GEOQUEST

TechSpan®

Whether it is a new build or replacing an old bridge, the design and durability of TechSpan® precast arches are **the perfect fit for any short-span bridge project.**

The segmental precast arch from Geoquest

Team Gushue Highway – Waterford River

The Waterford river has a swift current and is located in a meandering gorge. Access to the site was extremely difficult.

A 63 m long, 11 m span TechSpan® concrete arch structure supports 19 m of overburden allowing the highway a level crossing of the gorge and river.

TechSpan®

The segmental precast arch from Geoquest

TechSpan® is a state-of-the-art, three-hinged, buried precast concrete arch system. It typically consists of half-arch units that meet at the crown, supported by a footing sized for site-specific foundation conditions. The backfill around the arch contributes to the resistance of the entire structure, constraining lateral deflections of the arch under vertical loads (soil-structure interaction).

Ideally suited for the construction or replacement of railway or road bridges spanning up to 23 m plus, as well as water culverts and mining/industrial access tunnels, TechSpan® precast arches provide all the benefits of precast concrete structures **plus** a number of additional advantages over the other culvert, bridge or arch systems.

Rapid, simple and predictable installation

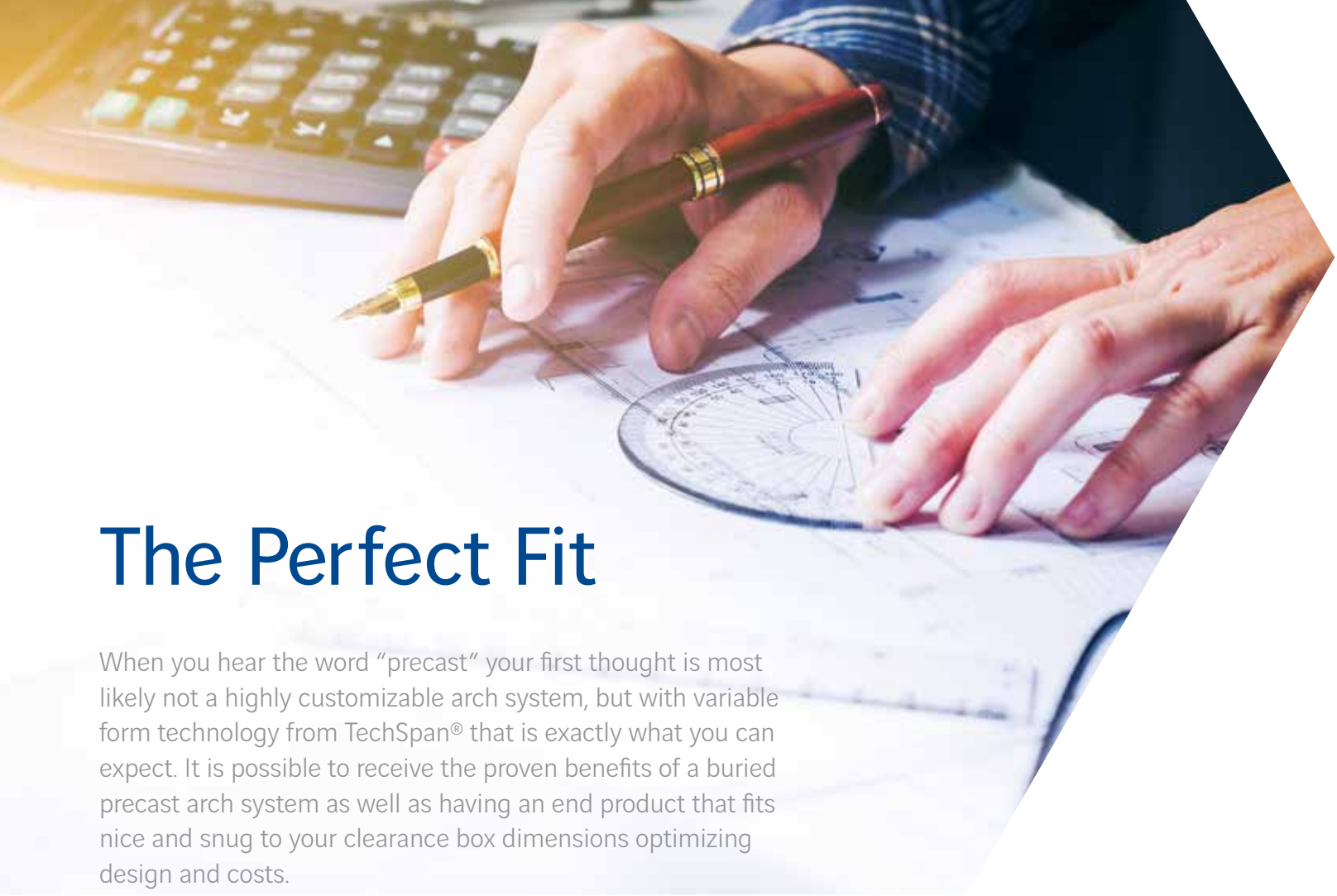
- No scaffolding or formwork
- Panels installed one at a time requiring a small crew and only one crane after the first half day
- Uninterrupted flow of traffic or stream below

Unique precasting methods conforming to any shape without being limited by set precast form sizes.

Comprehensive technical service, high-quality materials, timely design, and professional construction assistance all from Geoquest.

These advantages have translated into the most reliable, cost effective, precast arch system with more than 2000 installations worldwide.

GEOQUEST



The Perfect Fit

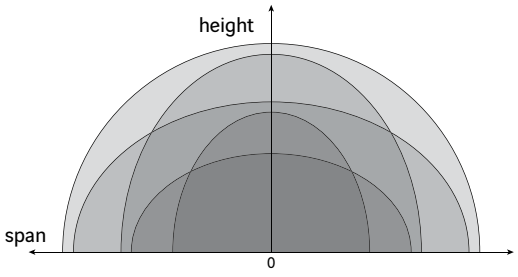
When you hear the word "precast" your first thought is most likely not a highly customizable arch system, but with variable form technology from TechSpan® that is exactly what you can expect. It is possible to receive the proven benefits of a buried precast arch system as well as having an end product that fits nice and snug to your clearance box dimensions optimizing design and costs.

Engineering and Design

The engineering benefits of arches have been known for thousands of years, and explored most famously by the ancient Roman Empire. Materials and methods of design have evolved over the years, but the basic principles have remained the same.

The overburden load is carried along the arch from the top down to the base, in pure compression, with zero or minimal tension in the arch member. It allows for a very efficient design of the arch.

With accompanying retaining walls, the result is efficient load-carrying ability with minimal materials that provide high-performance bridges and tunnels.



With a variable radius form, TechSpan can be optimized to specific project requirements, thereby lowering costs.

Visit www.Precastarches.com and learn more about the benefits of working with TechSpan® for your next short-span bridge project, including new construction or replacement.

- High-quality control standards
- Structural superiority of the "arch" shape minimizes bending moments
- All construction stage loading verified during design
- Designed to clearance box dimensions
- Analyzed as a three-hinged arch
- Design verification using Finite Element Method Analysis, checks every stage of backfill
- Adaptability of span to site-specific requirements
- Flexible steel forming conforms to optimized shape

Optimized Shapes

For the ease of design Geoquest offers an extensive catalogue of proven optimized shapes. You can download CAD files right from **www.precastarches.com** and use them in your drawings.

Our TechSpan® catalogue contains shapes ideal for roadways, railways, and hydraulic applications, which we have organized into nine series. For each shape, we provide the main arch dimensions and the reactions at the footings for several load combinations and various backfill heights.

The shapes are provided with a simple naming convention. TS for TechSpan® arch, F for funicular shape, and a number that refers to maximum span—in centimetres—for that shape. Each span offers up several heights, which can be identified by a corresponding letter from "A" representing the minimum height of the arch to "J" representing the maximum height of the arch.

Our live and interactive web site, www.precastarches.com walks you through your design including factors of footing loads, clearance boxes, live load, seismic loads, and hydraulic design.

TS-F_2200/A

Main dimensions

Arch configuration (piece)	Double
Span - S (m)	19.75
Height - H (m)	5.50
Arch Thickness - AT (mm)	450
Arch Development - AD (m)	24.63
Element Weight per unit width (ton/m)	13.85

Hydraulic waterways

Wet surface - WS (m^2)	72.79
Wet perimeter* WP (m)	33.03

* dimensions given for 1 meter freeboard

Unfactored footing reactions

	Backfill height over crown (BH) - BH ≥ 1 m									
	Load combination	1 m		2 m		3 m		4 m		5 m	
		HR	VR	HR	VR	HR	VR	HR	VR	HR	VR
reactions (kN/m)	Arch SW*	113	149	113	149	113	149	113	149	113	149
	BL	301	653	448	885	595	1116	739	1344	882	1571
	LLA	470	843	611	1069	752	1291	891	1509	1030	1724
	LLE	498	939	621	1140	747	1343	874	1550	1003	1760
	SH**	192	689	518	951	794	1222	1019	1501	1195	1789
	SV**	316	772	542	1045	750	1322	942	1602	1116	1884

* Arch SW stands for arch self weight

** SH and SV stand for horizontal/vertical seismic inertial loads. Live loads excluded

Find this shape and more at **Precastarches.com,** or contact us to create an arch that is the perfect fit.

Duchesnay Creek Bridge

Replacing a crumbling bridge that had performed to its service life on highway 11, one of the most important arteries to interconnect communities across Northern Ontario.

The 14.6 m span by 4.5 m high precast concrete arch was installed for a length of 19 m, in approximately 11 hours.

A Small Crew Can Go a Long Way

The main advantage of the TechSpan® precast arch is the high speed at which it can be constructed with erection rates of 10 to 20 linear metres per day.

Installation in Four Simple Steps

1. Foundation Options

- Spread footing with Pedestal
- Pile Cap on Deep Foundation
- Spread footing
- Raft Foundation

2. TechSpan Erection

- Each segment lifted by crane and staggered to rest against half of the opposite segment
- Panels installed one at a time requiring only one crane
- Simple repetitive installation with a small crew and one crane

3. Grouting and Joint Treatment

- Grout is placed to fill the keyway to secure TechSpan elements at the footing and a crown beam to secure TechSpan elements at the top
- Joints can be covered with geomembrane or geotextile. Optionally the entire arch can be waterproofed

4. Backfilling and Headwall

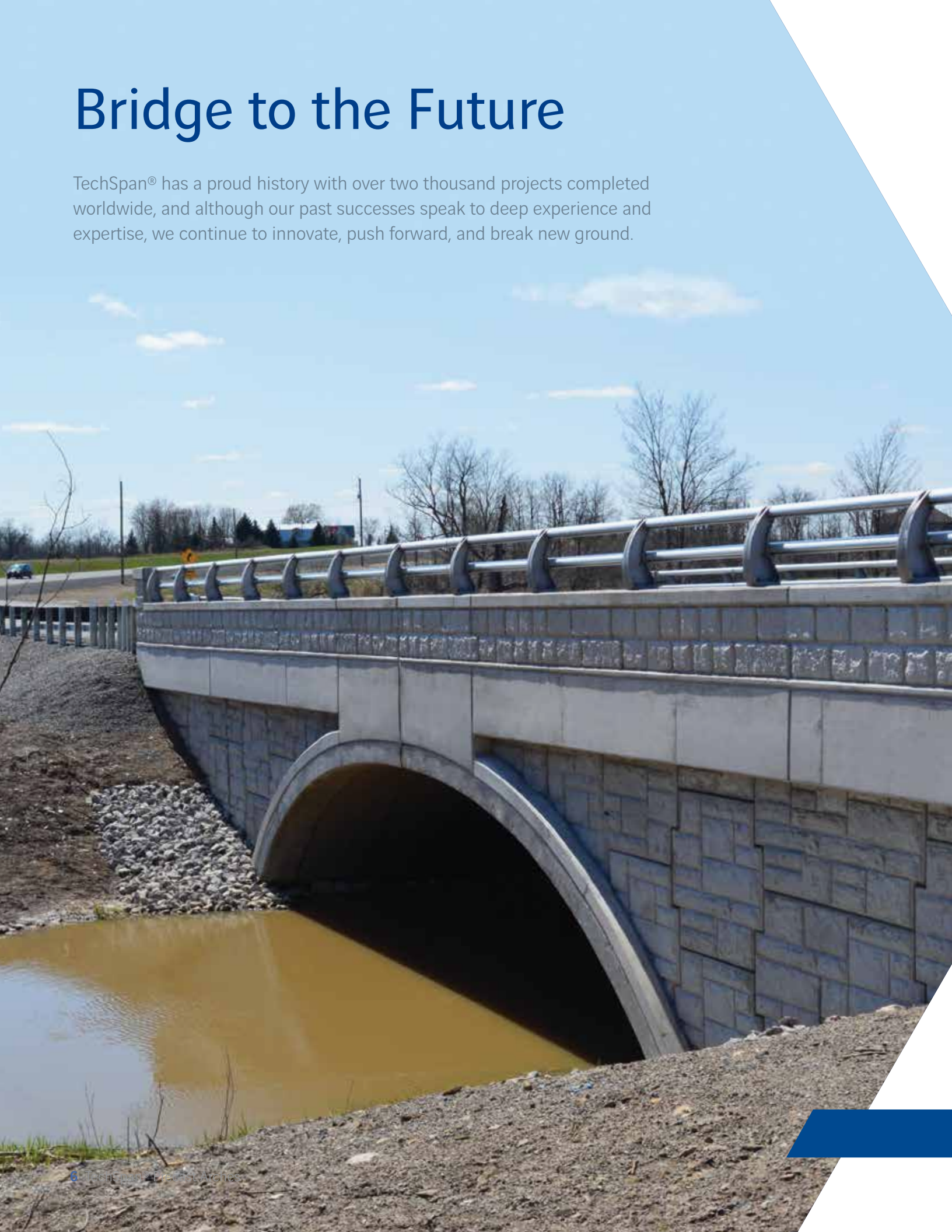
- The arch is backfilled to design height while headwalls and wing walls are constructed
- Headwalls and wingwalls are most economically achieved with Reinforced Earth® collar walls and wing walls

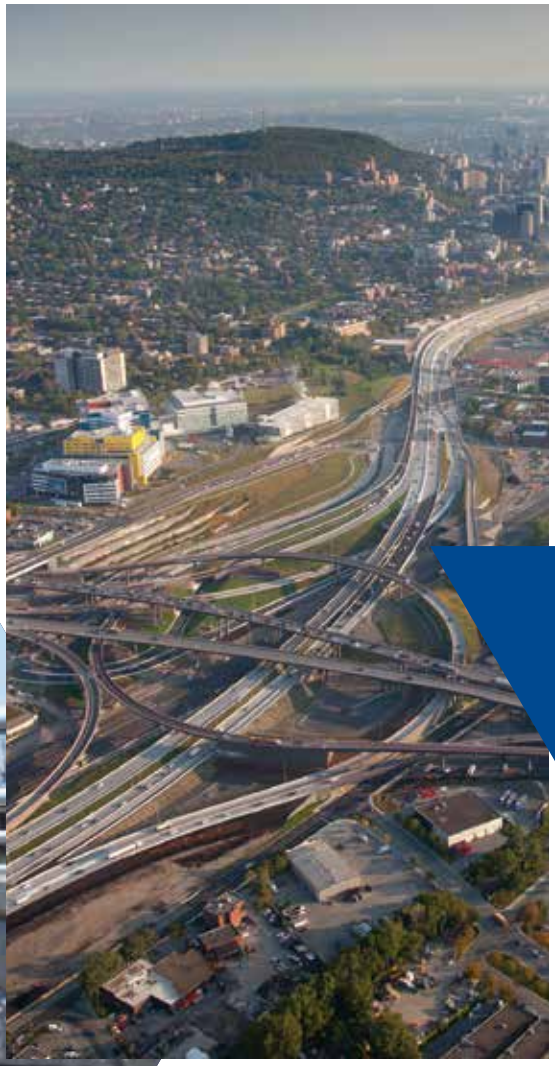
Advantages Over Short-Span Bridges

- Higher quality precast vs cast in place
- Easier construction
- In freezing temperatures, reduces bridge icing problems
- No girder bearings or expansion joints required, eliminating maintenance
- No scaffolding or bracing
- Cost savings

Bridge to the Future

TechSpan® has a proud history with over two thousand projects completed worldwide, and although our past successes speak to deep experience and expertise, we continue to innovate, push forward, and break new ground.





Canadian Highway Bridge Design Code

Geoquest is happy to announce that the design of our TechSpan precast arch product is now addressed in the Canadian Highway Bridge Design Code by the Canadian Standards Association, CSA. The 2019 release of the CSA S6:19, *Canadian Highway Bridge Design Code* now covers reinforced concrete buried arches. Section 7, Buried Structures, as of 2019 has a new subsection 7.9 Reinforced Concrete Buried Arches.

This Code subsection mandates design items including:

- Engineered fill
- Settlement
- Loads
- Concrete design (reference to Section 8)
- Minimum fill cover
- Seismic requirements
- Minimum thickness
- Foundation design
- Deflection
- Recommends a refined method of analysis such as the FEM used at Geoquest.

Pre-Approval by MTQ (Homologation)

The MTQ Homologation Status is a type of pre-approval, which will now allow the Geoquest Canada to provide contractors with a bid price (and subsequent design and supply) on projects where the Ministry of Transportation of Quebec (MTQ) sees a precast arch as an appropriate solution for a hydraulic or road crossing.

Homologation is defined as a generic approach to tendering of projects where the contractors bidding can pick from a short list of products that have met MTQ's pre-approval review prior to the tendering of the work.

Any homologated products must still meet all requirements of the Canadian Highway Bridge Design Code published by the Canadian Standards Association, (CSA).

Visit **Precastarches.com** to see how TechSpan is **the perfect fit** for any short-span bridge.

Holdich Arch

This structure was required to replace a section of road on Highway 23 North, which was washed out during the spring runoff.

Maximum soil cover over the crown of arch is about 18 m. The TechSpan precast arch was constructed upon spread footings.

Professional Services from Geoquest

Geoquest Canada formerly known as Reinforced Earth Company Ltd., established in Canada in 1970, offers one-source design and supply services from our on-staff professional engineers. In addition, we can provide technical expertise on footings, wingwall, and headwall construction. Full design and product liability insurance is provided on all projects.

Design Services

- Feasibility studies
- Written estimates
- Drawings

Construction Services

- Construction drawings
- Timely delivery to site
- On-site guidance

Consultation Services

- Available anytime from our on-staff professional engineers

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To contact us and learn more about Geoquest products and services please visit **geoquest.ca/contact**

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