

# A State-of-the-Art Prestressed Concrete Facility Designed with Sustainability in Mind

by Rob Holland and Blake Johnson, Knife River Prestress

Knife River Prestress recently constructed a new prestressed concrete plant near Spokane, Wash., to replace its 65-year-old outdoor facility. The state-of-the-art facility opened in August 2023, incorporating lean manufacturing, automation, and a focus on sustainability. All 57,000 yd<sup>3</sup> of aggregates used in the construction of the facility were sourced on site, cutting down on the need to transport materials.

With 45 total acres, including 4 acres under roof, the facility has room to expand its operations as the demand for prefabricated concrete structures continues to grow. The site's concrete batch plant uses dual mixers to produce up to 100 yd<sup>3</sup> per hour. Once batched, an automated concrete-delivery system mounted on electric rail delivers the concrete to remote-controlled pour buckets in each of the facility's three production bays. This process reduces waste, improves casting quality, and significantly lowers the production team's exposure to risk.

Sustainability was a key consideration in the plant's design. The use of diesel engines is reduced by using electric-powered overhead cranes, forklifts, and the concrete-delivery system. The closed-loop hydronic heating system, as compared to a "once-through" steam system, maximizes efficiency for concrete curing by reducing the amount of reheat required. The recycled process-water system reduces fresh water use by half compared with the consumption if recycling were not used. The roof is solar-panel ready, and panels may be added in the future. Lean manufacturing principles such as process mapping, visual operating procedures, kitting parts, and internal audits are incorporated throughout the facility to minimize waste—both material and time.

The plant is pursuing certification from the Concrete Sustainability Council, which would make it the first CSC-certified prestressed concrete facility in North America.

The plant contains twin casting beds for casting girders up to 250 ft in length or multiple shorter girders in line. It also has additional assets to produce up to 10,000 ft<sup>2</sup> of panels and 3600 ft<sup>2</sup> of hollow-core per day. Extra

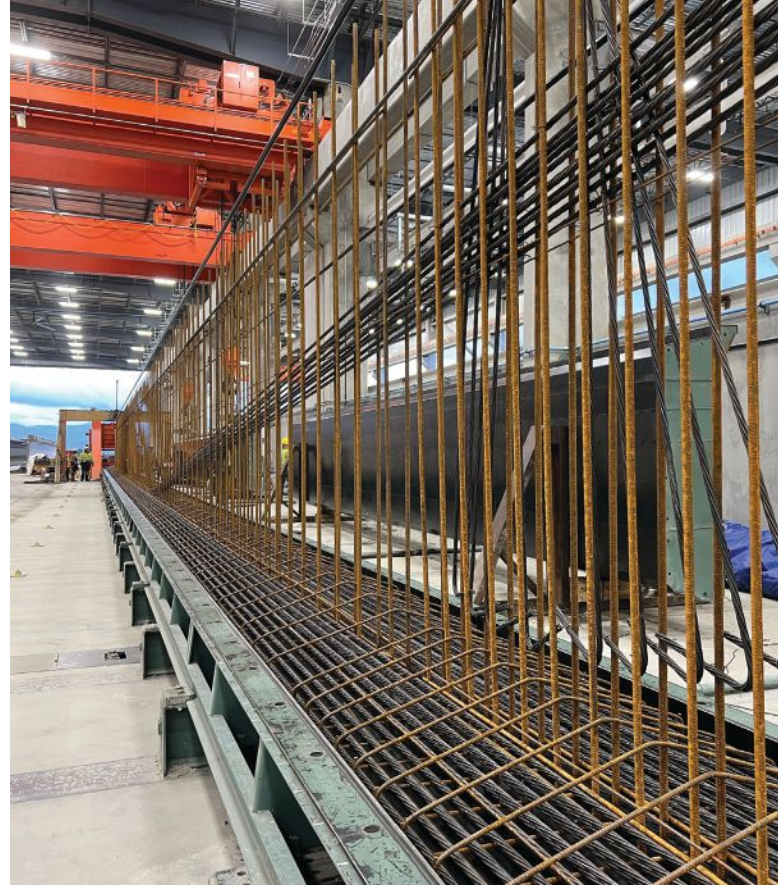
floor space is also available for casting one-off items such as wingwalls, footings, or other precast concrete components. The girder beds are rated for 7 million lb of pretensioning capacity, and overhead bridge cranes are sized to handle products weighing up to 300,000 lb. Girder heights up to 12 ft tall can be accommodated with the crane-mounted pour buckets. Extra space is available at the end of each bay for finishing activities, which could include secondary pours for end diaphragms and curbs on girders. This space is still under roof, with access to overhead bridge cranes and supplementary heat for efficient curing year-round. The beds are designed for quick changeovers to different bridge products, from slabs to I-girders and deck bulb tees. The two beds are expected to help service the region for the next 65 years.

Each girder bed foundation is up to 7 ft deep and composed of more than 1200 yd<sup>3</sup> of 8000-psi concrete, multiple drilled shafts, and post-tensioning at the end segments. With this foundation, the girder beds can accommodate up to one hundred sixty 0.6-in.-diameter strands, including up to 10 top strands. All strands are gang pulled, and girders with harped strands can also be fabricated. Also, 300-ksi strands and 0.7-in.-diameter strands can be accommodated.

The plant embodies Knife River's core values of safety, quality, environmental stewardship, and investment in people. The production of prestressed concrete components has traditionally involved large quantities of outdoor labor. This facility brings many processes indoors and uses automation to reduce hazards. An open-office floor plan and shared spaces foster communication among frontline workers and leadership, part of the "people-first" culture.

Knife River believes prestressed concrete enables sustainable construction, and this plant allows them to "walk the talk," by promoting sustainable construction, reducing waste, and decreasing transportation costs. The operation has capacity to supply major projects throughout the Northwest while leading the industry in technology, working conditions, and environmental responsibility.





An automated concrete-delivery system mounted on electric rail delivers concrete to remote-controlled pour buckets in each of the facility's three production bays.

This new facility incorporates state-of-the-art technology and will allow Knife River to continue providing high-quality solutions for decades to come. It stands as a model for how to build both a facility and a culture focused on people, community, and the environment. **A**

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Girders up to 250 ft in length, including girders with harped strands, can be fabricated at the new facility.

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#### 2024 Grouting Training

The next training event will be held April 1 at the J.J. Pickle Research Center in Austin, Texas. Please check the website for details and registration..



### October 20-23, 2024

#### 36th Annual Convention

Please Check the ASBI Website Events Page for Details of 2024 Event.



### ASBI Monthly Webinars

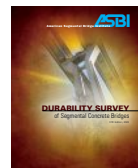
#### Monthly Webinars will resume in February of 2024!

Registration is free and PDH certificates will be issued for all attendees of the live sessions. All webinars are planned for the last Wednesday of each month from 1:00-2:00 ET. Access to past webinars and registration for future webinars can be found on the ASBI events page.

## Publications

### Durability Survey, 5th Edition

The newest edition of the Durability Survey is now available for download. The survey reports on durability of segmental concrete bridges based on National Bridge Inventory database.



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