The Search For Structure

by Karsten Oswald

Thesis submitted to the Faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Master of Architecture

approved:

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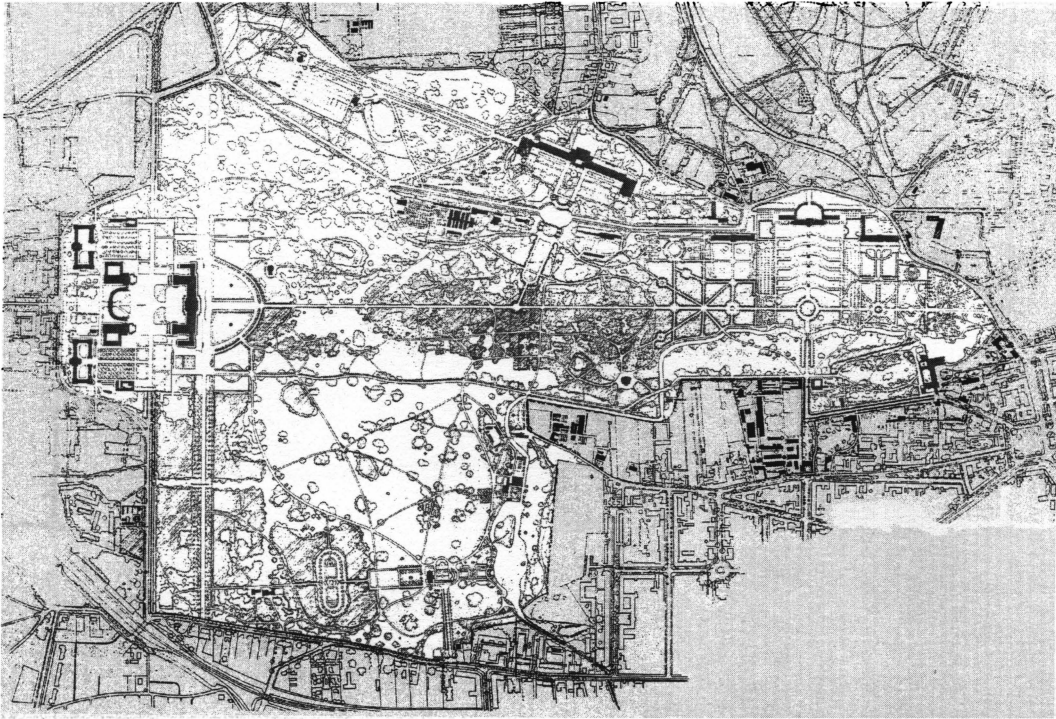Scott Gartner

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Heiner Schnoedt

Blacksburg, October 1995

Abstract: It has always been an important concern in architecture to develop a design which does not rely on actual trends but which accords to a deeper kind of truth. This requires the search for and the designation of structure. On the other side the designer has intentions and visions. Subjectivity intervenes unavoidably at any point in the design process. To find the right balance between truth and the individual creative act; to differentiate between the invariant and the designer's skill has to be the goal in architecture.

C o n t e n t s

Potsdam, located in southwest Berlin would have remained an insignificant country marketplace if the Great Elector Frederick William (1620-88) had not decided to build a town palace, and to transform "the whole island into a paradise," like his governor at Cleves J. M. v. Nassau-Siegen advised. Consequently, a ring of small palaces linked to one another by avenues was built around Potsdam. This initiated a building tradition which was upheld by all his successors. In 1744, Frederick the Great had a vineyard planted on the so-called "Desert Hill" near the city of Potsdam, marking the beginning of the history of *Park Sans Souci.*

The Baroque garden was dominated by geometrically laid out lawns, flower beds, trimmed hedges and trees and straight axes. In spite of many transformations in the garden, we still find these elements. Today the *Circle of Muses* shows the strongest connection to the traditional french garden design.
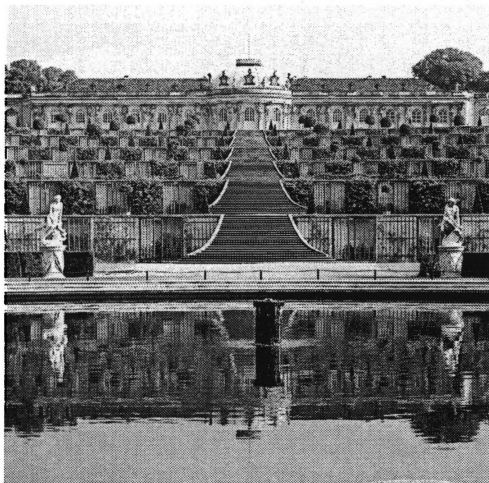

The buildings in this part of the garden, now used as museums, were designed in a late Baroque, Rococo and early Classicist style, primarily by G. W. v. Knobelsdorff, J. G. v. Buering, L. Persius, F. A. Stueler and K. v. Gontard.

Park Charlottenhof is a totally different idea of garden design: the landscape garden. In 1825, King Frederick William III bought Park Charlottenhof and made it a gift to his son. In the following years it was laid out by P. J. Lenne, K. F. Schinkel designed the buildings.

The design of the park is influenced by the English Landscape Garden which spread from England to the rest of Europe by the middle of the 18th century. As a reaction to the formal garden, this type of garden design imitated nature. The intervention of man remained nearly invisible.
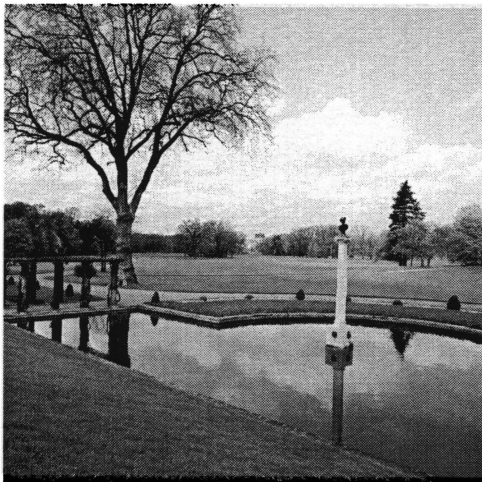
Walking in this kind of garden is an experience with carefully arranged viewpoints in order to create a number of illusions and to achieve a maximum of variety. In 1760, H. Rousseau summarized this idea in *La nouvelle Heloise* by saying that a garden should be somewhat irregular.

Accordingly, Park Charlottenhof is characterized by wide expanses of meadow and small woods. From the *drive*, the main road in the English landscape garden, surprising views to the pheasantry, Schloss Charlottenhof and the Roman Baths are experienced.

...this ideal surrounding is the site for a set of five architectural cubes.
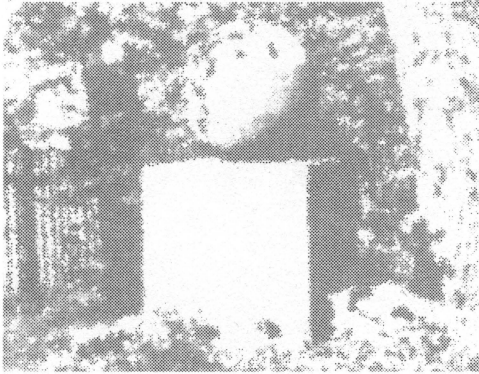
I call the set of five cubes a structure even though the idea of structuralism addresses a much larger realm of typically social, functional and formal aspects.

The project consists of five cubic exhibition pavilions: the Center Cube, the Painting Cube, the Sculpture Cube, the Architecture Cube and the Stage.

The intent of the design strategy is to find a balance between the demands of the object's structure and the designer's skill.

The design strategy draws from ideas of structuralism and involves serial works, order, rules and geometry as tools (see scheme on page 7).

The Design Process

belief in existing
eternal / universal truths
unconscious structures of depth
(structuralism)

structures let us
realize
experience
and **react** to
the environment in the related ways

in the **design process**
the knowledge of structures helps
to achieve a maximum of acceptance

the tools to find and to reveal structure are
serial works
order
rules
geometry

at some point in the design process
the designer's **skill and choice**
interact with the object's structure

this interaction / interference
strengthens the object's structure
reveals the designer's skill
becomes the quality of the design

Structuralism relating to architecture was developed in the atmosphere of the ending CIAM-movement in the 1960s. Ideas of structuralism, which originate from linguistics, can be found in various fields such as art, philosophy and ethnology.

Many structuralists refer to the linguistic terms "langue et parole" of Ferdinand de Saussure. He saw in language a collective system within which the individual speaks. The French structuralist Claude Levis-Strauss proclaimed that the human being is everywhere the same, has to follow the same principles of order and structures but react differently to exterior influences (transformation).

Generally, structuralists are in search for universal laws, sometimes denoted as unconscious structures of depth which hold together human society.

In *Structuralism in Architecture and Urban Planning*[1] Arnulf Luechinger describes a structure as a complete set of relationships, in which the elements can change, but in such a way that these remain dependent on the whole and retain their meaning. The whole is independent of its relationship to the elements. The relationships between the elements are more important than the elements themselves. The elements are interchangeable, but not the relationships.

For architects, Aldo van Eyck is one of the most important representatives of structuralism. Referring to studies of vernacular architecture, he said:

> "The time has come to gather the old into the new; to discover the archaic principles of human nature. Man is always and everywhere essentially the same. He has mentally the same equipment. We can meet "ourselves" everywhere in all places and ages, doing the same things in a different way feeling the same differently."

Still, most structuralists are not aiming at man as being entirely subject to the constrains of structure and they are more interested in enlarging the individual's freedom and responsibility. Even some existentialists like Jean-Paul Sartre draw from structuralism by saying:

> "The important thing is not what one has made out of man (man within the structure) but what man has made out of the things one has made out of him."
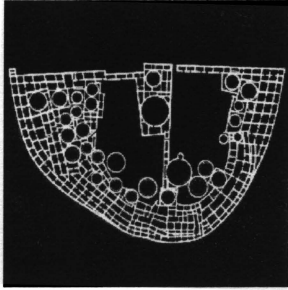
Indian village,
Pueblo Bonito,
New Mexico

El Oued Oasis,
Algeria

Church project,
Driebergen, 1964,
Aldo van Eyck
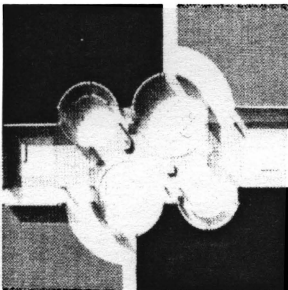
Children's Home,
Amsterdam, 1960,
Aldo van Eyck
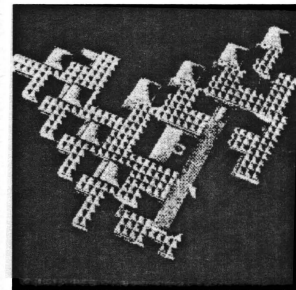
For some Structuralists exists in all objects a deeper kind of order. The revealing of an object's order is important. Serial works offer an approach to this. Repetition, transformation and the resulting comparability in serial objects are searches for internal truth (structure).

This intention can be seen clearly in the works of Sol Lewitt. His sets of cubes, showing various manipulations have one aim: to establish and analyze the basic structural units of his respective field of inquiry. For Sol Lewitt, it is the search for objectivity. By producing series and showing endless expanding possibilities, the strength of the object becomes visible. The variety, and its different presentation, allows comparison.

In a description of Serial Project No. 1 (ABCD) Sol Lewitt says:

> "Serial compositions are multipart pieces with regulated changes. The differences between the parts are the subject of the composition. If some parts remain constant it is to punctuate the changes. The entire work would contain subdivisions that could be autonomous but that comprise the whole. The autonomous parts are units, rows, sets or any other logical division that would be read as a complete thought." [2]

Consequently, Sol Lewitt dislikes his objects to be called *sculptures* - for him they are *structures*.

The ground for these activities Sol Lewitt has laid down in two statements - *Paragraphs on Conceptual Art* and *Sentences on Conceptual Art*. The most important can be summarized in the following:

> Perception is subjective and the artist is unable to perceive the work until it is completed.

> The idea must be worked out prior to execution so as to avoid the subjective intervention of the artist.

> Once the plan is pre-set it controls the outcome of the work and it determines the number of parts in series.

> The forms employed are restricted in scope and unemotive; they are uninteresting in themselves, becoming simply the grammar for the total work. Importance lies in their arrangement

> If the artist changes his mind midway through the execution of the piece he compromises the result and repeats past results.
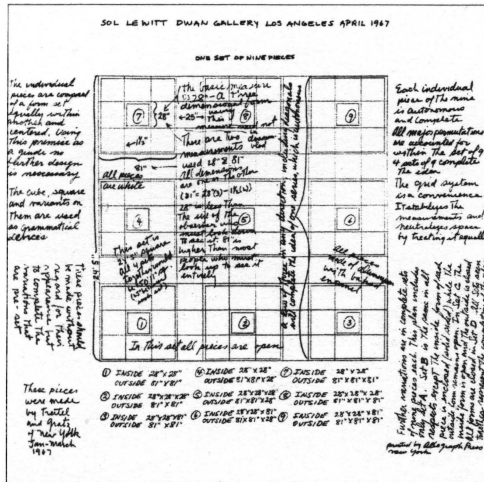
Serial Project No. 1 (ABCD),
Announcement for exhibition, Dwan Gallery,
Los Angeles, 1967

Serial Project No. 1 (ABCD)
Installation, Kunsthalle Bern, 1972
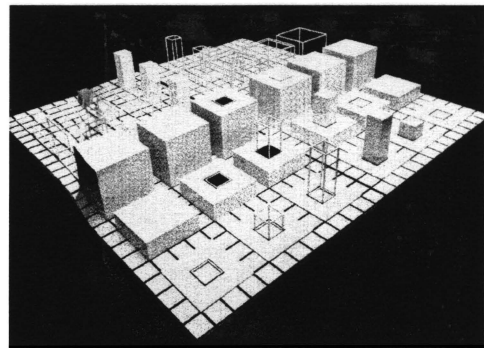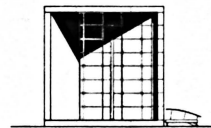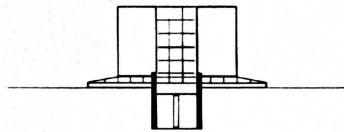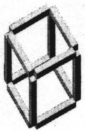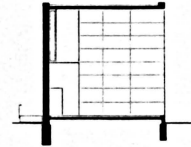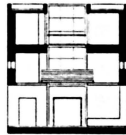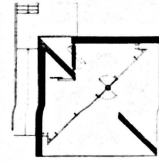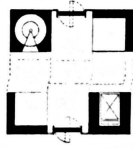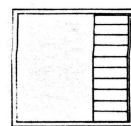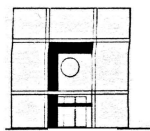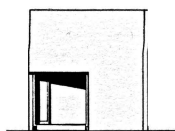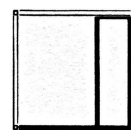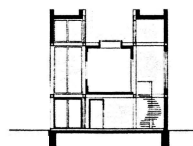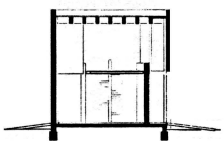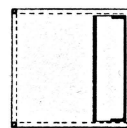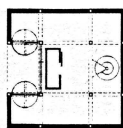
The Structuralist belief that behind every human activity and reaction to the environment there is a similar structure which means that their expression follows and shows a similar pattern. Consequently, this needs at an early level the same kind of order as a common ground.

According to Paul-Alan Johnson in *The theory of architecture*[3] the term *order* derives from the Latin word *ordo* and *ordin* (row, series, rank, class or degree) and is also related to *ordiri* (begin). The Greeks used two terms meaning order:

kosmos: referring to either a due order or arrangement of things, or to the world order;

taxis: arrangement, not only involving the placement of parts in relation to one another, but also the elegance of composition.

In design activities, the arrangement of parts becomes an important act. It divides the building and defines the resulting partitions as the architectural elements. It manipulates these elements according to some logical procedure. A basic scheme of this activity is the grid.

In *Towards a New Architecture*[4] Le Corbusier states:

"An inevitable element of architecture. The necessity of order. The regulating line is a guarantee against wilfulness. It brings satisfaction to the understanding."

The ground for this statement is Le Corbusier's belief that in human nature the will of ordering is inherited. Interestingly, Le Corbusier does not see a difference in the will of ordering in the work of the primitive man, a temple or the houses of Pompeji. He believes that man's design is governed "by elementary mathematical calculation". And by instinct, man uses right angles-axes, the square, the circle. These are what Le Corbusier calls geometrical truths which avoid chance, irregularity and capriciousness.

When order as a regulating scheme in architectural design is accepted, is then something that contrasts to the orderly scheme disorder? For Paul-Alan Johnson in *The theory of architecture*[3] it is the architectural equivalent of what J. P. Sartre calls man, the *universal singulier* or *individual generality*, general in all that connects, singular in all that does not.

As a reaction to the powerful but artificial surrounding of Park Sans Souci and its buildings the set of five cubes represents an autonomous and self-dependent structure.

In addition to the rule that the designed structure does not destroy existing views or plantings, the garden and the buildings exist respectfully next to each other.
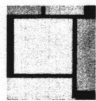
The relationships in the designed structure can be summarized as follows:

- same distance of each building to the center-point (Center Cube)
- axiality
- same principle shape
- each cube as a reaction to a special purpose
- same material along one axis
- same contrast (open /closed) along one axis
- dependence of the Center Cube as an identifying device
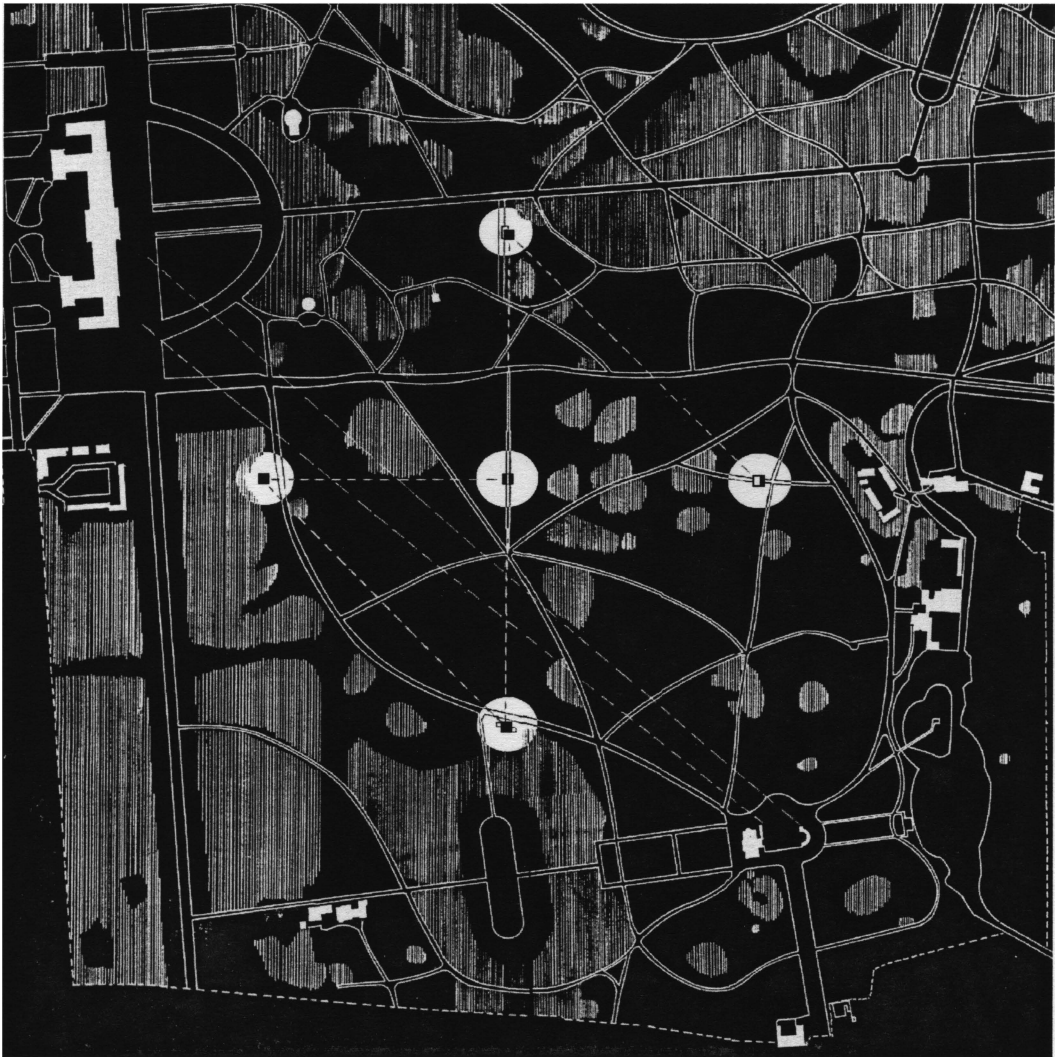
Rules

The establishment of rules in the design process has basically one aim: coming closer to the understanding of an object by revealing its structure.

In the design process, the use of a rule gives guide lines to support the making of decisions. It shows what is possible in order to support the basic understanding of the object. More than that, it creates a framework in which the designer works.

The set of rules regulates the further manipulation of the object. The limitations opposed by the rules reveal the strength of the object, and can even question the object's primary understanding.

In the finished object the employed rule under which it has been manipulated need not be shown. Again, the rule is a tool to reveal the structure of the object; the self-interested use is not the primary intention of establishing a rule.

Finally, the correct use of rules does not guarantee a successful design. At each moment the designer has to verify the outcome according to his own skills.
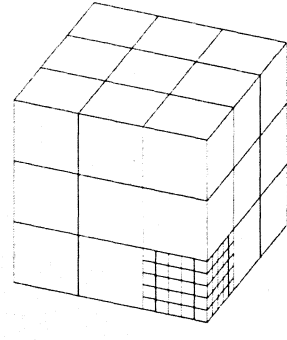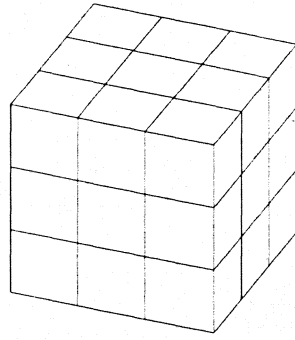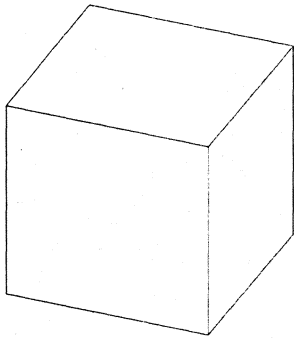
the understanding of the cube

the rule
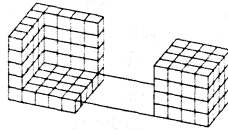
a series of elements
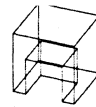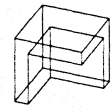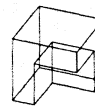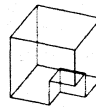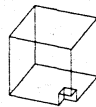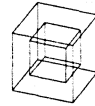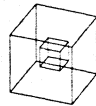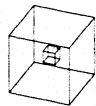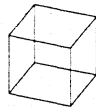
The Center Cube

The solid cube emerges
out of the ground, a
glazed wreath separates
it from a surrounding
square. A continuous cut
bisects the cubic solid
and leaves a sunken path
in the earth.

The spaces in the solid
are created by cubic sub-
tractions.

The building serves for
different kinds of exhibi-
tions.
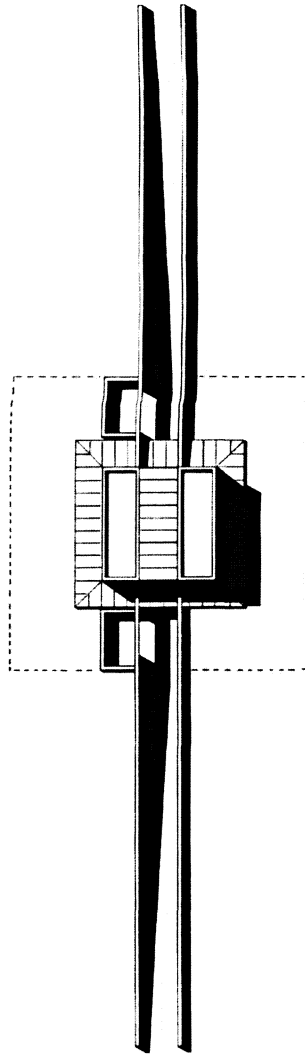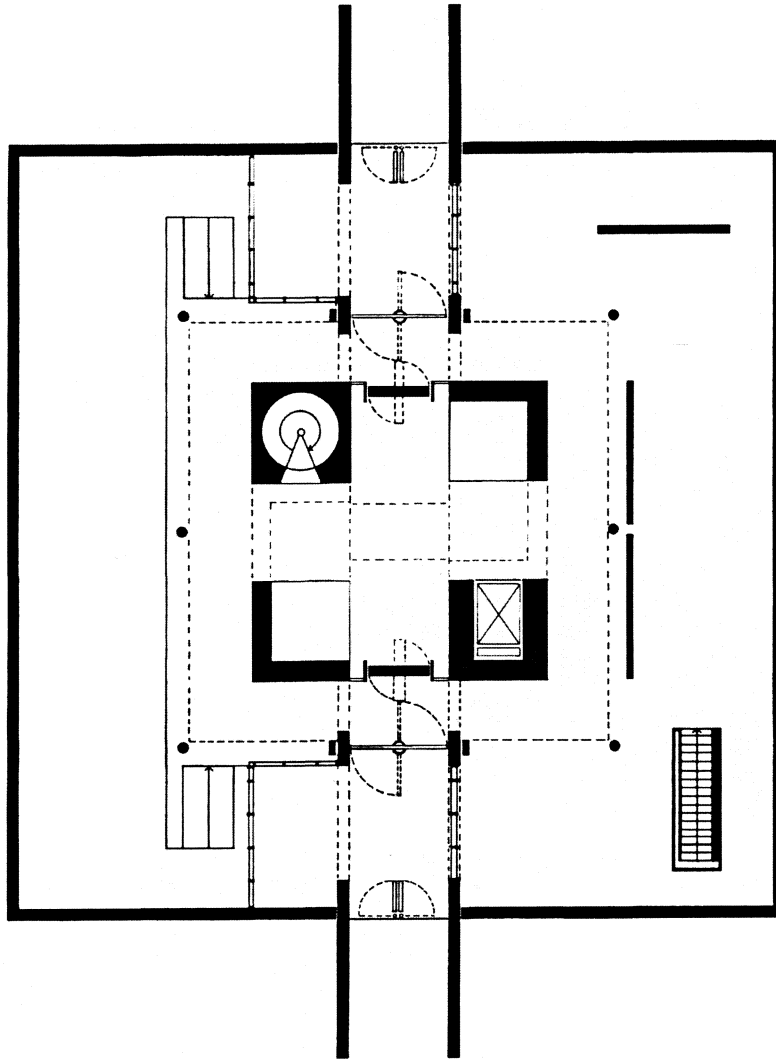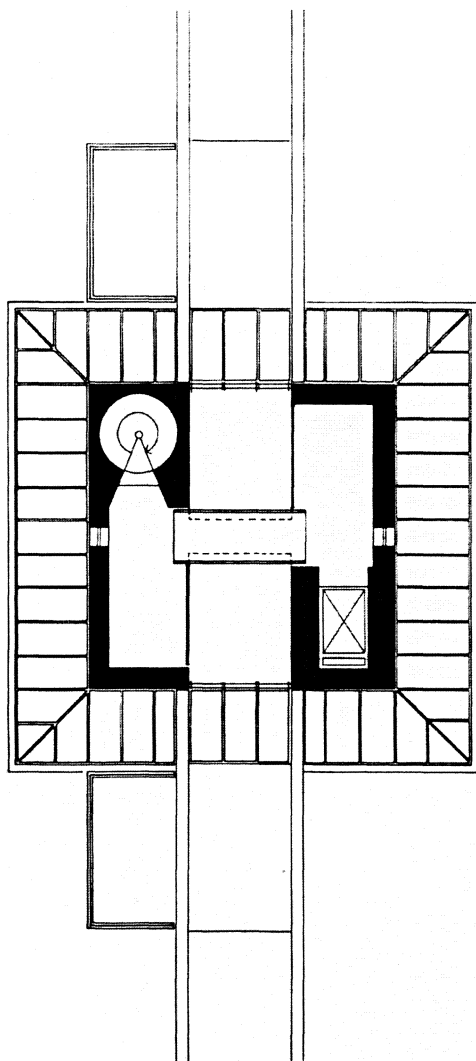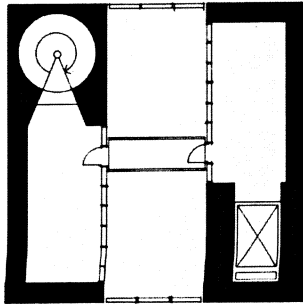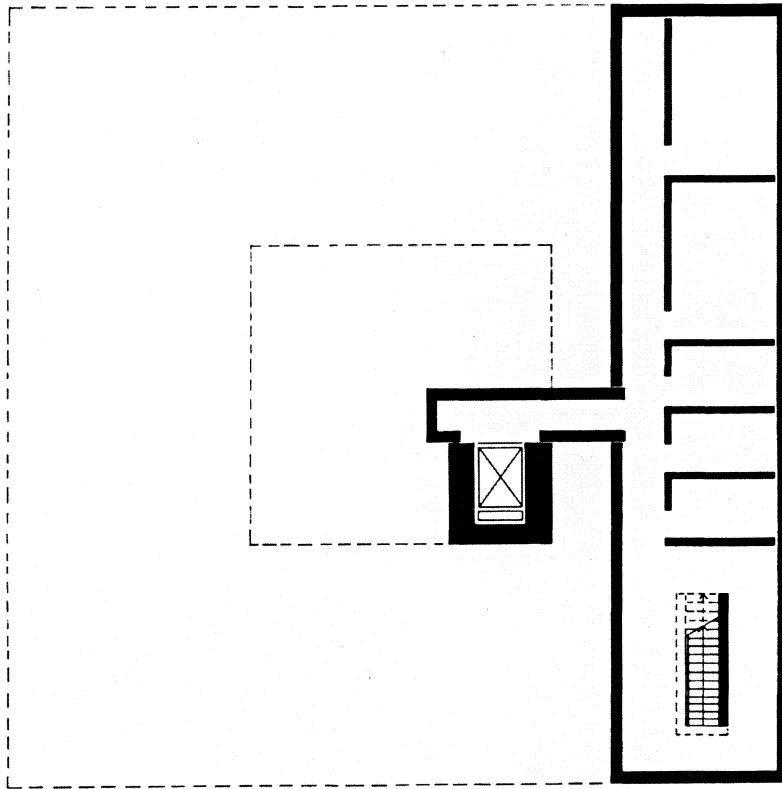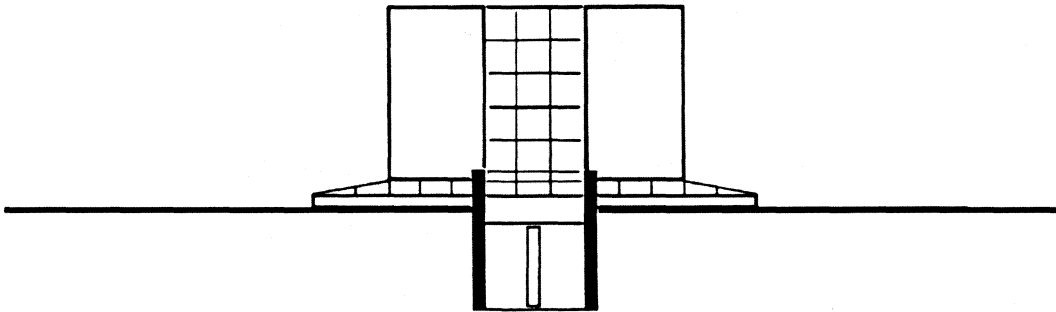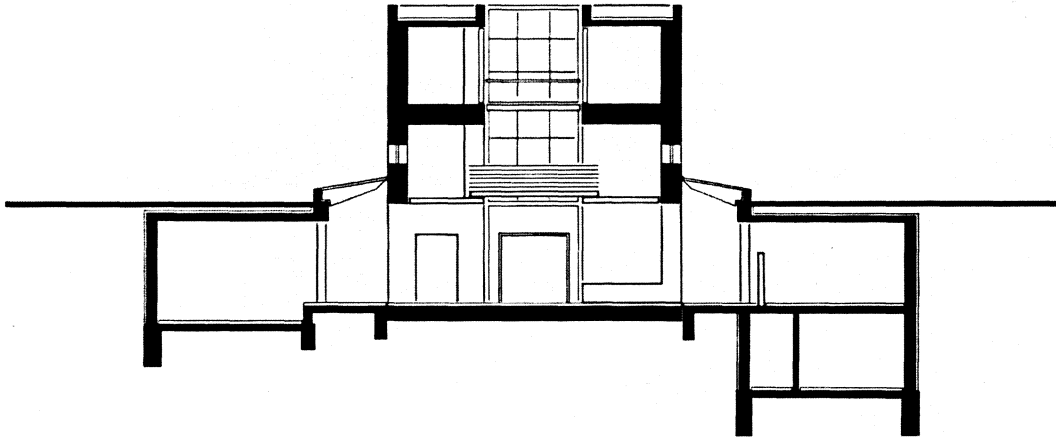
The Center Cube

The Center Cube

0 1 2   5 m

The Center Cube

0 1 2   5 m

The Center Cube

The Center Cube
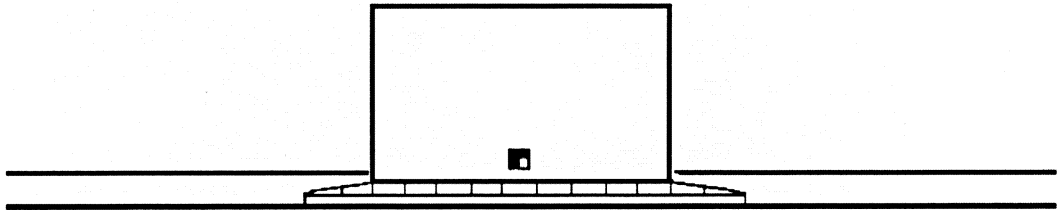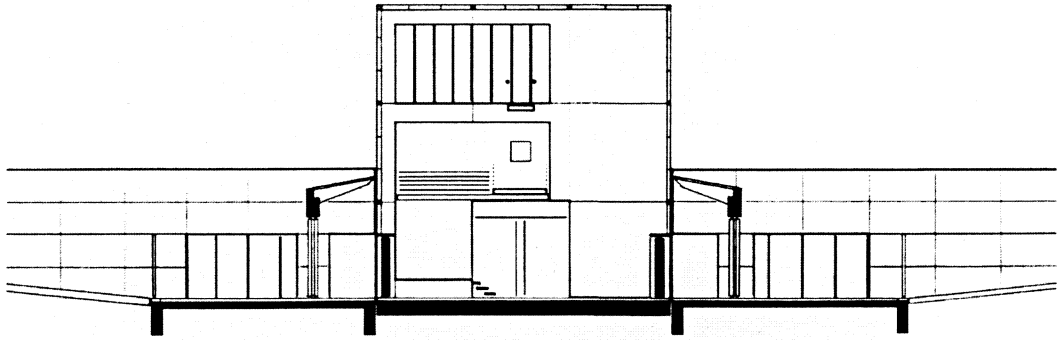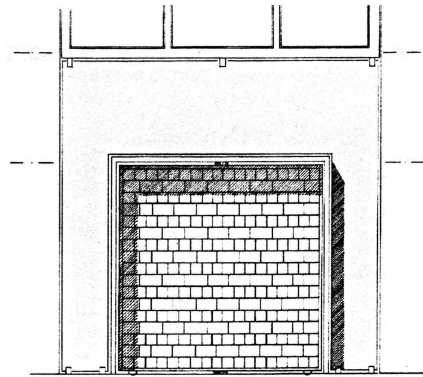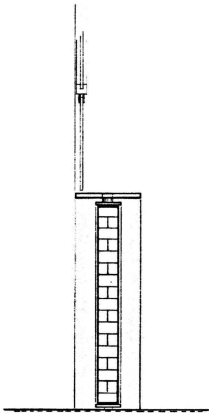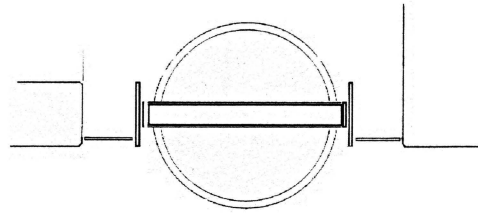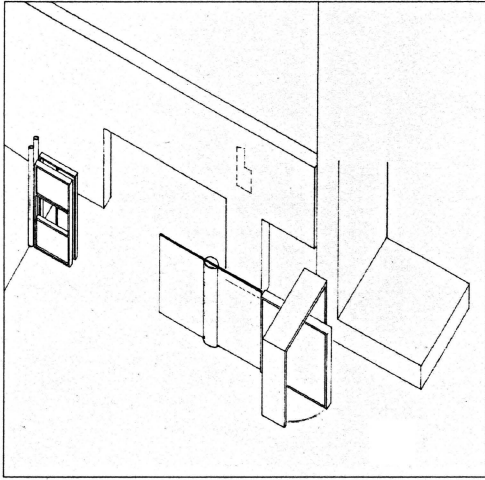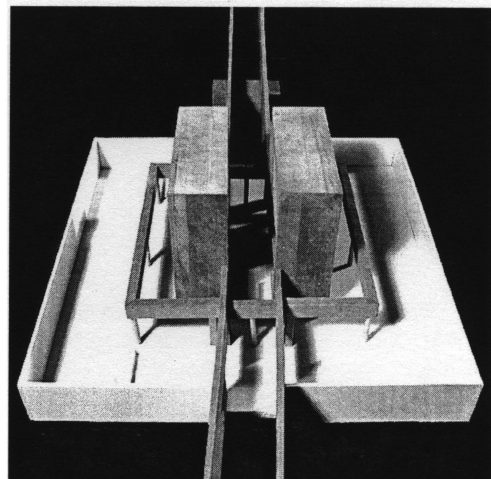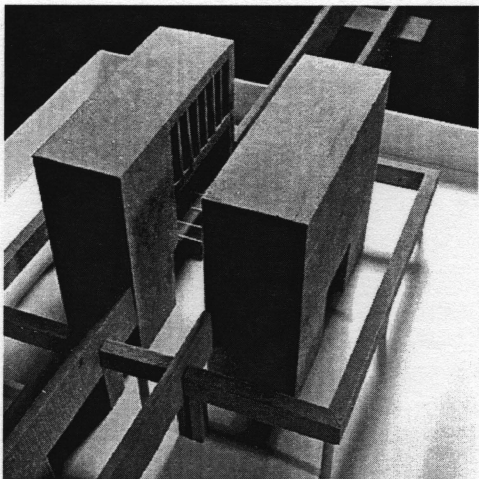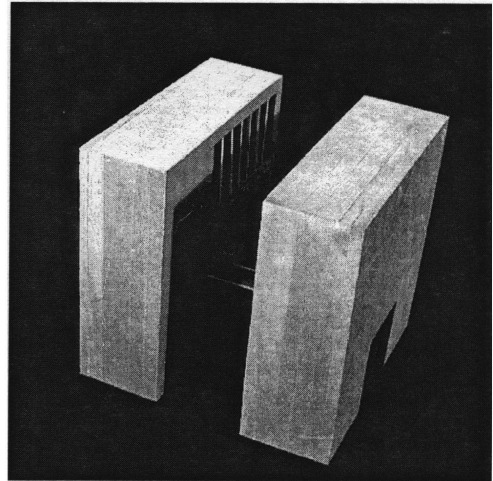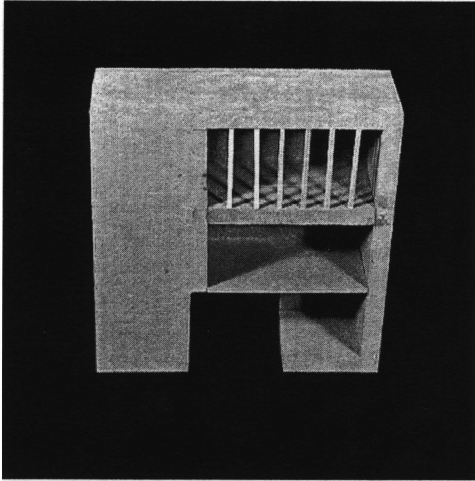
According to the structuralist understanding of the universality of the human being, a wide coherence of perception, resolution and manipulation can be supposed. Therefore, in the design process, the notion of geometry, which can be described as any proportional system or positional manipulation on surfaces or in space, establishes parameters and offers rules under which to operate.

The term *geometry* which stems from the Greek word *geometres* means surveyor or earth measurer. Its systemized form is called descriptive geometry (Pythagoras, Euklid). In architecture, solid geometry (stereometry) and the sectioning of solids (stereotomy) find importance.

The mathematician Hermann Weyl defines geometry as follows:

> "A geometry is defined by a group of transformations and investigates everything that is invariant under transformations of this given group." [5]

In Weyl's definition, the isolation of the invariant is the impact which geometry has on spatial relationships.

In *Towards a New Architecture* [4] Le Corbusier is speaking of geometrical truths as results which can be measured and recognized. By involving geometric rhythms he employs relations like the Golden Section, pleasant to "children, old men, savages and the learned."

In architecture, geometry will remain an empirical science, it can help the resolution of space and the isolation of the invariant. However, it remains still a question if the outcome by involving a geometrical underpinning in the design process is more a product of deviation from geometry or a compliance with it. Geometry describes the design rather than explaining it in terms of reason and determination.

The cube articulates itself through its surfaces. The surface is a shell which covers an inner cube. The two cubes are cut with square openings, revealing the planes of the inner cube. The square cut pieces are translated to the inside of the cubes. The position of the translated pieces change the spatial impression of the cube. It is no longer a cube.
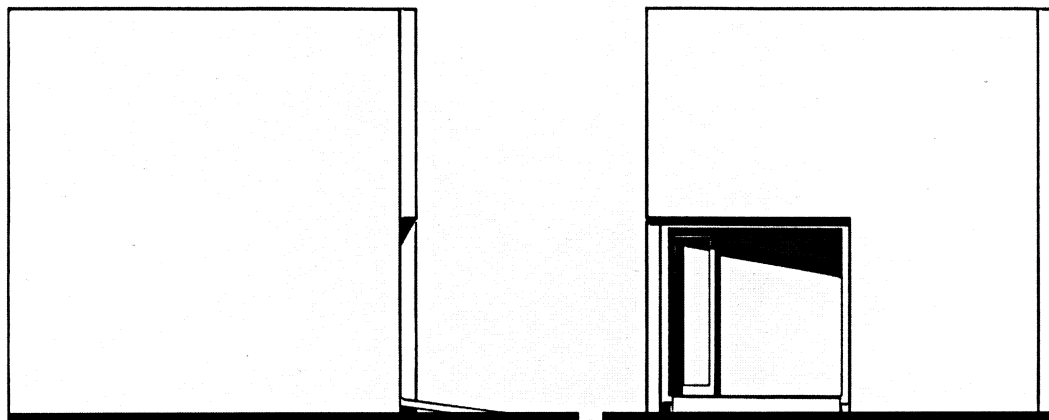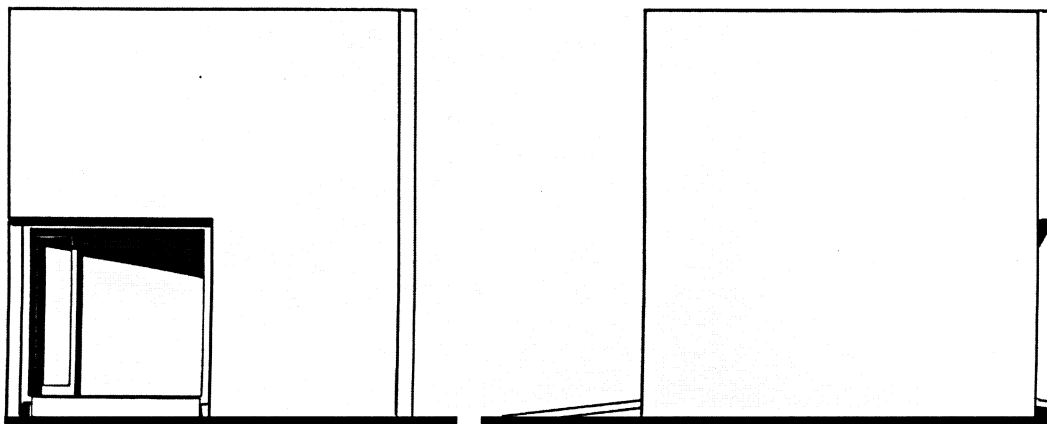
The pavilion, offering a large amount of wall surface, serves for exhibitions of paintings.
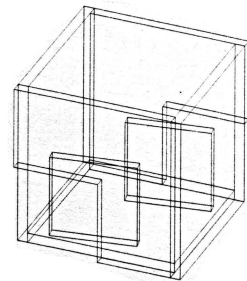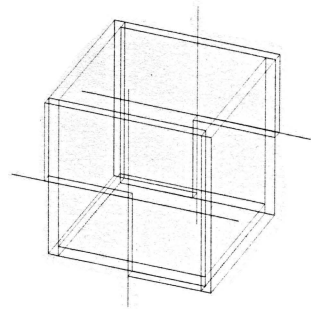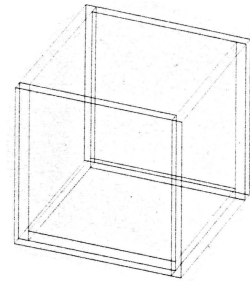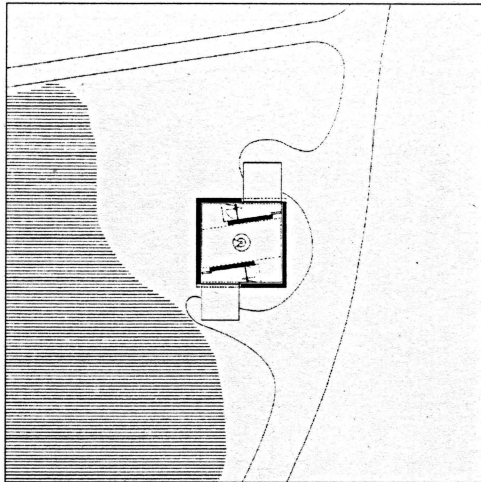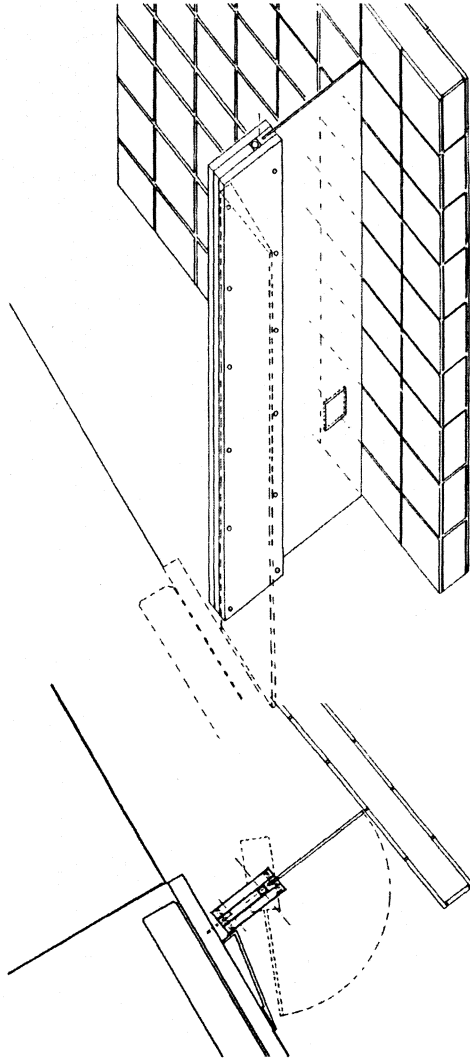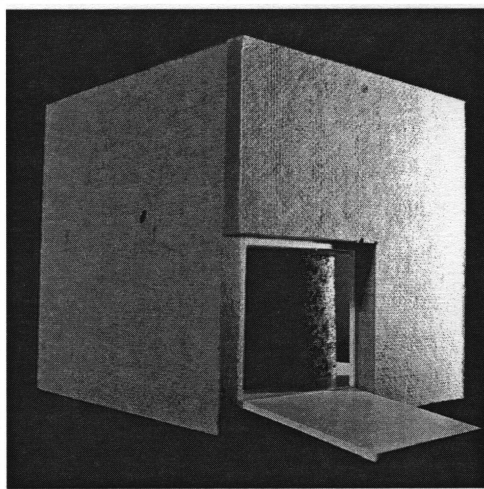
The Painting Cube
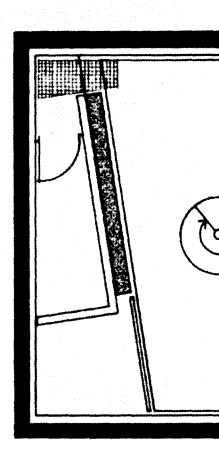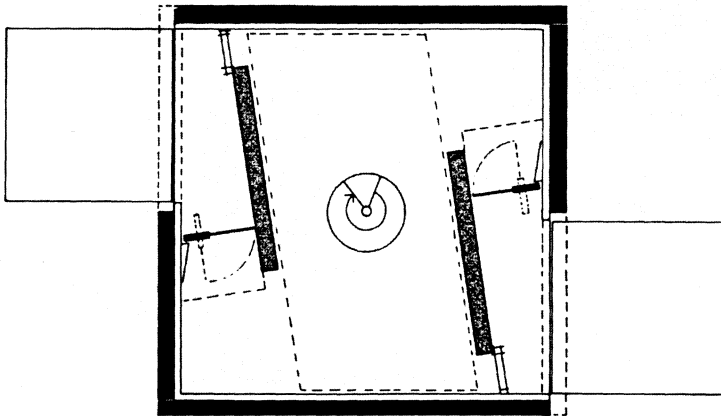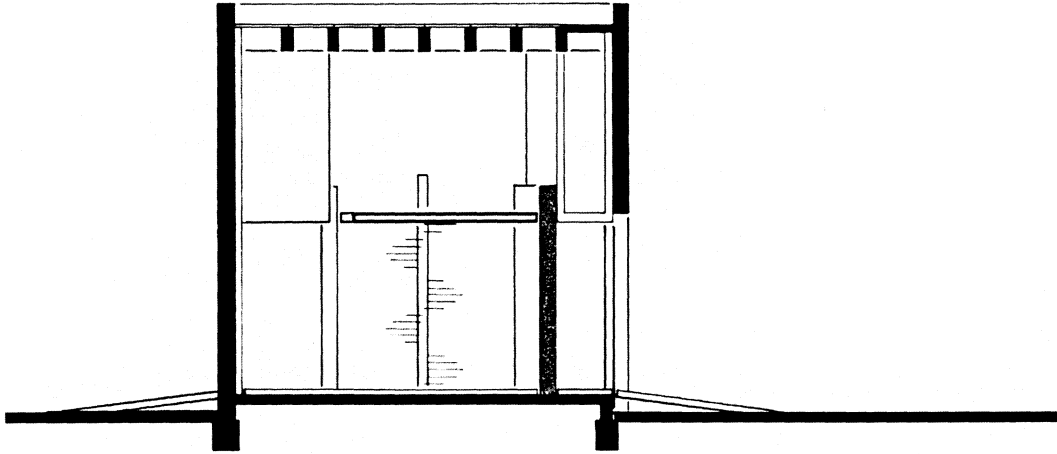
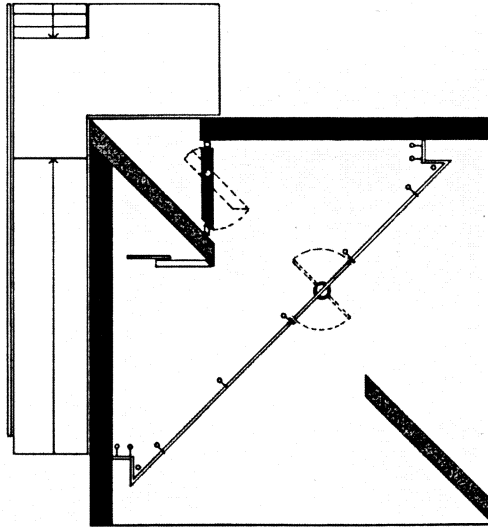
0 1 2   5 m
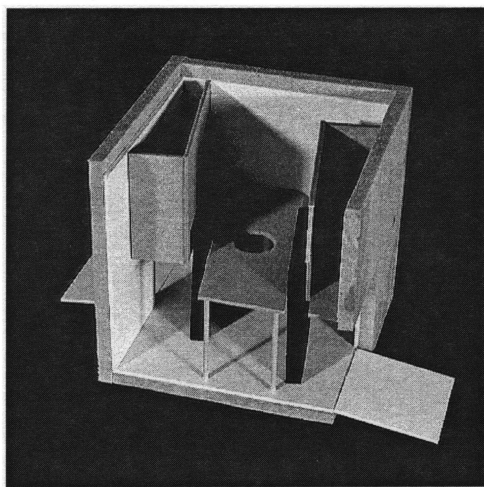
The Sculpture Cube

The cube expresses itself by its surfaces.
Their treatments at the outside and at the
inside are the same. Extracted planes open
the cube to the site.

The diagonals of the cube define the spa-
tial articulation: walls along the diagonals
accentuate the cube, a glazed wall divides
it in an inside and outside space. The spa-
tial impression in general remains a cube.
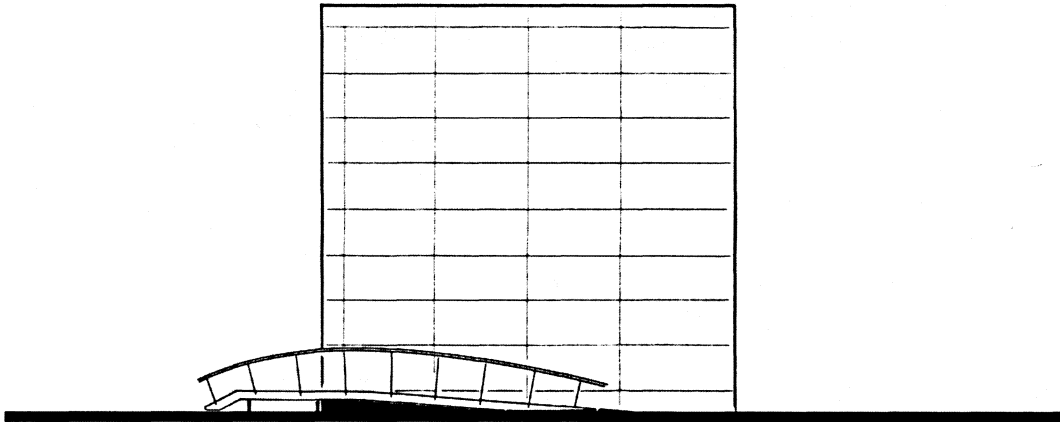
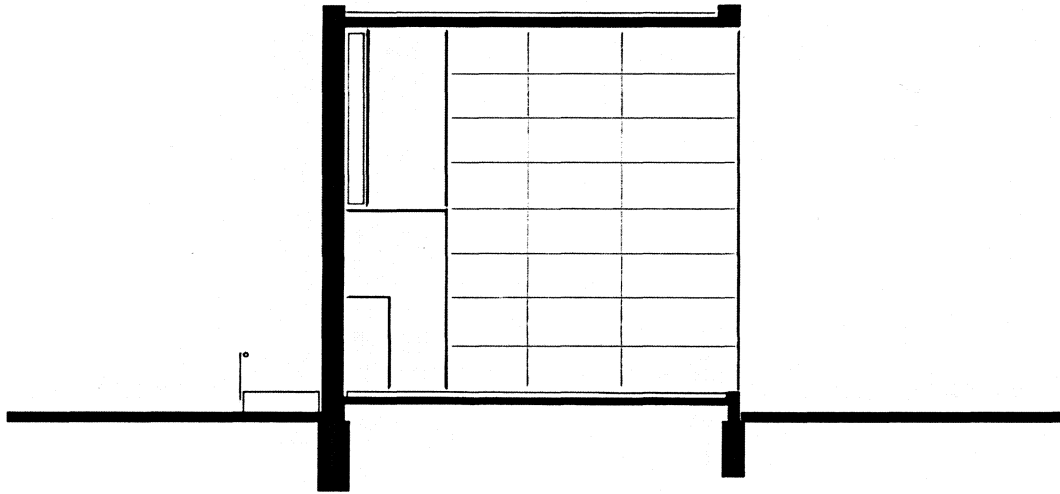The pavilion offers inside and outside ex-
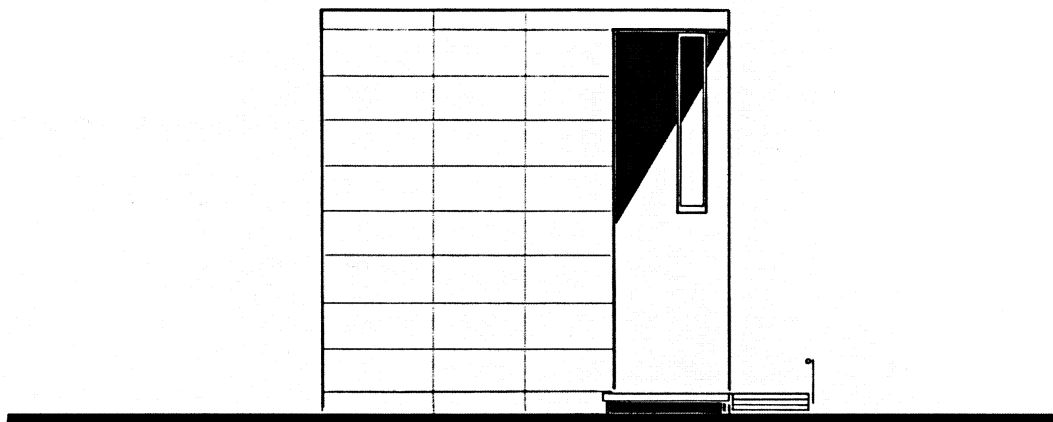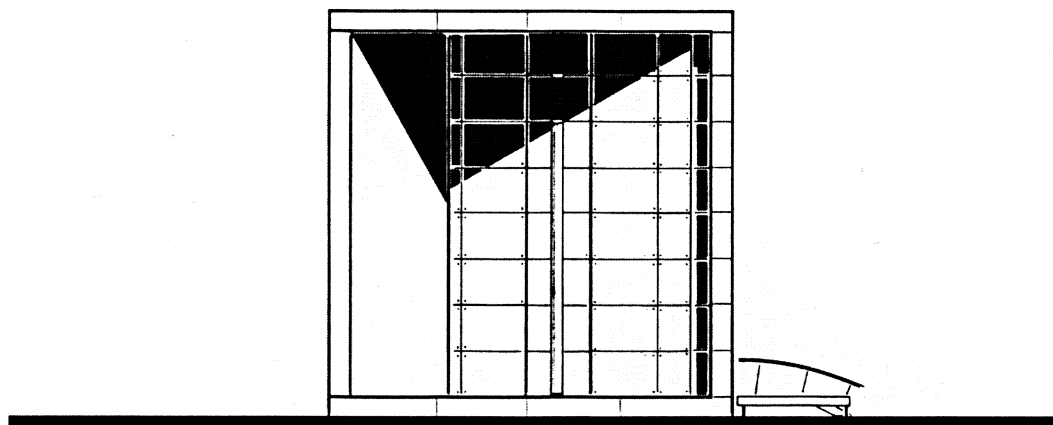hibition space for sculptures.
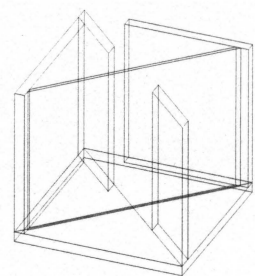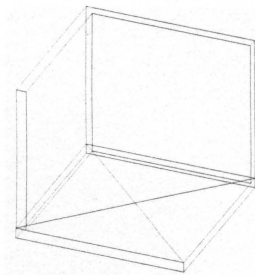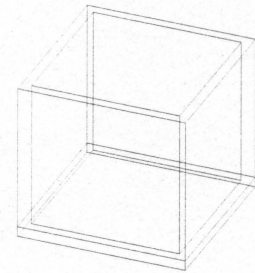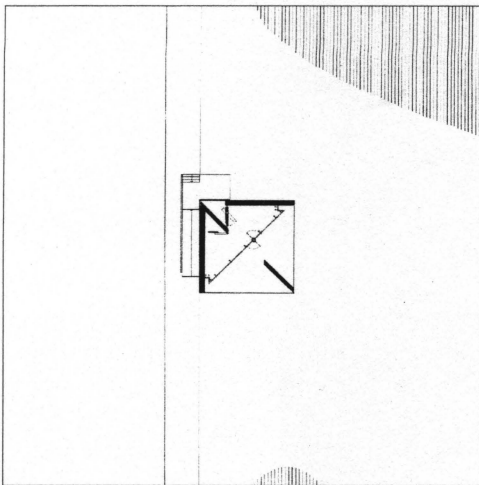
The Sculpture Cube

0 1 2   5 m

The Sculpture Cube

The Sculpture Cube

0 1 2   5 m
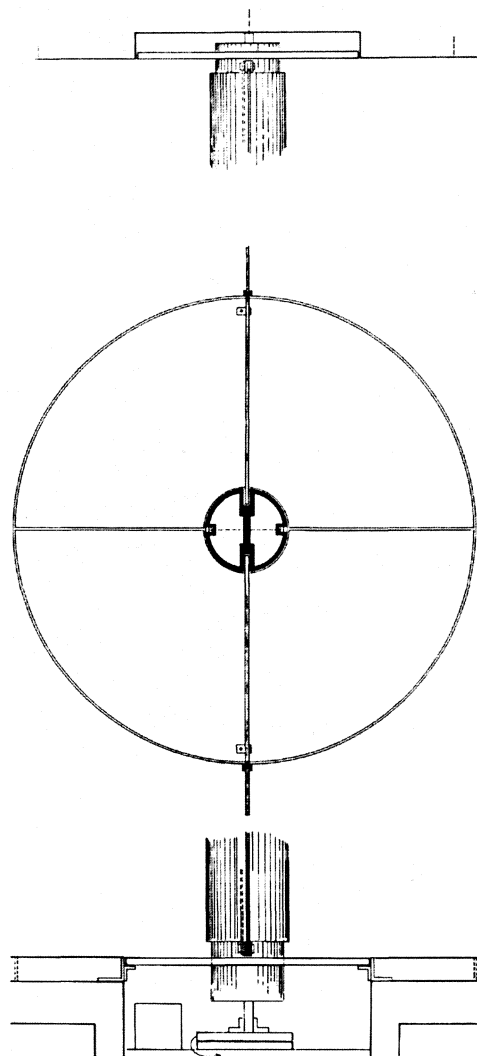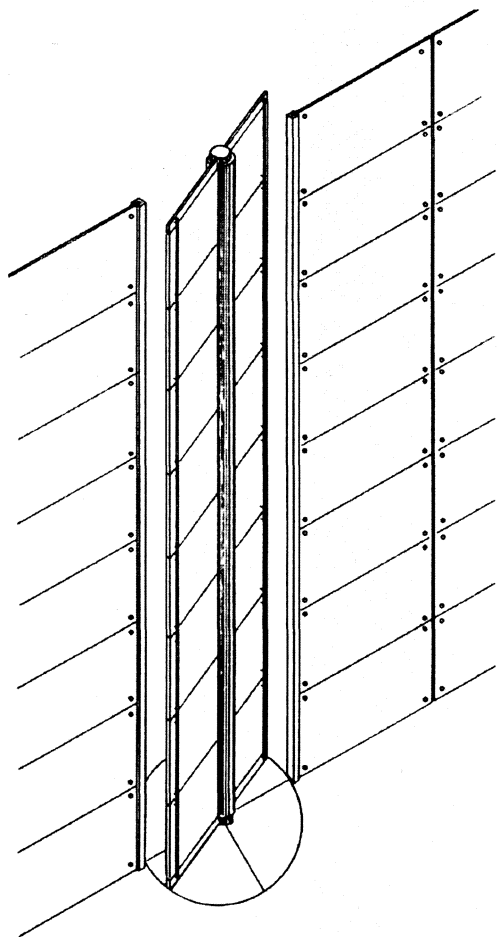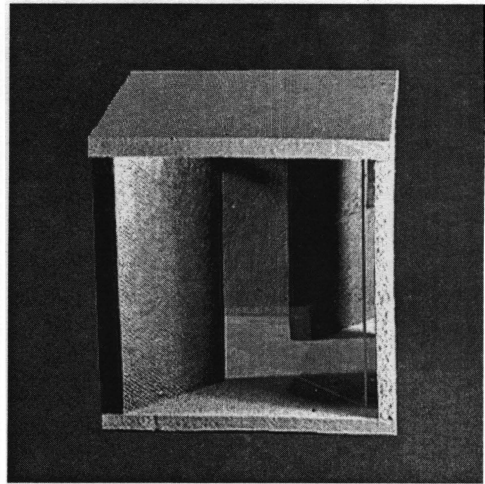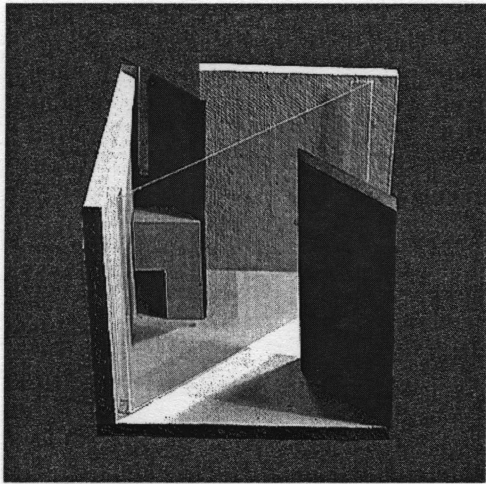
The cube in the cube - similar in construct,
but different in construction, both cubes
sit rotated to one another.

The pavilion is used for exhibitions related
to architecture.
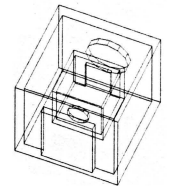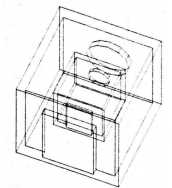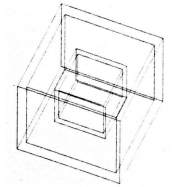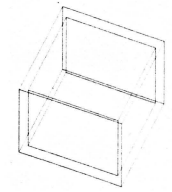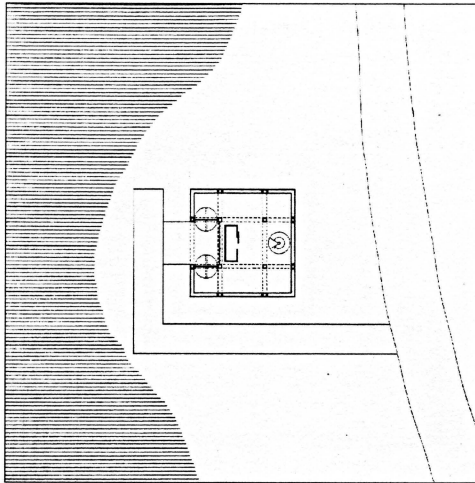
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The Architecture Cube

0 1 2   5 m
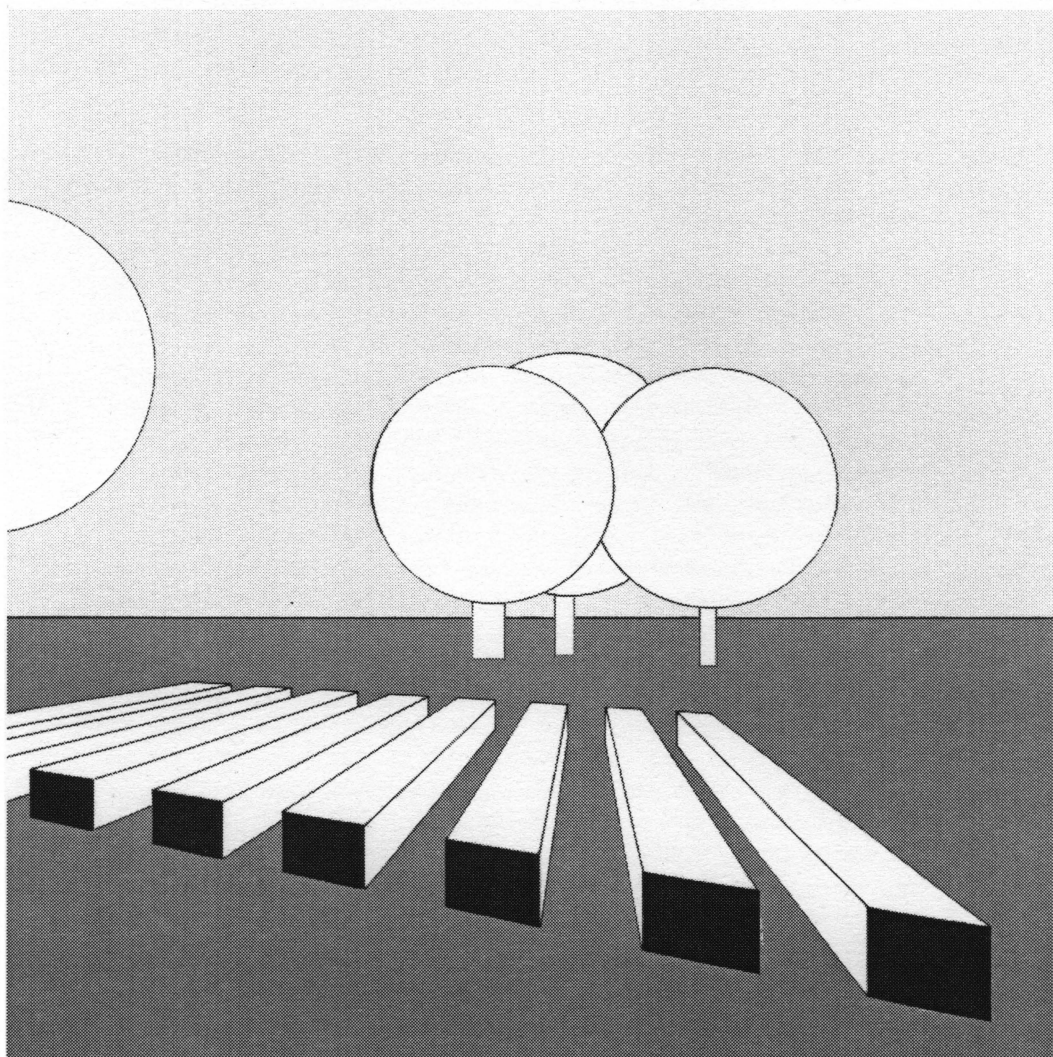
Conclusion: Every responsible designer and every artist who "makes" has to question his own work. In the design process many decisions have to be made and their correctness verified. In this context the search for inherent instructions is an appropriate way to come closer to a qualitative solution. This has nothing to 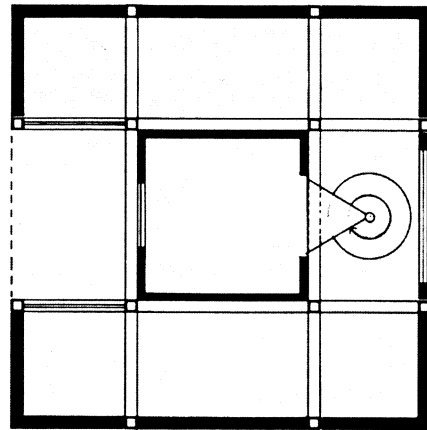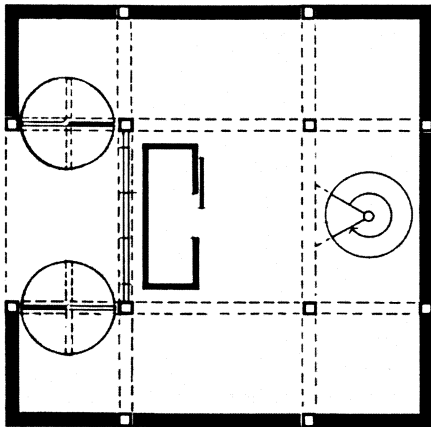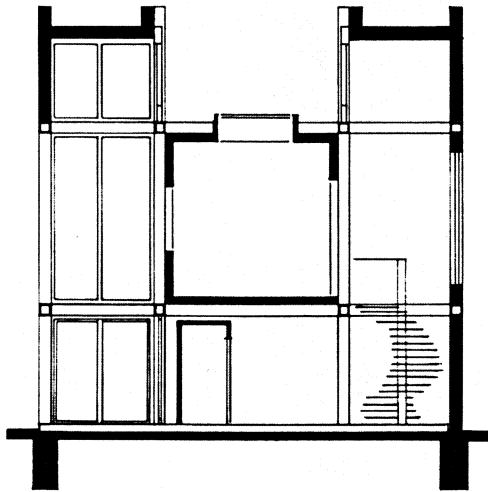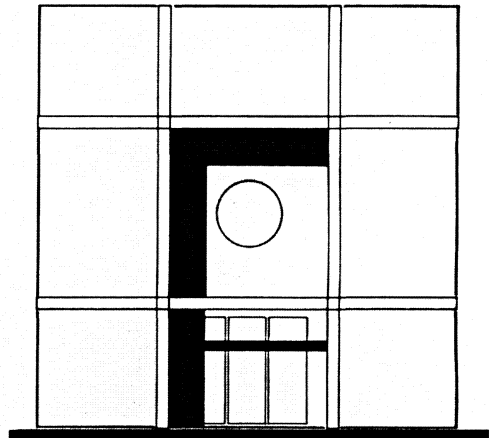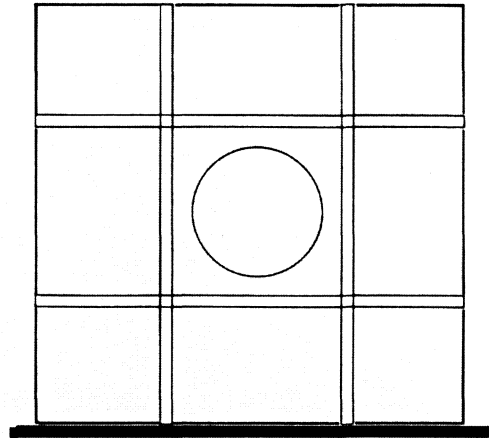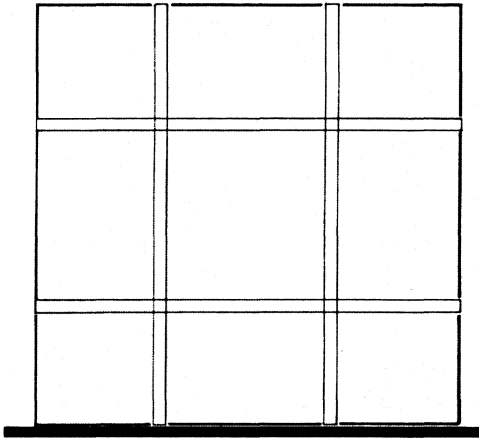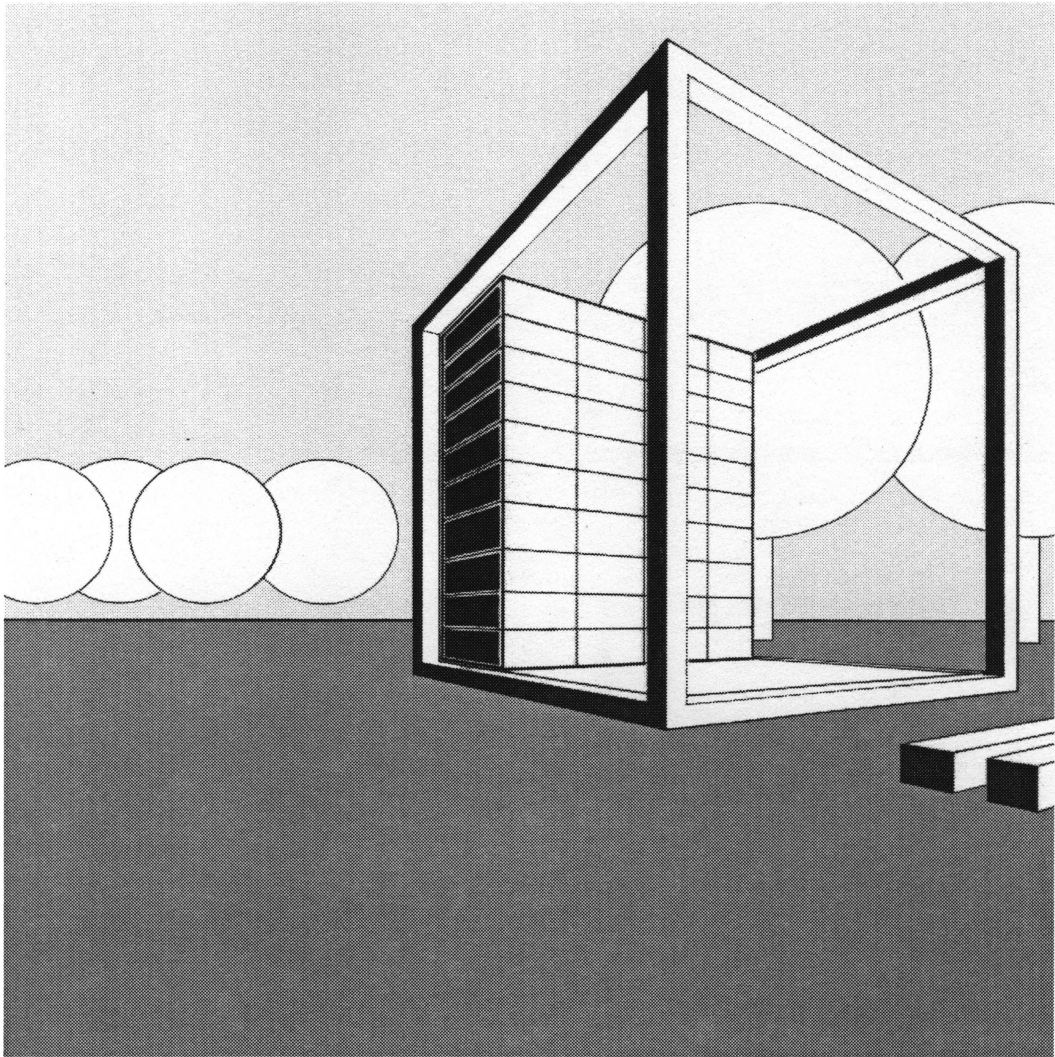do with the designer's ability to decide or his security. The will to use some kind of instructions in the design process is related to the deep belief that the work has to fit into a larger order. In this context, the structuralist movement and its understanding of the human conditions assuming the existence of *structures* could give useful guidelines. To reveal these structures and to respond to them is an important issue in the design process. Serial works, order, rules and geometry are, as mentioned, means to come closer to the structure of an object. Still, it remains an important question if the notion of structure and the reaction to it guarantee a satisfying result in architecture. In *Towards a New Architecture* Le Corbusier says: "The regulating line is a means to an end; it is not a recipe. Its choice and the modalities of expression given to it are an integral part of architectural creation". According to that understanding the designer is not caught in the constraints of the object's structure. He is the one who deals with it, manipulates it and, if necessary, contrasts to it. More than that he has to have a large amount of criteria to judge architectural qualities, such as conditions of light, space, material and texture, only to name a few. The designation of structures can serve as a framework in which the architect can develop his design intentions. The balance between eternal truth and the designer's skills forms the complexity of the design.

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