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

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December 1, 1978

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Dresden Station Unit 1
Proposed Amendment to Facility
Operating License DPR-2, Appendix A,
Technical Specifications, Regarding
Vessel Head Bolting Temperature
NRC Docket No. 50-10

References (a): R. L. Gutcher (CE) Letter to R. C. DeYoung (CECo.) Dated November 29, 1978

Dear Sir:

Pursuant to 10 CFR 50.59, Commonwealth Edison proposes to make an amendment to the Dresden Unit 1 Technical Specifications regarding the minimum reactor vessel head stud tensioning temperature. We propose to amend Section 3.6.B.4 (Page 3C) by changing the >130°F to >70°F. This change is required because it will be extremely difficult or impossible to maintain the >130°F when the chemical cleaning solvent is initially introduced into the primary system, brought up to temperature, and drained or dumped. The proposed Technical Specification change is enclosed.

The original Technical Specifications for Dresden 1 did not contain a minimum temperature requirement for the reactor head bolts under tension. The New York Shipbuilding Corporation instruction manual for Dresden 1 indicates the only temperature restriction during stud tensioning is to maintain both studs and flanges within 10°F.

The first Technical Specification LCO on Dresden 1 for a minimum stud tensioning temperature appears to have been copied from the Dresden 2 & 3 Technical Specifications in an attempt to place the Dresden 1 Technical Specifications into standard format. The limit for Dresden 2 & 3 and Quad-Cities was based on the bending stress under boltup as a result

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of the flexture of the head. Since the Dresden 1 design is different and does not produce any significant bending stress, the basis was removed from the Technical Specification at the time of Amendment 26 dated July 10, 1978.

The vessel flange and vessel head flange material that experienced the compression bolting stress is ASTM A336-55T Grade F1. The RTNDT of the material based on limited data is conservatively estimated to be 70°F or less. Note that Branch Technical Position-MTEB No. 5-2 Fracture Toughness Requirements in Paragraph B.1.1.(2) states that if suitable information is not available, then an NDTT of 60°F can be assumed for SA-508 Class II forgings. Both SA-336 F1 and SA-508 Class II are low alloy steel forgings and would be expected to have similar toughness properties. There should be no effect due to radiation because of the relatively low radiation levels at the location of the vessel flange.

The stresses as calculated by the General Electric Company (Reference (a)), attached, are about one half the magnitude of the stresses for the Dresden 2 design flange. The stress intensity factors for a 1/4t flaw calculated in accordance with the ASME Section III Appendix G equations are about 60% of the Dresden 2 values. These stress intensity factors are quite low in comparison to the stress intensity factors permitted by Figure G-2210-1 of Appendix G for a 70°F RTNDT.

The preoperational hydrostatic test pressure for Dresden 1 was 1.5 x design pressure of 1250 psig, i.e. 1875 psig. In accordance with Paragraph G-2222(c) of the 1977 ASME B&PV Code, the maximum pressure allowed for RTNDT is 20% of 1875 psig, i.e. 375 psig.

Therefore, in accordance with Paragraph G-2222(c) of the 1977 ASME B&PV Code Section III Appendix G, we request that the minimum vessel stud tensioning temperature of 130°F as stated in Section 3.6.B.4 of the Dresden 1 Technical Specification be changed to read as follows:

> "The reactor vessel head bolting studs shall not be under tension unless the temperature of the vessel shell immediately below the vessel flange is ≥ 70°F and the pressure is ≤ 375 psig. Above 375 psig, the temperature will be ≥ 130°F."

This Technical Specification change has received on-site and off-site review and approval. Please direct any additional questions on this matter to this office.

The current outage schedule calls for tensioning the studs on December 17, 1978 in preparation for a partial pressure hydrostatic test. We request that you expedite the Staff review to allow us to maintain the current schedule.

Pursuant to 10 CFR 170, Commonwealth Edison has determined that this proposed amendment is a Class III Amendment. As such, Commonwealth Edison has enclosed a fee remittance in the amount of $4,000.00.

Three (3) signed originals and thirty-seven (37) copies are provided for your use.

Very truly yours,

Cordell Reed
Assistant Vice-President

attachments

SUBSCRIBED and SWORN to
before me this ____, day
of _____, 1978.

_____
Notary Public

4. The reactor vessel head bolting studs shall not be under tension unless the temperature of the vessel shell immediately below the vessel flange is $>70^{o}F$ and the pressure is <375 psig. Above 375 psig, the temperature will be $>130^{o}F$.

C. Coolant Chemistry

1. The reactor coolant system radioactivity concentration in water shall not exceed 20 microcuries of total iodine per ml. of water.

2. The reactor coolant water shall remain below the following limits until steam flow is established except as specified in 3.6.C.3.

   Conductivity 2μmho/cm
   Chloride ion 0.1 ppm

3. For reactor startups, the maximum value for conductivity shall not exceed 10 μmho/cm and the maximum value for chloride ion concentration shall not exceed 0.1 ppm, for the first 24 hours after placing the reactor in the power operating condition.

4. Except as specified in 3.6.C.3 above, the reactor coolant water shall remain below the following limits with steam flow.

   Conductivity 5μhmo/cm
   Chloride ion 0.5 ppm

2. Neutron flux monitors and samples shall be installed in the reactor vessel adjacent to the vessel wall at the core midplane level. The monitor and sample program shall, as a minimum, conform to ASTM E 185-66. The monitors and samples shall be removed and tested periodically to verify the calculated values of integrated neutron flux that are used to determine the NDTT for Figure 4.6.1.

3. When the reactor vessel head bolting studs are tightened or loosened, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

C. Coolant Chemistry

1. a. A sample of reactor coolant shall be taken at least every 96 hours and analyzed for radioactivity. In addition, when off-gas monitors indicate an increase in release rate of 25% or 5000 μc/sec, whichever is greater, and which is not due to operations in progress, a reactor coolant sample shall be taken and analyzed for radioactivity.

   b. Isotopic analysis of a sample of reactor coolant shall be made at least once per month during power operation.

2. During startups and before steam flow is established, a sample of reactor coolant shall be taken every four hours and analyzed for conductivity and chloride content.

3. a. With established steam flow, a reactor coolant sample shall be taken at least every 96 hours and

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, 2015 SPRING ROAD, OAK BROOK, ILL. 60521
Phone (312) 986-3000

INSTALLATION AND
SERVICE ENGINEERING
DIVISION
WRITER'S DIRECT DIAL NUMBER

G-EBO-8-326

November 29, 1978

Mr. R. C. Lemke
Commonwealth Edison Company
P. O. Box 767
One First National Plaza
Chicago, Illinois 60690

SUBJECT: Stress and Fracture Mechanics Analysis of
Dresden-1 Reactor Pressure Vessel Closure Flanges

Dear Mr. Lemke:

A stress analysis was performed to determine the stresses in the closure flanges, head, and shell at a bolt-up condition of 33,000 psi stud stress. These stresses are shown in the attached figure.

The maximum tensile principal stresses were found to occur on the outside surface and are:

14.5 ksi at the hub to head flange junction
18.1 ksi at the spot face in the head flange hub
14.2 ksi at the hub to vessel shell junction

Mode I stress intensity factors were calculated using the equations in Appendix G of Section III for an assumed 1/4 t flaw and were found to be:

26.7 ksi $\sqrt{in}$ at the hub to head flange junction
30.8 ksi $\sqrt{in}$ at the spot face in the head flange hub
20.8 ksi $\sqrt{in}$ at the hub to vessel shell junction

For comparative purposes, bolt-up stresses were extracted from the B&W stress report for Dresden-2 and are also shown on the attached figure.

A review of the available Dresden-1 files indicated that the original design analyses (in accordance with Sections I and VIII of the ASME code) would not be adequate for an evaluation to today's standards, so it was necessary to perform a new stress analysis of the closure flanges. A computer code for shells of revolution was used which treated the flanges as rings, the hubs as tapered cones, the head as a spherical segment, and the shell as a cylinder. Interaction effects

between the flanges themselves and between the flanges and bolts were neglected (i.e., it was assumed that the bolts were pinned to the flanges and a roller transfers bearing loads between the flanges). These assumptions are slightly conservative on stresses in the flanges, hubs, and shells.

The stress calculations were verified by an independent analysis which used the same major assumptions.

If you have any further questions or comments, please advise.

Very truly yours,

RM Fairfield for

D. L. Butcher
Service Supervisor
Mechanical & Nuclear Services

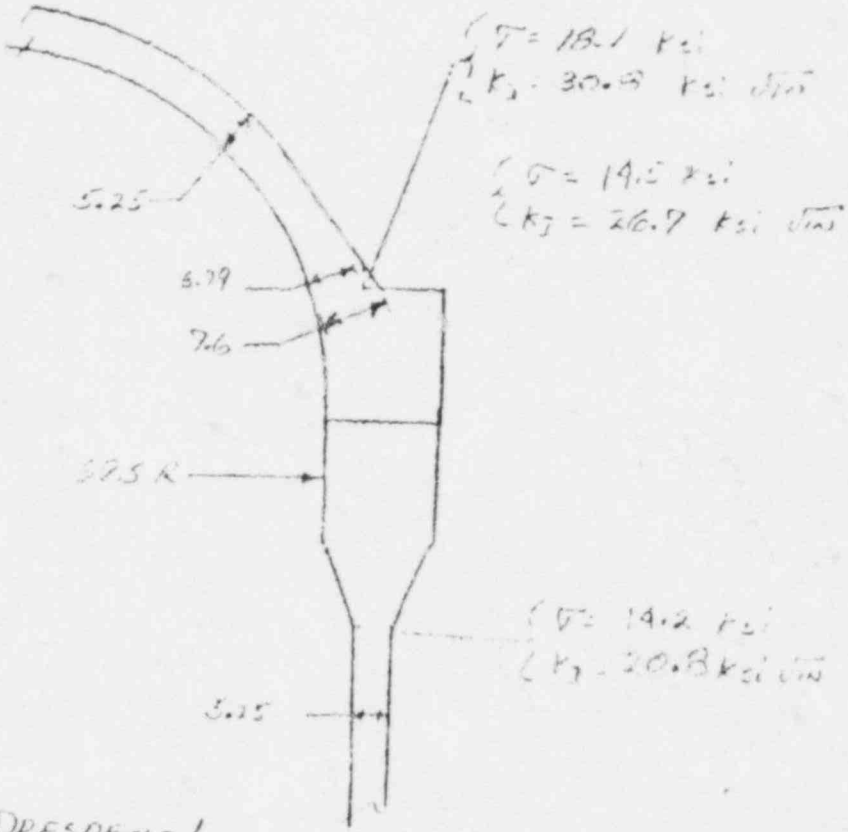
DLB:RMF:eb

Attachment

GENERAL ELECTRIC CO.
Nuclear Energy Division
ENGINEERING CALCULATION SHEET

NUMBER
SUBJECT
DATE 11/27/79
BY
SHEET
OF

(NOT TO SCALE)



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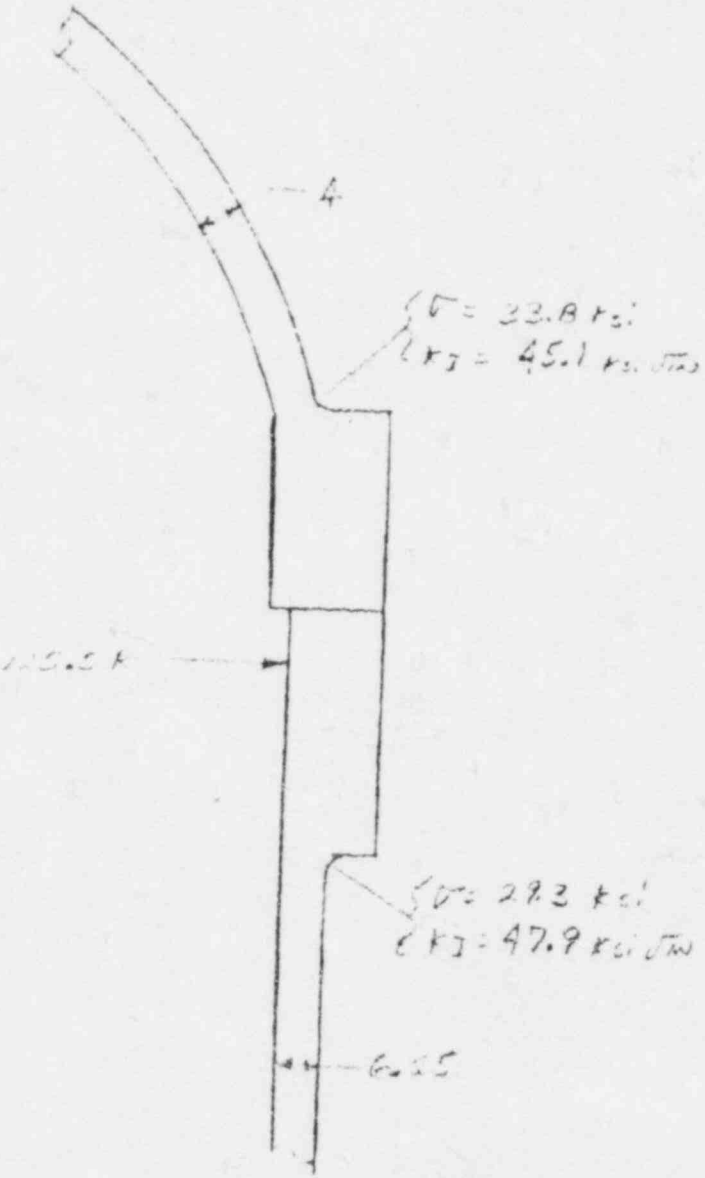

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BELT-UP STRESSES (σ) AND STRESS INTENSITY FACTORS (K_I) FOR D-1 & D-2.