Passive Design Principles

By applying the Passive Design Principles, the Royd Clan's House is an autonomous, off-the-grid home, achieving zero emissions and is carbon positive.

North facing was maximized by the design of clustered pavilions and by the sun penetration through double glazed roofs over the connectors.

Based in an early wind simulation on Rhino software consolidated the concept of clustered pavilions to reduce wind turbulence.

Continuous R5 insulation in the roofs and R3.5 in the walls avoided thermal bridging; Thermally broken with low-E double glazed aluminum windows provided further comfort.

Most materials including CLT and Glulam were sourced locally, with low VOC and Formaldehyde.

A central glazed fireplace heats currently the whole house in winter. Natural cross and stacked ventilation along fans cool the house in summer.

30kw of photovoltaic solar panels off-grid, including batteries powers the house and electrical vehicles. LED lights & energy-efficient appliances are only in use.
Heat Pumps units are used to heat the water.

80,000litres water tank provides for the residents' needs. Greywater is used for flushing toilets. An efficient septic tank is provided. Taps & toilets are rated minimum 5-star WELS.

Over 2000 native trees and shrubs have been planted with no longer need for irrigation on the land. 4 Native trees are planted in a long natural planter box in the lounge. The remaining of the property is used for reforesting, running a native flower business, and minimal animal grazing.

Timber and construction

The choice of CLT and Glulam timber was crucial for the sustainable outcome of the Royd Clan's House due to:

- Resource from Australian sustainable managed plantations, PEFC certified
- Sequestration of carbon
- High strength and versatility for any structure as used as floor, wall, and roof
- Insulation R1 value for CLT which as well avoids thermal bridging
- Higher thermal mass index than timber frame as it is denser
- Biophilic properties as it is a natural, warm, non-toxic, low VOC and formaldehyde
- Contribution to better Indoor Air Quality particularly in its raw finish
- High Acoustic performance as it has sufficient noise control for airborne and impact sound transmission.
- Fire Resistance performance due to its cross-sectional thickness and airtight construction
- Great Seismic performance as it is lighter
- Draught proof due to its high airtightness rate

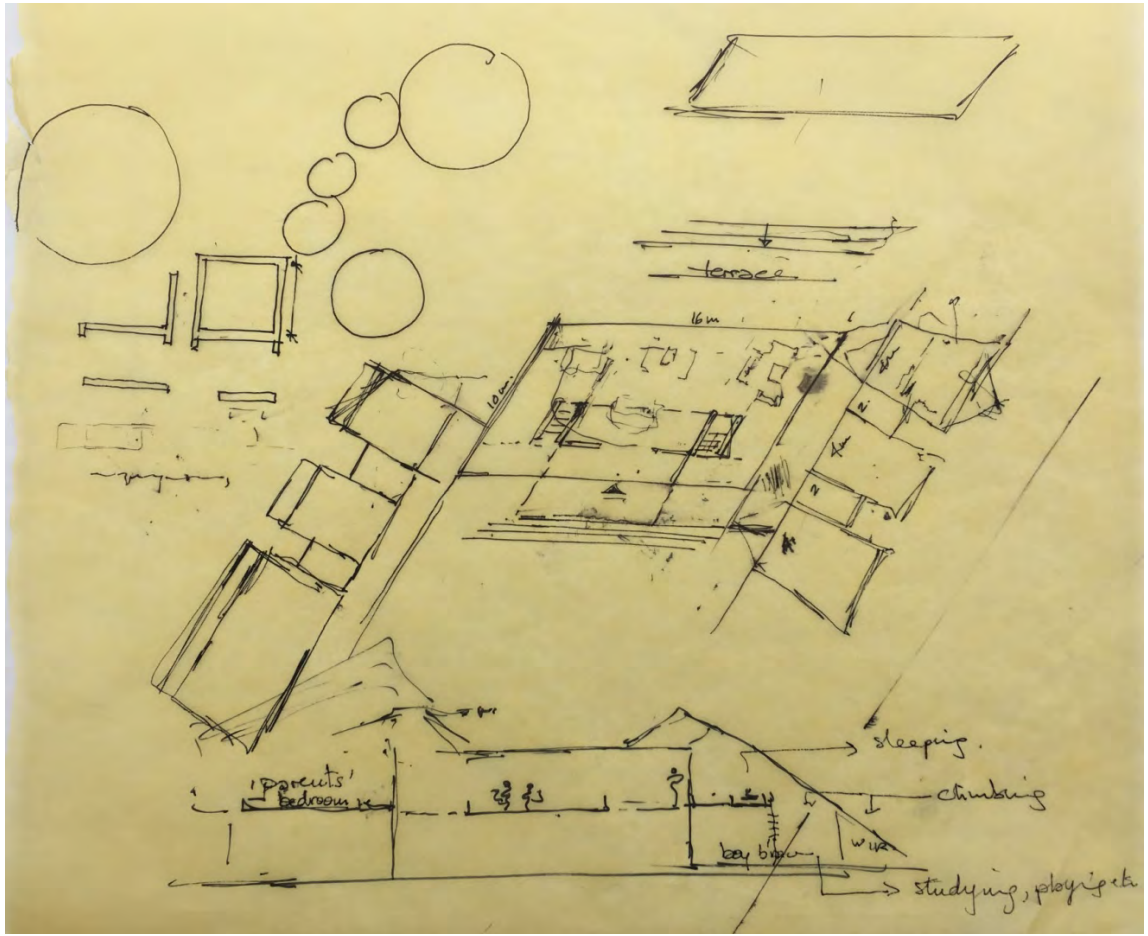
The construction conversation started early with all stakeholders including structural engineer Vistek, ECI (Early Contractor Involvement) as Level Konstrukt and Building Bloc, and ESI (Early Supplier Involvement) as Hyne Timber and XLAM. DFMA (Design for Manufacture and Assembly) was discussed from the outset as traditional construction was not an option due to the geometry of the Royd Clan's House.

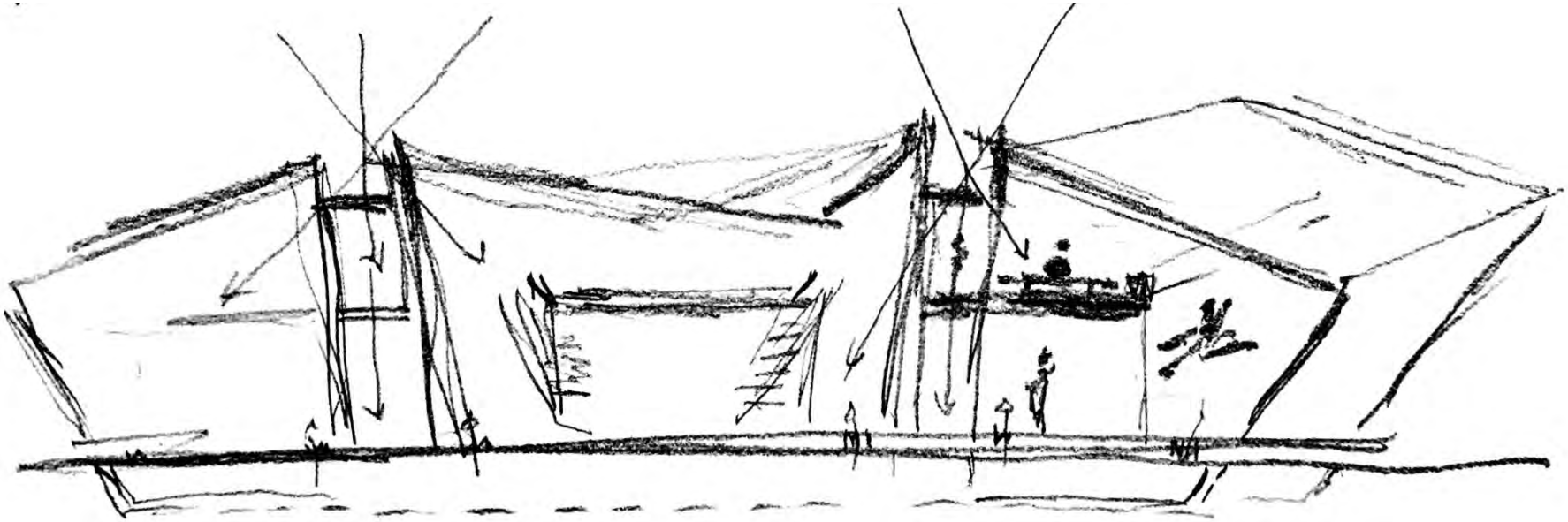
The Design was done once with the following process:

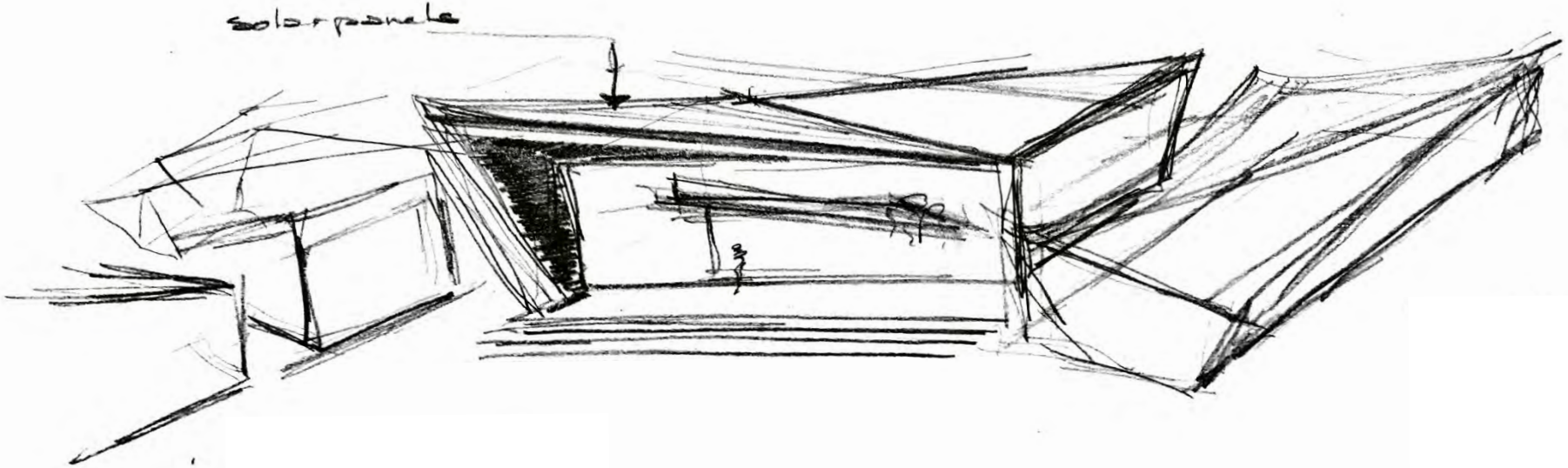
- Architectural drawings executed by Level architekture on Revit.
- Exported in IFC to Vistek, Xlam, and Hyne.
- Shop drawings produced by Xlam and Hyne.
- Reviewed by Vistek and Level architekture
- CLT and Glulam cut to precision by Xlam and Hyne.
- Transported as 3 trucks of Glulam and 6 trucks of CLT panels
- Assembled on-site by Level Konstrukt and Building Bloc
- Installed with a small crew on-site within 15 lifting days in Glulam erection and 10 lifting days in CLT erection
- Matched members and connections which improved time and reduced waste.

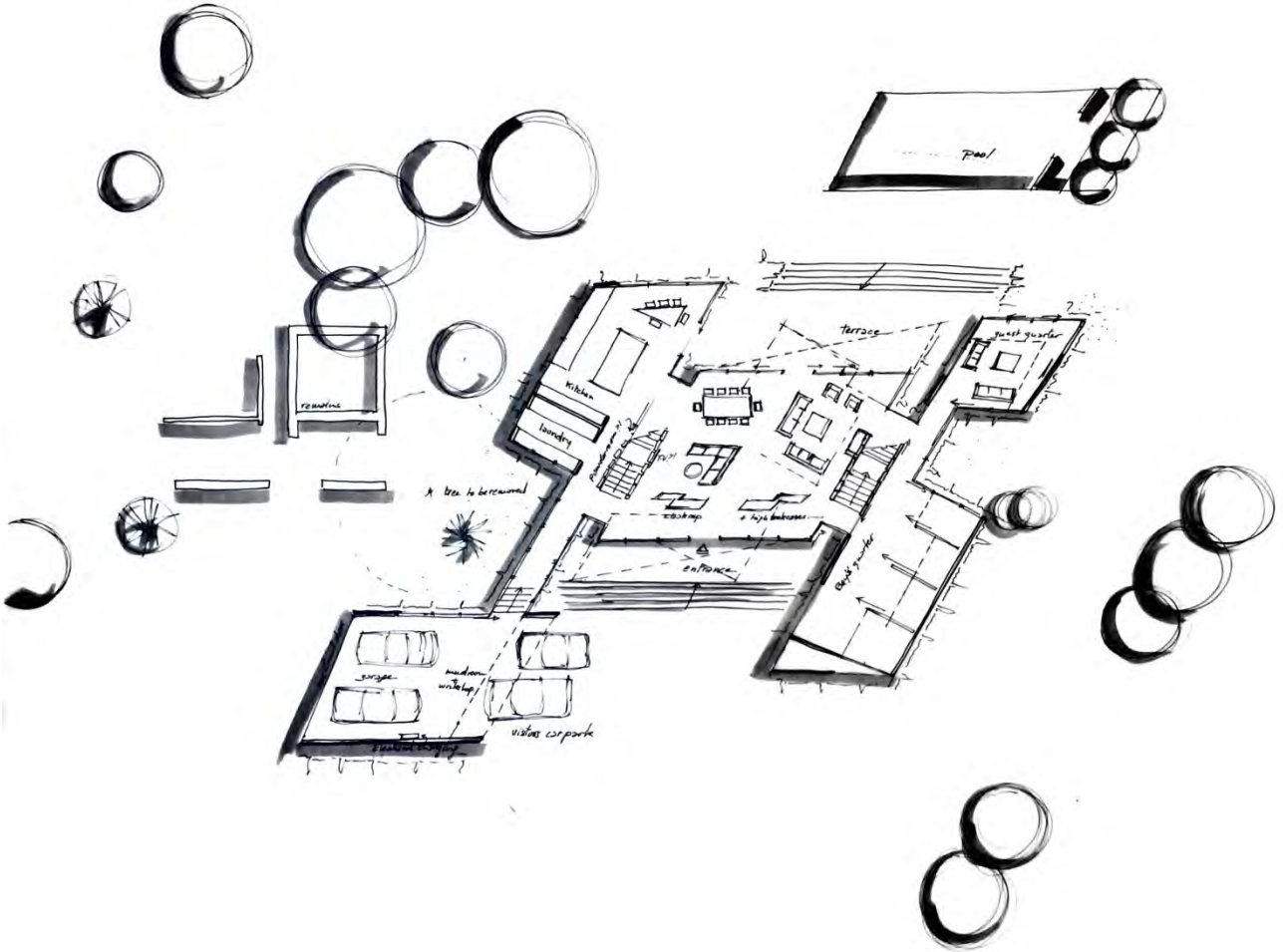
The total volume of timber was re-grown in Australian Pine Plantations in 17 minutes.

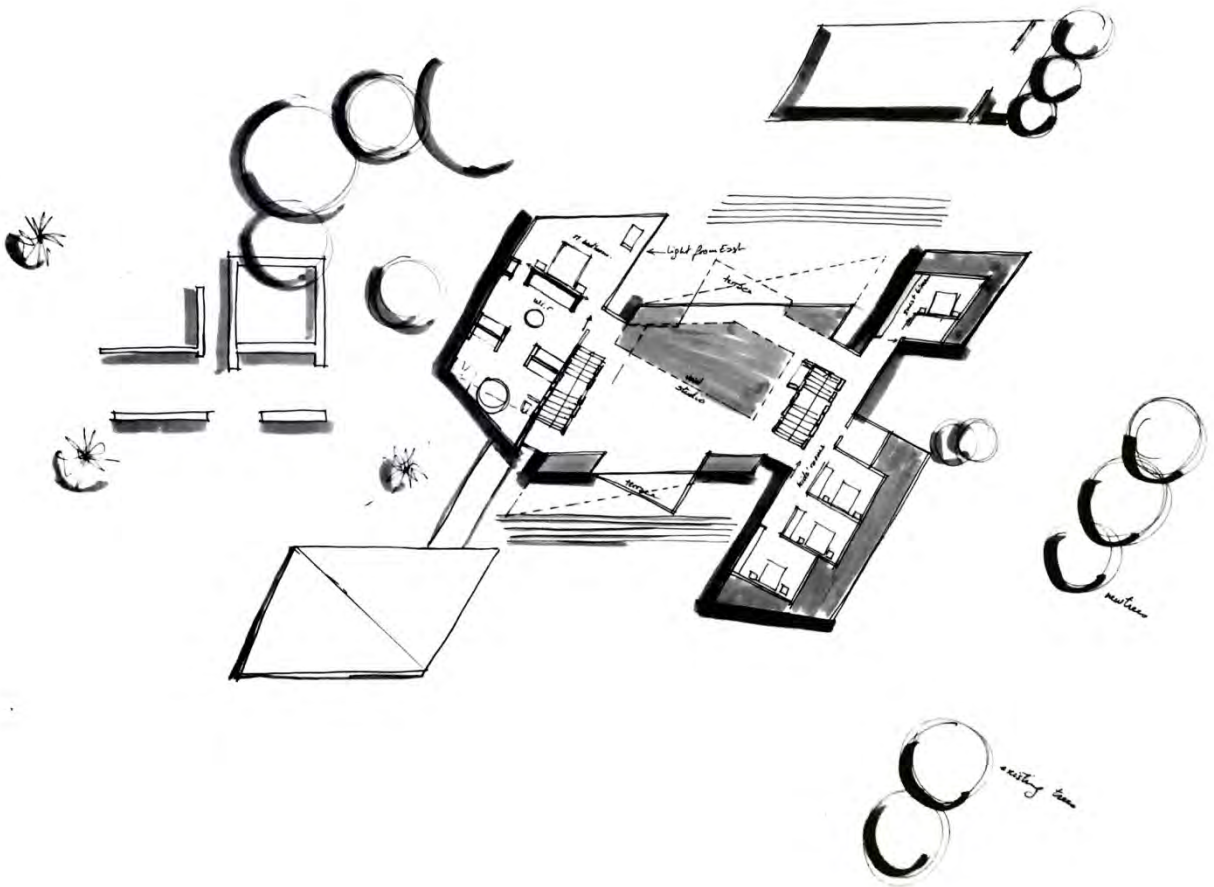


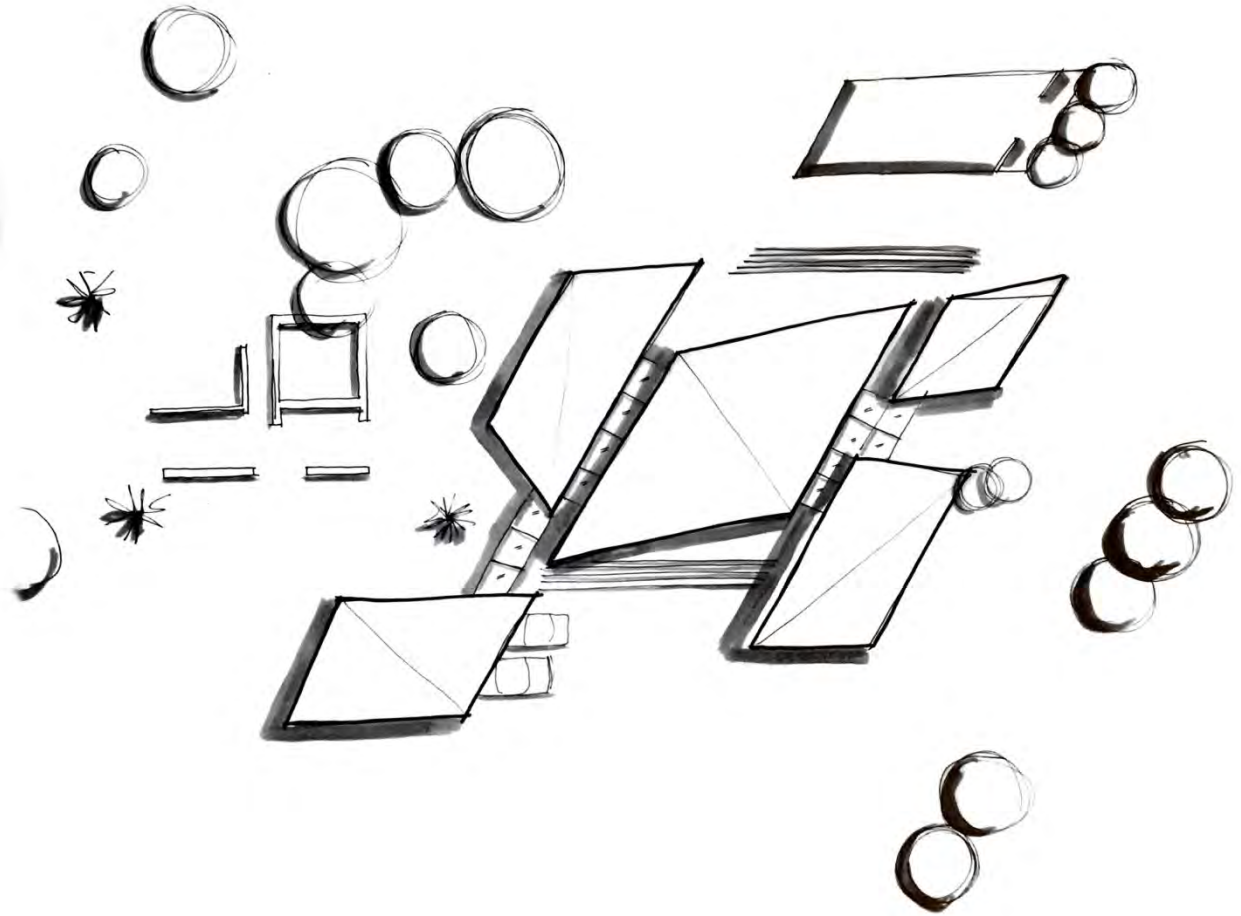

terrace
16m
10m
sleeping.
'parents' bedroom
climbing
bay brown
studying, playing etc

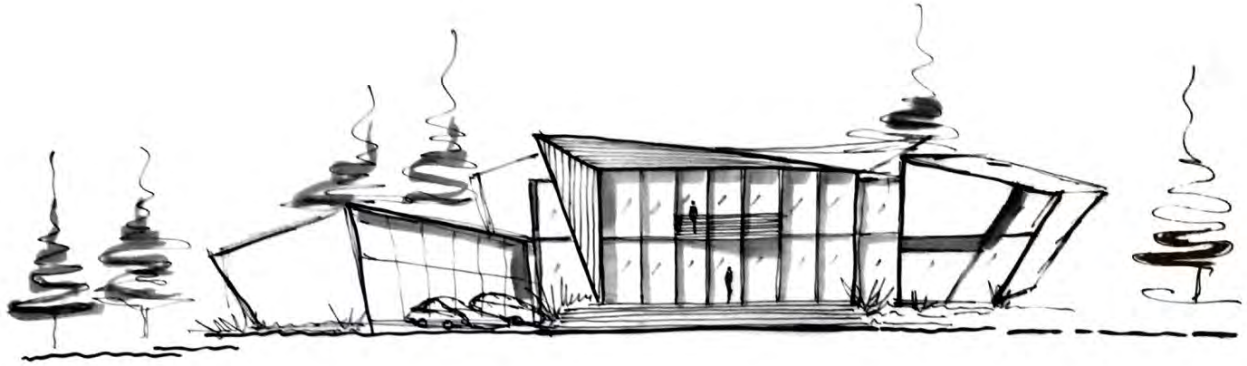



solar panels

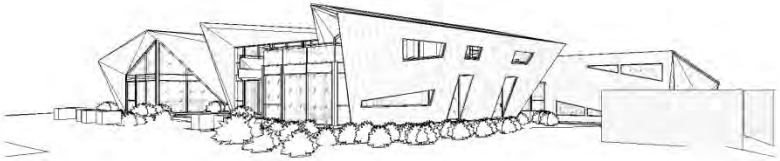

pool
terrace
guest quarter
kitchen
laundry
remains
tree to be removed
entrance
garage
mudroom
visitors car parks


light from East
existing trees









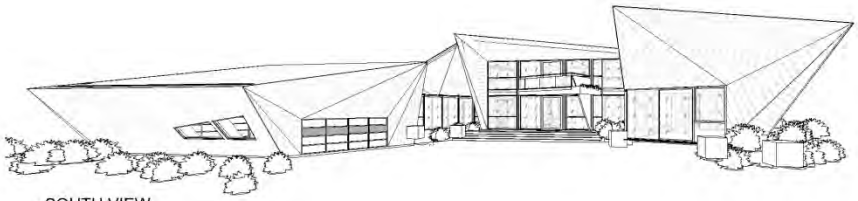
NORTHWEST VIEW



NORTH EAST VIEW



NORTH VIEW



SOUTH VIEW

CONCEPT DESIGN

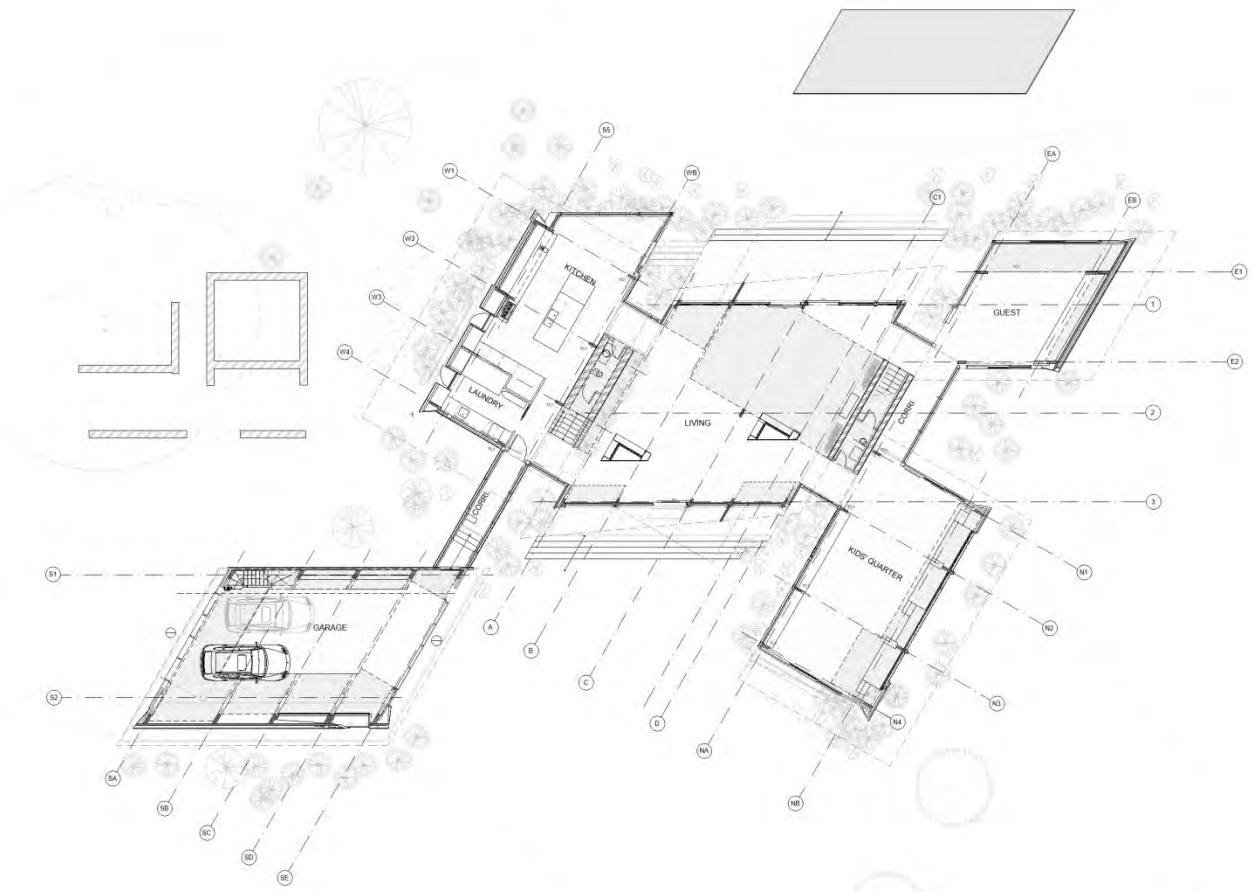
The concept design has been inspired by the boulders formed on the site, the need for a playful architecture for the active young boys and the strategic location of the residence on the hill.

The new residence will be erected on a relatively flat surface where it will capture 360 degrees stunning views of the Ceres area and enjoy the remains of the original house.

These remains will be viewed from different angles in the proposal, where the falling stones from the ruins will be used to erect the stairs' walls. Connecting with the physical remains of the original residence will consolidate a sense of history, belonging and continuity.

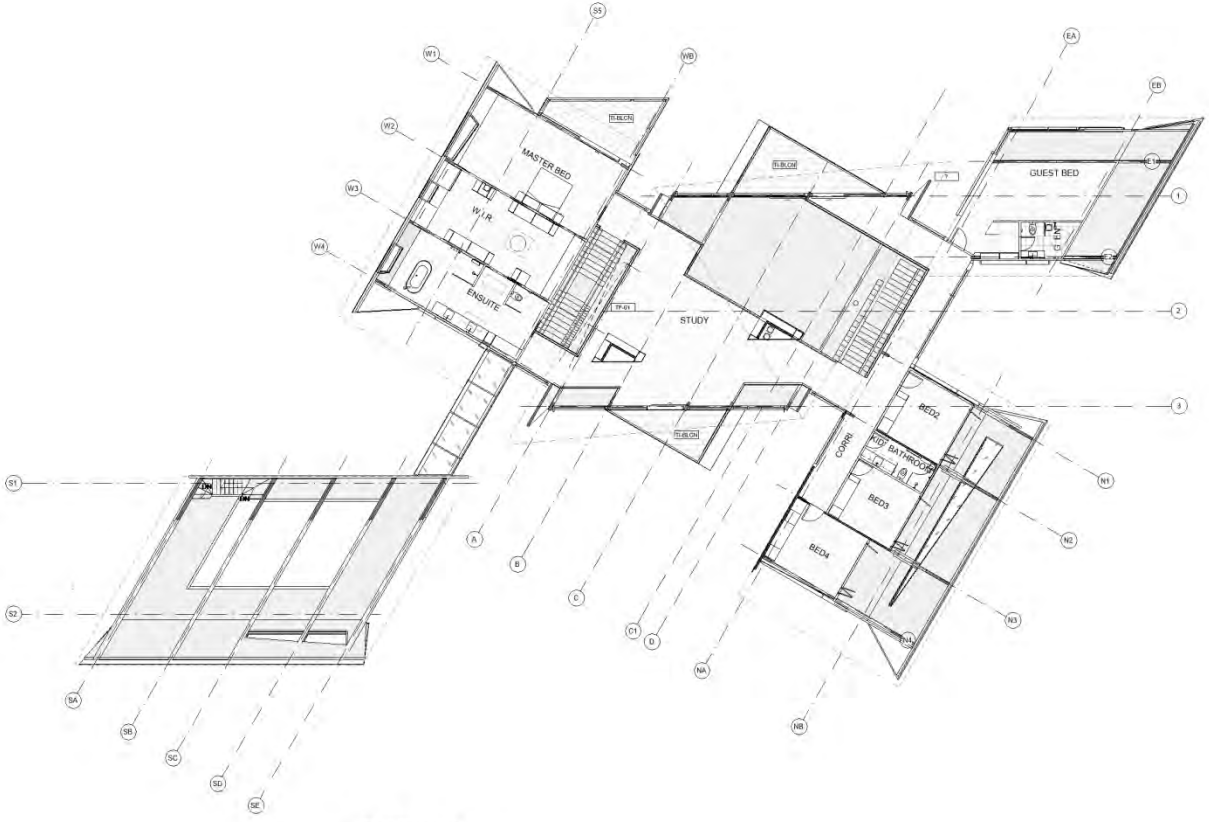
The concept design create separate pavilions for each specific function of living that are connected through glass roofs and vertical circulation connectors.

This type of cluster design allows flexibility in the functionality of the project, maximise the orientation and minimise wind turbulence.



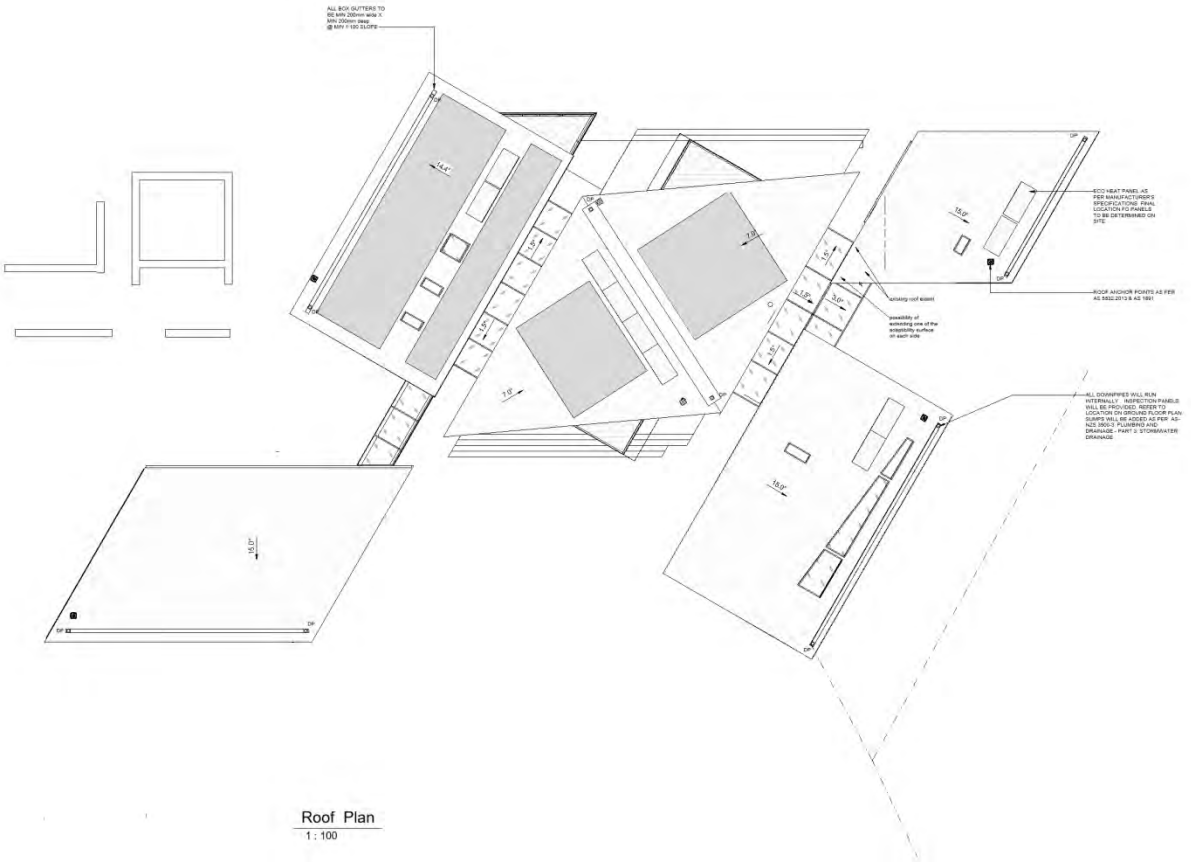
Ground Floor Plan

1 : 100



First Floor Plan

1 : 100



Roof Plan

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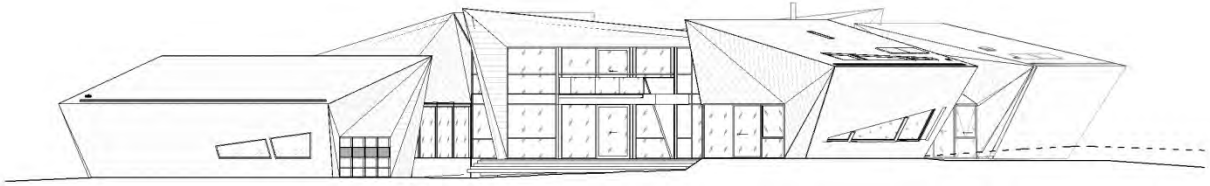
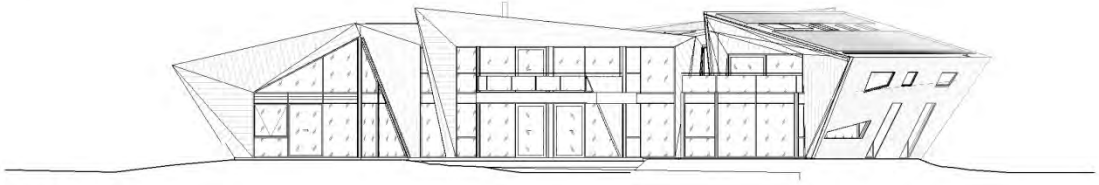
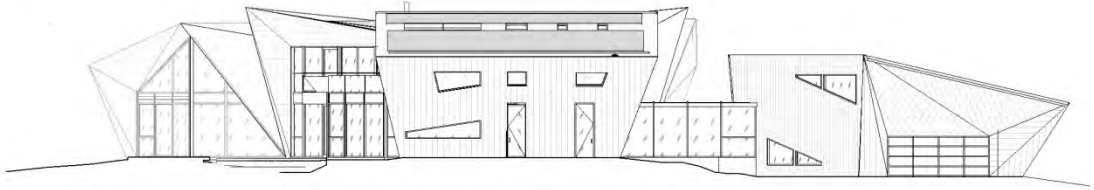


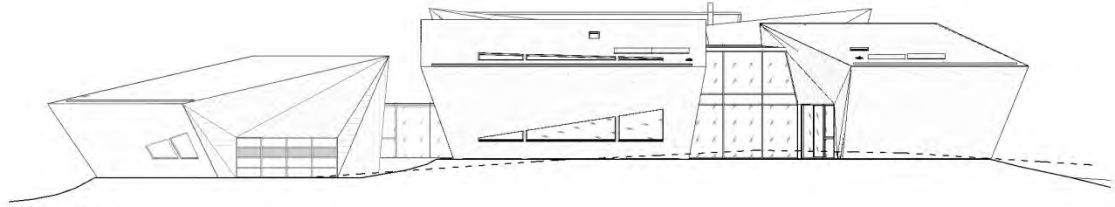
South Elevation



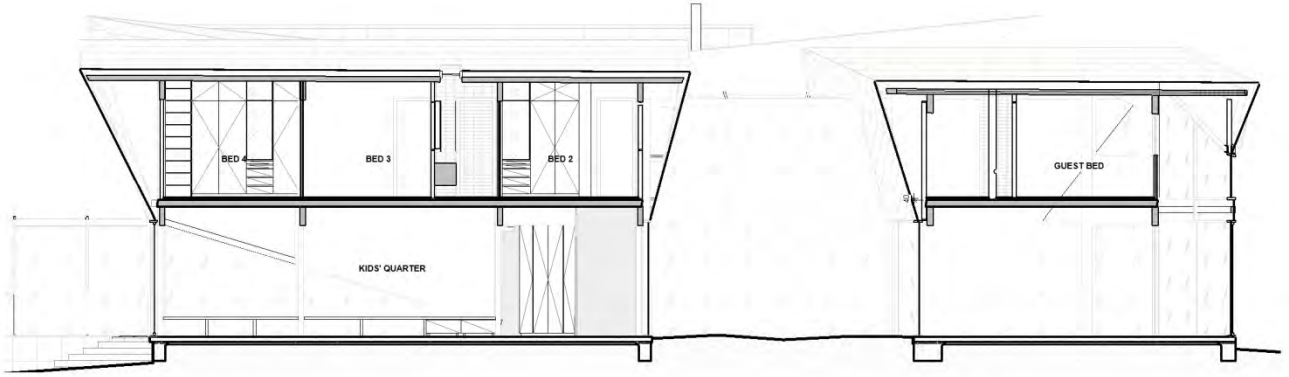
North Elevation



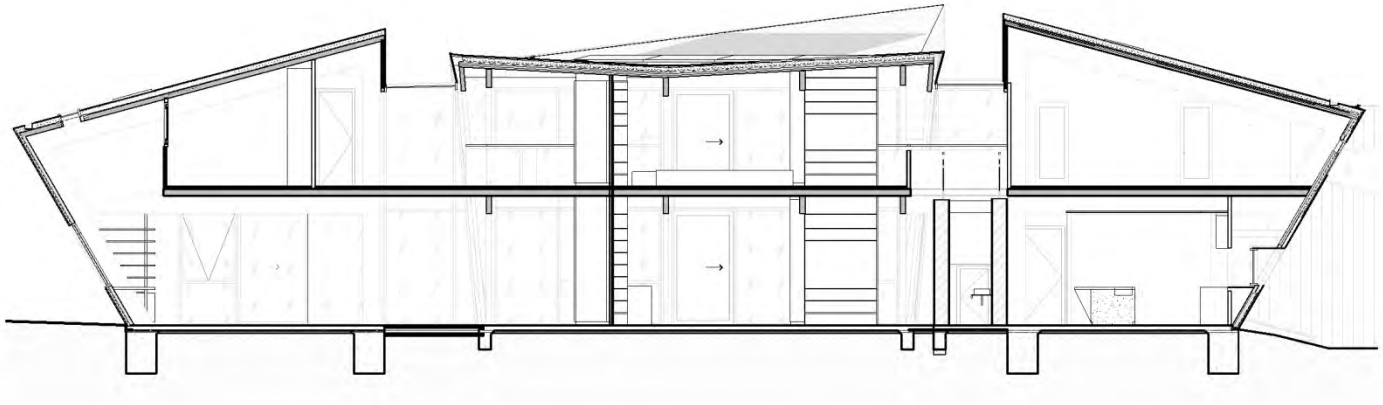
West Elevation



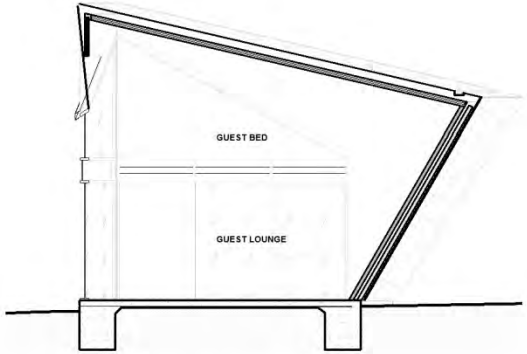
East Elevation



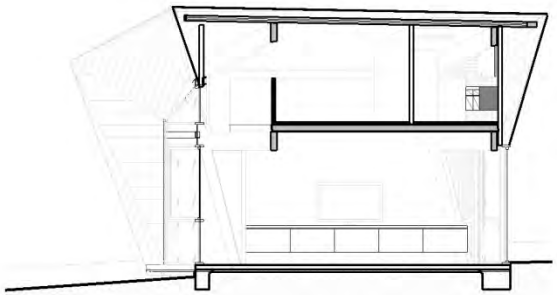
Kids Pavilion Section 1



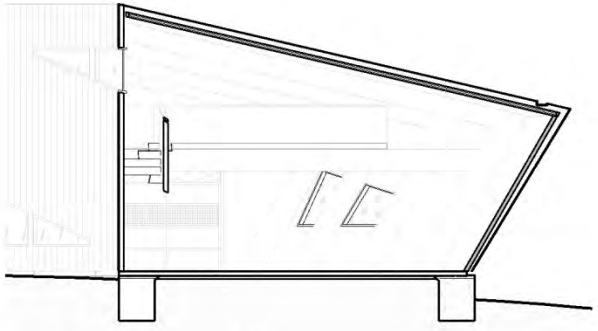
Kids' Pavilion Section 2



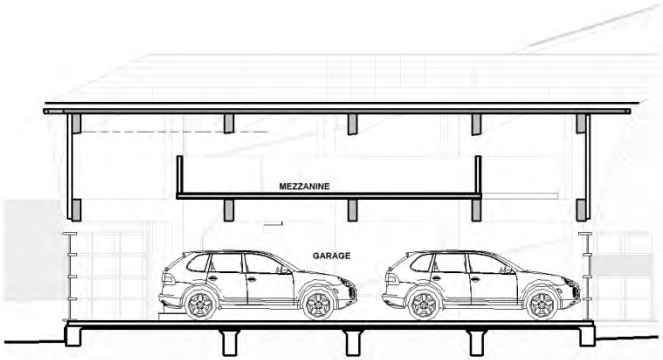
Guest Pavilion Section 1



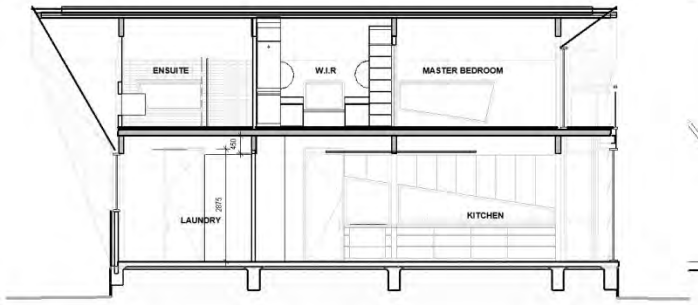
Guest Pavilion Section 2



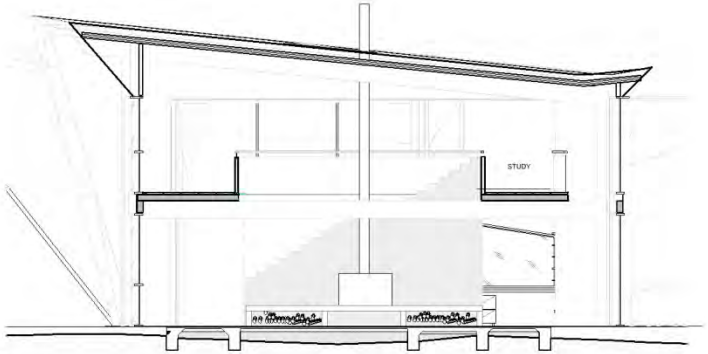
Garage Section 2



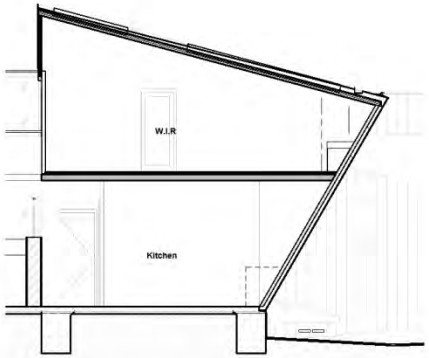
Garage Section 3



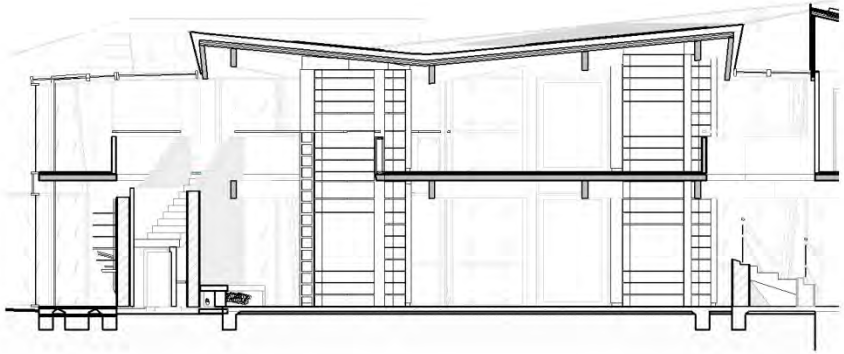
Master Pavilion Section 2



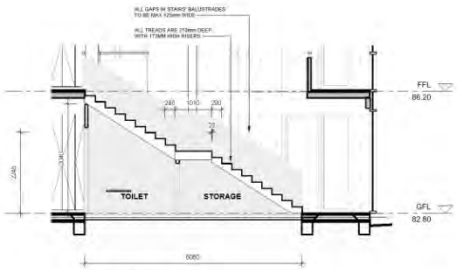
Living Pavilion Section 1



Master Pavilion Section 1

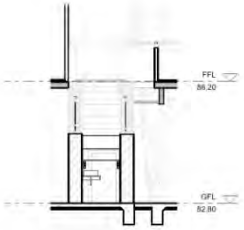


Living Pavilion Section 2



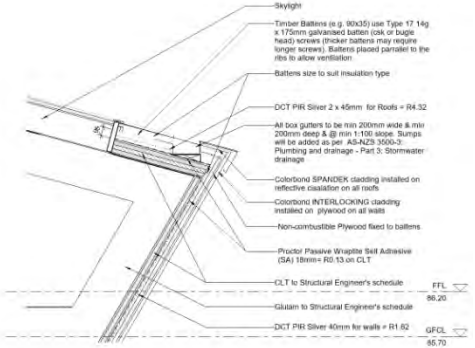
STAIRS SECTION

1 : 50



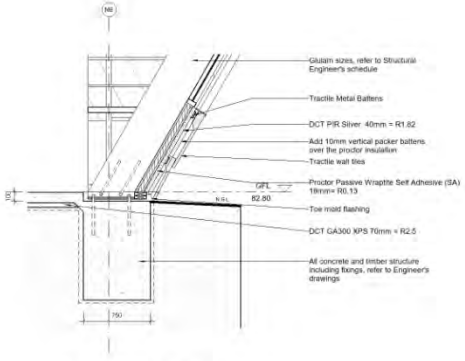
STAIRS CROSS SECTION

1 : 50



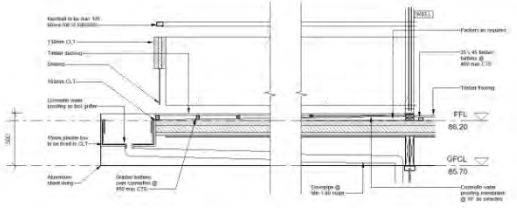
CONCEALED GUTTER DETAIL

1 : 20



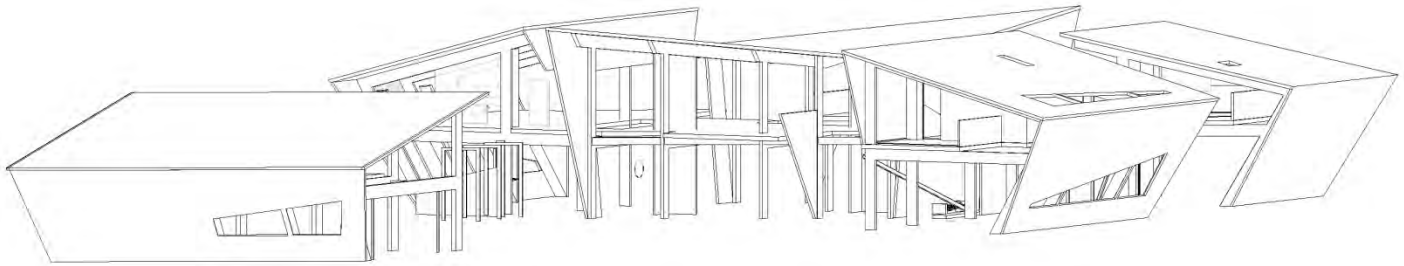
WALL - WINDOW DETAIL

1 : 20

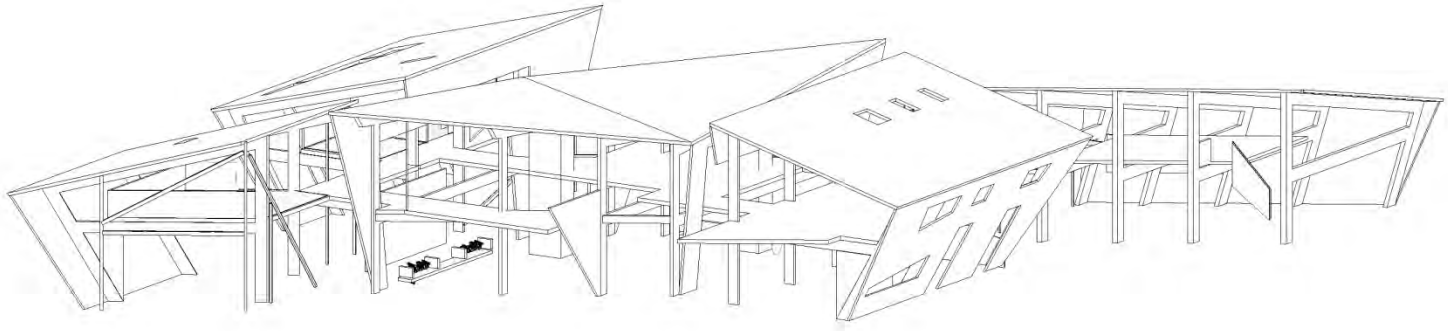


TERRACE DETAIL

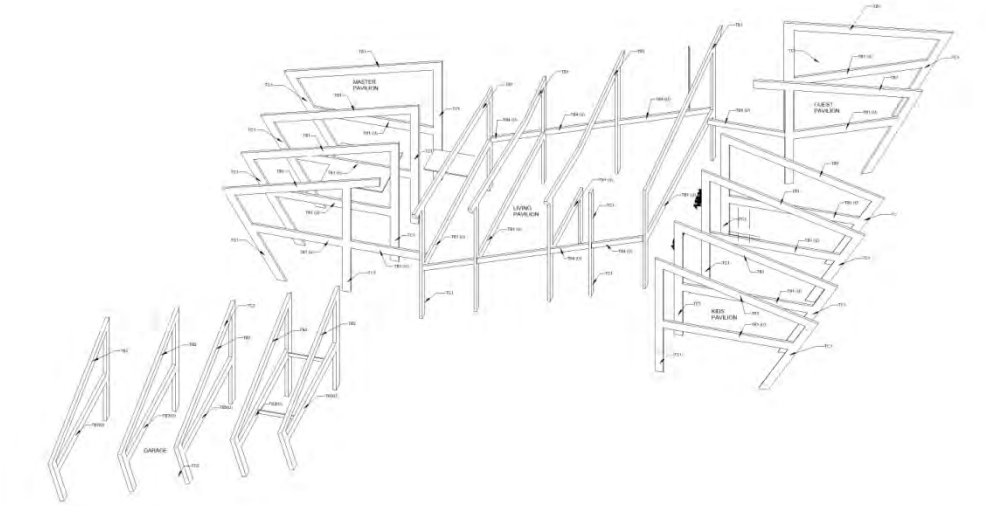
1 : 20



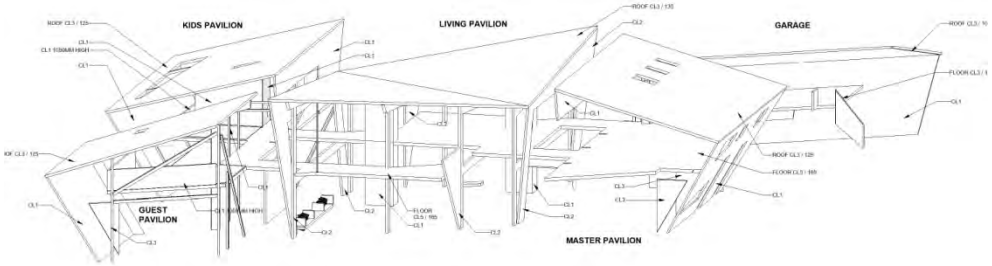
3D VIEW FROM NORTHWEST



3D VIEW FROM SOUTHWEST



ALL PORTAL 3D



CLT PANEL 3D