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Maintenance of the Voortrekker Monument Wagon Laager Wall

Needs assessment and technical report

for

Mr Ben Mwasinga

Manager: Built Environment Unit

The South African Heritage Resources Agency

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Pretorius, C. (*Voorsitter/Chairman*), Ackermann, M. F., Aucamp, C., Bailey, A., Cruywagen, A. A., De Kock, C., Grobler, J. E. H., Landman, E. F., Noëth, J.G., Pienaar, A. J., Titus, D.J., Tredoux, K. G., Van der Merwe, J.H., Van Wyk, W.C.

This document has been prepared by the Heritage Foundation for:

Mr Ben Mwasinga
Manager: Built Environment Unit
The South African Heritage Resources Agency

111 Harrington Street
CAPE TOWN
8001

bmwasinga@sahra.org.za

021 462 4502



die erfenisstigting
the heritage foundation

PO Box 1514 Groenkloof, Pretoria 0027

Tel: +27 (12) 325 7885 / 323 9050 Fax: 086 617 8067

admin@es.org.za www.es.org.za

Compiled by: Johan Nel
Head: Heritage Resources Management for the Voortrekker Monument
and Heritage Foundation

Reviewed by: Cecilia Kruger
Managing Director of the Voortrekker Monument and Heritage Foundation

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1. INTRODUCTION

The Voortrekker Monument is a declared Grade I National Heritage Site in terms of section 27 of the National Heritage Resources Act, 1999. It is likely the most visited cultural heritage tourist attraction in South Africa outside Cape Town. The Voortrekker Monument is, however, not only a tourist attraction, but also comprises an important part of our South African history, aesthetic and living heritage and Afrikaner cultural identity.

The role played by the Management of the Voortrekker Monument contributes significantly to a general, public awareness of the value of heritage within society. Both the public and various organisations hold the Voortrekker Monument Management in high regard as leaders in heritage resources management and conservation. It is therefore important that Management follow the correct procedures regarding the responsible and sustainable use of this heritage site to promote the example that has been set.

The wagon laager wall is one aspect of the greater Voortrekker Monument precinct. This structure comprises 64 wagons that surrounds the Monument proper as a laager.

2. BACKGROUND

The 64 wagons each comprises 16 terrazzo¹ panels. The 1 024 panels were cast on-site in the 1940s. Materials to cast and construct the panels included white cement imported from the United States of America, white marble from Marble Hall in today's Limpopo Province and blue granite out of Namaqualand in the Northern Cape. The Pretoria-based firm Dey constructed the laager wall's foundation, already completed in 1949.²

The sculptor, Frikkie Kruger, created a clay model of a *kakebeenwa* (jawbone wagon, so called as the wagon's body looked like a lower mandible) to cast a plaster of Paris mould. This mould formed the 'die' used to produce cement forms in Johannesburg. The Johannesburg-based Italian firm, Lupini, completed the terrazzo casting of the forms on-site at the Monument (see Figure 1).³

¹ *Terrazzo* refers to an Italian technique where ground marble and granite are mixed with cement and cast into molds created by a sculptor.

² Ringmuur waens vir Monument eersdaags gegiet. *Die Transvaler*. 1949-03-05

³ *Ibid*, 1949-03-05

According to minutes held in the Voortrekker Monument archive, Lupini already needed to do repairs as early as 1959.⁴ Thereafter, repairs and maintenance frequently occurred over the past 60 years (see e.g. Figure 2). Naudé shows that these frequent repairs were, in part, necessitated due to inherent design faults in the original design of the wall and panels, and that continued deterioration is inevitable.⁵

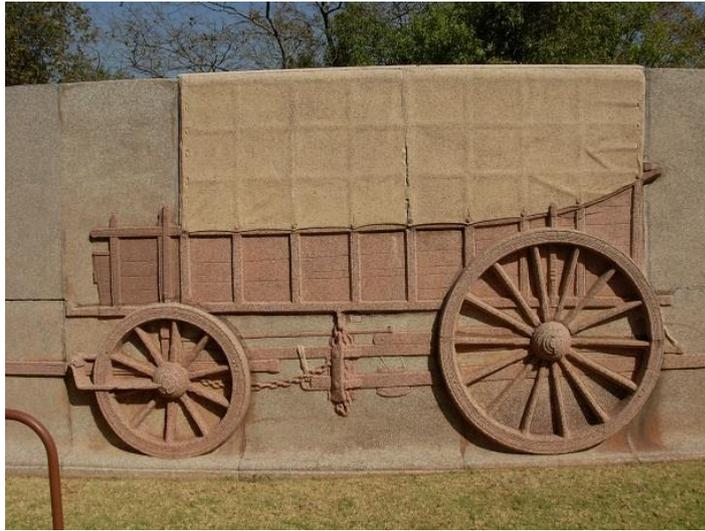


Figure 1: Example of typical terrazzo wagon.



Figure 2: Example of previous repair work.

⁴ *Minutes of the Council of the VTM, Report June to October 1959*

⁵ M. Naudé, *Assessment of the technical maintenance interventions on the structure of the 'walaer' at the Voortrekker Monument, Pretoria, May 2019*

3. NEEDS ASSESSMENT

In 2016, the Voortrekker Monument realised that the wagon laager wall again required repairs and maintenance. The Monument completed a needs assessment that identified panels that require immediate maintenance to prevent significant damage to individual panels. The initial estimate was that the maintenance will be completed within six months. However, once preliminary work commenced various hidden defects became apparent that significantly contributed to the deterioration, such as corroded steel reinforcing, old electrical wiring and intruding tree roots, as well as natural expansion and contraction of the fabric (see Figure 3 and Figure 4).

After securing donor funding in 2017, the Voortrekker Monument prioritised the maintenance work as the current deterioration not only affects the physical structure of the panels, but also poses a risk, albeit a very low one, to visitor safety.



Figure 3: Example of current maintenance challenges – corroding metal reinforcement



Figure 4: Example of current maintenance challenges – vegetation rooting in open joints

4. TECHNICAL RECORD

The maintenance work carried out to date managed to stabilise and stop immediate further deterioration of the individual wagon panels, safeguarding the current integrity of the entire structure. This section provides an overview of the technical maintenance completed to date.

4.1. PHASE 1: PRE-TREATMENT AND FIXING OF LOOSE PANELS

Resonance tests of all panels preceded maintenance work to determine which panels have pulled or are busy pulling away from the internal cement 'core' to prioritise panels in terms of highest future conservation risk. Closer inspection of high-risk panels showed that loosening occurs due to several factors. The quantity and quality of cement used, or the use of rubble and stones as infill instead of cement, during the 1949 construction notably contributes to loosening and overall deterioration.

Maintenance interventions of such high-risk panels included the removal and re-fixing of panels with added support into the original cement core.

Pre-treatment further comprised manual removal and treatment of intruding vegetation and pruning low-hanging branches to approximately 500 mm from the wall to prevent moss growth on the walls.

Cuts made at panel joints and on top of the panels enabled the pouring of a fluid cement mixture between the panels and original internal concrete cast. Where necessary, inserted copper rods provide additional reinforcing and better adherence for the panels to the concrete cast, such as on top of the wagons and in larger panels (see Figure 5 and Figure 6).



Figure 5: Example of original internal concrete cast behind a removed panel. Note the space between the panel and cast.



Figure 6: Example of copper staple inserted to join the panel to the concrete cast



Figure 7: View of top part of wall after filling cavity and sealing of joints. White conduit contains electrical wiring.

4.2. PHASE 2: GROUTING AND POINTING

Grouting and pointing of panel joints followed the initial fill of voids behind loose panels. Grouting refers to filling the spaces, or joints, where panels meet with a cement mixture. Pointing refers to the final cosmetic smoothing of the grouted joints.

The grouting and pointing sequence included the following steps and illustrated in Figure 8 to Figure 12 –

1. Opening of existing joints between and on top of panels to remove old, deteriorating material.
2. After opening the existing joints and removing as much old material as possible, wet newspaper inserted into the joints acts as a temporary seal to contain the cement mixture poured in behind the panels.
3. The fluid sand-and-cement mixture poured from the top of the wall into the cavity between the panel and original concrete core fills the void and aids adherence between the two surfaces. The mixture cures for at least two days.
4. After sufficient curing, the temporary seals are removed curing and the joints are ready for grouting and final pointing.
5. Grouting then commences using a mixture of building sand and cement and left to cure, after which the grouted joints are pointed to an even finish.
6. Resonance testing is again carried out to confirm that cavities are sufficiently filled.



Figure 8: Step 1 – Opening of old joints around panels.



Figure 9: Step 1 – Opening cavity between panel and internal concrete cast.



Figure 10: Step 2 – Wet newspaper inserted into joints as temporary seals.



Figure 11: Seals removed after curing and before grouting and pointing.



Figure 12: Example of final grouted and pointed joints.

4.3. PHASE 3: PATCHING

Patching refers to the superficial application of material over a specific area to repair, reinforce or conceal broken elements that could include holes or cracks. Patching is distinct from grouting and pointing joints in that patching does not allow the same measure of contraction and expansion as grouting, and therefore cracks easily.

Patchwork is a tedious process requiring patience and concentration to obtain the correct thickness and colour of patches.

Patchwork is applied directly to the terrazzo panels where, for instance, corroding steel reinforcing caused surface damage or to conceal joints after final pointing is completed. The steps followed in patching included the following and illustrated in Figure 13 and Figure 14 –

1. Cleaning of panels and pre-treatment where necessary.
2. Damaged panel elements are built up to the same dimensions using a sand-and-cement mixture that is cured over at least two days.
3. The final layer applied over the cement base comprises a mixture of building sand, river sand, oxides and cement blended to a similar colour as the original terrazzo. The oxide mixture consists of two or more colours to obtain the desired colour to match the panel.



Figure 13: Example of superficial damage to a panel element.



Figure 14: Patchwork on damaged area to obtain a uniform appearance of the panel element

5. CONCLUSION

The expected completion date for the current maintenance work is 1 July 2019. However, continued preventative maintenance is required to prevent damage and deterioration occurring on the current scale.

The Heritage Foundation and Voortrekker Monument engaged with the Built Environment Unit of the South African Heritage Resources Agency (SAHRA) on 17 May 2019 in this regard. Following this meeting, the Built Environment unit undertook a site visit on 27 May 2019.

The meeting and site visit lay the foundation for a Heritage Agreement between the Voortrekker Monument, Heritage Foundation and SAHRA, which will be drafted by the Heritage Foundation. The agreement will address future routine maintenance and repair works.

The Built Environment unit furthermore requested that the Heritage Foundation submit this report and other relevant documentation in support of an Emergency Repair Order application that will be appended to the Heritage Agreement.

6. REFERENCES

Anonymous. 1949. Ringmuur waens vir Monument eersdaags gegiet. *Die Transvaler*, 5 March 1949

Naudé, M. 2019. *Assessment of the technical maintenance interventions on the structure of the 'wa-laer' at the Voortrekker Monument, Pretoria.*