Tera

Public Service Company of Colorado

50-267

October 28, 1980
Fort St. Vrain
Unit No. 1
P-80381

Mr. Karl V. Seyfrit
Director Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76012

Subject: Masonry Block Walls

Dear. Mr. Seyfrit:

The following is Public Service Company of Colorado's 180 day response to IE Bulletin 80-11.

Item 2b Provide a reevaluation report of the design adequacy of the masonry block walls.

PSC has completed the reevaluation of the masonry block walls which have the potential of affecting the operation of Class I equipment. A total of 65 walls were analyzed and reevaluated as to their ability to withstand a seismic event. A total of 16 walls were found to be in need of reinforcing upon completion of the reevaluation program.

The function of the various walls in the Turbine Building included in the reevaluation are as follows:

1. Separation walls between major equipment components as in the 480 volt room.

2. Walls that make up the enclosures for rooms such as the Maintenance Shop and Turbine Lube Oil Storage Room.

The function of the various walls in the Reactor Building included in the reevaluation are as follows:

1. Separation walls between major equipment components as in Level 1 of the Reactor Building.

2. Walls that make up the enclosure for the pipe chases.

3. Walls used for radiological shielding purposes, such as those located in the liquid waste and gas waste facility.

No masonry block walls are used to support Class I pipe hangers.

The walls in the Reactor Building are a nonload bearing, single wythe, solid block type wall. The walls vary in thickness from six inches to twelve inches.

The walls in the Turbine Building are also nonload bearing, single wythe, hollow block type wall, varying in thickness from six inches to twelve inches.

The block and mortar combination is classified as an N-Type with the following mechanical properties:

Allowable Compression Stress = 300 psi

Allowable Tension Stress Perpendicular to the Bed Joints = 16 psi

Allowable Tension Stress Parallel to the Bed Joints = 32 psi

Modulus of Elasticity = 1,000,000 psi

These allowable strength values are from the ACI-531 code. These values were used to reevaluate the masonry block walls during a seismic event.

The walls are reinforced with 3/16 inch diameter wire "dur-a-wall" running horizontal at alternate block courses. The walls do not have vertical reinforcing steel.

The block walls were built about 1970 and the applicable codes, inspections, and specifications that pertain to masonry walls at that time were followed. Since the walls do not have vertical reinforcing, there is no problem with possible voids in the concrete fill since none is required.

Each wall that has the potential of affecting a Class I system was field audited. A sketch was made of the wall showing the type of attachment to the wall and its location for use in analysis. From this information a reanalysis of the wall was made taking into account all attachments and the loads they would impart into the wall.

The differential floor displacement problem was reviewed and analyzed from both an in plane and out of plane consideration. It was determined that the seismic displacements are small enough that the strains that would be produced in the wall would result in very small stresses. Wall adequacy was shown in all cases. Therefore, the differential floor displacements are not a problem with the masonry block walls at Fort St. Vrain.

There were no thermal lines found attached to the Class I masonry block walls, therefore, no thermal affects due to pipe growth required evaluation.

Potential cracking under dynamic loadings is always a problem for brittle type materials such as masonry which has low tensile resistance strength. This is especially true around openings and penetrations where there can exist stress concentrations. However, we have shown in our reanalysis, or we have modified the wall by reinforcing it, that the allowable stress values of the masonry wall units are not exceeded. The potential for cracking under dynamic loadings is further reduced by the ductility of the "dur-a-wall" which would tend to maintain wall integrity during a seismic event. The affects of wall cracking during dynamic conditions would tend to be offset by an increase in the damping ratio of the wall due to internal friction which would lower the dynamic response of the wall.

The mechanism for load transfer into the masonry walls is not considered a problem. The majority of the attachments on the masonry block walls is conduit, three inches in diameter or less. During a seismic event, not enough force is exerted by the attachment to cause the block or blocks to pull out of the wall.

Those 16 walls which were found to require reinforcing because of the loads imparted to them during a seismic event are in the process of being reinforced. The scheduled completion date for this work is February 1, 1981.

Very truly yours,

Frederic E. Swart
Nuclear Project Manager

FES/RAG:pa