

**Ma, John**

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**From:** Ma, John *nrc*  
**Sent:** Tuesday, July 13, 2010 11:33 AM  
**To:** 'hou chunlin'  
**Subject:** RE: I really need you help, Teacher Ma.

Chunlin:

The answer is what I had already provided to you, and let me copy it again below:

What percentage (%) of  $I_g$ , as well as damping values, should be used for the analysis of a structure depends on the stress level that structure is expected to experience at the design earthquake levels. Therefore, it is the responsibility of the designer to choose an adequate % of  $I_g$  for the structural system in the stage of conceptual design, and later demonstrate that the % of  $I_g$  that he/she had selected is adequate for the final design. We have SSE (Safe Shutdown Earthquake) and RLE (Review Level Earthquake) levels in USA. Stress level in a structure subjected to RLE would be greater than that of SSE. Therefore, there would be more concrete cracking in the structure subjected to the RLE than that of SSE. Consequently, the % of  $I_g$  for RLE should be less than that of SSE.

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**From:** hou chunlin (b)(6) EFC  
**Sent:** Tuesday, July 13, 2010 11:27 AM  
**To:** Ma, John  
**Subject:** Re: I really need you help, Teacher Ma.

Teacher Ma:

Thanks!

I will find more information to understand the two issues.

The last question, For the RC wall, Can we use the  $0.8I_g$  to consider the concrete crack?

Regards

Chunlin

On Tue, Jul 13, 2010, at 11:07 PM, Ma, John <John.Ma@nrc.gov> wrote:

accordance with the Freedom of Information Act  
Exemptions 6  
FOIA/PA 2010-0290

J/16

Chunlin:

I am glad to hear that you are fine. I am preparing information to brief Gary, our Office Deputy Director, this week. Since you have a need and I am busy, let me briefly answer your two questions below:

1. With respect to torsion, the analysis methods, including computer codes, are difficult to perform for a complex and unsymmetrical geometry (AP1000 SC and RC walls plus connections to the auxiliary building roof and walls) with irregular boundary conditions (SC/RC connections) and the adequacy of the analysis result is difficult to verify in the elastic range, and no analysis methods is available for torsion in the inelastic region to the best of my information. WEC assumed that the SC/RC connections were non-existence and did not model the stiffness of SC/RC connections into the ANSYS model. The amount of changes in seismic response (frequency, member force, and deformation), as a result of this neglect, is unknown until analyses are performed .
2. With respect to the  $0.8E_c$  subject, it is technical incorrect to say  $0.8E_c$ . The correct way is  $0.8I_g$  ( $I_g$  is the gross moment of inertia of a cross-section assuming that concrete is uncracked). What percentage (%) of  $I_g$ , as well as damping values, should be used for the analysis of a structure depends on the stress level that structure is expected to experience at the design earthquake levels. Therefore, it is the responsibility of the designer to choose an adequate % of  $I_g$  for the structural system in the stage of conceptual design, and later demonstrate that the % of  $I_g$  that he/she had selected is adequate for the final design. We have SSE (Safe Shutdown Earthquake) and RLE (Review Level Earthquake) levels in USA. Stress level in a structure subjected to RLE would be greater than that of SSE. Therefore, there would be more concrete cracking in the structure subjected to the RLE than that of SSE. Consequently, the % of  $I_g$  for RLE should be less than that of SSE.

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From: hou chunlin (b)(6)  
Sent: Tuesday, July 13, 2010 8:46 AM  
To: Ma, John  
Subject: I really need you help, Teacher Ma.

Dear Teacher Ma:

How are you?

I am fine. As I had told you, in this period, I have been busying on reviewing Rev.15 AP1000 SB design/analysis.

In this process, I had given two issues on SB that I had learn from you, But our experts did not think so.

I really need you help me.

one is torsion of SB, In the SRP3.7.2, they was described as "Methods Used to Account for Torsional Effects. An acceptable method to account for torsional effects in the seismic analysis of Category I structures is to perform a dynamic analysis that incorporates the torsional degrees of freedom. An acceptable alternative, if properly justified, is the use of static factors to account for torsional accelerations in the seismic design of Category I structures. To account for accidental torsion, an additional eccentricity of  $\pm 5$  percent of the maximum building dimension shall be assumed for both horizontal directions. The magnitude and location of the two eccentricities is determined separately for each floor elevation."

For the dissymmetry SB, you had mentioned that WEC did not consider the torsion, Please explains me, the torsion means torsional effects or accidental torsion, how to do consider the torsion in the SB design/analysis.

The second issue is using 0.8Ec to consider the concrete crack, it is too high for the SC model. Do you think that it is also have some effects on the SC wall? In China, all of experts who had been employed by NNSA thought that use 0.8Ec is not a big problem. 0.8Ec is right, I do not think so. What is your opinion?,

Please give me some ideas and related informations on this two issues.

Best of you!

Chunlin

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