



zero.plus

Design and Realisation of NZ's 1st Zero Emission House

[project/aim]

The project aims to develop New Zealand`s first zero emission house and neighbourhood to meet international passive house standards as defined by the “Passivhaus Institut” (Darmstadt, Germany)

zero.plus stands for zero emission and high quality living

// ZERO

1. Zero fossil fuel
2. 100% renewable energy sources
3. Reduction of energy requirements by passive solar design
4. On-site ecological water treatment
5. Low embodied-energy materials
6. Ecological connection to services and facilities
7. Optimizing urban surfaces and open spaces

// PLUS

1. Increase the IEQ according to WHO and ISO standards
2. Quality of materials, construction and fabrication
3. High quality design adapting to the needs and desires of the New Zealand lifestyle
4. Application of Smart-House technologies
5. User-friendly solutions in design and technology
6. Biodiversity principles at the urban scale
7. Urban recycling- consideration of heritage & cultural resources
8. Intensifying the landscape component to urban living environments
9. Increasing the public and communal space

04 CONCEPT

DESIGN AND REALISATION OF NZ'S 1ST ZERO EMISSION HOUSE



Photovoltaic Panels

Convert solar energy into direct current electricity via the photovoltaic effect. Energy produced by the PV array can be sold back to an energy provider.

Water Collection

Collect and store rain water runoff, typically from rooftops via rain gutters.

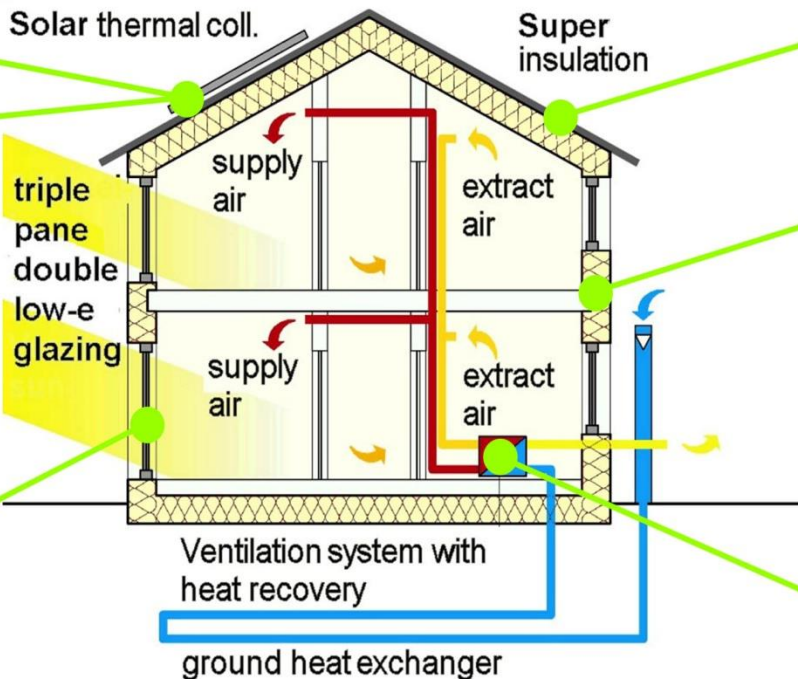


* Grey water Treatment



Solar Water Heater

Solar energy is the most cost efficient way of converting energy into heat because the type of energy is free.



Passive Houses

Consist of 3 main points
1. Watertightness
2. Insulation
3. Airtight



Double Glazing

Improve the thermal performance of glass. May be framed in a sash or frame or in a curtain wall.

Heat Recovery

Absorbs heat from warm, air for discharge to outside. Recovered heat is transferred via a heat exchanger into supply duct to room.



- Compact Shape
- Precision in Detailing
- Waste Treatment
- Active Ventilation

// SITE

Unspecified (urban residential context)

On a slope

North Facing

// SIZE

150sqm + External garage/workshop/storage

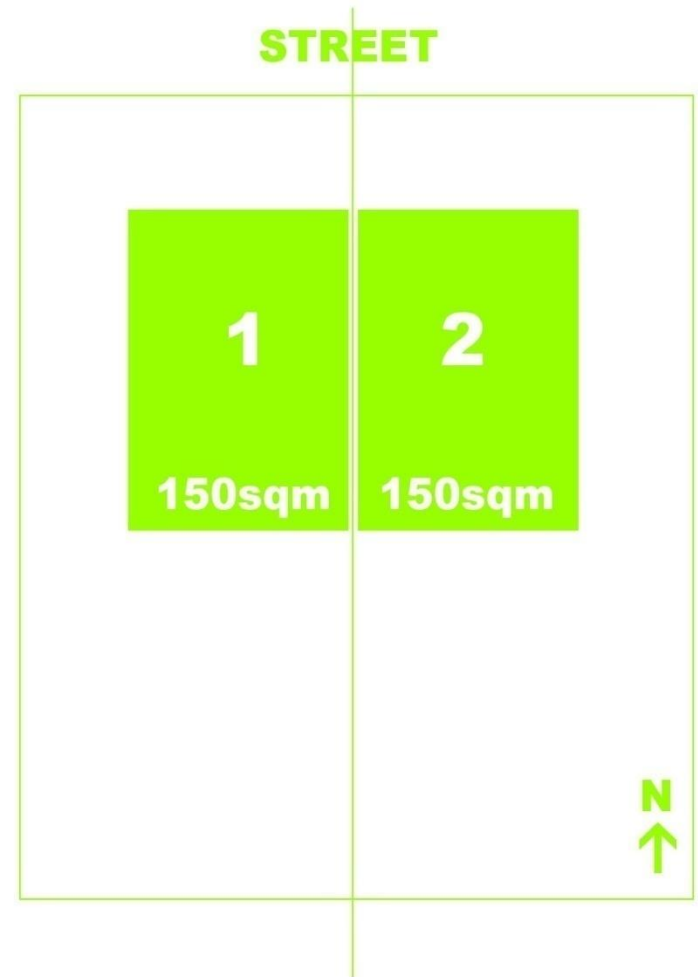
2 levels

// PROGRAM

2 Semi attached units

3 bedrooms, 2 bathrooms

Multi functional space



// Building Automation

To optimise, efficiency, comfort, pleasure, security, monitoring and informative (educational)

// Flexible spaces

Flexible bathroom arrangement, open plan, (Not conventional spaces), bigger bedrooms

// 3 layers: 'Airtight Core'

Service core, linked by kitchen, toilet, storage space, etc.

// 'Buffer Zone'

Intermediate space leading to the outside

// 'External Space'

Covered outside space, such as a deck that can be used for other purposes

// Passive Solar Design / Daylighting

Maximise daylighting, positive solar gain, reduce overheating through efficient shading system

Clerestory windows or Skylights that display PV cells

// PV Panels and Solar Water Heating Tubes

Unconventional Integrated to facade approach, Green PV panels

// Deck as a “tool belt”

Below Deck space used as storage / garage / workshop / play area / laundry hanging area

// Multiple Accessibility

Multiple entry points for flating situation and teenagers

// Hedge / Green screen

Vegetation as a building material - extension of the NZ landscape. (boundary marker, shading device)

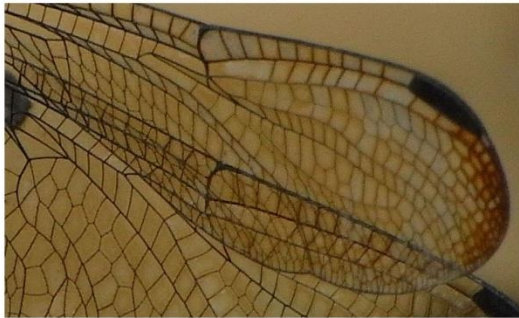
// ‘Second Skin’

Loose, fabric skin that protects from solar and rain. Blurs the harshness of the box

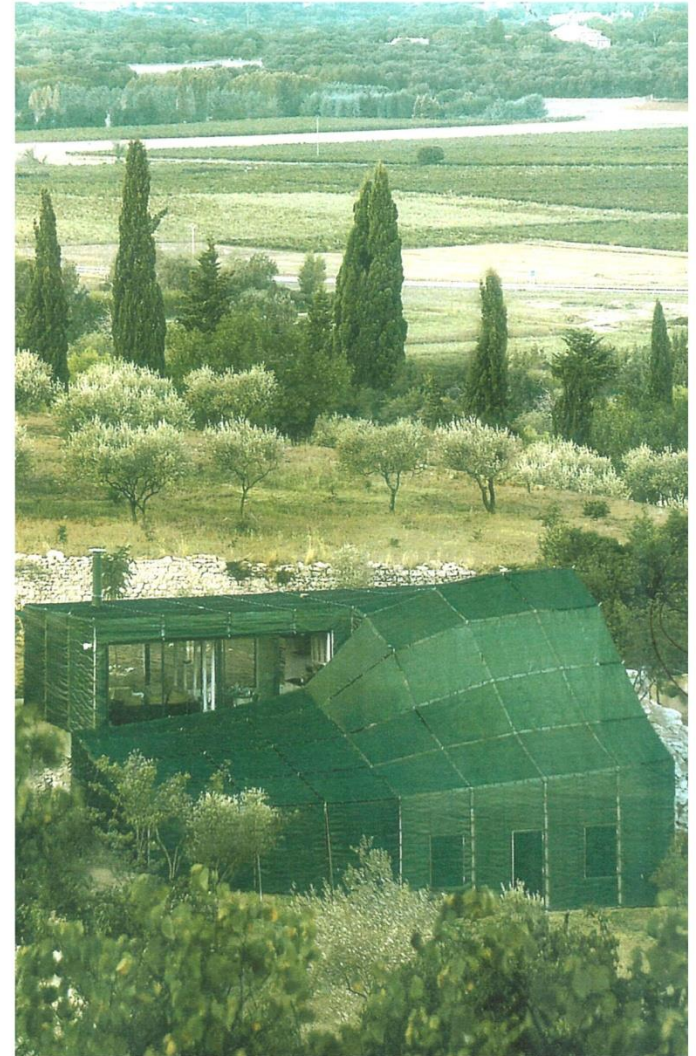
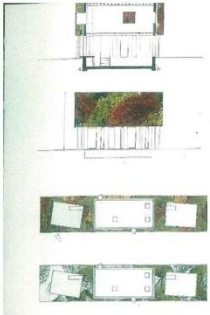
// Reactive Architecture

Introduces dynamic and responsive systems to optimise design, fabrication construction and usage and behaviour of space

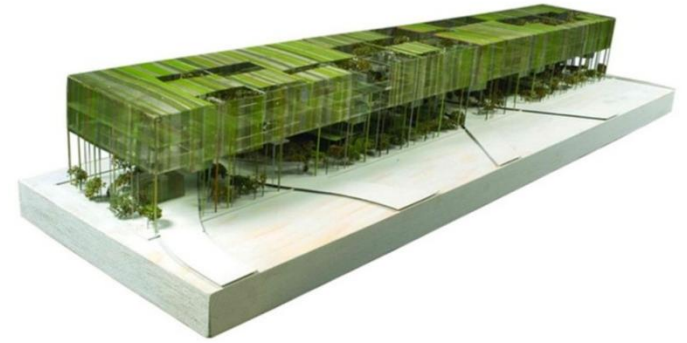
// EXAMPLES - GREEN / CURTAIN SCREEN



- Second “skin” to blur the box shape
- A solar shading system
- Retractable and moveable
- Mesh like system
- Temporary Tent like structure
- ‘Dragonfly wings’



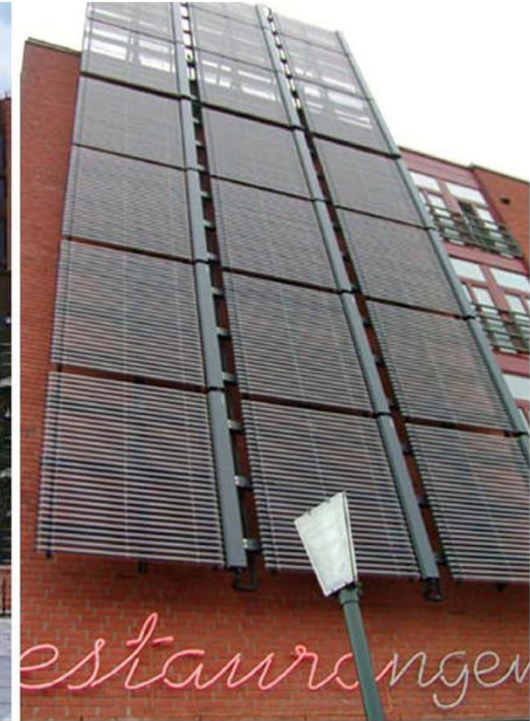
- Hedge – Typical NZ landscape as inspiration
- Green space as volumes
- Vegetation as an extension of architecture



// EXAMPLES - SOLAR PANELS / TUBES



- Integrated PV cells in glass as shading system
- Moving/ external PV panels



// PV integration

PV panels are integrated into the building instead of being a separate element attached



- PV integration on roof
- PV integration on facade shading system
- Roof angles orientated for maximum PV panel efficiency



- PV integration on roof
- PV integration on facade shading system

// DESIGN OF ZERO PLUS

1. Plant the site

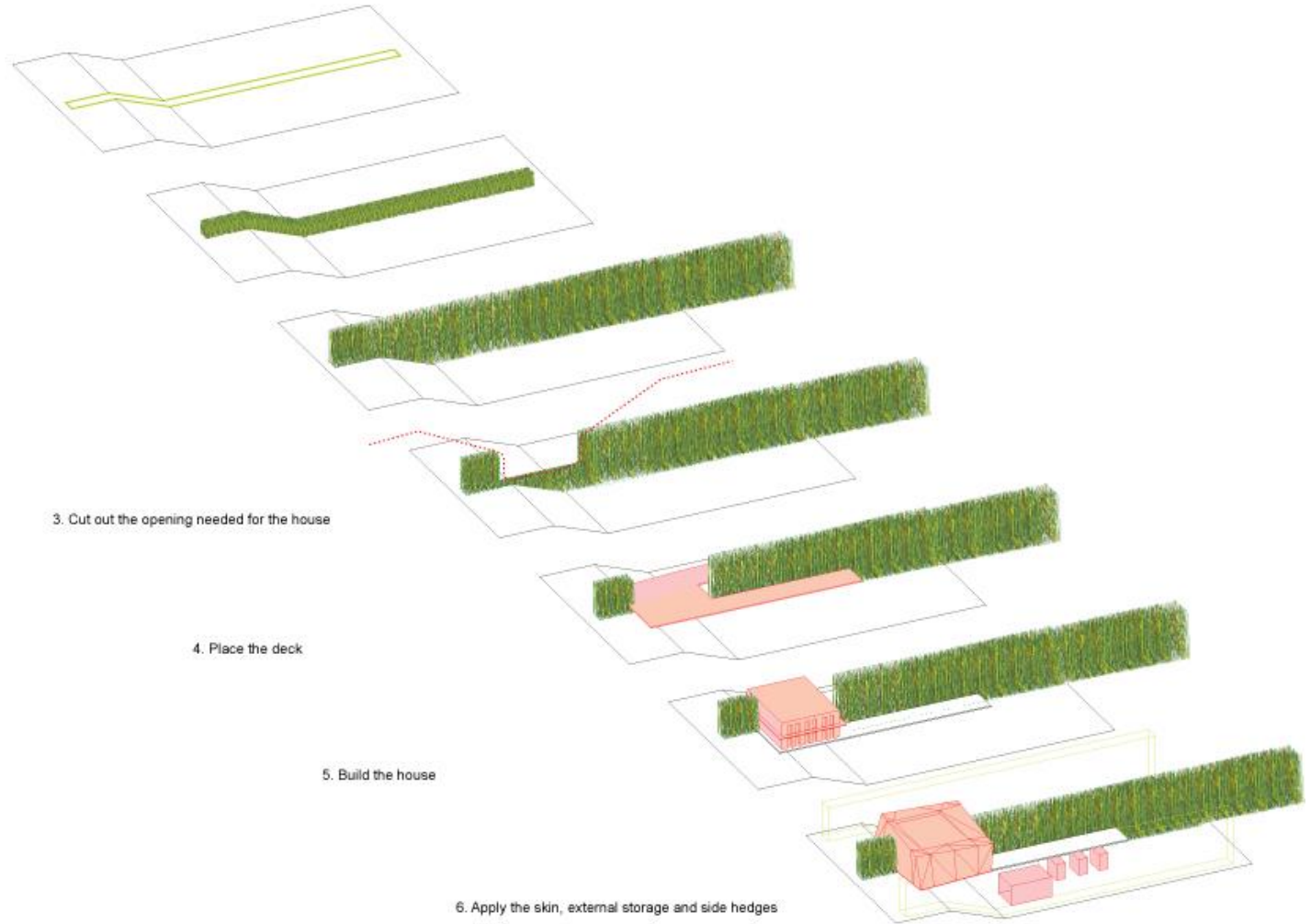
2. Let the vegetation grow

3. Cut out the opening needed for the house

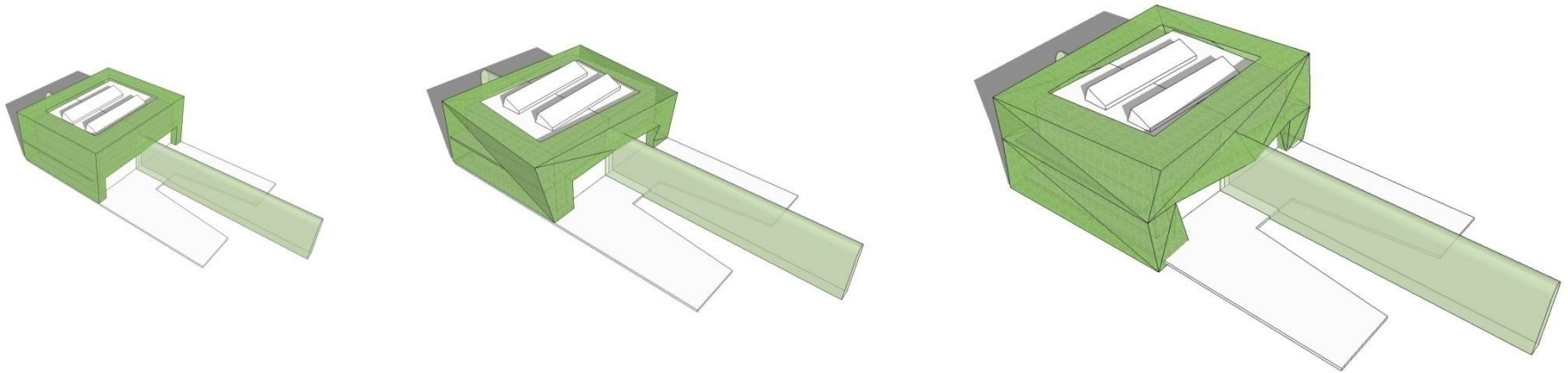
4. Place the deck

5. Build the house

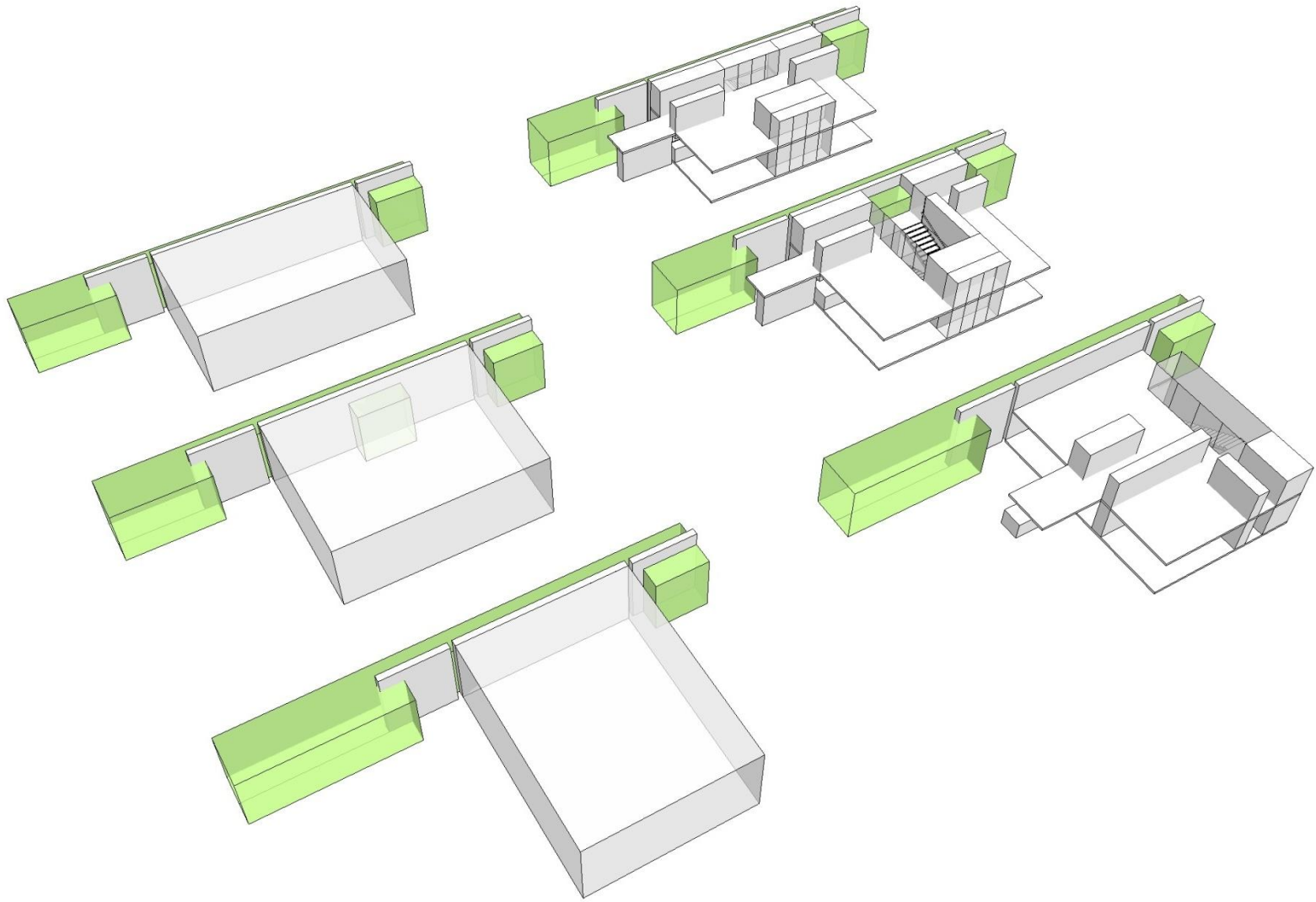
6. Apply the skin, external storage and side hedges

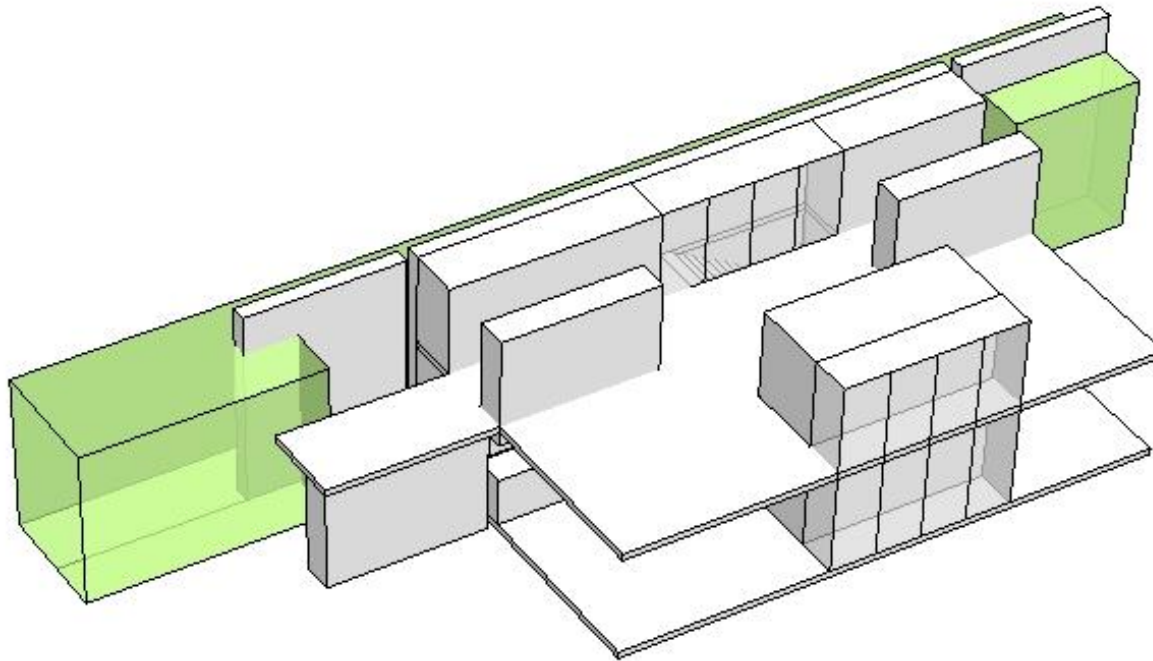


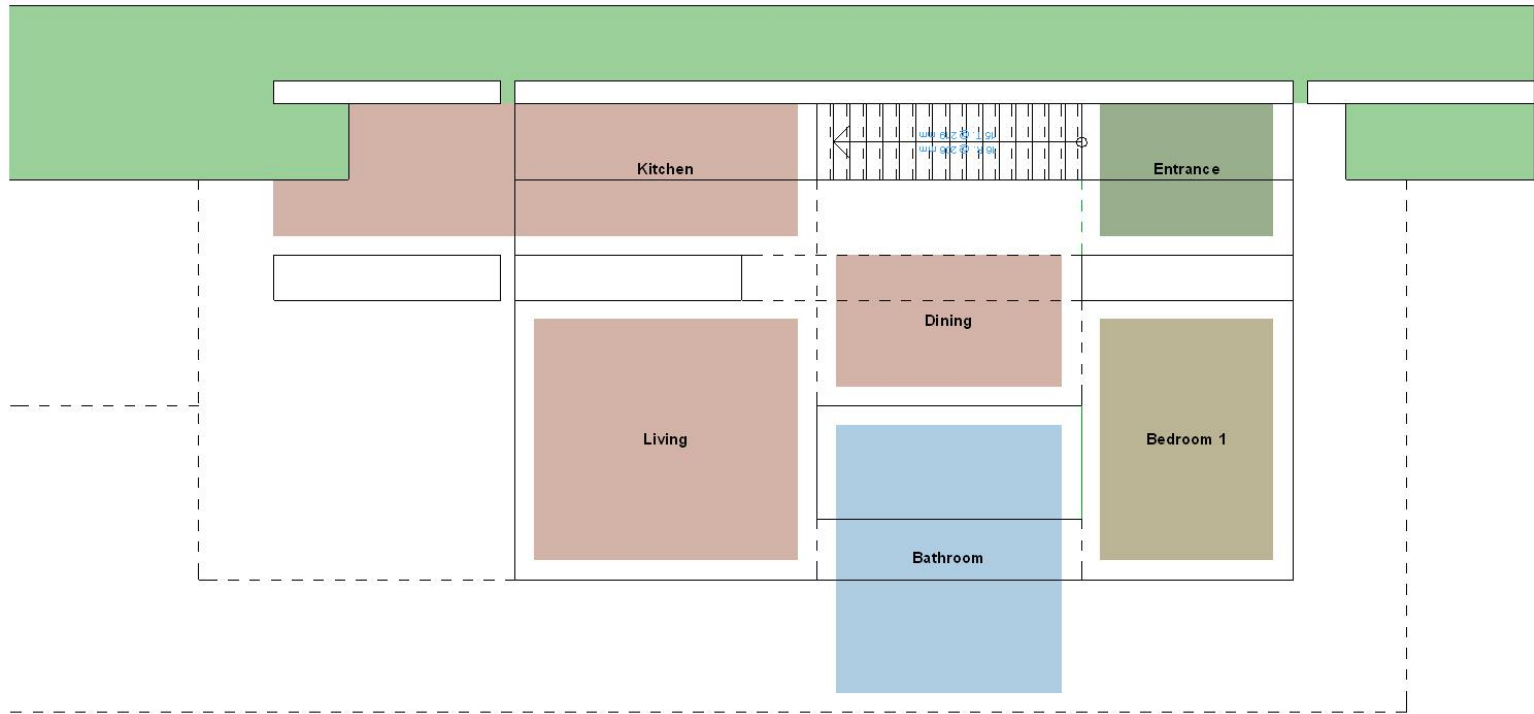


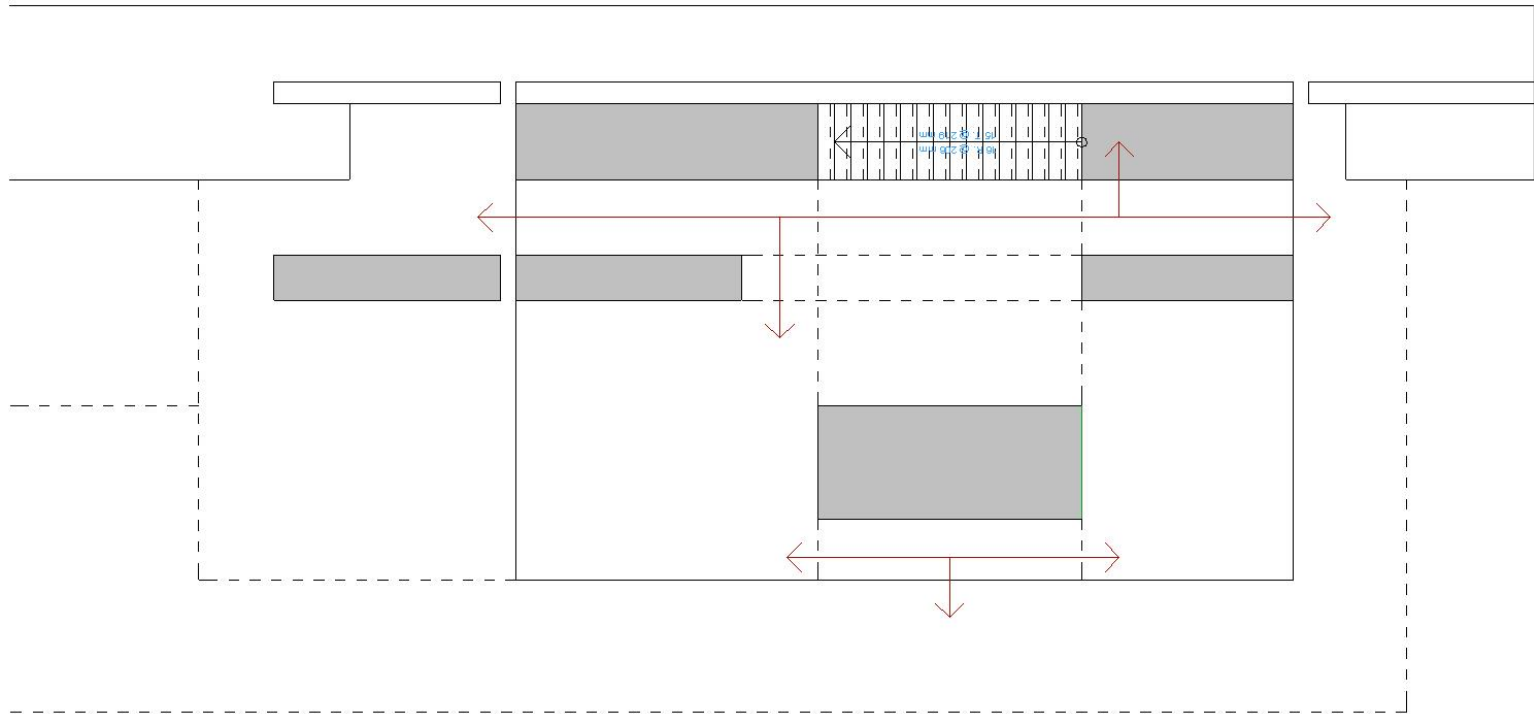


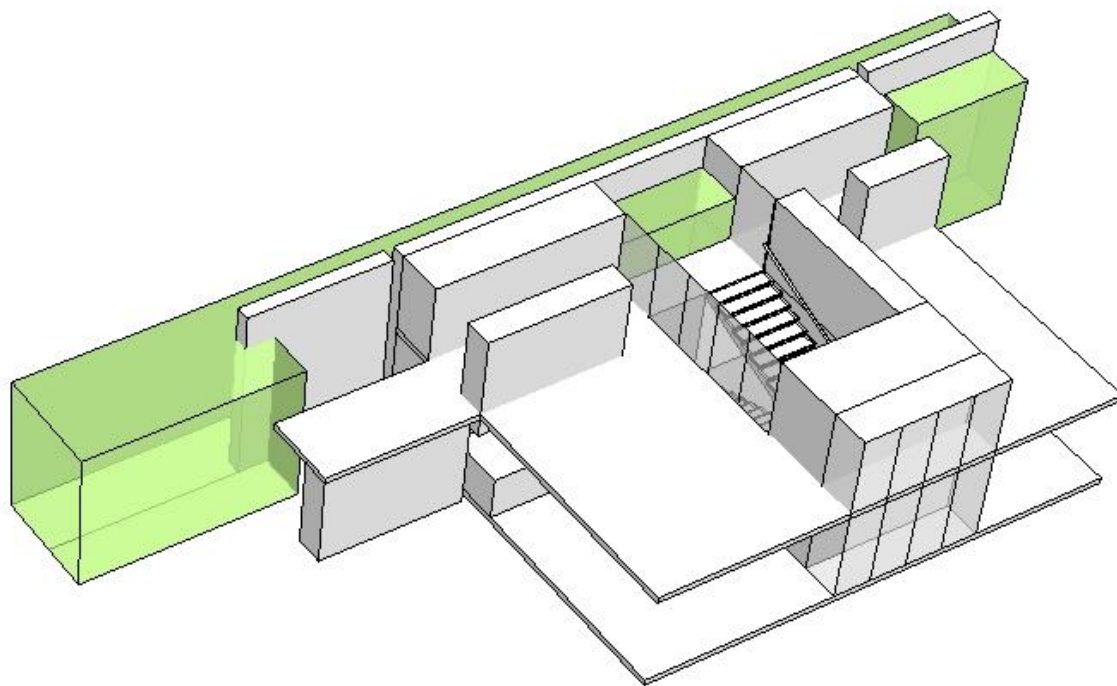
- Developmental Exploration of facade system

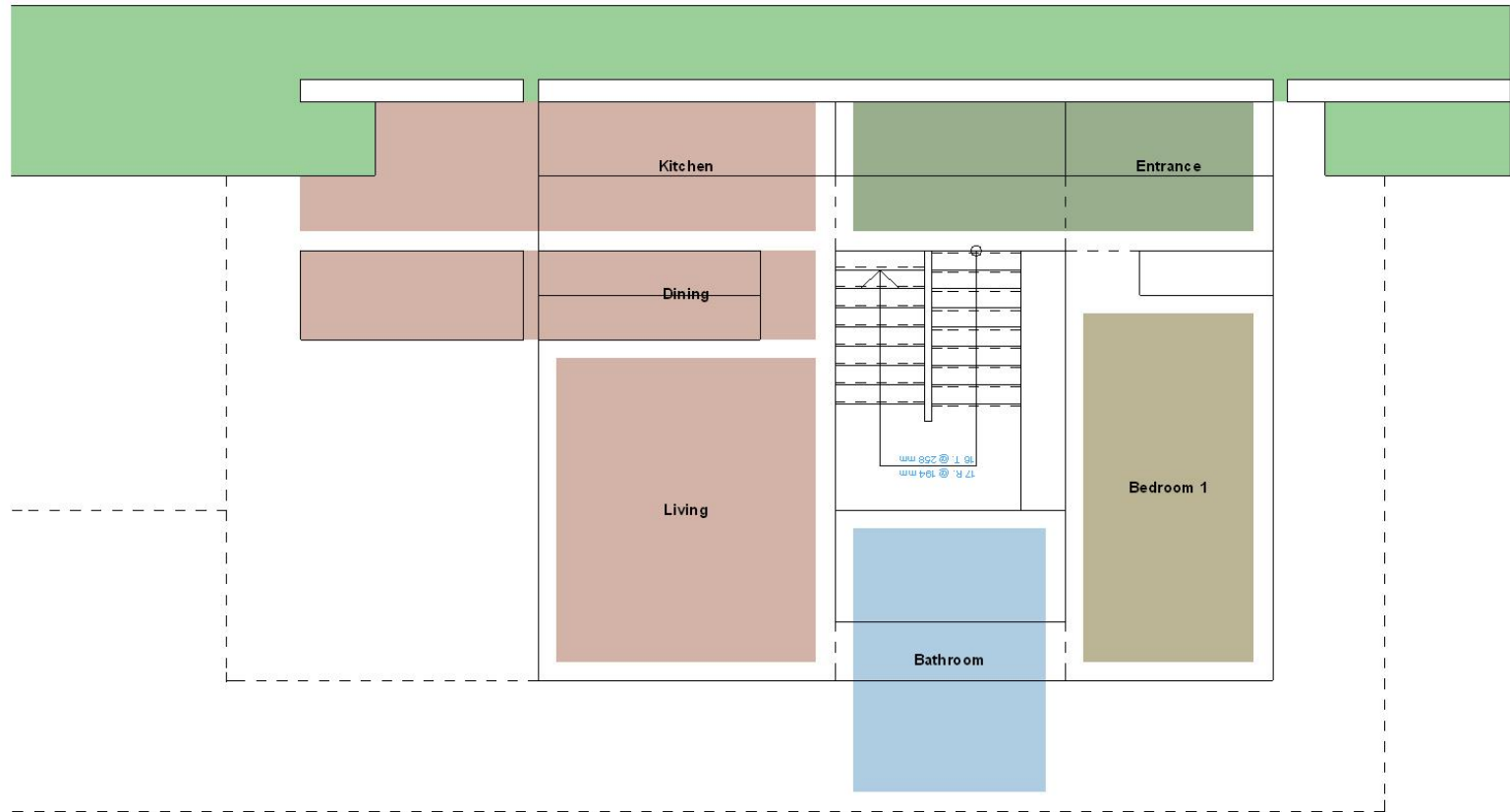


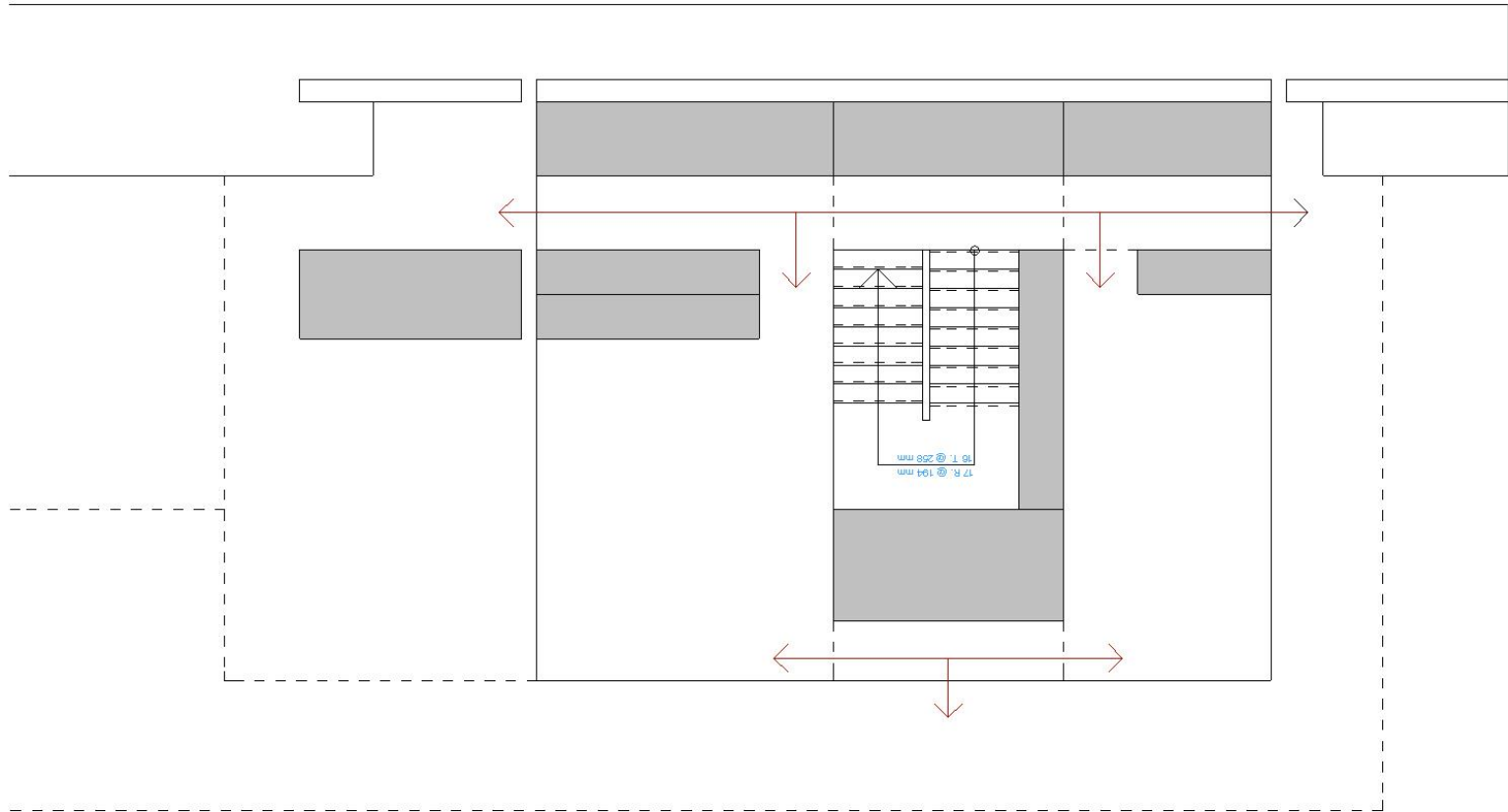


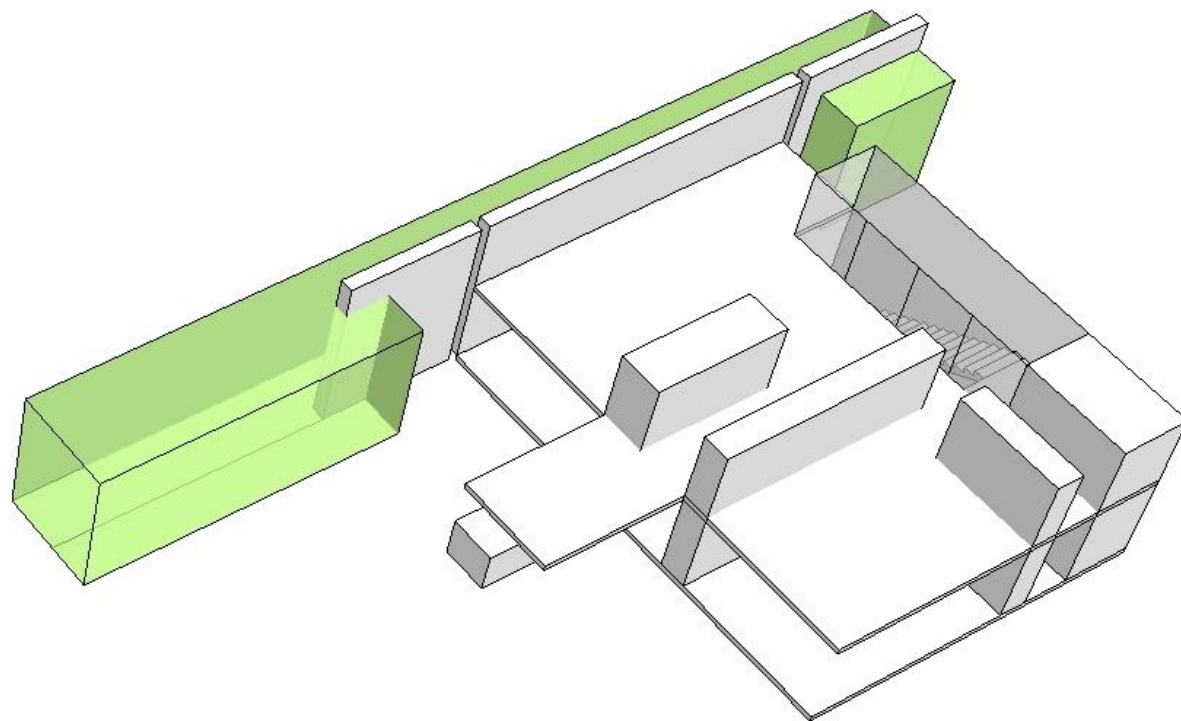


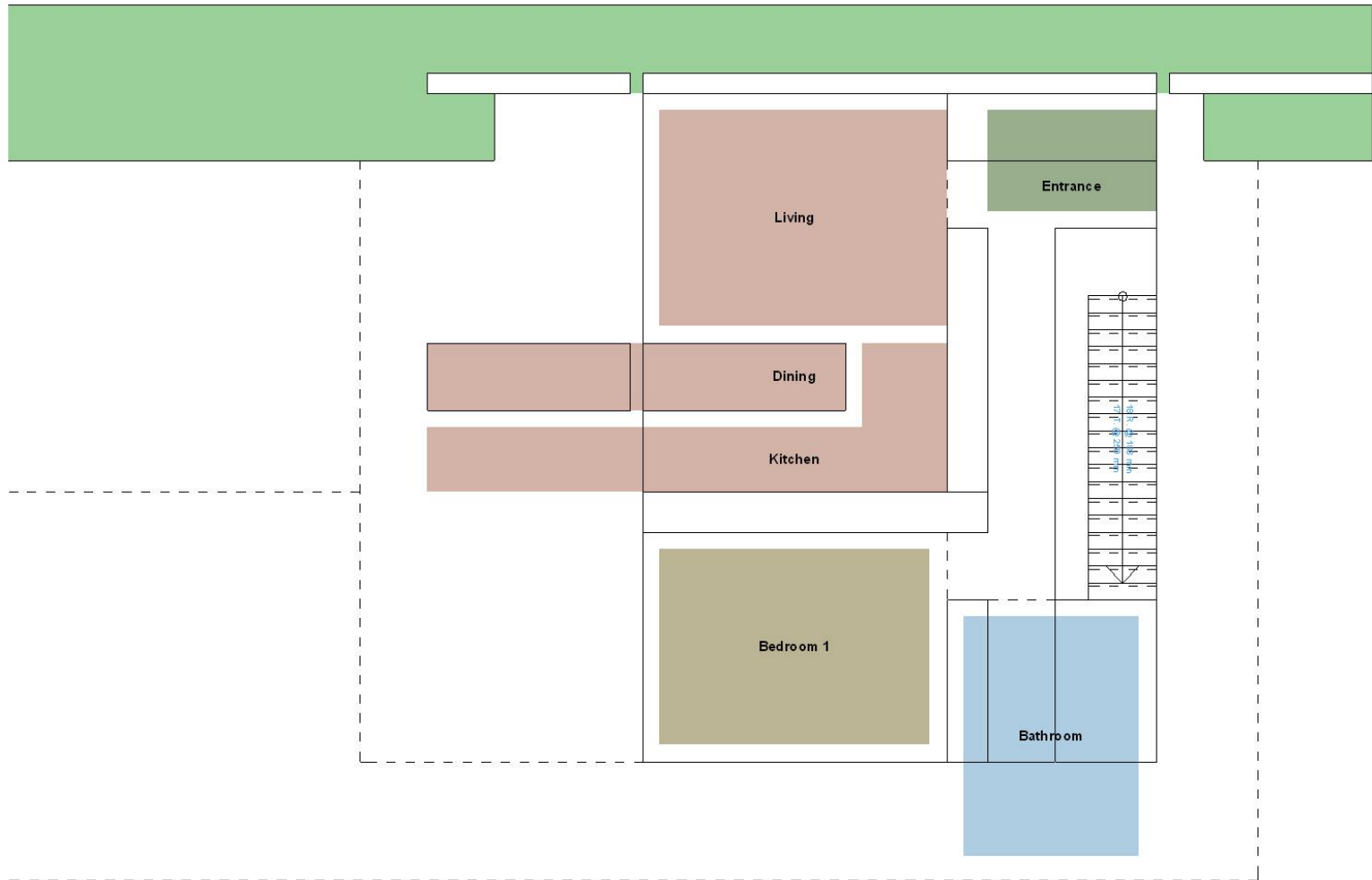


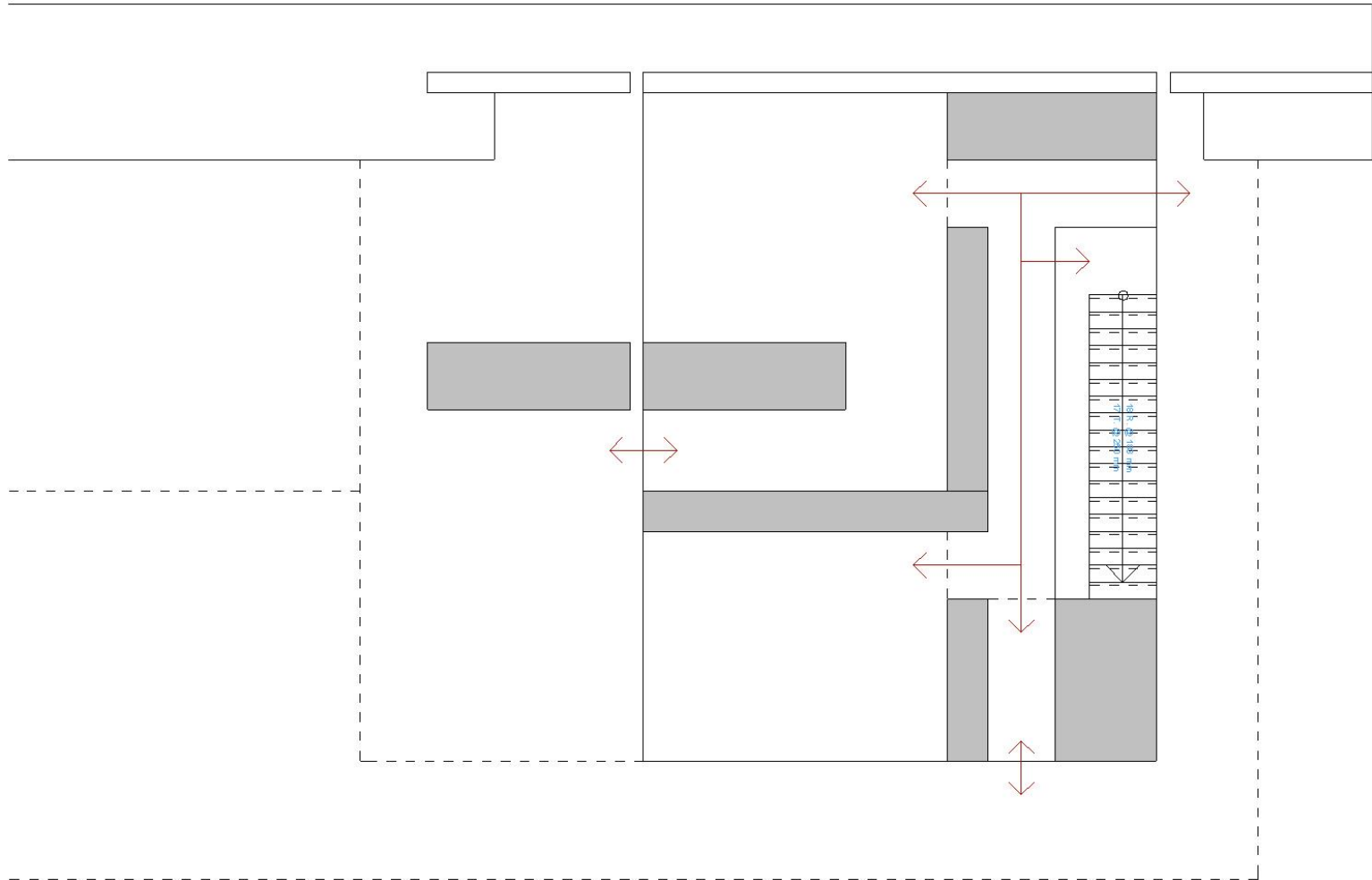




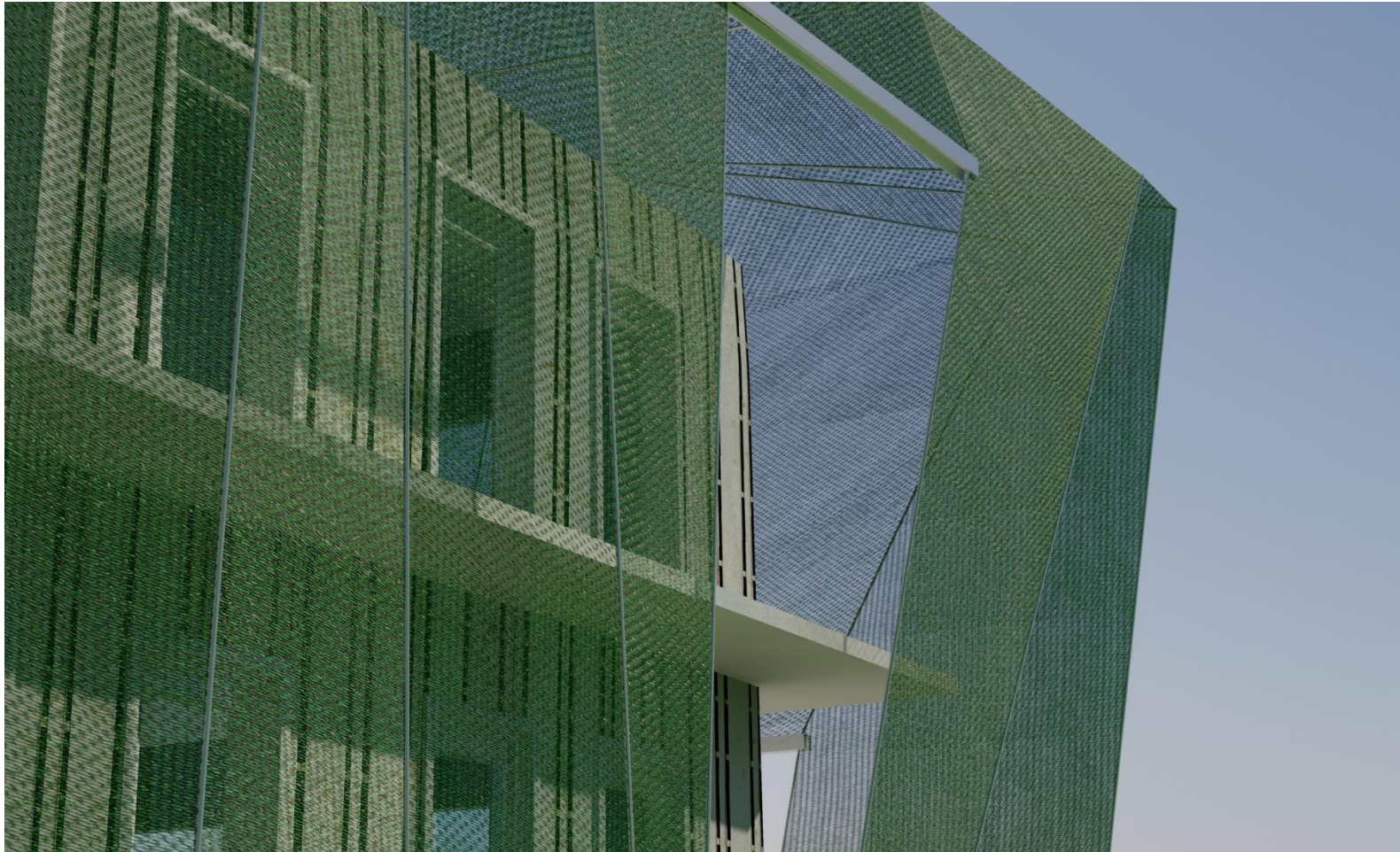
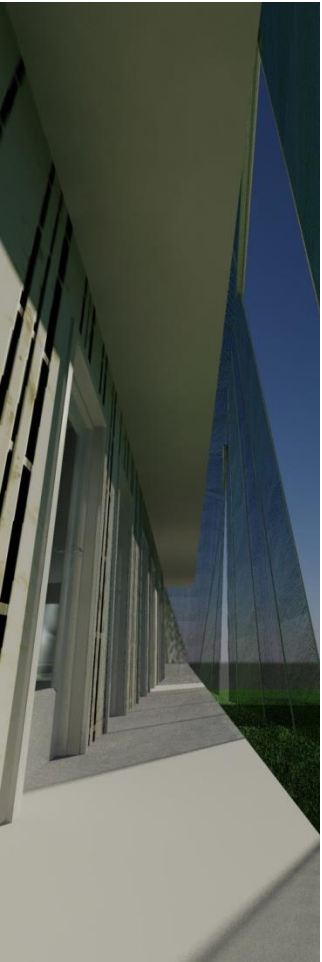


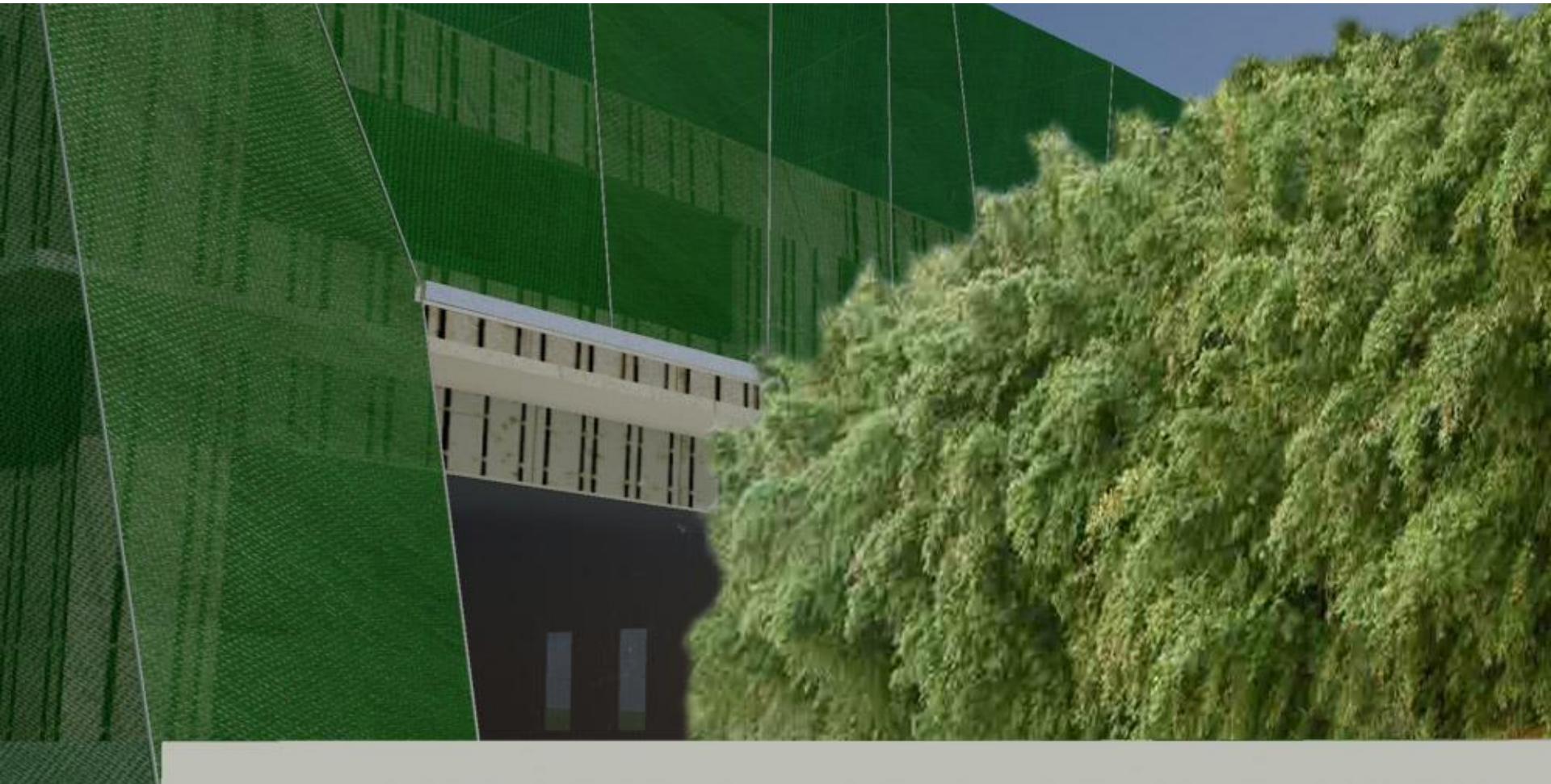












// EXAMPLES - CONSTRUCTION SYSTEM / DETAIL

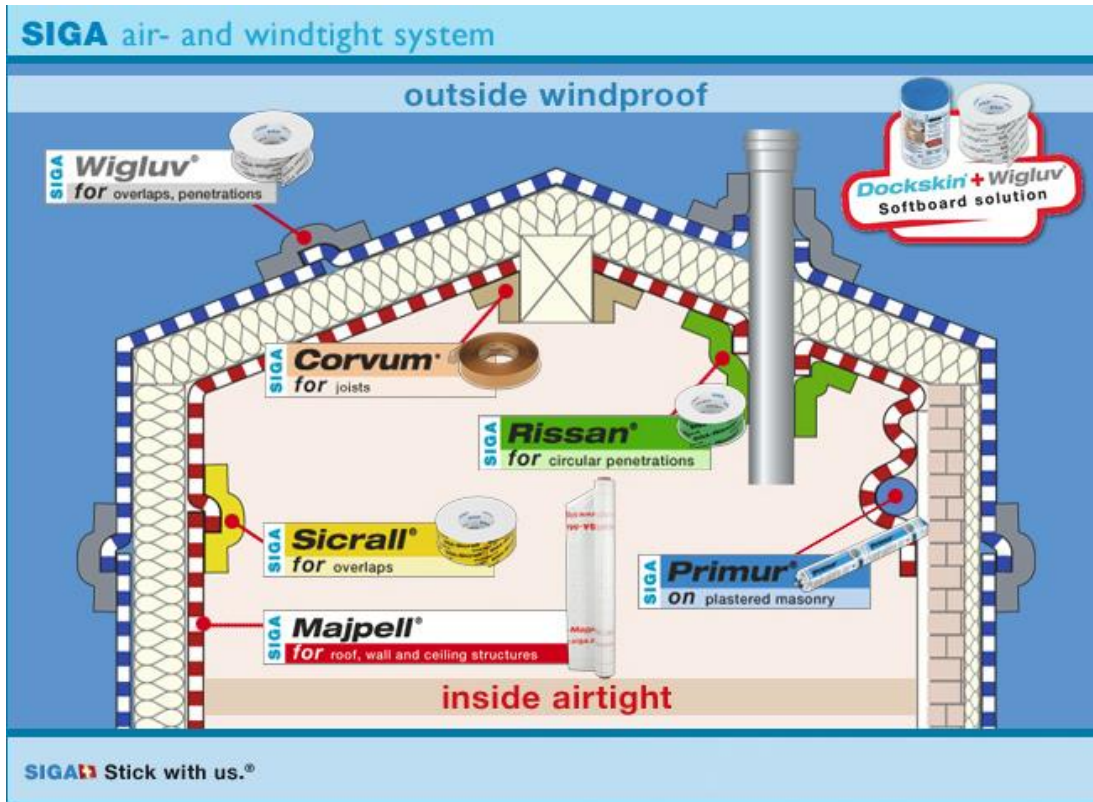


Prefabricated modules

- + Building under controlled conditions
- + Standardization and flexibility
- + Cost efficient
- + Consequent quality control
- + Significantly shorter construction period



- Modular System
- Timber Frame Construction
- Integrated Insulation



Single-sided, high-performance adhesive tape for durable, airtight bonding of vapour barriers for overlaps in interior applications.

Sturdy carrier material for long overlaps, hand-tearable, saves time, extremely strong adhesion, highly resistant to aging