should be consistent with the guidelines in Regulatory Guides 1.3, 1.4, 1.7, and 1.25 (Ref. 1, 2, 3, and 4).~~

~~Components such as demisters, heaters, prefilters, HEPA filters, mounting frames, filter housings, adsorbent, fans, ductwork and dampers should be designed, constructed and tested in accordance with ANSI 509-1980 design and qualification testing criteria. Water drain design and the accessibility of components and ease of maintenance should be in accordance with the recommendations of ERDA 76-21 (Ref. 8) and ANSI 509 (1980).~~

~~Acceptability with respect to inplace testing should include meeting the requirements of ANSI N510-1980 (Ref. 7). For laboratory testing of activated carbon adsorbent, conformance with ANSI N509-1980 will be used as an acceptability criterion.~~

~~ETSB will accept the following deviations from the above acceptance criteria for the post loss-of-coolant accident (LOCA) ESF atmosphere cleanup system:~~

~~1. If the calculated dose (sum of the long-term doses from the LOCA and the purge dose at the low population zone outer boundary) is less than the guidelines of 10 CFR Part 100, no filtration system is required.~~

~~2. If a radioiodine decontamination factor of 10 or less is needed for the calculated dose to be below Part 100, an atmosphere cleanup system that meets the acceptance criteria listed in Item 5 of Acceptance Criteria in SRP Section 11.3 is acceptable.~~

~~3. If a radioiodine decontamination factor of greater than 10 is needed for the calculated dose to be below Part 100, the ESF atmosphere cleanup system meeting all of the above acceptance criteria with the exception of Items 2b and 2c of Part C of Regulatory Guide 1.52, is acceptable.~~

III. REVIEW PROCEDURES

The reviewer will select and emphasize material from this SRP section, as may be appropriate for a particular case.

1. ~~In the ETSB~~SPLB[55] reviews the plant design ~~is reviewed~~[56] to determine where ESF atmosphere cleanup systems are needed. This effort is coordinated with ~~AEB~~PERB.[57]

2. The ~~ETSB~~SPLB[58] review is carried out by making a detailed comparison of atmosphere cleanup system designs with the acceptance criteria of Section II, above.[59]

3. SPLB verifies each ESF atmosphere cleanup system, as follows:[60]

   a. The system is designed so that it can operate after a design basis accident (DBA) and can retain radioactive material after a DBA.[61]

      The capability of a system to remove fission products from the atmosphere after a DBA is reviewed, based on a design loading of 2.5 mg of total iodine (radioactive plus stable) per gram of activated charcoal adsorbent. Designs consistent with General Design Criteria 19, 41, 42, 43, 61, and 64 and the guidelines of Regulatory Guide 1.52 will be assigned the system efficiencies for removal of elemental iodine and organic iodides given in Table 2 of Regulatory Guide 1.52 and a system efficiency of 99% for removal of particulates resulting from a DBA. The assigned efficiencies are for ~~AEB~~ PERB[62] use in accident analyses to calculate offsite doses to the whole body and thyroid.

   b. The system has provisions to prefilter air, remove moisture, and meet the requirements of Regulatory Guide 1.52 for charcoal adsorption.[63]

   c. The system is redundant, is designed to Seismic Category I requirements, is able to actuate automatically, and is limited to an airflow rate of approximately 15 m^3/s (30,000 cfm).[64]

   d. Design of instrumentation for ESF atmosphere cleanup systems conforms to the guidelines of Regulatory Guide 1.52 and to the recommendations of ASME N509-1989. Instrumentation, readout, recording, and alarm provisions for ESF atmosphere cleanup systems meet the minimum requirements given in Table 6.5.1-1 of this SRP section.[65]

   e. Environmental design guidelines for acceptability are based on the conditions following a DBA. Radiation source terms are consistent with the guidelines in Regulatory Guides 1.3, 1.4, 1.7, and 1.25.[66]

   f. Fabrication of the charcoal tray and screen involves all-welded construction to preclude potential loss of charcoal from adsorber cells. Further guidance on charcoal loss is found in NRC Bulletin 80-03.[67]

   g. Components such as demisters, heaters, prefilters, HEPA filters, mounting frames, filter housings, adsorbent, fans, ductwork, and dampers are designed, constructed, and tested in accordance with ASME N509-1989 design and qualification testing criteria. Water drain design and the accessibility of components and ease of maintenance are in accordance with the recommendations of ERDA 76-21 and ASME N509-1989.[68]

h. Inplace testing includes meeting the requirements of ASME N510-1989. For laboratory testing of activated carbon adsorbent, conformance with ASME N509-1989 will be used as an acceptability criterion.[69]

i. For the post-LOCA ESF atmosphere cleanup system, SPLB will accept the following deviations from the above requirements:[70]

(1) If the calculated dose (sum of the long-term doses from the LOCA and the purge dose at the low population zone outer boundary) is less than the guidelines of 10 CFR ~~Part~~[71] 100.11, no filtration system is required.

(2) If a radioiodine decontamination factor of 10 or less is needed for the calculated dose to be below ~~Part~~ § 100.11,[72] an atmosphere cleanup system that meets ~~the acceptance criteria listed in Item 5 of SRP Section 11.3~~the design, testing, and maintenance guidelines for HEPA filters and charcoal adsorbers as specified in Regulatory Guide 1.140 are acceptable. If decontamination factors for iodine differ from those specified in Regulatory Guide 1.140 for design purposes, this fact should be supported by test data under operating or simulated conditions (including temperature, pressure, humidity, expected iodine concentrations, and flow rate). The effects of aging and poisoning by airborne contaminants should also be supported by test data.[73]

(3) If a radioiodine decontamination factor of greater than 10 is needed for the calculated dose to be below ~~Part~~ § 100.11,[74] the ESF atmosphere cleanup system meeting all of the above acceptance criteria, with the exception of Items 2b and 2c of Part C of Regulatory Guide 1.52, is acceptable.

4. If the applicant proposes to use the standby gas treatment system (SGTS) more than 90 hours per year during normal operation, the reviewer will verify that this level of use does not impair the capability of the SGTS to perform its intended function in the event of a LOCA.[75]

5. The applicant has provided for monitoring all radioactive releases from the ESF atmosphere cleanup systems.[76]

For standard design certification reviews under 10 CFR Part 52, the procedures above should be followed, as modified by the procedures in SRP Section 14.3 (proposed), to verify that the design set forth in the standard safety analysis report, including inspections, tests, analysis, and acceptance criteria (ITAAC), site interface requirements and combined license action items, meet the acceptance criteria given in subsection II. SRP Section 14.3 (proposed) contains procedures for the review of certified design material (CDM) for the standard design, including the site parameters, interface criteria, and ITAAC.[77]

IV. EVALUATION FINDINGS

~~ETSB~~SPLB[78] verifies that sufficient information has been provided and that the review is adequate to support conclusions of the following type, to be included in the staff's safety evaluation report:

> The staff concludes that the design of the ESF atmosphere cleanup systems, including the equipment and instrumentation to control the release of radioactive materials in gaseous effluents following a postulated design basis accident, are acceptable. This conclusion is based on the applicant having met the requirements of General Design Criteria 19, 41, and 61 by providing ESF atmosphere cleanup systems on the control room habitability, containment, and associated systems. The applicant has met the requirements of General Design Criteria 41, 42,[79] 43, and 64 by providing a program for inspecting and testing the ESF atmosphere cleanup systems and monitoring for radioactive materials in effluents from these systems. In meeting these regulations, the applicant has provided an evaluation that demonstrates that the design of the ESF atmosphere cleanup systems meets the guidelines of Regulatory Guide 1.52 and the ~~ANSI N509~~ASME N509-1989[80] and ~~N510 (Ref's. 6 and 7)~~ASME N510-1989[81] industry standards. We have reviewed the applicant's system descriptions and design criteria for the ESF atmosphere cleanup systems. Based on our evaluation, we find the proposed ESF atmosphere cleanup systems are acceptable, and the filter efficiencies given in Table 2 of Regulatory Guide 1.52 are appropriate for use in accident analyses.

For design certification reviews, the findings will also summarize, to the extent that the review is not discussed in other safety evaluation report sections, the staff's evaluation of inspections, tests, analyses, and acceptance criteria (ITAAC), including design acceptance criteria (DAC), site interface requirements, and combined license action items that are relevant to this SRP section.[82]

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

This SRP section will be used by the staff when performing safety evaluations of license applications submitted by applicants pursuant to 10 CFR 50 or 10 CFR 52.[83] Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications docketed six months or more after the date of issuance of this SRP section.[84]

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides.

VI. REFERENCES

1. Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of-Coolant Accident for Boiling Water Reactors."

2. Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of-Coolant Accident for Pressurized Water Reactors."

3. Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident."

4. Regulatory Guide 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors."

5. Regulatory Guide 1.52, "Design, Testing, and Maintenance Criteria for Post Accident Engineering-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants."

6. Regulatory Guide 1.140, "Design, Testing, and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants."[85]

7. ~~ANSI N509, "Nuclear Power Plant Air Cleaning Units and Components," American National Standards Institute (1980).~~ASME N509-1989, "Nuclear Power Plant Air Cleaning Units and Components," American Society of Mechanical Engineers, 1989.[86]

8. ~~ANSI N510, "Testing of Nuclear Air Cleaning Systems," American National Standards Institute (1980).~~ ASME N510-1989, "Testing of Nuclear Air Cleaning Systems," American Society of Mechanical Engineers, 1989.[87]

9. ERDA 76-21, "Nuclear Air Cleaning Handbook," Oak Ridge National Laboratory, C. A. Burchsted, I. E. Kahn and A. B. Fuller, March 31, 1976.

10. "Building Materials List," Underwriters' Laboratories, Inc.

11. 10 CFR Part 50, Appendix A, General Design Criterion 19, "Control Room.~~,~~" ~~Criterion 41, "Containment Atmosphere Cleanup," Criterion 42, "Inspection of Containment Atmosphere Cleanup Systems," Criterion 43, "Testing of Containment Atmosphere Cleanup Systems," Criterion 61, "Fuel Storage and Handling and Radioactivity Control," and Criterion 64, "Monitoring Radioactivity Releases."~~

12. 10 CFR Part 50, Appendix A, General Design Criterion 41, "Containment Atmosphere Cleanup."

13. 10 CFR Part 50, Appendix A, General Design Criterion 42, "Inspection of Containment Atmosphere Cleanup Systems."

14. 10 CFR Part 50, Appendix A, General Design Criterion 43, "Testing of Containment Atmosphere Cleanup Systems."

15. 10 CFR Part 50, Appendix A, General Design Criterion 61, "Fuel Storage and Handling and Radioactivity Control."

16. 10 CFR Part 50, Appendix A, General Design Criterion 64, "Monitoring Radioactivity Releases."[88]

17. NRC Generic Letter 80-11, "IE Bulletin No. 80-03, Loss of Charcoal from Standard Type II, 2 Inch, Tray Adsorber Cells," January 30, 1980.

18. NRC Bulletin 80-03, "Loss of Charcoal from Standard Type II, 2 Inch, Tray Adsorber Cells," July 1, 1981.[89]

TABLE 6.5.1-1 Minimum instrumentation, readout, recording, and alarm provisions for ESF atmosphere cleanup systems

References: ~~ANSI N509~~ASME N509-1989[90] and Regulatory Guide 1.52

Continuously manned control panel (main control room or auxiliary control panel if manning is a tech spec requirement)	Sensing location	Local readout/alarm
Unit inlet or outlet	Flow rate (indication)	Flow rate (recorded indication, high alarm and low alarm signals)
Demister	Pressure Drop (indication) (optional high alarm signal)	
Electric heater	Status indication	
Space between heater and prefilter	Temperature (indication, high alarm and low alarm signals)	Temperature (indication, high alarm, low alarm, trip alarm signals)
Prefilter	Pressure drop (indication, high alarm signal)	
First HEPA (Pre-HEPA)	Pressure drop (indication, high alarm signal)	Pressure drop (recorded indication)
Space between Adsorber and second HEPA (Post-HEPA)	Temperature (two stage high alarm signal)	Temperature (indication, two-stage high alarm signal)
Second HEPA (Post-HEPA)	Pressure drop (indication, high alarm signal)	
Fan	(Optional hand switch and status indication)	Hand switch, status indication
Valve/damper operator	(Optional status indication)	Status indication

Deluge valves	Hand switch, status indication	Hand switch, status indication	
System inlet to outlet		Summation of pressure drop across total system, high alarm signal	

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SRP Draft Section 6.5.1
Attachment A - Proposed Changes in Order of Occurrence

Item numbers in the following table correspond to superscript numbers in the redline/strikeout copy of the draft SRP section.

Item	Source	Description
1.	Current PRB name and abbreviation	Changed PRB to Plant Systems Branch (SPLB).
2.	SRP-UDP format item	Added PERB as the secondary review branch as per instructions from NRC.
3.	Editorial revision	Reorganized this paragraph as an introduction. The paragraph had been the first in a series of numbered items.
4.	Current PRB designation	Changed PRB to SPLB.
5.	Current PRB designation	Changed PRB to SPLB.
6.	Editorial revision	Added words to emphasize that there are multiple ESF atmosphere cleanup systems. The systems are unrelated to one another.
7.	Current PRB designation	Changed PRB to SPLB.
8.	Editorial revision	Moved this paragraph to the top of AREAS OF REVIEW. The succeeding items all refer back to this paragraph. The succeeding items were renumbered.
9.	Current PRB designation	Changed PRB to SPLB.
10.	Editorial revision	Corrected from "atmospheric" to "atmosphere."
11.	SRP-UDP format item	Added "Review Interfaces" to AREAS of REVIEW.
12.	SRP-UDP format item	Added lead-in paragraph for reviews conducted by the primary review branch. Added interfaces for the five related reviews. Note that evaluations of the ESF atmosphere cleanup system in the System 80+ FSER appeared in the section that covered each system — not in Section 6.5.1. Note also that Regulatory Guide 1.70 allows an applicant to provide review information in sections for each system rather than in Section 6.5.1.
13.	Current PRB responsibility	Reorganized to place all activities for which SPLB has primary review responsibility in one location under "Review Interfaces."
14.	Editorial revision	Added words to clarify who does what.
15.	Current PRB designation	Changed PRB to SPLB.
16.	Editorial revision	Reorganized the remainder of "Review Interfaces" into numbered sections for the various review branches.

Item	Source	Description
17.	Editorial revision	Added a review interface for secondary containment systems because the discussion of the CE 80+ annulus ventilation system, which is an ESF atmosphere cleanup system, was provided in Section 6.2.3 of the FSER rather than in Section 6.5.1.
18.	Current review branch designation	Changed review interface branch to ECGB.
19.	Editorial revision	Used plural noun because more than one such system is likely to exist.
20.	SRP-UDP format item	Updated EMB to EMEB.
21.	Editorial revision	Broke up this sentence to provide each review interface with a separate entry.
22.	Current review branch designation	Changed review interface branch to TSB.
23.	Editorial revision	This information had been part of the sentence immediately above. It was made a separate entry and the responsible branch name has been updated.
24.	Current review branch designation	Changed review interface branch to HICB.
25.	Editorial revision	Broke up this sentence to provide each review interface with a separate entry.
26.	Editorial revision	This information had been part of the sentence immediately above. The name of the responsible review branch has been updated.
27.	Current review branch designation	Changed review interface branch to PERB.
28.	Editorial revision	Deleted "primary" because the PERB is the secondary review branch for some of the review plans identified (namely: 6.4, 6.5.2, 6.5.3, 6.5.4, 15.1.5, 15.4.8, 15.4.9, and 15.6.5). PERB is not listed as the primary or secondary review branch for 15.8; however, it performs the dose calculations. PERB is the primary review branch for SRP Sections 15.6.2 to 15.6.4, 15.7.4, and 15.7.5.
29.	Editorial note	PERB is not identified as either a primary or secondary review branch for SRP Section 15.8. However, doses would be calculated by PERB on an as-required basis.
30.	Current review branch designation	Changed review interface branch to PERB.
31.	Current PRB designation	Changed PRB to SPLB.
32.	Current PRB designation	Moved to part 1 of "Review Interfaces" because SPLB has been assigned primary responsibility for SRP Section 3.11.
33.	Editorial	Simplified to provide clarity and readability.

Item	Source	Description
34.	Editorial revision	Changed "system" to "systems." (See items 6 and 19 above.)
35.	Current PRB designation	Changed PRB to SPLB.
36.	Editorial revision	Provided "GDC 19" as initialism for "General Design Criterion 19."
37.	Editorial revision	Defined "LOCA" as "loss-of-coolant accident."
38.	Editorial revision	Provided "GDC 41" as initialism for "General Design Criterion 41."
39.	Editorial revision	Provided "GDC 42" as initialism for "General Design Criterion 42."
40.	Editorial revision	Broke this into two sentences to make separate entries for GDC 42 and GDC 43.
41.	Editorial revision	This information had been part of the sentence immediately above.
42.	Editorial revision	Renumbered acceptance criteria sequentially.
43.	Editorial revision	Provided "GDC 61" as initialism for "General Design Criterion 61."
44.	Editorial revision	Provided "GDC 64" as initialism for "General Design Criterion 64."
45.	SRP-UDP format item	Added "Technical Rationale" to ACCEPTANCE CRITERIA.
46.	SRP-UDP format item	Added lead-in paragraph for "Technical Rationale."
47.	SRP-UDP format item	Added technical rationale for GDC 19.
48.	SRP-UDP format item	Added technical rationale for GDC 41.
49.	SRP-UDP format item	Added technical rationale for GDC 42.
50.	SRP-UDP format item	Added technical rationale for GDC 43.
51.	SRP-UDP format item	Added technical rationale for GDC 61.
52.	SRP-UDP format item	Added technical rationale for GDC 64.
53.	Integrated Impact Numbers 607 and 747	Regulatory Guide 1.52 references four outdated standards.
54.	Editorial revision	Deleted sentence because the material that follows was moved to REVIEW PROCEDURES.
55.	Current PRB designation	Changed PRB to SPLB.
56.	Editorial revision	Removed redundant "reviewed."

Item	Source	Description
57.	SRP-UDP format item	Updated the abbreviation of the coordinating review branch to PERB.
58.	Current PRB designation	Changed PRB to SPLB.
59.	Editorial revision.	Broke up paragraph into two parts so that review procedures previously included under ACCEPTANCE CRITERIA could be moved here. A lead-in sentence was also provided.
60.	Editorial revision	The following items, lettered a through i (except f) appear under ACCEPTANCE CRITERIA in Revision 2 of this SRP section. These items seem to work better as REVIEW PROCEDURES. (Rev. 2 simply requires a procedure to verify that all acceptance criteria are met.)
61.	Editorial revision	Moved sentence to this location from ACCEPTANCE CRITERIA because it seems more appropriate as a review procedure.
62.	Current review branch designation	Changed review interface branch to PERB.
63.	Editorial revision	Moved to REVIEW PROCEDURES from ACCEPTANCE CRITERIA, providing minor editorial modifications.
64.	SRP-UDP format item	Moved to REVIEW PROCEDURES from ACCEPTANCE CRITERIA and added metric equivalent. Although 14 m^3/s is closer to 30,000 cfm than is 15 m^3/s, "15" is preferred because it does not imply the precision implied by "14."
65.	Integrated Impact Number 610	Moved REVIEW PROCEDURES from ACCEPTANCE CRITERIA and updated the standard from ANSI N509 to ASME N509-1989. Approval by the staff for the update was indicated in the Improved Technical Specifications.
66.	SRP-UDP format item	Moved to REVIEW PROCEDURES from ACCEPTANCE CRITERIA and deleted unnecessary reference callouts.
67.	Integrated Impact Number 609	Added a procedure to review for potential loss of charcoal.
68.	Integrated Impact Number 610	Moved to REVIEW PROCEDURES from ACCEPTANCE CRITERIA and updated the standard from ANSI N509-1980 to ASME N509-1989. Approval by the staff for the update was indicated in the Improved Technical Specifications.

Item	Source	Description
69.	Integrated Impact Numbers 610 and 611	Moved to REVIEW PROCEDURES from ACCEPTANCE CRITERIA and updated the standards from ANSI N509-1980 to ASME N509-1989 and from ANSI N510-1980 to ASME N510-1989. Approval by the staff for these updates was indicated in the Improved Technical Specifications.
70.	Editorial revision	Moved to REVIEW PROCEDURES from ACCEPTANCE CRITERIA, providing minor editorial modifications. Note that Items (1), (2), and (3) under Review Procedure 3.i were also relocated from ACCEPTANCE CRITERIA.
71.	Editorial revision	Corrected citation format for reference to the Code of Federal Regulations (global change for this section).
72.	Editorial revision	Changed the citation to 10 CFR 100.11 to indicate that the same dose comparison is used for items 1, 2, and 3.
73.	Editorial revision	Instead of referencing item 5 of the acceptance criteria in SRP Section 11.3, these criteria have been included here. Possible renumbering of SRP Section 11.3 during the revision process could make cross references difficult to track.
74.	Editorial	See item 72 above.
75.	Integrated Impact Number 608	Added a procedure for reviewing the impact of using the ESF during normal plant operation.
76.	Editorial revision	Added a review procedure to address monitoring radioactive releases in a manner that complies with GDC 64.
77.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
78.	Current PRB designation	Changed PRB to SPLB.
79.	Editorial revision	Added GDC 42 to complete the list of General Design Criteria cited in EVALUATION FINDINGS.
80.	Integrated Impact Number 610	The current version of this standard is ASME N509-1989. Approval by the staff was indicated in the Improved Technical Specifications.
81.	Integrated Impact Number 611	The current version of this standard is ASME N510-1989. Approval by the staff was indicated in the Improved Technical Specifications. Deleted an unnecessary reference callout.
82.	SRP-UDP format item	Added standard language for additional findings for design certification reviews.

Item	Source	Description
83.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard sentence to address application of the SRP section to reviews of applications filed under 10 CFR Part 52, as well as Part 50.
84.	SRP-UDP Guidance	Added standard paragraph to indicate applicability of this section to reviews of future applications.
85.	SRP-UDP format item	Added Regulatory Guide 1.140 to aid the reviewer and renumbered subsequent reference numbers.
86.	Integrated Impact Number 610	The current version of this standard is ASME N509-1989. Approval by the staff was indicated in the Improved Technical Specifications.
87.	Integrated Impact Number 611	The current version of this standard is ASME N510-1989. Approval by the staff was indicated in the Improved Technical Specifications.
88.	Editorial revision	Broke up the reference to provide a separate reference to each GDC.
89.	Integrated Impact Number 609	Added references to GL 80-11 and Bulletin 80-03 as the basis for resolving concerns over potential losses.
90.	Integrated Impact Number 610	The current version of this standard is ASME N509-1989. Approval by the staff was indicated in the Improved Technical Specifications.

SRP Draft Section 6.5.1

Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
607	SRP cites Regulatory Guide 1.52, which in turn cites outdated ANSI Standards.	IV
608	Add procedure to address impact of use of ESF ACS during normal operation.	III.4
609	Add procedure to review for potential loss of charcoal.	III.3.f, VI.17 & 18
610	Update reference to ANSI N509-1980 to current version: ASME N509-1989.	III.d, g, and h; IV; Table 6.5.1-1; & VI.7
611	Update reference to ANSI N510-1980 to current version: ASME N510-1989.	III.3.h, IV, & VI.8
747	Regulatory Guide 1.52 cites two additional outdated standards, ANSI B1241 1971 and IEEE 279.	IV