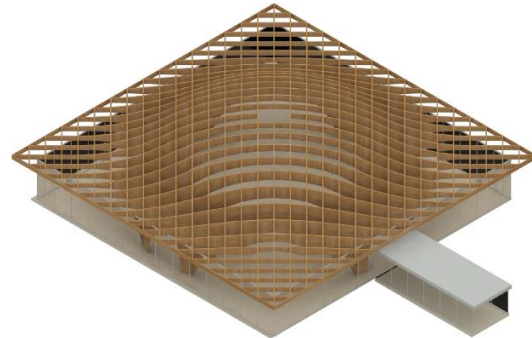# Case Study: Hanmaum Zen Center
A Timber Shell Structure for Fabrication

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Abstract

The Hanmaum Zen Center (HZC) temple design by Kyu Sung Woo Architects in collaboration with Thornton Tomasetti and CORE studio will be situated in the suburbs of Chicago. The building will serve as a mediation center. The form was generated through an exploration of the space between the exterior defined by a discretize arc and an interior dome. It will be constructed with a rationalized quadrilateral timber structure.

The main space will serve as the meditation center and main hall for the temple, which is connected to ancillary buildings around the site. The dome will rises 8 meters at the center and spans 36 meters in both directions forming a square shape. The team derived a pure timber structural system that can serve both structural and architectural functions. CORE studio developed a flexible script in Grasshopper, a Rhino 3D plugin, which allowed the team to explore different variations of the form. This process provided information about overall quantities, performance and aesthetics within a very speedy design timeline. In the end, the most efficient system was chosen that allowed access to stock material and minimized waste material.

The structural form varies the depth of timber elements ranging from 300mm at the highest point to 1200mm where the supporting columns intersect with the roof grillage, the resulting form is a rectilinear grid shell system that covers the dome and continues to cantilever outwards to the exterior facade. The structure will be fabricated out of glulam elements that will be coordinated directly from the scripted model constructed with Grasshopper. By using visual programming, it is possible to generate tool paths and fabrication processes that can be sent directly to manufacture. The use of visual programming also allowed coordination material takeoff and classification of timber elements, while visualizing the complex model during parametric design studies.

To accurately predict the global behavior of the grid shell dome, Thornton Tomasetti has developed custom workflow that generates a finite element models from the Grasshopper script. This analysis model is used for optimization of member sizes and performance. Thornton Tomasetti is also providing advice on construction sequencing and fabrication of the timber grid shell structure, as well as the related secondary structures and cladding systems.

The primary goal of the entire design team is to generate a meaningful, expressive structural system that enhances this space for meditation.