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MIDLAND PROJECT
MIDLAND DOCKET NO 50-329, 50-330
CLOSURE OF DECEMBER 14, 1981 HEARING OPEN ITEM
CONCERNING SOIL IMPEDANCE FUNCTIONS OF THE AUXILIARY
BUILDINGS ELECTRICAL PENETRATION WINGS
FILE: 0485.16, B3.7 SERIAL: 17209
ENCLOSURE: "RELATIVE SOIL IMPEDANCES BENEATH ELECTRICAL PENETRATION WINGS FOR THE MIDLAND AUXILIARY BUILDING" BY R P KENNEDY, ET AL; MARCH 1982

On the behalf of Consumers Power Company, Dr R P Kennedy of Structural Mechanics Associates gave testimony before the NRC and the Soils Hearing Board on December 14, 1981 at the Midland County Courthouse, Midland, Michigan, on the seismic building models. As is documented on Page 5990 of the hearing transcript, Dr Kennedy discussed the uncertainty in the stiffness of the soil impedance functions under the Auxiliary Building Electrical Penetration Areas (EPA). The enclosed report entitled, "Relative Soil Impedances Beneath Electrical Penetration Wings For The Midland Auxiliary Building," is the result of an investigation into the effects of the postulated variability of soil impedances.

The analyses performed, along with the results of this investigation are documented in the enclosed report and are briefly summarized as follows. Three soil cases were studied. The first case corresponded to a global stiffness case where soil impedances were developed based on the global foundation geometry of the auxiliary building complex and were attached to the mathematical model at a single location. The second case was defined as the lower bound relative wing stiffness case. This procedure minimized the relative soil stiffness beneath the EPAs and represents a realistic lower bound. Discrete soil springs were modeled under both the EPA and main auxiliary/control tower for this case. The final case studied was an upper bound relative EPA stiffness case obtained by maximizing the relative soil stiffness under the EPA.

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Comparison of in-structure response spectra, peak relative displacements and peak absolute accelerations were developed for typical locations in the structure. Results showed that for all locations studied, the floor response spectra, accelerations and displacements were virtually identical. The lower bound relative wing stiffness and global stiffness cases predict slightly more conservative spectral accelerations, zero-period accelerations and displacements than the upper bound relative wing stiffness case. Therefore, it is recommended that the lower bound wing stiffness case be used for development of inertial loadings for determining moment and shear distributions in the structure. Either the lower bound relative stiffness or the global stiffness case should be used to determine in-structure floor response spectra. The soil impedance functions developed by Bechtel for their analyses, and presented in the hearing testimonies, are based upon the lower bound relative stiffness.

Therefore, the results of the enclosed report, in conjunction with the testimonies given by both Dr K P Kennedy and the NRC staff, serve to provide further proof of the adequacy of the analytical techniques used to evaluate the Category I structures of the Midland Project.

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