STRUCTURAL ENVELOPE

Inspired by Baroque style and Leibniz theory, Gilles Deleuze created a conception of the Fold. Deleuze thought that the unit of matter is the Fold. A fold is always folded within a fold. When a fold goes up to the following fold, unfolding happens. Unfolding is to increase, to grow, whereas folding is to diminish, to reduce, to withdraw into the recesses of a world. The characteristic of the Fold is bending or flexion.

When we apply the concept of the Fold in architectural design, we will have folding architecture which is a kind of non-linear masses with bending trait. What kind of materials are best for fabricating bending form? We are having worked seeking a material which could act as structure and as surface at the same time. It could be called structural surface or structural envelope.
FOUR FUNCTIONS IN ONE BOARD

FRP (Fiber Reinforced Polymer) is exactly this kind of material. It has the abilities to bear load independently and to close the space perfectly. FRP is a compound material which consists of polyurethane foam (as core material) and fiber reinforced resin (as coating on surfaces of the foam). This sandwich polymer is light in weight, strong in intensity, insulative in electricity and heat, and corrosion-resistant. It has been widely used in bridge, fanblade, pressure vessel and aeronautical parts. We used FRP as structural surface in Kaidi project to construct a permanent gate house.

The FRP gate house of Kaidi was constructed prefabricating in factory and assembling in site. The components of the FRP building were manufactured by CNC milling machine, and they are 106mm in thickness (100mm core, 3mm coating in each side).

They have the qualities of insulation, waterproof, structure and decoration. When the components were transported to the construction site, each board was connected to the steel frame and then mutually connected together by pouring joint with the same materials, so as to become an integral building.

THE PROCESSES OF PREFABRICATING AND ASSEMBLING

The FRP structural surface of Kaidi project was divided into 82 pieces (1.5m × 4.5m each) for fabricating with following procedures: a) building a steel stand covered by steel pipe with square section; b) using polyurethane to foam on the stand; c) milling the foam to the out surface shape of the components; d) brushing release agent and pasting fiber reinforced resin in surface of the foam; e) foaming again to certain thickness; f) milling the foam.
**Support platform and FRP resin**

**Paste fiber reinforced resin**

**Unit of FRP board**

**Breaking test for FRP board**

**Fill the gap and make waterproof**

**Installation of FRP board**
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After fabrication in factory, the boards were transported to the construction site, lifted onto the steel frame and connected to the frame. When all pieces of board were in the position, all seams were filled with foam and pasted with fiber reinforced resin, finally polished and decorated by spraying fluorocarbon.