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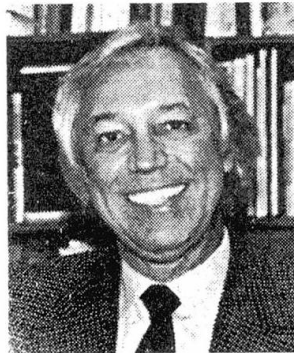
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## Aesthetics and Structural Design

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Armando Rito, born 1936, received his civil engineering degree from the Technical University of Lisbon. Has devoted his professional life essentially to bridge design. Received the AFPC medal (1997) and the FIP medal (1998) for his accomplishments in prestressed concrete design.

### Summary

Where structure is dominant and where technical and structural matters used to control the design, esthetical considerations are now, among learned designers, considered to be an issue as important as the other two. Aesthetics in structural design is, at last, considered a fundamental issue.

As a contribution to this matter, in the following text a few considerations on the subject will be presented.

**Keywords:** Structure; aesthetics; beauty; design; environment; quality; roof; dome; tower; bridge.

### Abstract

The fundamental goals of structural design should be to serve the public needs with economy, durability, scrupulous environmental respect, and good aesthetic quality.

Design must be governed by function. A functional design is simple and simple designs are beautiful. A gigantic design, record breaking for record sake, is neither responsible designing nor progress. No technological breakthrough can justify a design out of proportion with the intended objective.

Many old structures are superb because their designers, their builders and also their Owners considered esthetical quality a value as important as safety, functionality or economy. Besides the creativity, they possessed the necessary educational and cultural background to understand this simple truth and, thus, implement aesthetics in their works.

Unfortunately, in spite of the present concern with aesthetic quality in structures, many of the contemporary designers and public officials still lack the adequate cultural and educational preparation needed to carry out their jobs properly.

From the second half of this century to the end of the eighties, economics took precedence over creativity. In fact, design became governed by "economics", in the sense that building cheaply became the final goal for the majority of the Owners.

The consequences can be perceived everywhere. Hideous constructions invaded our environment.

We, designers and builders, should make every effort to see that this state of affairs is changed.

Every construction involves modifications on its surroundings. Therefore, if the structure is apparent, as its structural options will be reflected in the final aspect of the building, a bad option can disfigure the edifice and its environment.

As such, the structure must represent, with simplicity, economy of means and in harmony with its environment, the flow of forces it is called upon to master. Simplicity of design leads to simplicity of construction and simplicity of form. Furthermore, form must clearly represent the function for which the structure was conceived. A sound structural design is always a good foundation for an aesthetically pleasing structure.

Consequently, if those objectives are achieved, the structure will certainly have a beautiful visual aspect. It certainly does not need any additional, and usually superfluous, embellishment.

Design must address from the very beginning the key issues of functionality, safety, durability and cost. However the designer must be well aware that aesthetics, being also a key issue, is as important as the other ones.

In fact, if a good design is to be attained, one must start one's own work by addressing first of all both functional and esthetical issues. Still, esthetical considerations, having been present at the very beginning of the project, must continue to be addressed during every step of the subsequent phases of the design.

As an engineer, I have a strong feeling that the structural designer must handle himself the aesthetics of his own structures. In fact, no one knows better how to satisfactorily deal with this challenge. No adviser can aesthetically rescue a poorly designed structure, or conceal its inadequacy.

In the last twenty years we witnessed that, among several renowned structural engineers, a renaissance of esthetical concerns has been under way setting an example for their contemporary colleagues and for the new generations of designers.

Contrary to the earlier habits, in designs where structure is dominant, the absolute prevalence of the technical and structural aspects began to soften and aesthetic considerations commenced to change for better the appearance of many of our present works.

Without abandoning structural functionality and economy, sensible designers began to integrate in their projects cultural values, as well as social and environmental concerns.

Unfortunately, the present computing capacity and modern technological means allow us to materialise almost any absurdity we can conceive. We can thus witness that, by the sole desire of being different, many designers have departed from sensible design creating structural aberrations that serve no other purpose than promoting their egos and the ones of their clients.

Successful structures are the final result of a complex and joint labour of skilful designers and discerning Owners. Therefore, both should be very demanding on their projects. It must be clear to us all that if the Owner demands cheap designs no designer, no matter how talented he is, can deliver an aesthetically satisfying structure.

One of the best ways to development is to educate people through the example of fully accomplished constructions. We should never forget how pervasive structures are on our day to day lives, how they contribute to ameliorate, or to ruin, the perception of beauty and, consequently, the quality of life.

Thus, although aesthetic quality is an elusive and hardly quantifiable value, we should spare no efforts to provide the public with structures of purer aesthetics and more human dimension. To accomplish that, aesthetics must become a full concern of our everyday life.

Future generations will not forgive us for ruining the environment and spreading hideous and obtrusive constructions, no matter how technologically exceptional they are.