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Advanced plant design and technology helps Canada's Eagle Builders deliver high quality precast year-round



THE PRECAST CONCRETE CONNECTION

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Advanced plant design and technology helps Canada's Eagle Builders deliver high quality precast year-round

■ Hank Giles, Giles Associates, USA

Eagle Builders has succeeded...excelled...in the face of adversity throughout its 18-year history. Founded by former farmer Dan Haan in 2000, the firm—a leading design-builder of precast buildings and infrastructure products—faced a tragic setback when, in 2003, Dan died suddenly at age 46 following an accident. His young family members—including sons Dennis and Craig—immediately stepped in and stepped up to run the business in keeping with Dan's vision and beyond. Located in Blackfalds in the western province of Alberta, Canada, Eagle Builders is strategically positioned in the center of the Edmonton-Calgary economic corridor.

The firm has built on its economic foundation of designing and producing precast concrete structures for Alberta's strong agricultural market by extending its reach to industrial and commercial customers across western Canada, including the



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provinces of Manitoba, Saskatchewan, Alberta, British Columbia and the Yukon. Even in the face of two major recessions—the global recession of 2008-2009 and the Alberta provincial recession of 2014-2016—the firm has increased sales by an average of 25% each year.

This continuous growth has led to a relocation and three major expansions of its plant in Blackfalds and a new office building (fig. 1). Each new plant expansion has included a mix of new equipment and features that have helped increase production capacity, boost efficiency, introduce new products, and increase quality and consistency.

Eagle Builders has a total of 225 employees, with about 170 working in production or the office, and the rest in the field installing its products at job sites all over western Canada. Approximately 85 percent of Eagle Builders' precast products are used by the firm itself to complete buildings and infrastructure projects, including many structures for the agricultural, commercial and industrial markets (fig. 2-5).

One current agricultural project includes the construction of a 100,000 ft² hog barn located about 30 minutes from its plant. The project features hundreds of Eagle's insulated precast wall panels and hollow-core slabs. Wall panels are typically 12 feet wide and up to 60 feet tall. A single 12' x 30' precast wall panel can weigh about 25,000 pounds. The panels are stored indoors at the Eagle plant until the site is ready to receive them.

One of the firm's commercial projects is a 2,000-car parkade (aka parking garage) at the Foothills Medical Centre in Calgary (fig. 6). The project features a wide range of Eagle's precast products, including double tees, columns, stairs, architectural cladding, hollow-core floor and roof panels, and prestressed beams.



Fig. 1: Eagle Builders' new office building was completed and occupied by the firm last August. The facility features the firm's precast insulated wall panels, hollow-core slabs, and other precast components.



Fig. 2: Here, Eagle Builders provided a 25,500 ft² distribution warehouse for the Korth Group. The project included nearly 200 30-foot-high precast insulated wall panels.



Fig. 3: The Higson Dental Clinic in Grande Prairie, Alberta, Canada, features more than 75,000 bricks cast into the insulated precast walls at the Eagle Builders production facility in Blackfalds, Alberta.



Fig. 4: Road bridge in the county of Lacombe, Alberta, Canada. Eagle Builders manufactured 24 girders for this project at its 150,000 ft² production facility in Blackfalds, Alberta.



Fig. 5: Eagle Builders hoists into place one of the 100 precast arches it manufactured for one of the world's largest wildlife crossings, located in the in the Yoho National Park in British Columbia, Canada.

These and other precast components enable the firm to erect even large buildings within weeks rather than the months typically required for conventional construction. Fast and efficient construction is also important here because winters last more than half the year and the average low temperature in January is -2.9°F. Even when the ground is frozen solid, Eagle's precast wall panels can be installed on heavy steel pilings, which can be driven below the frost line to create a strong foundation.

Expansion #1 - growing new markets

Eagle's first major plant expansion was completed in 2008, when the firm grew its footprint from 10,000 ft² to 55,000 ft². "We just ran out of space in our original plant," explains co-

owner and production director Kevin Kooiker. This first expansion design was heavily influenced by ideas acquired during a research trip to Europe.

The new plant featured heated floors, indoor aggregate bins, dedicated shops for carpentry, mesh and rebar reinforcement fabrication, multiple overhead cranes, a vacuum lift system, automated bed cleaners, prestressing systems, and a cart-based system for moving concrete from under the original ribbon mixer to the production floor.

Within just a few years, the firm outgrew the expanded plant as it continued to grow beyond its core base of new and repeat agricultural customers. Increasingly, the firm's projects began to include office, retail, and manufacturing facilities throughout western Canada. Plans were put in motion to



Fig. 6: One of Eagle Builders' commercial projects is a 2,000-car parking garage at the Foothills Medical Centre in Calgary. The project features a wide range of Eagle's precast products, including insulated wall panels, double tees, columns, stairs, architectural cladding, hollow-core floor and roof panels, and prestressed beams.

nearly double the plant footprint to accommodate a wider range of products and sizes, as well as to provide even greater indoor storage capacity for curing and finished product.

Expansion #2 - SCC changes the game

By late 2011, Eagle Builders was again experiencing growing pains. "We needed more capacity to supply more projects and a larger geographic market," Kooiker recalls. The new expansion plans were finalized and construction started in early 2012. The plan was to continue using the existing concrete batch plant; however, a twist of fate brought a dramatic shift in thinking.



Fig. 7: Eagle Builder's 2012 expansion resulted in an increase in plant floor space from 55,000 to 100,000 ft² and featured the addition of an advanced computer-controlled batch plant from ACT/Wiggert that enabled the firm to convert to SCC and thereby eliminate most vibration equipment.

"Our original batch plant had a large skip hoist to lift the aggregates from a conveyor to the mixer," he notes. "There was a flaw in the cable mechanism and just before the new expansion was completed, the skip hoist came crashing down. We experienced about six weeks of downtime while we worked to get that fixed and had to use ready-mix in the meantime." This incident caused the firm to rethink its long-term batching needs and opened the door to a positive change. The expansion from 55,000 ft² to 100,000 ft² and with it a doubling of production capacity meant even greater strain on its old batch plant.

"We knew we needed a bigger mixer," Kooiker says. "We also realized that with the right batching system we could achieve much more. For instance, with the right system we could introduce the use of SCC and possibly eliminate a lot of the vibrators and even the casting machine we were dependant on with the old batch plant—our old system was incapable of producing reliable SCC."

Kooiker says the firm was already aware of the top batching systems on the market having attended multiple precast shows in North America and Europe. "We received quotes from several companies and met with their representatives," he notes. "We liked the proposal from Advanced Concrete Technologies (ACT) and the extra value they provided with their experience and design assistance."

Increased production made possible

ACT engineers suggested a major reconfiguration for Eagle Builders' new expansion. The proposed ACT/Wiggert WicoMix 3000-WCS single-mixer batching system would be centrally located and be able to efficiently feed both sides of the production facility via two separate concrete chutes. The



Fig 8: Insulated wall panel casting beds inside the 150,000 ft² Eagle Builders plant in Blackfalds, Alberta, Canada. Once panels are stripped, a vacuum-powered lift from Aerolift is used to lift the finished panel from its casting bed.



Fig. 9: Multiple overhead bridge cranes and crane buckets have been used to replace concrete carts there were required in the old plant. The new fully automated ACT/Wiggert batch plants allow the batch plant operator to focus on crane operation and timely concrete placement.

cart used with the earlier mixer would be replaced by four crane buckets, two for each production hall.

The improved batch plant would incorporate Eagle’s preexisting cement and concrete silos, as well as the firm’s custom-made aggregate bins. Was it a tight fit maneuvering the new batch plant (fig. 7) into the existing structure? “Oh yeah,” says Kooiker. “That was a challenge for sure. With our original plant, the roof was still open and we could just crane the mixer platform into the space. This time, we had a 16’ x 18’ overhead door we had to work through. The new primary aggregate bins and conveyors had to be moved to a new area without crane access, so it all had to be done with forklifts and a picker truck.”

The ACT batch plant installed in 2012 features a high-shear planetary countercurrent ACT/Wiggert HPGM 3000 mixer with two cubic-meter-per-batch output for a total of about 48 cubic meters (63 yd³) per hour continuous production. Aggregate moisture is automatically measured and compensated in real-time with ACT Hydrotester microwave moisture sensors at the bottom of each sand bin and through the PC-based WCS Control system.

Improved batching accuracy and consistency helped Eagle transition to the use of self-consolidating concrete (SCC) for nearly all of its wet cast products, including insulated wall panels (fig. 8), bridge elements, box beams, and other infrastructure components. Eventually, the firm was able to eliminate the large self-propelled casting machine it had used to fill, screed, and vibrate its wall panel beds. “The system was a hindrance to speed and efficiency,” notes Kooiker.

The combination of continuous and consistent production of SCC, the new crane bucket delivery system (fig. 9), and the strategic position of the batching system led to a 15%-20% increase in production efficiency and better overall product quality. “The relocation of the batching system was a huge improvement. We noticed the improvement in concrete quality and consistency right away. We were able to refine our mixes to a greater degree and ultimately began using less admixture and still achieve the same or better compressive strength,” Kooiker says.

Expansion #3 - built-in flexibility

As the old saying goes: ‘nothing succeeds like success.’ Eagle Builders’ 2012 expansion met their needs for about three years before the firm began planning its next growth surge. “There was a strong demand for more infrastructure products and hollow-core panels,” Kooiker explains. “The expansion we did in 2016 was strictly for those products. We began doing infrastructure products with our previous expansion and realized we could do much more—bridge girders, modular parking garages, sound barriers, and box culverts. And, we needed hollow-core panels for both flooring and roof structures.”

Kooiker says they carried over many design elements from the previous plant expansion to the 2016 project, with a few exceptions. “We had the old batch plant layout in mind when we were designing the 2016 expansion, that is until we met again with ACT,” he recalls. “Their engineers came up with a

configuration for our aggregate bins that ended up saving us space and equipment (fig. 10). We were able to shrink the roof height and length of the building by creating a more compact bin arrangement. We saved nearly \$150,000 in building costs.”

The 50,000 ft² addition in 2016—for a total of 150,000 ft² – would be dedicated to the production of hollow-core planks and infrastructure products and components. For instance, hollow-core roofing panels are currently being produced for the 100,000 ft² hog barn noted earlier. Eagle’s hollow-core prestressed panels are available in 8-, 10- and 12-inch thicknesses and up to 60 feet in length (fig. 11).

The 2016 expansion includes the following features:

- ACT/Wiggert WicoMix 4500-WCS turnkey batch plant with a single HPGM 4500 planetary countercurrent mixer (fig. 12 & 13) provides a compact footprint and four cubic yard (3 m³) output every 2.5 to 3 minutes.
- ACT/Wiggert WCS PC-based computer control system provides a user-friendly graphical interface and complete recording and reporting of recipes, batches, inventory, maintenance, and other critical metrics. “We enter



Fig. 11: Eagle Builders uses a complete hollow-core casting system from UltraSpan, featuring casting beds, dry-cast concrete extruder, saw, plotter, and hoist system.

how many cubic meters we want each day and the system will automatically run unattended. Our batch operator runs a crane since he doesn’t have to actually be in the batch control room.”

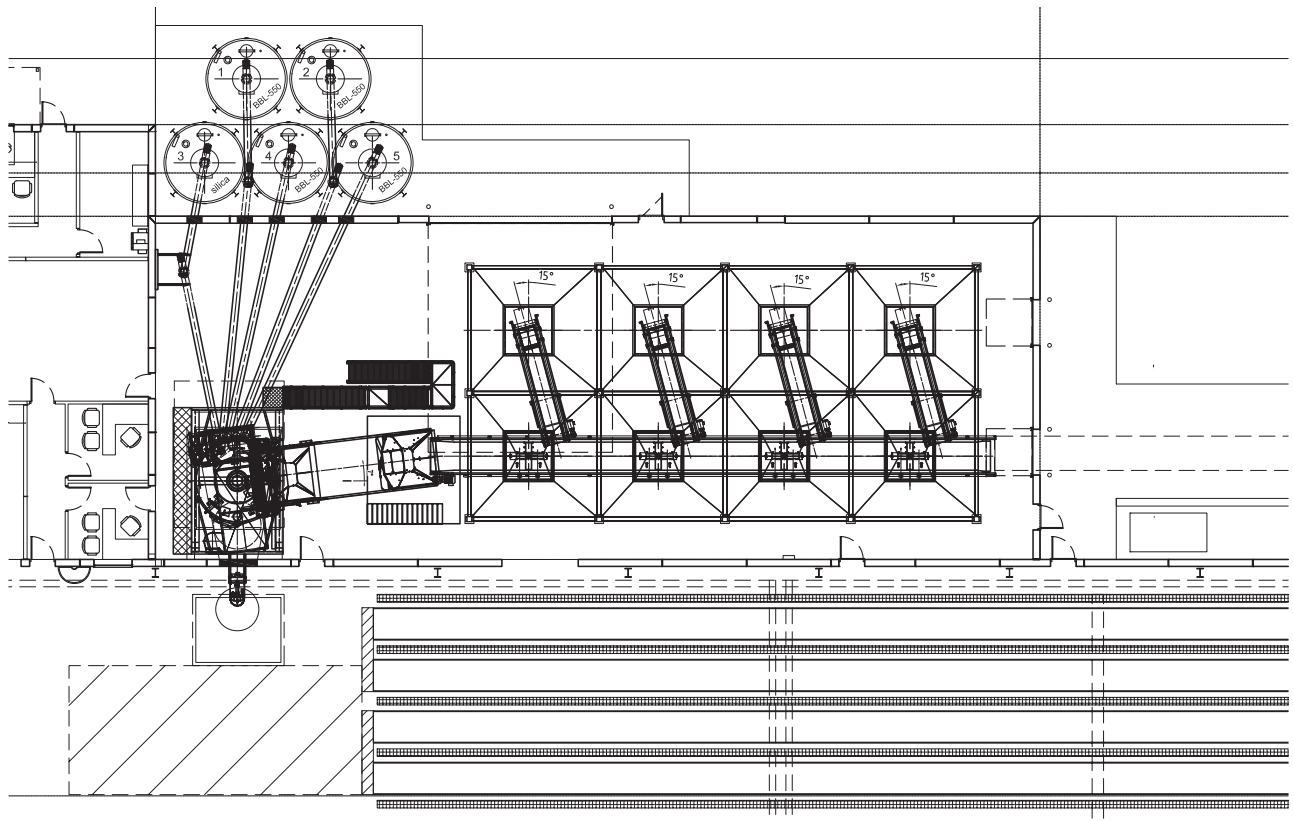


Fig. 10: The 2016 plant expansion at Eagle Builders’ Blackfalds location in Alberta, Canada, increased the firm’s production space from 100,00 ft² to 150,000 ft² and included the addition of a second ACT/Wiggert concrete batching system and a space-saving layout for aggregate storage.



Fig. 12: The newest concrete batch plant installed at the Eagle Builders plant in Blackfalds, Alberta, Canada, features an ACT/Wiggert HPGM 4500 planetary countercurrent mixer that can produce 4 cubic yards every three minutes.



Fig. 13: Admixture tanks (right) are located at the base of the mixer platform. Eagle Builders uses Type I and Type III Portland Cement, as well as fly ash, and silica fume in its high performance SCC and dry cast mixes. Multiple cement screws (top of photo) meter into a cement weigh batcher situated above the ACT/Wiggert planetary mixer.



Fig. 14: The indoor heated 8-compartment aggregate storage systems used with both of Eagle Builders' ACT/Wiggert batching systems can each hold up to 1,600 tons of sand and stone to enable continuous operations even in the harshest weather.



Fig. 15: Eagle Builders' custom-made aggregate bins are equipped with ACT dual-gate batching cones for precision coarse/fine batching. The aggregates are deposited onto an ACT weigh belt and then charged into a skip hoist on the ACT WicoMix 4500-WCS batch plant.



Fig. 16: One of three outdoor rubber-tired gantry cranes from Shuttlelift is used to load a precast beam onto a special trailer for delivery to a job site in western Canada.

- Hydrotester moisture probes in all sand bins feeds the WCS Hydromat moisture system with the real-time measurement it needs for automatic batch water correction. Water/cement ratio accuracy is critical for SCC and other high performance mixes.
- Both ACT/Wiggert batch plants used by Eagle Builders feature automatic mixer cleaning and washout systems that can be cycled at break times and shift ends, saving labor and helping to extend mixer life. “We not only save about an hour per day on clean-ups, but it saves our guys from going in the mixer, which is a huge safety benefit.”
- Five 550 BBL (2,200 ft³) silos for the storage of Type I and Type III Portland Cement, as well as fly ash and silica fume. ACT/Wiggert dust collection on the silos provides automatic cartridge-style filtration with auto air-shock cleaning.
- Eight low-profile aggregate bins (fig. 14), set in two rows of four, provide 1,600 tons of storage and are interconnected by short shuttle conveyors to a common weigh belt (provided by ACT) that feeds a skip hoist for final loading up to the mixer platform. This bin system was produced by a local shop based on Eagle’s own design and allows aggregate batch to be pre-weighed and staged to go in the mixer at any time, enabling faster processing. The aggregate bins are equipped with ACT dual-gate batching cones (fig. 15) for coarse/fine batching. The bins have a network of pipes that are heated by the same Pathfinder/Curetec hot water boiler system used to heat the new plant’s concrete floors. The heated bins helps to condition the aggregates for winter concrete production.
- Hollow-core casting beds, dry-cast concrete extruder, hollow-core plotter and saw, and a clamp-based product hoist system from UltraSpan.
- 15 overhead cranes (through the entire plant) from Konecranes and Teko Cranes with capacities from 5 to 40 tons. Three outdoor rubber-tired gantry cranes from Shuttlelift (fig. 16) serve the entire plant with up to 50 tons each of lifting capacity.
- Helser parkade and bridge girder forms.

“As a leading edge precaster, we are constantly striving to improve our technology and processes to provide the most cost-effective and highest quality product possible.” Kooiker says. “The sophistication and appearance of our plant gives our customers confidence in our capabilities.

We have long-time customers—especially in the agricultural market—who have been with us since the early days. I think they are impressed not only by our expansion, but also in the fact that we have not forgotten them and continue to provide them with great service any time they need it.”

What about the future? Every few years seems to bring a new expansion for the young firm. “Our last two big expansions and our move to the two ACT batching systems has enabled us to consistently produce any mix we need,” Kooiker continues. “We can switch easily between dry cast and SCC throughout the day. Our current plant provides us with tremendous flexibility. We are confident we can support any product opportunities that arise, absolutely.” ■

FURTHER INFORMATION



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