TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

5N 157B Lookout Place

JAN 08 1988

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) - ENHANCED CALCULATIONS FOR PLATFORM THERMAL LOADING CONDITIONS

During the review of calculations related to thermal growth of platforms, NRC verbally requested that additional calculations be provided regarding the magnitude and nature of the thermal stresses for a representative structure.

The structure shown on 48N937-1 was selected as representative because, of the structures that have been evaluated, it is the most complex with regard to thermal loading and offers the appearance that thermally induced stresses could be a concern. It is a structure made up of two platforms at different elevations that are interconnected by column framing. The platform framing is composed of relatively small steel members varying in size from W8X20 to W12X36.

Corrective action identified by Significant Condition Report (SCR) SCRSQNCEB86103 was performed in January 1987 to evaluate platforms that contained members that appeared to be constructed in such a manner that thermal movement was constrained. In that evaluation, certain connection modifications on the representative structure were identified to release thermally constrained connection locations. These modifications were constructed in June 1987.

To qualify the effects of thermally induced loading on the as-modified structure, a linear elastic analysis was completed (Calculation SCG1S81X7). The structure was subjected to a temperature rise of 216 degrees Fahrenheit, which represents the difference between the operating temperature inside containment and the design basis accident temperature. The resulting member stresses and connection reactions were reviewed to determine the worst case locations. The magnitude of those thermal stresses is as shown on the enclosures. The maximum flexural stress because of thermal is 15 kips per square inch (k/in^2). The critical connection locations for the thermal condition were determined to be at concrete expansion anchors. The concrete anchor evaluations indicate that the anchors meet design criteria requirements.

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Thermally induced stresses are generally secondary and self-limiting in nature; therefore, they are not additive to the other stresses in the structure. However, for comparative purposes, thermal stresses were added to the primary stresses such as deadload, piping support reaction loads, and seismic inertia loads. The results indicate that, at only one location shown in the enclosed attachment A, the combined maximum primary and secondary stresses would exceed the elastic yield stress of the material. The magnitude of this combined stress is 43.75 k/in^2 in minor axis bending and 1.87 k/in^2 in major axis bending. It is postulated that, since some local yielding at extreme corner fibers of the member flange would take place, some thermal stress relief would occur; and the net resulting primary stresses will be within elastic allowable criteria. For this condition, the ability of the section to develop the plastic moment capacity was ensured because the member meets the compact shape criteria and the maximum unbraced length requirement. Similarly, the connections for the member were checked to ensure that the plastic section capacity could be developed if required.

In accordance with NRC's request, the extreme corner fiber strain for the combined primary and secondary stress was calculated to be 0.001585. Yield strain for A36 steel is 0.00124. The ratio of the calculated strain to yield strain is 1.28.

Therefore, it is concluded that, based on the calculated maximum member stresses and relatively low ratio of calculated strain to yield strain, the demonstrated ability of the end connections of the critical member to resist forces created by the postulated thermally induced stresses, and the demonstrated ability of the member to develop full plastic capacity, the representative structure is adequate to withstand thermally induced loads and stresses and will continue to perform its safety-related functions in the event of design basis occurrences.

If you have any questions, please telephone M. R. Harding at (615) 870-6422.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R Gridley

R. Gridley, Director
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Enclosures
cc: see page 3

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Enclosures

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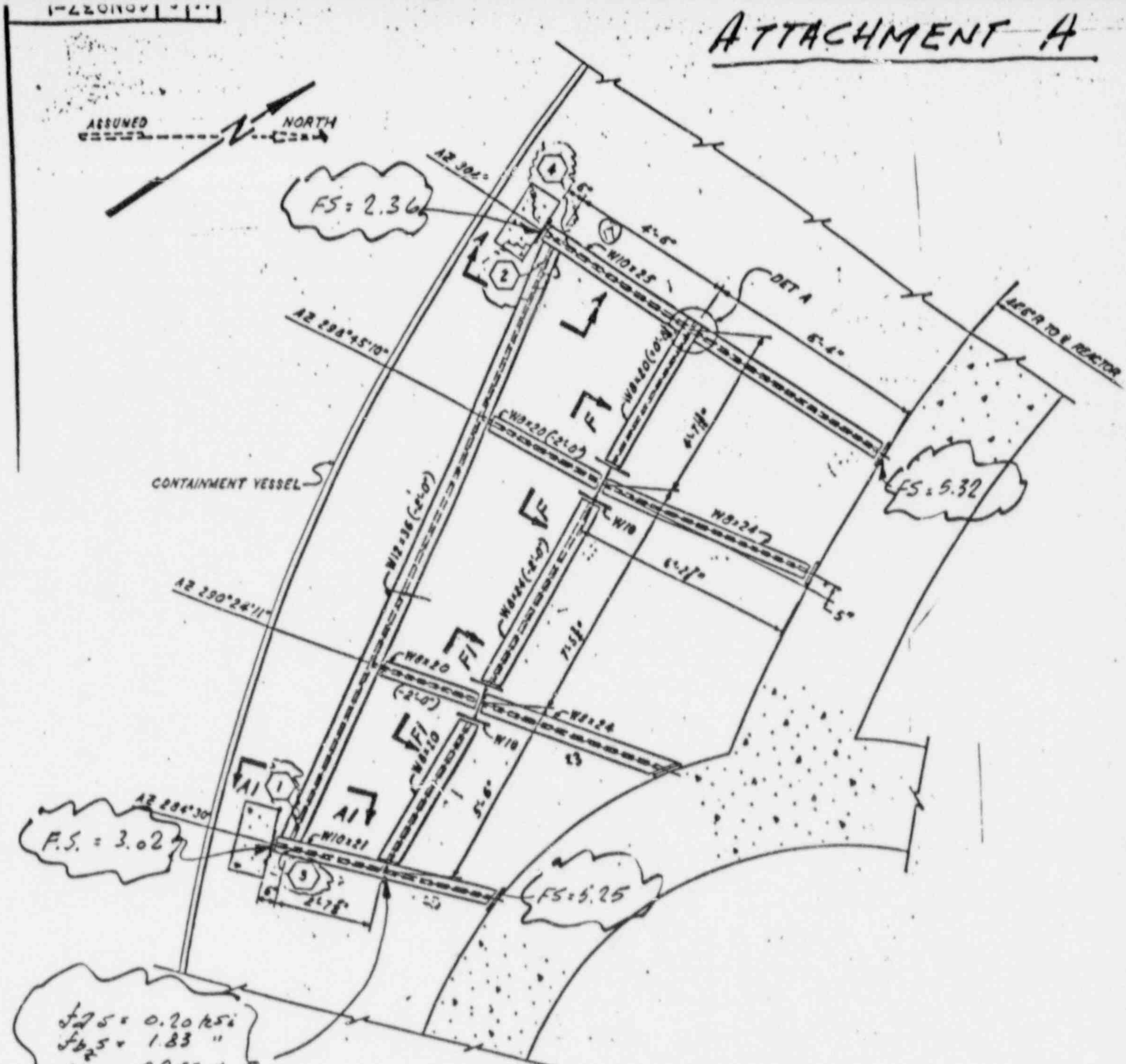
ENCLOSURES

Attachment A - Stresses at PLAN-EL 705'-0"

Attachment B - Stresses at PLAN-EL 711'-1"

ATTACHMENT A



PLAN-EL 705'-0"
T/8 EL 705'-0" (EXCEPT AS NOTED)
UNIT 1 (AS SHOWN)
UNIT 2 (OPP H)
AZIMUTHS SHOWN ARE FROM ℄ OF REACTOR BLDG

LEGEND:

F.S.	FACTOR OF SAFETY FOR SSD ANCHORS
f_{as}	AXIAL STRESS - SEISMIC
f_{bzs}	MAJOR AXIS FLEXURE STRESS - SEISMIC
f_{bys}	MINOR AXIS FLEXURE STRESS - SEISMIC
f_{at}	AXIAL STRESS - THERMAL
f_{bzt}	MAJOR AXIS FLEXURE STRESS - THERMAL
f_{byt}	MINOR AXIS FLEXURE STRESS - THERMAL

ATTACHMENT 1D