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DESIGN TOOL IN T&L: RC RETAINING WALL

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ABSTRACT

The economic booms experienced by Malaysia in recent times has propelled the construction industry as never before to serve the growing needs for structural and infrastructural developments. Myriad of projects with differing scales, complexity and market expectations have been taunting practitioners and academicians in the technical compass for years. This is further compounded by restrictive land constraints pushing developments ever towards more challenging topographies. As a result, unexpected and undesirable work outcomes would inadvertently come to the fore in the form of sub-standard or even failed products. Not too uncommon would we be served with news of retaining wall failures leading to massive property damages and potential loss of lives. Conventional practices are either inflexible or not customizable to local practices. This innovation develops an Excel VBA-based program that could facilitate the analysis and design processes of a reinforced concrete (RC) retaining wall based on the con-current design standard namely Eurocode 2. It employs an array of programmable functionalities such as alphanumeric entries and graphical displays to allow for flexibility as well as intuitive usage over ubiquitous platform. Both practitioners and academicians would benefit from resulting computational accuracies and resolved intricacies at a fraction of the cost and time.

Keywords: Excel VBA, RC retaining wall, construction, computation

1. INTRODUCTION AND OBJECTIVE

Failure of the retaining wall due to poor construction and design flaws has been well documented in prior researches (Binici, Temiz, Kayadelen, Kaplan, & Durgun, 2010). In addition, when the retaining wall construction which is usually closely associated with that of the adjoining retained slope, the consequent landslide of the latter resulting from the prescribed flaws would be intertwined with that of the former (Kazmi, Qasim, Harahap, & Baharom, 2016; Kim, 2009). These circumstances have led to unnecessary property damages and even loss of lives as outlined by DOSH (DOSH, 2019). Lack of adequate design appreciation and accomplishment might arguably be due to the grueling manual design process (Mohammad & Ahmed, 2018), unaccustomed technical parameter in pre-existing computer-assisted implementation and non-customizable interfacial framework to well-tried local practices (Bhoyar & Awachat, 2019). In the academic sphere, exposure to practical approaches in problem-solving is limited by the capacity of the instructors, and availability of innovative tools and resources as proposed in some researches (Temür & Bekdaş, 2016). Notwithstanding, it is the aims of this work to address some of these shortcomings through programmatic implementation via ubiquitous Excel platform but automated at crucial junctures via VBA scripting. The program shall mimic the recognizable conventional design steps of a R.C. cantilever retaining wall using EC 2 but its role become incipient when intense computational processes were involved. Interactive graphical display would aid in modeling of the problem. At greater accuracy and pace, multiple potentially determining factors and scenarios could be contemplated and simulated for a more thorough treatment of the varying subject-matter.

2. MATERIAL AND METHOD

The theoretical foundation for the analysis the cantilever retaining wall was based on the works of Rankine which promulgated the Maximum Stress Theory for the estimation of the active and passive earth pressures (Rankine, 1856). For the design aspect, the standard code of practice EC 2 has been employed for currency and compliance to prevailing requirements. Being packaged with MSO product and hence readily accessible, the work exploited the Excel functionalities in conjunction with VBA and API enhancements to produce a more flexible tool for a R.C. cantilever retaining wall design.

3. FINDINGS AND ARGUMENT

Figure 1 shows the snippets of the R.C. cantilever retaining wall program.

Figure 1. Snippets of the R.C. Cantilever Retaining Wall Program

4. CONCLUSION AND SUGGESTIONS

The program allows for parallel design considerations which facilitate comparison and optimization aims.

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