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Two Towers

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Two towers, Duetsche Post in Bonn and the MAX in Frankfurt, rethink the typology of the high-rise tower in relation to function, technology and user comfort. The primary material used in the expression of these towers is glass. Both buildings use glass with differing results. It is the one material that offers the opportunity for technological advancement, primarily in the development of the façade and the resultant effect on the energy systems and user comfort. Its qualities of transparency, opacity, reflection and refraction, allow for a varied architectural expression.

Duetsche Post is a 42 story, 162-meter tower sited as an extension of the Rheinauenpark forming an edge to the city. The plan is conceived as split, shifted oval with its primary orientation towards the Rhine. In addition to facilitating views toward the city, the aerodynamic shape minimizes negative wind effects

In plan, the split oval halves are separated by a 7.20-meter space. Connecting glass floors at 9 story intervals form skygardens that serve as communicating floors and elevator crossovers. The glass elevators of the low and high zones run in the center of the skygarden, providing views and orientation.

The typical floor plate of 1818 SM has a lease span of 6.80 m, allowing for the typical layout of cellular offices. Column spacing is nominally 5.80 m. Concrete cores provide lateral stiffness. The two halves are tied together with X-bracing at the skygarden levels so that the tower behaves as one structure.

The building has a twin shell façade. The outer shell is completely out of glass, enabling natural ventilation especially in the spring and fall. The outer shell protects from rain, wind and noise and allows for placement of the sunshades. Glass from floor to ceiling optimizes daylight. The blinds in the interstitial space further protect the inner façade from direct solar gain. The inner shell is double-glazed with a low-e coating on the number 2 surface and has a series of operable windows allowing for natural ventilation of the offices. The result is the creation of two channels for air, the inner for ventilation and the outer to exhaust heat gain. Solar gain heats up the outer shell creating a convection current that draws the air up through the cavity

The concrete structure has an integral heating and cooling pipe system, taking advantage of the low energy characteristics of water and the thermal storage capacity of the concrete.

If comfortable temperatures cannot be achieved at the high and low exterior temperatures of summer and winter, an air displacement system along the façade mechanically assists in creating a comfortable environment.

Exhaust air from the offices is used to condition the skygardens with some mechanical assistance in special occupied zones. The east–west orientation of the skygarden allows for cross ventilation. A computerized building management system controls all of these components and selects the most effective operational mode, balancing the exterior and interior conditions. Cost comparisons show that the total cost of the climate systems and twin shell façade is comparable to a conventional system. Operating costs are reduced by 60%.

Lighting is an additional feature incorporated into the façade. A series of three cold cathode tubes, red green and blue, are synchronized to allow for a variety of color combinations.

The design for the MAX was selected in an invited competition. The shape, an incised ellipse, responds to its central and mid-block location in the high-rise bulk of Frankfurt next to the Commerzbank and new Rhein-Main Tower. This tower is 63 stories and 228 meters in height. Typical floor areas are approximately 8,493 SM.

Several strategies were used to make the building lighter, less material and more transparent towards the top. As the core areas diminish, the building sets back four times minimizing deep space. At the long axis, skygardens bring light into the interior plan areas allowing for the layout of cellular offices. Within the last segment of the tower they continue to setback behind the all glass enclosure of the skygardens thereby increasing the dematerialization. Within the top garden, light steel structures for elevators and stairs facilitate circulation between those special floors. The top floor is developed as a conference center with perimeter circulation reading as recognizable figure and skyline image. At night special lighting reinforces the towers figure by distinguishing between its solids and its voids.

The structure is reinforced concrete. Stiffness is provided in the core. Concrete columns, slabs and walls are intended to remain exposed.

The façade furthers the architectural intentions through reduction of the stainless steel spandrels until their elimination at the top. The façade also re-examines the nature of the high-rise enclosure, addressing shading, daylighting, natural ventilation, and increased vision while maintaining visual control of the tower façade. The typical façade module of 1.35 m consists of a narrow operable window behind vertical panels of perforated stainless steel and a fixed glass portion of triple glazed units with a low-e coating on the number 2 surface. Only a selective interior shade reduces vision and daylight.

The triple-glazed, heat-absorbing glass reduces solar transmission by 62%, yet allows 75% of the daylight to pass through. The interior shade reduces energy transmission by another 50%. This results in the room comfort being primarily affected by interior loads. The perforated stainless steel panels in front of the operable windows also serve as sun and weather protection. From the inside they give an interesting modulation to the views, form the outside they reinforce the verticality.

Again the offices are naturally ventilated. During exterior temperature extremes, fan coil units in the floor, which distributes the air as a displacement system, provide mechanical assistance. Low air changes of 1.5/hour are

achieved through radiant cooled or heated integral piping in the concrete structure again using the efficiency of water as energy carrier and concrete for thermal mass.

These buildings represent the only way architecture can be new and responsible, not only relying on form and aesthetic. Responsible architecture can control its environment through design, not solely through added technical and mechanical systems.

The goal here is to include the idea that the skin of the building can modulate its own climate through daylight, natural ventilation and solar energy as essential components in commercial design. The result is a building with high technology and low energy.

Form, space, function, materials, construction and technology all enforce and support each other in a totally integrated design.