UNISA Florida Campus

Foundation construction for extensions to UNISA's Florida Campus

FINALIST – Technical Excellence Category

KEY PLAYERS

Client
University of South Africa
Professional team
Royal HaskoningDHV
Main contractors
WBHO & Trencon Construction (Pty) Ltd

INTRODUCTION

In 2006 Royal HaskoningDHV (RHDHV) was commissioned to carry out extensions to UNISA's Florida Campus to allow for further growth. Extensions to the campus consisted of four demarcated projects:

- Main Buildings
- Engineering Buildings and Laboratories
- Gate Way Building
- Block D

The client specified that the university had to remain operational and that connectivity for the distance learning students had to remain uninterrupted for the duration of construction.

OVERVIEW OF WORKS

Platforms

Ground was broken at the end of 2010 with the contractor needing to clear the existing parking area, and excavating to the correct level for construction purposes. At this stage it became apparent that the Main Building 3 foundation would need protection from exposure. It was therefore decided to protect the area by means of shotcrete, creating an anchored layer that would protect the footings from rain.

Piling and pads

The building footprint included movement joints which allowed the design team to split the type of footings between pad footings and piles according to requirements. Around 68 piles were cast.

Services tunnel

One of the biggest challenges was the clashing of services that were running between the buildings. At the Main Building this was overcome by introducing an underground services tunnel. To minimise clashes with the foundations, the tunnel did not run in a straight line, but moved in three directions, with an access shaft.

Ground beams

As the piles were cast and the construction of the tunnel reached completion, the contractor started on the surface beds. Ground level slabs were supported by either pile caps or stubs to the piles or pad footings. The two different types of footings, the pile caps and the piles created a dense location of reinforcing, which posed a challenge in maintaining the reinforcement within the required specifications.

Retaining walls

The retaining structures were incorporated into the main foundations. This resulted in areas where concrete walls had the dual function of retaining the soil and supporting the first floors above.

In the Engineering Building, a void was created in front of the retaining wall where the services were placed. This void created a secondary solution for seepage water that could build up behind the retaining wall and where it could not be completely drained by the primary sub-soils drainage at the back of the wall.

CIVIL WORKS

Main Building

Due to poor soil conditions, high loads and the proximity of existing buildings and services, the Main Building was placed on driven piles. Pad footings were designed to transfer loads to the ground layers.

The building also had a stepped level between blocks 1 and 2, as the basement necessitated a retaining wall through the width of the building. The foundation had to be placed around the central services tunnel that ran along the centre of the building and along its full length.

The pile cap with ground beams provided the first level of support onto which floating surface beds were attached. From this base the normal concrete structure columns, beams and slabs continued to roof level, with mezzanine levels and staircases. These areas were covered by structural steel roofing. The building has three movement joints running through to accommodate any differential settlement.

To speed up construction, the casting of columns was done in one pour, with concrete poured into the shuttering from a height of 5 to 6 m.

Engineering Building

This building was designed with two sections – upper and lower parts to accommodate the various departments of the engineering faculty, with a walkway connecting the two sections.

At roof level a ring beam supports the steel roof structure. This design accommodates gantry cranes in each building, including large roll-up doors to provide access to the different engineering and laboratory areas. Additional internal mezzanine floors were added at a later stage.

Gate Way Building

UNISA's new laboratories required a greenhouse, as well as other engineering workshops and buildings. The greenhouse area was prone to subterranean water during the rainy season. To remedy this an engineered fill, using crushed rock with a geotextile layer underneath, allowed the natural flow of water to filter under the platform while at the same time making sure the greenhouse had a solid foundation.

General logistics

Late addition of mezzanine floors in the engineering building caused the design team to opt for a composite construction consisting of a steel support structure with a concrete deck that would be connected via studs to the steel beams. As construction progressed, overhead gantry cranes were installed.

The engineering workshops and laboratories had specific requirements regarding floors, including a channel to accommodate services within the workshop areas and a high-impact finish to the epoxy-coated floors to sustain the intense loading pressures from the gantry cranes.

RHDHV coordinated all services in the Main Building's basement area using the computer program Revit, which minimised the clashing of services during installation.

CONCLUSION

Requests by the client for structures to have high load capacities were adequately attended to. RHDHV successfully managed the design, documentation, tender and contract administration for all engineering services. This complex and challenging project was completed successfully and handed over in December 2012. □

Construction of extensions to UNISA's Florida Campus nearing completion; note the new greenhouse in the foreground