



Creative Construction Conference 2015 (CCC2015)

Evaluating the impact level of design errors in structural and other building components in building construction projects in Cambodia

Vachara Peansupap^{a,*}, Rothmony Ly^b

^aAssistant Professor, Department of Civil Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok 10330, Thailand

^bGraduate student, Department of Civil Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok 10330, Thailand

Abstract

Design errors are unavoidable in any construction projects and can negatively affect cost, schedule and safety performance. The different types of design drawings may have various levels of design errors due to many factors such as unclear overview of the designs, lack of coordination process, and human mistakes. Civil engineers, both designers and contractors, have limited understanding of the importance of design errors that occur in construction phases. This paper attempts to evaluate the impact level of groups of design errors in structural and other building components and also the impact level of their cases which occur in building construction projects in Cambodia. Respondents were asked to provide the impact score for design errors based on the five-point Likert scale, ranked from 1-negligible to 5-disastrous. The average impact score was determined in order to rank the impact of design errors. As a result, design errors in structural and mechanical works are found as the first group to be focused due to its impact, followed by design errors in structural and plumbing works. The top three cases under the group of design errors in structural and mechanical works are those in reinforced concrete walls and lift systems, footing and lift systems, and slab and HVAC systems. These results are significant for engineers to be aware of the possible high impact of design errors, and also to determine which group of design errors should be considered first. Further studies should look at the combination of such occurrence and impact of design errors in order to efficiently identify the most critical and significant design errors in terms of not only their impact, but also their occurrence in building construction projects.

© 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the organizing committee of the Creative Construction Conference 2015

Keywords: Building construction projects; design errors on structural and other building components; five-point Likert scale; impact.

* Corresponding author. Tel.: +66-02-218-6460; fax: +66-02-251-7304.
E-mail address: vachara.p@chula.ac.th

1. Introduction

Design errors are an inevitable and important issue which have negative impact on project management efficiency and effectiveness [1]. They are the important contributors to reworks, cost overruns, schedule delays, and unsafe environments which affect project performance [1, 2]. In practice, owner, designer, contractor, and other stakeholders have different interests in the design [3]. These various interests certainly lead to design errors which can arise at any time [4]. The occurrence of these errors can increase many difficulties in construction management. These difficulties can lead to between 80% and 90% of the failures occurring in civil engineering projects [5]. They can also incur more cost that adds a project's value around 14.2% [6-8]. Design errors are a serious threat to construction projects [5, 9-11]. Besides, the use of technology is limited in construction development in Cambodia because of inadequate human resources and limited education system. This is a reason that the occurrence of design errors cannot be effectively controlled and can greatly affect the construction process. Design errors are thus very significant and should be carefully managed to ensure the success of construction projects and to minimise difficulties in project performance. To create an effective strategy to manage design errors, it is important to recognise the level of their impact. The impact of design errors has been already assessed in previous studies; however, only schedule delays have been studied by developing a model of seven sub-modules, such as generic work execution, effort, precedence relationship, productivity, resources, progress measurement, and managerial control [4]. The impact of design errors in structural and other building components has not been yet studied in detail and well-understood. Design errors in different building components may have different levels of impact. Therefore, the purpose of this study is to evaluate the impact level of design errors in structural and other building components in building construction projects. This study can help practitioners to clearly understand the most affected groups of design errors and the most significant cases under each group. It will help them to learn the kinds of design errors that disastrously affect the projects.

2. Design errors in building construction projects

Design errors are inevitable in the construction industry. Many researchers consider design errors as the most critical problems and have defined the term 'design errors' in various ways. Reichart [12] claims that design errors are unavoidable failures occurring when information is incorrectly applied or used, or the pertinent information is not accessible. 'Design errors' refers to the failures of humans to design tasks within time limits and accuracy [13]. Owing to the required level of accuracy and time constraints, common human errors can lead to design errors. These problems can influence the quality of both design and construction. Deviation from actual values, inadequate precision and inconsistencies in measurement are also considered as design errors [14]. In this article, 'design errors' refers to design mistakes, design omissions, and design conflicts. Design mistakes are the human errors that are occur naturally and are unavoidable. An inexperienced designer may apply the design information incorrectly. These mistakes can be lapses (memory failures) or slips (when failure arises even if knowledge is correct) [5]. Design omission occurs if any part of a system has been forgotten in the design [15]. Design conflicts are the overlapping items that cannot be constructed at the same time.

3. Groups of design errors between structural and other building components

Detailed building design process consists of five disciplines: architectural design, civil design, structural design, mechanical design, and electrical design [16]. Mechanical, electrical, and plumbing systems (MEP systems) have caused many problems related to limited space for MEP system installation [17]. This suggests that it is necessary to study about design errors associated with MEP systems. Design errors in structural and plumbing works are also included in this study, while civil work is excluded because it is not about the internal structure of the building.

According to the detailed building design process and the necessity of MEP systems, design errors between structural and other building components involve five different groups, such as design errors between structure and architecture (Group A), design errors between structure and structure (Group B), design errors between structure and mechanical works (Group C), design errors between structure and electrical works (Group D), and design errors

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات