

Edl, Michele

From: Charles G. Brockway [charles.g.brockway@brockwayeng.com]
Sent: Friday, July 08, 2011 1:34 PM
To: Edl, Michele
Cc: Charles E. Brockway; Peppersack, Jeff
Subject: RE: request for snowmelting spreadsheet
Attachments: Geothermal snow melting - asbuilt.xls; Geothermal snow melting calcs sheet.xls

Spreadsheets for both exams are attached. They both use the same procedure.

Please note that saturation vapor pressure is not a matter of choice, but is a defined function of air temperature either using tables or empirical equations.

The difference between the unit heat requirement at the road surface and that required from the pipes is the pavement heat loss factor of 20%.

Chuck

Charles G. Brockway, Ph.D., P.E.

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All information, calculations, maps, drawings, or other documents transmitted via e-mail are preliminary unless explicitly stated in the e-mail text or in the documents themselves.

From: Edl, Michele [<mailto:Michele.Edl@idwr.idaho.gov>]
Sent: Friday, July 08, 2011 11:31 AM
To: Charles G. Brockway
Subject: RE: request for snowmelting spreadsheet

Mr. C.G. Brockway,

Thank you for your response.

I have been assigned to review 37-8388. If the snow melting spreadsheet for the Warfield Hot Spring is not capable of "standing alone", then I would appreciate the linked pages too.

For the most part I can follow through the input choices and the calculations. My choice for vapor pressure of moist air (Pav in the qe equation) differed from yours. But I am only imperfectly familiar with this design procedure and the qe is after all not the most significant loss.

Much more important to my understanding is to follow your calculation from the total heat flux off the surface of the slab, (q0) to the heat flux from the pipes.

I have access to Geo-Heat Center software for estimating heat loss through pipe and I'm willing to run through my paces using those tools if they are applicable or can minimize the size of your return email

Sincerely,

Michele Edl

From: Charles G. Brockway [<mailto:charles.g.brockway@brockwayeng.com>]
Sent: Friday, July 08, 2011 8:47 AM
To: Edl, Michele; Charles E. Brockway
Subject: RE: request for snowmelting spreadsheet

Michele,

You want the spreadsheet for 37-8205 or 37-8388?

Chuck

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From: Edl, Michele [<mailto:Michele.Edl@idwr.idaho.gov>]

Sent: Wednesday, July 06, 2011 1:01 PM

To: Charles E. Brockway

Cc: Charles G. Brockway

Subject: request for snowmelting spreadsheet

Mr. C.E. Brockway,

I am following up on our discussion of the SDRTR geothermal water right 37-8388.

I understand that you used a spreadsheet developed for the snowmelting use of the geothermal right 37-8205 (Clarendon Hot Springs) as a template for the snowmelting use under this right. I have a copy of Pavement Snow Melting by John W. Lund, Geo-Heat Center bulletin June 2000. But I not been able to reproduce your calculations.

Please provide a copy of the spreadsheet with the embedded formulae so that I may match my math to yours.

Sincerely

Michele Edl

ROBBINS TRUST **ROADWAY SNOW MELTING WITH GEOTHERMAL WATER**

Lund, John W. (2000). Pavement Snow Melting. Geo-Heat Center Bulletin.
Assumes direct-use hydronic method, buried pipelines.

Met data from Hailey station

SCENARIO: FIRST USE OF GEOTHERMAL WATER

DESIGN CONDITION:

Parameter	Value	Units
Total area	22,956	ft2 Based on snowmelting area .shp file
Rate of snowfall	0.17	inches of water equivalent per hour
Air temperature	-1.6	F
Wind speed	4.1	mph
Water film temperature	33	F
Ratio of snow-free area to total	1	
Resource temperature	115.5	F
Effluent temperature	85	F
Road pavement heat loss	20%	

CALCULATIONS:

Parameter	Value	Units
Vapor pressure of air	0.06	in Hg
Heat of vaporization at film temp	1075.5	Btu/lb
Sensible heat	14.9	Btu/hr/ft2
Heat of fusion	126.8	Btu/hr/ft2
Heat of evaporation	18.6	Btu/hr/ft2
Heat transfer (conv. & radiation)	54.2	Btu/hr/ft2
Unit heat required at road surface	214.5	Btu/hr/ft2
Unit heat required from pipes	268.1	Btu/hr/ft2
Total heat required	6155379	Btu/hr
Flow rate required	404	gpm
	0.90	cfs
Snow melt System Operation	150.0	days
Snow melt System Operation	8.0	hours/day
Diversion Volume required	89.2	afa

Formula: $V_{div} = Q \times D \times H/24 \times 1.9835$

SCENARIO: SECOND USE OF GEOTHERMAL WATER

DESIGN CONDITION:

Parameter	Value	Units
Total area	22,956	ft2 Based on snowmelting area .shp file
Rate of snowfall	0.17	inches of water equivalent per hour
Air temperature	-1.7	F
Wind speed	4.1	mph
Water film temperature	33	F
Ratio of snow-free are.	1	
Resource temperature	102.5	F
Effluent temperature	85	F
Road pavement heat l	20%	

CALCULATIONS:

Parameter	Value	Units
Vapor pressure of air	0.06	in Hg
Heat of vaporization at	1075.5	Btu/lb
Sensible heat	14.9	Btu/hr/ft2
Heat of fusion	126.8	Btu/hr/ft2
Heat of evaporation	18.7	Btu/hr/ft2
Heat transfer (conv. &	54.4	Btu/hr/ft2
Unit heat required at r	214.7	Btu/hr/ft2
Unit heat required from	268.4	Btu/hr/ft2
Total heat required	6162035	Btu/hr
Flow rate required	704	gpm
	1.57	cfs
Snow melt System Op	150.0	days
Snow melt System Op	8.0	hours/day
Diversion Volume req	155.6	afa

Formula: $V_{div} = Q \times D \times H/24 \times 1.9835$

CLARENDON RESORT ROADWAY SNOW MELTING WITH GEOTHERMAL WATER

Lund, John W. (2000). Pavement Snow Melting. Geo-Heat Center Bulletin.
Assumes direct-use hydronic method, buried pipelines

SCENARIO: SECONDARY USE AFTER SPA / POND

DESIGN CONDITION

Parameter	Value	Units
Total area	39,535	ft ²
Rate of snowfall	0.17	inches of water equivalent per hour
Air temperature	-1.6	F
Wind speed	4.1	mph
Water film temperature	33	F
Ratio of snow-free area to total	1	
Resource temperature	85	F
Effluent temperature	60	F
Road pavement heat loss	20%	

CALCULATIONS

Vapor pressure of air	0.06	in Hg
Heat of vaporization at film temp	1075.5	Btu/lb
Sensible heat	14.8512	Btu/hr/ft ²
Heat of fusion	126.82	Btu/hr/ft ²
Heat of evaporation	18.6393	Btu/hr/ft ²
Heat transfer (conv. & radiation)	54.2	Btu/hr/ft ²
Unit heat required at road surface	214.5	Btu/hr/ft ²
Unit heat required from pipes	268.1	Btu/hr/ft ²
Total heat required	10600841	Btu/hr
Flow rate required	848	gpm

SUN VALLEY LAND & MINERALS

ROADWAY SNOW MELTING WITH GEOTHERMAL WATER - PEAK FLOW REQUIREMENT

Permit 37-8205

As-built condition as of 10/13/09

Lund, John W. (2000). Pavement Snow Melting. Geo-Heat Center Bulletin.

Assumes direct-use hydronic method, buried pipelines

FIRST USE OF WELL DISCHARGE

DESIGN CONDITION

Parameter	Value	Units
Total area	38,922	ft ²
Rate of snowfall water equiv. per hr	0.17	inch/hr
Air temperature	-1.7	F
Wind speed	4.1	mph
Water film temperature	33	F
Ratio of snow-free area to total	1	
Resource temperature	124.7	F
Effluent temperature	70	F
Road pavement heat loss	20%	

CALCULATIONS

Vapor pressure of air	0.06	in Hg
Heat of vaporization at film temp	1075.5	Btu/lb
Sensible heat	14.8954	Btu/hr/ft ²
Heat of fusion	126.82	Btu/hr/ft ²
Heat of evaporation	18.67041	Btu/hr/ft ²
Heat transfer (conv. & radiation)	54.35665	Btu/hr/ft ²
Unit heat required at road surface	214.7	Btu/hr/ft ²
Unit heat required from pipes	268.4	Btu/hr/ft ²
Total heat required	10447757	Btu/hr
Flow rate required	382	gpm

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- 2006 1 meter

Robbins Snowmelt POU 2-9-11

FID	Shape	Id	ACRES	Sqft
0	Polygon	0	0.5	21488.76

(0 out of 1 Selected)



Edl, Michele

From: Zach Latham [zach.latham@brockwayeng.com]
Sent: Tuesday, June 28, 2011 2:55 PM
To: Edl, Michele
Cc: Charles E. Brockway
Subject: RE: Robbins shape
Attachments: Robbins Snowmelt POU 2-9-11.sbn; Robbins Snowmelt POU 2-9-11.sbx; Robbins Snowmelt POU 2-9-11.dbf; Robbins Snowmelt POU 2-9-11.shp; Robbins Snowmelt POU 2-9-11.shx

Sensitivity: Confidential

Michele-

The shape file previously sent by our office was not intended to project beyond the Robbins property boundary, please see the attached correct shape file and associated files. Thanks for your time,

Zach Latham

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From: Edl, Michele [<mailto:Michele.Edl@idwr.idaho.gov>]

Sent: Tuesday, June 21, 2011 2:15 PM

To: Zach Latham

Cc: Amy Runser

Subject: RE: Robbins shape

Sensitivity: Confidential

Zach, Amy

I'm closer. I can bring in the recreation pond shape now. I don't have a .shp for the space heating place of use which includes the snowmelting and the space heating all in one. Is that what you meant by the Place of Use shape.

Before you resend, please look at the snowmelting shape for the driveway west of the caretakers residence. Your shape appears to project outside of the current taxlot boundary that I have for the Robbins property (AM Lot 1B Blk 1) and into Sawtooth National Forest property. Is that correct?

Michele

From: Amy Runser [<mailto:amy.runser@brockwayeng.com>]

Sent: Tuesday, June 21, 2011 1:30 PM

To: Edl, Michele

Subject: RE: Robbins shape

Sensitivity: Confidential

Michele,

I apologize I did forget to send that shape. Zach Latham is the person who created these shapes at Chuck Sr. request incase you have further question on them. The Place of Use shape if the heating POU.

Thanks,