

Docket 52-001

February 12, 1993

NOTE TO: J. Fox, GE

FROM: C. Poslusny, NRR

SUBJECT: GUIDANCE FOR TIER 2 INFORMATION RELATED TO CHECK VALVES AND
POWER-OPERATED VALVES

Enclosed are guidance documents related to Tier 2 information which should be considered in the preparation of future SSAR revisions to complement the ITAAC items discussed in recent meetings with MEB staff. Please contact R. Li on 504-2772 for clarification. We would like to have a conference call to discuss these items on Thursday February 18th at 2 pm EST. Please confirm this date and time.

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Acceptable Method for Meeting the ITAAC for Check Valves

Design and Qualification Requirements

For each check valve with an active safety related function, the design basis and required operating conditions (including testing) under which the check valve will be required to perform will be established.

The licensee will establish the following design and qualification requirements and will provide acceptance criteria for these requirements. By testing each size, type, and model the licensee will ensure the design adequacy of the check valve under design (design basis and required operating) conditions. These design conditions include all the required system operating cycles to be experienced by the valve (numbers of each type of cycle and duration of each type cycle), environmental conditions under which the valve will be required to function, severe transient loadings expected during the life of the valve such as waterhammer or pipe break, life-time expectation between major refurbishments, sealing and leakage requirements, corrosion requirements, operating medium with flow and velocity definition, operating medium temperature and gradients, maintenance requirements, vibratory loading, planned testing and methods, test frequency and periods of idle operation. The design conditions may include other requirements as identified during detailed design of the plant systems. The licensee will ensure that valve design features, material, and surface finish will accommodate non-intrusive diagnostic testing methods available in the industry or as specified. The licensee will also ensure that flow through the valve is determinable from installed instrumentation and that valve disk positions are determinable without disassembly such as by use of non-intrusive diagnostic methods. Valve internal parts are designed with self-aligning features for purposes of assured correct installation. The licensee will compare the maximum loading on the check valve under design basis and the required operating conditions to the allowable structural capability limits for the individual parts of the check valve. Prior to delivery, the manufacturer will test each valve to demonstrate the adequacy of the check valve to perform under design conditions. The qualification acceptance criteria noted above will include baseline data developed during qualification testing and will be used for verifying the acceptability of the check valves after installation.

Pre-operational Testing of Check Valves

The following testing requirements and acceptance criteria are applicable to each safety related check valve.

The licensee will test each check valve in the open and/or close direction, as required by the safety function, under all normal operating system conditions. To the extent practical, testing of the valves as described in this section will be performed under fluid temperature conditions that would exist during a cold shut down as well as under fluid temperature conditions that would be experienced by the valve during other modes of plant operation. The testing will identify the flow needed to open the valve to the full-open position. The testing will include the effects of rapid pump starts and stops as

required by expected system operating conditions. The testing will include any other reverse flow conditions that may be required by expected system operating conditions. The licensee will examine the disk movement during valve testing and verify the leak-tightness of valve when fully closed. By using methods such as non-intrusive diagnostic equipment, the licensee will examine the open valve disk stability under the flow conditions during normal and other required system operating conditions.

The parameters and acceptance criteria for demonstrating that the above functional performance requirements have been met are as follows.

- 1) During all test modes that simulate expected system operating conditions, the valve disk fully opens or fully closes as expected based on the direction of the differential pressure across the valve.
- 2) Leak-tightness of valve when fully closed is within established limits, as applicable.
- 3) Valve disk positions are determinable without disassembly.
- 4) Valve testing must verify free disk movement whenever moving to and from the seat.
- 5) The disk is stable in the open position under normal and other required system operating fluid flow conditions.
- 6) The valve is correctly sized for the flow conditions specified, i.e., the disk is in the full open position at normal full flow operating condition.
- 7) Valve design features, material, and surfaces accommodate non-intrusive diagnostic testing methods available in the industry or as specified.
- 8) Piping system design features accommodate all the applicable check valve testing requirements as described in SSAR Table 3.9-8.

Chapter 3.9.6

Design and Qualification Requirements for Power-Operated Valves

For each power-operated (includes pneumatic-, hydraulic-, piston-, and solenoid-operated) valve assembly (POV) with an active safety-related function, the design basis and required operating conditions (including testing) under which the POV will be required to perform will be established.

The licensee will establish the following design and qualification requirements and will provide acceptance criteria for these requirements:

By testing each size, type, and model the licensee will determine the force (as applicable to the type of POV) requirements to operate the POV and will ensure the adequacy of the force that the operator can deliver under design (design basis and required operating) conditions.

The licensee will also test each size, type, and model under a range of differential pressure and flow conditions up to the design conditions. These design conditions include fluid flow, differential pressure (including pipe break), system pressure, fluid temperature, ambient temperature, minimum air supply system (or accumulator) pressure, spring force, and minimum and maximum stroke time requirements. From this testing, the licensee will demonstrate that the results of testing under in-situ conditions can be used to ensure the capability of the POV to operate under design conditions. The licensee will ensure that the structural capability limits of the assembly and the individual parts of the POV will not be exceeded under design conditions. The licensee will ensure that packing adjustment limits are specified for the valve for each application such that it is not susceptible to stem binding.

Pre-Operational Testing of Power-Operated Valves

The following testing requirements and acceptance criteria are applicable to each power-operated valve assembly (POV) with an active safety-related function and referenced by Chapter 14:

The licensee will test each POV in the open and close directions under static and maximum achievable conditions using diagnostic equipment that measures or provides information to determine total friction, stroke time, seat load, spring rate, and travel under normal pneumatic or hydraulic pressure (as applicable to the type of POV), and minimum pneumatic or hydraulic pressure. The licensee will test the POV under various differential pressure and flow up to maximum achievable conditions and perform a sufficient number of tests to determine the force requirements at design conditions. The licensee will determine the force requirements to close the valve for the position at which there is a diagnostic indication of full valve closure (as required for the safety function of the applicable valves). The determination of design force requirements will be made for such parameters as differential pressure, fluid flow, minimum pneumatic or hydraulic pressure, power supply, temperature, and seismic/dynamic effects for POVs that must operate during these transients. The design force

requirements will be adjusted for diagnostic equipment inaccuracies.

The licensee will measure the total force delivered by the POV under static and dynamic conditions (including diagnostic equipment inaccuracies) to compare to the allowable structural capability limits for the assembly and individual parts of the POV. The licensee will test for proper control room position indication of the POV.

The parameters and acceptance criteria for demonstrating that the above functional performance requirements have been met are as follows:

- (a) As required by the safety function, the valve must fully open and/or the valve must fully close with diagnostic indication of hard seat contact.
- (b) The assembly must demonstrate adequate margin to achieve design requirements including consideration of diagnostic equipment inaccuracies and margin for degradation.
- (c) The assembly must demonstrate adequate output capability of the power-operator at minimum pneumatic or hydraulic pressure or electrical supply (or loss of motive force for fail-safe positioning) with consideration of diagnostic equipment inaccuracies and margin for degradation.
- (d) The maximum force (as applicable for the type of POV) achieved by the POV including diagnostic equipment inaccuracies must not exceed the allowable structural capability limits for the assembly and individual parts of the POV.
- (e) The remote position indication testing must verify that proper disk position is indicated in the control room and other remote locations relied upon by operators in any emergency situation.
- (f) Stroke-time measurements taken during valve opening and closing must meet minimum and maximum stroke-time requirements.
- (g) For SOVs, the Class 1E electrical requirements are to be verified. The SOV should be verified to be capable of performing for design requirements for energized or deenergized and rated appropriately for the electrical power supply amperage and voltage.
- (h) Provide leak-tight seating which must meet a specified maximum leakage rate, or meet a leakage rate to ensure an overall containment maximum leakage.