



in partnership with



MINGHUI ZHANG

“Floating” museum-Lucerne hydro power museum



PROJECT FACTS

Museum Building Use	City Lucerne	835m² TFA
-------------------------------	------------------------	--------------------------------

PASSIVHAUS STRATEGY

Double layer external facade - In order to achieve a transparent building with good thermal performance. Using double layer facade to maintain indoor temperature and airtightness.

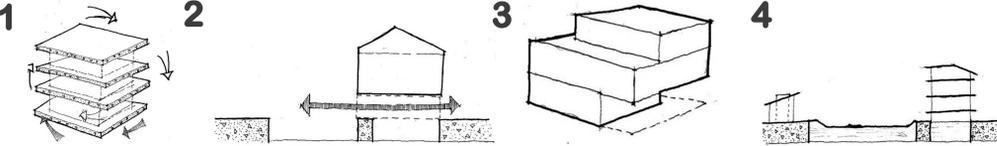
Concrete to provide thermal mass - All the interior wall, roof and slabs are quite and using concrete to help store the indoor heat.

Low impact material ---local timber -The extension of public spaces are bridge and water platform which the material are mainly local timber. This can help reduce the embodied energy ,carbon emission during both construction and application period. Using timber also can respond to Lucerne’s vernacular building and old timber bridge nearby to create an comparison between old and new timberstructure.

Adapting renewable energy for electricity --- hydro power

Movable external shading devices - To avoid overheating problem, external shading which also follow the vernacular Switzerland building, the covering area of the shading can be moved automatically or manually adjust each sigle blind to adjust different sun angle. The electricity that been used also provided by water power.

DESIGN PHILOSOPHY



The new water power museum is located at the Reuss River which cross the Lucerne city. The concept is to create an transparent building with timber bridge and platform that can become the landmark of the city and the extension of public spaces. Also the relationship between water, history and city are enhanced by the new museum. 1&2. To create a “floating” building and to make it more light in sight, large glazing and particular facade material -- polycarbonate are been used which combine with concrete slab and create a smooth circular exhibition rote between exterior and interior 3. Create several outdoor spaces at higher level facing different orientation to enhance the visual connection between surroundings and new building.

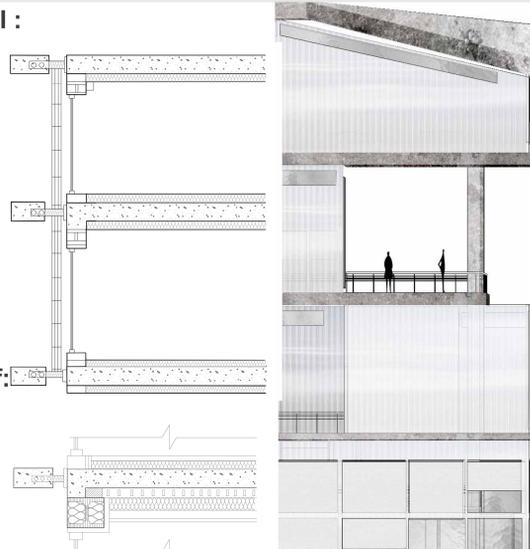
4. The main building and glass pavilion are connected by the bridge and platform which can let visitors get close to the station to see how it works. This can become part of the outdoor exhibition.

MATERIALS

The g-value of 500mm polycarbonate is 0.35 W/(m²k), combine with triple glazing to used as facade material, the U-value is 0.106 W/(m²k). This will help achieve transparent and better performance at the same time.Well insulated concrete slabs (U-value:0.143) provide lots of thermal mass.

External Wall :

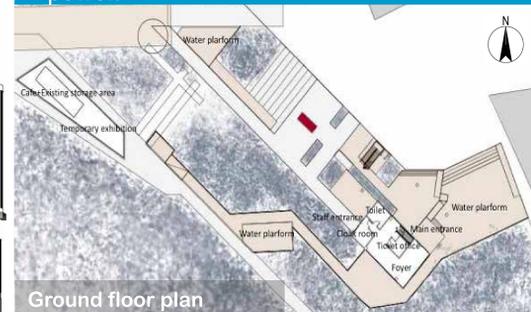
triple glazing
air
polycarbonate



Floor & Roof:

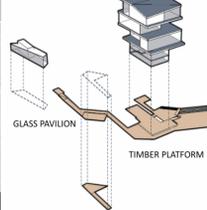
plaster
insulation (mineral wood)
concrete slab
insulation (wood firber)
plaster

Fcade & Floor detail

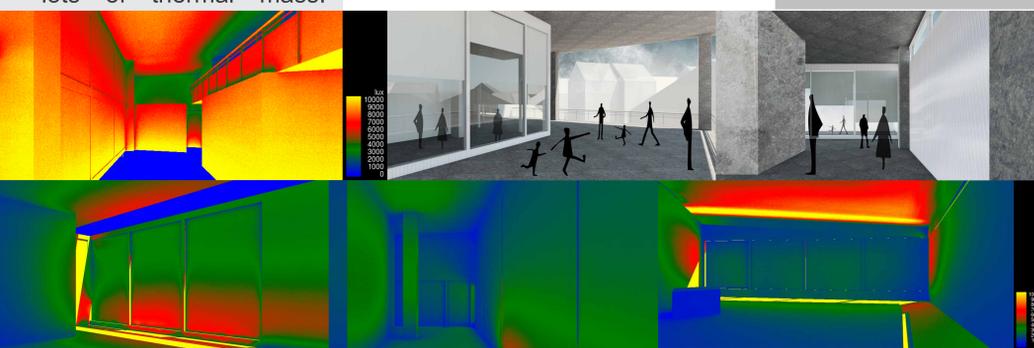


Ground floor plan

MAIN BUILDING



Roller blinds



PREDICTED PERFORMANCE

Walls 0.106 Floor 0.143 Roof 0.143 Windows 0.400	12 w/m² Heating Load	3.30 Form Factor
---	---	----------------------------

Specific building demands with reference to the treated floor area		835.0 m ²
Space heating	Heating demand	18 kWh/(m²a)
	Heating load	12 W/m²
Space cooling	Overall specif. space cooling demand	kWh/(m²a)
	Cooling load	W/m²
Primary energy	Frequency of overheating (> 25 °C)	0.6 %
	Heating, cooling, dehumidification, DHW, auxiliary electricity, lighting, electrical appliances	kWh/(m²a)
	DHW, space heating and auxiliary electricity	kWh/(m²a)
	Specific primary energy reduction through solar electricity	kWh/(m²a)
Airtightness	Pressurization test result n ₅₀	0.6 1/h



Acknowledgements

MSc Sustainable Architecture Studies
Tutor: Aidan Hoggard, Paul Testa, Andrew Lees



UK PASSIVHAUS STUDENT COMPETITION

