From: "BENNETT, STEVE A" <SBENNE2@entergy.com>
To: "'Tom Alexion'" <twa@nrc.gov>
Date: 5/16/05 1:02PM
Subject: Draft Response to ANO-1 RAI on Polar Crane Tripod Lic Amendment

Tom,

This is the proposed Entergy response to the RAI received on the ANO-1 Tripod License Amendment.
Pass on to reviewer

Sorry it took awhile!

Steve Bennett
NSA - Licensing
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Subject: Draft Response to ANO-1 RAI on Polar Crane Tripod Lic Amendment
Creation Date: 5/16/05 1:01PM
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ANSWERS TO THE REQUEST FOR ADDITIONAL INFORMATION

SUBJECT: UPRATING OF THE TRIPOD SPECIAL LIFTING DEVICE ARKANSAS NUCLEAR ONE, UNIT 1

Q1. In the last paragraph on Page 2 of Attachment 1, the licensee states that the resultant load factor is 0.02, which is well below, the 0.15 minimum dynamic factors; therefore, Entergy is applying a dynamic factor of 0.15 to the static load. **Please provide the guidance used in determining the applicable dynamic load factor within Crane Manufacturers Association of America 70-1983, Specifications for Electric Overhead Traveling Cranes, and indicate whether the applied dynamic factor is consistent with the guidance.**

A1. The guidance in CMAA 70 is to use the greater of the two values as a dynamic load factor:

1. Value calculated based on Hoist Speed, and
2. Minimum value = 0.15

As stated in the 9th line of the same paragraph, the *hoist load factor* 0.005 (Ref. CMAA 70-1983 – Section 3.3.2.1.1.4.2) is multiplied by the hoisting speed of 4fpm (ANO-1 Polar Crane hoisting speed) to arrive at the resultant load factor of 0.02 (0.005*4=0.02).

The calculated dynamic load factor, 0.02 is less than the minimum dynamic load factor of 0.15.

Entergy is applying a minimum dynamic load factor of 0.15 to the static load to calculate the dynamic load.

Q2. On Page 3 of Attachment 1, the licensee provided a list of the equations used to calculate the allowable stresses. The licensee states that these allowable stresses are based on the allowable stresses provided in American National Standards Institute N14.6-1978 and in American Society of Mechanical Engineers Code, Section III, and Paragraph NF-3322-1. It is not clear to the staff how these equations were developed. Please clarify how you arrived at the numbers listed on your equations (i.e., the 7 bullets under "Given").

A2. The ANSI 14.6 guidance is to use 1/3 of the Yield Strength or 1/5 of the Ultimate Tensile Strength, whichever is more limiting.

This allowable from above guidance is considered as Allowable Tensile Stress (F_t).

There is no further guidance given to calculate other Allowable like Shear Stress, Bearing Stress, Tensile stress at the pin holes, Compressive Stress etc.

Hence the various coefficients are calculated with the help of ASME Code. For example the Allowable Shear Stress is 2/3 of the Allowable Tensile Stress.

Detailed explanation for the factors used for various Allowable Stresses are as follows:

Allowable Tensile Stress is equal to "F_t" (which is the minimum of 1/3 of S_y or 1/5 of S_u).

The ASME Allowable Shear Stress is $0.4S_y$ which compares to the ASME

Allowable Tensile Stress of $0.6S_y$. The ratio of these two allowable stresses is 2/3 (=0.4/0.6). Hence, for the purpose of this calculation, the Allowable Shear Stress is considered as 2/3 of the Allowable Tensile Stress (F_t) or lesser of $(2/3)(1/3)S_y$ and $(2/3)(1/5)S_u$. Therefore, the same conservative method used to determine the Allowable Tensile Stress is applied in determining the Allowable Shear Stress for this calculation.

In a similar manner, the ASME Allowable Bearing Stress is $0.9S_y$. The ratio of Allowable Bearing Stress to the Allowable Tensile Stress is 3/2 (=0.9/0.6). Hence, the Allowable Bearing Stress is considered as 3/2 of F_t or the lesser of $(3/2)(1/3)S_y$ and $(3/2)(1/5)S_u$. Therefore, the same conservative method used to determine the Allowable Tensile Stress is applied in determining the Allowable Bearing Stress for this calculation.

The ASME Allowable Tensile Stress at the pin is $0.45S_y$ which is 3/4 (=0.45/0.6) of the Allowable Bending Stress ($0.6S_y$). Hence, the allowable Tensile Stress at the pin is considered as 3/4 of F_t or the lesser of $(3/4)(1/3)S_y$ and $(3/4)(1/5)S_u$. Therefore, the same conservative method used to determine the Allowable Tensile Stress is applied in determining the Allowable Tensile Stress at the pin for this calculation.

The ASME Allowable Compressive Stress is $0.66S_y$ which is 1.1 (=0.66/0.6) of the Allowable Bending Stress ($0.6S_y$). Hence, the allowable Compressive Stress is considered as 1.1 of F_t or the lesser of $(1.1)(1/3)S_y$ and $(1.1)(1/5)S_u$. Therefore, the same conservative method used to determine the Allowable Tensile Stress is applied in determining the Allowable Compressive Stress for this calculation.

The approach used in the calculation is similar to multiplying the design load by 3 (or by 5) and comparing the results with ASME allowables.