

Design Standards of the Architectural Surfaces Using New Cladding Materials

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Abstract

The research highlights the Design Standards of the architectural Surfaces using New Cladding materials. The research aims to achieve the functional benefit besides achieving the aesthetic aspect through the deep study of raw materials, smart materials, the knowledge of each application and how they interact with the environment. And to achieve the concept of sustainability through the optimal employment of these materials. The research assumes that enhancing the designer's architectural understanding through his deep and complete understanding of all modern techniques and materials enables him to develop basic design criteria to achieve the best interaction of architectural surfaces and environmental space around them. There are many evidences of the impact of the design process in general and the thought of the design of architectural surfaces, especially that this impact was directly motivated by the designer to go to this technology to know its benefits, or indirectly as a response to the impact of modern technologies on the development of life, society, interior design, and architecture in general, such as Thermo bimetal, Aluco bond, Coagulated Glass and Aerogel Glazing, etc. The research finds that the importance of the interaction between technology and design leads to creativity in architecture, where the smart materials add aesthetic value of the building and give a distinctive texture of the outer shell, finally the research recommendation is designers should be continuously updated with all brand-new in design, materials, techniques and modern technology

Keywords

Architectural Surface- Smart Materials- Thermo bimetal- standards- Composite Fibers

Introduction

Smart materials had recently a significant role in architectural surfaces design, that's why when starting in architectural surface design using new cladding materials is called the smart design method and the perfect utilization for these materials by achieving the functional and aesthetic appearance perspectives which lead to achieving sustainability.

Statement of the problem

- 1- What impact does modern technologies have on architectural surface design?
- 2- Did these techniques assist in a positive interaction between architectural surfaces and environmental spaces?
- 3- How have these technologies maintained the concept of sustainability that we are looking for in all areas?

Objectives

Setting design standards for the use of modern materials in indoor and outdoor surfaces verify the suitability of modern materials in the internal and external spaces for the concept of sustainability and their impact on the design process of architectural surfaces.

Significance

Study the design criteria for internal and external spaces using modern technology

Extent of taking advantage of modern technologies to design interior and exterior architectural surfaces.

Emphasizing the role of the designer in making use of modern technology in the design of interior and exterior architectural surfaces.

Methodology

Descriptive and analytical method

The applied approach: It is based on many applied experiences according to the foundations and criteria reached from the analytical study of the architectural models of the research study.

Display and analyze some examples of modern architectural surfaces in terms of design, creative thinking, functional and aesthetic aspect.

A- Design as a creative process

The design process is a product of human needs, as it differs in different identity and culture, and it must have formative innovation from a functional aspect and create things that bring pleasure to our soul and thus satisfy the human need psychologically and aesthetically at the same time, and design means creative work that achieves its purpose, and every design in order to achieve its purpose, it must add new and formal aspects.

B- Design thinking

Design thinking is a pattern of thinking that results from the accumulation of academic research and actual practice with continuous development, and depends on a mixture of science, the most important of which are architecture, engineering, humanities, and business management are integrated in an innovative way.

C- Designer and sustainable design

Creativity in all stages must have special importance from the designer in order to develop innovative solutions to the problems we face, sustainable design aims to create an integrated design system for preserving the environment and interacting with it to meet human needs without any harm to each of them. It also aims to achieve efficiency in the use of materials and

achieve the environmental efficiency of the structure, which means the ability of the building to adapt and integrate with the surrounding environment without disturbing it.

The types of architectural surfaces differed according to the ages and civilizations according to each time period and the materials available at the time, so ancient Egyptian architecture used stones as construction materials as in Figure (1) and the use of sculptures and drawings as wall coverings as in Figure (2) then in ancient classical times natural materials were used as stone Bricks and wood in the building, but the difference was in the way they were treated, which gave each civilization its own character.



Fig. (1)

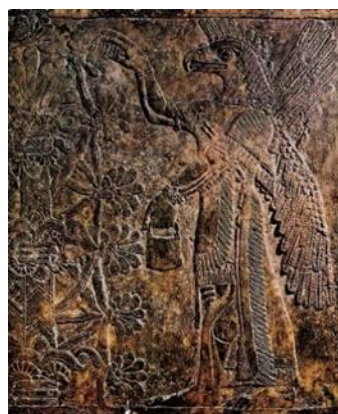


Fig. (2)

Using stones in Pyramids in Giza Ashur Nasser Palace in Iraq

In modern classical times, glazed tiles started to be used, which were frequently used in the 14th century, began using ceramic tiles in Italy, and the manufacture of glass and its use in openings as in facades evolved. Paola Della Carta Palace, Italy as in figure (3), In the classical middle ages, graphite and copper sheets began to be used as roofs, as in Al-Homra Palace (Figure 4).



Fig. (3)



Fig. (4)

Using glazed glass in Paola Della Carta, Italy Using copper in Al Homra Palace roofs

Integration between modern materials and design vision

The process of technological development of architecture and its impact on architectural output has become very important in light of massive architectural booms that have moved from one stage to another in the stages of massive technological development where the discovery of new

construction materials and new materials as well as advanced and high-speed implementation techniques and progress to save time and effort. The design of architectural surfaces has been greatly affected with this progress in terms of the diversity of new materials and the type of application techniques, the materials are an essential part that cannot be separated from the applied design, as the functional aspect of the design depends on them, and since the applied design has functional and technical goals and is affected by many external factors, it was necessary to put Basics for choosing design materials.

Study the possibilities of modern materials in developing the shape

Smart Materials

Materials that have a self-ability to feel the environmental changes and perform operations on that information that they obtained and then influence the surrounding environment and the smart materials may be composed of a mixture of materials or improved.

Smart materials have several characteristics: -

- Immediacy: will answer on time without slowing down.
- Transiency: Responds quickly to more than one environmental condition.
- Selectivity: Ability to respond adequately to changing environmental conditions, building on previous data and conditions



Fig. (5) Illustration template for smart materials containing components that respond to changing circumstances

It has several applications, the most important of which are:

1- Aerogel

It is considered a good heat insulator, as it reduces the temperature by a thickness equivalent to 10-20 cm from ordinary window glass, as well as it is light in weight and has several applications, most notably Coagulated Glass, as it contains an aerogel gel between its layers. When the solar radiation falls. The aerogel inside the glass turns from the transparent to the translucent state, where the light transmission factor decreases automatically whenever the brightness of the lighting rises, it is also good thermal insulation, and provides privacy.



Fig. (6)The Aerogel Material

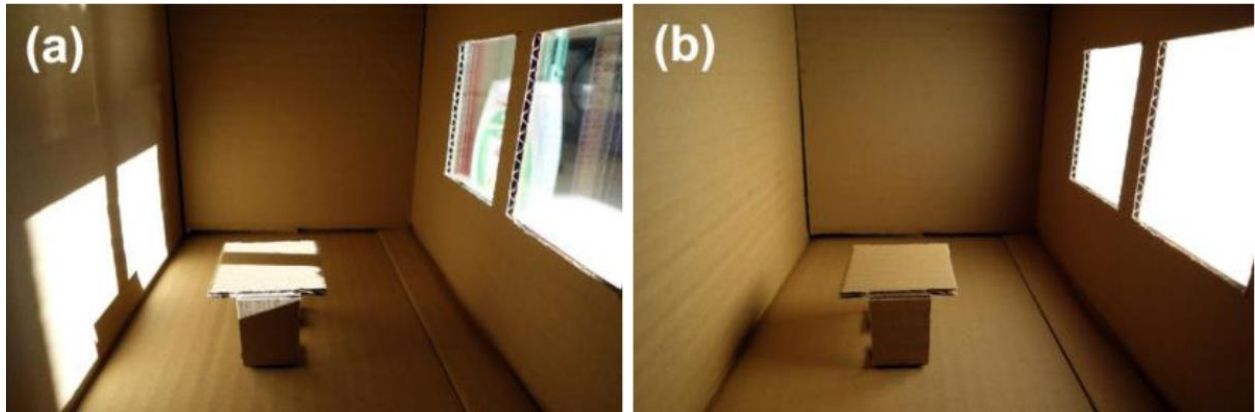


Fig. (7) A simplified form to show the effect of aerogel in glass when exposed to sunlight

2- Bimetallic Thermal materials

It depends on the presence of two different metals in their coefficient of thermal expansion so that one is less and the other is higher and when heating, one of its ends warms faster than the other creating mechanical movement which produces a process similar to wrinkle so the building becomes like the human body has an outer covering layer with pores that open and close.

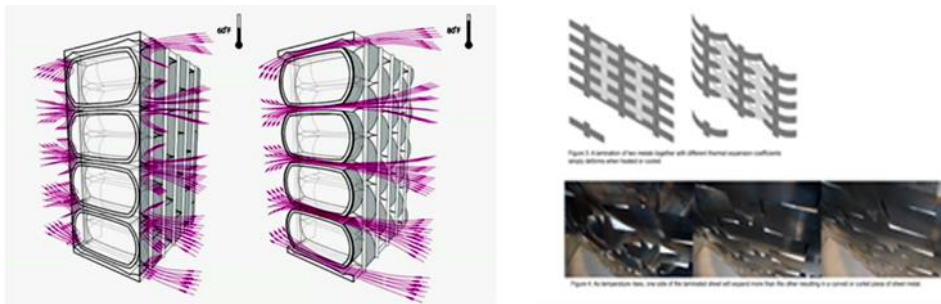


Fig. (8) Illustration of the mechanics of the movement of bimetallic thermal materials when exposed to different temperatures

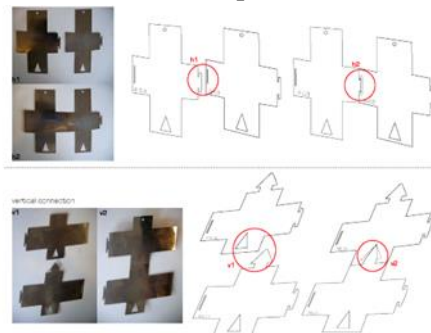


Fig. (9) Explains how to properly fit the two metals



Fig. (10) Demonstrates the mechanical movement caused by bimetallic thermal materials with varying temperatures at the Bloom Gallery in Los Angeles

Applications, results and recommendations

1- The Torre de Especialidades hospital (New Mexico)

This hospital is covered with 300-foot skin of. Prosolve370e tiles that developed by a German company called Embellishment

The material contains titanium dioxide, which purifies the toxin air. Just as air filters around spongy structures, free radicals that work with ultraviolet radiation destroy any contaminants, leaving the air clean to the patients inside. When ultraviolet radiation from the sun rays reach titanium dioxide, Tiles, it leads to chemical reaction and smog crumbles to safer chemicals such as water, carbon dioxide and calcium nitrate. In addition, the innovative grid design creates turbulence for a better distribution of pollutants.



Fig. (11) The Torre De Especialidades New Mexico



Fig (12) The shape of the envelope surrounding the building from an external and internal perspective

Modern materials were used in the development of local buildings such as the radio and television building (Maspero) by making proposed designs for the building's facade using Alcobond and fiberglass materials in the first application and then the use of bimetallic thermal materials in the second application.

First application:

The idea of the application is to make an iterative pattern of triangles in a coiled way so that all 6 triangles combine to make a fake pistol shape and the BMS (Building Management System) system is used. On the building's mechanical and electrical equipment, such as ventilation,

lighting, energy systems and fire systems, the alcobond material was used in the form of frequent rows of permanently open triangles but smaller in size than in the front (Figure 13).



Fig. (13) First Application

The second application:

The idea of application is to create an iterative pattern of rectangles in the form of bimetallic thermal materials and use the inexpensive and easy-to-clean aluminum material in the design to support the bimetallic thermal materials and achieve diversity in the interface in terms of the use of materials and break the iterative pattern of the shape of rectangles, figure (14).



Fig. (14) Second Application

Results

- 1- The smart materials add an aesthetic value to the building and add a distinct feel to the exterior cover, which achieves the aspirations of the designer in buildings that are compatible with nature and create an interior atmosphere with effective dynamics.
- 2- Extracting the criteria for designing architectural surfaces using new materials and modern technologies.
- 3- The interaction of technology and design, in turn, led to the formal creation of architecture through the design of architectural surfaces.

Recommendations

- 1- The necessity to follow the criteria for designing architectural surfaces to achieve the highest aesthetic value for design without affecting the function and with the lowest costs.
- 2- Attempting to discover new aesthetic values by exploiting smart materials and modern techniques in design.

Conclusion

The necessity of continuous searching by the designer and a full understanding of all modern technologies and materials where the impact of technological development in the design process in general and the thought of designing architectural surfaces in particular and this impact must be motivated by the designer to go to this technology to know its secrets and take advantage of them as appropriate.

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