

A suitable function of construction industry



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Introduction

Until 1958 when the construction industry began to be formulated following rules, construction businesses had suffered a poor reputation due to wrong practices of the past. The construction industry was known as an area of illegality and corruption. Accordingly, it is no exaggeration to say that for Korea's construction industry, the past six decades were characterized by a war against illegality and corruption. Ironically, the response to this was the introduction of the American type of construction system. In addition, it is notable that competition has been introduced for construction project bidding. To be sure, there were limitations in rooting out illegality and corruption. Through these efforts, however, the nation could establish a modernized delivering system for construction projects over the year. Additionally, it is not too much to say that policy and system were formulated. In meanwhile, large-scale construction accidents frequently occurred due to dishonest work, which will happen in the process of industrialization. In April 2002, the South Korea government announced that it will work more closely with non-governmental actors in the fight against corruption. The government procurement agency announced the introduction of an ombudsman system and a clean procurement committee in an effort to break ties between the government and its contractors. The corruption law also established an anti corruption commission, with a specific mandate to investigate cases involving high rank officials. Before the commission was launched in January 2002, however, its first chairman resigned because of his suspected involvement in a major corruption. Like this, corruption is occurring by human selfishness. There were many

accidents through human errors and misdeeds. Sampoong Department Store is one of the examples.

On 29 June 1995, a department store building in Seoul suddenly collapsed. It was only five years old and killed 502 people and injured 937 people. The structural collapse of the Sampoong Department Store was not an isolated deviation but a clear omen of deeper problems within society. In the Sampoong collapse, bribery of inspectors was rampant. No one raised any alarm when a huge, unauthorized air-conditioner was erected on the roof of the building which caused enormous cracks in the walls. A probe revealed that the building's owners sacked contractors who had complained that planned design changes were unsafe. The new contractor, a subsidiary of the store, had no objections. In this accident, at the same time, South Korea's construction industry had been attacked by man-made disasters even before the Sampoong Department Store tragedy. In this paper, the main reasons of the collapse and evaluation of this collapse will be briefly described.

Background

The Sampoong building had two wings, with one housing the department store and the other sports and leisure facilities. The wing that collapsed was the one housing the department store. It was built by Sampoong Construction and Industry Company and completed in November 1989. An addition to the building was completed in October 1994. The building housed 556 departments with 681 employees. It stood 27.6 meters high and sat on a 29,008-square-meter. The four underground floors consisted of a parking place and an electricity control room. Three of the collapsed building's floors

which comprised the department store was operated by Sampoong Construction Company whose engineering ranks 858th among the nation's construction firms.

If it was careful, the warning signs that could have prevented the collapse of the Sampoong Department Store came as early as 15 days before the accident. At that time, a restaurateur on the fifth floor reported a crack on the ceiling of the building to management. But, management's response was lukewarm, and management took no action. Then, 5 days before, a customer who had entered the same restaurant to get something to eat after some routine weekend shopping, was showered with a water leak from the ceiling of the restaurant. Three days before the collapse, a report of a gas leak again went unheeded by the department store management.

On the day of the collapse, June 29, the signs that should have set off alarm bells appeared before opening hours in the restaurants on the fifth floor. Around 9: 30 a. m., the floor of the restaurant cracked open slightly. An environmental technician reported the incident to the management. Top executives of the department store stopped by an hour later, mumbling something about seeking professional assessment. Between 11a. m to 12p. m, neighbouring restaurants were experiencing water leaks from ceilings and cracks in the floors. Only at this point did the management close off the fifth floor, while the other floors continued with business as usual. Sometimes after 1 p. m., a breakdown of air conditioning and gas services as well as a power failure occurred throughout the department store. The management met around 3 p. m. for an emergency meeting without notifying the employees and shoppers of the situation. When things were at their worst,

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the executives of the department management left the building, consequently leaving many employees and shoppers still inside. At 6p. m. on 29 June, the centre of the building collapsed, similar to a controlled implosion, in 20 seconds. Customers were concentrated in the basement and in the fifth floor restaurant. The customers and employees had no time to escape. Some survivors were found in the wreckage, and one was brought out 17 days after the collapse. The overall death toll was 502.

Corruption

The main issues addressed in this paper are corruption, frequent design change and maintenance repair in South Korea. The first section of this paper will examine corruption in the collapse of the Sampoong Department Store. This report was delivered by Seoul District Prosecutors Office, entitled The Final White Book of Finding out the Real Truth of the Collapse of the Sampoong Department Store. The public was outraged. In particular, the news that the senior executives had fled the building without warning others was disturbing. The report on the collapse, as well as earlier structural and construction failures, suggested a widespread pattern of corruption in the country's construction business. A government survey of high-rise structures found 14% were unsafe and needed to be rebuilt, 84% required repairs, and only 2% met standards. Joon Lee, the chairman of Sampoong, and his son Han-Sang Lee, were convicted and sent to prison for 10 and half years and 7 years, respectively. Twelve local building officials were found guilty of taking bribes of as much as \$17, 000 for approving changes and providing a provisional use certificate. The cause of the Sampoong collapse, then, was not a technical issue as much as outright fraud. The Korean construction

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industry, protected by government regulation from outside competition, had become complacent. Bribes were used to get around the usual government checks and balances that serve to protect public safety.

Relationship problem between the architects and builders

In the design planning process, relationship and communication between architectural designers and structural designers are important. Generally, if their relationship and communication are in discord some construction works, it can bring out accidents such as Sampoong Department Store collapse. This paragraph begins by laying out the theoretical dimensions of the research and looks at how design problems occurred in this collapse. In recent years, the subject of the design quality has become one of the important issues in the domestic construction industry. However, important design processes are made by judgement of the architect without the rational communication and information sharing among the related participants. Therefore, the objective of this research suggests the constitution plan of design error management system not only for systematizing types about the design error in construction projects but also for analyzing the primary factors of design error to embody the actual condition of trouble between architects and builders. Normally, in South Korea, builders think know-how is more important but architects think that beauty of art and quality what contractor ordered, are more important so that there were lack of communication of information and a narrow sense between architects and builders.

Relationship and communication problem between architectural designers and Structural designers

Generally, design drawings are distributed, such as architectural design drawing, structural design drawing, mechanical facility design drawing, electric facility design drawing and engineering design drawing. Structural calculations need to be correct in order to ensure the safety of the building and structural design drawing with structural calculations need to be written exactly and used on-site. Mechanical facility and electric facility design drafts are written considering the calculations which were reviewed in advance about facility capacity or standards according to the structure calculations in the structure design drawings which include the safety of a building and standards. In the process of structural design planning which affected the most important reason of the collapse, architectural designer and structural designers decided the scale of a building, stories, appearance and use in the early architecture plan and then on a basic structure plan like pitch of columns or structure style. The architectural designer writes the architectural design draft first, and the structure designer carries out structure calculations according to all conditions given in the architecture blueprint which the architectural designer wrote. In many cases, however, architectural designers distribute structural design drafts which are calculations made by structural designers. As the result, structural designers are different with structural draft authors, so that structural designers' design can be changed by authors who may make fatal errors. In this accident, it the relationship and communication between architectural designers (architect) and structural designers (structural experts) was not

adequate, and their communication was only call and memoranda, so that they had not exchanged information. Thus, structural calculations, structural drafts and construction drafts were different.

Design problems

There were many structural and architectural problems in the Sampoong Department Store collapse. This paragraph will describe problems of use change and flat slab systems in the problems. Firstly, construction of the Sampoong Department Store was a flat slab system. The flat slab system can be defined as a construction method that builds safely several columns established in the upper part inside of the building. However, the weak point of this system is many columns. So, this flat slab system is insufficient to department store buildings because if there are lots of columns in the building, the space will be narrow. So, structural designers removed block walls for the purpose of making wide clearances to sell products and punched a passage for an escalator. Also, size and shape of uplift column was changed. In flat slab system, the column is very important but structural designers of Sampoong Department Store had neglected design load calculus. Moreover, even though the fifth floor was made, column size was lessened 25% (79cm to 58cm) for appearance and even columns located near the escalator were lessened more.

Secondly, the use of the Sampoong Department Store was four stories office building at first and this building was approved as a four stories building. However, owners of the building wanted to change to a department store building and the owners referred it to Woosung Construction Company.

Constructors and managers of Woosung Co. opposed that because it needed more columns and thicker columns. Thereupon, the head of the Sampoong group changed Construction Company to own Sampoong Construction Company. Lastly, the five stories Sampoong Department Store were built without reinforcement of uplift columns by the company. The most serious problem was the fifth floor. The fifth floor was the restaurant area and the interior was composed of a Korean floor heater for a luxury Korean traditional restaurant so that, 30cm concrete was added for the Korean floor heater. Also, heavy kitchen equipment was needed. As the result, the whole building collapsed when these added loads affected columns.

Maintenance problems

This paragraph explains the maintenance of collapse of this Sampoong Department store. Sampoong made significant changes to the structure. The most important was the conversion of the original use as an office block to that of a department store. Other changes included changing the upper floor from a roller-skating rink to a traditional Korean restaurant. Stricter standards had to be met for fire, air conditioning and evacuation. Although the structure apparently met all building code requirements, the revised design was radically different from the original. This accident was a man-made disaster that the government official allowed haughty businessman who brought out blind money as a result and the building company built it.

Conclusion

The construction work of Sampoong Department store was started on July 1987 and opened on December 1st 1989 with Temporary Use Permit and <https://assignbuster.com/a-suitable-function-of-construction-industry/>

operated for 5 years. Unlike a normal building framework using beam and column, its structure system uses Flat Slab structure so that the floor slab supports the column by itself without any beam. In a flat Slab structure, one column can stand the same amount of stress so that the collapse of one column can cause progressive collapse which can be them the entire building. Investigating the present state of collapse was analyzed minutely and based on this analysis, the design, construction work, and maintenance of this building was discovered as the direct and indirect cause of collapse.

As a result, the collapse of this building was brought from a flaw in design, unreliable construction work, and maintenance problems interacting with each other for long term. A brief summary is the following. Firstly, the one that influenced collapse the most is the maintenance problem. Changing design and use, without any approval, causing additional overweight to be added and also cutting structures left the whole building structure with low durability. Secondly, in the process of construction work, managing the work and superintendence was negligent which caused part of the collapse. Thirdly, inappropriate construction and structure plan caused progressive collapse. Moreover, neglecting safety diagnosis on the long term cracks and sinking process and insufficient managing of crucial moments like right before the collapse brought about a disastrous accident. Finally, those causes, which continued for 5 years, gave no security and safety, and at the end, around the fifth floor, the roof slab was destroyed and the adjoining slab destroyed, which caused progressive collapse.

A building can maintain safe conditions through fine design, construction work/supervision and appropriate maintenance. However, if a domestic

construction system does not include a structure expert who puts safety first anywhere in the process of design, construction work/supervision and maintenance, there will be major problems. According to the law for architect, article 4 clause 1 and clause 2, designing and supervision of construction can only be done by an architect, and blocks the structure expert from designing and supervising the construction from the beginning. In addition, the law for architect article 2 clause 2 states that structure expert has subordinate relationship with architect, so that structure expert is not at the position where he can take responsible for the safety.

Such a system cannot be found in developed countries except in Korea. For example, America does not limit the construction right to either architect or structure expert and Germany gives right to design structure only to structure expert. Also, Japan and Singapore structure expert takes care of structure design. Especially in Germany and other EU, client or representative picks ' safety coordinator' who takes charge of every process from beginning to the end, such as consulting and superintendence.

To look at design, construction work/supervision and maintenance of Sampoong department store closely, structure expert was never in the responsible position so that he did not finish his work with responsibility. Moreover, the current domestic system had no coordinator who could point out faulty structure design and construction so that an architect who was responsible for construction asked the structure expert only for structural calculations and used them on the structure layout. When use and design were changed, the architect only asked the structure expert orally or in memo form and not with any official document. It seemed that structure

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expert was legally only in an assistant position which made it harder to ask for formal documents and the structural expert also did not have any obligation to be responsible for the structure problem since they are only an assistant.

Recently constructions with size over fixed standard or for special needs are required to have affixing a seal of structure expert on the structure layout. However this is only the action of affixing a seal from the structural expert, it does not mean that they are responsible for construction like in other developed countries. In Korea, the current system does not have any way to prove the faulty safe the issues from in the process of design, approval, and construction/supervision like Germany or EU. In the deliberation for a Construction Permit, structure field is handled but it's only 10 or 20 minutes which is impossible time to point out any problem in the structure and examine an entire complex design perfectly so that the Construction Permit is only a formal document to avoid responsibility.

In conclusion, although common administrative regulations should be softened in order to solve inconvenience of the people and the vitalization of market, strengthening the regulations to protect the nation and their property is a global trend. To take this into consideration, experts who can take care of their work with responsibility and specialty is essential and needed on every step in the process of design, construction/supervision, and maintenance in order to prevent the reappearance of such a disaster like the collapse of the Sampoong department store.