

# Le Corbusier and a New Structural System as the Germ of the Modern Grammar

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**Abstract:** The opposition between the terms *carcasse* (carcass), conceptualized by Auguste Perret, and *ossature* (frame), proposed as an alternative by Le Corbusier, gives rise to the exploration of the capital contribution of the “Dom-ino” prototype as the basic and inescapable condition for an aesthetic operation. Some issues addressed are: the importance of the question of the structure—which remains implicit in *Toward an Architecture*—as key to a quest for the specificity of architecture; Le Corbusier’s troublesome relationship with Perret and the debates between them, which convey two different ways of understanding the potential contributions of concrete to the redefinition of architectural vocabulary; the “Dom-ino” system considered as a new structural type in the sense ascribed to this category by Violette Duc; the topic of the *abri souverain* (sovereign shelter) fit for all programs, which triggered typological invention; the ways in which Le Corbusier plays with Gottfried Semper’s *Urformen* and, finally, how this new structural type anchors Le Corbusier’s radical redefinition of the elements of the discipline, the making of a new grammar.

**Key words:** Structure, modern architecture, concrete, structural type, architectural vocabulary.

## 1. Introduction

“Finding a free, comprehensive structural system applicable to all the programs and that allows to use all the materials and is suitable for all applications, from the most complex to the most simple ones; cover this structure in a way which is nothing else but the expression of the system itself; decorate the structure without ever contradicting it, explaining it by means of the combination of profiles outlined by using a geometrical method which is a corollary of the method used to conceive the ensemble; apply to the architecture—i.e., to the structure covered by an artistic shape—the stability principles which are most simple and understandable to the eye... In short, this was what our secular school at the end of the 12th century did” [1].

“Over the centuries, architecture has left pure systems. These systems constitute the different

architectures of history. These systems extend their effects from the house to the temple. Every time an age has failed to elaborate a system, the architectural moment has failed to exist. These systems entail the rigorous solution to a statics problem: each architecture is linked to a type of structure” [2].

In the 19th century, hand in hand with the possibilities associated with the changes in construction technologies, the issues of the structure and of the relationship between the shape and the support system were topics that structured the debate between essence and appearance, simultaneously with the questioning of historical styles and the erosion of the aesthetic grounds of Vitruvianism. They represent a clear progress towards the acknowledgment of the resources and the constituent laws of architecture as a discipline with a nature and a purpose independent from social conventions or tradition.

The issue of the structure is key for modern architecture’s first theorizing efforts, under the operative hypothesis of a need to focus on the specificity of architecture’s characteristic resources as

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a strategy to explore in greater depth the autonomy of a self-referential art. We will analyze the importance of the issue of the structure in *Toward an Architecture* (1923), which was perhaps the first doctrine for a new architecture.

What bigger evidence of a search for the specificity of means than the very notion of “purism”, in the light of which the articles contained in *Toward an Architecture* were written? In the concerned view taken by Amédée Ozenfant (who was following Stéphane Mallarmé), purism was a call to clean the plastic language not only of representative connotations, but also of terms parasitic upon literature or of any appeal to science—cubist sin [3]. Le Corbusier reinterprets purism for architecture in formal terms and advocates for a purity associable with geometry and the smooth surfaces typical of industrial production, leaving behind any traces of craftsmanship or of the heterogeneity of the natural material.

This was his contribution to *Après le cubism* (1918): the collective fierceness of a new society, forged in contact with the clarity and power of machinery and its products, the shapes of which, rigorously conditioned by calculation and accurately executed, would have determined, according to Le Corbusier, a new way of seeing and new aesthetic demands<sup>1</sup>. This was exactly what the use of reinforced concrete was offering to architecture: an artificial material, homogeneous and tested in the laboratory, which can be strictly determined by means of calculation and offer an accurate execution through the use of metal formwork, which, reinforced by the homogenizing action of roughcast, can obliterate any reference to the hand of man.

However, despite Le Corbusier’s insistence that reinforced concrete would start a revolution in architecture, the issue of the structure is not raised in any of the “Three Reminders to Architects” which organize *Toward an Architecture* [4]. Moreover, the

term only appears three times, and in a nonspecific sense, within a text that repeatedly rejects any attempt to assimilate architecture to construction—“Architecture is an artistic fact, an emotional phenomenon that is outside questions of construction, beyond them. Construction: That’s for making things together. Architecture: That’s for stirring emotion” [4]—or to enhance the expressive manipulation of architecture as tectonics—“Emphasizing construction is fine for students at the Arts et Métiers who want to show what they are worth. Our good Lord indeed emphasized wrists and ankles, but then there’s all the rest” [4].

However, not few people have pointed out that Le Corbusier’s normative codification in “The Five Points of a New Architecture” (1927) can be read as a transformation of the new building techniques into architectural resources, a starting point for a new aesthetics and for the reformulation of the foundations of the discipline [5, 6].

## 2. Frame versus Carcass

“Through their works and, sometimes, in our discussions, the Perrets told me “You don’t know anything”. Through my study of the Romans, I became aware that architecture was not a matter of an eurhythm of the form but something else... But what? I still was not sure. Then I studied the mechanics and, after that, the statics... and today, I angrily take notice of the gaps on which I have based my science of modern architecture. Angrily, but yet with joy because I finally get to know where the good thing lies: I studied the forces of matter. It is hard but beautiful—this mathematics so logic and perfect. With the Perret brothers at the construction site, I saw what concrete is and the revolutionary shapes it demands. The eight months I spent in Paris screams to me “Logic, truth, honesty and leaving behind any dreams of an art of the past! Eyes up and forward!” One talks about an art of tomorrow. This art will happen. Because humanity has changed the way they live, the way they

<sup>1</sup>Ozenfant, A., and Corbusier, L. 1921. “Le purisme.” op. cit.: 99.

think. The program is new. The dawn of this art is shining because from iron—a material subject to destruction—reinforced concrete has been made, an amazing creation that, because of the monuments it will allow to build, will be a bold landmark in the history of peoples.”<sup>2</sup>

The importance of Auguste Perret’s influence cannot be left aside when considering the issue of the structure in *Toward an Architecture*.

We know that the notion of “structure” was introduced as topic of the discipline by Eugène Viollet-le-Duc—structure as internal reason, as a principle that generates and organizes the shape in accordance with the dominant static logics in a construction system. This internal reason would be the basis for establishing aesthetic registers and the supreme value of style, in a clear step forward towards the recognition of the discipline’s constituent laws and resources, of its nature and purpose beyond tradition or social conventions.

This viewpoint is not very different from Karl Bötticher’s notion of *Tektonik*, which he states in his reflections on the dialectics between *Kernform* and *Kunstform*: a relationship of a necessary and constitutive interdependency, wonderfully achieved in Ancient Greece, between a “core” which resides in the

material, static and functional aspect, and an artistic “skin” which expresses and high lights the function of the core with which it is intimately linked [7]. With this, Bötticher issues a moral demand that resounds once and again in Le Corbusier’s notes.

Tracking in Le Corbusier’s thinking, the organizational survival of these 19th-century conceptualizations—which, many times, happen on the quiet, with transformations and changes of meaning<sup>3</sup> also places us in the historiographic debate on his formative years. We refer to the alleged dominance of idealism over any flirtation with the French rationalist tradition, which would have been reduced to a weak note or reinterpreted as absolute principles underlying Nature [8-10]. It is a debate in which the importance of Le Corbusier’s references to Perret and the concepts and registers of constructive rationalism are at stake.

Perret is the interlocutor in *Toward an Architecture*. He is the ghost behind Le Corbusier’s reference to the aesthetics of the engineer with which he decides to start the compilation. Perret’s concept of carcass is the one that organizes—by means of a subversion, but without a change of register—Le Corbusier’s arguments around the issue of the structure.

It was through the Perret brothers that Le Corbusier came into contact with the French rationalist tradition and, in general, with architecture as a discipline. We know that their relationship started in July 1908, when Le Corbusier joined the studio under a work schedule which left the afternoons free for him to visit libraries and museums and take courses. It was Auguste who acquainted him with mathematics, the writings of Viollet-le-Duc (Le Corbusier bought the *Dictionnaire Raisonné* with the money from his first salary), Auguste Choisy and Adolf Loos, and who introduced

<sup>2</sup>“Les Perret... ils me dirent -par leurs œuvres et parfois dans des discussions—Vous ne savez rien. Je soupçonnais par l’étude de Roman que l’architecture n’était pas une affaire d’eurythmie des formes mais... autre chose... quoi? Je ne savais encore bien. Et j’étudiai la mécanique, puis la statique (...) et aujourd’hui, avec colère, je constate les creux dont est formée ma science d’architecte moderne. Avec rage et joie, parce que je sais enfin que là es le bon, j’étudie les forces de la matière. C’est ardu mais c’est beau, ces mathématiques, si logiques si parfaites. ...Sur le chantier des Perret je vois ce qu’est le béton, les formes révolutionnaires qu’il exige. Les huit mois de Paris me crient: logique, vérité, honnêteté, arrière les rêves vers les arts passés. Les yeux hauts, en avant! ...On parle d’un art de demain. Cet art sera. Parce que l’humanité a changé sa manière de vivre, sa façon de penser. Le programme est nouveau. ...L’aurore de cet art devient éblouissante parce que du fer, matériau sujet à la destruction, on a fait du béton armé, création inouïe et que dans l’histoire des peuples par leurs monuments marquera un jalon hardiesse.” Jeanneret, Ch. E. 1908. Letter of November 22nd to Charles L’Eplattenier. Jenger, J., 2001. *Le Corbusier. Choix de Lettres*: 65. Berlin: Birkhäuser.

<sup>3</sup>In *Toward an Architecture*, Le Corbusier explains what he still has not imagined. He lays down the principles of a new aesthetics before he moves on to concrete projects where these principles are put to the test and can serve as examples. Thus, he has to resort to the work of engineers, to the products of technology, to the poetics of avant-garde movements—but also to concepts from the nineteenth-century debate on architecture as shortcuts to lead a way that he can barely make out.

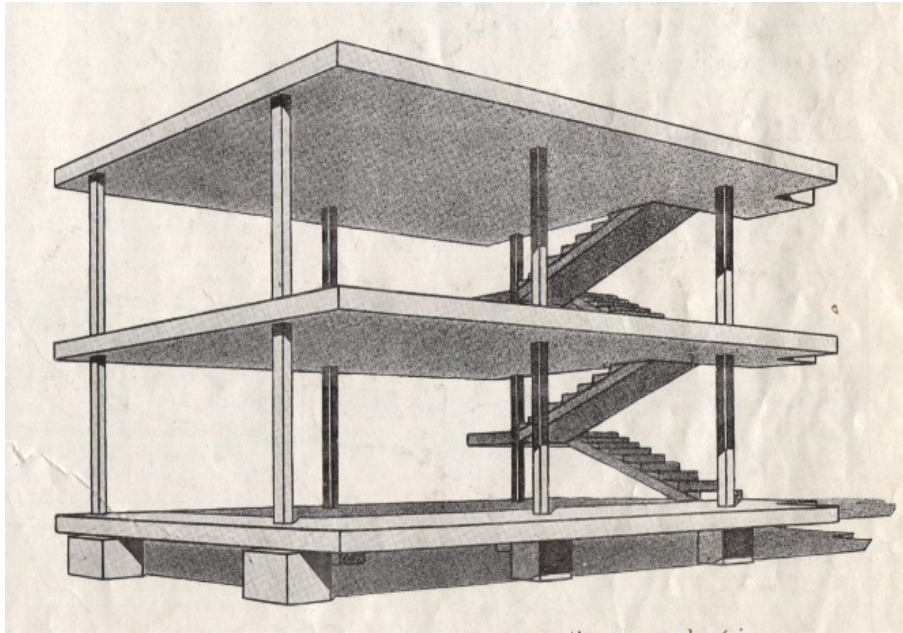


Fig. 1 Perspective of a “Dom-ino” module, 1915 [12].

him to Ozenfant and Tony Garnier. To Le Corbusier, Perret was a father figure, and he would constantly turn to him for guidance and advice—even with regard to the “Dom-ino” system; Perret also supported Le Corbusier’s *L’Esprit Nouveau* magazine project by being a member of the publishing society.

Their relationship was full of tensions, as can be easily noticed in several *Toward an Architecture* statements where Le Corbusier contradicts Perret’s principles. The conflict became more virulent when Perret attacked Le Corbusier in an interview by saying that he was “a disciple of a school of volume creators”. This sparked off a fierce public debate that was resolved through the press and focused on the role of the structure in the process of the formal description of architecture, on the expression of materials, on the *fenêtre en longueur* and the elimination of cornices. What was at stake was Le Corbusier’s will to differentiate himself from Perret’s continuity with tradition. The conflict eventually led to a breaking-off of the relationship around the year 1925, with Le Corbusier accusing Perret of being, among other things, a simple engineer and inviting him to mind his own business [11].

As we have already mentioned, Le Corbusier

borrowed the notion of *carcasse* (carcass)—only bones, no flesh, no modeled details—from Perret. This notion led Le Corbusier to become absorbed in a reflection on the building itself.<sup>4</sup> The carcass as an element which is beyond contingencies, is determined by permanent factors (like the materials and the laws of stability) can be assimilated to Charles Perrault’s concept of “positive beauty” and resounds in the “Dom-ino” system and its purist retrieval in *Toward an Architecture*.

Perret conceives the notion of carcass in terms of woodwork (*charpente*)—first translated into stone, then into steel and, at that time in France, into reinforced concrete.<sup>5</sup> This is why, for him, the framework—not only the support frame but also the enclosure frame with its infilling areas—is a formal

<sup>4</sup>To this, Le Corbusier refers with the note he wrote on a page of the first volume of the *Dictionnaire raisonné*: “These lines allow to see that this art lives because of its carcass. It is also a monolith, a cage of iron wires—where vertical and oblique pressures are located in the cement of the Roman walls and in the steel bars of concrete. Or, August Perret would say to me, ‘If you have the carcass, you have the art.’” Reproduced by Turner, P., *La formation de Le Corbusier*. op. cit.: 63.

<sup>5</sup>Auguste Perret, A. 1952. *Contribution à une théorie de l’architecture*. Paris: Cercle d’études architecturales. Reproduced in Roberto Gargiani, R., 1993. *Auguste Perret 1874-1954. Teorie e opere*. Milan: Electa: 43, 46.

issue, and it enables him to reintroduce composing topics of classic or gothic inspiration and to define interior space in accordance with the rhythm and the modulation of the support frame and the enclosure frame.

In Le Corbusier's thinking, this relationship between carpentry and the classic language is lost. The carcass, that monolithic reinforced-concrete cage, no longer defines the outer shape. The *ossature* (as structural skeleton) and the membrane (as architectural external "skin") are now considered as two separate entities, different in terms of material nature, resolution and construction role. Thus, the internal space no longer depends on the vertical structural frame, and the external skin of the building dissolves the presence of the *ossature* through the veil of a surface without sutures, free to get involved in an autonomous plastic interplay since it is now free from any tectonic reference.<sup>6</sup>

While for Perret, the reference to carpentry was based on the need of a wooden form work that would work as the negative of the reinforced concrete carcass, Le Corbusier makes several extreme attempts to break this bond. He resorts to complex technical tricks to get rid of the wooden formwork and to set the structural concrete frame free from carpentry as a model, all this without being disloyal to the rationalist maxim that establishes that the shape cannot but be the result of the exact construction nature of the thing.

### 3. Revolution

<sup>6</sup>Within Perret's logic (as well as in the examples of structural grid which define the shape and the internal space in the industrial buildings chosen as examples by Le Corbusier in the illustrations of "The second reminder: Surface"), the showing up of the carcass seemed to achieve, by means of the radical exposure of the *Kernform*, the coherence between essence and appearance pursued in the nineteenth century. By establishing that frame and membrane constitute two independent orders, Le Corbusier avoids reopening the discussion: the external "skin" would not be a *Stillhülse* which has the mission to reveal the logic of a structural *Kernform*. As Oechslin points out, instead of penetrating the essence of the shape, the eyes rest on the new exterior: the surface has been set free and constitutes a corporeal and pure volume that moves, the quality of which must be ruled by a proportion-regulating system typical of pictorial composition.

"Architecture finds itself with an amended code. If we set ourselves against the past, we see that the old codification of architecture, weighed down by forty centuries' worth of rules and regulations, ceases to interest us, it is no longer our concern; there has been a revision of values; there has been revolution in the conception of architecture."<sup>7</sup>

We know that, once and again, Le Corbusier held that the laws of architecture are always the same and that they do not change along with the transformation of technical means, within a logic that seems to refer more to absolute laws present in all ages under different forms than to positive principles—as is the case with a very similar statement by Viollet-le-Duc.<sup>8</sup> However, both reinforced concrete and, later on, *everite* and other innovative techniques for the construction of light partitions (slag, plaster, compressed straw, wood, laminated sheets) arose his interest and stimulated him to devise a construction system which could be industrially exploitable in the promising post World War I reconstruction scene.

We refer to the "Monolythe" system—later on, "Dom-ino system" with its connotations of house and flexible assembly. In *Toward an Architecture*, Le Corbusier relegated the subject to the last two chapters dealing with mass production housing [13]. However, the "Dom-ino" system, reinterpreted as the core of purism in architecture, functions as the through-line and justification of the whole book.

Stimulated by the mass destruction of houses in Flanders, Le Corbusier conceived the "Dom-ino" system in the solitude of Chaux de Fonds in late 1914. It was a construction system devised with the technical support of Max Du Bois, a friend engineer who had

<sup>7</sup>Le Corbusier, *Toward an Architecture*, op. cit.: 304.

<sup>8</sup>"Let's learn to know the art of ancient times better; by analyzing it patiently, we will be able to lay down the foundations of the art of our century and we will become aware that along with the material data that change all the time, there are invariable principles, and that history not only arises the curiosity but also reveals, to those who know how to search for them, treasures of knowledge and experience that the intelligent man must use." Viollet le Duc, E., "Proportion". *Dictionnaire Raisonné...* op.cit. Vol. VII: 561.

translated Emil Mörsch's book on reinforced concrete and with whom Le Corbusier went into partnership to patent the system and obtain commercial profit from it as a way to launch his career in France.<sup>9</sup>

It is not worth tracking and discussing the potential references for each component. We will focus on the changes that Le Corbusier introduced with respect to similar structural proposals inspired on the possibilities open by reinforced concrete, since these changes are the ones which allowed him to make the "Dom-ino" frame the key to a redefinition of the vocabulary and the syntax of a new architecture.<sup>10</sup>

The system is supported by Le Corbusier's intention—which is clear from the very beginning—to consider, in a radically independent way, that frame and membrane constitute a vital separation of powers.<sup>11</sup>

Such independent stance is not limited to the rejection of the resolution of the supporting structure and the enclosure on the same plane: Le Corbusier also rejects the vertical window due to its ambiguous status of opening in the wall or gap between two supporting

elements.

With a reformulation made possible by the new construction procedures, Le Corbusier, in a way, makes use of the *Urformen* identified by Gottfried Semper, each one of them associated with precise technical operations. The membrane (*Wand*), as the enclosure and the light partitions that delimit and orientate the interior space through the figurative inscriptions of horizontal movements (*la marche* in depth), is textile: by eliminating any reference to the material; the roughcast transforms the membrane in a painter's canvas, in a freed surface that can be treated with the compositional resources of Purist painting.<sup>12</sup> The frame would be the roof's support (*Decke*) translated into horizontal slabs. The concrete dices—later on, the pilotis and the free ground plan, would serve as mound (*Mauern*), protecting the building from the damp and differentiating it from the soil.

There are five other attributes of the "Dom-ino" system: (1) The rectangular proportion of the slabs in order for them to be attached to one another by the ends, with the possibility of orienting them in different ways; (2) The cylindrical character of the six pillars, the autonomy of which is reinforced by the elimination of all the elements of passage with respect to the bearing and support planes, for which lightened beamless slabs would be used; (3) The recessed location of the pillars with respect to the longer side of the projecting slab, in order to make the facade (as well as internal partitions) totally independent from the structural frame; (4) The emphasis on the smooth character of all the elements, reinforced by the use of roughcast in order to eliminate any reference to the material nature; (5) The replacement, of course, of the pointed roof by a terrace.

Many of these architectural choices negatively affect the structural behavior, so much so that Perret warned Le Corbusier that it would be impossible to build such

<sup>9</sup>Although in *Toward an Architecture* no credit is given to Du Bois, his collaboration was important: he prepared the construction details with the engineer Juste Schneider, he discussed the terms and covered the costs of the patent request.

<sup>10</sup>We refer not only to technical solutions, but also to the devising of prototypes suitable for mass-production housing during the post-war reconstruction. In this regard, in his carnets, Le Corbusier transcribes a quotation from D. Adshead, reproduced in Benoît-Levy's book, on the urgent need of a totally different type of building, leaving aside sloping roofs and glass-paned windows. This new type would express the energy and refinement of urban life in accordance with the possibilities offered by the machine as new tool. It would be in accordance with a new urban design, understood as art and responsible for the communication of the ideas and emotions typical of the spirit of a modern industrial era. Cf. Turner, P., *La formation...* op. cit.: 144.

<sup>11</sup>"Construction systems suitable to be juxtaposed according to infinite combinations on the ground plan thanks to a uniform sub-multiple module for monolithic reinforced concrete skeletons, with monolithic and smooth slabs. A separation of powers over 6-pillar foundation which permits, through (resistance) calculations, the construction at any point of any type of enclosures in the facade or in the interior. Special characteristics: the interior pillars do not appear in the facade. Interior distribution. To be intervened later on through automatic casting, allowing to build a house in 20 days." Le Corbusier, 1915. Brevet. p. 120, carnet A-2. Reproduced en Turner, P., *La formation...*, op. cit.: 218.

<sup>12</sup>This was one of Perret's harshest criticisms to Le Corbusier. For Perret, the membrane is just cosmetics, an easy and ephemeral formula to disguise the duality between structure and enclosures made with materials with different coefficients of thermal expansion.

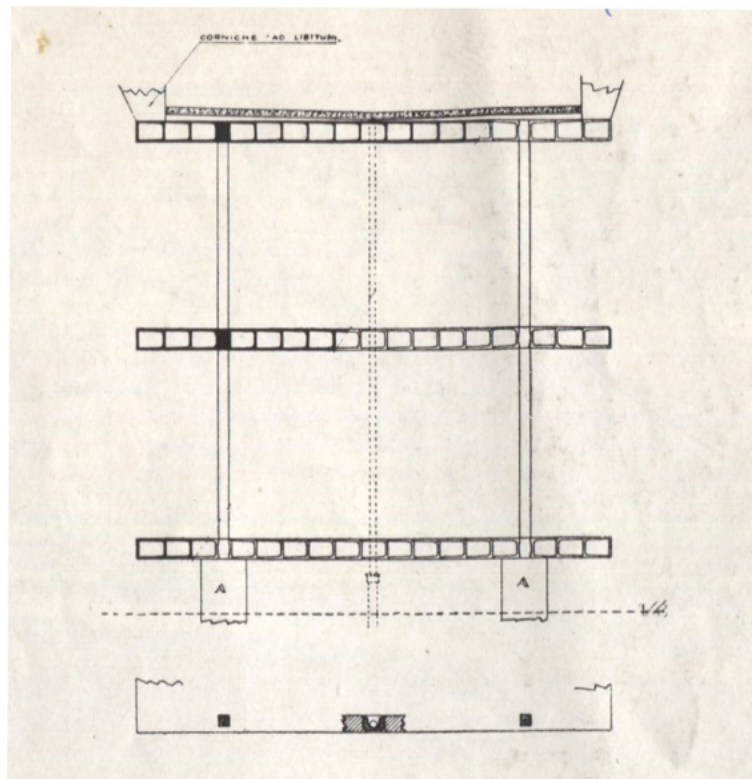


Fig. 2 Cross section on the ceiling of "Dom-ino" module [12].

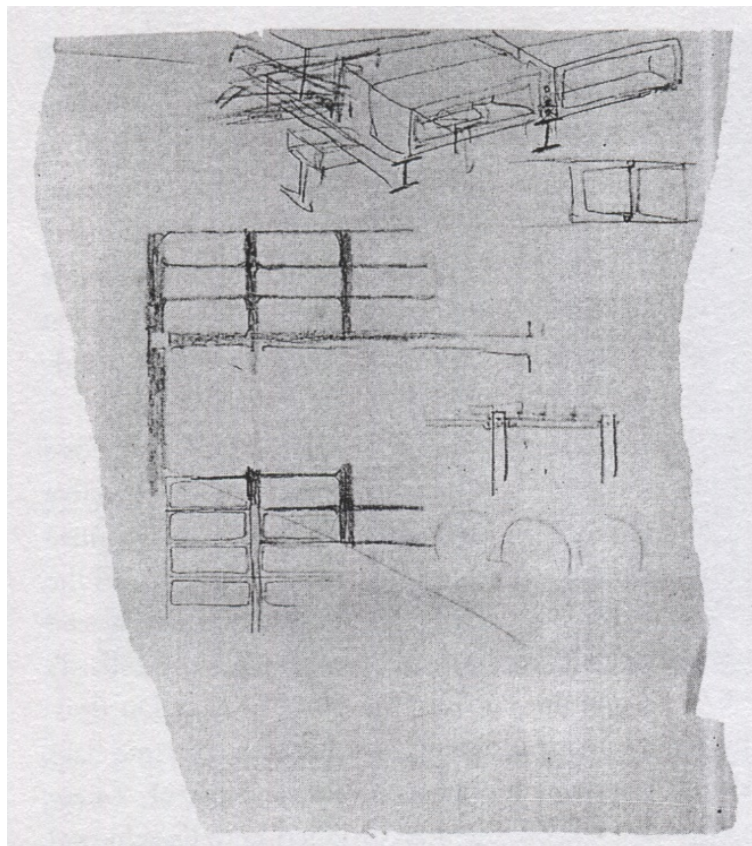


Fig. 3 Study of I beams and hollow tiles, 1915 [9].

houses, and Le Corbusier did not even use this system in the many commissions that he got between 1917 and 1919 to build groups of houses for the working-class.<sup>13</sup>

The recess of the pillars with respect to the edge of the slab had been used by Perret in the interior of the Ponthieu garage in order to improve the performance of the monolithic slabs. However, Le Corbusier resorted to a complex lightened system with hollow blocks that made the execution of the overhangs and the infrastructure installation very difficult. The beamless slabs had been used by François Hennebique and Robert Maillart, but they resorted to mushroom-shaped columns to ensure a rigid joint with the slabs. Le Corbusier also made complicated efforts to avoid resorting to wood formwork as the negative of the concrete structure and potential determining factor of its shape. Despite the increase in weight that this entailed, instead of removable waffle slabs, he made use of hollow bricks supported by a double framework of angle iron pieces that would demand a two-stage casting for each level.

The “Dom-ino” system productively intermingles the design of a prototype for mechanical reproduction and the definition of a new structural type that partly makes use of, and is defined in counterpoint to, the three structural types defined by Viollet-le-Duc. Le Corbusier attempted to achieve the synthesis and coherence of the Greeks (separate pieces resting on one another), and he made use of reinforced concrete based on the Roman construction principle (monolithic unit, small construction elements, support system autonomous from the enclosures that define the inner space), but starting from the radical distinction between “frame” and “membrane” of the gothic.

The new structural type not only allowed him to

<sup>13</sup>This is one of Turner’s strong argumentative points to stress the predominance of Le Corbusier’s idealism over any rationalist concern: although the apparent purpose is a new structural system for the mass-production of houses, its elements would embody, in almost a platonic way, the ideal of column and the ideal of slab, with Le Corbusier following the method recommended by Henry Provencal of creating from ideas, with pure and general shapes.

leave behind the means of the old architecture but also more than half a century of trials—still engaged in a dialogue with the oldest principles of the discipline—at defining the formal and spatial resources of a post-wall architecture with regard to the structural frame. The frame/membrane polarity as essentialist reduction of the primitive cottage enabled Le Corbusier to make a revolutionary return—like M. A. Laugier in 1753—to a point zero of the discipline in order to radically reconsider its resources—i.e., by re-elaborating the logical support in a new construction base, he was able to review the values and even the concept of architecture.

The amendment of the code is internal to the discipline and it is supported by the devising of this new structural type underlying the “Dom-ino” system.

#### 4. Elements

“The purist element born out of the depuration of standard shapes is not a copy, it is a creation aimed at materializing the object with all its general and invariable character. Thus, the purist elements are comparable to words whose meaning is well settled; the purist syntax is the application of construction and modular means.”<sup>14</sup>

What is the relationship between this construction system—which Le Corbusier devised in 1914 with the purpose of starting a career in Paris in the novel capacity of architect-entrepreneur—with the *L’Esprit Nouveau* adventure he undertakes with Ozenfant in the Parisian cultural circle, and of which *Toward an Architecture* is a direct result?

From the first issue of the magazine—in “Sur la plastique” and continuing in “Le Purisme” in the fourth issue—it is clear that the main purpose of its publishers was to build the foundations of a rational aesthetic in order to reach that utmost degree of the sensations that they called “mathematical lyricism” and which, up to that time, had been exclusive to some architectural works. It was a physics of the arts that was supported

<sup>14</sup>Ozenfant, A. and Le Corbusier, 1921. “Le Purisme”, op. cit.



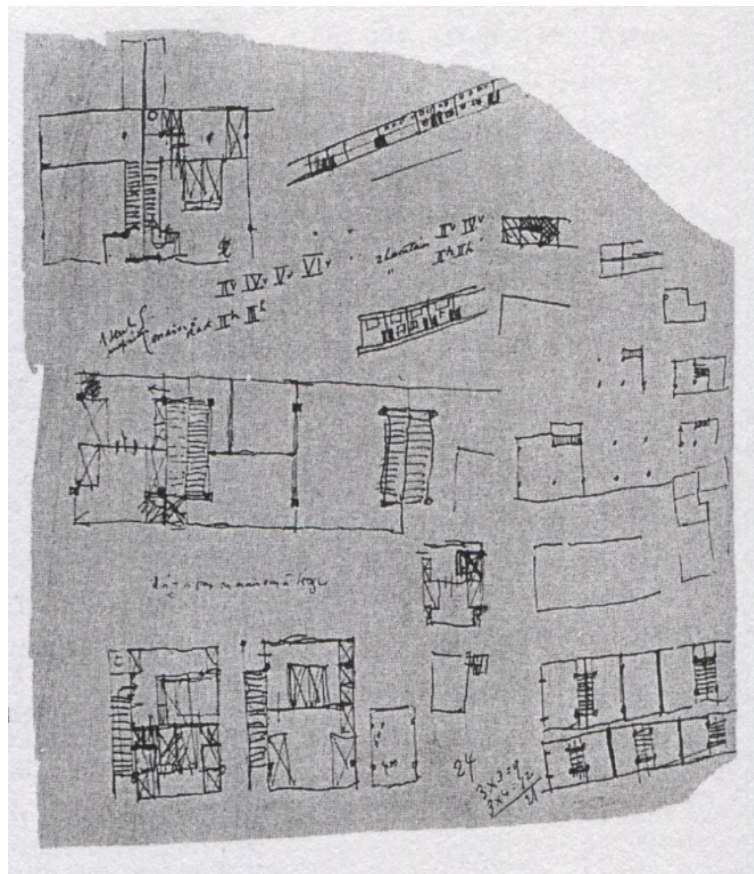


Fig. 4 “Dom-ino”. Study for plans, 1915. FLC 19140 [9].



Fig. 5 “Dom-ino” house, residence and workshop [12].

by the definition of the primary elements and the syntax of a plastic work.

This would be the contribution of the “Dom-ino” system, recovered and reinterpreted from a purist standpoint.

Since Le Corbusier’s initial formulation of the

system, it was evident that there was a search for a simplification that would allow to polish and reduce each one of the construction system’s parts to “elements” (in the sense given to the term by J. N. L. Durand—objective, invariable elements resulting from an empiric systematization, devoid of figurative or

historical dimension) to which he repeatedly alluded in *Toward an Architecture*.<sup>15</sup>

These elements were a series of pieces that became words of an autonomous, universal language. For this reason, these pieces underwent a visual and conceptual cleaning-up operation that turned them into clear, distinctive elements by means of a process that was similar to the mechanical selection of industrial production objects. They are smooth elements that keep us at a distance, re-creating the impersonal experience that we have in front of mass-production objects but dodging the subjective nature of the consumer [14].

This purist retrieval of the “Dom-ino” system matures in consonance with Le Corbusier’s collaboration with Ozenfant. In the initial 1915 projects, Le Corbusier still resorts to the use of lintel windows—although of landscape layout, well-defined 45-degree-angled cornices used as crownings, with flowerbeds that soften their silhouettes. The cornices and the entablatures of the openings will only disappear in the 1919 Troyes project in order to ensure the integrity of the cubic shape *à la Garnier*, and the pure, smooth, geometric resolution is applied to the whole building. The ambiguous notion used by Le Corbusier to re-signify these construction elements as purist objects is the notion of “economy”—the natural selection law, driving force of the industrial civilization, but also a substitute notion for *venustas* in Durand that Le Corbusier recovers, linking it to the rational satisfaction of the spirit: “...a will to the purest, the

clearest, the most economical... to leave only those concise and violent things, sounding clear and tragic like bronze trumpets”.<sup>16</sup>

In this sense, it is rather a depuration typical of the standardization of production by means of applied science that what Wilhelm Worringer, in *Abstraktion und Einfühlung* (1907), called “a drive towards the absolute when facing with the uncertainties of reality”. In the same way as the Parthenon would have been the climax of Doric temples, through a selection and refinement process that made use of a standard comparable to that of automobiles, planes and boats, the “Dom-ino” system was the result of the improvement and purification of the frame structural system. It is comparable to Le Corbusier’s attraction to industrial production objects as heralds of a new formal freedom. In the same register is his strategy to present himself as an architect manager of a serial production project for the market, taking a very different stance regarding production modes from the one taken by the Bauhaus (still linked to the will to redeem industrial production through art).

For Le Corbusier, machinery and the selection and depuration associated with it have a rigor which is comparable to that of the great works of architecture: in the Parthenon, “plastic mechanics is realized in marble with the rigor that we have learned to apply in machines”.<sup>17</sup> This extreme precision enables him to keep the “Dom-ino” system’s radical bareness and its cubic resolution away from any aesthetic notion of balance, beauty or solidity, making them fall, notwithstanding—concise and violent—within the register of the sublime. Thus, through formal abstraction, a bridge is created between the mere construction and architecture as machine for stirring emotion: “Architectural abstraction has the distinctive and magnificent quality that, while being rooted in brute fact, it spiritualizes it”.<sup>18</sup>

<sup>15</sup> Throughout the text, Le Corbusier makes a distinction between architectural elements that are invariable with time (light, shadow, materials, wall and space) and construction elements. The latter ones, transformed by the serial-production spirit in the construction site, can be classified in: (1) elements of detail that are interchangeable and, thus, are devised and manufactured according to modules (*les cloisons légères*, standard windows and furniture) that guarantee the indispensable unity for the creation of architectural beauty; and (2) general elements typical of the support system that are designed for a longer permanence and that, if “soundly set up and combined into a unity”, can produce a “beautiful arrangement.” Cf. Le Corbusier, *Toward an Architecture*, op. cit. p. 154.

<sup>16</sup> Le Corbusier, *Toward an Architecture*, op. cit.: 236.

<sup>17</sup> Ibidem: 246, 203.

<sup>18</sup> Ibidem: 101.

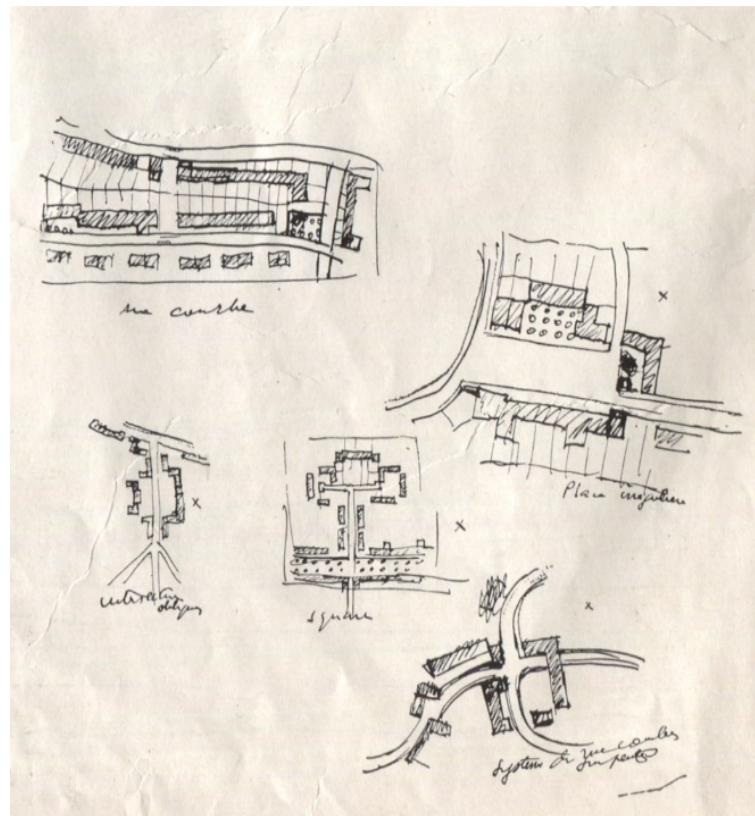


Fig. 6 Cluster of mass-production houses with Dom-ino frames 1915 [12].

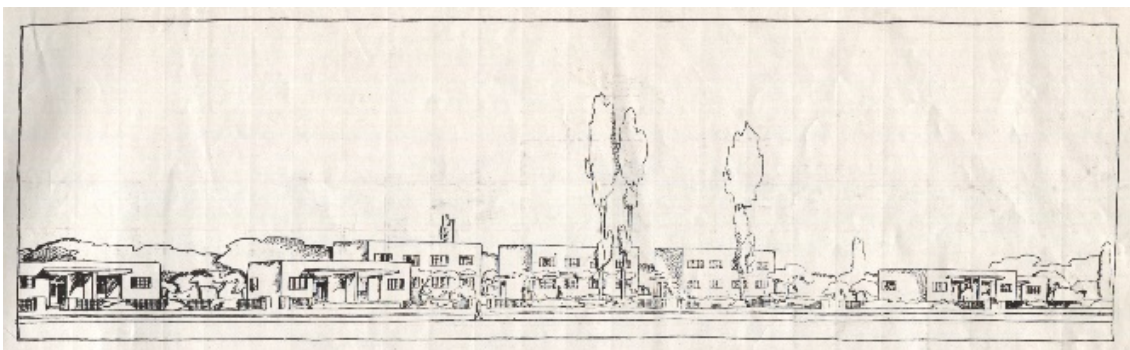


Fig. 7 Project workers' housing for J. Jourdain & Co. at Troyes. October 1, 1919 [12].

## 5. Syntax: Beyond the Human Factor

“Perspective only offers an accidental appearance of objects—what the eye would see if it were situated in the corresponding visual angle, always specific and, thus, incomplete. A painting that is created based on perspective resorts to poor-quality sensations and deprives itself of what can be universal and true.”<sup>19</sup>

As it happens in the attempt of purism to achieve a scientific aesthetic for painting, in the “Dom-ino”

system not only the construction parts are defined as architectonic elements, but also organizational rules are settled: a syntax.

The “Dom-ino” elements are not independent; they create a system according to which the relationship between the rectangular slab, the pillars and the staircase is not interchangeable. It is a system that guarantees the separation of powers between the frame and a membrane that can be perforated unlimitedly (as is explicit in the *fenêtres en longueur*) and the articulation by means of the longitudinal aggregation

<sup>19</sup>Ozenfant, A., and Corbusier, L. 1923. “Le Purisme.” op. cit.

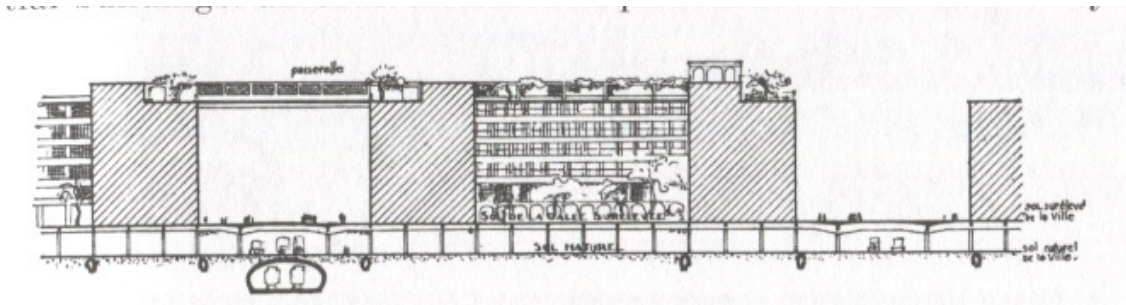


Fig. 8 Pilotis-Cities, 1915 [12].

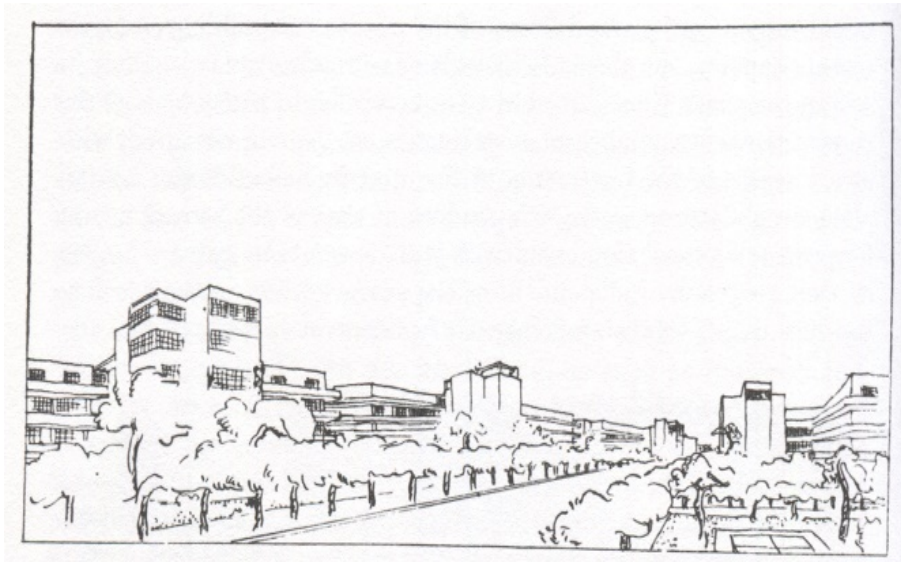


Fig. 9 Streets with Indents, 1920 [12].

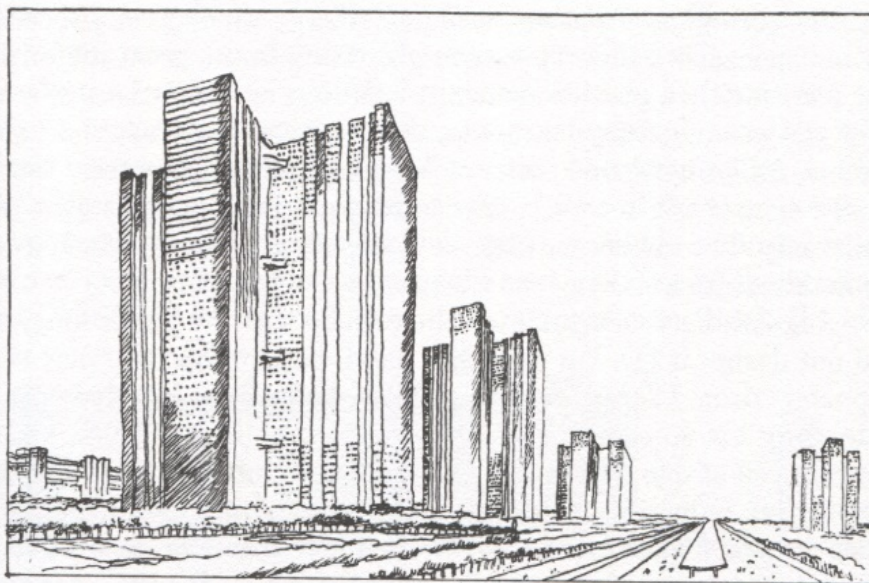


Fig. 10 Tower-Cities, 1920 [12].

of the slabs as unanchored surfaces to achieve an unprecedented spatial freedom with reference to the

horizontal plane.

Another generative rule is the modular organization

that, according to Choisy himself, was a principle present since the beginning of monumental architecture. It creates order and simplifies the design processes, multiplies the combinatorial possibilities of the different elements, adds an aesthetic quality associated with the pleasure that results from the visual economy, and re-establishes the value of proportion as architectonic quality.

But perhaps the most outstanding thing is the abandonment of perspective as register of the architectural formal syntax—the same abandonment promoted by purism in the pictorial field. This becoming engrossed in the internal logics—unchanging with respect to the historical changes and the actions of men, this autonomy that is pursued even for the subject who perceives, putting the communicative dimension in suspense, are pursued in several convergent registers. It is given by the cylindrical or flat definition of each element, which is unchanging even from different points of view; by the autonomous nature of the membrane that liberates the front plane from any external visual register of the structural frame; and by making the compositional keys fall within the ground plan, as notations in a diagram that is not affected by deformations with respect to the point of view of the potential observer and that is confirmed by means of the axonometric projection (borrowed from Choisy) chosen to represent it. Peter Eisenman has underlined that this operation is evidence of the condition of self-referential sign of the “Dom-ino” system (he says that “the Maison ‘Dom-ino’ can be seen to reflect a Modernist or self-referential condition of sign”), which is a substantial turning point after four centuries of humanist culture [15].

## 6. Conclusions: The Structural Type, a Grammar

“Almost all periods of architecture have been linked to structural investigations. The conclusion has often been drawn: architecture is construction, but this is not reason to confuse the two. It is clear that the architect

ought to have mastered his construction at least as the thinker has mastered his grammar.”<sup>20</sup>

In short, without taking it for a crass concern for the constructive determination of architecture expression or for an ontological tie between manners of doing and form, the “Dom-ino” system was a key piece in the appeal to become aware of the specific means of architecture and to re-create the language of a new art.

As a new structural type for which reinforced concrete is a means and not an end, the “Dom-ino” system provided Le Corbusier with the grammar for a new, purified architecture. It provided him with a construction means capable of revolutionizing the elements and the syntax of the discipline. Later on, he will state that: Reinforced concrete is a revolution in the history of the window. “Reinforced concrete backs the flat roof and revolutionizes the use of the house. Reinforced concrete gives us the pilotis, the house is in the air. If the skin of architecture is a new one, that is because its structure is completely new, the system is a new one. The architectural aesthetic is subverted by a new technical phenomenon: reinforced concrete.”<sup>21</sup>

It is a construction system that guarantees the utmost freedom regarding the ground and the interior arrangement, and is able to meet the changeable and temporary needs of people in a changing world by means of a permanent structure—idea that will be taken up again by Perret in 1931 in terms of the *abri souverain* (sovereign shelter).<sup>22</sup> It is a matrix that boosts architectonic events for the rich and for the poor, for the working-class house, for the villas and *les*

<sup>20</sup>Le Corbusier, *Toward an Architecture*, op. cit.: 245

<sup>21</sup>“Le ciment armé fait révolution dans l’histoire de la fenêtre. Le béton armé apporte le toit plat et révolutionne l’usage de la maison. Le ciment armé nous donne les pilotis. La maison est en l’air loin du sol. ...si l’épiderme de l’architecture est autre, c’est que de fond en comble sa structure est autre: le système est autre. ...l’esthétique architecturale se trouve bouleversée par un phénomène technique nouveau: le ciment armé.” Le Corbusier, *Almanach*. op. cit.: 14- 16 and 31.

<sup>22</sup>“A porche, a container, a ship, a sovereign shelter able to receive in its unity the diversity of organs necessary for the functions. It is through construction that the architect meets both permanent and temporary conditions.” Auguste Perret, “Contribution...” op. cit.: 39.

*appartements à redents.*

Le Corbusier made use of these compositional possibilities at *la Ville Contemporaine* (1922), the first of a series of projects in which the urban scale is the device he needs to account for the potential of his typological investigations, enabled by a construction system strained to bold extremes.

Because, lifting it up to the destiny of architecture (i.e., to stir emotion), it is a complete and pure construction system. Besides, it is a system that is taken to bold extremes to express the economy, in a spiritual sense.

“When a construction system allows us to build a hangar or a church, i.e., when that system is the most perfect one that can be devised to serve as shelter, architecture is possible—made by depurating the shapes, with harmonious arrangements, with the spiritual intention that puts its constituent elements into proportion.”<sup>23</sup>

To sum up, it is in connection with the invention of a new structural type that Le Corbusier created a turning point in the tradition of the discipline, subverting its codes internally.<sup>24</sup> The “Dom-ino” frame, reformulated as new structural system, defined the elements (*pilotis, cloisons légères, roof garden, promenade architecturale, fenêtres en longueur*) and the syntax (independence of powers between frame and membrane, compositional notation on the ground plan autonomous with respect to the observer’s point of view). Thus, it became the grammar for a sovereign shelter, a grammar that enabled typological invention and, thence, the redefinition of the city and the relationship between architecture and landscape through big dimension. It was a sharp turning point in the development of architectonic form, and it is

<sup>23</sup> Le Corbusier. “Un standard ne résout pas un problème d’architecture.” *Almanach...* op. cit.: 115.

<sup>24</sup> “The abandonment of the plaid grid of the Paris Opera House for the free plan of Dom-ino, possible one of the most critical changes ever in the continuous cycle of changes, appears to herald a decisive cultural phenomenon: the birth of a Modern sensibility that is to parallel and even supersede classical Western thought.” Eisenman, P., “Aspects of Modernism...”, op. cit.

analogous to the one set forth by Viollet-le-Duc in the epigraph that introduces the present work.

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