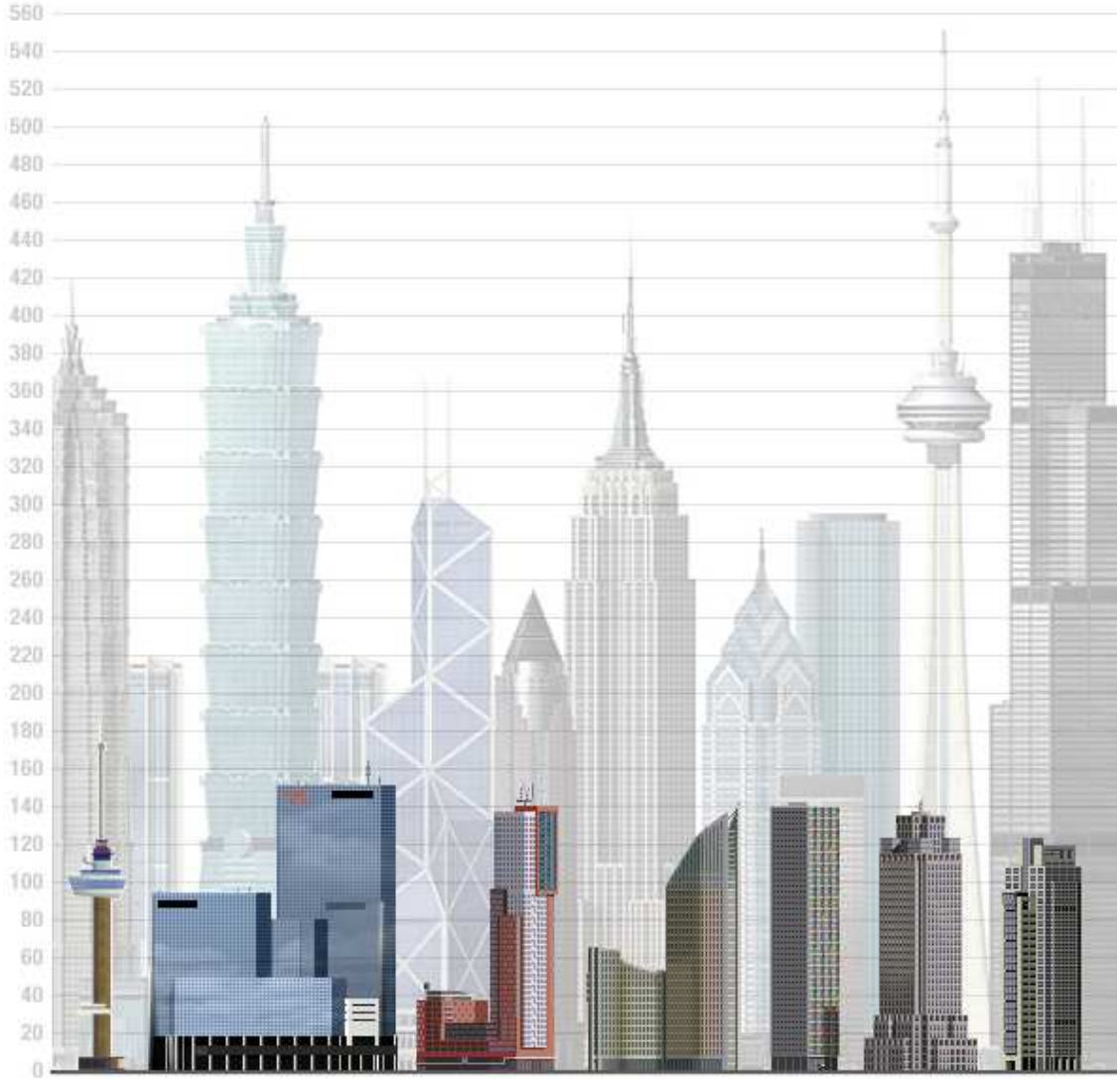
Super high-rise in Rotterdam
Addendum: Basement and parking



Master's Thesis Report

U.M. Winter

June 2011

Super High-Rise in Rotterdam

Author :
U.M. Winter

Graduation Committee:
Prof.dipl.ing. R. Nijsse
Prof.dipl.ing. J.N.J.A. Vambersky
Ir. K.C. Terwel
Ir. S. van Eerden
Ir. H.J. Everts

Delft University of Technology
Faculty of Civil Engineering and Geosciences
Structural Engineering

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Content

1.1 introduction

Like the tower, the basement and raft have a round shape. The diameter of the basement and the 3 meter thick raft is 140 meter.

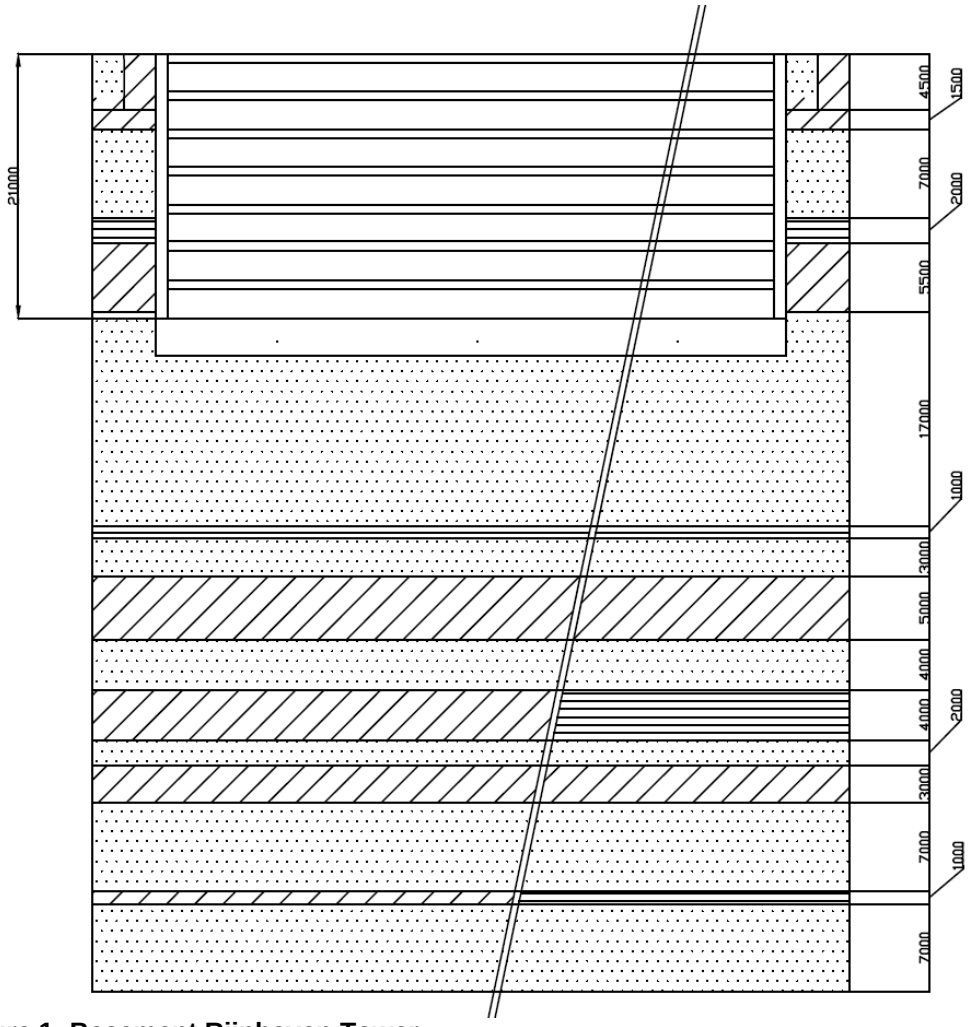

Figure 1: Basement Rijnhaven Tower

The basements functions are:

- transferring the forces from the superstructure to the foundation raft
- providing parking spots for the towers' inhabitants and visitors

Starting points according to NEN 2443:

Length parking spot	: 5.00 m
Width parking road	: 6.00 m
Load basement function	: 3.50 kN/m^2
Minimal free height	: 2.30 m
Maximum height vehicle	: 2.20 m

1.2 Structural design

The basements structural system consist of the following structural elements:

- concrete walls
- concrete beams
- concrete columns
- prefabricated TT-slabs (see Figure 3)

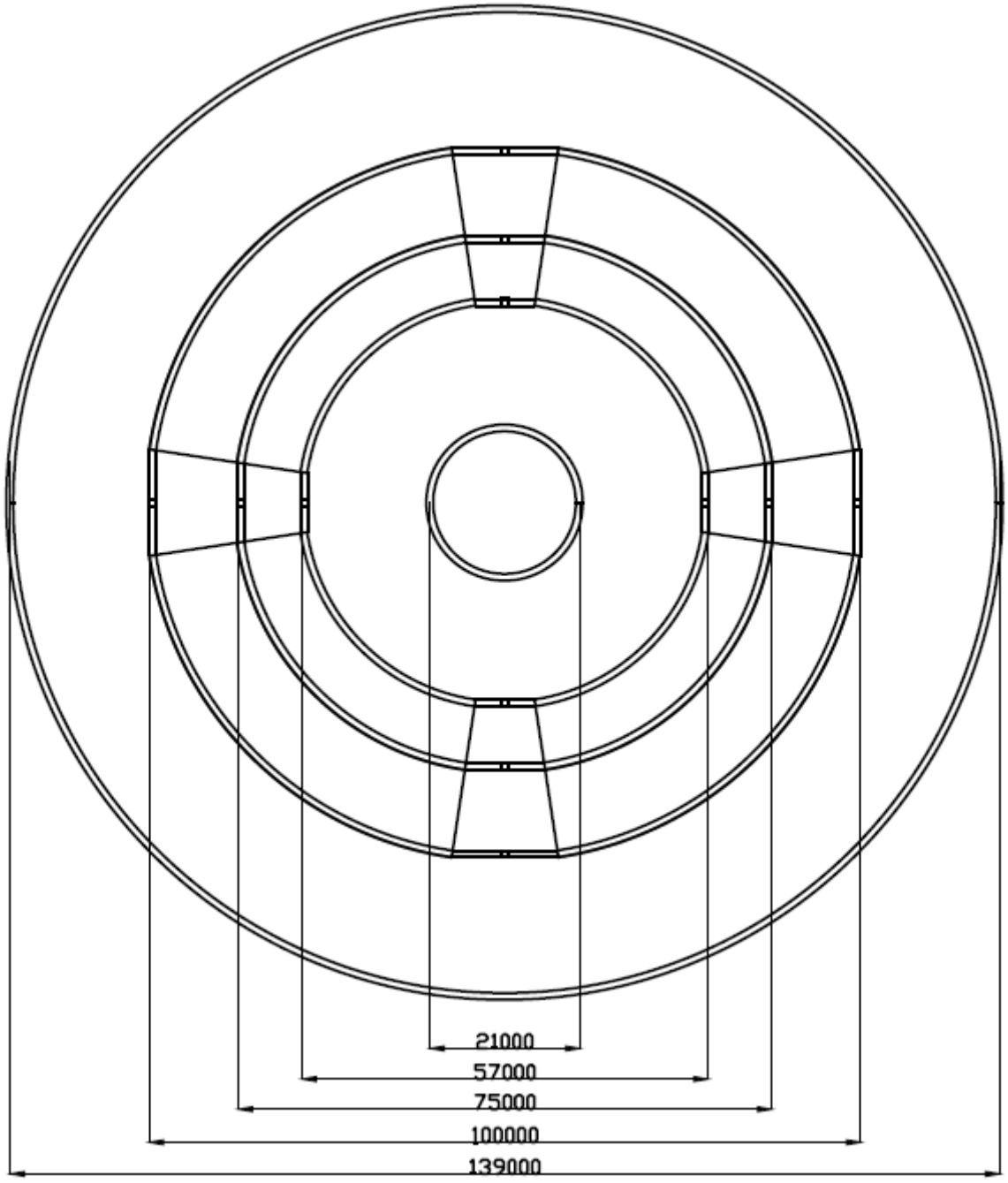

Figure 2: Loadbearing elements

The concrete walls from the superstructure are extended throughout the basement and used to support the TT-slabs. These walls have a thickness of 1000 mm. The vertical forces from the tower and basement are transferred via the basement through the loadbearing concrete walls and columns.
At the place where the slots are located (in the tower) concrete columns and beams are used to bridge the span and support the TT-slabs.
In the middle of the basement a span of 28 meter needs to be crossed and extra circular wall is added in the center (void) to bridge the span. This circular wall has a radius of 10.5 meter and houses a spiral ramp which allows vehicles to travel on a continuous helical path between parking levels,.up-clockwise and down-counterclockwise.

Floor-system

The floor-system of the basement is similar to design of the footprint of the superstructure however the composite floor-system with comflor 210 is replaced by TT-slabs. The concrete TT-slabs are used to cross a span of 20 meter and their dimensions have been determined using the tables and graph in appendix D.

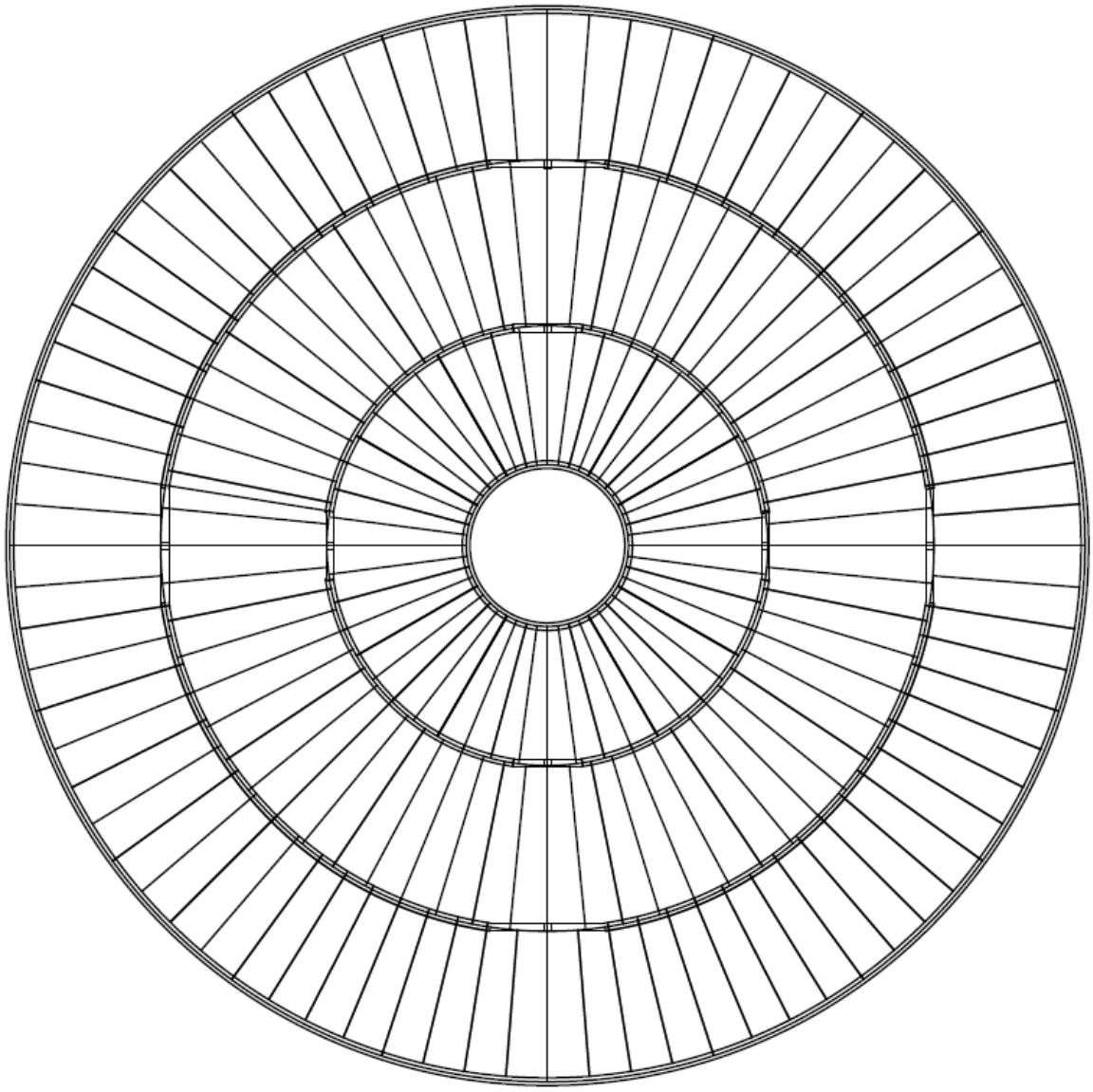

Figure 3: Floorsystem consisting of TT- plates

In order to deal with the curvature the TT-slabs can be cut as shown as shown Figure 3.
At the location where the voids would be present in the building the TT-slabs are supported by concrete columns and concrete beams.

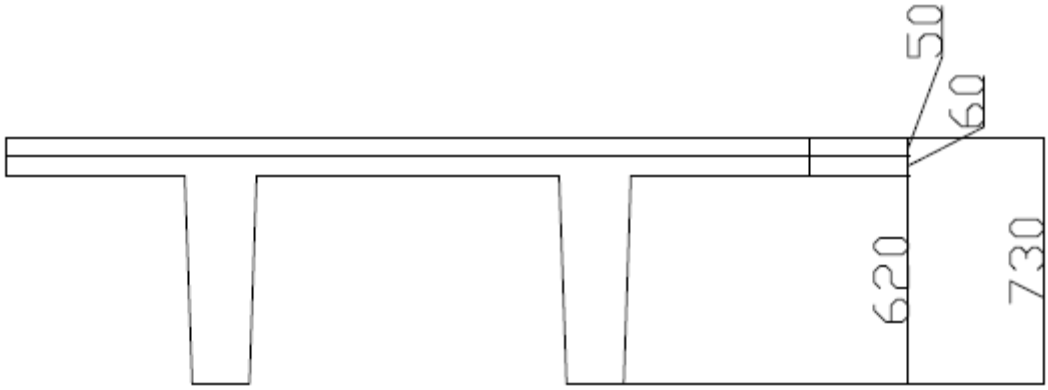

Figure 4: Dimensions TT-slabs

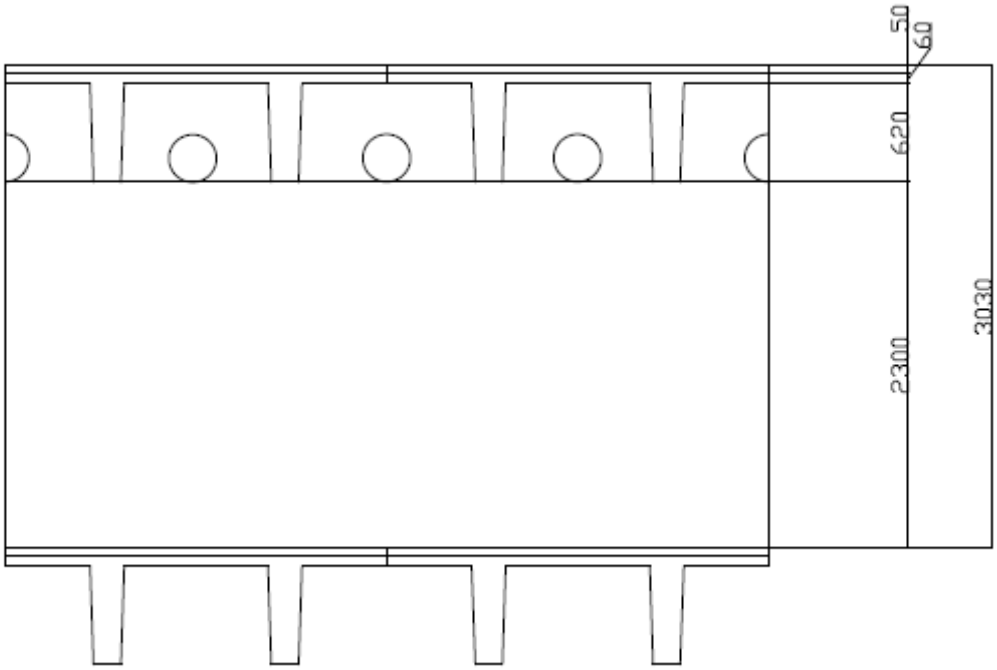

Figure 5: Floor-to-floor height basement Rijnhaven Tower

1.3 Parking

The arrangement of the parking spots in the basement is similar to parking garage the Ossemarkt Groningen see Figure 6.

Figure 6: parking garage Ossemarkt Groningen

The basement has multiple parking spots which follow the concentric circles of the load bearing walls. The parking spots are shown in Figure 8 and Figure 9. The vehicles are able to use multiple exits and access points to avoid traffic congestion. Vehicles are able to travel up and down to different floors of the basement through the spiral ramp located in the center.

Figure 7: example of a helical ramp at hancock garage

After the vehicle is parked an elevator is used to transport visitors to the building. Elevators are located at the same locations as in the building (the core) (see Figure 8).

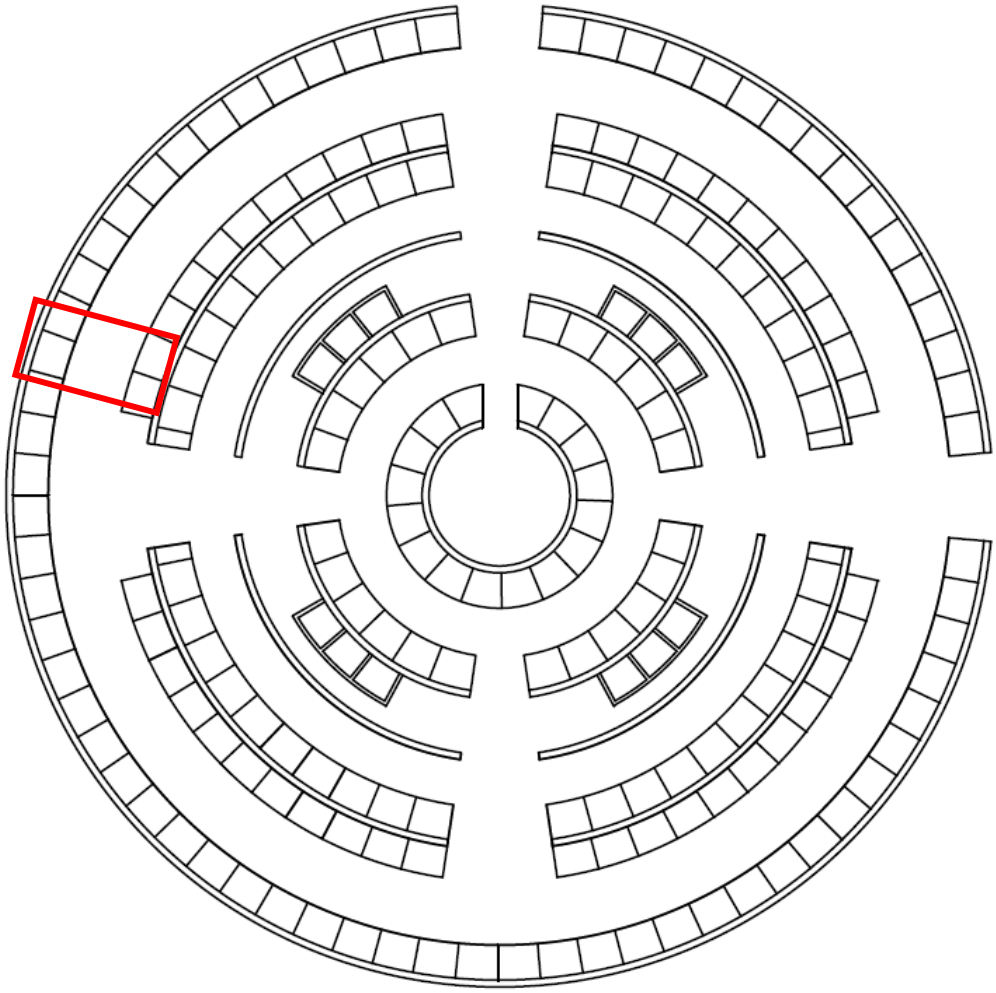

Figure 8: Parking spots and Elevators

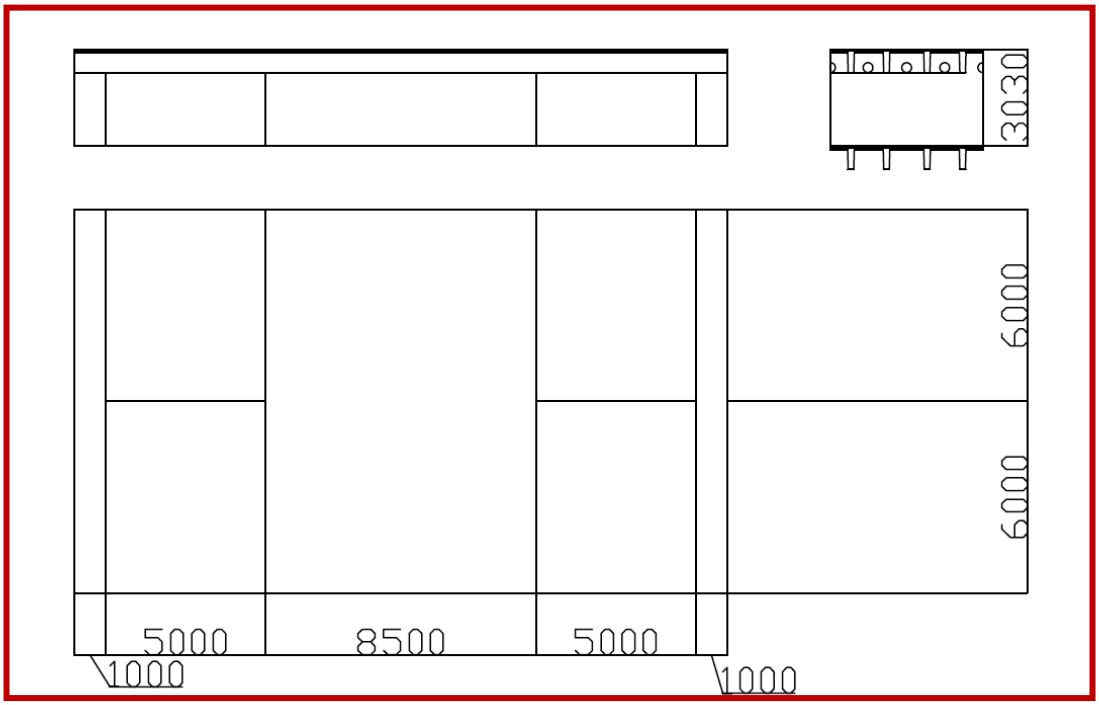

Figure 9: Parking spots outer circle