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May 3, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Dresden Station Units 2 and 3
Quad Cities Station Units 1 and 2
Containment Purge and Vent Valve
Operability
NRC Docket Nos. 50-237/249 & 50-254/265

References (a): B. Rybak letter to H. R. Denton dated December 21, 1983.

(b): D. M. Crutchfield letter to D. L. Farrar dated November 10, 1983.

(c): T. J. Rausch letter to G. C. Lainas dated July 6, 1981.

(d): NUTECH Report COM-0708-03, May, 1980.

Dear Mr. Denton:

This letter is written to provide the responses to the NRC concerns pertaining to the operability of the containment purge and vent valves identified in the Reference (b) letter and discussed during subsequent meetings. The specific response to each concern is given in Attachment 1.

The following provides a summary of the responses to the NRC concerns from the Reference (b) letter and subsequent conversations.

1. The hydrodynamic torque (T_D) valves used in the stress evaluation of the subject valves were developed from scale model tests. The scale model tests performed at FluiDyne and Allis-Chalmers provide an empirical basis for the hydrodynamic torque values used to demonstrate the operability of the 18 inch butterfly valves installed at Dresden and Quad Cities. All critical valve parts have sufficient design margins to withstand the pressure related loads of the DBA/LOCA.

2. The hydrodynamic torque (T_D) values used in the stress evaluation of the subject valves were also used to demonstrate the capability of the valve actuators. The valve actuators are capable of stroking the valves closed during the DBA/LOCA. The valve actuators are structurally capable of withstanding the actuator and hydrodynamic torque loads when the hydrodynamic torque acts to close the valve disc.

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3. The Systematic Evaluation Program (SEP) review of Dresden Unit 2 concluded on a generic basis that the equipment and systems required for safe shutdown will remain functional under the design hazard.

4. Since these valves will perform their safety function in the event of a DBA/LOCA, Commonwealth Edison will continue to operate the purge and vent system in accordance with the procedures outlined in Attachment 1 of Reference (a). The subject valves were not sealed closed in accordance with SRP Section 6.2.4.III.6.f. These valves have not been verified to be closed every 31 days, because they are not sealed closed.

In addition to the technical concerns expressed in Reference (b), the NRC verbally requested additional information during a February 15, 1984 meeting Bethesda. Commonwealth Edison's response to the NRC's verbal information request is provided in Attachment 2. Attachment 2 contains a complete listing of all valve connected to the containment atmosphere. Those valves marked with an asterisk are either valves that are not active or valves less than two (2) inches in size. The listing does not completely identify the manufacturer(s) of the valve and its appurtenances. When a complete list becomes available it will be sent to you.

Based on the information provided in Attachments 1 and 2, Commonwealth Edison concludes that all valves directly connected to the primary containment atmosphere will perform their safety function in the event of a DBA/LOCA.

If you have any questions regarding this matter, please contact this office.

One signed original and forty (40) copies of this letter and the attachments are enclosed for your review.

Very truly yours,

B. Rybak

B. Rybak
Nuclear Licensing Administrator

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Attachments

cc: NRC Resident Inspector - Dresden
R. Gilbert - NRR

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ATTACHMENT 1

Dresden/Quad Cities Station

Response to NRC Concerns on Purge and Vent Valves

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This attachment restates the NRC concerns from the November 10, 1983 NRC letter to CECo. After each concern, Commonwealth Edison's response is presented.

NRC PARAGRAPH 4.1 CONCERNS

"The T_D values predicted by CE for the 18-inch 2 FII valves in the Dresden and Quad Cities plants are very low in comparison to T_D values given by H. Pratt for the 18-inch 2 FII valves in the Prairie Island purge and vent system. Comparing the maximum T_D values predicted, CE predicts a maximum T_D of 2,600 in-lbs where H. Pratt's prediction is approximately 18,000 in-lbs.

In addition to the Prairie Island information, torque information available for other valve designs also indicates that CE's T_D predictions are low for an 18-inch valve.

Based on the above, the staff finds that the T_D predicted by CE for the subject valves are not conservative, and therefore not acceptable to the staff."

PARAGRAPH 4.1 RESPONSE

The torque values presented by Commonwealth Edison were determined based upon a bench test of a 6" Pratt butterfly valve (Reference 2). The disk of this valve was custom-machined to simulate the disk of the 18" Pratt 2FII valve used in the vent and purge systems at Dresden and Quad Cities. The aspect ratio of the 6" test valve was 0.2428. For the actual 18" valve, the aspect ratio is 0.2455. Thus, the modelling of the 18" valve is accurate. The test conditions were selected to maximize flow velocity at the valve for each upstream test pressure. Test pressure and valve disk angle were varied parametrically to identify the combination which produced maximum torque.

The maximum torque in an 18 inch butterfly valve as determined by the tests performed at FluiDyne is 216 ft-lbs (Section 7 of COM-0708-03). The 216 ft-lbs (2592 in-lbs) obtained from the test results is an empirical value rather than a prediction based on an analytical method of computing hydrodynamic torque. For uniform flow geometry, 2592 in-lbs is the maximum torque for an 18 inch butterfly valve installed in the Dresden and Quad Cities purge and vent systems. As indicated in the Pratt report, the Pratt maximum torque values were established based on a conservative bounding analysis for Prairie Island. Thus, the Pratt results are not appropriate for use on Dresden and Quad Cities since Dresden and Quad Cities specific test values are available. Note, the effect of non-uniform flow geometry was addressed separately as discussed in the Paragraph 4.2 response.

NRC PARAGRAPH 4.2 CONCERN

"Although CE does not have test data to quantify the effect of piping elbow configurations on C_T (uniform flow) values for the 2 FII design, information available from other valve manufacturers indicated that for a given design at the same conditions the ratio of C_T (elbow-shaft in plane) to C_T (uniform flow) is greater than 1.0 and the ratio of C_T (elbow-shaft out of plane) to C_T (uniform flow) is greater than two in some instances. Based on limited elbow testing information available, the staff believes that where bench tests did not include elbows in the piping configuration a factor of 1.5 times C_T (uniform flow) for an elbow-shaft in-plane configuration and a factor of 3.0 times the C_T (uniform flow) for an elbow-shaft out of plane configuration would yield conservative values of T_D.

Based on the above, the Staff finds that the 1.5 factor used by CE is conservative for those valves identified as having straight pipe inlet or elbow-shaft in-plane piping configurations and is not conservative for the three valves identified as having elbow-shaft out of plane configurations. To be acceptable to the Staff, a factor of at least three times C_T (uniform flow) must be used for the three valves having elbow-shaft out of plane configurations."

PARAGRAPH 4.2 RESPONSE

In Reference 2, CECo provided the NRC with a reference to test data prepared by Allis Chalmers Company for Dairyland Power. The test data showed that for valves with shafts in-plane with upstream elbows, no correction factor is necessary. For valves with shafts out of plane with upstream elbows, a factor of 1.283 is shown to adequately account for the effect of non-uniform flow on torque. This is documented in References 2 and 5. The Allis Chalmers results are suitable for comparison with the Commonwealth Edison results documented in Reference 2 since the upstream disk shape and aspect ratio of the Allis-Chalmers and Pratt valves are comparable. The Allis-Chalmers data cited by Commonwealth Edison predict a non-uniform flow factor that is conservative for the Pratt valves.

The maximum torque on a Pratt eighteen (18) inch butterfly valve, as scaled from test data gathered at FluiDyne, is 216 ft-lbs. Multiplying 216 ft-lbs by 1.283 yields a maximum torque value of 277 ft-lbs for "out-of-plane" valves. Since this is less than the 300 ft-lbs used in the valve analysis (Reference 4), the hydrodynamic torque value used in the stress analysis is applicable to the worst case geometry of upstream piping.

NRC PARAGRAPH 4.3 CONCERN

"CE indicated that the minimum elbow to valve separation distance required to assure uniform approach flow to the valve is 10 pipe diameters. CE should provide a source reference to justify using 10 D as the minimum. The staff would accept the separation distances referenced in the Instrument Society of America Standard S39.4."

PARAGRAPH 4.3 RESPONSE

The hydrodynamic torque value used in the stress analysis is applicable to the worst case geometry of upstream piping, i.e. a non-uniform approach flow is assumed for the analysis. Thus, the effect of non-uniform flow for valves with elbows upstream between 10D and the ISA criteria has already been accounted for in the analysis.

NRC PARAGRAPH 4.4 CONCERN

"Based on the discussions in Section 4.1, 4.2, and 4.3 of this report, the staff finds that CE has not demonstrated that the critical valve parts have sufficient design margins to withstand the pressure-related loads of the DBA/LOCA."

PARAGRAPH 4.4 RESPONSE

The valve component with the highest stress is the pin in the valve shaft with a predicted stress of 11.3 ksi. The yield strength for the pin material is 30 ksi. Based on an allowable stress of 90% of yield strength (27 ksi), the lowest safety factor is 2.4. This value is judged to provide sufficient design margin in the critical valve part to withstand the pressure-related loads of the DBA-LOCA.

NRC PARAGRAPH 4.5 CONCERN

"Based on the discussions in Section 4.1, 4.2, and 4.3 of this report, the staff also finds that CE has not demonstrated that the actuators are capable of stroking the valve closed during the DBA/LOCA nor has CE demonstrated that the actuators are structurally capable of withstanding the resultant torque loads where those loads act to close the valve disc."

PARAGRAPH 4.5 RESPONSE

Although Pratt has not specified a maximum allowable operator torque for these valves, it has been demonstrated that the valve and operator linkage will function at 300 ft-lbs torque. (Reference 4). From scaled test results, the maximum torque developed in the linkage during a LOCA is 277 ft-lbs. (Reference 4). Note that the LOCA maximum torque (277 ft-lbs.) is less than the value used in NUTECH's actuator capability calculations (300 ft-lbs.).

The Miller air cylinder is rated for a maximum pressure of 250 psi. The peak air cylinder pressure during a LOCA, assuming that the solenoid valve fails and there is no venting and no adiabatic heating is 157 psi. This pressure is well below the air cylinder pressure rating.

Finally, the actuator is designed such that the hydrodynamic torque does not combine with the actuator spring imposed loads. The maximum torque in the actuator linkage is 277 ft-lbs.

NRC PARAGRAPH 4.6 CONCERN

"CE indicated that the seismic qualification of the subject valves is being handled by the Systematic Evaluation Program (SEP) and NRC Bulletin 79-14. CE should confirm that the subject valves have been seismically qualified."

PARAGRAPH 4.6 RESPONSE

Commonwealth Edison has determined that the subject valves have not been seismically qualified via specific testing or analysis. The original procurement specification did not include seismic qualification criteria.

CECo has reviewed the SEP and NRC Bulletin 79-14 and concluded that the seismic qualification of the subject valves was not specifically addressed under those programs. However, the senior seismic review team has concluded on a generic basis in their SEP report (Reference 7) that based on design redundance and their experience with respect to functioning of equipment in earthquakes throughout the world and under military requirements, the systems required for safe shutdown will remain functional during a seismic event.

NRC PARAGRAPH 4.7 CONCERN

"Dresden-2 valves AO-2-1601-56,60,63, and -55, Dresden-3 valves AO-3-1601-56,60,63, and -55, Quad Cities-1 valves AO-1-1601-56,60,63, and -55, and Quad Cities-2 valves AO-2-1601-56,60,63, and -55 are not included in the review. The staff assumes that these valves are maintained closed during Modes 1, 2, 3, and 4".

PARAGRAPH 4.7 RESPONSE

Valves AO-*-1601-55 and AO-*-1601-56 at Dresden 2, Dresden 3, Quad Cities 1, and Quad Cities 2 are not maintained closed during Modes 1, 2, 3, and 4. The pumpback system which maintains drywell-to-torus differential pressure requires that these valves be maintained in the open position. Although these valves were not considered in the initial evaluation, these valves were considered in the evaluation summarized in Attachment 2.

* : 1 and 2 for Quad Cities
2 and 3 for Dresden

ATTACHMENT 2

Additional Information

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REVIEW OF BALL, GATE, AND GLOBE VALVES

During the February 15, 1984 meeting in Bethesda, the NRC requested a list of all active valves directly connected to the primary containment atmosphere. The subject list is included with this attachment.

The list of active valves directly connected to the primary containment atmosphere with Group 2 isolation includes valves of butterfly, ball, gate, and globe constructional design. Butterfly valves subject to the hydrodynamic lift effects of flow are addressed in Attachment 1. The operability of ball, gate, and globe valves is addressed below.

Ball and gate valve discs slide closely past the valve seat when the valve is opened or shut. Globe valve discs move perpendicular to the valve seat. Butterfly valves combine these two basic disc motions and it is this combination of disc motions that results in a hydrodynamic lift effect. Ball, gate, and globe valves are not subject to the hydrodynamic lift effect associated with butterfly valves.

The design of the ball, gate, and globe valves and the actuators was based on standard design considerations for these types of valves. A detailed review of a typical valve has been performed and the results indicate that the valve will remain operable under the following conditions:

1.	Maximum differential pressure across the valve seat	225 psi
2.	Maximum static pressure	225 psig @ 300°F

Based on the above detailed review, the ball, gate, and globe valves directly connected to the primary containment atmosphere have sufficient design margin to withstand the effects of a DBA/LOCA.

ACTIVE VALVES DIRECTLY CONNECTED TO THE PRIMARY CONTAINMENT ATMOSPHERE

	DRESDEN 2	DRESDEN 3	QUAD CITIES 1	QUAD CITIES 2	POSITION	FUNCTION
A.		PRESSURE SUPPRESSION SYSTEM				
	P&ID M-25(AL)	P&ID M-356(ZZ)	P&ID M-34-1(TT)	P&ID M-76-1(ZZ)		
A1.	PEN X-125	PEN X-125	PEN X-25	PEN X-25		
	AO-2-1601-23	AO-3-1601-23	AO-1-1601-23	AO-2-1601-23	NC/FC	Drywell Purge and Drywell Vent Discharge
	AO-2-1601-24	AO-3-1601-24	AO-1-1601-24	AO-2-1601-24	NC/FC	Drywell Purge and Drywell Vent Discharge
*	AO-2-1601-62	AO-3-1601-62	AO-1-1601-62	AO-2-1601-62	NC	Drywell Vent Discharge Bypass
	AO-2-1601-63	AO-3-1601-63	AO-1-1601-63	AO-2-1601-63	NC/FC	Standby Gas Treatment Inlet
A2.	PEN X-318	PEN X-318	PEN X-203A	PEN X-203A		
	AO-2-1601-60	AO-3-1601-60	AO-1-1601-60	AO-2-1601-60	NC/FC	Torus Purge and Torus Vent Discharge
*	AO-2-1601-61	AO-3-1601-61	AO-1-1601-61	AO-2-1601-61	NC/FC	Torus Purge and Torus Vent Discharge Bypass
A3.	PEN X-126	PEN X-126	PEN X-26	PEN X-26		
	AO-2-1601-21	AO-3-1601-21	AO-1-1601-21	AO-2-1601-21	NC/FC	Drywell Purge and Drywell Vent Inlet
	AO-2-1601-22	AO-3-1601-22	AO-1-1601-22	AO-2-1601-22	NC/FC	Drywell Vent Inlet
	AO-2-1601-55	AO-3-1601-55	AO-1-1601-55	AO-2-1601-55	O/FC	Purge and PumpBack
	AO-2-1601-56	AO-3-1601-56	AO-1-1601-56	AO-2-1601-56	O/FC	Torus Purge, Torus Vent Inlet, PumpBack
*	MO-2-1601-57	MO-3-1601-57	MO-1-1601-57	MO-2-1601-57	O	Purge Make-up
*	AO-2-1601-58	AO-3-1601-58	AO-1-1601-58	AO-2-1601-58	O	Torus Purge Make-up
*	AO-2-1601-59	AO-3-1601-59	AO-1-1601-59	AO-2-1601-59	O	Drywell Purge Make-up
*	(See X-204)	(See X-204)	AO-1-8803	AO-2-8803	O	Drywell Air Sample Bypass Pump Return
*	(See X-204)	(See X-204)	AO-1-8804	AO-2-8804	O	Drywell Air Sample Bypass Pump Return
A4.	PEN X-309A	PEN X-309A	PEN X-217	PEN X-217		
*	FCV-2-8501-1A	FCV-3-8501-1A	FCV-1-8801D	FCV-2-8801D	O	Torus Air Sample
*	FCV-2-8501-1B	FCV-3-8501-1B	FCV-1-8802D	FCV-2-8802D	O	Torus Air Sample

*Valves less than 3" Nominal Pipe size have been included for completeness.

ACTIVE VALVES DIRECTLY CONNECTED TO THE PRIMARY CONTAINMENT ATMOSPHERE

	DRESDEN 2	DRESDEN 3	QUAD CITIES 1	QUAD CITIES 2	POSITION	FUNCTION
A5.	PEN X-304	PEN X-304	PEN X-205	PEN X-205		
	AO-2-1601-20A	AO-3-1601-20A	AO-1-1601-20A	AO-2-1601-20A	NC/FO	Reactor Building to Torus Vacuum Breaker
	AO-2-1601-20B	AO-3-1601-20B	AO-1-1601-20B	AO-2-1601-20B	NC/FO	Reactor Building to Torus Vacuum Breaker
	AO-2-1601-31A	AO-3-1601-31A	AO-1-1601-31A	AO-2-1601-31A	C	Reactor Building to Torus Vacuum Breaker
	AO-2-1601-31B	AO-3-1601-31B	AO-1-1601-31B	AO-2-1601-31B	C	Reactor Building to Torus Vacuum Breaker
A6.	PEN X-143	PEN X-143	PEN X-43	PEN X-43		
*	FCV-2-8541-5A	FCV-3-8541-5A	FCV-1-8801A	FCV-2-8801A	O	Drywell Air Sample
*	FCV-2-8541-5B	FCV-3-8541-5B	FCV-1-8802A	FCV-2-8802A	O	Drywell Air Sample
*	FCV-2-9505A	FCV-3-9205A	FCV-1-8801B	FCV-2-8801B	O	Drywell Air Sample
*	FCV-2-9205B	FCV-3-9205B	FCV-1-8802B	FCV-2-8802B	O	Drywell Air Sample
*	FCV-2-9206A	FCV-3-9206A	FCV-1-8801C	FCV-2-8801C	O	Drywell Air Sample
*	FCV-2-9206B	FCV-3-9206B	FCV-1-8802C	FCV-2-8802C	O	Drywell Air Sample
A.7	PEN X-204	PEN X-204				
*	FCV-2-8501-3A	FCV-3-8501-3A	(See X-26)	(See X-26)	O	Drywell Air Sample Bypass Pump Return
*	FCV-2-8501-3B	FCV-3-8501-3B	(See X-26)	(See X-26)	O	Drywell Air Sample Bypass Pump Return
A.8	PEN X-	PEN X-				
*	AO-2-9207A	AO-3-9207A	Not Applicable	Not Applicable	O	Portable Pump Connection
*	AO-2-9207B	AO-3-9207B			O	Portable Pump Connection
A.9	PEN X-	PEN X-				
*	AO-2-9208A	AO-3-9208A	Not Applicable	Not Applicable	O	Portable Pump Connection
*	AO-2-9208B	AO-3-9208B			O	Portable Pump Connection

B. ATMOSPHERIC CONTAINMENT ATMOSPHERE DILUTION

P&ID M-707-1	P&ID M-707-2	P&ID M-642	P&ID M-642

C. INSTRUMENT AIR

P&ID M-37-2(KK)	P&ID M-367-2(AA)	P&ID M-24-2(AD)	P&ID M-71-2(U)

*Valves less than 3" Nominal Pipe size have been included for completeness.

ACTIVE VALVES DIRECTLY CONNECTED TO THE PRIMARY CONTAINMENT ATMOSPHERE

	DRESDEN 2	DRESDEN 3	QUAD CITIES 1	QUAD CITIES 2	POSITION	FUNCTION
C1.	PEN X-139D	PEN X-139D	PEN X-32C	PEN X-32C		
*	AO-2-4720	AO-3-4720	AO-1-4720	AO-2-4720	O	Instrument Air Inlet from Drywell
*	AO-2-4721	AO-3-4721	AO-1-4721	AO-2-4721	O	Instrument Air Inlet from Drywell
D.	RADWASTE					
	P&ID M-39(SS)	P&ID M-369(NN)	P&ID M-43(AF)	P&ID M-85(AA)		
D1.	PEN X-117	PEN X-117	PEN X-18	PEN X-18		
	AO-2-2001-105	AO-3-2001-105	AO-1-2001-3	AO-2-2001-3	O/FC	Drywell Flor Drain Sump Discharge
	AO-2-2001-106	AO-3-2001-106	AO-1-2001-4	AO-2-2001-4	O/FC	Drywell Floor Drain Sump Discharge
D2.	PEN X-118	PEN X-118	PEN X-19	PEN X-19		
	AO-2-2001-5	AO-3-2001-5	AO-1-2001-15	AO-2-2001-15	O/FC	Drywell Equipment Drain Sump Discharge
	AO-2-2001-6	AO-3-2001-6	AO-1-2001-16	AO-2-2001-16	O/FC	Drywell Equipment Drain Sump Discharge
E.	TRAVERSING IN-CORE PROBE					
	P&ID M-37-2(KK)	P&ID M-367-2(AA)	P&ID M-24-2(AD)	P&ID M-71-2(U)		
E1.	PEN X-35	PEN X-35	PEN X-35G	PEN X-35A		
*	(5) 700-733	(5) 700-733	(5) 700-733	(5) 700-733	O	TIP Ball Valve

*Valves less than 3" Nominal Pipe size have been included for completeness.

DRESDEN STATION - MANUFACTURER'S SUMMARY

ACTIVE VALVES DIRECTLY CONNECTED TO THE PRIMARY CONTAINMENT ATMOSPHERE

VALVE NUMBER		VALVE SIZE				
DRESDEN 2	DRESDEN 3	AND BODY	MANUFACTURER	REFERENCE DWG.	OPERATOR	MANUFACTURER
* 2-0700-733	3-0700-733	1/2" - Ball				
AO-2-1601-20A	AO-3-1601-20B	20" - Butterfly	Pratt	P340 12-10-90780[(1)]	Air	Pratt
AO-2-1601-20B	AO-3-1601-20B	20" - Butterfly	Pratt	P340 12-10-90780[(1)]	Air	Pratt
AO-2-1601-21	AO-3-1601-21	18" - Butterfly	Pratt	P340 12-10-90780[(1)]	Air	Pratt
AO-2-1601-22	AO-3-1601-22	18" - Butterfly	Pratt	P340 12-10-90780[(1)]	Air	Pratt
AO-2-1601-23	AO-3-1601-23	18" - Butterfly	Pratt	P340 12-10-90780[(1)]	Air	Pratt
AO-2-1601-24	AO-3-1601-24	18" - Butterfly	Pratt	P340 12-10-90780[(1)]	Air	Pratt
2-1601-31A	3-1601-31A	20" - Check				
2-1601-31B	3-1601-31B	20" - Check				
AO-2-1601-55	AO-3-1601-55	- Ball				
AO-2-1601-56	AO-3-1601-56	18" - Butterfly	Pratt	P340 12-10-90780[(1)]	Air	Pratt
*MO-2-1601-57	MO-3-1601-57	1" - Globe	Crane	B-103009	Motor	Limitorque SMB-000-2
*AO-2-1601-58	AO-3-1601-58	1" - Globe	Crane	B-140337	Air	Crane
*AO-2-1601-59	AO-3-1601-59	1" - Globe	Crane	B-104337	Air	Crane
AO-2-1601-60	AO-3-1601-60	18" - Butterfly	Pratt	P340 12-10-90780[(1)]	Air	Pratt
*AO-2-1601-61	AO-3-1601-61	2" - Globe	Crane	C665 B-103122	Air	Crane
*AO-2-1601-62	AO-3-1601-62	2" - Globe	Crane	C665 B-103122	Air	Crane
AO-2-1601-63	AO-3-1601-63	6" - Butterfly	Pratt	P340 12-10-90780[(1)]	Air	Pratt

(1) See drawings P340 24-10-31014A, P340 25-10-31014B, P340 25-10-31014C for additional information.

*Valves less than 3" Nominal Pipe size have been included for completeness.

DRESDEN STATION - MANUFACTURER'S SUMMARY

ACTIVE VALVES DIRECTLY CONNECTED TO THE PRIMARY CONTAINMENT ATMOSPHERE

VALVE NUMBER		VALVE SIZE				
DRESDEN 2	DRESDEN 3	AND BODY	MANUFACTURER	REFERENCE DWG.	OPERATOR	MANUFACTURER
AO-2-2001-5	AO-3-2001-5	3" - Gate	Crane	C665 B-101328	Air	
AO-2-2001-6	AO-3-2001-6	3" - Gate	Crane	C665 B-101329	Air	
AO-2-2001-105	AO-3-2001-105	3" - Gate	Crane	C665 B-101341-D	Air	
AO-2-2001-106	AO-3-2001-106	3" - Gate	Crane	C665 B-101342-D	Air	
*AO-2-4720	AO-3-4720	1"				
*AO-2-4721	AO-3-4721	1"				
*FCV-2-8501-1A	FCV-3-8501-1A	1/2"				
*FCV-2-8501-1B	FCV-3-8501-1B	1/2"				
*FCV-2-8501-3A	FCV-3-8501-3A	1"				
*FCV-2-8501-3B	FCV-3-8501-3B	1"				
*FCV-2-8541-5A	FCV-3-8541-5A	1/2"				
*FCV-2-8541-5B	FCV-3-8541-5B	1/2"				
*FCV-2-9205A	FCV-3-9205A	1/2"				
*FCV-2-9205B	FCV-3-9205B	1/2"				

*Valves less than 3" Nominal Pipe size have been included for completeness.

DRESDEN STATION - MANUFACTURER'S SUMMARY

ACTIVE VALVES DIRECTLY CONNECTED TO THE PRIMARY CONTAINMENT ATMOSPHERE

VALVE NUMBER		VALVE SIZE				
DRESDEN 2	DRESDEN 3	AND BODY	MANUFACTURER	REFERENCE DWG.	OPERATOR	MANUFACTURER
*FCV-2-9206A	FCV-3-9206A	1/2"				
*FCV-2-9206B	FCV-3-9206B	1/2"				
*FCV-2-9207A	FCV-3-9207A	1"				
*FCV-2-9207B	FCV-3-9207B	1"				
*FCV-2-9208A	FCV-3-9208A	1"				
*FCV-2-9208B	FCV-3-9208B	1"				

*Valves less than 3" Nominal Pipe size have been included for completeness.

QUAD CITIES STATION - MANUFACTURER'S SUMMARY

ACTIVE VALVES DIRECTLY CONNECTED TO THE PRIMARY CONTAINMENT ATMOSPHERE

VALVE NUMBER		VALVE SIZE AND BODY	MANUFACTURER	REFERENCE DWG.	OPERATOR	MANUFACTURER
QUAD CITIES 1	QUAD CITIES 2					
* 1-0700-733	2-0700-733	1/2" - Ball				
AO-1-1601-20A	AO-2-1601-20A	20" - Butterfly	Pratt	P340 12-10-90780	Air	Pratt
AO-1-1601-20B	AO-2-1601-20B	20" - Butterfly	Pratt	P340 12-10-90780	Air	Pratt
AO-1-1601-21	AO-2-1601-21	18" - Butterfly	Pratt	P340 12-10-90780	Air	Pratt
AO-1-1601-22	AO-2-1601-22	18" - Butterfly	Pratt	P340 12-10-90780	Air	Pratt
AO-1-1601-23	AO-2-1601-23	18" - Butterfly	Pratt	P340 12-10-90780	Air	Pratt
AO-1-1601-24	AO-2-1601-24	18" - Butterfly	Pratt	P340 12-10-90780	Air	Pratt
1-1601-31A	2-1601-31A	20" - Check	Atwood & Morrill	A585 20741-H	Self Actuated	
1-1601-31B	2-1601-31B	20" - Check	Atwood & Morrill	A585 20741-H	Self Actuated	
AO-1-1601-55	AO-2-1601-55	4" - Gate	Crane	C665 B-105341	Air	Crane
AO-1-1601-56	AO-2-1601-56	18" - Butterfly	Pratt	P340 12-10-90780	Air	Pratt
*MO-1-1601-57	MO-2-1601-57	1" - Globe	Crane	C665 B-103886	Motor	Limitorque SMB-000
*AO-1-1601-58	AO-2-1601-58	1" - Globe	Crane	C665 B-104336	Air	Crane
*AO-1-1601-59	AO-2-1601-59	1" - Globe	Crane	C665 B-104336	Air	Crane
AO-1-1601-60	AO-2-1601-60	18" - Butterfly	Pratt	P340 12-10-90780	Air	Pratt
*AO-1-1601-61	AO-2-1601-61	2" - Globe	Crane	C665 B-103888	Air	Crane
*AO-1-1601-62	AO-2-1601-62	2" - Globe	Crane	C665 B-103888	Air	Crane
AO-1-1601-63	AO-2-1601-63	6" - Butterfly	Pratt	P340 12-10-90780	Air	Pratt

*Valves less than 3" Nominal Pipe size have been included for completeness.

QUAD CITIES STATION - MANUFACTURER'S SUMMARY
ACTIVE VALVES DIRECTLY CONNECTED TO THE PRIMARY CONTAINMENT ATMOSPHERE

VALVE NUMBER		VALVE SIZE				
QUAD CITIES 1	QUAD CITIES 2	AND BODY	MANUFACTURER	REFERENCE DWG.	OPERATOR	MANUFACTURER
AO-1-2001-3	AO-2-2001-3	3" - Gate				
AO-1-2001-4	AO-2-2001-4	3" - Gate				
AO-1-2001-15	AO-2-2001-15	3" - Gate				
AO-1-2001-16	AO-2-2001-16	3" - Gate				
*AO-1-4720	AO-2-4720	1"				
*AO-1-4721	AO-2-4721	1"				
*FCV-1-8801A	FCV-2-8801A	3/4" - Globe	Copes-Vulcan	C635 S-104167	Air(Diaphragm)	Copes Vulcan Model No. D-100-60
*FCV-1-8801B	FCV-2-8801B	3/4" - Globe	Copes-Vulcan	C635 S-140167	Air(Diaphragm)	Copes Vulcan Model No. D-100-60
*FCV-1-8801C	FCV-2-8801C	1/2"				
*FCV-1-8801D	FCV-2-8801D	1/2"				
*FCV-1-8802A	FCV-2-8802A	3/4" - Globe	Copes-Vulcan	C635 S-140167	Air(Diaphragm)	Copes Vulcan Model No. D-100-60
*FCV-1-8801	FCV-2-8801C	1/2"				
*FCV-1-8802D	FCV-2-8802D	1/2"				
*AO-1-8803	AO-2-8803	2" - Globe	Crane	C665 B-106702	Air	Crane
*AO-1-8804	AO-2-8804	2" - Globe	Crane	C665 B-106703	Air	Crane

*Valves less than 3" Nominal Pipe size have been included for completeness.