

NUCLEAR ENERGY INSTITUTE

May 31, 1994

Mr. Dennis Crutchfield  
Associate Director for  
Advanced Reactors and License Renewal  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Dear Mr. Crutchfield:

By letters dated March 24, 1994, the NRC staff provided two of the applicants for design certification (General Electric (GE) and ABB-Combustion Engineering (CE)) with review guidance for Certified Design Material (CDM), including inspections, tests, analyses, and acceptance criteria (ITAAC). These letters requested comments on the draft guidance. We would like to express our appreciation for the opportunity to provide comments on the draft guidance. We believe that such guidance will in the future help design certification applicants prepare their CDM, help facilitate the NRC staff's review of the CDM, and help minimize potential disputes regarding the appropriate contents of the CDM. The staff initiative in preparing this guidance is commendable.

In addition, the NRC staff has also received GE's memorandum documenting CDM form, scope and content understandings established during interactions on the ABWR.

On behalf of the industry (including all three design certification applicants: GE, ABB-CE, and Westinghouse), the enclosed comments are provided for NRC staff consideration.<sup>1</sup>

In general, the draft guidance is consistent with the approach taken during preparation of the CDMs for the evolutionary plants. As a result, almost all of our comments are in the nature of clarifications, rather than disagreements with the staff's approach. Our comments are summarized in Enclosure 1. Marked-up pages containing suggested clarifications to the staff's draft guidance on the ABWR and System 80+ are provided in Enclosures 2 and 3, respectively.

<sup>1</sup>Note that Appendix D, on instrumentation and control systems, and Appendix H, on CDM examples, were not included in the March 24 material provided for industry review.

4601/1

Mr. Dennis Crutchfield

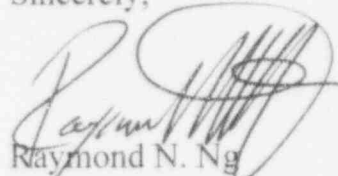
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We trust this information is helpful to NRC staff finalization of this useful guidance document. We would welcome the opportunity to review a subsequent draft of the document, including any general introductory material and appendices.

Please contact me should you have any questions or if we can be of further assistance to your efforts.

Sincerely,



Raymond N. Ng  
Manager, Technical Division

RNN/RJB/ljw

Enclosures

COMMENTS ON THE DRAFT CDM GUIDANCE

The attached mark-up provides, for NRC staff consideration, specific wording changes consistent with the comments in this enclosure.

## Comment

No.Comment

- 1 As a general comment, we recommend that the CDM review guidance include an up-front explanation describing its purpose. In particular, the guidance should state that it does not pre-empt, and is not intended to pre-empt, the rule itself, SECYs and SRMs issued by staff and Commission, the FDA, the FSER, or the multitude of technical agreements achieved and documented between staff and design certification applicants. The purpose of the guidance is to retrospectively document the process that was generally applicable to formulation of Tier 1 for a particular design, but not to impose independent requirements on a design certification applicant. The guidance should state that there may be other acceptable alternatives to suggestions recommended in the guidance, and that issuance of an FDA constitutes the NRC's determination that the applicant has satisfied the guidance, even where deviations occur. Finally, the guidance should note that, where deviations occur between it and other regulatory documents, those other documents should be presumed to govern.
- 2 At several places (e.g., pp. 1, 2, 7, B-1, B-3, B-18), the draft guidance refers to significant or key features or functions. These statements should be clarified to refer to significant or key safety features or functions, since there are many features or functions that may have significance for economic or other reasons unrelated to safety.
- 3 The discussion of the change process on pages 2 and 4 of the draft guidance does not precisely track the language of 10 CFR § 52.63 and the Commission's Staff Requirements Memoranda. These statements should be modified accordingly.
- 4 At several places (pp. 2, 3), the draft guidance refers to the change process for the standard safety analysis report (SSAR). These statements should refer to the change process for Tier 2, since it will be the DCD, not the SSAR, that will be the focus of possible future changes.

- 5 At several places (pp. 2-3, B-13), the draft guidance refers to treatment of Tier 2\* issues (i.e., pre-designated unreviewed safety questions). We note that the manner in which Tier 2\* is implemented and the specific Tier 2 information to be so designated have not been precisely determined at this time. For instance, it has not been determined that Tier 2\* areas will be labeled "unreviewed safety questions." The implementation of Tier 2\* is being focused on as part of preparation of evolutionary plant DCDs. The noted sections of the draft CDM guidance may warrant revision depending on the results of these activities.
- 6 At several places (pp. 3-4), the draft guidance states that the purpose of ITAAC is to verify that the as-built facility conforms with the approved design and applicable regulations. These statements should be modified to conform with the language in 10 CFR 52.47(a); i.e., the purpose of design certification ITAAC is to verify that the as-built facility conforms with the certified design.
- 7 The last paragraph of page 5 of the draft guidance addresses the design acceptance criteria (DAC) for the control room and instrumentation and controls (I&C). Additionally, this paragraph states that failure to satisfy the DAC acceptance criteria for one phase will require a repeat of that phase. This statement should be modified to indicate that a repeat may be required (there may be corrective actions that would obviate the need for a complete repeat of that phase of the DAC).
- 8 The description of Tier 2 on page 6 should be modified to be consistent with the description of Tier 2 on page 1 of the draft guidance.
- 9 The first paragraph on page 6 of the draft guidance states that all information necessary for the staff's safety finding must be in the SSAR, not just on the docket. This statement goes beyond what is required under Part 52 and should be deleted. For example, 10 CFR 52.47 states that the design certification application shall include a probabilistic risk assessment (PRA); it does not require that the PRA be part of the SSAR.
- 10 The first paragraph of page 7 of the draft guidance states that non-safety-related features are typically only described in the Design Descriptions with no corresponding ITAAC. However, to the extent that non-safety-related features perform safety-significant functions, GE and ABB-CE have provided ITAAC for such features.

- 11 The discussion of alarms on pages B-3 and C-5 should be modified to be consistent with the discussion of alarms at other places of the draft guidance (e.g., page B-12).
- 12 Page B-3 of the draft guidance states that Tier 1 should identify the electrical power source for equipment. This statement should be modified to indicate that such identification is only needed for Class 1E sources, not for non-safety-related sources.
- 13 At several places (pp. B-4, B-7, C-4), the draft guidance lists information in the Design Descriptions that need not have a separate ITAAC. This list should include safety and seismic classifications.
- 14 The last paragraph of page B-5 of the draft guidance states that the Tier 1 figures should include the valves shown on the SSAR P&ID, with certain exceptions. This statement may inadvertently result in the inclusion of valves in Tier 1 that have no safety-significant function. This paragraph should be modified to indicate that the Tier 1 figures should include the valves with a significant safety function, and that certain types of valves generally do not fall into that category.
- 15 At several places (pp. B-6, B-15, B-19), the draft guidance states that certain fail-safe positions should be shown on Tier 1 figures. As a general rule, Tier 1 figures for the Advanced Boiling Water Reactors (ABWR) do not show any valve positions. The statements in the draft guidance should be modified to indicate that the appropriate fail-safe positions will be discussed in either the text or figures.
- 16 At several places (pp. B-8, F-3), the draft guidance states that the basic configuration ITAAC applicable to welding "includes" ASME pressure boundary welds. This welding ITAAC pertains only to ASME pressure boundary welds, and the draft guidance should be modified accordingly.
- 17 Page B-11 of the draft guidance states that the motor operated valve (MOV) ITAAC includes the MOVs shown on the figures. This statement should be modified, because there may be some MOVs shown on the figures that do not perform an active safety function and therefore are not within the scope of the MOV ITAAC.

- 18 At several places (pp. B-11, F-3), the draft guidance states or implies that all piping systems will have an ASME hydrostatic ITAAC test. These statements should be modified to indicate that only ASME piping systems will have an ASME hydrostatic ITAAC test.
- 19 Page B-14 of the draft guidance states that the proper operation of valves and pumps in general will be verified by ITAAC for system functional tests. The systems functional tests will verify the proper operation of the system as a whole, not necessarily every valve and pump in the system. The draft guidance should be modified accordingly.
- 20 Page B-14 of the draft guidance states that roadmaps contain a cross-reference between transient and accident analyses parameters and ITAAC. Per NRC agreement, the roadmaps in the SSAR need not contain such a reference, and the draft guidance should be modified accordingly.
- 21 Page C-3 states that the Greybeard comments should be considered for Tier 1 treatment, but notes that the staff does not agree with all of their comments. This statement does not provide useful guidance and should be deleted. To the extent that the Greybeard comments were accepted and are significant, the draft guidance already reflects their comments.
- 22 Page F-3 of the draft guidance states that the ASME hydrostatic ITAAC test will verify welding and bolting. This statement should be modified to use the language of the ITAAC; i.e., the purpose of this test is to verify pressure integrity.
- 23 Page F-4 of the draft guidance states that the welding ITAAC may involve a records review. This statement should be deleted because the welding ITAAC requires an inspection, including NDE, for welds.
- 24 There are several matters that are not appropriate topics for inclusion in the certified design, including programmatic provisions for maintenance and operations, design and construction processes (except as provided in the basic configuration ITAAC and DAC), and portable equipment and consumables. The draft guidance should be expanded to explain that these matters need not be addressed in Tier 1. The following language is suggested for inclusion as Item 15 on p. B-4 or perhaps in the front section of the guidance:

Several matters are not appropriate topics for inclusion in the certified design. These matters include the following:

Programmatic provisions - The Design Descriptions should focus on the physical characteristics of the facility. The Design Descriptions should not contain programmatic requirements related to operating conditions or to operations, maintenance, or other programs because these matters are controlled by other means such as the Technical Specifications.

Design and construction processes - The Design Descriptions for systems should discuss the configuration and performance characteristics that the systems and components should have after construction is completed. In general, the Design Descriptions should not discuss the processes that will be used for designing and constructing a plant because the safety-function of a system or component is dependent upon its final as-built condition and not the processes used to achieve that condition. Exceptions to this general guidance include welding, seismic qualification, and environmental qualification (which are the subject of the basic configuration ITAAC), and the generic ITAAC for piping.

Portable equipment and consumables - In general, the Design Descriptions should address fixed design features expected to be in place for the lifetime of the facility, and not portable equipment and replaceable items that are controlled through operational related programs.

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The standard ITAAC entries at Appendix G differ in some aspects from the standard ITAAC entries agreed to between ABB-CE and staff for System 80+ and actually used by ABB-CE in the Tier 1 production process. Note that GE's standard entries and ABB-CE's standard entries also differ somewhat. We suggest that staff attach to each guidance the standard entries actually used for each design.

- 26 Consideration should be given to providing a general description of Design Acceptance Criteria (DAC) and the potential differences between Tier 1 for a DAC and Tier 1 for other systems. The additional elaboration may fit prior to the last paragraph on p. 2 of the guidance.
- 27 In at least two places (p. 5, Column 2 discussion, 5th sentence) and p. B-16 (Item 4), the guidance indicates that where methods of ITAAC demonstration are described in the SSAR, reference should be provided in the SSAR to the associated ITAAC. By agreement between the NRC staff and industry, references to CDM, including ITAAC, are not required in the SSAR. Thus, the draft guidance should be modified accordingly.



# CERTIFIED DESIGN MATERIAL/ITAAC REVIEW GUIDANCE

## REVIEW RESPONSIBILITIES

Primary - All Branches.

### I. AREAS OF REVIEW

The rule that certifies a standard reactor design will reference a Design Control Document (DCD). The DCD will set forth the design-related information that a referencing applicant must conform with. The DCD includes the Tier 1 information that is certified by the rule and the Tier 2 information that is approved by the rule. The Tier 1 information will consist of the design descriptions, ITAAC, site parameters, and interface requirements. The Tier 2 information consists of the SSAR with deletion of proprietary information, conceptual designs, etc. The guidance on form and content of a DCD is under preparation by PDST. The change process for Tier 1 and 2 is set forth in the certification rule. *design-specific*

An application for Design Certification must provide inspections, tests, analyses, and acceptance criteria (ITAAC). If an applicant for a combined license (COL) references a certified standard design, then the ITAAC from the certified design must apply to those portions of the facility which are covered by the design certification. Therefore, when reviewing design certification ITAAC, it is important to remember that they will be used at the COL stage. The explicit requirement for ITAAC, from 10 CFR 52.97(b) and as revised by the Energy Policy Act of 1992, is set forth below:

The Commission shall identify within the combined license the inspections, tests, and analyses, including those applicable to emergency planning, that the license shall perform, and the acceptance criteria that, if met, are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

The level of detail in any particular ITAAC should be proportional to the <sup>safety</sup> safety significance of the systems, structures, and components (SSC) covered by that ITAAC. The Design Descriptions for an SSC should contain the significant functions and bases for that SSC. Further guidance on selection of the design information that should be extracted from the application for design certification and included in the Design Description and ITAAC is described below. } Comment # 1

The information and review guidance herein is consistent with the staff's proposals to the Commission in SECY 92-287, "FORM AND CONTENT FOR A DESIGN CERTIFICATION RULE." This guidance is subject to change as a result of the

Commission's review. If necessary, this guidance will be revised and reissued following the Commission's decision on SECY 92-287.

1. Design Description <sup>at a minimum</sup>

<sup>mandated</sup>  
(by the NRC

Comment #2  
\*

The Design Description (DD) (sometimes called Tier 1 Design Description) consists of narrative and simplified schematic drawings which will be incorporated into the Design Certification Rule for a particular standard design. The DD will be incorporated into the NRC's Part 52 Regulations and will be effective for the life of the Certified Design approval and will be effective for the life of a facility which is licensed pursuant to a Certified Design. Changes to the DD following the design certification rulemaking require a finding by the NRC that the change is needed to assure adequate protection. The change requires either an order or another rulemaking to effect the change. The net effect is to provide a very high threshold for change by either the NRC or others once the rule is issued.

or to comply with applicable regulations in effect at the time of certification.

Comment #1

The staff should ensure that significant features of the certified design application contained in the SSAR upon which the staff is relying to reach its safety conclusion are captured 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 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 specific 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 sufficient detail in the SSAR for the staff to reach its safety decision. The detail in the SSAR would thus be similar to an NRC Regulatory Guide in that the SSAR would describe an acceptable, but not the only acceptable method, of meeting the DD functional requirements and/or broad commitments. However, in order to make changes to the SSAR a licensee must use a 10 CFR 50.59-like process to determine if the change impacts the DD or ITAAC or creates an unreviewed safety question. The use of Design Acceptance Criteria is another example where the preferred approach is to have functional requirements and/or broad commitments in the DD and detailed information in the SSAR to specify an acceptable method for meeting the DD.

Tier 2

Comment #3

Tier 2

Comment #3

The staff must also be cognizant of the fact that a licensee under Part 52 may make changes to SSAR material under a 10 CFR 50.59-like process provided the change does not impact the DD or ITAAC or create an unreviewed safety question. Thus a licensee may make changes to material in the SSAR upon which the staff relied in approving an acceptable method for meeting the DD. The staff proposed in SECY 92-287 that certain SSAR

material not be allowed to be changed without prior NRC approval of the change. This SSAR material would be identified in the staff's SER and would require either an amendment to the Combined Operating License (COL) or would require the change to be identified in the COL application and reviewed and approved by NRC as a part of the COL proceeding. The following statement should be used in the staff's SER to identify material in the SSAR which the staff concludes may not be changed without prior NRC approval:

Comment #4

"any change to [this commitment] would involve an unreviewed safety question and, therefore, requires NRC review and approval prior to implementation. Any requested change to [this commitment] shall either be specifically described in the COL application or submitted for license amendment after COL issuance."

The commitment identified in the above statement needs to be specific to the information in the SSAR upon which the staff has relied in the SER. For example, the specific SSAR sections or text for which this conclusion applies must be identified.

Defining in advance that material in the SSAR which if changed would constitute an unreviewed safety question should be used rarely. In discussions with the Commission, NUMARC and GE on the ABWR review, the staff has indicated that it believes that SSAR material which would likely receive this special treatment would be limited to: Design Acceptance Criteria and fuel and control rod design details which are in Topical Reports referenced in the SSAR. All cases where the staff includes the above quoted statement in its SER are to be reviewed and approved by the cognizant ADT Division Director. The staff's basis for each case must be specified in the SER and must provide the rationale for its decision that a change would constitute an unreviewed safety question.

Comment #3

The staff has proposed in SECY 92-287 that all changes to <sup>Tier 2</sup> SSAR material by a COL licensee be reported to the NRC and that the licensee's evaluation include the basis for its determination that the change does not involve an unreviewed safety question. NRC can take enforcement action if it determines that a licensee change involved an unreviewed safety question or was inconsistent with the DD or ITAAC. Whether or not the NRC identifies [commitments] which if changed would in NRC's view constitute an unreviewed safety question, the COL applicant or licensee is responsible to identify and review all changes and determine that each change before implementation does not constitute an unreviewed safety question.

## 2. INSPECTIONS, TESTS, ANALYSES AND ACCEPTANCE CRITERIA (ITAAC)

Comment #5

The purpose of <sup>certified</sup> ITAAC is to verify that the as-built facility conforms with the ~~approved design and applicable regulations~~ <sup>design certification</sup>. If the licensee demonstrates that ITAAC are met, then the licensee will be permitted to load fuel. Therefore, ITAAC must be necessary and sufficient to provide the NRC with reasonable assurance that the facility should be authorized to load fuel. The Design Descriptions should be based upon this requirement for ITAAC. As a result, the ITAAC must verify the significant design

Comment #5

features, from the Design Descriptions, and the applicable requirements that are necessary and sufficient to authorize fuel loading and subsequent operation.

Comment #2

The ITAAC that are developed at the design certification stage will become part of the certified design information. In order to provide stability to the licensing process, certified design information will be controlled by a new change process. This process will only allow changes to the ITAAC for the certified design that are approved through a rulemaking process and meet the adequate protection standard. As a result, the staff needs to be careful about the information included in the certified Design Descriptions and ITAAC. The information that is included must be accurate because it will be difficult to change and information that will need to be changed must not be included, such as details of the nuclear fuel design. A lower change standard will apply to information that is approved by the NRC but not certified.

only

NRC generic

or are necessary for compliance with applicable regulations effective at the time of certification.

The scope of ITAAC at the design certification stage is limited to, and must be consistent with, the 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. Things like power ascension testing that are also described in the application will be covered by license conditions on the COL.

Comment #5

*Tier 1 Design Descriptions*  
Since an applicant for design certification does not have to provide as-built, as-procured information or information on design features whose technology is currently evolving, ITAAC will also need to verify that the applicable requirements are met when information becomes available. Therefore, ITAAC at the design certification stage will either verify approved design features or applicable requirements. For example, if the design certification application contains sufficient information for the staff to determine that the Residual Heat Removal (RHR) system meets the applicable requirements, then the ITAAC only needs to verify the key features of the RHR design. However, if specific equipment (i.e. pumps and valves) has not been procured, then the staff cannot determine if the environmental qualification (EQ) requirements have been met at the certification stage. In that case, the ITAAC must be written to verify that the EQ requirements are met when the equipment is procured and installed. In addition, some ITAAC will contain design acceptance criteria for design efforts that will be performed post-COL, such as the stress analysis for piping.

Finally, the level of detail in any particular ITAAC should be proportional to the safety significance of the SSC covered by that ITAAC. The certified Design Descriptions for an SSC should contain the significant functions and bases for that SSC. Further guidance on selecting the design information that should be extracted from the application for design certification and included in the certified Design Description and ITAAC is described below.

safety

The staff and industry have reached agreement on a three column format for ITAAC. The following guidance should be followed in reviewing proposed ITAAC:

### Column 1 - Design Commitment

The specific text for the design commitment described in Column 1 is to be extracted from the DD discussed above. Any differences in text should be minimized and be intentional. Design commitments which are to be verified prior to fuel load are to be identified under Column 1. Design commitments which cannot be verified until after fuel load are to be included in the Initial Test Program (ITP) description (SSAR Chapter 14). The ITAAC and the ITP description must include sufficient inspection, testing, and/or analysis commitments to verify that the facility will operate in accordance with the certified design.

### Column 2 - Inspections, Tests and Analyses

The specific method to be used by the COL licensee to demonstrate that the design commitment in Column 1 has been met, is to be described in Column 2. The method is either an inspection, test, or analysis or some combination of inspection, test and analysis. If the method of demonstration includes an analysis, the details of the analysis method must be described in either Column 2 or in the SSAR. The preferred location for analysis methods is in the SSAR. The SSAR should include a reference to the particular ITAAC analysis which is being described in detail. Standard pre-operational tests defined in the SSAR and R.G. 1.6B are not a substitute for ITAAC, however, the results of pre-operational tests can be used to satisfy an ITAAC.

No.  
See  
Comment  
27

### Column 3 - Acceptance Criteria

The specific acceptance criteria for the methods described in Column 2 which, if met, demonstrate that the design commitment in Column 1 has been met, is to be described in Column 3. When a choice between putting detail in Column 1 and Column 3 exists, the preference should be to put the detail in Column 3. This ensures that the acceptance criteria is detailed and thereby removes ambiguity regarding acceptable implementation of the commitment. 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.

*for which design details are not available*  
In the case of ITAAC for the Control Room Design and for Digital Instrumentation and Control Design, the ITAAC for each phase of the design development process should be separately identified with entries in Column 1, 2 and 3. Failure to satisfy the Column 3 acceptance criteria for a particular phase will require repeating that phase of the design development process until the Column 3 criteria is met for that ITAAC and all subsequent phased ITAAC.

Comment  
#6

may

### 3. STANDARD SAFETY ANALYSIS REPORT

*design related*

*with deletion of proprietary information, conceptual designs, etc.*

10 CFR 52 does not discuss Tier 1 or Tier 2 material. These terms have been developed during implementation of the rule for the lead reviews. Tier 1 material is the DD and ITAAC discussed above plus site parameters and interface requirements as defined in 10 CFR 52.47(a)(1)(ii) and (vii). Tier 2 is that material in the SSAR ~~which is not in Tier 1~~. The SSAR is to include all Tier 1 and Tier 2 material; i.e., it must include all information reviewed by the staff which is relied upon in reaching the staff's safety determination. 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 submitted ~~as an amendment to the SSAR. It is not sufficient for such information to be on the docket, it must be in the SSAR.~~

*Comment #7*

*Comment #8*

## II. REVIEW PROCEDURES

In the review of the Design Description and ITAAC, definitions of certain terms are crucial and, therefore, a list of DEFINITIONS is included as Appendix A.

### 1. SAFETY RELATED STRUCTURES, SYSTEMS, AND COMPONENTS

- a. Review System (or building) description in the SSAR for the high level safety features to be included in the Design Description and ITAAC. Use engineering judgement guided by the principles discussed in the Appendixes.
- b. Review the Design Description (DD) to verify the above high level safety features are treated adequately. Use the Appendixes to check for correct wording and consistency. Also use the examples included in Appendixes G and H.
- c. Review of ITAAC - Use the Appendixes for guidance on ITAAC entries.
  1. Review the ITAAC to verify that the important features in the DD are included in the ITAAC Design Commitment (DC) column. For guidance on acceptable wording use the examples included in Appendixes G and H.
  2. Review the Inspection, Tests, and Analyses (ITA) column to verify that the DC is adequately verified. Use the examples in Appendixes G and H for guidance.
  3. Review the Acceptance Criteria (AC) column to verify that the results of the ITA are adequately specified. Use the examples in Appendixes G and H for guidance.

## 2. NON-SAFETY RELATED SYSTEMS

If the Non-safety related structure, system or component has some <sup>significant</sup> safety related feature, it should be considered for inclusion in the DD and ITAAC. However in general, the non-safety related features are typically ~~only described in the DD with no corresponding ITAAC with the intent to certify the design but not check the nonsafety aspects.~~ See the examples in Appendixes G and H for guidance. (comment #1)

## III. EVALUATION FINDINGS

"The staff finds/concludes that the design commitments in this ITAAC accurately summarize the Design Description for [SSC which is the subject of this section]; that the inspections, tests, and/or analyses identified are acceptable methods for determining whether the design commitments have been met; and that the acceptance criteria are sufficient to establish, if they are met, that the design commitments have been met."

### APPENDIXES

- Appendix A - DEFINITIONS
- Appendix B - FLUID SYSTEMS
- Appendix C - ELECTRICAL SYSTEMS
- Appendix D - INSTRUMENTATION AND CONTROL SYSTEMS
- Appendix E - BUILDINGS
- Appendix F - PIPING
- Appendix G - STANDARD ITAAC ENTRIES
- Appendix H - EXAMPLES (This includes examples of Design Descriptions and ITAAC which include standard DD and ITAAC entries. The ITAAC entries are annotated with a "fourth" column indicating the Rationale used for including the entry.)

CONSIDER  
APPENDICES FOR: HUMAN FACTORS (FROM NRE PROGRAM REVIEW MODEL)  
RADIATION PROTECTION  
PLANT AND/OR REACTOR SYSTEMS

APPENDIX B  
FLUID SYSTEMS

I. DESIGN DESCRIPTION AND FIGURES

The following guidance and rationale of what should be included in the certified design material was developed during the review of fluid system Design Descriptions (DD) and ITAAC, and provides the staff's positions regarding the content of the DD and ITAAC. The information should be included in the design description in a consistent order. As additional experience is gained, this guidance may be updated and revised. Examples of Design Descriptions and Figures are provided in Appendix H.

A. DESIGN DESCRIPTION

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

The design description 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 design description.

3. Key design features of the system

*Comment #1* | *to the extent those components perform a significant safety function.*  
The design description should describe the components that make up the system. Key features such as the use of the some of the ABWR 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, should not be included in the design description because this could limit the COL applicant to a particular make and model of a component. 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 HELBs outside of containment - The minimum pipe diameter will 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) are not included



for fluid systems do not need to be specified in the design description except in special cases such as ISLOCA where the system has to meet additional requirements.

5. System operation

*Comment #1* The DD should provide a description of the various modes of operation of the system. *to the extent those modes perform a significant safety function.* This should include realignment of the system following a LOCA (or other) signal.

6. Controls, Displays and Alarms

The design description will describe the system controls, displays (do not use the term "indications"), and alarms available in the control room. Important instrumentation will be shown on the system figure. The EOPs and Chapter 1B have identified the minimum set of controls, displays, and alarms necessary to perform safety functions. They will be used as guidance for establishing the needs for main control room controls, displ. and alarms to be included in Tier 1. If an alarm

*Comment #10* is identified in the SSAR inventory of alarms based upon the EOPs and PRA, then it need not be specifically called out in the system

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. *ITAAC.*

8. Interlocks

Interlocks needed for direct safety functions will be included in the system design description. 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 SSAR.

9. Class 1E electrical power sources/divisions

*Comment #11* The DD or figure should identify the *Class 1E* 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 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 "mild" environments will be addressed in the I&C ITAAC.

11. Interface requirements

The interface requirements will be identified in the Design Descriptions for applicable systems and cross-referenced in a separate section of the certified information. An example is the Reactor Service Water System. The methodology for developing ITAAC for the interface requirements will be described in the SSAR or certified information. Non-safety systems which cannot impact safety systems do not need Interface Requirements. Specific in-scope design details which preclude the non-safety system from impacting a safety system must be addressed in Tier 1.

12. Accessibility for ISI Testing and Inspection

The accessibility does not have to be addressed in Tier 1. However, NRC will not 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.

14. Normally, all design commitments in Tier 1 must be verified by a specific ITAAC, unless there are specific reasons why this is not necessary. Some acceptable reasons include: (a) the information is only included for context, (b) fulfillment of other ITAAC are sufficient to show verification of the design commitment; (c) a single ITAAC can verify more than one design commitment; (d) the information

*Comment #12*

B. FIGURES

*pertains to safety or seismic classification.*

*INSERT*

*comment #23*

*editorial change*

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 that, in the process of fabricating the overall piping system, the welding and bolting requirements for ensuring the pressure integrity have been met.
5. As a minimum, instruments required to perform emergency operation procedures (as described in the SSAR, Chapter 18) are shown on the figure.
6. The minimum inventory of alarms as established in the MCR or RSP ITAAC do not have to be shown on DD Figures. Other essential alarms, e.g., associated with SCS high pressure (ISLOCA), SCS performance monitoring indications, not part of the minimum inventory should be shown on the DD figures.
7. 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.
8. Identification of all <sup>displays</sup> ~~indication~~ and control on the remote shutdown panel will be included in the system diagram or alternatively in the remote shutdown panel ITAAC.
9. ~~Figures for safety-related systems should include valves on SSAR 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~~

editorial change  
see p. B-3  
#6

Comment #13

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- In general,*
- (or discussed in the Design Description if there is no figure)*
- on the figure. If*
- unless*
- the position will be discussed in the text of the Design Description*
- Containment Isolation Valves*
- or the figure.*
10. Fail-safe positions of the pneumatic valves will not be shown unless the fail-safe position is relied on to accomplish the direct safety function of the system, the position will be discussed in the text of the Design Description.
11. CIVs are to be shown on the figure of the applicable system ITAAC. 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 will be addressed in the containment ITAAC. This approach should be explained in the General Provisions section or in an alternate section of the Tier 1 document.
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

The following general guidelines should be used during the review of 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).

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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)

The following guidance and rationale of what should be included in the certified design material was developed during the review of fluid system Design Descriptions and ITAAC, and provides the staff's positions regarding ITAAC. Each of the standard ITAAC entries are discussed in the order they are presented in Appendix G. Additional guidance refers to example ITAAC presented in Appendix H. As additional experience is gained, this guidance may be updated and revised.

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. Some acceptable reasons include: (a) the information is only included for context, (b) fulfillment of other ITAAC are sufficient to show verification of the design commitment; (c) a single ITAAC entry can verify more than one design commitment, (d) *the information pertains to safety or seismic classification.*

} Comment  
#12

A. STANDARD ITAAC ENTRIES

1. BASIC CONFIGURATION

This ITAAC entry includes inspection of the functional arrangement of the system components as shown in the figures and includes inspections, tests and analyses of welding, environmental qualification, seismic qualification, and MOVs as described in the definitions and general provisions provided in Appendix A, and as discussed below:

FUNCTIONAL ARRANGEMENT

The system will be inspected to determine that the functional arrangement of the components is as discussed in the Design Description and shown in the figures. 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 SSC 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 only addressed by the 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 will not be performed because the keep-fill system will be tested as part of the overall 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 exists, but will 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 Tech Spec surveillance.

Severe Accident Features - These features will be described in the design description and the configuration ITAAC will verify that they exist. The capabilities of the features will not be included in the ITAAC because these features do not lend themselves to in-situ verification.

#### WELDING

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 integrity of the pressure boundary in the plant will be ensured, in part, through a verification of the welding quality. An inspection is required to be performed to verify the quality of welding for ASME Code Class 1, 2, and 3 pressure-retaining components using appropriate non-destructive examination (NDE) methods. Verification of welding quality is performed as a part of ITAAC for the basic configuration check of each specific system.

*Comment # 15* | The scope of welding to be verified by the ITAAC <sup>is</sup> includes ASME Code Class 1, 2, and 3 pressure-boundary welds. The ASME Code class welds are included in Tier 1 because the ASME Boiler and Pressure Vessel Code, Section III is referenced in 10 CFR 50.55a. Nuclear power plant components classified as Quality Groups A, B, and C are required by 10 CFR 50.55a to meet the requirements for ASME Code Classes 1, 2, and 3, respectively. In each system description, the functional drawing identifies the boundaries of the ASME Code classification. The integrity of the pressure boundary is required to be maintained

earthquake, an inspection is required to be performed to verify that the as-built equipment is qualified to withstand seismic and dynamic loadings. The equipment qualification for seismic and dynamic effects is performed in conjunction with an ITAAC for the basic configuration check of each specific system.

The scope of equipment qualification to be verified by the ITAAC includes those seismic Category I mechanical and electrical equipment (including associated instrumentation and controls) that are depicted on the functional drawings in the design description. Although other seismic Category I equipment might exist within the system and might not be depicted on the functional drawing, they are still required to be seismically qualified but are not required to be included in the ITAAC verification scope. The reason is that the design description and the functional drawings define that portion of the standard design, that is approved by certification and is necessary to perform the system's safety function. Thus, only the seismic Category I equipment that is included in the certified design is required to be verified by the ITAAC. The verification of these other seismic Category I equipment is considered a part of the 10 CFR Part 50, Appendix B quality assurance program.

#### MOTOR-OPERATED VALVES

General Design Criterion (GDC) 1 requires that structures, systems, and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. GDC 1 further requires that a quality assurance program be established and implemented in order to provide adequate assurance that these structures, systems, and components will satisfactorily perform their safety functions. Criterion III, "Design Control," of Appendix B to 10 CFR 50 requires that measures be established to assure that the design bases for those structures, systems, and components are correctly translated into specifications, drawings, procedures, and instructions. Criterion XI, "Test Control," requires that a test program be established to assure that testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed.

The ability of motor-operated valves (MOV) to perform their safety functions will be ensured, in part, through verification of the MOV qualification program. The ITAAC for the basic configuration check requires verification that:

The results of test of 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

*Note:*  
*This is a close paraphrase, not a quote.*

temperature, minimum voltage, and minimum and/or maximum stroke-time.

The MOV qualification program relies on testing of each size, type, and model. The testing and acceptance criteria for qualification are described in the SSAR.

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 installed MOVs are required in each system ITAAC.

*Comment #16*

The scope of MOVs to be verified by these ITAAC entries ~~includes those MOVs that are depicted on the functional drawings in the Design Descriptions. These MOVs will include all MOVs with a safety related active function, a complete list of which is contained in the IST plan.~~ *are the*

### 2. HYDROSTATIC TEST

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.

*Comment #17*

The pressure boundary integrity will be ensured, in part, through a test verifying the leak-tightness of the ASME Code piping systems. A hydrostatic test is specified as a part of the ITAAC for each individual ASME piping system.

*ASME Code Class*

The scope of the hydrostatic test for the ITAAC includes ASME Code Class 1, 2, and 3 piping systems. The ASME Code class piping systems have been selected for Tier 1 treatment because the ASME Boiler and Pressure Vessel Code, Section III is referenced in 10 CFR 50.55a. Nuclear power plant components classified as Quality Groups A, B, and C are required by 10 CFR 50.55a to meet the requirements for ASME Code Classes 1, 2, and 3, respectively. The ASME Code, Section III requires that a hydrostatic test be performed. In each system description, the functional drawing identifies the boundaries of the ASME Code classification. The integrity of the pressure boundary is required to be maintained because it is directly involved in preventing or mitigating an accident or event under the defense-in-depth principle.

### 3. NET POSITIVE SUCTION HEAD (NPSH)

The system ITAAC will verify that pumps with direct safety functions (typically ECCS and SLCS pumps) have the required NPSH to accomplish their



guidance for establishing the needs for remote shutdown panel displays and controls to be included in Tier 1.

If the controls, displays, and alarms are identified in the system ITAAC, the design description will describe the system displays and controls available on the remote shutdown panel. Important instrumentation will be shown on the system figure. The system ITAAC will only verify that these features exist since their performance will be addressed in the HFE and I&C ITAAC.

#### B. MOTOR OPERATED VALVES

In addition to the MOV qualification testing (Generic Letter B9-10) 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 SSAR will 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 SSAR in Section 3.9.6 further defines that these tests will be conducted under maximum achievable pre-operational conditions and describes the analysis of these tests results that will be conducted to demonstrate that the valve will function under design conditions. (Any change to the commitment to conduct these tests under maximum achievable conditions and to analyze these results to assure MOV function under design conditions would involve an unreviewed safety question and, therefore, would require NRC review and approval prior to implementation. Any requested change to these commitments shall either be specifically described in the COL application or submitted for license amendment after COL issuance.

Comment  
# 4

#### 9. PNEUMATICALLY OPERATED VALVES

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

#### 10. CHECK VALVES

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

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expected based on the direction of the differential pressure across the valves.

Note: Since the industry has not experienced significant operational problems with other types of valves, or with pumps in general, the proper operation of these components will be tested as part of the functional tests of the system under the system ITAAC *or pre-operational tests.*

*Comment # 18*

B. ADDITIONAL ITAAC ENTRIES (see Appendix H for examples)

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. "Roadmaps" will be used to identify the critical input parameters assumed in the transient and accident analyses. All critical input parameters given in the SSAR (mainly in chapters 6 and 15) will be identified in the "roadmap" ~~with the respective system ITAAC number.~~ The reviewer will verify in the individual system ITAAC that the critical input parameters are included in the corresponding system ITAAC ~~as indicated in the "roadmap".~~

*Comment # 19*

3. PRA 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 staff's SER. The reviewer will verify in the individual system ITAAC that the PRA insights are included in the corresponding system ITAAC as indicated in the SSAR.

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, in the case of the ABWR

RCW surge tank a certain 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 SSAR. 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 <sup>need</sup> (DBE) <sup>Design Basis Event</sup> (e.g., thermal overloads for MOVs), may not be included in the ITAAC because there are other acceptable methods for assuring system function during a DBE. /editorial

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

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 <sup>or the text of</sup> the Design Description, <sup>Comment # 14</sup> B-15

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## 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 SSAR and Reg Guide 1.6B are not a substitute for ITAAC, however, the results of pre-op tests can be used to satisfy an ITAAC. SSAR and Reg Guide 1.6B 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 the SSAR with reference to the ITAAC. / No. See  
Comment 27
5. Use of the Terms "Test" and "Type Test" in the ITA should be consistent with the Definitions. Testing which would be classified as "Vendor", "Manufacturer", "Shop" could be specified as such to make clear what type of test is intended. An alternate approach would be to define "shop" test.
6. If an analysis is required in the ITAAC, then the analysis or at least the outline of the analysis will be prepared and that will be put in the ITAAC or the SSAR with reference to the ITAAC it supports.
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.

DESIGN DESCRIPTION CHECK LIST

SYSTEM: \_\_\_\_\_

*Comment #/*

- 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 <sup>Safety</sup> 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 for guidance.)

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### FIGURES CHECK LIST

SYSTEM: \_\_\_\_\_

1. All components discussed in the design description. \_\_\_\_\_
2. System boundaries with other 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 emergency operation procedures (as described in the SSAR, 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 *displays* indication and control on the remote shutdown panel unless these are covered by the remote shutdown panel ITAAC. *editorial change - see p. B-3, #6* \_\_\_\_\_
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.~~ \_\_\_\_\_

*Comment # 14*

(See Appendix C for guidance.)

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have been highlighted. In addition, breaker coordination and short circuit protection have been also highlighted.

5. Policy issues raised for the ALWRs. 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.
6. New features in the design. In the electrical area on the ABWR this includes the main generator breaker for back feed purposes; and the potential for harmonics introduced by new RIPs, MFW pump controllers and its potential effects on the Class 1E equipment.
7. PRA identified insights or key assumptions. In the electrical area this typically involves SBO which should already receive treatment in ITAAC because of the 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 has 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.
8. The ACRS/Greybeard Committee issues. For examples see the ACRS letters and Greybeard comments. NOTE: The staff has gone on record as not necessarily agreeing with all their comments.
9. 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.
10. Resolution of a Generic Safety Issue (GSIs) has identified a solution which has resulted in design/operational features. For example, in the electrical area 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.
11. Post TMI requirements - e.g., power to PORV block valve, Pressurizer heaters, etc.

B. ITAAC ENTRIES (for the above equipment)

The following guidance and rationale of what should be included in the certified design material was developed during the review of electric system Design Descriptions and ITAAC, and provides the staff's positions regarding ITAAC. The standard ITAAC entries for electrical systems are discussed in Appendix G. Additional guidance refers to example ITAAC presented in Appendix H. As additional experience is gained, this guidance may be updated and revised.

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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. Some acceptable reasons include: (a) the information is only included for context, (b) fulfillment of other ITAAC are sufficient to show verification of the design commitment; (c) a single ITAAC entry can verify more than one design commitment, (d) the information pertains to safety or seismic classification.

Comment #12

1. BASIC CONFIGURATION (see Appendix G)

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

Qualification - seismic and harsh environment will be covered by the "basic configuration" ITAAC (see definitions in Appendix A). Tier 1 will only deal with electrical equipment in harsh environments. Electrical equipment in a "mild" environment will be treated in the SSAR only. An exception is made for I&C state-of-the-art digital equipment in "mild" environment which the I&C ITAAC will cover, mild environment. Since there is some of this type equipment which may be utilized in the Electrical Distribution Systems, the I&C ITAAC will be expanded to cover this potential. The basis for this exception is that newer I&C equipment in mild environments has some operating experience that shows sensitivity particularly to temperature, and in addition the 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 (see Appendix G).

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. The SSAR should discuss the analyses. Testing should be included to demonstrate the EDG capacity and capability. This is the same as the Tech Spec tests.

(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 Tech Spec tests.



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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 would be in the SSAR.
  - 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 the SSAR.
  - 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.
8. <sup>CONTROLS, DISPLAYS</sup> ~~INDICATIONS, ALARMS~~ - check chapter 18 on the EOPs
9. TEST FEATURES - limited to cases where special on-line test features have been specifically included (maybe for a special new design feature)
10. 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.
11. LOCATION OF EQUIPMENT - important for some equipment in relation to its environment.

## II. PROTECTION AGAINST HAZARDS

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

## III. SITE PARAMETERS

1. The site parameters should include a requirement that liquefaction not occur underneath structures, systems, and components resulting from the site-specific SSE.
2. Although the design for the sites should be based on the 0.3g RG 1.60 spectra, the evaluation of the sites for liquefaction potential should use the site-specific SSE with acceptance criteria ~~demonstrating adequate margin~~ for no liquefaction.

Note:  
Tier 1 Site Parameters  
do not refer to  
"adequate margin" for  
no liquefaction.

DRAFT

### Fabrication

A basic configuration check (system) 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. A hydrotest <sup>ITAAC</sup> is also required ~~in each system ITAAC~~ for ASME Code Class 1, 2, and 3 piping systems to verify that, ~~in the process of fabricating the overall piping system, the welding and bolting requirements for ensuring the pressure integrity have been met.~~

Comment # 17

Comment # 21

A detailed description of the ITAAC for component design qualification and fabrication and the bases for determining which material is Tier 1 or Tier 2 are discussed in the following sections.

#### 1. WELDING

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 integrity of the pressure boundary in the plant will be ensured, in part, through a verification of the welding quality. An inspection is required to be performed to verify the quality of welding for ASME Code Class 1, 2, and 3 pressure-retaining components using appropriate non-destructive examination (NDE) methods. Verification of welding quality is performed as a part of ITAAC for the basic configuration check of each specific system.

The scope of welding to be verified by the ITAAC <sup>is</sup> includes ASME Code Class 1, 2, and 3 pressure-boundary welds. The ASME Code class welds are included in Tier 1 because the ASME Boiler and Pressure Vessel Code, Section III is referenced in 10 CFR 50.55a. Nuclear power plant components classified as Quality Groups A, B, and C are required by 10 CFR 50.55a to meet the requirements for ASME Code Classes 1, 2, and 3, respectively. In each system description, the functional drawing identifies the boundaries of the ASME Code classification. The integrity of the pressure boundary is required to be maintained because it is directly involved in preventing or mitigating an accident or event under the defense-in-depth principle. ASME Code Class 1, 2, and 3 structural welds (e.g., pipe support welds) are not included within the Tier 1 scope because they were deemed to be indirectly involved in preventing or mitigating an accident or event (e.g., Pipe supports provide protection of the piping; but, it is the piping itself that is needed for accident mitigation). Thus, ASME Code Class 1, 2, and 3 structural welds are included in the Tier 2 scope.

Comment # 15

The ITAAC for the basic configuration check requires:

Inspections, including non-destructive examination of the as-built, pressure-boundary welds for ASME Code Class 1, 2, and 3 components identified in the design description to demonstrate that the requirements of the ASME Code, Section III for assuring the quality of pressure-boundary welds are met.

~~The inspection of the ASME Code Class 1, 2, and 3 welding activities may involve a review of NDE records or the actual performance of the appropriate NDE method described in the SSAR.~~

Comment  
# 22

The acceptance criteria for the welds are the ASME Code, Section III weld examination requirements. The specific weld examination requirements for a particular ASME Code Class 1, 2, and 3 component and weld type are considered Tier 2 and are tabulated in the SSAR. The specific weld examination requirements are considered Tier 2 because they could change depending on future revisions to the ASME Code, Section III requirements.

Other welding activities (non-ASME Code) includes:

- (1) pressure-boundary welds other than ASME Code, Section III welds,
- (2) structural and building steel welds,
- (3) electrical cable tray and conduit support welds,
- (4) heating, ventilation, and air-conditioning support welds, and
- (5) refueling cavity and spent fuel pool liner welds.

These other types of welding are included in the Tier 2 scope. The SSAR describes the applicable codes and standards for the other types of welding and the weld acceptance criteria. Similar to the ASME Code Class 1, 2, and 3 structural welds, the function of these other welds is needed for protection of safety-related systems, structures, and components but are not directly involved (or are redundant) in preventing an accident or event. Accordingly, these other types of welding were deemed inappropriate for Tier 1 scope.

## 2. HYDROTEST

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. A hydrostatic test is specified as a part of the ITAAC for each individual piping system.

# CERTIFIED DESIGN MATERIAL/ITAAC REVIEW GUIDANCE

## REVIEW RESPONSIBILITIES

The document should state its purpose, scope and applicability.

Primary - All Branches.

## I. AREAS OF REVIEW

CDM is the "official" terminology

The rule that certifies a standard reactor design will reference a Design Control Document (DCD). The DCD will set forth the design-related information that a referencing applicant must conform with. The DCD includes the ~~Tier 1~~ <sup>Certified Design Material (CDM)</sup> information that is approved by the rule. The ~~Tier 1~~ <sup>[Tier 1]</sup> information will consist of the design descriptions, ITAAC, site parameters, and interface requirements. The Tier 2 information consists of the SSAR with deletion of proprietary information, conceptual designs, etc. The guidance on form and content of a DCD is under preparation by PDST. The change process for Tier 1 and 2 is set forth in the certification rule.

Spell out 1st time

An application for Design Certification must <sup>specify</sup> provide inspections, tests, analyses, and acceptance criteria (ITAAC). If an applicant for a combined license (COL) references a certified standard design, then the ITAAC from the certified design must apply to those portions of the facility which are covered by the design certification. Therefore, when reviewing design used <sup>applied?</sup> at the COL stage. The explicit requirement for ITAAC, from 10 CFR 52.97(b) and as revised by the Energy Policy Act of 1992, is set forth below:

The Commission shall identify within the combined license the inspections, tests, and analyses, including those applicable to emergency planning, that the license shall perform, and the acceptance criteria that, if met, are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

GE Commented on 10 CFR 52 wording.

The level of detail in any particular <sup>safety</sup> ITAAC <sup>CDM section</sup> should be proportional to the safety significance of the systems, structures, and components (SSC) covered by that ITAAC. The Design Descriptions for an SSC should contain the significant functions and bases for that SSC. Further guidance on selection of the design information that should be extracted from the application for design certification and included in the Design Description and ITAAC is described below.

Comment # 1

The information and review guidance herein is consistent with the staff's proposals to the Commission in SECY 92-287, "FORM AND CONTENT FOR A DESIGN CERTIFICATION RULE." This guidance is subject to change as a result of the <sup>and features</sup> <sup>No</sup> <sup>What does that mean with respect to to ABBW 845 80 CDM</sup>

Commission's review. If necessary, this guidance will be revised and reissued following the Commission's decision on SECY 92-287. Then why follow?

1. Design Description <sup>at a minimum</sup> (mandated by the NRC)

*Comment #2*  
The Design Description (DD) (sometimes called Tier 2 Design Description) consists of narrative and simplified schematic drawings which will be incorporated into the Design Certification Rule for a particular standard design. The DD will be incorporated into the NRC's Part 52 Regulations and will be effective for the life of the Certified Design approval and will be effective for the life of a facility which is licensed pursuant to a Certified Design. Changes to the DD following the design certification rulemaking require a finding by the NRC that the change is needed to assure adequate protection. The change requires either an order or another rulemaking to effect the change. The net effect is to provide a very high threshold for change by either the NRC or others once the rule is issued.

*Comment #1*  
The staff should ensure that significant features of the certified design application contained in the SSAR upon which the staff is relying to reach its safety conclusion are captured 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 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 sufficient detail in the SSAR for the staff to reach its safety decision. The detail in the SSAR would thus be similar to an NRC Regulatory Guide in that the SSAR would describe an acceptable, but not the only acceptable method, of meeting the DD functional requirements and/or broad commitments. However, in order to make changes to the SSAR a licensee must use a 10 CFR 50.59-like process to determine if the change impacts the DD or ITAAC or creates an unreviewed safety question. The use of Design Acceptance Criteria is another example where the preferred approach is to have functional requirements and/or broad commitments in the DD and detailed information in the SSAR to specify an acceptable method for meeting the DD.

*Comment #3*  
The staff must also be cognizant of the fact that a licensee under Part 52 may make changes to SSAR material under a 10 CFR 50.59-like process provided the change does not impact the DD or ITAAC or create an unreviewed safety question. Thus a licensee may make changes to material in the SSAR upon which the staff relied in approving an acceptable method for meeting the DD. The staff proposed in SECY 92-287 that certain SSAR

material not be allowed to be changed without prior NRC approval of the change. This SSAR material would be identified in the staff's SER and would require either an amendment to the Combined Operating License (COL) or would require the change to be identified in the COL application and reviewed and approved by NRC as a part of the COL proceeding. The following statement should be used in the staff's SER to identify material in the SSAR which the staff concludes may not be changed without prior NRC approval:

Comment #4

"any change to [this commitment] would involve an unreviewed safety question and, therefore, requires NRC review and approval prior to implementation. Any requested change to [this commitment] shall either be specifically described in the COL application or submitted for license amendment after COL issuance."

What is the status of the SER after issuance? I assume the Tier 2 boundaries will be transferred to the DCD.

The commitment identified in the above statement needs to be specific to the information in the SSAR upon which the staff has relied in the SER. For example, the specific SSAR sections or text for which this conclusion applies must be identified.

Defining in advance that material in the SSAR which if changed would constitute an unreviewed safety question should be used rarely. In discussions with the Commission, NUMARC and GE on the ABWR Review, the staff has indicated that it believes that SSAR material which would likely receive this special treatment would be limited to: Design Acceptance Criteria and fuel and control rod design details which are in Topical Reports referenced in the SSAR. All cases where the staff includes the above quoted statement in its SER are to be reviewed and approved by the cognizant ADT Division Director. The staff's basis for each case must be specified in the SER and must provide the rationale for its decision that a change would constitute an unreviewed safety question.

ABB was involved!

Comment #3

The staff has proposed in SECY 92-287 that all changes to SSAR material by a COL licensee be reported to the NRC and that the licensee's evaluation include the basis for its determination that the change does not involve an unreviewed safety question. NRC can take enforcement action if it determines that a licensee change involved an unreviewed safety question or was inconsistent with the DD or ITAAC. Whether or not the NRC identifies [commitments] which if changed would in NRC's view constitute an unreviewed safety question, the COL applicant or licensee is responsible to identify and review all changes and determine that each change before implementation does not constitute an unreviewed safety question.

Tier 2

## 2. INSPECTIONS, TESTS, ANALYSES AND ACCEPTANCE CRITERIA (ITAAC)

Comment #5

The purpose of <sup>certified</sup> ITAAC is to verify that the as-built facility conforms with the <sup>design certification</sup> approved design and applicable regulations. If the licensee demonstrates that ITAAC are met, then the licensee will be permitted to load fuel. Therefore, ITAAC must be necessary and sufficient to provide the NRC with reasonable assurance that the facility should be authorized to load fuel. The Design Descriptions should be based upon this requirement for ITAAC. As a result, the ITAAC must verify the significant design

Comment

#5

features from the Design Descriptions, and the applicable requirements that are necessary and sufficient to authorize fuel loading and subsequent operation.

Comment II 2

The ITAAC that are developed at the design certification stage will become part of the certified design information. In order to provide stability to the licensing process, certified design information will be controlled by a new change process. This process will <sup>only</sup> allow changes to the ITAAC for the certified design that are approved through a rulemaking process and meet the adequate protection standard. As a result, the staff needs to be careful about the information included in the certified Design Descriptions and ITAAC. The information that is included must be accurate because it will be difficult to change and information that will need to be changed <sup>should</sup> not be included, such as details of the nuclear fuel design. A lower change standard will apply to information that is approved by the NRC but not certified.

NRC generic

ABB test specified design features

or are necessary for compliance with applicable regulations effective at the time of certification

The scope of ITAAC at the design certification stage is limited to, and must be consistent with, the 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. Things like power ascension testing that are also described in the application will be covered by license conditions on the COL. (A)

Tier 1 Design Descriptions

Comment #5

Since an applicant for design certification does not have to provide as-built, as-procured information or information on design features whose technology is currently evolving, ITAAC will also need to verify that the applicable requirements are met when information becomes available. Therefore, ITAAC at the design certification stage will either verify approved design features or applicable requirements. For example, if the design certification application contains sufficient information for the staff to determine that the Residual Heat Removal (RHR) system meets the applicable requirements, then the ITAAC only needs to verify the key features of the RHR design. However, if specific equipment (i.e. pumps and valves) has not been procured, then the staff cannot determine if determine if the environmental qualification (EQ) requirements have been met at the certification stage. In that case, the ITAAC must be written to verify that the EQ requirements are met when the equipment is procured and installed. In addition, some ITAAC will contain design acceptance criteria for design efforts that will be performed post-COL, such as the stress analysis for piping.

design feature (bases are not provided)

Finally, the level of detail in any particular ITAAC should be proportional to the safety significance of the SSC covered by that ITAAC. The certified Design Descriptions for an SSC should contain the significant functions and bases for that SSC. Further guidance on selecting the design information that should be extracted from the application for design certification and included in the certified Design Description and ITAAC is described below.

safety

For a referencing COL holder regulatory

non referencing COL

February 1993

(A) The function and the authority of the ITAAC cease at the time the NRC authorizes fuel loading. At this time, ITAAC are relegated to an archival status



The staff and industry have reached agreement on a three column format for ITAAC. The following guidance should be followed in reviewing proposed ITAAC:

Column 1 - Design Commitment

The specific text for the design commitment described in Column 1 is to be extracted from the DD discussed above. Any differences in text should be minimized and be intentional. Design commitments which are to be verified prior to fuel load are to be identified under Column 1. Design commitments which cannot be verified until after fuel load are to be included in the Initial Test Program (ITP) description (SSAR Chapter 14). The ITAAC and the ITP description must include sufficient inspection, testing, and/or analysis commitments to verify that the facility will operate in accordance with the certified design.

*This is misleading. This implies these are DC that are unresolved until after fuel load.*

Column 2 - Inspections, Tests and Analyses

The specific method to be used by the COL licensee to demonstrate that the design commitment in Column 1 has been met, is to be described in Column 2. The method is either an inspection, test, or analysis or some combination of inspection, test and analysis. If the method of demonstration includes an analysis, the details of the analysis method must be described in either Column 2 or in the SSAR. The preferred location for analysis methods is in the SSAR. The SSAR should include a reference to the particular ITAAC analysis which is being described in detail. Standard pre-operational tests defined in the SSAR and R.G. 1.6B are not a substitute for ITAAC, however, the results of pre-operational tests can be used to satisfy an ITAAC.

*the description of the*

*which description? Chap 14 or COM?*

*No! By agreement*

Column 3 - Acceptance Criteria

The specific acceptance criteria for the methods described in Column 2 which, if met, demonstrate that the design commitment in Column 1 has been met, is to be described in Column 3. When a choice between putting detail in Column 1 and Column 3 exists, the preference should be to put the detail in Column 3. This ensures that the acceptance criteria is detailed and thereby removes ambiguity regarding acceptable implementation of the commitment. 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.

*1/17/93*

*Sufficient for which design details are not available*

In the case of ITAAC for the Control Room Design and for Digital Instrumentation and Control Design, the ITAAC for each phase of the design development process should be separately identified with entries in Column 1, 2 and 3. Failure to satisfy the Column 3 acceptance criteria for a particular phase will require repeating that phase of the design development process until the Column 3 criteria is met for that ITAAC and all subsequent phased ITAAC.

*N/A For ABB. We have not specified the process steps.*

*may*

### 3. STANDARD SAFETY ANALYSIS REPORT

*Design Descriptions*  
*design related*

*with deletion of proprietary information, conceptual designs, etc.*  
*probability risk assessment*

*Should be up front.*

*Comment #7*

*Comment #8*

10 CFR 52 does not discuss Tier 1 or Tier 2 material. These terms have been developed during implementation of the rule for the lead reviews. Tier 1 material is the DD and ITAAC discussed above plus site parameters and interface requirements as defined in 10 CFR 52.47(a)(i)(ii) and (vii). Tier 2 is that material in the SSAR which is not in Tier 1. The SSAR is to include all Tier 1 and Tier 2 material; i.e., it must include all information reviewed by the staff which is relied upon in reaching the staff's safety determination. 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 submitted as an amendment to the SSAR. It is not sufficient for such information to be on the docket, it must be in the SSAR.

## II. REVIEW PROCEDURES

In the review of the Design Description and ITAAC, definitions of certain terms are crucial and, therefore, a list of DEFINITIONS is included as Appendix A.

### 1. SAFETY RELATED STRUCTURES, SYSTEMS, AND COMPONENTS

- a. Review System (or building) description in the SSAR for the high level safety features to be included in the Design Description and ITAAC. Use engineering judgement guided by the principles discussed in the Appendixes.
- b. Review the Design Description (DD) to verify the above high level safety features are treated adequately. Use the Appendixes to check for correct wording and consistency. Also use the examples included in Appendixes G and H.
- c. Review of ITAAC - Use the Appendixes for guidance on ITAAC entries.
  1. Review the ITAAC to verify that the important features in the DD are included in the ITAAC Design Commitment (DC) column. For guidance on acceptable wording use the examples included in Appendixes G and H.
  2. Review the Inspection, Tests, and Analyses (ITA) column to verify that the DC is adequately verified. Use the examples in Appendixes G and H for guidance.
  3. Review the Acceptance Criteria (AC) column to verify that the results of the ITA are adequately specified. Use the examples in Appendixes G and H for guidance.

## 2. NON-SAFETY RELATED SYSTEMS

one or more functions which may affect a safety function significantly

If the Non-safety related structure, system or component has some <sup>a</sup> safety related feature, it should be considered for inclusion in the DD and ITAAC. However in general, the non-safety related features are typically only described in the DD with no corresponding ITAAC with the intent to certify the design but not check the nonsafety aspects. See the examples in Appendixes G and H for guidance.

Comment #9

Comment #1

## III. EVALUATION FINDINGS

"The staff finds/concludes that the design commitments in this ITAAC accurately summarize the Design Description for [SSC which is the subject of this section]; that the inspections, tests, and/or analyses identified are acceptable methods for determining whether the design commitments have been met; and that the acceptance criteria are sufficient to establish, if they are met, that the design commitments have been met."

## APPENDIXES

- Appendix A - DEFINITIONS AND GENERAL PROVISIONS
- Appendix B - FLUID SYSTEMS
- Appendix C - ELECTRICAL SYSTEMS
- Appendix D - INSTRUMENTATION AND CONTROL SYSTEMS
- Appendix E - BUILDINGS
- Appendix F - PIPING
- Appendix G - STANDARD ITAAC ENTRIES
- Appendix H - EXAMPLES (This includes examples of Design Descriptions and ITAAC which include standard DD and ITAAC entries. The ITAAC entries are annotated with a "fourth" column indicating the Rationale used for including the entry.)

CONSIDER APPENDICES FOR: HUMAN FACTORS (FROM NRE PROGRAM REVIEW MODEL)  
RADIATION PROTECTION  
PLANT AND/OR REACTOR SYSTEMS

**SYSTEM 80+™**

*Replace these "Definition"  
and "General Provision" sections  
with ABB-CE's 12/31/93 versions.*

**1.1 DEFINITIONS**

The following definitions apply to terms used in the Design Descriptions and associated ITAAC:

**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 a 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 structural features (e.g., floors, ceilings, walls, columns, and doorways) and any structures, systems or components which are specified in the building Design Description.

**Basic Configuration (for a System)** means the functional arrangement of structures, systems, or components specified in the Design Description and the verifications for that system specified in Section 1.2.

**Channel** [ABB C-E to add definition.]

**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.

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Test means the actuation, 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 a test of the as-built structures, systems, or components.

## 1.2 GENERAL PROVISIONS

The following general provisions are applicable to the Design Descriptions and associated ITAAC:

### Verifications For Basic Configuration For Systems

Verifications for Basic Configuration of systems include and are limited to inspection of the system functional arrangement and the following inspections, tests, and analyses:

- (1) Inspections, including non-destructive examination (NDE), of the as-built, pressure boundary welds for ASME Code Class 1, 2, or 3 components identified in the Design Description to demonstrate that the requirements of ASME Code Section III for the quality of pressure boundary welds are met.
- (2) Tests, or tests and analyses, of the Seismic Category I mechanical and electrical equipment (including connected instrumentation and controls) identified in the Design Description, including associated anchorage, to demonstrate that the equipment is qualified to withstand design basis dynamic loads without loss of its safety function.
- (3) Tests, or tests and analyses, of the Class 1E electrical equipment identified in the Design Description (or on accompanying Figures) to demonstrate that it is qualified to withstand the environmental conditions that would exist during and following a design basis accident without loss of its safety function for the time needed to be functional. These environmental conditions, as applicable to the bounding design basis accident(s), are as follows: expected time-dependent temperature and pressure profiles, humidity, chemical effects, radiation, aging, submergence, and their synergistic effects which have a significant effect on equipment performance. As used in this paragraph, the term "Class 1E electrical equipment" constitutes the equipment itself, 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 identified in the Design Description, to the extent such equipment is not located in a mild environment during or following a design basis accident.

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Electrical equipment environmental qualification shall be demonstrated through analysis of the environmental conditions that would exist in the location of the equipment during and following a design basis accident and through a determination that the equipment is qualified to withstand those conditions for the time needed to be functional. This determination may be demonstrated by:

- (a) Testing of an identical item of equipment under identical or similar conditions with a supporting analysis to show that the equipment is qualified; or
  - (b) testing of a similar item of equipment under identical or similar conditions with a supporting analysis to show that the equipment is qualified; or
  - (c) experience with identical or similar equipment under identical or similar conditions with supporting analysis to show that the equipment is qualified; or
  - (d) analysis in combination with partial type test data that supports the analytical assumptions and conclusions to show that the equipment is qualified.
- (4) Tests or type tests of active safety-related motor-Operated Valves (MOVs) identified in the Design Description to demonstrate that the MOVs are qualified to perform their safety functions under design basis differential pressure, system pressure, fluid temperature, ambient temperature, minimum voltage, and minimum and/or maximum stroke times.

Treatment of Individual Items

The absence of any discussion or depiction of an item in the Design Description or accompanying Figures shall not be construed as prohibiting a licensee from utilizing such an item, unless it would prevent an item from performing its safety functions as discussed or depicted in the Design Description or accompanying Figures.

When the term "operate," "operates," or "operation" is used with respect to an item discussed in the Acceptance Criteria, it refers to the actuation and running of the item. When the term "exist," "exists," or "existence" is used with respect to an item discussed in the Acceptance Criteria, it means that the item is present and meets the Design Description.

Implementation of ITAAC:

The ITAAC are provided in tables with the following three-column format:

<u>Design Commitment</u>	<u>Inspections Tests, Analyses</u>	<u>Acceptance Criteria</u>
--------------------------	--	----------------------------

## SYSTEM 80+™

Each Design Commitment in the left-hand column of the ITAAC tables has an associated Inspections, Tests, or Analyses (ITA) requirement specified in the middle column of the tables.

The identification of a separate ITA entry for each Design Commitment shall not be construed to require that separate inspections, tests, or analyses must be performed for each Design Commitment. Instead, the activities associated with more than one ITA entry may be combined, and a single inspection, test, or analysis may be sufficient to implement more than one ITA entry.

An ITA may be performed by the licensee of the plant, or by its authorized vendors, contractors, or consultants. Furthermore, an ITA may be performed by more than a single individual or group, may be implemented through discrete activities separated by time, and may be performed at any time prior to fuel load (including before issuance of the Combined Operating License for those ITAAC that do not necessarily pertain to as-installed equipment). Additionally, an ITA may be performed as part of the activities that are required to be performed under 10 CFR Part 50 (including, for example, the Quality Assurance (QA) program required under Appendix B to Part 50); therefore, an ITA need not be performed as a separate or discrete activity.

### **Discussion of Matters Related to Operations**

In some cases, the Design Descriptions in this document refer to matters that relate to operation, such as normal valve or breaker alignment during normal operation modes. Such discussions are provided solely to place the Design Description provisions in context (e.g., to explain automatic features for opening or closing valves or breakers upon off-normal conditions). Such discussions shall not be construed as requiring operators during operation to take any particular action (e.g., to maintain valves or breakers in a particular position during normal operation).

### **Interpretation of Figures**

In many but not all cases, the Design Descriptions in Section 2 include one or more Figures. The Figures may represent a functional diagram, general structural representation, or other general illustration. For I&C systems, Figures also represent aspects of the relevant logic of the system or part of the system. Unless specified explicitly, the Figures are not indicative of the scale, location, dimensions, shape, or spatial relationships of as-built structures, systems, and components. In particular, the as-built attributes of structures, systems, and components 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.

APPENDIX B  
FLUID SYSTEMS

I. DESIGN DESCRIPTION AND FIGURES

The following guidance and rationale of what should be included in the certified design material was developed during the review of fluid system Design Descriptions (DD) and ITAAC, and provides the staff's positions regarding the content of the DD and ITAAC. The information should be included in the design description in a consistent order. As additional experience is gained, this guidance may be updated and revised. Examples of Design Descriptions and Figures are provided in Appendix H.

A. DESIGN DESCRIPTION

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

The design description 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 design description.

3. Key design features of the system

*to the extent those components perform a significant safety function.*  
 The design description should describe the components that make up the system. Key features such as the use of the some of the ABWR 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, should not be included in the design description because this could limit the COL applicant to a particular make and model of a component. 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 HELBs outside of containment - The minimum pipe diameter will 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) are not included



## DRAFT

because their small size limits the effects of HELBs outside containment.

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.

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 will 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 configuration ITAAC will check that the filter exists, but will not test the filter performance.~~

Surge Tank - The capacity of the surge tank will 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 will be described in the design description and the configuration ITAAC will verify that they exist. The capabilities of the features will not be included in the ITAAC.

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

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 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 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 design description except in special cases such as ISLOCA where the system has to meet additional requirements.

5. System operation

Comment #1

*to the extent those modes perform a significant safety function.*

The DD should provide a description of the various modes of operation of the system. This should include realignment of the system

following a LOCA (or other) signal, e.g., a Safety Injection Actuation Signal for an activation a PWR or a LCA Signal for an ABWR.

6. Controls, Displays and Alarms

The design description will describe the system controls, displays (do not use the term "indications"), and alarms available in the control room. Important instrumentation will be shown on the system figure as described in the DD. The EOPs and Chapter 18 have identified the minimum set of controls, displays, and alarms necessary to perform safety functions. They will be used as guidance for establishing the needs for main control room controls, displays and alarms to be included in Tier 1. If an alarm is identified in the SSAR inventory of alarms based upon the EOPs and PRA, then it need not be specifically called out in the system

Comment #10

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. ITAAC.

8. Interlocks

Interlocks needed for direct safety functions will be included in the system design description. 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 SSAR. included.

9. Class 1E electrical power sources/divisions

Comment #11

The DD or figure should identify the Class 1E 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

required

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 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 "mild" environments will be addressed in the I&C ITAAC. *Other than harsh*

11. Interface requirements

The interface requirements <sup>out of scope or partially out of scope</sup> will be identified in the Design Descriptions for applicable systems and cross-referenced in a separate section of the certified information. An example is the Reactor Service Water System. The methodology for developing ITAAC for the interface requirements will be described in the SSAR or certified information. Non-safety systems which cannot impact safety systems do not need Interface Requirements. Specific in-scope design details <sup>for interfacing</sup> which preclude the non-safety system from impacting a safety system must be addressed in Tier 1.

*non-safety systems*

12. Accessibility for ISI Testing and Inspection

The accessibility does not have to be addressed in Tier 1. <sup>but must be addressed in the SSAR</sup> However, <sup>The</sup> NRC will not 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.

14. Normally, all design commitments <sup>in the DD</sup> ~~in Tier 1~~ must be verified by a specific ITAAC, unless there are specific reasons why this is not necessary. Some acceptable reasons include: (a) the information is only included for context, (b) fulfillment of other ITAAC are sufficient to show verification of the design commitment; (c) a single ITAAC can verify more than one design commitment; (d) the information <sup>pertains to safety or seismic classification.</sup>

*Comment #12*

B. FIGURES

INSERT

*comment FRB editorial change*

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

15. Other Matters Not Warranting Tier 1 Treatment

Several matters are not appropriate topics for inclusion in the certified design. These matters include the following:

Programmatic provisions - The Design Descriptions should focus on the physical characteristics of the facility. The Design Descriptions should not contain programmatic requirements related to operating conditions or to operations, maintenance, or other programs because these matters are controlled by other means such as the Technical Specifications.

Design and construction processes - The Design Descriptions for systems should discuss the configuration and performance characteristics that the systems and components should have after construction is completed. In general, the Design Descriptions should not discuss the processes that will be used for designing and constructing a plant because the safety-function of a system or component is dependent upon its final as-built condition and not the processes used to achieve that condition. Exceptions to this general guidance include welding, seismic qualification, and environmental qualification (which are the subject of the basic configuration ITAAC), and the generic ITAAC for piping.

Portable equipment and consumables - In general, the Design Descriptions should address fixed design features expected to be in place for the lifetime of the facility, and not portable equipment and replaceable items that are controlled through operational related programs.

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. <sup>Generally,</sup> ~~AT~~ components discussed in the design description should be shown on the figure. ~~However, some components specified in the DD may not be shown on the figure, because the level of detail is not appropriate for 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 that, in the process of fabricating the overall piping system, the welding and bolting requirements for ensuring the pressure integrity have been met.   
*safety related*
5. As a minimum, instruments required to perform emergency procedures (as described in the SSAR, Chapter 18) are shown on the figure or as described in the Design Description.   
*Safety related*
6. The minimum inventory of alarms as established in the MCR or RSP ITAAC do not have to be shown on DD Figures. Other essential alarms, e.g., associated with SCS high pressure (ISLOCA), SCS performance monitoring indications, not part of the minimum inventory should be shown on the DD figures. The inclusion of "other essential alarms" is limited to those alarms which have been associated with very substantial plant operating occurrences.
7. ~~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.~~
8. Identification of all <sup>displays</sup> ~~indication~~ and controls on the remote shutdown panel will be included in the system diagram or alternatively in the remote shutdown panel ITAAC.   
*editorial change see p. B-3 # 6*
9. ~~Figures for safety-related systems should include valves on SSAR 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.~~   
*inclusion*

Do not specify division

Comment # 13

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(or discussed in the Design Description if there is no figure)

on the figure. If

Comment # 14

10. In general, fail-safe positions of the pneumatic valves will not be shown unless the fail-safe position is relied on to accomplish the direct safety function of the system, the position will be discussed in the text of the Design Description.

11. CIVs are to be shown on the figure of the applicable system ITAAC. 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 will be addressed in the this containment ITAAC. This approach should be explained in the General Provisions section or in an alternate section of the Tier 1 document. Or in other ITAAC as designated, e.g., containment ITAAC.

Valve positions are other not depicted on figures.

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

The following general guidelines should be used during the review of 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.

Commission has exempted Sup 80+ from this requirement

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 or there is redundancy within a Division).

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- 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." *with some the same terms may be used in the name of system*
- 10. The correct system name should be used consistently.

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

The following guidance and rationale of what should be included in the certified design material was developed during the review of fluid system Design Descriptions and ITAAC, and provides the staff's positions regarding ITAAC. Each of the standard ITAAC entries are discussed in the order they are presented in Appendix G. Additional guidance refers to example ITAAC presented in Appendix H. As additional experience is gained, this guidance may be updated and revised.

Normally, all design commitments in <sup>DD</sup> Tier-1 must be verified by a specific ITAAC entry, unless there are specific reasons why this is not necessary. Some acceptable reasons include: (a) the information is only included for context, (b) fulfillment of other ITAAC are sufficient to show verification of the design commitment; (c) a single ITAAC entry can verify more than one design commitment; (d) *the information pertains to safety or seismic classification.*

Comment #12

A. STANDARD ITAAC ENTRIES

1. BASIC CONFIGURATION

This ITAAC entry includes inspection of the functional arrangement of the system components as shown in the figures and includes inspections, tests and analyses of welding, environmental qualification, seismic qualification, and MOVs as described in the definitions and general provisions provided in Appendix A, and as discussed below:

FUNCTIONAL ARRANGEMENT

The system will be inspected to determine that the functional arrangement of the components is as discussed in the Design Description and shown in the figures. 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 SSC 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 only addressed by the 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 will not be performed because the keep-fill system will be tested as part of the overall 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 <sup>NRC reversed position</sup> exists, but will 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 Tech Spec surveillance.

Severe Accident Features - These features will be described in the Design Description and the configuration ITAAC will verify that they exist. The capabilities of the features will not be included in the ITAAC because ~~these features do not lend themselves to in-situ verification.~~ <sup>the performance of these features cannot be verified by testing.</sup>

WELDING

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 integrity of the pressure boundary in the plant will be ensured, in part, through a verification of the welding quality. An inspection is required to be performed to verify the quality of welding for ASME Code Class 1, 2, and 3 pressure-retaining components using appropriate non-destructive examination (NDE) methods. Verification of welding quality is performed as a part of ITAAC for the basic configuration check of each specific system. <sup>as specified in the ITAAC</sup>

The scope of welding to be verified by the ITAAC <sup>is</sup> includes ASME Code Class 1, 2, and 3 pressure-boundary welds. <sup>is</sup> The ASME Code class welds are included in Tier 1 because the ASME Boiler and Pressure Vessel Code, Section III is referenced in 10 CFR 50.55a. Nuclear power plant components classified as Quality Groups A, B, and C are required by 10 CFR 50.55a to meet the requirements for ASME Code Classes 1, 2, and 3, respectively. In each system description, the functional drawing identifies the boundaries of the ASME Code classification. The integrity of the pressure boundary is required to be maintained

Comment # 15

Irrelevant Quality Groups is not used in Tier 1



because it is directly involved in preventing or mitigating an accident or event under the defense-in-depth principle. ASME Code Class 1, 2, and 3 structural welds (e.g., pipe support welds) are not included within the Tier 1 scope because they were deemed to be indirectly involved in preventing or mitigating an accident or event (e.g., Pipe supports provide protection of the piping; but, it is the piping itself that is needed for accident mitigation). Thus, ASME Code Class 1, 2, and 3 structural welds are included in the Tier 2 scope.

#### ENVIRONMENTAL QUALIFICATION

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 "mild" environments will be addressed in the I&C ITAAC. *Anderson Kaseh*

#### EQUIPMENT SEISMIC QUALIFICATION

General Design Criterion 2 of 10 CFR Part 50, Appendix A requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena including earthquakes. In addition, General Design Criterion 4 requires that structures, systems, and components be appropriately designed against dynamic effects.

To verify the ability of mechanical and electrical equipment to perform their safety functions during and following a safe shutdown

earthquake, an inspection is required to be performed to verify that the as-built equipment is qualified to withstand seismic and dynamic loadings. The equipment qualification for seismic and dynamic effects is performed in conjunction with an ITAAC for the basic configuration check of each specific system.

The scope of equipment qualification to be verified by the ITAAC includes those seismic Category I mechanical and electrical equipment (including associated instrumentation and controls) that are depicted on the functional drawings in the design description. Although other seismic Category I equipment might exist within the system and might not be depicted on the functional drawing, they are still required to be seismically qualified but are not required to be included in the ITAAC verification scope. The reason is that the design description and the functional drawings define that portion of the standard design, that is approved by certification and is necessary to perform the system's safety function. Thus, only the seismic Category I equipment that is included in the certified design is required to be verified by the ITAAC. The verification of these other seismic Category I equipment is considered a part of the 10 CFR Part 50, Appendix B quality assurance program.

ISN'T ALL EQUIP. QUALIFIED UNDER PART 50 AS REQUIRED BY PART 52?

MOTOR-OPERATED VALVES

General Design Criterion (GDC) 1 requires that structures, systems, and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. GDC 1 further requires that a quality assurance program be established and implemented in order to provide adequate assurance that these structures, systems, and components will satisfactorily perform their safety functions. Criterion III, "Design Control," of Appendix B to 10 CFR 50 requires that measures be established to assure that the design bases for those structures, systems, and components are correctly translated into specifications, drawings, procedures, and instructions. Criterion XI, "Test Control," requires that a test program be established to assure that testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed.

The ability of motor-operated valves (MOV) to perform their safety functions will be ensured, in part, through verification of the MOV qualification program. The ITAAC for the basic configuration check requires verification that

Note: This is a close paraphrase

The results of test of 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

not a quote.

temperature, minimum voltage, and minimum and/or maximum stroke-time.

The MOV qualification program relies on testing of each size, type, and model. The testing and acceptance criteria for qualification are described in the SSAR.

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 installed MOVs are required in each system ITAAC<sub>x</sub> that have MOVs.

Comment #16

The scope of MOVs to be verified by these ITAAC entries ~~includes those MOVs that are depicted on the functional drawings in the Design Descriptions. These MOVs will include all MOVs with a safety related active function, a complete list of which is contained in the IST plan.~~ *are the*

## 2. HYDROSTATIC TEST

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.

Comment #17

The pressure boundary integrity will be ensured, in part, through a test verifying the leak-tightness of the ASME Code piping systems. A hydrostatic test is specified as a part of the ITAAC for each <sup>ASME</sup> individual ASME piping system. *Code Class*

The scope of the hydrostatic test for the ITAAC includes ASME Code Class 1, 2, and 3 piping systems. The ASME Code class piping systems have been selected for Tier 1 treatment because the ASME Boiler and Pressure Vessel Code, Section III is referenced in 10 CFR 50.55a. Nuclear power plant components classified as Quality Groups A, B, and C are required by 10 CFR 50.55a to meet the requirements for ASME Code Classes 1, 2, and 3, respectively. The ASME Code, Section III requires that a hydrostatic test be performed. In each system description, the functional drawing identifies the boundaries of the ASME Code classification. The integrity of the pressure boundary is required to be maintained because it is directly involved in preventing or mitigating an accident or event under the defense-in-depth principle.

## 3. NET POSITIVE SUCTION HEAD (NPSH)

The system ITAAC will verify that pumps with direct safety functions (typically ECCS and ~~SUCS~~ pumps) have the required NPSH to accomplish their

RHR

safety function by a combination of test and analysis. The analysis method for determining NPSH will typically be provided in the SSAR.

#### 4. DIVISIONAL POWER SUPPLY

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

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 FEATURES

Controls and displays (we are not using the term <sup>STBI</sup> "indications" in ITAAC) - The design description will describe the system displays and controls available in the control room. Important instrumentation will be shown on the system figure. The EOPs and Chapter 18 of the SSAR identify the minimum set of controls and displays necessary to perform safety functions. They will be used as guidance for establishing the needs for main control room displays and controls to be included in Tier 1. The system ITAAC will only verify that these features exist since their performance will be addressed in the HFE and I&C ITAAC.

Alarms - If an alarm is identified in the SSAR inventory of alarms based upon the EOPs and PRA, then it need not be specifically called out in the system ITAAC. These alarms will be addressed in the HFE and I&C ITAAC. Any additional alarms determined to be necessary should be included in the system ITAAC.

#### 7. REMOTE SHUTDOWN PANEL

Controls, displays, and alarms available on the remote shutdown panel can be identified and verified as part of the remote shutdown panel ITAAC, or identified in the system ITAAC and verified as part of the remote shutdown panel ITAAC.

The EOPs and Chapter 18 of the SSAR identify the minimum set of controls and displays necessary to perform safety functions. They will be used as

guidance for establishing the needs for remote shutdown panel displays and controls to be included in Tier 1.

If the controls, displays, and alarms are identified in the system ITAAC, the design description will describe the system displays and controls available on the Remote Shutdown Panel. Important instrumentation will be shown on the system figure. The system ITAAC will only verify that these features exist since their performance will be addressed in the HFE and I&C ITAAC. *IF not shown on the system ITAAC, the <sup>design and</sup> performance of the controls, displays, and alarms will be addressed in the RSR ITAAC.*

### 8. MOTOR OPERATED VALVES

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 SSAR will 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 SSAR in Section 3.9.6 further defines that these tests will be conducted under maximum achievable pre-operational conditions and describes the analysis of these tests results that will be conducted to demonstrate that the valve will function under design conditions. *(Any change to the commitment to conduct these tests under maximum achievable conditions and to analyze these results to assure MOV function under design conditions would involve an unreviewed safety question and, therefore, would require NRC review and approval prior to implementation. Any requested change to these commitments shall either be specifically described in the COL application or submitted for license amendment after COL issuance.)*

*Comment #4*

### 9. PNEUMATICALLY OPERATED VALVES

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

### 10. CHECK VALVES

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

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expected based on the direction of the differential pressure across the valves.

Note: Since the industry has not experienced significant operational problems with other types of valves, or with pumps in general, the proper operation of these components will be tested as part of the functional tests of the system under the system ITAAC *or pre-operational tests.*

*Comment # 18*

B. ADDITIONAL ITAAC ENTRIES (see Appendix H for examples)

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. "Roadmaps" will be used to identify the critical input parameters assumed in the transient and accident analyses. All critical input parameters given in the SSAR (mainly in chapters 6 and 15) will be identified in the "roadmap" ~~with the respective system ITAAC number.~~ The reviewer will verify in the individual system ITAAC that the critical input parameters are included in the corresponding system ITAAC ~~as indicated in the "roadmap".~~

*Comment 319*

3. PRA 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 staff's SER. The reviewer will verify in the individual system ITAAC that the PRA insights are included in the corresponding system ITAAC as indicated in the SSAR.

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, in the case of the ABWR

RCW surge tank a certain 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 SSAR. 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 <sup>need</sup> (DBE) <sup>Design Basis Event</sup> because there are other acceptable methods for assuring system function during a DBE. /editorial

## 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

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 <sup>or the text of</sup> /Comment # 14

the Design Description. B-15

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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 SSAR and Reg Guide 1.68 ~~are not a substitute for ITAAC, however,~~ <sup>CAN ENCOMPASS</sup> the results of pre-op tests can be used to satisfy an ITAAC. SSAR and Reg Guide 1.68 tests should be examined and tests ~~elevated to ITAAC as necessary,~~ <sup>designated as tests</sup> in the development of the ITP.
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 the SSAR with reference to the ITAAC. <sup>no SSAR reference to ITAAC</sup>
5. Use of the Terms "Test" and "Type Test" in the ITA should be consistent with the Definitions. Testing which would be classified as "Vendor", "Manufacturer", "Shop" could be specified as such to make clear what type of test is intended. An alternate approach would be to define "shop" test.
6. If an analysis is required in the ITAAC, then the analysis or at least the outline of the analysis will be prepared and that will be put in the ITAAC or the SSAR with reference to the ITAAC it supports. <sup>No by Agreement.</sup>
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.

Repeated  
in  
earlier  
portion  
of document



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14. The correct system name should be used consistently.

### III. REVIEWER CHECK LISTS

The following check lists are provided to assist 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: \_\_\_\_\_

*Comment #*

- 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 <sup>*Safety*</sup> 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 <sup>*requirements*</sup> sources/divisions \_\_\_\_\_
- 10. Equipment to be qualified for harsh environments \_\_\_\_\_
- 11. Interface requirements \_\_\_\_\_

(See Appendix C for guidance.)

FIGURES CHECK LIST

SYSTEM: \_\_\_\_\_

*Generally,*

1. ~~All~~ components discussed in the design description. \_\_\_\_\_
2. System boundaries with other 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 emergency operation procedures (as described in the SSAR, 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. *(if not described previously displays change - see p-B-3, #6)* \_\_\_\_\_
7. Identification of all indication and control 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 ~~POVs~~ 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. \_\_\_\_\_

*(comment # 14)*

(See Appendix C for guidance.)

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ITAAC CHECK LIST

SYSTEM: \_\_\_\_\_

- 1. Basic configuration \_\_\_\_\_
- 2. Hydrostatic test \_\_\_\_\_
- 3. Net positive suction head \_\_\_\_\_
- 4. Divisional power supplies \_\_\_\_\_
- 5. Physical separation \_\_\_\_\_
- 6. Control room <sup>controls, displays, alarms</sup> configuration \_\_\_\_\_
- 7. Remote shutdown system (optional) \_\_\_\_\_
- 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 \_\_\_\_\_
- 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 \_\_\_\_\_

(See Appendix D for guidance.)

APPENDIX C  
ELECTRICAL SYSTEMS

The following guidance and rationale of what should be included in the certified design material was developed during the review of electric system Design Descriptions (DD) and ITAAC, and provides the staff's positions regarding the content of the DD and ITAAC. The information should be included in the design description in a consistent order. As additional experience is gained, this guidance may be updated and revised. Examples of Design Descriptions and Figures are provided in Appendix H.

This section is intended to provide additional guidance for evaluating the DD and ITAAC, in the Electrical area (for purposes of review responsibility the Electrical area also includes the Lighting Systems).

A. DESIGN DESCRIPTION

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, 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.

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- DC system - battery/battery chargers
  - Emergency diesel generator (EDG support systems need to be covered also - Plant Systems Branch has lead responsibility)
  - <sup>Class 1E</sup> Vital AC inverters, regulating transformers, transfer devices
  - Alternate ac power sources for 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 will be in ITAAC.
6. Lighting

The Design Description should also cover the following:

- no ITAAC because covered by interface requirements*
1. 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. Here is a case where some design description and ITAAC are needed for a "non-Class 1E" area, because of its "importance to safety."
  2. Other specific Rules, Regulations that are applicable to electric systems. For example - the Station Blackout Rule is to be met by an Alternate AC source and, therefore, that feature should be in Tier 1. This is another non-1E aspect, but "important to safety."
  3. Regulatory Guides which have specific recommendations (all the RG guidance may not need Tier 1 treatment). Here may be an area that the Tier 1 treatment captures the design aspect addressed by the RG but the acceptance allows alternate approaches which are then discussed in the SAR.
  4. Operating Experience problems of safety significance that have been identified - particularly through EDSFIs, Generic Letter, 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.

5. Policy issues raised for the ALWRs. 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.
6. New features in the design. In the electrical area ~~on the ABWR~~ this includes the main generator breaker for back feed purposes; and the potential for harmonics introduced by ~~new RFPs~~ MFW pump controllers and its potential effects on the Class 1E equipment.
7. PRA identified insights or key assumptions. In the electrical area this typically involves SBO which should already receive treatment in ITAAC because of the 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 has raise 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.

Comment #20

8. The ACRS/Greybeard Committee issues. For examples see the ACRS letters and Greybeard comments. NOTE: The staff has gone on record as not necessarily agreeing with all their comments.
9. 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.
10. Resolution of a Generic Safety Issue (GSIs) has identified a solution which has resulted in design/operational features. For example, in the electrical area 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.
11. Post TMI requirements - e.g., power to PORV block valve, Pressurizer heaters, etc.

B. ITAAC ENTRIES (for the above equipment)

The following guidance and rationale of what should be included in the certified design material was developed during the review of electric system Design Descriptions and ITAAC, and provides the staff's positions regarding ITAAC. The standard ITAAC entries for electrical systems are discussed in Appendix G. Additional guidance refers to example ITAAC presented in Appendix H. As additional experience is gained, this guidance may be updated and revised.

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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. Some acceptable reasons include: (a) the information is only included for context, (b) fulfillment of other ITAAC are sufficient to show verification of the design commitment; (c) a single ITAAC entry can verify more than one design commitment, (d) *the information pertains to safety or seismic classification.*

*Comment #12*

1. BASIC CONFIGURATION (see Appendix G)

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

Qualification - seismic and harsh environment will be covered by the "basic configuration" ITAAC (see definitions in Appendix A). Tier 1 will only deal with electrical equipment in harsh environments. Electrical equipment in a "mild" environment will be treated in the SSAR only. An exception is made for I&C state-of-the-art digital equipment in "mild" environment which the I&C ITAAC will cover mild environment. Since there is some of this type equipment which may be utilized in the Electrical Distribution Systems, the I&C ITAAC will be expanded to cover this potential. The basis for this exception is that newer I&C equipment in mild environments has some operating experience that shows sensitivity particularly to temperature, and in addition the 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 (see Appendix G).

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. The SSAR should discuss the analyses. Testing should be included to demonstrate the EDG capacity and capability. ~~This is the same as the Tech Spec tests.~~ *Can be based on*

(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 Tech Spec tests.



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 would be in the SSAR.
  - 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 the SSAR.
  - 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.
8. <sup>CONTROLS, DISPLAYS</sup> ~~INDICATIONS, ALARMS~~ - check chapter 18 on the EOPs
9. TEST FEATURES - limited to cases where special on-line test features have been specifically included (maybe for a special new design feature)
10. 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.
11. LOCATION OF EQUIPMENT - important for some equipment in relation to its environment.

Comment #15

APPENDIX D  
INSTRUMENTATION AND CONTROL SYSTEMS

To be provided upon completion of I&C ITAAC review.

APPENDIX E  
BUILDING STRUCTURES

The following guidance and rationale of what should be included in the certified design material was developed during the review of building structures Design Descriptions (DD) and ITAAC, and provides the staff's positions regarding the content of the DD and ITAAC. The information should be included in the design description in a consistent order. As additional experience is gained, this guidance may be updated and revised. Examples of Design Descriptions and Figures are provided in Appendix H.

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 SSAR 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 design description does not need structural drawings (the SSAR 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 SSAR should include a description of the need for the T/B to withstand a UBC Zone 3 level earthquake, and the T/B should not use a dual-system or a concentric system design. *Acwe*
4. The building design descriptions should specify the embedment depth (from the top of the foundation to the finished grade). An ITAAC should verify the embedment depth.

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II. PROTECTION AGAINST HAZARDS

1. Internal flooding - features such as divisional walls, fire doors, watertight doors, and penetrations will be included in the DD 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 *need* not be included, because the wall thickness is being relied upon to prevent in-leakage. *Characteristics are*
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.

III. SITE PARAMETERS

1. The site parameters should include a requirement that liquefaction not occur underneath structures, systems, and components resulting from the site-specific SSE.
2. Although the design for the sites should be based on the 0.3g RG 1.60 spectra, the evaluation of the sites for liquefaction potential should use the site-specific SSE with acceptance criteria demonstrating adequate margin for no liquefaction.

*Pretty  
Tense*

*Not a  
Tier I  
Site  
parameter*

*I suggest that the Site Parameter list be prescriptive in the sense that the parameters included are specified. I don't think other plans will expand them the list.*

## APPENDIX F

### PIPING SYSTEMS

The following guidance and rationale of what should be included in the certified design material was developed during the review of piping systems Design Descriptions (DD) and ITAAC, and provides the staff's positions regarding the content of the DD and ITAAC. The information should be included in the design description in a consistent order. As additional experience is gained, this guidance may be updated and revised. Examples of Design Descriptions and Figures are provided in Appendix H.

#### I. PIPING DESIGN

General Design Criterion 2 of 10 CFR Part 50, Appendix A requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena including earthquakes. In addition, General Design Criterion 4 requires that structures, systems, and components be appropriately designed against dynamic effects including pipe whipping. However, dynamic effects associated with postulated pipe ruptures may be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping.

To verify the ability of piping systems to perform their safety functions during and following a safe shutdown earthquake, an inspection is required to verify that the as-built piping systems are designed to retain their pressure integrity and functional capability under design basis loadings. In addition, an inspection is required to verify that safety-related structures, systems, and components are protected against the dynamic effects associated with postulated high-energy pipe breaks. The ITAAC for verifying the piping design requirements are performed under the generic Piping Design.

The scope of the piping to be verified by the generic Piping ITAAC includes all ASME Code Class 1, 2, and 3 piping systems and high-energy piping systems. The ASME Code Class piping systems are included in Tier 1 because the ASME Boiler and Pressure Vessel Code, Section III is referenced in 10 CFR 50.55a. Nuclear power plant components classified as Quality Groups A, B, and C are required by 10 CFR 50.55a to meet the requirements for ASME Code Classes 1, 2, and 3, respectively. In each system description, the functional drawing identifies the boundaries of the ASME Code classification for the piping systems. The piping pressure boundary and structural integrity are required to be maintained because they are directly involved in preventing or mitigating an accident or event under the defense-in-depth principle.

The ITAAC in the generic Piping Design provides a certified design commitment that the as-built piping system be designed to meet ASME Code, Section III requirements. The certified design commitment also requires that safety-

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related structures, systems, and components be protected against the dynamic effects associated with postulated high-energy pipe breaks. An inspection of ASME Code-required documents will be conducted to confirm the existence of an ASME Code-certified stress report and a pipe break analysis report.

The inspection will involve a walkdown of the as-built piping and supports and a review of the ASME Code certified stress report to ensure that the as-built piping system has been reconciled with the piping design requirements. The existence of a Code-certified stress report (also referred to as a design report) provides confidence that all the design and service loadings as stated in the design specification have been evaluated, and that the acceptance criteria of the ASME Code, Section III have been considered. The methodology and specific attributes to be inspected are described in the SSAR.

The inspection will also involve a review of the as-built, high-energy pipe break mitigation features (e.g., pipe whip restraints and jet impingement shields) to ensure that the installed features are consistent with the pipe break analysis report. The methodology and specific attributes to be inspected are described in the SSAR. Alternatively, if an NRC-approved leak-before-break report exists, then the dynamic effects from those postulated high-energy pipe breaks could be excluded.

II. PIPING DESIGN QUALIFICATION AND FABRICATION

The verification of design, fabrication, testing, and performance requirements are partially addressed in conjunction with the specific system ITAAC. However, performance tests are not practical for verifying certain component design requirements such as its seismic design or safety classification. Therefore, ITAAC have been developed to verify certain areas where performance tests are not practical. These areas include seismic design qualification and fabrication of components (i.e., welding). The ITAAC for seismic design qualification and fabrication are established on a generic basis rather than on an individual component basis.

The verification of the design qualification and fabrication of components are captured in the ITAAC as discussed below:

Design Qualification

*structures and systems and the ASME Code classification of*

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. The verification of the overall piping design including the effects of high-energy line breaks is performed in conjunction with the generic piping design ITAAC. The as-built piping system is required to be reconciled with the design commitments.

Fabrication

Comment # 17
 A basic configuration check (system) 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. A hydrotest ITAAC is also required ~~in each system ITAAC for ASME Code Class 1, 2, and 3 piping systems to verify that, in the process of fabricating the overall piping system, the welding and bolting requirements for ensuring the pressure integrity have been met.~~
Comment # 21

A detailed description of the ITAAC for component design qualification and fabrication and the bases for determining which material is Tier 1 or Tier 2 are discussed in the following sections.

1. WELDING

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 integrity of the pressure boundary in the plant will be ensured, in part, through a verification of the welding quality. An inspection is required to be performed to verify the quality of welding for ASME Code Class 1, 2, and 3 pressure-retaining components using appropriate non-destructive examination (NDE) methods. Verification of welding quality is performed as a part of ITAAC for the basic configuration check of each specific system.

is
 The scope of welding to be verified by the ITAAC <sup>is</sup> includes ASME Code Class Comment # 15 1, 2, and 3 pressure-boundary welds. The ASME Code class welds are included in Tier 1 because the ASME Boiler and Pressure Vessel Code, Section III is referenced in 10 CFR 50.55a. Nuclear power plant components classified as Quality Groups A, B, and C are required by 10 CFR 50.55a to meet the requirements for ASME Code Classes 1, 2, and 3, respectively. In each system description, the functional drawing identifies the boundaries of the ASME Code classification. The integrity of the pressure boundary is required to be maintained because it is directly involved in preventing or mitigating an accident or event under the defense-in-depth principle. ASME Code Class 1, 2, and 3 structural welds (e.g., pipe support welds) are not included within the Tier 1 scope because they were deemed to be indirectly involved in preventing or mitigating an accident or event (e.g., Pipe supports provide protection of the piping; but, it is the piping itself that is needed for accident mitigation). Thus, ASME Code Class 1, 2, and 3 structural welds are included in the Tier 2 scope.

The ITAAC for the basic configuration check requires:

Inspections, including non-destructive examination of the as-built, pressure-boundary welds for ASME Code Class 1, 2, and 3 components identified in the design description to demonstrate that the requirements of the ASME Code, Section III for assuring the quality of pressure-boundary welds are met.

~~The inspection of the ASME Code Class 1, 2, and 3 welding activities may involve a review of NDE records or the actual performance of the appropriate NDE method described in the SSAR.~~

Comment  
# 22

The acceptance criteria for the welds are the ASME Code, Section III weld examination requirements. The specific weld examination requirements for a particular ASME Code Class 1, 2, and 3 component and weld type are considered Tier 2 and are tabulated in the SSAR. The specific weld examination requirements are considered Tier 2 because they could change depending on future revisions to the ASME Code, Section III requirements.

Other welding activities (non-ASME Code) includes:

- (1) pressure-boundary welds other than ASME Code, Section III welds,
- (2) structural and building steel welds,
- (3) electrical cable tray and conduit support welds,
- (4) heating, ventilation, and air-conditioning support welds, and
- (5) refueling cavity and spent fuel pool liner welds.

These other types of welding are included in the Tier 2 scope. The SSAR describes the applicable codes and standards for the other types of welding and the weld acceptance criteria. Similar to the ASME Code Class 1, 2, and 3 structural welds, the function of these other welds is needed for protection of safety-related systems, structures, and components but are not directly involved (or are redundant) in preventing an accident or event. Accordingly, these other types of welding were deemed inappropriate for Tier 1 scope.

## 2. HYDROTEST

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. A hydrostatic test is specified as a part of the ITAAC for each individual piping system.



The scope of the hydrostatic test for the ITAAC includes ASME Code Class 1, 2, and 3 piping systems. The ASME Code class piping systems have been selected for Tier 1 treatment because the ASME Boiler and Pressure Vessel Code, Section III is referenced in 10 CFR 50.55a. Nuclear power plant components classified as Quality Groups A, B, and C are required by 10 CFR 50.55a to meet the requirements for ASME Code Classes 1, 2, and 3, respectively. The ASME Code, Section III requires that a hydrostatic test be performed. In each system description, the functional drawing identifies the boundaries of the ASME Code classification. The integrity of the pressure boundary is required to be maintained because it is directly involved in preventing or mitigating an accident or event under the defense-in-depth principle.

The ITAAC for each piping system contains a certified design commitment that the ASME Code components of the system retain their pressure boundary integrity under internal pressures that will be experienced during service. A hydrostatic test is required to be conducted on those ASME Code components of the system that are required to be hydrostatically tested by the ASME Code. The acceptance criteria for the hydrostatic test will meet the ASME Code, Section III requirements.

### 3. SAFETY CLASSIFICATION

General Design Criterion 1 of 10 CFR Part 50, Appendix A requires that structures, systems, and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed.

To verify the acceptability of the use of quality standards, an inspection is required to confirm the availability of code-required design documentation. The documentation review is performed as a part of the generic Piping Design ITAAC. The design description for each system contains the ASME Code classification for the various portions of the system.

The ASME Boiler and Pressure Vessel Code class requirements are verified because the ASME Code, Section III is referenced in 10 CFR 50.55a. Nuclear power plant components classified as Quality Groups A, B, and C are required by 10 CFR 50.55a to meet the requirements for ASME Code Class 1, 2, and 3, respectively. The ASME Code classes allow a choice of rules that provide assurance of structural integrity and quality commensurate with the relative importance assigned to the individual items of the nuclear power plant. The functional drawings in each individual system design description identifies the ASME Code class boundaries. The use of other codes and standards (e.g., AISC Steel Construction Manual for building structural steel) are considered within the Tier 2 scope, and the SSAR contains descriptions of the applicable codes and standards for these other safety-related structures, systems, and components that are not designed to the ASME Boiler and Pressure Vessel Code, Section III.

Limited  
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DRAFT

The ITAAC in the generic Piping Design provides a certified design commitment that the piping system is designed to meet its ASME Code Class requirements. An inspection of ASME Code-required documents will be conducted to confirm the existence of an ASME Code certified stress report.

The inspection may involve a review of the as-built documentation and of the ASME Code certified stress report. The existence of a Code-certified stress report (also referred to as a design report) provides confidence that the overall ASME Code design process was followed for that particular system, and thus, the applicable requirements of the various ASME Code classes have been met.

Substitute wording used in System 80+ Standard ITAAC entries for outdated wording below (see attached pages)

Statement  
Meet the intent

## APPENDIX G

### STANDARD ITAAC ENTRIES

#### Design Description

#### Inspections, Tests, Analyses

#### Acceptance Criteria

#### Rationale

### 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 \_\_\_\_\_.

II.A.1  
App. B

### 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)

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)

II.A.2  
App. B

(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.)

Design Description

Inspection, Tests, Analysis

Acceptance Criteria

Rationale

**NET POSITIVE SUCTION HEAD**

3. The \_\_\_\_\_ pumps have sufficient NPSH.

No

\* 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.

II.A.3  
App. B

**DIVISIONAL POWER SUPPLY**

4. Class 1E loads of the \_\_\_\_\_ System are powered from Class 1E Divisions, as described in Section \_\_\_\_\_.

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 under test in the \_\_\_\_\_ System.

II.A.4  
App. B

**PHYSICAL SEPARATION**

5. Each mechanical division of the \_\_\_\_\_ System (Divisions A, B, C)\* is physically separated.

\*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 the other mechanical divisions of the \_\_\_\_\_ system by structural and/or fire barriers (with the exception of \_\_\_\_\_).

II.A.5  
App. B

Design Description

Inspection, Tests, Analysis

Acceptance Criteria

Rationale

**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.

6. Alarms, displays, and/or controls\* exist or can be retrieved in the Control Room as defined in Section \_\_\_\_\_.

II.A.6  
App. B

\*Delete any category for which no entries are included in the Design Description.

No Tests

**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 \_\_\_\_\_.

II.A.7  
App. B

**MOTOR OPERATED VALVES**

8. Motor-operated valves (MOV) designated in Section \_\_\_\_\_ as having an active safety-related function open and/or close under differential pressure and fluid flow and temperature conditions.

8. Opening and/or closing tests of installed valves will be conducted under preoperational differential pressure, fluid flow, and temperature conditions.

8. Each MOV opens and/or closes. The following valves open and/or close in the following time limits upon receipt of the actuating signal:

II.A.8  
App. B

Rewritten

\*Table entries for key valves only; i.e., one or two most important valves in a system.

Valve*	Time (sec)
_____	_____ open _____ close
_____	_____ open _____ close

<u>Design Description</u>	<u>Inspection, Tests, Analysis</u>	<u>Acceptance Criteria</u>	<u>Rationale</u>
<b>PNEUMATICALLY OPERATED VALVES</b>			
9. The pneumatically operated _____ valve(s) in the _____ System closes (opens) when either electric power to the valve actuating solenoid is lost or the pneumatic pressure to the valve(s) is lost.	9. Tests will be performed on _____ valve(s).	9. _____ valve(s) closes.	II.A.9 App. B

<b>CHECK VALVES</b>			
10. Check valves designated in Section _____ as having an active safety-related function will open and/or close under system pressure and fluid flow conditions.	10. Opening and/or closing tests of installed valves will be conducted under system preoperational pressure, fluid flow, and temperature conditions.	10. Each check valve opens and/or closes.	II.A.10 App. B

<b>INDEPENDENCE FOR ELECTRICAL AND I&amp;C SYSTEMS</b>			
11. Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the _____ System.	11.1. Tests will be performed in the _____ System by providing a test signal in only one Class 1E Division at a time.	11.1. The test signal exists only in the Class 1E Division under test in the _____ System.	B.2 App. C
	11.2. Inspection of the as-installed Class 1E Divisions in the _____ System will be performed.	11.2. Physical separation exists between Class 1E Divisions in the _____ System. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the _____ System.	

These are the ABB wordings for the applicable ITAAC entries.

SYSTEM 80+

TABLE 2.4.4-1

SAFETY INJECTION SYSTEM  
Inspections, Tests, Analyses, and Acceptance Criteria

<u>Design Commitment</u>	<u>Inspections, Tests, Analyses</u>	<u>Acceptance Criteria</u>
1. The Basic Configuration of the safety injection system (SIS) is as shown on Figure 2.4.4-1.	1. Inspection of the as-built SIS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.4-1, the as-built SIS conforms with the Basic Configuration.
2. Two SIS pumps, in conjunction with the SITs, have the capacity to deliver coolant to the reactor vessel to cool the core during design basis events.	2.a) Testing to determine SIS flow will be performed. Analysis will be performed to convert the test results from the test conditions to the design conditions.  2.b) Testing will be performed using signals simulating a safety injection actuation signal (SIAS).  2.c) Testing will be performed to open the SIT isolation valves with the SITs pressurized and the RCS depressurized. Analysis will be performed to convert the test results from the test conditions to the design conditions.	2.a) Each SIS pump has a pump-developed pressure differential of no less than 1600 psid and no more than 2040 psid at the vendor's specified minimum flow rate, and injects no less than 980 gpm and no more than 1232 gpm of borated water into the reactor vessel at atmospheric pressure.  2.b) The SIS initiates and begins to deliver flow to the reactor vessel within 40 seconds following receipt of a signal simulating SIAS, including emergency diesel generator start time and load time.  2.c) The pressurized SITs discharge water to the depressurized RCS.  Resistance coefficient K of the discharge line from the SIT to the reactor vessel is equal to or between 4.5 to 30 (based on a cross-sectional area of 0.6827 ft <sup>2</sup> ).

TABLE 2.4.4-1 (Continued)

**SAFETY INJECTION SYSTEM**  
**Inspections, Tests, Analyses, and Acceptance Criteria**

<u>Design Commitment</u>	<u>Inspections, Tests, Analyses</u>	<u>Acceptance Criteria</u>
2. (Continued)	2.d) Inspection of construction records for SIS piping will be conducted.	2.d) The volume in each direct vessel injection line, from the connection for the SIT return header to the piping-to-DVI nozzle weld, is no greater than 27.8 cubic feet.
3. The safety injection tanks can be depressurized by venting for entry into shutdown cooling.	3. Testing will be performed with the SITs pressurized and the associated SIT isolation valve shut. Each SIT vent valve will be opened from the MCR.	3. The SIT vent valves can be opened from the MCR and the SIT pressure decreases while the SIT is being vented.
4. A flow recirculation line from each SIS pump discharge to the IRWST provides a minimum flow recirculation path.	4. Testing of SIS will be performed by manually aligning SI flow to the IRWST through the minimum flow recirculation line and manually starting each SIS pump.	4. Minimum flow recirculation rate meets or exceeds the pump vendor's minimum flow requirements.
5. The SIS pumps can be tested at full flow during plant operation.	5. Testing of the SIS will be performed by manually aligning SIS flow to the IRWST and manually starting each SIS pump.	5. Each SIS pump has a flow capacity of at least 980 gpm to the IRWST through the test line.
6. The ASME Code Section III SIS components shown on Figure 2.4.4-1 retain their pressure boundary integrity under internal pressures that will be experienced under service.	6. A pressure test will be conducted on those components of the SIS required to be pressure tested by ASME Code Section III.	6. The results of the pressure test of ASME Code Section III components of the SIS conform with the pressure testing acceptance criteria in ASME Code Section III.



**TABLE 2.4.4-1 (Continued)**

**SAFETY INJECTION SYSTEM**  
**Inspections, Tests, Analyses, and Acceptance Criteria**

<u>Design Commitment</u>	<u>Inspections, Tests, Analyses</u>	<u>Acceptance Criteria</u>
7.a) Displays of the SIS instrumentation shown on Figure 2.4.4-1 exist in the MCR or can be retrieved there.	7.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	7.a) Displays of the instrumentation shown on Figure 2.4.4-1 exist in the MCR or can be retrieved there.
7.b) Controls exist in the MCR to start and stop the SIS pumps, and to open and close those power operated valves shown on Figure 2.4.4-1.	7.b) Testing will be performed using the SIS controls in the MCR.	7.b) SIS controls in the MCR operate to start and stop the SIS pumps and to open and close those power operated valves shown on Figure 2.4.4-1.
7.c) SIS alarms shown on Figure 2.4.4-1 are provided in the MCR.	7.c) Testing of the SIS alarms shown on Figure 2.4.4-1 will be performed using signals simulating SIS alarm conditions.	7.c) The SIS alarms shown on Figure 2.4.4-1 actuate in the MCR in response to signals simulating SIS alarm conditions.
8. Water is supplied to each SIS pump at a pressure greater than the pump's required NPSH.	8. Testing to measure SIS pump suction pressure will be performed. Inspections and analyses to determine NPSH available to each SIS pump will be performed based on test data and as-built data.	8. The calculated available NPSH exceeds each SIS pump's required NPSH.
9.a) The Class 1E loads shown on Figure 2.4.4-1 are powered from their respective Class 1E Division.	9.a) Testing on the SIS will be conducted by providing a test signal in only one Class 1E Division at a time.	9.a) Within the SIS, a test signal exists only at the equipment powered from the Class 1E Division under test.
9.b) Within a Division, one SIS pump and associated valves and controls are powered from a different Class 1E bus in the same Class 1E Division than the other SIS pump and associated valves and controls.	9.b) Testing on the SIS will be conducted by providing a test signal in only one Class 1E bus at a time.	9.b) Within the SIS, a test signal exists only at the equipment powered from the Class 1E bus under test.

**TABLE 2.4.4-1 (Continued)**

**SAFETY INJECTION SYSTEM**  
**Inspections, Tests, Analyses, and Acceptance Criteria**

<b><u>Design Commitment</u></b>	<b><u>Inspections, Tests, Analyses</u></b>	<b><u>Acceptance Criteria</u></b>
9.c) Within a Division, the two hot leg injection isolation valves are powered from different Class 1E buses in the same Class 1E Division.	9.c) Testing on the SIS will be conducted by providing a test signal in only one Class 1E bus at a time.	9.c) Within the SIS, a test signal exists only at the equipment powered from the Class 1E bus under test.
9.d) Independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment, in the SIS.	9.d) Inspection of the as-installed Class 1E Divisions of the SIS will be performed.	9.d) Physical separation exists between Class 1E Divisions in the SIS. Physical separation exists between Class 1E Divisions and non-Class 1E equipment in the SIS.
10. The two mechanical Divisions of the SIS are physically separated.	10. Inspection of as-built mechanical Divisions will be performed.	10. The two mechanical Divisions of the SIS are separated by a Divisional wall or a fire barrier except for components of the system within containment which are separated by spatial arrangement or barriers.
11. Valves with response positions indicated on Figure 2.4.4-1 change position to that indicated on the Figure upon loss of motive power.	11. Testing of loss of motive power to these valves will be performed.	11. These valves change position to the position indicated on Figure 2.4.4-1 upon loss of motive power.
12. The SIS is automatically initiated by a safety injection actuation signal (SIAS).	12. Testing will be performed by generating a signal simulating SIAS.	12. A signal simulating SIAS starts the SI pumps and opens the SI header isolation valves and safety injection tank (SIT) isolation valves. The SIT isolation valves, when open, receive a confirmatory open signal.

TABLE 2.4.4-1 (Continued)

**SAFETY INJECTION SYSTEM**  
**Inspections, Tests, Analyses, and Acceptance Criteria**

<u>Design Commitment</u>	<u>Inspections, Tests, Analyses</u>	<u>Acceptance Criteria</u>
13. The SIS can be manually realigned for simultaneous hot leg injection and direct vessel injection (DVI).	13. Testing will be performed with the system manually aligned for simultaneous DVI and hot leg injection.	13. The SIS injects no less than 980 and no more than 1232 gpm through each hot leg injection line with the RCS at atmospheric pressure.
14. Motor operated valves (MOV)s having an active safety function will open, or will close, or will open and also close, under differential pressure or fluid flow conditions and under temperature conditions.	14. Testing will be performed to open, or close, or open and also close MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	14. Each MOV having an active safety function opens, or closes, or opens and also closes.
15. Check valves shown on Figure 2.4.4-1 will open, or will close, or will open and also close under system pressure, fluid flow conditions, or temperature conditions.	15. Testing will be performed to open, or close, or open and also close check valves shown on Figure 2.4.4-1 under system preoperational pressure, fluid flow conditions, or temperature conditions.	15. Each check valve shown on Figure 2.4.4-1 opens, or closes, or opens and also closes.
16.a) An interlock automatically opens the SIT motor-operated isolation valves when RCS pressure increases above the SIT normal operating pressure.	16.a) Testing will be performed using a signal simulating increasing RCS pressure, with the SIT isolation valves closed.	16.a) The SIT motor-operated isolation valves open in response to a signal simulating RCS pressure increasing above the SIT normal operating pressure.
16.b) The interlock prevents closing the SIT motor-operated isolation valves until RCS pressure decreases below the interlock reset point.	16.b) Testing will be performed using a signal simulating decreasing RCS pressure with the SIT isolation valves open and attempting to close the valves from the main control room.	16.b) The SIT motor-operated isolation valves do not close when RCS pressure is above the interlock reset point.