ABWR CERTIFIED DESIGN MATERIAL/ITAAC
REVIEW GUIDANCE

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ABSTRACT

This memorandum provides guidance to personnel assigned to preparation of Certif ed Design Material (CDM) material for the Advanced Boiling Water Reactor (ABWR) design certification application. The CDM is the technical information that will be certified by the 10 CFR Part 52 rulemaking process and must include entries for: design descriptions; inspections, tests, analyses and acceptance criteria; design acceptance criteria; site parameters; interface requirements. This memorandum addresses all of these entries and provides preparation guidance based on the GE-NRC-Industry consensus that has now evolved regarding the necessary scope, form and content of the CDM.

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The remainder of this memorandum uses the same section numbers as the ABWR CDM document.

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ATTACHMENTS

1.0 INTRODUCTION

Proposed commercial nuclear power production facilities can receive design certification under the provisions of Federal Regulations 10 CFR Part 52. This involves rulemaking proceedings and formulation of a Rule to be published in the Code of Federal Regulation. As currently envisioned, only the principal design bases and principal design characteristics of a nuclear facility will be certified in a Rule. The larger body of design information included in the design certification application* is part of the Rule but is not certified. The top-level design information to be certified is called the Certified Design Material (CDM).

For the GE Advanced Boiling Water Reactor (ABWR), the form, scope and content of the CDM have been arrived at a result of extensive GE/NRC interactions in the time period mid – 1991 through mid – 1993. A summary of the broad guidelines agreed to as a result of these interactions is included in SSAR Section 14.3. These broader, global guidelines are not repeated here.

The purpose of this document is to provide explicit, detailed guidance to engineering personnel assigned responsibility for preparing the CDM required to support the Advanced Boiling Water Reactor (ABWR) design certification application. The intended user of this memorandum is an engineer who is thoroughly familiar with the technical content of his/her area of responsibility but may not be particularly familiar with the Part 52 design certification process and the associated documentation requirements.

The motivation for providing very explicit, detailed guidance is the recognition that in addition to being a technical description of the design, the CDM is also in a large part a legal document. It will appear in the Federal Regulations as part of the Rule and will be valid for at least fifteen years. If

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*Provided in a Standard Safety Analysis Report (SSAR) the certified design is used as the basis for licensing a particular facility, that facility must maintain compliance with the certified design for the lifetime of the facility. In particular, the CDM defines acceptance criteria which will be used as a basis for authorizing loading of fuel at the end of the construction process. Consequently, it is very important that CDM language be clear, precise and unambiguous; poorly written material can lead to conflicting interpretations as to intended meaning and disputes as to compliance with acceptance criteria. Many of the guidelines presented in this document are intended to help the individual authors avoid these pitfalls.

Overview of Content

This document addresses all of the entries that are required in the CDM for the ABWR. For ease of use, these guidelines have been structured using the same section numbering system as the proposed CDM document. The following table summarizes this structure.

In addition to the material in this memorandum, the ABWR SSAR, Section 14.3 contains a discussion of the overall approach to selecting material for the CDM.

Note 1: The terms Tier 1 and Tier 2 are currently in widespread use and are convenient ways of referring to a) the top-level, most important aspects of the design which will be certified by the Rule (Tier 1) (the CDM) and b) the larger body of technical information provided in the design certification application Standard Safety Analysis Report (SSAR-Tier 2) that is part of the Rule but is not certified. However, the terms Tier 1/2 are considered informal in that they do not appear in any regulations. As a result of this lack of definition in any regulation, the terms Tier 1 and Tier 2 will not be used in certification documentation formally submitted to NRC.

STRUCTURE OF CDM DOCUMENTATION

SECTIONS			
CDM	**THIS GUIDELINE**	**CDM TITLE**	**ISSUES ADDRESSED IN THESE GUIDELINES**
NA	GENERAL GUIDANCE	NA	Summary of key guidelines.
1.0	1.0	INTRODUCTION	No entry.
1.1	1.1	DEFINITIONS	Guidelines on which terms require definition within the CDM document.
2.0	2.0	CERTIFIED DESIGN FOR ABWR SYSTEMS	Content and Style Guide for all ABWR Systems: – System Design Descriptions – System Figures – Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) Tables Within this document (but not in the CDM), the following attachments give specific guidance on: 2.1 Mechanical and Fluid Systems 2.2 Electrical Systems 2.3 Instrumentation and Control Systems 2.4 Structures
3.0	3.0	CERTIFIED DESIGN FOR NON-SYSTEM BASED FEATURES	Broad guidelines only; each issue require issue-specific treatment.
4.0	4.0	INTERFACE REQUIREMENTS	Guidelines on content and structure for CDM material required by Part 52 for systems which are (in whole or in part) outside the scope of the Certified Design.
5.0	5.0	SITE PARAMETERS	Guidelines for selecting site-related design parameters to be included in CDM .
NA	6.0	NA	Other guidelines and Recommendations for preparing CDM material.
NA	7.0	NA	Summary of NRC/industry agreements on Part 52 implementation approaches for selected issues.

GENERAL GUIDANCE

The following is an overview of the sequence in which ABWR design certification documentation must be prepared.

Step	Documentation
1	Complete the necessary design activities and prepare the plant Standard Safety Analysis Report (SSAR).
2	Using the SSAR design description as a basis, develop CDM design descriptions.
3	Develop (if necessary) figures and/or diagrams to support the design descriptions.
4	Based on the technical entries in the design description, develop inspections, tests, analyses and acceptance criteria (ITAAC) called for by 10 CFR Part 52. The ITAAC are intended to verify that the as-built facility complies with the certified design described in Steps 2 and 3.
5.	Add to the SSAR any discussion of tests and analyses needed to support the ITAAC.

Steps 2, 3 and 4 of these activities are described in detail in this memorandum. It is important to recognize that:

1. The CDM design descriptions derive from the SSAR and cannot be finalized before SSAR completion.

2. ITAAC contents derive from the CDM design description and can only address design characteristics introduced in the design description.

1.0 INTRODUCTION

1.1 Definitions

This section of the CDM provides definition and/or clarification of the terms used in the body of the CDM technical material. The section is intended to define terms that have a very specific and important meaning for the CDM but are not already defined elsewhere in regulations which are applicable to design certification under Part 52. The contents of Section 1.1 have been arrived at by GE/NRC interactions and decided on a case-by-case basis. No additional discussion is provided in this memorandum. See SSAR Section 14.3 for additional information.

1.2 General Provisions

Entries in this section have also been decided by GE/NRC interactions on a case-by-case basis. The Section contains a mixture of provisions that were selected on the basis that the provision was necessary to either a) define technical requirements applicable to multiple systems in the CDM or to b) to provide clarification and guidance for future users of the CDM. Further discussion is provided in SSAR Section 14.3.

2.0 CERTIFIED DESIGN FOR ABWR SYSTEMS – GENERAL GUIDANCE

This section presents overall guidelines for preparing the system-by-system technical information required for the ABWR CDM design certification material. The majority of these guidelines are applicable to all ABWR systems. Attachments 2.1, 2.2, 2.3 and 2.4 provide specific guidance on preparing entries for mechanical, electrical, control and instrumentation and structural systems.

2.1 **System Selection**

It is intended that the Table of Contents for CDM Section 2 include all of the systems identified in the Standard Safety Analysis Report (SSAR) as being within the scope of the certified design. (Currently a total of approximately 135 systems.) The extent to which a particular system is to be described in the CDM Section 2 depends upon the safety significance of the system. A graded approach is to be used. Important safety-related systems are described in some detail; less important non-safety-related systems will not be described at all. Table 2.1 provides guidelines for determining the level of CDM treatment for each of the ABWR systems. Application of this graded approach will result in significant system-to-system variations in the scope of CDM treatment.

2.2 **Design Descriptions**

The intent of the CDM design description entry for each ABWR system is to define the top-level design features and commitments as they will appear in the Rule. The CDM design description is derived directly from the larger body of technical information presented in the SSAR. Determining what (if any) of the SSAR contents should be extracted and given CDM status is, in part, a judgmental process. The following guidelines should be used when selecting system design features to be included in the CDM design description. The checklists in Attachments 2.1, 2.2, 2.3 and 2.4 give more explicit guidance for the various types of systems in the certified design.

Table 2.1. CDM TREATMENT OF ABWR SYSTEMS

TYPE OF SYSTEM	EXAMPLE	SCOPE OF CDM TREATMENT
Safety-related systems that contribute to plant performance during design basis accidents.	High Pressure Core Flooder (2.4.2).	Major safety-related features and performance characteristics.
Systems that contribute to plant performance during beyond-design-basis events (severe accidents, ATWS, etc.)	Combustion Turbine Generator (2.12.11).	Brief discussion of the system. In the event the CTG is an alternate source of AC power for station blackout, an ITAAC on capacity would probably be required.
Non-safety-related systems or equipment having some feature(s) of safety significance.	Main Turbine (2.10.7) axis of rotation.	Address aspects of these systems that have some safety significance.
Important elements of the ABWR with no direct safety significance but with some influence on overall plant design (i.e., arrangement).	Drywell Cooling System (2.14.7).	Case-by-case; these systems may be significant enough that the overall standardization goal warrants a brief CDM description.
Non-significant systems with no relationship to safety or influence on basic plant design. This category also includes special case systems such as plant startup equipment.	Control Rod Drive Removal Machine Control Computer (2.2.13) and Plant Startup Test Equipment. (2.5.11).	CDM treatment not necessary except to retain the system title in the overall CDM list of systems.
System for which the necessary CDM treatment has been handled in another system.	Unit Auxiliary Transformer (2.12.2) is covered in Emergency Power Distribution System (2.12.1).	No additional CDM treatment required for systems so covered.

GUIDELINES FOR SELECTING CDM DESIGN DESCRIPTION ENTRIES

1. CDM must be based on the SSAR design. It is important that the CDM include **only** design information and characteristics presented in the SSAR.

2. All CDM material must be nonproprietary. If use of data that is currently proprietary becomes unavoidable, the only acceptable approach will be to declassify the material to nonproprietary status.

3. The CDM design description will consist of a subset of the body of technical information in the SSAR. The selection process reflects implementation of the tiered approach to the design certification, and the selection process is (ultimately) based on engineering judgment. Knowledgeable engineers must identify the set of top-level criteria and design features that will be included in the CDM. Not everything in the SSAR is of equal (high) importance, nor need be included in the CDM. An all-inclusive approach would make the tiered concept meaningless. Exclusion of a particular technical issue from the CDM does not mean that either:

   a. the SSAR commitment will be exposed to future undisciplined changes,* and

   b. The technical issue will not be subject to a thorough construction certification process because it is not identified as a CDM entry. (Part 50 QA processes still apply under Part 52.)

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* This memorandum does not describe the SSAR change control processes and controls.

4. The CDM design description contains numerical information to the extent needed to identify the principal design criteria and design features. Numerical values should correspond to the information used in the SSAR safety analyses. All CDM numbers should have tolerances (e.g. ±, ≤ ≥) except for ASME/code design conditions.

5. The CDM is to be self-contained and must not make reference to the SSAR or any other documents. This approach is necessary because referencing other documents in the CDM would elevate the other documents to CDM status. This is unacceptable because it would impose on the referenced document all of the more rigorous CDM controls and thus be incompatible with the intent of the tiered approach.

6. Design descriptions may include diagrams that define system scope and functional relationships. Section 2.3 provides guidelines for preparation of these figures. If a figure is provided, it should show all of the system components discussed in the design description.

7. The design descriptions should be limited to statements of what the design features are. They should not include any information on plant operating conditions as these factors are covered separately by Technical Specifications. Examples of operations-related information that should not be included in the CDM are:

   - administrative control of components
   - normal valve and breaker positions (some exceptions)
   - operator actions to control systems

8. The design description text should be limited to statements as to what the design is and should avoid any discussion of what is achieved. For example, the following statements are **not** appropriate CDM entries:

   - This feature gives the RHR system the capability to withstand a single failure.

- The three-division core cooling system design results in a highly reliable network of systems in the event of loss of coolant accident.

- The 2% reactor water cleanup system design minimizes buildup of impurities in the reactor water.

9. The design description should not include a discussion of the design development process. For example, the following is **not** appropriate: "The options of 3x50% pumps or 2x100% pumps were studied, and, on the basis of cost, it was decided to use the 2x100% option."

10. All CDM figures and tables should be introduced and referenced in the design description.

11. All design-related numbers to be included anywhere in the CDM (e.g., pump flow rates, parameter tolerances, etc.) should appear first in the design description.

12. In general, the design description should avoid references to Codes, Standards, and Regulations. Exceptions are Codes and Standards already included in the Regulations such as ASME references for mechanical system equipment and seismic classification of structures.

13. In general, protection against pipe whip, jet impingement, flooding, fires, etc., will be included as part of the Piping Design DAC entry in Section 3.0 or the building entries in Section 2.0. Accordingly, these subjects should not also be addressed in the Section 2.0 entries for individual systems.

14. Each system should address the control room or remote shutdown panel features associated with that system (that merit CDM treatment).

2.3 CDM Design Description Figures and Diagrams

The CDM design descriptions may (but do not have to) include supporting figures and diagrams. However, it is anticipated each system with a CDM design description entry will have a figure unless there is a well defined reason for not providing one. Figures are considered part of the system design description and have the same significance in terms of being certified. The following general guidelines should be used when preparing figures for the CDM:

1. It is anticipated that most systems having CDM design descriptions will also have supporting figures. However, it is not mandatory and will not be required in cases where the design description can be satisfactorily covered by text alone and there are legitimate reasons for not including a figure. The latter is likely to center on systems with extremely simple CDM treatment for which a figure would approach the trivial. The following table summarizes what is typically expected.

SYSTEM TYPE	EXAMPLE	FIGURE OR DIAGRAM
Mechanical	2.1.1 Reactor Pressure Vessel	General arrangement drawing showing major dimensions and features.
Fluid/Hydraulic	2.4.1 Residual Heat Removal	Process diagram showing relationship of major system components.
Electrical	2.12.1 Electrical Power Distribution	One-line electrical diagram (for class 1E portion) showing relationship of major system components.
Instrumentation and Control	2.2.3 Feedwater Control	Block diagram showing major system functions.
Structural	2.15.10 Reactor Building	Figures showing basic building arrangement and structural elements.

2. The figures should use the legends, symbols, and nomenclature provided in Appendix A of the CDM.

3. It is intended that the figures include all of the equipment items addressed in the design description text.

4. The introductory paragraph included in the Appendix A of the CDM discusses the regulatory/legal significance of these figures. This is important information since figures will be part of the certified design incorporated into the Rule and will have the same legal significance as the text of the design description. Briefly, CDM figures represent a functional description of the system and should identify important components and should not purport to reflect the exact location of components.

5. All figures will be standard size paper (8-1/2 x 11 inches). The CDM will contain no fold-out pages.

2.4 CDM Inspections, Tests, Analyses and Acceptance Criteria (ITAAC)

10 CFR Part 52 states that the intent of ITAAC entries is to provide procedures for determining that the as-built facility conforms with the certified design. As currently envisioned, the ITAAC entries are to be prepared using the following general guidelines. The checklist given in Attachments 2.1, 2.2, 2.3 and 2.4 provide more explicit guidance on the details for each type of system.

GUIDANCE FOR PREPARING CDM ITAAC ENTRIES

1. The ITAACs are derived from the design description content and generally correspond to the elements in the CDM design description. The overall intent is to have an ITAAC entry corresponding to most of the design description material, but a strict one-for-one relationship

is not required. Groundrules guiding which design description entries do not need corresponding ITAAC are:

a. Minimize the number of cases where this occurs.

b. Where it occurs, there must be a rational basis as to why it is an acceptable approach. Examples of legitimate reasons include:

   - Identifies a design characteristic that is in fact verified by other ITAAC. For example, the design description text might identify that a system is safety-related. There is no specific test for this characteristic, but other ITAAC aimed at separation, Class 1E power supplies, redundancy, etc., all address the issue of system safety status.

   - Design description text contains material necessary for a minimum explanation of the system but includes factors that do not warrant verification via ITAAC. For example, some of the building design descriptions give a summary of the type of structures (reinforced concrete, integrated slabs, etc.) that do not need specific verifying ITAAC.

   - Some systems have ITAAC which verify overall system functions and do not need to include ITAAC entries for design description text which discusses the set of specific system components which together yield the required system functional performance.

   - Certain design description material cannot be made the subject of ITAAC entries because of the processes defined in Part 52. Primarily, ITAAC must be completed prior to fuel load which means that any testing that requires fuel in the reactor cannot be addressed by ITAAC.

2. ITAACs will be prepared in tabular form that links an ITAAC to commitments made in the CDM design description. Table 2.4 shows the required format for the ITAAC table.

3. The ITAACs are aimed at confirming the as-built facility complies with the CDM design contained in the design description. The left-hand column entry should use words directly from the design description text (if possible).

4. It is necessary to specify ranges and/or tolerances for numerical values included in the ITAAC (except for ASME/Code design conditions). The objective of specifying tolerances is to recognize: a) legitimate site variances that can occur in complex construction projects such as a nuclear power plant, and b) values of input parameters can often vary without affecting safety. Tolerances specified should be technically justified by supporting analyses etc.; such supporting information need not be included in the CDM but should be in the SSAR.

5. Consistent with the provisions of Part 52, the ITAAC process ends prior to fuel load. This means that post-fuel load testing should not be included in the ITAAC entries.

6. To the extent possible, the verification activities defined in ITAAC will utilize existing nuclear power plant verification programs. ITAAC will not lead to a definition of new tests and inspections (unless necessary) that have not been used in past practices. (An example of a new test would be confirmation of multiplexed timing devices.)

7. Procedural and Training aspects of the design and construction process (operator training, qualification of welders, etc.) are part of the licensee's programs and are commitments made at the time of COL issuance; they are not part of ITAAC. An exception is any material in this category which is addressed in the DAC material in Section 3.

8. The ITAAC should not be written so as to require or imply that a separate test or inspection be performed for each ITAAC entry. Instead, the ITAAC should be written so as to permit a single test or inspection to cover one or more ITAAC entries (if possible).

Table 2.4. REQUIRED FORMAT FOR ITAAC TABLES

Example Shown for Main Steam System

Table 2.10.1: Main Steam System

Inspections, Tests, Analyses and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria

9. The sequence in which subjects should be listed in the ITAAC table should follow as closely as possible the design description sequence.

10. Lefthand column – **Design Commitment**

    a. Column title should be Design Commitment.

    b. Entries must derive from the design description; do not introduce technical issues in the ITAAC table that are not covered in the design description.

    c. The Design Commitment should either quote directly or closely paraphrase the relevant design description entry being addressed.

    d. Any design-related numbers addressed in the table should appear first in the design description.

    e. Do not list any specific, detailed references to codes, standards and regulations; e.g., specific Regulatory Guide numbers, code paragraph references. It is acceptable to broadly reference the ASME Code, Section III. Do not reference the DAC entries in Section 3.0.

11. Middle column – **Inspections, Tests and Analyses (ITA)**

    a. A specific inspection, test or analysis should be identified. Terms such as "demonstrate," "verify," "confirm," should not be used. In general, the first word in this column should be either tests, inspections or analyses.

    b. Anything done in the field should be called an inspection rather than a walkdown.

    c. The ITA must be aimed at the as-built facility; do not use terms like "review of the design."

d. If it is not self-evident, the proposed verification activity (i.e., inspection, test or analysis) should be briefly described. The ITA column should briefly state the process and should use an action word. For example:

   – A valve closure test will be conducted using simulated signals.

   – An analysis of containment volume will be performed using as-built dimensions.

   It is anticipated that in most cases the scope and content of the ITA will either be self-evident or can be adequately described by a brief summary in the ITA column. In a limited number of cases, this may not be possible, and it will be necessary to add descriptive material in the section of the SSAR describing the system in question.

e. Do not incorporate acceptance criteria into the middle column text.

f. The ITA entry should not identify the organization (e.g., licensee, vendor, constructor, contractor) who will implement the inspection, test or analyses.

g. To the extent possible, avoid direct reference to a "documentation review". Instead refer to the actual test, inspection or analysis to be performed. Documentation review activities are generally an implicit part of any test, inspection or analysis activity specified.

h. Existing preoperational testing may be used when defining proposed testing for ITAAC.

12. Right-hand column – **Acceptance Criteria**

a. It is very important that the acceptance criteria use objective and specific terms. Where practical, numerical acceptance criteria should be used. This will eliminate opportunities for multiple, subjective (and potentially conflicting) interpretations. The acceptance criteria should be a simple statement of what constitutes acceptance. For example:

"The pump flow is greater than 4200 gpm."

"The containment volume is equal to or greater than 135,000 ft^3."

Avoid use of prefaces such as:

"The tests demonstrate that ...."

"The inspections show that ...."

b. Avoid use of terms such as "include," "including." For example:

"Instrumentation is provided including temperature monitors, ..."

Instead, state that, "Temperature monitors, ... are provided".

c. Do **NOT** reference design documents, specifications, etc. For example, avoid statements such as:

"The design complies with design documents."

Instead, describe the important requirements reflected in the design documents.

d. Although it should be avoided, it is acceptable to refer to the design commitment in the lefthand column. For example:

An acceptance criteria can be

"The design commitment is met."

e. Avoid use of terms such as "can" and "is capable of." For example, rather than stating that "the pump is capable of providing ....," state that "the pump provides ..."

See Section 6.0 of this memorandum for other guidelines.

3.0 CERTIFIED DESIGN FOR NON-SYSTEM-BASED FEATURES

Section 3.0 of the CDM provides a design description, ITAAC and interface requirements for systems, structures and components for which the design process (in addition to selected design features) is being certified. For the ABWR only the following topics are in this category and are to appear in Section 3.0.

1. Human Factors Engineering

2. Radiation Protection

3. Piping Design

4. Instrumentation and Control

Preparation of material for each of these topics must comply with the guidelines presented in this memorandum. Because each of these issues requires unique treatment, this memorandum provides no specific guidance for Section 3.0 entries.

4.0 INTERFACE REQUIREMENTS

The ABWR design information presented in the SSAR addresses portions of the plant that are within scope of the certified design. Some aspects of the overall facility are dependent upon specific site characteristics and cannot be designed and considered at the time of design certification. Consequently, the SSAR contains no design details for these features – other than the conceptual design called for by 10 CFR Part 52. Portions of the plant not included in the certification will be designed by the individual combined license (COL) applicants and reviewed by the NRC on an application-specific basis. Systems not within the scope of the certified design fall into one of two categories:

a. The system is partially within the scope of plant design for which design certification is being sought. The remainder of the system is not within the ABWR design certification scope. The Reactor Service Water (RSW) is an example of a system in this category. The RSW equipment located in the Control Building is part of the design certification scope whereas the piping, valves, pumps, etc., beyond the Control Building boundary are not within scope. The design of the latter is site-dependent and will be provided by the COL applicant.

b. The complete system is outside of the design certification scope. The Ultimate Heat Sink (UHS) is an example of a system in this category. The design of the UHS is completely dependent upon the type of heat skink (forced draft towers, natural draft towers, spray ponds, once-through cooling etc.) being proposed and is likely to vary considerably depending upon site particulars.

10 CFR Part 52 requires the design certification applicant to provide certain information for systems, structures and components that are not within scope of the design certification application. These information requirements center on entries in the SSAR (e.g., a reference design and consideration of the systems in the plant probabilistic risk analysis [PRA]). However, Part 52 does call for the CDM to includ a definition of interface requirements. In the context of Part 52, interface requirements are defined as the characteristics of the out-of-scope system, structure or component that were relied upon when developing the certified design and which **must** be provided by the COL applicant when the design of the out-of-scope portions of the plant is completed. An example is the need for the out-of-scope RSW system to support the in-scope design by including three separate divisions of equipment in a Seismic Category 1 structure.

In addition to providing interface requirements in the CDM, Part 52 requires there be sufficient evidence that compliance with the requirements can (ultimately) be verified through inspections, tests and analyses.

Interface requirements are to be documented in Section 4.0 of the CDM; the following guidelines should be used when preparing these interface requirements.

A. Systems Partially With Scope

1. The portion of the system within scope should be treated exactly like a fully in-scope system. The in-scope part of the system is to be addressed in Section 2.0 and given a design description, figure and ITAAC table. These should be prepared using the guidelines in this memorandum. The text of the Section 2.0 design description should identify the scope split.

2. The design description text in Section 2.0 should have a separate section that specifies in text form the interface requirements between the in- and out-of-scope portions of the system.

3 It is not intended that the interface requirements be a comprehensive listing of all design requirements applicable to the out-of-scope equipment. The listing should be limited to those requirements that were specifically assumed when designing the in-scope portion of the system.

4. ITAAC are not required for the interface requirements.

5. Even if all interface requirements are fully discussed in Section 2.0, an entry is still required in Section 4.0 that references back to the interface requirements in Section 2.0. The intent of this approach is that Section 4.0 have an entry for all situations where 10 CFR Part 52 calls for a definition of interface requirements.

B. Systems Fully Out-of-Scope

1. Interface requirements for systems in this category are addressed exclusively in Section 4.0 of the CDM and no Section 2.0 entry is required. The Section 4.0 entry is to be prepared using guidelines noted above for interface requirements; i.e.,

   - a simple text discussion,
   - limited to characteristics assumed by the in-scope portion of the plant,
   - no ITAAC are to be provided.

5.0 SITE PARAMETERS

The intent of Section 5.0 of the CDM is to provide a summary of the site parameters that are significant to safety and were the basis of the design described in the CDM and SSAR. The site for any design which references the certified design must either be within this envelope of conditions or the necessary exceptions must be obtained using the Part 52 provisions for this process. Section 5.0 is to be prepared using the following guidelines.

1. The section will consist of a simple tabulation of the site parameters already defined in the SSAR.

2. No CDM discussion of these parameters is envisioned; i.e., no discussion of the bases for the assumed site characteristics nor any discussion of where/how the parameters were used in the design process.

3. No ITAAC entries are required. The Safety Analysis Report submitted by the COL applicant must demonstrate compliance with the site parameters (or obtain an exemption). Consequently, ITAAC for site parameters are not required.

6.0 OTHER GUIDELINES AND RECOMMENDATIONS

There is no Section 6.0 in the CDM document. This section of this memorandum contains information on miscellaneous subjects and collects in one place the accumulated agreements and guidelines that have been developed as a result of multiple NRC, GE and Industry interactions on issues associated with implementation of the Part 52 design certification process. At this time, the information in this section is not ranked, but is valid and should be complied with (as applicable) during preparation of CDM entries.

6.1 **Tenses**

The following table defines the tenses which should be used for CDM entries.

ENTRY	TENSE	EXAMPLE
Design Description (DD)	Present	The valve opens when a low reactor water level signal is received.
Figures and Diagrams	Present	The pump is powered from the Division I Class 1E bus.
ITAAC Table-Design Commitment (DC)		--- Exactly the same as the DD. ---
ITAAC Table – Inspections, Tests, Analyses (ITA)	Future	A valve test will be conducted using a simulated signal.
ITAAC Table – Acceptance Criteria (AC)	Present	The valve opens on receipt of the low water level signal.
Interface Requirements	Future	There shall be three safety-related divisions of the site-specific RSW
Site Parameters	Present	– – –

ENTRY		TENSE	EXAMPLE
DAC Items			
a)	Description	Optional (Future Preferred)	The MCR will be designed using accepted HFE principles
b)	ITAAC Design Commitment	Future	The MCR will be designed using accepted HFE principles
c)	ITAAC ITA Entry	Future	An inspection will be performed
d)	ITAAC AC Entry	Optional Case-by-case	

6.2 Treatment of Units and Numbers

Units

The CDM will use the metric units defined in the SSAR for that parameter.

Numbers

1. Do not specify numerical values for any parameters that could cause unnecessary implementation difficulties or that are likely to be changed during detailed design and construction activities. Factors to be considered when selecting numerical values are:

   - safety significance of the parameter
   - standard engineering practice and accepted BWR practice on use of significant digits
   - values used in the SAR

2. All numerical values (except ASME/Code design conditions) must include ranges or tolerances; e.g.,

   flow rate is $\geq 4200\ m^3 \cdot hr$

pressure is 1280 ±5% psig

Such ranges or tolerances shall have a technical justification. It is not necessary to include this justification in the CDM but it should be in the SSAR.

3. For building dimensions, the following approach will be used.

   a. Building figures will include key dimensions (no tolerances). A statement will be included in each of the building entries stating these dimensions are for reference only and are SSAR information.

   b. Critical dimensions only (e.g., shear wall thickness) will be included in the design description text and ITAAC. Tolerances must be included for these text entries.

4. Rather than use non-quantified terms such as design basis wind velocity, use the actual values; e.g.., designed for a wind velocity of 300 mph.

6.3 Definitions, Usage and Standard Phrases

The following is an un-ranked collection of guidelines covering preferred format, usage and standard phrases. Unless stated otherwise, they are applicable to all elements of the CDM material.

1. Some of the standardized wording in this memorandum contains "and/or"; specific applications should dictate which is correct and the appropriate word should be used.

2. Individual system figures should not contain any Legend entries. All Legend information should be accumulated in Appendix A of the CDM.

3. The CDM will be structured with the figures located right after the design description text and before the ITAAC table. This arrangement is contrary to standard technical publication procedures, but is appropriate because the figures are an integral part of the text.

4. The correct phrasing for ASME Code Class and Seismic Category identification is:

   "... the pump is designed to ASME Code Class 1 requirements and is classified as Seismic Category I ... (II)."

5. There are no general statements in the Introduction and Definition sections of the CDM on accuracy/tolerances for numerical values. This issues needs to be addressed by each system on a system-by-system basis.

6. The following strategy is being used for dimensions of the buildings. Each building entry in Section 2.0 should clearly state that the dimensions identified in the figures for that building are provided for information only and should not be construed as part of the CDM material. The design description text for each building will identify critical building dimensions (with tolerances). These text entries will be considered CDM commitments and subject to ITAAC treatment.

7. If more than one figure is included for any system, the figures should be numbered with lower-case subscripts. For example, the RHR figures are numbered 2.4.1a, 2.4.1b, and 2.4.1c.

8. It is not acceptable to have a CDM design description entry where no corresponding ITAAC table entry is planned (some exceptions).

9. It is important that the left-hand column of the ITAAC table be a statement of what the design is or does. It is not appropriate that this column be used to restate the system design basis or higher level governing requirements. For example, in an ECCS ITAAC, it is **not** appropriate for the left-hand column entry to be: "System flow rate is sufficient to ensure the post-LOCA fuel clad temperatures remain within Appendix K limits." A more appropriate entry would be: "System flow rate when injecting into the reactor is equal to or greater than 700 l/min." The design basis accident analyses presented in the SSAR demonstrate that this pump flow rate will result in compliance with Appendix K requirements. This justification does not have to be repeated in the CDM.

10. For systems with more than one figure, general references to the figure in the design description text should call out all figures. Example: "Figure 2.4.1a, 2.4.1b, and 2.4.1c show the basic configuration of the RHR system."

11. When discussing mechanical systems, the correct phrases are, "physical separation," "... are physically separated."

12. If a table is included in the design description text, treat it as an imbedded table without a table number. Providing table numbers for these text entries would interfere with the ITAAC table numbering scheme that has been adopted.

13. Do not identify system modes on the figures.

14. Certain terms should not be used in formal submittal of design certification material to the NRC. These terms include design acceptance criteria (DAC), and Tier 1/Tier 2.

15. Any discussion of information availability in the main control room should use the phrase, "exists" or "can be retrieved." This is necessary because in practice most data

will be stored electronically in large data pools that will be accessed by the operators on an as-needed basis.

16. When preparing the ITAAC table entries, there is often an option of putting material in either the left-hand or right-hand column. For example, a pump flow rate can be included in either the left- or right-hand column. When this choice exists, the preferred approach is to put the detailed material in the right-hand column rather than the left-hand column. This helps ensure that the acceptance criteria is detailed and precise and thus minimize potential ambiguities regarding implementation of the commitment. However, it is important that this process does not result in the left-hand column being reduced to a commitment to a broad design basis or higher level design requirement.

17. The design description text (in general) should not have any paragraph headings other than the introductory heading. For particularly complex systems such as the Nuclear Boiler System, sub-headings can be used for major groups of equipment in the system.

18. Quality Groups are not discussed in the CDM. Code Class is identified on figures and need not be duplicated in the design description text except for special cases such as ISLOCA commitments.

19. All specifications of pressure (other than differential pressure) should identify gauge or absolute.

20. When identifying interfacing systems, the formal system name as defined in the CDM table of contents should be used.

21. It is not appropriate in the CDM to discuss the internal details of the equipment. For example, it is not necessary in the Nuclear Boiler System to discuss the design of the main steam isolation valves in terms of how the springs, main disc, or pilot disc operate in relationship to each other.

22. CDM treatment of a particular piece of equipment should be handled in the Section 2.0 entry for the system to which the equipment is formally assigned via the GE MPL. (Exceptions are permitted but should be deliberate.)

23. The numbering of electrical Divisions should use Roman numerals. Mechanical division use A, B, C.

24. Avoid the use of the following words: "loops," "subsystems," "train." Where possible, use the word, "divisions." Avoid the use of the word, "functional." Use the term, "inspections," rather than "visual inspections." Do not specify test type; i.e., "functional hydraulic, etc.," simply say, "a test will be performed."

25. Avoid use of the words, "determine" and "make a determination." This is an NRC request and has been made because the word "determine" has broad licensing implications not relevant to the CDM.

26. The correct term is "seismic interface restraint."

27. Official system names always start with capital letters.

28. Do not use mathematical symbols in text. For example, use the words "equal to or greater than" rather than the symbol for this.

29. Sub-paragraphs in ITAAC table entries should use sub-paragraph headings with small letters.

30. Most ABWR systems have multiple, direct or indirect connections with many other systems. For example, a typical hydraulic system has interfaces with power distribution systems, I&C systems, pneumatic systems, HVAC, flushing systems, radiation monitoring, etc. The CDM entries should not routinely identify all of these interfaces because it would not be useful and would add a lot of unnecessary detail to

the CDM. However, in cases where there is a particularly significant interface, it may be appropriate to identify the interface in the system design description and confirm its existence via an ITAAC. For example, the RHR system figure shows the special connection to the plant fire protection system, and the existence of this connection will be verified via the RHR configuration ITAAC.

31. Overriding of initiation signals such as LOCA, ATWS, isolation, etc., should be addressed in the system whose performance requires the override. For example, the Flammability Control System should address the override of the isolation valve closure signal that is necessary to support system initiation.

32. Do not identify voltage levels in any of the AC or DC power supply systems.

33. Do not use the word, "consumer" when discussing the multiple users of supporting auxiliary systems such as cooling systems, power supply systems.

34. Use the term "control blades," not "control rods."

35. Avoid uses of equipment identifiers such as SLU, TLU, etc. Instead, use a functional description.

36. When using the term "isolation," it should be defined. For example, is it containment isolation, isolation between systems, other? In addition, avoid the use of the word "isolation" if what is really meant is valve closure. When performing system logic tests using simulated input, the term "simulated actuation signals" should be used.

37. To the extent practical, the middle column of the ITAAC table shall always start with the words either, "Inspections," "Tests," or "Analyses." It is important to use the term "as-built" when appropriate.

38. The system figures in the CDM should not include any logic descriptions. For example, there should be no definition of which signals cause isolation valves to close.

39. The term "sensors" is preferred rather than "transmitters."

40. Valve operators using gas-motive power should use the term "pneumatic" rather than "air" or "nitrogen." The valve legends in CDM Appendix A will show P as the motive power.

41. The plural of electrical bus is spelled "busses."

42. Avoid any descriptive material on setpoints. For example, say, the valve closes on receipt of high-temperature signal," and do not use such terms as "high-high temperature signal."

43. All design description and ITAAC table entries should use full sentences.

44. Care should be taken to differentiate between formal plant design basis conditions and the various beyond-design basis evaluations presented in the SSAR (ATWS, station blackout, severe accidents). Statements that certain aspects of the plant are designed for the beyond-design-basis conditions should be avoided.

45. Avoid the use of percentage capacity figures. Just say what the capacity is rather than quantifying it as a percentage.

46. Legal interpretation: Adding items to the actual plant that are not identified in the CDM is acceptable because the CDM is not seen as being exclusive. That is, the CDM is not inclusive.

47. Avoid use of terms such as "adequate," "approved," "acceptable," proper," "appropriate," "reasonable," and "sufficient." These terms usually have no common definition and are subject to varying interpretations. Instead, use objective or specific criteria that are not subject to different interpretations.

48. Avoid use of phrases such as "applicable codes and standards," "applicable requirements," "applicable regulatory requirements," or "accepted industry practice." These phrases do not provide any identification of which codes, requirements, or practices should be applied. In fact, use of these phrases may subject a future COL licensee to codes, requirements, or practices that are not even in existence today. Instead, either specific sections of a code or requirements should be referenced, or specific provisions in codes, requirements, or practices should be paraphrased.

49. With the exception of references to the ASME Code, avoid general references to codes and standards such as references to the "ACI" or "AISC-123." Such references make the entire code or standard applicable to the COL, and any nonconformance with any provision of such a code or standard should be a basis for withholding authorization to load fuel or a request for a hearing prior to fuel load. Instead, either specific sections of a code or standards should be referenced, or specific provisions in a code or standard should be paraphrased. When referencing a code or standard in the CDM, the edition or year should not be specified, and any edition or version may be utilized to satisfy the requirements in the CDM. The SSAR may identify a specific edition or version of a Code, Standard, or Regulatory Guide that is referenced more generally in the CDM. An applicant or licensee may utilize a different edition or version only if the applicant or licensee has complied with the applicable process for making changes in SSAR information.

50. Avoid use of terms such as "all," "every," "each," "full," and "complete," unless the term is used in a very narrow or specific sense; e.g., "all three pumps," or "each of the three trains." These terms usually are unnecessary and do not allow future flexibility for any exceptions.

51. Unless a clear reference is provided, avoid use of terms such as "as needed", "required," "selected," or "specified." Such terms do not identify what is needed or required and are subject to different interpretations.

52. In general, statements should be affirmative rather than negative in nature; e.g., statements should identify or describe the functions or components in a system, and should not identify or describe what a system is not designed to do or components the system does not have.

53. In general, avoid use of terms that are permissive in nature; e.g., terms such as "should" or "may." Instead, the CDM should be reserved for mandatory requirements.

54. In general, avoid use of terms such as "including," "include," and "included." Such terms leave the exact list of requirements open-ended. Instead, the CDM should be narrowed to a list of the important items or criteria. Such a list will not, in general, prohibit a licensee from adding additional items or criteria.

55. Avoid use of relative terms such as "high," "low," "minimize," "maximize," "minimal," "dry," "optimal," or "clean," unless it is used as a part of a specifically defined term such as "low level setpoint."

56. Avoid use of the term "important to safety" because it has no accepted definition. Instead, the term "safety-related" or other defined term should be used.

57. System entries should be used to describe features of that system; avoid repeating descriptions of other systems. For example, isolation logic described in the LDIS should not be repeated when describing the isolation valves of a particular system.

58. Within each system entry, define all acronyms at time of first use.

59. Avoid use of terse language that might potentially be subject to misinterpretation. Examples:

NOT OK: The isolation valves close on high radiation level.

OK: The main steam line isolation valves close on a high radiation signal from the steam line radiation monitors.

60. When discussing control logic, use the word signal rather than just the sensed variable. See above example on high steam line radiation.

61. When durations are specified, the initial point of the duration should be identified. For example:

Correct: The isolation valve closes within 30 seconds of receipt of an isolation signal.

Incorrect: The isolation valve closes within 30 seconds.

62. The CDM design descriptions should not be prescriptive in areas where technological advances or acceptable alternatives are likely to exist in the future. For such areas, the design description should identify the performance criteria that must be satisfied, rather than the specific feature that will be used to satisfy the criteria. Examples include:

- defining the feedwater pump motive power that would preclude choosing either steam or adjustable speed driver.

- Specifying a traveling in-core probe (TIP) based neutron monitoring system that would preclude future implementation of more advanced concepts.

63. Data on plant operating conditions will (in most cases) be in the form of a digitized data pool that operating personnel will access as-needed. Consequently, the term "display" should be used when referring to presentation of information to the operators. In this context, terms such as "control room features," "indicators," "indications" should not be used. An example of correct usage is: "Control Room alarms, displays, and controls provided for the RHR System are defined in Section 4.2.1."

64. The term "design basis accident" should be used rather than the simple term "accident". The latter is all inclusive and could be construed as including beyond-design-basis events such as severe accidents and station blackout.

65. The correct terminology for divisional identifiers is:

	Divisions			
Power	I	II	III	IV
Mechanical	A	B	C	D
Instrumentation and Control	I	II	III	IV

66. Exercise care when using the word associated. This word has special meaning when applied to electrical circuits and in an electrical context should only be used when specifically referring to circuits formally identified as "associated". When not referring to this type of circuit, instead of a term such as "including associated instrumentation and controls", it is better to say "including connected instrumentation and controls".

67. The term main control room should be used rather than control room.

68. Avoid using the QC/QA processes as a basis for fuel load justification; successful completion of the ITAAC is the only basis NRC has for authorizing fuel loading. An ITAAC may be based on use of site records; the preferred approach is to refer to this material as "The records of the as-built facility".

69. When discussing the structure of I&C controls, the term "architecture" should be used.

70. If a single figure is to be used for a system with multiple divisions, the figure should be identified as "representative". i.e.

    This Figure is representative of four Divisions.

71. The term fail-safe should not be used as it is undefinable. Rather the test (or ITAAC left column entry) should state what the design is. For example:

    On loss of power supply or open circuit failure, the system will go to a tripped condition.

    Note: The ABWR CDM contains a few exceptions to this item but these exceptions include a precise definition of the failure mode and the consequences.

72. In the ITAAC tables, it will be assumed that tests specified in the ITA column apply to as-built (i.e. as-installed) components, unless that ITA explicitly states to the contrary. Consequently, it is important to identify cases in which either shop tests or special qualification tests are intended.

73. In general, it is not necessary to identify that signals are being transmitted via the multiplexing systems. The system providing the signals should be identified; e.g. the Feedwater Control System identifies that it gets water level signals from the Nuclear Boiler System. It does not state that these signals are transmitted by the Non-Essential Multiplexing System.

74. Not Used.

75. Design description entries on location of equipment is intended to address the main elements of the system. It is not intended to be a detailed listing of the location of all system components.

76. In formal CDM submittals, do not use the term DAC; the preferred approach is (for example):

    Certified Design Material addressing Radiation Protection.

77. Numerical values of ASME design conditions such as pressure, temperature do not need tolerances. It is acceptable (for example) to state:

    The RHR pump design pressure is 500 psig.

78. Reserve the term "interface" for those situations when Part 52 specifically calls for interface requirements.

79. Use the term "as-built" rather than "as-installed" except in specific cases when there is a specific need to use the phrase "as-installed."

80. The ITA column of the ITAAC Table should use the following action words:

    Tests – conducted

    Inspections – conducted

    Analyses – performed.

81. The Design Commitment column of the basic configuration ITAAC entry (usually the first entry is the table) should be structured as follows:

a) For configuration checks based on a figure, use the following approach:

The basic configuration of the RHR System is shown in Figures 2.4.1a, 2.4.1b, 2.4.1c, and 2.4.1d.

b) For configuration checks based on entries in the system DD, use the following approach:

The equipment comprising the LDS is defined in Section 2.4.3.

82. The Safety System Logic and Control System, while not a formal ABWR system, will be treated as such stylistically, i.e., it will be referred to as the SSLC.

83. Interfacing systems shown on the individual system diagrams will not identify the piping Code Class. If a significant length of interfacing system piping is shown on a system figure (which should not be the case usually), the correct Code Class legend will be used for this piping.

84. The term "wetwell" should be used rather than "suppression chamber." Suppression pool is appropriate.

85. Interface requirements should use the future tense. They are requirements and the word "shall" should be used.

86. The Control Interface Diagrams (CIDs) should not include any power supply systems in the interface boxes.

87. In general, logic tests should be performed using simulated signals (for input parameters).

88. "Control Blades" is preferred over "Control Rods".

89. "Reactor shield wall" should be used rather than "biological shield wall".

90. Use "startup" rather than "start-up".

91. Rules for use of acronyms:

   - in text, define at first use in each system entry
   - all acronyms to be defined in Appendix B of the CDM
   - if only used in Tables and Figures, it is acceptable to rely on Appendix B for definition (i.e., do not define).

92. Describe logic in the system that actually performs the logic (as defined in the SSAR IBD). In general SSLC does not own any logic (some exceptions) and only performs a processing function for other systems. Consequently, most logic is **not** described in SSLC. (Exceptions: part of the ATWS logic assigned to SSLC).

93. Use upper case for official CDM system names (e.g. Control Rod Drive System) but lower case for systems below this level (e.g., control rod drive hydraulic system). Do not use the term subsystem.

94. Use the word "operates" other than "functions" or "works". Basis: operates is defined in CDM 1.1.

95. Any tests called for in the middle column of the ITAAC table will be assumed to be in-situ unless specifically identifies as factory tests, laboratory tests, ...

96. Use the term "design basis accident" rather than the less precise "accident" (unless discussing severe accidents in which can use the term "beyond design basis accident").

97. Interface requirements relating to site compliance with CDM Section 5.0 Site Parameters are not necessary. Basis: COL application activity.

98. ABWR 72 hour walk-away capability is a GE product enhancement commitment and not needed for regulatory compliance. Consequently, it is not necessary to address this issue in the CDM.

99. Logic equipment "sends" signals rather than "issues" them.

100. All Instrumentation and Control (I&C) systems (with a few exceptions) should have a CID.

101. For electrical and I&C systems, Class 1E can be used instead of safety-related. Basis: terms are equivalent.

102. Divisions is upper case (Divisions) when referring to a specific division. Use lower case for a general discussion of divisions.

103. A simulated signal means going to the transmitter/device and inserting an electrical signal.

104 For electrical and I&C systems, Class 1E also means Seismic Category I; there is no need to restate the latter if a system is identified as Class 1E.

105. The CIDs in the CDM should be coordinated. If system x says a signal is sent to system y, then system y should show it as input and state what use is made of it.

106. Accessibility for ISI is not a CDM topic. Basis: as-procured issue.

107. Any use of standardized ITAAC table entries must be supported by DD entries corresponding to the DC of the ITAAC entry.

108. Use the term Turbine Main Stop Valve for the turbine stop valves.

109. Signal names identified in the CID should (if possible) be the same as the signal name on the system IBD in the SSAR.

110. For mechanical/fluid systems, the basic configuration check using system figures should include the CID.

111. The CDM will use metric units and will achieve consistency with the NRC metrication policy by using the units for each parameter that are defined in the SSAR.

112. Nuclear fuel, control blades and channels will not have any ITAAC entries.

113. Remote Shutdown System (RSS) interfaces will be identified in each system that has control/display interfaces with the RSS.

7.0 REGULATORY AGREEMENTS

There is no Section 7.0 in the CDM document. This section of this memorandum documents understandings and agreements that have been reached between Industry and NRC.

In many cases, the currently proposed structure of the ABWR CDM reflects agreements and understandings that have been reached with the NRC. These agreements and understandings have resulted from a long series of intensive (and public) interactions involving NRC, GE, other vendors, and industry groups. These types of interactions are a necessary part of implementing new regulatory processes for which the Regulations do not provide detailed, explicit guidance on form, scope and content. This section of the memorandum documents the agreed-to approaches that have the most influence on the structure of the CDM.

7.1 Generic Issues

Generic issues are technical subjects which are relevant to more than one system. Generic issues can fall into several categories, and examples are:

CATEGORY	EXAMPLES OF GENERIC ISSUES
Construction processes and installation.	Welding, concrete properties, painting.
Procurement	Equipment qualification, motor-operated valve testing.
Plant testing	Instrumentation setpoints and accuracy, motor-operated valve testing.

The extent to which generic subjects should be addressed in the CDM and the methods (if any) for treating these issues have been extensively discussed by all parties. The following summarizes what GE believes the NRC has agreed to as an acceptable treatment of generic issues.

1. Only the following generic subjects will be addressed in the CDM; other detailed construction, installation and testing processes will be verified by the existing QA/QC programs deriving from 10 CFR Part 50, Appendix B.

    a. Welding

    b. Equipment qualification

    c. Instrumentation setpoints

    d. Motor-operated valves

    e. Electrical independence

    f. Electromagnetic interference

    g. Dynamic qualification

2. Table 7.1 summarizes the methods by which these issues will be handled in the CDM. Unless stated otherwise, this table only applies to safety-related equipment. The table includes a brief summary of the supporting entries that are required in various parts of the CDM and in the SSAR.

3. The CDM no longer contains any separate sections specifically addressing generic items. The generic issues that NRC has agreed should receive CDM treatment are now covered by various entries in Sections 1.0, 2.0 and 3.0.

7.2 **Miscellaneous Regulatory Agreements**

1. Severe accident treatment in the CDM will be limited to the ABWR features which have been specifically added as a result of severe accident consideration; i.e.,

   - AC independent water addition

   - containment vent

   - lower drywell flooders

   - lower drywell basaltic concrete

   The existence of these features will be identified in the appropriate system design description and their existence confirmed via the standard configuration ITAAC. There will be no (or very few) performance verification ITAAC.

2. The following guidelines should be used when deciding which alarm functions should be included in a system design description and in the associated control room ITAAC.

   a. Assume the Main Control Room design/Human Factors Engineering DAC will handle alarms identified in SSAR Chapter 18.f as an integral part of operator implementation of the EPG. Do not include these alarms in individual system entries.

Table 7.1. CDM TREATMENT OF GENERIC ISSUES

		NECESSARY SUPPORTING ENTRIES			
ISSUE	**SUMMARY OF APPROACH**	**SECTION 1**	**SECTION 2 SYSTEM DD**	**ITAAC**	**SSAR**
• Welding – ASME Code Class 1, 2, 3 (and some NNS) pressure boundary	Tie to configuration ITAAC	Configuration definition welding entry	Identify CC 1, 2, 3 boundaries	None	Discussion of weld testing and acceptance criteria
• Equipment qualification (EQ)					
A) Electrical in harsh environment	Tie to configuration ITAAC	Configuration definition EQ entry	Identify items to be qualified	None	Discussion of EQ methodology and EQ conditions
B) Instruments and controls	Cover under I&C DAC as part of hardware procurement	None	**Section 3** Cover in scope statement for DAC	Include as a DAC entry	Discussion of applicable codes and standards
• Instrument setpoints/accuracy	Cover under I&C DAC as a part of I&C testing	None	**Section 3** Cover in scope statement for DAC	Include as a DAC entry	Discussion of setpoint methodology
• Motor-operated valves (Letter 89-10 issues)	A) Pre-installation testing – tie to configuration ITAAC	A) Configuration definition MOV entry	A) Identify Class 1E MOV	A) None	**A, B** Discussion of valve testing methods and acceptance criteria
	B) In-situ test. System-by-system treatment	B) None	B) Covered by A	B) Standard testing ITAAC entry for MOV	

Table 7.1. CDM TREATMENT OF GENERIC ISSUES (CONTINUED)

ISSUE	SUMMARY OF APPROACH	NECESSARY SUPPORTING ENTRIES			
		SECTION 1	SECTION 2 SYSTEM DD	ITAAC	SSAR
• Electrical independence (including separation)	Handle in electrical systems	None	Separation statements	Standard electrical separation entry	Discussion of the design and applicable codes and standards
• Electromagnetic interference (I&C issue)	Cover under I&C DAC as part of I&C design/testing	None	Section 3 Cover in scope statement for the DAC	Include as a DAC entry	Discussion of codes and standards
• Dynamic qualification	Tie to configuration ITAAC	Configuration ITAAC dynamic qualification entry	Identify Seismic Category I	None	Discussion of methodology and acceptance criteria

b. Add to the system design description and ITAAC any other alarms that are considered important. Since alarms are not safety-related and are not relied upon for any safety-related operator actions, there will be only a very few alarms added beyond those already covered in the HFE DAC.

c. Alarms related to maintaining systems in standby mode are not addressed in the CDM. Example: The ECCS pump discharge low pressure alarm aimed at alerting the operator to problems with the pipe keep-fill system.

3. In general, it is not necessary to identify ASME Code design conditions (pressure, temperature) in a system design description. However, where special specific design commitments have been made, it may be appropriate to identify these design conditions. An example is the higher design pressure commitments that have been made in response to intersystem loss-of-coolant accident requirements (ISLOCA) on the RHR low pressure piping.

4. The following guidelines apply to treatment of piping relief valves in the CDM:

   a. CDM 1 treatment is not required for piping pressure relief valves associated with thermal expansion and anticipated valve leakages.

   b. If relief valves have been added to address High/Low pressure interface issues, they should be treated in the CDM. (Not currently applicable to ABWR.)

5. ITAAC to address the issue of pump run-out protection are not necessary. Basis: Provided by other ITAAC and there are many ways of achieving protection.

6. When developing interface items for Section 4.0, it is not necessary to include PRA-based requirements on the out-of-scope systems. This is acceptable to NRC because the COL applicant will be required to update the PRA to reflect the site-specific design details.

Furthermore, interface requirements are limited to functions and do not include I&C logic, etc.

7. The following table summarizes the extent to which Equipment Qualification is to be treated in CDM consistent with the requirements of 10 CFR Part 50.49

Equipment	Environment	CDM Treatment
Electrical	Harsh	Address via configuration
Mechanical	Harsh	Do not address
Electrical	Mild	Do not address
Mechanical	Mild	Do not address
I&C	Harsh	Address in I&C DAC
I&C	Mild	Address in the I&C DAC

8. Design features associated with system flushing are not CDM material.

9. Not used

10. Individual system descriptions should not address shielding. To the extent this issue is addressed in the CDM, it is covered by the Radiation Protection DAC.

11. CDM treatment of pumps is limited to the hydraulic performance items in each of the systems with pumps. Issues such as bearings or vibrations are considered SSAR items and/or are covered by Technical Specifications testing.

12. The failure modes of pneumatic valves should only be addressed in the CDM (Design Description and ITAAC) if the failure mode is important to accomplish the safety function.

13. The CDM should identify the limiting break size associated with rupture of high energy lines outside the containment. This does not include instrument lines and other small lines that will only release limited amounts of fluid outside the containment.

14. The issue of site-specific external threats such as toxic gases, ammunition trains, etc., needs to be addressed in Section 4.0, Interface Requirements. The strategy will be to state that if the hazard exists, then a sensor and appropriate system design features will be provided.

15. Not used

16. It is not necessary for the CDM to specifically verify thermal overload protection on MOV. This is done indirectly by other valve testing.

16. Confirmation of HVAC performance may involve testing and observation of pressure, temperature and humidity conditions in the buildings. There is no requirement to perform analyses aimed at adjusting observed performance to the performance expected when worst-case weather and heat-load conditions are present. Basis: HVAC equipment will be in operation for extended periods prior to fuel load and performance shortcomings will be obvious. Furthermore, the HVAC sections are not required to commit to (and test for) specific volumetric flow rates. Bases: Covered by the testing described above.

17. The CDM need not address the following filter-related items:

    a. Charcoal filter thickness

    b. Filter performance

18. Many safety-related systems are actuated on the basis of input from several different sensed variables; this input is often subject to logic processing by another system. For example, the ATWS signal that auto-initiates the Standby Liquid Control System (SLCS) involves input of neutron flux, reactor pressure and reactor water level; and these signals are processed in the Recirculation Flow Control System which then sends an ATWS signal to the SLCS and other systems. When referring to actuation signals that are in this category, preferred practice is to avoid a detailed discussion of the various inputs For example, the Standby Liquid Control System would state that automatic actuation occurs on receipt of an ATWS signal rather than listing the conditions of flux, pressure and level that generate the signal. The system doing the logic processing (in this case, the Recirculation Flow Control) will include a description of the sensed parameters and logic.

19. The following guidelines should be used when considering the CDM treatment of interlocks:

    a. Do not (in general) address interlocks aimed specifically at equipment protection.

    b. Interlocks aimed at preventing an event are candidates for the CDM and should be considered within the context of CDM selection criteria. For example, The RHR System does address the interlock which closes the injection valve if the reactor pressure increases. This is an ISLOCA protection feature.

    c. Interlocks/logic that are an integral part of system performance during design basis events should be considered.

    d. Treatment of bypasses around equipment protection interlocks: Some equipment protection features such as the RHR injection valve thermal overload devices have bypass provisions that are operative during an accident. On the basis of item a. above, these bypass features will not be addressed in the CDM.

20. Unless stated otherwise, it is understood that check valves have no main control room indication. Those with some form of indication should be explicitly identified.

21. All system figures must include all valves with an active safety-related function.

22. The approach for handling the remote shutdown system interface with other system is as follows:

    a. Each system will add to the design description (usually in the figure) which of the system features interface with the remote shutdown system panel for control and/or monitoring of these features.

    b. The remote shutdown system ITAAC will confirm that signals and features are present and can be used to control the assigned equipment.

23. Individual systems should not address the source of power to the busses to which they are connected; i.e., there should be no system discussion of off-site, on-site emergency diesels, etc. Each system should simply identify the busses to which they are connected.

24. For mechanical systems is not acceptable for the Acceptance Criteria to be based on the existence of the ASME N stamp and associated documentation.

25. In general, there will be no ITAAC entries related to ISI access provisions. This issue is equipment-dependent and not related to safety. Exceptions would be cases where very specific design features have been provided to support ISI requirements in critical areas. The CDM entries should discuss the more important provisions for allowing the performance of in-service tests; e.g., full flow test loops.

26. Individual system CDM entries should pick up system-level initiation switches; e.g., testing and system-level initiation.

27. Nuclear fuel, control blades, and fuel channels will be treated in the CDM as follows:

   a. Section 2.0 will contain a summary description of the design features and principal design bases.

   b. No ITAAC table entries are necessary.

   The rationale for this approach is that a CDM commitment to design features coupled with a detailed description in the SSAR provides an envelope for fuel procurement by the COL applicant that will assure compatibility with the certified design.

28. DO not include any local controls in the CDM unless a very special system-unique situation exists.

29. The following summarizes the relationship between Technical Specifications and ITAAC. Since fuel loading cannot proceed until the plant is in compliance with the operability provisions of the Technical Specifications, it could be argued that any testing performed as part of Technical Specifications need not be duplicated in ITAAC. This is not an acceptable approach, and key safety features of ABWR systems need ITAAC entries independent of whether they are covered in Technical Specifications. For example, flow rates of ECCS pumps are addressed in the Technical Specifications but also must have ITAAC aimed at confirming satisfactory performance.

   There are exceptions to this guideline. The need for plant compliance with Technical Specifications operability requirements prior to fuel load can be used as the basis for not addressing certain operability issues separately in ITAAC. For example, it is not necessary to have an ITAAC on the issue of ECCS pump bearing vibrations. The Technical Specifications for this system will not be met if there is an unacceptable level of bearing vibration, thus, fuel loading will not take place until the pumps operate correctly.

30. With some exceptions (e.g., reactor pressure vessel, piping DAC), issues related to material integrity are not sufficiently significant to warrant CDM treatment. (CDM hydro-tests address pressure integrity)

31. In general, the CDM for buildings need not discuss wall/column thickness. Instead, licensee calculation/analyses on thickness will be subject to NRC audit.

32. The recently passed Law related to Part 52 requires Emergency Planning to be addressed in ITAAC. For design certification, this treatment will be limited to the design features that are included in the plant to support emergency planning. These design features include TSC, OSC, and communication circuits.

33a. System figures will not identify the fail-open, fail-close characteristics of pneumatic valves.

33b. Safety Classes per the NRC Regulatory Guide are not addressed in the CDM

34. The following summarizes the current policy on CDM treatment of programmatic issues such as the Design Reliability Assurance Program (D-RAP) and the initial tests program (ITP). Only the ITP will be addressed and only a design description entry is required, i.e., no ITAAC. See SSAR Section 14.3 for further discussion.

35. The following table summarizes the overall approach to CDM treatment of separation and independence in terms of ITAAC entries to verify physical separation and independence.

System Type	Physical Separation	Independence
Mechanical, Fluid, Hydraulic (including power supplies to components)	Standardized entry - Table 2.1.3.1, Supplement 5	Standardized entry - Table 2.1.3.1, Supplement 4
Electrical Power Supply Systems* (AC and DC)	Attached standardized entry	Attached standardized entry
Instrumentation and Control	Attached standardized entry	Attached standardized entry
Structural	ITAAC for the buildings will be used to verify necessary divisionality	N/A

* For Class 1E Systems and non-Class IE Systems to which the requirements apply; e.g., off-site power sources.

Standardized Entry for Independence for Electrical

Power Supply and Instrument and Control System

Design Commitment	Inspections, Tests, Analysis	Acceptance Criteria
1. In the ___________ System, independence is provided between Class 1E Divisions, and between Class 1E Divisions and non-Class 1E equipment.	1a. Tests on the as-built _________ System will be conducted by providing a test signal in only one Class 1E Division at a time.	1a. A test signal exists only in the Class 1E Division under test in the _________ System.
	1b. Inspection of the as-installed Class 1E Divisions in the __________ System will be performed.	1b. In the _________ System, physical separation or electrical isolation exists between Class 1E divisions. Physical separation or electrical isolation exists between these Class 1E divisions and non-Class 1E equipment.

36. Do not address in the CDM the feature of valve operator thermal overload and their bypass during LOCA conditions. Basis: This feature has been particularly troublesome in the field and is likely to change in the future.

37. Inspections, tests and analyses aimed at checking Seismic II-over-I need not be addressed in the CDM unless there is a special case to be addressed in a particular system. Basis: This issue does not merit CDM treatment on the basis that the adequacy of the design is heavily tied to the as-built, as-procured characteristics of the equipment which makes definition of CDM acceptance criteria difficult.

38. Some PRA studies are dependent upon an assessment of the ability of certain key structures, systems and components (SSC) to function during seismic events that are more severe than the design basis SSE. It has been agreed that SCC seismic margin beyond the design basis is not a subject that needs to be treated in the CDM. Basis: If equipment is designed and qualified for the seismic design basis, the design process is such that the added capability assumed in the PRA will inherently be present. Consequently, no specific CDM treatment is required.

39. The safety-related Reactor Protection System (RPS) utilizes input from several safety-related instruments located in the non-Seismic Category I Turbine Building. It is not necessary to have a specific ITAAC entry aimed at confirming these instruments exist. Basis:

    1) The instruments are qualified for their environment

    2) Most likely failure mode is fail-safe.

    3) The probability of there being a failure in enough of the four channels to give a non-fail-safe situation is very low.

    4) There is the manual scram backup in the event of non-fail-safe failures.

40. All microprocessed based I&C systems that are either safety related or of safety significance, will have a basic configuration ITAAC similar to the LDIS example (ITAAC #1). This configuration check is based on a reference to the section rather than the system figure.

41. The CDM will not define the feedwater pumping system motive power. Basis: not necessary to define this in the CDM and it retains flexibility for applicants to select from several acceptable alternatives.

42. Some I&C systems list (in either the design description or figures) interfacing systems. It is not necessary to have an ITAAC entry specifically to address these interfaces. It is considered covered by the configuration ITAAC.

43. The CDM will not address the issue of recording of data.

44. Issues covered by any of the Section 3 DAC entries do not need to be repeated in the individual systems. For example, the I&C DAC will address setpoint methodology and this issue will not be discussed in the many systems that have safety-related setpoints.

45. For multichannel I&C systems, the CDM will not address the reliability of inadvertent actuation. For example, the RPS ITAAC does not include a test to show that if one division of input channels reaches a trip condition, RPS trip does not occur. Basis: not a safety issue.

46. When a design description identifies that signals are sent to an interfacing system, there will be no discussion of what the interfacing system does with the signal. If CDM treatment is warranted, it will be handled in the system entry for the interfacing system.

47. The following table summarizes the intent to which valve and pump testing will be addressed in the CDM.

Type of Valve	CDM Treatment
MOV	Covered by a combination of. a) Configuration check b) Line item entry in each system with safety-related active valves
Solenoid Valves	Not specifically addressed. Covered by performance of the controlled equipment. EQ picked up by the EQ on the controlled equipment. Additionally, not an historical source of problems.
Pneumatic	Check the failure mode if it is of safety significance.
Check Valve	Line item entry in each system.
Pumps	Functional testing only; no 80-10 or equivalent testing in the CDM.

48. One criteria for selecting CDM entries is that a particular aspect of the design has historically been troublesome and should this be elevated to the CDM. This information is not a primary selection criteria but will only be applied in borderline cases.

49. Pressure integrity testing of HVAC duct work is not required. Basis: Only RCPB testing ties back directly to a GDC. Also, the Control Room Habitability Area HVAC leak test covers the integrity of this system.

50. The CDM does not address local controls and displays. (A few exceptions)

51. Site parameters do not require either:

    a) ITAAC, or,

    b) Verification via COL Action Items

    Basis: Covered by Part 52 processes.

52. Site parameter listing in the CDM does not need to include a definition of aircraft crash. (The SSAR must contain a justification that the design basis tornado missile bounds the General Aviation crash applicable to the site).

53. Structural capabiiity of Seismic Category I structures will be addressed by providing:

a) A summary in the design description of the design basis loading condition

b) An ITAAC entry per the attached Reactor Building example.

c) SSAR material defining the contents if the analysis report.

54. No CDM figures are required for either the turbine or radwaste buildings. Basis: not required for safety finding and likely to dependent upon as-procured equipment.

55. For non-safety-related control systems such as the Feedwater Control System, it is not necessary in the CDM to specify the number of processed channels. A commitment to redundancy is required.

56. The SSLC CDM entry will address all bypass and automatic, internal self-testability.

57. Mechanical systems designed to ASME Code Section III will <u>not</u> have a verifying ITAAC based on the presence of an N stamp. Basis: the N stamp results from implementation of a program and does not involve an inspection or test of the as-built equipment.

Example of ITAAC Entry for Structural

Capability of Seismic Category I Structure

Design Commitment	Inspections, Tests, Analysis	Acceptance Criteria
The R/B is able to withstand the structural design basis loads as defined in Section 2.15.10.	A structural analysis will be performed which reconciles the as-built data with the structural design basis as defined in Section 2.15.10.	A structural analysis report exists which concludes that the as-built R/B is able to withstand the structural design basis loads as defined in Section 2.15.10.

ATTACHED NUMBER 1

NOT USED

ABWR DESIGN CERTIFICATION

CDM GUIDELINES MEMORANDUM

ATTACHMENT NUMBER 2.1

MECHANICAL AND FLUID/HYDRAULIC SYSTEMS

Contents

Mechanical and Fluid/Hydraulic Systems

2.1.1 See Section 2.2 of the memorandum for general guidance on Design Description entries.

2.1.1.1 Design Description Checklist

Table 2.1.1.1 is a list of technical subjects which should be considered for CDM design description treatment for mechanical and fluid/hydraulic systems. Which of these subjects is appropriate for any particular system is a judgment to be made by the responsible system engineer using the graded approach noted elsewhere in this memorandum. To the extent practical and depending on which subjects are addressed in any system entry, the design description text for that system should follow the sequence of subjects listed in Table 2.1.1.1. Supplements to this table provide examples of wording that should be followed for all systems to the extent it is applicable.

Table 2.1.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS

Technical Issue	Applicable Supplement* Number	CDM Treatment	Corresponding Treatment in ITAAC (See Table 2.1.3.1)
• System name, scope configuration and control interfaces	1	Provide for all systems having any CDM Design Description (DD) entry. Reference any figures here or under functions or modes. (Including the CID showing key input/output interfaces, if applicable.)	Configuration: Entry 1 Hydrotest: Entry 2 Note: The CID is usually the diagram showing the relationship between safety-related systems and SSLC.
• System purpose	2	Overview of system purpose as selected for CDM treatment.	None
• Safety-related or non-safety-related	4	Identify portions of system which are safety-related and non-safety-related.	None. Basis: system safety-related status covered by other ITAAC such as separation, Class 1E power supplies, etc.

Table 2.1.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

Technical Issue	Applicable Supplement* Number	CDM Treatment	Corresponding Treatment in ITAAC (See Table 2.1.3.1)
• System modes, logic, and performance	3	Overview of modes of operation. Treat mode-by-mode. Identify the signals and logic associated with system initiation if logic is performed by the system or is performed by SSLC for the system. Include major performance parameters such as flow, head. Also include key logic/interlock features meriting CDM treatment.	System-specific material. Examples shown in Entry 3.
• System seismic classification	5a	Identify Seismic Category I portions of safety-related systems.	None (seismic/dynamic qualification covered by configuration).

Table 2.1.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

Technical Issue	Applicable Supplement* Number	CDM Treatment	Corresponding Treatment in ITAAC (See Table 2.1.3.1)
• ASME Code Class and Quality Groups	5b	In general, do not identify Quality Groups in the CDM. ASME Code Class should be identified on the figure using the legend in Appendix A of the CDM. This should be referred to in the text per Supplement 5b.	None. (Welding covered by configuration.)
• Location, layout	6	Major location of the system (usually limited to describing which building it is located in).	None. Covered in building sections for major mechanical and fluid/hydraulic systems.

Table 2.1.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

Technical Issue	Applicable Supplement* Number	CDM Treatment	Corresponding Treatment in ITAAC (See Table 2.1.3.1)
• Power supplies – physical separation and electrical independence	7	Identify which items receive Class 1E power and from which divisions. (This information should be covered on the system figure or in the text.) Include the issues of independence between 1E and non-1E equipment.	Item 4
• Physical separation – mechanical systems	8	Describe the extent to which mechanical divisions of safety-related equipment are physically separated. Note: The issue of electrical and instrument/control (I&C) separation for fluid systems is handled in the electrical and I&C systems.	Item 5

Table 2.1.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

Technical Issue	Applicable Supplement* Number	CDM Treatment	Corresponding Treatment in ITAAC (See Table 2.1.3.1)
• Instrumentation, controls and alarms	9	For safety-related systems, the DD text should identify (as appropriate) that the main control room has the following: • status indication for all active safety-related components shown on the system figure • alarms (very few in the CDM) • manual control of active safety-related components shown on the system figure • status indications (specify) on the condition of the automatic logic	Item 6 NOTE: Modify text for system-specific conditions.

Table 2.1.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

Technical Issue	Applicable Supplement* Number	CDM Treatment	Corresponding Treatment in ITAAC (See Table 2.1.3.1)
		• parameter displays for all instruments shown in the system figure • manual system level initiation capability and other manual control features in the MCR	
	10	The system interfaces with the remote shutdown panel should be identified. (Operation from the panel is discussed elsewhere.)	Item 7

Table 2.1.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

Technical Issue	Applicable Supplement* Number	CDM Treatment	Corresponding Treatment in ITAAC (See Table 2.1.3.1)
• Equipment Qualification	11	State which safety-related electrical equipment is qualified for a harsh environment. (An option is to address this issue in the system figure.)	None (covered by configuration)
• Motor-operated valves (MOV)	12	Identify which system MOVs have safety-related active functions.	Item 8. This is the in-situ valve testing; pre-installation testing is covered under configuration.
• Check Valves (CVs)	15	Identify which system CVs have safety-related functions.	Item 11
• Pneumatic valves	14	Address the failure mode of any valve where this failure mode is important to safety.	Item 10

Table 2.1.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

Technical Issue	**Applicable Supplement* Number**	**CDM Treatment**	**Corresponding Treatment in ITAAC (See Table 2.1.3.1)**
• Special features	13a and 13b	Describe any special features of the system that need to be addressed in the CDM. Of note is the need to address piping system design pressure commitments for ISLOCA. See Supplement 16.	Case-by-case. ITAAC usually necessary. (ISLOCA does not require ITAAC. Basis: addressed in piping DAC.)

In addition, systems which are partially or completely out of scope, the design description should include a discussion of the interface requirements called for by Part 52. (This information also should be discussed in Section 4.)

*Supplements to this table provide examples of wording for these CDM DD entries.

NOTE

The following supplements to Table 2.1.1.1 are examples only of design description entries for various subjects. These examples should be used to the extent applicable, but in many cases will require system-specific modification. Furthermore, not all systems will require design description entries for each of the technical subjects covered in Table 2.1.1.1 and its supplements.

Table 2.1.1.1. SUPPLEMENT NUMBER 1

TECHNICAL ISSUE

System name, scope, configuration and control interfaces.

Note: Control interfaces only required for safety-related ESF systems.

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The Residual Heat Removal (RHR) System has three separate divisions. The major functions of the RHR System are:

(1) Containment heat removal.

(2) Reactor decay heat removal.

(3) Emergency reactor vessel level makeup and

(4) Augmented fuel pool cooling.

Figures 2.4.1a, 2.4.1b, and 2.4.1c show the basic system configuration and scope. Figure 2.4.1d shows the RHR System control interfaces.

TYPICAL REFERENCE TO THE CONTROL INTERFACE DIAGRAM FOR SAFETY-RELATED SYSTEMS

As shown on Figure 2.4.1d, the RHR System channel measurements are provided to the Safety System Logic and Control (SSLC) for signal processing, setpoint comparisons, and generating trip signals. The RHR System is automatically initiated when either a high drywell pressure or low reactor water level condition exists (i.e., LOCA signal). An RHR initiation signal is provided to the systems as identified on Figure 2.4.1d. The SSLC processors use a two-out-of-four voting logic for RHR System initiation. Each RHR division can also be initiated manually (LPFL) mode.

COMMENTS AND NOTES

None

Table 2.1.1.1. SUPPLEMENT NUMBER 2

TECHNICAL ISSUE

System purpose.

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The RHR System operates in the following modes:

(1) Low pressure core flooder (LPFL) (Divisions A, B, and C)

(2) Suppression pool cooling (Divisions A, B, and C)

(3) Wetwell spray (Divisions B, and C)

(4) Drywell Spray (Divisions B, and C)

(5) Shutdown cooling (Divisions A, B, and C)

(6) Augmented fuel pool cooling, and fuel pool makeup (Divisions B, and C)

(7) AC power source independent water addition (Division C)

(8) Full flow test (Divisions A, B, and C)

(9) Minimum flow bypass (Divisions A, B, and C)

COMMENTS AND NOTES

None

Table 2.1.1.1. SUPPLEMENT NUMBER 3

TECHNICAL ISSUE

System modes and performance.

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The suppression pool cooling mode of the RHR System limits the long-term post-LOCA temperature of the suppression pool, and limits the long-term peak temperatures and pressures within the wetwell and drywell regions of the containment. In this mode, the RHR System circulates water through the RHR heat exchangers and returns it directly to the suppression pool. This mode is manually initiated by control of individual system components. In the suppression pool cooling mode, the total heat removal capacity between the RHR and ultimate heat sink is no less than 88.5 kcal/sec°C for each division. 88.5 kcal/sec°C is the limiting heat removal capacity of all the RHR modes. The heat removal path is the RHR heat exchanger, the Reactor Building Cooling Water (RCW) System, and the Reactor Service Water (RSW) System. In the suppression pool cooling mode, the RHR tube side heat exchanger (Hx) flow rate is 954 m^3/hr minimum per division. The RHR pumps have sufficient net positive suction head (NPSH) available at the pump. Suction from the suppression pool is the limiting NPSH condition of all the RHR modes.

COMMENTS AND NOTES

This material is an example of the level of detail for an important safety-related mode of operation. Other descriptions may have considerably less detail.

Table 2.1.1.1. SUPPLEMENT NUMBER 4

TECHNICAL ISSUE

Safety-related and non-safety-related.

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

1. The main condenser is classified as non-safety-related.

2. Except for the non-ASME Code components of the AC independent water addition feature (Figure 2.4.1.c), the entire RHR System shown on Figures 2.4.1a, 2.4.1b, 2.4.1c is classified as safety-related.

COMMENTS AND NOTES

None

Table 2.1.1.1. SUPPLEMENT NUMBER 5a

TECHNICAL ISSUE

Seismic classification.

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

1. SLCS components required for RPV injection are classified as Seismic Category 1.

2. The safety-related equipment shown on Figure 2.10.3 is classified as Seismic Category 1.

3. The RHR System is classified as Seismic Category 1.

COMMENTS AND NOTES

None

Table 2.1.1.1. SUPPLEMENT NUMBER 5b

TECHNICAL ISSUE

ASME Code Class and Quality Groups.

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

Figure … shows the ASME Code Class for the … system piping and components.

COMMENTS AND NOTES

None

Table 2.1.1.1. SUPPLEMENT NUMBER 6

TECHNICAL ISSUE

Location, layout

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

1. The SLCS System is located in the Reactor Building. The storage tank, test water tank, the two positive displacement pumps and associated valving, are located in the secondary containment on the floor elevation below the operating floor.

2. The main condenser is located in the turbine building which is not classified as a Seismic Category 1 structure.

3. The RHR System is located in the Reactor Building.

COMMENTS AND NOTES

None

Table 2.1.1.1. SUPPLEMENT NUMBER 7

TECHNICAL ISSUE

Power supplies.

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

A. Design Description Text. (RHR example)

Each of the three divisions is powered from the Class 1E division as shown on Figures 2.4.1a, 2.4.1b, 2.4.1c. In the RHR System, independence is provided between Class 1E divisions, and also between the Class 1E divisions and non-Class 1E equipment.

B. Figures

The following is an example taken from one of the RHR Figures (Division C):

All electrical power loads for the Class 1E components shown on this figure are powered from Class 1E Division III except the outboard containment isolation valve, which is Division I.

COMMENTS AND NOTES

1. The preferred approach is to treat this issue in the text and on the figure(s). Text treatment alone is acceptable if it is more appropriate.

2. Note the importance of identifying exceptions such as the RHR outboard isolation valve example above.

Table 2.1.1.1. SUPPLEMENT NUMBER 8

TECHNICAL ISSUE

Physical separation.

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

Outside of the containment, each mechanical Division of the RHR System (Divisions A, B, C) is physically separated from the other Divisions.

COMMENTS AND NOTES

Any exceptions to this statement should be identified in the Design Description and the Acceptance Criteria column of the corresponding ITAAC entry for physical separation.

Table 2.1.1.1. SUPPLEMENT NUMBER 9

TECHNICAL ISSUE

Instrumentation and Controls

A. Main Control Room

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The RHR System has the following displays and controls in the main control room:

(1) Parameter displays for the instruments shown on Figures 2.4.1a, 2.4.1b, and 2.4.1c.

(2) Controls and status indication for the active safety-related components shown on Figures 2.4.1a, 2.4.1b, and 2.4.1c.

(3) Manual system level initiation capability for the following modes:

(a) LPFL initiation

(b) Standby

(c) Shutdown cooling

(d) Suppression pool cooling

(e) Drywell spray

COMMENTS AND NOTES

Alarms should be added if (and only if) any are identified in the design description.

For safety-related systems, the DD text should (as applicable) identify that the main control room has the following:

- Alarms for ... (specify; delete if none) ...
- Parameter displays for the sensors shown on the figures or defined in the DD text.

Table 2.1.1.1. SUPPLEMENT NUMBER 9 (Continued)

- Controls and status indication for the active safety-related components shown on the figures as defined in the text.
- Status indications of the condition of the automatic logic; e.g trip status
- Other manual control features such as system level initiation capability, reset, division trips, etc.

NOTE: Individual safety-related systems should not discuss sensor bypass, division maintenance bypass, calibration/self-diagnosis. These issues will be covered in SSLC.

Table 2.1.1.1. SUPPLEMENT NUMBER 10

TECHNICAL ISSUE

Instrumentation and Controls

B. Remote Shutdown System

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

RHR System components with display and/or* control interfaces with the Remote Shutdown System (RSS) are shown on Figures 2.4.1a, and 2.4.1b.

COMMENTS AND NOTES

The Remote Shutdown System has no alarms.

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*For each system, be specific.

Table 2.1.1.1. SUPPLEMENT NUMBER 11

TECHNICAL ISSUE

Equipment Qualification

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The safety-related electrical equipment shown on Figures 2.4.1a, 2.4.1b, and 2.4.1c located inside the primary containment and the Reactor Building is qualified for a harsh environment.

COMMENTS AND NOTES

It is important that this entry identify only safety-related electrical equipment in a harsh environment.

Table 2.1.1.1. SUPPLEMENT NUMBER 12

TECHNICAL ISSUE

Motor-Operated Valves

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The motor-operated valves shown on Figure _______ (except for the heat exchanger bypass valve) have active safety-related functions and perform these functions to open, close, or both open and close under system pressure, fluid flow and temperature conditions.

COMMENTS AND NOTES

The intent of the entry is to identify safety-related valves with active safety-related functions.

Table 2.1.1.1. SUPPLEMENT NUMBER 13a

TECHNICAL ISSUE

Special Features

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The RHR System main pumps are interlocked to prevent starting with a closed suction path.

COMMENTS AND NOTES

This type of special issue must be treated on a case-by-case basis.

Table 2.1.1.1. SUPPLEMENT NUMBER 13b

TECHNICAL ISSUE

Inter-System Loss of Coolant Accident (ISLOCA)

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The HPCF System suction piping and components from the pump suction valves to the pump inlet have a design pressure of 28.8 kg/cm^2g for intersystem LOCA (ISLOCA) conditions.

COMMENTS AND NOTES

No ITAAC table entry is necessary for this type of ISLOCA DD entry.

Table 2.1.1.1. SUPPLEMENT NUMBER 14

TECHNICAL ISSUE

Pneumatic Valves.

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The pneumatic-operated valves shown in Figures 2.11.3a, 2.11.3b, and 2.11.3c fail as follows in the event that either electric power to the valve-actuating solenoid is lost or pneumatic pressure to the valve is lost: RCW makeup valves from the MUWP fail open, RCW water temperature control valves fail open, RCW heat exchanger bypass valves fail closed, and the safety-related/ non-safety-related separation valve fails closed.

COMMENTS AND NOTES

NOTE: The intent of this entry is to identify the failure mode of any pneumatic valve(s) when the failure mode is of safety significance.

Table 2.1.1.1. SUPPLEMENT NUMBER 15

TECHNICAL ISSUE

Check Valves (CVs)

EXAMPLE OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The check valves (CVs) shown on Figures 2.4.1a, 2.4.1b, and 2.4.1c have safety-related functions to open, close, or both open and close under system pressure, fluid flow, and temperature conditions.

COMMENTS AND NOTES

None

2.1.2 CDM Design Description Figures and Diagrams

See Section 2.3 of the memorandum for general guidance on CDM figures.

2.1.2.1 Figure/Diagram Checklist

Table 2.1.2.1 is a checklist of items that needs to be considered when preparing figures for mechanical and fluid/hydraulic systems.

Table 2.1.2.1. CHECKLIST OF ITEMS TO BE CONSIDERED WHEN PREPARING FLUID SYSTEM CDM DIAGRAMS

ISSUE	CORRECT TREATMENT
Figure number and system title	Identical to design description section number and system title.
Scope	Include all equipment items addressed in the design description. As a minimum, this will usually include all active safety-related components in the system.
Numbering (multiple figures)	Use section number with lower case subscripts; e.g., Figures 2.17.2a, 2.17.2b ...
Valves	Use the non-specific valve type symbol (CDM Appendix A) unless there is a functional requirement for a particular valve type.
	The legend does not permit valve position (open/closed) to be shown. No attempt should be made to show different modes of operation.
System boundary	Show system boundaries by identifying connected systems.
Piping	Piping to be shown with Code class as required by the Legend in the CDM Appendix A.
Code class	Provide Code class numbering on figure where classification changes and at system boundary.
	Do not show Code class of interfacing systems. (Some exceptions.)

Table 2.1.2.1. CHECKLIST OF ITEMS TO BE CONSIDERED WHEN PREPARING FLUID SYSTEM CDM DIAGRAMS (Continued)

ISSUE	CORRECT TREATMENT
Power supply	Add note to state safety-related, Class 1E power supply Divisions. Use Roman numeral for Division numbers. See Table 2.1.1.1 Supplement 7 for example wording.
	State any exception to power supply divisions.
Instruments	In general, the parameter being sensed (flow, temperature, etc.) should be identified, and the type of measurement device should not be identified. For example, use flow element symbol without specifying the type of element used such as venturi or orifice type. Exception: if a flow measuring device also has a flow limiting function, show the element type.
	Show all instruments and devices which belong to the system and provide input to the automatic control of the system. Also show any additional instruments needed for operator monitoring of system performance and/or items needed by interfacing systems.
Terms	All component names to be consistent with what is used in Design Description.
	System name to be consistent with CDM Table of Contents listing.
Alarms	Show any alarms that merit CDM treatment (very few).
Symbols	All symbols to be as shown in the CDM Legend.

Table 2.1.2.1. CHECKLIST OF ITEMS TO BE CONSIDERED WHEN PREPARING FLUID SYSTEM CDM DIAGRAMS (Continued)

ISSUE	CORRECT TREATMENT
Penetrations	Show a barrier and specify what is being penetrated, such as Primary Containment, Reactor Building or equivalent.
Valves	Indicate valve function, if necessary, to guide reader (not usually necessary) Show only those valves whose function is important to the system. (Usually limited to valves with active safety-related functions.)
Remote Shutdown System	Denote components that have status indicating and/or control on the Remote Shutdown System with an "R" on the figure.
Flow direction	Arrowheads may be (but do not have to be) added to pipe to indicate direction of flow.
Legend	Do not define legend on figure. Add any symbols and abbreviations to Appendix A of the CDM for legend.
Notes	Provide notes under a heading for "Notes" and number all notes (even if there is only one note).

2.1.3 CDM ITAAC Entries

See Section 2.4 for general guidance on ITAAC entries.

2.1.3.1 ITAAC Table Checklist

The sequence in which subjects should be listed in the ITAAC tables must follow as closely as possible the design description sequence defined in Table 2.1.1.1. Table 2.1.3.1 is a list of the technical subjects which should be considered for ITAAC table entries. Maximum use should be made of the standardized ITAAC table entries provided in the supplements to Table 2.1.3.1. These standardized entries should be modified as needed for application to a particular system but are intended to be replicated verbatim unless there are legitimate reasons for not doing so. The sequence in Table 2.1.3.1 is based on the order in which subjects are addressed in the design description (Table 2.1.1.1) and should be followed to the extent practicable and/or applicable.

Table 2.1.3.1. ITAAC TABLE CHECKLIST

Issue	Applicable Supplement Number *	Treatment in ITAAC Table
System name, scope, configuration and control interfaces	1, 2	Use the standardized words shown on Supplements Number 1 and 2.
System purpose	—	None.
System modes, logic, and performance	3	Provide ITAAC entries to address major performance, logic and interlock features of the design as discussed in the design description. Supplements 3a, 3b, and 3c give examples. Include system level manual initiation for safety-related systems (if applicable).
Safety-related or non-safety-related	—	None
System Seismic Classification	—	None. (Covered by configuration.)
ASME Code Class and Quality Group	–	None. (Welding aspects covered by configuration.)
Location, Layout	—	None, unless there is a specific special case that should be addressed.

Table 2.1.3.1. ITAAC TABLE CHECKLIST (Continued)

Issue	Applicable Supplement Number *	Treatment in ITAAC Table
Power Supplies – physical separation and electrical independence	4	Use the standardized words shown on Supplement 4. This entry addresses physical separation and electrical independence for electrical power supplies (including I&C).
Physical separation for mechanical portion of system	5	Use the standardized words shown on Supplement 5.
Instrumentation and Controls	6, 7	Use the standardized words shown on Supplements 6 and 7.
Equipment Qualification	—	None. (Covered by configuration.)
Motor Operated Valves	8	Use the standardized words shown on Supplement 8.
Pneumatic Valves	10	Use the example in Supplement 10 as guidance for other cases where pneumatic valve failure is relevant to safety and is being addressed in an ITAAC.
Special Features	9	Treat case-by-case. See Supplement 9 for an example.

Table 2.1.3.1. ITAAC TABLE CHECKLIST (Continued)

Issue	Applicable Supplement Number *	Treatment in ITAAC Table
Check Valves	11	Use the format shown on Supplement 11.
ISLOCA	—	None. Design pressure covered by the piping DAC.

*Supplements to this table provide standardized and/or recommended wording for these CDM entries.

NOTE

The following supplements to Table 2.1.3.1 are examples of ITAAC entries for various subjects and should, if possible, be used verbatim. However, they should be used only to the extent applicable and in many cases may require system-specific modifications. Furthermore, not all systems will require ITAAC entries for each of the technical subjects in Table 2.1.3.1. (Only provide ITAAC entries to the extent subjects are addressed in the design description.)

Table 2.1.3.1. SUPPLEMENT NUMBER 1

TECHNICAL ISSUE

1. Configuration

NOTE: This standardized entry is <u>not</u> to be used for I&C Systems. See entry in Table 2.3.3.1 for I&C material.

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
1. The basic configuration of the _____________ System is shown on Figure ________. (See Note 1.)	1. Inspections of the as-built system will be conducted.	1. The as-built __________ System conforms with the basic configuration shown in Figure _________.

COMMENTS AND NOTES

Note 1: If a figure is not used, reference the Section number.

Note 2: This entry is intended to be a general verification that the system described in the design description is in place in the as-built plant. Particularly critical system characteristics may well justify a separate ITAAC table entry. An example would be a separate ITAAC to verify elevation of a flood protection float switch shown on the figure.

Table 2.1.3.1. SUPPLEMENT NUMBER 2

TECHNICAL ISSUE

2. Hydrostatic Test

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
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. (See Note 1.)	2. The results of the hydrostatic test of the ASME Code components of the __________ System conform with the requirements in the ASME Code, Section III. (See Note 1.)

COMMENTS AND NOTES

Note 1: Modify to call out pressure test for pneumatic/gas and oil systems, if that is what is proposed.

Table 2.1.3.1. SUPPLEMENT NUMBER 3a

TECHNICAL ISSUE

3a. System Modes and Performance – Hydraulic Performance of a Fluid System

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
d. The LPFL injection flow for each division begins when the RPV dome pressure is no less than 15.8 kg/cm^2 above the drywell pressure. When the RPV dome pressure is no less than 2.8 kg/cm^2 greater than the drywell pressure, the LPFL injection flow for each division is 954 m^3/hr minimum.	d. Tests will be conducted on the as-built RHR System in the RHR LPFL mode. Analyses* will be performed to convert the test results to the conditions of the Design Commitment.	d. The converted RHR flow satisfies the following: The LPFL injection flow for each division begins when the RPV dome pressure is no less than 15.8 kg/cm^2 above the drywell pressure. When the RPV dome pressure is no less than 2.8 kg/cm^2 greater than the drywell pressure, the LPFL injection flow for each division is 954 m^3/minimum.

*These analyses are defined in the SSAR.

Table 2.1.3.1. SUPPLEMENT NUMBER 3a (Continued)

COMMENTS AND NOTES

This is an example only. These entries must be developed on a system-specific basis.

Table 2.1.3.1. SUPPLEMENT NUMBER 3b

TECHNICAL ISSUE

3b. System Modes and Performance – Logic Test for a Fluid System

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
3.	3.	3.
a. The RHR System is automatically initiated in the LPFL mode when either a high drywell pressure or a low reactor water level condition exists.	a. Tests will be conduced using simulated input signals for each process variable to cause trip conditions in two, three, and four instrument channels of the same process variable.	a. Each division of the RHR System receives an initiation signal.
b. Each RHR division can be initiated manually (LPFL mode).	b. Tests will be conducted by initiating each division manually.	b. Each division of the RHR System receives an initiation signal.

Table 2.1.3.1. SUPPLEMENT NUMBER 3b (Continued)

COMMENTS AND NOTES

This is an example only. These logic-based entries must be developed on a system-specific basis.

Table 2.1.3.1. SUPPLEMENT NUMBER 3c

TECHNICAL ISSUE

3c. NPSH Evaluation

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
3.	3.	3.
c. The __________ System pumps have sufficient NPSH.	c. Inspections, tests and analyses will be performed upon the as-built system. The analyses will consider the effects of: – pressure losses for pump inlet piping and components,	c. The available NPSH exceeds the NPSH required by the pumps.

Table 2.1.3.1. SUPPLEMENT NUMBER 3c (Continued)

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
	*– 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.	

COMMENTS AND NOTES

This is an example to be followed for NPSH evaluations for critical pumps, e.g., ECCS.

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* These items require system-unique modification.

Table 2.1.3.1. SUPPLEMENT NUMBER 4

TECHNICAL ISSUE

4. Power Supplies

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
9. Each of the three RHR divisions is powered from the Class 1E division as shown on Figures 2.4.1a, 2.4.1b and 2.4.1c. In the RHR System, independence is provided between Class 1E division, and between Class 1E divisions and non-Class 1E equipment.	9. a. Tests will be performed on the RHR System by providing a test signal to only one Class 1E division at a time.	9. a. The test signal exists only in the Class 1E division under test in the RHR System.

Table 2.1.3.1. SUPPLEMENT NUMBER 4 (Continued)

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
9.	9. b. Inspection of the as-installed Class 1E divisions in the RHR System will be performed.	9. b. In the RHR System, physical separation or electrical isolation exists between Class 1E divisions. Physical separation or electrical isolation exists between these Class 1E divisions and non-Class 1E equipment.

COMMENTS AND NOTES

None

Table 2.1.3.1. SUPPLEMENT NUMBER 5

TECHNICAL ISSUE

5. Physical Separation

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
10. Each mechanical division of the RHR System (Divisions A, B, C) is physically separated from the other divisions.	10. Inspections of the as-built RHR System will be performed.	10. Each mechanical division of the RHR System is physically separated from other mechanical divisions of RHR System by structural and/or fire barriers with the exception of primary containment.

COMMENTS AND NOTES

NOTE: Any instances where this physical separation is not maintained should be clearly identified in the Acceptance Criteria and Design Description.

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* As appropriate for each system.

Table 2.1.3.1. SUPPLEMENT NUMBER 6

TECHNICAL ISSUE

6. Instrumentation and Controls

Main Control Room

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
6. Main control room alarms,* displays and/or controls provided for the __________ System are as defined in Section ________.	6. Inspections will be performed on the main control room alarms,* displays, and/or controls for the __________ System.	6. Alarms,* displays, and/or controls exist or can be retrieved in the main control room as defined in Section ________.

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

Table 2.1.3.1. SUPPLEMENT NUMBER 6 (Continued)

COMMENTS AND NOTES

RHR example is as follows:

11. Main control room displays and controls provided for RHR System are defined in Section 2.4.1.	11. Inspections will be performed on the main control room displays and controls for the RHR System.	11. Displays and controls exist or can be retrieved in the main control room as defined in Section 2.4.1.

Table 2.1.3.1. SUPPLEMENT NUMBER 7

TECHNICAL ISSUE

7. Instrumentation and Controls

Remote Shutdown System

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
7. Remote Shutdown System (RSS) displays and controls* provided for the _________ System are as defined in Section ________.	7. Inspections will be performed on the RSS displays and controls* for the ___________ System.	7. Displays and controls* exist on the RSS as defined in Section _______.

____

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

Table 2.1.3.1. SUPPLEMENT NUMBER 7 (Continued)

COMMENTS AND NOTES

Only to be used for those systems with RSS interfaces. RHR entry is as follows:

12. RSS displays and controls provided for the RHR System are as defined in Section 2.4.1.	12. Inspections will be performed on the RSS displays and controls for the RHR System.	12. Displays and controls exists on the RSS as defined in Section 2.4.1.

Table 2.1.3.1. SUPPLEMENT NUMBER 8

TECHNICAL ISSUE

8. Motor-Operated Valves (MOV)

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
8. Motor-operated valves (MOV) designed in Section ___________ as having an active safety-related function open, dose, or both open and close* under differential pressure, fluid flow and temperature conditions.	8. Tests of installed valves for opening, closing or both opening and closing, will be conducted under preoperational differential pressure, fluid flow, and temperature conditions.	8. Upon receipt of the actuation signal, each MOV opens, closes or both opens and closes, depending on the valve's safety functions. The following valves open and/or* close in the following time limits upon receipt of the actuation signal.

Table 2.1.3.1. SUPPLEMENT NUMBER 8 (Continued)

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
		8. Valve** Time (sec) ______ _____ open ______ _____ close ______ _____ open ______ _____ close

COMMENTS AND NOTES

RHR example:

13. a. MOVs designated in Section 2.4.1 as having an active safety function open, close, or both open and close under differential pressure, fluid flow, and temperature conditions.	13. a. Tests of installed valves for opening, closing or both opening and closing, will be conducted under preoperational differential pressure, fluid flow, and temperature conditions.	13. a. Upon receipt of the actuating signal, each MOV opens, closes, or both opens and closes, depending upon the valve's safety functions.

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* Modify to reflect specific system application.

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

Table 2.1.3.1. SUPPLEMENT NUMBER 9

TECHNICAL ISSUE

9. Example of special case ITAAC.

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
12. A surge tank with a capacity of greater than or equal to 16 m^3 is provided for each RCW division.	12. Inspection and a volume calculation using as-built dimensions will be performed.	12. The capacity of the surge tanks is greater than or equal to 16 m^3.

COMMENTS AND NOTES

This is an example of a special situation ITAAC that must be developed case-by-case.

Table 2.1.3.1. SUPPLEMENT NUMBER 10

TECHNICAL ISSUE

10. Pneumatic valve failure modes

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
11. The pneumatic-operated valves shown in Figures 2.11.2a, 2.11.2b, and 2.11.2c fail as follows in the event that either electric power to the valve actuating solenoid is lost or pneumatic pressure to the valve is lost: MUWP makeup valves fail open, RCW water temperature control valves fail open, RCW heat exchanger bypass valves fail closed, and the safety-related/non-safety-related separation valves fail closed.	11. Tests will be conducted on the as-built valves by initiating loss of pneumatic pressure and power to the actuating solenoids.	11. The pneumatic actuated valves listed below fail as desired when either electric power to the valve actuating solenoid is lost or pneumatic pressure to the valve is lost: MUWP makeup water valves fail open, RCW water temperature control valves fail open, RCW heat exchanger bypass valves fail closed, and the safety-related/non-safety-related separation valves fail closed.

Table 2.1.3.1. SUPPLEMENT NUMBER 10 (Continued)

COMMENTS AND NOTES

This is an example only. This entry must be developed on a system-specific basis.

Table 2.1.3.1. SUPPLEMENT NUMBER 11

TECHNICAL ISSUE

11. Check Valves

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
b. Check valves (CVs) designated in Section 2.4.1 as having an active safety-related function open, close, or both open and close, under system pressure, fluid flow, and temperature conditions.	b. Tests of installed valves for opening, closing, or both opening and closing, will be conducted under system preoperational pressure, fluid flow, and temperature conditions.	b. Based on the direction of the differential pressure across the valve, each CV opens, closes, or both opens and closes, depending upon the valve's safety functions.

COMMENTS AND NOTES

The above example should be modified as necessary for each application.

ABWR DESIGN CERTIFICATION

CDM GUIDELINES MEMORANDUM

ATTACHMENT NUMBER 2.2

ELECTRICAL SYSTEMS

Contents

2.2 CDM Treatment of Electrical Systems

Electrical systems are not as amendable to a standardized approach as the fluid/hydraulic systems. The various electrical system entries in the ABWR CDM have been derived case-by-case through extensive GE/NRC interactions. consequently, detailed generic guidance for these systems is not meaningful and this attachment is limited to the broad guidelines in Table 2.2.

Table 2.2. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS

TECHNICAL ISSUE	CDM TREATMENT	CORRESPONDING TREATMENT IN ITAAC
• System name, scope and configuration	Provide for all systems having any CDM Design Description (DD) entry. Reference any CDM figures here or under system features or functions.	Configuration: Usually Item 1 in ITAAC table.
• System function	Overview of system functions as selected for CDM treatment.	None
• Key interfaces	Show all important interfacing systems on figure or discuss them in DD. Specify termination points or system boundaries.	Part of the configuration check.
• Safety-related status	Identify portions of system which are safety-related and non-safety-related. (Use the IEEE Class-1E designation)	None
• System seismic classification	None	None
• Location	Major location of the system (usually limited to describing which building it is located in and the seismic category of the building).	Part of the configuration check.

Table 2.2. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

TECHNICAL ISSUE	CDM TREATMENT	CORRESPONDING TREATMENT IN ITAAC
• Redundancy	Discuss items that are redundant, triplicated or other backups.	Address if applicable.
• Rating/Capacity	Provide rating/capacity for those items that are being discussed.	Address if applicable.
• Power sources	Identify which item receives Class 1E power and from which division. (If possible, this information should be covered on the system figure rather than in the text.) Discuss any alternative power sources and logic or switching mechanisms when power is lost.	Address is applicable.
• Special Features		
Grounding	Discuss design features required for grounding.	Address is applicable.
Breaker coordination	Discuss requirements for breaker coordination.	Address is applicable.
Harmonic distribution analysis	Discuss requirements for allowable harmonic distribution.	Address is applicable.

Table 2.2. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

TECHNICAL ISSUE	CDM TREATMENT	CORRESPONDING TREATMENT IN ITAAC
• Physical separation and electrical independence	Discuss requirements for separation and independence and note any exceptions.	Address is applicable using the standardized entry given in Attachment 2.1.
• Interface requirements	Provide interface requirements. (See Section 4.0 for handling of interface requirements.)	None. ITAAC not required.

ABWR DESIGN CERTIFICATION

CDM GUIDELINES MEMORANDUM

ATTACHMENT NUMBER 2.3

INSTRUMENTATION AND CONTROL SYSTEMS

2.3 Instrumentation and Control Systems

2.3.1 Design Description Text

2.3.1.1 Checklist

2.3.2 CDM Design Description Figures and Diagrams

2.3.2.1 Checklist

2.3.3 CDM Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) Entries

2.3.3.1 Checklist

2.3 **Instrumentation and Control**

2.3.1 Design Descriptions

(See Section 2.2)

2.3.1.1 Design Description Checklist

Table 2.3.1.1 is a list of technical subjects which should be considered for CDM design description treatment. Which of these subjects is appropriate for any particular system is a judgment to be made by the responsible system engineer using the graded approach noted above. To the extent practicable and depending on which subjects are addressed in any system entry, the design description text for that system should follow the sequence of subjects listed in Table 2.3.1.1. Supplements to this table provide examples of wording that should be followed for all systems to the extent it is applicable.

Table 2.3.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS

TECHNICAL ISSUE	APPLICABLE SUPPLEMENT* NUMBER	CDM TREATMENT	CORRESPONDING TREATMENT IN ITAAC (See Table 2.3.3.1)
• System name, scope, control interfaces	1	Provide for all systems having any CDM Design Description (DD) entry. Reference any figures here or under functions or modes. Control Interface Diagram (CID) includes key input/output interfaces.	Configuration: Entry 1
• System Purpose	2	Overview of system functions as selected for CDM treatment.	None
• Safety-related or non-safety-related and System seismic classification	3	Identify portions of system which are safety-related and non-safety-related. As a minimum, identify Class 1E portions of safety-related systems. Class 1E infers seismic qualification consistent with Seismic Category 1.	None (Seismic Qualification covered by I&C DAC)

* Supplements to this Table provide examples of wording for these CDM entries.

Table 2.3.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

TECHNICAL ISSUE	APPLICABLE SUPPLEMENT* NUMBER	CDM TREATMENT	CORRESPONDING TREATMENT IN ITAAC (See Table 2.3.3.1)
• System modes and performance	4	Overview of modes of operation. Treat mode-by-mode. Include major performance parameters such as control signals to actuating devices. Also include key logic/interlock features meriting CDM treatment.	System-specific material. Examples shown in Entry 2.
• Setpoints	—	Do not include numerical setpoints valves in the CDM.	None (Setpoint methodology covered by I&C DAC)
• Codes and Standards	—	Do not identify codes and standards in the CDM.	None
• Power supplies	5	As a minimum, identify which items receive Class 1E power and from which divisions. (This information should be covered on the system figure or in the text.) If appropriate for CDM, identify power sources for non-safety-related I&C systems.	Item 3.

* Supplements to this Table provide examples of wording for these CDM entries.

Table 2.3.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

TECHNICAL ISSUE	APPLICABLE SUPPLEMENT* NUMBER	CDM TREATMENT	CORRESPONDING TREATMENT IN ITAAC (See Table 2.3.3.1)
• Independence (Covers physical separation and electrical isolation)	6	Describe the extent to which divisions of safety-related equipment are physically separated and electrically isolated.	Item 4 (For safety-related systems powered from 1E Divisions).
• Location, layout	7	Major location of system (usually limited to describing which building it is located).	Covered in configuration. Item 1.
• Instrumentation, controls and alarms	8	The text should identify the minimum set of information required in the control room.	Item 5.
	9	The system interfaces with the remote shutdown panel and should be identified. (Operation from the panel is discussed elsewhere.)	Item 6.

* Supplements to this Table provide examples of wording for these CDM entries.

Table 2.3.1.1. CANDIDATE SUBJECTS FOR TREATMENT IN CDM SYSTEM DESCRIPTIONS (Continued)

TECHNICAL ISSUE	APPLICABLE SUPPLEMENT* NUMBER	CDM TREATMENT	CORRESPONDING TREATMENT IN ITAAC (See Table 2.3.3.1)
• Equipment Qualification		No discussions required.	None (covered by I&C DAC)
• Special Features	10	Describe any special features of the system that need to be addressed in the CDM.	Case-by-case. (Examples in Item 7.)

* Supplements to this Table provide examples of wording for these CDM entries.

NOTE

The following supplements to Table 2.3.1.1 are examples only of design description entries for various subjects. These examples should be used to the extent applicable but in many cases will require system-specific modification. Furthermore, not all systems will require design description entries for each of the technical subjects covered in Table 2.3.1.1 and its supplements.

Table 2.3.1.1. SUPPLEMENT NUMBER 1

TECHNICAL ISSUE

System name, scope, configuration and control interfaces.

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

Name

The Reactor Protection System (RPS) is an instrumentation and control system and its purpose is to initiate reactor scram whenever RPS logic requirements for scram initiation are satisfied.

Control Interface

As shown in Figure 2.2.7.a, the RPS interfaces with Neutron Monitoring System (NMS), Process Radiation Monitoring System (PRRM), Nuclear Boiler System (NBS), Control Rod Drive System (CRD), Rod Control and Information System (RCIS), Recirculation Flow Control System (RFCS), Suppression Pool Temperature Monitoring System (SPTM), Essential Multiplexing System (EMS), and the Process Computer System. Figure 2.2.7.a also depicts the implementation of RPS logic within Safety System Logic and Control (SSLC).

Scope

The RPS has four divisions. Figure 2.2.7.b shows the RPS divisional aspects and the signal flow paths from sensors to scram pilot valve solenoids. Equipment within an RPS division consists of sensors (transducers or switches), multiplexers, Digital Trip Modules (DTM), Trip Logic Unit (TLU) Output Logic Unit (OLU), and Load Drivers (LD). The LDs are only in divisions II and III.

COMMENTS AND NOTES

Typical reference to the Control Interface Diagram for safety-related systems is shown above.

This is applicable to mechanical systems with safety-related I&C

Table 2.3.1.1. SUPPLEMENT NUMBER 2

TECHNICAL ISSUE

System Purpose

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The Reactor Protection System (RPS) is an instrumentation and control system and its purpose is to initiate reactor scram whenever RPS logic requirements for scram initiation are satisfied.

COMMENTS AND NOTES

None

Table 2.3.1.1. SUPPLEMENT NUMBER 3

TECHNICAL ISSUE

Safety-related and non-safety-related.

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The RPS is classified as a Class 1E safety-related system.

The FDWC system is classified as non-safety-related.

COMMENTS AND NOTES

The inclusion of "Class 1E" invokes seismic qualification requirements implemented through I&C DAC, therefore a separate seismic classification statement is not necessary for I&C systems.

Table 2.3.1.1. SUPPLEMENT NUMBER 4

TECHNICAL ISSUE

System modes and performance.

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

The RPS consists of logic and circuitry for initiation of both automatic and manual scrams. The automatic scram function is comprised of four independent divisions of sensor instrument channels, hardware-/software-based logic, and two independent divisions of actuating devices. Automatic scram is initiated whenever a scram condition is detected by two or more automatic divisions of RPS logic. For automatic scram, the sensor input signals to RPS originate either from RPS's own sensors or other systems' sensors. For determination of the existence of an automatic scram condition within each automatic scram channel of the RPS, the DTM of a given RTPS channel compares the monitored process variable with the stored set-point in its memory and issues a trip signal if the monitored process variable exceeds the set-point. The DTM then sends the trip signal to the TLU of its own channel and the TLUs of the other three channels of RPS, where two-out-of-four voting is performed (see Figure 2.2.7.b).

a. Turbine Stop Valves Closure at about 40% power levels [RPS]

b. Low Turbine Control Valves Oil Pressure (Fast Closure) at above 40% power levels [RPS]

[The above is not complete RPS example]

Table 2.3.1.1. SUPPLEMENT NUMBER 4 (Continued)

COMMENTS AND NOTES

This material is an example of the level of detail for an important safety-related mode of operation. Other descriptions many have considerably less detail.

The sequence of operation modes should be discussed in following order:

1. Automatic
2. Manual
3. Fail-safe
4. Other (for example, reset logic with safety significance such as the RPS reset logic to assure scram completion)

This is applicable to mechanical systems with safety-related I&C.

Table 2.3.1.1. SUPPLEMENT NUMBER 5

TECHNICAL ISSUE

Power supplies.

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

Safety-Related System – Standardized wording

Each of the four RPS divisional logic and associated sensors is powered from its respective divisional Class 1E power supply.

Non-Safety-Related (with "safety significance") Example

Each channel of the FDWC System is powered by separate non-Class 1E uninterruptible power supplies..

COMMENTS AND NOTES

For I&C Systems, the preferred approach is to treat this issue in the text. Figure treatment is acceptable if it is more appropriate. The design description text of safety-related systems should address power to component, sensors, and control logic. Where the power to mechanical and I&C portion of a mechanical system division is the same respective power source, do not describe power source separately.

Non-safety-related systems do not have to identify power supply unless it is important to a safety significant function of the system.

Table 2.3.1.1. SUPPLEMENT NUMBER 6

TECHNICAL ISSUE

Independence

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

In the RPS, independence is provided between Class 1E divisions and also between the Class 1E divisions and non-Class 1E equipment.

COMMENTS AND NOTES

Any exceptions to this statement should be identified in the Acceptance Criteria column of the corresponding ITAAC entry for independence.

Independence sentence above required for all safety-related I&C. Further explanation of exceptions, or how independence is accomplished, may be used as necessary for special cases.

This is applicable to mechanical systems with safety-related I&C.

Table 2.3.1.1. SUPPLEMENT NUMBER 7

TECHNICAL ISSUE

Location, layout

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

These RPS controls and displays are provided in the main control room. RPS sensors are turbine control valve-oil pressure switches, turbine stop-valve position switches, and turbine first-stage pressure sensors. These sensors are located in the Turbine Building.

COMMENTS AND NOTES

Discussion of location for mechanical systems may need modification to include safety-related I&C (logic processors covered by SSLC).

Table 2.3.1.1. SUPPLEMENT NUMBER 8

TECHNICAL ISSUE

Instrumentation and Controls

A. Main Control Room

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

- Preferred example

The LDS has the following displays and controls in the main control room:

1. Parameter displays for LDS plant sensors defined on Figure 2.4.3
2. LDS manual controls as described above (or defined on Figure _______ if appropriate).
3. LDS divisional Trip Status

COMMENTS AND NOTES

Alarms should be added if (and only if) any are identified in the design description.

Table 2.3.1.1. SUPPLEMENT NUMBER 9

TECHNICAL ISSUE

Instrumentation and Controls

B. Remote Shutdown System

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

RHR System components with display and control interfaces with the Remote Shutdown System (RSS) are shown on Figure 2.4.1.a and 2.4.1.b.

COMMENTS AND NOTES

The Remote Shutdown System has no alarms.

Table 2.3.1.1. SUPPLEMENT NUMBER 10

TECHNICAL ISSUE

Special Features.

EXAMPLES OF WORDS TO BE USED IN THE DESIGN DESCRIPTION TEXT

1. The RPS logic seals in the scram signal, and permits reset of scram logic after a time delay of at least 10 seconds.

COMMENTS AND NOTES

This type of special issue must be treated on a case-by-case basis. In this example, the reset timer is required to assure completion of safety function. Resets are not normally in the CDM.

2.3.2 CDM Design Description Figures and Diagrams

(Refer to Section 2.2 for general guidance for CDM Figures.)

2.3.2.1 Figure/Diagram Checklist

Table 2.3.2.1 is a checklist of items that needs to be considered when preparing figures for instrumentation and control systems and for safety-related mechanical systems that include Control Interface Diagrams in the Design Description.

Table 2.3.2.1. CHECKLIST OF ITEMS TO BE CONSIDERED WHEN PREPARING I&C SYSTEM CDM DIAGRAMS

ISSUE	CORRECT TREATMENT
Figure number and system title.	Identical to design description section number and system title.
Scope	Include all equipment items addressed in the design description.
Numbering (multiple figures)	Use section number with lower case subscripts; e.g., figures 2.17.2a, 2.17.2b.....
System boundary	Show system boundaries by identifying interfacing systems. For I&C systems where inputs from multiple systems are identified, the systems should be clearly identified, and ITAAC will be identified only for the system that is subject of the DD section.
Power Supply	It is preferred to address power supply in text for I&C systems. If addressed on the figure, modify the following RPS example to suit the figure: "Each of the four RPS divisional logic and associated sensors is power from its respective divisional class 1E power supply". State any exception to power supply divisions.
Terms	All component names to be consistent with what is used in Design Description. System name to be consistent with CDM Table of Contents listing.

Table 2.3.2.1. CHECKLIST OF ITEMS TO BE CONSIDERED WHEN PREPARING I&C SYSTEM CDM DIAGRAMS (Continued)

ISSUE	CORRECT TREATMENT
Plant Sensors	Identify plant sensors that interface with the control logic. State the sensed parameter only; do not give trip condition such as high or low. Sensed parameters should have identical name in text, on Figure, in Design Description of interfacing system, and ABWR SSAR.
Symbols	All symbols to be as shown in the Legend.
Remote Shutdown System	Denote components that have status display and/or control interfaces with Remote Shutdown System with a "R" on the figure.
Legend	Do not define legend on figure. Add any symbols and abbreviations to CDM Appendix A for legend. Exceptions may be made if symbols or abbreviation used only on the one figure.
Notes	Provide notes under a heading for "Notes" and number all notes (even if there is only one note).

2.3.3 CDM Inspection, Tests, Analyses and Acceptance Criteria (ITAAC)

(See 2.4 for generally applicable discussion.)

2.3.3.1 ITAAC Table Checklist

The sequence in which subjects should be listed in the ITAAC tables must follow as closely as possible the design description sequence defined in Table 2.3.1.1. Table 2.3.3.1 is a list of the technical subjects which should be considered for ITAAC table entries. Maximum use should be made of the standardized ITAAC table entries provided in the supplements to Table 2.3.3.1. These standardized entries should be modified as needed for application to a particular system but are intended to be replicated verbatim unless there are legitimate reasons for not doing so. The sequence in Table 2.3.3.1 is based on the order in which subjects are addressed in the design description (Table 2.3.1.1) and should be followed to the extent practicable and/or applicable.

Table 2.3.3.1. ITAAC TABLE CHECKLIST

ISSUE	APPLICABLE SUPPLEMENT NUMBER *	TREATMENT IN ITAAC TABLE
System name, scope and configuration	1	Use the standardized words shown on Supplement Number 1.
Control Interface	—	None (covered by configuration and/or system modes & performance)
System Purpose	—	None.
Safety-related or non-safety-related, and System Seismic Classification	—	None. (Seismic Qualification covered by I&C DAC.)
System modes and performance	2	Provide ITAAC entries to address major performance, logic and interlock features of the design as discussed in the design description. Supplements 2a, 2b, 2c, and 2d give examples for safety-related systems. Supplements 2e and 2f show examples for non-safety-related systems.
Codes and Standards	—	None.

Table 2.3.3.1. ITAAC TABLE CHECKLIST (Continued)

ISSUE	APPLICABLE SUPPLEMENT NUMBER *	TREATMENT IN ITAAC TABLE
Power Supplies	3	Covered by independence check for safety-related systems. See Supplement 3 for non-safety-related system.
Independence	4	Use the standardized words shown on Supplement 4.
Location, Layout	—	None, unless there is a specific special case that should be addressed.
Instrumentation and Controls	5,6	Use the standardized words shown on Supplements 5 and 6.
Equipment Qualification	—	None. (Covered by I&C DAC.)
Special Features	7	Treat case-by-case. See Supplement 7 for an example.

* Supplements to this table provide standardize and/or recommended wording for these CDM entries.

NOTE

The following supplements to Table 2.3.3.1 are examples only of ITAAC entries for various subjects and should, if possible, be used verbatim. However, they should by used only to the extent applicable and in many cases may require system-specific modifications. Furthermore, not all systems will require ITAAC entries for each of the technical subjects covered in Table 2.3.3.1. (Only provide ITAAC entries to the extent subjects as addressed in the design description text.)

Table 2.3.3.1. SUPPLEMENT NUMBER 1

TECHNICAL ISSUE

1. Configuration

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
1. The equipment comprising the _______ System is defined in Section _______.	1. Inspections of the as-built system will be conducted.	1. The as-built _______ System conforms with the description in Section _______.

COMMENTS AND NOTES

- This entry is intended to be a general verification that the system described in the design description is in place in the as-built plant. Particularly critical system characteristics may well justify a separate ITAAC table entry.

Table 2.3.3.1. SUPPLEMENT NUMBER 2a

TECHNICAL ISSUE

2a. System Modes and Performance - Automatic Mode Logic Test

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
2. RPS logic uses four independent sensor instrument channels of each process variable described in Section 2.2.7 for its automatic scram function.	2. Tests will be conducted using simulated input signals for each process variable to cause trip conditions in two, three, and four instrument channels of the same process variable.	2. The RPS LDs change their states to interrupt electrical power to scram solenoids. RPS back-up scram relays close and RCIS relays close to provide signals to RCIS.

COMMENTS AND NOTES

- This is an example only. These logic-based entries must be developed on a system-specific basis.
- This ITAAC example applies to mechanical systems with safety-related I&C.

Table 2.3.3.1. SUPPLEMENT NUMBER 2b

TECHNICAL ISSUE

2b. System Modes and Performance - Manual Controls

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
3. For manual scram initiation two manual scram push-buttons of the RPS must be simultaneously depressed.	3. Tests will be conducted by depressing the A scram push-button, the B scram push-button, and both.	3. When manual scram push-button A is depressed Division II AC power to A scram solenoids is interrupted. When scram push-button B is depressed Division III AC power to B scram solenoids is interrupted. When both A & B scram push-buttons are depressed reactor scram occurs. RPS back-up scram relays close to energize the solenoids of scram air header dump valves and RCIS relays close to provide signals to RCIS.

Table 2.3.3.1. SUPPLEMENT NUMBER 2b (Continued)

COMMENTS AND NOTES

- This is an example only. These logic-based entries must be developed on a system-specific basis.

- This ITAAC example applies to mechanical systems with safety-related I&C.

Table 2.3.3.1. SUPPLEMENT NUMBER 2c

TECHNICAL ISSUE

2c. System Modes and Performance - Fail-Safe

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
4. RPS design is fail-safe in the event of loss of electrical power to one division of RPS logic.	4. Tests will be conducted by disconnecting electrical power to one division of RPS logic at a time.	4. Upon loss of electrical power to one division of RPS logic, the LDs of that division change their state to interrupt electrical power to scram solenoids.

COMMENTS AND NOTES

– This is an example only. These logic-based entries must be developed on a system-specific basis.

Table 2.3.3.1. SUPPLEMENT NUMBER 2d

TECHNICAL ISSUE

2d. System Modes and Performance - Other

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
5. Each MSIV can be subjected to a partial closure from the main control room.	5. Tests will be conducted by actuating each MSIV test switch.	5. When the test switch is activated, the MSIV partially closes and then reopens automatically.

COMMENTS AND NOTES

– This is an example only. These logic-based entries must be developed on a system-specific basis.

Table 2.3.3.1. SUPPLEMENT NUMBER 2e

TECHNICAL ISSUE

2e. System Modes and Performance - Non-Safety-Related I&C System - Safety Significant Functions

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
8. The FDWC System monitors reactor water level signals and, if a high RPV water level setpoint is reached, issues trip signals to the Turbine Control System and to the CFCAE System. If a low RPV water level setpoint is reached, the FDWC System issues trip signals to the RFC System.	8. Using simulated RPV water level signals, testing will be performed on the FDWC System.	8. When a high RPV water level setpoint is reached, trip signals are issued to Turbine Control System and Condensate, Feedwater and Condensate Air Extraction System. In the event that a low RPV water level setpoint is reached, trip signal is issued to the RFC System.

COMMENTS AND NOTES

– This is an example only. These logic-based entries must be developed on a system-specific basis.

Table 2.3.3.1. SUPPLEMENT NUMBER 2f

TECHNICAL ISSUE

2f. System Modes and Performance - Non-Safety-Related I&C System - Normal Control Function

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
10. The FDWC system controls the flow of feedwater into the RPV.	10. A test will be performed by simulating a decreasing reactor level signal.	10. The signal to increase feedwater flow occurs.

COMMENTS AND NOTES

– This is an example only. These logic-based entries must be developed on a system-specific basis.

Table 2.3.3.1. SUPPLEMENT NUMBER 3

TECHNICAL ISSUE

3. Power Supplies

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
5. The FDWC System digital controllers are powered by separate non-Class 1E uninterruptible power supplies.	5. Tests will be performed by providing a test signal in only one non-Class 1E uninterruptible power supply at a time.	5. The test signal exists in only one digital control channel at a time.

COMMENTS AND NOTES

– Power supplies for safety-related systems are covered by the independence ITAAC (See supplement number 4). Power supply ITAAC is used for non-safety-related system only when power supply is judged to be safety-significant and included in the Design Description.

Table 2.3.3.1. SUPPLEMENT NUMBER 4

TECHNICAL ISSUE

4. Independence

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
7. Each of the four LDS divisional logic channels and associated sensors is powered from its respective divisional Class 1E power supply. In the LDS, independence is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E equipment.	7. a. Tests will be performed on the LDS by providing a test signal to only one Class 1E division at a time. b. Inspection of the as-installed Class 1E divisions in the LDS will be performed.	7. a. The test signal exists only in the Class 1E division under test in the LDS. b. In the LDS, physical separation or electrical isolation exists between Class 1E divisions. Physical separation or electrical isolation exists between these Class 1 E divisions and non-Class 1E equipment.

Table 2.3.3.1. SUPPLEMENT NUMBER 4 (Continued)

COMMENTS AND NOTES

- Any instances where this independence is not maintained should be clearly identified in the Acceptance Criteria and Design Description.

- This ITAAC example applies to mechanical systems with safety-related I&C.

Table 2.3.3.1. SUPPLEMENT NUMBER 5

TECHNICAL ISSUE

5. Instrumentation and Controls

Main Control Room

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
13. Main control room alarms,* displays and controls provided for the _______ System are as defined in Section _______.	13. Inspections will be performed on the main control room alarms,* displays and controls for the _______ System.	13. Alarms,* displays and controls exist or can be retrieved in the main control room as defined in Section _______.

COMMENTS AND NOTES

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

Table 2.3.3.1. SUPPLEMENT NUMBER 5 (Continued)

The LDS entry is as follows:

8. Main control room displays and controls provided for the LDS System are as defined in Section 2.4.3.	8. Inspections will be performed on the main control room displays and controls for the LDS.	8. Displays and controls exist or can be retrieved in the main control room as defined in Section 2.4.3.

Table 2.3.3.1. SUPPLEMENT NUMBER 6

TECHNICAL ISSUE

6. Instrumentation and Controls

Remote Shutdown System

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
14. Remote Shutdown System (RSS) displays and/or controls* provided for the _______ System are as defined in Section _______.	14. Inspections will be performed on the RSS displays and controls* for the _______ System.	14. Displays and controls* exist on the RSS as defined in Section _______.

COMMENTS AND NOTES

– Only to be used for those systems with RSS interfaces.

---

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

Table 2.3.3.1. SUPPLEMENT NUMBER 6 (Continued)

The HPCF entry is as follows:

7. RSS displays and controls provided for the HPFC System are as defined in Section 2.4.2.	7. Inspections will be performed on the RSS displays and controls for the HPCF System.	7. Displays and controls exist on the RSS as defined in Section 2.4.2.

Table 2.3.3.1. SUPPLEMENT NUMBER 7

TECHNICAL ISSUE

7. Special Features

STANDARDIZED ITAAC TABLE ENTRY

DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
7. Digital controllers used for the FDWC System are redundant.	7. Tests will be performed by simulating failure of each operating FDWC System digital controller.	7. There is no loss of FDWC System output upon loss of any one digital controller.
8. Digital controllers used for the FDWC System have diagnostic capabilities that identify and isolate failure of level input signals.	8. Tests will be performed by simulating level input signal failures to the FDWC System digital controllers.	8. There is no loss of FDWC System output upon loss of any one level input signal.

COMMENTS AND NOTES

– These are examples of special features for non-safety-related system that were judged to warrant CDM treatment due to safety significance of this system.

ABWR DESIGN CERTIFICATION

CDM GUIDELINES MEMORANDUM

ATTACHMENT NUMBER 2.3

STRUCTURES AND BUILDINGS

CONTENTS

2.4 Structures and Buildings

Each of the ABWR structures and buildings has unique characteristics which make development of general guidelines of limited value. The attached Tables 2.4a and 2.4b for the Reactor Building and Turbine Building (R/B and T/B) summarize the basic approach for these two buildings -- one of which is an important Seismic Category 1 structure and one of which is a non-safety-related, non-Seismic Category 1 structure containing no safety-related equipment. Specific R/B and T/B CDM material has been developed on the basis of these tables. The summary tables and the CDM entries for the R/B and T/B should be used as guidance for developing CDM material for other ABWR structures and buildings.

The overall approach to ABWR structures is summarized on Table 2.4c.

Table 2.4a. ABWR REACTOR BUILDING. PROPOSED CDM TREATMENT

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
A. Overview			
Building name, scope, type, configuration	Yes	Yes (Configuration)	Follows mechanical system pattern. DD references the figures.
B. Arrangement-Related Issues			
General Arrangement:	Yes (part of A)	Yes (part of A)	—
– Overall building dimensions	Yes (part of A)	No	Dimensions for information only.
– General equipment layout	Yes (part of A)	Yes (part of A)	—
– Detailed equipment layout	No	No	Detail design; depends on as-built, as-procured equipment.
– Dimensions of structural items (walls, etc.)	No	No	Some special case exceptions -- dimensions **with** tolerances not known at time of design certification

Table 2.4a. ABWR REACTOR BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
B. Arrangement-Related Issues (Cont.)			
Divisional Boundaries:			
– Overall	Yes (part of A)	Yes (part of A)	—
– Internal flood; doors and sills	Yes (part of A)	Yes (part of A)	—
– Internal flood; drains	No	No	Cover under CDM drain system entry.
– Internal flood analysis	Yes	Yes	Confirm worst case flood event. Prepare Flood Evaluation report.
– 3-hour fire barrier in place	Yes (part of A)	Yes (part of A)	—
External Flooding:			
– Wall thickness, penetrations	Yes	Yes	—
– Seals/water stops	No	No	—

Table 2.4a. ABWR REACTOR BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
B. Arrangement-Related Issues (Cont.)			
Pipe Break Protection			
– Pipe whip	No	No	Detail design dependent. Covered by piping DAC.
– Jet impingement	No	No	
– Subcompartment pressurization	Yes	No	Not covered in building arrangement.
Internal Missile Protection	No	No	No missiles anticipated. Walls are back-up protection and are covered by Item A.
External Missile Protection	No	No	Covered by structural capability evaluation report – See C.
Secondary Contained Boundary	Yes (part of A)	Yes (part of A)	—

Table 2.4a. ABWR REACTOR BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
B. Arrangement-Related Issues (Cont.)			
Radiation Protection			
-- Clean/controlled zone definitions	No	No	Covered by radiation DAC.
Personnel Access	Yes (part of A)	Yes (part of A)	
Security Provisions	-------------- Not discussed in public documents --------------		
Embedment Depth	Yes	Yes	
C. Structural Design Issues			
Applicable Codes and Standards	No (Seismic Category I only)	No	CDM is not calling out codes and standards.
Site Parameters and Seismic Input	No	No	Covered by CDM Section 5 Site Parameters. Compliance assessment to be provided by COL applicant.

Table 2.4a. ABWR REACTOR BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
C. Structural Design Issues (Cont.)			
Ability of As-Built Structure to Withstand Design Basis Load Combinations	Yes (State design bases)	Yes	Covered by structural analysis report item.
Construction Processes			
– Rebar	No	No	}
– Excavation/Backfill	No	No	} Not CDM issues. Subject to verification by QA/QC.
– Concrete properties	No	No	}
– Others	No	No	}
D. Special Topics			
Fire Detection and Alarm Features	No	No	Covered under Fire Protection 2.15.6.

Table 2.4a. ABWR REACTOR BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
D. Special Topics (Cont.)			
Fire Suppression Features	No	No	Covered under Fire Protection 2.15.6.
Combustible Loading	No	No	COL Action Item. Equipment and licensee dependent.
CRD/SLCS Separation	Yes (part of A)	Yes (part of A)	CRD and SLC system entries also will address this item.
Secondary Containment Leakage and Leakage Control	No	No	Covered by SGTS 2.14.4.
Fire Dampers and Other Smoke Control Features	No	No	Covered by HVAC Systems 2.15.5.
EQ Zones	No	No	Design details.

Table 2.4a. ABWR REACTOR BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
D. Special Topics (Cont.)			
Load Drop Considerations	No	No	[illegible]ent is not a building design basis event. Procedural requirements covered in Cranes and Hoists 2.15.3.
PRA	Yes	Yes	Items to added it they are: a. CDM b. Not covered by the above.

Table 2.4b. ABWR TURBINE BUILDING. PROPOSED CDM TREATMENT

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
A. Overview			
Building name, scope, type, configuration	Yes	Yes (Configuration)	Follows general CDM pattern. Use text (not figure) as basis for the configuration check. (Arrangement is turbine vendor dependent.)
B. Arrangement-Related Issues			
General Arrangement	Yes	Yes (part of A)	—
– Overall building dimensions	No	No	Dimensions not important to safety. Firm dimensions to be established via detail design.
– General equipment layout	No	No }	Not required for non-safety-related power generation equipment.
– Detailed equipment layout	No	No }	
– Dimensions of structural items (walls, etc.)	No	No	Detailed design information.

Table 2.4b. ABWR TURBINE BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
B. Arrangement-Related Issues (Cont.)			
Divisions, Fires, Internal Floods	No	No	Issues not relevant to Turbine Building.
Condenser Pit Flooding	No	No	Protection provided by features in the Circulating Water System 2.10.23.
Flooding into Service and Control Building	Yes	Yes (part of A)	Related to flood protection of Control Building.
External Flooding:	No	No	No flooding protection required.
Pipe Break Protection }			
– Pipe whip }			
– Jet impingement }	No	No	Issues not applicable to Turbine Building. (Steam tunnel covered under Reactor Building 2.15.10.)
– Subcompartment pressurization }			

Table 2.4b. ABWR TURBINE BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
B. Arrangement-Related Issues (Cont.)			
Internal Missiles	No	No	Issue not applicable to Turbine Building.
Radiation Protection	No	No	Covered by radiation DAC.
Personnel and Equipment Access	No	No	Not CDM material.
Security Provisions	-------------- Not discussed in public documents --------------		
C. Structural Design Issues			
Codes and Standards	No (Identify Non-Seismic Category I)	No	Codes and Standards not identified in CDM.
Site Parameters	No	No	Covered by CDM Section 5 - Site Parameters.
Structural Capability			
– Design basis	No	No	Not a Seismic Category 1 structure.

Table 2.4b. ABWR TURBINE BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
C. Structural Design Issues (Cont.)			
Structural Capability (Cont.)			
– Collapse issues	Yes	Yes	
-- Earthquake			
– Tornado design	No	No	Not a Seismic Category 1 structure. CDM treatment not required.
– Rain/snow	No	No	Not a Seismic Category 1 structure. CDM treatment not required.
D. Special Topics			
Construction Processes	No	No	Not a CDM issue.
Fire Detection and Alarms	No	No	Covered (as necessary) by Fire Protection 2.15.6.

Table 2.4b. ABWR TURBINE BUILDING. PROPOSED CDM TREATMENT (Continued)

TECHNICAL ISSUE	DESIGN DESCRIPTION	ITAAC	BASIS
D. Special Topics (Cont.)			
Fire Suppression Features	No	No	Covered (as necessary) by Fire Protection 2.15.6.
Combustible Loading	No	No	COL Action Item.
Load Drop Considerations	No	No	Not an issue for the Turbine Building.
Fire Dampers and Smoke Control Features	No	No	Covered (as necessary) by the HVAC System 2.15.5.
EQ Zones	No	No	Not a CDM issue.
Turbine Axis of Rotation	No	No	Covered in Turbine System 2.10.7.

Table 2.4c. ABWR DESIGN CERTIFICATION - SUMMARY OF CDM TREATMENT FOR BUILDINGS

BUILDING	CDM APPROACH	BASIS
Reactor	Address features of safety significance and general arrangement.	Important Seismic Category 1 Structure.
Control	Address features of safety significance and general arrangement.	Important Seismic Category 1 Structure.
Turbine	Limited coverage. Address only items with safety significance. No figures.	Non-seismic Category 1. Few areas of safety significance.
Service	Limited coverage. Simple configuration. No figures.	Non-seismic Category 1. Need to address location of TSC and OSC. No other items of safety significance.
Radwaste	Limited coverage. Include the radwaste tunnel. No figures.	Partially seismic Category 1 but no items of safety significance.