University of Mohammed Kheider- Biskra
Faculty of architecture, urbanism, civil engineering and hydraulic
Department of Architecture

MASTER'S DISSERTATION

Domain: **Architecture, urbanism and city professions**

Field: **Construction Project Management**

Specialization: **Construction Project Management**

Presented and defended by:
Amira Seghir

On: June 22, 2025

Theme: The effect of the completion costs on the realization deadline (schedule) for school equipment. Study case: Ben Mbarek Dahman primary school -Batna roud- in Biskra province

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Examiner's committee

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Academic year: 2024 - 2025

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In the journey of research, not all contributions are written in ink, and not all support is measured in pages and citations. Behind this thesis stood those who believed, who critiqued with kindness, and who illuminated the path in silence.

To the one who taught me that knowledge is a responsibility before it is a credential — Dr. Badashe Halima — I extend my deepest gratitude.

And to those who passed gently through this process — with a word, a smile, or a silent prayer — know that your presence, however brief, left an imprint on this accomplishment.

Dedication

To those whose souls echoed behind every line, whose presence is unseen but deeply felt...

To my father, **Ahmed**, the wisdom that dwelled in silent expressions, and the patience that gave meaning to every step and a lesson to every stumble.

To my mother, **Nora**, the warmth of prayer, the joy of contentment, and a blessing that no words could ever truly capture.

To **Hana and Souha**, the sisters who were the beautiful tale amid every chaos, the gentle light that came before clarity and peace.

To **Badis and Badie**, your presence was like serenity at the heart of a storm.

To **Risslan, Kayan, and Ilyan**, you are the flavor and color of life— a generation I wish dreams beyond dreams and hopes purer than longing.

To **Amal**, my friend not a shadow behind me, but a light that reshaped my face whenever it cracked.

To **Professor Hiba Barbara**, the light quietly placed upon the academic table, never boastful, yet illuminating far more than I expected.

And to Professor **Majda Atta Allah**, who saw ambition in the details and wisdom in the path—her presence left a mark that will never fade.

To **myself** the quiet warrior behind every sleepless night and every silent victory.

Abstract:

This research explores the impact of completion costs on the scheduling of school construction projects, with a particular focus on the interrelationship between time management, schedule management, and deadlines within the context of educational infrastructure development. The research centers on a project to construct a Class C primary school in the Batna Road district of Biskra a high-priority initiative directly overseen by the regional governor in response to rapid urban growth and the pressing need for educational facilities in the area.

The study was structured around three primary phases. The first phase addressed the theoretical and organizational framework of the education sector in Algeria. The second phase provided a technical and architectural analysis of the selected project. The third, applied phase involved the administrative, temporal, and financial assessment of the project, employing advanced project management tools such as Microsoft Project, the Earned Value Management (EVM) method, and the Critical Path Method (CPM).

The findings indicate that changes in contractual arrangements, administrative disruptions, and rising costs were significant factors contributing to deviations from the scheduled completion deadlines. Furthermore, the research highlights that cost overruns have a direct and measurable impact on project timelines, underscoring a strong correlation between financial performance and schedule adherence in school construction projects. The study concludes with a series of administrative and organizational recommendations designed to enhance the future performance of educational infrastructure projects, particularly regarding cost control and timely project delivery.

Keywords: Time Management, Schedule , Deadlines, Primary School, Biskra. Cost .

الملخص : تهدف هذه المذكرة إلى دراسة تأثير تكلفة الإنجاز على الجدول الزمني للمشاريع المدرسية، مع التركيز على العلاقة بين إدارة الوقت، وإدارة الجدول الزمني، والآجال النهائية في سياق البنية التحتية التعليمية. تمحورت الدراسة حول مشروع بناء مدرسة ابتدائية صنف "ج" بحي طريق باتنة بمدينة بسكرة، وهو مشروع ذو أولوية كبرى أشرف عليه الوالي شخصيًا استجابةً للنمو العمراني والحاجة الملحة للمؤسسات التربوية بالمنطقة.

اعتمدت الدراسة على ثلاث مراحل رئيسية: الأولى تناولت الإطار النظري والتنظيمي لقطاع التعليم في الجزائر، والثانية قدمت قراءة تحليلية تقنية ومعمارية للمشروع المدروس، أما المرحلة الثالثة فكانت تطبيقية، شملت التقييم الإداري والزمني والمالي للمشروع باستخدام أدوات متقدمة في إدارة المشاريع مثل برنامجMS Project ، وطريقة القيمة المكتسبة(EVM) ، وطريقة المسار الحرج (CPM).

كشفت نتائج الدراسة أن تغيّر المقاولات، والتعطيلات الإدارية، وتضخم التكاليف، كانت عوامل حاسمة في انحراف الجدول الزمني عن الآجال التعاقدية. كما أبرزت أن أي تجاوز في التكلفة يؤثر بشكل مباشر على زمن الإنجاز، مؤكدة على وجود علاقة طردية بين التكلفة والمدة الزمنية في المشاريع المدرسية. واختُتمت الدراسة بجملة من التوصيات الإدارية والتنظيمية التي تهدف إلى تحسين أداء المشاريع التربوية مستقبلاً من حيث التحكم في التكلفة واحترام الآجال النهائية.

الكلمات المفتاحية: إدارة الوقت. الجدول الزمني . الآجال النهائية إدارة المشاريع ، التكلفة، ، بسكرة . المدارس الإبتدائية .

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Introductive chapter

General introduction

The management of the institution comes to the success of its production, service, educational or any field because the role of management is taken as one the most important factors in the success or failure of an institution thus one of the most important reasons for the growth progress or backwardness of a society applies. It is the engine that takes an institution where it wants to go and the much more specific main task of management is to make an institution and its various components perform well using preferable human and material resources.

Establishment and installation of school equipment create a conducive learning environment. From furniture to technological tools, school equipment is a must in primary school, secondary school, or even college. Educational resources – can be much better related to teaching effectiveness and student engagement.

Yet, the planning and management of school equipment projects such as the purchase, installation, and maintenance of resources are beset by many challenges regarding cost, time schedule, and quality.

In the area of project management, particularly in education, timely production of school supplies is a significant challenge. Cost to complete, however, greatly influences the success of such projects. This refers to the extra costs that will be incurred in the course of the project due to unforeseen circumstances or poor management of resources.

Completion costs have a direct impact on the ability to meet deadlines and affect the delivery of equipment needed to run educational institutions smoothly. When such costs rise, resources must be reallocated, where in in reality that would lead to delays, changes in the schedule, and even downtime.

Hence, these projects will be successfully completed with proper planning and effective resource management, as well as continuous evaluation of the impact of this equipment on teaching and learning conditions.

This phenomenon is even more important in the school context where delivery dates are often linked to fixed calendars, such as the beginning of the school year or specific reorganization periods. It is therefore important to understand how completion costs, whether due to unforeseen technical events, economic fluctuations or management decisions, affect equipment completion times. Through this analysis, this study aims to examine the links between these two elements – completion costs and completion time – taking into account the specificities of school equipment project management.

The problematic:

The installation of school equipment is a complex issue, where managing the costs of completion and meeting the completion deadlines are determining factors for the completion of projects to the best of their ability. In this context, and within the framework of the project under study * Realization of a type C Primary School on Batna Road*

We ask the basic question:

How do completion costs affect the ability of project managers to meet the deadlines (schedule) for completing school equipment?

More specifically this study seeks to determine whether **cost overruns are a predictor of delays in the installation of equipment ?** and **how organizations can better manage these costs to minimize the impact on completion times??**

Work objectives

This research proposes a case study on * Realization of a type C Primary School on Batna Road* in order to The effect of the completion costs on the realization deadline for school equipement .

Through a study and in-depth analysis of the strategies implemented and the results obtained, we hope to provide valuable information and practical recommendations.

The objectives of our research are based on :

- To analyze the project's schedule and assess the level of adherence throughout the various phases of execution.
- To identify financial and time deviations and examine their causes and impact on project progress.
- To employ modern project management tools to evaluate financial and schedule performance.
- To establish the relationship between completion costs and deadlines, and propose practical recommendations to enhance time and cost management in future school equipment projects.Structure of the memorandum:

Structure of the dissertation:

Chapter one :

This chapter discusses the theoretical aspects of the subject of construction project management in the Algerian education sector, starting with an overview of the Algerian education sector, reviewing the structure of the national Ministry of Education, followed by an introduction to the Biskra National Directorate of Education and explaining its organizational structure and role in supervising local educational institutions. Thereafter, the ministry and the various programs implemented by the department in this field are presented, followed by a definition of a case study represented by a Category C primary school and a detailed study plan for this institution based on approved educational and engineering standards. With regard to project management in this field, this chapter reviews the concept of construction project management and focuses on the project life cycle and its planning, implementation, monitoring and closure phases.

while explaining the importance of identifying stakeholders and the role of each of them in achieving the project objectives. This chapter also addresses cost management as a basic process to ensure commitment to the budget, and schedule management that aims to respect deadlines and avoid delays. This theoretical presentation paves the way for linking the practical aspects with academic concepts, leading to building a scientific base that contributes to understanding the mechanisms for implementing middle school projects efficiently and effectively.

Chapter two :

This chapter focuses on the analytical study of an approved project, the construction of Ben Dahman Mbarak Primary School on Batna Road in Biskra. The case study is presented by showing a technical card of the project, which contains detailed information about the location, area and capacity of the facility. Subsequently, an urban planning study is conducted by analyzing the network of connections and urban planning characteristics of the area, studying the relationship between space and buildings (open and built spaces). The architectural study examines the design elements of the building, such as the functional organization, spatial organization and the structural systems used. This is reinforced by explaining the management path of the project through a table that shows how the official and technical procedures required to complete the project were followed, including the approval and licensing stages.

Introductive chapter

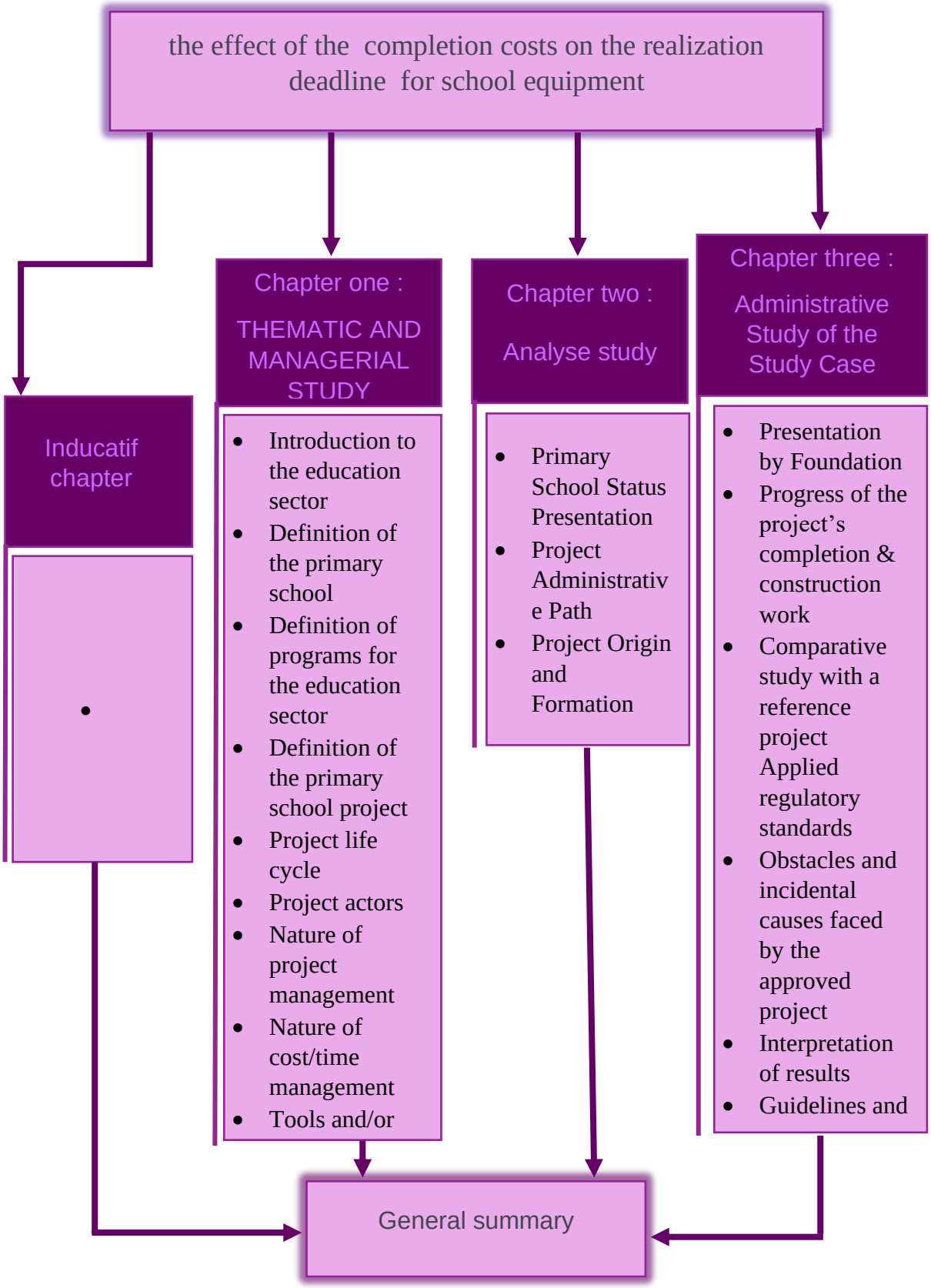
The chapter also addresses the historical aspect of the emergence of the project, including the factors that led to the decision to build a new primary school in this region, with reference to the urban and educational context surrounding the project. At the end of this chapter, a summary is presented that highlights the most important analytical results related to the reality of the project and the circumstances affecting it.

Chapter three :

This chapter discusses the management aspects of the project and s hlighting how human and material resources are managed within the Ben Mbarek Dahman School. First, the implementing agency (contractor) responsible for implementation is presented by reviewing its organizational structure, previous experience, and the quality of human and material resources provided. The completion and construction schedule of the project will then be explained, detailing the construction phases and the techniques used to ensure compliance with technical specifications and educational standards. The chapter also includes a comparative study with similar reference projects, reviewing the regulatory standards applied and evaluating the similarities and differences in management and completion methods. The chapter also discusses the obstacles and supporting reasons faced by the project and analyzes these challenges along the two main axes of cost and schedule.

Through the interpretation of the results, the effectiveness of administrative procedures in dealing with various difficulties and the extent of the commitment of the parties concerned to achieving the specified objectives is shown. Finally, the chapter presents the directions, solutions, proposals, and recommendations that can be used to improve administrative performance in educational institution construction projects, especially in similar environments. The administrative study concludes with a brief summary that summarizes the most important lessons learned and possible development prospects in this field.

Introductive chapter



Chapter 01:

thematic and

managerial study

I.Chapter 01: thematic and managerial study

Introduction:

The education sector plays a fundamental role in shaping the future of societies by promoting knowledge, skills, and personal development. Within this sector, primary education stands as the cornerstone of every individual's academic journey, providing the essential foundations for lifelong learning.

Primary school buildings are designed to provide a safe, inclusive and stimulating environment for young learners. These projects require careful planning, budgeting and execution to provide a safe, inclusive and stimulating learning environment for young students.

The successful realization of such educational facilities depends heavily on the application of construction project management principles. These include , time and cost control, elements that are essential to delivering infrastructure that meets the pedagogical and architectural standards required in the Algerian context.

This chapter provides a comprehensive overview of the administrative and structural framework that governs the educational sector in Algeria, with a specific focus on the primary school as the central subject of the study.

Further, the chapter delves into national educational programs and the spatial organization of school infrastructures,. It then transitions to an analysis of the project itself, covering its definition, type, and life cycle, from initiation to closure. Special attention is paid to the roles and responsibilities of various stakeholders involved in construction projects,

In the final sections, the focus shifts to core project management principles, particularly those related to Schedule, Cost, and Quality Management. The chapter concludes by presenting practical tools and techniques for managing time and costs effectively in the context of educational infrastructure projects. This structured approach lays the foundation for understanding the complexities of managing construction projects within the educational sector and prepares the ground for the analytic study that follows.

1. Presentation of the sector

1.1 Education:

Origin of the word:

Definition 01: The origin of the word <<< education >> is << ex ducere >> and means to bring out of oneself, Developer, blossomed. (Augé, 1984)

Definition 02: According to Grand Larousse de la langue française: Training of someone in a particular field of activity; set of intellectual, cultural and moral knowledge acquired in this field by someone, by a group. (Petit Larousse illustré 1984, 1984)

Definition 03: it is the action of forming and enriching the mind of a person. (education worldeducation guide, 1923).

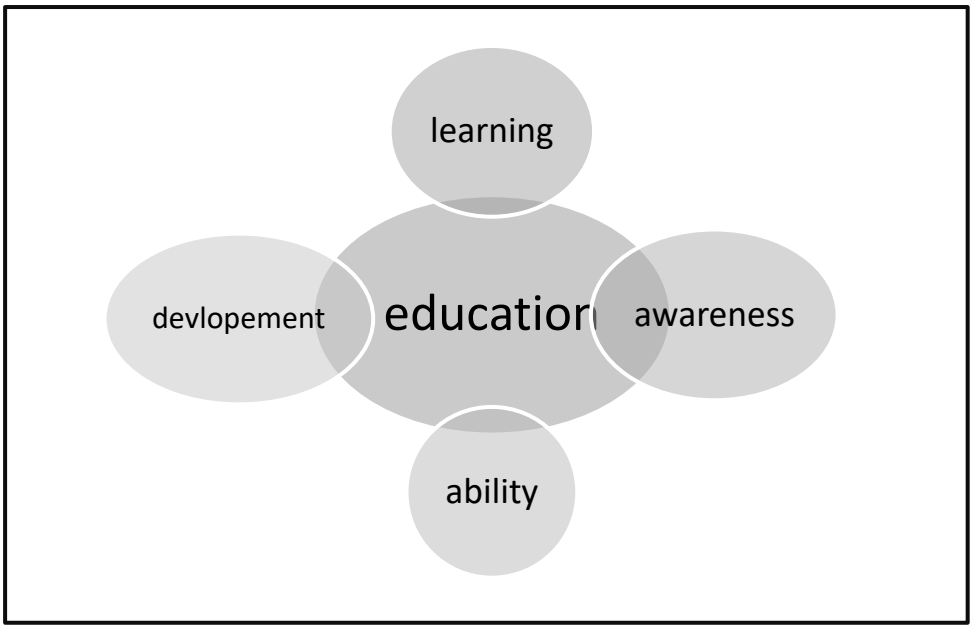


Figure I.1 shows the education principles source : the author2024

1.2 The education sector:

The education sector in Algeria is one of the vital sectors that represents the cornerstone of community development and achieving sustainable growth. This sector has witnessed significant development, with the state focusing on improving the educational system at various levels.

The education sector in Algeria is responsible for organizing and developing education at various levels, ranging from primary education to higher education. (Nationale, 2024)

This sector includes educational institutions, curricula, teaching programs, as well as the teaching and administrative bodies involved in the education system.

The main goal of the education sector is to provide comprehensive, diverse, and advanced education that meets the needs of society and contributes to sustainable human development. The sector aims to improve the quality of education, enhance individuals' skills through updated curricula, continuous teacher training, and the use of modern educational technologies. (UNICEF, 2024)

1.3 Ministry of education:

Definition of the ministry of education: it is one of the government ministries concerned with educating the people through its various institutions, from primary school to high school. its also

focuses on the moral aspect of student and works to prepare a responsible and virtuous youth by providing all the necessary means and human resources and working to develop the field and to raise the nation's educational standards. (Nationale, 2024)

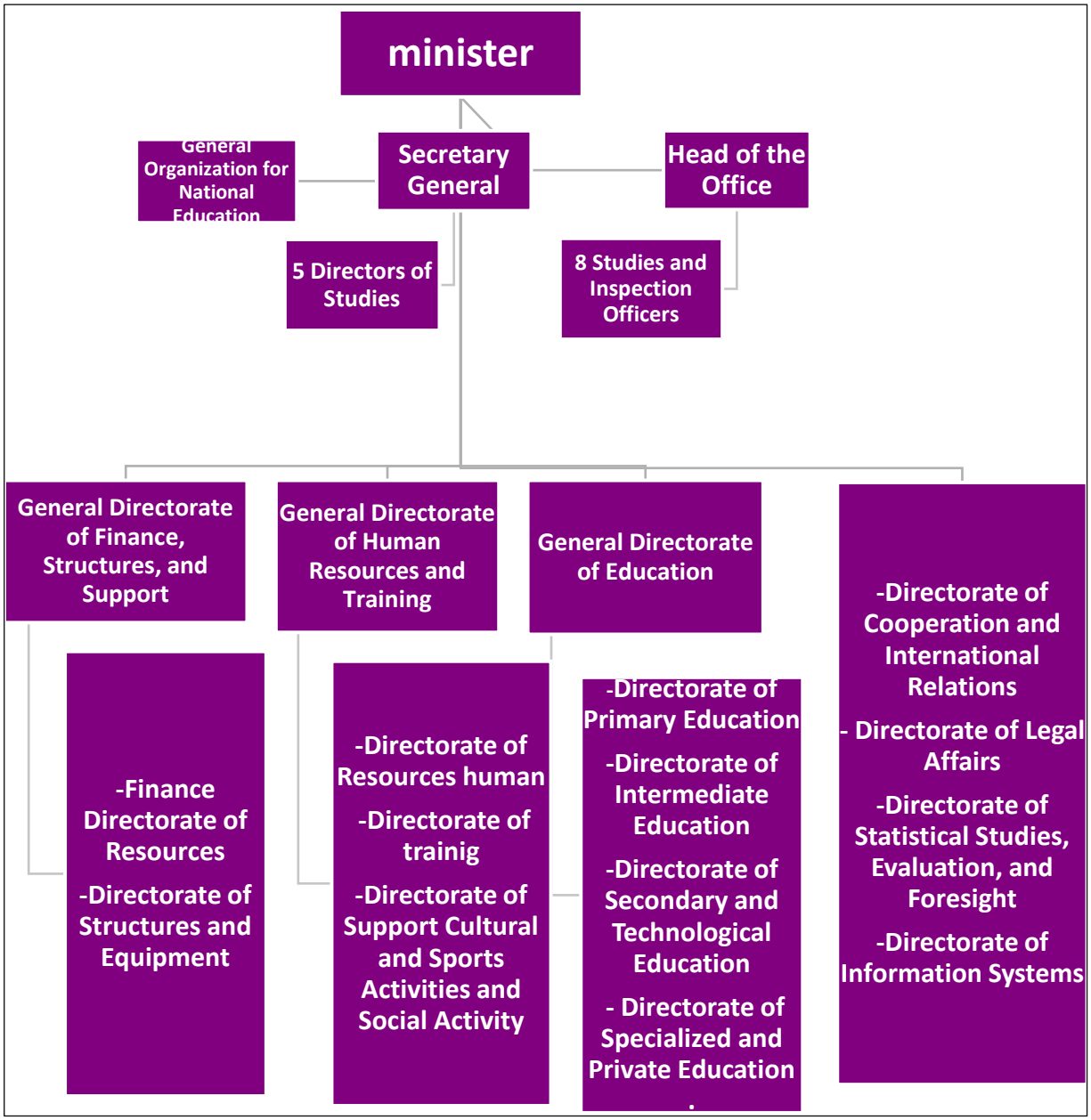


Figure I.2 type of school source : the author 2024

Bodies under the guardianship of the Ministry of Education:

- Institutes
- Centers
- Diwan

1.4Definition of the Directorate of Education:

It is an entity or company that implements and manages construction and building projects, where the contractor is responsible for implementing the project and coordinating the various operations such as construction, equipment and finishing. The contractor coordinates the workers, materials and

equipment necessary to complete the project successfully according to the specifications and deadlines. (off)

1.5Educational equipment:

We can cite the educational equipment in the following diagram:

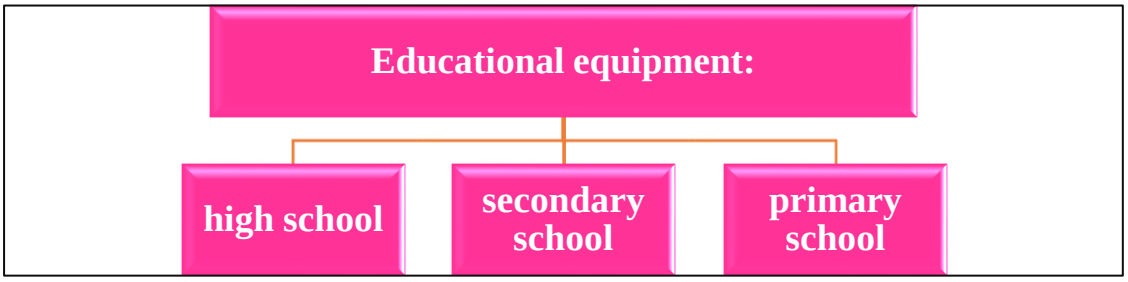


Figure I.3 School equipement , source:the author 2025

1.5.1high school:

high school is an educational institution that comes after the preparatory stage and is concerned with educating students in the secondary stage of general education. It usually lasts from the age of 15 to 18 years, and aims to prepare students to continue their studies in higher education or join the labor market after graduation. In Algeria, the secondary stage consists of general secondary education (which includes academic departments such as literature, science, and mathematics) and technical or vocational education (which focuses on technical and professional skills).
High school is an important transitional stage between basic education and higher education, as it focuses on providing students with advanced knowledge in specialized fields, developing critical and analytical thinking skills, and developing communication skills. (Education system in Algeria, 2024)

1.5.2secondary school:

Secondary school is the stage of education that comes after primary school and before secondary school, and is part of basic education in many countries, including Algeria. In Algeria, secondary school is also known as "intermediate education" and usually lasts from the first year to the fourth year (from the age of 12 to 15 years).
The secondary school aims to develop the basic knowledge and skills that students need to continue their secondary education. At this stage, students study a range of subjects such as Arabic, mathematics, science, Islamic education, history and geography, foreign languages, physical education and other subjects. (Education system in Algeria, 2024)

1.5.3primary school: **“the study case”**

2. Primary school

2.1 Definition of primary school

Definition 01: is the educational institution that is concerned with educating children in the first stage of basic education, and is considered a starting point for forming the child at the level of basic knowledge and skills that he needs in his daily life. In primary school, students learn the first principles of reading, writing, arithmetic, and basic sciences, in addition to providing them with social and moral values. (Nationale, 2024)

Definition 02: is an educational institution that provides the first stage of formal education for children, typically between the ages of 5 or 6 and 11 or 12, depending on the country. It is the foundational level of schooling where children are introduced to basic academic subjects such as

reading, writing, mathematics, and basic sciences, as well as social, moral, and physical development. (UNESCO Institute for Statistics, 2024)

Definition 03: aim to develop essential skills in children, including literacy, numeracy, critical thinking, and social skills, which are crucial for further education and personal growth. In many countries, primary school is part of compulsory education, meaning that children are required by law to attend school during these years**.**

2.2Types of school

In Algeria, primary schools are classified based on the type of education they provide, and these categories vary according to educational orientations and specific objectives. Primary schools can be divided into several main categories, including:

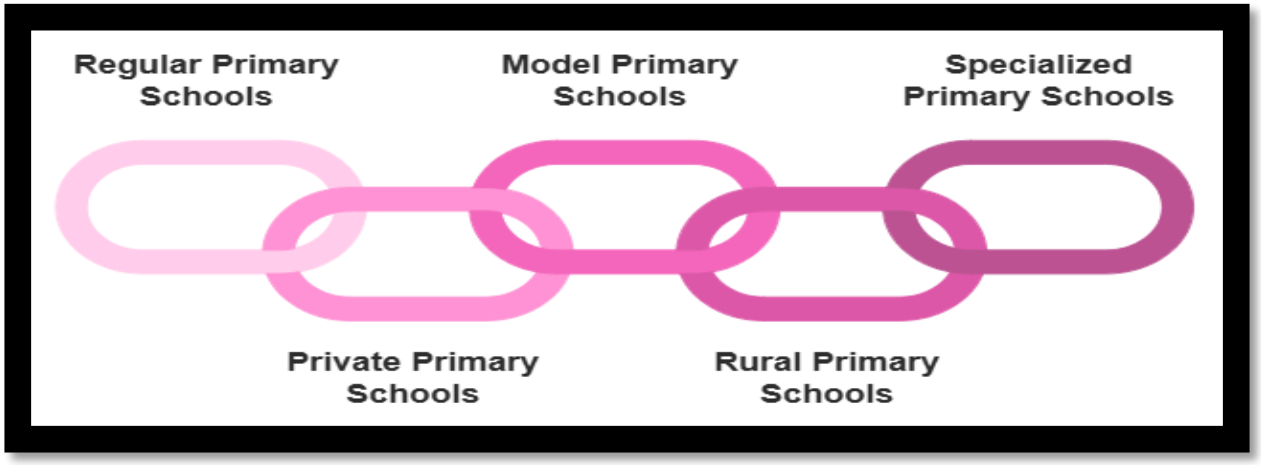


Figure I.4type of school source : the author 2024

2.2.1 Regular primary schools:

Description: These are basic schools that provide primary education for all children, and their mission is to teach official curricula that include basic subjects such as Arabic, mathematics, science, Islamic education, and physical education.
Objective: They aim to provide comprehensive education for all students in early childhood.

2.2.2Private primary schools:

Description: These are schools that are not affiliated with the state, and provide education according to curricula that may be private or modified in accordance with the needs of students or the special requirements of the institution.
Objective: These schools provide a flexible educational environment, and may focus on providing distinguished education in some areas such as languages, science, or sports.

2.2.3 Model primary schools:

Description: These schools represent a model of good and advanced education, as they focus on using advanced teaching methods, in addition to the presence of well-qualified teachers.
Objective: These schools seek to provide a quality education by providing a high-quality learning environment, and are often located in major urban areas.

2.2.4 Rural or remote primary schools:

Description: Schools dedicated to educating children in rural or remote areas, where curricula and teaching methods are designed to suit the needs of students in those areas.

Objective: Ensure that educational opportunities are provided to children in areas that may lack the necessary educational resources.

2.2.5 Specialized primary schools (such as special needs schools):
Description: Schools that provide education specifically for children with special needs, such as motor, mental, or sensory disabilities.
Objective: Provide children with special needs with an adapted education that helps them develop their skills and academic and social development.

2.3Classification of primary school:

Primary schools are classified in Algeria according to the number of classes, there are 05types

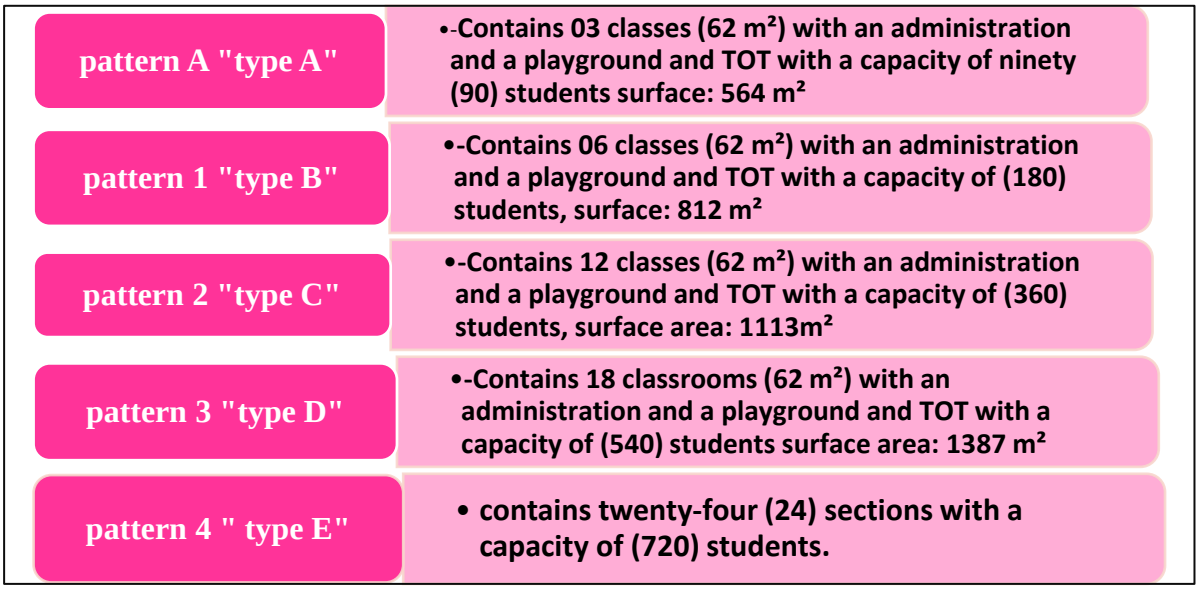


Figure I.5 classification of primary school source: officiel journal of the Algerian Republic, Legislation on Establishing Standards for School Buildings, No. 33, 2025

2.4Typical school canteen:

The central school canteen is responsible for transporting meals to other primary schools and must be provided with the necessary human and material means stipulated in Article 5 of Executive Decree No. 18-03 of Rabi' al-Thani 27, 1439, corresponding to January 15, 2018

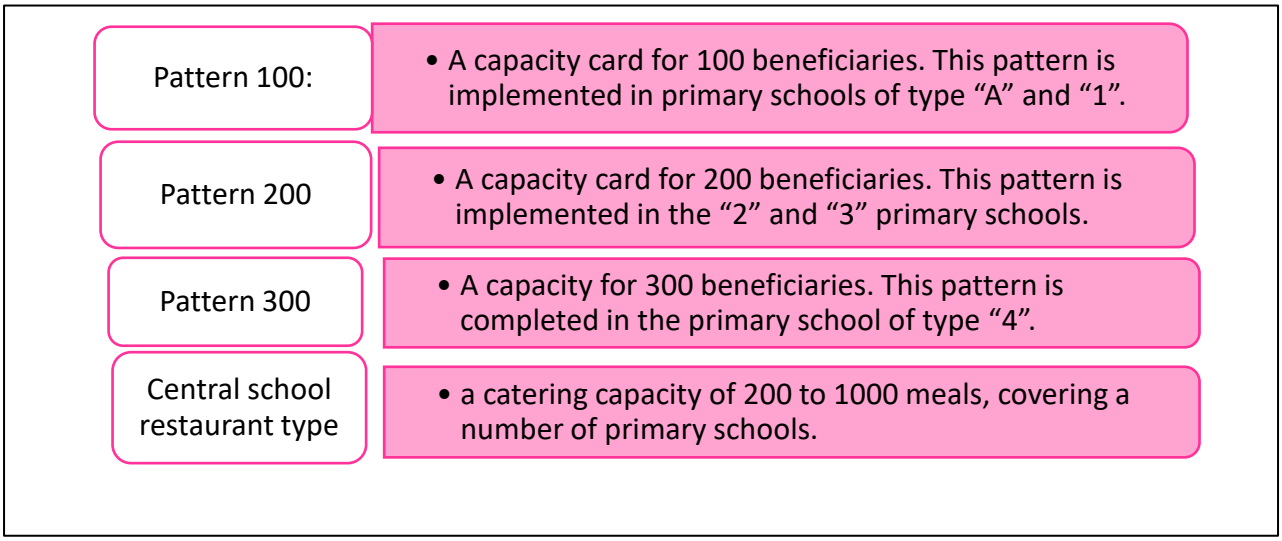


Figure I.6 typical school canteen source : officiel journal of the Algerian Republic, Legislation on Establishing Standards for School Buildings, No. 33, 2025

2.5School Typology:

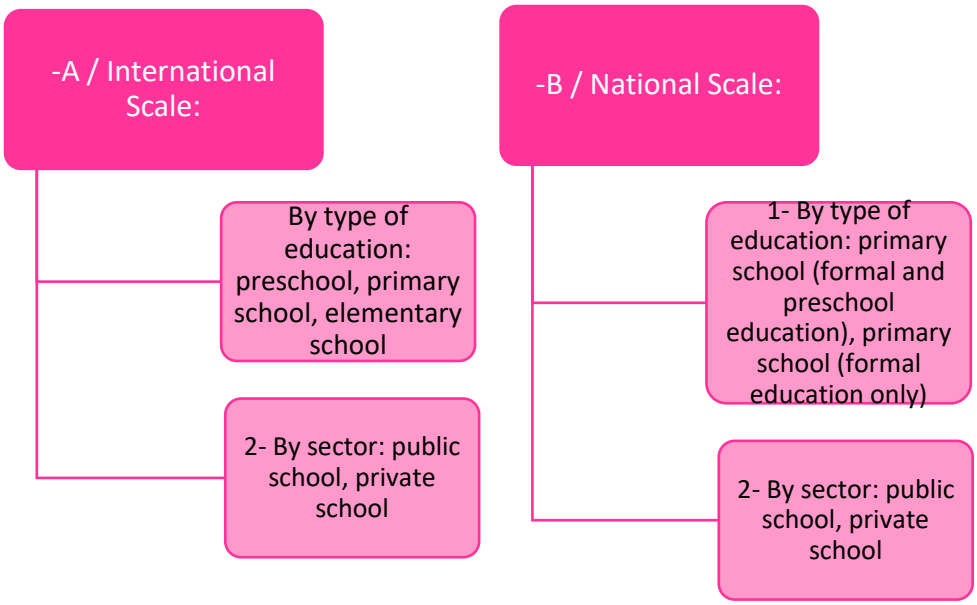


Figure I.7school typologie source : France school

2.6 Urban standards

2.6.Location:

- The school must be far from sources of pollution (such as factories or highways).
- Easily accessible for students on foot.
- Located within a safe residential area.

2.6.2Area:

- Total area: approximately 2,000 to 4,000 m².

2.6.3Orientation:

- Orient classrooms toward the south or east to benefit from natural light.
- Provide good ventilation for all spaces.
- To be 500 meters away from the residential area.

2.7 Architectural standards

Primary schools in Algeria are subject to a set of urban and architectural standards determined by the Ministry of National Education and the Ministry of Housing and Urban Planning. These standards aim to ensure a safe, comfortable, and suitable educational environment for children.

2.7.1Space design

- Group work spaces must be available from at least two classrooms.
- The number of floors must not exceed 3 to 4 floors, and schools for people with special needs must be one or two floors only. (Neufert, 2012)

2.7.2Dimensions and engineering standards

- Maximum number of students in a class: 30 students.
- Classroom area per student: 1.80 to 2.00 m².
- Air volume per student: 5.00 to 6.00 m³.
- Ceiling height not less than 3.00 m, with the possibility of a maximum decrease of 0.30 m in some cases.
- Maximum depth of a classroom with unilateral natural lighting: 7.20 m.
- The distance between the blackboard and the back seats must not exceed 9.00 m.

- Double tables must be used to accommodate students comfortably. (Neufert, 2012)

2.7.3Computer room

- The screen should be positioned below eye level so that the head tilt angle is 15-20 degrees to avoid neck strain

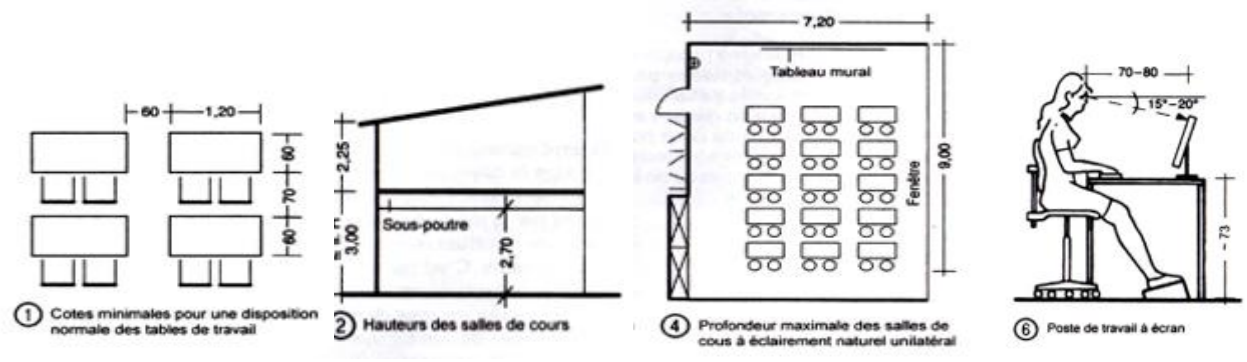


Figure I.8 dimensions and engeering standards ,Source: Neufert 7th edition

2.7.4Basic facilities

- Administration: Director's offices, teachers, secretariat, and meeting room.
- Library: Suitable area with designated places for reading and research.
- Laboratories: For science and technology, with safety equipment provided.
- Multi-purpose hall: For sports, cultural and artistic activities.
- School restaurant: Provides healthy meals with high hygiene standards.
- Playgrounds and yards: Must include a sports field suitable for physical activities.
- Bathrooms: A sufficient number distributed between males and females, with good ventilation and adequate sanitation.

3. programs for the education sector (Algeria)

study case : A pattern 2 primary school designed to accommodate 200 students, with comprehensive food services provided during school hours. This typ0e features a balanced distribution of spaces, including dedicated learning areas, administrative facilities, recreational areas, and facilities (restaurant + stadium) to meet the recreational needs of students.

3.1programme of spaces:

The purpose of a school building program is to reflect as faithfully as possible the needs of users for the performance of various educational activities. The main criteria used to determine the size and technical programs of schools in Algeria, according to the proposed guidelines, are:

- The school-age population in the area under consideration;
- The curriculum;
- The educational organization of the school;
- The occupancy rate of the premises. (Ministry of National Education, 1982).

3.2properties :

Table I.1properties of programme spaces,Source: officiel journal of the Algerian Republic, Legislation on Establishing Standards for School Buildings, No. 33, 2025

Number of students	360
Number of educational groups	12
Size of the educational group	30

3.3Space blog :

Table I.2 space blog source: officiel journal of the Algerian Republic, Legislation on Establishing Standards for School Buildings, No. 33, 2025

Shops			Number	Units area	Total area
A.	**Pedagogical Wing:**				
	Classrooms		12	62	744
	IT Room		1	70	70
	Reading Room		1	70	70
	Multi-Activity Room		1	70	70
	Student Restroom		2	22	44
	TOTAL				**998**
	Movement area		20 %		200
	TOTAL 1				**1198**
B.	**Administrative Wing:**				
	Principal's Office		1	16	16
	Assistant Principal's Office		1	16	16
	Secretariat		1	9	9
	Teachers' Lounge		1	50	50
	Guard Room		1	6	6
	Waiting Room		1	16	16
	Archives Hall		1	20	20
	Warehouse/Storage		1	16	16
	Restrooms for professors and administrative staff		1	9	9
	Total				**158**
	Movement area		10%		16
	Total 2				**174**
C.	**Dormitories:**				
	4-room dormitory		1	85	85
	3-room dormitory		2	70	140
	Total 3				**225**
D.	**Attached Shops:**				
	Boiler Room		1	16	16
	Workshop and Store for the Professional Worker		1	16	16
	Renewable Energy Equipment Shelter		1	10	10
	Water Tank		1	2	2
	Total 4				**44**
Total Built-Up Area of the School (Ground 1 + Ground 2 + Ground 3 + Ground (4))					**1640**
E.	**Restaurant**				
	Restaurant	kitchen	Dining Hall	1	180	180
			Entrance with Annex Facilities	1	29	29
			Store	1	42	42
			Preparation	1	42	42
			Washing Sink	1	10	10
	Total					**123**

	Movement sarea	10%		12
	Total 5			**315**
Total built-up area of the school including the restaurant (tot 1+tot2tot3+tot4+tot5)				**1956**

Shops		**Number**	**Units area**	**Total area**
F.	**the external area, including the movement corridor (width: 2 m)**			
	Rest area (3 m2 per student)	1	1080	1080
	Space for physical education and sports (18 m x 16 m)	1	288	288
	Green area and gardening area (20) m2 per section	1	240	240
	Total 6			1608
Total floor area : (tot1+tot2+tot3+tot4+tot5+tot6)				3546
Future expansion area				**436**
Total floor area				4000

4. The project

4.1Definition of the project

Definition 01: The Project Management Institute defines a project as: "A program or organization that produces and delivers a new product or service or provides a unique result." (Institute, guide to the project management body of knowledge (PMBOK® guide) (6th ed.), 2017)

Definition 02:"A set of interrelated, non-routine activities, with a definite beginning and end, that seek to achieve specific performance and objectives by an individual or organization within the framework of cost, time, and quality criteria."

Definition 03:"A project is a temporary endeavor that has a definite beginning, a tangible end, and an overview of what happens in between, and cannot continue forever." (institute, 2021)

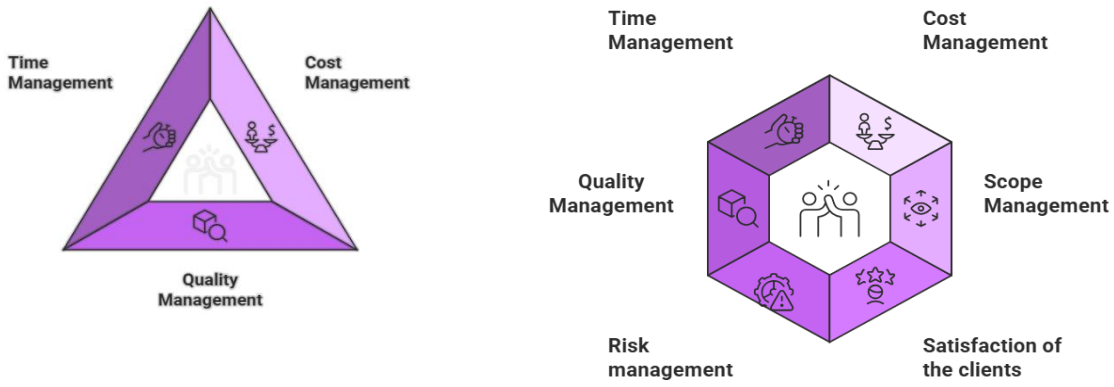


Figure I.9 project managements contraints ,source: the author 2024

Table I.3 definition of project constrainte ;Source: (project management: course textbook, 2019)adapted by the author 2024

Scope	Represents the objectives and requirements that must be accomplished in the project
Time	The timetable required to complete the project.
Cost	The budget required to cover all required activities
Quality	The extent to which the project outputs meet the requirements and expectations of stakeholders
Risk	Uncertain events or conditions that may negatively or positively affect the project objectives.

Synthesis:

A project is an effort undertaken to create a unique service, product or result. It can also be said that the project is a basic tool for achieving the organization's strategic plan, such as: customer demands, technological progress, government demand and market demands. There is a difference between projects and operations, as operations continue and are repeated; while projects are individual and repeated. Projects are also governed by three constraints: scope, cost and time. However, some project management specialists find that there are six constraints, not three: scope (project scope), cost, quality, customer satisfaction, degree of risk and time. No matter how different opinions are about the number of constraints, these opinions reflect the extent of interest in project management to overcome these constraints. (management of projects 2013-2012 , إدارة المشروعات)

4.2 Project characteristics:

- Purpose: The project is done once to achieve specific final results, as the project is complex, which requires dividing it into partial tasks and a series of sub-activities.
- Life cycle: The project starts slowly at first, then the activities accelerate until they reach their peak, then they decrease until they end when the project is completed.
- Individuality: Construction projects are characterized by their unique specificity that distinguishes them from other projects. Projects may be similar in terms of basic elements, but they differ in terms of the degree of risk and management style.
- Conflict: The project manager faces a set of situations characterized by a type of organizational conflict. Among these conflicts is the project's competition with other functional departments in the organization for available human and material resources. On the one hand, the conflict arises as a result of the multiple relationships between project management and the various stakeholders in the project.
- Interferences (complexity): Companies that carry out several projects in several countries face several interferences between the functional departments of the organization (supply, manufacturing, etc.) and the project manager must have a clear picture of these interferences at each stage of the project's implementation. (1997 ,سلمان)

4.3Project type

- Investment projects
- Research and development projects
- Organizational projects (project management: course textbook, 2019)

5. Project life cycle

5.1Definition of project life cycle

The project life cycle represents a set of stages that a project goes through from its inception until its completion. These stages may be sequential, where a new stage does not begin until the previous stage is completed, as is the case in construction projects that begin with a feasibility study, then move to design, and finally to the construction stage. In some cases, the stages may be repetitive, where several attempts or models are implemented before reaching the optimal solution. The stages may also be overlapping, where some stages occur in parallel, such as implementing the design of the project parts in conjunction with the selection and approval of materials. (برهان)

5.2Type of project life cycle:

- Predictive (or waterfall) life cycle
- Iterative life cycle
- Incremental life cycle
- Agile (or adaptive) life cycle
- Hybrid life cycle

5.3phases of project life cycle

Many researchers agree that the project goes through five basic stages, which are: the initiation stage, the planning stage, the implementation stage, the follow-up and control stage, and finally the closing and completion stage of the project. This sequence is clear from the following figure

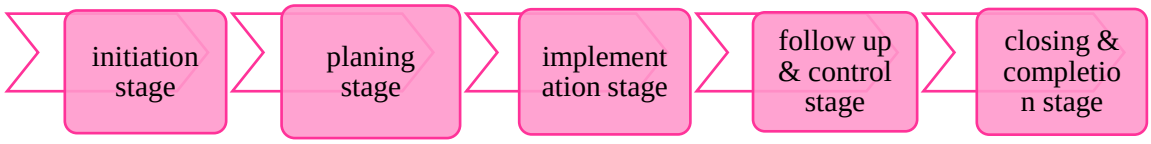


Figure I.10 project life cycle,Source: the author 2024

5.3.1Initiation Phase: In this phase, the client or funder identifies the needs, explains all requirements and specifications, and the project team is formed with an overview of the project. This phase is considered the conceptual phase, i.e., the basic construction phase of the project. This typically includes feasibility studies, project descriptions, and requirements specifications. In this phase, the team must perform and prepare for the following important activities:

- Interviews and meetings with clients, funders, or stakeholders to determine needs and objectives.
- Research and planning gather all the information necessary for all phases of the project.
- Preparing all relevant documents such as feasibility documents, project concepts and project plans (engineering plans, bills of quantities, technical specifications).
- Collecting and studying all the standards, regulations and rules required to complete the project.

The project may be exposed to some problems at this stage,The Role of the Project Life Cycle in Project Management. www.maxwideman.com. 2004.

- Delaying the start of the project.
- Lack of commitments from financiers or stakeholders.
- Not forming an ideal team with the right people.
- Different points of view between the manager, stakeholders, financiers or the client, which may lead to the destruction of the project before it starts if they are not resolved.
- Not setting final goals for the project, which is an important step.
- Lack of communication between stakeholders. (R, 2004)

5.3.2Planning stage: This is achieving the goals and planning the course of work and its scope to obtain outputs represented by the project management plan, its scope, activities and their schedule, human resources plan, communications and risks.
If the project is well planned from the beginning, this will help avoid many Problems and confusion later, and this stage includes the following:

- Review and create work requirements.
- Review project details, including costs, schedules, start and end dates for each activity.
- Plan and provide the required resources.
- Identify and divide the required work using the work breakdown structure. The latter helps organize the project scope, allocate resources, assign responsibilities, control and monitor the project.
- the work breakdown structure is used in planning because it helps the project manager monitor achievements, risks, costs and time to ensure that the project is on track. (Sons, 2003)

5.3.3Implementation stage: It is the integration between the engineering work parties (owner-contractor-consultant) and resources to implement the project plan while ensuring quality and the appropriate work team to implement the project and distribute information. At this stage. (Institute, guide to the project management body of knowledge (PMBOK® guide) (6th ed.), 2017)

5.3.4Follow-up and monitoring stage: This includes tracking the progress of work and comparing actual performance with the plan, while taking corrective measures when necessary.

5.3.5Closing Phase: The closing phase is the final phase of the project life cycle. In this phase, the project is completed and closed, and this process requires several procedures:

- Processing the project and handing it over to the client.
- Collecting all the documents and information that the client needs.
- Describing the individuals and equipment used in the project and submitting a complete report.
- Identifying all the activities and tasks that have stopped and are ongoing, and the duration required for each task.
- Terminating all contracts with suppliers and determining whether the project is within its scope and budget and has achieved its goal and objectives.
- Identifying the lessons learned from the project by documenting everything to benefit from the levels of success and failure in completing another project in the future.

Synthesis:

The project life cycle defines the phases that connect the beginning of a project to its end.

In construction project a project proposal could start with design development (DD) or a contractor request for proposal/quotation (RFP/RFQ), depending on the time of initiation of the proposed project.

6. Project actors

6.1Stakeholders and their role in construction projects:

Stakeholders in construction projects are all parties that have a direct or indirect relationship with the project, at all stages. They are all individuals, groups, and organizations that can affect the project or be affected by its results. Stakeholder management is an important aspect that contributes to the

success of the project, as it requires continuous communication with these parties to meet their needs and expectations. (institute, 2021)

In construction projects, stakeholders can be divided into several main categories based on their role and influence in the project. They include:

Table I.4 stakeholders and their roles,source: PMBOK 7th edition

stakeholders	Their role
Project Owner	The person or entity that owns and finances the project. He is responsible for defining the project objectives and requirements.
Project Manager	Responsible for the day-to-day management and implementation of the project. Acts as a link between all parties involved. Develops project plans, monitors performance, coordinates between different teams, and ensures adherence to budget and schedule.
Contractor	They are responsible for implementing the actual construction work on the project according to the designs and specifications.
Designers	Include architects, civil engineers, and electrical engineers who design the project. Their responsibilities include developing engineering designs, determining technical specifications, and providing design solutions.
Suppliers	Entities that provide the project with the materials and equipment needed for construction.
Regulators	Governmental bodies that set the laws and standards that the project must adhere to.
Workers	Workers who carry out the daily construction work on site according to the specified specifications and standards.
Consultants	Experts who provide advice in specific areas such as the environment, law, or project management.
End users	Persons or entities who will use the facility after the project is completed according to the intended purpose.

6.2Types of Stakeholders

- **Internal Stakeholders:** Internal stakeholders are individuals or groups within the organization who are directly influenced by the project's outcomes. They are associated with the organization that is managing the project and can include employees, owners, board members, project managers, investors, and others.
- **External Stakeholders** :External stakeholders are individuals or groups outside the organization who are indirectly affected by its projects. While they are influenced by the organization's activities, they do not work for it. This category includes suppliers, customers, creditors, clients, intermediaries, competitors, society at large, government entities, and more

Figure I.12 Stakeholder Classification in Project Management ,source: helpfulprofesson.com website

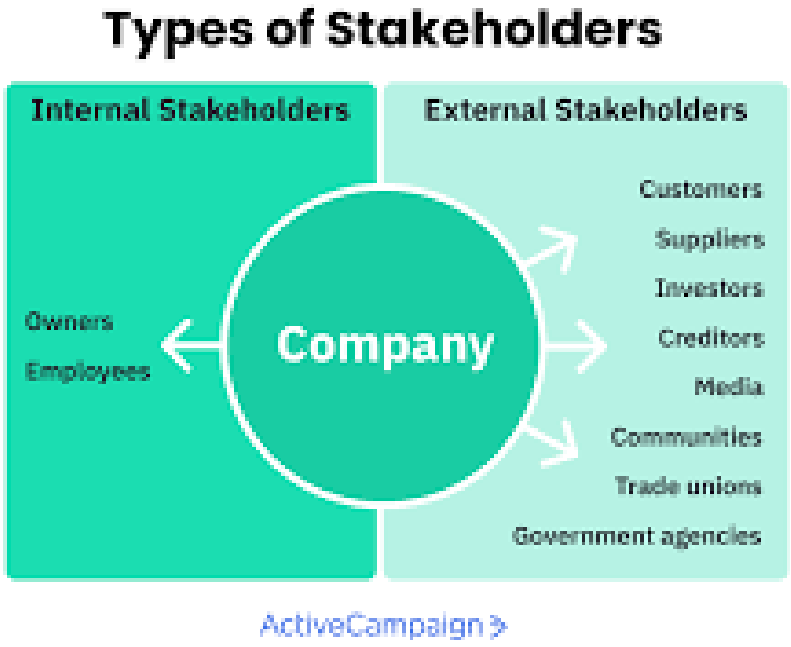


Figure I.11 Classification of Internal and External Stakeholders in a Company ,source: Meduim website

6.3Construction project stakeholders:

There are several stakeholders involved in the execution of construction projects .However, they can be briefed in five:

- The project owner: This is the main person behind the project and is responsible for the deliverable and making sure it meets their expectations and requirements. Usually called the client or customer
- The project coordinator.: The project manager is responsible for implementing the project.

- Contractors is responsible for the implementation of projects on the realities
- The technical controller It is the authority responsible for monitoring the implementation of the project and conducting the necessary tests to ensure that all completed elements comply with building regulations and codes.
- The project manager: The construction project manager bears overall responsibility for the project, from its identification and feasibility in line with the company's strategy to its final acceptance, is responsible for the planning and management of individuals and groups. He informs himself and supervises all the details concerning the project The manager plans; Plans; Organizes; order; coordinates and controls the entire implementation of the project until its completion.

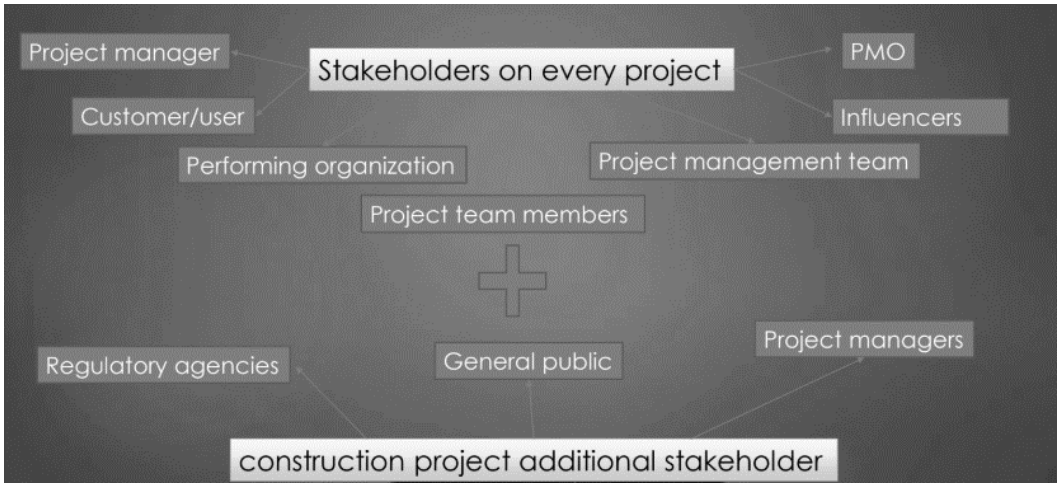


Figure I.13 stakeholders on every project,source: management course

7.project management

7.1Definition of project management:

Definition: 01: "Project management is the management that includes setting goals, planning, scheduling, estimated budgets, organization, guidance and control necessary to achieve the technical and time objectives of the project". (2014 ,الغريري)

Definition: 02: "It is a science that includes a set of functions performed by the responsible manager or decision-maker in the project, which are planning, organization or scheduling, manager development, guidance and then performance control, material and time spending within the project activities, as it ultimately aims to achieve the objectives for which the project was approved as an administrative and organizational entity". (Yves M. Cheniot, 1990)

Definition 03: It is the administrative function that includes the responsibility for setting goals, organization, planning, scheduling, estimated budgets, guidance and control necessary to achieve the technical and time objectives of the large and complex project ". (2000 ,ماضي)

- According to the ISO 9000 standard: A project is a unique process consisting of a set of coordinated and controlled activities, which include start and end dates, and are implemented with the aim of achieving a goal in line with specific requirements, including time, cost and resource constraints. (International Organization for Standardization, 2000)

According to the International Project Management Association (IPMA): A project is a set of actions that must be carried out to achieve a specific goal, within the framework of a specific task, and not only the beginning of the project, but also its end has been determined. (International Project Management Association (IPMA), 2015)

Synthesis:

Through the previous definitions, project management is a set of principles, methods, skills, tools and techniques for effective management to accomplish a work with specific objectives. As for project management, it is defined as "a set of processes, rules and resources necessary to ensure the processing of management data, the translation and interpretation of this data, the formulation of decisions, and finally the actual implementation of these decisions. Project management also works to address the following points:

- Evaluation and estimation of project costs.
- Cost control.
- Planning and control of deadlines.
- Quality control.
- Resource management at the level of the process of various activities. (Marchat, 2001)

7.2Definition of construction project management:

Definition 01: Construction project management is an integrated process that includes the systematic application of knowledge, skills, tools, and techniques to all project activities to ensure that its objectives are achieved effectively, so that construction project management is not limited to implementing construction tasks only, but rather includes all aspects related to the project from its early stages until its successful completion.

Definition 02:"It is a set of methods and concepts related to planning resources and functions in all stages of the project life cycle according to the following determinants: cost, time, quality, in order to achieve the project's objectives and requirements." (برهان)

Definition 03: Ghaleb Al-Abbasi and Muhammad Nour Burhan, two authors specializing in project management, defined it as “the administrative function that includes the responsibility for setting goals, organizing, planning, scheduling, budget estimates, implementation mechanisms, and control, to achieve the technical, time, and financial standards of the project.” “It is a set of methods used to manage a team of individuals and to accomplish a series of tasks within a specific time schedule and budget.”

Definition 04: As defined in the PMBOK® Guide, “Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. Project management is accomplished through the application and integration of the project management processes of initiating, planning, executing, monitoring and controlling, and closing. The project manager is the person responsible for accomplishing the project objectives. (Institute, guide to the project management body of knowledge (PMBOK® guide) (6th ed.), 2017)

Managing a project includes:

- Identifying requirements
- Establishing clear and achievable objectives
- Balancing the competing demands for quality, scope, time and cost

- Adapting the specifications, plans, and approach to the different concerns and expectations of the various stakeholders. (Institute, guide to the project management body of knowledge (PMBOK® guide) (6th ed.), 2017)

7.3Elements of construction project management:

Table I.5 elements of construction project management,source:PMBOK 6th edition

planning	Organizing	Supervision and Monitoring	Adaptation and Change Management
• Defining project objectives • Developing implementation strategies • Creating detailed plans including timeline, cost, and resource allocation	• Organizing work teams • Defining tasks and responsibilities • Coordinating between all relevant project parties (engineers, workers, suppliers, etc	• Monitoring workflow to ensure commitment to schedule, budget, and required quality • Evaluating actual performance compared to the plan • Immediate intervention when problems arise	• Ability to adapt to changes such as climate conditions, resource shortages, or changes in client requirements • Managing their impact on the project is one of the key functions of project management

7.4Construction Project Management Objectives:

The objective is to ensure that the project is implemented efficiently and with high quality, on time, and within the approved budget. The objectives of construction project management can be summarized as follows:

- Adherence to the specified scope: Ensuring that all agreed-upon work is completed according to project requirements without any shortages or overruns.
- Cost Control: Managing financial resources wisely to ensure that the specified budget is not exceeded.
- Adherence to the schedule: Implementing the project on time and avoiding delays that could result in additional costs or impact on reputation.
- Quality Assurance: Adherence to engineering and technical standards to achieve the required quality of implementation.
- Risk Management: Analyzing potential risks and developing effective response plans to mitigate their negative impact**.**

7.5Project Management Knowledge Areas

These areas work together to ensure successful project execution. each representing a key aspect of managing a project and crucial for achieving project objectives while balancing constraints like scope, time, cost, and quality. (institute, 2021)

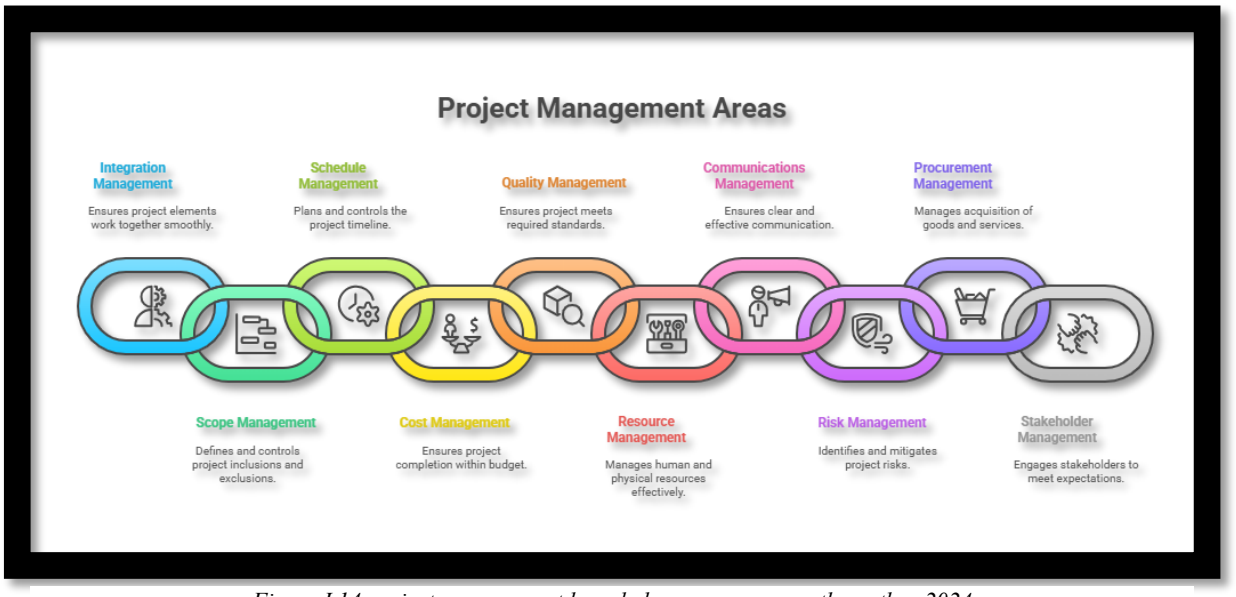


Figure I.14 project management knowledge areas ,source: the author 2024

- Integration Management: Ensures different project elements work together smoothly, including developing the project charter, creating a project management plan, and managing changes.
- Scope Management: Defines and controls what is included (and excluded) in the project. It involves collecting requirements, defining scope, creating the Work Breakdown Structure (WBS), and controlling scope changes.
- Schedule Management: Focuses on planning, developing, and controlling the project timeline. It includes defining activities, sequencing them, estimating durations, and monitoring the schedule.
- Cost Management: Ensures the project is completed within the approved budget. It involves estimating costs, determining the budget, and controlling expenses.
- Quality Management: Ensures the project meets required standards by planning, managing, and controlling quality processes.
- Resource Management: Focuses on acquiring, managing, and optimizing human and physical resources for project success.
- Communications Management: Ensures clear and effective project communication, including planning, managing, and monitoring communication among stakeholders.
- Risk Management: Identifies, analyzes, and responds to project risks to minimize threats and maximize opportunities.
- Procurement Management: Handles acquiring goods and services from external vendors, including contract management and supplier relationships.
- Stakeholder Management: Identifies and engages stakeholders throughout the project to meet their expectations and ensure project success. (institute, 2021)

8. Schedule & Cost & Quality Management

8.1 Time, Schedule, and Deadline Management :

In construction project management, the timely delivery of a project is as critical as its cost and quality. This title explores the relationship between time management, schedule management, and how both influence the project's ability to meet its final deadline, with specific reference to the context of school equipment realization projects.(htt3)

8.1.1Time and Duration in Project Management

- time definition : the indefinite continued progress of existence and events in the past, present, and future regarded as a whole.
- time definition: a point of time as measured in hours and minutes past midnight or noon. (Dictionnaire oxford)

-Duration definition : It is the period of time during which a set of activities or tasks are carried out until the desir ed goal is completed. In project management, duration is used to determine the time that should be allocated to each part of the project from start to finish. Duration management is an essential part of project time planning, as start and end dates are determined for each activity according to the available resources. (Project Management: A Systems Approach to Planning, Scheduling, and Controlling , 2017)

8.1.2 Time management

Time management is the process of planning and exercising conscious control over the amount of time spent on specific activities to increase effectiveness, productivity, and efficiency. In the context of projects, it goes beyond merely adhering to timelines it is a dynamic process that requires continuous monitoring and re-evaluation to ensure that goals are achieved efficiently.
By using appropriate techniques and tools, time management helps in reducing delays, improving team performance, and ensuring that all project tasks are completed within the agreed timeframe.

8.1.3 Schedule Management:

Schedule management is a core component of time management. It translates the project's general time planning into a detailed operational roadmap that governs the execution of activities.

Definition of schedule:

- "the real converter of the project's work plan, i.e., placing it within a time list, through which the project is moved as a whole and is thus used as a basic rule in organizing and monitoring project activities" (بلوط, 2002)
- "the process of converting the project plan into operational schedules". (العلي, عمان)

Synthesis:

Through the previous definitions, scheduling is considered one of the most motivating tools for managing all project activities, in terms of priority and sequence of activities or in terms of their timing, and therefore it is one of the axioms of project management work and success.

8.1.4 The importance of scheduling

Scheduling has important roles in the life of projects, including the following:

- Controlling the project activity after determining the necessary stages for its implementation: The first role of scheduling lies in being a main tool for project management by controlling and organizing the various project activities, according to the methods of their occurrence and according to a logical and temporal sequence after determining and agreeing on the main project stages.
- Monitoring and controlling project resources during its implementation period: The second role of scheduling lies in being a monitoring tool for the progress of the project within the plan set

for it, as it helps to know the distribution of resources decided by the project management on its various activities and parts.

- Collecting important information about the project that benefits the institution's current and future projects: As for the last role of scheduling, it is storing important information related to the project implementation processes. (بلوط, 2002)

8.1.5 Scheduling Objectives

The main objectives of scheduling in construction projects revolve around achieving time efficiency, resource optimization, and risk reduction. These objectives guide the planning and implementation of project activities and are summarized as follows:

- Establishing a Logical Sequence of Activities: Scheduling aims to define a coherent order for executing tasks based on their interdependencies, ensuring workflow continuity and minimizing the risk of task overlap or delays.
- Estimating Activity Duration: One of the core objectives is to determine the expected time frame for each task. This enables the creation of a realistic and executable schedule that reflects project constraints and resource availability.
- Identifying the Critical Path: Scheduling seeks to highlight the sequence of tasks that directly affect the overall project duration. Recognizing this path helps in prioritizing critical activities and avoiding overall project delays.
- Optimizing Resource Utilization: Proper scheduling contributes to efficient allocation of available human and material resources, preventing overuse, conflicts, and unnecessary downtime.
- Monitoring Progress Against Plan: A well-designed schedule allows for systematic tracking of actual progress compared to the initial plan. This supports early identification of delays or deviations.
- Predicting and Preventing Potential Problems: Scheduling facilitates early detection of bottlenecks or risks, enabling the development of proactive mitigation strategies. (Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide)", 6th Edition. , 2017)

8.1.6 Role of Scheduling Management:

While the objectives of scheduling set the intended outcomes, the role of scheduling management focuses on the practical implementation of these objectives. It involves applying scheduling tools and processes to guide the project's execution. The key roles include:

- Task Organization and Sequencing: Scheduling serves as a method for arranging tasks in a clear and logical sequence, ensuring that each activity is performed in the appropriate order and time frame.
- Accurate Time Estimation: Through the use of available data and resource analysis, scheduling helps calculate the required time for each task, accounting for real-world conditions.
- Critical Path Monitoring: Scheduling management includes the constant observation of critical activities to ensure they do not cause delays in the overall project.
- Resource Management: One of its fundamental roles is to manage the distribution and timing of labor, equipment, and materials to maximize efficiency.
- Progress Tracking: It enables the project manager to follow up on activity completion, detect delays, and implement corrective measures as necessary.

- Team Coordination: Scheduling fosters collaboration between different departments and project teams, reducing the likelihood of conflicts or duplicated efforts.
- Change Management: As the project evolves, scheduling plays a key role in adjusting time plans in response to unforeseen events or scope changes.
- Risk Reduction: By anticipating potential challenges, scheduling allows teams to prepare alternative scenarios and minimize the impact of disruptions.
- Informed Decision-Making: Updated schedule data equips project managers with the insights needed to make timely and strategic decisions.

8.1.7 schedule Management Processes

this following six processes under Project Schedule Management:

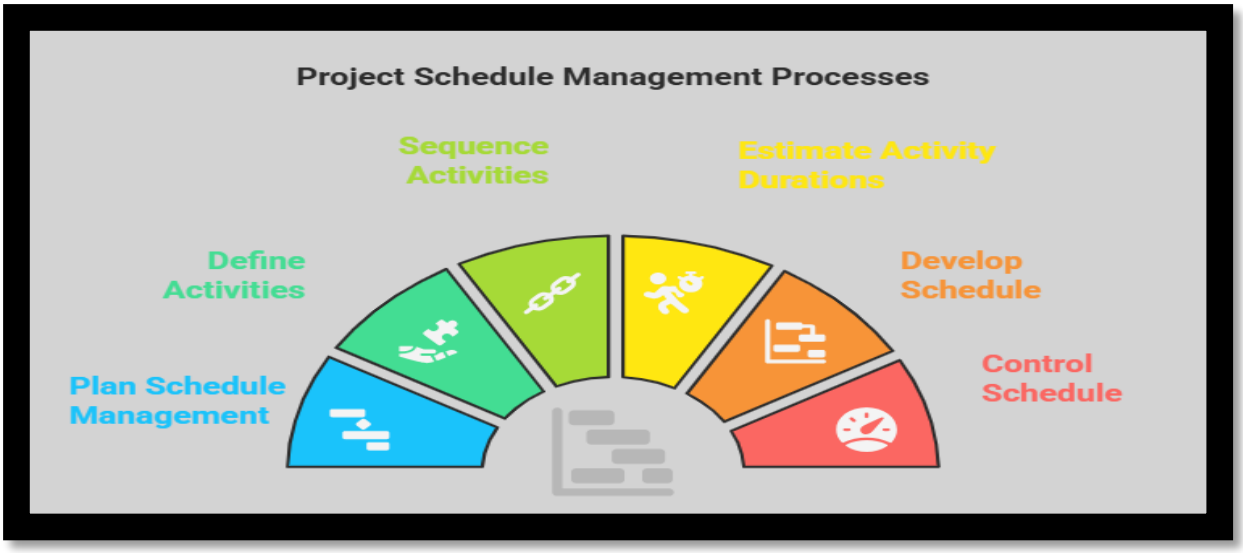


Figure I.15schedule management process,source: the author 2024

Table I.6 schedule management process,source: PMBOK 7th edition

Process	Objective	Inputs	Tools	Outputs
1. Plan Schedule Management	Define the policies, procedures, and documentation for planning, developing, managing, and controlling the project schedule.	Project charter, project management plan, enterprise environmental factors, organizational process assets	Expert judgment, analytical techniques, meetings	Schedule management plan (defines how the schedule will be developed, managed, and controlled)
2. Define Activities	Identify the specific actions needed to produce the project deliverables.	Schedule management plan, scope management plan, Work	Decomposition, rolling wave planning, meetings	Activity list, activity attributes, milestone list

		Breakdown Structure (WBS)		
3. Sequence Activities	Identify and document relationships among project activities.	Activity list, activity attributes, milestone list, EEFs, OPAs	Precedence diagramming method, dependency determination, sequencing tools	Project schedule network diagram, project documents updates
4. Estimate Activity Durations	Estimate the number of work periods needed to complete each activity.	Activity list, activity attributes, resource calendars, project scope statement	Expert judgment, analogical and parametric estimating, reserve analysis	Activity duration estimates, project documents updates
5. Develop Schedule	Analyze activity sequences, durations, resource requirements, and constraints to create the project schedule.	Schedule management plan, activity list, activity sequence, duration estimates, resources	Critical path method, scheduling tools (e.g., MS Project, Primavera), resource leveling	Project schedule, schedule baseline, schedule data
6. Control Schedule	Monitor the status of project activities and manage changes to the schedule baseline.	Schedule baseline, project schedule, performance data	Performance reviews, variance analysis, schedule compression, project management software	Schedule updates, performance reports, change requests, updates to the project management plan

8.1.8 Definition and Importance of Deadline

The project deadline refers to the final date by which a project or specific milestone must be completed. Unlike the project schedule, which can be adjusted and optimized, the deadline is typically contractual and non-negotiable. It is considered a critical indicator of project success, especially in construction projects related to public or institutional services—such as school equipment—where delays can disrupt educational planning and resource allocation.

8.1.9The Relationship and Difference Between Schedule Management and Time Management in Project Management

In project management, Time Management serves as the overarching framework that governs how time is planned, allocated, and controlled across all project activities. Within this framework, Schedule Management plays a central operational role by translating the project scope into a detailed timeline, organizing tasks into a logical sequence, estimating their duration, and monitoring their

progress through tools such as Gantt charts and the Critical Path Method. Deadline Management, on the other hand, focuses on the specific time constraints assigned to key deliverables or milestones within the schedule. It ensures accountability and timely execution by establishing fixed due dates that must be respected to avoid cascading delays. The interrelationship among these three elements is hierarchical: time management provides the strategic direction, schedule management structures the workflow, and deadline management enforces timely adherence. Together, they form an integrated approach that supports the timely delivery of a project while maintaining efficiency, resource balance, and quality standards.

Table I.7 difference between schedule management and time management ,source: scheduleit.com

Component	Function	Relation
Time Management	**Provides the overall strategy and monitoring framework.**	**Encompasses both scheduling and deadline adherence.**
Schedule Management	**Translates strategy into actionable plans and tracks progress.**	**Organizes tasks to respect deadlines.**
Deadline	**Sets non-negotiable time constraints.**	**Serves as the fixed goal around which scheduling is structured.**

8.1.10 The Impact of Scheduling on Meeting the Deadline

The relationship between scheduling and the project deadline is direct and influential. The schedule serves as the operational roadmap that leads to the achievement of the deadline. If scheduling is inaccurate, unrealistic, or poorly managed, it increases the likelihood of delays, which can result in missing the final deadline. On the other hand, a well-developed and adaptive schedule allows for proper resource coordination, early detection of risks, and proactive mitigation, all of which contribute to meeting the deadline effectively. Therefore, the success of a project in meeting its deadline is highly dependent on the quality and management of its schedule.

Synthises:

Time management in construction projects is not only concerned with scheduling activities but also with meeting predefined deadlines. The deadline represents a fixed target that the entire schedule is built around. A delay in critical activities often leads to missing the deadline, resulting in cost overruns and client dissatisfaction. Therefore, integrating deadline control into the time management strategy is essential for successful project delivery.

8.2 Cost

8.2.1Definition of Cost:

It is the total cost of the budget allocated to plan and implement the project, to achieve its effective objectives. It includes the cost of everything spent directly or indirectly on the project, and it is a basic factor in evaluating the success of the project, as it must be controlled at all times within the specified budget.

8.2.2Types of project costs:

Project estimates can be divided into groups of different costs, the most important of which are the following:

- Direct costs: These are costs that can be easily identified and spent directly on the activity or project, such as the cost of direct materials.
- Indirect costs: also called administrative expenses, are those costs that cannot be directly calculated and recorded on the work or activity directly, but are linked to
- Fixed costs: These do not change with changes in business volume, such as rent.
- Variable costs: These include material costs, which increase with increased production.
- Capital costs: Expenses used to purchase fixed assets.
- Operating costs: Day-to-day expenses required to maintain the business.
- Time-related costs: These costs include the following:
- Increasing delay costs over time; Operating costs such as the costs of service networks such as water, electricity and gas that increase over time;
- Labor costs: These are the costs of individuals working in the project, which is a direct cost. These costs include the four main groups, as follows:
  - Salaries and wages for project workers
  - Costs related to workers
  - Contributions to administrative expenses
  - Contributions to the organization's profits.
- Supply costs: This is the expected cost of supplies purchased from outside the organization and includes the materials and parts needed for the project as well as the services necessary for it. The simplified method is used to calculate this cost, as it depends on adding a percentage to its purchase prices so that it covers the cost of all supplies. These percentages usually range between (20-30%). (العلي, عمان)

8.2.3Cost components:

The total cost of the project consists of several costs, which are: (T, 1989)

- Material cost.
- Labor cost.
- Equipment cost.
- Indirect costs: such as management and supervision costs.
- Financing cost.
- Wasted cost.
- Emergency costs.
- Quality costs.
- Consumption costs.

8.2.4Stages of Cost Management

Cost management is divided into three main stages:

- Cost Estimation: The process of developing approximate estimates of the costs of resources required for project activities. This includes the costs of materials, labor, equipment, and overhead.
- Cost Budgeting: In this process, estimated costs are compiled and allocated to project activities, and a financial plan is developed to ensure the necessary funding is available on time.
- Cost Control: Monitoring actual project cost performance, comparing it to the budget, and taking corrective action if the financial path deviates.

8.2.5Factors Affecting Cost

- **Project Design Factors**
  - Design complexity increases the need for advanced technologies and materials.

- Changes during implementation lead to increased costs.
- Using high-quality materials increases costs.

❖ **Economic Factors**
- Variations in raw material prices (cement, steel).
- Inflation leads to higher labor and material costs.
- Exchange rate fluctuations affect import costs.

❖ **Administrative and Organizational Factors**
- Project Management: Poor management leads to delays and increased costs.
- Stakeholder Coordination: Lack of cooperation leads to conflicts and additional costs.
- Technical Expertise: Inexperienced workers may increase the rate of errors.

❖ **Environmental Factors**
- Weather Conditions: Severe weather may delay implementation and increase costs.
- Environmental Restrictions: The need to comply with environmental laws and safety procedures.
- Soil Type: Unstable soil may require additional foundation improvements.

❖ **Social Factors**
- Labor Wages: A shortage of skilled labor may increase costs.
- Worker Strikes: Work stoppages resulting from labor disputes.
- Customer Expectations: Clients with high demands may increase project costs.

❖ **Time Factors**
- Project Duration: Delays in the schedule lead to increased operational costs.
- Expedited Delivery: Some clients request shorter project durations, which increases costs.

8.2.6Factors Affecting Costs

- Scope Creep: Leads to unexpected cost increases.
- Market Prices: Volatile raw material prices can increase or decrease costs.
- Project Delays: Cause additional expenses such as extended labor wages or rent.
- Estimation or Design Errors: Leads to rework and additional costs.

8.2.7Cost Management Processes

Project Cost Management into four key processes!

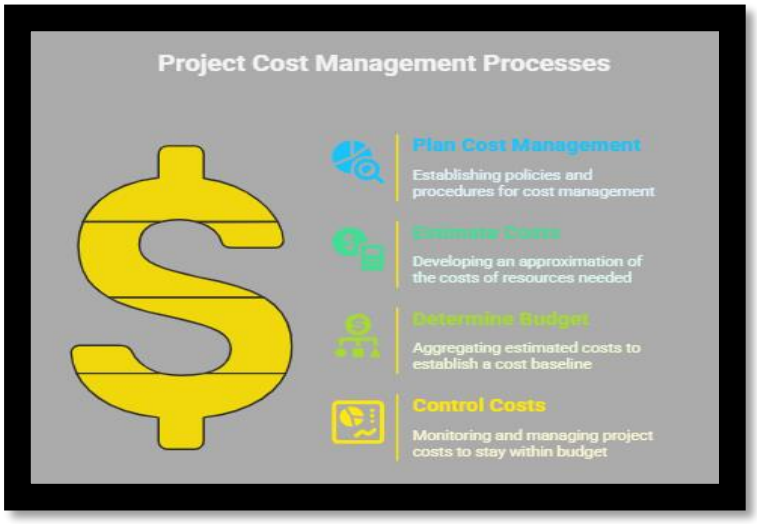


Figure I.16 cost management process ,source:The author 2024

Table I.8 cost management process,source:PMBOK 7th edition

Process	Objective	Inputs	Tools	Outputs
Plan Cost Management	Establish policies, procedures, and documentation for planning, managing, and controlling project costs.	Project management plan, project charter, enterprise environmental factors.	- Define policies and procedures.- Use technical tools such as cost management software.	Cost management plan that defines how costs will be estimated, budgeted, and controlled.
Estimate Costs	Determine the estimated costs for all resources required to complete the project, including labor, materials, equipment, and other expenses.	Cost management plan, project scope, work breakdown structure (WBS).	Alternatives analysis, historical data, rough or detailed estimation.	Updated cost estimates for activities and resources.
Determine Budget	Aggregate the estimated costs to establish the cost baseline.	Cost estimates, resource management plan, risk management plan.	Cost aggregation, reserve analysis.	Cost baseline and funding requirements.
Control Costs	Monitor project status and make necessary changes to ensure adherence to the approved budget.	Performance reports, cost baseline.	Earned value management (EVM), variance analysis.	Financial performance reports, updates to the project management plan.

8.2.8The Relationship Between Cost Management and Other Elements of Project Management

- With time management: Any delay leads to increased costs.
- With quality management: Poor quality may temporarily reduce costs but increase maintenance costs.
- With risk management: Unexpected costs can be reduced by anticipating and mitigating potential risks.

8.2.9The Importance of Cost Management in Construction Projects:

Cost management is one of the most important elements for the success of construction projects, as these projects are typically characterized by complexity, numerous variables, and multiple stakeholders. The importance of cost management lies in the following points:

- Adherence to Budget :Prevents cost overruns and helps implement the project within the specified budget.
- Achieving the best value for money: Enables the selection of high-quality solutions at a lower cost.
- Decision Support :Provides accurate information that helps make smart financial decisions during the project.
- Reducing Financial Risk :Helps in predicting and preparing for financial problems.
- Enhancing Investor Confidence :Good cost management demonstrates professionalism and increases stakeholder confidence.

- Increasing Competitiveness : Enables companies to submit appropriate bids without compromising quality.
- Achieving a balance between quality, time, and cost :Contributes to the success of the project in all aspects.

8.3 quality

8.3.1Definition of project quality:

Quality: is defined as "a set of characteristics and qualities that distinguish a product or service that led to meeting the needs of customers, whether in terms of product design, manufacturing, or its ability to perform in order to reach the satisfaction and happiness of these customers". (علوان, 2009)

Total quality management: is defined as "a modern administrative philosophy that takes the form of an approach or administrative system based on making radical positive changes to everything in the organization, in order to improve and develop all its components to reach the highest quality in its outputs, goods or services, at the lowest cost, with the aim of achieving the highest degree of satisfaction among its customers by satisfying their needs and desires according to what they expect". (العزاوي, 2005)

the project's quality management : is defined as "the necessary processes to verify that the project will meet the needs for which it was created, and it includes both project management and the project as the final product". (العلي, عمان)

8.3.2Quality Management Main Processes

Plan Quality Management:– Identifies quality requirements and standards for the project and its deliverables, and documents how to meet them.

Manage Quality:– Translates the quality management plan into executable quality activities to ensure processes are effective and quality standards are being followed (also called quality assurance).

Control Quality:– Monitors and records results of quality activities to assess performance and ensure deliverables meet requirements (quality control)

Figure I.17 quality managemenet process,source: quality management courses

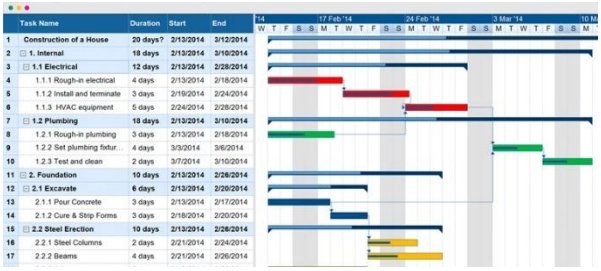
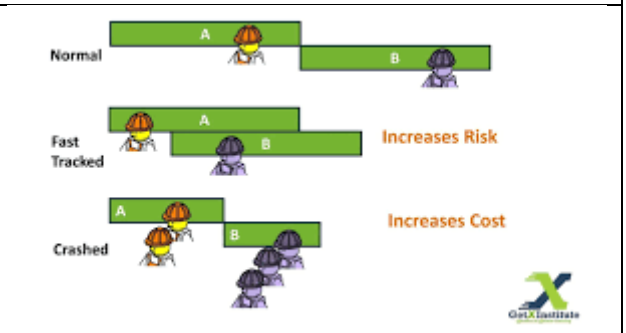
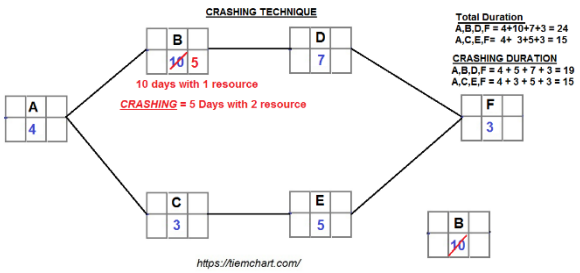
9.Tools and Techniques for Time Management

9.1schedule:

9.1.1Schedule management techniques: Schedule management techniques are strategies and methods used to plan, develop, monitor, and control a project's timeline to ensure tasks and

deliverables are completed on time. These techniques help project managers allocate resources efficiently, track progress, and meet deadlines. Here are some key schedule management techniques

Table I.9 schedule management techniques,source: (kamel, 2015) adapted by the author

Technique	Description	Contents	
Gantt Chart	A visual tool for planning and tracking project activities over time using horizontal bars.	- Represent activities on a timeline. - Show start and end dates. - Track actual progress vs. planned.	 *Figure I.18 Exemple of gantt chart ,source: all time designe website*
Fast Tracking	Shortening project duration by performing activities in parallel instead of sequentially.	- Identify activities that can be done in parallel. - Evaluate risks associated with overlapping tasks.	 *Figure I.19 Exemple of fast tracking ,source:monday.com website*
Crashing	Reducing project duration by adding more resources to critical activities to speed them up.	- Identify critical activities. - Analyze cost vs. time reduction. - Add resources to improve timeline.	 *Figure I.20 Exemple of crashing ,source:timechart.com website*

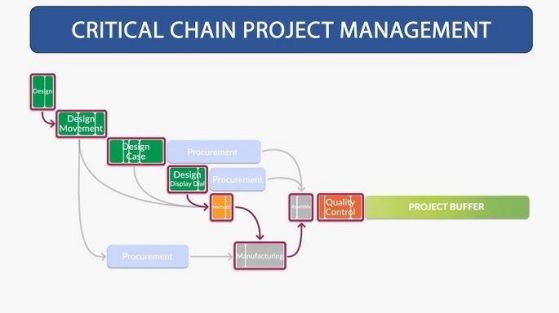
Critical Chain Project Management (CCPM)	Focuses on resource management and inserting buffers to reduce delays.	- Identify critical path based on resource availability. - Use time buffers. - Reduce schedule slippage.	

Figure I.21 Exemple of CCPM ,source:researche gate website

These techniques are often used in combination and supported by project management tools (like Microsoft Project, Primavera, or online tools like Asana and Trello) to ensure effective schedule management.

9.1.2Scheduele management tools: Schedule management tools are software applications or systems used to help plan, develop, monitor, and control project schedules. These tools assist project managers and teams in organizing tasks, allocating resources, tracking progress, and ensuring timely project completion. Here are some key schedule management tools:

Table I.10 schedule management tools,source: : (kamel, 2015) adapted by the author

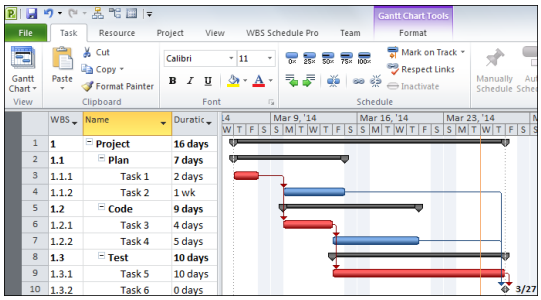
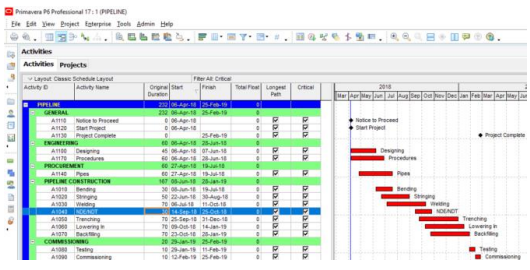
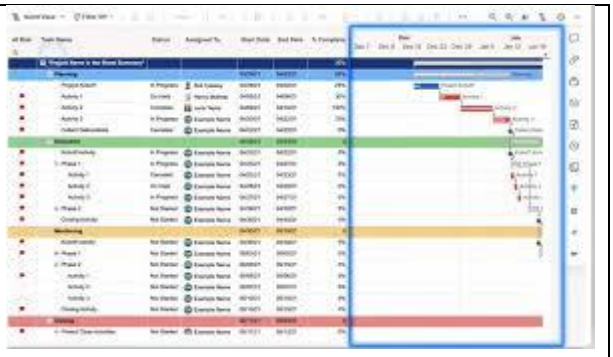
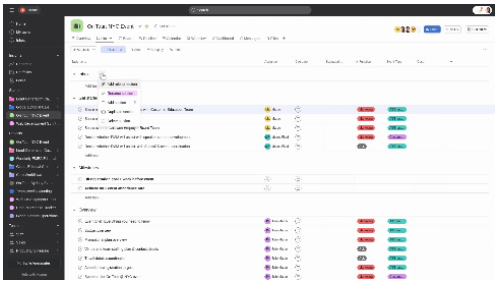
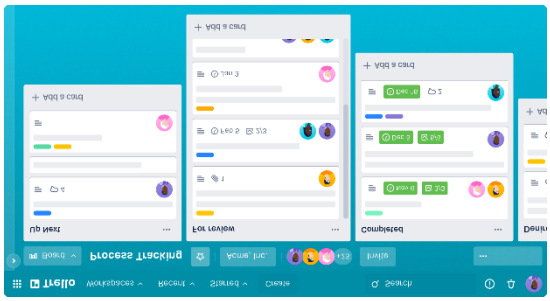
Tool Name	Description	Key Features	
Microsoft Project	A powerful tool from Microsoft for project planning, resource, and task management.	- Supports Gantt Chart, CPM, and PERT. - Detailed reporting. - Integrates with other Microsoft tools.	
Primavera P6	A professional tool used for large-scale projects (especially engineering and infrastructure).	- Manages large, complex projects. - Advanced resource and cost control. - Widely used in large companies.	

Figure I.22 Exemple of MS Project ,source: MS Project software

Figure I.23 Exemple of Primavera P6 ,source: Primavera P6 software

Smartsheet	A cloud-based platform for project management with a spreadsheet-like interface.	- Easy-to-use interface. - Team collaboration support. - Gantt chart and time tracking.	 *Figure I.24 Exemple of smartsheet ,source:software connecte website*
Asana	A flexible tool for managing tasks and projects, ideal for small to medium teams.	- Timeline view. - Task tracking and progress monitoring. - Integration with Slack, Google Drive, etc.	 *Figure I.25 Exemple of Asana ,source:Asana software*
Trello	A visual tool using a card-based (Kanban) system to manage projects.	- Simple and intuitive. - Great for light projects. - Supports plugins and integrations.	 *Figure I.26 Exemple of Trello ,source:Trello software*

9.2 Cost

9.2.1Cost management techniques: Cost management techniques refer to the strategies employed to plan, estimate, distribute, oversee, and track the financial resources of a project, ensuring it remains within the sanctioned budget. These techniques assist project managers in preventing budget overruns, enhancing financial effectiveness, and making well-informed choices throughout the project's duration.

Table I.11 cost management techniques,source: (kamel, 2015) adapted by the author

Technique	Description	Contents
Earned Value Management (EVM)	A technique that integrates time, cost, and performance to assess project progress and compare it to the plan.	- Calculate Planned Value (PV). - Calculate Earned Value (EV). - Calculate Actual Cost (AC). - Analyze schedule and cost variances.
Cost Estimating	The process of estimating the costs of resources required to complete activities.	- Use methods such as expert judgment, analogous estimating, and parametric estimating. - Estimate direct and indirect costs.
Value Analysis / Value Engineering	Analyzing project components to reduce costs without compromising quality or performance.	- Study alternatives. - Evaluate cost versus function. - Improve efficiency and cost-effectiveness.
Cost Control	Monitoring costs and comparing them to the financial plan, taking corrective actions when necessary.	- Prepare periodic financial reports. - Compare actual costs with budget. - Make adjustments when deviations occur.
Regression Analysis	A statistical technique for forecasting future costs based on historical data.	- Use relationships between variables (e.g., time and cost). - Predict future costs.
Reserve Analysis	Determining a financial reserve to address potential risks or unforeseen events.	- Calculate contingency reserves. - Allocate a percentage of the budget.

9.2.2Cost management tools：Cost management tools are software applications or systems used to plan, estimate, budget, monitor, and control the financial aspects of a project. These tools help ensure that project costs are properly tracked and managed to stay within the approved budget.

Table I.12 cost management tools,source: (kamel, 2015) adapted by the author

Tool Name	Description	Key Features
Microsoft Project	A comprehensive project management tool that includes cost planning and scheduling.	- Budget creation and cost tracking. - Cost analysis reports. - Integration with resource and schedule management.
Primavera P6	A professional tool for managing large and complex projects, with a focus on cost and resources.	- Detailed budget management. - Monitoring actual spending and costs. - Supports Earned Value Management (EVM).
Deltek Cobra	Specialized software for project cost management and earned value analysis.	- Advanced cost analysis tools. - Support for budget and risk management. - Detailed and accurate reporting.
Procore	A construction management platform that integrates cost planning with field operations.	- Real-time cost tracking. - Budget and invoice management. - Integration with accounting software.
SAP Project System (PS)	Part of the SAP system for project management with cost management and monitoring features.	- Real-time cost and budget monitoring. - Integrated financial reporting. - Integration with other financial modules.
Oracle Primavera Unifier	A tool for cost management and project control, especially in construction and engineering sectors.	- Cost planning and control. - Contract and invoice management. - Integration with other project management software.

10. Techniques and methods used to evaluate financial and time performance

10.1 Ms project:

10.1.1 Definition of MS Project :

Microsoft Project (commonly abbreviated as **MS Project**) is a powerful project management software developed by **Microsoft Corporation**. It is one of the most widely used tools in the field of project planning and control, especially in construction, engineering, IT, and industrial projects. Its primary purpose is to help project **managers plan, organize, monitor, and control** all aspects of a project's lifecycle.

10.1.2 Main Features and Capabilities

- Allows task definition, scheduling, and priority setting.
- Uses Gantt charts to visualize timelines and task dependencies.
- Supports resource allocation and cost estimation.
- Provides progress tracking and performance reporting tools.

10.1.3 Use in Scheduling and Performance Analysis

- Enables creation of baseline schedules and updates with actual progress.
- Supports analytical tools like:
    - Earned Value Management (EVM)
    - Schedule Performance Index (SPI)
    - Critical Path Method (CPM)
- Helps in identifying delays and performance deviations.

10.1.4 Role in Construction Projects

- Manages complex, multi-phase construction projects.
- Handles multiple work packages (lots) and specialized components.
- Simulates real-world scenarios like task overlaps and work suspensions.
- Enhances coordination and project decision-making. (Microsoft. , 2023)

10.2 Earned Value Management (EVM)

10.2.1 Definition of Earned Value Management (EVM)

EVM :is a project performance measurement technique that integrates scope, time, and cost to provide an objective evaluation of project progress. It compares the planned work and budget with the actual work accomplished to assess project performance and forecast future trends.

10.2.2 Key Concepts

EVM relies on three core metrics:

- Planned Value (PV): The estimated value of the work scheduled to be completed by a specific time.
- Earned Value (EV): The estimated value of the work actually completed by that time.
- Actual Cost (AC): The real cost incurred for the completed work.

These are used to calculate performance indicators such as:

- Schedule Performance Index (SPI):

$$\text{SPI} = \frac{\text{EV}}{\text{PV}} (\text{measures schedule efficiency})$$

- Cost Performance Index (CPI):

$$\text{CPI} = \frac{\text{EV}}{\text{AC}} (\text{measures cost efficiency})$$

10.2.3 Purpose and Benefits

EVM allows project managers to:

- Track project performance over time.
- Detect schedule and cost variances early.
- Forecast project completion dates and final costs.
- Make informed decisions to correct deviations.

10.2.4 Application in Project Management

EVM is widely used in sectors like construction, engineering, and IT. When used with tools like Microsoft Project, it provides real-time performance dashboards and predictive insights, enabling better control and communication among stakeholders.

10.3 Critical Path

10.3.1 Definition of Critical Path:

The Critical Path is the longest sequence of dependent tasks in a project schedule that must be completed on time for the entire project to be finished by its deadline. It determines the minimum project duration.

10.3.2 Key Features

- Zero Float: Tasks on the critical path have no slack or flexibility.
- Direct Impact: Any delay in a critical path activity causes a delay in the whole project.
- Project Control Tool: It helps project managers prioritize activities that require strict monitoring.

10.3.3 How It Works:

To identify the critical path, you:

a) List all project tasks.
b) Determine task durations and dependencies.
c) Build a network diagram (flow of tasks).

10.3.4 Why It Matters:

Knowing the critical path allows project managers to:

- Focus resources on the most time-sensitive tasks.
- Forecast project duration accurately.
- Mitigate risks related to scheduling. (Kerzner H.)

Conclusion:

This chapter provided a comprehensive overview of the administrative foundations of the education sector in Algeria, with a focus on the construction of primary schools. Through this exploration, the project at the center of this study was identified and classified as a Type C Primary School, corresponding to pattern 2 in the Algerian spatial programming standards. This classification not only defines the spatial and functional organization of the school infrastructure but also informs the planning and resource allocation required for its construction.

Furthermore, the chapter examined the essential relationship between time and cost in the execution of educational construction projects. In the context of public infrastructure, delays in project timelines often result in increased costs and disrupted service delivery. Thus, managing time effectively becomes a financial necessity. In this regard, the interconnection between time, schedule, and deadline management was emphasized. A clear understanding of how scheduled activities align with predefined deadlines is critical to ensuring timely project completion and budget adherence.

Lastly, the chapter concluded by introducing key tools and techniques used in the management of both costs and schedules. These methods—ranging from Gantt charts and Critical Path Method (CPM) to cost estimation models and performance tracking systems—serve as essential instruments for project managers to plan, control, and deliver successful educational facilities.

This foundational understanding prepares the ground for the next chapters, which will explore in more detail the practical implementation of these principles in the field, using a real-world case study of a Dahman ben mbarek primary school construction project.

Chapter02 :

analysis study

II.Chapter02 : analysis study

Introduction :

Following the theoretical and administrative foundations established in the first chapter, this chapter presents a detailed analytical study of the selected primary school construction project. It aims to provide an in-depth understanding of the project's technical, urban, and architectural dimensions, serving as a bridge between the project's conceptual framework and its real-world implementation.

The chapter begins with the technical presentation of the project, including its official registration and essential data, thus The urban analysis section examines the project's integration within its environment by evaluating the characteristics of its location, accessibility, and its importance in serving the surrounding community.

The chapter then transitions to an architectural analysis that focuses on the internal organization of spaces, the structural systems employed, and the key construction components such as perimeter walls, columns, beams, and sanitation systems. Special attention is paid to how these elements contribute to the functionality, safety, and sustainability of the school facility.

Finally, the analysis culminates in a synoptic table, offering a chronological analysis of the project's progress through a synoptic table that traces the historical path of the project, documenting key milestones from registration to execution phases. This timeline-based approach enables a critical assessment of scheduling efficiency, identifies potential delays, and sets the stage for further evaluation in the following chapters.

1. Presentation of the project

1.1 Technical card of the project

Full project name: Realization of a Class C Primary School in the Batna Road Neighborhood, Biskra Province.

Project location: The project is located in the middle of an urban fabric next to a stadium neighborhood El Izdihar.

Figure II.27location the primary school ,Source:google maps adapted by the author 2025

1.1.1Project Registration:

•Project Title: Realisation of a Class C Primary School in the Batna Road Neighborhood, Biskra Province .

•Project Registration Number: 501/2023

•Total Project Amount:

- Original transaction amount with full fees :79 448 130,65 DA
- Amount of Annex No. 01 :12 538 953,66
- New transaction amount with full fees :91 987 084,31

Project Owner: Directorate of Public Equipment Biskra

Technical monitoring of the project C.T.C: Biskra.

Study Office: Group (Ben Saleh Amina + Bouzaher El Hashemi).

Construction Contractor: are 4 contractors :

- E T B - Ben Abdelkarim El Hassen
- Construction Works Establishment in its various stages and real estate development -Swalhi Amar-Construction Works Company - Electricity and Irrigation - Alloui Mohamed.
- Multi-purpose Boucetta establishment Boucetta Saber.

Lot 01: Administrative wing + Pedagogical wing + External development, roads and various networks (VRD) + External wall (case study).

Lot02: Restaurent (case study).

Lot03: Employee housing

Start date and completion period:

Start date: Novembre 18,2022

Completion period: 23 months

1.2 Urban reading :

1.2.1 Standard conditions for the project's location

The Batna Road neighborhood is one of the vital neighborhoods in the Biskra Province, and is distinguished by its strategic location at the northern entrance to the city. The following are the most important standard conditions for the location of a project in this neighborhood:

❖ Urban Location and Connectivity:

- The school is situated near a major road (RN3), ensuring easy accessibility from multiple directions.
- It is in proximity to existing residential complexes as well as ongoing developments, making it a suitable option for catering to the needs of residents as the area expands.
- The availability of a nearby public sports field (to the west) is an added advantage for supporting various activities.

❖ Infrastructure and Accessibility:

- Roads: The school is linked to a temporary road that branches off from the main road, facilitating convenient access for cars and buses.
- Utilities: The area is equipped with an electricity network and roads, and it seems to have access to water and gas services. However, there appears to be a lack of sufficient green spaces nearby, which could impact the environmental aspect.

❖ Educational and Social Standards:

- There is a favorable distribution in the new residential zone, concentrated in an area of urban expansion. The setting is appropriate as there are no factories or markets immediately adjacent, minimizing sources of inconvenience.

❖ Site and Technical Standards:

- The project's ground is not level and has not been prepared for construction, which is critical for ensuring safety standards.

1.2.2 Location in the city and characteristics of the nearby surroundings

The Batna Road neighborhood is located at the northern entrance to the city of Biskra along the road leading to the state of Batna. This neighborhood is considered an important residential and commercial area, and is considered one of the vital neighborhoods that have witnessed remarkable development in recent years.

The primary school project is situated in the urban expansion zone to the North east of Biskra, along National Road No. RN3, making it strategically accessible and well-connected to the road network. This project is embedded in a modern residential area that is gradually evolving in terms of population density and urban infrastructure.

The nearby neighborhood is entirely residential and features essential facilities like a sports stadium and several shops, indicating the early stages of developing an integrated urban communit

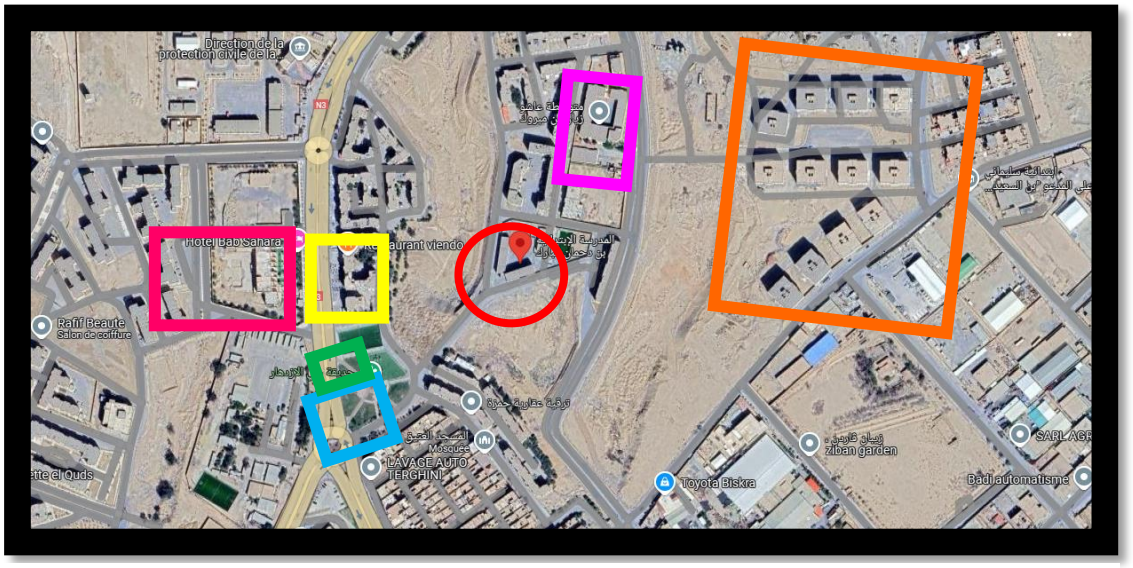


Figure II.28 location of the project with nerby characteristiques ,Source: google maps adapted by the author 2025

	The primary school project		Projects on progress		Bab El Sahra Hotel		Secondary school Ammar ben Mnad		Viando's Restaurent		Park		stadium

1.2.3 Location and specificity of accebility to the project

Project location: The project is located in the middle of an urban area, next to the Al-Izdihar neighborhood stadium and Ashour Zian Ben Mebrouk Intermediate School in the Batna-Biskra Road neighborhood and city 24 housing.

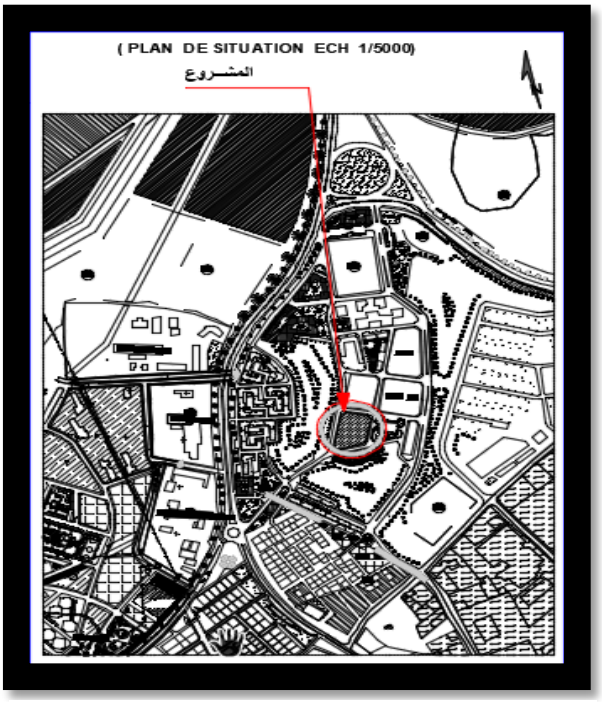


Figure II.29 location of primary school ,Source: site plan

Accessibility: There are several ways available to reach the primary school, including:

- It can be reached by taking the Emir Abdelkader Road to reach the roundabout next to the police training center and turning right and entering the street leading to 24 residential units to find the school - about 235 meters betweenthe roundabout and the school

- Or via the northern entrance to the city of Biskra-- Batna Road roundabout-- and heading towards the side street between the Nael Zakaria Hotel and the Martyrs Cemetery and heading directly to reach Ashour Zian Ben Mebrouk Middle School and turning left at its end for about 143 meters to find the school

Figure II.30 the accebility to the Dahmen Ben Mbarek school ,Source: google maps adapted bythe author2025

1.2.4 The importance of the project to serve the nearby surroundings

Establishing a primary school in the Batna Road neighborhood is a strategic initiative that offers significant benefits to both the local residents and the broader region. Key reasons highlighting the importance of completing this project include:

- Addressing the needs of the growing population.
- Alleviating overcrowding in nearby schools.
- Providing better access to quality education.
- Enhancing the overall quality of life within the community.

In short, the Batna Road neighborhood is considered one of the promising neighborhoods in the city of Biskra, as it combines a strategic location and urban development, which makes it an attractive area for housing and investment, and there is an urgent need to provide services that meet the needs of the residents of this neighborhood, such as establishing primary schools.

synthesis

✓ Establishing a primary school in the Batna Road neighborhood is a necessary project to meet the needs of the population and ensure high-quality education for children.

✓ The project contributes to improving the quality of life, supporting local development, and reducing pressure on other schools.

✓ Providing integrated educational services within the neighborhood will enhance its stability and attractiveness to new residents and investors.

➢ Therefore, this project is an important investment in the future of future generations and in the development of the Batna Road neighborhood as a whole.

1.2.5Parceling Grid / Plot Subdivision Grid

The site for the primary school enjoys multiple advantages at the allocation and topological levels, including:

- A regular network and easy distribution of facilities.
- Excellent connectivity to roads and residential areas.
- Coherence with neighboring allocations without conflict.
- Seamless integration into the general urban fabric.

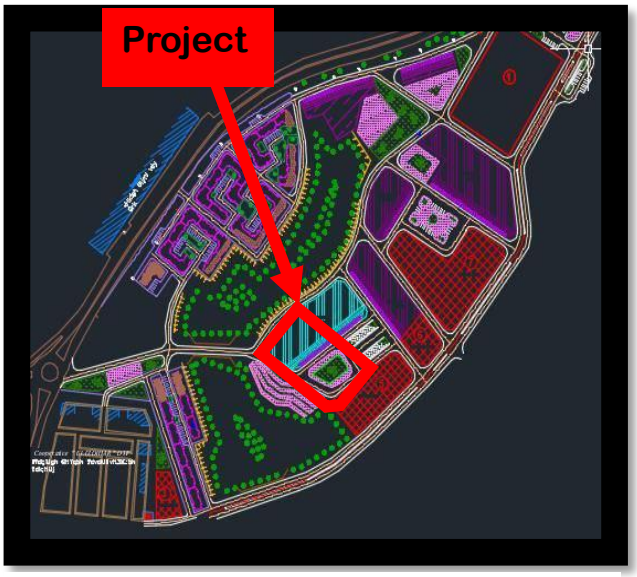


Figure II.31 pareceling grid of the project ,Source:Master Plan of Development and Urbanism PDAU

1.2.6 Project entrance

The school has entrances leading to it :

→	The main entrance
→	A secondary entrance for the staff housing.
→	A secondary entrance for the restaurant
→	The surrounding road infrastructure

Table II.13 project entrance legend ,source :the author 2025

- Entrance organization: The layout of the school entrances is structured to allow convenient access for different groups (students, teachers, employees, visitors) to their designated areas, enhancing safety and comfort.
- Separation of uses: The distinct secondary entrances for staff housing and the restaurant signify thoughtful planning to reduce interference among different activities in the project.
- Effective site design: The placement of entrances throughout the building's organizational scheme aids in smooth movement and decreases crowding at entry points.

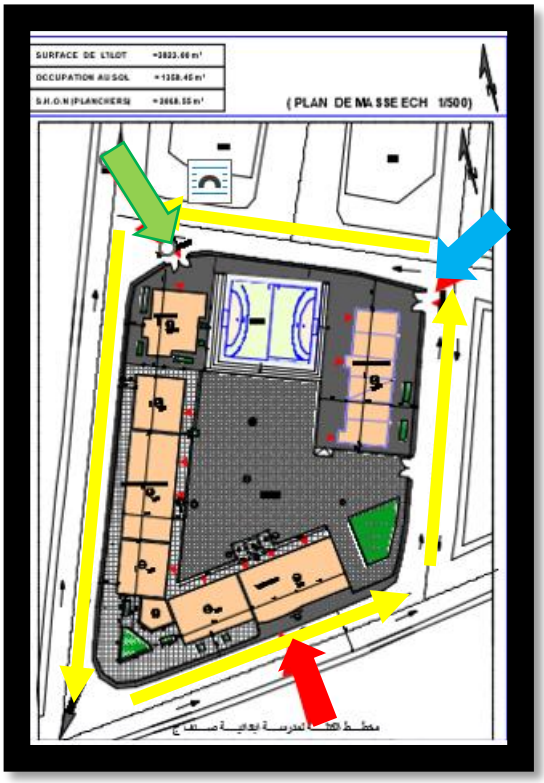


Figure II.32 project entrance ,Source:massing plan adapted by the author 2025

1.2.7 The specificity of the (empty/built) project

1.2.7.1 Building Shape

The general shape of the plan is very similar to an irregular trapezoid, consisting of several straight lines and different angles that form the overall design of the site. It somewhat resembles the shape of a plot of land with unequal sides, with buildings and facilities distributed within it in a harmonious manner.

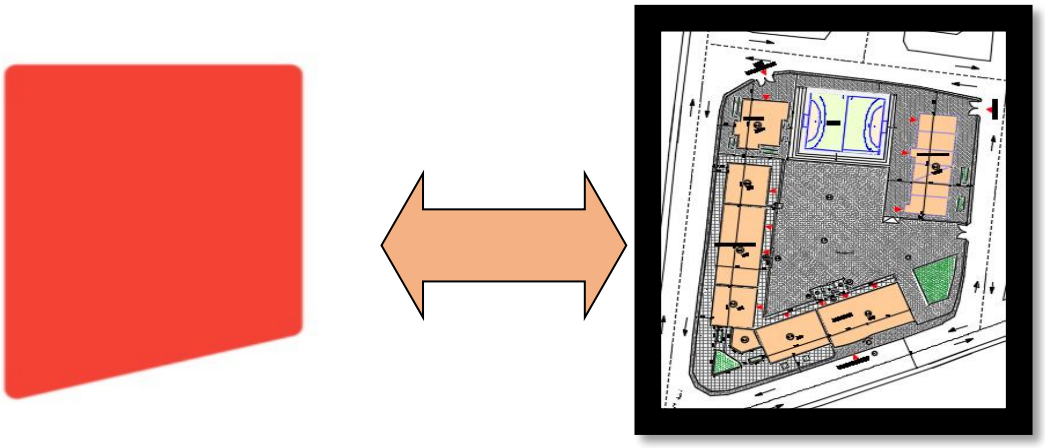


Figure II.33 building shape shape ,Source: massing plan adapted by the author 2025

1.2.7.2 Relative Relationship: (filled/ empty)

Filled: Represents 42% of the project area and includes the following facilities: Educational departments (study halls, reading halls, and computer science) Administrative facilities (secretary's room, director's office, archives, other offices, and professors' hall) Restaurant, and mandatory housing. “pink shadow”

Empty: Represents 45% of the project area and includes: playground, green space, and two parking lots.”purple shadow”.

Figure II.34 the field and the empty area ,Source: massing plan adapted the author

Land Use Ratio (CES):

$$CES = \frac{\text{Total built up area}}{\text{total plot area}} = \frac{2098.15}{3323.08} = 0.63$$

Land Coverage Ratio (COS)

$$COS = \frac{\text{Ground floor built area}}{\text{total plot area}} = \frac{1394.45}{3323.08} = 0.42$$

1.3 Architectural reading

1.3.1 Functional organization

In the design of the primary school, the facilities were distributed along the floor in an organized manner, where the interests were distributed in a way that aims to meet the needs of the educational process and provide a suitable environment for students and staff. The following is an analysis of this distribution with criticism:

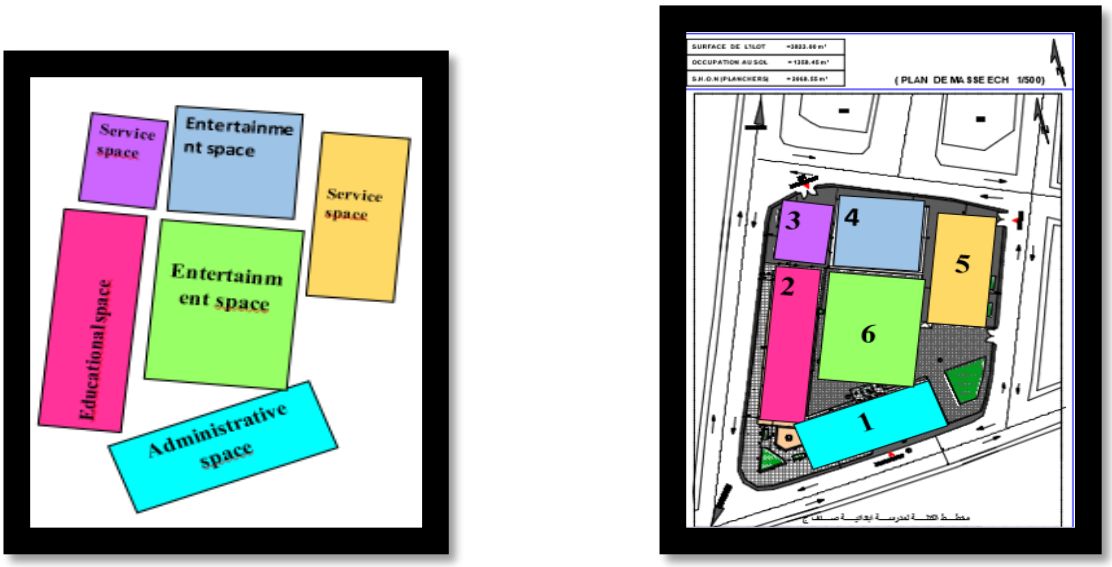


Figure II.35 the organization of spaces in the primary school 1 administration 2.classrooms 3. functionel resident 4. staduim 5. canteen 6. school yard ,Source: the author 2025

- Part One: Administration
  - Ground floor: Consists of

o Multi-activity hall: Its location on the ground floor is suitable for facilitating access and use in various activities without the need to use stairs.

o Study hall: Its presence on the ground floor can be useful for students with special needs.

o Large lobby:

  - First floor:

o Computer science hall: Its location on the first floor is suitable for protecting equipment from possible humidity on the ground floor.

o Study hall and reading hall:

  - Second floor:

o Archive office:

o Professors' hall and other offices:

- Part Two: classrooms and sanitary facilities

• Distribution: The presence of study halls and toilets on the ground and first floors ensures easy access and reduces congestion. It is preferable for toilets to be close to classrooms to meet students' needs quickly.

- Part Four: School Restauran

• Location: Located in the northeast of the floor at ground level, and from it easy access by students and staff, and reduce vertical movement that may cause congestion or safety risks.

- Part Four: Mandatory Housing for employees

• Location: Located in the northwest of the floor at ground level, and is separate from the educational buildings to ensure the privacy and comfort of employees, and reduce the interference between personal and professional life.

Overall, the layout of the facilities across the floors appears to have been thoughtfully designed to meet the needs of the school. Taking into account the above points, the design could be improved to ensure a safe and comfortable learning environment for all.

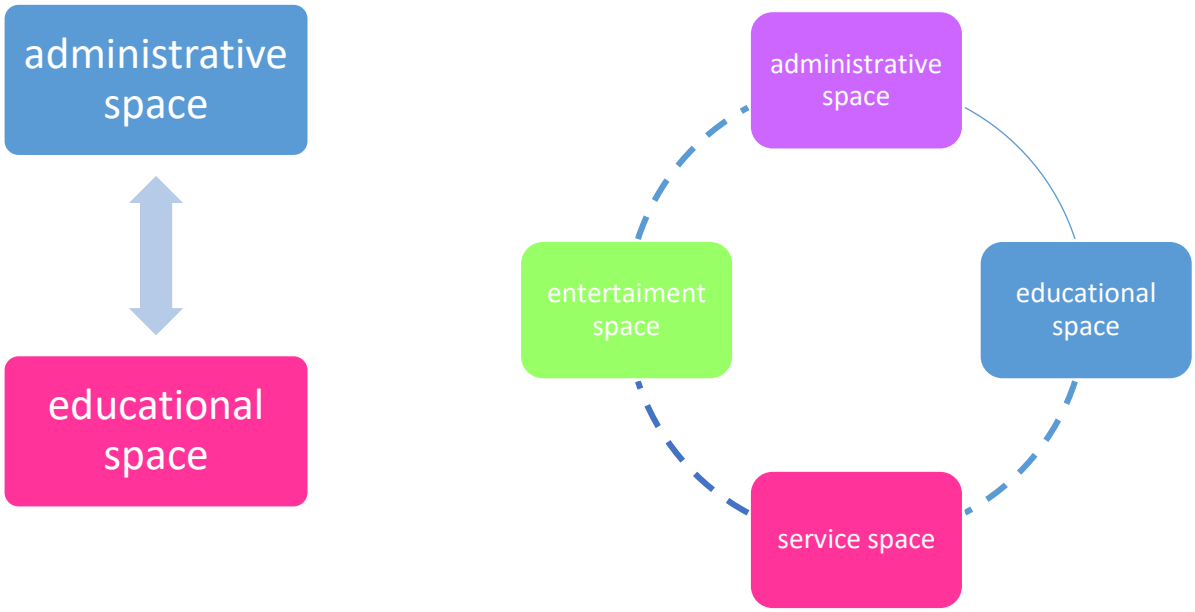


Figure II.36 relation between the domain organization of the school ,Source: the author 2025

	Strong relation		**Weak relation**

1.3.2 spatial organization

1.3.2.1 Circulation : (Administration suite) The shape of the distribution of the space of movement on the ground floor, first floor and second floor is horizontal for the halls -- Study sections. Reading. Multi-activity. Computer science. Corridors. Archives. Administration offices. Professors' hall. Secretariat -- As for the stairs, the shape of the space of movement is vertical

- the ground floor

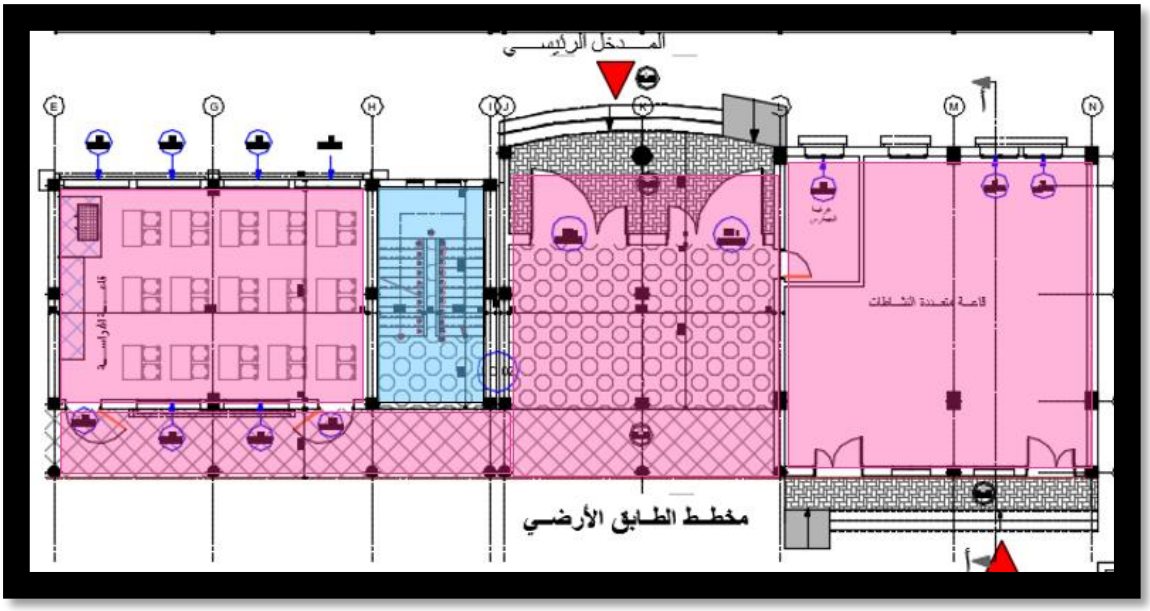


Figure II.37 circulation space in the ground floor in adminstrative wing ,Source: ground floor plan adapted by the author 2025

	the champ of circulation is horizontal		the champ of circulation is vertical

➢ Analyse :The ground floor plan highlights both horizontal and vertical circulation areas. Horizontal circulation, marked in pink, consists of corridors and passageways linking classrooms and functional spaces. Vertical circulation, shown in blue, is centered around staircases, ensuring access to other floors of the building.

- first floor

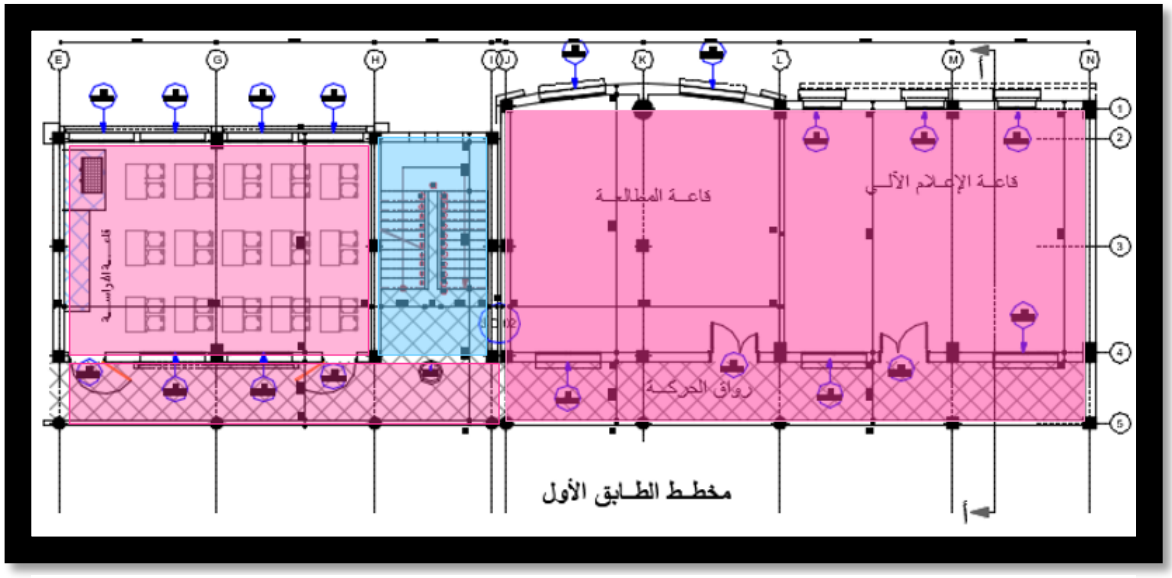


Figure II.38 circulation space in the first floor ,Source: first floor plan adapted by the author

	the champ of circulation is horizontal		the champ of circulation is vertical

➢ Analyse: The first floor features horizontal pathways that efficiently link key functional areas. The vertically positioned staircase core ensures seamless access between levels, promoting clear and organized movement throughout the space.

- second floor

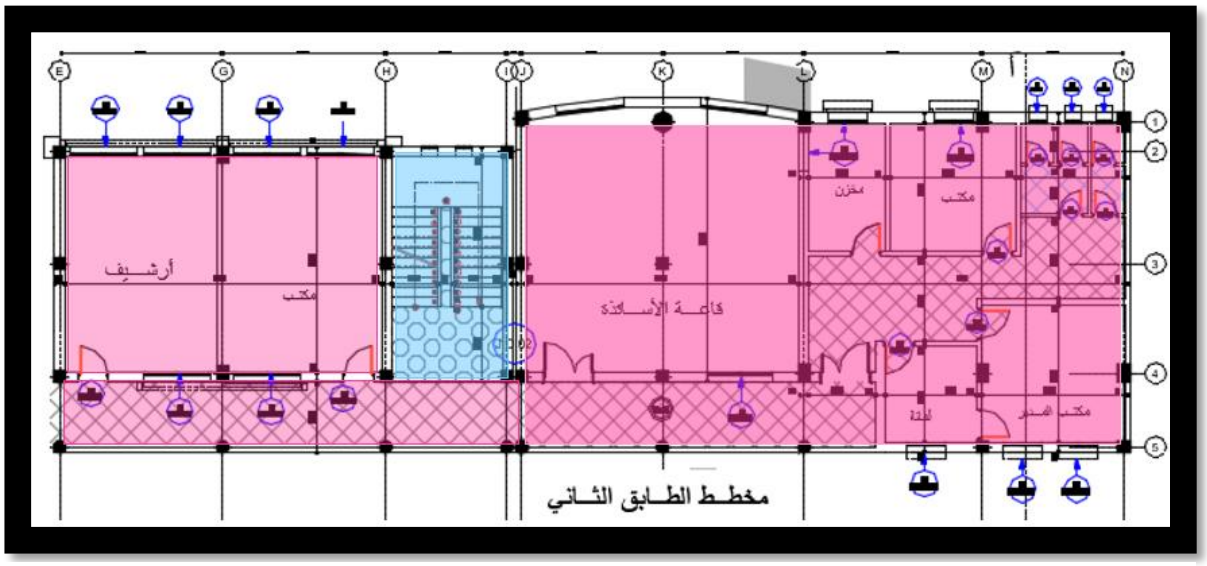


Figure II39 circulation in second floor ,Source: second floorplan adapted by the author 2025

	the champ of circulation is horizontal		the champ of circulation is vertical

➢ Analyse: Similar to the first floor, horizontal pathways connect the classrooms effortlessly, while strategically placed stairs provide vertical circulation, ensuring smooth and intuitive movement throughout.

Study Classes suite : The shape of the distribution of the champ of circulation on the ground floor, first floor is horizontal for the halls -- Study sections. Corridors. bathrooms -- As for the stairs, the shape of the champ of movement is vertical.

- The ground floor

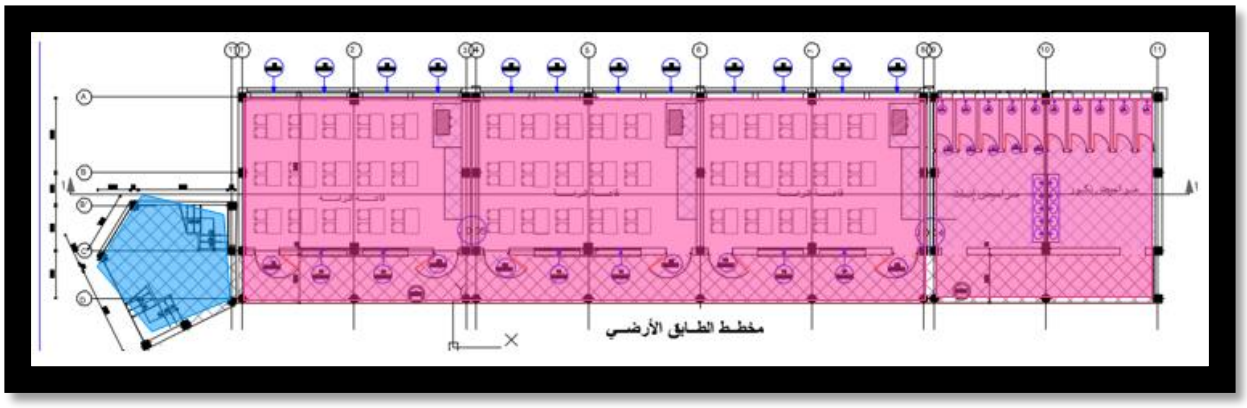


Figure II.40circulation in the ground floor of classerooms wing ,Source: ground floor plan adapted by the author 2025

	the champ of circulation is horizontal		the champ of circulation is vertical

➢ Analyse: Horizontal circulation, indicated in pink, includes corridors and passageways that connect classrooms and other functional spaces. Vertical circulation, marked in blue, is concentrated around staircases, facilitating efficient movement and access to the building's upper floors.

- The first floor .

Figure II.41 circulation in the first floor ,Source: first floor plan adapted by the author 2025

	the champ of circulation is horizontal		the champ of circulation is vertical

- Analyse: The first-floor circulation analysis reveals a dominant horizontal movement pattern, also highlighted in pink. This horizontal circulation seamlessly connects all primary spaces, ensuring smooth user flow throughout the floor.

- <u>Functional residence</u> The shape of the distribution of the champ of movement on the Functional residence is horizontal along the halls -- 3 rooms. kitchen. Corridors. bathrooms . living room.

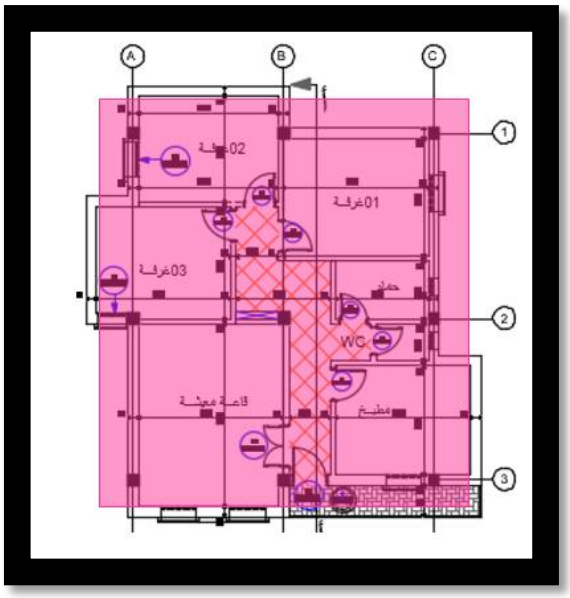


Figure II42 circulation in functional resident ,Source : functional resident plan adapted by the author 2025

- Analyse:The circulation system within the functional residence is predominantly horizontal, highlighted in pink. Horizontal circulation is structured through central corridors, seamlessly connecting key areas such as bedrooms, living spaces, and sanitary facilities.

	the champ of circulation is horizontal
	the champ of circulation is vertical

- Restaurent : The shape of the distribution of the champ of movement on the restaurant is horizontal along the halls -- . kitchen. Cold room. bathrooms . dining room. storage room --

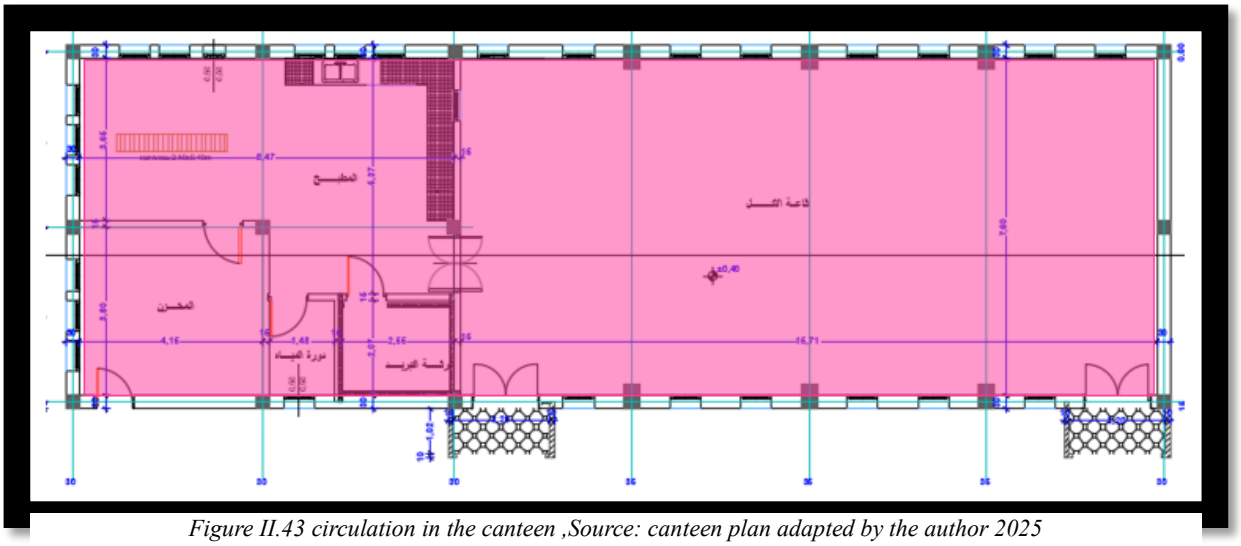


Figure II.43 circulation in the canteen ,Source: canteen plan adapted by the author 2025

	the champ of circulation is horizontal		the champ of circulation is vertical

➢ Analyse: The restaurant's circulation is primarily horizontal, as indicated by the pink areas. This horizontal flow efficiently connects entrances, halls, the kitchen, cold room, bathrooms, dining areas, and storage spaces.

Criticsem: The analysis of the floor plans highlights a clear reliance on horizontal circulation through corridors connecting key functional areas, including classrooms, offices, and halls. This layout promotes efficient movement on each floor, ensuring clear pathways and ease of daily navigation for users. However, this strong focus on horizontal organization is not complemented by an adequate provision of vertical circulation options, which are confined to specific points near the central stairwells. This limitation can disrupt the smooth flow of vertical movement, particularly during peak times or emergencies.

Furthermore, the design lacks essential accessibility features, such as elevators or ramps, failing to accommodate the needs of individuals with disabilities. The insufficient integration of horizontal and vertical movement compromises the building's functional efficiency and reduces its overall adaptability.

Synthesis :

By studying and analyzing the horizontal and vertical circulation in the building, it becomes clear that the architectural design is primarily based on a clear and effective horizontal organization, represented by corridors and paths that connect the various functional spaces, such as classrooms, offices, and halls. This organization supports clear circulation within the floors and facilitates daily use, especially given the logical distribution of functions throughout the spaces.

However, this focus on horizontality was not accompanied by a balanced and integrated distribution of vertical circulation methods, which are limited to specific points, often centrally located staircases. This limited distribution leads to poor vertical flow and hinders smooth access to the next floor, particularly in emergency situations or for users with special needs, due to the absence of alternative elements such as elevators or ramps.

Based on this, it can be concluded that the current design succeeds in organizing horizontal movement, but suffers from a clear deficiency in addressing vertical movement. Hence, the need to adopt a more integrated design strategy that takes into account the balanced distribution of means of movement and provides comprehensive accessibility solutions, enhancing the building's functional efficiency and improving the user experience across all spaces.

1.3.2.2Fields feature:

Determine the wet area and the dry area (the wet area is in blue and the dry area is in yellow).

Administration suite

- the ground floor.

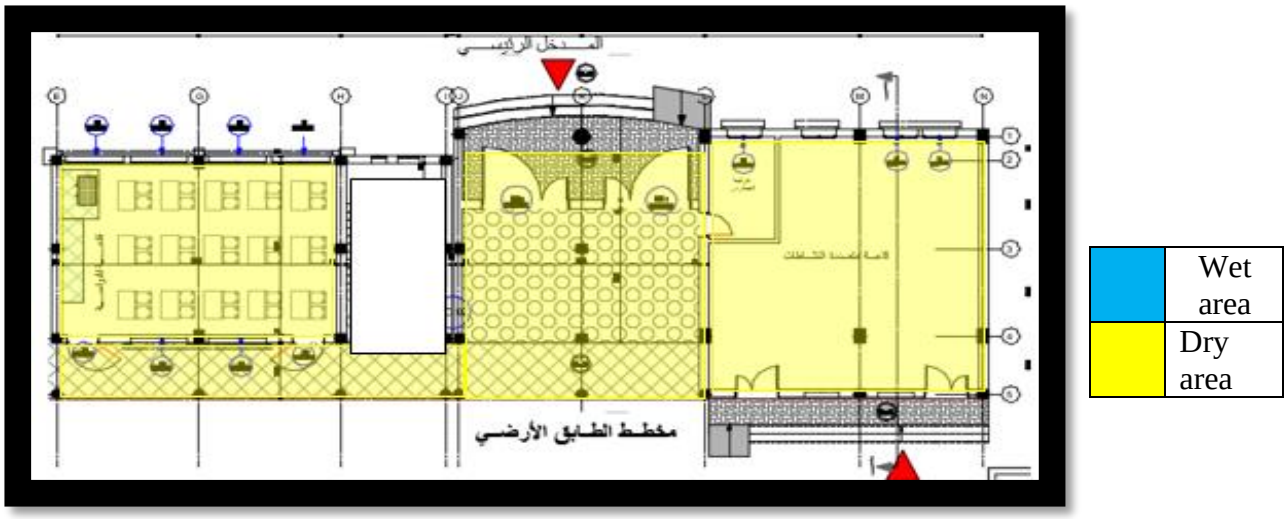


Figure II.44 feild features in the ground floor ,Source: ground floor plan adapted by the author 2025

- Analyse: The ground floor of the administration suite is primarily dry, as highlighted by the yellow zones. These areas consist of classrooms, the reception, a multipurpose room, and circulation

spaces. This strategic zoning improves user comfort and maintains cleanliness by confining wet areas to designated corners of the layout.

- the first floor.

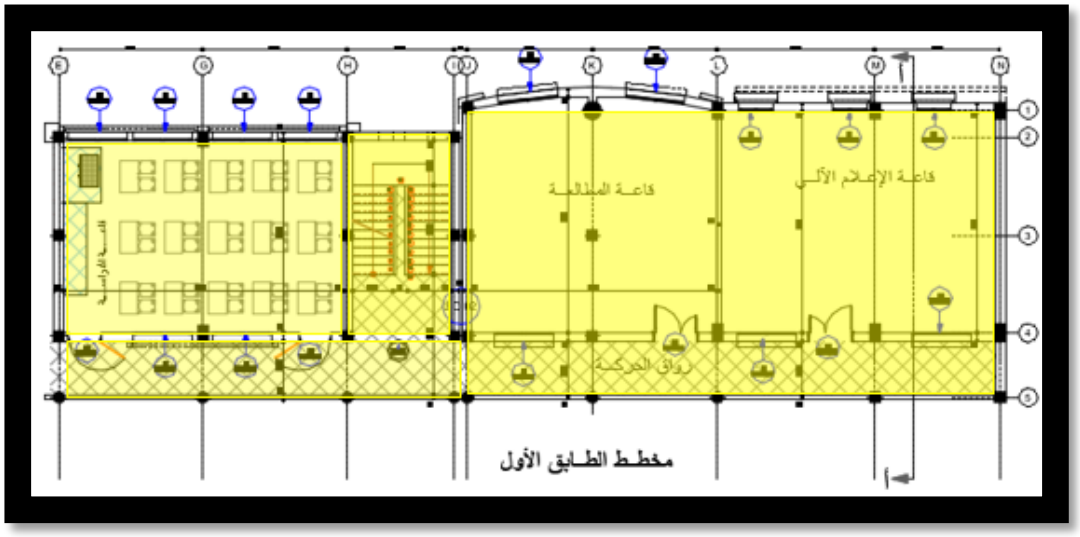


Figure II.45 feild feature in the first floor ,Source: first floor plan adapted by the author 2025

➢ Analyse: On the first floor, the layout predominantly follows a dry-focused design. The majority of the space is allocated to workspaces, meeting rooms, and corridors, all forming part of the dry zone. Wet areas are non-existent and normaly centralized around bathroom facilities, which are typically located near staircases or vertical circulation points to ensure convenient access and plumbing efficiency.

- **the second floor.**

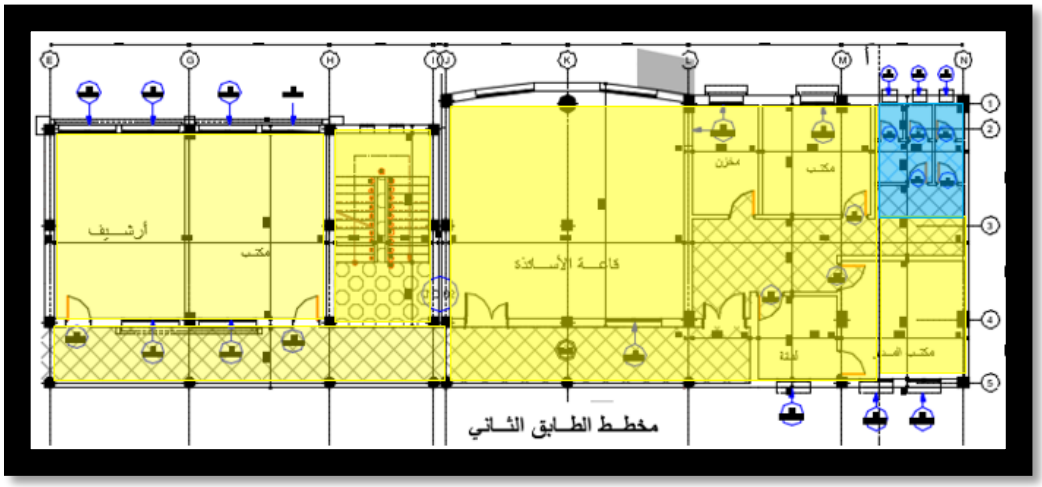
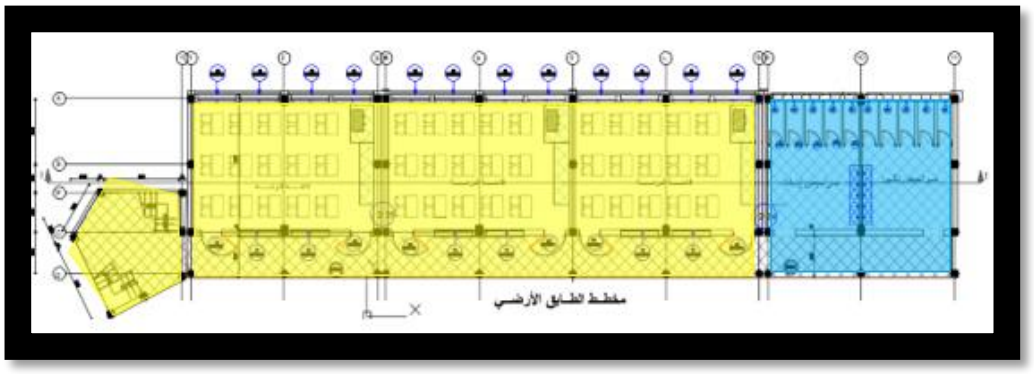


Figure II46 feild feature in the secnd floor ,Source:second floor plan adapted by the author 2025

➢ Analyse:The second floor maintains a layout that is largely composed of dry areas (highlighted in yellow), such as: (Office rooms+Meeting or multipurpose rooms+Circulation spaces) .The wet areas (highlighted in blue) are located at one end of the layout and include: (Toilets+ Washroom facilities) .The clear zoning continues the trend of effective functional separation between dry workspaces and necessary sanitary zones.

Study Classes suite :

- the ground floor.

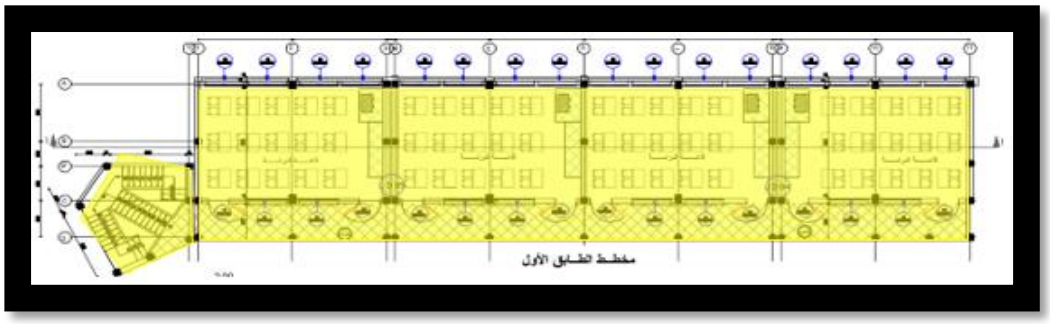


	wet area
	Dry area

Figure II47field features in the ground floor ,Source: ground floor plan adapted by the author 2025

- Analyse:The ground floor of the study classes suite shows a dominant presence of dry areas, reflecting:(Classrooms+Corridors and entryways) .The wet areas, indicated in blue, are situated towards the far right end of the plan and include:(Toilets+Sanitary rooms for students and employees)

- <u>the first floor.</u>



	wet area
	Dry area

Figure II48 feild feature in the first floor ,Source : first floor plan adapted by the author2025

- Analyse:On the first floor, the layout consists entirely of dry areas (yellow), emphasizing:(Classrooms+Hallways).There are no wet areas on this level, suggesting that all sanitary needs are addressed on the lower floor. This reduces plumbing complexity and concentrates maintenance in one location.

- <u>Functional residence:</u>

- Analyse:The plan of the functional residence shows a clear distinction between wet areas (in blue) and dry areas (in yellow).Dry areas include living spaces such as bedrooms (01, 02, 03), the living room , and the office , These zones are designed for comfort and daily living, Wet areas are clearly centralized and include the bathroom , WC, and kitchen . These zones are clustered together for efficient water and waste management, minimizing plumbing complexity.

	wet area
	Dry area

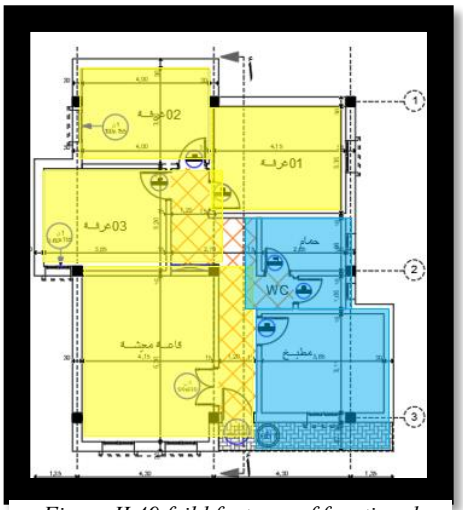
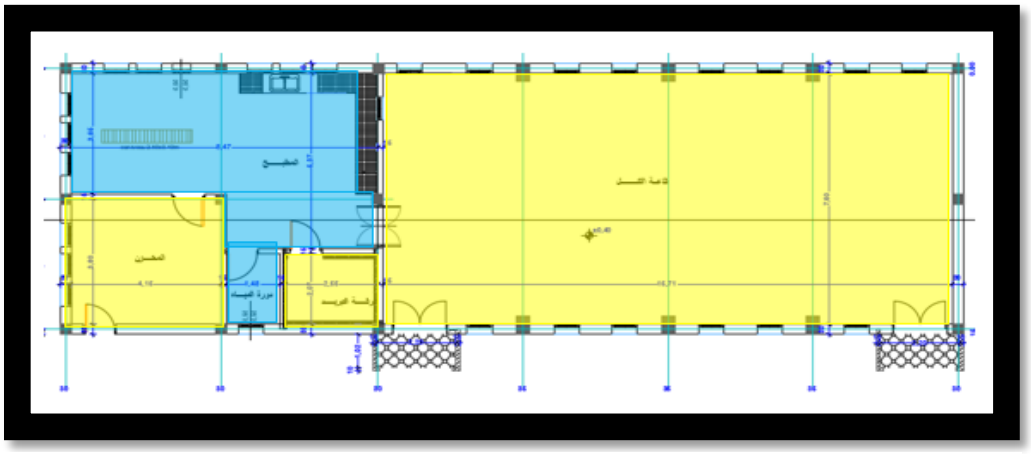


Figure II.49 feild features of functional resident,Source : functional resident plan adapted by the author 2025

- Restaurent



	wet area
	Dry area

Figure II.50 feild features of canteen ,Source: canteen plan adapted by the author 2025

➢ Analyse:The restaurant plan also demonstrates an organized distribution between wet and dry zones: Dry areas (in yellow) dominate the dining hall . This space is kept dry for cleanliness and comfort. Wet areas (in blue) include the kitchen , cold room , toilets , and washing zone . These are located at the rear and along one side of the building, enabling smooth operational flow for staff without interfering with students zones.

Criticism: The distribution of wet and dry areas in the Ben Dahman Mubarak Elementary School project reflects a clear functional understanding. Dry areas were allocated to educational, administrative, and living spaces, while wet areas were restricted to specific locations to ensure efficient connection to sanitary networks.

However, the complete absence of wet areas on the first floor is noticeable. This constitutes a functional weakness in the overall layout, negatively impacting the building in several ways:

- Poor functional comfort: The lack of sanitary facilities or wet services on this floor forces users to travel to other floors to meet their basic needs, reducing the comfort of daily use, especially for children and educational staff.
- High pressure on lower facilities: This distribution creates an imbalance in service consumption, with wet areas on the ground floor bearing a greater functional burden, especially during peak periods.
- Lack of functional independence: The first floor loses its independence as a self-sufficient function, becoming functionally linked to the other floors, which contradicts the principles of practical organization of educational institutions.

Synthesis:

By analyzing the distribution of wet and dry areas in the Ben Dahman Mubarak primary school project, it is clear that the overall layout respects the principle of functional separation between spaces, contributing to improved hygiene and comfort within the institution. However, the absence of wet areas on the first floor is a design weakness that negatively impacts user comfort, especially given the ongoing need for such facilities by students and teaching staff.

1.3.3 Structural system

1.3.3.1Definition of the Structural System: Column-Beam

The structural system implemented in the construction of the Ben Dahman Mubarak School is a post-and-beam system. This system is among the most commonly utilized in building design, particularly for educational institutions, due to its key advantages:

- Strong resistance to vertical loads, including self-weight and live loads.
- Flexibility in accommodating various architectural layouts.
- Enhanced earthquake resistance when designed with appropriate joints, as demonstrated.

1.3.3.2Determine the joints

Table 14 type of joints

Number: 6

Type: 2

Joint dimensions: 10cm

seismic joint	rupture joint
Between axe (8-9)	Between axe (1-1')
Between axe (3-4)	Between axe (B-B')

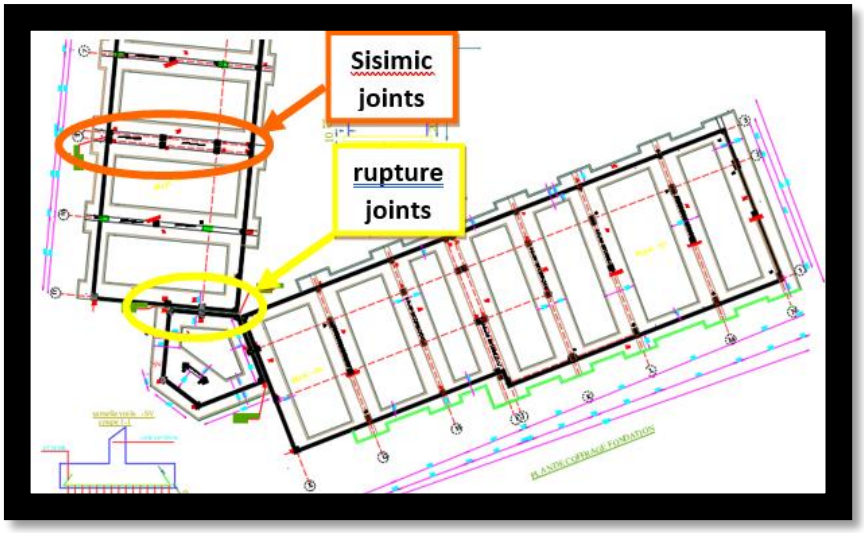


Figure II.51 the joints in the plan ,Source : Formwork and Reinforcement Plan adapted by the author 2025

1.3.4 Dimensions of building parts:

- Number of building parts: 05 + restaurant + functional resident

Parts dimensions:

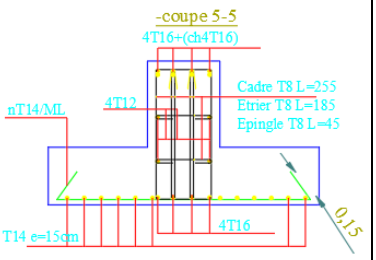
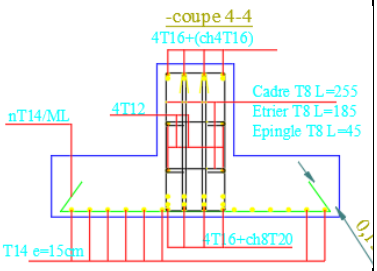
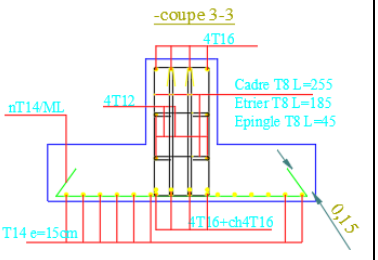
- Administration part : (9.77*31.96)
- Classrooms with stairs part : (8.81*40.36)
- Restaurant: (24.94*9.32)
- Functional resident : (12.31*11.30)

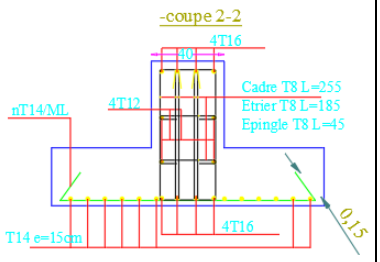
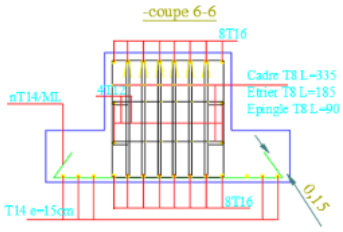
1.3.5 Fondations:

As part of the construction project for a primary school, a continuous footing system of the "Semelle filante avec libage" type was implemented. This system is particularly well-suited for structures with light to moderate loads, such as low-rise educational buildings. It ensures efficient load distribution on the soil, is straightforward to execute, and offers a cost-effective solution.

The foundations were designed with varying dimensions and lengths based on the positioning of axes and columns, adhering to precise reinforcement standards and seamlessly integrating with vertical elements like columns. Additionally, concrete tie beams (libage) were incorporated to connect the footings, providing enhanced lateral stability.

Table II.15 study of fondations (Continuous footing) ,Source: Reinforcement Plan

Foundation Type	Section	Dimensions (cm)	Total Width (cm)	Main Reinforcement	Additional Reinforcement	Mesh Reinforcement	Notes	picture
SFJ	5-5	80×90	180	4T16 + (ch 4T16)	2×2T 14	T14 every 15 cm	Double reinforcement	 *Figure II52 Section 5-5 Continuous footing ,Source: Reinforcement Plan*
SFJ	4-4	80×90	180	4T16 + ch(4T16) + ch 8T20	2×2T 14	T14 every 15 cm	Strongest reinforcement	 *Figure II53 Section 4-4 Continuous footing ,Source: Reinforcement Plan*
SFJ	3-3	80×90	180	4T16 + ch 4T16	2×2T 14	T14 every 15 cm	Similar to 5-5	 *Figure II54 Section 3-3 Continuous footing ,Source: Reinforcement Plan*

SFJ	2-2	80×90	180	4T16	2×2T 14	T14 every 15 cm	Simplest reinforcement	
SF	6-6	80×90	180	8T16 (top and bottom)	2×2T 14	T14 every 15 cm	Strong main + dense stirrups	

❖ **Dimension Variation Based on Structural Needs:**

- A constant width of 180 cm was used, while the height varied between 40 cm and 80 cm depending on load conditions and number of connected columns.
- Foundations with greater height (80 cm) were placed in zones with higher column density or larger loads.

❖ **Well-Planned Axis Distribution:**

- Columns are evenly distributed across axes to ensure balanced load transfer to the ground.
- Foundations are connected by integrated tie beams (libage) to enhance structural stability.

❖ **Precise Reinforcement Detailing:**

- All foundations are reinforced at both top and bottom with T16 bars spaced at 15 cm to resist bending.
- The use of stirrups and pins (étriers and épingles) improves shear resistance and prevents local buckling.

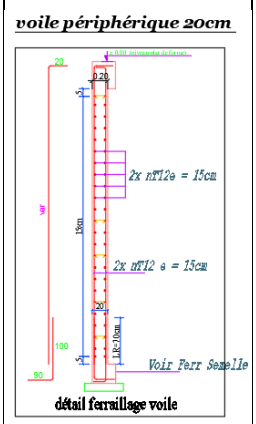
❖ **Column Section Detail (Section 6-6):**

- Shows the integration between foundation and vertical column reinforcement using 8T16 bars.
- The addition of frames and stirrups ensures the stability and strength of the vertical structural element

1.3.6 Primeter walls

For the structural design study of an elementary school project, 20 cm thick concrete perimeter walls (voiles périphériques) were chosen due to their exceptional ability to endure both horizontal and vertical loads. This makes them ideal for educational facilities requiring long-term stability and durability. The table below outlines the technical specifications for reinforcing these walls, including dimensions and the geometric arrangement of the reinforcement bars, as detailed in the implementation plans.

Table II16 study of primeter walls,Source: Reinforcement Plan

Element	Dimensions (cm)	Thickness	Main Reinforcement	Overall Reinforcement	Additional Reinforcement	Sketch
perimeter wall Voile 20 cm	350 × (length as needed)	20	2×T12 vertical 15 cm spacing	2×T12 horizontal 15 cm spacing	U-bars at base (90–100–20 cm)	

Analysis of the Perimeter Wall Reinforcement Schedule :The perimeter wall under review measures 20 cm in thickness and 3.5 m in height, designed to endure both vertical and horizontal loads, particularly seismic forces. The reinforcement plan includes the following:

- Vertical Reinforcement:T12 steel reinforcing bars are placed at 15 cm intervals on both sides, providing resistance against compression and buckling.
- Horizontal Reinforcement:T12 steel reinforcing bars are spaced every 15 cm to counteract shear forces and minimize cracking.
- Additional Reinforcement: U-shaped steel reinforcing bars are incorporated at the base to ensure secure anchorage to the foundation.

This comprehensive reinforcement detailing guarantees superior structural performance while adhering to technical safety and durability standards required for educational facilities.

1.3.7 Column:

For the new elementary school project, structural columns were inventoried by function—administrative areas, classrooms, staff housing, and restaurent. The table outlines their type, quantity, dimensions, placement, and alignment to streamline planning and ensure balanced load distribution.

Table II17 study of column ,Source: Reinforcement Plan of column

Type	Number	Dimensions		position		
		Section	Height	centre	angle	rim
ADMINISTRATION						

P1	**22**	**35*35**	**+11.90**	**8**	**8**	**6**
P2	**7**	**Ø35**	**+11.90**	**0**	**2**	**5**
P3	**8**	**35*60**	**+11.90**	**0**	**5**	**3**
P4	**1**	**Ø55**	**+11.90**	**0**	**0**	**1**
CLASSES						
P1	**22**	**35*35**	**+8.16**	**10**	**3**	**9**
P2	**11**	**Ø35**	**+8.16**	**0**	**0**	**11**
P3	**8**	**35*60**	**+8.16**	**4**	**0**	**4**
FUNCTIONEL RESIDENT						
P1	**9**	**35*35**	**+3.23**	**1**	**4**	**4**
RESTAURENT						
P1	**8**	**40*65**	**+4.00**	**0**	**2**	**6**
P2	**9**	**30*30**	**+4.00**	**2**	**2**	**7**

Technical Analysis: The structural design effectively addresses height variations and functional requirements, as detailed below:

- Administrative Section: Positioned at a height of +11.90 meters, this area features columns of varying sizes to accommodate its diverse uses, including offices, reception areas, and meeting rooms.
- Educational Space (Classrooms): Located at a height of +8.16 meters, this section has the highest density of columns, reflecting the large number of classrooms. The consistent repetition of dimensions ensures a regular and efficient structural grid.
- Functional Residence: Situated at a height of +3.23 meters, this area contains fewer columns, signifying a less dense residential design with greater flexibility.
- Restaurant: Found at a height of +4.00 meters, this space incorporates two types of columns to provide adequate support for the expansive areas required by the dining facilities.

1.3.8 Sanitation

The sewage network components, forming a critical aspect of the institution's infrastructure, were thoroughly analyzed to ensure effective wastewater management and prevent any operational disruptions that might compromise user safety or future infrastructure stability.

The table below outlines the allocation of sewage devices, such as junction boxes and floor siphons, across key functional areas: administration, departments, staff housing, and the restaurant. Additionally, the dimensions of each component are provided to facilitate precise estimation of the work scope and installation needs.

Table II.18 sanitation study ,Source: Reinforcement Plan

Type	**Number**	**Dimensions**		
		Length	**width**	**height**
ADMINISTRATIOn				
Boite de branchement	**1**	**80**	**80**	**80**
Boite de branchement	**1**	**60**	**60**	**60**
CLASSES				
Séphon de sol	**2**	**Ø40**		

Boite de branchement	**2**	**60**	**60**	**60**
Boite de branchement	**2**			
Boite de branchement	**1**	**80**	**80**	**80**
FUNCTIONEL RESIDENT				
Séphon de sol	**1**	**Ø40**		
Boite de branchement	**2**	**80**	**80**	**80**
Boite de branchement	**3**	**60**	**60**	**60**
RESTAURENT				
Boite de branchement	**1**	**80**	**80**	**80**
Boite de branchement	**1**	**60**	**60**	**60**

Technical Analysis: In the administrative area, there are two medium to large junction boxes (80x80x80 cm and 60x60x60 cm), reflecting a limited number of drainage points suitable for facilities such as toilets and sinks.

Classrooms require multiple drainage installations as approved:

- Two floor siphons (Ø40) to collect cleaning water.
- Five junction boxes, with dimensions unspecified for two. This requires further review of the plans or consultation with the technical office to ensure consistent implementation.

The functional residence includes:

- One floor siphon and five junction boxes of varying sizes, indicating multiple wet areas such as a kitchen and bathroom.

The restaurant is equipped with only two main fixtures, likely due to its reliance on a centralized drainage system to manage water from dishwashing and food preparation.

1.3.9 beams:

A detailed inventory of beams and horizontal structural elements has been compiled, which are essential for connecting columns and ensuring overall structural stability. The table below outlines the various beams designed for each section of the school, including academic areas, staff housing, and administration. It specifies their cross-sections, lengths, quantities, and the type of structural system employed (beam-column). This categorization facilitates accurate quantity estimation, selection of suitable construction methods, and ensures optimal load distribution.

Table II.19 beams study,Source: Reinforcement Plan

Type	Demensions		number	Structural system type
	Section	extension		
Classrooms part				
Beam 1	30*40	3.05	10	Beam-column
Beam 2	30*40	1.78	12	Beam-column
Beam 3	30*40	3.00	10	Beam-column

Beam 4	30*40	1.78	10	Beam-column
Beam 5	30*40	1.75	4	Beam-column
Beam 6	30*40	4.45	4	Beam-column
Beam 7	35*60	6.80	8	Beam-column
Chainage 1	30*35	4.55	8	Beam-column
Chainage 2	30*35	4.50	24	Beam-column
Chainage 3	30*35	4.15	6	Beam-column
Chainage 4	30*35	4.60	6	Beam-column
Fonctional resident part				
Beam 1	30*45	4.90	3	Beam-column
Beam 2	30*45	4.25	3	Beam-column
Chainage1	30*30	3.93	9	Beam-column
Administration part				
Beam 1	35*60	6.90	6	Beam-column
Beam 2	35*40	1.75	6	Beam-column
Beam 3	30*40	1.75	12	Beam-column
Beam 4	30*40	3.05	10	Beam-column
Beam 5	30*40	3.85	4	Beam-column
beam 6	30*40	3.00	6	Beam-column
Chainage 1	30*35	4.55	12	Beam-column
Chainage 2	30*35	3.28	6	Beam-column
Chainage 3	30*35	3.80	14	Beam-column
Chainage 4	30*35	5.00	6	Beam-column
Chainage 5	30*35	3.90	4	Beam-column

Technical Analysis: Several technical observations can be derived from the table:

Classrooms Section:

- This area contains the highest number of beams, reflecting the dense layout of spaces and the multiplicity of halls.
- Most beams have a 30 x 40 cm cross-section, a standard size in medium-sized buildings, allowing for easier repetition in formwork and construction.
- The inclusion of main beams measuring 35 x 60 cm, with spans reaching up to 6.80 m, suggests the presence of larger or more open classroom spaces.
- The use of 30 x 35 cm cross-section chains in various locations enhances the horizontal structural cohesion.

Functional Residential Section:

- This part includes fewer beams, consistent with its smaller spatial dimensions compared to other areas.
- Slightly larger beams (30 x 45 cm) are used to support longer spans of up to 4.90 m, complemented by a single 30 x 30 cm chain.

Administration Section:

- A diverse range of beam sections and lengths is present, reflecting the varied distribution of spaces such as offices, halls, and corridors.
- Beam spans range from 1.75 m to 6.90 m, with multiple chains incorporated to improve lateral wall cohesion.

2. Synoptic table

To monitor the administrative progress of the primary school project, all procedural and administrative stages were documented, from initial registration to the issuance of service orders and contracts. The table below outlines the sequence of administrative processes, highlighting key dates and completed tasks at each stage. This provides a clear overview of the project's organizational development and helps identify any delays or overlaps that may have occurred.

Table II.20 synoptic table ,Source: Directorate of Public Facilities – Biskra

phases	Operational phase	Task	Date	observation
	Initiation phase			
Program preparation	Planning phase	Registration Date:	27/05/2021	The project has been officially registered in the relevant records.
		Publication of the competition notice	Consultation 25/10/2021	The announcement has been officially published to open the competition.
		Opening of bids and evaluation of application files	07/03/2021	Preliminary bids have been received and reviewed to ensure compliance with the requirements.
		Opening and evaluation of technical bids	19/04/2021	Technical aspects of the bids submitted by the participating parties have been examined.
		Opening of bids and evaluation of financial bids	20/04/2021	Financial analysis of the bids has been carried out to ensure they are consistent with the budget.
		Publication date of the provisional award notice	22/04/2021	Provisional award has been announced to the winning company or entity.
		Contract approval date:	contrat- visé par le CF le 20/12/2021	Official approval of the terms and conditions (DAO).
		Notification of the ODS to the engineering consultancy (BET)	20/12/2021	Notification of the Engineering Office (BET) of the Service Order (ODS) to commence work.

		CDC realization approval	28/12/2021	Final approval of the project implementation by the competent authority (CDC).
		Publication of the call for tenders notice	28/11/2021	Preparation of the official service order document for the implementation work.
		Opening of bids and evaluation of bids	14/11/2021	Proposed specific percentage/price for the project within the framework of the financial agreement.
		Publication of the provisional award notice	26/10/2021	
		Contract approval date:	28/02/2022	Official approval of the contract.
		ODS file	27/04/2022	The service order (ODS) document has been prepared.
		Termination for exclusive damages dated with the 20% rate	20/06/2023	Indication of the contract termination due to a 20% exclusive error.
		CDC realization approval	16/08/2023	Approval of the procurement committee (or competent authority) for implementation.
		Publication of the call for tenders notice	29/08/2023	
		Opening of bids and evaluation of bids	09/07/2023	Envelopes have been opened and bids have been reviewed.
		Publication of the provisional award notice	20/09/2023	Provisional award has been announced.
		Contract approval date:	12/04/2023	Official approval of the contract.
		ODS	21/12/2023	Issuance of the service order for implementation.
		Registration Date:	27/05/2021	
		Publication of the competition notice	Consultation 25/10/2021	Another announcement of the provisional award or update of information.

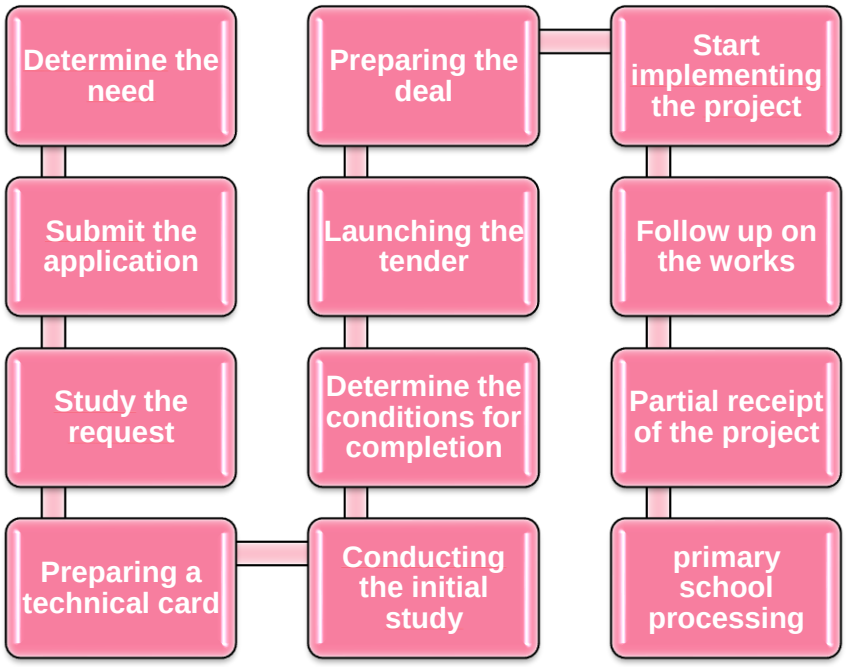
		Registration Date:		The project has been officially registered in the relevant records.

Analysis:

An analysis of the administrative stages' timeline highlights the following insights.

- The project was officially initiated on May 27, 2021, with its registration marking the starting point.
- Throughout its progression, the project experienced several administrative cycles, including announcements, the opening of envelopes, and the evaluation of technical and financial bids. These steps highlight the authorities' dedication to ensuring transparency and compliance with established procedures.
- Multiple service orders (ODS) were issued, signifying various phases or subcontracting arrangements within the project.
- On June 20, 2023, a 20% contract termination was recorded, suggesting potential challenges or shortcomings involving one of the stakeholders.
- Delays were noted between certain phases, such as the period between the contract announcement and its approval. These delays may have stemmed from re-announcements or technical concerns.

3. Project origin and formation



- Determining the need: The demographic and educational situation is analyzed to determine the need for a new educational institution, due to the overcrowding in the neighboring primary schools.
- Submitting the application: A request is submitted by the mayor or district to the Directorate of Education regarding the need.

- Studying the application: The application is examined and studied by the competent authorities to verify the priorities and available capabilities, then it is studied by the Ministry of Finance to determine the financial envelopes, and the application is returned with approval.
- Preparing a technical card: The Directorate of Public Equipment in Biskra prepared a technical card that includes the project site and its basic characteristics.
- Conducting the preliminary study: Preparing a feasibility study that includes all the educational and engineering requirements of the project.
- Determining the conditions for implementation: The specifications book is prepared by a specialized study office, including all the criteria and requirements.
- Announcing the tender: The tender is announced to select the institution responsible for implementing the project according to the specified criteria.
- Awarding the deal: The appropriate contractor is selected according to the quality, cost and time criteria, where the Construction Works Establishment in its various stages and real estat development -Swalhi Amar-
- Starting the project implementation: After signing the contract, work begins according to the specified schedule.
- Follow-up of the work: The competent authorities follow up on the implementation of the project to ensure compliance with the required specifications and quality.
- Receiving the project: Upon completion of the work, the project is officially received after ensuring that it conforms to the specifications, as the project was partially delivered because it was not completed.
- Preparing the primary school and starting the activity: The institution is provided with the necessary equipment and supplies before opening it to receive students.

Conclusion:

The analytical study presented in this chapter confirms that the spatial organization of the project is well-structured and suitable for its intended function. The distribution of spaces supports educational activities efficiently, ensuring a functional environment for both students and staff. Moreover, the strategic location of the school within the rapidly urbanizing area of Roud of Batna enhances its relevance, as it addresses the growing educational demand in the surrounding neighborhoods.

The study of internal circulation paths shows an overall efficient movement flow within the facility. However, it is important to note that the current design lacks proper considerations for individuals with special needs, which highlights an area for improvement in future educational infrastructure projects. Architecturally, the project adopts a compact vertical layout, where the upper floors are considered "dry zones" (non-wet areas), and notably lack essential facilities such as restrooms an element that may affect functional accessibility and operational convenience.

Structurally, the school relies on a beam-column system, a common and practical choice for educational buildings that ensures stability and ease of construction.

From the synoptic table , the timeline analysis reveals key milestones in the lifecycle of the project:

- The project underwent several administrative steps, such as tender announcements, envelope openings, and bid evaluations, reflecting a commitment to procedural transparency.
- A 20% contract termination, recorded on June 20, 2023, suggests the presence of challenges or partial disengagement by one of the involved parties.
- Noticeable delays occurred between some stages, particularly between the contract announcement and final approval likely due to re-announcements or technical issues.

In summary, while the project shows strong aspects in planning, spatial allocation, and structural implementation, the synoptic table highlights several administrative and execution challenges. These insights form a critical foundation for the next chapter, which will further examine project progress and performance indicators in greater detail.

Chapter 03 :

Administrative Study of the Study Case

III. Chapter 03 : Administrative Study of the Study Case

Introduction

Following the first two chapters, which addressed the theoretical and organizational frameworks of the educational sector and provided a technical analysis of the studied project, this third chapter represents the practical application of the research. It focuses on the administrative evaluation of the Ben Mbarek Dahman Elementary School project, with particular attention to its time and cost performance.

To do so, the study applies a set of modern project management tools and techniques such as MS Project for schedule simulation, Earned Value Management (EVM) to assess financial and schedule performance, and the Critical Path Method (CPM) to identify key activities that control the overall project duration.

It explores the project's progress through its various stages, evaluates its financial and time-related components, and compares it with a similar reference project to highlight differences in execution. The aim is to identify strengths and weaknesses in administrative practices and determine the causes of any deviations from planned timelines or costs.

Considering the project's administrative history and the shifts in contracting companies during its execution, it is essential to review both the initial and supplementary budget allocations to accurately determine the project's final cost and conduct a thorough analysis.

The chapter concludes with an analysis of the challenges and constraints encountered during the project and explores the causal relationship between cost and time, offering practical recommendations to enhance project performance in future educational infrastructure developments.

This structured approach ensures a thorough understanding of the project’s administrative performance and contributes to answering the core objective of this research. In this context, it becomes essential to study the project schedule rather than merely managing time or deadlines, as the schedule serves as the link between time allocation and deadline achievement, reflecting the real dynamics and performance of the project.

1. Introduction of the Implementing Institution (Contractor)

The project to build a Class C primary school in Biskra is considered a top-priority educational initiative, given its urgent nature and the direct supervision of local authorities, particularly the Wali of Biskra. The project aims to meet the growing demand for educational institutions in the region and improve student learning conditions, particularly in densely populated neighborhoods such as the Batna Road neighborhood.

Since its inception, the project has faced several setbacks. Initially, all construction work was awarded to the contractor Ben Abdel Karim El Hassan, who took over the entire project with all its components. However, the pace of completion was extremely slow, with the contractor spending approximately eight months completing only the initial phase of the project. Consequently, the relevant authorities decided to withdraw the project.

To compensate for this delay and ensure faster implementation, the project was distributed among three additional contractors. The educational and administrative wings were awarded to the contractor Soualhi Ammar, who was able to complete the work in a considerable timeframe, especially since he had already begun site work. The restaurant and staff accommodation were awarded to contractors Alloui Mohammed and Bouceta Saber, and are currently under construction.

1.1 Foundation Profile

1.1.1 First foundation : Ben Abdel Karim El Hassan

- Name of the Foundation: E T B - Ben Abdelkarim El Hassen

1.1.2 Second foundation : Soualhi Ammar

1.1.2.1 Technical card :

- Name of the Foundation: Foundation for Construction Works in Various Phases and Real Estate Development, Soualhi Amar
- First Location: Batna, Al-Zahour District
- Branches: Biskra - Al-Mujahidin District - .. Chetma
- Activity: Completing all construction-related projects
- Date of Inception: 1993
- Class: Fifth
- Number of Offices: 3

1.1.2.2 Office stuff

Table III21 office stuff of Soualhi Amar contractor ,source: Interview with the Contractor

Office stuff		
Batna’s office	Biskra’s office	Chetma’s office
Reception Office	Reception Office	Contractor's Office
Contractor's Office	Contractor's Office:	Reception Office
Meeting room	Bathroom:	
Bathroom		
Stockage room		
Garage		

1.1.2.3 Office equipement

Table III22 office equipement of Soualhi Amar contractor ,source: Interview with the Contractor

Office equipement		
Batna's office	Biskra's office	Chetma's office
2 Desks	2 Desks	2 desks
6 Printers	4 Printers	2 printers
3 Computers	3 Computers	2 computers
6-Chair Meeting Table	6 Chairs	5 chairs
6 Chairs	2 closet	1 car
TV	4 cars	
Closet		
6 Cars		

1.1.2.4 Human Resources:

To organize work and ensure the smooth running of projects, the contracting company relies on an organizational structure that clearly defines tasks and responsibilities at various levels. This organizational table provides a comprehensive overview of the distribution of human resources within the company:

Table III23human ressources of soualhi amar contractor ,source: Interview with the Contractor

Skilled Workforce	**Technical Supervision**		
(1 point) for each worker up to (45 points)	Construction Technician (4 points)	Senior Construction Technician (4 points)	Civil Engineer and Architect (5 points)
45	4	4	5

1.1.2.5 Material Resources:

Material resources are among the fundamental pillars upon which the contracting company relies to complete its projects, as they directly contribute to improving performance and facilitating the implementation of work on the ground. In this section, we will provide an overview of the material resources and equipment available to the company:

Table III24 material ressource of soualhi amar contractor ,source: Interview with the Contractor

Material Resources		
Fixed Crane	Own (3p)	3
Mobil Crane	Own (3p)	3
Tractopelle (Backhoe loader)	Own (2p)	2
Excavator	Own (3p)	3
Concrete Mixer	Own (5p)	5
Truck 10 tons or larger	Own (7p)	7
Normal truck	Own (5p)	5

1.1.3 Third foundation : Alloui Mohammed

1.1.3.1 technical card:

- Name of the Foundation: Construction Works Company - Electricity and Irrigation - Alloui Mohamed.
- First Location: 150-unit buildings, Building No. 1, Hakim Saadane Street, Biskra.
- Activity: construction.

1.1.4 Fourd foundation : Boucetta Saber

1.1.4.1technical card:

- Name of the Foundation: Multi-purpose Boucetta establishment Boucetta Saber.
- First Location: Bab El Dharb – Biskra-.
- Activity: construction
- Date of Inception: 24/05/2004
- Class: three
- Number of Offices: 1

1.1.4.2 Office stuff

Table 25office stuff of bouceta saber contractor ,source: Interview with the Contractor

Office stuff	
Reception Office	1
Contractor's Office	1
Architecter’s office	1
Bathroom	1

1.1.4.3 Office equipement

Table III26 office equipement of bouceta saber contractor ,source: Interview with the Contractor

Office equipement	
Desks	2
Printers	1
Computers	2
Closet	1
Cars	1

1.1.4.4 Human Resources:

To organize work and ensure the smooth running of projects, the contracting company relies on an organizational structure that clearly defines tasks and responsibilities at various levels. This organizational table provides a comprehensive overview of the distribution of human resources within the company:

Table III27 human ressource of boucetta saber contractor ,source: Interview with the Contractor

Skilled Workforce	**Technical Supervision**		
(1 point) for each worker up to (18 points)	Construction Technician (1 points)	Senior Construction Technician (1 points)	Civil Engineer and Architect (2 points)
18	1	1	2

1.1.4.5 Material Resources:

Material resources are among the fundamental pillars upon which the contracting company relies to complete its projects, as they directly contribute to improving performance and facilitating the implementation of work on the ground. In this section, we will provide an overview of the material resources and equipment available to the company:

Table III28 material ressource of boucetta saber contractor ,source: Interview with the Contractor

Material Resources		
Tractopelle (Backhoe loader)	Own (1p)	1
Excavator	Own (1p)	1
Concrete Mixer	Own (4p)	4
Truck 10 tons or larger	Own (1p)	1
Normal truck	Own (2p)	2

Synthesis :

Despite its strategic importance, the project initially suffered from major delays due to the underperformance of the first contractor, Ben Abdel Karim El Hassan, who failed to make substantial progress over eight months. In response, authorities intervened by redistributing the work among three new contractors to accelerate completion. This restructuring significantly improved progress, with contractor Soualhi Ammar leading the educational and administrative buildings, while Alloui Mohammed and Bouceta Saber took over the restaurant and staff housing. The shift highlights the critical role of timely decision-making and efficient project management in rescuing stalled public infrastructure efforts. Souallhi Amar is a strong and well-established construction company, distinguished by its robust organizational structure and a clear balance between technical supervision and qualified labor. Its proprietary equipment reflects its independence and efficiency in project implementation. Its internal organization also reflects a precise allocation of roles and tasks, enabling close coordination among various stakeholders and ensuring that work is carried out under the best conditions in terms of quality, safety, and adherence to deadlines.

1.2 Timeline Evaluation

The project witnessed significant delays at the beginning due to the underperformance of the first contractor, which led to a redistribution of tasks among other contractors:

Table III29 timeline evaluation,Source: Directorate of Public Facilities – Biskra

Contractor	Assigned Work	Time Taken	Remarks
Ben Abdelkrim El Hassan	Entire project (all facilities)	8 months	Only completed an initial phase
Soualhi Ammar	Pedagogical wing + Administration wing	5 months	Completed within planned duration
Alaoui Mohamed	Restaurent	In progress	Work currently underway
Boucetta saber	Employee housing	Didn't start yet	

From this table, it is clear that redistributing the tasks helped partially recover the initial delay, particularly with contractor Ammar meeting his timeline.

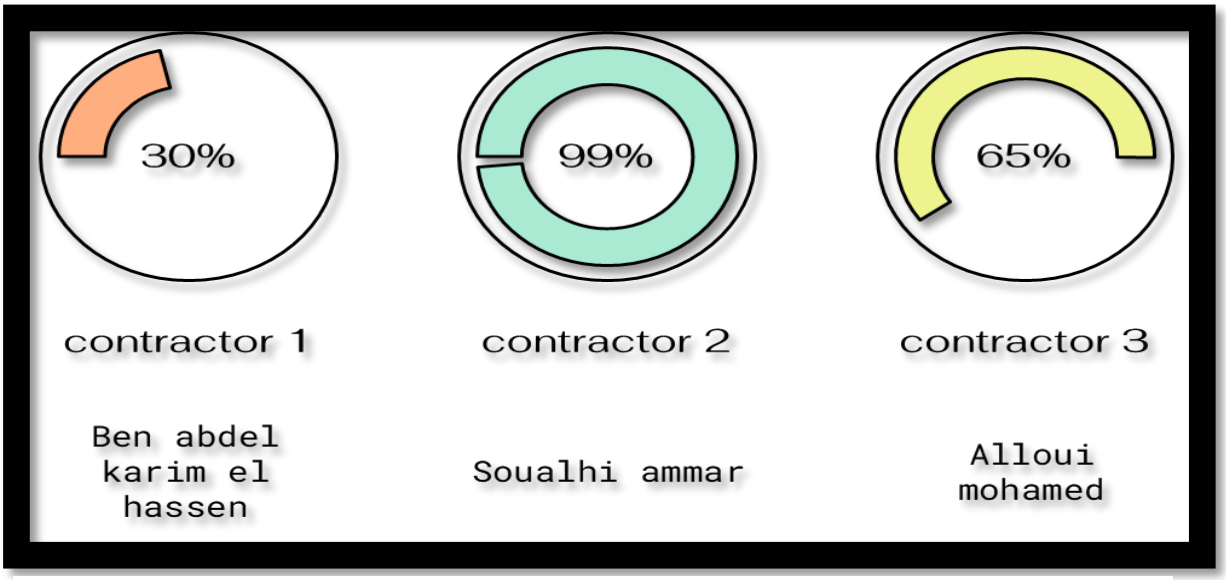


Figure III.55 percentage of contractors work ,Source: DEP of biskra adapted by the author 2025

2. The progress of the project's completion and construction work (study of completion phases)

2.1 Study the financial compenents of the project

2.1.1Restructuring the cost of works

As part of the project to build a Class C primary school in the Batna Road neighborhood, Biskra Municipality, three main financial tables were prepared, representing the various stages of project cost estimation and tracking. These tables represent a pivotal tool for assessing the effectiveness of financial planning and actual project implementation. They also help identify discrepancies between what was initially forecasted and what was actually achieved.

These tables show the financial sequence of the project and highlight the extent to which actual implementation conforms to or deviates from the initial projection. This serves as a fundamental reference for improving future project planning and efficient cost control.

2.1.1.1 Pricing for major assignments: The first table presents the initial estimated cost of the project, which served as the basis for funding and approval of the works.

Table III30 initial estimation of primary school project ,source: Schedule of Unit Rates

•Project Title: Completion of a Class C Primary School in the Batna Road Neighborhood, Biskra Municipality.
•Project Registration Number: 501/2023
Lot 01: Administrative wing + Pedagogical wing + External development, roads and various networks (VRD) + External wall

Task	Price
Administration	
Infrastructure	**1559000.00Ad**
Internal Wastewater Drainage	**97000.00Ad**
Overhead Works	**7225490.00Ad**
Construction Works	**1221000.00Ad**
Cladding	**1317580.00Ad**
Covering	**2682250.00Ad**
Waterproofing	**1157975.00Ad**
Carpentry	**2965000.00Ad**
Plumbing	**206050.00Ad**
Electricity	**610100.00Ad**
Painting and Glazing	**680650.00Ad**
Exterior Finishing	**10770800.00Ad**
External Wall	**5449000.00Ad**
Pedagogical wing	
Excavation works	**81750.00 Ad**
Infrastructure	**5146040.00 Ad**
Internal Wastewater Drainage	**278000.00 Ad**
Overhead Works	**8025830.00Ad**
Construction Works	**1466400.00Ad**
Cladding	**1828500.00Ad**
Covering	**3765400.00Ad**
Waterproofing	**1804100.00Ad**
Carpentry	**6264000.00Ad**
Plumbing	**421520.00Ad**
Electricity	**797200.00Ad**
Painting and Glazing	**942500.00Ad**

•Total Project Amount:
- Original transaction amount with full fees :79 448 130,65 Ad
- Amount of Annex No. 01 :12 538 953,66
- New transaction amount with full fees :91 987 084,31

Analyse: Table : Costs before Project Completion (Estimated Budget)

-Total Original Project Cost: 79,448,130.65 DZD (Before Adding Additional Works)

-Cost Components: Major works include the following:

- Administration Wing: Infrastructure, cladding, construction works, electricity, plumbing, and final finishing.
- Pedagogical Wing: Almost the same type of work, with different quantities and prices.

➢ The most costly components are construction works, followed by painting and glazing. Wall cladding, waterproofing, and cladding also account for substantial portions of the budget. In contrast, infrastructure and internal drainage are estimated to require relatively lower expenditures.

- **2.1.1.2 Budget at completion not the the ultimate cost at wish the project was finished**

Table III31 supplementary & addition works prices,source: Detailed Quantitative and Cost Estimate

•Project Title: Completion of a Class C Primary School in the Batna Road Neighborhood, Biskra Municipality. •Project Registration Number: 501/2023 Lot 01: Administrative wing + Pedagogical wing + External development, roads and various networks (VRD) + External wall	
Task	**Price**
Administration	
Internal Wastewater Drainage	**6000.00**
Overhead Works	**527410.00**
Cladding	**468308.00**
Covering	**690873.00**
Waterproofing	**32681.00**
Carpentry	**690000.00**
Plumbing	**13480.00**
Electricity	**305600.00**
Painting and Glazing	**729569.00**
Pedagogical wing	
Overhead Works	**33120.00**
Construction Works	**28114.00**
Cladding	**87116.50**
Covering	**41664.00**
Waterproofing	**918.00**
Plumbing	**235320.00**
Electricity	**100000.00**
Painting and Glazing	**39840.00**
External landscaping, roads and various networks	
sewage network	**200000.00**
External lighting	**690050.00**
External landscaping	**1527098.00**
External Wall	
External Wall	**604398.00**
•Total Project Amount: Total excluding fees:8 385 019,50Ad Value added tax of 19%:1 593 153,70 New transaction amount with full fees :9 978 173,20	

Analyse : Table : Additional Work Costs

-Total additional work cost with fees: 9,978,173.30 DZD

-Additional Work Components: Additional work on the same tasks mentioned above and addition of new components such as:

- External lighting
- External landscaping
- Sewage network

➢ Significant expenses were noted for cladding, painting, and carpentry. The inclusion of the drainage network, lighting, and external landscaping suggests an expansion of the original project scope or the completion of additional elements initially excluded. Certain items, like waterproofing, incurred limited costs, reflecting a reduction or efficient resource usage.

2.1.1.3 The ultimate cost at which the project was finished :

The third table represents the final cost of the project after completion, reflecting all actual expenditures, including modifications and expansions.

Table III32 the finish cost ,source: General and Final Account Statement

•Project Title: Completion of a Class C Primary School in the Batna Road Neighborhood, Biskra Municipality. •Project Registration Number: 501/2023 Lot 01: Administrative wing + Pedagogical wing + External development, roads and various networks (VRD) + External wall	
Task	**Price**
Administration	
Infrastructure	**1708359.00**
Internal Wastewater Drainage	**97000.00**
Overhead Works	**8450796.00**
Construction works	**1410435.00**
Cladding	**2210843.00**
Covering	**7418079.00**
Waterproofing	**1176620.50**
Carpentry	**5241000.00**
Plumbing	**184420.00**
Electricity	**884300.00**
Painting and Glazing	**1171929.00**
Pedagogical wing	
Excavation works	**132195.35**
Infrastructure	**6219928.00**
Internal Wastewater Drainage	**193000.00**
Overhead Works	**7261656.00**
Construction Works	**1364770.00**
Cladding	**1610214.50**
Covering	**3521922.00**
Waterproofing	**1491542.50**

Carpentry	**4735800.00**
Plumbing	**617240.00**
Electricity	**823550.00**
Painting and Glazing	**508650.00**
External landscaping, roads and various networks	
sewage network	**1028325.65**
External lighting	**1939050.00**
External landscaping	**7365155.50**
External Wall	
External Wall	**4356575.15**
•Total Project Amount: - Total excluding fees:81049956.56 - Value added tax of 19%:15 399 491.76 - New transaction amount with full fees :96 449 448.41	

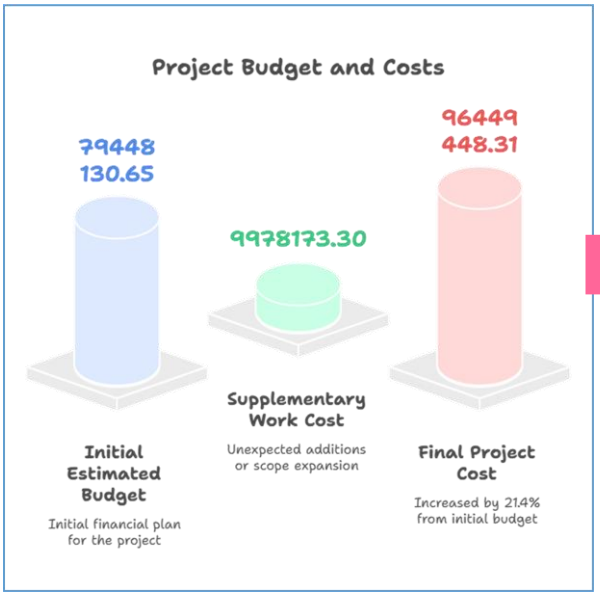
Analyse : Table: Cost after Project Completion

-Total Final Cost with Fees: 96,449,448.31 DZD

-Compared to the Estimated Budget: The final cost increased by 17,001,317.66 DZD compared to the original estimate. That's an increase of approximately 21.4% over the original estimate.

- Significant additions were made that were not part of the initial plan, including external walls, outdoor spaces, lighting, and drainage networks. Additionally, some elements experienced a twofold increase, such as painting and glazing, construction work, and cladding.

Synthesis:



The project experienced a notable cost increase due to supplementary works and expanded scope, reflecting either poor initial estimation or justified project enhancements. Better pre-project studies and tighter cost control could reduce such deviations in future projects.

Figure III56 project budget and costs synthesis ,source: the author2025

2.2 Study the time compenets of the project (excuting phases)

The following table presents the chronological sequence of the execution stages of the primary school construction project, starting from the initial works up to the completion of the external landscaping. It includes the dates of each stage, along with explanatory notes and on-site images that document the progress of the work. This overview provides a clear picture of how the project advanced throughout its various implementation phases.

Table III33 excuting phases of the primary school Source: Site Supervision Report adapted by the author 2025

Completion phases	Day date	Observation	Picture
Excavation and Pouring Clean Concrete	**18/11/2022**	The project began with essential excavation work, followed by pouring a layer of clean concrete to create a solid and level base for the structure.	 *Figure III57 Exavation & pouring clean concrete , phase Source: Site Supervision Report*
Infrastructure	**30/11/2022**	This stage included the installation of essential underground networks such as water, sewage, and electricity, along with the pouring of the foundation that supports the concrete structure.	 *Figure III58 Infrastructure phase Source: Site Supervision Report*
superstructure	**9/12/2023**	Columns, load-bearing walls, and slabs were constructed, forming the vertical structure of the school. The image shows a complete concrete frame with multiple floors.	 *Figure III59 superstructure phase Source: Site Supervision Report*

Construction works	**6/1/2024**	Brickwork and concrete works were carried out to build internal and external walls, defining the functional spaces of the school such as classrooms and corridors.	 *Figure III60 construction works phase Source: Site Supervision Report*
Waterproofing	**2/3/2024**	This phase included covering roofs and/or foundations with waterproof materials to protect the building from water leakage and ensure long-term durability.	 *Figure III61 waterproofing phase Source: Site Supervision Report*
Carpentry	**202/03/224**	Doors, windows, and wooden frames were installed throughout the building, contributing to the completion of the interior layout.	 *Figure III62 carpentry phase Source: Site Supervision Report*
Plumbing	**4/4/2024**	Water and sewage lines were installed inside the building, connecting to sanitary facilities like toilets and sinks.	 *Figure III63 plumbing phase Source: Site Supervision Report*

Painting and Glazing	**26/6/2024**	Interior and exterior walls were painted with school-appropriate colors, and glazing was installed for windows and glass doors.	 *Figure III64 painting & glazing phase Source: Site Supervision Report*
External landscaping	**30/10/2024**	In the final stage, paving and tiling were completed in the outdoor areas, with pathways and school yards prepared in a functional and visually appealing way.	 *Figure III65 external landscaping phase Source: Site Supervision Report*

2.2.1 Execution Process Analysis:

By reviewing the table, it is evident that the project followed a structured sequence, starting with preliminary works and infrastructure, followed by the construction of the concrete frame, and concluding with secondary and finishing works. However, a notable observation is the significant time gap between the infrastructure stage (30/11/2022) and the superstructure stage (09/12/2023), which spans over a year. This suggests a possible interruption in the work or delays due to external factors such as funding issues, technical challenges, or administrative constraints.

The subsequent stages progressed at a more regular pace, particularly from January to October 2024, indicating a clear and organized resumption of activities, especially in the final works such as painting,carpentry, and external landscaping.
Overall, the execution process demonstrates a relative adherence to the logical sequence of project implementation. Nevertheless, the extended delay during a critical phase highlights the need to improve scheduling coordination and project monitoring mechanisms in future projects.

2.3 Project Schedule Simulation Using MS Project:

Project management is considered one of the key elements in ensuring the successful completion of works on time, with the required quality, and within the allocated budget. Among the tools that enable engineers and project managers to efficiently organize and sequence tasks is **MS Project**, which is used to define activities, estimate durations, and logically link tasks based on well-planned dependencies.

In this context, the aim of this study is to simulate the project schedule for the construction of a type C primary school using MS Project, and to compare the results between the theoretical planning and the actual on-site progress. This type of analysis helps assess how realistic the theoretical schedule is, its effectiveness in predicting time-related issues, and identifying deviations and their causes.

2.2.2 Theoretical Project Schedule Simulation:

The theoretical schedule for the "Construction of a Type C Primary School" project was developed using MS Project, based on technical documentation and the main planned phases of the project prior to the start of construction works. This schedule includes the sequence of activities, their durations, start and end dates for each task, as well as the dependencies between them.
"Based on this, the major tasks involved in the execution of the project can be identified."

Table III34 major tasks ,Source: planning

No.	Task Description	Duration (Weeks)	Start Date	End Date
1	Infrastructure	9 week	22/12/23	23/02/24
2	Superstructure	13 weeks	11/01/24	18/04/24
3	Construction works	12 weeks	01/02/24	26/04/24
4	Waterproofing	3 weeks	01/05/24	24/05/24
5	Carpentry	7 weeks	24/05/24	07/06/24
6	Plumbing	2 weeks	29/04/24	17/06/24
7	Painting and Glazing	4 weeks	29/04/24	05/08/24
8	External landscaping	12 weeks	29/04/24	02/07/24

According to the earlier table, the theoretical timeline for the primary school completion project was like this :

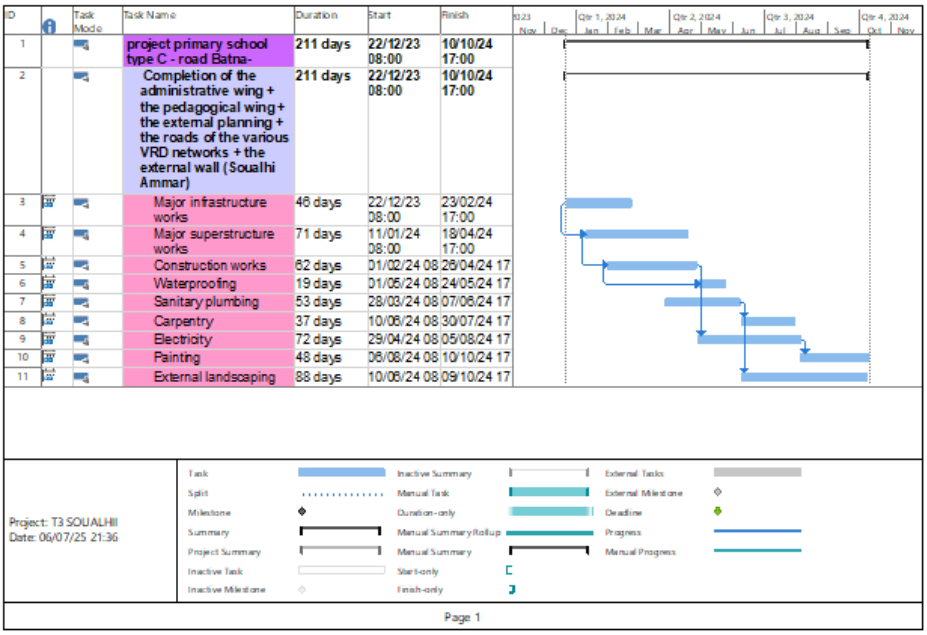


Figure III.66 theorical gantt chart of the project, source: the author 2025

2.2.2.1 Analysis and Evaluation of the Schedule for the Primary School Construction Project - Batna Road (Soualhi Ammar)

The last simulation provides an overview of how the project was organized theoreticaly Through the figure shown for the simulation, the schedule can be analyzed through:

- ❖ Overall Structure of the Schedule

The project runs from 22/12/2023 to 10/10/2024, lasting 211 days.
It consists of a series of overlapping and sequential phases covering all aspects: infrastructure, superstructure, construction, interior and exterior finishing.
The schedule is divided into one main task (rows 1 and 2), covering all works, which is a common approach in managing large public projects.

- ❖ Scheduling and Timeline Analysis

Infrastructure: - Duration: 46 days

- From: 22/12/2023 to 23/02/2024
- Note: This is the project's starting point, with no apparent delays, indicating a positive beginning.

Superstructure: -Duration: 71 days

- From: 11/01/2024 to 18/04/2024

- Note: Starts 14 days after infrastructure begins (overlap), showing smart time management.

Construction Works: - Duration: 62 days

- From: 02/04/2024 to 26/06/2024

- Note: Starts before superstructure work finishes, which speeds up the process but requires strict supervision to avoid conflicts.

- ❖ Task Overlaps

Positives:

- There is overlap between several key tasks which shortens the project duration:
- Electrical and plumbing works run parallel to construction and finishing.
- Painting and external landscaping are done concurrently, enabling timely project completion.

Negatives:

- Heavy overlap may lead to crowding of teams on site, causing:
- Space conflicts.
- Logistical challenges.
- A high need for daily coordination.

2.2.3 Actual Project Schedule Simulation:

The actual project schedule was developed based on real data collected through periodic reports during the execution of the project, prepared by the supervisory authority and the contractor. This schedule reflects the actual progress of the work, including modifications to activity durations, recorded delays, and any changes in task sequencing.

The following table summarizes all project tasks performed by each contractor and the actual time it took. :

Table III35 all project tasks source: Progress Reports of Works + Interview with the architect

Task Description	Duration (Weeks)	Start Date	End Date
project primary school type C - road Batna-	**639 days?**	**26/09/22 08:00**	**27/02/25 17:00**
Lot No. 01: The administrative wing + the educational wing + the health wing + external landscaping and roads and various networks (VRD) + the external fence + restaurent (Ben abdel karim el hacen)	**175 days?**	**26/09/22 08:00**	**26/05/23 17:00**
Excavation works	**39 days?**	**26/09/22 08:00**	**17/11/22 17:00**
Major infrastructure works	**127 days?**	**30/11/22 08:00**	**25/05/23 17:00**
Suspension of works	**1 day?**	**26/05/23 08:00**	**26/05/23 17:00**
Completion of the administrative wing + the pedagogical wing + the external planning + the roads of the various VRD networks + the external wall (Soualhi Ammar)	**259 days?**	**15/11/23 08:00**	**03/11/24 17:00**
Major infrastructure works	**18 days?**	**15/11/23 08:00**	**08/12/23 17:00**
Major superstructure works	**29 days?**	**29/11/23 08:00**	**06/01/24 17:00**
Construction works	**44 days?**	**21/12/23 08:00**	**18/02/24 17:00**
Plastering	**32 days?**	**05/02/24 08:00**	**15/03/24 17:00**
Waterproofing	**17 days?**	**18/03/24 08:00**	**08/04/24 17:00**
Sanitary plumbing	**7 days?**	**23/03/24 08:00**	**01/04/24 17:00**
Carpentry	**75 days?**	**02/03/24 08:00**	**11/06/24 17:00**
Electricity	**98 days?**	**12/03/24 08:00**	**23/07/24 17:00**
Painting	**75 days?**	**22/03/24 08:00**	**03/07/24 17:00**
External landscaping	**119 days?**	**11/06/24 08:00**	**22/11/24 17:00**
Completion of the restaurant (Aloui Mohamed)	**193 days?**	**04/06/24 08:00**	**27/02/25 17:00**
Major infrastructure works	**65 days?**	**04/06/24 08:00**	**02/09/24 17:00**
Major superstructure works	**30 days?**	**04/09/24 08:00**	**15/10/24 17:00**
Construction works	**41 days?**	**16/10/24 08:00**	**11/12/24 17:00**
Plastering	**15 days?**	**17/12/24 08:00**	**06/01/25 17:00**
Waterproofing	**10 days?**	**03/10/24 08:00**	**16/10/24 17:00**
Painting	**31 days?**	**16/01/25 08:00**	**27/02/25 17:00**
Completion of the functional housing project (Bousta Saber)	**1 day?**	**14/05/25 08:00**	**14/05/25 17:00**
excavation	**1 day?**	**14/05/25 08:00**	**14/05/25 17:00**

According to the earlier table, the actual timeline for the primary school completion project was like this :

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**project primary school type C - road Batna-**	**639 days?**	**26/09/22 08:00**	**27/02/25 17:00**	
2		**Lot No. 01: The administrative wing + the educational wing + the health wing + external landscaping and roads and various networks (VRD) + the external fence + restaurent (Ben abdel karim el hacen)**	**175 days?**	**26/09/22 08:00**	**26/05/23 17:00**	
3		Excavation works	39 days?	26/09/22 08	17/11/22 17	
4		Major infrastructure works	127 days?	30/11/22 08	25/05/23 17	3
5		Suspension of works	1 day?	26/05/23 08	26/05/23 17	4
6		**Completion of the administrative wing + the pedagogical wing + the external planning + the roads of the various VRD networks + the external wall (Soualhi Ammar)**	**259 days?**	**15/11/23 08:00**	**03/11/24 17:00**	
7		Major infrastructure works	18 days?	15/11/23 08	08/12/23 17	5
8		Major superstructure works	29 days?	29/11/23 08	06/01/24 17	
9		Construction works	44 days?	21/12/23 08	18/02/24 17	
10		Plastering	32 days?	05/02/24 08	15/03/24 17	
11		Waterproofing	17 days?	18/03/24 08	08/04/24 17	7
12		Sanitary plumbing	7 days?	23/03/24 08	01/04/24 17	7
13		Carpentry	75 days?	02/03/24 08	11/06/24 17	9
14		Electricity	98 days?	12/03/24 08	23/07/24 17	10SS+7 days
15		Painting	75 days?	22/03/24 08	03/07/24 17	10
16		External landscaping	119 days?	11/06/24 08	22/11/24 17	
17		**Completion of the restaurant (Aloui Mohamed)**	**193 days?**	**04/06/24 08:00**	**27/02/25 17:00**	
18		Major infrastructure works	65 days?	04/06/24 08	02/09/24 17	
19		Major superstructure works	30 days?	04/09/24 08	15/10/24 17	18
20		Construction works	41 days?	16/10/24 08	11/12/24 17	19
21		Plastering	15 days?	17/12/24 08	06/01/25 17	20
22		Waterproofing	10 days?	03/10/24 08	16/10/24 17	18

Figure III.67 actual gantt chart ,source: the author 2025

2.2.3.1 Analysis and Evaluation of the actual Schedule

❖ Total Project Duration:

The project spans 639 days (from 26/09/2022 to around 17/06/2025).

Main Project Structure is divided into:

- Lot No. 01: Includes the administrative and educational wings, health wing, external landscaping and networks, fencing, and the restaurant (Ben Abdelkarim El Hacen).
- suspension of works
- lot01 : Completion of the Administrative and Pedagogical Wings (Soualhi Ammar).
- lot02 :Completion of the Restaurant (Alloui Mohamed).
- lot03:Completion of the Functional Housing Unit (Boucetta Saber).

❖ Section and Task Analysis

- Lot No. 01 (Start: 26/09/2022 – End: 26/05/2023)

Tasks archeived :

- Excavation Works (26/09/2022 – 17/11/2022)
- Major Infrastructure Works (25/10/2022 – 06/02/2023)
- Suspension of Works for one day (25/05/2023), likely indicating a temporary pause (administrative / technical).

- Completion of the Administrative + Pedagogical Wings (15/11/2023 – 01/08/2024)

Includes:

- (Infrastructure, superstructure, construction, painting, waterproofing, plumbing, electricity, and external landscaping).
- Significant task overlap suggests parallel work, aimed at saving time.

- Completion of the Restaurant (Alloui Mohamed) (02/03/2024 – 31/07/2024)

- Follows a similar task sequence: infrastructure, superstructure, construction, painting, etc.

- Completion of the Functional Housing Unit (Boucetta Saber)
  - Very short duration: 14/05/2025 to 17/05/2025 (only 3 days).
  - Only one task listed: Excavation.

Synthesis :

By analyzing both Gantt charts for the project, a clear difference is observed between the planned schedule and the actual schedule in terms of duration, scope, and task organization. The key findings are as follows:

- Difference in Project Scope:
  The first (planned) schedule represents only a specific portion of the project — namely the administrative and pedagogical building wing, assigned to a single contractor (*Soualhi Ammar*). In contrast, the actual schedule covers the entire project, including additional components such as the restaurant, external landscaping, and a functional housing unit, executed by multiple contractors (*Ben Abdelkrim El Hassan, Soualhi Ammar, Alloui Mohamed, and Bousta Saber*).
- Significant Time Gap:
  The theoretical duration was estimated at 211 days, while actual execution took 639 days, mainly due to the expanded project scope, the involvement of multiple contractors, and a formal work suspension recorded on 26/05/2023.
- Task Complexity and Overlap:
  The actual Gantt chart shows a more complex structure, with overlapping tasks, multiple project lots, and parallel execution paths. This contrasts with the planned schedule, which follows a linear and simplified sequence of activities.
- Need for Realistic Planning:
  The initial plan underestimated the true scope and challenges of the project. It did not account for contractor diversity, future expansions, or real-world delays — highlighting the critical importance of realistic and integrated scheduling based on thorough site studies and stakeholder coordination.

Synthesis :

"By analyzing the project's progress, cost variances, and schedule delays, it becomes evident that the initially planned final deadline was not respected, which confirms a misalignment between the theoretical timeline and the actual execution realities."

3.Comparative Study with a Reference Example:

3.1 Reference Example Project:

3.1.1 Technical card:

• Project Name: Construction of a Class C School Complex in Baalb Bouassid, Biskra Municipality -- el daraji ammar--

• Project Location: The project is located in the 275 LPA neighborhood, El Ghrous Municipality, Biskra Province.

• Owner: Directorate of Education, Biskra Province.

• Studies and Follow-up Office: bachir ben madour

• Contractor: Public Works and Irrigation Company, Hamdi Tawfiq.

• Completion Period: 16 months.

• Work Start Date: October 30, 2018.

• Monitoring Authority: Technical Control Authority (CTC)

Figure III68 daraji amar ben el eid primary school,source:interview with the architect

3.1.2 Restructuring the cost of works

As part of the comparative analysis between theoretical and actual project implementation, the following table presents the cost breakdown (Bill of Quantities) for a reference project of the same type. The selected project is a Class C primary school located in Baalb Bouassid, Biskra, registered under project number 544/2015. This table includes the main components and work packages executed for Lot 1, which consists of the administrative wing, multi-service hall, restrooms, nine classrooms, and two staircases.

The table below details the unit costs of major construction activities, covering excavation, infrastructure, construction, plumbing, carpentry, electrical works, and finishing, along with the total project cost before and after tax.

Table III36 restructring the cost of works of daraji amar primary school,source: Directorate of Public Facilities – Biskra

•Project Title: : Construction of a Class C School Complex in Baalb Bouassid, Biskra Municipality.
•Project Registration Number: 2015/544
Lot 1: Administration + Multi-Service Hall + Restrooms + 9 Classrooms + 2 Staircases

Task	Price
Pedagogical wing + Administration	
Excavation works	**845525,80Ad**
Infrastructure	**9740206,00Ad**
Internal Wastewater Drainage	**5127748,00Ad**
Construction Works	**7876664,00Ad**
Waterproofing	**2654059,00Ad**
Carpentry	**2289000,00Ad**
Plumbing	**569900,00Ad**
Electricity	**916780,00Ad**
Painting and Glazing	**1025296,20Ad**
Total Project Amount: - Total excluding fees:40 785 385,00 - Value added tax of 19%:7 749 223,15 - New transaction amount with full fees :48 534 608,15	

Analysis of the cost structure of the reference project:

Through studying the quantity table of the primary school construction project of class "C" in the municipality of Baalab Bouassid (phase 1), a set of important observations can be drawn regarding the distribution of costs and the importance of each category of works within the overall structure of the project.

- Cost distribution by type of works The infrastructure works represent the largest part of the cost at 9,740,206.00 DZD, reflecting the importance of foundations and land preparation in such educational projects.
  The major construction works (the concrete structure and walls) come in second at 7,876,664.00 DZD, which aligns with the construction nature of the building.
  The internal sewage network reached 5,127,748.00 DZD, a significant figure indicating the project's attention to health and environmental aspects.
  Waterproofing works were estimated at 2,654,059.00 DZD, highlighting the concern for quality insulation and protecting the facility from dampness and groundwater.
- Proportion of secondary costs Carpentry, electricity, and plumbing collectively represent approximately 3,770,680.00 DZD, which is essential to ensure the internal functions of the building even though they represent a smaller percentage compared to the major works.
  Final finishing works (painting and glazing) were estimated at 1,025,296.20 DZD, the last stage before handing over the project, reflecting the importance of aesthetic aspects and final finishes.
- Overall financial analysis Total amount before tax: 40,785,385.00 DZD
  Added value (VAT 19%): 7,749,223.15 DZD
  Final total amount: 48,534,608.15 DZD

This amount reflects the true cost of completing this type of project in the Algerian local context, and it can be relied upon as a reference indicator for comparing with similar projects, whether in terms of economic feasibility or budget estimation in new projects.

3.1.3 Reference Example Project Schedule Simulation

A Gantt chart was created to depict the order of important activities necessary for constructing a Class C school complex in the municipality of Baalb Boussaid, located in the Biskra district.

This chart visually represents the project timeline, highlighting the dates for starting and finishing tasks, the time required for each task, and the sequential dependencies among them, such as excavation, infrastructure, structure, and final finishing work.

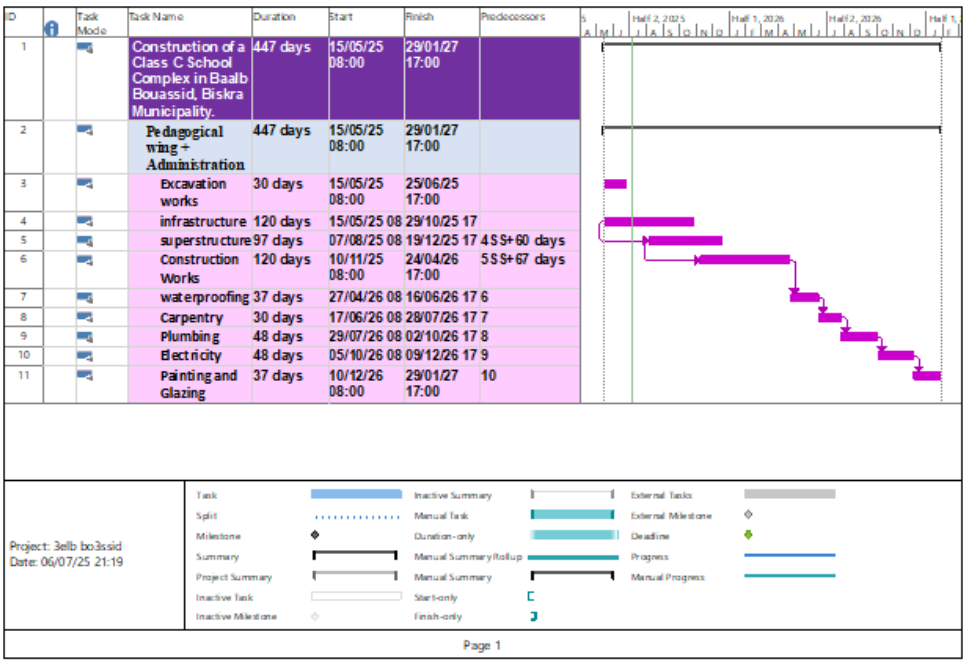


Figure III.69 simulation of daraji ammar primary school planning ,source: the author 2024

Analyse : This image shows a Gantt chart for the project — the construction of a Class C School Complex in Baalb Bouassid, Biskra Municipality —

- Start Date: 30/10/2018
- End Date: 15/07/2020
- Project Duration: 447 days

From the previous chart showed the following:

- Time overlap between tasks: Some tasks do not wait for the completion of the previous one .
- Task interconnection: Each task is almost dependent on its predecessor, demonstrating a precise logical sequence.
- Progress: The progress rate for each task is not shown in this version of the chart, although there is a key for the "Progress" symbol.
- Gantt chart: Clearly displays the timeline over a period spanning late 2018 to mid-2020.

3.2 Comparaison between projects :

In order to evaluate the performance of two projects for educational institutions—the Bin Dahman Bin Mubarak School project and the Draji Amar Bin Al-Eid School project—an analytical methodology was adopted based on two fundamental techniques in project management: Earned Value Analysis (EVA) and the Critical Path Method (CPM).

- The Earned Value Analysis (EVA) allows for measuring the actual progress of the project compared to the plan in terms of cost and duration, through quantitative indicators such as: Financial Performance Index (CPI) and Schedule Performance Index (SPI). This technique is useful to determine whether the project is on budget and on schedule.

- The Critical Path Method (CPM) is used to analyze the project schedule by identifying the sequence of critical tasks that directly affect the completion duration. Any delay in these tasks will necessarily lead to a delay in the project.

Reason for choosing these two techniques These tools were chosen because they provide a comprehensive perspective: EVA highlights deviations in terms of cost and time numerically. CPM explains these deviations by analyzing the sequence and interrelation of tasks.

Since one of the projects was completed by several contractors and the other by a single contractor, these tools help analyze the impact of that on overall performance from both financial and temporal aspects.

3.2.1 First: Analysis Using Earned Value Analysis (EVA)

❖ Key EVA Metrics: *Table III37 key EVA metrics,source: (management of projects 2013-2012 , ادارة المشروعات)*

Symbol	Definition	Formula
PV	Planned Value	The value of work scheduled
EV	Earned Value	The value of work actually performed
AC	Actual Cost	The actual cost incurred
CPI	Cost Performance Index	EV / AC
SPI	Schedule Performance Index	EV / PV
CV	Cost Variance	EV - AC
SV	Schedule Variance	EV - PV

❖ **Project: Ben Dahman Ben Mbarek School**

Project Data:

- **PV (Planned Value)** = 81,049,956.56 DZD
- **AC (Actual Cost)** = 96,449,448.41 DZD
- Duration: 639 days
- Suspension period: 173 days
- Estimated progress: 90% (based on Gantt chart and timeline)

Calculations:

- EV = 90% × PV = 0.90 × 81,049,956.56 = 72,944,960.9 DZD

➢ $\mathbf{CPI = \frac{EV}{AC} = \frac{72,944,960.9}{96,449,448.41} \approx 0.76}$

➢ $\mathbf{SPI = \frac{EV}{PV} = \frac{72,944,960.9}{81,049,956.56} \approx 0.90}$

- CV = EV - AC = 72,944,960.9 - 96,449,448.41 = -23,504,487.5 DZD
- SV = EV - PV = 72,944,960.9 - 81,049,956.56 = -8,104,995.66 DZD

Interpretation:

- **CPI < 1**: The project is over budget.
- **SPI < 1**: The project is behind schedule.

Negative **CV** and **SV** indicate poor cost and time performance

❖ **Project: Draaji Ammar Ben El Aid School**

Project Data:

- **PV = EV** = 40,785,385.00 DZD
- **AC** = 48,534,608.15 DZD
- Duration: 447 days
- Completion: 100% (project delivered as scheduled)

Calculations:

- EV = PV = 40,785,385.00 DZD
- ➢ $\mathbf{CPI = \frac{EV}{AC} = \frac{40{,}785{,}385}{48{,}534{,}608.15} \approx 0.84}$
- ➢ $\mathbf{SPI = \frac{EV}{PV} = 1.00}$
- **CV = EV - AC = -7,749,223.15 DZD**
- **SV = 0 DZD**

Interpretation:

- **CPI < 1**: The project exceeded the planned budget.
- **SPI = 1**: The project is on time.
- Cost performance is weak, but schedule adherence is strong.

❖ **EVA Performance Comparison Summary**

Table III38 EVA performance comparison summary ,source:the author2025

Metric	Ben Dahman	Draaji Ammar	Better Project
PV	81 million DZD	40.78 million DZD	—
EV	72.94 million DZD	40.78 million DZD	—
AC	96.44 million DZD	48.53 million DZD	—
CPI	0.76	0.84	Draaji Ammar
SPI	0.90	1.00	Draaji Ammar
CV	-23.5 million DZD	-7.75 million DZD	Draaji Ammar
SV	-8.10 million DZD	0	Draaji Ammar

3.2.2 Second: Analysis Using Critical Path Method (CPM)

CPM Overview: The critical path is the longest sequence of tasks in a project. Any delay in this sequence delays the whole project.

❖ **Ben Dahman ben mbarek Project (Gantt Analysis):**

- The project experienced a **173-day suspension** which likely affected the critical path.
- Coordination challenges due to **multiple contractors (4 total)**.
- The critical path likely includes: Resumption of works → construction → electricity → carpentry → finishing → external works
- Parallel task dependencies increase risks of delay propagation.

❖ **Draji Ammar ben el eid Project (Gantt Analysis):**

- Smooth sequentialworkflow: Excavation → infrastructure → superstructure → construction → carpentry → plumbing → painting
- Clear and controlled critical path.
- Project duration: 447 days (achieved without visible interruptions or deviations).
- Managed by a single contractor, contributing to time efficiency.

Based on advanced project control tools (EVA and CPM):

• The Draaji Ammar project achieved better schedule adherence, completing on time (SPI = 1).

• Both projects had budget overruns, but Ben Dahman had severe cost inefficiency (CPI = 0.76).

• The use of multiple contractors in the Ben Dahman project negatively impacted synchronization and critical path continuity, leading to suspension and delay.

• In contrast, the single-contractor model in Draaji's project ensured streamlined task execution and better time performance.

4. Obstacles and incidental causes facing the approved project

The project to complete the primary school in the Batna Road neighborhood in the Biskra municipality faced a number of field and organizational obstacles that directly impacted the completion period and progress of work. Among the most prominent of these obstacles were:

a) Multiple contractors assigned to the project: The project was divided among three subcontractors, which led to:
   - A lack of close coordination between the work teams.
   - Each contractor handled a different part of the project (administrative wing, pedagogical wing, external works), creating difficulties in ensuring temporal and technical integration.
   - A conflict in intervention schedules, particularly for overlapping tasks (such as the concrete structure and interior fit-outs).
   - Repeated downtime between the completion of one contractor's work and the start of another's, which negatively impacted the project's critical path.
   - Delayed delivery of some components led to delays in the remaining phases, thus derailing the schedule.

b) Prolonged work stoppages: The project experienced a 173-day stoppage due to administrative procedures related to changing contractors and reviewing the remaining parts of the work, significantly extending the completion period.

c) Difficult soil conditions: The project was implemented on terrain with difficult geotechnical characteristics, which required:
   - Additional support work for the foundations (possibly not planned in advance).

- Adjustments to the implementation method to avoid landslides or landslides, which increased the cost and duration of the work.

d) Weak technical follow-up in some phases: Due to the complexity of the tasks and the multiple stakeholders involved, there was insufficient field follow-up to ensure real-time coordination and avoid delays. This allowed landslides to accumulate over time without being addressed immediately.

4.2 Project Analysis from a Time-Cost Perspective (Project Management Triangle)

In terms of schedule: a delay of more than five months from the original schedule was recorded.

This was due to stoppages, re-assignments, poor coordination, and soil modifications.

The Time Performance Index (SPI) of 0.90 reflects a 10% delay from the planned progress.

In terms of costs: the project recorded a significant financial slippage compared to the original planned cost. Unforeseen expenses were also added, such as:

- Reinforcement works,
- Re-work, and the cost of new contracts.

The Financial Performance Index (CPI) of 0.76 indicates that for every dinar spent, only 0.76 dinars of the completed value was achieved, representing a waste of financial resources.

Synthesis :

This analysis revealed that the technical and administrative obstacles faced by the project clearly impacted the schedule, through increased indirect costs and deteriorating quality indicators.

5.Interpretation of results :

5.1 From the financial perspective (Cost Analysis):

The project experienced unplanned cost increases due to a combination of factors:

- Additional work due to soil difficulty.
- Changing and terminating contracts with contractor Bin Abdul Karim Al Hassan.
- Reassigning work to new contractors - Sawalhi Ammar + Alawi Muhammad + Bousta Saber-
- Restarting some tasks due to technical reservations or deterioration of stalled work.
- These increases resulted in:
- A decrease in the Financial Performance Index (CPI = 0.76): This means that the project is not utilizing its financial resources efficiently.
- The project budget was wasted without achieving the desired progress.

5.2 From the time perspective (Schedule Analysis):

The project experienced significant delays in completion:

- Work was halted for approximately 173 days.
- Delays in the implementation of some work due to slow coordination between contractors.
- This resulted in:
- A decrease in the time performance index (SPI = 0.90): The project is progressing 10% slower than planned.
- According to the simulation results of the approved project schedule,

"The analysis of scheduling performance indicates that delays in execution, particularly due to contractor changes and administrative interruptions, directly impacted the project's ability to meet its final deadline, underscoring the strong correlation between effective time planning and deadline achievement."

5.3Causal Relationship: The Impact of Cost on Time

Through this project, three primary mechanisms can be identified that link cost increases to deadline slippage:

- Unexpected cost increases necessitated administrative actions (such as re-awarding contracts or adjusting budgets), which took time and halted construction.
- The budget pressures resulting from these costs led to temporary underfunding of some projects, leading to their postponement.
- Repair and redevelopment expenses diverted resources from upcoming projects, leading to an accumulation of delays.

Synthesis:

Any cost variance, especially when unplanned, directly leads to a deviation in the project schedule. Based on the actual project data:

A significant cost increase (over 19% due to additions and interruptions)

led to a delay of more than five months from the scheduled completion date.

Thus, the direct answer to The Impact of Cost on Time is :

The increase in unplanned completion costs had a direct negative impact on the realization deadline. Cost overruns—caused by contractor changes, site issues, and work suspensions—led to delays in project delivery, confirming a proportional relationship between cost increases and schedule slippage.

6.Recommendations and Suggestions

Based on the findings of the study of the Ben Mbarek Dahman Elementary School project, its comparison with the reference project, and an analysis of its financial and timeline indicators, the following recommendations can be proposed:

- **Administrative and Organizational Recommendations**

- Avoid Multi-Contractor Execution: Future projects should avoid dividing the work among multiple contractors, which leads to miscoordination, overlapping responsibilities, and scheduling conflicts.
- Improve Public Procurement Procedures: Revise qualification criteria to ensure that selected contractors possess sufficient financial, technical, and managerial capacity.

- Strengthen Monitoring and Supervision: Enhance the role of design offices and project inspectors throughout the construction process to maintain control over time and cost deviations.

➢ **Technical and On-Site Recommendations**

- Conduct Detailed Soil Studies in Advance: To prevent delays caused by unexpected ground conditions, comprehensive geotechnical investigations must be conducted before launching the project.
- Develop a Flexible and Realistic Schedule: Incorporate time buffers and alternative execution scenarios to accommodate unforeseen events.

➢ **Cost Management Recommendations**

- Apply Earned Value Management (EVM): Adopt this methodology from the early phases of the project to monitor cost and schedule performance consistently.
- Include a Financial Contingency Reserve: Allocate a fixed percentage of the budget to cover unforeseen expenses without affecting critical activities.
- Define Delay Cost and Responsibility Clearly: Ensure contract documents specify who bears the cost of delay and under which conditions.

➢ **Quality Control Recommendations**

- Implement a Project Quality Assurance Plan (PAQ): Introduce a structured QA plan to ensure that any cost increase is matched with measurable quality outcomes.
- Integrate Performance Indicators: Establish Key Performance Indicators (KPIs) for cost, schedule, and quality, and use them as a reference throughout project execution.

➢ **General recommendations**

- Strict contractor capability assessment: Ensure contractors have the necessary resources and workforce, with a detailed execution timeline.
- Regular on-site technical supervision: Increase monitoring visits by technical services and consulting offices to ensure compliance with quality standards.
- Emergency procedures for delays: Establish rapid-response mechanisms when excessive delays are detected (e.g., formal warnings, contract termination, reallocation).
- Encourage coordination among contractors: Assign a technical coordinator to oversee scheduling and ensure smooth interaction between teams.
- Streamline administrative and financial processes: Accelerate approval and payment workflows to prevent work stoppages due to funding issues.

Conclusion :

This chapter has presented a detailed administrative evaluation of the Ben Mbarek Dahman Elementary School project, exploring its financial and schedule-related dimensions using modern project control tools such as MS Project, Earned Value Analysis (EVA), and the Critical Path Method (CPM). The practical analysis confirmed the direct connection between administrative decisions, contractor performance, and the overall efficiency of the project.

Although the project was identified as a top-priority public initiative due to increasing demand in the Batna Road neighborhood, it initially suffered considerable delays. These were largely attributed to the underperformance of the first contractor, which prompted authorities to redistribute tasks among three new contractors. This restructuring significantly improved progress but introduced new complexities in terms of coordination and schedule integration.

The execution process, while logical in structure, revealed a major interruption between the infrastructure and superstructure phases—highlighting the need for tighter monitoring and contingency planning. Furthermore, the comparison between the theoretical and actual Gantt charts emphasized how the original planning underestimated the project's true complexity and failed to account for possible interruptions, cost changes, or contractor reassignments.

The application of EVA and CPM revealed that while some project components achieved time efficiency, the project as a whole experienced budget overruns and delays due to cost increases and administrative setbacks. This analysis clearly showed the proportional relationship between cost variances and schedule deviations, confirming that financial instability leads to extended completion timelines.

In light of the project's administrative timeline and changes in the contracting firms, it was also essential to identify the initial, additional, and final financial allocations of the project to understand the full financial scope and the impact of these changes on the schedule.

Moreover, this study emphasizes that the project schedule is not merely a planning tool, but a critical framework for determining the final deadlines of school construction projects. Any deviation in the schedule—whether due to delays, changes in scope, or financial disruptions—directly impacts the project's ability to meet its intended completion date. In particular, cost overruns and fragmented contractor performance have shown to prolong the timeline, reaffirming that effective cost control and schedule management are inseparable in achieving timely delivery of educational infrastructure.

Ultimately, the chapter emphasizes that rather than relying solely on general time or deadline management, the schedule itself must be analyzed as a structured, measurable element. Only by studying the project schedule in detail can one accurately assess whether final deadlines were met and understand the real impact of time on project cost.

General Conclusion of the Thesis:

The construction of educational institutions represents one of the most strategic and socially impactful areas of public investment, given its direct influence on improving the learning environment, supporting social equity, and strengthening human capital development. Within this critical sector, the effective management of time and cost emerges as a decisive factor for ensuring projects are delivered on schedule, within budget, and to the required quality standards.

This dissertation , entitled "Study of the Impact of Execution Cost on the Duration of School Equipment Projects – Case Study: Ben Mbarek Dahman Primary School, Batna Road, Biskra Province," sought to investigate the intricate and often underestimated relationship between the financial and temporal dimensions of construction project management. Through a detailed technical, architectural, and administrative analysis of the selected case study, the research provided evidence of how delays and cost overruns are not isolated issues but symptoms of deeper systemic challenges.

The findings clearly revealed that the Ben Mbarek Dahman Primary School project experienced significant schedule slippage—from an initially planned duration of 211 days to an actual completion time of 639 days. This nearly threefold extension was driven by multiple factors, most notably the inadequate performance of the initial contractor, which necessitated a reallocation of the project to three separate contractors. While this intervention was critical to resuming work, it inadvertently introduced new complexities, such as fragmented coordination, increased administrative burden, and additional financial costs resulting from contractual modifications and procedural delays.

Moreover, the study underscored that in public construction projects, especially in the educational sector, time and cost performance are deeply interlinked. Delays do not simply postpone delivery dates; they trigger cascading effects across financial, administrative, and operational dimensions. For educational infrastructure, these consequences are particularly severe, as project delays can directly disrupt academic calendars, undermine learning conditions, and erode public confidence in state institutions tasked with delivering essential services.

Comparative analysis with a reference project, successfully managed by a single and experienced contractor, highlighted the advantages of unified project execution. Such centralized management fosters clearer accountability, smoother coordination, and more effective problem-solving, contributing to better control of both timeframes and costs. In contrast, a fragmented execution model, while sometimes necessary, often diminishes efficiency and increases the risk of budget overruns.

Beyond the technical dimensions, the research also addressed the organizational and institutional contexts that frame public project execution in Algeria. The findings pointed to the importance of robust administrative procedures, proactive risk management, and the adoption of modern project management tools such as MS Project for schedule planning and Earned Value Management (EVM) for integrated time-cost performance monitoring. These tools provide managers with crucial visibility into project progress and allow for timely interventions to mitigate risks.

The broader implication of this research is that effective schedule management must be viewed not merely as a technical exercise, but as a strategic necessity in achieving the social and developmental goals associated with public investments. Particularly in educational infrastructure projects, where timely delivery is closely tied to population needs and national development plans, delays carry a cost far beyond financial overruns—they hinder the educational mission and social progress.

In light of the evidence and insights gathered, the following recommendations are proposed to enhance the management of future educational infrastructure projects in Algeria:

- Minimize reliance on multiple contractors where possible, as it often leads to fragmented responsibilities and coordination difficulties.
- Apply stringent criteria in contractor selection to ensure both technical expertise and financial stability.
- Strengthen technical oversight through systematic and frequent monitoring by design offices and independent inspection bodies.
- Conduct comprehensive geotechnical surveys during the planning phase to reduce unforeseen site-related complications.
- Develop project schedules with built-in flexibility and contingency buffers to accommodate unexpected disruptions.
- Integrate Earned Value Management (EVM) practices for precise, real-time tracking of both schedule and budget performance.
- Allocate financial contingency reserves within the project budget to manage potential overruns without jeopardizing progress.
- Establish clear links between any cost increases and measurable improvements in construction quality through robust quality assurance processes.
- Clearly define contractual responsibilities and penalties related to delays to ensure accountability and timely resolution of disputes.
- Streamline administrative and financial processes to minimize bureaucratic delays that could halt project activities due to funding issues.

In conclusion, this research affirms that successful delivery of public construction projects—particularly those in the critical domain of educational infrastructure—requires an integrated approach to time and cost management. Delays and cost overruns are not merely operational issues but reflect deeper challenges in project planning, contractor performance, and institutional capacity. By highlighting the causal relationship between time and cost and proposing practical solutions, this study contributes valuable insights to the academic and professional discourse on construction project management in Algeria. The lessons drawn extend beyond the specific case analyzed and hold relevance for a wide range of public infrastructure initiatives aiming for timely, efficient, and sustainable outcomes.

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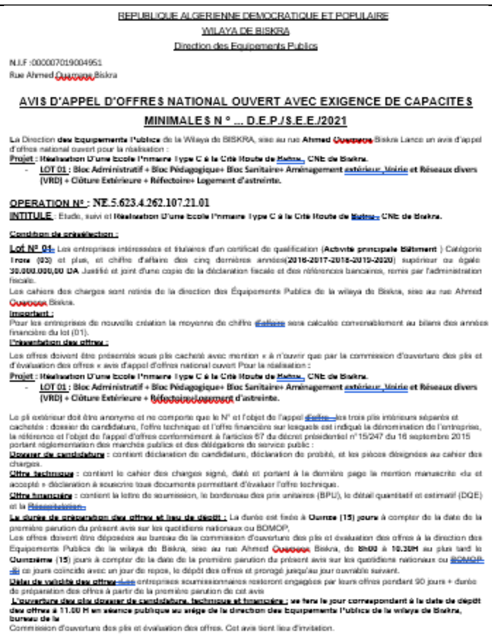
ANEXES

Administrative anexe	
	
	Annexe 1 National Tender Notice for the Construction of a Type "C" Primary School ,source: Directorate of Planning of Biskra Province
	
	Annexe 2 Press Announcement for the Tender of a Type "C" Primary School Project,source: Directorate of Planning of Biskra Province

Content of Annexe 1 image:

REPUBLIQUE ALGERIENNE DEMOCRATIQUE ET POPULAIRE
WILAYA DE BISKRA
Direction des Equipements Publics

N.I.F :000007019004951
Rue Ahmed Ouamane Biskra

AVIS D'APPEL D'OFFRES NATIONAL OUVERT AVEC EXIGENCE DE CAPACITES MINIMALES N ° ... D.E.P./S.E.E./2021

La Direction **des Equipements Publics** de la Wilaya de BISKRA, sise au rue **Ahmed Ouamane** Biskra Lance un avis d'appel d'offres national ouvert pour la réalisation :
Projet : Réalisation D'une Ecole Primaire Type C à la Cité Route de Batna , CNE de Biskra.
- **LOT 01 : Bloc Administratif + Bloc Pédagogique+ Bloc Sanitaire+ Aménagement extérieur, Voirie et Réseaux divers (VRD) + Clôture Extérieure + Réfectoire+ Logement d'astreinte.**

OPERATION N° : NE.5.623.4.262.107.21.01
INTITULE : Etude, suivi et **Réalisation D'une Ecole Primaire Type C à la Cité Route de Batna , CNE de Biskra.**

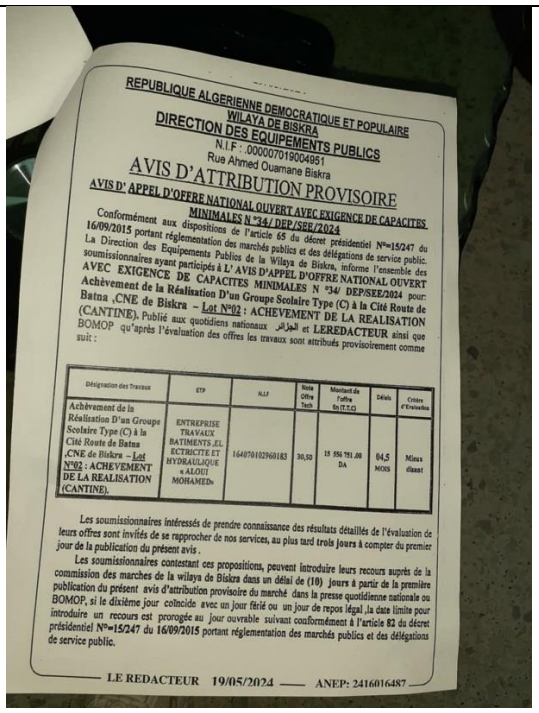
Condition de présélection :
Lot N° 01- Les entreprises intéressées et titulaires d'un certificat de qualification (**Activité principale Bâtiment**) Catégorie **Trois** (03) et plus, et chiffre d'affaire des cinq dernières années(**2016-2017-2018-2019-2020**) supérieur ou égale **30.000.000,00 DA** Justifié et joint d'une copie de la déclaration fiscale et des références bancaires, remis par l'administration fiscale.
Les cahiers des charges sont retirés de la direction des Équipements Publics de la wilaya de Biskra, sise au rue Ahmed Ouamane Biskra.
Important :
Pour les entreprises de nouvelle création la moyenne de chiffre d'affaire sera calculée convenablement au bilans des années financière du lot (01).
Présentation des offres :
Les offres doivent être présentée sous plis cacheté avec mention « à n'ouvrir que par la commission d'ouverture des plis et d'évaluation des offres « avis d'appel d'offres national ouvert Pour la réalisation :
Projet : Réalisation D'une Ecole Primaire Type C à la Cité Route de Batna , CNE de Biskra.
- **LOT 01 : Bloc Administratif + Bloc Pédagogique+ Bloc Sanitaire+ Aménagement extérieur, Voirie et Réseaux divers (VRD) + Clôture Extérieure + Réfectoire+Logement d'astreinte.**

Le pli extérieur doit être anonyme et ne comporte que le N° et l'objet de l'appel d'offre , les trois plis intérieurs séparés et cachetés : dossier de candidature, l'offre technique et l'offre financière sur lesquels est indiqué la dénomination de l'entreprise, la référence et l'objet de l'appel d'offres conformément à l'article 67 du décret présidentiel n° 15/247 du 16 septembre 2015 portant réglementation des marchés publics et des délégations de service public :
Dossier de candidature : contient déclaration de candidature, déclaration de probité, et les pièces désignées au cahier des charges.
Offre technique : contient le cahier des charges signé, daté et portant à la dernière page la mention manuscrite «lu et accepté » déclaration à souscrire tous documents permettant d'évaluer l'offre technique.
Offre financière : contient la lettre de soumission, le bordereau des prix unitaires (BPU), le détail quantitatif et estimatif (DQE) et la Récapitulation.
La durée de préparation des offres et lieu de dépôt : La durée est fixée à **Quinze (15) jours** à compter de la date de la première parution du présent avis sur les quotidiens nationaux ou BOMOP,
Les offres doivent être déposées au bureau de la commission d'ouverture des plis et évaluation des offres à la direction des Equipements Publics de la wilaya de Biskra, sise au rue Ahmed Ouamane Biskra, de **8h00** à **10.30H** au plus tard le **Quinzième** (15) jours à compter de la date de la première parution du présent avis sur les quotidiens nationaux ou BOMOP. Si ce jours coïncide avec un jour de repos, le dépôt des offres et prorogé jusqu'au jour ouvrable suivant.
Délai de validité des offres- Les entreprises soumissionnaires resteront engagées par leurs offres pendant 90 jours + durée de préparation des offres à partir de la première parution de cet avis
L'ouverture des plis dossier de candidature, technique et financière : se fera le jour correspondant à la date de dépôt des offres à 11.00 H en séance publique au siège de la direction des Equipements Publics de la wilaya de Biskra, bureau de la
Commission d'ouverture des plis et évaluation des offres. Cet avis tient lieu d'invitation.

Content of Annexe 2 image (partly legible):

الجمهورية الجزائرية الديمقراطية الشعبية
ولاية بسكرة
مديرية التجهيزات العمومية

ANEP N° 2416012351



REPUBLIQUE ALGERIENNE DEMOCRATIQUE ET POPULAIRE
WILAYA DE BISKRA
DIRECTION DES EQUIPEMENTS PUBLICS
N.I.F : .000007019004951
Rue Ahmed Ouamane Biskra

AVIS D'ATTRIBUTION PROVISOIRE

AVIS D' APPEL D'OFFRE NATIONAL OUVERT AVEC EXIGENCE DE CAPACITES MINIMALES N °34/ DEP/SEE/2024

Conformément aux dispositions de l'article 65 du décret présidentiel N°=15/247 du 16/09/2015 portant réglementation des marchés publics et des délégations de service public. La Direction des Equipements Publics de la Wilaya de Biskra, informe l'ensemble des soumissionnaires ayant participés à L'AVIS D'APPEL D'OFFRE NATIONAL OUVERT AVEC EXIGENCE DE CAPACITES MINIMALES N °34/ DEP/SEE/2024 pour: Achèvement de la Réalisation D'un Groupe Scolaire Type (C) à la Cité Route de Batna ,CNE de Biskra – Lot N°02 : ACHEVEMENT DE LA REALISATION (CANTINE). Publié aux quotidiens nationaux الجزائر et LEREDACTEUR ainsi que BOMOP qu'après l'évaluation des offres les travaux sont attribués provisoirement comme suit :

Désignation des Travaux	ETP	N.I.F	Note Offre Tech	Montant de l'offre in TT.C.t	Délais	Critère d'évaluation
Achèvement de la Réalisation D'un Groupe Scolaire Type (C) à la Cité Route de Batna ,CNE de Biskra – Lot N°02 : ACHEVEMENT DE LA REALISATION (CANTINE).	ENTREPRISE TRAVAUX BATIMENTS ,EL ECTRICITE ET HYDRAULIQUE « ALOUI MOHAMED»	164070102960183	30,50	15 886 781,00 Da	04,5 MOIS	Mieux disant

Les soumissionnaires intéressés de prendre connaissance des résultats détaillés de l'évaluation de leurs offres sont invités de se rapprocher de nos services, au plus tard trois jours à compter du premier jour de la publication du présent avis .

Les soumissionnaires contestant ces propositions, peuvent introduire leurs recours auprès de la commission des marches de la wilaya de Biskra dans un délai de (10) jours à partir de la première publication du présent avis d'attribution provisoire du marché dans la presse quotidienne nationale ou BOMOP, si le dixième jour coïncide avec un jour férié ou un jour de repos légal ,la date limite pour introduire un recours est prorogée au jour ouvrable suivant conformément à l'article 82 du décret présidentiel N°=15/247 du 16/09/2015 portant réglementation des marchés publics et des délégations de service public.

LE REDACTEUR 19/05/2024 —— ANEP: 2416016487

Annexe 3 Provisional Award Notice for the Primary School Construction Project,source: Directorate of Planning of Biskra Province

Annexe 4Notice of Provisional Acceptance,source: Directorate of Planning of Biskra Province

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة السكن والعمران والمدينة

مديرية التجهيزات العمومية

ولاية بسكـــرة

رقم الأمر :

مسجل تحت رقم: 660 بتاريخ: 21/12/2023

رقم العملية: NE5.623.4.262.107.21.01

تسمية العملية: دراسة، متابعة ،إنجاز وتجهيز مدرسة إبتدائية صنف (ج) بحي طريق بالثة بلدية بسكرة

المشروع: تكملة انجاز مدرسة إبتدائية صنف (ج) بحي طريق بالثة بلدية بسكرة

الحصة 01 : تكملة إنجاز (الجناح الإداري +الجناح البيداغوجي +التهيئة الخارجية +الطرقات ومختلف الشبكات (VRD)+السور الخارجي

مقاولة : مؤسسة أشغال البناء في مختلف مراحله والترقية العقارية "صوالحي عمار"

أمر بالعمل ليـــدء الأشغـــال

مقاولة: مؤسسة أشغال البناء في مختلف مراحله والترقية العقارية "صوالحي عمار" الساكن ببسكرة رقم 29 نهج الحدائق حي بارك فوراج ولاية بالثة، الحائزة على الصفقة المؤشرة من طرف اللجنة الولائية للصفقات العمومية تحت رقم 2023/501 بتاريخ 2023/12/04 المؤشر من طرف مراقب المالي تحت رقم 2023/2050 بتاريخ: 2023/12/17 وصدق من طرف المصلحة المتعاقدة تحت رقم: 2023/623/395 بتاريخ: 2023/12/18 وذلك قبله مدعوا للمثول والتبليغ نسخة من الصفقة ومباشرة في الأشغال ليوم الموالي للتبليغ

يشهد الأمر بالعمل مطبقا لسجل تحت رقم: 660، وهذا الأخير يتم التبليغ إلى السيد(ة) مسير (ة) صوالحي عمار بـ: رقم 29 نهج الحدائق حي بارك فوراج ولاية بالثة من طرف السيد مدير التجهيزات العمومية لولاية بسكرة هذا الأمر بالعمل يسجل تحت رقم: 660 بتاريخ: .....

بسكرة في: 21 ديسمبر 2023

المديـــــر

مديرية التجهيزات العمومية

ولاية بسكـــرة

رقم الأمر :

مسجل: 660 بت.ع.ج.ولا.ت.ع/2023

ملاحظة: يجب فصل هذا التبليغ عن الأمر بالخدمة المتخصصة لرئيس القسم الفرعي

رقم العملية: NE5.623.4.262.107.21.01

تسمية العملية: دراسة ، متابعة ،إنجاز و تجهيز مدرسة إبتدائية صنف (ج) بحي طريق بالثة بلدية بسكرة

المشروع: تكملة انجاز مدرسة إبتدائية صنف (ج) بحي طريق بالثة بلدية بسكرة

الحصة 01 : تكملة إنجاز (الجناح الإداري +الجناح البيداغوجي +التهيئة الخارجية +الطرقات ومختلف الشبكات (VRD)+السور الخارجي

مقاولة : مؤسسة أشغال البناء في مختلف مراحله والترقية العقارية "صوالحي عمار"

التبليـــغ

أنه سلم إلى السيد(ة) مقـــاولـــة : صوالحي عمار النسخة طبق الأصل لأمر بالعمل والمسجلة تحت رقم: 660 بتاريخ: 21 ديسمبر 2023

المقاولة

Annexe 5 Service Order (Commencement of Works),source: Directorate of Public Equipment of Biskra Province

الجمهوريـــة الجزائريـــة الديمقراطيـــة الشعبيـــة

وزارة السكن والعمران و المدينة

مديرية التجهيزات العمومية

بسكـــرة

رقم الأمر : 660

مسجل تحت رقم: 660 بت.ع.ج.ولا.ت.ع/2024

رقم العملية : NE.5.623.4. 262.107.21.01

تسمية العملية: دراسة ، متابعة ، إنجاز و تجهيز مدرسة إبتدائية صنف "ج" بحي طريق بالثة ، بلدية بسكرة

المشـــروع: تكملة إنجاز مدرسة إبتدائية صنف "ج" بحي طريق بالثة ، بلدية بسكرة

الحصة رقم 01: تكملة إنجاز (الجناح الإداري + الجناح البيداغوجي + التهيئة الخارجية + الطرقات و مختلف الشبكات (VRD) + السور الخارجي)

مقاولة : مؤسسة أشغال البناء في مختلف مراحله و الترقية العقارية " صوالحي عمار "

أمر بالتوقف عن الأشغال

مقاولة : مؤسسة أشغال البناء في مختلف مراحله و الترقية العقارية " صوالحي عمار " الساكن بـ: رقم 29 نهج الحدائق حي بارك فوراج ولاية بالثة ، الحائزة على الصفقة المؤشرة من طرف اللجنة الولائية للصفقات العمومية تحت رقم 2023/501 بتاريخ 2023/12/04 و المؤشرة من طرف المراقب المالي تحت رقم: 2023/2050 بتاريخ: 2023/12/17 ، و صدق من طرف المصلحة المتعـــاقدة تحت رقـــم : 2023/623/395 بتاريخ : 2023/12/18 وذلك قبله مدعو للتوقف عن الأشغال ابتداءا من تاريخ : 2024/02/29 الى حين الإلتزام بالملحق رقم 01

يشهد الأمر بالعمل مطبقا لسجل تحت رقم: 660 و هذا الاخير يتم التبليغ الى السيد (ة)مقاولة : مؤسسة أشغال البناء في مختلف مراحله و الترقية العقارية " صوالحي عمار " الساكن بـ: رقم 29 نهج الحدائق حي بارك فوراج ولاية بالثة هذا الأمر بالعمل يسجل تحت رقم: 660 بتاريخ: .....

بسكرة في: 29 فيفري 2024

المديـــر

ولايـــة بسكرة

مديرية التجهيزات العمومية

رقم الأمر : 660

مسجل تحت رقم: 660 بت.ع.ج.ولا.ت.ع/2024

ملاحظة: يجب فصل هذا التبليغ عن الأمر بالخدمة المتخصصة لرئيس القسم الفرعي

- بعد أن يتم إمضائه من طرف المقاولة يجب تسجيله على مستوى سجل خاص

رقم العملية : NE.5.623.4. 262.107.21.01

تسمية العملية: دراسة ، متابعة ، إنجاز و تجهيز مدرسة إبتدائية صنف "ج" بحي طريق بالثة ، بلدية بسكرة

المشـــروع: تكملة إنجاز مدرسة إبتدائية صنف "ج" بحي طريق بالثة ، بلدية بسكرة

الحصة رقم 01: تكملة إنجاز (الجناح الإداري + الجناح البيداغوجي + التهيئة الخارجية + الطرقات و مختلف الشبكات (VRD) + السور الخارجي)

مقاولة : مؤسسة أشغال البناء في مختلف مراحله و الترقية العقارية " صوالحي عمار "

التبليـــغ

بصرح أنه سلم إلى مقاولة : " صوالحي عمار " النسخة طبق الأصل لأمر بالعمل

بتاريخ:.....و مسجل تحت رقم : 660 /بت.ع.ج.ولا.ت.ع/2024.

المقاولة

2024 فيفري 29

Annexe 6 Work Suspension Notice,source: Directorate of Public Equipment of Biskra Province

الجمهوريـــة الجزائريـــة الديمقراطيـة الشعبيـة

وزارة السكن والعمران والمدينة

مديرية التجهيزات العمومية

ولاية بسكـــرة

رقم العملية: N.1.011.044.01.4807.000.007.21.009

تسمية العملية: دراسة،متابعة، انجاز وتجهيز مدرسة ابتدائية صنف (ج) بحي طريق باتنة بلدية بسكرة

المشروع : تكملة انجاز مدرسة ابتدائية صنف (ج) بحي طريق باتنة بلدية بسكرة

الحصة رقم01: تكملة انجاز (الجناح الاداري+الجناح البيداغوجي +التهيئة الخارجية +الطرقات ومختلف الشبكات (VRD) +السور الخارجي

مقـاولـة : مؤسسة اشغال البناء في مختلف مراحله والترقية العقارية *صـوالحـي عمـار *

أمـــر بالتبليـــغ و الإستئناف الأشغال

مقـاولـة مؤسسة اشغال البناء في مختلف مراحلـه والترقيـة العقاريـة صـوالحـي عمـار الساكن بـ: رقم 29 نهج الحدائق حي بارك فوراج ولاية باتنة ، الحائزة على الصفقة تحت رقـم:2023/501 بتاريخ :2023/12/04، وذلك مدعو لإستئناف الأشغال والمباشرة في الأشغال الاضافية والتكميلية والأخذ والتبليغ نسخة من ملحق رقم 01،المؤشر من طرف مراقب الميزانيات تحت رقم: 2024/1466 بتاريخ 2024/09/25، والمؤشرة من طرف اللجنة الولائية للصفقات تحت رقم: 2024/501 بتاريخ: 2024/08/29 وصدق من طرف مدير التجهيزات العمومية تحت رقم: 2024/623/328 بتاريخ:2024/09/30

يشهد الأمر بالعمل مطبقـا لسجل تحت رقـم:328...... ، وهـذا الأخير يتم التبليغ إلـى السيـد(ة) مسير (ة) صـوالحـي عمـار الساكن بـ: رقم 29 نهج الحدائق حي بارك فوراج ولاية باتنة ، من طرف السيد مدير التجهيزات العمومية لولاية بسكرة. هـذا الأمر بـالعمـل بسجل تحت رقم: 328...... بتاريخ:..........

رقم الأمر:

سجل: 328 ...2024

بسكرة في 30 جانفي 2024

المديــر

رقم العملية: N.1.011.044.01.4807.000.007.21.009

مديرية التجهيزات العمومية

ولاية بسكـــرة

التبليـــغ

Annexe 7Notice of Suspension and Resumption of Works ,source: Directorate of Public Equipment of Biskra Province

الجمهوريـة الجـزائـريـة الـديمقـراطيـة الـشعبيـة

مديرية التجهيزات العمومية

لولاية بسكرة

مؤسسة أشغال البناء في مختلف مراحله والترقية العقارية – صوالحي عمار –

صـفقـــــــــة

المشروع: تكملة انجاز مدرسة ابتدائية صنف (ج) بحي طريق باتنة بلدية بسكرة

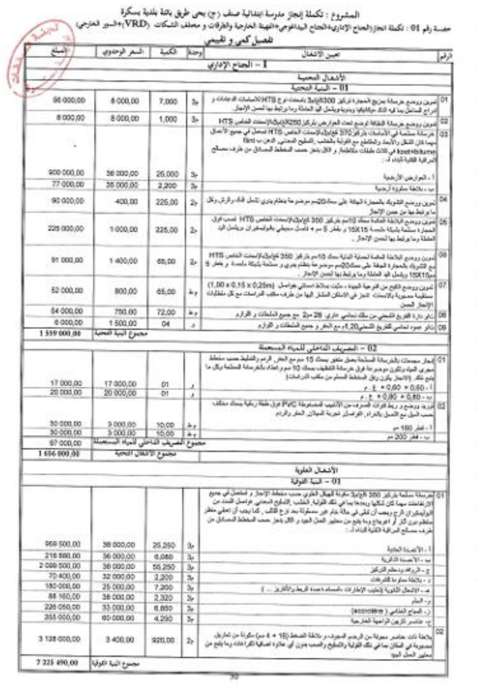
الحصة رقم 01 : تكملة إنجاز (الجناح الاداري + الجناح البيداغوجي + التهيئة الخارجية + الطرقات ومختلف الشبكات (VRD) + السور الخارجي)

تسمية العملية: دراسة ،متابعة ، انجاز وتجهيز مدرسة ابتدائية صنف (ج) بحي طريق باتنة ، بلدية بسكرة

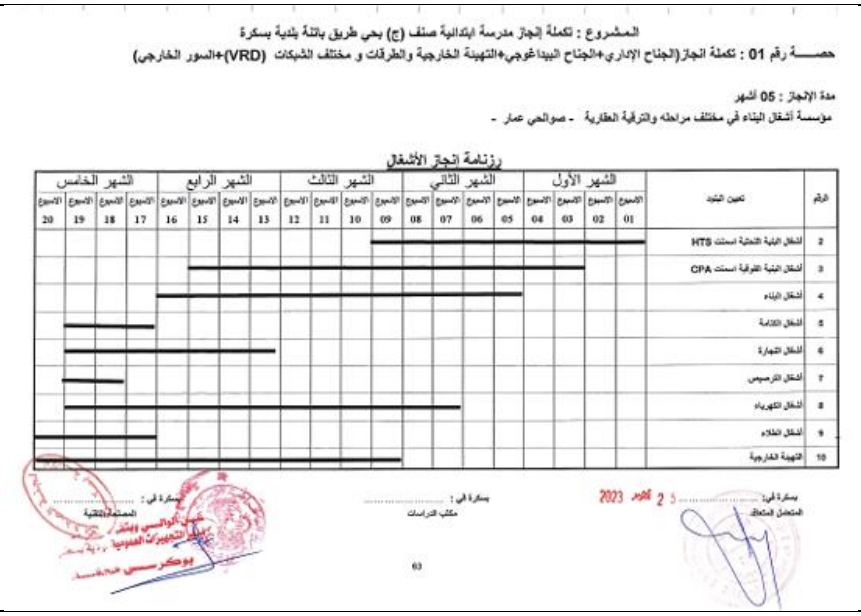
العملية رقم : NE.5.623.4.262.107.21.01

Annexe 8 Contract - Project: Construction of a Middle School,source: Directorate of Public Equipment of Biskra Province

Annexe 9 Unit Price Schedule,source: Directorate of Public Equipment of Biskra Province



Annexe 10 Quantitative and Evaluative Breakdown,source: Directorate of Public Equipment of Biskra Province



المشروع : تكملة إنجاز مدرسة ابتدائية صنف (ج) بحي طريق باتنة بلدية بسكرة

حصـــــة رقم 01 : تكملة انجاز(الجناح الاداري+الجناح البيداغوجي+التهيئة الخارجية والطرقات و مختلف الشبكات (VRD)+السور الخارجي)

مدة الإنجاز : 05 أشهر

مؤسسة أشغال البناء في مختلف مراحله والترقية العقارية - صوالحي عمار -

رزنامة انجاز الأشغال

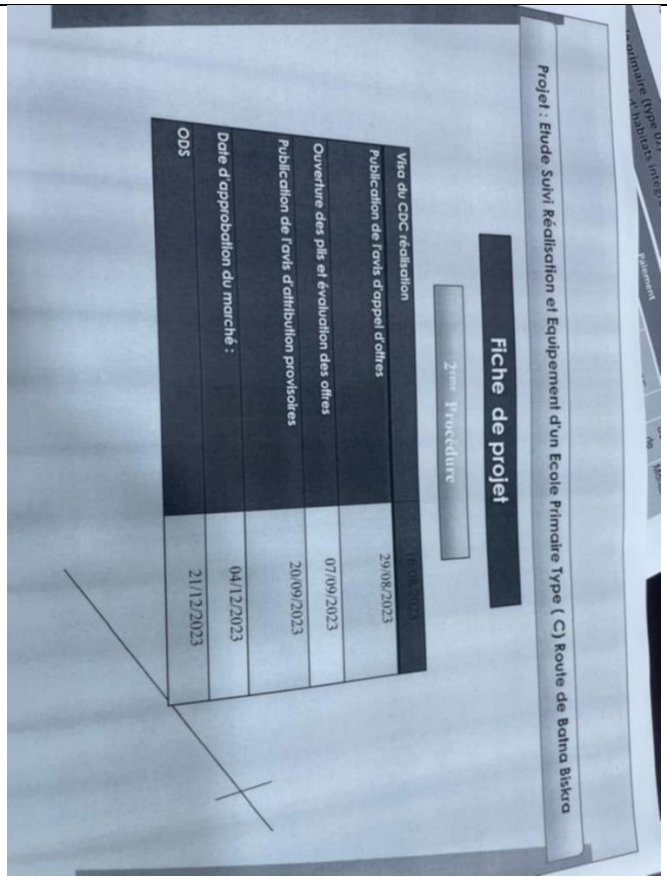
الرقم	نعين البند	الشهر الأول				الشهر الثاني				الشهر الثالث				الشهر الرابع				الشهر الخامس			
		الاسبوع 01	الاسبوع 02	الاسبوع 03	الاسبوع 04	الاسبوع 05	الاسبوع 06	الاسبوع 07	الاسبوع 08	الاسبوع 09	الاسبوع 10	الاسبوع 11	الاسبوع 12	الاسبوع 13	الاسبوع 14	الاسبوع 15	الاسبوع 16	الاسبوع 17	الاسبوع 18	الاسبوع 19	الاسبوع 20
2	أشغال الهياكل الخرسانية لسكنات HTS																				
3	أشغال الهياكل المعدنية لسكنات CPA																				
4	أشغال البناء																				
5	أشغال الكتابة																				
6	أشغال التجارة																				
7	أشغال الترصيص																				
8	أشغال الكهرباء																				
9	أشغال الطلاء																				
10	التهيئة الخارجية																				

بسكرة في : ..... بسكرة في : ..... بسكرة في : 2023 مارس 2 5 .....

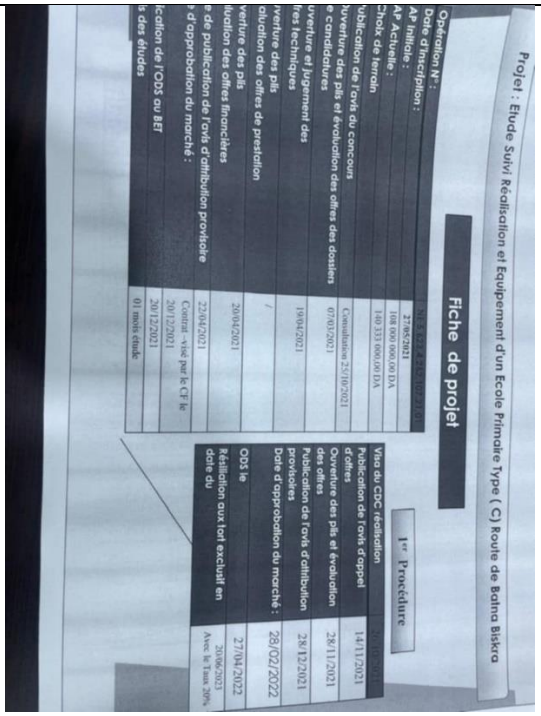
المقاولة المكلفة مكتب الدراسات المتعامل المتعاقد

63

Annexe 11 Work Execution Schedule,source: Directorate of Public Equipment of Biskra Province



Annexe 12 project sheet ,source: Directorate of Public Equipment of Biskra Province



Annexe 13 project sheet ,source: Directorate of Public Equipment of Biskra Province

الجمهوريـــة الجزائريـــة الديمقراطيـــة الشعبيـــة

وزارة السكن والعمران والمدينة
مديريـــة التجهيـــزات العموميـــة
لولايـــة بسكـــرة

ملحق رقم 01

2 4 \$ 5 0 1

المتعلق بالصفقة تحت رقم : 2023/501 المؤرخة في 2023/12/04

الخاص بمشروع:

تكملة انجاز مدرسة ابتدائية صنف (ج)بحي طريق باتنة بلدية بسكرة

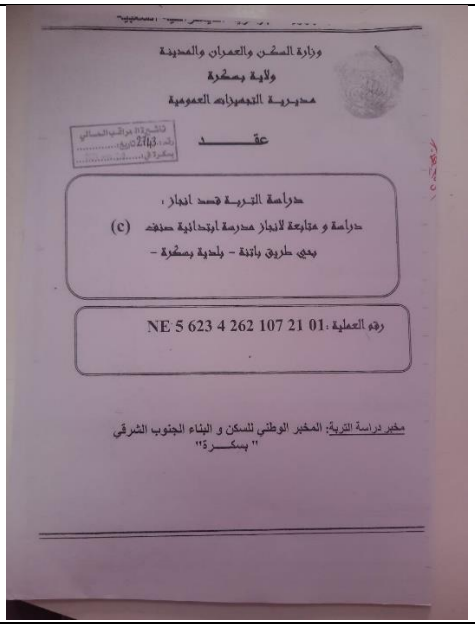
الحصة 01:تكملة إنجاز (الجناح الإداري+ الجناح البيداغوجي+ التهيئة الخارجية + الطرقات و مختلف الشبكات(VRD)+ السور الخارجي.

تسمية العملية: دراسة ،متابعة ، انجاز و تجهيز مدرسة ابتدائية صنف (ج) بحي طريق باتنة ، بلدية بسكرة

رقم العملية : N 1.011.044.01.4807.000.007.21.009

مقاولة الإنجاز: مؤسسة أشغال البناء في مختلف مراحله و الترقية العقارية *صوالحي عمار*

Annexe 14 Addendum No. 01 related to contract No: 501/2023,source: Directorate of Public Equipment of Biskra Province



وزارة السكن والعمران والمدينة
ولاية بسكرة
مديرية التجهيزات العمومية

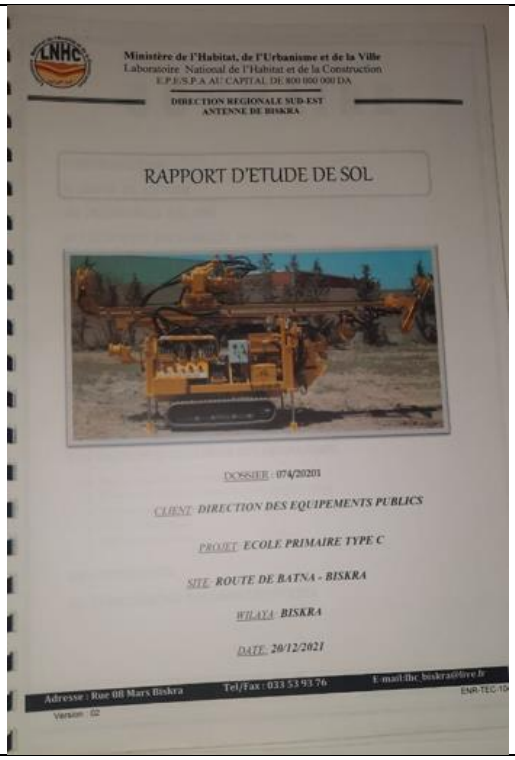
عقـــــــد

دراسة التربة قصد انجاز :
دراسة و متابعة لانجاز مدرسة ابتدائية صنف (c)
بحي طريق باتنة – بلدية بسكرة –

رقم العملية :01 21 107 262 4 623 5 NE

مخبر دراسة التربة: المخبر الوطني للسكن و البناء الجنوب الشرقي
" بسكـــرة"

Annexe 15 Contract with the Soil Investigation Laboratory,source: Sub-Directorate of Public Equipment of Biskra Province



Ministère de l'Habitat, de l'Urbanisme et de la Ville
Laboratoire National de l'Habitat et de la Construction
E.P.E/S.P.A AU CAPITAL DE 800 000 000 DA
DIRECTION REGIONALE SUD-EST
ANTENNE DE BISKRA

RAPPORT D'ETUDE DE SOL

DOSSIER : 074/20201
CLIENT: DIRECTION DES EQUIPEMENTS PUBLICS
PROJET: ECOLE PRIMAIRE TYPE C
SITE: ROUTE DE BATNA - BISKRA
WILAYA: BISKRA
DATE: 20/12/2021

Adresse : Rue 08 Mars Biskra Tel/Fax : 033 53 93 76 E-mail:lhc_biskra@live.fr

Annexe 16 Internship Study Report for the Site: Batna Road – Biskra,source: Sub-Directorate of Public Equipment of Biskra Province

الجمهورية الجزائرية الديمقراطية الشعبية

مديرية التجهيزات العمومية

1- المصلحة : مديرية التجهيزات العمومية لولاية بسكرة

2- المشروع : انجاز مدرسة ابتدائية صنف (ج) نمي طريق بلدية بسكرة

الحصة رقم 01: تكملة انجاز (الجناح الإداري +الجناح البيداغوجي + التهيئة الخارجية + الطرقات ومختلف الشبكات VRD+ الصور

3- رقم العملية : N 1.011.044.01.4807.000.007.21.009

4- صفقة رقم 2023/501 بتاريخ 2023/12/04

محضر استلام مؤقت

في يوم : الثالث من شهر ديسمبر عام ألفين وثلاثة وعشرون تمثلت اللجنة المتكونة من السادة

- ممثل فرع مديرية التجهيزات العمومية لدائرة بسكرة .....
- ممثل مكتب الدراسات : تجمع مكتب الدراسات من صالح أمينة بوزاهر المهندس.
- ممثل مديرية التربية لولاية بسكرة .....
- المقاولة : صوالحي عمار .

لتسلم موقع المشروع : انجاز مدرسة ابتدائية صنف ج نمي طريق بلدية بسكرة الحصة رقم 01: تكملة انجاز (الجناح الإداري +الجناح البيداغوجي + التهيئة الخارجية + الطرقات ومختلف الشبكات VRD+ الصور بعد المعاينة وبعد الأشغال المنجزة من طرف مقاولة : صوالحي عمار

قررت اللجنة الاستلام المؤقت للأشغال المشروع بدون تحفظات

حرر هذا المحضر في اليوم و الشهر و السنة المذكورين أعلاه

ممثل مكتب الدراسات — ممثل مديرية التربية لولاية بسكرة

Annexe 17 Temporary Handover Report for Works Related to Lot No. 01,source: Sub-Directorate of Public Equipment of Biskra Province

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة السكن والعمران والمدينة

مديرية التجهيزات العمومية

لولاية بسكرة

القسم الفرعي لدائرة بسكرة

بسكرة في 09 أكتوبر 2024

رقم: ..... ف . ت . ع 2024

الى السيد/ مدير التجهيزات العمومية لولاية بسكرة

20241365

جدول الإرسال

نوعية الوثائق	العدد	الملاحظات
يحتوي على هذا الجدول - محضر استلام مؤقت المشروع : انجاز مدرسة ابتدائية صنف (ج) نمي طريق بلدية بسكرة (برنامج 2021) الحصة رقم 01: تكملة انجاز الجناح الإداري + الجناح البيداغوجي + الجناح الصحي + التهيئة الخارجية و الطرقات و مختلف الشبكات VRD + السور الخارجي مقاولة الانجاز: صوالحي عمار	08	بعد التأشيرة

رئيس القسم الفرعي

Annexe 18 Transmission Table,source: Sub-Directorate of Public Equipment of Biskra Province

وضعية الأشغال رقم 01

وضعية الأشغال في : 30 نوفمبر 2023	المبلغ بالدينار
المبلغ الاجمالي للأشغال	24 041 617,00
التخفيضات العرفية المقبلة	
التخفيضات الثابتة للعون	
مبالغ أخرى (توضيح)	
المجموع 01	24 041 617,00
الفائض	
مبلغ الأشغال المنجزة سابقا	
التسبيق العرفي المحصل عليه	
تسبيق على التموين المحصل عليها	
مبالغ أخرى (توضيح)	
المجموع 02	0,00
المبلغ الصافي لوضعية الأشغال : (3)=(1)-(2)	24 041 617,00
قيمة الوضعية خارج الرسوم	20 203 039,50
الرسم على القيمة المضافة 19 %	3 838 577,50
التخفيضات	
التسبيق العرفي	
التسبيق على التموين	
مبالغ أخرى (توضيح)	
المجموع 04	0,00
مبلغ وضعية الأشغال مع كل الرسوم (5)=(3)+(4)	24 041 617,00
مبالغ أخرى (توضيح) قبض الضمان 5 % من مبلغ الرسم	1 202 080,85
المجموع 06	1 202 080,85
المبلغ الصافي للتسديد	22 839 536,15
(7) = (05) - (06)	

القيمة الصافية للتسديد : اثنان وعشرون مليون وثمانمائة وتسعة وثلاثون ألف وخمسمائة وستة وثلاثون دينار جزائري و 15 سنتيم

Annexe 19 Statement of Work Progress 01,source: Sub-Directorate of Public Equipment of Biskra Province

وضعية الأشغال رقم 02

وضعية الأشغال في : 30 أبريل 2024	المبلغ بالدينار
المبلغ الاجمالي للأشغال	37 838 190,81
التخفيضات العرفية المقبلة	
التخفيضات الثابتة للعون	
مبالغ أخرى (توضيح)	
المجموع 01	37 838 190,81
الفائض	
مبلغ الأشغال المنجزة سابقا	24 041 617,00
التسبيق العرفي المحصل عليه	
تسبيق على التموين المحصل عليها	
مبالغ أخرى (توضيح)	
المجموع 02	24 041 617,00
المبلغ الصافي لوضعية الأشغال : (3)=(1)-(2)	13 796 573,81
قيمة الوضعية خارج الرسوم	11 593 759,50
الرسم على القيمة المضافة 19 %	2 202 814,31
التخفيضات	
التسبيق العرفي	
التسبيق على التموين	
مبالغ أخرى (توضيح)	
المجموع 04	0,00
مبلغ وضعية الأشغال مع كل الرسوم (5)=(3)+(4)	13 796 573,81
مبالغ أخرى (توضيح) قبض الضمان 5 % من مبلغ الرسم	689 828,69
المجموع 06	689 828,69
المبلغ الصافي للتسديد	13 106 745,12
(7) = (05) - (06)	

القيمة الصافية للتسديد : مائة وثلاثة ملايين ومائة وستة آلاف وسبعمائة وخمسة وأربعون دينار جزائري و 12 سنتيم

Annexe 20 Statement of Work Progress 02,source: Sub-Directorate of Public Equipment of Biskra Province

الجمهورية الجزائرية الديمقراطية الشعبية

وضعية الأشغال رقم 03

القسم الأول: المقاولة

تسمية المقاولة: مؤسسة أشغال البناء في مختلف مراحله والأشغال العقارية – سوالحي عمار - بالكة

العنوان : 29 تجمع الحدائق هي باركا فوراج بالكة

رقم التسجل في السجل التجاري 98/ أ / 1114454 05/00 بتاريخ : 2019/02/07

الرقم الجبائي: 194805440138726 N.I.Fiscale : 148.051.801.387.128

رقم الحساب البنكي : 00400360400000043769 بنك القرض الشعبي الجزائري CPA لمجزئة عمر الثنية بالكة

صفقة رقم : 2023/501 بتاريخ : 04 - 12 - 2023

موضوع الصفقة المشروع : تكملة إنجاز مدرسة ابتدائية صنف (ج) بحي طريق بالكة بلدية بسكرة

حصة رقم 01 : تكملة انجاز(الجناح الإداري+الجناح البيداغوجي+التهيئة الخارجية والطرقات و مختلف الشبكات (VRD)+السور الخارجي)

مبلغ الصفقة : 79.448.130,65 دج

وضعية الأشغال رقم 03

وضعية الأشغال في: 21 فيفري 2024

	المبلغ بالدينار
المبلغ الاجمالي للأشغال	45 105 095,98
التسبيقات الجزائية المكتسبة	
التسبيقات المكتسبة للتموين	
مبالغ أخرى (للتوضيح)	
المجموع 01	45 105 095,98
القطاع	-
مبلغ الأشغال المنجزة سابقا	37 838 190,81
التسبيق الجزائي المحصل عليه	-
تسبيق على التموينات المحصل عليها	-
مبالغ أخرى (للتوضيح)	-
المجموع 02	37 838 190,81
المبلغ الصافي لوضعية الأشغال : (3)=(1)-(2)	7 266 905,17
قيمة الوضعية خارج الرسوم	6 106 643,00
الرسم على القيمة المضافة 19 %	1 160 262,17
التسبيقات	-
التسبيق الجزائي	-
التسبيق على التموين	-
مبالغ أخرى (للتوضيح)	-
المجموع 04	0,00
مبلغ وضعية الأشغال مع كل الرسوم :(5)=(3)-(4)	7 266 905,17
مبالغ أخرى (للتوضيح): قبض الضمان 5 % من مبلغ الوضعية	363 345,26
المجموع 06	363 345,26
المبلغ الصافي للتسديد	
(7) = (05) - (06)	6 903 559,91

تذكير	
تسبيق جزائي :	.....
مماثلة :	.....
تسبيق على التموين المشتركة :	.....
مماثلة :	.....
مجموع قطاع الضمان :	.....
متعاقد في :	.....

القيمة الصافية للتسديد : ستة ملايين وتسعمائة وثلاثة ألف وخمسمائة وتسعة وخمسون دينار جزائري و 91 سنتيم

صاحب المشروع — مكتب الدراسات — المقاولة

بسكرة في 11 جوان 2024

Annexe 21 Statement of Work Progress 03,source: Sub-Directorate of Public Equipment of Biskra Province

الجمهورية الجزائرية الديمقراطية الشعبية

وضعية الأشغال رقم 04

القسم الأول: المقاولة

تسمية المقاولة: مؤسسة أشغال البناء في مختلف مراحله والأشغال العقارية – سوالحي عمار - بالكة

العنوان : 29 تجمع الحدائق هي باركا فوراج بالكة

رقم التسجل في السجل التجاري 98/ أ / 1114454 05/00 بتاريخ: 2019/02/07

الرقم الجبائي: 194805440138726 N.I.Fiscale : 148.051.801.387.128

رقم الحساب البنكي : 00400360400000043769 بنك القرض الشعبي الجزائري CPA لمجزئة عمر الثنية بالكة

صفقة رقم : 2023/501 بتاريخ : 04 - 12 - 2023 ملحق رقم 01: 2024/501 بتاريخ : 29 - 08 - 2024

موضوع الصفقة المشروع : تكملة إنجاز مدرسة ابتدائية صنف (ج) بحي طريق بالكة بلدية بسكرة

حصة رقم 01 : تكملة انجاز(الجناح الإداري+الجناح البيداغوجي+التهيئة الخارجية والطرقات و مختلف الشبكات (VRD)+السور الخارجي)

مبلغ الصفقة + ملحق رقم 01 : 91.967.084,31 دج

وضعية الأشغال رقم 04

وضعية الأشغال في: 15 أكتوبر 2024

	المبلغ بالدينار
المبلغ الاجمالي للأشغال	82 511 443,11
التسبيقات الجزائية المكتسبة	
التسبيقات المكتسبة للتموين	
مبالغ أخرى (للتوضيح)	
المجموع 01	82 511 443,11
القطاع	-
مبلغ الأشغال المنجزة سابقا	45 105 095,98
التسبيق الجزائي المحصل عليه	-
تسبيق على التموينات المحصل عليها	-
مبالغ أخرى (للتوضيح)	-
المجموع 02	45 105 095,98
المبلغ الصافي لوضعية الأشغال : (3)=(1)-(2)	37 406 347,13
قيمة الوضعية خارج الرسوم	31 433 905,15
الرسم على القيمة المضافة 19 %	5 972 441,98
التسبيقات	-
التسبيق الجزائي	-
التسبيق على التموين	-
مبالغ أخرى (للتوضيح)	-
المجموع 04	0,00
مبلغ وضعية الأشغال مع كل الرسوم :(5)=(3)-(4)	37 406 347,13
مبالغ أخرى (للتوضيح): قبض الضمان 5 % من مبلغ الوضعية	1 870 317,36
المجموع 06	1 870 317,36
المبلغ الصافي للتسديد	
(7) = (05) - (06)	35 536 029,77

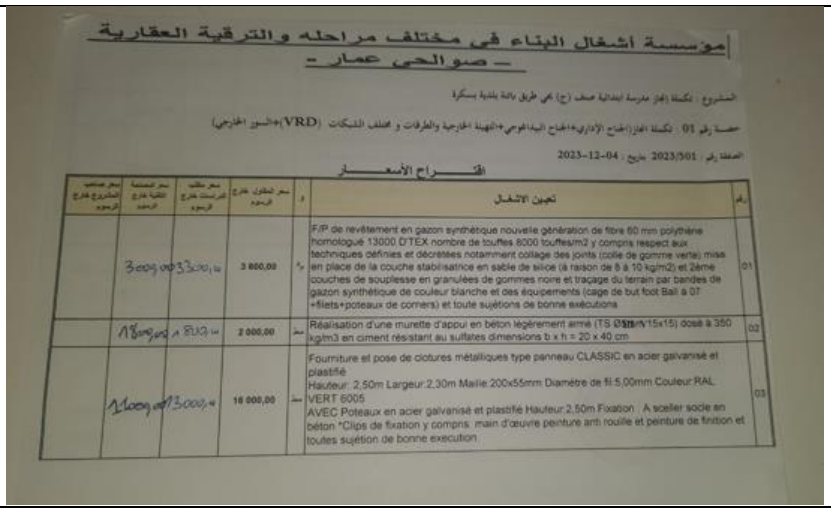
تذكير	
تسبيق جزائي :	.....
مماثلة :	.....
تسبيق على التموين المشتركة :	.....
مماثلة :	.....
مجموع قطاع الضمان :	.....
متعاقد في :	.....

القيمة الصافية للتسديد : خمسة وثلاثون مليون وخمسمائة وستة وثلاثون ألف وتسعة وعشرون دينار جزائري و 77 سنتيم

صاحب المشروع — مكتب الدراسات — المقاولة

بسكرة في 15 أكتوبر 2024

Annexe 22 Statement of Work Progress 04,source: Sub-Directorate of Public Equipment of Biskra Province



مؤسسة اشغال البناء في مختلف مراحله والترقية العقارية
– ص/و الحي عمار –

المشروع : تكملة إنجاز مدرسة ابتدائية صنف (ج) بحي طريق باتنة بلدية بسكرة

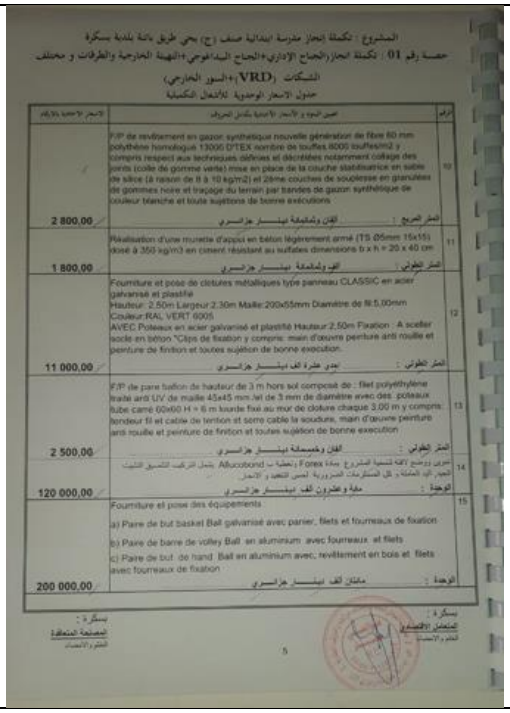
حصة رقم 01 : تكملة انجاز(الجناح الإداري+الجناح البيداغوجي+التهيئة الخارجية والطرقات و مختلف الشبكات (VRD)+السور الخارجي)

الصفقة رقم : 2023/501 بتاريخ : 2023-12-04

اقتـــــراح الأسعـــــار

رقم	تعيين الاشغال	و	سعر الدكتور خارج الرسوم	سعر مطلوب خارج الرسوم	سعر المصلحة خارج الرسوم	سعر صاحب المشروع خارج الرسوم
01	F/P de revêtement en gazon synthétique nouvelle génération de fibre 60 mm polythène homologué 13000 DTEX nombre de touffes 8000 touffes/m2 y compris respect aux techniques définies et décrétées notamment collage des joints (colle de gomme verte) mise en place de la couche stabilisatrice en sable de silice (à raison de 8 à 10 kg/m2) et 2ème couches de souplesse en granulées de gommes noire et traçage du terrain par bandes de gazon synthétique de couleur blanche et des équipements (cage de but foot Ball à 07 +filets+poteaux de corners) et toute sujétions de bonne exécutions	م²	3 800,00	3300,00	3800,00	
02	Réalisation d'une murette d'appui en béton légèrement armé (TS Ø8mm 15x15) dosé à 350 kg/m3 en ciment résistant au sulfates dimensions b x h = 20 x 40 cm	متر	2 000,00	800,00	1800,00	
03	Fourniture et pose de clotures métalliques type panneau CLASSIC en acier galvanisé et plastifié Hauteur: 2,50m Largeur:2,30m Maille:200x55mm Diamètre de fil:5,00mm Couleur:RAL VERT 6005 AVEC Poteaux en acier galvanisé et plastifié Hauteur:2,50m Fixation : A sceller socle en béton *Clips de fixation y compris: main d'œuvre peinture anti rouille et peinture de finition et toutes sujétion de bonne execution	متر	10 000,00	13000,00	11000,00	

Annexe 23 cost suggestion,source: Directorate of Planning of Biskra Province

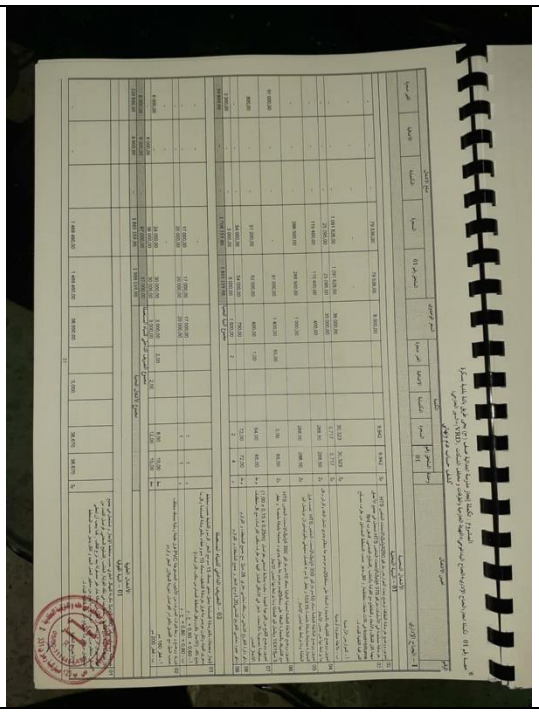


المشروع : تكملة إنجاز مدرسة ابتدائية صنف (ج) بحي طريق باتنة بلدية بسكرة
حصة رقم 01 : تكملة انجاز(الجناح الإداري+الجناح البيداغوجي+التهيئة الخارجية والطرقات و مختلف الشبكات (VRD)+السور الخارجي)
جدول الأسعار الوحدوية للأشغال التكميلية

رقم	تعيين النوع و الأسعار الأحادية بالكامل للمرفق	الأسعار الأحادية بالأرقام
12	F/P de revêtement en gazon synthétique nouvelle génération de fibre 60 mm polythène homologué 13000 DTEX nombre de touffes 8000 touffes/m2 y compris respect aux techniques définies et décrétées notamment collage des joints (colle de gomme verte) mise en place de la couche stabilisatrice en sable de silice (à raison de 8 à 10 kg/m2) et 2ème couches de souplesse en granulées de gommes noire et traçage du terrain par bandes de gazon synthétique de couleur blanche et toute sujétions de bonne exécutions المتر المربع : ألفان وثمانمائة دينـــــار جزائـــــري	2 800,00
11	Réalisation d'une murette d'appui en béton légèrement armé (TS Ø5mm 15x15) dosé à 350 kg/m3 en ciment résistant au sulfates dimensions b x h = 20 x 40 cm المتر الطولي : ألف وثمانمائة دينـــــار جزائـــــري	1 800,00
12	Fourniture et pose de clotures métalliques type panneau CLASSIC en acier galvanisé et plastifié Hauteur: 2,50m Largeur:2,30m Maille:200x55mm Diamètre de fil:5,00mm Couleur:RAL VERT 6005 AVEC Poteaux en acier galvanisé et plastifié Hauteur:2,50m Fixation : A sceller socle en béton *Clips de fixation y compris: main d'œuvre peinture anti rouille et peinture de finition et toutes sujétion de bonne execution. المتر الطولي : أحد عشرة ألف دينـــــار جزائـــــري	11 000,00
13	F/P de pare ballon de hauteur de 3 m hors sol composé de : filet polyéthylène traité anti UV de maille 45x45 mm /et de 3 mm de diamètre avec des poteaux tube carré 60x60 H = 6 m lourde fixé au mur de clôture chaque 3,00 m y compris fondeur fil et cable de tention et serre cable la soudure, main d'œuvre peinture anti rouille et peinture de finition et toutes sujétion de bonne execution المتر الطولي : ألفان وخمسمائة دينـــــار جزائـــــري	2 500,00
14	تعرين ووضع لافتة تشهيرية للمشروع بمادة Alucobond و تغطية بـ Forex يشمل التركيب التثبيت الجهاز اليد العاملة و كل المستلزمات الضرورية لحسن التنفيذ و الاحسان الوحدة : مائة و عشرون ألف دينـــــار جزائـــــري	120 000,00
15	Fourniture et pose des équipements a) Paire de but basket Ball galvanisé avec panier, filets et fourreaux de fixation b) Paire de barre de volley Ball en aluminium avec fourreaux et filets c) Paire de but de hand Ball en aluminium avec, revêtement en bois et filets avec fourreaux de fixation الوحدة : مائتان ألف دينـــــار جزائـــــري	200 000,00

بسكرة :
المتعامل الاقتصادي
المختص المتعاقد
المدير والاعضاء

Annexe 24 Unit Price Schedule for Additional Works,source: Directorate of Planning of Biskra Province



Annexe 25 General and Final Account Statement,source: Directorate of Planning of Biskra Province

Annexe 26 Service Order of the referance project (Commencement of Works),source: Directorate of Public Equipment of Biskra Province

الجمهورية الجزائرية الديمقراطية الشعبية

ولاية بسكرة

مديرية التجهيزات العمومية

صفقة

المشروع : انجاز مجمع مدرسي صنف (ج) بعلب بوعصيد

بلدية بسكرة

حصة رقم 01 : الإدارة + قاعة متعددة الخدمات +

المراحيض+ 09 أقسام + 02 سلم

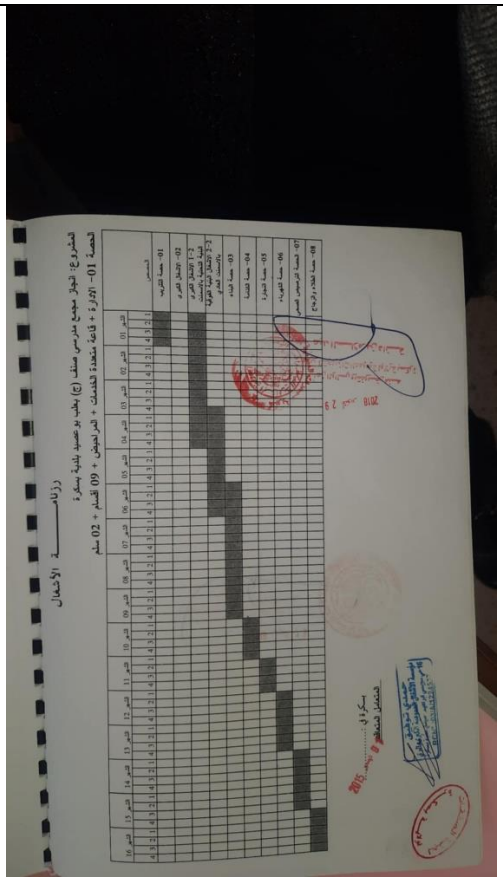
تسمية العملية: متابعة ، بناء و تجهيز مجمع مدرسي صنف (ج) بسكرة

رقم العملية : NK5.623.4.262.107.11.23

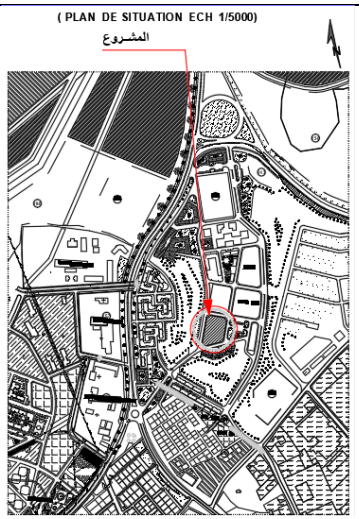
مؤسسة الأشغال العمومية الكبرى والري

(حمدي توفيق)

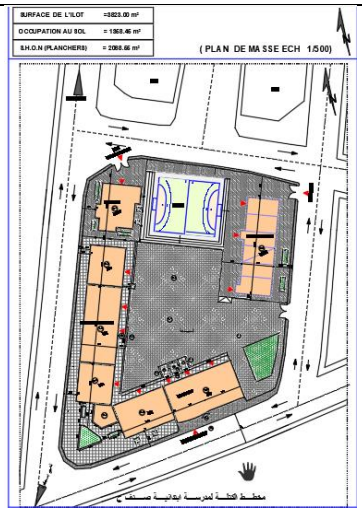
Annexe 27 Contract referance Project:,source: Directorate of Public Equipment of Biskra Province



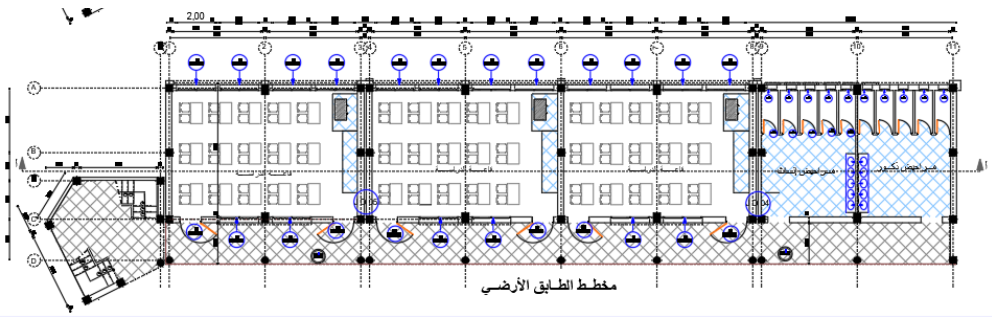
Annexe 28 Work Execution Schedule of the referance project ,source: Directorate of Public Equipment of Biskra Province



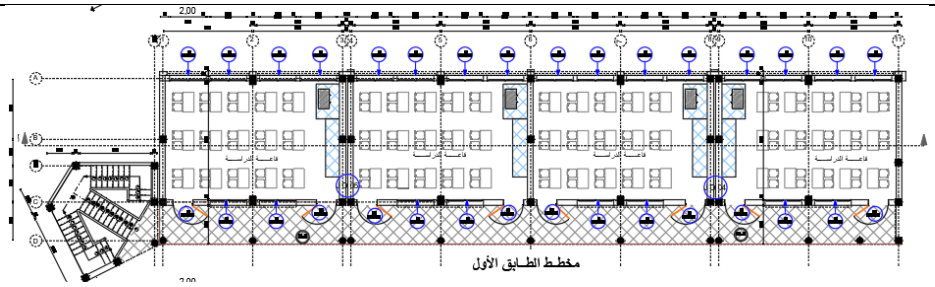
Annexe 29 Site plan ,source : Design Office: GROUP "ARCHICIVIL"



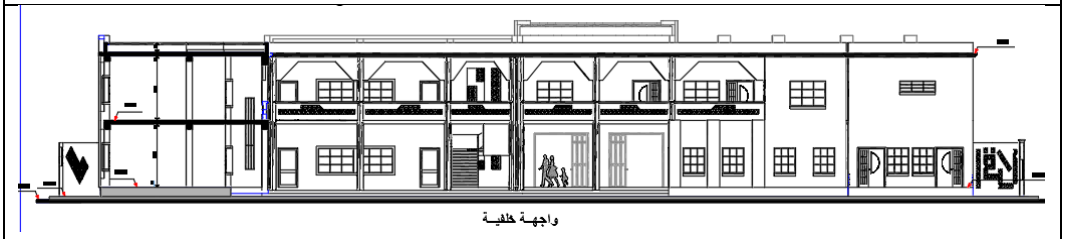
Annexe 30 Master block plan ,source : Design Office: GROUP "ARCHICIVIL



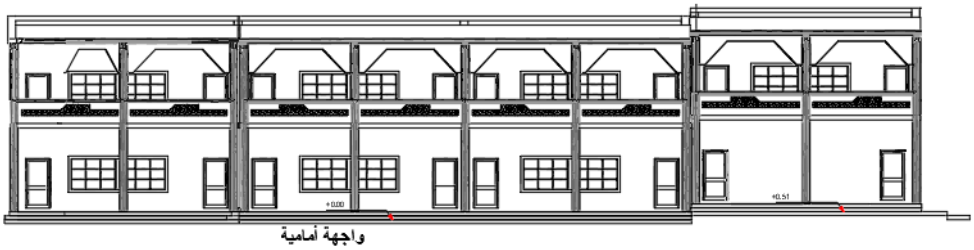
Annexe 31 Pedagogical Wing Plan – Ground Floor,source : Design Office: GROUP "ARCHICIVIL



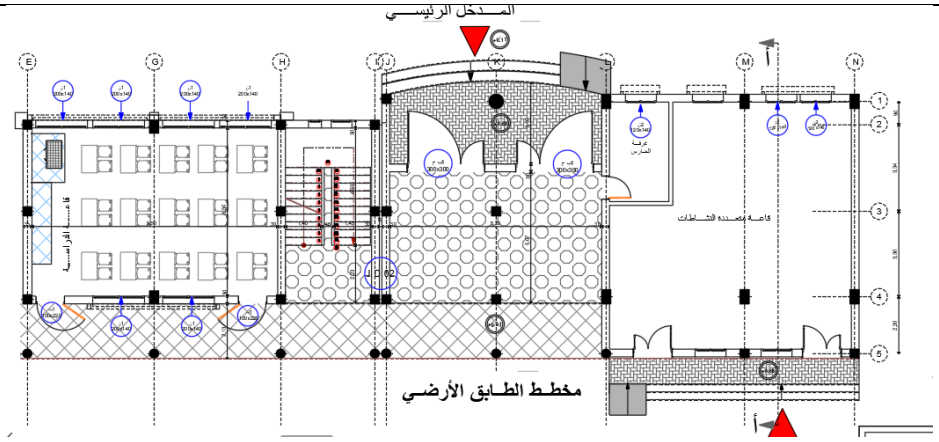
Annexe 32 Pedagogical Wing Plan – First Floor,source : Design Office: GROUP "ARCHICIVIL



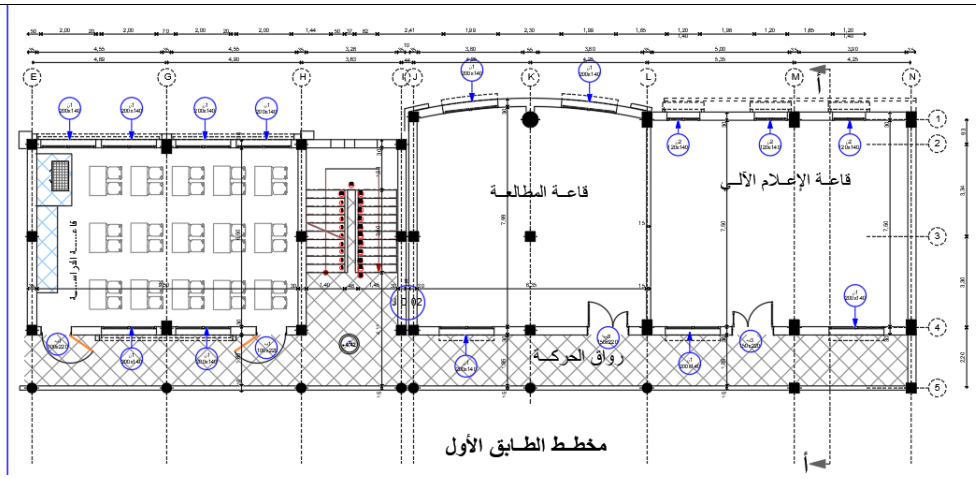
Annexe 33 Back Elevations of the Pedagogical Wing,source : Design Office: GROUP "ARCHICIVIL



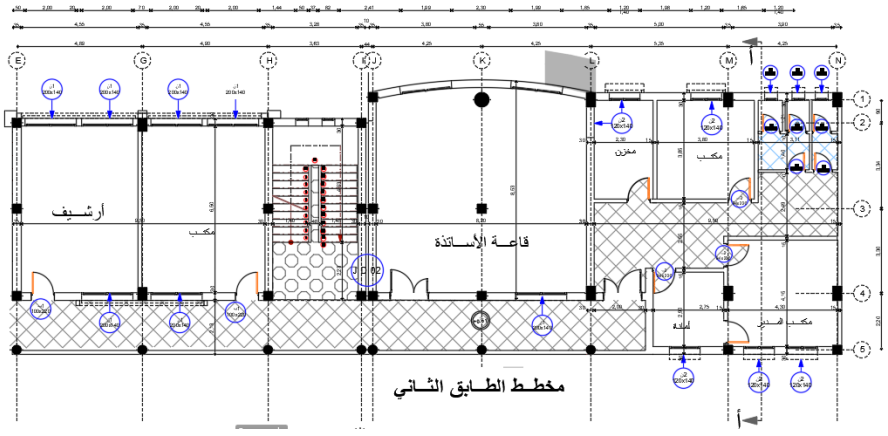
Annexe 34 Front Elevations of the Pedagogical Wing,source : Design Office: GROUP "ARCHICIVIL



Annexe 35 *Administrative Wing Plan – Ground Floor*,source : Design Office: GROUP "ARCHICIVIL



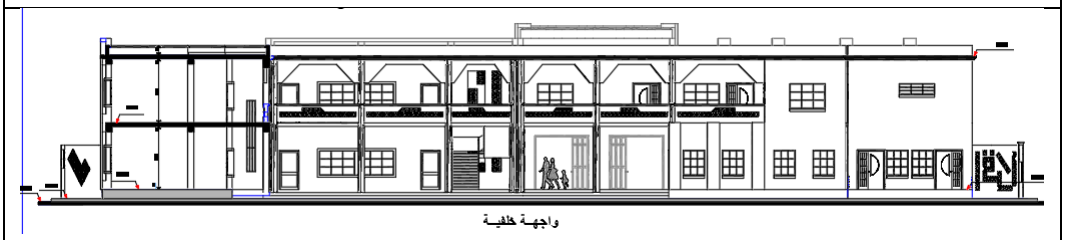
Annexe 36 *Administrative Wing Plan* – First *Floor*,source : Design Office: GROUP "ARCHICIVIL



Annexe 37 *Administrative Wing Plan* – Seconde *Floor*,source : Design Office: GROUP "ARCHICIVIL

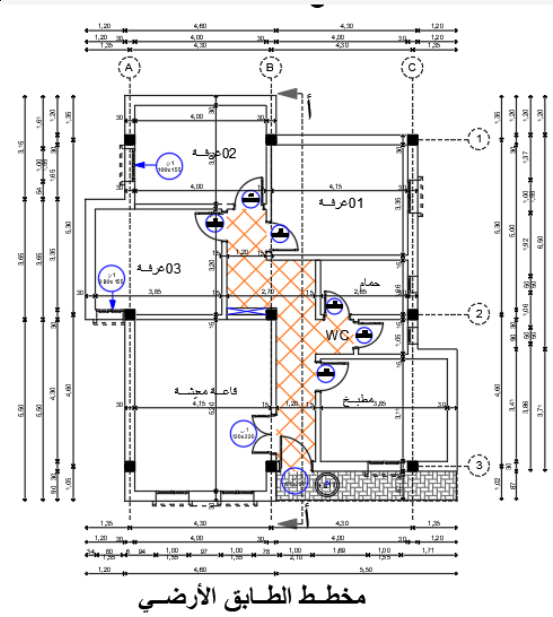
واجهة أمامية

Annexe 38 *Administrative Wing Plan* – Front Elevations,source : Design Office: GROUP "ARCHICIVIL

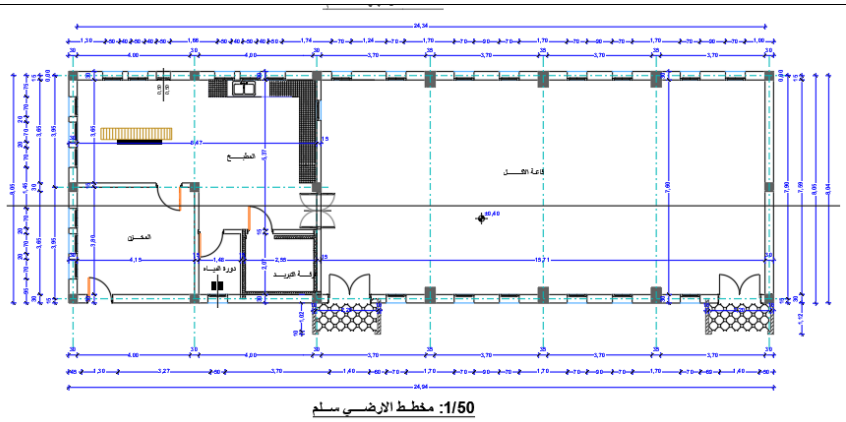


واجهـة خلفيـة

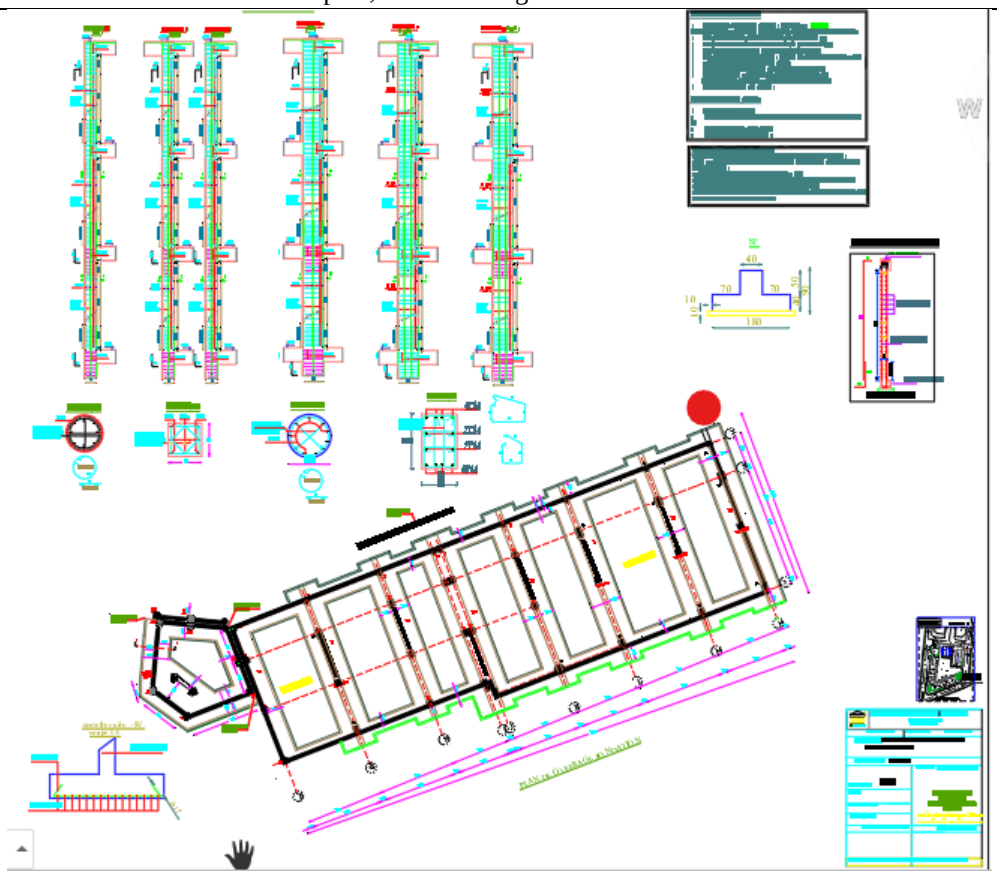
Annexe 39 *Administrative Wing Plan* – Front Elevations,source : Design Office: GROUP "ARCHICIVIL



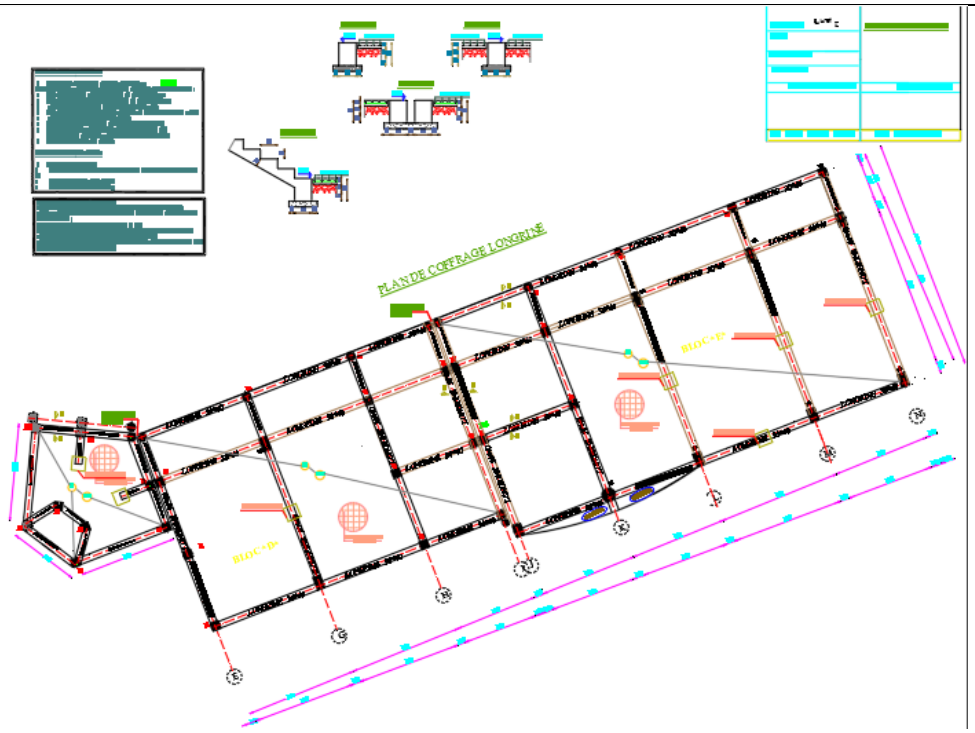
Annexe 40 Service Housing Plan,source : Design Office: GROUP "ARCHICIVIL



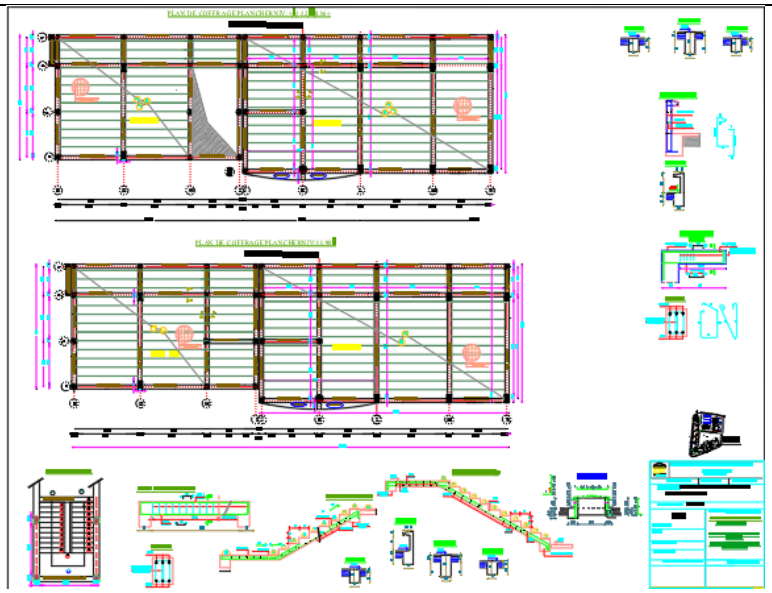
Annexe 41 Canteen plan,source : Design Office: GROUP "ARCHICIVIL



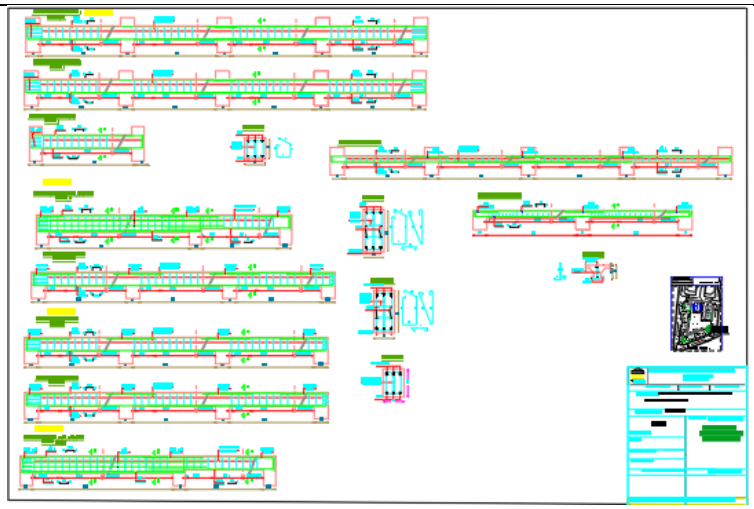
Annexe 42*Formwork Plan for Foundations and Reinforcement of Columns*,source : Design Office: GROUP "ARCHICIVIL



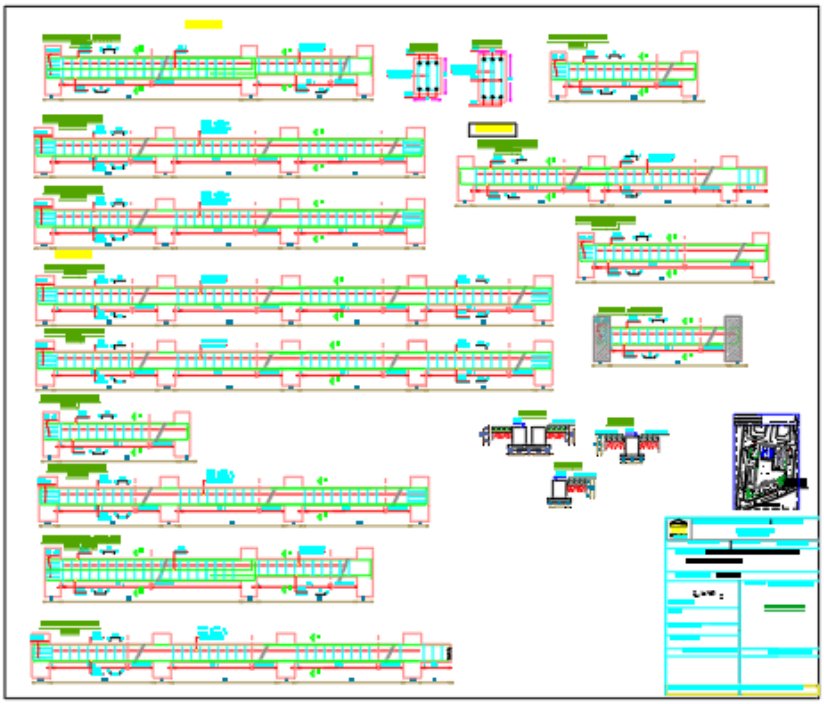
Annexe 43Formwork Plan for Ground Beams,source : Design Office: GROUP "ARCHICIVIL



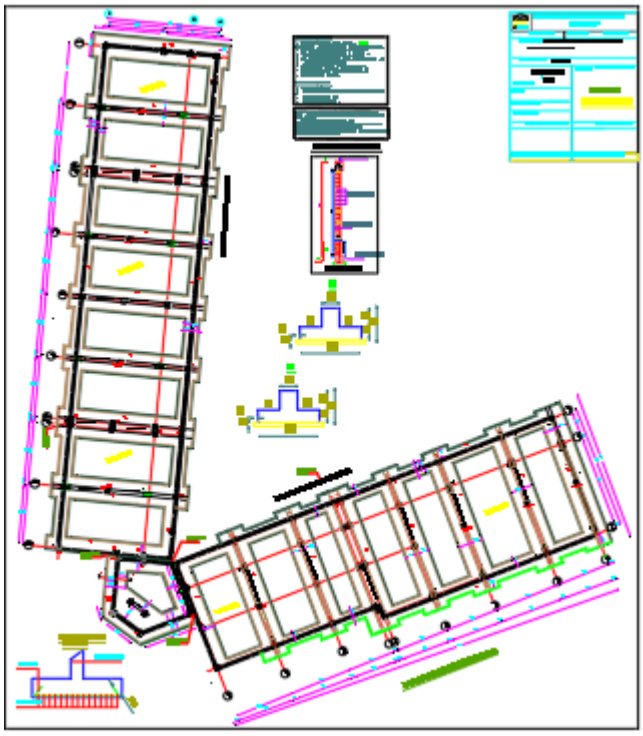
Annexe 44 Detailed Formwork and Reinforcement of Parapet Staircase and Slabs – Levels +4.42, +8.16, and +11.90,source : Design Office: GROUP "ARCHICIVIL



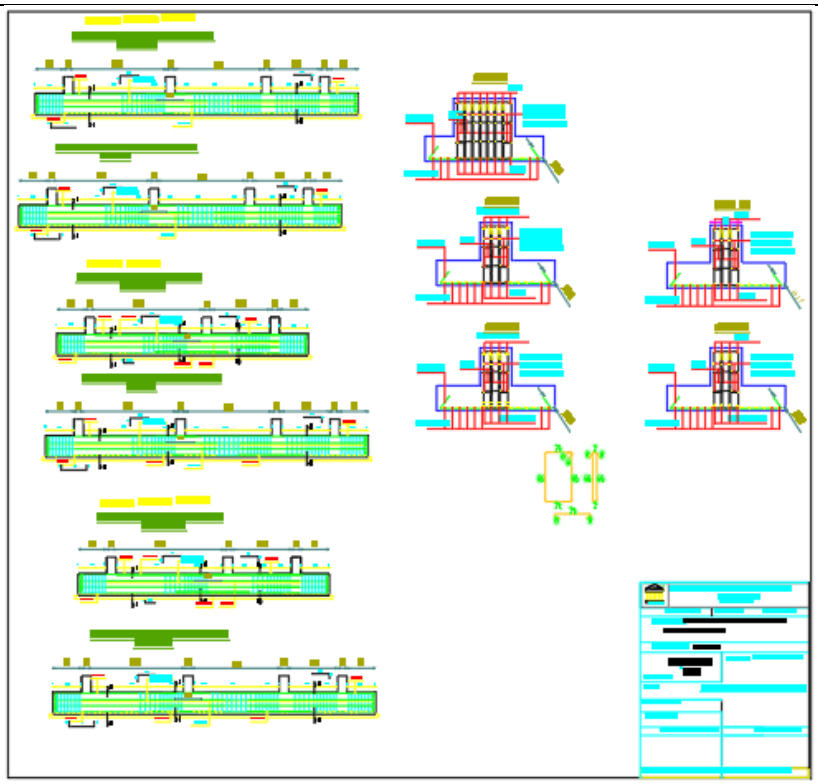
Annexe 45 *Reinforcement and Formwork Details – Chain Beam Connections, Ribbed Slab (16+4), and Standard Beam Type*,source : Design Office: GROUP "ARCHICIVIL



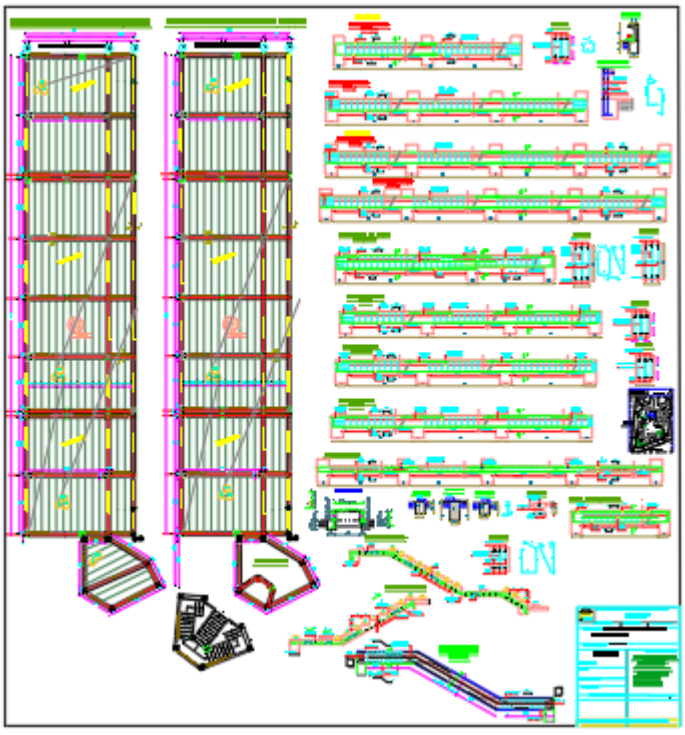
Annexe 46 *Formwork and Reinforcement of Ground Beam (Longrine)* ,source : Design Office: GROUP "ARCHICIVIL



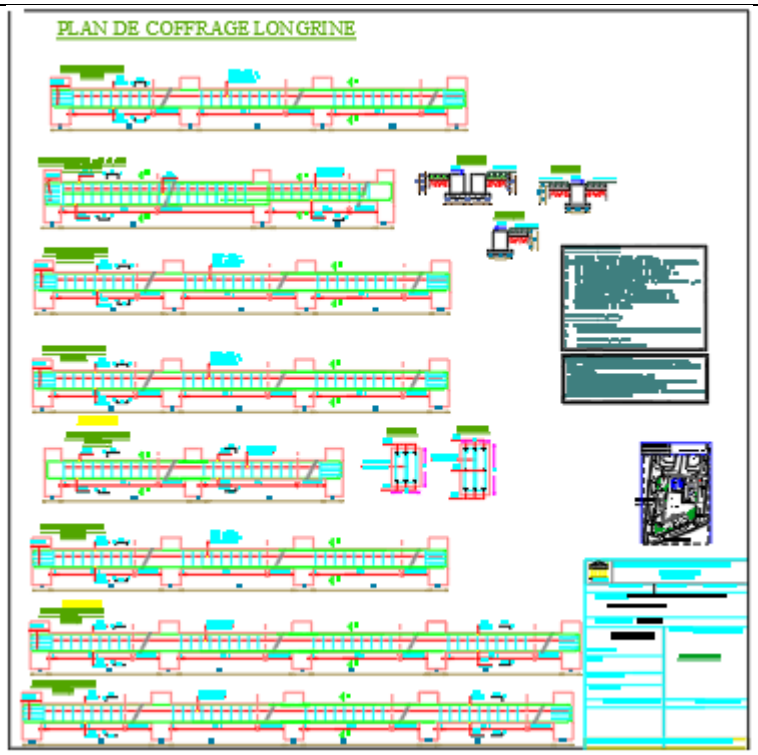
Annexe 47 **General Layout Plan,source : Design Office: GROUP "ARCHICIVIL**



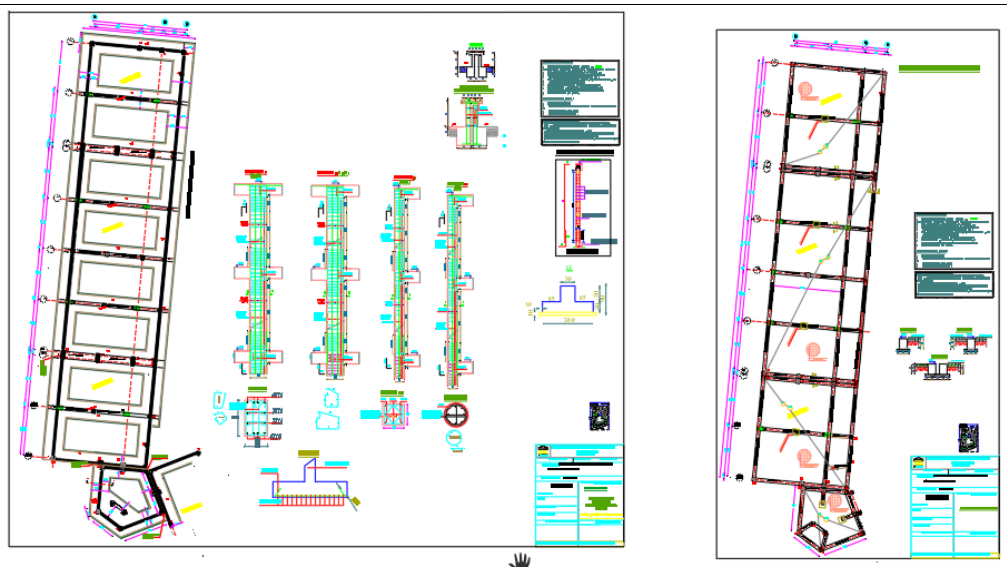
Annexe 48 *Reinforcement of Continuous Footing Foundation*,source : Design Office: GROUP "ARCHICIVIL



Annexe 49 *Structural Formwork and Reinforcement Details – Slab Plans (Levels +4.42 & +8.16), Ribbed Slab (20+5), Beam Type, Parapet, Staircase, and Wall Tie Beams*,source : Design Office: GROUP "ARCHICIVIL



Annexe 50 *Formwork and Reinforcement of Ground Beam (Longrine)* ,source : Design Office: GROUP "ARCHICIVIL



Annexe 51 Foundation, Column Reinforcement, and Ground Beam Formwork Plans,source : Design Office: GROUP "ARCHICIVIL

جامعة محمد خيضر بسكرة
قسم الهندسة المعمارية

استمارة مقابلة مع المقاول صوالحي عمار أو أطرافه المسؤولين
مقابلة مع السيد.....
التاريخ: ..... المكان: .....

مرحبًا،
أشكركم على تخصيص وقتكم لهذه المقابلة. أنا طالبة سنة ثانية ماستر تخصص ادارة مشاريع البناء بقسم الهندسة المعمارية بجامعة بسكرة، وأجري دراسة حول العراقيل التي تؤثر على إنجاز مشروع المدرسة الإبتدائية بن دحمان مبارك بطريق باتنة ولاية بسكرة وتأثير تكاليف الإنجاز على الموعد النهائي المحددة للإنجاز.
نظرًا لإدارتكم للمشروع، أود طرح بعض الأسئلة حول هذا الموضوع. إذا لم يكن لديكم أي مانع، سأقوم بتسجيل المقابلة لتوثيق ملاحظاتكم، مع ضمان السرية التامة.
شكرًا لتعاونكم.

« هذه المعلومات تستخدم لأغراض علمية بحتة »

أولا: أسئلة عامة عن المشروع
ما هو تقييمكم الحالي للوضع العام في إنجاز مشروع المدرسة الإبتدائية بن دحمان مبارك بطريق باتنة ولاية بسكرة.
.....
.....
ما هي المراحل التي تم إنجازها حاليًا في المشروع؟ وهل سارت وفق الجدول الزمني المحدد؟.....
.....
ثانيًا: أسئلة عن العراقيل والمشاكل
ما أبرز العراقيل التي واجهتموها خلال تنفيذ المشروع؟
.....
.....
1. عراقيل تقنية (مواد البناء، التصميم....).
.....
2. عراقيل إدارية (إجراءات التصاريح....)
.....
3. عراقيل مالية (تمويل غير كاف، تأخير في الدفعات....).
.....
4. عراقيل بشرية (نقص العمالة، ضعف الكفاءة....).
.....
هل كان هناك دعم أو تدخل لحل هذه العراقيل؟ وكيف تم ذلك؟

Annexe 52 *Interview Form*, source : the author 2025

هل كانت هناك صعوبات في التنسيق بين الأطراف المتدخلة في المشروع؟

ما هي أكثر المشاكل الإدارية التي أثرت على سير العمل؟

كيف تم التعامل مع هذه العراقيل؟ وهل تم تعديل الجدول الزمني بناءً على ذلك؟

ثالثًا: أسئلة عن إدارة الوقت والجداول الزمنية

هل قمتم بإعداد مخطط زمني مفصل (Planning) قبل بداية المشروع؟ ومن قام بإعداده؟

ما هي الأدوات أو البرامج المستخدمة في إعداد الجدول الزمني؟

كيف تم تقسيم المشروع إلى مراحل (تهيئة، هيكل، تشطيب... إلخ)؟ وهل حددتم مدة لكل مرحلة؟

كيف يتم متابعة مدى احترام الجدول الزمني خلال الأشغال؟ وهل توجد تقارير دورية؟

هل التزم المشروع بالجدول الزمني المحدد؟ إذا لا، ما هي الأسباب؟

كم مرة يتم فيها تحديث الجدول الزمني للمشروع؟ ومن يشرف على ذلك؟

كيف يتم التعامل مع التأخير في الإنجاز؟

هل تعتقدون أن الجدول الزمني للمشروع كان واقعيًا منذ البداية؟ ولماذا؟

ما هي أكثر المراحل التي شهدت تأخيرًا ملحوظًا؟ وما السبب الرئيسي وراء ذلك؟

هل تم تعديل الجدول الزمني للمشروع نتيجة التأخيرات؟ وإذا كان كذلك، ما هي الاستراتيجيات لتعويض هذا التأخير؟

رابعا: الجانب المتعلق بالتكاليف

كيف يتم تحديد الميزانية التقديرية للمشروع؟ وهل تعتمدون على دراسة أولية مفصلة؟

Annexe 53 *Interview Form*, source : the author 2025

ما هي العوامل التي تؤثر أكثر على الميزانية خلال التنفيذ؟

هل تم إحترام الميزانية المخصصة للمشروع؟ وإن لم يتم، فما أسباب تجاوزها؟

هل أثرت تقلبات الأسعار (كالزيادات في أسعار مواد البناء) على التكلفة الإجمالية للمشروع؟

هل يتم إعداد تقارير مالية دورية خلال تقدم الأشغال؟ ومن يراجعها؟

هل حدث أن تجاوزتم الميزانية المقررة؟ وما كان السبب؟

هل تم طلب تعديلات أو أشغال إضافية غير مبرمجة مسبقاً؟ وكيف أثرت على الكلفة؟

هل توجد مستحقات مالية لم يتم تسديدها إلى غاية الآن؟ وهل لذلك تأثير على سير الأشغال؟

خامسا: تأثير التكلفة على الزمن والموعد النهائي

هل أدت أي عراقيل مادية أو مالية إلى تأخير في الإنجاز؟

هل تأخر تسليم الدفعات أثر على وتيرة العمل؟

ما هي خطتكم للتعويض عن التأخير (إن وجد)؟

« شكرا جزيلا لتعاونكم »

Annexe 54 Interview Form , source : the author 2025