



## IIT Hyderabad has developed an Affordable Ultra-High Performance Fiber Reinforced Concrete (UHPFRC) For Bridge and Other Infrastructural Applications

### Highlights:

- ***UHPFRC developed at IITH provides a compressive strength of 150 MPa and direct tensile strength of 8 MPa.***
- ***The cost of UHPRC is made affordable by optimizing the fiber dosage and replacing costly fine aggregates with cheaper, locally available ones.***
- ***The cost of UHPFRC developed at IITH is about two times cheaper than commercially available proprietary products.***
- ***UHPFRC mix can be used in a variety of applications, such as bridges, long-span structural beams, columns and in off-shore structures where durability is a major concern.***
- ***Several full-scale post-tensioned UHPFRC bridge girders were tested to understand the shear behavior.***
- ***Design guidelines are being developed for practicing design engineers, which will promote and increase confidence of using UHPFRC for various infrastructural applications in India.***

**Hyderabad, November 04, 2022:** Prof S Suriya Prakash, CASTCON Lab, Department of Civil Engineering and his research group have developed an affordable special ultra-high performance fiber reinforced concrete (UHPFRC) using locally available materials like cement, fly-ash, river sand, ground granulated blast furnace slag, micro-silica, water, steel fiber, polypropylene fibers and high range water reducing agent (HRWRA). The cost of UHPRC is brought down and made affordable by reducing the quantity of cement, fibers and replacing costly fine aggregates with cheaper locally available ones through proper gradation. The composition combines the best features of self-consolidating concrete (SCC), fiber-reinforced concrete (FRC) and high-performance concrete (HPC). The cost of UHPFRC developed at IITH is about two times cheaper than commercially available proprietary products. ***UHPFRC, developed at IITH for pre-stressing applications, yields a cube compressive strength of 150 MPa and a direct tensile strength of 8.0 MPa.*** Several full-scale post-tensioned UHPFRC concrete bridge girders were tested to understand the shear behavior. Test results show that providing a minimum web shear reinforcement ratio and adequate steel fiber dosage leads to better serviceability, ultimate strength, and stiffness of bridge girders. ***The overall cost of UHPFRC girders in bridge applications can be further reduced by providing the minimum web-shear reinforcement of 0.6% and a hybrid fiber volume dosage of about 1.0%***

**Complimenting Prof Suriya & his team on the findings, Prof B S Murty, Director, IITH, said, “Strong & durable infrastructure is a must for holistic development of any nation. Developing construction materials with improved strength using locally available raw materials is a creditable stride towards realizing our dream of Aatma Nirbhar Bharat. I am sure such innovation will not only benefit local development in terms of economic & efficient infrastructure but extend its advantage to the infrastructure sector globally.”**

**Enlisting the uniqueness of the UHPFRC, Prof S Suriya Prakash, CASTCON Lab & Mr Chandrashekhara Lakavath, Research Scholar, Dept. of Civil Engg., IITH, said, “The aim is to develop an affordable ultra-high-performance concrete using locally available materials and do a thorough material categorization to understand the behavior of UHPFRC in compression, tension, fracture, and direct shear. Several full-scale bridge girders made of UHPFRC were tested. Our test results have given deeper insights into the shear behavior of pre-stressed bridge girders, which will be used to develop design guidelines for practising engineers. Our research is expected to increase the confidence in using UHPFRC in India for various infrastructure applications”.**



Prof S Suriya Prakash and his team have extensively worked on various industry-relevant research work and developing innovative solutions, including the use of Glass FRP rebars, lightweight precast concrete panels, Carbon FRP based strengthening solutions and Ultra-High-Performance Fiber Reinforced Concrete (UHPFRC) for infrastructure applications.

**Electronic Release:** <https://youtu.be/LwaAfzabPiE>

### **About IIT Hyderabad**

Indian Institute of Technology Hyderabad (IITH) is one of the eight new IITs established by the Government of India in 2008. In a short span of **14** years, the institute has become a top-ranker. It has **290+** full-time faculty, **~3,800** students, **18** Departments + Centre for Interdisciplinary Program, nearly **200+** state-of-the-art laboratories, and five research and entrepreneurship centers. The institute has a strong research focus with approx. Rs **535+** crore of sanctioned research funding, with PhD scholars accounting for about **30%** of total student strength. IITH has more than **7,500+** research publications with **1,00,000+** Citations, **190+** Published Patents, **1,700+** sponsored/consultancy projects with **500+** running projects, and about **100+** startups.

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