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A time when France chose to use prefabricated panel construction systems: the “4 000 logements de la Région parisienne” programme (1952-1958)

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Introduction

Government archives declassified over the last 20 years now provide an understanding of the information available to the State to evaluate the efficiency of policies applied during the 1950s and 1960s in the field of town planning and housing production, especially the "industrialization of building industry".

The industrialization of construction was above all supposed to concern structural works. Although there were lively discussions as to the choice of materials and the most adapted construction methods (Havel, pp. 115-127, Comm. Plan, pp. 114-122), there was nevertheless a presupposition that in the future, building sites should be based on the assembly of large elements and that the mass production of these latter would result in substantial price reductions, as was already the case for a large number of consumer goods. Another dominant idea consisted in stating that, even ignoring issues of site, roadways and networks, the construction of apartment blocks was supposed to be cheaper than building single family houses and that industrialization would still come to widen the gap to the benefit of apartment blocks (Olchanski, pp. 190-198, Havel, pp. 18-19).

Although engineers and economists publishing articles or writing their doctoral theses showed a touching unanimity which led them to praise the Soviet construction model right through to the 1960s, documents which can now be consulted reveal that assessments available to government departments repeatedly expressed a completely different reality. It is important to remember that in the period immediately after the Second World War, France was governed by a hyper-centralised system and, within this context, it was the government itself that assumed the functions of client for a large number of reconstruction and new social housing programmes: it awarded commissions, paid contractors and then handed over completed buildings to war victims or social housing departments ("Offices d'HLM"). As a result, the effective running of the sites and first-hand economic information were concentrated in the hands of the ministry responsible for town planning and construction, despite this body having changed names over the years: ministry of reconstruction and town planning (MRU), ministry of reconstruction and housing (MRL), etc.

Within this framework where the government had all the means available to carry out experiments, the first step taken was nevertheless to continue the "experimental building sites" first initiated by the Vichy regime. As shown by an assessment drawn up by the administration on 31 May 1949 (AN, 19820690, C4904), these were relatively small operations, often using "improved traditional" type building processes. In the 1950s, national housing production changed scale, from 90 000 new housing units built in 1952 to 320 000

units in 1959. The identical scale difference was also to be found in experimental operations and, over this same period, there was a clear movement towards the prefabrication of large reinforced concrete components. While the first large-scale use of this new system can be seen in the 800 housing units forming the Cité Rotterdam in Strasbourg, attributed by competition in 1951, it was the "4 000 logements de la région parisienne" (4 000 housing units for the Paris region) programme that saw this new building system come into its own. The size of the order, the technical bias, and the personality of the designers and contractors responsible for the construction all contributed to making this operation a real test. The following is a brief analysis of the process and the results.

Programming

The "4 000 logements de la Région parisienne" operation was scheduled by article 24 of the law dated 3 January 1952 and its programme set by the MRU services on 1 November 1952 (AN, 19771075, C1646). Although the authorisation to enter into contract resulted in a decree signed on 2 March 1953 (JO, 1953, p. 2094), it was not until the beginning of autumn 1953 that the corresponding works "commitments" were signed and works did not actually begin before spring 1954 as, at the end of 1953, the project was still in its final design phase. It can be seen that while the works were programmed to take three and half years, the two-year period for the preliminary administrative and design phases represented a considerable delay. While the need for housing was urgent, there was also a need, as for all town planning exercises affecting the reconstruction of damaged towns, to give considerable thought as to how the problems should be approached.

The project was presented as a "competition", but of a very *particular* type... The programme dated 1 November 1952 required that the project be "based on the Camus process" and specified sites that had first been subject to detailed initial studies and equipped with "on-site temporary factories" able to produce the concrete panels required for the process. What was not written was "based on the Camus process *or equivalent*". By avoiding the use of this phrasing, a standard condition for building programmes and not just a matter of stylistic phraseology, the prepared "competition" not only favoured the "industrialized sector" but also quite simply and clearly found itself uniquely targeting the delighted holder of the concerned patented construction system. The fact of the matter is that this all-time contract was effectively awarded without a competition being held. The exception to the public contracts rule was given by decree dated 2 March 1953 which stated that "the works, production and supplies for the construction as such of the 4 000 housing units covered by article 24 of the law dated 3 January 1952 shall be subject to a contract awarded by direct negotiation". Apart from reflections concerning the esteem in which Raymond Camus was held, this condition can be interpreted in two apparently contradictory ways that are, at the end of the day, complementary: it either translates the confidence that the government as client had in the advantages of prefabrication, particularly the Camus process, or it expressed the worries held concerning the potential performances that could be provided by other more "traditional" competitors within the scope of an open call for bids.

In any event, an agreement was finally reached between the MRU and the "Société d'Etudes et de Réutilisations de Procédés Économiques de Construction" (SERPEC), a company specially created for this project and run by Emile Campenon who, in addition to the Raymond Camus engineering department and the Campenon-Bernard building contractor, also associated Balency and Schuhl, Dumez, Dumont and Besson, and Entreprise de Génie Civil et de Travaux Publics de Lens. These five contractors are also to be found seventeen

years later among the delighted winners of the "approved HLM models" competition held in 1969-1970. Within the context of the 1952-1953 project, an agreement needed absolutely to be reached: all along the archive files there is no trace of any other proposal, apart from that made by SERPEC, whose architects were R. Camelot, M. Crevel, J. de Mailly, C. Ricome and B. Zehrfuss.

Following some hesitancy as to the building sites, which could partially explain the time spent on preliminary reflection, it was agreed that the "4 000 housing units" would be spread over three sites in the Boulogne-Billancourt, Nanterre and Clichy municipalities located in Paris's inner suburbs. The layout was based on two types of strip buildings, with 80% of housing units located in five-storey buildings built over half-sunken basements and 20% in nine-storey buildings also built over half-sunken basements. The nine-storey strips were equipped with lifts to meet new modern requirements and the basements exclusively used for cellars, store rooms and plantrooms. External car parks were to be provided on ground level.

The programme dated 1 November 1952 provided the provisions to be adopted for the housing units which were finely calibrated to allow future tenants to profit from rental subsidies. The average unit to be built represented 52 m² habitable surface area and was positioned as an intermediary between "type III", being a 44 m² two-room (one bedroom) unit to be occupied by two or three people, and "type IV", being a 56 m² three-room (two bedrooms) unit to be occupied by four or five people. While space was sparingly allocated, the volumetric organisation and fittings were designed in compliance with the fairly generous 1947-1949 HLM requirements. With the exception of small units where a living room-kitchen continuity was accepted, the kitchen was a room apart and it was necessary that "*the bathroom be separated from the kitchen*" (words in italics are underlined in the text). The wet rooms were to be supplied in hot and cold water; the kitchen equipped with a work surface, a sink with "bowl" and "draining board", cupboards and a place reserved for a cooker; the bathroom equipped with a "hand basin" and a "*bac-à-laver-douche*" [shower-clothes washing tray], a shower whose base edges raise up to 0.85 meter to allow manual laundry wash; and the toilet equipped with "seat and lid" and a "flush system". On top of all this, there would be "central heating". Cupboards were to be provided throughout; apart from those in the kitchen, 1.50 m² cupboards were to be provided in the two main rooms and 0.50 m² cupboards in each of the other rooms. The care taken in the provision of equipment and fittings and the affirmed modern comfort levels, were to be backed by the inevitable presence of a refuse chute and lifts, although only serving the nine-storey buildings and only stopping every second floor. Over and above these specific requirements and insofar as current accepted practice was concerned, the programme referred to the "construction rules codified in the Répertoire des Eléments et Ensembles Fabriqués (REEF) [handbook of statutory and official documents for the design and construction of buildings in France]" and the "Cahier des Prescriptions Techniques Générales (CPTG) [book of general technical specifications] to be written by the Centre Scientifique et Technique du Bâtiment (CSTB) [scientific and technical centre for the building industry]".

In reality, the progress programmed for equipping these housing units was relatively limited, as witnessed by the general lack of lifts in the five-story strips and as confirmed by the "shower tray" anecdote, as well as by the insufficient number of electricity sockets, etc. Given these conditions, it might have been thought that this extraordinary contract would have produced a highly significant result in terms of prices, whether due to "industrialization" or simply because of the advantages of such a large programme in terms of grouped purchases of materials, the simplification of the studies to be carried out by contractors or the continuous

and efficient use of teams and materials. In addition, following the long months devoted to the preliminary design, it might have been thought that the time required for production would have been reduced.

Construction deadlines and prices

The first disappointment concerned the production deadlines. A note issued by MRU sent during spring 1952 envisaged a total duration of forty-two months. Contract amendment no. 1 to the declaration of commitment dated 15 September 1953 set a deadline of forty-one months, but a codicil immediately went on to state that this period would begin as from the effective start-up of the works. It added, as can be seen in the following table, that deliveries were held up and that mean delivery dates delayed. It is clear that nothing had been gained from the seventeen or eighteen months set aside to develop the design. On the contrary, there was awareness that the project would not go ahead as fast as had initially been claimed.

Table 1. Successive project phases (AN, 19771075, C1646; 19771077, C1665).

	Note dated spring 1952	Programme dated 1 November 1952	Commitment made 15 September 1953
Production delays	42 months of which: -18 months: 1200 units -12 months: 1400 units -12 months: 1400 units		41 months of which: -17 months: 800 units -12 months: 1600 units -12 months: 1600 units
Total construction cost	1.5 million per unit, being 6 billion Francs for the whole project, reference 1 April 1952	5.78 billion Francs, reference 1 January 1953	5.78 billion Francs, reference 15 August 1953

A second disappointment arose in terms of price. The apparent reduction that brought the price down from 6 billion to 5.78 billion old Francs between April 1952 and January 1953 was illusory, as was the price setting through to summer 1953. This was in fact one of the rare periods that saw a general fall in building prices, a phenomenon undoubtedly related to the adjustment of public payments and the subsequent restored financial health among contractors. On a basis of 100 in the first quarter of 1948, the Institut National de la Statistique et des Études Économiques (INSEE) [national institute of statistics and economic studies] index for building prices rose to 252 in the first quarter of 1952 and then fell to 242 in the first quarter of 1953: it was this fall of 4% which was approximately reflected in the reduction from 6 billion to 5.78 billion Francs. Given the minimal importance of the "industrialized sector" in total production, it would be difficult to maintain that it played a determining role in general price movements. The drop continued, although somewhat more slowly, until 1954 when it bottomed out. The new INSEE index, which started with a 100 base in the third quarter of 1953, fell to 99 in 1954, representing its lowest point. Seen in this light, the stabilised prices in 1953 cannot be seen as a positive performance. Despite the highly refined design studies, the project was not able to improve on the average figure of the building industry and was even a little worse.

While the evolution under study was not particularly favourable, what can be said concerning the price level which, it might be imagined, were set at a very low level from the outset? To judge this, reference can be made to the statistics prepared by the Crédit Foncier de France concerning the "economic housing" that it financed in 1954 (INSEE, 1955). In this category,

the average estimate per main habitable room was 0.49 million Francs for sites where a large proportion of works was carried out using traditional masonry techniques. However, on the basis of a housing unit with an average of 2.7 rooms, the SERPEC estimate represented 0.54 million, with the potential for a price revision to match increases in the prices of materials and manpower. Admittedly, it should not be forgotten that SERPEC was operating in the Paris region, the most expensive region in the country, and that its programme included central heating and hot water, services probably not very common in "economic housing" projects. According to the then applicable prices, this might have justified an average divergence of 10% due to location and 5 to 6% for the services provided. But, seen from the opposite point of view, the extraordinary nature of an order representing 4 000 housing units and a guaranteed activity level over a three and a half year period should have, in itself, justified a reduction of around 10%. Taking all these aspects into consideration, the overall impression is that the SERPEC contract fell within the realms of an ordinary price for economic constructions, as if, at best, the "industrialization" effect was a neutral pricing factor.

Face to an overall performance which is not particularly convincing, it is worth repeating that the project was "snatched" by the contractor and this undoubtedly had an effect on the end result. Two price studies, a "reworked" addition and an "estimate" representing a final version are available for the period from June to September 1953 (AN, 19771 075, C1641), being a total of four successive suggestions provided by SERPEC. The first study, said to be "preliminary", was dated 3 June 1953 and the second, said to be "corrected" was provided exactly one month later on 3 July 1953. As it was not always possible to satisfy objectives, SERPEC sent a letter to the MRU's Director of Construction on 10 July, in which it stated its "certainty [...] of achieving the set goal", and proposed a third version, said to be "reworked". Following yet another period of hesitation, an "estimate" was finally produced on 31 August in which the total at the bottom of the column precisely matched the expected price: 5.78 billion Francs. It is hardly plausible that within this three month period, the on-site temporary factory design underwent a revolution. The respective changes in the structural works and the fixings and finishings works from one study to another show that in this very difficult pricing exercise, it was finally the services related to the fixings and finishings works that suffered. As usual in the building world, when prices do not add up, the solution is to tear into and strip the project.

Table 2. Price studies carried out in summer 1953, in billions of Francs (AN, 19771075, C1641)

	"Preliminary" study (3 June)	"Corrected" study (3 July)	"Reworked" proposal (10 July)	Final estimate (31 August)
Structural works	3.600	3.244	3.184	3.513
Fixings and finishings	3.300	2.735	2.625	2.267
Total	6.900	5.979	5.809	5.780

The cost of the structural works reduced from 3 June to the end of August, finally returning to its initial price while the cost of the fixings and finishings works fell by over 31%. Concerning the structural works, it is worthwhile noting that in a letter dated 6 July, SERPEC envisaged a variant that would reduce the cost by around 100 million by decreasing the number of "loggias and balconies". The price given in the final estimate clearly stipulates "structural works without balconies", but it is considerably higher than the one proposed on 3 July. This trend, revealed in a caricatured manner in the estimate dated 31 August, was

already visible in the move from the "preliminary study" to the "reworked" study: while the cost of the fixings and finishings works fell by over 20%, that of the structural works reduced by a mere 12%, with the latter being at least partially obtained by reducing the floor to ceiling height in the cellars to 2.10 m. "Industrialized" or not, it is clear that the cost of the structural works continued to remain a fundamental constraint. An experiment carried out in exceptionally favourable conditions resulted in a complete denial of the idea – the dream – of giving each resident a spacious, comfortable, etc. housing unit thanks to the benefits of massive industrialisation.

The detailed tables per section and the accompanying commentaries reveal the points where large savings were made. The "framework-roofing" and "joinery-ironmongery" work sections remained untouched and were even slightly increased. The heating was slashed by 20% between 3 June and 3 July, but subsequently retained its credit of 280 million. The continually "simplified" works sections concerned the plumbing (from 642 million to 436 million), electricity (from 413 million to 188 million), cupboards (from 438 to 173 million), lifts (from 71 to 47 million), painting (from 292 to 236 million), and refuse chutes (from 31 to 18 million). Floor finishes were sacrificed, dropping from 248 million to 76 million by, in particular, eliminating the initially programmed "Tapiflex" type plastic floor finishes and replacing them with a painted finish deemed sufficient "given the perfection we expect from the floor surfaces". This provides an understanding of the real benefits of "industrialization": while it does nothing to reduce the cost of the structural works, it may give an opportunity to eliminate the fixings and finishings works, a radical way in which to replace site works by industrialization. As for the "shutters", providing external protection to the glazed surfaces, these were quite simply eliminated. A close analysis of the details confirms thus that it was by using the most ordinary devices available in the building trade that it was possible to meet the preordained objective of 5.78 billion Francs. Incontestable proof is provided by a note dated 4 September 1953 (AN, 19771075, C1641): on that day, SERPEC proposed reintroducing 246 balconies, kitchen smoke outlets, added floor finishes, additional cupboards ("to comply with the file drawings"), etc., but... as an option and at an added cost of 400 million.

Cars as an afterthought

Substantially stripped in its built volumes, the "4 000" project also suffered by not being prepared for a modern approach to car parking. It has previously been mentioned that from the outset, car parks were planned to be located outside on ground floor level. This was no accident, as precast panel producers do not like deep basements that do not make use of panels and which always call on competing technologies and contractors who might be tempted to go even further and submit a proposal for the entire project. The issue of external layouts comes to the forefront once the "declarations of commitment" have been made for the building works as such, in other words at a time when the form taken by the project has, in theory, been determined. This results, between 30 November and 10 December 1953, in a rather animated exchange of notes and letters that see the appearance of two new players: the architects Maurice Cammas and Marcel Lods, who have been awarded a "coordination" mission by MRU (AN, 19771075, C1645).

The problem concerns the 2 600 housing units in Nanterre for which, according to the MRU services, around 450 parking places have been allocated. Maurice Cammas and Marcel Lods fight to extend this to at least 1 000 places. Following a meeting held on November, their point of view is accepted by the Ministry which immediately has its services study solutions to achieve this new number of places. On 8 December, the two architects send the Director of

Construction a rather sharp letter. Firstly, they are irritated to see that the landscaping arrangement has been awarded to Mr. Scherrer (an MRU engineer also involved in the "emergency cities" in 1954), which clearly encroached on their prerogatives: "[...] unless we wish to see a monster, there is no question of having a whole series of persons able to intervene in this matter". They then decide to legally base their argument on a ministerial circular dated 5 November 1953, which recommends that attempts should be made to provide one place per housing unit, and dryly observe: "It remains to be seen if, having taken this type of decision, we shall begin by adopting a completely opposite decision for the first project built under the stewardship of the administration". To overcome this contradiction, they demand the construction of parking places on two levels, or to expropriate a neighbouring plot to increase the parking potential by 200 places.

Both these proposals are rejected for the dual motive that there is no more financing available within the framework of the "4 000" programme and no longer any time to begin long studies when there is a need to finalize the works project for a site that is (hopefully) planned to open in 1954. The MRU continues to work on a "solution" that has already been rejected by the architects: the emergency accesses which have been primarily foreseen for ambulances, fire brigade, etc. will be reinforced and completed by parking places in the heart of the plot, despite the initial drawings having placed all parking areas around the built complexes, with the shared courtyards being reserved for pedestrian activities. It is claimed that this would result in increasing the number of places from 450 to 750 at no additional cost. Apart from the fact that this remained far from the objective of 1 000 places, itself inadequate when given the idea of one parking place per housing unit (in this case 2 600 places would have been needed), this type of "solution" fully justifies the disillusioned and tardy analysis made by the coordinating architects: "the very few green spaces that we had been able to save now have to disappear".

The impression given by the programming of the "4 000 housing units in the Paris region" project can be summarized by saying that the landscaping management and the understanding of the future role of the car were even hazier than the management of the building project itself. Clearly destabilised by the mediocre results provided by "industrialization" in terms of construction cost and, whether consciously or by inadvertence, having in addition committed a grave error in terms of car parking, the MRU programmers found themselves particularly ill-equipped when the time came to make decisions concerning the layout of external spaces. The lesson was at least partially learned as, when the Zones à Urbaniser par Priorité (ZUP) [public housing estates] were being prepared after 1958, considerable budgets were allocated to infrastructures and car parks. However, it goes without saying that in 1953, it did not occur to anybody that the results of this first major operation in themselves represented a condemnation of the way that "industrialization" was then being interpreted.

Conclusion

At the point actually reached by researches in the mass of original documents – about half of the 2.5 kilometres of documents bequeathed by the ministry in charge of construction and town planning over the period 1945-1975 have been explored – it seems clear that fifteen years were needed for the government's position on industrialization in the building sector to truly begin to change. Various sources from the 1968-1970 period, particularly from the Minister's Office (AN, 19770813, CAB9) and the Planning Office (Comm. Plan, pp. 31, 116), reveal a growing doubt and awareness of a need for change. It is now acknowledged that site organisation, supply management, etc., are more efficient in improving productivity than the

invention of a wide range of construction processes using large prefabricated panels that are all incompatible with one another. Instead of looking towards the model provided by the Soviet Union, attention is now focussed on the United States and industrialization is being directed towards the production of small components that are compatible with one another. This practice has already been used for single family houses and is now being extended to housing blocks. As suggested by the theme of a new ideas competition concerning industrialization launched at the beginning of the 1970s, the aim is now to create processes that associate traditional building suppliers and can be compared to a "construction set". In the field, heavy construction structures have for a number of years been increasingly using tunnel formwork and cast in situ concrete: it is the end of an era.

This little chunk of history, covering two decades and marking the conditions governing the construction of millions of housing units, leaves today's observer somewhat perplex. How could the error of understanding represented by the choice of large prefabricated panels have continued for so long despite the fact that experience showed, right from the outset and confirmed over time, that this option was particularly inefficient when it came to meeting cost and productivity objectives? Clearly it is not the technical and building aspects that need to be understood to interpret the situation, but rather the political and administrative structure that existed in France at that time. At the end of the day, what we have learned from this piece of history is that large bureaucracies and the elites at their service have the power to turn the opinions and consensuses that link them into lasting truth, independently of the relevance of the ideas that that conveys. To achieve this, all they have to do is to discard or simply not publish the results of experiments that contradict their own vision.

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