



Villa Circuitus, First one-storie single family house as a Passive House in Sweden

1. Data of building / Gebäudedaten

Year of construction/ Baujahr	2015	Space heating / Heizwärmebedarf	15 kWh/(m²a)
U-value external wall/ U-Wert Außenwand	0.08 W/(m²K)		
U-value basement ceiling/ U-Wert Kellerdecke	0.114 W/(m²K)	Primary Energy Renewable (PER) / Erneuerbare Primärenergie (PER)	87 kWh/(m²a)
U-value roof/ U-Wert Dach	0.073 W/(m²K)	Generation of renewable energy / Erzeugung erneuerb. Energie	17 kWh/(m²a)
U-value window/ U-Wert Fenster	0.61-0,73 W/(m²K)	Non-renewable Primary Energy (PE) / Nicht erneuerbare Primärenergie (PE)	- kWh/(m²a)
Heat recovery/ Wärmerückgewinnung	94 %	Pressure test n_{50} / Drucktest n_{50}	0.2 h-1

Brief Description

Passive House Villa Circuitus

This round house is the first one storie single-family house built in Sweden as a Passive House.

First floor is the actual passive house and is 176 m² big, upper part is outside thermal envelope and is about 40 m², unheated. In second floor a stove is installed for heating the room occasionally.

The whole house is built with eco-design, only using eco-friendly materials, wood, glass, reused glass as foamglass in the ground, wooden fibre and cellulose insulation in walls and in roof.

The house has participated in a program from Swedens Energy Department who has measured and registered data for heating, cooling, water usage, electricity usage, produced electricity from solar cells and so on for three years now.

Compared with normal Swedish single-family houses the building uses about a fourth – a third of the heating- and hotwater energy.

Responsible project participants Verantwortliche Projektbeteiligte

Architect Entwurfsverfasser	Simone Kreutzer, Tommy Wesslund Drawings made by Nina Sandal, Sajt Arkitektbyrå AB
Implementation planning Ausführungsplanung	Simone Kreutzer, Tommy Wesslund
Building systems Haustechnik	Tommy Wesslund, Enerwwex AB www.enerwwex.se
Structural engineering Baustatik	Simone Kreutzer and Gunnar Isaksson, Masonite Beams
Building physics Bauphysik	Simone Kreutzer, IG Passivhus Sverige AB www.igpassivhus.se
Passive House project planning Passivhaus-Projektierung	Simone Kreutzer, Tommy Wesslund www.circuitus.se
Construction management Bauleitung	Simone Kreutzer, Tommy Wesslund

Certifying body Zertifizierungsstelle

Passivhusbyrå
www.passivhusbyran.se

Certification ID Zertifizierungs ID

4540

Project-ID (www.passivehouse-database.org)
Projekt-ID (www.passivhausprojekte.de)

Author of project documentation Verfasser der Gebäude-Dokumentation

Simone Kreutzer, Tommy Wesslund

Date
Datum

Signature
Unterschrift

29.11.2018

1. Building from outside

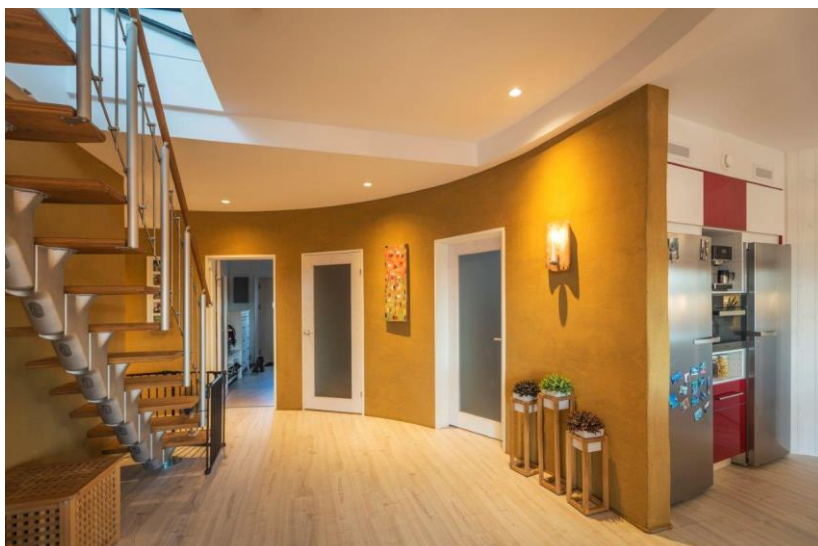


North

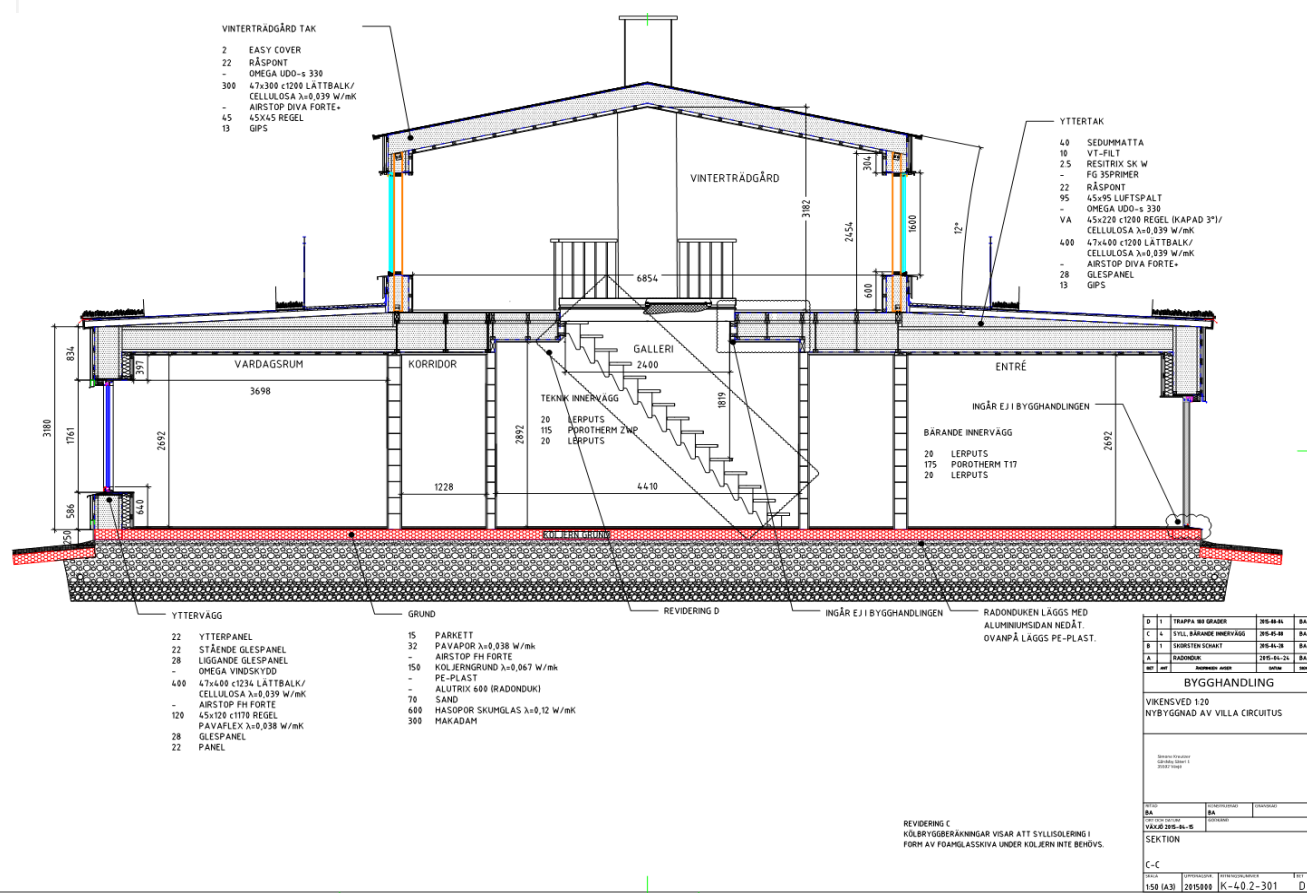


South west

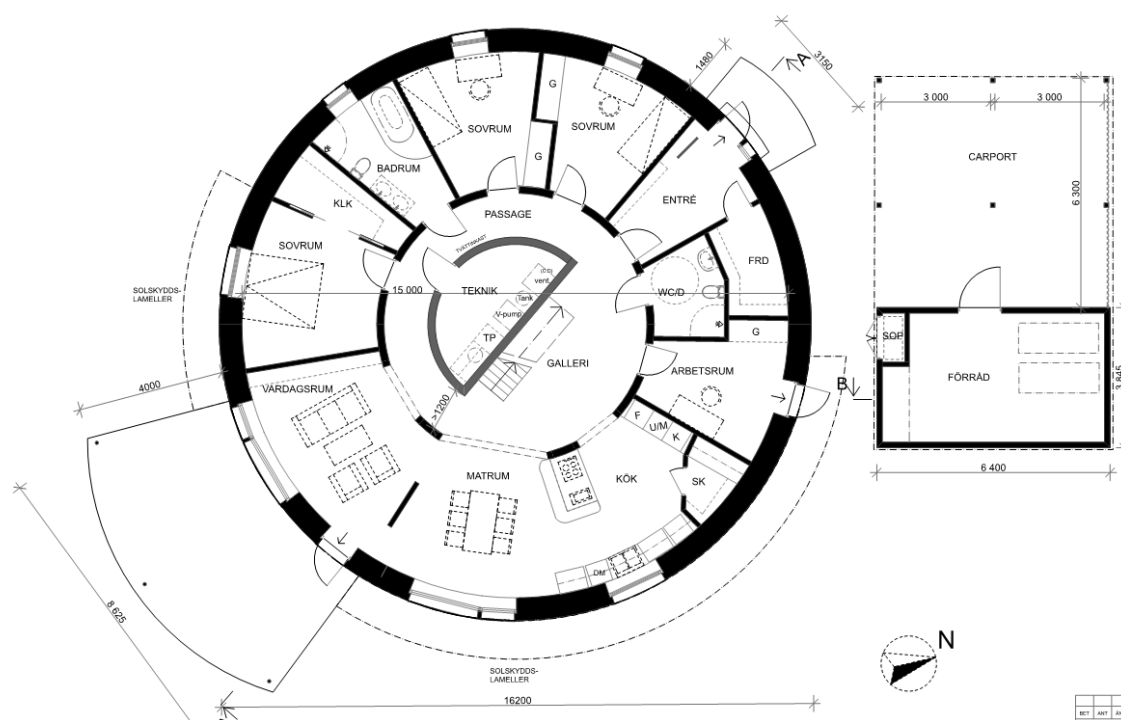
2. Inside view



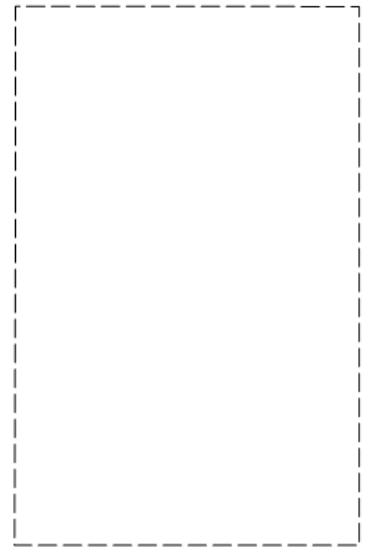
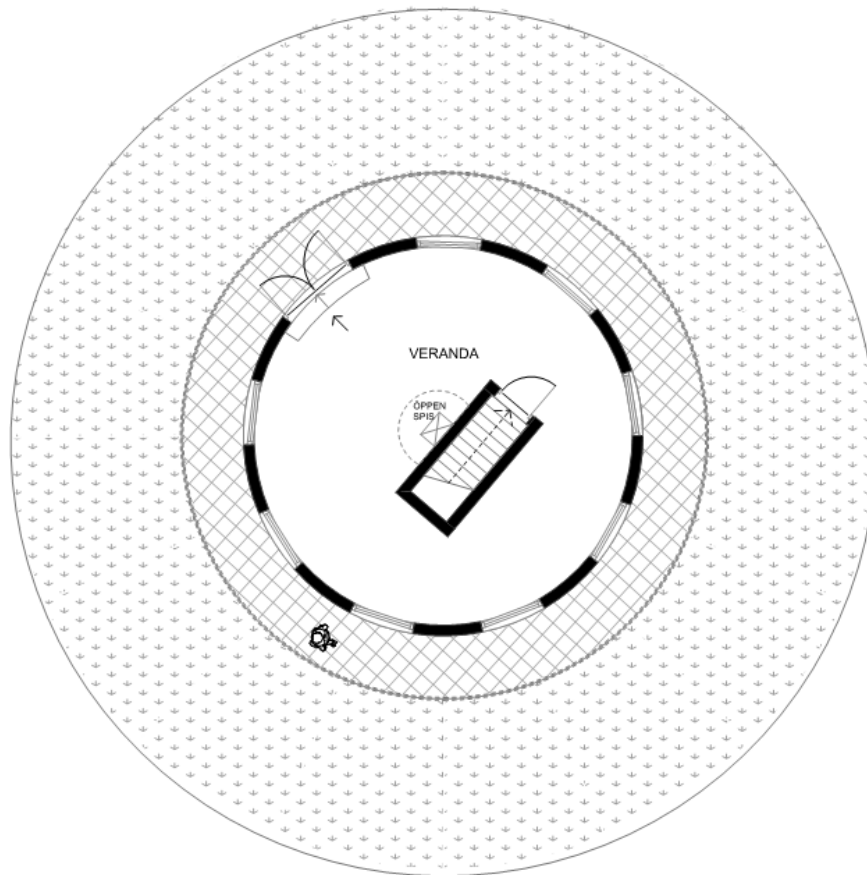
3. Section and construction



4. First floor



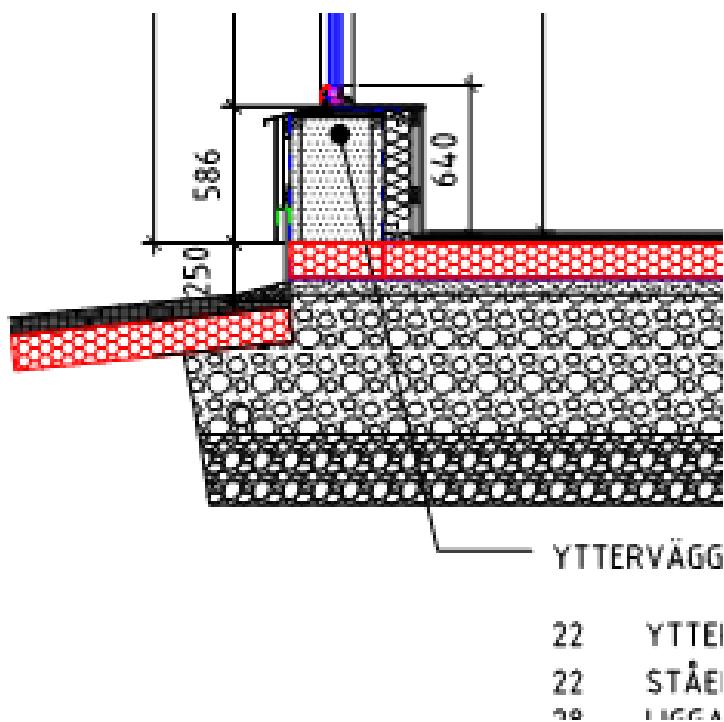
5. Second floor – Winter garden



PLAN 2



6. Construction of the floor



There is a layer of about 700 mm of Hasopor. (Foam glass stones)

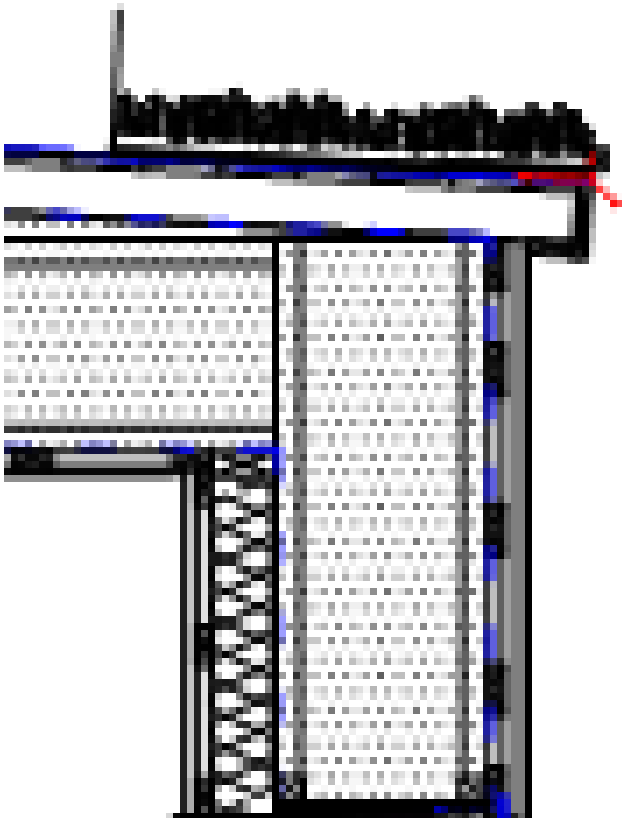
Then a small layer of sand to even the surface.

Upper a layer of FOAM-Glass Boards, 150 mm thick.

Assembly no.		03ud Grund				Interior insulation?		no	
Orientation of building element		3-Floor		Heat transmission resistance [m ² K/W]		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]			
Parkett	0,130					8			
träfiber	0,038					32			
Koljern-foamglas	0,067					150			
Sand	2,000					70			
Hasopor	0,110					800			
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total			
100%						106,0 cm			
U-value supplement				U-value:		0,094 W/(m ² K)			

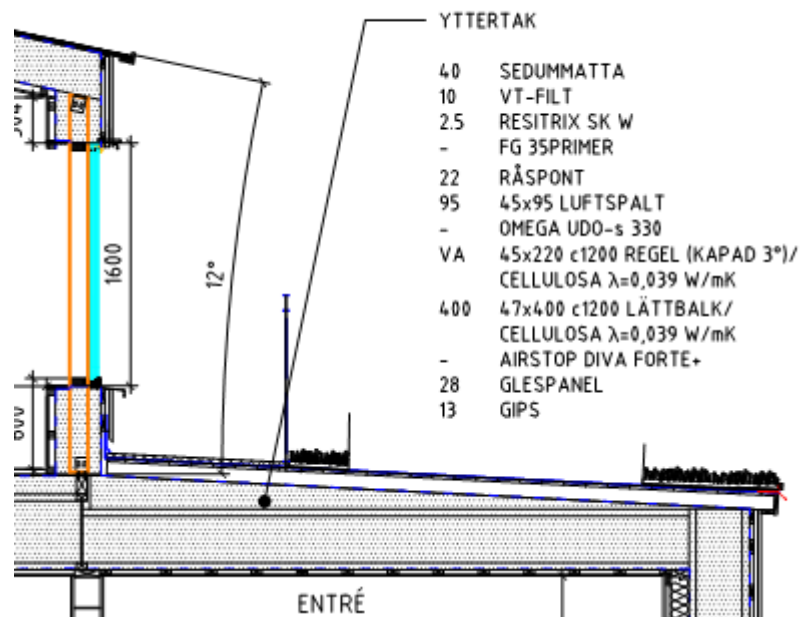
7. Construction of outer wall

White painted wooden panel.
 Wooden stud, 140 x 95 mm.
 Insulated with wooden fibre.
 Then a airtight layer.
 Then wooden light studs, 400 mm, insulation
 cellulose.
 Windstopper, wooden panel.



Assembly no.	Building assembly description			Interior insulation?		
01ud	Yttervägg			no		
			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]
träfiberskivor	0,038			träregel cc 1200	0,140	120
Cellulosa	0,039	lättregel cc 1200	0,140			306
Cellulosa	0,039			flange (corr.)	0,160	94
spalt	0,150					28
panel	0,140					22
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
92%		1,0%		7,5%		57,0 cm
U-value supplement		U-value:		0.076		
		W/(m²K)		W/(m²K)		

8. Construction of roof



Grass planted on a rubber layer that works as waterprotection.
 Ventilated woodenpanel, then wooden light studs with cellulose insulation, 400 mm,
 Airtight layer.
 Gypsum boards, painted.

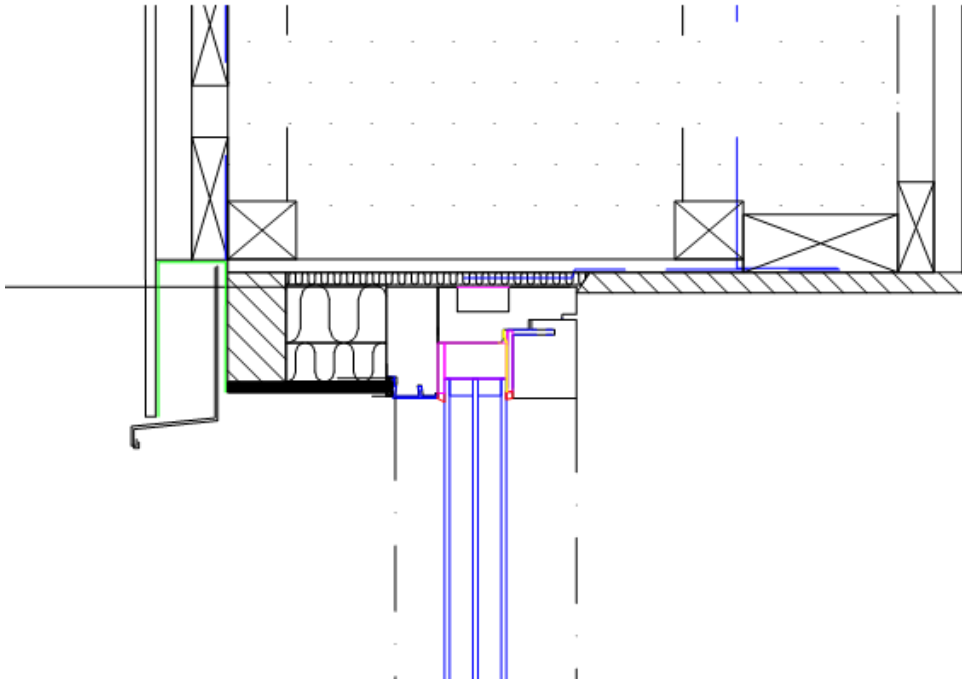
Assembly no. 02udl		Interior insulation?	
Tak		no	
Heat transmission resistance [m ² K/W]			
Orientation of building element	1-Roof	interior R _{si}	0,10
Adjacent to	3-Ventilated	exterior R _{se}	0,10

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Gips	0,210					13
luft/giespanel	0,170			virke (corr.)	0,440	28
Cellulosaisol. sned	0,039			regel cc1200	0,140	97
Cellulosaisolering	0,039	lätregel cc1200	0,140			306
Cellulosaisolering	0,039			flange (corr.)	0,160	94

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
92%	1,0%	7,5%	53,8 cm

U-value supplement	U-value:
	0.081

9. Windows



Windows are mounted in the insulationlayer and are overinsulated with wooden fibre.

Hersteller	I2, RIGA.
Fabrikat Fenster (rahmen; Produktname)	Smartwin
Rahmen-U-Wert U_f	0,60 – 0,75 W/(m ² K)
Bauart der Verglasung	Argon ausgefüllt; 4 22 4 22 4
Glas-U-Wert U_g	0,52 W/(m ² K)
g-Wert der Verglasung	0,53

10. Description of airtightness

Blower door-test is made by engineercompany ÅF, in Växjö.



Construction airtightness

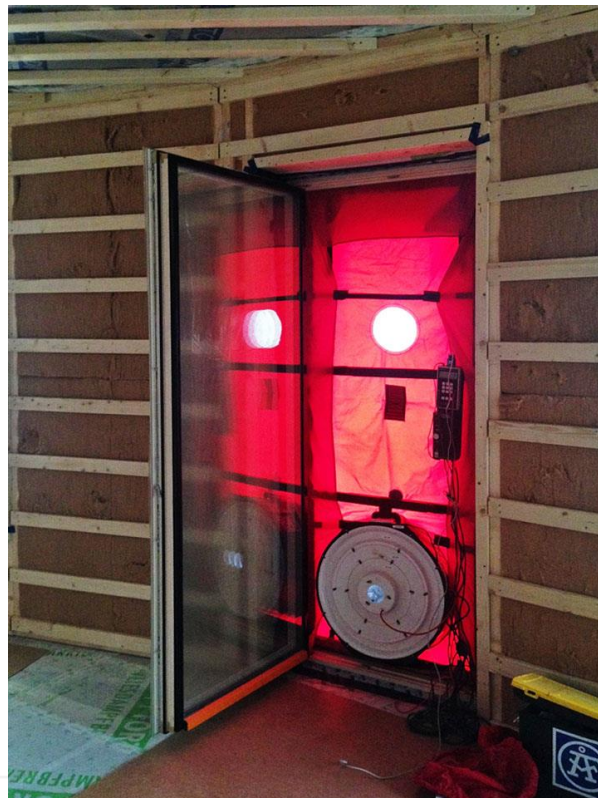
Walls: Air tight folie,

Floors: A mix between concrete and air tight folie

Windows/Wall: Tejp and folie

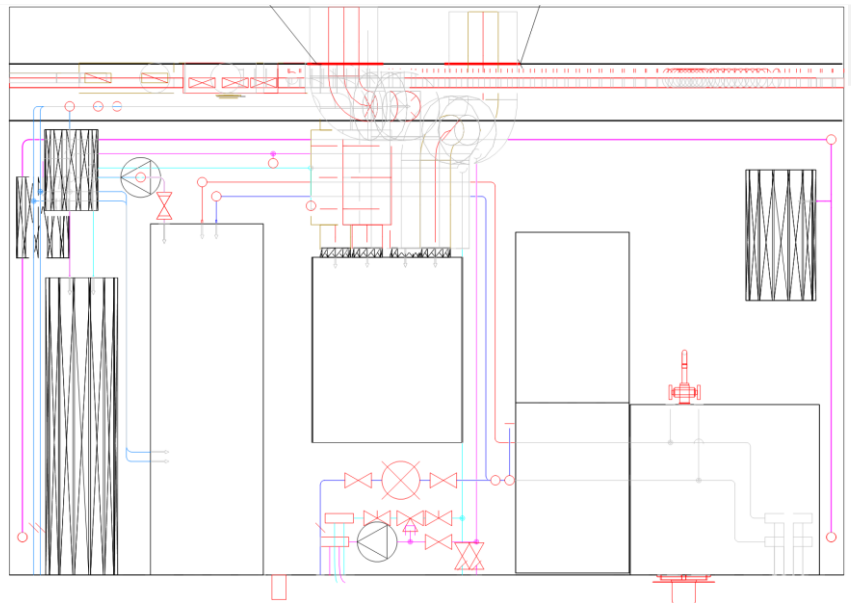
Roof: Air tight folie

Messung	50 Pa-Drucktest-luftwechsel $n_{50} \text{ h}^{-1}$
Villa Circuitus	0,21



11. Ventilation unit

The house is ventilated by a PAUL NOVUS 300-unit. We ventilate, heat and cool the house through this unit. Preheater and cooler is connected to a borehole in the ground.

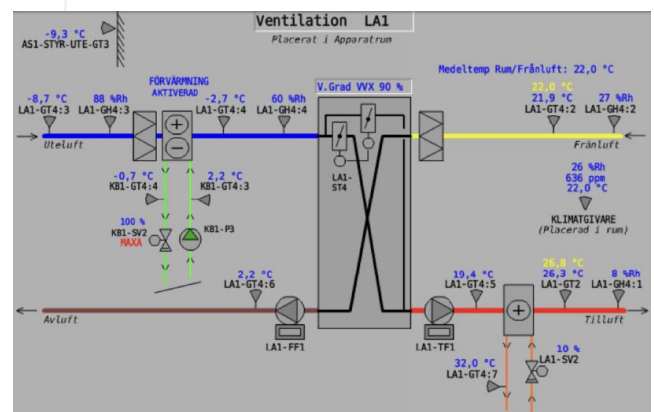
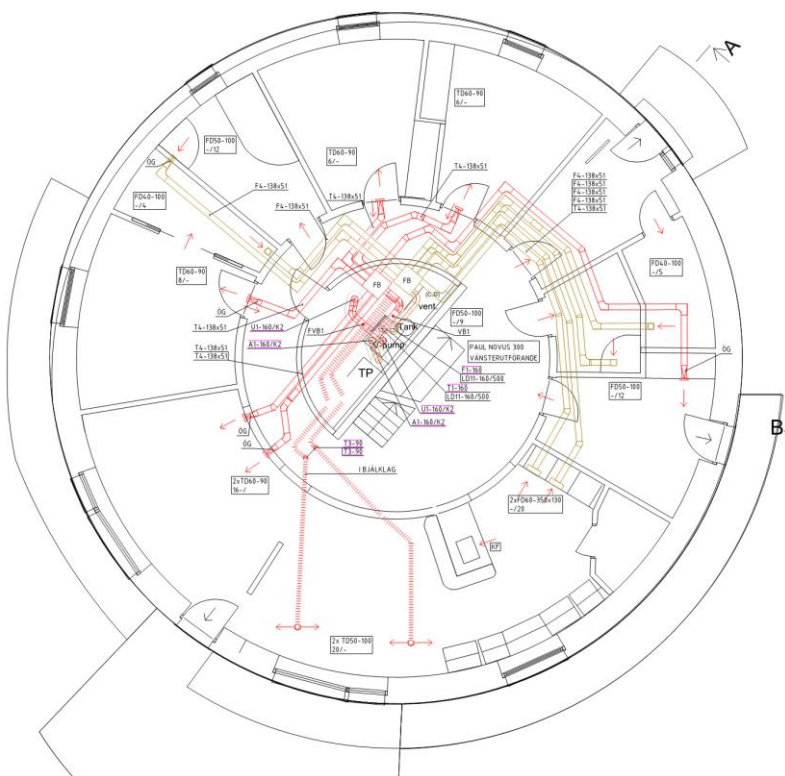


Ventilation unit PAUL NOVUS 300

Heat recovery 94 %

Electrical efficiency 0,24 Wh/m³

12. Drawing with ducting



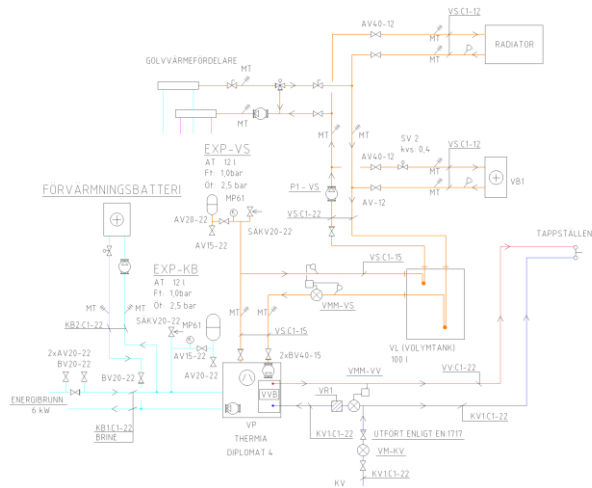
Momentan performance

Supplyair goes to bedrooms and dining/TV-room

Exhaustair is evacuated in the kitchen, bathroom, toilet and storeroom.

Transfer units are gaps between doors and frames in all rooms.

13. Heating system



Heating and hot water is produced in a ground heat pump, Thermia 4 kW.

It contains a hotwater tank of 180 l.

The heatpump works with a 100 l storage for heating water, and the house is provided with the heatingwater needed for the moment out of this storage.

Main heating is by supplyair in all living areas.

Exhaustair rooms has got floorheating or a towelheater, connected to the heating water system.

14. Cost

The building cost are similar to a normal Swedish one family house, but the energydemand in all are about 1/3 – 1/4 of a normal Swedish one family house.

14. PHPP-results

Passive House Verification									
				Building: Villa Circuitus Street: Vikensved 20 Postcode/City: 355 92 Växjö Province/Country: Småland SE-Sweden Building type: Enfamiljshus/bostad Climate data set: ud-03-Växjö / Kronoberg Climate zone: 2: Cold Altitude of location: 200 m					
				Home owner / Client: Simone Kreutzer och Tommy Wesslund Street: Gårdsby Säteri 1 Postcode/City: 355 92 Gårdsby Province/Country: Småland SE-Sweden					
				Mechanical system: Enerwex Street: Honnörsgatan 16 Postcode/City: 352 36 Växjö Province/Country: Småland SE-Sweden					
				Certification: Passivhusbyrå Ingo Theoboldt Street: Vasared 301 Postcode/City: 52394 Tvärred Province/Country: Västra Götaland SE-Sweden					
Architecture: Sajt arkitektstudio Street: Vallgatan 3 Postcode/City: 352 34 Växjö Province/Country: Småland SE-Sweden				Energy consultancy: IG Passivhus Street: Honnörsgatan 16 Postcode/City: 352 36 Växjö Province/Country: Småland SE-Sweden					
Year of construction: 2015 No. of dwelling units: 1 No. of occupants: 3,0				Interior temperature winter [°C]: 20,0 Interior temp. summer [°C]: 25,0 Internal heat gains (IHG) heating case [W/m²]: 2,4 IHG cooling case [W/m²]: 2,4 Specific capacity [Wh/K per m² TFA]: 108 Mechanical cooling:					
Specific building characteristics with reference to the treated floor area									
		Treated floor area m²	164,3		Criteria		Alternative criteria	Fulfilled? ²	
Space heating	Heating demand kWh/(m²a)	15	≤	15	-			yes	
	Heating load W/m²	9	≤	-	10				
Space cooling	Cooling & dehum. demand kWh/(m²a)	-	≤	-	-			-	
	Cooling load W/m²	-	≤	-	-				
	Frequency of overheating (> 25 °C) %	0	≤	10				yes	
	Frequency 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)	58	≤	-				-	
Primary Energy	PER demand kWh/(m²a)	26	≤	60	60			yes	
Renewable (PER)	Generation of renewable energy kWh/(m²a)	17	≥	-	-				
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 Classic? yes	
Task:		First name:		Surname:		Signature:			
2-Certifier		Ingo		Theoboldt					
Certificate ID:		Issued on:		City:					
		23-11-2015		Tvärred					