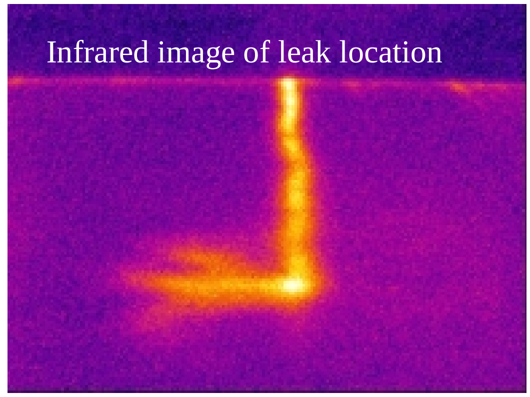
Ice Rink Leak Location with Thermography



This is Canada. The highest per capita number of indoor ice arenas in the world belongs to us. Even in the smallest small towns all over this country some style of indoor ice facility is usually at the centre of town gatherings and events. Countless hours are spent by Canadians in these arenas cheering on minor hockey games or attending early morning skating classes. An indoor facility to extend the winter playing seasons has come to be the norm. The NHL hockey season extends well into the warm months of spring. Without indoor ice pad facilities, none of this would be possible. How difficult is it to maintain an indoor ice rink facility? Things don't get much more simpler than frozen water, right? That is if all systems function as designed without fault. Most indoor ice pads reply on a cooling system of pipes, pumps and electronic controls to keep the water frozen and in satisfactory form. Chilled coolant is pumped through these pipes embedded, usually in concrete, in the floor of the ice pad. The ice pad surface gets very cold and freezes the water flooded on its surface. A real headache for facility management can occur when leaks develop in the embedded piping system. Losses of coolant levels in the system indicate leaks that can be very difficult to locate for repairs. Infrared thermography can prove to be a valuable tool for ice pad leak location. The following inspection technique located two separate leak locations when other methods were exhausted. The leaks were repaired and the ice rink was returned to service with no further leaks suspected.

Changes to the normal operation of the ice pad cooling system are required. Instead of pumping coolant through the piping system, a warm heated medium must be used. In this case, water was heated to approximately 40 degrees Celsius and pumped into the piping system. With the heated water, the system was pressurized to normal pressure and operated as a closed system. The theory for leak detection with thermography in this case relies on water flowing through the pipe that is leaking. The heater water flow will be greatest through the leaking pipe section and cause the ice pad surface to be heated at a faster rate. The heated water system was put into operation and checked for varying pad surface temperatures with a FLIR model PM695 thermal imaging system every half hour. Time allows for heat from the embedded piping to radiate through the cement surface of the ice pad. Different leak rates will take different times to show at the ice pad surface. In this case, two different suspect leak locations were noted after one hour.

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Thermography can be used to continue monitoring the surface for other smaller leaks. Varying times may be required to locate all leaks. The infrared images showed exact pipe installation location as well as a temperature rise plume at the actual leak location. The concrete was broken up and inspected at each suspect leak location. Confirmed leaks were noted at each location. Repairs to both leaks were completed and the cooling system returned to service. No further significant dropping of coolant levels were noticed.
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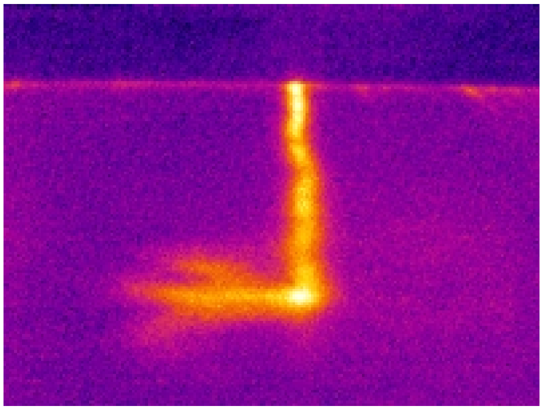
Images:

Typical ice pad surface. Ice removed with a cement floor surface.



Infrared image of the ice pad cement floor surface. Same location as in the photograph. Thermography can see the small temperature difference cause by the embedded leaking pipe. Indicated here is the leaking pipe installation and a temperature rise plume at the leak location.

A leak was exposed and confirmed at the suspect location. Shown here are the exposed sub-surface ice pad cooling system piping.