

The Eternal Nature of Architecture

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I participated in the international competition for the design of the Mother Temple of South America in 2002. This is an outline of my thoughts on this project.

1. Design Concept

One of the greatest challenges in designing a Bahá'í House of Worship is the creation of an architectural work that will endure materially, spiritually and artistically for a period of one thousand years.

In designing the Mother Temple of South America, I have attempted to achieve spiritual and artistic permanence by incorporating the organic shapes and laws of nature into the fabric of the design and physical permanence by using prefabricated structural components and replaceable materials.

The tetrahedron was adopted as the basic design form in the superstructure and it has been evolved through fractal scaling, a process found in the natural world. My objective was to minimize the arbitrary decisions of the architect as much as possible and allow the spatial form to evolve naturally.

2. 1000-Year Architecture

Highly Durable Materials

The vast majority of the building's exterior is covered in glass, a very durable material. The glass is tempered to allow the use of metal bolts at joints and eliminate the use of metal frames, maintaining a clean exterior and sharp outline. The structural members are made of stainless steel, which does not require painting or rust-proofing, to reduce overall maintenance.

Earthquake Resistant Design

Comprised almost entirely of glass and three-dimensional trusses, the superstructure is relatively lightweight, a factor that significantly reduces seismic stress. Any components damaged by unexpected seismic stress can be restored with comparative ease by replacing the relevant parts. Almost all materials used in the superstructure are pre-fabricated, standard factory products that can be readily procured and easily assembled on-site.

Measures for Counteracting Foundation Aging

The substructure of the building including the foundation is reinforced concrete construction. A good reinforced concrete foundation can be expected to last for several centuries, depending on local soil conditions and other factors. After that, the superstructure can be temporarily dismantled and any portions of the foundation that have deteriorated due to the passage of time can be reinforced. If the foundation needs replacing, a new one can be built on another part of the site and the dismantled superstructure reassembled on top of it.

3. Design Plan

Tetrahedron

The Mother Temple of South America must retain its nobility for a thousand years to

come and, therefore, the design must be supported by an enduring, a timeless concept. For this reason, I decided to adopt the tetrahedron, a shape inherent to God's creation, as the basic form. This is nature's simplest polyhedron and can be seen in crystals and molecules.

A Complex Whole of Simple Parts

In the natural world, amazingly complex entities are formed from the most basic elements. A rock, for example, is comprised of combinations of different minerals and a highly advanced living organism, of simple cells. It is this type of natural structure - a complex whole formed of simple parts - that I strove to express in the Mother Temple of South America. The basic component is the tetrahedron and the principal of fractal scaling was used to generate this same form at different scales.

The superstructure is comprised of nine main frames surrounding the center and rising to form the dome. Each frame is made of five tetrahedrons (10.6m per side) for a total of forty-five large tetrahedrons. Each of these forty-five tetrahedrons is further subdivided into seventeen smaller tetrahedrons (3.8m per side) and, as a result, the four triangular faces of each 10.6m-sided tetrahedron are each comprised of nine smaller triangles. Some of these are left incomplete while others have been added to in order to create the dome, combining to make a single organic whole.

Continuity between Structure and Ornamentation

Fractal scaling can be used wherever necessary to create ornamental patterns that are a unified part of the structure, such as in the entrance and the interior walls and roof of the assembly hall. For example, the seventeen tetrahedrons (3.8m per side) can each be further subdivided into seventeen smaller tetrahedrons (1.36m per side), resulting in a total of 289 tetrahedrons. Further fractal subdivision results in $289 \times 17 = 4,923$ tetrahedrons (0.49m per side).

4. Structural Plan

3-Dimensional Trusses

The superstructure is comprised of 3-dimensional trusses, the basic unit of which is a tetrahedron frame with 3.8m length sides. Each frame is composed of four triangular faces, representing the smallest polyhedron. This shape is structurally very stable. The frames are made of stainless steel pipes 200mm in diameter joined by ball joints. Multiple frames are joined together in a 3-dimensional truss by a compound ball joint with a 300mm diameter ball in the center. The trusses are placed, in principle, between the exterior and interior walls of the building, with a maintenance space between the two to facilitate inspection.

Construction

Although the stainless steel 3-dimensional trusses and heat-reflective, tempered glass, which are the main materials of the superstructure, result in higher costs due to the need for precision and quality, this is counteracted by lower labor costs as the materials can be easily and speedily assembled on site. In consideration of the materials' durability, this construction method is economical.

5. Equipment Plan

Maintenance Space

The truss space between the interior and exterior walls functions as a maintenance space that can accommodate air conditioning ducts, electrical wiring, etc. Stairs and catwalks

have been incorporated all the way up to the top of the building to facilitate easy maintenance.

Natural Light

The exterior wall is made of heat-reflective, tempered glass while the interior wall is comprised of white polycarbonate panels. Blinds installed between the two walls in the maintenance space control the direction and intensity of natural light filtering through the tempered glass and the milky white panels diffuse it, filling the assembly hall with a soft, homogenous light. The maintenance space also acts as a skylight directing light into the basement.