

Abstract of project presented to Universiti Putra Malaysia in partial fulfillment of the requirement for the Degree of Master of Science

DEVELOPMENT OF CONCRETE CONTAINING POLYPROPYLENE FIBERS

BY

MURTADA ABASS ABED ALI

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Supervisor: Professor Ir. Mohd Saleh Jaafar, PhD

Faculty: Engineering

Recent days, a rapid development in the world generally and in the field of construction materials especially, makes an intensive ambition to discover and develop new type of concrete (Ultra High Strength Concrete) to satisfy the best of quality requirements. Let's imagine high-rise buildings (sky scrapper) with smaller cross section concrete columns (in the same time high modulus of elasticity), or concrete members with no shear reinforcement required any more, a concrete columns without coarse aggregate and no reinforcement bars anymore, producing precast concrete elements that show excellent mechanical and durability performance, putting concrete under service at earlier ages (possibility to remove the formwork within 3 or 7 days) , and constructing long span pedestrian bridge without steel reinforcement. This kind of concrete has higher mechanical properties (high compressive and tensile strength, and large modulus of elasticity) than the normal strength concrete (NSC). For the mentioned reasons above, this study includes (18) concrete mixes with different mix proportions and by utilizing

some additives like; silica fume, local sand, silica sand, silica sand powder, local sand powder, different cement contents (715 and 850 kg/m^3), chemical admixture (super plasticizer), polymer fibers (polypropylene), steel fibers, 4.75mm maximum nominal size aggregate from crushing the coarse aggregate and consequently eliminating the coarse aggregate to cast (87) cubes size (100mm), (72) cubes size (50mm), and (20) cylinder size ($150\text{mm} \times 300\text{mm}$) just for the sake of optimizing the (UHSC) mix proportions that achieves highest compressive (84.4 Mpa) and tensile strength (6.891) and large modulus of elasticity (40775.623 Mpa). Investigating the properties of the fresh mixes and the hardened specimens as well, Later on the obtained results from the tests that had been conducted on each mix specimens discussing, comparing, and analyzing them as well, Concluding how the fineness of the cementitious materials and powders affects on the strength of concrete and the water demand on the other hand, also the significant conditional effect of the dosage of superplasticizer on the strength of concrete and how the maximum dosage of superplasticizer has been optimized, also worth adding what is lowest water to binder ratio that achieved highest strength. The prime role of utilizing the polypropylene fibers on gaining higher strength than utilizing steel fibers or only silica fume in the concrete mixes, Realizing the best replacement of cement by silica fume better to be 22% than 30% to react completely as pozzolana than reacting as inert filler, Last but not least summarizing the whole scope of this study, clarifying the limitations during this project and what are the recommendations for future work. All those have been well articulated in this present study.