

Design and Construction of Stabilised Subgrades for Roads

CIVIL AND STRUCTURAL ENGINEERING TECHNICAL DIVISION



reported by
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The Civil & Structural Engineering Technical Division (CSETD) organised an evening talk on the design and construction of stabilised subgrades for Malaysian roads on 7 April, 2016, at Wisma IEM, chaired by Ir. Chong Chee Meng and attended by 41 participants.

The talk was delivered by Mr. Scott Young, who had vast experience in both design and construction of pavement stabilisation here and in Australia. He is also a guest lecturer at undergraduate and postgraduate level at the University of New South Wales and University of Technology Sydney.

This talk focused on the design procedures for the improvement of non-conforming subgrade layers for new pavement construction and the rehabilitation of existing pavements. It also emphasised on the construction aspect of stabilised subgrades which included specifications, equipment, process and verification of CBR.

On pavement design, Mr. Young asserted the importance of subgrade modelling. Whether building a new road or rehabilitating an existing one, subgrade stiffness is, by far, one of the highest risk elements to ensure the finished pavement meets the design life expectations. According to the new Design Guideline published in 2013, a minimum CBR of 5% is recommended for pavements that have to support traffic volumes corresponding to Traffic Classes T1 through T5. Mr. Young argued that at least 1m depth of subgrade should be modelled in the determination of design CBR to be used for the input into the pavement design process; he added that this was international practice. Such an approach can yield savings in the upper pavement layers. There are many methods to model the subgrade stratum using different CBR values within the profile. One common and well accepted approach was developed by the Japanese Road Association (as shown in Eq 1).

$$CBR_m = \left[\frac{\sum_i h_i CBR_i}{\sum_i h_i} \right]^3 \leq 20$$

Eq 1

Where:

CBR_i = CBR value in the layer thickness *h_i*
 $\sum h_i$ = the total subgrade depth, is taken up to 1.0m

In the second part of the talk, Mr. Young presented the construction process of subgrade stabilisation, starting with the specification requirements as stated in Standard Specification for Road Works published by JKR. Following that, he presented the equipment used for the construction of stabilised subgrades namely stabiliser/reclaimer, mechanical spreader, roller compactor, motor grader etc. Lastly on the construction process, subgrade stabilisation work starts with:

1. Site preparation – relocation of utilities, removal of topsoil, cutting or filling of existing material
2. Spreading of stabilising agent – the required quantity of stabilising agent is distributed as per design. Normally, this is achieved by controlling the spread rate of the spreader
3. Mixing – the optimum moisture content is crucial during the mixing process and it must be checked
4. Compaction – compaction is carried out to ensure that it has achieved minimum density requirements.
5. Grading – to level the stabilised subgrade
6. Curing – this is critical especially for cement based stabilisers. It is to ensure the proper hydration of cement.

At the end of the talk, there were questions from the floor which Mr. Young answered and clarified in detail. He also shared some of his personal experience and tips in stabilisation with the participants. The talk ended with the presentation of a memento to Mr. Young by CSETD Chairman Ir. Hooi Wing Chuen. ■