PRECAST CONCRETE BOX CULVERTS SECURE BUILDING UTILITIES

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Few materials on earth have the versatility of concrete for uses in construction. When precast concrete products first became an option for speedy and standardized drainage systems, few would have thought that one day the same products would be used for housing utilities in buildings. Today, with high costs of construction and maintenance of utilities services, engineers and architects have rediscovered the use of concrete vaults and chambers to house services for easy access and lowered maintenance costs. The use of precast concrete products, like box units, for this purpose has expanded the market for precast concrete drainage products.

Four 8-foot x 9-foot precast concrete box sections were installed as a sub-grade building component for the building's heating, ventilation and air conditioning system.

The idea of enclosing utilities in underground chambers, or galleries, is not a new idea. Many buildings and structures have been built with concrete block and poured concrete galleries so that access and maintenance of utilities is more efficient. What is new is the use of precast concrete box units for housing conveyance pipes, telecommunications cables, heating and air conditioning conduits, and electrical services. The environment around these services can be controlled to extend their service lives, and the services can be more easily protected from potential intruders by various security devices built into the design of the galleries. With precast concrete galleries, efficiency has been extended to both yard use and construction.

Hanson Pipe and Products, Inc. of Salem, Virginia and Toronto, Ontario is chalking up successful projects where standard products were supplied for buried galleries. Two recent projects receiving attention are the Amfibe Building in Martinsville, Virginia, and an undisclosed (security reasons) private enterprise near Cambridge, Ontario. In Martinsville, the structure was required for heating, ventilation and air conditioning (HVAC) and in Toronto, the structure was used to accommodate coolant pipelines.

The Martinsville project required the structural integrity of a sub-grade building component to handle construction loads while the boxes were being assembled to form the buried gallery. Precast concrete box units with an 8-foot span by 9-foot rise placed in pairs, satisfied the sub-grade structural integrity and HVAC requirements. The use of box culvert sections for the gallery was found to be economical while conforming to the aggressive construction schedule. Steve Martin Trenching of Martinsville installed the HVAC structure quickly and accurately.

The construction schedule and HVAC alignments provided quite a challenge for Hanson. The Salem plant, headed up by Bobby Law, produced and shipped nearly 1,100 feet of the 8-foot x 9-foot box units in five weeks. This included 23 mitered bends, openings for 22 vertical shafts and several end-caps. In order to meet the tight produc-

tion schedule, Hanson made use of their Roanoke, Virginia plant, headed up by Larry Mueller, to "fit-up" and finished the majority of the miter bends after Salem produced and prepared the basic components.

Martin installed the 14-ton HVAC units in close proximity to, and between foundation piers and elevator shafts with remarkable precision. His forces constructed the vertical shafts with concrete masonry blocks. Upon completion, Steve Martin complimented Hanson on the quality of the product, and timely delivery for a successful project.

The main purpose of the structure in Ontario was for housing a piping system used for pumping glycol to a series of air-conditioning units. The buried gallery was considered an option because the air conditioning system for the building was to be located approximately 31 metres (102 feet) from the condenser units. Between the building and condenser units was a parking lot and shipping area. The piping system was proposed to be constructed below grade to have direct access to the condenser units with minimal impact on the daily functions of the building and yard operations. Had the original proposal of installing the piping in an overhead carrier frame been approved, the visual impact of the overhead support frame would have detracted from the architecture of the building, piping would have been less secure, and the supports for the frame would have impacted the use of the parking and shipping area.

The precast concrete box sections were installed on a "mud slab." Sand bedding was placed over the mud for leveling the boxes as they were installed.

The below-grade precast concrete box structure provides excellent security and convenient access to the HVAC piping systems.

The consulting engineering firm, Morrison Hershfield Limited, and engineering staff at Hanson Pipe & Products Ontario (formerly Centennial Concrete Pipe & Products), worked to finalize a design for the 31 meter-long (102 feet) "design-build" structure that included the use of standard size 3000 mm x 1800 mm (10-foot by 6-foot) box units. The gallery was designed to Ontario Highway Bridge Design Code live load specifications because of the truckload conditions of the shipping area, and the 0 to 600 mm (0 to 24-inch) cover requirement, depending on site grading.

Once the installation contractor had been retained by Cityscape Contracting Limited (general contractor), the completion date for the entire project was moved ahead to the first week of July 2001 to meet the client's business plan. Subsequently, the installation of the precast concrete box units for the gallery became critical as the gallery had to be completed before piping and other essential works could be installed. Cityscape required delivery of the box units within 10 days of placement of the order. Hanson was able to adjust production of the units to the new schedule, and delivered the product to the site within the 10-day window.

The box units were installed on a "mud slab" base that included sub-drain piping that drained to the sump pump pit located below the box floor. Sand bedding was placed over the mud slab for

leveling the box units as they were installed. Because certain units were delivered with openings on top, they had to be installed with lifting points located on the sides of the units, instead of the roof slab. Six units were installed on the first day, but further installation was delayed to permit other work to be completed near the gallery. Two days later, the remaining nine units were installed, allowing installation of the condenser unit pad and glycol piping system. A waterproofing membrane was applied to the outside surface of each box unit upon installation, and butyl tape was installed prior to delivery to ensure that the joint treatment of every unit was applied properly to restrict leakage. The gallery was backfilled immediately to limit disruption to construction traffic.

Jim Stadelman of Cityscape noted that by using precast concrete box units, costs were easily predetermined and installation time reduced. He said, "By engineering this tunnel for piping, and choosing precast concrete products, we have built a structure that will become more common in buildings and site servicing. Precast concrete galleries will be used outside and within buildings to house technology needed to regulate the environment required for safely operating computer systems. Such structural systems that facilitate maintenance make our clients very happy."

Buried galleries using precast concrete box units are now an option for servicing buildings, or groups of buildings in urban centers, or for servicing high security installations. The efficiencies gained in conserving on-site space for complementary uses, and construction costs are worth consideration. Galleries are being considered seriously by municipalities throughout North America for reducing the impact of preventative and emergency maintenance on buried infrastructure on local economies. And now, the private sector has revived the use of an old technology with precast concrete products for enhancing the value and security of its capital assets.

	Hanson Virginia Project	**Hanson Ontario Project**
Project:	Amfibe Building Martinsville, Virginia	Glycol Coolant Gallery Toronto, Ontario
Owner:	Amfibe, Inc., Martinsville, Virginia	Confidential
Designer:	Smith & Beasley, P.C. Architect / Engineer Martinsville, Virginia Rayford B. Smith, P.E.	Morrison Hershfield Limited Toronto, Ontario Ernie Chan
General Contractor:	Frith General Building Construction Martinsville, Virginia	Cityscape Contracting Limited Edmonton, Alberta Jim Stadelman
Sub-Contractor:	Steve Martin Trenching Martinsville, Virginia Steve Martin	
Quantities:	1,100 feet (335 m) – 8-foot x 9-foot reinforced concrete box units	31 meters (102 feet) – 3000 x 1800 mm (10-foot x 6-foot) reinforced concrete box units
Producer:	Hanson Pipe & Products Salem, Virginia Bobby Law	Hanson Pipe & Products Ontario Cambridge, Ontario Nick Vinski

In January 1999, Gifford-Hill became Hanson Pipe & Products, Inc. The name change strengthens the company's identity both in the U.S and abroad, and unifies the pipe and precast operations with the rest of the Hanson organization. Hanson Pipe & Products added LOC PIPE, Whitby, Ontario to its family in 1999, and Centennial Concrete Pipe & Products, Cambridge, Ontario in 2001. Hanson's broad range of building materials includes concrete pipe, and precast concrete products for sewers and storm drainage. For more information visit www.hansonpipeandproducts.com.