VALIDATION OF MULTISCALE MODEL FOR HEAT GENERATION IN HARDENING CONCRETE

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ABSTRACT

Urbanization has increased dramatically the demand of concrete production and quality control in developing countries. At present, several mass concrete elements are under construction in Brazil and India, to mention a few; and it is important to assure that the thermal behavior of such structures complies with local regulations to avoid durability issues.

Our approach to predict the thermal behavior of mass concrete is based on a semi-adiabatic calorimeter setup, the affinity hydration model, and FE analysis, as indicated in Fig. 1. [1, 2]

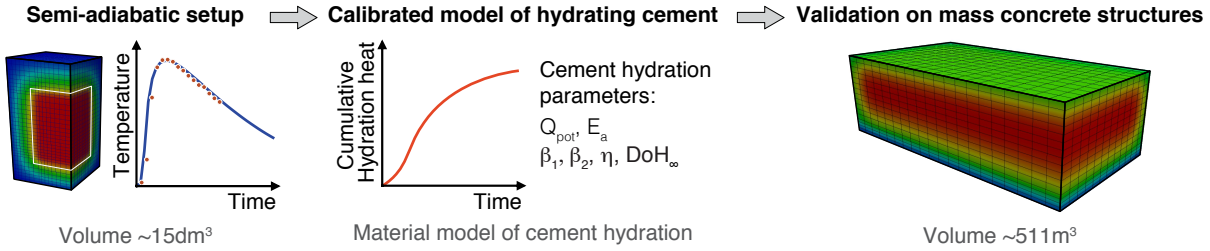

Figure 1: Multiscale model for heat generation in hardening concrete

This combination provides evolution of hydration heat under isothermal temperature and enables upscaling to the temperature evolution in mass concrete on a multi-scale level. The upscaling approach is demonstrated on a 511m^3 mass concrete block cast in Southern Brazil.

In summary, validation results indicate that the upscaling approach proved successful for predicting mass concrete temperature at different scales. This approach features a low cost and pragmatic approach, representing an alternative solution for the concrete industry in developing countries.

References

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