The Path to Ultra-High Performance Fiber Reinforced Concrete (UHP-FRC)

by

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Abstract: Ultra-high performance fiber reinforced concrete is defined as having a compressive strength in excess of 150 MPa (22 ksi) and preferably a strain-hardening response in tension. Following the onset of modern developments of fiber reinforced concrete in the early 1960’s, there has been a continuous search for improved performance. One can thus follow such progress in milestones along four inter-related paths: one path for the cementitious matrix, another for the fiber, the third for the interface bond between fiber and matrix, and the forth for the composite itself. After illustrating the need for UHP-FRC in modern structures, the presentation will focus on the development at the University of Michigan of special UHP-FRC composites obtained without any special process such as heat or pressure curing, while using materials available on the US market and conventional mixers. Compressive strengths up to 290 MPa (42 ksi) were achieved and record-breaking results in direct tension (in terms of strength, ductility, and fracture energy) are described setting limits to exceed in the future.

Bio: Antoine E. Naaman is Professor Emeritus of Civil Engineering at the University of Michigan which he joined in 1983. He is a Fellow of the American Concrete Institute, the Prestressed Concrete Institute, the American Society of Civil Engineers, and the International Ferrocement Society. His research interests include prestressed concrete, high performance fiber reinforced cement composites, and the integration-tailoring of advanced construction materials to improve structural performance. Dr. Naaman’s research studies have led to more than three hundred technical publications, including two textbooks, and thirteen co-edited books.