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Office of Nuclear Reactor Regulation
Division of Licensing
US Nuclear Regulatory Commission
Washington, DC 20555

MIDLAND PROJECT

MIDLAND DOCKET NO 50-329, 50-330

NEW SEISMIC DAMPING VALUES FOR DESIGN BASIS

FILE: B3.7, 0505.803 SERIAL: 17968

ENCLOSURE: (1) REQUEST FOR NEW SEISMIC DAMPING VALUES
FOR THE DESIGN OF CABLE TRAYS CONDUITS,
PIPING, TUBING AND THEIR SUPPORTS

The seismic critical damping values Midland is currently using in the seismic analysis were determined from G W Housner earthquake design recommendations during the early sixties. These damping values are generally recognized as being overly conservative in light of the currently available experimental test data. The purpose of this letter is to request NRC concurrence in the use of more realistic damping values than those currently described for seismic design in the FSAR. The request is based on results of recent test programs investigating dynamic damping of specific types of structures.

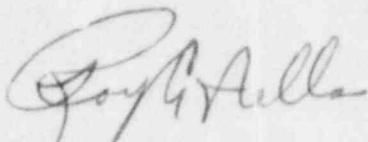
Enclosure 1 describes the details and justification of our proposed new seismic damping values. The changes apply specifically to the following items: cable-trays, conduits, piping and tubing and their respective supports. Previous discussions with the Staff on damping indicate that they would be willing to review the Midland case for the above items in light of the new test data available to them. Our request has precedence since NRC has approved requests for use of higher damping values by other applicants based on these same test results.

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We would be happy to discuss the details of the test programs referenced in enclosure 1 and their applicability to Midland seismic design upon request. We would appreciate a timely response to our request for higher damping values because it has an impact on engineering analysis currently in progress.



R A Wells
Executive Manager

for J W Cook
JWC/WJC/mkh

CC RHernan, NRC, w/a
FRanaldi, NRC, w/a
JRajan, NRC, w/a
DBMiller, Midland, w/a (3)
RJCook, Midland Resident Inspector, w/o

BCC RCBauman, P-14-312B, w/o
MEgaaly, Bechtel, w/a
BFHenley, P-14-212, w/o
EMHughes, Bechtel, w/a
RWHuston, Washington, w/a
TJSullivan, P-24-624A, w/o
TRThiruvengadam, P-14-400, w/o
DJVandeWalle, P-24-414, w/a
RAWells, P-14-113A, w/o
NRC Correspondence File

Request For New Seismic Damping Values
For The Design of Cable Trays, Conduits,
Piping, Tubing, and Their Supports

This is a request for NRC concurrence in the use of more realistic damping values, for seismic analysis of Midland Plant Units 1 and 2, than those currently described in the FSAR. The site horizontal design response spectra for Midland are shown in the FSAR, Figures 3.7-1 and 3.7-2. These spectra were developed by Housner and the responses were increased for Midland design in the period range from 0.2 to 0.6 seconds by 50%.

The higher damping values will be used to qualify existing designs of cable trays, conduits, piping, tubing, and their supports to increased response resulting from seismic reanalysis under FSAR design basis. Specifics and technical justification for this request are addressed in the following:

1. Cable-Trays and Their Supports

We are requesting the use of 4% damping for OBE and 7% damping for SSE, in lieu of the FSAR commitment of 2% damping for both OBE and SSE. Higher damping values if needed and can be justified, based on the in-structure zero period acceleration (ZPA) and the amount of cable in the trays, will be used.

The new damping values are based on and supported by the results of a cable tray and conduit raceway seismic test program⁽¹⁾. The test program was developed by Bechtel Power Corporation with participation from 11 other organizations. Details of this test program and the results obtained were discussed on a generic basis with the NRC⁽²⁾, and were published in the technical literature^(3,4).

The reason for requesting the use of higher damping values is to minimize the changes in the supports' designs which have been issued for construction and in most cases have been installed. These changes will be required due to increase in building response as obtained from seismic reanalysis of the FSAR design basis. Furthermore, additional supports may be needed, which would pose significant restrictions on construction and on maintainability of the plant during operation.

Details of the referenced test program and its applicability to Midland design can be discussed with the NRC, if required. Vogtle, Palo Verde, Susquehanna, and SNUPPS projects, have requested from the NRC and received permission to use higher damping values than originally were committed to based on and supported by the referenced test program.

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- (1) "Cable Tray and Conduit Raceway Seismic Test Program - Release 4 (Final)," Test Report 1053-21.1-4, December 15, 1978, Anco Engineers, Inc.
 - (2) The test reports were provided by Bechtel to the NRC following a meeting held on January 8, 1980, in Bethesda, Maryland, to discuss the test results on a generic basis - letter from R. Kosiba to Dr. Franz Schauer (NRC-Structural Branch), dated January 21, 1980.
 - (3) "Dynamic Testing of Electrical Raceway Support Systems for Economical Nuclear Power Plant Installations," by P.Y. Hatago and G.S. Reimer, Presented at the IEEE PES Winter Meeting, New York, N.Y., February 4-9, 1979.
 - (4) "Development of Bechtel's Electrical Raceway System Test Program," by R.B. Linderman and A.H. Hadjian, Proceedings of the American Power Conference, 1981

2. Conduits and Their Supports

We are requesting the use of 2-5% damping, in lieu of the FSAR commitment of 2%. The damping value to be used will be dependent on the conduit diameter, the number of cables in the conduit, and the governing ZPA.

The new damping values are based on and supported by the results of the test program⁽¹⁾ referenced above with respect to cable trays.

3. Piping Systems and Tubing

We are requesting the use of 1% and 2% damping values for OBE and SSE, respectively. This is in lieu of the FSAR commitment to use 0.5% damping for OBE or SSE. The requested damping values are based, conservatively, on the recommendation by Newmark and Hall⁽⁵⁾.

The use of low damping values leads to requirements for an excessive number of piping supports, snubbers, etc. The addition of such devices grossly limits access to piping for maintenance and inservice inspection. Furthermore, a rigid system requires great care in alignment to eliminate exposure to severe loads during heatup and cooldown. A flexible piping system can absorb large quantities of seismically generated energy through inelastic deformation without failure in contrast with stiff systems.

The aforementioned benefits from a flexible system have been recognized by both the industry and the NRC^(6,7,8). The NRC Regulatory Guide 1.61 recommended damping values are in general lower than the best estimate values reported in a survey of experimentally determined damping values in nuclear power plant piping systems⁽⁹⁾, especially at low frequencies. In reference 7, Mr. Dircks of the NRC concludes that the test data⁽⁹⁾ substantiates the fact that the piping damping values in Regulatory Guide 1.61 are generally conservative lower bound values. Furthermore, in the same reference, Mr. Dircks states that the NRC staff, in some cases, has permitted the use of higher values of piping damping than those recommended in Regulatory Guide 1.61.

Details of the available test results and technical data and its applicability to Midland design can be discussed with the NRC, upon request.

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- (5) "Seismic Design Criteria for Nuclear Reactor Facilities" by Newmark and Hall; Proc. 4th WCEE, IAEE, Santiago, Chile - Vol II, Session B-4, PP 37-50, 1969 (This paper is referenced in Midland FSAR)
 - (6) From S.H. Bush of the ASME Pressure Vessel Research Committee to N.J. Palladino, Chairman - NRC; August 20, 1981.
 - (7) From W.J. Dircks, Executive Director for Operations, NRC to N.J. Palladino, Chairman - NRC; September 23, 1981.
 - (8) "Effects of Postulated Event Devices on Normal Operation of Piping Systems in Nuclear Power Plant," By D.F. Landers, R.D. Hookway, and K.D. Desai, May 1981 - NUREG/CR-2136.
 - (9) "A Survey of Experimentally Determined Damping Values in Nuclear Power Plant Piping Systems," By A.G. Ware, November 1981 - NUREG/CR-2406.