

**National Nuclear Safety Administration (NNSA) Questions
and U.S. Nuclear Regulatory Commission (NRC) Responses
Regarding AP1000 Seismic Instrumentation**

August 2017

Question

RG 1.12-1997 section C.1.2 requires a triaxial time-history accelerograph be provided at the following locations: 1) Free-field, 2) Containment foundation, 3) Two elevations (excluding the foundation) on a structure inside the containment, 4) An independent Seismic Category I structure foundation where the response is different from that of the containment structure, and 5) An elevation (excluding the foundation) on the independent Seismic Category I structure selected in 4 above.

And AP1000 triaxial acceleration sensors are mounted as follows, 1) One sensor unit will be located in the free field, 2) A second sensor unit is located on the nuclear island basemat in the spare battery charger room at elevation 66'-6" near column lines 9 and L, 3) A third sensor unit is located on the shield building structure at elevation 266' near column lines 4-1 and K, 4) The fourth sensor unit is located on the containment internal structure on the east wall of the east steam generator compartment just above the operating floor at elevation 138' close to column lines 6 and K.

There is only one elevation (excluding the containment foundation) on a structure inside the containment of the AP1000 projects has been placed with a triaxial time-history accelerograph, but the RG 1.12 require two elevations (excluding the containment foundation) on a structure inside the containment, so we want to know why the seismic instrumentation sensor location can be accepted in American AP1000 Units?

Response

Regulatory Guide (RG) 1.12 identifies the following as locations for the placement of the tri-axial time-history accelerographs.

SEISMIC INSTRUMENTATION TYPE AND LOCATION

1.1 Solid-state digital instrumentation that will enable the processing of data at the plant site within 4 hours of the seismic event should be used.

1.2 A triaxial time-history accelerograph should be provided at the following locations:

- 1) Free-field.
- 2) Containment foundation.
- 3) Two elevations (excluding the foundation) on a structure inside the containment.

Enclosure

- 4) An independent Seismic Category I structure foundation where the response is different from that of the containment structure.
- 5) An elevation (excluding the foundation) on the independent Seismic Category I structure selected in 4 above.
- 6) If seismic isolators are used, instrumentation should be placed on both the rigid and isolated portions of the same or an adjacent structure, as appropriate, at approximately the same elevations.

The AP1000 Design Certification Document, Revision 19, Tier 2 Section 3.7, in pages 47 and 48, specifies where the AP1000 design approved by NRC should have the triaxial accelerographs, consistent with RG 1.12. The only difference in the implementation of the guidance in RG 1.12 for the American AP1000 licensed design is the use of accelerographs inside the containment structure. The guidance recommends accelerographs at two elevations (excluding the foundation) on a structure inside the containment. For the American AP1000, one of these accelerographs is on the containment internal structure near the steam generator compartment and the other is on the shield building. RG 1.12 is generic guidance which applies to all types of designs. As most designs do not have a shield building, RG 1.12 was not modified to include instrumentation of the shield building. For the American AP1000, the use of one accelerograph each for the containment internal structure and the shield building was made to capture the seismic structure response of two heavy structures in close proximity and on the same basemat instead of adding additional accelerographs for the shield building. The NRC staff accepted this modified distribution of accelerograph locations based on the usefulness of the data to be collected. In addition, the ability to access the instruments routinely without excessive exposure to the plant crew is in line with the as low as reasonably achievable (ALARA) principle.

The instrument location cited from the Chinese plant above is also one of the locations identified in the U.S. plants.