INCLUSIVE STATION DEVELOPMENT

Achieving post-war neighbourhood renewal by creating station areas of the future

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Area sections
School capacity

School has a total area of 9500 m², based on reference projects student capacity is: 800

14 class rooms: +/- 80 m²  +/- 24 students

class room capacity: 336 students

7 offices: +/- 50 m²  +/- 6 staff members

Office capacity: 42 staff members

7 meeting rooms: 14 - 50 m²  8 - 20 people

meeting room capacity: 68 people

2 study areas: 315 m²  170 students

Study area capacity: 170 students

Workplaces: Robotica 180 m²

Building technology: 460 m²

Mechanical engineering: 360 m²

Automotive: 360 m²

Total workplaces: 1360 m² roughly equals 200 students

Dwellings, size & typology

The building has multiple dwelling typologies. The aim was to create typologies that are missing in the post war neighbourhood, such as elderly and family housing. In combination with dwellings for starters, which are in high demand in the neighbourhood.

Starters:
- Loft: 3x 75 m²
- Two bedroom: 11 x 75 m²

Elderly:
- Two bedroom: 6 x 85 m²

Family:
- Maisonette, three bedroom: 6 x 100 m²
- Maisonette, three bedroom 2 x 140 m²

Total amount of rentable floorspace: 2440 m²
Gross area

Gross area of the building is 19,800 m².

- Offices: 5,400 m²
- Dwellings: 2,700 m²
- Dwellings: 1,200 m²
- Functions in plinth: 10,500 m²
Floor plan Ground floor
Floor plan level 2
Floor plan level 6
Elevation West

0 m

7.5 m
Elevation North

0 m 7.5 m
View from van Eedenlaan
View from Marcellus Emantpad
Public square on higher level
View from vulcanusweg
View on Vulcanusweg
Interior of IT Helpdesk
Benefits of Cross Laminated Timber construction

**Sustainability.** Constructions using wood from sustainable managed forests, CLT provides a number of environmental benefits in addition to its excellent thermal performance. Wood is the only major building material that grows naturally and is renewable, and life cycle assessment studies consistently show that wood outperforms steel and concrete in terms of embodied energy, air pollution and water pollution. It also has a lighter carbon footprint—because wood products continue to store carbon absorbed by the trees while growing, and wood manufacturing requires less energy and results in less greenhouse gas emissions. In addition CLT panels are manufactured for specific end use applications, which results in little to no job site waste. Plus, manufacturers can reuse fabrication scraps for stairs and other architectural elements, or as biofuel.

**Innovation.** Manufacturers use CNC equipment to cut panels and openings to exact specifications, often to meet very tight tolerances (within millimeters).

**Installation speed.** Because panels are prefabricated, erection time is greatly reduced, which improves efficiency and results in lower capital costs and faster occupancy. Wall, floor and roof elements can be pre-cut, including openings for doors, windows, stairs, service channels and ducts. Insulation and finishes can also be applied prior to installation, reducing demand for skilled workers on site. The faster installation cuts cost in the building process, reducing cost.

**Design flexibility.** It is relatively easy to increase the thickness of a CLT panel to allow for longer spans requiring fewer interior support elements. Plus, when field modifications are needed, they can be made with simple tools. By being adjustable the building has a longer life span.
Prefab elements

Prefab elements, beams and columns, are connected on site by dry connection elements. This reduces construction time and costs.

Floor construction

The floor construction is made by a secondary beam system, beam 100 x 400 mm. The space between the secondary beams is used as a plenum ventilation system.

Enlarged beams, needed to carry the vegetation on the terraces, are perforated to create the airflow needed for the plenum ventilation system.
Construction floor plan level -1

- Floor Secondary beam system
- Concrete wall d= 300 mm
- Concrete beam 400 x 560 mm
- CLT Beam 400 x 560 mm
- CLT Beam Vegetation 400 x 1120 mm
- CLT Beam Auditorium 400 x 800 mm
- CLT Column School 400 x 400 mm
- CLT Column Dwelling 300 x 300 mm
- Concrete Column 400 x 400 mm

0 10 m
Construction floor plan level 1 (GF)

- Concrete wall d= 300 mm
- Concrete beam 400 x 560 mm
- CLT Beam 400 x 560 mm
- CLT Beam Vegetation 400 x 1120 mm
- CLT Beam Auditorium 400 x 800 mm
- CLT Column School 400 x 400 mm
- CLT Column Dwelling 300 x 300 mm
- Concrete Column 400 x 400 mm

Legend:
- Floor Secondary beam system
- Floor Vegetation, secondary beam system
- Vegetation beam
Construction floor plan level 2

Floor Secondary beam system
Floor Vegetation, secondary beam system
Concrete wall d= 300 mm
Concrete beam 400 x 560 mm
CLT Beam 400 x 560 mm
CLT Beam Vegetation 400 x 1120 mm
CLT Beam Auditorium 400 x 800 mm
CLT Column School 400 x 400 mm
CLT Column Dwelling 300 x 300 mm
Concrete Column 400 x 400 mm

Vegetation beam

Vegetation beam

Vegetation beam

Vegetation beam

Vegetation beam

Vegetation beam

Vegetation beam

Vegetation beam
Construction floor plan level 5

- B1
- B2
- B3
- B4
- B5
- B6
- B7
- B8
- B9
- B10
- B11

- A1
- A2
- A3
- A4
- A5
- A6
- A7
- A8
- A9

- C1

- CLT Beam 400 x 560 mm
- CLT Beam 400 x 800 mm
- CLT Beam Auditorium 400 x 800 mm
- CLT Column Dwelling 300 x 300 mm
- CLT Column School 400 x 400 mm
- Concrete Column 400 x 400 mm
- Concrete beam 400 x 560 mm
- Concrete wall d= 300 mm

Legend:
- Floor Secondary beam system
- Floor Vegetation, secondary beam system

Scale: 0 to 10 m
Construction floor plan level 6

- Floor Secondary beam system
- Floor Vegetation, secondary beam system
- Concrete wall d= 300 mm
- Concrete beam 400 x 560 mm
- CLT Beam 400 x 560 mm
- CLT Beam Vegetation 400 x 1120 mm
- CLT Beam Auditorium 400 x 800 mm
- CLT Column School 400 x 400 mm
- CLT Column Dwelling 300 x 300 mm
- Concrete Column 400 x 400 mm

0 10 m
Construction floor plan level 7

Floor Secondary beam system
Floor Vegetation, secondary beam system
Concrete wall d= 300 mm
Concrete beam 400 x 560 mm
CLT Beam 400 x 560 mm
CLT Beam Vegetation 400 x 1120 mm
CLT Beam Auditorium 400 x 800 mm
CLT Column School 400 x 400 mm
CLT Column Dwelling 300 x300 mm
Concrete Column 400 x 400 mm

0 10 m
Construction floor plan level 8

- Floor Secondary beam system
- Floor Vegetation, secondary beam system
- Concrete wall d= 300 mm
- Concrete beam 400 x 560 mm
- CLT Beam 400 x 560 mm
- CLT Beam Vegetation 400 x 1120 mm
- CLT Beam Auditorium 400 x 800 mm
- CLT Column School 400 x 400 mm
- CLT Column Dwelling 300 x 300 mm
- Concrete Column 400 x 400 mm

Dimensions:
- 0 10 m
Construction floor plan level 9

- Floor Secondary beam system
- Floor Vegetation, secondary beam system
- Concrete wall d= 300 mm
- Concrete beam 400 x 560 mm
- CLT Beam 400 x 560 mm
- CLT Beam Vegetation 400 x 1120 mm
- CLT Beam Auditorium 400 x 800 mm
- CLT Column School 400 x 400 mm
- CLT Column Dwelling 300 x300 mm
- Concrete Column 400 x 400 mm

Scale: 0 - 10 m
Exterior facade

The exterior facade tries to be a transition from the existing neighbourhood to the new station development. The exiting high rise buildings are characterized by prefab panels. There are all kinds of panels; glass, ceramic, plastic, asbestos. The two stories row houses are characterized by their traditional brick facades. The design of the houses follows the traditional facade of the row houses and is constructed in brick prefab panels. There has been chosen for panels to reduce the weight of the facade, CLT constructions are not suitable for carrying heavy brick facades. The identity of the panels is clearly visible to show that they are not completely traditional.

The facade of the school is made of recycled glass panels. In current high rise the prefab panels are deteriorating which is not improving their aesthetic quality. Therefore recycled glass is chosen for the new development. Recycled glass has a clear texture (is not completely smooth) which improves the deteriorating process (imperfections are accepted as the glass itself is imperfect/not smooth).

Magna recycled glass is made of 100% recycled glass, industrial and glass bottles, being the final piece itself fully recyclable. MAGNA Glaskeramik has developed a crystallization course, where parts of the production are hand-made; acquiring a unique translucent optic that allows a crystal-like brilliance effect when shone upon by light and thanks to which, each slab is different, but always maintaining a full recycled glass composition.
**Interior school**

The construction consists of Cross laminated timber beams, columns, and floors. The wood used in this project is in Scandinavia produced “vuren hout” (Picea abies). Which is a light type of wood with a clear texture. The construction is not visible in all the parts of the building. In the school, the construction is clearly visible. It is a vital element of the interior design of the school. The wood is complemented with white stucco and the rough texture of the concrete screed floor. In the school, there are two types of walls; the ‘closed’ white stucco walls and the ‘open’ glass walls. The open walls are used to let natural sunlight penetrate the areas of the building that have less natural daylight from the roof. To provide the classrooms with privacy, and prevent distraction for the students, the parts of the wall are filled with translucent recycled glass.
Energy source

The metropolitan area Den Haag - Rotterdam is planning a large energy network which will combine geothermal heating, cold/heat storage and the use of residual heat. The first connection to be developed is the energy network between Den Haag and Rotterdam, luckily, the neighbourhood Voorhof is located right next to the line and will be able to participate. The production of heat is therefore no longer a problem, the network will provide it.

However, the energy network does not provide sufficient energy to support the energy demand for cooling, extra needed with the expected climate change. The energy will be obtained through solar panels. These are located on the roof of the dwellings and integrated in the glass of the glass roof.
The building uses a plenum ventilation system, the space in between the secondary beams is used to transport fresh air from the facade into the classrooms and offices. The positive benefit of this system is the short distance from the facade into the classrooms, all rooms have their own air supply. The hot/used/not fresh air is taken out of the building by mechanical ventilation system.
Floor:
- Primary timber beam: 400 x 560 mm laminated
- Secondary timber beam: 100 x 400 mm laminated
- Cross laminated timber board 30 mm
- Insulation: 30 mm
- Water repellent layer
- Dekvloer: concrete with heating 95 mm
Wall structure:

Interior wall: Plasterboard 12 mm, vapour retarder.
Sandwich panel: Spaanplaat 12 mm, Rock wool insulation λ- 0.035 W/m·K between 50/170 mm wood studs, spaanplaat 12 mm
Finish: House wrap (waterkerende laag)
Stijl en regel ophang systeem: 50/70 mm and 40/45 mm.
Recycled glass 21 mm

Raised Floor
- Primary timber beam: 400 x 560/1120 mm laminated
- Secondary timber beam: 100 x 400 mm laminated
- Cross laminated timber board 30 mm
- Concrete screed 95 mm
- Sound insulation 120 mm
- Steel understructure,
- Floor panels with integrated heating system.
- Floor finishing
Positive assets of green roofs

Water storage

The vegetation roof uses a system called “Stormwater Management Roof” by Zinco. This roof has the capacity to store large amounts of water underneath the substrate. Benefit of this system is that the vegetation can not drown. And second it will prevent the sewage system from flooding.

The size of the vegetation

The construction has two types of beams the normal one, which can carry substrate to 200 mm. This beam carries most of the roof. At positions a larger beam is used to carry more and bigger plants. This beam can carry up to 400 mm of substrate.
Section vegetation roof, detail of section E 1:50
Urban details

In the street to the station, now the Marcellus Emantspad a design by the Philadelphia water management team has been implemented. The design creates an open rainwater system that provides water storage and increase biodiversity. Additionally, During hot summers the open water provides cooling. The water basins are used to create barriers between the pedestrians and the cyclists.
Section F, Street profile