O. M. Beketov National University of Urban Economics

in Kharkiv

School of Architecture, Urban Planning and Design

Department of Architecture of Buildings and Constructions

ABSTRACT

for the master's degree

on the topic**: "The techniques of human-oriented architectural design of modern office centers of Morocco"**

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Wiame Belegchour

Supervisor: Veligotska Yuliia
Reviewer: Borysenko Artem

Kharkiv – 2026

O. M. BEKETOV NATIONAL UNIVERSITY OF URBAN ECONOMICS IN KHARKIV

Institute **School of Architecture, Urban Planning and Design**
Department **Architecture of Buildings and Constructions**
Educational and qualification level **Master degree**
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APPROVE
Head of ABaC department
Olga V. Smirnova
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T A S K
FOR THE STUDENT'S QUALIFICATION WORK

Wiame Belegchour

Topic of the project (work): "**The techniques of human-oriented architectural design of modern office centers of Morocco**"

1.Supervisor of project (work): Veligotska Yu.S., PhD., Assoc.prof, Assoc. Prof. of dep. ABaS
approved by order of the higher educational institution from 26 November 2025 № 1116-03
2. The deadline for student submission of the project (work): 21 May, 2026.
3. Initial data for the project (work): diploma design tasks, results of pre-diploma practice, theoretical studies, graphic-analytical materials
4. The content of abstract (list of issues that need to be developed): Section 1. "Analysis of theoretical and practical experience of office centers", Section 2. "Human-oriented approaches of modern office centers of Morocco", Section 3. "Research approval: project of human-oriented modern office center of Morocco", Section 4. "Calculation and Constructions", Section 5. "Occupational health and safety".
5. A list of graphic material (with a precise indication of mandatory drawings): scheme of the location of the territory in the structure of the city; scheme of the location of the territory in the structure of the district; scheme of the existing functional and transport organization; scheme of the project functional and transport organization; reference plan, general plan; photo fixation; plans, facades, section, perspective projections of the main angles of the building.

6. Consultants of project sections (works)

Section	Surname, initials and position consultant	Signature, date	
		Task issued	Task accepted
1	Yu.S. Veligotska, Ph.D., Assoc. prof.	01.12.2025	14.02.2026
2	Yu.S .Veligotska,, Ph.D., Assoc. prof.	16.02.2026	14.03.20265
3	Yu.S .Veligotska, Ph.D., Assoc. prof.	16.03.2026	18.04.2026
4	A.V. Naboka Ph.D, Assoc. prof.	20.04.2026	30.04.2026
5	V.V. Malysheva, Ph.D., Assoc. prof.	20.04.2026	30.04.2026

7. The date of issue of the task is December 1, 2025.

CALENDAR PLAN

№ s/p	Name of diploma project stages (work)	Term of project stages execution	Note
1	Clarification of the design task	December 2025	Done
2	Development of the staging part (relevance, problems, tasks, object, subject, research methods)	December 2025	Done
3	Approval of the plan for conducting scientific research (content of the qualification work)	February 2026	Done
4	Analysis of scientific literary sources on the topic of the master's qualification work (writing "Introduction", "Section 1" subsections 1.1, 1.2)	February 2026	Done
5	Analysis of prototypes (writing "Section 1" subsection 1.3, "Conclusions to Section 1"). Hypothetical model of an architectural project	February 2026	Done
6	Methodology and techniques of scientific research of an architectural object (writing "Section 2" subsections 2.1, 2.2)	February-March 2026	Done
7	Development and graphic design of analytical schemes (models) based on scientific research (writing "Section 2", subsection 2.3 and "Conclusions to Section 2")	March 2026	Done
8	Generalization of the conclusions of the conducted scientific research work and design of a graphic model of the design object (writing "Section 3" subsections 3.1, 3.2, 3.3, "Conclusions to Section 3")	March, April 2026	Done
9	Writing related sections ("Section 4" and "Section 5")	April 2026	Done
10	Preparation of the master's thesis	April 2026	Done
11	Defense of the master's thesis before the examination commission	May 2026	Done

Student _____ Wiame Belegchour

Supervisor _____ Yu.S. Veligotska

CONTENT

INTRODUCTION

In contemporary Moroccan cities, the demand for efficient, comfortable, and people-centered workplaces has increased due to rapid urbanization, economic growth, and changing work patterns. Modern office centers are no longer designed solely as functional workspaces; they are evolving into human-oriented environments that prioritize users' well-being, productivity, and social interaction. This shift reflects the growing recognition that architectural design significantly influences employees' physical comfort, mental health, and overall performance.

Today, human-oriented architectural design has become a fundamental principle in the development of modern office centers in Morocco, especially in major urban hubs such as Casablanca, Rabat, and Fes. These office complexes integrate ergonomic workspaces, natural lighting, biophilic elements, flexible layouts, and accessible public areas within a single architectural system. Such approaches respond to contemporary challenges by improving working conditions, encouraging collaboration, and creating healthier indoor environments.

The human need for comfort, accessibility, safety, and environmental quality in workplaces is steadily growing. Human-oriented office centers address these needs by incorporating climatic-responsive design strategies adapted to Morocco's diverse climate, including shading systems, natural ventilation, and energy-efficient materials. Additionally, the integration of green spaces, communal zones, and pedestrian-friendly surroundings enhances users' satisfaction and strengthens the relationship between the building and its urban context.

It is expected that in the future, the techniques of human-oriented architectural design will continue to evolve in response to technological innovation, environmental concerns, and new organizational models such as hybrid and flexible work. Smart building systems, sustainable construction methods, and adaptable interior spaces will become essential components of modern office centers, ensuring long-term efficiency and resilience.

Thus, designing human-oriented office centers is a complex architectural task that requires balancing functionality, aesthetics, technological integration, and environmental responsibility. It involves creating spaces that support diverse activities, encourage social interaction, and maintain optimal conditions for physical and psychological comfort while ensuring efficient spatial organization.

The analysis of scientific publications shows that existing studies primarily emphasize sustainability, energy efficiency, and economic performance of office buildings. Prominent urban theorists such as Jan Gehl highlight the importance of human-centered design and public life in architectural environments, while researchers like Richard Florida emphasize the role of creative and comfortable workplaces in urban development. International research increasingly explores how office architecture can enhance well-being, productivity, and social connectivity.

However, despite the growing body of research on sustainable and smart office buildings, there is still a lack of comprehensive studies focusing specifically on the techniques of human-oriented architectural design in the context of Moroccan office centers. In particular, methodological approaches that address ergonomic planning, cultural factors, climatic adaptation, and user experience remain insufficiently developed.

In this regard, modern office centers of Morocco should be considered as an independent subject of architectural research and design. It is necessary to develop systematic guidelines for their formation based on human needs, environmental sustainability, technological innovation, and local cultural identity.

The relevance of this topic and the current state of research indicate the necessity of conducting a theoretical study that examines the techniques of human-oriented architectural design, identifies their key principles and components, and provides practical recommendations for the future development of modern office centers in Morocco.

Research Objectives

1. To analyze theoretical works on human-oriented architectural design of office centers.
2. To identify techniques that enhance users' comfort, well-being, and productivity.
3. To determine current trends in the design of modern office centers in Morocco.
4. To identify key factors influencing human-oriented architectural solutions.
5. To explore ergonomic, spatial, and environmental design principles.
6. To develop conceptual proposals for innovative human-oriented office centers.

The object of the study is modern office centers of Morocco.

The subject of the study is the techniques of human-oriented architectural design of modern office centers.

The research problem is the lack of comprehensive studies and practical recommendations regarding the application of human-oriented architectural techniques in Moroccan office centers, considering contemporary work requirements, environmental sustainability, technological advancement, and users' well-being

SECTION 1: ANALYSIS OF THEORETICAL AND PRACTICAL EXPERIENCE OF OFFICE CENTERS

1.1. Analysis of theoretical experience of the formation of office centers

Modern urban development increasingly integrates economic, administrative, technological, and social processes within a unified architectural framework. In modern office centers, these processes include workplace organization, social interaction, communication, recreational activities, and integration with urban infrastructure. The concept of human-oriented design plays a crucial role in contemporary architectural practice, allowing for the creation of office environments that optimize comfort, productivity, and user satisfaction while responding to the dynamic demands of organizations and cities.

A human-oriented office center is a complex architectural system that combines workspaces, meeting areas, service zones, and often public or semi-public spaces to create a healthy, productive, and socially engaging environment. The architectural evolution of office centers has been shaped by socio-economic changes, technological advancements, and the increasing awareness of the impact of the built environment on human well-being. As Moroccan cities such as Casablanca, Rabat, and Fes continue to expand, the integration of human-oriented design techniques within office complexes helps improve employee satisfaction, reduce stress, and enhance urban vitality.

The evolution of office architecture demonstrates a clear shift from rigid, function-driven modernist buildings toward flexible, sustainable, and human-oriented office environments. As illustrated in the timeline, early examples like the Seagram Building prioritized corporate identity and formal order, while later innovations such as the Lloyd's Building introduced high-tech flexibility with exposed services. Bioclimatic towers like Menara Mesiniaga incorporated climate-responsive design and environmental comfort, paving the way for contemporary human-centered offices that emphasize well-being, adaptability, and integration with urban life. This progression highlights how architectural strategies have increasingly focused on the physical,

cognitive, and social needs of users, reflecting both technological advancements and evolving urban demands

The growing emphasis on user comfort, accessibility, and adaptable work environments has led architects and developers to prioritize human-oriented techniques in the planning of office centers. These techniques respond to modern challenges by fostering collaboration, encouraging interaction, improving environmental performance, and creating visually and functionally comfortable spaces.

According to Dannhauser and Zak (n.d.), office openness and spatial configuration play a key role in promoting teamwork and collaboration in contemporary office environments. The study highlights that open layout facilitate communication, knowledge sharing, and social interaction among employees, while also emphasizing the importance of balancing openness with privacy and acoustic control to maintain productivity and focus. [1] (Fig.1.1).

Definitions of key terms were analyzed**:**

Human-Oriented Office Center – A development that prioritizes the needs, comfort, and well-being of its users by integrating ergonomic workspaces, flexible layouts, environmental comfort, and social interaction spaces within a single structure or interconnected buildings.

Ergonomic Workspace – a workspace designed according to human physical and cognitive characteristics to maximize comfort, health, and productivity while reducing fatigue and stress.

Human-Centered Design – an architectural approach that emphasizes the adaptation of spaces to users' needs, including environmental quality, accessibility, safety, and opportunities for social interaction.

According to Söderlund et al. (2020), outdoor working environments contribute positively to employees' well-being by improving environmental quality and reducing stress levels. The study shows that exposure to natural elements such as daylight, greenery, and fresh air enhances concentration, cognitive performance, and overall

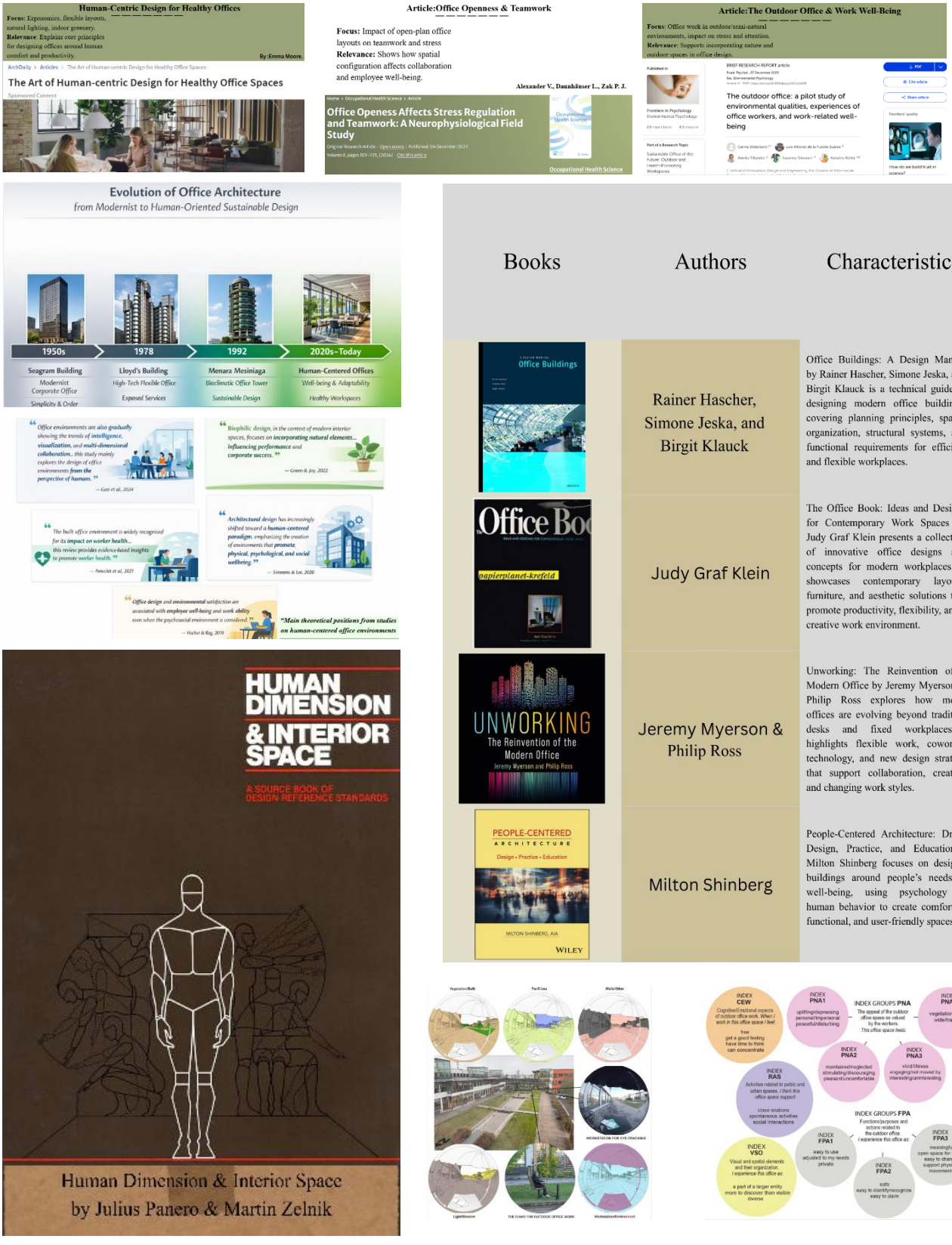


Figure 1.1 Visual synthesis of literature sources (books, journal articles, and analytical diagrams)

workplace satisfaction, supporting the integration of biophilic principles in contemporary office design [2] (Fig.1.1).

The architectural and spatial organization of human-oriented office centers continues to evolve to reflect changes in work patterns, technological innovation, and environmental sustainability. These developments are not only reshaping the physical fabric of cities but also influencing the way employees interact with their workplaces and urban surroundings.

Analysis of research studies indicates that the majority of theoretical work on human-oriented office design is found in international literature, while studies specifically focused on Morocco are limited. Scholars have examined various aspects of office architecture, including ergonomic planning, biophilic integration, flexible layouts, environmental comfort, and the integration of smart building technologies.

The evolution of human-oriented office architecture has been explored in the works of renowned architects and theorists such as Norman Foster, Richard Rogers, and Ken Yeang, who have contributed significantly to the development of sustainable, flexible, user-focused office environments. Their studies emphasize new principles in spatial organization, adaptive reuse, ergonomic considerations, and environmental responsiveness.

The organizational and functional-planning principles of office centers have been examined by researchers such as Frank Duffy and Robert Kronenburg, who analyzed strategies for improving spatial efficiency, environmental quality, and human comfort in office buildings. Their research highlights the importance of designing workplaces that accommodate diverse work styles, promote collaboration, and provide spaces for both focused and informal activities.

The urban and social significance of human-oriented office centers has been discussed by theorists such as Jan Gehl and Richard Florida. Their research emphasizes how office architecture influences urban vitality, accessibility, pedestrian movement,

and social interaction, highlighting the role of office complexes in shaping modern urban environments.

Among Moroccan studies, recent research highlights the adaptation of global human-oriented design principles to local contexts, considering climatic conditions, cultural patterns, and urban planning regulations. Techniques such as climate-responsive facades, interior greenery, natural lighting, and flexible layouts are being implemented to enhance employee well-being while creating context-sensitive office environments.

Thus, the theoretical analysis of human-oriented architectural design demonstrates a shift from purely functional office buildings toward integrated environments that prioritize comfort, social interaction, adaptability, and environmental sustainability. These principles provide a strong foundation for the formation of modern office centers in Morocco that are responsive to human needs, urban demands, and technological advancements.

Modern office centers must respond not only to the internal needs of employees but also to the broader demands of the urban context and technological innovations. Human-oriented design in Morocco increasingly emphasizes flexibility, multifunctionality, and adaptability to changing work patterns, social behavior, and urban infrastructure. Office spaces today are designed to allow for seamless transformations — work areas can be converted into collaborative hubs, temporary exhibition spaces, or even short-term residential or educational functions, reflecting the evolving needs of both organizations and cities.

Technological advancements play a crucial role in this transformation. Smart building systems, such as automated lighting, climate control, occupancy sensors, and energy-efficient facades, enhance user comfort while reducing operational costs. Integration of digital technologies also enables real-time space management, ensuring that office layouts can adapt dynamically to the number of users, activities, or environmental conditions.

Urban demands further shape the architecture of human-oriented office centers. In Moroccan cities like Casablanca, Rabat, and Fes, office complexes are increasingly linked to public transport, pedestrian networks, and mixed-use developments, encouraging connectivity, accessibility, and social interaction. The blending of work, leisure, and public spaces supports both employee well-being and urban vitality. Techniques such as interior greenery, daylight optimization, climate-responsive facades, and natural ventilation are used to enhance environmental comfort while responding to local climatic conditions.

Flexibility in design is essential to accommodate diverse functions over time. As highlighted in contemporary research, spaces initially designed for office use can later host apartments, kindergartens, laboratories, or cultural facilities. This approach ensures long-term relevance, sustainable use of resources, and adaptability to future urban and social needs. Case studies from global mixed-use developments, alongside Moroccan examples, demonstrate that thoughtful integration of flexibility, human comfort, and urban connectivity creates office centers that are resilient, multifunctional, and aligned with local cultural contexts.

Ultimately, the theoretical and practical evolution of human-oriented office centers demonstrates a shift toward holistic architectural strategies that prioritize human well-being, environmental performance, urban integration, and technological responsiveness. By combining flexible layouts, smart systems, and sustainable solutions, modern Moroccan office centers are increasingly capable of meeting the complex and dynamic demands of contemporary work, society, and city life

On mixed-use office concepts, modern developments often combine office spaces, coworking areas, meeting rooms, wellness facilities, restaurants and cafés, parking garages, and occasionally student or temporary housing, all within a single complex program. The most interesting question regarding this building typology is how these different functions are organized and accessed, ensuring both efficiency and user comfort.

This approach highlights the importance of human-oriented design principles in contemporary office environments. Human-centric office design has become a fundamental approach in contemporary workplace architecture. According to Moore (n.d.), healthy office environments are achieved through the integration of ergonomic planning, natural lighting, air quality, and spatial configurations that reduce stress and enhance physical and mental well-being. The study emphasizes that workplaces designed around human needs significantly improve productivity, comfort, and long-term occupational health. [2] (Fig.1.1).

In the book "Human Dimension and interior space" by Julius Panero and Martin Zelnik, the authors outline core principles of human-centered architectural design, emphasizing anthropometric data, ergonomic planning, and spatial decisions that directly support occupant needs, creating office centers that are functional, comfortable, and socially engaging [4] (Fig.1.1).

In the book "Office Buildings: a Design Manual" by Rainer Hascher, Simone Jeska, and Birgit Klauck, this comprehensive guide provides a detailed examination of planning principles, spatial organization, structural systems, and functional requir**ements** for modern office buildings. It covers strategies for creating efficient, flexible, and user-oriented workplaces [5] (Fig.1.1).

In "*Unworking: The Reinvention of the modern office*" by Jeremy Myerson and Philip Ross, the authors explore how contemporary offices are evolving beyond traditional desks and fixed workplaces. The book highlights **flexible workspaces, coworking, technology integration, and new design strategies** that promote collaboration, creativity, and adaptable work environments [6].

In the book "*People-Centered Architecture: Driving Design, Practice, and Education*" by Milton Shinberg focuses on **architecture that prioritizes human experience**, combining behavioral research, environmental psychology, and design strategies to enhance **well-being, comfort, and connection** within office spaces [7].

In the book "*The Office Book: Ideas and Designs for Contemporary Work Spaces*" by Judy Graf Klein presents a collection of innovative office layouts, furniture solutions, and aesthetic concepts that foster productivity, flexibility, and a creative work environment, offering practical inspiration for designing mixed-use office Therefore, the theoretical experience of forming modern office centers demonstrates a transition from rigid functional structures toward flexible, human-oriented, and multifunctional environments [8]. Contemporary office architecture integrates ergonomic planning, environmental sustainability, technological innovation, and urban connectivity, forming a new model of office centers that respond to both human needs and urban development processes (Fig.1.1).

An analysis of these sources of literature shows that quite a lot of issues were considered in the formation of business centers, but from the point of view of a humanistic approach, the research requires a more detailed consideration. For this purpose, more detailed studies will be conducted, namely based on the analysis of real design objects.

1.2. Analysis of practical experience of the formation of office centers

A modern office center is a multifunctional architectural complex that integrates administrative, business, commercial, and social functions within a unified spatial system. Unlike traditional office buildings that serve only as workplaces, contemporary office centers are designed as dynamic environments that support productivity, communication, innovation, and employee well-being. These complexes form important elements of the urban structure, contributing to economic growth and the development of business districts while creating comfortable conditions for users.

The primary function of office centers is to accommodate workplaces for companies, institutions, and organizations. Such complexes include open-plan offices, private workspaces, conference halls, co-working areas, and communication zones. In addition to administrative functions, modern office centers incorporate retail spaces,

dining facilities, fitness centers, and public areas, forming a self-sufficient environment that supports daily activities and reduces transportation needs. This multifunctionality enhances urban efficiency and promotes social interaction.

One of the most prominent examples of the formation of a modern office center is the *Seagram Building*, New York City, USA. This landmark project represents the classical model of a high- rise corporate office center that integrates architectural clarity with functional efficiency. The building accommodates headquarters and administrative offices for major corporations, forming a symbol of economic power and modern urban identity [9].

From the perspective of the formation of office centers, the building demonstrates an effective organization of office space within a high-rise structure. Its clear structural grid and flexible floor plans allow for efficient workplace arrangement and adaptability to different office functions. This approach illustrates the principles of rational spatial planning, vertical zoning, and efficient use of urban land, which are key aspects in the development and architectural formation of modern office centers (Fig.1.2).

The Seagram Building is composed as a rectangular high-rise tower organized around a steel structural frame and a reinforced concrete core that houses elevators, staircases, and service systems. The tower is set back from the street, creating a large public plaza that enhances pedestrian accessibility and establishes a transition between the skyscraper and the urban environment. This planning decision improves human comfort by providing open spaces for rest, social interaction, and visual relief from the dense urban context.

The facade consists of bronze-tinted glass curtain walls and vertical steel elements that express the structural grid while allowing natural light to penetrate deep into office floors, improving indoor environmental quality and supporting occupants' well-being.

Figure 1.2. Seagram Building, New York City, USA (Ludwig Mies van der Rohe, 1958)

The open-plan interior layout ensures flexibility, enabling companies to adapt workspaces to organizational needs and promote collaborative work environments. Amenities such as access to daylight, ventilation, and public plaza interaction make the building not only efficient but also comfortable and inviting for its users.

A significant example of sustainable office center formation is the *Menara Mesiniaga,* Subang Jaya, Malaysia [10]. This bioclimatic skyscraper represents an innovative approach to office architecture in tropical climates, integrating environmental strategies to reduce energy consumption and enhance occupant comfort

The tower is organized around a central core with circular floor plates that optimize structural stability and spatial efficiency. External sun-shading devices, sky gardens, and naturally ventilated zones are integrated into the building envelope to reduce heat gain and provide comfortable indoor temperatures. The spiral arrangement

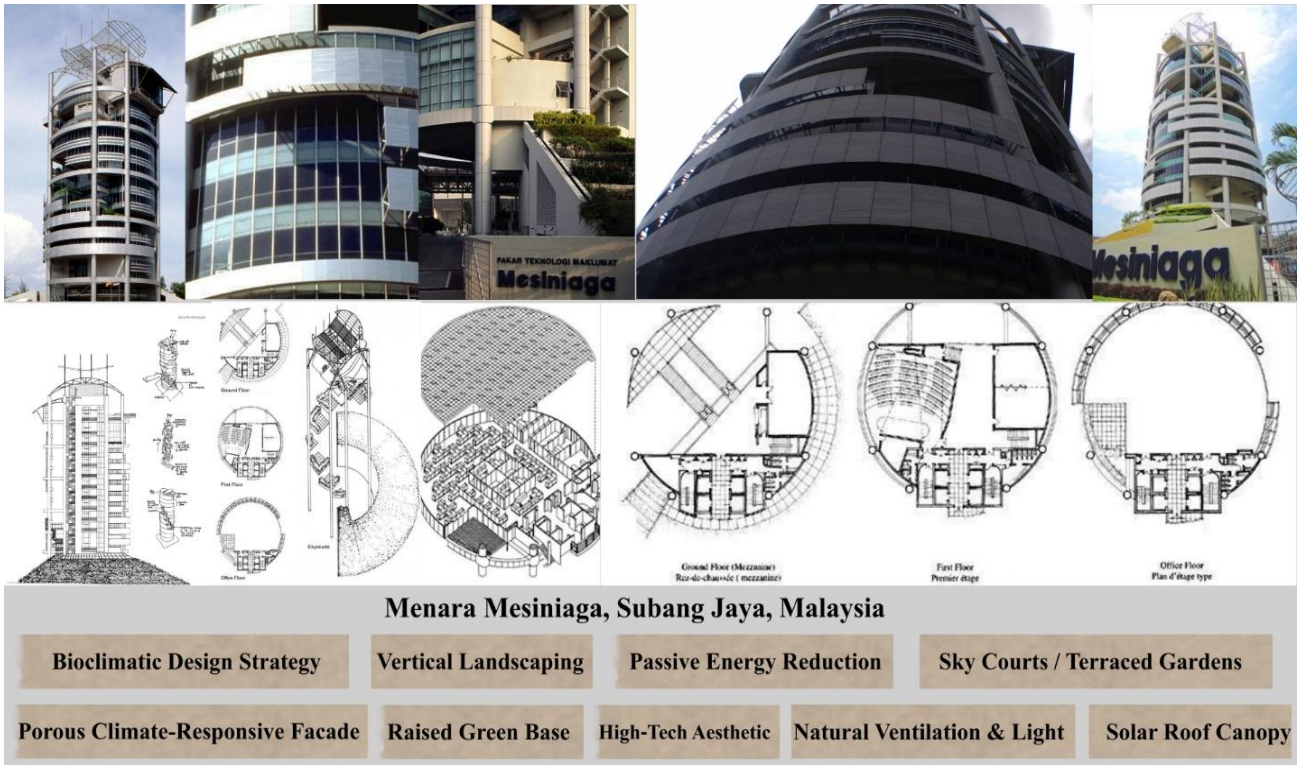


Figure 1.3. Menara Mesiniaga, Subang Jaya, Malaysia (Ken Yeang, 1992)

of landscaped terraces offers spaces for relaxation, social interaction, and informal meetings, improving psychological well-being and productivity. High-performance glazing, reinforced concrete, and lightweight aluminum shading systems ensure visual comfort, daylight control, and energy efficiency. Menara Mesiniaga demonstrates how bioclimatic strategies can create office environments that are not only sustainable but also supportive of human health, comfort, and satisfaction (Fig.1.3).

An outstanding example of human-oriented office architecture with green infrastructure is the *ACROS Fukuoka Prefectural International Hall*, Fukuoka, Japan [11]. This multifunctional complex integrates administrative offices, conference

facilities, and cultural spaces within a terraced structure covered by a stepped green roof.

The building's composition creates a gradual transition from the urban fabric to a vertical landscape, forming a public park that extends from ground level to the roof. The accessible green space provides recreational areas for relaxation, walking, and social activities, while improving air quality and reducing urban heat. These green terraces enhance occupants' well-being, offering visual and physical connections to nature and creating comfortable outdoor spaces for users. The structural system combines reinforced concrete with glass facades that allow natural lighting and maintain visual openness. Vegetation layers serve as thermal insulation, reducing indoor temperatures and creating pleasant microclimates that directly improve human

Figure 1.4. ACROS Fukuoka Prefectural International Hall, Fukuoka, Japan

comfort. The ACROS Fukuoka project demonstrates how office centers can function as ecological and social infrastructure, prioritizing human-centered design alongside environmental sustainability.

Additionally, the terraced configuration improves accessibility and encourages continuous movement between interior and exterior spaces, allowing users to

experience the building as an extension of the urban landscape rather than a closed structure. The presence of shaded seating areas, walking paths, and viewpoints supports informal meetings, rest, and recreational activities during the working day, which contributes to stress reduction and increased productivity. By integrating public functions with workplace environments, the *ACROS Fukuoka Prefectural International Hall* promotes social interaction, inclusivity, and a sense of community, demonstrating how architectural design can positively influence both physical comfort and psychological well-being of occupants and visitors (Fig.1.4).

A notable example of office center formation in the Arab region is the *Al Bahar Towers,* Abu Dhabi, United Arab Emirates [12]. This complex represents an advanced model of climate-responsive office architecture adapted to hot desert conditions. The twin towers accommodate corporate offices and business facilities while incorporating innovative environmental technologies that directly improve human comfort.

Figure 1.5. Al Bahar Towers, Abu Dhabi, United Arab Emirates (Aedas Architects, 2012)

The towers are composed as cylindrical volumes organized around reinforced concrete cores, allowing flexible office layouts and efficient circulation systems. Their adaptive facade system, inspired by traditional mashrabiya screens, consists of movable shading elements that respond automatically to sunlight. This dynamic envelope reduces solar heat gain and glare, creating visually comfortable and thermally stable interiors. Occupants benefit from daylight access, controlled shading, and improved air quality, which together enhance health, productivity, and comfort. Landscaped areas and shaded public spaces surrounding the towers provide outdoor areas for rest and social interaction, promoting psychological well-being. Smart building technologies optimize indoor lighting, ventilation, and temperature, ensuring a consistently comfortable working environment for all users. (Fig.1.5).

The OCP Administrative Offices in Benguerir stand as a prominent example of modern, human-oriented office architecture in Morocco [13]. This complex demonstrates how functional, climate-responsive design can be combined with employee comfort and well-being, adapting to the region's semi-arid environment.

The building is organized as a low-rise, horizontal composition, prioritizing accessibility, efficient circulation, and intuitive spatial organization. Open-plan office areas, meeting rooms, and shared common spaces provide flexible work environments that support collaboration, focus work, and informal interactions. Large windows and landscaped outdoor areas ensure abundant **daylight access**, natural ventilation, and visual connections to the surrounding environment, creating a psychologically pleasant and stimulating work setting. (Fig.1.6).

Materials such as glass, concrete, and metal are combined with **shaded outdoor terraces** and pergolas, helping to regulate indoor temperature and improve thermal comfort. The architectural design incorporates elements reflecting **Moroccan cultural identity**, connecting employees with local heritage and enhancing a sense of place. Pathways, entrances, and circulation zones are clearly defined, reducing spatial confusion and supporting intuitive movement throughout the complex.

Overall, the OCP Administrative Offices demonstrate a careful integration of **architectural functionality, climate responsiveness, and human-centered design**, providing a working environment that enhances productivity, health, and well-being for all occupants.

Figure 1.6. OCP Administrative Offices, Benguerir, Morocco (Ricardo Bofill Taller de Arquitectura, 2019)

Thus, the analyzed examples demonstrate that the formation of modern office centers involves the integration of functional diversity, advanced technologies, environmental strategies, and human-oriented design principles. Contemporary office centers evolve from purely administrative buildings into multifunctional complexes that prioritize not only economic efficiency but also human comfort, well-being, and usability within the urban context.

1.3. Trends in human-oriented architectural design of modern office centers

The analysis of contemporary architectural practices indicates that, alongside rapid technological advancement and digital transformation, the design of office centers is shifting toward a human-oriented paradigm. Modern office architecture is no longer focused solely on efficiency and density but increasingly prioritizes employee well-being, productivity, social interaction, and environmental comfort. Office buildings are evolving into complex ecosystems that support diverse work styles, mental health, and work-life balance while integrating seamlessly with the urban fabric.

Human-oriented office centers are still undergoing transformation; however, numerous innovative projects demonstrate departure from rigid, monotonous corporate environments toward flexible, inclusive, and adaptive workplaces. Architects are implementing spatial, technological, and environmental strategies that place users at the center of the design process. The following key trends characterize the human-oriented architectural design of modern office centers:

One of the most important trends is **Flexible and activity-based workspaces**. This approach responds to the changing nature of work, which increasingly requires mobility, collaboration, creativity, and individual concentration within the same environment. Instead of assigning one permanent desk per employee, activity-based offices provide a variety of spaces designed for specific tasks, allowing users to choose the most suitable setting according to their needs.

Flexible office environments typically include open collaborative zones, quiet focus rooms, informal lounges, meeting hubs, and multifunctional areas for social interaction. Movable partitions, modular furniture, and adaptable layouts enable rapid reconfiguration of space, ensuring that the office can evolve alongside organizational changes. Such spatial flexibility improves productivity, supports teamwork, reduces stress, and accommodates diverse working styles and preferences. In addition, this trend emphasizes ergonomic comfort, access to daylight, acoustic control, and opportunities

for movement throughout the workday, all of which contribute to physical and psychological well-being. By prioritizing user experience rather than rigid efficiency, activity-based design transforms the office into a dynamic, inclusive, and human-centered environment.

A prominent example illustrating this trend is The Edge in Amsterdam, designed by PLP Architecture (Fig.1.7) This mid-rise office building is organized around activity-based working principles, offering a wide range of workspace types instead of fixed desks. The spatial composition revolves around a large central atrium that promotes visual connectivity, daylight distribution, and social interaction between floors. Employees can select environments suited to focused work, collaboration, or informal meetings, while smart building technologies allow personalized control of lighting and temperature. The use of transparent glass facades, open floor plans, and adaptable interior elements reinforces flexibility and accessibility.

Figure 1.7. The Edge Office Building, Amsterdam – Example of a human-centered and activity-based workplace design.

Through the integration of spatial adaptability, technological innovation, and user comfort, this building exemplifies how flexible and activity-based workspaces enhance both organizational efficiency and human well-being in contemporary office centers.

Another significant trend in human-oriented office design is **biophilic and wellness-centered architecture**, which integrates natural elements into office spaces to improve physical and psychological well-being. Modern offices incorporate indoor vegetation, green walls, natural materials, daylight optimization, and access to outdoor terraces to create environments that reduce stress, enhance cognitive performance, and foster satisfaction [15]. This approach also prioritizes healthy indoor air quality, acoustic comfort, and opportunities for movement, transforming office spaces into restorative environments that support both productivity and employee wellness.

By connecting occupants with nature, biophilic design addresses both the environmental and social dimensions of human-oriented workplaces.

A prominent example illustrating this trend is *CapitaSpring* in Singapore (Fig.1.8). This high-rise office tower integrates sky gardens, green terraces, and urban farming elements across multiple floors, creating a strong visual and physical connection to nature. The spatial composition combines office floors with outdoor green spaces, enhancing daylight penetration, natural ventilation, and employee access to fresh air.

The use of glass curtain walls, open-plan layouts, and landscaped terraces promotes visual connectivity and flexibility, while sustainable materials and passive environmental strategies improve energy efficiency and indoor comfort. CapitaSpring demonstrates how biophilic and wellness-centered design can be applied in high-rise office centers to support employee health, productivity, and satisfaction.

Figure 1.8. CapitaSpring, Singapore – Biophilic high-rise office integrating sky gardens and vertical greenery.

Sustainability is a fundamental trend in human-oriented office design, emphasizing energy efficiency, environmental responsibility, and occupant well-being. Modern offices integrate renewable energy systems, natural ventilation, solar shading, green roofs, and non-toxic materials to reduce environmental impact while enhancing comfort. Low- and mid-rise offices also prioritize daylight, access to outdoor spaces, and ergonomic interior design, ensuring that occupants benefit from a healthy and stimulating environment. Sustainable office centers demonstrate that environmental performance and human comfort are mutually reinforcing, supporting productivity, health, and social engagement. [16]

A prominent example illustrating this trend is *Bullitt Center* in Seattle (Fig.1.9). This low-rise office building is designed as a net-zero energy workspace, incorporating solar panels, natural ventilation, rainwater harvesting, and healthy, non-toxic materials. The spatial composition features open floor plates and rooftop green areas, allowing

occupants to experience daylight and outdoor access throughout the workday. This trend supports work-life balance by allowing employees to live, work, shop, dine, and socialize within proximity. It enhances convenience, fosters social interaction, and strengthens connections between buildings and urban fabric.

Figure 1.9. Bullitt Center, Seattle – Net-zero energy office building integrating sustainable and human-centered design strategies.

The building's design integrates passive environmental strategies with energy-efficient systems to minimize ecological impact while maximizing comfort. The Bullitt Center exemplifies how sustainability and human-oriented design converge to create productive, healthy, and environmentally responsible office centers.

Another trend in contemporary human-oriented office architecture is the integration of **mixed-use functions** within office centers. Rather than isolated corporate towers, modern developments combine workplaces with retail, hospitality, public spaces, and cultural amenities to create vibrant, multi-functional urban environments. Mixed-use office complexes encourage a pedestrian-friendly streetscape and diverse user experiences, transforming work centers into dynamic, socially engaging hubs.

A prominent example illustrating this trend is *King Abdullah Financial District* in Riyadh, Saudi Arabia (Fig.1.10). This large-scale development integrates office towers with residential units, retail malls, hotels, parks, and cultural venues, creating a comprehensive mixed-use environment. The spatial composition consists of multiple office buildings organized around public plazas and pedestrian boulevards, which promote visual connectivity and social interaction.

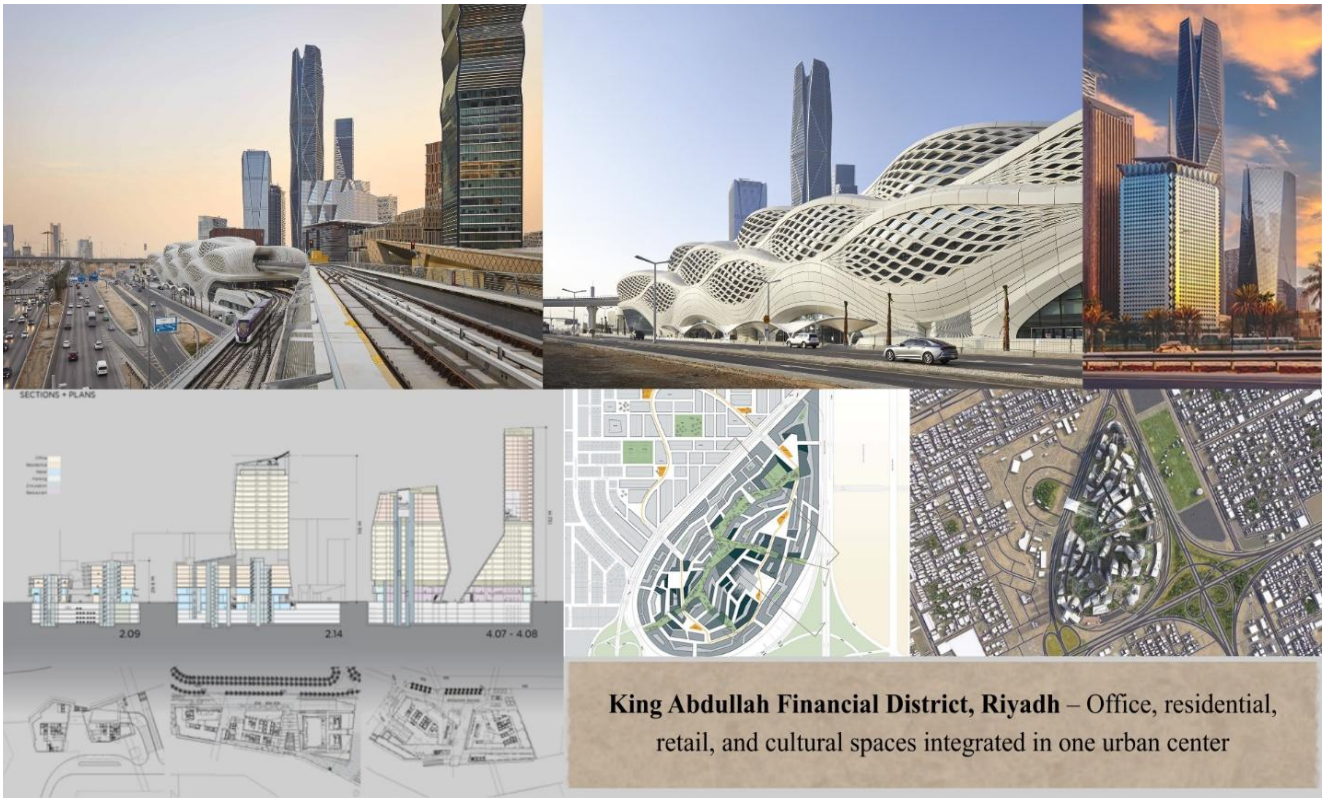


Figure1.10. King Abdullah Financial District, Riyadh – Mixed-use development combining office buildings with supporting commercial and public amenities within a pedestrian-oriented urban framework.

Office floors are interlinked with commercial and public amenities, enabling seamless access to cafes, shops, meeting spaces, and leisure areas. The use of glass facades, open plazas, shaded walkways, and landscaped public spaces emphasizes transparency, accessibility, and human comfort. Techniques such as integrated shading devices, energy-efficient facades, and pedestrian-oriented circulation enhance environmental performance while improving user experience.

As a result, the King Abdullah Financial District demonstrates how mixed-use human-oriented design can combine work, lifestyle, and urban life into a cohesive, sustainable built environment that prioritizes user engagement and comfort [17].

An important trend in human-oriented office architecture is the integration of **smart technologies** that optimize environmental conditions, support user comfort, and enhance operational efficiency. Smart offices use networks of sensors, automation systems, and digital interfaces to monitor and adjust lighting, heating, ventilation, noise levels, and space usage in real time. These technologies allow workplaces to respond dynamically to human needs while also improving energy performance. By enabling personalized control of environmental conditions and facilitating efficient building management, smart design contributes to employee satisfaction, well-being, and productivity [18].

A notable example illustrating this trend is *Google Bay view campus* in Mountain View, California (Fig.1.11). Rather than being a high-rise tower, this office campus consists of low- and mid-rise structures arranged to promote interaction, natural light, and technological integration. The campus incorporates extensive sensor networks that monitor indoor conditions and adjust lighting, temperature, and air quality for occupant comfort.

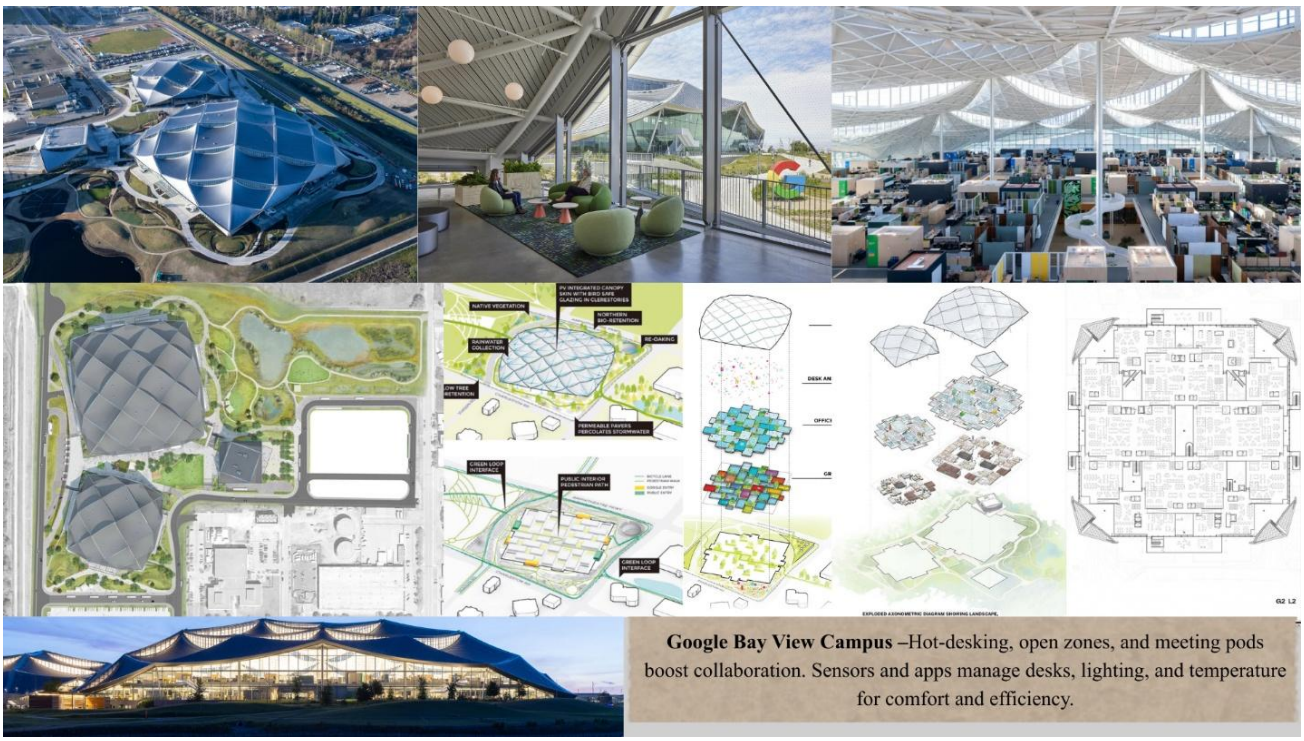


Figure1.1.11. Google Bay View Campus, California — Smart low-rise office campus integrating environmental systems, flexible workspaces, and nature-based design.

Intelligent systems also manage space utilization, allowing flexible scheduling of desks, meeting rooms, and collaborative areas. The spatial composition emphasizes connectivity between indoor spaces and landscaped outdoor areas, encouraging movement and interaction throughout the workday. Transparent facades, open floor plans, and adaptive interiors promote visual connectivity and adaptability.

Smart building technologies at the Google Bay View Campus demonstrate how advanced digital systems can transform traditional office environments into responsive, efficient, and human-oriented workplaces without relying on vertical high-rise forms.

Conclusions to the 1st section

1.The analysis of the theoretical and practical experience of the formation of office centers demonstrates the significant transformation of office architecture over time. The theoretical foundations show that office centers evolved from rigid administrative buildings focused primarily on economic efficiency into multifunctional urban elements integrating social, technological, and environmental aspects. Contemporary theory highlights flexibility, sustainability, and human-centered design as fundamental principles of modern office development.

2.The study of practical experience confirms this evolution. Early modernist office buildings such as the Seagram Building reflected corporate identity, structural clarity, and standardized workspaces. In contrast, more recent examples like the Menara Mesiniaga demonstrate the integration of bioclimatic strategies, environmental responsiveness, and improved user comfort. These examples illustrate the shift from purely functional office structures to adaptive, sustainable, and people-oriented environments.

3.The identified trends in human-oriented architectural design emphasize employee well-being, spatial flexibility, access to natural light, green spaces, ergonomic planning, and areas that encourage communication and collaboration. Smart technologies and sustainable materials further enhance efficiency and comfort. Modern office centers increasingly function as dynamic components of the urban environment, often incorporating mixed-use and socially interactive spaces.

SECTION 2: HUMAN-ORIENTED TRENDS AND APPROACHES OF MODERN OFFICE CENTERS OF MOROCCO

2.1 Factors influencing the architectural formation of office centers

The architectural formation of modern office centers is influenced by a complex combination of economic, technological, environmental, and social factors. These factors shape the spatial organization, functional structure, and architectural expression of contemporary office environments. In recent decades, rapid technological progress, globalization, and changes in working culture have significantly transformed the role of office buildings. Modern office centers are no longer designed only as places for administrative work; instead, they function as dynamic environments that support communication, innovation, and collaboration. (Fig. 2.1).

One of the most significant factors influencing the architectural formation of office centers is the **development of modern technologies**. The integration of digital infrastructure, high-speed communication systems, and intelligent building technologies has fundamentally changed the way office buildings are designed and operated. Smart building systems allow automated control of lighting, heating, ventilation, air conditioning, and energy consumption. These systems improve energy efficiency while creating comfortable working conditions for employees. In addition, digital technologies support flexible workplace management through desk reservation systems, occupancy sensors, and mobile applications that help optimize the use of office space.

Another important factor is the **transformation of work processes and organizational structures**. Traditional office models were based on fixed workplaces and strict hierarchical spatial organization. However, the modern economy increasingly relies on teamwork, creativity, and knowledge exchange. As a result, contemporary office centers are designed with flexible spatial configurations that allow employees to move between different work settings depending on their tasks. These environments often include open-plan workspaces, collaborative areas, meeting rooms, informal

lounges, and quiet zones designed for individual concentration. Such diversity of spaces helps create a more dynamic and adaptable work environment.

The **growing importance of environmental sustainability** is also a key factor shaping the architectural formation of modern office centers. In response to global environmental challenges and increasing energy costs, architects and developers are adopting sustainable design strategies aimed at reducing the environmental impact of buildings. These strategies include the use of energy-efficient materials, natural ventilation systems, solar shading, green roofs, and rainwater management solutions. Sustainable office buildings often emphasize the use of natural lighting, which not only reduces energy consumption but also improves the psychological well-being and productivity of employees.

Closely related to sustainability is the increasing emphasis on **human-oriented architectural design**. Contemporary office environments prioritize the comfort, health, and well-being of employees. Architects pay special attention to the quality of the indoor environment, including natural light, thermal comfort, air quality, and acoustic conditions. The integration of greenery, interior landscaping, and recreational spaces within office complexes has become an important design strategy. Such elements help create a healthier and more pleasant working environment while supporting informal interaction and social communication among employees.

Another important factor is the **urban context and spatial integration of office centers within the city structure**. The location of office buildings, their accessibility, and their relationship with surrounding infrastructure significantly influence their architectural formation. Modern office centers are often located in areas with good transportation connections, including public transit systems and major road networks. In addition, contemporary office complexes frequently incorporate public spaces such as plazas, landscaped courtyards, and pedestrian pathways that contribute to the development of vibrant urban environments. [19].

Figure 2.1 A multi-dimensional classification of factors influencing the architectural formation of office centers. (Source: Prepared by the author, 2026).

Economic considerations also play a major role in shaping the architecture of office centers. Developers seek to create buildings that are economically efficient while remaining attractive to tenants and employees. This often leads to the use of flexible planning solutions that allow office spaces to be easily adapted to the needs of different companies and organizations. The ability to reorganize internal spaces over time increases the long-term functionality and market value of office buildings.

These factors can be clearly observed in contemporary office developments in Morocco, particularly in projects implemented by the OCP Group in Benguerir. Administrative and research facilities in this area demonstrate the integration of advanced technologies, flexible workspace organization, and environmentally responsible design strategies. Such projects reflect the growing adoption of human-oriented and sustainable architectural approaches in the formation of modern office environments in Morocco.

2.2. The patterns of forming of human oriented architectural design of modern office centers of Morocco

Modern office centers in Morocco can be classified according to several criteria, including their functional composition, spatial organization, architectural form, and user-oriented design strategies. This classification allows for a comprehensive understanding of the diverse typologies and planning approaches that characterize contemporary office architecture, particularly within the framework of human-oriented design This approach emphasizes enhancing user comfort, supporting well-being, and promoting social interaction within office environments.

In the proposed office center project, the functional composition is developed according to human-oriented design principles, aiming to create a comfortable, inclusive, and well-balanced working environment. In addition to the primary office spaces, the project integrates a wide range of supporting functions that respond to users' daily needs. These include a restaurant and café area that provide convenient access to

food services, as well as a pharmacy and bank that support essential services within the workplace. A gym is incorporated to promote physical well-being, while resting rooms for staff offer spaces for relaxation and recovery. The project also includes prayer rooms, reflecting cultural and social considerations in the Moroccan context, and accessible sanitary facilities designed for people with disabilities, ensuring inclusivity and equal access for all users. Furthermore, a winter garden is integrated within the building, introducing natural elements and improving environmental quality, while a gallery space enhances the social and cultural experience of the users. (Fig 2.2)

Special attention is given to spatial organization, with large corridors designed not only for efficient circulation but also as interactive spaces incorporating seating areas and visual connections to green zones [20]. Open-plan workspaces are implemented to enhance flexibility, communication, and collaboration, complemented by a variety of spatial settings, including quiet zones, semi-private areas, and open social spaces, allowing users to choose environments that suit their needs. In addition, the design maximizes natural daylighting through large openings, skylights, and transparent elements, while incorporating shading devices to control glare and improve visual comfort.

The project further strengthens its human-oriented approach through the integration of biophilic design strategies, including indoor vegetation, green walls, and accessible outdoor terraces [22]. that encourage interaction with nature and reduce stress. Climate-responsive design solutions, such as shaded outdoor areas, natural ventilation, and the use of greenery for cooling, are implemented to adapt to the Moroccan climate and enhance thermal comfort. Additional well-being features, including relaxation zones and quiet spaces, contribute to mental and physical health, while inclusive design principles ensure accessibility and comfort for all users.

Together, these elements create a multifunctional, flexible, and user-centered environment that supports productivity, well-being, and social interaction, reflecting th

Figure 2.2. Functional configuration and integrated pillars of the human-oriented office center project. (Source: Prepared by the author, 2026).

When classified according to their **integrated functions**, modern office centers include several key components. The **office function** represents the core element, comprising individual offices, open-plan workspaces, co-working areas, and meeting rooms These configurations accommodate diverse working styles while supporting collaboration and flexibility [21]. In addition, the **commercial function** includes retail spaces, cafés, and restaurants that support daily user needs and enhance convenience in the Moroccan context, these facilities reduce travel time and provide a comfortable, convenient experience for workers. The **recreational function** integrates relaxation areas, terraces, and green spaces, contributing to psychological comfort and stress reduction [24]. These spaces allow users to disconnect and recharge, which is essential

for mental well-being. The **social function** is expressed through informal meeting zones and collaborative spaces that encourage communication and interaction. this arrangement aligns with Moroccan cultural values, which favor social interaction and community-building in workspaces. Furthermore, **administrative functions** ensure the operational management of the building, while **educational and training functions**, such as conference rooms and seminar spaces, support professional development. Increasingly, modern office centers also incorporate **wellness functions**, including fitness areas and healthcare facilities, reflecting the growing importance of user well-being. Finally, **parking and service functions** provide the necessary infrastructure for accessibility and building maintenance. together, these functions create a comprehensive environment that responds to the physical, social, and professional needs of users

Beyond these primary functions, Moroccan office centers often emphasize a connection between architecture, environment, and culture. Designers integrate features such as large windows and skylights to maximize natural light, shaded outdoor areas for relaxation, and local materials like stone or wood to reflect regional aesthetics. Flexible layouts allow spaces to adapt to different needs, from informal gatherings to formal events, while eco-friendly systems such as energy-efficient lighting, water-saving fixtures, and green rooftops enhance sustainability. Thoughtful planning of circulation routes, communal areas, and quiet zones ensures both accessibility and comfort, promoting a healthy balance between productivity and well-being. By combining functionality, culture, and sustainability, these office centers create dynamic, human-oriented environments that support both professional efficiency and social interaction, making them key landmarks in modern Moroccan urban life.

From a spatial perspective, office centers can be classified based on the **arrangement of their functions**. In **vertical organization**, different functions are distributed across multiple activities at floors within a single building, typically placing public and commercial

Figure 2.3. Relationship between integrated building functions and spatial zoning strategies in modern office centers. (Source: Prepared by the author, 2026).

lower levels and office spaces above. This configuration enhances user orientation and ensures that public spaces are easily accessible while private work areas maintain focus and privacy

In contrast, **horizontal organization** distributes functions across several buildings or zones, allowing for greater flexibility and stronger connections with outdoor spaces.

A widely adopted model is the **campus-type configuration**, where multiple buildings are integrated within landscaped environments, promoting movement, interaction, and contact with nature. in Morocco, campus-type layouts take advantage of outdoor spaces and shaded areas to provide thermal comfort and encourage outdoor socialization

Additionally, **live-work environments** aim to reduce commuting and enhance work-life balance by integrating workspaces with supporting amenities. This approach supports a flexible and user-centered lifestyle, increasingly relevant in modern Moroccan cities

The effectiveness of these configurations is further defined by zoning strategies**.**

In **combined zoning**, multiple functions coexist within the same spatial framework, sharing common facilities and enhancing accessibility.

Separated zoning organizes functions into distinct zones or buildings connected through circulation networks and open spaces.

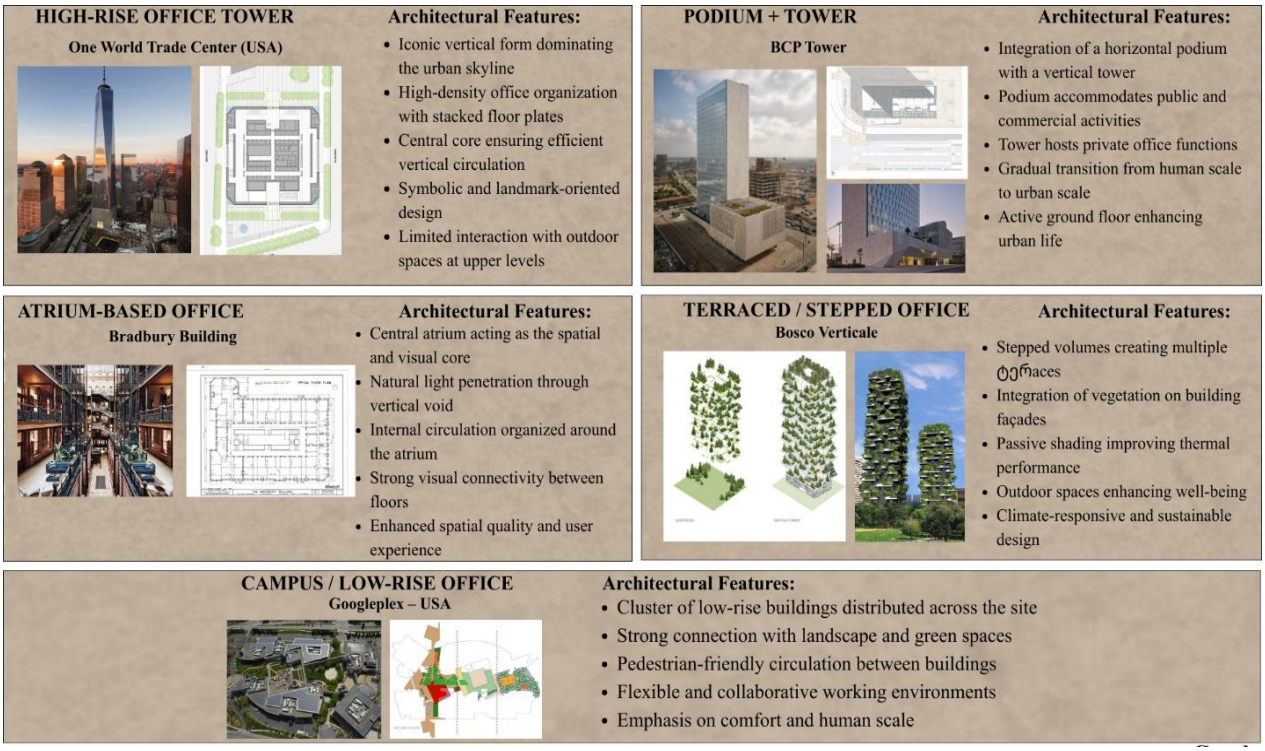
Vertical zoning distributes functions across different levels of a building, while **horizontal zoning** spreads them across different sections of a complex.

More advanced approaches adopt **hybrid zoning**, combining these strategies to achieve greater flexibility and spatial efficiency. Effective zoning improves circulation, minimizes conflicts between functions, and enhances spatial clarity, directly contributing to user satisfaction and productivity. (Fig 2.4)

In terms of **architectural form**, modern office centers exhibit a variety of configurations. **High-rise tower buildings** are common in dense urban areas, optimizing land use and creating strong visual identities. [23].

Podium-and-tower structures combine a horizontal base containing public functions with vertical office volumes above, ensuring a transition between human scale and urban density.

Low-rise and campus-type complexes emphasize horizontal development and integration with green spaces, providing a more comfortable and human-scaled environment.



Picture 2.4 Comparative analysis of architectural forms and typologies in modern office design. (Source: Prepared by the author, 2026).

Atrium-based buildings organize spaces around central voids, improving natural lighting, ventilation, and visual connectivity.

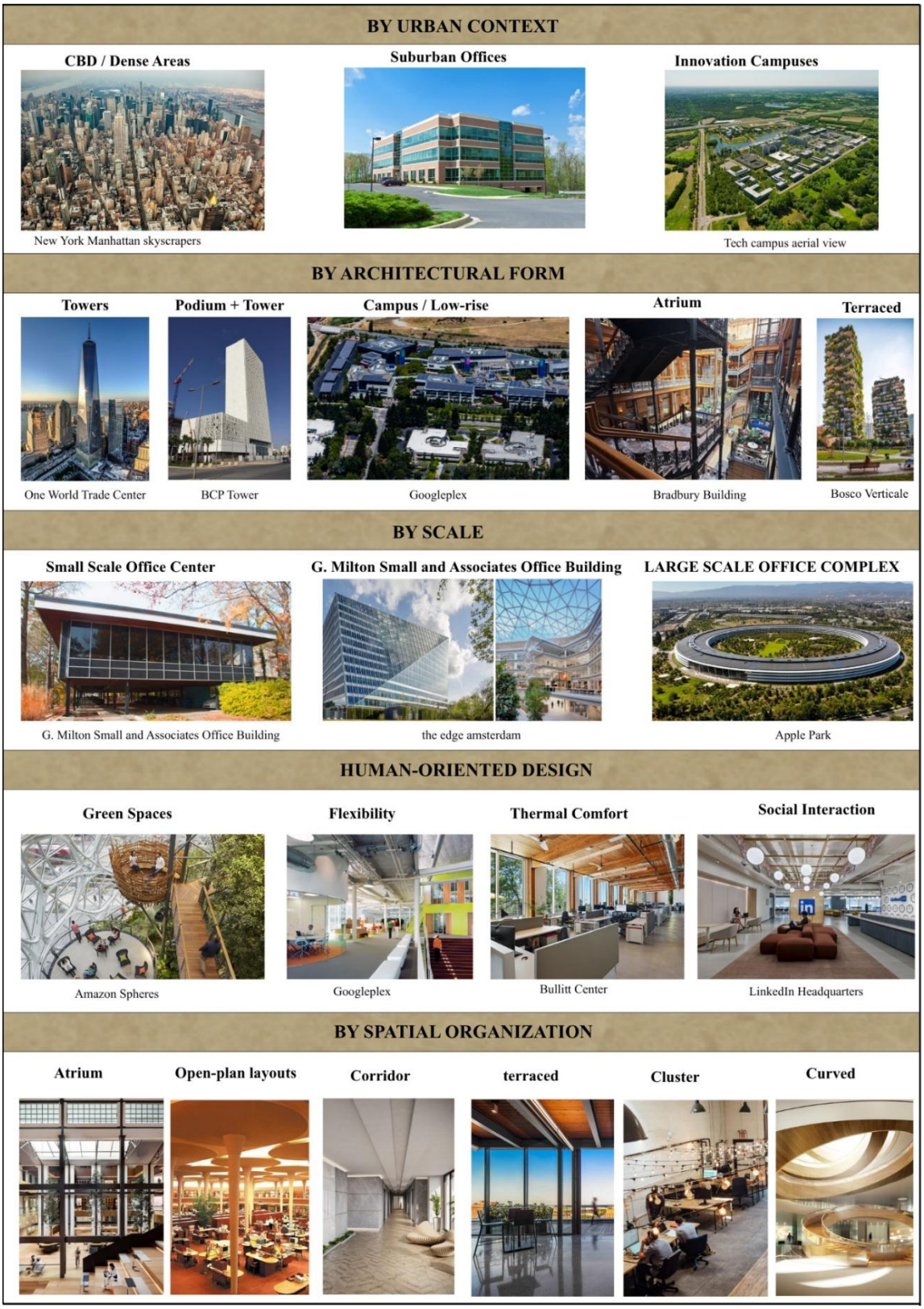
Additionally, **terraced and stepped forms** introduce outdoor spaces and greenery, enhancing environmental quality and user experience. in Morocco, terraced

forms and landscaped atriums help reduce heat, provide shaded areas, and encourage outdoor activity, all of which enhance user comfort (Fig 2.4)

Office centers can also be classified according to their urban context. Developments located in central business districts are typically compact and vertical, responding to high-density conditions. In contrast, suburban or peripheral office centers offer more spacious layouts and stronger integration with natural elements. Technology parks and innovation hubs represent another category, often designed as campus-like environments that support creativity and collaboration. The urban context influences the degree of openness, access to greenery, and human-scale design, which are crucial for user satisfaction

From a compositional standpoint, the **volume-spatial organization** of office centers includes several planning structures. **Corridor layouts** provide linear and efficient circulation, while **atrium layouts** create centralized spaces that enhance environmental quality and social interaction. **Cluster layouts** divide the workspace into smaller units, fostering a more human scale. **Open-plan layouts** ensure flexibility and adaptability, whereas non-linear and curvilinear configurations introduce dynamic spatial experiences and respond to specific site conditions. **Terraced layouts** further enhance sustainability by integrating vegetation and outdoor spaces. These organizational patterns promote interaction, flexibility, and a sense of community, which are essential for human-centered office environments

Finally, office centers can be classified according to their scale, including small-scale buildings, medium-sized complexes, and large multifunctional developments. The scale of the project significantly influences its spatial organization, functional diversity, and overall impact on the urban environment. Larger-scale developments provide a wider range of services and amenities, enhancing convenience, comfort, and well-being for users (Fig 2.5)



Picture 2.5. Comprehensive classification of modern office centers based on urban context, architectural form, scale, and human-oriented design strategies.

(Source: Prepared by the author, 2026)

In conclusion, the formation of human-oriented office centers in Morocco reflects a shift toward more flexible, multifunctional, and user-centered design

approaches. By integrating diverse functions, adaptive spatial structures, and strong connections with natural elements, these office centers aim to create environments that support not only productivity but also the physical and psychological well-being of users These patterns indicate that contemporary Moroccan office architecture increasingly prioritizes adaptive, comfortable, and socially responsive environments that enhance the overall quality of the user experience."

2.3. The techniques of human oriented architectural design of modern office centers of Morocco

Human-oriented architecture is an approach that places the physical, psychological, and social needs of users at the center of the design process, aiming to create environments that enhance comfort, productivity, well-being, and interaction. In modern office centers in Morocco, this approach responds not only to functional requirements but also to climatic conditions, cultural context, and evolving work patterns**.** The primary objective is to create healthy, flexible, and stimulating work environments that improve the quality of daily life for users**.**

The human-oriented requirement has a direct influence on the architectural form and spatial configuration of office buildings. It affects building orientation, massing, facade treatment, circulation systems, and the integration of natural elements. Buildings are no longer designed as rigid functional containers but as **adaptive systems** that respond to human behavior, environmental conditions, and social interaction. The principle of human-centered design ensures the harmonious integration of spatial, environmental, and social components, where efficiency and comfort are achieved through the interaction of these elements.

Drawing from international practices and adapted to the Moroccan context,

the design of human-oriented office centers can be guided by three main techniques (Fig 2.6):

Volumetric-spatial techniques focus on the three-dimensional organization of space, ensuring functional efficiency, environmental quality, and visual coherence while enhancing user experience [23].

- **Vertical stacking of functions** — such as commercial spaces, reception areas, or services at lower levels and office spaces above which allows for efficient land use and creates a hierarchy between public and private zones. This configuration supports accessibility while maintaining privacy and security in upper office levels. It also contributes to urban density and activates the ground level, making the building more integrated into the city.
- **Incorporation of atriums, courtyards, and light wells** plays a crucial role in human-oriented design by introducing natural light and ventilation into the core of the building. These elements act as climatic regulators, improving air circulation through the stack effect while also serving as social and visual connectors between different floors. They create central gathering spaces that encourage informal interaction and strengthen the sense of community within the workplace.
- **Stepped, terraced, or fragmented building forms** are used to reduce the visual mass of large office blocks and to create human-scale environments. These forms allow the integration of outdoor terraces, green areas, and transitional spaces, which improve thermal comfort, reduce noise, and provide opportunities for relaxation. They also enhance solar exposure control and create shaded zones adapted to the Moroccan climate.
- **Adaptable and modular spatial systems** enable flexibility in interior organization. By using structural grids, movable partitions, and modular construction, spaces can be reconfigured according to changing organizational needs, technological evolution, or occupancy patterns. This adaptability ensures the long-term relevance and sustainability of office buildings.

- **Permeable and activated ground floors** establish a strong connection between the building and the urban context. Using open layouts, arcades, shaded walkways, and public functions such as cafés or exhibition areas, the ground level becomes an interactive interface that promotes accessibility, social exchange, and urban continuity [26].

Next important techniques are **functional and planning**. They focus on the organization of activities, circulation, and services, ensuring efficiency, accessibility, and user comfort:

- **Zoning and hierarchical organization of spaces** allows for the clear separation of functions such as work areas, meeting rooms, service zones, and relaxation spaces. This reduces spatial conflicts, improves orientation, and enhances productivity by providing environments adapted to different types of activities.
- **Integration of amenities and support functions** — including gyms, prayer rooms, rest areas, cafeterias, and childcare facilities which addresses the diverse needs of users and promotes physical and mental well-being. These functions transform office buildings into comprehensive environments that support daily life beyond work tasks.
- **Efficient and legible circulation systems** are essential for human-oriented design. Wide corridors, clearly defined pathways, vertical circulation cores, and accessible routes ensure smooth movement and reduce stress. The design often prioritizes **pedestrian movement**, encourages the use of stairs, and ensures inclusivity for people with reduced mobility.
- **Creation of community and interaction spaces**, such as lounges, atriums, terraces, and informal meeting zones, fosters collaboration and social engagement. These spaces play a key role in improving communication, creativity, and team cohesion within the workplace.
- **Orientation and climatic planning** influence the placement of functions and circulation paths according to sun exposure, prevailing winds, and environmental

conditions. This ensures optimal daylighting, natural ventilation, and thermal comfort while reducing energy consumption.

Next important techniques are **architectural and decorative**. They focus on aesthetic quality, environmental performance, and cultural identity, contributing to a holistic human-oriented experience:

- **Expression of identity and cultural context** is achieved through the use of materials, textures, colors, and architectural elements inspired by Moroccan heritage. This creates a sense of belonging and strengthens the emotional connection between users and the space.
- **Bioclimatic and sustainable design strategies** integrate environmental considerations into architectural form. The use of shading devices, double-skin facades, green roofs, and high-performance materials improves energy efficiency and indoor comfort. Incorporating vegetation, water elements, and natural materials enhances both environmental performance and user well-being.
- **Integration of biophilic elements**, such as green walls, indoor gardens, courtyards, and rooftop landscapes, reinforces the connection between humans and nature. These elements contribute to stress reduction, improved air quality, and increased productivity.
- **Innovative and responsive facades** play a crucial role in regulating light, heat, and ventilation. [25].. Dynamic shading systems, louvers, and kinetic panels adapt to environmental conditions, reducing solar gain and glare while maintaining visual comfort and outdoor views.
- **Acoustic and visual comfort strategies** involve the use of appropriate materials, spatial configurations, and design elements to control noise levels and create pleasant visual environments. This includes sound-absorbing surfaces, controlled lighting, and balanced proportions that align with human perception.

Figure 2.6. Architectural techniques of human-oriented design in modern office centers, categorized by volumetric-spatial, functional-planning, and architectural-decorative strategies. (Source: Prepared by the author, 2026).

Artistic and interactive installations enrich the spatial experience by integrating cultural, creative, and technological elements into office design. Murals, sculptures, digital displays, and light installations not only enhance visual interest but also create opportunities for engagement, reflection, and collaboration. In addition, carefully designed circulation paths, sculptural staircases, and atriums allow employees to move comfortably and interact naturally within the building, fostering both social and professional connections.

By applying volumetric-spatial, functional-planning, and architectural-decorative techniques, modern office centers in Morocco can achieve human-oriented environments that prioritize adaptability, sustainability, and social well-being. Volumetric-spatial strategies, such as atriums, terraced configurations, and flexible open-plan layouts, optimize daylight, natural ventilation, and visual connectivity, while providing spaces for informal meetings, relaxation, and communal activities. Functional-planning approaches, including integrated gyms, cafeterias, prayer rooms, and multipurpose workspaces, ensure that the building supports diverse daily needs efficiently. Architectural-decorative strategies, such as culturally inspired facades, green walls, and interactive artistic features, strengthen the building's identity while enhancing user comfort.

Together, these techniques create office spaces that respond to human needs, environmental conditions, and cultural context, transforming them into dynamic, comfortable, and engaging places for work, social interaction, and well-being. They also promote productivity, creativity, and a sense of belonging, ensuring that employees feel inspired, connected, and motivated within their workplace

Conclusions to the 2nd section

This chapter examined the main human-oriented trends, factors, patterns, and design techniques shaping modern office centers in Morocco. It has demonstrated that contemporary office architecture is no longer limited to functional efficiency, but increasingly focuses on creating environments that enhance user well-being, comfort, and social interaction.

The analysis of influencing factors highlighted the important role of technological development, environmental sustainability, economic considerations, and evolving work patterns in shaping architectural solutions. These factors contribute to the transformation of office buildings into flexible, intelligent, and adaptive environments.

Furthermore, the study of spatial and functional patterns revealed the growing importance of multifunctionality, integration of services, and the relationship between architecture and urban context. Moroccan office centers increasingly adopt diverse configurations, including vertical, horizontal, and campus-type models, which respond to both climatic conditions and cultural values.

Finally, the chapter identified three main groups of human-oriented design techniques: volumetric-spatial, functional-planning, and architectural-decorative. The combination of these approaches ensures the creation of balanced environments that integrate spatial efficiency, functional clarity, environmental performance, and aesthetic quality.

In conclusion, modern office centers in Morocco reflect a shift toward more holistic and user-centered design strategies. By integrating flexibility, sustainability, and cultural identity, these environments support productivity, well-being, and social cohesion, contributing to the development of more livable and responsive architectural spaces.

SECTION 3: RESEARCH APPROVAL: PROJECT OF HUMAN-ORIENTED MODERN OFFICE CENTER OF MOROCCO

3.1. Analysis of the design territory

The proposed project is strategically located in Casablanca, the economic heart of Morocco and one of the most dynamic metropolitan areas in North Africa. The city's urban fabric is a complex mosaic of industrial heritage and modern development. Specifically, the project site is situated within the Hay Al-Hasani district, a pivotal neighborhood in the southwestern part of the city (Figure 3.1.).

Hay Al-Hasani serves as a vital bridge between the historic center and the modern extensions like Casa Anfa and CFC (Casablanca Finance City). The site is characterized by its integration into a high-density area that balances residential tranquility with intense commercial and educational activity. It is bounded by major transit arteries—notably Boulevard Sidi Abderrahmane and Boulevard Ghandi—which ensure high accessibility at the city scale, while local streets like those surrounding the Georges Vanier School provide a more intimate, pedestrian-friendly environment.

From a human-oriented perspective, the choice of this territory is deliberate. The proximity to educational institutions and local services creates a constant flow of diverse users (students, professionals, and residents), offering an ideal context for a multifunctional office center that aims to enhance social interaction and reduce commuting stress. By placing the project in this established urban fabric, the design seeks to transform the site into a "community anchor", aligning with the contemporary Moroccan trend of creating decentralized, user-centered professional hubs.

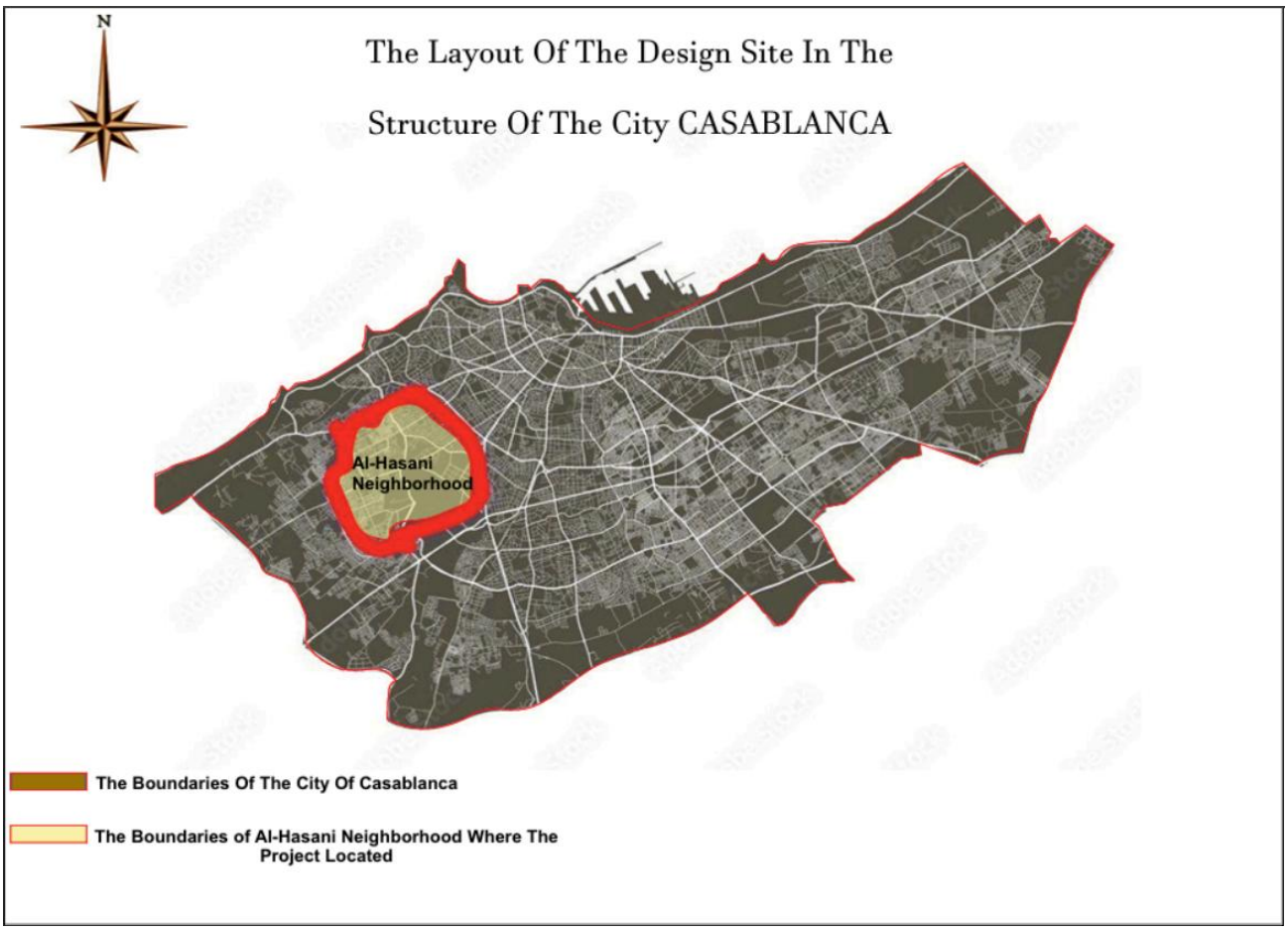


Figure 3.1. Location of the project site within the urban structure of Casablanca and the boundaries of Al-Hasani neighborhood. (Source: Prepared by the author, 2026)

To ensure the project's functional integration within the Al-Hasani neighborhood, a detailed analysis of transport and pedestrian traffic was conducted (Figure 3.1.19). The site is characterized by a high degree of accessibility, supported by a hierarchical road network that balances intense vehicular movement with safe pedestrian circulation.

The territory is bounded by Major Roads (indicated in pink) that accommodate active, high-volume traffic, ensuring the project is well-connected to the broader urban infrastructure of Casablanca. These are complemented by Minor Roads (indicated in yellow) that provide more controlled access to the site, reducing noise and congestion in the immediate vicinity of the office center.

A key feature of the site's "human-oriented" accessibility is the extensive network of Pedestrian Paths (blue lines) that weave through the neighborhood. This emphasizes a walkable environment, reducing reliance on private vehicles. Furthermore, the public transport integration is robust, with several Bus Stations and established Bus Routes in close proximity, facilitating a sustainable commute for employees and visitors alike.

The organization of traffic flow, including clearly defined one-way and two-way systems, minimizes conflicts between vehicles and pedestrians. This strategic traffic management directly contributes to the safety, comfort, and well-being of the users, reflecting the core principles of creating a responsive and accessible modern office hub.

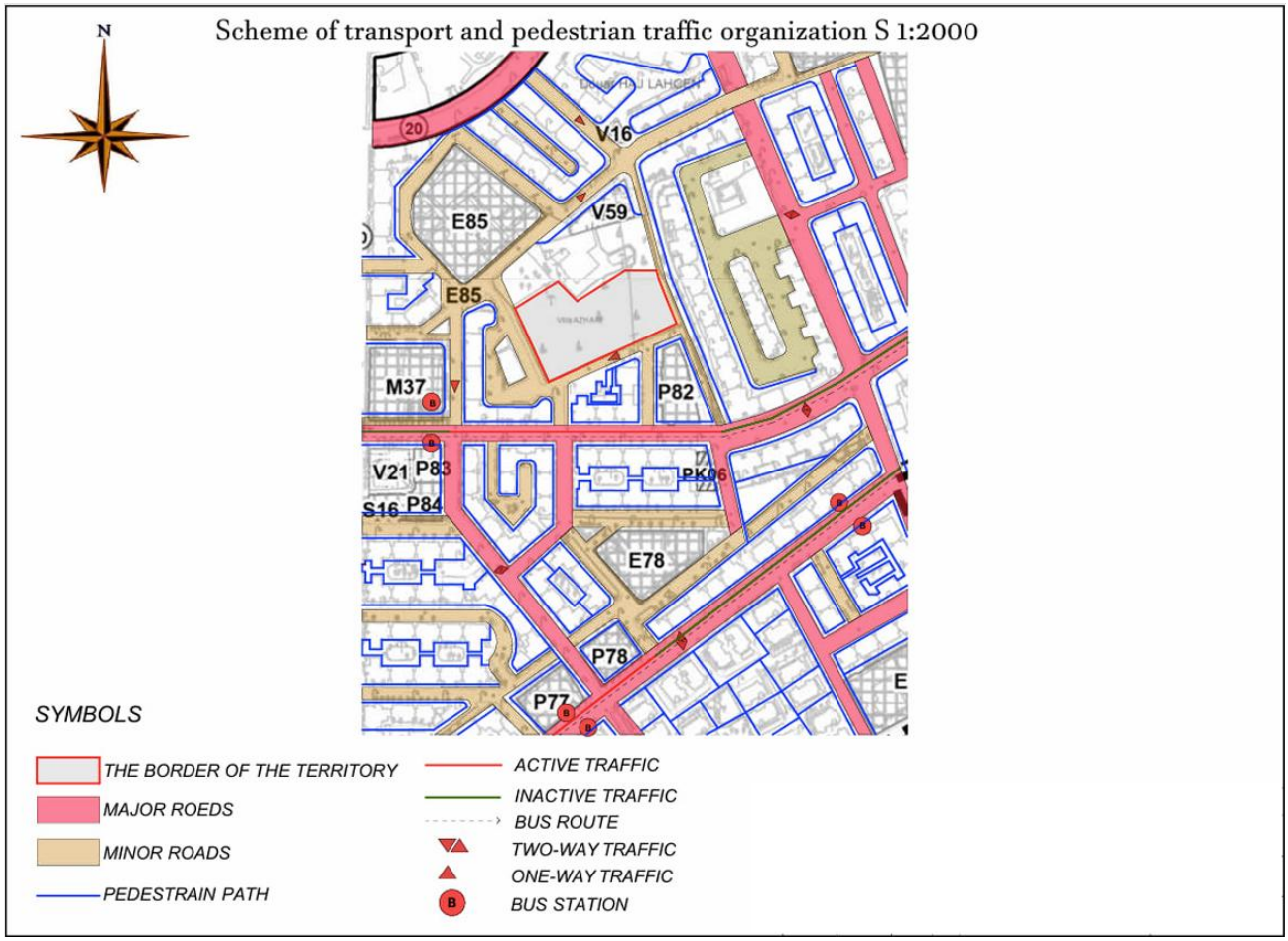


Figure 3.2. Scheme of transport and pedestrian traffic organization of the design site (Scale 1:2000). (Source: Prepared by the author, 2026).

comprehensive investigation into the surrounding urban functions was conducted to evaluate the site's integration within the socio-economic and structural fabric of the Al-Hasani district (Fig. 3.3.). The territory displays a diverse and vibrant mosaic of land uses, which is a fundamental prerequisite for establishing a successful multifunctional "human-oriented" hub. The immediate surroundings are predominantly defined by Residential Areas (olive green). This high residential density ensures a stable, local user base and fosters a sense of community security and "eyes on the street" throughout the day and evening. From a design perspective, this proximity allows the office center to potentially serve the local population, reducing the need for long-distance commuting and supporting the "work-near-home" trend.

This residential fabric is strategically balanced by several key specialized zones: Educational Areas (dark olive), such as the nearby Georges Vanier School, generate significant professional and academic footfall, creating a dynamic environment where the office center can act as a bridge between academic learning and professional practice. Administrative and Cultural Zones (yellow) contribute to the institutional weight of the neighborhood, ensuring that the site is perceived as a formal and organized professional destination. Furthermore, the proximity to Religious and Social Anchors (cyan) emphasizes the established social and cultural character of the neighborhood, ensuring that the new architectural intervention respects local traditions and social rhythms.

The strategic distribution of Green Areas (light green) near the site boundaries serves as a critical environmental asset. In a "human-oriented" framework, these spaces are not merely decorative but are essential for psychological well-being. They provide "visual relief" from the dense urban built-up area and offer immediate opportunities for incorporating biophilic design principles, such as natural ventilation corridors and views of greenery from office workstations. In conclusion, this rich functional diversity confirms that the project site is not an isolated professional entity but is deeply embedded in a "15-minute city" model. By situating the office center within such a

versatile territory, the design naturally facilitates a better work-life balance, where professional, residential, and essential services coexist within a walkable radius. This integration is paramount to mitigating urban stress and enhancing the overall quality of life for the future occupants of the center.

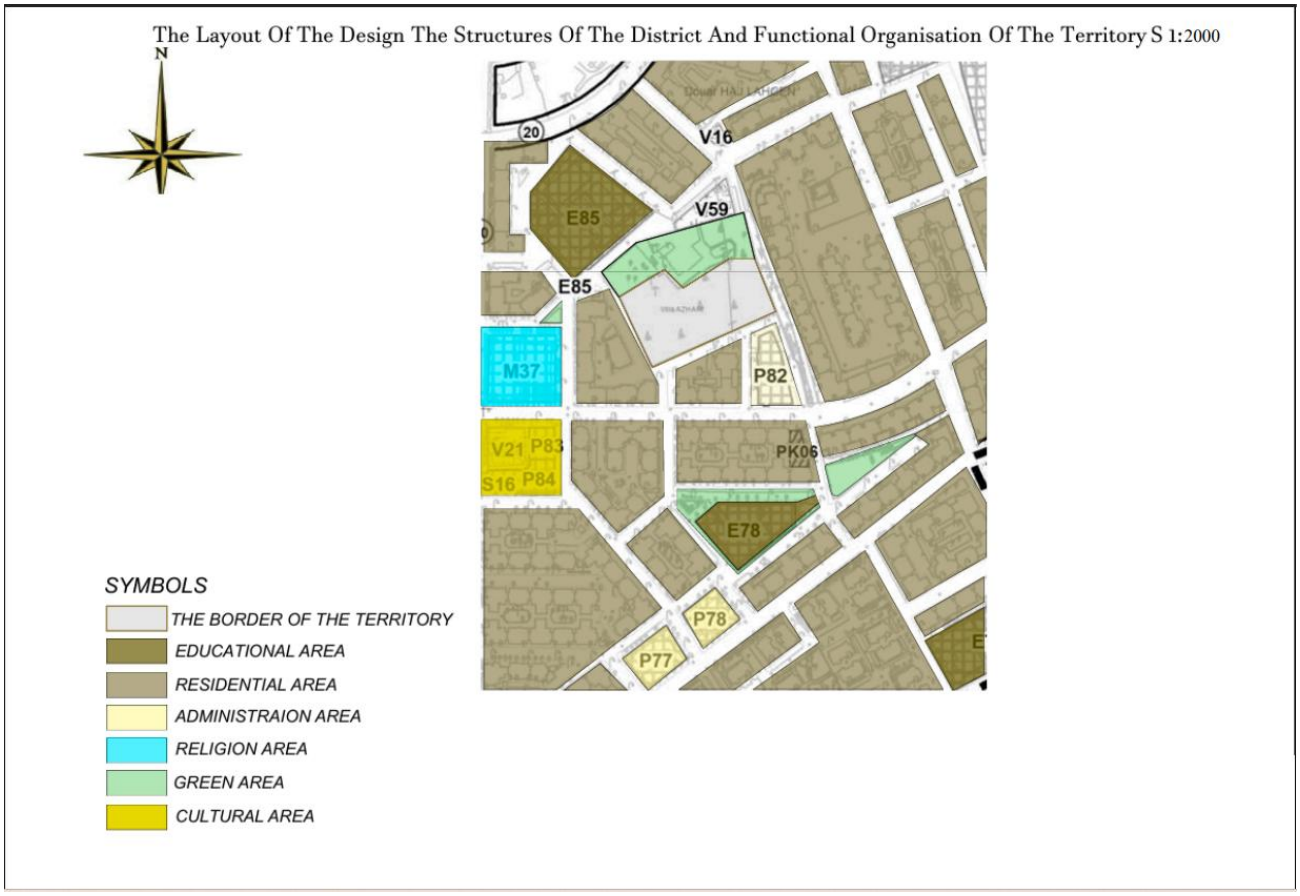


Figure 3.3. Functional organization and land use structure of the district (Scale 1:2000). (Source: Prepared by the author, 2026).

To ensure architectural harmony and contextual integration, an analysis of the building heights and urban density within the district was performed (Figure 3.4). The surrounding urban fabric is characterized by a varied verticality, ranging from low-rise structures to medium-density residential blocks.

The territory is dominated by buildings with 2 to 4 floors (indicated in olive green), reflecting the predominantly residential character of the Al-Hasani neighborhood. Strategic nodes within the district feature higher structures of 4 to 5

floors (indicated in dark olive), which are typically associated with mixed-use or institutional functions. Conversely, lower-density areas consist of single-story structures (Floor 1, in light yellow) and medium-rise buildings (Floor 3, in gold), creating a diverse skyline.

This analysis of "Urban Porosity" and verticality is essential for the proposed office center's design. It allows for a calibrated volumetric approach where the building's height can respect the existing residential scale while asserting its identity as a modern professional landmark. Understanding these floor distributions helps in optimizing natural light access and maintaining privacy for neighboring residential units, further reinforcing the "human-oriented" sensitivity of the architectural intervention

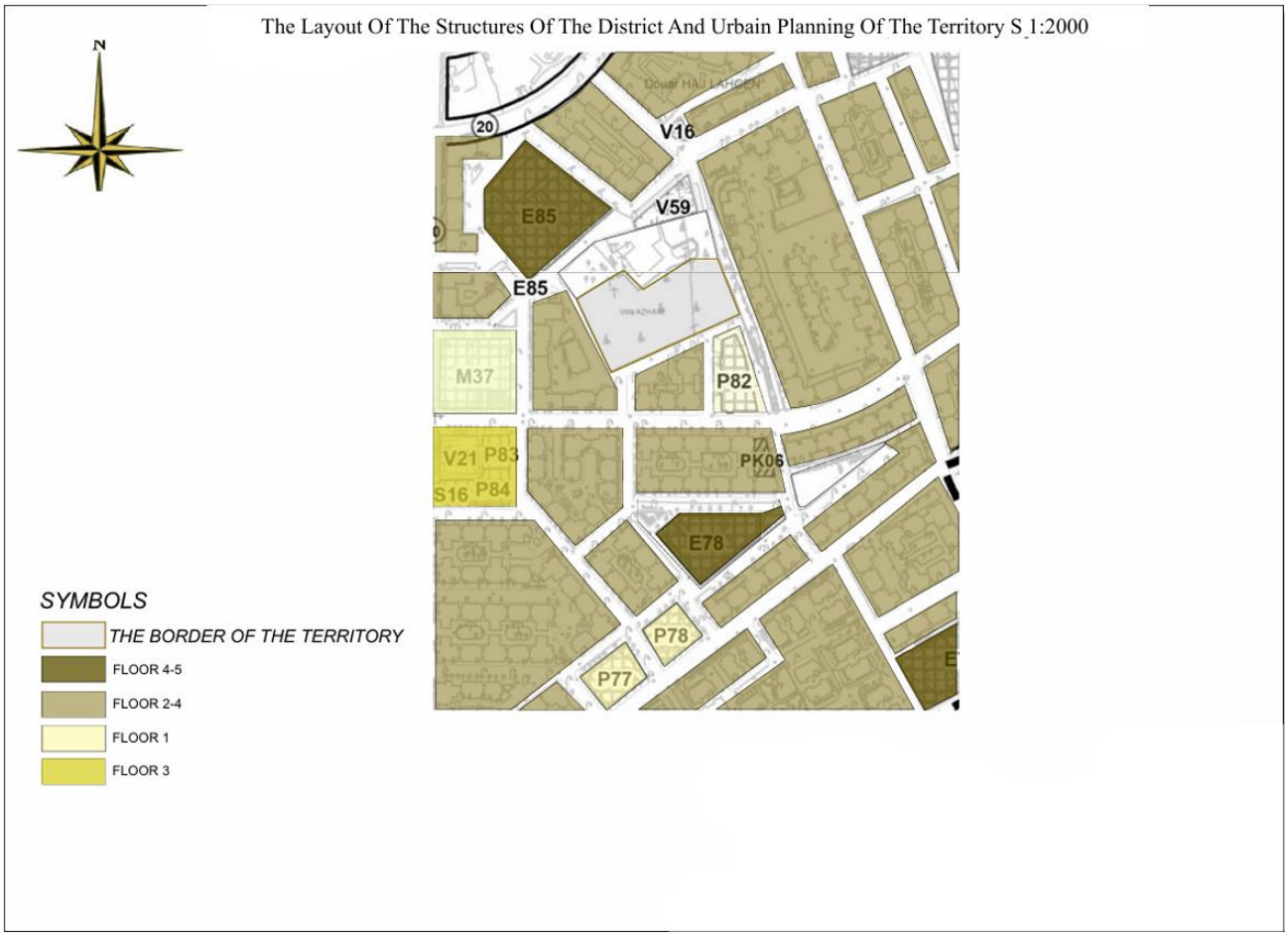


Figure 3.4. Urban planning of the territory: Building heights and floor distribution.

(Source: Prepared by the author, 2026).

The final stage of the territory analysis involves the Functional and Compositional Planning scheme (Figure 3.5), which dictates the spatial logic of the future architectural intervention. This scheme identifies the Compositional Axes (dashed red lines) that align the project with the surrounding urban fabric, ensuring visual harmony with neighboring landmarks such as the Mosque (M37) and the local educational facilities (E85).

A critical element of this analysis is the identification of Important Views (red arrows), which ensures the building is oriented to capture strategic vistas and establish a strong visual presence within the district. To respond to these site constraints and opportunities, the proposed project is designed as a mid-rise multifunctional structure comprising an underground level and fore above-ground floors (G+4).

The underground level is dedicated to technical services and a robust parking facility, effectively removing vehicular clutter from the surface to prioritize pedestrian well-being and safety. The vertical scale of fore stories was carefully chosen to respect the neighborhood’s existing skyline while providing sufficient density to support a diverse range of professional and social functions.

By integrating the building into the adjacent Green Area (light green) and aligning it with the established compositional axes, the design ensures a "human-oriented" transition between the built environment and open public spaces. This strategic positioning allows for maximum natural light penetration and optimized ventilation across all five levels, directly enhancing the internal environmental quality and psychological comfort for the future users of the center

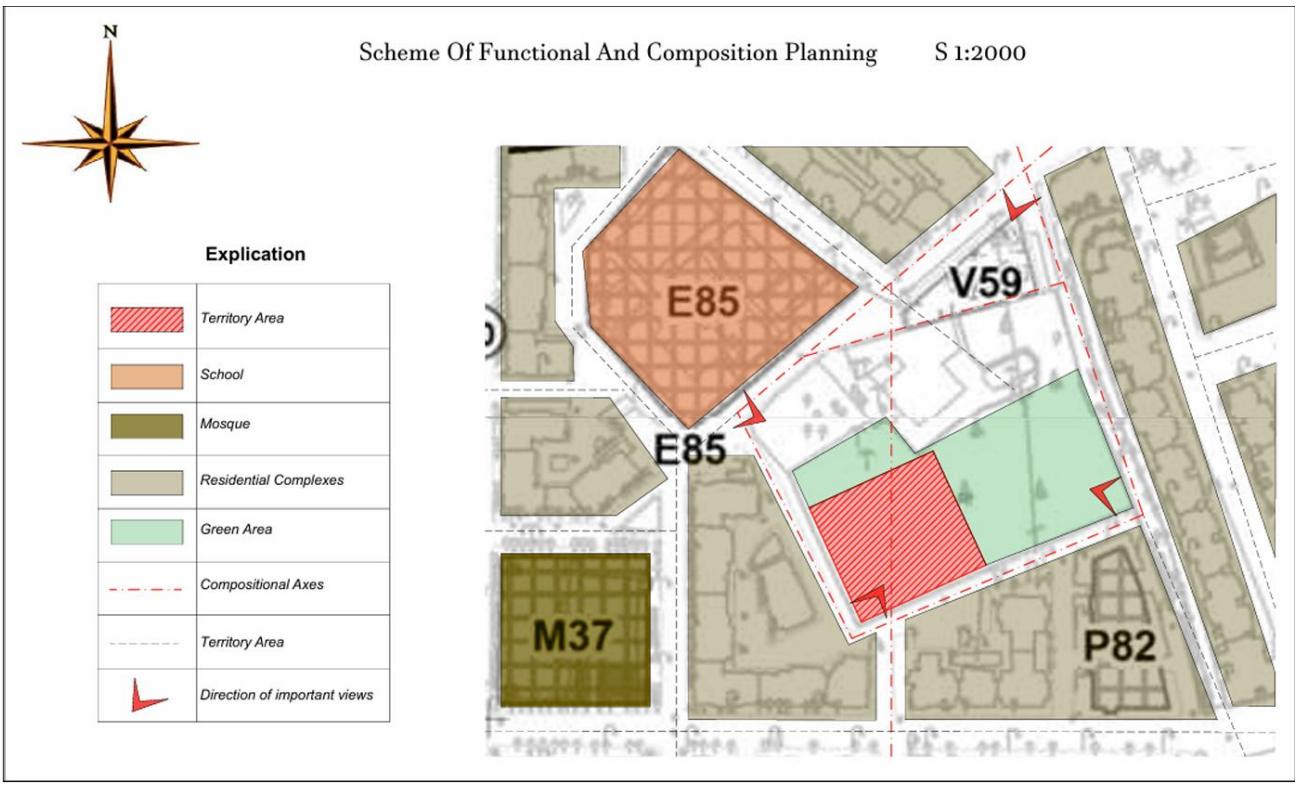


Figure 3.5. Scheme of functional and compositional planning (Scale 1:2000), highlighting compositional axes and strategic views. (Source: Prepared by the author,

Landscape Integration and Climatic Adaptation. The project site significantly benefits from its proximity to existing green pockets within the Al-Hasani district. The landscape analysis identified a strategic opportunity to extend this natural continuity into the building's footprint. As a core "human-oriented" strategy, integrated greening is proposed—including vertical gardens on the southern facades, green terraces, and internal planted courtyards. These elements are designed to maintain biodiversity, support natural evaporative cooling, and enhance the microclimatic comfort of the professional environment.

Climatic Conditions and Architectural Response. Casablanca's climate is characterized by a Mediterranean influence, which directly shapes the architectural logic of the office center:

• Mild Winters & Warm Summers: Average temperatures range from 12°C in January to 26°C in August, requiring a design that balances solar gain and natural ventilation.

• High Solar Radiation: The city enjoys significant sunlight throughout the year, necessitating advanced shading strategies.

• Coastal Humidity and Breezes: Predominant winds from the Atlantic (North and Northwest) offer a natural cooling resource.

These climatic factors have a direct influence on the architectural design of the office center, as illustrated in the volumetric evolution (Fig 3.6).

• Orientation and Shading: The building's volume is optimized to maximize natural light while using sun-shading devices and cantilevered balconies to protect the interior from harsh afternoon sun.

• Natural Ventilation: The building envelope incorporates "breathable" facade strategies, utilizing the prevailing Atlantic breezes to reduce the reliance on mechanical cooling during transitional seasons.

• Green Buffer Zones: The inclusion of green roofs and terraced gardens acts as a thermal mass, reducing the "heat island effect" and providing employees with shaded, outdoor relaxation areas that improve psychological well-being.

• Thermal Performance: High-performance glazing and insulated envelopes are employed to ensure a stable indoor temperature, reducing overall energy consumption.

Through these features, the project is not only visually integrated into the urban fabric of Casablanca but is also climate-responsive. By harmonizing the architectural form with the local environment, the design achieves a sustainable balance that prioritizes user comfort and environmental responsibility.

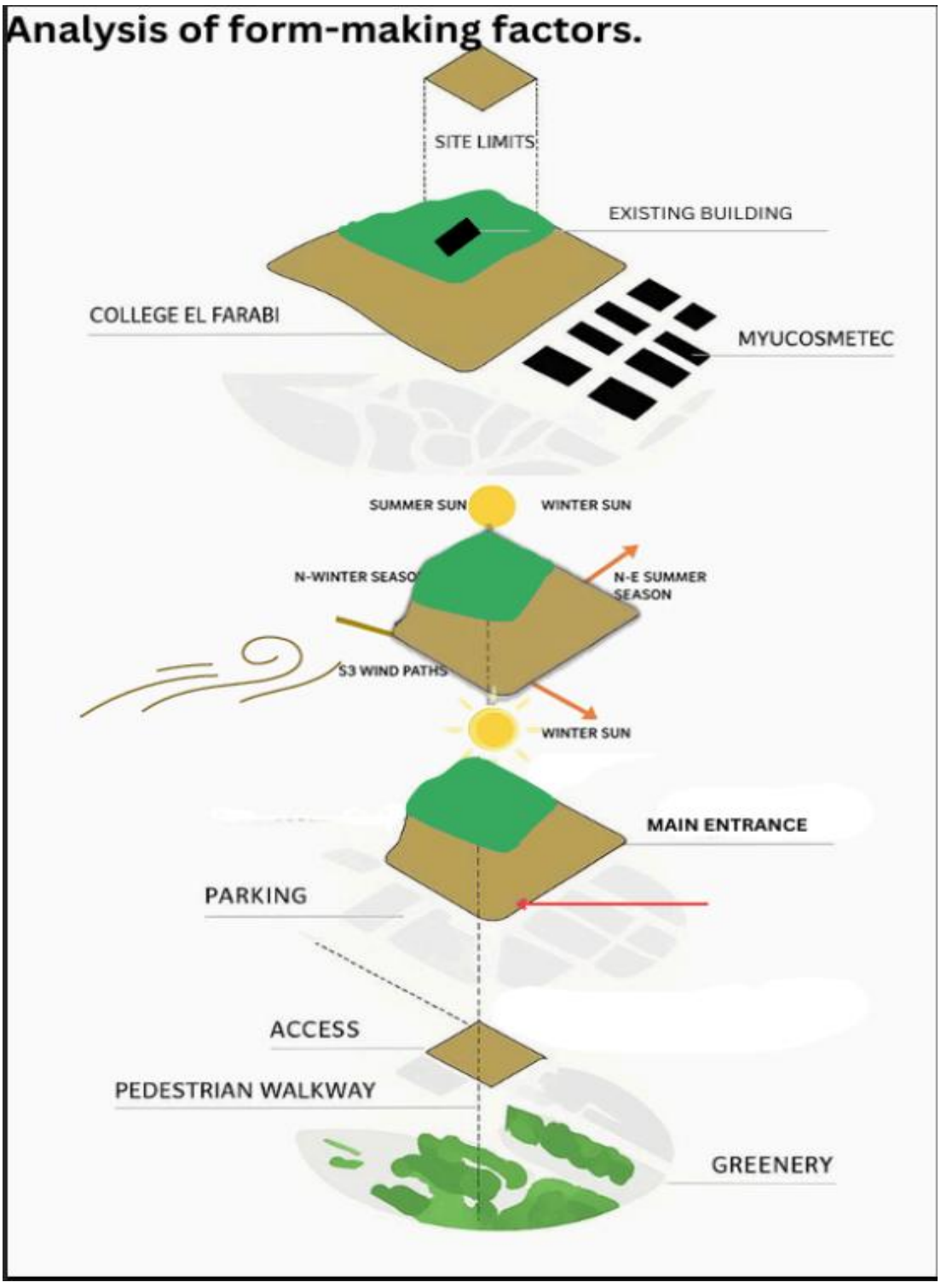


Figure 3.6. Layered analysis of form-making factors: an exploded axonometric scheme integrating urban context, bioclimatic constraints, accessibility, and greenery strategies.

3.2. The concept of a multifunctional office center in the city of Casablanca Morocco

The architectural concept of the multifunctional office center is strongly rooted in a human-oriented design approach, where spatial organization is developed primarily around the user experience. The central circular core acts as the social and functional heart of the building, emphasizing the importance of human interaction and collective activity. Surrounding this core, spaces are arranged in a fluid configuration inspired by spiral movement, creating a continuous and intuitive circulation path.

This "Helix Logic" serves as the primary organizational principle for the building's complex program. By combining a clear central focus with progressive spatial rotation, the design transcends the static nature of traditional office blocks. This dynamic layout enhances accessibility and reduces spatial confusion, ensuring that the transition between the vibrant public services on the ground floor—such as the gym, restaurant, and pharmacy—and the private executive hubs on the upper levels is seamless and engaging.

Furthermore, this spiral geometry is a strategic bioclimatic response to Casablanca's coastal environment. The fluid, non-linear form is designed to channel the prevailing Atlantic breezes through the structure for natural ventilation, while the resulting staggered volumes provide self-shading to protect the interiors from harsh solar radiation. By integrating green terraces and "pods" of activity within this rotation, the project maintains a strong biophilic connection, enhancing the microclimatic comfort and psychological well-being of the professionals.

Ultimately, the project stands as a dynamic urban landmark in Casablanca. It harmonizes the city's maritime energy with modern professional needs, creating a sustainable, flexible, and healthy ecosystem that prioritizes the human element in every curve and corner.

The master plan of the multifunctional office center (Fig 3.7) is organized through a balanced integration of architecture, landscape, accessibility, and public activity zones. The project is strategically positioned within an existing urban context, respecting surrounding buildings while creating a contemporary and accessible environment. The central building mass acts as the main focal point of the composition, with circulation systems and open spaces arranged around it to ensure functional efficiency and visual connectivity.

The site planning emphasizes clear pedestrian and vehicular movement. Separate access points for parking, basement parking ramps, loading areas, and service circulation help reduce traffic conflicts and improve accessibility. The inclusion of accessible parking near the main entrance strengthens universal design principles and ensures comfortable access for all users.

Landscape elements play a major role in the environmental and social quality of the project. Large green zones, pedestrian pathways, fountains, shaded structures, and seating areas create a comfortable outdoor environment that encourages social interaction and relaxation. Recreational functions such as the outdoor amphitheater,

sculpture plaza, restaurant terrace, and outdoor gallery transform the site into an active public space rather than only an office complex.

The master plan also integrates sustainable and human-centered design strategies through the use of open green spaces, walkable connections, and outdoor gathering areas. Bicycle parking and waste collection areas are carefully positioned to support functionality and environmental responsibility. Overall, the project aims to create a multifunctional urban environment that combines workspaces, public activities, recreation, and landscape design into one cohesive architectural composition.

Figure 3.7. Master Plan

3.3. Architectural planning and functional solution

The **underground level** is conceived as a high-efficiency service hub, covering a total area of 1,534 m². It accommodates all technical, logistical, and operational functions in a dedicated layer, ensuring that the upper floors remain fully oriented toward user comfort and spatial quality (Fig 3.8).

At its core, a circular atrium acts as a vertical light well, introducing natural daylight and ventilation into the underground level while enhancing user comfort, spatial perception, and intuitive orientation. This element establishes a visual and environmental connection between levels, reinforcing the human-centered approach of the project.

The parking facility includes 25 stalls (421 m²), designed with standard dimensions of 3.0 × 5.0 m to ensure ease of maneuvering and reduce user stress. It is supported by a 296 m² drive aisle that allows smooth and legible vehicular circulation. A centralized vertical circulation core integrates elevators (17 m²) and an emergency staircase (60 m²), ensuring efficient, safe, and intuitive movement for users throughout the building.

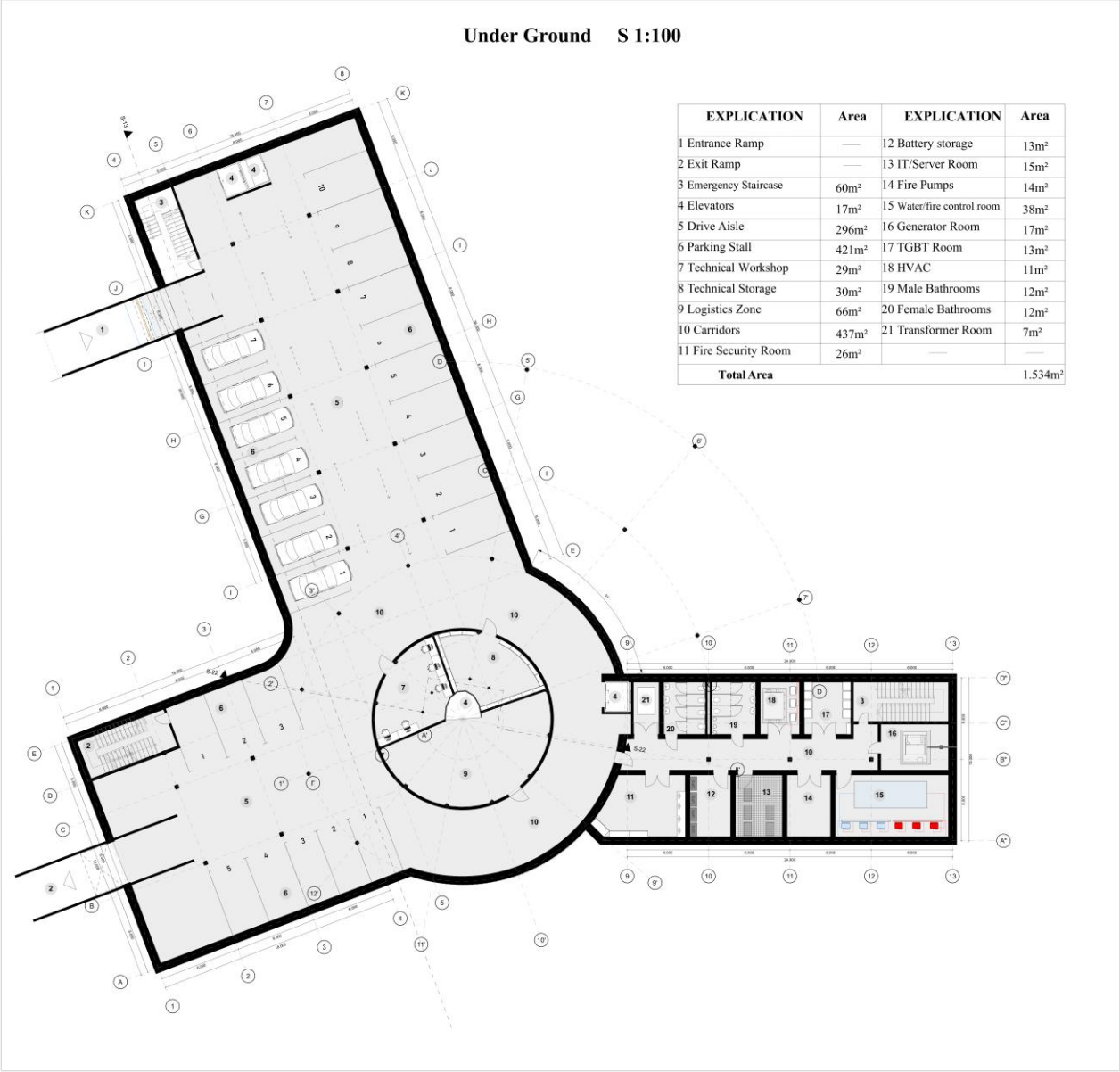
Logistical operations are handled through a dedicated 66 m² service zone, allowing deliveries and waste management to occur without interfering with the user experience or public flows.

Technical support spaces, including a workshop (29 m²) and storage (30 m²), are positioned near the central core and remain enclosed to ensure discreet maintenance operations, preserving the visual and acoustic quality of the environment.

The level also houses essential digital and power infrastructure, including the IT/server room, battery storage, TGBT, and transformer room, forming the backbone of the building's functionality.

Environmental and safety systems are ensured through HVAC, fire pumps, fire security, and water/fire control rooms, maintaining optimal indoor conditions and a high level of safety.

Sanitary facilities are also provided for staff, ensuring functional autonomy at this level. Overall, the underground level operates as an integrated technical platform that supports the building efficiently while actively contributing to a human-oriented design approach, enhancing user comfort, safety, clarity of movement, and overall spatial experience.



EXPLICATION	Area	EXPLICATION	Area
1 Entrance Ramp	——	12 Battery storage	13m²
2 Exit Ramp	——	13 IT/Server Room	15m²
3 Emergency Staircase	60m²	14 Fire Pumps	14m²
4 Elevators	17m²	15 Water/fire control room	38m²
5 Drive Aisle	296m²	16 Generator Room	17m²
6 Parking Stall	421m²	17 TGBT Room	13m²
7 Technical Workshop	29m²	18 HVAC	11m²
8 Technical Storage	30m²	19 Male Bathrooms	12m²
9 Logistics Zone	66m²	20 Female Bathrooms	12m²
10 Carridors	437m²	21 Transformer Room	7m²
11 Fire Security Room	26m²	——	——
Total Area			1.534m²

Figure 3.8. Basement Floor Plan

The **ground floor** serves as the primary interface between the building and its urban surroundings, covering a total area of 1,534 m². It is conceived as a dynamic,

multifunctional platform that activates the streetscape while prioritizing user comfort, accessibility, and social interaction (Fig 3.9).

At its core, a grand circular atrium (384 m²) acts as the spatial and social heart of the project. This light-filled volume enhances natural illumination and intuitive orientation, while creating a welcoming public realm that encourages gathering and visual connectivity. It integrates the main vertical circulation, including elevators (17 m²) and a central staircase (13 m²), ensuring smooth and legible movement.

The health and wellness sector is designed to support users' physical well-being, featuring a gym (113 m²) and a personal training room (24 m²). Supporting facilities, including changing rooms, showers, and a staff room, are carefully arranged to provide comfort, privacy, and ease of use.

A vibrant social and gastronomic hub is anchored by a restaurant (171 m²), conceived as a lively space for interaction and relaxation. The inclusion of an open kitchen and a piano corner enhances the sensory and social experience, while back-of-house functions are efficiently organized to maintain seamless service.

To reinforce the mixed-use character and daily convenience, the ground floor incorporates essential public services such as a pharmacy, a bank branch, and an open kiosk. These functions contribute to accessibility and reduce the need for external travel, supporting a user-oriented lifestyle.

A dedicated professional and administrative zone ensures efficient building management and user support, including reception, meeting rooms, and customer service areas. Security and control spaces are strategically positioned to maintain safety while remaining unobtrusive to the overall user experience.

Reflecting a human-centered approach, the design integrates spaces for mental well-being and cultural practices, including a prayer room (61 m²) and a breakout area (27 m²), offering moments of calm, reflection, and informal interaction within the active environment.

Circulation is organized through clear and generous corridors, ensuring intuitive wayfinding and smooth pedestrian flow. Sanitary facilities, including accessible units, are distributed strategically to guarantee comfort and inclusivity for all users.

Overall, the ground floor operates as an active urban interface and social condenser, where diverse functions are integrated around a central atrium to create an engaging, inclusive, and human-oriented environment that enhances both daily use and collective experience.

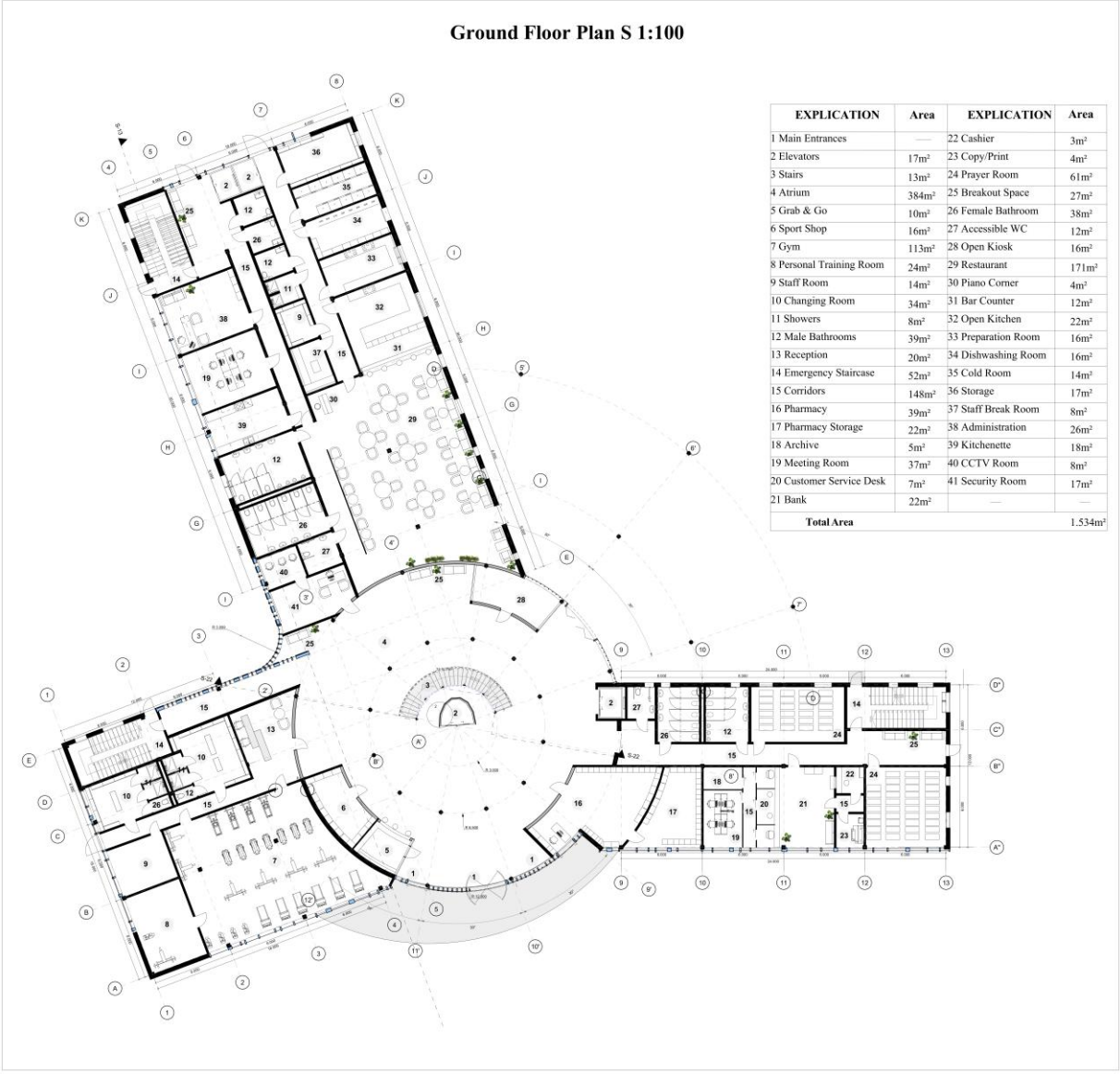


Figure 3.9 Ground Floor Plan

The **first floor** (Fig 3.1.26) is conceived as a balanced environment that supports both physical well-being and collaborative productivity, covering a total area of 1,609 m². It reflects a human-oriented design approach by integrating wellness, social interaction, and flexible workspaces into a cohesive spatial experience.

The wellness and mind-body wing is dedicated to holistic health, offering a yoga studio (70 m²), a stretching zone (33 m²), and a meditation corner (19 m²). These spaces are designed to promote relaxation, mental clarity, and physical balance, and are supported by changing rooms and showers to ensure comfort and continuity of use.

A vibrant social and recreational hub acts as a secondary gathering space within the building. It includes a large dining area (227 m²) with integrated kitchen facilities, encouraging shared moments and informal interaction. Complementary leisure spaces such as the billiard room, playing room, and outdoor terrace (81 m²) enhance social cohesion and provide opportunities for relaxation and outdoor engagement.

The co-working and administrative suite forms the professional core of the level, combining a flexible co-working lounge (103 m²) with private offices (120 m²). A biophilic quiet room introduces natural elements to support focus and reduce stress, while meeting rooms and administrative spaces ensure functional efficiency within a comfortable working environment.

The central atrium extends vertically through the building, allowing natural light to penetrate deep into the floor and improving spatial orientation. Circulation is organized through wide, legible corridors, supported by a central staircase and elevator core, ensuring smooth and intuitive movement.

Additional support spaces, including a relaxation room and well-distributed sanitary facilities, contribute to the overall comfort, inclusivity, and usability of the level.

Overall, the first-floor functions as a holistic environment where work, wellness, and social life are seamlessly integrated, fostering user well-being, productivity, and a sense of community within a human-centered architectural framework.

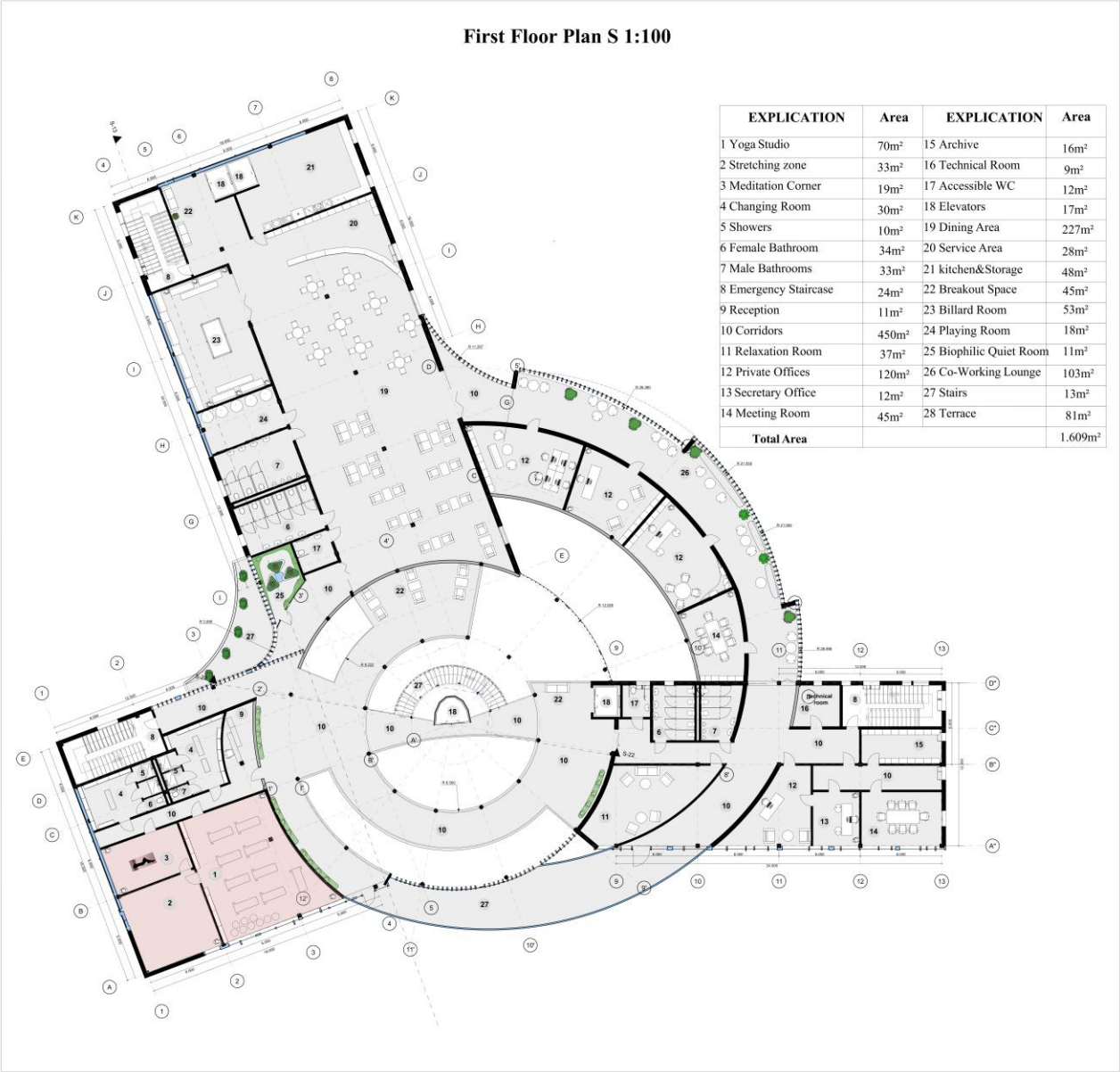


Figure 3.10.First Floor Plan

Second Floor is dedicated to high-level professional activities, corporate events, and versatile working environments, covering a total area of 1,507 m². It is conceived as a flexible and efficient business hub that supports both large-scale gatherings and focused individual work, while maintaining a strong emphasis on user well-being and spatial quality (Fig 3.11).

The Conference & Events Suite is anchored by a Flexible Conference Hall (85 m²) designed for seminars, presentations, and corporate events. It is supported by a

Conference Preparation Room (28 m²) and a sound-proof Phone Booth (10 m²), ensuring smooth event organization and private communication when required.

The Dynamic Co-Working Ecosystem offers a variety of adaptable working environments that respond to different professional needs. It includes an open Co-Working Space (160 m²), a Co-Working Lounge (103 m²), and a Flexible Work Area (132 m²), complemented by Focus Pods (27 m²) that provide semi-private zones for concentrated tasks and productivity.

The Executive & Team Offices area ensures a higher level of privacy and functionality, combining Private Offices (112 m²), a Focus Office (27 m²), and a Small Team Office (31 m²). This zone is completed by a central Meeting Room (23 m²), which supports formal discussions and collaborative decision-making.

The Wellness & Breakout Zones are integrated to maintain balance within the professional environment, in line with the project's biophilic approach. This includes a Biophilic Quiet Room (11 m²) for relaxation and mental reset, a Coffee Bar (9 m²), a Breakout Space (7 m²), and generous Outdoor Terraces (114 m²) that provide fresh air, natural light, and informal networking opportunities.

The circulation system is organized through a clear and efficient layout, dominated by a wide corridor network (409 m²) that ensures legible movement across the floor. Vertical circulation is provided by central elevators (17 m²), a main staircase (13 m²), and an emergency staircase (24 m²), while technical support spaces include a Server Room (11 m²) and a Storage Room (45 m²), ensuring operational functionality.

Sanitary facilities are centrally distributed for accessibility and comfort, including Male (45 m²), Female (44 m²), and Accessible WCs (12 m²).

Overall, the second-floor functions as a comprehensive professional environment where corporate activity, flexible work, and user comfort are seamlessly integrated, creating a productive and human-centered architectural experience.

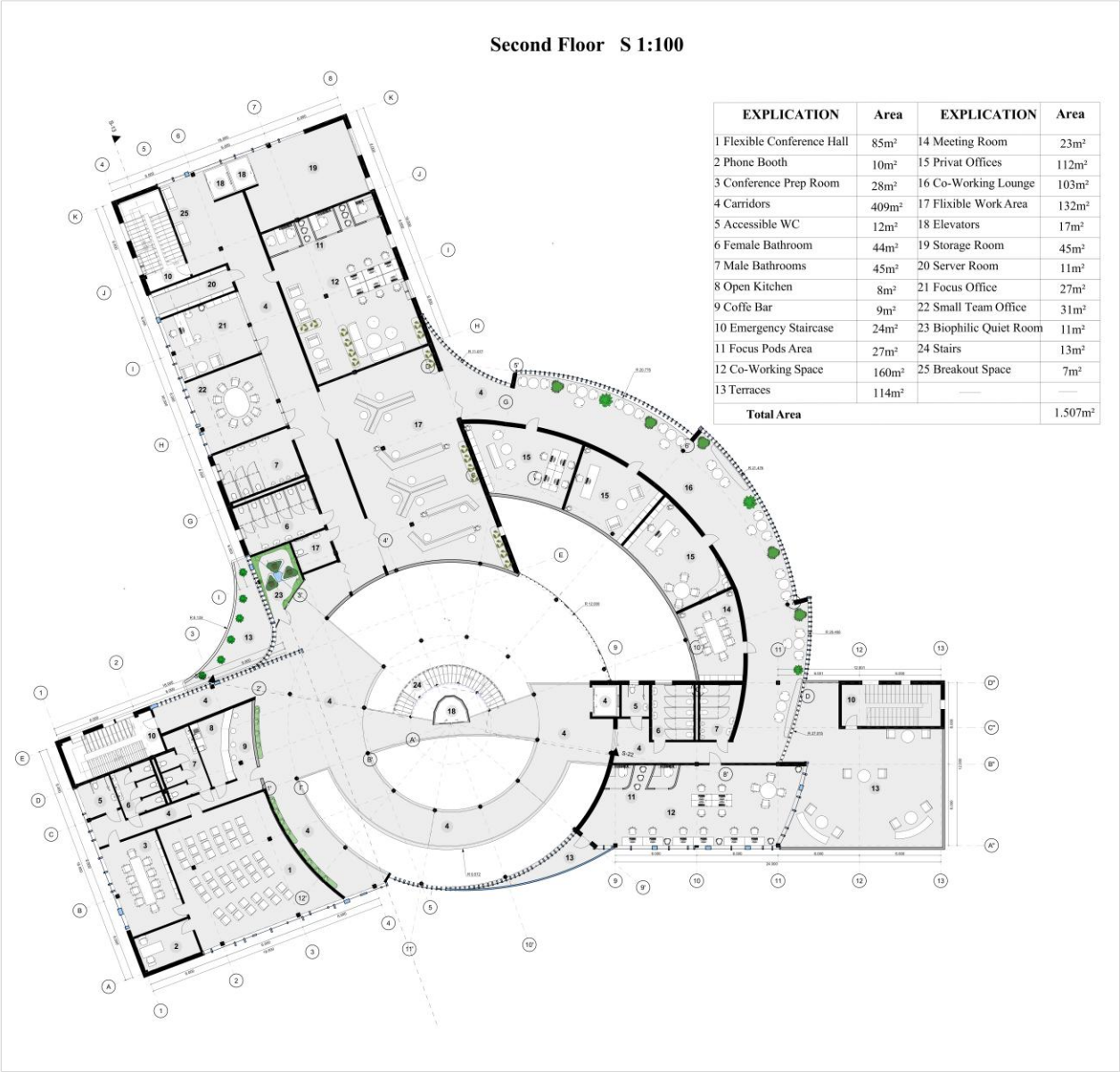


Figure 3.12.Second Floor Plan

The **Third Floor** is designed to accommodate the building's most concentrated professional activities and its administrative core, spanning a total area of 1,418 m². It prioritizes acoustic privacy, spatial clarity, and operational efficiency, offering a refined environment dedicated to executive functions and high-performance work (Fig 3.13).

The Executive Administration & Management zone forms the organizational heart of the floor, hosting key decision-making functions such as the Director's Office (28 m²), Legal Department (28 m²), and Accounting Department (28 m²). This area is

further supported by a dedicated Archive (16 m²), a Meeting Room (23 m²) for executive coordination, and a private Management Kitchenette (11 m²), ensuring both functionality and discretion.

The Focused Working Environments are designed to support deep concentration and productivity, offering a combination of Focus Offices (112 m² total), a dedicated Deep Work Zone (85 m²), Focus Pods (27 m²), and a Flexible Work Area (132 m²). This variety of spatial typologies allows users to adapt their working environment according to the level of privacy and focus required.

The Collaboration & Quiet Zones provide a balanced complement to the more intensive work areas. A spacious Co-working Lounge (103 m²) encourages informal interaction and teamwork, while a Meeting Room (45 m²) supports structured collaboration. In alignment with the project's biophilic approach, a Biophilic Quiet Room (11 m²) introduces a calm, nature-inspired space for mental reset and stress reduction.

Circulation and outdoor access are organized through a clear and efficient system centered around the Central Atrium, supported by the main elevator core (17 m²) and a central staircase (13 m²). A wide Corridor network (333 m²) ensures smooth connectivity between all functional zones, while a large Outdoor Terrace (114 m²) extends the usable space vertically, offering panoramic views and an open-air breakout environment.

Support Infrastructure & Facilities include essential technical and service spaces such as a Server Room (11 m²) and comprehensive sanitary facilities, including Male (45 m²), Female (44 m²), and Accessible WCs (12 m²), ensuring full operational comfort and accessibility.

Overall, the third floor establishes a high-performance working environment where executive management, focused work, and collaborative interaction are carefully balanced within a coherent and human-centered spatial framework.

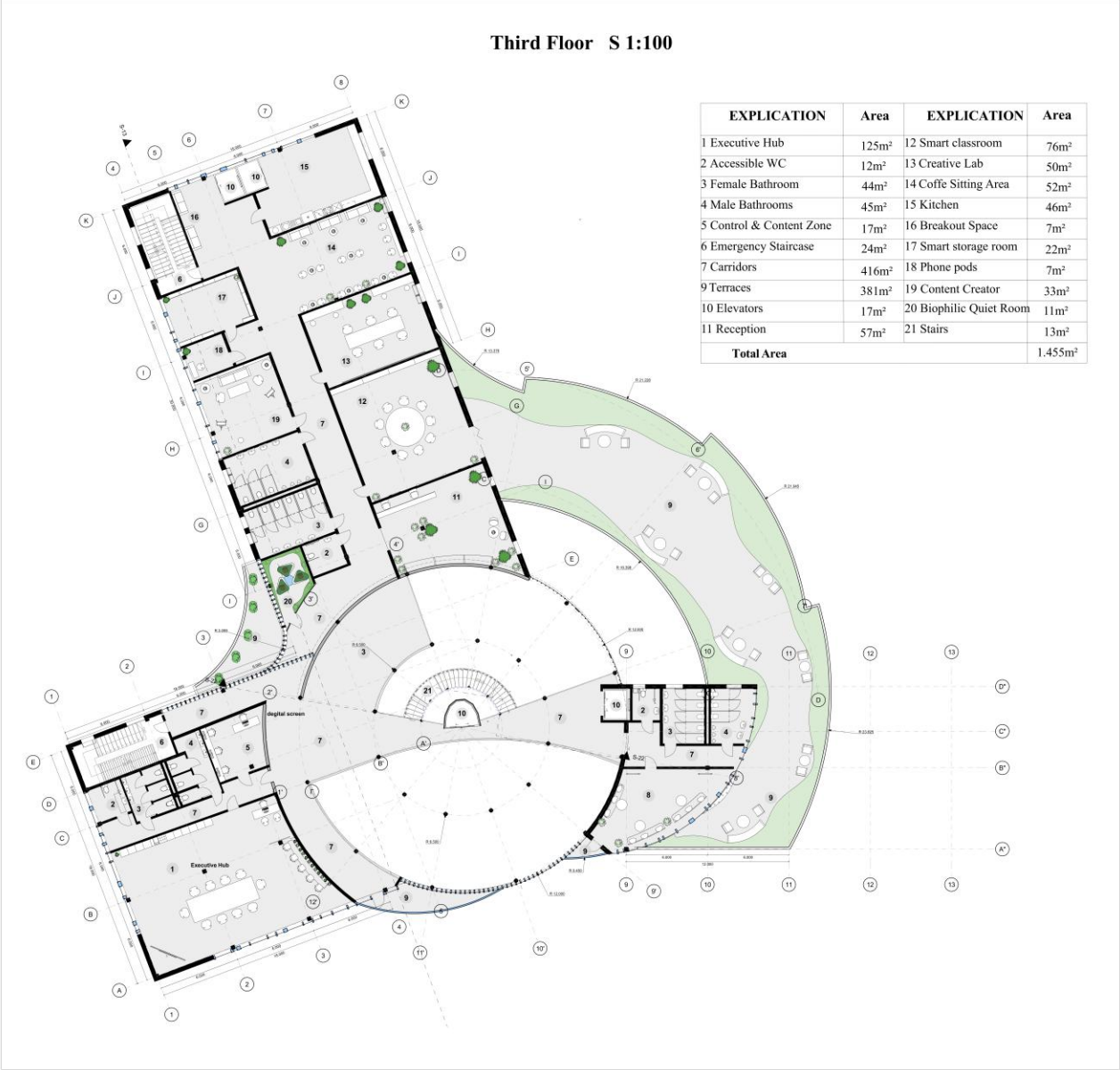


Figure 3.13.Third Floor Plan

The Fourth Floor (Fig 3.14) serves as the intellectual pinnacle of the MURC, spanning a total area of 1,418 m². It is dedicated to research, quiet study, and high-level creative collaboration, offering a calm and focused environment that is clearly detached from the more dynamic and public functions of the lower levels.

The Modern Library & Research Suite forms the core of this level, anchored by a large Library (112 m²) designed for academic research and quiet reading. It is supported by a Deep Work Zone (85 m²), a Silent Study Area (37 m²), and a Reading

Room (28 m²), creating a gradient of increasingly focused learning environments. A Meeting Room (23 m²) is also integrated to support group research and academic discussion.

The Creative Co-working & Social Interaction zone encourages innovation through exchange and flexibility. It includes a Co-working Lounge (103 m²) and a Flexible Work Area (132 m²), both designed for collaborative and adaptive use. This is complemented by a Training Room (45 m²) dedicated to workshops and skill development, as well as Focus Pods (27 m²) that provide semi-private spaces for individual creative work.

The Executive Administration & Support area ensures the operational management of the knowledge center, including a Director's Office (28 m²), a Secretary Office (28 m²), and a Staff Room (28 m²). It is further supported by an Archive (16 m²) for document storage and a Staff Kitchenette (11 m²), ensuring smooth daily functioning.

The Wellness & Outdoor Breakout spaces reinforce the biophilic identity of the project, featuring a large Outdoor Terrace (114 m²) that functions as an open-air reading and relaxation space, as well as a Biophilic Quiet Room (11 m²) that offers a calm, nature-inspired environment for mental reset and reflection.

The circulation and facilities system is organized around a Central Atrium, supported by a wide Corridor network (333 m²) that ensures clarity and ease of movement. Vertical circulation is provided through elevators (17 m²) and a central staircase (13 m²), while sanitary facilities are centrally distributed, including Male (45 m²), Female (44 m²), and Accessible WCs (12 m²).

Overall, the fourth floor creates a balanced intellectual environment where research, creativity, and focused study are seamlessly integrated, supporting academic growth and professional development within a serene and human-centered architectural framework.

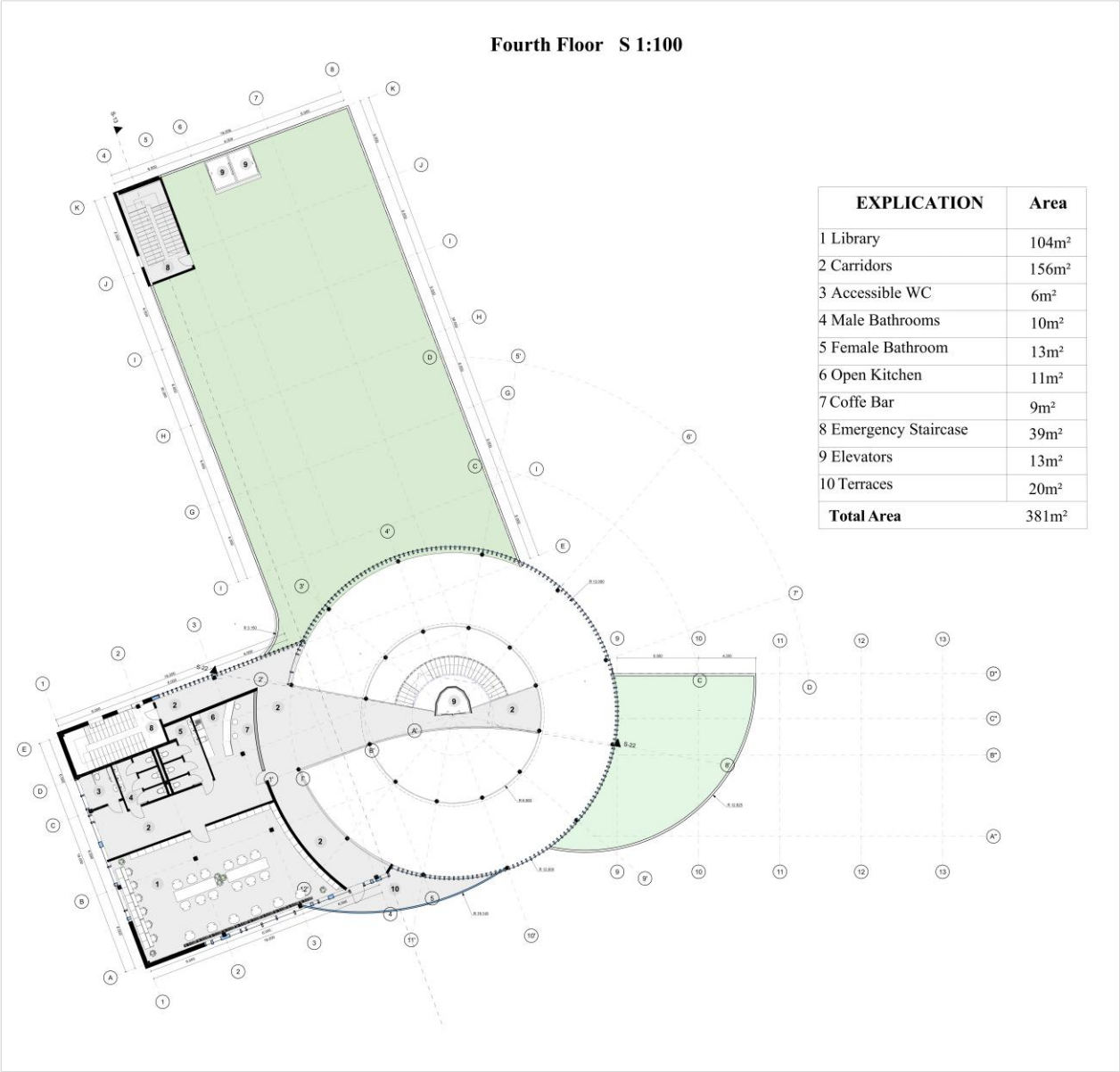


Figure 3.15.Fourth Floor Plan

The **roof plan** (Fig 3.16) illustrates the overall roofing configuration of the project, combining a circular roof structure with an adjacent green roof area. The circular roof is designed with a radial drainage system directing rainwater toward designated perimeter drain points to ensure efficient water evacuation. Structural grid lines and reference axes organize the geometry and positioning of the roof elements.

The green roof section is slightly sloped to facilitate water runoff while contributing to thermal insulation and environmental sustainability. Slope directions

are indicated by arrows to clarify drainage flow across the roof surfaces. The plan also highlights circulation paths, roof boundaries, and service areas, ensuring functional accessibility and maintenance efficiency.

The integration of curved and angular geometries creates a dynamic architectural composition while maintaining proper drainage performance and structural coherence.

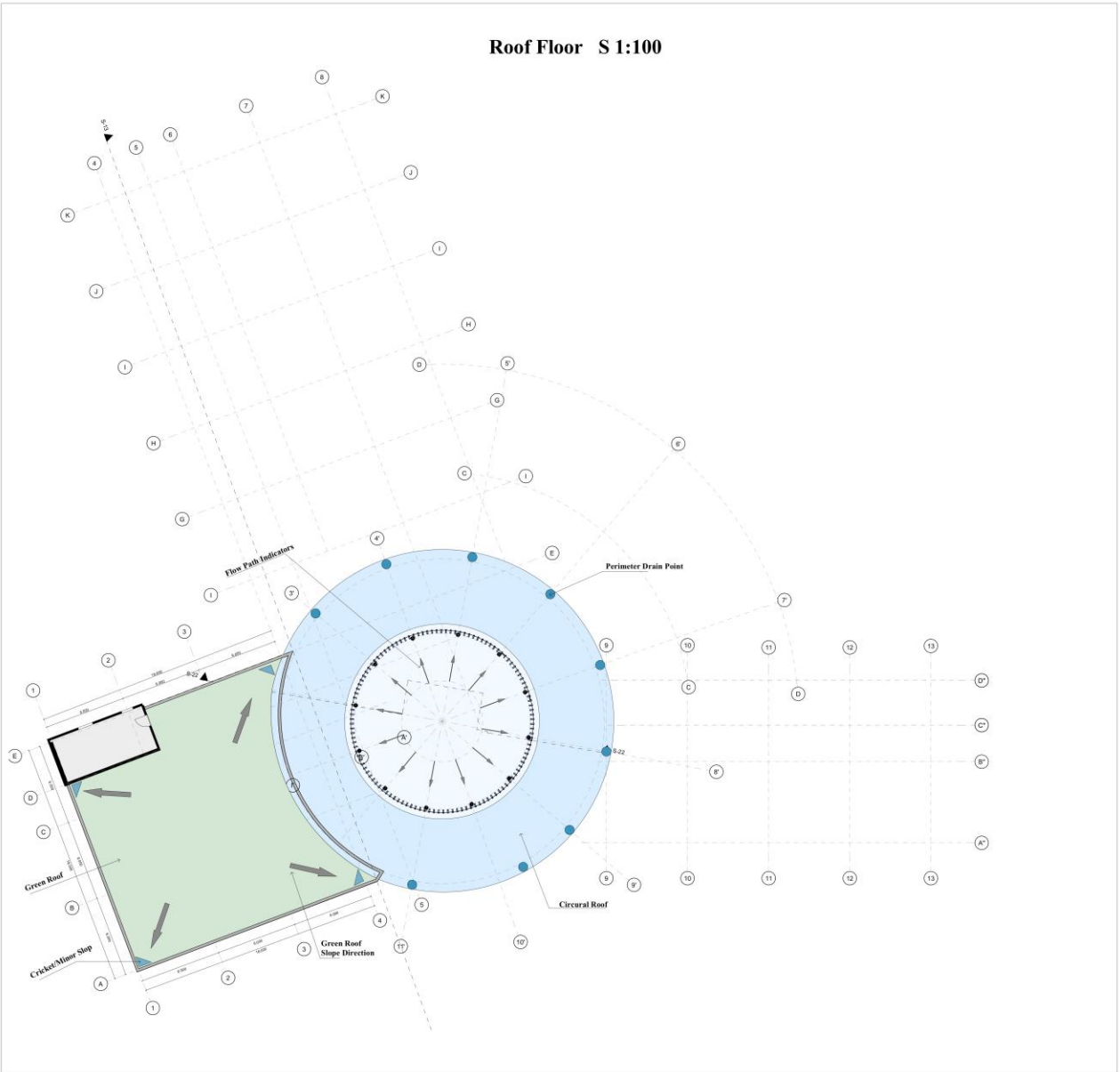


Figure 3.16. Roof Plan

Conclusions of Section 3

Based on the conducted research and design development, a comprehensive concept of a multifunctional office center in Casablanca was established. The project reflects contemporary architectural and urban trends by integrating flexible workspaces, wellness-oriented environments, and social interaction zones within a unified spatial system. Particular emphasis was placed on human-oriented and biophilic design principles, including the use of natural lighting through a central atrium, the integration of green and outdoor terraces, and the creation of diverse spatial atmospheres that enhance user comfort, productivity, and well-being. The project also responds to the dynamic context of Casablanca as a growing business hub, where modern office environments increasingly combine work, lifestyle, and social functions

Throughout the design process, a holistic and adaptive approach to spatial organization was applied. The architectural and compositional solution is based on flexibility and multifunctionality, achieved through varied workspace typologies, modular planning strategies, and the integration of collaborative, private, and recreational zones. Circulation systems were carefully structured around a central atrium and clear corridor networks to ensure spatial legibility and efficiency. In addition, the incorporation of contemporary design strategies—such as adaptable work environments and the connection between interior and exterior spaces—aligns with current developments in Casablanca’s office architecture, where projects increasingly merge workspaces with services and urban lifestyle components

SECTION 4. CALCULATION AND CONSTRUCTIONS

4.1. Location and climatic condition

The designed multifunctional office center is located in Casablanca, Al-Hassani district, at the coordinates (33°32'36.10"N, 7°41'27.41"W). The site is situated within an urbanized area characterized by mixed residential and commercial functions, ensuring accessibility for employees, visitors, and service vehicles.

The plot includes an existing building preserved within the project, which influenced the spatial and structural organization of the new development. The terrain is relatively flat, with minor elevation differences that do not exceed 1.5–2.0 meters, allowing simplified foundation solutions and efficient drainage design.

From a climatic perspective, Casablanca is characterized by a Mediterranean Atlantic climate, with mild winters and warm summers.

- Average winter temperature: +12°C to +18°C
- Average summer temperature: +22°C to +28°C

Dominant winds: Atlantic winds from the North-West

Wind speed: approximately 3–5 m/s

Unlike continental climates, snow loads are negligible, while wind loads and humidity become the governing environmental factors.

According to Moroccan standards:

RPS 2011 (Règlement Parasismique Marocain) → seismic considerations [28]

NV65 adapted for Morocco → wind load estimation [29]

The estimated wind pressure in Casablanca ranges between 0.5–0.7 kN/m², requiring proper façade fixation systems and structural stability. [31]

Special attention was given to:

natural ventilation (especially for underground parking),

solar protection (west and south façades),

humidity resistance and corrosion protection.

4.2 Architectural and Structural Solution

In the design of the multifunctional office center located in Casablanca, modern architectural and structural solutions were adopted, aimed at creating a functional, safe, and technologically efficient building adapted to the local context. The building consists of four above-ground floors and one underground level used for parking and technical spaces. The typical floor height is designed to meet office standards and ensure comfortable working conditions, with sufficient space for ventilation systems and technical installations.

The structural system is designed as a monolithic reinforced concrete frame, ensuring stability, durability, and flexibility in space organization. The spatial configuration of the building is based on a radial structural grid with a span of 6.0 meters between columns, allowing for open-plan office layouts and efficient circulation.

The external walls function as enclosing structures with a thickness of approximately 300 mm, combined with a ventilated façade system that includes thermal insulation and external cladding materials such as glass and aluminum panels. This solution improves energy efficiency and protects the building from climatic influences specific to Casablanca, such as humidity and solar exposure.

The underground level includes a parking area with a capacity of approximately 25 vehicles, with separate entrance and exit ramps to ensure smooth traffic flow. The basement also accommodates technical rooms, including HVAC systems and service spaces. The retaining walls of the underground structure are made of reinforced concrete with a thickness of 600 mm, ensuring structural resistance against soil pressure.

Interfloor slabs are designed as monolithic reinforced concrete slabs with a thickness of 250–300 mm, providing the required load-bearing capacity and structural integrity. The columns have a cross-section of 300 × 300 mm, ensuring adequate

support for vertical and horizontal loads according to Moroccan standards, including seismic considerations.

The roof is designed as a flat roof with internal drainage, incorporating waterproofing layers, thermal insulation, and a slight slope for rainwater evacuation. The overall architectural composition reflects the functional purpose of the building as a modern office center, combining structural efficiency, environmental performance, and contemporary design principles.

Foundation

A reinforced concrete foundation system was adopted for the multifunctional office center, taking into account the presence of an underground parking level and the structural loads transmitted by the radial reinforced concrete frame. (Fig 4.1)

Considering the geological conditions typical of the project site and the moderate to variable load levels generated by the spiral configuration of the building, a **raft foundation (radier général)** was selected as the most appropriate solution.

The raft foundation ensures a **uniform distribution of loads** over the soil and minimizes the risk of differential settlements, especially important given the **eccentric load distribution caused by the rotational geometry and progressive setbacks** of the structure.

It is designed as a monolithic reinforced concrete slab with a thickness varying approximately between **500 and 700 mm**, depending on structural calculations. Under the main load-bearing elements, including the **300 × 300 mm columns and the central core**, [30] local thickening zones are introduced to enhance load resistance and improve stress distribution.

The underground level is enclosed by **reinforced concrete retaining walls** with a thickness ranging between **400 and 600 mm**, designed to resist lateral earth pressure and potential groundwater effects. These walls are structurally connected to the raft foundation, [36] forming a **rigid and unified basement system**.

This foundation solution provides sufficient rigidity, durability, and structural reliability, while ensuring compatibility with the architectural complexity of the spiral form and complying with standard construction practices.

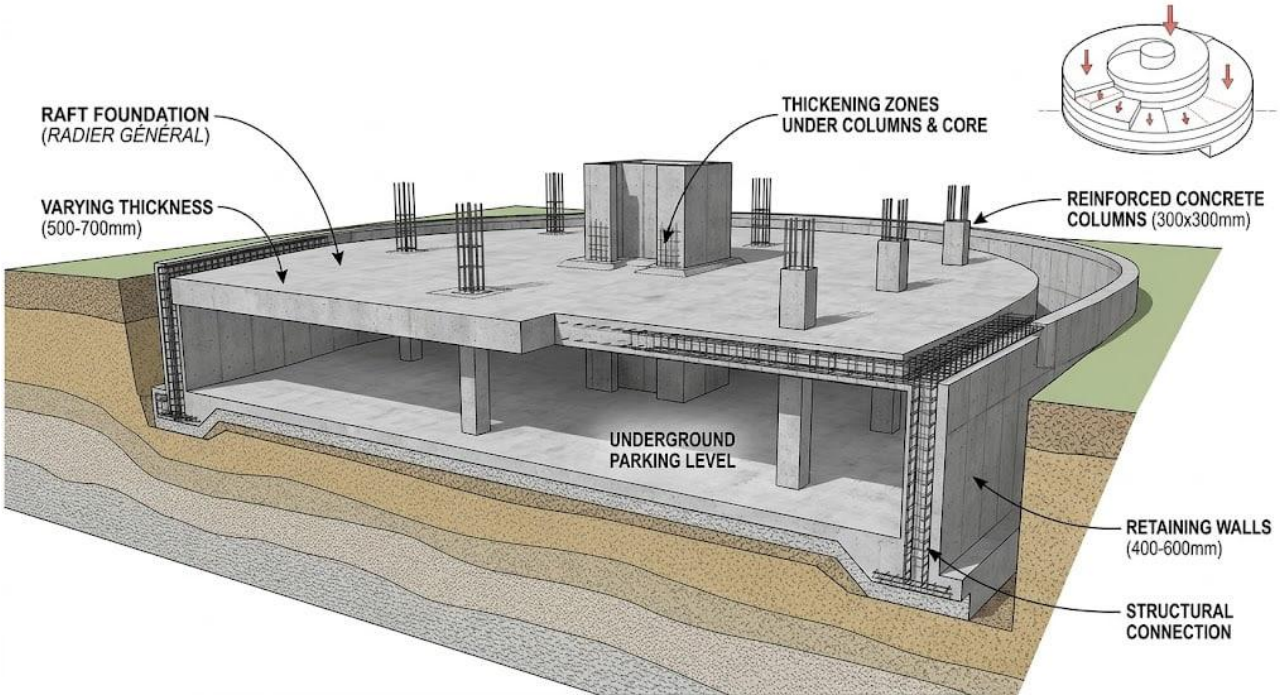


Figure.4.1.Architectural section foundation detail

Constructive System

When designing the multifunctional office center, a reinforced concrete structural system based on a radial frame configuration was adopted. The structural concept is organized around a central monolithic reinforced concrete core, which serves as the main stabilizing element of the building and accommodates vertical circulation (stairs and elevators).

The spatial scheme of the structure is based on a centered radial grid, from which radial axes extend towards three main wings. This system allows the building to develop a spiral (helical) geometry, generated through the progressive rotation and setback of each floor level. Unlike conventional orthogonal grids, the structural grid in this project is dynamic, maintaining constant structural dimensions while varying in orientation.

The supporting vertical elements are represented by reinforced concrete columns with a rectangular section of 300 × 300 mm, positioned along the radial axes and following the perimeter of the building. These columns, in combination with the central core, ensure efficient load transfer and structural stability despite the geometric complexity of the form.

Overlapping and Covering

The interfloor structures are designed as monolithic reinforced concrete slabs with a thickness of 300 mm. These slabs ensure a high level of structural rigidity for the building and contribute to the overall stability of the radial structural system. They provide an efficient distribution of loads to the central core and peripheral columns, ensuring the coordinated operation of all vertical load-bearing elements despite the rotational geometry of the project (Fig 4.2)

Due to the spiral configuration of the building, the slabs are designed to follow the progressive rotation of each floor, while maintaining structural continuity and supporting the cantilevered zones generated by the setbacks. This solution allows the integration of accessible terraces without compromising structural performance.

For interior finishes, office and circulation areas are equipped with raised flooring systems and wear-resistant finishing materials (such as technical vinyl or ceramic tiles). These materials are selected to meet the functional requirements of office environments, ensuring durability under continuous use, ease of maintenance, and adaptability for technical installations (electrical and data networks).

In terrace zones, appropriate waterproofing and protective layers are applied above the slab to ensure durability and resistance to weather conditions.

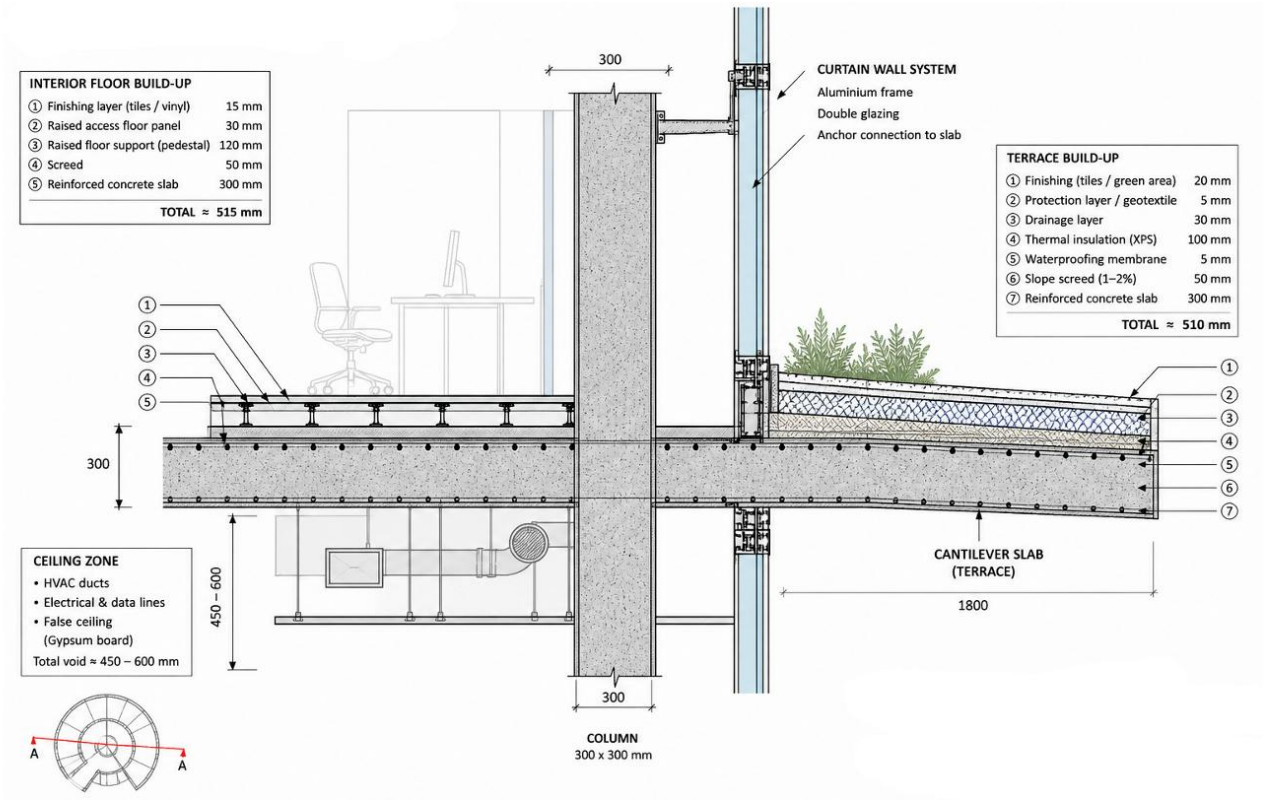


Figure.4.2. Staircases and Landings

The staircases and landings are designed as monolithic reinforced concrete elements (class C20/25), ensuring high fire resistance, structural rigidity, and durability. The vertical circulation system is organized into two complementary components:

A main public staircase located within the central atrium (Fig 4.3), which serves as the primary circulation element for users and enhances spatial connectivity and visual interaction within the building.

Secondary fire escape staircases located in each of the three wings, designed to ensure safe and efficient evacuation in accordance with fire safety regulations.

Considering a typical floor height of approximately 4.0 m, all staircases are designed to provide comfortable and safe ascent and descent, following ergonomic and safety standards applicable to office buildings (Fig 4.4)

The geometric parameters of the steps are defined as follows:

Tread width: 300 mm

Riser height: 150 mm

The width of stair flights and landings is dimensioned to ensure smooth circulation for daily use and adequate capacity for emergency evacuation, with particular attention given to the fire staircases to comply with safety requirements.

The integration of staircases within both the central core and peripheral wings ensures an efficient distribution of vertical circulation and enhances the overall functional organization of the building.

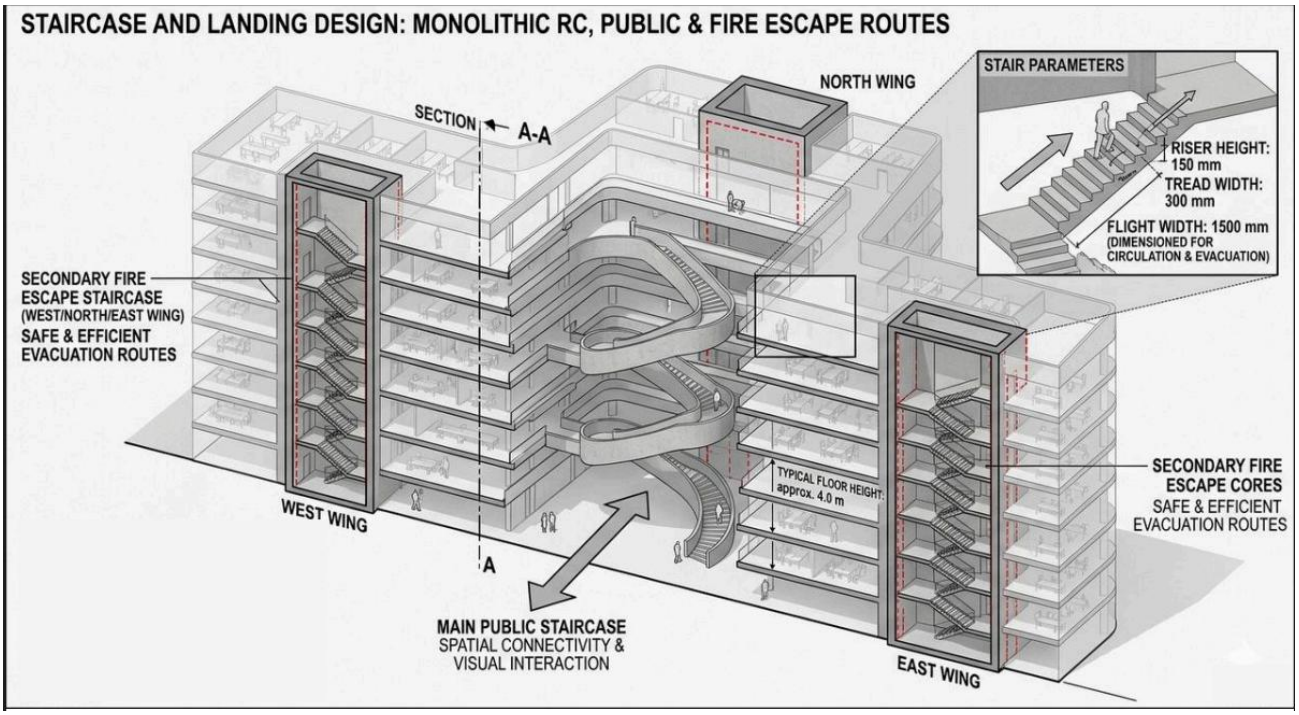


Figure.4.3. Vertical Circulation and Fire Safety System

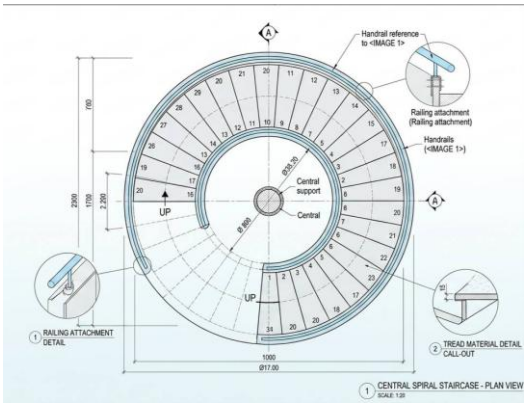


Figure 4.4. Central Spiral Staircase – Technical Plan View

Operated Roof (Green Roof System)

The design of the multifunctional office center incorporates operated green roofs and accessible terraces, which contribute to both environmental sustainability and user comfort. These roof areas are designed as functional outdoor spaces, combining vegetation zones with wooden circulation decks. (Fig 4.5)

The roof structure is developed as a multi-layer system [35], [37] ensuring structural safety, waterproofing, thermal insulation, [32] and proper drainage.

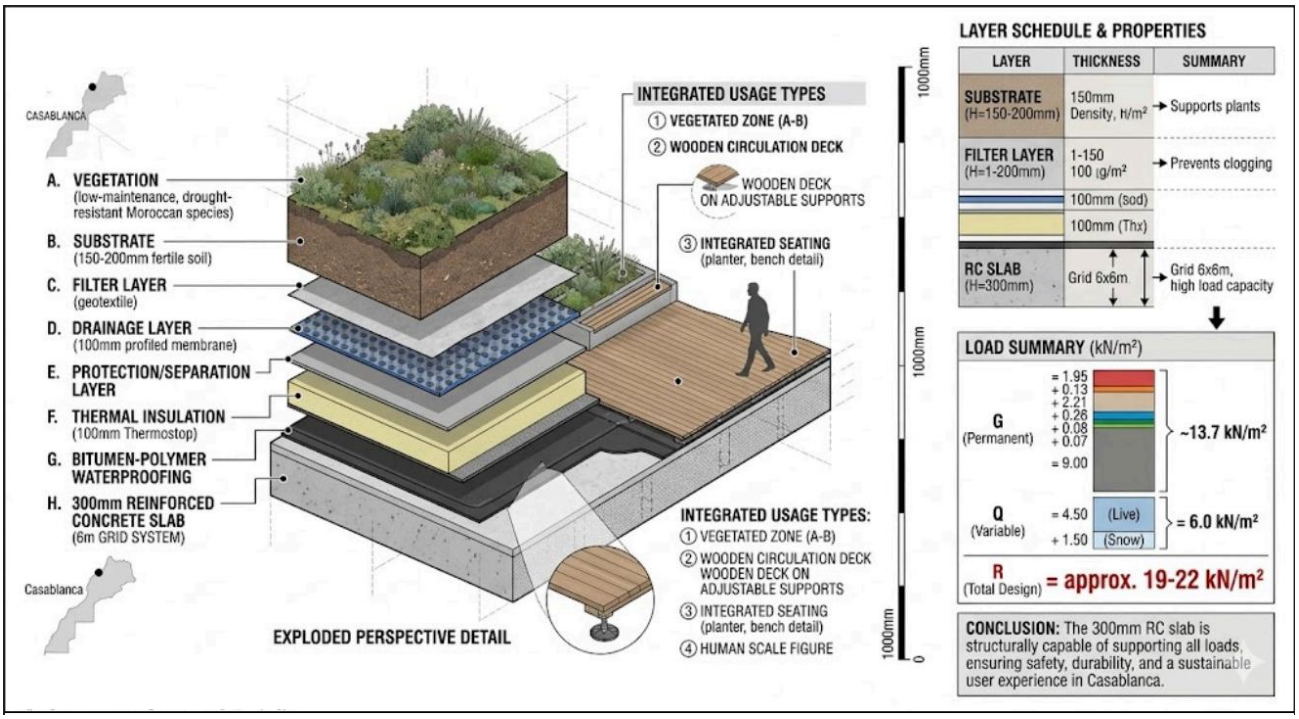


Figure.4.5. Structure of the operated green roof

Roof Structure Composition

The operated roof is constructed on a reinforced concrete base and consists of the following layers:

- Reinforced concrete slab – thickness 300 mm, designed within the RC frame system (grid 6 m), ensuring adequate load-bearing capacity.
- Bitumen-polymer waterproofing membrane – provides complete protection against water penetration.

- Thermal insulation layer (Thermostop or equivalent) – ensures energy efficiency and indoor thermal comfort.
- Protective and separation layer – prevents mechanical damage to the waterproofing membrane.
- Drainage layer (profiled membrane) – allows efficient removal of excess water.
- Filter layer (geotextile) – prevents fine particles from entering the drainage system.
- Substrate layer (fertile soil) – thickness 150–200 mm, adapted to vegetation requirements.
- Vegetation layer – consists of drought-resistant and low-maintenance plants suitable for the Moroccan climate.

For accessible terraces, additional layers are included:

- Wooden decking system (on adjustable supports) for circulation zones
- Planters and integrated seating elements

The total thickness of the roof system varies between 550 mm and 700 mm, depending on the type of use (extensive or semi-intensive green roof).

Load Calculation

The structural design of the operated roof is based on the evaluation of permanent (G) and temporary (Q) loads. [31]

General Formula:

$R=G\cdot\gamma G+Q\cdot\gamma Q$

Where:

G – permanent loads

Q – variable loads

γ (gamma) – safety factors

No.	Element	Density / Thickness	G (kN/m²)	γ	G × γ (kN/m²)
1.1	Vegetation soil (H = 150 mm)	10 kN/m³	1.5	1.3	1.95
1.2	Filter layer	—	0.1	1.3	0.13
1.3	Drainage layer (H = 100 mm)	17 kN/m³	1.7	1.3	2.21
1.4	Protection layer	—	0.2	1.3	0.26
1.5	Thermal insulation (H = 100 mm)	0.6 kN/m³	0.06	1.3	0.08
1.6	Waterproofing	—	0.05	1.3	0.07
1.7	RC slab (H = 300 mm)	25 kN/m³	7.5	1.2	9

Table: Permanent Load Calculation (G) for the Operated Green Roof System

Temporary Loads (Q)

No.	Load Type	Q (kN/m²)	γ	Q × γ (kN/m²)
1.8	Live load (terrace use)	3	1.5	4.5
1.9	Snow load	1	1.5	1.5

Table 2: Temporary Load Calculation (Q) for Accessible Terraces and Green Roofs

Total Design Load

R≈19–22kN/m2

Analysis of the Structural Solution of the Facade

A curtain wall system [33,34] combined with a ventilated facade (hinged ventilated facade) is adopted for the multifunctional office center. This solution is widely used in contemporary office buildings due to its high performance in terms of energy efficiency, architectural flexibility, and durability (Fig 4.6).

The facade system is connected to the reinforced concrete structural frame (RC frame with 6 m grid), ensuring structural stability and allowing for flexible spatial organization within the building (Fig 4.7)

The facade design integrates transparent, semi-transparent, and opaque elements, reflecting the architectural concept of the project, which combines glass, greenery, and warm materiality (wood).

Advantages of the Facade System

1. Thermal Performance

The facade provides effective thermal insulation through the integration of insulation materials within the external wall assembly. This reduces heat loss in winter and overheating in summer, ensuring improved energy efficiency of the building. [32], [34]

2. Ventilation and Moisture Control

The ventilated cavity between the cladding and insulation layer allows continuous air circulation. This prevents:

- moisture accumulation
- condensation formation
- deterioration of materials

As a result, the lifespan of the facade system is significantly increased.

3. Acoustic Comfort

The combination of insulated layers and glazed elements improves sound insulation, which is particularly important in an office environment exposed to urban noise.

4. Architectural Expression

The facade system allows high design flexibility through the combination of:

- Glass curtain walls → transparency and natural lighting
- Wood cladding elements → warm aesthetic identity
- Green integrated terraces → biophilic design approach

This creates a strong architectural identity that reflects the concept of a modern, human-oriented, and ecological office center.

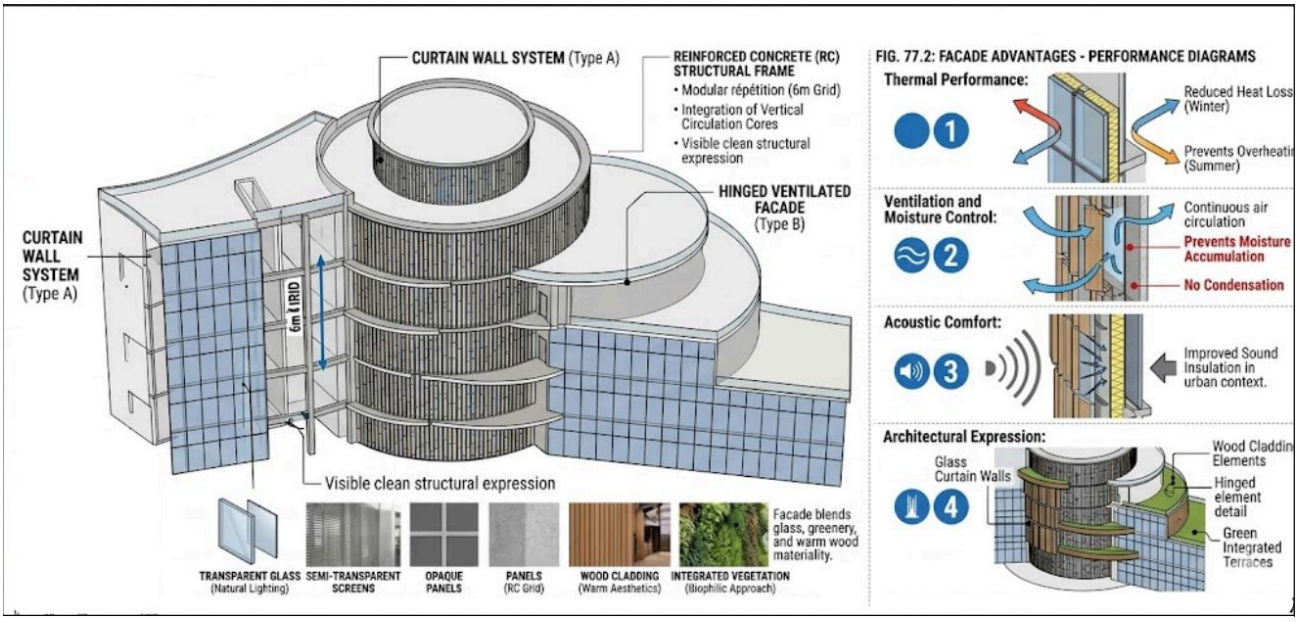


Figure.4.6: Integrated Facade Systems – Structural and Performance Analysis

5. Structural Compatibility

The facade is fully compatible with the RC structural system, allowing:

- modular repetition (6 m grid)
- integration of vertical circulation cores
- clean structural expression without visual overload

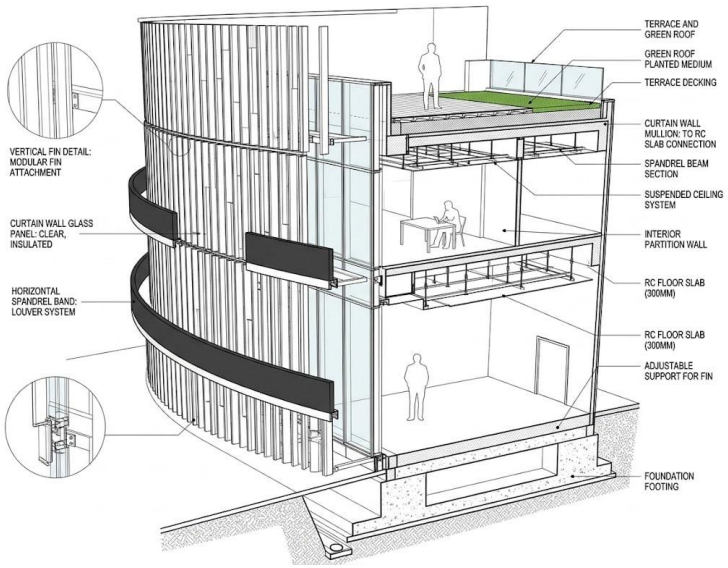


Figure.4.7. Technical Wall Section – Integrated Facade and Structural Assembly

Conclusion of Section 4

In conclusion, the calculation and construction solutions adopted for the multifunctional office center in Casablanca demonstrate a coherent integration of architectural concept, structural efficiency, and environmental responsiveness. The analysis of the site and climatic conditions confirms the importance of addressing local factors such as wind loads, humidity, and solar exposure, which significantly influence both structural and envelope design decisions.

The selected monolithic reinforced concrete structural system, based on a radial grid and a central core, ensures stability, rigidity, and adaptability to the complex spiral geometry of the building. The use of a raft foundation (radier général) guarantees uniform load distribution and minimizes differential settlement risks, particularly in relation to the irregular and rotational configuration of the structure.

The constructive solutions, including interfloor slabs, retaining walls, and vertical load-bearing elements, provide the required structural performance while maintaining compatibility with the architectural layout. The integration of operated green roofs and accessible terraces enhances environmental performance, improves thermal behavior, and contributes to user well-being, while the multilayer roof system ensures durability and effective water management.

In addition, the implementation of a combined curtain wall and ventilated façade system allows for high energy efficiency, moisture control, and acoustic comfort, while reinforcing the architectural identity through the combination of glass, wood, and greenery

Special attention to vertical circulation and fire safety, through the use of a central public staircase and secondary escape staircases, ensures compliance with safety standards and efficient movement within the building.

SECTION 5. OCCUPATIONAL HEALTH AND SAFETY

5.1. Regulation of occupational health and safety issues at the legislative level

designers, developers, and building management authorities. These types of buildings combine administrative, technical, and service functions, which increases the complexity of occupational safety requirements during both construction and operational phases.

A number of key international documents provide guidelines and best practices for maintaining safe and healthy working environments. These frameworks form the basis for safety protocols applied throughout the lifecycle of the building.

Among the most important international documents are the **International Labour Organization (ILO) Convention No. 155**, [38] which establishes general principles for ensuring safe and healthy working conditions, including risk prevention, employee training, and employer responsibility. In addition, the **ISO 45001 standard** [39] provides a structured approach to occupational health and safety management systems, allowing organizations to identify hazards, assess risks, and implement effective control measures.

The **International Building Code (IBC)** [40] also plays an important role by defining safety requirements related to fire protection, structural integrity, and emergency evacuation in complex buildings such as office centers.

At the national level, occupational health and safety in Morocco is regulated by several legal and technical documents, including the Moroccan Labour Code [41], national fire safety regulations [43], and construction standards. Particular attention is given to the **RPS 2011 (Règlement Parasismique Marocain)** [42], which ensures structural safety under seismic conditions.

These international and national frameworks define essential requirements related to working conditions, including ventilation, lighting, accessibility, fire safety, and emergency evacuation. Their proper implementation ensures the protection of

employees, maintenance staff, and visitors, contributing to a safe and efficient working environment. [44][45][46]

5.2. Identification of Potential Hazards Related to the Multifunctional Office Center

Ensuring safety in a multifunctional office center requires a detailed understanding of the working environment and the different categories of users occupying the building. The project under study is a multifunctional office center located in Casablanca, consisting of an underground parking level, technical service areas, and four above-ground office floors.

The building accommodates various users, including administrative employees, maintenance personnel, cleaning staff, security workers, and visitors. Each group performs different tasks under specific working conditions, which leads to a diverse range of potential hazards.

Office employees typically carry out computer-based work in organized workspaces equipped with desks, chairs, and digital devices. In this context, **ergonomic risks and mental strain** are among the most significant hazards. Prolonged sitting, repetitive movements, and continuous screen exposure may lead to musculoskeletal disorders, visual fatigue, and decreased productivity. [44][45].

The quality of the indoor environment also plays an important role. **Insufficient or poorly distributed lighting** may negatively affect visual comfort and overall work performance.

Circulation areas such as corridors, staircases, entrances, and underground parking zones present risks of **slips, trips, and falls**, especially in cases of wet surfaces, poor maintenance, or obstacles. [46]

The underground parking and technical zones introduce additional risks. **Noise and vibration**, generated by HVAC systems, mechanical equipment, and vehicle movement, may affect both workers and building users. Maintenance staff may also face **chemical exposure risks** due to cleaning products and technical substances. [45].

Another important category includes **confined spaces**, such as technical rooms, shafts, and service areas, where limited ventilation and restricted access may create hazardous working conditions.

Among all identified hazards, **fire risk** remains one of the most critical, due to the presence of electrical systems, office equipment, and parking areas. This requires particular attention during both design and operation stages. [40][43]

In conclusion, the hazards identified in the multifunctional office center are directly related to its functional organization and technical infrastructure. Their proper identification is essential for ensuring safe and comfortable working conditions.

5.3. Study of the Risk of Implementation of Potential Hazards and Development of Preventive Measures

Risk assessment is a systematic process aimed at identifying potential hazards, evaluating their likelihood and severity, and defining appropriate preventive measures. It is a key component of occupational safety, allowing for the prevention of accidents and the improvement of working conditions. [39]

In the case of the multifunctional office center, the previously identified hazards—such as ergonomic stress, poor lighting, slips and falls, noise, chemical exposure, confined spaces, and fire risks—are directly related to the functional organization of the building and the activities performed by its users.

The main objective of risk assessment is to reduce uncertainty and anticipate dangerous situations before they occur. It provides a structured approach for prioritizing risks and implementing effective safety strategies.

The risk level is determined using the following formula:

$$\mathbf{R = Pa \times Q}$$

where:

Pa – probability of occurrence (from 1 to 10)

Q – severity of consequences (from 1 to 10)

Hazard	Pa	Q	R
Ergonomic stress	6	3	18
Poor lighting	5	2	10
Slips, trips, falls	5	3	15
Noise and vibration	4	3	12
Chemical exposure	3	4	12
Confined spaces	6	3	18
Fire hazards	5	5	25

Table 5.1 – Risk Assessment

The results of the assessment indicate that fire hazards represent the highest level of risk due to their potentially severe consequences, including damage to property and threat to human life. Ergonomic stress and confined space risks also show relatively high values, reflecting their importance in daily building operation.

Although some risks, such as poor lighting or noise, have lower severity, they may significantly affect the comfort, health, and productivity of employees over time.

The strength of risk assessment lies in its preventive nature. By identifying and evaluating hazards in advance, it becomes possible to implement design and management solutions that minimize risks and improve overall safety conditions. [38][39]

Preventive Measures

Based on the risk assessment, several preventive strategies are proposed. (Fig 5.3.37)

Improving ergonomic conditions through appropriate furniture and proper workplace organization helps reduce physical strain on employees. Ensuring adequate lighting, both natural and artificial, contributes to visual comfort and efficiency. [44]

Regular maintenance of floors and circulation areas is essential to prevent slips, trips, and falls. The installation of acoustic insulation reduces the negative impact of noise and vibration generated by technical systems. [46]

In addition, safe storage and proper handling of chemicals must be ensured in maintenance areas. Confined spaces should be clearly identified and equipped with adequate ventilation systems and safety procedures.

Finally, special attention must be given to fire safety through the installation of detection systems, alarm devices, and clearly defined evacuation plans. [40][43]

The implementation of these measures significantly improves safety conditions and reduces occupational risks within the multifunctional office center.

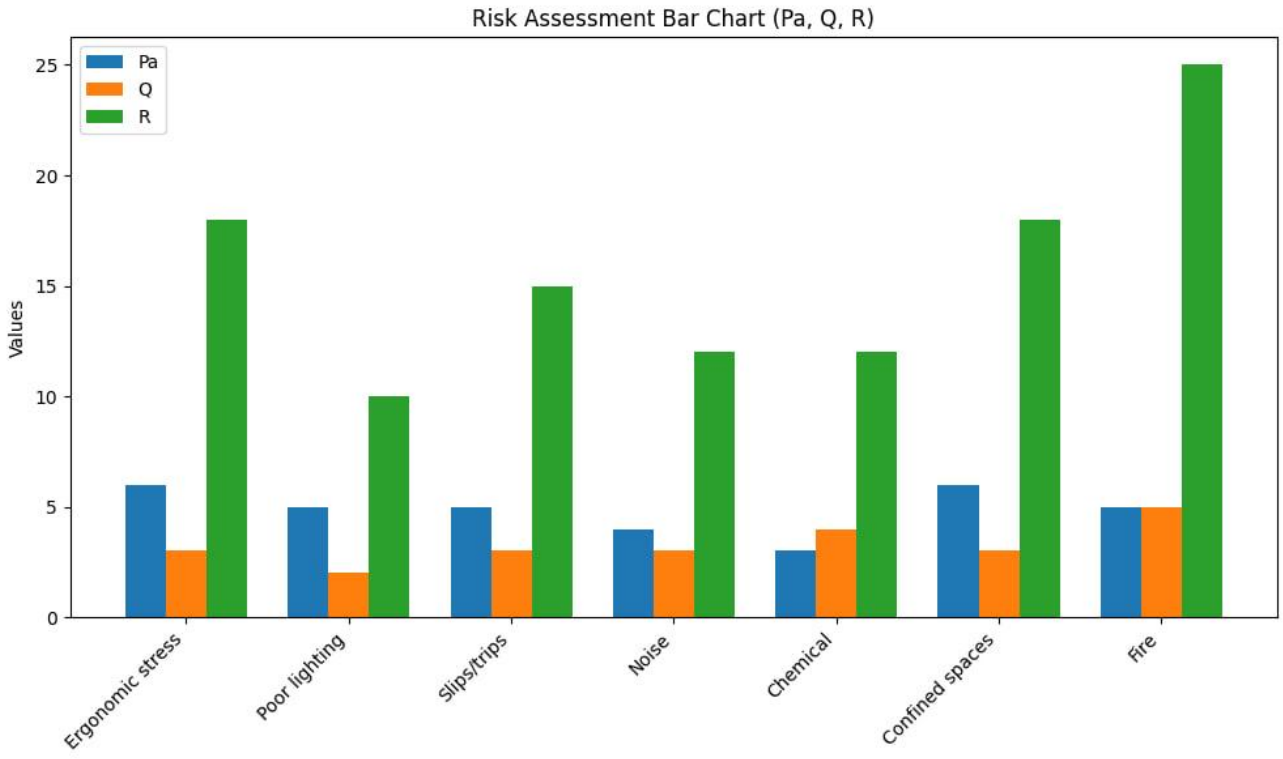


Figure.5.3.37. Risk Assessment Diagram (Pa, Q, R)

5.4. Safety in Emergency Situations

Emergency situations in multifunctional office centers represent unexpected events that require immediate and coordinated responses in order to ensure the safety of occupants and minimize potential damage.

Due to the functional complexity of the building, which includes office spaces, underground parking, and technical areas, several types of emergency situations may occur. Among the most common are fire incidents, which may result from electrical faults, equipment malfunction, or human error. These situations require efficient fire detection systems and clearly defined evacuation procedures. [40][43]

Seismic events also represent a potential risk, as the building is located in a region governed by the Moroccan seismic regulation RPS 2011 [42]. In such cases, the structural design must ensure stability, while occupants must follow appropriate safety procedures.

Medical emergencies may occur at any time, especially in a building with a high number of occupants. These situations require rapid access to emergency services and basic first-aid knowledge among staff.

In addition, infrastructure failures, such as power outages, elevator malfunctions, or water system failures, may create hazardous conditions, particularly in underground and technical areas.

Hazardous material incidents may also occur due to leaks or improper handling of chemicals in maintenance zones [45], requiring strict control and safety procedures. In order to respond effectively to these situations, several preventive and organizational measures must be implemented. These include the installation of fire alarm systems, emergency lighting, and clearly marked evacuation routes. Regular training and emergency drills help ensure that occupants are familiar with evacuation procedures and can react appropriately [44],[46].

During an emergency, it is essential for occupants to remain calm, follow instructions provided by building management or emergency services, and use

designated escape routes. Elevators must be avoided, and assistance should be provided to vulnerable individuals when necessary.

In conclusion, safety in emergency situations depends on both the quality of building design and the preparedness of its users. By integrating preventive measures and ensuring proper training, the multifunctional office center can provide a safe and resilient environment for all occupants.

Conclusion to the 5th Section

In conclusion, occupational health and safety in a multifunctional office center is a fundamental aspect that must be considered throughout both the design and operational phases of the building. The analysis of international and national regulations highlights the importance of a structured legal framework in ensuring safe and healthy working conditions for all users.

The identification of potential hazards demonstrates that risks in such buildings are diverse and closely linked to their functional complexity, including ergonomic issues, environmental conditions, technical risks, and fire hazards. Among these, fire safety and confined space risks require particular attention due to their potential severity.

The risk assessment process proves to be an essential tool for evaluating and prioritizing these hazards, allowing for the development of effective preventive strategies. By applying appropriate measures, such as improving ergonomic conditions, ensuring proper lighting and maintenance, controlling technical risks, and implementing fire protection systems, the overall safety level of the building can be significantly enhanced.

Furthermore, the study of emergency situations emphasizes the importance of preparedness, efficient building design, and user awareness. The integration of evacuation systems, emergency equipment, and regular training ensures that occupants can respond quickly and effectively in critical situations.

Conclusions of the Work

1. The theoretical foundations of human-oriented architectural design in modern office centers were analyzed, showing the evolution from rigid office buildings to flexible, sustainable, and user-centered environments. The study emphasized key principles such as ergonomics, biophilic design, flexibility, and environmental comfort as essential components of contemporary office architecture.

2. Practical aspects of office center design were examined through international and Moroccan case studies, highlighting the importance of integrating natural lighting, green spaces, adaptive facades, mixed-use functions, and smart technologies. These elements improve user well-being, productivity, and spatial quality.

3. Current trends in human-oriented office design were identified, including activity-based workspaces, wellness-oriented architecture, sustainability strategies, mixed-use developments, and intelligent building systems. These trends reflect the global shift toward more flexible, healthy, and adaptable workplaces.

4. Main factors influencing the architectural formation of modern office centers in Morocco were defined, such as technological development, changing work patterns, environmental sustainability, urban context, and economic considerations. These factors strongly shape spatial organization and design strategies.

5. Human-oriented spatial and ergonomic principles were explored, emphasizing flexible layouts, efficient circulation, accessibility, natural lighting, comfort, and integration of green and recreational spaces as essential elements in improving user experience and workplace quality.

6. Conceptual proposals for a human-oriented modern office center were developed based on the synthesis of theory and practice. The project integrates multifunctional spaces, flexible planning, biophilic elements, climate-responsive design, and sustainable solutions to meet the needs of contemporary users and the Moroccan context.

List of references

1. Dannhauser, A. V., & Zak, P. J. (2023). Office Openness and Teamwork. *Journal article*. [Electronic resource]: https://link.springer.com/article/10.1007/s41542-023-00167-7

2. Söderlund, C., de la Fuente Suárez, L. A., Tillander, A., Toivanen, S., & Bälter, K. (2020). The outdoor office: A pilot study of environmental qualities, experiences of office workers, and work-related well-being. *International Journal of Environmental Research and Public Health*. [Electronic resource] https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2023.1214338/full

3. Moore, E. (n.d.). Human-Centric Design for Healthy Offices. *Journal article*. [Electronic resource]: https://www.archdaily.com/997709/the-art-of-human-centric-design-for-healthy-office-spaces

4. Panero, J., & Zelnik, M. (1979). *Human Dimension and Interior Space*. [Electronicresource]:https://books.google.co.ma/books?id=OuoU_DxmKuEC&hl=fr&source=gbs_book_other_versions

5. Hascher, R., Jeska, S., & Klauck, B. (2002). *Office Buildings: A Design Manual*. [Electronic resource]: (https://books.google.com/books/about/A_Design_Manual.html?id=IlOrtLq6nWUC)

6. Myerson, J., & Ross, P. (2022). *Unworking: The Reinvention of the Modern Office* - [Electronic resource]: https://books.google.com/books/about/Unworking.html?id=TpN8EAAAQBAJ

7. Shinberg, M. (2025). *People-Centered Architecture: Driving Design, Practice, and Education*. - [Electronic resource]: https://books.google.com/books/about/People_Centered_Architecture.html?id=exlaEQAAQBAJ

8. Klein, J. G. (1982). *The Office Book: Ideas and Designs for Contemporary Work Spaces*. [Electronic resource]: https://books.google.com/books/about/The_Office_Book.html?id=xBf5IQImYaoC

9. Seagram Building. (n.d.). New York, USA. [Electronic resource]: https://www.britannica.com/topic/Seagram-Building

10. Yeang, K. Menara Mesiniaga, Subang Jaya, Malaysia. [Electronic resource]: https://archnet.org/sites/957

11. ACROS Fukuoka Prefectural International Hall, Fukuoka, Japan. - [Electronic resource]: https://fr.wikipedia.org/wiki/ACROS_Fukuoka

12. Al Bahar Towers, Abu Dhabi, United Arab Emirates. - [Electronic resource]: https://www.e-architect.com/dubai/al-bahar-towers-abu-dhabi

13. OCP Administrative Offices, Benguerir, Morocco. - [Electronic resource]: https://fr.le360.ma/economie/le-plus-puissant-supercalculateur-dafrique-est-au-maroc-234002/

14. Arup. (2016). *The Edge, Amsterdam: The world's smartest building*. - [Electronic resource]: https://www.cdbb.cam.ac.uk/system/files/documents/TheEdge_Paper_LOW1.pdf

15. Archello. (n.d.). *CapitaSpring project*. - [Electronic resource]: https://archello.com/project/capitaspring

16. Miller Hull Partnership. (n.d.). *Bullitt Center*. - [Electronic resource]: https://millerhull.com/project/bullitt-center/

17. Hassan, M. A., Aljutaily, I., & Alhulaibi, M. (2022). *A blend of sustainable architectural design: An overview of the King Abdullah Financial District (KAFD), Riyadh, Saudi Arabia*. Journal of Sustainable Development, 15(4). https://doi.org/10.5539/jsd.v15n4p28

18. Architonic. (2022). *Google Bay View Campus by BIG + Heatherwick Studio*.

https://www.architonic.com/en/project/big-and-heatherwick-studio-google-bay-view/20714820

19. Vischer, J. C. (2008). Towards an environmental psychology of workspace: How people are affected by environments for work. Architectural Science Review, 51(2), 97–108

20. Alexander, C., Ishikawa, S., & Silverstein, M. (1977). A pattern language: Towns, buildings, construction. Oxford University Press.

21. Duffy, F. (1997). The new office. Conran Octopus.

22. Kellert, S. R., & Calabrese, E. F. (2015). The practice of biophilic design. Metropolis Books.

23. Neufert, E., & Neufert, P. (2019). Architectural data (5th ed.). Wiley-Blackwell.

24. Terrapin Bright Green. (2014). 14 Patterns of biophilic design: Improving health and well-being in the built environment. Terrapin Bright Green LLC.

25. Yeang, K. (2006). Ecodesign: A manual for ecological design. Wiley.

26. Gehl, J. (2011). Life between buildings: Using public space. Island Press.

27. Ching, F. D. K. (2014). Architecture: Form, space, and order (4th ed.). Wiley

28. Kingdom of Morocco. *Règlement Parasismique Marocain (RPS 2011).* Rabat: Ministère de l'Équipement, du Transport et de la Logistique, 2011. Available at: http://www.equipement.gov.ma (accessed: 17.05.2026).

29. Kingdom of Morocco. *Règles NV65 modifiées – Règles définissant les effets de la neige et du vent sur les constructions.* Rabat: Ministère de l'Équipement et du Transport du Maroc. Available at: http://www.equipement.gov.ma (accessed: 17.05.2026).

30. European Committee for Standardization (CEN). *EN 1992-1-1:2004 Eurocode 2: Design of Concrete Structures – Part 1-1: General Rules and Rules for Buildings.* Brussels: CEN, 2004. Available at:

https://standards.iteh.ai/catalog/standards/cen/8908e7a7-1f1f-4d77-8e52-6d0d5d295df1/en-1992-1-1-2004 (accessed: 17.05.2026).

31. European Committee for Standardization (CEN). *EN 1991-1-1:2002 Eurocode 1: Actions on Structures – Part 1-1: Densities, Self-weight and Imposed Loads for Buildings.* Brussels: CEN, 2002. Available at: https://standards.iteh.ai/catalog/standards/cen/4eec1c90-9f4c-48a3-aedc-df6a3e2f63bf/en-1991-1-1-2002 (accessed: 17.05.2026).

32. International Organization for Standardization (ISO). *ISO 6946:2017 Building Components and Building Elements – Thermal Resistance and Thermal Transmittance – Calculation Methods.* Geneva: ISO, 2017. Available at: https://www.iso.org/standard/65708.html (accessed: 17.05.2026).

33. International Code Council (ICC). *International Building Code (IBC).* Washington, DC: ICC. Available at: https://codes.iccsafe.org/codes/i-codes (accessed: 17.05.2026).

34. Chartered Institution of Building Services Engineers (CIBSE). *Guide A: Environmental Design.* London: CIBSE. Available at: https://www.cibse.org/knowledge-research/knowledge-portal/cibse-guide-a-environmental-design (accessed: 17.05.2026).

35. National Institute of Building Sciences. *Whole Building Design Guide (WBDG).* Available at: https://www.wbdg.org (accessed: 17.05.2026).

36. Fédération Internationale du Béton (fib). *fib Model Code for Concrete Structures 2010.* Lausanne: fib, 2013. Available at: https://fib-international.org/publications/fib-model-code-2010.html (accessed: 17.05.2026).

37. Green Roofs for Healthy Cities. *Green Roof Design and Implementation Guidelines.* Available at: https://greenroofs.org (accessed: 17.05.2026).

38. International Labour Organization (ILO). *Convention No. 155 on Occupational Safety and Health and the Working Environment.* Geneva: ILO, 1981. Available at:

https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312300 (accessed: 17.05.2026).

39. International Organization for Standardization (ISO). *ISO 45001:2018 Occupational Health and Safety Management Systems – Requirements with Guidance for Use.* Geneva: ISO, 2018. Available at: https://www.iso.org/standard/63787.html (accessed: 17.05.2026).

40. International Code Council (ICC). *International Building Code (IBC).* Washington, DC: ICC. Available at: https://codes.iccsafe.org/codes/i-codes (accessed: 17.05.2026).

41. Kingdom of Morocco. *Code du Travail Marocain (Dahir n° 1-03-194 du 11 septembre 2003 portant promulgation de la loi n° 65-99 relative au Code du travail).* Rabat, 2003. Available at: https://www.ilo.org/dyn/travail/docs/496/Labour%20Code.pdf (accessed: 17.05.2026).

42. Kingdom of Morocco. *Règlement Parasismique Marocain (RPS 2011).* Rabat: Ministry of Equipment, Transport and Logistics, 2011. Available at: http://www.equipement.gov.ma (accessed: 17.05.2026).

43. Kingdom of Morocco. *Règlement de sécurité contre les risques d'incendie et de panique dans les constructions.* Available at: http://www.interieur.gov.ma (accessed: 17.05.2026).

44. World Health Organization. *Healthy Workplaces: A Model for Action.* Geneva: WHO, 2010. Available at: https://www.who.int/publications/i/item/healthy-workplaces-a-model-for-action (accessed: 17.05.2026).

45. National Institute for Occupational Safety and Health (NIOSH). *Workplace Safety and Health Topics.* Centers for Disease Control and Prevention (CDC). Available at: https://www.cdc.gov/niosh/topics/default.html (accessed: 17.05.2026).

46. Occupational Safety and Health Administration (OSHA). *Safety and Health Regulations for Construction and General Industry.* U.S. Department of Labor. Available at: https://www.osha.gov/laws-regs (accessed: 17.05.2026).

47. W. Belegchour. Human-centered design in modern office centers of Morocco (2025). Комунальне господарство міст. Серія: «Інформаційні технології та інженерія», 6 (194), 133-138. https://khgts.kname.edu.ua/index.php/khgts/uk/article/view/6651

48. W. Belegchour. Modern Office Design Trends in Morocco: Towards More Human Workspaces. Current problems of the city building. prospects and priorities of development, November 14, 2025 https://konf-mbg.wixsite.com/lntu-bci-mbg-2025/tezi-dopovidej