

A MORPHOLOGICAL ANALYSIS OF THE FRENCH COLONIAL ARCHITECTURE IN ALGERIA: THE FACADES OF BISKRA

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1 INTRODUCTION

In Algeria, after independence, the urbanisation tendency dictated by political choice, excluded the colonial city centre from the whole development of the town. This led to its marginalisation, taking numerous forms and generating many problems. However, despite the fact, that today this marginalisation is recognised, the inherited situation of these old centres is still problematic, if we consider the dangerous evolution they are experiencing and which is compromising their life. Biskra old colonial city centre is an example, illustrating the case of similar colonial urban areas, which are marginalised today. Nevertheless, this urban and architectural heritage is part of territorial, social and economic reality and has also historic, symbolic and patrimonial qualities, which give it a particular position in this city.

Unfortunately, this town centre has not yet been investigated by consistent studies. The objective of this research is to determine the morphological characteristics of the facades of this colonial architecture. This study will analyse the facades using a morphological approach that is independent from the current stylistic ones. It aims to construct a structural model through collected information about the formal properties of façades. The formalism of this approach allows the control of the coherence and data presentation, as well as the re-organisation of these data, showing the underlying structures out of reach of the visual observation. The objective is to acquire a profound architectural knowledge about a vernacular architectural production which could not be registered in the mould of any known architectural style. This knowledge should ensure on one hand a coherent urban renewal of the colonial town centre, without breaking with the past, on the other hand, the preservation of this heritage within an evolutionary perspective. Besides, the originality of this

research work lies on the development and application of a morphology based scientific approach, applied to an architectural heritage, which was perceived, for a long time, as insignificant.

2 BISKRA OLD COLONIAL CENTRE, BIRTH AND GROWTH

In 1844, the French military forces conquered Biskra, a southern town and settled in the old Turkish fortress situated in the northern part of the town, outside the palm grove and where was located the irrigation distribution system. Just like the Ottoman setting, the French colonial one was chosen in order to have a control on population. At this place, the French military founded the "Fort Saint Germain", followed many years later, by the civil colonisation. In order to house the new population, a rectangular layout was proposed at the southern part of the "Fort saint Germain".

The urban fabric of this new colonial settlement is constituted by many blocks and a street network forming a rectangular grid, parallel to the direction of the Fort Saint Germain. Three major steps characterized the urban growth of this colonial urban fabric [1]. The first one was a settlement superimposed on the previous traditional village and ignoring its particularities. The second and the third steps continue the same street network, changing only the blocks sizes. Each block presents at each of its sides four or five houses. Many courtyards or sometimes gardens are found in the inner part of the block.

This settlement shows the colonial desire to create a new city, with new urban and architectural design. It should be pointed out here, that the picturesque and touristic character of this town attracted many European visitors, who came in

during winter holidays. As a result of this, the town knew a new boost and took a legal status of a big oasis. During the post colonial era, Biskra experiences a huge urban development. This urbanisation spread without any coherent planning and management, onto the non occupied areas of the town, leaving aside the colonial centre. This was excluded from the new circle of activities and activity exchange. As a result, this old colonial centre is marginalised and in a state of slow decay.

2.1 The Styles of Colonial Domestic Architecture in Biskra

The neo-Classic and the neo-Moresque were the most used styles during the colonial period in Algeria [2, 3, 4, 5]. In Biskra several buildings adopted both styles. Furthermore, it has been assumed that the casino of Biskra designed by the architect Albert Ballu (1892-1898) was the precursor of the neo-Moresque style that become later the official style for public buildings [6, 7].

However, the domestic architecture did not always adopt a stylistic tendency. Even if the styles are present in the dwellings facades, these cases are still fewer. Sometimes the facades present eclectic designs like those associating different Islamic art elements (Ottoman and/or Moorish arches forms, ceramic and brick work decoration) to Classical components (decorated pillars and columns, balustrade, moulding). Other dwellings facades (particularly those built during the last extension of the colonial city) give the same appearance of rural houses often noticed in other Algerian colonial towns and villages [8] and which the origins could be Provençal (presence of tiles and gables). In addition, a remarkable number of facades couldn't be classified from the stylistic point of view because of their sobriety and simplicity as well as the irregular and/or too obvious components' arrangement (a simple translation movement of the various components).

Also, the architects who designed the houses are not known. Very little information is revealed by inscriptions. The first one is of a Turkish bath placed next to its owner's house. This inscription indicated that the architect is Fernand Galiana and that the house is built in 1936. A second inscription placed on the chimney piece of a house gives also the name of the designer which is Rodari. This latter is known in Biskra as an important businessman (building contractor). Both houses enclose neo-Moresque components. Differently, an inscription from an older dwelling located near the first quarter of this colonial area informs about the building owner, the construction date (1858) but did not give any indication about the architect. However, the façade includes components that make its affiliation away from the neo-Moresque and closer to the neo-classical and Provençal styles. Unfortunately, the wide variety of facades design styles and components as well as the big lacks of information about their designers acutely impacted the appropriate choice of a methodological approach to analyze these facades

The houses from the colonial period in Biskra are built of bearing walls of mud brick elevated on stone foundations. Sometimes, the walls at the first floor level are in stone or brick. The ceilings are generally constituted by wood beam and layers of mud and a fabric of reeds extracted from palms. Sloping roofs exist also and consist of a wood framework covered by tiles. The recourse to the traditional constructive system could result from an understanding of earth architecture efficiency against the harsh climatic conditions [9, 10]. During first occupation years, military engineers noticed the thermal performance of the traditional architecture and recommended its use for the colonial buildings [11, 4].

2.2 The State of Buildings

A previous investigation conducted on one part of this colonial town centre corresponding to the old settlement of Ras El Ma, considers 227 buildings and show that 62 % of this building stock is colonial whilst the rest (38 %) is post-colonial. Half of the colonial buildings (54, 6 %) appears to be generally well conserved, 33,4 % are in a medium state and 12 % are seriously damaged [12]. This fact reveals a relative conservation of the architectural heritage of the colonial era; it reveals also, that the rate of renewal of the buildings is slow. In the majority of cases, the construction of the new buildings is not completed yet; only the ground floor is finished and occupied, most of the time, by commercial activity. The steel left unfinished, waiting on the top of the terraces; lets us suppose that the building will be extended again vertically, by adding other floors. It must be noted here, that the character of these new buildings is different from that of the old ones. The new constructions respect the street continuity and the buildings alignment, but they ignore the rhythm, the architectural composition, the building material, the proportion and the architectural details so characteristic of the colonial architectural landscape.

Today, the old colonial town is no longer attractive. The old harmony resulting from the fusion of local and colonial architecture is visually lost. The new buildings are usually not well integrated to the urban landscape. In parallel to this situation, the old buildings are still experiencing many changes and degradation (Fig. 1), such as, the addition of levels on the terraces and the sealing of doors or windows by building walls instead. The majority of these transformations ignored the local architectural characteristics. As a consequence of this, the unity and the harmony of the façade are disrupted. Moreover, no official planned or unplanned actions are conscious about this risk and/or gave to this urban and architectural heritage its legal value. The majority of the buildings in this town centre are private ones. A great number of the inhabitant have left this centre to settle in another part of the city, leaving their own building to house other activities. This situation led to a slow creation of "a centre without life". This is noticeable in the evenings and the week ends when all the commercial activities and offices are closed.

The transformations and changes that are occurring in this town centre need special care and urgent intervention from the authorities. Two objectives are identified here: i) to protect this heritage, and ii) to conserve the aesthetical particularities of such characterized urban fabric.

The expected result of this research is to determine the actions to be held in order to protect this heritage and to elaborate, using a morphological analysis instrument, a repertory of normative prescriptions, applicable to this particular case and ensuring a possibility of generalisation.



Figure1: Examples of the contrast between contemporary and old buildings as well as the deteriorated colonial dwellings in Biskra.

3 METHODOLOGY: A MORPHOLOGY BASED APPROACH

In general, the methods used in historical buildings research works are closely related to the epoch, the region, the artistic or the designer style. Also, few buildings are analyzed as masterpieces including the most authentic, current and/or significant constituents of the style. The study of the façade is frequently based on the description of its components as concrete named objects and characteristics (number of floors, forms, features and locations of the windows and the entrances, horizontal and vertical bands, materials and colors) as well as on their compositional arrangements (symmetry, hierarchy...) [13, 14, 15, 16]. Recently, research works adopt different approaches mainly based on methodologies associating morphology, mathematics and computing [17, 18].

The method proposed in the present research work gives to the forms the opportunity to express themselves. Secondly, this method is asemantic because it analyses the facades components and their syntax properties as abstract formal characters rather than named concrete objects and known compositional arrangements. Thirdly, it gives an equal importance to all the case study objects since it considers an illustrative corpus for the analysis. Indeed, this method allows the analysis of those architectural objects which are not considered as artwork pieces like vernacular or popular domestic architecture [19]. Thus, it allows going beyond stylistic rules and their methodological constraints.

3.1 The morphology based approach

The morphology based approach has its roots in Fechners'

theoretical trend, which tends to investigate scientifically the subjective universe [20]. It also refers to the works of Henri Focillon on objects' formal properties [21] but also to Bernard Deloche's research works aiming to set a methodology for art works authentication [20, 22]. Several works present an application within architecture and urban planning area [23-27]. All these research works try through a formal approach and the modelling of objects to construct artificially spatial configurations and to establish "a science of movement and of perceptive suggestions" [20, p.21].

In fact, the methods of the morphological studies are very different. Many of them are linked to the information treated and are often, invented alongside the treatment of the information extracted from the corpus. The morphological method used in this study, makes a break with the approximate discourse on art. It tries to draw a new insight into the architectural heritage. This method can also be generalized to other fields, other than architectural production, dealing with the study of forms.

The aim of this method is not to analyze the unique, single edifice, but a collection of edifices; it tries to handle the diversity of the collection by comparison across the different specimens, in order to establish a comparative segmentation of the forms studied. This comparison establishes classes of homologues. The features of each specimen of the collection are saved into each class of homologous segments using a symbolic notation mainly morphology based and fundamentally asemantic. The morphological information obtained is then, treated using methods of statistical analysis. The main purpose of this approach concerns the syntax resulting from the intrinsic qualities of the form of the objects studied. However, this research could be further developed by studying the impact of the extrinsic factors, such as the psychological, socioeconomic, cultural significations as well as technical requirements on the intrinsic properties revealed by this study.

3.2 The different Steps of the Analytical Method

The method considered here is composed by four steps, starting from the first observation of the corpus and ending with the results of the analysis obtained through an application of decomposition and structuring procedures.

3.2.1 First Step: Observation

The first step of this method is concerned with the identification of groups of attributes that may characterize the façade studied. This identification is conducted by observation and examination of each façade, in order to detect and to classify the different variations of the elements that allow the decomposition of the façades into segments.

3.2.2 Second Step: Decomposition

The different facades of the corpus are considered as

composed of different parts which can be analysed. This condition supposes that two distinctive façades A and B can be composed by parts susceptible to present similarities or differences. The aim is the search for common properties shared by different façades. The analytical hypothesis put forwards in the elaboration of this method, considers the existence of a global structuring, corresponding to the organisation of the façade.

This structuring encompasses some operations of organisation, distribution and repetition, leading to the perception of the façade as a whole.

The hypothesis considering the façade as decomposable into parts is not a hypothesis to be validated, but it is a primary condition that is to say each façade from the studied corpus must verify, through the observation step, the opportunity of being decomposable into different separate parts. Its objective is not only to define the façades to be analysed, in the aim of grouping them into a valid unit to be studied later, but also, to question the analytical property of the façade studied, in order to detect the possible decomposition to be defined. It must be pointed out, that the decomposition of the façade into distinctive material and functional entity or using architectural terminology will be avoided. A codification is used in order to prevent resorting to the usual verbal description for the observed façade and / or its elements. These latter are abstract and easily understandable by every one.

3.2.3 *Third Step: Structuring*

At this level of analysis, the object is to construct a grid in relation to the façades to be analysed. This will allow the intrinsic analysis of the distinctive parts. It is important here, not only to distinguish between the significant segments and the possible ones, but also, to define these segments and the principles of their arrangement. It must be noted that the façade could not be analysed if it is not possible to detect some discontinuities defining its parts. The study of the discontinuities comes first, before the analysis. It decomposes the façade in order to grasp its organisation. It is conducted by systematic comparison between the different façades of the corpus. The aim is to construct a structural model for the different specimens considered in the corpus.

The boundaries can be either real or perceptible ones, such as virtual lines drawn out of a group of windows' edge and axis continuity. Two definitions of discontinuities are considered here. These are either an obvious boundary (a plain moulding going continuously along the façade height and/or width), or differential spatial distribution, which means that a differential gap exists between the elements leading to the perception of the internal organised space as a whole (a group of similar openings at close intervals).

3.2.4 *Fourth Step: Results interpretation*

The results of the analysis are transcribed into a symbolic language. This notation allows a variety of logical

operations. These need, later on, the use of mathematical methods and tools, which will explain the observed morphological phenomenon. The final step consists of the interpretation of the phenomenon discovered by the analysis.

4 THE FACADES OF THE COLONIAL DWELLINGS IN BISKRA

The morphology based approach was applied on a corpus composed of 190 façades of dwellings constructed during the colonial era, between 1887 and 1962. The façades represented graphically are referred to into the cadastral sections 61, 62, 63, 64, showing the colonial rectangular quarter. These façades appear as homogenous and coherent morphological entities, each one corresponds to a patch land. The façade, considered as an urban segment of street elevation, results from the volumetric differences and difference in the number of storeys between contiguous buildings [28]. These urban disparities which allow one to distinguish between the units studied are reinforced by variations at an architectural scale: dimension and proportion of windows on each façade and the detail variation: decoration and various treatments of the façade elements.

Generally, the façade corresponds, to the vertical plan (front wall) separating the plot from the street. Over time, some plots have been grouped or divided, through many operations of plot revision. This situation had an effect on the façades, which were transformed consequently, by either an addition of floor level, extending of walls on terraces, or obstruction of doors and windows. In reality, these transformations did not affect the whole coherence of the façade composition. The former state of the façade is still easily recognizable. The selection process of the studied façades is mainly operated at the field level. Hence, most of the selected façades of the corpus are the less transformed and damaged ones. However, an attention is given to wholly cover the four cadastral sections by means of a quantitatively consistent sample. Indeed, the 190 selected façades represent 55, 23 % of the total number of the colonial dwellings in the four cadastral sections (Table 1).

The impact of extrinsic factors upon the revealed intrinsic properties of the studied façades has not been investigated. This is because of the lack of information such as their designers and builds date. However, the present research objective is not a historical one that could require such investigation. In addition, the circumstances of the production of this vernacular architecture have widely changed and would not be of a significant importance from the practical preservation or renewal point of view.

Table 1: Theoretical caesuras of the openings sequences through the localisation of one or more wide interfenestration codified by *. The letter B is used to codify the word "Baie" in French which means an opening for a door or a window [28, p.142].

| sequence | 1 caesura | 2 caesuras | 3 caesuras |
|------------|--|---|--|
| BBB 3 | B*BB/BB*B 1-2/1-2 | | |
| BBBB 4 | B*BBB/ BBB*B 1-3/3-1 | B*B*BB / BB*B*B 1-1-2/2-1-1 | |
| BBBBB 5 | B*BBBB/ BBBB*B 1-4/4-1 BB*BBB/ BBB*BB 2-3/3-2 | B*B*BBB / BBB*B*B 1-1-3/3-1-1 B*BB*BB / BB*BB*B 1-2-2/2-2-1 B*BBB*B / BB*B*BB 1-3-1/2-1-2 | B*B*B*BB / B*BB*B*B 1-1-1-2/2-1-1-1 B*B*BB*B / B*BB*B*B 1-1-2-1/1-2-1-1 |

5 OBSERVATION

The observation conducted on a corpus of façades reveals a various and coherent group of attributes which may characterise the studied façades. Each of them presenting a group of openings (doors, windows, French windows...) either decorated or not, some cantilevered volumes (balconies, Maghribian 'K'bou' and oriental 'Mashrabyia') , much often genoeses, friezes, cornices, chains, windrows but less and less pilasters, columns and piers. Cornices, chains and windrows occur quite often. They characterize the discernable discontinuities of the façade as a horizontal organisation able to create their own mode of structuring. In all the façades studied, the number of storeys does not exceed three; the buildings are either a ground floor buildings or buildings with one, two or three storeys.

The commonly observed elements from the studied corpus of facades allow the decomposition of the colonial façade into parts or segments which are distinctive and comparable. This mode of decomposition applied to all the specimens of the corpus, has led to the morphological description of the analysed façade under a generic form of horizontal partition (Fig. 2). It is admitted that this horizontal partition can be considered as a primary horizontal structuring of the façade.

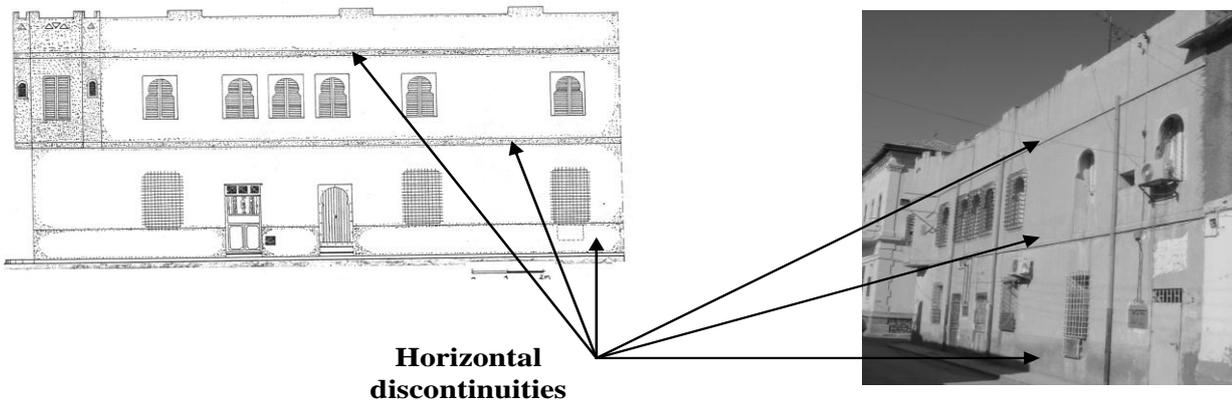


Figure 2: An example of horizontal discontinuities and horizontal structuring

A second mode of decomposition similar to the precedent one is also remarkable when observing the façades. It consists on a vertical partition due to the presence of pilasters and columns (Fig. 3). In addition, it could be noted here, that the façades of the studied corpus present a third mode of decomposition. These are distinctive morphological groups, composed by series of elements, such as openings and balconies and their decoration organised in what will be called here 'sequences' (Fig. 4). Thus, the horizontal partition considered as a primary structure of the façade, defines a canvas within which groups of distinctive morphological elements are spread and organised into a delimited level of composition. It must be kept in mind, that the level of composition is different from a building floor.

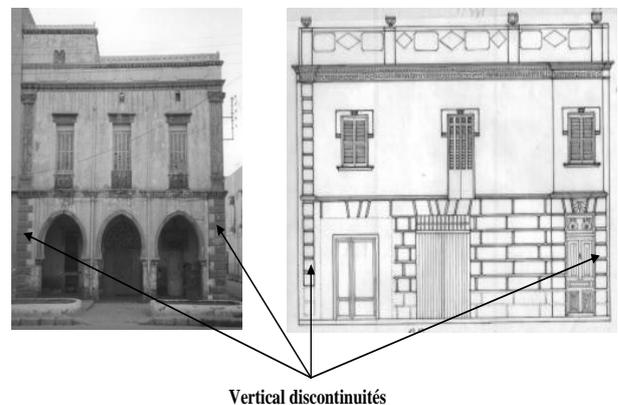


Figure 3: An example of vertical discontinuities

A secondary structuring is then superimposed, as a second layer, to the primary one (Fig. 5). This consists on the vertical partitions of the façade. A third structuring is added to the previous ones. This one presents the differential variations of openings, decoration, or in the composition and grouping of openings. The produced morphological entities divide into segments the sequences of openings, creating therefore, an organised windowed network at the considered level.

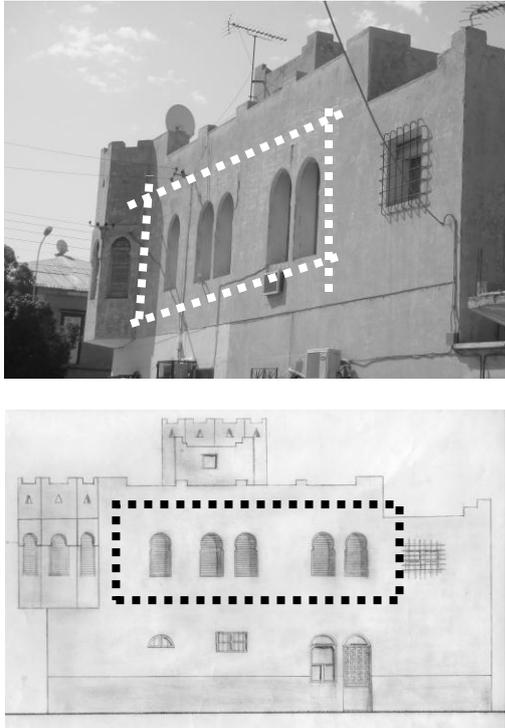


Figure4: An example of morphological groups

6 DECOMPOSITION

The observation of the façades of the corpus reveals two discernable and simultaneous organizational modalities. The first one is the primary structure. This is a group of horizontal discontinuities, which subdivides the façade into superimposed morphological entities. These are renowned by “lyses structuring”. Their corollaries are the levels of composition. The second one, is the secondary structuring, this corresponds to the subdivision of the primary structure. It forms groups with distinctive attributes (continuous cantilevered vertical elements as well as openings’ common decoration and arrangement). This structuring allows their grouping into a secondary subdivision renowned by “spans structuring”.

6.1 The Lyses Based Decomposition

The word ‘lysis’ (plural ‘lyses’) has a Greek origin that means to separate or to loosen. The word Lysis (written ‘Lyse’ in French language) was appropriated by the researchers of the LAF (Laboratoire d’Analyse des Formes

of the High National School of Architecture in Lyon, France) in such a way it indicates the different parts of an urban or an architectural object. They define the lysés as “the manifest discontinuities, which allow the decomposition of the analysed entities into parts, and the construction of a structural model...defined by its constitutive parts” and consider the classical moulding as a particular kind of analytical discontinuities or “lysis” [28].

According to the precedent definition, the architectural wall of the colonial façade, with its network of openings, presents a variety of projecting horizontal elements such as cornices, chains, windrow, plain moulding... Such elements create discontinuities or lysés defining a different subdivision from the windowed network one. Although, these elements may satisfy to constructive needs, they are mainly decorative ones contributing to the definition of the composition structuring. In this research the lysés will be considered specifically as a decoration contributing to the subdivision (structuring) of the whole composition of the façade.

The façade projecting horizontal elements divide the windowed network into levels of composition. A level is a group of openings (a row of openings arranged horizontally); it can be unique double or triple. These levels are independent from the building floors. A level corresponds to one or many building storeys and can be spread in different ways within buildings having the same number of floors.

6.2 Spans based decomposition

The spans structuring could take either the delimited mode or the spaced out one. These later can either be superimposed on the primary structure, or superimposed on each other.

6.2.1 Subdivisions by Delimited spans

This secondary structuring mode is revealed by continuous vertical cantilevered components emerging from the principal plane of the façade. These components vary from columns, pilasters or piers of particular architectural styles to a rustic work of coin stones, stones cladding or plaster frame subdividing vertically the façade. These elements are not dictated only by constructive imperatives but result also from compositional needs, specific to the organisation they constitute.

6.2.2 Subdivisions by Spaced out spans or ‘caesura’

Within a façade, each level of composition consists of one or more openings sequences. The positional and decorative variations of the openings existing within a sequence produce a secondary structuring of the windowed network. This research work investigates the possible structuring based only on the openings positional variation.

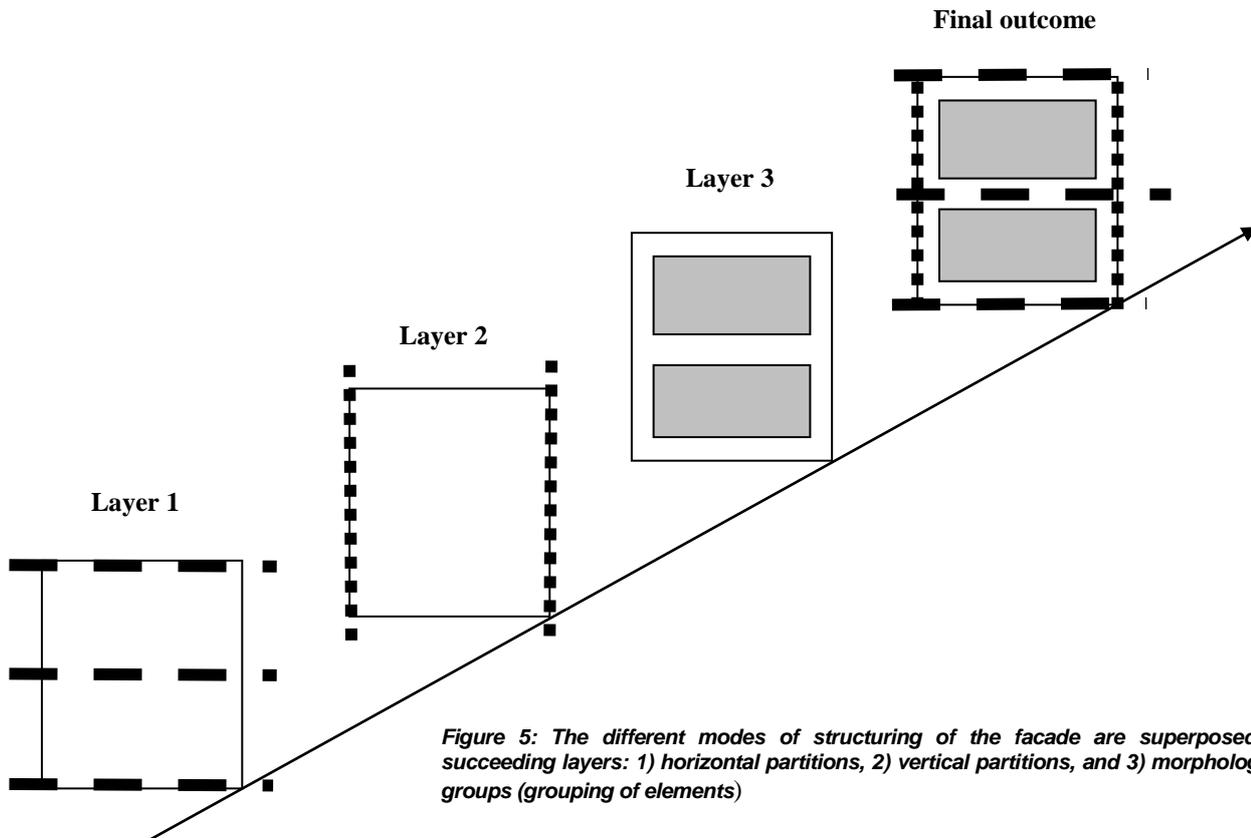


Figure 5: The different modes of structuring of the facade are superposed as succeeding layers: 1) horizontal partitions, 2) vertical partitions, and 3) morphological groups (grouping of elements)

7 STRUCTURING

7.1 The Primary Lyses Structuring of the Façade: Horizontal Discontinuities

Considering a building with n floors, including the ground floor, let us suppose that this building has a wall base corresponding to a lower lysis, a capping corresponding to a higher lysis and an intermediary lysis defining each floor. This building will then, have n levels of composition. If one intermediary lysis is removed, two floors will be linked together. The resulting façade will then have n floors but $n-1$ levels of composition.

The observation of the different specimens of the corpus shows the existence of a group of façades, which do not have any projecting elements which could be considered as horizontal lysés. These façades will be considered as having only one level of composition. This does not mean that this building has only one floor, but, such a façade can have many storeys, and moreover many openings distribution. The most common case is one, in which the level of composition corresponds exactly to the number of the building floors. This composition is called "Saturated". The number of partition is equivalent here, to the number of building floors.

Taking this saturated composition as a reference, the comparison of the different corpus specimens reveals the elimination of the projecting horizontal elements as forming discontinuities between two floors. These latter are thus linked together in one same partition. This elimination can also be found in the lower (wall base) or in the higher (capping) projecting horizontal elements. They can be repeated many times along the height of the façade, either between consecutive floors or not. These partial absences, unique or multiple, create a varied composition. As a result, many configurations can be obtained by systematic variation of the number (unique or multiple elimination) and the position of the lysés on these façades.

A certain number of configurations are eventually obtained with the horizontal lysis on the façade of a two storey building, having a ground floor and a roof or terrace wall (a frequent typology within this colonial centre). In considering all the possible positions of lysés into the structured façade, sixteen expected configurations were established and codified (Fig. 6).

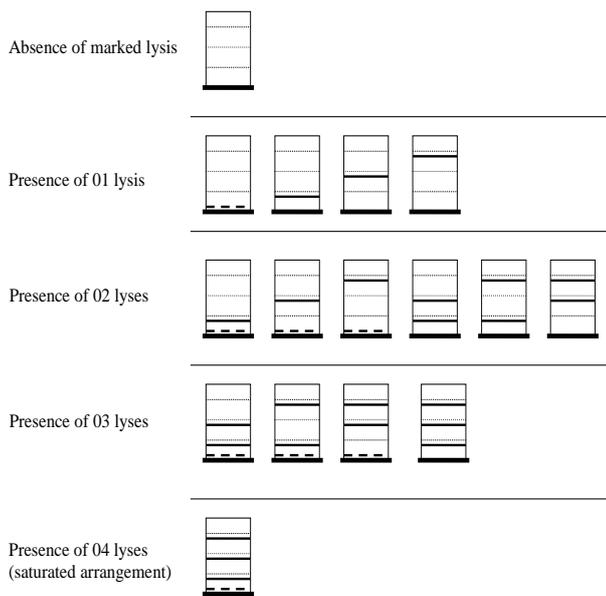


Figure 6: Probable 16 lyses structuring (variation of lyses position and number)

7.1.1 Convention of codification

In order, both to identify the possible structures obtained by the variation of the position and the number of lyses, and to classify the specimens of the corpus according to the attested structure (the real structure used), it is necessary to have a descriptive system which facilitates the acknowledgement of the similar structural organisation. Thus, a three story building with roof or terrace was taken as a reference. This case represents the façade with the maximum number of stories. A symbolic language was used. The lyses were successively noted (Fig. 7):

- A: wall base
- B: projecting horizontal element which define the discontinuity between the ground floor (it will be referred to by the number (0)); and the first floor (1)
- C: projecting horizontal element which marks the discontinuity between the first floor (1) and the second floor (2).
- D: projecting horizontal element which marks the discontinuity between the second floor (2) and the attic (that may be the roof or the terrace) (3).

The facade code includes successively, from the ground floor to the attic, the floor numbers separated by the letter corresponding to the specific lysis, in respect to its position, when it exists. Hence, the code defines the number of composition levels dependently from the position of the letters between the numbers. For example, the code 0A1B23D implies a façade with two composition levels

and which possesses a wall base (lysis A) at the ground floor (Level 0), a second lysis (B) marking the discontinuity between the ground floor (Level 0) and the first one (Level 1), and a last lysis (D) separating the first floor (level 1) from the attic (Level 3).

Even if the Level 3 corresponding to the second floor does not exist, it is nevertheless present within the facade code. This is done in order to preserve the coherence of the codification within a group of facades, which could be different in number of floors, but not in number of composition levels. The code 0A12C3D, for example, is for a façade having one floor more than the previous one. In fact, the lysis C marks the discontinuity between the first and the second floor and indicates then the existence of a second floor, which did not exist for the case of the previous facade. However, the two facades correspond to the same model of the façade with two composition levels.

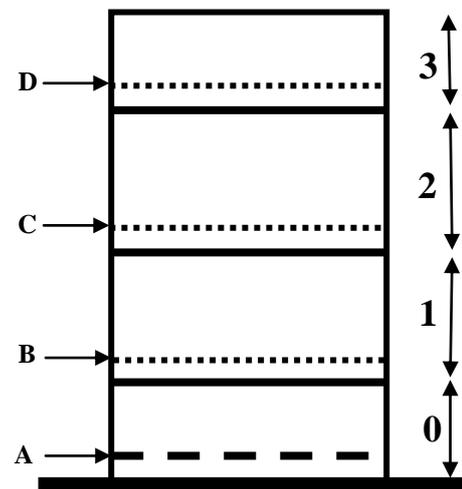


Figure 7: codification of the facades according to the composition level (numbers), the existence of lyses and their position (letters)

7.2 Delimited spans structuring

These vertical discontinuities, namely vertical lyses, are classified and codified accordingly to their positions in the façade:

- A single lateral device framing the façade at its right or left limit (respectively L_r and L_l), and
- A binary device framing the façade at its both right and left limits (L_r+L_l).

7.3 Spaced out spans or ‘caesura’ structuring

This structuring way, called ‘caesura’, consists of separating the openings sequence by unequally spacing out one or more sequences [28]. In order to disclose this structuring way, the comparison between the interfenestration widths is needed. Hence, when these latter are equal, wider or narrower than the openings widths, they produce a regular sequence of a unique segment. Differently, the comparison between wide and narrow interfenestration existing within a sequence of openings of equal height and width is always sufficient to clearly reveal the division of the segment into two or more segments. Thus, a caesura is produced when an interfenestration width

variation exists following opposed values (narrow-wide).

Considering a sequence of $n+1$ openings, n interfenestration and p caesura, one can note that the number p of caesuras could vary from 1 to $n-1$ ($1 \leq p \leq n-1$). In such a way, p caesuras will give $p+1$ segments. Hence, a zero value for p or a value equal to n will produce a sequence without any caesura. It must be noted here, that a caesura exists only if the number of openings is equal or greater than three. In fact, a sequence of two openings could not be differentiated. While sequences enclose a number of three to five openings, the possible position permutations produce several structures (Table 2).

Table 2: Openings sequences by floor level; attested and occurring cases

| Openings sequence | 0 Caesura | 1 Caesura | 2 Caesuras | 3 Caesuras and more | Total |
|-------------------|---------------------|---------------------|-------------------|---------------------|--------------------|
| 0 Opening | 6 | 0 | 0 | 0 | 6 (2.17 %) |
| 1 Openings | 46 | 0 | 0 | 0 | 192 (69.57 %) |
| 2 Openings | 63 | 0 | 0 | 0 | |
| 3 Openings | 54 | 23 | 6 | 0 | |
| 4 Openings | 20 | 9 | 0 | 0 | 62 (22.46 %) |
| 5 Openings | 11 | 5 | 16 | 1 | |
| 6 Openings | 0 | 1 | 0 | 3 | 16 (5.8 %) |
| 7 Openings | 3 | 0 | 1 | 2 | |
| 8 Openings | 1 | 0 | 0 | 1 | |
| 9 Openings | 0 | 0 | 1 | 2 | |
| 11 Openings | 0 | 0 | 0 | 1 | |
| Total | 204 (73.9 %) | 38 (13.77 %) | 24 (8.7 %) | 10 (3.63 %) | 276 (100 %) |

8 ANALYSIS

8.1 Analysis of the lyses structuring

In applying the achieved sixteen probable configurations to the 190 selected facades of the corpus, it has been observed, that some are largely used, whereas others are not used at all. The calculation conducted reveals on the one hand, that 65% of the façades examined have only one level of composition, this means that there is no intermediate ‘lyses’ subdividing these facades. On the other hand, 28 % of the facades have two and only 7 % have three levels of composition. It is important to note, the non existence of the structuring case of four levels of composition within the studied corpus.

According to the structural configurations elaborated from a three storey building with an attic (roof or terrace), the models concerned for the cases of only one composition level are: 0123, 0A123D, 0A123, 0123D. Similarly, for the case of two levels of composition the following models are revealed: 01B23, 012C3, 0A1B23, 0A12C3, 0A123D. Finally, the three levels of composition cases are referred to

the models: 01B2C3, 01B23D, 012C3D (Fig. 8).

8.1.1 Analysis of the formal variation of the lyses (morphological variation of the lyses)

The façade decomposition showed clearly the predominance of a horizontal segmentation for the façade structuring. Furthermore, the observation shows that these moulding horizontal elements (cornices, plain moulding, windrow, wall base ...) have several forms and positions within the façade wall. In order to describe morphologically these features it was necessary to identify their variety pattern among all their diversity within the corpus. For this description, three descriptors: location, composition and form, were considered when observing the façades studied.

8.1.1.1 Position

A lysis could have one or several positions within the same

façade wall. These may be: i) a base wall, ii) indicating a floor by dividing the façade into different levels or iii) making the upper limit of the façade. However, a façade may not possess any lyses; a case which will also be considered in this research work. The different positions were codified as follows: i) ‘Nothingness’ (a façade without

any lysis), ii) ‘B’ (a façade with a lower position lysis), iii) ‘I’ (a façade with an intermediary position lysis), and iv) ‘H’ (a façade with a higher position lysis) (Fig. 9).

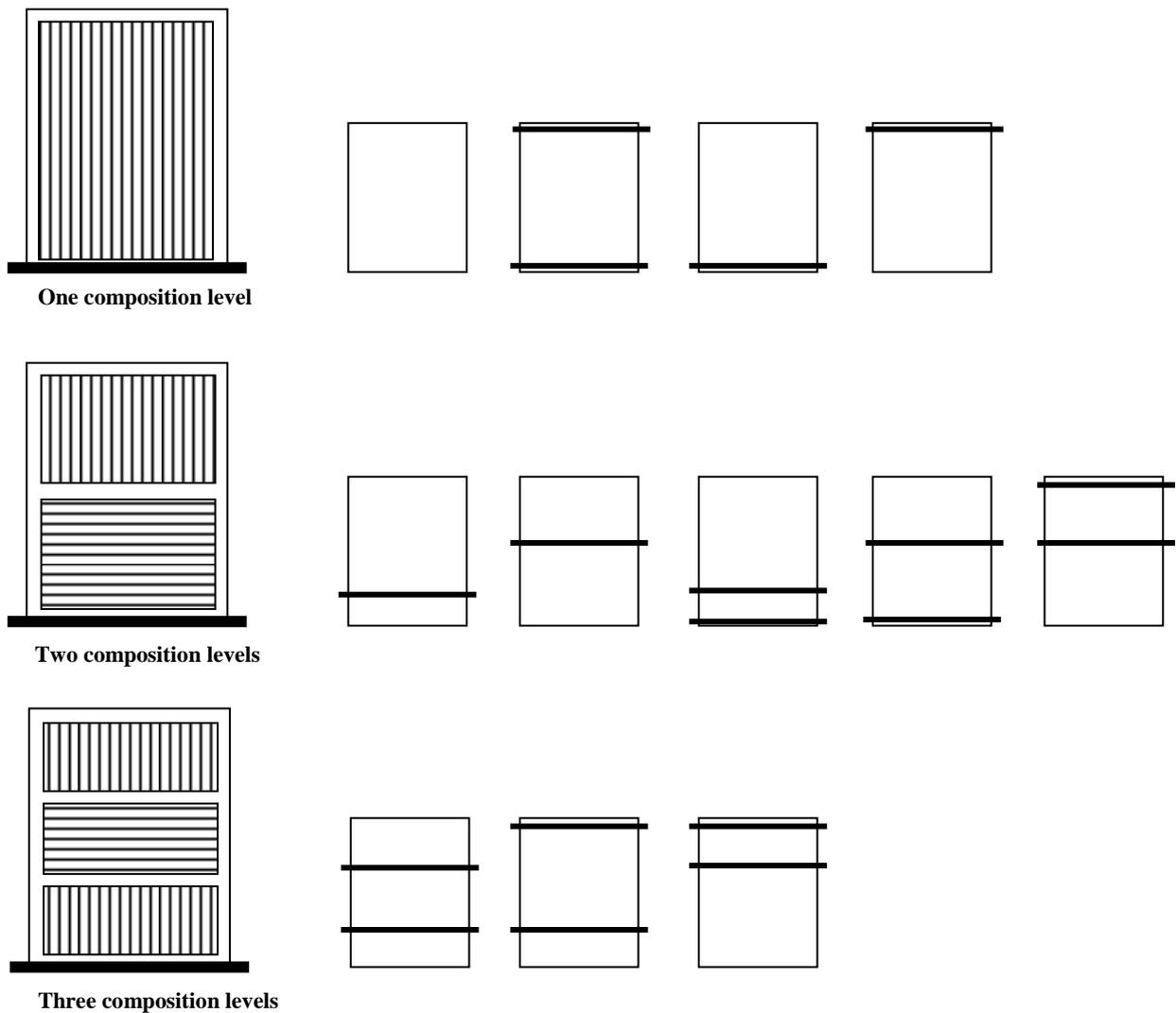


Figure 8 : The existing cases of lyses position in respect of the number of composition levels within the studied corpus facades.

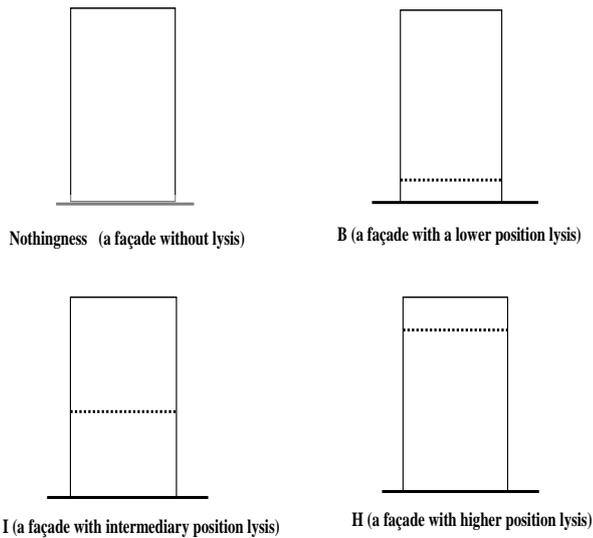


Figure 9: Codification for the different positions of the horizontal lysés

8.1.1.2 Composition

The observation process refinement reveals also another variety, much focused on the lysis appearance. In fact, the lysés could be simple, constituted only by a horizontal strip, or composed by multiple horizontal lines set out in tiered rows. Thus, two modes of composition were retained for and codified: i) 'S' for the simple lysis with a unique horizontal strip, and ii) 'M' for the all other cases constituted by two or more horizontal strips (Fig. 10).

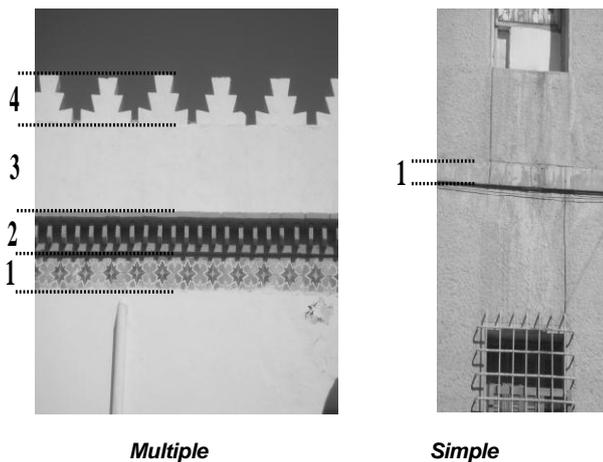


Figure 10 : Examples of horizontal lysés composition

8.1.1.3 Forms

A more detailed observation of the lysis surface revealed large variations of forms expressed by different ornamentations. Indeed, the lysis surface could be a simple horizontal strip without any relief or decoration, or in the opposite, a richly decorated hence possessing several reliefs and sometimes many colours. It is clear that, these moulding and ornamentation variations result from the use and the combination of several building materials such as solid brick, fluted plaster, plain or Roman tiles, ceramic, wood and even lined up bottles' bottoms. All these materials are combined differently, in order to produce a multitude of forms.

At this level of the analysis, some difficulties appeared, concerning the description of these different ornamentations. The problem was to avoid the focus on details and fine features, by generalising the description and avoiding the presentation of the stylistic details. Thus, the form of the lines generated by these materials was retained as descriptors for their analysis. These forms could be: i) 'H' horizontal, ii) 'V' vertical, iii) 'C' curved, or iv) 'B' broken line. Also, a combination between two or more of these forms could exist. The possible combinations are HV, HC, HB, VC, VB, CB, HVC, HVB, HCB, VCB, and HVCB.

8.1.2 Morphological co-occurrence relationships between the horizontal lysés

The following analysis aims to carry out results confirming co-occurrence relationships based on the morphological descriptors of the horizontal lysés, these are the position, the composition and the form. Hence, a statistical analysis is applied to the facades studied.

Firstly, a descriptive statistical analysis of the studied corpus shows that few facades (16 %) did not have a lysis whilst the more dominant categories are the facades with both higher and lower positions lysés (27 %) or only with a higher position one (22 %). The facades with higher and intermediary positions lysés or with higher, intermediary and lower position ones represent respectively 14 % and 10 % of the corpus. All other categories represent nearly 5 % of the same corpus.

The analysis shows also, the predominance of the multiple composition modes (53 %) for the higher position lysis case inversely to the intermediate position one presenting only few facades (2%) with a multiple composition. The mode simple composition is strongly exclusive for the lower position lysis (47 %) but moderately for the intermediary position case (28 %). However, this mode is also still notable for the higher position lysis case (23 %).

When considered all together, the following combinations are the prevalent ones within the studied corpus : i) higher position multiple composition lysis - lower position simple composition lysis (18 %), ii) higher position multiple

composition lysis - intermediary position simple composition lysis (12 %), and the higher position multiple composition lysis (13 %). Also, a moderately significant presence of two other cases must be noted: i) higher position simple composition lysis (9 %), and ii) higher position simple composition lysis-lower position simple composition lysis (10 %).

8.2 Analysis of delimited spans structuring

The examination of the corpus shows that vertical lyses occur within only 16 % of the facades of the studied corpus. Slightly more than half of these facades (58 %) are from the second category (Lr+Ll) whilst less than the quarter of the corpus include a right or left lyses (respectively 22,5 and 19,5 %).

8.3 Analysis of Spaced out spans or 'caesura' structuring

A number of 276 openings sequences from the facades of the studied corpus was analysed and leads to the following outcomes (Table 2). Firstly, the examination of the openings sequences reveals that short sequences of one, two or three openings are the most current ones with a rate of 69,57 %, followed by the average ones, representing those of four and five openings with 22,46 % and the long ones, having up to five openings with 5,8 % .

In addition, this investigation reveals that the sequences without caesura ($p=0$) represents 73,9 % of the studied corpus and thus are the most dominant for all the openings sequences lengths categories (short, average and long). Also, it shows that segmentations with a unique caesura follow with a representativeness rate of 13,77 %, with two caesuras by 8,7 % and finally with multiple caesuras (equal or up to three) with 3,63 % (Table 2).

Secondly, the examination shows that the facades without caesura are the most common independently of the number of composition level (Table 2). Representing 61,6 % of the studied facades, the facades without caesura occur with a rate of 23 % within the first floor facades, 36,1 % within the two floors one and 2,5 % within the three floors ones. The openings sequences with one caesura are most frequent within the façade with two levels (13,8 %) whilst the sequences equal and more than two caesuras are the most observed ones within the facades with one and two floors (Table 3).

Table 3 : Compilation of the results of the analysis of the caesura structuring

| Caesura | Facade with ground floor | Facade with ground floor + first floor | Facade with ground floor + two upper floor | Rate (total) |
|---------------------|--------------------------|--|--|----------------|
| 0 | 23 % | 36,1 % | 2,5 % | 61,6 % |
| 1 | 6 % | 13,8 % | 0,75 % | 20,55 % |
| 2 and more | 8,55 % | 8,55 % | 0,75 % | 17,85 % |
| Rate (total) | 37,55 % | 58,45 % | 4 % | 100 % |

9 RESULTS INTERPRETATION

This research attests, that the facades of the dwellings built in Biskra during the colonial era, contain various components, which refer, in some cases, to particular well-known styles, such as, the neoclassical or the neo-Moorish ones. The different forms and compositions of the horizontal elements offer a quite small illustration of these styles. Despite the richness and variety of these elements, it seems however, that they are neither the most recurrent ones, nor did their organisation reveals a comparable level, which can be qualified as an 'art work'.

Three structuring modes allowed the search on an intrinsic organisation of the façade within the studied corpus. The primary structure, namely lyses structuring, is the most occurring one. The presence of a lysis at the upper composition level is noticeable for all the models emerging from the studied corpus. The weakness of the spans structuring also confirm the primacy of the lyses horizontal structuring mode.

In fact, the results with concern to the delimited spans and caesura structuring show that the former mode is not meaningful, whilst the latter reveals the general random organisation of the openings sequences. These latter are in general, irregularly segmented (neither rhythm nor symmetry) and reflect the arbitrary character of the facades, particularly when these have a longer distance, enclosing several sequences of openings.

10 PRESERVING FRENCH COLONIAL ARCHITECTURE

The outcomes of the present research attest the particularities of the domestic colonial architecture in Biskra. They also reveal the colonial architecture own value as an architectural heritage which is frequently omitted in architecture and town planning governmental discourse. However, accordingly to the heritage related Algerian regulation, the French colonial urban and architectural could be considered as cultural heritage because of the historical, architectural and artistic interest they present [29]. This will allow the classification of the French colonial quarters as particular areas locally called 'secteurs sauvegardés' (protected sectors). Such areas are managed by a preservation plan corresponding to the most conventional land use plan namely 'Plan d'Occupation des Sols'.

This latter focuses particularly on the instructions related to the buildings height and exterior aspect (mainly the facades elements) [30, 31]. Thus, the research results could serve as a set of guidelines for the preservation as well as the development of the colonial town centre of Biskra. Therefore, the rich visual (graphic and picture) index of the façade components and the various revealed facades components arrangements would be very helpful guidelines to designers. These latter could create their design on the basis of the colonial facades components associated to new different arrangements but also by inserting new components within the revealed facades arrangements. Besides, the abstract morphological character of the results provides a certain flexibility which allows the avoiding of the constraints of a rule and provides the necessary creative liberty for the designer [32].

11 CONCLUSION

The analysis of these dwellings facades, constructed during the French colonial era in Biskra, an Algerian southern town, aims to identify not only the characteristics of this largely mistreated architectural heritage, but also, to grasp the co-occurrence of its morphological characteristics. Hence, a morphological approach was applied to a representative corpus of 190 facades located in the centre of this town.

In order to conduct such an analysis, a model of the façade consisting on an elementary mesh of solid and void (a window network) was elaborated. This model allows various operations of segmentations through the observation of discontinuities, namely lyses. These latter define the composition levels (primary structuring) and the openings' sequences (secondary structuring). The combinations of composition levels and spans arrangement produce a particular organisation for this windowed network, which was examined in detail, in this study.

The outcomes from the studied corpus give prominence to both the delimited levels through the horizontal lyses

(primary structuring) and the definition of the spaced out spans (secondary structuring). They also allows the description of the façades studied as having a simple character, denoted by a variety of elements, connected arbitrarily and organized into one or more levels of composition.

Moreover, these results suggest, that the renewal of the building stock in this old colonial city centre, could be done in respect to the models of the horizontal lyses structuring with either the introduction of new architectural elements, such as windows, balconies and arches, or the re-use of the forms of the existing ones. It is important to mention here, that the outcomes of this research can also help in different works and actions aiming to restore the old buildings stock within the area studied. A protected sector plan is the most suitable framework for such actions according to Algerian planning regulation.

Finally, this research has demonstrated that some of the façades studied shared a homogeneous character, whereas others are different, they neither share the same stylistic elements, nor do they share the same structuring models. This result needs a further research, not only to explain the origin of these disparities within the corpus, considering the geographical localization of the façade in this colonial city centre (the cadastral section), but also, to explore some extrinsic factors, in order to interpret and explain the morphological characteristics of these dwellings façades in Biskra city centre, during the French colonial era.

REFERENCES

- [1] N. Agli, *Intervention sur le Centre Ville de Biskra. Mémoire de Fin d'Etudes, Ecole d'architecture Paris-Villemin, France, 1988.*
- [2] N. Oulebsir, *Les Usages du Patrimoine. Monuments, Musées et Politique Coloniale en Algérie (1830-1930), Maison des sciences de l'homme, Paris, 2004.*
- [3] S. Almi, *Urbanisme et Colonisation. Présence Française en Algérie, Pierre Mardaga, Liège, 2002.*
- [4] A. Picard, *Architecture et urbanisme en Algérie. D'une rive à l'autre (1830-1962), Revue du Monde Musulman et de la Méditerranée, 73-74 (1994) 121-136.*
- [5] F. Béguin, *Arabisations, Bordas, Paris, 1983.*
- [6] N. Bertrand (Editor), *L'Orient des architectes, P. U. Provence, Aix-en-Provence, 2006.*
- [7] D. Jarassé, *Références orientalistes dans les villes d'eaux d'Algérie et de Tunisie. Transfert du modèle thermal et usage des motifs patrimoniaux, in: M. Bacha (Ed.) Architecture au Maghreb (XIXe-XXe siècles). Réinvention du patrimoine, P. U. Francois-Rabelais, 2011, pp. 49-67.*
- [8] J. P. Courtillot, *Damier colonial et extensions contemporaines de Biskra, Architecture, Mouvement et Continuité, 48 (1979) 77-81.*
- [9] A. Belakehal, K. Tabet Aoul, L. Sriti, *Shading: an*

- aesthetic solar control strategy, Open House International, (26) 1 (2001) 65-73.
- [10] [10] A. Bennadji, Adaptation climatique ou culturelle en zones arides : cas du sud-est algérien. Thèse de Doctorat, Université de Aix-Marseille 1, France, 1999.
- [11] [11] S. Burth-Levetto, Le service des bâtiments civils en Algérie (1843-1872). Entre discours et réalité, Revue du Monde Musulman et de la Méditerranée, 73-74 (1994) 137-152.
- [12] [12] K. Boussora, L. Sriti, H. Saouli, A. Belakehal, Enjeux de l'évolution parcellaire. Cas du damier colonial de la ville de Biskra, in : Ecole Polytechnique d'Architecture et d'Urbanisme (Ed.), Proceedings of Séminaire International Enseignement et Pratique d'Architecture, Quelles Perspectives, April 23-26, Algiers, 2001, 425-434.
- [13] [13] İ. M. Özdemir, C. Tavşan, S. Özgen, A. Sağsöz, F. B. Kars, The elements of forming traditional Turkish cities: Examination of houses and streets in historical city of Erzurum, Building and Environment, 43 (2008) 963-982.
- [14] [14] A. Friedman, A methodology for the preservation of the architectural heritage of Senneville, Quebec, Canada, Journal of Urban Design, (12) 3 (2007) 359-373.
- [15] [15] A. Sağsöz, O. I. Tuluk, S. Özgen, Influences of different ages and cultures on each other from architectural point of view : Examination of historical buildings in Trabzon / Turkiye, Building and environment, 41 (2006) 45-59.
- [16] [16] A. Tugnett, and M. Roberston, Making Townscape. A Contextual Approach to Building in an Urban Setting, Mitchell, London, 1987.
- [17] [17] B. H. Eiloutli, A fromal language for Palladian palazzo. Façades represented by a string recognition device, Nexus Network Journal (10) 2 (2008) 245-267.
- [18] [18] K. Vollers, The CAD-tool 2.0 morphological scheme of non-orthogonal high-rises, CTBUH journal III (2009) 38-49.
- [19] [19] J. Cuisenier, La Maison Rustique: Logique Sociale et Composition Architecturale, P.U.F, Paris 1991.
- [20] [20] B. Deloche, Une Esthétique Expérimentale, LAMPAS, Lyon, 1992.
- [21] [21] H. Focillon, Vie des Formes, Presses Universitaires de France, Paris, 1970.
- [22] [22] B. Deloche, Muséologica. Contradictions et Logique du Musée. Vrin, Paris, 1985.
- [23] [23] B. Duprat, Morphologie Appliquée : L'Analyse des Conformations Architecturales, ses Problèmes, ses Principes, ses Méthodes. Thèse d'Habilitation à diriger des recherches, University of Lyon III, France, 1999.
- [24] [24] B. Duprat, M. Paulin, Les Types de l'Architecture Traditionnelle des Alpes du Nord. Maisons et Chalets du Massif des Bornes, Laboratoire d'Analyse des Formes, School of Architecture of Lyon ; Laboratoire d'Esthétique, University of Lyon III ; Maison Rhône-Alpes des Sciences de l'Homme, Lyon, 1986.
- [25] [25] B. Duprat, M. Paulin, Moulinage de Soie en Ardèche, l'Architecture des Usines Traditionnelles, Atlas et Catalogue Raisoné, School of Architecture of Lyon, Centre d'Etude et de Recherche Lyonnais d'Architecture et d'Urbanisme, Lyon, 1985.
- [26] [26] M. Paulin, B. Duprat, De la Maison à l'Ecole, l'Elaboration d'une Architecture Scolaire, à Lyon, de 1875 à 1914, Laboratoire d'Analyse des Formes, School of Architecture of Lyon, Lyon 1991.
- [27] [27] S. Malfroy, L'Approche Morphologique de la Ville et du Territoire, Eidgenössische Technische Hochschule, Zurich, 1986.
- [28] [28] B. Duprat, M. Paulin, C. Duvette, and C. Piaton, Le système de la Façade et de la Baie : Maisons à Loyer Urbaines du XIXe Siècle. Laboratoire d'Analyse des Formes, School of Architecture of Lyon, Lyon, 1995.
- [29] [29] J.O.R.A. (Journal Officiel de la République Algérienne) n° 44. Loi n° 98-04 du 15/06/1998 relative à la protection du patrimoine culturel, 1998, 3-15.
- [30] [30] J.O.R.A. (Journal Officiel de la République Algérienne) n° 26. Décret exécutif n° 91-178 du 28/05/1991 fixant les procédures d'élaboration et d'approbation des plans d'occupation des sols ainsi que le contenu y afférant, 1991, 811-814.
- [31] [31] J.O.R.A. (Journal Officiel de la République Algérienne) n° 52. Loi n° 90-29 du 01/12/1990 relative à l'aménagement et l'urbanisme, 1990, 1408-1415.
- [32] [32] D. Raynaud, Contrainte et liberté dans le travail de conception architecturale, Revue Française de Sociologie, (2) 45 (2004) 339-366.