

Architecture of Workplaces 1. Lecture 5

Questions of today and challenges of the future

INDUSTRY4.0 – network. World of recent past and today, digitalization, intelligent factory, cyber-physical system, cloud computing.

34. The station was hailed as an avant-garde piece of modernist architecture when it opened in 1963.

35. More emphasis on common public transport: more attractive stations

The city of Strasbourg has been developing a new tram-line service to combat increasing congestion and pollution in the city centre. It encourages people to leave their cars outside the city in **specially designed car parks**, and then take a tram to the more inner parts of the city. The first part of this initiative was the development of Line 'A' that ran east to west across Strasbourg. A parallel initiative to the design of the transport system was the inclusion of a number of artists, such as Barbara Kruger and Mario Mertz, to make specific installations at key points of the line. Currently, Strasbourg is planning the second line, 'B', that will run north to south.

Zaha Hadid has been invited, as part of the new artist's interventions, to design the tram-station and a car park for 700 cars at the northern apex of the line.

The overall **concept** towards the planning of the car park and the station is one of **overlapping fields and lines** that knit together to form a constantly shifting whole. Those 'fields' are the patterns of movement engendered by cars, trams, bicycles and pedestrians. Each has a trajectory and a trace, as well as a static fixture. It is as though the transition between transport types (car to tram, train to tram) is rendered as the material and spatial transitions of the station, the landscaping and the context.

MATERIALISED VECTORS

The Station contains a basic program of waiting space, bicycle storage, toilets and shop. This sense of three dimensional vectors is enhanced in the treatment of space: the play of lines continues as light lines in the floor, or furniture pieces or strip-lights in the ceiling. Viewed in plan, all the 'lines' coalesce to create a synchronous whole. The idea is to create an **energetic and attractive space** that is clearly defined in terms of **function and circulation**, which is made possible through three-dimensional graphics of light and openings.

MAGNETIC FIELDS

The car park is divided into two parts to cater for 700 cars. The notion of the cars as being ephemeral and constantly changing elements on site is manifest as a 'magnetic field' of white lines on the black tarmac. These delineate each parking space and start off aligned north/south at the lowest part of the site, then gently rotate according to the curvature of the site boundaries. Each space has a vertical light post. In contrast with the lines on the ground, an area of darker concrete, almost an imaginary 'shadow', cuts gently through the car park, linking the field of the station to the one of the car park. Overall, the 'field' of the light posts maintains a constant datum height that combines with the gradient of the floor slope. Again, the intention is to reciprocate between static and dynamic elements at all scales.

38-39. Airport on artificial island

Kansai airport is located on a specially built island in the Bay of Osaka. The terminal is 1.7km long, with 42 boarding gates, and can handle 100,000 passengers a day.

In the Main terminal Building the geometry of the roof's **undulating cross-section** is formed of a series of arcs of different radii connected at tangent points. Three-dimensional beams spanning 80m follow the cross-sectional asymmetrical form of the roof, supported at their extremities by pairs of inclined columns.

The **42 boarding gates** are housed within the "wings" of the glider. Their glazed facades address the runway, while their opaque, curved roof sweeps down to turn its back on the distant coastline. The height of the "wings" decreases to the buildings' extremities, with the roofs following an almost imperceptible curve, just sufficient to ensure the control tower's lateral line of vision.

40. The Transportation Hub is conceived at street level as a freestanding structure situated on axis along the southern edge of the "Wedge of Light" plaza. As described in Daniel Libeskind's master plan for the site, the Plaza is bounded by Fulton, Greenwich and Church Streets to the North, West and East respectively and Tower 3 to the south. It links the procession of green, urban spaces that extend along Park Row from City Hall Park to St. Paul's churchyard, to the gardens of the WTC Memorial and Battery Park along the Hudson River.

The arched, elliptical structure - the Oculus - is approximately 350' long, 115' across at its widest point and rises to a height 96' above grade at its apex. The structural steel ribs that form the Oculus extend upward, like outspread wings, to form a pair of canopies that rise to a maximum height of 168' above grade.

Access into the Oculus is provided through two entrances located at the east and west nodes of the building's central axis at Church and Greenwich Streets respectively. The entrances open onto symmetrical stair landings with cylindrical glass elevators. From this level, visitors descend approximately 22' to the Upper Concourse level where the elliptical interior space

opens to its full dimensions (approx. 400' x 216'), and where visitors have access to the MTA 1, R and E subway lines, Towers 2, 3 and 4, as well as retail galleries.

The form may be summed up, according to Calatrava, by the image of a bird released from a child's hands.

The project's sculptural form is achieved through the modulated repetition of structural steel ribs which unify the complex composition, and provides dignity and beauty to the building's sub-grade levels and pedestrian walkways. Between the ribs, glass allows natural light, a powerful symbol of hope and vitality, to flood the facility. Calatrava speaks of light as a structural element in the Hub, saying that the building is supported by "columns of light." At night, the illuminated Oculus serves as a lantern in the reconstructed WTC site. On September 11th of each year, as well as on temperate spring and summer days, the Oculus's operable skylight opens to bring a slice of the New York sky into the building, reminiscent of the Pantheon in Rome.

51-54. The aim was to create an **emblematic building** to reflect the quality of Renault's products. Possible future changes had to be considered in the scheme. Thus the concept is based on modular building systems offering the possibility of future extensions. The whole building consists of 42 **modules of 24x24m**. The interior clearance of 7,5m ensures all various uses, storage, distribution, car- and truck showroom, educational centre, restaurant, foyer.

The structure contains joints for potential additions in order to enable construction works without disturbing the production process. The visible bearing structure dominates the outlook, it consists of steel girders suspended from prestressed steel masts. The structure reacts as a whole for the acting forces, the envelope follows the structure, so is the roof a wawing roof-land. The prestressed structure enables maximum span with minimal use of material. The glazed envelope runs behind the structure. The walls consist of two layers of sheet metal with an insulating polyurethane core. The roof is interrupted by skylights in the centre of each module. All details are well considered, **using methods and materials of latest technic**; of ship-, spaceship-, aeroplane-technic.

The outstanding architectural quality contributes largely to the image of the product – the appearance of „prestige architecture”.

55-60. The main principle is a **central provision backbone** for the connecting production and office areas on both sides. So it is a **suspended roof construction** from the central ridge, that can be extended longitudinal. Construction: middle double piers, suspended primary and secondary space trusses and struts.

To leave the working areas totally free without construction is meant and solved in three dimensions; a „sandwich room” is created. Bearing structure and all the installation pipes run above and cover the roof from outside, an underfloor canalization system serves for take away the waste. Thus all useful areas can be supplied with all media at all points. The plan and facade is designed with a high grade of changeability.

An extraordinary example: a special form for very special use.

Size standardization>flexibility, possibility of rearrangement, replacement

61-68. Nagler used a cladding of **translucent** honeycomb panels of polycarbonate. It ensures a **diffuse light**, so a pleasant light intensity. The building high polycarbonate panels are joined with tongue and groove. At the bottom they are restrained, at the top sliding to allow thermal movements.

Through the transparent façade the inside the structure, production process can be seen, and vice versa the exterior also influences slightly the interior through **changing light intensity**. The appearance is changing with different angles, from an angle looks like a shiny surface, standing in front the inside structure appears as well.

69-71. creation of large open-plan, flexible spaces

The interior space of the hall is spanned subtly and without columns by a very stiff **spatial truss** at a height of 12.5m. The entire surface of the hall is covered by an orthogonal girder grid that consists of trusses which cross each other at a spacing of 7.5m. It was created entirely out of tubes, which are connected bending resistant to each other. A design challenge was the development of the typical nodal points as a pre-fabricated system for the intercrossing girders group. The load bearing steel structure is supported by six base concrete cores along its edges via the facades and on short pendulum columns at the inner corners. Wooden hollow sections with glazed overhead lights alternately span across the mesh size of the grid.

78-84. Ricola Europe's new factory building is located at an idyllic wooded site between the Rhine-Rhone Canal and the river Ill on the southern edge of the city of Mulhouse.

The building is to be used simultaneously as a factory and for storage. Its **simple hall with flexible floor plan** divisions offers the perfect solution.

The building's form recalls a cardboard box lying on the floor with open flaps. The cantilevered extending roofs on the two long sides open up both to the landscape and to the entrance and loading areas for fork lifts and transport vehicles, as well they create shade and weather protection.

The short sides of the factory building are each closed by a black concrete wall. Water from the roof runs down over these black concrete walls and trickles into a deep bed of Alsatian gravel. The water running down the walls forms a fine film of plant life; a natural drawing ensues.

Both long walls are light walls providing the work area with constant, pleasantly filtered daylight. Light filtering occurs through **printed translucent polycarbonate façade panels**, a common industrial building material. Using silkscreen, these panels are printed with a repetitive plant motif based on photographs by Karl Blossfeldt.

The effect the panels have on the interior can be compared to that of a curtain – textile-like – that creates a relationship to the site's trees and shrubs. Viewed from outside, the translucent printed panels on the façade and the extended roof again recall textiles – the lining of a dress or the inner padding of a box. If daylight diminishes, the printing is barely visible from outside and the material of the façade panels becomes much stronger. Their surfaces then seem rather closed and smooth, and their expression becomes more like that of the building's concrete side walls.

85-94. There have been a number of „signature“ buildings with exterior architectural features following on from the Renault building.

The Igus factory a slick shed with its demountable office pods and ventilation domes sitting under the two large yellow painted **masts** as the factory itself lies apparently **suspended below**.

The building concept provides a **flexible column-free space, interchangeable between factory and office use**. Space is organised non-hierarchically, with the customer as the focus. The building plan is of four blocks, each of which has a landscaped courtyard in the centre. Moveable, multi-function pods, sited inside or outside the main structure, increase the building's flexibility. **Roof domes provide natural north light and ventilation** together with smoke and heat venting in case of fire. All architectural aspects of the construction are openly expressed from the pylons supporting the roof to the detailing of the cladding. Components are standardised and straightforward to assemble and interchange.

95-96. 220 000 m²

sight plant, spatial connection

The Tiexi facility is the second production site in Shenyang for the Brilliance/BMW joint venture, adding to the car-maker's first plant in Dadong. Since construction first started in 2009, the site now finds itself in a third expansion phase. The main entrance and office building lie at the centre of the whole works, which comprises a **press works, paint shop and final assembly line**. The below-ground storeys house the social and locker rooms for all the employees at the works. **Visible to all employees and visitors, a conveyor belt snakes through** the terraced, curved **office landscapes**. It **transports car bodies** fabricated in the works from the paint shop to the final assembly line. All employees and visitors are thus continuously **made aware of the production process** and quality standards of the products. The roof of the 100 x 100 metres main building is characterised by a parametrically designed pattern of skylights, which, in combination with light reflectors, bring daylight into the open office floors.

97-102. With its Gläserne Manufaktur, Volkswagen became the first manufacturer to realise a production concept linking processes of classical industrial automobile production and fine craftsmanship: the result is the VW luxury class limo Phaeton manufactured in handwork. Gläserne Manufaktur is a place of transparency and dialogue and makes the **experience of automotive production** visible to the outside.

In Gläserne Manufaktur, themes of and related to the automobile are presented – events range from art exhibitions and music concerts to television talk shows. The clearly delineated and comprehensible areas are defined with few materials, glass, aluminium, maple, bog oak, cherry tree, granite. The available space and the material composition of the building allow a new quality of customer service: **spatial experience of the automobile and spatial experience of architecture** flow naturally into each other.