The Katajanokan Laituri Façade: Computational Design Meets Nordic Timber

The Katajanokan Laituri stands as a remarkable example of architectural ingenuity and sustainability, marking its place as the largest timber building in Finland by the volume of wood used. Located on the Helsinki seafront, the structure serves as the headquarters of Stora Enso and a hotel, incorporating 7,600 m^3 of spruce in the form of CLT, glulam, and LVL. Its design harmoniously complements the neighboring Stora Enso headquarters, originally designed by Alvar Aalto in 1962.

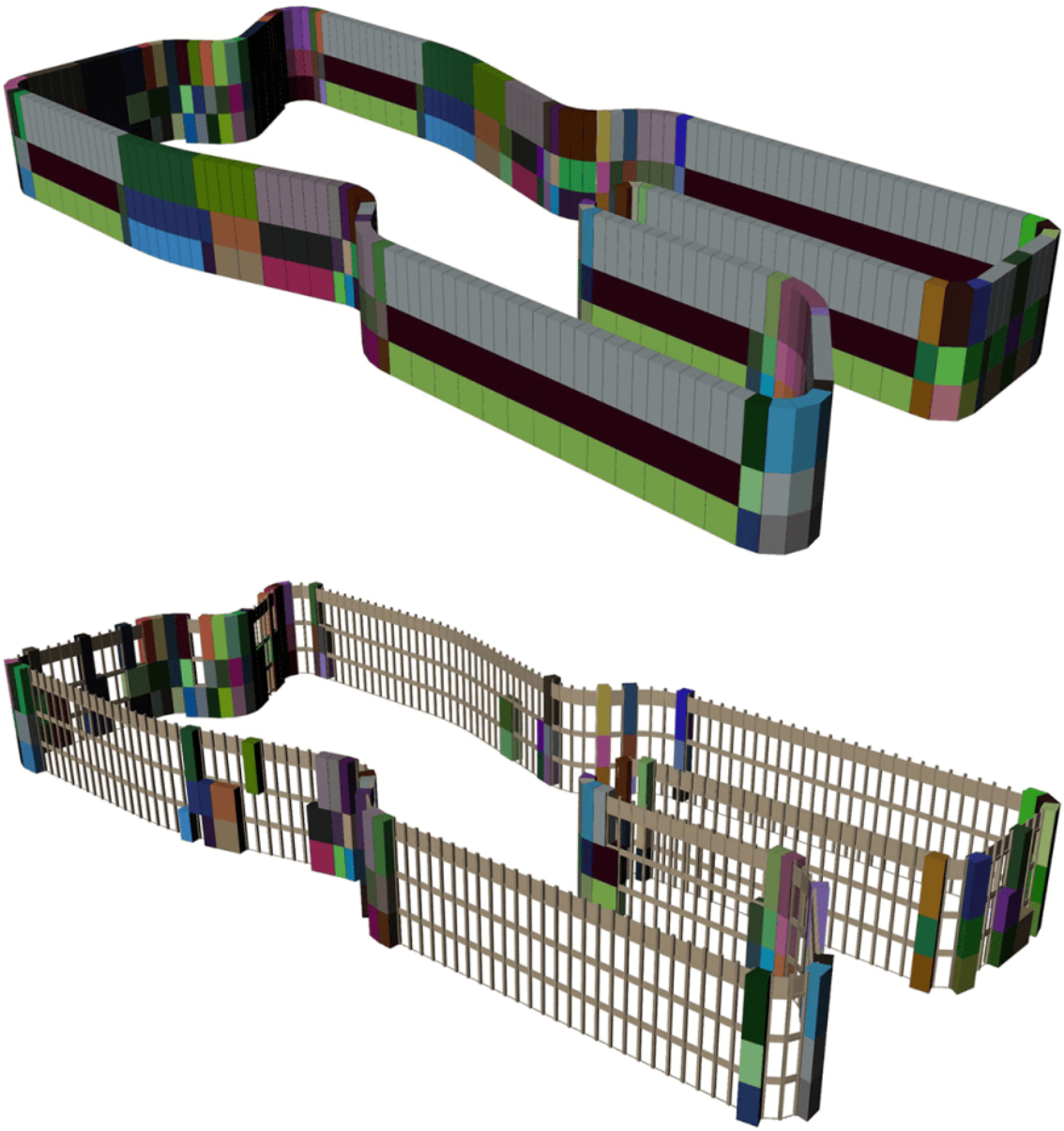
At the heart of its architectural achievement is the long, curved double façade, a feature engineered to endure Helsinki's demanding maritime climate. This façade, both functional and aesthetic, encapsulates advanced computational design and precise fabrication modeling, a hallmark of Finnish consultancy Geometria Architecture.



CRAFTING COMPLEXITY WITH COMPUTATIONAL DESIGN

Commissioned by façade contractor Haka Pks Oy, Geometria Architecture took on the formidable task of developing the fabrication model for the building's intricate façade. This involved segmenting the façade into 586 prefabricated elements, which were further categorized into 170 geometrically unique types (298 when considering variables like glazing types). The segmentation was vital in simplifying fabrication while preserving the façade's visually continuous appearance.

Each façade element comprises nearly 200 individual parts, requiring meticulous planning to bridge the geometric discrepancies between the straight, polygonal timber interior structure and the smoothly curved external façade. These elements were grouped into three main categories: straight, curved with symmetry, and asymmetrical—each posing unique challenges, particularly at the intersections of linear and arc sections.



LEVERAGING TOOLS FOR PRECISION

The design and fabrication of the façade were facilitated by numerous custom Grasshopper scripts. Instead of creating monolithic scripts for the entire process, Geometria employed smaller, task-specific tools, enabling greater flexibility and manual oversight during inevitable design iterations. Geometria's reliance on Rhino and Grasshopper was further enhanced by the selective use of plugins such as VisualARQ and EleFront.

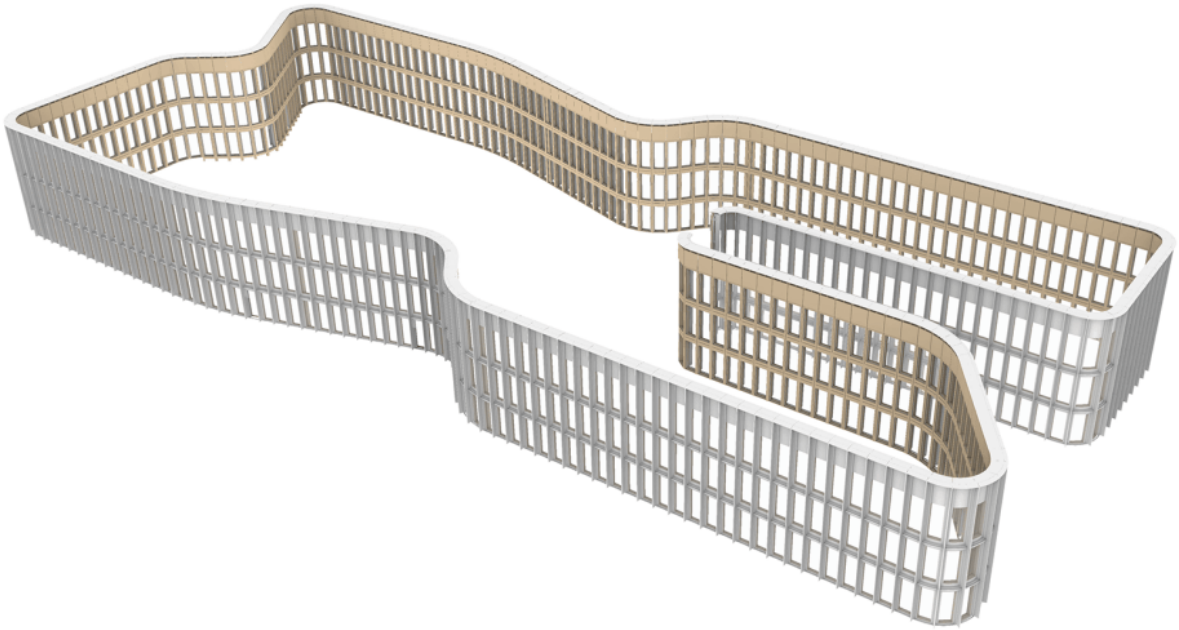
These tools were essential for managing BIM metadata, generating bills of materials, and producing fabrication-ready geometries. Additionally, custom Python scripting allowed the team to maintain a

streamlined workflow, ensuring future adaptability.

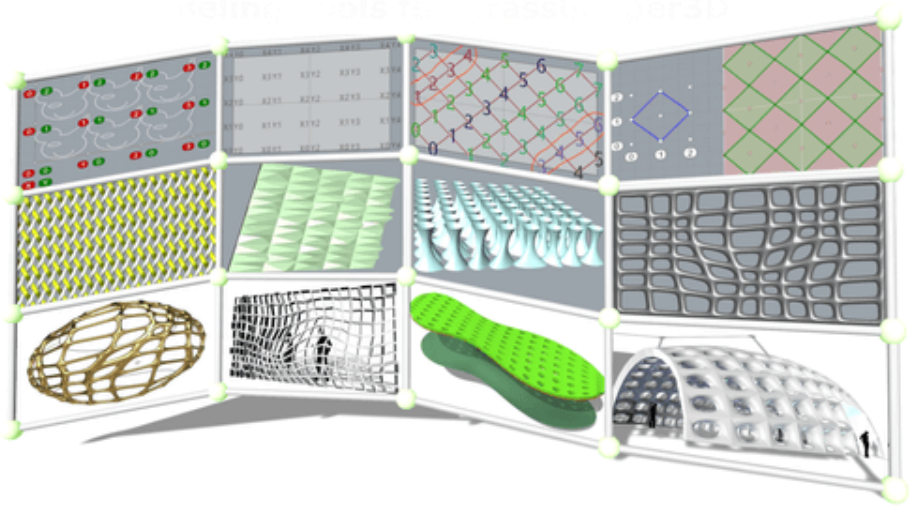


FROM DIGITAL MODELS TO FABRICATION

The precision of the 3D model allowed Geometria to produce an impressive 1,252 part fabrication drawings and 1,740 element assembly drawings. Spreadsheet lists and toolpaths for CNC machines were also generated directly from the 3D model, using bespoke Grasshopper tools for aluminum component milling.



Some timber parts were outsourced for fabrication using .stp models, emphasizing the importance of interoperability in the project. This rigorous preplanning culminated in a remarkably efficient assembly process, where only four drawings were required on-site for installation.

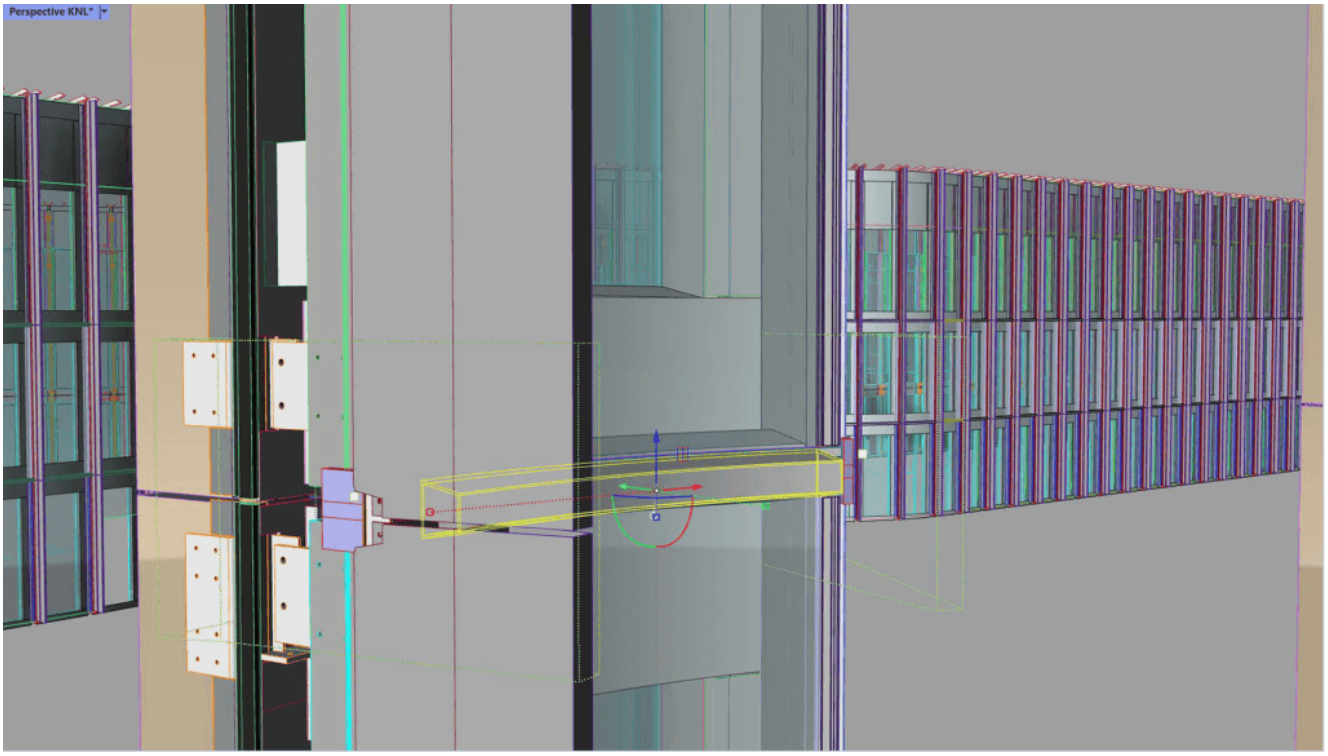


See Also

A TESTAMENT TO TIMBER ARCHITECTURE

The Katajanokan Laituri project exemplifies how computational design can transform ambitious architectural visions into practical realities. By fusing traditional Nordic materials with advanced digital fabrication techniques, Geometria Architecture not only pushed the boundaries of timber construction but also demonstrated how technology can be harnessed to create sustainable, iconic structures.

In doing so, this project sets a benchmark for combining creativity, sustainability, and technical expertise, inspiring future endeavors in timber architecture and computational design.



CREDITS

Developer: Keskinäinen työeläkevakuutusyhtiö Varma
Architectural design: Anttinen-Oiva Architects Oy
Structural design: Sweco Finland Oy
Main contractor: Haahtela-rakennuttaminen Oy

Timber provider: Stora Enso (CLT, LVL), Punkaharjun Puutaito Oy (LVL)
Timber components, lobby: Raision Puusepät Oy
Façade contractor: Haka pks Oy
Façade DfMA: Geometria Architecture Oy