“Unitized Curtain Wall Systems for Truly Double-Curved Facades”

With the increasing complexity in facades due to technical demands and the building performance requirements, the market has become more and more specialized in maximum prefabrication, standardization and preassembly of facade components in order to get a higher quality and minimize the work on site.

Using these same principles, Scheldebouw is specialized in custom-made unitized curtain wall design for buildings in the top end of the building market. Nowadays, among these buildings there is an increasing demand for glazed double-curved facades which are typically approached with faceted facade design solutions.

The aim of this research was to find out whether the current unitized curtain wall systems' strategies can be used for truly double-curved facades with double-curved glass and, if so, inform facade contractors (in particular: Scheldebouw B.V.) and Architects about the complexity that designing a double-curved unitized curtain wall system means and propose a concept unitized system solution for a target group among the double-curved facade scenarios.

The research strategy consisted on having three sub-fields of research: unitized systems analysis, geometry research and material research being the conclusions of these three combined in a final scenario defining the starting point for the design development phase.

Among the double-curved building morphologies the target group chosen was the “Twisted Extruders” from which the most complex variation, “Floor-based Twisted Extruder” was selected as final scenario for the design development phase.

This scenario would, in principle, mean that double-curved insulating glass, straight-twisted or single-curved-twisted transoms and single curved-twisted mullions would have to be used.

After the material research we can assume that large double-curved insulating glass units are possible within admissible tolerances but we cannot assume that the aluminium curtain wall profiles can be twisted with the accuracy needed for the correct performance of unitized systems.

Therefore, the design development phase focused on the design of a unitized system for the “Floor-based Twisted Extruder” using double-curved insulating glass, straight or single-curved transoms and single curved mullions. The use of non-twisted profiles led to several rotations or deviations in the cross joint (where four units meet) as well as to varying angles between the glass unit and the load-bearing curtain wall profiles.

The final system design proposal achieves solutions for these challenges using the typical unitized systems’ strategies except for the varying angle between the glass unit and the aluminium curtain wall profile which is solved by placing local blocks on the external face of the profile, cut at different angles and on which a thin aluminium strip is slightly twisted in order to be parallel to the glass unit being this the surface on which the structural sealant is poured.