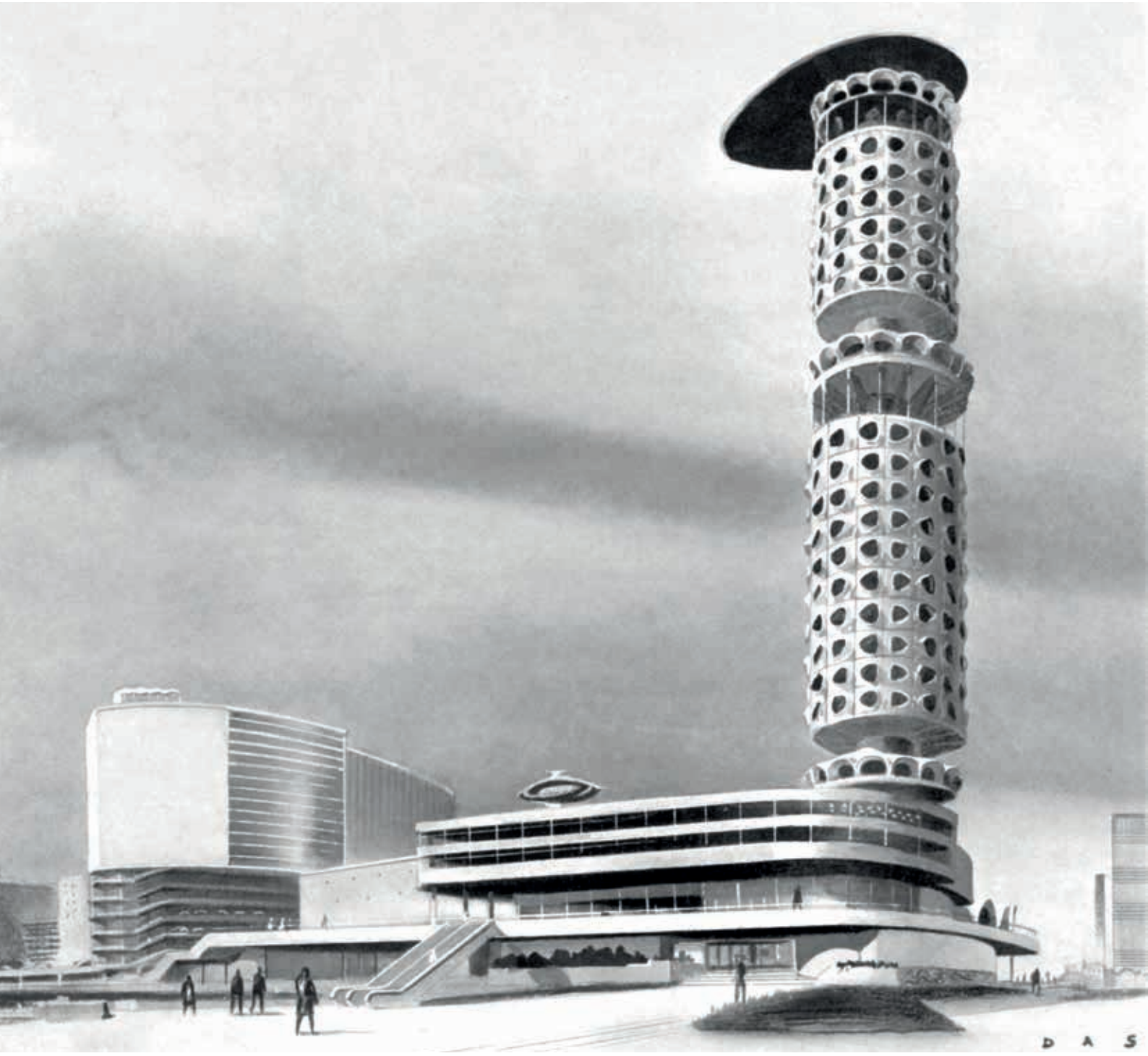
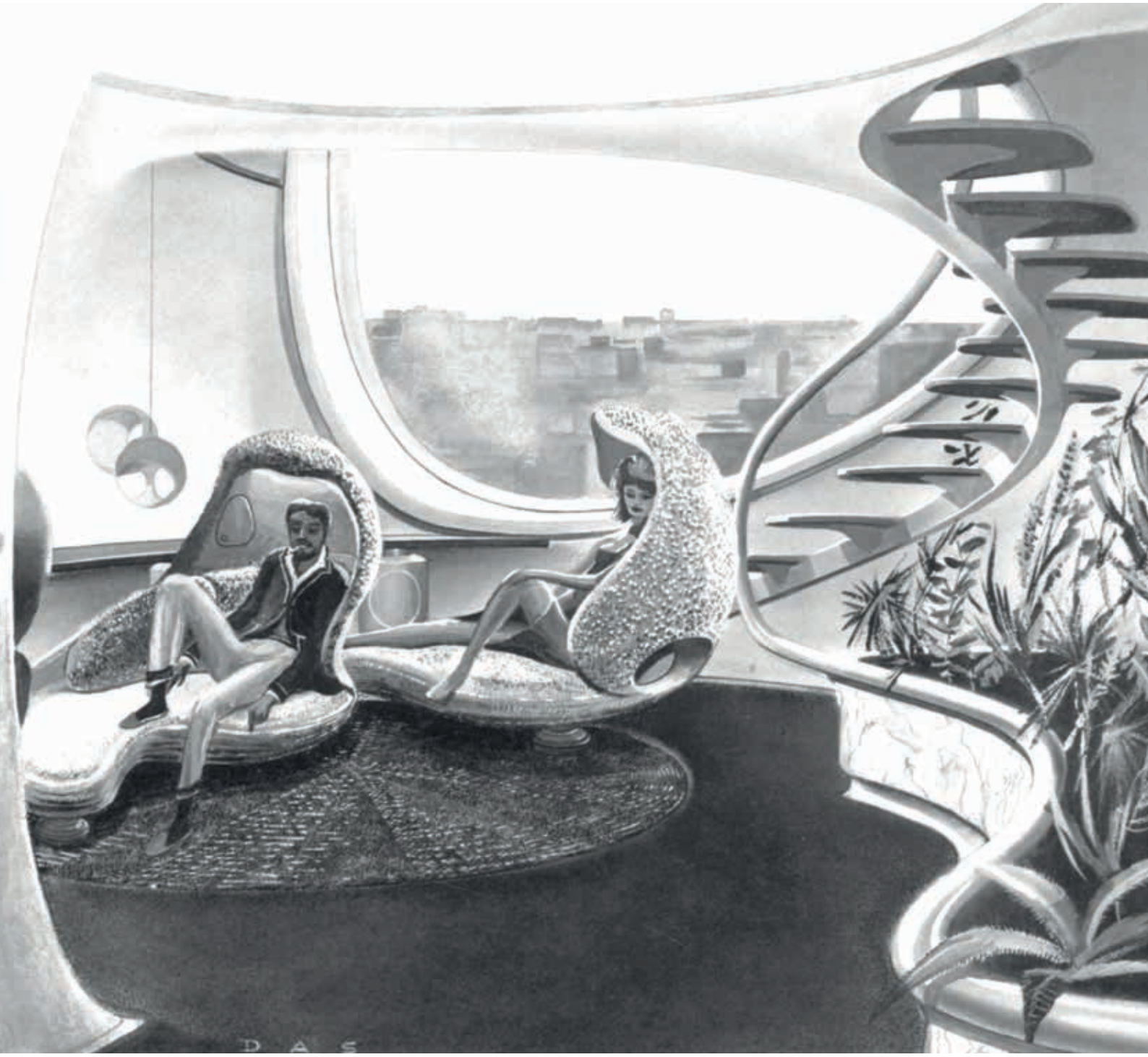


PLASTIC DREAMS

FACADES OF FIBREGLASS REINFORCED POLYESTER IN THE NETHERLANDS

SARA DUISTERS

▲ 1 and 2. Robbert and Rudolf Das and C.R. de Vries, design for the Futurotel exterior and interior, 1966 (*Futurotel. De hotelkamer van de toekomst*, 1966)



A world without plastic is almost impossible to imagine anymore. Yet it is only around 160 years ago that the first synthetic plastic was developed.[1] The material, which has brought about major changes in a variety of industries, is used in a range of products, including packaging, clothing, furniture, military supplies, dinner services, electronics – and in the construction industry. At the end of the 1950s experiments with the use of plastics in architecture were being carried out in various places around the world. Architects like Ionel Schein (France) and Richard Buckminster Fuller (United States) were among the first to see the potential for using plastic in the exterior of their buildings.[2] The most important plastic for this purpose was fibre-reinforced plastic, FRP for short. Mixing fibreglass and polyester resulted in a lightweight material that was extremely strong – ideal for construction in other words. FRP was used for a variety of building elements, such as skylights, internal walls, bathrooms and toilets. However, thanks to its exceptional proper-

ties – it could be used for load-bearing walls, for example – it was employed chiefly for external cladding; as a facade material it played an important role in experiments with plastic in architecture.

The Netherlands has its share of post-war FRP structures, built mainly in the years 1959-1983.[3] It is those buildings that are the subject of this article, which looks at the social changes that helped fuel the use of this material in facades and buildings. Source materials about the use of plastics, and FRP in particular, in Dutch architecture are thin on the ground. Little scientific research has been conducted into the use of this material and the archives of construction companies and architects known to have worked with FRP are often inaccessible.[4] This article consequently draws on newspaper articles and trade journals from the 1950s to 1980. From the resulting inventory of Dutch buildings with an FRP facade, a number of examples that illustrate the social ideas associated with the use of plastic in architecture have been selected as a spur to further research.

A PLASTIC FUTURE

Plastic-making experiments began as far back as 1860, but the true breakthrough did not occur until the Second World War when a shortage of natural rubber stimulated the manufacture of synthetic rubber.[5] The army's demand for plastic – for gas masks, helmets, radios and the like – prompted an explosive growth in production.[6] When the war ended this development continued at a rapid pace. Thanks to the falling price of oil, one of the main ingredients of the material, the use of plastic became increasingly attractive.[7] After this there was no going back: plastic was *the* material of the future.

Reinforced plastics, which is to say plastics mixed with another material, played a key role in this development. The initial impetus behind this composite material was financial: fillers like paper or glass fibres were added to the plastic to drive down the cost of materials. When it turned out that these additions improved the material's properties, experiments with reinforced plastics really took off. One of the products was fibreglass reinforced polyester.[8] During the war FRP was used in the production of ships, aircraft and cars. When the army's demand for these forms of transport fell away after the war, the manufacturing companies involved looked for new markets in which to deploy their expertise. One such market was housing construction.[9]

PLASTIC IN ARCHITECTURE

During the post-war reconstruction of Europe there was a lot of experimentation in housing. In the wake of the war, European countries experienced a severe shortage of housing. The solution was sought in industrial production methods. System building, which employed prefabricated elements, made it possible to build large numbers of dwellings in a short period of time. This was where plastic shone: it was industrially manufactured and was well suited to use in the 'sandwich panels' that were widely employed in system building.[10] These panels were made up of two thin outer layers of plastic with a core of foam or cardboard. FRP was ideal for this because the material has a high load-bearing capacity, is lightweight, and can be manufactured in every shape and colour imaginable.[11]

The experiments with plastic building materials were also in tune with the prevailing social ideas of the reconstruction period. People were optimistic about the future and architects translated that optimism into a wholly new way of living.[12] With lightweight and industrially manufactured plastics like FRP, the dwellings of the future would be flexible and mobile. Ideally, they would grow with the family and be relocatable, so that people could take their dwelling with them when they moved to another place. That was the idea, at any rate.[13]

It was the oil crisis of 1973 that put paid to the use of plastic in construction. The material became more expensive and less attractive for high-volume housing construction.[14] It turned out that plastic was not an unfailing solution because raw materials like oil could run out.[15] People were also starting to think about plastic's damaging effect on the environment and the material acquired negative connotations in society.[16]

FRP ARCHITECTURE IN THE NETHERLANDS

The development and importance of plastics in the Dutch construction world was the subject matter of *Plastica. Maandblad ter verspreiding van de kennis der kunststoffen*, a monthly trade journal published from 1948 by the Netherlands Association-Federation for Plastics. In 1956 the journal published a two-part article entitled 'Does the plastic house have a future?'.[17] Although the author believed that the industrial manufacture of the material could play a major role in high-volume housing construction, he nonetheless observed that the earliest examples of plastic dwellings in other countries should be seen 'as interesting experiments rather than as serious attempts to solve the prevailing housing shortage'. The experiments deviated too much from the 'normal' housing type to be able to offer occupants the level of comfort they were used to.

The idea of building with plastic also figured in the centenary celebrations of Amsterdam's Grand Hotel Krasnapolsky in 1966. The management asked industrial designers Robbert and Rudolf Das and architect C.R. de Vries to come up with an impression of what

3. Wim Pijpers, plastic house, produced from 1962 by the firm Frits Bode Bouwplastic N.V. (*Bouw* 18 [1963] 51)

the hotel might look like in the year 2000. The designers made extensive use of FRP (figs. 1 and 2).[18] In *Futurotel. De hotelkamer van de toekomst* they justified the use of this material as follows: 'Serial use of fibreglass-polyester as a building material is tentatively gathering pace right now. In our opinion it is often completely misused, namely in flat rectangular panels, just like wood or concrete, whereas it is a material that calls for a new double-curved form.'[19] The Futurotel could be built cheaply and industrially using FRP and, because the room modules were removable, it would be easy for Krasnapolsky to adapt to any new trends in the future.

The use of FRP in the Netherlands did not end with Hotel Krasnapolsky's dreams of the future. Several interesting structures featuring FRP elevations were actually built and some of these are discussed below.

PLASTIC CITY, 1959

On 24 March 1959 Dutch newspapers reported the construction of the first plastic bungalow in the Netherlands. The architect was the fifty-year-old Wim Pijpers from Rotterdam. He had designed the house for the Belgian Magiotte Company, which had wanted to demonstrate the potential of plastic in housing construction by building a 'Plastic City' in Putte and Rotterdam.[20] Pijpers' plastic house in Vlissingen was manufactured by N.V. Plastic City and was sold in the form of a DIY flat pack for 12,000 guilders (fig. 3). The model home contained 120 kilos of plastic and the front elevation was in bright yellow and black.[21] The inner and outer walls were made of an FRP sandwich structure reinforced with a core of honeycomb cardboard.[22]

This first plastic house was still an experiment and the notion of a Plastic City, like Krasnapolsky's Futurotel, was a vision for the future. Nevertheless, the design clearly embodied the social ideas of the time. Journalists pointed to the new, flexible mode of living provided by the bungalow: 'One advantage of the house: when people need to relocate, they don't just load the contents into a removal van, they also load the (dismantled) house onto a lorry .... Only to reassemble it at their destination like a box of building blocks.'[23]

INSTANT HOME, 1963

In 1963, four years after Wim Pijpers' pioneering plastic house, the Royal Dutch Aircraft Factory Fokker presented an entirely factory-made plastic home. The factory had embarked on experiments like this in anticipation of a decline in the production of military aircraft. To compensate that loss, Fokker was looking for a secondary activity that would allow them to make use of their expertise with FRP. In 1958, with an eye to the post-war housing shortage, Egbert van Emden, aircraft designer and technical director of Fokker, came up with a plan for a prefabricated home made entirely of plastic.[24]

Between 1963 and 1964 a prototype of the Instant Home was built on the Fokker factory site, after which Van Emden and his wife took up residence in order to put it to the test (fig. 4).[25] The house was made of self-supporting FRP sandwich panels that were new to the market.[26] The Instant Home was 10.14 metres long,

4. The Instant Home by the Royal Dutch Aircraft Factory Fokker, 1963 (National Archives of the Netherlands/ Collection Spaarnestad/Henk Hilterman)

7 metres wide and 2.8 metres high. The dimensions conformed to the maximum permitted sizes for road transport.[27] This meant that the components of the dwelling could be transported in a single factory-to-site journey and then assembled on location; this represented a considerable cost saving compared with traditional housing construction.[28]

Fokker adapted aircraft construction techniques to make the Instant Home as robust as possible. For example, it used a special gluing technique to fix the building components together.[29] Fokker was keen to demonstrate the important role the industry could play in solving the housing crisis. In the end the Instant Home was never marketed, but Fokker did go on to produce their in-house designed plastic facade panels.[30]

SINGLE-FAMILY HOMES IN STADSKANAAL, 1967

In 1967 a block of houses with an FRP facade was built in Stadskanaal in the province of Groningen (fig. 5). The four houses were designed by the EGKS working group, made up of the architects D.A. **E**maar, H. **G**roefsema, B. **K**leinenberg and J.N. van der **S**luis. They regarded the houses as a prototype that would eventually generate an infinite number of possibilities for different housing types in low- and high-rise permutations, as well as office buildings and factories.[31]

The dwellings were the usual single-family type and could be delivered in just two weeks.[32] Unlike the earlier designs by Pijpers and Fokker, where the focus had been on achieving maximum flexibility, these dwellings had a fixed steel frame, which made them difficult to relocate. Each house in this construction project contained six FRP system panels manufactured by the Frits Bode company in Breda.[33]

Although the architects had had great plans for the future with these houses, one year after completion three of the four were still standing empty; society was not yet ready to make the switch to a plastic house.[34]

OEGEMA HOUSE, 1969

The first three plastic dwellings still looked reasonably conventional owing to their rectangular form. That all changed with Groningen architect Pieter Oegema. In 1969 he designed a plastic house that was built a year later on Friesestraatweg in Groningen (fig. 6). It had already been established that plastic could be used to make houses that were easy to relocate or adapt.

Oegema added one more advantage, demonstrating that designers could use the material to give buildings a completely different appearance. 'Living will take a different form. The fact is that we want more playful shapes,' he stated.[35]

The house, which Oegema used for his architectural practice, would certainly have stood out among the surrounding rectangular apartment buildings given its striking semicircular domed form – Oegema dubbed it a 'half melon'.[36] It stood above ground level on concrete posts and consisted of fifteen FRP shells. One of the shells contained a door and four others round windows.[37] This unusual structure opened the way for a new approach to FRP use. In the years that followed architects and manufacturers increasingly experimented with the futuristic forms that could be achieved with this material.

5. EGKS working group, houses in Stadskanaal, 1967 (photo Hans de Smidt, Groninger Archieven)

FUTURA, 1970

Playful forms also feature in the design of Futura, a holiday home marketed in 1970 by the Dutch Plastics Industry (NKI). The NKI was a major supplier of plastic facade elements and Futura was intended to demonstrate the material's versatility.[38]

Futura was made up of twelve separate FRP segments combined into a round shape (fig. 7). The house had a flexible internal layout that could be determined by the occupant.[39] There were also two options for the holiday house's placement: directly on the ground, or perched mushroom-like above the ground on a solid

6. Pieter Oegema, the Oegema House in Groningen, 1969 (photo Persfotobureau D. van der Veen, Groninger Archieven)

7. Dutch Plastic Industry (NKI), Futura holiday house, 1970 (photo Jos Pé, Regionaal Historisch Centrum Eindhoven)

8. Le Comte Holland N.V., Gemini-bungalow, 1972 (National Archives of the Netherlands/Collectie Spaarnestad/ANP)

central base.[40] The structure's odd-looking external appearance prompted comparisons with a flying saucer.[41] NKI's Futura was the first FRP project intended to be sold in large numbers. And in that it succeeded. In 1975, in a special issue on plastics in construction, *de Architect* reported that two hundred Futuras had been produced so far; the plastic bungalow had passed beyond the experimental phase.[42]

GEMINI, 1972

Like Fokker's Instant Home, the Gemini bungalow had its roots in the transport industry. Its producer, Le Comte Holland N.V. was a major player in shipbuilding.[43] The Gemini consisted of two dome-shaped FRP shells coupled together by a gently sloping FRP roof (fig. 8). The front elevation was made of dark aluminium. The form of the shells reflected the bungalow's shipbuilding origins: they looked like the hull of a ship.[44] It is not clear whether this was done in a subtle allusion to the expertise of the designer or because using ship's hull moulds saved money.

Managing director Adolf Le Comte had a prototype

installed on the factory site and he and his wife moved in to test it.[45] *Het Parool* wrote: 'It looks as if the first plastic house project of any size to really take off in the Netherlands will be a bungalow complex in Vianen.'[46] Yet it appears that not much came of this venture either: after 1972 there is little mention of the bungalow to be found in newspapers and magazines. *Trouw* had written: 'The design, by Mr Le Comte, is rather futuristic and breaks radically with prevailing views on housing in the Netherlands.'[47]

AZM OFFICE BUILDING, 1972

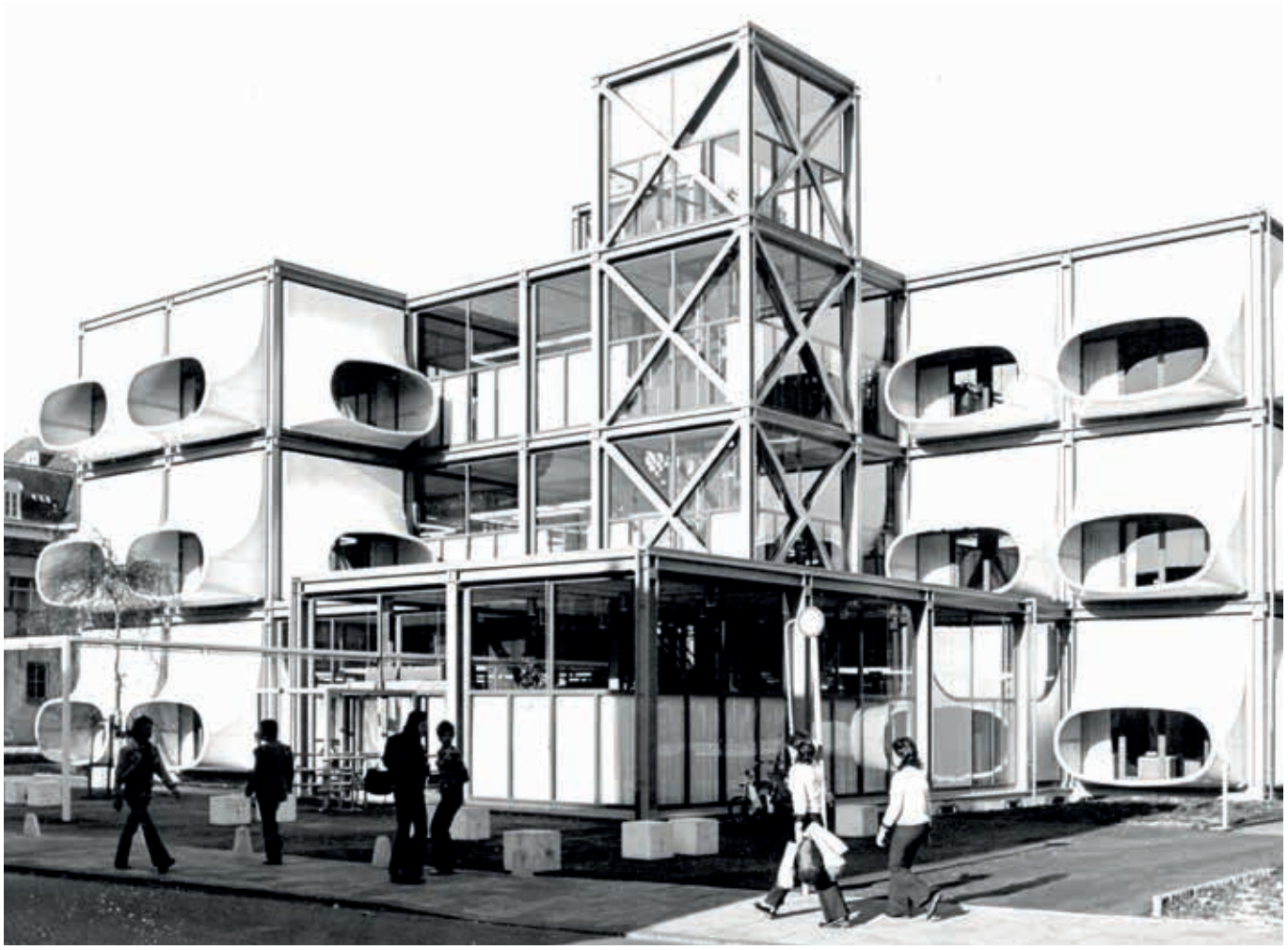
Another elevation in which FRP was used to create a new formal idiom was that of the Algemeen Ziekenfonds van de Mijnstreek (AZM) offices in Heerlen. Architect and artist Laurens Bisscheroux was commissioned to design an office building that was flexible and open in character. The brief specified that it should be easy to adapt both the interior and exterior and that the building should have a flexible internal layout.[48] This was one of the first occasions on which FRP panels were used in a large office building for a major client.

Bisscheroux designed a futuristic structure with FRP components supplied by NKI. Owing to the unusual protrusions around the windows, the building was popularly known as the 'tooter' or 'tits' building (fig. 9). The office had a steel frame into which the polyester panels were inserted. The shape of the facade panels was functional to the extent that the 'tooters' ensured that the amount of light entering the large windows remained constant.[49] This ultimately proved to be a mistake; in summer the building was too warm and in winter too cold. In addition, the FRP panels were quickly dirtied by the exhaust fumes of passing cars and in the evenings the protrusions were popular with amorous teenagers. The upshot was that in 1987, a mere fifteen years after completion, the AZM building was demolished.[50]

SONY DISTRIBUTION CENTRE, 1972

The Sony distribution centre in Vianen is one of the last buildings with an FRP facade to have been completed before the 1973 oil crisis. At that time the architect Jan Brouwer was busy experimenting with the use

9. Laurens Bisscheroux, AZM office building in Heerlen, 1972 (Historisch Centrum Limburg)



of plastic facade panels: at first primarily with FRP, later with glass-filled polycarbonate as well.[51] Brouwer was working towards a recognizable visual idiom using FRP.[52] His facade panels were distinguished by rounded corners, a ripple structure and facade openings reminiscent of car windows.[53]

The Vianen distribution centre's dual functions were reflected in the building's two storeys (fig. 10). The more enclosed ground floor, for which Brouwer used reinforced concrete, was for storing merchandise. The upper floor contained offices and its facade consisted of yellow FRP sandwich panels with large window openings. Brouwer's use of the possibilities offered by FRP to signal the building's different functions (distribution centre and office) to the outside world was a first in FRP architecture.[54]

SBC BUILDING, 1975

The educational building for Stichting Bijzondere Cursussen (SBC) in Zwijndrecht was built after the 1973 oil crisis. The NKI-supplied plastic panels that architect Ton Lanz used to cover the facade were much longer than any of the previously mentioned examples. The eleven-metre-tall vertical panels span all three storeys (fig. 11).[55] The cuboid building, which stands on a kind of brick pedestal, has a minimalist appearance courtesy of the taut white plastic facade with small square windows. The building's corners are rounded, and the sculptural window frames were moulded together with the panels.[56]

In 2018 the owner's plans to demolish the building caused an outcry in Zwijndrecht. The local historical society led a successful campaign for preservation and the building was granted municipal listed status on account of its special cultural value – an indication of the growing appreciation for plastic architecture in the heritage sector.[57]

10. Jan Brouwer, Sony Distribution Centre in Vianen, 1972 (photo Jan Brouwer)

THE EVALUATION OF FRP ARCHITECTURE

Most of the buildings mentioned in this article have since been demolished. Many of the earliest examples of FRP architecture were one-off prototypes or experiments that were not intended for long-term occupation.[58] Some of these buildings, like aircraft manufacturer Fokker's Instant Home, stood on factory sites where they were briefly occupied in order to demonstrate that plastic did not diminish living comfort.[59] Furthermore, the material was never really popular. People were loath to exchange their brick or concrete dwellings – materials with a proven history of safety and solidity – for a plastic version.[60]

Even today the material is not exactly popular, as became apparent when the SBC building was granted local listed status in 2018. Many Zwijndrecht residents were astonished; they thought it was 'hideous'.[61] Another problem is the lack of knowhow in the heritage sector regarding the conservation and restoration of buildings containing FRP. That became obvious in relation to the FRP 'Shelter' prototype designed in the late 1970s by interior architect Kor Aldershoff (fig. 12). It was intended as temporary housing, for example in disaster areas. But because it proved difficult to assemble and disassemble – a crucial feature of the design – the Shelter did not proceed beyond the prototype.[62] The badly damaged building was recently gifted to the heritage preservation association, Vereniging Hendrick de Keyser. There, due to the lack of FRP knowhow, Shelter's restoration proved to be something of a nightmare.[63]

That said, interest in plastic architecture is increasing in the heritage sector, in tandem with the growing interest in post-1965 architecture, and this time the focus is on preservation rather than demolition. FRP's negative image is finally starting to swing the other way.

11. Ton Lanz, SBC building in Zwijndrecht, 1975 (Regionaal Archief Dordrecht)

12. Kor Aldershoff, Shelter, late 1970s (photo Roos Aldershoff)

CONCLUSION

This article has considered the social changes and ideas that informed the decision by architects and companies to employ fibre reinforced polyester in architecture. To illustrate how this new way of thinking about living and building was applied in practice it has looked at ten Dutch buildings in which the material was used in the elevations. The examples show how the use of FRP evolved during the 1960s and '70s. Experiments with FRP began at a time when plastic was seen as a material that could be used to shape the future and solve the housing crisis. When its price soared, and its harmful ecological effects became known this idea had to be adjusted. Architects switched their focus to the possibilities offered by FRP's formability. The structure of FRP buildings also underwent a change. The early plastic houses had load-bearing FRP walls, but later on the material was used in the form of facade panels mounted in a steel frame.

All in all, there were a lot of experiments with FRP in the Dutch building industry. The material was used in a variety of building types: holiday houses, permanent dwellings, office buildings and distribution centres. Although there were high hopes for the use of FRP in construction in the 1950s and '60s, they were never realized on a large scale. Plastic does not occupy the prominent place in architecture that people envisaged after the war. Nevertheless, some exceptional buildings with FRP elevations were realized in the Netherlands and they represent a history in which there is still much to discover.

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62 Vereniging Hendrick de Keyser, 'De Shelter Kor Aldershoff – lange versie', accessed 27 July 2023, www.youtube.com/watch?v=xag9BnaYvSs&t=2s.
63 Vereniging Hendrick de Keyser 2023 (note 62).

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PLASTIC DREAMS

FACADES OF FIBRE-REINFORCED PLASTIC (FRP) IN THE NETHERLANDS

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In the wake of the Second World War, architects and construction companies in the Netherlands started to experiment with the use of fibre-reinforced plastic (FRP) in architecture. At the time this combination of polyester and fibreglass, which is strong, malleable and lightweight, was seen as an ideal building material. Yet to date very little research has been carried out into the use of FRP in Dutch architecture. This article investigates the social changes that prompted architects and construction companies to experiment with FRP.

After the Second World War various factories in the transport industry were keen to find new markets for their expertise with FRP. They found them in housing construction. The plastic material was eminently suited to system building, a process that speeded up the construction of much-needed housing. Thanks to its high load-bearing capacity and factory production, FRP was ideal for the sandwich panels used in this construction method.

Another factor in FRP's favour was the prevailing sense of optimism about the future in the Netherlands in that period. Architects were considering new, flexible forms of living and the designs they produced gave residents the freedom to organize, extend and even relocate their dwelling. Some architects also felt that the outward appearance of buildings should change – that a new era demanded new forms. Buildings should express an optimistic view of the future, and for that FRP, which could be produced in a wide range of shapes and colours, was ideal. Until 1973, that is, when the global oil crisis caused the price of oil to rise so steeply that the use of FRP in large-scale housing projects ceased to be cost-effective.

Many of the buildings containing FRP have since been demolished. The earliest examples were often experimental prototypes, one-off structures not intended for long-term occupancy. Plastic never became really popular as a building material for housing; people were reluctant to exchange their solid brick or concrete dwellings for a plastic version.

Fast forward to today and the restoration and preservation of buildings constructed with FRP is problematical since the relevant expertise is still lacking in the heritage sector. Nonetheless, interest in plastic architecture is growing, accompanied by an emphasis on preservation rather than demolition. This new approach is a corollary of the increasing interest in post-1965 architecture. The negative image of FRP is gradually starting to change.