



SOLENO

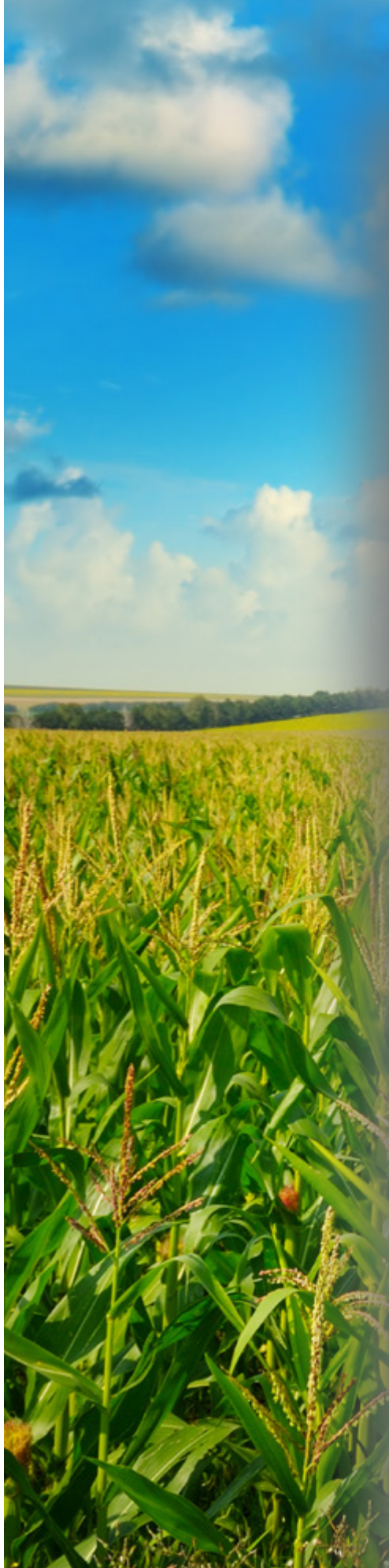
Mastering Storm Water

AGRICULTURAL DEVELOPMENT

OUR INNOVATIVE AND SUSTAINABLE SOLUTIONS FOR AGRICULTURAL LAND USE



OUR EXPERTISE



A PROUD HERITAGE

Soleno was founded in the late 1970s by the Lazure brothers, Germain and Roger. In 1989, Lazure and Poirier families, both recognized for their expertise in the field of agricultural drainage in Quebec, decided to join forces to create the Soleno company we know today.

Over the years, Soleno has developed an exceptional expertise in many markets, while remaining true to its origins. Because continuous innovation is an integral part of the company's values, Soleno now offers the most complete range of products for the agricultural drainage sector.

OUR INNOVATIVE SOLUTIONS FOR YOUR LAND

Planning an agricultural development project is of paramount importance in a comprehensive plan for storm water and groundwater management, erosion control and yield improvement. Poor water management on a parcel of land can cause numerous problems: late seeding in spring, difficulty harvesting in the fall, settling or compaction of the soil and a threat to crop survival. This is why Soleno offers complete and custom solutions for agricultural development.

Good agricultural subsurface drainage must promote gravitational drainage of water in farmland and help to control the groundwater level. With 3 perforation types and filter sheaths, Soleno offers the most complete range of agricultural products available, allowing you to create the most effective combination according to the granulometric analysis of your soil. The filter sheath plays a crucial role in preventing fine particles from migrating into the perforated drainage pipe and causing drain obstruction problems.

SUPPORT FOR AGRICULTURAL DEVELOPMENT

Actively involved in the agricultural sector since the beginning, Soleno became a major partner in the ALUS Montérégie program in 2016, a commitment of \$150,000 over five years. Launched by ALUS Canada and the Fédération de l'UPA de la Montérégie, this program aims to help and support agricultural producers in **improving water and air quality, and to encourage the implementation of developments that increase biodiversity.**

Because sustainable development and future generations are constant concerns, Soleno annually encourages the next generation of farmers through various activities, and proudly supports the initiatives of Quebec farmers to reduce the environmental footprint of their daily activities.

As a leader in sustainable solutions for stormwater control and management, Soleno is proud to invest in the future of agriculture.



PLANNING A PROJECT



STEPS BEFORE STARTING A DRAINAGE PROJECT

- 1. Choose a contractor**
- 2. Choose a designer to create the drainage plan**
 - Carry out topographical surveys
- 3. Perform permeability and iron ochre tests**
- 4. Carry out particle size analyses according to the following recommendations:**
 - Homogeneous soil:
1 hole per 5 hectares
 - Non-homogeneous soil:
3 holes per 5 hectares
- 5. Create a soil profile**
- 6. Design a drainage plan that includes:**
 - Drain spacing and layout
 - The choice of materials and filter sheaths
 - Slopes and soil profiles
 - Sizing of collectors
- 7. Establish a work budget, negotiate a contract for a turnkey project or shop for the materials with the quantities and types of drains listed in the plan**
- 8. Follow up with the contractor**

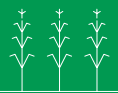
KNOW THE LAND YOU ARE CULTIVATING

Granulometric analysis is one of the key elements in the development of a good drainage plan. It consists of analyzing the type of soil and the size of the particles that compose it in order to choose the ideal sluice size and the appropriate filter sheath. Soil samples are analyzed in the laboratory to determine certain factors: the percentage of clay and D85. The D85 factor accurately indicates that the diameter of 85% of the soil particles analyzed is finer than this diameter.

The soil profile, another key element in the development of a drainage plan, is the responsibility of the designer. The creation of a soil profile will make it possible to assess the state of the soil and diagnose or highlight certain problems. Visual recognition of colour, compaction, perched groundwater or soil mixtures are examples.

The evaluation of these data facilitates the development of a detailed drainage plan. The contractor will then be able to carry out the work accurately and correctly. Your Soleno representative can help you select a laboratory to perform these analyses.





TRAINING SUPPORT

In recent years, the field of agricultural drainage has evolved considerably. New realities, such as climate change, new environmental standards, unusual amounts of water to drain, soil compaction, and increasingly massive machinery, are forcing the adoption of new practices. This is why Soleno offers training courses that meet the current challenges of agricultural drainage.

Our training courses are intended for farmers and agri-installers who wish to learn about the benefits of agricultural drainage, have drainage work carried out or undertake it themselves. Understanding the importance of good drainage and the challenges of the preparatory work, the



different steps and the products to be used are essential to ensure the success of a project.

Delivered by a group of engineers and consultants specialized in the agricultural field, our courses have trained more than 800 people from the agricultural sector. Soleno has also been collaborating with ITA, MAPAQ and Laval University for training in agricultural drainage.

OUR APPLICATIONS

AGRICULTURAL SUBSURFACE DRAINAGE

Our **complete range of perforated drains**, with or without filter sheath, **promotes gravitational drainage** of water in agricultural land after precipitation and **helps control the ground water level**.

According to the results obtained by a granulometric analysis, the choice of the right filter sheath to use will depend on the type of soil to be drained or the backfill material used.

COLLECTOR AND DRAINAGE OUTLET

Our **drainage pipes**, with or without filter sheaths, used as collector, collect water from several drainage lines to divert it towards a drainage outlet.

DRIVEWAY CULVERT

Our HDPE and steel **pipes** allow engineered structures in a ditch to **allow crossing between a public roadway and adjacent land** while ensuring the free flow of water.

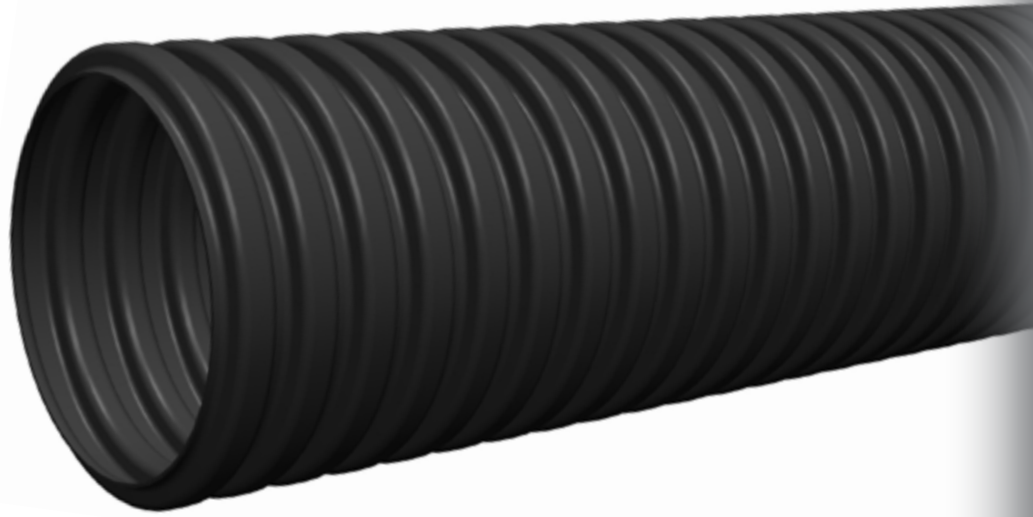
HDPE AND STEEL CULVERT

Our HDPE and steel **culverts allow crossing while ensuring the free flow** of water and **unrestricted movement of aquatic fauna**.

Product selection depends on the specified service life. **HDPE culverts** should be favoured when infrastructure longevity is the primary consideration. Availability of various diameters and hydraulic capacity (Manning's roughness coefficient, diameter and slope) must also be taken into account. Mainly used in the rural, forestry and mining sectors, **steel culvert** offers great flexibility in terms of non-standard lengths and are an economical solution for large-diameter pipes.



OUR DRAINS



TYPE 1 DRAIN (NON-PERFORATED)

Non-perforated flexible single wall pipe, with corrugated interior and exterior walls for agricultural subsurface drainage applications use.

—
Serves to **convey water** in order to minimize erosion on an extreme slope.

—
At the edge of a forest, a **Type 1** drain is ideal, as it **prevents roots from penetrating the drainage collector**.

—
The **Type 1** drain is recommended for **gravity flow of water towards an outlet**, for a drainage collector and outlet application.

PERFORATED DRAIN WITH OR WITHOUT A FILTER SHEATH

Perforated flexible single wall pipe, with corrugated interior and exterior walls for agricultural subsurface drainage and collector applications use.

—
Offered with a **filter sheath** or **not**, according to the results of the granulometric analysis:

- Nonwoven polyester with 100-microns openings

- Nonwoven polypropylene with 250-microns openings

- Woven polyester with 450-microns openings

—
Fits perfectly with our complete range of injected accessories, guaranteeing a high-performing and resistant assembly.



SAND SLOT PERFORATION

This drain's perforations are approximately **0.7 mm sluce**.



TYPE 2 DRAIN

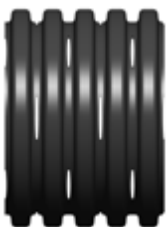
The **Type 2** drain perforations are **1.8 mm sluce**.



TYPE 3 DRAIN

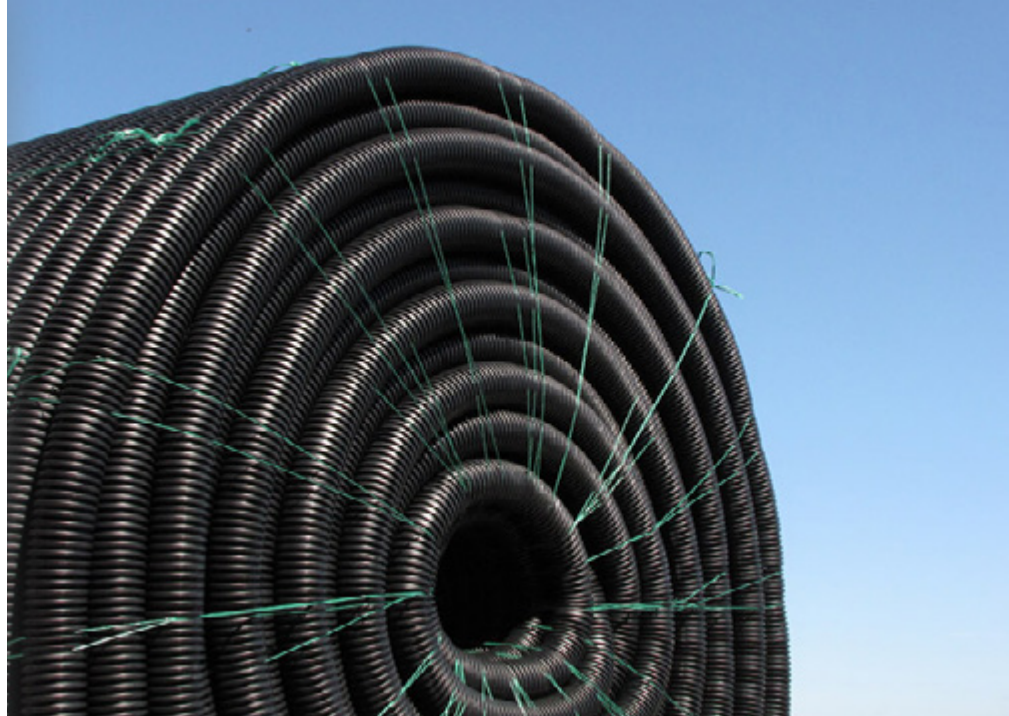
The **Type 3** drain perforations are **3.0 mm sluce**.

The **Type 3** drain should always be filtered when installed in agricultural land, due to the absence of clean stone backfill.



MEGA 3 (TYPE 3) DRAIN

The **Mega 3** drain perforations provide **more than 3.0 mm sluce**.



MEGA 3 DRAIN (TYPE 3)

In the presence of iron ochre, the shape and size of the **Mega 3** sluce reduce the possibility of clogging and obstructing the perforations and facilitate cleaning when necessary.

The **Mega 3** drain should always be filtered when installed in agricultural land, due to the absence of clean stone backfill.

THE MEGA 3 DRAIN ENABES MORE EFFICIENT AND FASTER AGRICULTURAL DRAINAGE!

33% more perforation area than Type 3 drain: the size and number of perforations of the **Mega 3** drain allow groundwater to be captured and evacuated as quickly as possible.

Increased protection during torrential rains: allows greater protection against damage caused by excess water.

Designed to guarantee maximum rigidity in the drain, while offering the largest perforation area than the **Type 3** drain.



Our range of drains, 100 mm to 250 mm (4 to 10 in) of diameter, was awarded EcoDesigned Product Attestation by the Council of sustainable industries (CSI).

OUR FILTER SHEATHS



CHOOSING THE RIGHT FILTER SHEATH

The filter sheath plays an important part in keeping fine particles from penetrating the interior of the perforated drainage pipe and causing drain obstructions. Soils, composed of different types of particles (silt, sand, clay or gravel), may have low permeability. The granulometric analysis, recommended by Soleno, determines the filtration openings required for the filter sheath to be used before undertaking a drainage project.

ADVANTAGES AND BENEFITS OF A NON-WOVEN GEOTEXTILE

- Due to their three-dimensional construction and filtration openings, non-woven geotextiles are versatile and allow the filtration of different soil types, unlike a woven geotextile which is limited to a single soil type.
- The main functions of non-woven geotextiles in an agricultural drainage application are filtration and drainage.
- Non-woven geotextiles follow the movements of the drain while maintaining their physical, mechanical and hydraulic properties; unlike knitting, they do not stretch or deform.
- Nonwoven textiles provide excellent tearing resistance.
- Its smaller openings prevent infiltration by fine particles.
- Non-woven geotextiles resist UV rays.

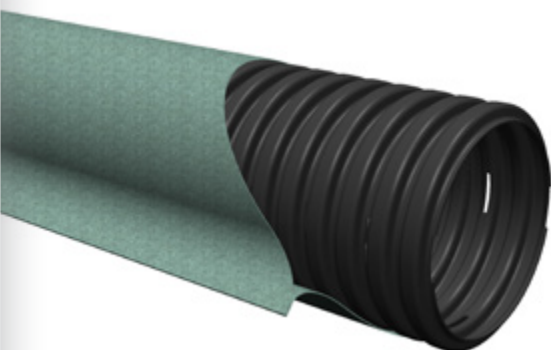




NONWOVEN POLYESTER - 100 MICRONS

Filter sheath for perforated and filtered drain with 100-microns openings

The nonwoven filter sheath, with 100-microns openings, is recommended when the results of the granulometric analysis clearly indicate a **sandy or silty soil** or when a draining sand is used as backfill around the drain.



NONWOVEN POLYPROPYLENE - 250 MICRONS

Filter sheath for perforated and filtered drain with 250-microns openings

The nonwoven filter sheath, with 250-microns openings, is recommended when the results of the granulometric analysis clearly indicate a **soil rich in fine and medium sand**.

More efficient for filtration and permittivity

—

Better water flow rate than other products such as 100-microns filter sheath. The latter prevents silting in a **sandy or silty soil**.

—

Superior rupture resistance, which reduces the risk of tearing and ensures that the product retains its properties.

—

Cleaning drains is much easier than with a 450-microns polyester filter sheath which is often more difficult to clean due to silting.



WOVEN POLYESTER - 450 MICRONS

Filter sheath for perforated and filtered drain with 450-microns openings

The woven filter sheath, with 450-microns openings, is recommended when the results of the granulometric analysis clearly indicate a **soil containing coarse sand to gravel**.



CHOOSE THE BEST COMBINATION

The choice of the preferred combination (type of drain perforations and filter sheath filtration openings) will depend on the results of the **granulometric analysis**.

TYPES OF SOILS	LEVEL OF D85 (particles size)				PRESENCE OF IRON OCHRE*
	Less than 20	Between 21 and 120	Between 121 and 400	More than 400	
Clay soil	(2) 2				
Sandy or silty soil		(2)	(2)		(M3) 3
Soil rich in fine and medium sand		(3) (M3)	(3) (M3) 3		(M3) 3
Soil containing coarse sand to gravel				(3) (M3)	(M3)

* Soleno recommends colorimetry and pH tests to determine the degree of contamination due to iron ochre.

SEVERAL FACTORS INFLUENCE THE CHOICE OF PRODUCT TO USE. TO SELECT THE RIGHT DRAINAGE PRODUCT, CONSULT OUR ONLINE TOOL THEPERFECTDRAIN.COM



COMPLETE RANGE OF PERFORATED OR NON-PERFORATED DRAINS

Our drains are available in the following **standard diameters** and **lengths**:

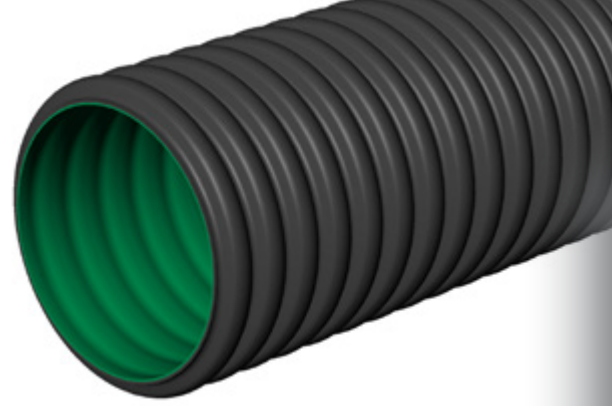
LENGTHS	DIAMETERS			
	100 mm (4 in)	150 mm (6 in)	200 mm (8 in)	250 mm (10 in)
30 m (98.4 ft)			① ② ② ② ②	
75 m (246.0 ft)	① ② M3 M3 M3 M3			
120 m (393.7 ft)			① ② ② ② ② ① ② ② ②	
300 m (984.3 ft)		① ② ② M3 M3		
600 m (1968.5 ft)	① ② ③ M3 M3 M3			
1200 m (3937.0 ft)	① ② ③ ③ M3 M3 ③			

* 300 mm (12 in) diameter available on request. ** Available in 30 and 45 m lengths, for 100 mm (4 in) and 150 mm (6 in) diameters, consult price list available at soleno.com/en/resource-center

LEGEND

- ① Non-filtered drain
- 100-microns
- 250-microns
- 450-microns
- SoliFlex
- ① : Type 1 drain
- ② : Type 2 drain
- ③ : Type 3 drain
- M3 : Mega 3 drain
- SoliFlex 250-microns





SOLIFLEX

**FLEXIBLE CORRUGATED DRAIN WITH SMOOTH INTERIOR WALL
25% MORE EFFICIENT THAN TRADITIONAL CORRUGATED DRAIN*.**

Provides a **better Manning's value** (0.012) than the standard corrugated drain, to **promote rapid water evacuation**.

Its smooth interior wall **minimizes sediment accumulation**, while greatly facilitating cleaning.

Offered with a **filter sheath of nonwoven polypropylene with 250-microns openings** or **not**, according to the results of the granulometric analysis.

Offered with **Type 1** perforations (non-perforated), **Type 2** (1.8 mm sluice) and **Type 3** perforations (3.0 mm sluice).

Now **certified to BNQ 3624-115** and conforms to the **National Building Code** of Canada.

*Calculated with a slope of 0.10%

OUR PRODUCTS

ADVANTAGES AND BENEFITS

It **fits perfectly** with the Soleno standard range of drainage accessories with external connections, ensuring **that the assembly will be high-performing and resistant**.

Being a flexible HDPE pipe that's **lightweight and durable**, it is easy to install and handle.

Its **green-coloured interior wall** distinguishes it from other standard corrugated drains and facilitates its inspection with a camera.

RECOMMENDATIONS

—
Type 1 SoliFlex drain is recommended for **water conveyance** that requires no collecting.

—
Type 2 SoliFlex drain is recommended when the results of the granulometric analysis clearly indicate a **clay soil**.

—
Type 3 SoliFlex drain is recommended in **presence of iron ochre** or when it is installed with a **clean stone backfill**.

—
Type 3-250 microns SoliFlex drain is recommended when the results of the granulometric analysis clearly indicate a **soil rich in fine and medium sand**.



Soleno recommends the use of the SoliFlex Type 3 drain when dealing with iron ochre.

—
The **Type 3** perforations **slow down** the obstruction of the sluices caused by the presence of iron ochre.

—
The smooth interior of SoliFlex **minimizes** sediment accumulation and **makes cleaning much easier**.

—
The use of SoliFlex Type 3, in the presence of iron ochre, ensures a durable installation.

IRON OCHRE

THE PROBLEM

Farmers and agricultural installers are now concerned about a phenomenon that was relatively unknown until recently: iron ochre.

The problem of clogged drains and the ensuing headaches are nothing new. However, in the last few years, research has shown that a significant number of problems related to clogged drains are caused in part by iron ochre in aerated soils.

THE IRON OCHRE

Iron ochre comes from a biochemical phenomenon. When exposed to oxygen and water, iron in the soil and iron-oxidizing bacteria in ground water produce a gelatinous mass of ferric hydroxide called iron ochre. Gradually, this gelatinous mud

attaches itself to the walls of the drain and can block the drainage pipes.

The vast majority of soils contain iron, but not all are equally affected by iron ochre. Several factors influence the progression of this phenomenon. Iron ochre usually develops more quickly in fine sand, silty sand, organic soils and soils containing minerals.

Iron ochre deposits are identifiable by their ochre or orange colour.



DRAINAGE OUTLET NON-PERFORATED SOLFLO MAX (R320)

NON-PERFORATED RIGID DUAL WALL PIPE, WITH SMOOTH INTERIOR AND CORRUGATED EXTERIOR WALLS FOR DRAINAGE OUTLET APPLICATION.

—
Offered in diameter of 100 mm (4 in) to 250 mm (10 in) and in standard length of 3 m (9.8 ft).

- Also available with a stainless steel fork grate at the end.
- Allows gravity flow of water in networks and water course piping.
- Optimal stiffness and flow allowing drainage water to evacuate.

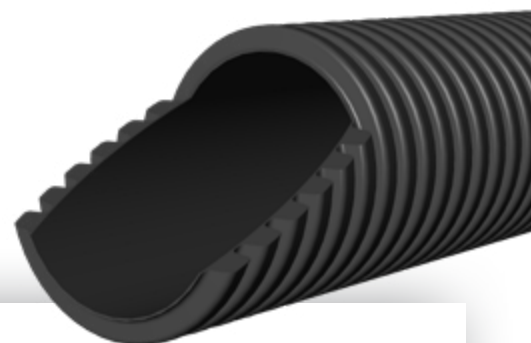
NON-PERFORATED SOLFLO MAX

NON-PERFORATED RIGID DUAL WALL PIPE, WITH SMOOTH INTERIOR AND CORRUGATED EXTERIOR WALLS FOR ROADWAY USE.

- Offered in diameter of 300 mm (12 in) to 1500 mm (60 in).
- **Bevelled cut** (optional) in an HDPE culvert application, increases the flow of water circulating in the culvert in the event of a thunderstorm.
- The use of a **Non-Perforated Solflo Max** with a diameter of more than 450 mm (18 in) is ideal for an **HDPE culvert** or **driveway culvert** applications.

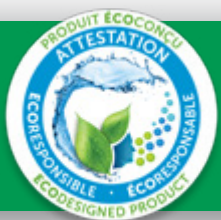


- Has a high load-bearing capacity.
- Made of HDPE, our drainage outlets are resistant and lightweight.



ADVANTAGES AND BENEFITS

- With an **exceptional service life**, Solflo Max pipes are **strong** and withstand abrasion and corrosion.
- The length of the pipes reduces **installation time** and **the number of joints required**.
- Fits perfectly with our full range of watertight and non-watertight proof fittings and accessories, designed to meet field requirements or comply with network requirements.



Our non-perforated Solflo Max pipe, 210 kPa, was awarded EcoDesigned Product Attestation by the Council of sustainable industries (CSI).

STEEL PIPE

CORRUGATED GALVANIZED STEEL PIPES (CGSP), AN ECONOMICAL SOLUTION USED IN STEEL CULVERTS AND DRIVEWAY CULVERT APPLICATIONS.

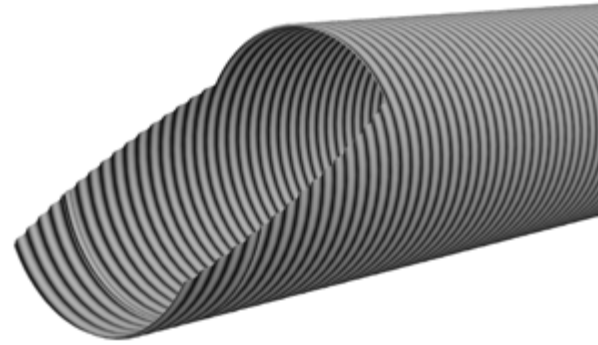
— Customized **non-standard lengths** up to 18 m (60 ft) for diameters 3600 mm (144 in) and less, allowing less joints to be required.

— An **economical** solution in large diameters pipes, allowing savings in transport due to the optimization of the loading space.

— The pipe ends are adjusted to provide annular re-rolled corrugations, which allow couplings to be used to assemble successive lengths on a project.

— Optional **spiral end, bevelled cut and arched** pipes.

— With their arched shape, they help minimize depth of the backfill while conveying additional water volume at a low rate.



— Withstands CL-625, H-25 and HS-25 loads.

— **Factory welded lifting lugs available on request.**

The use of a **steel pipe** is recommended for **steel culverts and driveway culvert applications.**

STEEL ACCESSORIES

Soleno manufactures **steel clamps** with **3, 5 or 9 corrugations**, that enables the elongation of two steel pipes by reinstating the corrugations parallel to the pipe's endpoint.

— Steel clamps ensure **a strong and durable connection.**

— **New!** Now easier to install with the addition of an 200 mm (8 in) bolt for each set supplied!





OUR CUSTOM STRUCTURES



VENTILATION PIPES AERIAL AND SUBSURFACE

UNDERGROUND HEAT EXCHANGER

Surface geothermal system that allows preheating or refreshing air from outside a building before distributing it in the inhabited space.

AERIAL VENTILATION

Pipe used to suck up and evacuate stale air from a building.

TANK FOR PUMPING STATION

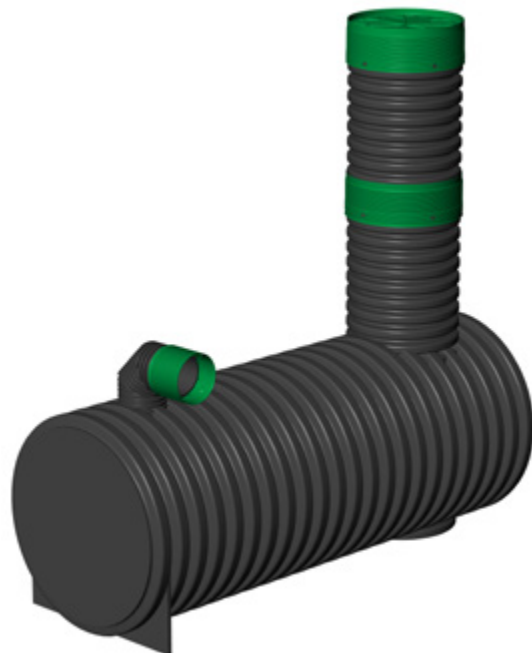
Water tank from the drainage system for temporary storage and groundwater control application.

HAY DRYER AND PIG FARM VENTILATION

Pipe network used to control product humidity or mechanically evacuate odors from a farm building.

POTATO WAREHOUSE VENTILATION

Culverts buried under a concrete slab in which openings are provided to ventilate the underside of plantations.



OUR GEOTEXTILE

TX-300

NONWOVEN NEEDLED GEOTEXTILE, MAINLY USED FOR SEPARATION IN DRAINAGE OUTLET, CULVERTS AND DRIVEWAY CULVERT APPLICATIONS.

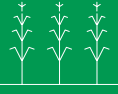
— Ideal solution for **stone packs** at the ends of the drainage outlet and culverts.

— Made of polypropylene, TX-300 is mainly used for **separation**.

— Better permeability than woven geotextile due to its three-dimensional structure and its filtration openings.

— Provides good resistance to puncturing, greater burst strength and tear resistance.





OUR COUPLERS AND ACCESSORIES

Solenio offers a complete range of drainage fittings and accessories, with internal or external connection, that fits our range of drains. Most of our accessories are made of factory injection molded resin.

COUPLERS

***Improved!**



Internal coupler
100 mm (4 in)* to 200 mm (8 in)

***Improved!**



Double bell snap
100 mm (4 in) to 250 mm (10 in)



Split coupler
100 mm (4 in)* to 250 mm (10 in)



ACCESSORIES



*Improved!

Internal end cap
100 mm (4 in)* and 150 mm (6 in)



*Improved!

External end cap
100 mm (4 in)*
150 mm (6 in)*



*Improved!

90-degree elbow
100 mm (4 in)*



*Improved!

External reducer
100 mm (4 in) x 75 mm (3 in)
150 mm (6 in) x 100 mm (4 in)*
200 mm (8 in) x 150 mm (6 in)
250 mm (10 in) x 200 mm (8 in)



Tee
250 mm (10 in) and 300 mm (12 in)



*Improved!

Reducing tee
100 mm (4 in) x 100 mm (4 in) x 75 mm (3 in)
150 mm (6 in) x 150 mm (6 in) x 100 mm (4 in)*
200 mm (8 in) x 200 mm (8 in) x 150 mm (6 in)
200 mm (8 in) x 200 mm (8 in) x 100 mm (4 in)



*Improved!

Tee-wye (Y)
100 mm (4 in)* and 150 mm (6 in)



Wye (Y)
100 mm (4 in) and 150 mm (6 in)



Wye (Y) reducer
150 mm (6 in) x 150 mm (6 in) x 100 mm (4 in)



Extensible tape
Black 52 mm x 35,65 m
(2 in x 108 ft)
White 48 mm x 50 m (2 po x 164 ft)



Plastic grate with small holes
100 mm (4 in) and 150 mm (6 in)



Plastic grate with large holes, reinforced with stainless steel inserts
100 mm (4 in) to 200 mm (8 in)



Stainless steel fork grate
100 mm (4 in) to 375 mm (15 in)



Stainless steel inside grate
200 mm (8 in) to 1200 mm (48 in)



Stainless steel grate
100 mm (4 in) to 250 mm (10 in)



Vertical drain, Hickenbottom (big and small holes)
125 mm (5 in) to 250 mm (10 in)



Vertical drain tee
125 mm (5 in) to 250 mm (10 in)



Vertical drain reducer
150 mm (6 in)



Tap tee (regular)
100 mm (4 in), connects to a 150 mm (6 in) drain



Tap tee (long)
100 mm (4 in), connects to a drain of 200 mm (8 in) to 300 mm (12 in)



Drainage flag
Orange, blue, yellow



Drainage outlet sign
Red, resists UV rays



Steel clamp
Wide range available, see our price list



OUR EXPERTS



AVAILABLE AND SPECIALIZED TEAM

At Soleno, the excellence of our solutions is based on our **specialized consulting services** and our expertise developed over the years with contractors, farmers, agricultural installers and agricultural professionals, responsible for the realization of a drainage plan.

Our **customer service team**, supported by very efficient logistics management, will ensure that all your **storm water projects run smoothly**.



SOLENO OBTAINED

its **ECORESPONSIBLE** Certification - level **2. Performance** in sustainable development from the Council for sustainable industries (CSI) **ECORESPONSIBLE™** Program.

(Soleno plant located at 1160, route 133, Saint-Jean-sur-Richelieu only)



SOLENO IS ISO 9001 CERTIFIED

(Saint-Jean-sur-Richelieu plant only)

SOLENO IS A MEMBER OF THESE AGENCIES:



OUR HDPE PRODUCTS AND SOLUTIONS ARE DESIGNED AND MANUFACTURED ACCORDING TO THE MOST RIGOROUS STANDARDS.