

**Talk on “ Essential knowledge of Superflat Concrete floor “**

by Mr. Yeo Shih Horng

Mr. Yeo Shih Horng is currently a committee member in Civil and Structural Engineering Technical Division (CSETD).

The “Essential knowledge of Superflat Concrete Floor” was organised by the Civil & Structural Engineering Technical Division of The Institute of Engineers of Malaysia on 25th April 2017. The technical talk was attended by 56 participants.

The talk was presented by Mr. Lim Eng Hock (or known as Zack Lim as he is popularly recognised in the flooring circle in Malaysia and Asia). He was the immediate past president of American Concrete Institute (ACI) Kuala Lumpur Chapter and the founding member of Concrete Floors Asia. His area of expertise is in the construction of industrial floors which require floor flatness tolerance.

Zack has been promoting different categories of floor flatness such as moderate flat (for car parks and commercial buildings), flat floor (for industrial building and sport complex), very flat floor (for warehouse with racking height > 8m), super flat (warehouse with racking height >13 m), and ultra-flat floor (currently has no demand).

He explained the difference between flatness and levelness which are very basic words but yet most people wrongly implied during their discussion. He stressed that flatness is more important for smooth



Figure 1 Zack demonstrating the difference between levelness and flatness of concrete floors.

and efficient operation of vehicles, while levelness is important for racking installation only, if floors are not level, shimming the supports are necessary.

Basically, there are two kinds of industrial floor traffic i.e. Random/Free movement Traffic floor and Defined Traffic movement floor. When the mechanical handling equipment (MHE) is moving randomly, it is considered a Random traffic or Free movement. When the MHE is moving in the same wheel path guided by a concealed wire or rail guided (similar to railway line), the movement is categorized as Defined movement traffic (e.g. Very Narrow Aisles (VNA) warehouse).

There are various standards for floor specification/ classification. In BS 8204, floor is classified based on surface regularity (SR). Basically there are 3 categories, namely SR1 (3mm tolerance), SR2 (5mm tolerance and SR3 (10mm tolerance) To measure the floor profile, a two meter straight-edge is used. A lower SR value indicates higher floor flatness requirement. However, SR standard only measures the floor flatness but unable to measure the levelness and does not mentioned how many dips can be allowed under a 2 meter straight-edge. Hence this standard could result in ambiguity.

In Technical Report 34 (TR 34), the Free movement floor is measured according to Property E (Elevation control) and Property F (Flatness control). While for Defined movement traffic, the floor tolerance is extremely stringent and need strict specification on both longitudinal and transverse flatness and levelness based on racking height.

In ASTM E-1155, the floor is classified based on F-Numbers system. For Random traffic movement floor, the floor quality is defined by F-Numbers, namely floor flatness (FF) and floor levelness (FL). For example, FF30/FL20, the higher these values the better the floor. Floor standard for Defined movement floor is based on Fmin, which measures the transverse & longitudinal flatness and transverse & longitudinal levelness.

There are several factors to be considered for flooring construction i.e.rack height, type of MHE, type of specification, floor loading, reinforcement, mix design and construction method.

Zack shared his experience as an industrial floor constructor, according to him, an industrial floor can be constructed based on narrow strip, wide strip or large bay method. To construct a superflat floor, it is mandatory to use the narrow strip method using a truss vibrating beam with maximum width of not more than 6 meter. However, it will produce more construction joints and possibility of having transverse cracks. Wide strip construction is faster due to less formworks, however the floor's flatness and levelness need to be compromised compared to narrow strip construction. Large bay construction is for less stringent floors and where large seamless floor up to 50m x 50m can be constructed. However, using a laser screed machine to strike-off the floor surface profile will improve thus produce a flatter floor.

The surface finishing of industrial floor can be done by normal power float to produce a smooth finish or repeating power trowelling to produce a "burnished" finish which appeared to be mirror-like. Dry shake hardener or liquid densifier can be applied to concrete surface to increase the abrasion resistance of floor with dust-proofed.

Zack reminded us that construction of a good floor requires the right machinery, equipment and competent contractors. All floors constructed should be measured within 72 hours using floor measuring equipment and preferably to be witnessed by client's representative.

The talk ended with questions and answers session. To appreciate the contribution of Zack Lim for sharing his knowledge, Ir Chong Chee Meng, the deputy chairman of Civil & Structural Engineering Technical Division presented him a token of appreciation.



Figure 2 Ir. Chong Chee Meng presented a token of appreciation to Zack Lim