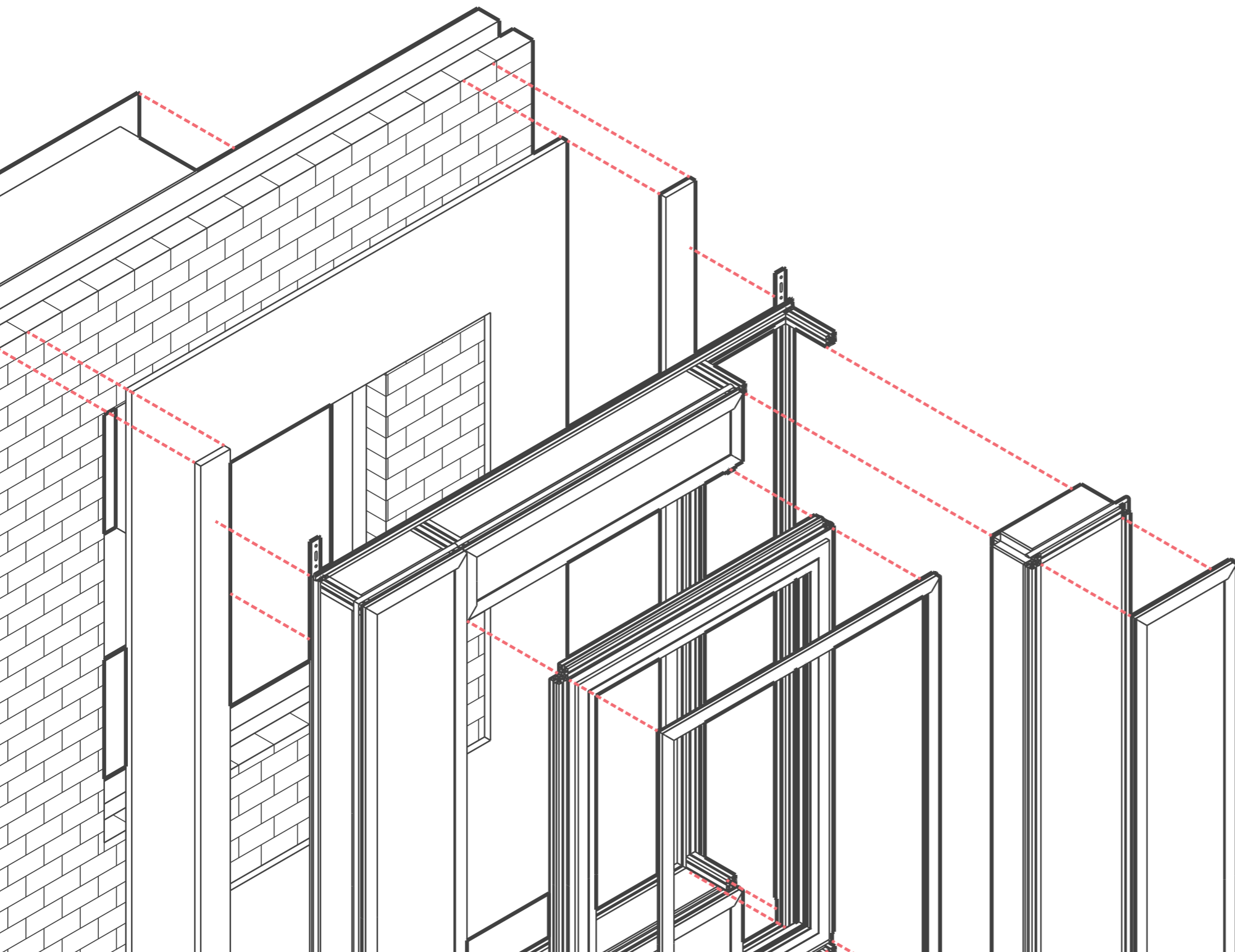


# RE<sup>∞</sup>NOVATE

Upgradable Building Envelope System for Energy  
Reduction Renovation of Dutch Post-war Apartments

Mick Simmering



# RE<sup>∞</sup>NOVATE

## Upgradable Building Envelope System for Energy Reduction Renovation of Dutch Post-war Apartments

### Master of Science (MSc) thesis

Re-novate- Upgradable Building Envelope System for Energy Reduction Renovation of Dutch Post-war Apartments

Part of series of graduation projects aligned with the 2ndSkin Project.

25 January 2019

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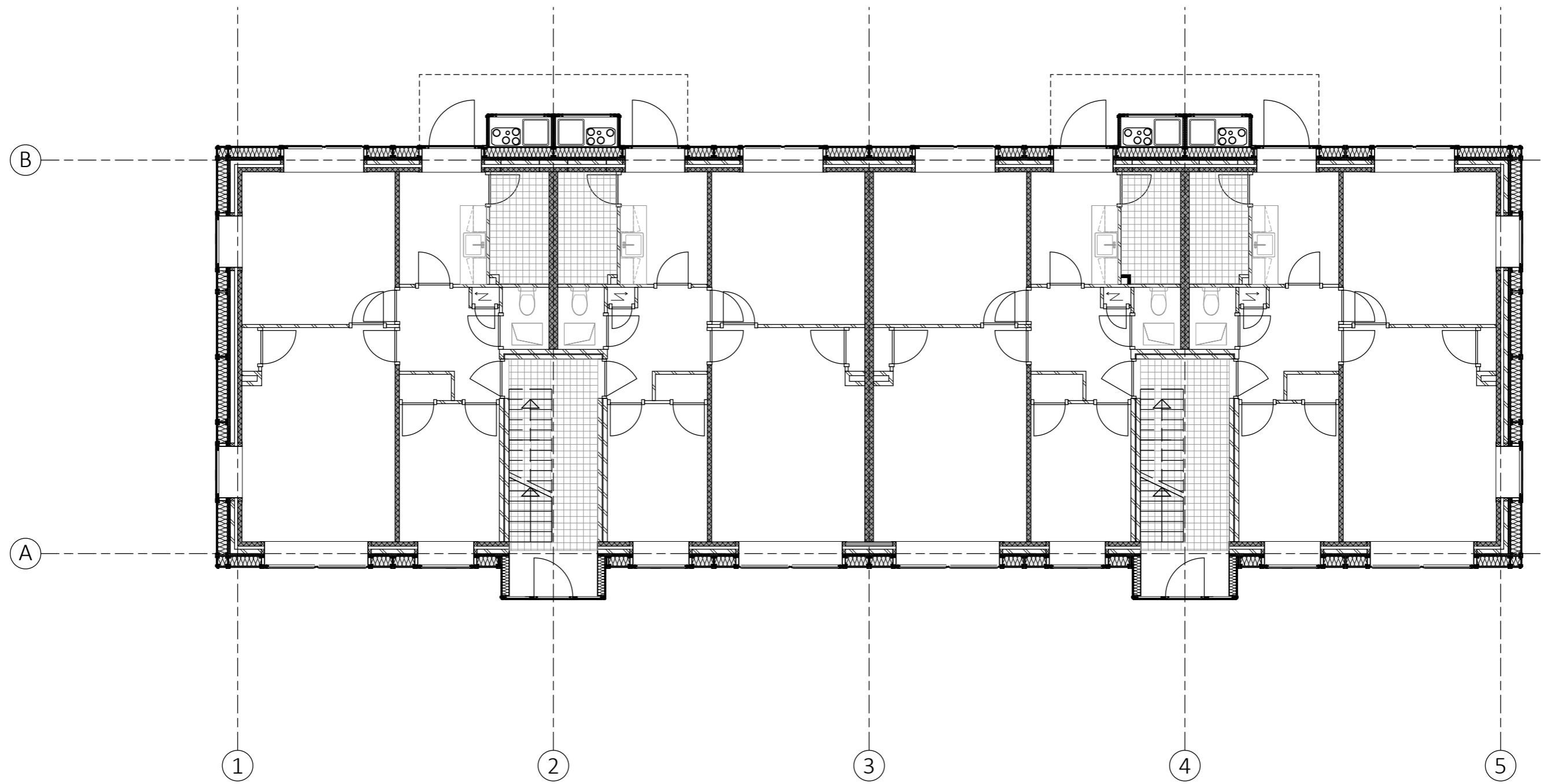


Fig. 9.2.1: Plan | 1:100 | Ground Floor

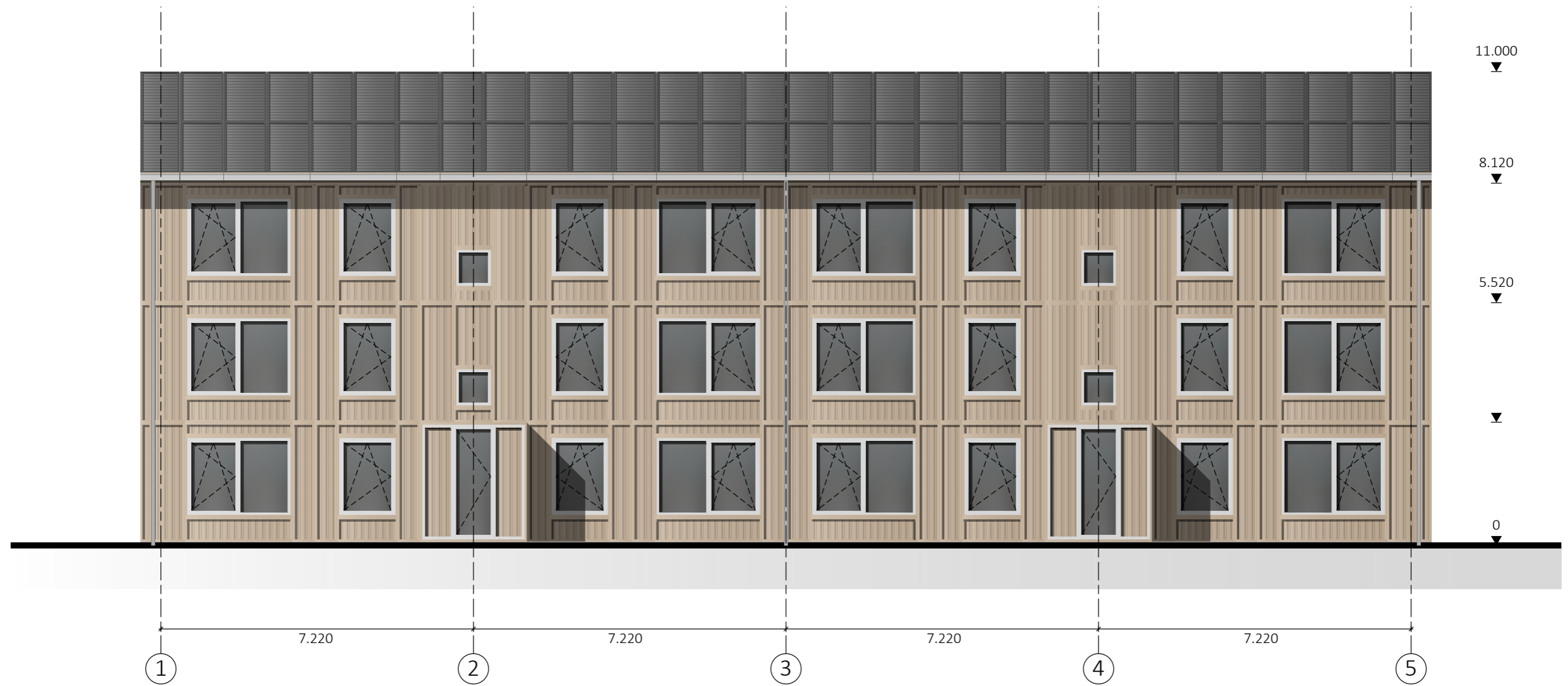


Fig. 9.2.2: Elevation | 1:100 | South



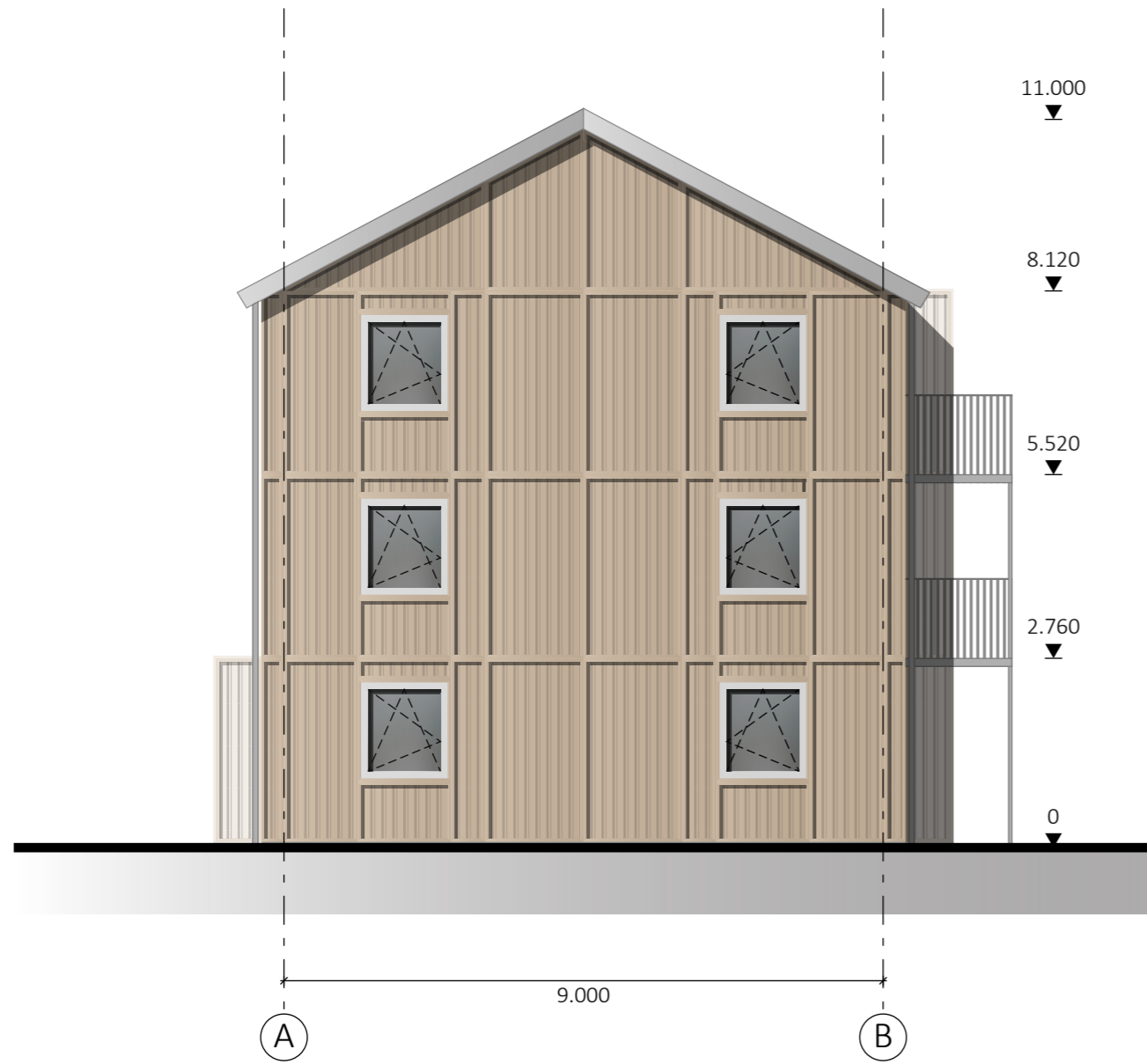


Fig. 9.2.3: Elevation | 1:100 | East

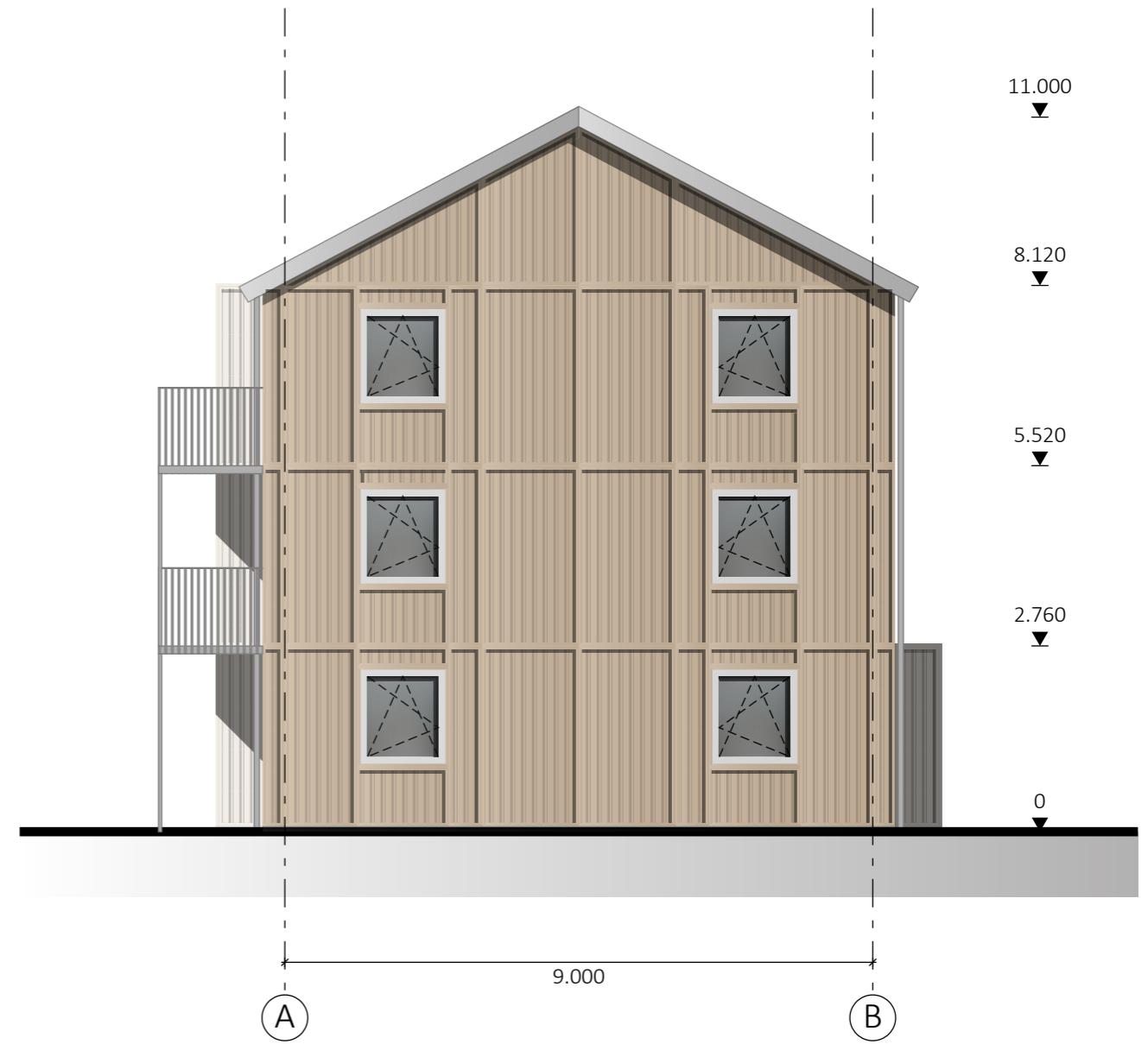


Fig. 9.2.4: Elevation | 1:100 | West



Fig. 9.2.5: Elevation | 1:100 | South

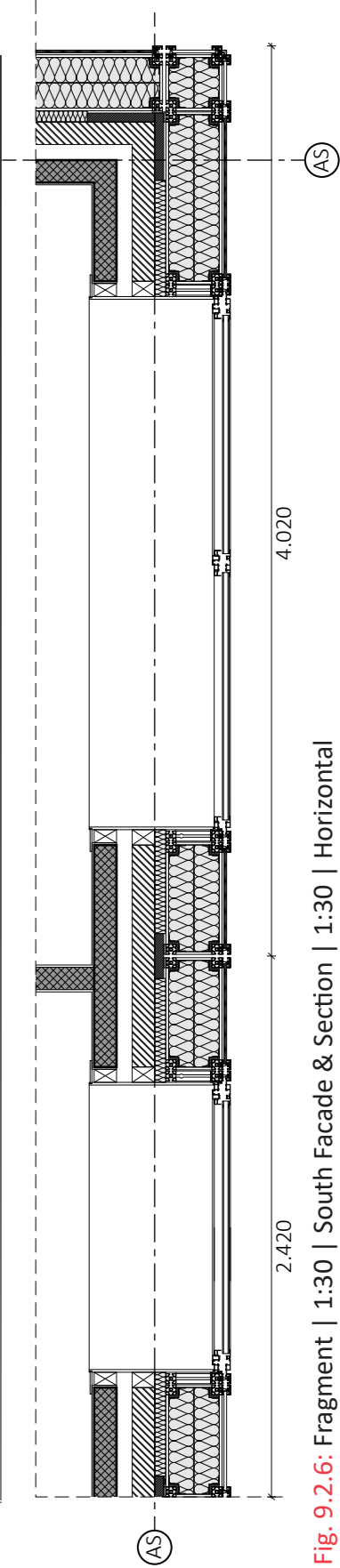


Fig. 9.2.6: Fragment | 1:30 | South Facade & Section | 1:30 | Horizontal

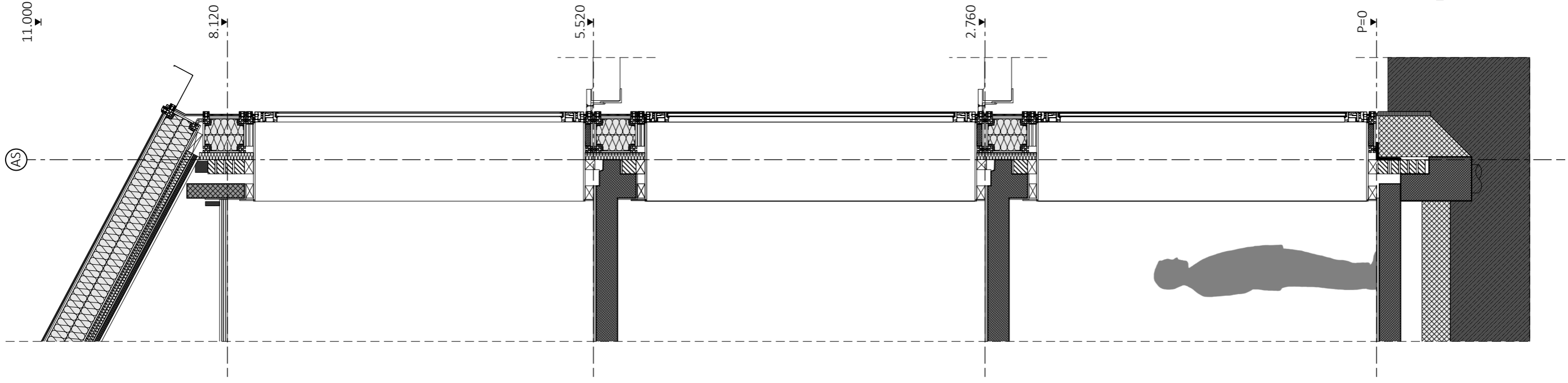


Fig. 9.2.8: Section | 1:30 | North

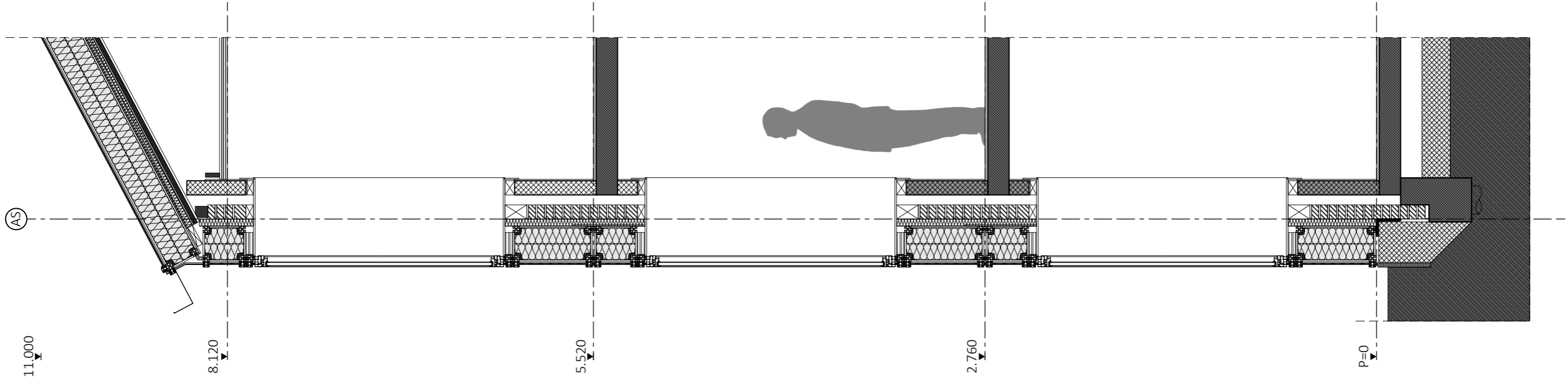
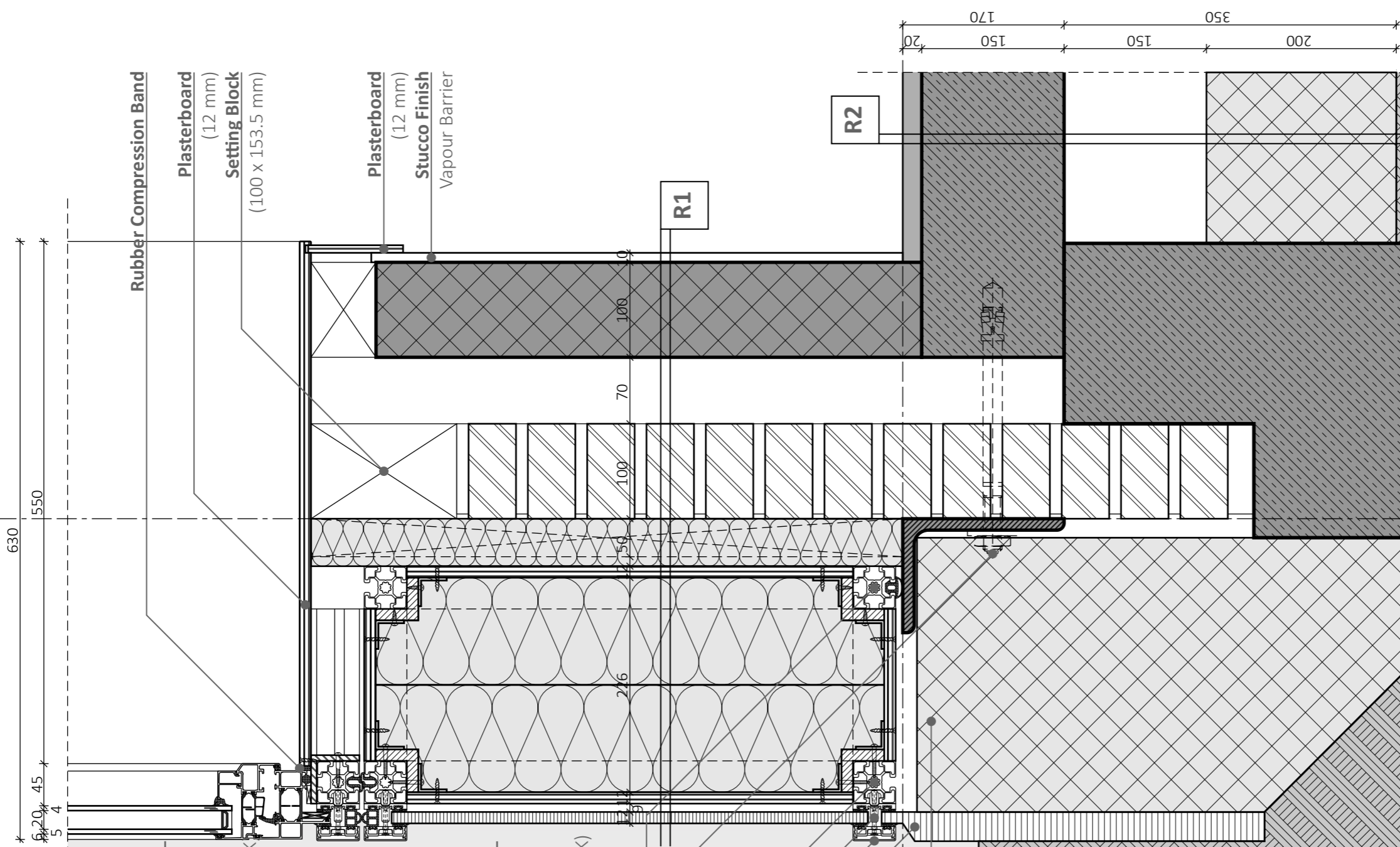


Fig. 9.2.7: Section | 1:30 | South



AS



R1

- STANDARD MODULE CONFIGURATION**
- Bamboo Composite Panel (12 mm)
  - Air Cavity (9 mm)
  - MDF Panel (12 mm)
  - EPS Insulation (226 mm) ( $R_c = 7,7 \text{ m}^2/\text{W}^*\text{K}$ )
  - MDF Panel (12 mm)
  - Adaptation Layer (50 mm)
  - Existing Brick Facade (100 mm)
  - Air Cavity (70 mm)
  - Existing Concrete Wall (12 mm)
  - Stucco Finish (10 mm)

635

R2

- FOUNDATION INSULATION**
- Finishing Floor (20 mm)
  - Existing Concrete Floor (150 mm)
  - Crawlspace (150 mm)
  - XPS Insulation (200 mm) ( $R_c = 6.1 \text{ m}^2/\text{W}^*\text{K}$ )
- 80/20 T-slot Profile 45X45L**
- Aluminium extrusion profile (standard)
  - Steel L-Profile
  - Support for substructure
- 80/20 T-slot Profile 45X45L**
- Aluminium extrusion profile (two-flange)
  - Aluminium Clamp Profile
  - Connected to T-slot with Insulated Stud
- Aluminium Finishing Cap**
- Customisable shape and material
- Concrete Cement Board (30 mm)**

P=0

P-80

P-170

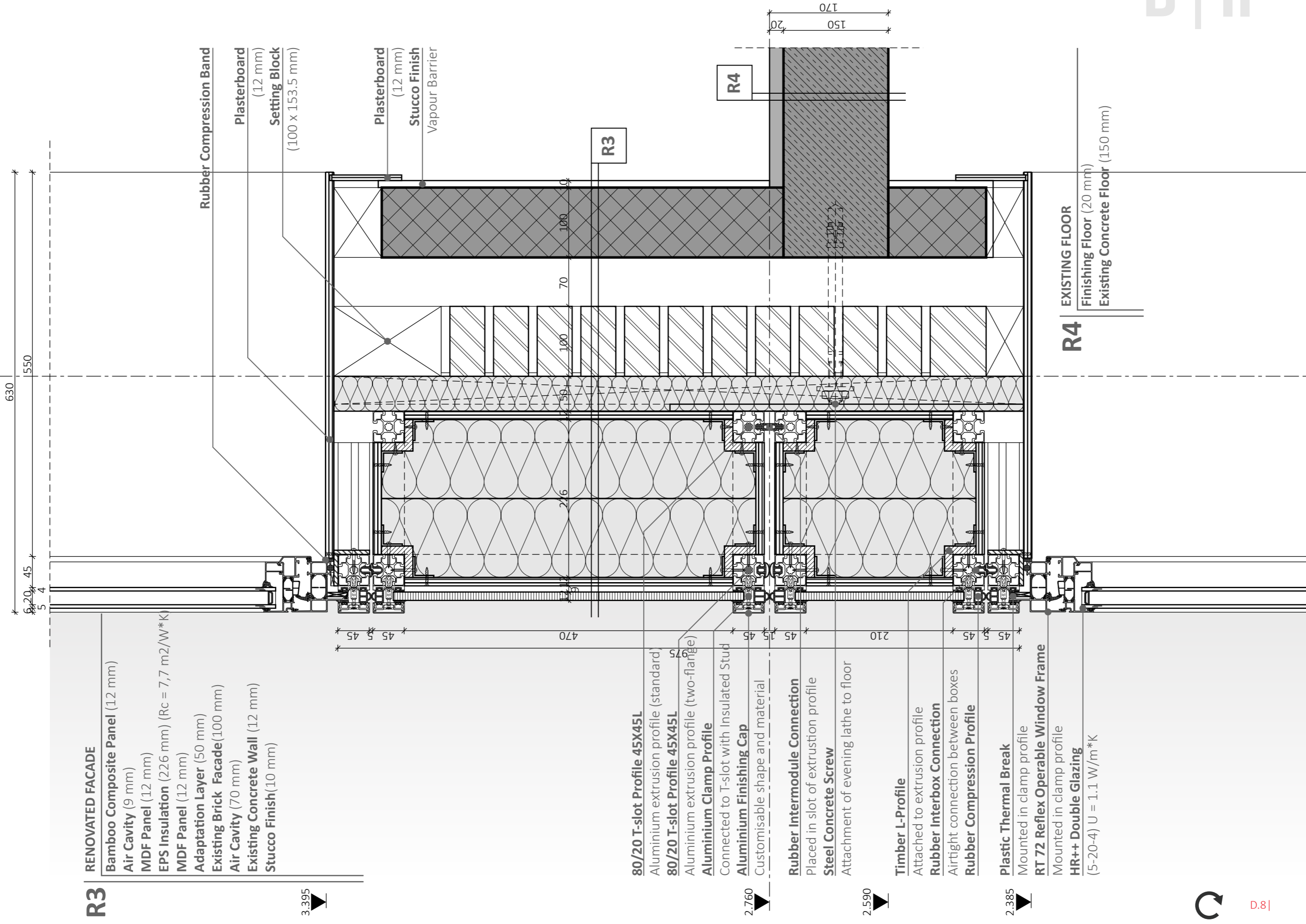
P-520



D.7|

Fig. 9.2.9: Detail | 1:5 | Vertical | Foundation

AS



R3

**RENOVATED FACADE**

- Bamboo Composite Panel (12 mm)
- Air Cavity (9 mm)
- MDF Panel (12 mm)
- EPS Insulation (226 mm) ( $R_c = 7,7 \text{ m}^2/\text{W}^*\text{K}$ )
- MDF Panel (12 mm)
- Adaptation Layer (50 mm)
- Existing Brick Facade (100 mm)
- Air Cavity (70 mm)
- Existing Concrete Wall (12 mm)
- Stucco Finish (10 mm)

3.395

**80/20 T-slot Profile 45X45L**

Aluminium extrusion profile (standard)

**80/20 T-slot Profile 45X45L**

Aluminium extrusion profile (two-flange)

**Aluminium Clamp Profile**

Connected to T-slot with Insulated Stud

**Aluminium Finishing Cap**

Customisable shape and material

**Rubber Intermodule Connection**

Placed in slot of extrusion profile

**Steel Concrete Screw**

Attachment of evening lathe to floor

**Timber L-Profile**

Attached to extrusion profile

**Rubber Interbox Connection**

Airtight connection between boxes

**Rubber Compression Profile**

**Plastic Thermal Break**

Mounted in clamp profile

**RT 72 Reflex Operable Window Frame**

Mounted in clamp profile

**HR++ Double Glazing**

(5-20-4)  $U = 1.1 \text{ W}/\text{m}^*\text{K}$

2.760

2.590

2.385



Fig. 9.2.10: Detail | 1:5 | Vertical | Floor Connection

## R6

### SOLAR PANEL MODULE CONFIGURATION

- Photovoltaic Panel
- Air Cavity (9 mm)
- MDF Panel (12 mm)
- EPS Insulation (226 mm) ( $R_c = 7,7 \text{ m}^2/\text{W}^*\text{K}$ )
- MDF Panel (12 mm)
- Adaptation Layer (50 mm)
- Woodwool Cement Board (56 mm)

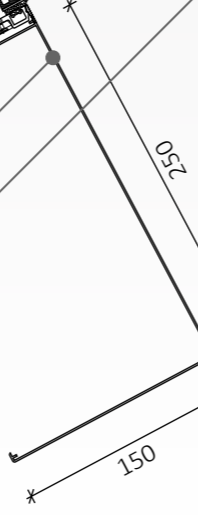
### Aluminium Clamp Profile (Chamfered)

Adjusted to guide water into gutter

### Corner Piece Thermal Break

### Aluminium Gutter

### Sandwich Panel



### Rubber Intermodule Connection

Airtight connection profile

### Aluminium Finishing Cap

Customisable shape and material

### Aluminium Clamp Profile

Connected to T-slot with Insulated Stud

### 80/20 T-slot Profile 45X45L

Aluminium extrusion profile

### 80/20 T-slot Profile 45X45L

Aluminium extrusion profile (standard)

### Rubber Interbox Connection

Airtight connection between boxes

### Rubber Compression Profile

### Plastic Thermal Break

Mounted in clamp profile

### RT 72 Reflex Operable Window Frame

Mounted in clamp profile

### HR++ Double Glazing

(5-20-4) U = 1.1 W/m<sup>2</sup>K

## R5

### STANDARD MODULE CONFIGURATION

- Bamboo Composite Panel (12 mm)
- Air Cavity (9 mm)
- MDF Panel (12 mm)
- EPS Insulation (226 mm) ( $R_c = 7,7 \text{ m}^2/\text{W}^*\text{K}$ )
- MDF Panel (12 mm)
- Adaptation Layer (50 mm)
- Existing Brick Facade (100 mm)
- Air Cavity (70 mm)
- Existing Concrete Wall (12 mm)
- Stucco Finish (10 mm)



8.175



8.120



7.925



D.9 |

D | III

Fig. 9.2.11: Detail | 1:5 | Vertical | Roof Connection



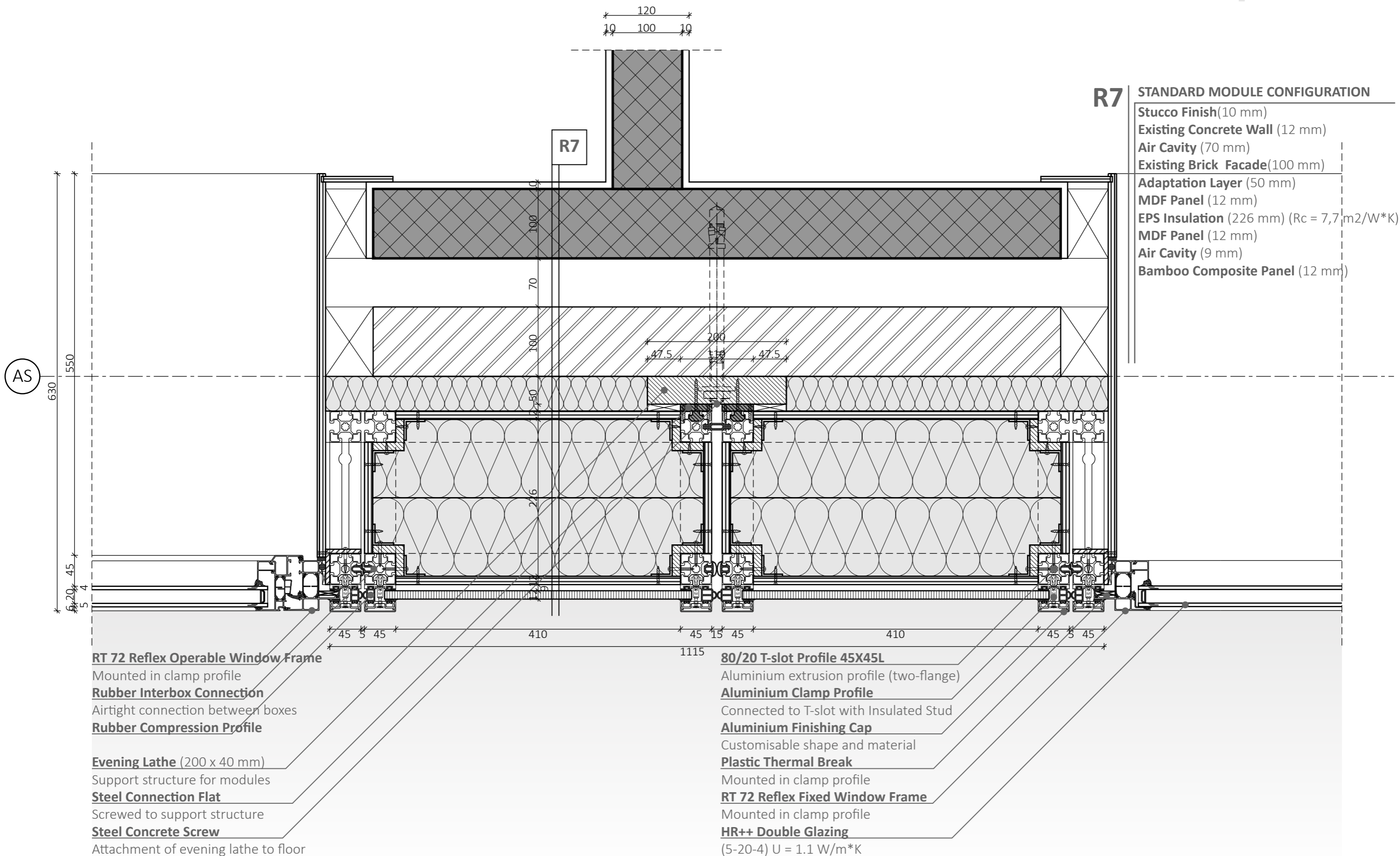


Fig. 9.2.12: Detail | 1:5 | Horizontal | Module Connection

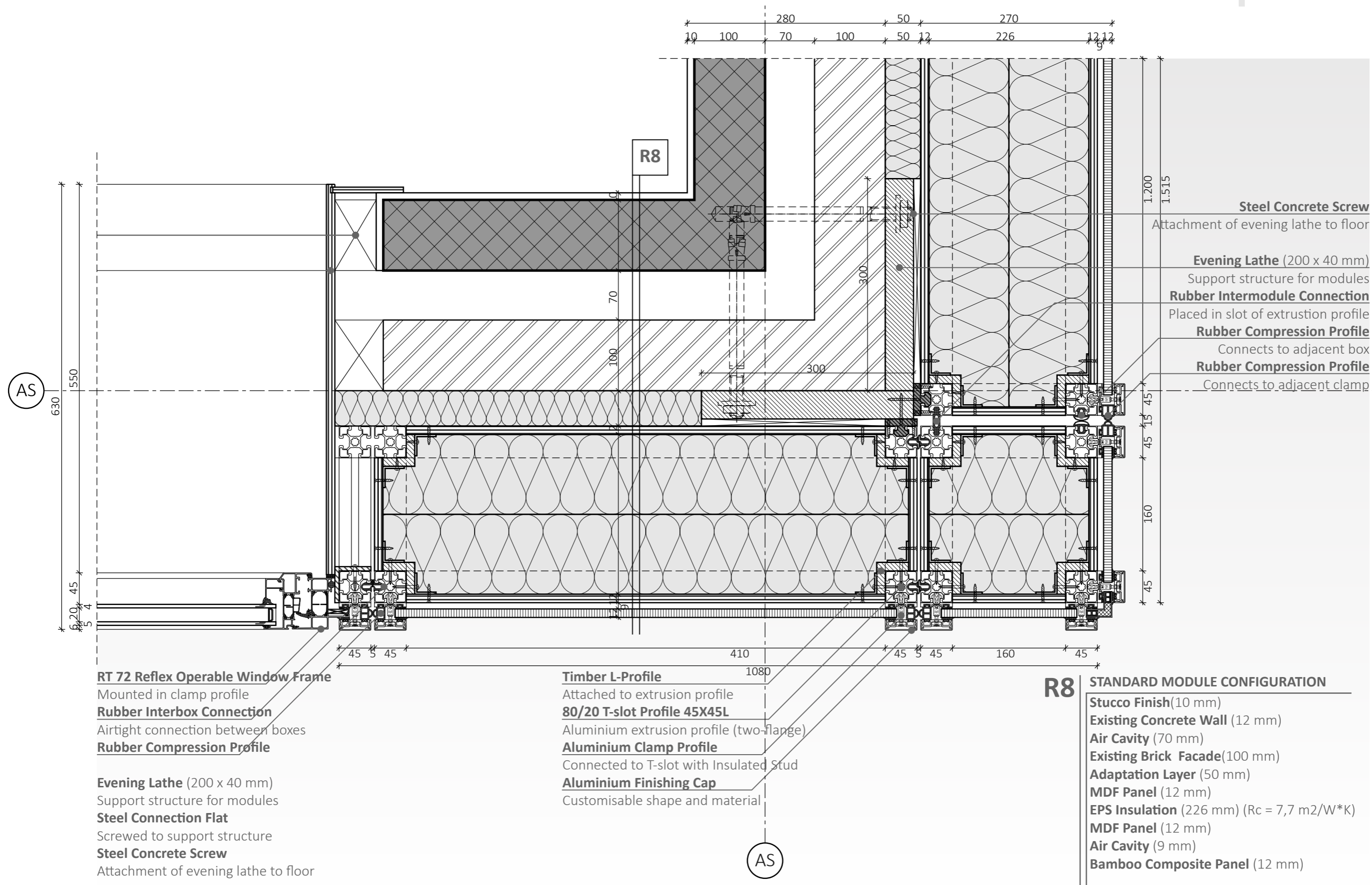
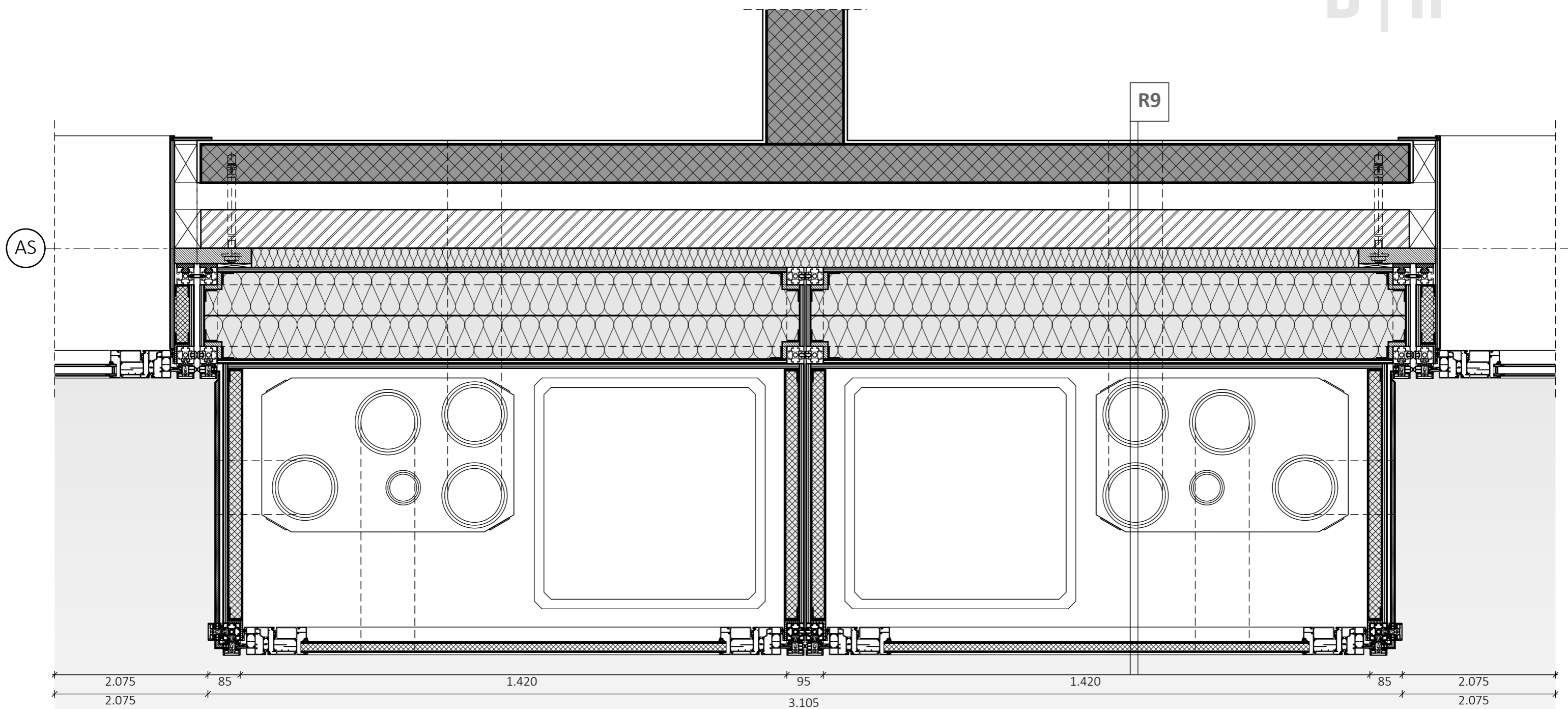


Fig. 9.2.13: Detail | 1:5 | Horizontal | Corner Connection



**R9** INSTALLATIONS MODULE CONFIGURATION

- Stucco Finish**(10 mm)
- Existing Concrete Wall** (12 mm)
- Air Cavity** (70 mm)
- Existing Brick Facade**(100 mm)
- Adaptation Layer** (50 mm)
- MDF Panel** (12 mm)
- EPS Insulation** (226 mm) ( $R_c = 7,7 \text{ m}^2/\text{W}\cdot\text{K}$ )
- MDF Panel** (12 mm)
- MDF Panel** (12 mm)
- Installation Space** (710 mm)
- Integrated RT 72 Reflex Door** (29 mm)

Fig. 9.2.14: Detail | 1:10 | Horizontal | Installation Box

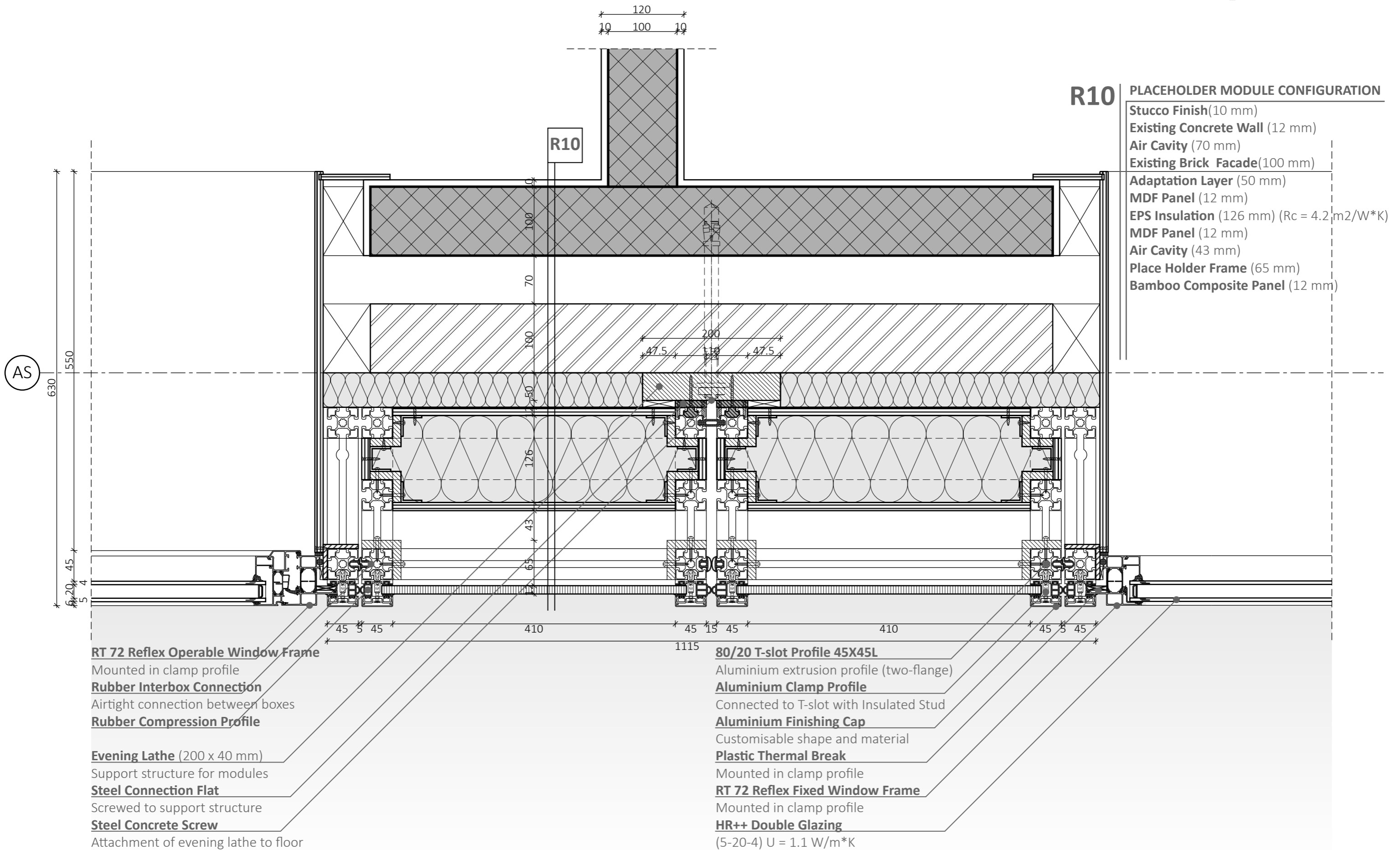


Fig. 9.4.1.2: Detail | 1:5 | Horizontal | Placeholder Frame



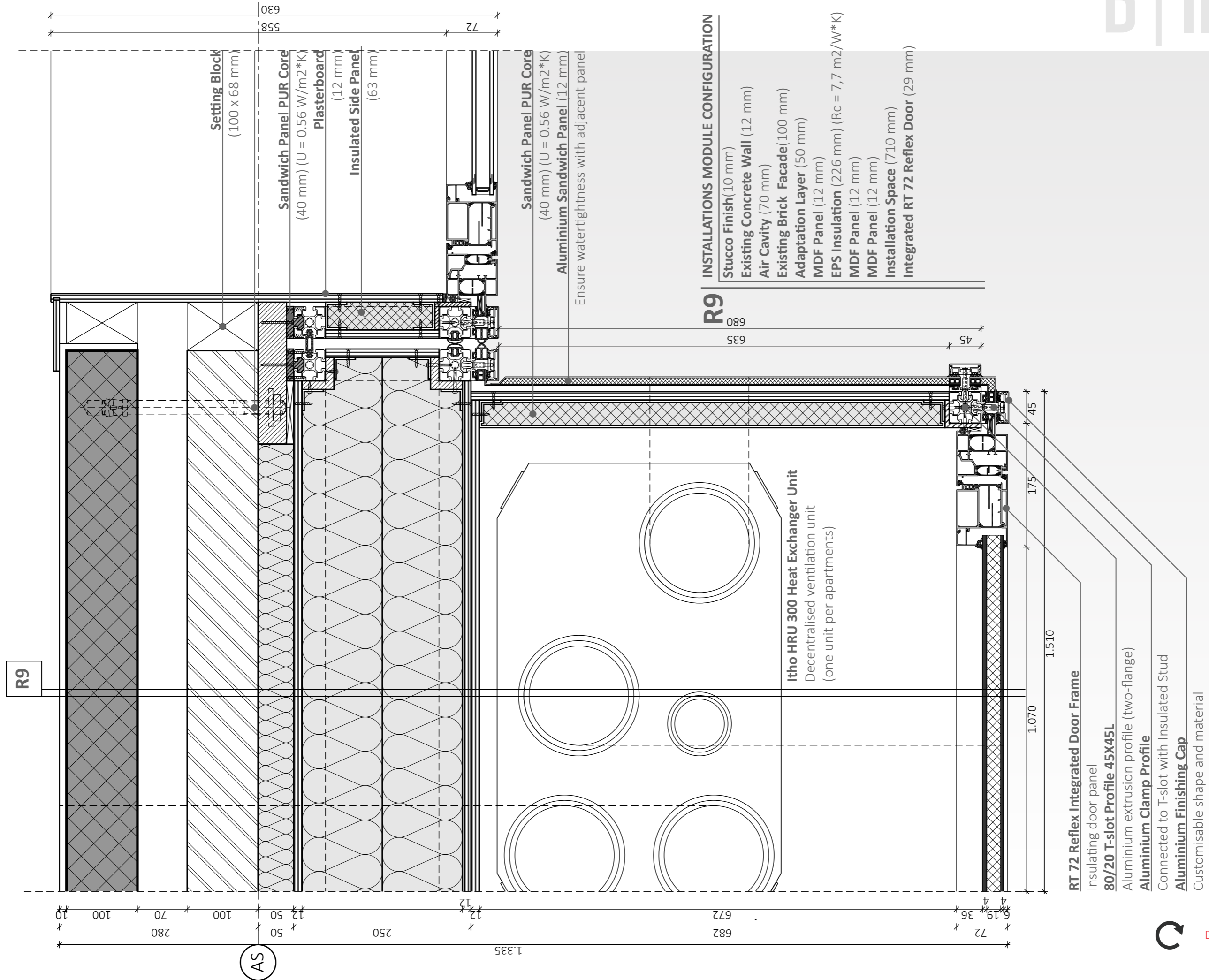


Fig. 9.4.2.4: Detail | 1:5 | Horizontal | Installation Box

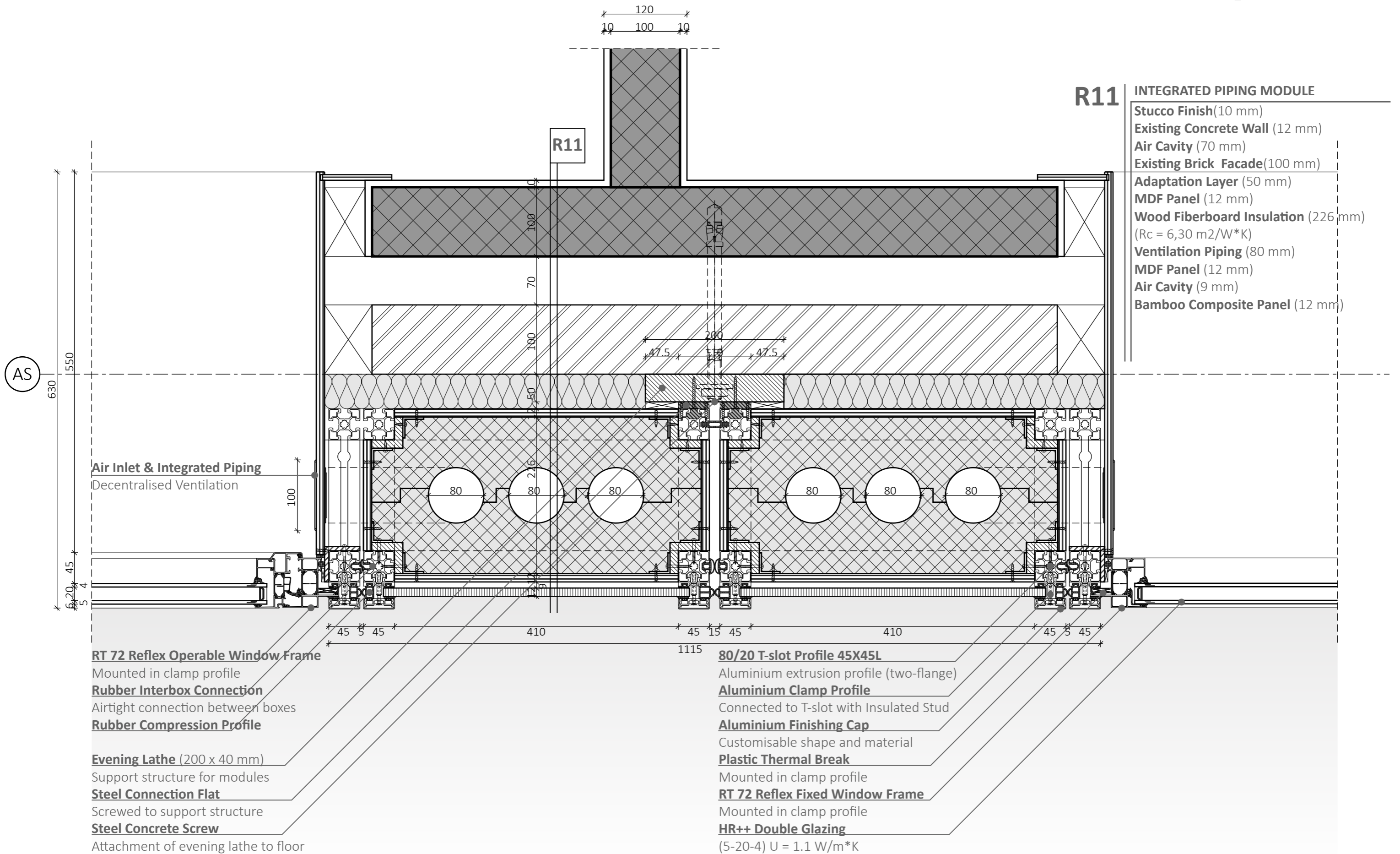
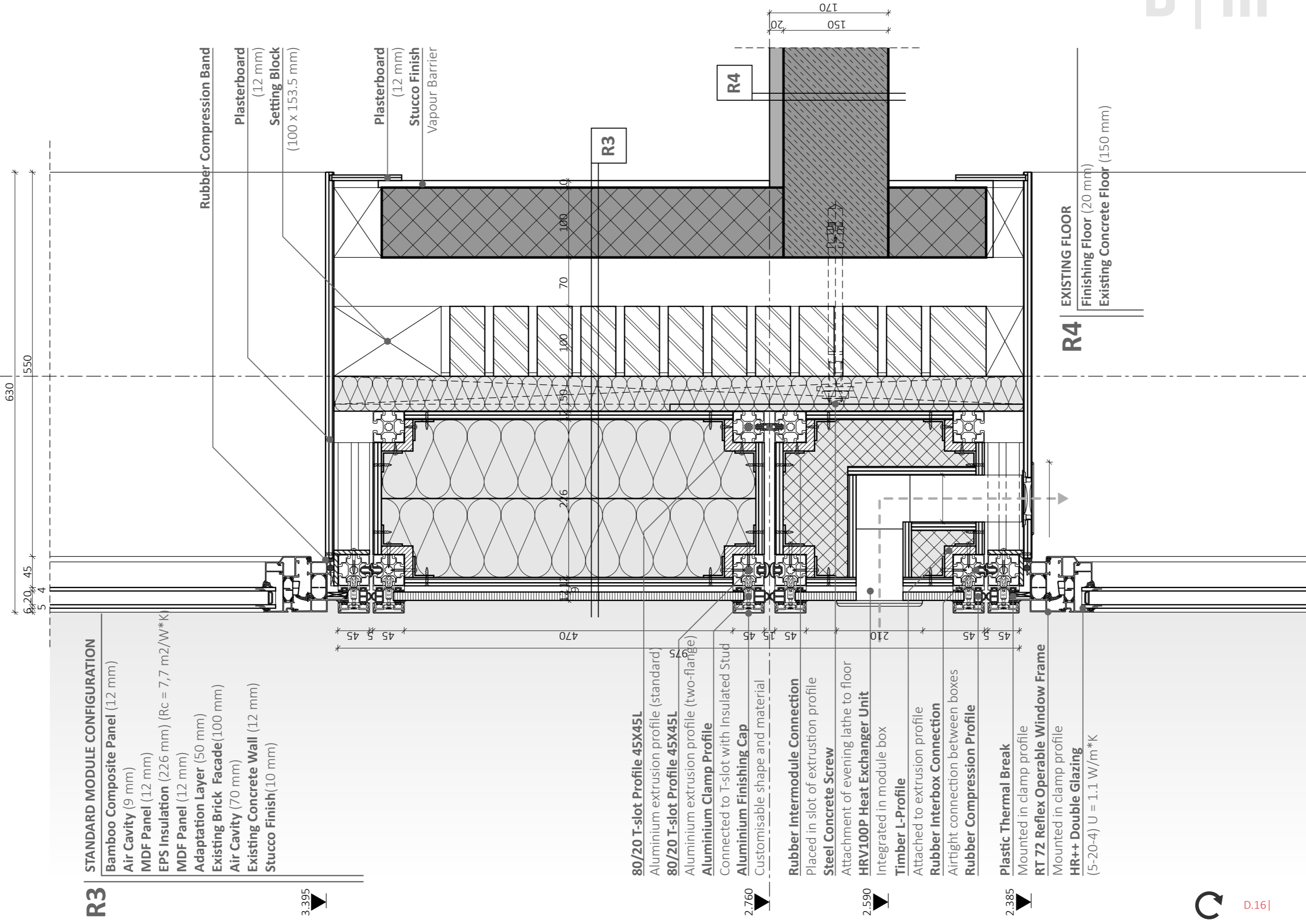


Fig. 9.4.3.4: Detail | 1:5 | Horizontal | Integrated Piping

AS



R3

**STANDARD MODULE CONFIGURATION**

- Bamboo Composite Panel (12 mm)
- Air Cavity (9 mm)
- MDF Panel (12 mm)
- EPS Insulation (226 mm) ( $R_c = 7,7 \text{ m}^2/\text{W}^*\text{K}$ )
- MDF Panel (12 mm)
- Adaptation Layer (50 mm)
- Existing Brick Facade (100 mm)
- Air Cavity (70 mm)
- Existing Concrete Wall (12 mm)
- Stucco Finish (10 mm)

3.395



**80/20 T-slot Profile 45X45L**

Aluminium extrusion profile (standard)

**80/20 T-slot Profile 45X45L**

Aluminium extrusion profile (two-flange)

**Aluminium Clamp Profile**

Connected to T-slot with Insulated Stud

**Aluminium Finishing Cap**

Customisable shape and material

2.760



**Rubber Intermodule Connection**

Placed in slot of extrusion profile

**Steel Concrete Screw**

Attachment of evening lathe to floor

**HRV100P Heat Exchanger Unit**

Integrated in module box

2.590



**Timber L-Profile**

Attached to extrusion profile

**Rubber Interbox Connection**

Airtight connection between boxes

**Rubber Compression Profile**

**Plastic Thermal Break**

Mounted in clamp profile

**RT 72 Reflex Operable Window Frame**

Mounted in clamp profile

**HR++ Double Glazing**

(5-20-4)  $U = 1.1 \text{ W}/\text{m}^*\text{K}$

2.385



D.16 |

Fig. 9.4.4.4: Detail | 1:5 | Vertical | Integrated Single Heat Exchanger





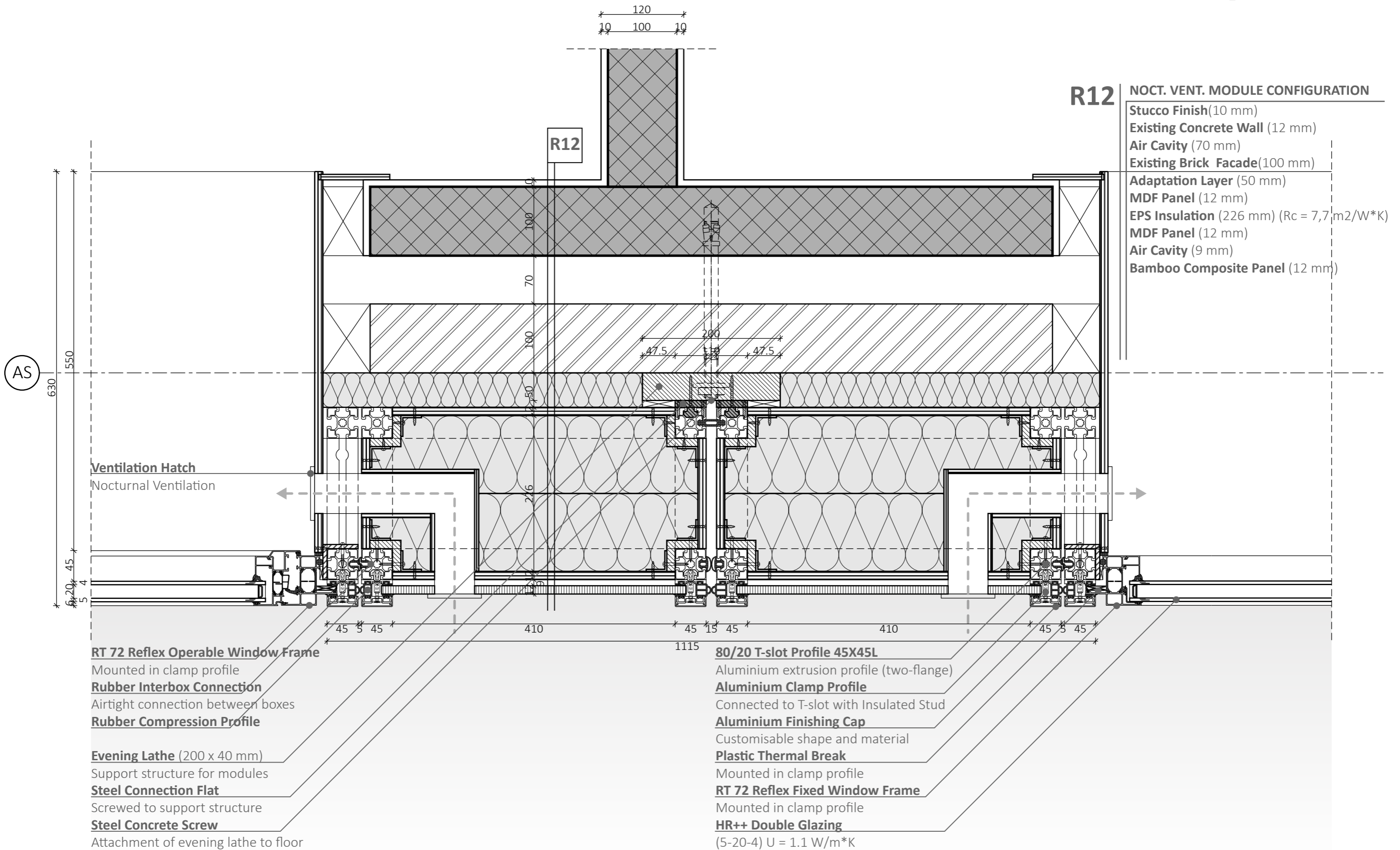
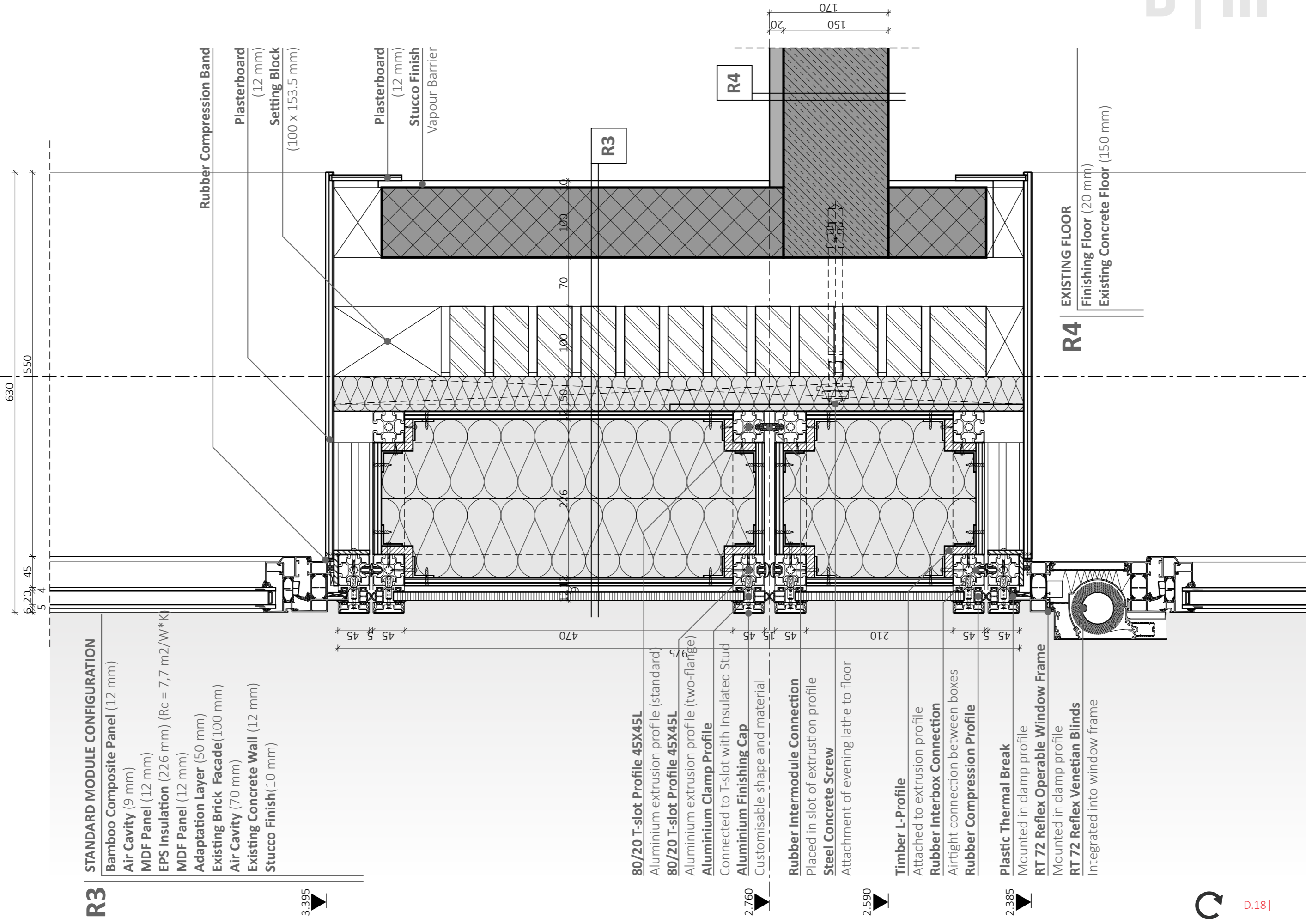


Fig. 9.4.6.4: Detail | 1:5 | Horizontal | Nocturnal Ventilation

AS



R3

**STANDARD MODULE CONFIGURATION**

- Bamboo Composite Panel (12 mm)
- Air Cavity (9 mm)
- MDF Panel (12 mm)
- EPS Insulation (226 mm) (Rc = 7,7 m2/W\*K)
- MDF Panel (12 mm)
- Adaptation Layer (50 mm)
- Existing Brick Facade (100 mm)
- Air Cavity (70 mm)
- Existing Concrete Wall (12 mm)
- Stucco Finish (10 mm)

3.395



**80/20 T-slot Profile 45X45L**

Aluminium extrusion profile (standard)

**80/20 T-slot Profile 45X45L**

Aluminium extrusion profile (two-flange)

**Aluminium Clamp Profile**

Connected to T-slot with Insulated Stud

**Aluminium Finishing Cap**

Customisable shape and material

2.760



**Rubber Intermodule Connection**

Placed in slot of extrusion profile

**Steel Concrete Screw**

Attachment of evening lathe to floor

2.590



**Timber L-Profile**

Attached to extrusion profile

**Rubber Interbox Connection**

Airtight connection between boxes

**Rubber Compression Profile**

**Plastic Thermal Break**

Mounted in clamp profile

**RT 72 Reflex Operable Window Frame**

Mounted in clamp profile

**RT 72 Reflex Venetian Blinds**

Integrated into window frame

2.385



R4

EXISTING FLOOR

Finishing Floor (20 mm)

Existing Concrete Floor (150 mm)

D | III



Fig. 9.4.8.3: Detail | 1:5 | Vertical | Integrated Solar Shading Window

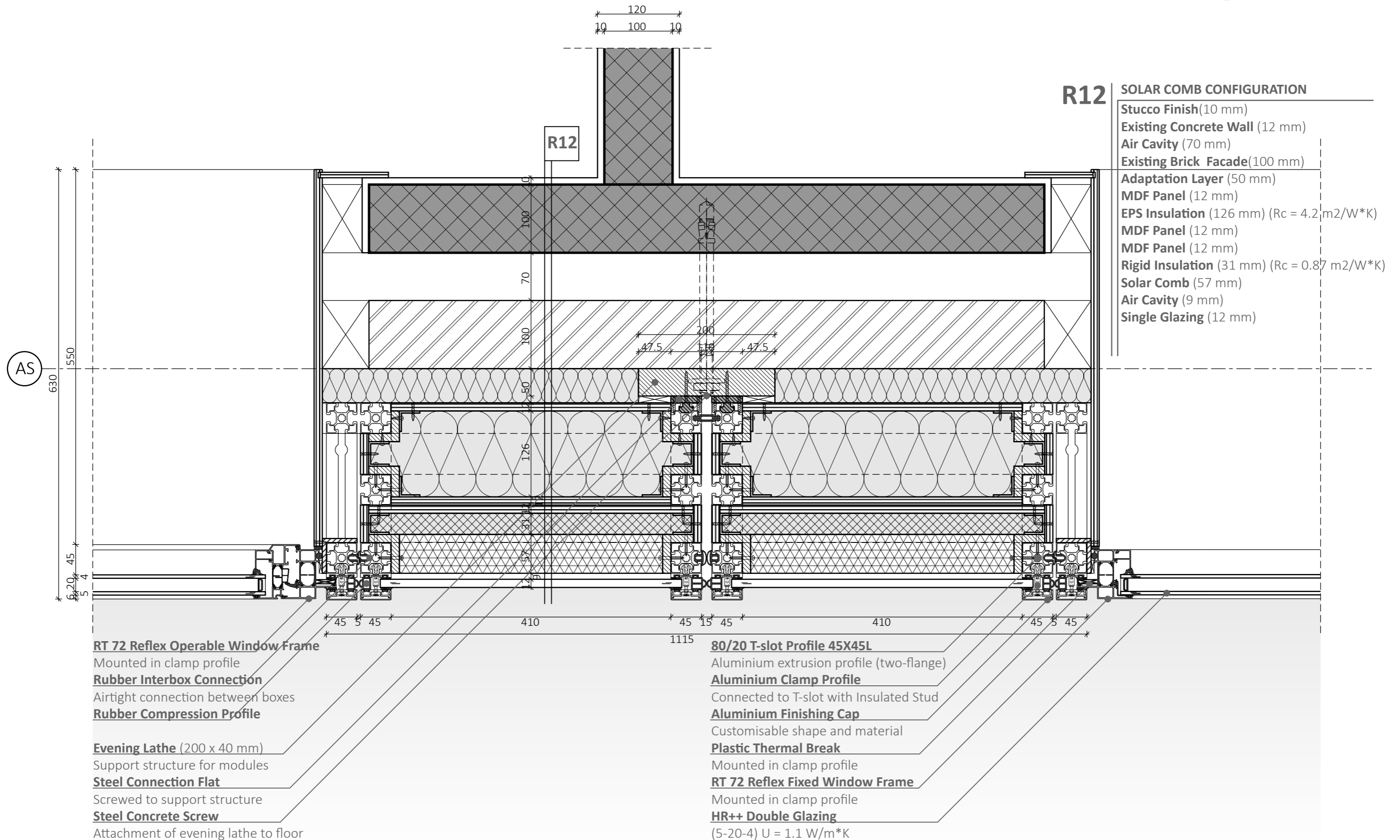


Fig. 9.4.9.3: Detail | 1:5 | Horizontal | Solar Comb





Fig. 9.5.2: Fragment | 1:30 | Differing cap and panel color





Fig. 9.5.4: Fragment | 1:30 | Deeper extruded caps in combination with panel color variation.





Fig. 9.5.6: Fragment | 1:30 | Extruded static solar shading in combination with a steel finish



Fig. 9.5.8: Fragment | 1:30 | Solar comb with glazing in front.