

The influence of Regional Building Materials on the Architecture of French Gothic Cathedrals

A comparative Study of the Cathedrals: Chartres, Amiens and Albi

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Abstract

This thesis discusses to what extent local building materials influenced in the structural composition, aesthetic beauty and symbolic meaning of three great French Gothic cathedrals Chartres, Amiens and Albi. While Gothic architecture is normally imagined as a monolithic stylistic phenomenon, this thesis illustrates that local material availability and geological location had a significant role in generating diverse architectural outcomes. Through comparison, the research demonstrates how limestone at Chartres and Amiens enabled verticality, intricate sculpture and light interiors, whereas brick in Albi produced enormous, fortress-like buildings emphasizing ecclesiastical domination. From architectural theory, historical records and material analysis, this research reveals the material, spatial interdependence of place and architectural innovation, demonstrating a more nuanced understanding of Gothic architecture as regionally and materially dependent.

Keywords: Gothic architecture, building materials, Chartres, Amiens, Albi, regionalism, limestone, brick, medieval construction

Introduction

The soaring vaults, colourful windows and sculptural statues of the French Gothic cathedrals have captivated architectural historians, architects and artists for centuries. Yet behind the beauty and religious ambition of these great buildings lies a more mundane and less investigated influence: the influence of local building materials. While Gothic architecture is typically addressed in terms of stylistic evolution and engineering feats, this thesis foregrounds materiality, not merely as a technical constraint but rather as a productive force in the generation of Gothic form and meaning.

Although researchers such as Frankl (2000) and Bony (1983) have more than adequately explored the spatial and symbolic dimensions of Gothic architecture, the specific role of locally available materials in structuring and appearance has been a tangential concern. In addition, comparatively few studies have undertaken comparative analysis connecting geological availability to architectural outcome at multiple locations. This research attempts to fill that gap.

This thesis investigates the ways in which local material conditions like stone in Chartres and Amiens and brick in Albi impacted the construction process, structural innovations and aesthetic decisions in three great French Gothic cathedrals. The main research question is:

How did local building materials influence the structure and aesthetic of Chartres, Amiens and Albi?

To address this question, the following sub-questions are examined:

- What building materials were available in each area?
- How did materials influence structural tendencies such as height, light incidence and durability?
- To what extent did the aesthetic qualities of materials dictate the symbolism and appearance of the cathedrals?



Figure 1: Cathedral of Amiens, (Structurae, z.d.)



Figure 2: Cathedral of Chartres, (The Editors of Encyclopaedia Britannica, 1998)



Figure 3: Cathedral of Albi, (Wikipedia contributors, 2025)

Methodologically, the study employs a comparative case study approach supported by architectural and material analysis. It draws upon primary historical documents, existing material studies and ongoing research in architectural history and medieval construction theory.

Gothic architecture, this thesis argues, despite its pan-European label, was intensely regionalized in expression. Material availability was not the simple backdrop to design, but a co-author of the architectural tale, shaping everything from technical resolution to iconographic expression. The comparative case study of Chartres, Amiens and Albi puts materiality as a prism through which to understand not only how cathedrals were built, but why they look and feel the way they do.

By reimagining these cathedrals in light of their material origins, this thesis introduces a new voice into Gothic scholarship. One that recontextualizes well-known monuments and brings long-overdue attention to the architectural personality of lesser-known examples like Albi. In doing so, it enriches our understanding of the ways that architecture mediates between nature, culture and religion.

Chapter 1: Building Materials Used and Regional Availability

1.1 Introduction

Gothic architecture, while common to universal stylistic characteristics, is characterized by regional variations dependent on the availability and nature of local building materials. This chapter explores the dominant building materials used in three of France's most renowned Gothic cathedrals, Chartres, Amiens and Albi. It explores how geological, economic and cultural factors affected their selection and architectural appearance. The materiality of the cathedrals not only dictated their structural character but also their symbolic and aesthetic meanings.

1.2 Chartres Cathedral: Berchères Limestone

Chartres Cathedral, in the Île-de-France region, is renowned for material and form uniformity. The cathedral was constructed primarily of Berchères limestone, a readily available fine-grained, white-grey calcareous stone from quarries in the area around Chartres (*Pierre de Berchères*, z.d.). This limestone was extremely resistant to frost and compression, which made it easy to achieve tall, thin walls, high clerestories and complex sculptural programs (Frankl & Crossley, 2000, pp. 105–106). In the village of Berchères-les-Pierres, the people extracted the quarry for over thousand years. While the hardness of the Berchères limestone certainly made the completion of a large-scale construction possible, the successful completion of the cathedral also depended on the organisation skills of the local guilds, ecclesiastical patronage and the documented

tradition of sacred buildings in the region (*Pierre de Berchères*, z.d.). In figure 4 is a detail picture seen of the limestone that is used to build the cathedral.



Figure 4: Berchères limestone used for cathedral, (Structurae, z.d.-b)

The consistent use of this limestone throughout the cathedral created visual unity and allowed for detailed figurative programs on portals and facades. As Turnbull (1993) suggests, building at Chartres was decentralized and relied on local knowledge, geometry and skill, with masons working ad hoc from templates and string. Although Turnbull (1993) rightly emphasises the pragmatic value of using locally available stone, his focus on ad hoc craftsmanship perhaps underestimates the intentionality of the overall design programme, which combined complex iconographic schemes with theological and liturgical objectives.

1.3 Amiens Cathedral: Lutetian Limestone

Amiens Cathedral in the Picardy region exemplifies a High Gothic prototype type with its verticality and refinement of detail. The main building material used here was high-grained Lutetian limestone, which came from local quarries, particularly near Saint-Leu-d'Esserent and the Oise valley (Frankl & Crossley, 2000, p. 114–116; Vondráčková et al., 2016, p. 1754).

This harder, denser stone allowed for the construction of slender piers, higher nave walls and extremely complicated tracery. The characteristics of the stone permitted structural and decorative elegance, but this must be seen alongside Amiens civic aspirations and economic prosperity. As Davis (1999, p. 420) indicates, Amiens cathedral was not merely a feat of engineering, but also a physical manifestation of the image of the city and its growing prominence. In figure 5, the limestone is shown in a close up picture of the cathedral.



Figure 5: Lutetian limestone used for cathedral, (Debbie, 2019)

Moreover, regional prosperity economically enabled investment in such high-quality materials. Amiens was a prosperous textile industry hub in the 13th century and this wealth funded the monumental scale and its demanding use of superior limestone of

the cathedral (Frankl & Crossley, 2000, p. 114–116). The structural analysis of Frankl & Crossley (2000) demonstrates the functional advantage of limestone. However, they pay little to no attention to the ways in which the textile wealth of the city and the political rivalry with other bishoprics might have influenced the decision to extend the verticality beyond Chartres.

1.4 Albi Cathedral: Brick as Regional Identity

Far from the light-filled cathedrals of Chartres and Amiens, the Cathédrale Sainte-Cécile of Albi in the Occitanie region was built nearly all of baked clay brick. The decision was not a stylistic choice but one of regional expediency: the lack of natural stone and the presence of clay made brick a viable and economic option (Thomas, 2002, pp. 1–6). The construction of the cathedral began in 1282, led by Bishop Bernard de Castanet, a pivotal leader in the re-establishment of Catholic rule following the Albigensian Crusade. The cathedral "encloses, on an unusual scale, all the elements of southern architecture: a large single nave, resting on heavy buttresses, small windows and a serious fortress-like look" (Barrenechea, 2025, p. 17). The resulting structure, with its massive walls, little exterior ornamentation and slit-like windows, reflects both the material restraint and the ideology of the time. Brick required load-carrying walls that precluded the sculptural lightness found in northern cathedrals, but also had ascetic heft, monumentality and strength. Features suitable for a post-crusade context characterized by the imposition of orthodoxy and episcopal dominance (Thomas, 2002, pp. 1–6; Henderson, 2013).



Figure 6: Brick used for cathedral, (Henderson, 2013)

The architecture therefore played a dual purpose: it adapted to material and economic constraints while visually articulating ecclesiastical authority within a region previously stigmatized as heretical. As Barrenechea (2025, p. 17) notes, the personality of Bishop Bernard de Castanet “a polemical figure and defender of the Church’s autonomy against royal authority” may explain this architectural assertiveness. Albi’s fortress-like silhouette ultimately reflects not only material pragmatism, but also the symbolic ambitions of a Church re-establishing its control over the region.

1.5 Comparative Overview

Cathedral	Primary Material	Source/Region	Properties	Impact on Architecture
Chartres	Berchères limestone	Beauce Plateau (near Chartres)	Durable, easy to sculpt	Uniformity in style, intricate sculpture, clarity of form
Amiens	Lutetian limestone	Picardy (Saint-Leu etc.)	Dense, strong, fine-grained	High vaults, thin piers, fine tracery
Albi	Brick	Local clay from Occitanie	Solid, heavy, less suitable for carving	Thick walls, austere exterior, fortress-like massing

1.6 Conclusion

Regional materials not only influenced structural forms in French Gothic cathedrals but also conveyed broader cultural, economic and symbolic meanings. At Chartres, the limestone allowed for aesthetic and technical refinement, at Amiens, material strength allowed for bold structural ambitions and at Albi, brick use created an architecture of restraint and power. This chapter has shown that material conditions actually shaped architectural expression, but never in isolation. Rather, materials blended with economic potential, political initiative and theological aspiration. By situating material analysis within the broader cultural forces, this work upends the stylistic homogeneity typically ascribed to Gothic architecture and reveals a more complex, regionalized architecture.

Chapter 2: Influence of Materials on Structural Innovations

2.1 Introduction

The structural innovations of Gothic architecture, its enormous elevations, delicate ribs, and airy interiors were not only the exclusive outcome of abstract engineering genius or devotional impulse. They were also based on the physical behaviour and limitations of the local building materials. This chapter considers how materials at Chartres, Amiens and Albi cathedrals directly affected their structures, enabled (or limited) technical innovation and prescribed features like vertical height, light incidence and durability.

2.2 Chartres Cathedral: Structural Optimism in Limestone

The locally available Berchères limestone at Chartres permitted structural confidence without compromising on stability. The rather light but convenient to work with stone, gave satisfactory compressive strength. It was a characteristic that was necessary to support thin and tall walls and pointed arches.

As Turnbull (1993) puts it, medieval masons absence of formal structural theory was compensated by thorough local knowledge and geometry-based methods, including the use of string, templates and trial-and-error fine tuning. This means that the physical handling and familiarity with Berchères limestone controlled the way that builders organized buttressing systems and vaults (Turnbull, 1993, pp. 317–320). These flying buttresses are shown in figure 7. While Turnbull (1993) maintains Chartres masons decentralized, empirical approach, his analysis gives less priority to the master planning or liturgical thought which would have governed the coherence and monumentality of the building.



Figure 7: Flying buttresses Chartres Cathedral, (Notmusa, z.d.)

In addition, Frankl & Crossley (2000) characterize Chartres interior as one of the first examples of a coherent skeletal system, with piers, ribs and vaults producing a

continuous transmission of force down to the floor (figure 8). The stone enabled builders to experiment freely with taller clerestories and narrower wall planes, this was supported by a strong patronage structure and theological motives to create a luminous and elevated space for worship (Frankl & Crossley, 2000, pp. 105–106).



Figure 8: Rib vaulting Chartres Cathedral, (Jessiechensaid, z.d.)

The roof of the cathedral was made of a wooden frame that was called the forest. But in 1836 it was destroyed by a fire. A new frame was made, not by wood but it was a metal structure with a copper cover that replaced the missing elements (*Chartres Cathedral, France - Google Arts & Culture*, z.d.).

2.3 Amiens Cathedral: Engineering at the Limits

The Amiens cathedral is the epitome of High Gothic ambition. Here, the Picard limestone, notable for its superb compactness and density, allowed for the achievement of extremely high vaults, 42.3 meters in the nave (figure 9). That is one of the tallest of any French Gothic cathedral (Frankl & Crossley, 2000, pp. 114–115). The stone's compressive strength made such vertical ambition feasible structurally.



Figure 9: Rib vaulting, Amiens Cathedral, (*The Editors of Encyclopaedia Britannica*, 1999)

But bending the material limits had a cost. Amiens flying buttresses were designed at a great cost and iron tie rods and double flying arches were used by the builders to support the upper walls (Vondráčková et al., 2016, p. 1755).



Figure 10: Flying buttresses, Amiens Cathedral, (Wikipedia contributors, 2025)

Frankl comments on how physical material and the requirement of spiritual aspiration were joined at Amiens: the immense height is neither an ornament nor a symbol, but the outcome of material deployment planned to balance vertical thrust and horizontal stability (Frankl & Crossley, 2000, pp. 114–117). It was the solid strength of Picard limestone that enabled such structural beauty to exist, but it was the combined force of economic ability, urban want and theological meaning that compelled this architectural masterpiece.

2.4 Albi Cathedral: Brick and the Architecture of Solidity

In Albi, when stone was supplanted by brick, the entire building system was different than the cathedrals in the north. Bricks lower tensile strength and high density rendered impossible the thin walls and delicate stone-like tracery. Rather, the architects at Sainte-Cécile designed a cathedral of fortress style, with dense load-bearing walls, minimal outside sculpture and internal vaulting relying on volume rather than the resolution of tension (Thomas, 2002, pp. 1–6). Thomas (2002) presents Albi's form as materially determined by brick, but this reading could be expanded by considering how the fortress-like appearance may also have functioned as a visual response to regional instability after the Albigensian Crusade shown in the previous chapter.

The use of brick limited the rise of vaults and the proportion of openings, hence reducing the role of flying buttresses. The weight of walls became the prime force absorber. This practical restriction provided a different kind of Gothic expression, one of power, bulk and dominance rather than lightness and loft. This is seen in figure 11.



Figure 11: Load-bearing walls, Albi Cathedral, (Albi Cathedral, 2025)

Characteristically, the vaults of Albi also exhibit Gothic ribbing, though in a structurally conservative and simplified form. The use of brick consequently defined not only the paths of loading but also the very sense of space, converting the Gothic from airy to massive (figure 12)(Thomas, 2002, pp. 1–6).



Figure 12: Rib vaulting, Albi Cathedral, (Wikipedia contributors, 2025a)

2.5 Structural Durability: Material and Time

Durability is a material property that cannot be divorced from structure. Limestone's capacity at Chartres and Amiens to weather centuries of exposure without disintegration provided an assurance of permanence for flying systems and exterior decoration. Frankl points out the way that such stone permitted sculptural programmes and intricate facades to endure despite climate and pollution (Frankl & Crossley, 2000, p. 175).

Conversely, bricks durability is measured differently. While less susceptible to erosion than some limestone types, brick imposes limitations on load dispersion, leading to more conservative structural geometries. Yet, Albi's survival through wars and neglect demonstrates how massive masonry can ensure resilience through brute volume (Thomas, 2002, p. 5).

2.6 Comparative Matrix

Cathedral	Material	Max Vault Height	Structural Solution	Role of Material
Chartres	Berchères limestone	~36 m	Flying buttresses, skeletal piers	Allowed for elegant verticality and thin walls
Amiens	Picard limestone	42.3 m	Advanced buttress system, iron ties	Enabled height and lightness, but near material limits
Albi	Brick	~30 m	Load-bearing thick walls, minimal buttressing	Enforced solidity, limited openness and height

2.7 Conclusion

The Gothic cathedrals technical advances were not generic formulas but deeply material-specific solutions. In Chartres, the local limestone is used to organize balanced weight distribution with precision. At Amiens, the capacity to support more weight permitted record-breaking vaults and technical sophistication. At Albi, the structural choices reflect bricks bodily limitations, firm, earthy, imposing.

Rather than existing solely as an appendix to architecture, but these material conditions worked together. They interact theological imagination, local resources and institutional

hopes. This dependence of matter and meaning is what shows us that Gothic structure is not so much a question of form-following-function, but rather a negotiation between physical constraint and cultural expression.

Chapter 3: Aesthetics and Symbolism of Building Materials

3.1 Introduction

In Gothic building art, materials are never neutral. They are laden with symbolic meaning, aesthetic possibility and geographic narrative. This chapter explores how the prevalent building material of Chartres, Amiens and Albi influenced not just the visual character of each cathedral but also its theological symbolism, spatial atmosphere and geographic identity.

3.2 Chartres Cathedral: Limestone as Medium of Light and Iconography

The use of light-coloured Berchères limestone in Chartres Cathedral greatly impacted its visual and symbolic environment. The material allowed for high-level sculptural detail, which enabled the extensive iconographic schemes of the portals, capitals and archivolts to be carried out with precision and legibility (Frankl & Crossley, 2000, pp. 106–107). There are more than 1500 statues carved from Lutetian limestone (*Chartres Cathedral, France - Google Arts & Culture*, z.d.).



Figure 13: Jambes of the center doorway of the Royal Portal, with statues of the men and women of the Old Testament, Chartres, (SCULPTURES – American Friends Of Chartres, z.d.)

The sheer reflectivity of the limestone also enhanced light within buildings, a key Gothic objective. As Fingesten (1961) argues, Gothic cathedrals such as Chartres were intended as blueprints of the universe where form expressed divine harmony. Guided by Abbot Sugars ideals, stone transcended its weight, becoming a conduit for heavenly

light in service of a luminous theology (Fingesten, 1961, pp. 4–6). Although the sculptural capacity of the limestone enabled narrative expression, these iconographic programs were no less inspired by didactic liturgical functions and theological requirements arising from Chartres pilgrimage status.

Furthermore, the sculptural quality of the material allowed masons to create richly carved reliefs that animated facades with saints, prophets and heavenly visions. This conversation between material and meaning enhanced the narrative and didactic function of the cathedral's facades.

The deep blue colour that dominates Chartres Cathedral's stained glass windows became so famous that it earned the name Chartres Blue. This distinctive colour was originally produced with a sodium flux mixed with substances like cobalt, antimony, copper and iron. In the 13th century, the chemical makeup of the glass changed, beech ash increasingly replaced cobalt, yielding a darker, more saturated blue (Chartres Cathedral, France – Google Arts & Culture, n.d.). An example is shown in figure 14.

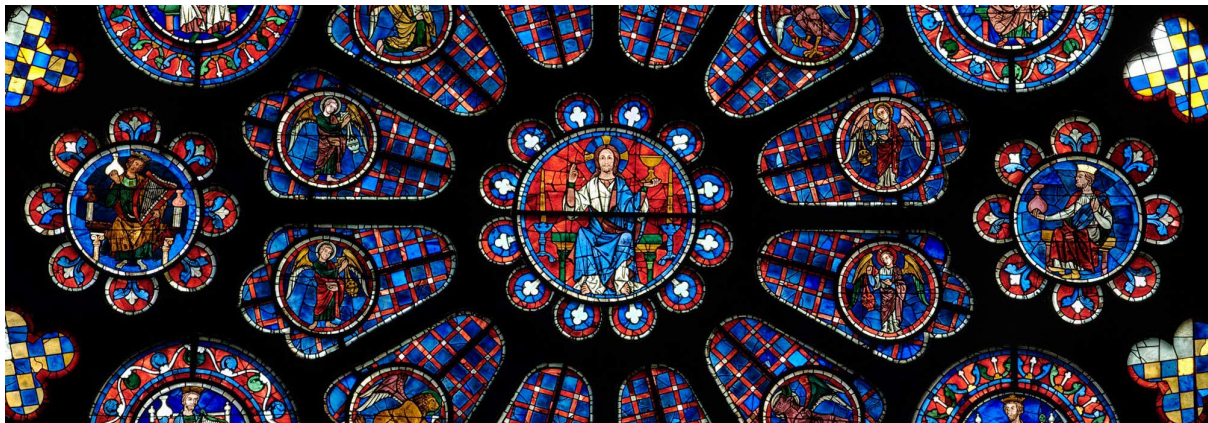


Figure 14: Stained glass, Chartres Cathedral, (*The Stained Glass Windows - Cathédrale de Chartres*, 2024)

3.3 Amiens Cathedral: Nuanced Limestone and Theatrical Light

Amiens Cathedral utilized high quality Lutetian limestone, prized not just for its strength but for the delicate tonal gradations. This allowed sculptors to achieve subtle gradations of surface treatment, necessary for the fine modelling of religious figures and narrative subjects (Frankl & Crossley, 2000, pp. 114–115) (figure 15).



Figure 15: Sculptures Amiens Cathedral, (*The Editors of Encyclopaedia Britannica*, 1999b)

What was distinctive about Amiens aesthetically is that it used material to encourage a theatrical space experience. The extensive height and open lines of the stonework, combined with extensive clerestory windows, created harsh light and dark contrasts. This gave rise to what Davis (1999) refers to as a "polysemous space", where architectural elements serve also as symbolic referents, light as Holy Spirit, stone ribs as spiritual order (Davis, 1999, pp. 414–416). Davis's interpretation is powerful in its symbolization of architectural detail. But one wonders if sometimes this symbolism was deliberately inscribed or whether some arose out of spatial practice and cult practice.

In addition, the uniform pale stone creates a very good environment for stained glass projections (figure 16), enhancing the sensory impact of colour and theology. This union of material and light produced a sacred mood. This sacred mood, while materially grounded, also reflects evolving devotional trends in the 13th century that prioritized sensory immersion and affective religion. This was a movement visible across Northern France.

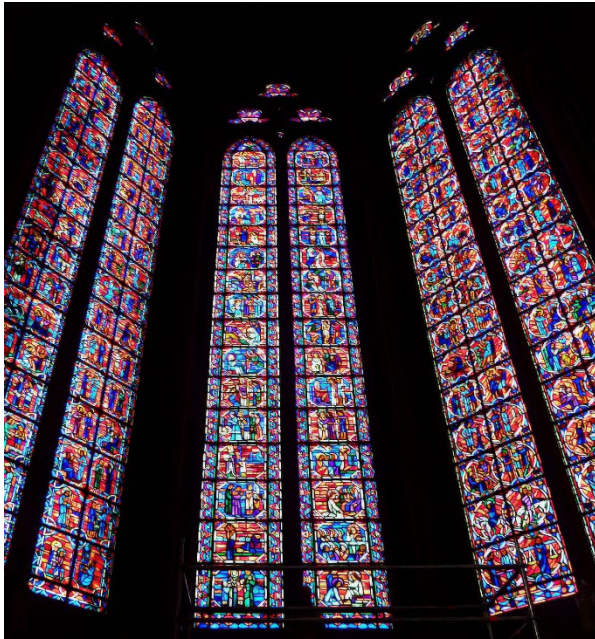


Figure 16: Stained glass, Amiens Cathedral, (Broadhurst, 2020)

3.4 Albi Cathedral: Brick and the Aesthetics of Power

Albi Cathedral, built almost entirely of red fired brick, is a jarring stylistic contrast. Its unbroken, opaque facades and ascetic geometry give an impression of fortress like solidity. The colour of the brick, warm, earthy and local, invokes not transcendence but authority and enclosure (Thomas, 2002, pp. 3–6).

This aesthetic is intimately linked to Albi's historical context. Following the Albigensian Crusade, the Catholic Church sought to assert doctrinal orthodoxy and spiritual control in a region long associated with heresy. The cathedral's design responded through architectural restraint, shaped not only by bricks limitations but by an evolving ecclesiastical aesthetic that emphasized internalized spirituality and doctrinal clarity.

“Albi's brick walls do not invite light, they absorb it. The architecture is not a vision of heaven but a statement of terrestrial authority” (Thomas, 2002, p. 5). Thomas's reading aligns the material with political authority, which is persuasive. However, the use of brick also reflects continuity with local Romanesque traditions and material pragmatism, not only post-crusade messaging.



Figure 17: Sculpture, Albi Cathedral, (Structurae, z.d.-a)

While less suited for intricate ornamentation, the brick surfaces were occasionally enhanced with frescoes and interior polychromy, offering an alternative visual richness. Aesthetic restraint here aligns with values of sobriety and discipline, reinforcing the building's didactic purpose (Barrenechea, 2025).

3.5 Color Symbolism, Textural Connotation and Form

The visual impact of architectural materials in Gothic cathedrals was also filtered through symbolism of colour and textural meaning. Light limestone at Chartres and Amiens came to be associated with purity, sanctity and celestial translucence, imagined ideals drawn from Neoplatonic ideas about divine light (Fingesten, 1961, pp. 7–9).

By contrast, the dense red brick of Albi created a material language of earth, fire and authority. The lack of reflective surfaces and the restrained treatment of ornament generated a spatial theology of interiority and discipline, though it also reflects a visual tradition distinct from Northern Gothic ideals. One rooted in the austere material cultures of southern France (Fingesten, 1961, pp. 7–9). While Fingesten (1961) calls on Neoplatonic ideals to explain light symbolism, his own explanation is directed specifically to northern instances. In Albi, material expression was less compatible with light metaphysics and more with spatial enclosure and acoustic atmosphere.

Moreover, Gothic material sensibilities were never merely visual. They engaged all of the senses: the chill of stone, vault sound and even the aroma of wood or plaster all helped to construct a multisensory sacred environment. The materials consequently pre-conditioned both symbolic signification and daily life.

3.6 Comparative Overview

Cathedral	Material	Aesthetic Qualities	Symbolic Expression	Artistic Outcome
Chartres	Light limestone	Bright, finely sculpted, reflective	Divine light, cosmic harmony	Narrative portals, luminous elevation
Amiens	Compact limestone	Smooth, pale, nuanced	Theatrical light, transcendence	Sculptural refinement, stained glass interaction
Albi	Red brick	Opaque, earthy, massive	Ecclesiastical power, sobriety	Fortress-like unity, minimal ornamentation

3.7 Conclusion

French Gothic cathedral material aesthetics were not random but rather ideologically inflected, regionally determined and spiritually calculated. Limestone at Chartres and Amiens facilitated articulations of light and spiritual ascension, whereas brick at Albi enforced a visual discourse of order and discipline. Material symbolic and sensorial impact was interwoven with theological, liturgical and cultural forces, forming a complex dialogue between matter and meaning. By form, colour and texture, materials were the means of meaning, shaping both how the cathedrals were built and how they were experienced by centuries of pilgrims.

Chapter 4: Synthesis and Comparative Analysis

4.1 Introduction

The cathedrals of Chartres, Amiens and Albi are three distinct responses to a common vision in architecture: the creation of sacred space through verticality, light and symbolic ornament. Their differences in form, structure and symbolism demonstrate how regional materiality and socio-political context reshaped a shared Gothic vision into distinct architectural expressions. This chapter weaves together the conclusions of earlier chapters, examining how availability, economic factors, material characteristics and regional identity shaped these three great buildings of French Gothic architecture.

4.2 Availability and Economic Influence of Building Materials

The three cathedrals utilized materials that were locally available, but the quality and nature of the materials differed considerably and influenced design from the very start.

- Chartres utilized local quarries of Berchères limestone, reducing transport costs and allowing extensive uniform use (Frankl & Crossley, 2000, p. 106).
- Amiens, within a more prosperous region, exploited good-quality Lutetian limestone deposits near the Oise valley. 13th-century Picardy's economic prosperity, driven by the production of textiles, allowed the bringing in of the best quality of stone even from more distant quarries (Vondrářková et al., 2016, p. 1754).
- Albi, under regional geology and post-crusade austerity, employed locally produced brick, a non-traditional Gothic ecclesiastical material in application, yet one that was frugal and symbolically resilient under the conditions (Thomas, 2002, pp. 3–5).

Such examples indicate how local conditions of geology and economy directed the material range and therefore outlined the cathedrals' architectural potentialities from the start, shaping aspiration within limitation.

4.3 Structural and Technical Differences

Structural options were directly controlled by material properties, including the way builders addressed issues like height, load-bearing ability and openness of spaces. Each cathedral produced distinctive structural reactions based on the compressive strength, workability and formal language facilitated by its primary material. These reactions were not only technical but also conveyed theological and symbolic meanings, as explored below.

Cathedral	Structural Approach	Influencing Material
Chartres	Ribbed vaulting, flying buttresses, tall clerestories	Durable but moderately heavy limestone enabled complex but balanced skeletal systems (Turnbull, 1993, pp. 317–318)
Amiens	Ultra-tall vaults, multiple flying buttresses, iron reinforcement	Dense limestone permitted soaring height and thin piers, though pushed structural limits (Frankl & Crossley, 2000, p. 115)
Albi	Thick, massive load-bearing walls, minimal buttressing	Brick required conservative engineering; verticality and light were limited by compressive strength (Thomas, 2002, p. 5)

4.4 Aesthetic and Symbolic Functions of Materials

Aside from structure, material influenced aesthetic philosophy and theological statement.

- Chartres: Its light-permeable limestone enabled sophisticated sculpture and interaction with stained glass, evidencing a cosmic and Neoplatonic spirituality (Fingesten, 1961, pp. 4–6).
- Amiens: Its pale, smooth stone was hospitable to visual clarity and vertical transcendence, a theatrical sacred space welcoming affective devotion (Davis, 1999, p. 416).
- Albi: Its red opaque brick expressed ecclesiastical power and doctrinal rigidity, aesthetic minimalism was a deliberate choice, recalling Dominican severity and political intent after the Albigensian Crusade (Thomas, 2002, pp. 3–6).

Material thus acted as symbolic medium, not merely construction material, facilitating how theology, local culture, and history were incorporated into architecture.

4.5 Convergences and Divergences

Convergences:

- All three cathedrals articulate Gothic ideals, verticality, unity, sacred symbolism, but each converts these goals to the affordances and constraints of local materiality.
- Despite differences in materials, all utilized rib vaulting, albeit to differing degrees of elaboration and scale.

Divergences

- structural emphasis is different: Chartres balances height and weight; Amiens maximizes verticality; Albi concentrates on solidity and mass.
- light and space: Chartres and Amiens are dynamic space and light, while Albi is dense to behold and reflective.
- iconographic type: Stone (Chartres, Amiens) permitted rich biblical narrative in sculpture; brick (Albi) preferred inner decoration and austere outer surfaces.

4.6 General Insights: The Importance of Material in Determining Gothic

The comparative study of Chartres, Amiens and Albi proves that Gothic architecture is not a style imposed upon diverse regions. But an architectural compromise by which architects translated spiritual desire and liturgical function into built structure, working within the affordances and constraints of their materials.

Where Frankl presents Gothic unity as a mental harmony of space and form, this thesis reveals the diversity of that harmony as regional expression of identity in matter. The Gothic was not merely a question of height, but elevation adapted.

4.7 Conclusion

By this synthesis, we can see that French Gothic cathedrals were not simply "built" but culturally and materially made. Chartres, Amiens and Albi each express a unique regional theology, a material spirituality. Where stone or brick is the medium through which divine presence is imagined and brought into being. The study of building materials thus provides not simply insight into technical process but opens a wider understanding of how architecture inscribes meaning, identity and belief.

Conclusion

This thesis has traced the formative role of local building materials in the architectural, structural and symbolic development of three French Gothic cathedrals: Chartres, Amiens and Albi. While existing scholarship has traditionally understood Gothic architecture within paradigms of style, verticality and theological symbolism, this thesis refocuses the argument on material agency. Placing geology, availability and economy at the centre of architectural expression.

The literature acknowledges the presence of limestone and brick in these cathedrals but naturalizes these materials as background conditions rather than active design drivers. The novelty of this research lies in its comparative, material-specific approach: by analysing how different cathedrals responded to local material conditions, it shows that Gothic architecture was less a monolithic stylistic program than a regionally inflected architectural process.

At Chartres, the local availability of Berchères limestone enabled the development of a highly integrated architectural scheme, marked by high vaults, expansive clerestory windows and intricate sculptural programs. At Amiens, the fine-grained limestone of Picardy allowed masons to innovate structurally and to achieve remarkable verticality and slenderness of tracery. These examples confirm the conventional account of Gothic innovation, but enhance it by showing how such achievements were rendered possible in material terms.

Albi, by contrast, offers new insight into the flexibility of the Gothic idiom. Built almost entirely of brick due to a scarcity of local stone, Albi Cathedral contradicts prevailing notions of the appearance of Gothic architecture. Its massiveness, starkness and absence of decoration seem not so much aesthetic deficiencies as thoughtful responses to material constraint and post-crusade ecclesiastical authority. This thesis brings Albi forward not as an exception, but as a witness to the creative negotiation between resource and vision.

In all three cases, material was not just structural, it was symbolic, sensory and regional. Limestone provided the luminous backdrop for theological narrative and optical drama, brick provided solidity and institutional gravity. These findings dismantle the conception of Gothic architecture as a stylistic unity and recast it as a materially diverse phenomenon shaped by context and constraint.

By doing so, this study contributes in three ways to the field of architectural history:

- It demonstrates that material availability posed not a limit but a source of architectural form.
- It proposes a comparative model that highlights the geological and cultural diversity inherent in French Gothic architecture.

- It foregrounds materiality as a hermeneutic tool, inviting researchers to reconsider construction media not as passive vessels, but instead as generative agents in the production of spatial and symbolic meaning.

Lastly, this thesis proposes a new type of reading of Gothic architecture, not as the triumph of abstract style or ecclesiastical ambition alone, but as a dialogue between human desire and material circumstance. That dialogue, inscribed in the stone of Chartres and Amiens and brick the brick of Albi, remains heard today in the silent testimony of their standing walls.

References

Barrenechea, L. (2025). *Occitanie, terre de cathédrales*. Direction régionale des affaires culturelles Occitanie.

Chartres Cathedral, France - Google Arts & Culture. (z.d.). Google Arts & Culture.
<https://artsandculture.google.com/story/chartres-cathedral-france-unesco/8AXB4pZjx-G76g?hl=en>

Davis, M. T. (1999). "Sic et Non": Recent trends in the study of Gothic ecclesiastical architecture. *Journal of the Society of Architectural Historians*, 58(3), 414–423.
<https://www.jstor.org/stable/991535>

Fingesten, P. (1961). Topographical and anatomical aspects of the Gothic cathedral. *The Journal of Aesthetics and Art Criticism*, 20(1), 3–23. <https://www.jstor.org/stable/427347>

Frankl, P., & Crossley, P. (2000). *Gothic architecture*. Yale University Press.

Pierre de Berchères. (z.d.). <https://cathedralsofthecosmicchrist.com/index.php?id=964>

Thomas, J. (2002). *Albi Cathedral and British Church Architecture*. The Ecclesiological Society.

Turnbull, D. (1993). The ad hoc collective work of building Gothic cathedrals with templates, string, and geometry. *Science, Technology, & Human Values*, 18(3), 315–340.
<https://www.jstor.org/stable/689724>

Vondráčková, T., Vondráček, D., & Vondráček, V. (2016). Characteristics of Gothic cathedrals in France and their structural elements. *Procedia Engineering*, 161, 1751–1756. <https://doi.org/10.1016/j.proeng.2016.08.771>

Figures References

1. Structurae. (z.d.). Amiens Cathedral (Amiens, 1269) | Structurae. *Structurae*. <https://structurae.net/en/structures/amiens-cathedral>
2. The Editors of Encyclopaedia Britannica. (1998, 20 juli). *Chartres Cathedral | History, interior, stained glass, & facts*. Encyclopedia Britannica. <https://www.britannica.com/topic/Chartres-Cathedral>
3. Wikipedia contributors. (2025, 2 januari). *Albi Cathedral*. Wikipedia. https://en.wikipedia.org/wiki/Albi_Cathedral
4. Structurae. (z.d.-b). Chartres Cathedral (Chartres, 1240) | Structurae. *Structurae*. <https://structurae.net/en/structures/chartres-cathedral>
5. Debbie. (2019, 19 mei). *Notre-Dame d'Amiens - Exploring the Exterior Details - France Travel Info*. France Travel Info. <https://www.france-travel-info.com/notre-dame-damiens-exploring-the-exterior-details/>
6. Henderson, A. (2013, 25 oktober). *Languedoc & Albi, a hilltop treasure & a mighty Cathedral, all built on woad*. Arran Q Henderson. <https://arranqhenderson.com/2013/05/07/languedoc-albi-a-hilltop-treasure-and-a-mighty-cathedral-all-built-on-woad/>
7. Notmusa. (z.d.). *Post by @notmusa | 1 image*. Tumblr. <https://www.tumblr.com/notmusa/3616537261/chartres-cathedral-more-flying-buttresses-than>
8. Jessiechensaid. (z.d.). *Post by @jessiechensaid | 1 image*. Tumblr. <https://www.tumblr.com/jessiechensaid/151594189082/ribbed-vaulting-system-of-chartres-cathedral-this>
9. The Editors of Encyclopaedia Britannica. (1999, 23 maart). *Amiens Cathedral | Gothic architecture, 13th century, UNESCO*. Encyclopedia Britannica. <https://www.britannica.com/topic/Amiens-Cathedral>
10. Wikipedia contributors. (2025, 11 februari). *Amiens Cathedral*. Wikipedia. https://en.wikipedia.org/wiki/Amiens_Cathedral
11. *Albi Cathedral*. (2025, 25 maart). Minube. <https://www.minube.net/place/cathedral--a37392#gallery-modal>
12. Wikipedia contributors. (2025a, januari 2). *Albi Cathedral*. Wikipedia. https://en.wikipedia.org/wiki/Albi_Cathedral
13. *SCULPTURES – American Friends of Chartres*. (z.d.). <https://friendsofchartres.org/the-cathedral/art-architecture-history/art/sculptures/>
14. *The stained glass windows - Cathédrale de Chartres*. (2024, 19 februari). Cathédrale de Chartres. <https://www.cathedrale-chartres.org/en/cathedrale/monument/the-stained-glass-windows/>

15. The Editors of Encyclopaedia Britannica. (1999b, maart 23). *Amiens Cathedral* | *Gothic architecture, 13th century, UNESCO*. Encyclopedia Britannica.
<https://www.britannica.com/topic/Amiens-Cathedral>
16. Broadhurst, K. (2020, 30 juli). *Stained glass in the cathedral at Amiens*.
<https://ckenb.blogspot.com/2020/07/stained-glass-in-cathedral-at-amiens.html>
17. Structurae. (z.d.-a). Albi Cathedral (Albi, 1390) | Structurae. *Structurae*.
<https://structurae.net/en/structures/albi-cathedral>