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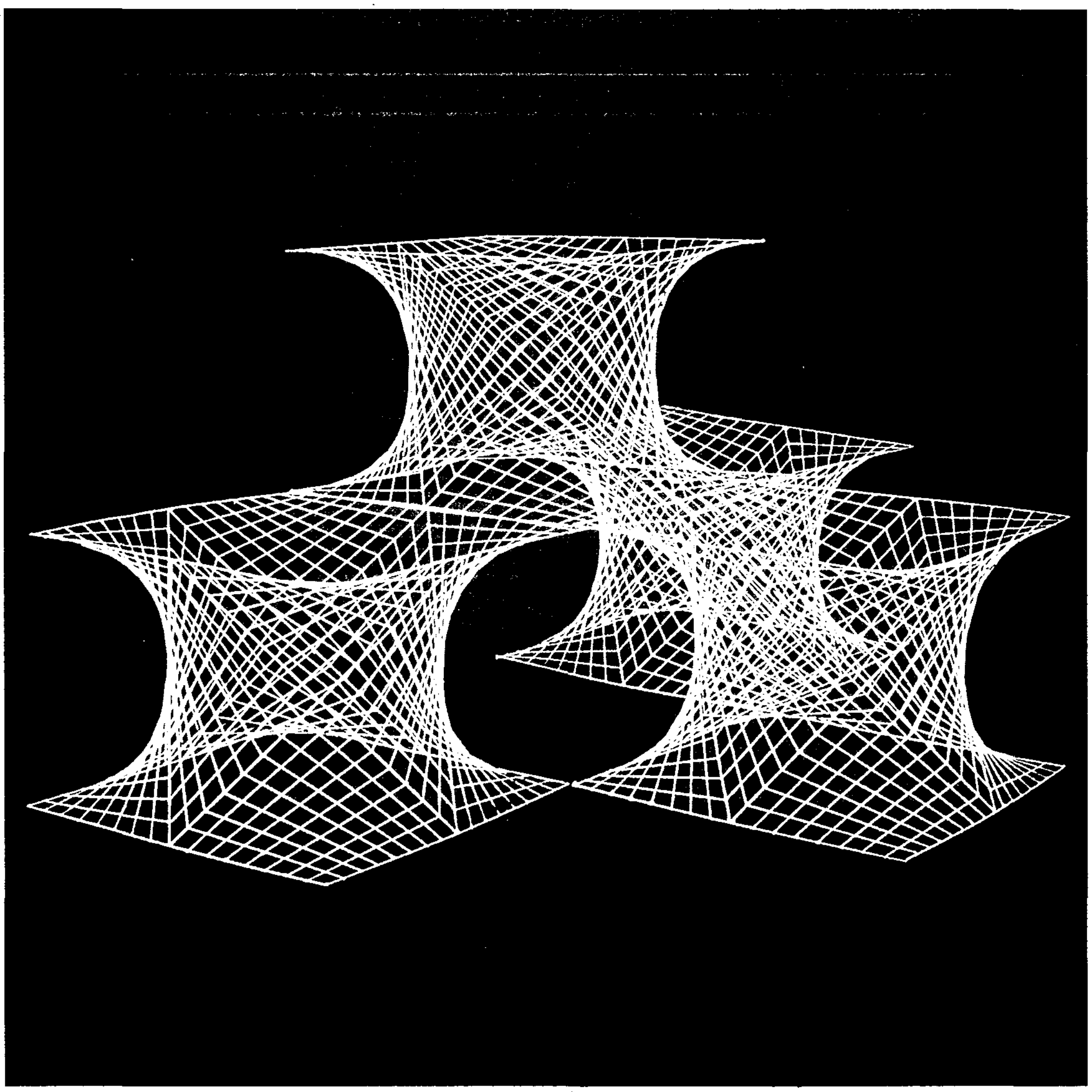

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THE ORDER OF STAIRS: ARCHITECTURAL CONSIDERATIONS IN STAIRCASE DESIGN

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Abstract: *Man spatial movement within given volume of structures is a complicated fascinating phenomena. On the face of it, such 3-D movement seems to be a simple trival matter. However, careful examination reveals a multi-criteria design problem which should address a variety of architectural-engineering considerations. A proper result of sound architectural design of stairs is a biased order of programmatic goals designed to achieve desired movement in built space. However, malpractice could result in a chaotic- disorder, the result of which is an unsatisfactory structure.*

In this paper, architectural considerations of stair design are brought forward, together with optional geometric solutions, demonstrated by outstanding examples of fine architectural design.

1. STAIR DESIGN - THE MEETING POINT OF ART AND TECHNOLOGY

Stairs are one of the most fascinating building sub-systems when architectural design is concerned. Apart from being a tool for connecting various levels inside structures - without which no human activity could take place when the third dimension is concerned, stairs combine aesthetics as well as spatial geometry, building and construction technology, art and craftsmenship. A proper staircase is a work of art. It might be regarded as a 'construction statue'. Its spatial appearance inflicts upon personal feeling and human perception. Presenting staircases and exploring the immediate space around them to the ascending or descending people is one of the most valuable assets of designers trying to achieve structural quality.

Stairs have inspired people for ages and several eye-pleasing examples have lasted through building history both structurally as well as aesthetically. The first well-known stairs have probably been biblical such as Jacobs ladder to heaven and the Babylon tower, which were expressed in artistic works of Peter Bruegel and Abel Pan. These were later succeeded by the famous flights of stairs leading to the Parthenon, followed by those in the Epidarius theatre (350 B.C.) and the stairs designed in the Colosseum (72-82).

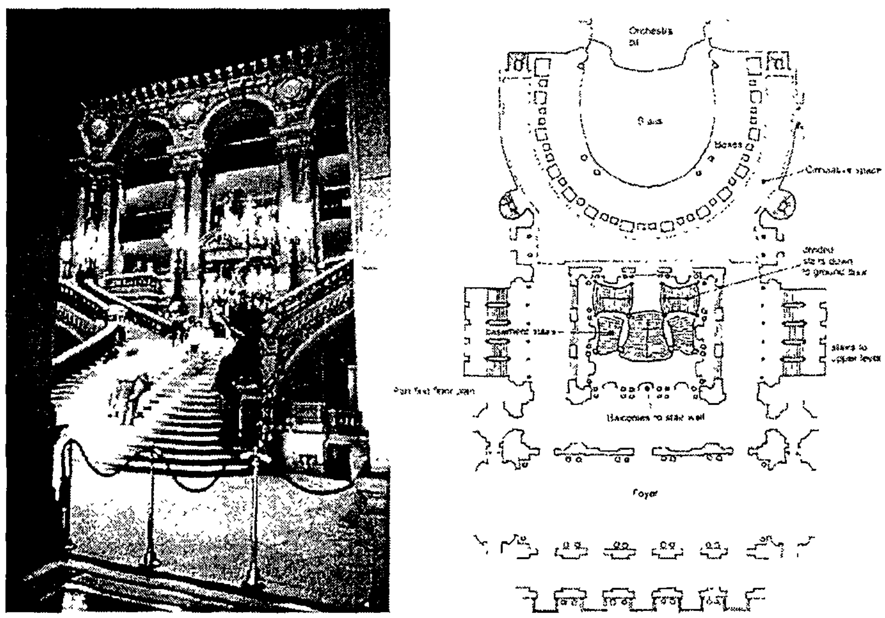

Figure 1: Pans Opera House

In recent times the double staircase designed in Chateau de Blois (1515-1530), the grand staircase built at the Paris Opera House (see Figure 1) by Charles Garnier (1861-1974), the double radial staircase leading to the Sistine Chapel at the Vatican, Gaudi's spiral stairs at the Sagrada Familia (1920), the well-known mule-path in Santorini (see Figure 2), the Spanish stairs in Rome (end of the 17^{th} century), Frank Lloyd Wright descending spiral ramp in the Guggenheim museum (1956, see Figure 3), the escalator system in Charles de Gaule terminal, the escalator in Pompidou centre (Piano and Rogers 1977), Lloyd's building entrance staircase (Rogers, 1986) and lately the spiral ramp in the Louvre glass pyramid (Pei, Cobb & Freed; see Figure 4). All these fascinating man-made inventions are fine examples of human spirit combined in architectural-engineering skill supported by superb building craftsmanship.

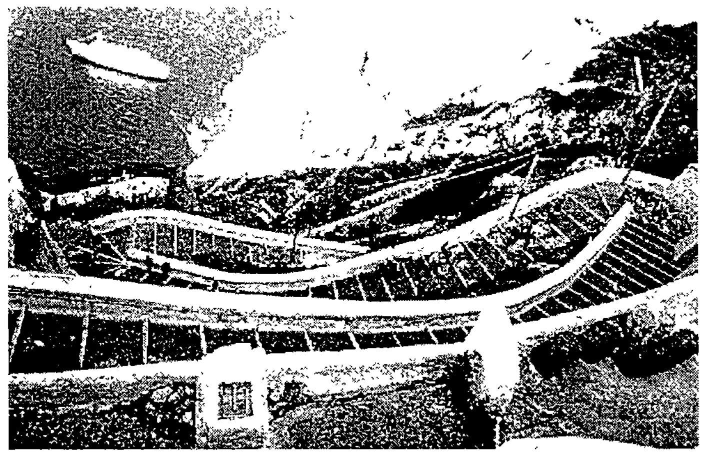

Figure 2: The mule-path in Santonni

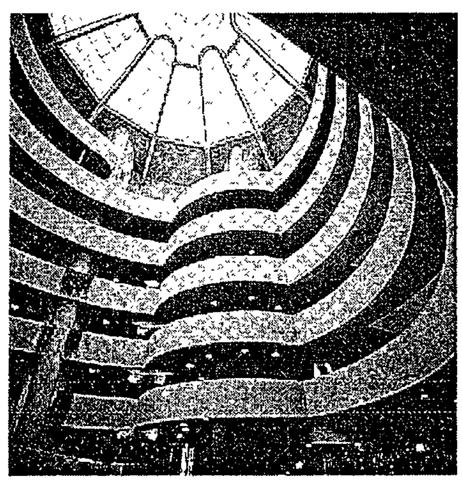

Figure 3: Frank Lloyd Wright Guggenheim museum, N.Y.

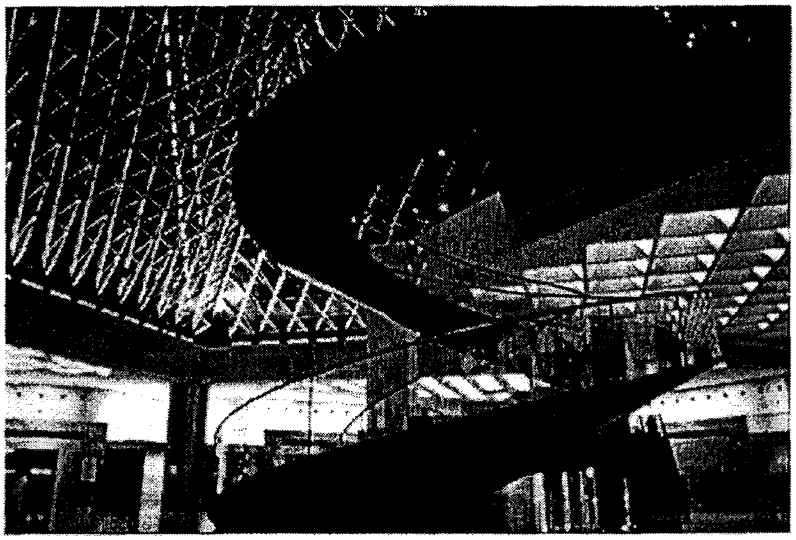

Figure 4: Louvre spiral ramp

Applying the appropriate staircase to buildings interior space, physical performance and man comfort presents first class professional challenge to designers. Objectives like aesthetics, spatial appearance, walking directions in the various levels connected to staircase, constructive system supporting the flights of stairs, sound selection of building materials, texture and colour, walking comfort, safety, maintenance, cost and industrialization - are all to be properly addressed by designers. Alternatives should be regarded leading to the best possible choice addressing all design goals. Such work is not an easy achievement and various solutions have proved numerous times to be unsatisfactory and even dangerous as Edward Bear - Christopher Robin play-mate experienced when making his way down in a most unorderly manner:

"Here is Edward Bear, coming downstairs, bump, bump, bump,

on the back of his head, behind Christopher Robin.

It is, as far as he knows, the only way of coming downstairs,

but sometimes he feels that there really is another way,

if only he could stop bumping for a moment and think of it..."

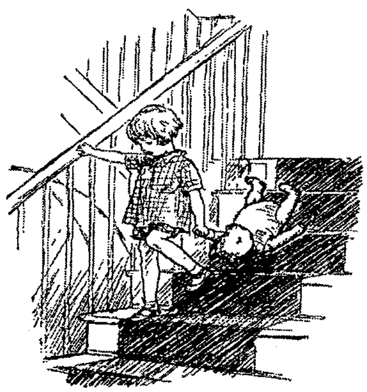

Figure 5: Winnie-the-Pooh by A. A. Milne.
Decorations by E. H. Shephard

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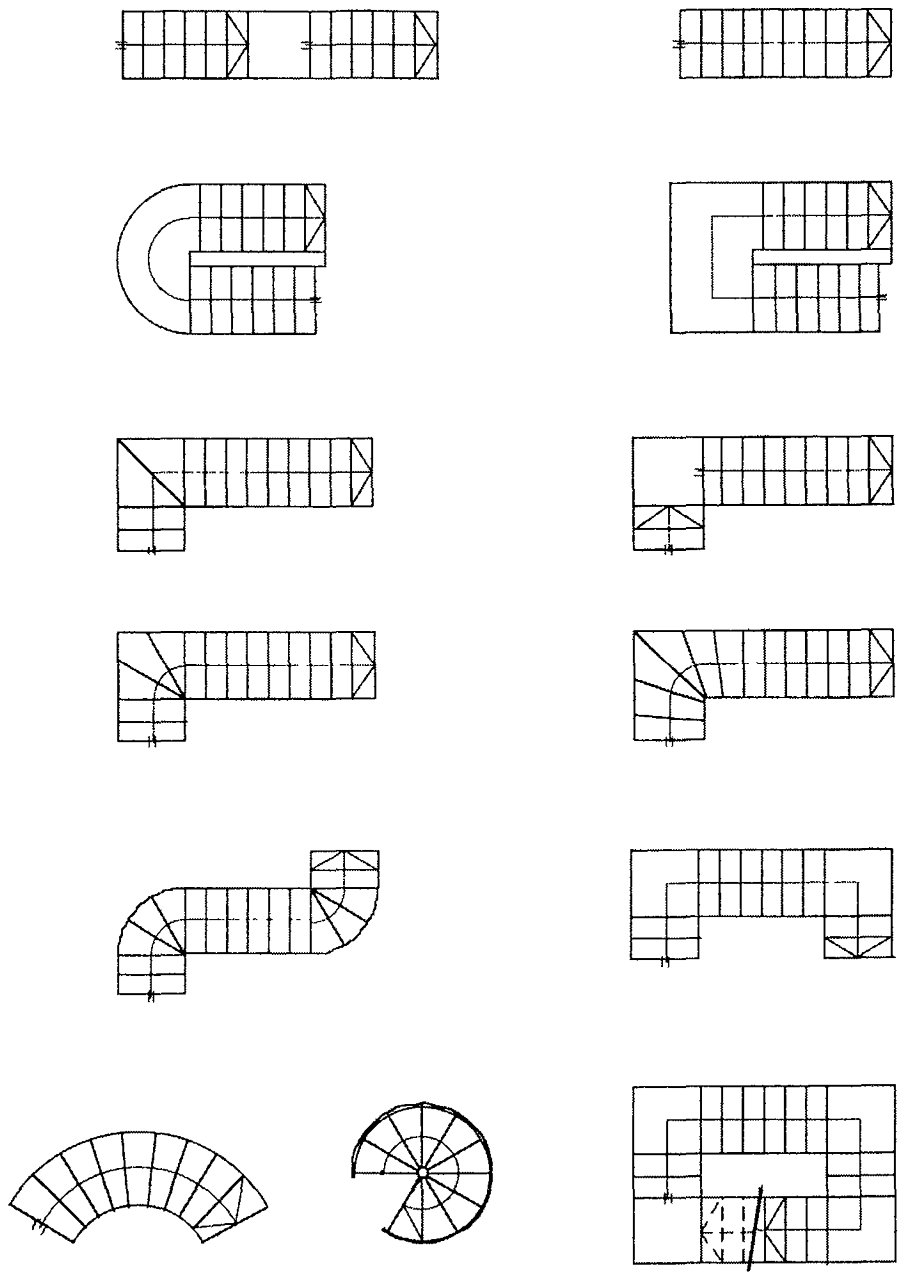

Figure 6: Various staircase geometries

2. TYPES OF STAIRS

2.1 Geometrical Classification

The variety of buildings has produced various types of stair design differing in shape, spatial organization, overall dimensions, construction methods and building materials.

In Figure 6 common types are presented according to staircase spatial geometry. Some staircases are linear, some *L* shaped while others may converge in any other degree, radial, elliptic and hybrid. Staircases may include resting areas *(podest)* or not up to a certain number of stairs in each flight. Dimensions may also vary according to specific stair dimensions (tread and riser).

2.2 Architectural Considerations of Stair Design

Choosing a suitable solution among such alternatives is influenced by several architectural/engineering constraints:

- Overall dimensions of specific space designed to accommodate the staircase
- Directions from which people are expected to approach or leave stairs
- Comfort expected to be achieved while ascending/descending
- Eye-pleasing appearance of the stairs in structure
- The effect the stairs have on the activity conducted near by
- Structural system needed to support the staircase and the building construction system to support stairs' system

3. ORDER-DISORDER IN STAIR DESIGN

Having presented the relevant considerations regarded when designing stairs, the question of order-disorder arises. In fact, the problem is how the overall geometry of a staircase and its specific place inside the building volume create order or perhaps cause disorder within structures. Can a professional decision create chaos or perhaps enhance building integrity concerning movement, user's flexibility and comfort, etc?

A fine example is Corbusier's design (see Figure 7) to the artist Ozenfant. Corbusier had to place a flight of stairs leading to an upper floor in Ozenfant's studio. Instead of accommodating the stairs adjacent to the wall in a straight or *L* shaped flight, he decided to use the diagonal for a linear flight. By doing so, an interesting space was achieved, as well as using the stairs as a semi-open partition dividing the small studio into two interior spaces which seemed to be needed for the artist's work.

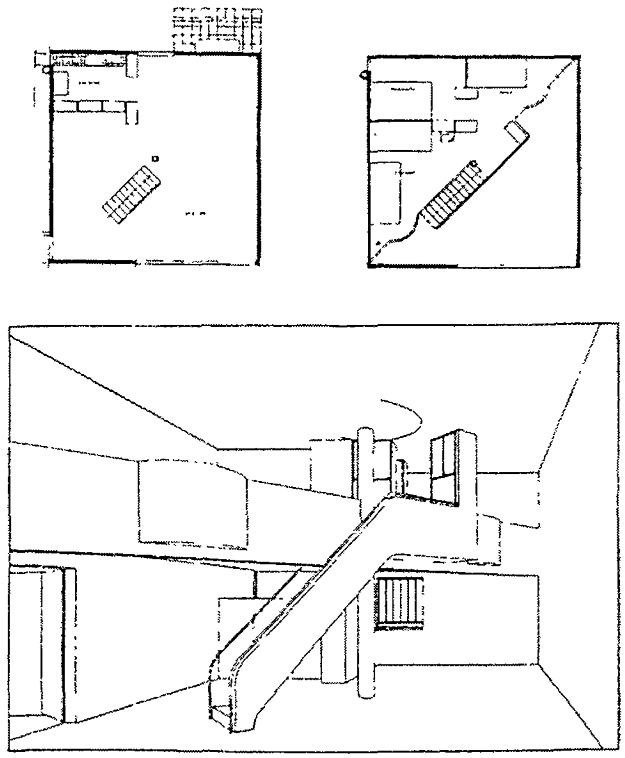

Figure 7: Corbusier maison pour artisans

Other cases may involve the question of symmetry. Would symmetrical stairs prove to be a better solution or should asymmetrical solution be applied? The grand staircase in Charles Garnier's Paris opera house (see Figure 1) seems to be the perfect solution for this unique, highly praised building. Here, a symmetrical solution was applied, offering opera lovers either right or left approach to the hall. Clearly the solution is a perfect result of the interior volume of the building. So is the case of the exterior stairs leading to the *Sacré Coeur* or the Spanish Stairs in Rome considered by many as the finest in the world.

When symmetry is involved several possibilities are relevant such as mirror (left-right) symmetry, radial symmetry etc. The sophisticated double spiral staircase at the Sistine Chapel in the Vatican (see Figure 8) is a puzzling architectural invention. Although space is small, the objective was to divide the ascending from the descending thus allowing better movement inside the entrance to the gallery. The idea was not new originating in Leonardo's double helical stair although it had been applied only few times before as in the *Chateau de Blois*. Double symmetry is achieved. First a radial one then a mirror type symmetry concerning the crowd movement. Symmetry is used again in Pei's East Wing of the Art Museum in Washington where two magnificent small radial stone stairs are situated at both ends of the building.

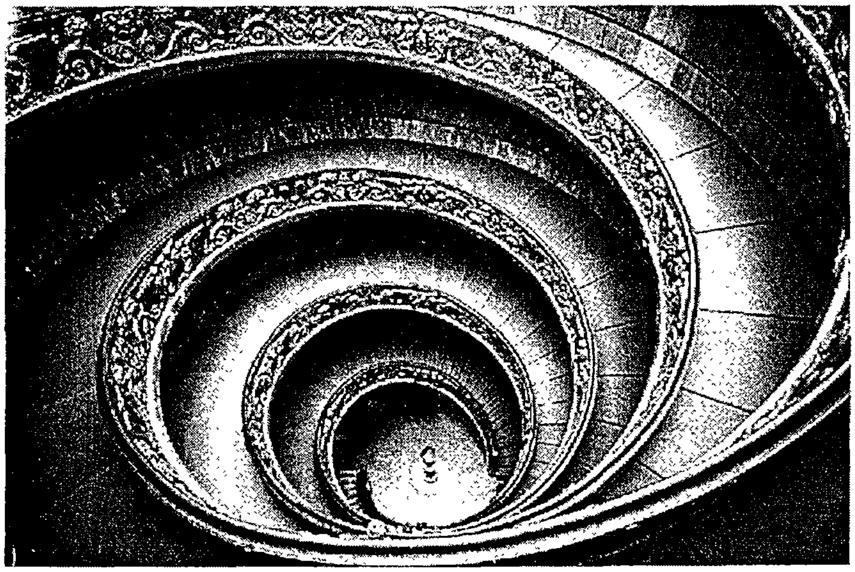

Figure 8: Vatican – double spiral staircase at the entrance to the Sistine Chapel

However, asymmetrical solutions seem to enjoy special qualities as well, providing their own contribution to building order. Perhaps, the famous of all is the mule ramp in the island of Santorini, which had served for years as the main climbing route to the top of the mountain. The escalators system in Trump Tower, N.Y. is not a symmetrical solution either as it is not placed in the middle of the interior space thus leaving enough room for other activities. Pei, Cobb and Freed Louvre spiral ramp is asymmetrical, too, serving only the descending crowd, while a side escalator carries the ascending leaving crowd out of the museum. Right's descending spiral ramp in the Guggenheim museum is another contribution to architectural ingenuity not only serving as descending route, but also creating a great interior for a relative small museum, allowing all-around view and creating pleasant atmosphere.

Another puzzling effect of order and space conception as well as user's comfort and safety is the turning directıon when using stairs. Should the user turn left or right when ascending/descending? Professional experience proves that descending is more important to regard due to safety considerations. Descending to the left (anti-clockwise) is easier than to the right. The same problem is clearly experienced when running in a sport arena. All over the world the preferred turning direction is anti-clockwise and so is the case in most airfields for descending-landing airplanes. There is a hidden characteristic in mankind enabling better turning movement in an anti-clockwise manner than vice versa, and this inflicts directly on stair design although normally such design is created unconsciously by architects.

4. SUMMARY

Stair design has direct impact on order/disorder of architectural design. Stairs are work of art as well as technological inventions. Professional design of stairs provides users with sound understanding and biased perception of space, thus creating pleasant atmosphere and satisfaction. Malpractice concerning such design may prove unsatisfactory as well as hazardous and could lead to physical damage resulting from disorder in space perception and environmental behaviour.

Therefore special attention should be paid to architectural design of stairs providing users with an aesthetic building sub-system as well as with proper technological structural component.

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