

PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

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Course handout

PROJECT THEORY 3

S3 : Method of analysis of a construction site

Site and integration into the site

Field: Architecture, Urban Planning, and City Professions

Program: Architecture

Specialization: Architecture

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Summary

The "Project Theory" course for second-year architecture students aims to deepen their understanding of the physical, environmental, and socio-cultural context in architectural design. It introduces key concepts such as typo-morphological analysis, the relationship between architectural objects and their environment, and the social dimension of space. The program is divided into two main parts: site analysis—which covers urban, climatic, natural, and built environments with an emphasis on physical and regulatory data—and project integration into the site, considering natural site perception, types of architectural integration, and topographical constraints. The course's main goal is to develop students' comprehensive site understanding at multiple scales to design architectural projects that meet user needs while respecting their environment, preparing them to face the complexities of architectural production.

Résumé

Le cours « Théorie du Projet » destiné aux étudiants en 2ème année d'architecture vise à leur faire comprendre l'importance du contexte physique, environnemental et socio-culturel dans la conception architecturale. Il introduit des notions clés comme l'analyse typo-morphologique, la relation entre l'objet architectural et son environnement, ainsi que la dimension sociale de l'espace. Le programme se divise en deux parties principales :

L'analyse du site, qui inclut l'étude de l'environnement urbain, climatique, naturel et bâti, avec un accent sur les données physiques et réglementaires et L'intégration du projet dans le site, en tenant compte de la perception du site naturel, des types d'intégration architecturale, et des contraintes topographiques.

L'objectif est de développer chez les étudiants une compréhension approfondie du site à différentes échelles, afin de concevoir des projets architecturaux qui répondent aux besoins des usagers tout en respectant leur environnement. Ce cours prépare ainsi les futurs architectes à affronter les réalités complexes de la production architecturale.

ملخص

يهدف مقرر «نظرية المشروع» الموجه لطلاب السنة الثانية في الهندسة المعمارية إلى تمكينهم من فهم أهمية السياق الفيزيائي والبيئي والاجتماعي الثقافي في التصميم المعماري. يقدم المقرر مفاهيم أساسية مثل التحليل الطوبو-مورفولوجي، العلاقة بين الكائن المعماري وبيئته، بالإضافة إلى البعد الاجتماعي للمكان. ينقسم البرنامج إلى جزأين رئيسيين:

تحليل الموقع، الذي يشمل دراسة البيئة الحضرية والمناخية والطبيعية والمبينة، مع التركيز على البيانات الفيزيائية والتنظيمية.

دمج المشروع في الموقع، مع الأخذ في الاعتبار إدراك الموقع الطبيعي وأنواع التكامل المعماري والقيود الطوبوغرافية.

الهدف هو تطوير فهم عميق لدى الطلاب للموقع على مختلف المستويات، من أجل تصميم مشاريع معمارية تلبى احتياجات المستخدمين مع احترام بيئتهم. بهذا، يُعد هذا المقرر المعماريين المستقبليين لمواجهة تعقيدات الإنتاج المعماري.

Course presentation

‘PROJECT THEORY’ (S3)

The ‘Project Theory’ course is a teaching subject that forms part of the fundamental units of learning in architecture. It has been designed, within the framework of current architectural training, as a fundamental basis for teaching in the ‘Architectural Studio’ and constitutes its theoretical support. This course handout is intended for 2nd year Architecture students. It does not claim to be a specialisation course.

Teaching objectives for the second year.

- Dealing with physical, environmental and socio-cultural factors. On the basis of a familiar pretext for study, the learner broadens his or her field of knowledge by gradually integrating the contextual determinants with which he or she will have to come to terms in a project learning situation as a product of the synthesis of acquired knowledge. In addition to raising awareness of the urban scale, the approach is expected to provide an introduction to :

- Typo-morphological analysis,
- The dialectic between the object and its environment,
- The social dimension of space.

The content of the course is essentially devoted to the acquisition of design tools and methods in which architecture is considered, not as an isolated object, but in its physical, social and cultural context. The course is an opportunity to make second-year students aware of the reality of architectural production and the dualities they will have to face in their future profession.

Its main aim is to help students understand the dialectic of site/project, container/content, space/use, by focusing on the criteria for perceiving a site, its morphology, and the natural and man-made physical factors that characterise it (sun, wind, rainfall, natural landscape, urban landscape, etc.), as well as how to understand an environment in order to implement an architectural project that provides comfort and well-being for its users. :

Part I: Method of analysing a site as the basis for a building, which is the subject of the teaching programme in semester 3 of the course (2nd year Architecture). This should cover :

- The urban environment and the definition of concepts: the district, the neighbourhood unit, the residential group, etc., while integrating notions on urban regulations and town planning instruments (PDAU, POS, etc.). Specifically, the issues, needs and content of urban analysis.
- The climatic environment and the study of climatic data: solar geometry; types of wind and their effects according to the geomorphology of the site; the effects of wind according to the built form.
- The natural environment and the visual approach to the context, the shape of the natural relief, the vegetation and the hydrography.
- The built environment must include an analysis of the gauges, full/empty ratio, skyline, analysis of the facades according to the following criteria: fenestration; grid; ratio of glazed surfaces to opaque walls; horizontal/vertical accent; composition and rhythm (geometric rules); texture and construction materials.

Part II: Site and integration into the site, as part of the teaching programme for semester 3 of the course (2nd year). This should cover :

- The notion of ‘site’ and the criteria for its perception, in particular, the perception of a natural site: silhouettes; contours; textures; groupings; views, focal points and landmarks; sunlight and natural lighting; obstacles to sunlight and views (the masking effect); natural ventilation; vegetation (regulating heat gain, windbreaks, etc.); etc.
- The notion of ‘integration with the site’ and the way in which an environment is apprehended in order to set up an architectural project, definition of the different types of integration (functional integration, socio-cultural integration, morphological integration, etc.), the architect's different attitudes to the built environment (pastiche, mimicry, reference, analogy, opposition, etc.).

- Incorporation of relief, relief and topographical sections, type of siting on sloping ground and stabilisation of sloping ground, earthmoving techniques.

The main objective of the course is :

to instil in students the importance of the site, at all its scales, in the production of works of art.Scales, in architectural and urban production (design). The role of this is to help them understand ‘the dialectic of site/project, container/content, spaces/uses.

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INTRODUCTION TO PART I:

METHOD FOR ANALYSIS A SITE SUPORTING CONSTRUCTION

The analysis of a building site is a crucial stage in the architectural design process. It enables the physical, social and environmental characteristics of the site to be assessed in order to ensure that the project is harmoniously integrated into its context. This analysis takes place in several phases: research, analysis and synthesis. In the first phase, the research involves collecting data on the site, including its topography, history and existing infrastructure. Next, the in-depth analysis examines elements such as sunlight, winds and regulatory constraints, which helps us to understand how these factors can influence the architectural design. Finally, the synthesis brings this information together to guide the design choices, taking into account the objectives of sustainability and comfort for future occupants. Using graphical tools such as diagrams and maps is essential for visualising the relationships between the different variables and for making informed decisions throughout the design process.

In this section, we will look at the urban, natural, climatic and built environment so that the student can understand the building site from all angles. This will enable a complete and relevant analysis of the site, which is essential to guarantee the success of the architectural project.

I/The urban environment

INTRODUCTION

The urban environment, according to urban planners, encompasses the physical, social and economic elements that make up a city. It includes public spaces such as parks, squares and streets, which are crucial for community life and private spaces such as homes and offices, which also determine how people interact within the city, transport infrastructure which facilitates the mobility of residents and is essential for the economic functioning of the city. These include roads, public transport and cycle paths and services, as well as green spaces, which are essential for sustainability (Gehl, 2010). Urban planners take into account social interactions (encounters between individuals, strengthening the social fabric of the community (Talen, 2012) and the needs of communities to create inclusive and accessible spaces) Furthermore, the preservation of cultural heritage is crucial to strengthening local identity (Jacobs, 1961). Thus, the urban environment is emerging as a complex whole requiring an integrated approach to meet contemporary urban challenges (Lynch, 1960; Alexander, 1979).

In short, the urban environment is a dynamic ecosystem that requires an in-depth understanding of the interactions between its various components. For architecture students, this means that it is crucial to adopt a holistic perspective when designing for the city, in order to create spaces that are not only functional but also socially and culturally enriching.

II/ Definition of concepts: neighbourhood, neighbourhood unit, residential cluster :

of activities and a sense of identity, making it easier for people to find their way around and experience the area. These elements include:

- **Boundaries:** The physical or perceptual boundaries that define the neighbourhood, such as roads, rivers or buildings.
- **Paths:** Traffic routes, such as streets and footpaths, that guide movement in and around the neighbourhood.
- **Nodes:** Focal points or meeting places, such as public squares or intersections, where people gather.
- **Districts:** Areas with a particular characteristic or function, such as commercial, residential or cultural districts.
- **Landmarks:** Distinctive visual or architectural elements that help orient residents and anchor their experience of the neighbourhood.

2. Key Diagrammatic Models

Neighborhood Unit Concept:

Clarence Perry's "neighborhood unit," developed in the early 20th century, proposed a self-contained community framework. This model emphasized pedestrian-friendly design, separating vehicular traffic from residential areas to enhance safety and community interaction. Perry's diagrams laid out specific guidelines for the spatial distribution of homes, schools, parks, and businesses within a neighborhood.

Garden City Movement:

Ebenezer Howard's "Garden City" concept introduced diagrams that aimed to address urban overcrowding and pollution by creating self-sufficient communities surrounded by green belts. His vision combined urban and rural elements, promoting a balanced lifestyle that remains influential in modern urban planning¹.

3. Characteristics of Pre-Industrial Neighborhoods:

¹ <https://www.britannica.com/topic/urban-planning/The-era-of-industrialization>

Agrarian Roots: Most neighborhoods were small, agrarian communities centered around agriculture, with houses often clustered around a central square or village green.

Mixed Uses: Residential areas typically included mixed-use spaces where homes, workshops, and small markets coexisted. The community was tightly knit, with social interactions occurring in shared public spaces.

Limited Infrastructure: Urban infrastructure was rudimentary, lacking modern sanitation and transportation systems. Streets were often narrow and unpaved, accommodating foot traffic and horse-drawn vehicles.

4. **The Impact of the Industrial Revolution on Neighborhood Design**

Urbanization: The Industrial Revolution spurred massive urban migration as people flocked to cities for factory jobs. This led to rapid urban expansion and the creation of densely populated neighborhoods near industrial sites².

Infrastructure Development: New transportation networks, including railways and roads, facilitated the movement of goods and workers, reshaping urban layouts to connect residential areas with industrial zones.

Emergence of New Housing Types:

Factory Towns: Planned communities arose around factories, featuring worker housing designed for efficiency. These towns often included essential amenities but were characterized by overcrowded living conditions.

Back-to-Back Houses: In industrial cities, back-to-back houses became common—small dwellings arranged in rows that shared walls but had limited access to light and air. This design aimed to maximize space but resulted in poor living conditions³.

5. **Neighborhood Design After the Industrial Revolution**

² <https://fortmed2018.blog/industrial-revolution-how-architecture-adapted-to-changing-times/>

³ <https://www.archdaily.com/959373/evolution-of-the-house-plan-in-europe-from-the-industrial-revolution-to-the-interwar-period>

Functionalism: Post-industrial architecture prioritized functionality over ornamentation. Buildings were designed to meet specific industrial needs, resulting in large open spaces suitable for manufacturing

Skyscrapers and Urban Density: Advances in construction materials like steel allowed for taller buildings, leading to vertical expansion in urban centers. This shift created new residential and commercial spaces within compact city footprints.

Public Spaces and Parks: In response to overcrowding and poor living conditions, urban planners began incorporating parks and recreational areas into neighborhood designs during the late 19th century. This movement sought to improve quality of life for urban residents.

Definition of the Neighbourhood Unit :

The neighbourhood unit is an urban planning concept that refers to a residential complex designed to promote social interaction and an optimal quality of life. It is generally characterised by a human scale, allowing residents to get around easily on foot or by bicycle (Duany & Plater-Zyberk, 1991). Proximity to essential services such as shops, schools and parks is also crucial (Mumford, 1961). Public spaces play a key role in providing meeting places and leisure facilities, encouraging interaction between residents (Duxbury & Lyle, 2006). This concept aims to strengthen social cohesion and the sense of community among residents.

Residential cluster

A residential cluster is a group of dwellings grouped together in a defined space, designed to foster community and social interaction between residents. These spaces may include single-family homes, flats or condominiums, often accompanied by common spaces such as parks, playgrounds and community facilities. Residential clusters aim to create a safe and friendly environment, where residents can benefit from shared services and leisure facilities (Boyer, 2018; Talen, 2019).

Relationship between the three :

- Interconnection: A residential cluster can be part of a neighbourhood and neighbourhood unit, interacting with other types of housing and services in that space.

- Scale: The neighbourhood is the broadest scale, the residential cluster represents a form of housing within that neighbourhood, while the neighbourhood unit focuses on the day-to-day experience of residents on a human scale.
- Social cohesion: All three aim to strengthen social interaction and quality of life, but they do so at different levels and with different approaches.

II/ Basics of urban regulations

In Algeria's current legal environment, urban planning instruments consist of the master development and urban planning plan (P.D.A.U) and the land use plan (P.O.S).

The master plan for development and town planning (PDAU) is an instrument for spatial and urban development, it establishes the fundamental guidelines for the land use development policy of the concerned municipalities in accordance with the national territorial planning scheme (SNAT), the regional territorial planning schemes (SRAT) and the district land use plan (PAW), it outlines also the terms of reference for the land use plan (POS) (Lakhdar Hamina & Abbas, 2015).

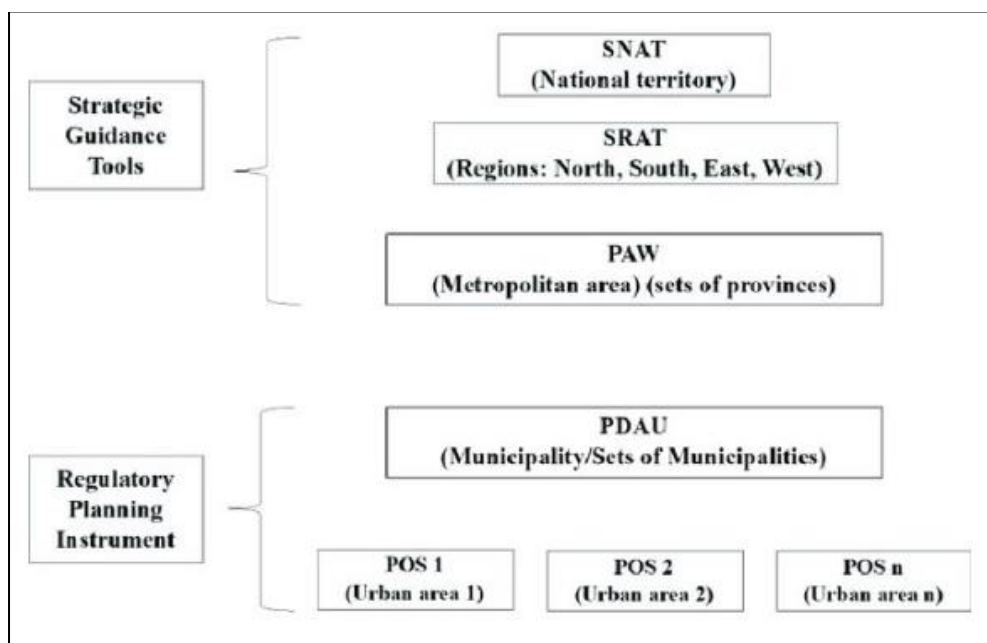


Fig2 : The hierarchical tree of Algerian urban planning tools.source : Leghrib, F., Mazouz, S., Laroui, A. & Benameur, O. (2021). Introducing urban growth models (UGM) in the Algerian urban planning practice

They are enforceable against third parties. As defined by law no. 90-29 of 1 December 1990 on urban planning and development and decrees no. 91-177 and no. 91-178 of 28 May 1991. Urban planning instruments are preceded by instruments for land use planning and sustainable development. For the national territory, these are the national land use plan (S.N.A.T), the master plan for coastal development, the master plan for land protection and combating desertification. For the regional territory, these are the regional development schemes (S.R.A.T).

Master plans for the development of metropolitan areas (S.D.A.A.M) which replace the development plans for the wilaya territories, for the metropolitan areas defined by the national land development plan. The wilaya territory with the wilaya land use plans (P.A.T.W) (Ministry of Housing, Urban Planning and Towns, law n° 01-20 of 12 December 2001, relating to land use planning and sustainable development (JO n° 77 of 15.12. 2001).

The master plan for development and urban planning PDAU :

The master plan for development and urban planning (PDAU), instituted by law 90/29 on development and urban planning, is a spatial planning and urban management instrument that sets out the fundamental guidelines for the development of the territory of the municipality or municipalities concerned.

This instrument is essential to the development of the local community, and plays an important role in rationalising land use and planning to meet present and future needs (sustainable development, development and urban planning directorate (P.D.A.U)).

Objectives of the PDAU

Determines the general use of land throughout the territory of one or a group of municipalities by sector. Determines the perimeters of intervention of the P.O.S with the related terms of reference. Delimitation and regulation of high-risk areas.

Safeguarding and enhancing the environment and natural resources; Defining new urban development areas to meet the population's needs in terms of housing, facilities and jobs; Determining areas for intervention in the urban fabric and areas to be protected; Defining the extension of human settlements, the location of services and activities, and the nature and location of major facilities and infrastructures.

The land use plan (p.o.s)

The POS is an instrument for urban management and detailed planning. It has no impact on land use. The P.O.S must comply with the provisions of the P.D.A.U. It can only interpret them to the extent provided for in the P.D.A.U. One of the consequences of this is that a P.O.S cannot be studied unless an approved P.D.A.U. exists.

Objectives of the land use plan: In compliance with the provisions of the master development and town planning plan, the land use plan sets out in detail the rights of land use and construction.

To this end, the land use plan:lays down in detail for the sector(s) concerned the urban form, organisation, building rights and land use, locates the agricultural land to be preserved and protected, defines the easements, specifies the districts, streets, monuments and sites to be protected, renovated and restored, delimits the public space, the green spaces, the areas reserved for public works and installations of general interest as well as the layout and characteristics of the traffic routes, defines the rules relating to the external appearance of buildings, defines the minimum and maximum quantity of construction authorised, expressed in square metres of floor area excluding works or in cubic metres of built volume, the types of construction authorised and their uses, The rules and easements set out in the P.O.S. may not be modified in any way, with the exception of simple adaptations imposed by the nature of the soil, the shape of the land or the context of neighbouring buildings.

IV/ The issues, needs and content of urban analysis

1 The need for urban analysis:

According to Pannerai, urban analysis is crucial to developing functional, inclusive and sustainable urban environments, while meeting the needs and aspirations of communities:

- **Contextual understanding:** It provides an understanding of the historical, social and geographical context of an urban space, helping to understand its evolution and unique characteristics.
- **Informed design:** In-depth analysis provides data and insights that guide planning and design decisions, ensuring that urban interventions meet the needs of users.
- **Optimisation of space:** By examining urban morphology and the functionality of spaces, analysis helps to maximise the use of resources and improve connectivity between different parts of the city.
- **Quality of life:** It takes into account the perception and experience of users, enabling the creation of spaces that promote well-being, safety and social interaction.
- **Sustainability and resilience:** Urban analysis helps to anticipate future challenges, such as rapid urbanisation and climate change, by integrating sustainability strategies into urban development.

2 Content of urban analysis:

Urban analysis according to Pannerai is therefore multidimensional, integrating morphological, functional, historical and social aspects to provide an in-depth understanding of urban space and its use. This approach aims to inform urban planning and design decisions. Here are the main aspects of its analysis:

Spatial and historical context: Pannerai emphasises the importance of understanding the historical and geographical context of a city or neighbourhood, including its evolution over time.

-Historical context

The history of cities is marked by political, economic and social events that have influenced their development. For example, decentralisation in France has changed the dynamics of urbanisation, leading to fragmentation of political decisions and increased competition between local authorities to attract investment⁴. In addition, traditional urban theories have often neglected the evolutionary aspect of cities, focusing instead on static models that do not take account of their transformation over time⁵.

-Geographical context

Geography plays a crucial role in urban evolution. Cities develop not only in response to internal forces; they are also influenced by their physical environment and by the transport networks that link them to other regions. Patterns of urbanisation, such as suburbanisation, illustrate how housing choices can lead to excessive consumption of space and affect the quality of urban life.

-Interconnected transformations

The physical transformations of cities often reflect social and economic changes. For example, the emergence of new urban development models, such as City Improvement Districts, shows how economic dynamics can redefine urban management and spatial organisation. The need for an integrated approach to understanding these interactions is essential to developing effective urban policies that respond to contemporary challenges.

In short, urban development is a multidimensional phenomenon that requires a thorough understanding of its historical and geographical context. Cities are constantly changing, shaped by a variety of interrelated factors that must be taken into account in any urban analysis.

⁴ <https://anabf.org/pierredangle/dossiers/territoire-ville-et-patrimoine-une-culture-pour-l-amenagement/la-ville-expression-des-fonctions-sociales-economiques-et-culturelles>

⁵ https://www.persee.fr/doc/spgeo_0046-2497_1997_num_26_2_1063

3. Urban morphology:

Is the study of the forms and structures of urban spaces, encompassing the analysis of streets, buildings, public spaces and transport networks. This discipline is essential for understanding how cities develop and evolve over time. Here are some key concepts:

- **Urban Form** : Urban forms include street layouts, plot patterns and built volumes. They are the result of various historical, political and cultural influences that shape a city's urban planning
- **Typo-Morphology**: This approach combines morphological and typological analysis, making it possible to study not only the shape of buildings but also their distribution in urban space. It examines the relationships between urban form (such as the road network) and building types⁶.
- **Public and private spaces**: Urban morphology distinguishes between 'solids' (built spaces) and 'voids' (public spaces such as streets and parks). This distinction is crucial for urban planning, as it influences the quality of life in neighbourhoods⁷.

4. Importance of morphological analysis:

Morphological analysis makes it possible to assess how different urban forms influence social practices and quality of life. For example, a well-designed street network can promote connectivity and encourage active modes of transport such as walking or cycling.

Elements to consider

- **Urban grid**: The configuration of the street network determines the connectivity of a neighbourhood. Orthogonal grids offer better accessibility, while curvilinear grids can limit transit .

⁶ <https://journals.openedition.org/echogeo/14642>

⁷

<https://documents1.worldbank.org/curated/pt/596921468322469237/pdf/470860WPOFRENC1cal0economy01PUBLIC1.pdf>

- **Urban density:** Density is measured by the land use coefficient (LUC) and directly influences the perception of urban spaces. Neighbourhoods can be perceived as dense or airy depending on how they are laid out .

- **Historical evolution:** Urban forms bear witness to the historical evolution of a city. Each period has produced distinct architectural styles that reflect the socio-political values of their time⁸.

Conclusion:

In conclusion, the interconnection between the urban environment, the concept of the neighbourhood, urban analysis and urban planning instruments underlines the importance of an integrated approach in the training of future architects. They must be prepared to work in collaboration with a wide range of players - urban planners, landscape architects and sociologists - to develop innovative solutions that respond to contemporary challenges. The city of tomorrow requires a holistic vision that integrates not only physical aspects but also social and environmental ones. Architects must be committed to designing spaces that not only improve the living environment but also strengthen resilience in the face of ecological and social crises.

⁸ <https://journals.openedition.org/edc/103?lang=es>

Lecture 02

THE CLIMATIC ENVIRONMENT

INTRODUCTION :

The climate smart environment refers to the integration of climate considerations into urban planning and development. This includes assessing the impacts of climate change on urban areas and implementing adaptation and mitigation strategies.

Cities need to adapt to the impacts of climate change such as rising temperatures, floods and heat waves. This includes measures such as reducing soil sealing and greening urban spaces to manage rainwater and improve thermal comfort.

Urban planning must also aim to reduce greenhouse gas emissions. This can be achieved by making sustainable energy choices, promoting renewable energy and improving the energy efficiency of buildings.

I/ Study of climatic data

The integration of climatic data, in particular that relating to sun and wind, is essential in architectural studies if sustainable and comfortable buildings are to be designed. Optimising solar gain through appropriate orientation and bioclimatic strategies maximises solar gain while reducing energy costs. At the same time, taking good account of wind directions encourages natural ventilation, reducing dependence on air conditioning systems. By analysing the interactions between solar radiation and air currents, architects can create spaces that improve thermal comfort, reduce environmental impact and contribute to resilience in the face of today's climatic challenges.

II/Solar geometry

Solar geometry plays a crucial role in modern urban planning, helping to optimise the use of solar energy in urban spaces. Here are some key concepts and approaches:

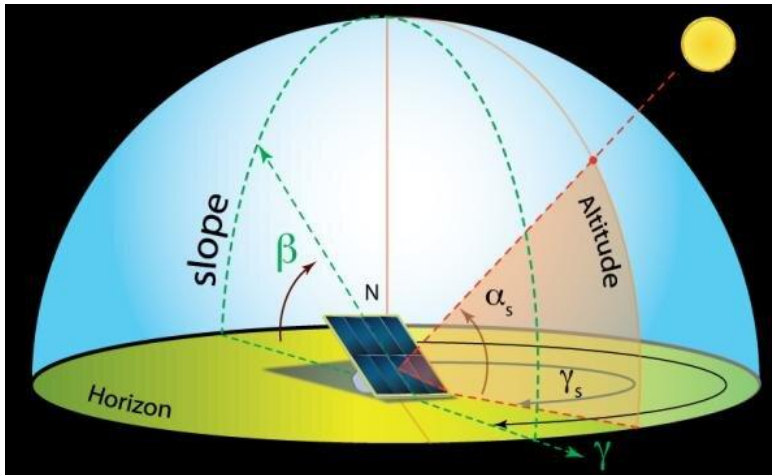


Fig1 : Solar geometry defined for the energy prediction analysis⁹

1. The solar envelope

The solar envelope is a concept developed by Ralph Knowles, which defines a theoretical zone around buildings to maximise solar gain while minimising shadows on neighbouring buildings. This method allows architects to design buildings without fear that future developments will compromise their energy efficiency. By incorporating this approach, cities can achieve higher population densities while ensuring adequate access to the sun].

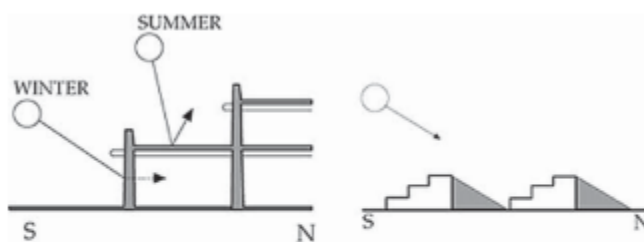


Fig. 1. Acoma Pueblo: thick masonry walls and timber roof-terraces respond well to seasonal migrations of the sun (left); the spacing between Acoma's rows of houses is strategic, just far enough to avoid winter shadows while conserving precious space on a high, small plateau (right).

Fig 2: a concept of solar envelope developed by Ralph Knowles

⁹

https://www.researchgate.net/publication/316313933_Photovoltaic_Energy_Prediction_Analysis_Considering_Tilt_and_Azimuthal_Orientation_in_Brazil/figures?lo=1

2. Building orientation and design

The orientation of buildings is essential for maximising sunlight. Local urban development plans (PLU) or POS can include specific rules on the orientation of buildings and the management of shadows created by the urban environment. For example, a southerly orientation can increase solar gains for heating and daylighting, which is particularly beneficial in homes and schools .

4. Regulations and incentives

Planning regulations can include incentives to encourage the integration of solar technologies, such as photovoltaic panels or green roofs. Density bonuses' can be offered to projects that meet specific energy criteria, thereby promoting sustainable design.

5. Architectural strategies

Architects can apply various strategies to improve solar potential, such as designing south-facing facades, using extraverted shapes that maximise exposure to the sun, and choosing materials that optimise heat gain.. The configuration of streets (height/width ratio) also influences the amount of sunlight received in urban spaces.

III/ Winds and their effects according to the geomorphology of the site :

Winds play a crucial role in the design and siting of buildings. Their impact on urban morphology and building sites can be analysed from several angles, including their classification, their effects on thermal comfort, and architectural considerations.

Wind classification:

Winds can be classified according to several criteria:

- **Spatial amplitude:** Local winds (breezes) and regional winds (such as the trade winds).
- **Speed:** Measured by the Beaufort scale, which rates wind strength on a scale of 0 to 12.
- **Geographical location:** Winds can vary according to the topographical and climatic characteristics of a region.

Effects of winds on urban morphology

- Thermal comfort:

- Winds can influence thermal comfort inside buildings. For example, cool winds in summer can improve natural ventilation, while cold winds in winter can lead to heat loss.

- One study has shown that urban geometry affects wind flow, which can modulate thermal comfort depending on building layout .

- Building orientation and layout:

- The orientation of buildings in relation to prevailing winds is essential. For example, orienting openings in the direction of prevailing winds can maximise natural ventilation.

- Building shapes also influence access to the wind. Slim buildings are often more effective at capturing the wind than wider structures.

- Impact on air circulation:

- The topography of a site can create areas of overpressure or depression that modify the behaviour of the wind. Landforms such as hills or valleys can channel or disperse air flows.

- Numerical simulations have shown that the layout of buildings has a significant influence on wind flow, which can lead to better outdoor ventilation in summer and protection against cold winds in winter .

- Architectural shapes:

Architects should design shapes that encourage air circulation while taking account of surrounding obstacles. For example, sloping roofs can help direct the wind towards openings.

- Landscaping:

Incorporating green spaces can also moderate the effects of wind, providing shelter from strong gusts and improving the urban microclimate[1].

IV/ The effects of wind on building form

The interaction between wind and the shape of buildings is a crucial subject in architecture and town planning, as it affects not only the thermal comfort of occupants, but also the durability and safety of structures.

- Aerodynamic effects of building shape:

The shape of a building plays a key role in how the wind interacts with it. Buildings with broken or irregular shapes can provide better ventilation in summer, but can also cause discomfort in winter due to their exposure to cold winds. One study has shown that specific geometries can model wind flow, influencing the circulation of air around and inside buildings.

- Building orientation and layout

The orientation of buildings in relation to prevailing winds is crucial to optimising natural ventilation. For example, in urban areas, the wind direction can be altered by arterial roads and other surrounding buildings. Strategic orientations can maximise the effectiveness of free-cooling, a phenomenon that uses the wind to naturally cool interior spaces. Slim buildings are often more effective than massive constructions at allowing adequate air circulation.

- Architectural innovations in the wind

With the increase in extreme weather events, it has become crucial to design buildings capable of withstanding significant aerodynamic forces. Innovative solutions include the use of adjustable plates that modify the aerodynamic shape of a structure in response to environmental conditions.¹⁰ This not only reduces wind loads, but also improves interior comfort.

When siting a building, the main aim should be to face the prevailing south-westerly and north-easterly winds. However, in urban centres, wind direction is influenced by roads, buildings and the topography of the site. You can get an initial idea of the best location by assessing the obstacles around the area to be built. In Brussels, for example, the canal is an area subject to

¹⁰ <https://guidebatimentdurable.brussels/free-cooling/implantation-forme-batiments-quels-choix-influent-effets-vent>

prevailing winds. It is therefore easy to orientate the building in this direction or to develop a shape that captures the winds.

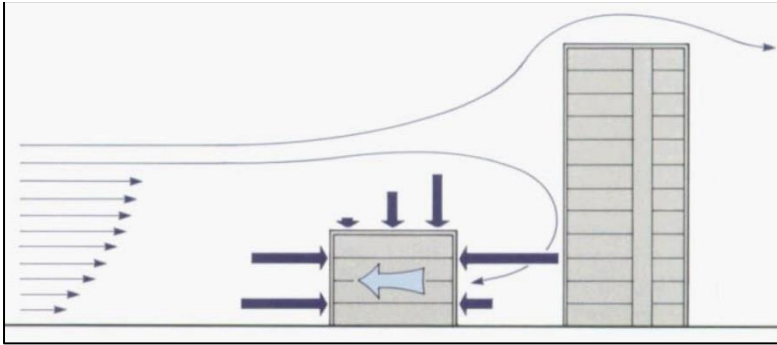


Fig3 : Impact of neighbouring buildings on wind access ,Source : Natural ventilation in non domestic buildings, BRE).

High buildings increase the efficiency of free-cooling, as they have an impact on wind accessibility and on the natural phenomenon of the chimney effect. Thin buildings are also more advantageous than thick buildings. Thick buildings make it difficult to implement effective natural free-cooling down to the centre of the building.

The openings will also be located taking into account the prevailing winds. The figure below illustrates in plan view the impact of different window opening designs on air movement in a room (only the effect of wind is taken into account) as a function of prevailing winds. In the figure, prevailing winds are represented by arrows, the wind rose represents air circulation in the room and the symbols (+) and (-) represent areas of overpressure and depression.

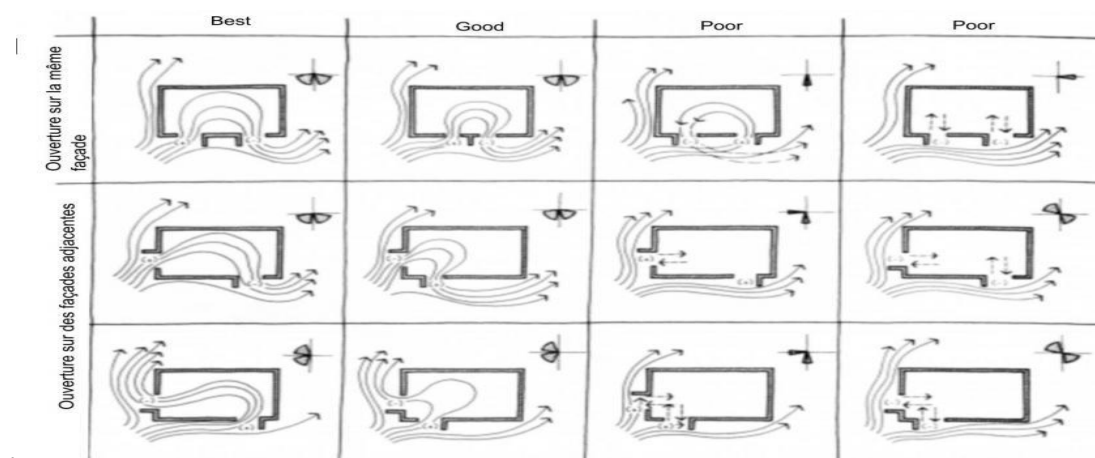


Fig 4: the impact of different window opening designs on air movement in a room

Conclusion:

In summary, a thorough and integrated understanding of climate data, such as solar and wind geometry, is essential for designing built spaces that promote human well-being while respecting the environment. Modern urban planning must build on these principles to create sustainable communities that are resilient and adaptable in the face of growing environmental challenges. Ultimately, this holistic approach not only improves quality of life, but also contributes to a more sustainable future for all.

Lecture 03:

THE NATURAL ENVIRONMENT

INTRODUCTION :

The natural environment is a complex and interconnected set of elements that form the framework for life on Earth. It represents not only the aesthetic beauty of landscapes, but also the vital systems that support biodiversity and the resources necessary for human existence. In this introduction, we will explore four fundamental aspects of the natural environment: the visual approach to context, natural landforms, vegetation and hydrography.

I/ Visual approach to the context

The visual approach to the natural context in architecture and urban planning is a design method that seeks to establish harmony between human constructions and their natural environment. This approach is based on several fundamental principles that influence the way architects and urban planners perceive, interpret and integrate natural elements into their projects.

Perception and interaction with the environment

The visual approach is inspired by theories of perception, in particular that of James J. Gibson, who emphasises that perception is a direct relationship between the individual and his or her environment. According to Gibson, to understand how living beings perceive their environment, it is essential to analyse their interaction with it, rather than focusing solely on isolated sensory aspects¹¹. This means that architecture must be designed not only to be seen, but also to be experienced within a given natural context.

- Integrating natural elements

This approach encourages the integration of natural elements such as relief, vegetation and hydrography into architectural design. For example, buildings can be oriented to maximise views of picturesque landscapes or to blend harmoniously into the surrounding relief. Studies

¹¹ https://fr.wikipedia.org/wiki/Approche_%C3%A9cologique_de_la_perception_visuelle

show that this integration not only improves the aesthetics of buildings but also promotes the well-being of occupants by creating more pleasant environments¹².

- Visual landscape analysis

Visual landscape analysis involves a close examination of the physical characteristics of a site, including dominant shapes, textures and colours. This analysis often takes place in several stages:

- Focal scanning: Active visual exploration of the landscape to identify salient features.
- Cognitive filtering: Selection of relevant visual signals that attract attention.

These stages enable designers to understand how the eye moves through a space and to identify the 'lines of force' that structure the perception of the landscape.

- Examples of application

Recent architectural projects illustrate this approach:

- Bosco Verticale in Milan: These residential towers incorporate dense vegetation that improves air quality while creating a visually appealing environment.
- Centre Pompidou in Paris: Its open design allows dynamic interaction with the surrounding urban landscape, strengthening the link between the building and its context.



¹² <https://atlas-de-paysages.lavienne86.fr/vous-avez-dit-paysage/lire-un-paysage-lapproche-sensible>

Fig1 : left Bosco Verticale in Milan, right Centre Pompidou in Paris

II/ Natural landforms :

Relief is the overall shape of the Earth's surface (elevations, depressions, slopes). The constant movement of tectonic plates and the forces of nature shape the Earth's crust.

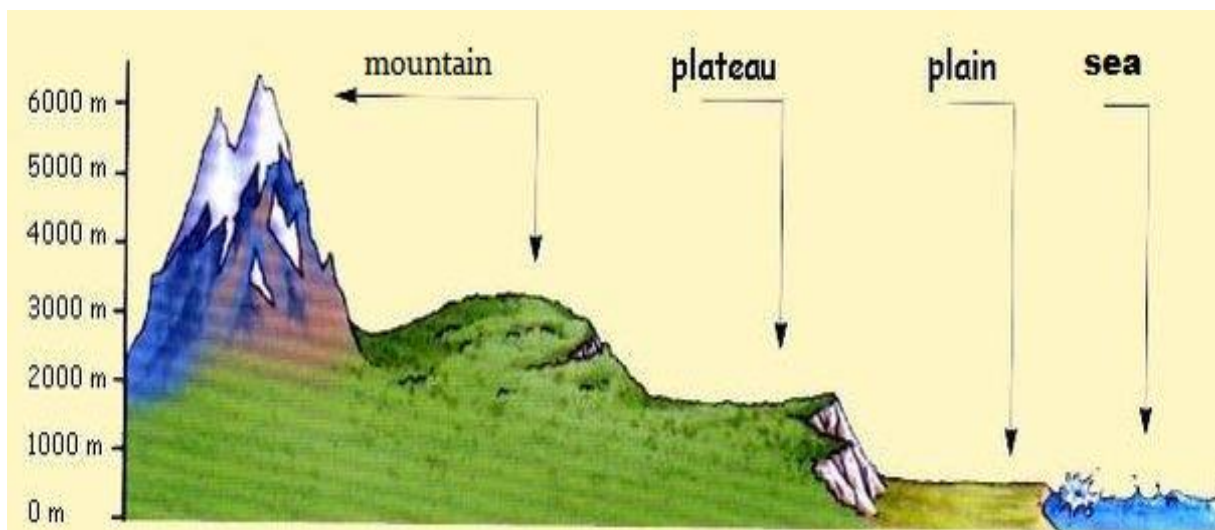


Fig 2 : Natural landforms

- Basic landforms :

The main basic landforms are hills, knolls and valleys.

1-**A hill** is a small elevation of land with a rounded top.

2-**The hillock** is a small rise of land with a flat top.

3-**The valley** is an elongated hollow or depression created by the run-off of water on sloping ground; the valley may be deep or shallow; the bottom of the valley is called a talweg. But there are other elementary secondary forms of relief which are:

- **The slope** is a slope which connects two reliefs of different levels on the continent, e.g. plain and plateau.

- **The cliff** is a rocky slope linking the continent to the ocean or the sea.
- **the interfluvium** is the portion of land or topographical space between two neighbouring valleys.
- **The basin** is a closed depression towards the bottom of which the slopes converge on all sides.

Complex landforms:

There are three types of complex landforms: mountains, plains and plateaux.

1-**Mountains:** These are elevated regions with great differences in height that vary constantly along the same slope, long, steep slopes linking high ridges to deep valleys. A mountain is characterised by its altitude, its aeration, i.e. both the width and depth of the valleys, by the orientation and shape of its ridges, and by the layout of its hydrographic network.

2- **The plain** is an almost flat surface (flat surface can rise) with an altitude varying from 0 to 100 metres or even 300 metres. On the plains, the watercourses run just above the ground.

3-**The plateau** is a relief of variable altitude with a surface presenting hollows (deep valleys) and humps. Its altitude varies from 350 metres to 900 metres.

There are two types of plateau in Algeria: the low plateaux in the centre of the country with an altitude varying from 300 metres to 500 metres. The low plateaux in the north of the country, with altitudes ranging from 500 to 800 metres.

Characteristics of a relief :

All landforms are characterised by their altitude and the arrangement of their slopes¹³.

¹³ (2nd year A town planning; topography2; Mrs ABDI NIDAL; year 2023-2024)

1 **Altitude** is the height of a point in relation to sea level. There is absolute altitude, which is measured in relation to sea level. Relative altitude (difference in altitude) expresses the difference in altitude between the top of a relief (mountain or plateau) and the absolute altitude of neighbouring regions (plains, valleys).

2- **Height difference**: this is the height difference between two points on the relief.

3- **Slopes**: slight or non-existent slopes (which are rare) characterise plains and plateaus; steeper slopes correspond to the sides of a valley, the slopes of a mountain or the edge of a plateau. All these slopes (concave, convex, broken, convex-concave, complex, etc.) lead to low areas, which are usually valleys.

III/ Vegetation :

Vegetation plays a crucial role in modern architecture, especially in the context of sustainability and eco-design. This course explores the interactions between vegetation and architecture, highlighting the ecological, aesthetic and functional benefits of integrating plant elements into buildings.

The Importance of Vegetation in Sustainable Architecture

- Reducing the Carbon Footprint

Vegetation helps to reduce the carbon footprint of buildings by absorbing carbon dioxide (CO₂) and producing oxygen. Green spaces, such as gardens and green roofs, play a key role in this process, helping to improve urban air quality¹⁴.

- Energy savings

Plant features such as green walls and roofs provide natural insulation that can reduce energy costs associated with heating and cooling. In summer, foliage acts as a sun screen, while in winter it helps to conserve heat¹⁵

¹⁴ <https://www.abscisse-architecture.fr/actualites/importance-vegetation-architecture-durable>

¹⁵ <https://www.greenskin.tech/blog/architecture-vegetal>

- **Improving acoustic comfort**

The presence of vegetation helps to reduce ambient noise by absorbing sound. Plant walls and green roofs can reduce noise levels by up to 50 dB, creating quieter, more pleasant indoor environments for occupants.¹⁶

Techniques for integrating vegetation

Green roofs

Green roofs are plant-covered surfaces that offer a number of advantages:

- Thermal insulation: Reduced air conditioning requirements.
- Rainwater management: Absorption of part of the rainfall, reducing run-off.
- Aesthetics: Improves the urban landscape.

Plant walls

Plant walls are integrated into building facades to :

- Improve indoor air quality: filter pollutants.
- Reduce energy consumption: By providing additional insulation.

Green spaces

Creating green spaces around buildings helps to:

- Regulate the local climate: Plants release moisture and absorb heat.
- Provide recreational areas: Spaces for community activities and relaxation.

Economic Benefits of Plant Architecture

- **Increase in property value** :Buildings incorporating plant elements tend to have a higher market value. Green spaces also attract more potential buyers or tenants¹⁷.

¹⁶ <https://www.archionline.com/actualites/avantages-architecture-vegetale/>

¹⁷ <https://www.abscisse-architecture.fr/actualites/importance-vegetation-architecture-durable>

- **Reduced maintenance costs** :Green roofs and walls can reduce maintenance costs thanks to their ability to protect surfaces from the elements and reduce the need for frequent repairs.

Successful projects

Analyse emblematic projects that illustrate the successful integration of vegetation(Fig1):

- **Le Bosco Verticale in Milan: Residential buildings with planted balconies.**
- **Hanging Gardens: green spaces on the roofs of urban buildings**

This course can be enhanced by site visits to observe first-hand the impact of vegetation on different architectural projects, as well as practical workshops on bioclimatic design and the use of environmental analysis software.



Fig3 : Emblematic projects that illustrate the successful integration of vegetation

IV/ Hydrography

The relationship between hydrography and architecture is essential to the design of sustainable buildings and urban spaces, especially in coastal areas or near watercourses. This course will explore how architects can integrate hydrographic data into their projects to optimise sustainability, safety and aesthetics.

Hydrography is the study of the physical characteristics of water, including its depth, circulation, and quality. Hydrographic data is crucial for urban planning, water resource management and architectural design.

Many terms are used to designate the structures through which water flows.

a. Watercourse: any channel through which a continuous or temporary flow of water flows. It is a general term for a river, stream, torrent or wadi.

b. Canal: an artificial channel dug by man and used either for navigation or floating, or for irrigation or draining certain regions. Canals generally follow long straight lines. There are many different words to describe the different types of watercourse.

c. Stream: a small watercourse of limited width and length, fed by natural water sources, often a tributary of a pond, lake or river. Creeks are found at the head of catchment areas.

d. River: a moderately large watercourse, with continuous or intermittent flow, following a defined course and flowing into another watercourse, a lake or a sea.

e. River: a large, long, fast-flowing watercourse with many tributaries flowing into the sea.

f. Wadi: Arabic term for a temporary watercourse in arid or semi-arid regions. Its flow depends on rainfall and it can remain dry for very long periods.

Watercourses flow through the landscape, growing in size and joining up with other watercourses. The network of watercourses forms what is known as the drainage network and adopts different forms that are influenced by the relief and geology of the subsoil. Rivers transport water and sediment in a dynamic process that shapes their beds.

Importance of Hydrographic Data in Architecture

1. Planning and Design: Architects use hydrographic data to

Assess the site: Understand groundwater levels, flood risk and soil characteristics.

Design infrastructure: Incorporate efficient drainage systems and design buildings to withstand the forces of water.

Water management: An integrated approach to water management involves :

Rainwater harvesting systems: Using data to design systems that capture and reuse rainwater.

Sustainable landscaping: Creating green spaces that encourage water infiltration and reduce run-off.

Conclusion:

Integrating hydrographic data, topography and vegetation into the architectural process is crucial to designing buildings that are sustainable and resilient in the face of modern environmental challenges. By analysing the interactions between water, landforms and vegetation with the built environment, students can create spaces that not only meet human needs, but also preserve the surrounding ecosystems. This can be achieved by using visual approach methods to better understand these interactions.

Lecture n°04

The Built Environment

INTRODUCTION

The built environment refers to all the physical spaces created by man, including buildings, infrastructure and urban development. It represents the way in which these elements are designed and constructed to meet human needs while taking into account social, economic and ecological aspects.

I/ Template analysis, void/full ratio, skyline

Components of the Built Environment

1. **Buildings:** This covers all types of building, whether residential, commercial, educational or governmental.
2. **Infrastructure:** Roads, bridges, transport networks, water supply and sanitation systems.
3. **Green spaces:** Parks, gardens and other natural spaces integrated into the urban environment.
4. **Transport Systems:** Including public transport, cycle paths and pavements that facilitate mobility.

Analysis of Building Dimensions and Façades in Architecture:

Gauge and façade analysis is essential to understanding how buildings fit into their urban environment and how they meet aesthetic and functional standards. Here is a detailed exploration of these concepts.

Definition of a template

In architecture, a template refers to the dimensions, shape and configuration of a building. It is used as a reference to determine the constructible limits of a structure, including :

- **Maximum height:** Determines how high a building can rise in relation to its surroundings.
- **Width and depth:** Defines the building's footprint.
- **Crown:** The top shape of the building, often influenced by aesthetic or regulatory considerations.

The role of templates

Standards play a crucial role in :

- **Urban organisation:** They help to maintain architectural coherence in neighbourhoods.
- **Heritage preservation:** They can limit heights to protect views of historic buildings.
- **Managing public space:** By defining boundaries, they ensure efficient circulation and preserve green spaces.

Façade analysis

Façades are the external face of a building, playing a crucial role both functionally and aesthetically. They are often considered the ‘face’ of a building, influencing public perception and architectural identity.

- Aesthetic characteristics

Modern façades are characterised by a number of features:

- **Innovative materials :** Use of glass, steel, recomposed wood, allowing a variety of textures and finishes.
- **Clean design:** Clear lines, geometric shapes, integration of vertical gardens.
- **Bold colours:** Combinations of bright colours with neutral tones to create a visual contrast.

Functionality

Facades are not just aesthetically pleasing; they also fulfil a number of essential functions:

- **Protection from the elements :** Resistance to the elements (rain, wind, heat).
- **Thermal and acoustic insulation:** Contributing to the building's energy efficiency.
- **Regulation of natural light:** Openings (windows) are designed to maximise the entry of light while minimising heat loss.

Historical evolution

The evolution of facades reflects changes in architectural styles and technologies

Antiquity to the Renaissance: Façades were massive with few openings.

Industrial Revolution: Introduction of iron and glass led to larger, brighter façades.

Modernism: Favoured functionality with clean lines and large areas of glass.

Interaction between templates and façades

The interaction between gauges and façades is fundamental to ensuring that buildings meet not only urban planning standards but also aesthetic expectations:

- Conformity with the template: Façades must fit within the framework defined by the template, respecting the maximum height and footprint.
- Architectural expression: Architects use the constraints imposed by the template to express their creativity through the design of the façade. This can include variations in texture, colour and shape that nevertheless respect the defined volume.

Analysis of the architectural elements of a façade

Analysis of the architectural elements of a façade is essential to understanding its aesthetics, functionality and integration into the environment. Here is a detailed exploration of the main elements that make up a façade, along with their role and importance.

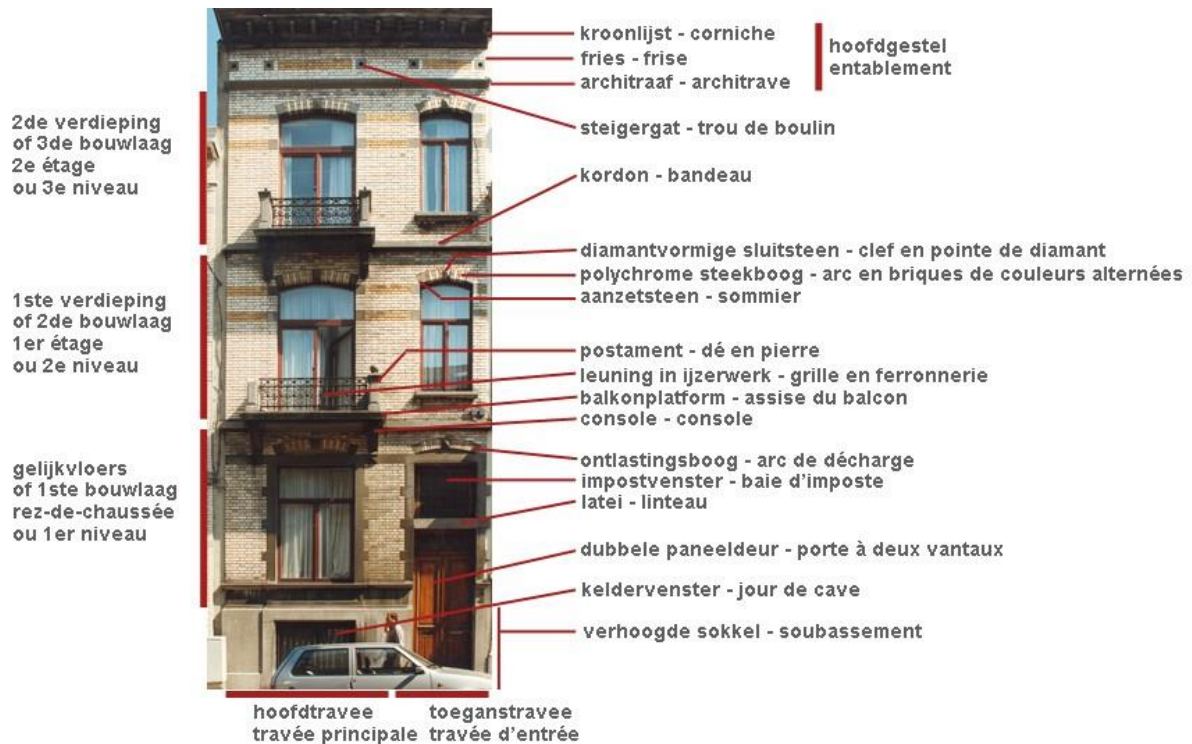


Fig 1: Description of façades, source : <https://monument.heritage.brussels/fr/glossary/507>

Main architectural elements

- **Base :**The plinth is the lower part of a wall, often a thicker section, which serves as a base for the façade. It plays a crucial role in protecting the structure from damp and bad weather.
- **Bay frames :**Bay frames are structures that surround openings (windows and doors) and can be made of brick, wood, stone or concrete. They emphasise the contours of the openings and contribute to the overall aesthetics of the façade.
- **Cornice :**The cornice is a horizontal element that separates the façade from the roof. It is often decorated with mouldings and contributes to the elegance of the building while protecting the walls from the elements.
- **Lintel :**The lintel is a horizontal piece placed above openings to support the weight of the wall above. It can be made of stone, metal or concrete and is essential for structural stability.
- **Canopy :**A canopy is a glazed awning placed over an entrance door or stoop, providing protection from the rain while adding an aesthetic touch to the entrance.

Dormer window :A dormer is a projecting structure on a roof with a window that provides light for an attic space. It contributes to the aesthetics of the roof while improving natural lighting inside.

Pediment :The pediment is a decorative element, usually triangular, that crowns certain façades. It can be simple or ornate, adding character to the structure.

Window sill :Window sills are horizontal elements placed under windows to prevent water from rising up into the masonry. They must be designed to ensure a perfect seal.

Proportions and Scale

Proportions : Proportions refer to the dimensional relationships between different architectural elements:

- **Rule of Thirds**: This rule suggests that important elements should be placed at the intersections of the lines dividing the space into thirds, creating a visual balance.
- **Golden ratio**: Using the golden ratio to determine the dimensions of windows and other elements can create a pleasing aesthetic.

Scale: Scale refers to the relationship between the actual dimensions of a building and those of its representation:

- **Human scale**: Reference to the size of people to design comfortable spaces
- **Representational scale**: Use of different scales to draw plans (for example, 1/50 for details).

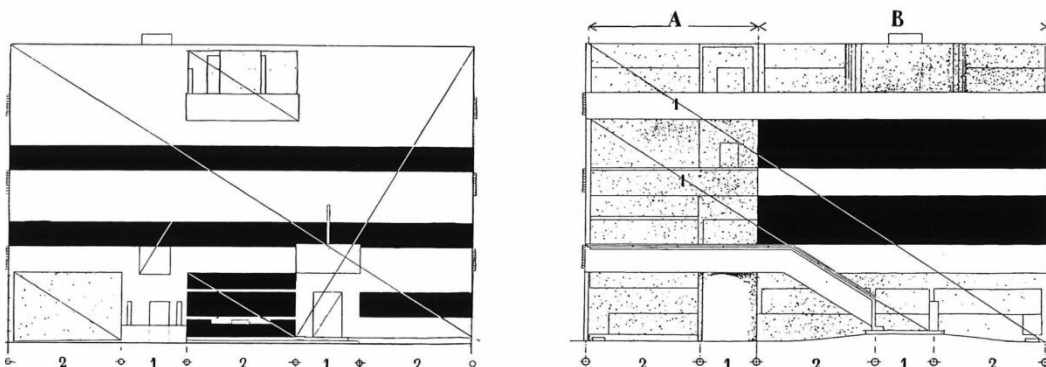


Fig 2 : Drawing of the facade proportions at Villa Stein designed by Le Corbusier¹⁸

II/ Analysis of facades according to various architectural criteria

The analysis of a building's facades is based on a number of criteria that influence both their aesthetics and their functionality. Here is a detailed exploration of these criteria: fenestration, grid, ratio of glazed surfaces to opaque walls, horizontal/vertical accent, composition and rhythm, and texture and construction materials.

Fenestration

Fenestration refers to the arrangement and size of openings (windows and doors) on a façade. It plays a crucial role in the aesthetics and energy performance of a building.

Functional role

- **Natural light:** Windows should be positioned to maximise light entry while minimising glare.
- **Ventilation:** Properly positioned windows encourage air circulation, improving indoor comfort.

Aesthetic role

- **Proportions :** The size of the windows should match the size of the façade. For example, wider windows can give a more modern impression.
- **Architectural style:** The choice of window type (square, rectangular, rounded) should match the overall style of the building.

The grid

The grid refers to the repetitive structure of architectural elements on a façade.

- **Spatial organisation :** Repetition of elements : A regular grid creates visual coherence. For example, aligned rows of windows can reinforce harmony.

¹⁸ <https://donnallyarchitects.com/proportion-and-scale/attachment/041/>

- **Variation:** Introducing a variety of elements (balconies, dormer windows) can add dynamism to the façade while respecting the overall pattern.
- **Ratio of glazed surfaces to opaque walls :**The ratio of glazed surfaces to opaque walls is essential for energy efficiency and aesthetics.

Energy performance

- **Thermal insulation:** A good balance between glazing and opaque walls reduces heat loss in winter and controls solar gain in summer.
- **Natural Lighting:** An appropriate ratio (often recommended between 30% and 50% glazed surface area) promotes optimum natural lighting without overheating .

Aesthetics

Visual balance: A harmonious relationship between glazed and opaque surfaces contributes to the overall aesthetic, avoiding a façade that is too heavy or too light.

Horizontal/Vertical Accent :The horizontal or vertical emphasis of a façade influences its visual perception.

- **Horizontal emphasis**

Horizontal elements: Cornices, window sills and other horizontal elements can visually broaden the façade.

Relaxing effect: A horizontal accent can give an impression of stability and tranquillity.

- **Vertical Accent**

Vertical elements: Pilasters, columns or narrow windows accentuate the height of the building.

Dynamic: A vertical accent can create an impression of movement and reaching for the sky.

Composition and rhythm :The composition of a façade refers to the way in which the different elements are arranged to create a coherent whole.

- **Geometric rules**

Symmetry vs Asymmetry: A symmetrical façade can evoke a sense of order, while an asymmetrical one can generate greater visual interest.

Repetition and Variation : Alternating between similar and different elements creates a rhythm that draws the eye.

Texture and Building Materials

The materials used influence not only the aesthetics but also the durability and energy performance of a façade.

Texture

- **Varied textures :** Using materials with different textures (rough, smooth, shiny) can add depth to the façade.
- **Shadows:** Textures create shadows that visually enrich the surface.

Materials

- **Durability:** The choice of materials (brick, concrete, wood) should take into account their resistance to weathering and their maintenance.
- **Consistent aesthetics:** Materials must harmonise with the overall architectural style of the building while meeting functional requirements.

Conclusion

Analysis of the architectural elements of a façade is essential to fully appreciate the design of a building. By examining each component, its proportions and scale, students can create facades that not only meet practical needs but also enrich the visual and emotional experience of users. The integration of these criteria into the analysis of facades helps to design buildings that are not only aesthetically pleasing but also functional and durable. By balancing fenestration, screening, the relationship between glazed and opaque surfaces, horizontal/vertical accents, rhythmic composition, and texture and materials, we can create façades that are not only aesthetically pleasing but also functional and sustainable.

This approach makes it possible to create façades that meet contemporary needs while blending harmoniously into their urban or natural environment.

CONCLUSION OF PART I

In conclusion, site analysis should not be seen as a mere preliminary phase; it is an essential foundation for thoughtful and sustainable architectural design, responding to contemporary challenges while respecting the principles of environmental sustainability. This reflection concludes the first part of the course, during which we examined the theoretical and practical foundations needed to enable architecture students to develop an integrated and sustainable approach in their future projects.

In short, teaching about the urban, natural and climatic environment is fundamental to training architects who are aware of their role in creating sustainable built spaces that are resilient in the face of contemporary environmental challenges.

These courses aim to raise students' awareness of current environmental issues, such as climate change, the depletion of natural resources and environmental degradation. By integrating these themes, students learn to design buildings that minimise their ecological impact and adapt to the specific climatic conditions of their location.

INTRODUCTION TO PART II: SITE AND SITE INTEGRATION

Buildings do not develop in isolation; they interact with their environment and respond to socio-cultural, economic and political needs. Architectural design must take into account the contextual forces of a site, which influence planning and construction. The natural context, representing the location of a building, is essential to the development of an architectural idea. Architects need to study this context to establish a meaningful link with their design.

The context can be classified into four categories: natural, rural, semi-urban and urban, each of which presents challenges and opportunities for architectural integration. In this section, we will explore two key aspects: integration with the site, which examines the relationship of the building to its surroundings, and incorporation with the landform, which considers the harmonisation of structures with the surrounding topography.

It is crucial to integrate a project into its site, taking into account architectural and urban data to create harmony with the existing fabric (Djaalali & Gherraz, 2021).

Lecture : 01

I/ Definition of the 'site' concept.

Introduction

Architectural design in relation to a site is based on principles of harmony, scale, form, texture, colour and space. A building can have a different impact depending on the characteristics of the site (rounded, flat, elevated, etc.), either enhancing the environment or upsetting its balance. Faye and Tournaire's *Sites et Sitologie* (1974) explores this relationship by studying the perception of a site, its physical description and its harmonic structure, and proposes a methodology. The approach consists of analysing the site at different scales and developing the project in interaction with the elements of the landscape.

Site definition

A site refers to the geographical and contextual space in which a construction project is located. It includes not only the physical characteristics of the site (topography, climate, vegetation, etc.), but also its social, historical and cultural environment. The site can be a bare plot of land, an urban district, a natural landscape or an area that has already been built on, and it plays a fundamental role in architectural design.

The site influences the form, structure and integration of the building into its environment. It determines the choice of materials, orientations and aesthetics, as well as the way in which the project fits harmoniously into the landscape and interacts with its users. The architect's job is to analyse the site, to understand its constraints and opportunities, in order to design an architecture that is in tune with the place while meeting the needs of the programme.

Any building is part of a place, called - the site .The site has distinctive characteristics in terms of topography, geographical location and historical context. Mazouz (2004) defines the site as a landscape considered from the point of view of its picturesque aspect - which is striking and original.

The approach to the site as a perceived (observed) landscape is a sensitive one. It is based on observation as a means of studying and manipulating landscapes.

According to NEURAY (1982), landscape is 'what I see', the physiognomy of a space that we look at, fly over or cross. BERQUE (1991) defines it as follows: it is at the hinge between an object (space, a place) and a subject (the observer). In town and country planning, the landscape is a collective material production that is social, physical, cultural and symbolic (BERTRAND, 1978). It is therefore the image of a spatial structure on a local scale.

There are therefore several types of landscape, each with its own distinctive features and elements. Here is an overview of the main types of landscape:

1. **Plains landscapes:** gentle relief, with fields, meadows and forests.
2. **Coastal landscapes:** Coastal areas with beaches, dunes and sometimes cliffs. The relief varies according to the nature of the soil.
3. **Mountain landscapes:** High altitude (over 1000 metres) with a rugged relief. Vegetation varies according to altitude.
4. **Urban landscapes:** Dominated by human activity, with a strong presence of buildings and infrastructure and few natural areas.
5. **Rural landscapes:** Agricultural or natural areas with scattered villages, cultivated fields and green spaces.
6. **Desert landscapes:** Extreme climates with little plant or animal life. Deserts can be hot or cold.

These different types of landscape reflect the world's geographical and ecological diversity. Each type plays an important role in the cultural identity and economy of the regions in which they are found.

II/ / Perception of a natural site

Faye and Tournaire propose an analysis of the site based on the perception of forms, emphasising that this perception follows precise rules. A landscape is perceived as a set of units and groupings of elements spread over different planes, each with a distinct silhouette, hues and light. Successive planes are more easily identifiable if they are made up of coherent groups,

such as a wood or a village, characterised by proximity and similarity of form and materials. This similarity is essential to give coherence to the group. A group of buildings can therefore be perceived as homogeneous or, on the contrary, disparate, which weakens the harmony of the site.

In these groupings, major features such as a bell tower or belfry can become focal points or landmarks, adding a dynamic element to the landscape. However, human action can disrupt this coherence, creating an imbalance, for example, with buildings of varying materials and colours. Auditory and olfactory perceptions also contribute to spatial perception: sound, such as that of a road or waterway, can serve as a point of call, while odours establish a more intimate link with the landscape.

III/ outlines and contours :

Silhouettes and contours are simple but powerful tools for geographical analysis. They can be used to summarise complex information about the shape, structure and evolution of landscapes.

- **Silhouettes:** The shapes and contours of landscape features, which create distinct visual profiles. They influence the way a site is perceived from a distance.
- **Contours:** The limits or edges of natural or built features, which define space and structure the landscape. They contribute to the hierarchy of elements on the site.

Applications of silhouettes and contours

- **Studying natural hazards:** Landform outlines can be used to identify areas at risk of flooding, landslides, etc.
- **Land use planning:** contours are used to delimit the different areas of a territory (urbanised areas, agricultural areas, natural areas, etc.).

The difference between silhouette and contour

- **Silhouette:** This is the general shape of an object, seen in two dimensions and often against a light background. It emphasises the overall shape and external lines.
- **Contour:** This is the line that delimits the shape of an object. The outline can be more or less detailed and can include information about texture and volume.

IV/ Textures and groupings

Textures and groupings are key elements that contribute to the diversity and complexity of natural landscapes. They influence our perception of space, our understanding of geological and biological processes, and our aesthetic appreciation of natural environments.

- **Textures:** The sensory characteristics of soil, materials and surfaces, which influence the visual and tactile experience of the site.
- **Groupings:** Elements that group together by similarity (shape, colour, materials), creating coherent wholes in the landscape. This may include natural formations or human constructions.

The Importance of Textures and Groupings

- **Reading the landscape:** Texture and grouping help us to understand the processes that have shaped a landscape: erosion, sedimentation, vegetation, human activities.
- **Aesthetic perception:** Texture and grouping influence our aesthetic appreciation of a landscape. A varied landscape, with contrasting textures and complex groupings, is often perceived as more interesting.
- **Ecology:** Texture and grouping influence biodiversity and the functioning of ecosystems.

V/ views, call points and landmarks

- Views

A view is a particular perspective on a landscape, a panorama observed from a certain point. It is often determined by natural features (summits, cliffs) or man-made features (belvederes, towers).

- **Panoramic view:** A view that offers a very wide field of vision, embracing a broad horizon.
- **Framed view:** A view delimited by natural or architectural features, creating a more intimate composition.
- **Plunging view:** A view taken from a high point, offering an aerial perspective of the landscape.

Call points

A focal point is a visual element that attracts attention in a landscape. It can be very different in nature: an isolated tree, a building, a mountain, an element of colour, etc. The focal point guides the eye and creates a visual hierarchy.

- **Colour focal point:** A brightly coloured element that contrasts with the rest of the landscape.



Fig1 : Colour focal point, source :<https://atlas-de-paysages.lavienne86.fr/vous-avez-dit-paysage/lire-un-paysage-laproche-sensible>

Call point by shape: An element with an unusual or isolated shape.

The interrelationship between these elements

Views, call points and landmarks are closely linked. A landmark can become a call point in a specific view. A view can be defined by a set of call points.

To summarise:

- **The view**: This is the general framework, the panorama.
- **The call point**: This is the element that attracts attention within the view.

The reference point: This is the element that serves as a reference for orientation.

These elements are essential for:

- **Artistic composition**: Painters and photographers use these elements to create harmonious and dynamic compositions.
- **Orientation**: Landmarks allow us to situate ourselves in space.
- **Understanding the landscape**: By identifying views, points of call and landmarks, we can better understand the structure and organisation of a landscape.

Conclusion

Visual perception, a complex and fascinating process, is intimately linked to our understanding and appreciation of the world around us. Elements such as silhouettes, textures, views, landmarks and call points play a crucial role in this perception.

- **Silhouettes and textures**: These elements contribute to the recognition of shapes and the creation of atmospheres. They help to simplify visual information and highlight the essential features of an object or landscape.
- **Views and landmarks**: These elements structure the visual space and help us to orientate ourselves. Views offer varied perspectives on the world, while landmarks serve as stable references.

- Points of appeal: These elements draw our attention and guide our gaze. They create a visual hierarchy and reinforce the emotional impact of an image.

In short, visual perception is a complex construction based on specific visual elements. By understanding how these elements interact, we can better appreciate the beauty and complexity of the world around us. Whether in art, photography, architecture or simply in our daily lives, these concepts help us to decode images and construct our own representation of the world.

In conclusion, visual perception is a rich and complex field that offers many opportunities for exploration. By deepening our understanding of these mechanisms, we can not only better appreciate the world around us, but also develop our creativity and sense of aesthetics.

Lecture n°02

INTEGRATION WITH THE SITE (THE RELATIONSHIP BETWEEN THE BUILDING AND ITS ENVIRONMENT)

INTRODUCTION

The integration of a building is not a neutral act. It brings into play a multitude of factors, ranging from stylistic coherence to adaptation to the site, via socio-cultural issues, as WOITRIN M. (1979)¹⁹ points out: 'The integration of a building into its built environment has always been the subject of much criticism, raising questions such as:

- this building is not suitable for this site';
- This architecture contrasts with its urban, rural or landscape surroundings,
- This building is beautiful in its own right, but in this context it does not fit in',

Integrating a building into its environment is a major challenge for contemporary architecture. Beyond the aesthetic aspect, it determines the quality of life for users, the impact on the environment and the heritage value of a site. This report explores the different levels of building integration: physical, functional, visual and cultural. We will analyse the factors that influence this integration, such as the geographical, urban and historical context and the regulations in force. Using concrete examples, we will show how architects and urban planners implement strategies to create buildings that are in harmony with their environment. Finally, we will present the tools and methods used to assess the quality of this integration.'

¹⁹ WOITRIN M. (1979), 'Intégration en architecture et urbanisme', Les Annales de la recherche urbaine, n°5, p.15.

I/ Integration with the site and different types of integration

Integration with the site involves several dimensions:

Site analysis: Before any design, it is crucial to carry out an in-depth study of the site, including its topography, vegetation and climatic conditions (sunshine, prevailing winds), which will influence the design of the building.

Aesthetic harmony: A well-integrated building should respect local architectural features and blend in with the surrounding landscape. This can include the use of local materials and forms that blend into the urban or natural context.

Functionality and sustainability: Integration into the site must also take into account the building's intended uses. This means designing spaces that meet users' needs while minimising ecological impact. For example, a building can be oriented to maximise energy efficiency through better management of natural light and draughts.

Importance of site integration

Environmental impact: Successful integration reduces a building's ecological footprint by optimising its interaction with the natural environment. This includes managing rainwater, preserving local biodiversity and reducing noise pollution.

User comfort: By taking environmental factors into account, a well-integrated building offers occupants greater thermal and acoustic comfort, contributing to their well-being].

In short, site integration is a complex process that requires a thoughtful, multidisciplinary approach aimed at creating buildings that enrich their environment while meeting human needs.

Site integration is a fundamental concept in architecture and urban planning, and can be broken down into several types depending on the context and the objectives being pursued. Here is an overview of the different types of site integration, each with its own characteristics and challenges:

II/ functional integration

According to Boudon, functional integration involves designing a building whose form and spatial organisation are closely linked to its intended uses. The aim is to create a space that is both efficient and pleasant to live in, taking into account the needs of users and technical constraints.

The principles of functional integration

- **Flexibility:** A building must be able to adapt to changes in use over time.
- **Efficiency:** Spaces must be organised to optimise flows and circulation.
- **Comfort:** The building must offer optimum thermal, acoustic and visual comfort.
- **Safety:** Spaces must be designed to guarantee user safety.
- **Sustainability:** The building must be designed to last over time, while minimising its environmental impact.

The challenges of functional integration

- **Quality of life:** A functional building improves users' quality of life by offering them spaces adapted to their needs.
- **Productivity:** For professional buildings, good functional integration can increase user productivity.
- **Cost reduction:** A functional design can reduce the construction and operating costs of a building.

Functional integration tools

- **Needs analysis:** An in-depth study of the needs of future users enables the building's functions to be defined.
- **Architectural programming:** Programming translates requirements into a precise architectural programme.
- **Digital simulation:** Digital simulation is used to test different spatial configurations and optimise building performance.

III/ Socio-cultural integration

The socio-cultural integration of a building or urban fabric goes far beyond mere aesthetics. It involves a profound interaction between the building and its human and social context. This concept encompasses the way in which a building or neighbourhood adapts to the uses, customs, history and aspirations of the people who live there.

- **Cultural identity:** A building can reflect the identity of a place, using local materials, traditional architectural forms or incorporating symbolic elements.
- **Social life:** The public spaces created around a building or in a neighbourhood can encourage social interaction, meetings and exchanges between residents.
- **Civic participation:** Involving residents in the design and implementation of an urban project strengthens their sense of belonging and makes it easier for them to take ownership of the area.
- **Accessibility:** A building or neighbourhood must be accessible to all, in terms of mobility, services and facilities.

Factors influencing socio-cultural integration

- **Historical context:** The history of a place shapes its identity and influences residents' expectations.
- **Uses:** The activities that take place in a place determine its needs in terms of space and facilities.
- **Social representations:** Residents have mental representations of their environment that influence their perception of a new building or urban project.
- **Public policies:** Spatial planning, sustainable development and social cohesion policies play an important role in socio-cultural integration.

Examples of successful sociocultural integration

- **Renovating old neighbourhoods:** By preserving heritage features and adapting buildings to new uses, we can create dynamic and attractive neighbourhoods.

IV/ morphological integration

Morphological integration, according to Boudon, is not limited to a simple aesthetic adaptation to a given context. It involves an in-depth analysis of the relationships between :

- **The form of the building:** its volumes, materials, openings, etc.
- **The site:** its topographical, geological and climatic characteristics, etc.
- **The urban context:** the existing urban fabric, planning regulations, practices, etc.
- **Culture:** historical references, symbols, lifestyles, etc.

The principles of morphological integration

- **Consistency:** The shape of the building must be in harmony with its surroundings, respecting existing proportions, materials and rhythms.
- **Adaptation:** The building must adapt to the climatic and topographical conditions of the site, using local materials and appropriate construction techniques.
- **Symbolism:** The form can carry cultural or symbolic meanings, in reference to the history of the place or the aspirations of its inhabitants.
- **Innovation:** Morphological integration is not simply a matter of imitation. It can also be a source of innovation, proposing new architectural forms adapted to contemporary challenges.

The challenges of morphological integration

- **Quality of life:** Good morphological integration helps to improve the quality of life of residents by creating aesthetic and functional environments.
- **Sustainability:** By taking into account the specific characteristics of the site, we can design buildings that are more sustainable and better adapted to local conditions.
- **Identity:** Morphological integration strengthens the identity of a place and creates a sense of belonging.
- **Social cohesion:** Buildings that are well integrated into their environment encourage social interaction and strengthen ties between residents.

The tools of morphological integration

- **Site analysis:** An in-depth study of the site identifies its potential and constraints.

- **Urban morphology:** Analysis of the existing urban form helps to understand the rules governing spatial organisation.
- **Modelling:** Creating models or digital simulations to visualise the effects of different architectural solutions.
- **User participation:** Involving future users in the design process ensures that their needs and expectations are taken into account.

V//The architect's different attitudes to the built environment

As creators of space, architects play a decisive role in the way we interact with our built environment. Their choices, designs and attitudes have a direct influence on the quality of life, urban design and environmental impact of our cities.

The architect as heir: preservation and restoration

Some architects see built heritage as a source of inspiration and a duty to preserve. They strive to restore old buildings, adapting them to contemporary uses while respecting their authenticity. This approach values history and collective memory.

The architect as innovator: innovation and experimentation

At the other end of the spectrum, other architects prefer to break new ground and experiment. They seek to push back the boundaries of architectural creation, using innovative materials, bold forms and cutting-edge technologies. This approach is often associated with a desire to respond to contemporary challenges, such as climate change and urban densification.

The architect as mediator: dialogue between past and future

Many architects take a more nuanced approach, seeking to strike a balance between heritage preservation and innovation. They strive to create buildings that fit in with their context while providing a contemporary response to the needs of users.

The architect as a player in sustainable development: respect for the environment

Environmental issues have become a major preoccupation for architects. More and more of them are taking a sustainable construction approach, favouring natural materials, renewable energies and passive construction techniques.

The architect as a social player: creating living spaces

Beyond the aesthetic and technical aspects, architects have an important social role to play. They can help to create pleasant living spaces that encourage interaction and enhance the well-being of residents.

VI/ Pastiche, mimicry, analogy, opposition.

The concept of pastiche and mimicry in site integration is essential in the field of architecture and urban planning. These two approaches reflect architects' different attitudes to the built environment, influencing the way in which buildings fit into their spatial and cultural context.

Pastiche:

Pastiche in architecture refers to an imitation or reproduction of an existing architectural style. It is often an approach that seeks to evoke historical periods or specific styles, without necessarily respecting the original principles of these styles. Pastiche can be used to create visual continuity with a region's architectural heritage, but it can also be criticised for its lack of authenticity and innovation.

Characteristics of pastiche :

Imitation of styles: Use of motifs, materials and forms from previous eras.

Nostalgic aesthetic: Seeks to evoke a certain atmosphere or feeling linked to an architectural past.

Criticism: Often perceived as superficial or lacking in originality.

Mimicry

Mimicry, on the other hand, involves a more subtle and contextual adaptation of buildings to their surroundings. This can mean that buildings are designed to blend harmoniously into the surrounding landscape, taking into account local features such as topography, available materials and climate.

Characteristics of mimicry :

Contextual adaptation: Buildings are designed to respond to the specific features of the site, both aesthetically and functionally.

Harmony with the environment: Aims to create continuity between the building and its natural or urban setting.

Sustainability: Often associated with sustainable practices that respect the local ecosystem.

characteristic	mimicry	Pastiche
inspiration	nature	Past or existing style
objectif	Performance,sustainability,integration	Experimentation ironie
method	Study of natural process	Imitation of stylistic codes
result	Building inovative and sustainable	Building taht quote or perody a style

Fig1 : table of comparaisn between mimicry and pastiche style

The architectural integration of a building into its environment is a complex process that requires in-depth consideration of the relationship that the building will have with its context. Analogy and opposition are two particularly interesting tools for creating architecture that fits harmoniously or in contrast with its environment.

Analogy: a bridge between the building and its context

- **Principle:** Analogy involves drawing a parallel between the building and its environment. The analogy can be formal (shapes, materials), functional (uses) or symbolic (cultural references).

- **For example**

A building echoing the shapes of the dunes: By echoing the gentle curves and natural materials of the surrounding landscape, the building blends into the landscape.



Fig 2 : a bridge between the building and its context (analogy)

A contemporary art museum with a glass façade: The transparent material evokes transparency and openness, values associated with contemporary art.

An administrative building with facades punctuated by pilasters: The pilasters, borrowed from classical architecture, evoke solidity and permanence, values associated with institutions.

Opposition: creating contrast and identity

- **Principle:** Opposition consists of creating a contrast between the building and its environment. This contrast can be formal, functional or symbolic.

- **Examples:**

A contemporary building in a historic district: the contrast of materials, shapes and colours marks a break with the past and asserts the modernity of the project.

A transparent building in the middle of an industrial zone: The contrast between transparency and opacity creates an effect of enhancement and underlines the function of the building.

A curved building in an orthogonal urban environment: The curves soften the urban environment and add a touch of poetry.

Conclusion

Integrating an architectural object into its surroundings means fitting it into the environment to which it belongs, ensuring that it is harmoniously set in an urban, rural or landscape setting, and thus contributing to defining and confirming the identity of its place. Depending on the scale of the architectural project, there are two types of integration:

- Architectural integration seen in terms of homogeneity rather than difference: the identity of the object is blurred so that the architecture blends into the urban environment,
- Architectural integration seen in terms of dominance, where architecture extends over the urban, and so it is the urban that becomes homogenised in the architectural: the architectural absorbs the urban.

Finally, Michel Woitrin puts forward an integrative vision that goes beyond the simple coexistence of buildings. Architectural integration is a complex process that requires particular attention to the relationships between built forms, their environment and the social dynamics that flow from them. His reflection on Louvain-la-Neuve serves as a model for considering how future projects can be designed to enrich their context while responding to contemporary challenges.

Lecture 03

INCORPORATION INTO RELIEF

INTRODUCTION :

Integrating a building into the topography of its site is essential to creating spaces that are not only functional but also aesthetically pleasing. By taking account of topographical features, using modern techniques and complying with local regulations, architects can design buildings that enrich their environment while minimising their ecological impact. This approach contributes to sustainable architecture that celebrates the natural beauty of the landscape while meeting human needs.

I/ Relief and topographic sections

Reliefs are natural features that shape the Earth's surface. They are the result of various geological processes and can be found across the planet, encompassing a wide range of shapes, sizes and formations. Landforms provide valuable information about the Earth's history and are essential for understanding the dynamic processes that have shaped our planet over millions of years.

All landforms are characterised by their altitude and the arrangement of their slopes.

Absolute altitude is measured in relation to sea level. Relative altitude (difference in altitude) expresses the difference in altitude between the summit of a relief (mountain or edge of a plateau) and the absolute altitude of neighbouring regions (plains, valleys).

2- Slopes: slight or non-existent slopes (which are rare) characterise plains and plateaux; steeper slopes correspond to the sides of a valley, to the slopes of a mountain or to the edge of a plateau. All these slopes (concave, convex, broken slope, convexo-concave, complex, etc.) lead to low-lying areas that are usually valleys.

Types of relief

Landforms can be classified into different types according to their characteristics, the geological processes involved in their formation and their location. Here are some of the main types of landform:

1. **Mountains:** Mountains are large landforms characterised by high elevation and steep slopes. They are generally formed by tectonic processes such as the collision of tectonic plates or volcanic activity. Examples include the Himalayas, the Andes and the Alps.
2. **Plateaux:** Plateaux are flat, raised areas with steep sides. They can be formed by volcanic activity, tectonic uplift or erosion. Plateaux are often the remains of ancient mountain ranges. mountains or can be associated with tectonic processes. The Colorado Plateau in the United States and the Deccan Plateau in India are notable examples.
3. **Plains:** Plains are vast low-lying areas characterised by relatively flat or gently undulating landscapes. They are generally formed by the deposition of sediment by rivers, wind or glaciers over long periods of time. Plains are common in river valleys, coastal regions and glaciated areas. The Great Plains of North America and the Indo-Gangetic Plain of South Asia are well-known examples.
4. **Valleys:** Valleys are low-lying areas between mountains or hills, often carved out by rivers or glaciers. They can vary in size, shape and depth. Valleys are generally U-shaped or V-shaped, depending on whether they are formed by glacial or fluvial processes. The Grand Canyon in the United States and the Nile Valley in Egypt are striking examples.
5. **Deserts:** Deserts are arid regions characterised by sparse vegetation and low rainfall. They can be sandy (like the Sahara Desert), rocky (like the Atacama Desert) or a combination of both. Deserts often include sand dunes, rock formations and vast expanses of arid land.
6. **Coastal landforms:** Coastal landforms are shaped by the interaction of land and sea. They include beaches, cliffs, bays, estuaries and deltas. Coastal landforms are influenced by processes such as erosion, sediment deposition, wave action and changes in sea level. Examples include the Great Barrier Reef in Australia and the Cliffs of Moher in Ireland.
7. **Karst landscapes:** Karst landscapes are characterised by unique features formed by the dissolution of soluble rocks such as limestone or dolomite. They include sinkholes, caves, underground rivers and limestone pavements. Karst landscapes are often found in regions with

abundant rainfall and soluble rock formations. The karst region of Slovenia and the Yucatan Peninsula in Mexico are well-known examples.

8. **Glacial landforms:** Glacial landforms are formed by the movement and erosion of glaciers. They include features such as U-shaped valleys, cirques, moraines and fjords. Glacial landforms are commonly found in regions that have been glaciated in the past, such as the Alps, the Canadian Rockies and Antarctica.

Topographical sections :

Vertical section of a portion of land obtained either directly on the ground or from a topographic survey or map.

Highlighting relief on topographic maps

Cartographers have several ways of showing relief on maps, the main one being represented by contour lines or isohypses. As can be seen from the diagram, the steeper the slope, the closer the contour lines; conversely, the shallower the slope, the further apart the contour lines.

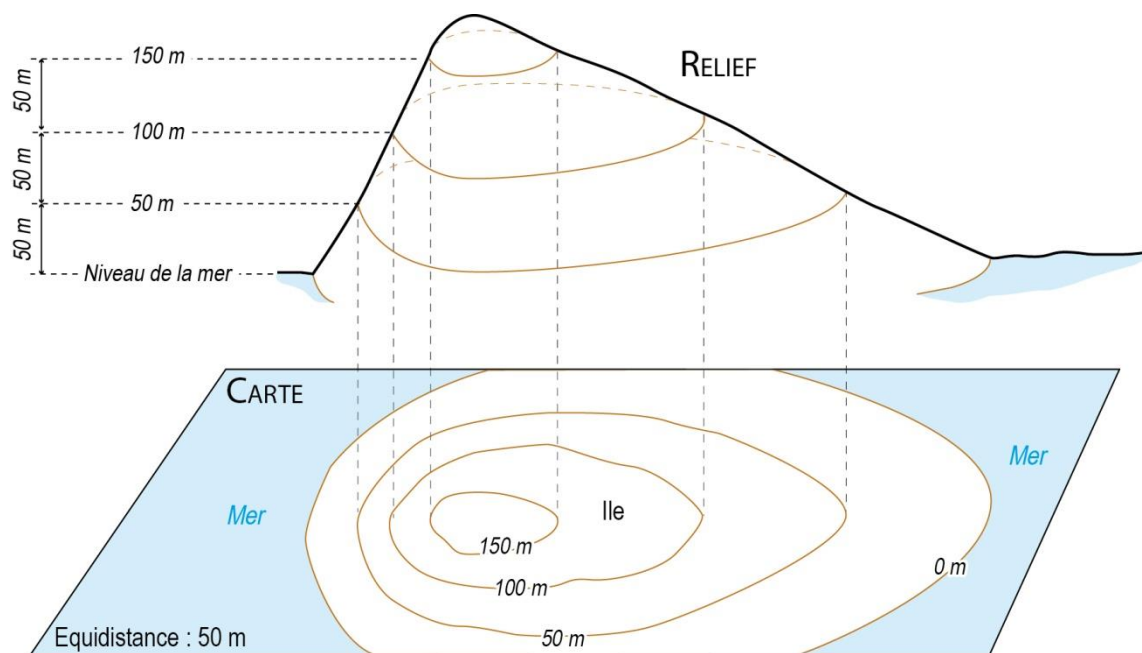


Fig 1 : Principle of representation of relief on a source map, archambault Met al997 documents and methods for map commentary

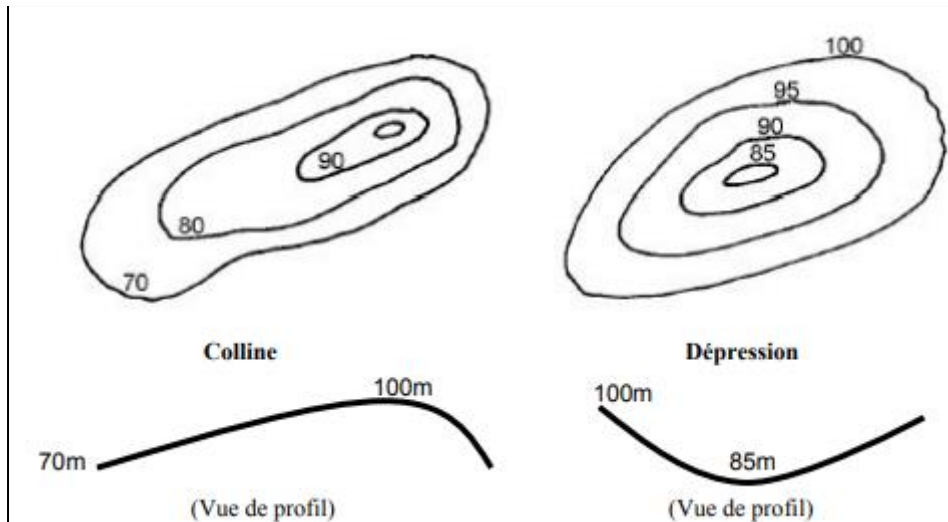


Fig 2 : Representation of colline and depression on a topographic map²⁰

II/ Types of layout on a sloping site

There are three essential elements to good site adaptation:

1- adapting the levels and volumes of the building to the slope of the land, avoiding ground movements as much as possible (cuttings, retaining walls, etc.) Building on a slope always requires earthworks, but these will be more or less significant depending on the attitude chosen. What's more, the design of the house can turn the constraint of the slope into an advantage:

Unobstructed views, level access to all levels of the house, less overlooking.

²⁰ https://blog.u-bourgogne.fr/licence-geographie/wp-content/uploads/sites/23/2015/10/Correction_Profil.pdf

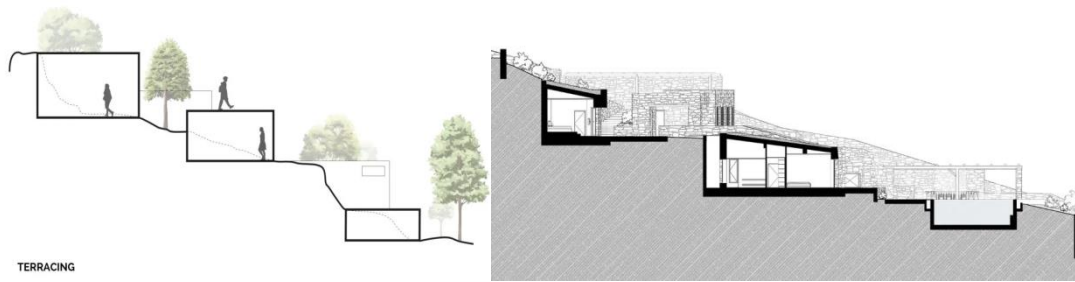


Fig 3 : Adapting the levels and volumes of the building to the slope of the land.

In some cases, it is worthwhile to move away from the classic layout of the single-storey house or the house with the garage in the basement and the house above.

In the first case shown opposite, access from the top of the plot means that the garage has to be accessed via a long loop, to the detriment of the pleasure garden.

Locating the garage as close as possible to the access road frees up more space for the garden and allows for better organisation of the living space on the plot.

In some cases, it is even preferable to consider separating the residential building from the garage.

2- the position of the garage in relation to access to the plot, to prevent driveways from disfiguring the landscape and taking up the whole plot.

3- the direction of the ridge in relation to the slope, bioclimatic orientations, etc.

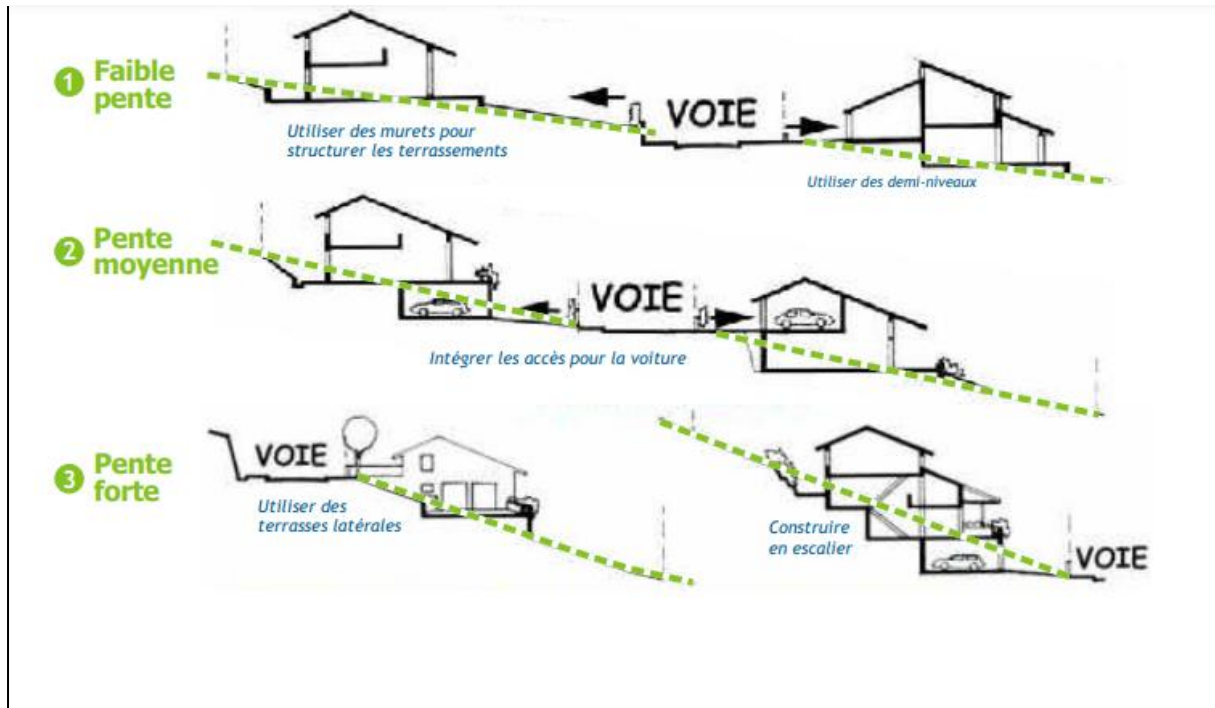


Fig 4: The three essential elements to good site adaptation²¹

III Earthmoving techniques.

Earthworks on a slope: different methods

²¹ https://www.salles-curan.fr/fr/documents/2.2.2_implantation_pente_SC.pdf

There are a number of possible solutions for earthworks on sloping ground. In particular, you can opt for levelling or backfilling, which are the most conventional methods.

However, other techniques are also available, depending on the configuration of the site.

Embedding

As the name suggests, the embedding technique involves embedding part of the house in the ground. In most cases, the foundations of the house will be gradually sunk into the sloping ground.

This type of earthworks on sloping ground is more discreet than others in terms of the results obtained, and also means very little exposure to the wind. On the other hand, it requires continuous clearing and backfilling throughout the works.

Raising the height

This involves placing the house on posts or pilings. This technique, used mainly on steep slopes, has the advantage of requiring very little handling of the land. It also allows you to benefit from an elevated surface area, which is particularly useful for enjoying an unobstructed view. However, it is expensive and complex to build.

In-depth architectural studies are required to ensure the solidity of the construction. Raising the height of the house also means that it is exposed to a lot of wind and that access is limited to one side of the house.

Supporting the slope

This method consists of creating a cascading construction with levels and semi-levels created according to the evolution and degree of inclination of the slope.

Access to the interior is then possible from all sides, but movement around the home is less uniform, with different levels depending on the gradient, requiring the installation of staircases between the different rooms.

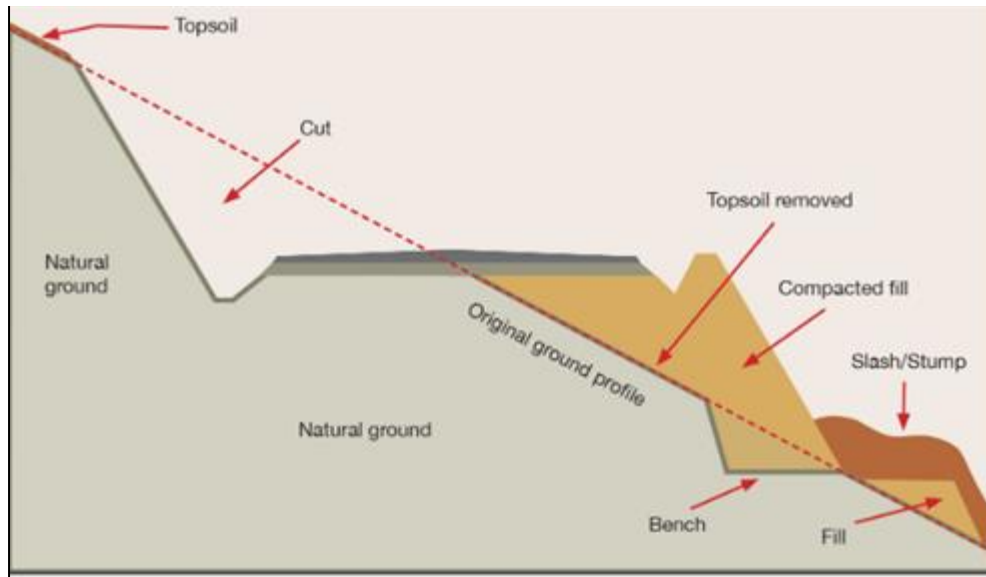


Fig5 : Earthworks method ²²

How do you make it flat?

The operation remains more or less the same for the methods mentioned above. Even if you opt to build in or raise your garden, it may still need to be levelled.

Levelling

Levelling involves using the excess soil from the top section to gradually fill in the shortfall. To do this, work the top soil with a shovel or rake and leave it to rest. Once this has been done, you will move it downwards.

This operation requires you to leave the soil to rest for at least 48 hours without walking on it. Once this time has elapsed, you can level it with a sand or water roller.

Backfilling

²² <https://docs.nzfoa.org.nz/live/nz-forest-road-engineering-manual-operators-guide/earthworks/cut-and-bench-fill-construction/>

While levelling involves using the same amount of soil as on your sloping site, when backfilling it is necessary to add more.

In particular, you can add building materials such as sand, rubble or earth to make the slope zero and obtain a solid composition thanks to the different layers of various materials.

This operation offers better results than levelling in terms of stability and can be carried out immediately with a solid base.

Before carrying out this type of operation, be sure to find out about the necessary regulatory authorisations (prior declaration of works or planning permission in particular).

Types of foundations for sloping ground

When digging on a sloping site, you need to choose the type of foundations to use. These can take a variety of forms, whatever the technique chosen. Each of them has its own specific features that need to be anticipated beforehand, as they may require additional work to be carried out.

Semi-deep or deep foundations

Whichever construction method you choose, the foundations must be installed in a solid manner to support the building.

On sloping ground, semi-profound foundations (poured between 2 and 5 metres) or deep foundations (more than 6 metres) should be installed to support the weight of the structure given the height difference. Surface foundations are not sufficient to support the construction and can lead to cracks unless the ground is completely levelled.

Semi-deep or deep foundations are also recommended for uneven, multi-storey sites or those subject to harsh weather conditions (particularly frost). They are therefore 3 to 5 times more expensive than shallow foundations.

Level foundations

Level foundations are particularly important when building a stepped wall. In this case, the wall bases need to be laid out and positioned at different levels to form a staircase.

To undertake this type of construction, you need to start by drawing the bottom shapes of the staircase and then mark out the thickness of the benches. You then need to draw lines parallel to those you drew before. All that remains is to draw the treads and risers to create a level foundation.

How to strip it?

Digging up a slope (or stripping) is an all-purpose solution that can be used for a variety of earthworks.

It can be used during the construction of a house itself, but also for work on a sloping garden. In particular, it can be used to install a swimming pool or terrace.

The concept

Displacement is an operation that involves removing a layer of topsoil to make the ground flat and stable. It is one of the most common operations carried out on sloping ground.

It is sometimes necessary to remove a 40 cm layer to ensure that all the roots have been removed. This precaution ensures greater safety for the construction.

CONCLUSION

As a student of architecture, understanding the specific features of relief, topographical sections, sloping terrain and earthmoving techniques is fundamental to the design of projects that are harmonious and respectful of the environment. Relief, whether mountainous, hilly or flat, influences not only the aesthetics of your projects, but also their stability and integration into the landscape. A topographical cross-section allows you to visualise variations in the terrain, which is essential for anticipating the challenges associated with planning and building on complex terrain.

Sloping ground, if not properly taken into account, can lead to risks of landslides, inefficient drainage or inappropriate foundations. Earthmoving techniques then become a

key tool for transforming a difficult site into a viable space, while complying with geotechnical and environmental constraints.

By mastering these elements, you can design projects that are more sustainable, safe and aesthetically integrated, capable of meeting the challenges posed by geography while enhancing the landscape. This in-depth understanding will prepare you to tackle each site with a sensitive and technical approach, essential to the success of your future architectural projects.

CONCLUSION OF PART II:

The students of architecture, are called upon to approach each project as a technical, aesthetic and environmental challenge. Successful design is based on an integrated and in-depth understanding of several fundamental dimensions: consideration of climatic data, harmonious integration into the urban context, and adaptation to the site's relief and geotechnical constraints.

First of all, mastering climatic parameters such as solar geometry and wind dynamics is essential for designing built spaces that promote not only the comfort and well-being of the occupants, but also the energy efficiency of the buildings. These natural elements should not be seen as constraints, but as opportunities to create resilient and sustainable spaces capable of adapting to environmental change. In this sense, modern urban planning uses this knowledge to adapt buildings to contemporary needs and environmental imperatives, actively contributing to the creation of sustainable communities adapted to the challenges of climate change.

At the same time, the architectural and urban integration of a project cannot be limited to a simple imitation of its surroundings, but must be based on an in-depth analysis of the specific characteristics of the site. The historical and cultural invariants of the site, as well as the rules governing massing, siting and materials, must guide your thinking in order to ensure harmonious continuity with the existing fabric. By taking into account the contextual, landscape, social and technical dimensions, you can create projects that are not only aesthetically pleasing, but also firmly rooted in their environment, while respecting the principles of sustainable development. This enhances architectural quality and helps to enrich the identity of the site, while preserving its history and culture.

Finally, mastering the specific geographical and topographical features of a site, such as variations in relief, slopes and soils.

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