Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

Regulatory File Cy.

August 1, 1973

RECEIVED AUG 6 1973 Mail Section

Mr. D. J. Skovholt
Assistant Director for
Operating Reactors
Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Subject: Dresden Station Units 2 and 3
Drywell to Torus Vacuum Breakers
Dresden Station Special Report No. 23A,
AEC Dkts 50-237 and 50-249

Dear Mr. Skovholt:

In response to your letter of June 6, 1973, requesting additional information concerning the Dresden Units 2 and 3 drywell to torus vacuum breakers, the attached Dresden Special Report No. 23A is submitted. In addition to the requested information, a discussion of the current status of modifications to the valves is included in this report.

As indicated in the attached report, all modifications to the Dresden Unit 3 valves except installation of position switches have been completed, and the position switches will be installed by August 31, 1973. At the next refueling outage Dresden Unit 2 will be modified to the extent necessary to make the valves the same as Unit 3, but the position indication system will be installed by August 31, 1973.

Proposed changes to the Technical Specifications will be prepared on the basis of information contained in Dresden Special Reports No. 23 and 23A and formally submitted to you by September 17, 1973.

One signed original and 39 copies of this report are submitted for your use.

DOCKETED USAEC AUG 2 1973 REGULATORY MAIL SECTION DOCKET CLERK

Very truly yours,

J. S. Abel
Nuclear Licensing Administrator -
Boiling Water Reactors

5993

2018.1

DRESDEN STATION SPECIAL REPORT NO. 23A

Supplemental Information Concerning Dresden Units

2 & 3 Drywell to Torus Vacuum Breakers

AEC Dockets
50-237
50-249

Commonwealth Edison Company

July, 1973

20181.2

TABLE OF FIGURES

The purpose of this report is to supplement Dresden Special Report No. 23, submitted April 23, 1973, with additional information and developments since the writing of that report, and to respond to your questions of June 6, 1973.

During the refueling outage on Dresden 3 this past spring, the vacuum breakers were inspected in preparation for the leak test to be performed prior to power operation as described in Special Report No. 23. Preliminary testing indicated problems with the valves and it became apparent that they would not meet the extremely restrictive criteria proposed for the leak test.

Upon disassembly of the valves, it was determined that the discs of some of the valves were not squarely seating due to corrosion between the disc and the disc arm. The corrosion closed up the clearance between these pieces and prevented the disc from properly aligning with the seat. Referring to Figure 1, it can be seen that the disc is held onto the disc arm by means of an integral post or hub and a nut. Due to the corrosion, extreme difficulty was experienced in disassembling the disc from the disc arm. Attempts at separating these pieces caused failures of the post or hub flush with the rear surface of the disc or at the base of the threads for the retaining nut on several valves. The disc material is cast aluminum and the disc arm is cast steel. There was a fairly sharp corner at the base of the post and it is theorized that the lack of an adequate radius was at least partially the cause of failure. A compounding cause of failure is attributed to the seizure of the disc and disc arm. Normal closure of the valve with adequate clearances would place the base of the post in simple compression. However, the seized joint prevented proper alignment resulting in the force of closure of the valve continually being taken at the same point on one edge of the disc. This placed a bending stress on the base of the post in the area of the sharp corner every time the valve was cycled. Surveillance frequency on these valves had been increased from monthly to weekly in the light of the difficulties with the Quad-Cities valves and prior experience with the sticking of the bushings as reported in Special Report No. 23. It should be noted that all failures were caused during the disassembly and no failures were evident in the as found condition of the valves.

All twelve valves on Unit 3 underwent modification to prevent future recurrence of this problem. The posts were cut off of the discs and the discs faced on both sides to obtain true surfaces.

Redesigned post assemblies were obtained from the manufacturer of the valves. The new posts were machined from 304 stainless steel and were threaded on each end. The discs were bored to accept the new posts and the disc was attached to the post with a nut which was then locked in place. The posts were assembled to the disc arm with a high temperature, low chloride, anti-seize compound to preclude future corrosion and subsequent seizing.

The continued pounding of the valves in one place on the disc caused deformation of the soft seat material. Examination of the original material showed it to be silicone rubber as opposed to ethylene propylene as reported to you previously. As a corrective measure, the seat material on all Dresden 3 valves, whether damaged or not, was replaced with ethylene propylene.

During the course of these modifications it became evident that the counterweight assembly on Dresden 3 also differed from that reported in Special Report No. 23. The counterweight configuration described in that report does indeed exist at the present time on Dresden 2. The Dresden 3 system utilized twenty-five pound weights as opposed to ten pound weights and had considerably longer counterweight arms. Consequently, modifications were in order in this area also.

One of the two counterweight arms and twenty-five pound weights were completely removed from each valve. The remaining arm was rotated 20° to a position 10° from vertical with the valve in the fully closed position. This configuration is contrasted with the original configuration of Dresden 3 in Figures 2 and 3. While the Dresden 2 counterweights are presently as reported in the Special Report, and are now technically acceptable, they will undergo modification to make them identical to Dresden 3. In addition to making the counterweight assemblies similar, it will increase the range of counterweight adjustment and yield identical limit switch installations. This modification is to be accomplished by August 31, 1973. The Dresden 2 valves will undergo modification of the discs to accept the redesigned posts and new ethylene propylene seats will be installed during the next refueling outage, presently scheduled for fall of 1974.

Although all valves on Dresden 2 were verified closed by means of the counterweight arms, the difficulties experienced on Dresden 3 created doubts as to whether the Dresden 2 discs were seated tightly. A pressure test was devised to determine the bypass area between the drywell and torus. Calculations based on the results of this test indicated that a bypass area of approximately 10% of the allowable area existed, thus justifying continued operation.

2018.5

We do not wish to make revisions to our tentatively proposed Technical Specifications as presented in Special Report No. 23 at this time. Inasmuch as we prefer to formally request Technical Specification changes separately from special reports, these proposed specifications will be reviewed by the Dresden Station Review Board and the Nuclear Review Board as presently required and then formally submitted.

The remainder of this supplemental Special Report will address the questions in your letter of June 6, 1973.

Question 1:

You have stated that position switches, indicators, and alarms will be installed. Information requested in 1.e, f, g, h and i of our January 12, 1973 letter relating to position switches is required. Also, we request the schedule for installation and tests of these switches.

Answer:

The limit switches being installed on the vacuum breakers at Dresden are identical to those presently installed at Quad-Cities. They are manufactured by MICRO SWITCH, a division of Honeywell. The model number is BAFI-2RN and have a contact rating of 20 amps at 125 volts AC and 0.5 amps at 125 volts DC. These switches are capable of detecting 0.010 inches of movement and hence, are sufficiently sensitive for the application. An installed assembly drawing for this modification is not available. The switches will be mounted on a bracket perpendicular to the shaft of the valve and will be directly actuated by the counterweight arm. The micro switches are housed in a dust-tight, water-tight aluminum housing. Since the Dresden vacuum breakers are mounted external to the valves, both the ambient and accident condition for the switches is the reactor building atmosphere.

Two redundant limit switches will be provided for each valve. Both switches will sense full closure of the valves. Limit switches to detect the full open position are unnecessary since the valves are external to the torus and during testing are manually actuated. Redundancy is being provided throughout the position indication system. IEEE-279 criteria is being followed. Cables will leave each valve via separated conduit enroute to a local panel, built with ESS Div. I and Div. II compartments, and leave the panel enroute to redundant control room alarms via separated conduits. Normally open contacts on the switches will be used such that when the valve is closed the switch contacts will be closed, energizing a relay. Opening of a valve will cause contacts on both of its switches to open, dropping out the two redundant relays, dropping out the two redundant local indicator lights, and picking up both

2018.6

control room alarms. The position indication system will be observed to be operational during the monthly operability check of the vacuum breakers. This system will be installed and tested by August 31, 1973.

Question 2:

You have stated no deleterious effects are anticipated due to chemicals. We request that you report your latest inspection results to provide verification that no deleterious effects have occurred.

Answer:

No deleterious effects have occurred due to chemicals. During the surface preparation and application of the suppression chamber coating, the piping in which the vacuum breakers are contained was plugged to prevent entry of foreign materials or contaminants into the valves. Subsequent to the coating operation, the seat material was replaced as described in the previous sections of this report.

Question 3:

You have stated that the valves are verified closed before and following each weekly test of the valves. You are requested to describe the verification tests, including the means to determine if test acceptance criteria are met. In addition, state the acceptance criteria and the required limiting conditions of operation or verify that the proposed Limiting Conditions of Operations stated in reply to Question 10 of our January 12,1973 letter apply.

Answer:

The valves are verified closed by manually pushing against the counterweight arm in the closed direction and checking that there is no movement of the valve shaft. The acceptance criteria is no movement of the valve shaft. If there is no movement, the acceptance criteria is met and the verification is satisfactory. We are presently operating within the intent of the Limiting Conditions for Operation as tentatively proposed in response to your question 10 of January 12, 1973. It is not possible to operate within the letter of these proposed limiting conditions until the position indication system is completely installed. These proposed Limiting Conditions for Operation do, however, apply.

2018.8

Question 4:

Due to the problems you have experienced with the shaft seals and bushings, a replacement program including tests, is underway. Provide a schedule of your planned replacement and a description of interim measures taken prior to replacement.

Answer:

The trial replacement of shaft seals and bushings on one valve was reported in answer to Question 9 of your January 12, 1973 letter. We did not commit to a replacement program at that point, but rather to a test program to determine whether more suitable seals and bushings were available. Phosphor-bronze bushings and seals with o-rings were obtained but attempts to install them proved fruitless. The delivery cycle on these specially made components was quite long and when the parts finally were delivered, they would not fit in the valve. The shaft seal was so long that one of the o-rings protruded from the end of the stuffing box and the flange on the bushing was considerably thicker than the original equipment. All parts have been returned to Atwood and Morrill, the vendor, in an attempt to obtain correct components for installation on a future outage. It should, however, be noted that the sticking problems with the teflon bushings were prior to the counterweight arm modifications. In the unmodified condition, the friction present in the bushing and shaft seals was extremely close to the available closing moment due to the weight of the moving components. Since the arm modification, the closing torque is greatly increased and it is believed that the problems with the bushings are considerably diminished, if not completely resolved.

Question 5:

The weekly test is not considered sufficient verification that all valves are closed. In addition to the weekly tests, each valve should be verified to be closed after any occurrence that adds energy to the torus. We intend to add this requirement to your Technical Specifications unless you provide acceptable justification for its omission.

Answer:

The surveillance requirements included in our proposed Technical Specifications submitted in response to Question 10 of your January 12, 1973 letter requires "Each drywell-pressure suppression vacuum breaker shall be exercised through an opening-closing cycle monthly and immediately following the termination of the discharge

2018.9

of steam from any source to the suppression chamber." The intent of this test is to verify the valves are closed. This test is being performed on a weekly basis at present and will continue at that frequency until the limit switches are installed and we are confident that the sticking problem with the bushings is not recurring.

Question 6:

The operability tests should be performed in such a manner as to demonstrate an acceptable closure of the valve and preclude manual closure of the valves during an operability test. Your operability tests of the valves are performed manually. We do not consider a manually operated test to be acceptable unless stringent administrative controls preclude manual closure during the test. Describe your administrative controls to assure that your test method will demonstrate proper valve operation. Until the limit switches and control room alarms are installed and tested satisfactorily, the operability tests should continue to be performed weekly.

Answer:

Procedures have been prepared to define the method of testing and ensure a proper operability test of the vacuum breakers. The valves are permitted to free swing to the closed position and are then verified to be closed by manually pushing against the vacuum breaker counterweight arm in the closed direction. If there is no movement of the valve shaft during this verification of valve disc seating, the test is satisfactory. This test is either performed by supervised or management personnel. Data sheets used for documentation of testing are initialed by the person performing the test. This test precludes manual closure of the valve during the free swing from the open position. Manual attempts at further closure are applied only as a verification that further closure is not possible. This test will be performed weekly until the position indication and alarm system is operable and tested and until experience with the counterweight modification indicates that previous difficulties with valves sticking due to bushing friction is no longer a problem.

Question 7:

In your analysis of the sequence of events for a typical small break, you omitted the use of drywell torus sprays as an alternative operator corrective action. Discuss the reason for this omission and the capability of the sprays to maintain pressure below design pressure if use of sprays is necessary.

2018.16

Answer:

In our analysis of the sequence of events for a typical small break with maximum permissible drywell to torus bypass area, the use of either drywell or torus sprays was purposely omitted. This analysis indicated that operator action to terminate containment pressurization would not take place until ten minutes after containment pressure reached 35 psig. Furthermore, this action was ineffective for five minutes. Any use of sprays adds an additional element of conservatism to this sequence of events. Depressurization of the primary system via either the condenser or suppression chamber is adequate to prevent containment overpressurization without the use of either spray system. This analysis supports the maximum allowable drywell to torus bypass area of 0.3 square feet or approximately the orifice area of eight inches in diameter.

However, before units are returned to service from a refueling outage, the total leakage between the drywell and torus is verified to be less than 0.79 square inches, the area of a one-inch hole. This area is less than two percent of the allowable bypass area and thus provides still another element of conservatism. An analysis of the sequence of events for a typical small break with the 0.79 square inch bypass area was also submitted in Special Report No. 23 and indicated that containment design pressure was not reached for at least sixteen hours. This analysis also noted the fact that the torus spray system alone was capable of condensing all the steam that could flow through a one-inch leakage path. An analysis of the ultimate capability of the drywell or torus sprays has not been performed.

Since neither the drywell nor torus spray systems are required to terminate the containment pressurization, we consider them only to be additional conservatism to an already conservative analysis. We do, however, recognize their beneficial effects and have instituted procedures for their use in the event of an accident.

Question 8:

You have indicated that operator action can be taken 10 minutes after the pressure from a small primary system break has exceeded 35 psig. Describe the torus pressure monitoring, including post-accident monitoring, and alarm system for the control room.

2018.10

Answer:

For a small primary system break the pressure differential between the torus and drywell is limited to a maximum of approximately 2 psi by downcomer submergence in the suppression pool. As drywell pressure begins to increase due to a small break, a control room alarm is reached at 1.5 psig. At 2 psig, the containment isolates, the reactor scrams, and the ECCS initiates with the accompanying alarms. Both torus and drywell pressure are monitored in the control room in the range of -5 inches H_g to 5 psig. For pressurization of the containment above 5 psig, a recorder in the control room continuously records in the range of 0 to 75 psig. While this recorder is measuring drywell pressure, it should be noted that the small break is the only break for which operator action is required to terminate the containment pressurization. As mentioned previously, the torus pressure will follow the drywell pressure by 2 psig or less during the small break. Thus, the presently installed instrumentation is deemed adequate to provide sufficient information to the operator in the event of drywell to torus vacuum breaker bypass in conjunction with a small primary system break.

2018.12

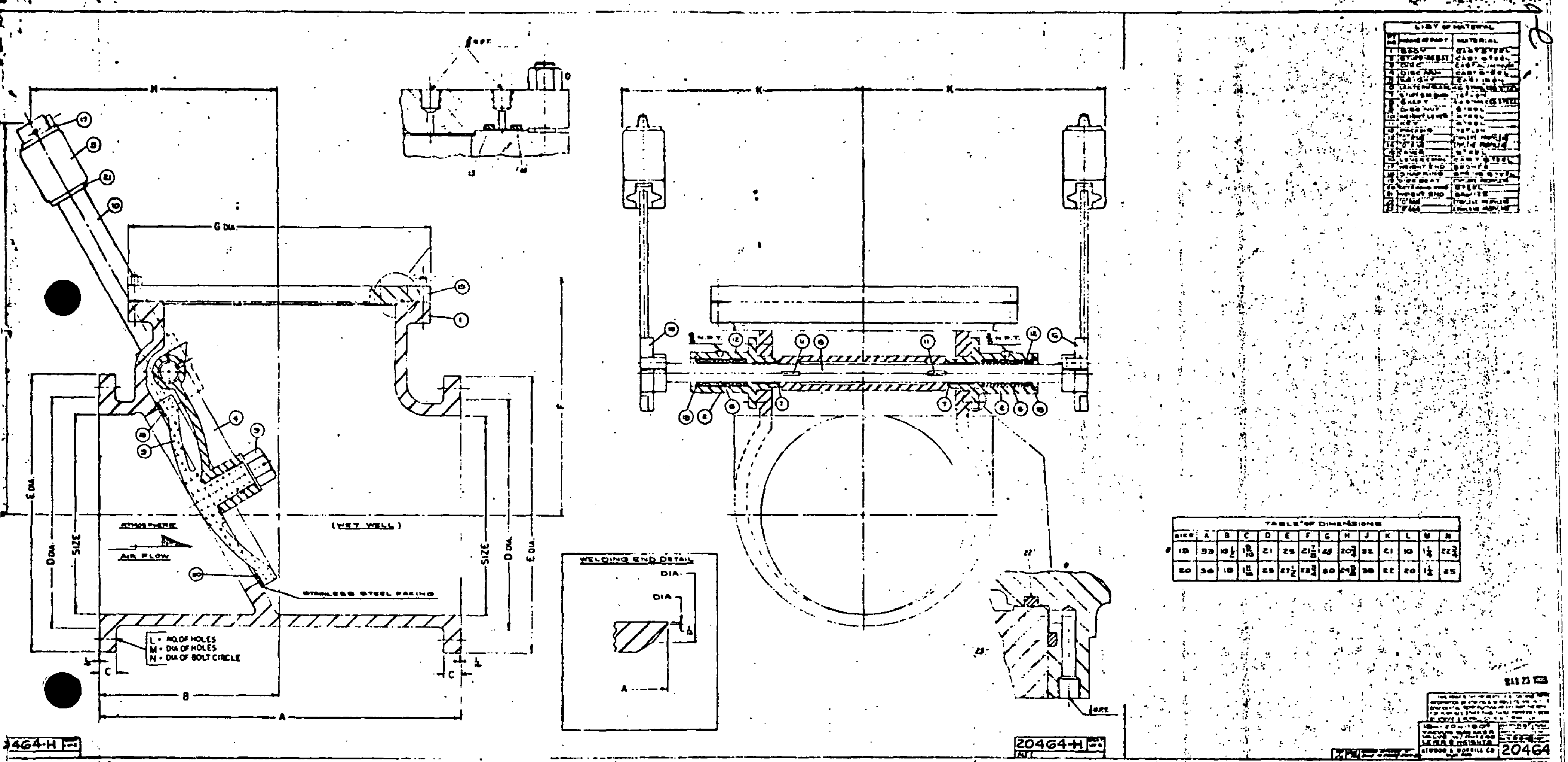
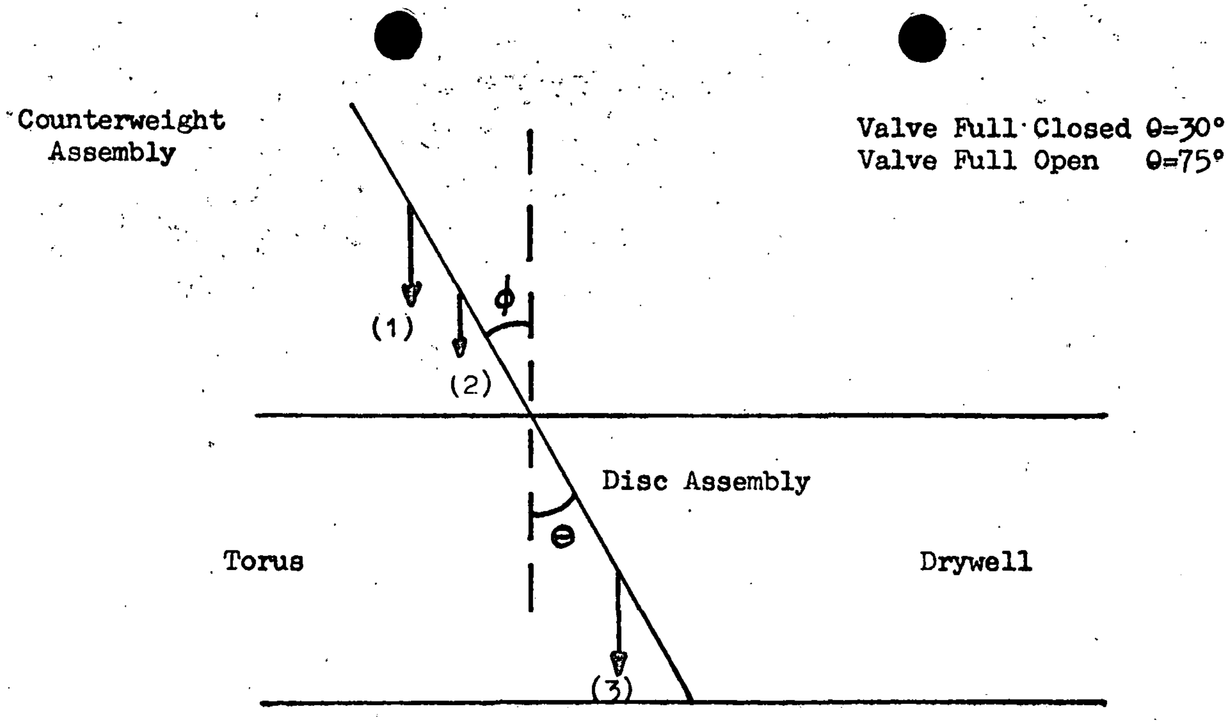

ATMOSPHERE
(WET WELL)
AIR FLOW
STAINLESS STEEL FACING
L = NO. OF HOLES
M = DIA OF HOLES
N = DIA OF BOLT CIRCLE
WELDING END DETAIL
20464-H

FIGURE I



ORIGINAL CONFIGURATION Ø=θ

		Weight		Moment Arm About Pivot	
		D-2	D-3	D-2	D-3
(1)	Counterbalance Arm*	5.1#	11#	8.5"	13.5"
(2)	Counterbalance Weight*	10#	25#	7"	7"
(3)	Disc Assembly	69.3#	69.3#	10 3/8"	10 3/8"

PRESENT CONFIGURATION DRESDEN 3 Ø=θ-20°

		Weight		Moment Arm About Pivot	
		D-2	D-3	D-2	D-3
(1)	Counterbalance Arm**	11#		13.5"	
(2)	Counterbalance Weight**	25#		15"	
(3)	Disc Assembly	76#		10 3/8"	

(* Two Per Valve)
(** One Per Valve)

Schematic Representation of 18" Vacuum Breakers on Dresden 2 and 3

2018-141

Figure 2

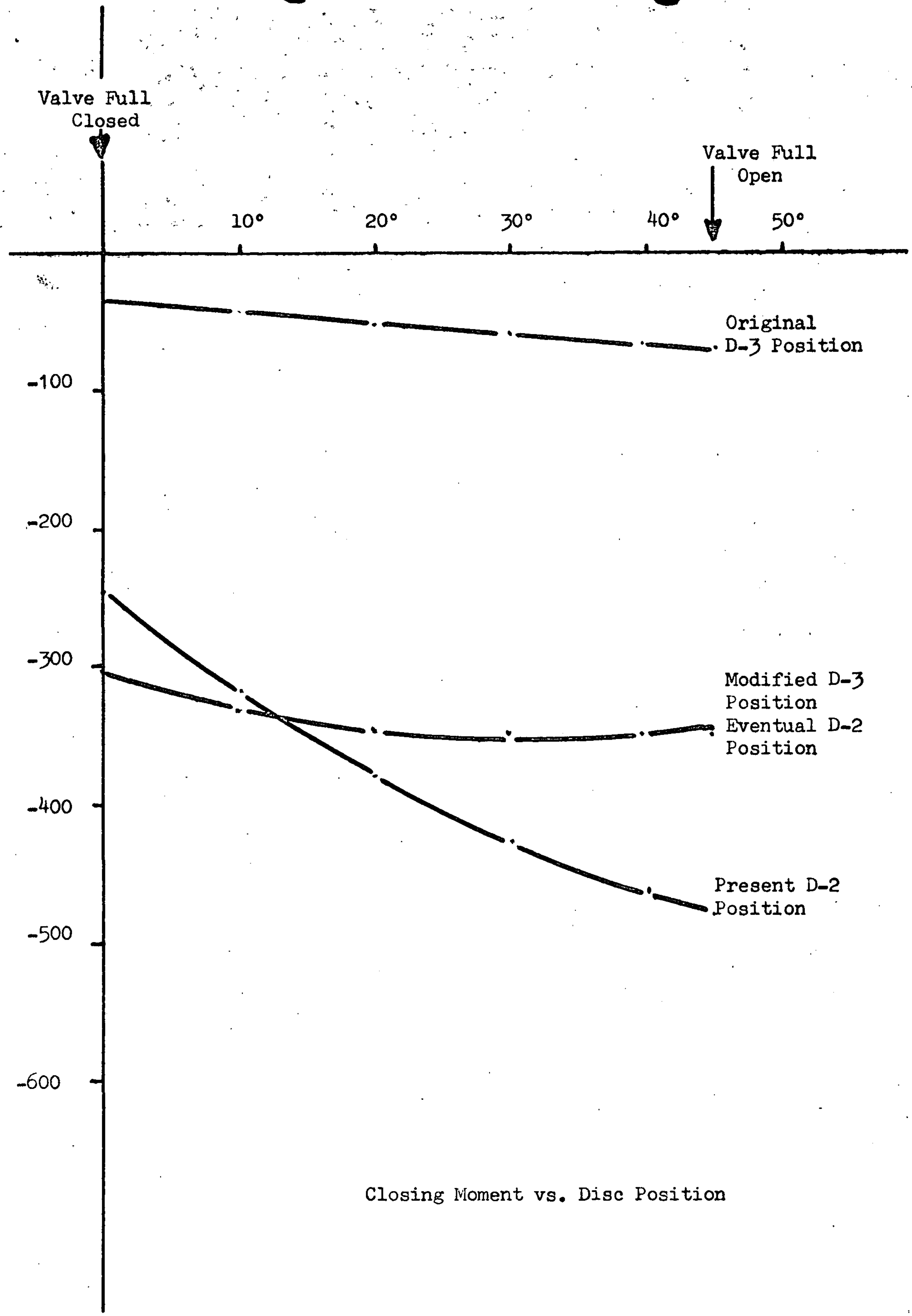


Figure 3

2019.15