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TENNESSEE VALLEY AUTHORITY
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RECEIVED

Mr. John C. McKinley, Chief
Project Review Branch #1
USNRC, ACRS
Washington, D. C. 20555

Dear Mr. McKinley:

In response to your letter of May 15, 1984, I accompanied members of the ACRS on a tour of the Diablo Canyon Nuclear Plant on May 23, 1984. As requested by your referenced letter, I observed the installation and sizing of the pipe support/restraint systems. Comments on what I observed are enclosed.

I am very appreciative of the opportunity to make the tour with you.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

E. D. Mysinger

E. D. Mysinger, Principal
Mechanical Engineer
Civil Engineering Support Branch

Enclosure

DESIGNATED ORIGINAL

Certified By _____ ATTACHMENT

Diablo Canyon Nuclear Power Plant
Pipe Support/Restraint Observations
by E. Douglas Mysinger

On May 23, 1984, I accompanied members of the ACRS on a tour of the Diablo Canyon Nuclear Power Plant. As requested by Mr. John C. McKinley, Chief, Project Review Branch No. 1, I observed the installation and sizing of pipe support/restraint systems. The purpose of this paper is to comment on what I observed.

On the tour Mr. Isa Yeu, a NRC inspector previously assigned to the site, pointed out typical examples of concerns he had documented.

Concern No. 1 - A snubber had been placed on a small branch line relatively close to the run line. Thermal movements were not sufficient to justify a snubber and seismic movements were not as large as the snubber free travel. Thus, the snubber would not provide the support as modeled in the piping analysis.

Response: The small branch line had initially been qualified by conservative span tables (alternate analysis rules). The designer had prudently specified a snubber adjacent to a valve to accomodate relative thermal movement of the run and branch line and to provide seismic support of the valve. PG & E has subsequently performed a computer analysis of the line and it is qualified with or without the snubber. There is no safety concern for leaving the snubber in.

Concern No. 2 - A spring and snubber and two rigid supports were very close together near a valve. The spring and snubber could not be effective due to the close proximity to the rigid supports.

Response: PG & E had run the problem with and without the spring and snubber and the pipe was qualified. At one time during the design of the plant, an economic decision was made to leave the supports in place.

Concern No. 3 - A rigid and snubber are close together. The snubber cannot be effective because of close proximity to the rigid and inherent free travel of the snubber.

Response: If the rigid support does not deflect enough to redistribute load to the snubber, it cannot be overloaded.

Concern No. 4 - A snubber was attached to a valve operator. An analysis without the support indicates movement of the operator was not sufficient to lock up the snubber. A strut should be specified.

Response: A strut has very little free travel. Rigid supports in the run line near the valve are designed with gaps. A fixed support point on the valve operator and a gap in adjacent rigid support points on the pipe could potentially overload the operator. Concrete creeps and shrinks for years, pipe shakes down during the first few cycles of operation, etc. These

things are not considered in a computer analysis and resulting movement calculations are not indefinitely accurate. If the snubber and strut were comparable in reliability and maintenance, a snubber would be a clear choice for this application.

Concern No. 5 - Calcium silicate insulation with metal cover has been installed on relatively large pipe without sufficient clearance to avoid impact with the building structure during a seismic event.

Response: Building structural steel members were obviously sufficient to crush the insulation or withstand the seismic loading transmitted by the pipe through the insulation. It is reasonable to expect that crushing of the insulation will increase dynamic damping in these pipe runs which will reduce stress in the pipe and load on adjacent supports.

Concern No. 6 - There are too many snubbers in the plant. Examples were sited of plants that have removed hundreds of snubbers. The expressed concern was for radiation exposure to personnel during inspection and maintenance of the snubbers.

Response: It has been difficult for experienced piping designers to specify rigid supports that reduce flexibility of piping systems. This desire to maintain flexibility has resulted in the use of snubbers where a rigid support would qualify. As indicated by NUREG/CR-3718 (Reliability Analysis of Stiff Versus Flexible Piping - Status Report) reliability of rigid systems is still being questioned. It is also apparent, industry wide, that inexperienced designers specified an excessive number of supports including snubbers. However, meaningful relief such as higher damping, elimination of 1/2 SSE as a design consideration, spectrum peak broadening changes, etc., is now being considered. Removal of snubbers considered in design of the piping is an economic and not a nuclear safety consideration. Many factors enter into the economic evaluation such as age of snubber, type of snubber, operating experience, pending changes in industry practice, etc.

Concern No. 7 - It is industry practice to specify a 1/16-inch gap between a pipe and rigid structural steel type support. A 1/16-inch gap on each side plus a reasonable tolerance of 1/16-inch can result in a cumulative gap of 3/16-inch. When two supports are closely spaced and the major part of the 3/16-inch cumulative gap is on opposite sides of the pipe at the two supports, load distribution to the supports may not be equal.

Response: PG & E is shimming supports to address this concern. To expedite licensing, this approach seems prudent. However, unless nuclear power plants are extremely overdesigned for such an unlikely event an an SSE, it is reasonable to expect deformation to redistribute load through a 3/16-inch gap. For normal operation, the larger gap is preferable.

In summary, taking out supports that are not required but have been considered in the piping qualification is an economic consideration. Changing out snubbers with struts is an economic consideration. If a system is so conservatively supported that movement will not be sufficient to load up a snubber, there is no safety concern. Snubbers on valve operators versus struts are preferred by some designers to ensure against loads due to normal operation. With the possible exception of concern No. 7 there was clearly no valid safety problems observed during the tour. PG & E is modifying support gaps in response to concern No. 7 to avoid further delays.