UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
631 PARK AVENUE
KING OF PRUSSIA, PENNSYLVANIA 19406

Docket No. 50-289 NOV 5 1980

Metropolitan Edison Company
ATTN: Mr. R. C. Arnold
Senior Vice President
100 Interpace Parkway
Parsippany, New Jersey 07054

Gentlemen:

This refers to your letter dated October 17, 1980, in response to our letter dated June 10, 1980.

Thank you for providing us the requested information regarding OTSG Auxiliary Feedwater Nozzle Thermal Sleeve/Collar Weld Attachment.

Your cooperation with us is appreciated.

Sincerely,

E. C. McCabe, Jr., Acting for
Eldon J. Brunner, Chief
Reactor Operations and Nuclear
Support Branch

cc:
H. D. Hukill, Director, TMI-1
J. G. Herbein, Director - Nuclear Assurance
R. J. Toole, Manager, Unit 1
J. J. Colitz, Manager - Plant Engineering, Unit 1
R. F. Wilson, Director, Technical Functions
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Ms. Mary V. Southard, Chairperson, Citizens for a Safe Environment

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Post Office Box 480
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Writer's Direct Dial Number

October 17, 1980
TLL 509

Reactor Operations & Nuclear Support Branch
Attn: E. J. Brunner, Chief
U. S. Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, Pa. 19406

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
OTSG Auxiliary Feedwater Nozzle Thermal
Sleeve/Collar Weld Attachment

The following information is in response to your inquiry of June 10, 1980 concerning the above mentioned subject.

1. Design/environmental conditions leading to possible degradation of subject weld integrity. Identification of probable failure mode.

   Injection of condensate or river water into a nozzle thermal sleeve (Figure 1) at steady state temperture will cause thermal shock. Translating flow conditions into stress, transient thermal conditions create peak principal stresses high enough to produce crack initiation in as little as 10 cycles for a temperture difference, between the sleeve and the collar, equal to 500°F. About 100 cycles can be anticipated for a temperature difference equal to 250°F. Each of these estimates is based on the ASME, BPVC, Section III, Design Fatigue Curves. These temperature differences are realizable as a result of short bursts of cold emergency feedwater or more sustained flow using somewhat warmer emergency feedwater.

   One emergency feedwater usage represents one thermal fatigue cycle regardless of how many times feedwater was called for during the emergency event or what the feedwater temperature was. The basis for this assumption is that once the thermal sleeve was thermally shocked, the peak stress field is constant.

2. Interim action taken, if any.

   We will partially drain the OTSG and inspect Z-axis nozzles. If cracking is noted on these nozzles, the remainder will also be inspected and weld repaired as required. Z-axis nozzles were inspected in 1977 and found free of cracks. Only two thermal cycles have been recorded since these inspections.

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3. Possible long term modifications.

No long term design modification is anticipated at this time. Z-axis AFW nozzles will be removed and blanked due to concern for potential OTSG tube inspection lane flow impingement.

4. Safety consequences

B&W evaluation (TMI-80-053 dated March 17, 1980) of the auxiliary feedwater thermal sleeve/collar weld attachment failure finds that decay heat removal is not impaired if the nozzle is short of the shroud due to either assembly tolerance or postulated backing into the external piping elbows after thermal sleeve separation.

This B&W evaluation does not include the safety consequences of water filling the steam lines.

The safety consequences of static and dynamic conditions resulting from water accumulating in the main steam line can be addressed in terms of the following terms:

a. Unbalanced Forces at Elbows

Auxiliary feedwater leakage may result in moisture carryover into the main steam lines. While the mass of the water content may be low (8 1/2% leakage, maximum), its velocity is high resulting in high unbalanced forces. Steam hammer pipe restraints will react the unbalanced forces.

b. Filled Main Steam - Deadweight and Increased Pressure

If the feedwater fills the main steam lines, the additional deadweight can be accommodated by the existing supports. Internal pressure in the main steam line will increase because the feedwater pressure exceeds the steam pressure. The main steam lines are shown to be structurally sound by hydro test to 1.5 times the design pressure.

c. Discharging of Safety Valves

Due to increased pressure identified in Item 2, above, the spring loaded safety valves can be expected to open resulting in higher than normal discharge forces due to pressure and density effects. Margin is provided via the thermally compensated elbow supports. Even if the nominal safety valve reactions are exceeded the thermally compensated supports will protect the structural integrity of the main steam piping. Each of the thermally compensated supports was designed for 55 kips of unbalanced dynamic force as per USAS B31.1-1967.

d. Seismic Stresses

For a full main steam line, it is likely that the resulting seismic stresses will exceed the allowable values of USAS B31.1-1967. However, the pressure boundary may still be preserved due to the existence of steam hammer restraints and pipe deflection limit devices such as rupture restraints and concrete penetrations. Furthermore, simultaneous occurrence of the subject overfill and seismic event are beyond the B&W safety concern and has a very low probability of actual realization.

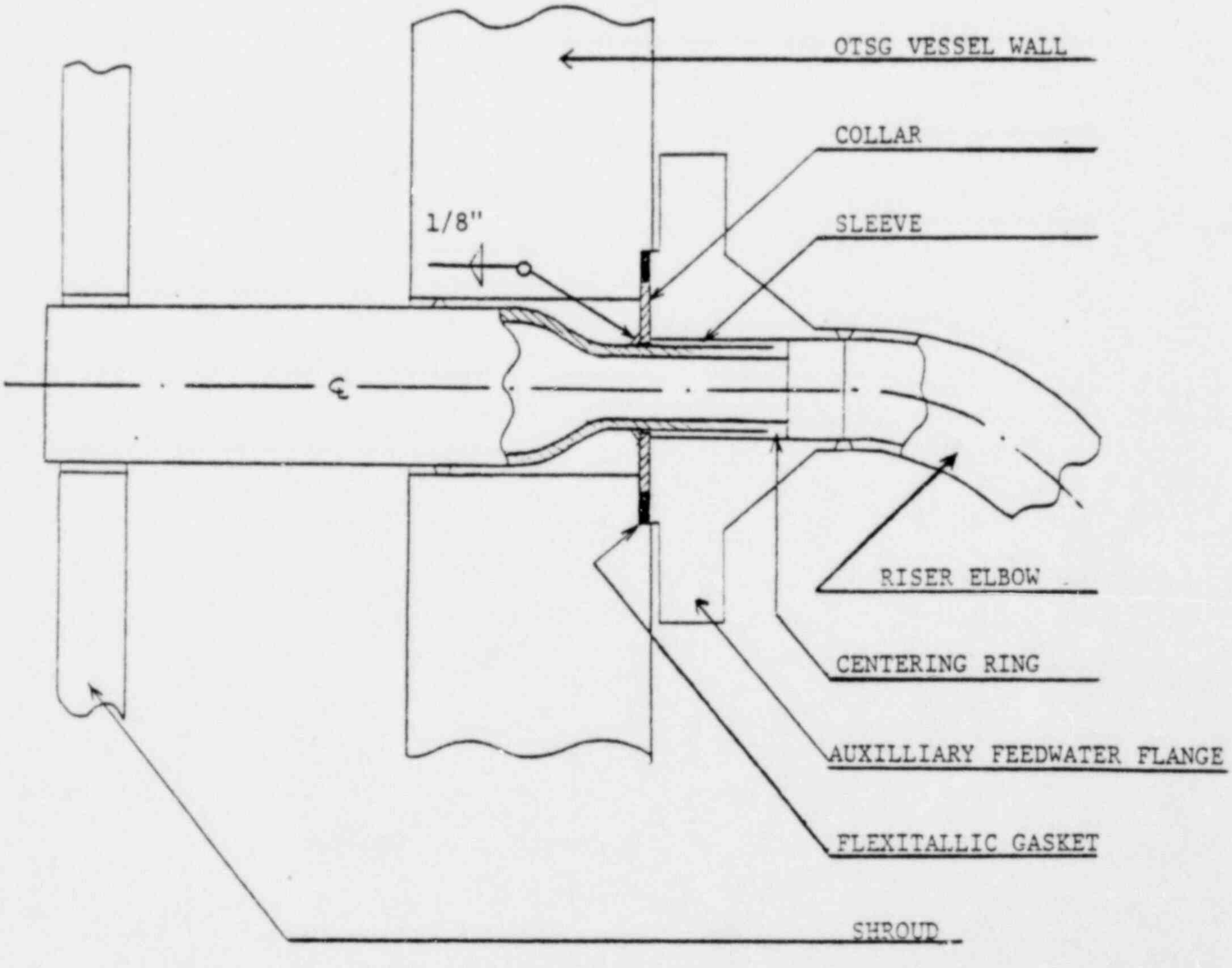
Sincerely,

H. D. Hukill
Director, TMI-1

HDH:DGM:hh

Attachment

cc: J. T. Collins
B. J. Snyder
R. W. Reid
B. H. Grier
D. DiIanni
H. Silver



AUXILLIARY FEEDWATER NOZZLE/COLLAR/THERMAL SLEEVE CONFIGURATION

FIGURE 1