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REED & REED

The Hiawatha at 667 Congress Street

2018 AGC BUILD MAINE



PC Construction wins building division with Portland high-rise.

Redfern Properties LLC envisioned developing a high-rise multi-use building located in the heart of downtown Portland's Longfellow Square. To make their vision a reality, the owners engaged a construction manager (CM) to assist them with budgeting and building the project. Unfortunately, despite nearly two months of preconstruction efforts, the CM was unable to find a way to bring the owner's vision within budget.

That's when Redfern called PC Construction. Within a day of the first meeting with Redfern, PC was able to narrow the four proposed structural systems to two choices—which the prior CM was unable to accomplish even after seven weeks on the job. The 35-member in-house estimating team was able to quickly provide a range of likely project cost that met the owner's approval. Soon after, PC was hired to replace the first CM and immediately went to work.

Partnering and building a positive team dynamic was essential to the success. As the CM, the team was brought onto the project during schematic design, which enabled the team to effectively integrate and partner prior to the start of construction. Although no formal, facilitated partnering session was held, PC held an informal one.

During preconstruction, the PC team employed value analysis, design assist and constructability reviews to work toward Redfern's schedule and budget.

However, if, following PC's preconstruction efforts the project was

still over budget, then the owner was (reluctantly) prepared to cancel the project altogether.

Thankfully the hard work, creative problem-solving and meticulous attention to detail during preconstruction paid off when they were able to provide a guaranteed maximum price (GMP) and schedule that met the owner's budget and construction duration.

When the project progressed to the construction phase, PC utilized a variety of tools and approaches to keep things on track, including employing a tower crane to erect steel on the tight site; mock-ups to ensure quality; a hydro-mobile lift system to facilitate movement and placement of materials; and "lean" pull-planning to enable smooth sequencing of subcontractors. In the end, 18,607 work hours were expended by PC without notching a single recordable or lost-time injury.

The result is The Hiawatha at 667 Congress Street, an eight-story 142,000-square-foot multi-use high-rise building with sub-grade and ground-level parking. The Hiawatha blends the charm of the historic neighborhood with modern amenities, and features:

- 139 apartments including studio, one-bedroom and two-bedroom units on seven levels, all with open floor plans, heat pumps for heating and air conditioning, fresh air ventilation systems, high-end finishes and LED lighting.
- Tenant amenities include a fitness center, lounge, and on-site parking.
- Facility includes on-site administrative office space as well as ground-floor retail and commercial space.
- Built to the highest standards for energy

efficiency, sound transmission and air quality.

- The building's shell utilizes an innovative insulated panel system that provides a high insulation value and minimizes building energy use.
- Steel and concrete structure with traditional brick facade and contrasting metal-panel siding.

CONTRIBUTION TO THE COMMUNITY

The project site is bounded on three sides by residential buildings, so prior to starting any work, PC took the initiative to engage with the surrounding neighbors. They explained to them the upcoming project's scope including potential impacts regarding noise, dust and construction traffic. PC's team also introduced themselves and provided their contact information – including non-work hours and weekends – in case of any issues/complaints throughout the project.

The project's proximity to residential housing made it a priority for PC and Redfern to be good neighbors and cause as little disruption to neighbors' day-to-day activities. To that end, they maintained strict, predictable work hours; cleaned the surrounding streets daily; and even plowed the adjacent roads and neighbors' driveways during winter months. PC also assisted a neighbor who had several heavy pieces of debris on their property by using our equipment and dumpster for disposal. Additionally, when repaving one of the adjacent roads, PC also paved another neighbor's deteriorated driveway.



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INNOVATION IN CONSTRUCTION TECHNIQUES OR MATERIALS

Building information modeling (BIM) was employed to develop a 3D model of a typical apartment unit.

The BIM model was used primarily to review mechanical, electrical and plumbing (MEP) locations and installation with both the owner and the subcontractors. This allowed PC to ensure that all the MEP components would fit without conflict and that the final components of each apartment were as the owner desired.

They also used several techniques that allowed us to increase efficiency on site and manage the tight site conditions. PC held daily huddle meetings with all the subcontractors to discuss and address any restraints they were experiencing. The team also utilized “lean” pull planning to develop a matrix to guide all subcontractors’ work. They broke each floor into zones and each foreman contributed by detailing how many people they would need, what resources they required and how long their work would take.

Using this information and the matrix, they were able to effectively sequence the work and assign only 1-2 subcontractors to each zone at any given time. This allowed the work to flow efficiently, minimized potential damage and instilled a sense of ownership with each

subcontractor. Without the buy-in and support from each of the subcontractors, it would have been extremely challenging to meet the schedule constraints and deliver such a high-quality project.

To help keep the project running smoothly, PC’s field personnel utilized mobile computer technology via iPads to provide electronic access to relevant project documents and management tools to manage technical issues and ensure quality in the field.

MEETING THE CHALLENGES OF A DIFFICULT JOB

Budget – The initial challenge was meeting the owner’s budget. Despite seven weeks of work, Redfern’s initial CM failed to achieve the prescribed budget. PC subsequently was tasked with finding a way to make the numbers work; if not, the project would be canceled. The team labored to find cost savings at every turn without sacrificing quality, program or design aesthetics. We determined one of the biggest cost drivers was the MEP system, which the PC team felt came in roughly \$1 million over budget. To bring the costs in line, we broke out the mechanical, electrical and plumbing systems into individual pieces and bid out the smaller packages separately. The result was nearly \$1 million in savings, which brought the project back into budget and – perhaps most importantly – back to viability.

Foundation – After careful analysis of a traditional sheet pile method, it was determined an alternate shoring system utilizing shotcrete and soil nails would provide the support of excavation required while avoiding potential conflicts with underground utilities in the surrounding streets and allow for minimal noise and vibration impact throughout installation. This alternative solution saved both time and money, thus keeping the project on schedule and within budget.

Tight Site – The extremely tight project site posed a host of challenges, including lack of laydown/staging areas and how best to erect steel. The PC team considered a variety of options including erecting the superstructure in three phases using a luffing crane.

However, they ultimately determined the best course of action was to erect a tower crane in an area that would eventually become a stair tower. This enabled the team to place the steel in a more efficient manner, again saving time and money.

Once the superstructure was in place and the tower crane removed, they had even less room with which to operate. This made it difficult to efficiently lift material to the upper levels since they now did not have room for a crane.



To address this issue, they evaluated several options and decided to use a hydromobile staging system around the entire exterior of the building. The system is a platform on two towers that moved up and down the building and eliminated the need for multiple staging systems.

The hydro-mobile system made the exterior masonry work more efficient, particularly in the winter.

ENVIRONMENTAL SENSITIVITY (COMMUNITY & NATURE)

As previously noted, the project site fronted directly on one of the busiest sections of the always active Congress Street.

Throughout construction PC maintained a strong relationship with the City of Portland and adjusted work hours to accommodate City events such as art festivals, cruise tours, and parades. They also made an effort to integrate the new building into the City of Portland community by hosting tours for multiple local professional societies and businesses.

RESPONSIVENESS TO CLIENT NEEDS/CUSTOMER SATISFACTION

While the GMP was developed prior to final selection of the interior finishes, parameters and specifications were outlined. However, the owner made several selections outside those parameters. PC openly and honestly discussed the outlying

selections regarding their impact, both in terms of budget and schedule. We discussed decision-making deadlines to ensure the products could be delivered to the project site on time and would maintain the budget. PC also provided pricing options and sought methods to find savings, so the owner could make cost-effective decisions without compromising their vision. This transparent communication and collaborative effort were essential to the project's success and assisted in the development of a trust-based relationship between all team members.

Additionally, the owners of the former Joe's Smoke Shop – which was razed to accommodate The Hiawatha – were anxious to reopen their retail business as Joe's Super Variety in the ground floor storefront space of the new building. To accommodate them, PC worked with Redfern Properties and the City of Portland to achieve a partial certificate of occupancy two months before the rest of the building was completed. Doing so enabled the store owners to re-engage with their customers earlier than anticipated and help enliven the space, making it more attractive for potential tenants.

SAFETY

With consistent established goals and an internal safety culture promoting project assurance of safety, PC Construction completed the project safely, logging 18,607 PC work hours without a recordable incident or lost-time injury and zero

OSHA violations over the course of the project's 18-month duration. This was no easy feat considering the extremely tight site that fronts directly on Portland's bustling Congress Street and had a mere 14-foot clearance on the two sides and only 5 feet of clearance along the rear of the new building.

Keys to the project's safety record included:

- Development and management of site-specific logistics and safety plans before the first shovel pierced the ground.
- Safety orientation program for all new employees onsite.
- Implementation and daily management of PC's proactive Zero Accidents Prevention Program (ZAPP).
- Daily safety meetings, tool box talks and job hazard analysis reviews during which every worker on site reviewed in detail the potential hazards and mitigation of activities planned for that day.
- Regular safety audits of all construction activities and the project site as a whole.



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PROJECT TEAM

Owner:

Redfern Properties LLC – Jonathan Culley and Katherine Culley, Principals

Construction Manager:

PC Construction – Joe Picoraro, Vice President; Garret Bertolini, Senior Project Manager; Bill Lawrence, Senior Superintendent; Marieke Thormann, Project Manager; Bert Kiesow, MEP Specialist

Architect:

Ryan Senatore Architecture – Ryan Senatore, Principal

Civil Engineer:

Acorn Engineering – William Savage, Principal

Structural Engineer:

Structural Integrity – Aaron Jones, Principal

Owner's Project Manager:

Cordjia Capital Projects Group – Blaine Buck, President & CEO

Key Subcontractors:

- Eastern Excavation, Inc. – Sitework/site utilities
- NS Giles Foundations, Inc. – Concrete foundations/slabs
- Ocean Steel & ARC Erecting – Steel erection
- Shawmut Equipment Co. – Tower crane
- Industrial Roofing & Siding Co. (IRC) – Roofing/metal panels
- Ranor Mechanical – Plumbing
- Atlantic Comfort Systems - HVAC
- BH Milliken – Electrical
- Coastal Masonry – Masonry
- Timberland Drywall – Framing & Drywall



From pre-construction to final completion, PC Construction was outstanding. In Redfern Properties' experience as a real estate developer, we have worked with a handful of excellent Construction Managers, but our experience with PC Construction has been by far the best.

Jonathan Culley
Principal, Redfern Properties LLC

AGCMAINE



Wednesday April 11, 2018

Social Hour 5:00 PM

Dinner & Awards 6:00 PM

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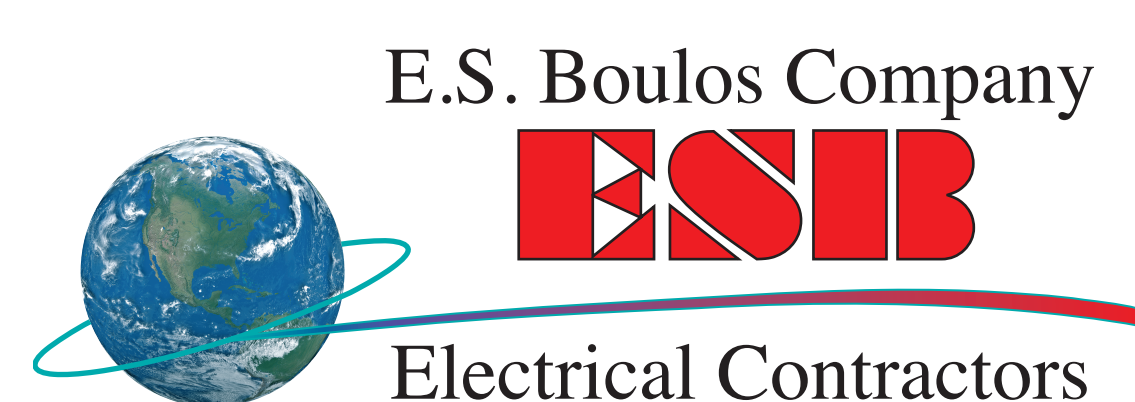
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The Viaduct in Bath

2018 Build Maine Award

Highway/Bridge Division

REED & REED



Reed & Reed Construction- wins the highway/bridge division for the new Bath Viaduct.

The Bath Viaduct is located on State Route 1, crossing downtown Bath and Bath Iron Works (BIW). It provides a vital bypass that helps Bath connect to the high-traffic volume on Route 1. According to the state, more than 18,000 vehicles travel over the viaduct each day.

Reed & Reed, Inc. of Woolwich, ME located only 4.5 miles from the site, was awarded the project. Reed & Reed was more than capable of meeting the challenges of the project and completed the project 26 days ahead of schedule.

The old viaduct was a 20-span steel girder and concrete structure, standing about 30 feet over the streets of downtown Bath. It was opened to the public in 1958, allowing for the growing demand of traffic to bypass Bath as efficiently as possible. Over its nearly 60 years in operation, the viaduct has taken a lot of wear and tear from the heavy traffic count and was worn out.

The new viaduct is a beautiful 1,300 ft long, 20-span concrete structure. Instead of using steel girders, the new viaduct used precast concrete NEXT beams, spanning 60-75 foot sections and bonded together with Ultra High Performance Concrete (UHPC). The appearance of the new viaduct is similar to the old viaduct, standing 30 feet over the streets below. Over the west side entrance to the viaduct spans the High Street Bridge that Reed & Reed repaired at the request of MDOT.

Contribution to the Community

The Bath Viaduct is an important

structure for alleviating the traffic in downtown Bath. By working through the winter, Reed & Reed was able to complete the job 26 days ahead of the 220 day schedule, decreasing the impact this project had on the local traffic and community. Another way Reed & Reed lessened the congestion and traffic was by keeping both lanes open on either side of the viaduct during the weekends, as well as at night for traffic going eastbound. The Maine Department of Transportation (MDOT) stated that the original structure's roadway and supporting piers were worn out. The deterioration of the old viaduct was quickly becoming a safety concern that needed to be addressed. The rusted and crumbling old viaduct was also an eyesore in the middle of downtown Bath that the local community did not take pride in.

Construction took place during the winter months. After any snow falls or ice storms, Reed & Reed went above and beyond preparing the job site by clearing and salting the surrounding sidewalks, ensuring pedestrians could walk down the side of the street without fear of falling.

Demolition is a noisy activity in all construction, and the viaduct was not an exception. Downtown Bath has a large population of residents that were going to be effected by the noise, and in order to meet the demolition time constraint, Reed & Reed had to work around the clock. Although Reed & Reed was unable to mute the noise, working 24/7 with multiple crews during this stage to finish demolition of the viaduct in just 26 days, a whole month sooner than planned.

At the end of the project, Reed & Reed installed a sidewalk traveling west along Leeman HWY, giving pedestrian traffic a safe path to

walk what previously was not available.

Innovation in Construction Techniques or Materials

Reed & Reed had to be creative in the field throughout the project, starting with the demolition of the old viaduct. During the night shift, Reed & Reed's 150 ton crane paired with a drop ball would collapse the deck in between each existing pier. Then using a couple large excavators equipped with hydraulic hammers, Reed & Reed proceeded to topple the existing piers, ensuring the pier fell in a safe and controlled manner. During the day, crews would then break apart the concrete structures into small enough pieces, separating out rebar for recycling, to be hauled off in a dump truck.

Reed & Reed also used their dockyard, 1 mile from the viaduct, to precast the 19 concrete pier caps during the summer and fall, as well as build the pier shaft rebar cages. This creative construction sequence enable them to limit the amount of time spent working in between two busy roads. Cast-in-place concrete for the pier caps would have been a high risk operation due to the ends of each pier cap hanging over the street below; moreover, a cast-in-place approach would have delayed the project waiting seven days after each placement for the concrete to cure. Each pier cap had rigging points cast into them that were designed to handle the load of lifting the 112,000-120,000 lb pier cap onto the pier shaft. (UHPC)



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Meeting the Challenge of a Difficult Job

The construction of the viaduct presented a set of unique challenges. The first challenge was the project's location. Bath is a busy city, full of both pedestrian and vehicle traffic. The crews had to overcome the traffic by being extra diligent moving around the site as well as extensive traffic control systems. Traffic was directed away from the viaduct during construction. The traffic control plan directed vehicles to merge from two lanes down to one lane at the end of the Sagadahoc Bridge. Traffic cones and barrels were utilized to direct traffic, and fences with "Do Not Enter" signs kept out the local pedestrians. Since the viaduct was surrounded on both sides by busy streets, the allowable work area was severely limited. This required use of the lay down yard and dock yard as much as possible to gain much needed space to construct our larger components. They purchased an entire city block adjacent to the project to use as laydown space which was critically important to staging equipment and materials.

Another challenge to overcome was using the UHPC. UHPC has a very high silica content with brass fibers incorporated. Each bag of UHPC was 2,400 lb. and required a dry storage area. The site had 11 tractor trailer trucks worth of material that needed to be stored. UHPC could not be placed during heavy rain events, and a representative from LaFarge had to be present while mixing, putting a constraint on the amount of time we had to place. Additionally, the UHPC could not be placed in extreme temperatures, cold or hot. Mapping the weather was crucial to ensuring the UHPC was placed without an issue. All the UHPC was mixed in large grout mixers, using the

bridge for cover, and placed using Georgia Buggies and wheel barrows.

The weather on this project added another challenge. Most of the work took place between October, 2016 and May, 2017, which is "Winter" in Maine. Reed & Reed had to extensively use heating devices to combat the cold temperatures. Concrete blankets and clear poly, as well as ground heaters, were used to retain heat after concrete and grout placements. Reed & Reed was successful in ensuring any item potentially impacted by winter weather was placed following the ACI specification 306 Cold Weather Concrete, ensuring weather affected the concrete as little as possible. Reed & Reed also had to remove snow from the roads and the surrounding sidewalks, adding to the difficulty of meeting our schedule goal.

The demo and rebuild of the viaduct had a tight time constraint. The project had only 220 days to demolish, rebuild and open to the traffic. In order to meet the time constraint, we had crews working 24 hours a day for the entirety of the demolition. Reed & Reed also had a night crew setting the NEXT beams during the rebuild of the viaduct.

The goal from day one was to open the viaduct earlier than the MDOT projected. Despite the projects many constraints and challenges, they were able to exceed the MDOT schedule goal by 26 days. The success depended on working through the winter, being creative, utilizing smart means and methods, and working 24 hours a day on selected constructive activities.

Environmental Sensitivity

Reed & Reed took the appropriate

steps to minimize the environmental impacts during the demolition of the old viaduct and the construction of the new bridge. They had all disturbed soils tested for lead, and any soils found to contain lead was disposed of in accordance with Maine and Federal laws.

During concrete placements, care was taken to avoid contaminating water sources. This was especially important at the dockyard due to the close proximity of the Kennebec River. All waste concrete was placed into scale pans to cure and then properly disposed.

During the construction of the Viaduct, Reed & Reed was asked to provide repairs and rehabilitation to the High Street Bridge, which crossed the viaduct. This work contained old insulation that was riddled with asbestos. Reed & Reed hired a specialist to remove and dispose of the asbestos in accordance with Maine law.

Responsiveness to Client Needs/ Customer Satisfaction/Partnering

The goals of our client, MDOT, on this project were to replace a structurally deficient viaduct with the least amount of public and environmental impact. The location of this project demanded a close and positive cooperation between the MDOT resident, Reed & Reed personnel, and the City of Bath. A high level of communication ensured a safe project and a high quality product.



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Safety

The Bath Viaduct had a safety-first attitude that ensured every worker went home safe at the end of their shift. The project had a couple safety challenges that were incorporated into the Site Specific Safety Plan.

A big safety challenge for this project was the high volume of traffic due to the project's location. In 2016, the Maine DOT shows an Annual Average Daily Traffic (AADT) on the Intersection of Washington Ave and Leeman HWY to be 6,900 vehicles.

The viaduct also carries an additional 18,000+ vehicles a day that needed to be rerouted during construction and combined with the 6,900 vehicles already traveling through the surrounding area. Leeman HWY is located next to US-1 South, following the length of the project. Sign packages were installed with temporary traffic lights to direct traffic. The high traffic volume was a daily focus and was mentioned on the Job Safety Analysis for each activity every day. Reed & Reed also designated a full-time traffic coordinator for the duration of the project. This was vital, as it took time for the locals to adjust to the new traffic patterns.

Working with UHPC also posed a safety challenge. The mix for UHPC contains a high concentration of silica. Silica represents a health danger, causing diseases such as cancer and silicosis. All personnel mixing the UHPC at the mixture were required to wear respirators. All other personnel not mixing were required to stay far enough away from the mixers that the silica was not a concern or wear dust masks.

UHPC also contains sharp metal fibers. The crews were given

cut resistance gloves to use when handling material. Personnel at the mixers wore coveralls to avoid getting metal fibers on their clothes. Another safety hazard was transporting and installing the pier caps from our dockyard to the job site, about 1 mile down the road. This hazard was mitigated by careful planning from the site's superintendents and foremen. All lifts had a critical lift plan; the cranes were in position before the arrival of the pier caps, and transport vehicles were guided where to safely park. There was an active railroad crossing through the project that posed a potential safety hazard as well. All large equipment needed to remain off the railroad crossing when the equipment was not being operated. If time was spent working around the railroad, then Reed & Reed needed to contact the railroad, request the train schedule and advise them that we would be working in the area.

Overall, Reed and Reed Inc. worked over 50,000 safe working hours with no recordable incidents. We also had a successful visit from OSHA resulting in zero citations, as well as no recommendations on how to make the project safer.



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PROJECT TEAM

Key team members were as follows:

Owner: Maine DOT

General Contractor: Reed & Reed, Inc.

Designer: VHB

Earthwork Contractor: Crooker Construction

Concrete Supplier: Auburn Concrete

Rebar Supplier: Dimension Fabricators

NEXT Beam Supplier: Stresscon Corporation

Pavement: Crooker Construction



“It’s been a truly successful project,” said **Glenn Philbrook**, the MDOT resident engineer for the project. “It’s a great day.”



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Kennebec Hydro Fish Passage

2018 Build Maine Award

Environmental Division



Bancroft Construction wins the environmental division for the construction of a fish passage at the Kennebec River Hydro.

From June 2016 and August 2017, Bancroft Contracting Corporation constructed an upstream fish passage and a fish elevator on the Kennebec River at Winslow, Maine for Brookfield Renewable Energy of Gatineau, Quebec. The 350-foot-long reinforced concrete upstream passage flume and the elevator structure are located just downstream of the Hydro Kennebec dam and they provide passage around Hydro-Kennebec powerhouse and dam. The purpose of the fish passage is to allow anadromous fish such as alewives, American shad, shortnose and Atlantic sturgeon, and Atlantic salmon, access to spawning areas upriver of the dam and powerhouse.

Mobilization to the site began in June, 2016 and the project was substantially complete by the middle of August, 2017. Cost of the project was approximately 11 million dollars. Project Manager for Brookfield Renewable Energy was Gerry Mitchell, engineering was by Kleinschmidt Associates. Bancroft Contracting Corporation was general contractor, represented on site by Mario DeMillo, Project Superintendent. Subcontractors included McGee Construction (ledge removal and earthwork), Maine Drilling and Blasting (line drilling and blasting ledge), HB Fleming (upstream cellular cofferdam), and Rioux Electric.

Bancroft crews self-performed the remainder of the project, approximately 80% of the overall project scope. Bancroft's work included construction of a downstream sheet pile cofferdam, de-watering the worksite, installing about 5,200

cubic yards of complex concrete structures, 508,000 pounds of re-bar, six mechanically operated gates, and 550 linear feet of 4.5 and 5 foot diameter butt-welded attraction water piping. In addition, Bancroft crews erected 140 tons of structural steel, the proprietary fish-lift system, and a wide variety of miscellaneous metals including steel grating, stairs, and handrails.

Contribution to the Community

The Hydro Kennebec fish passage makes its most important contribution to the community by enabling the continued production of clean hydroelectric power. Maine's electric power needs are currently met in largest part by power generated from burning natural gas and imported oil. The Hydro Kennebec hydroelectric complex, including the new fish passage, represents a continuing source of clean, locally produced electric power that lessens the community's reliance on imported fossil fuels and their attendant carbon outputs, increasing cost, and potential availability issues.

Innovation in Construction Techniques or Materials

The design of the fish passage required the construction of radiused concrete wall and abutments throughout the downstream end of the structure. Ordinarily radiused forms are constructed painstakingly using dimensional lumber frames faced with thin flexible plywood panels. In projects that require only a few radiused forms this construction technique, while slow, typically provides the most efficient approach.

However, given the prevalence of radiused concrete throughout the Hydro Kennebec project, Bancroft Contracting recognized that a more productive approach would have to

be employed. Responding to this challenge Bancroft identified and sourced the MEVA Arcus circular formwork system, a proprietary form system allowing the quick production of a wide variety of radiused concrete structures. The Arcus system consists of pre-fabricated steel framed panels faced with plywood allowing crews to readily set up forms for circular and semicircular structures of any radius.

Bancroft forms carpenters quickly recognized the value of the Arcus system in speeding production of radiused structures. After a brief familiarization period our crews were able to utilize the Arcus system to greatly increase production speed and accuracy on all the radiused portions of the fish passage.

Job Challenges

This challenging project required Bancroft Contracting to begin and complete the work within time constraints imposed by river flow levels, to control ingress of river and ground water within the site, and to respond effectively to rapidly changing water levels that followed significant rain events during the course of construction. In order to de-water the site, subcontractor HB Fleming constructed an earth-filled cellular cofferdam at the upstream end of the site, and Bancroft crews built an extensive sheet-pile cofferdam at the downstream end of the site.

Maintaining integrity of the downstream cofferdam in close proximity to drilling, blasting, and ledge removal operations proved a significant challenge as well.



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Since stability of the bedrock could only be estimated, blasting operations close to the downstream cofferdam had to be conducted with great care. Even so, at one point unanticipated instability in the ledge resulted in a blast causing significant damage to the downstream cofferdam. Having anticipated this possibility, no damage resulted from brief worksite flooding. Bancroft crews quickly repaired the damage restoring the integrity of the downstream cofferdam. Crews then dewatered the site and work resumed with minimal delays.

Environmental

Bancroft Contracting was able to construct the Hydro Kennebec fish passage with minimal impact to the river by strictly controlling siltation and minimizing introduction of construction pollutants into the water flow. Bancroft believes that the construction of the Hydro Kennebec fish passage had essentially no long-term impact on the river environment.

Beyond such local issues, however, the fishway project as a whole benefits fish using the Kennebec River as a spawning waterway and migratory passage. Completion of Hydro Kennebec passage is just one step in a long-range plan to provide passage around all the major dams on the Kennebec River, thereby opening large tracts of the River environment to food species such as alewives and American shad, as well as to significantly challenged species such as Atlantic salmon and Atlantic and shortnose sturgeon.

Response to Client Needs

Unstable ledge located between an active substation and a maintenance garage provided Bancroft the opportunity to work with Brook-

field and project engineers Kelnischmidt develop a cost-effective solution that minimized project delays. The solution required engineering studies to determine stability of existing ledge. Once that information was available Bancroft worked with Kleinschmidt and Brookfield to design and install a steel sheet, concrete, and structural steel reinforcing structure (essentially a large site-built "trench box") to support the critical structures threatened by the unstable ledge.

Safety

Relying on workplace safety practices and the "zero accidents" culture developed and practiced over years at both Brookfield and Bancroft Contracting allowed Bancroft crews to complete this high-risk, 15-month project with zero incidents and zero injuries. The Hydro Kennebec fish passage project began and ended with no daylight between owner and contractor with respect to the priority placed on worker safety. Bancroft crews worked in excess of 62,000 man-hours over 15 months to construct the Hydro Kennebec fish passage. Because of a strict and continuous focus on hazard analysis and management, as well as rigorous concentration on safe work practices, the project was completed with no injuries requiring medical attention including no OSHA recordable or lost time injuries.

Credit for this accomplishment belongs in several places: Brookfield has always made it clear that production never takes precedence over safety on their projects. Bancroft Superintendent Mario DeMillo provided effective safety leadership for the duration of the project. However, the lion's share of the credit for this outstanding safety accomplishment goes to

the Bancroft crew. These trained and seasoned construction professionals worked under demanding conditions without compromise to safe work practices, producing safety results for the Hydro Kennebec project second to none in the industry.



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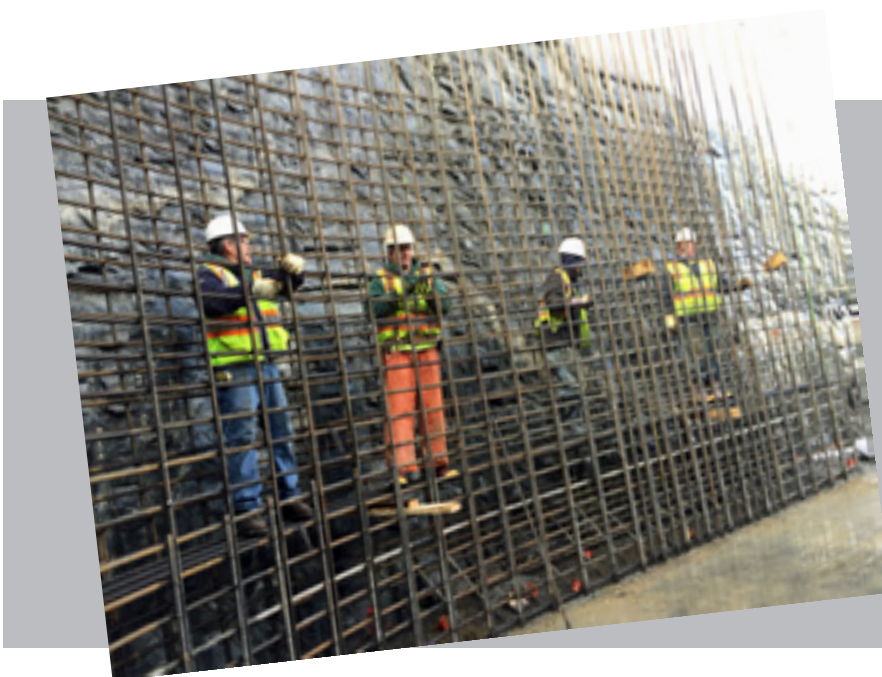
PROJECT TEAM

Key team members were as follows:

Owner: Brookfield Renewable Energy
General Contractor: Bancroft Contracting
Engineer: Kleinschmidt

Key Subcontractors

McGee Construction
Maine Drilling & Blasting
HB Fleming
Rioux Electric



Eastport Breakwater Pier

2018 Build Maine Award

Municipal/Marine Division



CPM Constructors wins the municipal division for the re-construction of the Eastport Pier.

The Eastport Breakwater Pier is the centerpiece of the city's waterfront and its marine freight and recreational boating industries. The structure protects the city's inner harbor, which is home to fishing vessels, tugboats, Coast Guard rescue boats, and U.S. Border Control vessels. It also provides 400 linear feet of berths for a wide range of commercial and private vessels. The U.S. DOT recognized the critical role the structure plays in the community when, in 2013, it awarded a \$6 million TIGER grant for the pier's reconstruction project. (Additional funding was provided by the State of Maine and the Eastport Port Authority.) At the announcement of the TIGER grant, Senator Angus King highlighted the importance of the structure,

"The Port of Eastport is a vital transportation hub and a center of economic activity for the region and for Maine. These funds will be used to repair currently failing infrastructure with new, state-of-the-art structures that will help to support the operations of those who utilize the port of entry, like our fishermen and commercial shippers."

The aging breakwater, originally built in 1962 with a pier extension built in 1985, was slated to be reconstructed in 2015. Before the original bid date for the project and while it was advertised, there was a "catastrophic collapse" (Bangor Daily News, December 4, 2014) of a portion of the structure in the early hours on December 4, 2014. One person was injured and one boat sunk. MaineDOT was managing the project for the Eastport Port

Authority and other partners, including the Maine Port Authority, U.S. Coast Guard, U.S. Navy, U.S. Border Control, and U.S. Marine Administration (MARAD). The department fast-tracked the \$15 million construction project, due to the critical role the pier has in the region's marine economy.

Contribution to the Community

The \$15 million marine reconstruction project had a considerable positive economic impact on the City of Eastport and the surrounding region. CPM Constructors employed an average of 20 crew members during the project, some of whom were local residents. The two-and-a-half-year construction project had 102 different employees working at the site at one time or another. Those employees stayed at local inns, hotels, and bed and breakfasts; they shopped at the city's stores and ate at the city's restaurants and different church and local "suppas". This boosted the local Eastport economy during both the summer and winter seasons. Businesses that sometimes closed in the fall were able to stay open and profitable through the winter.

In addition to CPM Constructors being a good corporate visitor, CPM Constructors' employees also made an impression on the Eastport community. In one particular instance, Tessa Ftorek, a local resident and employee of CPM Constructors, received the following text message entitled Random Act of Kindness,

"Hi, Tess...just thought I'd let you know of something really cool I witnessed at the IGA today. I was in the check out line, Rita's, and the fellow in front of me, fairly burly lad, not real smiley, noticed that the woman in front of him didn't have enough money to pay for her order ... he was one of the CPM

guys ... yellow vest like a bunch of the other guys in there buying lunch ... and he said ... don't worry, I've got it ... and he paid for her entire order. I told him he was a good man."

At the end of the project, MaineDOT returned the revitalized and reconstructed breakwater and pier to the city where it will continue to play a strong and integral role in the city's economy for decades to come.

Innovation in Construction Techniques and Materials

The reconstruction of the Eastport Breakwater Pier by CPM Constructors employed notable innovative materials and techniques.

1) Spin fin piles were used for the pier construction. The pipe pile design is equipped with angle plate fins and has been in use since the mid-1980s but has not been widely used in Maine. Because they are shorter than typical piles, they also achieve pile capacities far in excess of conventional pile and were a cost-effective choice.

2) CPM Constructors had to adhere to a complex set of acoustic monitoring rules and environmental regulations. As a means of mitigating some of these acoustic challenges, CPM Constructors' in-house engineers designed and fabricated a bubble curtain to assist with driving the project's pipe pile.

3) CPM Constructors designed and fabricated a barge and davit system to remove sheet pile from the collapse laying underwater and on the ground in the inner harbor.



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4) CPM Constructors developed and engineered a plan to use the existing and partially collapsed 1962 breakwater structure for the removal of aggregate, stone, and material from the inner harbor. This plan minimized the amount of actual on-water work necessary to complete the project.

5) CPM Constructors developed and engineered a plan to drive all pipe pile for the new breakwater structure from the existing 1985 breakwater structure. This plan also minimized the amount of actual on-water work necessary to complete the project.

6) CPM Constructors, with the project engineers, developed and redesigned the connection points of the reconstructed approach to the 1985 breakwater structure.

7) Due to high ledge in the inner harbor, CPM Constructors, along with the project engineers, designed a dead man support system for the new sheets installed around the 1985 breakwater structure.

8) Due to high ledge and other site conditions on the east side of the project, CPM Constructors had to change the pipe pile driving process for the new breakwater structure. In addition, CPM Constructors fabricated a series of driving frames needed to drive both the battered and plumb pipe pile.

Meeting the challenge of a Difficult Job

The project presented several challenges over its two-and-half-year duration.

√ The city of Eastport is in a remote, rural location four hours from Freeport, the home base of CPM Constructors. Moving materials, equipment, and crews to

the site was one of the challenges faced during construction. This was a true multi-modal project in which rail, marine, and trucks all were used to keep freight costs to a minimum. The pile used was manufactured in St. Louis, Missouri and required both rail and trucking to make it to Eastport.

√ Cobscook Bay is a sensitive marine habitat that is home to several protected species including seals and sturgeon, and environmental observers were on the job site daily throughout the project to monitor the effect of construction on the marine habitat. At the project's completion, CPM Constructors' protected species observers had worked more than 6,000 hours.

√ The waters of Cobscook Bay and the Port of Eastport are subject to heavy currents and legendary tides that at times reach 20 plus feet. Construction schedules had to be planned around tides to keep crews safe.

√ Mother Nature subjected the project to extreme weather, which included heavy snowfall, high winds with 70 plus mph gusts, thick fog, horizontal rain, and even an earthquake.

√ At the project's peak, CPM Constructors had six workboats, five excavators, four cranes, six sectional barges, and one small tug boat working on this project.

√ One of the project's larger challenges concerned the removal of the old sheet pile surrounding the existing and partially collapsed breakwater structure and approach. Many of these sheets were rotted and completely deteriorated, which made taking hold and removing them difficult. With considerable effort, CPM Constructors accomplished this. Interestingly, when these sheets were removed, CPM

Constructors discovered that the portions of sheets located below the mud line were in excellent condition. In lieu of discarding these sheets as scrap, CPM Constructors saved 7,500 square feet of these sheets and is presently using them on the Beals Island Bridge Project in Jonesport.

Environmental Sensitivity

Any time you build infrastructure on the water in a marine environment, there are essential steps to take to preserve habitats and wildlife. For this project, CPM Constructors had to adhere to a complex set of acoustic monitoring rules and environmental regulations, which required special equipment and some assistance from the Ocean Marine Department at the University of New Hampshire. As a means of mitigating some of these acoustic challenges, CPM Constructors' in-house engineers designed and fabricated a bubble curtain to assist with driving the project's pipe pile.

In addition to these acoustic issues, the other environmental issue CPM Constructors dealt with on this project concerned the actual removal of material from or around the water on this project. This required the use of siltation boom, making sure all equipment was suitable to work around the water, and developing means and methods that did not unnecessarily disturb the water and marine environment. This also required CPM Constructors to work closely U.S. Coast Guard, the Eastport Port Authority, and local water traffic, all of whom traveled in around CPM Constructors' work site.



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CPM Constructors handled both of these issues well, and there were no environmental issues on this project.

Responsiveness to the Community and Partners

The project began with a major challenge. After the bid opening in January 2015, MaineDOT asked CPM Constructors for cost savings measures and ideas. The company responded, finding savings in materials including the sheet pile specified for the project. This idea alone saved more than \$250,000 with the material buyout.

Several years ago, CPM Constructors completed another large-scale project in Eastport (construction of the nation's first commercial, grid-connected tidal power system), and the company and our staff truly feel a part of the community. For this project, CPM Constructors worked closely with our on-site partners and neighbors – Eastport Port Authority, the U.S. Coast Guard, the City of Eastport and U.S. Border Patrol – to be sensitive to the needs and concerns of local citizens and businesses. Two-and-a-half years is a long time to have construction at the center of a small town, and the company and crews tried at all times to be courteous and respectful.

The Eastport Port Authority also requested the reconstruction be completed in time for a much-anticipated visit by the U.S. Navy destroyer U.S.S. Lassen. Partnering with the Eastport Port Authority and MeDOT, CPM Constructors achieved this goal and made this happen. The Eastport Breakwater and Pier was rededicated on July 4, 2017 with U.S. Senator Susan Collins, U.S. Senator Angus King and U.S. Representative Bruce Poliquin and other local and state officials to help officiate – and the U.S.S.

Lassen berthed at the pier.

As construction of the Eastport Breakwater and Pier was nearing completion, Eastport Port Authority Director Chris Gardner noted:

“With a project like this, you are taking over the baby of the community, so to speak. We thought this was going to be an \$11 million project, then 10 days before putting it out to bid, [the pier] fell into the ocean. Nobody knew it was that bad. We knew we needed a contractor who would understand the significance of this.”

This was a significant project for many reasons:

-There was an urgent need. The project was fast-tracked after the collapse of the old breakwater and pier in late 2014.

-There were environmental challenges. Eastport Harbor and Cobscook Bay are home to sturgeon and seals, both protected species, and new technologies were used to minimize the impact on the bay's marine habitat.

-Reconstruction of the breakwater and pier required underwater construction in extreme tides and currents.

-The job site was remote, and moving materials, equipment, and crews to the site required extra planning.

-Funding constraints called for some creative project planning and design to cut more than \$250,000 from the budget.

-There were multiple partners, bosses, and interested parties: Maine DOT, the Eastport Port Authority, U.S. Marine Administration (MARAD), U.S. Customs and Border Patrol, and the U.S. Coast Guard.

-The project required the management of multiple subcontractors and suppli-

ers: LANE Construction, Hanscome, Hallowell Trucking, Newport Industrial Fabrication, Moulison North, Sunkhaze Project Solutions, S.W. Cole, Sargent Materials, P.E. O'Halloran, Morrison Manufacturing, and Moose Island Marine.

-The project has great economic significance for the marine economy of the City of Eastport and the region of Downeast Maine.

CPM Constructors dug in for the challenge, submitting its bid for the work in January of 2015 and breaking ground on the project just a short while later. In all, the project took just over 25 months to complete and boasted an impressive shopping list: 1.6 million pounds of sheet pile; 330,000 pounds of rebar; 29,000 cubic yards of excavated fill; 7,600 lineal feet of 20" concrete filled plumb piles (56 pieces); 5,100 lineal feet of 20" concrete filled battered piles (42 pieces) with "Spin Fins"; eight 36" piles; 67 16" fender piles; 307,000 lbs. of epoxy coated rebar; 2,500 cubic yards of cast-in-place concrete; and 17,000 square feet of 16" precast deck panel.

But the breakwater and pier means more than the sum of materials and labor that went into the project. The real beauty of the project was seeing the positive impact construction can have on a small, rural community that struggles every day to hold onto its marine traditions. We believe the Eastport Breakwater and Pier completed by CPM Constructors is a strong candidate for a Build Maine Award, for all of the above reasons – and because it brought out the best in everyone involved. It was a good partnering experience that built a complex piece of public infrastructure that will help a small, rural community thrive for decades to come.



PROJECT TEAM

Owner: Maine DOT

General Contractor: CPM Constructors

Key Subcontractors

Lane Construction

Hanscome

Hallowell Trucking

Newport Industrial

Moulison North

Sunkhaze Project Solutions

S.W. Cole

Sargent Materials

P.E. O'Halloran

Morrison Manufacturing

Moose Island Marine



“ They have said as construction goes on, they’re open to taking a look at whether we can press parts of this back into service, I cannot say enough about CPM.”

Chris Gardner, Director
Eastport Port Authority



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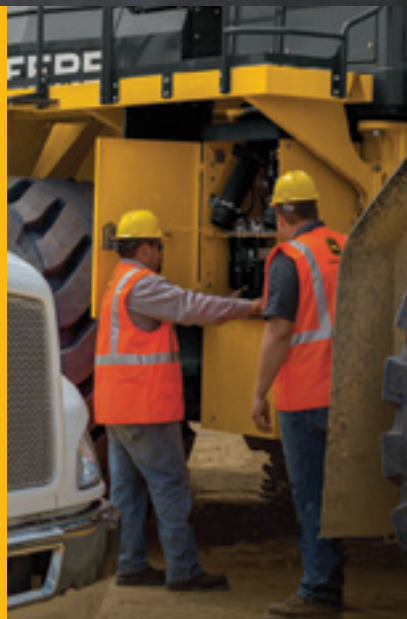
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Brookefield Penstock

2018 Build Maine Award

Industrial Division

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Sargent Constructors wins the industrial division for the construction of the Brookfield Penstock replacement.

In the early 1900s, seven penstocks were constructed to bring water from Ferguson Pond to the water wheels in the power house at the newly built mill in Millinocket, Maine. The water that came from the penstocks provided power directly to machinery at the mill, including the grinding wheels that ground wood into pulp.

Over 100 years later, with the mill now closed, the new owner, Brookfield Renewable Energy Group now utilizes the penstocks to generate power. The 7 penstocks now provide water to spin turbines that generate electricity. Currently, four of the penstocks are being used to power hydroelectric turbines.

The existing penstocks are each 10' in diameter. The original project proposed by Brookfield called for the replacement of Penstock No. 3. The design and fabrication of the replacement penstock was contracted out by Brookfield and was performed by a local Millinocket company, Millinocket Fabrication & Machine LLC. The new design called for the replacement penstocks to be 9' in diameter and was fabricated in mostly 10-foot-long sections. After the fabrication process, plans changed from rebuilding Penstock No. 3, as Brookfield determined that Penstock No. 1 was a higher replacement priority. They wanted to explore options on ways to utilize the already fabricated units for the Penstock No. 1 replacement.

Sargent Corporation accepted the challenge and started working with CES, Inc., our engineering partner,

to come up with a solution. All of the previously fabricated penstock sections were transported from Millinocket Foundry's yard, located on the Golden Road, to the work site near the existing powerhouse, and were able to be incorporated into the project with only minor modifications.

Sargent devised a plan to meet a tight schedule which resulted in the replacement of No. 1 Penstock being completed in three phases.

The first phase of the project was at the lower end of the penstock, under the power house. An elbow with a 9-foot bend that diverts water into the turbine needed to be replaced. The old elbow was removed and a new elbow, which was fabricated along with the other penstock sections, was put into place. But because of the elbow's shape, it couldn't be slipped-lined thru the existing penstock; therefore, the existing tailrace was used to provide access. The elbow had to be put into Millinocket Stream just downstream from the turbine building, floated upstream and under the building using air lift bags, and then maneuvered into position using multiple chain hoists. This was all done while working from a barge under the building and on fabricated work platforms.

The second phase was to replace the 125 feet of the penstock located under the brick building that houses the hydroelectric turbines. For that part of the project, the new penstock sections were slipped-lined inside the old sections, welded together, and then the space between the old and new sections were grouted.

The third phase was outside the building. This is where Sargent's plan allowed the schedule to be accelerated. Instead of continuing with the slip lining inside the old

penstock, Sargent decided to excavate and expose the existing penstock, cut the top half off and set the new penstock sections into the cradle of the old penstock. The 10 foot long penstock sections were welded into 40' sections while the other phases were ongoing, then set into place using a crane in an excavated trench and the larger sections welded together.

Another challenge was that the elbow being replaced in the first phase connects to a flange on the turbine, but a majority of the flange was embedded in the floor of the turbine building. That meant our crew had to jackhammer the concrete so that we could expose the old elbow and cut it out before the new elbow could be installed.

Sargent crews also faced another challenge when it came to the amount of welding required. Overseen by Project Superintendent Peter Broberg and Welding Supervisor Irving McInnis of Sargent's Fabrication Shop in Stillwater, welders on the job seven days a week for seven weeks, welding pipe 12-plus hours a day, using over 2,400 pounds of welding wire.

Sargent Corporation completed the project on a very tight 57 day schedule. Water was turned off to No. 1 Penstock on July 5th and we had to turn the project over to Brookfield no later than August 31st. Sargent completed the project three days ahead of schedule, completing the project on August 28th.

Key subcontractors on this project were, Wellman Paving, Winterport, Knowles Industrial Services, Gorham, grouting and painting, and Thomas DiCenzo Inc., Hermon, crane services.



Key Sargent Corporation employees on this project were, Tim Folster, Estimator, Colby Currier, Operations Manager, Peter Broberg, Superintendent, Pete Parizo, Project Manager and Irving McInnis, Welding Supervisor.

Contribution to the Community

The Brookfield hydroelectric system allows the utilization of the Powerhouse that formerly powered the Great Northern mill. This property could stand abandoned, but due to the continued operations of the Penstocks, the system continues to operate and create energy. During construction of this project, Sargent Corporation used local lodging and brought increased sales to the local community. The fabrication of the replacement units utilized a local fabrication company in Millinocket that brought increased business to the community.

Innovation in Construction Techniques or Materials

Sargent Corporation raised the bar on innovation in techniques on this project. We designed an approach that had never been used previously, but would benefit the owner by saving time and allowing the turbines to generate revenue. Through our approach of open cut, demo, and replacement of the penstock sections instead of a total slip-line, we were able to complete the project in less than half the time the previously used methods required. Our work with CES also allowed us to design a system that utilized the units that were previously fabricated for Penstock No. 3, again saving the owner money.

Meeting the challenge of a Difficult Job

This project not only had several challenging components, but it had a very tight timeframe. The instal-

lation of an elbow section required our crews to work on a barge below the Powerhouse. Most of the existing flange, where the elbow connects, was embedded in the floor of the turbine building. This required our crews to jackhammer the concrete so that we could cut out the old elbow before placing the new one. One of the most challenging aspects of this project was the amount of welding that was required. This challenging project used over a ton of welding wire. We had welders on the job seven days a week for seven weeks, welding pipe 12-plus hours a day. Our welding crews spent approximately 3,000 work hours welding the penstock sections together.

Environmental sensitivity (community & nature)

Sargent Corporation is always ready to practice the highest standards when it comes to environmental sensitivity. Due to the close proximity of the powerhouse to the Millinocket Stream, an effective Stormwater Pollution Prevention Plan was crucial. Sargent worked with CES to develop a plan that ensured no contaminated runoff left the jobsite.

Responsiveness to Client Needs/ Customer Satisfaction/Partnering

The owner had already had the parts fabricated for another penstock. When the project plan changed to replacing Penstock No. 1, Sargent Corporation worked with CES to find a solution. The end result allowed us to utilize all the previously fabricated sections into the current project. We also were able to complete the project 3 days ahead of schedule, allowing the turbine to be put back online and for the production of power to resume.

Safety

Safety was the primary concern on this project. Anyone working inside the penstock area in the turbine building, including welders and other Sargent employees, had to follow very strict lockout / tagout procedures, to ensure that water was not released into the penstock while they were inside.

A Sargent employee was assigned to the entrance to the work area and recorded the name and time everyone entered and left the penstock. Sargent Corporation trained our own entry and rescue team and the team was onsite full time during construction. They are pleased to report that there were no OSHA recordable, or lost time injuries during the 8,623 man hours on this project.

Conclusion

The Brookfield Penstock No. 1 Replacement project was a success for many reasons. Through the collaboration with CES, Inc., the Sargent led team was able to overcome challenges and meet the owner's goals and timeframe. Brookfield Renewable was pleased with the outcome and has contracted with us to complete the replacement of Penstock No. 3 during the 2018 construction season.



In Partnership With



PROJECT TEAM

Key team members were as follows:

OWNER: Brookfield Renewable

ENGINEER: CES, Inc.

Contractor:

Sargent Corporation

Herb Sargent, President

Timothy Folster, Vice President Operations

Colby Currier, Operations Manager

Pete Parizo, Project Manager

Peter Broberg, Project Superintendent Timothy

Folster, Project Estimator

Key Subcontractors/Suppliers: Knowles Industrial Services, Gorham Thomas DiCenzo Inc., Hermon, Wellman Paving, Inc., Winterport



“ Sargent Corporation provided a superior service to their client, Brookfield Renewable Energy Group (Brookfield), under difficult conditions and a tight timeframe.”

Peter Tuell, Senior Project Manager
CES, Inc.



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