

Climatic Characteristics of Algeria and Building Materials of Office Buildings of the Colonial Period

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Abstract

This research presents a classification of office buildings during the colonial period by adopting a bibliographic and monographic approach. This classification has two objectives: the first is to identify the typologies of building materials used in each climate zone of Algeria; the second objective consists of an evaluation of the choices of these materials according to the respect or not of the climatic characteristics of the construction site. The analysis of these data will allow us to verify and understand one of the climate strategies adopted by French architects in order to adapt the building to the climate

Keyword: Office building, colonial heritage, building materials, climate, Algeria.

1. Introduction

In Algeria, the architecture of colonial office buildings constitutes a rich heritage resulting from the combination of occidental culture and local Mediterranean environment (Picard, 1994). According to PierreLavigne, architecture must be studied according to the climate. As a result, we start from the premise that each climate zone in Algeria has its own building materials. Judicious choice of building materials and their properties affect a building's response to climatic requirements (Givoni, 1987). The properties of building materials are important for the health and comfort of people.

Through this research, we hypothesize that architecture of colonial office buildings was designed taking into account the climatic characteristics of Algeria. What are the types of materials chosen by French architects? Does this choice respect the climatic requirements of the areas in which these office buildings are located?

2. Methodology

Our methodology is essentially bibliographic, monographic and analytic. We based on the various issues of the North Africa site review (27 issues). This is in order to identify the types of office buildings from the colonial period as well as the building materials used. This work could constitute a usable database for Algerian architects. It will give recommendations on the choice of building materials according to the climatic zone.

3. Climate Zoning of Algeria

Algeria is characterized by its geographical and climatic diversity. We have identified three climatic zones based on the classification made by OuledHenia (OuledHenia, 2003):

- The coastal area with a temperate and humid climate of the Mediterranean type.
- The area of High Full of a climate of continental type.
- The Sahara zone characterized by an arid and dry climate .According to the calculations of degree days comfort base cumulated over the year),

3.1 Winter climate zones:

There are three zones:

- Zone H1 is influenced by sea areas according to altitude:
 - * H1a: a littoral zone characterized by mild winters with low amplitudes.
 - * H1b: a cold mountain region.
- Zone H2 composed by:
 - * H2a: an area of the Tell Atlas cold and significant daytime temperature differences.
 - * H2b: an area of the Saharan Atlas winters even colder than the area
- Zone H3 is influenced by latitude:
 - * H3a: a pre-Sahara zone high temperature.
 - * H3b: a Sahara zone diurnal temperature.
 - * H3c: Hoggar with very cold winters compared to the area H3a

3.2 Summer climate zones:

There are 5 climatic zones represented by:

- E1: a coastal zone characterized by hot and humid summers and a small diurnal temperature difference.
- E2: a high plateau area characterized by hot and less humid summers with significant diurnal temperature differences.

- E3: a pre-saharan zone with very hot and dry summers.
- E4: a Saharan zone with summers hotter and drier than zone E3.
- E5: characterized by summers even hotter and drier than the two previous zones.

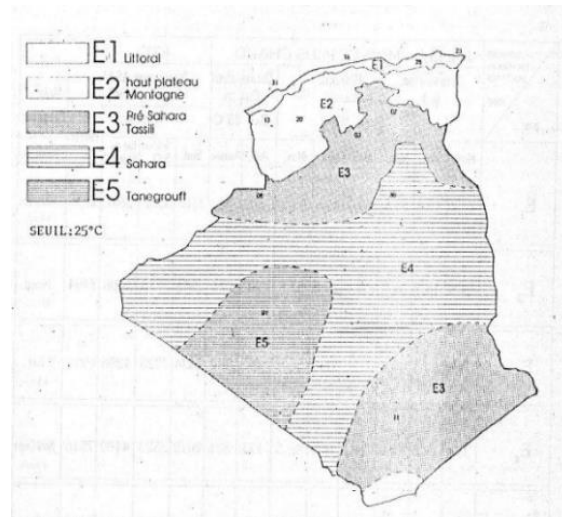


Figure 1. Summer Climate zoning

During our analysis, we will rely on the design principles determined by Ouled Heniya for each climatic zone in Algeria (Ouldhénia, 2003). For the coastal area, walls and floors must be massive. The roof must be light and well insulated. In order to ensure summer comfort, it is also advisable to use light colors in the exterior walls, the roof and the floor. For the climatic zones of the highlands and the Sahara, walls must be massive and the roof well insulated. Colors of the walls, the floor and the roof are preferably clear outside to guarantee summer comfort.

4. Corpus classified by climatic zone:

Based on the 27 issues of the North Africa Site Review published from 1952 to 1958, we collected a corpus of 25 office buildings built in Algeria during the colonial period that we classified by climate zone.

4.1. Coastal Climate Zone:

For this climate zone, we identified 24 office buildings. The analysis of these buildings has allowed us to identify different materials to provide user's thermal comfort. Among these materials, we find:

- THERMOLUX glass used in the finance hotel in Mostaganem. Thermolux is an insulating glass that diffuses light and reflects the sun's rays. It consists of at least two sheets of glass and a layer of intermediate glass wool. THERMOLUX provides a diffuse and glare-free light.
- HERAKLITH in the building of C.A.S.I.D.A. This material is in the form of light plates (thickness of 2cm to 7cm and density equal to 400kg / m³).

- The Betocel (multicellular concrete) used in the Blida finance hotel.

HERAKLITH and Betocel are thermal and acoustic insulation materials

Table 1. Office buildings from the colonial period of the coastal climate zone

	Projects	Architects	Location
1	Hotel finances	Jean Baptiste Paravisini	Mostaganem
2	Hotel finances	Bastelica	MENERVILLE Thénia(boumerdesse)
3	Building Mauritania (ex-Ministry of Finance)	Français George, Paul Bize ³⁸ and Jacques Ducollet	Alger
4	Administrative building of E.G.A. (Electricity and Gas of Algeria)	Henri CANTIE	Oran
5	CIASDO building (Interprofessional Social Insurance Fund of the Department of Oran)	Blancard de lery	Oran
6	Treasury building (1952-1955)	M.H, CHRISTOFLE	Alger
7	Post office building (1953-1955)	Pierre Ferrand	Alger
8	Building of the C.A.S.I.D.A (Interprofessional Social Insurance Fund of the Department of Algiers)	Louis Receste	Alger
10	Building of the Régie Foncière	M.LATHUILLIERE N. DI MARTINO	Alger
11	Hotel finances	R.LEGRAND	BOUGIE
12	Hotel finances	A.BETTOLI	BLIDA
13	Sub-prefecture	V.PALOMBA	Tiziouzou, Aumale
14	Maison du combattant	R.LEGENDRE, M.SOLIVERES and CAZALET	ALGER
15	Post Office	M.P.Ferrand	Koléa(Alger)
16	Hotel finances	M.A.Magrou	Tiziouzou Aumale
17	Sub-prefecture	L.TOMBAREL	Orléanville Chélif
18	Hotel finances	BASTELICA	Orléanville Chélif
19	Town hall	Louis tombarel	Orléanville Chélif
20	Post Office	Pierre ferrand	Orléanville Chélif
21	Building of the S.A.P Algerian provident society	M.lathuilliere N. Di martini	Orléanville Chélif
22	New administrative center	Guion Vieilhescaze	Orléanville, Chélif
23	Prefecture	Pierre Ferrand, Louis tombarel	Orléanville, Chélif
24	Courthouse	G.Bize, J. Ducollet	Orléanville, Chélif

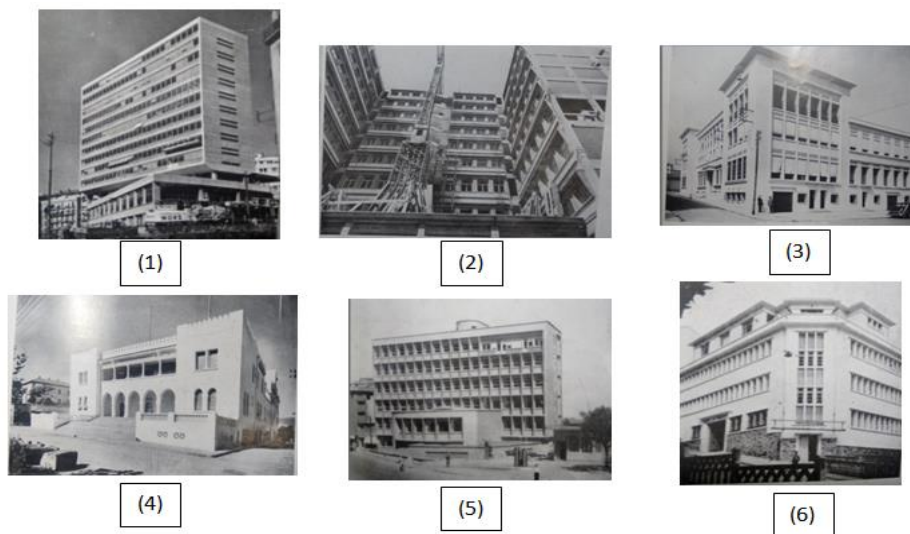


Figure 2.Buildings Office in the littoral zone

(1) Building Mauritania (ALGIERS), (2) Administrative building of EGA (ORAN), (3) Hotel of finances (CHELEF), (4) Sub-prefecture (TIZI OUZOU), (5) Hotel of finances (MOSTAGANEM), (6) Finance Hotel (BEJAIA)

4.2 Highland climate zone:

For this zone, we have found only one example in Setif. The building is characterized by a reinforced concrete frame, a subsoil in masonry rough limestone rubble, double hollow brick walls for the elevation of the walls of the ground floor on the 3rd floor, roof terrace; prefabricated floors, translucent concrete dome of parabolic profile-piles reinforced "rubbed" system with sills and reinforced concrete chaining.



Figure 3. Setif finance Hotel (Architect Louis Regeste)

Revue de chantier n°18, janvier, février, mars, 1955 édition, LE JOURNAL GENERALE –Travaux Publics ET Bâtiment.

Table 4.Choice of building materials for walls and floors by French architects

Location	Project	Walls	Floors
Mostaganem	Finance Hotel	Massif, concrete / stone	Concrete
MENERVILLE Thénia (boumerdesse)	Finance Hotel	Moellons and bricks	Concrete
Alger	Mauritania Building (ex Ministry of Finance)	Concrete	Concrete
Oran	Administrative building of E.G.A. (Electricity and Gas of Algeria)	massif Concrete stone	/
Oran	Building of the CIASTO (Interprofessional Social Insurance Fund of the Department of Oran)	Hollow walls in bricklaying	Prefabricated
Alger	Treasury building 1952-1955	Concrete	Concrete
Alger	Post office building 1953-1955	Concrete	Concrete
Alger	Building of the C.A.S.I.D.A (Interprofessional Social Insurance Fund of the Department of Algiers)	massive Brick	Brick
Alger	Building of the Régie Foncière	Concrete	Concrete
BOUGIE	Finance Hotel	stone	Concrete
BLIDA	Finance Hotel	Concrete	Vibrated concrete Multicellular concrete
Tiziouzou Aumale	Sub-prefecture	Limestone rubble	Prefabricated
Koléa (Alger)	Hotel Posts	Massive, Brick	Concrete
Tiziouzou Aumale	Finance Hotel	Concrete	Concrete
Orléanville Chélif	Sub-prefecture	massive stone	Prefabricated
Orléanville Chélif	Finance Hotel	Stone	Multicellular concrete
Orléanville Chélif	town hall	Brick	Concrete
Orléanville Chélif	Hotel Posts	Brick	Concrete
Orléanville Chélif	Prefecture	Brick Stone	Concrete
Orléanville Chélif	Courthouse	Brick Prefabricated plate	Concrete
Sétif	Finance Hotel	massive Limestone stone Brick	Prefabricated
Touggourt	Courthouse	massive Stone Concrete vibro-bloc	Concrete vibro-bloc

We can note from this classification that the concentration of office buildings in the NORD is higher than the SOUTH. The choice of building materials was by conscience to ensure comfort and well being for the occupants., In the area coastal climate, we have identified: the use of multicellular

concrete, rubble masonry, limestone, sandstone and insulating materials such as HERAKLITH (heat and sound insulating) and thermo-lux glass (thermal and light insulation). In the Sahara climatic zone, we have seen the use of the vibrobloc (which is made of specially dosed and strongly vibrated concrete) as well as local materials such as stone, red marble, bitumen concrete.

Based on the previous table, we were able to identify the number of projects that respect design principles.

The choice of building materials for the walls in Algeria during the colonial period was respected with a considerable percentage (77% of the number of buildings surveyed) and 23% not respected.

The choice of building materials for floors in Algeria during the colonial period was respected with a considerable percentage (81%).

Table 5. Number of projects meeting / not respecting the Design Principles for walls

Note	Walls	Floors
Respected	17 projects	18 projects
Not respected	5 projects	4 projects

6. Analysis and interpretation:

We noted a high concentration of office buildings in the North of the country. The choice of building materials was a wise choice to ensure comfort and well-being for the occupants. In the coastal climatic zone, we noted the use of multicellular concrete, rubble masonry, limestone, sandstone and insulating materials such as HERAKLITH (thermal and sound insulating) and thermo-lux (thermal and light insulating). However, in the Sahara climatic zone, we have noted the use of the vibrobloc as well as local materials such as stone, red marble, bitumen concrete.

The choice of building materials for the walls in Algeria during the colonial period was respected with a considerable percentage of 77%. As for the floors, this percentage is equal to 81%.

7. Conclusion:

Algeria has a very varied climate. As a result, the proper choice of building materials must be adapted to the climatic characteristics of the area. The coastal climate characterized by a high humidity, requires types of materials that ensure thermal comfort and thermo aéraulique.Saharian area requires types of materials that can ensure thermal comfort of the occupants. This research allowed us to show

that French architects have always sought the comfort and well-being of users of office buildings by using adequate building materials.

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