STEREOTOMIC VS. TECTONIC

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Materializing the concepts of tectonic and stereotomic can be an effective way to make architecture. Make visible the light and the heavy, and then contrast them.

We understand as stereotomic the architecture linked to the earth where it is born. It is architecture built with heavy materials that transmit their weight directly to the earth due to gravity. It is said stereotomic of a construction of load-bearing walls whose gravity is transmitted directly to the ground on which it rises. It is the architecture of the cave and the architecture of the podium.

We understand as tectonic the architecture that is detached from the earth and connects with it with the smallest possible surface. It is the architecture built with light materials that rests on the earth through punctual systems. As if it were resting on tiptoe on the earth. It is said tectonic of a construction of light structure of bars, whose minor but inescapable weight is transmitted to the ground on which it rests through points. It is the architecture of the hut and the architecture of the temple.

The use of these terms, stereotomic and tectonic, comes from Gotfried Semper which, rescued by Kenneth Frampton, have come down to us. In my case through Jesus Aparicio, when he was studying with Frampton at Columbia University.

Already in Pensar con las manos, I wrote a text about the stereotomic and the tectonic in Architecture, which I think is very appropriate here.

OF STEREOTOMICS AND TECTONICS IN ARCHITECTURE

In trying to clarify and make explicit the terms *stereotomic* and *tectonic*, not invented but learned, I am doing nothing more than trying to transmit something that has helped me in the architecture I have built over the years.

I use the terms *stereotomic* and *tectonic*, what Gotfried Semper calls "categories," because both for understanding what we architects do and how we do it, they are enormously effective.

Therefore, they are not abstract concepts applicable to architecture, as has been done with some philosophical systems that have so often been used in architecture in recent years in an interesting but sterile debate.

These are eminently architectural terms. Understanding that part of the building belongs to the earth (*stereotomic*) and that part is detached from it (*tectonic*), or considering that the whole building works in continuity with the earth, or, on the contrary, establishes with it the minimum contacts, can effectively help in the production of the new *architectural* organism.

Kenneth Frampton, in his book *Labor work and Architecture*, devotes a chapter to talk about these issues in an accurate way. He heads it, of course, with the well-known engraving by Abbé Laugier on the Primitive Hut. He takes up the text he published in 1990 in Architectural Design with the expressive title "Rappel a l'ordre, the case for the Tectonic". And he always makes it clear how the source of these terms is Gotfried Semper, who enunciated them in his most significant writings.

Frampton notes in the introduction to his book:

> Based on the hypothesis of the relative autonomy of architecture, the built form was as much structure and construction as it was creation and articulation of space. I attempt to recover the nineteenth-century notion of *tectonics*, in an effort to resist the current tendency to remain only in the scenographic effects.

And later Frampton makes explicit: "To evaluate twentieth-century architecture in terms of continuity and inflection, rather than in terms of originality as an end in itself." And he continues: "We must return above all to structural unity, as the irreducible essence of architectural form." And in the following paragraphs he proposes in a clear way the meaning of the terms *stereotomic and tectonic.*

In addition to these distinctions, Semper, who inspired Frampton, divides the built form into two distinct material procedures: the *tectonic* of the weft, in which the different parts are combined to form a single spatial unit; and the *stereotomic*, of the mass working in compression, which, when it forms a space, does so by superimposing equal parts. The term *stereotomic* comes from the Greek *stereos* which means *solid*, and *tomia* which means to *cut*.

In the first case, *tectonic*, the most common material throughout history has been wood, or its equivalents, such as bamboo, reeds and basketry work.

In the second case, *stereotomic*, the most commonly used material has been brick, or materials that work in compression in a similar way to brick, such as stone or adobe, or reinforced concrete.

There have been very significant exceptions to this division, especially where, on the basis of stability, the stone has been cut and placed in such a way that it takes shape and functions as a weft."

It is obvious that Frampton is referring here to that structural prodigy that is the Gothic in which a clearly stereotomic material such as stone adopts tectonic characters in a limit situation, almost miraculous, constituting a structure where the ribs of the masonry can be distinguished, as a premonition of what centuries later the Modern Movement would do in its breakdown of pillars and enclosure.

Although these facts are so well known to all, it is necessary to repeat them. We tend not to be aware of the ontological consequences of these distinctions, that is, of the way in which the framework of the structure tends towards the aerial, towards the

dematerialization of the mass, whereas when the form of the mass is telluric, it always settles deep within the earth.

The first tends towards light, while the other tends towards darkness. These gravitational opposites, the immateriality of the weft and the materiality of the mass, may well serve to symbolize the two cosmological opposites to which they aspire: heaven and earth.

Despite our highly secularized techno-scientific age, these two polarities will still long constitute the experiential boundaries of our lives. It is arguable that the practice of architecture has been impoverished, and to such an extent it has not, that we are wrong not to recognize these transcultural values and the way they are latent in all structural forms.

Indeed, these forms should serve to remind us, according to Heigegger, that inanimate objects should also evoke "being," and that, through this analogy with our own bodies, the body of a building should be perceived as if it were literally a physical being. This brings us back to Semper's consideration of the importance of joints as the primary architectural element, as the fundamental nexus around which the building comes into being, or rather, comes to be articulated, as a presence in itself. (This reference to Heidegger is taken from his well-known text "Building, Dwelling, Thinking").

Semper's emphasis on joints implies that this fundamental syntactic transition must be understood as a step from *stereotomic* base to *tectonic* structure, and that this transition is very essential in architecture. So it is these fundamental components that will mark the various periods of the culture of building. There is a spiritual value that resides in the "thingness" of the built object, so that the "generic joints" become points of "ontological condensation" rather than a simple connection.

APPROACH TO THE TERMS STEREOTOMICS AND TECTONICS

Stereotomic architecture is understood as that in which the force of gravity is transmitted in a continuous way, in a continuous structural system and where the constructive continuity is complete. It is the massive, stony, heavy architecture. The one that sits on the earth as if it was born from it. It is the architecture that seeks the light, that pierces its walls so that the light enters it. It is the architecture of the podium, of the base, of the stylobate. In short, it is the architecture of the cave.

Tectonic architecture is understood as that in which the force of gravity is transmitted in a syncopated way, in a structural system with knots, with joints, and where the construction is articulated. It is the bony, woody, light architecture. The one that rests on the earth as if rising on tiptoe. It is the architecture that defends itself from the light, that has to veil its hollows in order to control the light that floods it. It is the architecture of the shell. That of the abacus. It is, to sum it up, the architecture of the hut.

It is evident that this distinction is made on the basis of a "structural" consideration of architecture. I see more and more clearly every day the central importance of the

structure, load-bearing and load-transmitting and at the same time shaping and ordering the architectural space. The structure is the material response to gravity which, as I have so often repeated, "builds space", in the same way that light "builds time". The structure establishes the order of space.

GRAVITY

I will never tire of repeating that gravity "builds space". The load-bearing structure not only transmits the loads to the earth but, above all, establishes the order of space. The definition of the load-bearing structure, its establishment, is a key moment in architectural creation. We have already seen how Frampton defends this central role of the structure, of "structural unity as the irreducible essence of architectural form". For it is in this sense, in the gravitational, in the structural, that the concepts of the stereotomic and the tectonic have their clearest understanding.

In a *stereotomic* architecture, "gravity is transmitted en masse, in a continuous manner, in a continuous structural system where the constructive continuity is complete", where everything works fundamentally in compression.

Practically the entire history of architecture is made up of buildings in which this is the case. Massive stone or brick walls formed the enclosures. And when they reached the roof, arches, vaults and domes appeared as formal inventions capable of making everything constitute an enclosed space in continuity. Then, with the same materials, brick and stone, an attempt was made to lighten the artifice in order to be able to rise to greater heights. The powerful factories of the Romans, with their "chest" structures, such as the Basilica of Magentius or, even more sublimely, the Pantheon, gave way to the delicate "basket" structures of the Gothic. I have already pointed out how the main idea of the Gothic, to lighten the stone construction with ribs and plementeries, was nothing more than the will to reach greater height to take more light from above. It would seem to be a premonition of what in the 20th century constituted one of the central points of the architectural revolution: the separation of the pillars and the enclosure, of the load-bearing elements and the skin.

In a *tectonic* architecture, "gravity is transmitted in a syncopated way, in a structural system with knots, with joints, where the construction is articulated", where it stops working only in compression and "moments" appear. And just as the key buildings in the history of past architecture, stony and massive, belong to what we have called *stereotomic* character, another important part of architecture, the most recent, made with lighter materials, belongs to the *tectonic* field. The ephemeral condition of those light materials such as wood, means that when in the history of architecture the aim has been to achieve permanence over time, stone has basically been used. Until steel appeared more recently.

One of the key points of steel is to combine its maximum durability with its lightness, as well as its ability to resist the concentration of forces passing through it. The ability to

resist the structural stresses that architects and engineers call "moments". Mies Van der Rohe was well aware of all this and built his entire work with a clearly *tectonic* character. And the master also knew how ironic it was to seek permanence through elements, the tectonic, more perishable than the stereotomic. Perhaps to confirm that what remains are *ideas* over forms. As would happen for so many years with his Barcelona Pavilion before it was rebuilt, and yet it was a source of continuous teaching for all, with a force as great as that of the most imperishable Greek temples.

THE LIGHT

I have written many times about light. And I have always proposed that light in architecture "builds time", and that light is the material capable of putting man in relation to architecture. Hence my insistence on "Architectura sine luce nulla architectura est". For it is in this sense, in its relationship with light, that the concepts of the *tectonic* and the *stereotomic* acquire their clearest reading.

Stereotomic architecture seeks light. It pierces its walls so that, pierced by the sun's rays, it can trap the light inside. The windows here will be excavations in the walls to bring the light inside. And skylights cannot be opened in its upper plane until the appearance of flat glass in larger dimensions. Only the Pantheon, a place reserved for the gods, dares to open this upper hole to the open sky. The courtyards will then be the intermediate mechanisms to bring light into the interior of the buildings, always through the open windows in their vertical perimeter walls.

In many of the Romanesque churches, the excavation of the windows in the walls, and the orientation of the building itself, were made based on a study of the path of the sun throughout the year, so that the quantity and quality of light and the time when it would enter each space was known precisely.

And if we have noted how the Gothic in its relationship with the structure makes a "tour de force" to achieve that a stereotomic organism has tectonic airs, it also does so in relation to light. It opens its vertical plementeries to the top, and fills them with glass to allow light to flood into those generous spaces. The beautiful Sainte Chapelle in Paris is a clear example of what we say. And then all the Baroque is basically a brilliant exercise in the search for light.

On the contrary, a *tectonic* architecture, pure bone, will need to be protected from the light that floods it. If steel had managed to reach a delicate bones at the limit of the minimum expression, it will be the added vertical enclosure that will serve as a mediator between the interior space and the sunlight that now fills everything. This brings to mind the beautiful glass skyscraper that Mies Van der Rohe never built. But it remains forever in our minds. A pure structure with very thin pillars that are overlapping and free in the form of its undulating plant never equaled. And a glazing that is a hymn to transparency and whose reflections attest to the formal freedom of that plant. But everything calls for an effective control of light. This is what Mies would later do in his paradigmatic Crown

Hall at the IIT in Chicago: the first half, the lower half of its glazing would be translucent. This is tectonics, an architecture that defends itself from light, that in order to control it must veil its openings.

CONCLUSION

I think that in the coming years, this mechanism of architectural analysis through the categories of the *tectonic* and the *stereotomic*, in short a mechanism capable of concretizing the themes of Light and Gravity, can be enormously useful to architects both in developing their ideas and in setting up the works that materialize them.