

Heat treatment of UHPFRC

Type I heat treatment of UHPFRC is applied prior to setting to accelerate setting and hydration. The typical temperature range is moderate (50 to 60 °C), below 65 °C to avoid delayed ettringite formation. It is mostly aimed at optimizing the production cycle of prefabricated prestressed UHPFRC members for instance.

Type II heat treatment of UHPFRC is applied just after setting for typically 48 hours, around 90°C, in a moisture saturated environment. It has become a classical method to stabilize delayed response (creep and shrinkage) and accelerate and improve (by formation of new types of hydrates) the development of mechanical properties. More specifically, this type of heat treatment increases the efficiency of the pozzolanic reaction and the reaction of quartz powder, otherwise inert at ambient temperatures. Among the most spectacular applications of UHPFRC with a thermal treatment of type II, one can cite the extension of the Haneda airport in Japan.

Today the thermal treatment of UHPFRC is no more systematically applied in prefabrication and more and more UHPFRC on the market are produced without any thermal treatment.

→ *Following references report on various works on those two types of thermal treatments of UHPFRC at early age.*

AFGC/SETRA (2013), « Bétons Fibrés à Ultra Hautes Performances », Recommandations provisoires, éditées par Association Française de Génie Civil.

Richard P., Cheyrezy M., (1995), "Les bétons de poudres réactives", in Annales ITBTP, N° 532 – Mars Avril 1995, Série Béton 320, pp. 85-111.

Francisco P., (2012), ""Déformations différées des Bétons Fibrés à Ultra Hautes Performances soumis à un traitement thermique", Thèse de Doctorat de l'Ecole Normal Supérieure de Cachan. Domaine: Mécanique – Génie Mécanique - Génie Civil.

http://w3.edsp.ens-cachan.fr/Publique/PresentationThese.php5?insert_mode=false&calling_page=ListeThesesEnCours.php5&numid=1028

Philippe Francisco, Farid Benboudjema, Patrick Rougeau, Jean-Michel Torrenti, (2011), "UHPFRC creep prediction taking into account the influence of heat treatment", 18th IFF Weimar Conference – Germany.

Francisco, Benboudjema, Rougeau, Torrenti and Rimlinger, (2010), "PREDICTION OF ULTRA HIGH PERFORMANCE CONCRETE CREEP AND SHRINKAGE – THE ROLE OF HEAT TREATMENT", 3rd fib International Congress 2010

P. Francisco, F. Benboudjema, P. Rougeau, J-M. Torrenti, (2009), "Ultra High Performance Concrete for prestressed elements – Interest of creep prediction", UHPFRC 2009 – November 17th & 18th – Marseille, France

Graybeal B., (2006), "Material Property Characterization of Ultra-High Performance Concrete", PUBLICATION NO. FHWA-HRT-06-103, US Dept. of Transportation, Research, Development, and Technology, Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, VA 22101-2296.