ILLINOIS POWER COMPANY

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500 SOUTH 27TH STREET, DECATUR, ILLINOIS 62525

December 1, 1981

RECEIVED DEC 4 1981 U.S. NUCLEAR REGULATORY COMMISSION

Mr. James R. Miller, Chief
Standardization & Special Projects Branch
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Miller:

Clinton Power Station Unit 1
Docket No. 50-461

Mr. N. Chokski, SEB reviewer, has requested clarification on how surface waves have been considered in Clinton project design of buried pipes and ducts. The enclosure explaines why the consideration of surface waves will not effect the design.

Sincerely,

J D Geier

J.D. Geier
Manager, Nuclear Station Engineering

Attachments

cc: J.H. Williams, NRC CLinton Project Manager
H.H. Livermore, NRC Resicent Inspector
N. Chokski, NRC Structural Engineering Branch

B001 S,1/1 Add: N. Chokski (SEB)

CLINTON BURIED PIPE AND DUCTS

The maximum strains in pipes and ducts were based on the assumption that the specified ground particle velocity of 12 in/sec is due to a single inclined shear wave. An apparent shear wave velocity of 2500 ft/sec was used. The single shear wave assumption is consistent with the first approximation suggested in Yeh's paper when the relative contributions of the various waves to the given maximum particle velocity are not known. The assumption of a single shear wave is also conservative for sites east of the Rockies, where the design earthquake is due to a near-field earthquake and most of the energy transmitted to the site is in the form of body waves.

To evaluate the sensitivity of the buried pipe and duct design to the wave-type assumption, we have performed the following evaluations to show that any increase in stresses is more than compensated for by the margins built into the design.

If we assume that at the instant the maximum particle velocity of 12 in/sec occurs, 50% is contributed by S-waves, 25% by P-waves, and 25% by Rayleigh waves, then the maximum particle velocities for the S-, P-, and Rayleigh waves are 9.8 in/sec, 4.9 in/sec, and 4.9 in/sec, respectively.

Assuming the P-wave velocity to be twice the S-wave velocity and the Rayleigh wave velocity to be the same as the S-wave velocity leads to stresses 8% higher than when the particle velocity is assumed to be from a single shear wave.

If we assume that at the instant the maximum particle velocity of 12 in/sec occurs, 33% is contributed by S-wave, 33% by P-wave, and 33% by Rayleigh wave, then the computed maximum particle velocity for each of the three wave types is 6.9 in/sec, and the computed stresses are 15% higher than when the particle velocity is assumed to be from a single shear wave.

In our design basis calculations, we have used an apparent shear wave velocity of 2500 ft/sec. Clinton is a stiff soil site, and according to Hall & Newmark's paper, a 3000 ft/sec velocity is more appropriate. This, when combined with a 17% increase in strength due to the actual material strength being larger than the specified minimum, leads to a 40% margin in the Clinton buried ducts. The margins in the buried pipe design are also similar, where the design basis calculation leads to a maximum stress of 19.4 ksi, compared to the allowable stress of 29.2 ksi.

Based on the above discussion, it can be concluded that the Clinton buried duct and pipe design is conservative.