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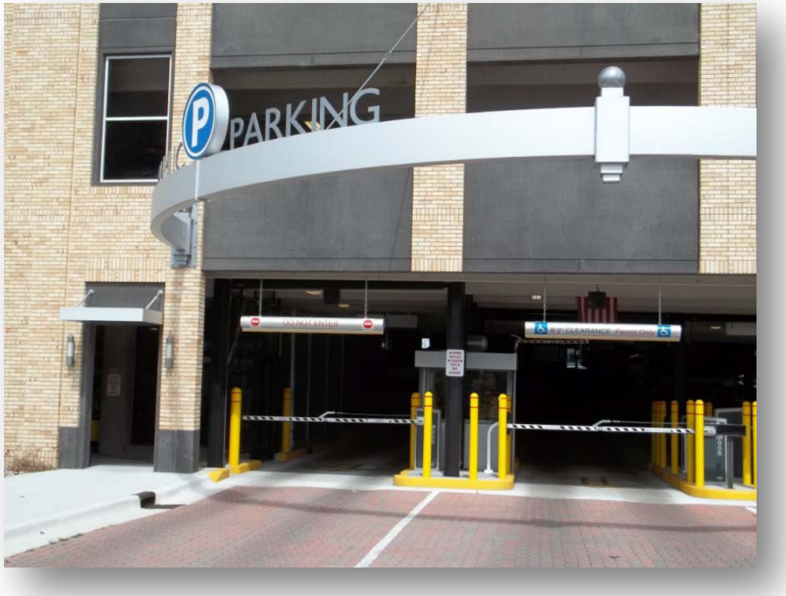
An Operational Comparison between the Larry C. Hardy & Old Town Parking Garages

Traverse City, MI

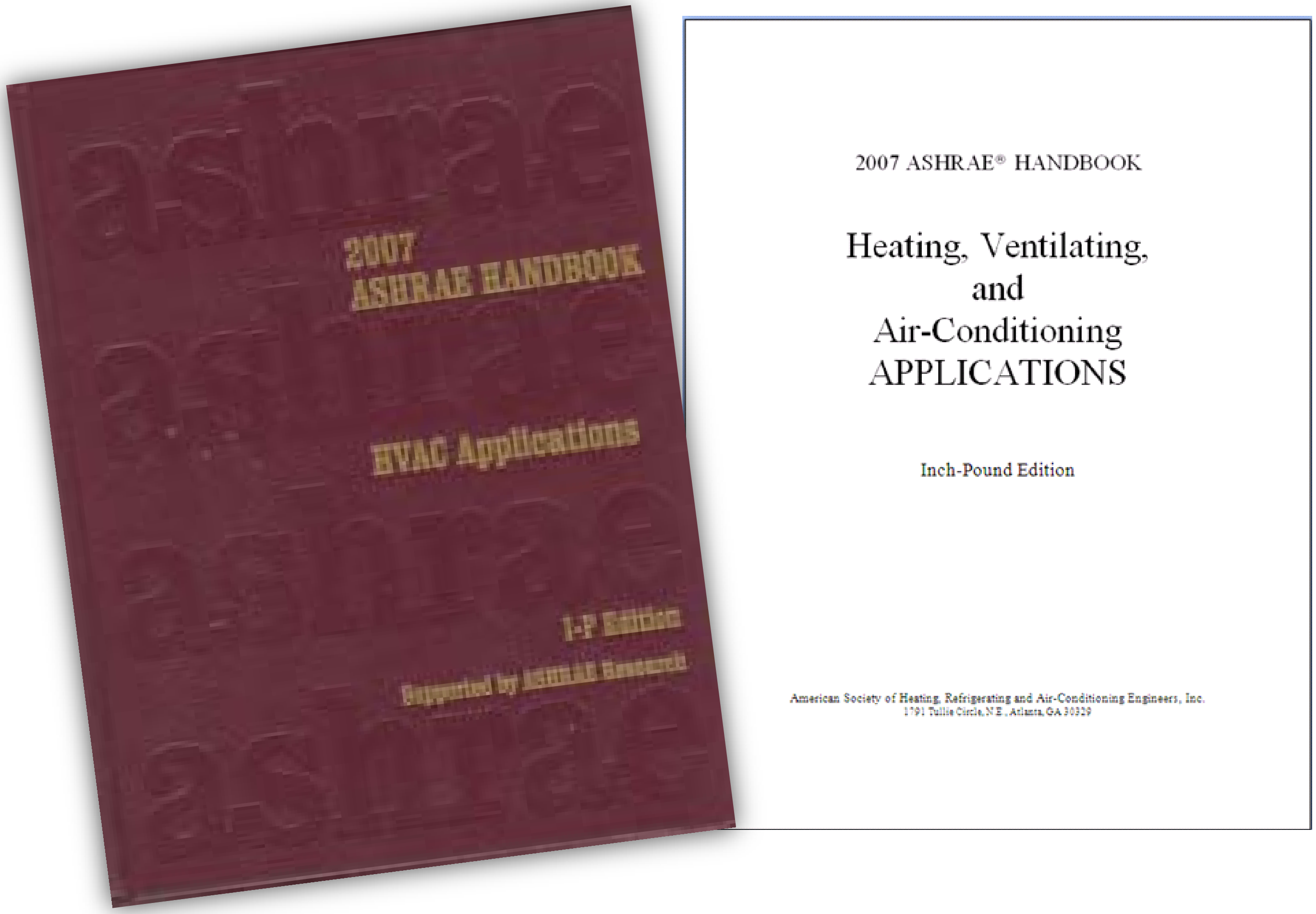
Larry C. Hardy Parking Garage

Old Town Parking Garage



Typical Snowmelt Design Basis:

These next few pages from the 2007 ASHRAE Handbook illustrate typical snow fall, energy requirements for surface snow melting, snow free ratios for electronic and idling hydronic snow melt systems.



2007 ASHRAE® HANDBOOK

Heating, Ventilating,
and
Air-Conditioning
APPLICATIONS

Inch-Pound Edition

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
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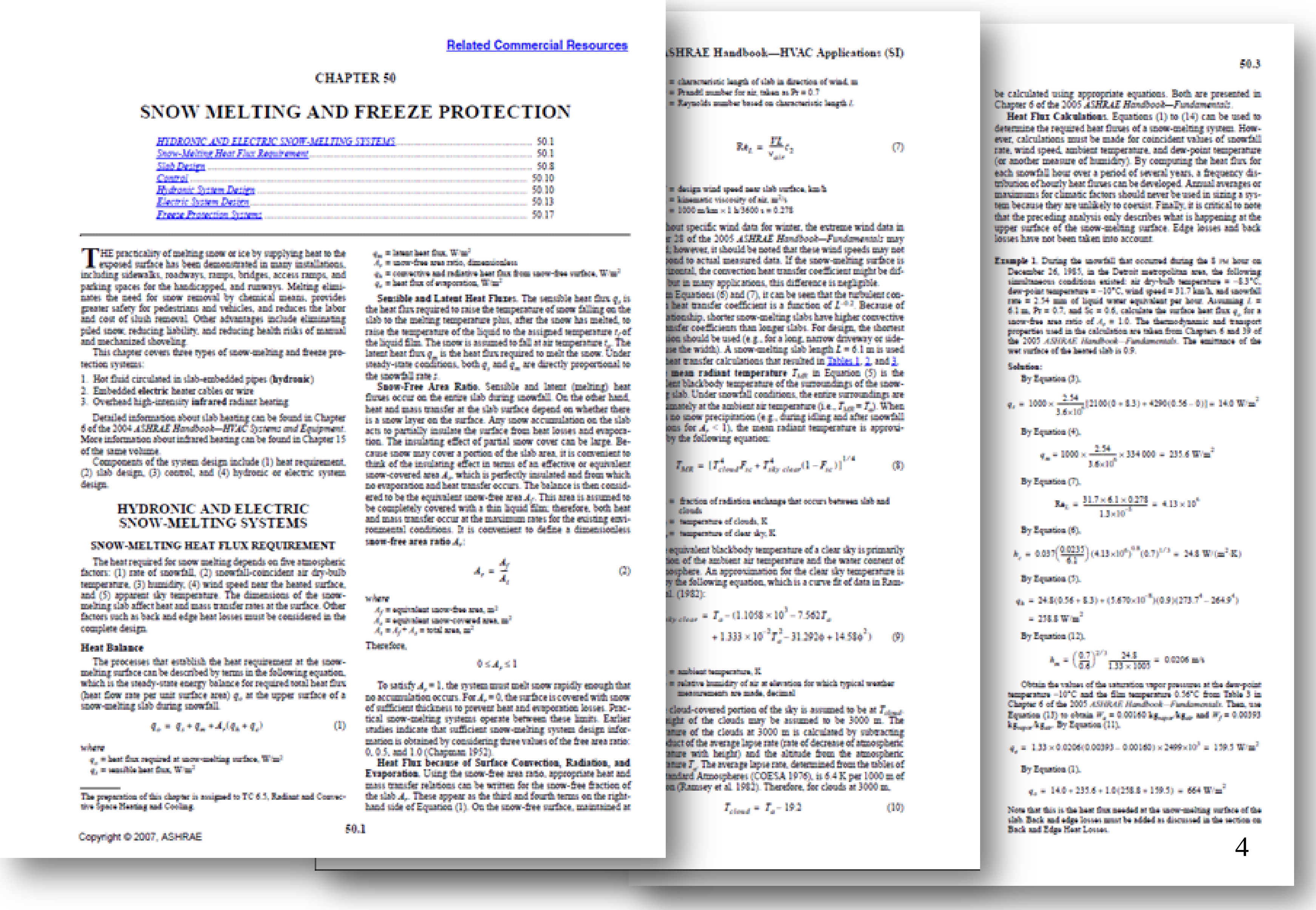

Related Commercial Resources

CHAPTER 50

SNOW MELTING AND FREEZE PROTECTION

HYDRONIC AND ELECTRIC SNOW-MELTING SYSTEMS

SNOW-MELTING HEAT FLUX REQUIREMENT

Heat Balance

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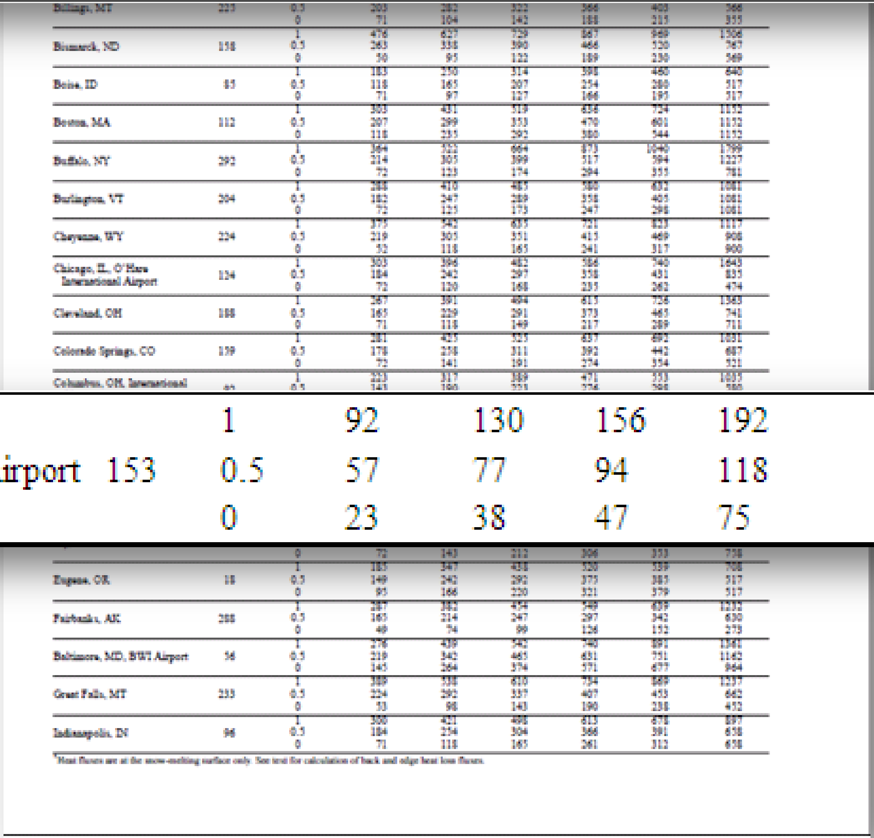
50.1

ASHRAE Handbook—HVAC Applications (SI)

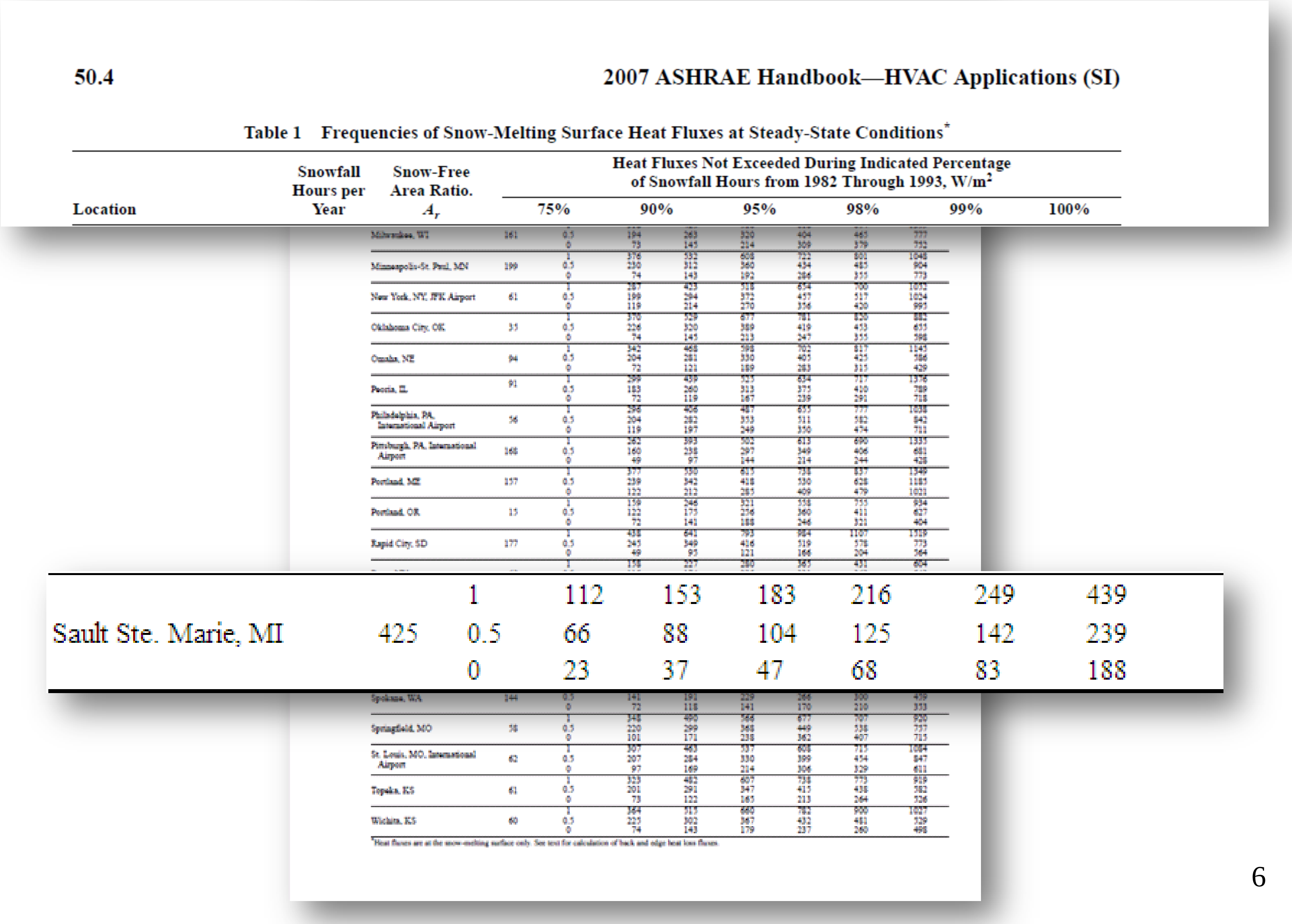
50.3

50.4 2007 ASHRAE Handbook—HVAC Applications (SI)

Table 1 Frequencies of Snow-Melting Surface Heat Fluxes at Steady-State Conditions*



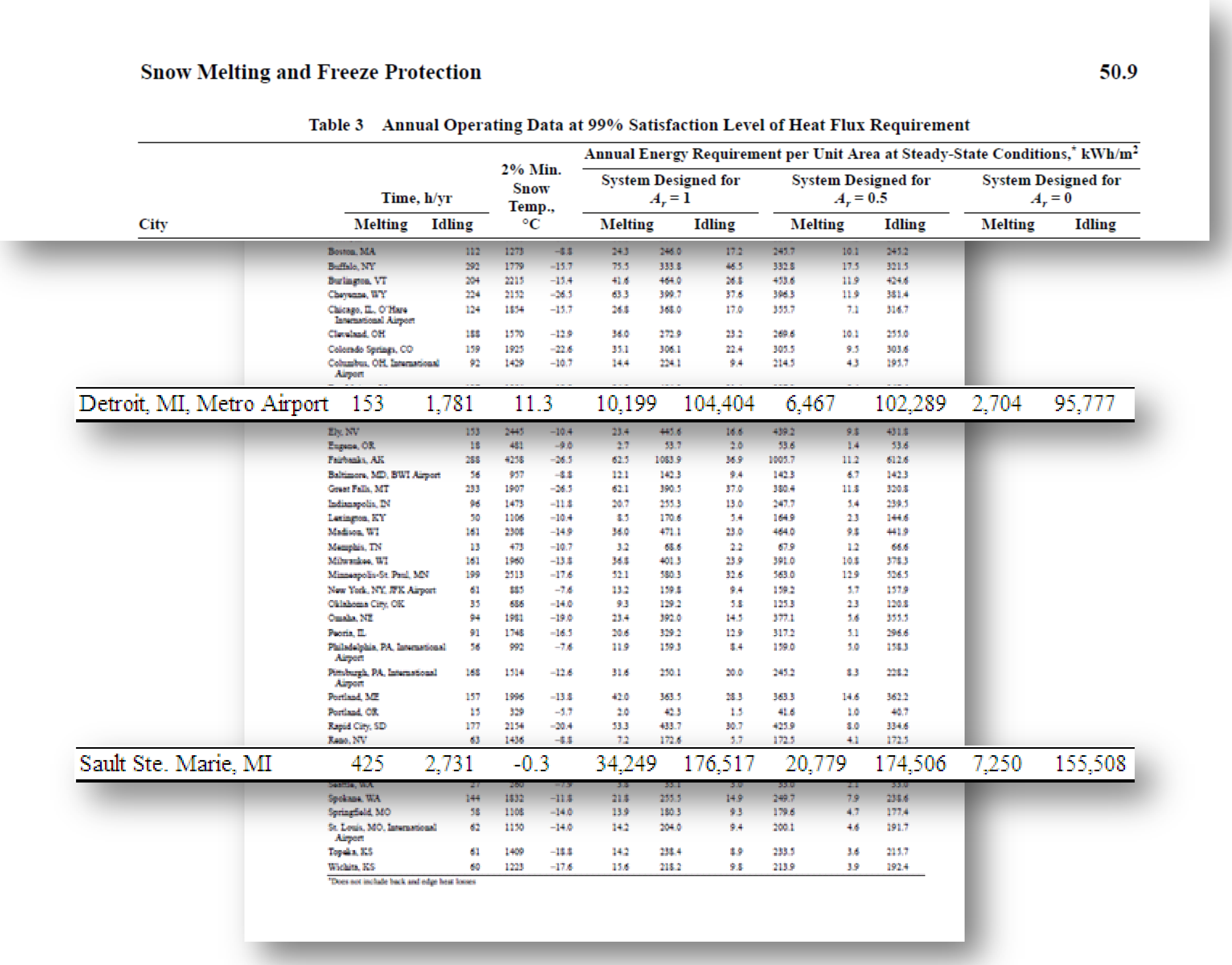
Location	Snowfall Hours per Year	Snow-Free Area Ratio. A_r	Heat Fluxes Not Exceeded During Indicated Percentage of Snowfall Hours from 1982 Through 1993, W/m² 75%	90%	95%	98%	99%	100%
Detroit, MI, Metro Airport	153	1	92	130	156	192	212	360
		0.5	57	77	94	118	134	227
		0	23	38	47	75	89	194



50.4 2007 ASHRAE Handbook—HVAC Applications (SI)

Table 1 Frequencies of Snow-Melting Surface Heat Fluxes at Steady-State Conditions*

Location	Snowfall Hours per Year	Snow-Free Area Ratio, A_r	75%	90%	95%	98%	99%	100%
			Heat Fluxes Not Exceeded During Indicated Percentage of Snowfall Hours from 1982 Through 1993, W/m²					
Sault Ste. Marie, MI	425	1	112	153	183	216	249	439
		0.5	66	88	104	125	142	239
		0	23	37	47	68	83	188



Snow Melting and Freeze Protection 50.9

Table 3 Annual Operating Data at 99% Satisfaction Level of Heat Flux Requirement

City	Time, h/yr		2% Min. Snow Temp., °C	Annual Energy Requirement per Unit Area at Steady-State Conditions,* kWh/m²					
				System Designed for $A_r = 1$		System Designed for $A_r = 0.5$		System Designed for $A_r = 0$	
	Melting	Idling		Melting	Idling	Melting	Idling	Melting	Idling
Boston, MA	112	1273	−8.8	24.3	246.0	17.2	245.7	10.1	245.2
Buffalo, NY	292	1779	−15.7	75.5	333.8	46.5	332.8	17.5	321.5
Burlington, VT	204	2215	−15.4	41.6	464.0	26.8	453.6	11.9	424.6
Cheyenne, WY	224	2132	−26.3	63.3	399.7	37.6	396.3	11.9	381.4
Chicago, IL, O'Hare International Airport	124	1834	−15.7	26.8	368.0	17.0	355.7	7.1	316.7
Cleveland, OH	188	1570	−12.9	36.0	272.9	23.2	269.6	10.1	255.0
Colorado Springs, CO	159	1925	−22.6	35.1	306.1	22.4	305.5	9.5	303.6
Columbus, OH, International Airport	92	1429	−10.7	14.4	224.1	9.4	214.5	4.3	195.7
Detroit, MI, Metro Airport	153	1,781	11.3	10,199	104,404	6,467	102,289	2,704	95,777
Ely, NV	153	2445	−10.4	23.4	445.6	16.6	439.2	9.8	431.8
Eugene, OR	18	481	−9.0	2.7	53.7	2.0	53.6	1.4	53.6
Fairbanks, AK	288	4258	−26.3	62.5	1083.9	36.9	1005.7	11.2	612.6
Baltimore, MD, BWI Airport	56	957	−8.8	12.1	142.3	9.4	142.3	6.7	142.3
Great Falls, MT	233	1907	−26.3	62.1	390.5	37.0	380.4	11.8	320.8
Indianapolis, IN	96	1473	−11.8	20.7	255.3	13.0	247.7	5.4	239.5
Lexington, KY	50	1106	−10.4	8.5	170.6	5.4	164.9	2.3	144.6
Madison, WI	161	2308	−14.9	36.0	471.1	23.0	464.0	9.8	441.9
Memphis, TN	13	473	−10.7	3.2	68.6	2.2	67.9	1.2	66.6
Milwaukee, WI	161	1960	−13.8	36.8	401.3	23.9	391.0	10.8	378.3
Minneapolis-St. Paul, MN	199	2513	−17.6	52.1	580.3	32.6	563.0	12.9	526.5
New York, NY, JFK Airport	61	885	−7.6	13.2	159.8	9.4	159.2	5.7	157.9
Oklahoma City, OK	35	686	−14.0	9.3	129.2	5.8	125.3	2.3	120.8
Omaha, NE	94	1981	−19.0	23.4	392.0	14.5	377.1	5.6	355.5
Peoria, IL	91	1748	−16.5	20.6	329.2	12.9	317.2	5.1	296.6
Philadelphia, PA, International Airport	56	992	−7.6	11.9	159.3	8.4	159.0	5.0	158.3
Pittsburgh, PA, International Airport	168	1514	−12.6	31.6	250.1	20.0	245.2	8.3	228.2
Portland, ME	157	1996	−13.8	42.0	363.5	28.3	363.3	14.6	362.2
Portland, OR	15	329	−5.7	2.0	42.3	1.5	41.6	1.0	40.7
Rapid City, SD	177	2154	−20.4	53.3	433.7	30.7	425.9	8.0	334.6
Reno, NV	63	1436	−8.8	7.2	172.6	5.7	172.5	4.1	172.5
Sault Ste. Marie, MI	425	2,731	-0.3	34,249	176,517	20,779	174,506	7,250	155,508
Seattle, WA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Spokane, WA	144	1832	−11.8	21.8	255.5	14.9	249.7	7.9	238.6
Springfield, MO	58	1108	−14.0	13.9	180.3	9.3	179.6	4.7	177.4
St. Louis, MO, International Airport	62	1150	−14.0	14.2	204.0	9.4	200.1	4.6	191.7
Topeka, KS	61	1409	−18.8	14.2	238.4	8.9	233.5	3.6	215.7
Wichita, KS	60	1223	−17.6	15.6	218.2	9.8	213.9	3.9	192.4

*Does not include back and edge heat losses

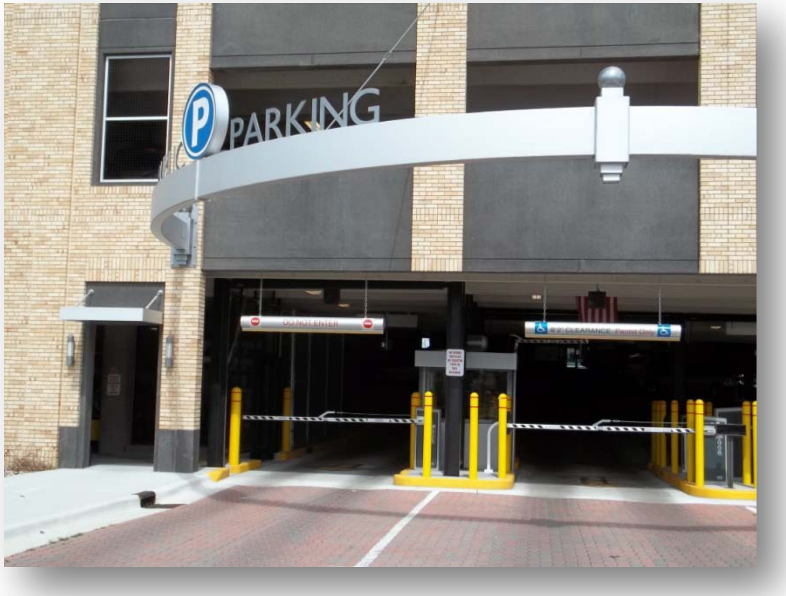
Idle vs. Non-Idle

An Operational Differences between the Larry C. Hardy & Old Town Parking Garages

Larry C. Hardy Parking Garage

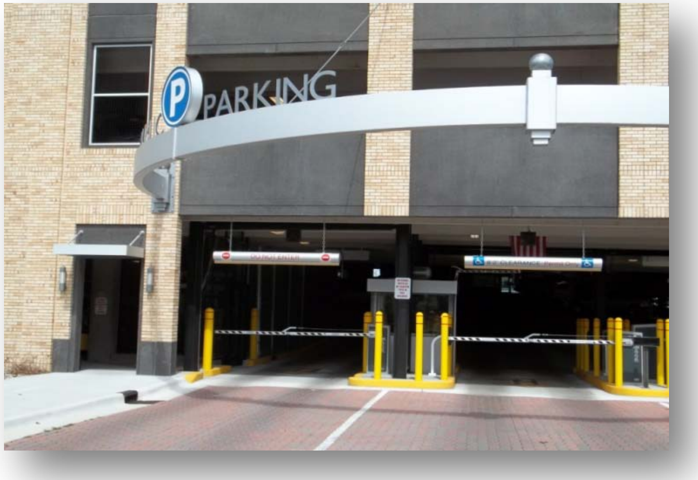
Idle System

Old Town Parking Garage



Non-Idle System

Size Comparison



Larry C. Hardy Parking Garage

- 8930 sq. ft. – Ramp
- 9015 sq. ft. – Sidewalk / Entrance
- 17,945 sq. ft. – Total sq. ft.

Differences

- Entrance – 150 btu / sq. ft.
- Sidewalks – 150 btu / sq. ft.
- Ramp – 200 btu / sq. ft.
- Entrance – Concrete

Old Town Parking Garage

- 8640 sq. ft. – Ramp
- 6200 sq. ft. – Sidewalk / Entrance
- 14,840 sq. ft. – Total sq. ft.

Differences

- Brick Entrance – 300 btu / sq. ft.
- Sidewalks / Drive – 250 btu / sq. ft.
- Ramp – 250 btu / sq. ft.
- Entrance – Brick

Larry C. Hardy Garage

The Larry C. Hardy Garage is a traditional idling snowmelt system that uses a universal snow controller, operating in (2) modes: 1. Snowmelt Mode & 2. Idle mode. The idle mode is in continual operation throughout the snow melt season, maintaining a set temperature, until such point it is called on to melt snow.

- In-slab Snow Detector (38 degrees)
- Start Temp “Warm Weather Shutdown” (40 degrees)
- Idle Mode (28 degrees ±)
- Snow Occurrence (40 degrees) slab temperature
- "Cold Weather Cut Out" (10 degrees)

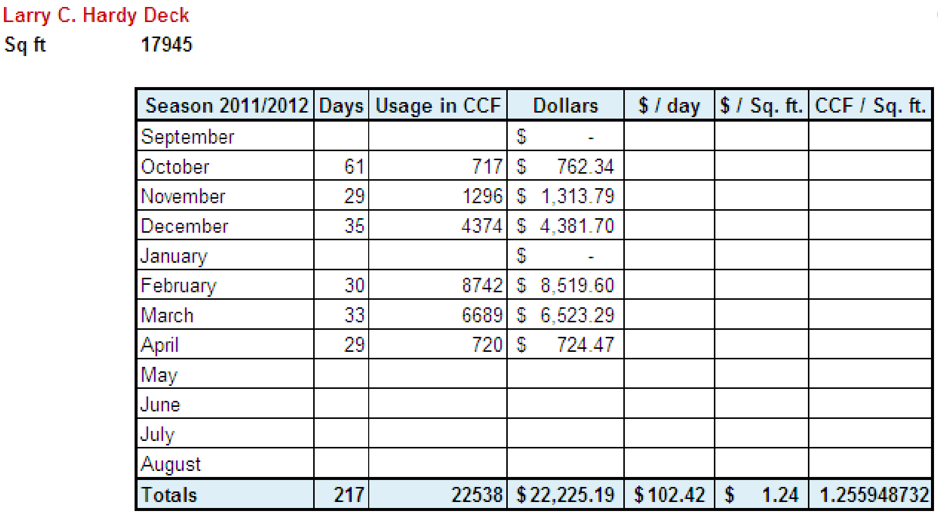
Old Town Parking Garage

The Old Town Parking Garage is equipped with a non-idling Snow-Tech snowmelt system. There is no idle mode in this system, it operates only when called on to melt snow.

- No-Idle
- Provides Considerable Energy Savings
- Roof Top Sensor
- Capable of Cold Start Up
- No "Cold Weather Cut Out"
- Will Not Crack Concrete
- Output Backs Down Once Slab Is Warm

Old Town Parking Garage

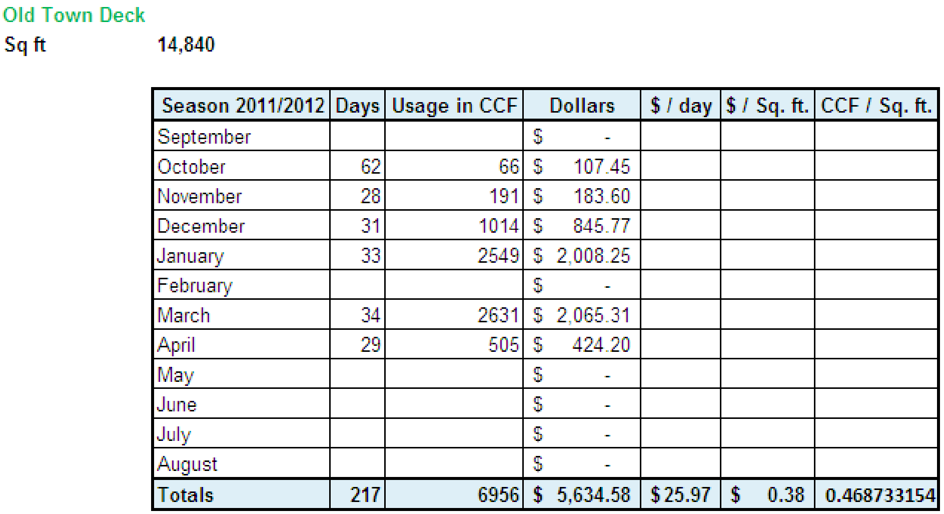
2011/2012 Seasonal Comparison



Larry C. Hardy Deck

Sq ft 17945

Season 2011/2012	Days	Usage in CCF	Dollars	$ / day	$ / Sq. ft.	CCF / Sq. ft.
September			$ -			
October	61	717	$ 762.34			
November	29	1296	$ 1,313.79			
December	35	4374	$ 4,381.70			
January			$ -			
February	30	8742	$ 8,519.60			
March	33	6689	$ 6,523.29			
April	29	720	$ 724.47			
May						
June						
July						
August						
Totals	217	22538	$ 22,225.19	$ 102.42	$ 1.24	1.255948732



Old Town Deck

Sq ft 14,840

Season 2011/2012	Days	Usage in CCF	Dollars	$ / day	$ / Sq. ft.	CCF / Sq. ft.
September			$ -			
October	62	66	$ 107.45			
November	28	191	$ 183.60			
December	31	1014	$ 845.77			
January	33	2549	$ 2,008.25			
February			$ -			
March	34	2631	$ 2,065.31			
April	29	505	$ 424.20			
May			$ -			
June			$ -			
July			$ -			
August			$ -			
Totals	217	6956	$ 5,634.58	$ 25.97	$ 0.38	0.468733154

Comparisons*:

1. $/Day $25.97 / $102.42 = .25 – Old Town 75% less per day
2. $/Sq. Ft. $.38 / $1.24 = .31 – Old Town 69% less per Sq. Ft.
3. CCF/Sq. Ft. .47 / 1.26 = .37 – Old Town 63% less gas usage *

* Gas is purchased at different rates for each of these parking decks so, for the best comparison, look at gas usage. As we know, this past winter was very mild . These figures illustrate the extreme cost of idling, as we did not have a number of snow storms this past season.

Additional Cost

Outside of gas usage, there are additional cost differences between an idle and non-idle snow melt system

- Electrical Costs – continual operation of pumps in an idling system
- Maintenance – wear and tear on pumps, boilers and other components that operate more frequently

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The Larry C. Hardy Garage – Idling System

- There are (2) 7.5 hp pumps at the garage
- The pumps turn on and run continuously once the controller comes out of Warm Weather Shut down
- The pumps turn off in the spring when the weather gets warm again
- The next page details the cost of running the pumps during idle mode. The Old Town Parking Garage does not operate with an idle, so this addition cost is only seen with the idling system

The Math

Full amp load for a 7.5 hp pump is 9.07 amps

9.07 full amp load
x 480 volts
x the square root of 3 (1.732)
7532 watts

7532 watts/ 1000 = 7.53 Kw

7.53 kw x $0.1035/kw hr (cost of electricity)
x 2256 hours per year*
$1758/year operating cost for each pump

The Larry C. Hardy Garage, with its (2) 7.5 hp pumps is
$1758 x 2 = $3516

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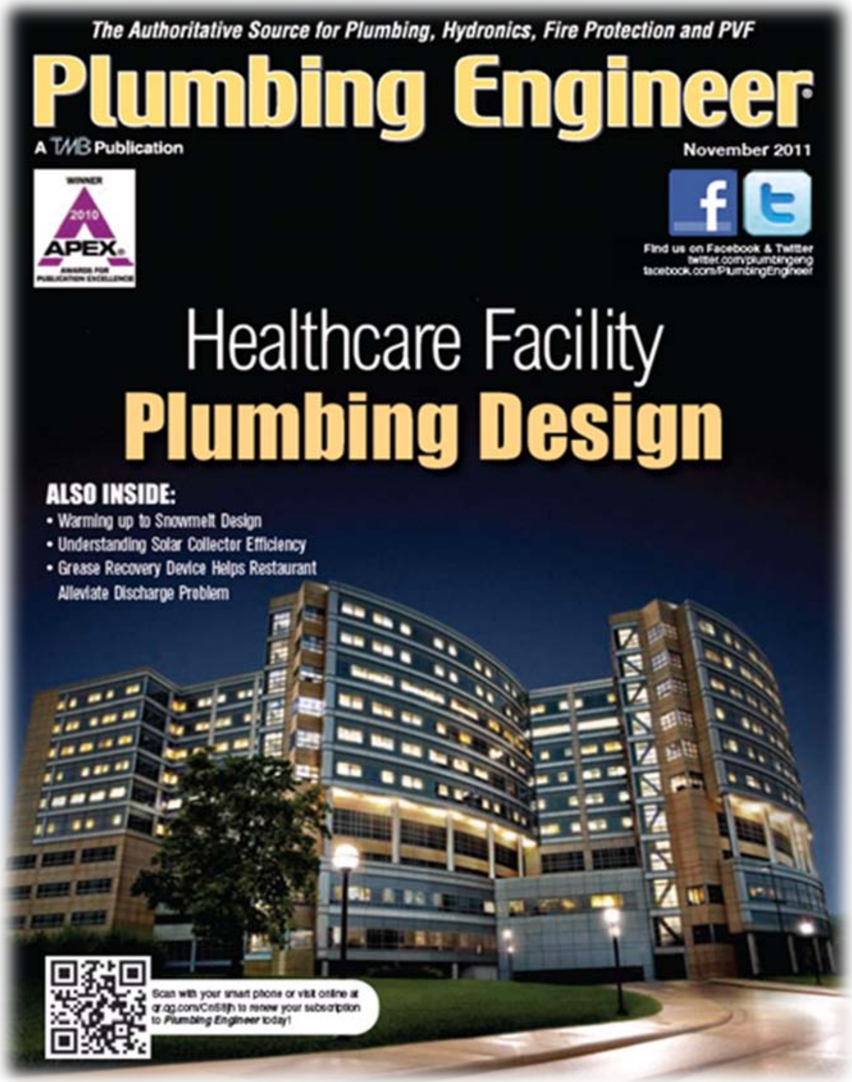
* **ASHRAE – Table 3. Annual Operating Data at 99% Satisfaction Level of Heat Flux Requirement**.
Because there is not an actual Time, hr/yr idle measurement for Traverse City, MI, within the ASHRAE Handbook, an approximation was derived by combining Sault St. Marie and Detroit, Michigan data and averaging those totals.



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Most of us in the trade readily see the value of snowmelt systems. Yet, many building and facility owners have yet to embrace them.

Warming up to Snowmelt Technology

Operating cost. Snowmelts themselves are not that expensive to operate, since they're only activated occasionally. The biggest cost incurred with a snowmelt system is the up-front cost. Glycol antifreeze is required for all systems, because system fluid is either dormant or could go dormant for a period of time. Relatively large pumps may be required to move slushy water-glycol mixture on initial system startup. Larger heat sources are required to deliver the 100 – 300 Btu/hr-sq ft. Supply and return piping is required to get the energy from the boiler to the manifolds for the tubing buried in the slab. With all these factors, including a larger heat source, a snowmelt system can typically cost between $6 – $12 per square foot.

- **On-off systems. The cheapest systems to operate are** on-off snowmelts, because they are only used five or 10 times a year. As an example, a Class II system in Buffalo, N.Y. may cost about $0.21 per square foot per year. The same system in Chicago may cost $0.12 per square foot per year. In Minneapolis, cost of operation might be $0.25 per square foot per year.

- **Idled systems. Idled systems cost more to operate,** because they operate any time the temperature is below 38 F. These typically consume up to 100 Btu/hr-sq ft whenever they are idling and up to 300 Btu/hr-sq ft. during full operation. Whether you're trying to eliminate snow in Lowell, Ark.— or warming a hospital entrance in Nome, Alaska, a snowmelt system, could be the answer you are seeking.

Author, John Vastyan, owns Commercial Ground, a trade communications firm based in Manheim, Pa. John has researched and written about plumbing and mechanical, HVAC, solar, geothermal and radiant heat systems for decades

Conclusion

This information is a quick look into the potential savings of using a non-idling hydronic snow melt system over an idling system. The Dale Prentice company would be happy to discuss this information in greater detail. Prentice also represents TYCO Thermal Controls and their electronic snowmelt systems. Whether it is hydronic, electronic or a hybrid of both, our associates are here to offer you the best solutions for your surface, roof and gutter snow melting needs.