NUREG-0800
(Formerly NUREG-75/087)

U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

6.5.3 FISSION PRODUCT CONTROL SYSTEMS AND STRUCTURES

REVIEW RESPONSIBILITIES

Primary - ~~Accident Evaluation Branch (AEB)~~Plant Systems Branch (SPLB)[1]

Secondary - ~~Effluent Treatment Systems Branch (ETSB)~~Materials and Chemical Engineering Branch (EMCB)[2]

Emergency Preparedness and Radiation Protection Branch (PERB)[3]

I. AREAS OF REVIEW

The description of the fission product control systems and structures ~~are~~ is[4] reviewed to (a) provide a basis for developing the mathematical model for design basis loss-of-coolant accident (LOCA)[5] dose computations, (b) verify that the values of certain key parameters are within pre-established limits, (c) confirm the applicability of important modeling assumptions, and (d) verify the functional capability of ventilation systems used to control fission product releases. The parameters which must be established for use in the calculation of the radiological consequences of accidents in Chapter 15 of the safety evaluation report (SER)[6] and the systems whose functions must be reviewed are outlined below. Many of these areas are the responsibility of other branches and are reviewed by the ~~AEB~~SPLB[7] to provide a general knowledge of the containment systems and their operation following a ~~loss-of-coolant accident~~ ~~(~~LOCA~~)~~.[8] The following areas are reviewed:

~~1~~A. Primary Containment Design[9]

1. Primary containment characteristics, including ~~of~~[10] (1) the containment isolation times and methods; (2) leak rates prior to nd following containment isolation if

venting, vacuum relief, or purging of the containment is permitted (by technical specification) during operation; (3) total and mixing volumes to be assumed from the recirculation characteristics given in safety analysis reports (SARs);[11] and (4) the efficiencies of the engineered safety features (ESF)[12] filters used for postaccident ventilation.

Each of the foregoing containment design and operational characteristics will influence the quantity of radioactive fission products available for release during normal operation and as a consequence of accidents.[13]

2. The dose mitigating function of the pressure suppression devices, e.g., subatmospheric operation, suppression pools, or containment heat removal,[14] is described in Sections 6.2.1, 6.2.1.1.A, 6.2.1.1.B, 6.2.1.1.C,[15] and 6.2.2 of the SAR.

The ~~existence and operation~~performance of pressure suppression devices ~~should be determined since their existence and performance~~[16] could affect fission product transport and release, as well as containment pressure and containment leakage rate.

~~2~~B. Secondary Containment Design[17]

1. Containment type, e.g., metal siding, reinforced concrete (see SAR Section 3.8.4).

The type of secondary containment structure may affect the potential for exfiltration and the probable leak tightness of the secondary containment.

2. Physical layout, e.g., volume completely surrounding primary containment, auxiliary building regions treated, main steam tunnel treated (boiling water reactors,[18] BWRs), main steam line leakage control system provided (BWRs), drawings or plan views defining secondary containment boundary, clarification of which regions are treated by cleanup systems (see SAR Sections 6.2.3, 6.5.3, and ~~9.3~~9.4[19]).

Knowledge of what regions are treated as part of the secondary containment is essential to establish the mathematical model for dose calculations.

3. Fission product removal or holdup system design, e.g., regions treated by each system, piping and instrumentation drawings of each system and its operation, fan flow rates, recirculation rate, filter locations and efficiencies, system redundancy, actuation signals, time to reduce region pressures below atmospheric, placement of ducting (see SAR Sections 6.2.3, 6.5.1, and 6.5.3).

The reviewer is responsible for determining that each system can perform its functions as claimed to reduce fission product release following a postulated design basis accident. ~~Information on fission product filter systems is provided~~

~~by the ETSB.~~[20] Knowledge of fission products removal systems is necessary for modeling the system for the dose calculation.

~~CSB has responsibility for evaluating the pressure transient in the secondary containment to verify secondary containment region pressures following a design basis accident and for reviewing bypass leakage paths. MEB has responsibility for evaluating the structural design of the ventilation system.~~[21]

4. General design characteristics, e.g., negative pressure during normal operation, free volumes and mixing regions, and leakage rates (see SAR Sections 6.2.3, 6.5.3, and 9.4).

   Knowledge of these parameters is necessary for developing the mathematical model for dose calculations.[22]

C. <u>ESF Ventilation System Design</u>[23]

The ventilation system used to control fission products and the capability to maintain a negative pressure during accident conditions (see SAR Sections 9.4.1 through 9.4.5).[24]

<u>Review Interfaces</u>[25]

1. A secondary review is performed by the ~~Effluent Treatment Systems Branch (ETSB)~~EMCB[26] and the results are used by ~~AEB~~SPLB[27] in the overall review of the fission product control systems and structures.

2. ~~ETSB~~PERB[28] reviews the efficiencies of filters used in the fission product control systems. The results of the ~~ETSB~~PERB[29] review are transmitted to ~~AEB~~SPLB[30] for use in the evaluation.

3. ~~In addition, AEB~~SPLB[31] will coordinate the evaluations of ~~with~~ other branches ~~those evaluations~~[32] that interface with the overall review of the system, as follows:[33]

   a. The Containment Systems and Severe Accident Branch ~~(CSB)~~(SCSB)[34]evaluates the containment pressure response and mixing fractions, verifies positive pressure periods, and determines containment leakage rates as part of its primary review responsibility for Standard Review Plan (SRP)[35] Sections 6.2.1 and 6.2.6.

   b. SCSB also has responsibility for evaluating the pressure transient in the secondary containment to verify secondary containment region pressures after a design basis accident and for reviewing bypass leakage paths as part of its primary review responsibility for SRP Section 6.2.3.[36]

~~The Auxiliary Systems Branch (ASB) reviews the ventilation system used to control fission products and the capability to maintain a negative pressure during accident conditions as part of its primary review responsibility for SRP Sections 9.4.1 through 9.4.5.~~[37]

c. The Mechanical Engineering Branch ~~(MEB)~~(EMEB)[38] reviews the seismic design and quality group classifications for ventilation systems as part of its primary review responsibility for SRP Sections 3.2.1 and 3.2.2.

d. The Mechanical Engineering Branch (EMEB) also has responsibility for evaluating the structural design of the ventilation system.[39]

The acceptance criteria for the review of those sections and the methods of application are contained in the referenced SRP section of the corresponding primary review branch.

II. ACCEPTANCE CRITERIA

In establishing the model for estimating the radiological consequences of a design basis loss-of-coolant accident and determining the acceptability of the fission products control systems and structures, ~~AEB~~SPLB[40] uses acceptance criteria based on the requirements of the following regulations:

A. General Design Criterion 41 (GDC 41)[41] ~~(Ref. 1)~~[42] as it relates to the containment atmosphere cleanup system being designed to control fission product releases to the environment following postulated accidents.

B. General Design Criterion 42 (GDC 42)[43] ~~(Ref. 2)~~[44] as it relates to the containment atmosphere cleanup system being designed to permit periodic inspections.

C. General Design Criterion 43 (GDC 43)[45] ~~(Ref. 3)~~[46] as it relates to the containment atmosphere cleanup system being designed to permit appropriate functional testing.

Specific criteria necessary to meet the relevant requirements of ~~GDC~~ General Design Criteria[47] 41, 42, and 43 are:

1. Primary Containment

Primary containment design leakage rates for which credit is given should not be less than 0.1% per day due to difficulties in measuring lower leakage rates. Containment isolation methods and times must be such that the calculated radiological doses resulting from the escape of radioactive material prior to and following isolation after a LOCA do not exceed the dose guidelines of 10 CFR Part 100 ~~(Ref. 4)~~[48] in accordance with the appropriate sections in SAR Chapter 15.0.

The primary reactor containment and associated systems should be designed so that periodic inspections and functional testing can be performed.[49]

2. Secondary Containment

To be classified as a secondary containment for the purpose of fission product control, a structure or structures should completely surround the primary containment, and at least should be held at a pressure of 0.6 cm (0.25 in)[50] (water), below adjacent regions, under all wind conditions up to the wind speed at which diffusion becomes great enough to ~~assure~~ensure[51] site boundary exposures less than those calculated for the design basis accidents even if exfiltration occurs.

Acceptance of other fission product control structures for collection and control of postaccident releases will be determined following consultation with the ~~CSB~~SCSB[52] and the ~~SEB~~ECGB,[53] on a case-by-case basis. The leakage and filtration rates of such structures are acceptable provided that the offsite doses calculated by PERB[54] under SRP Section 15.6.5 will meet the dose guidelines of 10 CFR Part 100 and provided that the preoperational testing and appropriate technical specifications are acceptable.

Other criteria include specifications for intake and return headers on recirculation systems. These should be placed as far away from each other as practical. The return header should provide a wide distribution over the secondary containment. The purpose of this placement is to ~~assure~~ensure[55] some degree of mixing of the return flow in the secondary containment volume before it is again drawn into the system intake.

With judicious placement, up to 50% mixing may be assumed. A claim for greater than 50% mixing must be supported by the applicant to the satisfaction of the staff. Spacing between intake and return headers is reviewed on a case-by-case basis. Adjustments in the mixing fraction to less than 50% may be indicated by some designs. Past practice has been to allow mixing in 50% of the volume between — and within 3 or 6 meters (10 or 20 feet)[56] of — the inlet and outlet headers if both have distributed openings or if one has distributed openings and the other is at the top of the containment.

3. <u>Partial Dual Containment</u>

Partial dual containments must meet the same basic requirements as those for secondary containments in order to be given credit for fission product holdup and removal. The fraction of leakage source considered to be treated by such partial fission products control structures is determined after consultation with the ~~CSB~~SCSB[57] ~~and ASB~~[58] reviewer on a case-by-case basis.

4. <u>Other Fission Product Cleanup Systems</u>

Fission product retention credit assumed by the applicant for other systems, e.g., containment spray systems as evaluated in SRP Section 6.5.2, pressure suppression pools as evaluated in SRP Section 6.5.5, and filtration and adsorption units as described in Regulatory Guide 1.52.[59] ~~may be acceptable provided that justification is supplied by the applicant. Such justification~~[60] Justification for fission product retention systems[61] should include analytical bases addressing the important physical and chemical variables of the fission product removal and retention processes~~, supported by experimental verification~~.[62]

Technical Rationale[63]

The technical rationale for application of these acceptance criteria is discussed in the following paragraphs:[64]

1. Compliance with GDC 41 requires that fission product control systems be provided in the reactor containment to reduce the concentration of fission products released to the environment after postulated accidents.

   In the primary containment, fission product control systems include spray, filtration systems, and pressure suppression devices, and in the secondary containment, fission product removal and holdup systems. The function of the fission product control systems is to mitigate the radiological offsite consequences of postulated accidents by decreasing the concentration of fission products available for release to the environment. The review and evaluation of these fission product control systems is the subject of SRP Section 6.5.3. The system and component design criteria for fission product control systems are outlined in Regulatory Guide 1.52, Regulatory Positions C.1, C.2, and C.3.

   Meeting the requirements imposed by GDC 41 provides assurance that offsite radiation doses resulting from postulated accidents will be within the guideline doses specified in 10 CFR Part 100.[65]

2. Compliance with GDC 42 requires that the fission product control systems be designed to permit periodic inspections of important components.

   The fission product control systems are provided to ensure that offsite radiation doses resulting from postulated accidents are within the guideline doses specified in 10 CFR Part 100. The ability to perform periodic inspection is essential for ensuring that components of the systems will function as designed. Testing and inspection criteria for fission product control systems are outlined in Regulatory Guide 1.52, Regulatory Positions C.5 and C.6.

   Meeting the requirements imposed by GDC 42 provides assurance that offsite radiation doses resulting from postulated accidents will be within the guideline doses specified in 10 CFR Part 100.[66]

3. Compliance with GDC 43 requires that fission product control systems be designed to permit periodic functional testing of important components.

   Fission product control systems are provided to ensure that offsite radiation doses resulting from postulated accidents are within the guideline doses specified in 10 CFR Part 100. Periodic functional testing is essential for ensuring that components of the systems will function as designed. Testing and inspection criteria for fission product control systems are outlined in Regulatory Guide 1.52, Regulatory Positions C.5 and C.6.

Meeting the requirements imposed by GDC 43 provides assurance that offsite radiation doses resulting from postulated accidents will be within the guidelines specified in 10 CFR Part 100.[67]

III. REVIEW PROCEDURES

The reviewer selects and emphasizes aspects of the areas covered by this SRP section as appropriate for a particular case. The judgment of which areas need[68] to be given attention and emphasis in the review is based on an inspection of the material presented to see whether it is similar to that recently reviewed on other plants and whether items of special safety significance are involved.

The purpose of the review of containment systems is to define a model to be used in ~~DBA (specifically,~~ the LOCA~~)~~[69] dose calculations, to check that the values of certain key parameters are within established limits, to confirm the correctness of important modeling assumptions, and to verify the functional capability of the primary and/or secondary containment ventilation systems. Therefore, the reviewer covers various areas (containment design, positive pressure periods, filters, etc.) to establish parameters and assumptions for dose calculations ~~utilizing digital computer codes~~.[70]

Where a review area is not the primary responsibility of the ~~AEB~~SPLB,[71] appropriate acceptance criteria in applicable SRP sections are used by the responsible branch and the ~~AEB~~SPLB[72] is informed where inadequacies are identified so that appropriate modifications of the model can be made. These areas include:

- primary containment leakage rate, bypass leakage, and testing of these (~~CSB~~SCSB[73])
- secondary containment vacuum maintenance systems (normal operation) (~~CSB~~SCSB[74])
- secondary containment pressure response (postaccident) (~~CSB~~SCSB[75])
- containment isolation (~~CSB~~SCSB[76])
- structural design of containments ~~(SEB)~~ and systems (~~MEB~~EMEB[77])
- engineered safety feature filter systems (~~ETSB~~PERB[78])

1. Primary Containment Design

    a. The primary containment design is studied to familiarize the reviewer with the overall construction and anticipated performance capability of the primary containment. Certain parameters and design features, such as design leakage rate, purge/vent systems leakage rate prior to containment isolation, containment free volume, internal fission product cleanup systems, should be noted for later use (see example of worksheet,

Table 6.5.3-1). The performance capability of the internal fission product cleanup systems (if any) should be verified (see SAR Sections 6.5.1, 6.5.2, and 6.5.4).

b. The transient response of the containment pressure following the accident should be studied. Historically, pressurized water reactor (PWR) containment design leakage rates have been reduced by a factor of two at one day into the accident (Ref. 5Regulatory Guide 1.4[79]), whereas boiling water reactor (BWR)[80] containment design leakage rates were assumed to be constant for all time periods following the accident (Ref. 6Regulatory Guide 1.3[81]). The reviewer should verify with CSBSCSB[82] that these modeling assumptions are valid for each case reviewed. For those containments designed to reach subatmospheric pressure at some time less than 30 days after the accident, the CSBSCSB[83] verifies the time required to reach subatmospheric pressure.

2. Secondary Containment and Other Fission Product Control Structures Design

a. The design of the secondary containment and other fission product control structures is reviewed to determine how it should be modeled for the dose calculations. The reviewer also ascertains that the applicant has considered the question of potential exfiltration from regions of the secondary containment under varying wind conditions, especially if the structure has a leakage rate greater than 100% per day. The anticipated leakage rate from each region is noted (see example of worksheet, Table 6.5.3-2), and special attention is paid to the accuracy of the proposed leakage testing if the leakage rates are less than 10% per day. (No facility reviewed to date has a proposed secondary containment leakage rate of less than 10% per day. Experience indicates that 10% per day may be difficult to achieve in actual practice.)

b. The boundary of the secondary containment and other fission product control structures are determined. Usually, the secondary containment boundary is composed of more than one region, e.g., a shield building (concrete) or enclosure building (metal siding) around the primary containment and all or parts (emergency core cooling pump rooms, etc.) of the auxiliary building. These regions may be treated by one or more ventilation systems.

c. For PWR containments and BWR MARK III containments, the annular region between the shield building or enclosure building and the primary containment may be held at a negative pressure relative to adjacent areas by a vacuum exhaust system during normal operation. Since this system is used during normal operation, it may appear in the SAR under auxiliary systems. The exhaust system may also treat the auxiliary building regions which are part of the secondary containment, but if these regions are maintained at a negative pressure during normal operation, it is most likely done with the auxiliary building ventilation system. Both theThe ability of the[84] vacuum exhaust and auxiliary building ventilation systems fall under the purview of the ASBSCSB.[85] The systems' ability to maintain a negative pressure of sufficient margin under varying wind conditions and operational modes prior to a design basis accident is verified by the ASBSCSB.[86] The AEB reviewer consults with the ASB reviewer to verify also verifies to SCSB the design of that the systems have the capability to maintaining[87] negative pressure following a design basis accident. If an adequate negative differential pressure (0.6 cm, or[88] 0.25 in, water gauge) is achieved within 60 seconds from the time the accident, then no positive pressure time period need be assumed in the dose model. All positive pressure periods at any time in the secondary containment regions are treated as direct outleakage periods following an accident, and no credit is given for filters or recirculation systems. The CSBSCSB[89] verifies the positive pressure periods. The large reactor buildings around older BWR containments are usually maintained at a negative pressure during normal operation, and the dose model used for these cases has not assumed any positive pressure period.

d. The exhaust systems used to maintain the negative pressure differential following the accident should be sized to meet the negative pressure criterion for the inleakage rate and the conservatively calculated heat load for the regions treated by each, and analyses to this effect should be presented by the applicant. The pressure response analyses are reviewed by the CSBSCSB.[90] The functional capability of the filter design associated with the exhaust system is reviewed by the ETSB[91] under SRP Section 6.5.1. Design guidance for postaccident cleanup air filtration and adsorption systems is provided in Regulatory Guide 1.52.[92] The reviewer should consult with ETSBPERB[93] concerning filter system efficiencies. The exhaust systems may be one of several designs. Common designs are:

(1) Straight exhaust through charcoal and high-efficiency particulate air (HEPA)[94] filters. Primary containment leakage to these regions is assumed to go directly to the filter with no mixing or holdup in the region being filtered.

(2) Recirculation system with split inflow (some exhausted through filters and some recirculated to the region being treated). Primary containment leakage to the region being treated is assumed to be directly to the intake of the recirculation fan. There, a fraction of it (the ratio of exhaust to total flow) is exhausted through the filters; the balance is then assumed to return to the region being treated. The placement of the system intake and return headers is examined to determine that return flow from the fans does not have a direct path to the intake again. Credit for mixing in 50% of the region is given for fission products returned by the

recirculation system to the secondary volume if the header placement is satisfactory.

(3) Other variations on the recirculation system are (a) filters in the recirculation line, (b) filters in both the recirculation line and the exhaust line, and (c) high exhaust flow to reduce the negative pressure to several centimeters (inches)[95] water gauge, and then no exhaust with recirculation only for some time period.

The sizing of the system fans for the volumes they are maintaining at a negative pressure may be critical in determining the ratio of exhaust flow to recirculation flow. Past history shows secondary containment structures are considerably more leaky than applicants anticipated (2 to 5 times as great as anticipated), and fan exhaust flows have been increased after testing to account for this. (When identical flow rates are predicted for two volumes which differ by a factor of 10 or more, it is difficult to believe that the negative pressure differential will be the same for both volumes.) The flow rates, negative pressure differential, and volumes are noted, and the ~~appropriate AEB reviewer and CSB~~SCSB[96] reviewer (pressure response only) is consulted for verification before performing dose calculations.

The systems should be reviewed to determine volumes treated, system operation, fan flow rates, and filter efficiencies. All the applicant's claims should be verified by appropriate staff members as noted on Table 6.5.3-2 of this SRP section. Leakage fractions from the primary containment to each volume should be identified and stated in the technical specifications. Completeness of information, adequacy of technical specifications and testing methods, and the adequacy and maintenance of the integrity of the secondary containment negative pressure considering failures of nonseismic piping or ducting are verified by the ~~CSB~~SCSB.[97]

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.[98]

IV. EVALUATION FINDINGS

The reviewer defines a dose model for the LOCA dose calculations to be performed by PERB[99] under SRP Section 15.6.5 and prepares tables of the data of the primary containment and other fission product control structures to be used in the calculation. In addition, the reviewer verifies that sufficient information has been provided and that the review and calculations which are performed under SRP Section 15.6.5 by PERB[100] support conclusions of the following type to be included in the staff's safety evaluation report:

> The staff concludes that the fission product control systems and structures are acceptable and meet the relevant requirements of General Design Criteria 41, 42, and 43. This conclusion is based on the following:

The fission product control systems and structures for mitigation of offsite doses resulting from design basis LOCA have been reviewed. The review has included the applicant's proposed design criteria and design bases for each system and the applicant's analysis of the adequacy of those criteria and bases. The applicant's analyses of the manner in which the designs of the fission product control systems conform to the proposed design criteria have also been reviewed.

The basis for acceptance in the staff review has been conformance of the applicant's designs, design criteria, and design bases for the fission product control systems and necessary auxiliary supporting systems to the Commission's regulations as outlined in 10 CFR Part 50, Appendix A, General Design Criteria 41, 42, and 43, staff technical positions, and industry standards.

The applicant's design of the fission product control systems has been reviewed to ~~assure~~ensure[101] that the parameters presented in Tables 6.5.3-1 and 6.5.3-2 are appropriate for calculation of the post-LOCA doses as outlined in SRP Section 15.6.5.

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.[102]

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.[103] 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.[104]

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

VI. REFERENCES

1. 10 CFR Part 50, Appendix A, General Design Criterion 41, "Containment Atmosphere Cleanup."

2. 10 CFR Part 50, Appendix A, General Design Criterion 42, "Inspection of Containment Atmosphere Cleanup Systems."

3. 10 CFR Part 50, Appendix A, General Design Criterion 43, "Testing of Containment Atmosphere Cleanup Systems."

4. 10 CFR Part 100, "Reactor Site Criteria."

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

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

7. Regulatory Guide 1.52, "Design, Testing, and Maintenance Criteria for Post Accident Engineered Safety Feature Atmospheric Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants."[105]

Table 6.5.3-1

Primary Containment Parameters

Data Description	Parameter Value	Staff Verification
Type of Structure		~~SEB~~ECGB[106]
Primary Containment Design Leak Rate		~~CSB~~SCSB[107]
Bypass Leakage Fraction to Volumes		~~CSB~~SCSB[108]
1.		
2.		
3.		
Primary Containment Free Volume		~~CSB~~SCSB[109]
Primary Containment Subatmospheric Operation		~~CSB~~SCSB[110]
Primary Containment Internal Fission Product Removal Systems:		~~AAB~~PERB[111]
Filter System		
Other		
Primary Containment Purge/Vent Operation:		~~CSB~~SCSB[112]
Leakage During Normal Operation		
Valve Arrangement		
Accident Leakage Via Purge/Vent System Prior to Containment Isolation		

Table 6.5.3-2

Secondary Containment Parameters

Data Description	Parameter Value	Staff Verification
For each Secondary Containment Region:		
Type of Structure		~~SEB~~ECGB[113]
Free Volume		~~CSB~~SCSB[114]
Mixing Fraction		~~AAB~~SCSB[115]
Design Leak Rate		~~CSB~~SCSB[116]
Annulus Width (where applicable)		~~CSB~~SCSB[117]
For each Ventilation System:		
Total Recirculation Flow		~~AAB~~EMCB[118]
Exhaust Flow		~~AAB~~EMCB[119]
Filter Placement		~~AAB~~EMCB[120]
Filter Efficiencies		~~ETSB~~PERB[121]
Header Placement		~~AAB~~EMCB[122]
Time Sequence for Operation Following an Accident or		~~CSB~~SCSB[123]
Operation of System Prior to an Accident if Used During Normal Operation		~~ASB~~SCSB[124]

SRP Draft Section 6.5.3

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.	Current SRB name and abbreviation	Changed SRB to Materials and Chemical Engineering Branch (EMCB).
3.	Current SRB name and abbreviation	Changed SRB to Emergency Preparedness and Radiation Protection Branch (PERB).
4.	Editorial	Corrected for noun-verb agreement.
5.	Editorial	Provided "LOCA" as acronym for "loss-of-coolant accident."
6.	Editorial	Identified the safety evaluation report (SER) as the source of Chapter 15.
7.	Current PRB abbreviation	Changed PRB to SPLB.
8.	Editorial	LOCA defined in item 4 above.
9.	SRP-UDP format item	Divided the subsection into numbered subparagraphs for clarity.
10.	Editorial	Revised wording for clarification.
11.	Editorial	Provided "SARs" as abbreviation for "safety analysis reports."
12.	Editorial	Defined "ESF" as "engineered safety features."
13.	Editorial	Added paragraph to specify reason for listing primary containment design characteristics.
14.	Editorial	Added containment heat removal as a dose mitigating function. Containment heat removal is the subject of SAR Section 6.2.2.
15.	Editorial	Added reference to SAR Sections 6.2.1.1.A, 6.2.1.1.B, and 6.2.1.1.C, which relate to dose mitigation functions.
16.	Editorial	Revised sentence to stress the function of pressure suppression devices.
17.	SRP-UDP format item	Divided the subsection into numbered subparagraphs for clarity.
18.	Editorial	Defined "BWRs" as "boiling water reactors."
19.	Editorial	Changed reference to SAR Section 9.4 from 9.3 because Section 9.4 relates to fission product control systems.

Item	Source	Description
20.	SRP-UDP format item	Deleted sentence (subject covered in "Review Interfaces").
21.	SRP-UDP format item	Review responsibilities for secondary containment pressures and structural design of ventilation system moved to "Review Interfaces."
22.	Editorial	Added "for design calculations" to specify subject of mathematical model.
23.	SRP-UDP format item	Added new subsection to AREAS OF REVIEW stating that SPLB review responsibilities for this SRP section include ESF ventilation system design.
24.	SRP-UDP format item	Item describes review responsibilities of SPLB for ESF ventilation system design per SRP Sections 9.4.1 through 9.4.5.
25.	SRP-UDP format item	Added "Review Interfaces" to AREAS OF REVIEW and put in numbered paragraphs describing how other branches support the review of fission product control.
26.	Current SRB abbreviation	Changed SRB to EMCB.
27.	Current PRB abbreviation	Changed PRB to SPLB.
28.	Current SRB abbreviation	Changed SRB to PERB.
29.	Current SRB abbreviation	Changed SRB to PERB.
30.	Current PRB abbreviation	Changed PRB to SPLB.
31.	Current PRB abbreviation	Changed PRB to SPLB.
32.	Editorial	Modified sentence for clarity.
33.	SRP-UDP format item	Modified lead-in paragraph to conform to numbered paragraph format. Numbered subsequent paragraphs.
34.	Current review branch name and abbreviation	Changed review interface branch to Containment Systems and Severe Accident Branch (SCSB).
35.	Editorial	Defined "SRP" as "Standard Review Plan."
36.	SRP-UDP format item	Moved sentence on SCSB review responsibility to "Review Interfaces" from "Secondary Containment Design" because the secondary containment pressure transient is no longer the responsibility of the PRB.
37.	SRP-UDP format item	Moved sentence to "ESF Ventilation System Design" because SRP Sections 9.4.1 through 9.4.5 are now the review responsibility of the PRB.
38.	SRP-UDP format item	Changed review interface branch to EMEB.

Item	Source	Description
39.	SRP-UDP format item	Moved sentence on MEB review responsibility from "Secondary Containment Design" to "Review Interfaces," and changed review responsibility to EMEB because the structural design of the ventilation system is no longer the responsibility of the PRB.
40.	SRP-UDP format item	Changed PRB to SPLB.
41.	Editorial	Provided "GDC 41" as abbreviation for General Design Criterion 41.
42.	SRP-UDP format item	Deleted "(Ref. 1)."
43.	Editorial	Provided "GDC 42" as abbreviation for "General Design Criterion 42."
44.	SRP-UDP format item	Deleted "(Ref. 2)."
45.	Editorial	Provided "GDC 43" as abbreviation for "General Design Criterion 43."
46.	SRP-UDP format item	Deleted "(Ref. 3)."
47.	Editorial	Changed "GDC" as "General Design Criteria" to accommodate plural usage.
48.	SRP-UDP format item	Deleted "(Ref. 4)."
49.	SRP-UDP format item	Added reference to inspection and functional testing because this section of ACCEPTANCE CRITERIA did not specify the manner in which the requirements of GDC 42 and GDC 43 would be met.
50.	Conversion to SI units	Added metric units for 0.25 in.
51.	Editorial	Replaced "assure" with "ensure" to reflect proper usage.
52.	SRP-UDP format item	Changed review branch to SCSB.
53.	SRP-UDP format item	Changed review branch to ECGB.
54.	Current SRB abbreviation	Added PERB as review branch responsible for SRP Section 15.6.5.
55.	Editorial	Replaced "assure" with "ensure" to reflect proper usage.
56.	Conversion to SI units	Added metric units for 10 or 20 feet.
57.	SRP-UDP format item	Changed review branch to SCSB.
58.	SRP-UDP format item	Deleted ASB because SPLB is now responsible for reviewing this subject.
59.	SRP-UDP format item	Added reference to SRP sections and regulatory guides that support fission product retention systems.

SRP Draft Section 6.5.3
Attachment A - Proposed Changes in Order of Occurrence

Item	Source	Description
60.	Editorial	Deleted conditional statement that such systems may be acceptable because currently they are acceptable with proper justification.
61.	Editorial	Revised sentence to state the type of justification required.
62.	Editorial	Deleted the requirement that justification needs to be supported by experimental verification because such justification is available in published literature.
63.	SRP-UDP format item/ Develop technical rationale	Added "Technical Rationale" to ACCEPTANCE CRITERIA and arranged in numbered paragraph form to describe the bases for referencing General Design Criteria 41, 42, and 43.
64.	SRP-UDP format item/ Develop technical rationale	Added lead-in sentence for "Technical Rationale."
65.	SRP-UDP format item/ Develop technical rationale	Added technical rationale for GDC 41.
66.	SRP-UDP format item/ Develop technical rationale	Added technical rationale for GDC 42.
67.	SRP-UDP format item/ Develop technical rationale	Added technical rationale for GDC 43.
68.	Editorial	Revised for clarity.
69.	Editorial	Revised for clarity.
70.	Editorial	Deleted specifying manner of dose calculation to allow flexibility.
71.	Current PRB abbreviation	Changed PRB to SPLB.
72.	Current PRB abbreviation	Changed PRB to SPLB.
73.	Current review branch abbreviation	Changed review interface branch to SCSB.
74.	Current review branch abbreviation	Changed review interface branch to SCSB.
75.	Current review branch abbreviation	Changed review interface branch to SCSB.
76.	Current review branch abbreviation	Changed review interface branch to SCSB.
77.	Current review branch abbreviation	Changed review interface branch to EMEB.
78.	Current review branch abbreviation	Changed SRB to PERB.
79.	SRP-UDP format item	Identified Regulatory Guide 1.4.
80.	Editorial	"BWR" defined in item 17 above.
81.	SRP-UDP format item	Identified Regulatory Guide 1.3.
82.	Current review branch abbreviation	Changed review interface branch to SCSB.

Item	Source	Description
83.	Current review branch abbreviation	Changed review interface branch to SCSB.
84.	Editorial	Revised for clarity.
85.	Current review branch abbreviation	Changed review interface branch to SCSB.
86.	Current review branch abbreviation	Changed review interface branch to SCSB.
87.	Editorial/Current PRB abbreviation	Revised for clarity and to reflect that SCSB has review responsibility for auxiliary building ventilation systems.
88.	Conversion to SI units	Added metric units for 0.25 in.
89.	Current review branch abbreviation	Changed review interface branch to SCSB.
90.	Current review branch abbreviation	Changed review interface branch to SCSB.
91.	Current PRB abbreviation	Changed to reflect SPLB review responsibility for SRP Section 6.5.1.
92.	SRP-UDP format item	Added Reference to RG 1.52 on postaccident air filtration and adsorption systems.
93.	Current SRB abbreviation	Changed SRB to PERB.
94.	Editorial	Defined "HEPA" as "high-efficiency particulate air."
95.	Conversion to SI units	Added centimeters to reflect metrication.
96.	Current review branch abbreviation	Changed review interface branch to SCSB.
97.	Current review branch abbreviation	Changed review interface branch to SCSB.
98.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
99.	Current review branch abbreviation	Added review branch responsibility for SRP Section 15.6.5.
100.	Current review branch abbreviation	Added review branch responsibility for SRP Section 15.6.5.
101.	Editorial	Replaced "assure" with "ensure" to reflect proper usage.
102.	SRP-UDP format item	Added paragraph to EVALUATION FINDINGS regarding design certification reviews.
103.	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.
104.	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.
105.	SRP-UDP format item	Added reference to RG 1.52 in REFERENCES.

Item	Source	Description
106.	Current review branch abbreviation	Changed review branch designation to ECGB.
107.	Current review branch abbreviation	Changed review branch to SCSB.
108.	Current review branch abbreviation	Changed review branch to SCSB.
109.	Current review branch abbreviation	Changed review branch to SCSB.
110.	Current review branch abbreviation	Changed review branch to SCSB.
111.	Current SRB abbreviation	Changed SRB to PERB.
112.	Current review branch abbreviation	Changed review branch to SCSB.
113.	Current review branch abbreviation	Changed review branch to ECGB.
114.	Current review branch abbreviation	Changed review branch to SCSB.
115.	Current review branch abbreviation	Changed review branch to SCSB.
116.	Current review branch abbreviation	Changed review branch to SCSB.
117.	Current review branch abbreviation	Changed review branch to SCSB.
118.	Current SRB abbreviation	Changed SRB to EMCB.
119.	Current SRB abbreviation	Changed SRB to EMCB.
120.	Current SRB abbreviation	Changed SRB to EMCB.
121.	Current SRB abbreviation	Changed SRB to PERB.
122.	Current SRB abbreviation	Changed SRB to EMCB.
123.	Current review branch abbreviation	Changed review branch to SCSB.
124.	Current review branch abbreviation	Changed review branch to SCSB.

SRP Draft Section 6.5.3

Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
	No Integrated Impacts were incorporated in this SRP Section.	