C.II.2 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)

The requirements of *proposed* 10 CFR 52.80(b) specify that the contents of a combined license application must include the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria which are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the combined license, the provisions of the Atomic Energy Act, and the NRCs regulations.

The combined license applicant should provide, in this section, its proposed selection methodology for structures, systems, and components (SSCs) that will be subject to ITAAC and its proposed criteria for establishing the ITAAC which are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the combined license, the provisions of the Atomic Energy Act, and the NRCs regulations. The combined license applicant should provide its proposed ITAAC, containing the necessary information described below in an appropriate section of the COL application, as defined in DG-1145, Section C.IV.2, Submittal Guidance. Since successful completion of all ITAAC is a pre-requisite for fuel load and a condition of the license, ITAAC will no longer exist after the Commission makes its finding in accordance with § 52.103(g) and fuel load is authorized. Therefore, the COL application section containing the ITAAC will not become a part of the FSAR for the facility. In recognition of this finite aspect of ITAAC, the COL application content requirements identify ITAAC in § 52.80 as additional technical information required in the application. However, ITAAC that are associated with a certified design will always remain part of the certified design unless modified in accordance with the change process specified in Section VIII of the applicable 10 CFR Part 52 appendix.

The ITAAC format discussed below has been used by previous applicants for design certification and is acceptable to the NRC. The ITAAC format for design certification was developed with a system-based focus on SSCs. The format discussed below is provided as guidance to COL applicants on an ITAAC format that is acceptable to the NRC. COL applicants are not required to follow the format provided in this guidance but may propose alternative formats for ITAAC with suitable justification for the alternative format and a discussion on the development and use of the proposed ITAAC format and content for NRC review. For example, the COL applicant may propose alternatives that include ITAAC formats that have a construction-based focused where ITAAC are organized by plant elevation, modules, etc. Or, COL applicants may propose an ITAAC format that is a hybridized combination of system-based and construction-based formats that seek to maximize NRC review efficiency and performance of ITAAC during plant construction.

Since COL applications may incorporate, by reference, early site permits (ESPs), design certification documents (DCDs), neither, or both, the scope of ITAAC development for a COL applicant will differ depending on which of these documents are referenced in the application. However, the COL applicant must propose a complete set of ITAAC that addresses the entire facility, including ITAAC on emergency planning and ITAAC on physical security hardware. The complete set of facility ITAAC (or COL ITAAC) will be incorporated into the COL as a license condition to be satisfied prior to fuel load. Guidance on ITAAC for COL applicants that reference an ESP, a DCD, or both is provided in DG-1145, Section C.II.7, ITAAC for COL Applications referencing a Certified Design and/or Early Site Permit.

C.II.2.1 Design Descriptions and ITAAC Format and Content

Design Description and ITAAC Design Description

The content of proposed ITAAC should be based on the information provided in the detailed design descriptions for SSC's contained in the FSAR portion of the COL application. This FSAR information is similar to the Tier 2 document provided for a certified design and includes specific information on design requirements and safety functions and provides relevant tables and figures. In a certified design, a Tier 1 document that contains design descriptions, ITAAC and site interface requirements is also provided and is strictly controlled by regulation. The design descriptions contained in a Tier 1 document provide a summary level design basis for the SSCs that is derived from the Tier 2 document. In addition, the design description contains tables and figures that are referenced in the design commitments column of the ITAAC. The tables and figures identify the components, equipment, system piping, building walls, etc. that must be verified by ITAAC and provide a convenient method for managing the size of the ITAAC tables. For example, ITAAC which require verification of functional arrangement for a system typically refer to "the functional arrangement of the XXX system as shown in Figure X.X". Also, ITAAC which require verification of the design functions of motor-operated valves (MOVs) may refer to a specific table listing these MOVs.

Although not a requirement, the COL applicant that does not reference a certified design may also develop design descriptions that include design bases, tables and figures for use and reference specifically by the ITAAC. In this case and to distinguish these design descriptions from those included in the Tier 1 document for a certified design, the COL applicant's descriptions should be called *ITAAC Design Descriptions*. These *ITAAC Design Descriptions* should be separate from but derived from the detailed design information contained in the FSAR portion of the COL application. The proposed ITAAC could reference specific sections, tables, and figures in the *ITAAC Design Descriptions* for design requirements/commitments to be verified. It is expected that any *ITAAC Design Descriptions*, tables or figures that are developed specifically for and referenced in the ITAAC should be included in the COL application section containing the ITAAC and maintained separate from the FSAR portion of the COL application. If the COL applicant chooses not to develop separate *ITAAC Design Descriptions*, the proposed ITAAC should reference specific sections, tables, and figures in the FSAR portion of the COL application. It should be noted that, although the information provided in a COL application that does not reference a certified design may be similar in level of detail as that provided in a certified design, the Tier 1 and Tier 2 designations do not apply to a COL application that does not reference a certified design because certified design information is subject to a different change process (i.e., Section VIII of the applicable 10 CFR Part 52 appendix) than COLs. Further guidance on the change process is provided in DG-1145, Section C.IV.3, General Description of Change Processes.

ITAAC Tabular Format and Content

The format of an ITAAC should be a 3-column table format as shown in the Sample ITAAC Format table on page 21 of this section. Please note that the input provided in this sample table is used to establish an acceptable format only (e.g., ITAAC terminology such as "basic configuration" that was used in previously certified designs has been replaced with more specific terminology such as “functional arrangement.” For further discussion on terminology refer to Section C.III.7).

The first column of the ITAAC table should identify the proposed design requirement/ commitment to be verified. This column should contain the text for the specific design commitment that is extracted from the detailed design descriptions contained in the COL application or from the ITAAC design descriptions. Any differences in text should be minimized, unless intended, for example, to better conform the commitments in the design description with the ITAAC format. Any differences in text, however, should retain the principal performance characteristics and safety functions of the design that must be verified.

The second column of the ITAAC table should identify the proposed method by which the design requirement/commitment described in Column 1 will be verified by the licensee. The method is by inspection, testing, or analysis or some combination of these. The detailed design information provided in the COL application should contain detailed supporting information for various inspections, tests, and analyses that can, and should be, used to satisfy the acceptance criteria. This information describes an acceptable means, but not the only means, of satisfying an ITAAC.

Inspections are as defined in Section C.II.2.1.1, and include visual and physical observations, walkdowns or record reviews.

Tests are as defined in Section C.II.2.1.1 and mean the actuation, operation, or establishment of specified conditions to evaluate the performance or integrity of the as-built SSCs. This includes functional and hydrostatic tests for the systems. The preferred means to satisfy the ITAAC is in-situ testing, where possible, of the as-built facility. The term "as-built" is intended to mean testing in the final as-installed condition at a facility. The term "type tests" is used in this column to mean manufacturer's tests or other tests that are not necessarily intended to be in the final as-installed condition. The results of pre-operational tests can be used to satisfy an ITAAC. However, the pre-operational tests described in Section 14.2 of a COL application, or in RG 1.68, are not a substitute for ITAAC. Where testing is specified, appropriate conditions for the test should be established in accordance with the Initial Test Program (ITP) described in Section 14.2 of a COL application, and in RG 1.68. Conversion or extrapolation of the test results from the test conditions to the design conditions may be necessary to satisfy the ITAAC. The COL applicant should provide suitable justification for and applicability of any necessary conversions or extrapolations of test results necessary to satisfy ITAAC.

Analyses are as defined in Section C.II.2.1.1, and may refer to detailed supporting information in the applicable sections of the COL application, simple calculations, or comparisons with operating experience or design of similar SSCs. The details of the analysis method must be specified in either the ITAAC or in the applicable sections of the COL application. The ITAAC should not reference the applicable sections of the COL application, but COL application sections may reference the appropriate ITAAC. For example, detailed analysis methods of seismic and environmental qualification supporting detailed design descriptions for SSCs are contained in Chapter 3 of the COL application and detailed piping design information supporting additional design material applicable to multiple sections of the design are also contained in Chapter 3.

The third column of the ITAAC table should identify the proposed specific acceptance criteria for the inspections, tests, or analyses described in Column 2 which, if met, demonstrate that the design requirements/commitments in Column 1 have been met by the licensee. In general, the acceptance criteria should be objective and unambiguous so that misinterpretations are prevented. Numeric performance values for SSCs may be specified as ITAAC acceptance criteria when values consistent with the design commitments are possible, or when failure to meet the stated acceptance criterion would clearly indicate a failure to properly implement the design (i.e., values selected for verification should be those credited in the safety analyses rather than the design values).

The type of information and the level of detail included in ITAAC is based on a graded approach that is commensurate with the safety significance of the SSCs for the facility. Top-level design information selected for verification in ITAAC should contain the principal performance characteristics and safety functions of the SSCs, their importance in various safety analyses, and their functions for defense-in-depth considerations. At a minimum, the following should be considered in the COL applicants development of proposed ITAAC:

- Design-specific and unique features of the facility should be carefully considered for inclusion in ITAAC
- Ensure that ITAAC reflect the important insights and assumptions from the PRA with respect to the safety significance of SSCs
- Ensure that ITAAC reflect the resolutions of technically relevant USIs/GSIs, NRC generic correspondence such as bulletins and generic letters; and relevant industry operating experience
- Ensure that ITAAC are consistent with the technical specifications, including their bases and limiting conditions for operation
- Ensure that ITAAC are consistent with the pre-operational test program described in Section C.I.14.2, since many of the pre-operational tests for SSCs may be used to satisfy ITAAC
- ITAAC should emphasize testing of the as-built facility and use the definitions for testing as provided in Section C.II.2.1.1
- Ensure that ITAAC include SSCs whose features or functions are necessary to satisfy the NRC's regulations in 10 CFR Parts 20, 50, 52, 73, or 100
- Ensure that ITAAC include severe accident design features and plant features designed for protection against hazards
- SSCs for which there is no discernible safety significance should have “no entry” for their ITAAC.

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

In addition, cross references should also be provided showing how key insights and assumptions from facility-specific PRA and severe accident analyses are addressed in the design information in the COL application. For these analyses only, the cross-references should show where each key assumptions and insights have been captured in ITAAC, as well as the technical specifications (including administrative controls), reliability assurance activities, emergency procedure guidelines, and the initial test program. These cross-references may be developed along with the detailed facility-specific PRA and severe accident analyses and should be provided in the section of the COL application containing the facility-specific ITAAC. The cross-references should be sufficiently detailed to allow a COL applicant or licensee to consider whether a proposed design change impacts the treatment (i.e., inclusion or exclusion) of these parameters in ITAAC.

Specific guidance on development of ITAAC is provided in Section C.II.2.2 and general guidance is provided in Attachment A to assist COL applicants with the development of their COL ITAAC. The specific guidance has been developed primarily to be consistent with NRC staff review responsibilities as defined in the Standard Review Plan and the general guidance has been developed to be consistent with functional engineering disciplines and may include specific guidance for topics unique to design certifications, advanced and/or evolutionary reactors.

C.II.2.1.1 Definitions

Although not all-inclusive, the following definitions associated with terms which may be used in the design descriptions for SSCs in the COL application should be used by COL applicants in the development of their proposed ITAAC:

Acceptance Criteria means the performance, physical condition, or analysis result for a structure, system or component that demonstrates the design requirement/commitment is met.

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

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

Column Line is the designation applied to a plant reference grid used to define the location of building walls and columns. Column lines may not represent the center line of walls and columns. (Alternative plant reference grids should be defined by the COL applicant and a discussion of its use should be provided in the COL application).

Design Description for a COL application that does not reference a certified design means the detailed design information contained in the FSAR. For a certified design, the design description is part of Tier 1 information (see appendices to 10 CFR Part 52 for definitions associated with certified designs) and is the design basis that is verified by ITAAC. Tier 1 information is strictly controlled by regulations can be considered to be a summation of the detailed design information contained in the FSAR (or Tier 2) for a certified design.

Design Requirement/Commitment means that portion of the design description provided in the COL application or in the ITAAC design description that is verified by ITAAC. The design requirement is a design commitment of the licensed facility and is equivalent to the design basis for an SSC.

Design Plant Grade means the elevation of the soil around the facility assumed in the design (i.e., typically, the elevation is correlated to an elevation specified in the nuclear island)

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

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

Exists means that the item is present and meets the design description provided in the COL application.

Functional Arrangement (for a system) means the physical arrangement of systems and components to provide the service for which the system is intended, and which is described in the system design description.

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

ITAAC means the set of inspections, tests, analyses and acceptance criteria that the licensee proposes and the staff approves to conduct on the facility design to verify that the design requirements as committed in the license can be met thus ensuring that the facility is constructed and can be operated in accordance with the licensed design.

ITAAC Design Description is an optional information feature for a COL applicant that does not reference a certified design to provide flexibility for developing ITAAC which may involve verification for numerous SSCs. It is intended to provide the same level of design information as the Tier 1 Design Description for a certified design but without the strict regulatory controls, and may, at a minimum, consist only of tables and figures that are referenced in the ITAAC.

Operate means the actuation of and running of the actuated equipment.

Physical Arrangement (for a structure) means the arrangement of the building features (e.g., floors, ceilings, walls, doorways, and basemat) and of the structures, systems, and components within, which are described in the building design description.

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

Transfer Open (Closed) means to move from a closed (open) position to an open (closed) position.

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

C.II.2.2 Specific ITAAC Development Guidance and Organizational Conformance with Standard Review Plan (NUREG-0800)

The guidance provided in Section C.I of DG-1145 is for a COL applicant that does not reference a certified design and/or an early site permit. The regulations contained in 10 CFR Part 52 include requirements for providing proposed ITAAC with an application for design certification per Subpart B of Part 52 and with an application for a combined license per Subpart C or Part 52. In developing the guidance in DG-1145, the NRC staff also considered the corresponding interface with the Standard Review Plan (SRP) NUREG-0800. That is, the guidance provided in DG-1145 for the information that must be submitted to the NRC by an applicant for a COL will be reviewed in accordance with the SRP to determine compliance with the applicable regulations. To better facilitate the interface between DG-1145 and the SRP, the specific guidance for developing ITAAC has been organized in the same manner as the SRP. That is, SRP Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria - Design Certification", provides introduction and general guidance for the following associated SRPs, which have been organized in accordance with the primary review responsibilities of the NRC technical staff branches:

SRP 14.3.1	Site Parameters (Tier 1)
SRP 14.3.2	Structural and Systems Engineering (Tier 1)
SRP 14.3.3	Piping Systems and Components (Tier 1)
SRP 14.3.4	Reactor Systems (Tier 1)
SRP 14.3.5	Instrumentation and Controls (Tier 1)
SRP 14.3.6	Electrical Systems (Tier 1)
SRP 14.3.7	Plant Systems (Tier 1)
SRP 14.3.8	Radiation Protection and Emergency Preparedness (Tier 1)
SRP 14.3.9	Human Factors Engineering (Tier 1)
SRP 14.3.10	Initial Test Program and D-RAP (Tier 1)
SRP 14.3.11	Containment Systems and Severe Accidents (Tier 1)

Based on discussions among the NRC staff with regard to the need for ITAAC, the following changes in SRP Sections should be made:

- separate SRP Section 14.3.8 into 2 distinct SRPs: one for Radiation Protection (14.3.8) and one for Emergency Planning (14.3.10).
- develop a new SRP Section for Physical Security hardware ITAAC (Physical Security - SRP Section 14.3.12).
- delete SRP Section 14.3.10 for Initial Test Program and D-RAP (Tier 1)(i.e., incorporated into SRP Section 14.2)

It should be noted, however, that SRP Section 14.3 and its associated SRP Sections were developed with more of a focus on reviewing design certification applications per Subpart B of 10 CFR 52. As a result, the review guidance for these SRPs may not address the entire review scope for a COL application. The guidance for Section C.I of DG-1145, however, addresses the entire scope for a COL application that does not reference a certified design. As such, exact correlations between the DG-1145 guidance and the SRP review guidance may not exist for some areas. For example, the guidance and review scope for site parameters will be different because a COL application that does not reference a certified design must include design information for an entire facility at a specifically chosen site. As such, the site parameters are defined by the chosen site and there is no effort required by a COL applicant, in this example, to ensure the site parameters assumed in a certified design are, in fact, applicable and in conformity with the parameters of the chosen site.

Additional generic guidance for development of ITAAC is provided in Attachment A of this section and was developed consistent with functional engineering disciplines. The following sections provide discussion and guidance on the development of ITAAC for a COL applicant that does not reference a certified design and/or an early site permit. To ensure consistency and completeness in the development of ITAAC, COL applicants should consider the specific guidance provided in the following sections, refer to the sample ITAAC format table provided in this section and apply the general guidance, as applicable, provided in Attachment A of this Section.

14.3.1 ITAAC for Site Parameters

COL applicants that do not reference a certified design and/or an early site permit must provide design information for their entire proposed facility at a specifically chosen site. As such, the site parameters that are specific to the chosen site will be used in the design basis for the proposed facility. This is unlike certified designs which are developed to encompass a broad range of potential sites and for which a set site parameters, as required by 10 CFR 52.47, are defined in the Tier 1 portion of the certified design and for which a COL applicant referencing that certified design must demonstrate compliance. Although the site parameters for certified designs were included in the Tier 1 document, no ITAAC were developed for these site parameters. Likewise, it is not expected that there will be a need for any site parameter ITAAC to be developed for a COL applicant that does not reference a certified design and/or early site permit. Therefore, no applicable guidance is provided for developing site parameter ITAAC. However, it is recognized that the parameters for the site specified in a COL application that does not reference a certified design will form the bases for many of the ITAAC developed for the facility described in the COL application.

14.3.2 ITAAC for Structures and Systems

This subsection primarily involves building structures and structural aspects of major components such as the reactor pressure vessel (RPV), pressurizer (PUR), steam generator, etc.

Ideally, ITAAC for structures and systems should be developed and grouped by systems and building structures. However, COL applicants may propose their own bases for grouping and organizing ITAAC for structures and systems. For as-built building structures, the structural capability is typically verified by performing an analysis to reconcile the as-built data with the structural design bases for each safety-related building or with verification of building dimensions. System-specific performance tests are typically conducted to demonstrate that the as-built system can perform its intended function. For major as-built components, the verification of design, fabrication, testing, and performance requirements should be partially addressed in conjunction with the specific system ITAAC.

The scope of structural design covers the major structural systems in the COL applicants proposed facility, including the RPV, ASME Code Class 1, 2, and 3 piping systems, and major building structures (primary containment, reactor building, control building, turbine building, service building, radwaste building, etc.). In addition, other structures and systems that are considered to be risk significant based on insights from the COL applicant's PRA should be included. Using the general design criteria (GDC) of 10 CFR 50, Appendix A, the following design attributes for the major structures and systems in the proposed facility should be verified by ITAAC proposed by a COL applicant:

1) pressure boundary integrity (GDC 14, 16, and 50)
2) normal loads (GDC 2)
3) seismic loads (GDC 2)
4) suppression pool hydrodynamic loads (GDC 4)
5) flood, wind, and tornado (GDC 2)
6) rain and snow (GDC 2)
7) pipe rupture (GDC 4)
8) codes and standards (GDC 1)

In addition, to ensure that the final as-built plant conforms with the licensed facility, COL applicants should provide ITAAC to reconcile the as-built plant with the structural design basis. The following provides summary level guidance for developing ITAAC to confirm the design attributes identified above.

Pressure Boundary Integrity

- ITAAC should be established to verify the pressure boundary integrity of the RPV, PUR, steam generator, piping, and primary containment as these are needed to ensure the defense-in-depth principle
- For the RPV, PUR, steam generator, and piping, hydrostatic tests and preoperational nondestructive examinations (NDE) performed in conjunction with the ASME Boiler and Pressure Vessel Code, Section III (ASME BPV III) and Section V (ASME BPV V) should be required by ITAAC
- For the primary containment, a structural integrity test should be required by ITAAC to be performed on the pressure boundary components of the primary containment in accordance with ASME BPV III.

Normal Loads

- ITAAC should be established to verify that the normal and accident loads have been appropriately combined with the effects of natural phenomena for the as-built SSCs.
- For piping systems, ITAAC should require an analysis to reconcile the as-built piping design with the design basis loads, which incorporate the appropriate combination of normal and accident loads.
- ITAAC should verify that the ASME Code-required reports exist to document that the RPV has been designed, fabricated, inspected, and tested to Code requirements to ensure adequate safety margin.
- For safety-related buildings, ITAAC should require a structural analysis report that reconciles the as-built plant with the structural design basis loads, which include the combination of normal and accident loads with the effects of natural phenomena
- ITAAC should apply only to safety-related and risk-significant structures
- ITAAC for other design aspects of structures as deemed appropriate by the COL

applicant may be included

Seismic Loads

- ITAAC should be developed to verify that safety-related systems and structures have been designed to seismic loadings
- Component qualification for seismic loads should be addressed by ITAAC established for the specific systems containing the components
- ITAAC should require an analysis to reconcile the as-built piping design with the design basis loads, which include seismic loads
- ITAAC should verify that the ASME Code-required reports exist to document that the RPV has taken seismic loads into proper consideration during design and fabrication
- For safety-related buildings, ITAAC should require a structural analysis report that reconciles the as-built plant with the structural design basis loads, which include seismic loads
- ITAAC should be developed to verify that, under seismic loads, the collapse of buildings containing components designed to prevent fission product leakage will not impair the safety related functions of any structures or equipment located adjacent to or within these buildings
- ITAAC should be developed, as needed, to verify that failure of non-seismic Category I structures, systems and components, will not impair the ability of nearby safety-related SSCs to perform their safety-related functions
- ITAAC should be developed to verify that under seismic loading, the fire protection standpipe systems in areas containing safety-related SSCs will remain functional

Suppression Pool Hydrodynamic Loads (BWRs only)

- ITAAC should be developed to verify that the safety-related systems and structures have been designed to suppression pool hydrodynamic loadings, which include safety relief valve discharge and loss-of-coolant-accident (LOCA) loadings
- Component qualification for suppression pool loading may be contained in or addressed by ITAAC developed for the specific systems containing the components
- ITAAC should require an analysis to reconcile the as-built piping design with the design basis loads, which include suppression pool hydrodynamic loads
- For the RPV, ITAAC should verify that the ASME Code required reports exist to ensure that the RPV has been designed (to accommodate hydrodynamic loads), fabricated, inspected, and tested to meet ASME Code requirements
- ITAAC should require an analysis for reconciling the building as-built configuration with the structural design basis loads, which include suppression pool hydrodynamic loads
- ITAAC should also require verification of horizontal vent system, water volume, and the safety-relief valve discharge line quencher arrangement to ensure adequacy of the suppression pool hydrodynamic loads used for design

Flood, Wind, Tornado, Rain, and Snow

- ITAAC should be developed to verify that the safety-related systems and structures have been designed to withstand the effects of natural phenomena other than a seismic event (i.e., flood, wind, tornado, rain, and snow, as applicable)

- For safety-related buildings and risk-significant structures, ITAAC should require an analysis for reconciling the as-built plant with the structural design basis loads, which include the flood, wind, tornado, rain, and snow loads, as applicable)
- ITAAC should require inspections to verify that divisional flood barriers and water-tight doors exist and penetrations in the divisional walls are sealed up to the internal and external flood levels
- For safety-related buildings and risk significant structures, ITAAC should require inspections to verify that flood barriers are installed up to the finished plant grade level to protect against water seepage, and flood doors and flood barrier penetrations are provided with flood protection features
- ITAAC should require inspections to verify that water-tight doors exist, penetrations in the divisional walls are at an acceptable level above the floor, and that safety-related and risk-significant electrical, instrumentation, and control equipment are located at an acceptable level above the floor surface
- For safety-related buildings and risk significant structures, ITAAC should verify that external walls that are below flood level are of adequate thickness to protect against water seepage, and penetrations in external walls below flood level are provided with flood protection features

Pipe Break

- ITAAC should be developed to verify that safety-related and risk significant SSCs have been designed to withstand the dynamic effects of pipe breaks
- Component qualification for the dynamic effects of pipe breaks should be addressed by ITAAC developed for the specific systems containing these components
- ITAAC for the RPV system should require an inspection of critical locations that establish the bounding loads in the LOCA analysis for the RPV to ensure that the as-built areas do not exceed the postulated break areas assumed in the LOCA analyses
- ITAAC should be developed to verify by inspections of as-built, high-energy pipe break mitigation features and of the pipe break analysis report that safety-related and risk significant SSCs be protected against the dynamic and environmental effects of the postulated high-energy pipe breaks

Codes and Standards

- ITAAC should be developed to verify by inspection that ASME Code-required documents that demonstrate that the RPV, piping systems, and containment pressure boundaries have been designed and constructed to their appropriate Code requirements

As-Built Reconciliation

- ITAAC should be developed to verify by inspection that structural analyses which reconcile the as-built configuration of plant structures with the structural design bases of the licensed facility are documented in structural analyses reports
- ITAAC should be developed to verify by inspection that analyses for piping systems which verify the existence of acceptable final as-built piping stress reports that conclude the as-built piping systems are adequately designed are documented in an as-built piping analysis report
- ITAAC should be developed to verify by inspection that for the as-built RPV, the key dimensions of the as-built RPV system and acceptable variations of the key dimensions

are verified to conform with the licensed design are documented in an as-built report

- For component qualification, ITAAC for seismic Category I mechanical and electrical equipment (including connected instrumentation and controls) to demonstrate that the as-built equipment and associated anchorages are qualified to withstand design basis dynamic loads without loss of safety function should be included in the specific system ITAAC in which the equipment is located.

14.3.3 ITAAC for Piping Systems and Components

This subsection primarily involves piping system design and components and includes treatment of motor-operated valves (MOVs), power-operated valves (POVs), and check valves, as well as dynamic qualification, welding, and safety classification of SSCs.

The scope of piping systems and components covers piping design criteria, structural integrity and functional capability of safety-related and risk significant piping systems included in the COL applicants facility design. The scope is not limited to ASME BPV Code Class 1, 2, and 3 piping and supports, but includes buried piping, instrumentation lines, the interaction of non-seismic Category I piping with seismic Category I piping, and any safety-related and risk significant piping designed to industry standards other than the ASME Code. It also includes analysis methods, modeling techniques, pipe stress analysis criteria, pipe support design criteria, high-energy line break criteria, and leak-before-break (LBB) approach, as applicable to the COL applicants facility design.

ITAAC for piping systems

- ITAAC should be developed to require that an ASME Code certified stress report exists to ensure that the ASME Code Class 1, 2, and 3 piping systems and components are designed to retain their pressure boundary integrity and functional capability under internal design and operating pressures and design basis loads
- ITAAC should be developed to require that a pipe break analysis report exists and documents that as-built SSCs that are required to be functional during and following an SSE have adequate high-energy pipe break mitigation features (i.e., confirms that: as-built piping stresses in the containment penetration area are within their allowable stress limits; as-built pipe whip restraints and jet shield designs are capable of mitigating pipe break loads; loads on safety related SSCs are within their design load limits, and; as-built SSCs are protected or are qualified to withstand the environmental effects of postulated pipe failures)
- If the design uses LBB methods, ITAAC should be developed to require that a LBB evaluation report exists which documents that LBB acceptance criteria are complied with for the as-built piping and piping materials for the systems to which LBB is applied
- ITAAC should be developed to require that an as-built piping stress report exists that documents the results of an as-built reconciliation analysis confirming that the as-built piping system(s) have been built in accordance with the ASME Code certified stress report (i.e., confirms through use of as-built documentation used for construction has been reconciled with the documentation used for design analysis and with the certified stress report)

ITAAC for components and systems should be developed to verify the piping and component classification, fabrication, dynamic and seismic qualification, and selected testing and performance requirements.

- the ASME BPV Code class requirements may be verified by either a generic piping ITAAC, as described above, or by each system-specific ITAAC
- system-specific ITAAC should be developed to verify the welding quality of as-built pressure boundary welds for ASME Code Class 1, 2, and 3 SSCs
- system-specific ITAAC should be developed to verify pressure integrity for ASME Code Class 1, 2, and 3 SSCs by specifying hydrostatic testing
- system-specific ITAAC should be developed to verify by inspection the dynamic qualification records (e.g., seismic, LOCA, and safety relief valve discharge loads) of seismic Category I mechanical and electrical equipment (including connected instrumentation and controls) including equipment anchorages
- system-specific ITAAC should be developed to verify by inspection the vendor test records that demonstrate the ability of MOVs to function under design conditions
- system-specific ITAAC should be developed to verify via in-situ testing the ability of installed MOVs, power-operated valves, check-valves, and dynamic restraints to perform their intended functions under expected ranges of fluid flow, differential pressure, electrical, and temperature conditions up to and including design basis conditions

14.3.4 ITAAC for Reactor Systems

This subsection primarily involves reactor systems, fuel, control rods, loose parts monitoring system, and core cooling systems.

- ITAAC should be developed to verify important input parameters used in the transient and accident analyses for the facility design
- ITAAC should be developed to verify net positive suction head for key pumps
- ITAAC should be developed to verify elevation differences between the reactor core and storage pools and/or tanks credited in the safety analyses for passive plants
- ITAAC should be developed to verify the design pressures of the piping systems that interface with the reactor coolant boundary to validate intersystem LOCA analyses
- ITAAC should be developed to verify the following design aspects of reactor systems:
  - (1) functional arrangement
  - (2) seismic and ASME code classification
  - (3) weld quality & pressure boundary integrity
  - (4) valve qualification and operation
  - (5) controls, alarms, and displays
  - (6) logic & interlocks
  - (7) equipment qualification for harsh environments
  - (8) interface requirements with other systems
  - (9) numeric performance values
  - (10) Class 1E electrical power sources and divisions, if applicable
  - (11) system operation in various modes

14.3.5 ITAAC for Instrumentation and Controls

This subsection primarily involves instrumentation and controls (I&C) involving reactor protection and control, engineered safety features actuation, reactivity control systems, other miscellaneous I&C systems, digital computers in I&C systems, and selected interface requirements related to I&C issues. It is recognized that in some I&C areas the facility design may not have attained design completion, therefore, some of the guidance related to ITAAC more accurately describes verification of design process application, design completion, and design implementation rather than just verification of as-built design implementation. Further guidance in these areas can be found in the Instrumentation and Control Systems portion of Appendix A to this section.

ITAAC for instrumentation and controls should be developed to address the following:

(1) Compliance with 10 CFR 50.55a(h), "Criteria for Protection Systems for Nuclear Generating Stations," and IEEE Standard 603-1991 and the correction sheet dated January 30, 1995, as they pertain to safety systems. The ITAAC needs to address each of the following sections of IEEE Std. 603-1991:

- Section 4.1 Identification of the design basis events
- Section 4.4 Identification of variables monitored and analytical limits
- Section 4.5 Minimum criteria for manual initiation and control of protective actions
- Section 4.6 Identification of the minimum number and location of sensors
- Section 4.7 Range of transient and steady-state conditions
- Section 4.8 Identification of conditions having the potential for causing functional degradation of safety system performance
- Section 4.9 Identification of the methods used to determine reliability of the safety system design
- Section 5.1 Single-Failure Criterion
- Section 5.2 Completion of Protective Action for protective actions
- Section 5.3 Quality
- Section 5.4 Equipment Qualification
- Section 5.5 System Integrity
- Section 5.6 Independence
  - Physical independence.
  - Electrical independence.
  - Communications independence.
- Section 5.7 Capability for Test and Calibration
- Section 5.8 Information Displays
- Section 5.9 Control of Access
- Section 5.10 Repair
- Section 5.11 Identification
- Section 5.12 Auxiliary Features
- Section 5.13 Multi-Unit Stations
- Section 5.14 Human Factors Considerations
- Section 5.15 Reliability
- Sections 6.1 and 7.1 Automatic Control
- Sections 6.2 and 7.2 Manual Control
- Section 6.3 Interaction Between the Sense and Command Features and Other Systems
- Section 6.4 Derivation of System Inputs
- Section 6.5 Capability for Testing and Calibration
- Sections 6.6 and 7.4 Operating Bypasses
- Sections 6.7 and 7.5 Maintenance Bypass
- Section 6.8 Setpoints
- Section 7.3 Completion of Protective Action for Executive Features

- Section 8 Power Source Requirements

(2) Compliance with General Design Criteria in Appendix A to Part 50. The ITAAC needs to address each of the following GDCs:

- GDC 1, as it pertains to quality standards for design, fabrication, erection and testing
- GDC 2, as it pertains to protection against natural phenomenon
- GDC 4, as it pertains to environmental and dynamic effects
- GDC 13, as it pertains to instrumentation and control requirements
- GDC 19, as it pertains to control room requirements
- GDC 20, as it pertains to protection system design requirements
- GDC 21, as it pertains to protection system reliability and testability requirements
- GDC 22, as it pertains to protection system independence requirements
- GDC 23, as it pertains to protection system failure modes requirements
- GDC 24, as it pertains to separation of protection systems from control systems
- GDC 25, as it pertains to protection system requirements for reactivity control malfunctions
- GDC 29, as it pertains to protection against anticipated operational occurrences requirements

(3) Documentation of a high quality software design process

- The following planning documentation should be addressed in the ITAAC, with a requirement to demonstrate each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14:
  - Software management plan
  - Software development plan
  - Software test plan
  - Software quality assurance plan
  - Integration plan
  - Installation plan
  - Maintenance plan
  - Training plan
  - Operations plan
  - Software safety plan
  - Software verification and validation plan
  - Software configuration management plan.

- The following implementation documents should be addressed in the ITAAC, with a requirement to demonstrate each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14:
  - Safety analyses
  - Verification and validation analysis and test reports
  - Configuration management reports
  - Requirement traceability matrix

  The implementation documents should document each of the following life-cycle phases:
  - Requirements
  - Design
  - Implementation

- Integration
- Validation
- Installation
- Operations
- Maintenance

• The following software life cycle process design outputs documents should be addressed in the ITAAC, with a requirement to demonstrate each of the characteristics shown in SRP Chapter 7, BTP 7-14:
  - The system test procedures and test results (validation tests, site acceptance tests, pre-operational and start-up tests) that provide assurance that the system functions as intended.
  - The application should confirm that Defense-in-Depth and Diversity design conforms to the guidance of SRP Chapter 7, BTP 7-19, "Guidance for Evaluation of Defense-in-Depth and Diversity in Digital Computer-Based Instrumentation and Control Systems.'
  - The application should confirm that digital safety system security guidance is in conformance with or commit to NRC Regulatory Guide 1.152, Revision 2, "Criteria for Use of Computers in Safety Systems of Nuclear Power Plants."
  - Software requirements specifications
  - Hardware and software architecture descriptions
  - Software design specifications
  - Code listings
  - Build documents
  - Installation configuration tables
  - Operations manuals
  - Maintenance manuals
  - Training manuals

14.3.6 ITAAC for Electrical Systems

This subsection primarily involves the entire station electrical system, including Class 1E portions of the system, major portions of the non-Class 1E system, and portions of the plant lighting system. The development of ITAAC for evolutionary plants which typically involve a significant amount of reliance on AC electrical systems for accomplishing safety systems may be much different than the development of ITAAC for passive plant designs that involve much less reliance on AC electrical systems for accomplishing safety functions.

ITAAC for electrical systems and equipment should be developed to verify the following:

1. Equipment qualification for seismic and harsh environments

• ITAAC should be developed to verify that Class 1E equipment is seismic Category I and equipment located in a harsh environment is qualified

2. Redundancy and Independence

• ITAAC should be developed to verify the Class 1E divisional assignments and independence of electric power by both inspections and tests

3. Capacity and capability

- ITAAC should be developed to verify the adequate sizing of the electrical system equipment and its ability to respond (e.g., automatically in the times needed to support the accident analyses) to postulated events
- ITAAC should be included to analyze the as-built electrical system and installed equipment (e.g., diesel generators, transformers, switchgear, DC systems and batteries, etc.) to verify its ability to power the loads, including tests to demonstrate the operation of equipment
- ITAAC should be developed to verify the initiation of the Class 1E equipment necessary to mitigate postulated events for which the equipment is credited (e.g., LOCA, loss of normal preferred power, and degraded voltage conditions)
- ITAAC should be included to analyze the as-built electrical power system for its response to a LOCA, loss of voltage, combinations of LOCA and loss of voltage, and degraded voltage, including tests to demonstrate the actuation of the electrical equipment in response to postulated events

4. Electrical protection features

- ITAAC should be included to analyze the as-built electrical system equipment for its ability to withstand and clear electrical faults
- ITAAC should be included to analyze the protection feature coordination to verify its ability to limit the loss of equipment due to postulated faults

5. Displays/controls/alarms

- ITAAC should be included to inspect for the ability to retrieve the information (displays and alarms), and to control the electrical power system in the main control room and/or at locations provided for remote shutdown

6. Offsite Power

(4) ITAAC should be included to inspect the direct connection of the offsite power sources to the Class 1E divisions and to inspect for the adequacy of voltage, capacity, and independence/separation of the offsite sources

- ITAAC should be developed to inspect for appropriate lightning protection and grounding features

7. Containment Electrical Penetrations

- ITAAC should be developed to verify that all electrical containment penetrations are protected against postulated currents greater than their continuous current rating

8. Combustion Turbine Generator (if applicable)

- ITAAC should be developed to verify, through inspection and testing, the combustion gas turbines and its auxiliaries as an alternate AC power source for station blackout events and its independence from other AC sources

9. Lighting

- ITAAC should be included to verify the continuity of power sources for plant lighting systems to ensure that portions of the plant lighting remain available during accident scenarios and power failures

10. Electrical Power for Non-Safety Plant Systems

- ITAAC should be included to verify the functional arrangement of electrical power systems provided to support non-safety plant systems

11. Physical Separation and Independence

- ITAAC should be included to verify separation and independence of redundant electrical equipment, circuits, and cabling for post-fire safe shutdown

14.3.7 ITAAC for Plant Systems

This subsection primarily involves most of the fluid systems that are not part of the reactor systems, and also includes new and spent fuel handling systems, power generation systems, air systems, cooling water systems, radioactive waste systems, and heating, ventilation and air conditioning systems, and fire protection systems.

- ITAAC should be developed to require as-built plant reports for reconciliation with flood analyses to ensure consistency with design requirements of systems, structures and components for flood protection and mitigation
- ITAAC should be developed to require as-built plant reports for reconciliation with post-fire safe shutdown analyses to ensure consistency with design requirements of systems, structures and components for fire protection and mitigation (e.g., fire detection and alarm systems, fire suppression systems, fire barriers, etc.)
- ITAAC should be developed to verify heat removal capabilities for design-basis accidents and tornado and missile protection
- ITAAC should be developed to verify net positive suction head for key pumps
- ITAAC should be developed to verify physical separation for appropriate systems
- ITAAC should be developed to verify the minimum inventory of alarms, controls, and indications as derived from emergency procedure guidelines, Reg Guide 1.97, and PRA insights is provided for the main control room and remote shutdown station(s)
- ITAAC should be developed to verify the following design aspects for plant systems:

  (1) functional arrangement
  (2) key design features of systems
  (3) seismic and ASME code classifications
  (4) weld quality and pressure boundary integrity, as necessary
  (5) valve qualification and operation

(6) controls, alarms, and displays
(7) logic & interlocks
(8) equipment qualification for harsh environments
(9) interface requirements with other systems
(10) numeric performance values

14.3.8 ITAAC for Radiation Protection

This subsection primarily involves those structures, systems, and components that provide radiation shielding, confinement or containment of radioactivity, ventilation of airborne contamination, or radiation (or radioactivity concentration) monitoring for normal operations and during accidents.

- ITAAC should be developed to verify the adequacy of as-built walls, structures, and buildings as radiation shields, as applicable
- ITAAC should be developed to verify the plant airborne concentrations of radioactive materials through the adequate design of ventilation and airborne monitoring system designs
- ITAAC should be developed to verify functional arrangement of ventilation systems
- ITAAC should be developed to verify equipment leakage characteristics (e.g., tanks, pumps, blowers, dampers, valves, primary containment penetrations, ductwork, etc.) assumed in developing plant radiation zone maps and accident doses
- ITAAC should be developed to verify environmental qualification of radiation detection and monitoring equipment, as necessary, including damper motors, etc.
- ITAAC should be developed to verify radiation levels and airborne radioactivity levels within plant rooms and areas to verify adequacy of plant shielding and ventilation system designs
- ITAAC should be developed to verify radiation levels are commensurate with area access requirements for compliance with ALARA during normal plant operations and maintenance
- ITAAC should be developed to verify adequate shielding is provided to ensure radiation levels in plant areas necessary for operator actions to aid in the mitigation of or recovery from an accident
- ITAAC should be developed to verify radiation dose to public is within a small fraction of EPA dose limit in 40 CFR Part 190
- ITAAC should be developed to verify performance requirements of components and systems assumed in accident consequence evaluations (e.g., minimum radioiodine removal efficiency of charcoal adsorbers, maximum delay time, maximum time for drawing specified negative pressure, ventilation system flow rates, etc.)

14.3.9 ITAAC for Human Factors Engineering

This subsection primarily involves human factors engineering as it pertains to main control panels, remote shutdown panels, local control panels, technical support center, and emergency offsite facility. In addition, it involves minimum inventory of alarms, controls, and indications appropriate for the main control room and the remote shutdown station.

Because the implementation of human factors engineering is part of the design process, the ITAAC for human factors engineering (HFE) should primarily address the verification of the products resulting from implementing the HFE (e.g., verification of the functionality of panel designs and associated instrumentation).

The following HFE ITAAC should be developed:

- Verification of the design implementation of the HFE aspects of the main control room (i.e., ensuring that the as-built design conforms to the verified validated design that resulted from the HFE design process). These ITAAC also should address the special considerations listed in Section C.I.18.7.3 of this Regulatory Guide such as safety function monitoring and minimum inventory of controls, displays, and alarms
- Verification of the design implementation of the HFE aspects of the remote shutdown station (e.g., functionality and minimum inventory of remote shutdown station controls, displays, and alarms)
- Verification of the design implementation of the HFE aspects of safety-related local control stations (LCSs) and those LCSs associated with risk important and credited human action (e.g., functionality and minimum inventory of LCS controls, displays, and alarms)
- Verification of the design implementation of the HFE aspects of the technical support center
- Verification of the design implementation of the HFE aspects of the emergency offsite facility

In addition, while it is the staff's expectation that all other HFE-related design activities as specified in SRP Chapter 18.II.A will be completed by issuance of the COL, ITAAC should be provided for any HFE activity that could not be completed by the time of COL issuance. An example of an activity that might fall into this category is completion of integrated system validation. When proposing such HFE ITAAC, justification should be provided for why these activities are not completed.

14.3.10 ITAAC for Emergency Planning

The COL applicant should provide proposed ITAAC on emergency planning (EP-ITAAC) for their facility. The COL applicant may provide proposed ITAAC on emergency planning that are consistent with the emergency planning ITAAC discussed in Section C.I.13.3, and modified as necessary to accommodate site specific impacts or features. The EP-ITAAC should be included in an appropriate section of the COL application together with all other facility ITAAC, as defined in DG-1145, Section C.IV.2, Submittal Guidance.

14.3.11 ITAAC for Containment Systems and Severe Accidents

This subsection primarily involves containment design and associated issues such as containment isolation provisions, containment leakage testing, hydrogen generation and control, containment heat removal, suppression pool hydrodynamic loads, and sub-compartment analysis.

- ITAAC should be developed to verify key parameters and insights from containment safety analyses, such as LOCA, main steamline break, main feedline break, subcompartment analyses, and suppression pool bypass analyses
- ITAAC should be developed to verify the existence of severe accident prevention and mitigation design features
- ITAAC should be developed to verify functional arrangements of containment isolation

provisions

- ITAAC should be developed to verify the design qualification of containment isolation valves
- ITAAC should be developed to verify by in-situ testing the containment isolation functions of MOVs and check valves
- ITAAC should be developed to verify containment isolation signal generation
- ITAAC should be developed to verify containment isolation valve closure times
- ITAAC should be developed to verify containment isolation valve leakage

14.3.12 ITAAC for Physical Security Hardware

The COL applicant should provide proposed ITAAC for physical security hardware (PS-ITAAC) for the facility. The COL applicant may provide proposed ITAAC for physical security hardware that are consistent with the physical security hardware ITAAC discussed in Section C.I.13.6, and modified as necessary to accommodate site specific impacts or features. The PS-ITAAC should be included in an appropriate section of the COL application together with all other facility ITAAC, as defined in DG-1145, Section C.IV.2, Submittal Guidance.

SAMPLE ITAAC FORMAT		
Design Commitment	**Inspections, Tests, Analyses**	**Acceptance Criteria**
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 __ .
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) Preoperational NDE will be conducted on those components of the ________ system for which inpsections are required by the ASME Code. (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)

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

SAMPLE ITAAC FORMAT		
Design Commitment	**Inspections, Tests, Analyses**	**Acceptance Criteria**
6. Control Room alarms, displays, and/or controls* provided for the _____ System are defined in Section ____.	6. Inspections will be performed on the Control Room alarms, displays, and/or controls* for the ____ System. *Delete any category for which no entries are included in the Design Description.	6. Alarms, displays, and/or controls* exist or can be retrieved in the Control Room as defined in Section ____.
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 ____.
8. Motor-operated valves (MOVs) designated in Section ___ as having an active safety-related function open, close, or both open and also close under design basis differential pressure, fluid flow, and temperature conditions.	8. Tests and/or analyses of installed valves will be performed for opening, closing, or both opening and also closing under differential pressure, fluid flow, and temperature conditions.	8. Upon receipt of the actuating signal, each MOV opens, closes, or both opens and also closes, depending upon the valve's safety function.
9. The pneumatically operated _____ valve(s) shown in Figure ______ closes (opens) if either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.	9. Tests will be conducted on the as-built _______ valve(s).	9. The pneumatically operated ______ valve(s) shown in Figure ______ closes (opens) when either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.

SAMPLE ITAAC FORMAT		
Design Commitment	**Inspections, Tests, Analyses**	**Acceptance Criteria**
10. Check valves designated in Section __ as having an active safety-related function open, close, or both open and also close under system pressure, fluid flow, and temperature conditions.	10. Tests of installed valves for opening, closing, or both opening and also closing, will be conducted under differential pressure, fluid flow, and temperature conditions.	10. Based on the direction of the differential pressure across the valve, each CV opens under minimum differential pressure and remains open under minimum flow conditions, closes, or both opens and also closes, depending upon the valve's safety functions.
11. In the ____ System, independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment.	11.1. Tests will be performed on the ___ System by providing a test signal in only one Class 1E Division at a time. 11.2. Inspection of the as-installed Class 1E Divisions in the ____ System will be performed.	11.1. The test signal exists only in the Class 1E Division under test in the ____ System. 11.2. In the ____ System, physical separation or electrical isolation exists between these Class 1E Divisions. Physical separation or electrical isolation exists between Class 1E Divisions and non-Class 1E equipment.

ATTACHMENT A
ITAAC General Development Guidance

FLUID SYSTEMS

The following provides guidance and rationale of what should be included in the ITAAC for fluid systems that have been selected for inclusion in ITAAC by the applicant based on the ITAAC selection methodology described in Chapter 14.3 of their SAR, including any Design Descriptions (DDs) developed separately for the ITAAC, and any supporting tables and figures. Examples of this type of information may be found in the Design Control Documents (DCDs) for the certified designs referenced in the applicable appendices to 10 CFR Part 52.

I. <u>DESIGN DESCRIPTIONS AND FIGURES</u>

A. DESIGN DESCRIPTIONS

For the ITAAC design descriptions that may be developed separately from the detailed design information contained in the COL application, the following information should be included in the various Design Descriptions in a consistent order.

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

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

2. Location of system

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

3. Key design features of the system

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

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

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

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

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

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

Severe Accident Features - These features should be described in the design description, and the functional arrangement ITAAC should verify that they exist. In general, the capabilities of the features need not be included in the ITAAC. Detailed analyses should be retained in the applicable section of the COL application.

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

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

4. Seismic and ASME code classifications

The safety classification of fluid systems and components should be described in each system's design description. The functional drawings should identify the boundaries of the ASME Code classification that are applicable to the safety class. The ITAAC for system piping should include a verification of the design report to ensure that the appropriate code design requirements for the system's safety class have been implemented. Therefore, design pressures and temperatures for fluid systems do not need to be specified in the DD except in special cases such as inter-system LOCA where the system has to meet additional requirements.

5. System operation

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

6. Alarms, Displays and Controls

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

The functioning of the alarms, displays, and controls in the main control room (MCR) and remote shutdown panel (RSP) must be verified in either the system ITAACs or in the MCR/RSP ITAACs. The intent is to test the integrated as-built system; however, separate testing of the actual operation of the system and the alarms/displays/controls circuits using simulated signals may be acceptable where this is not practical.

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 should be included in the system DD. Examples include the interlocks to prevent inter-system LOCA 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 should not be included in the DD and discussion of these interlocks should remain only in applicable section of the COL application.

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 should also be addressed in the ITAAC developed for the electrical and I&C systems.

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 should be completed for all equipment items important to safety in accordance with the requirements of 10 CFR 50.49. ITAAC associated with equipment qualification should verify this aspect of the design. The scope of environmental qualification to be verified by the ITAAC includes the Class 1E electrical equipment identified in the Design Description (or on the accompanying figures), and connected instrumentation and controls, connected electrical components (such as cabling, wiring, and terminations), and the lubricants necessary to support performance of the safety functions of the Class 1E electrical components. The qualification of I&C equipment for "other than harsh" environments should be addressed in the I&C ITAAC.

11. Accessibility for Inservice Inspection and Testing

The accessibility requirements should be discussed in the applicable sections of the COL application. Verification of accessibility should be provided in ITAAC associated with systems for which accessibility requirements are included in the design.

13. Numeric performance values

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

B. FIGURES

1. In general, figures and/or diagrams are required for all systems. However, a separate figure may not be needed for simple fluid systems 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 figures and form the basis for system-based ITAAC verifications. These verifications may include functional arrangement checks, system boundary checks, piping support checks, and inspections of the welding quality for all ASME Code Class 1, 2, and 3 piping systems described in the design description. A hydrotest and preoperational NDE is also required in each system ITAAC for ASME Code Class 1, 2, and 3 piping systems to verify the pressure integrity of the overall piping system, including the process of fabricating the system, and welding and bolting requirements.

5. As a minimum, the instruments (pressure, temperature, etc.) required to ensure plant safety and perform in accordance with technical guidelines for human factors as discussed in Chapter 18 of a COL application should be shown on the figures, or described in the DD.

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

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

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

9. Figures for safety-related systems should include most of the valves on the P&IDs included in applicable sections of the COL application except for items, such as fill, drain, test tees, and maintenance isolation valves. The scope of valves to be included on the figures are those MOVs, POVs, and check valves with a safety related active function, a complete list of which is contained in the IST plan. Valves remotely operable from the Control Room must be shown if their mispositioning could affect system safety function. Other valves are evaluated for exclusion on a case-by-case basis. Figures for non-safety-related systems may have less detail.

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

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

12. Heat loads requiring cooling, e.g., pump motors, heat exchangers, need not show the source of cooling unless the source of cooling has a specific or unique characteristic that is credited in the safety analyses, e.g., RCP seal water cooling.

C. STYLE GUIDELINES FOR DESIGN DESCRIPTIONS AND FIGURES

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

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

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

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

5. Numbers should be expressed in English units or metric units with converted units in parentheses, as appropriate.

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. 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)

1. OPERATIONAL/FUNCTIONAL ASPECTS OF THE SYSTEM

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

2. CRITICAL ASSUMPTIONS FROM TRANSIENT AND ACCIDENT ANALYSES

The critical assumptions from transient and accident analyses will be verified by ITAAC. Cross-references should be provided in Section 14.3 of the COL application showing how the key physical parameters from these safety analyses are captured and verified in ITAAC. These cross-references are also called "Roadmaps". All critical parameters given in the applicable sections of the COL application (mainly in chapters 6 and 15) should be identified in the roadmaps. COL applicants should ensure that the critical input parameters are included, as appropriate, in the applicable system ITAAC.

3. PRA AND SEVERE ACCIDENT INSIGHTS

If the results of the PRA indicate that a particular component or function of a system is risk significant, that component or function will be verified by ITAAC. PRA insights should be identified in Section 19 of the COL application. The reviewer should verify in the individual system ITAAC that the PRA insights are included in the corresponding system ITAAC as indicated in the DCD Tier 2. Roadmaps for PRA, including shutdown safety analyses, as well as severe accidents, should be included in the appropriate sections of the COL application, with specific references to the system ITAAC where the key parameters from these analyses are verified.

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 should be verified by ITAAC.

5. SURGE TANKS

The operating inventory and/or surge capacity of a surge tank should be verified if the tank is needed to perform the direct safety function. For example, for BWRs, a certain RCW surge tank inventory 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. Another example is the seismic analysis of the fire protection standpipe system that provides manual fire fighting capability in areas containing safety-related SSCs.

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 should 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 should be included in the system design description and ITAAC. Examples include the interlocks to prevent inter-system LOCA 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 not included in the ITAAC. Not all of the interlocks are tested in the system ITAAC because the overall logic is checked in the I&C ITAACs for the safety system logic.

9. AUTOMATIC OVERRIDE SIGNALS

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

ATTACHMENT A
ITAAC General Development Guidance

10. SINGLE FAILURE

The design description should not state that the system meets single failure criteria (SFC). There should not be an ITAAC to verify that the system meets single failure, rather, the system attributes such as independence and physical separation which relate to the SFC will be in ITAAC.

11. FLOW CONTROL VALVES

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

12. PRESSURE TESTING OF VENTILATION SYSTEMS

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

13. FIRE DAMPERS IN HVAC SYSTEMS

Verify full automatic closure of fire dampers in ductwork penetrating fire barriers required to protect important to safety SSCs.

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 applicable sections of the COL application 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.

4. If an ITAAC test is not normally done as part of a pre-operational test, the test methodology should be described in the applicable section of the COL application. Any supporting design or analysis issues should also be included in the appropriate sections of the application. Reference to the ITAAC may be included in these application sections.

5. Use of the Terms "Test" and "Type Test" in the ITA should be consistent with the definitions provided in Section C.II.2.1.1. Alternatively, testing may be classified as "Vendor", "Manufacturer", or "Shop" to make clear what type of test is intended.

6. If an analysis is required in the ITAAC, then the specific type of analysis or the

results/outcome of the analysis should be identified in the ITAAC. The specific analysis or the results/outcome of the analysis necessary to support the ITAAC may be discussed in the appropriate section of the COL application and reference to the ITAAC may be made in this section.

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).

13. Avoid clarifying phrases in the ITAAC.

14. The correct system name should be used consistently.

ATTACHMENT A
ITAAC General Development Guidance

INSTRUMENTATION AND CONTROL SYSTEMS

The following provides guidance and rationale of what should be included in ITAAC for instrumentation and control systems, including any Design Descriptions (DDs) developed separately for the ITAAC, and any supporting tables and figures. Examples of this type of information may be found in the Design Control Documents (DCDs) for the certified designs referenced in the applicable appendices to 10 CFR Part 52.

A. DESIGN DESCRIPTIONS AND FIGURES

Instrumentation and control equipment that is involved in performing safety functions should be addressed in the Design Description. This would basically include the complete Class 1E instrumentation and control systems.

1. Hardware architecture descriptions, including
   - Descriptions of all hardware modules
   - Cabinet layout and wiring
   - Seismic and environmental control requirements.
   - Power sources

2. Software architecture descriptions, including
   - Software design specifications
   - Code listings
   - Build documents
   - Installation configuration tables

3. Regulatory Guides (RGs) which have specific recommendations. Here may be an area where a specific design aspect addressed by the RG is identified as the design commitment but the acceptance criteria allows alternate approaches which are then discussed the FSAR portion of the COL application.

4. Operating experience problems of safety significance that have been identified - particularly through Generic Letters, NRC Bulletins and in some cases Information Notices.

5. Policy issues raised for the standard designs.

6. New features in the design. For example, communications between various portions of the digital system or other systems.

7. PRA identified insights or key assumptions.

8. Resolution of Generic Safety Issues (GSIs) have identified solutions that have resulted in design/operational features.

9. Post TMI requirements - e.g.,post-accident monitoring.

B. ITAAC ENTRIES (for the above equipment). The ITAAC for instrumentation and controls should be developed to address the following:

1. Compliance with 10 CFR 50.55a(h), "Criteria for Protection Systems for Nuclear Generating Stations," and IEEE Standard 603-1991 and the correction sheet dated January 30, 1995.
   - Section 4.1 Identification of the design basis events - The ITAAC should require a verification that the initial conditions and allowable limits of plant conditions for each such event are included.
   - Section 4.4 Identification of variables monitored - The ITAAC should require a verification of the analytical limit associated with each variable, the ranges (normal, abnormal, and accident conditions); and the rates of change of these variables to be accommodated until proper completion of the protective action is ensured.
   - Section 4.5 Minimum criteria for manual initiation and control of protective actions subsequent to initiation - The ITAAC should require a verification of the points in time and the plant conditions during which manual control is allowed, the justification for permitting initiation or control subsequent to initiation solely by manual means, the range of environmental conditions imposed upon the operator during normal, abnormal, and accident circumstances throughout which the manual operations is performed, and the variables which will be displayed for the operator to use in taking manual action.
   - Section 4.6 Identification of the minimum number and location of sensors - The ITAAC should require a analysis of the minimum number and locations of sensors which the safety systems required for protective purposes.
   - Section 4.7 Range of transient and steady-state conditions. - The ITAAC should require a verification of the range of transient and steady-state conditions, include both motive and control power and the environment (for example, voltage, frequency, radiation, temperature, humidity, pressure, and vibration) during normal, abnormal, and accident circumstances throughout which the safety system is required.
   - Section 4.8 Identification of conditions having the potential for causing functional degradation of safety system performance - The ITAAC should require a analysis of the conditions having the portentia for causing functional degradation of the safety systems (for example, missiles, pipe breaks, fires, loss of ventilation, spurious operation of fire suppression systems, operator error, failure in non-safety-related systems).
   - Section 4.9 Identification of the methods used to determine reliability of the safety system design - The ITAAC should require verification that this analysis was done correctly and accepted by the NRC.
   - Section 5.1 Single-Failure Criterion. The ITAAC should require a analysis or demonstration that the safety systems can perform all safety functions required for a design basis event in the presence of: (1) any single detectable failure within the safety systems concurrent

with all identifiable but non-detectable failures; (2) all failures caused by the single failure; and (3) all failures and spurious system actions that cause or are caused by the design basis event requiring the safety functions.

- Section 5.2 Completion of Protective Action - The ITAAC should require a analysis or demonstration that the safety systems are designed so that, once initiated automatically or manually, the intended sequence of protective actions of the execute features shall continue until completion, and that deliberate operator action is required to return the safety systems to normal.
- Section 5.3 Quality - The ITAAC should require that all components, modules and software is of a quality that is consistent with minimum maintenance requirements and low failure rates, and that the safety system equipment has been designed, manufactured, inspected, installed, tested, operated, and maintained in accordance with a prescribed quality assurance program
- Section 5.4 Equipment Qualification - The ITAAC should require a analysis or demonstration that the safety system equipment has been qualified by type test, previous operating experience, or analysis, or any combination of these three methods, to substantiate that it will be capable of meeting, on a continuing basis, the performance requirements as specified in the design basis.
- Section 5.5 System Integrity - The ITAAC should require a analysis or demonstration that the safety systems have been designed to accomplish their safety functions under the full range of applicable conditions enumerated in the design basis.
- Section 5.6 Independence - The ITAAC should require a analysis or demonstration that there is physical, electrical and communications independence between redundant portions of a safety system between safety systems and effects of design basis event, and between safety systems and other systems.
- Section 5.7 Capability for Test and Calibration - The ITAAC should require a analysis or demonstration that the safety systems have the capability for testing and calibration of safety system equipment while retaining the capability of the safety systems to accomplish their safety functions.
- Section 5.8 Information Displays - The ITAAC should require a verification that the display instrumentation provided for manually controlled actions for which no automatic control is provided are part of the safety systems, that the display instrumentation provides accurate, complete, and timely information pertinent to safety system status, and that there is an indication of bypasses.
- Section 5.9 Control of Access - The ITAAC should require a verification that the safety system design permits the administrative control of access to safety system equipment..
- Section 5.10 Repair - The ITAAC should require a verification that the safety systems has been designed to facilitate timely recognition,

location, replacement, repair, and adjustment of malfunctioning equipment.

- Section 5.11 Identification - The ITAAC should require a verification that the safety system equipment is distinctly identified for each redundant portion of a safety system, that identification of safety system equipment shall be distinguishable from any identifying markings placed on equipment for other purposes, and that identification of safety system equipment and its divisional assignment shall not require frequent use of reference material.
- Section 5.12 Auxiliary Features - The ITAAC should require an analysis or demonstration that auxiliary supporting features meet all requirements of this standard, and do not degrade the safety systems below an acceptable level.
- Section 5.13 Multi-Unit Stations - The ITAAC should require an analysis or demonstration that safety systems shared between units at multi-unit generating stations can simultaneously perform required safety functions in all units.
- Section 5.14 Human Factors Considerations - The ITAAC should require a verification that the functions allocated in whole or in part to the human operator(s) and maintainer(s) can be successfully accomplished to meet the safety system design goals,
- Section 5.15 Reliability - The ITAAC should require a verification that for those systems for which either quantitative or qualitative reliability goals have been established, an appropriate analysis of the design has been performed to confirm that such goals have been achieved.
- Sections 6.1 Automatic Control - The ITAAC should require a verification that there is initiation and control all protective actions.
- Sections 6.2 Manual Control - The ITAAC should require a verification that there are means provided in the control room to implement manual initiation at the division level of the automatically initiated protective actions.
- Section 6.3 Interaction Between the Sense and Command Features and Other Systems - The ITAAC should require an analysis or demonstration that no single credible event, including all direct and consequential results of that event, can cause a non-safety system action that results in condition requiring protective action and can concurrently prevent the protective action in those sense and command feature channels designated to provide principal protection against the condition.
- Section 6.4 Derivation of System Inputs - The ITAAC should require a verification that sense and command feature inputs are derived from signals that are direct measures of the desired variables as specified in the design basis.
- Section 6.5 Capability for Testing and Calibration - The ITAAC should require an analysis or demonstration that there are means for checking, with a high degree of confidence, the operational availability of each sense and command feature input sensor required for a safety function during reactor operation

- Sections 6.6 Operating Bypasses - The ITAAC should require an analysis or demonstration that whenever the applicable permissive conditions are not met, a safety system will automatically prevent the activation of an operating bypass or initiate the appropriate safety function(s).
- Sections 6.7 Maintenance Bypass - The ITAAC should require an analysis or demonstration that the safety system can accomplish its safety function while sense and command features equipment is in maintenance bypass.
- Section 6.8 Setpoints - The ITAAC should require a verification that the allowance for uncertainties between the process analytical limit and the device setpoint has been determined using a documented and approved methodology.
- Section 7.3 Completion of Protective Action for executive features - The ITAAC should require an analysis or demonstration that the safety systems are designed so that once initiated, the protective actions of the execute features will go to completion.
- Section 8 Power Source Requirements - The ITAAC should require a verification that the power to the safety system is Class 1E.

2. Compliance with General Design Criteria in Appendix A to Part 50. The ITAAC needs to address each of the following GDCs:
    - GDC 1, as it pertains to quality standards for design, fabrication, erection and testing - The ITAAC should require a verification that the safety-related I&C systems were designed, fabricated, erected, and tested to the required quality standards, that those standards were evaluated to determine their applicability, adequacy, and sufficiency, that a quality assurance program was established and implemented, and that appropriate records of the design, fabrication, erection, and testing of structures, systems, and components are being maintained by or under the control of the nuclear power unit licensee throughout the life of the unit.
    - GDC 2, as it pertains to protection against natural phenomenon - The ITAAC should require a verification that the safety-related I&C systems were designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions, that appropriate consideration of the most severe of the natural phenomena was made with sufficient margin, that appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena was made.
    - GDC 4, as it pertains to environmental and dynamic effects - The ITAAC should require a verification that the safety-related I&C systems were designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents.
    - GDC 13, as it pertains to instrumentation and control requirements - The ITAAC should require a verification that the safety-related I&C systems were designed such that instrumentation were provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational

occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems, and that appropriate controls were provided to maintain these variables and systems within prescribed operating ranges.

- GDC 19, as it pertains to control room requirements - The ITAAC should require a verification that in the control room actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents, and that adequate radiation protection has been provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 0.05 Sv (5 rem) total effective dose equivalent (TEDE) as defined in § 50.2 for the duration of the accident.
- GDC 20, as it pertains to protection system design requirements - The ITAAC should require a verification that the protection system was designed to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and to sense accident conditions and to initiate the operation of systems and components important to safety.
- GDC 21, as it pertains to protection system reliability and testability requirements - The ITAAC should require a verification that the safety-related I&C systems were designed for high functional reliability and inservice testability, and that redundancy and independence designed into the systems will be sufficient to assure that no single failure results in loss of the protection function and that removal from service of any component or channel does not result in loss of the required minimum redundancy unless the acceptable reliability of operation of the protection system can be otherwise demonstrated. The ITAAC should also required a verification that the protection system was designed to permit periodic testing of its functioning when the reactor is in operation, including a capability to test channels independently to determine failures and losses of redundancy that may have occurred.
- GDC 22, as it pertains to protection system independence requirements - The ITAAC should require a verification that the safety-related I&C systems were designed such that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis, and that design techniques, such as functional diversity or diversity in component design and principles of operation, were used to prevent loss of the protection function.
- GDC 23, as it pertains to protection system failure modes requirements - The ITAAC should require a verification that the safety-related I&C systems were designed to fail into a safe state or into a state demonstrated to be acceptable if conditions such as disconnection of the system, loss of energy, or postulated adverse environments are experienced.
- GDC 24, as it pertains to separation of protection systems from control systems - The ITAAC should require a verification that the safety-related I&C systems were

separated from control systems to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all reliability, redundancy, and independence requirements of the protection system, and that interconnection of the protection and control systems was sufficiently limited so as to assure that safety is not significantly impaired.

- GDC 25, as it pertains to protection system requirements for reactivity control malfunctions - The ITAAC should require a verification that the protection system was designed to assure that specified acceptable fuel design limits are not exceeded for any single malfunction of the reactivity control systems, such as accidental withdrawal of control rods.
- GDC 29, as it pertains to protection against anticipated operational occurrences requirements - The ITAAC should require a verification that the protection and reactivity control systems were designed to assure an extremely high probability of accomplishing their safety functions in the event of anticipated operational occurrences.

3. Documentation of a high quality software design process

- The following planning documentation should be addressed in the ITAAC, with a requirement to demonstrate each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14:
  - Software management plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed, and specifically how the quality of the vendor effort will be judged and found acceptable.
  - Software development plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed, and specifically, should verify that the software development plan clearly states which tasks are a part of each life cycle, what the inputs and outputs of that life cycle will be, and how the review, verification and validation of those outputs is defined.
  - Software test plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed, and specifically which tasks are a part of each life cycle, what the inputs and outputs of that life cycle will be, and how the review, verification and validation of those outputs were determined.
  - Software quality assurance plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed, and specifically following this plan will result in high quality software that will perform the intended safety function.
  - Integration plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed, and specifically, if some of the

software is dedicated commercial grade or is reuse of previously developed software, a verification of how this software will be integrated with newly developed software.

- Installation plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed.
- Maintenance plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed, and specifically, a verification of how software maintenance will be done after the system has been delivered, installed and accepted.
- Training plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed.
- Operations plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed, and specifically, the operational security of the system, with a verification that means used exist to insure that there are no unauthorized changes to hardware, software and system parameters, and that there is monitoring to detect penetration or attempted penetration of the system.
- Software safety plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed.
- Software verification and validation plan - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed, and specifically verify the independence of the V&V organization in management, schedule and finance.
- Software configuration management plan. - The ITAAC should require a verification each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14 was addressed, and specifically address verification that the following items will be under the control of a software librarian or group who is responsible for keeping the various versions of the software: any software or software information which affects the safety software, such as software requirements, designs, and code; support software used in development; libraries of software components essential to safety; software plans that could affect quality; test software requirements, designs, or code used in testing; test results used to qualify software; analyses and results used to qualify software; software documentation; databases and software configuration data; pre-developed software items that are safety system software; software change documentation; and tools used in the software project for management, development or assurance tasks.

• The following implementation documents should be addressed in the ITAAC, with a requirement to demonstrate each of the management, implementation, and resource characteristics shown in SRP Chapter 7, BTP 7-14:

- Safety analyses
- Verification and validation analysis and test reports
- Configuration management reports
- Requirement traceability matrix

The ITAAC should require verification that each of the implementation documents will document each of the following life-cycle phases:

- Requirements
- Design
- Implementation
- Integration
- Validation
- Installation
- Operations
- Maintenance

• The following software life cycle process design outputs documents should be addressed in the ITAAC, with a requirement to demonstrate each of the characteristics shown in SRP Chapter 7, BTP 7-14:
    - The system test procedures and test results (validation tests, site acceptance tests, pre-operational and start-up tests) that provide assurance that the system functions as intended.
    - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed, and specifically require verification that the Defense-in-Depth and Diversity design conforms to the guidance of SRP Chapter 7, BTP 7-19, "Guidance for Evaluation of Defense-in-Depth and Diversity in Digital Computer-Based Instrumentation and Control Systems.'
    - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed, and specifically require a verification that the application conforms with the digital safety system security guidance as shown in NRC Regulatory Guide 1.152, Revision 2, "Criteria for Use of Computers in Safety Systems of Nuclear Power Plants."
    - Software requirements specifications - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed, and specifically require a verification that each individual requirement is traceable to a digital system requirement, and that there are no added functions or requirements which are not traceable to the system requirement.
    - Hardware and software architecture descriptions - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed, and specifically require verification that the hardware and the software architecture is clear and understandable, and is

sufficiently detailed to allow understanding of the operation of the hardware and software.

- Software design specifications - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed.
- Code listings - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed, and specifically require verification that the code listings the have sufficient comments and annotations that the intent of the code developer is clear.
- Build documents - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed.
- Installation configuration tables - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed.
- Operations manuals - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed.
- Maintenance manuals - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed.
- Training manuals - The ITAAC should require verification that each of the functional characteristics shown in SRP Chapter 7, BTP 7-14, has been addressed.

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 applicable sections of the COL application 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.

4. If an ITAAC test is not normally done as part of a pre-operational test, the test methodology should be described in the applicable section of the COL application. Any supporting design or analysis issues should also be included in the appropriate sections of the application. Reference to the ITAAC may be included in these application sections.

5. Use of the Terms "Test" and "Type Test" in the ITAAC should be consistent with the definitions provided in Section 14.3.1.1. Alternatively, testing may be classified as "Vendor", "Manufacturer", or "Shop" to make clear what type of test is intended.

6. If an analysis is required in the ITAAC, then the specific type of analysis or the outcome of the analysis should be identified in the ITAAC. The specific analysis or the outcome of the analysis necessary to support the ITAAC may be discussed in the appropriate section of the COL application and reference to the ITAAC may be made in this section.

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).

13. Avoid clarifying phrases in the ITAAC.

14. The correct system name should be used consistently.

ATTACHMENT A
ITAAC General Development Guidance

ELECTRICAL SYSTEMS

This section is intended to provide guidance for developing system design descriptions (DDs) developed separately for the ITAAC, including supporting tables and figures, and for developing ITAAC for electrical systems, including lighting. Examples of this type of information may be found in the Design Control Documents (DCDs) for the certified designs referenced in the applicable appendices to 10 CFR Part 52.

A. DESIGN DESCRIPTIONS AND FIGURES

Electrical equipment that is involved in performing the direct safety function should be addressed in the Design Description. This would basically include the complete Class 1E electric system - including power sources (which include offsite sources even though they are not Class 1E) and DC and AC 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 (e.g., 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 these should probably be included in the DD. In addition, some fire protection analyses are based on the ability of breakers to clear electrical faults caused by fire. With respect to the non-Class 1E portions of the electrical system (powering the BOP loads), a brief 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 AC and DC cables, buses, breakers, disconnect switches, switchgear, motor control centers, motor starters, relays, protective devices, distribution transformers, and connections/terminations

2. Power sources including:

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

   - DC system - battery/battery chargers

   - Emergency diesel generator, including load sequencing and EDG support systems (these may be included for passive designs also due to risk significance)

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

   - Alternate AC (AAC) power sources for Station Blackout (SBO)(AAC power sources may be included for passive plants also due to risk significance)

3. Other Electrical Features including:

- Containment electrical penetrations

- Lighting - emergency control room, remote shutdown panel (the basis for inclusion may be more related to defense-in-depth, support function, operating experience, or PRA rather than "accomplishing a direct safety function.")

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 an inspection to check that the features exist. No analyses to demonstrate adequacy should be included in the ITAAC.

6. Lighting

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

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

9. Regulatory Guides (RGs) which have specific recommendations. Here may be an area where a specific design aspect addressed by the RG is identified as the design commitment but the acceptance criteria allows alternate approaches which are then discussed the FSAR portion of the COL application.

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

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

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

13. PRA identified insights or key assumptions. In the electrical area this typically involves

SBO which should already receive treatment in ITAAC because of the SBO rule (see above). As another example, in the case of System 80+, the "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. This arrangement was included in the ITAAC based on the PRA insights. NOTE: In some cases it may be possible to use PRA results to decide that some aspect of the design do not need to be verified by ITAAC, i.e. the PRA shows it is of little safety significance.

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

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

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

B. ITAAC ENTRIES (for the above equipment)

The following provides guidance and rationale for what should be included in the ITAAC for electrical systems that have been selected for inclusion in ITAAC by the applicant based on the ITAAC selection methodology described in Chapter 14.3 of their SAR.

1. ARRANGEMENT/CONFIGURATION

General functional arrangement - functional arrangement of the system should be verified by ITAAC associated with the functional arrangement of the system. The level of detail is determined by the design description and what is shown on any supporting figure(s).

Qualification of components - qualification of systems and components for seismic and harsh environments should be verified by ITAAC. Electrical equipment located in a "mild" environment should be discussed in the applicable sections of the COL application only. An exception is made for state-of-the-art digital I&C equipment located in an "other than harsh" environment. Operational experience has shown this state-of-the-art equipment to be sensitive to temperature. ITAAC should be included to verify the qualification of equipment whose performance may be impacted by sensitivity to particular environmental conditions not considered by regulations to be harsh.

2. INDEPENDENCE - ITAAC should be included to verify adequate separation, required inter-ties (if any), required identification (e.g., color coding), proper routing/termination (i.e., location), separation of non-Class 1E loads from 1E buses. Post-fire safe shutdown separation of electrical circuits should be addressed in the fire protection system ITAAC.

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

Loading - analyses to demonstrate the capacities of the equipment should be included in ITAAC to verify adequacy for supporting the accomplishment of a safety function. The applicable section of the COL application should provide a discussion of the analyses. Testing should be included in ITAAC to verify EDG capacity and capability based on the Technical Specifications.

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

Voltage - analyses to demonstrate the acceptability of voltage drop should be included in ITAAC to verify adequacy for supporting the accomplishment of a direct safety function. The applicable section of the COL application should include a discussion of how the voltage analyses will be performed, i.e., reference to industry standards. Testing should be included in ITAAC to verify the EDG voltage and frequency response is acceptable and is the same as that specified in the Technical Specifications.

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

   - Equipment short circuit capability and breaker coordination should be verified by specifying ITAAC for analyses. The description of the analyses should be included in the applicable section of the COL application.

   - Similarly, diesel generator protective trips (and bypasses if applicable) should be considered.

   - If the post-fire safe shutdown circuit 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 should be included in ITAAC. This is a direct safety function in response to design basis event of loss of power. Problems with relay settings should be considered in this requirement.

6. CONTROLS, DISPLAYS, AND ALARMS - ITAAC should be included to verify the minimum inventory for emergency operating procedures, etc., as discussed in the applicable section of the COL application (e.g., Chapter 18).

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

8. CONNECTION OF NON-1E LOADS ON 1E BUSES - because of the potential degradation of the Class 1E sources and fire-induced cable damage, ITAAC should be included to verify this aspect as part of the independence review.

9. LOCATION OF EQUIPMENT - because of the importance of location for some

equipment in relation to its environment and separation from redundant division equipment, ITAAC should be included to verify the equipment is properly located.

ATTACHMENT A
ITAAC General Development Guidance

BUILDING STRUCTURES

This section is intended to provide guidance for developing building structure design descriptions (DDs) developed separately for the ITAAC, including supporting tables and figures, and for developing ITAAC for building structures. Examples of this type of information may be found in the Design Control Documents (DCDs) for the certified designs referenced in the applicable appendices to 10 CFR Part 52. The following information should be included in the building design descriptions (DD):

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. 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.

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

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

4. Code boundary primary containment should be defined and verified by ITAAC.

II. PROTECTION AGAINST HAZARDS

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

2. External flooding - features such as thickness of walls and protection features for penetrations below the flood level should be included in the DD and verified by ITAAC.

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

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

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