Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, *Grand'Mare*, Rouen, France, 1968–1969. The whole *Grand'Mare* estate today. © Giulia Marino, 2015.

# The Controversial History of the "Steel and Glass" by Lods, Depondt and Beauclair. The GEAI Housing Estate *La Grand'Mare* in Rouen (1968–2016)

BY GIULIA MARINO

Marked by numerous setbacks, the history of the GEAI housing estate *La Grand'Mare* in Rouen is troubled, even highly controversial. It clearly epitomizes the twists and turns in the debate over the preservation of postwar architecture, whose "industrialized" (often meaning "experimental") dimension, is mistakenly made the excuse for its demolition. This is exemplified by the uncertain future of this now badly amputated pioneering housing complex, designed by Marcel Lods and his fellow architects.

The "great adventure of GEAI" began when Marcel Lods (1891–1978), the designer of various masterpieces of modern prefabricated architecture in France, lunched with Roger Lacharme, Director-General of the Glass Industries of the Compagnie Saint-Gobain. The architect was extremely persuasive:

> *Monsieur, you manufacture glass. You have a large advertising budget, though it is no business of mine to say whether it is managed usefully or not. I want to make you an unusual proposition. To dedicate part of your budget to financing the construction of a prototype. I will present you with the idea for it, but I will conduct the studies and tests. On the other hand, I'm not able to organize the financing of the various elements to be manufactured and tested. If you agree, we will proceed as industrialists, that is to say we will manufacture the components and test them. Then we will see how to assemble them. In this way, together with the production methods of heavy industry, we will reduce the prices and construct more buildings, so that you sell more glass!* [1]

Lacharme accepted the challenge and, together with other industrial groups — the Technical Office for the use of Steel (OTUA), Aluminium Français and Péchiney Saint-Gobain — agreed to fund the development and construction of a prototype of industrialized housing. Lods, for his part, brought together a team of young designers consisting of Paul Depondt and Henri Beauclair to undertake the development program. This led in 1962 to the formation of the *Groupement pour l'Etude d'une Architecture Industrialisée* GEAI.

### Clockwork precision engineering

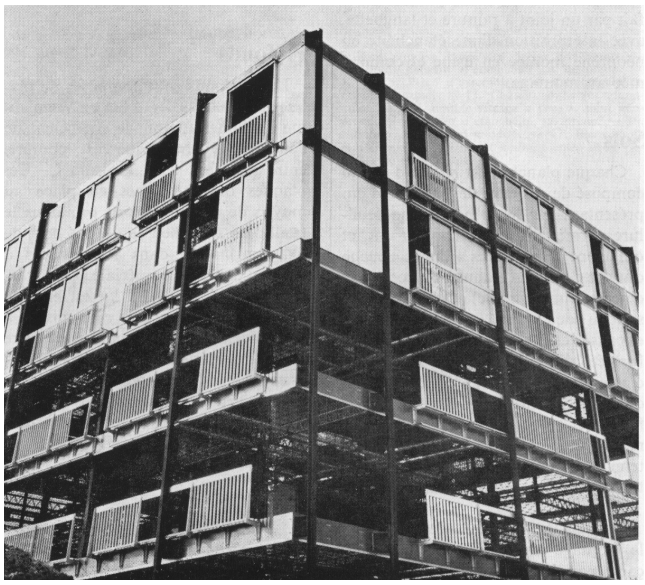
The aim of this experimental operation was to establish a "total synergy" between the imperatives of architectural design — constructional, aesthetic and social — and the business aspirations of a resurgent building industry. Industrialized metal construction, lightweight, flexible and rational, perfectly met this need. After four years of multidisciplinary research and the realization of a first prototype at Aubervillers (1966)[2], by 1968 the process was considered sufficiently ready for its first important appearance: for the future "priority housing zone" of *La Grand'Mare* in Rouen, a project of 500 homes grouped into 25 four-story units variably assembled in a number of small clusters.

Marcel Lods, who saw GEAI as the culmination of the research he had conducted in the interwar period in association with Eugène Beaudouin and in collaboration with Jean Prouvé, presented his pitch: "In a word, we have to construct a 'meccano set', the children's toy that architects, who have yet to come up with a construction system offering so many possibilities yet with so much apparent rigor, always dream of".

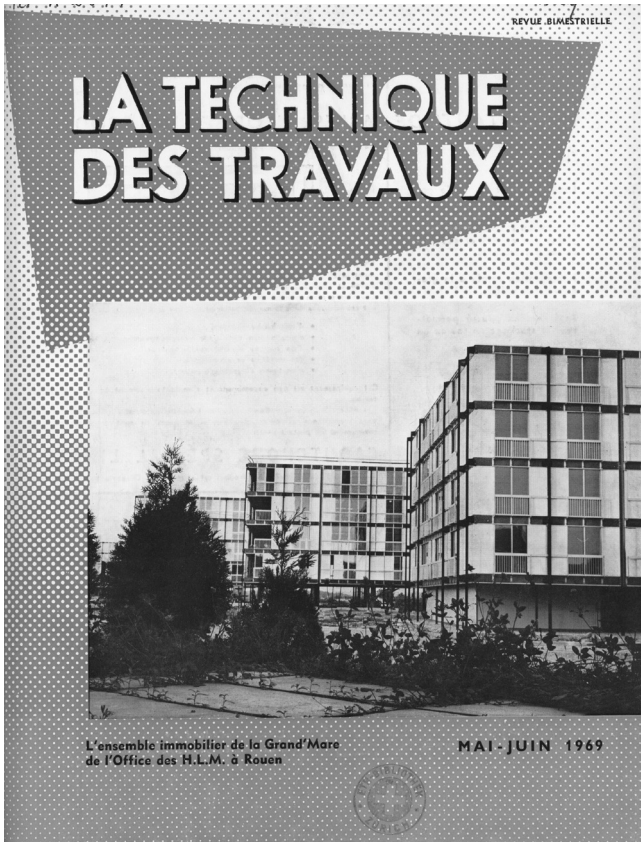
The "glass and steel" boxes of La *Grand'Mare* faithfully follow the logic of dry assembly. Thanks to a rigidly modular layout (on a 90 cm grid-frame) and the use of standardized (indeed, wholly factory-finished) components, the buildings at Rouen were erected using a construction procedure that "was simple, quick and efficient"[3]. In other words, "it is a question of increasing the factory operations (whose performance is certain) by all possible means, while reducing building operations onsite (whose performance is more doubtful) by every possible means"[4]. Detailed design of the bolted assemblies (which provoked criticism at GEAI — "the bolt is the enemy of industrialization" according to Jean Prouvé), and building tolerances, would play leading roles in a process deemed to deliver the largest number of comfortable homes at a modest price.

In this logic of the construction site freed from "clutter, replaced by packaging"[5], it became essential to supersede the distinction between the elements of the structural work and those of the secondary works. The central core — the "sway

**01** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, *Grand'Mare*, Rouen, France, 1968–1969. Installing the façades from inside the building. © *La Technique des Travaux*, May–June, 1969, 5–6.



**02** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, *Grand'Mare*, Rouen, France, 1968–1969. The whole *Grand'Mare* estate today. © Giulia Marino, 2015.




**03** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, *Grand'Mare*, Rouen, France, 1968–1969. Installing the façades from inside the building. © La technique des travaux, May–June, 1969, 5–6. © *La technique des travaux*, May–June, 1969, 5–6.

**04** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, *Grand'Mare*, Rouen, France, 1968–1969. Metal frame, assembly of the floorplates with integrated utilities. © *Bâtir*, 174, April 1969.

frame" [*palée de stabilité*] consisting of the two principal columns in Corten steel connected by cross-pieces — was erected first, anchored to the concrete sub-structure and suitably braced to increase its stability. It provided the support for the lattice floorplates, remarkable for their lightness — definitely the most innovative aspect of the GEAI — assembled to "constitute the floor of an apartment which, by integrating the utility networks, will be installed in a single piece in the vertical structure of the block"[6]. Numbered, the components of each three-dimensional layer were then assembled *in situ* on an assembly line housed in a construction workshop. Veritably clockwork precision!

### Lightness and comfort

As for the façades, they were particularly successful on the architectural plane by their juxtaposition in keeping with a very strict rule of opaque and transparent elements – notably the double casement window-doors. In addition, this welcome alternation mitigated the repetitive effect of prefabricated elements, namely an excessive monotony, by the presence of sliding shutters in micro-corrugated aluminum, creating a very striking movement by being superimposed on solid and transparent panels.

In constructional terms, the advantages of industrializing the building elements lay in extremely rapid installation, without being less effective in terms of airtightness and waterproofing, as well as thermal insulation. In fact the conception of the envelopes not only met the requirements of industrial construction through perfectly controlled phasing and simplified assembly (they were assembled by working in the interior of the buildings) but also revealed a special concern for thermal resistance, which was inseparable from the warm air central heating, intended to ensure the comfort of the inhabitants. The opening parts were thus made from extruded sections of anodised aluminum alloy and fitted in the factory with *Tégé* insulating glass. This was an innovative product featuring two panes of glass electrically welded around the edges, sealing a mattress of dehydrated air in the cavity, calculated to reduce heat loss by 40%.

The same concern for thermal performance — certainly remarkable in the context of the 1960s — is found in the composition of the three types of opaque infill elements, to which was added a special model that contained the forced-air heating blower port to the glazed surfaces.

### From the enthusiastic reception...

After 15 months' work, the inhabitants moved into the first home units. In a documentary produced by French television, the new tenants (who, it seems, had been carefully selected beforehand) expressed themselves satisfied[7]. Apart from a few problems with acoustic insulation due to the cavity floors and lightweight partitions, they appreciated these spacious, flexible layouts, in a pleasant setting open to the wooded landscaped exteriors. With regard to the technical press, it recounted this pioneering achievement with great enthusiasm. An example was the review *Techniques et Architecture*, which devoted a number of laudatory articles to the Rouen development, illustrated with a systematic report on the assembly of the housing blocks. Likewise, the GEAI method was shortlisted for the "innovation models" competition, and Lods, Beauclair and Depondt received the 1969 International Architecture Award from the Belgian National Institute of Housing, as well as the Reynolds International Grand Prix for 1970.

Marcel Lods' objectives were even more ambitious:

> *We must not consider the Rouen operation as an end but a beginning.[...] Our commitment to the GEAI method reveals new opportunities every day. This will have to be the path of development for construction as it has been of all developments in industry. During this process, the principal result of finding a solution to each problem has been to raise several more, each of which is generates progress. To illustrate this concept with an image, we can say we have now reached the stage that the T-model Ford or 1919 Citröen represented for the car!* [8]

After the prototypes of Aubervilliers (1962–1966) and Noyon (OREAM Building 1967–1968), then the *Grand'Mare* estate (1968–1969), the series of built works continued (Elancourt 1971, La Courneuve 1972–73, office building in Villeurbanne 1970–1971), including a slightly modified version for the north American market, which took the form of a pilot project in Chicago (487 housing units, 1969–1972).

### ... to its troubled recent history

It was destined not to happen. Despite the positive reception of the first GEAI method that encouraged its inventors to continue the operation,[9] its commercial success ran down very rapidly in 1975. The radical change in social housing policy in France and the effects of the oil crisis of the 1970s were the principal causes for this. On another scale, the history of the blocks in Rouen, punctuated with drama, contributed most of all to finally bury the ambitious project. In particular, following a fire at the *Collège Pailleron* on 6 February 1973 (leading to a drastic tightening of fire standards for steel construction in France), their low fire resistance was singled out for criticism. Paradoxically, the very nature of Lods, Depondt and Beauclair's inventive constructional process, conceived in terms of extreme lightness, became both its greatest asset and the strongest argument by its critics.

### The many lives of "steel and glass"

The history of the foundation of the *Grand'Mare*, tumultuous or even controversial, was marked by numerous turnarounds and deserves to be told in detail. In fact, Marcel Lods' ensemble had narrowly escaped demolition in the early 1980s, just ten years after being completed. A fire — the first in a long series — which broke out in one apartment and quickly spread to the whole building by the service shaft, caused a death. The reaction of the Municipality was immediate and radical: it planned to raze the complex to the ground. But demolition proved difficult to implement because of the status of the property (in the meantime, some storys had passed into private ownership)

**05** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, ***Grand'Mare***, Rouen, France, 1968–1969. ***Atelier de la Corderie architectes***, restoration of a block, view of the interior of the living room. © Giulia Marino, 2015.

and administrative obstacles tipped the balance towards a strategy of extensive restructuring.

Saved from destruction once, the buildings were then the subject of an extensive makeover that involved the departure of the original inhabitants, who had been highly sensitive (and responsive) to the innovative "steel and glass" architecture and their lifestyle. After the makeover, very disadvantaged social groups were installed in the buildings. The social balance of the neighborhood changed and insecurity gradually grew. The absence of all maintenance and servicing fomented repeated vandalism; the degradation of the buildings was rapid and extensive. It was in this very problematic social context that the planned demolition of the *Grand'Mare* estate again made the news. In 2000, the City of Rouen again planned to destroy the development, but this radical solution was strongly opposed. International mobilization, insisting on the quality of the project by Lods and his associates, had its effect. For the second time, the complex was saved.

20 years after the first phase of work, the buildings were still very dilapidated and had to undergo complete renovation. A major redevelopment project was then introduced, aiming to rediscover the "positive, modern and innovative image of the district in its infancy", including a proposal for the conversion of certain blocks into offices[10]. As a result, 18 blocks or 380 units, were rehabilitated[11]. "*Les Lods* as good as new," said the press. Block number 17 was sold to the Rouen HockeyClub. It commissioned the Parisian DND architectural office to carry out a conversion that respected the character of the building, which was completed in 2009. At the same time, architect Anna Deriquehem acquired one of the isolated blocks and carefully restored it (*Atelier de la Corderie architectes*), making some significant improvements that upgraded it to the current standards while remaining invisible on the plane of the heritage.[12] All the conditions seemed to have come together to restore the "steel and glass" to their former glory, saving an emblematic complex.

### Demolition of 18 blocks

And yet. Though these successful projects demonstrated that it was possible to act intelligently on the structure and the secondary works of "steel and glass" to preserve them, there was a further setback. A fire in January 2006 caused two deaths, furnishing the new municipal administration with fresh weapons, which on 24 October 2008, endorsed the demolition of three buildings. Alerted by a new mobilisation of architects, now supported by local residents, the French Ministry of Culture and Communication as the last resort signed a protection order as an emergency measure — unfortunately a common measure for 20th century architecture.

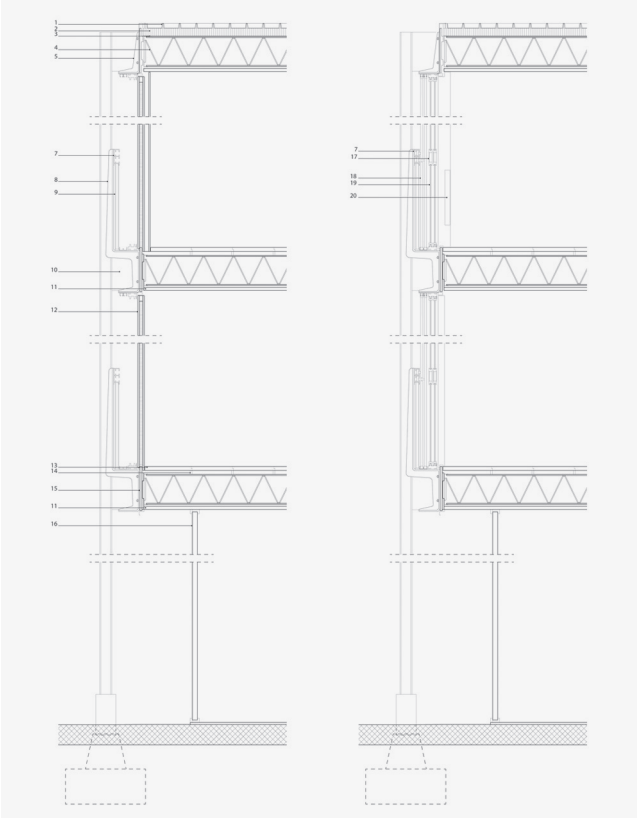
Registration of block no. 2 of the *Grand'Mare* estate in the supplementary inventory of historic buildings by an order of 9 July 2010 was certainly useful, but it proved to be ineffectual. Two further fires that broke out in 2011, due, it is important to point out, not to the constructional and material properties of the buildings, but rather the negligence of the inhabitants, were final. The emotion stirred by the death of two children finally "justified" to public opinion the destruction which GEAI had repeatedly escaped since the 1980s: completed in June 2013, the demolition, in every way regrettable, spared 7 buildings. And this was not the end…

### The uncertain future of the *Grand'Mare*

Despite their proven heritage value, amply argued over the numerous studies that have followed in these past 15 years[13], the future of some original blocks of *Grand'Mare* today remains more uncertain. The feasibility of upgrading them is not in doubt — together with the reuse project by DND[14] and the fine restoration work of the architects of the *Atelier de la Corderie*, it is worth citing in this respect the conversion of the GEAI by Villeurbanne to student

**06** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, ***Grand'Mare***, Rouen, France, 1968–1969. DND architects, reuse of a "steel and glass" block.
© Giulia Marino, 2015.

**07** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, ***Grand'Mare***, Rouen, France, 1968–1969. Constructional cutaways of the façade, on the solid section and French doors. © Aurélie Bichsel, Frédéric Bouvier, Marie Sagnières, EPFL–ENAC.



**08** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, ***Grand'Mare***, Rouen, France, 1968–1969. Interior view of the façade. © Giulia Marino, 2015.

**09** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, ***Grand'Mare***, Rouen, France, 1968–1969. The whole ***Grand'Mare*** estate today. © Giulia Marino, 2015.

**10** Marcel Lods, Paul Depondt, Henri Beauclair, the GEAI housing estate, ***Grand'Mare***, Rouen, France, 1968–1969. The whole ***Grand'Mare*** estate today. © Giulia Marino, 2015.

accommodation in 2005–2007. Ignoring the potential of the buildings, a new application to demolish three blocks now seems to be on the agenda.

The controversial history of the whole *Grand'Mare* complex clearly epitomizes the twists and turns in the debate over preserving postwar architecture, with the generally problematic perception of it, while its "industrialized" dimension (often meaning "experimental") mistakenly being taken as a pretext to justify its demolition. The notion of "lightness", the cutting-edge value of GEAI's architects, is now presented as a necessary and sufficient reason to decree the demolition of their buildings. In a period when the very fine Nanterre School of Architecture (Jacques Kalisz, Roger Salem, 1971) is neglected, and the *Maison des Sciences de l'Homme*, another emblematic work by Marcel Lods with Depondt and Beauclair (1957–70), subjected to heavy-handed renovation, only retaining the aluminum louvers of the existing materials, the surviving blocks deserve greater care. We can only hope that the remaining traces of the remarkable *Grand'Mare* ensemble, already unfortunately badly amputated, will be preserved as a major record of French industrialized lightweight construction, a source of constant innovation by an architectural current of capital importance in the architectural history of the 20th century. ■

## Notes

1 Marcel Lods, cited in Pieter Uyttenhove, *Marcel Lods (1891–1978), Une Architecture de l'Action*, PhD thesis in History, 3 Vols, EHESS (*Ecole des Hautes Etudes en Sciences Sociales*), 1999, 40. See also: Pieter Uyttenhove, *Marcel Lods. Action, Architecture, Histoire*, Verdier, 2009.

2 "Prototype expérimental du GEAI", Paris, *L'Architecture d'aujourd'hui*, 128, October–November 1966.

3 Marcel Lods, quoted in *Revue du CIMUR*, 37, Paris, January 1969, 3–14, No.5.

4 Marcel Lods, "*Une expérience de 500 logements H.L.M. à Rouen dans la Z.U.P. de la Grand'Mare*", Paris, *Techniques et Architecture*, Vol. 29, No.5, September 1968, 61–71: 64.

5 Marcel Lods, "*Les constructions américaines — à la recherche d'une solution au problème mondial du bâtiment*", Clichy, *Revue de l'Aluminium*, No. 242, April 1957, 395–408, 407.

6 In addition to simplifying the operations of assembly of the secondary installations, the envelopes, fittings and finishes, the concept of integrating the utilities into the shell should be cited as one of the salient features of GEAI. As was the case with other industrialized lightweight processes (think of the American CDSS system), the utilities – plumbing, wiring and warm air heating — were an integral part of the construction strategy and were incorporated into the lattice plates in the factory. Cf. Giulia Marino, "Inertia vs. insulation: services in light industrialisation. Performance upgrading and adaptive re-use potential of the G.E.A.I. buildings," in F. Graf, F. Albani, Y. Delemontey, G. Marino, *Material History of Buildings and Conservation Design, Critical Encyclopedia of Restoration and Re-use of 20th Century Architecture*, Report, Lausanne, EPFL–ENAC–TSAM, 2012, 181–185.

7 TV report, *Rouen La Grand'Mare*, 1973.

8 Marcel Lods, "*Une expérience de 500 Logements H.L.M. à Rouen dans la Z.U.P. de la Grand'Mare*", *op. cit.*

9 In 1968, during construction of *La Grand'Mare*, a company for exploiting the GEAI method, operating under the name of SAGEAI, was set up, against the advice of the architects. The company was supposed to be responsible for the sale of the licences developed within the Group.

10 Agence Nicolas Michelin Architectes Urbanistes (ANMA), 2002–2005.

11 Agence Artefact, 2006–2008.

12 Anna Deriquehem architect, visit and interview on 1 April 2015, Rouen, interview conducted by Giulia Marino.

13 We can cite, for instance: "*Quel avenir pour les logements Lods dans le quartier de la Grand'Mare à Rouen?*", the report of mission No. 007921-01 of the Ministry of Ecology, Sustainable Development, Transport and Housing and of the General Council for the Environment and Sustainable Development, headed by Christian Queffélec and Jean-Arnaud Calgaro, 25 August 2011, 20. See also: Aurélie Bichsel, Frédéric Bouvier, Marie Sagnières, *Ensemble de la Grand'Mare, Marcel Lods*, paper under the supervision of Franz Graf, Giulia Marino, EPFL–ENAC–TSAM, 2013–2014.

14 Benjamin Drossart, "*Marcel Lods 40 ans après: ré-emploi d'un Verre et Acier, — ensemble de la Grand'Mare à Rouen*", in Franz Graf, Giulia Marino, *Building Environment and Interiors Comfort in 20th Century Architecture: Understanding Issues and Developing Conservation Strategies*, International Conference organised by EPFL–ENAC–TSAM, 2012.

## References


"Le GEAI Rouen", Paris, *Revue du CIMUR*, No. 37, 1969, 3–14.

"Le GEAI Rouen", Paris, *Revue du CIMUR*, No. 38, 1969, 3–19.

"*Une réalisation recente de Marcel Lods un des précurseurs de l'architecture industrielle*", *L'Œil*, 179, 1969, 60–64.

LODS, Marcel, "*Une expérience de 500 logements H.L.M. à Rouen dans la Z.U.P. de la Grand'Mare*", Paris, *Techniques et Architecture*, Vol. 29, No. 5, 1968, 61–71.

*Quel avenir pour les logements Lods dans le quartier de la Grand'Mare à Rouen?*, report No. 007921–01 of the Ministry of Ecology, Sustainable Development, Transport and Housing and of the General Council for the Environment and Sustainable Development, headed by Christian Queffélec and Jean-Arnaud Calgaro, 25 August 2011.

UYTTENHOVE, Pieter, *Marcel Lods, Action, Architecture, Histoire*, Paris, Verdier, 2009.