

REPORT NO:

IE-77/03-SPS-413/414

REPORT DATE:

October 7, 1977 Initial  
August 10, 1979 Final

FACILITY:

Catawba Nuclear Station, Units 1 & 2

IDENTIFICATION OF DEFICIENCY:

Safety Related Valve/Operator Natural  
Frequency Analysis Deficiency

DESCRIPTION OF DEFICIENCY:

This report describes the potential malfunction of safety related valves supplied to Duke Power Company by Kerotest Valve Company, Pittsburgh, PA., and Fisher (Continental Valve Division) Control Valve Co., Coraopolis, PA. The affected Kerotest (2" and smaller) valves are those supplied with large extended operators. The affected Fisher valves are butterfly valves (8"-24") supplied with extended air and electric operators used as containment isolation valves.

Fisher and Kerotest have advised valve/operator natural frequency determination analysis used for the subject valves produced higher natural frequency results than those determined by natural frequency response testing recently performed on valves supplied by these manufacturers.

ANALYSIS OF SAFETY IMPLICATIONS:

Worst case safety consequence is the possible inability of subject valves to achieve tight shut-off under containment isolation operation in the event of a seismic event. For a postulated LOCA in the event of a seismic event, assurance of total containment isolation may not be possible assuming inadequate isolation valve closure concurrent with single failure of its redundant valve.

CORRECTIVE ACTION:

Kerotest, Fisher and Duke initiated a comprehensive program to:

- 1) Review and revise analytical techniques as required to achieve the most accurate analytical modeling program to predict valve natural frequencies which will correspond to actual test results.
- 2) Redesign structural components as required to meet rigid structure criteria.
- 3) Perform natural frequency response testing to verify manufacturer's analytical modeling program applicable for affected valves.
- 4) Make necessary hardware/software changes to affected valves as required to meet rigid structure criteria.
- 5) Add valve external support/restraints to meet rigid structure criteria or assure proper valve function.

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CORRECTIVE ACTIONS IMPLEMENTED:

- 1) Kerotest and Fisher have completed extensive testing programs to verify modeling used in analytical techniques to predict valve natural frequencies. The revised analytical models accurately correspond with actual test results.

Kerotest and Fisher valve seismic reports have been corrected and resubmitted using these revised valve models.

- 2) The Fisher operator support brackets were redesigned as rigid structures. This design improvement was implemented prior to shipment of active butterfly valves to the Catawba site.

The structural configuration of Kerotest valves (small valves with comparatively large operators) has precluded an operator support bracket redesign which will make the valve/operator assembly rigid. Accurate valve models are used to confirm that valve design loads are not exceeded. Dynamic piping analyses and/or valve external supports are used to assure valves will operate during a seismic event.

CONCLUSION:

Kerotest and Fisher have developed valve models which accurately predict valve natural frequencies. This design information has been used to assure that active valves will function properly in the event of a seismic event.

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