

ITAAC Development for APR1400 NRC Design Certification

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1. Introduction

ITAAC (Inspections, Tests, Analyses & Acceptance Criteria) is essential document for Design Certification, which is certified by NRC and ruled as the Appendix of the 10 CFR Part 52. Approximately 870 ITAAC items were selected for APR1400 Design Certification to be submitted to NRC. In this paper, the code & standard related to ITAAC and process of ITACC development are discussed to seek the way to complete the best ITAAC to get the Design Certification of APR1400 from NRC through the lessons learned from other competitive applicants.

2. Code & Standard for ITAAC

2.1 Design Control Document

Design control document (DCD) is partitioned into two tiers of information: the certified design material (Tier 1) and the approved design material (Tier 2). Tier 1 consists of design description (DD) and inspections, tests, analyses and acceptance criteria (ITACC).

2.2 RG 1.206 & SRP 14.3

RG 1.206 C.II.1 provides the specific ITAAC development guidance and organizational conformance with the Standard Review Plan (NUREG-0800).

The regulations contained in 10 CFR Part 52 include requirements for providing proposed ITAAC with an application for design certification in accordance with Subpart B to 10 CFR Part 52. In developing the guidance in this regulatory guide, the NRC staff also considered the corresponding interface with the SRP. That is, the staff will review the guidance provided herein, regarding information that a COL applicant must submit to the NRC, in accordance with the SRP to assess compliance with the applicable regulations. To better facilitate the interface between this regulatory guide and the SRP, the staff has organized the specific guidance for developing ITAAC in the same manner as the SRP. That is, SRP Section 14.3 provides introductory and general guidance for the following associated SRP sections, which have been organized in accordance with the primary review responsibilities of the NRC's technical staff branches:

- SRP Section 14.3.1 Site Parameters
- SRP Section 14.3.2 Structural & Systems Engineering
- SRP Section 14.3.3 Piping Systems and Components
- SRP Section 14.3.4 Reactor Systems
- SRP Section 14.3.5 Instrumentation and Controls
- SRP Section 14.3.6 Electrical Systems
- SRP Section 14.3.7 Plant Systems

- SRP Section 14.3.8 Radiation Protection
- SRP Section 14.3.9 Human Factors Engineering
- SRP Section 14.3.10 Emergency Planning
- SRP Section 14.3.11 Containment Systems
- SRP Section 14.3.12 Physical Security Hardware

2.3 ITAAC Tabular Format and Content

A three-column format for ITAAC is acceptable, as discussed below. Column 1 - Design Commitments: This column contains the text for the specific design commitment that is extracted from the design descriptions. Any differences in text should be minimized, unless intentional. Column 2 - Inspections, Tests, and Analyses: This column contains the specific method to be used by the licensee to demonstrate that the design commitment in Column 1 has been met. The method is either by inspection, test, or analysis or some combination of these. Column 3 - Acceptance Criteria: This column contains the specific acceptance criteria for the inspections, tests, or analyses described in Column 2 which, if met, demonstrate that the design commitments in Column 1 have been met.

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
The functional arrangement of the CCWS is as described in the Design Description of Subsection 2.7.2.2 and in Table 2.7.2.2-1 and as shown in Figure 2.7.2.2-1.	Inspection of the as-built CCWS will be performed.	The as-built CCWS conforms with the functional arrangement as described in the Design Description of Subsection 2.7.2.2 and in Table 2.7.2.2-1 and as shown in Figure 2.7.2.2-1.

3. ITAAC Development

3.1 Selection of Design Commitments

AS mentioned above, because ITAAC is a rule, it is not available to change or modify that after certified. So the selection of design commitment is very important from the first to make ITAAC. For US-APWR, 1003 ITAAC are counted. The number of APR1400 ITAAC for SKN 3, 4 is 667, which was developed on the basis of System 80+ certified by NRS in 1997. The deviation of two designs has happened due to the fact that US-APWR reflected the new RG 1.206 for its DC, but System 80+ didn't.

To save the time for selection of ITAAC, it needs to analyze and make database of APR1400 and US-APWR ITAAC. To make the basis ITAAC of APR1400 DC easier, items of US-APWR ITAAC excluded its

own unique design can be added using the analysis database. Then, the basis ITAAC for APR1400 NRC DC pursuant to RG 1.206 can be made. The level of detail of AP1000 certified design by NRC recently also could be a reference to APR1400 ITAAC.

3.2 Standardization of ITAAC Statements

Because so many of system designers write ITAAC, the statements of ITAAC could be different each other by systems. As a rule of US and for the sake of easier review of NRC staff, standardization and consistency of ITAAC are very important items to be checked in the process of ITAAC preparation.

Standardization is applied to the ITAAC items which are commonly required by SRPs.

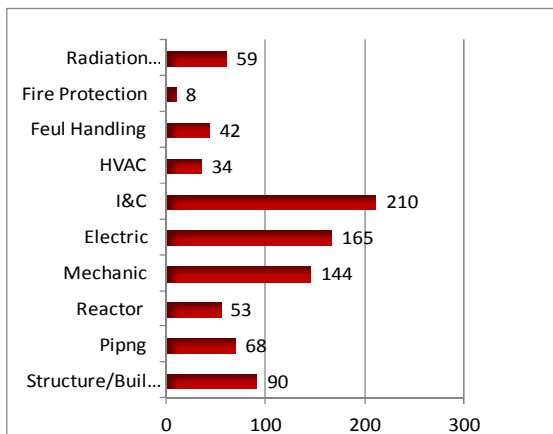
- Functional arrangement of the system
- ASME Code Section III Components & Piping
- Welding & Hydrostatic test
- Seismic Category I Components & Piping
- Class 1E Power
- Physical & Electrical Separation
- MOVs, AOVs, SOVs & Check Valves
- Controls, Alarms & Displays
- NPSH

These standard statements are selected and completed through the analyses and comparison with ITAAC of competitive designs and RG 1.206 & SRPs.

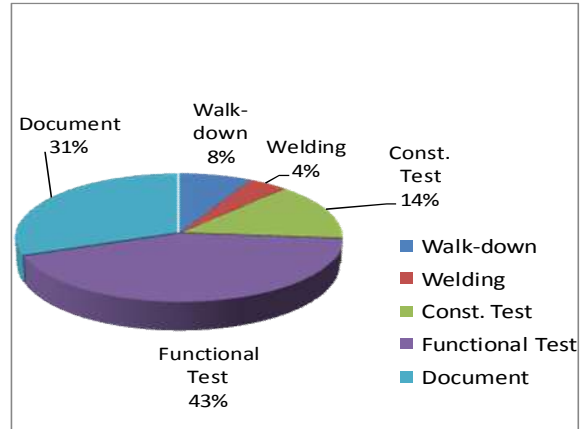
All figures included in Tier 1 were newly prepared to be simpler and text searchable. Table order, titles and contents are also standardized. The writing format of design description and design commitments need to be standardized.

3.3 Analyses of ITAAC items

Final Tier 1 was developed by the review process through the issue of revision G version. Total 873 ITAAC items based on the acceptance criteria were selected and analyzed as follow.



ITAAC implementation stage during construction and start-up test is analyzed as follow.



To complete the final ITAAC of APR1400 DC, several aspects should be reviewed. Testability, acceptability, pursuit of RG 1.206 and SRPs related to ITAAC must be checked. For the review and check process, ITAAC V&V table was fill out by the system designers.

4. Conclusions

For saving the time and manpower to complete ITAAC of APR1400 NRC DC and reduction of the RAIs (Request Additional Information) from NRC, we took advantage of the lessons learned from the competitive designs like US-APWR and AP1000 based on KNGR ITAAC. Finally new and different ITAAC from ITAAC of KNGR was developed for APR1400 DC from NRC. RG 1.206 and SRPs were applied first in Korea to the APR1400 DCD preparation. For testability and acceptability check, ITAAC V&V table was completed by the system designers. APR1400 DCD will be submitted by the end of September this year and we hope that NRC issues lees RAIs on ITAAC document.

REFERENCES

- [1] US NRC, Regulatory Guide 1.206 Combined License Application for Nuclear Power Plant (LWR edition), 2007
- [2] US NRC, 10 CFR 52 License Certification and Approvals for Nuclear Power Plant, 2009
- [3] 'Inspections, Tests, Analyses, and Acceptance Criteria,' "Initial Test Program and ITAAC – Design Certification," Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants. SRP 14.3, 2007