U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

14.3[1] INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA - DESIGN CERTIFICATION

This SRP section provides guidance that is applicable to all technical branches that are responsible for reviewing inspections, tests, analyses, and acceptance criteria (ITAAC). The SRP subsections listed below contain branch-specific guidance. Although this SRP was developed for design certification reviews, it is also generally applicable to combined license (COL) reviews under 10 CFR Part 52. Information on the evolutionary design certification reviews is provided in Appendix A to this SRP and in the statements of consideration for the respective design certification rules (SECY-96-077).

REVIEW RESPONSIBILITIES

Primary - The following list identifies the primary review responsibilities for each subsection to this SRP:

14.3.1	Site Parameters (Tier 1)	ECGB
14.3.2	Structural and Systems Engineering (Tier 1)	ECGB
14.3.3	Piping Systems and Components (Tier 1)	ECGB
14.3.4	Reactor Systems (Tier 1)	SRXB
14.3.5	Instrumentation and Controls (Tier 1)	HICB
14.3.6	Electrical Systems (Tier 1)	EELB
14.3.7	Plant systems (Tier 1)	SPLB
14.3.8	Radiation Protection and Emergency Preparedness (Tier 1)	PERB
14.3.9	Human Factors Engineering (Tier 1)	HHFB
14.3.10	Initial Test Program and D-RAP (Tier 1)	HQMB
14.3.11	Containment Systems and Severe Accidents (Tier 1)	SCSB
Appendix A	Information on Evolutionary Design Certification Reviews	ALL
Appendix B	Review Branch Responsibilities for the Evolutionary Designs	ALL

Appendix C	Detailed Review Guidance	ALL
Appendix D	Standard ITAAC Entries	ALL

Secondary - Probabilistic Safety Assessment (SPSB) and Safeguards (PSGB)

The primary and secondary review responsibilities for the Advanced Boiling-Water Reactor (ABWR) and System 80+ designs are identified in Appendix B to this SRP for additional guidance.

I. AREAS OF REVIEW

Each branch reviews the ITAAC and the supporting information in Section 14.3 of the Tier 2 portion of the Design Control Document (DCD) submitted by the applicant. It is necessary to develop the Tier 1 design descriptions before the ITAAC can be prepared for NRC staff review. An explanation of the terminology used in this SRP and how the Tier 1 information, which includes design descriptions and ITAAC, was developed for certification of the evolutionary designs is provided in Appendix A to this SRP.

The overall review approach consists of ensuring that the top-level design information in the DCD Tier 2 is appropriately included in Tier 1. The type of information and the level of detail in Tier 1 is based on a graded approach that is commensurate with the safety significance of the SSCs for the design. The top-level information selected should contain the principal performance characteristics and safety functions of the SSCs. This information must be appropriately verified by ITAAC. Also, design-specific and unique features of the facility should be carefully considered for inclusion in Tier 1.

Applicants may submit Tier 1 design descriptions that are based on the structures and systems of their design rather than on the review branch-oriented format of the DCD Tier 2 and the SRP, thereby creating overlapping NRC review responsibilities. Also, some branches have review responsibilities for many systems. For example, consistent treatment of alarms, displays, and controls is the responsibility of the Human Factors Branch, and functionality of safety-significant motor operated valves (MOVs) is the responsibility of the Structural and Geosciences Branch. Therefore, the review process may be facilitated using task groups comprised of reviewers from several branches, as was done for the reviews of the evolutionary designs.

All portions of Tier 1 information are reviewed by one or more branches. The primary review branches are responsible for the safety evaluations in their areas of responsibility and the secondary review branches provide input to the primary review branches. Additional secondary review branches are identified in the subsections to this SRP.

SPSB: Reviews Tier 1 to ensure appropriate treatment of important insights and assumptions from the probabilistic risk assessment (PRA). Reviewers should use the guidance in the SRP sections related to the PRA issues to determine the appropriate top-level design features for inclusion in Tier 1 and provide inputs to the responsible review branches. Important integrated plant safety analyses from Tier 2 should be considered, such as analyses of fires, floods, severe accidents, and shutdown risk. Applicants should document in Tier 2 how important insights from the PRA analyses were incorporated

into the standard design, including Tier 1, technical specifications, initial test program, reliability assurance activities, emergency procedure guidelines, and combined license action items. Guidance for documentation of the PRA review in the design control document (DCD) is contained in Appendix A to this SRP. The PRA for site-specific portions of the design will be evaluated during the combined license review.

PSGB: Reviews Tier 1 to ensure appropriate treatment of security issues. Reviewers should use the guidance in SRP Chapter 13 related to security issues to determine the appropriate top-level design features for inclusion in Tier 1 and provide inputs to the responsible review branches. Programmatic and site-specific aspects of security are considered as part of a combined license application.

II. ACCEPTANCE CRITERIA

The acceptance criteria for ITAAC are based on meeting 10 CFR §52.97(b)(1), which sets forth the comprehensive requirements for ITAAC. For design certification reviews, the scope of ITAAC is limited to the scope of the certified design as required by 10 CFR §52.47(b).

III. REVIEW PROCEDURES

Preparation for the review of ITAAC should include the following:

1. Complete the review of the structures, systems and components (SSCs) before beginning the review of ITAAC. If the ITAAC review is begun before the significant issues are resolved, then the ITAAC may have to be revised. Also, review the latest version of the Safety Evaluation Report (SER) and Tier 2 for the purpose of familiarization with the facility design and its nomenclature.

2. Review the applicable regulations, SRP sections, regulatory guides (RGs), unresolved safety issues (USIs), and generic safety issues (GSIs), NRC generic correspondence, industry operating experience, NRC inspection programs, and any additional regulatory guidance from the Commission, for the purpose of determining the safety significance of SSCs. Also review NRC generic communications and operating experience discussed in Tier 2 to achieve familiarity with how these issues were resolved on a design-specific basis and their safety significance.

3. Review the DCD for the evolutionary design similar to the current design, specifically the Tier 1 information, for the purpose of using a similar approach, format, and language and for familiarity with the treatment of SSCs, the appropriate level of design detail, and other certification issues.

4. Review the safety analyses for the design, including analyses of design basis accidents, severe accidents, flooding, overpressure protection, containment, core cooling, fire protection, transients, shutdown risk, ATWS, steam generator tube rupture, Unresolved Safety Issues and Generic Safety Issues (USIs/GSIs) and TMI items, probabilistic risk assessments (PRA), regulatory treatment of non-safety systems (RTNSS), or other analyses as specified by the staff. Review cross-references in Section 14.3 of DCD Tier

2 showing where key parameters from these analyses are addressed in the Tier 1 information. Review cross-references for PRA and severe accidents in the applicable sections of Tier 2.

5. Review the methodology and criteria for Tier 1 information in DCD Tier 2 Section 14.3.

General Review Procedures

1. Perform the preparatory steps listed above and ensure that the applicant's DCD is consistent with Appendix A.

2. Use the subsections to this SRP for your review area and determine the SSCs that are applicable to your review.

3. Review the Tier 1 design descriptions to ensure that the key performance characteristics and safety functions of SSCs are appropriately treated at a level of detail commensurate with their safety significance.

4. Review Tier 1 to ensure that all information is clearly delineated and consistent with the Tier 2 information. If any new items are added to ITAAC, then ensure that they are also added to the applicable sections of Tier 2, including appropriate supporting analyses. Figures and diagrams should be reviewed to ensure that they accurately depict the functional arrangement and requirements of the systems. Reviewers should use the detailed review guidance in Appendix C as an aid in establishing consistent and comprehensive treatment of issues.

5. Ensure that the standard ITAAC entries in Appendix D that are related to your review area are appropriately included. The reviewer should also review the general provisions for verification of dynamic qualification of equipment (ECGB), equipment qualification for harsh environments (SPLB), welding issues (ECGB), and MOVs (ECGB).

6. Ensure that definitions, legends, interface requirements, and site parameters that pertain to issues in your review area are treated consistently and appropriately in the DCD.

7. Review the cross-references in DCD Tier 2 Section 14.3 for safety analyses, and cross-references for PRA and severe accident analyses in the applicable sections of DCD Tier 2, that are applicable to your review area and verify that the key parameters and assumptions are addressed in Tier 1.

8. Review the design acceptance criteria (DAC) in Tier 1 and ensure that the necessary supporting information is present in Tier 2 of the DCD.

9. Ensure that the ITAAC emphasize testing of the as-built facility and use the definitions for testing in Appendix A. Ensure that the ITAAC are consistent with the pre-operational test program in Tier 2 Section 14.2, since many of the pre-operational tests for SSCs can be used to satisfy an ITAAC. However, pre-operational tests are not to be relied on for testing in lieu of ITAAC. Ensure that any testing designated in the ITAAC

is also included in the Tier 2 information. Ensure that any testing-related items requiring post-fuel load verification are identified in the power ascension test program and supporting information is specified in the applicable sections of Tier 2.

10. Ensure that the ITAAC are consistent with the technical specifications, including their bases and limiting conditions for operation.

11. Ensure that the ITAAC reflect the resolutions of technically relevant USIs/GSIs, TMI items, and operating experience.

12. Ensure that sufficient interfaces with other branches, as specified in these SRP sections, are accomplished to completely and comprehensively address all significant issues in Tier 1. Ensure that inputs from secondary review branches, including the secondary review branches identified in the subsections to this SRP, are appropriately reflected in Tier 1.

IV. EVALUATION FINDINGS

Each review branch ensures that sufficient information has been provided and concludes that the Tier 1 information is acceptable. However, safety findings for the standard design are based on Tier 2, not Tier 1 information. This is because the Tier 1 information is derived from Tier 2. Consequently, any design information presented in Tier 1 should also be in the appropriate sections of Tier 2. Further, the purpose of ITAAC is to verify that a facility that references the design certification has been built and will operate in accordance with the design certification and the applicable regulations. The evaluation findings on Tier 1 from each review branch are provided to the project manager to be combined in FSER Chapter 14.3 to support the following overall conclusive statement:

> The staff reviewed the Tier 1 information in the (standard design) DCD in accordance with the guidance in SRP Section 14.3. Based on this review and a review of the selection methodology and criteria for the development of the Tier 1 information in Section 14.3 of the DCD, the staff concludes that the top-level design features and performance characteristics of the SSCs are appropriately described in Tier 1 and the Tier 1 information is acceptable.
>
> Further, the Tier 1 design descriptions can be adequately verified by ITAAC. Therefore, the staff concludes that the ITAAC are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, then a facility referencing the certified design can be constructed and operated in conformity with the design certification and the applicable regulations.

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 design certification and combined license applications submitted by applicants pursuant to 10 CFR 52. 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.

VI. REFERENCES

1. 10 CFR Part 52, §52.47 "Contents of Applications."

2. 10 CFR Part 52, §52.97 "Issuance of Combined Licenses."

3. SECY-90-016, "Evolutionary Light Water Reactor Certification Issues and Their Relationship to Current Regulatory Requirements," dated January 12, 1990. The Commission's guidance on this SECY was provided in an SRM dated June 26, 1990.

4. SECY-90-377, "Requirements for Design Certification Under 10 CFR Part 52," November 8, 1990. The Commission's guidance on this SECY was provided in an SRM dated February 15, 1991.

5. SECY-91-178, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Design Certifications and Combined Licenses," June 12, 1991. The Commission's guidance on this SECY was provided in an SRM dated September 24, 1991.

6. SECY-91-210, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Requirements for Design Review and Issuance of a Final Design Approval (FDA)," July 16, 1991. The Commission's guidance on this SECY was provided in an SRM dated October 18, 1991.

7. SECY-92-053, "Use of Design Acceptance Criteria During 10 CFR Part 52 Design Certification Reviews," February 19, 1992.

8. SECY-92-134, "NRC Construction Inspection Program for Evolutionary and Advanced Reactors Under 10 CFR Part 52," April 15, 1992.

9. SECY-92-196, "Development of Design Acceptance Criteria (DAC) for the Advanced Boiling Water Reactor (ABWR)," May 28, 1992.

10. SECY-92-214, "Development of Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Design Certifications," June 11, 1992.

11. SECY-92-299, "Development of Design Acceptance Criteria (DAC) for the Advanced Boiling Water Reactor (ABWR) in the Areas of Instrumentation and Controls (I&C) and Control Room Design," August 27, 1992.

12. SECY-92-327, "Review of Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for the General Electric (GE) Advanced Boiling Water Reactor (ABWR)," September 22, 1992.

13. SECY-92-436, "Status of the Revised Construction Inspection Program", December 31, 1992.

14. SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor Designs, " April 2, 1993. The Commission's guidance on this paper was provided in an SRM dated July 21, 1993.

15. NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor", Volumes 1 and 2, July 1994.

16. NUREG-1462, "Final Safety Evaluation Report Related to the Certification of the System 80+ Design," Volumes 1 and 2, August 1994.

17. SECY-94-294, "Construction Inspection and ITAAC Verification", December 5, 1994.

18. SECY-95-090, "Emergency Planning Under 10 CFR Part 52," April 11, 1995.

19. SECY-95-132, "Policy and Technical Issues Associated With the Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Designs (SECY-94-084)," May 22, 1995.

20. SECY-96-077, "Certification of Two Evolutionary Designs," April 15, 1996

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SRP SECTION 14.3
APPENDIX A

INFORMATION ON EVOLUTIONARY DESIGN CERTIFICATION REVIEWS

The purpose of this appendix is to describe how previous design certification applications have implemented the requirements of Subpart B of 10 CFR Part 52, so that this information can be used as guidance for reviews of future design certification applications. The NRC staff developed guidance for implementing inspections, tests, analyses, and acceptance criteria (ITAAC) and other design certification issues as part of its review of the Advanced Boiling-Water Reactor (ABWR) and System 80+ designs (evolutionary designs).

I. Background - Design Certification

Design certification is a process whereby standard designs are approved by rulemaking. The resulting design certification rule is added to 10 CFR 52 as an appendix. Each appendix incorporates by reference a design control document (DCD) that contains the design information. An applicant for design certification is required to submit a DCD to the NRC for review and approval. A combined license applicant or licensee who references a certified design must comply with both the rule certifying the design and the DCD. The following terms were defined for the evolutionary design reviews:

Generic design control document (generic DCD) means the document that contains the generic Tier 1 and Tier 2 information that is incorporated by reference into the design certification rules. This document is prepared by the applicant for design certification.

Plant-specific DCD means the document, maintained by an applicant or licensee who references a design certification rule, consisting of the information in the generic DCD, as modified and supplemented by the plant-specific departures and exemptions made under the change process in the design certification rule. The plant-specific DCD is prepared by an applicant for a combined license that references the rule and will be effective for the life of a facility.

Tier 1 means the portion of the design-related information contained in the generic DCD that is approved and certified by this design certification rule (hereinafter Tier 1 information). The design descriptions, interface requirements, and site parameters are derived from Tier 2 information. Tier 1 information includes:

(1) Definitions and general provisions;
(2) Design descriptions;
(3) Inspections, tests, analyses, and acceptance criteria (ITAAC);
(4) Significant interface requirements; and
(5) Significant site parameters.

Tier 2 means the portion of the design-related information contained in the generic DCD that is approved but not certified by this design certification rule (hereinafter Tier 2 information). Compliance with Tier 2 is required, but generic changes to and plant-specific departures from

Tier 2 are governed by the change process in the design certification rule. Tier 2 information includes:

(1) Information required by 10 CFR 52.47, with the exception of technical specifications and conceptual design information;
(2) Information required for and FSAR under 10 CFR 50.34;
(3) Supporting information on the inspections, tests, and analyses that will be performed to demonstrate that the acceptance criteria in the ITAAC have been met; and
(4) Combined license (COL) action items (COL license information), which identify certain matters that shall be addressed in the site-specific portion of the final safety analysis report by a combined license applicant who references a design certification rule.

*Tier 2** means the portion of the Tier 2 information, designated as such in the generic DCD, which is subject to a special change process set forth in the design certification rule. This designation expires for some Tier 2* information at fuel load.

The DCDs for the evolutionary designs consisted of an introduction, Tier 2 information, which is mostly the standard safety analysis report (SSAR) for the standard design), and Tier 1 information. The significance of designating design information as either Tier 1 or Tier 2 is that different change processes and criteria apply to each tier, as described in the evolutionary design certification rules. Basically, Tier 1 information is difficult to change after the design certification rule is issued because changes require a finding by the NRC that the change is needed to assure adequate protection of the public health and safety. This results in a very high threshold for change to Tier 1 by either the NRC or others once the rule is issued. Whereas, Tier 2 information can be changed by a combined license (COL) applicant or licensee under a "50.59-like" process, provided the change does not impact Tier 1. The entire change process is described in SECY-96-077.

The remainder of this appendix discusses the form and content of the DCD, selected issues unique to design certification reviews, and additional guidance for DCDs. This guidance relies on the requirements for design information to be included in safety analysis reports (SARs) for facilities, as described in NRC Regulatory Guide (RG) 1.70, and the various sections of this SRP.

II. Introduction to the DCD

The introduction to the DCD should describe the purpose, content overview, and COL applicant or licensee uses of the Tier 1 and Tier 2 portions of the DCD. Although the introduction is part of the DCD, it is neither Tier 1 nor Tier 2 information. Rather, the DCD introduction provides a convenient explanation of the DCD, and is non-binding. All substantive requirements are described in the design certification rule.

III. Tier 2 information

1. General Content of the Tier 2 Information

The Tier 2 portion of the DCD should basically consist of the same information as is required for the design certification applicant's SSAR. However, some portions of the DCD may differ from a SSAR, as discussed below. The information in the design certification application (SSAR) is the basis for the staff's safety evaluation for the design. Conceptually, any information that is required for final design approval, but is not intended to be included in the DCD (e.g., proprietary information), should be submitted as a separate report that is referenced in the appropriate section of the DCD. This information should be minimized because it may need to be resubmitted to the staff as part of a combined license application.

2. Treatment of Proprietary and Safeguards Information

Because of the requirement of the Office of the Federal Register that all information incorporated into the design certification rule be publicly available, proprietary and safeguards information that is withheld from public disclosure cannot be included in the DCD. However, this information is part of the NRC staff's bases for its safety findings for the design, and the NRC considers this information to be a requirement for facilities that reference the design certification rule. Therefore, the proprietary and safeguards information that is withheld from public disclosure, or its equivalent, must be resubmitted as part of a COL application.

The maximum use of publically available information in the application is strongly recommended to facilitate resolution of issues for future COL applicants and licensees. For example, upon close examination by the evolutionary plant designers, significant portions of proprietary information were able to be reclassified as non-proprietary. Also, for one design, the SSAR and DCD were prepared using publically available safeguards information.

After determining what material cannot be included in the DCD, and to ensure that it is clear what is required as part of a COL application, the applicant should clearly indicate in the DCD any deletions of proprietary or safeguards information. The DCD should refer to the appropriate location of the proprietary or safeguards information residing in any separate, external documents.

3. Probabilistic Risk Assessment (PRA) Information

For the evolutionary design reviews, industry requested deletion of certain design probabilistic risk assessment (PRA) information from the DCD because of questions on the regulatory significance of that information. The PRA was used in the design review to determine the risk significance of key structures, systems, and components. The NRC concluded that the detailed methodology and quantitative portions of the design PRA did not need to be included in the DCD but the assumptions, insights, and discussions of PRA analyses must be retained in the DCD.

If the detailed portions of the PRA are not intended to be included in the DCD, the objective should be to provide sufficient structure and detail that COL applicants or licensees may fill in detailed design information using the design certification PRA as a baseline. Essentially, only selected quantitative portions should not be included in the DCD. Additional guidance is listed in the following paragraphs.

a. The details of the PRA are necessary for the staff to evaluate the risk significance of structures, systems, and components of the design during its review. However, to facilitate the removal of the detailed quantitative portion of the PRA at the completion of the design review, the staff believes that separate sections in the DCD or external reports should be developed for the PRA models, data, and quantitative analyses that support the results, qualitative discussion, and safety insights for the design.

b. Detailed discussions of PRA data analysis may be removed, but PRA insights, assumptions, results, sensitivity study results, and importance rankings should be retained. Any sections of information that were deleted should be indicated in the DCD, and should be contained in a separate, external report. Deterministic severe accident and shutdown risk analyses should remain in the DCD, although these may be edited to remove detailed PRA data, in any.

c. Qualitative discussions of the PRA analyses that demonstrate why various design features for structures, systems or components are important should be retained in the DCD. A list of risk-significant structures, systems, and components should be provided in the DCD. These analyses should be retained either in one DCD location or the appropriate sections of the DCD discussing the systems of the design. Also, cross references to other documents should be retained in the DCD if they support the information retained in the DCD.

d. Cross-references for probabilistic and severe accident analyses in Tier 2 showing where design features from key integrated plant safety analyses were incorporated into the design should be retained in the DCD in the same form as in the SSAR. Specific cross-references to the appropriate sections of Tier 1 and Tier 2 should be retained.

e. Information that is currently in the SSAR but does not involve PRA should be retained in the DCD. This includes items such as 10 CFR 50.34(f) items and unresolved and generic safety issues (USIs/GSIs).

4. Designation of Tier 2* Information in the DCD

Tier 2* information is that information in Tier 2 that, if considered to be changed by a combined license (COL) applicant or licensee, requires NRC approval prior to the change. The areas designated as Tier 2* by the NRC staff were listed in NUREG-1503 and NUREG-1462, and these areas should be similar for the passive designs. The areas designated as Tier 2* were generally those associated with detailed structural and equipment design; design and analysis methodology for fuel and control rods; and

supporting material for the Instrumentation & Controls, Control Room, and Piping design acceptance criteria (DAC). The requirement for prior NRC approval for many of these Tier 2* areas may expire at first full power for the facility.

The staff may determine that selected material in the SSAR, if considered for a change by an applicant or licensee that references the certified design, would require NRC approval prior to implementation of the change. This information is designated as Tier 2* information. Tier 2* is generally information that is not appropriate for treatment in Tier 1 because it requires a significant amount of information to describe and is subject to change. Tier 2* is generally considered for areas associated with detailed structural and equipment design; design and analysis methodology for fuel and control rods; and supporting material for the DAC areas of the design. Some designations of Tier 2* material may expire at first full power operation, when the detailed design of the facility and its performance characteristics are known, and tested through the initial test program. The NRC bears the final responsibility for designating which material in the SSAR is Tier 2*. All cases where the staff believes that Tier 2* applies are to be reviewed and approved by the cognizant Division Director. The staff's rationale for the Tier 2* information in each area and the basis for the determination that a change would require prior NRC approval, must be documented in the FSER.

The DCD should designate clearly (bracketed and italicized) the information that is determined to be Tier 2*. Use of other markers such as asterisks and bold type may also be appropriate. A table should be provided in the DCD listing the areas of the DCD that contain Tier 2* information. A statement should be included with the table stating that prior NRC approval is required to change the information, and the statement may be added to each Tier 2* area in the DCD as appropriate for clarity.

5. Conceptual Design Information

Conceptual design information is information that an applicant for design certification is required to submit for site-specific portions of the design by 10 CFR 52.47(a)(1)(ix). An applicant for a construction permit or COL that references the DCR must also describe those portions of the plant design which are site-specific, and demonstrate compliance with the interface requirements, as required by 10 CFR 52.79(b). The COL applicant does not need to conform with the conceptual design information in the DCD. The conceptual design information, which describes examples of site-specific design features, is required to facilitate the design certification review and it is non-binding.

Conceptual design information should be included in the DCD and be clearly designated as conceptual design information. The introduction to the DCD should identify its location, and explain that this information is included for informational purposes only. The introduction should also state that the site-specific design information must be submitted for review as part of a COL application.

6. Treatment of Combined License (COL) Action Items in the DCD

COL Action Items must be addressed by an applicant or licensee that references the design certification, as required by 10 CFR 52.77 and 52.79. In general, COL Action Items deal with programmatic or site-specific issues associated with the design that are out of the scope of the standard design review. The COL Action Items are not intended to be an all-inclusive list of the items required by a COL applicant. COL Action Items should be specified in the Tier 2 portion of the DCD in self-contained subsections, along with the general areas of the design to which they apply. The DCD Introduction should identify the location of the COL action items in the DCD. A table should be provided in the DCD listing the design areas that contain COL Action Items. An appropriate discussion on the status of these items may be included.

7. Treatment of Severe Accident Design Alternatives

A design certification applicant must submit an evaluation of design alternatives under 10 CFR 50.34(f)(1). This evaluation may be retained in the DCD, or submitted in a separate report that is referenced in the appropriate section of the DCD. In addition, design certification applicants are also required to submit a separate evaluation of severe accident mitigation design alternatives (SAMDAs) to address, in part, the environmental requirements in 10 CFR Part 51 as they pertain to the design certification rulemaking. The treatment of SAMDAs in design certification rulemakings is discussed in more detail in SECY-91-229, "Severe Accident Mitigation Design Alternatives for Certified Standard Designs." The evaluation of SAMDAs need not be referenced or incorporated in the DCD.

8. Treatment of Secondary References in the DCD

Secondary references are references in the DCD to external documents outside the DCD. They typically include industry codes, standards, and topical reports, as well as NRC regulations, regulatory guides, NUREGs, and generic correspondence. These also include references to proprietary information and references to information deleted from the SSAR for purposes of DCD preparation. The DCD itself is considered a primary reference of the rule certifying the design. The following guidance is designed to ensure that the requirements of the DCD and secondary references are clear for the benefit of reactor designers, the NRC, the public, and COL applicants. The staff recognizes that additional discussion with industry on implementation of this guidance may be required.

In general, the DCD should incorporate the applicable requirements of the secondary references rather than reference the external documents containing the requirements. However, if requirements are contained in an external document, the DCD should clearly identify the specific requirements contained in the external document, or the portions of the document that constitute the requirements. Also, references to external documents must be specific as to the applicable version, edition or date.

References that are cited for informational purposes should be retained in the DCD. In addition, internal cross-references to other parts of the DCD need not be modified, even if the cross-reference is to an external document. In either case, the DCD should be clear whether the reference is intended to be a requirement or is intended for informational purposes only.

9. Miscellaneous Format Issues

   a. Section numbering should be the same in the DCD as in the SSAR.

   b. Guidelines for preparation of Generic Technical Guidelines (e.g. EPGs and ERGs) are required to be in the DCD as Tier 2 information.

   c. Technical Specifications are required to be in the DCD but are treated like conceptual design information in the design certification rule.

   d. Documentation of requests for additional information (RAIs) should be included in the DCD as a separate section if the information in the RAIs is not otherwise described in the Tier 1 or Tier 2 portions of the DCD.

   e. Any currently copyrighted material in the SSAR will need to be the subject of further discussion between the staff and the applicant.

   f. The numbers in the DCD should be expressed in the International System of Units (SI), accompanied by the equivalent English units in parentheses. This is in accordance with the NRC's metrication policy (57 Federal Register 46202, October 7, 1992), and the Metric Conversion Act of 1975, as amended.

10. Unresolved Safety Issues/Generic Safety Issues (USI/GSIs)

Section 52.47(a)(iv) requires applicants for design certification to submit proposed technical resolutions for medium- and high-priority USI/GSIs identified in NUREG-0933 that are technically relevant to the design. Section 52.47(a)(ii) requires applicants for design certification to demonstrate compliance with any technically relevant portions of the Three Mile Island (TMI) requirements set forth in 10 CFR 50.34(f).

Applicants for design certification should provide a listing in Tier 2 of the issues applicable to the standard design. The listing should indicate where the technical resolutions have been incorporated into the Tier 2 design documentation. Rationale should be provided for those issues that the applicant determines to be not applicable.

Appendix B of NUREG-0933 may be used as a guide in determining applicable issues, but should not be considered an all-inclusive list for all standard designs.

Applicants may demonstrate the incorporation of operating experience in the design by addressing the technically relevant NRC generic communications, including circulars, bulletins, and generic letters. A summary listing of these documents is contained in NUREG form, and is also available electronically for searches. Additional review of operating experience may be required in selected areas of the design.

IV. Tier 1 information

A third section of the DCD is the Tier 1 information. This information consists of an introduction to Tier 1, certified design descriptions, figures, and corresponding inspections, tests, analyses, and acceptance criteria (ITAAC) for systems and structures of the design, design material applicable to multiple systems of the design (referred to as design acceptance criteria or DAC), significant interface requirements, and significant site parameters for the design. The information in the Tier 1 portion of the DCD is extracted from the detailed information contained in the application for design certification. While the Tier 1 information must address the complete scope of the design to be certified, the amount of design information is proportional to the safety-significance of the structures and systems of the design.

A. Introduction to Tier 1

This section of Tier 1 includes definitions of terms and a listing of general provisions that are applicable to all Tier 1 entries.

1. Definitions

This section defines terms used in Tier 1 that could be subject to various interpretations. The intent is to be consistent and as closely aligned as possible with the terminology in the SSAR, in common industry use, industry codes and standards, and NRC rules, regulations, and guidance. Thus, should questions on terminology arise, these references would aid in understanding the intent of the information in Tier 1. Although not all-inclusive, the following definitions that apply to terms used in the Design Descriptions and associated ITAAC are acceptable:

Acceptance Criteria means the performance, physical condition, or analysis result for a structure, system or component that demonstrates the Design Commitment is met.

Analysis means a calculation, mathematical computation, or engineering or technical evaluation. Engineering or technical evaluations could include, but are not limited to, comparisons with operating experience or design of similar structures, systems or components.

As-built means the physical properties of the structure, system, or component following the completion of its installation or construction activities at its final location at the plant site.

Basic Configuration (for a Building) means the arrangement of building features (e.g., floors, ceilings, walls, basemat and doorways) and of the structures, systems, or components within, as specified in the building DD.

Basic Configuration (for a System) means the functional arrangement of structures, systems, and components specified in the Design Description and the verifications for that system specified in the General Provisions.

Design Commitment means that portion of the Design Description that is verified by ITAAC.

Design Description means that portion of the design that is certified.

Division (for electrical systems or equipment) is the designation applied to a given safety-related system or set of components which are physically, electrically, and functionally independent from other redundant sets of components.

Division (for mechanical systems or equipment) is the designation applied to a specific set of safety-related components within a system.

Inspect or Inspection mean visual observations, physical examinations, or reviews of records based on visual observation or physical examination that compare the structure, system, or component condition to one or more Design Commitments. Examples include walkdowns, configuration checks, measurements of dimensions, or non-destructive examinations.

Test means the actuation or operation, or establishment of specified conditions, to evaluate the performance or integrity of as-built structures, systems, or components, unless explicitly stated otherwise.

Type Test means a test on one or more sample components of the same type and manufacturer to qualify other components of that same type and manufacturer. A type test is not necessarily a test of the as-built structures, systems or components.

2. General Provisions

This section of Tier 1 provides general provisions that are applicable to the design descriptions, figures, and the ITAAC.

a. Verifications for Basic Configuration for Structures and Systems

This section of Tier 1 includes provisions related to the verification of the ITAAC for basic configuration for systems and structures of the design. This ITAAC is contained in the buildings and most of the systems described in Tier 1. The ITAAC includes inspection of the functional arrangement of the system as described in the design description and as shown in the figures. It also includes, and is limited to, verifications of welding, environmental qualification, seismic

qualification, and motor operated valves as described in the definitions and general provisions provided in the DCD Tier 1.

b. Treatment of Individual Items

A licensee is not prohibited from utilizing an item not described in Tier 1. However, the as-built facility must be consistent with the rule approving the design, including both tiers of information. The change process for the certified design is described in the design certification rule.

The term "operate" as utilized in Tier 1 is intended to refer to the actuation and running of equipment. This is not meant to include the term "operable" in the context of the ongoing reliability and availability of equipment. In developing the ITAAC, the staff recognized that other programs ensure the continued safe operation of a facility after fuel load. For example, the continued operability of a facility after the ITAAC are satisfied is ensured through the Technical Specifications, Startup and Power Ascension Test Programs, as well as various programs such as the maintenance program, quality assurance program, and the in-service inspection and in-service testing program. Also, the operator ensures the facility is operated as designed, through the use of appropriate plant operating and emergency procedures.

The term "exists," when used in the Acceptance Criteria, means that the item is present and meets the design description. Detailed supporting information on what must be present to conclude that an item "exists" and meets the design description is contained in the appropriate sections of the SSAR.

c. Implementation of ITAAC

The implementation of a construction verification program, including ITAAC and other licensee programs, is the responsibility of the licensee. The successful completion of the ITAAC in the combined license will constitute the basis for the NRC's determination to allow fuel loading for the facility. The licensee will periodically certify to the NRC that the inspections, tests, and analyses have been performed, and that the acceptance criteria have been met. These notifications should document the basis for the successful completion of the ITAAC. A licensee may utilize the efforts of subordinate vendors, contractors, or consultants. However, the licensee referencing the certified design retains responsibility for ensuring that the ITAAC are met. Additionally, the ITAAC can be satisfied using other programs, such as the pre-operational testing portion of the initial test program or the QA program required by 10 CFR Part 50, Appendix B. However, these programs are not a substitute for ITAAC.

In accordance with 10 CFR 52.99, the staff will inspect to assure that the required inspections, tests, and analyses have been performed and that the prescribed acceptance criteria have been met. At appropriate intervals, the NRC will publish in the Federal Register, notices of the successful completion of the inspections,

tests, and analyses. The ITAAC may be satisfied at any time prior to fuel load, including prior to issuance of a combined license. However, the primary intent of the ITAAC is to verify that the as-built plant on the final site has been constructed and will perform in accordance with the design certification and applicable regulations. Thus, many ITAAC are anticipated to be met towards the end of facility construction and pre-operational testing.

Although the key aspects of the design are described in Tier 1, not all can be verified by the ITAAC because 10 CFR Part 52 requires that the ITAAC be satisfied prior to fuel loading. For these, the initial test program verifies various aspects of the design after fuel load, but prior to operation. Examples of these requirements are the post-fuel load startup and power ascension test program verification of fuel, control rod, and core characteristics, as well as system and integrated plant operating characteristics. The treatment of these issues will be similar to their treatment at facilities licensed under 10 CFR Part 50, in that verification of the satisfactory completion of these requirements will be a condition of the license.

Once completion of ITAAC and the supporting design information demonstrate that the facility has been properly constructed, it then becomes the function of existing programs such as the technical specifications, the maintenance program, and the in-service inspection and in-service testing program to demonstrate that the facility continues to operate in accordance with the certified design and the license. Additionally, a utility referencing the design is required by 10 CFR Part 50, Appendix B, to have a quality assurance program that ensures that SSCs are appropriately designed, procured, and perform satisfactorily in service. Further, the operator ensures the facility is operated as designed, through the use of appropriate plant operating and emergency procedures.

d. Discussion of Matters Related to Operations

Descriptions in Tier 1 may refer to matters of operation, such as normal valve or breaker alignment during normal operational modes. These descriptions are not intended to require operators to take any particular action. The operational matters referred to in Tier 1 are governed by existing programs to ensure the ongoing safe operation of a facility, such as plant operating and emergency procedures.

e. Interpretation of Figures

The design descriptions include the figures in Tier 1, where the figures are provided. They are intended to depict the functional arrangement of the significant SSCs of the standard design. An as-built facility referencing the certified design must be consistent with the performance characteristics and functions described in the design descriptions and figures.

f. Rated Reactor Core Thermal Power

The rated reactor core thermal power for the design must be specified.

3. Legend for Figures and Acronyms and Abbreviations

A legend supporting Tier 1 figures should be provided. The symbology selected should be consistent and as closely aligned as possible with the symbology in Tier 2, in common industry use, industry codes and standards, and NRC rules, regulations, and guidance. Thus, should questions on interpretation arise, these references would aid in understanding the intent of the information. In addition, the meanings of acronyms and abbreviations should be provided for any of those terms used in Tier 1.

B. System Design Descriptions, Figures, and ITAAC

System design descriptions and ITAAC should be provided for: (a) structures and systems that are fully within the scope of the standard design certification, and (b) the in-scope portions of those systems that are only partially within the scope of the standard design certification. The system design descriptions should be accompanied by the appropriate ITAAC. The selection methodology and criteria for the system design descriptions and ITAAC should be specified in DCD Tier 2 Section 14.3. Entries should be provided in Tier 1 for all systems necessary to define the full scope of the design. Checklists for fluid systems, electrical systems, and building structures are provided in Appendix C to achieve consistency in treatment of issues.

1. Design Descriptions and Figures

The design descriptions (DD) address the most safety-significant aspects of each of the systems of the design, and were derived from the detailed design information contained in Tier 2. The applicant should put the top-level design features and performance characteristics that were the most significant to safety in the Tier 1 design descriptions. The level of detail in Tier 1 governed by a graded approach to the SSCs of the design, based on the safety significance of the functions they perform. The design descriptions include the figures associated with the systems. The design descriptions serve as binding requirements for the lifetime of a facility to assure that the plant does not deviate from the certified design.

The scope of the certified design is defined by the information in the DCD. Therefore, each branch should ensure that all appropriate systems that are either fully or partially within the scope of the design certification are addressed in Tier 1, at the appropriate level of detail based on the safety significance of the SSCs. For example, safety-related SSCs should be described in Tier 1 with a relatively greater amount of information. Other SSCs should also be included based on their importance to safety, such as containment isolation aspects of non-safety systems. Some non-safety aspects of SSCs need not be discussed in Tier 1. This graded approach recognizes that although many aspects of the design are important to safety, the level of design detail in Tier 1 and verification of the key design features and performance characteristics should be commensurate with the significance of the safety functions to be performed.

The design descriptions include a narrative and simplified schematic figures in Tier 1, where the figures are provided. The narrative should state the system purpose, significant performance characteristics and safety functions, whether it is safety-related or not, system location, key design features, seismic and ASME code classifications, description of system operation, major controls and displays, logic circuits, interlocks, Class 1E power sources and divisions, equipment to be qualified for harsh environments (and other than harsh for certain I&C equipment), and interface requirements, as applicable.

Figures should be provided for most systems, with the amount of information depicted based on the safety significance of the SSCs. Where figures are not required, generally for simple non-safety significant systems, the narrative should be sufficient to describe the system. The figures are intended to depict the functional arrangement of the significant SSCs of the standard design. Particular attention should be paid to the legend for the figures to ensure common understanding of requirements, system boundaries, piping code breaks, electrical configurations, etc.

Numeric performance values and key parameters in safety analyses should be specified in the design descriptions based on their safety significance; however, numbers for all parameters need not be specified unless there is a specific reason to include them (e.g., important to be maintained for the life of the facility).

The use of codes and standards in Tier 1 should be minimized, with exceptions granted on a case-by-case basis. Instead, the applicable requirements from the regulations, codes, or standards should be stated in Tier 1, rather than reference them. This ensures that requirement is clear, and allows flexibility if the reference changes. References to various parts of ASME Section III are possible for verification of issues such as pressure boundaries, and references to ASME Section XI for pre-service inspection requirements. Also, references to 10 CFR Part 20 may be required for use in radiation protection. The specific code edition, volume, version, date, etc., should be specified in Tier 2, rather than Tier 1. This provides for specific requirements that are acceptable, yet allows the code to be updated via the change process in the rule certifying the design. It is important to note that, due to the provisions of 10 CFR 52.63 and the rule certifying the design, changes to the codes and standards in 10 CFR 50.55a would not necessarily be requirements for the certified design.

The staff should ensure that <u>significant</u> features of the application upon which the staff is relying to reach its safety conclusion are also included in the DD. The specific features or commitments which are to be included in the DD are a matter of staff judgment. Two important factors should be balanced in reaching a decision to incorporate information into the DD: (1) the safety significance of the design feature or commitment to the staff's safety decision, and (2) an evaluation of whether it is likely or not that the design feature or commitment will need to be changed in the future. If the staff concludes that it is likely that the details of a particular design feature or commitment will need to change then it is appropriate to limit the amount of detail in the DD. For example, if current technology is changing and the staff concludes it is inappropriate to specify a particular technology by rulemaking, then the level of detail in the DD should be limited to

functional requirements and/or broad commitments. Additional detail as to how the functional requirements and/or broad commitments will be met must be specified in Tier 2 in sufficient detail for the staff to reach its safety decision.

2. ITAAC

The purpose of the ITAAC is to verify that an as-built facility conforms to the approved plant design and applicable regulations. When coupled in a COL with the ITAAC for site-specific portions of the design, they constitute the verification activities for a facility that must be successfully met prior to fuel load. If the licensee demonstrates that the ITAAC are met and the staff agrees that they are successfully met, then the licensee will be permitted to load fuel. Once completion of ITAAC and the supporting design information demonstrate that the facility has been properly constructed, it then becomes the function of existing programs such as the technical specifications, the in-service inspection and in-service testing program, the quality assurance program, and the maintenance program, to demonstrate that the facility continues to operate in accordance with the certified design and the license.

The scope of ITAAC at the design certification stage is limited to, and must be consistent with, the systems, structures, and components (SSC) that are in the certified design. The ITAAC for the site-specific design features will be developed at the COL stage. Also, ITAAC are limited to the design features and requirements that must be verified prior to fuel loading. Therefore, items like power ascension testing that are also described in the application will be covered by license conditions in the COL.

Also, the scope of the ITAAC is consistent with the SSCs that are in the design descriptions. In general, each system has one or more ITAAC that verify the information in the design descriptions. The system ITAAC should verify that the key design characteristics and performance requirements of the SSCs are verified. The level of detail specified in the ITAAC should be commensurate with the safety significance of the functions and bases for that SSC.

Standard ITAAC have been developed that verify selected aspects of the standard design. These are provided in Appendix D to this SRP. The standard ITAAC should be used to ensure consistent and comprehensive treatment of these issues in the applicable systems of Tier 1.

A three-column format for ITAAC is acceptable, as discussed below.

a. Column 1 - <u>Design Commitments</u>

This column contains the text for the specific design commitment that is extracted from the design descriptions discussed above. Any differences in text should be minimized, unless intentional. Differences in text are generally intended to better conform the commitments in the design description with the ITAAC format.

b. Column 2 - Inspections, Tests, and Analyses

This column contains the specific method to be used by the licensee to demonstrate that the design commitment in Column 1 has been met. The method is either by inspection, test, or analysis or some combination of these.

Tier 2 contains detailed supporting information for various inspections, tests, and analyses that can, and should be, used to verify the Tier 1 design information and satisfy the acceptance criteria. If questions on interpretation should arise, the material in Tier 2 provides the background material and context for Tier 1 information. Tier 2 contains information reviewed by the staff which is the basis for the staff's safety determination for the design. Therefore, the information in Tier 2 describes an acceptable means, but not the only means, of satisfying an ITAAC.

Inspections are defined in the Introduction, and include visual and physical observations, walkdowns or record reviews. The inspections required for the "Basic Configuration Walkdown" ITAAC invoke the general provisions contained in the Introduction for as-built structures and systems.

Tests are defined in the Introduction, and mean the actuation, operation, or establishment of specified conditions to evaluate the performance or integrity of the as-built SSCs. This includes functional and hydrostatic tests for the systems. The preferred means to satisfy the ITAAC is in-situ testing, where possible, of the as-built facility. The term "as-built" is intended to mean testing in the final as-installed condition at a facility. The term "type tests" is used in this column to mean manufacturer's tests or other tests that are not necessarily intended to be in the final as-installed condition. The results of pre-operational tests can be used to satisfy an ITAAC. However, the pre-operational tests described in DCD Tier 2 Section 14.2 or RG 1.68 are not a substitute for ITAAC. Where testing is specified, appropriate conditions for the test should be established in accordance with the Initial Test Program (ITP) described in Tier 1, DCD Tier 2 Section 14.2, and RG 1.68. Conversion or extrapolation of the test results from the test conditions to the design conditions may be required to satisfy the ITAAC.

Analyses are defined in the Introduction, and may refer to detailed supporting information in the DCD Tier 2, simple calculations, or comparisons with operating experience or design of similar SSCs. The details of the analysis method must be specified in either the ITAAC or Tier 2 (preferred). The ITAAC should not reference Tier 2, but Tier 2 may reference the appropriate ITAAC. For example, detailed analysis methods of seismic and environmental qualification supporting the general provisions in the Tier 1 Introduction are contained in Chapter 3 of Tier 2 and detailed piping design information supporting additional design material applicable to multiple sections of the design are also contained in Chapter 3.

c. Column 3 - Acceptance Criteria

This column contains the specific acceptance criteria for the inspections, tests, or analyses described in Column 2 which, if met, demonstrate that the design commitments in Column 1 have been met.

In general, the acceptance criteria should be objective and unambiguous. In some cases, the acceptance criteria may be more general because the detailed supporting information in Tier 2 does not lend itself to concise verification. For example, the acceptance criteria for the design integrity of piping and structures may be that a report "exists" that concludes the design commitments are met. In these cases, Tier 2 provides the detailed supporting information on multiple interdependent parameters that must be provided in order to demonstrate that a satisfactory report exists.

Numeric performance values for SSCs are specified as ITAAC acceptance criteria when values consistent with the design commitments are possible, or when failure to meet the stated acceptance criterion would clearly indicate a failure to properly implement the design.

3. Tier 2 Supporting Information

The DCD Tier 2 must include all information reviewed by the staff which is relied upon in reaching the staff's safety determination. All requirements for the design must be included in the DCD Tier 2. To the extent that design detail or other information reviewed in the course of inspections or audits is necessary for the staff to reach a safety conclusion, that design detail or other information must be in the DCD Tier 2. It is not sufficient for such information to be on the docket, it must be in the DCD Tier 2.

In some cases, the detailed supporting information necessary to perform the inspections, tests, and analyses, or to demonstrate compliance with the acceptance criteria may not be identified by the standard format for safety analysis reports or the SRP, but is required to be added to Tier 2 to show the intended methods of performance of the ITAAC. Examples of this information includes detailed design, inspection, and construction items such as welding processes, piping stress reports, and building construction reports contained in appendices to DCD Tier 2 Chapter 3 for the evolutionary standard designs. Other examples may include supporting information for design processes and design acceptance criteria (DAC) for selected areas of the design.

4. Section 14.3 of Tier 2

The top-level design information in Tier 1 is extracted from the more detailed design information in Tier 2. Section 14.3 of Tier 2 should provide the bases, processes and selection criteria used to develop the Tier 1 information. However, the section should contain no technical information not already presented in other sections of Tier 2.

Section 14.3 should contain a description of each section of Tier 1 and a discussion of its development. The following items should be addressed:

a. A discussion of the scope of the certified design, the interfaces with the certified design, and the site parameters selected.

b. A discussion of the scope and applicability of any definitions and general provisions.

c. A discussion of the how the Design Descriptions were developed, and how the various inspections, tests, analyses, and acceptance criteria for design commitments were selected.

d. A discussion of the development of any additional design material, including the justification for any design processes and design acceptance criteria (DAC) for selected areas of the design.

e. A discussion of the Tier 1 commitments for the Initial Test Program and Design Reliability Assurance Program.

The design descriptions may utilize a system-based structure which is different than the structure of Tier 2. Consequently, developing the design description entries for any one system must be based on the multiple DCD Tier 2 chapters having technical information related to that system. This approach should be discussed in Section 14.3, describing how the many design aspects of the SSCs in Tier 1 were derived.

The emphasis in DCD Tier 2 Section 14.3 should be on discussing the level of detail in Tier 1. Acceptable approaches for selection of the top-level requirements for Tier 1 may be based on the safety significance of SSCs, their importance in various safety analyses, and their functions for defense-in-depth considerations. At a minimum, the section should include a discussion of how the following items were addressed in the selection of the Tier 1 material:

a. Selection of design information from the various chapters of Tier 2.

b. Features or functions necessary to satisfy the NRC's regulations in 10 CFR Parts 20, 50, 52, 73, or 100.

c. Treatment of safety-related SSCs.

d. Treatment of important features and functions identified in the NRC's SRP.

e. Important insights or assumptions from the probabilistic risk assessment

f. Treatment of severe accident design features.

g. Incorporation of operating experience. This includes USIs, GSIs, and TMI items; NRC generic correspondence such as bulletins, circulars, and generic letters; and relevant industry operating experience.

h. Provisions in the facility technical specifications and their bases.

i. Provisions in the test descriptions for the pre-operational and power ascension test programs contained in Section 14.2 of Tier 2.

The staff is particularly interested in ensuring that the assumptions and insights from key safety and integrated plant safety analyses in Tier 2, where plant performance is dependent on contributions from multiple systems of the design, are adequately considered in Tier 1. Addressing these assumptions and insights in Tier 1 ensures that the integrity of the fundamental analyses for the design are preserved in an as-built facility referencing the certified design. These analyses include flooding analyses, overpressure protection, containment analyses, core cooling analyses, fire protection, transient analyses, anticipated transient without scram analyses, steam generator tube rupture analyses (PWRs only), radiological analyses, USIs/GSIs and TMI items, or other key analyses as specified by the staff. Therefore, applicants should provide information, in tabular form, in Section 14.3 that cross references the important design information and parameters of these analyses to their treatment in Tier 1. The cross-references should be sufficiently detailed to allow a COL applicant or licensee to consider whether a proposed design change impacts the treatment of these parameters in Tier 1.

In addition, cross references should also be provided showing how key insights and assumptions from PRA and severe accident analyses are addressed in the design information in the DCD. For these analyses only, the cross references should show where each of the key assumptions and insights has been captured in Tier 1, as well as in the technical specifications (including administrative controls), reliability assurance activities, emergency procedure guidelines, the initial test program, and COL action items. These cross references may be provided along with the detailed PRA and severe accident analyses in the applicable sections of Tier 2. The cross-references should be sufficiently detailed to allow a COL applicant or licensee to consider whether a proposed design change impacts the treatment of these parameters in Tier 1.

C. Additional Certified Design Material

This section of Tier 1 should contain the Design Descriptions and their related ITAAC for design and construction activities that are applicable to more than one system of the design. The following items should be addressed in Tier 1, if applicable to the standard design. Applicants may propose additional items to be treated on a generic basis. The Design Descriptions should describe the scope and applicability of the additional certified design material to the appropriate systems. Alternatively, the additional material may be specified in the Design Descriptions and ITAAC for the SSCs to which they apply.

1. Design Acceptance Criteria (DAC)

Additional material may be provided because, in selected areas of the design, applicants may not provide sufficient design detail in the DCD Tier 2. Applicants may not have provided complete design information in these areas because they are either areas of rapidly changing technology where applicants believe it is unwise to prematurely freeze the design, or because the information is dependent on as-built or as-procured information. Areas of rapidly changing technology may include control room and remote shutdown system design (human factors), and advanced instrumentation and controls. Areas dependent on as-built or as-procured information may include piping design and radiation shielding, ventilation, and airborne monitoring design. For these areas, applicants should provide the design related processes and associated DAC in Tier 1 that a COL applicant or licensee would follow to complete the design.

The design information and appropriate design methodologies, codes, and standards provided in the DCD Tier 2, together with the design descriptions and DAC, should be sufficiently detailed to provide an adequate basis for the staff to make a final safety determination regarding the design, subject only to satisfactory design implementation and verification of the DAC by the COL applicant or licensee. The DAC are a set of prescribed limits, parameters, procedures, and attributes upon which the NRC relies, in a limited number of technical areas, in making a final safety determination in support of the design certification. The acceptance criteria for the DAC should be objective; that is, they should be inspectable, testable, or subject to analysis using pre-approved methods, and must be verified as a part of the ITAAC performed to demonstrate that the as-built facility conforms to the certified design. Thus, the acceptance criteria for DAC are specified together with the related ITAAC in Tier 1, and both are part of the design certification. The DAC and the ITAAC, when met, ensure that the completed design and as-constructed plant conforms to the design certification. The material in the DCD Tier 2 for each of the DAC areas should include, as appropriate, sample calculations or other supporting information to illustrate methods that are acceptable to the staff for meeting the Tier 1 DAC commitments.

The DAC may be provided in Tier 1 as part of additional certified design material applicable to more than one system. If so, the structure of each area where DAC are used is the same as for the other areas of the design that are verified by ITAAC. The structure consists of three parts: the Tier 1 Design Description, the corresponding DAC, and the Tier 2 supporting information in the DCD Tier 2 for the DAC. The Design Description for each DAC should describe its scope and applicability to the SSCs of the design. Amplifying information on this Tier 1 information should be contained in DCD Tier 2 Section 14.3. Alternatively, applicants may choose to address all design issues appropriately in the SSCs to which they apply.

For the two areas of rapidly changing technology, control room and remote shutdown system design (human factors), and digital computer-based instrumentation and controls design, the Design Descriptions and DAC delineate the process and requirements that a COL applicant or licensee must implement to develop the design information required in each area. Acceptance criteria are specified in Tier 1 for the development process at

various stages of detailed design and subsequent construction and testing. The COL applicant or licensee is required to develop the procedures and test programs necessary to demonstrate that the DAC requirements are met at each stage. Similar to ITAAC, the COL applicant or licensee will certify to the NRC that the design through that phase is in compliance with the certified design. The NRC will review, audit, and inspect the work to confirm that the COL applicant or licensee has adequately implemented the commitments of the DAC at these phases. The process may be referred to as a "phased" DAC because it consists of a set of sequential steps or phases that require successful completion. A COL applicant or licensee is not required to certify that each phase is completed sequentially. However, if the staff determines that a DAC was not successfully met, the design process may be required to be repeated to meet the DAC, possibly requiring a change to the as-built system design.

2. Initial Test Program (ITP)

Refer to SRP Section 14.3.10.

3. Design Reliability Assurance Program (D-RAP)

Refer to SRP Section 14.3.10.

D. Interface Requirements

This section of Tier 1 specifies interface requirements that must be met by the site-specific portions of a facility that are not within the scope of the certified design. The interface requirements in the DCD define the design attributes and performance characteristics that ensure that the site-specific portion of the design is in conformance with the certified design. The site-specific portions of the design are those portions of the design that are dependent on characteristics of the site, such as the design of the ultimate heat sink.

This section of Tier 1 also identifies the scope of the design to be certified by specifying the systems that are completely or partially out of scope of the certified design. Thus, interface requirements are defined for: (a) systems that are entirely outside the scope of the design, and (b) the out-of-scope portions of those systems that are only partially within the scope of the standard design. In some cases, the scope of the standard design requires that the DCD contain information that was supplied by a utility in the past. However, simply because design information may be traditionally "licensee-supplied" does not mean that it is "out-of-scope" of the standard design.

In some cases, the scope of the standard design requires that additional material be included in Tier 1 and Tier 2 beyond that required from reactor designers for facilities licensed under 10 CFR Part 50. In particular, supporting information for the ITAAC; certain aspects of power generation and support equipment; and aspects of facility structures, equipment and programs should be included in the DCD Tier 2. Examples of this information include the detailed analysis or testing methodology required to demonstrate that the acceptance criteria for various ITAAC have been met, amplifying information for diesel generators, form and content of

welding records, requirements for piping design stress and as-built reconciliation reports, and details of building design and construction reports.

Although the top-level interface requirements are specified in Tier 1, more detailed interface requirements may be specified in Tier 2 (generally in Chapter 1), but they must be consistent with the Tier 1 information. The evolutionary designs defined the interface between the systems of the design and the site-specific systems to be physically at the walls of the major buildings of the design, such as the turbine building, reactor building, and control building. All SSCs within those buildings were considered within the scope of the design, and the SSCs outside of those buildings were considered out of scope and site-specific. Alternative definitions of interfaces may also be acceptable, such as those based on the locations of transfers of various process flows into and out of the design scope (radioactive or contaminated flows, electrical flows, heat flows, water and air flows, etc.).

The requirements for interfaces for a design are contained in 10 CFR 52.47(a)(1)(vii-ix). An applicant for design certification is required to provide:

1. The interface requirements to be met by those portions of the plant for which the application does not seek certification. The interface requirements may be located in this section of Tier 1, or located with the Design Descriptions and ITAAC for applicable SSCs and cross-referenced to this section of Tier 1. Cross referencing is typically used for systems that are partially out of scope of the standard design.

2. Justification that compliance with the interface requirements is verifiable through inspection, testing, or analysis, and the method to be used for verification of interface requirements. This justification must be provided in Tier 1. An acceptable justification is a statement in Tier 1 that the development of ITAAC for the interface requirements will be similar in nature to the development of ITAAC for SSCs within the scope of the standard design. Thus, compliance with the interfaces is verifiable through ITAAC. The development process for the Design Descriptions and ITAAC should be described in DCD Tier 2 Section 14.3.

3. A representative conceptual design for those portions of the plant for which the application does not seek certification. Representative conceptual designs should be provided by design certification applicants in the appropriate sections of the DCD Tier 2 so that the staff can perform its review of the standard design. This information should be clearly identified as conceptual design information for the site-specific, out-of-scope portion of the design.

   An applicant for a combined license must provide appropriate information regarding the site-specific portion of the design and ITAAC to demonstrate compliance with the interface requirements, but is not required to conform to the conceptual design information. The review of this information is accomplished in the review of an application for a combined license under Subpart C of 10 CFR Part 52.

E. Site Parameters

Site parameters are specified in this section of Tier 1 for establishing the bounding parameters to be used in the selection of a suitable site for a facility referencing the standard design. The design is evaluated in terms of these parameters during the reviews for design certification. Therefore, to ensure that a facility built on the site remains in conformance with the design certification, a suitable site must be demonstrated to be within the bounding parameters and characteristics, and a facility must be constructed at the site in accordance with their use in the approved design.

The requirements for site parameters for a design are contained in 10 CFR 52.47(a)(1)(iii). An applicant for design certification is required to provide the site parameters used in the design, and an analysis and evaluation of the design in terms of these parameters. The top-level site parameters should be specified in Tier 1. Detailed site parameters should be specified in Chapter 2 of the DCD Tier 2, and the analysis and evaluation of the design should be contained in the applicable sections of the DCD Tier 2. The demonstration that the site parameters are met at a given site is accomplished in conjunction with an application and issuance of a combined license under Subpart C of 10 CFR Part 52.

SRP SECTION 14.3
APPENDIX B

BRANCH REVIEW RESPONSIBILITIES FOR TIER 1

This appendix contains the primary and secondary review branch assignments used for the GE Nuclear Energy Advanced Boiling Water Reactor (GE ABWR) and the Asea Brown Boveri-Combustion Engineering (ABB-CE) System 80+ evolutionary standard designs. They may be used as the basis to assign branch review responsibilities for other designs.

I. GE NUCLEAR ENERGY ABWR

Tier 1/ITAAC Section Number	System Title	Secondary Review Branches
A.	STRUCTURAL TASK GROUP	
2.1.1	Reactor Pressure Vessel System	SRXB
2.6.1	Reactor Water Cleanup System	SPLB
2.10.4	Condensate Purification System	SPLB
2.11.1	Makeup Water (Purified) System	SPLB
2.11.20	Sampling System	SPLB/PERB
2.14.1	Primary Containment System	SPLB/SCSB/PERB
2.15.10	Reactor Building	PERB/SPLB/PSGB
2.15.11	Turbine Building	PERB/SPLB
2.15.12	Control Building	SPLB/PERB/PSGB
2.15.13	Radwaste Building	SPLB/PERB
2.15.14	Service Building	SPLB/PERB/PERB
3.3	Piping DAC	
5.0	Site Parameters	PERB/SPLB/Projects
Appendix A	Legend for Figures	EELB/SPLB
TOTAL NUMBER OF SYSTEMS: 14		
B.	PLANT SYSTEMS TASK GROUP	
2.3.1	Process Radiation Monitoring System	PERB/HICB
2.4.3	Leak Detection & Isolation System	HICB
2.5.5	Refueling Equipment	SRXB
2.5.6	Fuel Storage Facility	ECGB/SRXB
2.6.2	Fuel Pool Cooling & Cleanup System	ECGB
2.6.3	Suppression Pool Cleanup System	ECGB
2.9.1	Radwaste System	PERB
2.9.2	Radioactive Drain Transfer System	PERB
2.10.1	Turbine Main Steam System	ECGB/PERB
2.10.2	Condensate Feedwater & Condensate Air Extraction System	ECGB
2.10.7	Main Turbine	ECGB

2.10.9	Turbine Gland Steam System	
2.10.13	Turbine Bypass	
2.10.16	Generator	
2.10.21	Main Condenser	ECGB
2.10.22	Off-Gas System	PERB
2.10.23	Circulating Water System	
2.11.2	Makeup Water (Condensate) System	
2.11.3	Reactor Building Cooling System	
2.11.4	Turbine Building Cooling Water System	
2.11.5	HVAC Normal Cooling Water System	
2.11.6	HVAC Emergency Cooling Water System	
2.11.8	Ultimate Heat Sink	ECGB
2.11.9	Reactor Service Water System	ECGB
2.11.10	Turbine Service Water System	
2.11.11	Station Service Air System	ECGB
2.11.12	Instrument Air System	ECGB
2.11.13	High Pressure Nitrogen Gas Supply System	ECGB
2.14.4	Standby Gas Treatment System	PERB
2.14.6	Atmospheric Control System	
2.14.7	Drywell Cooling System	
2.14.8	Flammability Control	ECGB/HICB
2.15.3	Cranes & Hoists	ECGB
2.15.5a	Control Building HVAC Systems	ECGB
2.15.5b	Control Room Habitability HVAC System	ECGB/PERB
2.15.5c	Reactor Building HVAC System	ECGB/PERB
2.15.6	Fire Protection System	HICB
2.16.2	Oil Storage & Transfer System	ECGB
4.1	Ultimate Heat Sink	ECGB/Projects
4.3	Potable & Sanitary Water System	
4.4	Turbine Service Water System	Projects
4.5	Reactor Service Water Interface	Projects
4.6	Makeup Water Preparation System	Projects

TOTAL NUMBER OF SYSTEMS: 43

C. REACTOR SYSTEMS TASK GROUP

2.1.2	Nuclear Boiler System	ECGB/SPLB
2.1.3	Reactor Recirculation System	ECGB
2.2.2	Control Rod Drive System	ECGB
2.2.4	Standby Liquid Control System	HICB
2.4.1	Residual Heat Removal System	ECGB/HICB
2.4.2	High Pressure Core Flooder System	ECGB/HICB
2.4.4	Reactor Core Isolation Cooling System	ECGB/HICB
2.8.1	Nuclear Fuel	
2.8.2	Fuel Channel	
2.8.3	Control Blade	

2.8.4	Loose Parts Monitoring	ECGB/HICB

TOTAL NUMBER OF SYSTEMS: 11

D. ELECTRICAL SYSTEMS TASK GROUP

2.12.1	Electrical Power Distribution System	
2.12.10	Electrical Wiring Penetrations	ECGB
2.12.11	Combustion Turbine Generator	SPLB
2.12.12	DC Power Supply	
2.12.13	Emergency Diesel Generator System	SPLB
2.12.14	Vital AC Power Supply & AC Instrument & Control Power Supply Systems	HICB
2.12.15	Instrument & Control Power Supply	HICB
2.12.17	Lighting & Service	HHFB
4.2	Offsite Power Interface	Projects

TOTAL NUMBER OF SYSTEMS: 9

E. HUMAN FACTORS TASK GROUP

2.2.6	Remote Shutdown System	HICB/SRXB/SPSB
2.7.1	Main Control Room Panel	HICB/EELB/ECGB/SPSB
2.7.3	Local Control Panels	HICB/EELB/ECGB/SPSB
3.1	Human Factors Engineering (DAC)	

TOTAL NUMBER OF SYSTEMS: 4

F. RADIATION PROTECTION TASK GROUP

2.3.2	Radiation Monitoring System	
2.3.3	Containment Atmospheric Monitoring System	
3.7	Radiation Protection DAC	

TOTAL NUMBER OF SYSTEMS: 3

G. INSTRUMENTATION AND CONTROL SYSTEMS TASK GROUP

2.2.1	Rod Control & Information System	SRXB
2.2.3	Feedwater Control System	SRXB
2.2.5	Neutron Monitoring	SRXB
2.2.7	Reactor Protection System	SRXB
2.2.8	Recirculation Flow Control System	SRXB
2.2.9	Automatic Power Regulatory System	SRXB
2.2.10	Steam Bypass & Pressure Control	SRXB/SPLB
2.2.11	Process Computer System	

2.7.5	Multiplexing System	
2.12.16	Communication System	EELB
2.14.9	Suppression Pool Temperature Monitoring System	
3.4	A. Safety System Logic & Control (DAC)	
	B. I&C Development & Qualification Processes (DAC)	
4.7	Communication System	Projects

TOTAL NUMBER OF SYSTEMS: 13

H. PROJECTS REVIEW RESPONSIBILITIES

1.1	Definitions	All
1.2	General Provisions	ECGB/SPLB
2.16.3	Site Security	Note: PSGB has lead
---	Reliability Assurance Program	Note: HQMB has lead; SPSB secondary
---	Initial Test Program	Note: HQMB has lead
---	Cross-references of key analyses	
	SSAR->Tier 1 (Roadmaps)	SPSB/SCSB/SPLB/SRXB
Appendix B	Acronyms & Abbreviations	
Appendix C	Metric Conversion Table	

I. OTHER

In a reorganization of NRR, responsibility for certain containment-related ABWR systems were transferred from the Plant Systems Branch to the Containment Systems and Severe Accident Branch as follows:

	Primary	Secondary
Reactor Pressure Vessel System		X
Nuclear Boiler System		X
Remote Shutdown System		X
Reactor Protection System		X
Containment Atmospheric Monitoring System	X	
Residual Heat Removal System		X
Leak Detection and Isolation System		X
Suppression Pool Cleanup System	X	
Main Control Room Panels		X
High Pressure Nitrogen Gas Supply System		X
Primary Containment System	X	
Atmospheric Control System	X	
Drywell Cooling System	X	
Flammability Control System	X	
Suppression Pool Temperature Monitoring System	X	
Fire Protection System		X

II. ABB-CE SYSTEM 80+ REVIEW RESPONSIBILITIES

Tier 1/ITAAC Section Number & System Title		Secondary Review Branches
A.	STRUCTURAL TASK GROUP	
1.3	Site Parameters	PERB/SPLB/Projects
1.4	Figure Legend	EELB/SPLB
2.1.1	Nuclear Island Structures	SCSB/PERB/SPLB/PERB
2.1.2	Turbine Building	SPLB/SPSB
2.1.3	Component Cooling Water Heat Exchanger Structure	
2.1.4	Diesel Fuel Storage Structure	SPLB
2.1.5	Radioactive Waste Building	PERB
2.1.6	Reactor Vessel Internals	SRXB
2.1.7	In-core Instrument Guide Tubes	SRXB
2.2.4	Control Element Drive Mechanism	SRXB
2.3.3	Component Supports	
2.7.7	Demineralized Water Makeup Systems	SPLB
2.7.16	Chemical & Volume Control System	SRXB/SPLB
2.8.7	Steam Generator Blowdown System	SRXB
3.1	Piping Design (DAC)	

TOTAL NUMBER OF SYSTEMS: 15

B.	PLANT SYSTEMS TASK GROUP	
2.4.2	Annulus Ventilation System	
2.4.3	Combustible Gas Control in Containment	
2.4.5	Containment Isolation	ECGB
2.4.6	Containment Spray	
2.7.1	New Fuel Storage Racks	SRXB/ECGB
2.7.2	Spent Fuel Storage Racks	SRXB/ECGB
2.7.3	Pool Cooling and Purification System	SRXB
2.7.4	Fuel Handling System	ECGB
2.7.5	Station Service Water System	
2.7.6	Component Cooling Water System	SRXB
2.7.8	Condensate Storage System	
2.7.9	Process Sampling System	SRXB
2.7.10	Instrument Air System	
2.7.11	Turbine Building Cooling Water System	
2.7.12	Essential Chilled Water System	
2.7.13	Normal Chilled Water System	
2.7.14	Turbine Building Service Water System	
2.7.15	Equipment & Floor Drainage System	
2.7.17	Control Building Ventilation System	PERB
2.7.18	Fuel Building Ventilation System	PERB
2.7.19	Diesel Building Ventilation System	
2.7.20	Subsphere Building Ventilation System	

2.7.21	Containment Purge Ventilation System	SCSB/PERB
2.7.22	Containment Cooling & Ventilation System	
2.7.23	Nuclear Annex Ventilation System	
2.7.24	Fire Protection System	
2.7.27	Compressed Gas Systems	
2.7.28	Potable & Sanitary Water System	
2.7.29	Radwaste Building Ventilation System	PERB
2.8.1	Turbine Generator	EELB/ECGB
2.8.2	Main Steam Supply System	
2.8.3	Main Condenser	
2.8.4	Main Condenser Evacuation System	
2.8.5	Turbine Bypass System	
2.8.6	Condensate and Feedwater System	
2.8.8	Emergency Feedwater System	HICB
2.8.9	Condenser Circulating Water System	

TOTAL NUMBER OF SYSTEMS: 37

C. REACTOR SYSTEMS TASK GROUP

2.2.1	Nuclear Design	
2.2.2	Fuel Systems	
2.2.3	Thermal and Hydraulic Design	
2.3.1	Reactor Coolant System	ECGB
2.3.2	Shutdown Cooling System	ECGB/SPLB
2.4.1	Safety Depressurization System	SPLB/HICB
2.4.4	Safety Injection System	HICB

TOTAL NUMBER OF SYSTEMS: 7

D. ELECTRICAL SYSTEMS TASK GROUP

2.6.1	Electrical Power Distribution System	
2.6.2	Onsite Standby AC Power Sources	
2.7.26	Lighting System	HHFB

TOTAL NUMBER OF SYSTEMS: 3

E. HUMAN FACTORS TASK GROUP

2.10	Technical Support Center	PERB
2.12.1	Main Control Room	
2.12.2	Remote Shutdown Room	HICB/SRXB
2.12.3	Control Panels	HICB

TOTAL NUMBER OF SYSTEMS: 4

F. RADIATION PROTECTION TASK GROUP

2.9.1	Condensate & Feedwater System	SPLB
2.9.2	Gaseous Waste Management System	SPLB
2.9.3	Solid Waste Management System	SPLB
2.9.4	Process & Effluent Radiological Monitoring & Sampling System	SPLB
3.2	Radiation Protection (DAC)	ECGB

TOTAL NUMBER OF SYSTEMS: 5

G. INSTRUMENTATION AND CONTROLS SYSTEMS TASK GROUP

2.5.1	Plant Protection System
2.5.2	Engineered Safety Features- Component Control System
2.5.3	Safety Related Display Instrumentation
2.5.4	Protection System Interfaces to Non-Safety Systems
2.7.25	Communication System

TOTAL NUMBER OF SYSTEMS: 5

H. PROJECTS REVIEW RESPONSIBILITIES

1.0	Introduction	
1.1	Definitions	
1.2	General Provisions	EELB/SPLB
1.4	Abbreviations	
2.11	Initial Test Program	HQMB
---	Reliability Assurance Program	HQMB

TOTAL NUMBER OF SYSTEMS: 6

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DETAILED REVIEW GUIDANCE

FLUID SYSTEMS REVIEW CHECKLIST

The following provides guidance and rationale of what should be included in the Tier 1 Design Descriptions (DDs), figures, and ITAAC for fluid systems. Examples of acceptable Tier 1 information may be found in the DCDs for the evolutionary designs.

I. DESIGN DESCRIPTIONS AND FIGURES

A. DESIGN DESCRIPTIONS

The following information should be included in the various Design Descriptions in a consistent order.

1. System purpose and functions (minimum is safety functions, may include some non-safety functions)

   The DD identifies the system's purpose and function. It captures the system components that are involved in accomplishing the direct safety function of the system. Each DD should include wording (preferably in the first paragraph) that identifies whether the system is safety-related or is a non-safety system. Exceptions should be noted if parts of the system are not safety-related or if certain aspects of a non-safety system have a safety significance.

2. Location of system

   The building that the system is located (e.g., containment, reactor building, etc.) shall be included in the DD.

3. Key design features of the system

   The design description should describe the components that make up the system. Key features such as the use of the some of the safety relief valves to perform as the Automatic Depressurization System should be described in the DD. However, details of a components design, such as the internal workings of the MSIVs and SRVs, need not be included in the design description because this could limit the COL applicant or licensee to a particular make and model of a component. If the results of the PRA indicate that a particular component or function of a system is risk significant, that component or function should be described in the DD. Any features such as flow limiters, backflow

protection, surge tanks, severe accident features, etc. should be described in the DD as follows:

Flow limiting features for high-energy line breaks (HELBs) outside of containment - The minimum pipe diameter should be confirmed because these features are needed to directly limit/mitigate Design Basis Events such as pipe breaks. Lines less than 1 inch (e.g., instrument lines) need not included because their small size limits the effects of HELBs outside containment.

Keep Fill systems - These should be included in the design description when needed for the direct safety function to be achieved without the damaging effects of water hammer.

On-line Test Features - Some systems/components have special provisions for on-line test capability which is critical to demonstrate its capability to perform the direct safety function. An example is an ECCS test loop. These on-line test features should be described in the DD.

Filters - Filters that are required for a safety function (such as Control room HVAC radiation filtering) should be in the design description. The basic configuration ITAAC will check that the filter exists, but need not test the filter performance.

Surge Tank - The capacity of the surge tank should be verified if the tank is needed to perform the direct safety function. For example, in the case of the RCW surge tank a certain volume is required to meet the specific system leakage assumptions.

Severe Accident Features - These features should be described in the design description, and the basic configuration ITAAC should verify that they exist. In general, the capabilities of the features need not be included in the ITAAC. Detailed analyses should be retained in Tier 2.

Hazard (e.g., flood, fire) Protection Features - Special features (switches, valves, dampers) used to provide protection from hazards should be included in the appropriate system design description. Other features such as walls, doors, curbs, etc., should also be covered, but in most cases these will be in an ITAAC for buildings or structures.

Special Cases for Seismic - There may be some nonsafety equipment that requires special treatment because of its importance to safety. An example is the seismic analysis of the BWR main steam piping that provides a fission product leakage path to the main condenser and allows the elimination of the traditional main steam isolation valve control system.

4. Seismic and ASME code classifications

The safety classification of structures, systems, and components are described in each system's design description. The functional drawings identify the boundaries of the ASME Code classification that are applicable to the safety class. The generic Piping Design ITAAC includes a verification of the design report to ensure that the appropriate

code design requirements for the system's safety class have been implemented. Therefore, design pressures and temperatures for fluid systems do not need to be specified in the DD except in special cases such as ISLOCA where the system has to meet additional requirements.

5. System operation

The DD should provide a description of the important performance modes of operation of the system. This should include realignment of the system following an actuation signal (e.g., a safety injection signal for a PWR or a LOCA signal for a BWR).

6. Alarms, Displays and Controls

The DD for the systems should describe the important system alarms, displays (do not use the term "indications"), and controls available in the control room. Important instrumentation that is required for direct operation or accident mitigation should be shown on the system figure, or described in the DD if there is no figure. Those that are provided for routine system performance monitoring or operator convenience need not be shown or discussed.

The Generic Technical Guidelines (e.g., ERGs, EPGs) in DCD Tier 2 Chapter 18 should have identified the minimum set of controls, displays, and alarms necessary for the main control room (MCR) and remote shutdown panel (RSP), and these should be included in Tier 1. The functioning of the alarms, displays, and controls in the MCR and RSP must be verified in either the system ITAACs or in the MCR/RSP ITAACs. The intent is to test the integrated as-built system; however, separate testing of the actual operation of the system and the alarms/displays/controls circuits using simulated signals may be acceptable where this is not practical. See also the standard ITAAC for control room features and the remote shutdown panel in Appendix C to this SRP section.

7. Logic

If a system/component has a direct safety function it typically receives automatic signals to perform some action. This includes start, isolation, etc. The DD captures these aspects related to the direct safety function of the system.

8. Interlocks

Interlocks needed for direct safety functions will be included in the system DD. Examples include the interlocks to prevent ISLOCA and an interlock that switches the system or component from one mode to a safety function mode. Other interlocks that are more equipment protective in nature, are only included in the DCD Tier 2.

9. Class 1E electrical power sources/divisions

The DD or figure should identify the electrical power source/division for the equipment included in the system. Independent Class 1E power sources are required for

components performing direct safety functions and are needed to meet single failure criterion, GDC 17, etc. Electrical separation will also be addressed in the electrical and I&C systems ITAAC.

10. Equipment to be qualified for harsh environments

Electrical equipment that is used to perform a necessary safety function must be demonstrated to be capable of maintaining functional operability under all service conditions, including LOCA, postulated to occur during its installed life for the time it is required to operate. Documentation relating to equipment qualification issues will be completed for all equipment items important to safety in accordance with the requirements of 10 CFR 50.49. The basic configuration standard ITAAC described in Appendix D to this SRP section verifies this aspect of the design. The scope of environmental qualification to be verified by the ITAAC includes the Class 1E electrical equipment identified in the Design Description (or on the accompanying figures), and connected instrumentation and controls, connected electrical components (such as cabling, wiring, and terminations), and the lubricants necessary to support performance of the safety functions of the Class 1E electrical components. The qualification of I&C equipment for "other than harsh" environments should be addressed in the I&C ITAAC.

11. Interface requirements

The interface requirements will be identified in the Design Descriptions for out of scope or partially out of scope systems and cross-referenced in a separate section of the certified information. An example for a BWR is the Reactor Service Water System. The methodology for developing ITAAC for the interface requirements will be described in the DCD Tier 2 or certified information. Non-safety systems which cannot impact safety systems do not need Interface Requirements. Specific in-scope design details which preclude a non-safety system from impacting a safety system must be addressed in Tier 1. This is discussed further in Appendix A to this SRP section.

12. Accessibility for ISI Testing and Inspection

The accessibility does not have to be addressed in Tier 1, but must be addressed in Tier 2. The NRC does not intend to grant reliefs to the ISI requirements after design certification.

13. Numeric performance values

Numeric performance values for SSC should be specified as ITAAC acceptance criteria to demonstrate satisfaction of a Design Commitment (DC). The numeric performance values do not have to be specified as DC and in the DD unless there is a specific reason to include them there. Key numbers and physical parameters used in the Chapter 6, 14.3, and 15 safety analyses and significant parameters of the PRA should be included in the DD.

14. Normally, all design commitments in the DD Tier 1 must be verified by a specific ITAAC, unless there are specific reasons why this is not necessary. A single ITAAC may verify several design commitments. For example, the basic configuration ITAAC verifies the physical arrangement of the system using the design description and figures, in addition to verifications of other specific issues.

B. FIGURES

1. In general, figures and/or diagrams are required for all systems. However, a separate figure may not be needed for simple systems, structures, and components (e.g., the condenser). The format for the figures and/or diagrams will be simplified piping diagrams for mechanical systems. Symbols used on the figures should be consistent with the legend provided by the applicant.

2. All components discussed in the design description should be shown on the figure.

3. System boundaries with other systems should be clearly delineated in the figures. With few exceptions, system boundaries should occur at a component.

4. ASME code class boundaries for mechanical equipment and piping are shown on the figure and form the basis for the basic configuration check (system) that is required in each individual system ITAAC. The configuration check includes an inspection of the welding quality for all ASME Code Class 1, 2, and 3 piping systems described in the design description. A hydrotest is also required in each system ITAAC for ASME Code Class 1, 2, and 3 piping systems to verify the pressure integrity of the overall piping system, including the process of fabricating the system, and welding and bolting requirements.

5. As a minimum, the instruments (pressure, temperature, etc.) required to perform Generic Technical Guidelines (e.g., ERGs, EPGs)(as described in the DCD Tier 2 Chapter 18) are shown on the figures, or described in the DD.

6. The minimum inventory of alarms, indications, and controls, if established in the main control room or remote shutdown panel ITAAC, do not have to be discussed in individual DD's or shown on figures. Other "essential" alarms (e.g., associated with shutdown cooling system (SCS) high pressure (ISLOCA), SCS performance monitoring indications) not part of the minimum inventory should be shown on the figures.

7. Identification of all alarms, displays and controls on the remote shutdown panel will be included in the system diagram or alternatively in the remote shutdown panel ITAAC.

8. Class 1E power sources (i.e., division identification) for electrical equipment can be shown on the figure in lieu of including them in the Design Description.

9. Figures for safety-related systems should include most of the valves on the DCD Tier 2 P&ID except for items, such as fill, drain, test tees, and maintenance isolation valves. The scope of valves to be included on the figures are those MOVs, POVs, and check

valves with a safety related active function, a complete list of which is contained in the IST plan. Valves remotely operable from the Control Room must be shown if their mispositioning could affect system safety function. Other valves are evaluated for exclusion on a case-by-case basis. Figures for non-safety-related systems may have less detail.

10. Fail-safe positions of the pneumatic valves need not be shown on figures or discussed in the DD unless the fail-safe position is relied on to accomplish a direct safety function of the system.

11. Containment isolation valves (CIVs) should be shown on the figures of the applicable system ITAAC, or discussed in the DD if there is no figure. The demonstration of CIV performance to a Containment Isolation Signal, electrical power assignment to the CIVs and failure response to the CIVs, as applicable, may be included in the system ITAAC or in a separate containment isolation system ITAAC that encompasses all CIVs. Leak rate testing of the CIVs should be addressed in Tier 1, and may be addressed in the containment ITAAC.

12. Heat loads requiring cooling, e.g., pump motors, heat exchangers, need not show the source of cooling unless the source of cooling has a specific or unique characteristic that would require Tier 1 treatment, e.g., RCP seal water cooling.

C. STYLE GUIDELINES FOR DESIGN DESCRIPTIONS AND FIGURES

1. New terminology should be avoided, standard terminology should be used (i.e., use terms in common use in the CFR or Reg Guides vice redefining them).

2. Pressures should include units to indicate if the parameter is absolute, gage, or differential.

3. "LOCA signal" should be used vice specific input signals such as "High drywell" or "Low water level" because control systems generally processes the specific input signals and generate a LOCA signal that actuates the component.

4. In general, the term "ASSOCIATED" should be avoided because this term has particular meaning regarding electrical circuits and its use may lead to confusion.

5. Numbers should be expressed in metric units with English units in parentheses.

6. The design description should be consistent in the use of present or future tense.

7. "Division" should be used instead of train, loop, or subsystem (unless it is a subsystem).

8. "Tier 1" and "Tier 2" should not be used in the design description or ITAAC.

9. Systems should be described as "safety-related" and "nonsafety-related," not "essential" and "nonessential."

10. The correct system name should be used consistently.

II. INSPECTIONS, TESTS, ANALYSES AND ACCEPTANCE CRITERIA (ITAAC)

Normally, all design commitments in Tier 1 must be verified by a specific ITAAC entry, unless there are specific reasons why this is not necessary.

A. STANDARD ITAAC ENTRIES

See Appendix D to this SRP section.

B. SYSTEM SPECIFIC ITAAC ENTRIES

1. OPERATIONAL/FUNCTIONAL ASPECTS OF THE SYSTEM

The design description captures the system components that are involved in accomplishing the direct safety function. Typically, the system ITAAC specify functional tests, or tests and analyses, to verify the direct safety functions for the various system operating modes.

2. CRITICAL ASSUMPTIONS FROM TRANSIENT AND ACCIDENT ANALYSES

The critical assumptions from transient and accident analyses will be verified by ITAAC. Cross-references should be provided in DCD Tier 2 Section 14.3 showing how the key physical parameters from these Tier 2 analyses are captured in Tier 1. These cross-references are also called "Roadmaps". All critical parameters given in the DCD Tier 2 (mainly in chapters 6 and 15) should be identified in the roadmaps. Reviewers should ensure that the critical input parameters are included, as appropriate, in the applicable system ITAAC. The roadmaps and the specific analyses are discussed further in Appendix A to this SRP section.

3. PRA AND SEVERE ACCIDENT INSIGHTS

If the results of the PRA indicate that a particular component or function of a system is risk significant, that component or function will be verified by ITAAC. PRA insights will be identified in the DCD Tier 2 and in the staff's SER. The reviewer should verify in the individual system ITAAC that the PRA insights are included in the corresponding system ITAAC as indicated in the DCD Tier 2. Roadmaps for PRA, including shutdown safety analyses, as well as severe accidents, should be included in the appropriate sections of the DCD Tier 2, with specific references to the system ITAAC where the key parameters from these analyses are verified. This is discussed further in Appendix A to this SRP section.

4. ON-LINE TEST FEATURES

Some systems have special provisions for on-line test capability which is critical to demonstrate its capability to perform the direct safety function. An example is an ECCS test loop. These on-line test features will be verified by ITAAC.

5. SURGE TANKS

The capacity of a surge tank will be verified if the tank is needed to perform the direct safety function. For example, for BWRs, a certain RCW surge tank volume is required to meet the specific system leakage assumptions.

6. SPECIAL CASES FOR SEISMIC QUALIFICATION

There may be some non-safety equipment that requires special treatment because of its importance to safety. An example is the seismic analysis of the ABWR main steam piping that provides a fission product leakage path to the main condenser and allows the elimination of the traditional main steam isolation valve leakage control system.

7. INITIATION LOGIC

If a system/component has a direct safety function it typically receives automatic signals to perform some action. This includes start, isolation, etc. The system ITAAC capture these aspects related to the direct safety function. The entire logic and combinations are not tested in the system ITAAC because the overall logic is checked in the I&C ITAAC for the safety system logic.

8. INTERLOCKS

Interlocks needed for direct safety functions will be included in the system design description and ITAAC. Examples include the interlocks to prevent ISLOCA and an interlock that switches the system or component from one mode to a safety function mode. Other interlocks that are more equipment protective in nature, are only in the DCD Tier 2. All of the interlocks are not tested in the system ITAAC because the overall logic is checked in the I&C ITAACs for the safety system logic.

9. AUTOMATIC OVERRIDE SIGNALS

Automatic signals that override equipment protective features during a DBE (e.g., thermal overloads for MOVs), need not be included in the ITAAC if there are other acceptable methods for assuring system function during a design basis event.

10. SINGLE FAILURE

The design description will not state that the system meets single failure criteria (SFC). There will not be an ITAAC to verify that the system meets single failure, rather, the

system attributes such as independence and physical separation which relate to the SFC will be in ITAAC.

11. FLOW CONTROL VALVES

In general, the flow control capability of control valves does not have to be tested in ITAAC. However, flow control valves should be shown on the figure if they are required to fail-safe or receive a safety actuation signal. The fail-safe position should be noted on the figure, or discussed in the DD if there is no figure.

12. PRESSURE TESTING OF VENTILATION SYSTEMS

Where ductwork constitutes an extension of the control room boundary for habitability, the ductwork should be pressure tested.

C. STYLE GUIDELINES FOR ITAAC

1. The first column (design commitment (DC)) should be as close in wording to the design description as possible.

2. The middle column of the ITAAC always should contain at least one of the three "Inspection" or "Test" or "Analysis". Sometimes, it will be a combination of the three.

3. Standard pre-ops tests defined in the DCD Tier 2 and Reg Guide 1.68 are not a substitute for ITAAC, however, the results of pre-op tests can be used to satisfy an ITAAC. DCD Tier 2 and Reg Guide 1.68 tests should be examined and tests elevated to ITAAC as necessary.

4. If an ITAAC test is not normally done as part of a pre-operational test, the test methodology should be in Tier 1 or added to the DCD Tier 2 Section 14.2. Any supporting design or analysis issues should be put in the appropriate sections of Tier 2. Reference to the ITAAC may be included in Tier 2. Reference should not be made from Tier 1 to Tier 2 because this effectively makes Tier 2 part of Tier 1.

5. Use of the Terms "Test" and "Type Test" in the ITA should be consistent with the Tier 1 Definitions. Alternatively, testing may be classified as "Vendor", "Manufacturer", or "Shop" to make clear what type of test is intended.

6. If an analysis is required in the ITAAC, then the analysis or at least the outline of the analysis should be prepared and that will be put in the ITAAC or the appropriate section of the DCD Tier 2. The DCD Tier 2 may reference the ITAAC.

7. ITAAC column 2 should identify the component, division, or system that the inspection, test, and/or analysis verifies.

8. Refer only to inspections, not "visual" inspections.

9. Numerical values, where appropriate, should be specified in the third column, acceptance criteria.

10. The ITAAC should be consistent in the use of present or future tense.

11. "Division" should be used instead of train, loop, or subsystem (unless it is a subsystem).

12. "Tier 1" and "Tier 2" should not be used in the ITAAC.

13. Avoid clarifying phrases in the ITAAC.

14. The correct system name should be used consistently.

III. REVIEWER CHECK LISTS

The following check lists are provided to assists the reviewer in the review of the fluid systems Design Descriptions, Figures, and ITAAC. As discussed before, the level of detail in any particular Design description, Figure, or ITAAC should be proportional to the safety significance of the SSC being reviewed. Therefore, all items shown on the check lists will not be applicable to all systems being reviewed.

DESIGN DESCRIPTION CHECK LIST

SYSTEM: _____

1.	System purpose/functions (minimum is safety functions, may include some non-safety functions)	____
2.	Location of system (containment, reactor building, etc.)	_____
3.	Key design features of the system (such as ADS part of SRVs, flow limiters, backflow protection, surge tanks, severe accident features, etc.)	_____
4.	Seismic and ASME code classifications	_____
5.	System operation	_____
6.	Controls/displays	_____
7.	Logic	_____
8.	Interlocks	_____
9.	Class 1E electrical power sources/divisions	_____
10.	Equipment to be qualified for harsh environments	_____
11.	Interface requirements	

(See Appendix C.I for guidance.)

FIGURES CHECK LIST

SYSTEM: _____

1.	All components discussed in the design description.	____
2.	Boundaries with interfacing systems should be clearly delineated in the figures/diagrams.	____
3.	ASME code class boundaries for mechanical equipment and piping.	____
4.	As a minimum, instruments required to perform Generic Technical Guidelines (e.g., ERGs, EPGs)(as described in the DCD Tier 2 Chapter 18).	____
5.	Essential alarms that are not included in the minimum inventory of alarms.	____
6.	Class 1E power sources (i.e., division identification) for electrical equipment.	____
7.	Identification of all alarms, displays, and controls on the remote shutdown panel unless these are covered by the remote shutdown panel ITAAC.	____
8.	Pneumatic- and motor-operated valves and check valves that perform "active" safety functions, including all POVs/MOVs that are within the scope of GL 89-10.	____
9.	Fail-safe position of pneumatic valves that are relied upon to accomplish the direct safety function of the system.	____

(See Appendix C.I for guidance.)

ITAAC CHECK LIST

SYSTEM: _____

1.	Basic configuration	____
2.	Hydrostatic test for ASME Section III components	____
3.	Net positive suction head	____
4.	Divisional power supplies	____
5.	Physical separation	____
6.	Control room configuration	____
7.	Remote shutdown system	____
8.	Motor operated valves	____
9.	Pneumatically operated valves	____
10.	Check valves	____
11.	Operational and functional aspects of the system	____
12.	Critical assumptions from transient and accident analyses	____
13.	PRA insights (RAP input)	____
14.	On-line testing features	____
15.	Surge tanks	____
16.	Special cases for seismic qualification (e.g., ABWR main steam line piping)	____
17.	Initiation logic	____
18.	Interlocks	____
19.	Flow control valves	____
20.	Pressure testing of ventilation systems	____
21.	Chapter 14 Testing reviewed (See Appendix C.II for guidance.)	____

ELECTRICAL SYSTEMS REVIEW CHECKLIST

This section is intended to provide additional guidance for evaluating Tier 1 system design descriptions (DDs), figures, and ITAAC in the electrical area (for purposes of review responsibility the electrical area also includes the Lighting Systems). The following information should be included in Tier 1 information in a consistent order.

A. DESIGN DESCRIPTIONS AND FIGURES

Electrical equipment that is involved in performing the direct safety function should be addressed in the Design Description (see IEEE-308-1980 paragraph 5.2 for a discussion of direct safety function). This would basically include (in Tier 1) the complete Class 1E electric system - including power sources (which include offsite sources even though they are not Class 1E) and distribution equipment. With regard to the electrical equipment that is part of the Class 1E system but is included to improve the reliability of the individual Class 1E divisions (for example equipment protective trips), additional factors need to be considered. For example, if a failure or false actuation of a feature such as a protective device could prevent the safety function, and operating experience has shown problems related to this feature; then treatment in Tier 1 should probably be included. In addition, some fire protection analyses are based on the ability of breakers to clear fire caused faults. With respect to the non-Class 1E portions of the electrical system (powering the BOP loads), a brief certified design description may be included. The DD for this portion should focus on the aspects, if any, needed to support the Class 1E portion. Therefore, based on the above, the following equipment should be treated in the DD:

1. Overall Class 1E electric distribution system - this would include any high level treatment for cables, buses, breakers, disconnect switches, switchgear, motor control centers, motor starters, relays, protective devices, distribution transformers, and connections/terminations

2. Power sources including:

   - Offsite, including feeds from the main generator (a generator breaker to allow backfeed should be addressed), main power transformers, UATs, RATS, etc.

   - DC system - battery/battery chargers

   - Emergency diesel generator, including load sequencing (EDG support systems need to be covered also - Plant Systems Branch has lead responsibility)

   - Class 1E vital AC inverters, regulating transformers, transfer devices

   - Alternate AC (AAC) power sources for Station Blackout (SBO)

3. Other Electrical Features including:

   - Containment electrical penetrations

- Lighting - emergency control room, remote shutdown panel NOTE:It may be difficult to rationalize its inclusion based on "accomplishing a direct safety function." The basis has to be more defense-in-depth and operating experience and possibly PRA.

4. Lightning protection - general configuration type check.

5. Grounding - configuration type check.

   For both lightning protection and grounding, it is expected that this will be part of a inspection to check that the features exist. No analyses to demonstrate adequacy need be in ITAAC.

6. Lighting

7. GDC 17 and 18 specified requirements. For example, GDC 17 requires that physically independent circuits be provided from the offsite to the Class 1E distribution system. Also, GDC 17 requires provisions be included to minimize the likelihood of losing all electric power as a result of a coincident loss of more than one power supply. Here is a case where some design description and ITAAC or interface requirements are needed for a "non-Class 1E" area, because of its "importance to safety."

8. Other specific rules and regulations that are applicable to electric systems. For example, the Station Blackout Rule (10 CFR 50.63) is met by an Alternate AC source or a coping analysis, and the appropriate features should be in Tier 1. These are non-Class 1E aspects, but are "important to safety."

9. Regulatory Guides (RGs) which have specific recommendations (all the RG guidance may not need Tier 1 treatment). Here may be an area that Tier 1 treatment captures the design aspect addressed by the RG but the acceptance criteria allows alternate approaches which are then discussed in DCD Tier 2.

10. Operating experience problems of safety significance that have been identified - particularly through EDSFIs, Generic Letters, NRC Bulletins and in some cases Information Notices. For example, degraded voltages have been highlighted. In addition, breaker coordination and short circuit protection have been also highlighted.

11. Policy issues raised for the standard designs. For the electrical area this includes the AAC source for SBO, second offsite source to non-Class 1E buses, and direct offsite feed to Class 1E buses.

12. New features in the design. For example, on the ABWR this includes the main generator breaker for back feed purposes; and the potential for harmonics introduced by new RIPs, MFW pump speed controllers and its potential effects on the Class 1E equipment.

13. PRA identified insights or key assumptions. In the electrical area this typically involves SBO which should already receive treatment in ITAAC because of the SBO rule (see

above). As another example, in the case of CE it appears that their "split bus" arrangement is a significant or key assumption in their PRA and therefore in some cases it is important that within a Division a particular pump motor is on a particular bus. CE raised this to its ITAAC based on the PRA. NOTE: In some cases it may be possible to use PRA results to decide that some aspect does not need Tier 1 treatment, i.e. the PRA shows it is of little safety significance.

14. A severe accident feature has been added to the design. If there are such features it may turn out that an electrical support aspect may need an ITAAC.

15. Resolution of Generic Safety Issues (GSIs) have identified solutions that have resulted in design/operational features. For example, the resolution of GI-48/49 (as part of GI-128) identified treatment of "tie breakers." The figure showing the Class 1E distribution system should show this feature if it exists. Then any special features to deal with this feature should be covered.

16. Post TMI requirements - e.g., power to PORV block valve, Pressurizer heaters, etc.

B. ITAAC ENTRIES (for the above equipment)

The standard ITAAC entries for electrical systems in Appendix D to this SRP section should be used to the extent possible. Normally, all design commitments in Tier 1 must be verified by a specific ITAAC entry, unless there are specific reasons why this is not necessary.

1. BASIC CONFIGURATION ITAAC (See also Appendix D)

General functional arrangement - this is captured in the basic configuration standard ITAAC, but the level of detail is determined by the design description and what is shown on any figure(s).

Qualification of components - qualification of SSCs for seismic and harsh environment is covered by the basic configuration ITAAC. Tier 1 will only deal with electrical equipment in harsh environments. Electrical equipment in a "mild" environment will be treated in Tier 2 only. An exception is made for I&C state-of-the-art digital equipment in "other than harsh" environment, which I&C ITAAC will cover. Since there is some of this type equipment which may be utilized in the electrical distribution systems, the I&C ITAAC should cover this potential. The basis for this exception is that recent I&C equipment in "mild" environments has some operating experience that shows sensitivity particularly to temperature, and new digital equipment may have even more sensitivity.

2. INDEPENDENCE - include separation, inter-ties (if any), identification (e.g., color coding), location, non-Class 1E loads on 1E buses. This may be covered by the divisional power supply and physical separation standard ITAAC in Appendix D to this SRP section.

3. CAPACITY AND CAPABILITY - sizing of sources and distribution equipment,

   Loading - analyses to demonstrate the capacities of the equipment because this is important to accomplishing the safety function. Tier 2 should discuss the analyses. Testing should be included to demonstrate the EDG capacity and capability. These can be based on the Technical Specifications.

   (NOTE: Margin - in some cases regulatory guidance specifies the need for margin in capacity to allow for future load growth. If it is only for future load growth, ITAAC does not need to check for the additional margin.)

   Voltage - analyses to demonstrate voltage drop(because this is important to accomplishing the direct safety function). Tier 2 would include the discussion of how the voltage analyses will be performed, i.e., reference to industry standards or company practice as appropriate. Testing should show the EDG voltage and frequency response. This is the same as Technical Specifications.

4. EQUIPMENT PROTECTIVE FEATURES - inclusion should be based on the potential for preventing safety functions and the operating experience.

   - Equipment short circuit capability and breaker coordination should be included by specifying ITAAC for analyses. The description of the analyses should be in Tier 2.

   - Similarly, diesel generator protective trips (and bypasses if applicable) should be considered. A bypass example might be LOCA signals which bypass EDG trips, however specifying that in the DD and ITAAC would probably lock a design into this approach and there is the alternative approach of providing coincidence for the trips. The information in Tier 1 should be written to allow for options which can then be described in Tier 2.

   - If the fire analyses rely on fire caused faults to be cleared, this may need to be treated in the DD and ITAAC. It may be covered by the breaker coordination (see above).

5. SENSING INSTRUMENTATION AND LOGIC - e.g., detection of undervoltage and start and loading the EDG. This is a direct safety function in response to design basis event of loss of power. Problems with relay settings should be considered in this requirement.

6. CONTROLS, DISPLAYS, AND ALARMS - check DCD Tier 2/FSER Chapter 18 on the minimum inventory for EOPs, ERGs, etc.

7. TEST FEATURES - limited to cases were special on-line test features have been specifically included (maybe for a special new design feature)

8. CONNECTION OF NON-1E LOADS ON 1E BUSES - because of the potential degradation of the Class 1E sources this is part of the independence review.

9. LOCATION OF EQUIPMENT - important for some equipment in relation to its environment.

BUILDING STRUCTURES REVIEW CHECKLIST

The following information should be included in the building design descriptions (DD) in a consistent order.

I. BUILDING STRUCTURES

1. An ITAAC item for each building should verify the structural capability of the building to withstand design basis loads. A structural analysis should be performed to reconcile the as-built data with the structural design basis. The acceptance criteria should be the existence of a structural analysis report which concludes that the as-built building is able to withstand the structural design basis loads.

   The DCD Tier 2 should describe the details of the scope and contents of the structural analysis report and the need for reconciliation of construction deviations and design changes with the building dynamic response and its structural adequacy.

2. Do not use the ASME Code N-stamp as an acceptance criterion. Rather, verify the existence of ASME Code-required design documents (e.g., design specifications or design reports) that are prepared by the COL licensee.

3. The turbine building DD may not need structural drawings (the DCD Tier 2 does not contain turbine building drawings) because it is non-safety related. For the boiling water reactors (ABWR and SBWR) that use the main steam line and condenser as an alternate leakage path for fission products, the DCD Tier 2 should include a description of the need for the turbine building to withstand a UBC Zone 3 level earthquake, and the turbine building should not use a dual-system or a concentric system design.

4. The building DD should specify the embedment depth (from the top of the foundation to the finished grade), and an ITAAC should verify it.

5. Design descriptions for building structures should provide enough dimensions for the COL applicant or licensee to develop dynamic models for the seismic analyses. Examples of these dimensions include overall building dimensions, thickness of walls and floor slabs, thickness of foundation mat, etc.

6. Code boundary primary containment should be defined.

II. PROTECTION AGAINST HAZARDS

1. Internal flooding - features such as divisional walls, fire doors, watertight doors, and penetrations will be included in the DDs and ITAAC.

2. External flooding - features such as thickness of walls and protection features for penetrations below the flood level will be included in the DD and ITAAC. The waterproof coating of the exterior walls will not be included because the wall thickness is

being relied upon to prevent in-leakage. Also, site parameters should be specified in the DCD.

3. Fire barriers - the fire rating of divisional walls, floors, doors, and penetrations will be included in the DD and ITAAC. Fire detection and suppression will be addressed in the fire protection ITAAC.

4. External events (tornados, wind, rain and snow) - these loads will be addressed in the structural analysis described in I.1.

5. Internal events (fires, floods, pipe breaks, and missiles) - these loads will be addressed in the structural analysis described in I.1.

6. For a discussion of site parameters, see SRP Section 14.3.1.

STANDARD ITAAC ENTRIES

Design Description	Inspections, Tests, Analyses	Acceptance Criteria	ITAAC #
	CONFIGURATION ITAAC		
1. The basic configuration of the _____ System is as shown on Figure ___. (If a figure is not used, reference the Section number.)	1. Inspections of the as-built system will be conducted.	1. The as-built _____ System conforms with the basic configuration shown in Figure __ .	1
	HYDROSTATIC TEST		
2. The ASME Code components of the ___ System retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A hydrostatic test will be conducted on those code components of the _____ System required to be hydrostatically tested by the ASME code.(Note 1) (Note 1: Modify to call out pressure test for pneumatic/gas and oil systems, if that is what is proposed; or, pressure test can be used for all entries since the code will determine the testing fluid.)	2. The results of the hydrostatic test of the ASME Code components of the ____ System conform with the requirements in the ASME Code, Section III.(Note 1)	2

Design Description	Inspections, Tests, Analyses	Acceptance Criteria	ITAAC #
	NET POSITIVE SUCTION HEAD		
3. The _____ pumps have sufficient NPSH. * These items in the list at right require system-unique modification.	3. Inspections, tests, and analyses will be performed based upon the as-built system. The analysis will consider the effects of: - pressure losses for pump inlet piping and components, *- suction from the suppression pool with water level at the minimum value, *- 50% blockage of pump suction strainers, *- design basis fluid temperature(100°C), *- containment at atmospheric pressure *- vendor test results of required NPSH.	3. The available NPSH exceeds the NPSH required.	3
	DIVISIONAL POWER SUPPLY		
4. Each of the ___ System divisions (or Class 1E loads) is powered from their respective Class 1E Division as shown on Figures ___.	4. Tests will be performed on the ____ System by providing a test signal in only one Class 1E Division at a time.	4. The test signal exists only in the Class 1E Division (or at the equipment powered from the Class 1E division) under test in the ___ System.	4
	PHYSICAL SEPARATION		
5. Each mechanical division of the ____ System (Divisions A, B, C)* is physically separated from the other divisions. *As appropriate for each system.	5. Inspections of the as-built ___ System will be performed.	5. Each mechanical division of the ____ System is physically separated from other mechanical divisions of the ____ system by structural and/or fire barriers (with the exception of _____).	5

Design Description	Inspections, Tests, Analyses	Acceptance Criteria	ITAAC #
	CONTROL ROOM CONFIGURATION		
6. Control Room alarms, displays, and/or controls* provided for the _____ System are defined in Section ____.	6. Inspections will be performed on the Control Room alarms, displays, and/or controls* for the _____ System. *Delete any category for which no entries are included in the Design Description.	6. Alarms, displays, and/or controls* exist or can be retrieved in the Control Room as defined in Section ____.	6
	REMOTE SHUTDOWN SYSTEM		
7. Remote Shutdown System (RSS) displays and/or controls provided for the ____ System are defined in Section ____.	7. Inspections will be performed on the RSS displays and/or controls for the ____ System.	7. Displays and/or controls exist on the RSS as defined in Section ____.	7
	MOTOR OPERATED VALVES		
8. Motor-operated valves (MOVs) designated in Section ___ as having an active safety-related function open, close, or both open and also close under differential pressure, fluid flow, and temperature conditions.	8. Tests of installed valves will be performed for opening, closing, or both opening and also closing under system preoperational differential pressure, fluid flow, and temperature conditions.	8. Upon receipt of the actuating signal, each MOV opens, closes, or both opens and also closes, depending upon the valve's safety function.	8

Design Description	Inspections, Tests, Analyses	Acceptance Criteria	ITAAC #
	PNEUMATICALLY OPERATED VALVES		
9. The pneumatically operated ____ valve(s) shown in Figure _____ closes (opens) if either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.	9. Tests will be conducted on the as-built _____ valve(s).	9. The pneumatically operated _____ valve(s) shown in Figure _____ closes (opens) when either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.	9
	CHECK VALVES		
10. Check valves designated in Section __ as having an active safety-related function open, close, or both open and also close under system pressure, fluid flow, and temperature conditions.	10. Tests of installed valves for opening, closing, or both opening and also closing, will be conducted under system preoperational pressure, fluid flow, and temperature conditions.	10. Based on the direction of the differential pressure across the valve, each CV opens, closes, or both opens and also closes, depending upon the valve's safety functions.	10
	INDEPENDENCE FOR ELECTRICAL AND I&C SYSTEMS		
11. In the ____ System, independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment.	11.1. Tests will be performed on the ____ System by providing a test signal in only one Class 1E Division at a time. 11.2. Inspection of the as-installed Class 1E Divisions in the ____ System will be performed.	11.1. The test signal exists only in the Class 1E Division under test in the ____ System. 11.2. In the ____ System, physical separation or electrical isolation exists between these Class 1E Divisions. Physical separation or electrical isolation exists between Class 1E Divisions and non-Class 1E equipment.	11

1. BASIC CONFIGURATION ITAAC

This ITAAC is contained in the buildings and most of the systems described in Tier 1. The verification consists of an inspection of the system functional arrangement in its final as-built condition, and also includes, and is limited to, verification of welding, environmental qualification, seismic qualification and motor operated valves (MOVs). The basis for selecting these aspects included their importance to safety as well as past experience with construction and operating problems.

a. FUNCTIONAL ARRANGEMENT

The verification consists of an inspection of the system functional arrangement of the SSCs in its final as-built condition at the plant site and includes the elements of the design descriptions and the system figures. This functional arrangement inspection verifies, using as-built system drawings, design documentation, and in-situ plant walkdowns, that the as-built facility is in conformance with the certified design and applicable regulations.

Unless specified explicitly, the figures are not indicative of the scale, location, dimensions, shape, or spatial relationships of as-built SSC. In particular, the as-built attributes of SSCs may vary from the attributes depicted on the figures, provided that those safety functions discussed in the Design Description pertaining to the figure are not adversely affected.

Some features and components of the systems are addressed by the basic configuration ITAAC as discussed below:

Keep-Fill Systems - These will be included in the design description when needed for the direct safety function to be achieved without damaging water hammer and verified by the configuration ITAAC. However, a separate functional test need not be performed because the keep-fill system will be implicitly tested as part of the other system functional tests.

Filters - Filters that are required for a safety function (such as Control Room HVAC radiation filtering) should be in the design description. The configuration ITAAC will check that the filter is exists, but need not test the filter performance because changes in technology and performance requirements could occur that would modify the specific performance criteria necessary for the filter. Additionally, filter performance is verified by Technical Specification surveillances.

Severe Accident Features - These features should be described in the design description and the configuration ITAAC will verify that they exist. The capabilities of the features need not be included in the ITAAC because the performance of these features in their design environment cannot be verified by in-situ testing.

b. WELDING

This includes verifications of the quality of pressure boundary welds for ASME Code Class 1, 2, and 3 components and systems described in the design descriptions and figures, using appropriate non-destructive examination (NDE) methods. Detailed supporting information for verification of welding requirements in accordance with ASME Code requirements is contained in SSAR Chapter 3.

c. ENVIRONMENTAL QUALIFICATION

This includes verifications of the environmental qualification of Class 1E electrical equipment described in the design descriptions and figures. Detailed supporting information for environmental qualification requirements is contained in SSAR Chapter 3.

Electrical equipment that is used to perform a necessary safety function must be demonstrated to be capable of maintaining functional operability under all service conditions, including LOCA, postulated to occur during its installed life for the time it is required to operate. Documentation relating to equipment qualification issues will be completed for all equipment items important to safety in accordance with the requirements of 10 CFR 50.49. This documentation will be in the form of the equipment qualification list and the device specific qualification files, and will include the specified environmental conditions, qualification methods (e.g., tests, or tests and analyses), and documentation of qualification results. The installed condition of electrical equipment important to safety will be compatible with conditions for which it was qualified. The scope of environmental qualification to be verified by the ITAAC includes the Class 1E electrical equipment identified in the Design Description (or on the accompanying figures), and connected instrumentation and controls, connected electrical components (such as cabling, wiring, and terminations), and the lubricants necessary to support performance of the safety functions of the Class 1E electrical components. The ITAAC will verify that the Class 1E electrical equipment identified in the Design Description (or on accompanying figures) is qualified for its application and meets its specified performance requirements when it is subjected to the conditions predicted to be present when it must perform its safety function up to the end of its qualified life. The qualification of I&C equipment for "other than harsh" environments will be addressed in the I&C ITAAC.

d. EQUIPMENT SEISMIC AND DYNAMIC QUALIFICATION

This includes verifications of the dynamic qualification (e.g., seismic, LOCA, and safety relief valve discharge loads) of seismic Category I mechanical and electrical equipment (including connected instrumentation and controls) described in the design descriptions and figures. This inspection verifies the ability of mechanical and electrical equipment in its as-built condition, including anchorages, to perform their safety functions during and following a safe shutdown earthquake. Detailed supporting information for dynamic qualification requirements, including seismic qualification records, is contained in SSAR Chapter 3.

e. MOTOR-OPERATED VALVES

This includes verifications of the design qualification of motor-operated valves (MOVs) described in the design descriptions and figures. The MOVs should include all MOVs with a safety related active function, a complete list of which is contained in the IST plan. The ITAAC requires that the results of qualification tests of the active safety-related MOVs identified in the figures or design descriptions demonstrate that the MOVs are qualified to perform their safety functions under certified design differential pressure, system pressure, fluid temperature, ambient temperature, minimum voltage, and minimum and/or maximum stroke-time in either the open or close direction, or both, depending on the valve's safety functions. The MOV qualification program relies on testing of each size, type, and model. The testing and acceptance criteria for qualification are described in Tier 2.

Numerous problems with MOVs in operating plants have been identified over the past several years through operational experience, licensee programs in response to NRC Generic Letter 89-10, and NRC staff inspections. Therefore, in addition to the configuration ITAAC, tests of the installed MOVs are required in each system ITAAC that have MOVs.

2. HYDROSTATIC TEST ITAAC

General Design Criterion 14 of 10 CFR Part 50, Appendix A requires that the reactor coolant pressure boundary be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage. In addition, General Design Criterion 30 requires that components which are part of the reactor coolant pressure boundary be designed, fabricated, erected, and tested to the highest quality standards practical. The pressure boundary integrity will be ensured, in part, through a test verifying the leak-tightness of the ASME Code piping systems. Therefore, a hydrostatic test is specified as a part of the ITAAC for the appropriate individual piping systems. The scope of the hydrostatic test for the ITAAC is for ASME Code Class 1, 2, and 3 piping systems.

3. NET POSITIVE SUCTION HEAD (NPSH) ITAAC

The system ITAAC will verify that pumps with direct safety functions (typically ECCS, RHR and SLCS pumps) have the required NPSH to accomplish their safety function by a combination of test and analysis. The analysis method for determining NPSH will typically be provided in the DCD Tier 2.

4. DIVISIONAL POWER SUPPLY ITAAC

Electrical independence (separation) will be verified in the system ITAAC. Independent Class 1E power sources are required for components performing direct safety functions and are needed to meet single failure criterion, GDC 17, etc. Electrical separation will also be addressed in the electrical and I&C systems ITAAC.

5. PHYSICAL SEPARATION ITAAC

Physical separation (for hazards) will be verified in the ITAAC. The hazards postulated are Design Basis Events and, therefore, the design features that protect the equipment need to be verified by the ITAAC to demonstrate independence (and single failure). System features (switches, valves, dampers) used to provide protection from hazards will be included in the appropriate system design description and ITAAC. Structural features such as walls, doors, curbs, etc., will also be covered, but in most cases these will be in a building ITAAC.

6. CONTROL ROOM CONFIGURATION ITAAC

Alarms, displays (the term "indications" should not be used in ITAAC), and controls - The design description will describe the system alarms, displays, and controls available in the control room. Important instrumentation will be shown on the system figure, as determined by its function or PRA. Where possible, integrated tests of the as-built systems from the control room are preferred. However, the operation of the system may be tested separately from the alarms, controls, and displays. Therefore, system ITAAC need only verify that these features "exist," and their performance will be addressed in the MCR, HFE and I&C ITAAC.

The Generic Technical Guidelines (e.g., EPGs, ERGs) in Chapter 18 of the DCD Tier 2 identify the minimum set of alarms, displays, and controls necessary to perform safety functions. This minimum set should be included in Tier 1, either in the systems or in the main control room (MCR) ITAAC. These alarms should be verified by the MCR, HFE and I&C ITAAC.

7. REMOTE SHUTDOWN PANEL ITAAC

Controls, displays, and alarms available on the remote shutdown panel can be identified and verified as part of the Remote Shutdown Panel (RSP) ITAAC, or identified in the system ITAAC and verified as part of the remote shutdown panel ITAAC. The EPGs and Chapter 18 of Tier 2 identify the minimum set of controls and displays necessary to perform safety functions. They will be used as guidance for establishing the needs for RSP displays and controls to be included in Tier 1.

If the controls, displays, and alarms are identified in the system ITAAC, the design description should describe the system displays and controls available on the RSP. Important instrumentation should be shown on the system figure. The system ITAAC need only verify that these features exists since their performance will be addressed in the HFE and I&C ITAAC. If not shown on the system ITAAC, the designation and performance of the controls, displays, and alarms should be addressed in the RSP ITAAC.

8. MOTOR OPERATED VALVES ITAAC

In addition to the MOV qualification testing (Generic Letter 89-10) required in the Basic Configuration ITAAC, MOVs with active safety functions are tested in the system ITAAC to check the capability of the as-installed MOV to operate under differential pressure. In some cases closing/opening times are specified. This addresses problems that have occurred due to

installation errors. The DCD Tier 2 should contain a complete list of safety-related MOVs which have an active function.

These tests are required to be performed under pre-operational differential pressure, fluid flow, and temperature conditions to assure that the valves open and/or close within time limits as specified. The DCD Tier 2 in Section 3.9.6 further defines that these tests will be conducted under maximum achievable pre-operational conditions and describes the analyses that will be performed to show how the test results demonstrate that the valve will function under design conditions.

9. PNEUMATICALLY OPERATED VALVES ITAAC

In cases where the fail-safe position of pneumatic valves is relied on to accomplish the direct safety function of the system, this ITAAC will verify the fail-safe operation.

10. CHECK VALVES ITAAC

Numerous installation problems with check valves in operating plants have been identified through operating experience and NRC staff's inspections. Therefore, in addition to the acceptance criteria for design and qualifications described in the SSAR, tests of installed (active) safety-related check valves are required in each system ITAAC. These tests will be conducted under system preoperational pressure, fluid flow, and temperature conditions to assure that the valves open and/or close as expected based on the direction of the differential pressure across the valves.

11. INDEPENDENCE FOR ELECTRICAL AND I&C SYSTEMS ITAAC

This ITAAC verifies that independence is provided between Class 1E divisions (if applicable), and between Class 1E and non-Class 1E equipment, using tests of the installed equipment.

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SRP Draft Section 14.31
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.	**Integrated Impact 1533**	The scope and content of this proposed SRP section is derived from the requirements of 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," as well as the guidance in staff SECY papers related to design certification and combined license reviews, and the staff positions established in the Final Safety Evaluation Reports (FSERs) for the evolutionary reactor designs.SRP Section 14.3, and the associated appendices, provides the general guidance for review of design information and related inspections, tests, analyses, and acceptance criteria (ITAAC) provided in applications submitted in accordance with the requirements of 10 CFR 52. Additional guidance for review of information and ITAAC applicable to the design of specific plant structures, systems, and components (SSC), as well as certain plant programs, is contained in several subsections to SRP Section 14.3. These subsections and the responsible review branch are identified in the REVIEW RESPONSIBILITIES subsection of SRP Section 14.3.

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Integrated Impact No.	Issue	SRP Subsections Affected
1533	Develop Acceptance Criteria and Review Procedures for review of Certified Design Material (CDM) and proposed inspections, tests, analyses and acceptance criteria (ITAAC).	All