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CONWAY,W.F. Arizona Public Service Co. (formerly Arizona Nuclear Power
RECIP.NAME RECIPIENT AFFILIATION
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SUBJECT: Requests approval to use ASME Code Case N-474-1 to replace Unit 2 RCS hot leg nozzles,currently Alloy 600,w/Alloy 690 matl which is more resistant to primary water stress corrosion cracking.

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WILLIAM F. CONWAY
EXECUTIVE VICE PRESIDENT
NUCLEAR

161-04062-WFC/RAB

July 18, 1991

Docket Nos. STN 50-528/529/530

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-37
Washington, D. C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Request to Use ASME Code Case N-474-1
File: 91-008-010; 91-056-026

Arizona Public Service Company (APS) requests NRC Staff approval in accordance with 10 CFR 50.55a(a)(3) to use ASME Code Case N-474-1. The Code Case, approved March 5, 1990 by the ASME, allows the use of Alloy 690 (UNS 06690, minimum yield strength, 35 ksi) in ASME Class 1 components. APS is planning to replace PVNGS Unit 2 Reactor Coolant System (RCS) hot leg nozzles, currently Alloy 600, with Alloy 690 material which is more resistant to Primary Water Stress Corrosion Cracking (PWSCC). The Alloy 600 nozzles to be replaced are considered susceptible to PWSCC due to their high yield strength, specific heat treatment, fabrication procedures, and a high temperature location.

Cracking of Alloy 600 nozzles has not occurred at PVNGS; however, APS intends to replace seven nozzles used to monitor steam generator differential pressure and a sampling nozzle in order to preclude potential cracking. The replacement work will take place during the refueling outage for Unit 2, scheduled to start on October 17, 1991.

Alloy 690 has been installed at various facilities including Calvert Cliffs, Unit 2. ASME Code Case N-20-3, which was accepted for use by NRC Regulatory Guide 1.85 approves use of Alloy 690, meeting specification SB-163, when separate Alloy 690 welding procedures and performance qualifications are established. ASME Code Case N-474-1 applies to SB-163, SB-166, SB-167, and SB-168. APS will use Alloy 690 per SB-166, "Nickel-Chromium-Iron-Alloy Rod, Bar and Wire" for hot leg nozzle material. The applicable welding requirements in Code Cases N-20-3 and N-474-1 will be used. In addition, procurement of material will be in conformance with ASME Quality Assurance requirements.

The use of Alloy 690, per the technical requirements stipulated above, will provide improved PWSCC resistant material and an acceptable level of quality and increased safety. APS is requesting NRC authorization to use Alloy 690 in Code Case N-474-1 prior to the start of the PVNGS Unit 2 refueling on October 17, 1991. The NRC approved a similar request for Baltimore Gas and Electric Company in a letter dated April 5, 1990.

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A summary description of the hot leg nozzle replacement process is attached for your information (Attachment 1). In addition, a copy of ASME Code Case N-474-1 is provided as Attachment 2.

Please call Michael E. Powell at (602) 340-4981 if you have any questions.

Sincerely,

WFC/RAB/pmm

Attachments

cc: J. B. Martin
D. H. Coe
A. C. Gehr
A. H. Gutterman

ATTACHMENT 1

BACKGROUND

Primary Water Stress Corrosion Cracking (PWSCC) of Alloy 600 material used as Reactor Coolant System penetrations has been experienced at BG&E's Calvert Cliffs-2 and was documented by Combustion Engineering (CE) Infobulletin 89-06 and NRC Information Notice 90-10. As part of APS' investigation of applicability of PWSCC in Alloy 600 penetrations at PVNGS, the material and manufacturing record of the RCS penetrations fabricated from Alloy 600 were reviewed. Based on criteria developed in conjunction with the Combustion Engineering Owners Group, the penetrations were grouped into categories relating to the material's susceptibility to PWSCC. Eight nozzles in Unit 2 were determined to have high susceptibility to PWSCC and the decision was made to remove and replace these nozzles. The remaining penetrations in Unit 2 and all of the penetrations in Units 1 and 3 were classified as either having low or moderate susceptibility to PWSCC. As more information about Alloy 600 and PWSCC becomes available, the penetrations in the low or moderate categories will be further evaluated.

The improved corrosion resistance of Alloy 690 over Alloy 600 is well documented in industry studies. Studies performed by Babcock & Wilcox (EPRI NP-5761, Stress Corrosion Cracking of Alloys 600 and 690 in AVT Water at Elevated Temperatures), and CE, Westinghouse, and EDF (EPRI NP-4665S-SR, Proceedings: Workshop on Thermally Treated Alloy 690 Tubes for Nuclear Steam Generators) have shown Alloy 690 to be more resistant to stress corrosion cracking in a variety of PWR water environments which have produced cracking in Alloy 600 material. These include primary water, with boric acid and lithium hydroxide additions representing the start, middle and end of typical fuel cycles, lead contaminated, cold worked, creviced conditions and a variety of secondary side environments in which the nominal AVT chemistry is faulted with aggressive contaminants.

The attached figures show the location, existing configuration and replacement design of the seven instrument nozzles and one sampling nozzle in Unit 2 that will be replaced in the next refueling outage. Four of the nozzles are located in each hot leg and provide connection for Reactor Coolant Pump and Steam Generator differential pressure instruments and a hot leg sampling nozzle.

Description of Modification:

The existing Alloy 600 nozzle will be trimmed to a length of approximately three inches. The machining fixtures will then be installed. After the fixture is installed, the integral flow restrictor in the nozzle will be machined out to allow access for Non-Destructive Examination (NDE) of the existing nozzle. An eddy current examination will be performed to determine if cracking has initiated in the nozzle ID. Upon completion of the NDE, the remainder of the nozzle will be removed and the hole enlarged to accept the corrosion resistant sleeve. The new weld prep is then machined into the outer wall of the hot leg piping. The corrosion resistant sleeve is then fitted up and rolled into place over its length to provide zero clearance. After verification of the sleeve position, the remote ID welder is installed and the inner end of the sleeve is welded to the cladding on the inside diameter of the pipe. A visual inspection of the weld is performed. The replacement Alloy 690 nozzle is then installed. A preheat of the base metal is required to complete the pressure boundary weld. Other requirements include a post welding soak. NDE requirements for the weld include a PT examination of the weld at the 1/2 T location and of the final layer.

ATTACHMENT
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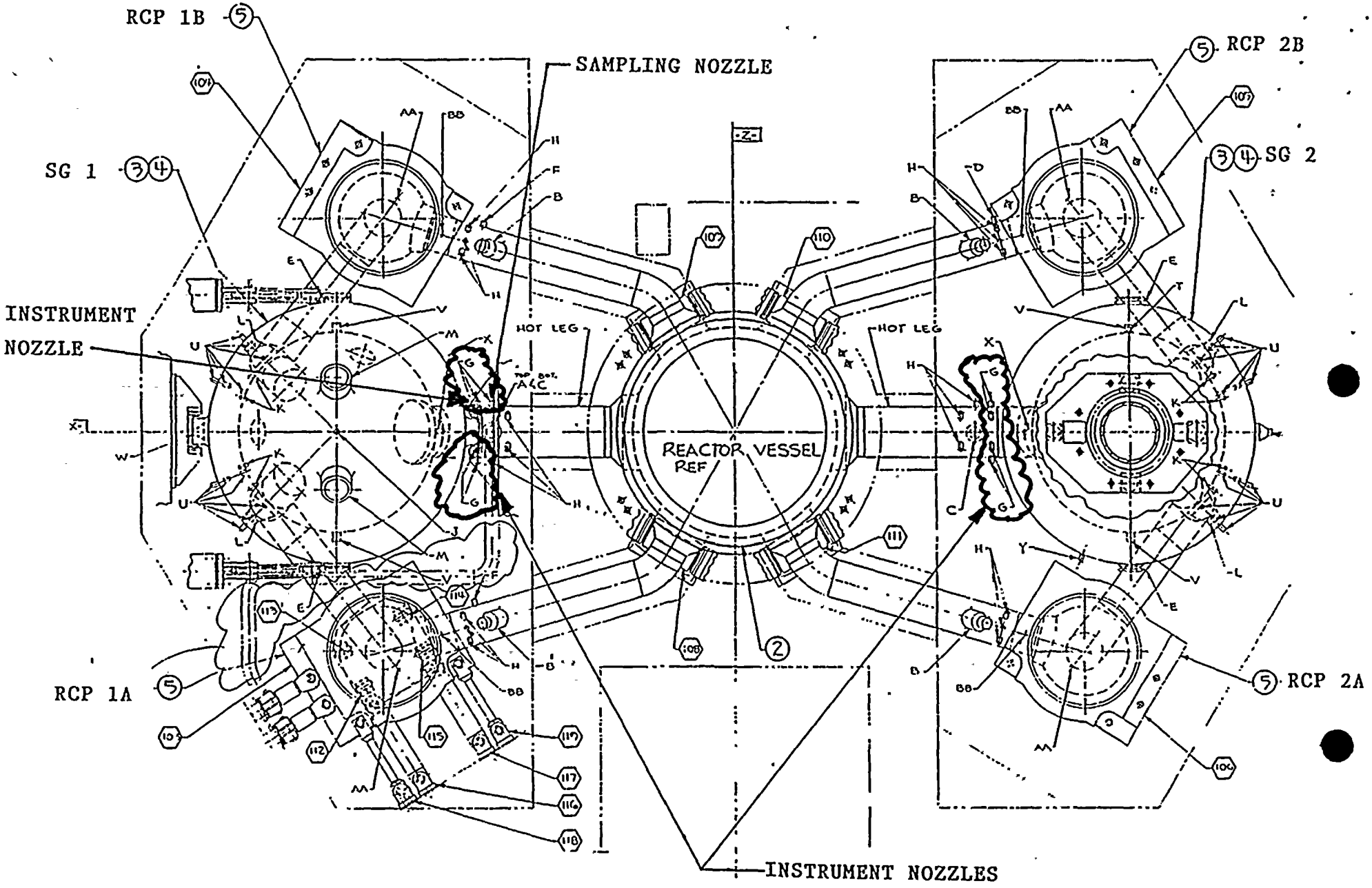
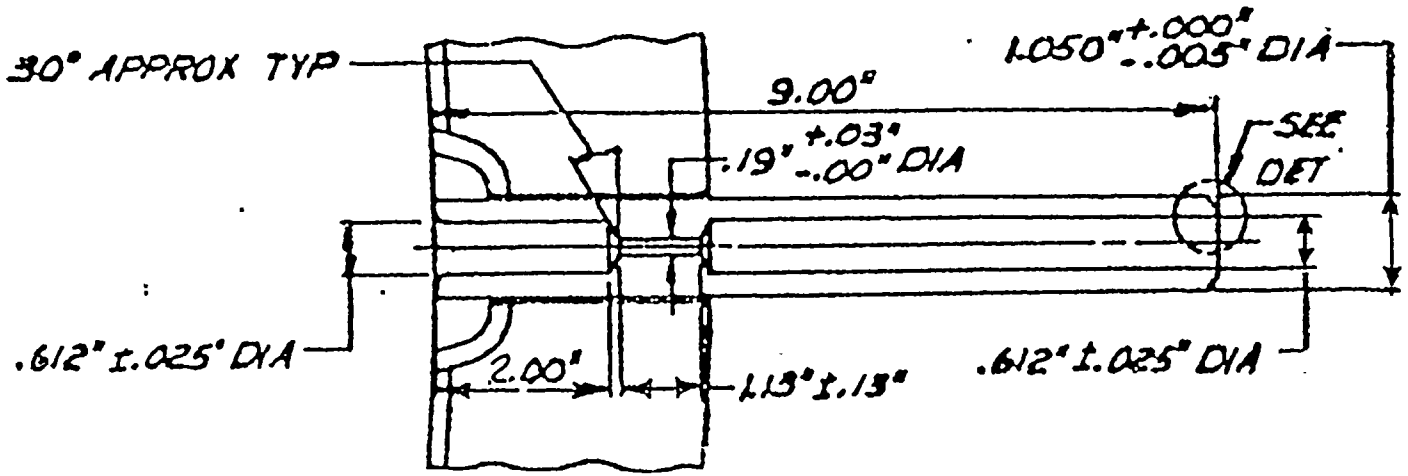


PLAN VIEW

NOZZLES & SERIAL NO'S

NOZZLE LOCATIONS



EXISTING NOZZLE DETAIL

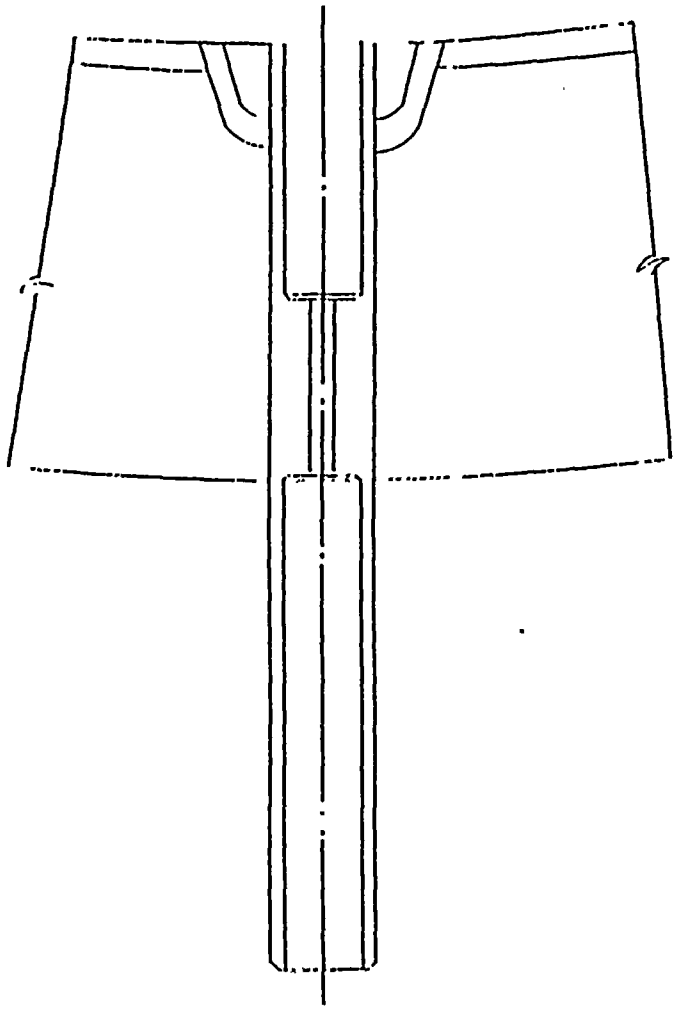


FIGURE 1

OLD CONFIGURATION

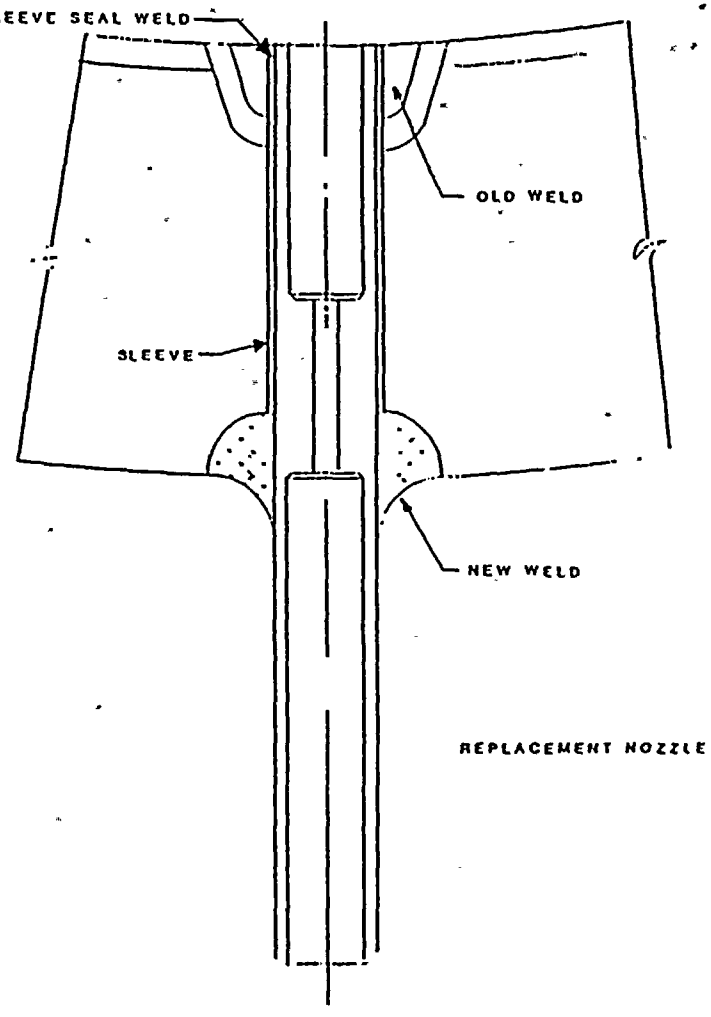


FIGURE 2

NEW CONFIGURATION

ATTACHMENT
2

Approval Date: March 5, 1990
See Numeric Index for expiration and any reaffirmation dates.

Case N-474-1
Design Stress Intensities and Yield Strength Values for UNS N06690 With a Minimum Specified Yield Strength of 35 ksi, Class 1 Components
Section III, Division 1

E *Inquiry:* Is it permissible in the construction of Class 1 components conforming to the requirements of Section III, Division 1, to use nickel-chromium-iron UNS N06690 with a minimum yield strength of 35 ksi as specified in material Specification SB-163, SB-166, SB-167, and SB-168?

Reply: It is the opinion of the Committee that the material specified in the Inquiry may be used in the construction of Class 1 components under the rules of Section III, Division 1, provided the following additional requirements are met.

(a) The stress intensity and minimum yield strength values shall be as shown in Table 1.

(b) For external pressure the required thickness shall be determined in accordance with NB-3133 using Fig. VII-1102-1 in Appendix VII of Section III.

(c) Welding Procedures and Performance Qualification shall be in accordance with Section IX and this Section. The material shall be considered to be P-No. 43.

(d) This Case number shall be listed on the Data Report Form for the component.

TABLE 1

Temperature	Design Stress Intensity, S_m, ksi	Yield Strength, ksi
100	23.3	35.0
200	23.3	31.6
300	23.3	29.8
400	23.3	28.7
500	23.3	27.8
600	23.3	27.6
700	23.3	27.6
800	23.3	27.6