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1. INTRODUCTION
The project brief, as issued by Gauteng Funding Agency (GFA), was to conduct an initial assessment of the building condition, services, structural integrity of FNB House, and to provide recommendations regarding the repairs and renovations of the buildings.

FNB House underwent a partial refurbishment in the past which involved complete internal strip out of finishes, walls and windows. The refurbishment process was stopped due to unknown circumstances at a stage when the building was completely stripped, structural steel for the 3 new floors on top of the building and an internal mezzanine were partially completed, and no internal services installed.

The rubble from the demolition works has been partially removed from site.

The condition of the structural components is described below.

1.1 Design Criteria and Specifications
This project will be implemented in compliance with all the requirements of the National Building Regulations and the new SANS10400, including any town planning prescripts of the local authority.

1.2 Scope of the Services Scheme Report
This report deals with the proposed structural services to be implemented and preliminary design for the feasibility for the repairs and renovations of the existing building.

2. STRUCTURAL ASSESSMENT
2.1 Building configuration and interfaces with adjacent buildings.
FNB Building comprises 7 suspended office floors above ground, and 2 levels of localised plant spaces at level 8 and 9 (above the building core) and 1 basement below ground level. Hence the building consists of 9 floors and 1 basement. A local concrete roof slab above the localised level 9 floor slab did previously exist, however has been demolished.

The building has no links to adjacent buildings.

The building was in the process of undergoing structural strengthening for the introduction of a new local mezzanine slab in the ground floor double volume, and 3 new floors above, that would be 8th, 9th and 10th floor slabs.

The 8th, 9th and 10th floor systems have been partially constructed. The new framework was to be completed in structural steel framework (beam and column configuration) with concrete slabs spanning between the beams to create the floor slab. A precast or bonddek type floor system would most likely to have been the envisaged solution for the floor slabs, however the previous engineers would need to be consulted to ensure that the correct design intent is followed should these floor levels need to be completed. Alternatively a full design audit can be performed to verify that the steel framework and new floor slabs including the existing structure strengthening works are structurally adequate. What one can see on site appears to be rational design, possibly on the conservative side and hence one can continue with the principle that design office space can be achieved, subject to structural audit.
2.2 Façade.
The two street facades (North and East) consist of rendered precast concrete panels with a window pop out detail from first floor level upward. This portion of the façade is in good condition, however all windows including the frames in the façade will need to be replaced.

The façade below the first floor level has been completely removed and will need to be replaced.

The parapets at 8th floor level have been extensively damaged due to the addition of new steel columns for the new proposed floors. These parapets would need to be reconstructed.

The building has two internal atria, which are plaster rendered and painted. Both of these atria have had the window frames removed, which resulted in extensive plaster damage. Both atria will need to be completely re-plastered once new window frames have been installed.

No window cleaning system exists for cleaning the exterior face of the building.

2.3 Roof Waterproofing and Roof Structures
The 8th floor slab has had extensive damage to the screed to fall and torch on waterproofing systems due to the partial completion of new steel framed floors above roof level. The screed, waterproofing system and insulation of the building will need to be removed and reconstructed.

The local 10th floor roof slab above the building core has been removed due to the demolition of the 10th floor roof slab. The final solution in this area will need to be debated with regard to the future use of the building, however it is suggested that a new soft roof (structural steel substructure and profiled roof sheeting) with appropriate gutter system is introduced to waterproof the structure.

Allow 25kg/m2 for the steel substructure. Alternatively allow for a new 250mm thick, 30MPa flat slab, rebar 120kg/m3 with 230 x 750mm concrete upstand beams, 30MPa, rebar 160kg/m3 for the new roof slab. Allowance must also be made for new screed to fall and waterproofing including new fulbore outlet and downpipes.

All of the building rainwater downpipes should be assumed to be blocked, and allowance should be made for renewing these.

2.4 General Structural Floor Assessment.
The floors are constructed in one way spanning ribbed slabs, which load wide primary support beams which span between the building columns. The slab systems within the building are in good condition, however a patching allowance of 5% of the area must be allowed for local defects.

The building contains a movement joint; running east west; on the southern side of the central internal atrium. The joint is in good condition. The joint must be respected in the new architectural finishes and improvements. No structural elements, including the new floors above, can span the movement joint without special provisions.

The building movement joint has not been carried through the new structural steelwork above 8th floor. This will need to be corrected it the new steel framework supporting any new floors above is to be retained.

A new structural steel frame has been constructed above the 8th floor slab to accommodate new floors. The structural steelwork has corroded due to exposure and will need to be treated and repainted if retained. No slab systems exist between the structural steel frames.
The structural steel frame is partially complete and numerous elements are scattered around the site, on the pavement and on the adjacent building roof.

It is our recommendation that this additional steel framework is removed from the building unless a structural audit of the entire structure is performed to reconfirm if the steelwork present on site (and the previously proposed alterations) is structurally sound. The structural adequacy of the additional three floors will require a structural audit, however in principle one can continue with scheme designs assuming the integrity of the new floors can be achieved as the basics are correct and strengthening works appear reasonable, possibly a conservative design. It is not clear if the steelwork required to complete the new proposed floor framework is present on site, or which elements are missing.

Architectural recommendations of light weight glass boxed areas are possible on the façade as required. These elements would require structural steel sub frames. Allow 45kg per square meter structural steel weight for such elements.

The ground floor slab and 9th floor slab contain holes through the slab which will need to be filled. These in-fills will consist of reinforced concrete infill slabs on permanent shuttering. Allow 120kg/m3 reinforcement, 25MPa concrete and 50kg/m2 structural steel support work over the plan areas of these openings.

A new structural steel framework has been partially constructed in the double volume ground floor space. The structural steelwork is partially complete. The steelwork has been damaged in sections and is extensively corroded. This steelwork will need to be removed or completed in the new refurbishment works, a similar allowance is to be made as per new proposed 8th, 9th and 10th floors.

The basement has a partially complete concrete overlay of approximately 150mm in place. Approximately 50% of the basement slab overlay will need to be completed to utilize the floor.

The new ramp systems as proposed by the architect are possible as reinforced concrete cast on top of the ground floor slab to a future design.

New proposed ablutions at slab level are possible if constructed in suitable light weight partition system and use is made of perimeter brick walls for hanging wash hand basins and new toilets.

2.5 Structural Column Assessment.

The buildings concrete columns are in good condition.

The majority of columns have been strengthened using structural steel channel sections for the previously envisaged three additional floors above. These channels have been chemically anchored to the columns and walls. The column capacities will need to be rechecked and the structural steel strengthening rechecked to ensure that the capacity of the columns will be sufficient if the three proposed new additional floors above.

The integrity of the structural steel design above the eighth floor will need to be rechecked as a separate appointment should the floors wish to be retained.

Should the additional floors not be required, the columns in their current strengthened state can be considered structurally sound, but are now architecturally large elements which need to be accommodated in the new space planning.
It may be considered necessary to remove all the strengthening, in which case filling of the drilled holes from the structural steel fixities will need to be filled with a suitable 50MPA non shrink structural repair grout.

It is noted that a number of concrete walls exist within the building.

In the basement, two of these walls have been broken out locally to accommodate the previously envisaged occupancy. The effect of the openings is not expected to cause structural issues. The openings require finishing works with structural patching products.

2.6 Foundations.
There are no signs of visible foundation settlement of the building, hence the current building foundations are in good condition.

It will need to be confirmed if the current foundations are able to accommodate the previously proposed 3 additional floors, as no visible signs of foundation strengthening works are present on site. Such checks do not form part of the scope of this report. If the three additional floors are required, allowance should be made for foundation strengthening works, details of which will need to be calculated.

The type of strengthening and budgetary allowance is an extensive exercise and it is suggested to form part of the final building upgrade project design scope for the successful structural engineer.

A large foundation for a signage tower exists on the sidewalk. This element is suitable for use, or if it is no longer required will need to broken up and removed from site.

2.7 Basement and Basement Retaining Walls.
The building has one basement level comprising safe areas and occupied office space.

There does not appear to be any water entry into the basement through the basement walls, which suggests that the basement waterproofing and subsoil drainage system are in working order.

A sump exists under the central concrete stairwell. A new sump pump is suggested for this sump, as well as the lift pits.

2.8 Building Internal Brickwork
The building has undergone a stripping and internal demolition process in the past.

No internal brickwork within the office spaces exist, however brickwork to the core areas remains. It can be assumed that all internal brick walls will need to be re-plastered.

2.9 Building Internal Finishes and Services.
No internal finishes exist within the building envelope.

2.10 Staircases
The building previously had two staircases, an internal concrete stair (which has remained) and an external structural steel staircase (which has been 90% removed).

The internal concrete staircase will require replacement of the floor finish and handrail replacement.

In certain areas rebar is exposed due to removal of floor finish. Such exposed rebar to be derusted, epoxy painted and plastered over with a remedial structural plaster. Allow 5 square metres of such patching.
The external steel fire escape staircase will need to be completely reconstructed in structural steel, allow 50kg/m² in plan including vastrap flooring material.

Disabled access is not addressed in the current building design. Refer to Architects report for solutions in this regard. Refer to architects recommendations in this regard.

2.11 Structural Floor Loading Allowances Allowed For Future Use.
Office and reception areas: 350kg/m² (Office occupancy + light weight partitions)

Roof Slabs (8th floor): 350kg/m² (Office Occupancy + light weight partitions or “reduced” mechanical plant loading).

Note no masonry brickwork partitions are allowed, unless verified by structural engineer. In general walls which are required to be masonry (that is bathrooms and kitchens) already exist.
3. PHOTOGRAPHIC EVIDENCE AND COMMENT:

Figure 1: North Street frontage: Façade work above first floor level in good condition, however the windows and frames will need to be replaced. A deep clean is also recommended.

Figure 2: Eastern street frontage of the building is in good condition, however the windows and frames will need to be replaced. A deep clean is also recommended.
Figure 3: The steel framework of a future 8th, 9th and 10th floor exist on the eastern portion of the building. Portions of a steel frame for a mezzanine floor are also visible between the round concrete columns of the ground floor.

Figure 4: View of the partially completed steel frame for a future 8th, 9th and 10th floor. The missing elements are scattered around the site and on the adjacent building roofs.
Figure 5: Eastern façade showing the condition of the windows and precast façade panels.

Figure 6: Southern internal Atrium showing the plastered finish and removed windows.
Figure 7: Northern internal atrium showing the plastered finish and the removed windows.

Figure 8: Eastern façade showing the ground floor façade which has been removed.
Figure 9: Large base for signage tower present on the eastern face of the building and portions of the steel frame of floors 8 – 10 lying on the sidewalk.

Figure 10: Roof Slab at level 7: Roof screed to fall and waterproofing which has been partially removed to accommodate the new baseplates of the steel framework above at all column positions.
Figure 1: Roof slab at level 7: Parapet of building extensively damaged during the installation of the steel frames above columns.

Figure 12: Old walls and internal parapets on the level 7 slab have been removed leaving gaps in the screed to fall and roof waterproofing system.
Figure 13: Steel framing above 7th floor level is rusting and has not been completed correctly.

Figure 14: The local level 9 roof slab (above building core) has been demolished. The local portion of slab will need to be re-constructed in soft roof or reinforced slab.
Figure 15: Local level 9 roof slab above the building core has been demolished. The local portion of slab will need to be re-constructed in soft roof or reinforced slab.

Figure 16: Structural steel framework for the previously proposed 8th to 10th floors is partially erected and in complete on site.
Figure 17: Structural steel framing above 7th floor level showing missing elements which are lying on the roof areas of surrounding buildings, on the building sidewalk, and on the level 7 roof slab.

Figure 18: Portions of the structural steel frames lying on the 7th floor roof slab.
Figure 19: Portions of structural steel frames lying on the surrounding building’s rooftops.

Figure 20: Internal view of a typical floor showing the existing windows which require replacement.
Figure 21: Typical internal floor slab construction showing the one way spanning slabs and primary support beams. The photo also shows the column strengthening installed on site on all lower floors, to accommodate the previously envisaged 8 – 10th floors.

Figure 22: Typical internal floor slab construction showing the one way spanning slabs and primary support beams. The photo also shows the column strengthening installed on site on all lower floors, to accommodate the previously envisaged 8 – 10th floors.
**Figure 23:** Typical internal floor slab construction showing the one way spanning slabs and primary support beams. The photo also shows the column strengthening installed on site on all lower floors, to accommodate the previously envisaged 8 – 10th floors.

**Figure 24:** Movement joint between the northern and southern portions of the building. The southern side of the building rests on the northern side (which contains the support columns). Note the concrete beam at this position.
Figure 25: Hole through ground floor slab that will need to be filled with a new reinforced concrete slab supported on structural steel support beams with permanent formwork.

Figure 26: Local holes that will need to be filled with new reinforced concrete infill slabs on the 8th floor slab.
Figure 27: Holes have been broken through vertical concrete walls on the basement level of the building to accommodate the previously envisaged occupancy.

Figure 28: Typical basement retaining wall strengthening system installed at column positions to accommodate the previously envisaged 8 – 10th floor extensions. Structural steel channel sections are bolted to the side of the wall.
Figure 29: Typical basement retaining wall strengthening system installed at column positions to accommodate the previously envisaged 8 – 10th floor extensions. Structural steel channel sections are bolted to the side of the walls and columns.

Figure 30: Typical perimeter columns strengthening system installed at column positions on ground to 7th floors to accommodate the previously envisaged 8 – 10th floor extensions. Structural steel channel sections are bolted to the side of the columns.
Figure 31: Typical internal columns strengthening system installed at column positions on ground to 7th floors, to accommodate the previously envisaged 8 – 10th floor extensions. Structural steel channel sections are bolted to the side of the columns.

Figure 32: In certain locations, a horizontal support beam is installed above the typical perimeter column strengthening system.
Figure 33: New mezzanine floor system and column strengthening system installed in the ground floor space of the building.

Figure 34: New mezzanine floor system and column strengthening system installed in the ground floor space of the building. A number of the beams in this frame have been damaged and have rusted.
Figure 35: Northern internal atrium structural steel fire escape stair has been removed and will need to be replaced. Note that the portions of remaining staircase will need to be removed and replaced as the structure has rusted beyond repair.

Figure 36: Northern internal atrium structural steel fire escape stair has been removed and will need to be replaced. Note that the portions of remaining staircase will need to be removed and replaced as the structure has rusted beyond repair.
Figure 37: Internal concrete stair concrete substructure is in good condition; however the finish to the stair and the handrail will need to be replaced.

Figure 38: Internal concrete stair concrete substructure is in good condition; however the finish to the stair and the handrail will need to be replaced.
Figure 39: Internal concrete stair concrete substructure is in good condition; however the finish to the stair and the handrail will need to be replaced.