COMFORTPRO HYDRONIC SNOW/ICE MELT SYSTEMS

DEFINITION Controlling of slab temperatures prohibiting the accumulation of snow and ice leaving water to be drained away or moisture evaporation resulting in safer surfaces during and after snowfalls and freezing rain conditions.

GUIDELINES Design, installation, and operation of ComfortPro snow and ice melt systems for sidewalks, stairways, ramps, driveways, landing pads, emergency roads, bridges, roofs, gutters and drains that meets or exceeds local or national standards requiring specific definition of objective and precise application of engineering and construction standards.

EXPECTED PERFORMANCE AND LIMITATIONS While every possible condition must be considered to insure proper design, installation, and performance of ComfortPro snow and ice melt systems, extreme temperatures, excessive wind, blowing and drifting snow, and unusually high snow fall rates may cause the best systems to fall short of their goal of total snow and ice removal.

HYDRONIC DESIGN REQUIREMENTS Total BTU loads are determined by ASHRAE standards based on local weather conditions combined with construction considerations including slab and edge insulation, tube spacing, flow rates, and fluid temperatures both input and return insuring predictable performance characteristics for the slab, tubing and heating plant.

DESIGN TEMPERATURES AND FLOW System flow rates are based on a 25 to 30 degree temperature differential (delta T) unless otherwise specified by a design engineer or professional engineer (P.E.). Specific heat and density of the fluid used at the desired delta T must be considered.

TUBE SIZING LENGTH AND SPACING Tubing size and length of loop is dependent on keeping the fluid velocity below 4.2 feet per second with head losses that can be easily managed with standard pump configurations while accounting for the head loss of all other components in the heating system. Tube spacing should be selected from the following table or consult your ComfortPro Systems design professional or a professional engineer (P.E.).

AUTOMATIC SNOWMELT CONTROL STARTUP AND SHUTDOWN Automatic snowmelt controls provide relay contacts for pump activation, mixing valve setting, and boiler call for heat. Temperature and moisture thermistors provide the initial system start with timed off feature for additional heating after sensor satisfaction. Manual over ride option may be used for testing.

DRAINAGE AND OTHER SITE CONSIDERATIONS Proper drainage must be considered against buildings and in front doors as well as driveways and sidewalks with varying elevations to keep potential run off from collecting and freezing once the system shuts down.

BOILER PIPING AND CONTROL CONSIDERATIONS Mixing valves, injection piping, or primary secondary piping techniques must be employed when using a non-condensing boiler. Return fluid temperatures on these appliances must remain above 140 degrees to prevent condensation in the boiler heat exchanger and burners. Condensing boilers have no minimum water temperature restrictions but may require primary secondary piping to insure proper flow through the boiler heat exchanger. Consult manufacturer specifications for proper pump flow rates. Shell and tube as well as plate type heat exchangers may also be used to protect appliances provided a separate air separator and expansion device are used.

TESTING AND STARTUP Pressure testing of the system components should be performed before filling with fluid. Manifolds and tubing may be pressurized to 100 PSI with the boiler isolated. The boiler and near boiler piping will only be tested up to the rating of the boiler relief valve. Once filled with fluid, loops may be bled one at a time to eliminate air. Supply lines may be purged next with the boiler and near boiler piping last. Test firing of the boiler will release suspended oxygen in the fluid to be released by the air separator and vent.

SnowMelting Performance

AquaHeat

Snow melting systems must be very carefully designed. Whether you are doing residential or commercial snow melting, the specific project objective must be considered during the design phase. Factors to consider; outdoor temperature, wind speed, area to be melted, local climate, rate of removal, cost of operation, and local codes. No area is too small or too large to be snow melted! It is essential for each project to be engineered to meet the specific requirements for the geographical area and the project's objective in rate of snow removal.

GROUND INSULATION IS IMPERATIVE: Insulation should be used underneath all areas, not for energy conservation (it does not substantially reduce the load)! What it does, it decouples the slab from the earth underneath. The benefits are: reduced back losses and warm up time, and quicker melting once the system is started. It is important to use ridgid structural insulating material (blue) to support the slab that is not affected by moisture.

SnowMelting Performance Chart				
Outdoor Temp.	Wind Speed	System Flowrate	Required Supply Temp.*	1000 sq. ft. req. /input*
(°F)	(mph)	(US gpm)	(°F)	(Btu/h)
14 ° F	0	6.4	92	72,000
- 10 ° C	5	9.0	110	100,000
	10	11.5	128	128,000
5 ° F	0	7.0	97	80,000
- 15 ° C	5	10.4	120	118,000
	10	13.8	144	156,000
-4 ° F	0	7.7	101	87,000
- 20 ° C	5	11.9	130	133,000
	10	16.1	160	184,000
- 13 ° F	0	8.3	105	94,000
- 25 ° C	5	13.3	140	151,000
	10	16.3	176	209,000
-22 ° F	0	8.9	109	101,000
- 30 ° C	5	14.7	150	167,000
	10	20.6	191	234,000

Note: * Items are based on 9" spacing

The abovesnowmelting chart uses the following parameters:
Area = 1000 square feet
SnowMelt Efectiveness Ratio = 0.75
Relative Humidity (at all temperatures) = 85%
Snowfall Rate = 0.75 inches / 1 hour
2.5 inches of concrete over 5/8" PEX pipe with 1.5 inches of polystyrene insulation (R-7) under tubing
Temperature Drop = 30 ° F (17 °C) (between supply and return water)
Loop Leader Length (distance between snowmelt area and manifold) = 10 feet
System Fluid = 50/50 glycol/water

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Project Considerations

DENSITY OF SNOW: Is very important when determining how much energy is needed to melt it. Unfortunately, the density of snow fall to snow fall can be dramatically different. Snow most commonly forms at temperatures between +40°F and -10°F. Depending on at what temperature it forms, snow can be very dense or less dense.

TEMPERATURE OF SNOW: The temperature of new fallen snow is not much different than the outside temperature, or 30°F, which ever is colder. Outside temperature can vary widely as well. Without knowing the outside temperature in advance, it is impossible to determine how much snow can be melted with a given amount of energy in a given time period.

WIND CONDITIONS: Are critical to the performance of the snowmelt system. Sometimes there is no wind present during a snow fall; sometimes winds are gusting at 30 to 40 mph. Strong winds steal BTU's from a slab faster than outdoor air temperature. The presents of buildings, landscaping or even snow fences reduces the negative effect of wind on a snowmelt slab. Even the control strategy plays a role in the effect of wind. If the system is controlled by an on/off system, the effect of the wind is often reduced because snow accumulates on the slab and shields the slab from the wind.

SITE: Proper site preparation along with an accurate engineered design allows many different types of materials to be snow melted; concrete, asphalt, interlocking brick pavers to flagstone. If additional surface material is used (asphalt, gravel, paving stones) the supply water temperature must be increased to compensate for the additional heat losses.

INSULATION: It is very critical to system performance to make sure that a minimum of 2 inches of closed cell structural high density (blue) ground insulation barrier to ensure quicker slab response time and optimum energy usage.

DRAINAGE: It is critical have good drainage to prevent ice build ups. These drains always should be located in warm zones. Ice formations may occur if drains are placed in border or cold zones.

PIPE INSTALLATION: Pex pipe has minimal structural strength and must be accounted for in any structural calculations. The load bearing capacity of a heated slab must be calculated to ensure proper reinforcement by local building standards.

FROST PROTECTION: Is a must! eg. Dowfrost or equivalent must be used.

Outdoor temp.	Outdoor temp.	Anti-freeze %
(°F)	(°C)	(%)
5	-15	26
-4	-20	32
-13	-25	37
-22	-30	42

CONTROLS: We recommend the use of automatic snow and ice sensors. We offer three types of snow melting systems; manual, on/off, semi-automatic and automatic.

Your Next Project

Contact us at 800-968-8905 or at www.comfortprosystems.com for our help with your next snow melting opportunity. We can assist with all design and specification questions.