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A MORPHOLOGICAL APPROACH TO REVEAL THE ARCHITECTURAL IDENTITY OF THE HISTORICAL ALGERIAN RAILWAY STATIONS (XIX AND XX CENTURIES)

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ABSTRACT

In the annals of railway architecture, the railway station emerges as a prominent edifice replete with profound symbolism, encapsulating a pivotal epoch in the annals of human history, notably the Industrial Revolution (RAISTRICK, 1972). Internationally, its architectural manifestations have evolved in tandem with temporal and geographical contexts, serving as a quintessential testament to the advancements in construction technology while mirroring the artistic, political, and socio-economic undercurrents of its era (BOWIE, 1987). Focused on Algeria's railway heritage, this research delves into select colonial-era stations. It aims to unveil morphological, historical and architectural aspects, shaping Algeria's railway identity. The study extends from Algiers to Touggourt, examining key terminals and stations. Ultimately, it seeks a deeper understanding of Algeria's railway evolution. The study discerned multiple categories and subcategories of railway stations. It revealed that Algerian railway stations exhibit a notable architectural heterogeneity that defies facile categorization into a singular, standardized formal or stylistic archetype. Furthermore, this investigation underscored the primary determinants contributing to these divergences, notably the imperatives of defense (both in terms of security and military considerations) and local regional characteristics. Ultimately, this discovery portends the possibility of a distinctive genre of railway architecture local to Algeria emerging from the confluence of these influences and architectural diversity.

KEYWORDS

Railway Architecture, Railway Station, Railway Heritage, Morphological, Stylistic Archetype, Algeria

CITATION

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Introduction.

Algeria's colonial heritage constitutes a multifaceted and sensitive topic of significant import within the context of contemporary Algerian history and society. The recognition and comprehension of Algeria's colonial legacy are imperative for a comprehensive grasp of the historical, social, and cultural dynamics that have molded the nation (GHARBI, 2001). Nevertheless, it is imperative to underscore that Algerian history is a multifarious tapestry, encompassing epochs ranging from pre-colonial eras to colonial domination and post-independence periods. Up until the late 19th century, the urban landscape of Algerian cities bore a substantial imprint of French colonial architecture, characterized by the prevailing French neoclassical style. This era represented the zenith of French colonization in Algeria, marked by extensive endeavors by colonial authorities in the construction of numerous public edifices and residential complexes, echoing architectural paradigms contemporaneous to that period in France (BACHA, 2011).

The architectural evolution of Algerian railway stations has been significantly shaped by the proficiency of engineers and architects employed by railway companies during their respective periods (BEJUI & al, 1992). This multifaceted stylistic spectrum manifests conspicuously within Algerian railway stations, serving as a tangible embodiment of the diverse epochs and external influences that have left their imprint on their architectural composition. The broad range of architectural styles witnessed in Algerian stations serves as a testament to the progression of railway architecture across distinct temporal epochs, concurrently highlighting the profound impact of cultural and historical factors on their design. This architectural heterogeneity imparts a compelling layer of complexity to Algeria's railway heritage, eloquently attesting to the nation's multifaceted historical and cultural heritage. The in-depth examination of the morphological architecture of railway stations serves as a means to uncover the inherent architectural attributes of these edifices, alongside their profound relevance within the framework of historical and cultural contexts. This comprehensive analysis contributes to a heightened comprehension of the architectural progressions and cultural forces that have forged the identity of these constructions throughout their historical evolution. Furthermore, this investigation assumes a pivotal role in substantiating compelling justifications for potential heritage preservation endeavors.

Typology and morphology are distinct concepts employed across diverse academic disciplines, including linguistics, biology, sociology, and anthropology. Although these terms are occasionally used interchangeably, they carry discrete definitions.

Typology pertains to the systematic classification or categorization of objects, phenomena, or entities based on their shared characteristics. It encompasses the process of organizing akin elements into discrete types or categories grounded in specific common properties or attributes. Typological analysis endeavors to identify inherent patterns or structures and to arrange elements into cohesive groupings. Its primary objective is the simplification of objects by abstracting away their idiosyncratic attributes, while retaining only the fundamental features upon which the classification rests (PANERAI, DEPAULE, & DEMORON, 1999). Form, possessing a measure of inherent autonomy, constitutes a pivotal concept scrutinized within the domain of morphology. Within this context, morphological analysis assumes a methodological stance oriented toward elucidating the structural makeup of a building through the adoption of a descriptive approach with a basis in structuralism. This analytical process involves meticulous examination of a building's constituent elements, with a concentrated focus on their arrangement and interrelationships, all with the objective of unearthing the underlying structural motifs and principles. Its overarching aim resides in the identification of the overarching attributes that define a building's form, emphasizing architectural facets transcending individual idiosyncrasies. Employing a rigorous methodology, morphological analysis furnishes insights into the spatial configuration and formal composition of a building, accentuating the recurrent themes and organizational principles that contribute to its holistic coherence (DUPLAY & DUPLAY, 1982).

Methodology.

The specific methodological approach adopted is based on three main axes, each defining an essential stage of the research.

Bibliographical research: The first stage of this research is based on a historical approach, in the form of a documentary search. The aim was to carry out a review of the literature on the railways in Algeria. To achieve this, two main sources were exploited: on the one hand, the literature of reports and accounts of missions dating from the colonial period, which are accessible via articles, books and Internet sites; on the other hand, the archival documentation and iconography of the French colonial period, available at the SNTF's archive centre at Hussein Dey.

Data collection: The second phase of this study involved essential fieldwork, including surveys, measurements and observations to build up the corpus of buildings to be analysed. Architectural surveys were carried out at several railway stations during numerous site visits, notably in Algiers, Skikda, Constantine, Batna, Biskra, Oumache and Touggourt. Where surveys were not possible, photographs were taken and observations recorded in order to understand each specimen in the study corpus.

Processing and analysing the data collected: Morphological analysis, as cultivated within the confines of the shape analysis laboratory in Lyon (LAF), is a method characterized by the deconstruction of architectural entities into discernible segments, with due consideration for the variances evident in the representations of reparable components. Its primary objective is to streamline the process of description by segregating the elements composing the whole and subjecting them to individual scrutiny. This methodology rests upon a set of fundamental tenets.

- Corpus Homogeneity: Corpus homogeneity in architectural analysis pertains to the internal consistency and likeness of the architectural instances under scrutiny. An architecturally homogeneous corpus comprises structures or projects that exhibit congruent features, encompassing aspects such as architectural style, construction era, geographic milieu, or program category (DUPRAT & PAULIN, 1989).
- Architectural Segmentation: Within the morphological framework, architectural segmentation pertains to the process of partitioning or disassembling architectural configurations into more manageable and semantically significant constituents. This entails the recognition and scrutiny of the various constituents, components, or morphemes constituting a building or architectural spatial arrangement. The application of segmentation may be executed at various analytical strata, encompassing the façade, the layout, the structural components, or the architectural intricacies (DUPRAT & PAULIN, 1995).
- Elaboration of the Structural Model: The construction of the structural model, as an integral component of shape analysis, culminates in the proposition of a model that characterizes the entity by deconstructing its constituent elements and explicating their precise disposition (DUPRAT & PAULIN, 1995).
- Codification: This procedure entails the establishment of a catalog comprising distinctive codes, each of which will be ascribed to individual segments. These codes may manifest as numerical designations, alphabetical characters, symbolic representations, or any other mode of symbolization designated to distinguish and identify the segments.
- Comparative Analysis of Codes: The deconstruction of the specimens will be characterized as elucidative through the methodical juxtaposition of their respective segments, facilitating the discernment of patterns and potential deviations in the configuration of these segments. This dissection will enable the delineation of how the segments are organized in mutual reference to one another, thus accentuating the interrelationships inherent in their arrangement (DUPRAT, 2010).

Comprehension and Significance of Analytical Outcomes: The interpretation of the analytical findings encompasses the process of imparting meaning and relevance to the insights derived from the scrutinized data. This endeavor entails the comprehension of the relationships, trends, or patterns that have been discerned.

1. Historical Overview of the Railway in Algeria

1.1 The railway period in Algeria (Colonial period)

Faced with the worries of displacement, the lack of infrastructure, and the need to exploit the riches of Algeria, the French found themselves in front of a Roman route that had been erased and replaced by narrow Ottoman paths, so they opted to develop communication networks by integrating them into the existing road network (GODARD, 1996). The birth and evolution of the Algerian railway are defined by a process divided into several periods and railway programs. The choice of the type of communication network went through several studies, including the comparison of creation and circulation expenses between roads and railways, where it turned out that the railway is the most affordable means considering maintenance, speed flows, and its impact (DELAVIGNE & al, 1854).

Fig. 1. An engraving depicting the inaugural train of the Algiers - Blida section : Despite the freedom of interpretation inherent in illustrations from this period, we can place this scene at the Algiers central station, at the foot of the Great Mosque. (BEJUI & al, 1992)

1.1.1 The first railway program 1857-1879:

The imperial decree of Napoleon III constituted the legal framework of the Algerian railway, thus representing its birth on April 8, 1857, the latter cited the following proposals (BEJUI & al, 1992).

- A parallel line to the Mediterranean, linking the three provincial capitals, Constantine, Algiers, and Oran
- Perpendicular lines to the Mediterranean, linking the main ports with the interior of the country.

In order to execute the different railway programs, several railway companies were involved, such as the Algerian Railway Company CFA, which was the initiator of the Algiers - Blida line, the Paris Lyon Méditerranée Company PLM, the Western Company, the Eastern Company, the Bône-Guelma Company, and the Algerian State Railway Company CFAE (Figure02).

1.1.2 The second railway program: 1879 – 1907

The second railway program was characterized by the classification of the existing lines of local interest towards the general interest, as well as the realisation of the branches in the North, the extension towards the Moroccan borders, and the creation of a network in the South of the departments Constantine, Algiers, and Oran (POGGI, 1931). During these years, the Algerian railway began to take shape, initially with a line parallel to the sea and north-south penetration routes (Figure02).

1.1.3 Third railway program: 1907 - 1920

Characterised mainly by the consolidation of engineering structures and other repair works, as well as the realisation of new branch lines not executed during the 1879 programme (BEJUI & al, 1992): Tlemcen -Beni-Saf, Sidi-Bel-Abbès -Tizi -Mascara -Uzès-le-Duc, Relizane -Prévost-Paradol via Zemmora, Orléansville -Ténès and finally Bouïra -Aïn-Bessem –Aumale (Figure02).

1.1.4 Fourth railway program 1920 - 1960

The program was applied late in 1921, characterised by the homogeneity of the companies' lines, PLM in the West and CFAE in the East, as well as the modernisation of the networks (electrification of the Bône - Oued Kébérit mining line) (Figure02).

Finally, the management was put in the hands of the National Society of French Railways in Algeria (SNCFA), with a capital provided by the state and the SNCF métropolitaine (BEJUI & al, 1992).

1.2 The railway during the post-colonial period

Apart from the electrification, doubling, and creation of industrial tracks, the Algerian railway has kept the same colonial structure (Figure02), which explains the will to industrialise the country. The railway is managed until today by the national railway company (SNTF). The twenty first century was marked by the creation of the ANSERIF, a national agency for the study and monitoring of railway investments in 2005, whose main mission is to develop the railway sector by building new stations and railway lines and acquiring new high-speed trains, although the old railway stations remain frozen in time, excluding them from the programs of adaptation, modernisation and preservation.

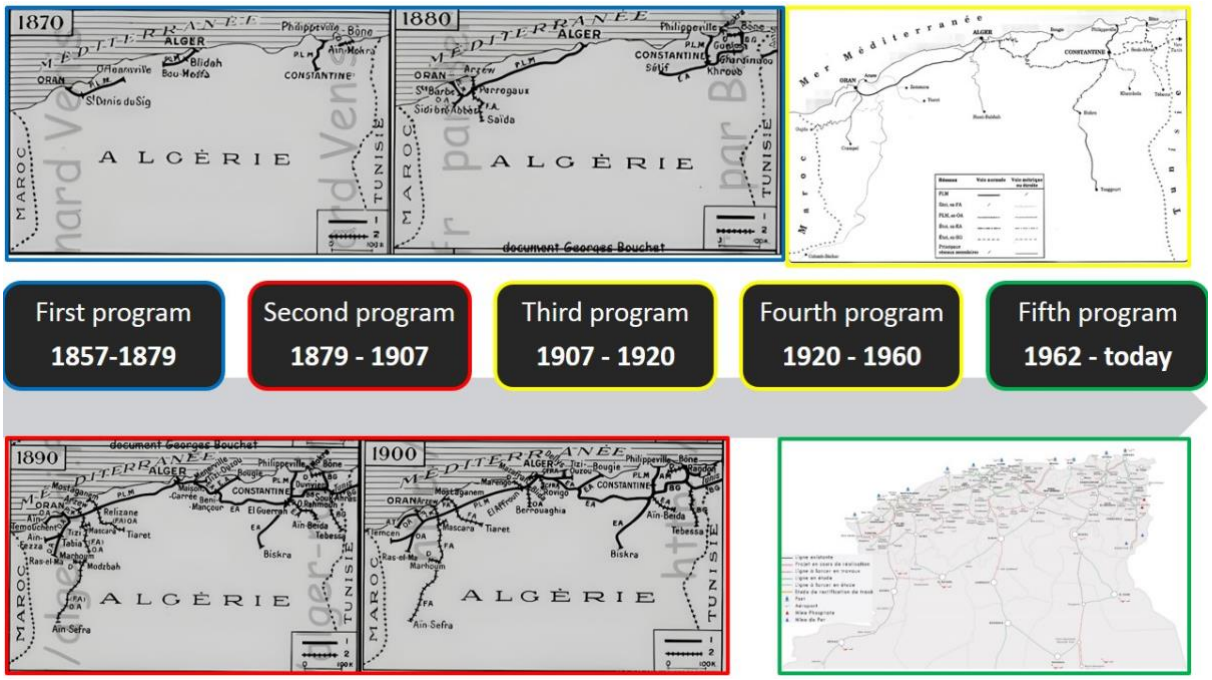


Fig. 2. Diachronic representation of the Algerian railway evolution. (Authors, 2023)

2. Presentation of the study corpus

The corpus encompasses a total of seven railway stations situated within Algeria (Figure 03), spanning from the central station in Algiers to the stations located in various towns along the eastern route, specifically Skikda, Constantine, Batna, Biskra, Oumache, and Touggourt.

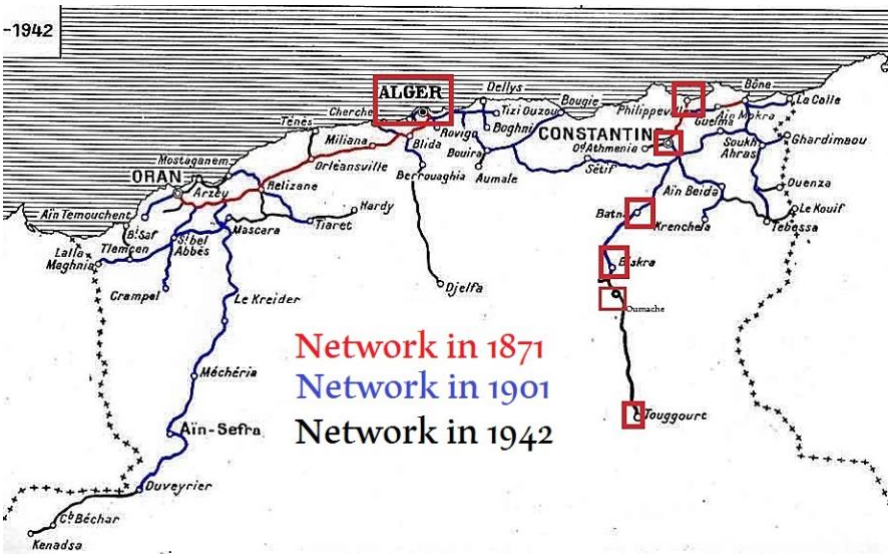


Fig. 3. Map showing the different specimens and their geographical location. Source: (Encyclopedie de l'Afrique du Nord, 2010)

The rationale behind this particular assortment of railway stations is founded on the imperative to comprehend the prevailing architectural and stylistic heterogeneity. Beyond their utilitarian function as transportation hubs, these railway stations constitute vibrant testamentaries to the historical, cultural, and regional identity of their respective areas and municipalities (Table 01). Each station serves as a mirror reflecting the era of its construction, the region's economic prosperity, the architectural influences shaping its conception, and even the aesthetic values prevalent within the society that brought it into existence. Consequently, the inclusion of stations originating from diverse cities and erected by distinct railway companies serves the overarching purpose of capturing this manifold architectural and stylistic opulence and diversity. Through the assembly of these diverse specimens, our corpus affords a comprehensive and representative cross-section of the evolutionary trajectory of colonial railway architecture in Algeria, thus facilitating an exhaustive and contextually grounded scrutiny of this architectural legacy.

Table 1. Data sheet of the chosen railway stations. (Authors, 2024)

	Year of construction	**Operating company**	**Nature**	**Type**	**Layout**
Station of Algiers	1867	C.F.A / PLM / E.A	Passenger Station	Terminus	Lateral
Station of Skikda	1937	PLM	Passenger Station	Terminus	Lateral
Station of Constantine	1870	E.A	Passenger Station	Head of line/ intermediate	Lateral
Station of Batna	1879	E.A	Passenger Station	Intermediate	Lateral
Station of Biskra	1887	E.A	Passenger Station	Intermediate	Lateral
Station of Oumache (Chegga)	1897	Southern Territories Administration	Passenger Station / Military Centre	Intermediate	Lateral
Station of Touggourt	1914	Southern Territories Administration	Passenger Station	Terminus	Lateral

2.1 The selection criteria

Within the particular framework of our study, the inclusion of Algiers Central Station is predicated upon national factors, stemming from its distinction as the primary railway terminal in the capital city of Algeria. This nomenclature is inherently intertwined with its indispensable function in the nation's railway transport infrastructure, serving as the central hub facilitating connectivity to several significant destinations. Moreover, Algiers Central Station represents one of the inaugural tangible accomplishments attributable to the Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée (PLM). The substantial involvement of this distinguished corporation in the establishment of the station imbues it with a distinctive and historical emblematic import. The railway stations located along the Eastern corridor (namely Skikda, Constantine, Batna, Biskra, and Touggourt) comprise a study corpus conducive to comparative analysis with the principal subject of investigation, Algiers Central Station. This selection of railway stations exhibits particular and compelling characteristics due to their construction spanning approximately a century and their affiliation with distinct railway companies, including the Algerian Railway Company (CFA), the Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée (PLM), the Compagnie de l'Est (E.A), and the Southern Territories Administration.

3. General Structure Lysée[1] of the selected station façades

The lysed general structuring phase, integral to the morphological analysis process, holds a paramount position. This foundational stage is designed to establish a robust methodological framework for the systematic and rigorous comprehension of the constituent components within a set of specimens. The lysed structuring is

[1] The term "lysé" (plural: "lyses") derives its origin from the Greek language, signifying the act of "separation" or "detachment." This conceptual nomenclature was embraced by scholars affiliated with the Laboratoire d'Analyse des Formes (LAF) at the École Nationale Supérieure d'Architecture in Lyon, France. They employed this term to delineate the diverse constituents of urban or architectural elements. Lyses, as per their definition, represent visible divisions that aid in the dissection of the entities under scrutiny into discrete components, thereby contributing to the formulation of a comprehensive structural model. From this standpoint, classical molding is regarded as a specific manifestation of analytical discontinuity, or what is referred to as a 'lysis.' (DUPRAT & PAULIN, 1995).

deployed along two pivotal dimensions, specifically the horizontal and vertical segmentation, which converge to furnish a comprehensive insight into the intrinsic attributes of each specimen.

3.1 Initial segmentation of specimens into supra-segments

In light of the inherent intricacy exhibited by the corpus under investigation, stemming from the considerable diversity observed across different morphological strata within each specimen subjected to analysis, it becomes imperative to initiate a preliminary segmentation phase. The primary objective of this initial segmentation is to partition the entities into distinct supra-segments, which can subsequently undergo a methodical comparative examination.

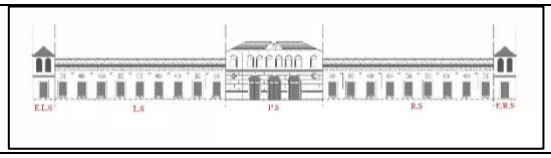
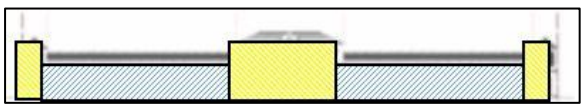
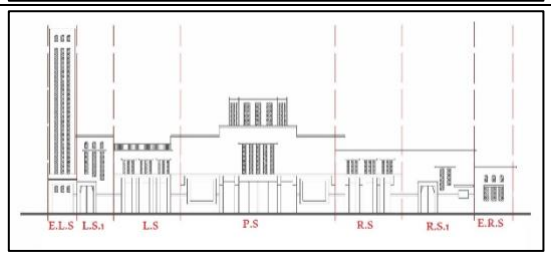
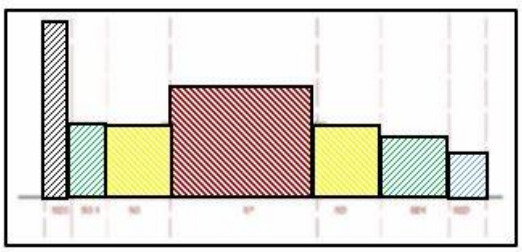
Each specimen presented for analysis undergoes a meticulous deconstruction process, resulting in the delineation of discrete supra-segments. These supra-segments emerge as a consequence of discernible volumetric variations, misalignments, and stratigraphic disparities apparent within the morphological composition of the same architectural structure.

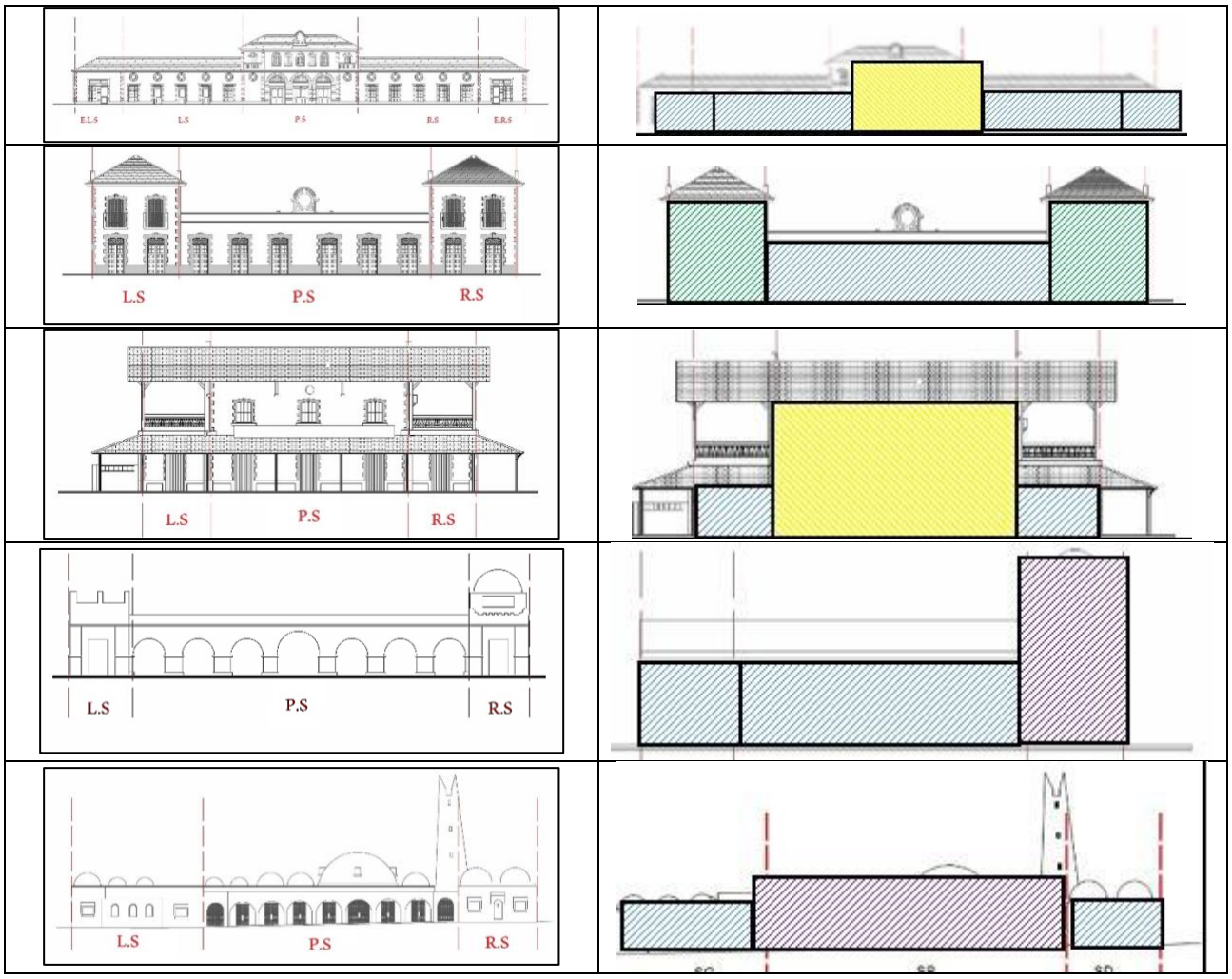
3.2 Horizontal lysis decomposition

The horizontal lysis decomposition approach focuses on the meticulous analysis of the protruding and recessed elements present on the façade of a building. These projections, often in the form of architectural elements, create horizontal visual divisions that fragment the overall composition of the façade (Table 2). This fragmentation makes it possible to perceive different strata or levels of the façade, each with its own distinct characteristics in terms of motifs, proportions, ornamentation and materials. The schematics presented (Figure 4) depict the horizontal decomposition model adopted, which will be used for all the sample components included in the corpus.

Fig 4. Configurations for horizontal lysis. (Authors, 2024)

Table 2. Horizontal decomposition of supra-segments. (Authors, 2023)

Specimen	Horizontal decomposition of supra-segments
	
	



The levels do not systematically coincide with the number of storeys, and it should be noted that a level is not invariably delimited by a distinct lysis. This observation is occasionally reflected in the presence of several storeys within a single level, as shown by the example of N4. Based on our findings, it is possible to identify six potential configurations for horizontal lysis (Figure 05).

There is some diversity in the make-up of the levels. Most of the supra-segments, labelled PS, are mainly single-storey, i.e. R+1, with no double-storey structures at all. This feature helps to explain why the levels in the section where the building's main entrance is located still allow the number of storeys to be discerned from the lyses.

The R.S and L.S supra-segments, with the exception of sample 6, generally show similar characteristics in terms of their level structure, which can be attributed to their simultaneous military (fortification) and railway status.

The double-level configuration is extremely unusual, occurring 100% only in supra-segments R.S.1 and L.S.1 of sample 2, and in supra-segments R.S and L.S of the single sample 4.

A balance in the configuration of the E.R.S and E.L.S supra-segments is generally observed, with the exception of sample 2, due to the introduction of a new architectural element in the typology of Algerian railway stations, namely the belfry.

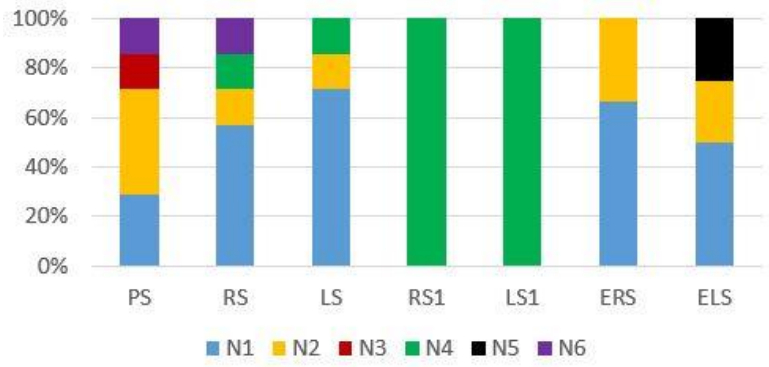
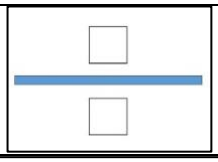
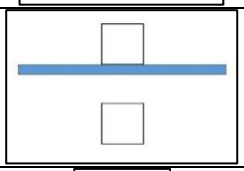
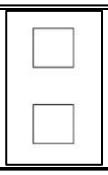
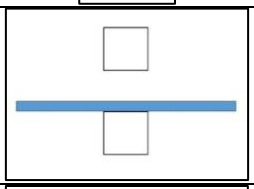
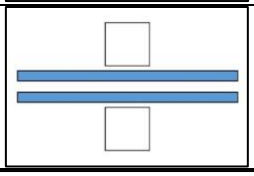
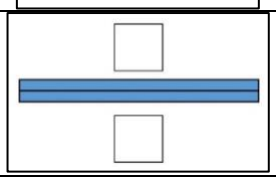


Fig. 5. Diagram illustrating the configurations of specimens with delimited levels. (Author, 2024)

3.2.1 Variability of lysis configurations by level

The visible horizontal elements responsible for delimiting the structural discontinuities within the fenestrated network take a variety of material forms. These lyses display distinct structures created by the variable offsets of each constituent element in relation to the openings in the levels they delimit. Within the study corpus, we were able to identify six distinct variations in the layout of the lyses, as shown in the Table 03.

Table 3. Variation in the arrangement of lyses by level. (Authors, 2024)

Representative figure	Arrangement of coded lyses
	Between the lower and upper bays, at mid-height (LH1)
	At the threshold of the upper bays (LH2)
	Absence of lyses (LH3)
	At the top of the ground floor bays (LH4)
	Double lyses at mid-height between the upper and lower bays (LH5)
	Double lyses close to mid-height between the upper and lower bays (LH6)

The diagram mainly illustrates that the greatest variation in terms of positioning of the horizontal lyses (Figure 06) is at the level of the main supra-segment (PS), with a slight prevalence of the LH3 configuration. This section is of major importance because of its function as the main entrance to the building. Supra-segments (R.S), (L.S), (E.R.S) and (E.L.S) show similar configurations, while supra-segments (R.S.1) and (L.S.1) are 100% identical, due to their exclusive presence in a single sample 2.

The configuration of double lyses, whether close together or far apart, occurs exclusively in the Oumache and Touggourt stations, samples 6 and 7, two stations that embody a distinctive local architectural style.

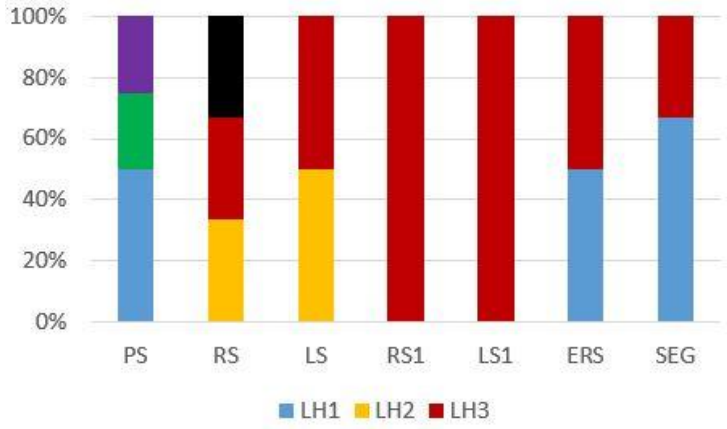


Fig. 06. Diagram showing the variability of horizontal lysis configurations in the corpus. (Authors, 2024)

3.2.2 Attested roof types

Based on our observations, three distinct categories of roof (Figure 7) were identified in this study: the inclined roof (TI), the flat roof (TT) and the composite roof (TC), the latter being a combination of the two.

An analysis of the graph reveals that flat roofs predominate in all the upper segments.

There is a balance between pitched and flat roofs in the upper segments R.S and L.S, accompanied by a minority and exclusive occurrence of the composite roof, identified in the case of sample 5.

In contrast to previous trends, the upper segments E.R.S and E.L.S show a slight predominance in favour of pitched roofs.

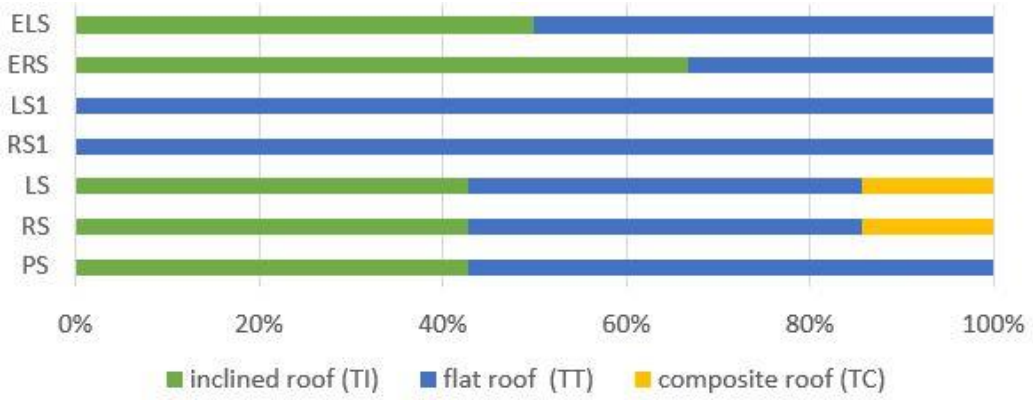


Fig. 07. Diagram showing attested roof types. (Authors, 2024)

3.3 Vertical decomposition into delimited spans

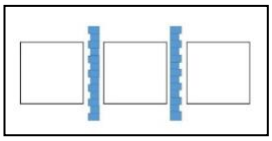
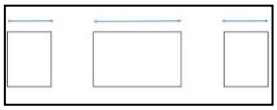
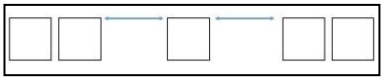
Vertical decomposition involves an analysis of the vertical discontinuities that separate the different parts of the façade. These discontinuities can take various forms (Table 04).

A: Vertical decomposition by delimitation: refers to the analysis of the different elements or parts of an architectural structure, in particular a façade, by identifying the vertical discontinuities that mark the separations between these elements.

B: Vertical decomposition by bay width variation: refers to a method of architectural analysis which involves examining the distribution of vertical openings such as windows along a façade.

C: Vertical decomposition by bay spacing variation: refers to an architectural analysis approach that focuses on variations in the distance between vertical openings, such as windows, along a façade or structure.

Table 4. Shapes of vertical discontinuities and codification. (Authors, 2024)

Shapes of vertical discontinuities	Coded decomposition
	Vertical decomposition by delimitation (LV1)
	Vertical breakdown by variation in bay width (LV2)
	Vertical decomposition by variation in bay spacing (LV3)

The diagram (Figure 08) illustrates the predominance of the configuration (LV1), which corresponds to decomposition by delimitation and is manifested through three distinct sequences of openings.

The variation in opening width (LV2) is balanced and takes the form of two different sequences, comprising 7 and 9 openings respectively.

The variation in opening spacing (LV3) is observed in two samples, within sequences of 6 openings and 5 openings.

It is important to note the total absence of even bay sequences, i.e. those comprising 2, 4 and 8 bays respectively.

It is observed that Supra-segments P.S mainly display a three-segmented configuration, followed by a single-segment segmentation, with a minority adopting a two-segment division.

Supra-segments R.S and L.S are identical, indicating an axial arrangement relative to the main segment P.S), with the exception of one isolated case (Specimen 7).

A nine-segment structure is exclusive to sample 1 for the R.S and L.S segments. The E.R.S, E.L.S, R.S.1 and L.S.1 segments are composed entirely of a single segment.

A majority of supra-segments composed of three segments display axial symmetry by adopting bay configurations in (1-3-1), (1-5-1), (3-1-3), and (1-6-1).

The supra-segments R.S.1, L.S.1, E.R.S and E.L.S are consistently made up of a single segment, consisting of either one, two or three respective bays.

The R.S and L.S supra-segments never display a three-segment configuration, in contrast to the SP supra-segment.

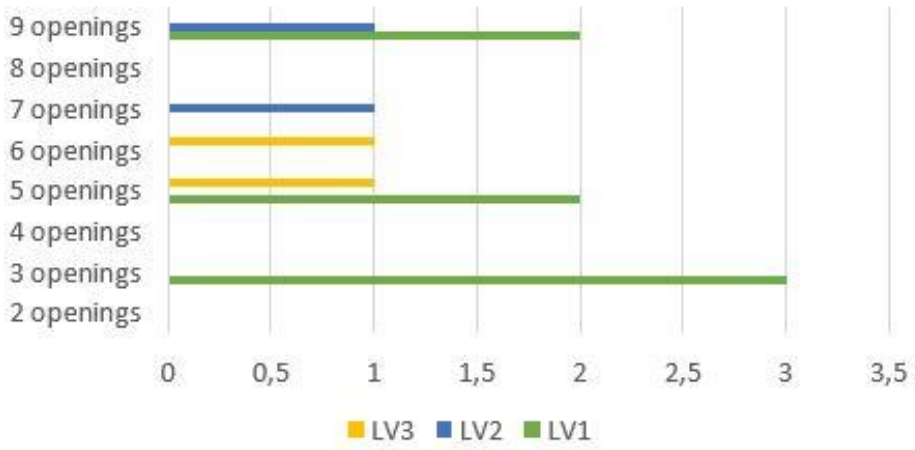
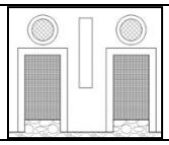
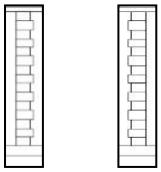
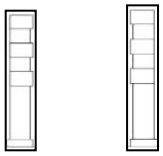
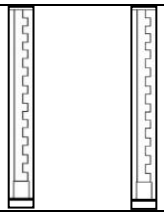


Fig. 8. Diagram illustrating the various discontinuity configurations based on the openings sequences attested in the study corpus. (Authors, 2024)

3.3.1 Variability of vertical lysis configurations per span

Vertical relief elements, which play a key role in delineating structural disjunctions within the composition of the openings, are embodied in a variety of material manifestations, including chains of bosses, tables, columns, pilasters and many others (Table 05). As noted earlier in our on-site observation, it is clear that the diversity of vertical architectural elements is relatively limited. However, despite this limitation, we have been able to classify several types of quoins.

Table 5. Vertical lyses attested in the corpus and its codifications. (Author, 2024)

Representative figure	Architectural element and its location
	Table (TBL) : architectural element located only in the facade trumeaux of Algiers station
	Left-hand boss chain without first level base (CBG1) Right-hand boss chain without first level base (CBG2)
	Left-hand boss chain with second level base (CBG3) Right-hand boss chain with second level base (CBG4)
	Left-hand boss chain with first and second level base (CBG5) Right-hand boss chain with first and second level base (CBG6)

4. General Structure (Contrastive) of selected station façades

The contrastive structuring phase represents the subsequent component of the morphological analysis and is characterised by its increased level of precision and focus. It focuses primarily on the meticulous

examination of the layout of openings, in particular architectural fenestrations. This phase involves a meticulous process of contrastingly disassembling both the vertical groups, known as bays, and the horizontal strata, also known as levels.

4.1 Contrastive span structuring

Contrastive structuring emerges from the identification of dissimilarities and disparities between elements within the same bay. This divergence can be apprehended by means of two main typologies: firstly, by observing variations in both form and ornamentation; secondly, by the perceptibility of the presence or absence of balconies.

4.1.1 Contrastive structuring of spans through variations in shape and ornamentation

The aim of this procedure is to detect changes in the bays, whether these result from a partial or total change in their configuration or ornamentation.

In addition, given that, the majority of the samples have a 2-storey typology, with the exception of sample (2); this gives rise to three probable scenarios.

Similarity of openings: no contrast between the ground floor and the first floor.

Disparity of openings: contrast between the ground floor and the first floor.

Absence of an upper floor: inapplicability of the approach.

Carrying out the methodology on all the samples analysed requires rigorous coding (Figure 9). In this case, code (B) is assigned to a specific configuration or ornament, while code (D) is assigned to a layout where the shape and ornament differ within the same bay, as shown in the illustration below. Code (C) is assigned where there is a 3rd bay level (the isolated case of sample (2).

Thus, there are three potential arrangements for the supra-segments.

Coded BB configuration (CTFO1): A lack of contrast resulting from an identical configuration.

Coded BD configuration (CTFO2): A presence of contrast resulting from a divergent configuration.

Coded BDC configuration (CTFO3): A presence of contrast resulting from a divergent configuration in 3 or more levels.

Fig. 9. Example of a contrastive decomposition of spans by shape. (Authors, 2024)

According to the diagram (Figure 10), it is discernible that all the main segments (PS) exhibit a contrast in span both in terms of form and ornamentation. The absence of bay contrast in terms of shape and ornamentation can only be seen in the (RS) and (LS) segments of a single case in the sample (case 4). Furthermore, apart from this situation, the vast majority of the samples present a single level, which makes it impossible to apply the approach.

When they are observed, the supra-segments (ERS and ELS) systematically show a contrast of spans in terms of shape and ornamentation (CTFO2) and (CTF03).

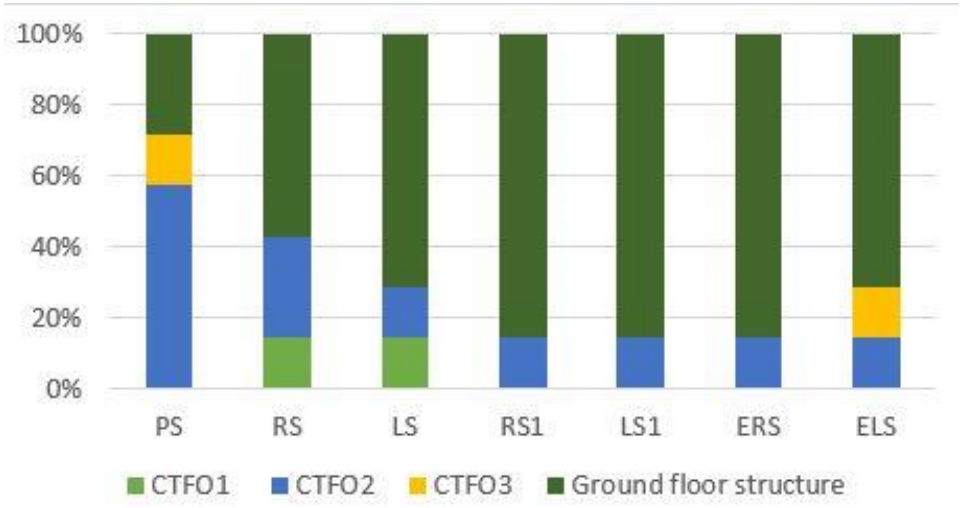


Fig. 10. Diagram of the contrasting structures of the spans by the shape attested to the supra-segments of the samples. (Authors, 2024)

4.1.2 Contrastive structuring of spans by the presence or absence of balconies

Here we adopt a similar procedure to that used previously, firstly by coding the attribute (CTB1) resulting from the absence of contrast (BB), which logically indicates the non-existence of a balcony on the upper level. At the same time, we code the attribute (CTB2), which is derived from the presence of contrast (BD), indicating the presence of a balcony on the first level (Table 06).

Table 6. Contrast of spans by balcony attested at the level of the supra-segments of samples 3, 4. (Authors, 2024)

Specimen	**Supra-Segments and configurations**						
Supra- segments	PS	RS	LS	RS1	LS1	ERS	ELS
Spec 3	BD	/	/	/	/	/	/
Spec 4	/	BD	BD	/	/	/	/

The two samples that show a contrast are clearly distinguishable and are in total opposition: the first at the level of the main segment (SP), while the second is differentiated at the level of the right segment (SD) and the left segment (SG).

4.2 Contrastive level structuring

In a similar way to the contrastive structuring of spans, the decomposition of levels derives from the variation of characteristics such as form, ornamentation and the presence or absence of balconies within the same level.

4.2.1 Contrastive structuring of levels through variations in forms and ornamentation

Analogous to the previous approach, we assign code (B) to a particular form or ornament, while code (D) is assigned to a layout where the differences in form and ornamentation differ within the same level.

As a result, two possible configurations emerge for the supra-segments.

Configuration BB: An absence of contrast resulting from an identical configuration.

Configuration BD: A presence of contrast resulting from a divergent configuration.

From the illustrative graphs provided (Figure 11), it can be discerned that the one-segment configuration (CNFO1) prevails in the majority of supra-segments.

At the same time, three-segment structuring (CNFO3) predominates within the supra-segments belonging to the supra-segment (PS) at Ground level, with the addition of a single occurrence of four-segment

structuring (CNFO4). This observation underpins the importance of the main segment, which plays a central role as the main access to the stations.

On the first floors of the supra-segments (PS), the configuration can be either one segment or three segments (CNFO1), (CNFO3).

The supra-segments (RS) and (LS) are characterised by a high prevalence of one-segment structuring on the ground floor, with a total presence of this configuration on the first floor where it exists.

In the unique case where the supra-segments (RS1) and (LS1) are present, a structure with one segment on the ground floor and two to three segments on the first floor is observed.

As for the supra-segments (ERS) and (ELS), when they are present, they adopt a one-segment configuration on both levels, with an occurrence rate of 100%.

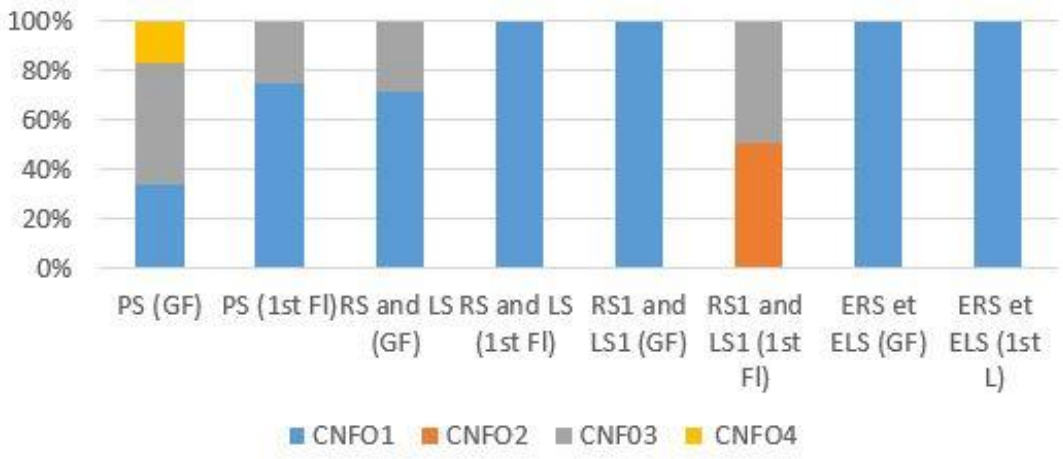


Fig. 11. Diagram of contrastive structuring of levels by form and ornamentation attested at supra-segments. (Authors, 2023)

4.2.2 Contrastive structuring of levels by the presence or absence of balconies

In this approach, we take a similar approach to that previously used. Initially, this involves designating the attribute (CNB1) by means of the absence of contrast (B), thus logically signalling the non-existence of a balcony on the level in question. At the same time, we implement the procedure for coding the attribute (CNB3), derived from the emergence of a contrast (D), attesting to the presence of a balcony on the same level.

The data presented (Table 07) reveals the existence of two distinct scenarios relating to the contrast of levels through balconies. The first takes the form of a three-segment configuration (CNB3) in the supra-segment (PS) of sample 3. In contrast, the second takes the form of a single-segment configuration (CNB1) in the supra-segments (RS) and (LS) of sample 4.

Table 7. Contrasting structuring of the levels by the presence or absence of balconies attested to the supra-segments. (Authors, 2024)

1st floor of SP (Specimen 3)	
Sequence	7 openings
3 Segment (CNB3)	D-BBBBB-D 1-5-1
1st floor of RS and LS (Specimen 4)	
Sequence	2 openings
1 Segment (CNB1)	DD 2

Results and Discussions

Following careful analysis and comparison of the results of the lysis and contrastive decomposition of the seven samples (Table 08), it is now possible to characterise them morphologically by juxtaposing the morphological codes acquired.

Table 8. Global coding of specimens. (Authors, 2024)

Specimen 1 Algiers station	PS	N2+LH1+TI+LV1+LV3+S3+CTFO2+CNFO3+P1+F1+F2
	RS	N1+TI+LV1+S9+TBL+CNFO1+F1+PF1
	LS	N1+TI+LV1+S9+TBL+CNFO1+F1+PF1
	ERS	N2+LH1+TI+S1+CTFO2+CNFO1(RDC)+CNFO1(R+1)+PF1+F3
	ELS	N2+LH1+TI+S1+CTFO2+CNFO1(RDC)+CNFO1(R+1)+PF1+F3
Specimen 2 Skikda station	PS	N3+LH2+TT+LV1+S1+CTFO3+CNFO1+P12+F9+F10
	RS	N2+LH2+TT+LV1+S1+CTFO2+CNFO1(RDC+R+1)+P12+F8
	LS	N2+LH2+TT+LV1+S1+CTFO2+CNFO1(RDC+R+1)+P12+F8
	RS1	N4+LH3+TT+LV2+S1+CTFO2+CNFO1+CNFO2+P7+F11
	LS1	N4+LH3+TT+LV2+S1+CTFO2+CNFO1+CNFO3+P7+F7
	ERS	N1+TT+S1+CTFO1+CNFO1+F8
	ELS	N5+LH1+LH3+TT+S1+CTFO3+CNFO1+F6+F10+F6
Specimen 3 Constantine station	PS	N2+LH1+TI+LV1+S3+CBG1+CBG2+CBG3+CBG4+CTFO2+CTB2+CNFO3+CNB3+P2+F4+F5+PF3
	RS	N1+TI+S1+CBG1+CBG2+CNFO1+P3+F4+PF2
	LS	N1+TI+S1+CBG1+CBG2+CNFO1+P3+F4+PF2
	ERS	N1+TI+S1+CBG1+CBG2+CNFO1+P5
	ELS	N1+TI+S1+CBG1+CBG2+CNFO1+P4
Specimen 4 Batna station	PS	N1+TT+S1+LV3+S2+CBG5+CBG6+CNFO1+P8
	RS	N4+LH3+TI+S1+CBG5+CBG6+CTFO1+CTB2+CNFO1+CNB1+P8+PF4
	LS	N4+LH3+TI+S1+CBG5+CBG6+CTFO1+CTB2+CNFO1+CNB1+P8+PF4
Specimen 5 Biskra station	PS	N2+LH4+TI+LV1+S1+CBG5+CBG6+CTFO2+CNFO1+P8+F12
	RS	N1+TC+S1+CBG5+CBG6+CNFO1+P8
	LS	N1+TC+S1+CBG5+CBG6+CNFO1+P8
Specimen 6 Oumache station	PS	N1+TT+LV2+S3+CNFO3
	RS	N6+LH5+TT+S1+CTFO2+CNFO1+F3
	LS	N1+TT+S1+CNFO1
Specimen 7 Touggourt station	PS	N6+LH6+TT+LV2+S3+CTFO2+CNFO4+P10+P11
	RS	N1+TT+LV2+S1+CNFO1+P9+F14
	LS	N1+TT+LV3+S3+CNFO3+F6+F14

The configuration of stations in supra-segments is a parameter of significant importance. Three major configurations have been clearly identified.

Type1: ELS+LS+PS+RS+ERS

Type2: LS+PS+RS

Type3: ELS+LS1+LS+PS+RS+RS1+ERS

The specific structure of each supra-segment has led to the establishment of a second typology, constituting a second parameter which can be divided into two configurations of Type 1 (Table 09).

This category is axially symmetrical in relation to the PS supra-segment. The latter remains constant as a first floor configuration with a single composition level (N2), and the two levels are demarcated by a lyse at mid-height between the two bays, In addition, the roof is of the inclined type.

With regard to the vertical decomposition studied, the supra-segment PS shows a decomposition by delimitation LV1, giving rise to three segments S3 according to the diagram (1-3-1). The distinction lies mainly in the presence or absence of chains of bosses and balconies, as well as variations in the shapes of windows and doors.

The RS and LS supra-segments systematically feature a ground floor with a single composition level (N1) covered by a pitched roof. Furthermore, they do not reveal any level contrast based on form.

The ERS and ELS supra-segments have two configurations, ground floor or First floor, both characterised by a single composition level and covered by a pitched roof.

Table 9. Codified representation of type 1. (Authors, 2024)

TYPE 1	
Type1'	Type1''
PS:N2+LH1+TI+LV1+LV3+S3+CTFO2+CNFO3+P1+F1 +F2 **RS:** N1+TI+LV1+S9+TBL+CNFO1+F1+PF1 **LS:** N1+TI+LV1+S9+TBL+CNFO1+F1+PF1 **ERS**: N2+LH1+TI+S1+CTFO2+CNFO1 (RDC) +CNFO1(R+1) +PF1+F3 **ELS**: N2+LH1+TI+S1+CTFO2+CNFO1 (RDC) +CNFO1(R+1) +PF1+F3	**PS**:N2+LH1+TI+LV1+S3+CBG1+CBG2+CBG3+CB G4+CTFO2+CTB2+CNFO3+CNB3+ P2+F4+F5+PF3 **RS**: N1+TI+S1+CBG1+CBG2+CNFO1+P3+F4+PF2 **LS**: N1+TI+S1+CBG1+CBG2+CNFO1+P3+F4+PF2 **ERS**: N1+TI+S1+CBG1+CBG2+CNFO1+P5 **ELS**: N1+TI+S1+CBG1+CBG2+CNFO1+P4

A second subdivision into four distinct configurations (2 Types and 2 Subtypes) is observed for Type 2: LS+PS+RS, which represents the majority of cases analysed (Table 10).

This category is characterised by partial and complete axial symmetry in relation to the PS supra-segment. In contrast to Type 1, this classification is characterised by the presence of PS supra-segments on the ground floor with a flat roof. It should be noted that Biskra station stands out by presenting both roof configurations simultaneously.

In terms of vertical decomposition by demarcation, a remarkable diversity was observed, including demarcation by variations in the width of bays as well as by differential spacing between them. In the same vein, it should be noted that the contrast of forms by spans and by level remains a recurring constant.

The two sub-types 2 are distinguished by an architectural style that draws its inspiration from local sources. One relevant observation concerns the emergence of the dome as an innovative design element. In addition, the presence of architectural arches and the persistence of the defensive character are salient features.

Table 10. Codified representation of type 2. (Authors, 2024)

TYPE 2	
Type 2'	Type 2''
PS: N1+TT+S1+LV3+S2+CBG5+CBG6+CNFO1+P8 **RS**:N4+LH3+TI+S1+CBG5+CBG6+CTFO1+CTB2+CNF O1+CNB1+P8+PF4 **LS**:N4+LH3+TI+S1+CBG5+CBG6+CTFO1+CTB2+CNF O1+CNB1+P8+PF4	**PS:**N2+LH4+TI+LV1+S1+CBG5+CBG6+CTFO2+C NFO1+P8+F12 **RS**: N1+TC+S1+CBG5+CBG6+CNFO1+P8 **LS**: N1+TC+S1+CBG5+CBG6+CNFO1+P8
Subtype	
Subtype'	Subtype''
PS: N1+TT+LV2+S3+CNFO3 **RS**: N6+LH5+TT+S1+CTFO2+CNFO1+F3 **LS**: N1+TT+S1+CNFO1	**PS**:N6+LH6+TT+LV2+S3+CTFO2+CNFO4+P10+P1 1 **RS**: N1+TT+LV2+S1+CNFO1+P9+F14 **LS**: N1+TT+LV3+S3+CNFO3+F6+F14

A third singular subdivision (Table 11) into a single configuration is revealed for Type 3: ELS+LS1+LS+PS+RS+RS1+ERS. This specific configuration is found in only one case within the corpus of the study, namely sample 2 corresponding to the Skikda railway station.

This typology is distinguished by its notable intricacy concerning supra-segmental attributes, and it exhibits a pronounced diversity in terms of compositional hierarchies. Notably, it is the sole category characterized by a configuration exceeding two levels of composition. Furthermore, this architectural style introduces novel constituents, notably the belfry, colloquially referred to as the "faux minaret". Another characteristic feature is that all segments of this type are covered by a flat roof (TT). Of particular significance, the novel supra-segments denoted as RS1 and LS1 manifest an axial asymmetry, constituting a hitherto unobserved configuration within this architectural category. These two constituents are characterized by a dual-level composition devoid of horizontal interruptions. Additionally, it merits attention that the level contrast, grounded in form, is observable in the second tier of each supra-segment.

Table 11. Codified representation of type 3. (Authors, 2024)

TYPE 3
PS: N3+LH2+TT+LV1+S1+CTFO3+CNFO1+P12+F9+F10
RS: N2+LH2+TT+LV1+S1+CTFO2+CNFO1 (RDC+R+1) +P12+F8
LS: N2+LH2+TT+LV1+S1+CTFO2+CNFO1 (RDC+R+1) +P12+F8
RS1: N4+LH3+TT+LV2+S1+CTFO2+CNFO1+CNFO2+P7+F11
LS1: N4+LH3+TT+LV2+S1+CTFO2+CNFO1+CNFO3+P7+F7
ERS: N1+TT+S1+CTFO1+CNFO1+F8
ELS: N5+LH1+LH3+TT+S1+CTFO3+CNFO1+F6+F10+F6

Following an in-depth analysis of the results obtained on both extrinsic and intrinsic aspects, a number of correlations between the architecture, forms and architectural style of railway stations in Algeria emerge in a discernible manner. It is worth highlighting the diversity that prevails in terms of architectural style, which is attributable to the time lag between the design and construction of each building. In addition to the features inherent in these architectural structures, a subsequent observation proved relevant following the morphological characterisation of the corpus under study (Figure12). The examination revealed that Type 1 railway stations correspond to the main stations in Algeria. These stations were built along the country's most prominent line, the imperial line. Type 2, which is subdivided into sub-types, has a morphology similar to that of Type 1, albeit on a reduced scale. As a result, this type of station is typical of the intermediate stations on the eastern line. Sub-types 2 derive their architectural influences from the type 2 model, while incorporating elements from the local architecture characteristic of the region. These elements include domes, minarets and galleries, in harmony with the architectural motifs typical of the locality. Type 3 is clearly in keeping with colonial policy, which aimed to achieve a progressive approach by adhering to the neoclassical style. At the same time, this contemporary architectural orientation is inspired by neo-Moorish motifs. This typology is characterised by the reintroduction of the belfry element, although this occurrence now refers to the minaret - an emblematic element of public buildings from this period. A crowning element reminiscent of a dome also sets this type of architecture apart.

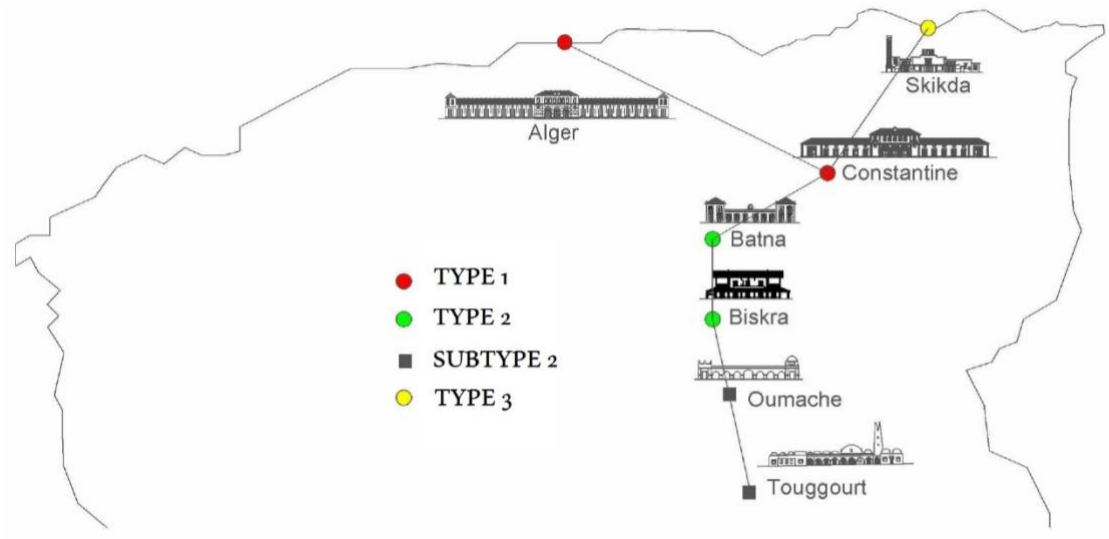


Fig. 12. Disposition and geographical location of types and sub-types. (Authors, 2024)

Conclusions.

This research constitutes a substantial and meaningful contribution to the comprehension of Algeria's railway heritage, specifically pertaining to railway stations. It unequivocally underscores that the architectural style and characteristics of railway structures in Algeria, which were crafted under the influence of the imported European model, have indeed incorporated distinct elements embodying defensive, military, and security attributes, in addition to locally derived features. Furthermore, this investigation has substantiated the existence of a distinctive form of railway architecture in Algeria, a product of the simultaneous confluence of

multiple factors, including colonial policies of the era, the railway industry's influence, and local needs and characteristics.

In its entirety, this study introduces novel insights and provides a foundational framework for the preservation and enrichment of the railway heritage. Notably, it lays the groundwork for prospective, comprehensive research endeavors, innovative preservation initiatives, and a reinvigorated recognition of the pivotal role played by railway stations in Algeria as integral components of its cultural and architectural heritage.

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