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Issues And Challenges Related To Generation Of Temperature Controlled Mass Concrete Structures

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Abstract – Literature review revealed that, the issues associated with thermal deformation in mass concrete structures are mainly due to evolution of cracking temperatures. Mass concrete structures are normally erected in hydraulic structures and thermal stresses arise due to cement hydration. These structures require special measures like controlling the cooling rate, cooling under controlled temperature etc. Failure to apply measures may result in generation of thermal stresses, induce early age cracks, structural damages and reduced durability. Nearly 70% of stresses on structures are as a result of internal restrained deformation and shrinkage. Literature further reported measures to control temperature rise in mass concrete structures such as temperature controlling before cooling and after cooling. Discrete references were reported in literature on the steps to be taken for controlling temperature during setting in mass concrete. However lot more work is yet to be undertaken to control temperature in mass concrete structures during curing operations. This issue assumes large dimensions with dams and heavy duty pillars, where the cooling rate at surface is more than inside the concrete, resulting in initiation of heavy thermal and residual stresses and cracks. Hence a temperature controlled concrete has to be suitably designed and developed to address above issues. An attempt is made in this paper to identify the issues related to thermal stresses, residual stresses, shrinkage etc, due to wide variation in temperature gradient and to address to same using a well organized system, resulting in sound temperature controlled concrete. The major contribution of present work is to propose a well developed method for temperature controlled concrete in mass concrete structures and to study the effect of artificial cooling on mechanical properties of mass concrete structures.