



Two Days Course On Bridge Loading And Concrete Bridge Design To Eurocodes

by Ir. Siow Yun Tong

Ir. Siow Yun Tong is presently a committee member of CSETD.

The two days course on “Bridge Loading and Concrete Bridge Design To Eurocodes” was jointly organized by the Civil and Structural Engineering Technical Division (CSETD) of IEM and IStructE Malaysia Regional Group on 24th & 25th November 2015 which was held at Crystal Crown Hotel, Petaling Jaya, Malaysia. This seminar was started with the welcoming speech by Ir. Ong Sang Woh who is the session chairman from CSETD.

The first Speaker of the seminar was Nigel Hewson, who has 35 years experience in design and construction of bridges. Nigel has been using Eurocodes for bridgeworks design since 2009. He is currently one of the director of H&T Associates and Hewson Consulting based in UK and Hong Kong. The second speaker was Ir. Teh Tzyy Wooi who obtained his MSc in Bridge Engineering (with Distinction) from University of Surrey, UK. Ir. Teh has involved in Hong Kong-Macau link using Eurocodes which was first project using Eurocodes in Hong Kong. He is also one of the director of H&T ASSOCIATES Sdn. Bhd.

During the first day of the course, Nigel presented a brief introduction on Eurocodes in the first session. He mentioned Eurocodes are a set of harmonized technical rules developed by the European Committee for Standardisation of structural design for construction works. He also explained the relationship between Eurocodes and National Annex. According to Nigel, Eurocodes is not fully adopted in UK yet. Some of the countries have started using Eurocodes such as Singapore, Hong Kong, Brunei, etc. Nigel also highlighted the Basis of Design and Principles of Limit State Design. He compared the design working life in both Eurocodes and National Annex. He discussed on Principles of Limit State Design which include Ultimate Limit States (ULS) and Serviceability Limit States (SLS). He said ULS shall be verified if the failure is caused by excessive deformation, rupture, fatigue, etc whereas SLS shall be verified based on the deformation that affects the appearance, vibrations which cause discomfort, etc.

In the second session, Ir. Teh elaborated on the combinations of actions based on Eurocodes. He emphasized on four variable actions which are Combination value of a variable action, Frequent value of a variable action, Quasi-permanent value of a variable action and Accompanying value of a valuable action. Action refers to a set of forces applied to the structure. Permanent action (G) refers to self weight and fixed equipment whereas Variable action (Q) refers to imposed loads, wind or snow loads. Accidental actions eg. explosion or impact from vehicles are unlikely to occur however its consequences could be severe. Ir. Teh also reminded the participants for not relating Eurocodes with British Standards as this two codes are different. He also gave a short presentation on Wind and Thermal actions. According to MS 1553, the wind velocity is based on 3 seconds gust wind whereas in Eurocodes, is based on 10 minutes mean wind velocity.

In the afternoon session, the course resumed on Wind Action with Traffic Loads by Ir.Teh. He has given some design examples on prestressed concrete bridge. Comparison on wind loading were made between Eurocodes and BD37/01. The session continued with elaboration on creep and shrinkage. According to Ir.Teh, creep and shrinkage are time-dependent of concrete.

For design of highway bridge with traffic loads, he explained that the current national standards in UK have been withdrawn by December 2009 and replaced by the 10 parts structural Eurocodes. Highway bridge is subjected to imposed loads, Vertical Traffic Actions and Horizontal Traffic Actions. According to him, Traffic Load Grouping is important as well.

After tea break, Ir.Teh resumed the course on Traffic Load Grouping and he stopped at 4.30pm. The last half an hour session then was taken over by Nigel. He focused on Accidental and Seismic Actions. The session ended with a short Q&A session where several questions were raised.

In the second day morning session, Nigel started off with the topic "Loading During Execution Stage". He explained that transient, accidental and seismic design situations shall be taken into account for design during execution. The design depends on the duration of construction together with the climate return period. In the next session, Ir Teh discussed about the concrete strength and properties. For steel reinforcement, Annex C allows for a strength range between 400 and 600 MPa whereas BS 4449: 2005 adopts 500 MPa. For prestressing steel, the properties should be in accordance with EN10138. There are three classes of relaxation for prestressing steel. Ir Teh also explained on design calculation of losses due to relaxation of the prestressing steel. He further elaborate on the durability of the structure which can be achieved in material selection, construction details, execution and quality control.

In the second part of the morning session, Nigel focused on the SLS requirement. There are some general assumptions in Eurocodes for example, structures are designed by appropriate qualified personnel, adequate supervision and quality control is provided etc. In structural analysis, Nigel presented Linear elastic analysis which may be used for both SLS and ULS. Then Ir Teh took over the session by giving some examples on analysis and design of bridges. The course resumed after lunch time. In the design examples, several comparison were made between BS and Eurocodes. Nigel started the second part of the afternoon session by presenting the ULS and SLS with some working examples. He emphasized that second order effects shall be taken into account where they are likely to affect the overall stability of a structure significantly.

The last session of the course was on detailing by Ir Teh. He talked about spacing of bars, anchorage of bars, lapping and curtailment of longitudinal tension reinforcement.

A simple Q&A session was carried out at the end of the course. Then Ir Ong presented a momento and certificate of appreciation to Ir Teh and Nigel. The course ended at 5pm.