Dufferin Grove AIR

Description	Total Cost	Savings by Measure																Total Savings	Simple Payback
		Natural Gas		Electrical Consumption				Electrical Demand				Water Consumption		Other					
	($)	cu-m	$	kWh w/ Demand	$	kWh w/o Demand	$	kW	$	kVA	$	cu-m	$	$				$	(years)
LIGHTING MEASURES	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Exterior Lighting	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Exit Signs	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Redesign	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Retrofit	$ 4,137	-47	$ (19)	1,581	$ 107	0	$ -	5	$ 19	5	$ 20	0	$ -	$ -				$ -	N/A
Sensors	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ 126	32.89
HID Dimming Controls	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
WATER MEASURES	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Water efficient flush valve toilet	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Water efficient tank toilet	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Water efficient urinal flush valve	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Water efficient shower head	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Water efficient faucet aerators	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Zamboni Fill Nozzle	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
CONTROLS MEASURES	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
BAS - Standard Arena	$ 21,467	5,915	$ 2,425	22,908	$ 1,549	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
BAS - Community Centre	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ 3,974	5.40
BAS - Natatorium/Recreation	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
BAS - Ventilation Zoning Isolation	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
BAS - Optimization/Modifications to ex	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
BUILDING INSULATION AND ENVELOPE MEASURES	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Air Sealing Program	$ 2,874	994	$ 407	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Header Insulation	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ 407	7.05
Low 'E' Ceiling	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Piping Insulation	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
MECHANICAL MEASURES	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
High Efficiency Equipment Installation	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Heat Recovery	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Energy Source Conversion	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Compressor Cooling - Closed loop sys	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
OTHER MEASURES	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
VendMiser	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Solar	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Power Factor Correction	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	$ -				$ -	N/A
Total	$ 28,478	6,862	$ 2,813	24,488	$ 1,656	0	$ -	5	$ 19	5	$ 20	0	$ -	$ -				$ 4,508	6.32

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LIGHTING	Dufferin Grove AIR - 41
Current Condition and Operational Methods of Equipment	The facility was found to operate an assortment of lighting systems. All linear fluorescent luminaires operate T8 lamps and energy efficient electronic ballasts. Exterior artificial ice surfaces are illuminated by high wattage pole mount luminaires. The exterior building lighting systems are generally a combination of low wattage metal halide and high-pressure sodium wall-mount luminaires. Luminaires are controlled by photocell or time clock.
Current Space Conditions	Light levels for most areas meet or exceed I.E.S.N.A. recommended levels for recreational facilities.
Proposed Modifications	**Retrofit** ➢ Existing T12 fluorescent luminaires to be relamped and reballasted with reduced wattage T8 lamps and low ballast factor electronic ballasts. Existing luminaires operating 4' T8 lamps will also be relamped and reballasted with reduced wattage T8 lamps and low ballast factor electronic ballasts. Select incandescent luminaires will be relamped with screw-in compact fluorescent lamps or replaced with new linear fluorescent luminaires one for one.
Impact on Maintenance	With the installation of new lighting equipment, the operations staff will have minimal lamp and ballast failures for the firs few years of operation, provided the lamps and ballasts perform as per manufacturers specifications.
Impact on Non-Utility Costs	The installation of new T8 fluorescent lamps will provide the occupants with a much higher Colour Rendering Index (CRI) as compared to the standard fluorescent T12 lamps due to the addition of Rare Earth Phosphors. High frequency electronic ballasts operating at frequencies grater than 20,000Hz virtually eliminate all ballast noise and lamp flicker associated with common fluorescent magnetic ballast lighting systems.
New Skills or Procedures Requirement	N/A
Expected Useful Life of Equipment	20,000 hours for T8 lamps. 60,000 to 100,000 hours for high frequency electronic ballasts.
Warranty	Installation on workmanship one-year Linear fluorescent T8 lamps two-years High frequency electronic ballasts five-years

BAS – STANDARD ARENA	Dufferin Grove AIR - 41
Current Condition and Operational Methods of Equipment	The facility currently has a Siemens automation system that monitors the refrigeration plant. There are space thermostats that control the buildings various heating devices. Unit Heater and Exhaust Fan: The existing compressor room, office and washrooms are either heated by electric or gas unit heaters. These heaters are operated throughout the ice season and beyond. They are normally cycled to maintain the space temperature according to the setpoint set at the local line thermostat or self contained thermostats. In some cases, these thermostats are not functioning properly due to age and lack of maintenance; the heaters are sometimes running 24 hours a day. In the summer, the exhaust fan is cycled on/off to maintain the space temperature at the preset setpoint at the local line thermostat in the compressor room in particular. Zamboni room Heater: The existing zamboni room heaters are either unit heaters with gas-fired burners, hot water coils, or electric heating coils. These systems are operated through a locally mounted wall thermostat. In most cases, when the zambonis are out cutting the ice or dumping the shavings, the garage doors remain open leaving the space exposed to either the cold environment outside or in the rink. The heaters will run during these periods to no avail. A low limit controller will be installed to prevent freezing conditions. Make-up air Unit: The gas furnace of the make-up air unit is cycled on/off to maintain a space temperature according to a fixed space temperature setpoint, even when the facility is unoccupied. The fan is presumably running in winter only. Brine Pump: The brine pump(s) is running continuously throughout the ice season. The existing supply and return brine temperatures are being monitored by the existing Honeywell or Cimco system. In the event of very cold days when the outside temperature is below -7°C, the ice pad can be maintained without the need of running the brine pump(s).
Current Space Conditions	Space temperature 22-25 °C. Zamboni space temperature 15-20 C Brine temperature maintained at -11.7°C to -12°C (10°F - 11°F).
Proposed Modifications	Building Automation System (BAS): A direct digital control system will be installed to operate the facility more efficiently. The installation will allow for remote access of the facility through a modem. An operator workstation will be installed in the facility which will include controls

BAS – STANDARD ARENA	Dufferin Grove AIR - 41
	graphics, operation schedules, and set point modification capabilities. The existing Siemens automation control panel will be removed and the points will be integrated into the new controls system. Unit Heater and Exhaust Fan: It is proposed to install a space temperature sensor at each zone and the space temperature will be monitored through the EMCS system. The space temperature will be maintained at a night setback temperature setpoint at night through a time of day schedule setup in the EMCS system during the ice season, and will setback throughout the day beyond the ice season. The exhaust fan will be cycled on/off to maintain a setback space temperature in the compressor room in the summer. The EMCS will open the intake louver and exhaust louver first when the compressor room space temperature is higher than its setpoint, and the exhaust fan will be started by the end switch installed at the intake louvers upon its fully opening. Zamboni Room Heater: It is proposed to install a door switches on the garage doors and interlock them to the heaters therefore when the doors are open, the heaters will not run. This will conserve unnecessary heating. Calculated savings is based only on the heater savings only. Make-up air Unit: It is proposed to impose a night setback temperature setpoint to the space through the EMCS system, when the facility is unoccupied. The gas furnace and supply fan will be disabled when outdoor temperature is above 13°C. Brine Pump: It is proposed to modify the interlock control of the brine pumps from the compressor control circuit, so that the brine pumps will be controlled by the EMCS system in series with the existing control. By installing a reliable outdoor air temperature sensor, the brine pump will be shut down when outdoor temperature is below -7°C. In order to prevent the freezing of the brine solution in the system, the brine pump will be re-activated when the outdoor temperature is below -15°C and will run continuously.
Impact on Maintenance	EMCS system need to be checked and maintained every year.
Impact on Non-Utility Costs	N/A
New Skills or Procedures Requirement	No training will be required. EMCS system training will be done through a global scheme.
Expected Useful Life of Equipment	10 – 15 years

BAS – STANDARD ARENA	Dufferin Grove AIR - 41
Warranty	1 year

AIR SEALING PROGRAM	Dufferin Grove AIR - 41
Current Condition and Operational Methods of Equipment	There are areas throughout the building that have large air gaps that are exposed to the exterior environment. Doors have poor weather stripping and sealing. All these deficiencies in the building envelope allows for unwanted infiltration of unconditioned air.
Current Space Conditions	▸ AIR ▸ 3 month ice season
Proposed Modifications	It is proposed to seal large air gaps in the facility and weather strip and seal doors to reduce the overall infiltration. ▸ Doors: 9 ▸ Roof and Wall Gaps: 45 feet ▸ Overhead Doors: 52 feet
Impact on Maintenance	The door sweeps will have to be inspected annually to ensure that they are not damaged. These will have to be replaced at the end of their useful lives.
Impact on Non-Utility Costs	The overall building comfort levels will be improved with the installation of this measure.
New Skills or Procedures Requirement	N/A
Expected Useful Life of Equipment	15 years – foam insulation 2-3 years – door sweeps
Warranty	1 year parts and labour