Ma, John

From: Ma, John NRC
Sent: Friday, August 06, 2010 1:56 PM
To: 'hou chunlin'
Cc: Thomas, Brian; Patel, Pravin; Tegeler, Bret
Subject: FW: One question from Chunlin（China NNSA）

Chunlin:

Before I answer your question, I should introduce two new terms: viscous damping and hysteric damping so that you will have a better understanding on damping. Damping in R.G. 1.61 and in NUREG/CR-6919 is called viscous damping – the damping force is proportional but opposite to the velocity of the mass. Pistons, such as shock absorbers in cars, uses fluid – viscous to damp out high responses. Structures do not have viscous damping. Structural damping mainly from molecular friction of materials - hysteric damping – area within hysteric cures of cyclic testing, such as the cyclic tests Westinghouse did for the SC modules. The reason for choosing viscous damping for structural dynamic analysis is its simplicity, because the damping force can be represented by a damping constant multiplied by the mass of the structure. Hysteric damping is real and can be converted into viscous damping. Another important part of structural damping is from connection slippage and yielding, but the damping value is difficult to assess and it is usually from tests.

From the above discussion you should know now that the treatment of damping in structural dynamic analysis is a rough estimate. Judgment is required as to whether the assumed viscous damping value for the structure is adequate or not. A person has to have sufficient knowledge in structural dynamic and design in order to make that adequate judgment.

I agree with your assessment on the inconsistency of the damping issue between the R.G.1.61 (yellow underline) and NUREG/CR-6919 (Red underline) and commend you for that ability to notice the inconsistency. Recognize that R.G. and NUREG are not NRC requirements and they are not necessary right. My assessment on your yellow and red underlines follow.

The content in yellow underline is theoretically incorrect. However, the lack of re-analysis, as a result of that statement, usually results in under stress values around 10%, and this amount of undervalue should not be a concern if other important factors exist, such as the geometry of the structure is not irregular and the selected structural systems that resist the gravity and seismic loads have redundancies. The time and expense for re-analysis may not be justified, and this issue is usually taken care in the design stage by adding 10% to 15% stress values by more experience engineer who is in charge of the project. It is important to recognize that analysis is simply a means to obtain some basic numbers for design. A good and successful structure is in the design and not in analysis. Therefore, a good structural engineer must invest a lot of time in the knowledge of structural design. The reason why I need more accurate analysis for the AP1000 shield building mainly because it has a very irregular configuration (SC/RC connections and the connections between the auxiliary building roof to the shield building wall) and has no redundancy and with a heavy PCS tank load on the roof that causes P-delta effect. Earthquake experience has indicated that structures with irregular configurations had failed even they were well designed. This is because our analytical tool for structures with irregular configurations are not good, especially with respect to torsion that irregular configurations would cause. The content in Red underline is theoretical correct. Whether a re-analysis is required or not again depends on judgment.

My grandsons are here for three weeks and I'll take them for one week vacation in the mountain.

J118

From: Thomas, Brian
Sent: Friday, August 06, 2010 9:40 AM
To: Ma, John
Subject: FW: One question from Chunlin (China NNSA)

John,
Do you have a "quick, off the top of your head" response for Chunlin on her question below?

From: hou chunlin (b)(6)
Sent: Friday, August 06, 2010 8:59 AM
To: Thomas, Brian
Subject: Re: One question from Chunlin (China NNSA)

Ex 6

Hi, Chief

I have one question, need you help.

Please give me some explanation.

Thanks

Regards

Chunlin

---------- Forwarded message ----------
From: **hou chunlin** (b)(6)
Date: Fri, Aug 6, 2010 at 5:15 PM
Subject: One question from Chunlin (China NNSA)
To: "Tegeler, Bret" <Bret.Tegeler@nrc.gov>

Ex. 6

Bret,

How are you going ? I am Chunlin.

When I review the Rev.15 SB design, I have one question about the damping ration, as we know, RG1.61 Rev.1 "DAMPING VALUES FOR SEISMIC DESIGN OF NUCLEAR POWER PLANTS", In this Guide, Page 5, When menion the the Special Consideration for In-Structure Response Spectra Generation, it describes "For structural evaluation, this is not a concern, because the stresses resulting from the use of damping-compatible structural response will still be less than the applicable code stress limits, as defined in Section 3.8 of NUREG-0800 [Ref. 15]."

However, In NUREG/CR- 6919, In page 6, They tell" 2) If the significant stresses due to load combinations that include SSE are less than 80% of the applicable code stress limits, then using SSE damping levels may under-predict the structure's response to seismic loads. In this case, [redacted] and development of in-structure response spectra should be based on a seismic analysis utilizing the OBE damping values specified in Table 2."

There is some difference between RG1.61 and NUREG/CR-6919 on requiring Structural evaluation,If you have time and much more information on this thing, Please give me some suggestions.

Thanks!

Best of you !

Chunlin

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