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Discussion on Paper No. 302, "Seismic and Geologic Siting Considerstions for Nuclear Facilities."

Discussion by Richard L. Meehan, Earth Sciences Associates, Palo Alto, California.

The authors present a correlation between maximum ground acceleration and intensity which they submit is a "provisionally valid" means of estimating ground accelerations, presumably for design of nuclear power facilities. The validity of deriving accelerations from historical intensity data has been questioned by others during this conference, and the several shortcoming of the general approach will not be discussed here. The authors have, however, in this paper attempted to refine the procedure by taking various types of ground conditions into account. Even assuming that such a refinement of the correlation were justified, the writer believes that the result presented on the graph is based on an erroneous concept of ground response.

Consider, for example, the level of ground acceleration predicted from the graph for various types of ground with an assumed recorded intensity of VII. This intensity level is below VIII and therefore within the range of the graph which the authors consider valid (no explanation is made as to why the graph is extended into the invalid range). The maximum acceleration predicted for a "firm bedrock" site is then about 10% g, and for a site underlain by "below average soil material" is 25% g. Stating this conclusion somewhat differently, Town A situated on a bedrock site, subjected to an earthquake with maximum local ground acceleration of 10% g, will suffer the same intensity effects as an identical Town B situated on weak alluvial soils and subjected to an earthquake with maximum local ground acceleration of 25% g. Certainly this would not be the case. It would be more reasonable to expect that Town B would suffer severe damage, with possible ground failures suggestive of intensities of greater than VIII. Town A, on the other hand, might escape relatively unscathed. Hence, it would appear that the ground classification scheme presented on the figure might well be more properly reversed.

This argument can be stated in another way, as follows. If we consider that maximum particle velocity probably provides a better indication of intensity level than does maximum acceleration, then we would expect that for a given maximum acceleration level, higher intensity would result from the longer period motion associated with poorer ground conditions. Figure 1 implies the opposite -- the better the ground, the higher the intensity, for a given acceleration.

It seems probable that whatever relations might be established between ground classification, acceleration, and intensity would be complex and could not be presented as a series of parallel bands as indicated on the figure. At relatively small epicentral distances (and the authors indicate that the chart is particularly suitable for that case), where intensities are highest, a relation between poor and good ground which is the reverse of that shown on the chart seems more appropriate.

The introduction of this chart by representatives of a U. S. Government agency at an international conference may suggest that it represents a method which is widely accepted in the United States. This is not the case.