

EVALUATION OF NOVEL FIBRE REINFORCEMENT BY PUNCH TESTING – A FEASIBILITY STUDY

W. M. Thomas¹, C. Paglia², B. Ralph³, R. Fenn⁴, R.L. Thomas¹

¹Co-tropic Ltd, 6, Howe Road, Haverhill, Suffolk, CB9 9NJ, UK

²University of Applied Sciences of Southern Switzerland (SUPSI), CH-6952 Canobbio, Switzerland

³Emeritus Professor Brunel University, Ty Carrog, St. Brides-super-Ely, Cardiff, CF5 6EY, UK

⁴Brunel University (Rtd) 3, London Road, Great Shelford, Cambridge, CB22 5DB, UK
wayne.thomas@co-tropic.co.uk

ABSTRACT

An evaluation of two innovative concrete reinforcement methodologies has been carried out. This study showed that a combination of polypropylene CoRe™ fibres and (resistance butt welded stainless steel) twisted closed loops, (with a three-dimensional effect) provided the best energy absorption performance of all the systems examined. Furthermore, this feasibility study showed that concrete slabs reinforced using a combination of conventional rebar and CoRe™ polypropylene fibres lessened the risk of fragmentation and significantly improved energy absorption. In this paper two novel anchorage methods leading to improved structural integrity were investigated.

KEY WORDS: Dispersible reinforcement, fibre reinforcement, polymers, concrete.

REFERENCES

- [1] Thomas D.J., Thomas R.L., Thomas B.J., *Reinforcement structures*, International Publication number WO 2008/035057 A1. 27th March 2008.
- [2] Naaman E.A., *New fiber Technology*, Cement, ceramic and polymeric composites, ACI's Concrete International, July 1998.
- [3] Naaman E.A., *Engineered steel fibres and optimal properties for reinforcement of cement composites*, Journal of Advanced Concrete Technology Vol. 1, No. 3, 1-12, October 2003, Japan Concrete Institute.
- [4] Zia P., Ahmad S., M.Leming, *High-performance concrete, a state-of-art report (1989-1994)*, U.S Department of Transportation Federal Highway Administration, Research and Development, Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, Virginia 22101-2296. <http://www.fhrc.gov/structure/hpc/hpc2/contnt.htm>
- [5] Brown R., Shklla A., Natarajan K. R., *Fibre reinforcement of concrete structures*, URITC Project No 536101, University of Rhode Island Transportation Center.
- [6] Greaves W.S., *Matrix for reinforcing concrete*, United States Patent Number 5,404,688, Date of patent April 11, 1995.
- [7] Lau A., Anson M., *Effect of high temperature on high performance steel fibre reinforced concrete* Cement and Concrete Research 36 2006, pp.1698-1707.
- [8] Heo Y.S., Sanjayan J.G., Han C.G., Han M.C., *Synergistic effect of combined fibers for spalling protection of concrete in fire* Cement and Concrete Research 40 2010, pp. 1547-1554.
- [9] Burgoyne C.J., *Rational use of advanced composites in concrete* Proceedings of the Institution of Civil Engineers, Structures and Buildings 146, Issue 3, pp. 253-262.