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Packaging Firm Gains New Levels Of Efficiency

During 2005, a leading manufacturer of plastic packaging renovated and expanded an empty warehouse in West Hazleton, Pennsylvania. The firm undertook the initiative in order to manufacture plastic bottles at the new site and transport them through a 578-foot long, enclosed bottle conveyor bridge connected to their client, one of America's leading manufacturers and distributors of liquid soap, laundry detergent, and fabric softener.

Relocating to a facility immediately adjacent to their client allowed the packaging manufacturer to eliminate transportation of bottles from their existing plant more than 100 miles away. Over the past 10 years, approximately 9,500 tractor-trailers were needed to ship bottles from the manufacturer to the client. By locating near the client and undertaking a Just-in-Time logistical supply strategy, the packaging firm was able to reduce shipping costs, improve energy efficiency, reduce fuel costs, and greatly improve operational efficiency between the supplier and client.

"We had been looking to relocate our blow-molding operation to a location closer to our client's facility," said the plant manager of the packaging operation. "The building adjacent to our client's plant became available, and we began examining ways we could link the structures. We eventually arrived at the bridge concept that would connect the facilities and streamline our operations."

To implement this design idea, the packaging firm retained QproQ Engineering, Inc. of Wilkes-Barre to design the additions, renovations, and conveyor bridge; and, also manage the design and construction of the project from start to finish.

Starting July 2004, QproQ prepared contract documents necessary to construct the three-percent sloped bridge over parking areas, access roads, and a small creek. Construction for the packaging firm's \$11.7 million investment began during December 2004 and was completed by May 2005. The company began delivering bottles through the conveyor bridge to their client by July 1, 2005.

"QproQ brought turn-key convenience to the bridge-building process," commented the plant manager. "Once the contract was awarded, they collected the necessary data, did the sight surveys, prepared the drawings, obtained the needed permits and supervised the construction process. Their comprehensive approach allowed us to focus on our business, and on the needs of our client."

The bridge consists of six simple-span, welded steel tube trusses encased with insulated metal roof and wall panels with a maximum span of 140 feet. A concrete-filled metal deck provides a clean, smooth floor surface. Supporting the bridge are six cantilevered, reinforced concrete T-columns anchored to spread concrete footings. Also incorporated into the design are three exit access hatches with ladders to grade, a fire detection system, fusible link, rolling fire doors at each end, as well as area lighting for maintenance workers. The bridge spans over lawn and wooded areas, paved access roads and the creek; thus affecting more than just

Project Name: Enclosed Bottle Conveyor Bridge

Project Location: West Hazleton, PA

Project Milestones:

July 7, 2004	QproQ Engineering, Inc. begins design services for Owner
August 19, 2004	QproQ mails Initial Notice To Municipalities
October 22, 2004	QproQ submits Joint Application for Pennsylvania Water Obstruction and Encroachment Permit and U.S. Army Corps of Engineers Section 404 Permit at PADEP Northeast Regional Office, Soils and Waterways Section, 2 Public Square, Wilkes-Barre, PA 18711-0790
October 27, 2004	QproQ completes Construction Plans and Specifications
October 29, 2004	QproQ solicits Construction Contractors through Invitation to Bid
November 3, 2004	Contractors Pre-Bid Site Visit/Meeting
November 15, 2004	Contractors Bid Proposals Due
December 1, 2004	Owner awards Contract and issues Notice to Proceed
April 29, 2005	Contractor Substantial Completion
July 1, 2005	Owner begins delivery to client via the bridge

the client. Considerations were made to accommodate the packaging firm, their client and other local companies. There were no service interruptions for any users of access roads during the construction. QproQ obtained permits from the PADEP and local municipalities assuring quality control and adherence to regulatory agencies to minimize environmental impacts.

Since there was a significant elevation difference between the bridge entry at packaging firm and the exit at the client's facility, it was determined early in the design process that a constant slope bridge was preferable to a variable slope bridge. It was determined that conveying product at variable slopes resulted in variable transport speeds and could potentially create backup-up of the product, along with increased maintenance. Exit and entry elevations had to be precisely calculated, as the maximum slope for product conveyance is three percent. The conveyor manufacturer's motors would not tolerate a greater slope. Fortunately, final elevations were acceptable to both users without resulting in major retrofits to existing building structures.

Modeling of the bridge structure was completed utilizing RISA 2-D and RamSteel 3-D software. For the roof panels, a Warren truss configuration with horizontal legs was selected for optimal load distribution, and Pratt truss configurations were selected for the side panels. A Vierendeel truss was

selected for the bridge deck with lateral stiffness provided by the concrete-filled metal deck. Deflection calculations resulted in separation of each span by an expansion joint to permit rotation between adjacent spans without damage to the metal siding.

Since the site is in a mountainous area, the 50-year design snow load was derived from a site-specific case study based upon historical snow depths and densities recorded within a 25-mile radius. Seismic and wind loads were derived in accordance with applicable building codes. A geotechnical engineering investigation revealed that the sub-grade was suitable to support the 250,000-pound column loads utilizing a system of spread concrete footings. To minimize sway, column bases were designed as moment resisting and the spread footings were designed to resist overturning forces.

According to Jim Kerns, QproQ President, the project is extremely satisfying for numerous reasons. "By 2008, 103 local jobs will be created by the packaging firm. The project significantly contributes to economic growth and development in northeastern Pennsylvania. The project is environmentally smart because it results in reduced fuel consumption and highway traffic. In accordance with the packaging firm's philosophy, this project creates a closer relationship with their client by virtue of their proximity."

"We are now better positioned than ever to directly respond to our client's needs," remarked the manager of the packaging firm. "We are also saving more than \$2 million each year in freight costs, and have been able to reduce our inventory costs as well."

From an engineering perspective, Kerns related that the project is unique in that it is the only project of its type in northeastern Pennsylvania. The length of the conveyor bridge is dramatic considering the product volume that is transported without any adverse affect on traffic patterns or the environment. Boxed bottles manufactured from recycled high-density polyethylene in the packaging firm's plant are directly conveyed through the enclosed bridge onto the client's conveyor lines where they are filled, capped, loaded and distributed before they see daylight. It is an extremely efficient operation.

"All in all, considering adherence with corporate philosophies, supplier-client relationship improvements, economic growth and development, creations of local jobs, completion of a unique and environmentally smart project in a compressed time-frame that results in significantly improved operational efficiencies for both the packaging firm and it's client are a sure way to make any engineer feel extraordinarily proud about being part of the building team and contributing to growth in northeastern Pennsylvania," said Kerns. ■



Setting bridge section on bearing plates



Looking from the packaging firm to the client's facility