DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

November 18, 1980

TELEPHONE: AREA 704
373-4083

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. B. J. Youngblood, Chief
Licensing Projects Branch No. 1

Re: McGuire Nuclear Station
Docket Nos. 50-369 and 50-370

Dear Mr. Denton:

Mr. R. L. Tedesco's letter of October 8, 1980 requested that Duke Power provide information regarding the holddown assembly springs at McGuire Nuclear Station. The requested information is contained herein and in the attached safety evaluation prepared by Westinghouse.

During an April 1980 first cycle refueling of a non-domestic Upper Head Injection (UHI) reactor, difficulty was encountered in engaging the holddown assembly of a non-fuel bearing component. Close inspection of the holddown assembly revealed that the spring beneath the yoke was broken, allowing the yoke to tilt such that the handling tool finger would not engage. Inspection of all holddown assemblies disclosed that 31 of the total 132 assemblies contained springs that were either cracked or broken. An inspection at a second foreign UHI plant revealed 9 cracked or broken springs out of 132.

The McGuire holddown assembly springs for non-fuel bearing components are similar to those used in the foreign UHI reactors. Duke has made arrangements with Westinghouse to substitute holddown assembly springs of a new design on all McGuire non-fuel bearing components which will be used for more than one cycle of operation (thimble plug and secondary source assemblies). The McGuire non-fuel bearing components which will only be used for the first cycle of operation (burnable poison and primary source assemblies) will utilize the existing holddown assembly springs.

B001
S 1/1

A 8011250261

Westinghouse has performed a safety evaluation (attached) which demonstrates that the operation of one cycle with the existing holddown assembly springs does not constitute a safety problem. This safety evaluation also describes Westinghouse's redesign and supportive testing of the holddown assembly spring and demonstrates that the potential for future failures has been minimized or eliminated. The results of Westinghouse's safety evaluation of the most limiting practical case for broken springs have already been documented as the result of an NRC inspection audit of the Westinghouse Safety Review Process (reference June 5, 1980 letter from NRC (Uldis Potapovs, Chief, Vendor Inspection Branch) to Westinghouse Electric Corporation (Attention: W. M. Jacobi, General Manager NTD); Subject: May 12-16, 1980 QA Inspection Audit of Monroeville Facility).

Duke Power Company and Westinghouse have concluded that operation with a limited number of the old holddown assembly springs and the balance of new holddown assembly springs does not constitute a safety question under the conditions of 10CFR §21, 10CFR §50.55 and Criterion 10 of Appendix A of 10CFR §50.

Very truly yours,

William O. Parker, Jr.

THH:scs
Attachment

SAFETY EVALUATION OF UHI HOLDDOWN ASSEMBLY SPRINGS

A. OLD HOLDDOWN SPRING

Westinghouse has examined the consequences of operation with broken springs and has concluded that operation with springs of the old design (See Figure 1) in non-fuel bearing components for one cycle and application of the new spring design for other components do not constitute a safety concern. The evaluation considers a most limiting practical case of spring breaks of the type generally observed in the examination of spring breaks in the foreign UHI reactor or all springs broken near the center with the two parts intertwining with each other.

The following summarizes the basis for the above conclusion:

1. Loose Parts Being Released to the System

   There is no visual evidence of any loose parts. Breaks as reported from examination of an affected foreign UHI reactor (plant A) were clean with no evidence of fragmentation. The spring design is such that the end coils are inactive and the close tolerances with the hub of the holddown assembly ensures the spring ends on either side of the observed breaks are fully captured.

2. Failure Potential for Unrestrained Components

   Fatigue analyses were performed by Westinghouse to evaluate the effects of vibration. The results indicated that there is adequate margin to the endurance limit for austenitic stainless steel used in the BP rodlets and plugging devices. This is supported by the observations from plant A where no rodlets or thimble plugs were observed to be detached from the 31 assemblies with failed springs. TV tapes during an earlier shutdown in plant A confirmed some spring failures were found to exist after 3000 hours of operation. Therefore, a substantial operating period had passed and produced no rodlet detachments.

3. Other Failures Resulting From Vibration

   Excess thimble wear is not considered a problem due to the close thimble-rodlet fit over a long length which results in a limited rodlet motion. Any wear would be superficial and would not be in a location so as to impair structural integrity.

4. Loss of Spring Load

   (a) Change in Thimble By-Pass Flow

   The effect on by-pass flow was evaluated for the conservative condition in which all core component holddown springs were failed and lifted the maximum amount expected. Analysis showed this to result in virtually no change in the design by-pass flow since the larger diameter of the thimble plug or rodlet remains inserted.

(b) Change in Pressure Drop

The conservative case of the effect of all base plates lifting has been evaluated. The core pressure drop was confirmed to be within the measurement uncertainties associated with the core outlet loss coefficient such that no measurable effect on core pressure drop will be experienced.

(c) Axial Repositioning of Burnable Poisons

The axial displacement of burnable poisons for the McGuire unit is nominally 2.1 inches from the bottom of the active fuel. The largest possible additional axial displacement for a baseplate lifting is 0.915 inches. Parametic studies have been performed by Westinghouse, which show that this limited axial repositioning has no significant impact on safety related parameters.

Local power distributions at the bottom of the active fuel length were also evaluated for potential burnable poison displacement. In this case the hot channel enthalpy rise, $F_{\Delta H}$, and radial peak F_{xy} used in the F_Q evaluation was also evaluated, and Westinghouse has confirmed the consequences to be negligible. Furthermore, F_Q and $F_{\Delta H}$ are monitored to verify that the Technical Specifications are satisfied.

(d) Reduction in UHI Inlet Flow Area

The most limiting practical case is when springs break and springs intertwine. In considering the dimensional displacements and resultant effect on UHI flow area, the safety evaluation confirms that the minimum flow area is through the UHI flow column itself. Therefore, the required UHI delivery would not be adversely affected.

Although highly unlikely, a more adverse break assumption than the "most limiting practical case" was evaluated. This more severe case is assumed to totally block flow from UHI column(s).

The effect of total blockage of a single column was evaluated and determined to be negligible. Cooling provided by the UHI system during blowdown phase of LOCA would be from the upper plenum or crossflow from neighboring assemblies. A larger quantity of 10 starved assemblies evaluated for plant A reflected an increase in PCT of approximately 36°F. Due to the very low probability and effects of total UHI column flow blockage, it is concluded that the LOCA PCT 2200°F limit will not be exceeded.

B. NEW HOLDDOWN SPRING

Westinghouse undertook a design and testing effort to revise the UHI holddown spring design in order to preclude failures such as those identified. This new design is shown in Figure 2 and incorporates the following features. Mean stress levels have been reduced and material grain size has been defined for better fatigue properties. Compared to the old design, the spring wire diameter was decreased from 0.33 to 0.270 inches and the free length decreased from 4.51 to 3.97 inches. These changes provide reduced stresses while maintaining adequate holddown force. The straight helical design with evenly spaced coils reduces the sensitivity of the spring to vortex shedding. Care was taken to ensure that the new spring fundamental frequency was not within the range of the reactor coolant pump pulsing frequency, so that the effect of this source of excitation is reduced. Inconel 718 was selected as the material, as with the original spring, since it combines high strength, corrosion resistance and fatigue life with low irradiation relaxation.

The spring design continues to retain the close fit with the hub of the holddown device so that even in the unlikely case the spring should break, the ends would be retained and the safety considerations discussed for the old design would continue to apply.

Flow delivery tests for UHI support columns were performed by Westinghouse to confirm the adequacy of the new design. Flow rate variations between a UHI column with a holddown assembly and one with no assembly resulted in variations of approximately 1 percent. Cases evaluated bracketed the flow rates which would occur with the new spring design and showed that the effect of the new springs are negligible.

Flow distribution tests were also performed. Although there was some variation in distribution, the minimum flow per unit flow channel in UHI delivery range exceeded the minimum required by a substantial amount.

Westinghouse tests have confirmed that the relationship between UHI plant hardware and the heat transfer used to develop the UHI model is still valid. The present UHI model was therefore determined to be applicable, and the use of the new spring results in no change in the PCT.

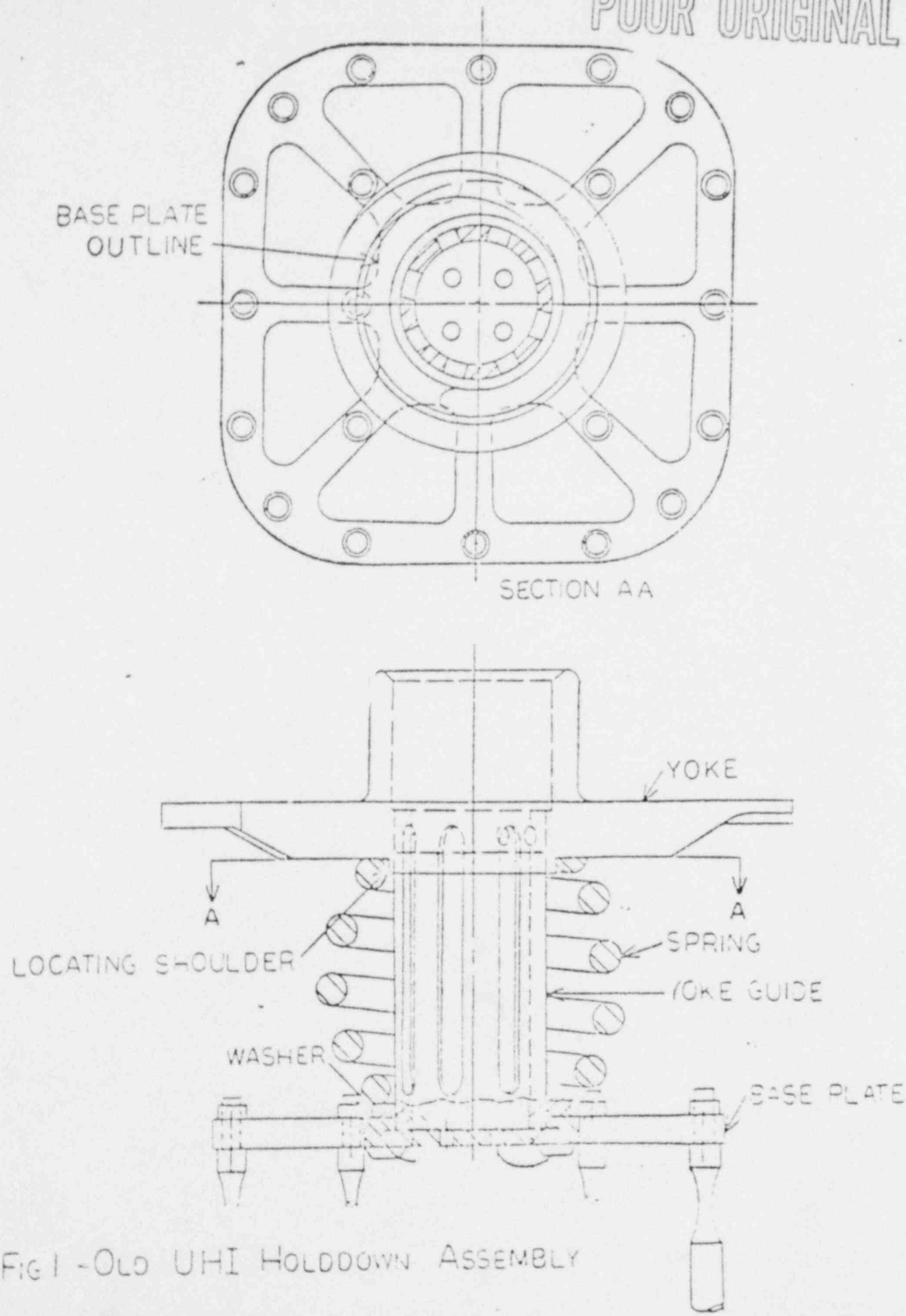

Fig 1 - Old UHI Holddown Assembly

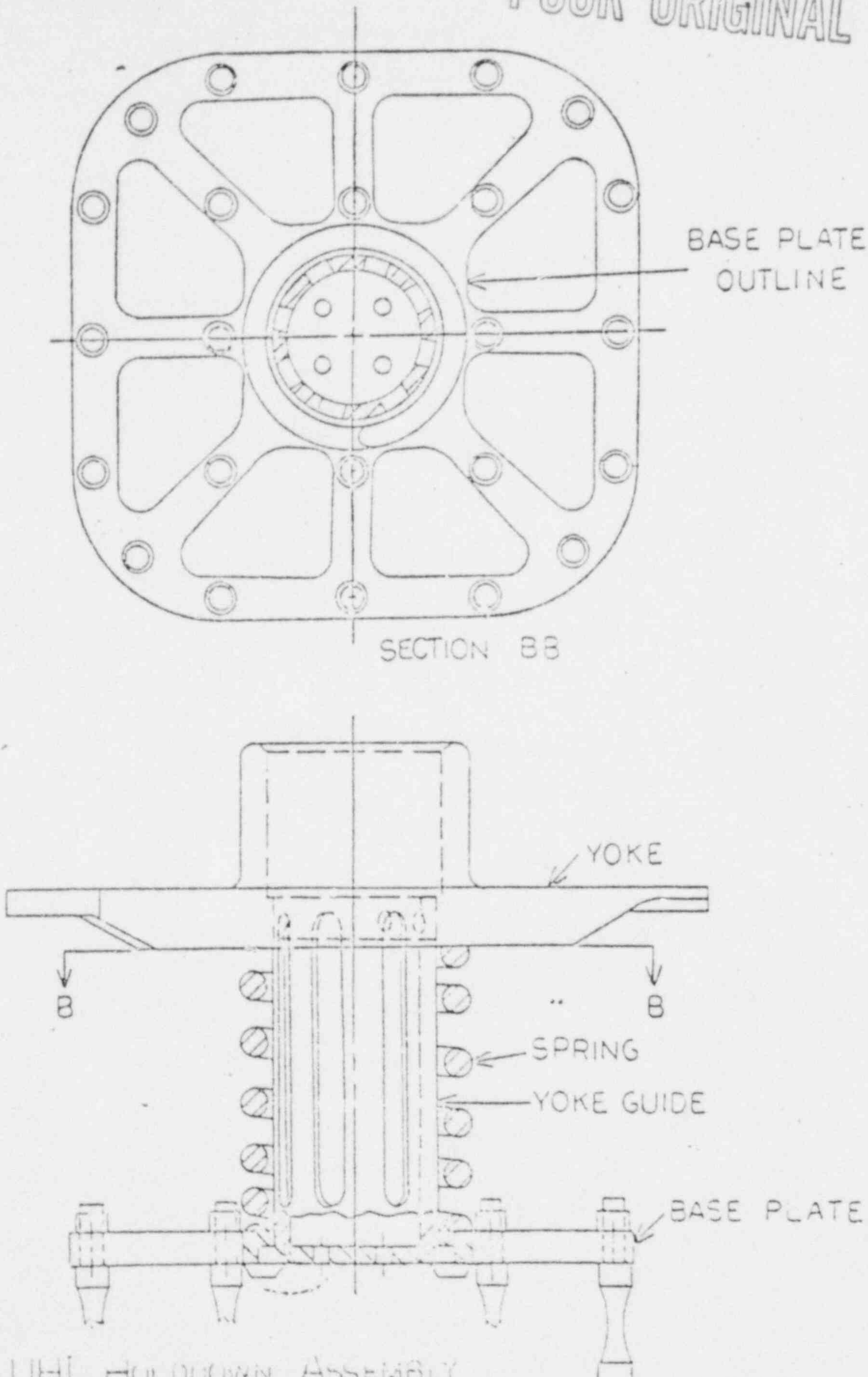

Fig 2 - New UHI Holddown Assembly