Project Documentation

Abstract

Brage preschool, Valsta, Sigtuna kommun

Data of building			
Year of construction Baujahr	2020	**Space heating**	**8** **kWh/(m²a)**
U-value external wall	0,081 W/(m²K)		
U-value basement	0,123 W/(m²K)	Primary Energy Renewable (PER)	33 kWh/(m²a)
U-value roof	0,066 W/(m²K)	Generation of renewable Energy	48 kWh/(m²a)
U-value window	0,67 W/(m²K)	Non-renewable Primary Energy (PE)	71 kWh/(m²a)
Heat recovery	83 %	Pressurization test n_{50}	0,2 h^{-1}
Special features	348m2 of PV panels on the roof		

Brief Description

Passive House Valsta Sigtuna

New building of preschool, 10 departments for 200 children. The customer is Sigtuna municipality. Architect TOL Arkitekter AB. Design and production was carried out between 08. 2016 – 04. 2020, when the project was completed. Areas BTA: 2725 M2. LOA: 2330 M2

The preschool is located in Valsta in Sigtuna municipality; a million program area with major problems such as integration, violence and vandalism. During some years, Sigtuna municipality have tried to change the area. The centre, which is 300 m from the preschool, has been remodeled and renovated for a few years. In the area around the center, new homes have been built and the area has acquired a small-scale character with wooden facades. To achieve the energy requirements for passive houses, the solution was a compact building. We wanted the house to be experienced on a small scale, and the solution was to divide the building into two volumes that had a certain offset. The roof was designed with a cold wind and gable roof volumes that had to be carriers of solar cells towards the south, which means that the building is perceived as more complex than it is, but above all, the building has received a variation that reduces the large volume.

The floor plan is designed with bright rooms for permanent residence with a core of stairwells, cloakrooms and toilets without daylight. We avoided skylights and have used materials and colors that compensate to some extent for daylight from windows. Escape stairs are integrated to avoid the possibility of climbing on facades and damage to roofs and solar cells. On floor 1 are all the entrances, large kitchen and dining room as well as 4 departments for the younger children. A further 6 departments are located on level 2.

The building consists of two squares that are slightly offset in plan. The building is very energy efficient and produces more energy than it consumes.

Site plan. *Source Google Maps*

Responsible project participants

Architect	TOL Arkitekter AB www.tolark.se
Implementation planning	TOL Arkitekter AB www.tolark.
Building systems	Knut Jönson Ingenjörsbyrå AB www. kjiab.se
Structural engineering	Knut Jönson Ingenjörsbyrå AB www. kjiab.se
Building physics	IG Passivhus Sverige AB www.igpassivhus.se
Passive House project planning	TOL Arkitekter AB www.tolark.se
Construction management	COBAB www.cobab.se

Certifying body

Passivhaus Institut Darmstadt www.passiv.de	

Certification ID

6316	Project-ID (www.passivehouse-database.org)

Author of project documentation

TOL Arkitekter AB www.tolark.se	
Date Datum	Signature Unterschrift
15.06.2024	

1. Exterior fotos

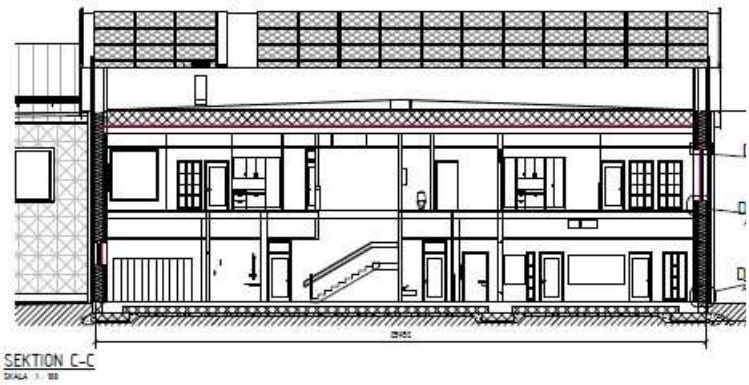
East

South

2. Interior fotos

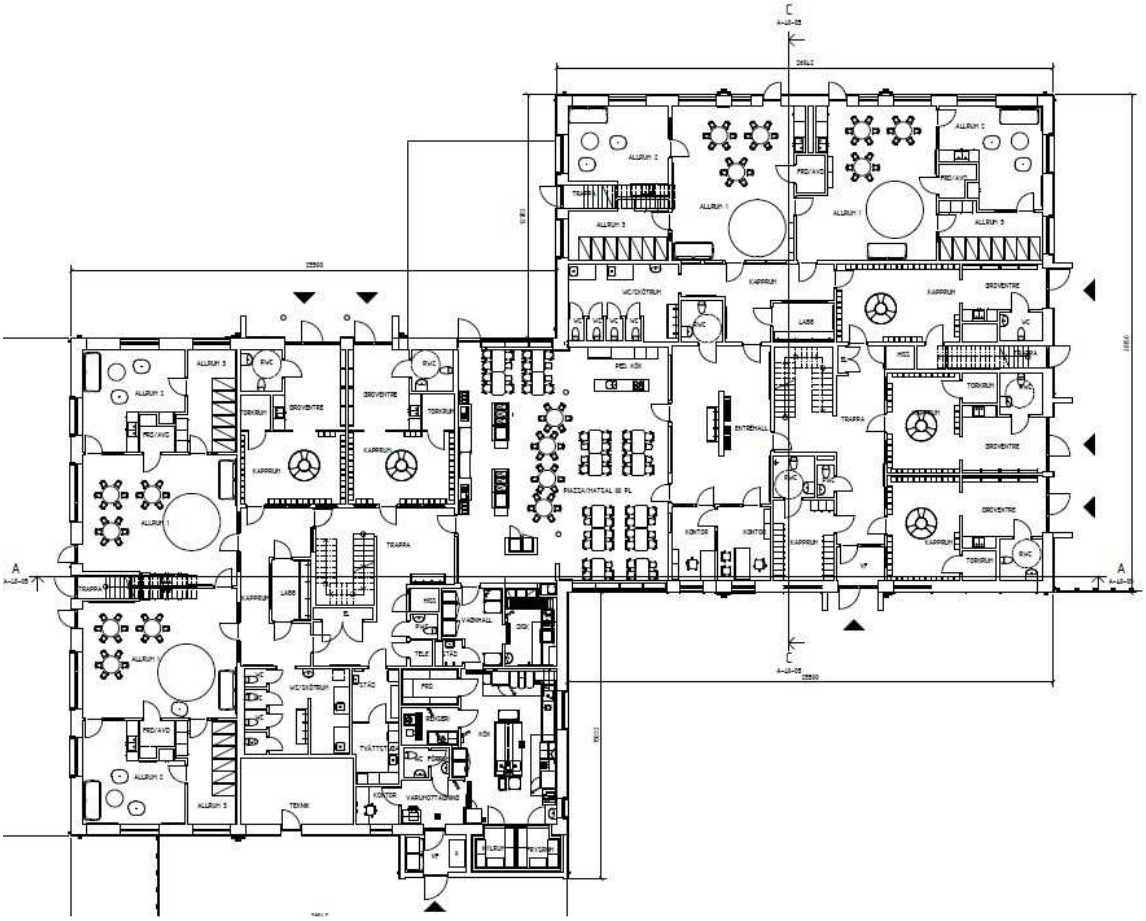
3. Sectional drawing

SECTION A-A

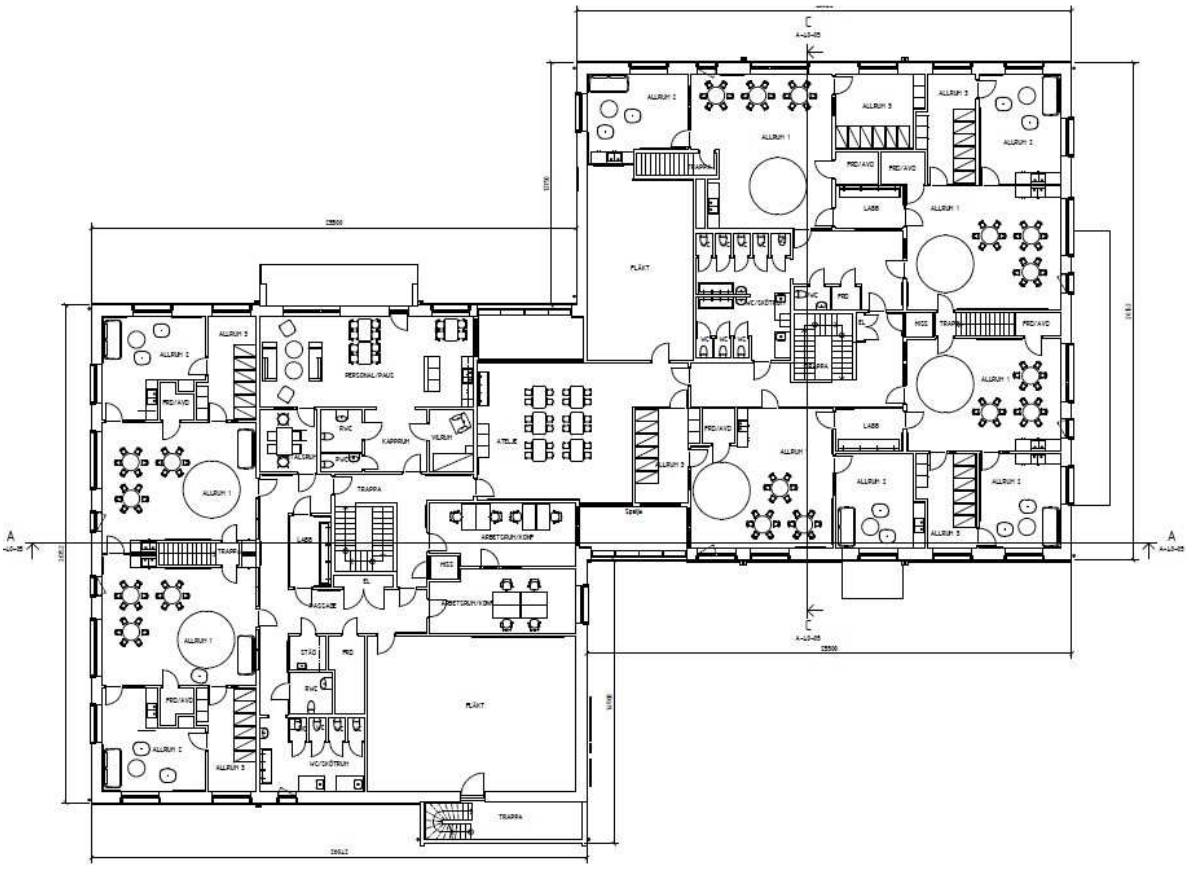


SECTION C-C

4. Floor plans



PLAN 1



PLAN 2

5. Construction of the floor slab

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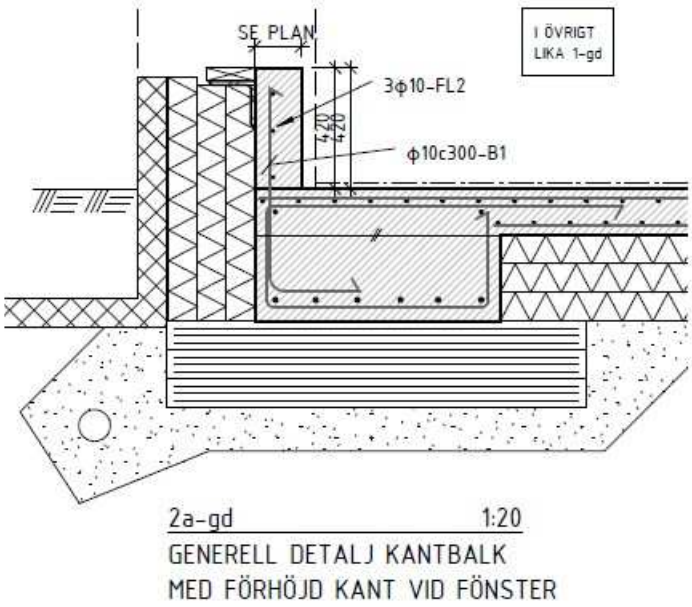


In order to keep the thermal bridge caused by the design low, the concrete plinth and concrete slab have been insulated with 300 mm cellular plastic with a lambda value of 0.037 W/Mk

Assembly no.						Interior insulation?
02ud	Floor slab					

Heat transmission resistance [m²K/W]

Orientation of building element	3-Floor	interior R_{si}	0,17
Adjacent to	2-Ground	exterior R_{se}	0,00

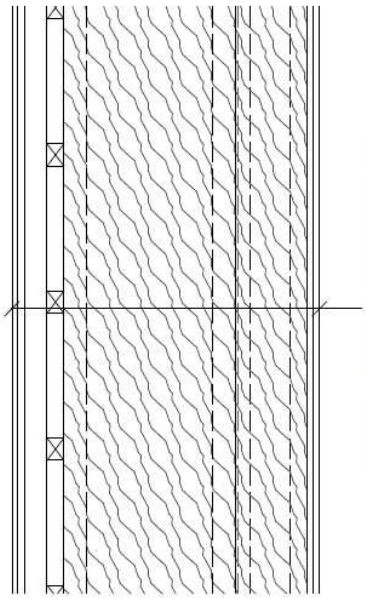
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Betong	2,300					160
Cellplast Sundolit s80	0,038					300

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			46,0 cm

U-value supplement W/(m²K)

U-value: 0,123 W/(m²K)

6. Construction of the external walls



FASADMATERIAL ENL. ARK.
LÄKT ENL. ARK.
34x45c300 GLESLÄKT
VINDDUK TYP PROCLIMA SOLITEX FRONTA
350 LÄTTREGLAR c600
(CELLULOSAISOLERING)
LAMBDA 0.04 W/mK
LUFTTÄTHETSDUK, TYP PROCLIMA INTELLO PLUS
LUFTTÄTAS MED PROCLIMA TESCON VANA TEJP
145 CELLULOSAISOLERING MELLAN 45x145c450
LAMBDA 0.040 W/mK
13 PLYWOOD
13 GIPS
(VÅTRUMSGIPS VID KÖK OCH DISKRUM)

YV-K1 1:10
YTTERVÄGGSUPPBYGGNAD

Facade material and air gap are followed by a wind screen. Two layers of insulation consisting of 350 mm lightweight stud wall with cellulose insulation, air tightness fabric + 145 cellulose insulation between wooden studs. On the inside, complete with a plywood sheet and a plasterboard.

Assembly no.	Building assembly description					Interior insulation?
01ud	**Exterior wall**					

Heat transmission resistance [m²K/W]

Orientation of building element	2-Wall	interior R_{si}	0,13
Adjacent to	3-Ventilated	exterior R_{se}	0,13

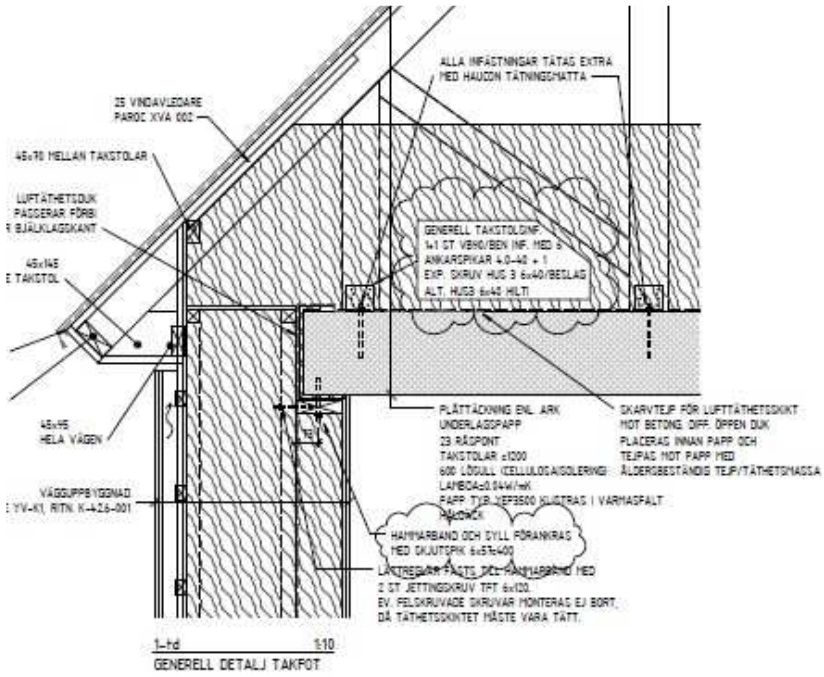
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Gips	0,210					13
Plywood	0,130					13
Cellulose	0,037			Timber	0,130	145
Cellulose	0,037			Timber	0,130	90
Cellulose	0,037	Plywood	0,170			260

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
87%	3,0%	10,0%	52,1 cm

U-value supplement W/(m²K)

U-value: 0,081 W/(m²K)

7. Construction of the roof



Roof joists consist of hollow decks made of concrete with a glued roof board on top. Insulation of 600 mm cellulose loose wool. The outer roof is built up of trusses with c-c 1200 mm with a surface layer of sheet metal and roofing cardboard on 23 mm raw rafters.

Assembly no.						Interior insulation?
03ud	Roof					

Heat transmission resistance [m²K/W]

Orientation of building element	1-Roof	interior R_{si}	0,10
Adjacent to	3-Ventilated	exterior R_{se}:	0,10

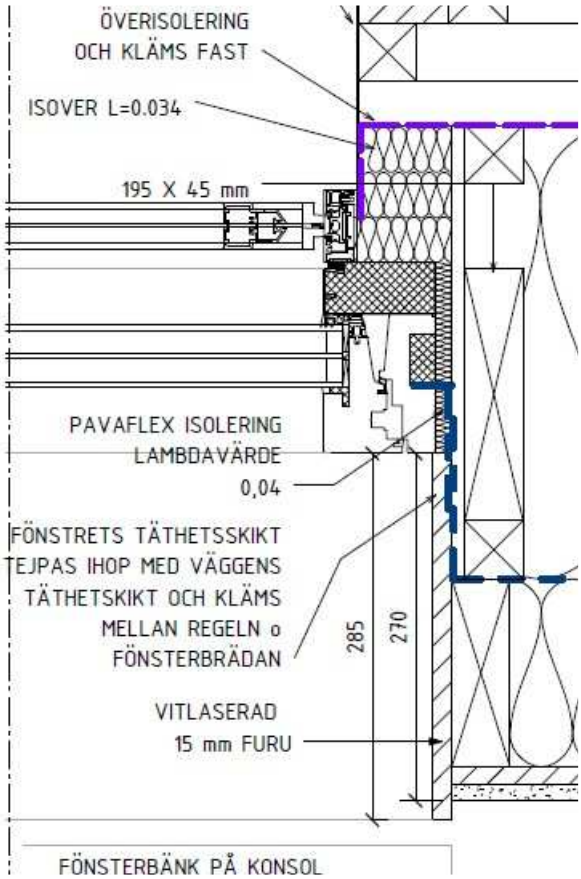
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
HÅLDÄCK	1,500					265
Cellulose	0,037			Takstolar c1200	0,130	600

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
96%		3,8%	86,5 cm

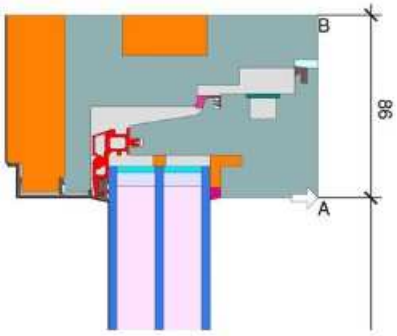
U-value supplement: W/(m²K)

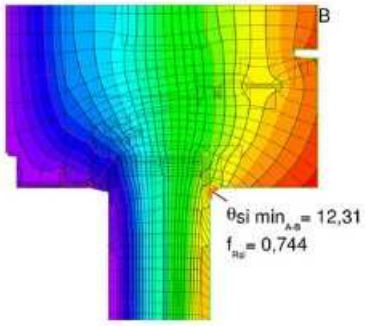
U-value: 0,066 W/(m²K)

8. Windows and window installation



Description of the window (frame) construction, Manufacturer	Smartwin, Raico Therm+ 50H-i och RAICO C- FRAME+ 75 DI
Muanufacturer Window (frame; product name)	Wooden window frames with frame insulation made of woodfiber insolation
Frame U-value Uf	0,82 W/(m²K)
Type of glazing	Argon filled in; 6 | 18 | 4 | 18 | 6,8
Glass U-value Ug	0,51 W/(m²K)
g value of the glazing	0,42





9. Description of the airtight cover

The first pressure test was carried out by the Eneeco Test AB on January 22, 2020 after completion of the airtight envelope.

Combined test data (average values). 50 Pa pressure test air change n50 h-1

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	Measurement	Uncertainty
Airflow at 50 Pa, V50 [l/s]	355,71	+/-9,9%
Air exchange at 50 Pa, n50 [/h]	0,20	+/-10,7%
Permeability at 50 Pa, Q50 [l/s/m2]	0,084	+/-10,7%
Specific leakage 50 Pa, w50 [l/s/m2]	0,144	+/-10,7%

Airtightness concept

Walls: Air tightness layers

Base plate: Concrete

Window connection: with sealing layer taped together with the wall's sealing layer

Roof: Concrete and air tightness layer together with roofing felt

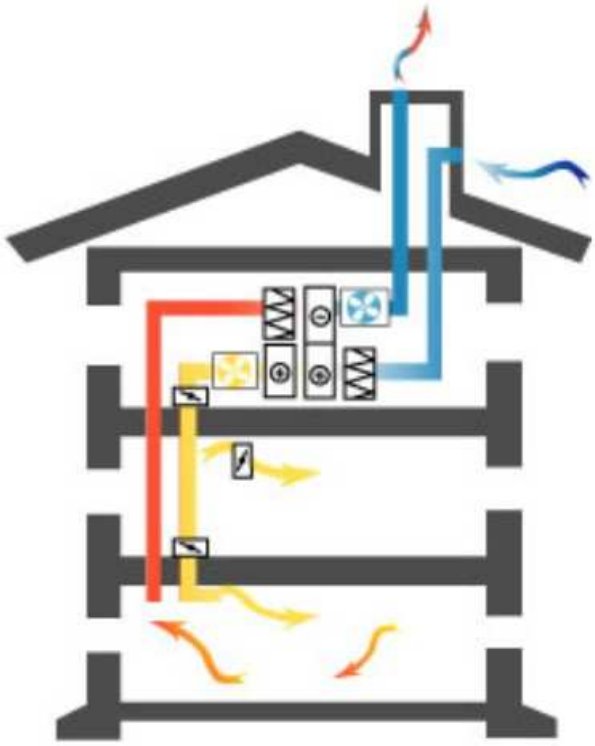
Push from|against	Basement ceiling	Casement frame	Frame	Exterior wall	Roof
Roof				Air tightness layers are drawn around concrete joists and taped with age-resistant tape	Air tightness fabric is placed before roofing felt and glued to roofing felt with age-resistant tape/sealant
Exterior wall	Air tightness fabric is sealed against the concrete plinth with proclima age-resistant tape		The window's and the wall´s sealing layer is taped together.	Air tightness layers are drawn around corners and taped	
Blind frame		Siga fentrim IS20			

10. Ventilation unit

In order to greatly reduce ventilation losses, a balanced supply/exhaust air system with a high efficiency, was used air handling unit with rotating heat exchanger.

Ventilation system maker	**Swegon Group AB, Swegon - GOLD RX**
effective level of heat provision	84 %
Electric efficiency	0,40 Wh/m³

11. Ventilation planning sewer network



Balanced ventilation with both supply and exhaust
air valves are placed in all rooms for permanent occupancy, eg common room, studios, cloakroom and dining room.
The ventilation is demand-regulated VAV (variable ventilation) dependent on measured CO2 values.
Exhaust air valves are placed in showers, toilets, laundry room, cleaning room.
The supply air is taken to the exhaust air ducts via overhead ventilation devices and the used air is brought back to the heat exchanger via an exhaust air duct network.

The figure on the left shows the principle of the building's exhaust and supply air ventilation.

12. Heat supply

Heating
Geothermal probe heat pumps with radiators as heating distribution system, Thermia Mega M HGW.
10 energy wells are connected to the heat pump with 29% bioethanol mixed water, active depth each 200 meters.
Hot water
Geothermal probe heat pumps provide the building with hot water

13. Building costs

The cost of the building landed at about SEK 85 000 000, about SEK 31 500 per square meter BTA, which is a relatively normal cost for a modern preschool building in the Stockholm area.

14. PHPP- Results

Passive House Verification

Building:	Brage Förskola		
Street:	Bragegatan 4		
Postcode/City:	195 53	Märsta	
Province/Country:			SE-Sweden
Building type:	Förskola		
Climate data set:	SE0001a-Stockholm		
Climate zone:	2: Cold	Altitude of location:	15 m
Home owner / Client:	Sigtuna kommun		
Street:	Södergatan 20		
Postcode/City:	195 85	Märsta	
Province/Country:			SE-Sweden

Architecture:	TOL Arkitekter AB		
Street:	Ljusslingan 4		
Postcode/City:	120 31	STOCKHOLM	
Province/Country:			SE-Sweden
Energy consultancy:	IG Passivhus Sverige AB		
Street:	Honnörsgatan 16		
Postcode/City:	352 36	Växjö	
Province/Country:			SE-Sweden

Mechanical engineer:	Knut Jönson Ingenjörsbyrå AB		
Street:	Stationsgatan 6A		
Postcode/City:	195 40	Märsta	
Province/Country:			SE-Sweden
Certification:	B.Tec Prof. Dr. Harald Krause		
Street:	Sonnenfeld 9		
Postcode/City:	83122	Samerberg-Törwang	
Province/Country:			DE-Deutschland

Year of construction:	2019	Interior temperature winter [°C]:	20,0	Interior temp. summer [°C]:	25,0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [W/m²]:	2,8	IHG cooling case [W/m²]:	2,8
No. of occupants:	225,0	Specific capacity [Wh/K per m² TFA]:	132	Mechanical cooling:	

Specific building characteristics with reference to the treated floor area — The PHPP has not been filled completely; it is not valid as verification

				Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area m²	2098,5				
Space heating	Heating demand kWh/(m²a)	8	≤	15	-	yes
	Heating load W/m²	7	≤	-	10	
Space cooling	Cooling & dehum. demand kWh/(m²a)	-	≤	-	-	-
	Cooling load W/m²	-	≤	-	-	
	Frequency of overheating (> 25 °C) %	0	≤	10		yes
	Frequency of excessively high humidity (> 12 g/kg) %	0	≤	20		yes
Airtightness	Pressurization test result n_{50} 1/h	0,2	≤	0,6		yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	67	≤	-		-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	31	≤	45	31	yes
	Generation of renewable energy (in relation to projected building footprint area) kWh/(m²a)	48	≥	60	38	

[2] Empty field: Data missing; '-': No requirement

I confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this verification.

Passive House Plus? yes

Task:	First name:	Surname:	Signature:
1-Designer	Mare	Mitrevica	

Issued on:	City:

The Passive House Project Planning Package (PHPP) was used for the analyzes and calculations.