

**REPORT ON**

**Quality Control and Assurance in Architectural Projects:**

**By**

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Major in Operation and Supply Chain Management

**An internship report Submitted To**

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Professor  
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Co-supervisor : Dr. Md. Arif Hossain Mazumder  
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In partial fulfillment of the requirements for the degree of Master of Business Administration,  
MBA

**BRAC Business School**

**BRAC University**

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## Declaration

It is hereby declared that

1. The internship report submitted is my own original work while completing the MBA degree at BRAC Business School, BRAC University.
2. The report does not contain material previously published or written by a third party, except where these are appropriately cited through full and accurate referencing.
3. The report does not contain material which has been accepted, or submitted for any other degree or diploma at a university or other institutions.
4. I/We have acknowledged all main sources of help.

**Student's Full Name & Signature:**

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Hussain Mohammad Zubayer  
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**Supervisor's Full Name & Signature:**

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Dr. Mohammad Abdul Hoque  
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Dr. Md. Arif Hossain Mazumder  
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To

Dr. Mohammad Abdul Hoque  
Professor  
BRAC Business School  
BRAC University  
Kha-224 Merul Badda  
Dhaka 1212. Bangladesh

**Subject: Letter of Transmittal**

Dear Sir,

This is my pleasure to display my entry level position providing details regarding 'Quality Control and Assurance in Architectural Projects of Riddhi Architects DWG (Design Work Group)', where I was appointed by your recommendation.

I have attempted my best to complete the report with the essential data and recommended proposition in as significantly compact and comprehensive manner as possible.

I trust that the report will meet the necessary requirements.

Sincerely yours,

---

Hussain Mohammad Zubayer

Student ID: 21364120

BRAC Business School

BRAC University

Date:

## **Non-Disclosure Agreement**

This agreement is made and entered into by and between Riddhi Architects DWG (Design . Work. Group) and the undersigned student at BRAC Business School of BRAC University.

# Introduction

As an accomplished professional, I, Hussain Mohammad Zubayer, bring over 15 years of expertise in architectural design and construction, anchored by a specialized focus on end-to-end project oversight. My proficiency in Project Management includes aligning strategic goals with Business Strategy, Design Development, Resource Management, Quality Assurance and Scheduling. This expertise extends across residential, commercial, and various building types within the real estate sector, consistently delivering high-quality projects that underscore a commitment to excellence and a nuanced understanding of architectural complexities.

In addition to strategic acumen, I possess robust technical skills encompassing Architectural Design, Architectural Drawings, Computer-Aided Design (CAD), and 3D modeling via SketchUp. This technical proficiency empowers me to translate conceptual ideas into meticulously executed designs, reflecting a comprehensive skill set.

My problem-solving proficiency, coupled with effective Project Coordination and team leadership, ensures the seamless execution of projects. My unwavering commitment to prioritizing adherence to construction regulations and codes is grounded in a comprehensive understanding acquired through practical experience over the years.

Beyond my technical prowess, I bring strong interpersonal skills, characterized by good communication, quick learning ability, responsibility, and honesty. These qualities enhance my collaborative efforts within teams and facilitate effective project coordination.

With an MBA in Supply Chain and Operation Management, I have significantly enriched my skill set. The MBA coursework, including Project Scheduling, Statistical Process Control (SPC), Total Quality Management, forecasting, business strategies, marketing, and an understanding of business culture, has been instrumental in enhancing my knowledge base. This advanced education has not only provided me with a holistic view of organizational operations, but also has equipped me with strategic insight that contributes directly to optimizing project outcomes.

As a proud member of the Institute of Architects Bangladesh, I actively engage in ongoing professional development, staying abreast of industry advancements. My responsibilities extend to coordinating with regulatory authorities, ensuring compliance with guidelines and regulations, and overseeing on-site execution. The MBA coursework has uniquely positioned me to bring a holistic and strategic perspective to my role, further enhancing my ability to navigate the multifaceted challenges of architectural projects with efficiency and foresight.

## About the Organization

The field of architecture has been evolving continuously due to its involvement in advancement by taking into account various kinds of factors such as, individual or collective endeavor as well as site and financial constraints, and adjustment with climate, politics, technology, and culture. This advancement has enforced with the creation of new architectural designs and their realization in the environment friendly building. However, these forces are subsequently altered over time, resulting in a greater level of iteration. This dynamic process of construction contributes to the liveliness and adaptability of our cities and their architecture with the changing requirement. The limitations of architecture, as one might assume, are not primarily rooted in a heritage of quirks and styles. Instead, they can be more accurately understood as the tangible expression of concepts, achieved through an intricate process in which the interaction of context and intuition is compelled to materialize. Riddhi Architects DWG (Design Works Group) is a cutting-edge architectural design and consultancy organization. The team consists of passionate architects that possess a modern understanding and are capable of tackling global difficulties. The essential individuals possess experience and familiarity with international education and service. With its contextual and local expertise, Riddhi Architects DWG is a highly adaptable firm that has successfully accomplished significant projects such as the Liberation War Museum in Bangladesh and the galleries for the Bangabandhu Military Museum, including the Victory Arena, Army, and Air force galleries. The firm's strength is in its distinctive capacity to draw upon a proven pool of technically skilled individuals on a project-by-project basis, while maintaining a high level of adaptability to meet client requirements and project expectations. This enables the firm to move forward

consistently with an innovative work flow and hence satisfy their clients with the expected level of services. It is worth noting that Riddhi Architects DWG excels in its fervent engagement.

They offer a comprehensive range of services, including CAD design, renderings, presentations, and technical documentations. Their expertise also extends to supervisory services, ensuring that their clients receive a complete solution for their projects. The specification formulated by the experts of the organization has provided a fresh perspective to a project in terms of construction approach, meticulousness and finalization. They have successfully partnered with both the large and the small companies as needed by various projects, demonstrating exceptional effectiveness in teamwork and collaboration.

### Workflow Diagram for an Architectural Firm: From a Concept to a Product

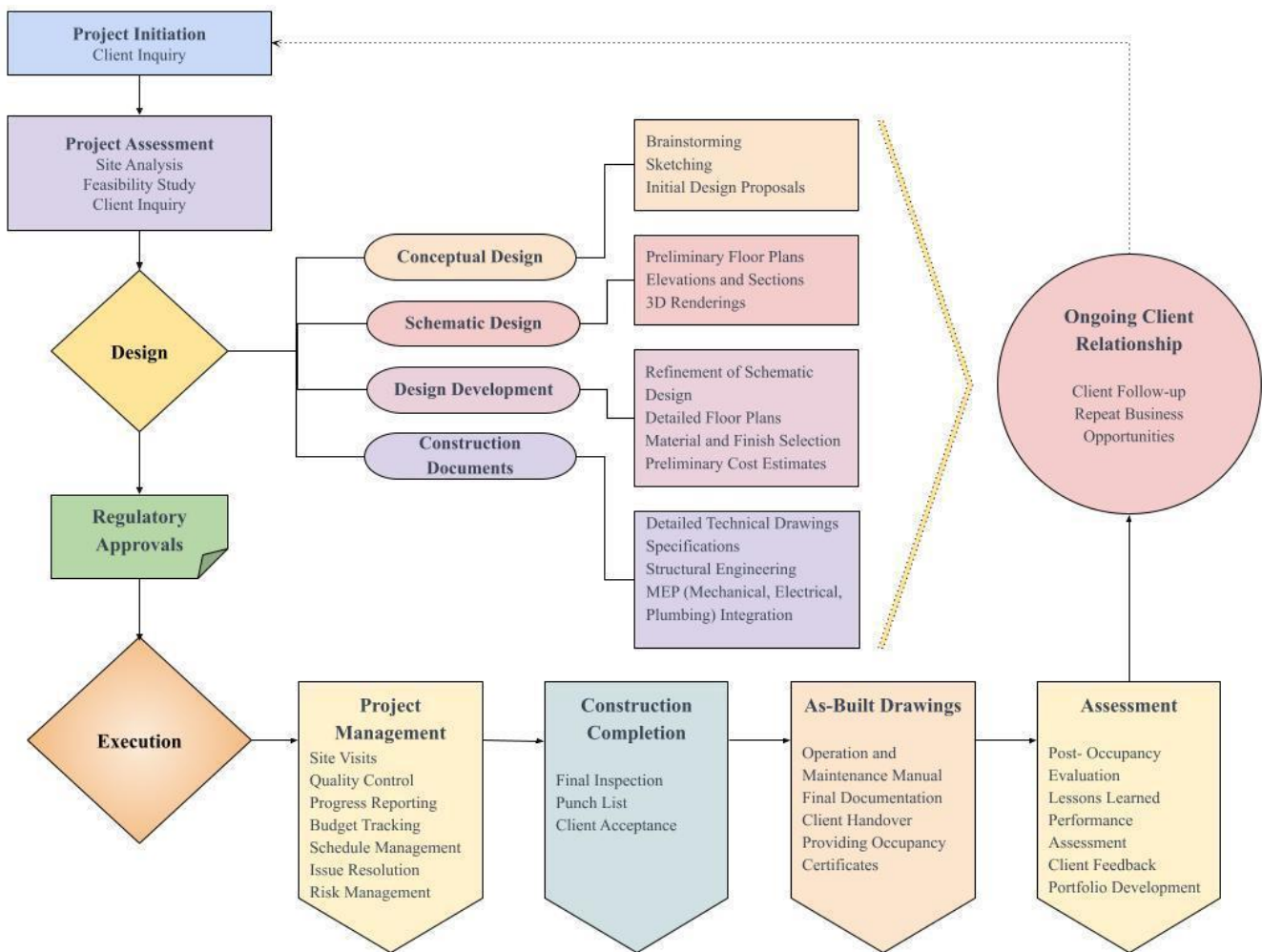


Figure 1- The architectural workflow, Source: Riddhi Architects Design Work Group (DWG).

# Project

The construction of the 9-storied Extension Building for Ahsanullah University of Science and Technology (AUST) in Kunipara, Tejgaon, Dhaka, holds significant importance within Bangladesh's evolving urban environmental requirement. With rapid urbanization, there's a growing demand for high-quality structures, particularly in the educational sector, reflecting the expansion of academic institutions.

Covering an extensive area of 60,000 square feet, this substantial project serves as a crucial addition to AUST's existing infrastructure. Designed to cater various kinds of functions, including student dormitories, science laboratories, faculties, and administrative offices, it meets the diverse needs of the university.

The project progresses through distinct stages, starting with the design phase in 2016. This involves client interactions, conceptualization of innovative ideas, and detailed design development, incorporating drafting and financial analysis ensuring alignment with the aesthetic goals and the budget constraints. Preparation of the construction drawings during this phase sets the groundwork for the subsequent execution stages ending in 2021.

During the execution phase, critical tasks such as material selection, on-site supervision, and collaboration with professionals and departments become paramount. Given the building's multifunctional nature, managing the project within the estimated budgetary limits and adhering to the strict timelines is crucial. The quality of the final product hinges on the effectiveness of quality assurance and control processes implemented.

The role of the Project Architect is pivotal in this endeavor. The Project Architect manages a team of architects and engineers, collaborating with different departments and clients to ensure that construction aligns with company objectives and standards outlined in architectural designs and drawings. As the building serves diverse functions, the Project Architect facilitates effective cross-functional collaboration, establishes and enforces architectural standards, conducts regular design reviews, and fosters innovation in architectural design and construction techniques.



In this project context, the Project Architect is not merely a design professional but a key figure in ensuring the success, functionality, and sustainability of the building. My role is to navigate challenges, adhere to regulations, and prioritize client needs underscores my crucial role in bringing the AUST Extension Building to fruition. Through effective project management, quality assurance, collaboration, and innovation, I play a vital role in transforming architectural concepts into a thriving educational space.

As a Project Architect I am responsible for managing a team of architect and engineers as well as collaborating with other departments and client, to ensure that construction of the projects is align with the company's objectives and standards by following architectural design and drawings. My role involves manage architectural project from inception to completion, ensuring the project meet quality, budget, and timeline objectives. Allocate resources effectively, including site visits, quality control, progress reporting, budget tracking, schedule management, issue resolution, and risk management.

## **Executive Summary**

Assessing and improving quality control measures in architectural projects is pivotal for ensuring excellence throughout the project lifecycle. This summary outlines key strategies for achieving this goal. Firstly, establishing a comprehensive quality assurance framework with clear objectives and criteria is essential. Regular reviews and updates ensure alignment with evolving project needs and industry standards. Secondly, implementing effective monitoring mechanisms such as checkpoints, tools and techniques enables proactive identification and resolution of quality issues. Thirdly, fostering collaboration among multidisciplinary teams promotes knowledge sharing and collective problem-solving. Additionally, leveraging a diverse range of tools and techniques, from advanced software to traditional methods, enhances quality assurance efforts. Lastly, maintaining comprehensive documentation of project activities, decisions, and changes ensures transparency and accountability. By integrating these strategies, stakeholders can consistently deliver high-quality architectural projects, meeting stakeholder expectations and industry benchmarks. As a project architect I have to ensure that, the execution is performed as per design by collaborating with stakeholders. Besides, another duty is to assure quality and dealing with problem solving of the material selection.

**Keywords:** Quality assurance; Frame work; Monitoring, Collaborations; Tools and Techniques; Documentations.

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# Chapter- 1

## Overview of Internship

### 1.1 Student Information

**Name** : Hussain Mohammad Zubayer  
**ID** : 21364120  
**Program** : Master of Business Administration (MBA)  
**Major** : Operation and Supply Chain Management

### 1.2 Internship Information

**1.2.1 Job Period** : Oct 01, 2021 to Present

**Company Name** : Riddhi Architect DWG (Design, Work, Group)

**Department** : Planning and Design

**Address** : House – 56 (1<sup>st</sup> FL.) APT # C-1 Road 27  
Dhanmondi - R/A, Dhaka – 1209.

Contact: +88-02-9125596, +88-01819-287680

e-mail: [tanzim@dwg-office.com](mailto:tanzim@dwg-office.com)

### 1.2.2 Internship Company Supervisor's Information:

**Name** : Architect Tanzim Hasan Salim  
(Member of the Institute of Architects Bangladesh)

**Position** : Deputy Team Leader

### **1.2.3 Job Responsibility**

As a Project Architect, my primary responsibility is to oversee a team of architects and engineers. I also work closely with other departments and clients to ensure that the construction of projects adheres to the company's aims and standards. This involves following architectural design and drawings. Main duties include as follows:

- Oversee architectural projects from start to finish, ensuring that they adhere to specified quality, estimated budget, and prescribed timeline goals.
- Optimize resource allocation; including personnel, financial resources, and technological assets, to guarantee the achievement of the project objectives.
- Implement and uphold architectural standards, best practices, and quality control processes throughout all projects.
- Perform periodic design evaluations and inspections to detect and resolve any concerns.
- Establish robust interdepartmental collaboration with engineering, construction, and other departments to guarantee smooth project implementation.
- Serve as an intermediary between the architectural team and other stakeholders.
- Discern potential areas for innovation and research in architectural design and construction methodologies.
- Analyze potential hazards in architectural projects and devise solutions to minimize risks, ensuring the success and safety of the project.
- Oversee and resolve any legal or regulatory compliance concerns pertaining to architectural designs.
- Compile and provide periodic reports to the Team leader, providing a concise overview of project progress, achievements, and significant architectural observations.

## **1.2.4 Objectives**

The primary objectives of this internship project are as follows:

- Familiarize with real-life work environment
- To understand the organization's operations and policies
- To know industrial analysis and strategy
- To measure and ensure the existing quality control on an architectural project within the firm.
- To determine the area where quality assurance can be improved throughout the project lifecycle.
- To propose and develop methods as well as strategies assuring consistently high-quality outputs.
- To enhance the company's reputation by completing the project with quality standards, client satisfactions and adhere to industry best practices.

## **1.3 Internship Outcomes**

### **1.3.1 Contribution to the Company**

As an intern at Riddhi Architects DWG, I bring a diverse range of skills and abilities to the organization. I offer novel insights and inventive concepts, drawing inspiration from cutting-edge academic research and contemporary trends in sustainable design. My enthusiasm for acquiring new knowledge and ability to adapt make me a valuable addition to collaborative initiatives, as I can actively contribute and learn from seasoned professionals. My contributions to the company have significantly enhanced the efficacy and success of architectural projects across all phases. By meticulously overseeing projects from initiation to completion, I have ensured that each endeavor aligns with our specified quality, estimated budgetary, and prescribed timeline targets. Through strategic resource allocation, encompassing personnel, financial resources, and technological assets, I have optimized project outcomes while minimizing resource inefficiencies. Central to my role has been the establishment and enforcement of architectural standards, best practices, and rigorous quality control protocols. This commitment has bolstered the consistency and excellence of our architectural deliverables, enhancing our reputation for reliability and professionalism.

Furthermore, my efforts in fostering collaboration among diverse departments, including engineering and construction, have streamlined project execution and bolstered interdisciplinary synergy. Serving as a conduit between the architectural team and stakeholders, I have facilitated clear communication and alignment of objectives, thereby enhancing project clarity and effectiveness.

Safety and compliance have remained paramount considerations in my oversight, as I have conducted thorough hazard analyses and navigated legal and regulatory frameworks to ensure project integrity and stakeholder well-being.

Finally, my commitment to transparency and accountability is reflected in the regular provision of concise project progress reports to team leaders. These reports offer valuable insights into project milestones, accomplishments, and notable architectural observations, empowering informed decision-making and strategic planning at all levels of the organization.

### **1.3.2 Benefits to an Intern**

There are several advantages to becoming an architectural intern at Riddhi Architects DWG. It offers a practical implementation of scholarly information, reducing the gap between theoretical concepts and their implementation in practice. Gaining exposure to innovative projects promotes comprehension of the current architectural trends and sustainable design methodologies. The chance to collaborate with experienced experts provides important guidance, expediting career advancement and enhancing skill acquisition. Interns acquire practical experience with sophisticated design software and project management tools. By engaging in networking activities within the sector, individuals can establish connections that pave the way for potential employment prospects in the future. This experience also cultivates a more profound appreciation for the intricacies of architectural projects, encompassing the entire process from inception to execution, so fostering a comprehensive understanding of the profession.



### **1.3.3 Problems/Difficulties**

While interning at Riddhi Architects DWG has been advantageous, it also has posed difficulties. Acclimating to the rapid and demanding professional setting, necessitates a significant increase in learning effort, particularly in effectively handling intricate assignments with strict time constraints. Initially, it might be overwhelming to navigate the complexities of special RCC cast architecture projects. Interns may encounter challenges in comprehending the full extent of sophisticated software and technologies employed in modern design methodologies. Collaborating with skilled professionals can result in communication difficulties, which may lead to misunderstandings. However, these challenges are wonderful opportunities for learning, which contribute to both personal and professional development.

### **1.3.4 Recommendations on Future Internships**

To excel as a prospective intern at Riddhi Architects, it is advisable to actively participate in educational endeavors. Embrace the wide array of initiatives and be receptive to taking on different duties, since this expands your expertise. Cultivate robust ties with mentors and coworkers, as their advice is of utmost value. Demonstrate proactive behavior by actively proposing ideas, displaying enthusiasm for team participation. Prior to commencing, acquaint yourself with the most recent software and design trends in order to facilitate the transfer. Ultimately, ensure that you allocate your time efficiently, dividing it appropriately between the tasks and duties of your internship and the academic commitments you have. By adopting a proactive and balanced approach, you will be able to optimize the advantages of your internship experience.

# **Chapter 2**

## **Organization Part**

### **2.1 Introduction**

Riddhi Architects DWG is a leading architectural design firm known for its modern approach and global capabilities. Their team of experienced architects combines international education and local expertise to tackle diverse challenges. With a focus on adaptability and innovation, they have delivered notable projects like the Liberation War Museum and Bangabandhu Military Museum galleries. Offering a wide range of services including CAD design, renderings, and supervisory support, they excel in providing comprehensive solutions with meticulous attention to detail. Their collaborative approach ensures effective teamwork, making them a trusted partner for projects of any scale.

### **2.2 Overview of Quality Control and Assurance in the Architectural Context of Riddhi Architects DWG.**

Quality control assurance is a crucial aspect in the architectural field, and hence of Riddhi Architects DWG, as they guarantee the integrity, safety, and excellence of their projects. Quality control in architecture entails a methodical set of procedures implemented throughout the design and construction stages to fulfill or surpass customer expectations complying with regulatory standards. This encompasses routine evaluations of architectural blueprints, scrupulous selection of materials, and guaranteeing adherence to construction regulations and environmental principles.

Quality assurance, however, involves the comprehensive management procedures that direct the entire project lifetime. It guarantees that each stage of the project, starting from the earliest design concepts to the final construction, conforms to the predetermined quality standards and objectives. This entails developing a comprehensive quality management strategy, defining explicit performance indicators, and executing periodic audits and feedback mechanisms.

At Riddhi Architects DWG, these methods are essential for upholding the exceptional quality of their architectural work. The company utilizes cutting-edge technologies to achieve precise design correctness, conducts comprehensive material testing, and ensures rigorous personnel training.

Their dedication to ensuring quality control assurance not only improves the longevity and functionality of their projects, but also promotes innovation and creativity, further establishing their outstanding reputation in the field of architecture.

### **2.3 Management Practices by Riddhi Architects DWG (Design Works Group)**

Management practices refer to the operational techniques and advancements employed by managers to improve corporate operations' productivity and efficiency. A manager's proficiency in applying effective management techniques is crucial for a successful career and is equally important for both the manager and the firm's employees.

Riddhi Architects DWG employs advanced management approaches that prioritize collaborative design processes, client-centered strategies, and continuous improvement. The company focuses on fostering cross-functional teams, utilizing technology to boost efficiency, and nurturing a creative work environment. Riddhi Architects DWG places a strong emphasis on ongoing staff training and development to ensure the delivery of high-quality projects. This is accomplished through rigorous quality control and proactive project management, which not only helps maintain robust client relationships but also ensures the success of projects.

Riddhi Architects DWG employs a combination of autocratic and democratic leadership styles within its organizational framework. In the autocratic approach, most decisions regarding work methods, design types, and materials are made by the team leader. This style allows for swift decision-making and ensures a clear direction for projects. However, during the design development phase, the leader adopts a democratic approach by involving employees in decision-making processes, delegating authority, and utilizing feedback to enhance project outcomes. This blend of leadership styles enables Riddhi Architects DWG to maintain efficiency while also fostering employee engagement and creativity.

Regarding human resource planning, Riddhi Architects DWG implements a comprehensive approach to selection and recruitment. The company seeks individuals who not only possess technical expertise but also demonstrate alignment with the firm's collaborative and client-centered ethos. The compensation system is designed to attract and retain top talent, offering competitive salaries and benefits packages. According to The Human Capital Hub human resource practices are deliberate and calculated efforts that direct and influence the performance of a company's

workforce. They serve as the foundation for assessing employee incentives, mitigating work-related injuries, and guaranteeing adherence to employment regulations. In terms of training and development initiatives, Riddhi Architects DWG prioritizes ongoing staff education to ensure the delivery of high-quality projects. Training programs are tailored to enhance both the technical skills and the soft skills such as communication and teamwork. This investment in employee development not only contributes to individual growth but also strengthens the firm's capabilities.

Performance appraisal at Riddhi Architects DWG is conducted regularly to assess employee contributions and provide constructive feedback. This process allows for recognition of achievements and areas for improvement, fostering a culture of continuous learning and development. By aligning individual performance with organizational goals, Riddhi Architects DWG ensures that employees are motivated and empowered to contribute to the firm's success.

## **2.4 Marketing Practices**

Riddhi Architects DWG, an architectural business, utilizes sophisticated marketing techniques to exhibit its architectural proficiency and cutting-edge designs. The firm leverages a robust online presence, including a captivating website and active social media platforms, to showcase its portfolio via visually appealing imagery and comprehensive project descriptions, with the objective of enticing prospective clients. In addition, Riddhi Architects DWG adeptly interacts with existing and potential customers by means of architectural blogs, email newsletters, and social media platform, offering valuable information on design trends and new ventures. In addition, the corporation extends its influence by actively participating in industry events and establishing partnerships with relevant organizations. In addition, Riddhi Architects DWG places great importance on client testimonials and word-of-mouth marketing in order to establish a robust reputation and inspire trust within the architectural community.

Institute of Architects Bangladesh organized some open architectural competition for all architectural firm in Bangladesh. Winner can get commissioned for the project as well as achieved reputation on relative market. Architectural firms are enthusing to participate in the competition to become renowned and earn reputation in the market by wining reward. That also introduce the firm to the developer and other stakeholders. Riddhi Architects DWG won the similar type of reward for the project of Liberation War Museum at Agargaon.

Real estate sectors in Bangladesh and government public projects are targeted stakeholder by an architectural firm. Along these some private customers show their interest for their individual building project or interior works. To focus on differentiation, here the firm seeks to be unique in its industry in some dimensions that are widely valued by buyers. It selects one or more attributes that many buyers in an industry perceive as important.

In avoiding failures in order to sustain in the market competition, the organization focuses on

- Innovation
- Efficient management
- Quality control
- Responsiveness to customer
- Initiate continuous improvement & learning
- Track Best Practices or Use benchmarking
- Overcome inertia

## **2.5 Financial Performance**

Financial performance indicators assess a company's efficiency in using resources and generating money. These measurements are used by analysts and investors to evaluate comparable organizations operating in diverse industries or sectors (Kenton, W. 2022, June 1).

Riddhi Architects DWG, an architectural business, has achieved impressive financial results via smart project portfolio management and the maintenance of a solid customer base. The organization assures project profitability by using meticulous financial planning and cost management strategies, while also making strategic investments in technology and personnel to maintain a competitive edge. Riddhi Architects DWG employs stringent budgeting and conducts monthly financial evaluations to oversee cash flows and make required adjustments to strategy. The business reduces market risks and takes advantage of new possibilities by diversifying its service offerings, resulting in consistent revenue growth. The company's commitment to ensuring customer happiness and optimizing operational efficiency leads to a higher rate of repeat business

and referrals, so bolstering its financial prosperity. In addition, Riddhi Architects DWG's strategic alliances and collaborations enhance its market penetration and diversify its sources of income. In summary, Riddhi Architects DWG's financial performance demonstrates a well-rounded strategy that encompasses expansion, risk mitigation, and investment in future capabilities, preparing the company for long-term success in the architectural sector.

## **2.6 Operation Management and Information System Practices and Supply Chain Management (SCM)**

Operations management refers to the effective management of business processes inside an organization, with the goal of optimizing profit by effectively transforming labor and resources into products and services. (Hayes, A. 2023, 28th March)

At Riddhi Architects DWG, our operations management strategy focuses on attaining operational excellence in the implementation of architectural projects. This approach is distinguished by a dedication to improving productivity and guaranteeing precision throughout the whole duration of the project, from its initiation to its conclusion. Central to this approach is a sophisticated project management system designed to effortlessly include and supervise all stages of a project. For project integration management the organization focus on Scope, Time, Cost, Quality, Human resource, Risk Management, Communication, Procurement. This methodology guarantees thorough strategic planning, efficient allocation of resources, and proficient risk mitigation, with the objective of achieving timely project completion, adherence to the designated budget, and customer contentment.

### **2.6.1 Project Integration**

Project integration management involves coordinating and overseeing all aspects of a project to ensure its successful completion. It involves combining various elements such as scope, time, cost, quality, human resources, risk management, communication, and procurement into a cohesive plan.

Scope management entails defining and controlling what is included and excluded from the project. This involves identifying objectives, deliverables, tasks, and requirements.

Time management involves creating a timeline for the project, scheduling tasks, and ensuring deadlines are met. It includes techniques such as creating schedules, setting milestones, and managing dependencies.

Cost management involves estimating, budgeting, and controlling costs throughout the project lifecycle. This includes cost estimation, budget development, and monitoring expenses.

Quality management focuses on meeting or exceeding stakeholder expectations and requirements. It involves implementing processes and standards to ensure deliverables meet quality standards.

Human resource management involves organizing and managing the project team. This includes tasks such as staffing, training, and performance management to ensure the team is equipped to complete the project successfully.

Risk management involves identifying, assessing, and mitigating risks that could impact the project's objectives. It includes techniques such as risk identification, risk analysis, and risk response planning.

Communication management involves establishing and maintaining effective communication channels within the project team and stakeholders. This ensures that relevant information is shared in a timely and efficient manner.

Procurement management involves acquiring goods and services from external associates. It includes tasks such as vendor selection, drawings deliverable, contract negotiation, and contract management to ensure that project needs are met within budget and schedule constraints.

This attitude prioritizes meticulous planning, optimal resource distribution, and proficient risk mitigation to guarantee the punctual and cost-effective completion of projects to the client's contentment. Additionally, it emphasizes the smooth incorporation and supervision of every phase of the project using a sophisticated project management system.

A framework of Project Management is shown in the figure below.

## FRAMEWORK OF PROJECT MANAGEMENT

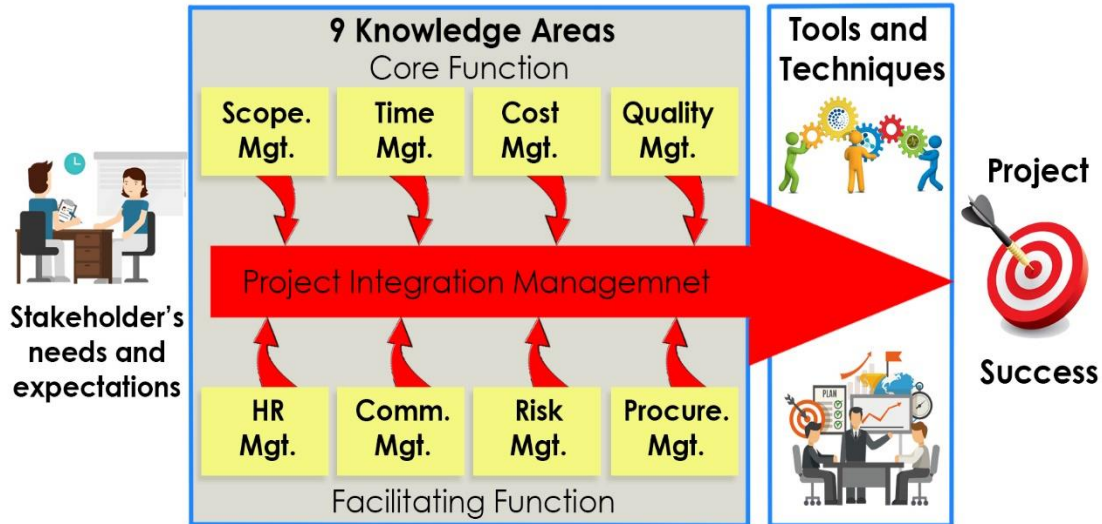


Figure 2- Framework, Source: Class materials.

Riddhi Architects DWG is a firm that employs strategic Supply Chain Management techniques to guarantee the punctual provision of materials and services, while maintaining exceptional standards in their architectural projects. To do this, they establish tight collaborations with reliable suppliers and contractors, enhance their supply chain via careful planning, and use technology to streamline procurement and logistics. This strategy enables them to decrease expenses while guaranteeing excellence.

### 2.6.2 Strategy for project management

Riddhi Architects DWG follows strategies for project management as follows:

- Mistake Avoidance
- Development Fundamentals
- Risk Management
- Schedule-Oriented Practices

**Mistake Avoidance:** This involves implementing strategies to anticipate and prevent common pitfalls and errors throughout the project lifecycle. It includes thorough planning, clear communication, stakeholder engagement, and regular monitoring and control to address issues before they escalate.



**Development Fundamentals:** This component emphasizes the importance of laying a strong foundation for the project by understanding and adhering to fundamental principles of project management. This includes defining clear objectives, establishing a realistic scope, identifying and allocating resources effectively, and setting achievable timelines and milestones.

**Risk Management:** A crucial aspect of project strategy is the proactive identification, assessment, and mitigation of risks that could potentially impact project success. This involves conducting risk assessments, developing contingency plans, and regularly monitoring and reassessing risks throughout the project lifecycle to minimize their impact on project outcomes.

**Schedule-Oriented Practices:** This entails adopting practices and techniques that prioritize adherence to project schedules and timelines. This includes effective scheduling and resource allocation, identifying critical path activities, managing dependencies, and implementing strategies to address schedule deviations promptly to ensure project milestones are met.

By incorporating these strategic elements into project management practices, Riddhi Architects DWG enhances their ability to deliver projects successfully, on time, and within budget while minimizing risks and avoiding common mistakes.

### **2.6.3 Process groups for project management**

In architectural project management, the project lifecycle typically follows five main phases: Initiating, Planning Development, Executing, Controlling, and Closing. Each phase involves specific processes that are characterized by inputs, tools & techniques, and outputs.

#### **Initiating:**

Inputs: In this phase, inputs may include the project charter, initial requirements, stakeholder expectations, and any relevant historical data or lessons learned from the similar projects.

Tools & Techniques: Tools and techniques commonly used in the initiating phase include project selection methods, stakeholder analysis, and conducting feasibility studies to assess the viability of the project.

Outputs: The primary output of the initiating phase is the project charter, which formally authorizes the project and defines its objectives, scope, stakeholders, and high-level requirements.

## **Planning Development:**

Inputs: Inputs to the planning phase include the project function, stakeholder requirements, constraints, assumptions, and any regulatory or industry standards applicable to the project.

Tools & Techniques: Tools and techniques utilized during planning include scope definition, work breakdown structure (WBS), scheduling techniques, cost estimation (BOQ), risk assessment, selection of materials and procurement planning.

Outputs: The planning phase yields various outputs such as the project management plan, which includes subsidiary plans for scope, schedule, cost, quality, risk, and procurement management, along with other relevant documents like Structural drawings, MEP drawings, Tender documents and other related drawing for construction the project.

## **Executing:**

Inputs: Inputs for the executing phase consist of the project management plan, approved change drawings and decision, as well as any additional resources or materials required to carry out project activities.

Tools & Techniques: Tools and techniques employed during execution encompass project execution workflows, team management, quality assurance processes, and communication methods to facilitate effective implementation of the project plan.

Outputs: The primary outputs of the executing phase are deliverables, along with work performance data and any updates to project documentation or records.

## **Controlling:**

Inputs: Inputs to the controlling phase include work performance data, project management plan, change requests, and any relevant performance metrics.

Tools & Techniques: Tools and techniques utilized in controlling include performance measurement and analysis, variance analysis according to Building Code and BNBC standard, change control processes, and risk monitoring to assess project performance and manage deviations from the plan.

Outputs: Outputs of the controlling phase include work performance reports, change requests status updates, and updates to project documentation such as the project management plan, schedule, compliance and budget.

**Closing:**

Inputs: Inputs to the closing phase include formal acceptance of deliverables, project documentation, and any remaining procurement-related activities such as contract closure. After those architect issues an occupancy certificate according to RAJUK standard.

Tools & Techniques: Tools and techniques used during closing encompass project reviews, lessons learned documentation, and administrative closure procedures to ensure all project activities are completed satisfactorily and submit as built drawing as a final drawing documentation of the project.

Outputs: The primary output of the closing phase is the formal closure of the project, including final deliverables acceptance, contract closure documentation, and lessons learned reports.

Levels of effort against time for various processes of a project are shown in the following figure.

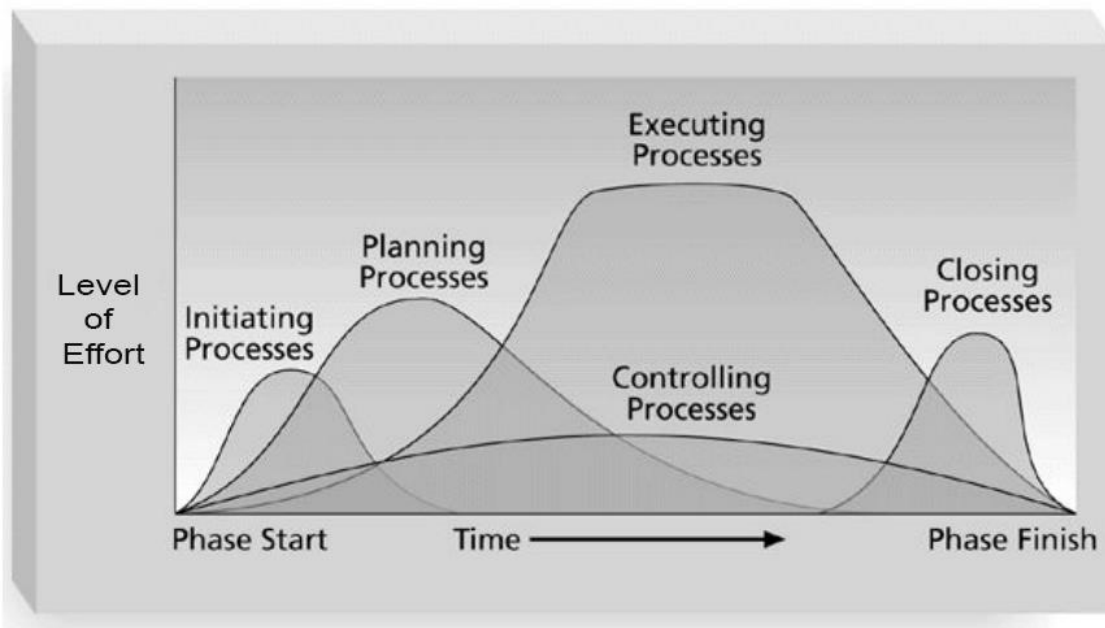


Figure 3- Process Groups, Source: Class materials.

Link among processes are shown in the figure below.

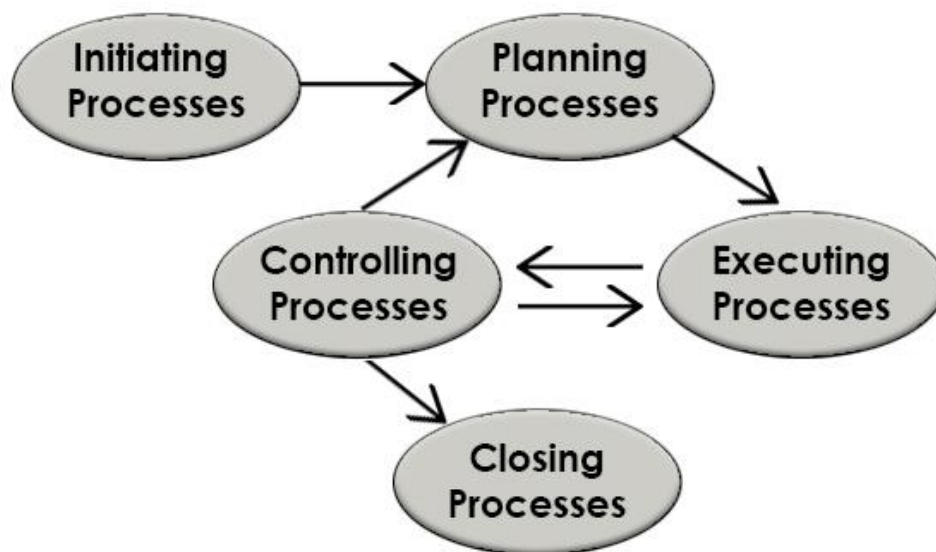


Figure 4- Process Link, Source: Class materials.

## 2.7 Industry and Competitive Analysis

### 2.7.1 Porter's Five Forces Analysis

Porter's Five Forces Analysis applied to the field of Riddhi Architects DWG, offers a thorough analysis of the competitive environment and market forces that impact the architectural industry in which the company works.

- **Threat of New Entrants:**

The architectural sector presents formidable hurdles to entry as a result of the need specialized expertise, established reputation, and substantial financial outlay. Riddhi Architects DWG gains an advantage from this since it diminishes the risk of new competitors joining the market and disturbing its position.

- **Bargaining Power of Suppliers:**

Suppliers have a vital role in architecture as they provide essential materials and technological solutions. Riddhi Architects DWG is expected to encounter a modest level of negotiating power from suppliers. Although there is a wide range of suppliers available, the requirement for superior quality and specialized materials may grant particular suppliers a greater advantage.

- **Bargaining Power of Buyers:**

Large clients who commission important projects in the architectural sector frequently possess considerable negotiating leverage. This could have an influence on the pricing and contractual conditions. In order to sustain its attractiveness to clients, Riddhi Architects DWG must consistently engage in innovation and showcase its worth.

- **Threat of Substitute Products or Services:**

The susceptibility to alternatives in the field of architecture is often minimal due to the difficulty in reproducing distinctive design and building services. Nevertheless, the progress in technology, exemplified by the use of prefabricated buildings, may provide potential risks in the future.

- **Rivalry among Existing Competitors:**

The architectural sector is characterized by intense competition, as firms strive to secure renowned contracts. Riddhi Architects DWG maintains its competitive advantage in a saturated market by focusing on design excellence, a strong reputation, and new solutions.

Gaining insight into these influences enables Riddhi Architects DWG to devise successful strategies and position itself advantageously in the architectural sector.

## **2.7.2 SWOT Analysis**

### **Strengths:**

The firm is well respected for its exceptional architectural designs, which provide a solid foundation of trust and reliability in the market. The focus on inventive and environmentally-friendly design distinguishes it from rivals and corresponds to the growing need for sustainable

building. The highly skilled team of architects and designers, supported by their vast expertise, guarantees the implementation of every project with the highest level of professionalism and originality. Moreover, the use of cutting-edge technology in design and project management greatly enhances operational efficiency and precision, facilitating the completion of projects that adhere to the utmost standards of perfection.

### **Weaknesses:**

The company's commitment to excellence and ingenuity, however advantageous, nevertheless results in a more expensive operational framework. This might limit its appeal to a broader market, particularly in price-sensitive areas. Overseeing extensive, intricate projects requires substantial resources, which may stretch the company's capabilities when managing many projects concurrently. Furthermore, depending on a limited number of significant customers exposes the organization to variations in business resulting from these crucial associations.

### **Opportunities:**

Entering developing markets presents a substantial chance for expansion by accessing untapped populations and geographical areas. By incorporating cutting-edge technologies such as Artificial Intelligence (AI) and Virtual Reality (VR) into architectural design processes, the firm has the potential to deliver groundbreaking services and establish itself as a frontrunner in the integration of technology within the field of architecture. Moreover, the increasing need for environmentally conscious and sustainable structures coincides with the company's proficiency, presenting an opportunity to assume a pioneering role in green construction endeavors.

### **Threats:**

The architectural sector encounters intense rivalry, which may exert pressure on profit margins and market share. Economic recessions may provide a hazard by possibly diminishing investment in architectural endeavors. Moreover, the swift advancement of technology poses a constant difficulty to remain up-to-date and proficiently include the most recent tools and techniques. Furthermore, unregulated urbanization, lack of knowledge, inadequate skills, and the absence of technical expertise among architects have been recognized as factors that contribute to the severity

of destruction in certain regions. This highlights the necessity for enhanced practices and education within the architectural domain.

The SWOT analysis of Riddhi Architects DWG identifies its strong brand image for producing high-quality and cutting-edge designs, a proficient workforce, and utilization of state-of-the-art technology as significant advantages. Nevertheless, it encounters obstacles as a result of an elevated cost framework, undertakings that require substantial resources, and reliance on crucial clientele. Potential avenues for advancement encompass venturing into flourishing markets, adopting cutting-edge technical advancements such as artificial intelligence and virtual reality, and leveraging the increasing desire for eco-friendly construction. The corporation must strategically manage challenges arising from fierce market rivalry, economic volatility, and the imperative to adapt to swift technical advancements. These insights are essential for formulating strategic plans and sustaining the company's competitive advantage.

## **2.8 Conclusion**

Riddhi Architects DWG is a highly regarded architectural practice renowned for its remarkable design, ingenuity, and dedication to sustainability. Despite encountering obstacles such as escalating operational expenses and dependence on crucial clientele, Riddhi Architects DWG 's emphasis on state-of-the-art technology and a proficient team prepares it for ongoing prosperity. The growth potential is emphasized by the prospects of entering developing markets and incorporating cutting-edge technology such as AI and VR. It is essential to adapt to the competitive environment and make necessary adjustments in response to economic swings. Riddhi Architects DWG 's proficiency in adapting to diverse situations, prioritizing exceptional performance, and cultivating a forward-thinking attitude displays its capability to take charge in the field of architecture and influence the development of the next construction phases.

## **2.9 Recommendations**

Riddhi Architects DWG has positioned itself as a frontrunner in the architectural sector by prioritizing exceptional, groundbreaking, and environmentally-friendly designs. In order to strengthen its position and take advantage of new possibilities, it is advised that the organization continues to allocate resources towards state-of-the-art technologies like AI and VR. These

investments will not only improve the design process but also provide customers with immersive experiences of their projects prior to the commencement of construction. In addition, Riddhi Architects DWG should broaden its market presence by investigating potential in developing areas where there is a rising need for sustainable and creative architectural solutions.

By fostering collaborations with educational institutions, the organization may enhance its position by securing a consistent supply of young and skilled individuals, while also staying ahead in terms of emerging architectural trends and technology. Furthermore, by broadening its customer base, the company may reduce the risks that come with depending on a small number of significant clients and improve its financial stability.

Ultimately, Riddhi Architects DWG need to bolster its marketing endeavors, placing emphasis on its triumphant undertakings and its capacity for sustainable design, with the aim of enticing fresh clientele and projects. By adopting these suggestions, the organization can sustain its success, foster creativity, and maintain a leading position in the architectural sector. This will enable the company to offer projects that are not only visually appealing but also ecologically conscious and technologically sophisticated.



## **Chapter 3**

### **Project Part**

#### **3.1 Introduction:**

The Quality Policy Statement is a crucial document that articulates a company's dedication to maintaining high standards of quality in every facet of its architectural projects. It functions as a prominent symbol, emphasizing the company's commitment to providing outstanding work that adheres to industry norms. The strategy prioritizes the utilization of superior materials, innovative design processes, and optimal project management methodologies. Furthermore, it underscores the significance of scrupulous focus on every small aspect from the beginning phases of design to the ultimate completion of the project. The statement further highlights the company's dedication to ongoing enhancement and originality, guaranteeing that every project fulfills or surpasses client expectations and industry standards. This encompasses routine staff training, allocation of resources towards new technology, and becoming abreast of emerging architectural trends. The Quality Policy Statement serves as more than a mere formal declaration; it represents the company's core values and fosters a culture that places great importance on and recognizes excellence in all architectural pursuits.

Quality control is a critical aspect of construction for the architectural projects, ensuring that the built environment meets the highest standards of safety, functionality, and aesthetics. As a project architect, the responsibility lies not only in the design phase but extends throughout the construction process. This report aims to explore the importance of quality control in construction and design, with a focus on supply chain management and overall operational management.

#### **3.1.1 Background Information**

In the context of Bangladesh's dynamic urban landscape, the 9-storied Extension Building project for the Ahsanullah University of Science and Technology (AUST) in Kunipara, Dhaka, holds particular significance. The country's rapid urbanization has fueled an increased demand for high-quality buildings, especially in the educational sector, reflecting the growth and expansion of academic institutions.

The project encompasses a substantial construction area of 60,000 square feet, making it a significant addition to the existing infrastructure of AUST. As with any architectural venture, the project life-cycle involves multiple stages, with each playing a crucial role in ensuring the successful execution of the building.

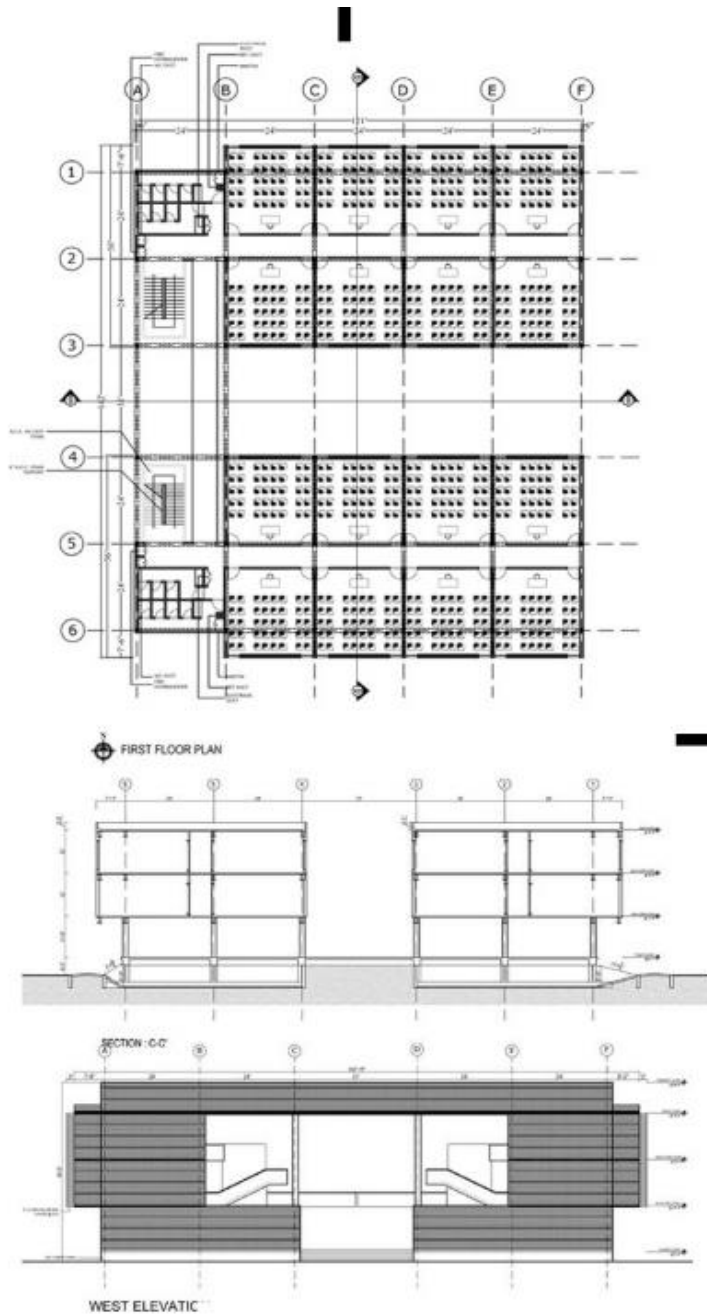


Figure 5- AUST architectural drawings, Source: Riddhi Architects DWG.

### Designing Stage:

The initial phase of the project involves the designing process, commencing with client interactions. During this stage, innovative ideas are conceived, and design development takes place. Proper drafting and financial analysis are undertaken to ensure that the project aligns with both the aesthetic and the budgetary considerations. The preparation of construction drawings is a vital aspect of this stage, laying the foundation for the subsequent execution phase.

### Execution Stage:

The execution phase is particularly critical, involving tasks such as material selection, on-site supervision, and collaboration with various professionals and departments, including engineers, contractors, subcontractors, and

laborers. Managing the project within budget constraints and adhering to a strict timeline are inherent challenges during this stage. The quality of the final product is intricately tied to the effectiveness of quality assurance and control processes implemented at this level.

Quality Control Methods are a fundamental aspect of Riddhi Architects DWG, a renowned architectural business organization. These methods guarantee that every project not only meets but surpasses expectations in terms of design integrity, durability, and functionality, showcasing the firm's operational expertise. The firm's extensive quality control procedure includes multiple crucial stages:

- **Design Review Protocols:**

Each project commences with a meticulous design review procedure. This encompasses comprehensive assessments conducted by a panel of specialists to guarantee that all architectural blueprints are not only visually appealing but also practical, in accordance with regulatory norms, and in line with customer specifications. The reviews are conducted in an iterative manner, which entails continuous input and revision in order to get a flawless design prior to proceeding with the building phase.

- **Material Testing:**

Riddhi Architects DWG prioritizes the utilization of high-quality materials in their projects. They do these thorough examinations of materials to guarantee their durability, sustainability, and safety. Conducting this testing assists in making well-informed selections regarding the materials



*Figure 6- Project's front view, Source: AUST Project's site office.*

that will most effectively meet the project's specifications and environmental circumstances, and hence improving the durability and effectiveness of the completed construction.

- **On-site Inspections:**

During the construction period, the company carries out frequent on-site inspections. These inspections are crucial for ensuring that the construction complies with the stipulated specifications and requirements. The organization utilizes skilled inspectors that thoroughly evaluate the craftsmanship, adherence to design criteria, and overall advancement of the project.

Through the implementation of these rigorous quality control measures, Riddhi Architects DWG ensures that every architectural project is carried out with exceptional accuracy, adhering to the firm's renowned standards of excellence.

- **Systematic Management Processes:**

The organization utilizes a methodical approach to project management, guaranteeing that every stage of the architectural process, starting from the first idea to the ultimate implementation, is carefully supervised and controlled. This encompasses explicit project planning, allocation of resources, management of risks, and tracking of timelines, guaranteeing that every element of the project adheres to the established quality standards.

- **Performance Benchmarks:**

Riddhi Architects DWG establishes precise performance benchmarks for every project. These benchmarks serve as quantifiable objectives for assessing quality, efficiency, and aesthetic worth. The standards are set at the beginning of the project and are consistently reviewed to verify that the project's development aligns with these preset criteria.

- **Feedback Mechanisms:**

An essential element of the quality assurance architecture is the integration of feedback mechanisms. This entails periodic evaluations and contributions from all parties involved, including clients, team members, and external consultants. Soliciting feedback is done at multiple phases of the project to pinpoint areas for enhancement and guarantee that the project is progressing in accordance with the client's vision and industry norm

### 3.1.2 Rationale for the Topic:

The selection of the topic for this project stems from the realization that the performance and reputation of an architectural firm hinge critically on its ability to deliver high-quality results and execute projects seamlessly, adhering to the specified standards without deviation. This is particularly pertinent in the context of Bangladesh, where construction and architectural design face unique challenges, and maintaining consistent quality becomes a paramount concern.

### 3.2 Methodology

This research aims to examine quality control and assurance in architectural projects using a systematic approach. It involves a comprehensive strategy that includes quality planning, control, and assurance, as well as synchronizing for smooth flow of deliverables throughout the project. The quality planning phase involves communicating and reaching consensus on a quality plan with clients, stakeholders, and the project team. The quality control process involves routine inspections, audits, tests, and reviews of design work and documentation to identify and rectify errors on the basis of established standards. The research also explores advanced methodologies, protocols, software, and national rules to determine quality control objectives and criteria.



*Figure 7- Project's inside view, Source: AUST Project's site office.*

To achieve the objectives outlined, the following methodology will be employed:

- **Data Collection:** Collecting data on quality control measures and processes from BNBC, and Imarot nirnam bidhimala 2008.

- **Interviews and Surveys:** Conducting interviews and surveys with project managers, architects, engineers, quality control personnel, and other relevant stakeholders to understand their perspectives on quality assurance.
- **Document Analysis:** Reviewing project documentation, quality control checklists, and project reports to evaluate the implementation of quality control processes from primary and secondary sources.
- **Site Visits:** Visiting ongoing construction sites to observe quality control measures in action and identify potential areas for improvement.

### **3.3 Job responsibility:**

As a Project Architect I am responsible for managing a team of architect and engineers as well as collaborating with other departments and client, to ensure that construction of the projects is align with the company's objectives and standards by following architectural design and drawings. My role involves manage architectural projects from inception to completion, ensuring they meet quality, budget, and timeline objectives. Allocate resources effectively, including site Visits, Quality Control, Progress Reporting, Budget Tracking, Schedule Management, Issue Resolution, and Risk Management.

I will outline the key responsibilities below, though my internship was not limited to these duties, rather they functioned as the driver for my learning.

#### **Quality Assurance:**

As a project architect, I have to establish and maintain architectural standards, best practices, and quality control procedures across all projects. This involves conducting routine reviews and audits of designs to identify and rectify potential issues.

#### **Collaboration:**

In the role of project architect, fostering strong collaboration among various stakeholders including engineering, construction, and other relevant departments is essential. Acting as a

liaison between these teams ensures seamless coordination and execution of the project, by facilitating effective communication and problem-solving.

### **Innovation and Research:**

As a project architect, gathering information about industry trends, emerging technologies, and sustainable practices is vital. Integrating these advancements into architectural projects fosters innovation and enhances design and construction techniques.

### **Risk Management:**

Managing risks is a critical aspect in the project architect's role. So, identification of potential risks in architectural projects and developing effective mitigation strategies are essential to ensure project success and safety. Additionally, monitoring and addressing legal or regulatory compliance issues related to architectural designs help mitigate potential liabilities and ensure project adherence to standards and regulations.

### **Reporting:**

Preparation and presentation of regular reports to the deputy chief architect, summarizing project status, performance, and key architectural insights, contributing to executive decision-making with architectural expertise and data-driven recommendations.

## **3.4 Pros and Cons:**

### **Pros:**

**Creative Expression:** The organization allows me to express my creativity and artistic vision through designing innovative and visually appealing structures.

**Encouragement:** Successfully completing a construction project can be immensely satisfying for architects, the organization rewards their employees for their achievements.

**Collaboration Opportunities:** As a Project Architect I get opportunity to collaborate with various professionals such as engineers, contractors, and vendors, fostering teamwork and mutual learning.

**Impact on Communities:** Well-designed architectural projects can positively impact communities by enhancing the built environment, creating landmarks, and improving quality of life.

**Career Growth:** Managing construction projects offers architects opportunities for professional growth and skill development in project management, communication, and problem-solving.

### **Cons:**

**Client Expectations:** Meeting and managing client expectations can be challenging, as clients may have unrealistic demands or frequently change their requirements during the project. Balancing their desires with the project's budget and schedule while maintaining quality can be difficult.

**Budget Constraints:** Staying within budget is often a significant challenge. Clients may want to cut costs or inflation which can impact the quality of materials and workmanship. Striking a balance between cost and quality is crucial.

**Regulatory Compliance:** Complying with building codes and regulations can be complex and time-consuming. Navigating the various rules and ensuring that the project meets all legal requirements is essential for quality but can be challenging.

**Design Changes:** Changes in the project's design, scope, or materials can introduce risks to quality. Managing and documenting these changes effectively is critical to avoid compromising the final quality product.

**Coordination with Multiple Stakeholders:** All architectural projects involve multiple stakeholders, including contractors, subcontractors, engineers, and interior designers. Coordinating these diverse groups can be challenging and may impact the quality of the work if not managed effectively.

**Site Conditions:** Unforeseen site conditions, such as environmental issues or unexpected geological challenges, can affect the project's quality and add unexpected costs and delays. As well as selecting the right materials and products is crucial for quality, availability, and the need for durability and aesthetics.



**Quality Control and Assurance:** Ensuring that the construction process and methodology of applying materials adheres to the project's design and quality standards is an ongoing challenge. Effective quality control measures are necessary.

### 3.5 Quantitative study and analysis:

**3.5.1 Test of deformed M. S. BAR:** The purpose of this study is to analyze the test results of deformed M.S. bars conducted according to ASTM A 615M-16 standards. The focus is on evaluating the unit weight of the bars sampled across different diameters (10mm, 12mm, 16mm, 20mm, 25mm) and determining if they meet the specified requirements.

#### TEST OF DEFORMED M. S. BAR [ASTM A 615M-16]

Measured unit weight shall not be less than 94% of the nominal weight. ( Z value for 94% acceptance = 1.89 )

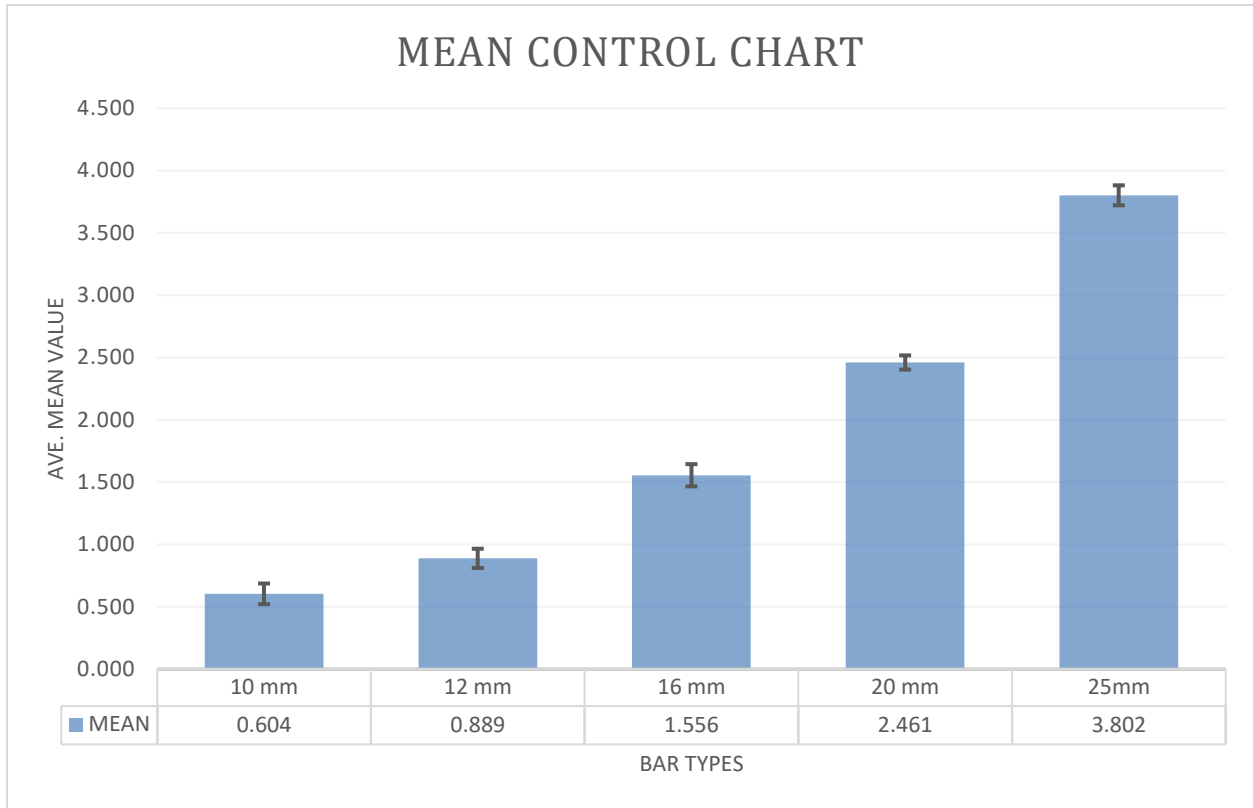
ASTM A 615M-16 weight requirements and nominal area of bars:

Bar Design / Nominal Dia. mm	10	12	16	20	25
Nominal area Sq.mm	79	113	201	314	491
Nominal weight. Kg/m	0.617	0.888	1.578	2.466	3.834

#### ANALYSIS:

Sample specification of the size of the bars are 10mm, 12mm, 16mm, 20mm, 25 mm. Each Test contains 3 sample. According to BUET laboratory test for the samples following results have been taken on random basis.	S/L	Bar Type	Test 1	Test 2	Test 3	Test 4	Mean	Standard Deviation	Mean Range		Difference
			Ave. Unit Weight	Ave. Unit Weight	Ave. Unit Weight	Ave. Unit Weight			Upper Limits	Lower Limits	
			Kg/m	Kg/m	Kg/m	Kg/m					
	1	10 mm	0.617	0.617	0.579	n/a	0.604	0.022	0.646	0.563	0.083
	2	12 mm	0.867	0.907	0.894	n/a	0.889	0.020	0.928	0.851	0.077
	3	16 mm	1.577	1.57	1.552	1.524	1.556	0.024	1.600	1.511	0.089
	4	20 mm	2.483	2.456	2.449	2.456	2.461	0.015	2.489	2.433	0.057
	5	25mm	3.787	3.817	n/a	n/a	3.802	0.021	3.842	3.762	0.080

Table 1- Test results of deformed MS Bar, Sources: BUET Lab.



Graph 1.1- Control chart, Source: Table – 1.

#### Observations:

- The average unit weight is close to the nominal weight, indicating compliance.
- The mean range and difference between upper and lower limits are within acceptable ranges (Graph 1.1).

**3.5.2 Test of sand:** This study examines the results of a sieve analysis conducted on sand samples according to ASTM C136 standards. The focus is on determining the fineness modulus of the sand, which is crucial for grading and classification purposes in construction materials. To achieve the desirable strength of 4500 PSI for concrete, we have to know values of fineness modulus of sand along with other materials in concrete mixture. For higher strength like 4500 PSI coarse sand are required. For this reason, we collect sand from supplier and sent those for lab test to measure fineness modulus range from renowned BUET lab. From our given sample following data are found from lab test result.

## SIEVE ANALYSIS OF SAND [ ASTM C136]

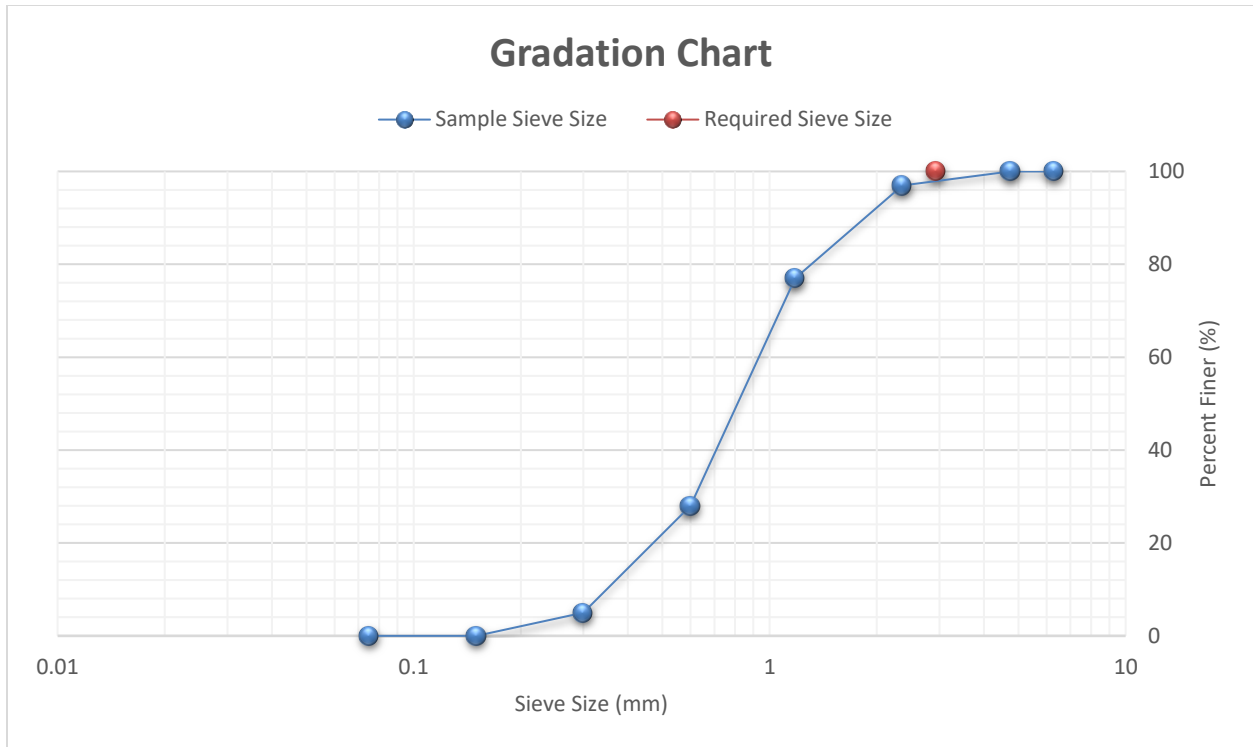
### Values of Fineness Modulus of Sand

Fineness modulus of fine aggregate varies from 2.0 to 3.5mm. Fine aggregate having fineness modulus more than 3.2 should not be considered as fine aggregate. Various values of fineness modulus for different sands are detailed below.

Type of sand	Fineness modulus range
Fine sand	2.2 – 2.6
Medium sand	2.6 – 2.9
Coarse sand	2.9 – 3.2

SAMPLE TEST REPORT	S/L	Sieve Size	Material Retained	Percent of Material Retained	Cumulative percent Retained	Percent Finer	Fineness Modulus
		mm	gm	%	%	%	
	1	6.3	1.1	0	0	100	2.94
	2	4.75	0.2	0	1	100	
	3	2.36	9.1	3	4	97	
	4	1.18	57.5	19	23	77	
	5	0.6	147.2	49	72	28	
	6	0.3	70.3	24	95	5	
	7	0.15	12.8	4	100	0	
	8	0.075	0.8	0	100	0	
	9	Pan	0.3	0			
	10	Total	299				

Table 2- Test result of sand sample, Source: BUET Lab.



Graph 2.1- Gradation Chart, Source: Table – 2.

### Observations:

- The calculated fineness modulus falls within the range for coarse sand (2.9 –3.2).
- This indicates that the sand sample is classified as coarse sand based on its gradation characteristics (Graph 2.1).

The sand sample analyzed exhibits characteristics typical of coarse sand based on its fineness modulus (Table 2).

- Understanding the fineness modulus helps in the proper classification and selection of sand for various construction applications.
- Monitoring the fineness modulus helps maintain the desired characteristics for specific construction needs.

**3.5.3 Test of cement:** The compressive strength of Portland Limestone Cement (Type IL) at 3 days is 2600 PSI (17.9 MPa) and at 7 days is 3800 PSI (26.2 MPa). Both results exceed the standard requirements specified by ASTM C595-19, which are 1890 PSI (13 MPa) at 3 days and 2900 PSI (20 MPa) at 7 days. This indicates that the cement meets or exceeds the strength requirements for Type IL cement.

**Test results of Portland Limestone cement (Type IL) Brand: SUPERCRETE**

TEST	AGE	
	3 Days	7 Days
Compressive Strength PSI and (Mpa): ASTM 109-11b	<b>2600</b> ( 17.9 Mpa)	<b>3800</b> ( 26.2 Mpa)
<b>Note:</b> Minimum of standard requirement for all types of IP/IS/IL/IT: ASTM C595-19	<b>1890</b> ( 13 Mpa)	<b>2900</b> ( 20 Mpa)



Graph 3.1- Strength of cement, Source: Table – 3.

Water for normal consistency: ASTM C187-11		Initial setting time (minutes) ASTM C191-08		Final setting time (minutes) ASTM 191-08	
Standard Requirements	Test Result %	Standard Requirements	Test Result	Standard Requirements	Test Result
20 % to 30 %	<b>25</b>	Not less than 45 minutes	<b>165</b>	Not more than 420 minutes	<b>385</b>

Table 3- Test result of cement sample, Source: BUET Lab.

**Observations:**

- The compressive strength results demonstrate that the Portland Limestone Cement (Type IL) meets or exceeds the standard requirements at both 3 days and 7 days (Graph 3.1).
- Additionally, the water consistency and setting times meet the ASTM standards, indicating good quality and performance of the cement.
- Continue monitoring the quality of production to ensure consistency in performance.

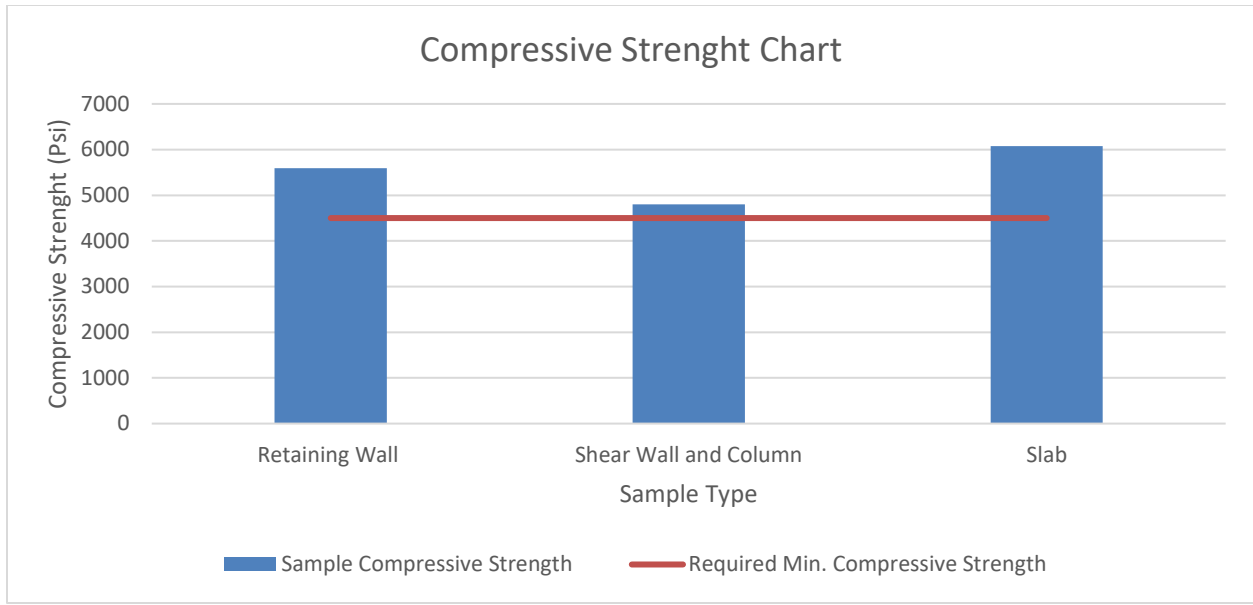
**3.5.4 Test of RCC cylinder:** This analysis examines the compressive strength test results of concrete cylinders categorized by sample type. The aim is to assess whether the samples meet the required minimum compressive strength of 4500 PSI and to identify any variations across the samples.

**COMPRESSIVE STRENGTH TEST OF CONCRETE CYLINDER**

**SAMPLE INFO: Required minimum compressive strength Psi = 4500 PSI**

S/L	TYPE OF SALPME	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Mean	Bench mark	Standard Deviation
		Ave. Unit Com. Stren gth	Ave. Unit Com. Stren gth	Ave. Unit Com. Stren gth	Ave. Unit Com. Stren gth	Ave. Unit Com. Stren gth	Ave. Unit Com. Stren gth	Ave. Unit Com. Stren gth	Ave. Unit Com. Stren gth	Ave. Unit Com. Stren gth			
		Psi	Psi	Psi	Psi	Psi	Psi	Psi	Psi	Psi			
1	Retaining Wall	6750	5320	7240	4811	4620	4795	n/a	n/a	n/a	5589	4500	1124
2	Shear Wall and Column	5490	5120	6020	3980	4310	5500	5660	5330	1770	4798	4500	1307
3	Slab	5770	6250	5318	6020	6130	5640	6800	6470	6264	6074	4500	449

Table 4- Test result of concrete cylinder sample, Source: BUET Lab.



Graph 4.1- Compressive strength chart, Source: Table – 4.

### Observations:

- All sample types exhibit compressive strength above the required minimum of 4500 PSI, indicating satisfactory performance in terms of strength (Graph 4.1).
- Continuous monitoring and testing can help maintain consistency and ensure that concrete meets or exceeds required standards.
- Quality control measures should be implemented to address any variations and maintain the desired level of performance in concrete structures.

### 3.6 Outcomes:

#### Structural Integrity:

The use of deformed M.S. bars with weights closely aligned with nominal values ensures the structural integrity of the construction. Coarse sand, as determined by sieve analysis, provides a suitable foundation material with proper gradation for stability.

### **Durability and Performance:**

Portland Limestone Cement, meeting or exceeding strength requirements, guarantees the durability and long-term performance of the concrete structures. Consistency in concrete strength across different sample types assures uniformity and reliability in load-bearing elements such as retaining walls, columns, and slabs.

### **Quality Assurance:**

Rigorous quality control measures, including regular testing and monitoring, ensure the consistent quality of construction materials and processes. Adherence to ASTM standards for materials like cement and sand reflects a commitment to quality and reliability in the construction project.

### **Safety and Compliance:**

Compressive strength tests confirming the strength of concrete cylinders above minimum requirements, ensure the safety and stability of the final structure. Compliance with industry standards and specifications, such as ASTM guidelines, underscores the project's adherence to the best practices and regulatory requirements.

In conclusion, the outcomes of material testing and quality control efforts contribute to the successful completion of a structurally sound, durable, and compliant construction project, ensuring safety and satisfaction to stakeholders.

### **3.7 Limitations:**

However, despite the importance of maintaining effective quality control, architectural projects in Bangladesh, including the 9-storied Extension Building for AUST, encounter various difficulties. These challenges include issues such as the presence of unskilled labor, communication gaps, financial limitations, time constraints, a lack of motivation, and the struggle to align with the core values of the consultancy firm overseeing the project.

The complex nature of architectural projects is underscored by the constant evolution of the field, influenced by factors ranging from individual and group dynamics to external forces such as site



conditions, budget constraints, climate considerations, political influences, technological advancements, and cultural nuances.

**As a project Architect I have faced the following challenges in the project:**

**Variations in Material:** In the project, several time I noticed materials are sent to the project which are not as per specification according to BOQ. For instance, in the construction project, the delivery of cement of different grades without proper documentation are supplied in the construction site which might result in variations in the compressive strength of the concrete, impacting the overall structural integrity of the building.

**Limited Collaboration Among Stakeholders:** Insufficient collaboration among project stakeholders, including architects, contractors, and suppliers, emerged as a critical issue. Tri-party are involved in this project in terms of consultant, AUST engineer, and contractor. But AUST engineers are shown less important for the project as they feel it make extra pressure to them. Even they are not empowering to take any decision for the project. This lack of collaboration hindered the seamless flow of information and coordination, ultimately impacting the overall quality of the project.

**Supply Chain Disruptions and Delays:** Supply chain disruptions and delays were identified as significant contributors to compromised quality. Unforeseen events, such as transportation issues, strikes, or material shortages, often disrupted project timelines. For example, our construction project faced delays due to a sudden increase in the cost of imported steel, leading to a halt in construction activities and subsequent challenges in coordinating phases.

### **3.8 Overcome The Limitations:**

In order to address the challenges faced in architectural projects, a comprehensive set of solutions is proposed. These solutions aim to improve operation management, quality control, and supply chain management, as well as foster cross-functional collaboration and continuous improvement.

### 3.8.1 Operation Management Solutions:

- ***Integrated project planning:***

Implementing a comprehensive project planning system that integrates all construction phases, including detailed schedules and resource allocation plans, is crucial. This helps address unforeseen challenges with contingency measures.



Figure 8- Site visit with authorities, Source: AUST project's site office.

- ***Skilled workforce development:***

Investing in training programs to enhance the skills of construction professionals ensures a workforce well-equipped with the latest techniques, minimizing variations caused by individual approaches.

### 3.8.2 Quality Control Solutions:

- ***Standardized quality assurance protocols:***

Developing and enforcing standardized quality assurance protocols for construction materials and practices ensures regular inspections, testing procedures, and compliance checks to maintain industry standards.



Figure 9- Monitoring during slab casting, Source: AUST site office.

- ***Continuous monitoring and auditing:***

Implementing a system of continuous monitoring and auditing throughout the construction process identifies deviations from design specifications early on, allowing for timely corrective measures.

- ***Collaborative design reviews:*** Fostering collaboration among stakeholders through regular design reviews ensures a clear understanding of design intent, reducing the risk of discrepancies in execution.

### 3.8.3 Supply Chain Management Solutions:

- ***Strategic supplier partnerships:*** Forming strategic partnerships with reliable suppliers through evaluations ensures a steady and consistent supply of high-quality materials.
- ***Contingency planning for disruptions:*** Developing contingency plans for potential supply chain disruptions, including alternative sourcing options and proactive risk management strategies, mitigates the impact of unforeseen events on project timelines.

### 3.8.4 Integrated Solutions

- ***Cross-functional collaboration:*** Fostering cross-functional collaboration among project teams ensures a holistic approach to decision-making, incorporating perspectives from architects, clients, contractors, and suppliers.
- ***Performance metrics and continuous improvement:*** Implementing performance metrics to assess the effectiveness of management strategies and incorporating continuous improvement initiatives enhances overall project efficiency and quality. Regular reviews of these metrics are essential for ongoing refinement.



Figure 10- Project under construction, Source: AUST project's site office.

### **3.9 Summary and Conclusion:**

In summary, the report underscores the critical role of project architects in ensuring quality control throughout the construction and design phases. Effective operational management, coupled with a robust supply chain, is imperative for delivering high-quality structures. Starting with the design phase and continuing with all the way through the construction phases, Quality Control (QC) and Quality Assurance (QA) are crucial. This approach stresses an exhaustive viewpoint that incorporates both aesthetic appeal and helpfulness. Project managers and quality assurance specialists emphasize the necessity of on-site monitoring and stakeholder collaboration, while architects emphasize the necessity of iterative procedures and inclusion of new technologies to maintain design quality. The use of Building code, 3D Modelling and digital technologies has revolutionized quality control (QC) and quality assurance (QA) practices, providing improved accuracy and predictive capabilities. These devices enhance visualization, coordination, and early detection of potential problems, therefore significantly reducing errors and enhancing performance. This anticipates a shift towards more structured, proactive, and inherently cautious QC and QA methodologies.

The assessment suggests that design companies should continuously enhance and adapt their quality control (QC) and quality assurance (QA) processes to keep pace with technological advancements and evolving industry standards. This entails including financial planning for new innovations, fostering a culture of continuous learning, and integrating sustainability into quality standards.

In conclusion, this comprehensive report underscores the pivotal role of project architects in maintaining quality control and assurance throughout architectural projects, particularly in the context of Bangladesh's dynamic urban landscape. It emphasizes the importance of effective operational management, collaboration among stakeholders, and proactive strategies for addressing challenges in supply chain management.

The report highlights the multifaceted nature of quality control and assurance, spanning from initial design phases to construction execution. It stresses the significance of standardized protocols, continuous monitoring, and collaborative approaches to ensure adherence to industry standards and client expectations.



Furthermore, the report acknowledges the challenges faced in architectural projects, such as variations in material quality, limited collaboration among stakeholders, and supply chain disruptions. However, it proposes practical solutions ranging from integrated project planning to strategic supplier partnerships to overcome these limitations and enhance overall project quality.

Ultimately, the report emphasizes the need for ongoing adaptation and improvement in quality control and assurance processes to align with technological advancements and evolving industry standards. It calls for a proactive approach to incorporate innovations, foster a culture of continuous learning, and integrate sustainability into quality standards, ensuring the delivery of high-quality architectural projects that positively impact communities and uphold the firm's reputation.

### 3.10 Recommendations:

Based on the findings, the following recommendations are proposed:

- Establishing industry-wide standards for construction materials and practices.
- Enhancing collaboration and communication among architects, contractors, and suppliers.
- Implementing advanced project management tools for streamlined operational management.
- Investing in training programs to enhance the skills of construction professionals.
- Regular monitoring and auditing of construction processes to ensure compliance with quality standards.



*Figure 11- AUST project building, Source: AUST site office.*

By implementing these recommendations, project architects can contribute significantly to elevating the quality of construction and design in Bangladesh, leading to safer, more resilient, and aesthetically pleasing built environments.

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