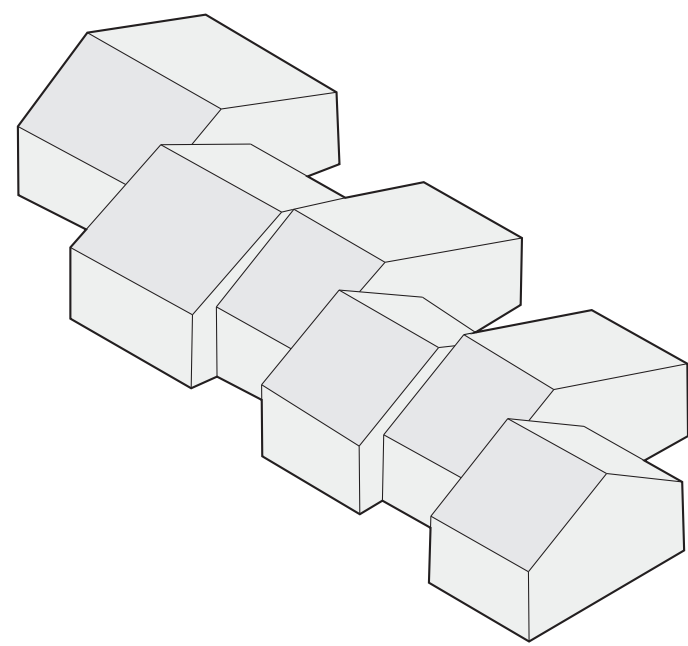


Renewable energy and the energy frame

Energy consumption	[kWh/m ² per year]		
Heat	41,3	0,85	35
Electricity for building operation	-12,9	1,9	-24,5
Total	28,4		10,6
BR18			49
Low energy			27

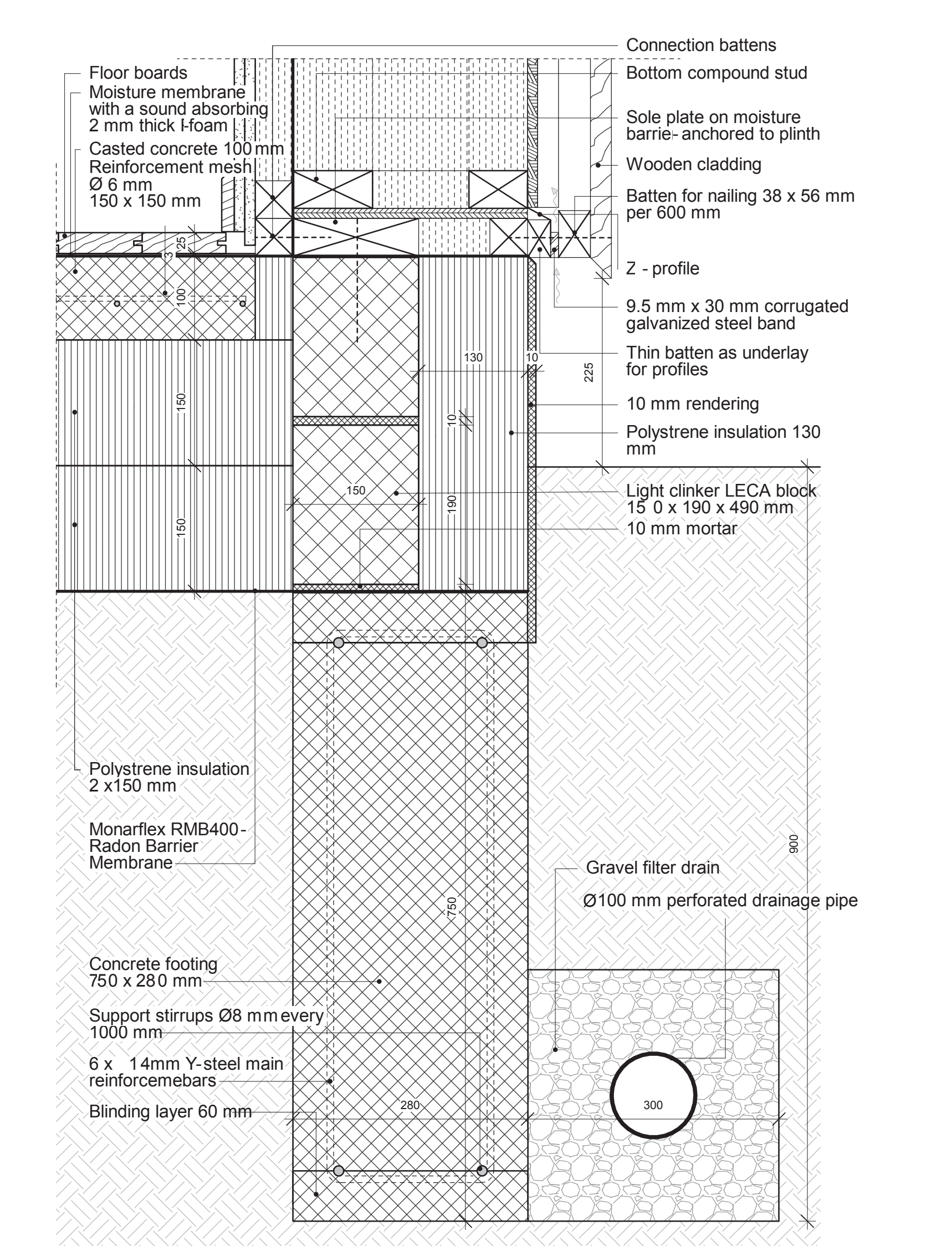
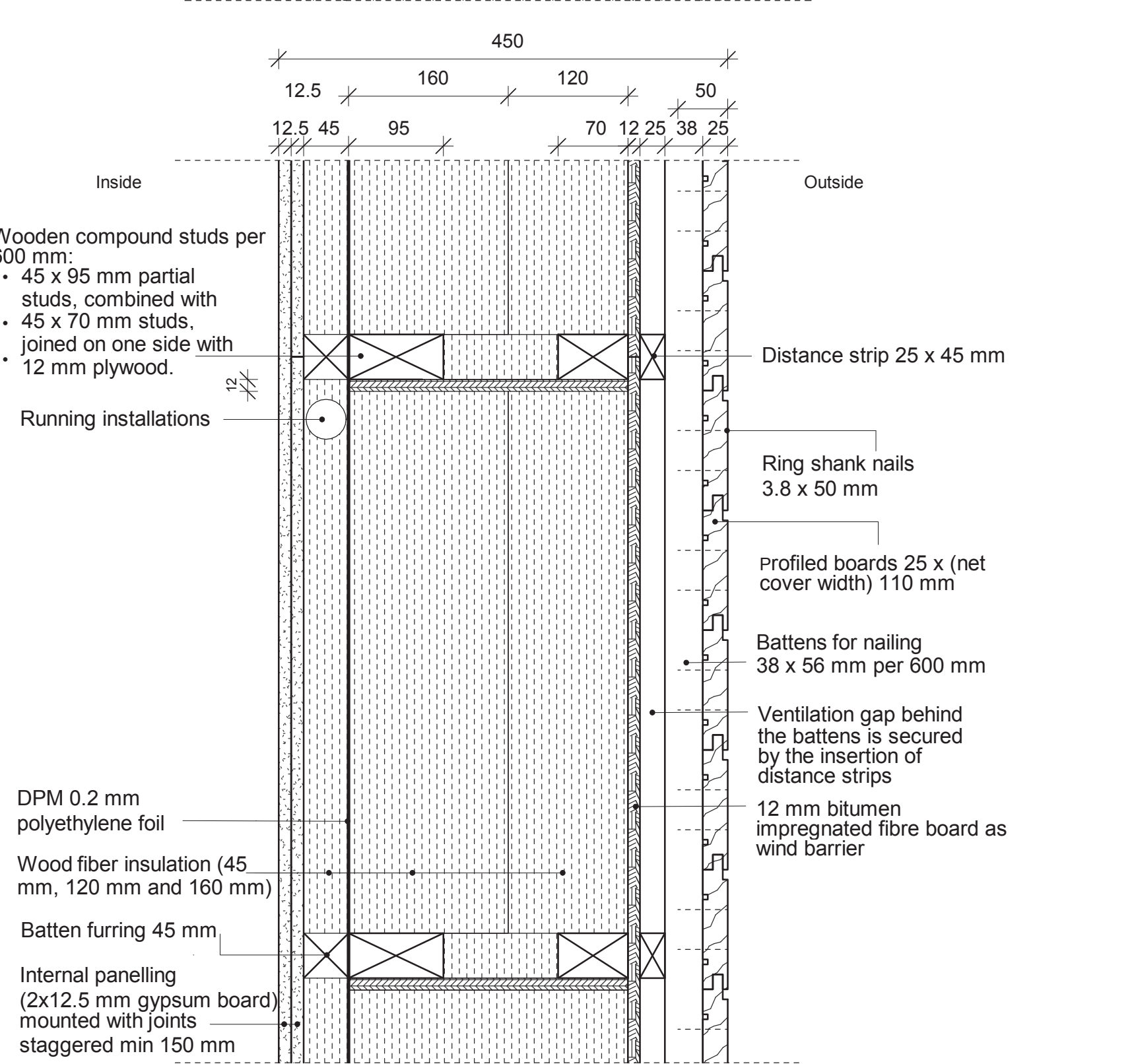
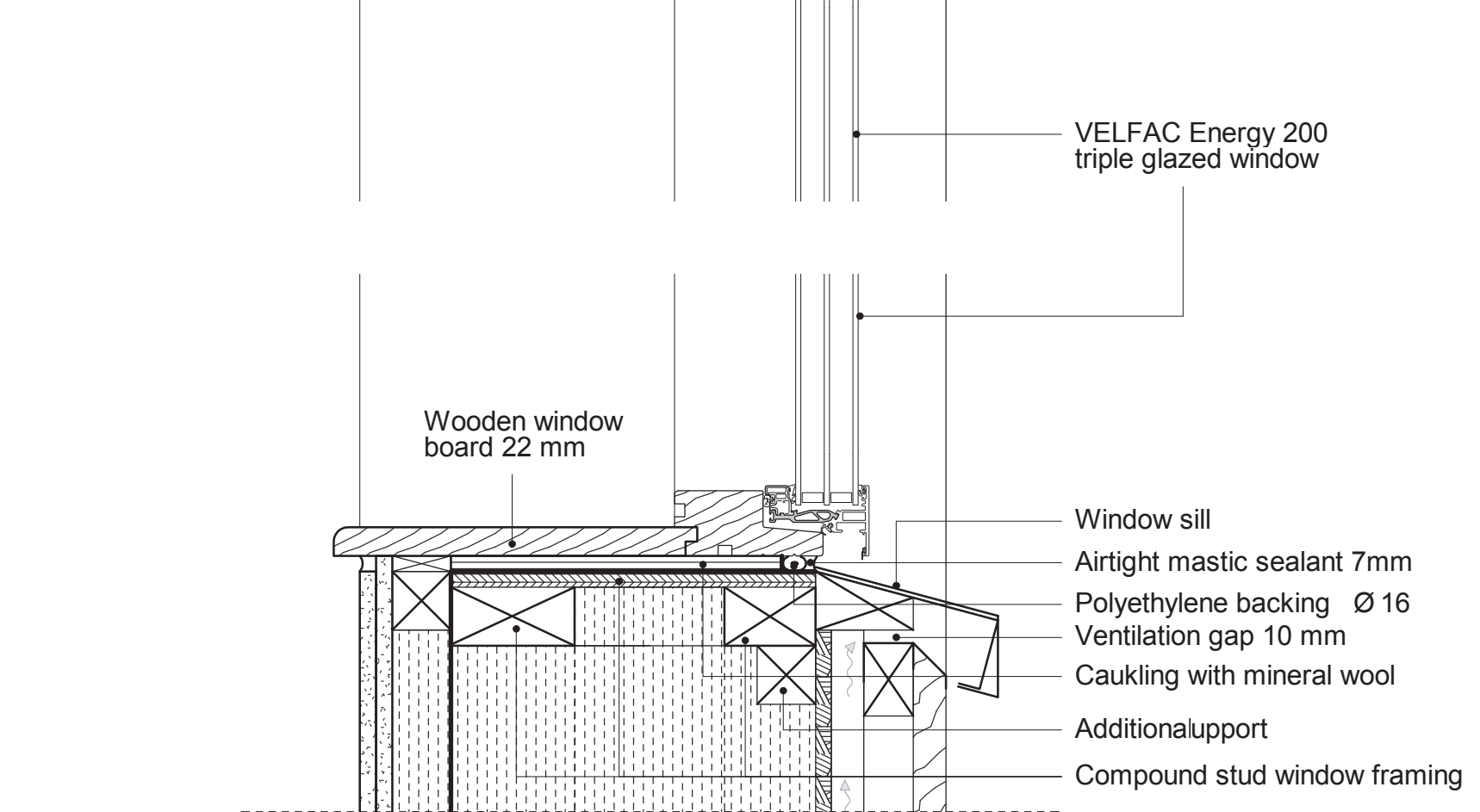
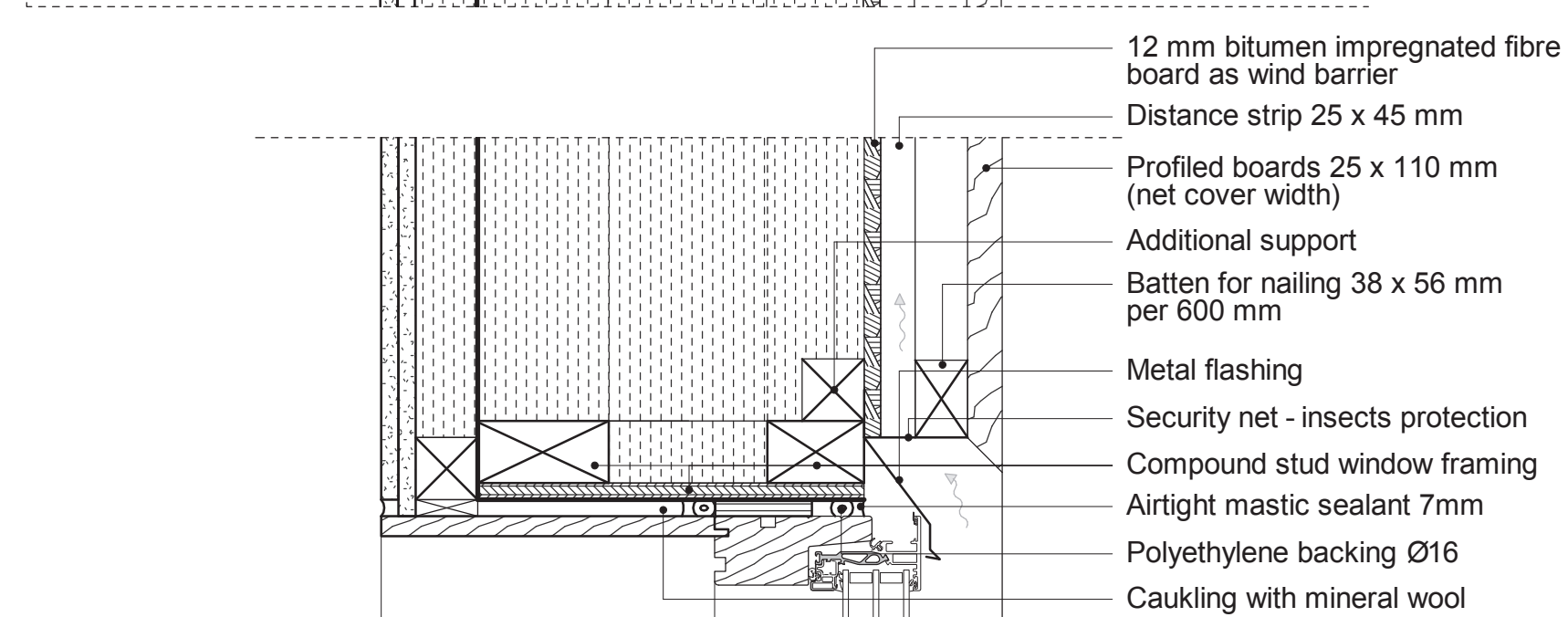
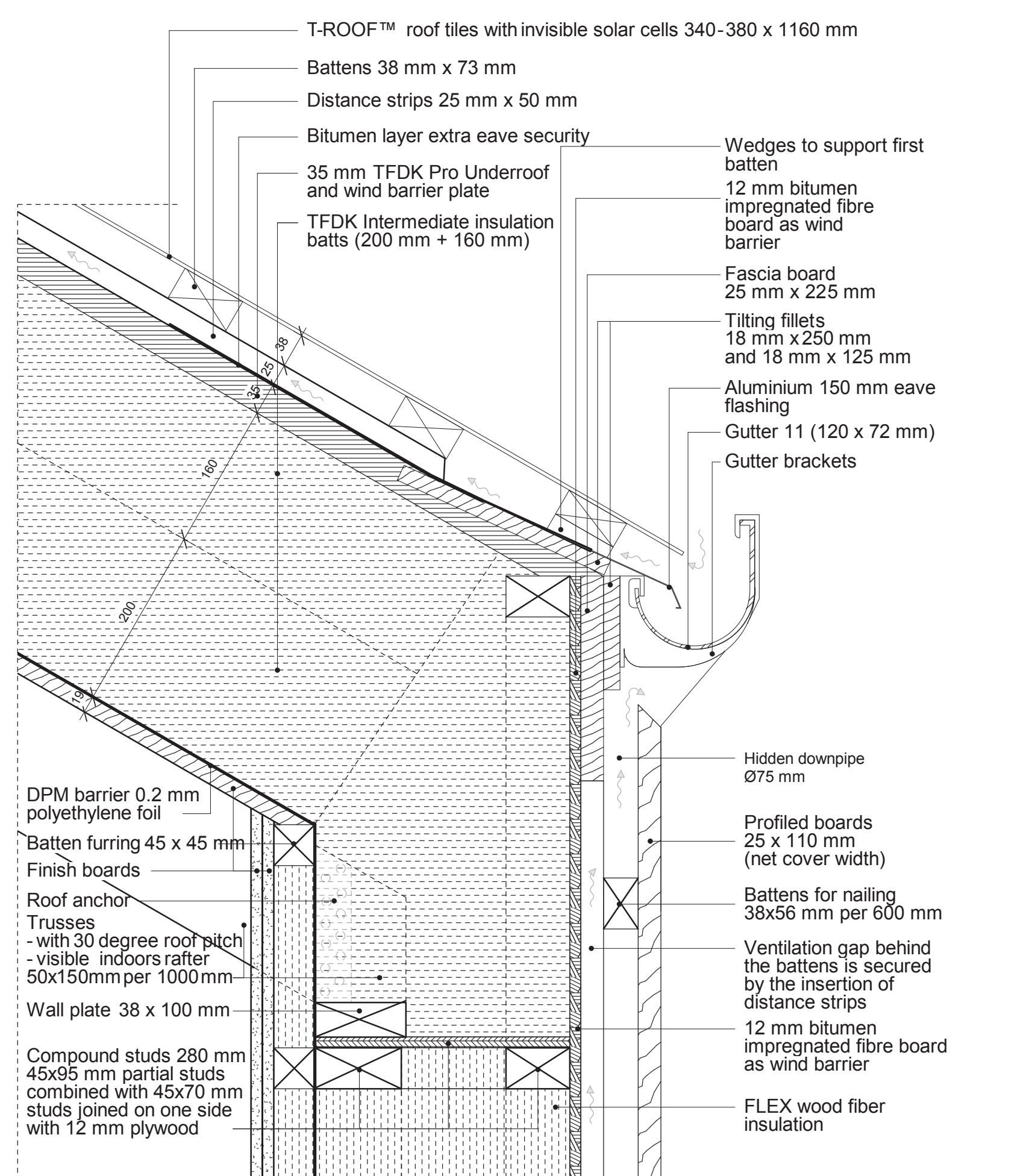
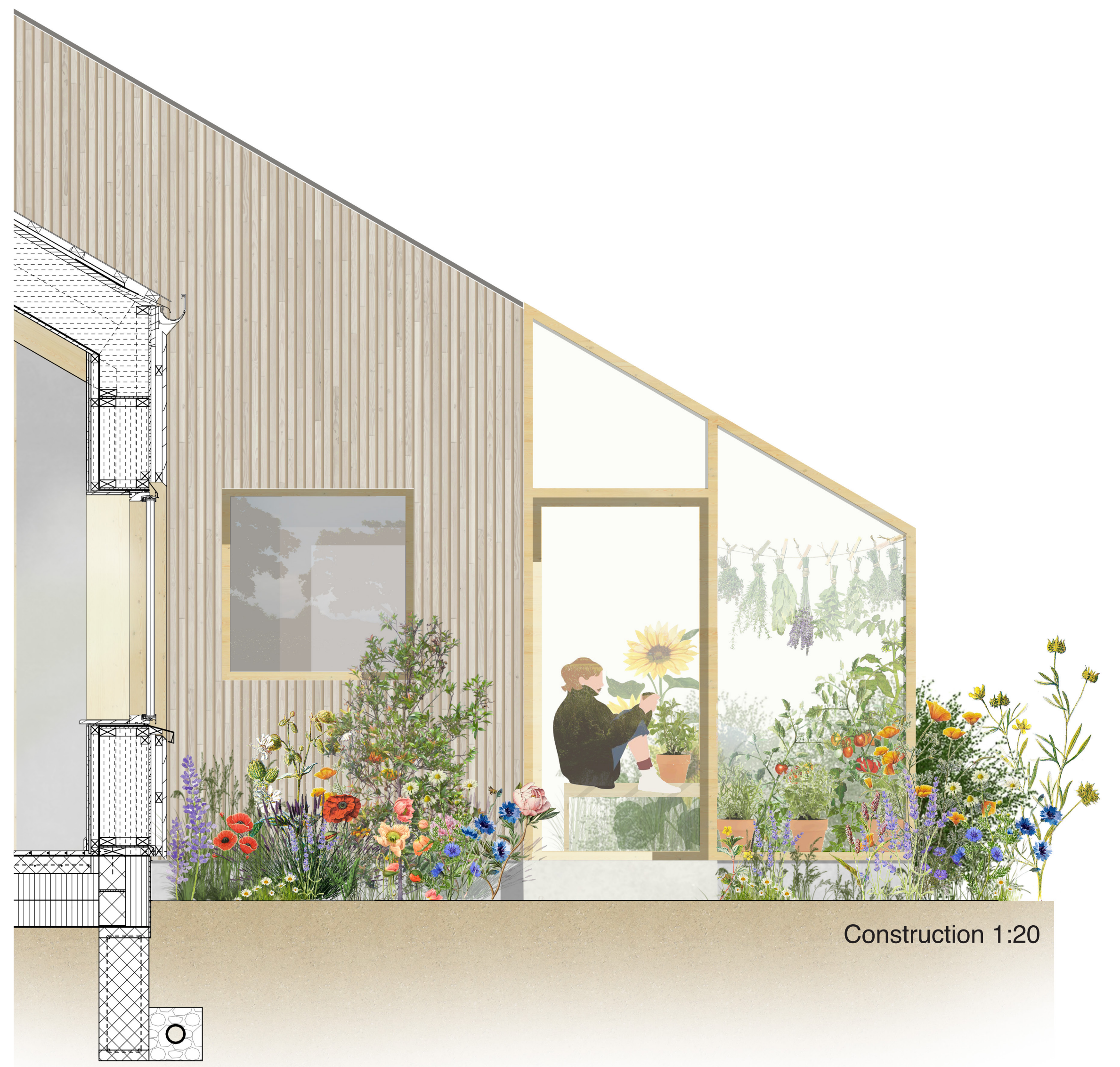


The energy consumption is calculated for a row of three housing units containing two 60 sq. m dwellings and one 80 sq. m dwelling in one level, see ill. 63. The building's energy consumption reaches the energy frame BR18 before applying renewable energy with an energy demand of 35,5 kWh per sq. m per year (see appendix C for types-in). The low consumption is a result of the building design; the highly insulated building envelope, the low energy windows and their orientation and shading. When applying the photovoltaics the energy consumption reaches the energy frame Low energy with an energy demand of 10,6 kWh per sq. m per year (see appendix C for types-in). Even though the photovoltaics produce more energy, it is not shown in the energy frame as no more than 25 kWh per sq. m per year of primary energy can reduce the energy frame (Trafik, bygge- og boligstyrelse 2018).

Construction section

The roof is a warm roof construction, allowing for the structural 150 mm rafters to be aesthetically visible in the indoor space. For the insulation purposes wood fibre insulation is used - placed in accordance with TræfiberDanmark® manufacturer guidelines. TFDK Intermediate insulation batts (with a thickness of 200 mm plus additional 160 mm) are applied as a primary insulation and TFDK Pro Underroof and wind barrier plate with a thickness of 35 mm is placed on the outer side of the roof - holding the batten system that supports SolarTag T-ROOFTM roof tiles with solar cells.

For the external wall construction wooden stud frame structural system is used with compound studs of a width of 280 mm, fitting TFDK Flex wood fibre insulation in between and between internal batten furring. Vertical wood cladding is applied as an external finish, with space between to allow for air to flow through and decrease the chance of root. Energy efficient triple glazed Velfac 200 Energy windows are inserted.



Construction details 1:5

Since all buildings are resting directly on the ground, having a direct contact to the soil, it was assessed that it is too risky to apply any form of organic insulation in that area. The standard, well known polystyrene insulation (300 mm in total) is applied as an exception from the "natural materials" design criteria to mitigate any possible risks of failure in the construction, expecting that this approach would appear to be more sustainable in the long run than experimenting with unsure alternatives. Insulation is resting on the Monarflex RMB400 Radon Barrier Membrane. For the same reason we are using concrete for the slab and foundation system, reaching for Unicon Uni-Green® more eco-friendly concrete that can also help us with heat storage capacity of the building envelope.

Materials and expression

The exterior cladding of the dwellings consist of slim cedar slats. The cedar is chosen as a sustainable choice compared to other species of timber. The wood is durable and contains fungicides and therefore does not need any further impregnation. When constructive wood preservation elements are implemented, the cladding will stay beautiful and healthy for many years and is therefore considered a sustainable choice. The wood will age with grace and turn gray with a glimmer of silver creating a lively facade. Due to wind and rain the different oriented facades will age uniquely and the cladding will within the years become diverse and show the beautiful aging through time. Photovoltaics are implemented on the southern faced roofs to collect solar energy. The northern faced roof consists of slates with the same expression as the photovoltaics.

The entrance is marked with vertical cladding and a colored front door. The color of the door is a choice for the settlers to make, and will enhance the feeling of belonging.

