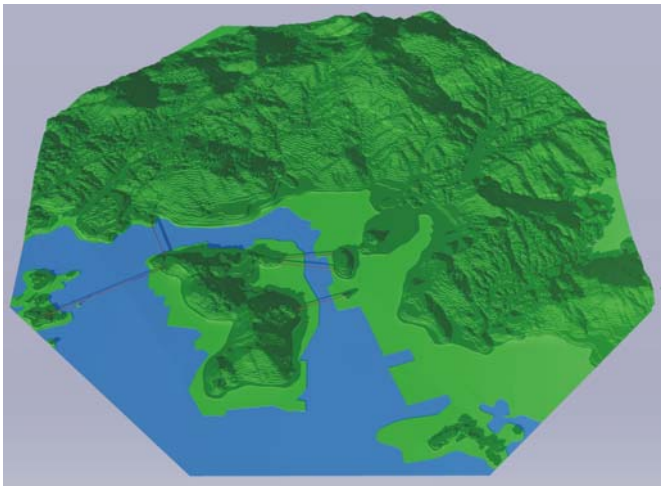
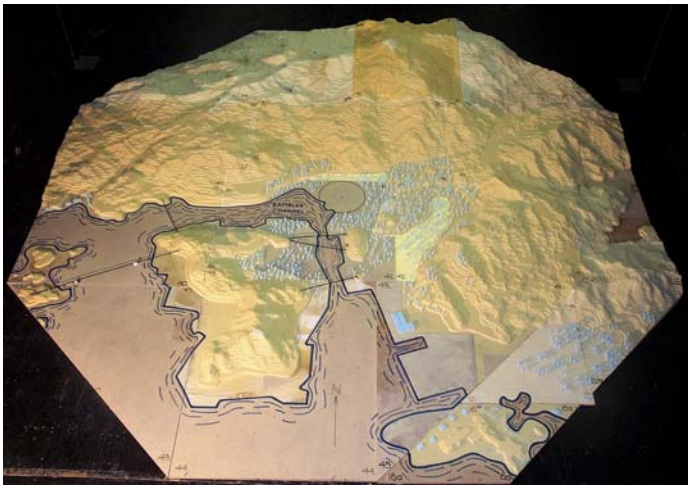
Hong Kong Topographic Studies

Wind Engineering Study



Computer Rendering of Generated 3-D Surface Data



1:3000 Scale Topographic Model (Tsuen Wan, N.T., Hong Kong shown)

Introduction

Small-scale topographic studies are used to determine the expected full-scale wind characteristics at a particular site influenced by the surrounding topography. This is particularly significant in Hong Kong where large hills with heights approaching 1000 metres above sea level are often in close proximity to urban areas.

Application

The expected full-scale wind profiles of wind speed and turbulence intensity obtained in the topographic studies are reproduced in larger scale (e.g. 1:400 used in building tests) matching wind characteristics including wind speed and turbulence intensity. This technique ensures that effects created by significant topographic features, which cannot be physically modelled at larger scales, are accounted for.

The Alan G. Davenport Wind Engineering Group carried out topographic studies for the Central District of Hong Kong in the early 1980's. They provided considerable insight into the type of modelling required for acceptable matching of wind tunnel and expected full-scale wind conditions. Recent topographic studies of regions in Hong Kong include the following:

- North and South districts of Victoria Harbour
- Aberdeen / Pokfulam
- Tsuen Wan
- Tseung Kwan O
- Tin Shui Wai

Details of Study

A typical topographic model covers a region with a radius of approximately 7 to 7.5 kilometres. A photograph of a completed topographic model is shown (top right). Digitized contour data of the project region, based on data from the Hong Kong Survey and Mapping Office, is used to generate a 3-D surface model as illustrated above (top left). The model is constructed using Computer Numerical Control machining technology.

In addition to the topographic features, the model also includes a generic representation of the buildings located within the region of study. The buildings in the immediate surroundings of the site are removed, matching the conditions in which the larger-scale wind profiles are measured.

The modelled upstream wind characteristics are matched to the expected typhoon conditions. Measurements of wind speed and turbulence intensity are taken at several heights up to an equivalent full-scale height of 1,400 metres. Wind characteristics are typically measured for 18 wind directions, at 20º increments over 360º compass directions.

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