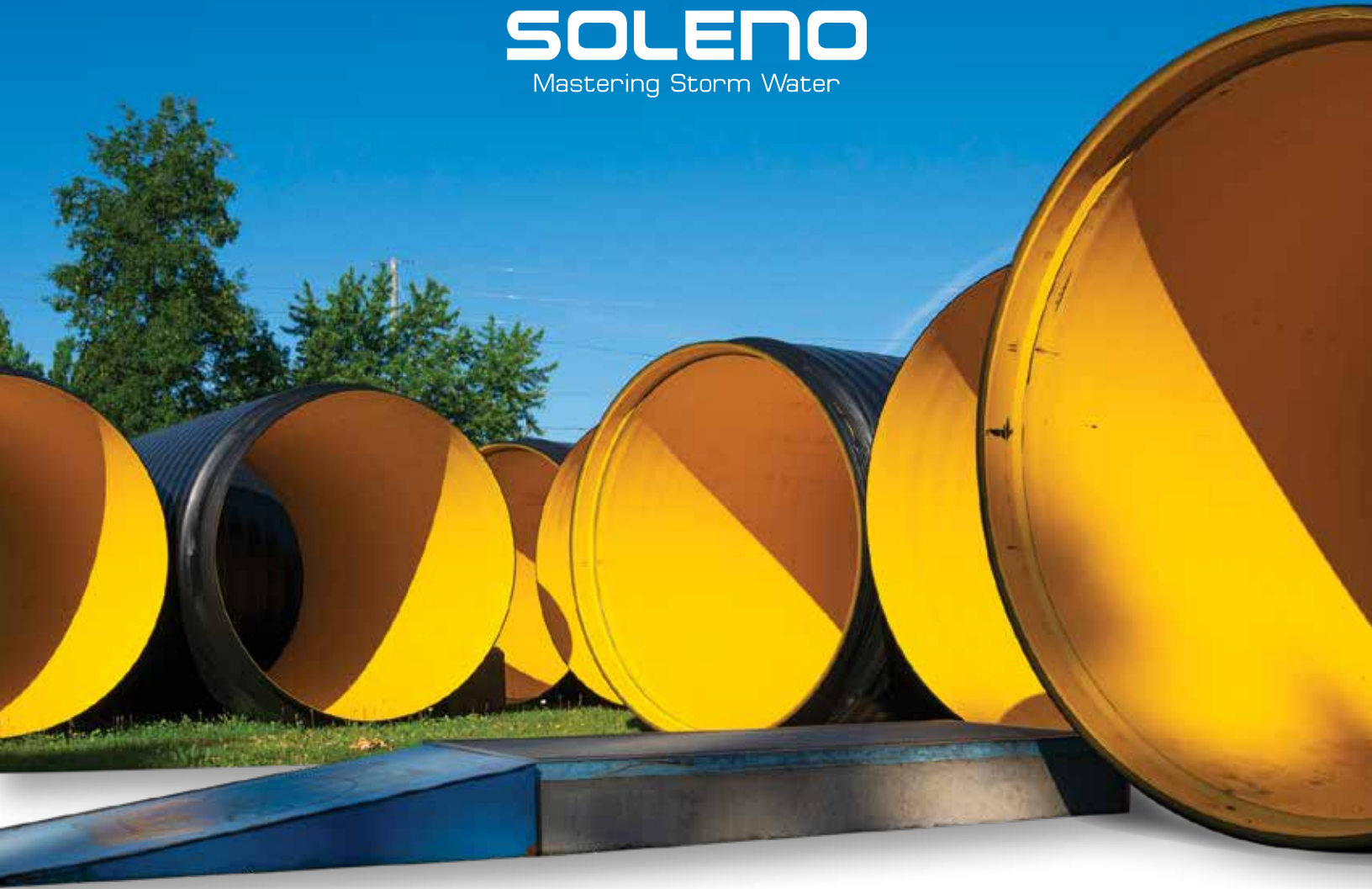




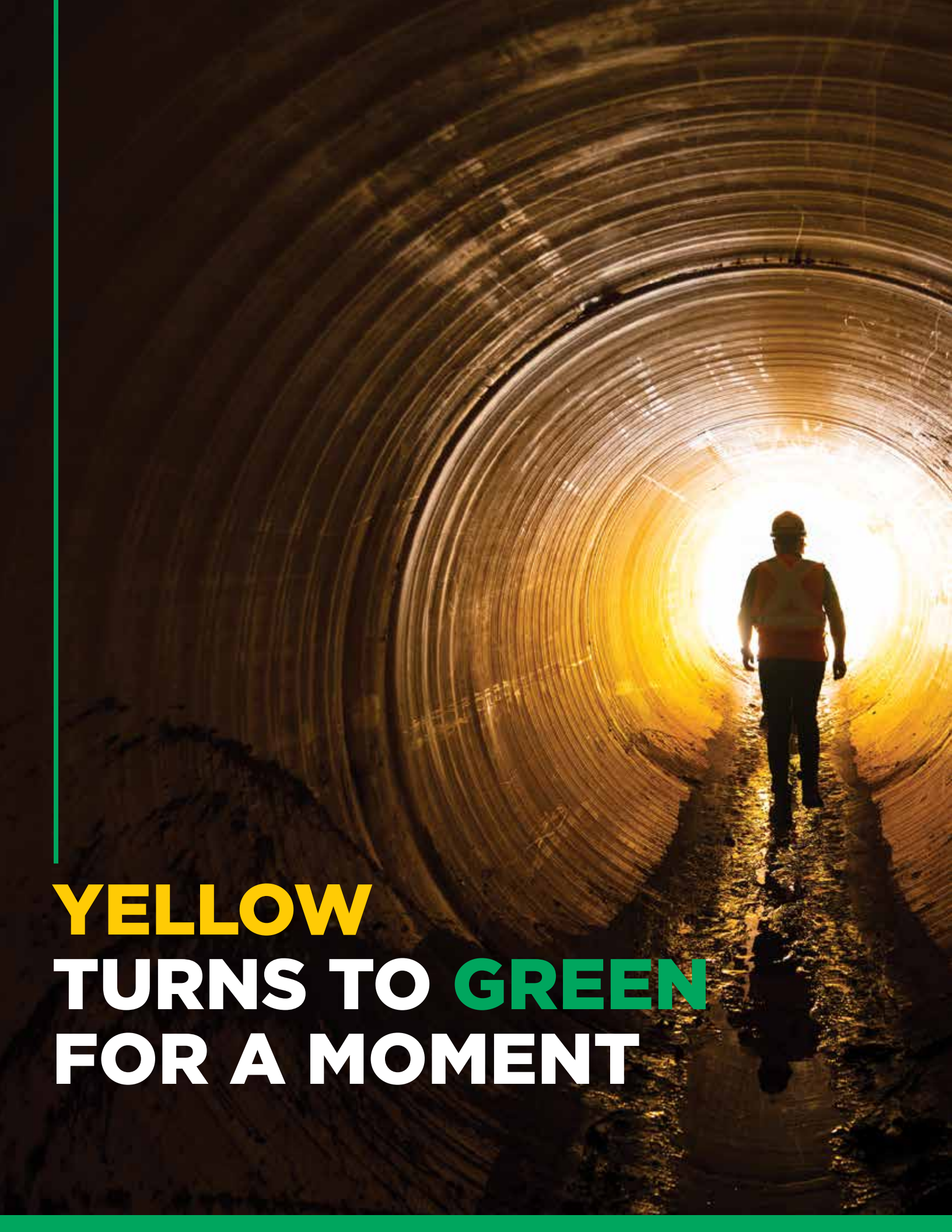
SOLENO
Mastering Storm Water



KRAH[™]
PIPES

KRAH[™] PIPES

.....
A Unique Technology



YELLOW
TURNS TO GREEN
FOR A MOMENT



KRAH™ was founded in 1968 by a young German engineer named Karl-Heinz Krah who over the years has developed great expertise in the field of thermoplastic pipes by associating with different pipe brands in Europe. **KRAH™** is now a major player in the **large-diameter** pipe industry and has 90 production lines installed in 34 different countries!

Always thrive to do better

Soleno was interested in **KRAH™** pipes for their **quality** and found that they offer a multitude of advantages such as variety of diameters, variety of joint types, and variety of design types while allowing Soleno to master the raw material.

Soleno's expertise in recycled material for the manufacture of pipes is an important asset for **KRAH™** and obtaining a **GREENER** product.

EXCLUSIVE

SOLENO is the **EXCLUSIVE** distributor
of the **KRAH™** series in Canada and the
eastern United States.



KRAH™ pipe

The KRAH™ pipe is made from 100% thermoplastic.
The Unique Technology

KRAH™'s **HDPE** pipe introduces a different concept. Resulting from an **ADAPTATIVE** process that allows the optimization of the pipe profile to meet the specific needs of the projects and applicable standards. This advantage allows custom manufacturing, relying on more than 100 different profiles to meet all needs.



Features and benefits

KRAH™ pipe is economical, lightweight, durable, quick to install, and has many advantageous features in addition to being the preferred alternative to traditional materials.

- Complete range offering diameters from 600 mm to 2400 mm and on demand from 300 mm to 5000 mm.
- Meets the requirements of both water mains and drainage pipes.
- Variable profiles adapted according to internal pressures or load applied to the pipe.
- Bell depth up to 125 mm.
- Resistant to de-icing salts, abrasives, chemical agents, and vibration.
- Quick installation since the pipes are very light and therefore easy to transport and handle.
- Allows for manufacturing of custom-made parts.
- Lifespan exceeding 100 years.

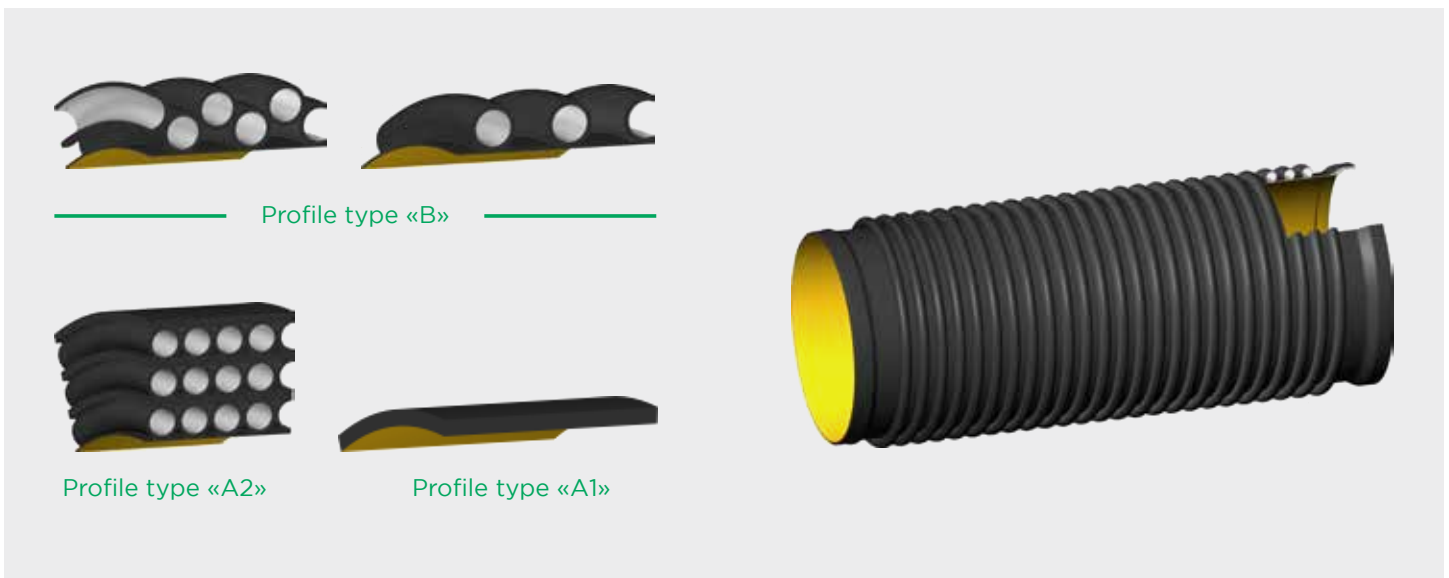


Profile types

More than 100 types of profiles available for the same pipe

Due to the **adaptive** process, it's possible to profile the pipe according to the specific characteristics of the site, while satisfying standards.

- › Smooth interior and corrugated exterior
- › Smooth interior and exterior
- › Double and triple profiles with smooth interior and exterior or not
- › Solid wall
- › Inner and outer walls may vary in thickness
- › The profile may vary every 200 mm
- › There are different core tube diameters: **21, 34, 42, 54, 65, 90, 110 and 112 mm**



HDPE material

High-density polyethylene (HDPE) is an extremely high-performance and durable material that can exceed a lifespan of 100 years.

- › HDPE is the most **environmentally-friendly** alternative for rainwater management.
- › This material stands out advantageously from concrete due to its **cost** and **low ecological footprint**.
- › HDPE resists **corrosion, abrasion, de-icing salts and vibration, which ensure the sustainability of the infrastructure**.



Connection types

KRAH™ offers a complete range of connections.

For a homogenous network and a reliable pipe system, several types of connections are available such as the plain end, bell and spigot, gasket bell, flange, and electro-fused joints.

Bell

- › Double gasket not installed
- › Waterproofing up to 15 psi
- › Spigot end no gasket
- › 125 m, spigot insert into bell

Electro-fused seals - *on demand*

The electro-fused joint system is the most preferred joint system, as the whole pipe system becomes a seamless unit. A welding wire that is included in the female part is heated using a special welding device, through which the two ends of the pipes are joined.

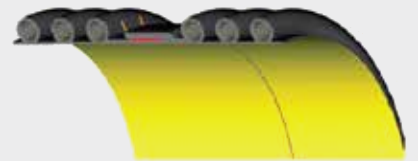
- › 125 mm nesting interlocking
- › High strength bell
- › Waterproofing up to 30 psi (higher value upon request)
- › The electrofusion wire is protected by a plastic film



Flange



Gasket bell



Electrofusion



KRAH™ pipe applications

Versatility, adaptability, and durability of KRAH™ pipes make them an excellent choice for most water management applications.

- › Sewers, collectors, and culverts
- › Manholes and pumping stations
- › Outfall pipelines
- › Insertion
- › Tanks and containers
- › Ventilation
- › Hydroelectric power plant intake



Installation

The KRAH™ pipe has features that make installation easier.

Made of **HDPE** and **polypropylene**, the pipes are very light, easy to transport and handle, and provide a significant speed of execution.

- › Lightweight sections simplify installation and handling
- › Pipes can be cut with a simple saw and produce no silica dust
- › Pipes with a significant section lengths of 5.7 metres can reduce the number of joints, reducing the risk of leakage, but also installation time
- › Requires no specialized equipment for installation



For your **CUSTOM-DESIGNED** projects, contact our technical service. They have been assisting you in all your projects **for over 20 years**.

CUSTOM-DESIGNED

Technical data

Diameters						Manning	Ring stiffness	Mass	Remblai minimum				Remblai maximum				
Nominal		Interior		Outside					RSC	kg/m	lb/ft	CL-625		E-80		CL-625	
mm	in	mm	in	mm	in	n						m	ft	m	ft	m	ft
500 ⁽²⁾	19,7 ⁽²⁾	500	19,7	595	23,4	0,009	250	on request	0,76	2,5			13,4	44,0			
600	23,6	600	23,6	695	27,4	0,009	250	34	22,8	0,76	2,5			10,7	35,1		
800	31,5	800	31,5	902	35,5	0,009	250	48	32,3	0,76	2,5			9,4	30,8		
1000	39,4	1000	39,4	1124	44,3	0,009	250	63	42,3	0,85	2,8			8,2	26,9		
1200	47,2	1200	47,2	1346	53,0	0,009	250	82	55,1	0,76	2,5			7,9	25,9		
1400	55,1	1400	55,1	1592	62,7	0,009	250	94	63,2	0,76	2,5			7,9	25,9		
1500	59,1	1500	59,1	1694	66,7	0,009	250	100	67,2	0,76	2,5	Available upon request ⁽¹⁾		7,9	25,9	Available upon request ⁽¹⁾	
1600	63,0	1600	63,0	1794	70,6	0,009	250	106	71,2	0,76	2,5			7,9	25,9		
1800	70,9	1800	70,9	1998	78,7	0,009	250	135	90,7	0,76	2,5			7,6	24,9		
2000	78,7	2000	78,7	2234	88,0	0,009	250	155	104,2	0,76	2,5			7,3	24,0		
2200	86,6	2200	86,6	2436	95,9	0,009	250	178	119,6	0,76	2,5			7,3	24,0		
2400	94,5	2400	94,5	2640	103,9	0,009	250	211	141,8	0,76	2,5			7,0	23,0		
3000 ⁽²⁾	118,1 ⁽²⁾	3000	118,1	3254	128,1	0,009	250	on request	0,76	2,5				7,0	23,0		

Note 1: The profile of the KRAH™ pipe can be designed according to the constraints specific to the project. The pipe can be manufactured according to a manufacturing standard adapted to the constraints. This datasheet defines data for closed profile KRAH™ pipe which meets ASTM F894 and has a RSC250 ring stiffness. Please contact your Soleno representative for specific needs.

Note 2: Those diameter are only available on request.



Meeting of standards

KRAH™ pipes are designed to meet the requirements of current international standards and ASTM F-894 and RSC 250.



Custom manufacturing

KRAH™ pipe can be custom-made, transformed and used in a variety of applications with its **adaptive process**.

Case studies

Use of KRAH™ pipes, a North American first

Rehabilitation of a storm sewer on Saint-Pierre St. in Joliette: A pipe that needs to be entirely replaced.

The installation of **KRAH™** pipes in Joliette for the upgrade of the storm sewer system under Saint-Pierre South St. was the first use of **KRAH™** products in North America. The City of Joliette, Sintra Inc, and Parallèle 54 chose to trust Soleno by opting for the large diameter **KRAH™** pipes which are durable, light, and easy to install.



Context

The work site offered limited space between neighboring homes to carry out the work, which involved replacing 350 meters of pipe at the bottom of a 7-meter deep trench. The pipe had to be able to carry a significant flow of water while withstanding the combined pressures of the weight of the overlying fill and the water table.



Solution

To meet the requirements of the engineers' specifications, Soleno's technical team proposed the use of 2200 mm and 2400 mm HDPE pipes manufactured by **KRAH™**.

Indeed, these pipes were perfect for the particularly complex specifications of the project. Their light weight made them easy to install, as they did not require a crane, as would be the case with a concrete pipe of a similar diameter. A simple excavator was all that was needed, greatly speeding up the operation, therefore cutting down costs drastically. Also, the high compressive strength of the pipes made it possible to withstand the high pressures that would be exerted on their external surface. Their large diameter and excellent roughness coefficient allowed them to easily accommodate the high-water flow that would be required to pass through the storm sewer system.



The benefits

The durability, lightness, and strength of HDPE

HDPE structures and pipes are much lighter than comparable concrete products, making their installation quicker and more affordable. In this project, **KRAH™**'s 2200 mm and 2400 mm pipes were on average 15 times lighter than the outdated concrete products being replaced. A unique feature of **KRAH™**'s technology is its method of manufacture, which allows the product design to be tailored to the unique specifications of a project. **KRAH™**'s 2200 mm and 2400 mm diameter pipes were smaller than their predecessors but could handle the same amount of water flow. Capable of withstanding the pressure of the overfill, the water table, and the frequent passage of cars on the roadway above, as well as corrosion, abrasion, and the effects of de-icing salts, **KRAH™**'s products will ensure the durability of the storm sewer system on Saint-Pierre Street South. Soleno supported its clients in the design, procurement, delivery, and implementation of this project with a dedicated technical team and a constant presence on the site. Once the proposal was approved, Soleno took charge of all the logistics and technical support required for the project to proceed smoothly. Soleno's Quebec ingenuity and international vision enabled it to provide an affordable and sustainable solution to a local municipality's problem.

EXCLUSIVE

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Our **expertise** is always **available**



At Soleno, our solutions excellence is based on our technical support and expertise developed over the years with designers, water system managers, and contractors responsible for the installation and maintenance of civil infrastructure.

Our engineers are available to assist you in identifying and implementing the best management practices to protect water resources that might be impacted by water runoff in urban or rural areas.



Visit soleno.com/en/produits/krah-pipe to learn more about **KRAH™** pipes. Installation video, installation guide, technical specifications, and quotes.



SOLENO HAS OBTAINED its **ECORESPONSIBLE** Certification - Level 2. **Performance** in sustainable development from the **ECORESPONSIBLE™** Program (Saint-Jean-sur-Richelieu plant only)



SOLENO EST CERTIFIÉE ISO 9001 (Usine de Saint-Jean-sur-Richelieu seulement)

Soleno is a member of:



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