CHU Sainte-Justine's «Growing Up Healthy»

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SNC-Lavalin inc.

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INNOVATION

The Centre hospitalier universitaire Sainte-Justine (CHUSJ), a health facility exclusively dedicated to children, teens and mothers, was the target of a major expansion project (130,000 m²). More specifically, this project, carried out in Design-Build Management, consisted in expanding the existing facility by constructing a building for specialized units (SUB), a new research center, a tiered indoor parking and a new heating plant.

The main goal was to provide the hospital with ultramodern sustainable facilities and to create a high-quality therapeutic environment. Delivered within a BIM process, this project is a benchmark in terms of performance in the fields of health and environment, appearing on the short list of the only two hospitals to have obtained a LEED NC 2009 Gold certification in Quebec.

The expansion has two ventilation units that stand out, on the one hand, for their impressive capacity. The first consists of ten air handling units that supply each floor, one of which is redundant, for a total of 194,980 L / s (413,360 cfm). The second includes three units of 6000 L/s (12 720 CFM) and 17 units of 1200 L/s (2500 CFM), for a total of 38 400 L / s (81 400 CFM). On the other hand, this system is truly innovative, while it allows all air handling units to operate with 100 % fresh air with a recovery wheel.

The deployment of our concept, which today provides exceptional indoor air quality, was first intended to allow each BUS floor to be linked to the floors of the existing building. To meet this requirement, our team had to design with a floor to floor height limited to a mere 3.66 m². While dual duct air supply systems were also required, our teams faced a significant challenge in coordinating distribution given the limited space in the mid-ceilings. Our design has proven to be the ideal solution, making it possible to minimize the number of ducts and ventilation units (since all typical areas can be treated by the same system) and to reduce the number of mechanical wells. As a bonus, this strategy now provides total flexibility in terms of potential redevelopments.

At the time of its inauguration in November 2016, the expansion of the CHUSJ was the first hospital center to offer to its users a 100 % fresh air operating environment.

COMPLEXITY

HVAC SYSTEMS
(5 MECHANICAL ROOMS)

413 360 PCM

COMPLEXITY

Achieving an energy target of 1.55 GJ / m² has proven complex given the large amount of energy consumed for heating and cooling purposes to guarantee exceptional indoor air quality (100 % fresh air). This challenge was also accentuated by the large surface area of the 82 wet laboratory modules (8,039 m²), requiring high rates of air change per hour (20 ACH). The adoption of strategies for recovering sensitive and latent energy from the exhaust air and the installation of high-efficiency boilers and coolers and variable-flow ventilation systems were some of the measures we implanted. For example, more than 100,000 CFM of exhaust air is cooled via a recovery coil connected to centralized heat pumps, which can recover up to 750 kW of heat.

The integration of a radiant water heating system in the ceiling, unusual in hospitals, offers undeniable advantages to users. It makes the rooms more comfortable by increasing surface temperatures without causing air movement, while being perfectly silent. Its installation presented a high degree of complexity at the time of design, because maintaining and controlling the water temperature is critical to ensure the proper functioning of the system and to avoid the formation of condensation in the windows.

The choice of equipment and the energy saving measures implemented saved 3,026,101 m³ in natural gas. This represents a reduction in emissions of 5,887 metric tons of CO_2 per year, the equivalent of about 1,250 cars.

Social and Economic Benefits

Social

Thanks to the expansion component of the Growing Up Healthy project, the hospital has become the largest mother-child center in Canada and one of the four largest pediatric centers in North America. Recognized as a «Health Promoting Hospital» by the World Health Organization, the CHUSJ stands out for its quality of cares and the comfort and safety it provides to users.

Through its new innovative spaces, the CHUSJ also aims to be a center of excellence in scientific research and education. Its fame attracts over 200 researchers, who use the hospital's state-of-the-art facilities to ensure the progression of science and to help sharing knowledge.

Economic

The choice and location of equipment, systems and networks is based on a life-cycle approach. The main objective is to minimize operating costs and facilitate maintenance, while maintaining optimal performance and quality.

With our simulation tools, we calculated that the total operating costs of the extension were almost 38 % lower than those of the 1997 CNEB reference building. The annual savings, at their full potential, are around $ 795,000 for natural gas and $ 73,000 for electricity.

In 2020, the value of energy recovery equipment (recuperative coolers, thermal wheels, etc.), estimated at $ 920,000, and the $ 3M invested in the installation of an efficient envelope will be absorbed by the annual savings made.

LEED-NC-GOLD

38%

Total operating costs 38% lower than the reference building of the CNEB 1997

ENVIRONMENTAL BENEFITS

Environmental Benefits

To ensure the protection of the next generations, the CHUSJ aimed to obtain a LEED Silver certification. Taking into account the diverse needs in the different sectors of the complex, the project team has developed several solutions to promote sustainable, affordable and ecological design practices. The result: the creation of a LEED Gold certified hospital center, surpassing the level initially targeted. Among the preferred measures to obtain LEED credits in electromechanics, we find:

- ◊ Recovery of sensitive and latent energy on the exhaust air;
- ◊ High efficiency boilers and coolers;
- ◊ Heat recovery from chillers;
- ◊ Variable flow ventilation system;
- ◊ Low consumption plumbing fixtures;
- ◊ Innovation through the minimal use of mercury in lighting sources;
- ◊ High indoor air quality (IAQ).

With the Growing Up Healthy expansion project, the CHSUJ is now one of the best performing hospitals in North America. The harmonious integration of the extension into the immediate environment was a must for the project, just like the importance given to good neighborliness and interaction with the community, A wind study was required to determine the positioning of the louvers and evacuators in the laboratories and to avoid inconvenience for residents nearby. Special precautions have also been taken regarding reduction of the acoustic impact of generators located near residential buildings. Our team even participated in meetings of the good neighbor committee to reassure residents about future noise levels.

MEETING CLIENT'S NEEDS

65%
Expansion of the total area

Project delivered in 52 months

Respect of the budget $458 M

Meeting Client's Needs

Without a doubt, the completion of the project now allows the CHUSJ to successfully pursue its fundamental mission: to actively contribute to improving the health of children, adolescents and mothers in Quebec. In addition, the expansion, which brought the hospital's surface area to 200,000 m2, was completed in perfect accordance with the schedule and the budget of $ 458 million. Respecting the schedule was almost a feat for a project of such a complex nature! The 65% expansion of the existing hospital was delivered in 52 months thanks to the use of avant-garde management methods, such as BIM for the production of detailed engineering, the collaborative approach of all stakeholders as well as the sustained presence of our professionals, and this, until the CHUSJ takes possession.

From the point of view of the quality of the built environment, the new facilities correspond perfectly to the needs and requirements expressed by the CHUSJ and its users. Our team of professionals has created sustainable, flexible living, hospitalization and work spaces, focused on the needs of customers, staff and the neighborhood.

In fact, when the provisional acceptance notice was published, the CEO of CHU Sainte-Justine, Fabrice Brunet said:

«We are delighted with the result of the efforts of our partner, who was able to meet a very tight schedule, in a very demanding project, if only technologically.»

July 3, 2016

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