

CNWRA890029/TRC EXAMPLE

- 1 -

**APR 21 1989**

MEMORANDUM FOR: Those on the Attached List

FROM: Philip M. Altomare  
Program Element Manager  
Waste Systems Engineering and Integration

SUBJECT: TECHNICAL REVIEW COMPONENTS EXAMPLE

Enclosed is a draft example of the "technical review components" concept being developed by the Center as an addition to Technical Operating Procedure (TOP)-001-02 ("Program Architecture Database Work Instruction"). This particular concept is being developed as a separate data field in response to the recent NRC/CNWRA dialogue regarding the Program Architecture developmental process. This draft has been provided informally by the Center for NRC's information as an approach they propose to follow. Thus, they would appreciate any timely comments we would have before it is formally introduced into TOP-001-02.

We would, therefore, be interested in any comments you may have on the submittal. Kindly submit them to Mike Lee (extension 20421) as early as practicable.

**Original Signed By**

Philip M. Altomare  
Program Element Manager  
Waste Systems Engineering and Integration

Enclosure: As stated

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# Center for Nuclear Waste Regulatory Analyses

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April 20, 1989

Mr. Philip M. Altomare  
U.S. NUCLEAR REGULATORY COMMISSION  
1 White Flint North (4-H-3)  
11555 Rockville Pike  
Rockville, MD 20852

SUBJECT: Example of Technical Review Components

Dear Mr. Altomare:

Attached is an example of the proposed PADB output of the newly approved record, Technical Review Components (TC). With NRC approval, we will process a TOP-001-02 Work Instruction to immediately implement the approved instructions for development of TC as well as the approved revisions of instructions for Regulatory Elements of Proof, NRC Compliance Determination Method, completion of the 22-step process in the presence of a Regulatory or Institutional Uncertainty, and NRC Uncertainty Reduction Method. This will include undertaking preparation/revision of information for Regulatory Requirements presently completed or in process.

All of these approved PA procedural revisions will, of course, be included in Revision 1 of TOP-001-02 which will be forwarded for NRC review and approval next month.

Sincerely,



D. Ted Romine  
Sr. Systems Engineer

Attachment

cc: J. Funches  
M. Mace  
W. Patrick



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CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES  
PROGRAM ARCHITECTURE SUPPORT SYSTEM  
TECHNICAL REVIEW COMPONENT LISTING

EXAMPLE

EXAMPLE

TECHNICAL REVIEW COMPONENT ID: RRI/EP1/TC1

|                     |              |                   |          |
|---------------------|--------------|-------------------|----------|
| ANALYST:            | Example, P G | SUBMISSION DATE:  | 19890420 |
| REVIEWER:           | Sample, P G  | REVIEW DATE:      | 19890420 |
| PARC REVIEW STATUS: | OK           | PARC REVIEW DATE: | 19890420 |
| QA REVIEW STATUS:   | OK           | QA REVIEW DATE:   | 19890420 |

TECHNICAL REVIEW COMPONENTS  
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TOPIC: IMPORTANT TO SAFETY - NATURAL PHENOMENA AND ENVIRONMENTAL CONDITIONS,, Geologic Repository Operations Area,, Safety functions,, Design of structures, systems and components

TECHNICAL REVIEW COMPONENTS TEXT (PAPD Steps 3 and 5)

TECHNICAL REVIEW COMPONENTS are (1) the products of technical investigations/analyses necessary to review a DOE demonstration of compliance, and/or support a NRC determination of compliance, with the lowest-level REGULATORY ELEMENTS OF PROOF and (2) the supporting material necessary to verify the technical adequacy of those products. TECHNICAL REVIEW COMPONENTS are not stated in the REGULATORY REQUIREMENT and, consequently, do not have the force of law. They are being developed solely for the internal use of the NRC Office of Nuclear Material Safety and Safeguards, Division of High-Level Waste Management, as a management tool.

The record below repeats each lowest-level REGULATORY ELEMENT OF PROOF (one at an end point of a branch of that logic hierarchy), then identifies in a logic structure the TECHNICAL REVIEW COMPONENTS derived from each of those REGULATORY ELEMENTS OF PROOF. TECHNICAL REVIEW COMPONENTS are predominantly the results of technical analyses, but in some cases may include physical measurements, data recordings, historical data, and research and test results, in addition to evidence of the applicability of the analyses and evidence of the technical adequacy of the data used in those analyses.

1.0 STRUCTURES, SYSTEMS, AND COMPONENTS IMPORTANT TO SAFETY ARE DESIGNED SO THAT NATURAL PHENOMENA AND ENVIRONMENTAL CONDITIONS ANTICIPATED AT THE GEOLOGIC REPOSITORY OPERATIONS AREA WILL NOT INTERFERE WITH NECESSARY SAFETY FUNCTIONS. 10 CFR 60.131(b)(1)

AND

1.1 Identification and characterization of the natural phenomena anticipated at the geologic repository operations area. (Examples: floods, tornadoes, earthquakes, lightning, subsidence, landslides, volcanic activity.) (TECHNICAL REVIEW COMPONENT)

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AND

1.1.1 Identification of anticipated natural phenomena considering site characteristics such as geology, geophysical properties, geochemistry, hydrology (surface and subsurface), climate, and meteorology. (TECHNICAL REVIEW COMPONENT)

AND

1.1.2 Characterization of each identified anticipated natural phenomena as to: anticipated variations in values, (temporal, spatial and magnitude); worst case (maximum/minimum) values; knowledge of, and period of time to collect the site history; accuracy of data/measurements; frequency of reoccurrence; duration of phenomena and margins for variations considering inaccuracies in the above information. (TECHNICAL REVIEW COMPONENT)

AND

1.2 Identification of natural phenomena that are not anticipated at the geologic repository operations area but that may be remotely plausible, and justification as to why these natural phenomena are not anticipated. (TECHNICAL REVIEW COMPONENT)

AND

1.3 Identification and characterization of environmental conditions anticipated at the geologic repository operations area. (Examples: temperature, winds, dust, air impurities, humidity, precipitation.) (TECHNICAL REVIEW COMPONENT)

AND

1.3.1 Identification of the anticipated environmental conditions considering site characteristics such as geology, geophysical properties, geochemistry, hydrology (surface and subsurface), climate and meteorology. (TECHNICAL REVIEW COMPONENT)

AND

1.3.2 Characterization of each identified anticipated environmental condition as to: anticipated variations in values (temporal, spatial and magnitude); worst case (maximum/minimum) values; knowledge of, and period of time to collect the site history; accuracy of data/measurements; frequency of reoccurrence; duration of conditions; and margins for variations considering inaccuracies in the above information. (TECHNICAL REVIEW COMPONENT)

AND

1.4 Identification of environmental conditions that are not anticipated at the geologic repository operations area but that may be remotely plausible, and justification as to why these environmental conditions are not anticipated. (TECHNICAL REVIEW COMPONENT)

AND

1.5 Identification and characterization of combinations of natural phenomena and environmental conditions anticipated to occur at the geologic repository operations area. (TECHNICAL REVIEW COMPONENT)

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AND

1.6 Identification of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.6.1 Identification and definition of geologic repository operations area functional requirements that are important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.6.2 Identification of geologic repository operations area functional requirements that are not important to safety, and justification to support this decision. (TECHNICAL REVIEW COMPONENT)

AND

1.6.3 Identification of the functional requirements important to safety that are to be performed by each structure, system, and component ("specific functions"). [Thus, an identification of the structures, systems, and components important to safety]. (TECHNICAL REVIEW COMPONENT)

AND

1.7 Definition for each structure, system, and component important to safety of the performance objectives and design criteria (including design constraints and interface requirements) in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.7.1 Identification and description of each of the values, limits, or ranges (i.e., response time, duration of response, load limits, margin of safety, tolerances, etc.) of the specific functions of each structure, system, and component important to safety under normal conditions in the presence of anticipated natural phenomena and environmental conditions (considering the maximum amounts and rates of waste handling). (TECHNICAL REVIEW COMPONENT)

AND

1.7.1.1 Identification and description of each of the values, limits, or ranges (i.e., response time, duration of response, load limits, margin of safety, tolerances, etc.) of the applicable normal functions of each structure, system, and component important to safety under normal conditions in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.7.1.2 Identification and description of each of the values, limits, or ranges (i.e., response time, duration of response, load limits, margin of safety, tolerances, etc.) of the applicable emergency functions of each structure, system, and component important to safety under normal conditions in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

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AND

1.7.1.3 Identification and description of each of the values, limits, or ranges (i.e., response time, duration of response, load limits, margin of safety, tolerances, etc.) of the safety functions of each structure, system, and component under normal conditions in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.7.2 Identification and description of each of the values, limits, or ranges (i.e., response time, duration of response, load limits, margin of safety, tolerances, etc.) of the specific functions of each structure, system, and component important to safety under accident conditions in the presence of anticipated natural phenomena and environmental conditions (considering the maximum amounts and rates of waste handling). (TECHNICAL REVIEW COMPONENT)

AND

1.7.2.1 Identification and description of each of the values, limits, or ranges (i.e., response time, duration of response, load limits, margin of safety, tolerances, etc.) of the applicable normal functions of each structure, system, and component important to safety under accident conditions in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.7.2.2 Identification and description of each of the values, limits, or ranges (i.e., response time, duration of response, load limits, margin of safety, tolerances, etc.) of the applicable emergency functions of each structure, system, and component important to safety under accident conditions in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.7.2.3 Identification and description of each of the values, limits, or ranges (i.e., response time, duration of response, load limits, margin of safety, tolerances, etc.) of the safety functions of each structure, system, and component under accident conditions in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.8 Identification and description of potential safety hazards (i.e., potential interferences with necessary safety functions) and appropriate measures to eliminate, control or mitigate those hazards in the presence of natural phenomena and environmental conditions anticipated at the geologic repository operations area. (TECHNICAL REVIEW COMPONENT)

AND

1.8.1 Identification, based on systematic preclosure safety analyses, of potential safety hazards in the presence of anticipated natural phenomena and environmental conditions. (Appropriate safety analyses include: Failure modes and effects analysis [FMEA], hazards analysis, fault tree analysis.) (TECHNICAL REVIEW COMPONENT)

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AND

1.8.2 Definition of the probabilities of occurrence of potential safety hazards singly and in potential combinations in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.8.3 Description of the potential consequences of each potential safety hazard in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.8.4 Description of measures taken to eliminate, control or mitigate potential safety hazards in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.9 Analytical verification (e.g., design analysis, design review) of (1) design assumptions and calculations and (2) the satisfaction of applicable performance objectives and design criteria. This applies to each structure, system, and component important to safety for each of the anticipated natural phenomena and environmental conditions, and potential combinations thereof. "Design" includes facilities, equipment, interfaces, software, operating procedures and training. (TECHNICAL REVIEW COMPONENT)

AND (Either 1.9.1 OR 1.9.2)

1.9.1 Analytical verification that the anticipated phenomena and conditions will not interfere with necessary safety functions. (TECHNICAL REVIEW COMPONENT)

OR

1.9.2 Analytical verification that protection of particular systems and components (by structures) from anticipated natural phenomena, anticipated environmental conditions, and potential combinations of these is feasible and will ensure that necessary safety functions will not be interfered with. (TECHNICAL REVIEW COMPONENT)

AND

1.10 Identification and description of the design and/or construction specifications for each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.10.1 Identification and description of the detailed design requirements (e.g.: rates, capacities, durabilities, etc.) of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.10.2 Identification and description of the applicable design standards and codes for each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

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AND

1.10.3 Identification of the materials and description of the characteristics of the materials of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.10.4 Identification and description of the fail safe features of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.10.5 Identification and description of the layout of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.10.6 Identification and description of the requirements for aging and durability for each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.10.7 Identification and description of fabrication, assembly, erection, and/or construction techniques/codes/standards, including QA, applicable to each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.11 Identification and description of the procedures for operations of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.11.1 Identification and description of operating procedures for each structure, system, and component important to safety under normal conditions in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

AND

1.11.1.1 Identification and description of normal operating procedures under normal conditions of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.11.1.2 Identification and description of emergency operating procedures under normal conditions of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.11.2 Identification and description of operating procedures for each structure, system, and component important to safety under accident conditions in the presence of anticipated natural phenomena and environmental conditions. (TECHNICAL REVIEW COMPONENT)

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AND

1.11.2.1 Identification and description of normal operating procedures under accident conditions of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

AND

1.11.2.2 Identification and description of emergency operating procedures under accident conditions of each structure, system, and component important to safety. (TECHNICAL REVIEW COMPONENT)

1.12 Verification of the ability of structures, systems and components important to safety to sustain necessary safety functions in the presence of natural phenomena and environmental conditions anticipated at the geologic repository operations area. (TECHNICAL REVIEW COMPONENT)

AND

1.12.1 Verification of the ability of the designs to sustain necessary safety functions to the levels prescribed by the performance objectives and design criteria in the presence of natural phenomena and environmental conditions anticipated at the geologic repository operations area. (TECHNICAL REVIEW COMPONENT)

AND

1.12.2 Verification of the ability of repository personnel to apply the operating procedures to sustain necessary safety functions to the levels prescribed by the performance objectives and design criteria in the presence of natural phenomena and environmental conditions anticipated at the geologic repository operations area. (TECHNICAL REVIEW COMPONENT)

AND

1.12.3 Verification that applicable design codes and standards have been used. (TECHNICAL REVIEW COMPONENT)

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