

XTRA's Herman Miller Shop-in-Shop: – Fabricwood



The new Herman Miller Shop-in-Shop at XTRA's new flagship store at Marina Square, Singapore, is a massive and intriguing structure.

Occupying a 20m long by 7m wide space, the continuous surface stretches across the entire site like a sail of tensile fabric, leading the viewer from the low 3m entrance to the lofty 8m glass curtain wall at the other end. And yet, this structure is made of plywood!

It is lightweight and features very little framework, and is symmetrical and takes on the proportions of the iconic curves of the Herman Miller logo.

The minimal surface, which reminds one of German architect and structural engineer Frei Otto's soap film experiments, contains a series of arches that frame the entrances and connections to the rest of XTRA, the street and the adjacent café.

Pan Yicheng, Design Director of PRODUCE WORKSHOP and the designer of the space, has coined it "Fabricwood".



Understanding Fabricwood

Being an established multi-brand furniture retailer in Singapore, the idea of a Shop-in-Shop is a response to XTRA's desire to showcase a comprehensive range of Herman Miller products in a space with "flagship" capacity.



After researching into Herman Miller's main product range, chairs, Pan found inspiration in their structural and material innovation – the use of moulded plywood produces light and elegant furniture; and their study of comfort and ergonomics in their work chairs resulted in an elastic mesh material that is stretched at the back of the chair to create a doubly curved, frameless suspended surface, that supports a full range of seating postures.

To reflect the Herman Miller image, the lightness and warmth of the plywood material with the geometric rigor and technological innovations of the work chairs have been combined. And learning from the key products and their design processes (which combines formal, structural and material innovation), the solution seeks to develop a soft and porous “skin” for the Herman Miller Shop-in-Shop that is “moulded” to its host.

This is Pan's second effort at an XTRA's Herman Miller Shop-in-Shop. The former Version 01 was executed for the previous XTRA Park Mall flagship store in 2012 when Pan was Design Director of P.A.C, and the design won the prestigious World Architecture Festival retail category award for 2012.

While Version 01 was shaped using a mesh geometry which stitched together an array of differentiated triangular plywood panels, Version 02 shapes the plywood using a tailoring technique called darting – which is more demanding to conceptualise and prototype.

Originally used for shaping fabric to fit the human body, Pan exported this technique onto plywood. The darts and their respective angles on a flat piece of plywood determine the eventual curvature when closed. Circular cut-outs are used at the converging point of the darts to allow the plywood to bend and avoid tears. When assembled, the structure forms a naturally undulated surface much like the ruching of fabric.

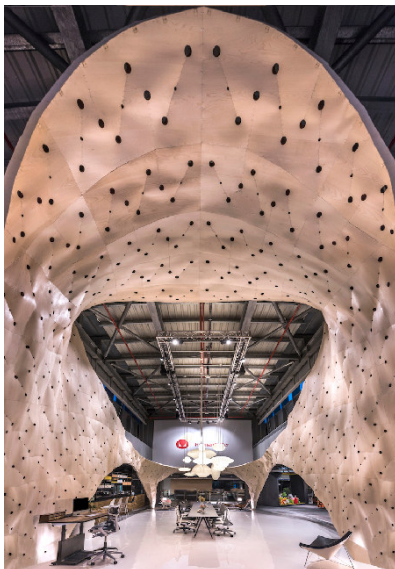
The most challenging part of the project has been the translation from flat pattern drawing to three-dimensional modelling and vice versa. A combination of computer simulation (with new computational techniques) and physical modelling helped to achieve the desired curvature. The elasticity of the plywood played a major factor in the shaping of the skin, and the dart angles had to be re-calibrated to accommodate any changes in the type of the plywood material.

Compared with conventional design and construction techniques, this component-based design process demands greater continuity and simultaneous planning across all stages of the project.

Like the Version 01 grid shell structure, the new Fabricwood structure pushes the boundaries of plywood construction. This is a project that is not just about the completed structure but also the entire experimental process to arrive at it.



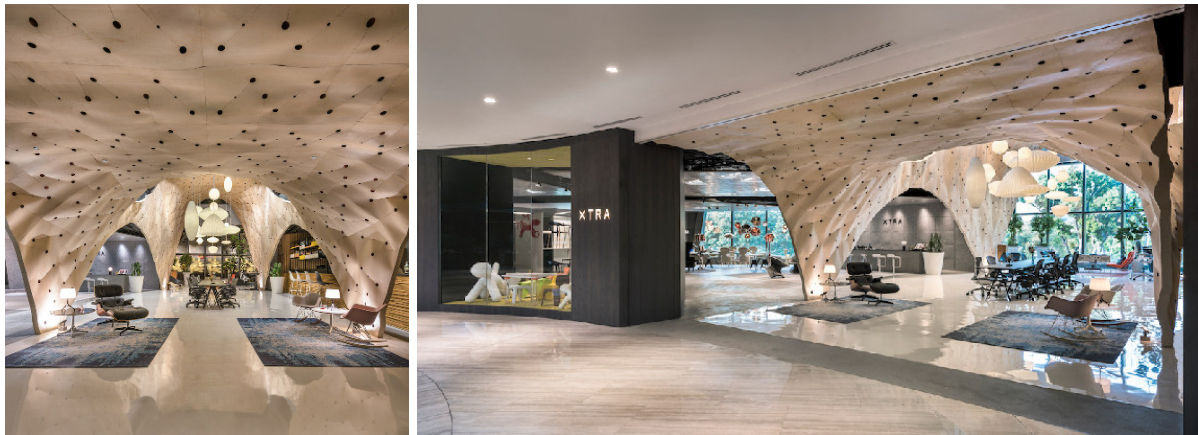
The rippling on the surface increases the appearance of “softness” of the plywood making it appear like a stagnant moment of a sail caught in the wind.



The darts on the flat panels are first “stitched” closed using cable ties. Male and female wooden dowelled props are then attached onto the front and rear panels respectively. The front and rear panels are then attached together forming a doubled layered module, and the modules are then riveted together and attached to the arched frames. The result is a fabric-like surface that appears to be casually pulled across the entire 8m volume.



The circular cut-outs, which allow for tolerance on the surface, are signature of this material system. Along with the cable ties and rivets, these features express almost intuitively the mechanical workings of the system.



Compared with the Version 01 grid shell, this pioneering technique of tailoring plywood allows us to form a larger surface with drastically much lower number of modules: in this instance 280 panels as compared to 4,000 panels in Version 01. The installation of the Fabricwood panel is also comparatively much simpler and can be accomplished by unskilled labour.

BACKGROUND – XTRA’s Herman Miller Shop-in-Shop Version 01

Instead of moulding plywood on a large scale, Version 01 of the Herman Miller Shop-in-Shop was a lightweight plywood grid shell structure formed simply by piecing together a series of modulated plywood panels.

Designing the entire skin out of a kit of parts, demanded a certain ease in assembly. A special interlocking lap joint was designed to attach modular panels together to form a larger surface. The joints were laid over a triangular grid which determined the geometrical relationship between the panels. The final modular 3-legged triangular panels were “stitched” together with a slight rotating motion.

Just as the Herman Miller work chairs were designed to adapt to our postures and movements, the skin was moulded to adapt to existing structures and customer movement patterns. Two continuous surfaces negotiated existing columns to form the façade, walls, ceiling and frame the entrances – inviting customers into the store and guiding them through the experience.

The components of the triangular grid shell were then applied on these base surfaces, and 3,651 panels are “stitched” together forming the rigid, woven double-layered envelope.

Version 01 was executed for the previous XTRA Park Mall flagship store in 2012 when Pan was Design Director of P.A.C. The design won the prestigious World Architecture Festival retail category award in 2012. Park Mall closed in September 2016 for demolition and redevelopment.

