

# **DELAYED ETTRINGITE FORMATION IN LARGE CONCRETE SECTIONS AND ITS PREVENTION**

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Degree of Master of Engineering

Department of Civil Engineering

University of Moratuwa  
Sri Lanka

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Engineering

Department of Civil Engineering

University of Moratuwa  
Sri Lanka

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## DECLARATION

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The above candidate has carried out research for the Masters thesis under my supervision.

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## ABSTRACT

### **Delayed Ettringite Formation in Large Concrete Sections and its Prevention**

With many large scale civil engineering construction projects undertaken, there is a possibility for having large concrete pores in thick members. Due to the hydration process, temperatures in concrete will increase during early stages and when the temperature of concrete is more than 70°C, there is a possibility for Delayed Ettringite Formation (DEF). DEF can have adverse long term effects that could lead to severe cracking of concrete with age when moisture is present. Thus, controlling maximum temperature that concrete would reach during early stages will be the key to prevent DEF. In this, mineral additives like fly ash can play a major role. This paper presents various strategies available to deal with DEF and also the likely concrete thicknesses that could be cast with different mixes and grades of concrete in the different climatic regions in Sri Lanka to minimize the potential for DEF.

With the use of a validated software peak temperatures for a range of concrete grades placed at different climatic zones of Sri Lanka were predicted. A series of charts were developed from the results. These charts can be directly used by the design engineer prior to concreting and the necessary remedial action could be taken to minimize the risk of DEF occurring.

Contrary to the usual practice for thin sections, the strength should be kept at a minimum, sufficient to address durability when thick sections are involved as it is necessary to address DEF related issues as well. A comparison with an alternative method of using a pipe network through the concrete to remove excess heat was also done, which showed that the use of charts is as much as effective but less expensive.

Key words: Delayed Ettringite Formation, Fly ash

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