Project:	Calculation examplel 3	Date:	2014-01-05
Description:	Family house		
Performed by:	User name	Sign:	Signature
Project file:	C:\Projekt\VIPENERGY.NET\Beräkningsexempel\Example 3 Family house\Calculation example 3 Family house.VIP	Company:	**Campany name**

COMMENTARIES

At the start of VIP-Energy text stings about Signature, User and Comment is loaded from the file Title_Eng.vpd.
Text strings can be updated under Catalog Data -> Update Catalogs. The check box "User Data" should be checked.

Projekt name and Description is loaded från the input file (VIP-file) an is updated when the file is saved.

INDATA

Generic

Calculation period - Day	1 - 365
Solar reflection from ground	20.00 %
Wind velocity % of climate data	S:70 SW:70 W:70 NW:70 N:70 NE:70 EO:70 SE:70 °
Air pressure	1013 hPa
Horizontal angle to ground	S:20 SW:20 W:20 NW:20 N:20 NE:20 EO:20 SE:20 ° °
Form factor for wind pressure	0:0.70 45:0.50 90:-0.60 135:-0.50 180:-0.50 ROOF:-0.00
'South facade' angle to south"	0 °
Activity	No Resident
NO of apartm	1
Ventilation volume	0.0 [m³]
Heated floor area	213.3 [m²]
Ground properties Heat conductance: Silt, Undrained sand and gravel, moraine.	2.3 [W/m*K]

Climate data

STOCKHOLM 1996-2005	Latitude	59.4	degrees	
	Highest value	Average value	Lowest value	
Outside temperature	30.2	7.5	-18.2	°C
Wind velocity	13.5	3.3	0.0	m/s
Solar radiation	905.0	111.8	0.0	W/m²
Relative humidity	100.0	74.3	0.0	%

Building part types 1-dimensional - Catalog

Build part name	Material From outside to inside	Layer thickness m	Heat conduct. W/m,K	Density kg/m³	Heat capacity J/kgK	U-value W/m²K	Delta U-value W/m²K	Permeability q50 l/sm²	Solar absorption %
Wall type 1	Wood Pine	0.020	0.140	500	2300	0.165	0.010	0.50	50.00
	Bars s600x600	0.195	0.042	87	961				
	Bars s600x600	0.045	0.042	87	961				
	Gypsum board	0.013	0.220	900	1100				
Wall type 2	Drained gravel	0.100	1.400	1800	1000	0.247	0.010	0.50	50.00
	Drain isol 60	0.100	0.042	55	1400				
	Leca blocks	0.300	0.210	650	800				
Plinth	KC-Plaster	0.010	1.000	1800	800	0.325	0.010	0.50	70.00
	Exp. Plastics 36	0.100	0.036	25	1400				
	Concrete Normal RH	0.100	1.700	2300	800				
	HEATLAYER	Hydronic							
	Concrete Normal RH	0.100	1.700	2300	800				
Floor type 2	Drained gravel	0.100	1.400	1800	1000	0.098	0.010	0.50	70.00
	Exp. Plastics 36	0.300	0.036	25	1400				
	Concrete Normal RH	0.100	1.700	2300	800				
	Exp. Plastics 36	0.050	0.036	25	1400				
	HEATLAYER	Hydronic							

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Building part types 1-dimensional - Catalog

Build part name	Material From outside to inside	Layer thicknes m	Heat conduct. W/m,K	Density kg/m³	Heat capacity J/kgK	U-value W/m²K	Delta U-value W/m²K	Permea-bility q50 l/sm²	Solar absorp-tion %
	Wood Pine	0.020	0.140	500	2300				
Floor type 1	Drained gravel	0.100	1.400	1800	1000	0.098	0.010	0.50	70.00
	Exp. Plastics 36	0.300	0.036	25	1400				
	Concrete Normal RH	0.100	1.700	2300	800				
	Exp. Plastics 36	0.050	0.036	25	1400				
	HEATLAYER	Hydronic							
	Wood Pine	0.020	0.140	500	2300				
Int flooring u	Wood Pine	0.020	0.140	500	2300	0.206	0.010	0.50	70.00
	Bars s600	0.200	0.045	87	961				
	Gypsum board	0.013	0.220	900	1100				
Int flooring o	Gypsum board	0.013	0.220	900	1100	0.200	0.010	0.50	70.00
	Bars s600	0.200	0.045	87	961				
	Chipboard	0.020	0.140	600	2300				
	HEATLAYER	Hydronic							
	Wood Pine	0.020	0.140	500	2300				
Interior wall	Gypsum board	0.013	0.220	900	1100	0.376	0.020	0.80	70.00
	Bars s600x600	0.100	0.042	87	961				
	Gypsum board	0.013	0.220	900	1100				
Roof type 1	Wood Pine	0.020	0.140	500	2300	0.100	0.010	0.50	70.00
	Blower wool	0.255	0.042	40	800				
	Bars s1200	0.145	0.040	68	900				
	Gypsum board	0.013	0.220	900	1100				

Building part types 2- dimensional - Catalog

Build part name	Psi-value W/m	Width m	Permea-bility q50 l/sm²	Solar absorp-tion %
Floor angle 2	0.050	0.200	0.80	50.00
Window splay	0.070	0.200	0.00	50.00
Ceiling angle	0.095	0.400	0.80	50.00

Build part name	Psi-value W/m	Width m	Permea-bility q50 l/sm²	Solar absorp-tion %
Outer corner 1	0.125	0.400	0.80	50.00
Outer corner 2	0.128	0.200	0.80	50.00

Building part - Walls, slabs

Description	Build part name	Orien-tation	Amount Area m² Length m	Lowest level m	Highest level m	Adjacent tempera-ture °C	Share of effect demand %	U-value with ground and D-U W/m²°K
	Wall type 1	SOUTH	23.3m²	0.0	2.5		0	0.175 W/m²K
	Wall type 1	NORTH	20.3m²	0.0	2.5		0	0.175 W/m²K
	Wall type 1	EAST	16.2m²	0.0	2.5		0	0.175 W/m²K
	Wall type 1	WEST	15.4m²	0.0	2.5		0	0.175 W/m²K
	Plinth	TEMP_O	12.2m²	0.0	0.0		0	0.335 W/m²K
	Wall type 2	BW 0-1 m	34.0m²	-2.5	0.0		0	0.237 W/m²K
	Wall type 2	BW 1-2 m	34.0m²	-2.5	0.0		0	0.204 W/m²K
	Wall type 2	BW >2 m	46.2m²	-2.5	0.0		0	0.170 W/m²K
	Floor type 1	SOG 0-1 m	20.4m²	0.0	0.0		0	0.102 W/m²K
	Floor type 1	SOG 1-6 m	38.9m²	0.0	0.0		0	0.091 W/m²K
	Floor type 2	BF 0-6 m	72.2m²	0.0	0.0		0	0.091 W/m²K
	Roof type 1	ROOF	127.8m²	2.5	2.5		0	0.110 W/m²K
	Int flooring u	INNER	76.5m²				0	

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Building part - Walls, slabs

Description	Build part name	Orientation	Amount Area m² Length m	Lowest level m	Highest level m	Adjacent temperature °C	Share of effect demand %	U-value with ground and D-U W/m²°K
	Int flooring o	INNER	76.5m²				0	
	Interior wall	INNER	350.0m²				0	
	Window splay	SOUTH	15.4m	0.0	2.5		0	0.070 W/mK
	Window splay	NORTH	30.4m	0.0	2.5		0	0.070 W/mK
	Window splay	WEST	6.2m	0.0	2.5		0	0.070 W/mK
	Window splay	EAST	5.0m	0.0	2.5		0	0.070 W/mK
	Outer corner 1	SOUTH	2.5m	0.0	2.5		0	0.125 W/mK
	Outer corner 1	WEST	2.5m	0.0	2.5		0	0.125 W/mK
	Outer corner 1	NORTH	2.5m	0.0	2.5		0	0.125 W/mK
	Outer corner 1	EAST	2.5m	0.0	2.5		0	0.125 W/mK
	Ceiling angle	ROOF	24.6m	2.5	2.5		0	0.095 W/mK
	Ceiling angle	SOUTH	8.0m	2.5	2.5		0	0.095 W/mK
	Ceiling angle	NORTH	8.0m	2.5	2.5		0	0.095 W/mK
	Ceiling angle	WEST	4.3m	2.5	2.5		0	0.095 W/mK
	Ceiling angle	EAST	4.3m	2.5	2.5		0	0.095 W/mK
	Outer corner 2	BW 0-1 m	4.0m	-2.5	0.0		0	0.128 W/mK
	Outer corner 2	BW 1-2 m	4.0m	-2.5	0.0		0	0.128 W/mK
	Outer corner 2	BW >2 m	3.1m	-2.5	0.0		0	0.128 W/mK
	Floor angle 2	BF 0-6 m	17.4m	-2.5	-2.5		0	0.050 W/mK
	Floor angle 2	BW >2 m	17.4m	-2.5	-2.5		0	0.050 W/mK

Building part - Window, door, valves

Description	Build part name	Orientation	Area m²	Glass share %	Solar transm. Total %	Solar transm. Direct %	U-value W/m²K	Lowest level m	Highest level m	Permeability q50 l/sm²	Solar protection name
	Window type 1	SOUTH	7.3	80	60	50	1.00	0.0	2.5	0.50	
	Door type 1	SOUTH	2.1	90	60	50	1.00	0.0	2.5	0.50	
	Door type 2	NORTH	2.1	0	0	0	1.00	0.0	2.5	0.50	
	Window type 1	NORTH	7.3	80	60	50	1.00	0.0	2.5	0.50	
	Door type 2	WEST	2.1	0	0	0	1.00	0.0	2.5	0.50	
	Window type 1	EAST	1.6	80	60	50	1.00	0.0	2.5	0.50	

Operating data

Operating case name	Activity energy W/m²	Activity energy W/lgh	Activity energy external W/m²	Building - energy to room W/m²	Building-energy external W/m²	Person energy W/m²	Hot tap water W/m²	Hot tap water W/lgh	Moist added mg/s,m²	Highest room temp °C	Lowest room temp °C	Room-temp passive forc °C
Family house 22	2.74	0.00	0.70	0.20	0.00	0.00	2.28	0.00	1.00	27.00	22.00	0.00

Operating hours

Operating case name	Week-days	Week number	Time
Family house 22	Mondays	Remaining time	- - - -
	Tuesdays	==	Mondays
	Wednesdays	==	Mondays
	Thursdays	==	Mondays
	Fridays	==	Mondays
	Saturdays	==	Mondays
	Sundays	==	Mondays

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Ventilation unit

Unit name	Inlet air Fan pressure Pa	Inlet air effc. %	Exhaust air Fan pressure Pa	Exhaust air effc. %	Control case
Airing	0.00	0.00	0.00	0.00	Värdr
Exhaust air	0.00	0.00	0.00	0.00	Frånl

Control case

Control case	Control type	Outside temperature L	Control value L	Outside temperature H	Control value H
Värdr	Återvinning	0.00 °C	0.00 %	0.00 °C	0.00 %

Ventilation unit - Operating hour and flow

Unit name	Week-days	Supply air l/s,m²	Exhaust air l/s,m²	Week number	Starttime-Endtime
Airing					
	Mondays	0.025	0.025	1 - 53	0 - 24
	Tuesdays	==	Mondays		
	Wednesdays	==	Mondays		
	Thursdays	==	Mondays		
	Fridays	==	Mondays		
	Saturdays	==	Mondays		
	Sundays	==	Mondays		
Exhaust air					
	Mondays	0.000	0.350	1 - 53	0 - 24
	Tuesdays	==	Mondays		
	Wednesdays	==	Mondays		
	Thursdays	==	Mondays		
	Fridays	==	Mondays		
	Saturdays	==	Mondays		
	Sundays	==	Mondays		

Heating and cooling

Heat pump: NIBE F750	Share of effect	100.0	%
Accumulator tank	0.0	Parallel linked	
NIBE F750			
Refrigerant type	R407C		
Heat pump type	Exhaust heat		
Lowest temperature cold side	-15.0	°C	
Highest temperature warm side	58.0	°C	
Heat to hot tap water			
Heat to heating system			
Speed control down to	25.0	%	
Speed control up to	148.0	%	
Output effect	3726.0	W	
COP	2.6		
Temperature warm side	45.0	°C	
Exhaust air flow	50.0	l/s	
Testing standard	EN 14511	Inclusive cirkulation pumps and fans	
Power to circulation fan	1.3	%	
Power to ciikulation cooling fan	1.3	%	
Power circulation pump room heating	0.2	%	

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Priority to hot tap water

Heating system	Op. point 1	Op. point 2
Outside temperature	-20.0	20.0
Supply pipe temperature	55.0	20.0
Drain pipe temperature	45.0	20.0
HOT TAP WATER SYSTEM		
Cold water temperature	8.0	[°C]
Hot tap water temperature	55.0	[°C]

OTHER

Power circulation pump room heating 0.00 % of energy supply to room and air
Lowest dimensioning outside temperature for heating -20.0 °C
Highest dimensioning temperature for comfort cooling 27.0 °C
Passive cooling

RESULT

Calculation date	2014-01-05	17:35:25

Time detailed energy balance Supplied energy

Period	Supplied	energy	kWh							
	(27)	(20)	(19)	(29)	(18)	(25)	(45)	(33)	(34)	(52)
	Solar energy window	Re-covery vent.	Re-covery HP	Re-covery sewer	Solar col-lector	Person heat	Process-energy	Heat supply	El supply	Latent energy
Mon 1	16	0	2021	0	0	0	466	81	1082	397
Mon 2	55	0	1821	0	0	0	421	79	1002	358
Mon 3	317	0	1722	0	0	0	466	8	844	397
Mon 4	422	0	1228	0	0	0	451	0	459	384
Mon 5	470	0	792	0	0	0	466	0	254	397
Mon 6	443	0	437	0	0	0	451	0	135	384
Mon 7	438	0	296	0	0	0	466	0	101	397
Mon 8	439	0	288	0	0	0	466	0	100	397
Mon 9	352	0	629	0	0	0	451	0	183	384
Mon 10	115	0	1326	0	0	0	466	0	438	397
Mon 11	20	0	1692	0	0	0	451	0	710	384
Mon 12	10	0	1901	0	0	0	451	28	969	384
Period	3096	0	14218	0	0	0	5492	196	6310	4670

Time detailed energy balance Emitted energy

Period	Emitted	energy	kWh		
	(23)	(24)	(21)	(28)	(22)
	Trans-mis-sion	Air-infil-tration	Venti-lation	Waste-water	Passive cooling
Mon 1	1628	12	2061	362	0
Mon 2	1499	19	1892	327	0
Mon 3	1489	10	1890	362	0
Mon 4	1101	7	1488	350	0

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Time detailed energy balance Emitted energy

Period	Emitted	energy	kWh		
	(23)	(24)	(21)	(28)	(22)
	Trans-mis-sion	Air-infil-tration	Venti-lation	Waste-water	Passive cooling
Mon 5	807	5	1197	362	0
Mon 6	533	3	934	350	23
Mon 7	437	2	795	362	80
Mon 8	459	2	852	362	36
Mon 9	598	3	1059	350	4
Mon 10	943	6	1435	362	0
Mon 11	1207	9	1694	350	0
Mon 12	1452	12	1929	350	0
Period	12200	90	17290	4259	143

Key values

Inner heat capacity	33.43	[Wh/m²°C]
Outer heat capacity	115.19	[Wh/m²°C]
Avg temperature	22.00	[°C]
Avg ventilation	0.38	l/s,m²
Process energy avg	3.64	[W/m²]
Person energy avg	0.00	[W/m²]
Shell area	515.53	[m²]
Inside pressure avg	-7.1	[Pa]
Specifiic fan power	0.0	[kW/(m³/s)]
Shell/Floor area	2.42	
Area windows+doors/Floor area	0.11	

Comparison to demands according to BBR

			Value olowed	
Jämförelse mot BBR19				
U-value		0.196	0.400	W/(m²K)
Energy usage	Totalt	32	55	kWh/(m²år)
Energy usage	Värmeförsörjning	1		kWh/(m²år)
Energy usage	El till värmepump	30		kWh/(m²år)
Energy usage	Fastighetsel	2		kWh/(m²år)
Installerad El-effekt		5.4	6.6	kW
Transmission:		3.0		kW
Luftläckage:		0.9		kW
Ventilation:		3.9		kW
Tappvarmvatten:		0.5		kW
Värmepump:		-2.8		kW
Dimensionerande temperaturer	Inne	Ute	Mark	
	20.0	-20.0	8.0	
Atemp: 213.3 m²				
Klimatzon BBR19	III			
Activity: / No Resident				
Elvärme				
Verkningsgrad värmeförsörjning: 100.00 %				

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Energy balance

Emitted energy		
(23)Transmission	12200	57.21
(24)Infiltration	90	0.42
(21)Ventilation	17290	81.08
(28)Sewer	4259	19.97
(22)Passive cooling	143	0.67
Supplied energy		
(27)Solar energy trough window	3096	14.52
(20)Heat recovery ventilation	0	0.00
(29)Heat recovery to hot tap water	0	0.00
(19)Heat recovery Heat pump	14218	66.67
(18)Heat recovery Solar collector	0	0.00
(45)Process energy	5492	25.75
(25)Person heat	0	0.00
(34)El supply	6310	29.59
(33)Heat supply	196	0.92
(52)Latent energy	4670	21.90

Specification of energy flows

(33)HEAT SUPPLY	196	0.92	(37)CONDENSER HEAT	20528	96.26
(2)Heating system	196	0.92	(5)Heating system	16269	76.29
(3)Hot tap water	0	0.00	(6)Hot tap water	4259	19.97
(47+48)BUILDING COOLING	143	0.67			
(48)Cooling in room air	143	0.67	(26)PROCESSENERGY	6800	31.89
(48S)Sensibel cooling in room air	118	0.55	(40)Activity energy internal	5119	24.00
(48L)Latent cooling in room air	26	0.12	(41)Activity energy external	1308	6.13
			(39)Operation energy internal	374	1.75
(34)EL SUPPLY	6310	29.59			
(35)Heat pump	6310	29.59	(43)HEATING SYSTEM	16465	77.21
			(44)HOT TAP WATER SYSTEM	4259	19.97

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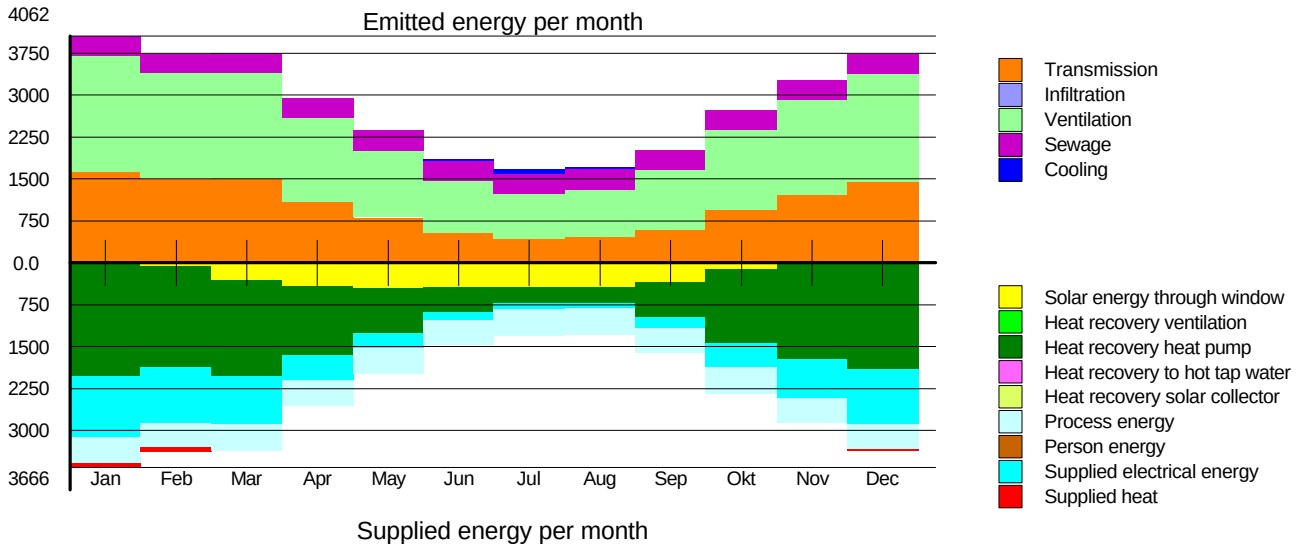
Energy balance - diagram