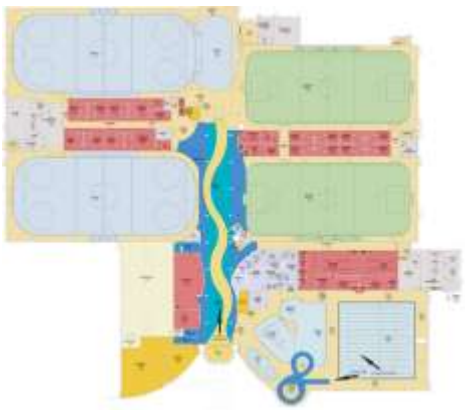
Introduction

- A unique and challenging approach was utilized for the design and construction of the Tri-Municipal Family Recreation Center project.
- The project involved three municipalities, Spruce Grove, Stony Plain and Parkland County, in the development of a $28,000,000 Multipurpose Recreation Complex. The Trans Alta Tri Leisure Centre includes swimming pools, twin ice rinks, twin indoor soccer fields, an indoor running track, fitness/aerobics facilities, gymnasium, child minding facilities, dining lounge and all the ancillary spaces required to support the various functions of the complex.
- The challenge faced in designing and selecting the mechanical systems for the facility was to incorporate energy efficiency and functionality of the mechanical systems and still stay within strict economic constraints.
- The design team consisted of the Architects; Barr Ryder Architects, Engineering Consultants; Stantec Consulting, Construction Managers; PCL-Maxim and the Client Steering Committee.

Floor Plans

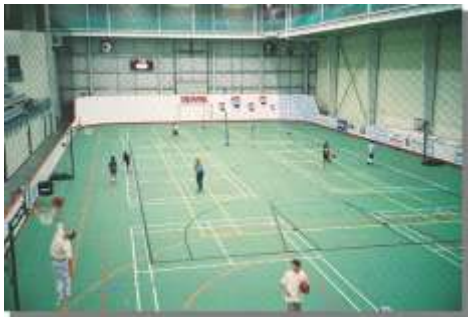


Main Floor

Second Floor

Building & Systems Requirements

- Building Envelope consists of two very distinct and different systems
  - Ice Arenas and Soccer Pitches with pre-engineered structures
  - The remainder of the facility constructed of custom steel and insulated wall cladding
- Mechanical systems design incorporated a number of different functions under one roof with distinct environments for each function.



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Building & Systems Requirements

- The swimming pools had to be kept at warmer temperatures as compared to the other spaces in the building while the ice had to be kept at a much cooler temperature than the offices and other adjacent areas.
- In the Ice Arenas, frost penetration into the slab below the ice surfaces had to be negated to ensure that the ice slab was not affected by ground movement.
- Humidity control was also a critical function for both the ice arenas and the pool areas
- The fitness and aerobics area needs to be kept at approximately 18°C to provide a degree of comfort for the participants working out on the various equipment in the rooms.

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Ice Arena Systems

- The arenas space temperature is to be kept at approximately 8-9°C.
- The ice plant design did not use ozone damaging either CFC's or HCFC's for producing the chilled brine solution.
- Two rotary screw ammonia chillers, each producing approximately 100 tons of cooling was used. The heat from the chillers ammonia was then passed through an heat exchanger where the heat was transferred to a glycol solution and pumped to an underslab pipe loop system below the ice surface.

Ice Arena Systems

- This waste heat source prevents the buildup of frost below the ice slab and protect the integrity of the concrete slab. The waste heat was also used in a heating loop located in a pit to melt the ice scraping collected by the ice resurfacer.
- An in-slab heating loop was also installed in the ice resurfacer room floor slab to help keep the floor dry and free from snow falling from the ice surfacer. The use of the indoor pit to melt the snow meant that there was no requirement for the ice resurfacer to leave the Arenas to the exterior to dispose of the snow as is done in the older style ice arenas.

Ice Arena Systems

- Natural gas fired infrared radiant tube heaters provide spectator comfort in the cold arenas. This radiant type of heat source is an energy efficient method of providing direct heat to the spectator areas without the necessity of heating the air first and then blowing the warm air at the spectators.
- Humidity control in the arenas is done with a dry desiccant heat wheel air system. This system draws the rink air through a desiccant wheel which absorbs the moisture from the rink air and transfers the moisture to air that is exhausted to the exterior.
- Desiccant dehumidifiers can eliminate fog, condensation, and mold/mildew while also reducing operational expenses, specifically related to the ice plant operation.
- The lower the humidity in the space the less time the chillers need to operate to maintain the ice temperature. The other main advantage that the desiccant dehumidifier units have over the refrigeration dehumidifier type units is the lower operating costs.

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Aquatic Systems

- When designing ventilation systems for pools, humidity and space temperature control are two important items to be accounted for. The ASHRAE guidelines for Natatoriums with spectators, indicates that a range of six to eight air changes are required to ensure humidity control in the space does not create conditions for mold and mildew to form on walls, ceilings or floors. The pool air system for the TransAlta Tri Leisure Centre was designed to provide six air changes per hour.

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Aquatic Systems

- The air system selected for the pool was designed complete with a “Glycol run a round” heat recovery loop. This heat recovery loop consists of a heat transfer coil in the warm exhaust air portion of the unit to outdoors and a heat transfer coil in the outdoor air intake portion of the unit. The coils are connected together with pipes and pumps that will circulate a 50/50 solution of glycol and water between the two coils. During the days when humidity control is required, the heat is extracted from the air being exhausted from the pool and transferred to the equal amount of outdoor air being brought into the pool. Digital controls will monitor and operate the glycol heat recovery system to its maximum efficiency.

- The pool air system also utilizes a indirect natural gas fired heat exchanger to condition the supply air as required to maintain the pool space temperature. The gas burner meets the requirements of the ASHRAE 90.1 Energy standards for combustion efficiency.

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Fitness/Wellness HVAC Systems

- The approach taken for ventilating, heating and air conditioning the various ancillary spaces of the Complex was to use individual packaged roof mounted heat/cool air systems with individual thermostat control. The rooftop units are designed with 100% free cooling capabilities, so that when the outdoor air temperatures are cool enough the unit will adjust from mechanical cooling to up to 100% outdoor air for cooling the space as determined by the space thermostat.

- The natural gas burner for the rooftop units also meets the requirements of the ASHRAE 90.1 Energy Standards for combustion efficiency.

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Fitness/Wellness HVAC Systems

- The use of individual rooftop air systems also allows the building operators to vary the space temperatures served by that rooftop unit when there is no occupancy in the room. All the rooftop air systems are connected to a central building computer which controls and monitors all the building mechanical systems.

- Through programming the rooftop air system space temperature sensors can be automatically adjusted based on the occupancy schedules for the various rooms.

Other Energy Efficient Systems

- The mechanical systems installed in the Complex are controlled by a direct digital controls system with a central computer located in the building operators office. From the computer the operator can monitor, adjust or stop start various components in the mechanical system. The advantage of the DDC system is in the various energy efficiency programs, trend logs and temperature reset programs that are available for operating the mechanical equipment at there most efficient conditions.

- High efficiency electric motors are utilized for all the mechanical operating systems including all pool circulating pumps.

Other Energy Efficient Systems

- The ice resurfacer fill with hot water utilizes an instantaneous heating boiler rather than a boiler and storage tank arrangement. The building tempered water system supplies water to the boiler at 49ºC and heats it up to 60ºC only when required. This eliminates the need for keeping a large volume of water hot during non-use periods.

- The natural gas burners for all the boilers utilized in the building comply the requirements of the ASHRAE 90.1 Energy Standards for combustion efficiency.

- The soccer locker rooms makeup air and washroom exhaust ventilation system utilizes the supply air delivered from the soccer fields air system as the makeup air and washroom exhaust requirements. This reduces the gas loads requirements for the Complex as well.