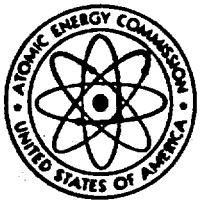
February 1974



U.S. ATOMIC ENERGY COMMISSION

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

REGULATORY GUIDE 3.17

EARTHQUAKE INSTRUMENTATION FOR FUEL REPROCESSING PLANTS

A. INTRODUCTION

On May 2, 1973, the Atomic Energy Commission published proposed amendments to its regulations in 10 CFR Part 50 "Licensing of Production and Utilization Facilities," which would require certain items to be included in the technical specifications for fuel reprocessing plants. Specifically, paragraph 50.36(c)(3), "Surveillance Requirements," would require that the technical specifications include surveillance requirements to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions of operation will be met. This regulatory guide describes a program which has been found to be acceptable to the Regulatory staff and which is considered to be generally acceptable with regard to instrumentation used to promptly determine the seismic response of fuel reprocessing plant features important to safety. The data obtained would permit a comparison of the actual response with that used as the design basis. Such a comparison would aid in deciding whether the plant can continue to be operated safely. This guide will be withdrawn or appropriately revised if the proposed rule is not adopted or if the effective rule substantially differs from the proposed rule.

B. DISCUSSION

When an earthquake occurs, it may not be known immediately how severe the effects of the earthquake were at a given fuel reprocessing plant. It is advisable to have strong-motion triaxial accelerographs installed at appropriate locations to provide data on the frequency, amplitude, and phase relationship of the seismic response of the confinement structures and to provide data on the seismic input to other structures, systems, and components important to safety. It is desirable that these strong-motion accelerographs be located so as to facilitate the engineering analysis of the recorded traces following an earthquake.

Other instrumentation, such as triaxial peak accelerographs, triaxial response spectrum recorders, and peak deflection recorders could also be installed on other selected structures, systems, and components important to safety to verify the seismic response determined analytically from the traces recorded by the strong-motion accelerographs. The extent to which this other instrumentation need be installed depends on factors such as the maximum vibratory acceleration expected at a given site. Such other instrumentation could also provide additional data which would justify the application of less conservatism in evaluating the possible effects on the plant caused by the earthquake than might be needed in the absence of such measured data.

Arrangements for promptly determining the maximum vibratory acceleration experienced below grade level in the confinement structure are needed in order to permit a timely determination to be made of the need for curtailing plant operation pending an evaluation of the complete data.

C. REGULATORY POSITION

1. At each fuel reprocessing plant site, two strong-motion triaxial accelerographs should be installed, one below grade level in the confinement structure and another at a higher elevation of the confinement structure, to provide data on the frequency, amplitude, and phase relationship of the seismic response of the confinement structure and the seismic input for other structures, systems, and components important to safety.

a. The accelerographs should be located one directly above the other and separated by a vertical distance which is a significant fraction of the confinement structure height,

b. One horizontal axis of each accelerograph should be parallel to the major horizontal axis assumed in the seismic analysis,

c. The accelerographs should be accessible for needed periodic servicing and recovery of the recorded traces following an earthquake, and

d. The accelerographs should be mounted rigidly to the confinement structure, or on a structure directly connected to the confinement structure, such that the accelerograph records can be related to confinement structure movement.

2. Other instrumentation, such as triaxial peak accelerographs, triaxial response spectrum recorders, and peak deflection recorders should also be installed on other selected structures, systems, and components important to safety to verify the seismic response determined analytically from the traces recorded by the strong motion accelerographs. The extent to which such other instrumentation need be installed will be evaluated on a case-by-case basis.

3. If another structure important to safety, or a structure which contains systems or components important to safety has a foundation independent of the confinement structure and is expected to have a significantly different response to an earthquake due to different underlying soil conditions or unique structural dynamic characteristics, instrumentation should also be provided to determine the seismic response of such a structure and the systems and components within the structure. The extent to which such other instrumentation need be installed will be evaluated on a case-by-case basis.

4. Where more detailed knowledge of soil structure interactions is important to an accurate assessment of potential damage to structures, systems, or components important to safety, a free field accelerograph should also be installed.

5. The value of the peak acceleration level experienced below grade level in the confinement structure should be indicated in the control room or available to the control room operator within a few minutes after the earthquake. Suitable indication of the peak acceleration level could include traces recorded by the accelerograph, either by direct readout or by quick playback of the recorded signals, or a multilevel acceleration readout which indicates when predetermined values have been exceeded.

6. The instrumentation should be designed to perform its function satisfactorily over the appropriate range of environmental conditions such as temperature, humidity, pressure, vibration, and radiation.

7. The applicant should develop a plan for timely utilization of the data to be obtained from the installed seismic instrumentation.