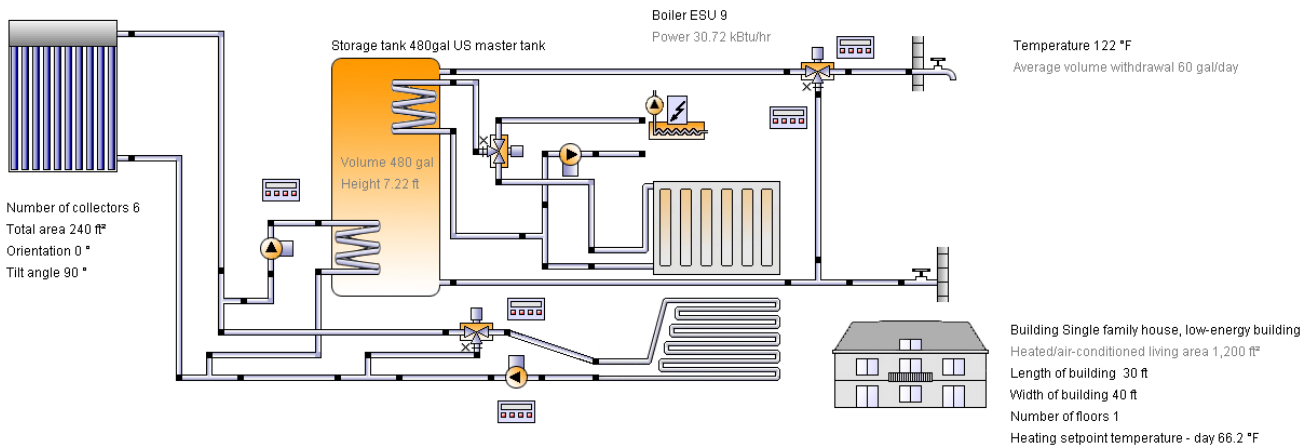


Project

9j: Space heating (solar thermal, direct floor heating)



Location of the system

Map section

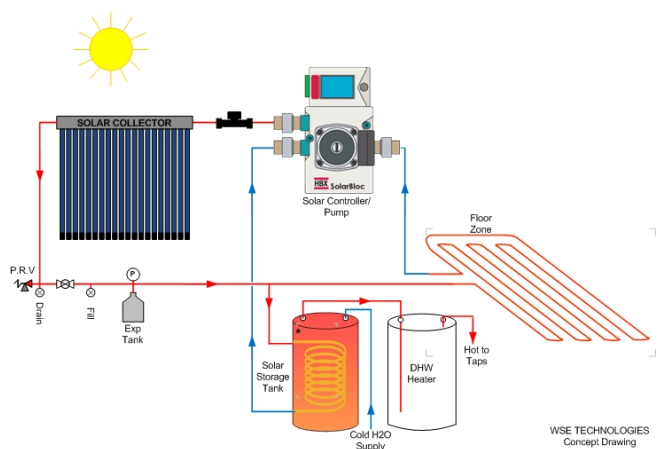
"Current report item is not supported in this report format."

Fort Qu Appelle
Longitude: -103.791°
Latitude: 50.768°
Elevation: 1,568 ft

This report has been created by:

William Elliott
303 47 Str.E
S7K 5H2 Saskatoon

Photograph of property



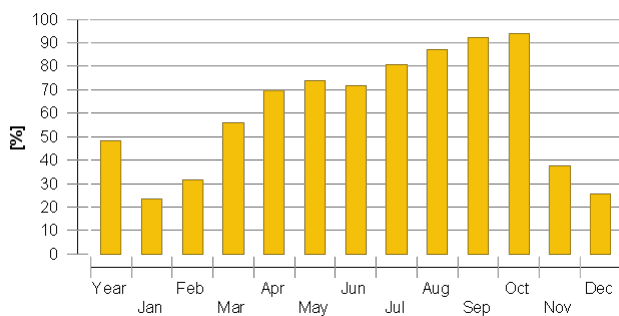
System overview (annual values)

Total fuel and/or electrical energy consumption of the system [Etot]	35,251.8 kBtu
Total energy consumption [Quse]	64,223.9 kBtu
System performance (Quse / Etot)	1.82
Comfort demand	Energy demand covered

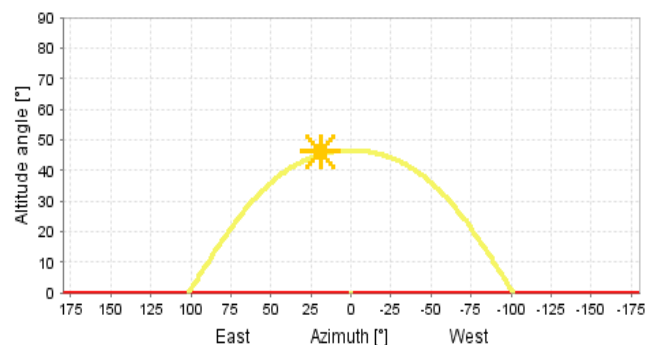
Overview solar thermal energy (annual values)

Collector area	240 ft ²
Solar fraction total	48%
Solar fraction hot water [SFnHw]	63.6 %
Solar fraction building [SFnBd]	41.1 %
Total annual field yield	33,151 kBtu
Collector field yield relating to gross area	138 kBtu/ft ² /Year
Collector field yield relating to aperture area	145 kBtu/ft ² /Year
Max. energy savings	33,150.9 kBtu
Max. reduction in CO2 emissions	11,489.3 pound

Solar fraction: fraction of solar energy to system [SFn]



Horizon line



Meteorological data-Overview

Outdoor temperature 24h	37.3 °F
Annual global irradiance	424.2 kBtu/ft ²
Annual diffuse irradiance	162.3 kBtu/ft ²

Financial analysis - Solar thermal

Purchase costs	7,000 CAD
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Financial analysis - Solar thermal

Life span	40 years
Proportional incentives	0 %
Incentives per area	0 CAD
Fixed incentives	0 CAD
Inflation	2 %
Interest	3 %
Increase of energy prices	6 %
Electricity	0.15 CAD/kWh
Effective purchase cost after grants	7,000 CAD
Annual fuel cost savings	1,457.341 CAD
Solar energy cost per kWh	0.03 CAD
Payback period	5 years
Present value of the system	172,405.422 CAD
Net present value	165,405.422 CAD

Component overview (annual values)

Boiler	ESU 9	
Power	kBtu/hr	30.72
Total efficiency	%	105
Energy from/to the system [Qaux]	kBtu	35,930.5
Fuel and electrical energy consumption [Eaux]	kBtu	34,231.2
Energy savings solar thermal	kBtu	33,150.9
CO savings solar thermal	pound	11,489.3
Fuel savings solar thermal	kBtu	33,159.4

Collector North America	WSE58ST	
Data Source		u138368
Number of collectors		6
Number of arrays		1
Total area	ft ²	240
Total aperture area	ft ²	228
Tilt angle	°	90
Orientation	°	0
Collector field yield [Qsol]	kBtu	33,150.9
Irradiation onto collector area [Esol]	kBtu	110,918.8
Collector efficiency [Qsol / Esol]	%	29.9
Direct irradiation after IAM	kBtu	59,683.7
Diffuse irradiation after IAM	kBtu	39,723.4

Building	Single family house, low-energy building	
Heated/air-conditioned living area	ft ²	1,200
Heating setpoint temperature	°F	66.2
Heating energy demand excluding DHW [Qdem]	kBtu	48,747.7
Specific heating energy demand excluding DHW [Qdem]	kBtu/ft ²	40.6
Solar gain through windows	kBtu	43,276.9
Total energy losses	kBtu	105,614

Convactor Floor heating	Floor heating 1000W	
Number of heating/cooling modules	-	3
Power per heating module under standard conditions	kBtu/hr	3
Nominal inlet temperature	°F	104
Nominal return temperature	°F	95
Net energy from/to heating/cooling modules	kBtu	18,793.5

Convactor Radiator	Radiator 1000W	
Number of heating/cooling modules	-	5
Power per heating module under standard conditions	kBtu/hr	3
Nominal inlet temperature	°F	149
Nominal return temperature	°F	131
Net energy from/to heating/cooling modules	kBtu	29,698.4

Hot water demand	Constant	
Withdraw volume	gal/d	60.4
Temperature setting	°F	122
Energy from/to the system [Quse]	kBtu	15,700.2

Pump Solar loop pump 2	Pump, small	
Circuit pressure drop	psi	0.136
Flow rate	gpm	1.8
Fuel and electrical energy consumption [Epar]	kBtu	417.6

Pump Heat generator pump	Pump, medium	
Circuit pressure drop	psi	0.789
Flow rate	gpm	4.4
Fuel and electrical energy consumption [Epar]	kBtu	456.4

Pump Solar loop pump 1	Pump, small	
Circuit pressure drop	psi	0.299
Flow rate	gpm	3.7
Fuel and electrical energy consumption [Epar]	kBtu	146.7

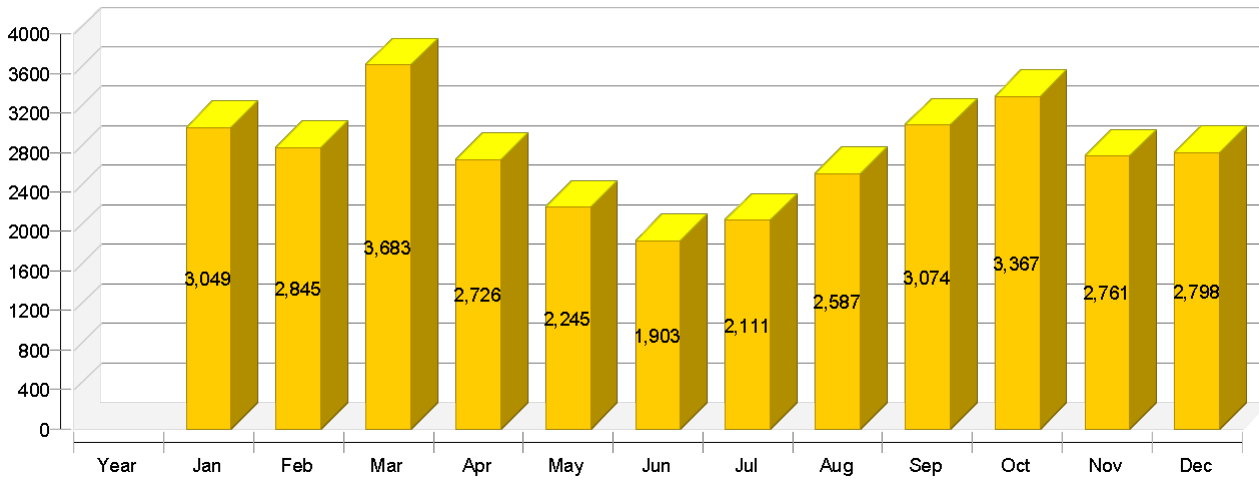
Storage tank Potable water tank	480gal US master tank	
Volume	gal	480
Height	ft	7.22
Material		Enameled steel
Insulation		Flexible polyurethane foam
Thickness of insulation	in	4
Heat loss	kBtu	1,886.9
Connection losses	kBtu	1,341.4

Loop

Solar loop		
Fluid mixture		Ethylene mixture
Fluid concentration	%	33.3
Fluid domains volume	gal	47.9
Pressure on top of the circuit	psi	58.016

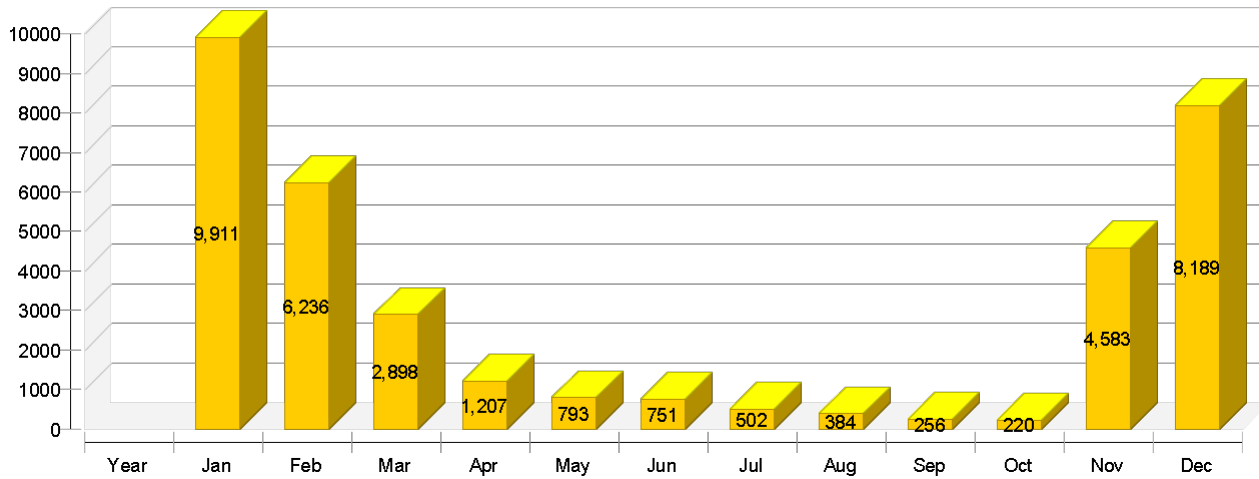
Solar thermal energy to the system [Qsol]

kBtu



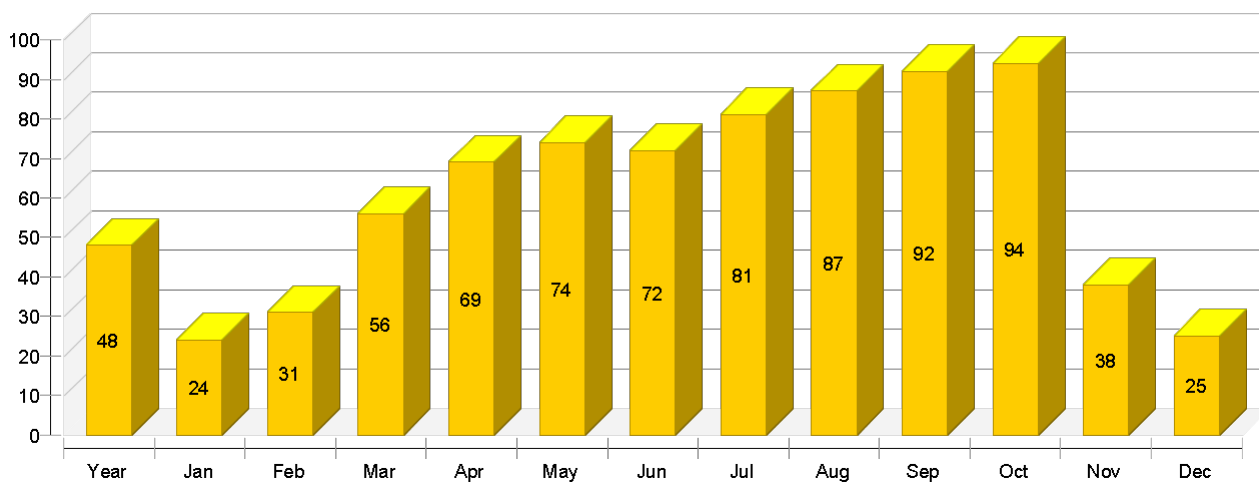
Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu



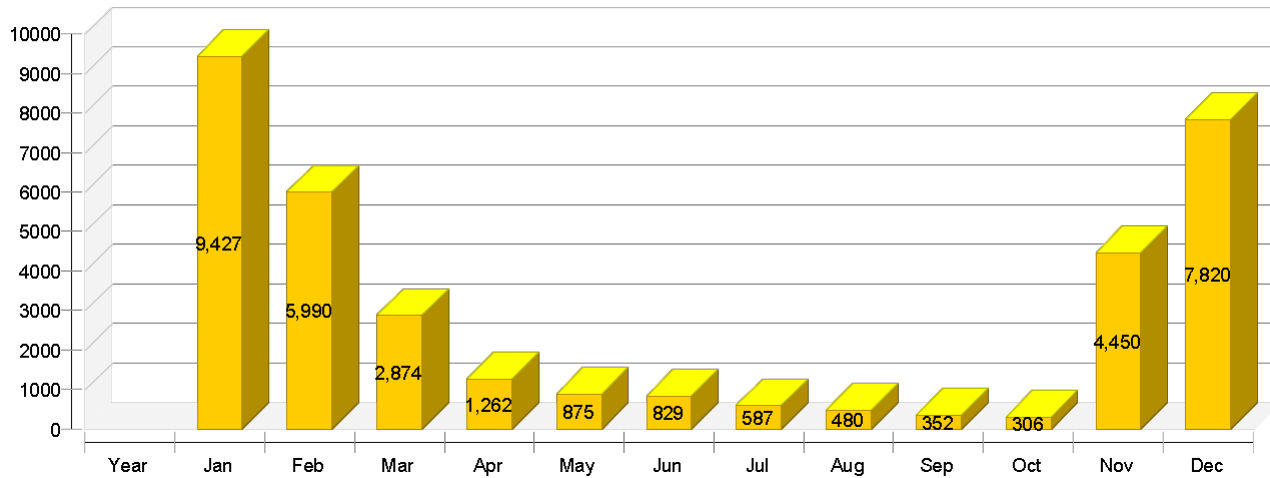
Solar fraction: fraction of solar energy to system [SFn]

%



Total fuel and/or electrical energy consumption of the system [Etot]

kBtu



Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Solar thermal energy to the system [Qsol]

kBtu	33151	3049	2845	3683	2726	2245	1903	2111	2587	3074	3367	2761	2798
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Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu	35930	9911	6236	2898	1207	793	751	502	384	256	220	4583	8189
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Heat generator fuel and electrical energy consumption [Eaux]

kBtu	34231	9262	5871	2785	1195	810	768	533	427	296	252	4353	7679
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Solar fraction: fraction of solar energy to system [SFn]

%	48	23.5	31.3	56	69.3	73.9	71.7	80.8	87.1	92.3	93.9	37.6	25.5
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Total fuel and/or electrical energy consumption of the system [Etot]

kBtu	35252	9427	5990	2874	1262	875	829	587	480	352	306	4450	7820
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Irradiation onto collector area [Esol]

kBtu	110919	10120	9634	12617	9497	7969	6861	7659	8719	9728	10423	8751	8941
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Electrical energy consumption of pumps [Epar]

kBtu	1021	164	119	90	68	65	61	54	53	56	53	97	141
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Heat loss to indoor room (including heat generator losses) [Qint]

kBtu	4096	108	222	426	360	341	334	407	463	468	477	327	164
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Heat loss to surroundings (without collector losses) [Qext]

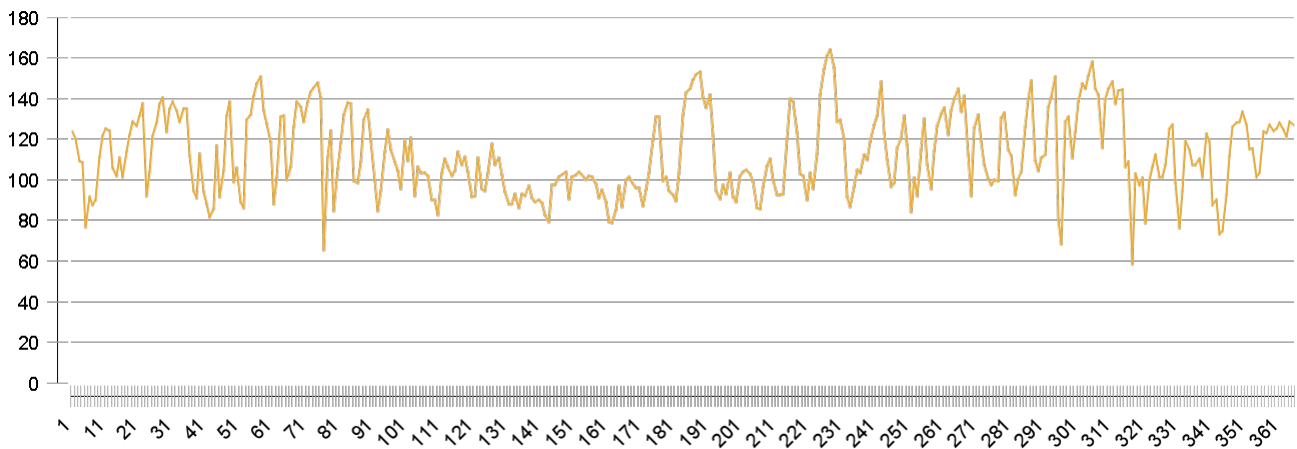
kBtu	126	16	14	16	10	7	5	6	7	9	11	12	13
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Total energy consumption [Quse]

kBtu	64224	12342	8623	6173	3696	2744	2398	2307	2523	2980	3089	6937	10413
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Collector North America

Daily maximum temperature [°F]



Energy flow diagram

