



# LAPME Seminars

應用物理及材料工程研究所

Institute of Applied Physics & Materials Engineering

## Research on Film Thicknesses Theory and Three-Tier Concrete Mix Design Method

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**M**odern concrete is often subject to stringent requirements on various performance attributes such as workability, strength, durability, dimensional stability, segregation stability and passing ability. This necessitates high-performance concrete (HPC) to come into play. The mix design of HPC is complicated because the number of ingredients in HPC is usually more than those in conventional concrete, and some of the required properties are conflicting with each other in the sense that improvement in one property would cause impairment of another property. There is still a lack of understanding regarding how the various mix parameters could be optimised for best performance of concrete. Most practitioners are conducting concrete mix design primarily through trial mixing, which is laborious, empirical, and iterative. To address the above issues, research has been conducted on particle packing and film thicknesses of concrete mixes including water film thickness (WFT), paste film thickness (PFT), and mortar film thickness (MFT). It has been revealed that the WFT, PFT and MFT are governing factors affecting the performance of concrete. Consequently, the three-tier concrete mix design method has been developed. It features the design of concrete mixes in three tiers, firstly the paste, secondly the mortar and finally the concrete, by selecting suitable values of WFT, PFT and MFT.



**Ir Dr. Pui-Lam Ng** (BEng(CivE), PhD, MBA, BEAM Pro, FAIIB, FHKCI, FHKIUS, MHKIE, MICE, APEC Engineer, CEng, Eur Ing, IntPE, RPE) is a visiting adjunct professor in the Faculty of Civil Engineering, Vilnius Gediminas Technical University in Lithuania. He obtained his Bachelor of Civil Engineering and Doctor of Philosophy degrees at the University of Hong Kong. After graduation, he has been principally involved in the design and construction of a number of major infrastructure projects in Hong Kong and he is chartered civil engineer in Hong Kong, United Kingdom, and Europe. He is an Executive Board member and an honorary secretary of the Hong Kong Concrete Institute. **P.L. Ng** has more than 15 years of experience in fundamental and applied research, and his research interests are in the areas of sustainable concrete materials and concrete structures. He is serving in the editorial board of 4 international journals, and he has published more than 90 technical papers and delivered more than 50 technical speeches. He was the recipient of Sir Edward Youde Memorial Fellowship (2005), The HKIE Outstanding Paper Award for Young Engineers/Researchers (2012), Certificate of Merit of The HKIE Innovation Awards for Young Members (2013 and 2017), and Marie Skłodowska-Curie Actions Fellowship awarded by the European Commission (2017).

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**All are welcome!**