

Green design and its role on administrative design shipping containers

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Abstract:

Shipping containers are used for more than just shipping and storage containers, as interior designers have identified a method to dramatically improve efficiency, By using storage containers in a creative way can take advantage of more additional space at a much lower cost than in administrative buildings. As Global trends towards green, environmentally eco-friendly architecture. Interior designers turned to the idea of integrating sustainability strategies and container architecture using various sustainability methods, which include external shading, natural ventilation, and different insulation methods for walls, whether external or internal insulation of container, Double roofs are also used for heat insulation, green roofs, solar cells of the building units, it is an ideal solution to benefit from them through reuse, shipping containers have many characteristics that make them an ideal solution and an excellent building unit for the construction of various buildings, they are units with specific, It has excellent structural properties, as it has strength, durability, and weather resistance. In an effort to temporarily create alternative spaces with simple methods and materials without adding design burdens to the country, shipping containers can be designed for users to set up an administrative office space at a low price. It is also possible to assemble the settings to suit your needs, as these boxes can be arranged according to your needs. It can help in investing for a mobile workspace (containers), improving productivity and having an innovative design. Since this type of container falls under the category of interior designer for small spaces, this makes it difficult for the interior designer to make the most possible use of space available to the unit, and the need to provide all elements of the space without deleting or dispensing any of these elements, The narrowness spaces forces the designer to have a different design idea , or leads him to a design logically, more abstract approach to the elements.

It also represents low-priced spaces characterized by simple designs and internal processors that meet their purposes and versatility in one place and the possibility of dismantling and installing in addition to the various assembly systems for more than one unit, which helps to change the shape of the space and change the activity according to the functional needs of the user.

Key words:

Sustainable green design – mobile offices design – shipping containers – effective space.

ملخص البحث :

تُستخدم حاويات الشحن لأكثر من مجرد الشحن والتخزين للحاوية ، حيث حدد المصممون طريقة لتحسين الكفاءة بشكل كبير ، باستخدام حاويات التخزين بطريقة مبتكرة يمكن الاستفادة من مساحة إضافية بتكلفة أقل بكثير من المباني الإدارية. الاتجاهات العالمية نحو العمارة الخضراء الصديقة للبيئة. تحول مصممو الديكور الداخلي إلى فكرة دمج استراتيجيات الاستدامة وهندسة الحاويات من خلال استخدام أساليب الاستدامة المختلفة ، والتي تشمل التظليل الخارجي والتهوية الطبيعية وطرق العزل المختلفة للجدران سواء العزل الخارجي أو الداخلي، كما تستخدم الأسقف المزدوجة للعزل الحراري ، والأسطح الخضراء ، والخلايا الشمسية لوحدات المبنى ، فهي حل مثالي للاستفادة منها من خلال إعادة الاستخدام ، وحاويات الشحن لها العديد من الخصائص التي تجعلها حلاً مثالياً ووحدة بناء ممتازة للبناء المباني المختلفة هي وحدات محددة لها خصائص إنشائية ممتازة ، حيث تتمتع بالقوة والمتانة ومقاومة العوامل الجوية. في محاولة لإنشاء مساحات بديلة بشكل مؤقت بأساليب ومواد بسيطة دون إضافة أعباء تصميمية إلى الدولة ، يمكن تصميم حاويات الشحن للمستخدمين لإنشاء مكتب إداري بسعر منخفض. من الممكن أيضاً تجميع الإعدادات لتناسب احتياجاتك ، حيث يمكن ترتيب هذه الصناديق وفقاً لاحتياجاتك. يمكن أن يساعد في الاستثمار في مساحة عمل متنقلة (حاويات) ، وتحسين الإنتاجية والحصول على تصميم مبتكر. نظراً لأن هذا النوع من الحاوية يندرج تحت فئة المصمم الداخلي للمساحات الصغيرة ، فإن هذا يجعل من الصعب على المصمم الداخلي تحقيق أقصى استفادة ممكنة من المساحة المتاحة للوحدة ، والحاجة إلى توفير جميع عناصر المساحة دون حذف أو الاستغناء عن أي من هذه العناصر ، تجبر المسافات الضيقة المصمم على أن يكون لديه فكرة تصميم مختلفة ، أو تقوده إلى تصميم منطقي ، ونهج أكثر تجريدية للعناصر كما أنها تمثل مساحات منخفضة السعر تتميز بتصميمات بسيطة ومعالجات داخلية تلي أغراضها وتعدد استخداماتها في مكان واحد وإمكانية الفك والتركيب بالإضافة إلى أنظمة التجميع المتنوعة لأكثر من وحدة مما يساعد على تغيير شكل المساحة وتغيير النشاط حسب الاحتياجات الوظيفية للمستخدم.

الكلمات المفتاحية :

التصميم الأخضر المستدام - تصميم المكاتب المتنقلة - حاويات شحن - المساحة الفعالة.

first-Introduction:

Global trends towards green, environmentally friendly architecture. Interior designers turned to the idea of integrating sustainability strategies and container architecture using various sustainability methods, which include external shading, natural ventilation, and different insulation methods for walls, whether external or internal insulation.

Double roofs are also used for heat insulation, green roofs, solar cells of the building units, it is an ideal solution to benefit from them through reuse, shipping containers have many characteristics that make them an ideal solution and an excellent building unit for the construction of various buildings, they are units with specific, It has excellent structural properties, as it has strength, durability, and weather resistance.

1.1-Research problem :

High prices for small spaces for establishing companies in new cities such as the New Administrative Capital.

Administrative buildings in Egypt in general have become at high prices, especially in new cities, and from here it was necessary to find alternative solutions to help the owners of start-up companies by using shipping containers as one of the creative and sustainable ways.

1.2-The aim of the research :

Exploitation of the increasing shipping containers in the establishment of administrative buildings with low prices in new cities.

1.3-Research Methodology:

The research relied on the comparative analytical method by analyzing the design ideas of local and international projects for sustainable administrative shipping containers.

Second- The most important stages of container design:

The process of constructing container buildings goes through several stages, including the process of drawing up foundation plans, how to choose containers, identifying and cutting architectural openings, making internal treatments, sanitary and electrical installations, thermal insulation, options for dealing with wooden floors and finally distributing multi functional furniture to comprise with the small spaces.

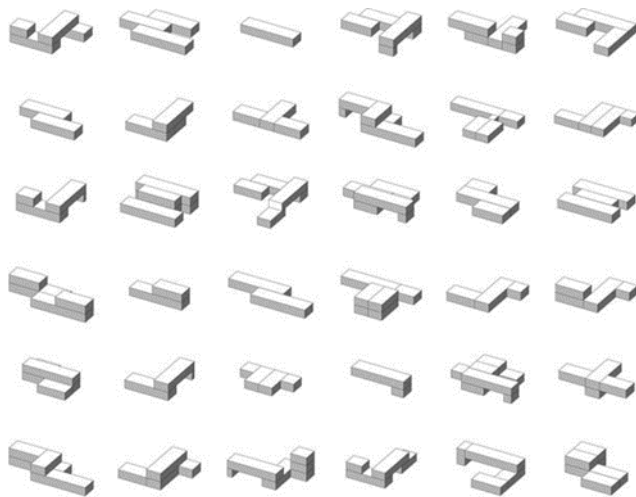


Fig. (1) Different ways of arranging module shipping containers vertically or horizontally



pic (1) illustrate shipping containers horizontally form.

Third-Mechanism of rowing and assembling shipping containers in container buildings:

A shipping container is a single, modular unit that can be used as an iterative building unit to obtain multiple solutions for interior spaces, maybe row these containers, either vertically or horizontally, or a combination of the two methods in one building According to the initial design, This is due to its constructive strength ,Container designed to carry such light weights, the standard maximum stacking of vertical containers is a six containers as a maximum numbers For loads equivalent to 21 tons per container.

Fourth-Advantages and challenges of reusing shipping containers in architecture and interior design:


Advantages of using shipping containers in buildings:		Challenges Facing Shipping Container Buildings:	
Durability and Structural Strength:	Shipping containers are manufactured and designed to withstand weather fluctuations, as they spend most of their life on sea ships exposed to continuous weather fluctuations and high wind speeds. By placing more than one container on top of each other.	Insulation and temperature control:	A normal shipping container is basically a large steel box that absorbs and transfers heat and cold weather very well, which means very cold winters and very hot summers which means a lot of energy is consumed to get a suitable environment, so temperature control is essential in building a shipping container company and This is through the use of appropriate thermal insulation materials, whether internally or externally, which may reduce the inner space of container.
Sustainability and Environmental Compatibility:	The reuse of previously used material stems primarily from the ideas and principles of sustainability, Shipping containers in the field of architecture work on saving in the consumption of raw materials used in construction on the one hand, and on the other hand reduces the use of those materials that are harmful to the environment, for this reason container architecture is A good way to protect the environment. Also, reusing metal containers reduces iron consumption. Reusing one container saves about 3,200 kg of iron and consequently about 9000 kilowatts of energy.	Health risks:	One of the most important drawbacks of shipping containers is that they were not made for humans to live in, so the necessary precautions were not taken to obtain a safe environment. Sometimes paints, insulation materials and solvents are used to control the temperature inside the container, which may be dangerous to human health. This can be avoided by covering the entire inner surface of the container, whether by using insulating paints or various coating. It is worth noting that in the case of painting the container many times at close intervals, this preserves it for a longer time and extends its life for more than 20 years.

Economy and Low Cost:	It is widely available and easily accessible at affordable Low prices especially after the end of its operating period in the field of maritime navigation, as the cost of a container company is 30% less than a company of bricks and concrete.	rust and corrosion:	Shipping containers are made of iron material that is resistant to weather factors, but this does not prevent them from being exposed to rust sometimes, Rust results in the metal's interaction with water and oxygen. Volatile weather conditions are one of the most important causes of this rust, and to avoid rusting, the weather must be dry in most cases Not rainy and wet.
Speed and achievement:	Container buildings are characterized by their speed of completion, as the time taken to create and equip a small company can reach only 21 hours.	Sound insulation:	Shipping containers allow sound to pass through to a large extent, so sound insulation must be taken into consideration, especially in the case of vertical stacking for more than one floor.
Flexibility and portability:	One of the most important advantages of container buildings is their portability which enables us to move buildings from one location to another during their life span through container trucks.	Exterior of container:	The outer shape of the shipping container may be unacceptable to some, which needs to work on the design item to show it in an acceptable aesthetic form, the containers need a high-accuracy modification and transformation process so as not to weaken their structure.




Table (1) illustrate Advantages and Challenges Facing Shipping Container Buildings


Fifth- Architectural strategies towards sustainable container buildings:

Container buildings need an environmentally conscious design that aligns with the principles of green architecture and sustainability , including

Ceiling design	<p>Green roofs help reduce Indoor temperature decreases on hot days by up to 8%, different roofing systems can be used such as roofing Duplex, which can be considered as a heat insulator, or reflective painted shed, depending on the design requirements.</p> 
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Pic (2) illustrate green roofs of shipping container

Power generation systems	<p>Photovoltaic panels may save energy Required to operate heating, cooling and lighting systems for an entire unit of the container.</p>  <p>Pic (3) illustrate green energy on top roofs of shipping container</p>
Architectural Processors	<p>includes the outer shading Small windows with low emissivity glass Inner blackout curtains .</p>  <p>Pic (4) Designing the locations and spaces of the windows in the building that allow the greatest amount of natural ventilation and lighting</p>
Foundations of shipping container	<p>some architectural solutions that contribute to reduce the thermal loads on the container, It is the lower ventilation space, which ensures the movement of air below it, Which can be implemented through the high foundations of container , This type of ventilation protects against mold and prevents moisture from seeping into the floor, Also, this type is not suitable for humid climates, the more humid the outside air, it is preferable to use moisture treatments.</p>  <p>Pic (5,6) illustrate the foundation of shipping container</p>

thermal insulation	<p>there are different types of insulation materials, as Thermal insulation which is suitable for metal structures.</p> <p>insulation blanket, fibers and environmentally friendly insulating materials, and can be applied to both internal and external walls of container, external insulation is better than internal for two reasons, the first one is the internal insulation reduces the internal dimensions of the container, and the second is the external insulation allows the designer to take full advantage of Container, It is worth noting that stacking containers greatly reduces the need for thermal insulation.</p> <div style="text-align: center;">  </div> <p>Table (2) illustrate principles of green architecture and sustainability strategies towards shipping containers</p>
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Sixth-Analytical study of some global models of shipping container architecture for administrative office space :



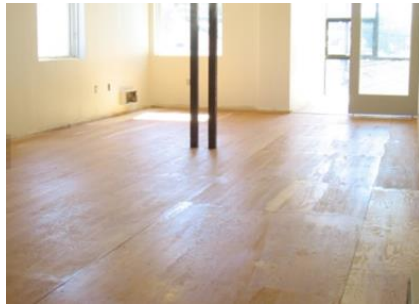
○ The Box office buidlidng - United State

This administrative building included 42 offices ranging in size from 90 to 210 m², in addition to containing several conference rooms, all of which included 32 shipping containers arranged in a distinctive architectural configuration that highlights the designers ability to penetrate borders regardless of the materials used. The design is characterized by bold, colorful facades with many protrusions, the building is characterized by high-performance insulation, and the tight design of windows and doors to control the degree of the heat.



Pic (7) box office building -shipping containers

Project description:	<p>The project was designed by jow haskett, director at distill ,the design was developed by truth studio.distill studio designed the project hoping to obtain LEED certificates for energy efficiency.</p> <p>The building consists of 12 offices of various size,conference rooms. The building is one of the largest container buildings in the United States, and one of the most energy efficient buildings in the northern region , it also meets the needs of customer and small business owners.</p>  <p>Pic (8) illustrate LEED shipping container project</p>
Exterior design of shipping container:	<p>Energy efficiency was a top priority in this project, as it features well-sealed external insulation with high-performance windows and doors, high-efficiency heat pumps as an air source in each unit, and energy recovery ventilators (ERV) to maintain On energy and providing fresh air, a large canopy in the middle of the inner courtyard building shades the space in summer.</p>  <p>Pic (9) illustrate energy efficiency on top roofs of shipping container.</p> <p>A set of solar panels (12 kWh) was used on the roof of the container , The building consumes about 20% of any conventional office building.the windows are located in best places providing the most daylight with small opening , design result is comfortable ,high air quality indoors.</p> <p>The structure and shape of the building inspire with movement ,resulting from the displacement and moving of some containers in and out, and also different colors used to paint the outside of containers.</p>  <p>Pic (10) illustrate the different colors used to paint the outside of containers</p>

Interior design of shipping container:	Walls:	<p>The walls of container were insulated by "spraying foam", which is one of the most efficient insulation materials, The rear feeders were made and completely covered with gypsum boards and painted in light colors such as White and gray, which gives a sense of large interior space.</p>  <p style="text-align: center;">Pic (11) spraying foam used on walls for efficient insulation</p>
	Ceiling:	<p>The ceilings were left in their original form without cladding, due to the fact that they are not directly exposed to sunlight. The ceilings are painted white, which indicates the height of the ceiling and breaks the barrier of the low ceiling height of standard containers.</p>  <p style="text-align: center;">Pic (12) the ceiling of shipping container</p>
	Flooring :	<p>completely covered with wood panels which provide a kind of insulation for it.</p>  <p style="text-align: center;">Pic (13) illustrate wooden panels floor in shipping container</p>
	Lighting :	<p>A good choice of window locations and spaces that provide sufficient natural lighting during the day. a lighting units of different sizes were used for night lighting .</p>



	Furniture:	<p>use of traditional modular simple furniture design used in administrative buildings in bright colors.</p>  <p style="text-align: center;">Pic (14) simple modern furniture used in shipping container</p>
	Ventilation:	<p>Designing the locations and spaces of the windows in the building that allow the greatest amount of natural ventilation. Was also used in the idea of the central courtyard which improves the quality of the internal environment of the office building from cross ventilation.</p>  <p style="text-align: center;">Pic (15) illustrate the nature lighting and ventilation</p>

Table (3) illustrate Analytical study of global model of shipping container architecture for administrative office space

○ Sustainability in shipping container office project:

Constructing the office building from used shipping containers, which maximizes its value “up cycling” which called utilizing resources , reducing energy consumption by using energy recovery ventilators to conserve energy and provid fresh air inside the container , use of alternative energy sources by using solar panels on the roof of the building , reducing waste and emissions through out reusing containers is basically working to reduce waste compared to using raw materials traditional construction.

Reducing construction and maintenance costs by the idea of prefabricating the unites outside the site helped reduce the period of construction and reduce costs, finally water efficiency in building by Collecting rainwater from the roof of the building and reusing it in the process of irrigating plants around the building.

○ **Office buildings, temporary stores - shanghai,china.**

The project is located at Qingpu district of Shanghai. It is a temporary sale office for a mix-use commercial complex to the west of it.



Pic (16) illustrate Analytical study of global model of office building shipping container-shanghai, china

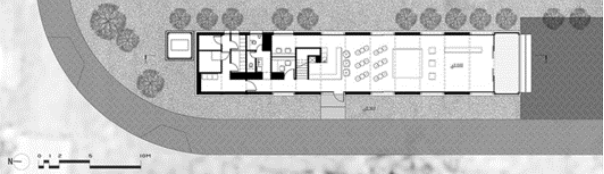
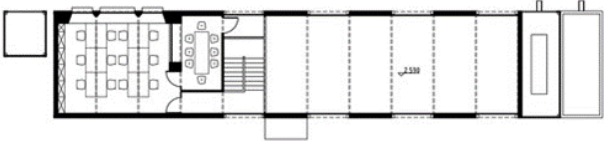


Project description:

The site of the project is also temporary: it is situated in-between two lines; one is the road redline and the other is the building set-back line. The width of it is 10m and it stretches along the north and south direction.

When the whole development is finished, the site will be taken by the set-back green. However, the life of the sale office will end even before that, when the commercial complex to the east side of it starts, it will be already taken by the excavation of the basement. As a result, the sale office will be only used for about one year.



Pic (17) illustrate shipping container project

Exterior design of shipping container:	<p>adopted to save the number of the containers and forms a maximized atrium space for location of the site-model and the business discussion area. The atrium is double-height and facing south as the main entrance, it is symmetrical. It's simple and strong space order is a result of rational design approach.</p>  <p>Fig. (2) illustrate the interior office space of shipping container</p>  <p>Fig. (3) the second floor of interior office space shipping container</p> <p>Tectonic of the building is clearly expressed both for the exterior space.</p>	
Interior design of shipping container:	<p>Walls :</p>	<p>Offset-piling method gives the atrium space a staggered positive-negative space interface. Positive interface for the walls, negative interfaces for the openings.</p> <p>The walls and the openings, the positive and the negative interfaces swap their roles at different times of a day, while the structure of the space is integrated.</p>  <p>Pic (18) interior wooden walls of shipping container</p>
	<p>Ceiling:</p> <p>in terms of the physical performance of the building, the space that is defined by the original container roof and the additional roof</p>  <p>Pic (19) original container roof and the additional roof ceiling</p> <p>is perfect for location of the insulation layer, to guarantee comfort for the interior space.</p>	




	Flooring :	<p>completely covered with wood panels which provide a kind of insulation for it.</p>  <p>Pic (20) illustrate interior wooden flooring of shipping container</p>
	Lighting :	<p>During the day time, negative interfaces, as for the openings, provide the atrium space with light and views; at night, with our customized florescent wall positive interfaces, as for the walls, are lighted up and provide the atrium space with light and a strong presentation of materiality.</p>  <p>Pic (21) negative interface with opening in walls to provide interior with natural light</p>
	Drainage :	<p>drainage pipes as one important tectonic element, instead of a mere part of infrastructure. The pipe is divided into four parts, each of which has a proper length that could be easily transported by mid-size trucks. These pipes are fixed to the main elevation of the building.</p>
	Ventilation:	<p>the windows in the building that allow the greatest amount of natural ventilation.</p>  <p>Pic (22) illustrate natural ventilation</p>

Table (4) illustrate Analytical study of global model of shipping container Office buildings, temporary stores - shanghai,china.

○ sustainability in shipping container office project:

With proper insulation shipping container office space can be incredibly energy efficient and handle both hot summers , cold and windy winters. As with many office space designs, a shipping container can be incredibly energy efficient, due to the using of solar pannels , reusing materials , easily assemble.

○ Co-working offices are built out of shipping containers inside old bakery


workshop spaces for small and start-up
companies located in Nolita


using 60 shipping containers. The stacking and arranging of the shipping
containers created exciting workspaces,
traffic areas and places to stay.

The containers, provided with their own ventilation, data and electricity connection, each have a full glass wall . With this the own identity of the various companies can be seen through the various interior designs of the containers.



Pic (23) co-working offices shipping containers inside old bakery.

Project description:	<p>design principles have been used as much as possible. The concept initially offers a large degree of flexibility. The shipping containers can be moved and adapted for future needs or even completely removed so that a generic empty industrial hall is available without demolition work. The sea containers themselves can also be reused.</p>  <p>Pic (24) shipping containers office design description</p>
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Exterior design of shipping container:</p>	<p>Modular containers are very adaptable to the environment in which it finds itself and can work in any number of configurations. They can be stacked without need of additional structural design.</p> <p>They also complement existing architecture. Rather than retrofitting or rebuilding rooms in facilities to house the computer equipment, electrical and mechanical infrastructure, and network, you only need to find 20 or 40 feet of space to set a container.</p>  <p style="text-align: center;">Fig. (4) illustrate modular containers in exterior space</p>	
	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Interior design of shipping container:</p>	<p>Walls :</p>
<p>Ceiling:</p>		<p>original container roof and the additional floor of the top one .</p>
<p>Flooring :</p>		<p>It,s differ from room to another,covered with wood panels, covered by vinyl .</p>



	Lighting :	<p>Outside the office room depends on the lighting of the place, in office rooms depends on direct light on top desk.</p>  <p>Pic (26) illustrate the light unit used in shipping containers office using wood modular simple furniture design in office room with bright colors.</p>
	Furniture:	 <p>Pic (27) simple wood furniture design</p>
	Ventilation:	<p>interior designer have issues with putting people in shipping containers, but in this case, it makes a lot of sense; sitting inside the bigger building, they do not have to be insulated or modified to any great extent. It is energy efficient too; the hall is kept at "semi-outdoor climate" and the shipping containers each have electric heating mats underfoot for individual control and comfort.</p>

Table (5) illustrate CO-working offices are built out of shipping containers inside old bakery

○ sustainability in shipping container office project:

Shipping container architecture is usually labeled as a green, sustainable, or eco-friendly form of building. It focuses on recycling or upcycling used shipping containers that would otherwise be nothing more than a discarded pile of steel taking up space in some ports worldwide. Also, by recycling these steel structures, there is less demand for brick, wood, and other building materials.

This subsequently lowers the total energy cost, While using recycled materials is a fundamental aspect of sustainable architecture, several aspects are related to shipping container office that need to be revisited. From toxic chemicals in the original flooring of most shipping

containers to an enormous amount of steel that makes up buildings, shipping container, like any architecture, need to be planned accordingly to achieve their maximum potential sustainability. transforming an abandoned shipping container into a livable building is undoubtedly a useful and meaningful example of recycling.

Many people are worried about the container's condition and opt for one-trip containers because they are usually in optimum condition without any dents or issues with rusting. Opting for shipping containers that have completed their useful life aboard cargo ships and are sitting unused in a port or parking lot is a much more sustainable way to recycle materials into administrative design.

Seventh- Analytical study of some local model's container architecture for administrative office space:




Mountain view – Egypt

"Mountain View" Compound project In "Ras El-Hekma" is a sales office, the company "Quebex" converted a container into a unit that perfectly fits the entire project, the design was completed inside and out in proportion to the surrounding environment.



Pic (28) Analytical study of local model office space shipping containers

Project description:	<p>"Mountain View" project In "Ras El-Hekma" is a sales office inspired by architecture in Greece, the company "Quebex" converted a 40-foot container into a unit that perfectly fits the entire project, the design was completed inside and out in proportion to the surrounding environment, the unit includes a bathroom, and a kitchen A small, reception area, and two large sales offices rooms and meeting rooms.</p>  <p>Pic (29) illustrate the description of "Ras El-Hekma" sales office</p>
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Exterior design of shipping container:</p>	<p>The outer surface of the container body was left in its original wavy shape and painted in white,</p> <p>with the addition of some blue touches in the windows and doors, with the incorporation of some distinctive plant elements, which gave the design a kind of joy and release, the entire design and colors are inspired by the surrounding environment of the container.</p>  <p style="text-align: center;">Pic (30) outer surface description of project</p>
	<p>Interior design of shipping container:</p> <p>Walls:</p> <p>The inside walls are completely insulated , The walls were covered with gypsum boards with simple designs and completely painted in white With some touches of blue in the windows and doors, inspired by The surrounding Environment.</p>  <p style="text-align: center;">Pic (31) coverage of inner walls</p> <p>Ceiling:</p> <p>The ceilings were completely covered by gypsum boards and painted with white color , which gives a feeling Of height in office space with some wooden slats in the reception area to link the design of Wooden Furniture with Ceiling Design.</p>  <p style="text-align: center;">Pic (32) gypsum with wooden slats in ceiling project</p>



Flooring:	<p>completely covered in wooden colors to make a kind of connection between the floor design, the ceiling and the wooden furniture.</p>  <p>Pic (33) coverage of flooring project</p>
Lighting:	<p>used some lighting units suspended from the ceiling and made of wicker or strings to give a natural touch that matches the design of the entire unit, which is inspired by the surrounding environment.</p>  <p>Pic (34) direct lighting units used in project</p>
Furniture:	<p>Use contemporary pieces of furniture with a simple design using some wooden tables and finishing them on the same color of the wood.</p>
Ventilation:	<p>We note the good ventilation of the interior space by choosing the number and size of windows in the spaces in addition to the use of air conditioning in some other spaces.</p>

Table (6) illustrate Analytical study of local model's container architecture for administrative office space, Mountain view – Egypt

○ Sustainability in shipping container office project:

Reusing one of shipping container saves about 3,500 kg of iron, in addition to saving about 8000 kilowatts of energy that may be used to melt it and use it as a raw material, as it saves on the use of the usual building materials , reducing energy consumption from natural lighting through large glass areas, which reduce the need of energy for lighting during the day. Reducing

construction and maintenance costs by Prefabrication of units in the factory reduces construction time and thus reduces construction costs.

Eighth-Through the analysis and study of global and local models show the following:

Global projects:

- variety in the external architectural formation of the buildings and the use of bright, eye-catching colors.
- A clear interest in creating open spaces and merging the interior spaces with the surrounding environment.
- Simplicity in interior design, good use of interior spaces, and the use of some units of multi-use furniture.
- A clear interest in implementing sustainability strategies.
- Adopting energy-reducing methods.
- Use of alternative energies as Solar cells to take advantage of natural energies.

Local projects:

- The external architectural formations are traditional and never out of the ordinary (out of the box).
- Interior design often lacks aesthetics and tends to be highly functional.
- Lack of interest in applying sustainability methods, but the issue is limited only to re-equipping and isolating the container until it becomes suitable for functional use.
- Some sustainability methods such as water and energy efficiency, use of alternative energy sources, and cost reduction still have not been taken into consideration.

Globally or locally, the design and division of the internal spaces of the containers depended on integrating units vertically and horizontally based on several principles, including extension, displacement, repetition, addition, merging, cutting, deleting, and rotation to obtain endless creative ideas from functional internal administrative spaces.

Ninth-Research results:

- There is an urgent need to find design solutions to one of the functional problems such as administrative buildings, and to find alternative spaces temporarily with simple methods and materials without the need to add design burdens on the state.
- Solve the problem of expensive administrative buildings and provide job opportunities for beginners.
- Facilitating the design process, and obtaining creative architectural formations depending on the container, which is an architectural space that can be exploited repeatedly, whether vertically or horizontally.
- There is no limited space, so spaces can be processed in several ways and with multiple possibilities.

- Using new technology and alternative raw materials that can be formulated and formed to achieve the aesthetic requirements of shipping container, which is characterized by several advantages, including shock resistance, heat resistance, as well as light weigh.
- The idea of reusing containers may contribute to changing the culture of individuals and it also opens the horizons of designers towards optimizing the use of spaces through innovative design ideas such as the use of smart furniture and multifunctional furniture.
- Achieving sustainability strategies was among the project's Global models, while local models were limited to container isolation, processing, and functional treatment Without explicitly paying attention to sustainability issues such as energy efficiency, Use of alternative energy sources as solar cells.

Tenth-Research Recommendations:

- The necessity of researchers looking at shipping containers as one of the quick, economical, and innovative solutions to some big problem as unemployment in Egypt.
- Directing scientific researchers to pay attention to sustainability in architecture because of its positive effects worldwide.
- The need for the state and ministry of planning to facilitate the implementation of such new and innovative ideas for sustainable shipping containers.
- Pay attention to environmental issues and pay attention to the application of sustainability methods in our contemporary local architecture.

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