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STRUCTURAL REPORT FOR ERF 5245 THE ORCHARDS.

Attention: NHBRC

Background: A single-storey house at 5245, The Orchards Ext 56 in the City of Tshwane built year 2019 showed some structural defects on the walls and roof. An investigation was then requested to determine the cause and possible remedial works to these defects. In this report are the findings and recommended remedial works found after the two site inspections dated (23 June and 02 July 2022).

1. Findings:

Walls:

The walls were found with cracks at different points throughout the house both inside and outside. These cracks included both structural and plaster cracks. The plaster cracks were mostly found on the outer part of the external walls, while structural cracks were found both inside and outside the building (structure). The structural cracks are visible on the garage wall, Bedroom 1 door to the bathroom, kitchen, door to main bedroom and door to the garage. There were further horizontal cracks in the garage at ground slab and brickwork interface. This horizontal crack between these two interfaces is also visible on the external face of the wall running around the house.

The cause of the structural cracks above door or window opening is the lack of articulation joints to allow some movement due to the settlement and heaving figures mentioned in our Geotechnical findings further down this report.

The plaster cracks cause no danger to the structure but merely aesthetically unpleasant, applying crack filler and 2 coats of paint can make this more appealing.



Fig 1 Lounge



Fig 2-From inside Bathroom



Fig 3-Door to Bathroom

Floors:

Although no cores were taken from the slab to determine thickness and quality of concrete, the tiling throughout the house remains intact with no loose tiles found. This gives an indication that there hasn't been any flexing or sinking of the ground slab.

Roof

The roof can be seen from the road as uneven, with some areas of the roof already sagging in (caving in). The unevenness is due to lack of support and overstressed trusses that have already buckled under load. The buckling of the support structure (roof trusses) has also caused the wall (beamfilling) to develop cracks from the wall plate level. This is visible in certain areas on the cobble running around the structure.



Fig 4- Roof sagging



Fig 5 – Buckled Trusses

A further inspection was done to assess the support structure (trusses) by going through the trap door and walking to the affected areas of the roof. It was found that the trusses spanning over the dining room and kitchen had failed and can collapse any minute. These trusses spanning about 9.6m are overstressed and have already buckled out of plane. The connections at certain areas of the trusses have pulled out with just a few nails still holding it up. A truss was also seen with a free (loose) end close to the trap door opening. The roof over the garage and bedroom also spans in the same direction as the adjacent dining room span. Even though the spans a shorter it is also affected and will have to be redone by a qualified roof fabricator and installer.



Fig 6- Loose connection



Fig 7 Truncated truss

Roof Continued

There were signs that this issue with the roof had been picked up earlier and efforts to remedy or improve the truss section had been made. This is evident from the additional timber section that have been added to the truss. The additional sections are visible on the bottom cord of the last bay and visible on the top-cord from support wall to the apex. However, these "additional timber sections" were not properly connected to the existing truss making them redundant.



Fig 8- Attempted fix



Fig 9- Stiffened bottom sections

The trusses over the garage will also require a redone as some are seen stopping short of the supporting truss.

The remainder of the roof over the master's bedroom had no signs of truss failure but will still need a re-evaluation to ensure that all connections and member sections are intact after the remedial works. It is important that the roof specialist or engineer goes through the entire roof, so that a roof certificate is issued for the whole roof.

Due to the findings stated above, these remedial works should commence immediately to avoid any catastrophic failure. Ensure that during the fix the area is cordoned-off and not accessible until the fix is completed and the roof should be prefabricated with a new redesigned roof and we will monitor the process and install it on load bearing walls because they were ignored by the installer .

Foundations

Two excavations were done from the outside to determine the type and size of the footing. It was discovered that the house is on approximately 600x300mm deep footing. This footing sits about 300mm from the finished paving level and we couldn't determine if the footing was reinforced or not.



Fig 10- Exposing foundation Fig 11- Exposed footing Fig 12- Footing thickness

2.Existing geotechnical Information

There is an existing geotechnical report of the area Prepared by SOILKRAFT CC titled "Geotechnical conditions on Portion 1 of The farm Plantland 644-JR (3497/1995). A Report for the Establishment of a proposed new residential development." This report dated 4th August 2005 covers Lavender estate where the above-mentioned property is positioned.

Below are extracts from the report which can be shared via email.

The report separates the study area into 5 different zones named I, II, III, IV and V. The estate falls into **Zone II**.

The report then highlights the following:

- The estate is underlaid by Fine Colluvium.
- Settlement is up to 37.5mm under strip footing for single-storey buildings.
- Property falls under geotechnical Zone II.
- Area Zoned as (S2-C2)/H1.
- Foundation design options are : Reinforced strip footings, reinforced raft and soil replacement.
- Construction must include articulation joints at some internal and external doors.
- Preferred foundation be Reinforced Raft (8.2)

Due to the above-mentioned highlights from the Geotechnical report, it is clear that although a reinforced strip foundation is an option, the preferred foundation was the Reinforced foundation raft to accommodate settlements determined in the design parameters.



Fig 13- Site Area

3.Recommendations:

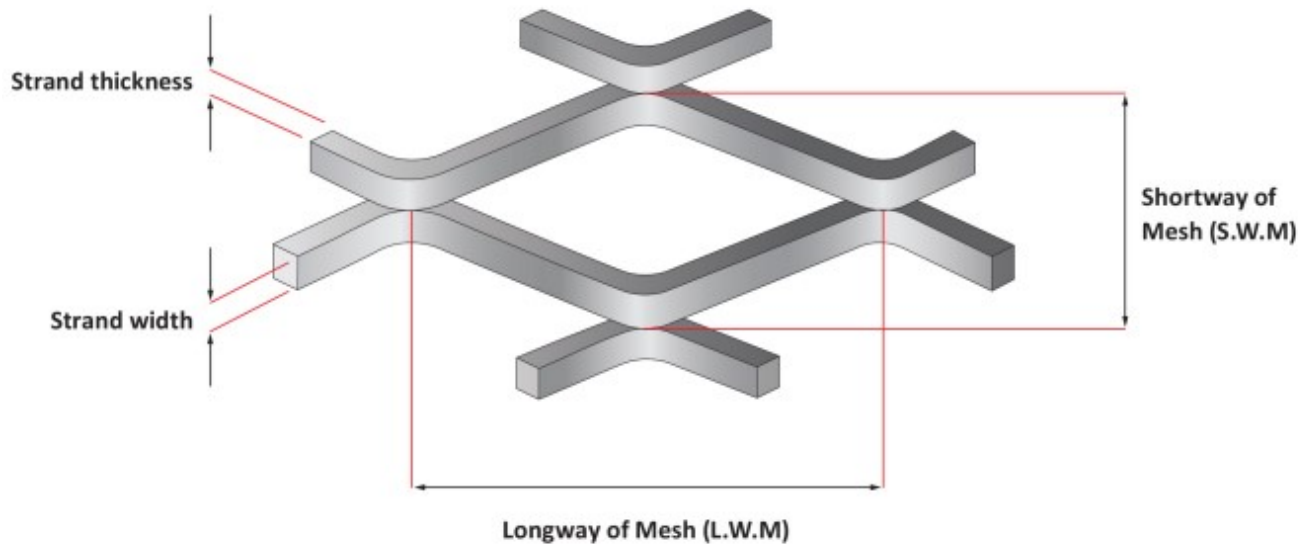
Roof: It is recommended that **the whole roof be stripped** and redone by a roof specialist and should be prefabricated, and who will also ensure that the necessary bracing and connections are done properly. The existing roof tiles can be reused after fixing the timber structure. Ensure that all tiles are checked for any defects prior to reinstalling.

The trusses **may not** (should not) go through the fireplace/Braai chimney. This could cause fire.

The maximum clear span of a six-bay Howe Truss is 8m as stated in the NHBC standards. An option of creating a midspan support girder will be ideal and splitting the span in two which allows for a standard 6 bay Howe truss to be used, thus keeping the members sizes smaller or a specific truss design from a roof specialist.

This must be done immediately without waste of time.

Walls: An introduction of articulation joints be done on some internal and external door openings including all doors with visible cracks running from the door opening. All other structural wall cracks can be fixed by chipping off the plaster and expose masonry units, then place expanded (1030R-A) or equivalent before plastering. The expanded mesh should extend a minimum of 200mm on either sides of the crack. The garage horizontal crack is an interface crack between concrete and brickwork should be exposed and sealed with crack sealer.



MAGNUS STEEL EXPANDED METAL SPECIFICATIONS

MAGNUS TYPE NUMBER	SIZE OF MESH SWM X LWM	STRAND		WEIGHT 2.4 X 1.2
		WIDTH	THICKNESS	
36R - A	3 X 6	1.0	0.6	7.54
510R - A	5 X 10	1.0	1.0	8.22
820R - A	8 X 20	2.0	1.0	10.17
1030R - A	10 X 30	2.5	1.6	11.3
1540R - A	15 X 40	2.5	1.6	10.05
1540R - C	15 X 40	3.0	2.5	17.59

4. Source of Reference:

- Geotechnical conditions on portion 1 of the farm plant land 644-JR (3497/1995). A report for the establishment of a proposed new residential development.
- Council of Geoscience- Akasia lavender estate layout.

Yours faithfully

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