



Renovation of the Binnenhof

The complex task of modernizing a historic landmark

By: **ir. Anne Derks & Earnest Alderliesten**

Trainee Design Management Heijmans, Structural Engineer at ABT

The large-scale renovation of the Binnenhof is in full swing. The beating heart of our democracy is being adapted to the requirements of today. Heijmans and ABT are closely involved in the work on the so-called Complexdeel 1, which consists of the 'Eerste Kamer' and the 'Raad van State'. The oldest parts of the complex date back to the 13th century. Over the years, the complex has been renovated several times. When a new resident took place, parts were added and demolished. The latest major renovation took place in 1880. Due to this continuous construction and renovation, the complex consists of buildings from many different times and, therefore, various types of floors and walls, making it an exceptional and exciting project.

Research phase

As with any renovation, information about the existing structure is crucial for all involved parties to assess the construction. Extensive archival research is often an initial step. However, at the Binnenhof, despite extensive archival research, little to no information about the construction has been uncovered. In order to have a good starting point, the buildings were measured with a 3D scan. These scans resulted in a Revit model that formed the basis for the renovation and provided useful information about the architectural finishings.

However, the 3D scan only detects architectural information and does not detect many structural details. Therefore, a research phase was started to obtain the missing structural, architectural, and installation-technical information. This information is essential to minimize surprises during the construction phase. Currently, the design process is in the Construction Documents phase (Technisch Ontwerp TO), while the research phase is still ongoing.

To structure the process, the contractors Heijmans and Burgy, together with designing parties ABT and BiermanHenket, have drawn up a working method for carrying out the investigations. All parties work together on the BIM360 server of Heijmans, where the Revit design

models are developed integrally. BIM360 is the central database where all information is available to all project partners.

The working method includes three steps:

1. Performing a research in the BIM360 environment, in which the location and research needs are defined.
2. Carrying out and documenting the research by the contractor in collaboration with consultants. Results and photos can be added directly from a tablet.
3. Processing the results in the design models by the design team, with a link to the research number of the element in question.

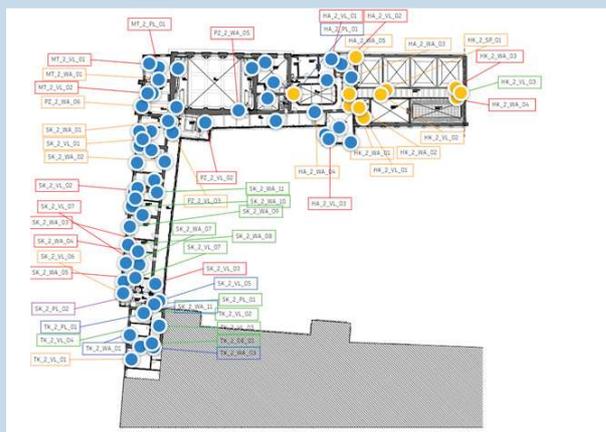


Figure 1: BIM360 environment research phase

Completed and ongoing research

During the investigations, several (archeological) discoveries were made, which impacted the design. For example, a retaining wall from the late 13th or early 14th century was discovered in the 'Volle Raadzaal' of the Raad van State (Figure 2). Additionally, a basement from the early 16th or early 17th century was found here. The retaining wall was a fascinating observation since it was preserved entirely in the ground despite its size and depth below ground.



Figure 2: Discovered basement Raad van State

In addition, archaeologists have found foundations from the 13th century under the gallery of the Eerste Kamer. According to the archaeologists (Figure 3), these are remains of an unknown building from the period of Count Floris the Fifth.



Figure 3: Discovered foundations under gallery Eerste Kamer

Currently, an investigation is going on at the base of the stairwell of the Raad van State (Figure 4). While excavating, a floor and multiple beams of natural stone were found. Further excavation revealed a monumental marble floor



Figure 4: Archeological found during excavation stairwell Raad van State

as well. Both floors were carefully removed and stored. After these floors were removed, a vault was found with a layer of sand underneath. Excavation has been halted to facilitate archaeological research on this vault.

Foundation reinforcement Stadhouderspoort

Due to future construction activities at the Binnenhof, large equipment needs to access the Opperhof. This equipment cannot be lifted over the buildings. Therefore, an alternative access route was sought. Ultimately, the Stadhouderspoort was found to be the only entrance wide enough. However, this passage did not have sufficient height. To achieve the required height, the idea emerged to lower the ground level in the gate by approximately 1 meter.

To determine whether lowering of the ground level was possible, foundation research was conducted. It was found that the foundation of one side of the gate was not deep enough to lower the ground level without additional measures. The foundation was reinforced with jet grouting columns (Figure 5). Jet grouting is a technique where a steel pipe with a nozzle goes into the ground. High-pressure grout (a mixture of cement and water) is then injected into the ground. The grout mixes with the soil, creating a soil-cement mass. After hardening, a hard block is formed, which is used as an additional foundation. The firm Keller constructed a wall of Soilcrete®-slats underneath the existing foundation until the desired depth to reinforce the foundation.

Particularly noteworthy is that all the work was done 100% emission-free, with 100% electrical equipment, including transportation, personnel transport, deliveries, and disposal of return liquids.

Temporary foundation reinforcement during the construction phase

As part of the renovation, excavation work will occur at the middle square known as the Opperhof. Due to this excavation, there is a risk of ground subsidence around



Figure 5: Jet grouting Stadhouderspoort (Binnenhof Renovatie, 2024) & (Keller, n.d.)

the arches. As a precaution and to prevent damage, these foundations are temporarily reinforced with two screw injection piles and hydraulic jacks (Figure 5). With these hydraulic jacks, it is possible to adjust the footings if settlements occur.

Installing the piles posed a challenge as they had to be constructed using a tiny crane, given that the arches were too low for a larger one. After the installation of the piles, a horizontal hole was made in the footing. In this hole, a beam was placed, supported by the two jacks on the piles. The jacks can be adjusted in height during the construction phase if settlements occur. Finally, the hole in the footings was poured with mortar. During the application of the jacks, temporary structures supported the arches.

All the buildings around the Opperhof are closely monitored for settlements. In case these settlements exceed a specific limit, there would be time to react to those changes.

Future prospects

The renovation of the Binnenhof is complex due to its construction across various historical periods. Thorough research into the existing structure is essential, as many discoveries have been made, yet significant unknowns persist. This dynamic process complicates precise predictions of time and costs. Nonetheless, the Binnenhof remains a vital part of Dutch history and the core of our democracy. Therefore, its careful preservation is of significant value. The progress of the renovation can be followed by visiting the visitor center at Plaats 22 or visiting the new observation tower, from which the Binnenhof can be overseen. ◀

References:

- [1] Binnenhof Renovatie. (2024, March 21). Eerste vrachtwagens door verlaagde en versterkte Stadhouderspoort. Opgehaald van Binnenhof Renovatie: <https://www.binnenhofrenovatie.nl/actueel/nieuws/2024/03/21/eerste-vrachtwagens-door-stadhouderspoort-dankzij-grouten>
- [2] Keller. (sd). Jet Grouting. Opgehaald van Keller: <https://www.keller.co.uk/expertise/techniques/jet-grouting>

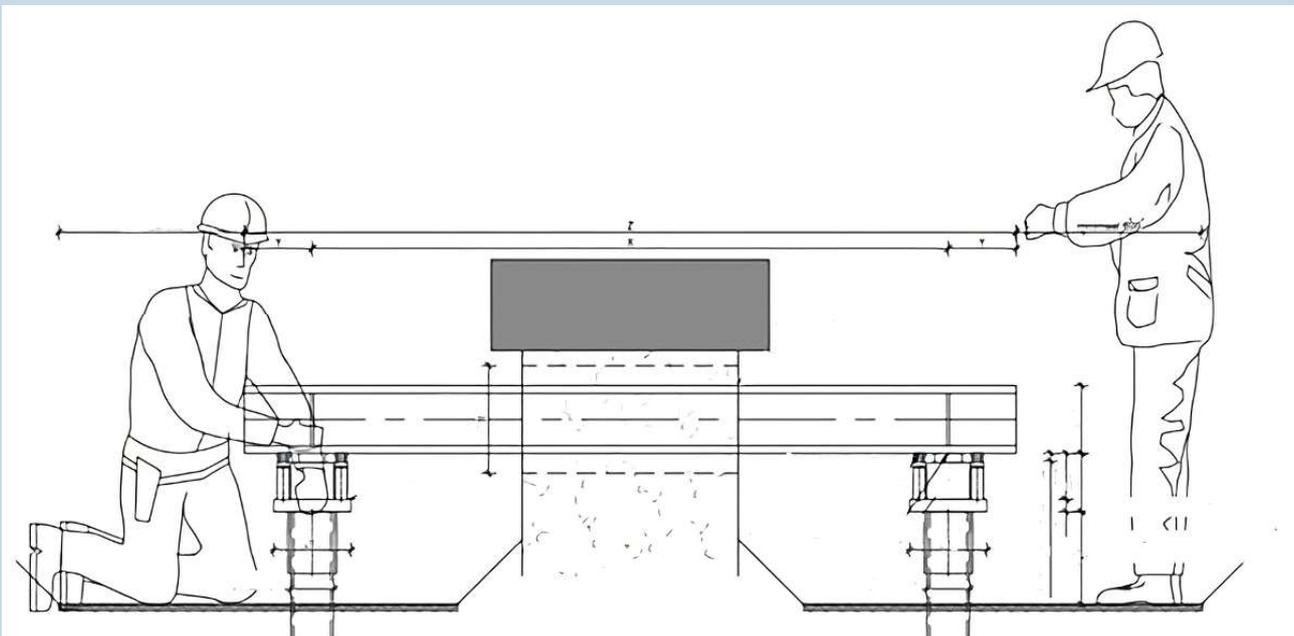


Figure 6: Temporary foundation reinforcement with hydraulic jacks