

A proposed methodology for design integration as one of the sustainable design goals for light metal construction

Prof. Mohamed Metwaly Morsy

**Professor of Design, Metal Furniture & Construction Dept, Faculty of applied arts,
Helwan University**

mohamed.mutwali@yahoo.com

Prof. Emad Shafik Abd Elrahman

**Professor of Design, Metal Furniture & Construction Dept, Faculty of applied arts,
Helwan University**

omdash14@gmail.com

Researcher. Ahmed Saied Gharieb Elghannam

Free Metal Construction Designer

a_elghannam@yahoo.com

Research problem:

The orientation towards achieving sustainability is a global trend that is followed by all disciplines and even global policies because of its great importance and sustainable design of the lightweight mineral structure in view of its characteristics and effectiveness and then its importance and the complexity of its functions and use and given that sustainability in its basis is an integrative concept linking the present And the future, the need emerged for a systematic conceptualization to arrive at a sustainable design of the mineral structure in which its components are complemented by the harmonious interaction between parts and functions.

Objective of the study:

To suggest a methodology for achieving integration in the sustainable design of the lightweight metal structure

Research methodology:

In the context of the study, the research follows the descriptive approach

Research axes:

To achieve the target of the research, the study is based on the following axes

The first axis: sustainable development and sustainability as a concept:

The concept of sustainable development: Sustainable development has been defined as the process of ensuring that our capabilities to meet our needs today do not negatively affect the capabilities of future generations to meet their needs.

The principles of sustainable development:

Needs Principle: It includes providing the basic requirements for human life, and it includes basic needs such as restaurant, clothing, housing, and unnecessary individual needs except to raise the standard of living.

Limits: It includes that the environment meets the current and future needs of the human being defined by the extent of technological development and the social system, and it does not include all the existing limits such as limited resources only, but extends to include all factors that lead to a decrease in the amount and efficiency of resources or reduce their quality.

The themes of sustainability: Sustainability as a whole aim to achieve a set of interlocking and interactive axes, including (economic, environmental, and social).

The second axis: sustainability and design (the sustainable design of the lightweight metal structure):

As the design of lightweight metal origin is one of the forms of the design process in general and is an organized mental process in which we can deal with multiple vocabulary and merge them into one set of ideas and finish with a clear vision of these ideas and is characterized by dealing with the goals and vocabulary of that origin in order to meet human needs by translating it into vacuum needs appropriate to the targeted activities.

The philosophy of sustainable design for lightweight metal construction: According to Jason F. McLennan * The philosophy of sustainable design "is based on a set of elements that are:) Understanding the principles of integration in natural cycles, the principle of conservation, the principle of vitality and is concerned with respecting the human environment from the social, psychological and civilizational aspects, respect for the place, respect for the future, the holistic principle

The objectives of sustainable design for a lightweight metal structure: The sustainable design of the lightweight metal structure aims to achieve (site efficiency, internal environment efficiency, energy efficiency, resource consumption efficiency, comprehensive design, environmental impact control, support for innovation and creativity).

Procedural stages for designing a lightweight metal structure: Many specialists submitted many proposals for the completion of the design, including the vision of Hans Gugelot *, which was presented to the methods of accomplishing the design by effectively overlapping activities, namely (information Stage ,Research Stage ,Analysis & design stage Decision Stage, ,Evaluation Stage , Implementation)

The third axis: Integration in design of the lightweight metal structure:

The integrated design differs from the traditional design in its interest in harmonious interaction and proper performance in a multidisciplinary framework through the complex relationships between parts and functions, and this appears in the design of lightweight metal structures in the relationships between the functions of origin and the requirements to be met and the relationships between components and different items of origin and Relationships between the interior design of the structure, its external formal structure, the urban perimeter of the structure, and the effectiveness of the integration of the lightweight metal structure have a comprehensive, holistic connotation that goes back to the origin as a whole. Rush, Richard assumed that each facility in existence was integrated but rarely The fact that this integration conscious, since the integration in the design of the metal origin of lightweight is to achieve a balance between a range of aspects affecting the functional output of origin, social, structural, environmental and economic

In general, the integrated design process is a flexible approach to building design that seeks to achieve the target of lightweight mineral origin through a wide range of clearly defined parameters and goals while remaining within economic boundaries and may depend on a multidisciplinary team with a shared vision and comprehensive understanding that traces design through The entire life of origin.

Types of integration of lightweight metal structure: The types of integration of lightweight mineral structure have been identified which are (integration of general structure of metal structures, integration of elements of structure of lightweight metal origin, optical integration, performance integration, integration of life cycle of lightweight metal origin).

Systems constituting the integral target lightweight metal structure: The complementarity of the lightweight metal structure is achieved whenever the best is achieved in the originating systems, as it aims to participate in the group of systems consisting of the lightweight metal structure in the design process in order to achieve a balance in performance, and thus the structural systems of the mineral structure are represented in the following (the structural elements of the lightweight metal structure, the casing The exterior of the lightweight metal structure, the internal formation of the lightweight metal structure, service systems).

Dimensions of the design integration process for a lightweight metal structure: A team of design researchers has identified the dimensions of a holistic process and design integration which are (understanding and meeting the needs of users of lightweight mineral origin, user flexibility and compatibility with the biosphere, meeting several goals through one design component, achieving connectivity between users of lightweight metal structure and The same origin, achieving efficient performance in different stages of lightweight mineral origin, making use of the biosphere of the lightweight metal structure, gathering diverse perspectives and participation from all specialists in various fields related to the lightweight mineral origin, using all Design tools to reach the target from the lightweight mineral origin.

Integration modeling for lightweight metal construction: The physical and functional characteristics of a lightweight metal structure are represented in the form of a form that is built using the computer so that it is the source of joint information during the design, creation and life cycle of that origin, which forms a reliable basis for making the necessary decisions, and building information modeling (BIM) Building Information Modeling It is one of the most promising developments and concerned with designing models for different installations and simulating each process that the origin goes through and for you includes its construction as a default three-dimensional (3D) shape and its properties and also includes time factor perception (4D) and the introduction of the cost factor (5D) and from Then the sustainability factor (6D) and the seventh factor It is the origin management (7D) after its completion.

suggested methodology for design integration of the metal structure in accordance with the objectives of sustainable design:

The first stage: collecting information on the job needs of the facility, the needs of the users, data on the environment of origin, according to that Determinants of the environmental, economic and social systems.

The second stage: research and analysis, which includes the analysis of all data received from the first stage in accordance with the objectives of sustainable design from site efficiency, internal environment efficiency, energy efficiency, resource consumption efficiency and harmony between functional relationships between elements of origin and the external environment and the associated mechanical systems And construction techniques, control the environmental impact of lightweight mineral structure on the environment and humans, control administrative processes.

The third stage: conceptualization and modeling using building information modeling (BIM) techniques.

The Fourth stage: evaluation using building information modeling techniques (BIM) according to the principles of sustainable design, performance integration, visual integration, structure component integration and life cycle integration.

The Fifth stage: adjusting perceptions according to the evaluation results and re-evaluation.

The Sixth stage: finalization according to the results of the reassessment.

The seventh stage: verification of the results of the evaluation for pre-construction, during construction, and during the life cycle of the origin.

Results:

The use of building information modeling techniques (BIM) Building Information Modeling is highly supportive in achieving the integration of lightweight metal structure within the framework of sustainable design goals.

Integration with sustainable design requires preventing interference and also achieving the conscious connection between the systems that make up the lightweight metal structure to form one system (the structural elements of the lightweight metal structure, the outer shell (the formal body) of the lightweight metal structure, the internal formation of the lightweight metal structure, service systems) during the process stages Design.

Integration is a relative process, the levels of its achievement change according to the change in the surrounding conditions and the new technologies, and according to the change in the goals of the users.

- Flexibility of design parts and their compatibility with many functions, one of the pillars of the ability of the lightweight metal structure to integrate.

- Supporting the design integration of the lightweight metal structure in accordance with the objectives of sustainable design, supports efficient resource consumption and environmental burdens over time.

Recommendations:

- It is recommended that specialized studies be carried out for the various functional fields in relation to the integration of mineral origin in accordance with the objectives of sustainable design, provided that these studies are carried out by a team of different disciplines concerned with the matter.

- It is recommended to support the issuance of code for the design and implementation of the mineral origin in all components of the research centers of the state and competent in that matter (the Housing and Building Research Center).

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