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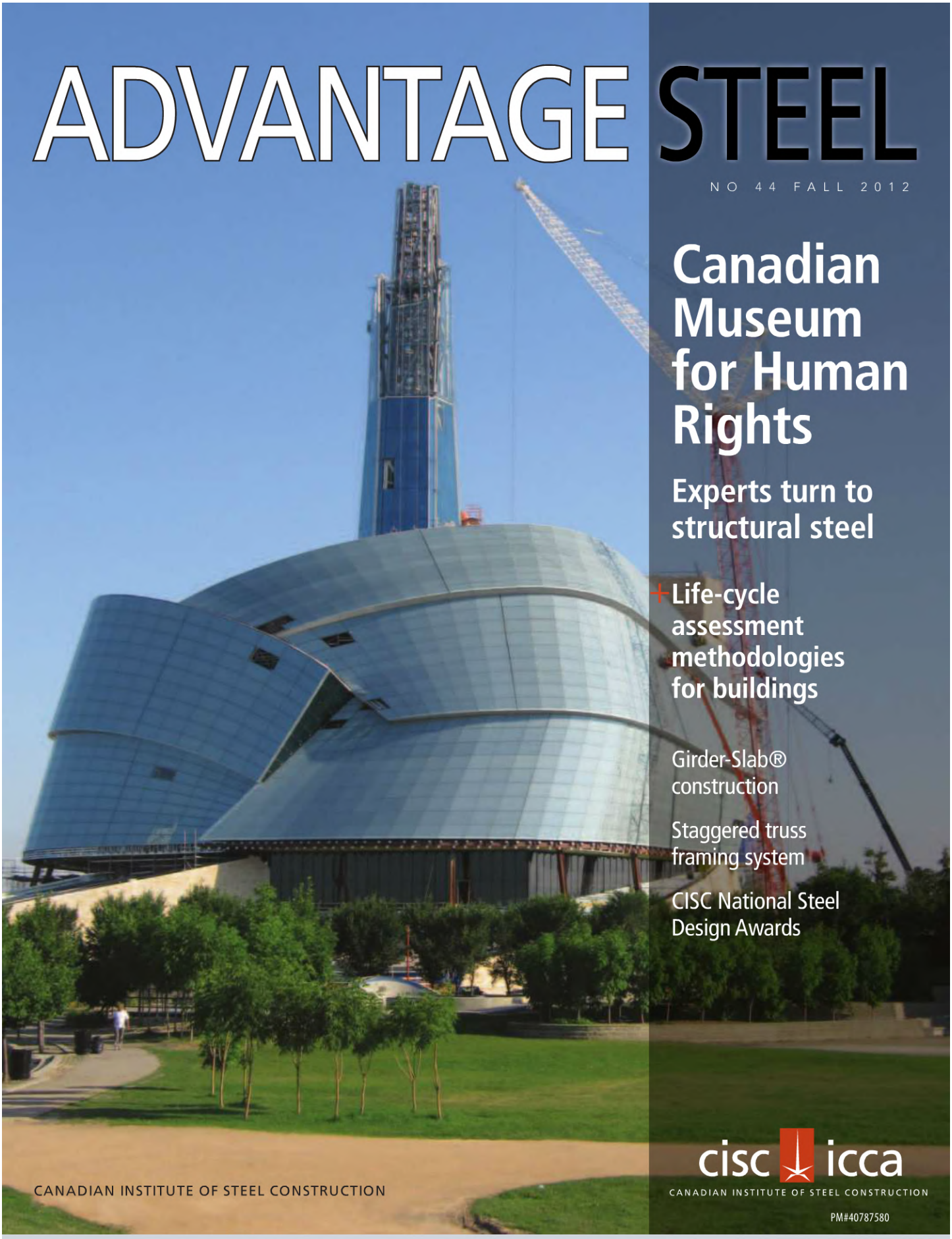

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A first for Canada

Supreme Group awarded Canada's first Girder-Slab® method of construction for its work on Edmonton's Courtyard Marriott Hotel

By Peter Timler, M.Sc., P.Eng.

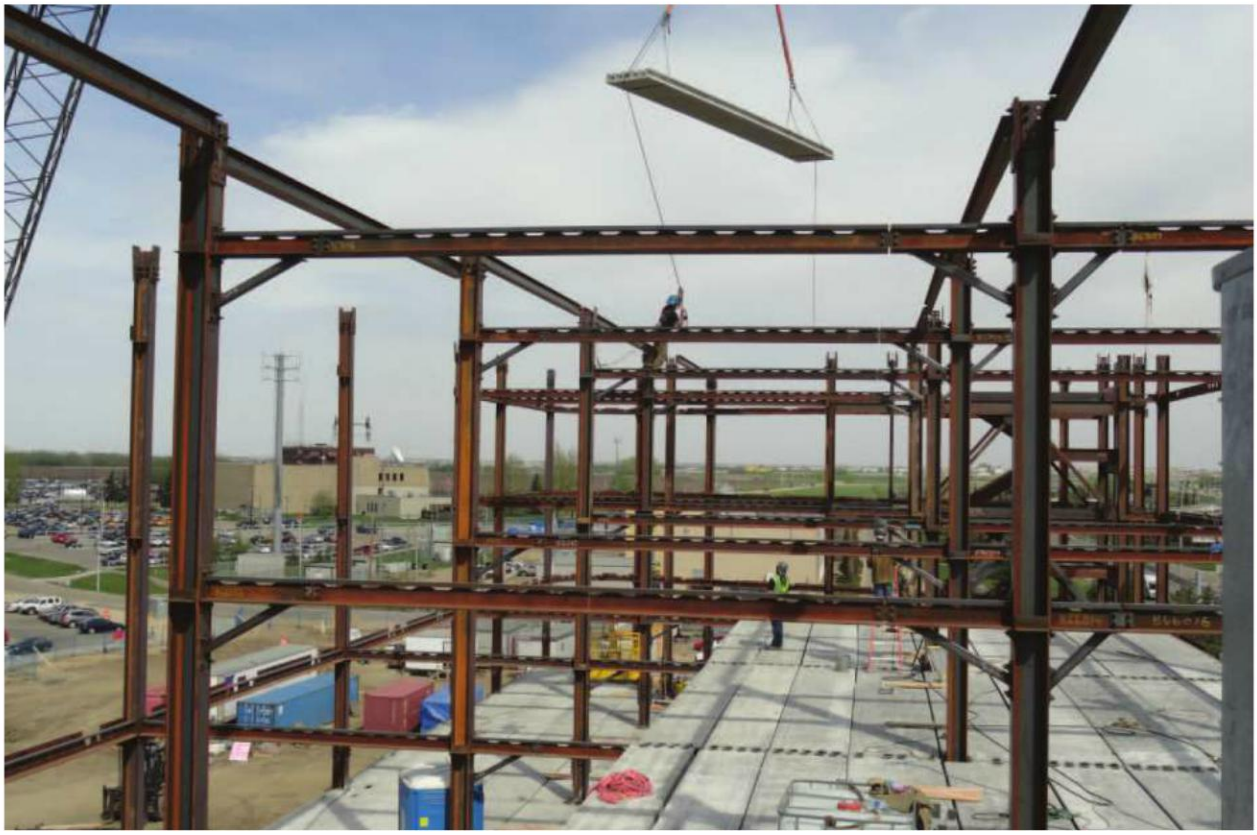

Figure 1: East wing of hotel under construction by ironworkers

Figure 2: Construction progress in early June 2012

For Supreme Group, an opportunity to be involved in a third consecutive project for the ongoing expansions at the Edmonton International Airport was reason enough to propose innovative ideas with the owner and design team assembled for the planned 178,000 sq. ft. Courtyard Marriott Hotel. Those early meetings were focused on understanding the needs of the project and sharing knowledge of a newer method of steel-framed construction to satisfy the imposed requirements of minimizing cost and construction duration within a cold-climate environment.

It's no secret that relatively limited construction projects utilize steel framing for the structure of residential developments in Canada, and in a grander sense, North America. However, that trend is definitely changing, and for good reason. To meet an aggressive opening season soon after the planned completion of expansion works at the airport, Supreme Group introduced the concept of a successful composite-steel-framed and hollow-core plank flooring system known as the Girder-Slab® method of construction.

Originally conceived, tested and further developed in the United States over a decade ago for broad application to the residential market (hotels, dormitories, apartments, condominiums and senior care facilities), it has been applied to approximately 90 construction projects spanning several countries and encompasses some 6,200,000 sq. ft. of finished floor area. Hence, ample evidence of numerous benefits over conventional methods of multi-storey residential construction has been well demonstrated.

The core of the innovative structural system that could be competitive to cast-in-place concrete construction is recognized as the D-Beam®, a simply modified structural wide-flange shape that supports long-span 8" hollow-core panels on its bottom flange. The shape is produced by cutting a saw-toothed pattern on the web area of a select range of wide flange shapes to produce two equal, yet opposite hand, T-Sections and generates no waste. By centring and welding a narrow flat bar of greater thickness than the bottom flange, a dissymmetric section is produced with a regular pattern of penetrations through the web.

This family of specialized floor framing elements, together with the assembly of supported hollow-core panels grouted monolithically with the special purpose beams, are the patented methods for floor construction by Girder-Slab Technologies LLC of New Jersey. By pulling nearly all the structural depth of the steel framing system into the thickness of the floor plate, a minimal floor-to-floor height condition is achieved, essentially matching the cast-in-place method that had previously been a near monopoly in such a construction market.

By introducing a low floor-to-floor height solution to the owner and design team for the six-level tower section above the main two-storey podium, with promise for a shorter erection period (coupled with strong potential that heating and hoarding costs could be either eliminated or reduced dramatically due to the near "dry" construction method), well-founded arguments had been made to change from the original plans for a full concrete structure. In fact, the owner shared that an additional level of hospitality space could be incorporated due to budget allowance and minimal structural height requirement. Further to that, for additional benefit of single-site trade dependence and reduced temporary works, Supreme Group developed a preliminary structural design for consideration that proposed elevator and stair shaft cores as braced-frame lateral load resisting elements for the structure, including steel stair inclusion for immediate construction access in the primary steel contract.

Courtyard Marriott Hotel

PROJECT OWNER: Diamond Airport Hotels Ltd. (Platinum Investments)

CONSTRUCTION MANAGER: Goldsmith Consulting Design Associates

HOSPITALITY DESIGN CONSULTANT: Goldsmith Consulting Design Associates

ARCHITECT: E.F. Gooch

STRUCTURAL ENGINEER: Williams Engineering Canada

STEEL FABRICATOR/ERECTOR: Supreme Steel LP

STEEL DETAILER: CadMax

HOLLOW-CORE SUPPLIER/ERECTOR: Armtec

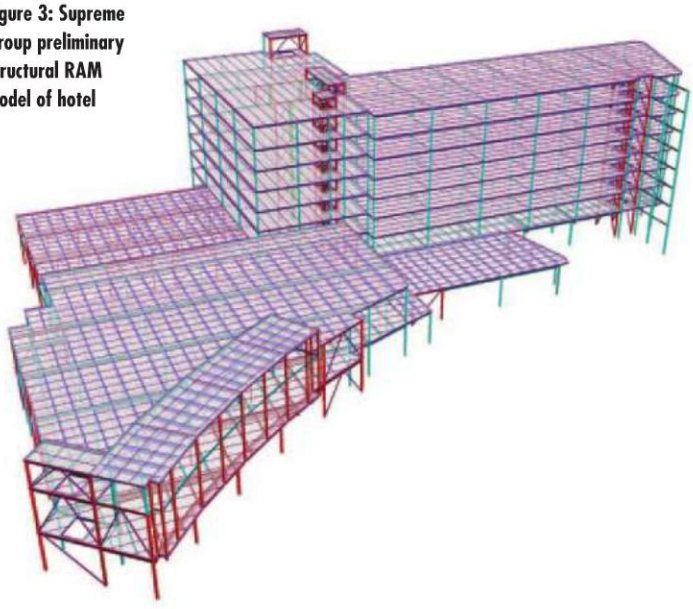

Figure 3: Supreme Group preliminary structural RAM model of hotel

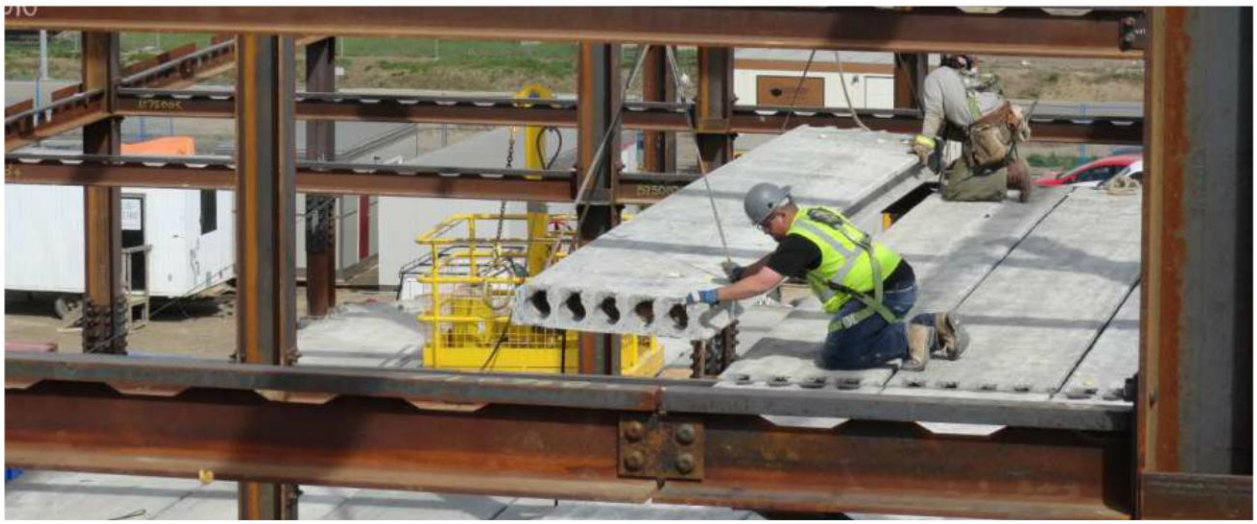

Figure 4: Hollow-core panel installation

Design refinement

With enough information gleaned from Supreme Group's early involvement work reflecting better value propositions, the next step was to work through design refinement with the established team. To meet a fall 2011 steel framing construction start, Supreme Group proposed an Integrated Project Delivery method and set out the program that would meld the efforts of its engineering and project management expertise with the architectural, hospitality specialists and structural consultants already engaged.

Apart from model file sharing and conditions of continuous open dialogue, an atmosphere of trust and collaboration for the benefit of the project was quickly realized. Within a few short weeks, confirmation of the proposed all-steel design, and late architectural changes made to satisfy new requirements for the Marriott Hotel chain, were managed and steel was ordered. This process alone shortened the conventional design period for development of construction drawings by several months.

The Girder-Slab® system has recognition through UL and ULC listings in the U.S. and Canada, respectively, and Girder-Slab Technologies LLC has referenced this information in their design guide, which is available on their website. For the pre-cast industry in Canada, the long-established process to satisfy jurisdictional building officials for two-hour fire rating of hollow-core floor systems has been by submission of calculations under a Professional Engineer's Seal following the Precast/Prestressed Concrete Institute's method of derivation that is acceptable by the National Building Code of Canada.

Hence, for those that recognize ULC's reference to a select number of U.S. precast suppliers in their listing due to limited historical test data, the alternate submission route is a viable method. The exposed steel flange of the D-Beam® is fire protected by conventional means, i.e., sprayed-on cementitious fireproofing or through standard gypsum wall board application.

For the Edmonton International Airport Courtyard Marriott Hotel, a decision was set on application of a nominal ¾" leveling compound as the topping for the hollow-core planking. The Girder-Slab® system has the capability of accepting 2" topping as well. Alternatively, in many lower cost applications in the U.S., dormitories in particular, floor finishes are applied to "carpet ready" hollow-core planking without any topping. The Structural Engineer of Record is typically involved in this decision-making process, as some consideration may be required respecting performance of diaphragm horizontal load transfer in seismic regions. For this project's application, however, seismic design is not a governing factor in the Edmonton region.

The Girder-Slab® method of construction is predicated on delivery of a completed structural system by a qualified steel fabricator that has previously achieved recognition within Girder-Slab Technologies LLC's licensed distributor network. Although various elements and the system have been patented in many countries, the application is non-proprietary and hence invites open-market suppliers in the steel and pre-cast industries to vie for projects designed for tendering. Therefore, it is to be understood that for the right to build with this method, the steel fabricator is engaged in the full structural frame and hollow-core supply and erect, reinforcing steel supply and install (composite D-Beam® joints) and grouting supply and placement.

Topping and fire protection application could also be considered as part of the scope, however they are optional

in delivery of a completed structural system. By encompassing the full structural system scope, effective control is maintained in planning the erection of the structure from an efficiency perspective. At the conclusion of the project, the steel fabricator is obligated to issue a compliance certificate to the owner identifying that the structure was built in accordance with Girder-Slab Technologies LLC's specific requirements.

Supreme Group and the design team were also faced with the challenge of incorporating an exterior precast wall panel system that had been non-typical for earlier Girder-Slab® structures in the U.S. A dressed-up D-Beam® for spandrel applications became the most cost-effective means to support the heavy cladding system.

Solid execution

With top-out of the structural system scheduled for early summer of 2012, Supreme Group and its supply team are very pleased with the project's execution given this first application experience. In fact, all others associated with the decision process on the structural scheme—owner, architect, hospitality design consultant, structural engineer of record and construction manager—have expressed very complimentary statements regarding the cleanliness, efficiency and proficiency on the installation of the system.

This doesn't happen through an osmosis process. Very careful planning —a forte for Supreme Group—to cover many aspects of the design for safe and reliable erection was continuous behind the scenes. Examples of the areas where consideration was required included camber control on D-Beams®, camber differential control with hollow-core, stabilization of structure during erection with weld plates, pre-cast plank end preparations, weep requirements, sequence planning for steel and hollow-core placement with single trade (ironworker) crews, grouting operations, temporary framing works, exterior panel connections, mechanical penetrations layout planning, grout damming details and transport logistics, to name a few. It is estimated that this construction method shaved approximately six months off the build-out schedule for a project of similar size had conventional means been deployed.

In summary, what was promised is being delivered: a sound structural system meeting the requirements of a high-end hospitality industry provider ahead of schedule and below cost compared to previous conventional means. We use the word "previous" as a literary gauntlet to the perception that the cast-in-place method of construction will continue as the preferred structural system for such projects. Since securing the Edmonton International Airport Courtyard Marriott Hotel, many developers have expressed interest and attended site visits to view firsthand the general simplicity of the construction method. They are either developing their own projects with the Girder-Slab® system or are serious about its consideration.

Having examined many projects for potential incorporation of the Girder-Slab® method of construction, Supreme Group has developed a considerable knowledge base on efficient application objectives and welcomes inquiries to assist in best value determination of projects. Please contact peter.timler@supremegroup.com for further information.

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