

# Duquesne Light Company

Beaver Valley Power Station  
PO Box 4  
Shippingport, PA 15077-0004

JOHN D. SIEBER  
Vice President - Nuclear Group

(412) 643-5255

April 14, 1989

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

TAC 72923

Reference: Beaver Valley Power Station, Unit No. 2  
Docket No. 50-412, License No. NPF-73  
Feedwater Regulating Valve Plug Material;  
Proposed Alternative to 10 CFR 50.55a(g)

Gentlemen:

The purpose of this letter is to request approval under the provisions of 10 CFR 50.55a(a)(3) to use Type 420 Stainless Steel material for plugs in the Beaver Valley Unit No. 2 main feedwater regulating valves. The reason for this material change is to eliminate the excessive wear found on the original components. This was initially discussed on April 6, 1989, with Mr. R. Hermann and Mr. P. Tam of the NRC's staff and Mr. S. Sovick of my staff.

ASME Section XI, Article IWD-7000, Replacements, states that materials shall meet the requirements to which the original plant component or part was constructed. The material originally used for these valves is ASME SA-479, Type 304L/Stellite weld overlay surface for the plug and anti-rotation pins and ASTM A 276, Type 420 SS for the valve cage. Previous experience has shown that ASTM A 276 Type 420 SS would eliminate wear concerns. However, this material is not ASME Code approved for use as disks (plugs). We are, therefore, requesting approval to use the Type 420 SS material as an alternative to the Code accepted material for the plug in our feedwater regulating valves.

The Unit No. 2 feedwater regulating valve is an ASME III, Class 3 construction which utilizes materials permitted by ASME III, Article ND-2000. The normal operating function of this valve is to regulate the flow of feedwater to the steam generators. The safety function of this valve is to serve as the redundant feedwater isolation valve as detailed in the Unit No. 2 UFSAR Section 10.4.

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During Unit No. 2's first operating cycle, these feedwater regulating valves showed significantly greater wear and deterioration than was expected. Figure 1 is a sketch of the Copes-Vulcan 12 inch Class 900 valve used at Unit No. 2. The excessive wear is associated with the anti-rotation pins which are designed to prevent the plug from rotating within the cage and potentially disengaging from the valve stem. Similar problems had been encountered in Unit No. 1 and were successfully corrected by utilizing a Type 420 SS material for the valve plug and anti-rotation pins.

Since startup of Unit No. 1 in 1976, the main feedwater regulating valves have gone through a number of modifications to the trim in an effort to improve valve reliability. In 1983, the present configuration was installed which was essentially a cavitation control design made of ASTM A 276, Type 420 SS cage and plug. This was acceptable since the Unit No. 1 feedwater piping was constructed to the ANSI B 31.1 Power Piping Code. From that time to the present, the three (3) main feedwater regulating valves' reliability has shown remarkable improvement in its wear resistance capability, especially around the anti-rotation pin area of the plug. This is the location where most wear has been experienced.

Review of the maintenance history for these valves since 1983 shows that most repair/replacement activities occurred during the period from 1983 to 1985, when the anti-rotation pins' design was changed from a mechanical attachment joint to a shrink fit arrangement. Since 1986, the valves have performed well with little maintenance related to the present trim/anti-rotation pin design. Recent inspections have shown excellent wear resistance by the ASTM A 276, Type 420 SS plug and anti-rotation pins.

In order to determine material acceptability for the feedwater regulating valve plug, we reviewed the applicable ASME III construction Code and Code Case N-62-4. ASME III, Article ND-2121(c) does not recognize this material as acceptable for Class 3 valve components. Code Case N-62-4 recognizes Type 420 SS as acceptable material except when used for category 3 valve items (ie: discs and stems). Our present Unit No. 2 feedwater regulating valves use Type 420 SS for the stem retainer roll pin and cage. Attachment 1 includes vendor drawings of the feedwater regulating valves for both units which illustrates the use of this material in each unit.

We are pursuing, in parallel with this request, approval from the ASME Boiler & Pressure Vessel Code Committee to use this material. It is our understanding that the NRC has reviewed and approved similar requests to use materials prior to Code Committee approval of proposed Code Case revisions (i.e. Public Service Electric and Gas Co. and Carolina Power and Light Co. requests in 1988 to use AL6XN material for service water piping. Code Case N-438-1 was subsequently approved in March of 1989 by the ASME Committees recognizing the use of AL6XN.)

On April 6, 1989, we submitted an inquiry to the Secretary, ASME B&PV Committee, requesting a Code change which would permit the use of Type 420 S.S. (Attachment 1) We have requested that our proposed revisions to NB/NC/ND-2121(c) to Section III and Code Case N-62-4 be placed on the Section III and Main Committee agendas for the May 1989, meetings in Tulsa, Oklahoma.

In preparing our inquiry for submittal to the ASME Committees, we discussed our proposed revisions with various members, chairmen and secretaries of the subgroup Materials, Fabrication and Examination, the Subcommittee on Nuclear Power (Section III), and the ASME B&PV Main Committee. Strong support has been given to our proposed revisions since the acceptability of this material for valve plugs has been demonstrated in other applications.

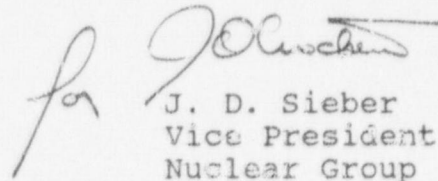
Copes-Vulcan provided the Type 420 SS plug for the Unit No. 1 valves. They were requested to provide additional documentation attesting to the acceptability of this material for this application. A letter from Copes-Vulcan, Attachment 2, documents successful testing and previous experience with this design.

In summary, approval is requested to use Type 420 SS material for the plug in the Unit No. 2 feedwater regulating valves. Our request is based on successful use of this material in Unit No. 1 in the same application, vendor endorsement, and ASME Committee support. Our safety review has concluded that this change will not adversely affect valve operation and that it will continue to be able to perform its safety function.

Since Unit No. 2 is currently shut down for refueling and our scheduled restart date is May 2, 1989, we request expedited review of this request.

If you have any questions, please call me or members of my staff.

Very truly yours,

  
for J. D. Sieber  
Vice President  
Nuclear Group

cc: Mr. J. Beall, Sr. Resident Inspector  
Mr. W. T. Russell, NRC Region I Administrator  
Mr. P. Tam, Sr. Project Manager  
Director, Safety Evaluation & Control (VEPCO)



FIGURE 1

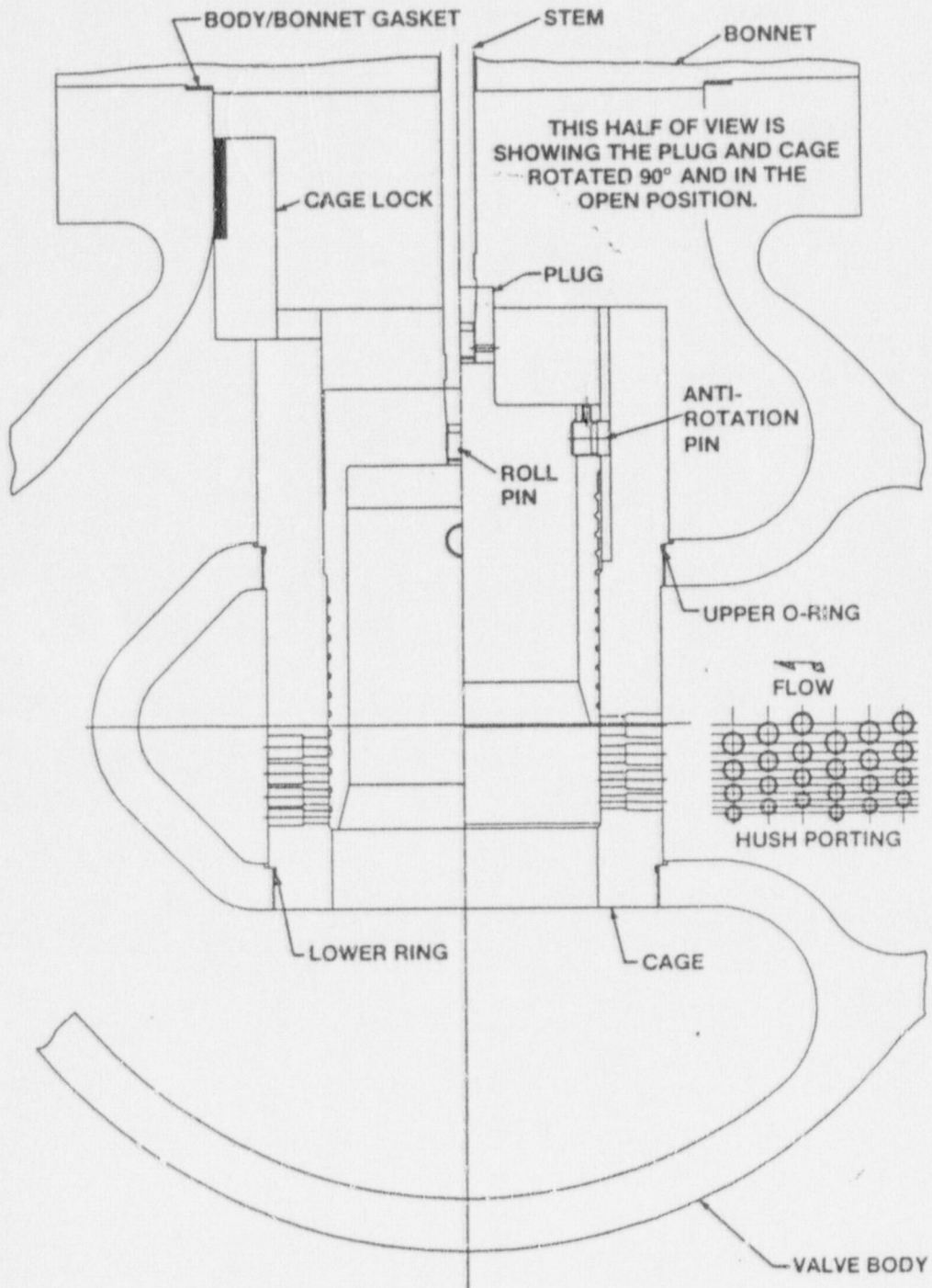


ILLUSTRATION NO. 5





Nuclear Group  
P. O. Box 321  
Shippingport, PA 15077-0321

Telephone (412) 393-6000

April 6, 1989  
ND3MNE:4721

Mr. G. M. Eisenberg, Secretary  
ASME Boiler and Pressure Vessel Committee  
United Engineering Center  
345 East 47th Street (M/S 8E)  
New York, NY 10017

ASME III CONTROL VALVE DISC MATERIAL INQUIRY

Dear Mr. Eisenberg:

Duquesne Light Company currently operates two nuclear power plants. Beaver Valley Power Station (BVPS) #1 is an ANSI B31.1 Nuclear Power System, whereas Beaver Valley #2 is an ASME Section III Nuclear Power System.

BACKGROUND

The high flow velocities which exist in nuclear power plants cause many problems not previously encountered in fossil fired utility boiler systems. In the feedwater systems, the control valve disks (plugs) were supplied by the valve manufacturer as ASME SA-479, Type 304 stainless steel base material with Stellite weld overlay. This material selection was later changed to high strength material for the Unit #1 valve disks. For Unit #2, because the valves are ASME, Section III Class 3, it was not permitted by paragraph ND-2121 (c). However, at the completion of the first operating cycle on BVPS Unit #2, the ASME material showed significantly greater wear and deterioration than expected.

We are currently using ASTM A276, Type 420, 13% Chromium martensitic steel in the BVPS #1 plugs of the Main Feedwater Control Valves as well as the cages and antirotation pins of both units. The disk material has shown excellent results in performing its function in the cavitation control trim design.

This material is used extensively in control valve applications by the entire industry. Failure of the plug material, which is enveloped by the cage, will not result in failure of the valve pressure boundary material. The valve is designed to fail safe in the closed position. It therefore approximates the protected situation found in the safety valves excluded now in paragraph 2121 (c). Even if the valve plug were to fail open, flow control and isolation can be achieved by other valves in the system.

INQUIRY

We request two parallel actions for the committee's consideration.

Revision 1

Due to our time constraints, we request urgent consideration of a proposed revision to Note (1) to Table 3.1.2-1, Code Case N-62-4, as shown in the attachment. The new note will read:

- 1) Not to be used for Category 3 Valve Items, except for: safety valve disks and nozzles, when the nozzles are internally contained by the external body structure; control valve disks, when the primary function of the valve is flow control; and line valve disks in valves with inlet connections NPS 2 and less.

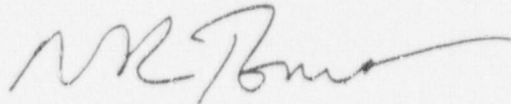
Revision 2

We request revision of paragraphs NB/NC/ND-2121(c) as shown in the attachments. This change will clarify that the 2 inch valve inlet restriction applies only to line valves. It will also provide the same exemption from material specifications listed in Appendix I, now permitted for safety valve disk and nozzles in 2121(c), to plugs of control valves.

Both revisions are urgently needed, and Duquesne Light Company respectfully requests that they be placed on the Section III and Main Committee agendas for the May meetings in Tulsa, and letter balloted by SG MFE (SC III). We are scheduled to complete our first refueling outage prior to that time.

Please contact Mr. J. C. DiPerna (412) 393-5542, Mr. M. P. Pettigrew, (412) 393-5554, or myself at (412) 393-5600, if additional information is required.

Very truly yours,



N. R. Tonet, P.E., Manager  
Nuclear Engineering Department

*MPP* *DAH*  
MPP/cal

Attachment

cc: R. L. Hansen  
M. P. Pettigrew  
W. S. Lacey  
J. R. Kasunick  
J. D. DiPerna  
G. S. Sovick  
L. Bussard (Factory Mutual)  
Central File (2)

## CASES OF ASME BOILER AND PRESSURE VESSEL CODE

Revise Note (1) to Table 3.1.2-1 as follows:

- (1) Not to be used for Category 3 Valve Items, except for: safety valve disks and nozzles, when the nozzles are internally contained by the external body structure; control valve disks, when the primary function of the valve is flow control; and line valve disks in valves with inlet connections NPS 2 and less.

## Notes to Table 3.1.2-1

- (1) ~~Not to be used for Category 3 Valve Items, except for valves 2 in. and less nominal pipe-~~  
~~size.~~
- (2) Welding of these materials is not permitted.
  - (3) For those materials in this table which do not have allowable stresses assigned, use 1/4 of room temperature specified minimum tensile strength, up to 650 F inclusive.
  - (4) The material shall be identified with this Case number in addition to the identification requirements of 3.1.7.1. Where the tensile strength, yield strength, hardness, tempering temperature or aging temperature listed in Table 3.1.2-1 differ from the requirements of the material specification, the minimum requirements listed in Table 3.1.2-1 shall apply.
  - (5) The maximum tensile strength shall not exceed the specified minimum tensile strength by more than 40.0 ksi.
  - (6) In addition to the requirements of 3.1.7.1 these materials shall be marked with the minimum specified tensile strength, in ksi, and this Case number.
  - (7) This material shall not be used at temperatures higher than 450 F.
  - (8) Carbon content shall not exceed 0.35%.



# ARTICLE NB-2000

## MATERIAL

### NB-2100 GENERAL REQUIREMENTS FOR MATERIAL

(c) Material made to specifications other than those specified in Tables I-1.0 may be used for the following applications:

- (1) Safety valve disks and nozzles, when the nozzles are internally contained by the external body structure.
- (2) Control valve disks and cages, when the primary function of the valves is flow control.
- (3) Line valve disks in valves whose inlet connections are NPS 2 and less.

### NB-2120 PRESSURE RETAINING MATERIAL

#### NB-2121 Permitted Material Specifications

(a) Pressure retaining material and material welded thereto, except as permitted in NB-4435, and except for welding, brazing, and hard surfacing metals and cladding which is 10% or less of the thickness of the base material (NB-3122), shall conform to the requirements of one of the specifications for material given in Tables I-1.0 and to all of the special requirements of this Article which apply to the product form in which the material is used.

(b) The requirements of this Article do not apply to items not associated with the pressure retaining function of a component, such as shafts, stems, trim, spray nozzles, bearings, bushings, springs, and wear plates, nor to seals, packing, gaskets, valve seats, and ceramic insulating material and special alloys used as seal material in electrical penetration assemblies.

(c) Material made to specifications other than those specified in Tables I-1.0 may be used for safety valve disks and nozzles, when the nozzles are internally contained by the external body structure, and for valve disks in line valves whose inlet connections are 2 in. nominal pipe size and less.

(d) Material for instrument line fittings, 1 in. nominal pipe size and less, may be of material made to specifications other than those listed in Appendix I, provided that the fittings are in conformance with the requirements of NB-3671.4 and the material is determined to be adequate for the service conditions by the piping system designer.

(e) Welding and brazing material used in the manufacture of items shall comply with an SFA specification in Section II, Part C, except as otherwise permitted in Section IX, and shall also comply with the applicable requirements of this Article. The requirements of this Article do not apply to material used as backing rings or backing strips in welded joints.

# ARTICLE NC-2000

## MATERIAL

### NC-2100 GENERAL REQUIREMENTS FOR MATERIAL

- (c) Material made to specifications other than those specified in Tables I-7.0 may be used for the following applications:
- (1) Safety valve disks and nozzles, when the nozzles are internally contained by the external body structure.
  - (2) Control valve disks and cages, when the primary function of the valves is flow control.
  - (3) Line valve disks in valves whose inlet connections are NPS 2 and less.

of the casting excluding flanges and sections designated by the designer as nonpressure-retaining.

### NC-2120 PRESSURE RETAINING MATERIAL

#### NC-2121 Permitted Material Specifications

(a) Pressure retaining material shall conform to the requirements of one of the specifications for materials given in Tables I-7.0 and to special requirements of this Article which apply to the product form in which the material is used. For vessels which are designed in accordance with NC-3200, the materials shall be restricted to those materials listed in Tables I-1.0 and to the following clad product specifications, provided they are composed of materials listed in Tables I-1.0:

SA-263 Specification for Corrosion-Resisting Chromium-Steel Clad Plate, Sheet, and Strip

SA-264 Specification for Corrosion-Resisting Chromium-Nickel Steel Clad Plate, Sheet, and Strip

SA-265 Specification for Nickel and Nickel-Base Alloy Clad Steel Plate

(b) The requirements of this Article do not apply to items not associated with the pressure retaining function of a component such as shafts, stems, trim, spray nozzles, bearings, bushings, springs, wear plates, nor to seals, packing, gaskets, valve seats, and ceramic insulating materials and special alloys used as seal materials in electrical penetration assemblies.

(c) Material made to specifications other than those specified in Tables I-7.0 may be used for safety valve disks and nozzles, when the nozzles are internally contained by the external body structure, and for valve disks in line valves whose inlet connections are 2 in. nominal pipe size and less.

(d) Material for line fittings, 1 in. nominal pipe size and less, may be of material made to specifications

## ARTICLE ND-2000 MATERIAL

### ND-2100 GENERAL REQUIREMENTS FOR MATERIAL

(c) Material made to specifications other than those specified in Tables I-7.0 and I-8.0 may be used for the following applications:

- (1) Safety valve disks and nozzles, when the nozzles are internally contained by the external body structure.
- (2) Control valve disks and cages, when the primary function of the valves is flow control.
- (3) Line valve disks in valves whose inlet connections are NPS 2 and less.

of the casting, excluding flanges and sections designated by the designer as nonpressure-retaining.

### ND-2120 PRESSURE RETAINING MATERIAL

#### ND-2121 Permitted Material Specifications

(a) Pressure retaining material shall conform to the requirements of one of the specifications for materials listed in Tables I-7.0 and I-8.0 and to the special requirements of this Article which apply to the product form in which the material is used.

(b) The requirements of this Article do not apply to items such as shafts, stems, trim, spray nozzles, bearings, bushings, springs, and wear plates, nor to seals, packing, gaskets, valve seats, and ceramic insulating materials and special alloys used as seal materials in electrical penetration assemblies.

(c) Material made to specifications other than those specified in Tables I-7.0 and I-8.0 may be used for safety valve disks and nozzles when the nozzles are internally contained by the external body structure and for valve disks in line valves whose inlet connections are 2 in. nominal pipe size and less.

(d) Material for line fittings, 1 in. nominal pipe size and less, may be of material made to specifications other than those listed in Appendix I, provided that the fittings are in conformance with the requirements of ND-3671.4 and the material is determined to be adequate for the service conditions by the piping system designer.

(e) Welding and brazing materials used in manufacture of items shall comply with an SFA specification in Section II, Part C, except as otherwise permitted in Section IX, and shall also comply with the applicable requirements of this Article. The requirements of this Article do not apply to materials used as backing rings or backing strips in welded joints.







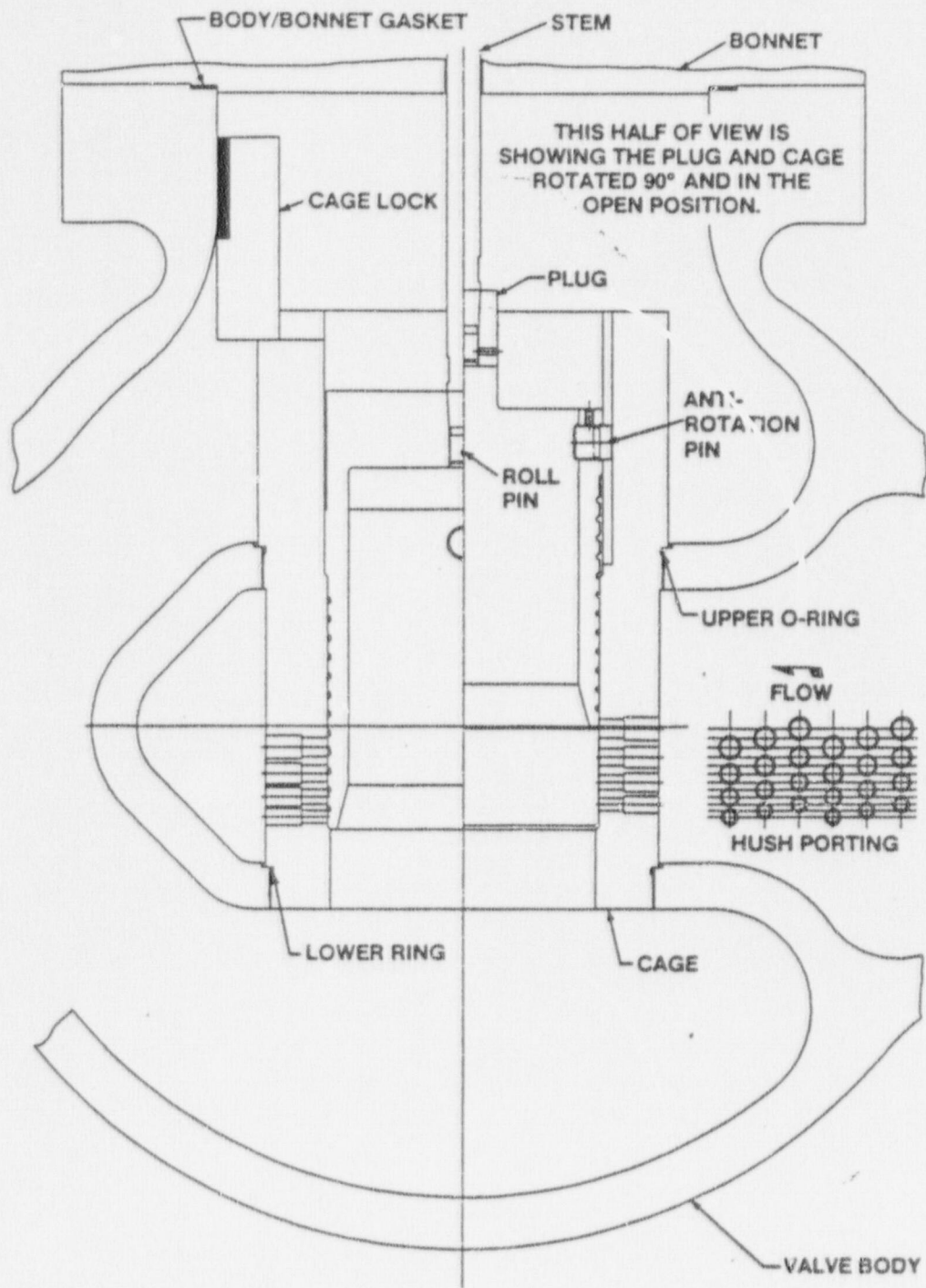
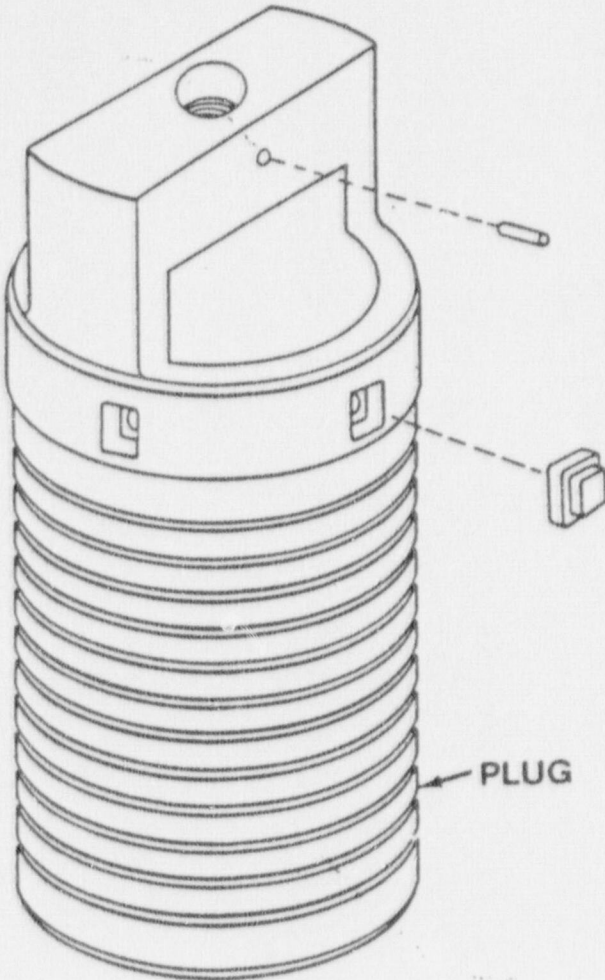


ILLUSTRATION NO. 5



**SHRINK FIT  
STYLE #5**





Attachment 2

**COPES-VULCAN**Division of White Consolidated Industries, Inc.  
*WCI*

P.O. BOX 577

LAKE CITY, PENNSYLVANIA 16423

PHONE 814 / 774-3151

TELEX: 91-4414

Apr 11 12, 1989

Duquesne Light  
P.O. Box 321  
Shippingport, PA 15077-0321

ATTN: Mark Pettigrew  
FAX No.: (412) 393-5536

SUBJ: Feedwater Plug Stress Analysis

Dear Mark,

A complete stress analysis for the feedwater plug, P/N 299794 in use at Duquesne Light Company, Beaver Valley Unit No. 1, does not exist. This plug has been designed using proprietary guidelines developed in analysis and test of prototypes of similar design. The prototype analysis and testing performed used static and dynamic loads equivalent to actual service conditions of this application. In addition, thousands of hours of satisfactory performance for plugs of this design under similar service conditions ensures that the plug design is acceptable for this application.

Very truly yours,

COPES-VULCAN, INC.

*R. L. Fetterman*

R. L. Fetterman  
Sr. Applications Engr.

RLF/cat