# Road Show on Malaysia National Annex to Eurocode 7

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**THE** road show on the Malaysia National Annex to Eurocode 7 (EC7) was conducted as a series of one-day workshops in Kuala Lumpur, Pulau Pinang, Kuching and Johor Bahru from 11 July 2011 to 18 July 2011. The workshop was conducted by two distinguished speakers, i.e. Prof. Brian Simpson, who is the Chairman of the UK National Annex to EC7 and has been working with the EC7 for more than 30 years, and Ir. Tan Yang Kheng, who serves as the Chief Drafter of the Malaysia National Annex to EC7 and has been working on the Malaysia National Annex since 2007. The workshop drew about 150 participants nationwide.

The main purpose of this road show is to increase the awareness among engineers about the adoption of the Malaysian Euro Norms (MS EN) in Malaysia, as well as the training on the practice of the EC7. This is part of the programs organised by the IEM EC7 Drafting Committee before turning the National Annex into an official SIRIM document. It is expected that the revised Uniform Building By-Law (UBBL) would incorporate the use of the Eurocodes in the near future as the current British Standards have been progressively withdrawn since 2010 (e.g. BS8002 and BS8004). Thus, there is an urgency for our engineers to familiarise themselves with this new code of practice.

The birth of the Eurocodes is meant to provide a common basis, design criteria and understanding among the member states of the European Union (EU), enhance free trade within the EU and improve the competitiveness of the European industry. Besides the European continent, they will also be adopted or widely referenced by Hong Kong, Russia, Singapore, South Africa, Malaysia and other Commonwealth countries.

Prof. Simpson advised the workshop participants that the Eurocodes may seem difficult from a distance but is actually quite straightforward when a person starts to use it. Hence, the key to mastering the new code of practice is to "just do it" right away.

The main skeleton of the workshop covers the introduction to the EC7, the Malaysia National Annex and a selection of design parameters and design of piled foundations based on the EC7 methodology. At the end of the workshop, participants were given a simple exercise on pile design using the Eurocodes approach.

Prof. Simpson highlighted that, using the Eurocodes approach, a geotechnical project would be governed by the following standards:

a) MS EN1997-1 and MS EN1997-2 (General rules, ground investigation and testing for geotechnical design)
b) Execution standards drafted by CEN/TC288
c) Ground properties standards drafted by CEN/TC341 (ISO/CEN Standards)

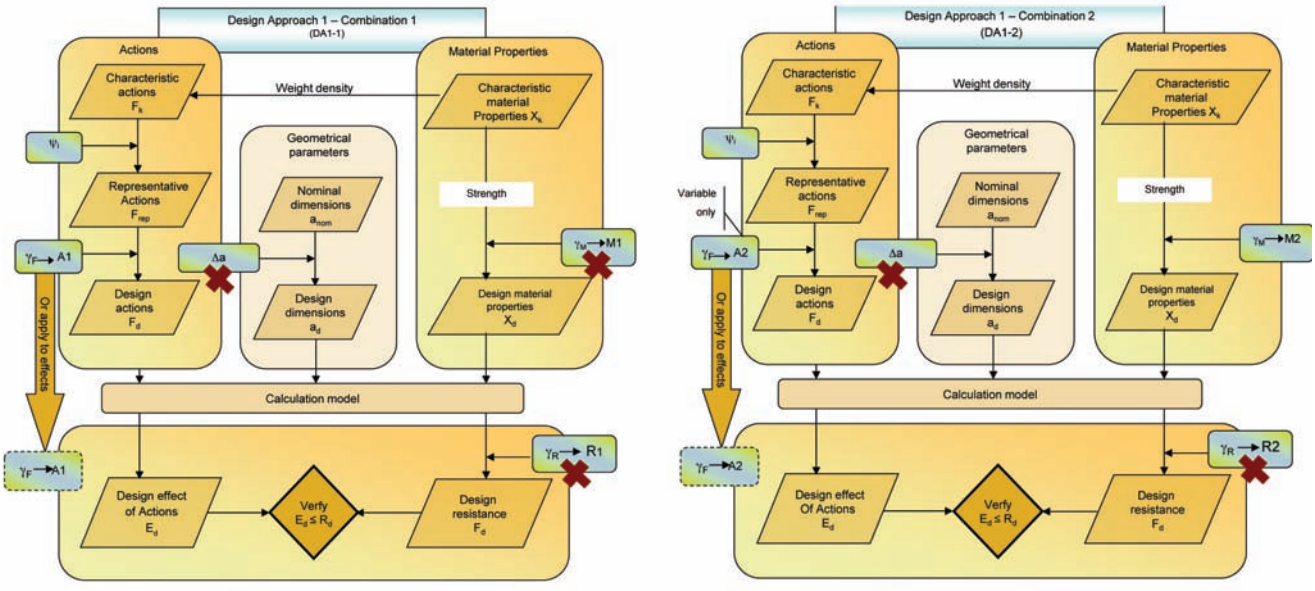


*Figure 1: Design flow as described in design approach and combination (DA1-1 and DA1-2) (after Bond & Harris 2008)*

d) Non-Conflicting Complementary Information (NCCI)
e) Other structural Eurocodes

The EC7 applies the limit state concept used in conjunction with the partial factor method, as well as the principles and requirements for the safety, serviceability and durability of structures as described by the EN 1990 (Basis of Design). The fundamental approach is to define the design values of actions, effects of actions, material properties, geometrical data and resistances by applying a set of "nationally determined partial safety of factors" on the respective characteristic values such that the design effects of actions are always smaller than design resistances. Alternative particular sets of partial factors are assigned to three different design approaches, namely, DA1, DA2 and DA3, the choice of which is determined by each individual nation and the corresponding set of partial factors is provided in the National Annex. In the Malaysian context, DA1 (see Figure 1) is selected with factors chosen to suit local practices. Besides the above, EC7 also requires an understanding of the ultimate limit state, serviceability limit state, documented geotechnical site investigation, design report, execution, supervision and monitoring program during the entire course of construction.

Ir. Tan presented that the basis of the Malaysia National Annex is to adopt the UK National Annex to EC7, and adapting it to the Malaysian practice wherever deemed fit. The method used to establish the values of the partial factors, model factors and correlation factors is the deterministic method (one of the methods described in Eurocode EN 1990).

The aim of the code calibration exercise is to ensure that the design to EC7 is essentially similar to that attained by conventional working stress design methods using the global factor of safety.

The main differences in the Malaysia National Annex compared to the UK National Annex are as follows:

a) Partial factors for soil parameters ($\gamma_M$) in Table A.NA.4
b) For pile foundations, partial resistance factors in Tables A.NA.6 to 8 and correlation factors in Tables A.NA.9 to 11
c) Jack-in piles (Not in the UK NA, but included in the Malaysia NA)
d) Ground anchors
e) Three country-specific data to geotechnical designs in Malaysia are mentioned, namely,
   i) Foundations in limestone areas
   ii) Geotechnical works in peat
   iii) Partially saturated fill

On pile foundation design, Ir. Tan highlighted that the partial resistance factor values were revised higher by 10% to meet the criterion that pile design to EC7 is essentially similar to the design produced from the current working stress design using the global safety factor (see Figure 2).

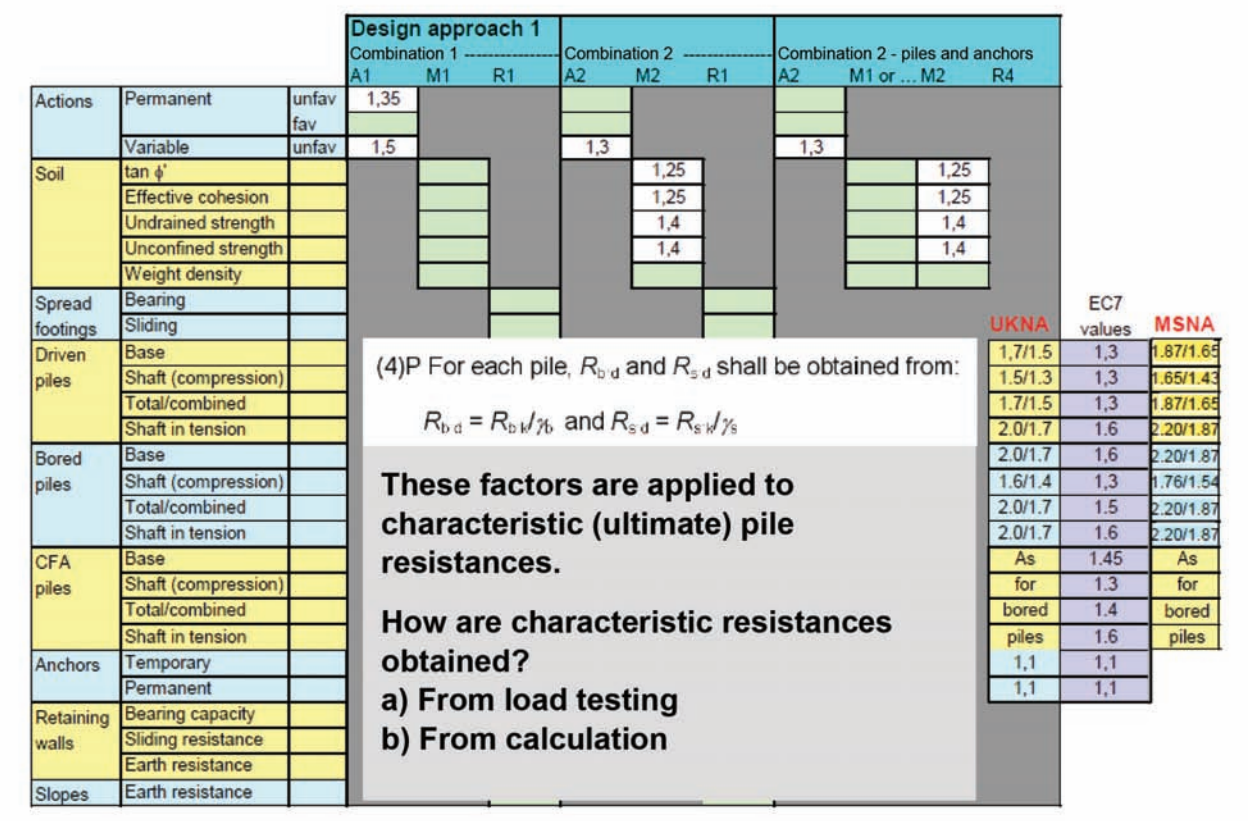


*Figure 2: Selection of partial factors is a national choice (after Simpson 2011)*

Nevertheless, he stressed that these values are subject to review and revision after a certain period of usage. A maintenance group to the new code in SIRIM should be set up for this purpose.

In general, the workshop was well received by the engineers at the different venues. The organiser thanked the two speakers and presented them with a token of appreciation.

Readers are encouraged to download the handout material from the IEM web portal, http://www.myiem.org.my/events/eventregistration.aspx?id=360 and try the design exercise used in the workshop, see Appendix A: Example 2.3: Pile foundation in stiff clay, taken from the European Technical Committee 10 (ETC10), http://www.eurocode7.com/etc10.

## APPENDIX A: EXAMPLE 2.3 PILE FOUNDATION IN STIFF CLAY (DESIGN EXERCISE USED IN THE EC7 WORKSHOP)

A building is to be supported on 450mm diameter bored piles founded entirely in stiff clay and spaced at 2m centres (see Figure 3). The piles are bored dry, without casing, and concreted on the same day as boring. Each pile carries a characteristic vertical permanent load of 300kN and a characteristic vertical variable load of 150kN. This is a small project for which there will be no load testing. Settlement in service is to be limited to 20mm. The pile's design working life is 50 years. The clay is over-consolidated marine clay of Miocene age, containing fissures and occasional claystones. Bedding is essentially horizontal.

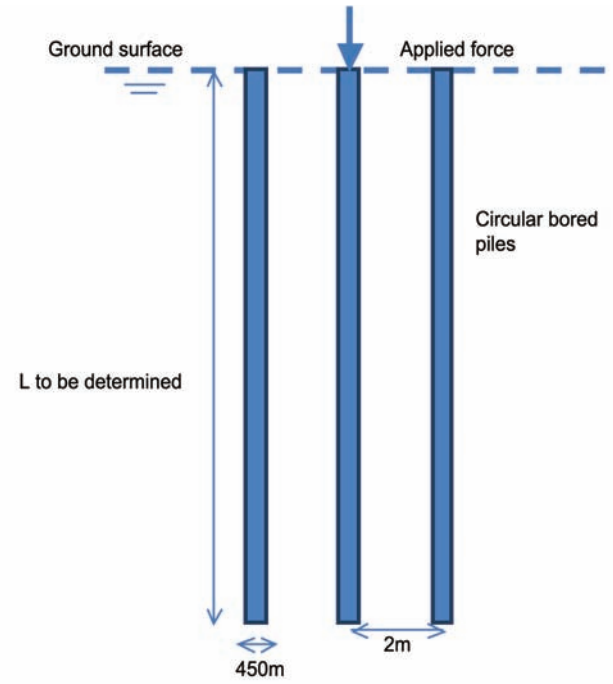


*Figure 3: Pile foundation in stiff clay (after Simpson 2011)*

The undrained shear strength of the clay at different depths can be determined from the results of four different types of tests that were carried out at the site: triaxial tests on samples from six percussion bored boreholes SG11, SG12, SG14, SG15, SG16 and SG17, SPTs in the six percussion bored boreholes, one CPT test and two self-boring pressuremeter (SBP) tests carried out at the locations shown in Figure 4, the results of the CPT tests, the logs of boreholes SG14 and RC13, and the results of the two SBP tests are available for reference in the IEM web portal, http://www.myiem.org.my. The design may select any or all of these data. Appropriate correlations are to be used to determine the characteristic values for design. Figure 5b shows a depth of 20m, the undrained shear strength is assumed to increase no further.

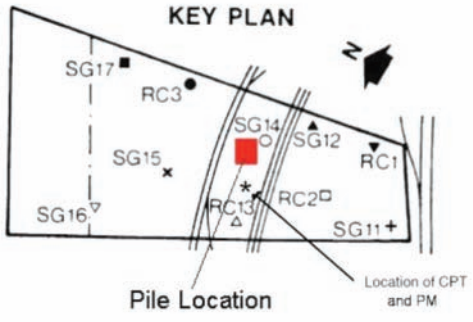


*Figure 4: Site plan (after Simpson 2011)*

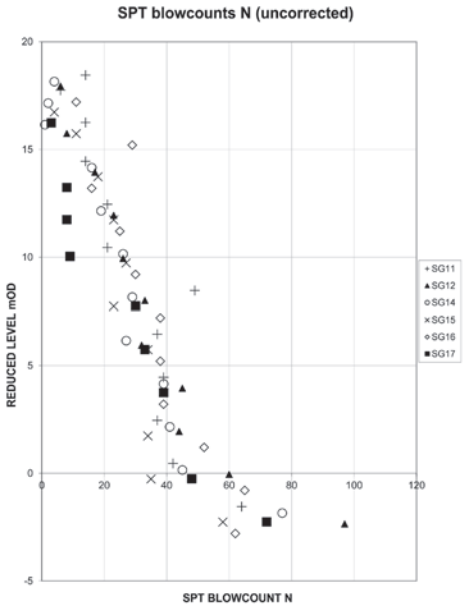


*Figure 5a: Combined SPT blowcounts (after Simpson, 2011)*

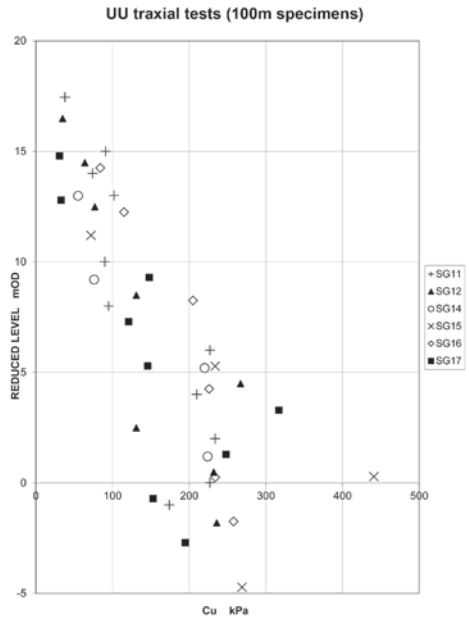


*Figure 5b: Results of undrained triaxial test (after Simpson 2011)*

The water table is at the surface of the clay, and water pressure may be taken to be hydrostatic. The weight density of the clay may be taken as 20kN/m$^3$. At this location, the ground surface should be taken to be +17m OD (OD = Ordnance Datum, i.e. reference level), which is also the level of the surface of the stiff clay. Using EC7, determine the design length of the pile at the location shown in Figures 5(a-b). The solution to this design example will be provided by Ir. Tan Yang Kheng, Ir. Dr Chan Sin Fatt and Ir. Dr Ting Wen Hui in the next issue of JURUTERA. ■

**REFERENCES:**

[1] Bond. A and Harris A, 2008, Decoding Eurocode 7, London: Taylor and Francis, 616pp.

[2] Simpson. B, 2011, The Institution of Engineers, Malaysia (IEM), Malaysia National Annex to EC7 Workshop