Relative stiffness of members of RC frames for the analysis of forces

I wish to comment on the paper titled "Relative stiffness of members of RC frames for the analysis of forces" by Mr D. Indu and Dr S.K. Mallick , published in ICJ, March 2001 with extreme caution and respect as I am proud to be one of the students of Prof S.K. Mallick, during the period 1954-58 at the Indian Institute of Technology (IIT), Kharagpur.

The code IS 456 : 2000 gives three methods based on gross section, transformed section , and cracked section for computing stiffnesses of members in the structural analysis of RC structures. Further, the code requires consistency in the approach in that the same method should be used for all members. The paper has shown that the method of gross section may continue to be used in analysis as other methods are not worth the trouble involved therein.

In practice, the method of gross section is used but for beams many engineers do not consider the effect of slab on the moment of inertia of beams. In other words, they consider only column and beam sizes and regard the building as a skeletal structure as if the slab diaphragm does not exist at all. Even in computer programs using 2-D or 3-D analysis, this short-cut is used. A skeletal building without the presence of slabs becomes a very flexible structure and its behaviour under gravity and lateral loads is far from its realistic behaviour with slab diaphragm cast monolithically with beams. The code IS 456 : 2000 is silent on this aspect and the previous versions IS 456 : 1978 and IS 456 : 1964 were also silent on this aspect on this aspect. Many young engineers refuse to accept this position as there is no specific mention in the code about it. The authors are to be thanked as they have categorically stated that slab effect on the moment of inertia of beam should be considered and the same has been done in both the examples given in the paper. Yet, our codes have repeatedly remained silent on this aspect and this often creates friction among engineers when proof consultants come into picture.

Further, the code requires centre-line dimensions to be used in frame analysis. The computer analysis gives stress resultants at centre of joints, while for design we require these values at the face. The computer programs in use give design of members using these centre-line values, thereby giving more reinforcement in beams and columns. In manual methods, the centre-line moments or shears can be reduced to face by some extra calculations, thereby leading to more steel consumption in buildings. These are practical difficulties in the design practice which I wish to share with my favourite professor Dr. S.K. Mallick.

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The authors reply :

We are pleased to note that Mr U. H. Varyani agrees with our views and conclusions and we thank him for his laudatory comments.

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