March 24, 1994

Docket No. 52-001

Mr. Joseph Quirk
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Dear Mr. Quirk:

SUBJECT: INPUT TO CERTIFIED DESIGN MATERIAL (CDM) REVIEW GUIDANCE

The development of the CDM for the evolutionary reactor designs has been an intensive and iterative process. In order to document the lessons learned and the treatment of key safety issues, you are requested to provide comments on the enclosed CDM review guidance. Please provide any information that you feel appropriate, including any lessons learned, suggested improvements, style guides, review checklists and markups. Please provide your input by April 15, 1994, if possible, to enable the staff to perform a timely update of the document.

Sincerely,
(Original signed by)
R. W. Borchardt, Director
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Associate Directorate for Advanced Reactors
and License Renewal
Office of Nuclear Reactor Regulation

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As stated

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# 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.

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 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.

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

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.

The staff should ensure that <u>significant</u> 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.

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:

> "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.

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.

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

The purpose of ITAAC is to verify that the as-built facility conforms with the 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 features, from the Design Descriptions, and the applicable requirements that are necessary and sufficient to authorize fuel loading and subsequent operation.

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 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.

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.

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.

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.

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. 1.68 are not a substitute for ITAAC, however, the results of pre-operational tests can be used to satisfy an ITAAC.

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.

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.

3. STANDARD SAFETY ANALYSIS REPORT

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.

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 immportant 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 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.

## 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 HF&I PROGRAM REVIEW MODEL)
RADIATION PROTECTION
PLANT AND/OR REACTOR SYSTEMS

# APPENDIX A

## DEFINITIONS

DEFINITIONS THAT APPLY TO THE CERTIFIED DESIGN MATERIAL (CDM) FOR EACH REACTOR DESIGN ARE CONTAINED IN SECTION 1.1 OF THE RESPECTIVE CDM.

# 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

   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 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 is 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

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.

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 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.

7. Logic

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

8. Interlocks

Interlocks needed for direct safety functions will be included in the system 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

The DD or figure should identify the electrical power source/division for the equipment included in the system. Independent Class 1E power sources are required for components performing direct safety functions and are needed to meet single failure criterion, GDC 17, etc. Electrical separation will also be addressed in the electrical and I&C systems ITAAC.

10. Equipment to be qualified for harsh environments

Electrical equipment that is used to perform a necessary safety function must be demonstrated to be capable of maintaining functional operability under all service conditions, including LOCA, postulated to occur during its installed life for the time it is required to operate. Documentation relating to equipment qualification issues will be completed for all equipment items important to safety in accordance with the requirements of 10 CFR 50.49. The 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.

B. FIGURES

1. In general, figures and/or diagrams are required for all systems. However, a separate figure may not be needed for simple systems, structures, and components (e.g., the condenser). The format for the

figures and/or diagrams will be simplified piping diagrams for mechanical systems. Symbols used on the figures should be consistent with the legend provided by the applicant.

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

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

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

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.

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).

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.

### 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 is 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.

The scope of welding to be verified by the ITAAC 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.

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.

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.

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

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.

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.

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.

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.

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 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 "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 exists 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 exists since their performance will be addressed in the HFE and I&C 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.

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 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.

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".

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 DBE (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.

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.

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, 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.

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.

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.

14. The correct system name should be used consistently.

## III. REVIEWER CHECK LISTS

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

## DESIGN DESCRIPTION CHECK LIST

SYSTEM: ______________________________

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

(See Appendix C for guidance.)

# 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 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 all POVs/MOVs that are within the scope of GL 89-10. ________
9. Fail-safe position of pneumatic valves that are relied upon to accomplish the direct safety function of the system. ________

(See Appendix C for guidance.)

# 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 configuration ________
7. Remote shutdown system ________
8. Motor operated valves ________
9. Pneumatically operated valves ________
10. Check valves ________
11. Operational and functional aspects of the system ________
12. Critical assumptions from transient and accident analyses ________
13. PRA insights ________
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.

- DC system - battery/battery chargers

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

- 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:

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 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 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.

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.

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.

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.

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. INDICATIONS, ALARMS - check chapter 18 on the EOPs

9. TEST FEATURES - limited to cases were 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.

# APPENDIX D

## INSTRUMENTATION AND CONTROL SYSTEMS

To be provided upon copmpletion 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.

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.

## 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.

# 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-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

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

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 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.

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 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.

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.

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.

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.

# 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)<br><br>(Note 1: Modify to call out pressure test for pneumatic/gas and oil systems, if that is what is proposed; or, pressure test can be used for all entries since the code will determine the testing fluid.) | 2. The results of the hydrostatic test of the ASME Code components of the _____ System conform with the requirements in the ASME Code, Section III.(Note 1) | II.A.2 App. B |

| Design Description | Inspection, Tests, Analysis | Acceptance Criteria | Rationale |
|---|---|---|---|
| | **NET POSITIVE SUCTION HEAD** | | |
| 3. The ________________ pumps have sufficient NPSH.<br><br>* 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:<br><br>- pressure losses for pump inlet piping and components,<br>*- suction from the suppression pool with water level at the minimum value,<br>*- 50% blockage of pump suction strainers,<br>*- design basis fluid temperature(100°C),<br>*- containment at atmospheric pressure<br>*- vendor test results of required NPSH. | 3. The available NPSH exceeds the NPSH required. | II.A.3<br>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<br>App. B |
| | **PHYSICAL SEPARATION** | | |
| 5. Each mechanical division of the ______ System (Divisions A, B, C)* is physically separated.<br><br>*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<br>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.<br><br>*Delete any category for which no entries are included in the Design Description. | 6. Alarms, displays, and/or controls* exist or can be retrieved in the Control Room as defined in Section _____. | II.A.6<br>App. B |
| | **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<br>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.<br><br>*Table entries for key valves only; i.e., one or two most important valves in a system. | 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:<br><br>Valve* — Time (sec)<br>___ — ___ open, ____ close<br>___ — ___ open, ____ close | II.A.8<br>App. B |

| Design Description | Inspection, Tests, Analysis | Acceptance Criteria | Rationale |
| --- | --- | --- | --- |
| | **PNEUMATICALLY OPERATED VALVES** | | |
| 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 |
| | **CHECK VALVES** | | |
| 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 |
| | **INDEPENDENCE FOR ELECTRICAL AND I&C SYSTEMS** | | |
| 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. | |