University of Mohamed Khider - Biskra
Faculty of Science and Technology
Department of Architecture

MASTER Dissertation

Field: Architecture, Urbanism and City profession
Sector: Architecture
Specialty: ARCHITECTURE
Thematic: Architecture, Environment and Technologies

Presented and supported by:
Kordi Khoubaib

On: Wednesday September 23, 2020

The theme:
The effect of day light on museum's exposition.

The project:
Museum, case study El oued Town

Jury

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Academic year: 2019 - 2020

Dedication

Yes, I could not have done this without the Almighty Allah.

I dedicate this work

To my parents who have provided me with their encouragement, love and understanding

To my Dreams who always pushed forward for more

To my brothers, Raibe and Mohammed for their whole-hearted support

To all my extended family

To all my friends, Mohamed, Hako and Oussama

and to all my teachers at the University of Biskra

To all who were there for me, thank you for your help and encouragement

To all those who have been supportive, caring and patient, I dedicate you this simple work.

Acknowledgement

First, before anything, thanks to 'Allah' who guides, helps and gives me the capacity to do this work.

I am indefinitely indebted to my mother who devoted all her time for me during the preparation of this work and my father who supported me throughout my studies. Allah bless them now and forever.

I would like to express my infinite gratitude and respect to my supervisors Dr. Boukhabla Moufida and Mme Sabti Moufida for there constant help, precious suggestions and valuable advices.

I am also grateful to all my teachers without whom this work would not have been possible. I especially express my sincere thanks to Dr.Mirad and Dr.Youcef Kamal for there valuable advices and provided knowledge,

I will not forget, of course, to express my gratitude to all the students of Master one who have kindly accepted to cooperate.

Thank you all for you help.

Abstract:

The most important characteristic of our time is the daylight and take advantage of it in buildings due to the technological development. we want to integrate the daylight and culture together in this research. This work came under the advanced technology and attempts to apply all the relevant technologies to serve the natural lighting in the regional Museum of art in El Oued.

The aim is to support the cultural and tourism sector with a facility beyond the borders of the traditional museums. In order to achieve these objectives, we have relied on a methodology based on an introduction that explains the reasons for selecting the project, the theme, the structure of the research, and a theoretical chapter in which we discussed the most important concepts related to the daylight architectural and the advanced technology also the museums and an analytical chapter based on extracting the most important technical conditions and requirements that will be included in the design of the project. And an application chapter explaining the objectives of the project and a detailed presentation of the design steps and showing the results of the simulation and finally explain the new devices used to take advantage of the daylight to conclude with a graphic presentation of the project.

By following this structure, we were able to integrate the culture and daylight into the museum project, which helped us to perform its tasks perfectly , Where the research work culminated in Museum of art in El Oued , which added to the city a cultural and tourist landmark because of its daylighting usage and its attractive technological envelope, which gives a contemporary concept of the museum project.

Keywords: Museum - Daylight - Advanced technology – El Oued – Shading System.

ملخص:

أهم ما يميز عصرنا هو ضوء النهار و استغلاله داخل المباني نتيجة للتطور التكنولوجي. نريد دمج ضوء النهار والثقافة معًا في هذا البحث. حيث جاء هذا العمل في ظل التكنولوجيا المتقدمة ومحاولات لتطبيق جميع التقنيات ذات الصلة لخدمة الإضاءة الطبيعية في المتحف الإقليمي للفنون بالوادي.

الهدف هو دعم القطاع الثقافي والسياحي بمرفق خارج حدود المتاحف التقليدية ولتحقيق هذه الأهداف اعتمدنا على منهجية مبنية على مقدمة تشرح أسباب اختيار المشروع والموضوع وهيكل البحث وفصل نظري ناقشنا فيه أهم المفاهيم المتعلقة بالمشروع اهمها ضوء نهار و التكنولوجيا المتقدمة وكذلك المتاحف وفصل تحليلي يعتمد على استخراج أهم الشروط والمتطلبات الفنية التي سيتم تضمينها في تصميم المشروع. وفصل تطبيقي يشرح أهداف المشروع وعرض تفصيلي لخطوات التصميم ويظهر نتائج المحاكاة وأخيراً يشرح الأجهزة الجديدة المستخدمة لاستغال ضوء النهار بشكل مثالي ليختتم بعرض رسومي للمشروع. باتباع هذا الهيكل تمكنا من دمج الثقافة وضوء النهار في مشروع المتحف مما ساعدنا على أداء مهامه على أكمل وجه ، حيث توج العمل البحثي بمشروع متحف الفن بالوادي الذي أضاف للمدينة طابع ثقافي وسياحي معلم بارز بسبب استخدامه لضوء النهار بشكل مثالي ومغلفه التكنولوجي الجذاب و الوظيفي ، والذي يعطي مفهومًا معاصرًا لمشروع المتحف.

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GENERAL INTRODUCTION

Introduction:

Art is essentially a means of expressing these emotional sensations and universal communication by means of its comprehensible understandings without limits. art has challenged us and the development of spaces for expression and communication is, in our view, an absolute priority of societies. The great civilizations have shone through the works and large-scale works on which the physical aspect (relationships with material needs) does not neglect, here, the aesthetic aspect (relationships with emotional and emotional needs). Architecture is an ideal field that constantly combines the physical and aesthetic aspects of works and works designed and realized. We therefore wanted to involve us in a contribution to the development of art through a multi-disciplinary and interdisciplinary complex allowing the population of the El-Oued region to find adequate spaces to satisfy their needs for expression, communication and the discovery of the creative genius of the human being.

Daylighting, a new term for an old practice, simply means managing natural light in a building or to control admission of natural light, direct sunlight, and diffused-skylight into a building to reduce electric lighting and saving energy, both by bringing light into the building and by keeping it out when it is not wanted. It is associated with recent efforts to make efficient use of materials and energy. This term is very familiar in Museum studies due to the importance of light in Museums spaces this why the study will be oriented towards the Daylighting in museums and its impact on the preservation and presentation of works, we approach the two processes of Daylighting (zenith& lateral), which are the most used in museums around the world.

1 Problematic:

The usage of Daylight is based on the capture of the sunlight, then its diffusion inside the spaces of the museum by two essential processes which are the zénithal and the lateral. These two modes of transmissions of Daylight, are elements very important for a good exhibition atmosphere inside the museum spaces, on one side; describe the courses designed by the architect and the routes experienced by the visitor, and on the other hand, enduring a presentation and meanings to the collections and objects of art exhibited in the museums. beside to all these advantages that Daylight offers to spaces; at the same time, it constitutes a real danger, for its same sources of illumination may constitute a danger to its exposed objects, by damaging their colors and constitutive materials by the rays of the sun's light. When the exhibitions are directly exposed to sun rays.

Question: How to ensure and control an adequate (Suitable) Daylight while putting in consideration a better visual perception for an optimal profit of the exhibited work in museum?

2 Hypotheses:

The use of various lighting devices and techniques to offer an optimal quality & quantity of lighting to museums.

3 Objectives:

The purpose of the research work carried out is to deal with the issue of Daylighting through the study of zenithal and lateral features in the museum space, in relation to the two major issues in museums;

- ✓ The presentation and conservation of the exhibited works.
- ✓ The effectiveness of the zenithal and lateral device in exhibition spaces.
- ✓ Take advantage of the strong points of each lighting device in the museums.

- ✓ The functioning of the spaces, in terms of natural lighting in the museum space.

4 Methodology:

Designing a perfect space for exhibition in El-Oued region, has a lot of problems according to lighting control or provide best lighting in museum in general, in this research we will study the luminous comfort in Exhibition areas of museum in El-Oued region.

A- the luminous comfort index that we will study is

1-Luminance

2-Illumination

B- The method we use is simulation with DIALux simulation tool this software is for planning, calculation , and visualization of indoor lighting , the software makes professional lighting design easier and accessible everyone .

5 Memory structure:

And the memorandum was arranged and developed using previously obtained knowledge according to the Harvard approach, which is based on an introduction and three basic chapters

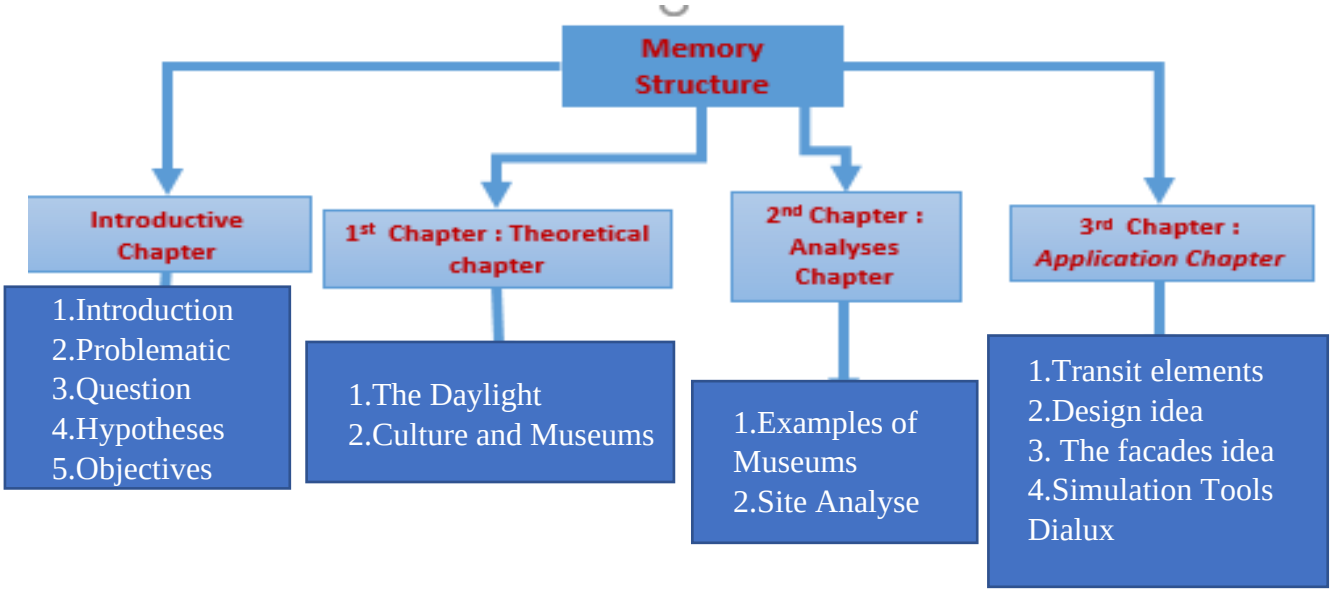
1.The beginning is the introduction to clarify and illustrate why the project has to be selected with a collection of methodologies that the research will use.

2.The first chapter was dedicated to studying the theoretical framework through a documentary Research in which all the theoretical principles and meanings underlying the project and the theme emerge.

3. The second chapter is an important part of the study of the documentary, which involves the different analyzes and applications which will be in the project.

4. The third chapter, with a full graphic overview of the project, in which we will present all the design procedures and project goals and the transit elements and project concept.

5. In conclusion, this research concludes with a general summary which includes highlighting the importance of the topic by fulfilling the objectives set for achieving the Completion of a project which answers previously asked questions and provides a solution to all of the above listed problems.



CHAPTER I: THEORICAL STUDIES

Introduction:

Architecture is one of the most important field affected by the environment and climate directly. In this chapter, we will discuss how architecture influenced by the light in terms of design and ideas. At the same time, we will understand the most important methods used in architecture to cope with environment and challenges which facing the building.
We have talked about the most important element in the human life, which is the light, we will study its historical and function and the most important components and characteristics and how it could be a challenge for architects and the technical requirements to take advantage of it in the internal space of the building.
We also discussed museums as cultural equipment and what is the advanced technology could include and what are the requirements of each the type of museum.
The purpose of this chapter is to explain the most important things that will apply in our project of dynamic envelope technology to benefit of daylight, modern exhibition techniques.

1 The light:

Sunlight (or white light) is actually composed of several colors, that we do not see because they are mixed; to see distinctly admiring an arc- rainbow or using a prism When light reaches an object, three things can happen: light can be reflected, transmitted or absorbed. A mirror reflects all the light it receives. Backgrounds transparencies (like water or glass) transmit light through them.

1.1 Types of Light:

There is two types of light :

1.1.1 Natural Light:

The Sun is actually the main source of natural lighting. Because, the brightness of the Sun is extremely high, it is of the order of 1600 times the luminance separating by a large distance, the sun offers luminance, and producing adequate illumination during the day In addition direct illumination by the Sun gives shadows clean and worn very contrasted, often let in homes, so workplaces. Also for visual and thermal exploitation of the sun. But sunshine is also influenced by cloudiness: the characteristics climatic and geographical (reliefs, body of water ... etc.) that prevail in a given place determine a cloudiness profile that affects theoretically available sunlight

1.1.2 Artificial Light:

Artificial light, as opposed to natural light, refers to any light source that is produced by electrical means. Artificial lighting has many different applications and is used both in home and commercially.

1.2 The Colors of light:

As the light is composed of several colors, part of them can be reflected, and the other party absorbed. If all colors are reflected, the object is colored white. If none is reflected (so all colors are absorbed), the object is black. Yes an object absorbs all colors except for example red, your eye will see the color reflected red and you will say that the object is red. The light that is absorbed will be naturally transformed into heat: this is why, in summer, dark objects are more hot than light objects because they absorb all colors.

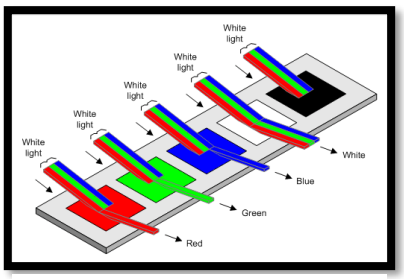


Figure I: Shining white light on different colored paints.

2 The Visual comfort:

2.1 The visual comfort:

means the ease of observation or the absence of discomfort in a determined environment. This concept involves factors that can stimulate other meanings. however, the comfort of each sense is evaluated independently, but architectural design is essential here. The visual comfort parameters are: illumination; glare, and the color of the light

2.2 Contrast:

One of the factors influencing visual performance. It is interpreted by the difference between two ranges or between the object and its background. It is essential for the performance of visual tasks, therefore for visual comfort. (D.BARKOUK , 2017)

This is the subjective appreciation of the difference in appearance between two parts of the visual field seen simultaneously or successively. it may be a color contrast, a luminance contrast.

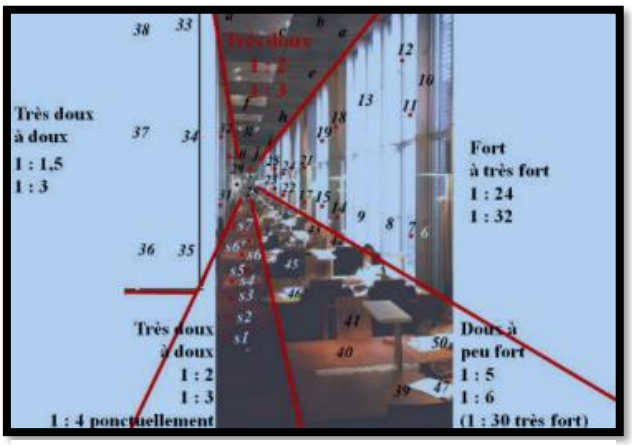


Figure II:Contrast Scale (Salma S.2012)

2.3 Glare:

Glare is a well-known problem in built environments, especially in Saharan regions. However, very little research has been done on glare in purely Saharan environments. Glare is a phenomenon bright which causes vision difficulties for the occupants of an environment bright due to overly bright artificial or natural lighting (Carlucci, Causone, et al. 2015 by D.BARKOUK).

Glare is defined as " a condition of vision in which there is discomfort or a reduction in the ability to see significant objects. Or both, due to an unsuitable distribution or range of brightness or to either simultaneous or successive, extreme contrasts in the field of view"

2.3.1 Direct glare:

where, the sun is in the immediate field of vision of the users **.** It is caused by the presence of an intense light source located in the same direction as the object viewed or in a nearby direction. (Daylight In Architecture).

2.3.2 Indirect glare:

It comes from a disruptive reflection of light sources on precolonous or shiny surfaces. Glare disability is due to excessive amounts of light reaching the eye and resulting in scattering of light inside the eye. A form of disability glare which is commonly found in buildings is due to the reflection of either artificial light or sky light, from the polished surfaces of furniture. Although the worker is

often unconscious of this type of glare, the effect is detectable by errors or a slowing down of his performance . . (Daylight In Architecture).

2.3.3 Reflected glare: the presence of the mirror effect on the surface of the monitor. Most glare-related clues aim to assess uncomfortable feeling occupants .

2.3.4 Background glare: the presence of a contrast in brightness between the screen and monitor background. (D. BERKOUK , 2017)

2.3.5 The measuring for evaluating the quantity of light:

The measuring device for light is a luxmeter, it allows to measure the illuminance expressed in lux of your bulb This is the most commonly used measurement, it measures the illumination received by a unit of surface. A lux is the illumination of a surface that receives, in a uniformly distributed manner, a luminous flux of one lumen per square meter.

Figure III: luxmeter (Salma S.2012)

3 Indices for evaluating the quality of light :

The quantification of daylight and its distribution in environments interiors is the first step to properly design lighting and lighting systems carry out an energy-efficient control and also to assess consumption energy

Daylight factor (DF):

The DF is usually expressed as a percentage, so there is no consideration of absolute illuminance values ($DA = (Eint / Eext) \times 100\ \%$) knowing that these researchers used a judgment scale as follows:

- FLJ <10: the optimal amount of light to superimpose;
- <FLJ <10: good quality of natural light;
- 2 <FLJ <5: request for additional artificial lighting;
- FLJ <2: request for total artificial lighting.
- **(**K .ROBERTSON,2010 , D E BAROUD, 2018)

4 Types of lighting (orientation of sources) found in buildings:

The position of the sun, and the intensity of the lighting are the two important factors, which determine the types of lighting in a room (lateral or zenith). Each type of lighting is at the origin of a

number of effects that should be known to ensure a good anticipation and a better control of the ambient qualities bright inside the premises.

4.1 Lateral lighting:

Side lighting is the oldest type of natural lighting historically and also the most used. because it easily meets the requirements of structural and climate of buildings. Also this type of lighting satisfies three basic needs **(comfort, light, view and ventilation).** The bays providing this lateral lighting, are often integrated with sunscreen and which made it possible to reduce the risk of glare, by transformation of the direct luminous flux into a light reflected mostly by the ground. Today, the use of side lighting in large office buildings consists of maximize the potential of indirect lighting while ensuring sun protection sufficient and reduces the risk of glare. To do this, it is always possible to play on the transmission coefficient of glazing **(tinted or translucent glass).**

4.1.1 Types of lateral lighting:

4.1.1.1 Unilateral lighting:

This is lighting provided by one or more vertical openings arranged on the same facade of a given orientation. This arrangement allows for relief effects and harmonies of contrasts. The disadvantage of this type of natural lighting system is the possibility of annoying shadows, due to lighters for example, especially if the walls of the room are dark.

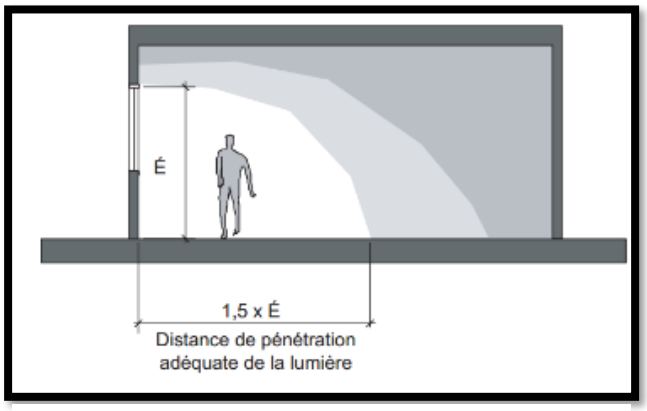


Figure IV:Approximate Penetration of Source Natural Light (D . E BAROUD, 2018)

4.1.1.2 Bilateral lighting :

Bilateral lighting consists of having vertical openings on two walls, either parallel or perpendicular, from the same room . This solution remedies the major defect posed by unilateral lighting. Indeed, according to (A. ANDENPLAS), the depth of the rooms lit by a bilateral device can reach easily four times the distance between the ceiling and the useful plane. (D E BAROUD, 2018)

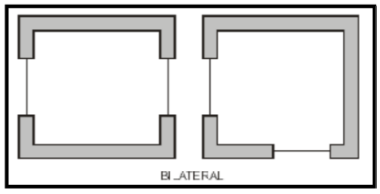


Figure V:Source bilateral lighting devices (D . E BAROUD, 2018)

This type of lighting is often used in low-rise buildings (one to two levels) in regions with temperate, cold or hot and dry climates, such lighting seems the most efficient in terms of energy. This is due to the fact that one can to obtain, in these cases, sufficiently intense and uniform horizontal illumination, with a rather low glazing index, which makes it possible to reduce the speed of heat exchange with the outdoor.

Figure VI:Source Zenithal lighting devices (google.image)

5 The Luminous comfort parameters:

5.1 The luminous flux:

Luminous Flux (Φv) is energy per unit time (dQ/dt) that is radiated from a source over visible wavelengths. More specifically, it is energy radiated over wavelengths sensitive to the human eye, from about 330 nm to 780 nm.

5.2 The luminous intensity I:

A light source or a light beam is the quotient of the luminous flux emitted in a direction through a solid angle given by the measurement of this angle d: I = d Φ / d It is expressed in candela (cd) or lumen per steradian (lm / sr)

5.3 Illumination E:

At a point of area of a surface is the quotient of the luminous flux that it receives by its area Illumination is expressed in lux (lx) or lumen per square meter (lm / m2) .

5.4 The luminance L:

Luminance is a photometric measure of the luminous intensity per unit area of light travelling in a given direction. It describes the amount of light that passes through, is emitted from, or is reflected from a particular area, and falls within a given solid angle d:L = dI / dA cos α. It is expressed in candela per square meter (cd / m2).

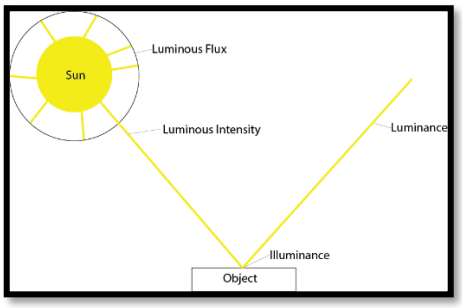


Figure VII:Shining white light on different colored. paints

6 Culture and Museums :

6.1 Definition of culture:

Culture is an infinite project in action, it is at the same time the transmission of works of belief, connivance, values, traditions and their questioning. In a general sense, culture is the set of spiritual, intellectual and sentimental characteristics that different one society brings to the other, in a time determines whether it also encompasses the main rights of man in traditions and beliefs

6.2 Algerian culture:

The Berbers were the original inhabitants of the region. The first invaders were the Phoenicians, whose empire covered the area that is today Lebanon. They began establishing ports along the Mediterranean in 1200 B . C . E . They built the cities of Constantine and Annaba in the east of present-day Algeria, but aside from teaching

the Berbers how to raise crops, for the most part they kept their distance from them. The Romans began making inroads into North Africa, declaring a new kingdom called Numidia. Roman rule lasted six hundred years. The Arabs swept across North Africa in the seventh century (during the lifetime of Muhammad, who died in 632), and again in the eleventh century. The Berbers put up resistance, particularly to the edict that both religious and political leaders could only be Arabian. The second Muslim conquest saw a great shift in Berber civilization, as the people were forced to convert in great numbers or to flee to the hills. However, as internal conflicts began to sway the Muslim stronghold in North Africa in the fifteenth century, Europeans capitalized on this, and by 1510 Spain had seized Algiers, Oran, and other important port cities.

The French took control in the nineteenth century. In retaliation for Algerian debts and insolence toward the European nation, they blockaded several Algerian ports, and when this did not succeed, they invaded Algiers on 5 July 1830. Four years later they declared Algeria a colony, beginning a 132-year reign. In 1840 Abd al-Qadir, an Algerian freedom fighter, led the Arabs in an insurgence against their colonizers, which ended in defeat in 1847. At about the same time, the French began immigrating in large numbers to Algeria, in an attempt by the French government to replace Algerian culture with their own. By 1881 there were 300,000 Europeans (half of them French) in an area of 2.5 million Arabs.

In 1871 Muslims staged the biggest revolt since that of Abd al-Qadir thirty-one years earlier. The French responded by tightening control and further restricting the rights of the Algerians.(Conrty and their Cultures)

6.3 Definition of Cultural Equipment:

Cultural Equipment "Is an institution, also non-profit, that connects creative works and the public, to promote artistic creation and training and more. generally , the diffusion of works of art develops the cultural exchange and communication, produces knowledge and to put it at the service of society.

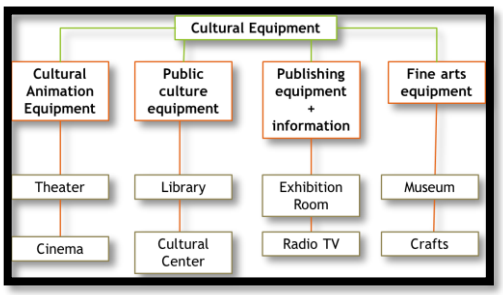


Figure VIII: Cultural structure (Salma S.2012).

7 Presentation of Museum :

7.1 Definiton of Museum :

The museum is a cultural and social place, representing a privileged tool for telling life through the objects of the past while participating in the emergence of traces of the memory of tomorrow. Place of popular education, center of reflection and action of the citizen, it associates new functions that of expressions and production of the culture.

7.2 The roles of museum:

Museums are responsible for the following missions:

- To conserve, restore, study and enrich their collections.
- To acquire material cultural property.
- Inventory goods.
- Participate in work related to his field.
- Make their collections accessible to the public by any means.
- Gather documentation related to their purpose.
- Disseminate information related to their purpose.
- Conduct animation programs (conferences, exhibitions.).
- Contribute to the progress and dissemination of knowledge and research related to his activity
- Study collections and direct scientific research related to their objectives.
- Publish the search result.
- Organize and participate in national and international scientific seminars.
- Exchange museum collections between national and / or foreign museums.

(Article 9--- Source : Direction Of Culture)

7.3 Classification Of Museums:

There are several types of museums and their variety does not allow for a specific classification, but they can always be classified according to certain factors such as:

- The concept of opening and closing
- The concept of the course
- The type of exhibition.

7.4 The Requirements of Museum:

7.4.1 Accessibility: The museum must ensure mechanical and pedestrian accessibilities.

7.4.2 The route: Must be in keeping with the museum program and easy in a way that the visitor is guided directly to the works, while leaving the possibility of independent access to the different rooms.

7.4.3 Flexibility: One relates to the musicographic organization as well as the equipment in order to adapt to the evolution of the participation of the public and sometimes to receive an increase of the collections.

7.4.4 The light: Enhancement of the works, accentuate or attenuate the importance of the different directions of the course by creating different atmospheres by playing on the colors, the intensity, the disposition.

7.4.5 Security: Security of works: use of surveillance cameras, glass protectors and the security of visitors: emergency exits.

7.4.6 General Museum: The largest museums, exhibit works made on different media and originating places

7.4.7 Specialized Museum: Are specialized on a subject or a theme, museums devoted to a discipline particular:

- Natural history, science, decorative arts, fashion, etc.
- Museums devoted to a single artist, museums devoted to original works.
- Within the same geographical area: for example, Asian art museums or art museums African.

7.5 Natural lighting in museums:

The principle factor in the lighting designs of museums and art galleries is the quality of light, Although, aIl objects of arts and sculptures need adequate light to display their colour and appearance, the relative brightness of objects, contrast, and glare resulting from direct sunlight are the most important problems, As ultra violet light tends to deteriorate most items on display in museums and art galleries, it would seem important to work with low illlli~nation levels and to make certain that these are maintained for the short time intervals, It also suggests that all natural light sources should be capable of being obscured so that daylighting can be moderated when it becomes excessive and if necessary totally excluded . It is difficult to give a "safe" level of illumination for sensitive materials because any light may cause some deterioration, To some extent the limit imposed on the illumination level must be arbitrary and dependent on the object being illuminated, In France a maximum illumination of 50 lumens per sq,ft, is prescribed for the artificial lighting of oil paintings, and 30 lumens per sq,ft, for pastels, water colors and other critical materials, In the Natural Gallery, London, and in recent galleries in Portugal and Australia, the illumination on pictures is restricted to 15 lumens per sq.ft.

The quality of light obtained from north-facing openings has long been considered as the best, however other factors may make it impossible to obtain light with "north" light qualities. (Daylight In Architecture)

Conclusion:

after we touched on two important elements in the modern architecture, the daylight and advanced technology and explained the importance of each of them to meet the appropriate internal requirements of the museum of lighting and ventilation and temperature, the architectural envelope must control all this, and to reach the best result of our opinion to be this envelope Of the dynamic type that will automatically respond to all external changes with the requirements and internal needs. To provide this type of envelope, the latest advanced technology must be used, the most important thing in the exhibition will be entirely related to daylight even the exhibition methods everything inside the museum is related to light.

After discussing the subject of architectural light and technology used in detail, we have to understand the project in which we will apply these two elements. By understanding all the characteristics and requirements of technical and functional and architectural of the museum and this in order to increase the effectiveness of the museum's internal and external role and reach the desired goals and this is what we will discuss In the next chapter to study everything related to the museum and to know the most important elements in its design.

CHAPTER II: ANALYTIQUE STUDIES

Introduction:

Every project or important building must have a tangible physical structure and spirit or a message to be delivered through it. In this chapter, we will discuss the project of the National Museum of Technology by listing all the details that mean both material and moral, Factors that strongly intervene in the design and construction of this edifice also illustrate and clarify the message that informs it to the fullest extent has been talked about the assets of the museum and the most important areas that are linked from the culture to the science of museums and its origins and development architecturally and intellectually. We tried to focus on the role of the museum from the old ages to now days then we tried to learn about the technical aspects of the museum, which interfere directly in the smooth functioning of the functions and the welfare of users and the protection of holdings as we presented a summary of the most important examples of analysis of examples The project will end with the presentation of the spatial program developed from the official program, the results of the technical studies and the analysis of the examples and the ground.

This chapter is the most important stage in the design of the architectural project. All that we have addressed is a pillar and a general element to reach the ideal design of the museum, which is designed to meet the full needs of visitors and workers and collectibles and to do all the desired functions of cultural and scientific and be the symbol and monument of El Oued.

1 Summary of analysis example:

The analysis tables have been developed according to a method which depends on the classification the most compatible examples in relation to the conditions related to the museum according to international standards and Neufert and the analytical study which contains two levels:

- ✓ The external level which study the urban integration. Accessibility. Circulation and mechanical and pedestrian flow and volumetric as well as facades
- ✓ The interior levels which study the spatial and functional organization. Horizontal and vertical circulation and project structure

We analyzed four museums projects

1.1 Technical cards:

Table 1: technical card Victoria & Albert Museum -Source: researcher 2020

Victoria & Albert Museum		
 Pic (I-19) V & A museum Source: archidaily.com	Location	1 Riverside Esplanade, Dundee DD1 4EZ, United Kingdom
	Project Year	2018
	period	from 2015 to 2018
	Architect in Charge	Kengo Kuma, Yuki Ikeguchi, Teppei Fujiwara
	Architect	Kengo Kuma
	Area	8500.0 m²

Table 2: technical card of The Mimesis Art Museum: researcher 2020

The Mimesis Art Museum		
 Pic (I-19) The Mimesis Art Museum Source: archidaily.com	Location	in Paju Book City, Seoul
	Project Year	2009
	Architect in Charge	Alvaro Siza + Castanheira & Bastai Arquitectos Associados + Jun Sung Kim
	Architect	Alvaro Siza
	Area	15.000 m2

Table 3:technical card of Louvre Abu Dhabi-Source: researcher 2020

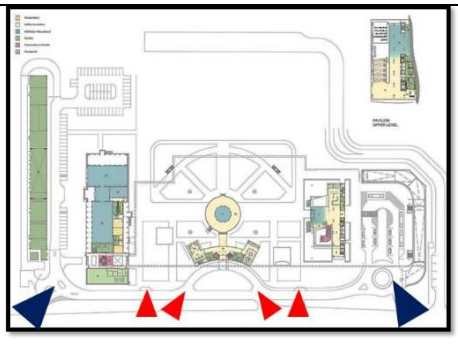
Louvre Abu Dhabi		
 Pic (I-20) louver Abu Dhabi Source: archidaily.com	Location	Saadiyat Cultural District, Abu Dhabi, United Arabe Emirats
	Project Year	2017
	period	from 2013 to 2017
	Architect in Charge	Jean Nouvel
	Architects	Ateliers Jean Nouvel
	Area	97000.0 m2

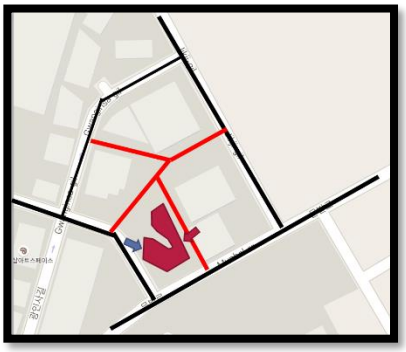
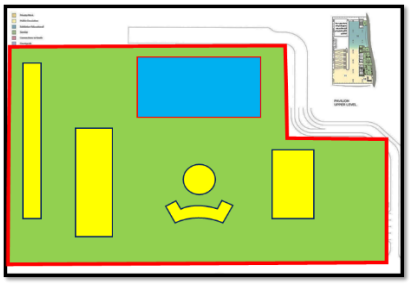
Table 4:technical card of Etihad Museum Source: researcher 2020

ETIHAD MUSEUM		
 Pic (I-21) Etihad museum Source: archidaily.com	Location	Dubai - United Arab Emirates
	Project Year	2016
	period	from 2014 to 2018
	Architects	Moriyama & Teshima
	Area	25000.0 m²

1.2 Synopsis Analysis of project examples:

Table 5: synthesis of examples analyses -Source: researcher 2020

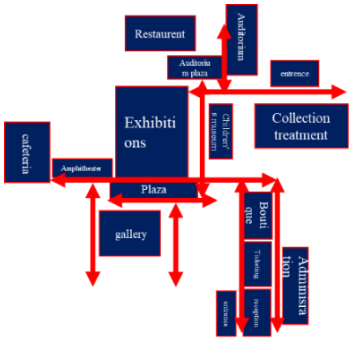
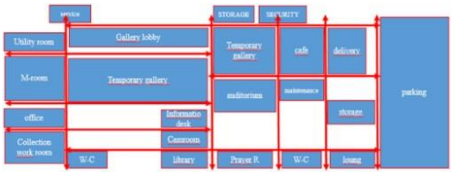
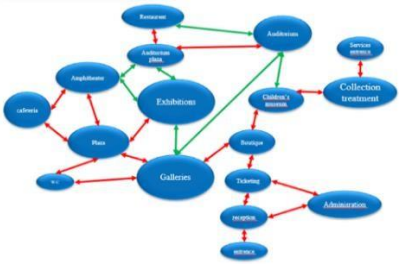
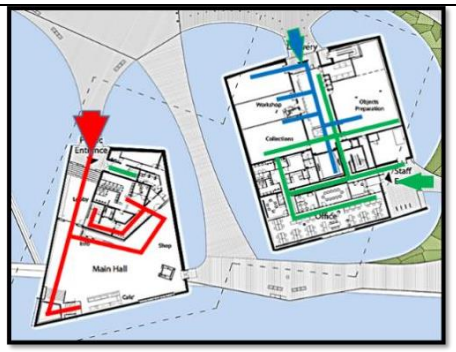
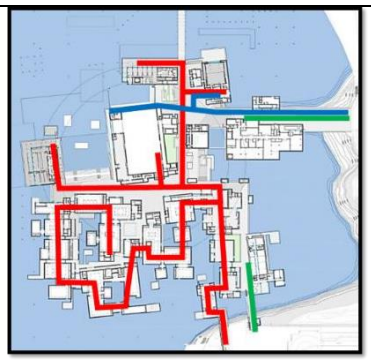
	Victoria & Albert Museum	ETIHAD MUSEUM	synthesis
1-Urban integration	 Fig (I-24) adjacent parcels Source: researcher 2019 -the project is obedience compared to adjacent roads Matching -the project is disobedience compared to the form of adjacent parcels	 Fig (I-25) adjacent roads Source: researcher 2019 -Note that the project is Adjacent to the town	The museum must have a good accessibility and it must be a Visible monument (different)
	Victoria & Albert Museum	The Mimesis Art Museum	
2- accessibility	 Fig (I-26) type of adjacent roads Source: researcher 2019 -From the city to the project the accessibility is directly and	 Fig (I-27) type of adjacent roads Source: researcher 2019 -From the city to the project the accessibility is directly and	The museum must have a good accessibility and must be easy to reach Diversity of roads leading to the project
	Louvre Abu Dhabi	ETIHAD MUSEUM	
3- The entrances to the area	 Fig (I-28) main entrances Source: researcher 2019 -the operating mode of the ground entrances was separation	 Fig (I-29) type of entrances Source: researcher 2019 -the operating mode of the ground entrances was separation	-The entrances must be separated according to users and functions function shouldn't be cross each other's Visitors entrance must be away from the others entrances

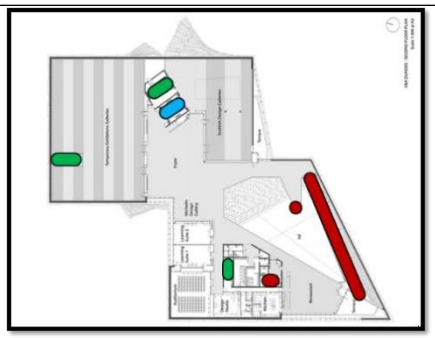
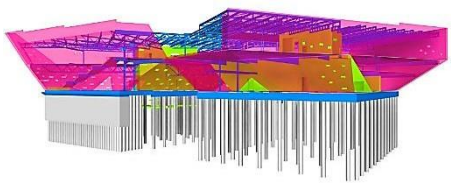
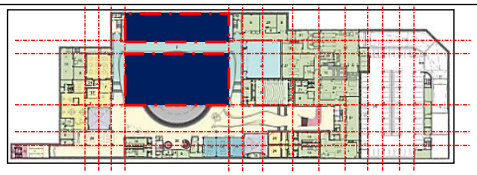
	The Mimesis Art Museum	ETIHAD MUSEUM	synthesis
4- the flow	 Fig (I-30) type of the flow Source: researcher 2019 -There is an intersection between the mechanical path and the Pedestrian path	 Fig (I-31) type and direction of the flow Source: researcher 2019 -There is High mechanical flow rate in the area coming from two axes	-The intersection between mechanical and pedestrian flow is acceptable -The flow ratio should be high in the area
	Victoria & Albert Museum	ETIHAD MUSEUM	
5- built and not built	 Fig (I-32) built and no built Source: researcher 2019 The built up area is estimated at 40% of the total area of the project land	 Fig (I-33) occupation of the ground Source: researcher 2019 The built up area is estimated at 25% of the total area of the project land	Prefaces of the project must be landscaping The building Positioning must located after in-depth study
	Victoria & Albert Museum	Louvre Abu Dhabi	
6-The volumetry	 Fig (I-34) project composition Source: researcher 2019 The composition of the project is a simple form and a complecated form following The Linear axis principale	 Fig (I-35) composition principale Source: researcher 2019 Dome: main(bulk) volume Concrete building : secondary volume Complex volume + dome The Linear axis principale	-The complicated form of the project a special look -the forme of the museum must be special

1.3 The Facades:

	The Mimesis Art Museum	Victoria & Albert Museum	
1-Rhythm	 Pic (I-24) facades components Source: archdaily.com -All facades of the project are Raw Concrete (beton brut)	 Pic (I-25) facades rythme Source: archdaily.com -All the facades of the project are characterized by full homogeneity in its components	the rhythm of the facade makes the project more attractive
	Louvre Abu Dhabi	The Mimesis Art Museum	
2-The Empty and filled	 Pic (I-26) the empty and the filled Source: archdaily.com -The percentage of empty walls does not exceed 10% Proportionality in color and characterized by gradation -The color used is gray and white and there is homogeneity in the colors -The texture is smooth	 Pic (I-27) the outer envelope Source: archdaily.com -The envelope makes the empty and filled reading difficult -The color used is gray -The texture is smooth	-The empty and the filled is up to the exterior nature and the interior function In the museum we need to control the natural light
	Louvre Abu Dhabi	Victoria & Albert Museum	
3-The entrances	 Pic (I-28) louvre entrance Source: archdaily.com -there is no volumetric fit of the entrances with the facades -The main entrance is characterized by the presence of pergola	 Pic (I-29) V & A museum Source: archdaily.com -Note that there is no volumetric fit of the entrances with the facades -All entrances are marked behind the cover	The main entrance must be clearly attractive

1.4 Internal study:

	Louvre Abu Dhabi	ETIHAD MUSEUM	
1-Spatial organization	 Fig (I-36) louvre spatial organization Source: researcher 2019 -all spaces are positioned linearly -Organized linearly and knotty	 Fig (I-37) etihad spatial organization Source: researcher 2019 -all spaces are positioned linearly -Organized linearly	The relation between galleries of the museum must be connected linearly and directly
	Louvre Abu Dhabi	ETIHAD MUSEUM	
2-Functional organization	 Fig (I-38) louvre functional organization Source: researcher 2019 Strong relation weak relation	 Fig (I-39) louvre functional organization Source: researcher 2019 Strong relation weak relation	-The storage and the exhibitions strong - the galleries and the auditorium weak - the galleries and the security strong
	Victoria & Albert Museum	Louvre Abu Dhabi	
3-horizontal movement	 Fig (I-40) H circulation Source: researcher 2019 the movement is integrated only in the entrances And the visitors movement is totally separated	 Fig (I-41) h circulation Source: researcher 2019 VIP circulation visitors circulation Worker circulation	the visitors must be separated from the others circulation -Collections circulation and the workers can be crossed

	Victoria & Albert Museum	ETIHAD MUSEUM	
4-vertical movement	 collections circulation visitors circulation Worker circulation -The vertical movement is homogeneous in the Project	 -the multiplicity of vertical movement zones and methods (stairs, elevator , ramp) -Separation in the spaces of vertical circulation	-The simplify of the vertical movement for all the categories -All the methods of the vertical movement must be use
	Victoria & Albert Museum	The Mimesis Art Museum	
5-Structural System	 The structural system of the building generally depends on the bearing walls of the special reinforced concrete with a Metal construction roof		The use of the bearing system aims to create large spaces for the exhibition
	Victoria & Albert Museum	ETIHAD MUSEUM	
Functional unit Construction Unit		 The structural system of the building generally depends on the bearing walls of the special reinforced concrete	It is preferable that the exhibition spaces have no structural obstacles

Analysis of project focused on natural lighting:

The Mimesis Art Museum

- The exhibition area on the first floor was illuminated with the natural light through a window as well as artificial lights on the ceiling .
- The exhibition area on the second floor was illuminated with the artificial light on the ceiling and the natural light through the skylight on
  the roof.
- The exhibition area on the third floor was illuminated with only natural light through the skylights and windows.
- The natural light through skylights was scattered in several directions by the panels installed under the ceiling to protect exhibits from direct sunlight, and effectively illuminate the exhibition areas

Figure I: interior view of first floor of Mimesis Museum.

Figure II : interior view of second floor of Mimesis Museum (

1.5 Simulation:

1.5.1 First Floor

the illumination levels on the first floor were the maximum illumination level of 757 lux, minimum of 130 lux and average of 239 lux

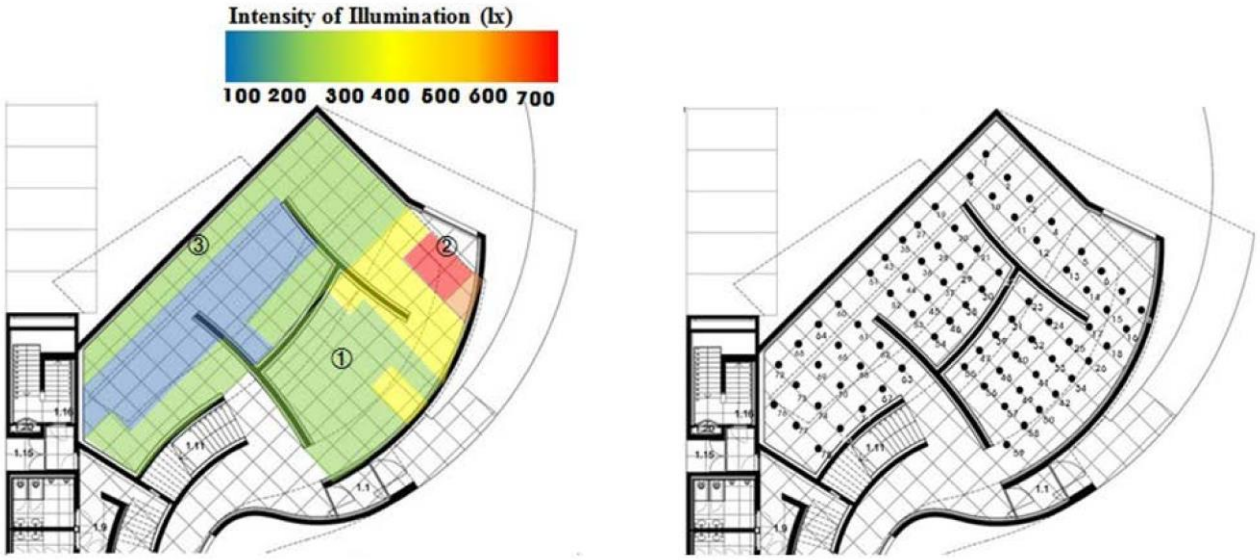


Figure III:Measurements on the first floor.

1.5.2 3rd Floor

The measurements on the third floor showed the maximum illumination level of 892 lux, minimum of 260 lux and average of 539 lux as shown

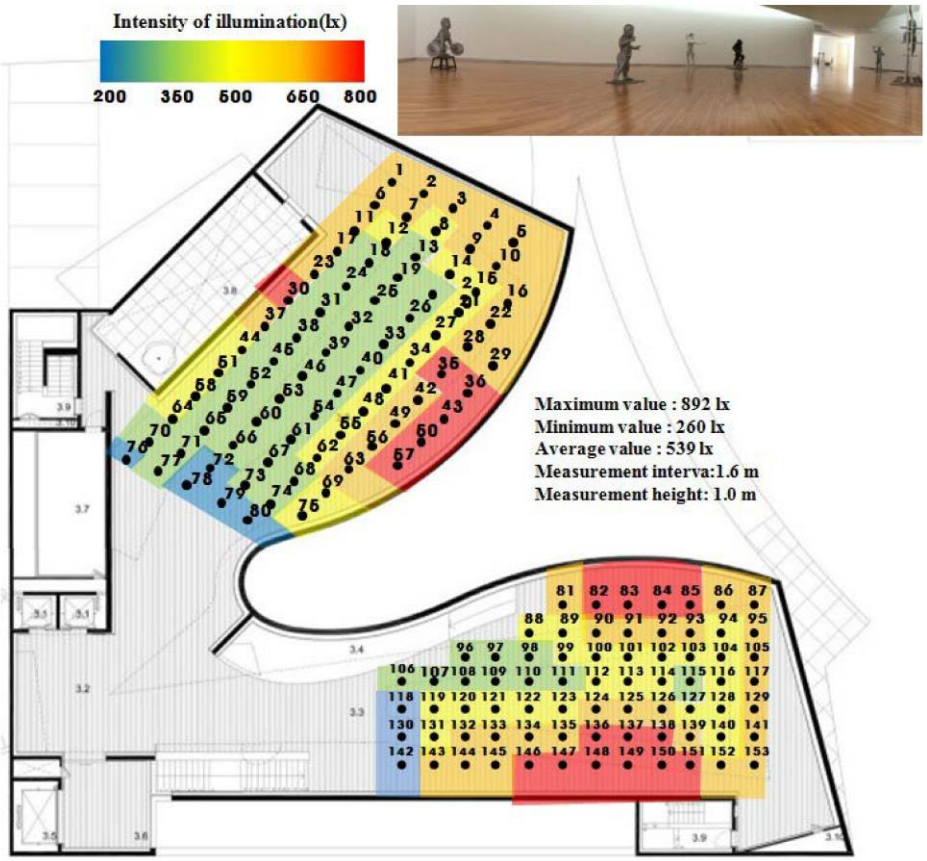


Figure IV:Measurements on the third floor

1.6 Results of simulation:

- According to the results of the measurements, the illumination levels on the first floor were effectively controlled to exhibit the art works in most of exhibition areas.

- The illumination levels on the third floor, however, were much higher than IESNA recommendations because of less controlled natural light entering through the skylights and windows. Therefore, more considerations to control the natural light are required for the stable
lighting conditions

1.7 Survey of the Visitors' Satisfaction about the Lighting Conditions

A survey was conducted to evaluate visitors' satisfaction under the lighting conditions of the Mimesis Art Museum

The survey was comprised by 5 questionnaires as below:

- The architectural design factors to influence viewing satisfaction in the museum.
- The environmental considerations to offer stable exhibition spaces in the museums
- The visitors' satisfaction under the lighting condition of the museum
- The glare problem in exhibition areas of the museum
- The visitors' satisfaction under the natural lighting condition of the museum

Questionnaires regarding the above issue distributed to 90 visitors, who were composed of 54 male and 36 female.

1.7.1 What do you think is the most important factor to offer stable environment in exhibition spaces of the museum?

The aim of the question was to measure the visitors' opinions on environment factors for comfortable museum such as temperature, lighting, ventilation, noise, humidity and color. Out of total 90 replies, 41 persons (46%) responded that the lighting was the important factor for the exhibition area, and 21 persons (23%) answered that the color of the museum was the second most one.

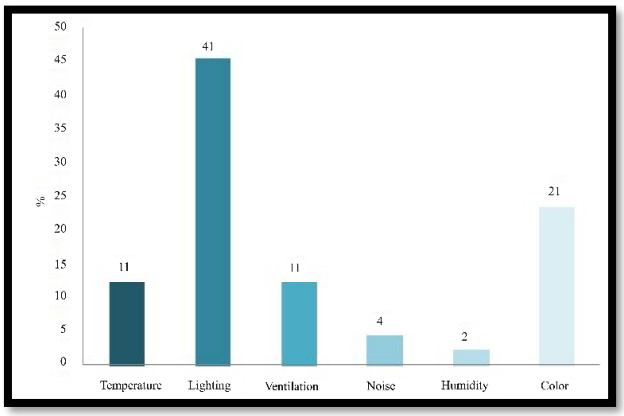


Figure V: Enivrommental Factors for comfortable Museum.

1.7.2 How did you feel about the lighting condition of the museum when you have viewed exhibits

The aim of the question was to measure the visitors' satisfaction on the lighting condition in the exhibition areas of the Museum, which was illuminated with the artificial light and natural light. Out of total 90 replies, 80 persons (89%) responded that they were satisfied with the lighting condition of the museum. Only 2 persons (2%) answered they had been unsatisfied with the lighting condition

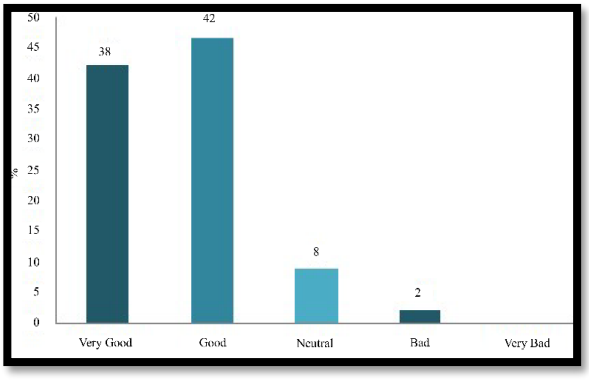


Figure VI: Visitors satisfaction about lighting condition

1.7.3 How much were you dazzled by glare problem in the exhibition areas of the museum while you were in the museum to view exhibits?

The purpose of the question was to measure the lighting quality of the museum by examining how much the visitors felt the glare in the Museum. Out of total 90 replies, 78 persons (87%) responded

that they were not dazzled the exhibition areas of the museum. Only 6 persons (7%) answered the question they were dazzled by the glare problem

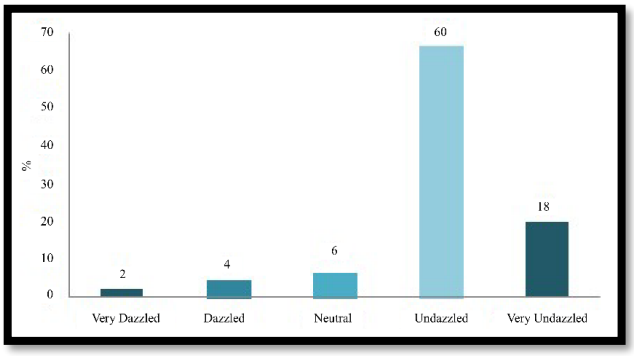


Figure VII: Glare problem

1.7.4 How did you feel about illuminating the exhibition areas of the museum with the natural lighting?

helpful for you to view exhibits in the museum? The purpose of the question was to measure the responses of the visitors about illuminating the exhibition areas of the museum with the natural light. Out of total 90 replies, 72 persons (87%) responded that natural lighting was helpful to illuminate the exhibition areas of the museum. Only 6 persons (7%) answered it was unhelpful to view exhibits in the museum

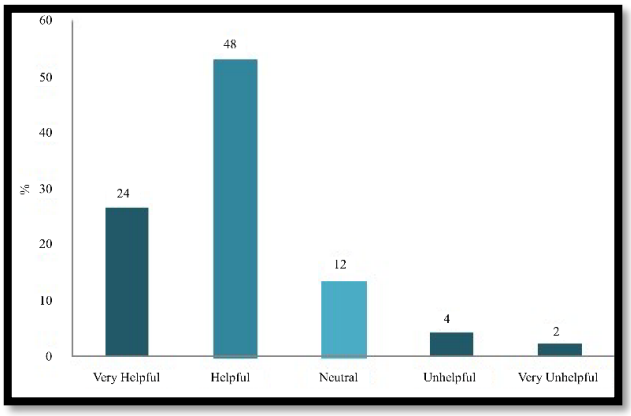


Figure VIII: Resonses about Natural light

1.7.5 Conclusions of the Analyze:

- Alvaro Siza was willing to use the natural light to be accord with climatic characteristics of regions. And, he drew the controlled natural light into indoor spaces, and made it harmonize with artificial light in order to create a living space and inspire a refreshing impression.
- The Mimesis Art Museum has two void spaces on the inside and outside of the building, which formed a sharp contrast against the massive structure by the light.
- The light also endowed the museum with a sense of continuity that helped guide the visitors' movements.
- the refined light helped the visitors to experience the continuous forms and spaces, while using the changes of the light to stimulate the interest of visitors and highlight the sequence of spaces.
- As conducted from the results of the full survey, he natural light was so effective to illuminate the exhibition spaces of the museum

2 Presentation of the city of El Oued:

2.1 Overview of the city:

Souf or Oued Souf is a city, and the capital of El Oued Province, in Algeria. The oasis town is watered by an underground river, hence its name is El Oued which enables date palm cultivation and the rare use (for the desert) of brick construction for housing. As most roofs are domed, it is known as the "City of a Thousand Domes".

Figure IX: Old Photo of El Oued 1992, Source El Oued Forum.

2.2 Situation of the City:

El Oued is located 400 miles (640 km) south east of Algiers (the capital city of Algeria), near the Tunisian border. The population of El Oued was 134,699 as of the 2008 census, up from 105,256 in 1998, with a population growth rate of 2.5%.

Figure X: Map of Algeria shows the location of El oued, Google maps.

2.3 Physical geography of the city:

El Oued Province lies in the Sahara Desert in northeast Algeria. The mostly uninhabited southern half of the province is covered by the Grand Erg Oriental, a vast region of uninterrupted sand dunes. The northern half of the province is a mixture of sandy desert with scarce vegetation, scattered oases, and salt lakes. The most notable oases are the Oued Souf region, upon which the capital El Oued and neighboring towns are built, as well as oases located near the towns of El M'Ghair and Djamaa, both of which support extensive palm plantations. Chott Melrhir, a large endorheic salt lake, lies in the north-central part of the province, while Chott Felrhir is a smaller salt lake to its southwest, near El M'Ghair. These salt lakes, and the surrounding areas, lie as much as 30 metres (98 ft) below sea level; nearby towns and villages including Hamraia, Méguibra, Dendouga and Aïn Cheikh are also below sea level.

2.4 Climate:

El Oued Province experiences a hot desert climate. Winters are mild, with average temperatures around 11 °C (52 °F) in January, but summers are hot with average temperatures around 32 °C (90 °F), average maxima around 40 °C (104 °F) and the hottest days approaching 50 °C (122 °F). Precipitation is very low throughout the province, but somewhat more rain does fall in the north, particularly during the winter and adjacent months. +++

Table 6: Climate data of El Oued, NOAA (2018)

Climate data for El Oued

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	27.6 (81.7)	35.5 (95.9)	40.0 (104.0)	40.0 (104.0)	45.2 (113.4)	48.7 (119.7)	49.7 (121.5)	49.0 (120.2)	46.0 (114.8)	41.0 (105.8)	32.0 (89.6)	28.2 (82.8)	49.7 (121.5)
Average high °C (°F)	16.9 (62.4)	19.6 (67.3)	22.5 (72.5)	26.8 (80.2)	31.7 (89.1)	37.4 (99.3)	40.1 (104.2)	39.8 (103.6)	34.9 (94.8)	28.3 (82.9)	21.8 (71.2)	17.3 (63.1)	28.1 (82.6)
Daily mean °C (°F)	11.0 (51.8)	13.4 (56.1)	16.1 (61.0)	20.1 (68.2)	24.7 (76.5)	29.8 (85.6)	32.5 (90.5)	32.4 (90.3)	28.2 (82.8)	22.0 (71.6)	15.7 (60.3)	11.5 (52.7)	21.5 (70.6)
Average low °C (°F)	5.1 (41.2)	7.1 (44.8)	9.6 (49.3)	13.3 (55.9)	17.7 (63.9)	22.2 (72.0)	24.7 (76.5)	24.8 (76.6)	21.5 (70.7)	15.6 (60.1)	9.6 (49.3)	5.4 (41.7)	14.7 (58.5)
Record low °C (°F)	−2.0 (28.4)	−2.0 (28.4)	−5.4 (22.3)	4.8 (40.6)	5.0 (41.0)	9.0 (48.2)	17.2 (63.0)	14.5 (58.1)	13.0 (55.4)	2.1 (35.8)	0.0 (32.0)	−2.2 (28.0)	−5.4 (22.3)
Average precipitation mm (inches)	10.7 (0.42)	9.3 (0.37)	9.9 (0.39)	7.0 (0.28)	5.6 (0.22)	2.0 (0.08)	0.1 (0.00)	1.1 (0.04)	5.3 (0.21)	7.8 (0.31)	9.4 (0.37)	7.0 (0.28)	75.2 (2.97)
Average relative humidity (%)	64.7	54.1	47.0	43.7	38.1	33.2	30.4	34.6	46.5	52.9	58.8	64.8	47.4

3 Motivation of choosing of the site:

The choice of the city of El Oued for the development of our end of study project is justified by:

- El Oued has a vast and rich cultural heritage, an indisputable proof of its artistic and architectural history which should be reinforced by a real heritage protection, safeguarding and enhancement policy.
- Its strategic position.
- The demographic mass of the city by 2025.

4 Analyze of the site:

4.1 Location of the ground:

The ground is located on the northern side of El Oued; Close to the most important landmarks; in the double road leading to the south of the University, west of Vocational Training Center and east of Flight School.

The mechanical accessibility is good where the ground is located adjacent to the highway.

Figure XI: Google Earth photo of the site.

4.2 Reasons for choosing the ground:

- The land makes the project of great national and continental importance.
- The site's attractions are the most important destinations of the Ardis Market and the Sablat Resort.

4.3 Ground morphology: The ground is regularly shaped close to A rectangle.

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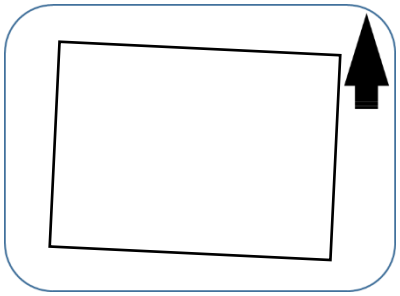

Figure XII: schema shows that The land is almost flat

4.4 Topography:

4.4.1 AA longitudinal section:

As we see the results from google earth, the field is almost flat at the section A-A.

Figure XIII: Google earth Topography section, researcher 2020

4.4.2 BB longitudinal section

The field is also flat at the section B-B, what give us the opportunity to design without any conditions.

Figure XIV: Google earth Topography section, researcher 2020

4.5 Sun path studies:

The site is exposed to sunlight all day without any protection and especially the west side and this is what needs to be found a solutions to control the sun rays With Taking in consideration the project interfaces that must be the facade of the capital.

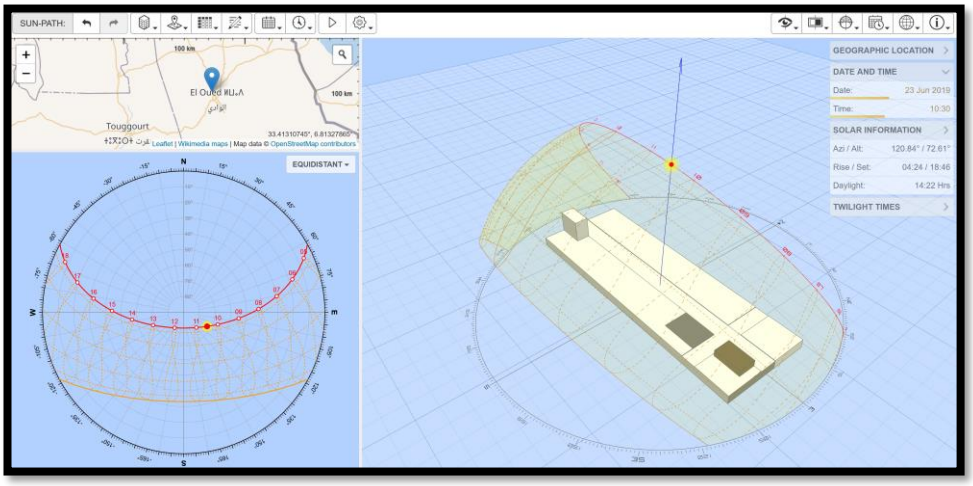

Figure XV: sun path study by andrewmarsh.com, researcher 2020

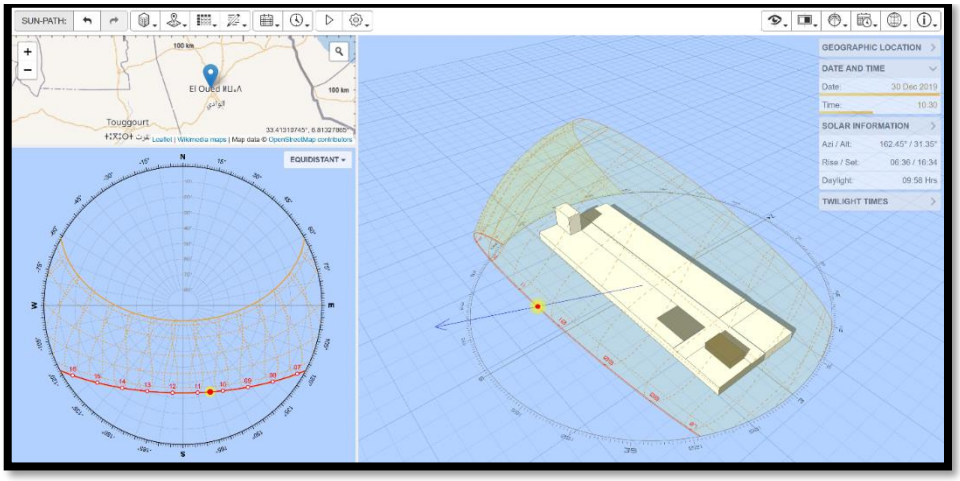

Figure XVI: sun path study by andrewmarsh.com, researcher 2020

4.6 Wind study:

From the wind rose of the capital we note that there two dominant direction of the winds from the north east and the east north east and the west and the west south west.

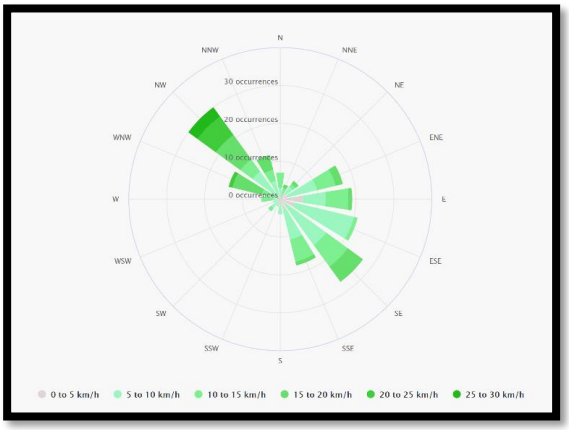

Figure XVII: Wind rose of El Oued, Wikipedia

4.7 Strong Points:

- Have good accessibility
- The absence of a topographic problem in order to place the site away from the valley.
- The easement distance between the university of El Oued and the site.

4.8 Weak Points:

- Exposure of the ground to the wind from all sides .

The project floor is exposed to the sun throughout the day because the astray of the buildings does not cover the site.

5 Norms and recommendations:

5.1 Lighting:

Whether they are of natural or artificial origin, whether they are visible or invisible, the radiation undergoes, as we know, more or less severe alterations (yellowing, drying, discoloration, destruction) to the objects they strike. The light sources (fluorescent tubes, incandescent lamps, iodine-cycle lamps, spotlights, controlled daylight) and illuminances, calculated in lux, thus give rise today to precise recommendations: 150 to 200 lx for sensitive objects, paintings in particular; 50 to 80 lx for very sensitive, tapestries, drawings, specimens of natural history, etc. (It should be noted, low thresholds, normal daylight can exceed 10,000 lx). (culture, 2008)

5.1.1 Natural lighting:

6.1.1.1 Lateral openings: The windows in the sidewalls of the gallery provide side lighting. Its strategies rely on apertures located in building's perimeter walls and it is also dependent upon the orientation of the building. Depending upon the need and use of space these windows may be placed at a high level or normal level. Windows on one side give unilateral light whereas the windows on two sides give bilateral lighting. This type of lighting is preferable for sculptures.

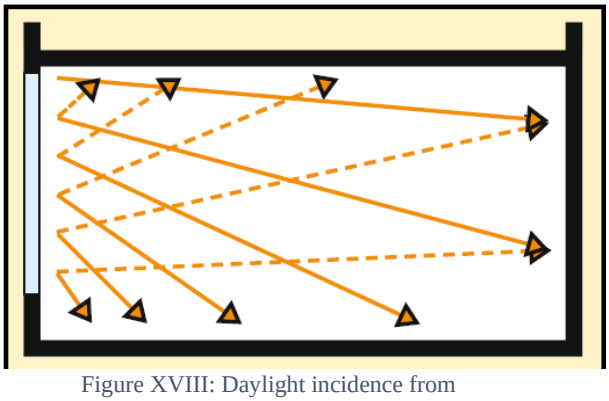

Figure XVIII: Daylight incidence from the side through a window source: (Licht, 2018)

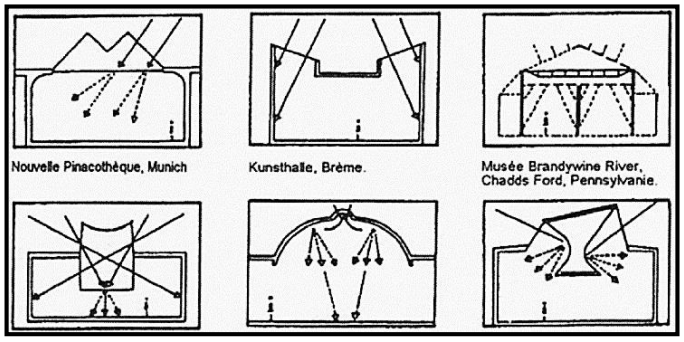

Figure XIX Lateral openings source: (neufert, 2010)

6.1.1.2 Zenith openings: Zenithal light, defined by the standard NBR 15215-2, "is considered as the natural light that enters through the upper closures (roofs) of the internal spaces", has enormous capacity in capturing the luminous solar radiation, direct and diffuse from the celestial vault and reflections of the environment. It is a feature that provides greater uniformity of distribution of light than lateral lightning.

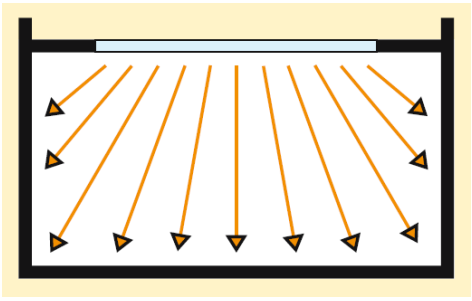

Figure XXII: Daylight incidence from above through a luminous ceiling source: (Licht, 2018)

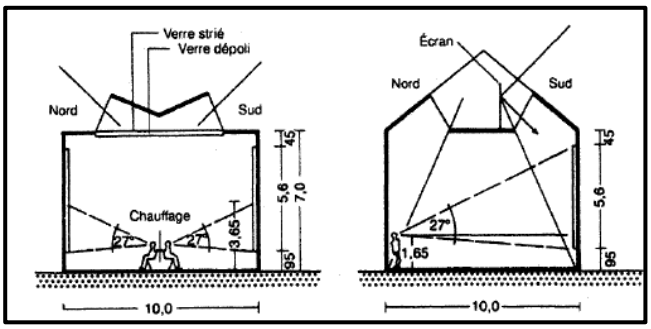

Figure XXI:Lateral openings source: (neufert, 2010)

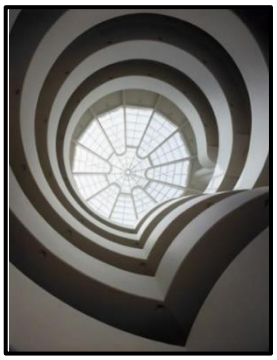

Figure XXIII: New York Guggenheim atrium skylight source: (Barritt, 2018)

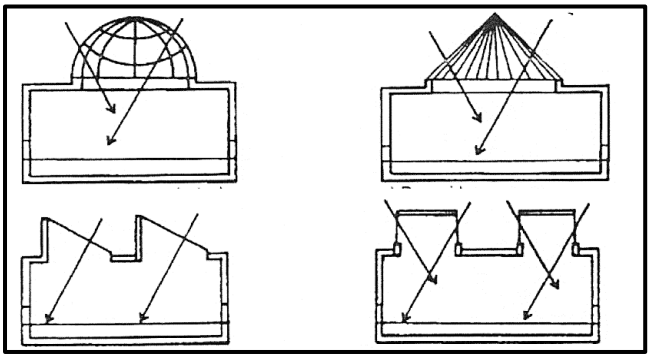

Figure XX: Types of roof openings source: (neufert, 2010)

5.1.2 Artificial lighting:

The principal requirement is to create optimum conditions for viewing objects, this does not only include the lighting of the object but also general conditions of visual comfort, that is suitable light for orientation and movement, ease of visual adaption to differing light levels required throughout the museum.

The most important lighting systems used in exhibition rooms are:

- **Luminous ceilings.**

The idea of luminous ceilings stems from a desire to imitate daylight. Luminous ceilings deliver light which is particularly suitable for painting galleries – predominantly diffuse with an opal enclosure, partly directional with enclosures of satinised/ textured glass.

- **Indirect luminaires.**

An impact similar to that of a luminous ceiling is achieved with indirect light bounced off the ceiling and upper wall surfaces into the room. This diffuse, uniform light is predominantly used in rooms where no daylight enters. It is produced by suspended luminaires radiating light upwards.

- **Cove luminaires.**

The diffuse light of luminaires installed in the curving transition between wall and ceiling – the cove or coving – is another indirect lighting solution. The cove luminaires most frequently used in modern museum buildings are models with housings which themselves form the coving.

- **Wallwashers.**

used as individual luminaires or in continuous rows. Installed flush with the ceiling (or with kick reflector protruding from the ceiling) or mounted close to the ceiling Such as illustrated. they should illuminate the walls as uniformly as possible this task is performed by reflectors with asymmetrical optics. It is important to ensure good shielding in the direction of the observer.

- **Spot lamps.**

Reflectors in reflector lamps or spots direct most of the light emitted by punctual light sources in a defined beam direction. Spots and downlights with spot characteristics can be fully or partially integrated into a ceiling (or wall) as recessed ceiling spots. Surface-mounted ceiling spots and downlights as well as spots for power track have visible housings.

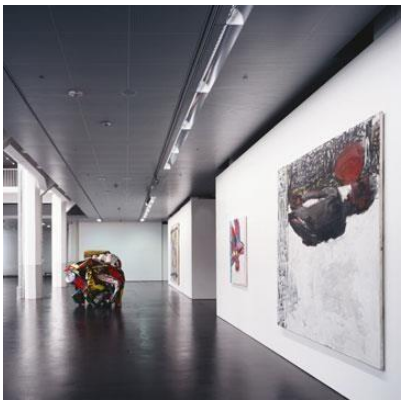

Figure XXV: luminous ceilings source: (Licht, 2018)

Figure XXIV:indirect luminaires source: (Licht, 2018)

Figure XXVII:Wallwashers distribute their light asymmetrically.

Figure XXVI:the directional light of spot lamps raises the brightness for exhibits Source: (Licht, 2018)

6.1.2.1 Artificial lighting requirements:

- Properly position of the lighting sources
- Reduce the visitor's drop shadow
- Avoid reflective glare
- Highlight walls and works
- Enlighten boxes without dazzling

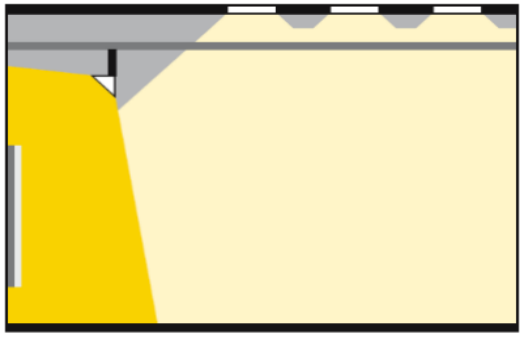

Figure XXX:Directional lighting for the wall, diffuse lighting for the room Source: (Licht, 2018)

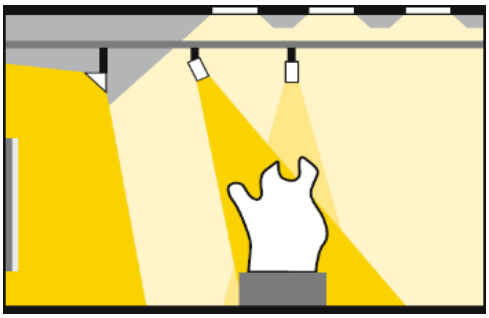

Figure XXVIII:Supplementary directional lighting for objects in the room Source: (Licht, 2018)

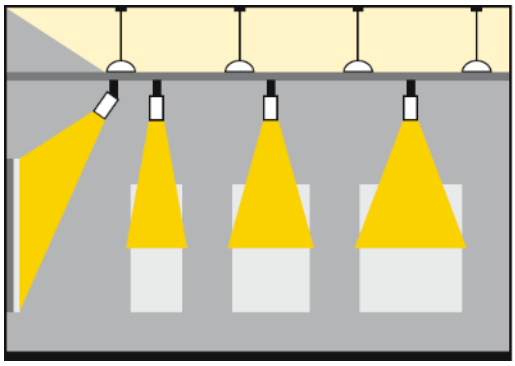

Figure XXIX: Indirect and direct components produce diffuse and directional lighting

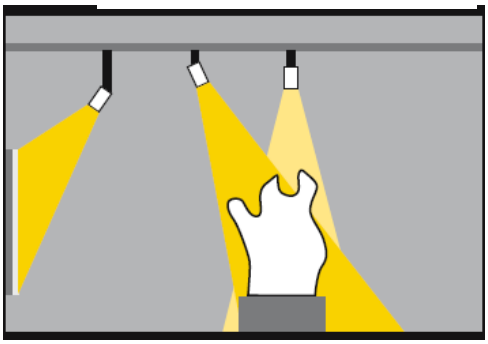

Figure XXXI:solely directional light Source: (Licht, 2018)

5.2 Difference between natural lighting and artificial lighting

Table 7:natural and artificial lighting Source: (Licht,2018)

DAY-LIGHTING	ARTIFICIAL LIGHTING
Superior color rendition	Light is based on a single color
Continuous spectral curve	Intermittent spectral curve
Lively natural environment	Can be manipulated as per need
U-V radiation corrodes sensitive objects displayed	It is non-corrosive
It is a planning constraint	Freedom in planning

5.3 Humidity and temperature:

Dangerous, too, for the collections when they are not controlled, these phenomena constitute a whole, because of their close natural relation. It is also known that it is not good conservation without a relatively constant climate atmosphere sudden fluctuations, hygrometric or thermal, are much more dangerous than slow variations of the same amplitude. In general, the standard of conservation for relative humidity is 55 ± 5%; for the temperature: 18 ± 2 ℃. (culture, 2008)

Archeological Materials	
Negligible Climate-Sensitive Materials	30% – 65%
Climate Sensitive Materials	30% - 55%
Significantly Climate Sensitive Materials	30% - 40%
Metals	<35%
Natural History Materials	
Biological specimens	40% - 60%
Bone and teeth	45% - 60%
Paleontological specimens	45% - 55%
Pyrite specimens	<30%
Paintings	40% - 65%
Paper	45% - 55%
Photographs/Film/Negatives	30% - 40%
Other organics (wood, leather, textiles, ivory)	45% - 60%
Metals	<35%
Ceramics, glass, stone	40% - 60%

Figure XXXII:Relative Humidity Optimum Ranges for Various Materials Housed in a Park's Museum Collection.

Temperature and relative humidity must monitoring so that we know what the environment in your storage and exhibit spaces is like over time.

The Monitoring helps to:

- Set a baseline of temperature and humidity to see if the storage space is adequate.
- Identify variations in the temperature and humidity throughout collections areas.
- Monitor equipment to be sure it is working right.
- Help develop strategies to improve the environment.
- Identify whether your strategies are working to improve the environment. (Floray, 2005) Monitoring equipment:

Figure XXXV:Assman Psychrometer Source: (Floray, 2005)

Figure XXXIII: Thermo-Hygrometer Source: (Floray, 2005)

Figure XXXIV:Electronic data loggers Source: (Floray, 2005)

6 The functional and Technical requirements of museums:

6.1 Accessibility:

The museum must ensure an ease of mechanical and pedestrian accessibility and a Diversity of roads leading to it.

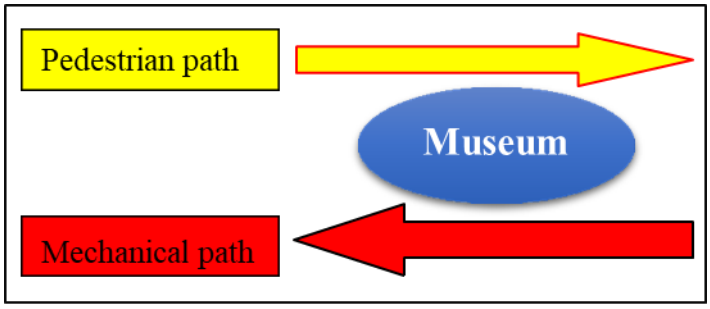

Figure XXXVI: Location of the museum compared to the roads

6.2 Circulation:

6.2.1 According to the users:

- Public circulation:

Which is one of the most important functions that must be carefully studied and it is done by a logical order for the exhibition halls, and which is related to the purpose of the creation of the museum. Circulation starts from the entrance of the museum, which leads to the entrance, in which all service activities required for visitors. (culture, 2008)

- Private circulation:

Museums must be equipped in several other entries for staff and administrators and users...

Their circulation is done by corridors and lifts in a private way which does not hinder the traffic of the visitors with the possibility of contact between the two very reduced unless it is necessary. (culture, 2008)

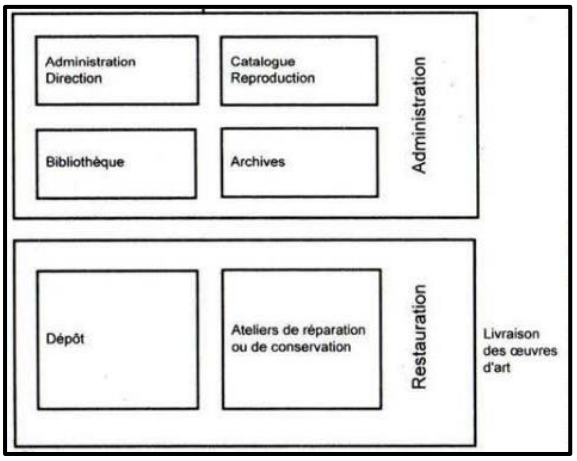

Figure XXXVIII:Private circulation
source: (neufert, 2010)

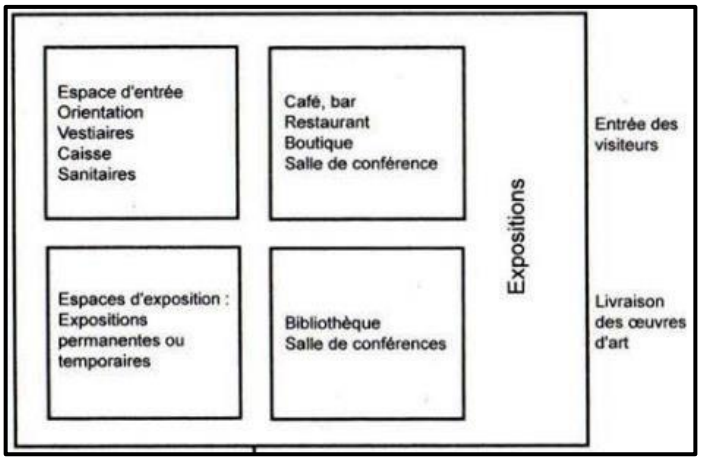

Figure XXXVII:Public circulation
source: (neufert, 2010)

6.2.2 According to the type of the paths:

- Tree type This principle works according to the idea of a main circulation with subsidiary sectors, the accesses can be carried out in the axis or on the sides.

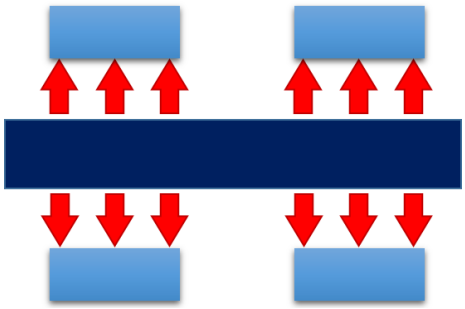

Figure XL:tree circulation source: researcher 2020

Figure XXXIX:Orsay Museum-France source: (Barritt, 2018)

- block types: This provision allows the free choice of the course according to the situation of the access points. And his type of movement requires multiple entrance to the museum.

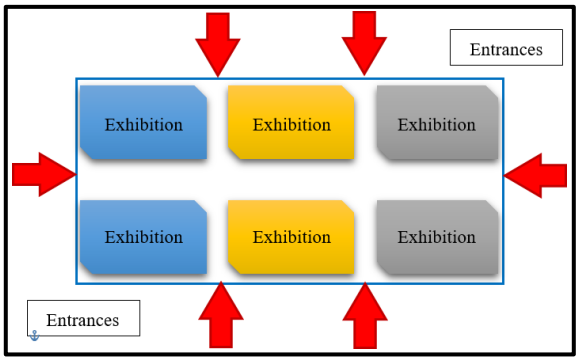

Figure XLII: block circulation source: researcher 2020

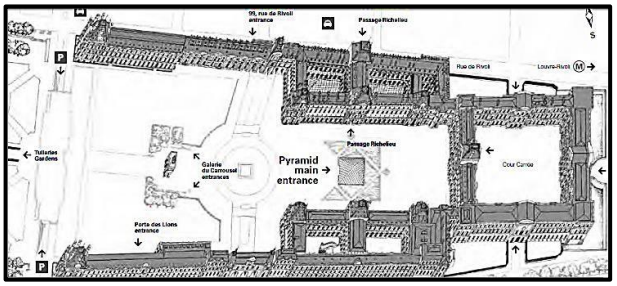

Figure XLI:the Louvre Museum-France source: (Barritt, 2018)

- Ribbon types This solution allows to guide the visitor without being aware of it, but has the disadvantage of obliging the visitor to go through the entire exhibition, it is divided into three parts: Spiral circuit, Broken line circuit and Rectilinear circuit.

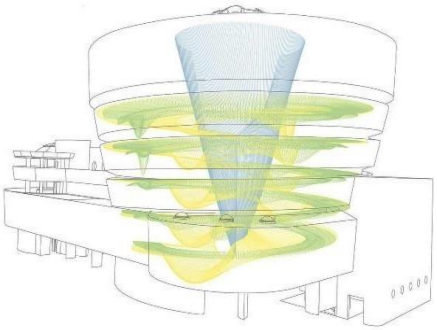

Figure XLIV:ribbon circulation source: (archdaily.com, 2018)

Figure XLIII:Solomon R. Guggenheim Museum-New York source: (archdaily.com, 2018)

- Labyrinth type A series of space differentiates, although chained to each other, does not impose a constraint of circulation.

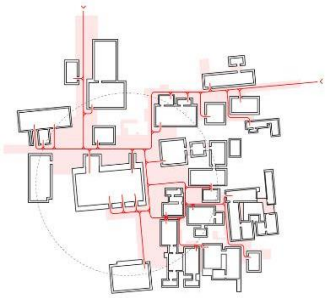

Figure XLVI:labyrinth circulation source: (archdaily.com, 2018)

Figure XLV:Louvre museum-Abu-Dhabi source: (archdaily.com, 2018)

7 Exhibition conditions of collections:

In the exhibition spaces - as elsewhere in the reserves - the collections are threatened by dangers that make them run physical, chemical or organic agents of degradation such as vibrations, atmospheric impurities, light, humidity, and the temperature. To prevent them, provisions are to be taken from the design of the architectural project. (culture, 2008)

7.1 Exhibition modes:

A. Display on fixed or mobile trunks with varied shapes and sizes based on the floor as in the Museum of Veterinary Medicine in Zurich.

Figure XLVII:Museum of Veterinary Medicine- Zurich- source: (Mahler, 2017)

B. The display on vertical tables as in the museums of literary documents and stamps.

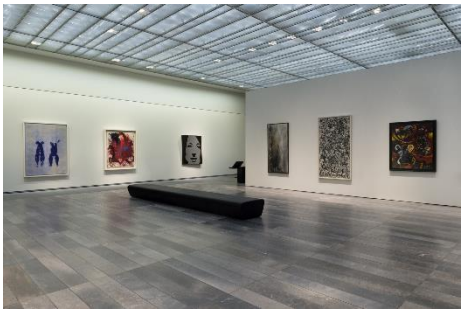

Figure XLVIII:Louvre museum-Abu-Dhabi source: (archdaily.com, 2018)

C. Display on a base based on the ground as in museums of folk traditions or crafts.

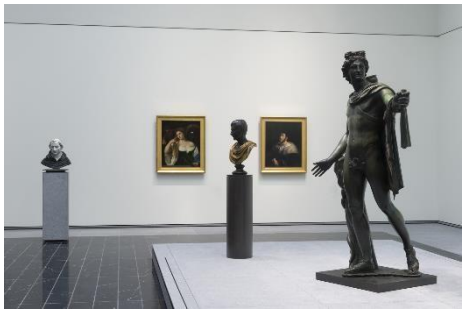

Figure XLIX:Louvre museum-Abu-Dhabi source: (archdaily.com, 2018)

D. Display on suspended supports as in scientific museums.

Figure L:Hong Kong science museum- Hong Kong source: (Leung, 2019)

7.2 Exhibition standards:

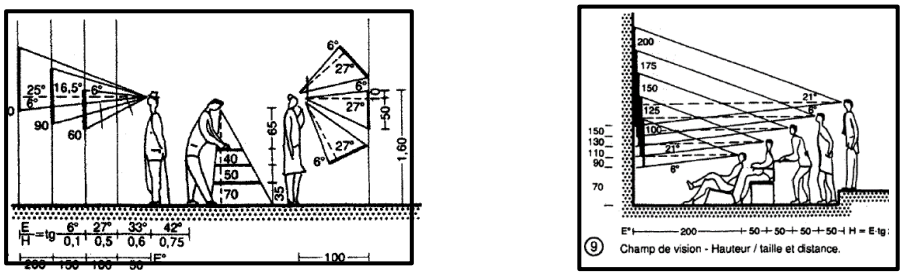

Figure LI:Horizontal, vertical and curved display standard source: (neufert, 2010)

8 Atmospheric impurities:

These are those brought by pollution proper (hydrogen sulphide, sulfuric acid, carbonic acid, etc.in large cities and industrial regions, chlorinated crystals suspended in the air, in maritime regions, etc.), but also dust that dirty, deteriorate by abrasion, carry bacteriological agents.

Figure LII:Athelhampton palace -England source: (archdaily.com, 2018)

9 The visitor's entrance (The lobby):

Transitional zone between the daily life and the museum place, the entrance hall is at the same time place of contact, time of introduction to the visit and zone of exit. It is a place where the visitor learns about the activities of the day, but also where he is resting, before or after his visit, where he makes contacts with other visitors, where he can talk about what he wants see or what he saw. (culture, 2008)

10 Amphitheatre:

An auditorium will often be desired, whose capacity and equipment will depend on the cultural policy of the museum; it can thus be presented in the form of a more or less versatile room (conferences, films, concerts, theatrical, choreographic, etc.). Preferably located on the ground floor or in the basement, opening directly on the general reception (having openings on the outside that the regulatory emergency exits), with a particular control, it must meet a number of technical requirements (acoustics and lighting in particular) . (culture, 2008)

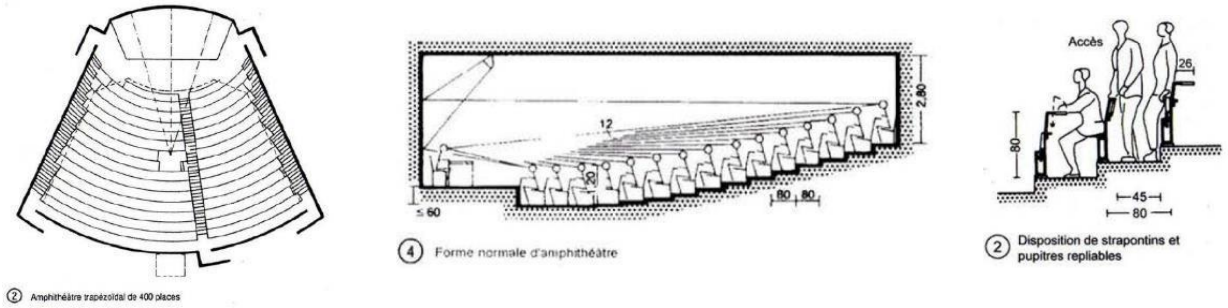

Figure LIII:Amphitheatre standards
Source: (neufert, 2010)

11 Coffee and restaurant:

A restaurant or cafeteria, or both, are on the hospitality program, their location - before or after the checkpoints: both advantages and disadvantages, in both cases well weigh, especially from the point of view of safety -, their service links, their aeration and the evacuation of odors, the storage of materials, foodstuffs and products will be studied with as much care as all that falls directly from the preparation of meals and the comfort of consumers.

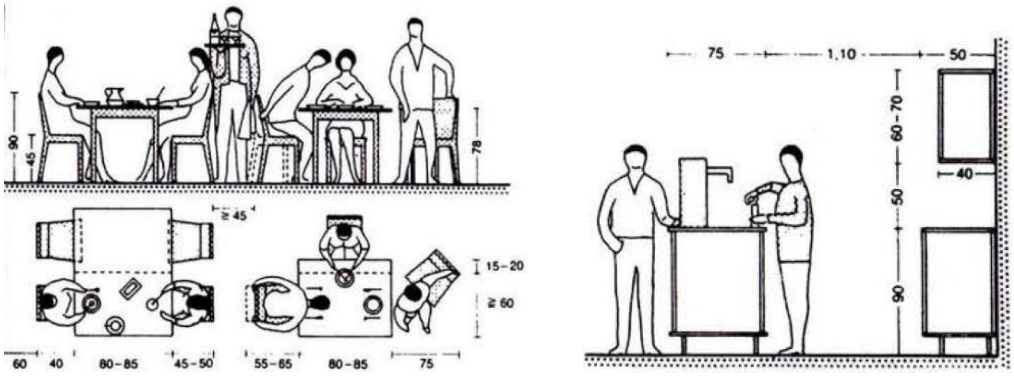

Figure LIV: Coffee and restaurant standards Source: (neufert, 2010)

12 Programming:

12.1 Program official:

b- UN MUSEE REGIONAL de 1.650 M2

Table 8: the official program of a regional Museum from the minister of Algerian Culture

DESIGNATION	SURFACE m2
1. ACCUEIL	**289 m².**
. Hall dégagement	120
. Accueil général du public	50
. Accueil groupe et scolaire	30
. Billetterie	10
. Boutique	15
. Cafétéria	25
. Vestiaires	15
. Sanitaires publics	15
. Infirmerie	09
2. ANIMATION	**139**
. Ateliers animation	64
. Rangement	15
. Terrasse extérieure	60
3. EXPOSITIONS	**260**
. Exposition permanente	120
. Forum	60
. Exposition temporaire	80
4. CONSERVATION	**164**
. Ateliers	64
. Réserve	100
5. BIBLIOTHEQUE	**195**
. Gestion et banque de prêt	20
. Lecture/rayonnages enfant/ Adultes/périodiques	80
. Multimédias/audio	35
. Rangement bibliothèque	60
6- SALLE CONFERENCE pour places 100	**200**
7. GESTION MUSEE	**135**
8. LOCAUX TECHNIQUES	**50**
9. CIRCULATIONS	**218**
TOTAL SURFACE UTILE	**1.650 m2**

12.2 Program of examples:

Table 9: Program of Examples, Researcher 2020

S P A C E2	Official Program	Mojahid Museum	MAXXI Museum	Louvre Abu Dhabi
1. RECEPTION	409m²	/	/	/
-Hall clearance	120	122	**340**	100
Security Station	120	/	/	/
. General reception of the public	50	280	/	80
. Home group and school	30	/	/	/
. Ticketing	10	/	/	/
. Shop	15	/	**53**	114
. Cafeteria	25	/	**266**	580
.Restaurent	/	/	/	600
. Cloakrooms	15	/	/	
. Public sanitary .	15	/	/	
. Infirmary	09	/	/	
2. ANIMATION	139m²	/	**240 m²**	/
. Animation workshops	64	/	/	/
. Arrangement	15	/	/	/
. Outdoor terrace	60	/	**80 m²**	/
3. EXHIBITIONS	260m²	/	**940 m²**	10000m²
. Permanent exhibition	120	520	**830**	6400
. Forum	60	120	/	1400
. Temporary exhibition	80	180	**110**	2000
.Children Museum	/	/	/	200
. Exterior Exhibition	/	/	/	/
4. CONSERVATION	164m²	/	**250 m²**	/
-. Workshops	64	/	/	/
. Reserve	100		/	/
5. LIBRARY	195m²	138m²	/	/

. Management and loan bank **. Reading / child racking /** **Adults / periodicals** **. Multimedia / Audio** **. Library storage** **. Introductory and animation workshop**	20 80 35 60 30 35	100 / / / 38 /	**/** **/** **/** **/** **/**	/ / / / /
6- CONFERENCE ROOM for 100 seats	200m²	420m²	**/**	420m²
7. MUSEUM MANAGEMENT	215m²		**420 m²**	550m²
Executive Office **. Management Office** **. Secretary's Office** **. Hall of Rebirth** **. Rest area**	40 25 25 80 45	25 42 21 / / / /	**45 m²** **/** **/** **/** **/** **/**	/ / / / / / /
8. TECHNICAL FACILITIES	50	/	**/**	/
9. CIRCULATIONS	15%	/	**/**	/
10.PARKING				
TOTAL SURFACE UTILE	**1650 m2**	**/**	**7100**	**64000**

12.3 Proposed Program:

This program is the program developed through the official program of the Ministry of Culture in addition to the technical requirements and analysis of examples and analysis of the ground and the architectural and urban programming.

Table 10: Proposed Program, Researcher 2020

Administration……..185m²			
Spaces	Unitary Surface	nbr	Total Surface
Services entrance	20	1	20
Director office	25	1	25
Accountant office	25	1	25
Secretary office	15	1	15
Meeting room	40	1	40
Archive	40	1	40
Washrooms	20	1	20

Visitors……..….625m²			
Entry hall	120	1	120
Information and reception	50	1	50
Ticketing hall	22	1	20
Boutique	25	1	25
Plaza	120	1	120
Library	120	1	120

Storage	30	1	30
Workshop	60	1	60
Washrooms	40	2	80

Exhibition…….1400m²			
Permanent exhibition gallery	200	1	200
Temporary exhibition gallery	80	1	80
Auditorium	250	1	250
Exterior Exhibition	100	1	100
Children's hall	145	1	145
Service…….300m²			
Security office	20	3	60
Service room	20	2	40
Parking	200	1	200
Used Surface……..2510m			
Circulation surface…….340(15%)			
The total surface of the project…….2850m²			

13 simulation methodologie :

In this study, Numeric simulations were used to offer an optimal quality & quantity of lighting to exhibitions rooms and the software used is **Dialux** and to verify our hypotehse

13.1 Overview on Dialux:

DIALux is the leading software for lighting design, available free of charge in 25 languages. Plan, calculate and visualize light for indoor and outdoor areas. From entire buildings and individual rooms to parking spaces or street lighting. Create a unique atmosphere with real products and convince with an individual lighting project

With Dialux, you are able to calculate and visualize the daylight, as well as plan your lighting scenes, plan the color and intensity of the lights you will use, position on the project the emergency lighting, with the right legal number of luminaires, and many more.

13.2 Numerical evaluation of natural lighting in museum by Dialux :

The objective of this approach is to quantitatively and qualitatively analyze the natural lighting in the exhibition space of our project. We took the results and compared them with the systematic standards to make sure that we reached our goal.

13.3 Steps of simulation:

a-perform numerical simulations using the dialux programs. in two different periods of the year (winter and summer).

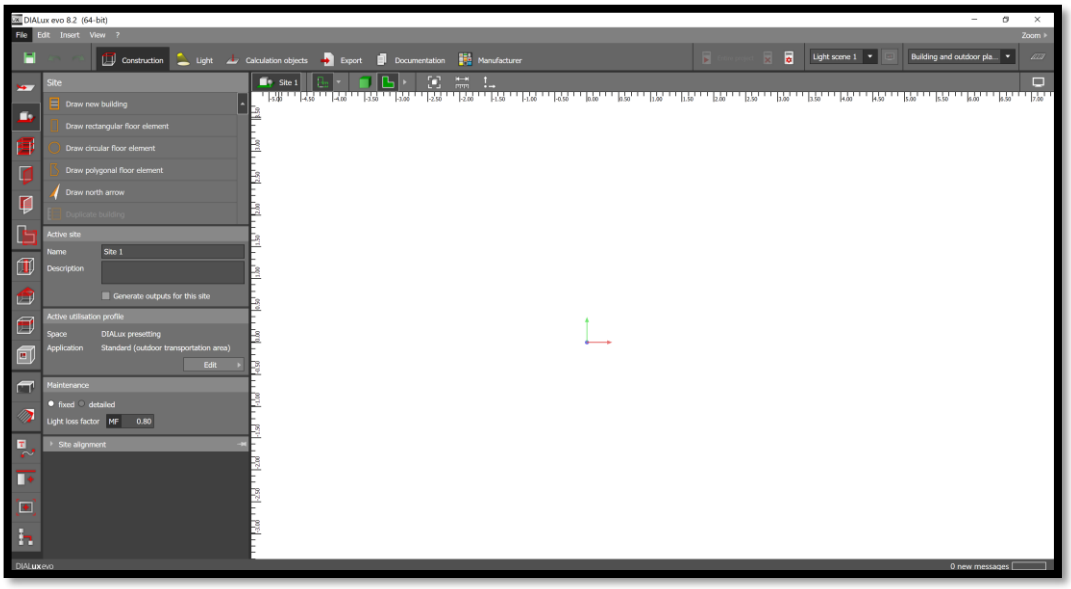

Figure LV: The interface of Dialux, researcher 2020

Step1: draw the plan or import it from ArchiCAD or AutoCAD as dwg extension.

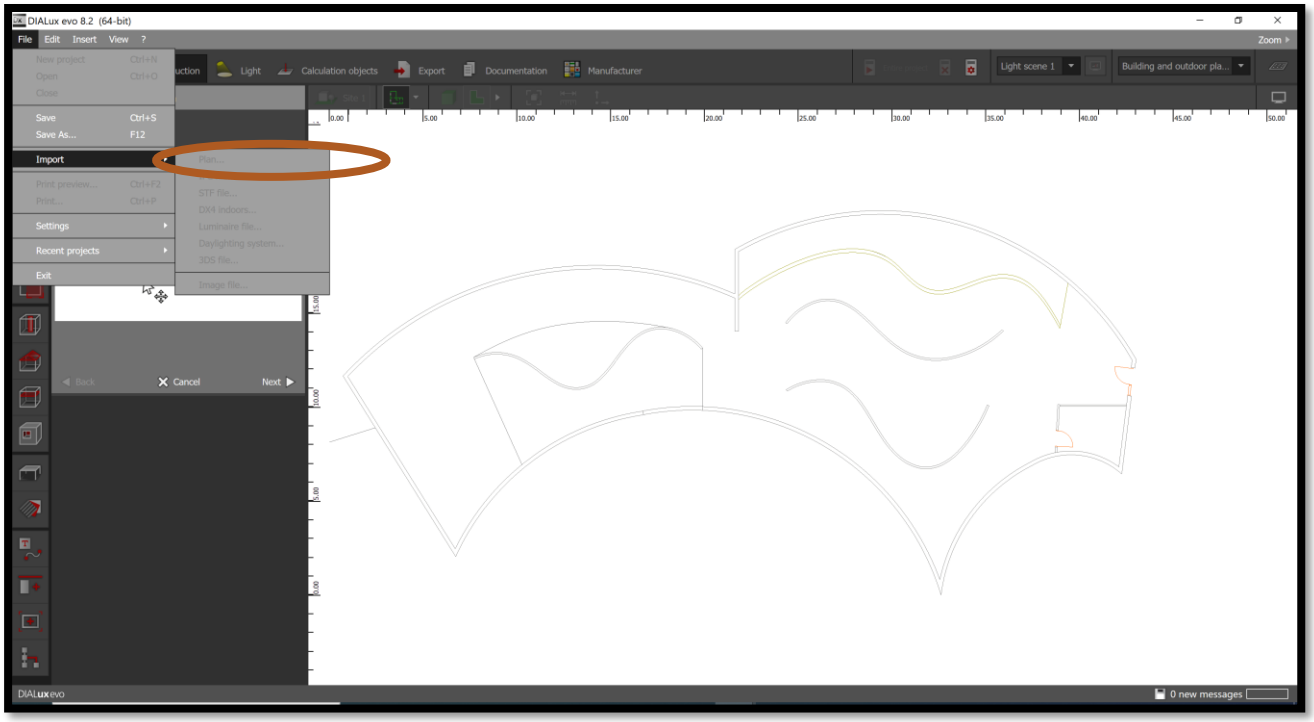

Figure LVI: import in Dialux, researcher 2020

Step 3: create the windows, the walls and zenithal openings with the presided dimensions after naming each zone.

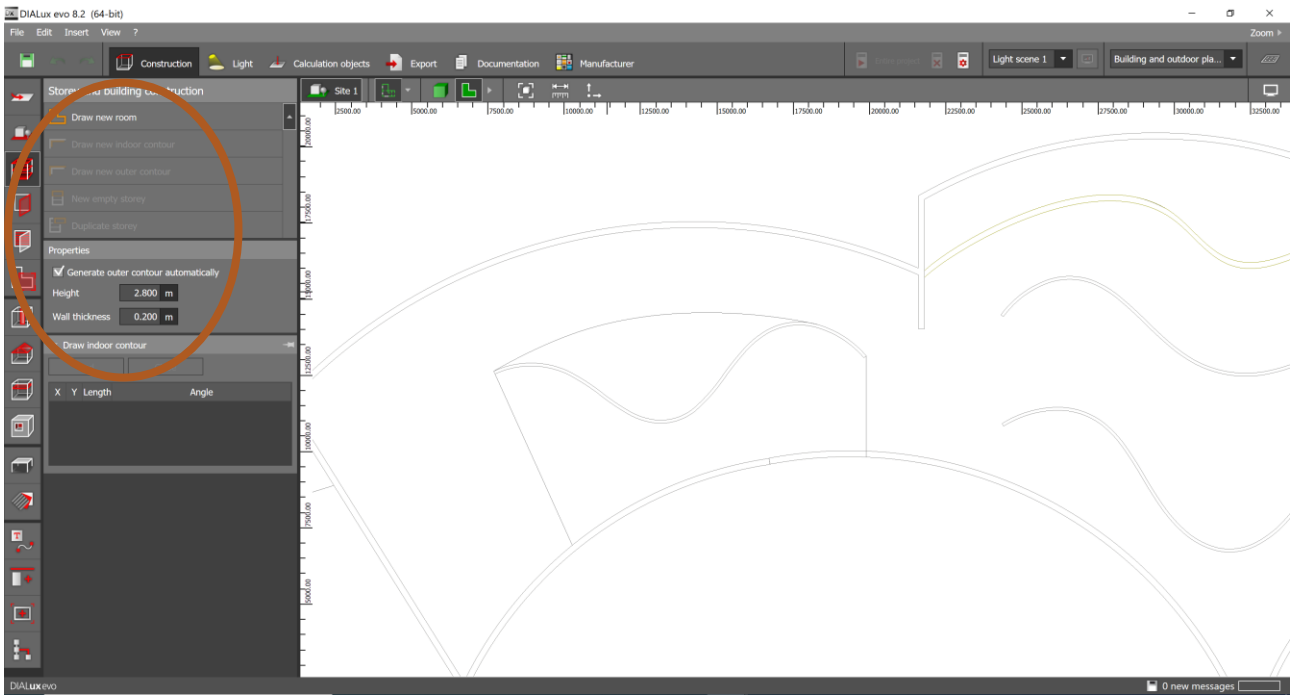

Figure LVII: Drawing in Dialux, researcher 2020

Step4: enter the most important data in this study which are the exact location of the site by giving the latitude and longitude of the site where our project is planned to executed (this data provided in Google earth) after this process, indicate the orientation of the north in the plan.

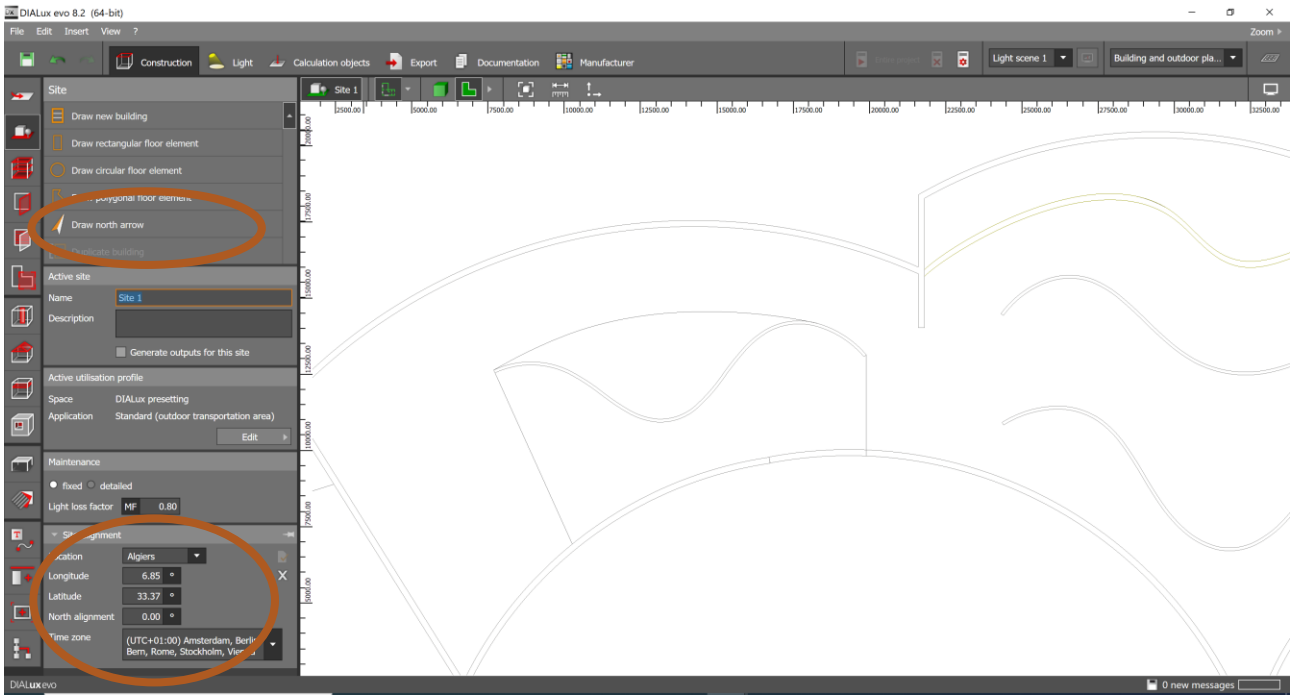

Figure LVIII: inserting the inputs in Dialux, researcher 2020

Step5: control the high of results wanted to receive from the simulation

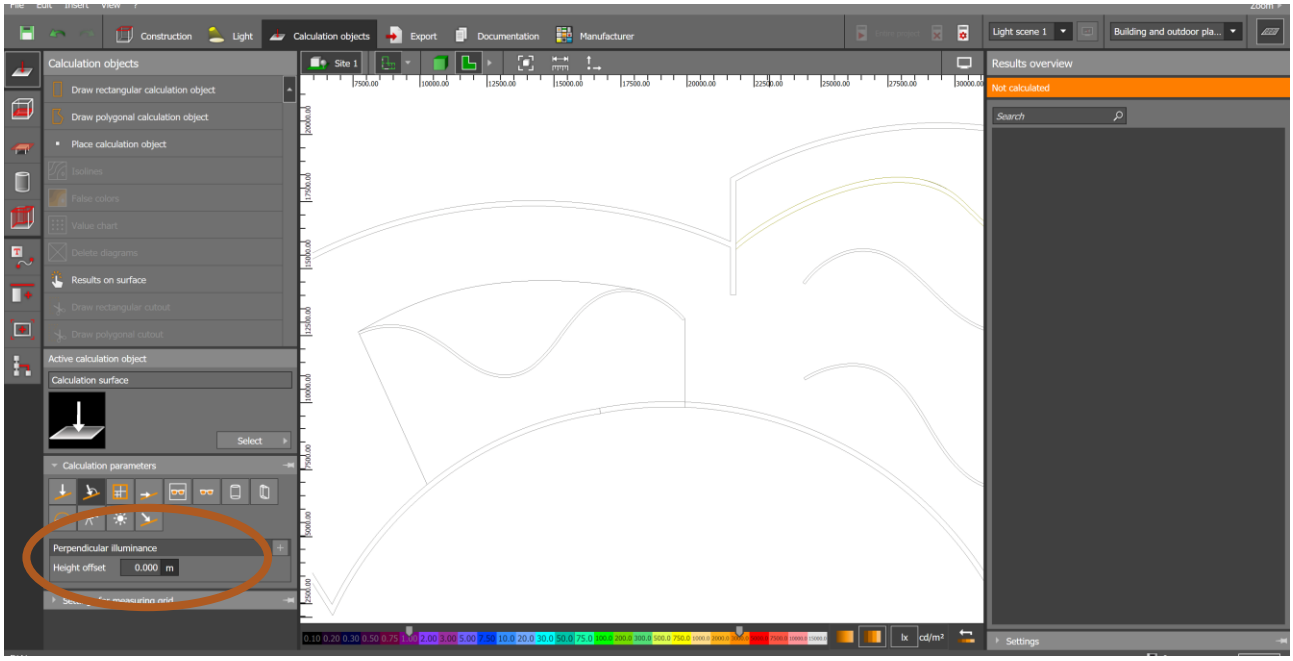

Figure LIX: adding the height in Dialux, researcher 2020

Step6: choose the period and type of the sky wanted to study in order to get précised results in different time and season.

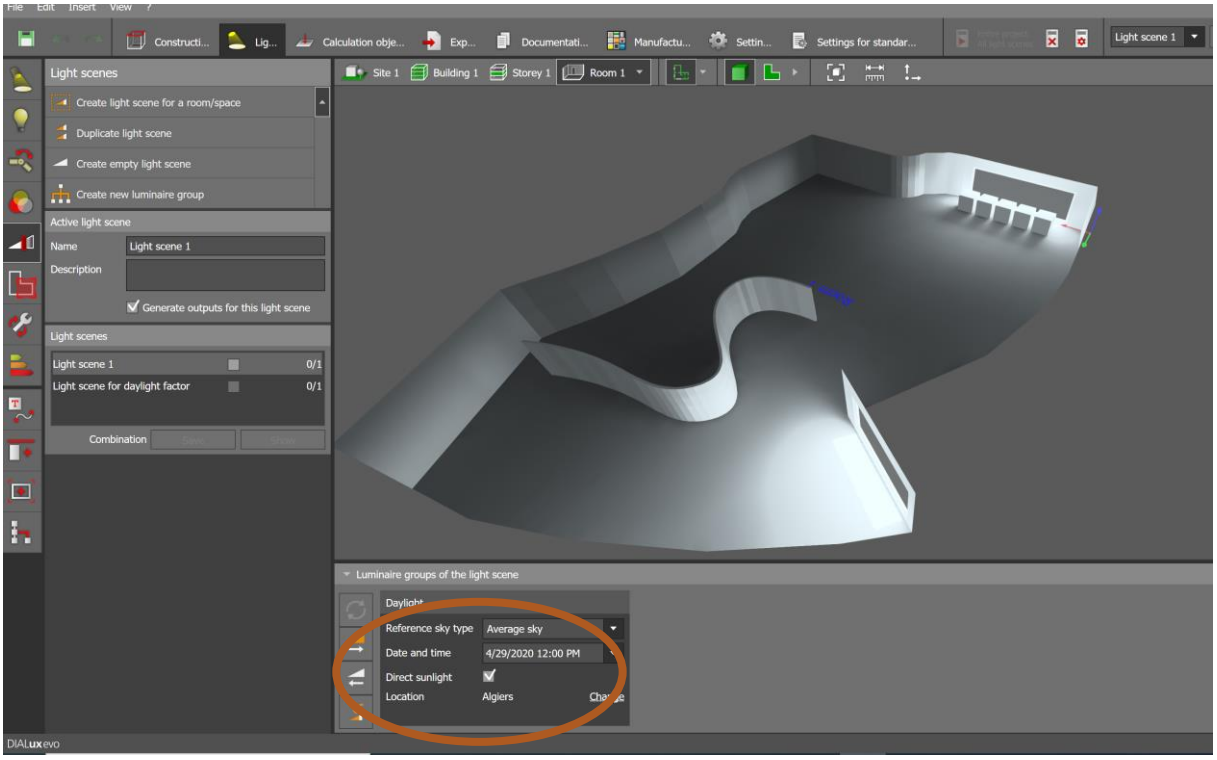

Figure LX: choosing the time and the type of sky in Dialux, researcher 2020

Step 7: calculation and results will be in the 3rd chapter.

graphic representation (synthetic image) and comparison against lighting standards show the results where we could control the daylight and got suitable lighting in the most of spaces (300 to 500 Lux).

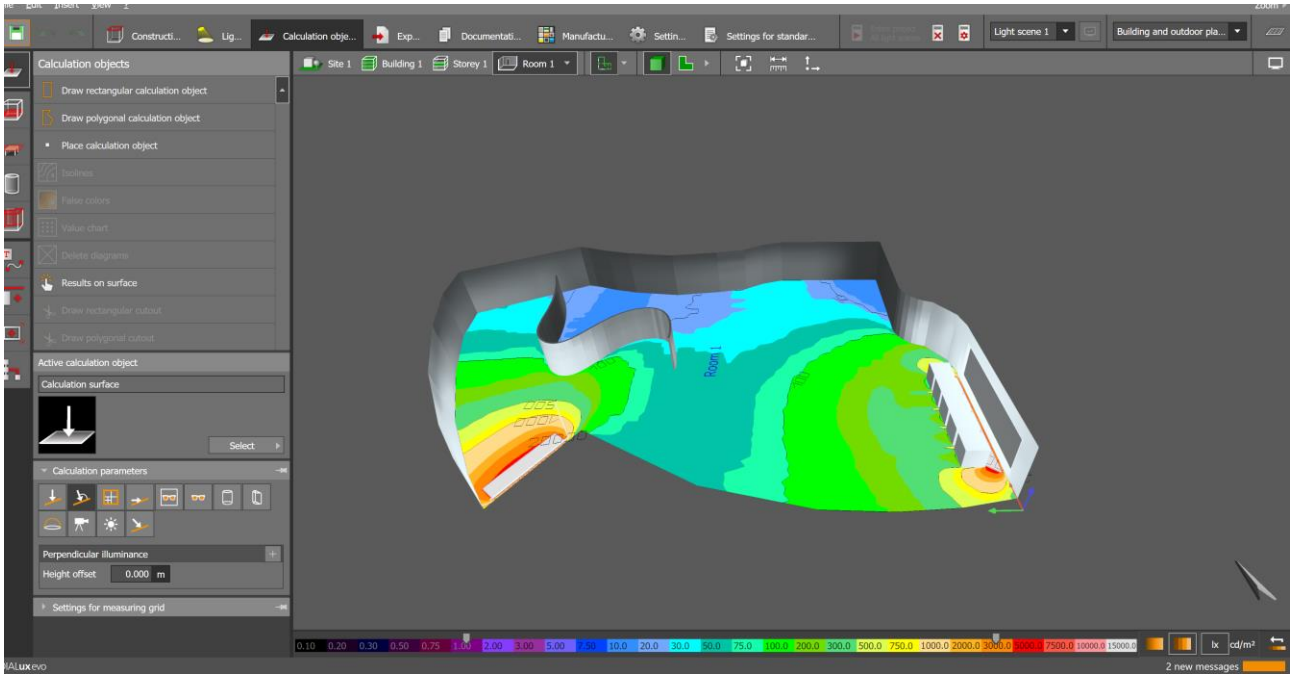

Figure LXI: map of results in Dialux, researcher 2020

13.4 Choice of the period:

the day and the moment of the evaluation of the natural lighting, we choose one period of the year (summer) because of the over lighting in this season and one day representative is chosen in the period such as Friday, June 24.

Conclusion

After discussing everything relevant to the museum in this chapter, from the cultural intellectual affiliation to the science that falls within it through the most important definitions and functional and spatial characteristics, and after mentioning the most important conclusions from the analysis of the examples and the land, we can conclude that the process of the study has been completed and that we have extracted the most important laws and standards which will help us to study is the adaption of the daylight in the exhibitions space and full physical integration of our project to the good study of the mechanical and pedestrian connectivity and the absolute clarity of the entrances of the ground and the project and the external design of the project ground is very importance like the internal design and the most important extracted from the exterior study is the project's mentality, which must give an impression on the difference and the intellectual and architectural importance through its unusual shape and its vague facades that give the desire to explore this building and know its function while not forgetting the nature and the surrounding environment Which affects the project and is affected by either internally As for any project dedicated to the public, the welfare of the users must be studied carefully and the project message should be delivered to them with ease and clarity.

We shouldn't neglect the importance of maintaining the exhibits from the hour they enter the museum to the exhibition storage and its maintenance techniques. With the most important applications of our subject in the sector, which will be techniques for offering the exhibition rooms an optimum quality & quantity of lighting. From here we have everything we need to move directly to the design process of the goals and objectives of the museum that we will address in the next chapter.

CHAPTER III: PRATIQUE CHAPTER

Introduction:

After discussing and describing everything related to daylight and various lighting devices with the different techniques and after theoretical review of the museum and discussing all the relevant meanings and characteristics and technical and functional criteria and after extraction of the regional crafts museum's spatial system, we have collected all we need to go through.

Throughout this chapter, we will describe the design phases of the project and how to incorporate all that was learned from the previous theoretical analysis throughout order to design a museum that achieves all its goals and demonstrate how to integrate the design concept on the museum's external and internal level and how the most relevant elements of the theme are implemented in the project

In order to explain what we said earlier, this chapter will include the most important goals and elements of the theme that will be implemented in the project and also the most important goals of the project with a sequential description of the transition elements, the internal and external actions of the project and the design phases and the basic design concept in the form of the building, the facades and the various internal functions. With a graphic display for the entire plans with the interior and exterior views of the project.

In this chapter, we aim to demonstrate how to integrate daylight into the museum, particularly in the exhibition areas, where the latest technology will be used in the museum's external envelope, which will automatically monitor itself in compliance with climate change and internal requirements, and to change the idea of the old museums and offer new looks for museums and a new approach to architecture towards the widespread use of advanced technology and driving the tourism sector through a world-class museum.

1 Objectives of the theme:

- ✓ full control to the amount of light and air entering the project to offer an optimal quality & quantity of lighting.
- ✓ reduce energy consumption.
- ✓ create promenade in the museums spaces and exhibits spaces.
- ✓ give a modern look to the museum and for the visitors and to give definition of areas and their characteristics And of course it is used for entertainment.
- ✓ reflect the traditions of old building of El Oued and customs in a modern way.

2 Objectives of the project:

- ✓ Create a tourist and cultural pole at the region and international levels for that the design should be unusual and in line with the latest artistic and architectural expressions.
- ✓ Design a Project in line with technological progress of daylighting and global standards by working through the latest technology.
- ✓ Helping to fill the needs of the region and the state in such projects. According to the Algerian legislator, each citizen has an area of 0.01 m 2 of museum that produces a national need for 74 museums of a contemporary national museum.
- ✓ The most important element to be taken into account is that the project should be based on the Algerian-Arab Islamic identity through the inclusion of the Islamic architectural elements and the inclusion of the traditional urban character of EL Oued, taking into account the customary and traditions

- ✓ Changing the people's view of the museums and promoting and cultivating the culture of their visits.
- ✓ Change the way of the design and construction of projects and stimulate the use of Natural light widely.

3 Crossing elements:

3.1 External Challenges:

3.1.1 Solarization:

- The site is exposed to sunlight during all the day without any protection.
- Programming the dynamical envelope to fully control the amount of light entering the project

3.1.2 The wind:

- The site is not protected against the wind and totally exposed to it.

3.1.3 Physical problems:

- Topography of the ground is flat and without any obstacles.
- The buildings do not give any shades to the floor.

3.2 Techniques applied in the project:

3.2.1 1. The form :

In order to protect the exhibition areas, the perfect shape and orientations of the project is important and in order to take advantage of the north side where the sun light is more controllable.

3.2.2 The dynamical envelope:

3.2.2.1 glass for literal lighting:

electrochromic glass (Dynamic Glass) allows users to control the amount of heat or light that passes through the glass at the flick of a switch, giving them the ability to regulate temperatures or create privacy at the flick of a switch. (John, 2010)

3.2.2.2 programmed Sun blocker for zenithal lighting:

They are elements of the architectural envelope that move automatically vertically and horizontally, according to the movement of the sun and the internal requirements of light and heat where they are connected with thermocouples and Thermal sensors which control their movement.

3.2.2.3 The usage of ramps :

In order to transport vertically we choose to integrate the ramps in the project to create promenade and entertain especially for the kids section. Compartmental study.

3.2.3 Use the centralization distribution plan:

In order to present the identity of the old building of the region which well know with a important yard in the middle of each house called El Houch. The reason behind that is to gain more privacy and to take a full advantage of light and to entertain the visitors with external periodic exhibition and a rest area.

3.3 Details Technology and techniques used to face the challenges:

3.3.1 Horizontal Shading system for the Zenithal openings:

These panels can significantly reduce glare and solar heat gain. they are also automated and dynamic because of a device tracks the location of the sun which is composed of some photosensitive and

monitors the light conditions and can adjust the panels when required. The panels can move in 360° and they are housed between two layers of glass, one on the outside providing protection from the extern elements such as rain, and the one on the inside protecting it from potential damage or interference with its operation

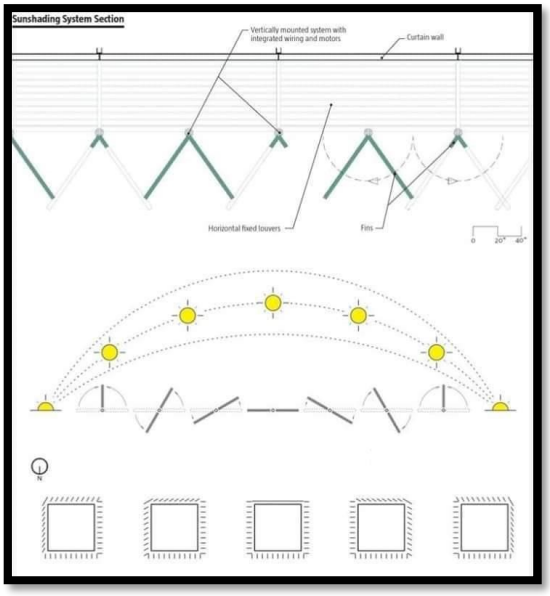

Figure I: shading System technology for zenithal windows. (Nady, R. 2017)

3.3.2 Vertical Shading system for the literal openings:

The majority of the exposed glass of the west facade is protected by a geometric shading device. The dynamic system covers all the windows face directly to the sun, and is constructed as a series of rectangular panels. These panels individually open and close, and this is done in reaction to the sun's path moving across the building. They respond to the light, and reduced the amount of solar energy that pierces through to the interior spaces. The predicted energy savings with this modular system is huge. While being a successful representative of the technology advancements in double skin systems.

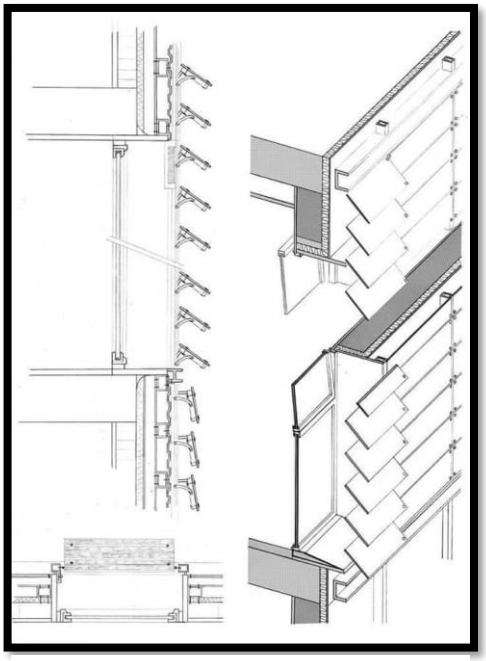

Figure II: Vertical Shading system for the Lateral openings. (Nady, R. 2017)

3.4 Internal study:

3.4.1 The most important sections in the museum are:

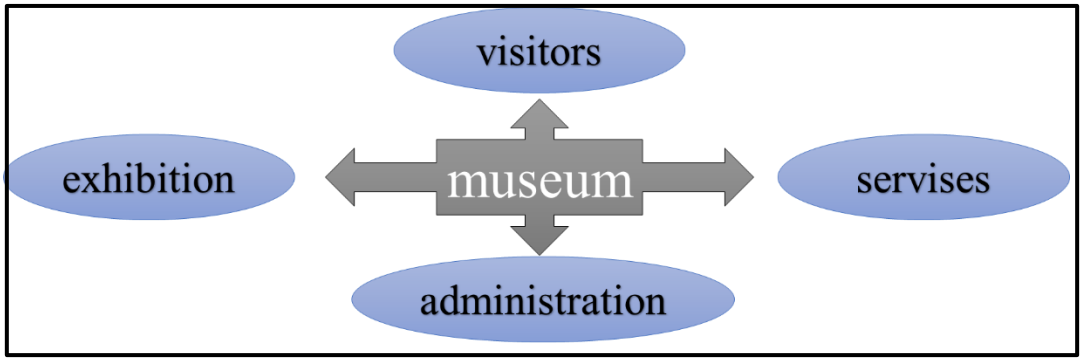

Figure III: important sections in the museum Source: author 2020

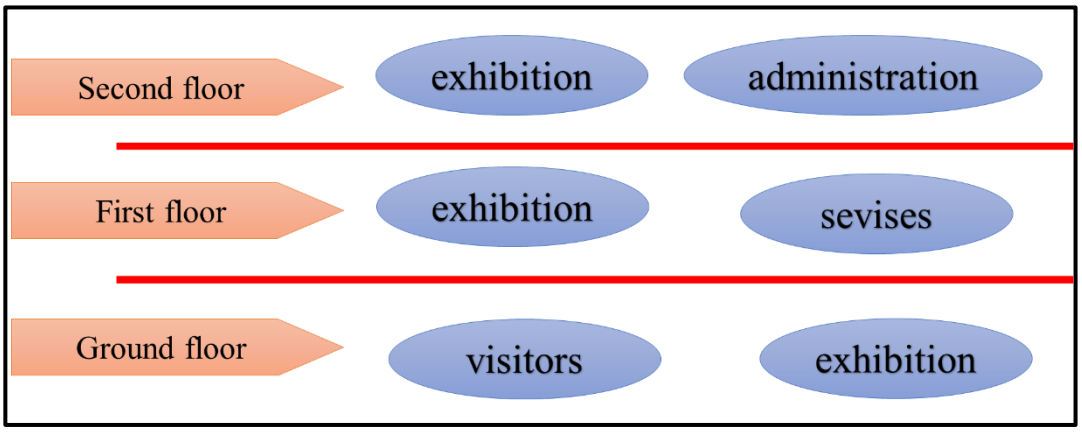

Figure IV: important sections in the museum Source: author 2020

3.4.2 Distribution of the most important spaces on the floors:

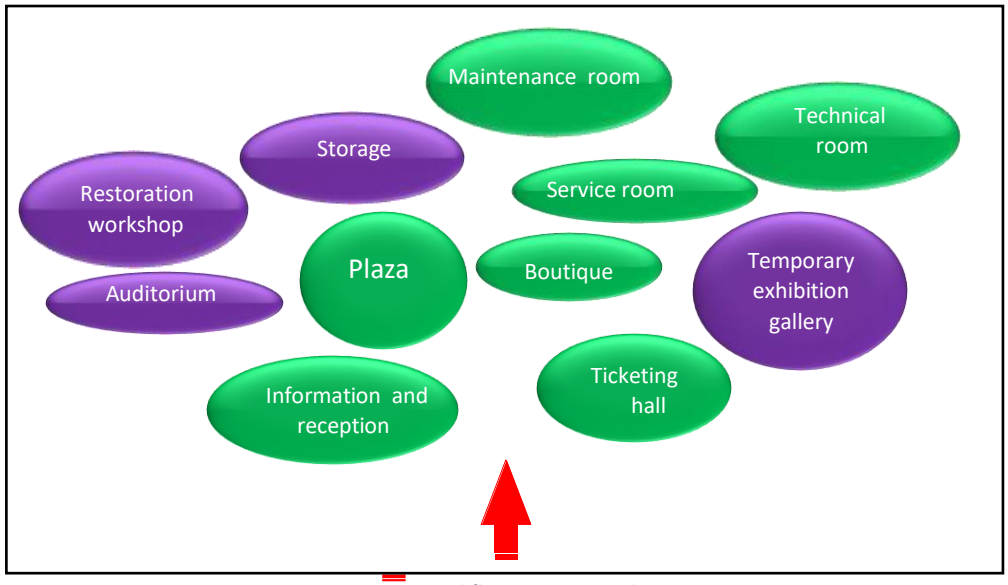

Figure V: ground floor Source: author 2020

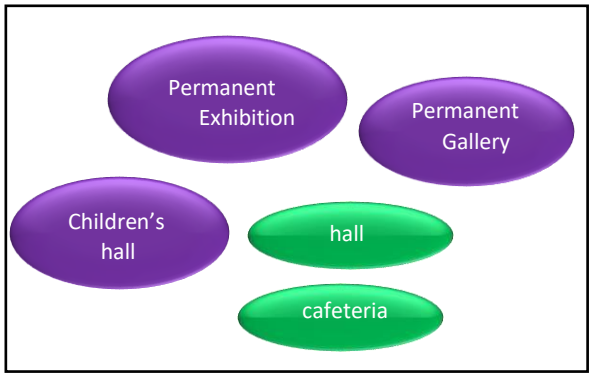

Figure VII: first floor Source: author 2020

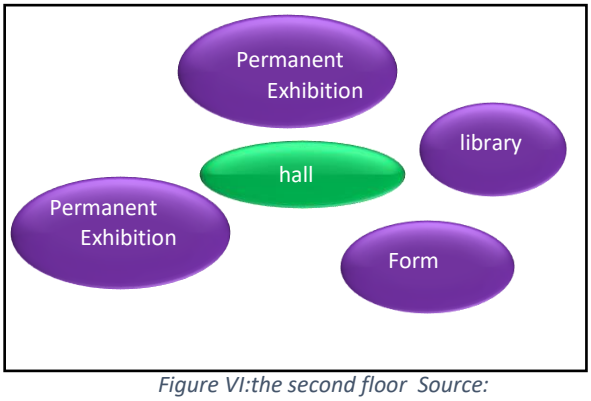

Figure VI:the second floor Source: author 2020

4 Design Idea:

4.1 The Main Idea:

The basis and source of the idea is the typical and the traditional old house of El Oued (EL hoch soufi) and the basic central plan of the house where the plan provide the privacy for the members.

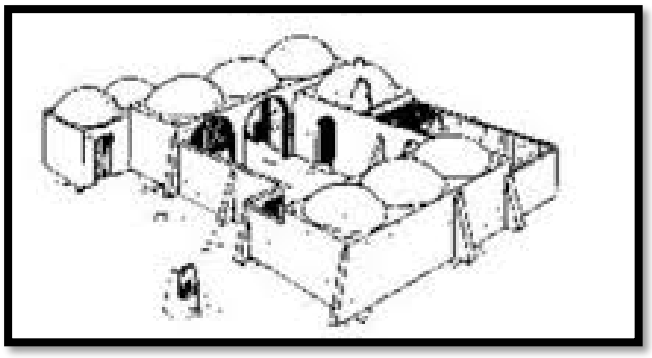

Figure IX: Axonometry of Traditional house of oued souf , Source El Oued Forum

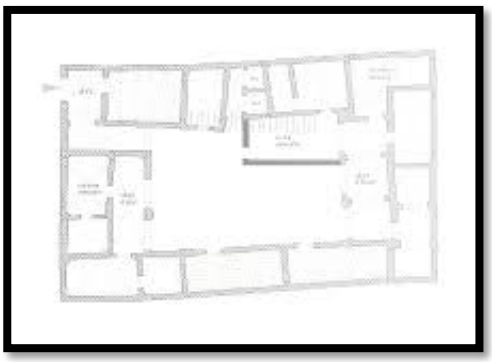

Figure VIII: Plan of traditional house of oued souf Source El Oued Forum

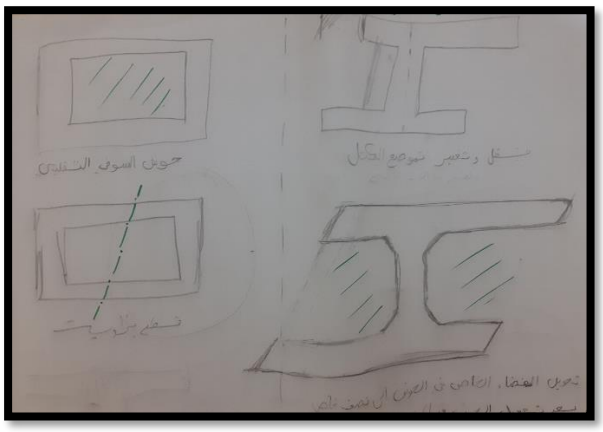

Figure XI: Steps of creating the plan, inspired from the traditional oued souf house, Author 2020

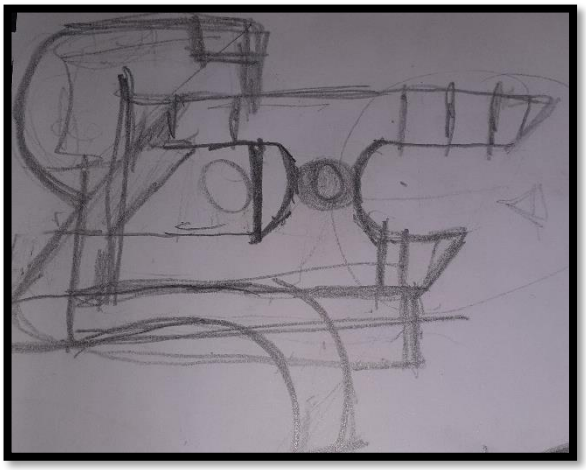

Figure X: esquisse of creating paths of the project, Author 2020

After the electrons' paths were balanced with the positive energy of the atom, the optical axes from the proximal surroundings of the project intervened to change the paths, and create the main lines of the project shape, and also create the dynamic elements of the project.

4.2 Design Idea of the façades:

The basic idea of the facades depends on the inclusion of the basic idea of the central plan to give a force on the center of each facades With the treatment of the sky line to match with the sand dunes of the region and with the environment to give the project a modern look, the dimensions of the surrounded buildings were taken as relative references to the dimensions of the project in Length and height. The entrance element was used to draw attention and importance to the hallway where the visitors can start their journey. As for the treatment of the openings, the dynamic elements of the architectural envelope were used to comply with external conditions and internal requirements.

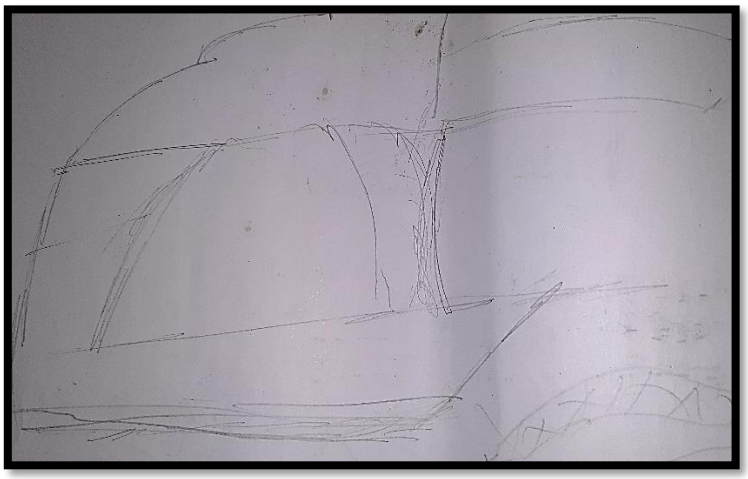

Figure XII: the first esquisse of the plan, author 2020

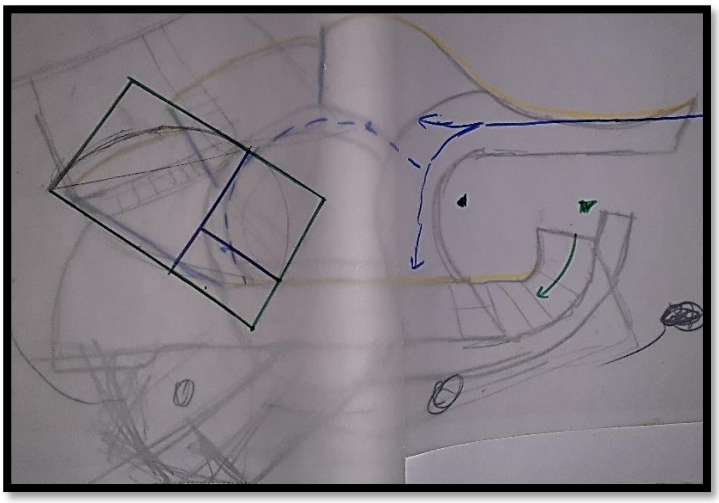

Figure XIII: esquisse of the plan, using the golden ratio to create facades, author 2020.

5 Discussing and analyze the results of the simulation:

5.1 The results of Simulation on 07 August 2020 at 08:00 AM:

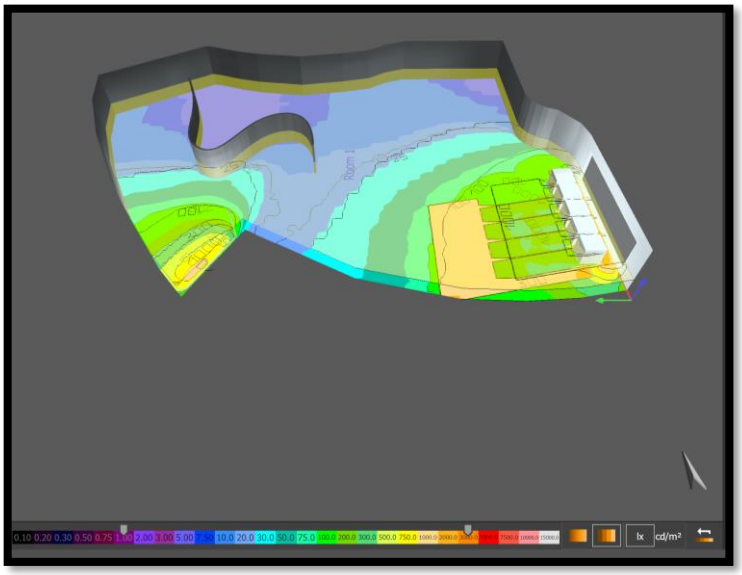

Figure XIV: Dialux results at 08:00am, author 2020

As the results show, the most of the room space is blue in morning which means the lighting is between 10 Lux to 75 Lux and that because of the good orientation of the project, we can increase the amount of light in side the exhibition rooms using the zenithal opening system or we can use artificial lighting in case it s not sufficient.

5.2 The results of Simulation on 07 August 2020 at 10:00 AM:

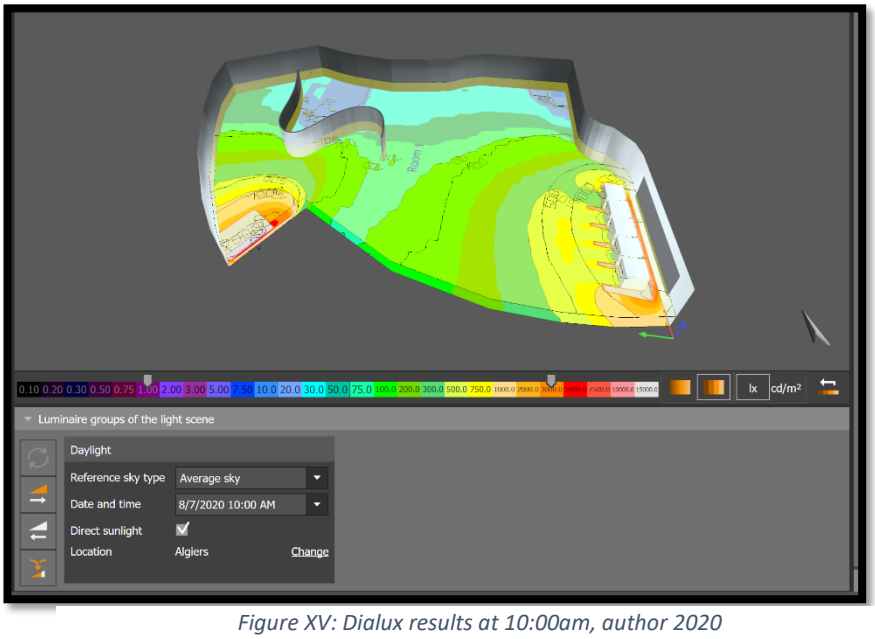

Figure XV: Dialux results at 10:00am, author 2020

The results at 10:00 Am is greener which means that the lighting is between 75 Lux to 300 Lux, the result according to the norms is optimal expect the surrounding of the windows where we should avoid place exhibitions or we can place a specific kind of exhibits like wood or stone.

5.3 The results of Simulation on 07 August 2020 at 12:00 PM:

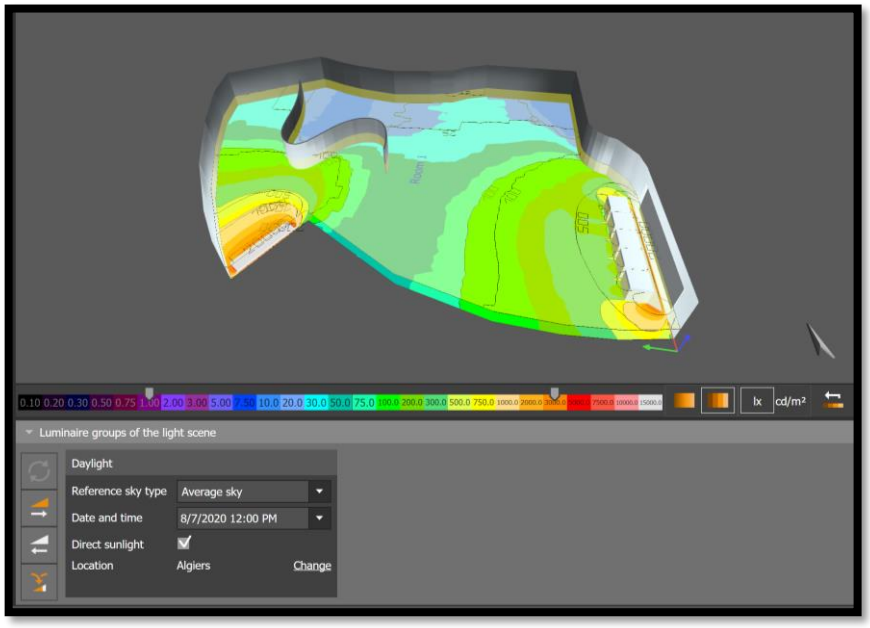

Figure XVI: Dialux results at 12:00am, author 2020

At 12:00 PM, we can notice that the right window of the east side is greener because the sun now is almost in the middle of the sky, and the room is protected from the south that s why we can get an optimal lighting in east side as well.

5.4 The results of Simulation on 07 August 2020 at 14:00 PM:

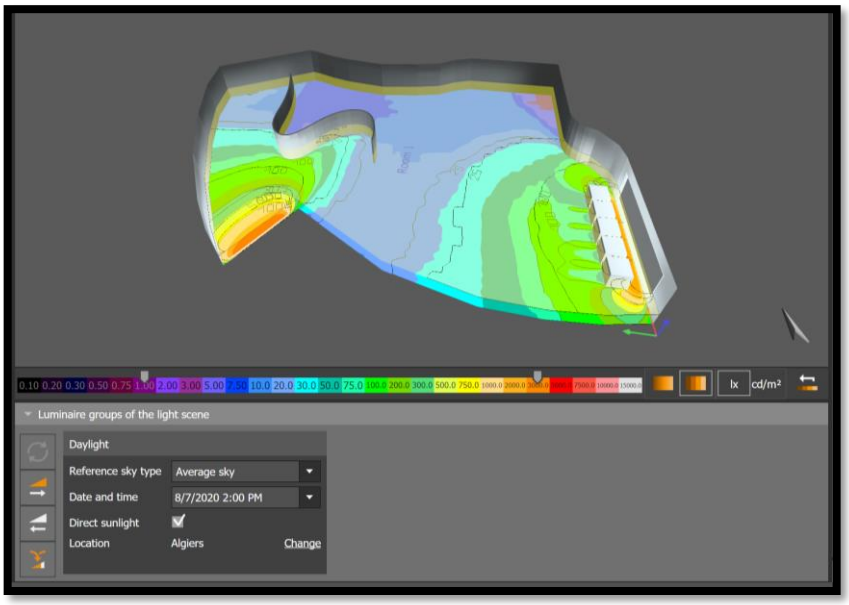

Figure XVII:Dialux results at 14:00am, author 2020

As we see at 14:00 Pm, the room is less lighting (20 to 30 Lx) because the sun now is in the west side and the room is fully protected from the sun in the west side that s why we must use the zinthal lighting technology to get more lighting .

6 Graphic presentation of the project:

6.1 Site Plan:

Figure XVIII: The Situation of the project – Google Earth

6.2 Master Plan:

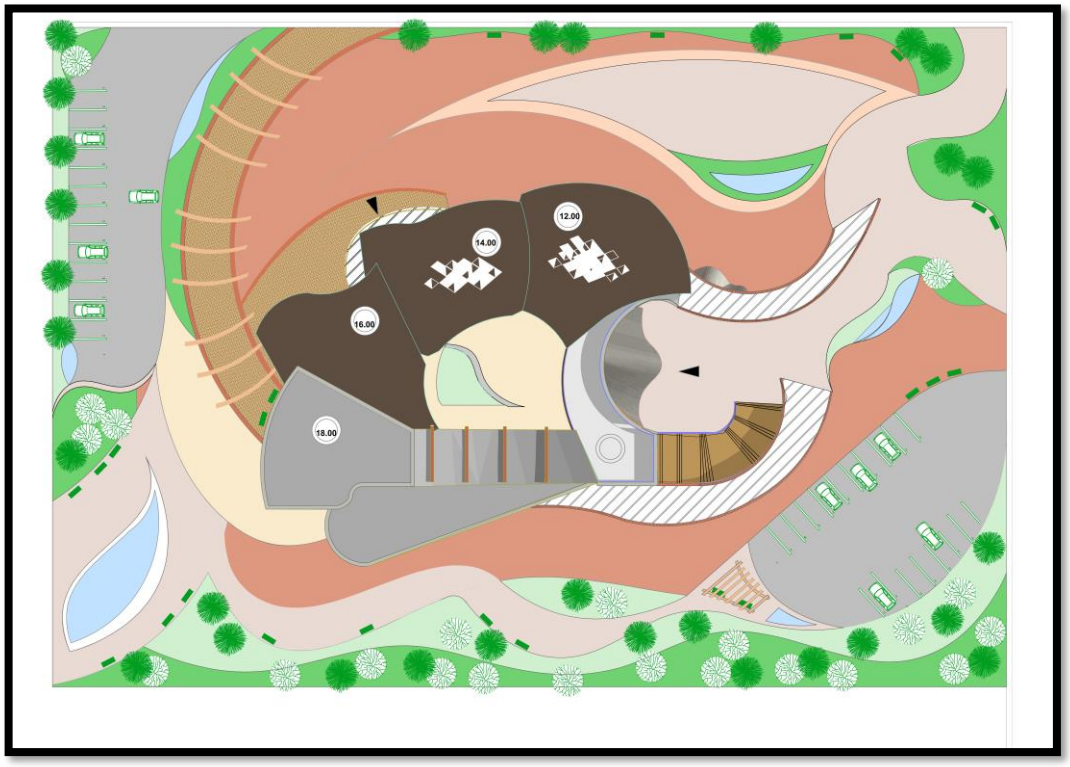

Figure XIX: Master plan - source author 2020

6.3 Ground Floor:

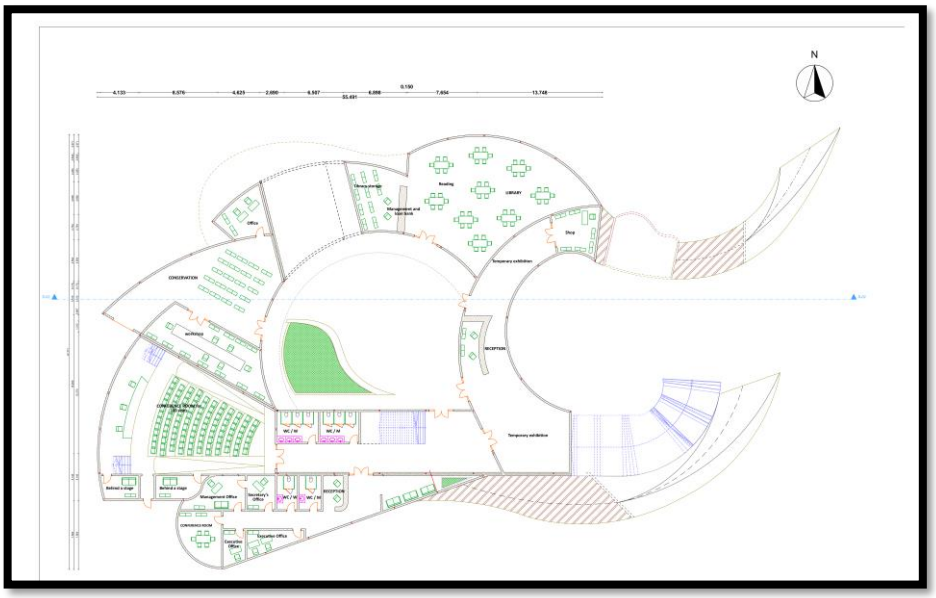

Figure XX: Ground Floor- source author 2020

6.4 First Floor:

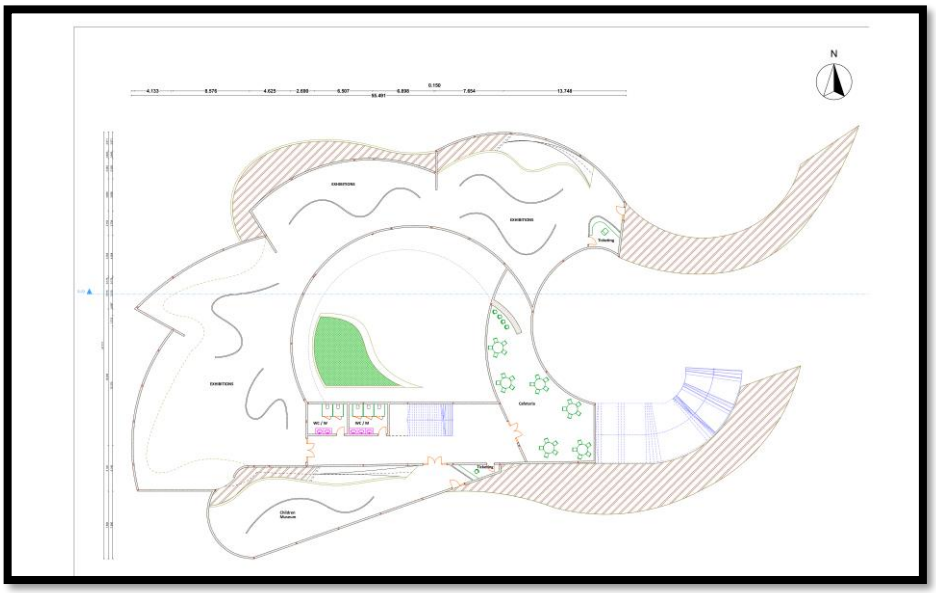

Figure XXI: First Floor - source author 2020

6.5 Second Floor:

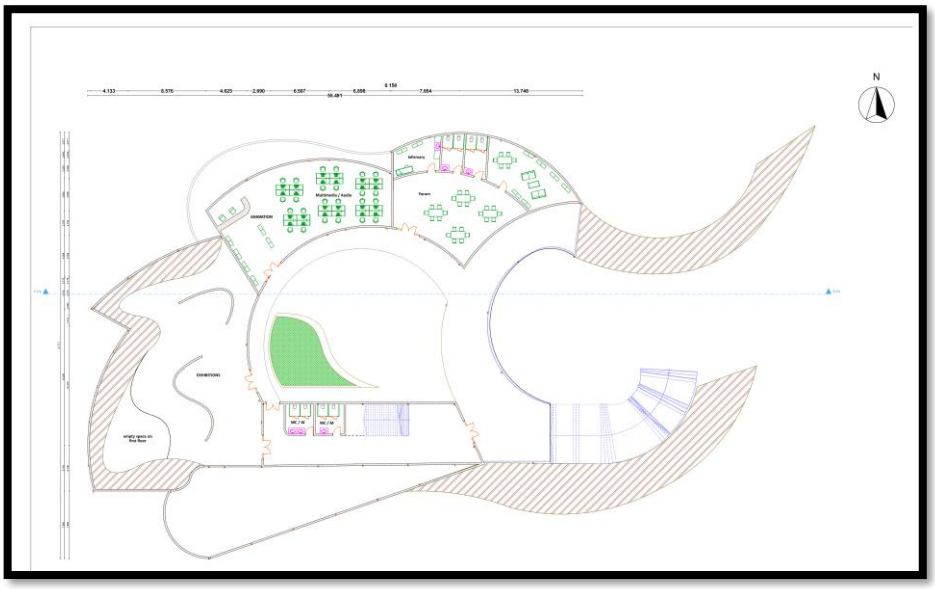

Figure XXII: Second Floor - source author 2020

6.6 The facades:

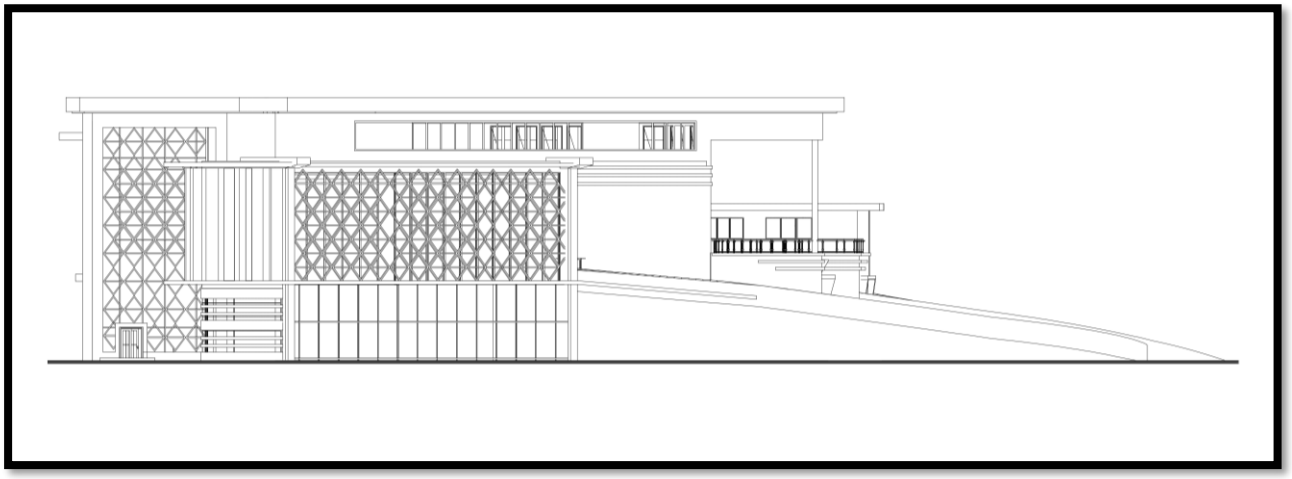

Figure XXIII: Eastern facade source author 2020

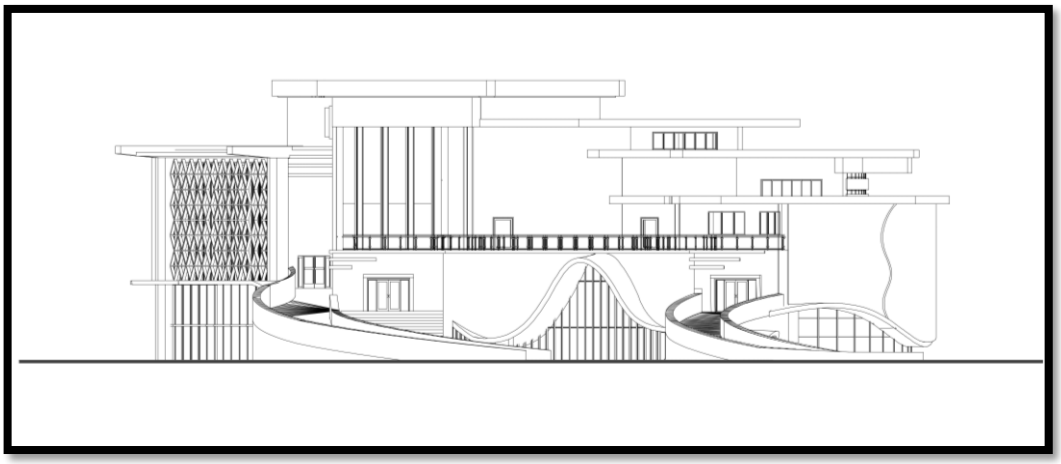

Figure XXIV: northern facade - source author 2020

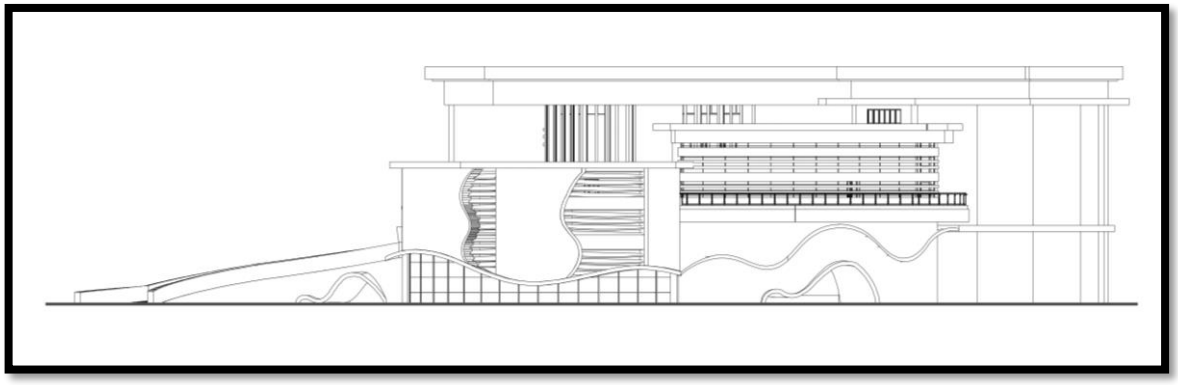

Figure XXV: Western Facade - source author 2020

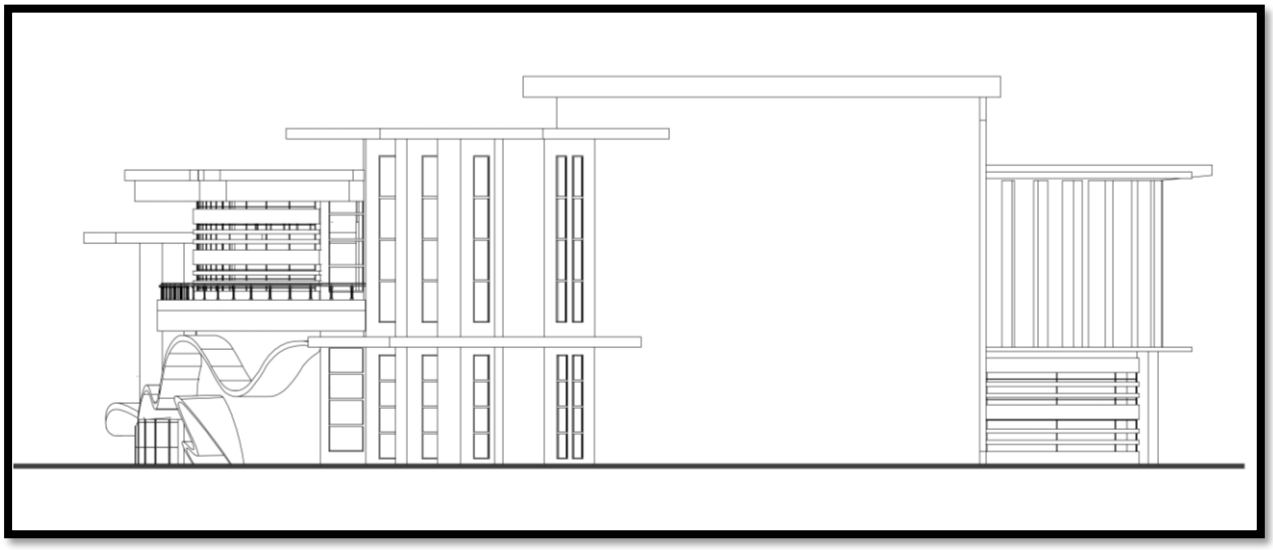

Figure XXVI: South facade - source author 2020

6.7 The Section:

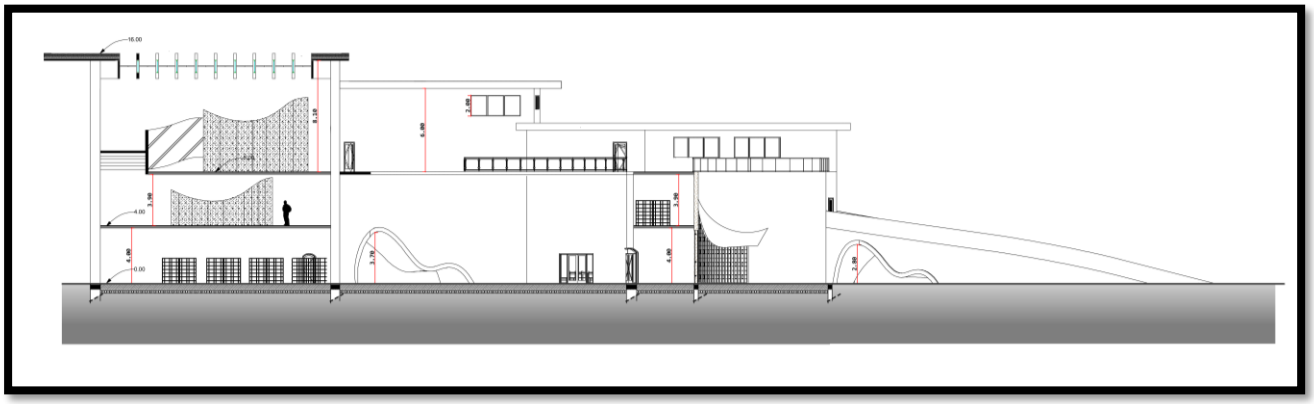

Figure XXVII: section AA - source author 2020

6.8 Views:

6.8.1 Exterior:

Figure XXVIII: Exterior view Source: author *2020*

Figure XXIX: Exterior view Source: author 2020

Figure XXX: Figure XXIX: Exterior view Source: author *2020*

Figure XXXI: Figure XXIX: Exterior view Source: author *2020*

Figure XXXII: Exterior view Source: author *2020*

6.8.2 Interior:

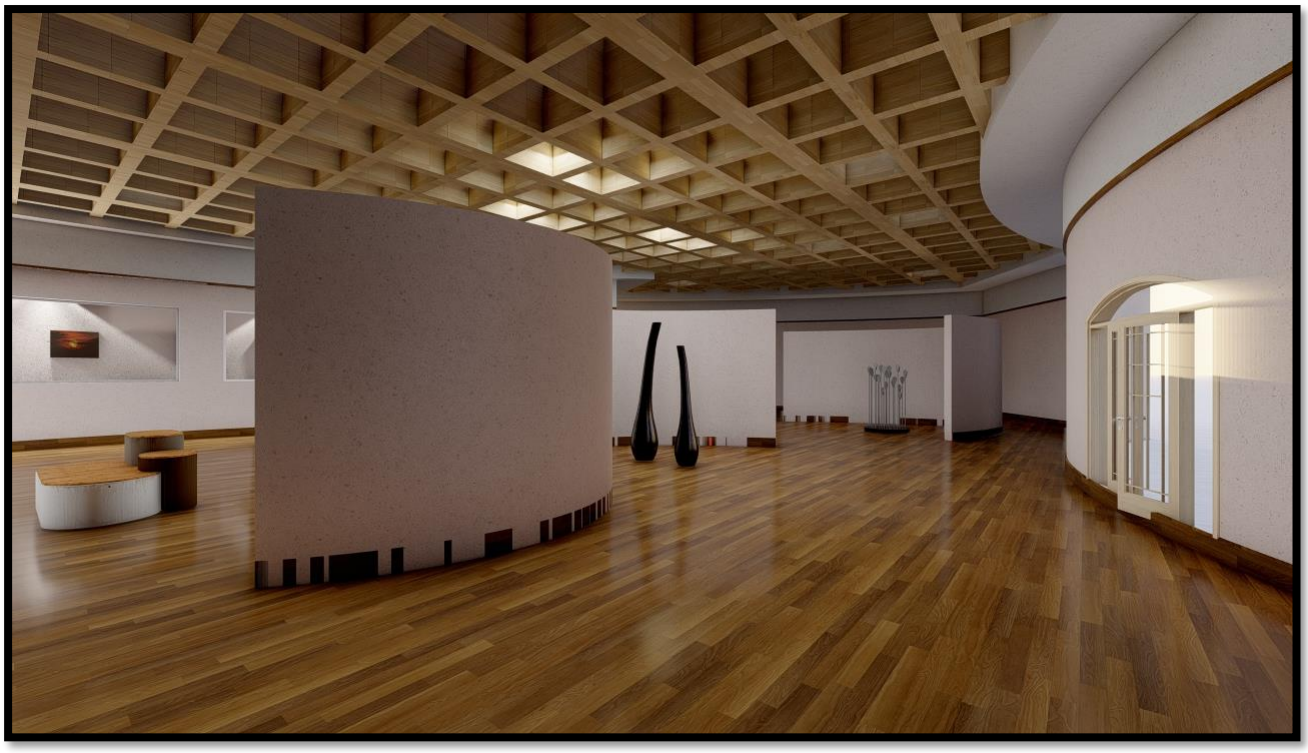

Figure XXXIII: Figure XXXI: Internal view Source: author *2020*

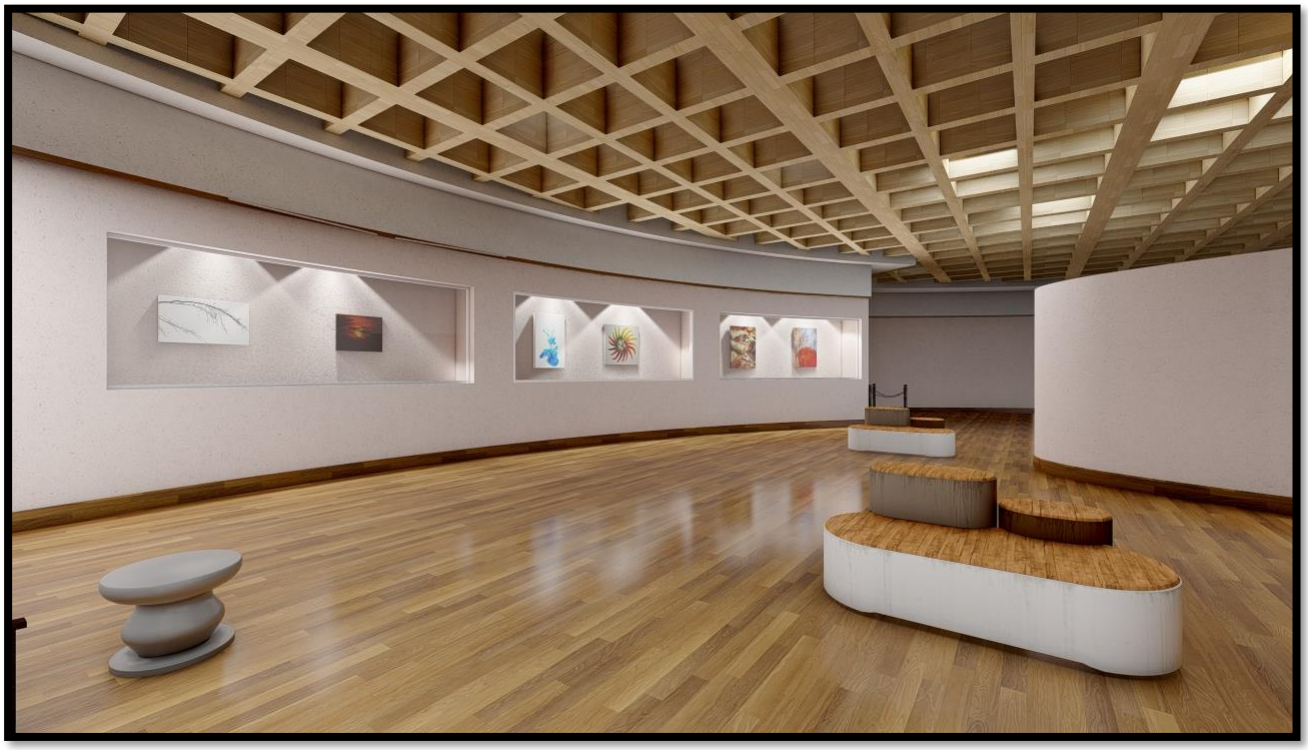

Figure XXXIV: Figure XXXI: Internal view Source: author *2020*

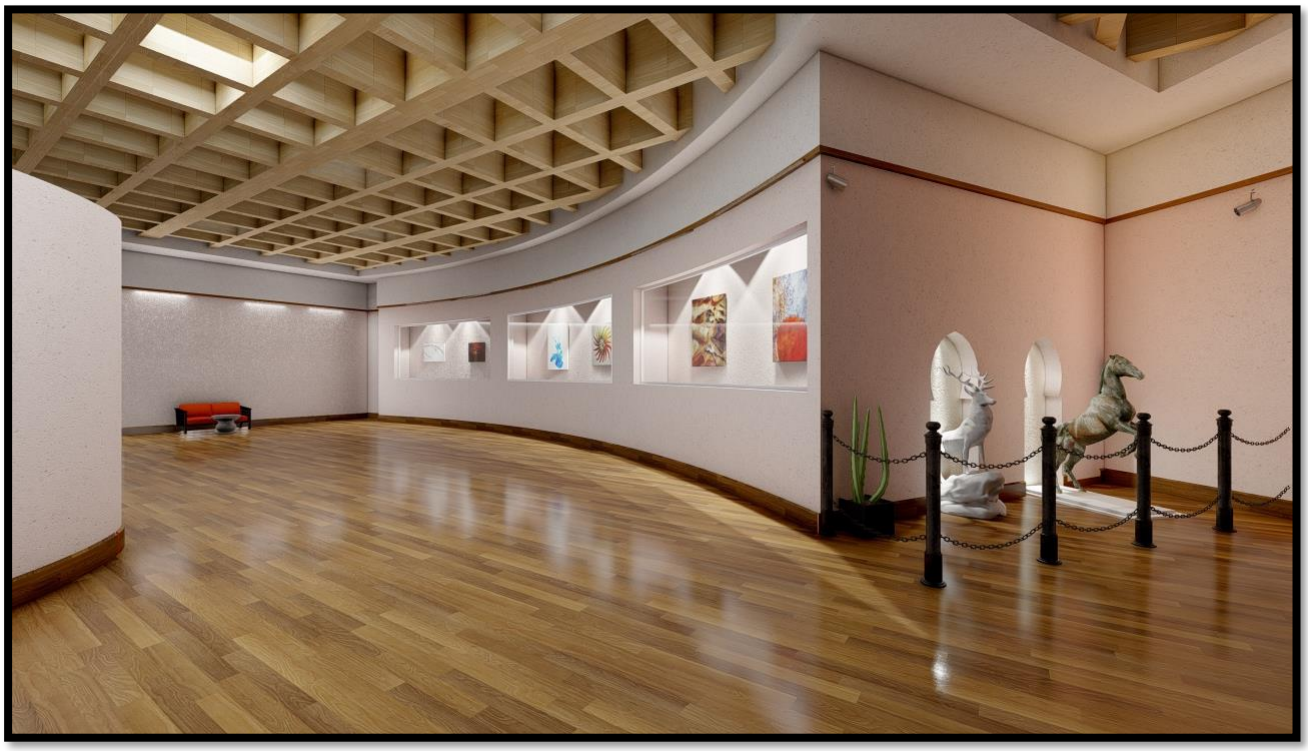

Figure XXXV: Internal view Source: author 2020

Conclusion:

After the completion of the conceptual and analytical study of everything related to the subject and the project we have extracted all the need for the design of the regional Museum of craft

In this chapter we discussed the most important stages of the design of the museum starting with the objectives and applications of the subject and the objectives of the project Then we mentioned the elements of transit, which include study of the internal and external behavior of the project and the general design idea and the design idea of the facades and then the graphic presentation of the entire project from plans facades sections and Interior and exterior views.

After following the previously established crossing elements and incorporating the subject techniques into the project, we were able to change the museum from a traditional project (a traditional museum) to a modern architectural masterpiece based on daylighting. It brings attention and makes people come to visit it through its unusual dynamic form, we have also been able to minimize energy use and control the amount of light and air within the project which can introduce the visitors in a new experience, which can even a part of this experience

GENERAL CONCLUSION

The importance of natural light in our time and its impact on all spaces of buildings made it the destination and goal of all and to acquire it and control it by using all the technologies to develop and update all fields in the life of the individual and groups of economy, culture, education and medicine. daylight is used to increase its effectiveness and improve its functions and it is necessary to architecture and it is considered one of the most important fields and to take advantage of. the light in line with technology to develop the internal space in which a person lives to suit his needs and modern requirements with taking in count the environment.

In order to reach our goal, it means to offer an optimal quality & quantity of lighting to museums. we offer this work and the systems of the stages of the first entrance, through which we were able to understand and know the reasons for choosing a regional museum project of crafts, as developing of tourism and the dissemination of the culture of museums. The first chapter covers all concepts related to the daylight, advanced technology used, and its most important applications, and the main points concerning the museums, starting with the crafts museum science, to the details of the museums. The second chapter dealt with The system and the technical requirements of the museum and we analyzed some examples of well know museums and we discussed how to offer an optimal amount of daylight in the project and after we presented a comprehensive analysis of the ground and its climate and dimensions , we analyzed the official program of the Regional Museum and the norms to archive a suitable program for our project. from this chapter we extracted the most important standards, rules and technical requirements for the design of the project

And the third chapter is an applied one in which the objectives of the project and the elements of transit and a complete graphic presentation of the project and this chapter was presented by showing the simulation and how we could reach the optimal lighting in the exhibitions area.

And for the good functioning of this work we followed the simulation of Dialux that helped us to reach and achieve the goals we sought from this study which are:

- Take advantage of the huge amount of daylight
- Setting up a world tourist destination in Algiers
- Changing the old view of the museums and giving a new perspective that fits the modern era and technological development
- Designing a project using the latest technologies in order to protect it from the sun rays.
- Establishing a culture of museum visits to the Algerian people
- Building an environmentally friendly building

After a thorough examination of this project, we will propose the following recommendations

- Stay away from expensive traditional designs and not environmentally friendly
- The use of advanced technology to facilitate the integration of developed countries and the improvement of architecture
- Study the needs and requirements of users for each project according to its function and characteristics

In the end we find the necessity of using the daylight in future architectural projects, which would raise the level of tourism and culture in the country and decries the level of energy consumed. with the help of the technology we could archive the idea of using the natural light in exhibitions areas museums and we could entertain the visitors more and provide promenade using ramps.

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