



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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NOV 9 1984

Docket Nos: 50-412, 50-456, 50-354, 50-546, 50-423,
50-410, 50-440, 50-458, 50-443, 50-400,
50-498, 50-424

MEMORANDUM FOR: B. Joe Youngblood, Chief
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FROM: Vincent S. Noonan, Chief
Equipment Qualification Branch
Division of Engineering

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON
CONTAINMENT PURGE AND VENT VALVE OPERABILITY
TMI II.E.4.2(6)

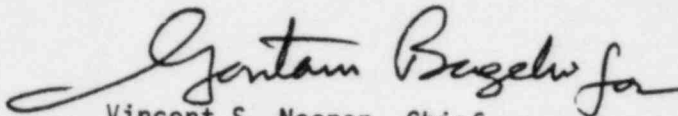
The attachments to this memo were part of the SQRT and PVORT request for additional information (attachments 4 and 5) previously made for the following plants:

<u>Name of Plant</u>	<u>Docket No.s</u>
Beaver Valley 2	50-412
Braidwood 1	50-456
Hope Creek 1	50-354
Marble Hill 1	50-546
Millstone 3	50-423
Nine Mile Point 2	50-410
Perry 1	50-440
River Bend 1	50-458
Seabrook 1	50-443
Shearon Harris 1	50-400
South Texas 1	50-498
Vogtle 1	50-424

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The information sought on the demonstration of containment purge and vent valve operability should be provided as soon as possible. There is no need to wait until the SQRT and PVORT audits to submit the requested information. Submittals on containment purge and vent valve operability made within one year prior to licensing generally result in a license condition. Please request the applicants to address TMI II.E.4.2(6) on an expedited basis.



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cc: See attached

Contact: R. Wright
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V. Nurses
E. Doolittle

Operability Qualification of Purge and Vent Valves

Demonstration of operability of the containment purge and vent valves and the ability of these valves to close during a design basis accident is necessary to assure containment isolation. This demonstration of operability is required by NUREG-0737, "Clarification of TMI Action Plan Requirements," II.E.4.2 for containment purge and vent valves which are not sealed closed during operational conditions 1, 2, 3 and 4.

1. For each purge and vent valve covered in the scope of this review, the following documentation demonstrating compliance with the "Guidelines for Demonstration of Operability of Purge and Vent Valves" (attached, Attachment #5) is to be submitted for staff review:
 - A. Dynamic Torque Coefficient Test Reports
(Butterfly valves only) - including a description of the test setup.
 - B. Operability Demonstration or In-situ Test Reports (when used)
 - C. Stress Reports
 - D. Seismic Reports for Valve Assembly
(valve and operator) and associated parts.
 - E. Sketch or description of each valve installation showing the following (Butterfly valves only):
 1. direction of flow
 2. disc closure direction
 3. curved side of disc, upstream or downstream
(asymmetric discs)
 4. orientation and distance of elbows, tees, bends, etc.
within 20 pipe diameters of valve
 5. shaft orientation
 6. distance between valves
 - F. Demonstration that the maximum combined torque developed by the valve is below the actuator rating.
2. The applicant should respond to the "Specific Valve Type Questions" (attached) which relate to his valve.

3. Analysis, if used, should be supported by tests which establish torque coefficients of the valve at various angles. As torque coefficients in butterfly valves are dependent on disc shape aspect ratio, angle of closure flow direction and approach flow, these things should be accurately represented during tests. Specifically, piping installations (upstream and downstream of the valve) during the test should be representative of actual field installations. For example, non-symetric approach flow from an elbow upstream of a valve can result in fluid dynamic torques of double the magnitude of those found for a valve with straight piping upstream and downstream.
4. In-situ tests, when performed on a representative valve, should be performed on a valve of each sinze/type which is determined to represent the worst case load. Worst case flow direction, for example, should be considered.

For two valves in series where the second valve is a butterfly valve, the effect of non-symetric flow from the first valve should be considered if the valves are within 15 pipe diameters of each other.

5. If the applicant takes credit for closure time vs. the buildup of containment pressure, he must demonstrate that the method is conservative with respect to the actual valve closure rate. Actual valve closure rate is to be determined under both loaded and unloaded conditions and periodic inspection under tech. spec. requirements should be performed to assure closure rate does not increase with time or use.

Specific Valve Type Questions

The following questions apply to specific valve types only and need to be answered only where applicable. If not applicable, state so.

- A. Torque Due To Containment Backpressure Effect (TCB)
For those air operated valves located inside containment, is the operator design of a type that can be affected by the containment pressure rise (backpressure effect) i.e. where the containment pressure acts to reduce the operator torque capability due to TCB. Discuss the operator design with respect to the air vent and bleeds. Show how TCB was calculated (if applicable).
- B. Where air operated valve assemblies use accumulators as the fail-safe feature, describe the accumulator air system configuration and its operation. Discuss active electrical components in the accumulator system, and the basis used to determine their qualification for the environmental conditions experienced. Is this system seismically designed? How is the allowable leakage from the accumulators determined and monitored.
- C. For valve assemblies requiring a seal pressurization system (inflatable main seal), describe the air pressurization system configuration and operation including means used to determine that valve closure and seal pressurization have taken place. Discuss active electrical components in this system, and the basis used to determine their qualification for the environmental condition experienced. Is this system seismically designed?
- D. Where electric motor operators are used to close the valve has the minimum available voltage to the electric operator under both normal or emergency modes been determined and specified to the operator manufacturer to assure the adequacy of the operator to stroke the valve at accident conditions with these lower limit voltages available? Does this reduced voltage operation result in any significant change in stroke timing? Describe the emergency mode power source used.
- E. Where electric motor and air operator units are equipped with handwheels, does their design provide for automatic re-engagement of the motor operator following the handwheel mode of operation? If not, what steps are taken to preclude the possibility of the valve being left in the handwheel mode following some maintenance, test etc. type operation?
- F. For electric motor operated valves have the torques developed during operation been found to be less than the torque limiting settings?

GUIDELINES FOR DEMONSTRATION
OF OPERABILITY OF PURGE AND
VENT VALVES

OPERABILITY

In order to establish operability it must be shown that the valve actuator's torque capability has sufficient margin to overcome or resist the torques and/or forces (i.e., fluid dynamic, bearing, seating, friction) that resist closure when stroking from the initial open position to full seated (bubble tight) in the time limit specified. This should be predicted on the pressure(s) established in the containment following a design basis LOCA. Considerations which should be addressed in assuring valve design adequacy include:

1. Valve closure rate versus time - i.e., constant rate or other.
2. Flow direction through valve; ΔP across valve.
3. Single valve closure (inside containment or outside containment valve) or simultaneous closure. Establish worst case.
4. Containment back pressure effect on closing torque margins of air operated valve which vent pilot air inside containment.
5. Adequacy of accumulator (when used) sizing and initial charge for valve closure requirements.
6. For valve operators using torque limiting devices - are the settings of the devices compatible with the torques required to operate the valve during the design basis condition.
7. The effect of the piping system (turns, branches) upstream and downstream * of all valve installations.
8. The effect of butterfly valve disc and shaft orientation to the fluid mixture egressing from the containment.

DEMONSTRATION

- Demonstration of the various aspects of operability of purge and vent valves may be by analysis, bench testing, insitu testing or a combination of these means.

Purge and vent valve structural elements (valve/actuator assembly) must be evaluated to have sufficient stress margins to withstand loads imposed while valve closes during a design basis accident. Torsional shear, shear, bending, tension and compression loads/stresses should be considered. Seismic loading should be addressed.

Once valve closure and structural integrity are assured by analysis, testing or a suitable combination, a determination of the sealing integrity after closure and long term exposure to the containment environment should be evaluated. Emphasis should be directed at the effect of radiation and of the containment spray chemical solutions on seal material. Other aspects such as the effect on sealing from outside ambient temperatures and debris should be considered.

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The following considerations apply when testing is chosen as a means for demonstrating valve operability:

Bench Testing

- A. Bench testing can be used to demonstrate suitability of the in-service valve by reason of its traceability in design to a test valve. The following factors should be considered when qualifying valves through bench testing.
 - 1. Whether a valve was qualified by testing of an identical valve assembly or by extrapolation of data from a similarly designed valve.
 - 2. Whether measures were taken to assure that piping upstream and downstream and valve orientation are simulated.
 - 3. Whether the following load and environmental factors were considered
 - a. Simulation of LOCA
 - b. Seismic loading
 - c. Temperature soak
 - d. Radiation exposure
 - e. Chemical exposure
 - d. Debris
- B. Bench testing of installed valves to demonstrate the suitability of the specific valve to perform its required function during the postulated design basis accident is acceptable.
 - 1. The factors listed in items A.2 and A.3 should be considered when taking this approach.

In-Situ Testing

In-situ testing of purge and vent valves may be performed to confirm the suitability of the valve under actual conditions. When performing such tests, the conditions (loading, environment) to which the valve(s) will be subjected during the test should simulate the design basis accident.

NOTE: Post test valve examination should be performed to establish structural integrity of the key valve/actuator components..