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DURBAN

Our ref: P 2402-02-01 **Forensic Engineering Assessment Report 00**

NATIONAL HOME BUILDERS NHBRC REGISTRATION COUNCIL

FORENSIC ENGINEERING ASSESSMENT REPORT

for

HOUSE RUST
ERF 3228, STERLING AVENUE
PARYS COUNTRY AND GOLF ESTATE, PARYS

PREPARED BY:

SCIP ENGINEERING GROUP

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Date: June 2025

SECOND ISSUE

36.44% black female owned & 125% recognition level
BBBEE: Level 2
ISO 9001.2015 Certified
NHBRC Reg: 1-181214979
A member of CESA

Reg No: 1996/015526/07
VAT No: 4010168278

ISO COMPLIANCE

REVISION NUMBER	REVISION DATE	CHANGE MANAGEMENT	AUTHOR	CHECKED BY
00	13 June 2025	Report created	S.Sumer (BSc Civil)	B Grobler (Pr.Eng)
01	June 2025	Method Statement B2	S.Sumer (BSc Civil)	B Grobler (Pr.Eng)
		Signed:		
		Date:	18 June 2025	18 June 2025

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

SCIP Engineering Group (Pty) Ltd was appointed by the National Home Builders Regulation Council (NHBRC) to conduct a forensic engineering assessment for House Rust in Parys, Free State. Concerns were raised due to excessive water penetration into the house during rain events.

The purpose of this report is to outline the concerns raised, address the cause of structural distress, and make recommendations on the way forward.

2 SCOPE OF WORK: FORENSIC ENGINEERING ASSESSMENT

The scope of the forensic assessment as set out by the NHBRC brief includes:

- Establish the condition of the housing unit.
- Evaluate the structural integrity of the housing unit based on a standardised high level visual inspection and evaluate compliance to norms and regulations.
- Indicate problematic areas and defects.
- Propose remedial measures.

3 SITE LOCATION

The site is located at the Parys Golf and Country Estate, ERF 3228, Sterling Avenue, Parys. The site has approximate coordinates as follows:

Latitude:	26° 88' 49.3" S
Longitude:	27° 48' 46.2" E

The site is shown in Figure 1.

Figure 1: Google Earth image of site

4 PROJECT BACKGROUND

Concerns were raised following rainwater penetration into the wine cellar, signs of damp in walls and water damage to ceiling boards.

The house is a double storey loadbearing masonry building with timber roof trusses and IBR roof sheeting. The house has no roof drainage system in place and utilizes two suspended reinforced concrete slabs (drainage slabs) above the entrance foyer to transfer rainwater from the roof sheets into a weephole positioned at the slab end.

A structural inspection was conducted on 20 May 2025 to identify the cause of the water ingress. A photographic survey was carried out and the findings of the investigation is discussed in succeeding paragraphs.

5 TERMINOLOGY

The following terminology applies to this report.

An **upstand beam** typically refers to a concrete beam integrated with a slab. An upstand beam is deeper than the slab with the soffit of the beam and the slab lining up such that the top of the beam protrudes above the slab.

Delamination of plaster refers to the loss of bond between plaster and concrete or masonry causing pieces of plaster to fall off or crack.

Penetrating damp refers to moisture entering the building's interior through exterior walls or other structural elements such as roofs, chimneys or openings.

6 SITE INVESTIGATION RESULTS AND DISCUSSION

The findings from the visual inspection are presented below. The possible causes will be discussed and remedial work presented in Table 1.

The house has two drainage slabs on opposite ends of the entrance foyer. A visual inspection was conducted on both slabs. Where access was not possible without dismantlement or demolition, assumptions were made to assist with the structural evaluation.

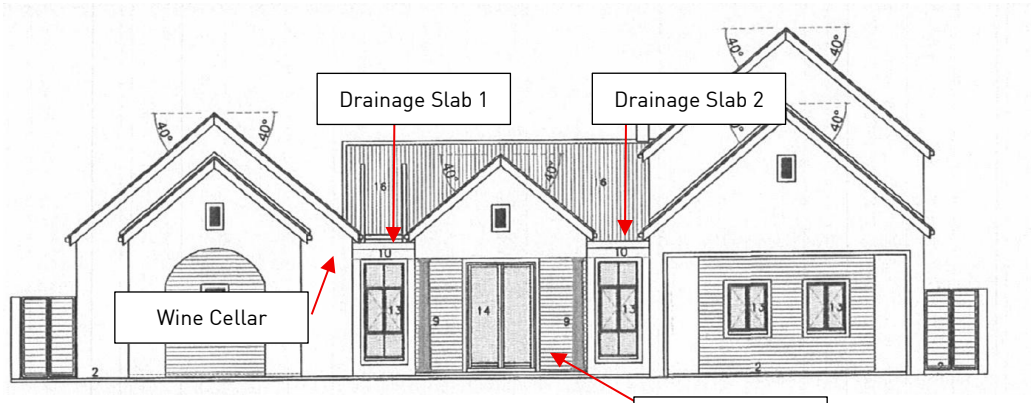


Figure 2: Front of house and slab positions

The figures below show the construction of the two slabs along with notes to identify elements that will be discussed later in this report.

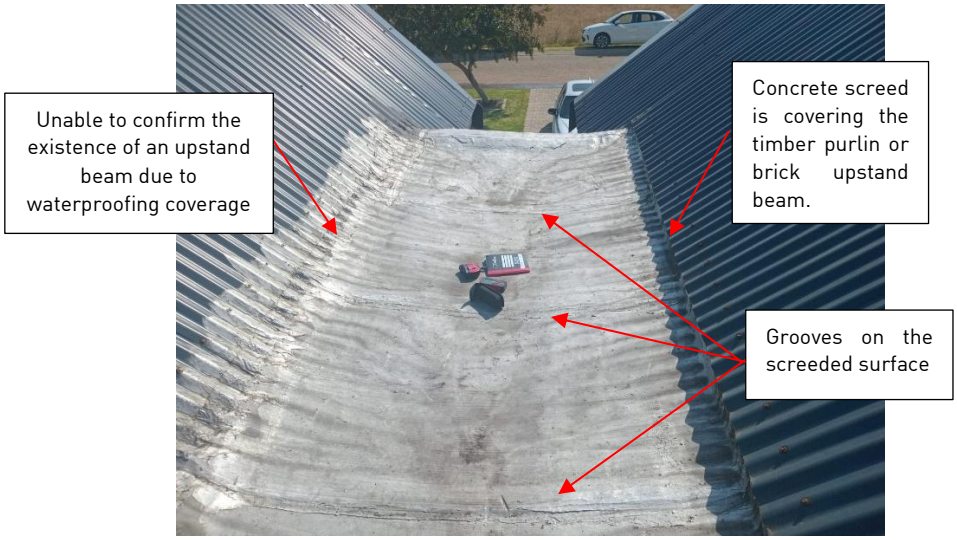


Figure 3: Drainage slab 1

Figure 4: Edges of drainage slab 1

Figure 5: Protruding grooves on screeded surface 1

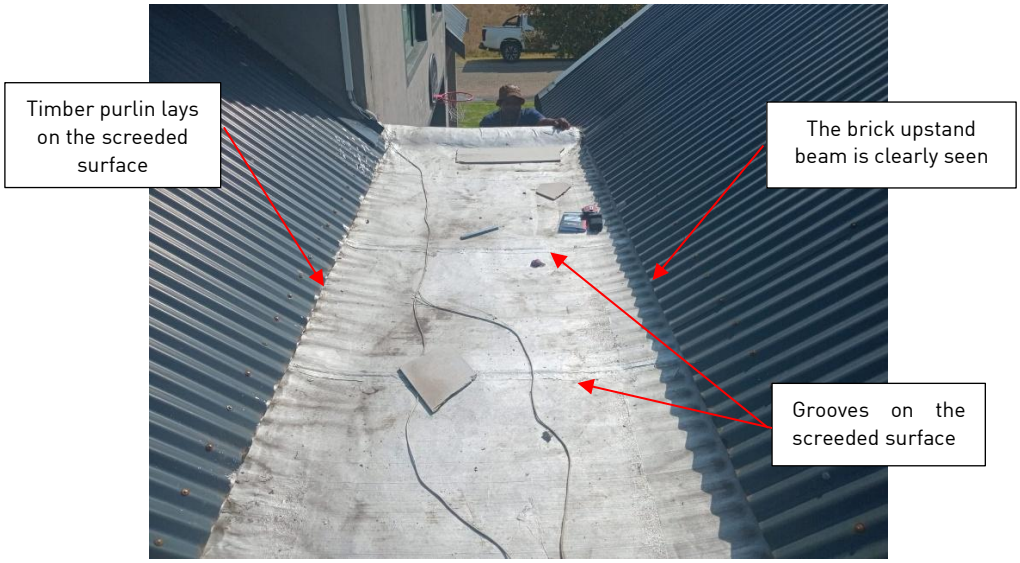


Figure 6: Drainage slab 2

Figure 7: Edges of drainage slab 2

Figure 8: Protruding grooves on screeded surface 2

6.1 WINE CELLAR

The wine cellar, shown in figure 9 below, is located adjacent to the drainage slab 1. It was observed that walls in the cellar had calcium build up on the surface and ceiling boards are stained from prolonged water ingress.

Figure 9: Wine Cellar

6.2 WATER INGRESS AT ENTRANCE FOYER

The figure below shows the window in the entrance foyer that is located between drainage slabs 1 and 2. Signs of water ingress were observed as paint bubbles away from the plastered surface.

Figure 10: Window at Entrance Foyer

6.3 Slab Construction and Waterproofing

As previously noted, the house was constructed in a such a manner that the external concrete slabs are utilized as water drainage systems. The water damage noted in preceding paragraphs are directly related to the effectiveness and water tightness of the slabs in question.

Upon review of the architectural drawings for the house, it was noted that the drawings show concrete upstand beams on the slab edges. Instead, the upstand beams were constructed with masonry on top of the slab.

Some of the timber purlins are placed on the slab and not behind the brick beams (not consistent at every edge).

Figure 11 below indicates the horizontal waterproofing done up to the timber beam. The waterproofing installation on the slab is not done adequately or in accordance with standard construction practices. The lack of vertical waterproofing firstly creates easy access for the water to penetrate through porous brickwork and secondly only serves its purpose until the water level reaches the highest point of the horizontal membrane.

Figure 11 also shows partial waterproofing done on the vertical face of the upstand brickwork in certain sections. It should be noted that it does not extend to the top of the parapet.

Figure 11: Vertical and Horizontal Water proofing

Figure 12 shows the application of water proofing over the sheeting. This is not standard construction practice and poses a problem relating to extensive movement of the sheeting due to thermal variations. The application is unsatisfactory.

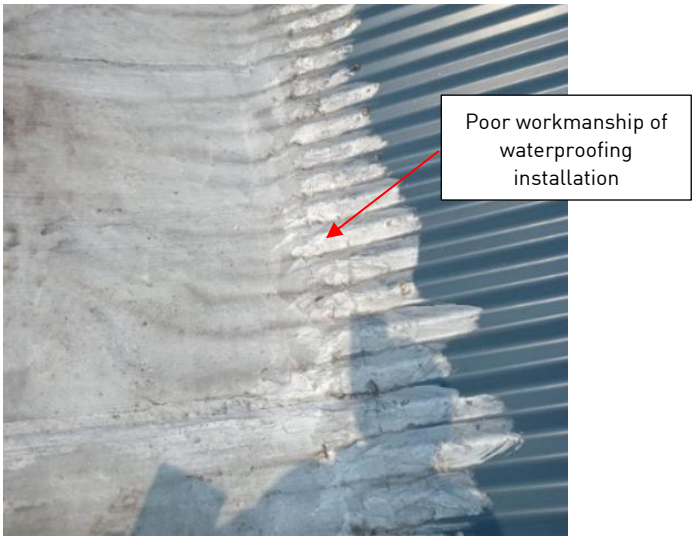


Figure 12: Poor Application of Waterproofing

6.4 Concrete Slab Surface

The concrete slab should be accommodating water runoff from the two roofs on either side of it.

The slab has an uneven surface with protruding grooves where water accumulates until it reaches a depth that exceeds the depth of the groove. This is an obvious obstruction for water flow intended to divert towards the weephole. The grooves can be seen in Figure 13 below.

The weephole invert is higher than the lowest point of the sloped slab surface creating a point where water accumulates rather than flows freely into the weephole.

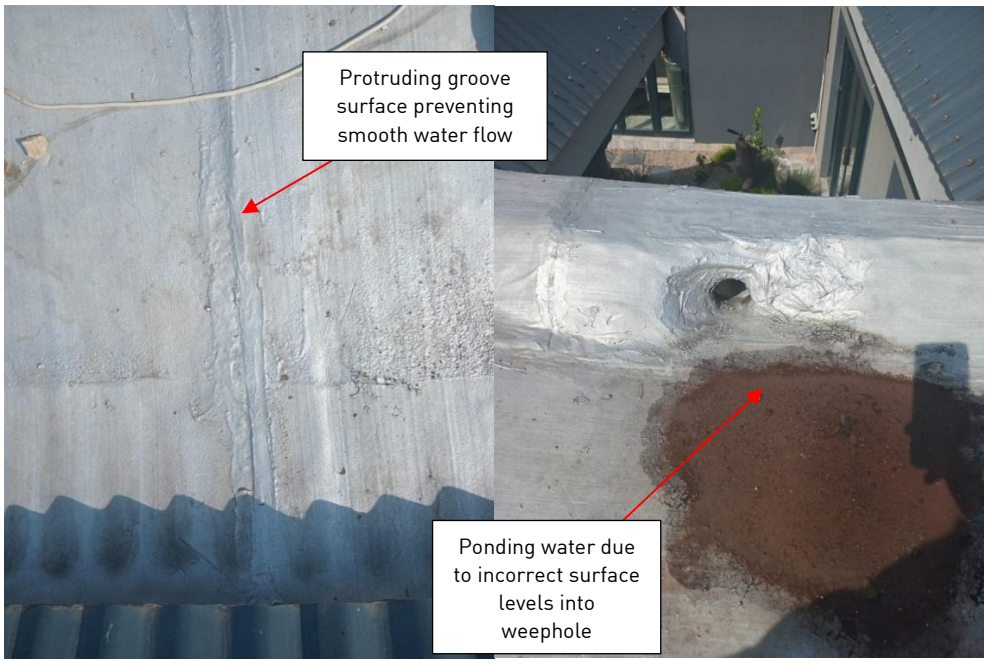


Figure 13: Concrete slab surfaces

6.5 WATER DAMAGE TO CONCRETE SLAB

Figure 14 below shows delamination of plaster on the external wall directly below the slab soffit.

The horizontal crack observed is caused by the different expansion characteristics of the concrete slab and the supporting masonry. This is normal structural behaviour and not a cause for concern. Good practice would be to have an expansion joint between the concrete and the brickwork with a sealant to prevent water ingress.

The current situation where a proper joint is not constructed, adds to the water damage seen inside the house. The crack allows penetrating damp to accumulate in the masonry walls.

Figure 14: Water damage on external walls

7 DESIGN EVALUATION AND PARAMETERS

The effectiveness of the slabs used as drainage systems were evaluated as a gutter system with similar characteristics such as average flow area and minimum depths.

Figure 15 shows an extract from PROKON's gutter and downpipe analysis software. The simulated slab with similar dimensions is effective in draining the required runoff water through the Ø80mm weephole.

This confirms that the slab is proportionally sufficient to effectively direct the water to the intended location provided that the water proofing is done in an appropriate manner.

In conclusion, the water ingress is caused by incorrect application of waterproofing membranes, insufficient waterproofing in areas and not inadequate structural design.

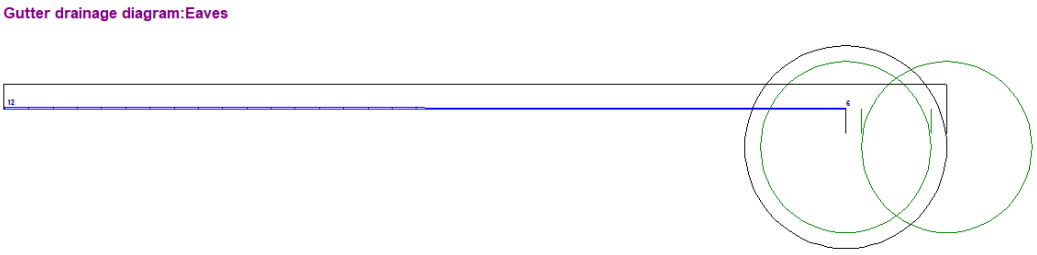
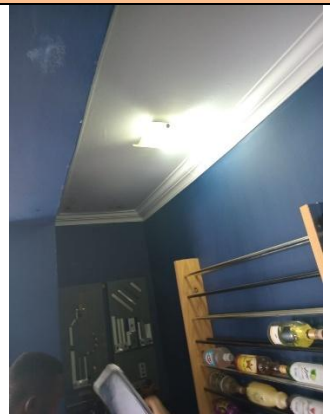


Figure 15:Existing slab simulation model

8 RECOMMENDATIONS

The following table reflects the defects encountered along with the recommendations to repair the damages.

Table 1:Summary of Defects and Recommendations

ITEM	REFERENCE PHOTO	DEFECT ENCOUNTERED	EFFECT ON STRUCTURE	RECOMMENDATIONS ON REMEDIAL WORK
1		Water ingress into wine cellar	Calcium build- up on the Wall. **Structural Defect** due to serviceability of the structure	Once the cause of the water ingress is remedied. (As per Method Statement 2 in Annexure B) Ceiling to be inspected, areas affected by water damage to be replaced with matching ceiling board Area of wall that is affected by water ingress to be opened up to dry for 3-5 days Replaster in accordance with Method Statement 1 in Annexure B
2		Water ingress at entrance foyer	Paint bubbles away from plaster surface. **Structural Defect** due to serviceability of the structure	Once the cause of water ingress is remedied. (As per Method Statement 2 in Annexure B) Area of wall that is affected by water penetration to be opened up and left to dry for 3-5 days Replaster in accordance with Method Statement 1 in Annexure B

3		Incorrect application of waterproofing	Does not conform to the serviceability limit state requirements of the building regulations - **Structural Defect** **The main cause for water ingress into the building**	Remedial work in accordance with Method Statement 2 in Annexure B
4		Concrete Slab having incorrect slopes and screeding levels	Does not conform to the serviceability limit state requirements of the building regulations - **Structural Defect** **The main cause for water ingress into the building**	Remedial work in accordance with Method Statement 2 in Annexure B

5		Delamination of plaster on external wall	No expansion joint present between concrete slab and brick wall. **Structural Defect** due to serviceability of the structure	Once the cause of water ingress is remedied. (As per Method Statement 2 in Annexure B) • Remove plaster 300mm above and below line of slab soffit • Scrape out at least 20mm of plaster between the slab and the brickwork • Fill and seal joint with polyurethane sealant approved by engineer • Replaster area with joint over sealant to allow for movement without cracking. Area of wall that is affected by water penetration to be opened up and left to dry for 3-5 days Replaster in accordance with Method Statement 1 in Annexure B

9 CONCLUSION

SCIP Engineering Group (Pty) Ltd was appointed by NHBRC to conduct a forensic engineering assessment for House Rust in Parys Free State. Concerns were raised due to water ingress into the walls and ceiling.

A structural investigation was conducted, and the defects have been noted in this report including recommendations on remedial work.

10 REFERENCES

NHBRC, N. H. (2015). *House Building Manual 2015.* Johannesburg: NHBRC Communications.

SABS. (2011). SANS 10400 -South African National Standard. *The application of the National Building Regulations*.

ANNEXURE A

- Architectural Drawing

ANNEXURE B
- Method Statements

METHOD STATEMENT B1: REPLASTERING EATER DAMAGED AREAS			
To:	HOUSE RUST	Date:	2025-06-13
Attention:	NHBRC	Site Instruction Number:	N/A
Ref. Spec.:		Ref. Drawing:	N/A

This method statement applies to replastering of walls

1. Remove plaster that has delaminated or shows signs of penetrating damp
2. Allow to dry for at least 3 days
3. Cover the exposed masonry with chicken wire mesh
4. Replaster with plaster key and make good the surrounding area

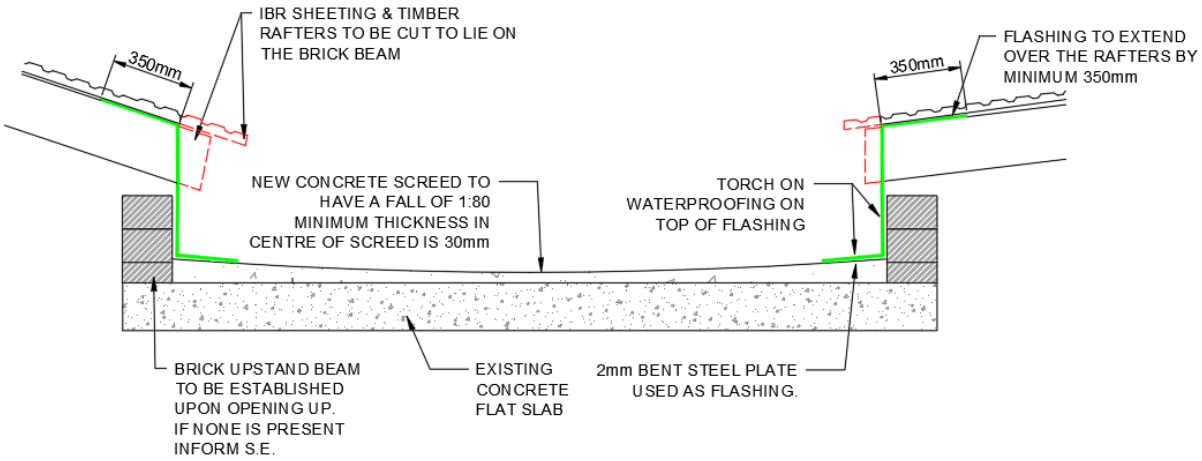
Issued By:	Bianca Grobler, Pr.Eng (Civil)
Authorised By:	F. Deysel, Pr.Eng (Civil)

METHOD STATEMENT B2: CONCRETE SLAB REMEDIAL WORK

To:	HOUSE RUST	Date:	2025-06-18
Attention:	NHBRC	Site Instruction Number:	N/A
Ref. Spec.:		Ref. Drawing:	N/A

This method statement applies to remedial work on the drainage slabs:

1. Remove existing waterproofing and uneven concrete screed.
2. Remove roof fixings for the last portion of sheeting (adjacent to the concrete slabs).
3. Cut the timber rafters and sheeting to lie on the brick upstand beam creating an overhang of at least 300mm if possible.
   If no brick upstand is present, inform Structural Engineer.
4. Re-screed in accordance with Structural Engineers specifications. Slopes and depths to be specified by Engineer.
5. Install flashing as shown in green in the sketch below. The flashing to be fixed to rafters with screws.
6. Waterproof the flashing and new screed layer in accordance with waterproofing specialist's specifications
7. Re-instate IBR sheeting



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