Current research topic: Developing non-heat treated UHPC in South Africa

Project description:

The very high strength, enhanced ductility and long-term durability of ultra-high performance concrete (UHPC) makes it an ideal material to be used for building structures in the future. Non-heat treated UHPC is developed in this research that is more relevant to be applied in South Africa industry. While UHPC mix design guidelines have been proposed, ingredient materials available locally, but which do not necessarily comply with recommended property ranges, may be compensated for by particular strategies. The local ingredient materials are compared based on their mineralogy, specific surface area, particle size and grading by researchers who successful developed non-heat treat UHPC. The majority of local materials were found not that ideal for UHPC and a new mix design philosophy is developed in this research, which helps to achieve the UHPC strength of 168 MPa with local non-ideal materials.

1. UHPC compressive strength evolvement

Figure 1: Compressive strength development of ultra-high performance paste (UHPP), ultra-high performance mortar (UHPM) and UHPC with age.

2. UHPC tensile behaviour

Figure 2: Typical stress-strain curve for UHPC direct tensile test.

3. Conclusion

Under the new mix design philosophy, the UHPC finally achieves a compressive strength of 168 MPa, first crack tensile strength of 5.29 MPa and peak tensile strength of 8.56 MPa with the help of only 1.5% steel fibres by UHPM volume.

**CURRICULUM VITAE**



**PERSONAL INFORMATION**

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**ACADEMIC QUALIFICATIONS**

1996-2000: B.Eng in Civil Engineering, Southwest Jiaotong University in China.

2006-2008: M-Tech in Civil Engineering, Transportation Engineering Division, Nelson Mandela Metropolitan University.

2008-2010: MScEng in Civil Engineering, Structural Engineering Division, University of Stellenbosch.

2010 till now: PhD candidate in Civil Engineering, Structural Engineering Division, University of Stellenbosch.

**Theses/Dissertations**

M-Tech thesis: Civil engineering components for a conceptual elevated light rail transit model with reference to Nelson Mandala Bay. (Study leader: Prof. JJ van Wyk)

MScEng thesis: Investigation into a beam-column connection in pre-cast concrete. (Study leader: Prof. J.A.Wium)

PhD research: Develop ultra-high performance concrete (UHPC) with the compressive strength over 150 MPa for highway bridges in South Africa. (Study leader: Prof. van Zijl G.P.A.G.)

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