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Docket Nos.: 50-458/459

Mr. William J. Cahill, Jr.
Senior Vice President
River Bend Nuclear Group
Gulf States Utilities Company
P. O. Box 2951
Beaumont, Texas 77704
ATTN: Mr. J. E. Booker

Dear Mr. Cahill:

Subject: River Bend Units 1 and 2 - Information Request for Plant Site Audit for Seismic and Dynamic Qualification Review.

Seismic and dynamic qualification review consists of two elements: (a) general program outlines as described in the FSAR, and (b) detailed on-site audit of equipment as installed and qualification documentation. The on-site audit is a critical element of the staff's review and, as a result, it is essential that the staff be kept informed of your progress in the area of equipment qualification. The enclosed information request is intended to inform the staff of your progress towards this qualification.

The staff's review of equipment qualification is conducted with the a assistance of Brookhaven National Laboratory. To facilitate our review, it is requested that a copy of your response to this information request be sent to:

Dr. Morris Reich
Department of Nuclear Energy
Building 129
Brookhaven National Laboratory
Upton, New York 11973

If you have any questions concerning this information request, please contact NRC Project Manager Edward J. Weinkam,at (301) 492-8430.

Sincerely,

/S/

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

Enclosure: As stated

cc: See next page

OFFICE	DL:LB#2/PM	DL:LB#2/BC					
SURNAME	EWeinkam:pt	ASchwencer					
DATE	12/ /82	12/21/82					

River Bend

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ATTN: Mr. J.E. Booker

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Equipment Qualification Branch
Audit Review Teams
Request for Information

To confirm the extent to which safety-related equipment meets the requirements of the General Design Criteria (GDC) of 10 CFR Part 50, the NRC staff, assisted by Technical Assistance Contractors, will conduct a plant site audit and review. It is our intent to conduct a plant specific on-site Pump and Valve Operability Review Team (PVORT) audit concurrent with the Seismic Qualification Review Team (SQRT) audit. We believe such scheduling should minimize manpower and scheduling conflicts for the applicant, the NRC staff, and our technical assistance contractors.

Since the site audit is performed on a sampling basis it is necessary to ensure that 85 to 90 percent of the safety related equipment are qualified and installed before the audit. In order that the staff is familiar with the seismic and dynamic qualification programs currently being conducted, it is requested that all test programs be identified by submitting a brief description of the program, items being tested, the vendor or the testing laboratory involved, and the dates and location of the tests. Information about the ongoing test programs should be submitted as soon as possible so that the NRC staff can review and witness relevant tests for selected items.

A list of all safety-related equipment should be provided so that an assessment of the equipment qualification status can be made by the staff. Equipment should be divided first by system then by component type. Attachment #1 shows a tabular format which should be followed to present the status summary of all safety-related equipment.

After the information on Attachment #1 is received, and it is determined that the equipment qualification is substantially complete, selections will be made of the equipment to be audited, and reviewed, by the SQRT and PVORT. Specific information on equipment selected for audit by each review team will be requested. The information that will be requested for those equipment selected by the SQRT is shown in Attachment #2. The information that will be requested for those equipment selected by PVORT is shown in Attachment #3. In addition, the applicant will be requested to provide a complete set of floor response spectra identifying their applicability to the equipment listed in Attachment #1.

For the equipment selected by the SQRT for audit, the combined Required Response Spectra (RRS) or the combined dynamic response will be reviewed. The SQRT will examine and compare the equipment on-site installation v/s the test configuration and mounting, and determine whether the test, or analysis which has been conducted conforms to the applicable standards and agrees with the RRS. In cases where the plant is a BWR facility, the equipment qualifying documentation must also provide evidence that the hydrodynamic loads in the (0 - 100) Hz frequency range have been accounted for.

For the equipment selected by the PVORT for audit, the applicant must provide evidence that appropriate manufacturers' tests have been conducted, reviewed, and approved, and that the equipment meets, or exceeds the design requirements. The applicant must also provide qualification test and or analysis results that provide assurance that the equipment will operate (function) during and following the Design Basis Events (DBE) and all appropriate combinations thereof.

The specific information requested in Attachments #2, and #3 should be provided to the NRC staff two weeks prior to the plant site visit. The applicant should make available at the plant site all the pertinent documents and reports of the qualification for the selected equipment. After the visit, the applicant should be prepared to submit certain selected documents and reports for further staff review. The purpose of the audits is to confirm the acceptability of the qualification procedures, and implementation of the procedures to all safety-related equipment based on the review of a few selected pieces. If a number of deficiencies are observed or significant generic concerns arise, the deficiencies should be removed for all equipment important to safety subject to confirmation by a follow-up audit of randomly selected items before the fuel loading date.

The site audits will also include a review of the extent to which the documentation of equipment qualification is complete. The acceptance criteria for requirements on records is provided in Section 3.10 of the Standard Review Plan Revision 2 (NUREG-800).

Another element of the seismic and dynamic qualification review deals with the containment isolation valves for the purge and vent systems to assure their ability to close against postulated accident pressure inside containment. Information needed for this review and the basis for the review are provided in Attachments 4 and 5.

ATTACHMENT #1

- MASTER LISTING OF SEISMIC AND DYNAMIC QUALIFICATION SUMMARY AND STATUS OF SAFETY-RELATED EQUIPMENT
- ASSOCIATED EXPLANATORY NOTE

S/D. Master List.

MASTER LISTING OF SEISMIC AND DYNAMIC QUALIFICATION SUMMARY AND STATUS OF SAFETY RELATED EQUIPMENT

PLANT NAME: DOCKET NO: UTILITY: A/E: NSSS: PAGE OF

FOR EQUIPMENT LISTED BELOW

THE SUPPLIER IS: A/E ☐, NSSS ☐, OTHER ☐. SAFTY SYSTEM & FUNCTION ARE:

IDENT. NO.	EQUIPMENT				LOCATION		LOADS CONSIDERED			QUALIFICATION METHOD			LOWEST NATURAL FREQUENCY			STATUS		RRS	CODES AND STANDARDS
	TYPE AND DESCRIPTION	MANUFACTURER AND MODEL NO.	TEST REPORT NO.	QUANTITY	BUILDING AND ELEVATION	MOUNTING	SEISMIC	OTHER DYNAMIC	READ INPUT (ZPA)	ANALYSIS	TEST FREQUENCY	TEST DIRECTION	F/B (HZ)	S/S (HZ)	V (HZ)	QUALIFICATION	INSTALLATION	REF	

NOTES TO MASTER LISTING

(1) The information on Plant Name, Docket No., etc., are pertinent to the power station and will be the same for all sheets.

(2) The equipment is listed by supplier (circle one after "SUPPLIED BY:") and by system (indicate name and function of system after "SYSTEM AND FUNCTION:"). Typical safety systems, for example, are Engineered Safeguard Actuation, Reactor Protection, Containment Isolation, Steamline Isolation, Main Feedwater Shutdown and Isolation, Emergency Power, Emergency Core Cooling, Containment Heat Removal, Containment Fission Product Removal, Containment Combustible Gas Control, Auxiliary Feedwater, Containment Ventilation, Containment Radiation Monitoring, Control Room Habitability System, Ventilation for Areas Containing Safety Equipment, Component Cooling, Service Water, Emergency Systems to Achieve Safe Shutdown, Postaccident Sampling and Monitoring, Radiation Monitoring, Safety-Related Display Instrumentation. The supplier will usually be either A/E or NSSS. Use separate sheets for each system. Use additional sheets when a given system has more equipment than can be listed on one sheet.

(3) "IDENT. NO." is to be filled in by the organization preparing the list. Each equipment listed should have separate identification number. The following form is recommended:

(a) For A/E supplied equipment, the number may be "BOP-XXX." If more than one group is preparing forms, the number may be "BOP-M-XXX" (Mechanical) or "BOP-IC-XXX" (Instrumentation and Control).

(b) For NSSS supplied equipment, the number may be NSSS-M-XXX, NSSS-IC-XXX, etc.

(c) The number written on each line (for each listed equipment) should be an ordered numeric listing for the above indicated-XXX (-001 through completion). These numbers need not follow in order for each system (-002 and -004 may be with one system, but -003 may be with another system).

(d) Inside the parenthesis should be the "BOP-M," "NSSS-IC," etc.

(4) The "TYPE" refers to its generic name, such as pressure transmitter, indicator, solenoid value, cabinet, etc. Equipment type should be described by indicating for example, motor driven pump, turbine driven pump, motor operated valve, air operated valve, 18" valve, etc. Following abbreviations can be used where appropriate.

Valves:
BV - Ball valve, BFV - Butterfly valve, CV - check valve, DV - Diaphragm valve,
GV - Gato valve, GLV - Glove valve, SV - Safety Valve, RV - Relief Valve

Pumps:
CP - Centrifugal pump, PDP - Positive displacement pump, DDP - Deep draft pump,
JP - Jet pump

(5) Quantity refers to the number of the same equipment used in the plant.

(6) Under mounting condition indicate the following as applicable:

CF for concrete floor mounting
CW for concrete wall mounting
DM for direct mounting
HM for hanger mounting
RM for rack mounting
CM for cabinet mounting
EM for equipment mounting

Mounting details such as number of bolts, weld length, etc. need not be indicated here.

(7) The columns "SEISMIC" and "OTHER DYNAMIC" need only be checked (X) if applicable. In the case of BWRs indicate "H" under "OTHER DYNAMIC" column where qualification includes hydrodynamic loads.

(8) Under "REQ'D INPUT (ZPA)," the applicable "g" level should be provided.

(9) Under Qualification Method under analysis, indicate "S" for static, and "D" for dynamic; under test frequency, indicate "SF" for single, and "MF" for multiple; and under text direction, indicate "SD" for single, "MD" for multiple.

(10) Equipment status is to be addressed separately to qualification and to installation.

The applicable letter should be provided under the column headed "QUAL," according to the following code:

A The qualification and associated documentation are complete.

B The qualification testing is finished but associated documentation is not yet submitted or still in review.

C The qualification plan/procedure is documented, but testing has not yet begun.

D Equipment to be qualified.

E Equipment is judged not qualifiable and will be replaced with qualified equipment.

F For BWR plants only: Equipment is qualified for seismic loading only. Requalification will be performed to account for the suppression pool hydrodynamic loading effects.

The applicable letter should be provided under the column headed "INSTALLATION," according to the following code:

A Installation is completed. Equipment is ready for service.

B Equipment mounting/hookup is completed, but significant parts of the equipment are not yet installed.

C Equipment is located at its intended service location, but mounting and/or hookup is not completed.

D The equipment is not installed and is not available for inspection.

(11) The Required Response Spectra (RRS) package should be provided along with the Master Listing. Only response spectra applicable to the listed equipment should be included, each numbered for reference under the column headed "RRS REF." In many cases, several equipment will reference the same RRS.

(12) Codes and Standards

Applicable codes, standards and Regulatory Guides should be indicated here, for example, ASME Section III Class 2; IEEE-344, 1975, 323-1974, 382-1972; ANSI N278-1, Regulatory Guide 1.100, 1.148 etc.

Seismic and Dynamic Qualification Summary of Equipment

I. Plant Name: ____________________ Type:

1. Utility: ____________________ PWR: ____________

2. NSSS: ____________ ________ BWR: ____________

3. A/E: ____________________ Other ____________

II. Component Name: ____

1. Scope: [ ] NSSS [ ] BOP [ ] Other

2. Model Number: ____________________ Quantity: ____________

3. Size or Range: ____

4. Vendor: ____

5. If the component is a cabinet or panel, name and model Number of the devices included: ____

____

6. Physical Description:

a. Appearance: ____

b. Dimensions: ____

c. Weight: ____

7. Location: Building: ____

Elevation: ____

8. Field Mounting Conditions [ ] Bolt (No. ____, Size ___)
[ ] Weld (Length ____)
[ ] ________________________

9. Mounting Orientation [e.g., on floor, cantilevered, suspended, etc.]

____

10. a. System in which located: ____

b. Functional Description: ____

c. Is the equipment required for [ ] Hot Standby [ ] Cold Shutdown

[ ] Both [ ] Neither [ ] Other ____________

II. Pertinent Reference/Design Specifications for Qualification Requirements: ____

____

a. Seismic Input

b. Hydrodynamic Load Input

c. Fatigue Considerations

d. Service Conditions

e. Qualified Life

III. Is Equipment Available for Inspection in the Plant:

[ ] Yes [ ] No [ ] Partial or limited availability

IV. Equipment Qualification Method:

[ ] Test [ ] Analysis [ ] Combination of Test and Analysis

Qualification Report*: ______________________________

(No., Title and Date): ______________________________

Company that Prepared Report: ______________________________

Company that Reviewed Report: ______________________________

Where Report is filed or available: ______________________________

Applicable Codes And/Or Standards: ______________________________

V. Vibration Input:

1. Loads considered:
   a. [ ] Seismic only
   b. [ ] Hydrodynamic only
   c. [ ] Vibration from normal operation
   d. [ ] Combination of (a), (b), and (c)

2. Method of Combining RRS:

   [ ] Absolute Sum [ ] SRSS [ ] ______________ (other, specify)

3. Required Response Spectra** (attach the graphs): ______________

NOTE:
*If more than one report complete items IV thru VII for each report.
**If other than RRS is used, describe method.

4. Damping Corresponding to RRS: OBE ________ SSE ____________

5. Required Acceleration in Each Direct:

   [ ] ZPA [ ] Other ______________ (specify)

   OBE S/S = ______________ F/B = ______________ V = ______________

   SSE S/S = ______________ F/B = ______________ V = ______________

6. Were fatigue effects considered:

   [ ] Yes [ ] No

   If yes, describe how they were treated in overall qualification program: ________________________________

   ____

   ____

VI. <u>If Qualification by Test, then Complete:</u>

1. [ ] Single Frequency [ ] Multi-Frequency [ ] random
   [ ] sine beat
   [ ] ____________

2. [ ] Single Axis [ ] Multi-Frequency
   [ ] Independent Axis [ ] In-phase motions

3. Number of Qualifications Tests:

   OBE ____________ SSE ____________ Other ______________________ (specify)

4. Frequency Range: ____

5. Natural Frequencies in Each Direction (Side/Side, Front/Back, Vertical):

   S/S = ____________ F/B = ____________ V = ________________

6. Method of Determining Natural Frequencies

   [ ] Lab Test [ ] In-Situ Test [ ] Analysis

7. TRS enveloping RRS using Multi-Frequency Test

   [ ] Yes (Attach TRS & RRS graphs)

   [ ] No

8. Maximum Input g Level Test:

OBE S/S = ____________ F/B = ____________ V = ____________

OBE S/S = ____________ F/B = ____________ V = ____________

9. Laboratory Mounting:

A. [ ] Bolt (No. ____, Size ____)

[ ] Weld (Length ____) [ ] ______________

B. Orientation and Fixturing: ______________________________

10. Functional operability verified:

[ ] Yes [ ] No [ ] Not Applicable

11. Test Results including modifications made: ________________

____

12. Other tests performed (such as aging or fragility test, including results):

____

____

13. Failure Modes (If appropriate ________________________________)

14. Margins Available: [ ] Input Spectrum [ ] Fragility

VII. If Qualification by Analysis, then complete:

1. Method of Analysis:

[ ] Static Analysis [ ] Equivalent Static Analysis

[ ] Dynamic Analysis: [ ] Time-History [ ] Response Spectrum

2. Natural Frequencies in Each Direction (Side/Side, Front/Back, Vertical):

S/S = ______________ F/B = ___________ V = _________________________

3. Model Type: [ ] 3D [ ] 2D [ ] 1D

[ ] Finite Element [ ] Beam

[ ] Closed Form Solution [ ] Other ________

4. [ ] Computer Codes: ______________________ ______________

Frequency Range and No. of modes

[ ] Hand Calculations

5. Method of Combining Dynamic Responses from Seismic and Other Dynamic Loads:

[ ] Absolute Sum [ ] SRSS [ ] Other: ______________ (specify)

6. Damping:

OBE ________ SSE ________ Basis for the damping used: __________

7. Support Considerations in the model: ______________________________

8. Critical Structural Elements:

A. Identification	Location	Governing Load or Response Combination	Seismic Stress	Total Stress	Stress Allowable

B. Maximum Critical Deflection	Location	Maximum Allowable Deflection to Assure Functional Operability

9. Failure Modes: ____

10. Margins Available: [ ] Input Spectrum [ ] Stress or Deflection

ATTACHMENT D

PUMP AND VALVE

OPERABILITY ASSURANCE REVIEW

I. PLANT INFORMATION

1. Name: ______________ Unit No. ___ 2. Docket No.: ______________

3. Utility: ____

4. NSSS: ____ [] PWR [] BWR

5. A/E: ____

6. C.P. and/or C.P. SER date ______________ ______________

II. GENERAL COMPONENT* INFORMATION

1. Supplier: [] NSSS [] BOP

2. Location: a. Building/Room ______________

b. Elevation ______________

c. System ______________

3. Component I.D. No. on P&ID dwg. ______________

4. If component is a [] Pump complete II.5.

If component is a [] Valve complete II.6.

5. General Pump Data

a. Pump		b. Prime-mover	
Name	______________	Name	______________
Mfg.	______________	Mfg.	______________
Model	______________	Model	______________
S/N	______________	S/N	______________
Type	______________	Type	______________

* The component, whether pump or valve, is considered to be an assembly composed of the body, internals, prime-mover (or actuator) and functional accessories.

a. Pump (continued)

Overall Dimensions ______________________

Weight ______________________

Mounting Method ______________________

Required B.H.P. ______________

Parameter	Component Design	System Normal/Accident
Press	______	____/____
Temp	______	____/____
Flow	______	____/____
Head	______	____/____
Media	______	____/____

d@ 0%, Required NPSH at maximum flow ______________________

Available NPSH ______________________

d@ 3%, hd Loss: 1.8 x NPSH req [illegible]
@ 1%, " " 1.2 x NPSH req'd [illegible] consider more

Operating Speed ______________________

Critical Speed ______________________

List functional accessories:* ______________________

____

____

____

____

____

b. Prime-mover (continued)

Overall Dimensions ______________________

Weight ______________________

Mounting Method ______________________

H.P. ______________________

Prime-motor requirements: (include normal, maximum and minimum).

Motor (voltage) ______________________

____

____

Turbine (pressure) ______________________

____

If MOTOR list:

Duty cycle ______________________

Stall current ______________________

Class of insulation ______________________

____

---

* Functional accessories are those sub-components not supplied by the manufacturer that are required to make the pump assembly operational, (e.g., coupling, lubricating oil system, [illegible] control sys., feedback, etc.)

6. General Valve Data

a. Valve

Name ______________________

Mfg. ______________________

Model ______________________

S/N ______________________

Type ______________________

Size ______________________

Weight ______________________

Mounting Method ______________________

Max Required Torque ______________________

Parameter	Component Design	System Normal / Accident
Press	____	____ / ____
Temp	____	____ / ____
Flow	____	____ / ____
Media	____	____ / ____

Max ΔP across valve ____________

Closing time @ max $\overline{\Delta P}$ ____________

Opening time @ max $\overline{\Delta P}$ ____________

b. Actuator (if not an integral unit)

Name ______________________

Mfg. ______________________

Model ______________________

S/N ______________________

Type ______________________

Size ______________________

Weight ______________________

Mounting Method ______________________

Max. Delievered Torque ______________________

Power requirements: (include normal, maximum and minimum).

Electrical ______________________

____

____

____

Other: [] Pneumatic [] Hydraulic

____

List functional accessories:* ______________________

____

____

____

____

____

* Functional accessories are those sub-components not supplied by the manufacturer that are required to make the valve assembly operational, (e.g., limit switches solenoid valves, accumulators, etc.)

III. FUNCTION

1. Briefly describe components normal and safety functions (include accident initiating signals.)

Normal: ______________________________

____

____

____

Safety: ______________________________

____

____

____

2. The components normal state is: [] Operating [] Standby

3. Safety function:

a. [] Emergency reactor shutdown

b. [] Containment heat removal

c. [] Containment isolation

d. [] Reactor heat removal

e. [] Reactor core cooling

f. [] Prevent significant release of radio-active material to environment

g. [] Does the component function to mitigate the consequences of one or more of the following events? [] Yes [] No If "Yes", identify.

[] LOCA [] HELB [] MSLB

[] Other ______________________________

4. Safety requirements:

[] Intermittent Operation [] During postulated event

[] Continuous Operation [] Following postulated event

If component operation is required following an event, give approximate length of time component must remain operational.

______________________________ (e.g., hours, days, etc.)

5. For VALVES:

does the component [] Fail open [] Fail closed [] Fail as is

Is this the fail safe position? [] Yes [] No

Is the valve used for throttling purposes? [] Yes [] No

What is the maximum acceptable internal and external leakrate?

______________________________ ______________________________

IV. QUALIFICATION

1. Reference by specific number those applicable sections of the design codes and standards applicable to the component: ________

____

____

2. Reference those qualification standards, used as a guide to qualify the component: ____________________

____

____

3. Have acceptance criterias been established and documented in the test plan(s) for the component? [] Yes [] No

4. Are the margins* identified in the qualification documentation? [] Yes [] No

5. Was the component that was qualified a model or an actual assembly? ________. If a model, what was its scale? ________. If an actual assembly, was it qualified as an assembly or by sub-assemblies? (i.e., valve, actuator, pump, driver) ________

6. List all component tests performed or to be performed that demonstrate qualification:

____

____

____

____

____

____

____

____

____

____

*Margin is the difference between design basis parameters and the test parameters used for equipment qualification.

7. List all component analyses performed that demonstrate qualification:

8. As a result of any of the tests (or analysis), were any deviations from design requirements identified? [] Yes [] No If "Yes", briefly describe any changes made in tests (or analysis) or to the component to correct the deviation.

9. Was the tested component precisely identical (as to model, size, etc.) to the in-plant component? [] Yes [] No If "No", is installed component [] oversized or [] undersized?

10. Is component orientation sensitive? [] Yes [] No [] Unknown If "Yes", does installed orientation coincide with test/analysis orientation? [] Yes [] No

List all loads and numerical values used during tests or analysis and indicate whether applied individually or in combination:

11. Does the component have a unique design or utilize unique material in its construction? (Examples are special gaskets or packing, one of a kind components, limitations on nonferrous materials, special coatings or surfaces, etc.)
[ ] Yes [ ] No If "Yes" identify: ___________

____

____

12. What is the design (qualified) life of the component, exclusive of normal maintenance items such as packing, bearings, seals, diaphragm, gaskets, and other elastomers?

____

13. Which of the components normal maintenance items requires the most frequent replacement? _______________
_______________________________ What is the normal time interval between replacements of this item?

____

14. What is the harshest (accident/post-accident) external environment that the component could be exposed to during its qualified life? (e.g. temp., press. humidity, submergence, radiation type and dose, etc.)

____

____

____

____

____

____

21. Information Concerning Qualification Documents for the Component

Report Number	Report Title	Date	Company/Organization Preparing Report	Company/Organization Reviewing Report

 Purge & Vent

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 (asymetric 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.

Purge & Vent Valve

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.

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.