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## DISCUSSION FORUM

### Thermal analysis of draft tube and spiral case mass concrete

This has reference to the excellent paper titled "Thermal analysis of draft tube and spiral mass concrete" by K.D. Sharda *et al* published in the July 2004, Vol 78, No 7, pp. 11-16, of the Journal. It deals with the subject of heat of hydration, a problem commonly experienced in mass concrete works. There are however some points which require clarifications.

- (i) A sketch showing the cross section of the part of the power house indicating dimensional details of the house, the draft tube and the spiral could have been given.
- (ii) As rightly observed the factors that have bearing on the generation of heat during concreting and curing are the size of the block, rate of concreting, temperature control measures adopted at site, type of aggregates and joints. Besides these, the other factors are the method of concreting (crane – bucket, pumping, etc), admixtures used, size of coarse aggregate, method of curing etc. There is no mention of these points with reference to the actual site practice. The model study could have considered these points for simulation.
- (iii) It is not clear why OPC was used at site when pozzolona /blast furnace slag cement could have been used. Cement contents -390 kg and 420 kg respectively for concrete grades M20

and M25 seem to be high. Even in normal works one does not come across cement content exceeding 350 kg even for M25 grade at present. In the case of such heavy mass concrete works special mixes with low cement content should have been designed.

I would request clarifications regarding the above from the authors.

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#### The authors reply:

On behalf of my co-authors, I would like to thank the discussor for the interest shown in our paper. Our clarifications are as below.

- (i) The sketches showing cross-sectional details of the power house are available with us but could not be printed due to the space constraints. These would be made available to the discussor or any other person on request.
- (ii) Pumped concrete has been placed around the draft tube and spiral case. Maximum size of aggregate used was 20 mm and comprises mainly crushed dolomite. No admixture has been used. While designing the mix, it was observed that there was no

appreciable improvement of workability with admixture. Also, there were apprehensions about long term durability of structural concrete with admixture. For pumped concrete, medium degree of workability with 75 to 100 mm slump was maintained. The model studies have been restricted/conducted for the input parameters derived from mixture proportions with available aggregates and construction practices being followed at project site.

Study has been conducted with 390 kg and 420 kg of cement content respectively for M20 and M25 grade of concrete. These values correspond to maximum value of cement content obtained in mixture proportions for pumpable concrete and were adopted to arrive at optimum curing measures and lift height. OPC was used in all the RC structures of the project. Procurement of pozzolana/blast furnace slag/low heat portland cement specifically for a comparatively smaller quantity of mass concrete was not considered feasible, hence the present study was restricted to concrete with OPC.

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