

## Outdoor polyester sculpture in transit: Joep van Lieshout's Mobile Home for Kröller-Müller

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*Abstract*

The nature and condition of the large-scale glass fibre reinforced polyester resin outdoor sculpture by Dutch artist Joep van Lieshout: *Mobile Home for Kröller-Müller* (1995) is challenging traditional conservation ethics. Chemists, physicists, art historians, conservators specialised in different fields, interns and students have extensively researched and evaluated its condition. The artist was interviewed about the idea, meaning, function, aesthetics and behaviour of the artwork. In order to find suitable products for securing the conservation of polyester outdoor sculptures, mock-ups were made to test conservation materials. The resulting knowledge was used to explore active and preventative conservation measures. This resulted in decisions that push the boundaries of conservation ethics and a realistic proposal for conservation in cooperation with the artist's company Atelier van Lieshout.

*Résumé*

La nature et la condition d'une fibre de verre de large gamme ont renforcé la sculpture extérieure en résine de polyester de l'artiste hollandais Joep Van Lieshout: *Mobile Home for Kröller-Müller* (1995) défie les éthiques de conservation traditionnelle. Des chimistes, physiciens, historiens d'art, conservateurs spécialisés dans des domaines différents, des internes et des étudiants ont longuement étudié et évalué son état. L'artiste a été entretenu sur l'idée, le sens, la fonction, l'esthétique et le comportement de l'oeuvre d'art. Des maquettes ont été fabriquées pour tester la conservation des matériaux, en vue de trouver des produits adaptés pour assurer la conservation des sculptures extérieures en polyester. Les connaissances acquises ont été utilisées pour explorer les mesures de conservations actives et préventives. Ceci a résulté en décisions qui poussent les limites des éthiques de conservation et en une proposition réaliste de conservation en coopération avec la compagnie atelier van Lieshout de l'artiste.

*Synopsis*

La naturaleza y condición de la fibra de vidrio a gran escala reforzó la escultura de exterior de resina de poliéster del artista holandés Joep van Lieshout: El *Mobile Home for Kröller-Müller* (1995) pone en duda la ética de conservación tradicional. Químicos, físicos, historiadores de arte, conservadores especializados en diferentes campos, alumnos en prácticas y

## Outdoor polyester sculpture in transit: Joep van Lieshout's *Mobile Home for Kröller-Müller*

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*Keywords*

contemporary art, glass fibre reinforced polyester (GRP), outdoor sculpture, filling materials, interdisciplinary approach, artist's interview, building physics, conservation ethics

**Introduction**

In 1995 (Joep van Lieshout 1964) created *Mobile Home for Kröller-Müller*. It immediately became an eye catcher in the Kröller-Müller Museum's sculpture garden. The colourful plastic trailer home stands out in the natural setting of the park and is distinctive in the outdoor collection (Figures 1 and 2). After ten years of outdoor display, the work still looked fairly good from the outside but started to develop severe signs of decay on the inside. Traces of mould appeared and leakage had left disturbing stains in the interior. An interdisciplinary research project was set up comprising conservation scientists, building physicists, art historians, conservators specialized in different fields as well as interns and students. It is a collaboration between Netherlands Institute

estudiantes han investigado y evaluado a fondo su condición. El artista fue entrevistado sobre la idea, significado, función, estética y funcionamiento de la obra de arte. Con el objetivo de encontrar productos adecuados para asegurar la conservación de esculturas de exterior de poliéster, se han realizado maquetas para comprobar los materiales de conservación. Los conocimientos resultantes se emplearon para explorar medidas activas y preventivas de conservación. Esto condujo a decisiones que empujaron los límites de la ética de la conservación y a una propuesta realista para la conservación en colaboración con la compañía del artista Atelier van Lieshout.



Figure 1



Figure 2

Figures 1–2. Joep van Lieshout, *Mobile Home for Kröller-Müller*, 1995, 3400 × 9000 × 7500 cm. KM 127.508, Photo: Sanneke Stijter

of Cultural Heritage, University of Paris 1 Panthéon-Sorbonne, Eindhoven Technical University, University of Amsterdam and the Kröller-Müller Museum.

### History and identity of the artwork

In 1993 Joep van Lieshout was asked to realize a work for the sculpture garden based on the collage *The ambulatory building: Part 1*<sup>1</sup>. The collage contains the text 'The Master and Slave-units are not limited in size or configuration, they offer user-determined architectural opportunities to create, expand or transform their own building at any time. The system is not tied to one level, surface or size, therefore many varieties are possible'<sup>2</sup>. According to this principle *Mobile Home for Kröller-Müller* consists of a rectangular 'master unit' to which several 'slave units' are attached. The slave units are playful forms that differ in texture and colour and determine a large part of the visual characteristics and identity of the house. There is a sleeping unit in the form of a bright yellow blob, a red cupboard-like kitchen unit, a cedar bevel sided study unit and a sanitary unit that is green on the outside and entirely turquoise on the inside. The units fit standard sized openings in the master unit and are interchangeable as shown in a drawing (Figure 3).

### Atelier van Lieshout (AVL)

The same year *Mobile Home for Kröller-Müller* was made, Joep van Lieshout founded Atelier van Lieshout (AVL), his studio company in Rotterdam harbour. It is a multidisciplinary art practice combining installation, design, furniture and architecture into each product. The AVL signature trademark is colourful polyester furniture and mobile home units designed for life and survival. They are practical, uncomplicated and substantial. One finds a polyester trailer home with a multi-women bed next to a weapon workshop in a sea container, a biogas installation connected to a polyester toilet and stables with livestock. Van Lieshout even concentrated on the process of slaughtering and making sausages. In short, life is shaped by Atelier van Lieshout, with the free state 'AVL-Ville' as the best example – prohibited by the Rotterdam authorities. Everything is done in a grand and playful style, with a hint of provocation, challenging the official authorities as well as the art world (Figure 4).

### Art-making process

After the creation of *Mobile Home for Kröller-Müller*, 'Atelier Van Lieshout: A Manual' was published, a catalogue elaborating largely on the art-making process, with *Mobile Home for Kröller-Müller* as one of the reference works (de Jonge 1997). The book is part of the democratic art-making idea with a strong do-it-yourself spirit. The typical AVL polyester look is documented using a hand lay-up technique on modelled plywood and more experimental

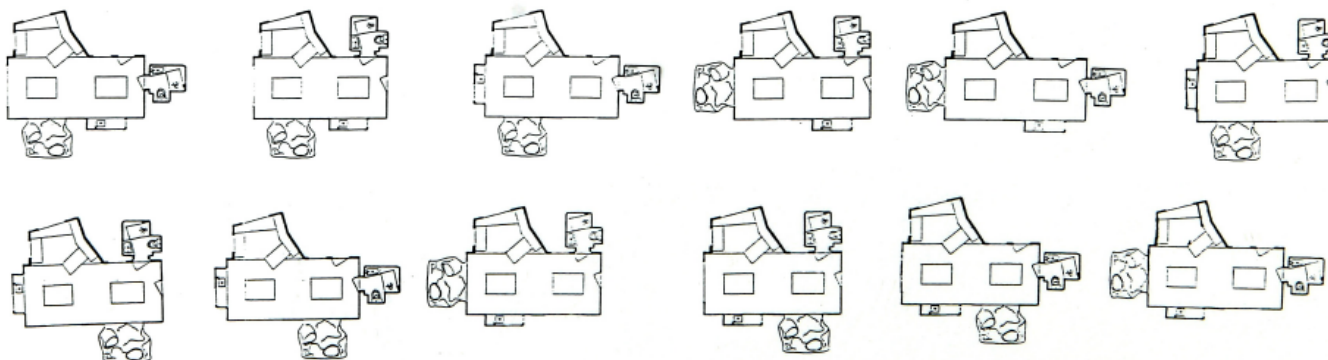


Figure 3. Detail from print *Mobile Home for Kröller-Müller*, 1995, 90 × 150 cm, KM 108.988, Photo: Rik Klein Gotink



Figure 4. Joep van Lieshout and crew,  
Photo: ©Atelier van Lieshout



Figure 5. Making of the sleeping unit,  
pouring expanded polyurethane foam  
over an air pumped bulb of polyethylene  
sheeting shaped by self-adhesive tape,  
the basis for a hand lay-up polyester finish,  
Photo: ©Atelier van Lieshout

structures created with polyurethane foam including the sleeping unit (Figure 5). A moulding technique is used to create shiny surfaces. To form the skylights a technique has been developed to make use of gravity. A sheet of polyethylene is hung from a framework to form a curved shape from an inverted skylight. This is covered with glass fibre mats and polyester resin and, after curing, the supporting sheet is removed. Bubbles and folds in the transparent skylights reveal the handwork and the AVL touch. The book promotes the idea that the art-making process is not restricted to the artist or his studio.

### Assessing condition

*Mobile Home for Kröller-Müller* has been displayed at different locations and moved around like a real mobile building. This caused the first mechanical damage and physical deterioration to the materials in the construction. Preventative conservation was started and the condition monitored until it was decided to place the work in storage and start a thorough investigation. To gain insight into the full complexity of the material state, the damaged locations and the overall condition were investigated and the causes were assessed. In some cases, invasive local investigations were necessary to establish the full scale of damage. The problems were listed and studied by several specialists. The intention and the functionality of the artwork were considered as well.

### Modular functionality

Although the idea of interchanging the slave units is important to the significance of the artwork, it was never actually carried out. The weight of the units may have caused the GRP-covered walls to 'settle' into its semi-permanent slave unit. The actual transformation of the artwork may be not as easy as it seems and could introduce new stress and damage. The question is whether this static situation affects the initial idea of a modular system, a significant aspect of the artwork's functionality.

### Experience

*Mobile Home for Kröller-Müller* was rarely open to the public because of the risk of damage if it was left unguarded. The closed display of the artwork is meant as a precaution, but it affected the artwork's interpretation at the same time. This was exemplified by the removal of bed linen from the humid indoor climate, despite the fact that the bed had to look inviting. Conservators of modern art are conscious of their responsibility of managing the concept of an artwork as well its material integrity, so a solution should be found.

### Glass fibre reinforced polyester (GRP) resin

The colourful glass fibre reinforced polyester (GRP) resin has faded, especially on the roofs of the master and kitchen unit, due to their direct exposure to sun and rain. The once deep green sanitary unit now shows a pale milky hue on the rounded top where sunlight hits the surface and in places where water runs down. The red kitchen unit has faded into a dull brownish orange and shows curved cracks in an area where the water would stand. The striking yellow blob is chalking, a well-known phenomenon on polyester surfaces. The once transparent skylights discoloured to amber brown. The GRP on the roof and skylights suffered most. A combination of extreme fluctuations in temperature, rain, sun, occasionally snow and dirt from leaves, bird excrement, algae and moss have damaged a large part of the top coat of polyester. Capillary action allowed water and dirt to enter the voids that appeared between the glass fibres and the polyester resin as well as the cracks on the roof (Figure 6). This caused physical and chemical deterioration that damaged the overall structure of the artwork.



Figure 6. Detail of cracked GRP on the  
roof of the master unit, Photo: Sanneke  
Stigter

*Sampling and analyses*

Unsaturated polyesters deteriorate due to osmosis, photo-oxidation and hydrolysis, especially if outdoors. These processes can be followed using Fourier transform infrared (FTIR) spectroscopy and pyrolysis gas chromatography mass spectrometry (Py-GCMS). FTIR analyses on samples of the polyester resins of various parts of the artwork were performed on a Perkin Elmer Spectrum 1000 infrared spectrometer with a Golden Gate Single Reflection Diamond Attenuated Total Reflectance accessory (ATR, Graseby Specac). Py-GCMS was carried out using a GSG curie point pyrolyser on a Thermo Quest 8000top Gas Chromatograph – Voyager Mass Spectrometer combination. From the results, it was concluded that the polyester resin on various parts of the sculpture aged differently and underwent oxidation, hydrolysis and other degradation types. The polyester resin on the sanitary unit's skylight degraded the most, probably because it was an older and re-used unit. The polyester resin on the roof of the kitchen unit degraded more than the other coloured polyester resins. Further research will be performed to estimate the condition of each unit and to provide guidelines at which state urgent measurements are needed such as a new layer of polyester resin.

*Water problems*

Water causes damage to outdoor sculpture and architectural design in the Netherlands. To protect the construction from leakage, a self-adhesive foam strip was applied between the units and each of the units sealed with silicone rubber from the outside. Rubber around the windows in the kitchen unit failed to keep out rain, resulting in dark stains on the wood and delaminating varnish. The porous and cracked structure of the polyester resin on the roof of the master unit allowed water to seep in. The enclosed water caused mould growth that damaged a large part of the inner sandwich construction of wooden beams and insulation material. This entire process had remained invisible to the naked eye, until mould started to emerge from a join in the ceiling.

*Assessment of building physics*

Insulation material and a vapour barrier sheet are incorporated within the ceiling construction. From a building physics perspective, the layered construction with a plastic sheet as a vapour barrier on the inner side, a mineral wool insulating material in the cavity and a damp proof outer layer of GRP is sufficient. In Scandinavian countries, many flat roofs are constructed in this way. Leakage of water into a cavity however, is a large problem for this kind of construction. Due to the presence of waterproof inner and outer layers, water entering a cavity cannot go anywhere and this can lead to severe structural damages. A solution might be a relatively new type of selectively operating vapour barrier. On wetting it opens to water and is waterproof when dry. Because the interior is never heated, the indoor climate can attain 90 per cent relative humidity (RH). A solution to this problem might be controlled heating or venting of the cabinet.

Another continuous problem is the overnight condensation of water on the inside of the thinly structured skylights, probably caused by cooling of air during clear and cold nights. Condensation on the inside surfaces of skylights causes water to seep along the wood directly below. To solve these structural problems, a physical modelling approach is suggested. Other solutions may be application of a vapour barrier or insulating material and adjustments to allow heating or venting of the cabinet. Verification of the calculated indoor climate is possible with a large number of already measured indoor climate temperature and relative humidity data (Schellen 2007).

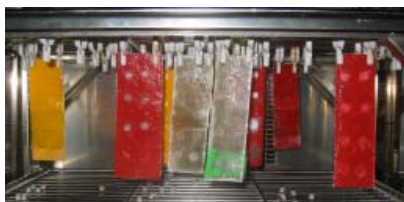


Figure 7. Samples in climate chamber at Netherlands Institute of Cultural Heritage, Photo: Sara Kuperholz

### Testing filling materials for GRP

To fill cracks and losses various putties and custom filled resins were tested and artificially aged to observe changes in appearance, behaviour and compatibility with GRP. Mock-ups were made following the three techniques described in the AVL-manual and the damages that had occurred were simulated. One set of samples was light aged for 300 hours in a Xenotest, Alpha High Energy (Atlas®) and another set underwent climate ageing during five weeks in a Vötsch Vc 0200 climate chamber at 60 °C and RH cycling between 35 and 80 per cent every three hours (Figure 7).

#### *Experimental results*

Promising results were obtained for both Araldite® 2020 and Hxtal NYL-1, both two component liquid epoxy resins used for filling microcracks (Table 1). They allow a long working time. Poly-Pol Gelcoat primer, a polyester paste, showed excellent ageing properties and good workability for larger areas with its viscous consistency. Milliput® Superfine White, a pre-filled epoxy putty, showed good results for small lacunas and excellent workability especially on vertical structures and overhead areas because of its consistency and fast curing properties. Mixtures incorporating chopped glass fibre strands were least visible on the GRP surface. Further research is necessary to test how effective a barrier the products are when exposed to heavy rain, frost and sun (Kuperholz 2007).

### Decision-making: crossing borders?

The key decision to be made is what *Mobile Home for Kröller-Müller* is really about. Joep van Lieshout states that ‘the modularity is an important feature. Nothing is fixed. The object is about freedom and elusiveness’<sup>3</sup>. However when asked about the static nature of the slave units, he states that the work can best be presented the way it had always been with the slave units in their original position. Apparently *Mobile Home for Kröller-Müller* gained an icon status as the first ‘modular’ trailer home by Atelier van Lieshout. It is convenient to go along with the artist’s wishes at this point, because deciding differently would probably conflict with the artwork’s material integrity.

#### *Transition*

A completely different solution could be to place the work indoors. The artist is not against this idea. In fact he likes it. The artwork then loses part of its identity as a mobile building as well as its art historical function in the Kröller-Müller sculpture garden. The work was made on request by director Evert van Straaten to augment the outdoor sculpture collection.

*Mobile Home for Kröller-Müller* should perhaps be considered architecture more than sculpture, maintenance being a logical part of that. Van Lieshout likes his work in mint condition but allows the development of patina at the same time. When asked how the work should look in 200 years he states, ‘it is allowed to look old and used, worn and discoloured, but it should still look usable. It should look as if someone has lived there for 200 years and that maintenance has been part of that. The roof and the windows may be replaced, the façade may be painted: all lovingly treated and well taken care of.’ In this light the conservator’s fear that the artwork is changed when extensive maintenance is performed could really be seen as superficial. Indeed these changes could be regarded as part of the artwork’s idea and behaviour. *Mobile Home for Kröller-Müller* is a sculpture in transit.

#### *Coating and protection*

Given the relatively rapid deterioration of unprotected GRP in the outdoors a new coating is necessary. This is an irreversible maintenance method that

Table 1. Tests on filling materials for GRP

	Filler added	Working time	Transparency	Physical properties	Advantages	Disadvantages	Light ageing		Climate ageing	
							Yellowing	Gloss loss	Yellowing	Gloss loss
ARALDITE® 2020 two-component liquid epoxy	none	6 hrs	transparent	<ul style="list-style-type: none"> <li>- long working time</li> <li>- flexible</li> <li>- good adhesion</li> <li>- same refraction index as glass</li> </ul>	<ul style="list-style-type: none"> <li>- polyester compatible</li> <li>- penetrates small cracks</li> <li>- good application</li> <li>- water resistant</li> <li>- heat resistant</li> <li>- light resistant</li> <li>- can be tinted</li> </ul>	<ul style="list-style-type: none"> <li>- difficult to determine if components are distributed evenly</li> </ul>	-	-	-	-
	glass fibre chopped strands	24 hrs	semi-transparent	<ul style="list-style-type: none"> <li>- all advantages of pure resin</li> <li>- strong: fibre reinforced</li> </ul>	<ul style="list-style-type: none"> <li>- all advantages of pure resin</li> <li>- suits GRP look</li> </ul>	<ul style="list-style-type: none"> <li>- needs large amount of filler</li> <li>- better workability after 12 hours of polymerisation</li> </ul>	x	o	o	o
	Aerosil® fumed silica	24 hrs	whitish	<ul style="list-style-type: none"> <li>- all advantages of pure resin</li> </ul>	<ul style="list-style-type: none"> <li>- all advantages of pure resin</li> <li>- suits semi-transparent surfaces</li> </ul>	<ul style="list-style-type: none"> <li>- needs large amount of filler</li> </ul>	x	x	x	x
	glass bubbles	20 hrs	opaque white	<ul style="list-style-type: none"> <li>- all advantages of pure resin</li> </ul>	<ul style="list-style-type: none"> <li>- all advantages of pure resin</li> </ul>	<ul style="list-style-type: none"> <li>- needs large amount of filler</li> <li>- cures faster</li> </ul>	x	o	x	o
	none	similar to Araldite® 2020		<ul style="list-style-type: none"> <li>- similar to Araldite® 2020</li> <li>- more fluid during application</li> </ul>	<ul style="list-style-type: none"> <li>- similar to Araldite® 2020</li> <li>- more flexible after curing</li> </ul>	<ul style="list-style-type: none"> <li>- similar to Araldite® 2020</li> <li>- expensive if to be imported from USA</li> </ul>	-	o	-	x
MILLIPUT® superfine white two-component epoxy putty	pre-filled with talc	3-5 min	white	<ul style="list-style-type: none"> <li>- sticky on application</li> <li>- tough</li> <li>- coarse</li> <li>- good adhesion</li> </ul>	<ul style="list-style-type: none"> <li>- good workability</li> <li>- moistening during application improves workability nicely</li> <li>- can be painted</li> </ul>	<ul style="list-style-type: none"> <li>- not for thin layers</li> <li>- not for large areas</li> <li>- 2 minutes kneading needed</li> <li>- limited working time</li> </ul>	o	o	x	o
	only polyester pigment paste	5-10 min	opaque	<ul style="list-style-type: none"> <li>- sticky on application</li> <li>- thick and tough</li> <li>- glossy</li> <li>- good adhesion</li> </ul>	<ul style="list-style-type: none"> <li>- polyester compatible</li> <li>- working time suitable for larger lacunae</li> <li>- medium viscosity</li> </ul>	<ul style="list-style-type: none"> <li>- difficult to obtain even surface</li> <li>- cannot be reworked</li> </ul>	o	o	o	o
POLY-POL GELCOAT PLAMUR two-component polyester paste	glass fibre chopped strands	5-10 min	semi-transparent	<ul style="list-style-type: none"> <li>- strong: fibre reinforced</li> </ul>	<ul style="list-style-type: none"> <li>- all advantages of pure resin</li> <li>- good workability</li> <li>- can be tinted</li> <li>- suits GRP look</li> <li>- excellent mix with glass fibres</li> <li>- smoother surface than without filler</li> </ul>	<ul style="list-style-type: none"> <li>- sugary look</li> <li>- not for transparent fillings</li> </ul>	o	o	o	o
	glass bubbles + polyester pigment paste	5 min	opaque	<ul style="list-style-type: none"> <li>- brittle</li> </ul>	<ul style="list-style-type: none"> <li>- all advantages of pure resin</li> </ul>	<ul style="list-style-type: none"> <li>- not for thin layers</li> <li>- cures faster: shorter working time</li> </ul>	o	o	o	o

x = small change  
 - = not tested  
 o = no change

affects both the original surface structure and the development of patina. For Atelier van Lieshout, this is not a problem. One just adds new glass fibre mats to the coating when needed. On the other hand omitting a new GRP layer is not an option as long as the work is shown outdoors, judging by the severe degradation that has already occurred. This has led to irreversible damage.

Recoating outdoor artworks is neither new nor unacceptable in the conservation of outdoor sculpture. The specific AVL polyester-look requires both craftsmanship and artistic feel. Working with the artist's studio to repair and recoat the work is therefore a necessity. This is a feasible option as long as AVL studio is active. On the long term it could be decided to show *Mobile Home for Kröller-Müller* indoors, which is however a change to the experience of the artwork as well. Conservation conventions are a hindrance to the functionality of *Mobile Home for Kröller-Müller* and in order to preserve the artwork maintenance has to be started in cooperation with the artist's studio while this is still possible. Hereafter less intrusive preservation treatments should be performed protecting the new surface with a protection layer as part of a well-designed maintenance plan.

### Conclusion

It has become clear that Joep van Lieshout's glass fibre reinforced polyester resin sculpture *Mobile Home for Kröller-Müller* cannot survive outdoors without maintenance and a protective layer. Promising results were found for filling materials. Recoating with polyester resin every 10 years seems inevitable and from the artist's interview it could be concluded that this approach suits the actual significance of the work. Modern art conservators need to cross boundaries and look past traditional conservation approaches in order to keep up with time and decay, managing material changes while preserving the artwork's identity at the same time.

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### Notes

- 1 Information from Evert van Straaten, director of the Kröller-Müller Museum, October 14 and 5 November 2007.
- 2 Part of a text on The ambulatory building; Part 1, 1993. KM 111.124.
- 3 Interview with Joep van Lieshout by Lydia Beerkens and Sanneke Stigter, filmed by Elisa Schöne 23 October 2007, Atelier van Lieshout, Rotterdam. Further quotes are from this interview, translated from Dutch.

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*COMSOL Conference 2007, 23–24 October 2007 Grenoble.* Grenoble: COMSOL France, Vol. 2, 601–607.  
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