



Westinghouse
Electric Corporation

Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

AW-93-408

February 5, 1993

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: MR. R. W. BORCHARDT

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

SUBJECT: SLIDES FROM THE FEBRUARY 5, 1993 NRC MEETING ON AP600 VALVES

Dear Mr. Borchardt:

The application for withholding is submitted by Westinghouse Electric Corporation ("Westinghouse") pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10CFR Section 2.790, Affidavit AW-92-408 accompanies this application for withholding setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference AW-93-408 and should be addressed to the undersigned.

Very truly yours,

P. J. Monis / for

N. J. Liparulo, Manager
Nuclear Safety And Regulatory Activities

/nja

cc: M. P. Siemien Office of the General Counsel, NRC
L. Barnett NRC (12H5)

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Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant specific review and approval.

In order to conform to the requirements of 10CFR 2.790 of the commission's regulation concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets and where the proprietary information has been deleted in the non-proprietary versions on the brackets remain, the information that was contained within brackets and where the proprietary information has been deleted in the non-proprietary versions only the brackets remain, the information that was contained within the brackets in the proprietary versions having been deleted. The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) contained within parentheses located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Section (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10CFR2.790(b)(1).

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Peter J. Morris, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Corporation ("Westinghouse") and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

Peter J. Morris

Peter J. Morris, Manager

Strategic Safety and Regulatory Issues

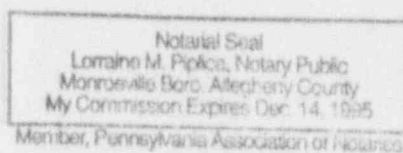
Sworn to and subscribed

before me this 3rd day

of February, 1993

Lorraine M. Piplica

Notary Public



- (1) I am Manager, Strategic Safety and Regulatory Issues, in the Nuclear and Advanced Technology Division, of the Westinghouse Electric Corporation and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rulemaking proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Energy Systems Business Unit.
- (2) I am making this Affidavit in conformance with the provisions of 10CFR Section 2.790 of the Commission's regulations and in conjunction with the Westinghouse application for withholding accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by the Westinghouse Energy Systems Business Unit in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

- (a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.
- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
- (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
- (d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.
- (e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.
- (f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
- (b) It is information which is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

- (c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.
 - (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.
 - (e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.
 - (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10CFR Section 2.790, it is to be received in confidence by the Commission.
 - (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
 - (v) Enclosed is Letter ET-NRC-93-3816, February 1993, being transmitted by Westinghouse Electric Corporation (W) letter and Application for Withholding Proprietary Information from Public Disclosure, N. J. Liparulo (W), to Mr. R. W. Borchardt, Office of NRR. The proprietary information as submitted for use by Westinghouse Electric Corporation is in response to questions concerning the AP600 plant and the associated design certification application and is expected to be applicable in other licensee submittals in response to certain NRC requirements for justification of licensing advanced nuclear power plant designs.

This information is part of that which will enable Westinghouse to:

- (a) Demonstrate the design and safety of the AP600 Passive Safety Systems.
- (b) Establish applicable verification testing methods.
- (c) Design Advanced Nuclear Power Plants that meet NRC requirements.
- (d) Establish technical and licensing approaches for the AP600 that will ultimately result in a certified design.
- (e) Assist customers in obtaining NRC approval for future plants.

Further this information has substantial commercial value as follows:

- (a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting NRC requirements for advanced plant licenses.
- (b) Westinghouse can sell support and defense of the technology to its customers in the licensing process.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar advanced nuclear power designs and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended for developing analytical methods and receiving NRC approval for those methods.

Further the deponent sayeth not.

**Westinghouse/NRC Meeting on
AP600 Valves**

Presentation Material

February 5, 1993

**Westinghouse Energy Center
Monroeville, PA**

NRC/WESTINGHOUSE VALVE MEETING
FEBRUARY 5, 1993
AGENDA

- | | |
|-----------------------------|----------------------------|
| 1. INTRODUCTION | Butler
Hasselberg (NRC) |
| 2. PASSIVE SYSTEMS OVERVIEW | Schulz |
| 3. MOTOR-OPERATED VALVES | (**) |
| 4. AIR-OPERATED VALVES | (**) |
| 5. CHECK VALVES | (**) |
| 6. SQUIB VALVES | (**) |
| 7. CONCLUSION / DISCUSSION | all |

(**) PRESENTATION MATERIAL FOR EACH VALVE TYPE

- | | |
|---------------------------------|-------------|
| - System Applications | Schulz |
| - Valve Functional Requirements | Schulz |
| - Valve Design Information | Vock |
| - Valve Testing Information | Fanto |
| - Miscellaneous Questions | As required |

AP600 SYSTEMS DESIGN

- **Greatly Simplify Systems to Improve Safety, Cost, Construction, Maintenance, & Operation**
- **Provide Simple Passive Safety Systems**
 - Use "natural" driving forces only
 - One-time alignment of active valves
 - No support systems after actuation
 - Reduced operator dependency
- **Provide Non-Safety Systems**
 - Reliable active equipment for normal operation
 - "First line of defense"; redundant active equipment powered by on-site non-safety diesels
 - Reduced use of passive safety systems
 - Reduced risk to utility & public
- **Iterative Design Development**
 - Safety analysis studies
 - Risk and severe accident analysis studies
 - Plant arrangement and modularization studies

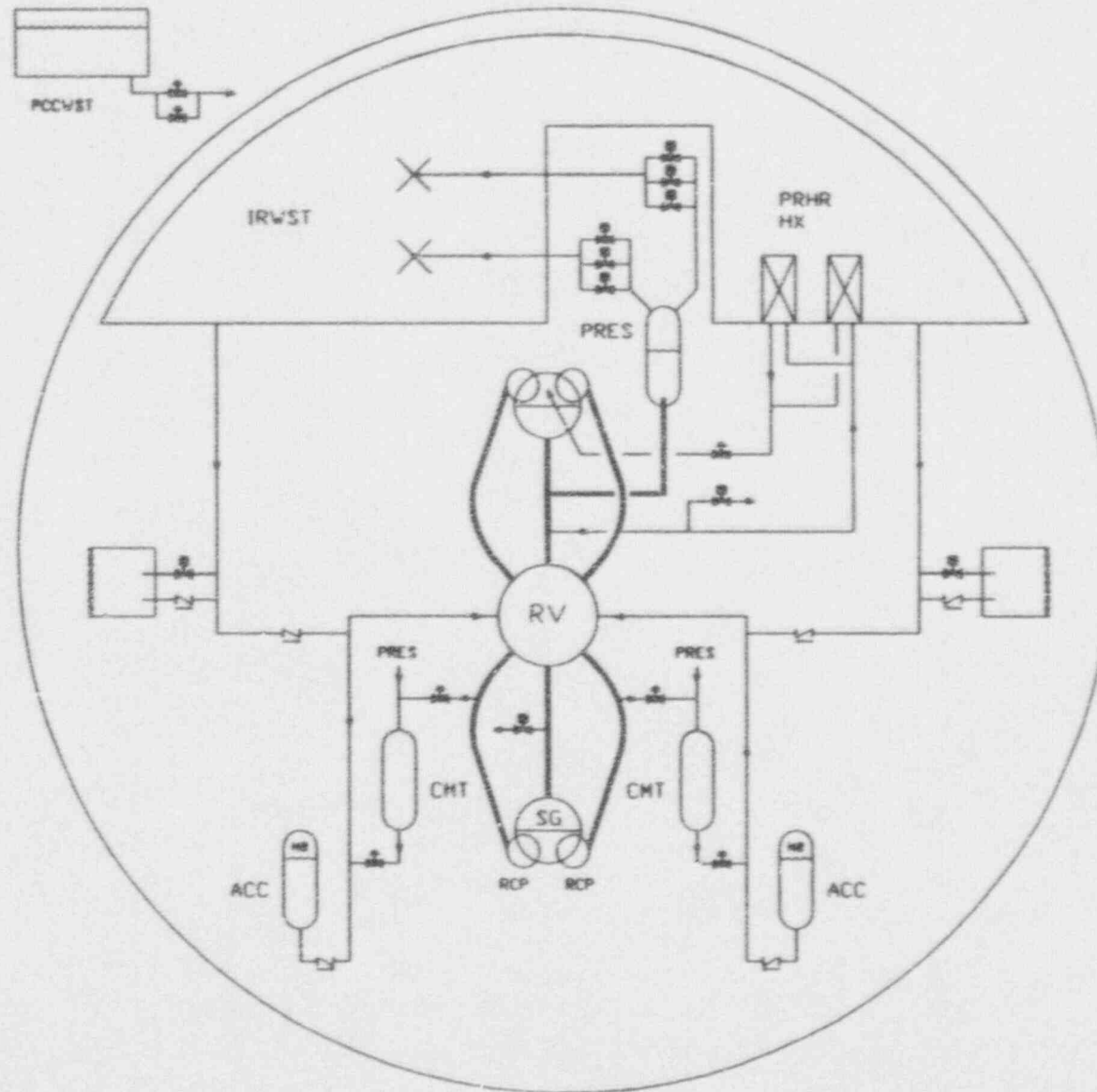
AP600 SAFETY SYSTEMS

- **Provide Passive Safety Systems**
 - Greatly simplified considering construction, maintenance, operation, ISI / IST
 - Mitigate design basis accidents without use of NNS systems
 - Meet NRC safety goals without NNS sys (EPRI)
 - Meet EPRI safety goals with NNS systems
- **Safety Systems Design Features**
 - Only passive processes; no "active" equipment
 - Significant design margins
 - Redundancy to meet single failure criteria
 - PRA based redundancy / diversity
 - Greatly reduced need for operator actions
- **Safety Equipment Design Features**
 - Reliable / experience based equipment
 - Improved inservice testing / inspection
 - Reg Guide 1.26 Quality Group A, B, or C
 - Seismic I design
 - Qualified Equipment
 - Availability controlled by Technical Specifications with shutdown requirements
 - Reliability Assurance Program
 - Tier I description and ITAAC

AP600 PASSIVE SAFETY FEATURES

- **Passive Decay Heat Removal**
 - Natural circulation HX connected to RCS
- **Passive Safety Injection**
 - N2 pressurized accumulators
 - Gravity drain core makeup tanks (RCS pressure)
 - Gravity drain in-containment refueling water storage tank (containment pressure)
 - Automatic RCS depressurization
- **Passive Containment Cooling**
 - Steel containment shell transfers heat to natural circulation of air and evaporation of water drained by gravity
- **Passive HVAC**
 - Compressed air for habitability of main control room
 - Concrete walls for heat sink (MCR and I&C rooms)

AP600 - PASSIVE SAFETY SYSTEMS



MOTOR OPERATED VALVES

- **Special Applications**

- ADS Stage 1
- ADS Stage 2 / 3

ADS VALVES - STAGE 1

- **Functional Requirements**

- Normally Isolate Pressurizer from IRWST
- Limited Manual RCS Depressurization
- Automatic RCS Depressurization

- **Valve Characteristics** ^{a, c}
[]

- **Valve Actuator**

- Motor-Operator, dc Powered
- Normally Closed, Fail-As-Is
- Slow Opening, []^{a, c}sec
- Open Against Full RCS Pressure

- **Valve Actuation**

- Low-1 CMT Level Setpoint

- **Valve Testing** ^{a, c}
[]

ADS VALVES - STAGES 2 AND 3

- **Functional Requirements**

- Normally Isolate Pressurizer from IRWST
- Automatic RCS Depressurization

- **Valve Characteristics**

[]^{a,c}

- **Valve Actuator**

- Motor-Operator, dc Powered
- Normally Closed, Fail-As-Is
- Slow Opening, []^{a,c} sec
- Open Against Full RCS Pressure

- **Valve Actuation**

- Low-2 & -3 CMT Level Setpoints

- **Valve Testing**

[]^{a,c}

AP600 ADS TEST FEATURES, STAGES 1 - 3

(AT POWER TEST)

A,C

AP600 ADS TEST FEATURES, STAGES 1 -- 3
(SHUTDOWN TEST)

a,c

CONTROL VALVE DATA SHEET NO: CT-001

Plant: System: Description:
AP600 RCS ADS Stage 1

Tag Number(s)

V001A,B,C,D

DRAFT

Rev: 5

Date: 01/31/93

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1)

CONTROL VALVE DATA SHEET NO: CT-001

Plant:	System:	Description:	Tag Number(s)
AF600	RCS	ADS Stage 1	V001A,B,C,D

DRAFT

Rev: 5 Date: 01/31/93

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CONTROL VALVE DATA SHEET NO: CT-001

Plant:	System:	Description:	Tag Number(s)
AP600	RCS	ADS Stage 1	V001A,B,C,D

DRAFT

[] a,c

CONTROL VALVE DATA SHEET NO: CT-002

DRAFT

Plant:	System:	Description:	Tag Number(s)
AP600	RCS	ADS Stage 2 and 3	V002A,B,C,D, V003A,B,C,D

a,c

CONTROL VALVE DATA SHEET NO: CT-002

DRAFT

Plant:	System:	Description:	Tag Number(s)
AP600	RCS	3-Stage 2 and 3	V002A,B,C,D, V003A,B,C,D

a,c

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15

CONTROL VALVE DATA SHEET NO: CT-002

DRAFT

Plant:	System:	Description:	Tag Number(s)
AP600	RCS	ADS Stage 2 and 3	V002A,B,C,D, V003A,B,C,D

[] a,c

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AP600
AUTOMATIC DEPRESSURIZATION SYSTEM (ADS)
TEST VALVES

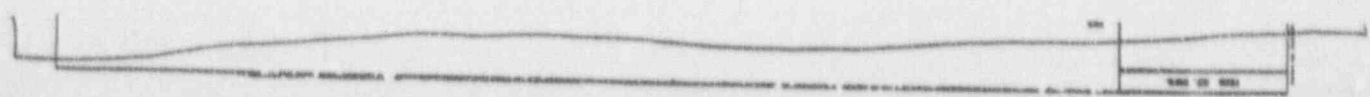
	<u>TAG NO. ADS-01</u>	<u>TAG NO. ADS-02</u>	<u>TAG NO. ADS-02</u> ^{a, c}
<u>DESCRIPTION</u>	[]
<u>MOTOR OPERATOR</u>			
<u>STROKE TIME</u>			
<u>VENDOR</u>			
	ANCHOR DARLING	ANCHOR DARLING	WESTINGHOUSE

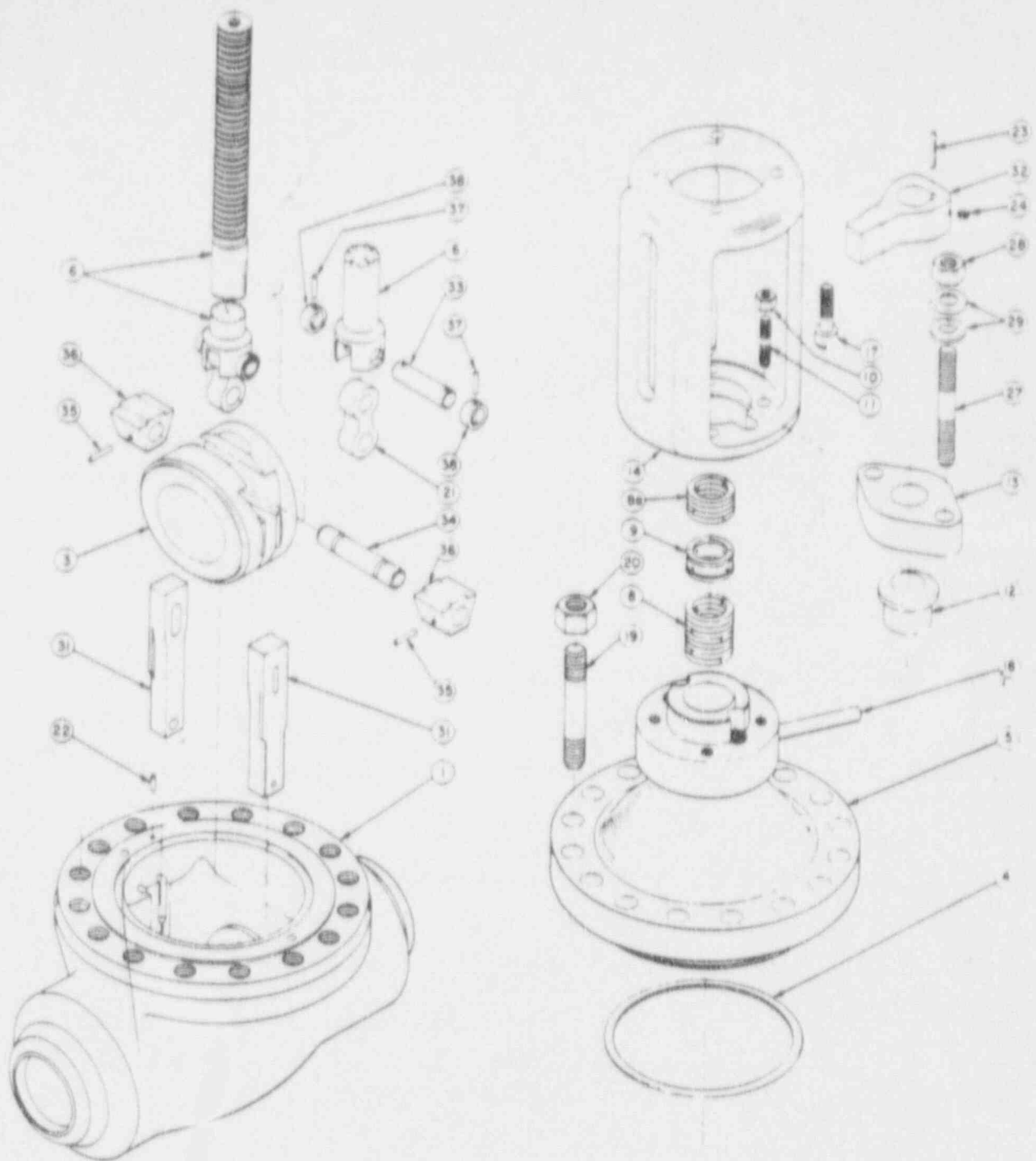


1-DIMENSION "B", END TO END, ARE TO MANUFACTURERS STANDARD

1. 凡在本行開戶之存款戶，均可參加本行各項儲蓄存款。

[illegible]





1. Body
3. Disc
4. Main Flange Gasket
5. Bonnet
6. Stem
8. Primary Packing
- 8a. Secondary Packing
9. Lantern Ring
10. Yoke-Bonnet Nut
11. Yoke-Bonnet Stud
12. Gland

13. Gland Follower
14. Yoke
17. Operator Cap Screw
18. Leak-Off Pipe
19. Main Flange Stud
20. Main Flange Nut
21. Link
22. Pin
23. Torque Key
24. Torque Arm Set Screw
27. Packing Gland Stud

28. Packing Gland Nut
29. Spherical Washer
31. Guide
32. Torque Arm
33. Stem Pin
34. Disc Pin
35. Lock Pin
36. Bearing Block
37. Lock Pin
38. Lock Ring

Gate Valve (Exploded View)
Figure 1.2



1 - DRAWING HAS TYPICAL INFORMATION ONLY.
FOR INSTALLATION PURPOSES USE CERTIFIED
DRAWINGS.
2 - DIMENSION "B" IS FOR SHORT PATTERN.
3 - WEIGHTS INCLUDE ACTUATORS

DO NOT WRITE IN THESE SPACES

[illegible]

AP600
BONNET OVERPRESSURIZATION

Potential Causes:

- Pressure in the valve bonnet is trapped when the valve is closed under pressure and pressure in both upstream and downstream piping is relieved or reduced.
- Higher than normal pressure can be trapped in the bonnet when the system experiences pressure spikes or surges.
- Pressure in the bonnet can be increased when the valve is closed full of fluid and then subjected to a thermal transient.

Methods to Reduce Overpressurization:

- Drill weep hole in the upstream disc
- Install external bypass with a check valve to connect the bonnet cavity to the upstream pipe
- Install relief valve in bypass to vent excessive pressure in the bonnet
- Implement administrative controls to relieve pressure by periodically cycling the valve

References:

NRC Information Notice No.: 92-26 "Pressure Locking of Motor Operated Flexible Wedge Gate Valves"

AIR OPERATED VALVES

- **Special Applications**

- ADS Stage 4
- Core Makeup Tank Isolation
- PRHR HX Control

ADS VALVES - STAGE 4

- **Functional Requirements**

- Normally Isolate RCS from Containment
- Automatic RCS Depressurization

- **Valve Characteristics** $q_{1,C}$
[]

- **Valve Actuator**

- Air Piston Operator
- Normally Closed, Fail-As-Is

[] $q_{1,C}$

- **Valve Actuation**

- Low-4 CMT Level Setpoint

- **Valve Testing**

[] $q_{1,C}$

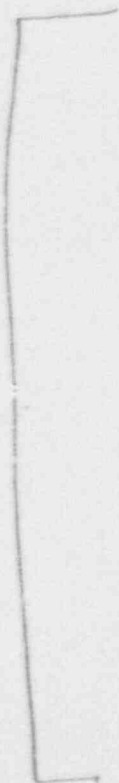
AP600 ADS TEST FEATURES, STAGE 4

(AT POWER TEST)

a, c

AP600 ADS TEST FEATURES, STAGE 4

(SHUTDOWN TEST)



CONTROL VALVE DATA SHEET NO: CT-003

Plant:	System:	Description:	Tag Number(s)
AP600	RCS	ADS Stage 4	V004A,B,C,D

DRAFT

a, c

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CONTROL VALVE DATA SHEET NO: CT-003

Plant:	System:	Description:	Tag Number(s)
AP600	RCS	ADS Stage 4	V004A,B,C,D

DRAFT

A, C

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CONTROL VALVE DATA SHEET NO: CT-003

Plant:	System:	Description:	Tag Number(s)
AP600	RCS	ADS Stage 4	V004A,B,C,D

DRAFT

Hand-drawn rectangular box with a horizontal line at the top and a vertical line on the right. The top right corner is labeled 'A, C'.

AP600 - 4TH STAGE ADS VALVES SOLENOIDS

a,c

AP600
AUTOMATIC DEPRESSURIZATION SYSTEM (ADS)
TEST VALVES

	<u>TAG NO. ADS-03</u>	<u>TAG NO. ADS-03</u>	
<u>DESCRIPTION</u>	[]	
<u>MOTOR OPERATOR</u>			
<u>STROKE TIME</u>			
<u>VENDOR</u>			
	EDWARDS	ATWOOD MORRILL	

α, C

CMT ISOLATION VALVES

- **Functional Requirements**

- Normally Isolate CMT from RCS
- Initiate CMT Injection

- **Valve Characteristics**

[

] a, c

- **Valve Actuator**

- Air-Operated Diaphragm
- Normally Closed, Fail Open
- Sized for Limited DP

- **Valve Actuation**

- SI, Low Pzr Level, and Low SG Level

- **Valve Testing**

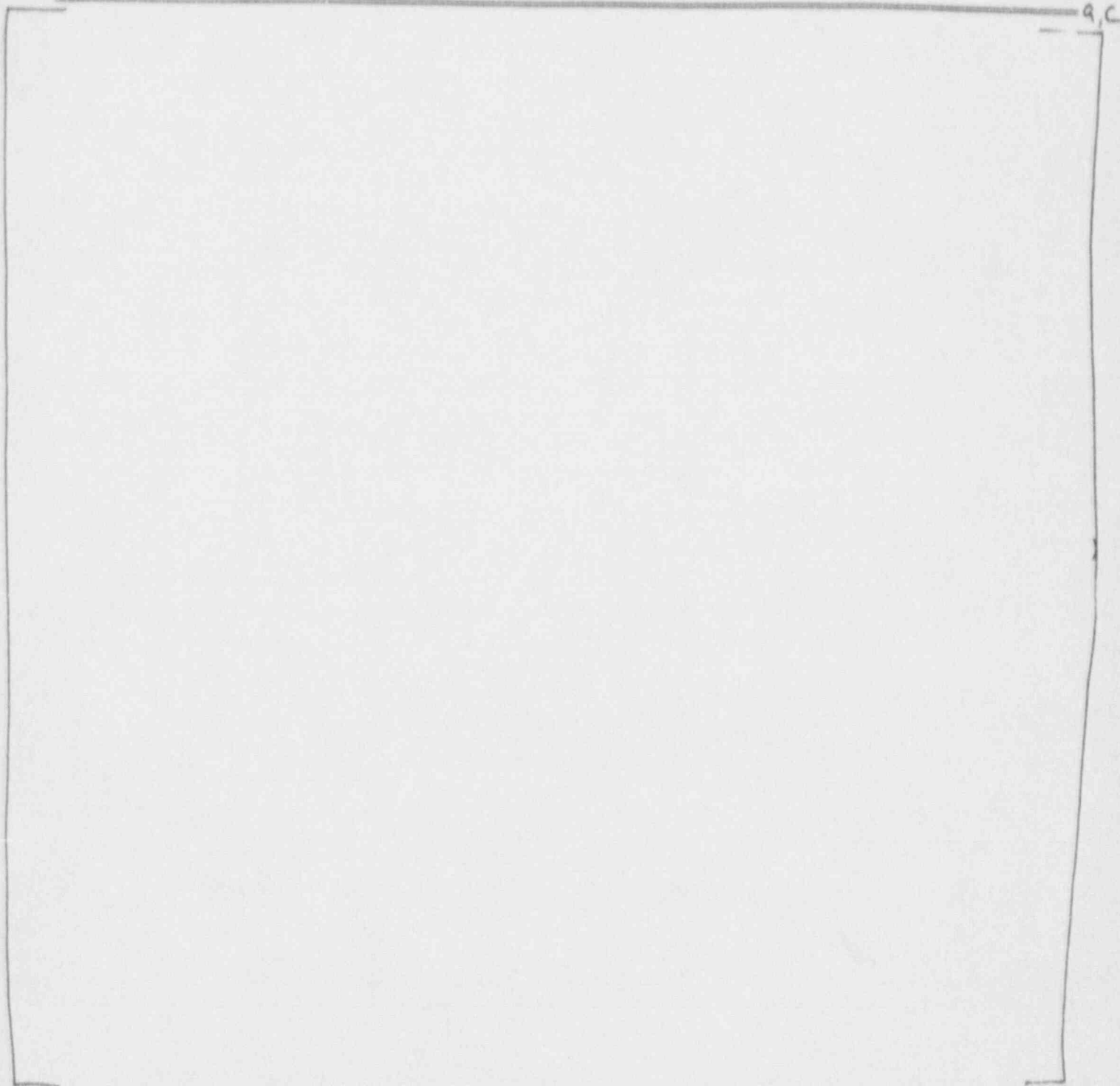
[

] a, c

CONTROL VALVE DATA SHEET NO: CT-004

DRAFT

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	CMT Inlet Isolation	V002A,B; V003A,B



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CONTROL VALVE DATA SHEET NO: CT-004

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	CMT Inlet Isolation	V002A,B; V003A,B

DRAFT

a, c

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CONTROL VALVE DATA SHEET NO: CT-005

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	CMT Outlet Isolation	V014A,B; V015A,B

DRAFT

q,c

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35

CONTROL VALVE DATA SHEET NO: CT-005

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	CMT Outlet Isolation	V014A,B; V015A,B

DRAFT

9, c

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32

PRHR HX CONTROL VALVES

- **Functional Requirements**

- Normally Prevent RCS Flow
- Initiate PRHR HX Flow
- Provide Nonsafety Throttling Capability

- **Valve Characteristics**

[

] ^{a, c}

- **Valve Actuator**

- Air-Operated Diaphragm with Positioner
- Normally Closed, Fail Open
- Operator Sized for Limited DP

- **Valve Actuation**

- Low SG Level, ADS, and High SG Level

- **Valve Testing**

[

] ^{a, c}

CONTROL VALVE DATA SHEET NO: CT-006

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	PRHR HX Control	V008A,B

DRAFT

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CONTROL VALVE DATA SHEET NO: CT-006

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	PRHR HX Control	V008A,B

DRAFT

a.c

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39

CHECK VALVES

- **Special Applications**

- IRWST Injection CV
- Containment Recirculation CV
- Core Makeup Tank Discharge CV
- Core Makeup Tank Pressurizer CV

IRWST INJECTION CV

- **Functional Requirements**

- Normally Prevent RCS Leakage to IRWST
- Open for IRWST Injection After ADS

- **Valve Characteristics**

- Simple Swing Check Design
 - No Dampers / Actuators
 - No Body Penetrations

[

] ^{9, C}

- **Valve Testing**

[

] ^{9, C}

CHECK VALVE DATA SHEET NO: CK-001

DRAFT

Plant: System: Description:

Tag Number(s)

AP600 PXS IRWST Injection

V122A,B, V123A,B, V124A,B, V125A,B

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42

CHECK VALVE DATA SHEET NO: CK-001

DRAFT

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	IRWST Injection	V122A,B, V123A,B, V124A,B, V125A,B

A,C

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CONTAINMENT RECIRC CV

- **Functional Requirements**

- Prevent Draining of IRWST to Containment
- Open for Recirculation from Containment

- **Valve Characteristics**

- Simple Swing Check Design
 - No Dampers / Actuators
 - No Body Penetrations

[

]

^{9, C}

- **Valve Testing**

[

]

^{9, C}

CHECK VALVE DATA SHEET NO: CK-002

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	Containment Recirc	V119A,B, V120A,B

DRAFT

a,c

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45

CHECK VALVE DATA SHEET NO: CK-002

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	Containment Recirc	V119A,B, V120A,B

DRAFT

a,c

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File: C:\ALPHA\VALVES\CKVA

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CMT DISCHARGE CHECK VALVES

- **Functional Requirements**

- Normally Stay Open
- Close to Prevent Gross Accumulator Backflow Through CMT During Cold Leg Break or Balance Line Break

- **Valve Characteristics**

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q, c

- **Valve Testing**

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CHECK VALVE DATA SHEET NO: CK-004

Plant:	System:	Description:	Tag Number(s)
AP500	PXS	CMT Injection	V016A,B, V017A,B

DRAFT

9,C

CHECK VALVE DATA SHEET NO: CK-004

Plant: System: Description:
AP600 PXS CMT Injection

Tag Number(s)
V016A,B, V017A,B

DRAFT

CMT PZR LINE CV

- **Functional Requirements**

- Normally Pass Steam Condensate to CMT Steam Trap
- Close to Prevent Gross CMT Backflow to PZR During PZR Pressure Balance Line Break or ADS

- **Valve Characteristics**

- Simple Swing Check Valves
 - No Dampers / Actuators
 - No Body Penetrations

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- **Valve Testing**

[

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CHECK VALVE DATA SHEET NO: CK-005

Plant:	System:	Description:	Tag Number(s)
AP600	PXS	CMT Pressure Balance	V006A,B; V007A,B

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CHECK VALVE DATA SHEET NO: CK-005

Plant:	System:	Description:	Tag Number(s)
AP600	R.S	CMT Pressure Balance	V006A,B; V007A,B

DRAFT

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Rev: 0 Date: 01/31/93

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AP600 CHECK VALVES

- o **Current PWRs Use Check Valves In Similar Service**
 - RCS chemistry
 - Stainless steel with stellite seats
 - Infrequent use, normally closed
- o **Well Designed, Simple Check Valves Are Reliable In Nuclear Power Plant Service**
 - Search of NPRDS failure records (1984 to 90) indicate 4500 check valve failures
 - Of these only 87 were failures to open
 - None of the failures was for a check valve with similar conditions to the IRWST valves
 - No indication of boric acid corrosion or self welding was found
- o **Check Valve Testing**
 - Performance tests show AP600 IRWST injection and recirculation check valves perform well
 - Further testing is being discussed to determine if in plant testing could be conducted to determine if corrosion bonding or other sticking failures would occur at IRWST opening pressures



PWR CHECK VALVE FAILURE OBSERVATIONS

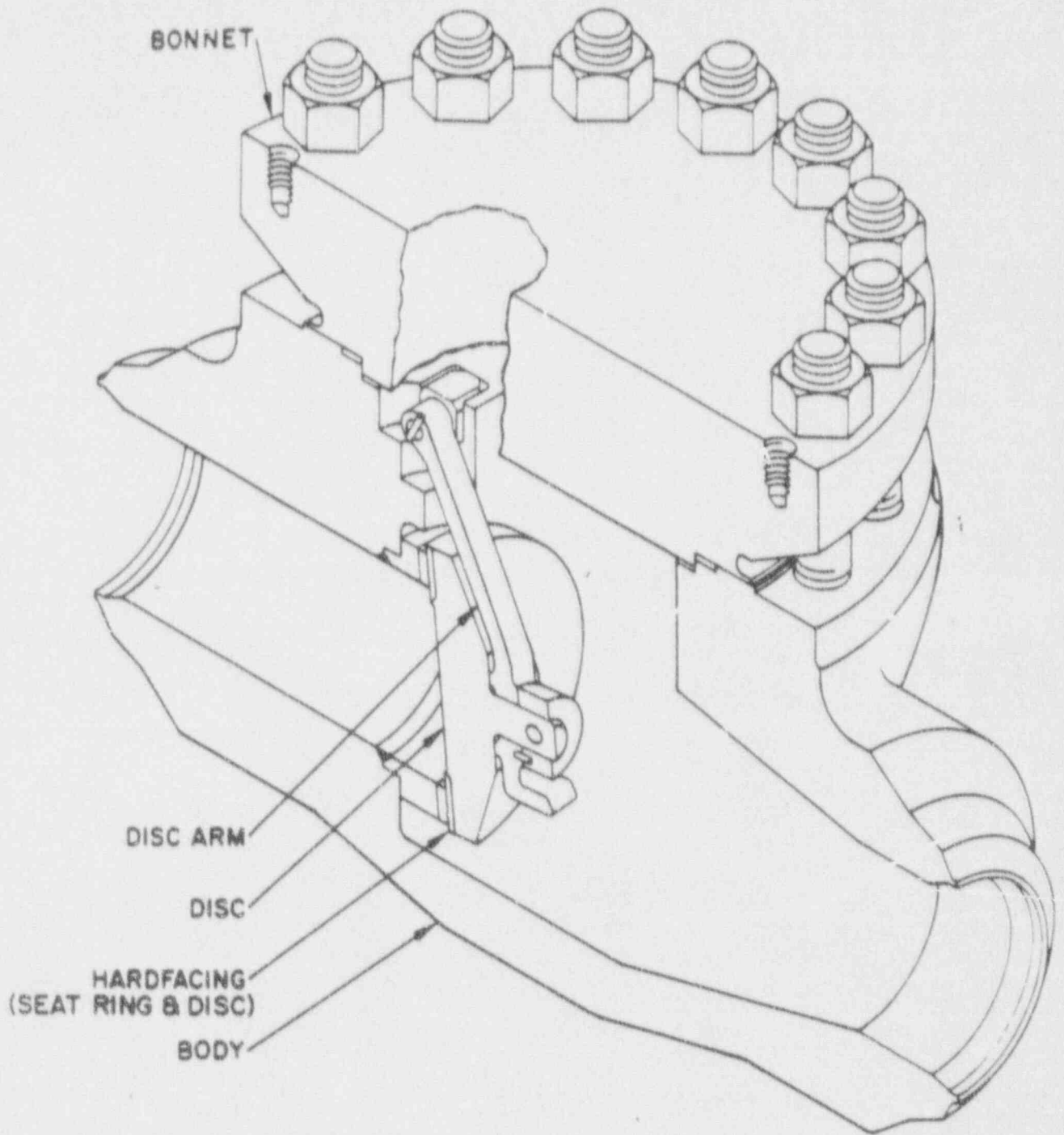
- o Most check valve failures occurred due to mechanical/wear damage (not applicable to AP600 valve application)
- o No failures to open due to corrosion observed for stainless steel valves
- o No failures to open due to foreign debris in water service for stainless steel valves



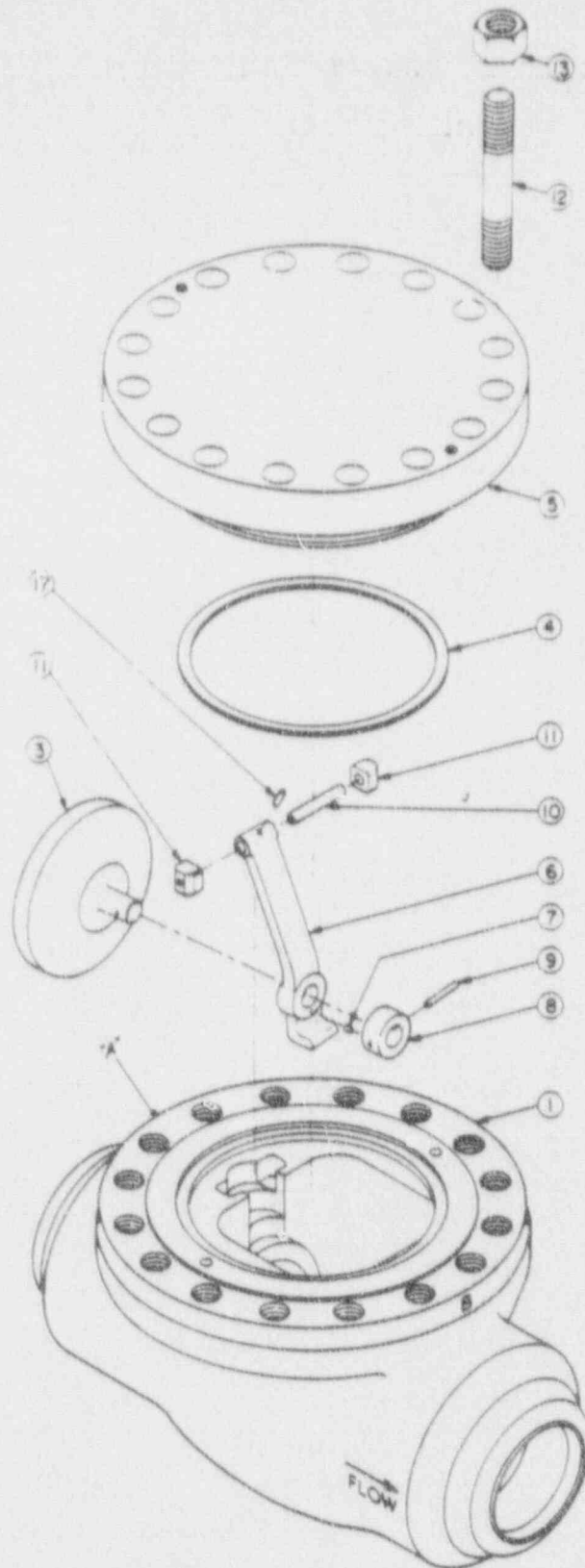
AP600 CHECK VALVE TEST

- o Verify hydraulic performance of swing check valve (provide valve design feasibility information)
 - Opening differential pressure
 - Differential pressure over the expected valve flow rate with prototypic valve arrangement
- o Develop a qualification plan
 - Contract Penn State University to review existing check valve data
- o Utility participation
 - Have contacted 5 utilities about the possibility of testing existing check valves

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Swing Check Valve Assembly
Figure 4.1



1. Body
3. Disc
4. Main Flange Gasket
5. Bonnet
6. Disc Arm
7. Antiroation Pin
8. Collar
9. Collar Pin
10. Pivot Pin
11. Bearing Block
12. Main Flange Stud
13. Main Flange Nut
17. Lock Pin

Swing Check Valve (Exploded View)
Figure 4.2

SQUIB VALVES

- **Special Applications**
 - pH Tank Outlet Isolation

pH ADJ TANK SQUIB VALVES

- **Functional Requirements**

- Normally Prevent Leakage of NaOH from pH Tank into Containment
- Initiate pH Tank Discharge

- **Valve Characteristics**

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- **Valve Actuator**

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- Ram Assembly Shears Inlet Fitting

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- **Valve Actuation**

- High Containment Radiation

- **Valve Testing**

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AP600
PROPOSED EXPLOSIVE SQUIB VALVE

VENDOR

CONAX CORPORATION

EXAMPLE DRAWING

7048-1700
1832-021

ASME CODE CLASS

I

MATERIAL

SS 304

