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Thinking of Automated Building as an Approach to Restore Creative Values in New City of Rashid in Egypt

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Abstract The application of automated thought in architecture appeared in 1960 to speed up the implementation of buildings and improve their quality. Most countries of the world are still seeking to apply automated thought in architecture because it has a more positive impact on economic, environmental, and creative levels than traditional building systems. However, this thought faced many objections, for technical reasons represented in the lack of advanced technological vision in construction and intellectual reasons represented in neglecting the human side at the creative and executive levels). The research problem is the absence of an objective vision that combines the advantages of automated thought in architecture without neglecting human creativity. The research focuses on activating automated thought in architecture, which includes many high technologies, the most important of which are (3D printing – prefabricated building - robot building-digital prefabrication - adaptive architecture – CAD design) and focus on how to link automated thought with creative thought in architecture, especially in the new city of Rashid. Therefore, the research aims to reach the vision that achieves the link between the advantages of automated thought in architecture and its use as a means to maintain the revival of fine values in Egyptian architecture. These values can increase the speed and efficiency of creative and environmental construction, unlike traditional construction as it aims to achieve creativity thought in building and applying this to an architectural example in the new city of Rashid in Egypt as a model for valuable Egyptian cities.

Keywords Automated Thought, Architectural Creativity, Automation, New Rashid City

1. Introduction

Most countries of the world seek to apply automated thought in architecture because of its importance on the economic, environmental, and social levels. Automated thought in architecture is the process of transforming the means of accomplishing work from the human or animal element to working by machines that are called (automation) process and controlled by sensors. Automated architecture has an important role in achieving functional efficiency. As it achieves architectural creativity and artistic aesthetic pleasures, and transforms the building from a solid material into a piece of art. Therefore, the research presents an advanced vision for activating automated thought in architecture, which includes many high technologies, the most important of which are (prefabricated building systems - 3D printing - robots in construction - digital prefabrication systems- adaptive architecture systems - computer design) [1] as well as the concept of creative thought in architecture. In addition, it connects automated thought and creative thought in architecture and tries to apply the best automated techniques to the new city of Rashid in Egypt in a way that suits its creative values to reach a vision that achieves the advantages of automated thought in architecture with

preserving the revival of creative plastic values in Egyptian architecture.

2. Methodology

The research follows a methodology that includes theoretical, analytical and case study as follows:

- Theoretical approach: the study of the basic concepts of automated architecture and its impact on architectural creativity by studying its various applications in architecture and urbanism to improve the quality and innovation in the construction. In addition, the concept of creating value in architecture and the extent to which it can be used to suit automated architecture.
- Analytical approach: analyzing global projects that are applied to contemporary automated thought with an interest in architectural creativity to deduce technological design strategies that achieve a balance between automated thought and creative thought in architecture.
- The case study approach: is an applied study of the technological design strategies deduced from the architecture of the new city of Rashid in Egypt with a study of the creative values and architectural vocabulary of the city, and proposals for the application of automated thought with preserving the creative plastic values on the methods of building city architecture) in order to reach a design model that achieves development in Building methods while achieving creative fine and environmental thinking in the new city of Rashid and improving the quality and accuracy of construction to preserve human life.

3. General Concepts

The general concepts include the concept of automated thought in architecture, creative thought in architecture and aspects of architectural creativity.

3.1. Automated Thought in Architecture

It is the process that depends on the machine in the designing and construction of the buildings and it is controlled by a closed-loop system where feedback is provided by sensors to accomplish work with more speed, efficiency, accuracy, and less energy [2].

3.2. Creative Thought in Architecture

It is the ability to invent new ideas of value for the establishment of buildings that achieve benefit, beauty and economy, and meet the material and psychological needs of human beings and the transfer of architecture from mere solid blocks to works of art that fulfill the user's psychological and social demands [3].

3.3. Aspects of Architectural Creativity

Fine creativity: it changes with the nature of each site and its environmental and heritage conditions and leads to the idea that creates the building's personality and formal image and achieves artistic pleasure of perception - Environmental creativity: dealing with the environment and space system and providing all human needs environmentally, spatially, functionally and aesthetically - Creativity Structural: It is the means to achieve utilitarian creativity by forming internal spaces and external blocks. The construction consists of building materials and innovative assembly methods [4].

4. Modern Automated Building Systems in Architecture

Sophisticated automated building systems play a crucial role in building complex structures quickly and efficiently. It includes the most important systems such as (prefabricated building - 3D printing - robot building - digital prefabrication - adaptive architecture - computer design).

4.1. Prefabricated Building System

It is a modern building technique in which complete units are assembled with internal finishes equipped by the factory and then are transferred for installation on the site as a single unit as in Figure 1 [5]. It is suited for limited land provision, Scarcity of skilled labor, and reducing the cost of construction and manufacturing. It has many advantages such as flexibility for the possibility of dismantling and installation, speed of construction, and decreasing noise by 90%, energy by 90%, risks and costs by 70%, where life expectancy of 150 years and maintenance every 30 years [6]. It has a specific executive method that has specific forms of implementation such as (the volumetric building system that has three-dimensional units with flat panels manufactured in the factory and assembled on-site, the semi-volume building system combines panels, and three-dimensional units). It has proper implementation ratios including the width of the units (15:10) feet, length (60 feet), and height (14:6) feet [7]. The finishing materials that are used are EASEE panels consisting of two thin layers of TRC with EPS insulation overlapping. The unit size (3.3 length x 15 width x 0.12 thickness TRC) m Implementation of the floor 400 m^2 in 3 days in the factory and installation on the site in half a day [8]. According to architectural creativity impact, Structural creativity was achieved through installing the structural system and external and internal walls, in which human intervention is less whiles the robot moves and the robot

execute the programmatic command through the device. It has the flexibility of dismantling, installation and transportation, efficiency of structural performance, and increasing the number of floors with reducing loads and the speed of building expansion. It also achieved environmental innovation through the rationalization of energy consumption, the reduction of toxic emissions, and the efficiency and quality) [9]. There are buildings implemented by the system such as Sky City Tower as in Figure 2. It was built in China in 2017 in an area of 17000 m^2 and with a height of 220 m and it was built within 90 days. 95% of the project was done in the factory and was assembled more quickly on-site. The building is earthquake resistant, provided fresh air, and is awarded a prize called the building outside location 2019 [10].

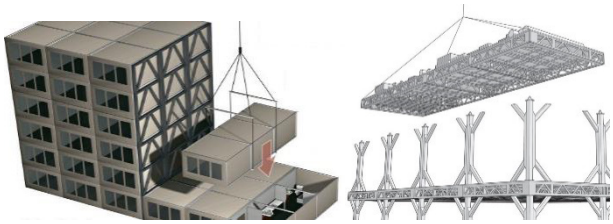


Figure 1. Prefabricated Building System [9].

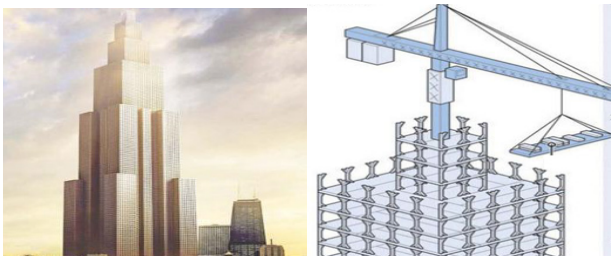


Figure 2. Sky city tower [10].

4.2. 3D Printing System

It is an automated system for pouring concrete with a printing system for complex parts and is capable of applying concrete directly on the building site through a layer-by-layer system. A special mixture of quick-setting concrete is mixed through the printer head nozzle, which is directed by a wide robotic system. The range can be printed at 3.5 m in an hour as in Figure 3 [11]. It has many advantages such as more efficiency, less time and cost 50%, less labor cost, new structures, less waste of materials, and less construction waste [12].

4.3. Robot Building System

It is a new construction method that depends on the use of robots to build complex structures. Moreover, the role of the human element in the system is a remote supervisor who helps to speed up the construction and delivery of projects in a more efficient manner with less energy.

The robot uses in building a brick size (4:12 inch) as in Figure 4 [13]. Its advantages are focusing on the robot to do some tasks, improving productivity, providing safety of the work environment and accuracy of work. In addition, the robot works 24 hours and it is a power generator with a safety sensor and the demolition robot recycles materials automatically) [14].

Figure 3. 3D printing [11]

Figure 4. Robot building [13].

4.4. Digital Prefabrication System

A system in which digital data directs the manufacturing equipment directly to form different building components. It has some types such as additive manufacturing in which firing an ultraviolet laser beam on a block of photopolymer is directed and subtractive manufacturing in which the process of sculpting objects from a solid block by computer is directed. Automatic processing is the other form of digital fabrication including folding and weaving using robots) as in Figure 5 [15]. It has many advantages such as high quality and accuracy of projects, saving cost and time, expedited schedules, less waste of resources, and simplifying the construction process [16].

Figure 5. Digital Prefabrication [16].

4.5. Adaptive Architecture

It is an adaptive programming or algorithm that changes its behavior according to available resources to design buildings adapted to the surrounding environment as in Figure 6. Its advantages are flexibility and durability, reducing energy consumption, providing comfort to users, presenting high quality and a pure healthy environment, and representing the second class of green buildings [17].

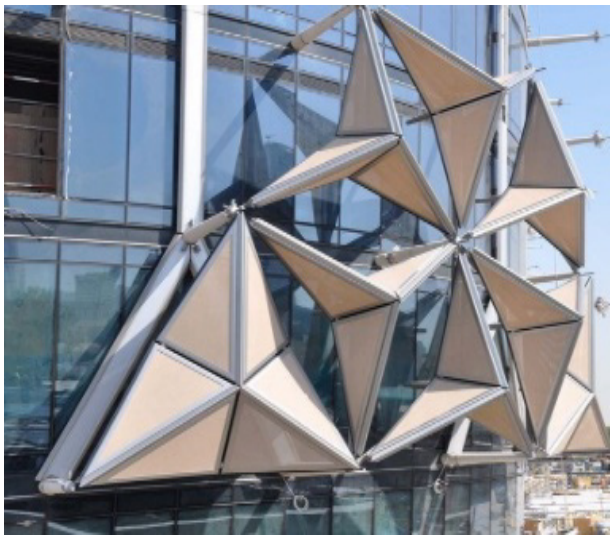


Figure 6. Adaptive architecture [17].

4.6. CAD Design

It is a technique that helps designers to create two or three- dimensional designs by computer to visualize the construction and to achieve the development, modification, and improvement of the design process to establish more accurate designs. It is characterized by ease and flexibility design, development process, and accuracy design. It has also some features such as saving time on drawing and modification, designing documentation, saving and printing, and future development) [18].

After this study, it was found the best automated system that can be applied to the construction method of buildings in the new city of Rashid in Egypt. It is considered a prefabricated building system for its efficiency in the speed of construction, flexibility of formation, creativity, rationalization of energy consumption, and reduction of toxic carbon emissions.

5. Case Study New Rashid City

Egypt seeks to create new urban cities that achieve technological, economic, and environmental efficiency by building new cities in Egypt and the most important of which is the city of (New Rashid) in Beheira Governorate.

5.1. Criteria for Selecting the Study Case (Rashid City)

Its representation of new cities in the fourth generation, city units, and repeatable building models. It is one of the most important heritage buildings that achieve architectural creativity, as it is the second archaeological city after Cairo- The city is under construction and has not yet been completed- Distinguishing the city's location for being between the river and the sea [19].

5.2. Introducing the Case Study (New Rashid City)

Introduction to the city stated that the construction year is 2019, the implementation period is 5 years, and its division is 3 phases. In addition, the area is 3200 acres, the area of the first phase is 600 acres, the area of the units is (120:150 m^2), and the number of floors is (6: 10 floors). The first phase consists of 100 buildings, 25 buildings have been implemented, and 75 buildings are being proposed. The nature of the climate is mild climate with rainy winters and warm to hot summers as in Figure 7&8 [20].

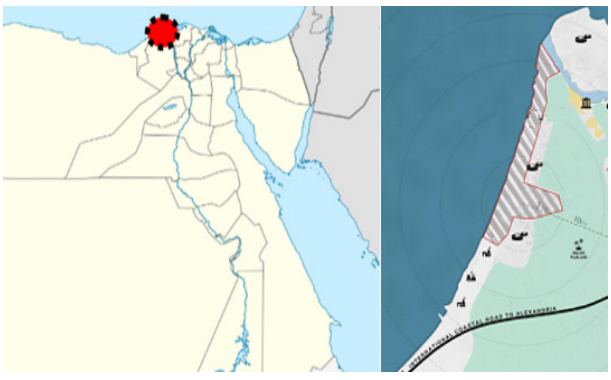


Figure 7. New Rashid City Site Map [20].

Figure 8. The Islamic character buildings of the city of Rashid [21].

6. Analytical Study of Creative Thought (Artistic Values) in Rashid City

The analytical study of creative thought in Rashid city includes the study of the formation and configuration of buildings and the analysis of their architectural vocabulary.

6.1. Configuration and Formation

The formation of the buildings respects the style and aesthetic standards of the place, which is Islamic architecture and consistent with the dimensions of geometric forms. It takes a regular and semi-regular shape emphasizing the horizontal and vertical axes of the facades, and the stripe extension of buildings in coastal areas to maintain privacy, and the use of a regular meditative rhythm represented in (weeps) in the formation of the facade and this appeared through the architectural vocabulary [21].

6.2. Architectural Vocabulary

It is an expressive vocabulary inherent in the formation of the form in architecture, and in the realization of the architectural style and personality to produce the final image. It varies according to the shape, size and architectural, structural, or aesthetic function and includes openings - entrances - ceilings - upper ends - columns and contracts - corners - decorations and ornaments - building materials). It is addressed as follows:

1. Openings: they are architectural elements that connect the interior to the exterior and express the style of the place. They take a regular and repetitive rhythm that achieves a relationship between the solid and the void according to the function as in Figure 9. They vary in vertical and horizontal dimensions; they can be rectangular, square or other forms as in Figure 10. They take the form of Geometric or floral motifs and are wooden, glass or metal as in Figure 11. They take the form of horizontal ends, or knotted with semi-circular knots or pointed or slightly inclined as in Figure 12. Part of which can be solid and part open and it is emphasized by its prominence. It is also provided with screens such as mashrabiyas to allow air permeation with maintaining privacy. There are double windows with one mashrabiya and the mashrabiyas are square, rectangular or other forms and lack of corner openings for privacy such as House (Al Tawaqali - Alwan Al Jamal - Mohram) [22].
2. Entrances: Entrances in the Islamic style are characterized by being pivotal, direct, and mediating the facade as in Figure 13. They are the recessed entrance to achieve privacy and increase the flatness of the shadows, the prominent entrance to emphasize its distinctiveness, and the flat entrance with the full height of the façade. They are decorated with arches and with a slight curve to emphasize their distinctions. The use of wooden doors is characterized by the splendor of their decoration and characterized by a large number of decorations where there are writings and geometric elements such as House (Baqrouli -Hassiba Ghazal) as in Figures 14&15&16 [23].

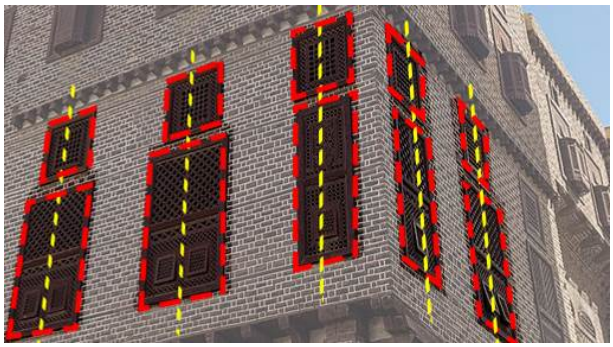


Figure 9. Shape and rhythm of repetition openings [22].

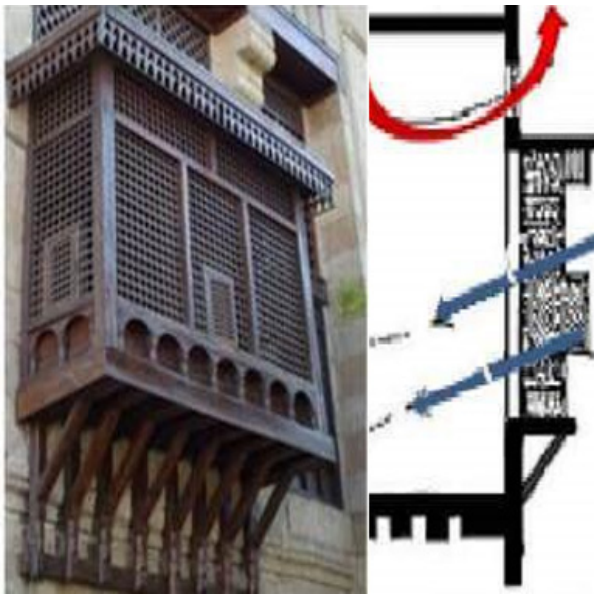


Figure 10. The Mashrabiya [22].

Figure11. Decorations with openings [22].

Figure 12. End shapes with openings [22].

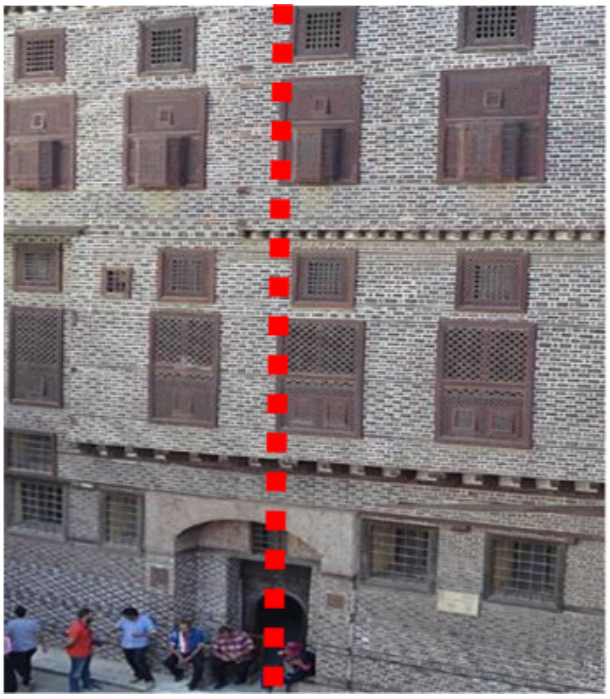


Figure 13. Entrance is in the middle [23].

Figure 14. wooden door [23].

Figure 15. The different shapes of the entrances [23].

Figure 16. Geometric and epigraphic decorations above the entrance [23].

3. Ceilings: It has several forms including moderate form, as the house of Hassiba Ghazal as in Figure 17, domes as Al-Mizouni house as in Figure 18 and it is implemented from several materials such as concrete or wood. There are 2 layers between them; a space of 50cm to strengthen the ceiling and permeate the air through it as in Figure 19 [24].

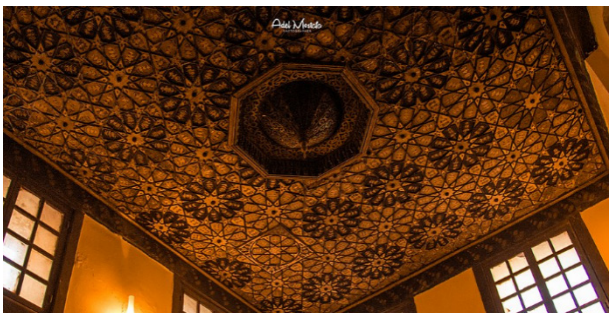


Figure 17. Moderate ceiling [24].

Figure 18. Domed ceiling [24].

Figure 19. Wooden ceiling [24].

4. Upper ends: they are aesthetic decorations that complement the formation of the facade and differ according to the civilization and style of each place. They help to form the sky line in proportion to the view of the building and its specifications. It is a strip architectural element that envelops the top of the building and it has several forms including hollow (perforated) or solid, and the perforations are divided into three types (simple ends, which have few details as in Figure 20. It has decorated ends, which have many details and they have simple ends which close together, and are medium details) to allow air to pass through. They are units with Repetitive lines and they are geometric shapes with curved lines and smooth or pointed edges as in Figure 21&22 expressing the line of the sky to the end of the building and emphasizing the relationship between the block and the sky. They are characterized by their appropriate height of about (1:2) m including stucco or wooden decorations and others that are the same building material or from ready-to-install units directly on the roof and give comfort with visual vision and the interference of light and shadow and the color of the blue sky [25].

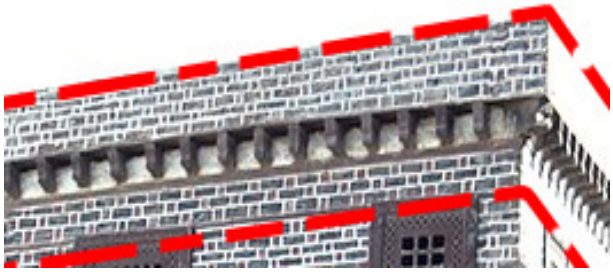


Figure 20. Mini top ends detail [25].

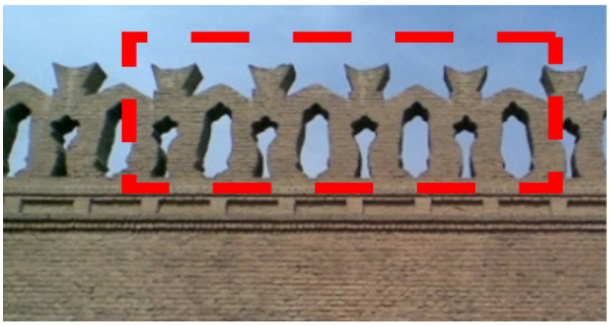


Figure 21. Ornate perforated ends [25].

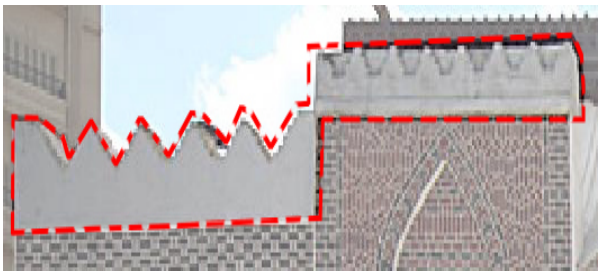


Figure 22. Pointed ends [25].

5. Columns and arches: they are vocabulary that expresses the identity of the place and their shape varies according to each civilization and the era to which it belongs. Islamic architecture was more concerned with arches and vaults than columns. Columns depend on the proportions of the body, crown, and base as in Figure 23. The arches are

distinguished by the simplicity of decoration and the use of semi-circular arches in the interior balconies or the prominent entrances and bays. In addition, the arches have several forms including pointed as in the local mosque - semi-circular arches as in the facades, and arches with a simple curve as in the facades and the entrance block) as in Figure 24 [22].

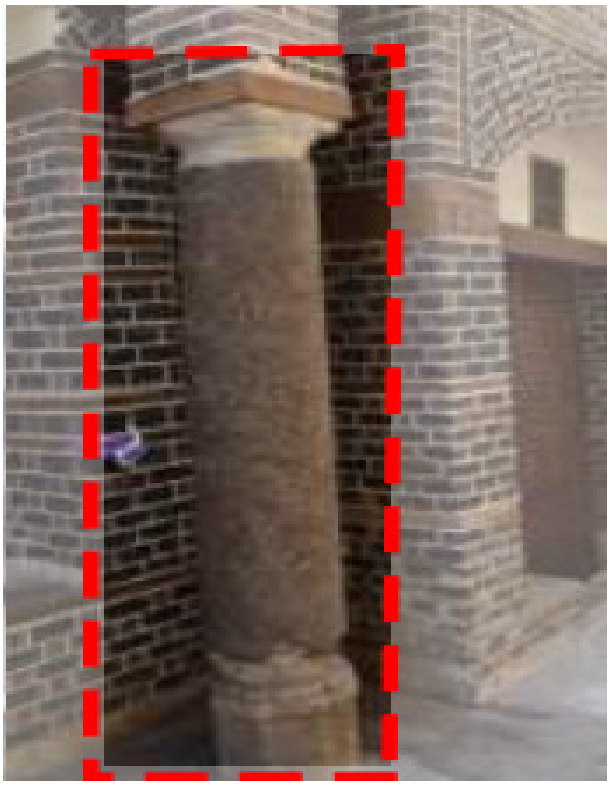


Figure 23. Column shape [22].

Figure 24. Different forms of arches [22]

6. Corners: they are part of the vocabulary that characterized Islamic architecture, and they are decorative elements represented in geometric shapes to give an architectural and structural beauty and a sense of mass by emphasizing the corners and angles and aesthetically affecting the enrichment of the space by diversifying the vision of the forms of facades and corners free of openings to maintain privacy as in Figure 25 [26].
7. Decorations and ornaments: the decorations are divided into several types including deaf decorations on walls, doors, and windows, functional decorations including performing a function such as ventilation and separation between spaces, and structural decorations including distributing loads for some elements). Islamic decorations have many shapes such as six-pointed stars and repeating in a regular rhythm, candlestick shapes such as the house of Ramadan, and flower shapes in red or yellow color such as the Al-Mizouni house. In addition, decorations around it and gradients such as the house of Al-Qanadili and Hasiba Al-Ghazali, and decorations with Kufic inscriptions such as the house of Al-Omsaili). The decorations are executed in many ways. Materials such as (carved bricks such as the house of Hasiba Ghazal and Ramadan - plaster such as the house of Al-Omsaili, colored bricks such as the house of Al-Baqouli , and pottery such as the house of Thabet and Makki). Ornaments are Tabular ornaments and aesthetic vocabulary that emphasize the spirit of space, place and its culture) as in Figures 26&27&28 [24].

Figure 25. Corner [26].

Figure 26. Decoration in regular rhythm [24].

Figure 27. Different shapes of ornaments [24].

8. Building materials: Materials from the surrounding environment were used that fit the nature and style of the place and the soil of the place in terms of (color - shape - texture - height - scale) and examples of the materials used (black and red carved bricks as in Figure 29- stone - plaster as in Figure 30- pottery - lime - gypsum - marble as in Figure 31- wood as in Figure 32) - The walls are double walls made of bricks to reduce heat emission from outside to inside. Limestone: It is found in coastal areas. There are also types such as pim stone that helps in thermal insulation, are light in weight and porous, bear climatic conditions and are easy to cut [26].

Figure 28. Geometric decorations [23].

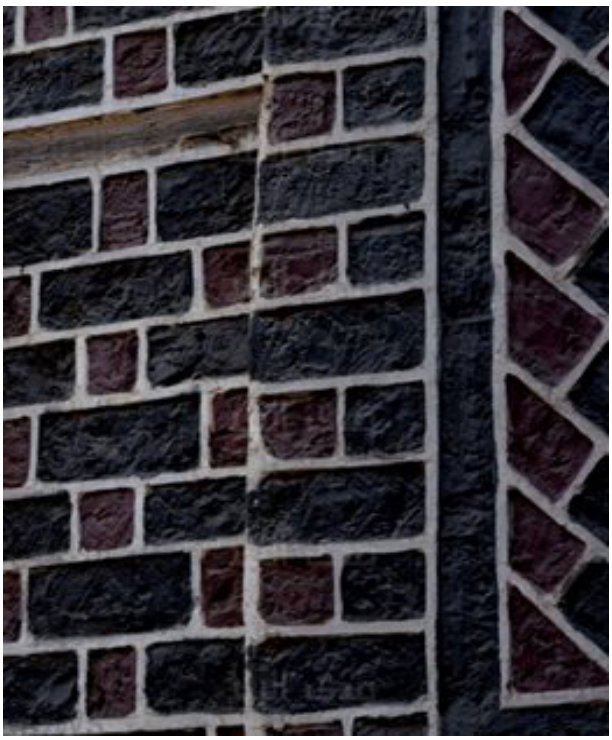


Figure 29. Red and black brick [26].

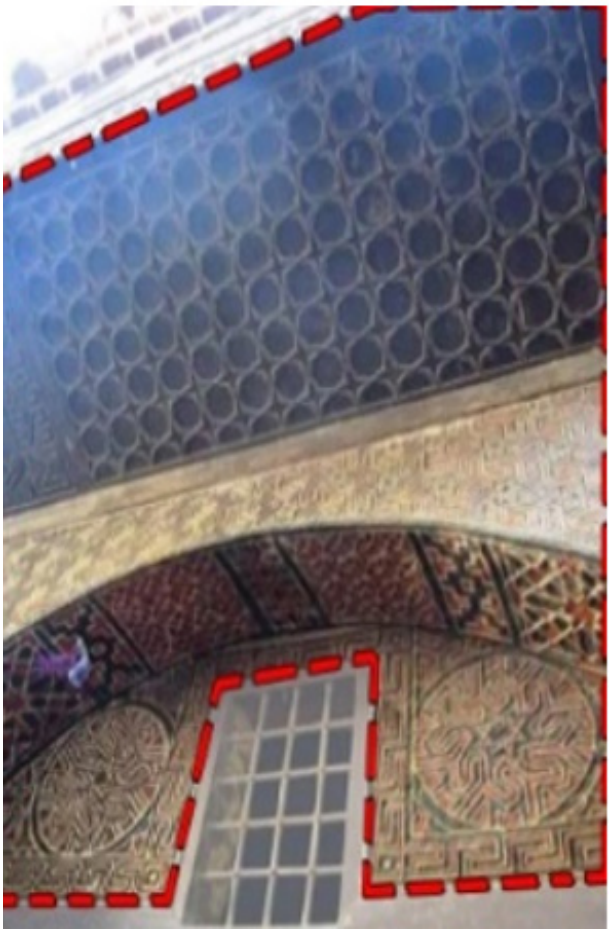


Figure 30. Plaster [26]

Figure 31. Column [26].

Figure 32. Mashrbya [26].

7. Field and Analytical Study of New Rashid City Buildings (Existing Buildings)

The buildings of new Rashid city were analyzed from two sides, first: architectural study represented in building system, architectural formation and the materials used in construction. Second: environmental study represented in ventilation, lighting, energy system, and carbon emissions.

7.1. An Architectural Study of Existing Buildings of the New City of Rashid:

The architectural study of existing buildings in new Rashid city represented in building system, architectural formation and the materials used in construction as the following:

*Building system: The construction period on the site in the traditional building style increases as a result of the completion of all stages of the construction process on the site and this percentage reaches 100%. The building period takes the traditional methods to implement its roundabout 4 apartments in the traditional system is about 7 months - The construction period of 6 floors building takes 3.5 years - The construction period of 10 floors building takes 6 years -The life span of the building that was built in the traditional system about 60:50 years - the total amount of concrete for the building (columns and roofs) is about 564 m^3 and the proportion of cement in it (564 × 35.) = 197.5 tons as in Figure 33 [27].

*Formation: The building uses a traditional system in the external cladding of the building, and it appeared in the external design of the building, which includes the facades, as follows: Facades: traditional facades of reinforced concrete and bricks - single-layer glass that is not heat or sound insulating - traditional and non-insulating facade paints. Openings: The shape of the openings that were designed in the buildings of the new city of Rashid are square openings of single-layer glass that are not heated or sound insulating, and were designed in a modern style, which is not commensurate with the character and identity of the city that is the Islamic character as in Figure 34. Corners: It was designed in a modern style, as it consists of corners of paints and glass and there are openings, so its design does not fit with the Islamic character of the city of Rashid. Balcony handrails: It is a balustrade made of bricks and metal with a white paint finish and is not characterized by any formation and its design is not commensurate with the Islamic character of the city as in Figure 35. Upper ends: The upper ends of the buildings are a 50 cm high turn and are not characterized by any formation as in Figure 36. Entrances: The entrance is not distinct and not central, as it does not mediate the facade and does not achieve the character of the place, which is the Islamic character. Arches: The formation does not depend on achieving the character of the place, which is the Islamic character, and therefore it

does not use parentheses in the formation and depends on the modern formation [22].

Figure 33. Buildings are in reality [19].

Figure 34. Openings in building [19].

Figure 35. Corner of building [19].

Figure 36. The shape of the endings and entrance is not in the middle of the facade [19].

*The materials used in construction: Traditional unsustainable building materials were used of reinforced concrete and bricks - Finishing materials of oyster and traditional paints were used -The building materials used are single-layer traditional and do not insulate heat, moisture or sound -Building materials were built and finished using traditional non-smart methods, as they lack automated construction methods the smart [27].

7.2. An Environmental Study of Existing Buildings of the New City of Rashid:

The environmental study of existing buildings in new Rashid city represented in ventilation, lighting system, energy system, and toxic carbon emissions as the following:

* Ventilation and Orientation: Not all buildings have a good orientation, which is towards the north, so thermal

comfort is not achieved, and this appeared on the plan of abuilding through the use of the Revit simulation program version 2023 [28]. Where the program conducts an analytical study of thermal comfort in spaces - the building does not achieve sufficient natural ventilation - the buildings depend on industrial ventilation as in Figure 37 [29].

*Lighting: The buildings were based on artificial lighting units that did not save energy and the lack of reliance on natural lighting, which increased the consumption of electricity [30].

*Energy system: The building depends on electricity only through the use of (lighting units - air conditioning units - electrical appliances) - the buildings are not energy-saving as they use non-energy-saving lighting units, which increases electricity consumption - the use of air conditioners for cooling, which increases the consumption of electricity and energy - Produces a ton of cement consumes energy by 100 kilowatts - a ton of cement consumes about 4 million thermal units, and the unit price is 8 dollars [27].

*Toxic carbon emissions: Toxic carbon emissions rise in the traditional building method as 1 ton of cement used in construction produces 1,000 kilograms of carbon dioxide - one building with 6 floors needs 197.5 tons of cement and thus results in carbon emissions of 197.5 tons [31].

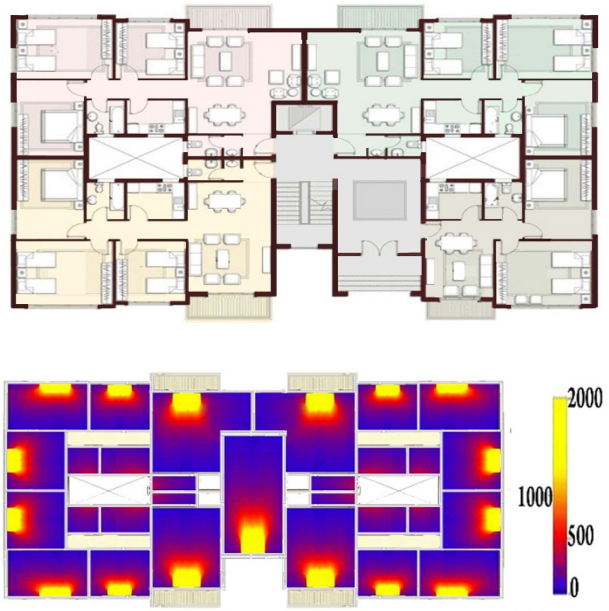


Figure 37. The plan of a building in new city of Rashid [19] shows the lack of thermal comfort with spaces by Revit program.

8. Suggestions for Applying Automated Thought to the New City of Rashid.

The first phase of the new city of Rashid includes 100 buildings, 75 of which are unimplemented, and includes two models of buildings (6 - 10) floors, so proposals for automated and creative development will be placed on them. Buildings, automatic thought, and creative fine values of the city. This appeared as follows:

8.1. A Proposal to Implement the Buildings by Automated Thinking and the Time of their Implementation

The floor was designed and equipped for the building in the factory within about 3 days, which represents 90% of the project in the factory and 10% on the site [32], which helps to assemble the pre-fabricated parts on the site more quickly. Forming facades using robots helped to speed up construction time. The building resists earthquakes with a strength of 9 degrees on the Richter scale, fire-resistant at a rate of 3 hours [33]. The floor is installed in about half a day, and therefore the floor (implementation and installation) consumes 3 and a half days. Therefore, a building consumes 6 floors, needs a period of 20 days, and buildings 10 floors as in Figures 38&39, needs a period of a month, through the installation of the metal structural system and the external and internal finishing. The system reduces construction time by more than 70%.

Figure 38. A proposal for a 10-floor building that achieves automated creative thinking by 3dmax program.

Figure 39. A proposal for a 6-floor building that achieves automated creative thinking by 3dmax program.

8.2. A Proposal to Achieve Creative Automated Thought on Buildings

A proposal is designed for buildings by a 3dmax program that achieves flexibility in creativity and formation [34] through: Composition: The building achieves balance in the shape of the block by achieving symmetry and repetition. First: Symmetry: the building achieves symmetry around the horizontal and vertical axis, which is one of the most important patterns of formation, so it helped to achieve the formal stability of the building with symmetrical balance as in Figures 38&39. Second: Repetition: The building achieves repetition in the shape by repeating unites. Formation: The formation of the proposed buildings achieved the character of the city of Rashid, which is the Islamic character and it appeared through the architectural vocabulary and they are finished with prefabricated panels called (EASEE), which are covered with a final layer that resembles stone in a dark beige color and from red bricks, one of the materials in surrounding environment as in Table 1 and the extent of its realization of automated thought was studied.

Table 1. The application of Islamic architectural vocabulary to buildings and the extent to which they achieve automated thought.

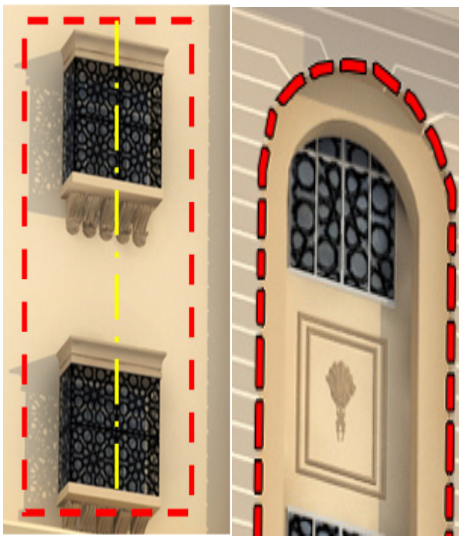
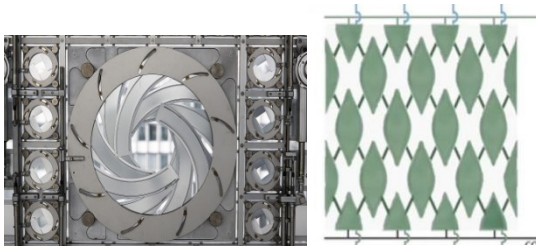
Compare	A proposal to achieve creative thought (architectural vocabulary)	Automation realization proposal in architectural terms
Openings	The use of windows that resemble square or rectangular mashrabiyas or sweetened with semi-circular arches carried on cables as in Figure 40.  **Figure 40.** The windows are like mashrabiyas.	The mashrabiyas move automatically to control the ventilation to allow the air to permeate while maintaining privacy as mashrabiyas of the Arab world institute in Paris. They are made of aluminum covered with a layer similar to wood that repeats in a regular rhythm. Inside the solid parts of the opening, there is algae material to absorb the carbon dioxide entering the space, which helps to purify the air before entering the space as in Figure 41.  **Figure 41.** Automatic movement with windows and algae material in them [31].

Table 1 continued.

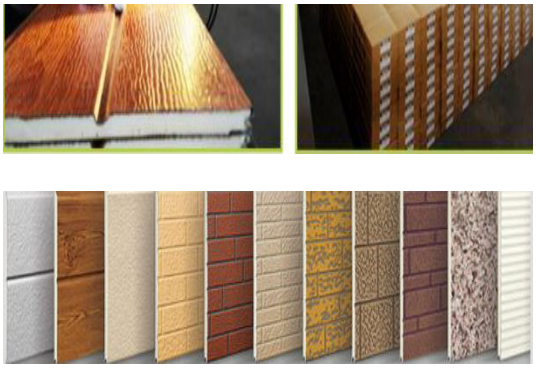
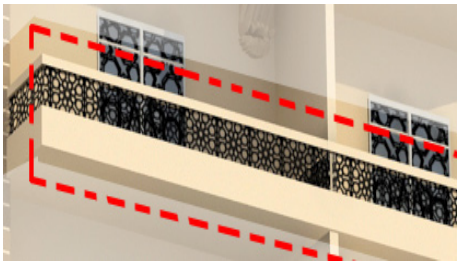
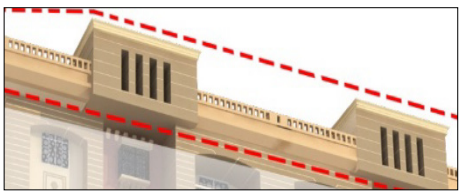
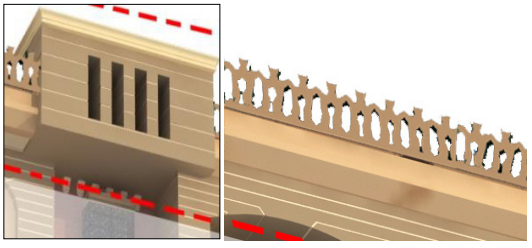
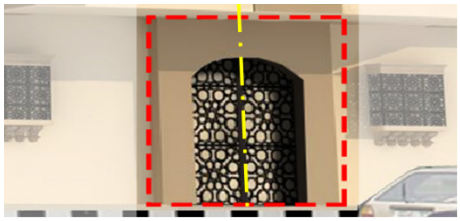
Corners	They are aluminum metal columns covered with a layer that resembles a dark beige stone and the corners are solid, there are no openings to achieve privacy to match the Islamic character of the city as in Figure 42.  **Figure 42.** Corners in the building.	The corners are made of prefabricated building materials in the factory called (EASEE), and they can be disassembled and installed, and they are made up of two layers of metal, including a heat-insulating layer as in Figure 43.  **Figure 43.** Corners are made of removable and erectable materials [35].
Balcony handrails	It is a hollow aluminum ornament similar in design to the Mashrabiya to match the design of the Islamic building as in Figure 44.  **Figure 44.** Handrail like the mashrabiya.	The mashrabiya moves automatically to control the ventilation to allow air to permeate while maintaining privacy. It is aluminum covered with a layer similar to wood and is repeated in a regular rhythm as in Figure 45.  **Figure 45.** Automatic movement handrail components [31].
Ceilings and upper ends	The ceiling is straight and characterized by hollow ornaments that resemble Islamic ornaments and repetitive units that take straight or curved geometric shapes and express the sky line to the end of the building and emphasize the relationship between the block and the sky as in Figure 46.  **Figure 46.** The decorative upper ends of the building.	They are separate units prefabricated in the factory that are installed on the site such as rectangular crowns and curves, they are flexible and can be removed and installed as in Figure 47.  **Figure 47.** Assembled units including the upper ends.

Table 1 continued.

Entrances	The entrances are designed in the Islamic style, where they take the form of the refractory entrance to achieve privacy and increase the flatness of the shadows and are localized with semi-circular arches in proportion to the nature and style of the place, the iron door, which takes the Islamic decorations, and the entrance is pivotal and mediates the façade as in Figure 48.  **Figure 48.** The broken shape of the entrance.	The entrance is a single, prefabricated unit that is manufactured in the factory and then installed on the site. It is flexible and can be removed and installed as in Figure 49.  **Figure 49.** Entrance prefabricated unit.
Arches	It is characterized by the simplicity of the decorations and the use of semi-circular knots in the windows, the prominent entrances and the balconies, and the contracts with a slight bend in the balconies as in Figure 50.  **Figure 50.** The different forms of arches in buildings.	Contracts are manufactured from prefabricated materials that are manufactured in the factory so that they are separate units and then assembled on site and are manufactured from (EASEE) materials and can be demounted and installed, which are made up of two layers of metal including a heat-insulating layer as in Figure 51.  **Figure 51.** Arches from prefabricated materials in the factory [35].

8.3. A Proposal to Achieve Innovative Environmental Thought on Buildings

* Orientation and Ventilation: The building achieves environmental innovation by achieving natural ventilation as follows: The building provides the residents with natural ventilation and clean fresh air to create a healthy environment without pollution - The building achieves the highest air quality, as the indoor air is at least 20 times purer than the outdoor air, through use mashrbya and algae curtains system which absorbs toxic carbon emissions, thus providing clean air. The effect of this was shown on the plan of buildings through the use of the Revit simulation program version 2023 where the program conducts an analytical study of thermal comfort in spaces as in Figure 52 the building achieves sufficient natural ventilation [36].

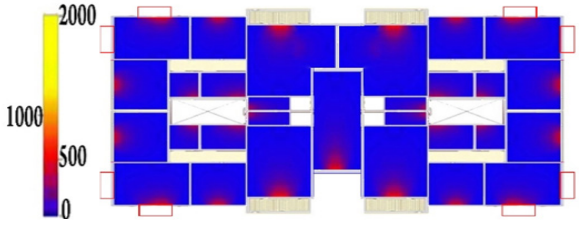


Figure 52. Thermal comfort with spaces by simulation program Revit.

* Lighting: The building achieves environmental creativity by paying attention to the considerations of natural lighting, which are: The natural lighting entering the spaces from windows that resemble mashrabiyas, which gives comfortable lighting to users without glare - and energy-saving LED industrial lighting units that work with a sensor where the lighting is turned on automatically by individuals entering the space and it is automatically closed by exiting the space as in Figure 53 [30].

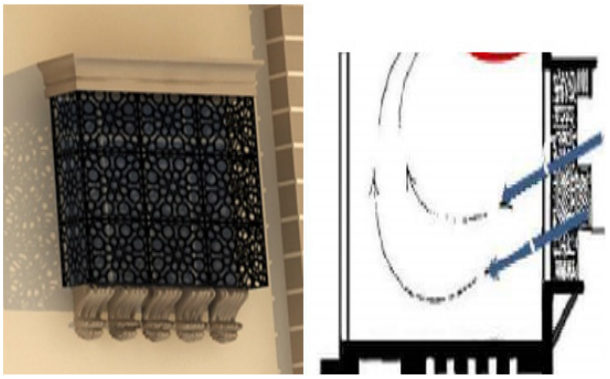


Figure 53. Window like mashrabiya.

* Building materials: There is a type of prefabricated panel called (EASEE) consisting of two thin layers of TRC with overlapping EPS insulation. Where TRC is a thin concrete material with high resistance and EPS is thermal insulation. The unit size is (3.3 length x 4 width x 0.15 thickness) m and it can implement the floor 400 m^2 in an average of 3 days in the factory and installation on site in half a day - of quadruple glass to achieve thermal insulation and reflect sunlight. It is controlled automatically - The outer walls of the facade walls are 15 cm thick to achieve thermal insulation from an aluminum sandwich panel system covered a stone, in line with the heritage of buildings on the site and was installed with a prefabricated system - the use of steel that achieves strength and flexibility as in Figure54 [35].

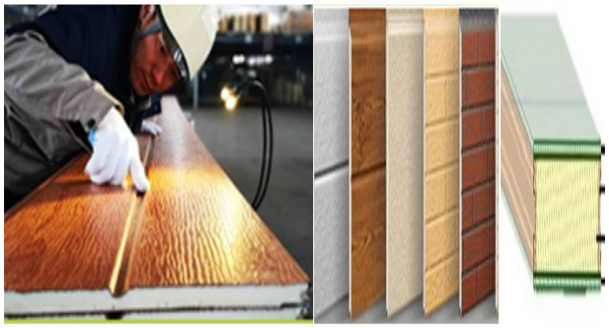


Figure 54. The material is prefabricated and demountable [35].

* Energy system: - Planting the roofs of the rest of the buildings of the first phase are solar cells, which are 75 buildings (the building includes 4 units, the unit area is 150 m^2 and the building area with Services reaches 750 m^2) so the total roof area of the buildings is 56250 m^2 and the cell used is made of graphene and its capacity is 0.5 kilowatts per 1 m^2 [37] and the cells are placed onan angle of 45 degrees through the use of the free mat accounting program version 2023 [38] so the amount of energy generated from the cells above the building is 420 kilowatts/ m^2 and the amount of energy generated from the rooftop cultivation of 75 buildings is 22500 kw/ m^2 as in Figure 55.

* Toxic carbon emissions: carbon emissions were reduced in buildings through the use of the (algae curtains) system, which is an injection system for parts of the facades with algae that feed on carbon dioxide molecules, store it and convert it to oxygen through the process of photosynthesis. It is applied in buildings on the solid parts of the mashrabiyas located in the openings and the balustrades of the balconies. This area in the building represents about 320 m. Therefore, the facade of the architecture absorbs 58 tons of carbon annually and façade of 75 buildings absorbs 4320 tons of carbon annually as in Figure 56 [39].

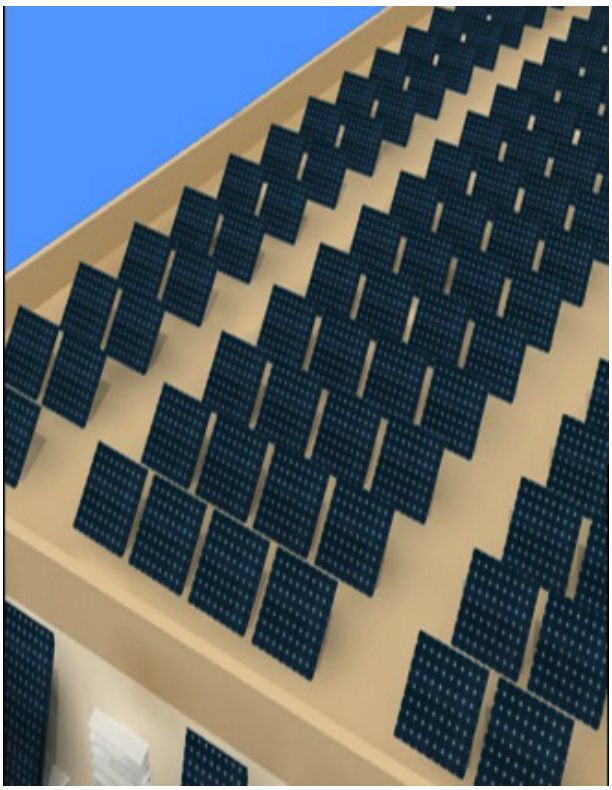


Figure 55. Roofs are solar cells.

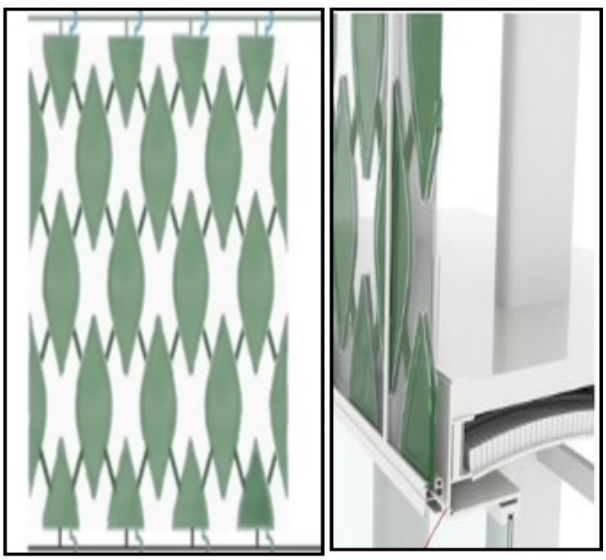


Figure 56. Filling solid parts of opening with algae material [39].

9. Results & Conclusion

The architectural study of the new city of Rashid was carried out through a viewpoint and creative automatic thought by analyzing the criteria for selecting the city, the nature of its climate, its orientation and its architectural vocabulary in the formation, building materials, energy system and toxic emissions - Proposals were made to apply automated thought in architecture to the buildings of the new city of Rashid while maintaining the realization of creative thought in the city. The vision achieved the spread of traditional formative values that express the environment and culture of the place, achieve civilizational continuity, and add to contemporary architecture a value and human dimension that achieves its connection with the place and the person. - After the completion of this study, the possibility of applying creative automated thinking to the buildings of the new city of Rashid was reached through the following:

- Achieving flexibility in creative formation and maintaining the character of the city.
- The speed of completion of work in less time, as the construction and implementation of the role can be completed within 3 days.
- The building of (6 floors) can be built and implemented with an automated system within 20 days and in a traditional system within 42 months, therefore the automated building saves more than 65% of the time.
- The prefabricated building system can finish 95% of the project in the factory.
- Provide natural lighting and ventilation.
- The roofs of buildings for all buildings were planted with solar cells with an area of 56250 m^2 to provide solar energy and convert it into electrical energy that can be used in buildings, which saves energy by 22500 kilowatts/ m^2 using graphene solar cells that save energy by 0.5 kilowatts / 1 m^2 annually.
- The materials used in construction help reduce toxic carbon emissions because it reduces the use of cement and materials with toxic emissions, as it uses a wall system with algae that helps absorb carbon by 1 kg/2 m^2 in 75 buildings that can absorb 4320 tons of carbon annually. With traditional construction system, they radiate 14775 tons of carbon, thus the carbon is absorbed by 30%.

Recommendations

The research recommends the following:

- Dealing with advanced automated building techniques as a basic criterion in the design and implementation of buildings and not just scientific research or an intellectual trend or a means of repetition without studying the recurring architectural elements.
- Disseminating the experience of developing the new city of Rashid by applying automated thinking to the new cities in Egypt whose reconstruction is planned.
- Focusing on achieving creative thinking along with implementing automated thought on buildings.
- Creating a guide and inventory of new cities that can be applied to automated thinking, and developing a proposal for how to apply automated thinking to all new cities.
- Making a comprehensive study of the heritage and plastic values of the new cities and how to apply them in an automated way to the buildings of the new cities, whether they have been completed or are being implemented.
- Improving the cultural awareness of the architectural designer with knowledge of automated building systems and linking them with architectural creativity for spreading aesthetic values and not just a construction method.
- Integrating the automated architecture thought with some subjects in the architectural education programs such as architectural construction, architectural design and executive designs.

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