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THE EVOLUTION OF STEEL IN RECREATION CENTRES

An Interview with Frank Cavaliere, P.Eng., Managing Principal, RJC Engineers

By Tanya Kennedy Flood

THE STEEL INDUSTRY has adapted and responded to the evolution of recreation centres. These long span building shave changed dramatically in the last 20 years, from simple, pre-engineered structures to dramatic custom landmark buildings, with steel being a popular material for both.

Frank Cavaliere, Managing Principal with RJC Engineers, has witnessed first-hand as a structural engineer how recreation centres have advanced from traditional pre-engineered structures to complex, highly aesthetic buildings. “Municipalities are investing in recreation centres, developing them as community buildings that house more than sport; they may include libraries or schools, for example. Larger municipalities now want award-winning design, highly aesthetic, architectural buildings.”

Based in Edmonton, Cavaliere shares that, historically, many recreation centres in Alberta used wood or pre-cast concrete for the structural system. At the time of his first recreation centre in the early 2000s, municipalities were constructing pre-engineered steel buildings to develop recreation centres. Using pre-engineered structures allowed owners to get major square footage for a relatively low cost. Design teams would incorporate one or two pre-engineered shells to house an arena or two, and potentially a gymnasium. The facility would be built out within the defined shell, possibly adding custom steel fabricated office areas, libraries, schools etc. Since the pre-engineered look was not desirable, the large space elements such as an arena or natatorium would be put at the back of the building. This approach created a highly efficient structure that provided major square footage at a relatively low cost.

Servus Place in St. Albert, the Bold Centre in Lac La Biche, the Leduc Recreation Centre and the Camrose Recreation Centre are all examples that used this pre-engineered steel structure approach. Delivering these structures was a team effort. The supplier of the pre-engineered structure was very involved throughout the design, because often additional elements, such as mezzanines or running tracks, had to be supported off the pre-engineered structure. The process was very collaborative and non- traditional, with the suppliers of the pre-engineered structures and the structural engineer of record working closely to deliver these facilities. Typically, the pre-engineered suppliers would work on their own to design big open spaces like shops or industrial buildings, but these recreation centres required a more custom approach to deliver a more customized building from their kit of parts.

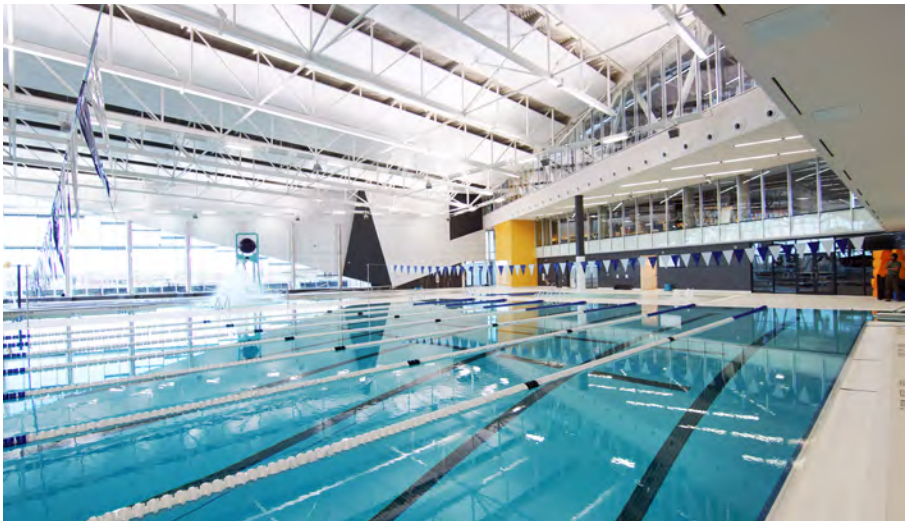
“We learned a lot about how pre-engineered suppliers do things and how they are efficient. In turn, they learned from us too. It wasn’t just a matter of putting a snow load on the roof and a wind load on the wall and away you go; there was a lot of coordination between what they were supplying and what we were supplying. On the Camrose Recreation Centre for example, one arena is a performance arena with 2,000 seats, so the bowl structure for the arena seating was cast-in-place concrete, but the perimeter of the building was pre-engineered steel. We had to develop an interface between the cast-inplace concrete and the engineered steel.” The two groups worked together closely to communicate loads and details, pushing the boundaries of the pre-engineered structures and allowing for the necessary customization. It was a new concept at the time and had challenges, who is responsible for what structurally? How do both groups detail and coordinate the design properly with respect to scopes of work – what is each discipline, supplier and trade responsible for? For example, it was a change for everyone to take a pre-engineered steel building that then had elements welded onto it in the field in order to integrate it with concrete. All team members had to literally think outside the box!

Over time, municipalities began to desire more architectural pieces for their recreation facilities, making pre-engineered structures less desirable. Changes to the energy code also spurred this change; owners were no longer saving as much money using a pre-engineered shell because of the modifications to the building envelope that had to be made to achieve the required energy efficiency.

The next generation of steel recreation centres are highly architectural and custom. Often there aren’t equal modules as far as grid line spacing or the building has odd shapes. Recreation centres are no longer just rectangular; they are parallelograms or rhombi for example. “For Clareview Community Recreation Centre,” says Cavaliere, “we have one big irregularly shaped box that houses both a natatorium and a library, and below the library is all the pool mechanical for that adjacent space. That entire box only has three interior columns carrying nearly 50,000 square feet of roof area. There are massive trusses spanning diagonally because the roof is ridged along the diagonal. There is just no way to do that kind of design effectively in any material but steel.”

Custom recreation centres is where steel really began to shine for this building type. The flexibility allows for trusses that span massive spaces and for things to hang wherever you want. In steel recreation centres, mezzanines, running tracks and viewing areas can hang in midair.

Commonwealth Community Recreation Centre and Field House



Clareview Community Recreation Centre

Architects can design very impressive buildings with features such as a library with a glass wall separating it from a pool, while still maintaining the integrity of the envelope. Many recreation centres today feature custom fabricated steel structures that span anywhere from 60-70m with no internal columns allowing for large arenas or natatoriums. Architects are able to put these big areas wherever they need to be in the building. Pre-engineered structures did allow for this in plain rectangular geometries, but the pre-engineered components were always at the back because it wasn't desirable to have them facing the street.

Today, Cavaliere's work includes Lewis Farms Facility and Park, a highly architectural modern recreation centre designed by architects Stantec and Saucier + Perrotte. One of the most dynamic features is also one of the most structurally complicated. Covered by a very large round roof are three levels of community space that include gymnasia, office space and wide-open circulation space, all under the rotunda roof that is 21m in the air. Steel allowed the design team to span 42m over a second-floor gymnasium and 18m over the main lobby/entrance area. The tallest part of the pool, where the dive towers are, is also underneath that high roof and then it steps down to enclose the shallower end of the competitive pool and recreational pools. The flexibility and customization of steel has made this design achievable.

"One of the advantages of steel, aside from its efficiency, is the variety of shapes you can get in steel members, and the finishes you can achieve. It gives architects the opportunity to decide if they want to hide the structure or leave it exposed. You can use very architecturally pleasing sections to make the trusses a feature versus hiding it behind a ceiling," states Cavaliere.

Leaving the structure exposed can not only save money, but there are issues that can come with having a ceiling in high humidity space such as a pool or arena. A ceiling can hide potential issues that may be developing, such as corrosion, and depending on the ceiling material it may not perform well in a humid environment. Damage can also happen to ceilings in recreation facilities. "The Field House we designed for Commonwealth Stadium Community Recreation Centre is where the Edmonton Football team practices, so there were strict height requirements, we had to have a clear height of 14m," says Cavaliere. "Even with these heights, there's always a risk of damage. You don't want the ceiling to be damaged from footballs hitting it, so you don't want a ceiling in that space."

Lewis Farms Recreation Facility

Leaving the steel structure exposed can be very attractive given the ability to develop customized trusses. Architects and engineers can use anything from the most highly efficient trusses, which tend to be less attractive, to very architecturally ornate trusses. Mechanical can also be run through the trusses, which is desirable for recreation facilities that have big spaces and need a lot of air movement. Trusses can allow for massive 1,200 diameter ducts to pass through, efficiently creating a very neat and tidy ceiling space and enhancing the look of the building.

Cavaliere only sees the use of steel in recreation facilities and other custom buildings increasing. "The steel industry itself provides many advantages over other materials. Fabrication shops are getting much more high-tech, a lot of them use computer aided fabrication methods and welding methods. The industry has really embraced the architectural side. Steel is not just some ugly thing that you need to hide anymore, the steel industry has really stepped up their game architecturally to make it more attractive for architects and owners who want to use it and to leave it exposed." Cavaliere also points to the welding methods and guidelines that the CISC created around architecturally exposed steel and the different levels of architecturally exposed steel. "The methods and guidelines have made it much easier for architects and engineers to speak the same language by creating a standard of finish that can easily be quantified and selected. It gives the architect a cheat sheet of sorts to say 'this is the level of finish that I want for this element', and it is just a matter of writing that into the specifications."

Steel is and will continue to be an excellent choice for recreation centres. While many municipalities desire iconic buildings, others continue to have limited budgets that benefit from the cost savings of pre-engineered steel structures. The ability for steel to benefit recreation centres at all ends of the design spectrum highlights the flexibility and advantages of this material. It will be interesting to see what the next 10 years brings in steel and recreation centre design!