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U.S. ATOMIC ENERGY COMMISSION

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

REGULATORY GUIDE 3.14

SEISMIC DESIGN CLASSIFICATION FOR PLUTONIUM PROCESSING AND FUEL FABRICATION PLANTS

A. INTRODUCTION

Each applicant for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant as defined in paragraph 70.4(r) of 10 CFR Part 70, "Special Nuclear Material," must satisfy the provisions of § 70.23, "Requirements for the Approval of Applications." Paragraph 70.23(b) requires that the design bases of the principal structures, systems, and components of such a plant and the quality assurance program provide reasonable assurance of protection against natural phenomena. Specifically, those structures, systems, and components important to safety whose continued integrity or operability is essential to assure confinement of radioactive material must be designed and constructed to withstand the effects of earthquakes and still be capable of performing their required safety functions.

This guide describes a method acceptable to the Regulatory staff for identifying and classifying those plant features that should be designed to withstand the effects of earthquakes.

B. DISCUSSION

Plutonium processing and fuel fabrication plants must be designed, constructed, and operated to protect the health and safety of the public from the release and dispersal of radioactive materials that might result from the effects of natural phenomena, including earthquakes. This objective may be achieved with a high degree of assurance through application of the defense-in-depth concept by:

1. Proper design, construction, and maintenance of the final confinement barrier, i.e., the exterior structure housing operations involving plutonium in dispersible form, including structure penetrations such as doors and ventilation/exhaust systems;

2. Proper design, construction and maintenance of primary confinement barriers such as glove boxes, tankage, piping, and storage containers, whose failure would result in release of substantial quantities of dispersible plutonium inside the structure; and

3. Proper design, installation, and maintenance of systems which serve to protect or monitor the integrity of items 1. and 2. above or otherwise function to mitigate consequences of the event.

A seismic design classification system has been developed for identifying those plant features that should be designed to withstand the effects of earthquakes, thus providing assurance that the plant can be constructed and operated without undue risk to the health and safety of the public. Those structures, systems, and components that should be designed to remain functional if an earthquake occurs have been designated as Seismic Category I.

C. REGULATORY POSITION

1. The following structures, systems, and components of a plutonium processing and fuel fabrication plant, including their foundations and supports, are designated as Seismic Category I and should be designed to withstand the effects of earthquakes and remain functional to the extent that they will prevent the uncontrolled release of radioactive materials. The pertinent quality assurance requirements of Appendix B of 10 CFR Part 50 should be applied to all activities affecting the safety-related functions of these structures, systems, and components.

a. The final confinement barrier and systems¹ associated with maintenance of its functional integrity.

¹The system boundary includes those portions of the system required to accomplish the specified safety function.

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Included are the plant exterior structure, ventilation intake filters or suitable intake damper, and the building exhaust ventilation system (i.e., that portion of the system consisting of final filtration equipment and equipment necessary to maintain a negative building pressure).

b. Glove boxes that may contain quantities of plutonium powder or solutions.

c. Fire protection systems.¹

d. Safety-related monitoring and alarm systems.¹ Included are those systems concerned with criticality, combustible gases, effluents, and maintenance of pressure differential between the ambient atmosphere and the plant interior.

e. Emergency utility services. Included are an electrical supply system with sufficient power and distribution networks to maintain the systems specified in regulatory positions C.1.a., c., and d., above, water supply systems with sufficient capacity and distribution capability for fire protection and required equipment cooling, a compressed air supply system with sufficient capacity and distribution capability for safety-related instrumentation and controls, and lighting to aid in personnel egress and reentry.

f. Fissile material storage vaults and components. Included are floors, walls, ceilings, doors, racks, and separation barriers.

g. Storage and process containers, including tankage and piping, for plutonium-bearing materials that are not contained in appropriately designed Seismic Category I glove boxes.

2. Those portions of structures, systems, or components whose continued function is not required but whose failure could reduce the functioning of any plant feature included in regulatory position C.1. above to an unacceptable safety level should be designed and constructed so that an earthquake would not cause such failure.

3. Seismic Category I design requirements should extend to the first seismic restraint beyond the defined boundaries. Those portions of structures, systems, or components which form an interface between Seismic Category I and non-Seismic Category I features should be designed to Seismic Category I requirements.

4. The pertinent quality assurance requirements of Appendix B to 10 CFR Part 50 should be applied to the safety requirements of those portions of structures, systems, and components included in regulatory positions C.2. and C.3. above.