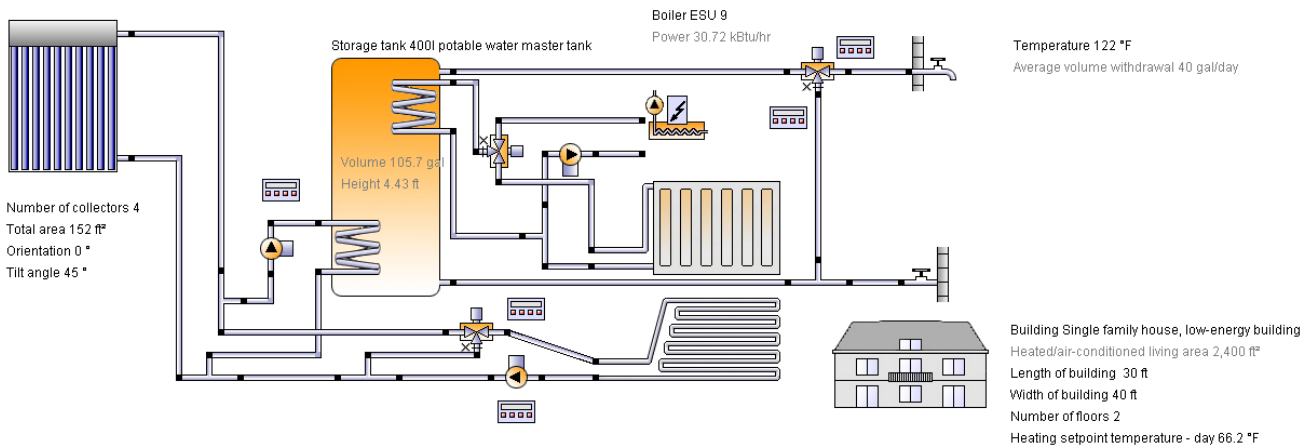


Project

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



Location of the system

Map section

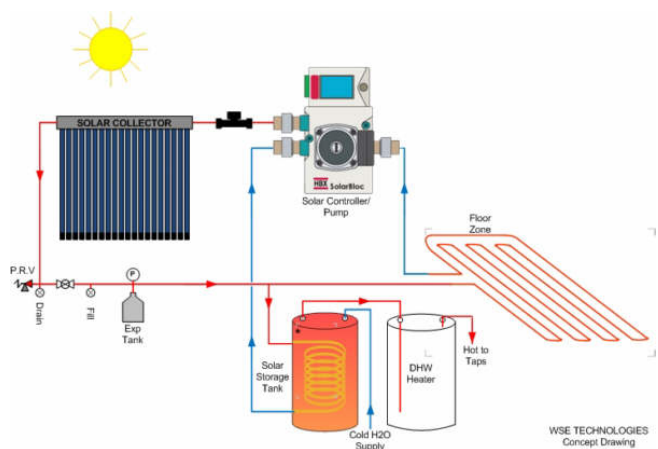
Ottawa
Longitude: -75.498°
Latitude: 45.398°
Elevation: 0 ft

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

This report has been created by:

William Elliott
303 47 Str.E
S7K 5H2 Saskatoon

Photograph of property



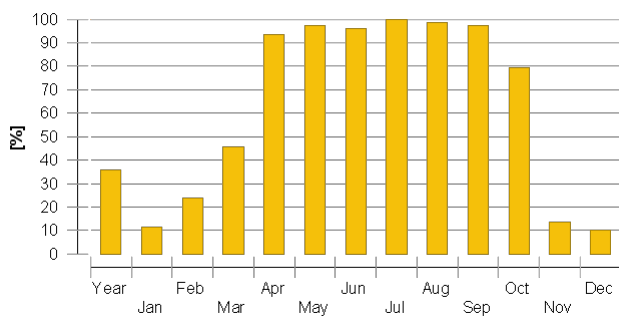
System overview (annual values)

Total fuel and/or electrical energy consumption of the system [Etot]	49,586.3 kBtu
Total energy consumption [Quse]	75,693.2 kBtu
System performance (Quse / Etot)	1.53
Comfort demand	Energy demand of the building not met

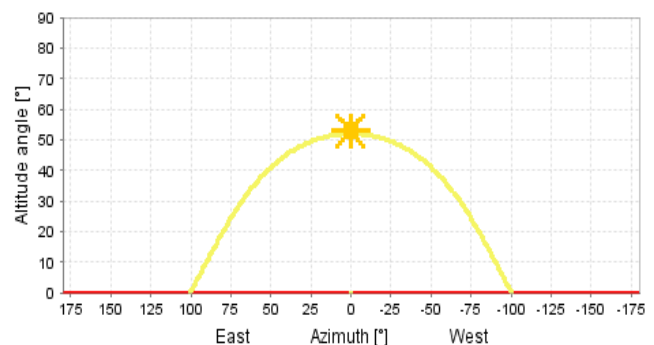
Overview solar thermal energy (annual values)

Collector area	152 ft ²
Solar fraction total	35.8%
Solar fraction hot water [SFnHw]	64 %
Solar fraction building [SFnBd]	29.7 %
Total annual field yield	28,716 kBtu
Collector field yield relating to gross area	189 kBtu/ft ² /Year
Collector field yield relating to aperture area	211 kBtu/ft ² /Year
Max. energy savings	28,716.4 kBtu
Max. reduction in CO2 emissions	9,952.4 pound

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



Horizon line



Meteorological data-Overview

Outdoor temperature 24h	44.8 °F
Annual global irradiance	437 kBtu/ft ²
Annual diffuse irradiance	180.7 kBtu/ft ²

Financial analysis - Solar thermal

Purchase costs	5,000 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	3 %
Interest	5 %
Increase of energy prices	6 %
Electricity	0.15 CAD/kWh
Effective purchase cost after grants	5,000 CAD
Annual fuel cost savings	1,262.399 CAD
Solar energy cost per kWh	0.02 CAD
Payback period	4 years
Present value of the system	116,666.359 CAD
Net present value	111,666.359 CAD

Component overview (annual values)

Boiler	ESU 9	
Power	kBtu/hr	30.72
Total efficiency	%	106.4
Energy from/to the system [Qaux]	kBtu	51,539.2
Fuel and electrical energy consumption [Eaux]	kBtu	48,444.9
Energy savings solar thermal	kBtu	28,716.4
CO savings solar thermal	pound	9,952.4
Fuel savings solar thermal	kBtu	28,723.8

Collector North America		WSE58Super Tube
Data Source		u138368
Number of collectors		4
Number of arrays		1
Total area	ft ²	152
Total aperture area	ft ²	136
Tilt angle	°	45
Orientation	°	0
Collector field yield [Qsol]	kBtu	28,716.4
Irradiation onto collector area [Esol]	kBtu	81,134.2
Collector efficiency [Qsol / Esol]	%	35.4
Direct irradiation after IAM	kBtu	57,048.7
Diffuse irradiation after IAM	kBtu	32,877.2

Building	Single family house, low-energy building	
Heated/air-conditioned living area	ft ²	2,400
Heating setpoint temperature	°F	66.2
Heating energy demand excluding DHW [Qdem]	kBtu	65,942.8
Specific heating energy demand excluding DHW [Qdem]	kBtu/ft ²	27.5
Solar gain through windows	kBtu	77,220.7
Total energy losses	kBtu	170,412.8

Convector 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	19,119.6

Convector 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	46,624.1

Hot water demand	Constant	
Withdraw volume	gal/d	40.1
Temperature setting	°F	122
Energy from/to the system [Quse]	kBtu	9,768.8

Pump Solar loop pump 2	Pump, small	
Circuit pressure drop	psi	0.102
Flow rate	gpm	1.8
Fuel and electrical energy consumption [Epar]	kBtu	373.9

Pump Heat generator pump	Pump, medium	
Circuit pressure drop	psi	0.785
Flow rate	gpm	4.4
Fuel and electrical energy consumption [Epar]	kBtu	645.9

Pump Solar loop pump 1	Pump, small	
Circuit pressure drop	psi	0.148
Flow rate	gpm	2.2
Fuel and electrical energy consumption [Epar]	kBtu	121.6

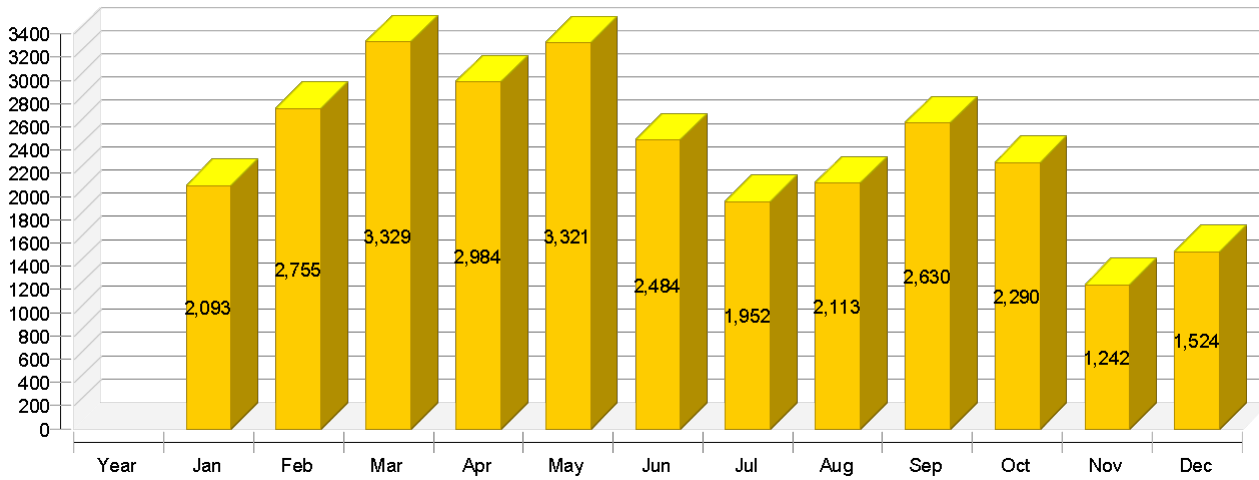
Storage tank Potable water tank	400l potable water master tank	
Volume	gal	105.7
Height	ft	4.43
Material		Stainless steel
Insulation		Rigid PU foam
Thickness of insulation	in	3.1
Heat loss	kBtu	1,207.3
Connection losses	kBtu	1,260

Loop

Solar loop		
Fluid mixture		Ethylene mixture
Fluid concentration	%	33.3
Fluid domains volume	gal	40
Pressure on top of the circuit	psi	58.016

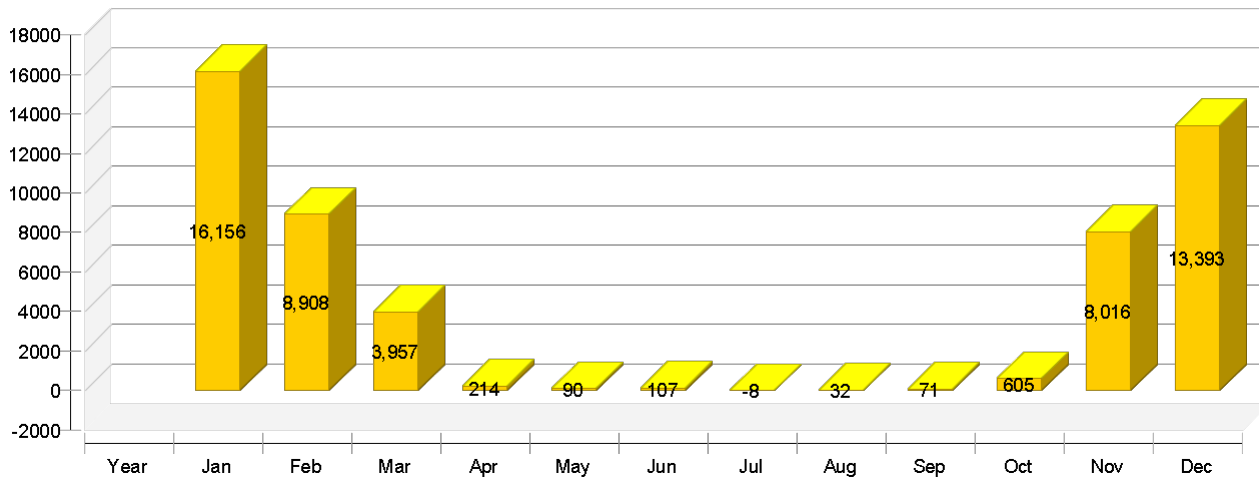
Solar thermal energy to the system [Qsol]

kBtu



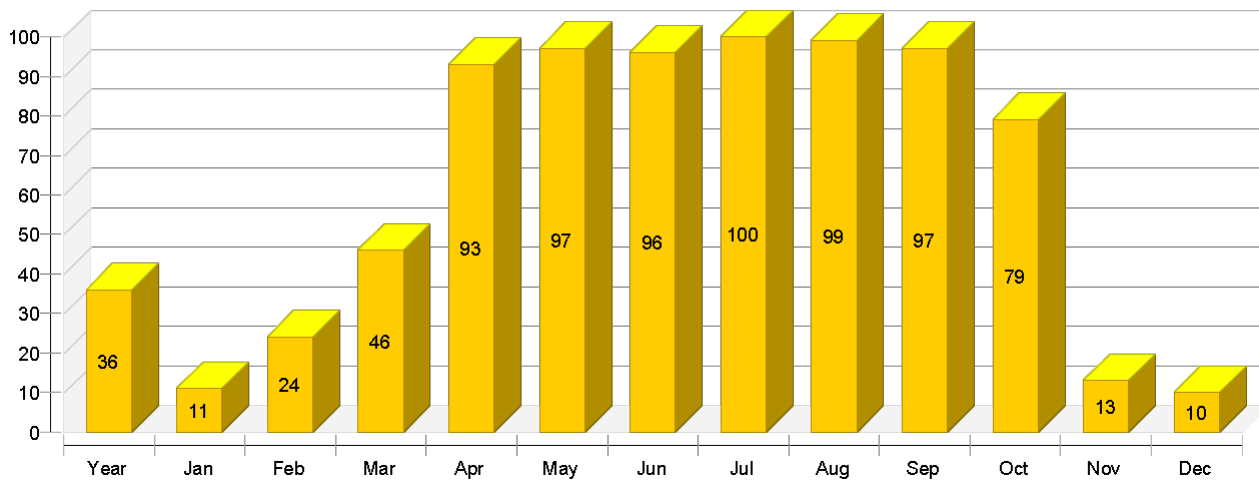
Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu



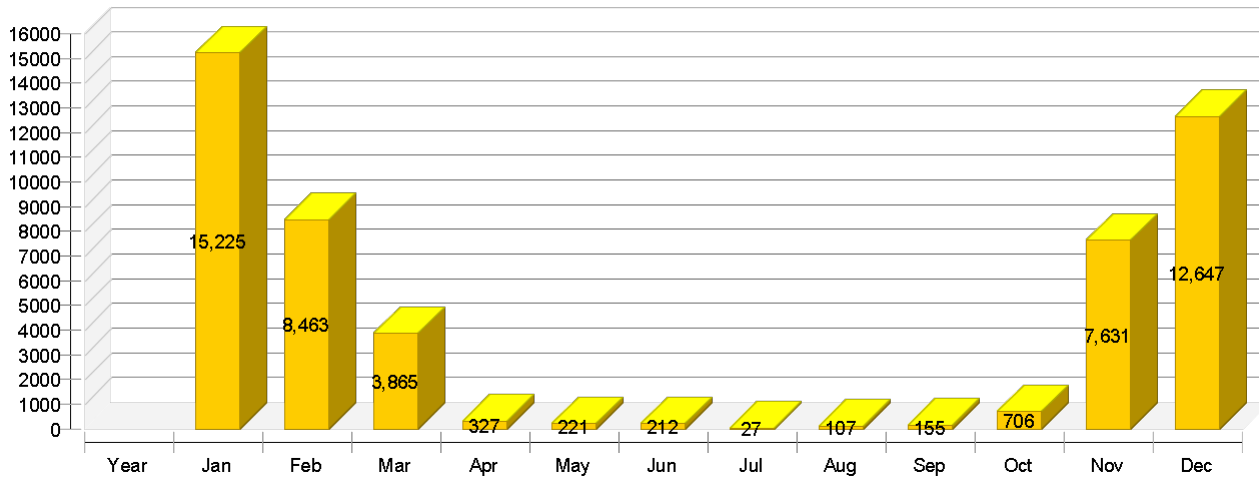
Solar fraction: fraction of solar energy to system [SFn]

%



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	28716	2093	2755	3329	2984	3321	2484	1952	2113	2630	2290	1242	1524
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Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu	51539	16156	8908	3957	214	90	107	-8	32	71	605	8016	13393
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Heat generator fuel and electrical energy consumption [Eaux]

kBtu	48445	14991	8312	3765	272	160	166	0	71	103	653	7501	12450
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Solar fraction: fraction of solar energy to system [SF_n]

%	35.8	11.5	23.6	45.7	93.3	97.4	95.9	100	98.5	97.4	79.1	13.4	10.2
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Total fuel and/or electrical energy consumption of the system [Etot]

kBtu	49586	15225	8463	3865	327	221	212	27	107	155	706	7631	12647
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Irradiation onto collector area [Esol]

kBtu	81134	5677	7086	8502	7586	8124	7862	8129	7750	7077	5595	3488	4257
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Electrical energy consumption of pumps [Epar]

kBtu	1141	235	150	101	55	61	46	27	35	52	53	130	196
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Heat loss to indoor room (including heat generator losses) [Qint]

kBtu	2627	-359	-33	250	387	432	449	491	507	463	336	-31	-264
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Heat loss to surroundings (without collector losses) [Qext]

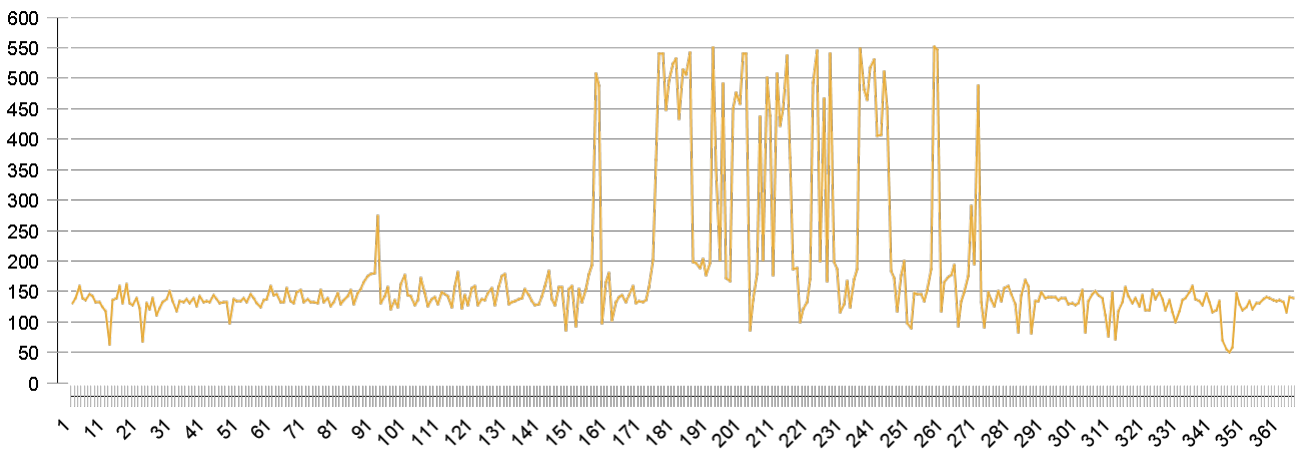
kBtu	135	12	13	14	12	10	10	15	13	11	8	7	9
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Total energy consumption [Quse]

kBtu	75693	17665	11227	6938	2964	3110	2189	1483	1706	2381	2652	8950	14427
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Collector North America

Daily maximum temperature [°F]



Energy flow diagram

