



Talk on Precast Concrete for Buildings - A Holistic Approach

by Ir. Dr Ng Soon Ching

Ir. Dr Ng Soon Ching is the Chairman in the Civil and Structural Engineering Technical Division (CSETD).

The Civil & Structure Technical Division organised a talk on “Precast Concrete for Buildings – A Holistic Approach” on 07 March 2018 at Wisma IEM. The talk was attended by 37 participants and the talk was delivered by Ir. Tang Lai Peng and Ir. Chu Kiun Heng.

Ir. Tang Lai Peng graduated from University of Aston in Birmingham, England as Civil Engineer in 1981. He has involved in the precast concrete industry, in particular the IBS in building structure, for the past 27 years. He specializes in precast concrete design, production, construction methods and contracts. While Ir. Chu Kiun Heng graduated from University of Malaya as Civil Engineer in 1995. He has over 20 years of experience in design and technical matters. His involvement is mainly in Precast Engineering and development, quality assurances and quality control.

Ir. Tang started the first session of talk with the introduction of the precast system, which the concrete components were cast offsite and delivered to the construction site to install or erect. The advantages for precast concrete were good finished product, fast in construction, minimum wastage at site, cleaner site condition, safer construction method and minimum labour required. Ir. Tang also presented different types of precast concrete elements such as precast concrete beams, precast concrete columns, load bearing wall, hollow core slab, double T slab, waffle slab, precast pilecap with socket, precast staircase and etc. He also present several project photos, which fully constructed with precast elements mostly in Malaysia and Singapore.

In the second session, Ir. Chu started the talk with the introduction of the precast modular coordination according to MS1064: Part 10: 2001. In MS1064, M is the basic module, which 1M is equivalent to 100mm. The preferred plan grid dimension is 20x3M (6000mm) to 40x3M (12000mm) with the incremental of 3M. For example 6000mm, 7200mm, 8400mm and etc. Meanwhile, the preferred vertical grid dimension to be 28M (2800mm) to 36M (3600mm).

There are 4 types of precast building system mainly used in Malaysia:

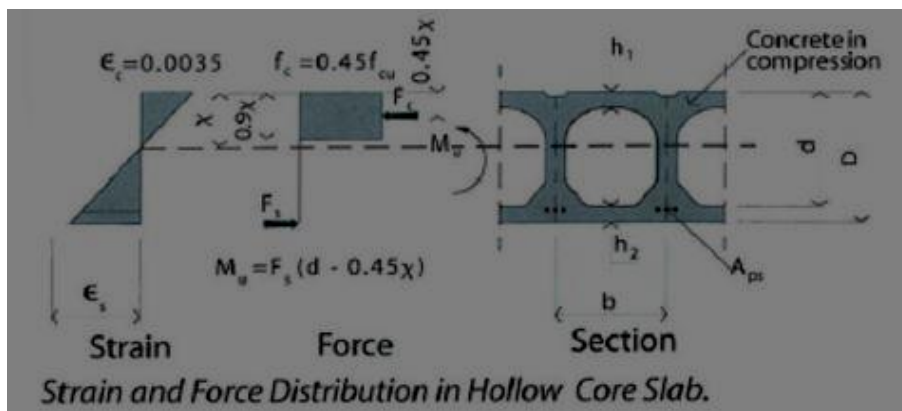
- Unbraced skeletal frame system (precast column, beams and slab with rigid joint),
- Braced skeletal frame system (precast column, beam, slab and wall with pinned joint),
- Bearing wall frame system (precast wall, beam and slab),
- Hybrid system (example precast slab with in-situ concrete column and beam, precast slab with steel beam and column and etc).

Then, Ir. Chu presented the design example of the structure ties, which including horizontal ties and vertical ties based on BS8110: Part 1. The function of the structure ties is to provide minimum levels of strength, continuity and ductility. Ties are continuous and fully anchored tensile elements, either rebar or prestressing strands. Normally ties are placed in in-situ toppings, infill strips or joints between the precast elements.

Subsequently, the design of the hollow core slab, precast beam and precast column in details were presented. The design of the hollow core slab was based on BS8110: Part 1: 1997, EN13369, EN1168 and FIP Recommendations for Prestressed Hollow Core Floors. The hollow core slab was designed as simply supported for ultimate condition and as continuous for service condition. The adopted design loads were superimposed dead load and live load only.

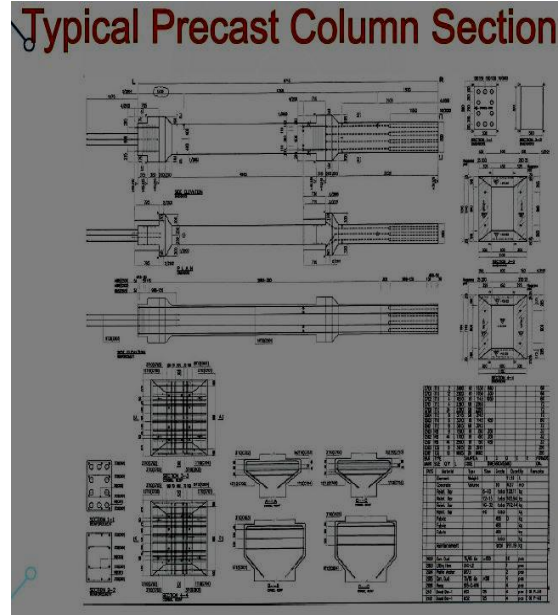
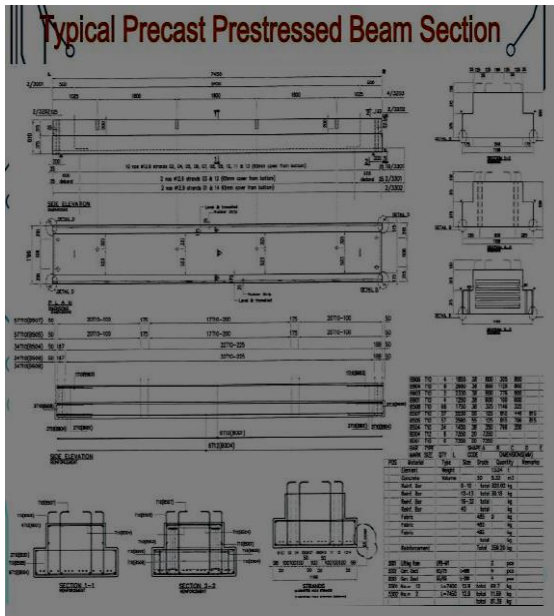
The concrete below the compression zone of the hollow core slab, which is redundant, normally was omitted by longitudinal voids to reduce the weight of the slab. Applying prestressing force at the bottom slab will increase the tensile capacity of the slab.

With these two additional factor, hollow core slab able to resist higher load and achieve longer span.



Large openings was allowed in the hollow core slab by adding spreader beams and small openings can be made on site by using diamond cutter or coring machine. The design of the precast beam shall be in two stages, mainly propped condition and unpropped condition for reinforced concrete beam and prestressed concrete beam.

For continuous span, the precast beam shall be designed as half beam and for simply supported spans, the precast beam shall be designed as full beam. While the precast column design can be divided as braced or unbraced column, single tier or multi tier column, column with corbel and etc. Example of precast elements design and connection detail were presented before the talk ended.



The talk ended with a simple Q&A session and tokens of appreciation were presented to Ir. Tang Lai Peng and Ir. Chu Kiun Heng by C&S TD Chairman Ir. Dr. Ng Soon Ching.