Concrete Pipe News

WINTER 2014
Volume 66 No. 1

American **Concrete Pipe** Association
www.concrete-pipe.org

Winter 2014
Volume 66 No. 1

Concrete Pipe News is published four times each year by the American Concrete Pipe Association. It is available in hard copy and digital format posted on the ACPA website. *Concrete Pipe News* content is linked to archived technical information, research and product development, educational products and applications of precast concrete pipe and boxes. Content is linked to archived word and graphic files on the ACPA and other industry-wide websites. Readers include engineers, specifiers, contractors, suppliers, government officials, and members of the American Concrete Pipe Association.

Published by:
American Concrete Pipe Association
Phone: (972) 506-7216
E-mail: info@concrete-pipe.org
www.concrete-pipe.org

On the Cover:

Oldcastle Precast manufactured nearly 4,300 feet of reinforced concrete boxes for the Cache Water Restoration Project.
Photo: Jeff Peck, Oldcastle Precast

Editorial

Successful Careers are Knowledge-Sensitive

Matt Childs, P.E., President
American Concrete Pipe Association

Over its 107-year history, ACPA has been instrumental in building knowledge about concrete and the behavior of precast pipe and other precast products. The Association's delivery of knowledge has varied in duration and intensity for many reasons including economic, technology, and market forces. The advent of the 80s, however, and the influencers of the ACPA at the time, launched the Association into education programs that would grow stronger through the years to what we enjoy today. A variety of short, medium, and long-term education programs ensure a strong knowledge-based industry and successful careers for professionals in the concrete pipe industry.

There are immediate needs for information and knowledge that are met by ACPA's Pipe School, Quality School, webinar series, and Newscast. Each has a unique delivery means, but a common goal to help members be more knowledgeable when assisting engineers with the design of precast concrete pipe and boxes. The Pipe School and Quality School run concurrently each winter at the same time as the NPCA Precast Show, which follows Pipe School. Pipe School offers seminars on quality, marketing, engineering, production and safety that address issues of the day, innovation, and refreshers to sharpen the knowledge and skills of attendees. Webinars are information updates and overviews of technology, specifications and marketing/sales. Newscast is the ACPA's monthly e-news that details regional activities and current events with contacts and links.

ACPA's medium-term education programs include P^3 training for members and engineers, an installation program that is delivered locally for contractors, and plant tours by producer members to selected audiences, so that information and knowledge-sharing is tailor-made. The P^3 program focuses on technical, sales and marketing training and offers PDHs for engineers. The program can be completed in less than a year. ACPA's *Contractor Installation Training* was requested by many DOTs, and is being delivered upon request.

There is a need for a long-term education program for people interested in starting careers in the concrete industry, or advancing their knowledge gained through experience. ACPA fulfills that need through a partnership with Middle Tennessee State University and its Concrete Industry Management (CIM) department. The school now offers an executive MBA degree in CIM through the Jennings A. Jones College of Business at Middle Tennessee State. CIM is the home of the program that trains future leaders of the concrete industry.

Since the 80s, ACPA has strengthened its education programs to share information, knowledge and skills throughout the concrete pipe industry. ACPA offers the most complete choice of short, medium and long-term education opportunities for people wishing to enjoy a successful career in the concrete pipe industry. Successful careers are knowledge-sensitive. If you want to succeed you need to know your product or service, and those of your competitors better than anyone. ACPA has the means to meet the charge *to help members be more effective in increasing the market share of precast concrete pipe and boxes* through its 21st century education programs.

Concrete Pipe and Boxes Specified for Logan Canyon Irrigation Channel

By Randy Wahlen, P.E., Marketing Engineer
Oldcastle Precast, Inc., North Salt Lake, UT
Randy.Wahlen@oldcastle.com

Oldcastle Precast[1] supplied nearly 10,000 feet of steel reinforced, precast concrete culvert and pipe for Utah's Cache Water Restoration Project (CWRP)[2]. The project involved the reconstruction of approximately six miles of mostly open, unlined channels that make up the Logan, Northern, Hyde Park and Smithfield canals. The project incorporated a concrete pipeline, box culvert, a section of pressurized pipe, metering systems, turn-outs, head gates, and improved maintenance access. A fatal landslide in 2009 killed three people in a house below a section of the irrigation canal. The tragedy prompted a total reconfiguration of the canal system.

Irrigation water is channeled into a box culvert that flows under U.S. Highway 89 and proceeds along the north wall of Logan Canyon. This canyon section of canal needed repair to alleviate leakage. There was uncertainty about fitting a precast reinforced concrete box culvert into the canal carved into the canyon cliffs over 100 years ago. At its widest, the open canal was approximately 14 feet with steep cliffs rising above the canal and sharp drop-offs to the state highway below. A precast box culvert with "bevels" would solve this problem.

Designers beveled the majority of the box segments so that the culvert could "snake" along the alignment, without elbows, transition vaults or closure pours. Oldcastle Precast designed and purchased new "headers" that could angle one side of the precast box so that a series of bevels would form a curve. The largest bevel provided an eight-inch drop in length when measuring opposing sides of the box. The joint at the end of each bevel was the same as straight box sections, so that there were no extra requirements at the joints.

To fit the numerous curves in the canal alignment, boxes were designed in ½-inch increments with bevels ranging from ½ inch to 8 inches. The bevels had to be designed as "curve to the left" or "curve to the right" and each box had to be numbered and installed in a series to avoid deviation from the alignment.

The installation progressed rapidly with the contractor averaging over 15 sections per day in winter conditions with only one access to this section of the project. Box sections and bedding had to be transported 3,000 feet along the canal at the start of the section. The culvert was backfilled with 6 inches of road base for a maintenance access road and a recreational trail. The CWRP was completed under budget and ahead of schedule. Early reports indicated that metering showed almost no water loss over two miles of the concrete box culvert and pipe.

The CWRP team included the owner, Cache County, NRCS[3]; program manager J-U-B Engineers, Inc.[4]; design engineers Montgomery Watson & Harza[5] and Hansen, Allen & Luce, Inc.[6]; and contractor Whitaker Construction Co[7].

LINKS

1. www.oldcastleprecast.com/Pages/default.aspx
2. www.cachewater.com
   www.youtube.com/watch?v=HtP8K2rjLgQ
3. www.nrcs.usda.gov/wps/portal/nrcs/detail/ut/programs/?cid=nrcs141p2_034041
4. www.jub.com
5. www.mwhglobal.com
6. www.hansenallenluce.com
7. www.whitcon.com

Learn More About Buried infrastructure

- **Keyword Search on American Concrete Pipe Association Website**
  (box, culvert, irrigation, channel, Utah)
  www.concrete-pipe.org
- **Concrete Pipe Design Manual**
  www.concrete-pipe.org/pages/design-manual.html
- **Concrete Pipe News**
  www.concrete-pipe.org/pages/cpnews.html

Culvert backfilled with 6 inches of road base for a maintenance access road and recreational trail.


66-inch diameter low pressure RCP supplied by Oldcastle Precast for the "Valley" segment of the CWRP.

Over 15 sections per day in winter conditions, with only one access to the project and limited installation space.

Photos: Randy Wahlen, Oldcastle Precast

Nine parallel lines of concrete pipe, each 128 feet long.

271,000 gallons of storm water had to be released at a pre-determined rate.

Storm Water Storage and Release Controlled with Concrete Pipe Structure

By Rick Beall,
Rinker Materials – Concrete Pipe Division CEMEX
RBeall@cemexusa.com

Stormwater management was the first regulatory consideration for the development of Canton Crossing, a new shopping center located close to the Inner Harbor in Baltimore, Maryland. The developer, BCP Investors, LLC[1] of Baltimore hired Century Engineering[2] to design the 31-acre site for a commercial development that would include a Harris Teeter grocery outlet and a Target store. Concrete pipe[3] was the product specified to manage storm water to be stored on site and slowly released into the city's stormwater management system.

It was important to conserve as much surface area as possible for the construction and servicing of the two anchor stores, as well as an additional 30 stores and restaurants planned for the Crossing. In addition, there was design consideration for soils that had become unfavorable for development due to previous business operations. The BCP development was once the site of a bustling industrial area. Some of the lands in and around Canton have been transformed into light commercial and residential areas prompting a surge in the need for commercial developments for residents moving into the city.

Century Engineering needed a product for managing storm water that could withstand soil conditions that had changed due to past industrial activities, and securely store up to 271,000 gallons of storm water to be released at a pre-determined rate. Since the structure would be located under an area designed for a parking lot, it would need to be constructed with products and material that could endure the weight of trucks and automobiles. The design engineer specified a manifold storage system[4] which consisted of nine parallel lines of concrete pipe, each 128 feet long. This system needed to be as water-tight as possible, stable, and resistant to aggressive soil conditions. Standard reinforced concrete pipe has the capability to withstand varying weight and soil conditions.

Gray and Son, Inc.[5], a local contractor from Timonium, Maryland contacted Rinker Materials[6] of Frederick to supply the pipe used to install the manifold storage system. Rinker Materials supplied 1,152 feet of 72-inch diameter Class 3 concrete pipe, complete with a water-tight O-ring joint using a neoprene gasket to allow the manifold system to withstand the harsh soil conditions.

LINKS

1. http://ctfirms.us/bcp-investment-llc.326770.company#top_info
2. www.centuryeng.com
3. www.concrete-pipe.org/pages/why.html
4. www.concrete-pipe.org/brochures/underground_storm_water.pdf
5. www.graynson.com
6. www.rinkerpipe.com/default.shtml

Learn More About Buried infrastructure

- **Keyword Search on American Concrete Pipe Association Website**
  (storm, storage, retention, detention, manifold)
  www.concrete-pipe.org
- **Concrete Pipe Design Manual**
  www.concrete-pipe.org/pages/design-manual.html
- **Concrete Pipe News**
  www.concrete-pipe.org/pages/cpnews.html

Photos: Courtesy of Rinker Materials – Concrete Pipe Division CEMEX

Precast Concrete Box Culvert Redesigned for Florida Railway

By David L. McClintock, P.E.,
Florida Technical Resource Engineer
Hanson Pipe and Precast
david.mcclintock@lehighhanson.com

Plans for the replacement of an existing single track railroad bridge and widening of the rail bed for a second siding track on the Jacksonville Florida Division of CSX Transportation[1] mainline along SR 39 south of Zephyrhills had to be redesigned after engineers at Hanson Pipe and Precast[2] reviewed the specification for a double-cell box culvert. The first design specified a monolithic double-cell box with 8-foot span x 4-foot rise cells. The 46 foot long culvert was laid out as four 8-foot long inside units and two 7-foot long outside units with integral headwalls 15 inches high by 12 inches wide.

Hanson engineers observed that the section weight was 4.54 tons per linear foot, resulting in a unit weight of 36.3 tons. This weight would be a major issue for precast fabrication, trucking and onsite construction. The units exceeded the crane capacity of the precast plant and would have required special permits for hauling, since they exceeded legal load weight. In addition, the units would require a crane of significant size for installation.

CSX engineers favored a precast box culvert because there was a window of only 10 hours to cut and remove the existing track, remove the existing wooden beam and abutment bridge, install the new structure, and replace the track before the next train. There was a set budget for the replacement work.

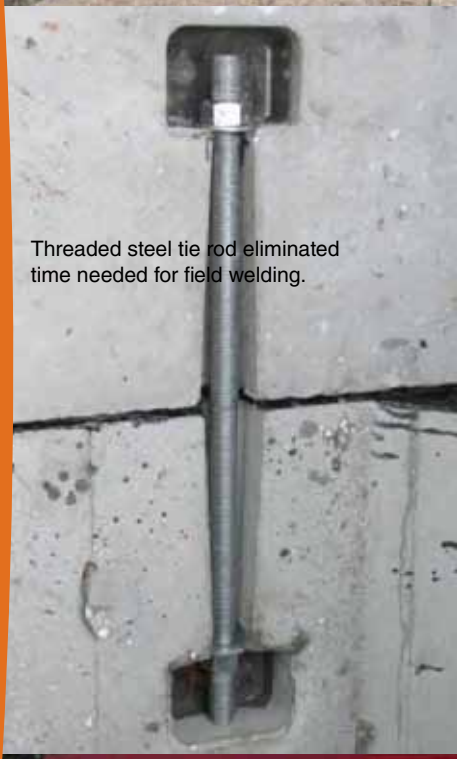
Hanson engineers proposed a redesign acceptable to the American Railway Engineering and Maintenance-of-Way Association (AREMA)[3] – twin 7-foot span by 4-foot rise precast boxes to be installed side by side. The 48 foot long structure was laid out as twin culvert with four 8-foot long inside units and two 8-foot long outside units and 18-inch high by 12-inch wide integral headwalls. The original cast-in-place wing walls were redesigned as 8-foot long precast units with straight, slope-tapered walls on a precast floor, making the complete precast structure 64 feet long. The precast box cross section had 12 inch top and bottom slabs and 12-inch side walls with 8-inch haunches, resulting in a unit weight of 15.3 tons (16.3 tons with headwalls). The precast wing walls weighed 9.6 tons each.

The redesigned structure had approximately 60 tons less concrete than the original specification (a reduction of more than 20%). The steel mesh reinforcing was more structurally efficient than the steel rebar design, resulting in less reinforcing steel per foot. The decrease in raw materials and subsequent transport costs helped keep the project on budget, while simplifying installation.

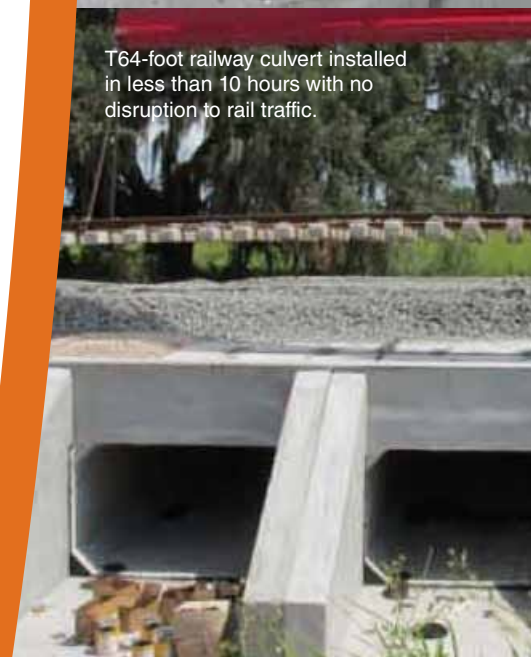
Motion of trains over the minimal-cover culvert could cause the units to separate, so Hanson and CSX determined that a threaded steel tie rod in a preformed pocket would solve the problem. The connection would eliminate time needed for field welding. Four steel tie rods were installed across each joint, two in the bottom slab inside surface and two in the top slab outside surface.

The project teamwork between Hanson, R. L. Patterson and Associates[4] and CSX resulted in a culvert design that was subsequently specified for a similar bridge replacement in Callahan, Florida designed by Transystems of Jacksonville.

Twin 7-foot span by 4-foot rise precast boxes installed side by side.



Threaded steel tie rod eliminated time needed for field welding.



T64-foot railway culvert installed in less than 10 hours with no disruption to rail traffic.

LINKS

1. www.csx.com
2. www.hansonpipeandprecast.com
3. www.arema.org
4. www.jlpatterson.com

Learn More About Buried infrastructure

- **Keyword Search on American Concrete Pipe Association Website**
  (box, culvert, joint, railway, rail, AREMA)
  www.concrete-pipe.org
- **Concrete Pipe Design Manual**
  www.concrete-pipe.org/pages/design-manual.html
- **Concrete Pipe News**
  www.concrete-pipe.org/pages/cpnews.html

Photos: David McClintock, P.E.

Trenchless Methods for Installation of 600mm to 900mm Diameter Pipelines in Winnipeg

By Derek Light, P.Eng.
Inland Pipe (Winnipeg)
derek.light@lehighhanson.com

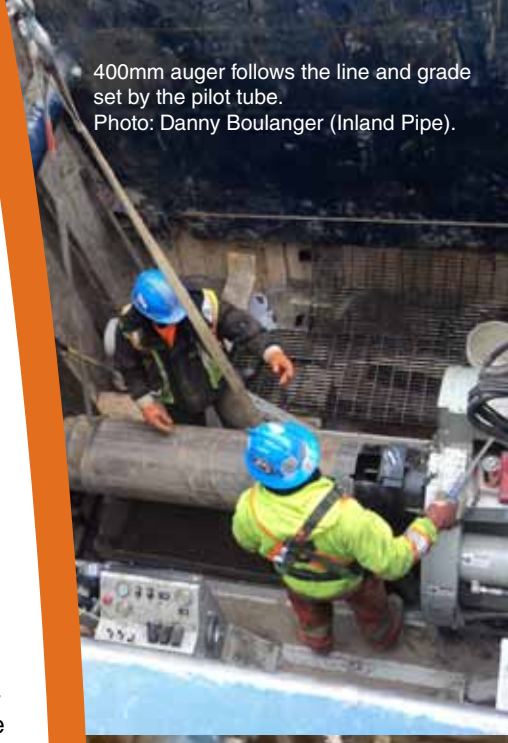
Winnipeg's Basement Flood Relief and Combined Sewer Overflow Relief Project[1] was initiated in 1977 to mitigate basement flooding, and improve surface water quality by reducing the frequency of combined sewer overflows. The installation of separate storm and sanitary sewers was considered the most cost effective solution. Borland Construction[2] was the contractor for Contracts 2 and 3 of the first phase of a $100 million dollar project which included the Jefferson East residential area of Winnipeg, Manitoba. The contractor used a combination of trenchless methods to install 600mm to 900mm diameter concrete pipelines through granular deposits. Due to low cohesion and high strength, granular soils are more difficult to tunnel than fine soils. The added pressures associated with the soil conditions were considered when determining drive distances.

One of the streets in the residential area follows the primary dike that has protected the area from flooding since the 1950s. Open cut excavation was not an option because of existing buried and surface infrastructure and close proximity to the primary dike. Trenchless installation methods[3] were most appropriate for the new sewers.

Throughout the project the drive lengths ranged between 70m and 114m. The accuracy of each drive was recorded and never exceeded 5mm on the vertical or horizontal axis. Pilot tubes were pushed from the access shaft to the reception shaft, and monitored with a theodolite to maintain line and grade. Once line and grade were established, a 400mm auger with a steel casing was attached to the pilot tube to excavate the soil for the concrete pipeline. As the excavation advanced, concrete pipe was jacked behind the cutting face until it reached the reception shaft.

Drive lengths were a major concern, since added skin friction increased the axial pressure. Plywood rings were fabricated to help pack the joints and cushion the load at the joints. Steel banding was used on the outside of the bell to increase the tensile strength of the joints. Design procedures outlined in ASCE Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction (27-00)[4] were used to calculate the maximum permissible jacking thrust and compressive stress for both concentric and eccentric loading conditions, and the angular deviation from the centerline and the associated eccentricity of the jacking thrust force (the angle off the centerline that results in eccentric conditions).

The calculations showed that the drives had to be as close to concentric as possible, so that the maximum axial thrust capacity of the pipe was not exceeded. The eccentric thrust capacity of the pipe is lower than the maximum thrust of the microtunneling machine, therefore an eccentric drive was not an option. The accuracy and precision of Borland's excavation method using concrete pipe allowed for longer drive lengths and increased efficiency at a lesser cost.



400mm auger follows the line and grade set by the pilot tube.
Photo: Danny Boulanger (Inland Pipe).

Concrete pipe prepared for installation using the trenchless method
Photo: Borland Construction

750mm diameter banded reinforced concrete jacking pipe.
Photo: Danny Boulanger (Inland Pipe)

LINKS

1. http://winnipeg.ca/waterandwaste/pdfs/sewage/publications/CSOMgmtStudy/publicReports/ph1-report.pdf
2. www.manta.com/ic/mt6frv1/ca/borland-construction-1989-limited
3. www.concrete-pipe.org/pdfdd/DD_4.pdf
4. Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction (27-00) http://www.asce.org/Product.aspx?ID=2147487569&ProductID=181375135

Learn More About Buried Infrastructure

- **Keyword Search on American Concrete Pipe Association Website**
  (trenchless, jacking, tunneling, concrete, microtunneling, combined sewer overflow)
  www.concrete-pipe.org
- **Concrete Pipe Design Manual**
  www.concrete-pipe.org/pages/design-manual.html
- **Concrete Pipe News**
  www.concrete-pipe.org/pages/cpnews.html

Standard GRP-lined jacking pipe coated with coal tar epoxy for sanitary sewer conveyance system in Bahrain.

4,347 meters of lined and unlined reinforced concrete jacking pipe coated with coal tar epoxy.

GRP-lined manholes for PS 70 interceptor sanitary trunk sewer system

QCast Products at Work in the Middle East

By Nasser Kammar, Doha Precast Factory
nasser.kammar@dohaprecast.com

The American Concrete Pipe Association offers an on-going quality assurance program to member and non-member companies. The "Quality Cast" Plant Certification Program[1] covers the inspection of materials, finished products and handling/storage procedures, as well as performance testing and quality control documentation. Plants can be certified in storm sewer and culvert pipe, sanitary sewer, box culverts, three-sided structures, manholes and precast structures. The reach of the program is far and wide. In the Middle East, Doha Precast Factory[2] embraces the QCast Program to supply projects in Qatar and Bahrain with high quality concrete pipe.

The Muharraq sewage treatment plant and flow conveyance scheme[3] in the Muharraq area of Bahrain is a 27-year Build Own Operate and transfer (BOOT) scheme to collect and treat waste water to a high standard suitable for the treated effluent to be reused. The project includes intercepting 24 existing pumping stations and diverting the flows through new wastewater connection networks to a 16km long, 1.8m diameter micro-tunnelled deep-gravity sewer which discharges to a terminal lifting station located at the head of the new sewage treatment plant. The new deep-gravity sewer has an intermediate lift station about half way along the route that lifts the flow so that its depth does not exceed 15m below ground level. Doha Precast Factory supplied standard jacking pipe lined with glass reinforced plastic (GRP) in diameters ranging from 1000 to 1800mm from December 2012 through December 2013.

Doha Precast Factory (DPF) supplied 3000mm lined and unlined jacking pipe from October, 2012 to June 2013 for the Lusail Expressway Package 1 project[4] in Lusail, Qatar. The pipe was used for construction of a pipeline system for the conveyance of storm water. The project involves construction of a 5.3 km road comprising about 16 lanes, some of which will reach up to two or three levels, including three major interchanges, slip roads, underpasses and a bicycle lane, as part of the 12 kilometer long expressway. DPF supplied 1,427 meters of 2500mm HDPE-lined jacking pipe and 2,920 meters of 3000mm unlined jacking pipe, externally coated with coal tar epoxy.

In mid-2012, DPF also supplied 45 pieces of 1800 and 280 pieces of 2800mm of QCast-certified manholes for the construction of Pumping Station 70 (PS 70), a major facility in an interceptor sanitary trunk sewer system in Doha, Qatar. The aim of the project is to pump, lift, and forward sewage to a treatment plant. PS 70 is a lifting pumping station with a shaft 40 meters deep and 40 meters wide. The coal tar epoxy-coated and GRP-lined manholes with a 400mm wall thickness are reinforced and gasketed.

Over 50 plants have become certified by ACPA's Quality Cast Plant Certification Program in North America and abroad. To receive certification, plants must meet all the requirements of the QCast Certification Manual and demonstrate compliance by agreeing to a third party audit.

LINKS

1. www.concrete-pipe.org/pages/qcast.html
2. www.dohaprecast.com/
3. http://ifclmedia.com/feeds/?p=2430
4. www.nce.co.uk/news/transport/qatar-receives-bids-for-lusail-expressway/8618334.article

Learn More About Buried Infrastructure

- **Keyword Search on American Concrete Pipe Association Website**
  (storm, sanitary, sewer, jacking, lined, manhole)
  www.concrete-pipe.org
- **Concrete Pipe Design Manual**
  www.concrete-pipe.org/pages/design-manual.html
- **Concrete Pipe News**
  www.concrete-pipe.org/pages/cpnews.html

Photos: Courtesy of Doha Precast Factory

American **Concrete Pipe** Association
8445 Freeport Parkway, Suite 350
Irving, TX 75063-2595

www.concrete-pipe.org

PRESORTED
STANDARD
US POSTAGE PAID
DALLAS, TX
PERMIT NO 1883

Concrete Pipe....
Proud Past devoted to the
FUTURE

ACPA 2014 Pipe School

February 11 - 14, 2014
Houston, Texas

Please visit the following link for more information
www.concrete-pipe.org/pages/pipe-school.html.

Save this link www.concrete-pipe.org/pages/cpnews.html to your favorites list to increase your knowledge about drainage applications and innovative ways to use precast reinforced concrete pipe and boxes to build structures that will last.