Department of Energy
National Nuclear Security Administration
Washington DC 20585

November 5, 2012

OFFICE OF THE ADMINISTRATOR

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004

Dear Mr. Chairman:

This letter is in response to your September 6, 2012, letter requesting a report describing the National Nuclear Security Administration's (NNSA) approach to validate the modeling assumptions in the analysis and design of the Uranium Processing Facility (UPF) main building.

Enclosed is the *Uranium Processing Facility Plan for Definition of Modeling/ Design Techniques in Calculations for Safety Related Structures*. The plan describes the technical approach to validate the modeling and design techniques that the project team will use to resolve the concerns raised in your letter.

If you have any further questions, please contact me or Mr. James McConnell, Deputy Associate Administrator for Infrastructure and Operations, at (202) 586-4379.

Sincerely,

Thomas P. D'Agostino
Administrator

Enclosure

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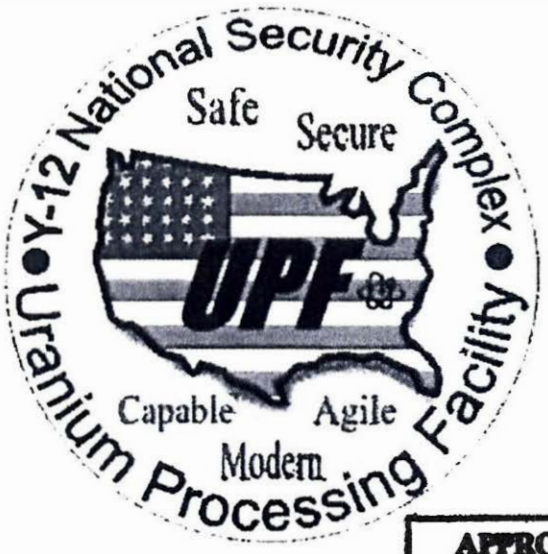
URANIUM PROCESSING FACILITY PROJECT

Uranium Processing Facility - Plan for Definition of Modeling/Design Techniques in Calculations for Safety Related Structures



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SUMMARY OF CHANGES

Revision No.	Date	Description of Change
0	5-29-2012	Initial Issue
1	10-10-2012	Total revision to address DNFSB comments and preparation of new Design Analysis Calculations resulting from building structural configuration changes due to the replan and space optimization programs.

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1.0 INTRODUCTION

The UPF project utilizes two types of assumptions to perform the analyses and design calculations for the safety related building structures. These two types of assumptions are (1) unverified assumptions and (2) modeling and design technique assumptions. The unverified assumptions define information that is currently considered as preliminary and must be verified at a later date, such as equipment loads. The unverified assumptions will be identified and tracked in the calculations and the calculations will be revised to resolve and confirm the unverified assumptions when the final information becomes available.

The modeling and design technique assumptions are used to idealize the actual building structural behavior. Examples of these assumptions are finite element mesh sizes used in the structural mathematical model, simplification of local areas, modeling of openings in walls, and reinforcement design around openings. These modeling and design techniques will be identified in the calculations along with the technical validation bases for the techniques.

2.0 Purpose of the Plan

The purpose of this plan is to define the approach to be used for identifying the modeling and design technique assumptions that are used in the safety related structural analyses and design calculations and delineating how the assumptions are validated. The plan is only applicable to the calculations for the safety related structures.

3.0 Plan to Define the Modeling and Design Techniques

3.1 Background of Plan

In a letter to The Honorable Thomas P. D'Agostino, dated April 2, 2012, the Defense Nuclear facility Safety Board (Board) noted that the Board's staff reviewed the structural analysis and design for the UPF main building, and determined that the overall structural design is adequate to resist anticipated natural and man-made hazards based on the information reviewed to date. The Board noted that modeling assumptions were developed to simplify the analysis of the main structure, and that the assumptions are reasonable and do not affect the fidelity of the completed analyses. However, they noted that the modeling assumptions would need to be addressed before completion of the design of the main structure.

As noted in the letter, the UPF project personnel worked to develop a path forward to provide additional justification for the modeling assumptions and documented the path forward in their plan, *Plan for Definition of Modeling/Design Techniques in Calculations for Safety Related Structures*. However the Board noted that this plan did not describe the technical approach to be used to resolve the types of issues previously identified by

the Board or the technical basis to justify the modeling and design techniques used. This R 1 revision of the plan addresses the concerns in the Board's letter and the enclosed report to the letter.

Since the Board's staff review of the structural analysis and design of the calculations for the process area structure (main building), changes are being made to the building configuration due to the replan and space optimization programs. These building configuration changes will require entirely new calculations to be prepared. This revised plan will be implemented to identify the modeling assumptions and to provide the validation bases of the assumptions as the new calculations are prepared. Since the majority of the modeling assumptions previously identified from implementation of the original plan will be used for preparing the new calculations, they will be used as the bases to address the Board's concerns. Any new modeling assumptions used in the new calculations will also be identified and validated.

3.2 Plan

The structural analyses and design calculations for the UPF safety related building structures are being performed by CJC & Associates and CH2M Hill/Degenkolb. CJC & Associates are performing the soil-structure interaction analyses calculations for the safety related structures. CH2M Hill/Degenkolb is performing the detailed structural analyses and design calculations for the safety related structures using the results from the soil-structure interaction analyses.

The UPF project utilizes two types of assumptions to perform the analyses and designs of the building structures. These two types of assumptions are (1) unverified assumptions and (2) modeling and design technique assumptions. This plan addresses the modeling and design techniques assumptions.

The new calculations will have a specific section that define and list the two types of assumptions. The modeling and design technique assumptions and their validation will be provided in this section of the calculation. The validation bases for the assumptions will be based on referencing 1) project design criteria or guidance documents, 2) industry standards or codes, 3) supplemental study calculations, 4) industry practice, and/or 5) engineering judgment. If 4) industry practice and/or 5) engineering judgment are used as the validation bases for the assumption, additional suitable engineering rationale will be provided to justify the industry practice and/or engineering judgment. CJC & Associates and CH2M Hill/Degenkolb will identify the modeling and design techniques and develop the validation bases for the techniques.

The following B&W Y-12 design criteria, guidance documents, and key industry standards and codes which can be used as the validation bases for the modeling and design techniques as applicable are listed below:

i) DE-PE-801768-A012, *UPF Natural Phenomena Design Criteria*
ii) DE-PE-801768-A023, *UPF Structural Design Criteria*

iii) RP-ES-801768-A007, *Seismic Analysis and Design Plan for Safety Related Structures*
iv) RP-ES-801768-A005, *Structural Design and Acceptance Criteria*
v) American Society of Civil Engineers (ASCE/SEI) 43-05, *Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities*
vi) American Society of Civil Engineers (ASCE) 4-98, *Seismic Analysis of Safety-Related Nuclear Structures and Commentary*
vii) American Concrete Institute (ACI) 349-06, *Code Requirements for Nuclear Safety Related Concrete Structures*
viii) American Institute of Steel Construction (AISC) N690-06, *Specification for the Design, Fabrication, and Erection of Steel safety Related Structures for Nuclear Facilities*

Some examples for guidance in defining the type of modeling and design decisions and their validation bases are as follows:

- Finite element mesh size for the structural mathematical model – the design criteria and guidance documents provide criteria for the mesh size along with ASCE 4. Any cases not addressed by the design criteria, guidance documents, or ASCE 4 will require addition mesh size studies to validate the assumption. These additional studies will be included in the calculations.
- Minimum size of wall opening to include in the structural model – Studies will be required to demonstrate that smaller openings not included in the model do not impact the local structural behavior around the opening nor impact safety related systems attached to the structure in the vicinity of the opening. These studies will be included in the calculations.
- Criteria for modeling several small closely spaced openings with one larger opening in the structural model – Studies will be required to demonstrate that the local structural behavior is not impacted when using one larger opening versus modeling the individual closely spaced openings and that it does not impact safety related systems attached to the structure in the vicinity of the openings. These studies will be included in the calculations.