

# THE ENGINEERING ASPECTS OF HILL-SITE DEVELOPMENT

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Ir. Dr Gue See Sew, managing director of Gue & Partners Sdn Bhd, presented a talk on "The Engineering Aspects of Hill-Site Development". The talk was held on 19 February 2004 at Bangunan Ingenieur, Petaling Jaya. The talk was well attended by more than 80 participants.

The theme of the talk was on the engineering input for hill-site developments which includes planning, analysis and design, construction and maintenance. The objective

was to provide the participants with an appreciation of the current issues faced by the engineering fraternity which are as follows:

- Frequent occurrences of slope failure at hill-sites in residential areas during the rainy season have resulted in public fear. Lack of systematic regulatory measures to address the safety problems of hill-site development is the root of the problem.
- Existing legislations and guidelines on slope failure mitigation have not been effective.
- Causes of landslides due to poor planning, design, construction and maintenance. Inadequate ground investigation, lack of quality assurance and quality control by contractors, lack of proper site supervision by consulting engineers and lack of communication amongst various parties involved in the construction are some of the attributes. Lack of slope maintenance culture is prevalent in both the public and private sector.

**TABLE 1: PROCEDURES FOR NEW HILL-SITE DEVELOPMENT**

CLASSIFICATION	PROCEDURE
1) Classification of hill-site development according to <b>CLASS 1, CLASS 2</b> and <b>CLASS 3</b>	Regulatory agencies and consulting engineers to classify hill-site development
2) For <b>CLASS 1</b> development, risk is considered LOW	Follow existing legislation in force
3) For <b>CLASS 2</b> development, risk is considered MEDIUM	Consulting engineers to submit geotechnical report prepared by qualified professional engineer
4) For <b>CLASS 3</b> development, risk is considered HIGH	Consulting engineers to submit geotechnical report prepared by qualified professional engineer. Accredited checker shall audit design from submitting consulting engineer

**TABLE 2: PROCEDURES FOR EXISTING HILL-SITE DEVELOPMENT**

CLASSIFICATION	PROCEDURE
1) Classification of hill-site development according to <b>CLASS 1, CLASS 2</b> and <b>CLASS 3</b>	Regulatory agencies and consulting engineers to classify hill-site development
2) Issue "Dangerous Hill-Site Order"	Order issued to owners of doubtful and unstable slopes after evaluation
3) Evaluation of the stability of slopes	Evaluation to be carried out by accredited checker

TABLE 3: GEOTECHNICAL INPUT FOR A HILL-SITE DEVELOPMENT PROJECT

GEOTECHNICAL INPUT	MAIN AREAS	DETAILS
1. Planning	1. Desk Study	Include site and adjacent sites: a) geological maps & memoirs b) aerial photographs c) topographic map
	2. Site Reconnaissance	Include the following: a) verify information collected from desk study b) collect new information exposed on site
	3. Site Investigation (SI)	Preferably in 2 stages: a) preliminary SI for overall site conditions b) detailed SI for specific areas
	4. Planning of Layout	Suit natural contours a) min. cut and fill b) min. retaining wall c) correct orientation of buildings and roads to minimize differential settlement
2. Analysis & Design	1. Design of Slopes	Requires: a) subsoil profile & properties b) ground water regime c) geology d) correct methodology and analysis e) external loading and design parameters.
	2. Factor of Safety	Two types of risk: a) Risk-to-life b) Economic risk Three level of risks: a) negligible b) low c) high
3. Construction	1. Site Supervision	Requires: a) proper supervision from a team b) geotechnical engineering knowledge (esp. field drainage requirement) c) close coordination with designers (site with design office) d) vlidate subsoil condition e) record site condition
4. Maintenance		Three major categories: a) routine maintenance inspection b) engineer inspections for maintenance c) regular monitoring of special measures (only if design is required)

The speaker also commented on the IEM Position Paper for Mitigating the Risk of Landslide on Hill-Site Development. A copy of the paper is available at IEM website (<http://www.iem.org.my>).

The speaker highlighted some pertinent points in the IEM Position Paper on the policies and procedures for mitigating the risk of landslide on hill-site development. This includes recommendation on the formation of a "Hill-Site Engineering Agency" to assist local authorities on engineering issues related to hill-site development and the registration of accredited independent checkers with the Board of Engineers, Malaysia (BEM) to audit submitting engineers' designs for major hill-site developments.

The speaker also touched on the subject of classification of slopes according to risk for new and existing hill-site developments. The classification of slopes is as shown in Tables 1 and 2. In addition to the existing legislation in force, the following procedures for mitigating the risk of landslide were also presented.

In his conclusion, the speaker highlighted the importance of having adequate and proper engineering input at the onset of a hill-site development to arrive at a safe, cost effective, uncomplicated construction procedure, environmentally friendly and aesthetically attractive hill-site development. A checklist of important geotechnical parameters to be considered for a hill-site development is given in Table 3. ■

#### AN OLD ENGINEERING JOKE

An engineering student was walking across campus when another engineer rides up on a shiny new motorcycle.

"Where did you get such a rockin' bike?" asked the first.

The second engineer replied, "Well, I was walking along yesterday minding my own business when a beautiful woman rode up on this bike. She threw the bike to the ground, took off all her clothes and said

"Take what you want."

The second engineer nodded approvingly

"Good choice, the clothes probably wouldn't have fit."