TEDx event center
Connecting the Binnengasthuis and the city

Technical drawings

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Graduation project Heritage & Architecture
Technical drawings

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In the lecture hall there are 350 seats. In this case there is a large space between the seats which make it very comfortable. It is possible to increase the number of seats by reducing this space.
Floorplan ground floor 1:200

- Workshops
- Reception
- Wardrobe
- Entrance
- Kitchen
- Foyer
- Cafe
- Interview room
- Personnel space
- Exit

Dimensions:
- 8550 x 42933 x 8550 x 60920 x 23458 x 10967 x 26477 x 60902
Floorplan second floor 1:200
Roofplan 1:200

- **Gutter for rainwater**
- **Direction of rainwater**

- Roofplan
- Gutter for rainwater
- Direction of rainwater
The atrium is made of an in cast concrete floor which is founded on piles. These new piles are placed on a distance of 1 meter from the existing facade. The lecture hall is one large concrete tank which has its own foundation of piles. The floor of the atrium is connected to the new piles and to the lecture hall.

- New foundation pile

The plate of the atrium floor should be made separate from the existing structure. On the corners at the facade the strip should be reinforced because here the column is not placed directly above the new foundation pile.

The plate of the lecture hall floor is attached to the atrium floor.
Atrium - construction principle

The columns that support the roof of the atrium are round steel columns filled with concrete. This increases their strength and also gives longer protection in case of fire. The columns support large concrete beams under the closed part of the roof. These beams are slightly bent and follow the lecture hall lines. The transparent part of the roof is supported by large steel beams.

The whole new construction of the atrium roof is made separate from the existing building. This is part of the architectural position. The old and the new are seen as two separate objects in which the new is dependent on the old. The new measurements, floors height etc are a consequence of the existing structure.
Lecture hall - construction principle

Concrete beams - main construction
Steel beams - secondary construction
Concrete slab - main construction

The lecture hall span is just like the roof made of slightly bent beams that follow the lines of the volume. These beams are supported by concrete slabs that are connected to the floor. On the atrium floor these slabs are intermitted by glass parts. For this the sound insulating glass of STADIP® SILENCE is used. There are two glass plates which are separated by air and also a foil is applied.

The principle of STADIP® SILENCE glass
(nl.saint-gobain-glass.com)
Acoustics

The acoustics in the lecture hall are very important. In these schemes the principle is explained. Because the roof of the lecture hall is sloped this has a negative effect on the sound waves. In a speaker situation, for which this lecture hall is mainly designed, it is desired that the sound waves reflect back on the audience. The solution for this is the use of acoustic panels. These panels are connected to the concrete beams, which also takes away the negative effect of the vertical surface of the beam. In the 1:50 section this is shown. For these panels the Texaa Stereo panels of the Plaka group are used.

Example of the acoustic panels that will be connected to the beams under the desired angle (plakagroup.com)

Acoustic panels
The panels are able to rotate. This way the position can be adjusted to the desired event, from a TED talk to a music event. The reverberation time should be adjustable from 0.8 seconds (speech) to 2 seconds.
**Construction calculations**

**Atrium**

Concrete beams
> cast on site, single field, standard rule:
height beam = 1/10 x length span, width = 1/3 x height

Because of the overhang that reduces bending the rule
h = 1/11 x l is used.

L\_{\text{max}} = 17800 \text{ mm} \\
L = 1/11 \times 17800 = \pm 1600 \text{ mm}

w = 1/3 \times 1600 = \pm 500 \text{ mm}

Columns
> 1 floor, round steel columns filled with concrete gives higher carrying capacity and fire safety.

standard rule for steel columns: width = length / 20

Here the rule of w = l/25 is used because the columns are much stronger

L\_{\text{max}} = 10700 \text{ mm} \\
w = 10700 / 25 = \pm 400 \text{ mm}

**Floor**
> cast on site, founded on piles, continues field,
standard rule height = 1/32 x length

L\_{\text{max}} = 6000 \text{ mm} \\
h = 1/32 \times 6000 = \pm 200 \text{ mm}

**Bridge**
> composite deck (staalplaatbetonvloer),
standard rule: height = 1/30 x length span

L\_{\text{max}} = 4500 \text{ mm} \\
h = 1/30 \times 4500 = 150 \text{ mm}

**Lecture hall**

**Floor**
> cast on site, has to compensate for ground water

Density water = 1000 \text{ kg/m}^3, concrete = 2400 \text{ kg/m}^3

Volume lecture hall under the ground = 5 \times 331 = 1655 \text{ m}^3

1655 \times 10^3 \text{ kg of water}

\[
\frac{1655000}{2400} = 689,58 \text{ m}^3 \
\frac{689,58}{331} = 2,0 > \text{height} = 2000 \text{ mm}
\]

**Beams**
> cast on site, single field, standard rule:
height beam = 1/10 x length span, width = 1/3 x height

L\_{\text{max}} = 14000 \\
H = 1/10 \times 14000 = 1400 \text{ mm}

Width = 1/3 \times 1400 = 450 \text{ mm}

**PV cells**

The glass panels that are currently in the roof will be re-used in the new design. The size of these panels has led to the pattern. On these panels there will be PV cells applicated. These prevent the atrium from heating up too much and can also produce energy. The PV cells can be made very transparent which keeps the roof transparent. In the image an example of this is shown.

Example of the use of PV cells on glass. As seen here the glass is still very transparent while the entrance of direct sunlight is reduced. (bouwprofsnederland.nl)
The building is ventilated and heated by air. There are three LBK units. One inside the lecture hall to control the climate there. One in the technical space on the souterrain floor for the climate of the building itself and the third one in the attic for the climate of the atrium. This way these three zones can be controlled separately. The climates of the lecture hall and inside the existing building will be 'inside climates' which are comfortable and where you take off your coat. The atrium climate can change and depends on the season. In the winter it can be that you have to keep on your jacket and in the summer it can be a bit warmer, but not too warm and therefore a separate LBK unit is needed. The ventilation pipes will run through the space, no lowered ceiling is present here. This way the height of the building can be experienced as it is. These pipes are shown in the illustration below.
In the atrium there can also be natural ventilation by the chimney affect. Fresh air is pulled in through ‘roosters’ in the doors and escapes through the windows in the roof that can be opened. Extra ventilation and heating is necessary here. Therefore there is a LBK unit placed on the attic floor. From here pipes lead to the atrium where the fresh air is supplied by nozzles.

In the lecture hall the fresh air is supplied by nozzles underneath the seating in the floor. There is one pipe in the end of the lecture hall where the polluted air is sucked away.
Detail 1A 1:5

Important aspects:
- smooth transition floors, small height difference
- clear separation inside - outside, visible window sill
Detail 1B 1:5
Detail 1C 1:5

steel column filled with concrete

insulated glass
Detail 1D 1:5

Important aspects:

- visible end of the facade, closed part between facades
Detail 2A 1:5

Important aspects:
- bridge must look floating
- space between floor and window
Important aspects:

- Bridge must look floating

'verjonging' applied on the wall
Detail 3A 1:5

Important aspects:

- window facade must look like it goes on
Detail 3B 1:5

Important aspects:

- Secondary beam system is hidden inside the ceiling
Detail 4 1:5

Important aspects:

- no connection between floor atrium and existing wall, separate foundations so space for movement is needed
Important aspects:
- connection floor bridge to existing facade, movement must be possible, expansion joint is needed
Detail 6 1:5

Important aspects:

- connection below the gutter:
  the new is dependent on the old structure, it lies between it.