QUESTIONS AND ANSWERS RELATED TO THE SUZI-SAEE LECTURE BY PROF. M.N. FARDIS MAY 25, 2022

1. Northern part of Serbia, with Belgrade as the largest urban center, belongs to a region of moderate to low seismic hazard, with peak ground acceleration (type A) of 0,10g. In our opinion, in such a case, some of EC8 2004 rules may be relaxed, as per ASCE-ACI Codes, for example.

   The option of designing for DCL may well be used in that case by the National Annex. G2 will give more "escape routes" and allow further flexibility

   Question: Can we expect that the new EC 202X will introduce seismic hazard as an additional criterion defining the need for special measures regarding ductility and detailing?

   Yes

   Question: Moreover, can we expect that ordinary buildings in the regions with peak ground acceleration up to 0,10g should not be designed for seismic actions at all?

   Although this is up to the country to decide through the National Annex, it is not advicable. Even under small magnitude Eqs PGAs and spectal accelerations in the short period range can be very high in the epicentral region.

2. EC8 2004 requires that '*Composite wall sections consisting of connected or intersecting rectangular segments (L-, T-, U-, I- or similar sections) should be taken as integral units*.' Extreme examples are RC composite wall cores in buildings. In combination with Multi Modal Analysis (MMA), the question arises of how to proceed. In our opinion, a distinction should be made between design for **strength** and design for ductility.

   Answered in presentation. Experimental data and knowledge for such cases are from non-existing to scarce. Design for ductility is not a safe option; preferable to design for strength and quasi-elastic behaviour (q~1.5)

   Question: In practice (for non high-rise buildings), the strength of RC core is usually designed wall by wall (e.g leg by leg of composite wall section) of a simple rectangular cross-section. Do you agree this is acceptable?

   No, it can be grossly wrong

   Question: Regarding design for ductility, such an approach is not a reliable solution. We developed procedure based on EC8 **2004** General Method for the design/check of RC composite sections, but it is highly time-consuming in everyday practice. Can we expect some simplified detailing rules, at least for moderate to low seismicity regions?

   I doubt it: there is very little knowledge.

Question: How to apply Moment envelope requirements in case of composite wall sections (core walls)?

If the question refers to the heightwise envelope, EC8's only option concerns the envelope of the moment in the wall as a single integral prismatic member

3. For RC DCH Coupled Wall structures, EC8 2004 limits the shear stress in the wall's plastic hinge region and requires X-type reinforcement detailing if shear stress in coupling beams exceeds a specific value. On the other hand, there are no such particular requirements in the case of DCM structures; bending and shear resistance may be designed solely on the requirements of Eurocode 1992-1-1:2004.
   Detailing coupling beams as specified in EC8 for DCH is a challenge. G2 allows this option irrespective of DC, by referring to E2's Strut-and-Tie approach, and mentions the use of diagonal reinforcement as one possibility
   Question: Do we understand EC8 2004 correctly that in the case of DCM RC wall structures, no reduction of permited shear stress in the wall hinge region and shear of coupling beams is required - the shear capacity of walls and coupling beams can be fully utilized (even for deep coupling beams L/h<2, with high shear forces close to VRdmax)?
   Y**es. This may not be so safe for DCM, whereas the provisions for DCH maybe overly conservative. G2 gives safer and more economic rules, applicable irrespective of DC and consistent with the new approach of EC2-G2 for shear.**

4. Two questions regarding seismic design of bridges, for both, the current Eurocode and for its new generation: 1. why behavior factor q is generally smaller for bridges than for buildings? 2. why seismic Eurocode load combination for bridges does not include shrinkage (EN1998-2 5.5 (2)P), when shrinkage is physically always present in the structure, and will create the bending moments in the bridge column in the same direction as longitudinal seismic load?
5. Does the new generation of Eurocode address the issue of effective stiffness in more detail, or current provisions from EN1998-3 are about to be implemented? If effective stiffness of 50% is assigned for all of the members, relative ratio of secondary members (less prone to cracking) to primary seismic members is skewed and some structures might be in danger of being designed with higher q factors than appropriate with unrealistic story drifts?
6. According to EC8: "Ductile walls are wall fixed at its base so that the relative rotation of this base with respect to the rest of the structural system is prevented, and that is designed and detailed to dissipate energy in a flexural plastic hinge zone free of openings or large perforations just

above its base. Question: Due to Architectural or MEP requirements it is not unusual that in later stages the need for a larger opening in walls at ground floor arises (e.g. Door in plastic hinge region). If it is the case for dominant primary structural wall, what parameters/criterias should we follow to make that wall ductile, and is there any limit/guidance for acceptable size/shape of opening/perforation in plastic hinge regions.

7. Would the thin walls in Chile buildings have failed the normalized axial force limit if calculated according to EC8?