

# RESEARCH ON SOLUTIONS TO IMPROVE QUALITY MANAGEMENT FOR DESIGN AND SURVEY WORK OF CONSTRUCTION PROJECTS: CASE STUDY AT BINH DUONG CONSTRUCTION INSPECTION CONSULTING COMPANY LIMITED

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**Abstract** - To evaluate the suitability of locations and natural conditions for construction projects, designing and selecting foundation solutions must be conducted reasonably and cost-effectively. Binh Duong Construction Inspection Consulting Co., Ltd. has succeeded significantly in this field. However, improving quality management is essential to adapting to economic and technological integration and enhancing companies' competitive capacity in survey and design. This study focuses on identifying common mistakes and researching solutions to improve the quality of survey and design work for construction investment projects at Binh Duong Construction Inspection Consulting Co., Ltd. The results of this study not only support both the company and investors in minimizing risks and costs for construction projects but also contribute to the sustainable development of the construction industry generally.

**Key words** - Quality management; surveying and design; construction project

## 1. Introduction

The survey and design work is one of the key stages in a construction investment project, directly affecting the project's feasibility, safety, and cost efficiency. To ensure the design quality aligns with the project's requirements and meets technical standards, the survey and design work must be carried out scientifically and in compliance with current legal regulations. The survey and design work task preparation must consider the project's objectives and characteristics, such as type and construction class, and select suitable survey methods and technologies for each design phase. The report on the results of this task must ensure accuracy, clarity, and legal compliance, and be approved by the relevant stakeholders.

Geological, topographical, and environmental surveys serve as the foundation for developing design solutions, ensuring the quality of the construction, and are crucial to the success of the project [1]. This work provides supporting information for planning and design, such as geological structure data, assessments of groundwater aquifer reserves, rock and soil layers, and environmental impacts. Modern survey methods, along with the application of technological advancements like Building Information Modeling (BIM) and geotechnical software, have improved accuracy and minimized risks during the project implementation phase [2].

The survey and design work in some construction projects in Vietnam still faces many challenges. Factors such as complex natural conditions, and limitations in equipment, along with issues related to legal procedures and quality management, have impacted the quality of the surveys. Studies emphasize that the lack of coordination between the survey and design work and the practical requirements of the project is one of the main causes of delays and increased construction costs [3]. Therefore, researching and evaluating the quality of survey and design work is essential to improve the efficiency of construction project management in Vietnam.

This study analyzes and evaluates the quality of the survey and design work at a representative construction consultancy company, and proposes improvement solutions to enhance the effectiveness and feasibility of construction investment projects. By combining comparative analysis and expert consultation methods, the research will provide deeper insights into both subjective and objective factors affecting the quality of survey and design work, covering aspects from technical, and legal to personnel management and technology.

The urgency of this issue is reflected in the need to raise awareness about the role of survey and design work throughout the project implementation process, while also proposing specific measures to improve the quality of consultancy services. Ensuring the accuracy and comprehensiveness of the survey and design work is a key factor in minimizing risks, saving costs, and accelerating project progress.

## 2. Research methods

### 2.1. Document analysis

First, the study synthesizes and analyzes relevant research on the survey and design process, technical standards, and factors affecting the quality of this work. The materials include articles, national and international construction standards, research reports from professional organizations, and current legal documents. This synthesis aims to build a solid theoretical foundation while identifying the common challenges faced by the construction industry, serving as a basis for proposing improvement solutions.

## 2.2. Data collection

Data is collected from representative projects at Binh Duong Construction Inspection Consulting Company Limited, focusing on projects that have been completed or are currently under implementation in various geological and natural conditions. The types of data collected are presented in Table 1.

*Table 1. Data types used in the project*

Data types	Description
Geological and topographical survey report	Contains information on geological structure, hydrological conditions, and factors affecting the design and construction process
Technical design documentation	Provides detailed insights into the design proposal process, from the preliminary phase to the technical design and construction drawings
Project quality assessment report	Includes information on compliance with standards, project schedule, and costs after the completion of the construction phase

## 2.3. Expert consultation method

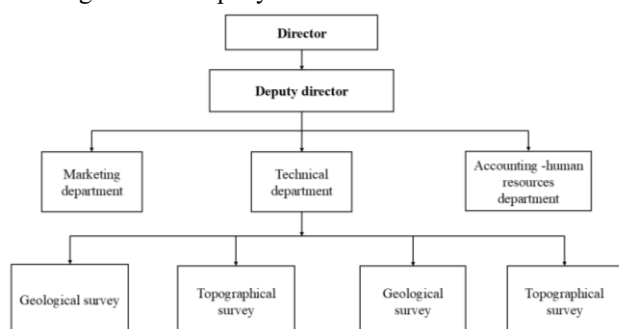
To ensure reliability and objectivity in the evaluation, the study surveyed leading experts in the field of survey and design work. The selected experts have extensive experience working on large-scale projects with complex technical requirements.

## 3. Current status of quality of survey and design work at the company

### 3.1. Company introduction

#### 3.1.1. General introduction

Founded in 2016, the company has established its position in the market within the field of survey and design work. The company boasts an impressive portfolio with a series of significant projects across various sectors such as transportation, irrigation, industrial, residential, technical infrastructure, and the environment. The company's core activities include geological and topographical surveys, as well as construction material testing. The organizational chart of the company, presented in Figure 1, illustrates a clear division of labor based on specialized functions, focusing on the company's core activities.



*Figure 1. Company organization chart*

#### 3.1.2. Business activities

The company is well-known within the construction community, particularly in Binh Duong province and neighboring areas. Thanks to its reputation, local

management authorities, private companies, and project management boards have chosen the company as their survey and design work provider. Table 2 summarizes the representative projects of the company.

*Table 2. Some typical projects of the company*

No.	Contract name	Location	Contract value (VND)
1	Upgrading Dau Tieng District Medical Company	Dau Tieng District, Binh Duong Province	241.828.000
2	An Phu Intersection (Overpass on 22/12 Street and underpass on DT.743 Street)	An Phu Ward, Thuan An City, Binh Duong Province	209.000.000
3	Thanh Tuyen High School	Dau Tieng District, Binh Duong Province	271.543.000
4	Renovation and expansion of Song Than Industrial Park Customs Branch	Di An City, Binh Duong Province	101.154.603

## 3.2. Issues to be considered

The company lacks a systematic quality management model when implementing new contracts, leading to a tendency to apply case-by-case approaches and a lack of modernization in management. Furthermore, quality assurance is entirely the responsibility of the survey lead, without clearly defined responsibilities among the stakeholders. This indicates that the company's quality management model has not been effective.

The company needs to improve its personnel management capabilities. Some engineers require further professional development to effectively address complex cases. Additionally, attracting more leading experts in the field will help generate more innovative solutions. The company also should optimize the use of machinery and equipment and consider investing in new equipment to increase work efficiency. Moreover, it also needs to improve the control of input data for design purposes to enhance product quality.

## 4. Proposed solutions

### 4.1. Application of new technologies

In the context of integration, the application of new technologies in the field of construction quality management has become an urgent requirement [1]. The company needs to invest in various types of machinery, equipment, and new technologies. At the same time, it is necessary to enhance the skills of machine operators through training courses.

The company should invest in the following technologies:

- Global Navigation Satellite System (GNSS) technology [2].
- Trimble RTX (Real-time extended) technology.
- LIDAR technology [3].

The products generated by these technologies include digital surface models, digital terrain models, intensity images, and true orthophotos. The goal is to eliminate the

limitations of the old solutions by applying more advanced and effective solutions, thereby improving the quality of the products.



**ViewPoint RTX**

Home

**Delivery:**  
Via Satellite  
Via IP/cellular

**Accuracy:**  
Horizontal  
< 1 m (39")

**Initialization:**  
< 5 minutes

Click to zoom

Figure 2. Trimble R1 and R10 Model 2 GNSS

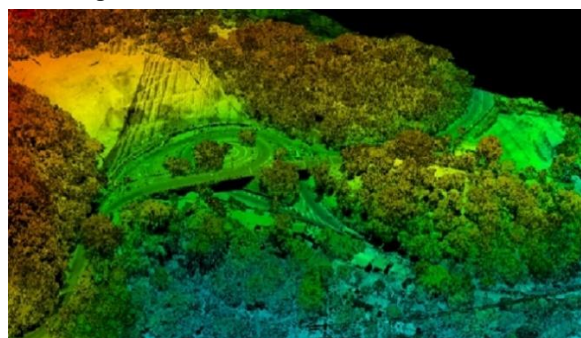


Figure 3. An illustrative example of a digital terrain model

**4.2. Improvement of human resource quality**

The company needs to implement policies that facilitate staff members in enhancing their professional qualifications through training courses. Additionally, clearly defining management levels for each department is essential to arrange and assign tasks effectively. The company should also conduct annual assessments of professional skills and competencies for employees. This will help classify and provide training based on different levels, from initial training to advanced or retraining.

Moreover, the company needs to encourage a self-learning spirit among employees through widely available information resources such as books, magazines, audio-visual materials, television, and the Internet, in order to enhance their capabilities. Building a dynamic, civilized, and professional working environment will improve effectiveness and increase employee satisfaction. At the same time, it is important to allocate work fairly and reasonably to enhance employees' income.

**4.3. Increase in equipment investment**

The company's management board needs to develop a strategy for investing in machinery and equipment.

However, due to financial constraints, investments should be focused rather than dispersed. During this process, the company must conduct a thorough analysis of actual needs as a basis for selecting equipment with appropriate technical specifications and technologies.

**4.4. Completion of organization work at the site**

The organization of survey execution is a key factor that significantly affects the safety, schedule, and economic efficiency of the project. The company needs to develop specific plans and detailed approaches to enhance the effectiveness of the execution organization. The level of organization must be adjusted according to the scale and duration of the survey, as well as reflect the ability to utilize investment capital, and equipment, and ensure the quality of the project.

**4.5. Strengthening stakeholder relationships**

By analyzing the stakeholders, the company will gain a clear understanding of the relationships within the project environment and will be able to exchange and discuss relevant issues on time. To take appropriate actions for each stakeholder, it is essential to understand the characteristics of stakeholders within each group.

**4.6. Consultation with experts on proposed solutions**

This study is also based on assessments of the current situation and opinions from experts, consulting units, contractors, and investors to propose the most optimal solutions. Table 3 presents the evaluation results from experts, reflecting the comparison and selection among different options, which helps make a final decision that is comprehensive and scientific, based on the integration of various professional and practical aspects.

Table 3. Results of expert evaluation of solutions

No.	Proposed solution	Sample number	Average score
1	Application of new technologies (S1)	22	3,86
2	Improvement of human resource quality (S2)	22	3,86
3	Increase in equipment investment (S3)	22	3,69
4	Completion of organization work at the site (S4)	22	3,68
5	Strengthening stakeholder relationships (S5)	22	3,69
6	Consultation with experts on proposed solutions (S6)	22	3,76

**4.7. Obtained results**

After implementing the proposed solutions in several recent projects, the fundamental results are described in Table 4. The results indicate a significant improvement in various aspects. Notably, the accuracy of the surveying work has increased, contributing to the reduction of errors and risks during project execution. The project execution time has been considerably shortened thanks to the application of new processes and methods. This enhances work efficiency and increases customer trust in the services provided. Importantly, surveying costs have also decreased, optimizing resources and budgets, and creating

a competitive advantage for the executing unit. These results demonstrate the effectiveness of the solutions proposed in the study.

**Table 4.** Results obtained implementing solutions

No.	Proposed solution	Result
1	S1	Completing projects ahead of schedule while enhancing accuracy
2	S2	Successfully handling multiple complex projects, increasing customer trust, and enhancing the company's reputation
3	S3	Increasing data accuracy and reducing field time
4	S4	Reducing survey costs and increasing customer satisfaction
5	S5	Decreasing the number of design errors arising after surveys and completing projects on schedule
6	S6	Reducing costs and survey time while increasing customer satisfaction, along with a decrease in labor costs

## 5. Case study

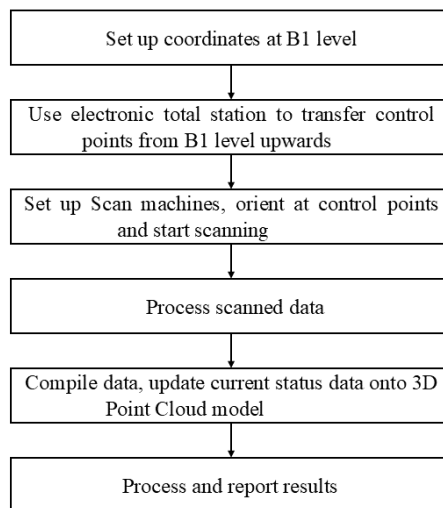
### 5.1. TDC Plaza project

The company has implemented numerous solutions to improve quality management in the survey and design work across various investment construction projects. The most notable example is the TDC Plaza project, where the task of surveying the current structural conditions and building components of the existing structure successfully applied several solutions, yielding significant results.



**Figure 4.** TDC Plaza building

The scope of the detailed surveying work includes the location of existing objects within the structure, referenced against the design grid system; dimensions of columns, walls, beams, and floors in the basement and upper floors; dimensions and positions of openings and slab edges; beam and ceiling structures; stairways and elevators; and the technical systems of pipes and septic tanks.



**Figure 5.** Process of collecting spatial data of the building using 3D scanning technology

3D scanning technology was applied to collect data from the building's spaces. The implementation process of this task is shown in Figure 5.



**Figure 6.** Positioning the coordinates and orientation using reference markers



**Figure 7.** Orientation using a total station prism and scan with the 3D Scanner – GLS2000

Figure 6 illustrates the process of determining the coordinates and X, and Y orientation of the surveyed data of the building using reference markers. Figure 7 presents the process of X, and Y orientation using a total station prism, combined with scanning the entire survey area with the 3D Scan – GLS2000 device. This is a crucial step in establishing accurate coordinate systems, helping to determine the position of the survey points on the field, and



ensuring consistency and precision throughout the survey and construction process.

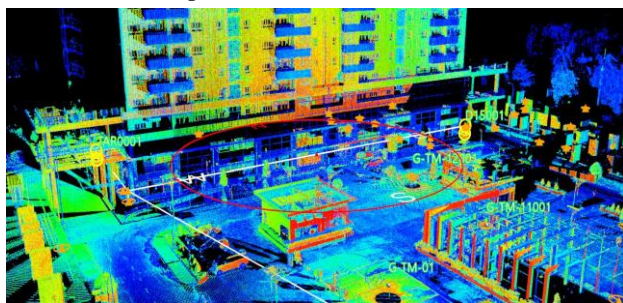


Figure 8. Illustration of the station positions and the overall model – merging data from 3D Scan stations

Figure 8 illustrates the process of orienting the X and Y axes using a total station prism, combined with scanning the survey area using the 3D Scanner – GLS2000. This method uses the total station prism for spatial orientation and precise positioning, followed by scanning the entire survey area with 3D scanning technology. This device allows for detailed data collection with high accuracy, reconstructing the actual surface of the structure or survey area in the form of a 3D model. This technique enhances accuracy in surveying, provides valuable support for analysis and design, and optimizes the construction process.

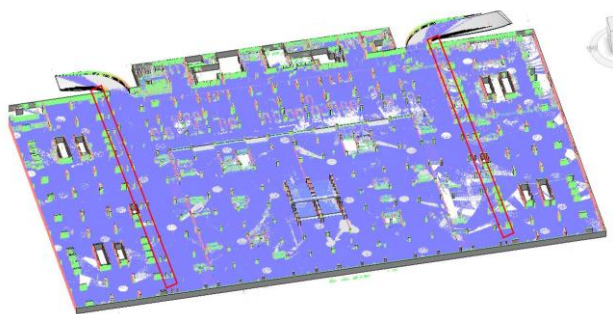


Figure 9. Floor plan drawing of columns and walls of basement

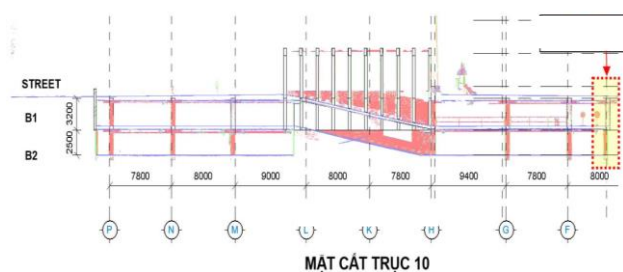


Figure 10. Longitudinal section drawing

After comparing the actual results following the processing of scan data and drawings, the survey team identified some discrepancies, such as the number of structural elements, positions, and elevations between the existing conditions and the design drawings, as illustrated in Figures 9 and 10.

5.2. Other projects

In addition to the aforementioned project, some of the achievements gained from the application of the proposed solutions in this research to other projects are summarized in Table 5.

Table 5. Results achieved for each specific project

No.	Project	Proposed solution	Results
1	Upgrade of National Road 13	Used GPS-RTK positioning equipment instead of traditional surveying methods	Completed the project ahead of schedule while enhancing accuracy Reduced surveying costs to the minimum for the investor
2	New city part	Utilized GPS-RTK positioning combined with drone surveying	Increased data accuracy and shortened fieldwork time Ensured precise results across the entire area (including the underwater lake bottom)
3	Overpass at Phuoc Kien	Fully contacted all stakeholders to understand the underground structure Developed a detailed schedule to ensure safety	Ensured traffic safety, with no congestion during the construction period Underground infrastructure was not affected by the survey work
4	Beck brewery	Improved geological drilling equipment	Met the challenging surveying conditions within the factory without disrupting production, increasing customer satisfaction
5	The One Residence housing project	Used GPS-RTK positioning combined with drone surveying Transitioned testing equipment from manual to automated systems	Increased data accuracy and halved construction time Saved costs and time for the investor Minimized errors caused by human factors Company staff confidently managed and processed all projects
No.	Project	Proposed solution	Results
6	TDC Plaza housing project	Used 3D Laser Scan GLS-2000 – TOPCON to implement the 3D model of the current state	Increased data accuracy and shortened fieldwork time. Ensured a highly accurate 3D model. Integrated with VN2000 coordinate data
7	Landmark at Bach Dang extended road	Used GPS-RTK positioning combined with electronic total stations	Increased data accuracy and shortened fieldwork time Ensured accurate results for the design and construction unit of the project

6. Conclusion

The research conducted a comprehensive analysis of quality management in the consulting services for construction surveying and design at Construction Inspection Consulting Co., Ltd, based on the current legal documents from the Ministry of Construction and the Ministry of Natural Resources and Environment. Through systematizing theoretical frameworks and assessing the current situation, the study clarified the fundamental

concepts of quality management while identifying specific issues related to the surveying and design process.

Through the research process, several errors and limitations in the consulting services for construction surveying and design were identified, including (1) Errors in measurements, (2) Omissions in design documentation, and (3) Non-compliance with current legal regulations. To improve the quality of the consulting services for surveying and design at the company by 2030, the study proposed specific solutions, including:

- Application of new technologies;
- Improvement of human resource quality;
- Increase in equipment investment;
- Completion of organization work at the site;
- Strengthening stakeholder relationships.

These measures will not only help minimize risks for construction projects but also contribute to enhancing the company's competitiveness in the market. At the same time, these improvements will also contribute to the sustainable development of the construction industry.

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