

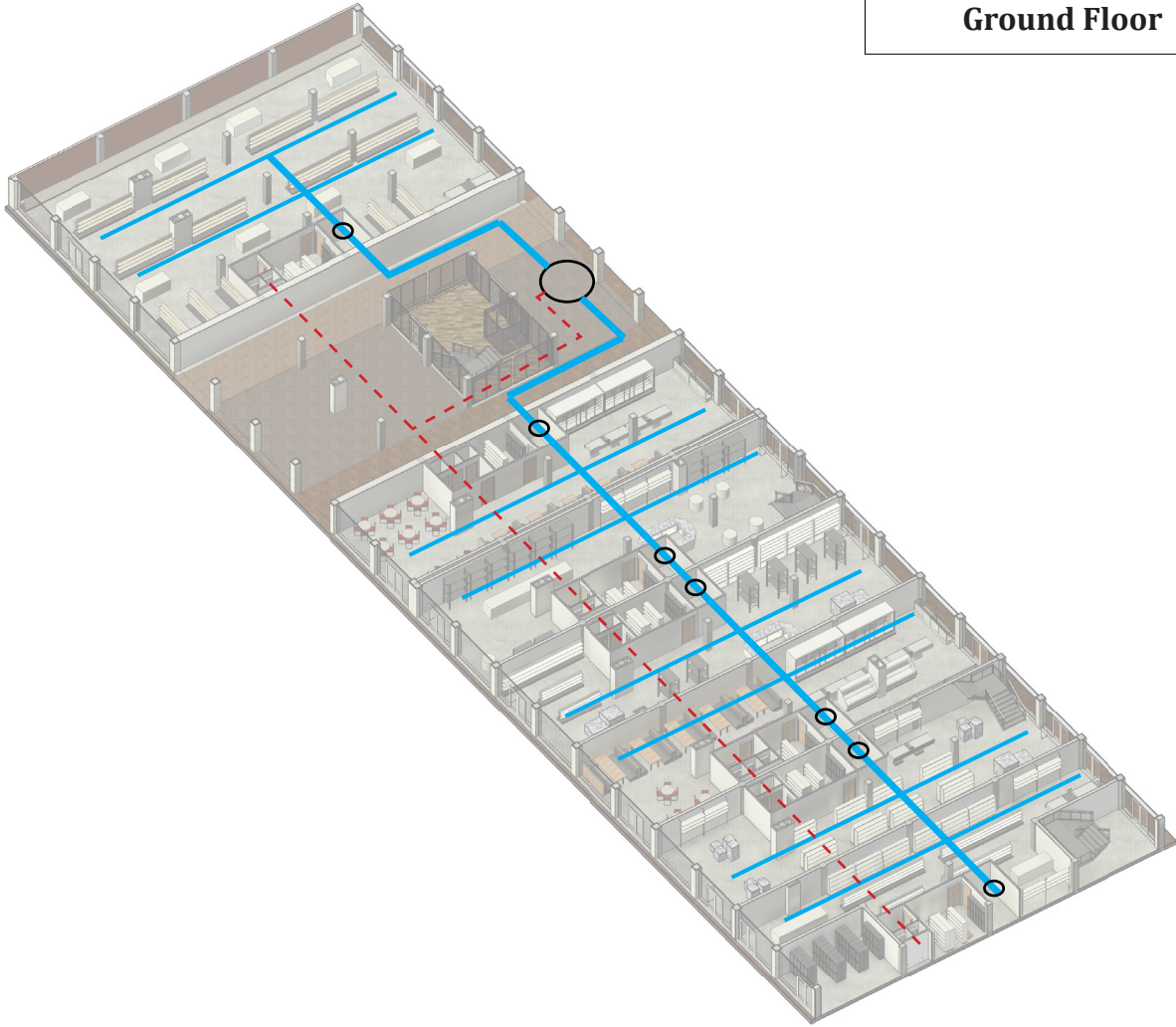
BUILDING TECHNOLOGY

De Bogaard: Reimagined

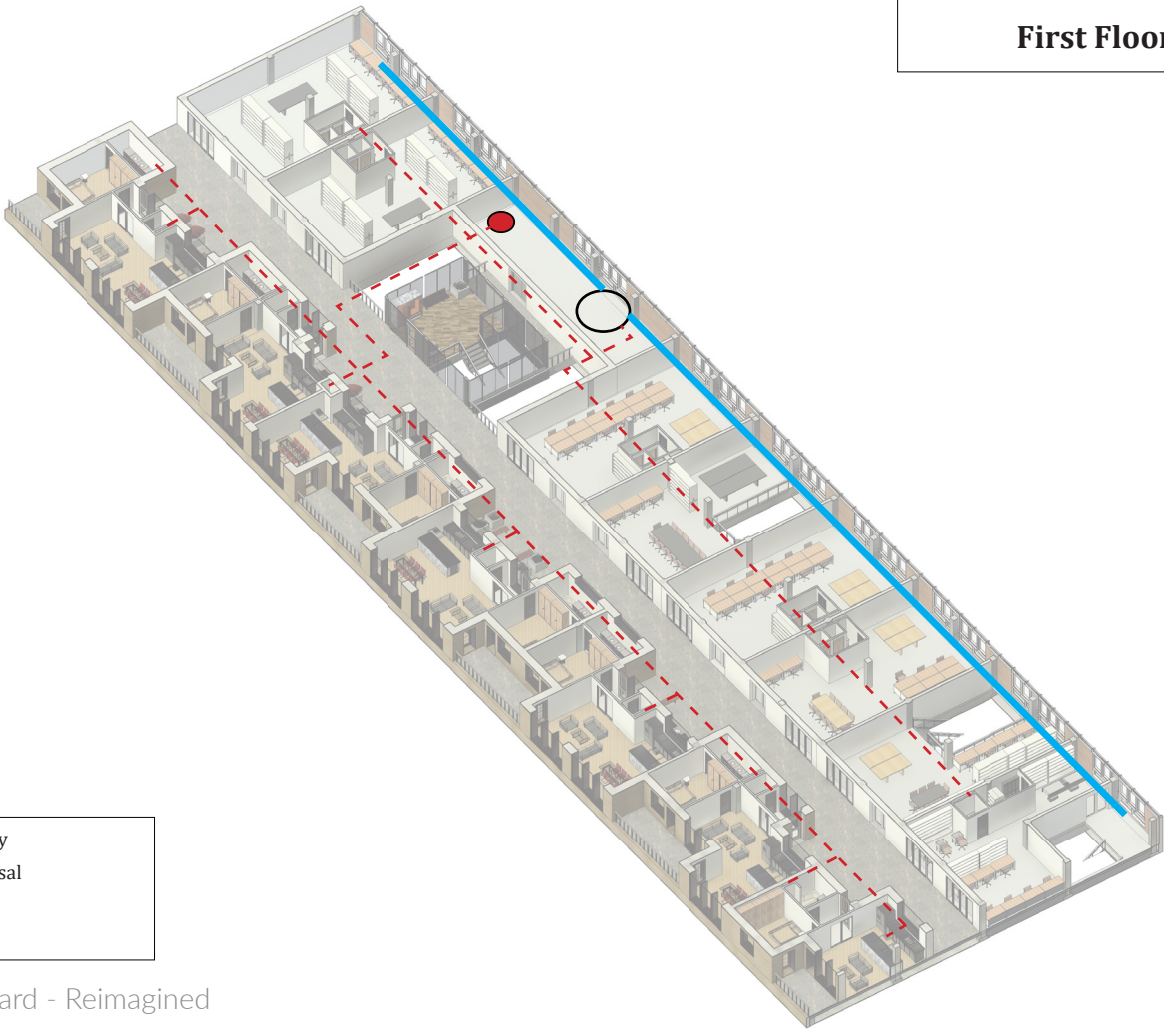


• ————— **VENTILATION** —————>

Ground Floor



First Floor



- Air supply
- Air disposal
- System C
- System D

Ventilation		Type D				
<i>Needs</i>						
Accomadation space	3	m3/h x m2				
Toilets	25	m3/h				
<i>Settings</i>						
High setting	200	m3/h	43	W	0,215	W*/h/m3
Low setting	120	m3/h	20	W	0,167	W*/h/m3

Ventilation		Type C+				
<i>Needs</i>						
Bathroom	50	m3/h				
Toilets	25	m3/h				
Accomadation space with k	76	m3/h				
<i>Settings</i>						
Average	85	m3/h	5	W	0,059	W*h/m3

Stores	220	m2	Units	8			
Needs							
Accomadation area	713	m3/h	Daily High setting	12	h		
Toilets	25	m3/h	Low setting	12	h		
High setting							
Accomadation area	8.554	m3	Low setting Accomadation area	1.440	m3		
Toilets	302	m3	Toilets	1.440	m3		
Total	8.856	m3	Total	2.880	m3		
Daily usage							
Accomadation area	1.839	W*h	Nightly usage Accomadation area	240	W*h	Yearly usage Accomadation area	759 kWh
Toilets	65	W*h	Toilets	240	W*h	Toilets	111 kWh
Total	1.904	W*h	Total	480	W*h	Total	870 kWh

Work space	116	m2	Units	8	
Needs					
Accommodation area	376	m3/h	Daily		
Toilets	25	m3/h	High setting	12	h
			Low setting	12	h
High setting					
Accommodation area	4.510	m3	Low setting		
Toilets	302	m3	Accommodation area	1.440	m3
			Toilets	1.440	m3
Total	4.812	m3	Total	2.880	m3
Daily usage					
Accommodation area	970	W*h	Nightly usage		Yearly usage
Toilets	65	W*h	Accommodation area	240	W*h
			Toilets	240	W*h
Total	1.035	W*h	Total	480	W*h
Total					
Accommodation area	442	kWh			
Toilets	111	kWh			
Total	553	kWh			

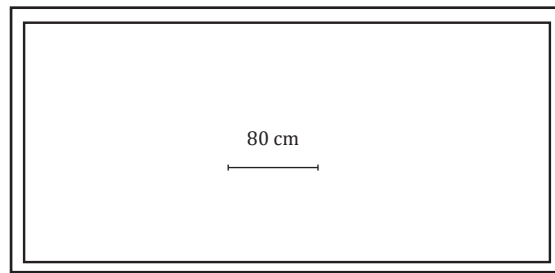
Living space			82	m2	Units		7	
Needs					Daily			
Bathroom	50	m3/h			On		12	h
Toilet	25	m3/h			Off		12	h
Accommodation space with kitchen			76	m3/h				
On								
Bathroom	600	m3						
Toilet	300	m3						
Accommodation space with kitchen			907	m4				
Total			1.807	m3				
Daily usage					Yearly usage			
Bathroom	35	W*h			Bathroom		13	kWh
Toilet	18	W*h			Toilet		6	kWh
Accommodation space with kitchen			53	W*h	Accommodation space with kitchen			19 kWh
Total			106	W*h	Total			39 kWh

Yearly usage		
Ground floor type D	6.961	kWh
First floor type D	4.423	kWh
First floor type C+	272	kWh
Total	11.384	kWh

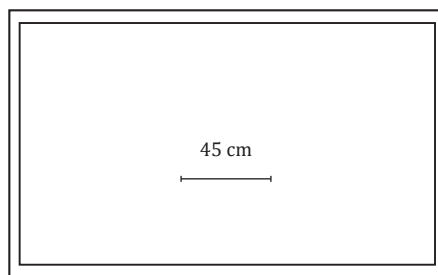
Source: Ventilatieland.nl

Source: Bouwinfolo.be

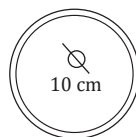
Main supply retail



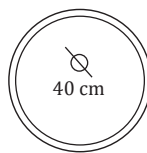
Main supply workshop



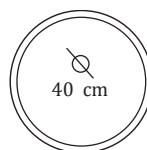
Sup supply retail



Disposal retail & workshop



Disposal living



Ventilation	Type D					
Needs						
Accomadation space	3	m3/h x m2				
Toilets	25	m3/h				
Settings						
High setting	200	m3/h	43	w	0,22	W*h/m3
Low setting	120	m3/h	20	w	0,17	W*h/m3
Max speeds						
Main channel	5	m/s	18.000	m/h		
Branch channel	3	m/s	10.800	m/h		
Available height	400	mm	0,40	m		

Ventilation	Type C+					
<i>Needs</i>						
Bathroom	50	m3/h				
Toilets	25	m3/h				
Accomadation space with kitchen	76	m3/h				
<i>Settings</i>						
Average	85	m3/h	5	W	0,059	W*h/m3
<i>Max speeds</i>						
Main channel	5	m/s	18.000	m/h		
Branch channel	3	m/s	10.800	m/h		
<i>Space available</i>						
Space available	1.100	mm	1,10	m		

Stores	220	m2	Units	8
<i>Needs</i>				
Accommodation area	713	m3/h		
Toilets	25	m3/h		
<i>Min main channel area</i>				
Accommodation area	0,040	m2		
Toilets	0,0014	m2		
<i>Min main channel width</i>				
Accommodation area	0,10	m	99	mm
Toilets	-			
All units	0,79	m	792	mm
<i>Min main channel diameter</i>				
Accommodation area	-	A=r2*π		
Toilets	0,021	m	21	mm
All units	0,17	m	169	mm
<i>Min branch channel area</i>				
Accommodation area	0,066	m2		
Toilets	0,0023	m2		
<i>Min branch channel diameter</i>				
Accommodation area	0,14	m	145	mm
Toilets	0,027	m	27	mm

Work space	116	m2	Units	8
<i>Needs</i>				
Accommodation area	376	m3/h		
Toilets	25	m3/h		
<i>Min main channel area</i>				
Accommodation area	0,021	m2		
Toilets	0,0014	m2		
<i>Min main channel width</i>				
Accommodation area	0,05	m	52	mm
Toilets	-			
All units	0,42	m	418	mm
<i>Min main channel diameter</i>				
Accommodation area	-	A=r2*π		
Toilets	0,021	m	21	mm
All units	0,17	m	169	mm
<i>Min branch channel area</i>				
Accommodation area	0,035	m2		
Toilets	0,0023	m2		
<i>Min branch channel diameter</i>				
Accommodation area	0,11	m	106	mm
Toilets	0,027	m	27	mm

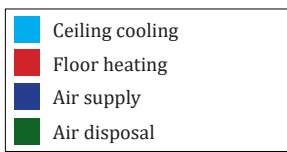
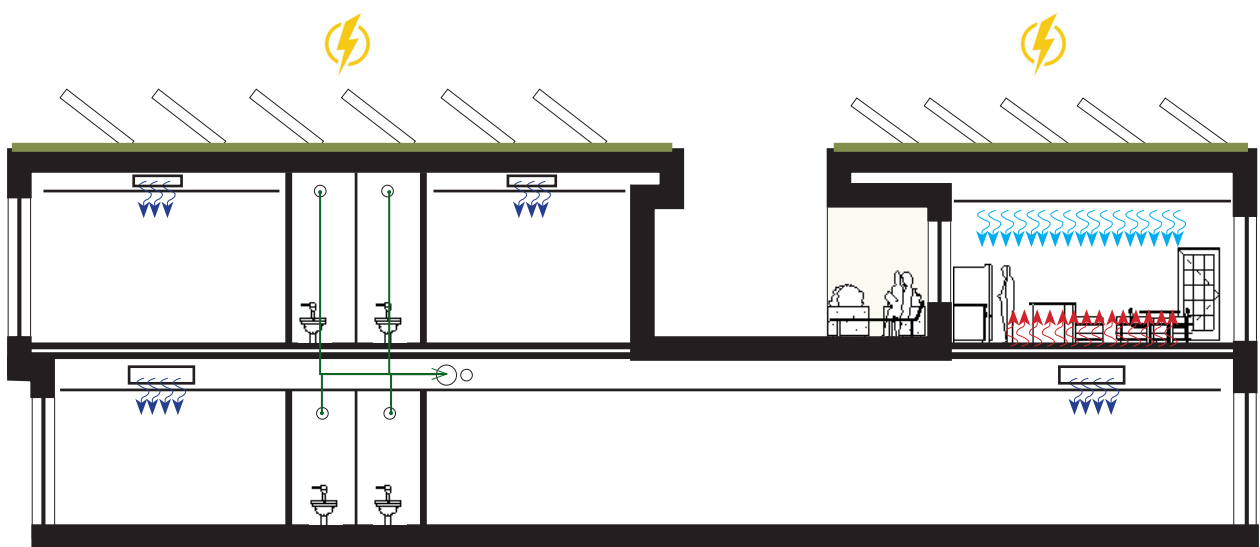
Living space	82	m2	Units	7
<i>Needs</i>				
Bathroom	50	m3/h		
Toilets	25	m3/h		
<i>Min main channel area</i>				
Bathroom	0,0028	m2		
Toilets	0,0014	m2		
<i>Min main channel width</i>				
Bathroom	0,0070	m	7	mm
Toilets	-			
All units	0,049	m	49	mm
<i>Min main channel diameter</i>				
Bathroom	-	A=r2*π		
Toilets	0,021	m	21	mm
All units	0,15	m	148	mm
<i>Min branch channel area</i>				
Bathroom	0,0047	m2		
Toilets	0,0023	m2		
<i>Min branch channel diameter</i>				
Bathroom	0,039	m	39	mm
Toilets	0,027	m	27	mm

Source: Ventilatieland.nl

Source: Bouwinfo.be

Source: Ventilatieland.nl

• ————— **HEATING/COOLING** —————→

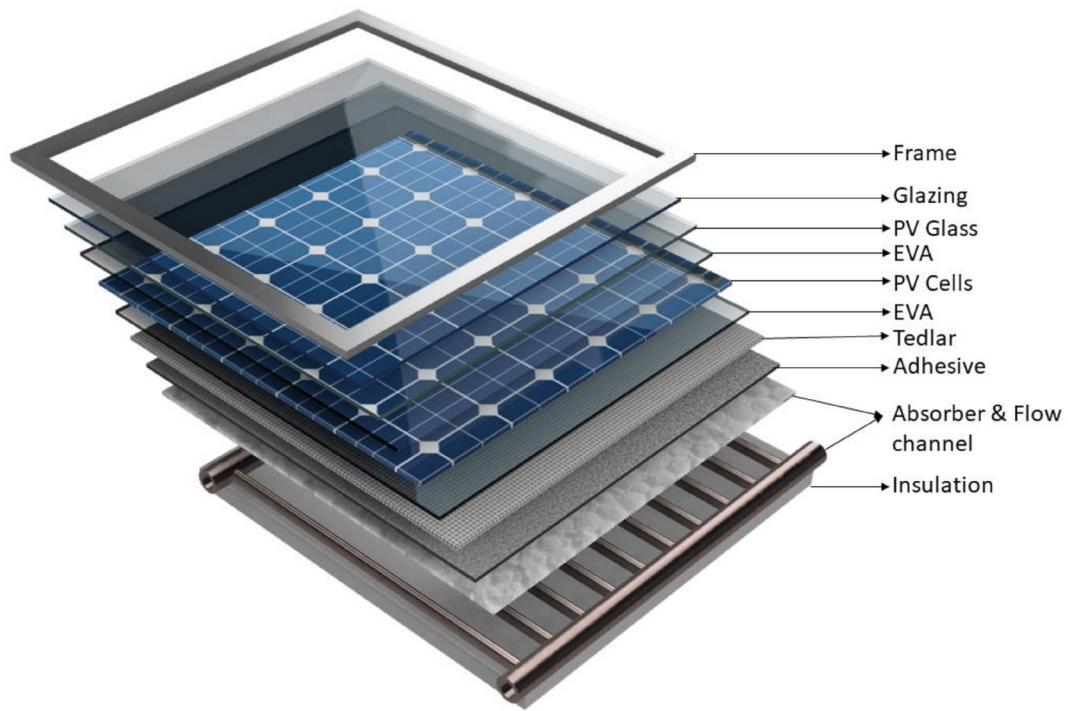


Floor heating/Ceiling cooling					
<i>Needs</i>					
<i>Time average needed</i>	20	min/h			
<i>Daily energy usage</i>	100	W/m2	13	W/m2*h	
<i>Daily average</i>			<i>Yearly average</i>		
<i>Heating</i>	8	h	<i>Heating</i>	151	days
<i>Cooling</i>	8	h	<i>Cooling</i>	123	days

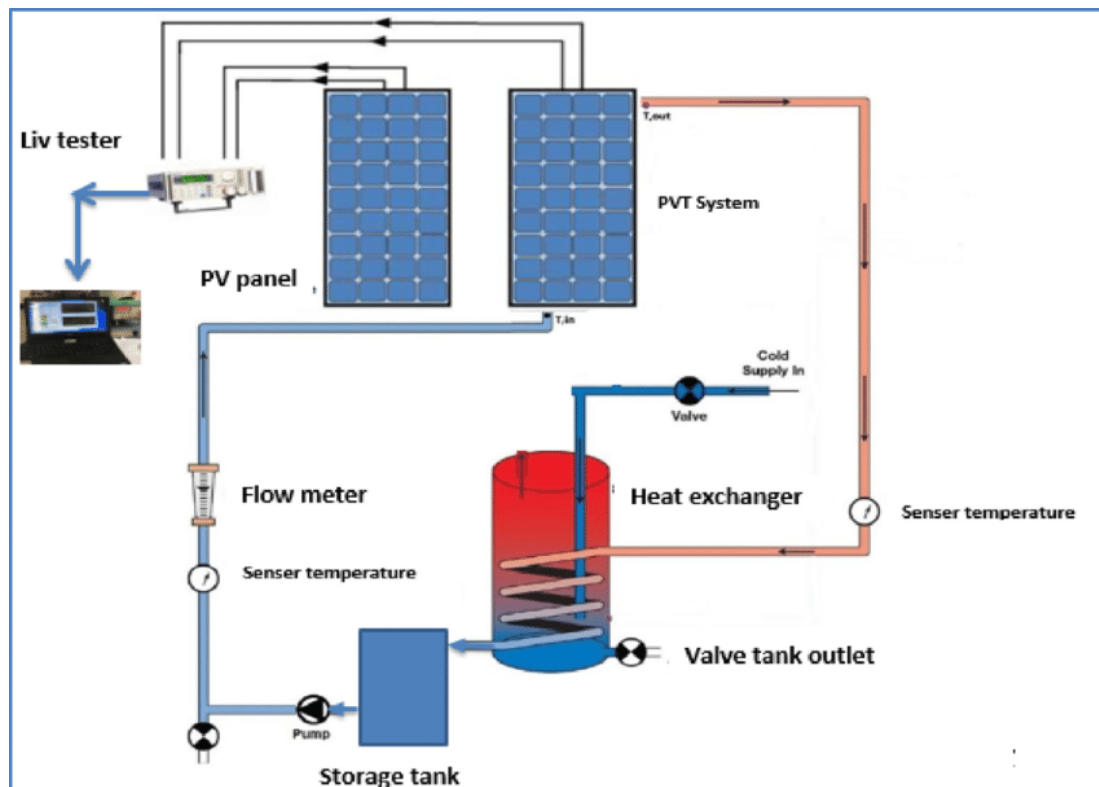
Living space	82	m2	Units	7	
<i>Usage system</i>					
<i>Heating</i>	1.025	W			
<i>Cooling</i>	1.025	W			
<i>Daily usage</i>			<i>Yearly usage</i>		
<i>Heating</i>	8.200	W	<i>Winter</i>	1.238	kWh
<i>Cooling</i>	8.200	W	<i>Summer</i>	1.009	kWh
			<i>Total</i>	2.247	kWh

Yearly usage		
<i>First floor</i>	15.728	kWh
<i>Total</i>	15.728	kWh

• ————— **ELETRICITY** —————→



Source: Bandaru et al., 2021



Source: Amira Lateef Abdulah on ResearchGate, 2019

Stores	220	m2
<i>Yearly</i>	81	kWh/m2
<i>Units</i>	8	
<i>Per store</i>	17.820	kWh
Total	142.560	kWh

Source: Minder.nl

Work spaces	116	m2
<i>Yearly</i>	60	kWh/m2
<i>Units</i>	8	
<i>Per space</i>	6.960	kWh
Total	55.680	kWh

Source: Skepp.nl

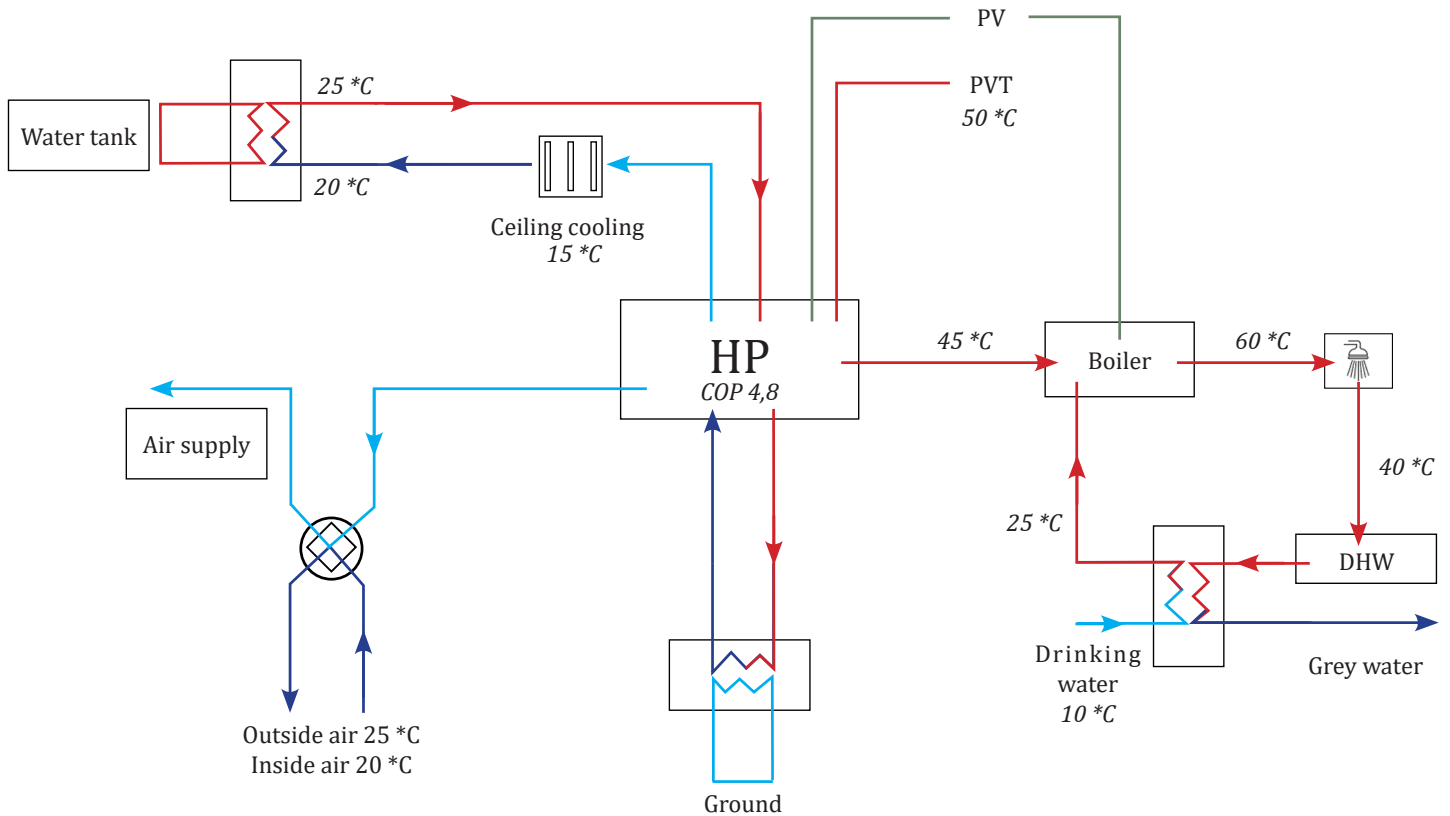
Living space	82	m2
<i>Yearly</i>	1.900	kWh
<i>Household</i>	2	pers
<i>Units</i>	7	
Total	13.300	kWh

Source: Pure-Energie.nl

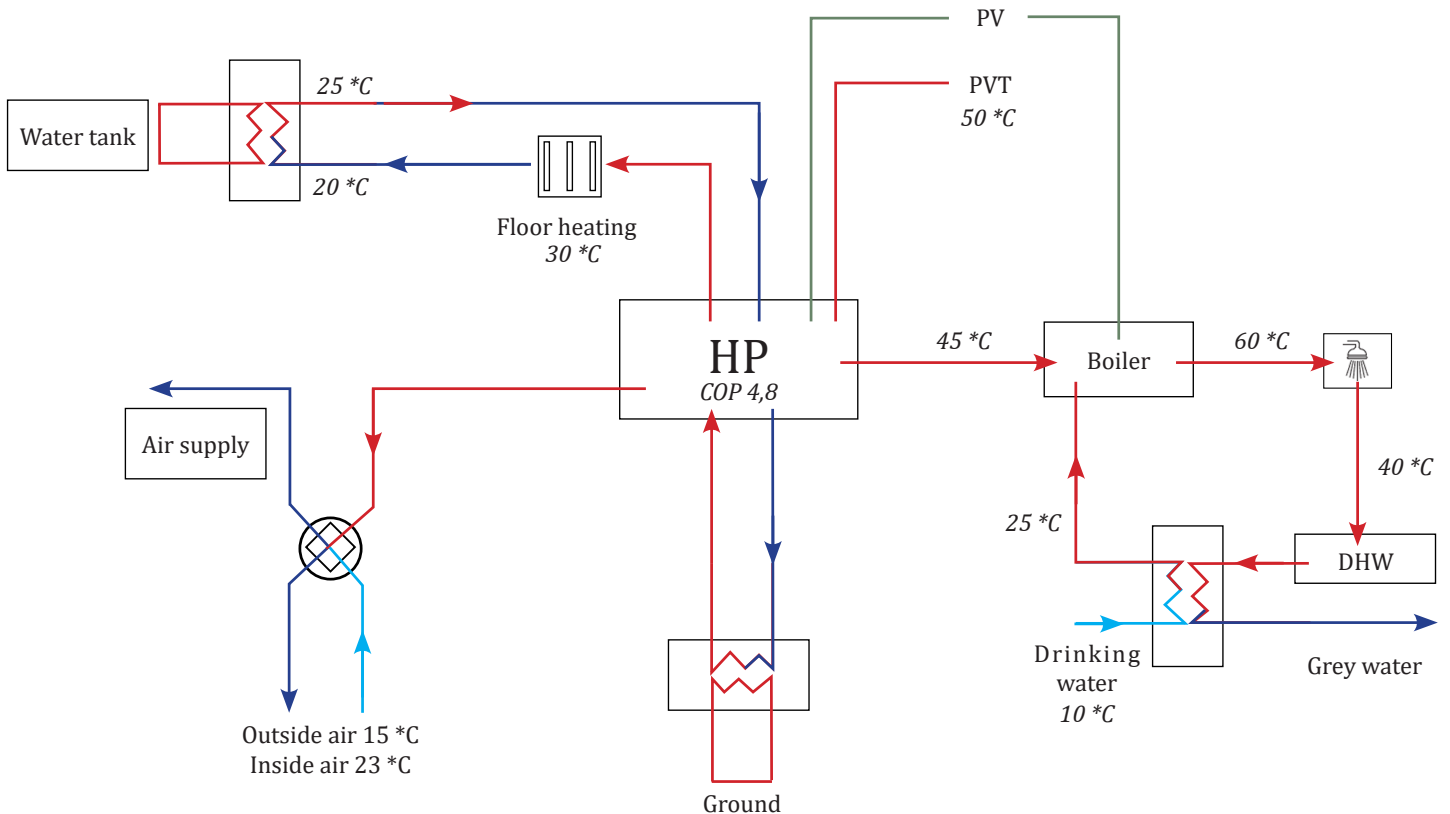
Yearly usage		
Total	211.540	kWh

• ————— **GENERATION** —————→

Summer strategy



Winter strategy



Energy usage/generation		
<i>Electricity</i>	211.540	kWh
<i>Ventilation</i>	11.384	kWh
<i>Heating & Cooling</i>	15.728	kWh
<i>Total electricity needed</i>	211.540	kWh
<i>Total heat production needed</i>	27.112	kWh

Heat pump		
<i>Depth</i>	150	m
<i>Settings</i>	4,8	COP
<i>Max needed generation</i>	27.112	kWh
<i>Usage</i>	5.648	kWh

Solar panels		
<i>Min electricity needed</i>	217.188	kWh
<i>Area roof work spaces</i>	1.176	m2
<i>Area roof living spaces</i>	760	m2
<i>Max occupation</i>	70%	
<i>Available area work spaces</i>	823	m2
<i>Available area living spaces</i>	532	m2
<i>Total available area</i>	1.355	m2

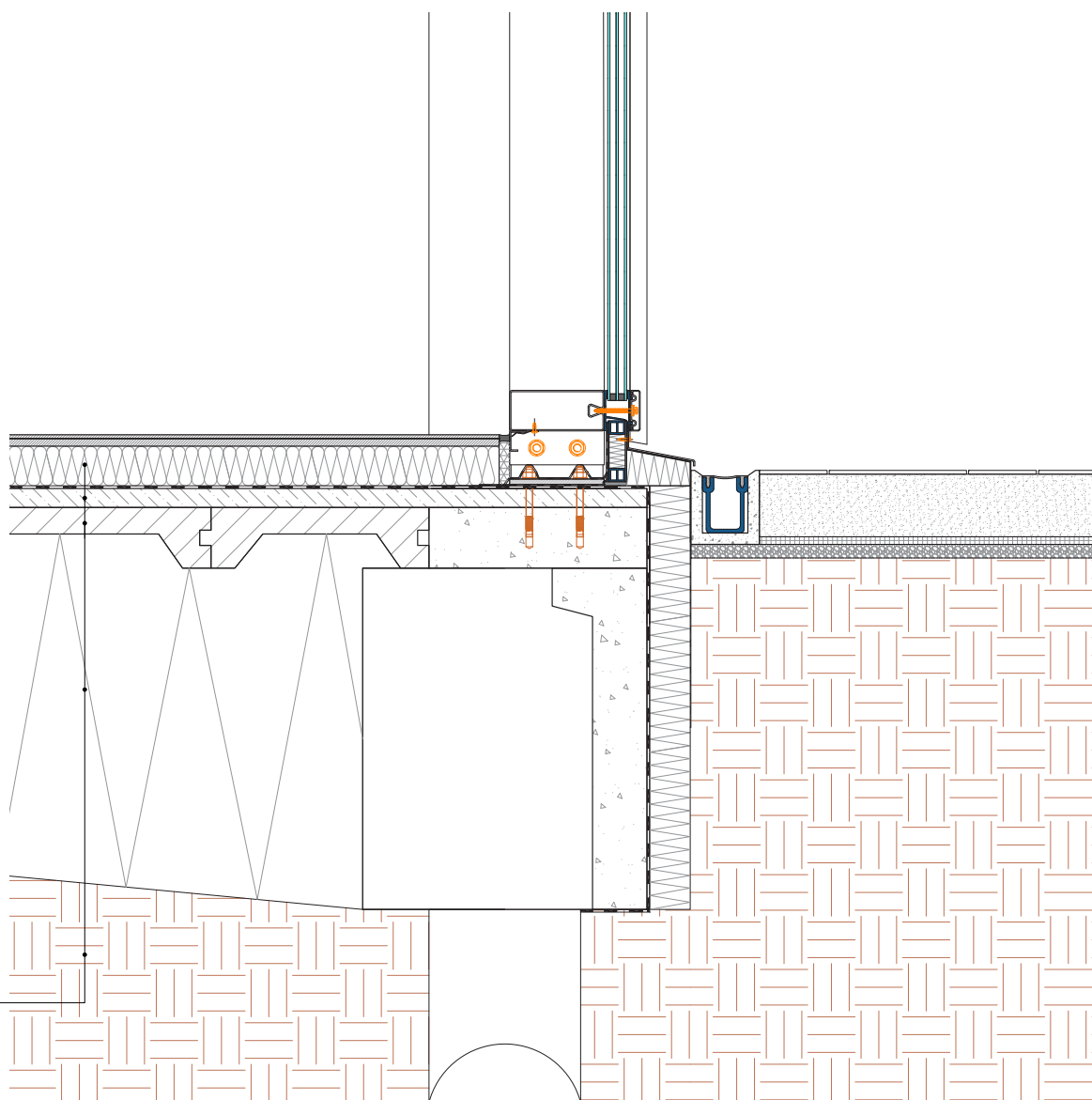
Broad calculation				
<i>(Daily kWh ÷ average sun hours) x 1.15 efficiency factor = DC solar system size</i>				
<i>Daily kWh</i>	595	kWh		
<i>Average sun hours</i>	5	hr		
<i>DC solar system size</i>	143	kWh	143.298	W
<i>Average solar panel generation</i>	250 - 400	W	250	W
<i>Average solar panel size</i>	0,8 x 1,5	m2	1,2	m2
<i>Total amount panels needed</i>	573			
<i>Total area panels needed</i>	666	m2		

Source: Weather-and-climate.com

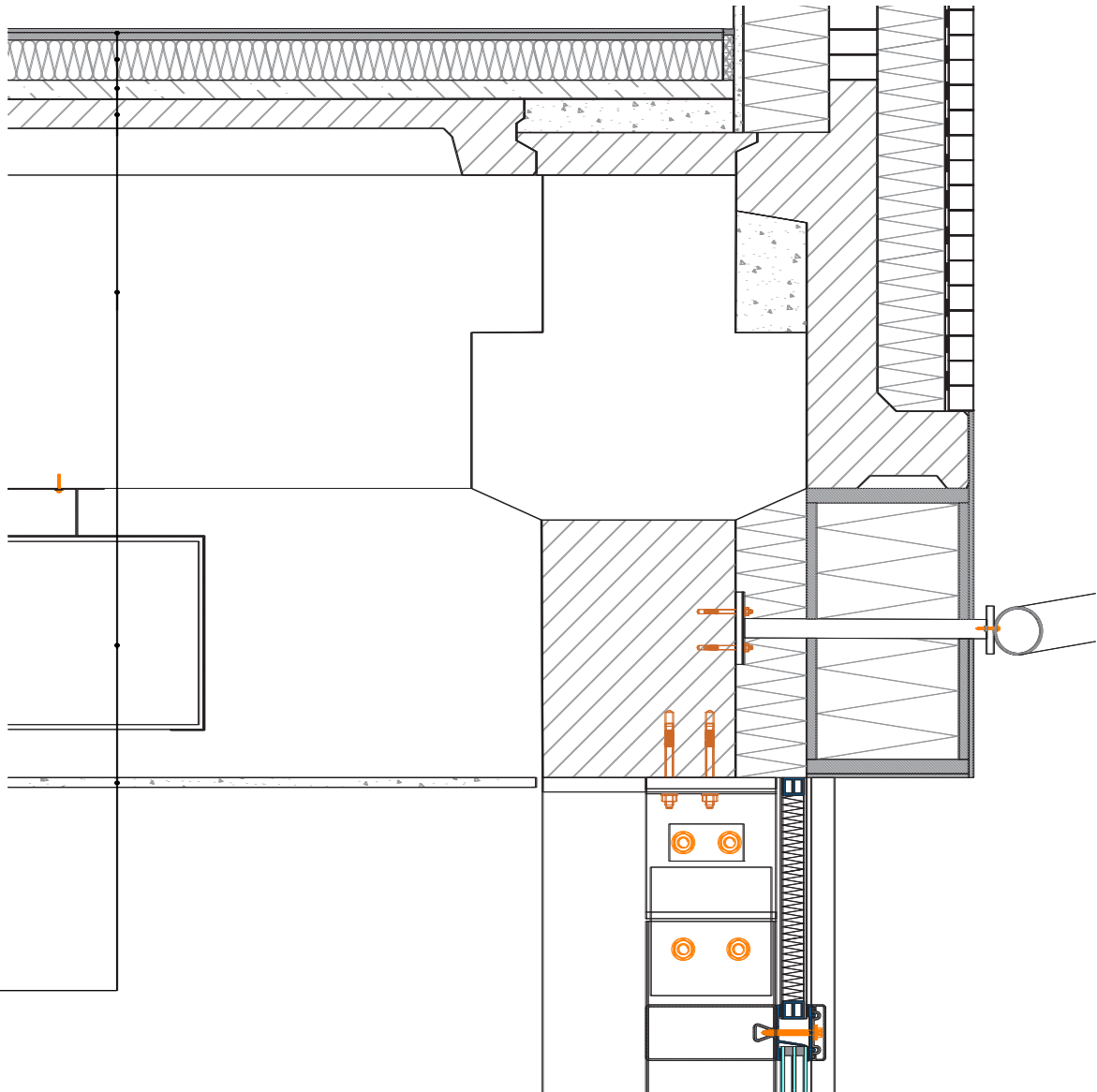
Source: Forbes.com



Concrete screed	20 mm
Sound proofing	60 mm
Concrete screed	40 mm
Reinforced concrete slabs	160 mm
PUR insulation in crawlspace	900 mm
Soil	-



Wooden flooring	30 mm
Sound proofing	60 mm
Concrete screed	40 mm
Reinforced concrete slabs	160 mm
Concrete column	800 mm
Ventilation duct	600 x 800 mm
System ceiling	800 mm
Gypsum ceiling	10 mm



Wood cladding	15 mm
Wooden system	40+ 20 mm
EPS insulation	60 mm
Plywood	15 mm
Cellulose	200 mm
Plywood	15 mm
Gypsum wall	20 mm

REFERENCES

Ventilatieberekeningen - ventilatiekanalen (instort)

Ventilatiekanaal (instort) 165 x 80 mm

luchthoeveelheid m³/h	breedte mm	hoogte mm	oppervlakte m²	snelheid m/s
125	165	80	0,013	2,63
130	165	80	0,013	2,74
135	165	80	0,013	2,84
140	165	80	0,013	2,95
145	165	80	0,013	3,05
150	165	80	0,013	3,16
155	165	80	0,013	3,26
160	165	80	0,013	3,37
165	165	80	0,013	3,47
170	165	80	0,013	3,58
175	165	80	0,013	3,68
180	165	80	0,013	3,79
185	165	80	0,013	3,89
190	165	80	0,013	4,00
195	165	80	0,013	4,10
200	165	80	0,013	4,21
205	165	80	0,013	4,31
210	165	80	0,013	4,42
215	165	80	0,013	4,52
220	165	80	0,013	4,63
225	165	80	0,013	4,73
230	165	80	0,013	4,84
235	165	80	0,013	4,95
240	165	80	0,013	5,05
245	165	80	0,013	5,16

Ventilatiekanaal (instort) 220 x 80 mm

luchthoeveelheid m³/h	breedte mm	hoogte mm	oppervlakte m²	snelheid m/s
175	220	80	0,018	2,76
180	220	80	0,018	2,84
185	220	80	0,018	2,92
190	220	80	0,018	3,00
195	220	80	0,018	3,08
200	220	80	0,018	3,16
205	220	80	0,018	3,24
210	220	80	0,018	3,31
215	220	80	0,018	3,39
220	220	80	0,018	3,47
225	220	80	0,018	3,55
230	220	80	0,018	3,63
235	220	80	0,018	3,71
240	220	80	0,018	3,79
245	220	80	0,018	3,87
250	220	80	0,018	3,95
255	220	80	0,018	4,02
260	220	80	0,018	4,10
265	220	80	0,018	4,18
270	220	80	0,018	4,26
275	220	80	0,018	4,34
280	220	80	0,018	4,42
285	220	80	0,018	4,50
290	220	80	0,018	4,58
295	220	80	0,018	4,66
300	220	80	0,018	4,73
305	220	80	0,018	4,81
310	220	80	0,018	4,89
315	220	80	0,018	4,97
320	220	80	0,018	5,05
325	220	80	0,018	5,13

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E-mail adres: info@ventilatieland.nl
Telefoonnummer: 0499-764433

Ventilatieberekeningen - spirobuizen

Spirobuis diameter 125 mm

luchthoeveelheid m³/h	diameter buis mm	oppervlakte m²	snelheid m/s
125	125	0,012	2,83
130	125	0,012	2,94
135	125	0,012	3,06
140	125	0,012	3,17
145	125	0,012	3,28
150	125	0,012	3,40
155	125	0,012	3,51
160	125	0,012	3,62
165	125	0,012	3,74
170	125	0,012	3,85
175	125	0,012	3,96
180	125	0,012	4,08
185	125	0,012	4,19
190	125	0,012	4,30
195	125	0,012	4,42
200	125	0,012	4,53
205	125	0,012	4,64
210	125	0,012	4,76
215	125	0,012	4,87
220	125	0,012	4,98
225	125	0,012	5,10

Spirobuis diameter 160 mm

luchthoeveelheid m³/h	diameter buis mm	oppervlakte m²	snelheid m/s
220	160	0,020	3,04
225	160	0,020	3,11
230	160	0,020	3,18
235	160	0,020	3,25
240	160	0,020	3,32
245	160	0,020	3,39
250	160	0,020	3,46
255	160	0,020	3,52
260	160	0,020	3,59
265	160	0,020	3,66
270	160	0,020	3,73
275	160	0,020	3,80
280	160	0,020	3,87
285	160	0,020	3,94
290	160	0,020	4,01
295	160	0,020	4,08
300	160	0,020	4,15
305	160	0,020	4,22
310	160	0,020	4,28
315	160	0,020	4,35
320	160	0,020	4,42
325	160	0,020	4,49
330	160	0,020	4,56
335	160	0,020	4,63
340	160	0,020	4,70
345	160	0,020	4,77
350	160	0,020	4,84
355	160	0,020	4,91
360	160	0,020	4,98
365	160	0,020	5,05
370	160	0,020	5,11

Spirobuis diameter 180 mm

luchthoeveelheid m³/h	diameter buis mm	oppervlakte m²	snelheid m/s
275	180	0,025	3,00
280	180	0,025	3,06
285	180	0,025	3,11
290	180	0,025	3,17
295	180	0,025	3,22
300	180	0,025	3,28
305	180	0,025	3,33
310	180	0,025	3,39
315	180	0,025	3,44
320	180	0,025	3,49
325	180	0,025	3,55
330	180	0,025	3,60
335	180	0,025	3,66
340	180	0,025	3,71
345	180	0,025	3,77
350	180	0,025	3,82
355	180	0,025	3,88
360	180	0,025	3,93
365	180	0,025	3,99
370	180	0,025	4,04
375	180	0,025	4,10
380	180	0,025	4,15
385	180	0,025	4,20
390	180	0,025	4,26
395	180	0,025	4,31
400	180	0,025	4,37
405	180	0,025	4,42
410	180	0,025	4,48
415	180	0,025	4,53
420	180	0,025	4,59
425	180	0,025	4,64
430	180	0,025	4,70
435	180	0,025	4,75
440	180	0,025	4,81
445	180	0,025	4,86
450	180	0,025	4,91
455	180	0,025	4,97
460	180	0,025	5,02

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Українська

HELP

FEEDBACK

RESOURCE DATA

SYSTEM INFO

RESULTS

SYSTEM INFO

Modify the inputs below to run the simulation.

DC System Size (kW):

291.6



Module Type:

Thin Film



Array Type:

Fixed (open rack)



System Losses (%):

14.08

Loss
Calculator

Tilt (deg):

20



Azimuth (deg):

180

Rooftop Size
EstimatorClick below to estimate
the system size from
your roof area on a
map. (optional)

Advanced Parameters

DC to AC Size Ratio:

1.2



Inverter Efficiency (%):

96



Ground Coverage Ratio:

0.4



Albedo:

From weather file



Bifacial:

No

Go to
resource
dataGo to
PVWatts
results

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HELP

FEEDBACK

RESOURCE DATA

SYSTEM INFO

RESULTS

RESULTS

Print Results

255,304 kWh/Year*

Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)
January	0.91	6,657
February	1.85	12,611
March	3.04	22,789
April	3.75	26,817
May	5.03	36,133
June	5.02	34,551
July	5.13	36,455
August	4.37	31,236
September	3.11	21,727
October	1.88	13,856
November	1.12	7,926
December	0.64	4,545

Annual

2.99

255,303

Go to
system Info