

Architectural Concept

Existing situation and design objective

The existing ESO Headquarters building has an outstanding position on the Garching research campus. It lies on the southern fringe of the campus site and is the starting point for the axis of the "Campusband". The building is noted for its unique concept, symbolising through its architectural design the scientific study of the cosmos carried out at ESO.

The building stands alone at the edge of Garching's green belt, and its elegant curves express a successful symbiosis between landscape and architecture, by embracing the natural surroundings and forming individual courtyard spaces.

Keeping the character of the site and emphasising the communicative atmosphere in close touch with the surrounding countryside form the key features for this design proposal.

Office and conference building

Design concept

The architectural concept for the extension buildings takes account of both the established green belt beyond the southern border of the research campus and the extrovert character of the existing headquarters building. The result is an open and individual building that blends both functionally and formally with the existing headquarters, while still respecting its prime position with main entrance, reception and public areas.

Since the new office and conference building is located south of the existing headquarters and therefore reaches even further into the green belt, it is conceived as a structure embedded in its natural surroundings. The height does not exceed three storeys, in keeping with the majority of the existing building, other than the two five-storey office rings towards the south east.

The circle dominates as an architectural component in the existing headquarters building. In this context it refers to scientific communication, but the concept is taken over and transformed by the extension building. While the existing building is composed from a series of open arcs opening out into the surrounding countryside, the new building forms a continuous band of convex and concave circles that enclose an inner circulation zone, and communicative and public facilities such as the auditorium, council room, cafeteria and generously dimensioned roof terraces.

Since the main public entrance to the existing headquarters is via a ramp from the northwest at a height of about 4 metres above ground, and the ground floor is mainly used for internal access and delivery, the new building is conceived with its two main floors floating above ground level. These two main floors rest on structural and functional parts of the building that contain the auditorium, delivery areas and covered bicycle and car parks. In order to avoid breaching the groundwater level, the basement areas are reduced to the required minimum in order to both avoid the risk of flooding and to reduce building costs for waterproof concrete structures. One basement level is located in the area of the auditorium.

Access and circulation

The main external entrance remains in the existing headquarters building. The internal connection between the existing building and the extension is at the point of the existing cafeteria and is via an enclosed bridge.

Car access and the second entrance to the extension building are provided via the access road to the additional 100 parking spaces, northeast of the existing building. These are arranged in a ring around the functional and structural parts of the building, on the ground floor of the new office and conference building. This entrance includes a taxi drop-off zone and a separate reception, which can also be used for major events such as congresses or seminars.

Although the specifications of the revised call for tender require access from northeast, the possibility for another attractive pedestrian access is still provided from the west side of the plot along the beautiful path next to the Wiesäckerbach, because this will be an important pedestrian access for staff coming via local train or bicycle. Since people can move freely in the part of the building below the elevated upper floors, pedestrians can easily reach the entrance of the office and conference building via the bridge over the Wiesäckerbach.

1
circles as predominant
architectural component

completing
circular shapes

2

placing circles
on site

Architectural concept, appearance

The curved envelope of the extension building, with its fully glazed façade provides the illusion of a structure floating above ground on timber-clad supports. During the day both the existing headquarters and the surrounding countryside are reflected as fractured images through the shingled folded façade. The extension opens outwards by means of glazed panels onto the cafeteria terrace and an additional terrace towards the south.

In the evening the building is lit from inside and optically opens fully outwards over the entire building height since the façade is constructed without parapets. In addition to this, the floating structure can be dimly illuminated from below by uprights embedded in the asphalt surface of the car parks.

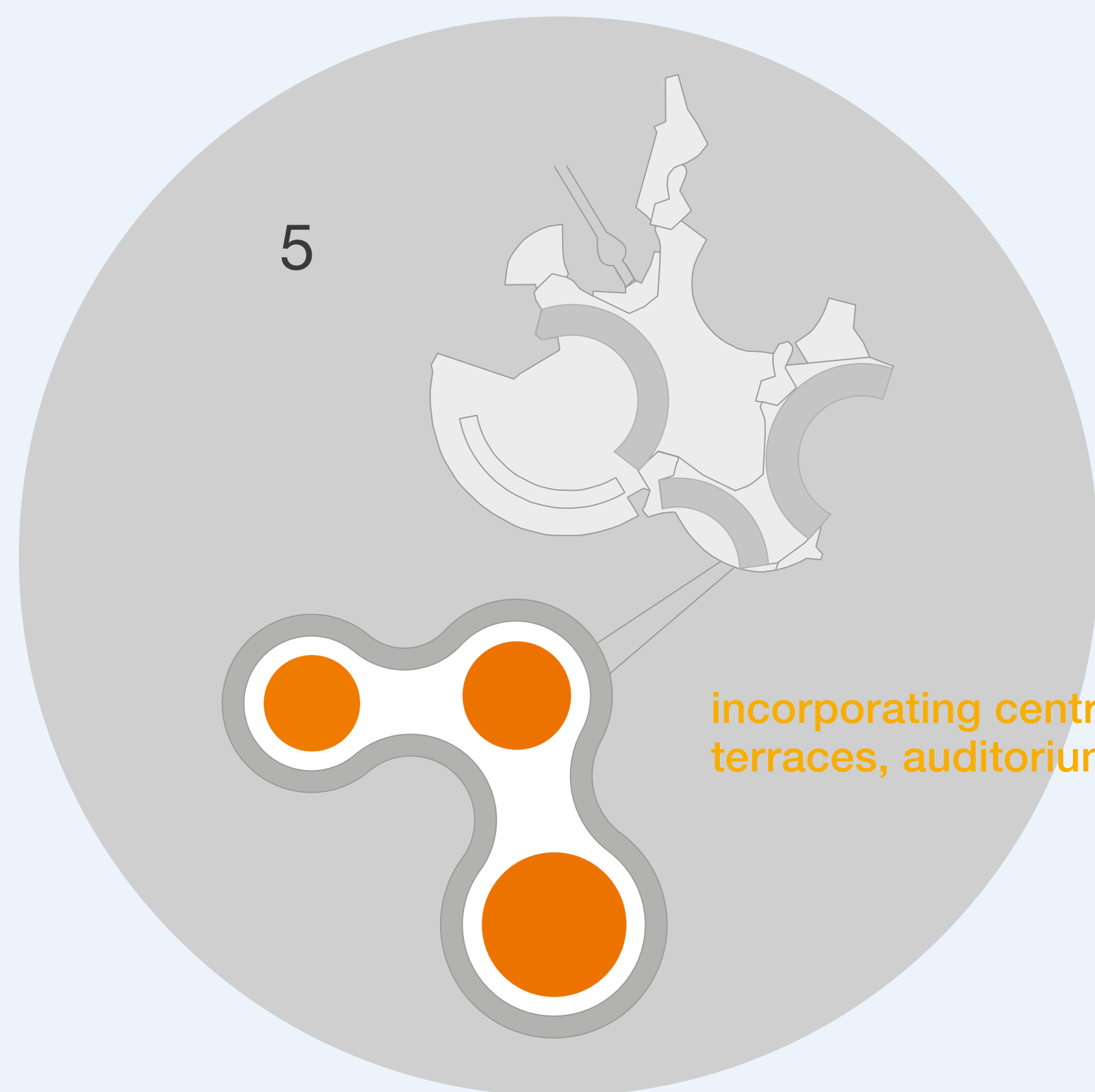
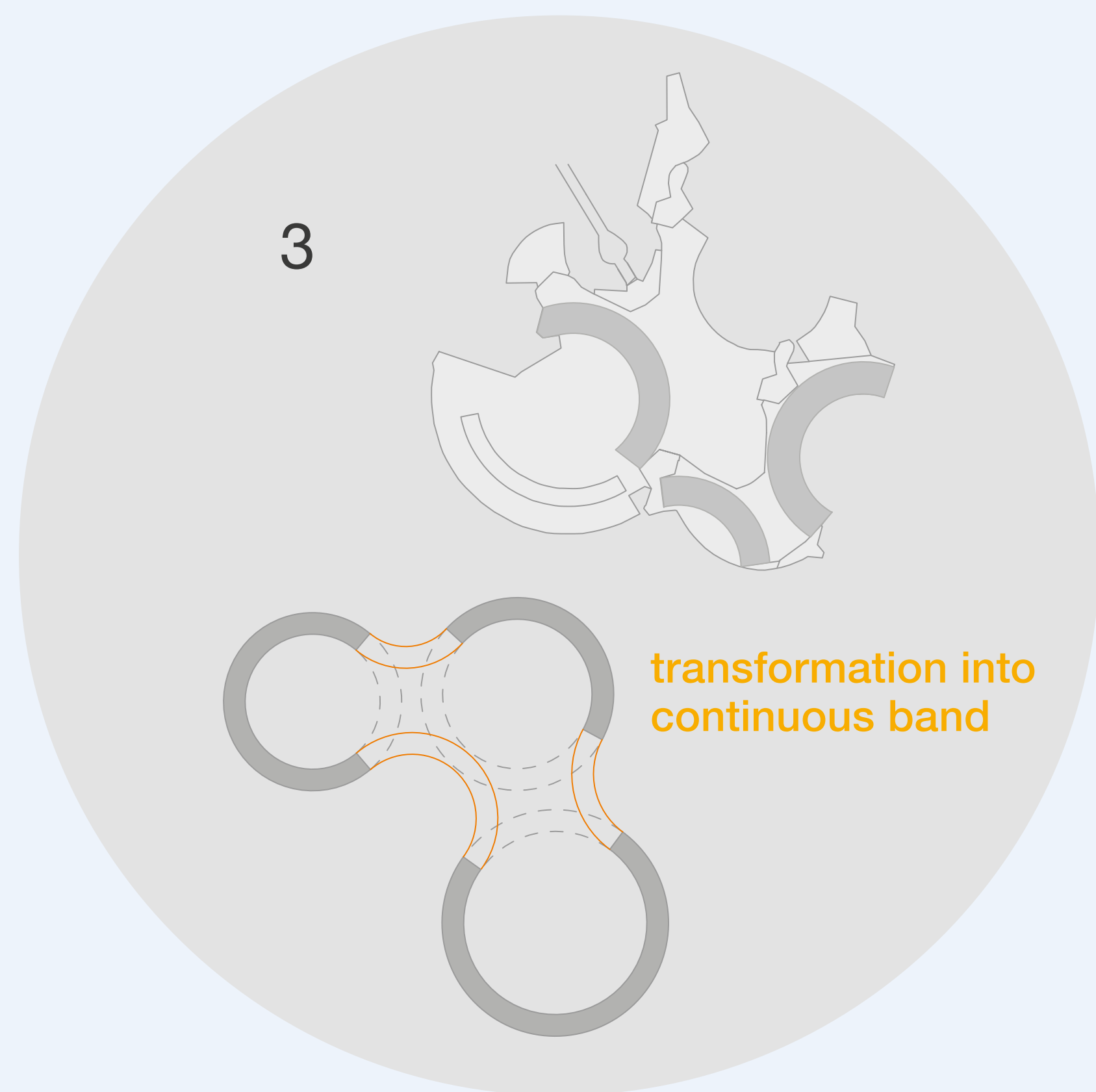
Internal organisation

The auditorium, the cafeteria and the council room of the new building are situated in the area next to the existing building and will thus form the balance point of the new layout for the ESO site.

Additional communicative centres with photocopiers, reading areas and kitchenettes are arranged on both upper floors around the two circular cut-outs with views to the outside. One of these cut-outs, with a diameter of 8.20 metres, has exactly the same dimensions as the large VLT mirrors at the Paranal Observatory. Similar reference dimensions to other telescopes of the ESO fleet can be found throughout the building, for example in round benches (diameter 3.60 metres/2.20 metres) placed on the roof terraces and serving as garden troughs for small trees.

All of the 12 m² offices are placed in the outer office ring and have views out onto the open country. The larger 18 m² offices, as well as the meeting rooms, are arranged as two inner office rings around open roof terraces. The council room opens onto a planted winter garden that can be used as a recreation area during conference breaks.





Landscape design

The planted areas between the existing building and the new office and conference building will be developed in accordance with the overall landscaping concept of the ESO site.

The new office and conference building should appear as a floating structure above the existing landscape, so paved surfaces should be kept to a minimum and green surfaces like lawn or grassland be brought as close as possible to the new building. Paved areas for pedestrian and car access will be carried out as ground asphalt, and the road access around the building will consist of stone pavement with vegetated gaps.

The plantation of additional trees should respect the character of the site where open fields meet densely wooded areas. Trees are planted only in a few selected areas (e.g., in the entrance area) to provide sight lines rather than to obstruct the view out over the surrounding country.

Structural concept

The first and second floor levels rest on a sub-construction, consisting of the first floor slab supported by circularly arranged concrete shear walls on the ground floor, together with horizontal timber cladding that forms sculptured spaces. As the circular floor slab and shear wall construction are used in only the second of the two upper floors, a column-free cantilever will be possible, thus enhancing the perception of a structure floating above ground level.

The first floor slab is supported by tensioned concrete columns suspended from the shear wall constructions on the second floor level allowing the design of open-plan areas on first floor such as the cafeteria and a terrace to the south.

Energy concept

Ventilation

- Natural ventilation of the offices via adjustable opaque façade elements.
- Mechanical ventilation systems only for meeting rooms, auditorium, council room and cafeteria.
- Mechanical ventilation systems with heat recovery and outside air intake through geothermal ducts for air preheating and precooling.

Heating and cooling

- Heat pump system (groundwater wells) as the basic system in addition to the district heat system.
- During summer the heat pump and groundwater will be used for cooling.
- Activation of exposed concrete ceilings for thermal storage.
- Thermal regulation via concrete core as basic means of heating and cooling. Additional prefabricated concrete core-strips installed close to the windows for individual temperature regulation.

Façade

Office building

- Floor-to-ceiling double glazing. The expected high wind speeds in the area mean that outside blinds have been avoided.
- Electrically operated blinds integrated into double-glazing layers ensure sufficient sun protection, additional daylight in the rooms and solar heat gains in winter.

Technical buildings

- The exterior layers of the façades consist of neutral sun protection glass. Sun protection by using outside blinds, in the technical building 2 (mandatory alternative) is achieved through an additional layer of perforated profiled sheeting.
- The total g-value for this façade element will be 0.06 to 0.1.

Fire protection concept

External access

- All façades can be reached by fire engines.

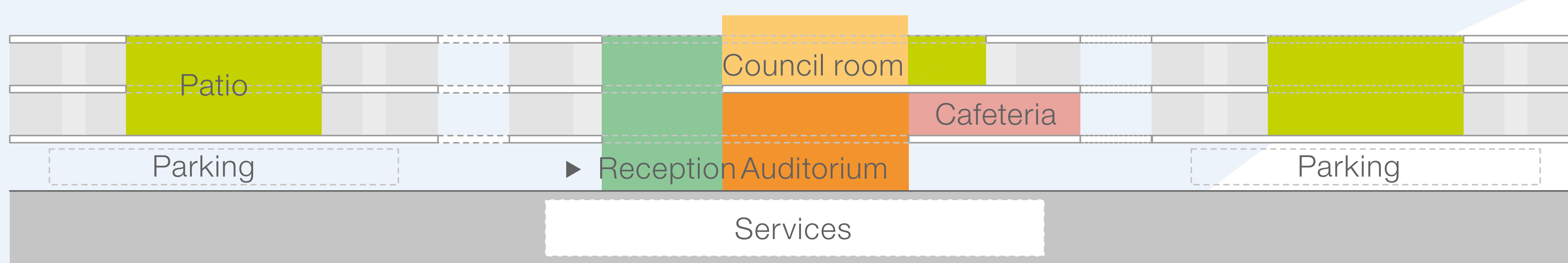
Evacuation concept

- First escape routes via enclosed staircases or direct exits.
- Second escape routes out of office units 400 m² via rescue equipment of the fire brigade.
- Council room, auditorium and cafeteria can be each evacuated via two separate staircases.
- In the technical building the second escape routes are provided either via second staircase or via rescue equipment of the fire brigade depending on the different design proposals.

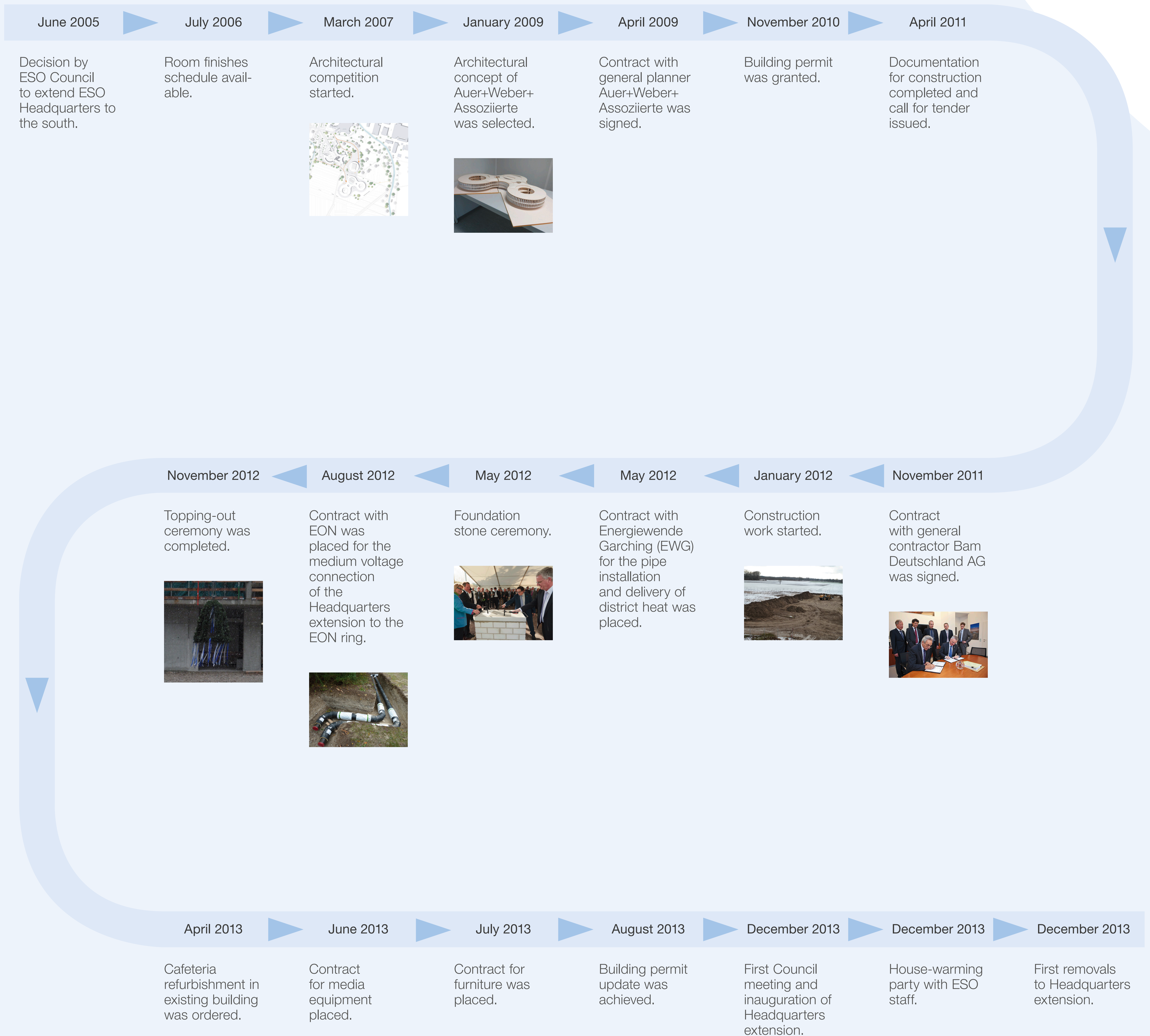
Structural fire protection means

- Both load-bearing walls and ceilings are fire resistant in accordance with the Bayerische Bauordnung (Bavarian construction regulations).
- The floors are connected in the central area of the office and conference building (auditorium, council room, and cafeteria) via an open space. In order to keep the open communicative atmosphere in this area and to avoid additional fireproof glazing a partial sprinkler system is proposed, but limited to only this area. The auditorium doesn't need a sprinkler system.
- Subdivision of the building by fire break walls over the full building height.
- Separation of the office units that are less than 400 m² by fire resistant walls.
- Fire-resistant separation of the auditorium against other units.

From the international architectural competition winner Auer+Weber+Assoziierte.



History



Site Planning and Landscaping

Office and conference building

The three-storey office and conference building consists of three circular sections (A, B and C) "floating" above ground level and resting on structural and functional parts of the building. These contain the offices, an auditorium, a council room, a cafeteria, meeting rooms, covered and open bicycle, motorcycle and car parking, and enclosed storage areas.

Office building gross external floor area: 10 300 m².

Technical building

The technical building is situated between the existing headquarters and the new office and conference building. The three-storey circular building enhances the campus-like appearance of the new ESO site.

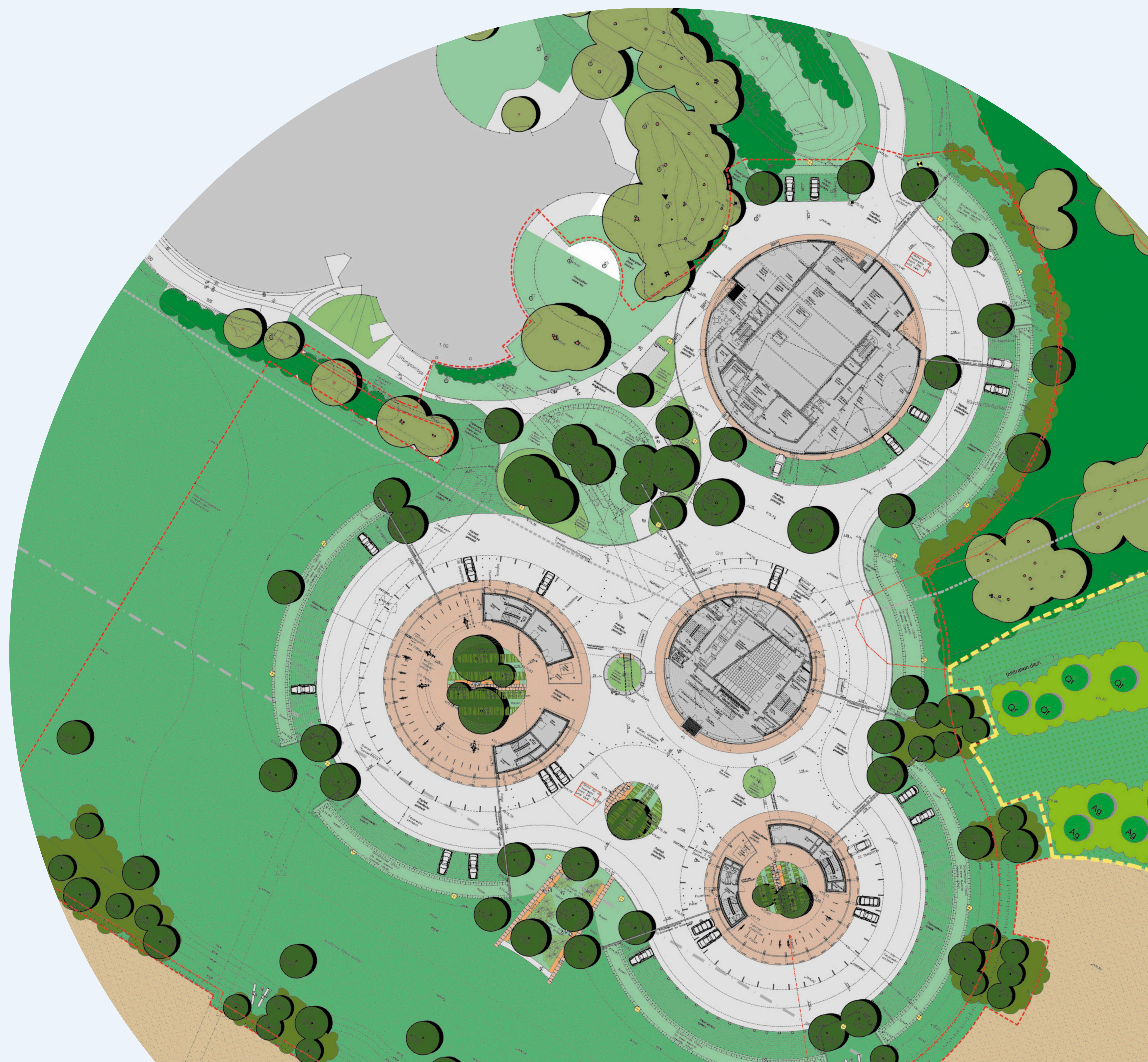
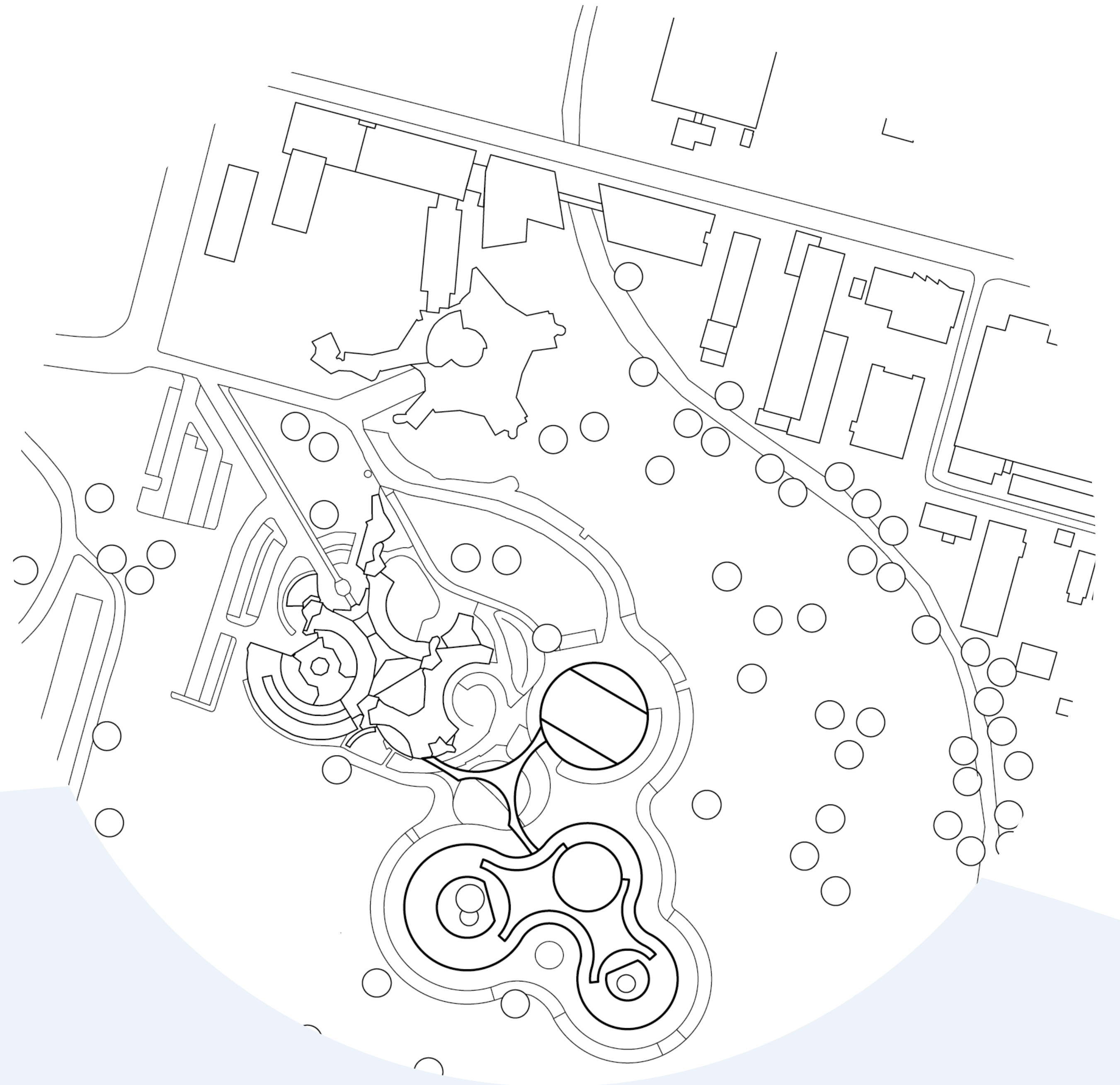
Technical building gross external floor area: 2 900 m².

Connecting bridge

The connecting bridge links the existing headquarters with the office building, conference building and the technical building. The curvature of the existing headquarters is integrated into the new design.

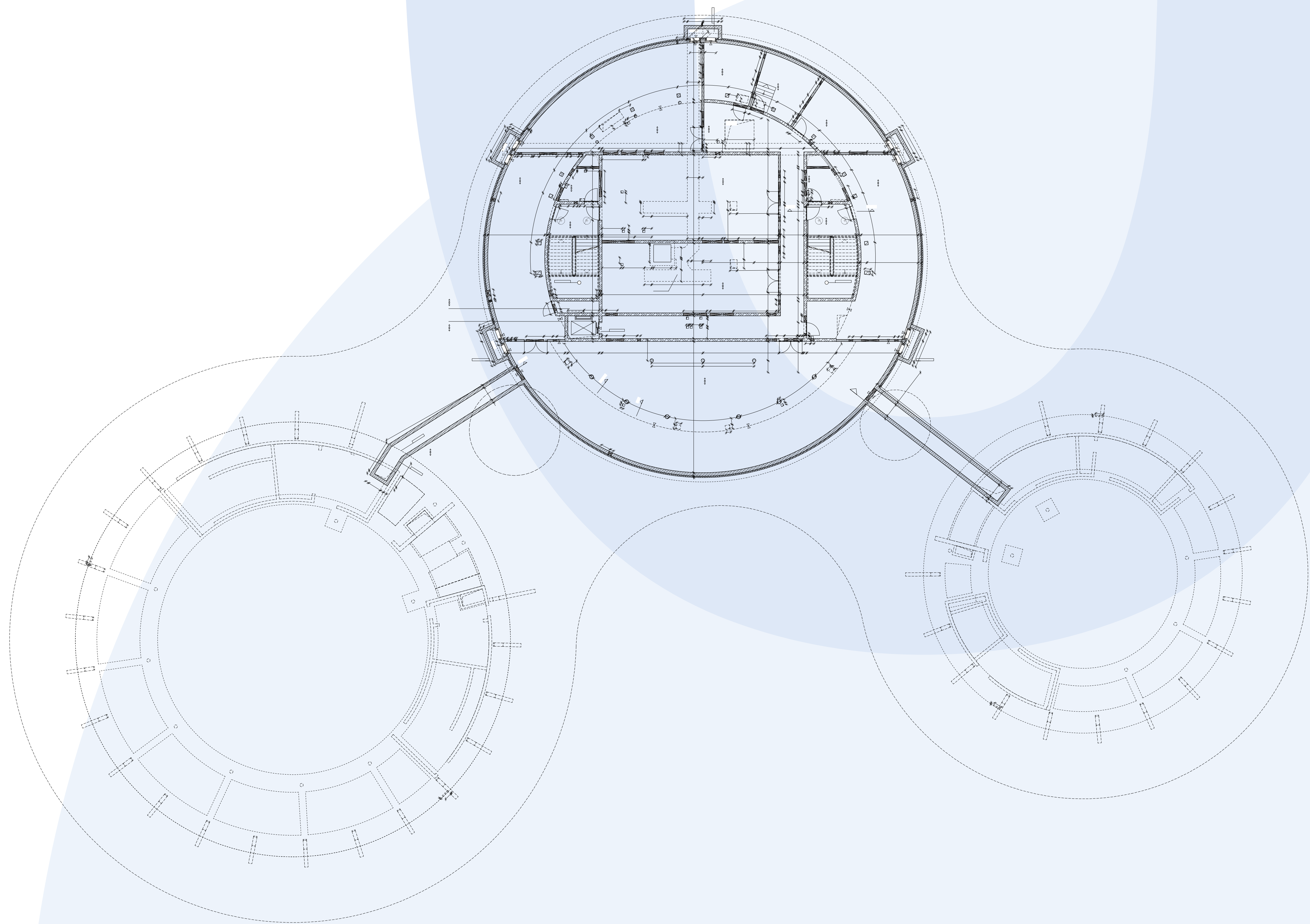
Landscaping

The landscaping includes all the exterior features such as asphalt, paving, habitat compensation areas, signage, trees, grass and bushes, drainage, fences and exterior lighting. The area of the exterior work amounts to 32 700 m². 142 new parking spaces for cars and approximately 100 spaces for motorcycles/bicycles have been allocated.



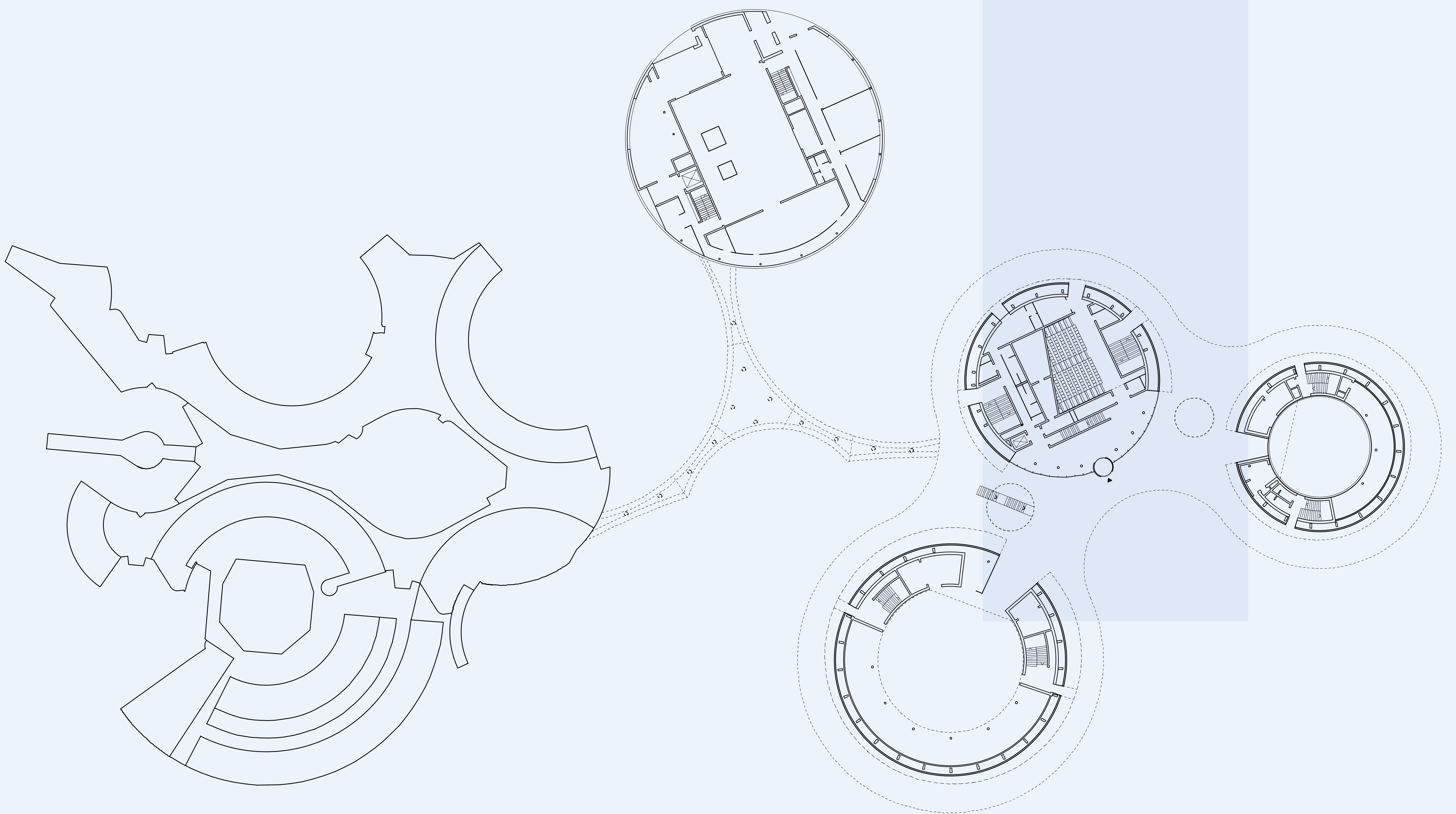
Office and Conference Building

Level



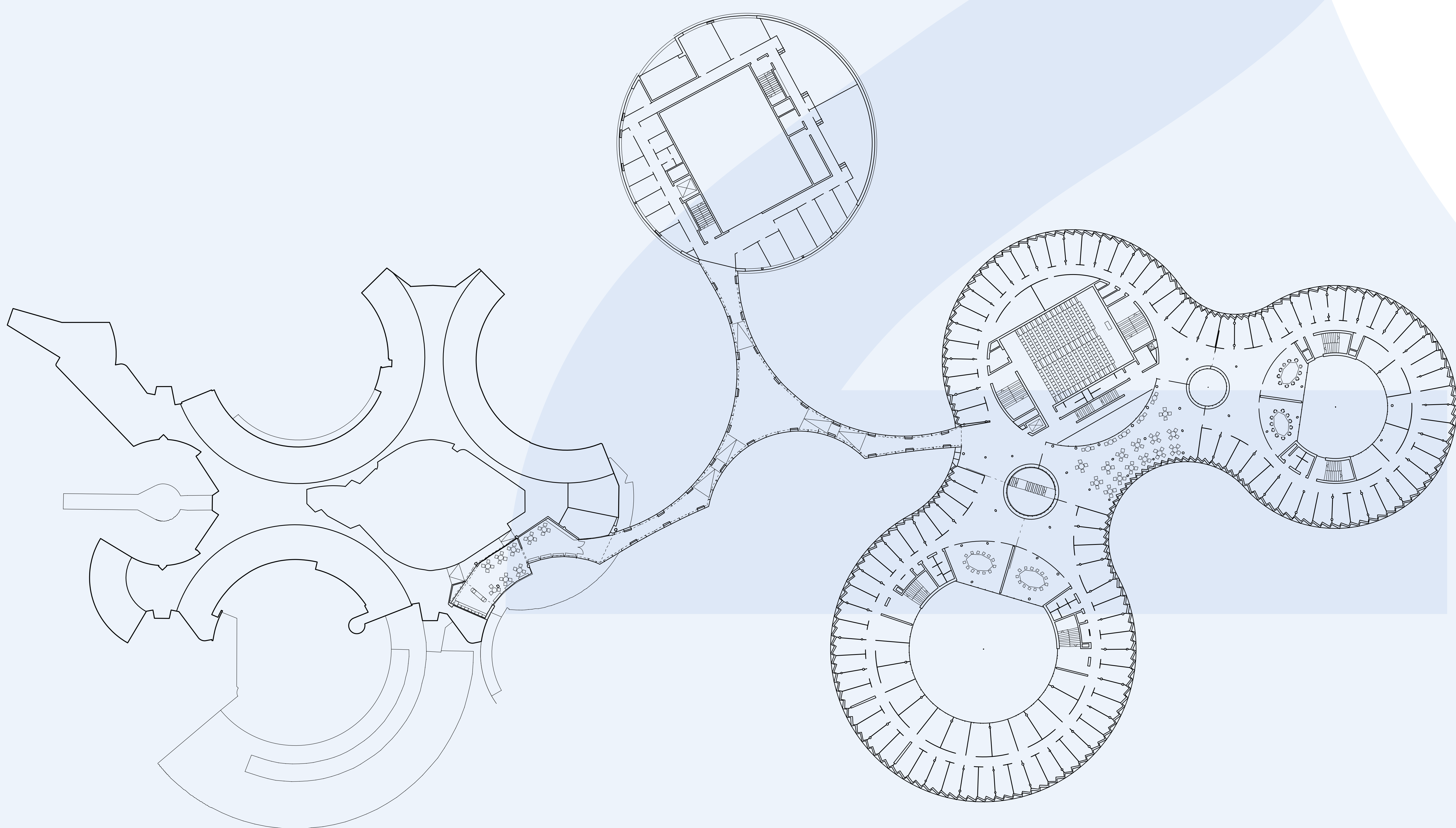
Office and Conference Building

Level 1



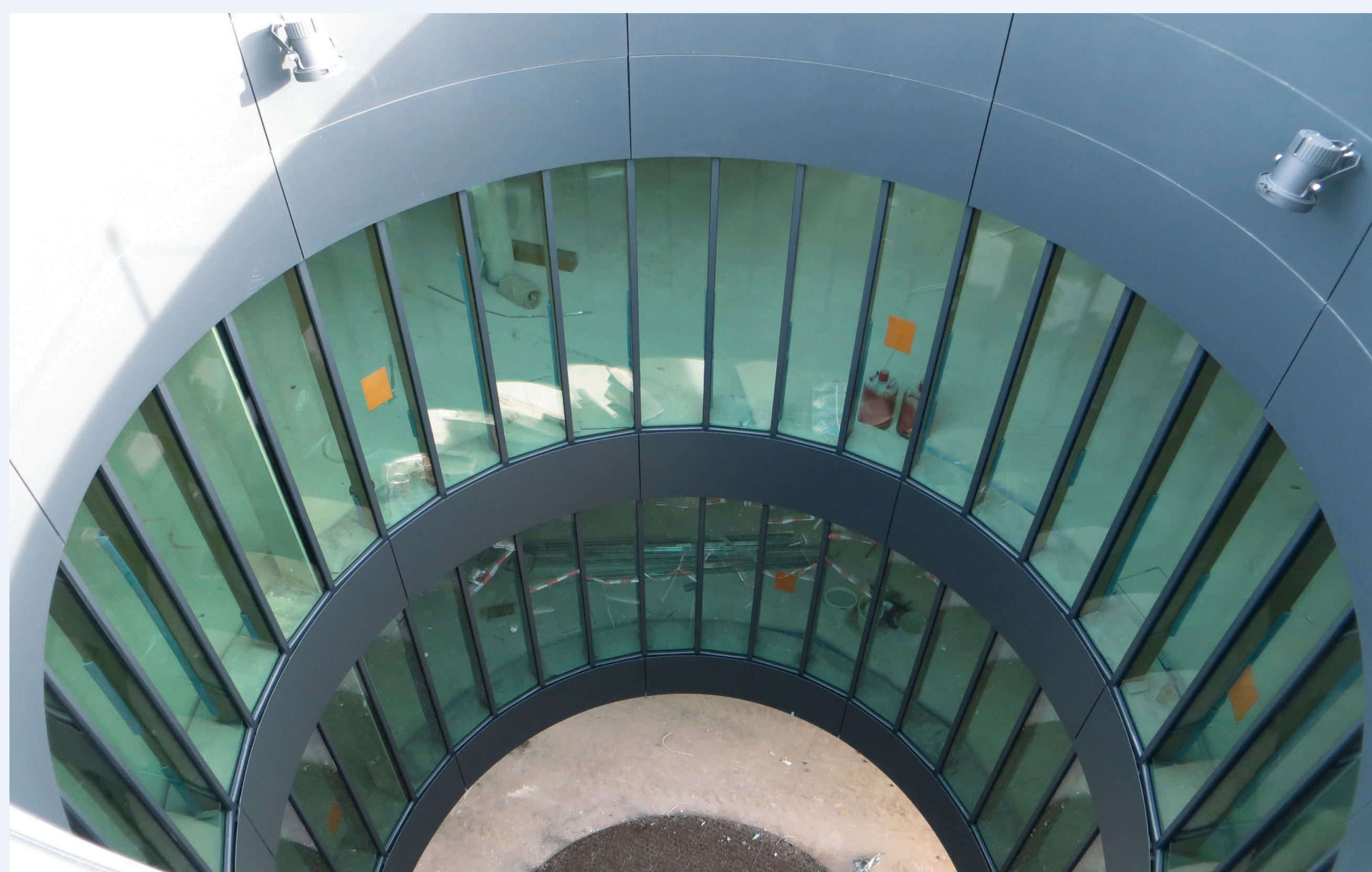
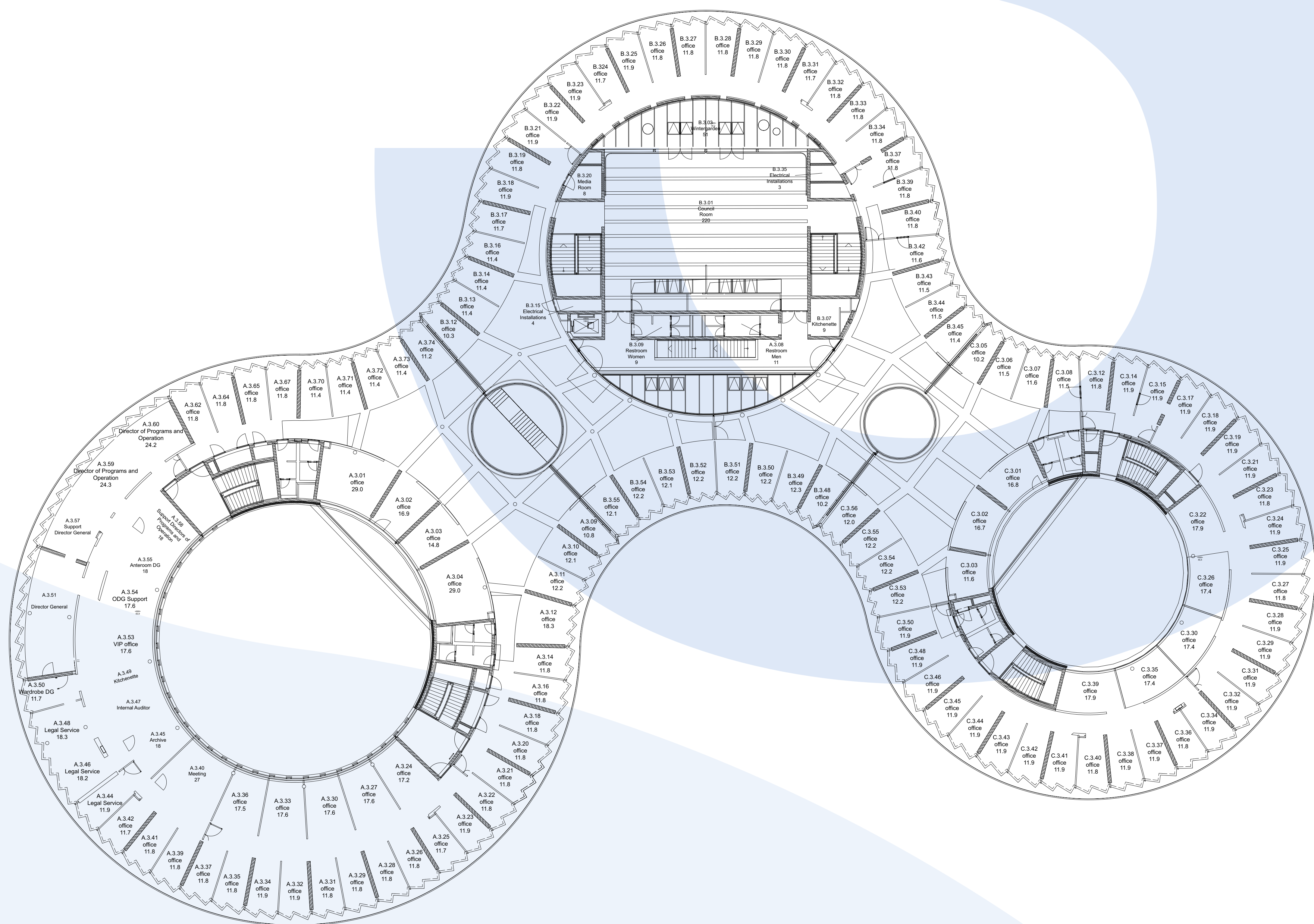
Office and Conference Building

Level



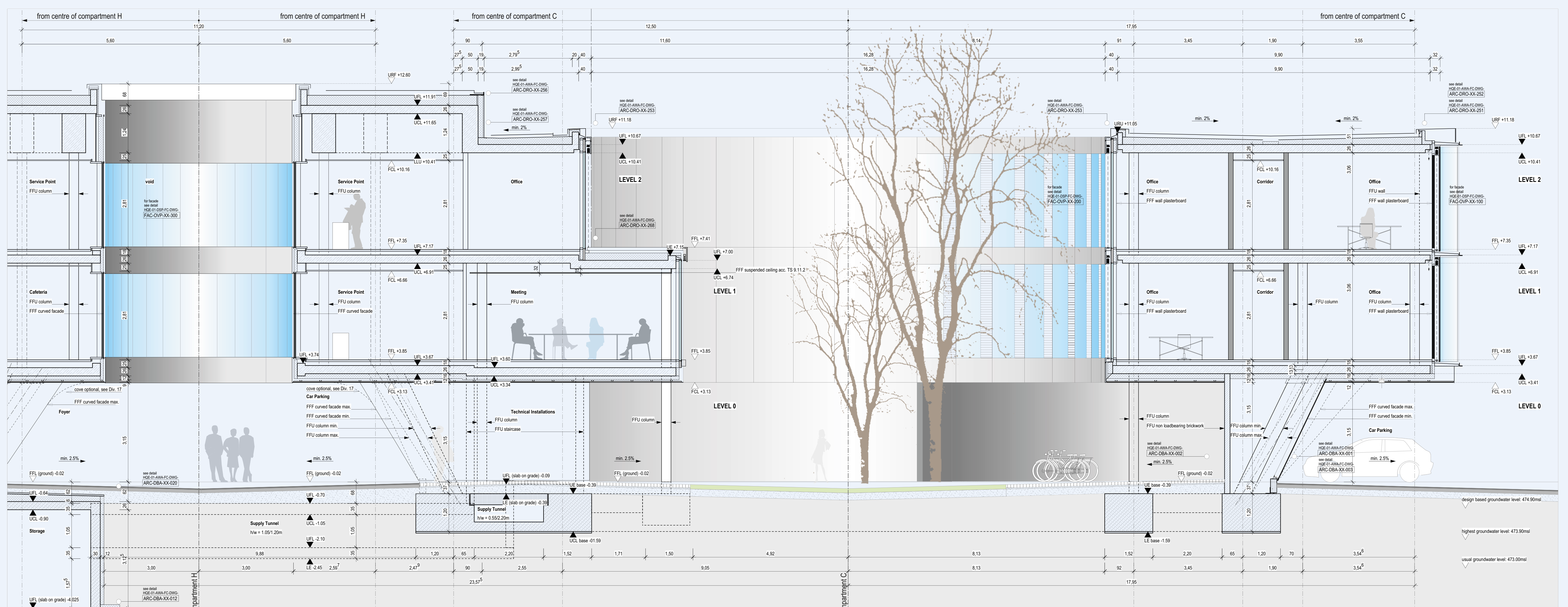
Office and Conference Building

Level



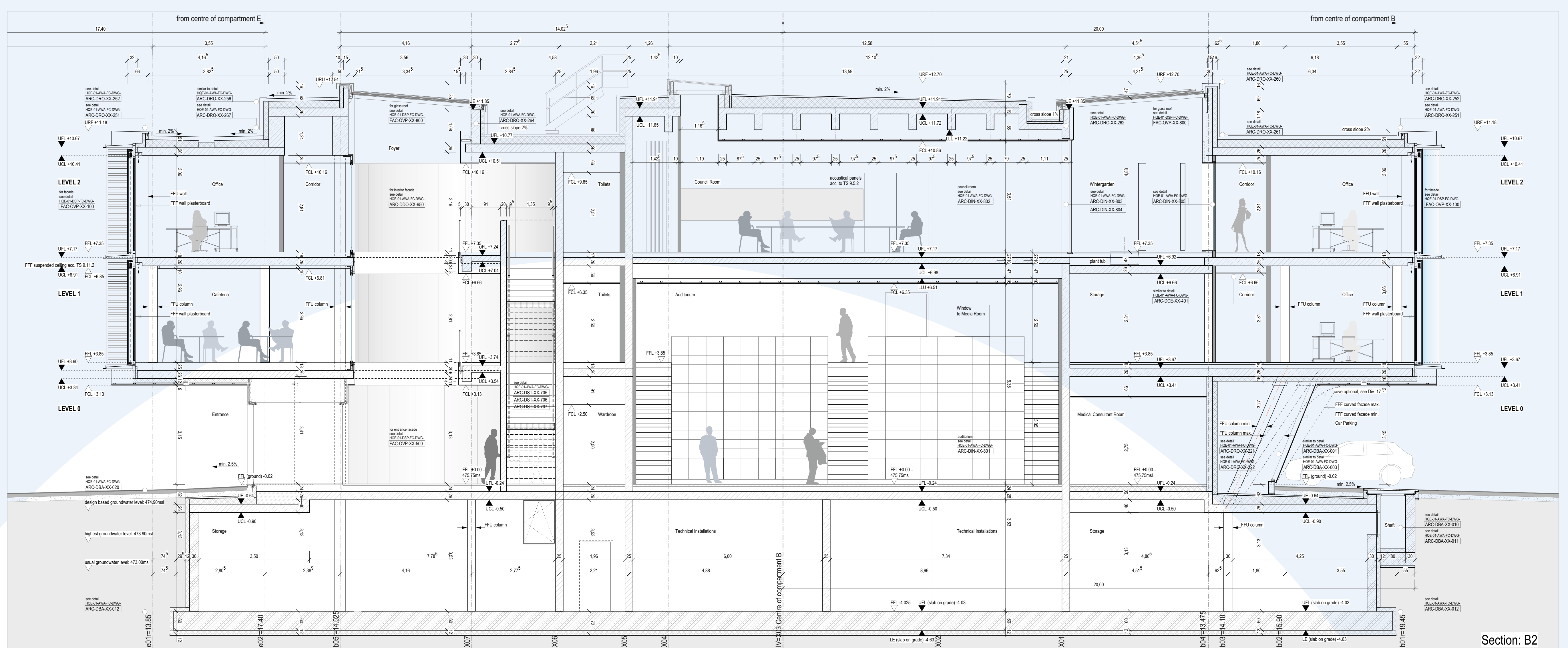
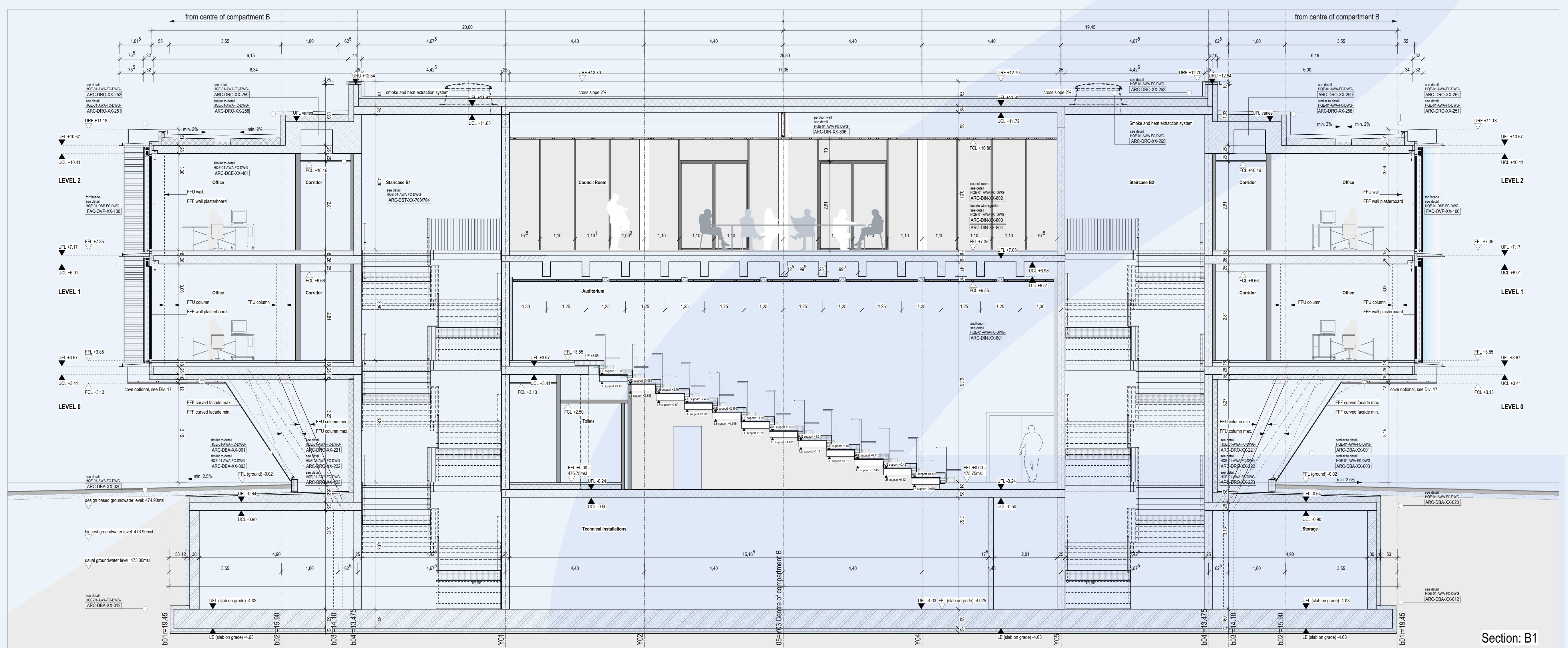
Office and Conference Building

Section



Office and Conference Building

Section



Office and conference building

The three-storey office and conference building consists of three circular sections (A, B and C) "floating" above ground level and resting on the structural and functional parts of the building. These contain the offices, an auditorium, a council room, a cafeteria, meeting rooms, covered and open bicycle, motorcycle and car parking, and enclosed storage areas. The building has a unique zigzag glass façade system, which reflects the existing headquarters and the landscape as a fractured image. In order to avoid penetrating into the groundwater level, basement areas have been reduced to a minimum. Only section B has a basement and includes technical rooms for heating, ventilation and air conditioning, electrical equipment and storage space.

Floor space: 10 300 m² with 267 desks

Heating and cooling: Offices are heated and cooled by means of concrete core activation. The slab is charged during the night and provides the required climate through radiation. Each office also has a radiator to support the concrete core activation on very cold days and during steep changes in temperature. An automatically operated sun protection system prevents the offices from overheating. The auditorium, council room, cafeteria and meeting rooms are equipped with cooled ceiling and ventilated air. Technical rooms are cooled by means of fan coils. Ground water, a heat pump and district heat from Energiewende Garching is used for heating and cooling.

Basement: Technical rooms and storage space.

Ground floor: Technical rooms, shower and staircases in sections A and C. Foyer and auditorium in section B.

Level 2: Offices, meeting rooms, cafeteria, service points and access to the connecting bridge.

Level 3: Offices, meeting rooms, council room, winter garden, service points.

Roof: The roof is built as inverted roof. Low maintenance landscaping has been installed on the roof. The roof is accessible for maintenance only through the roof window in section A.

Structural aspects: Sections A, B and C are linked together by slabs at levels 2 and 3 and a roof slab at level 4. The transparent façade is made of glass elements; the elements are supported at the slabs. At the edge of the three sections (A, B and C), the slab above level 0 has a cantilever of approximately 4.6 metres. Two areas between the sections A/B and B/C have no columns at level 0 and are suspended from the roof structure.

The building is designed as a reinforced concrete skeleton structure. Except for the roof area between the sections A/B and B/C and the slab over the conference and council room in section B, all slabs are 260 millimetres thick in situ concrete slabs. The slabs over the conference and council room in section B (level 2 and 3) are ribbed slabs. The roof slab at level 2 of the suspended and interlinking area between sections A/B and B/C is a ribbed slab. The ribs are at approximately 4.5 metres on centre with a 260-millimetre thick slab on top. The ribs are supported on columns and walls at the border areas of sections A, B and C. The edges of the slabs at the circular cut-outs, the so-called service points, between sections A/B and B/C in level 2 and 3 are strengthened with down stand beams.

All core walls, staircase walls, stair landings, and columns are made of reinforced-concrete.

The cantilever of the circular slabs is designed by combining tensions ties, pressure columns, and stiffener walls (shear planes). The cantilevered elevated slab of level 1 is suspended from the stiffener walls at level 3 with concrete tension ties. The stiffener walls are supported at their internal edges by circular concrete columns acting in compression. Therefore, the loads of the cantilevered elevated slab at level 1 can be carried by the tension ties to the stiffener walls. The stiffener walls transfer the loads to the internal compression columns.

Building Management System: The building is controlled through a Building Management System (BMS) and throughout the building the mechanical and electrical installation is connected through KNX cables, cables using a standardised network communications protocol, developed by the KNX Association.

Façade: Triple glazing with additional protective window. Between the triple glazing and the protective window there is automated sun protection, which can be individually overridden. The heat transfer coefficient (U-value) of the façade is 1.2 W/(m²K).

Hollow floor: A hollow floor is installed in the building in which the electrical cabling, heating and ventilation is installed.

Sound insulation: Office: > 37 dB, meeting rooms: > 45 dB



Auditorium

Architectural concept auditorium — shell-in-shell concept

Ceiling: Acoustic ceiling with integrated lighting and loudspeakers. It is filled, and painted anthracite.

Walls: Three walls are wood-laminated acoustic panels. One wall is painted anthracite.

Floor and furniture: Carpet anthracite and exposed concrete with anthracite-coloured wooden furniture and upholstery.

Area: 250 m².

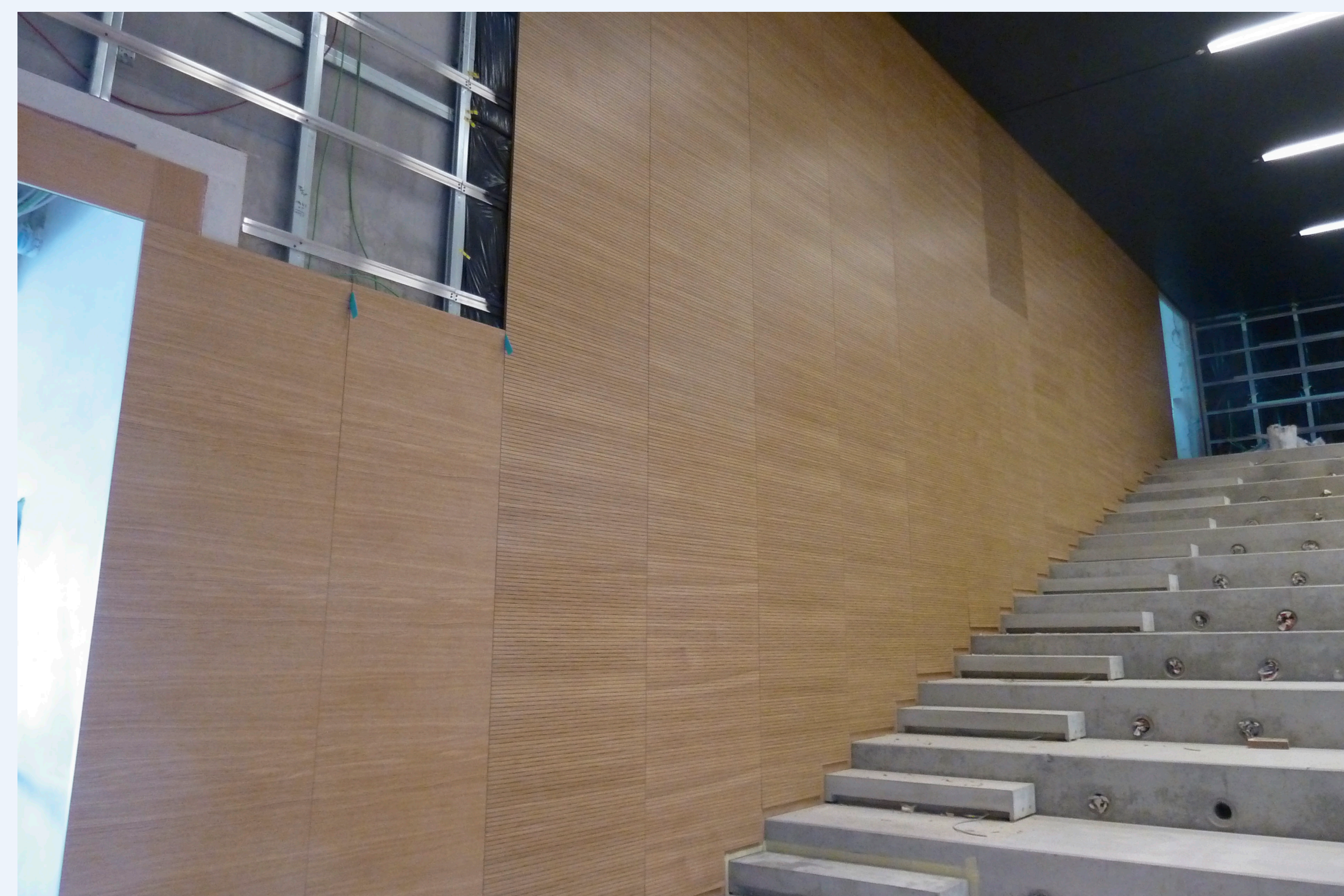
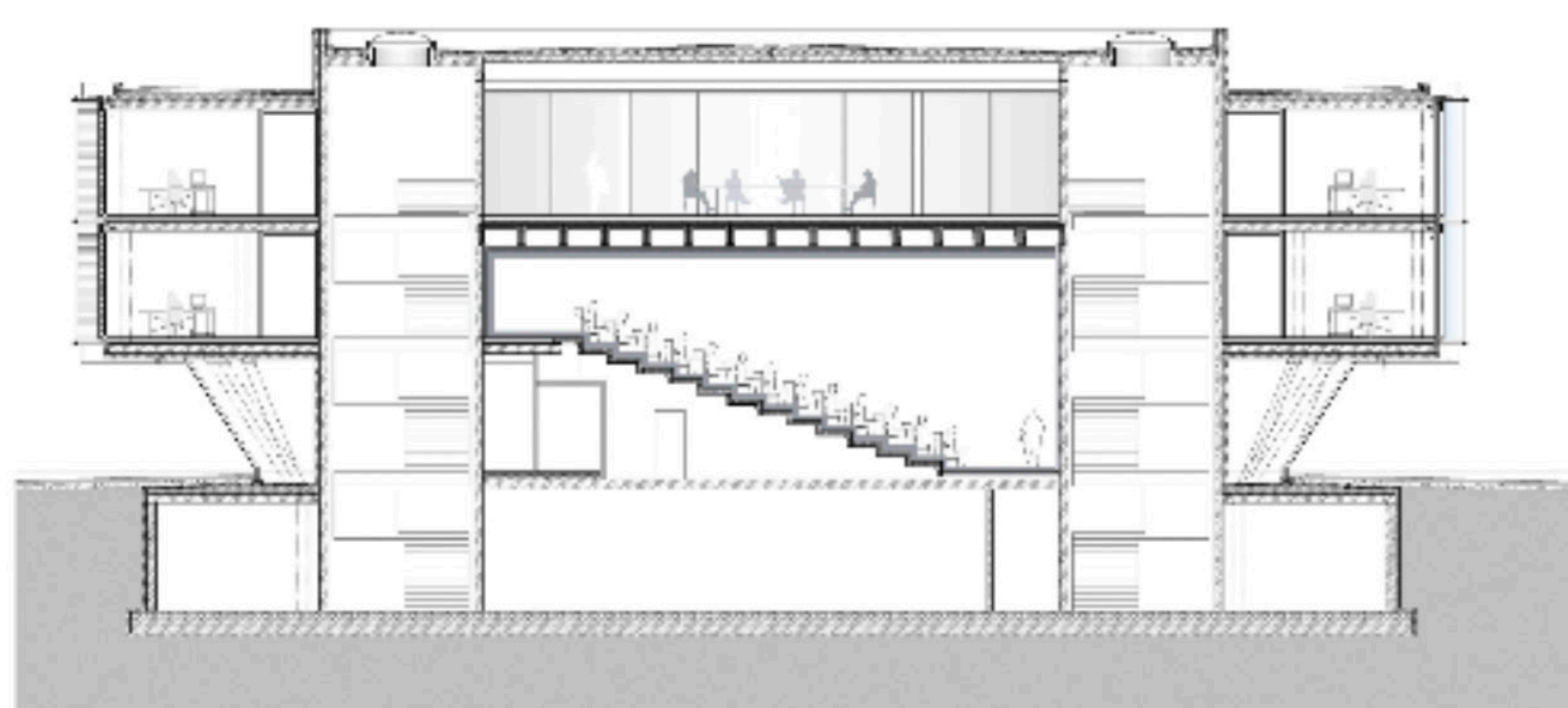
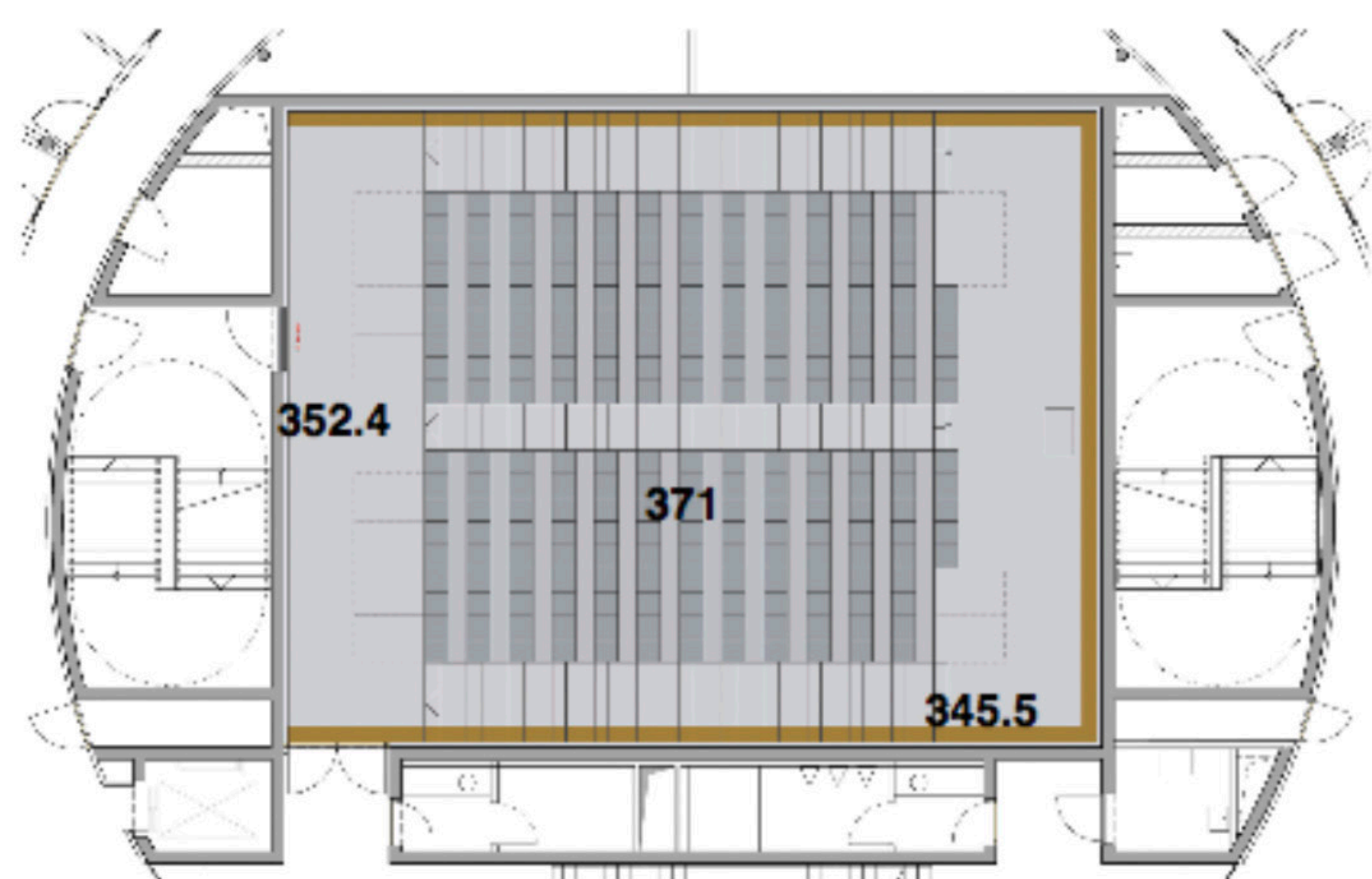
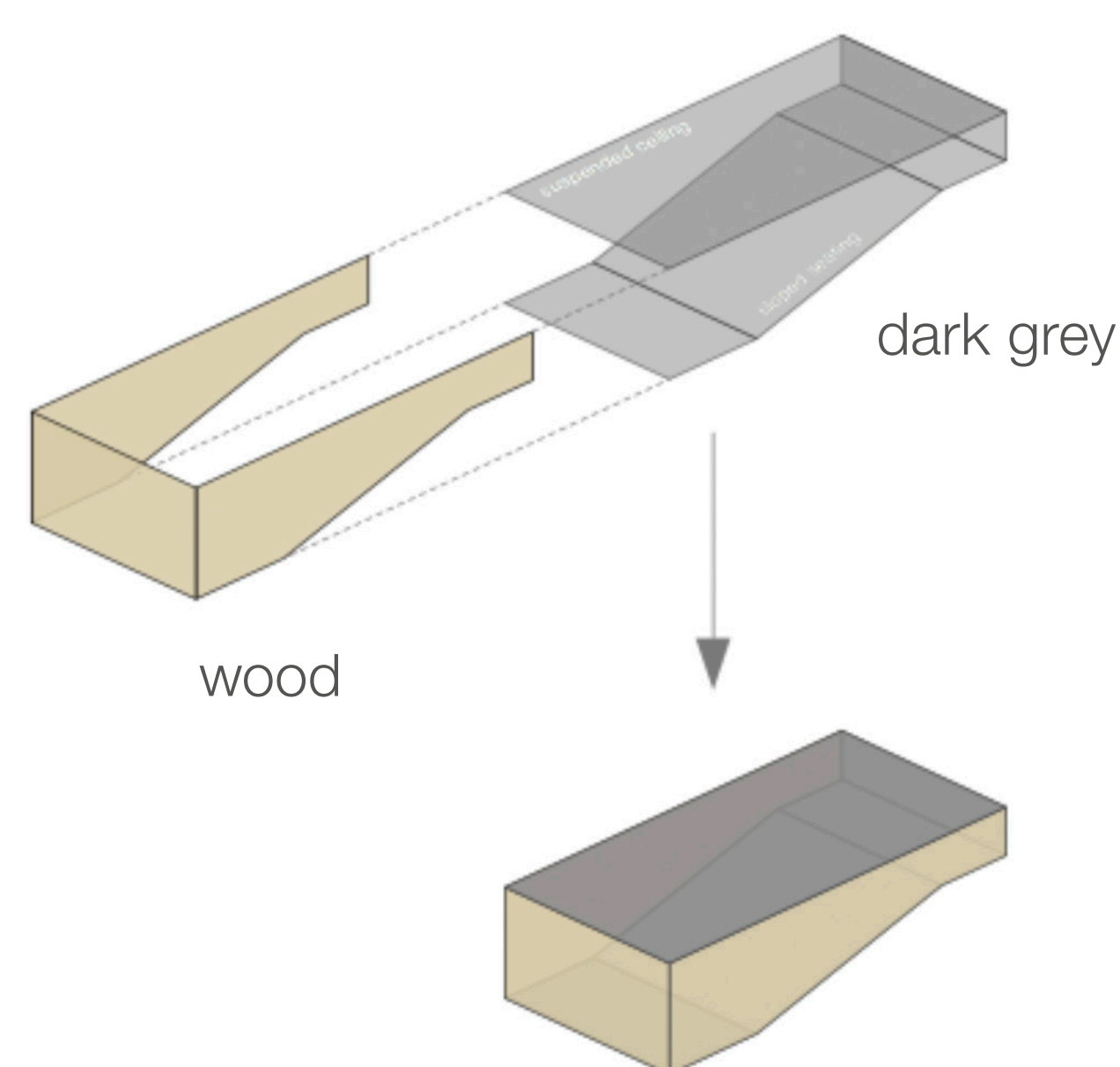
Number of people: There is room for 300 people in the auditorium: 234 seats, 65 standing and 1 presenter. Each seat has an electrical power outlet.

Ventilation: Underneath each seat is a vent to deliver fresh air at a preset temperature.

Heating and cooling: Heating and cooling of the auditorium is achieved primarily by radiation through the ceiling.

Media equipment: Most of the equipment and cabling is installed beneath the floor, in the walls and above the ceiling. Video conferencing and presentations can be done with ease, and each participant has access to the discussion system.

Health and safety: The auditorium is a place of assembly (Versammlungstätte), and is therefore subject to additional health and safety requirements in terms of access and emergency egress.



345.5 Internal Lining:
Wall mounted laminated acoustic panels. Wooden surface

352.4 Flooring Auditorium
Carpet (needle felt) on raised floor. Colour: anthracite

353.2 Ceiling Lining:
Acoustic ceiling with intergrated lighting. Filled and painted. Colour: anthracite

371 General Purpose Fitments:
Wooden seating with fold-out tables (listed as excluded), speakers desk.
Colour: anthracite

Council Room

Ceiling: Acoustic ceiling with integrated lighting and loudspeaker, filled and painted white.

Walls: White with acoustic panels. Glass wall to the winter garden with integrated darkening devices.

Roof light: Sun protection glass is used and can be darkened and the roof light opened.

Floor: Carpet anthracite.

Area: 220 m².

Number of people: There are seats for 43 people around the oval table and 14 seats at the long rectangular table.

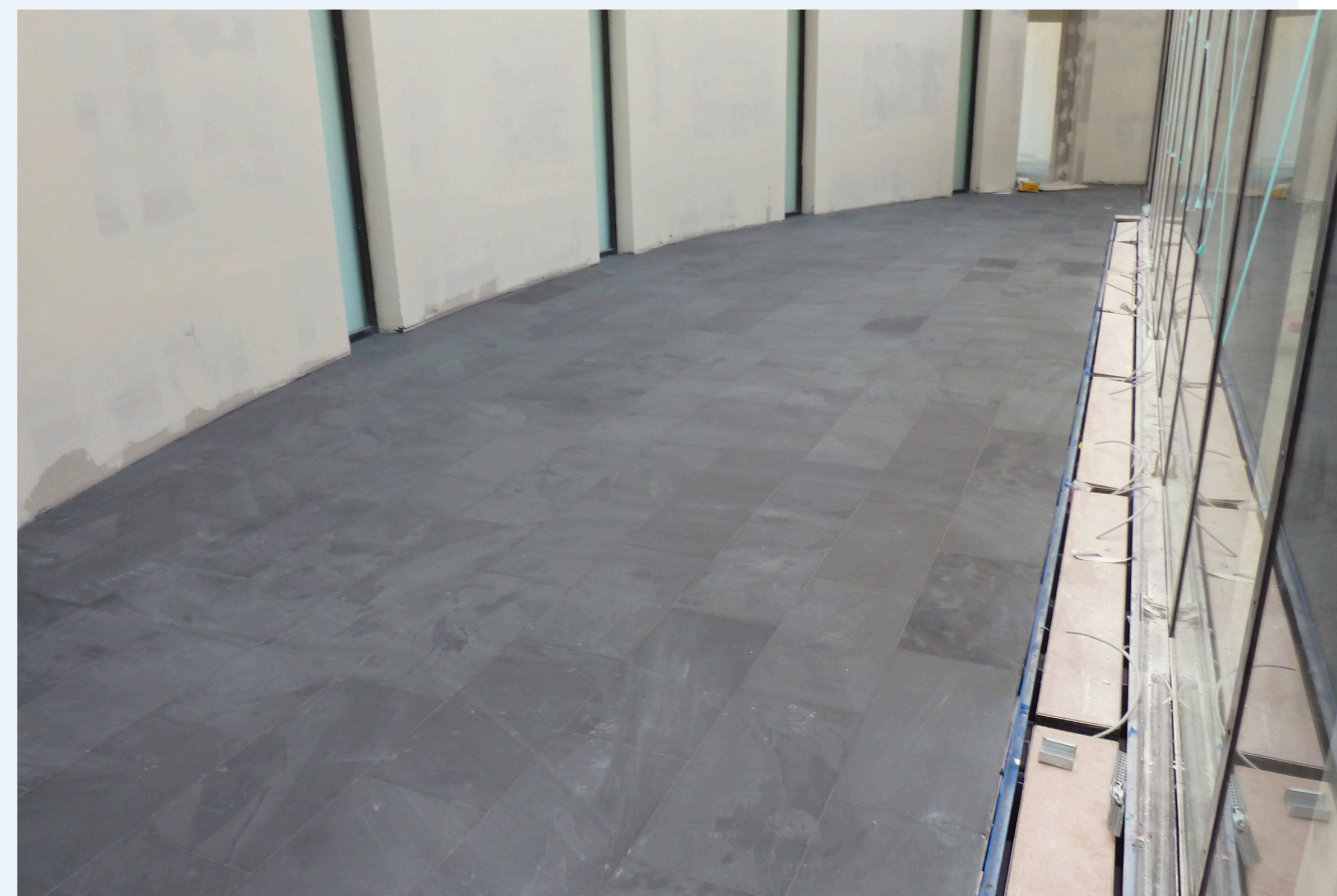
Ventilation: Air is supplied through a vent and returned through a circumferential slit in the ceiling.

Heating and cooling: The heating and cooling is achieved by a heated or cooled ceiling, mainly through radiation.

Media equipment: Most of the equipment and cabling is installed beneath the floor, in the walls and above the ceiling. Video conferencing and presentations can be done with ease, and each participant has access to the discussion system. The screens and beamer projections can be used simultaneously.

Health and Safety: The council room is a place of assembly (Versammlungstätte), and is therefore subject to additional health and safety requirements in terms of access and emergency exits.

Winter garden: Can be used for site meetings and breaks.



Single Office

Location: Most of the offices in the outer ring are single offices. They have an electronic locking system.

Ceiling: Concrete painted white.

Walls: Concrete or drywalls painted white.

Floor: Carpet anthracite.

Size: 12 m².

Ventilation: Window ventilation only.

Heating and cooling: Offices are heated and cooled by means of concrete core activation. The slab is charged during the night and provides the required climate through radiation. Each office also has a radiator to support concrete core activation on very cold days, and during abrupt temperature changes. An automatically operated sun protection system, which can also be operated manually prevents the offices to be heated.

Façade: Triple glazing with additional protective window. Between the triple glazing and protective window, automated sun protection is used. Each user can override the automated sun protection. The heat transfer coefficient (U-value) of the façade is 1.2 W/(m²K).

Power and network: Each office will receive three Cat cables for data transfer and a multi-socket outlet.

Furniture: No built-in furniture. Existing furniture will be reused.



Double Office

Location: Most of the double offices are located on the inner ring. They have an electronic locking system.

Ceiling: Concrete painted white.

Walls: Concrete or drywalls painted white.

Floor: Carpet anthracite.

Size: Approximately 18 m².

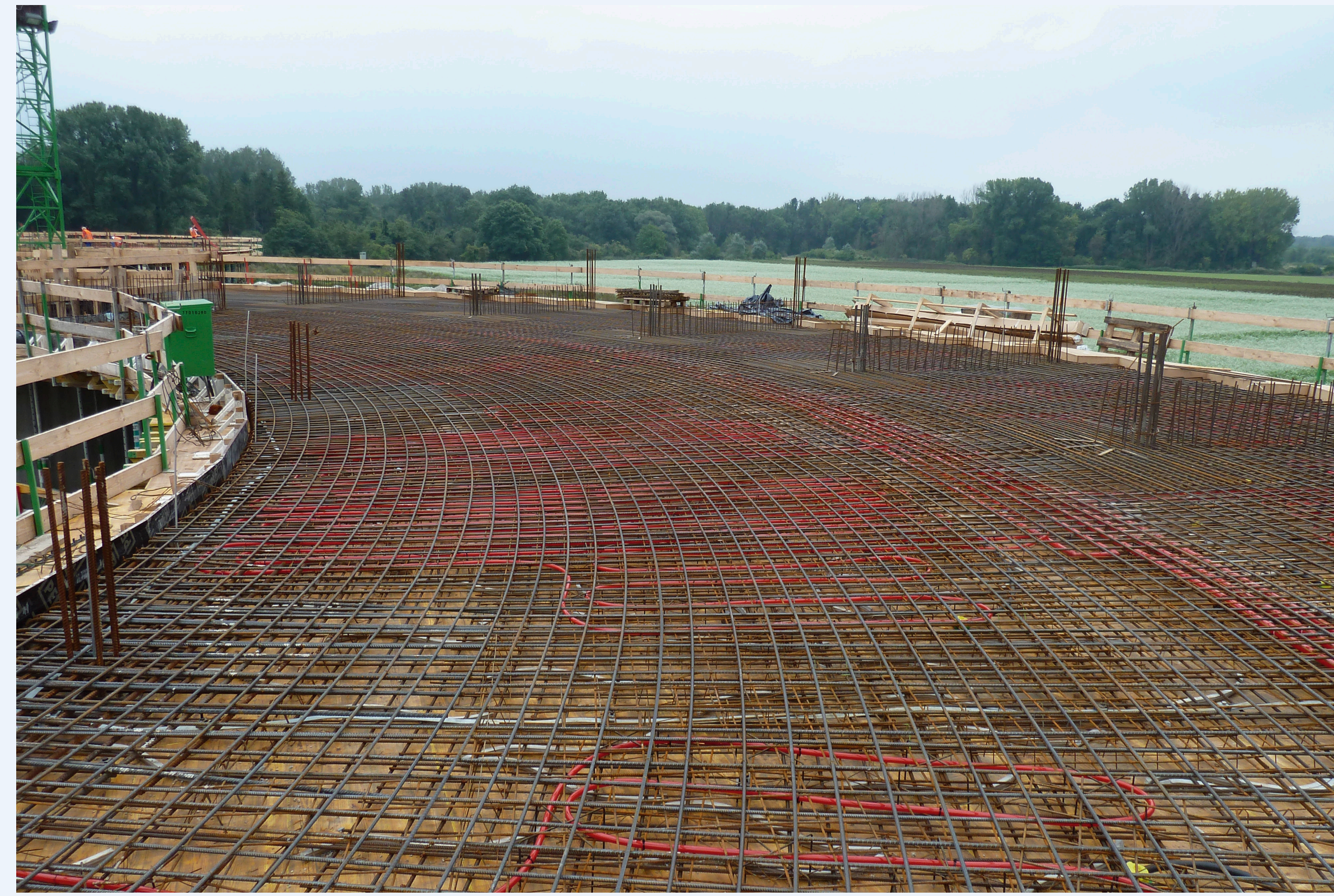
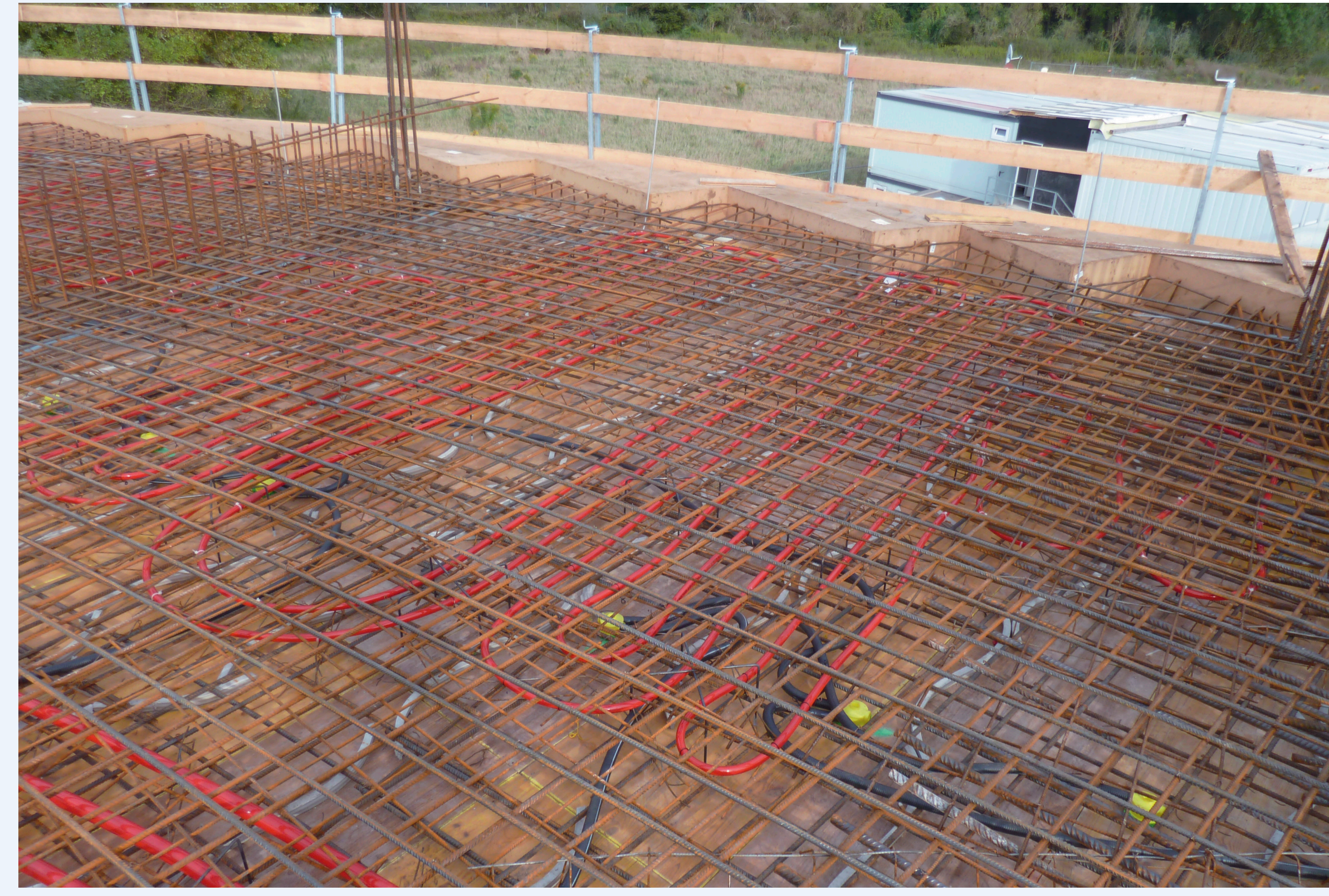
Ventilation: Window ventilation only.

Heating and cooling: Achieved through concrete core activation of the ceiling and radiation. Concrete is charged (heated or cooled) during the night and during the day the room is heated or cooled. Automated sun protection is also needed for the correct temperature, supplemented by a radiator for days when the outside temperature is very low and for when there are large temperature changes.

Façade: Triple glazing with additional protective window at outer ring. Between triple glazing and protective window an automated sun protection system is used. Each user can override the automated sun protection system.

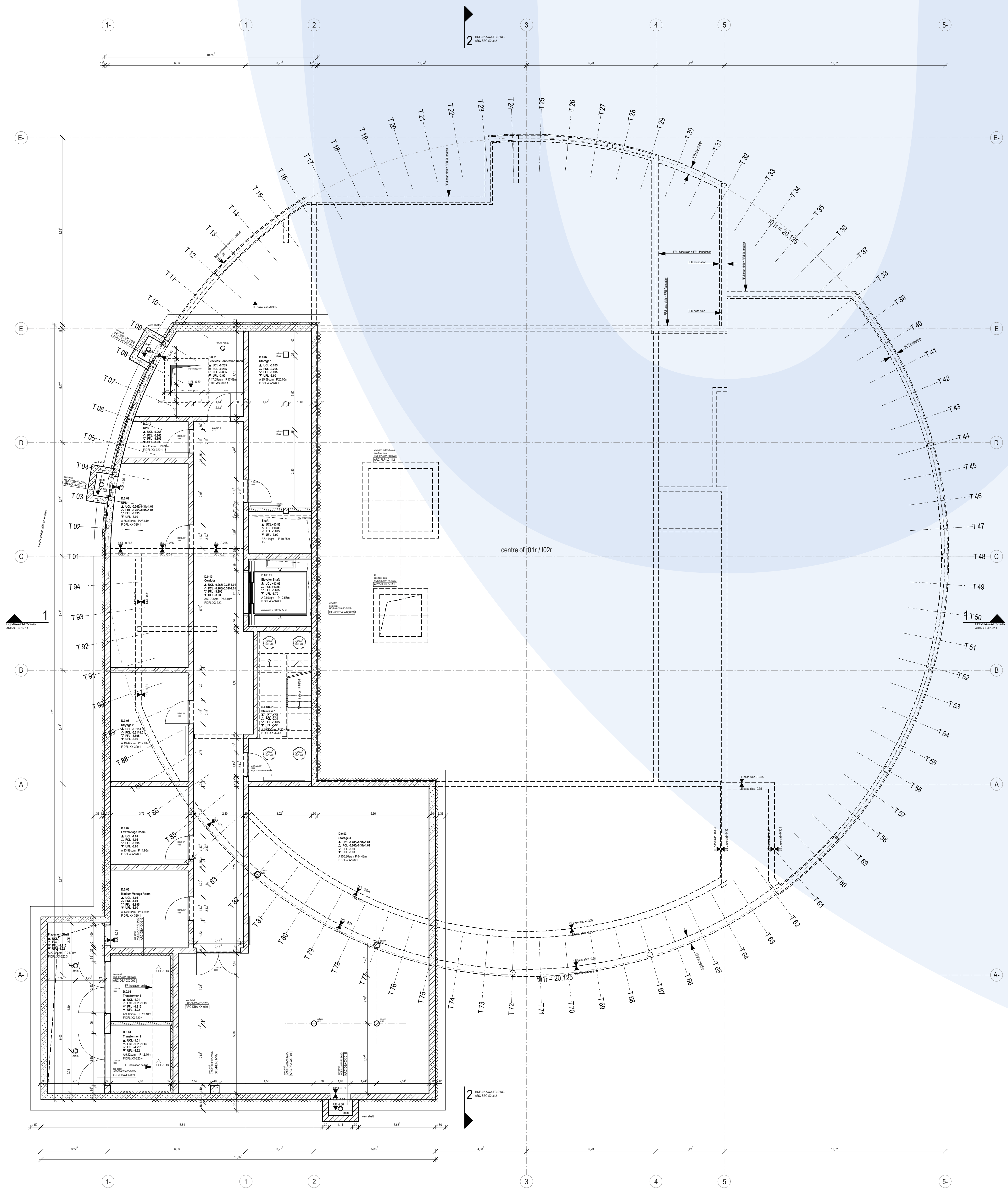
Power and network: Each office will receive three Cat cables for data transfer and a multi-socket outlet.

Furniture: No built-in furniture. Existing furniture will be reused.



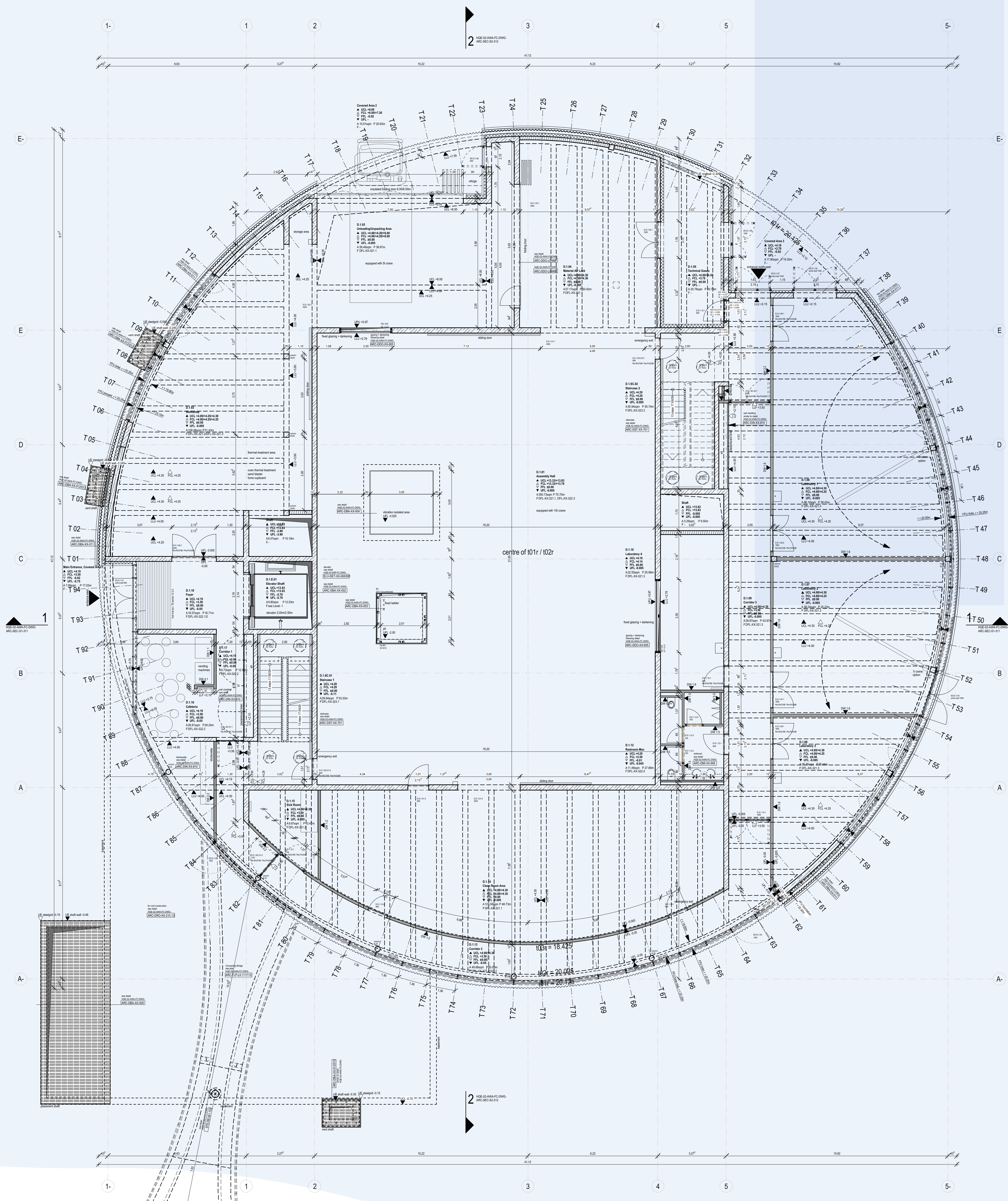
Technical Building

Level



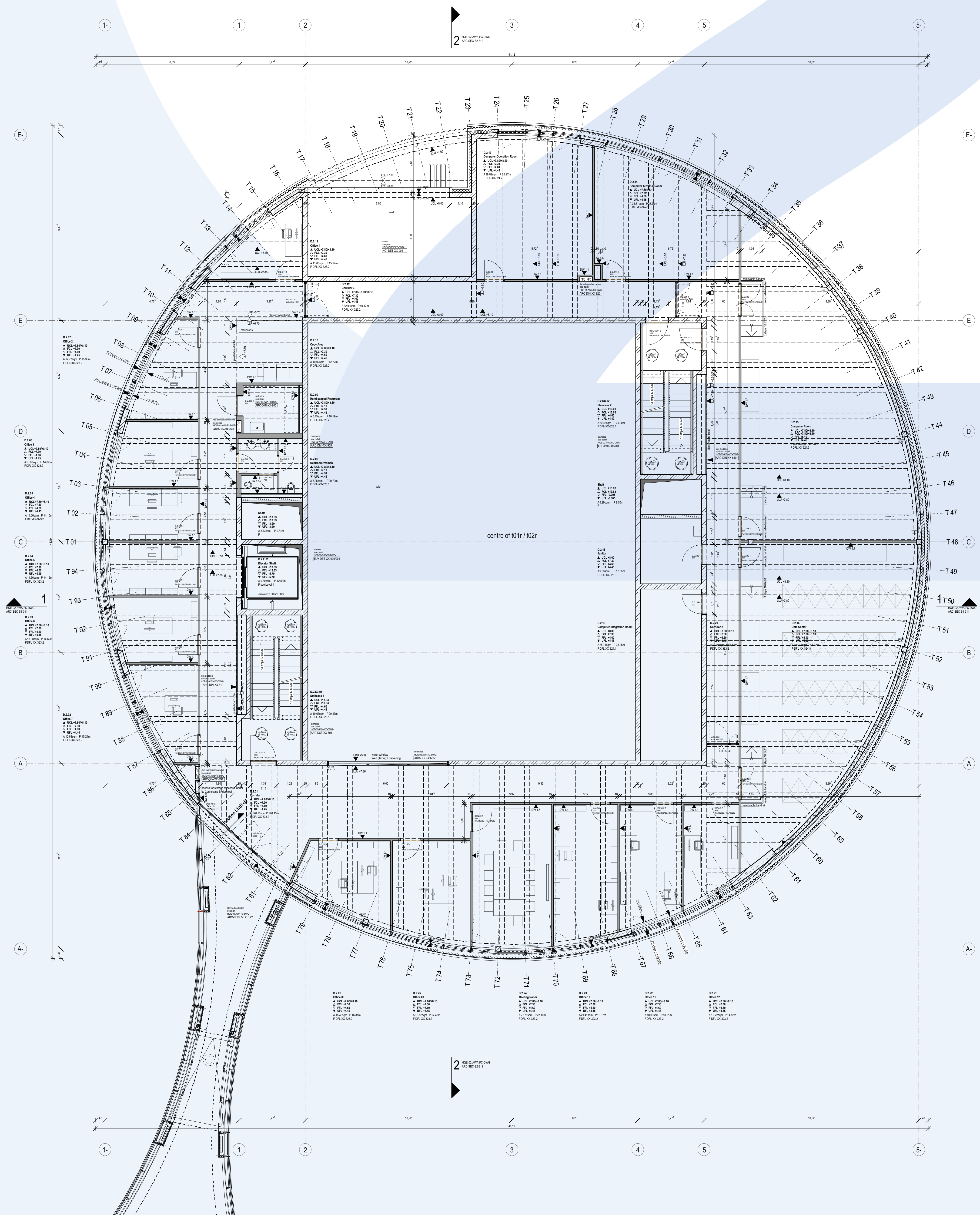
Technical Building

Level 1



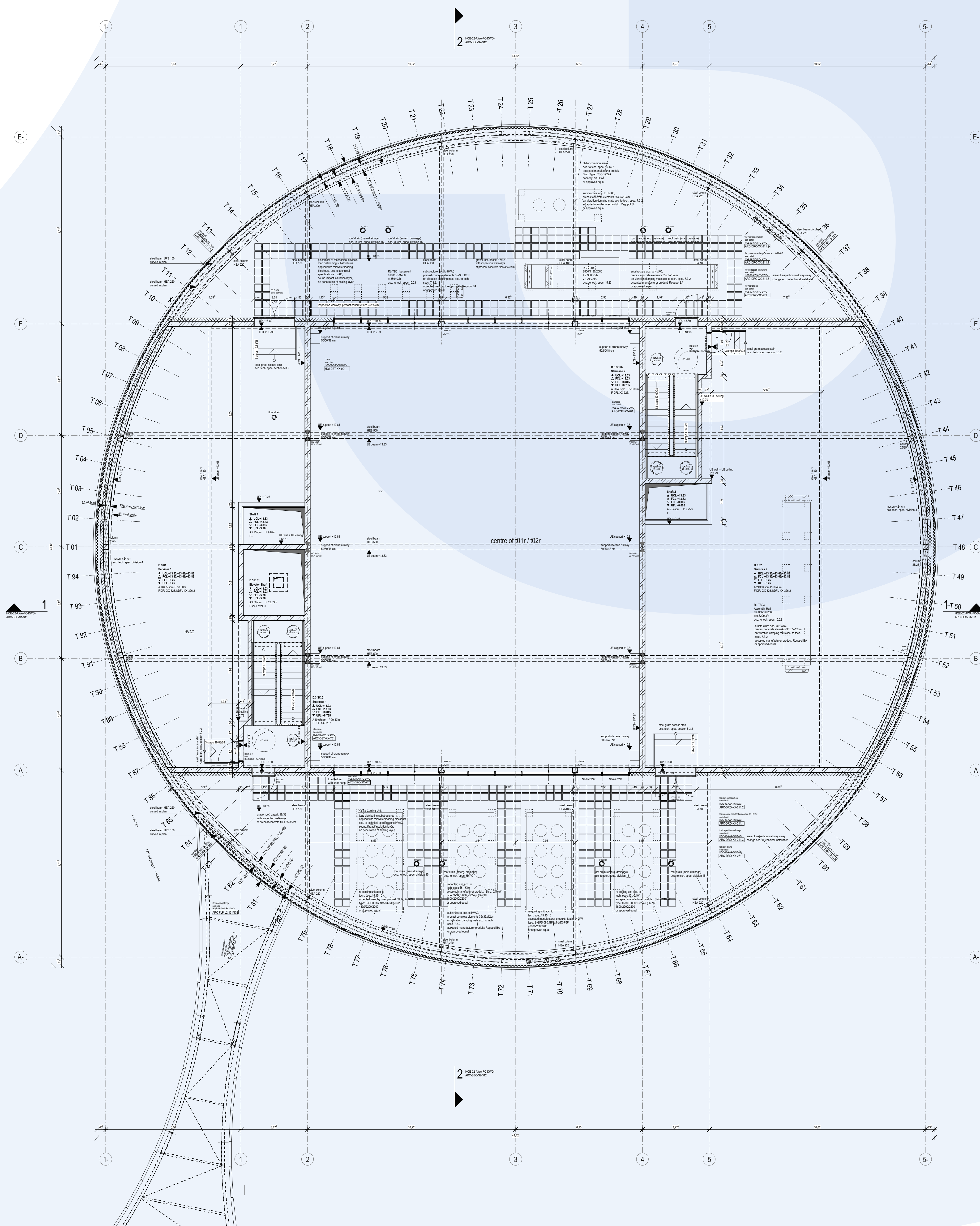
Technical Building

Level



Technical Building

Level



Technical Building

The technical building (TB) is designed to be a part of the overall design concept of the new buildings. The three-storey circular building enhances the campus-like appearance of the new ESO site. It contains offices, meeting rooms, an assembly hall, loading and unloading areas, storage areas, laboratories, workshops, computer rooms and a data centre. The TB is needed to assemble and test the instruments for the European Extremely Large Telescope (E-ELT).

Compared to the new office and conference buildings, the technical building has an industrial character with metal cladding/siding to reflect the existing headquarters. In selected areas at ground level (level 0), there is a recessed area that provides covered entrances and delivery areas.

Floor space: 2 900 m² and 28 desks.

Heating and cooling: The entire TB is supplied with ventilated air. Offices and laboratories are heated with radiators and cooled with cooled ceilings or fan coils. The computer rooms have dedicated cooling units.

Basement: Technical rooms and storage space.

Ground floor: The assembly hall, four laboratories and the reserved area for a cleanroom are located on the ground floor. It contains an unloading and loading area with crane, and houses a cafeteria and

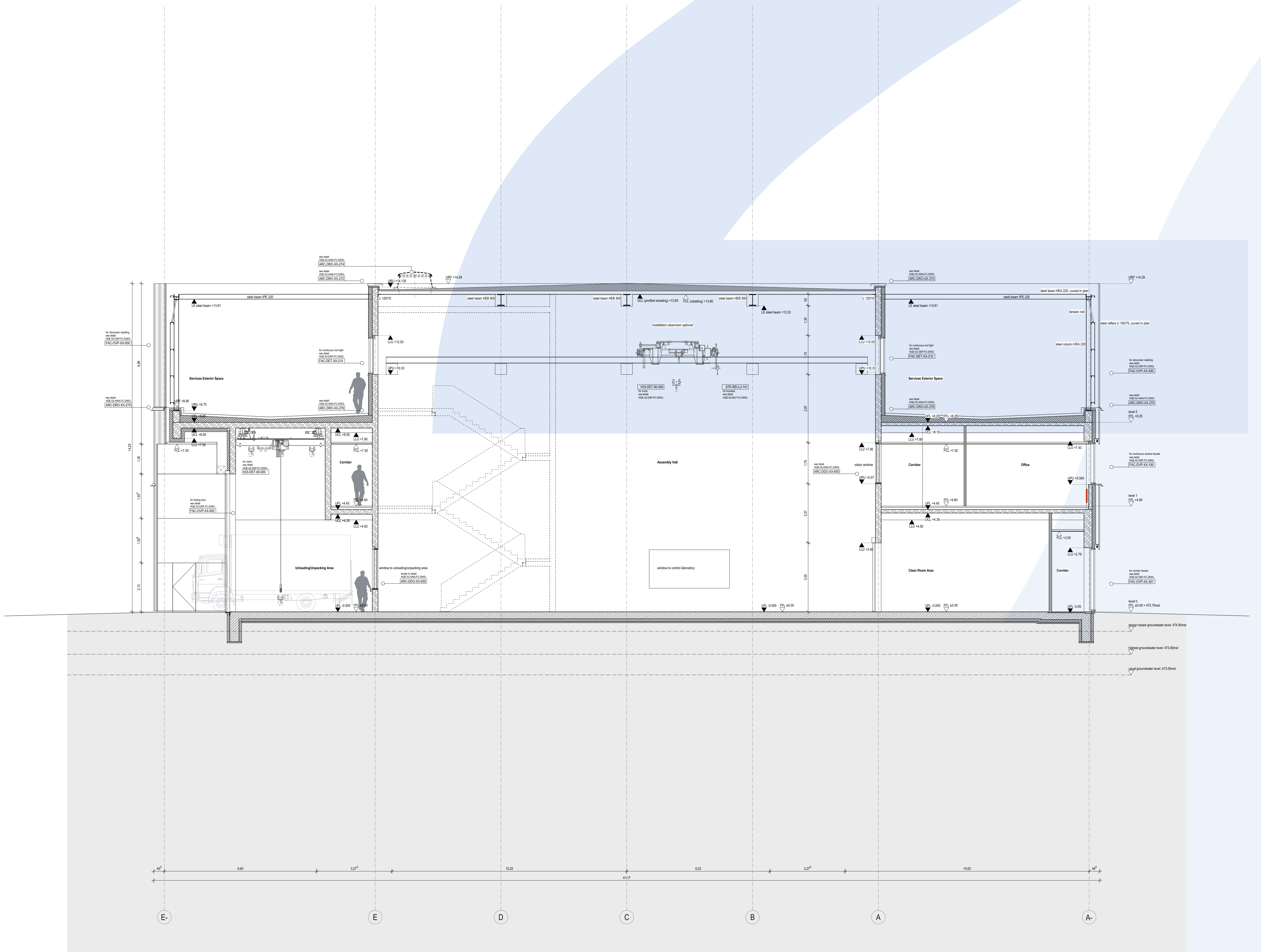
Level 2: Offices, meeting room, computer room and data archive.

Level 3: Technical equipment such as air-handler units, heat exchanger, chiller and compressor.



Assembly Hall

Section



Assembly Hall

Use: The assembly hall is located at the centre of the technical building and will be used for the integration and testing of ESO instruments. The hall features a 10-tonne crane, an anti-static floor, a vibration isolated pad and compressed air facilities. All windows can be darkened and experiments can be controlled by means of the adjacent control room. For the instruments, a separate cooling circuit was installed, which can be operated with water and glycol/water. Material is brought into the assembly hall through the loading and unloading zone, which has its own 5-tonne crane.

Next to the assembly hall is an area that can be converted to a cleanroom at a later stage. Space for the technical equipment is available on the third floor.

Ceiling: Acoustic ceiling.

Walls: White painted concrete.

Floor: Conductive epoxy resin; live load 15 kN/m², point load 10 kN/m², slip rating R9.

Size: Area approximately 350 m², height 13.5 m.

Heating, ventilation and cooling: Heating and cooling is achieved by means of eight air outlets.

Electrical power and network: Up to 60 kW of electrical power is available in the assembly hall sub-distribution. 400 V and 230 V outlets are installed and more can be added by means of the available cable tray.

Lighting: The lighting can be dimmed and switched in three groups to a maximum luminance of 1000 lux.

Lightning Protection Zone (LPZ): The assembly hall and the laboratories are designated as lightning protection zone 2, which means that they are protected against impulse currents and the lightning's electromagnetic field, and are thus less vulnerable to external interference.

Laboratories: The laboratories on the same floor as the assembly have a similar infrastructure except for the heating.



Connecting Bridge

The connecting bridge links the existing headquarters with the office and conference building and the technical building. The curvature of the existing headquarters is integrated into the design of the bridge.

The connecting bridge is a concrete bridge with an enclosure of steel and glass. Circular reinforced concrete columns support the connecting bridge. The fixed point of the bridge is in the central area. Where it meets the three buildings the connecting bridge is supported vertically and horizontally only in the traverse direction, so that would be possible to extend the bridge further along its length. The primary structure of the bridge enclosure is of structural steel. The roof is made of a trapezoidal metal deck supported by the longitudinal beams and an additional girder structure.

Special bird protection glass (Ornilux) is used in the bridge façade to avoid bird impacts. The bridge is heated and ventilated but not cooled. The slopes and the railing meet the accessibility requirements. Access to the bridge from the existing ESO Headquarters is through the refurbished cafeteria providing a smooth transition to the extended headquarters.

