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DEVELOPER
OF SUSTAINABLE SOLUTIONS
FOR MASTERING STORM WATER

2020 INSTALLATION GUIDE



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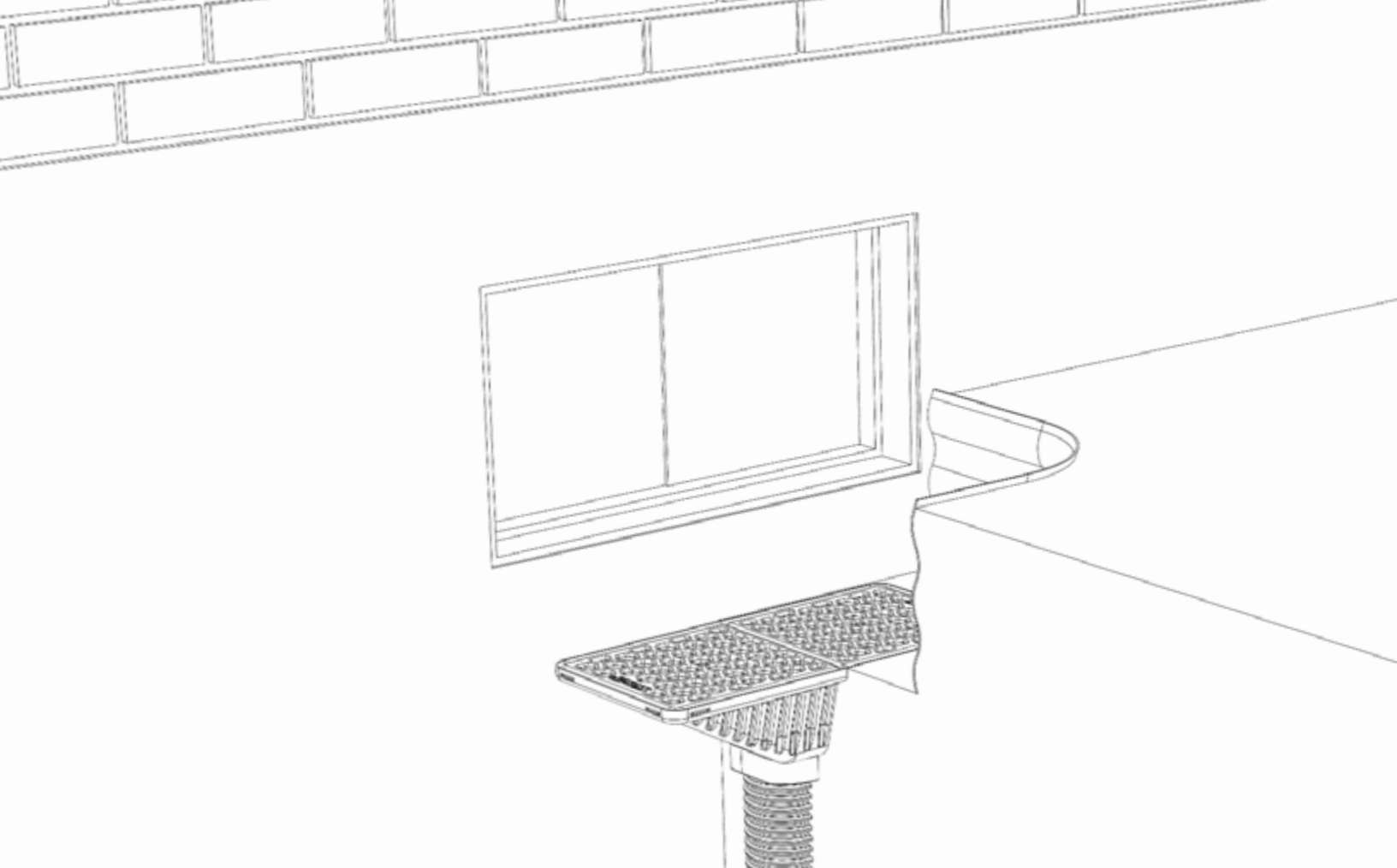
STORAGE

GEOSYNTHETIC

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HYDRAIN®

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR THE HYDRAIN® SYSTEM

STEPS

Installation for a window well

1. Positioning
2. Excavation
3. Installation and backfilling
4. Notes

Installation for a gutter downspout outlet

1. Positioning
2. Installation and backfilling
3. Notes

GENERAL NOTES

1. Inspection and maintenance

INSTALLATION FOR A WINDOW WELL

STEP 1 POSITIONING

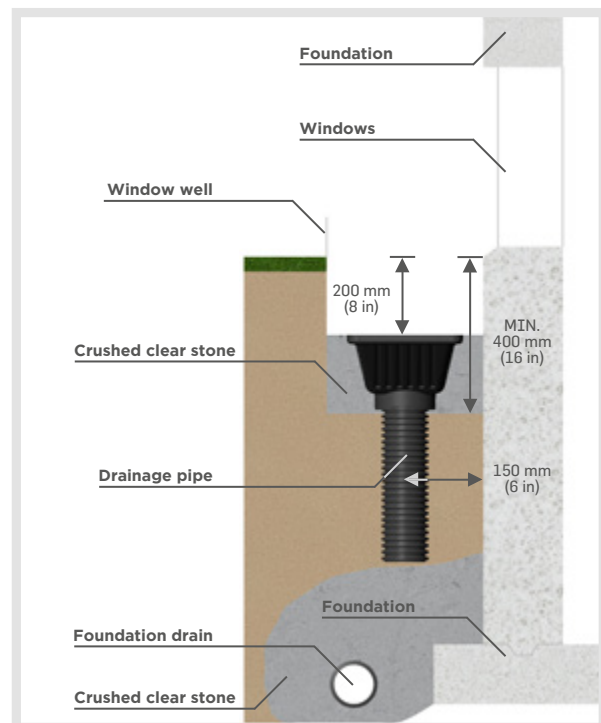
- Center the window well on the window and rest it against the foundation wall.
- Delimit its position by marking its contour on the ground.
- Aligning with the center of the window, position the center of the drain pipe vertically at 150 mm (6 in) from the edge of the foundation wall and mark its position on the ground.

STEP 2 EXCAVATION

- Excavate down to the geotextile covering the crushed clear stone installed around the foundation drain.
- Install the drainage pipe⁽¹⁾.
- Excavate the window well area (delimited in Step 1) to a minimum of 400 mm (16 in) below the bottom of the window. The trench walls must remain vertical.

STEP 3 INSTALLATION AND BACKFILLING

- Place the drainage pipe⁽²⁾ by placing it vertically against the geotextile covering the crushed clear stone and backfill to the bottom of the window well.
- Install the window well, according to the installation recommendations of its supplier, by resting it against the walls of the excavated trench.
- Place the Hydrain on the upper end of the drainage pipe⁽³⁾.
- Fill with crushed clear stone up to 200 mm (8 in) below the bottom of the window (being the top level of the Hydrain) to adequately support the conical base.



Note 1 : Do not connect the drainage pipe to the foundation drain.

Note 2 : HDPE pipes 100 mm (4 in) such as the drain, SoliFlex, Solflo or Solflo Max are recommended.

Note 3 : Ensure that the Hydrain grids reach the finished ground level. If necessary, cut off the excess end of the drainage pipe.

INSTALLATION FOR A GUTTER DOWNSPOUT OUTLET

STEP 1

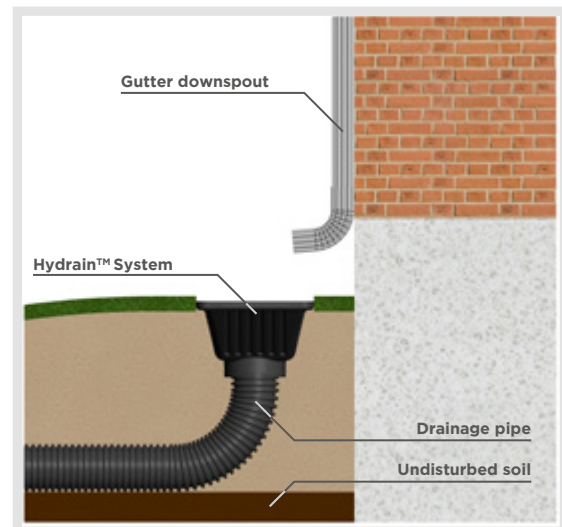
POSITIONING

- When aligning with the center of the gutter downspout outlet, position the center of the drainage pipe horizontally⁽¹⁾ and mark its position on the ground.

STEP 2

INSTALLATION AND BACKFILLING

- Excavate the ground for the drainage pipe, taking care to move the outlet away from the foundation wall⁽²⁾⁽³⁾⁽⁴⁾.
- Proceed with the installation and backfilling of the drainage pipe according to the local regulations for this type of installation.
- Place the Hydrain on the end of the drainage pipe⁽⁵⁾.
- Fill the Hydrain in such a way as to adequately support the conical base.



NOTES

INSPECTION AND MAINTENANCE

To ensure Hydrain's effectiveness, regular inspection and maintenance are required. To ensure the drainage of rainwater into the drainage pipe, no debris should obstruct, partially or completely, the honeycomb grids and debris strainer. If so, remove debris.

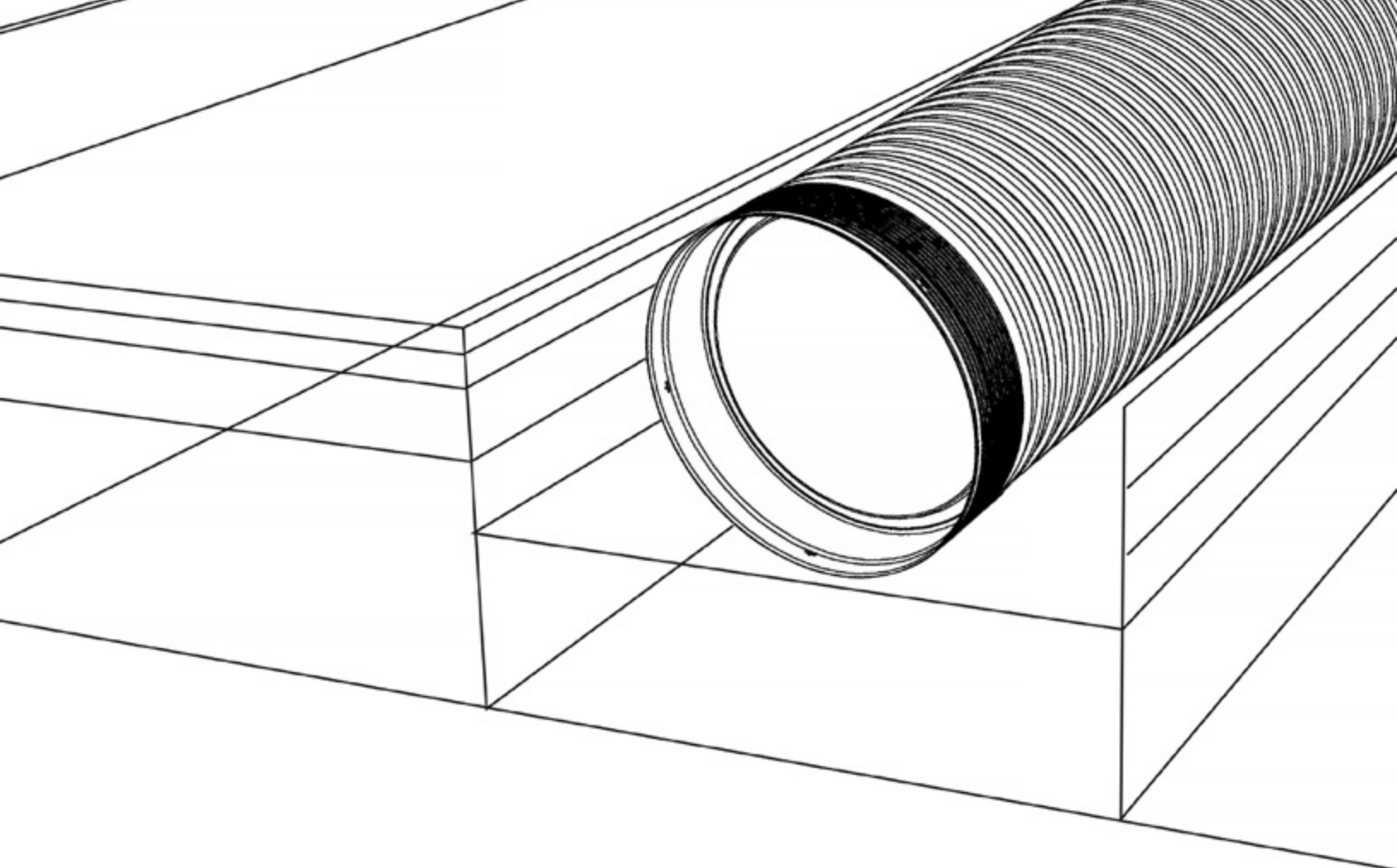
Note 1: HDPE pipes 100 mm (4 in) such as the drain, SoliFlex, Solflo or Solflo Max are recommended.

Note 2: Check and comply with local regulations regarding water from gutters and connection to an outlet.

Note 3: Depending on soil type and configuration, several outlets are possible.

Note 4: It is recommended to have a slope to allow gravity flow.

Note 5: Ensure that the Hydrain grids reach the finished ground level. If necessary, cut off the excess end of the drainage pipe.



SOLFLO MAX[®]

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR SOLFLO MAX[®] PIPES

STEPS

Work planning

1. Before undertaking work
2. Inspection of the materials
3. Handling
4. Storage on site

Installation

5. Trench preparation
6. Inspection, cleaning and lubrication
7. Assembly
8. Installation of removable clips (optional)

9. Positioning and installation of split couplers (optional)
10. Backfilling

GENERAL NOTES

1. Cutting a pipe on construction site
2. Connection to a structure

Figure 1 : Typical installation trench

STEP 1

BEFORE UNDERTAKING WORK

In case of discrepancy between the instructions contained in this guide and those contained in the plans and specifications, please contact your Soleno representative.

Contact your Soleno representative at least 48 hours before work begins. A visit from your authorized Soleno representative is recommended after receipt of the materials on site or before work begins.

STEP 2

INSPECTION OF THE MATERIALS

Upon receipt of the materials, ensure that all items required on the packing slip are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.

STEP 3

HANDLING

Use slings or forks with wide openings spaced 2.0 m (6 ft) apart to move bales.

If unloading equipment is not available, follow the unit method for moving individual pipes.

- **Do not** use steel wire ropes, chains or hooks to unload or handle pipes.
- **Do not** drop pipes or fittings on the ground.
- **Do not** lift the pipe by inserting the forks into the ends of the pipe.

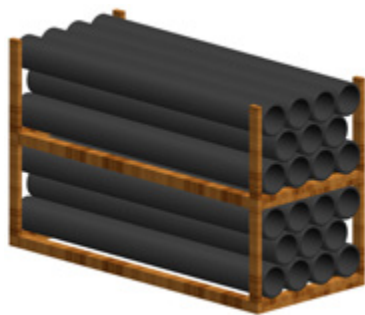
UNIT METHOD

- **For diameters of 450 mm (18 in) and less:** manual handling at each end.
- **For diameters between 525 mm (21 in) and 750 mm (30 in):** handling with a sling with a lifting point in the center of the pipe.
- **For diameters of 900 mm (36 in) and larger:** handling with a sling with two lifting points, in the first and second third of the pipe length.

STEP 4

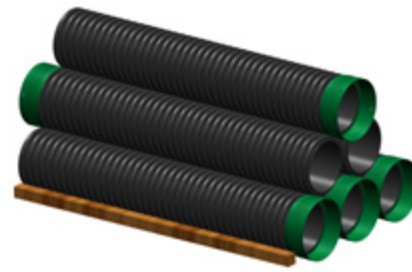
STORAGE ON SITE

Provide adequate storage space for pipes and fittings to prevent deformation. This storage area should be a large, flat surface, free of angular protuberances (rocks, tree stumps, etc.), in order to avoid any bursting.



Storage in bales
Maximum height : 2 bales

For pipes \leq 750 mm (30 in)



Storage in stacks*
Maximum height : 2 m (6 ft)

Note 1 : Pipes of 750 mm (30 in) and more must be laid individually on the ground.
Note 2 : The bells must be staggered configuration.

STEP 5

TRENCH PREPARATION

Start excavating the trench in accordance with local plans and specifications and safety regulations.

- Level and inspect the bottom of the trench. Remove any stone or debris that might damage the pipe.
- Compact the trench foundation, respecting the specification requirements. The design engineer is responsible for ensuring a stable foundation.
- Pour the bedding material and compact. The bedding material must not be pre-formed to sit the bottom of the pipe. The minimum bedding thickness shall be 150 mm (6 in). The bedding must be free of stones larger than 40 mm (1.5 in).

NOTES

- The granular material used to make the bedding can be Class I, II or III according to ASTM D2321 or Category CG-14³ compliant with standard BNQ 2560-114 according to standard

Note 1: CG-14 is a designation to group the grain size requirements of the granular material used to base and embed a pipe. This designation was previously known as "0-3/4 crushed stone or 0-3/4 gravel and Class A sand". This new designation is now referred to as CG-14, to be in accordance with the current nomenclature based on granular classes.

STEP 5

TRENCH PREPARATION (CONT'D)

specification BNQ 1809-300. This material must be free of large stones, frozen masses or other debris. In all cases, the backfill material chosen must meet the requirements of the plans and specifications and the design engineer is responsible for their selection.

- Where excavation is carried out in clay or silty soils, provide a uniform and unaltered bedding.
- The trench width must be:

Nominal diameter	mm	≤ 300	375	450	525	600	750	900	1050	1200	1500
	in	≤ 12	15	18	21	24	30	36	42	48	60
Width at the trench bottom	m	0.8	0.9	1.0	1.1	1.2	1.4	1.6	1.8	2.0	2.4
	ft	2.6	2.9	3.3	3.7	4.1	4.8	5.5	6.2	6.9	8.2

- **Presence of groundwater** : The installation of the pipe must be done in a dry trench. The drying techniques used must comply with local safety standards. The design engineer must adapt the foundation to these conditions.

STEP 6

INSPECTION, CLEANING AND LUBRIFICATION

The Solflo Max® are usually assembled with a bell with integrated gasket system. The male end is normally inserted inside the bell. If not, be sure not to insert backfill material inside the joint.

- Make sure that the bell is not damaged.
- For diameters of 1050 mm (42 in) or more, remove the protective film from the sealing gasket.
- Clean the male part of the pipe and the inside of the bell.
- Lubricate the inside of the bell and the exterior wall of the male part. Ensure that the lubricant does not come into contact with impurities.

STEP 7 ASSEMBLY

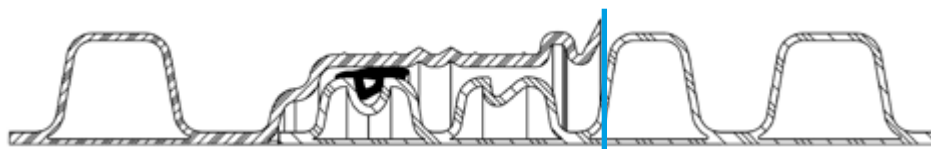
- Start the installation on the downstream side.
- Make sure that the male parts are fully inserted until the insertion line, see details below.
- Do not hesitate to enter into the pipe to inspect the joints from inside and to make sure there remains no space between the legths.
- Use one of the two following methods; with a waste pipe section or a sling for assembling Solflo Max® pipes.

DIAMETERS OF 300 mm (12 in) TO 1200 mm (48 in)

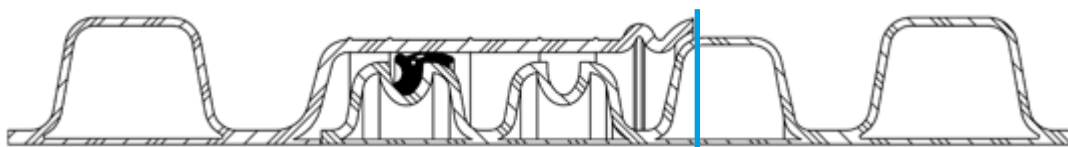
The insertion line is marked on the pipe itself with by means of a line of white paint. The following schedules are indicative.



Diameter of 300 mm (12 in) to 900 mm (36 in)



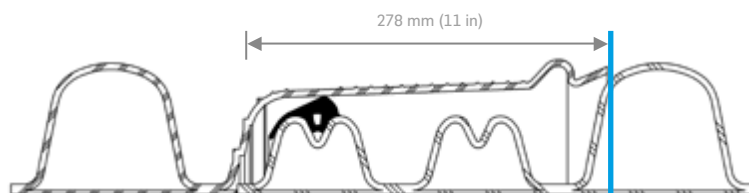
Diameter of 1050 mm (42 in)



Diameter of 1200 mm (48 in)

DIAMETER OF 1500 mm (60 in)

For diameter of 1500 mm (60 in), the insertion line ends at 278 mm (11 in) from the end of the male part.



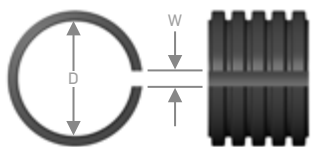
Diameter of 1500 mm (60 in)

STEP 7 ASSEMBLY (CONT'D)

Utiliser une des deux méthodes suivantes pour l'assemblage des conduites Solflo Max®.

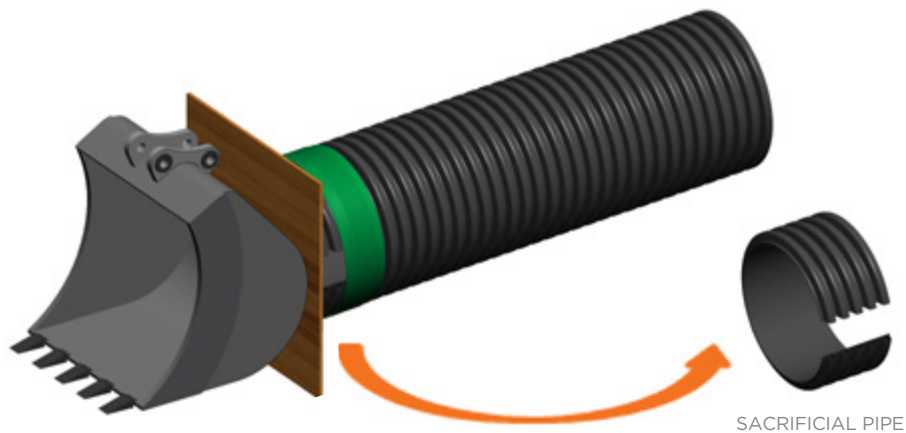
A - METHOD WITH SACRIFICIAL PIPE

- Prepare a piece of sacrificial pipe by cutting a piece of pipe at least five rings long and remove a strip of material along the length.



Pipe Diameter (D)	mm	300	375	450	525	600	750 - 1050	1200 - 1500
	in	12	15	18	21	24	30 - 42	48 - 60
Width (W) of the strip of material to be removed	mm	100	125	150	170	190	255	300
	in	4.0	5.0	6.0	7.0	7.5	10.0	12.0

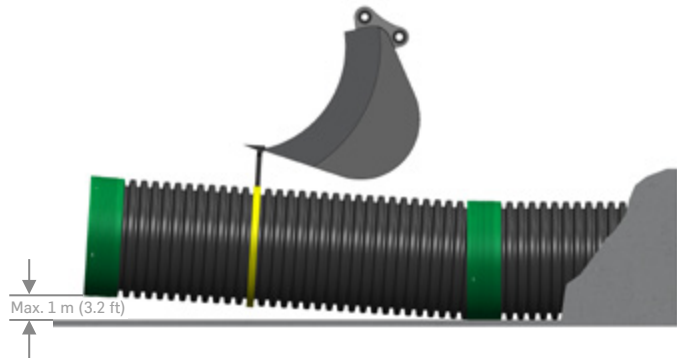
- Insert the sacrificial pipe end inside the bell of the pipe to be connected.
- Place a rigid panel against the end of the sacrificial pipe. The panel must completely cover the surface of the sacrifice pipe.
- Press the bucket of the excavator firmly against the panel and push until the insertion line is aligned with the end of the bell.



STEP 7 ASSEMBLY (CONT'D)

B - SLING METHOD

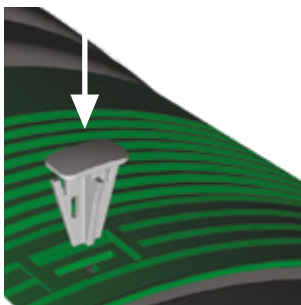
- Wrap the sling around the pipe.
- Using the excavator, slowly move the pipe to align the male end with the bell.
- Make sure there is no dirt inside the bell.
- The female end must not be higher than 1 m (3.2 ft) from the ground.
- When the first ring is in the bell, lower the pipe in order to have the best possible alignment with the other pipe.
- Pull the sling slowly until the insertion line is aligned with the edge of the bell. Validate the longitudinal alignment of the section as the installation progresses.



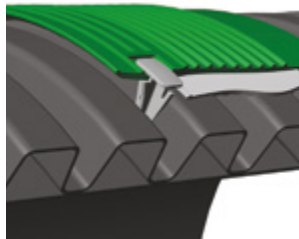
Note : For diameters of 1050 mm (42) and larger, support at two support points, 1 m (3 ft) apart.

STEP 8 INSTALLATION OF REMOVABLE CLIPS ON THE BELLS (OPTIONAL) - Pipes of 900 mm (36 in) and less, with BIG

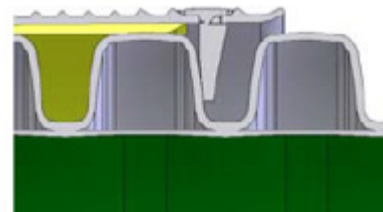
Installing the clips guarantees the complete insertion of the pipe and provides a robust interlocking until completion of the backfill.



Align the clip with the opening.



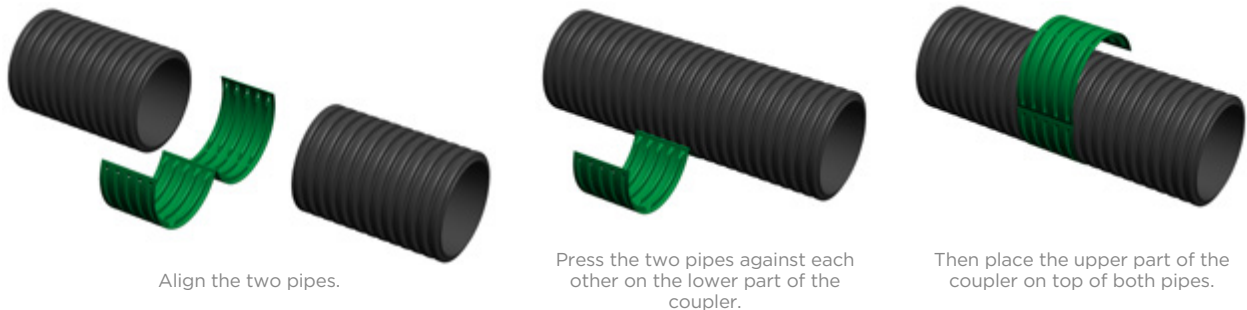
Push on the clip with the palm of your hand or with a hammer until it is fully inserted.



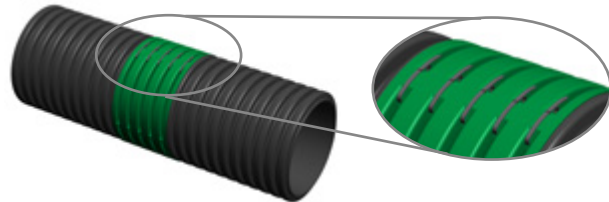
Install at least 3 clips per joint.

STEP 9 INSTALLATION OF SPLIT COUPLERS (OPTIONAL)

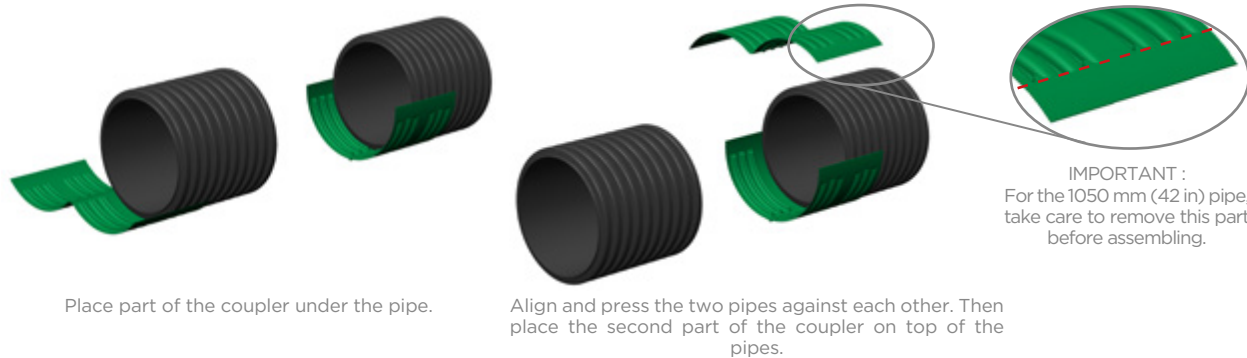
DIAMETERS OF 150 mm (6 in) TO 600 mm (24 in)



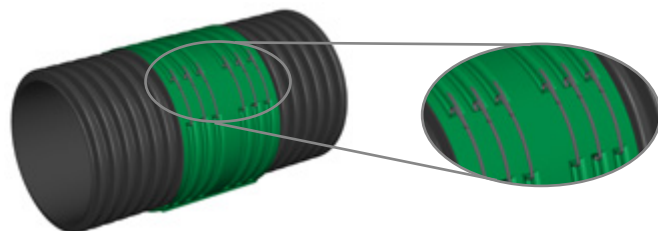
- Loosely fasten all quick fasteners to the coupler.
- When all fasteners are in place, properly tighten each one. Never fasten and tighten the fasteners one at a time as there is a risk of breakage.



DIAMETERS OF 750 mm (30 in) TO 1500 mm (60 in)

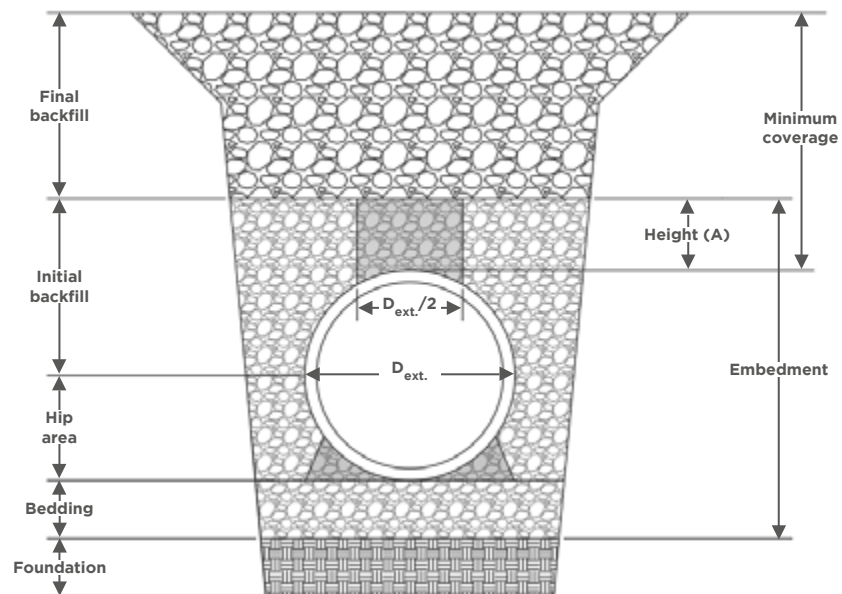


- Loosely fasten the two parts of the coupler with the quick fasteners until they touch.
- Then, tighten the quick fasteners, taking care to overlap the two parts of the coupler one on the other.
- Validate the alignment of the section as the installation progresses.



STEP 10 BACKFILLING

Backfilling is the most important step in ensuring the long-term structural functioning of a flexible pipe. The most sensitive portion of the backfill is located under the hips of the pipe. Insufficient compaction at this location can lead to ovalization of the pipe, as well as alignment and level problems.



- Place the backfill material on the pipe so that it flows evenly on both sides of the pipe.



STEP 10 BACKFILLING (CONT'D)

- While immobilizing the pipe, compact the backfill material under the hips with a hand tamper to ensure proper support for the pipe. If the trench is unstable, protect the walls with a prop system or widen the trench to allow compaction under the hips. Avoid any contact between the compaction equipment and the pipe.
- Continue the initial backfilling of the pipe by compacting in layers from 150 mm (6 in) to 300 mm (12 in) in thickness at 90% of modified Proctor. At this stage, the backfill height on one side must never exceed the backfill height on the other side by more than 300 mm (12 in). Only manual compaction equipment (e. g. mechanical tamper or vibrating plate) may circulate around the pipe.
- The pipe must be backfilled and compacted up to 150 mm (6 in) above its crown at 90% of modified Proctor with the material specified. No compaction should be made directly over the pipe until the backfill reaches at least this level.
- Finally, complete the final backfill (above the initial backfill area). For the selection of backfill materials in this area, consult the plans and specifications. This area must also be compacted according to the requirements of the plans and specifications.



NOTES

In order to maintain the structural capacities of the pipes, care must be taken to eliminate all conditions that would allow for buoyancy and erosion of backfill material. The design engineer must ensure sufficient backfill to prevent flotation. The minimum backfill height above the pipe to prevent buoyancy lift is given in Table 1.

TABLE 1
TABLE OF MINIMUM COVERAGE TO PREVENT BUOYANCY*

Nominal diameter	mm	100	150	200	250	300	375	450	525	600	750	900	1050	1200	1500
	in	4	6	8	10	12	15	18	21	24	30	36	42	48	60
Minimum coverage height	mm	300	300	300	300	300	300	300	300	330	400	450	550	600	720
	in	12	12	12	12	12	12	12	12	13	16	18	22	24	28

* Assumption for calculations :

1. The dry soil density is 1750 kg/m³ (109.25 lb/ft³) and its saturated density is 1200 kg/m³ (131.10 lb/ft³) (safety values).
2. The maximum groundwater height is at the same level as the pipe crown. Contact your Soleno representative for the specific data for your project.

NOTE 1

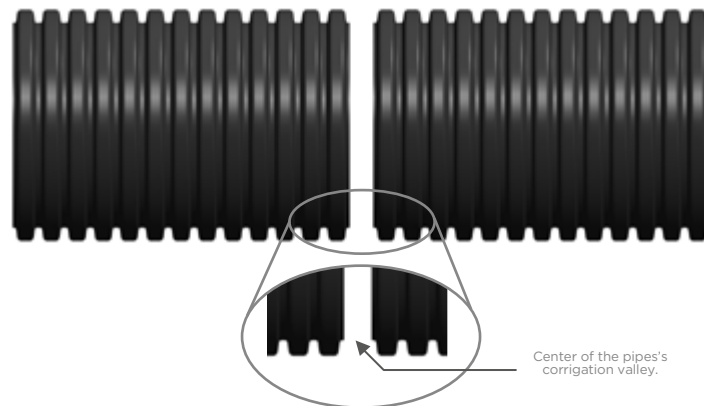
CUTTING A PIPE ON CONSTRUCTION SITE

If necessary, HDPE pipes can be cut at construction site.

Suggested tools for cutting :

- Reciprocating saw
- Circular saw
- Concrete saw

Note : Cut between two corrugations (in the center of the pipe's corrugation valley).



* Diameters of 1050 mm (42 in) and more have a male part with a smaller diameter. consulter votre représentant Soleno pour connaitre la procédure pour ce cas précis.

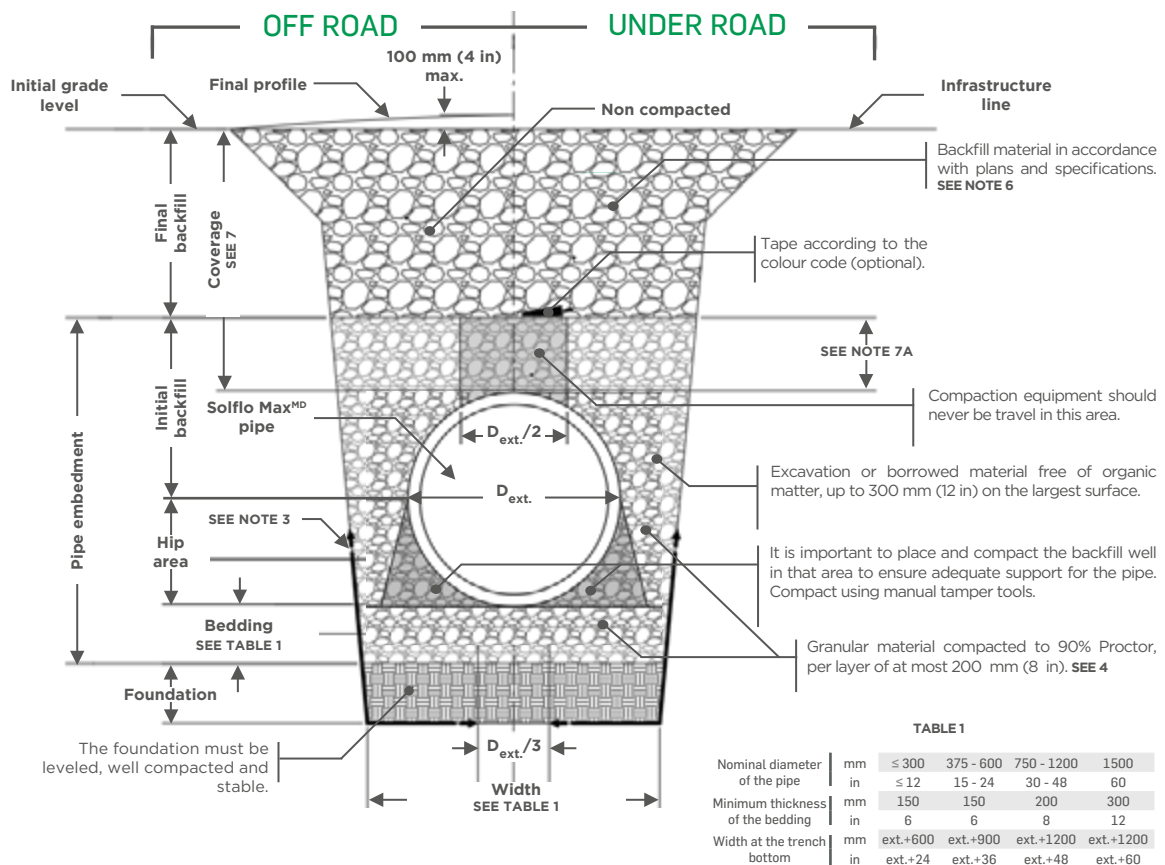
NOTE 2

CONNECTION TO A STRUCTURE

The Solflo Max[®] pipe connects to a rigid structure using the typical methods of flexible pipes installation. Contact your Soleno representative for the specifications for this type of connection.

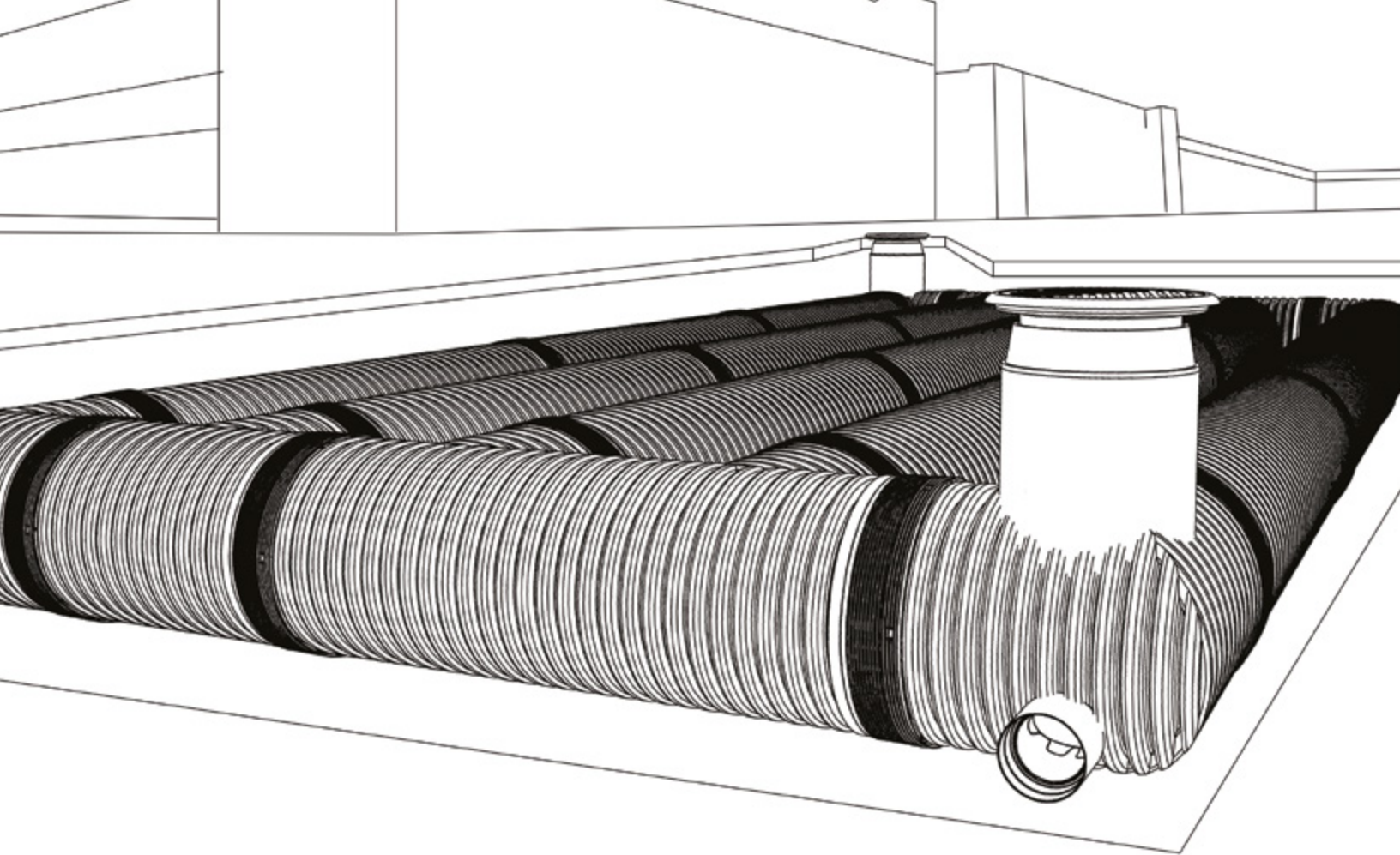
FIGURE 1 TYPICAL INSTALLATION TRENCH

The pipe installation method for Solflo Max™ shown below is based on standards BNQ 1809-300 R2007, CSA 182.11 or ASTM D2321. However, depending on the location of the project, other regulations or standards may apply. Soleno recommends that you comply with the requirements of the city or province of reference. Otherwise, Soleno recommends applying the method shown below.



Notes

- The excavation slopes are not restricted to the slopes shown in the figure above. The excavation must meet the requirements of the Construction Safety Code.
- The foundation must be free of any stone or debris that might damage the pipe.
- The use of a geotextile is necessary to prevent material migration. Geotextile is required in an installation where the water table is high in fine-grained soil. The geotextile will be installed on the walls and bottom of the trench prior to backfilling the pipe bedding and embedment.
- The pipe bedding and backfilling material up to mid-diameter can be Class I, II or III according to standard ASTM D2321 or Category CG-14, compliant with standard BNQ 2560-114 according to standard specification BNQ 1809-300. This material must be free of large stones, frozen masses or other debris.
- For the first meter above the pipe, the only accepted compaction equipment is the groomer, the plate compactor or vibrating drum roller. The total force applied from the equipment must not exceed 50 kN.
- The selection, the degree of compaction and the thickness of the layers before compaction of the material used for the final backfill is the responsibility of the design engineer. Consult the plans and specifications.
- The minimum backfill height above the pipe (measured from the top of the pipe to just below a flexible pavement or just above a rigid pavement) to support CL-625, H-25 or HS-25 is:
 - 300 mm (12 in) for pipes with a diameter of 100 mm (4 in) to 1200 mm (48 in).
 - 500 mm (19 in) or pipes with a diameter of 1500 mm (60 in).
 Note: The design engineer must ensure sufficient backfill to prevent flotation. Contact your Soleno representative for the specific data for your project.
- No compaction should be made directly over the pipe until it is backfilled and compacted above its crown at a minimum height of 150 mm (6 in). Note: During construction work, heavy vehicles might have to travel over the pipe. In this case, an additional minimum backfill must be added to allow for this type of traffic. Refer to the complete installation guide for this height.
- Consult the installation guide and your Soleno representative for project-specific data.



DETENTION/RETENTION SOLFLO MAX SYSTEM

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR A PIPE-BASED BASIN

STEPS

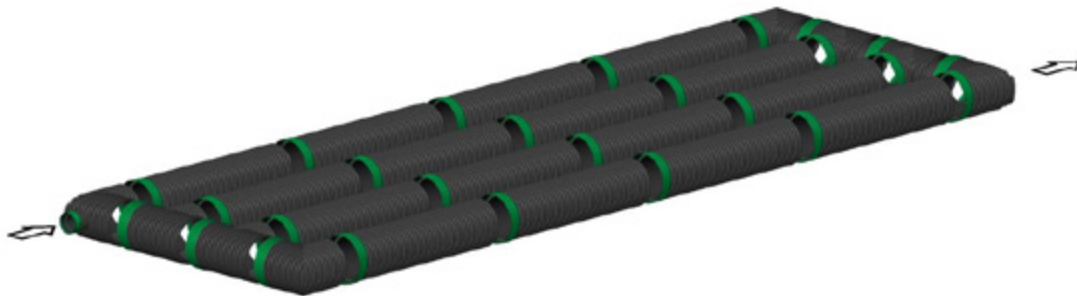
1. Before undertaking the work
2. Inspection of the materials
3. Identification of special parts
4. Site preparation
5. Assembly
6. Basin assembly
7. Backfilling
8. Connection
9. Finishing

STEP 1 BEFORE UNDERTAKING THE WORK

Contact your Soleno representative at least 48 hours before work begins.

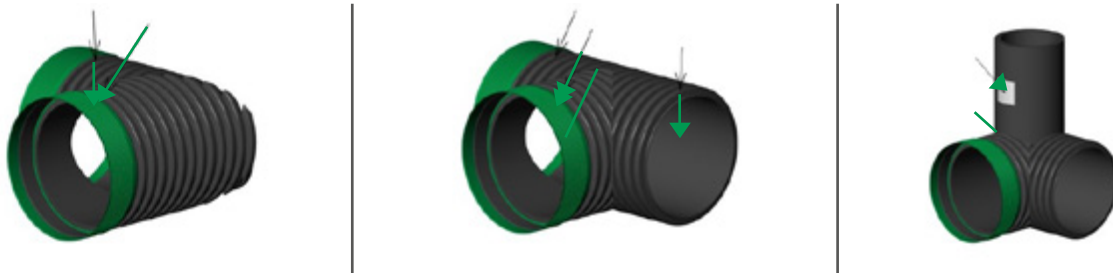
STEP 2 INSPECTION OF THE MATERIALS

Upon receipt of the merchandise, make sure that all items specified in the shop drawing are delivered. Handle parts carefully.



STEP 3 IDENTIFICATION OF SPECIAL PARTS

Each special part (other than a pipe of standard length) is identified by a letter (on the last ring or on the access port). These identified items must be installed in accordance with the shop drawing.



STEP 4 PREPARE THE BEDDING

Level and compact the bedding at the bottom of the trench, following the specifications requirements (material, thickness and compaction).

STEP 5 ASSEMBLY

For ease of assembly, pipe grease can be used. Also, to facilitate insertion of the pipes, a waste pipe section or plywood panel can be used.



STEP 6A BASIN ASSEMBLY

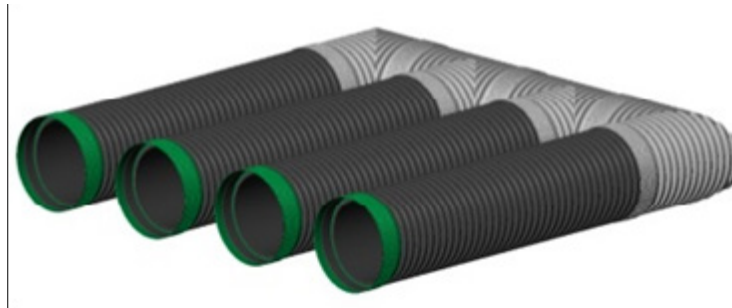
Begin assembly of the basin starting from the outlet (unless otherwise indicated on the shop drawings). Connect the discharge duct to the outlet collector. Complete assembly of the outlet collector.



STEP 6B

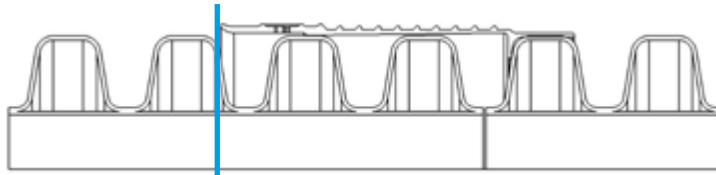
BASIN ASSEMBLY

Insert each length of the first section.

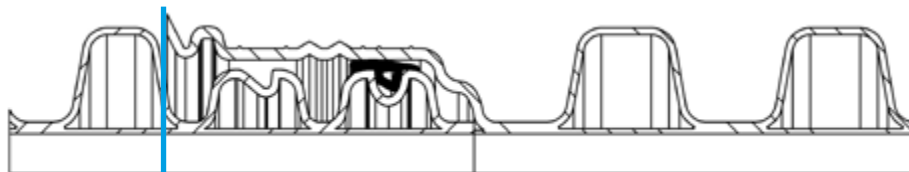


Make sure these pipes are fully inserted until the insertion line:

- diameter of 300 mm (12 in) to 900 mm (36 in)



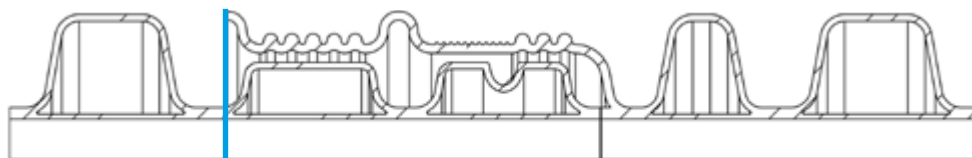
- diameter of 1050 mm (42 in)



- diameter of 1200 mm (48 in)



- diameter of 1500 mm (60 in)

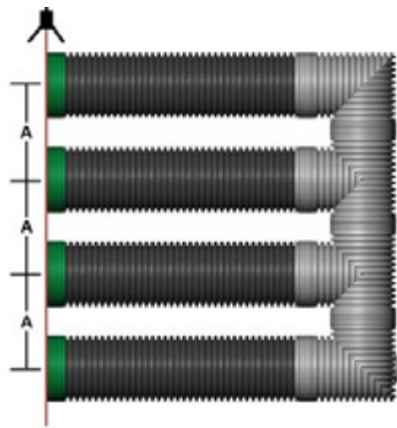


Do not hesitate to enter into the pipe to inspect the joints from inside and to make sure there remains no space.

STEP 6C

BASIN ASSEMBLY

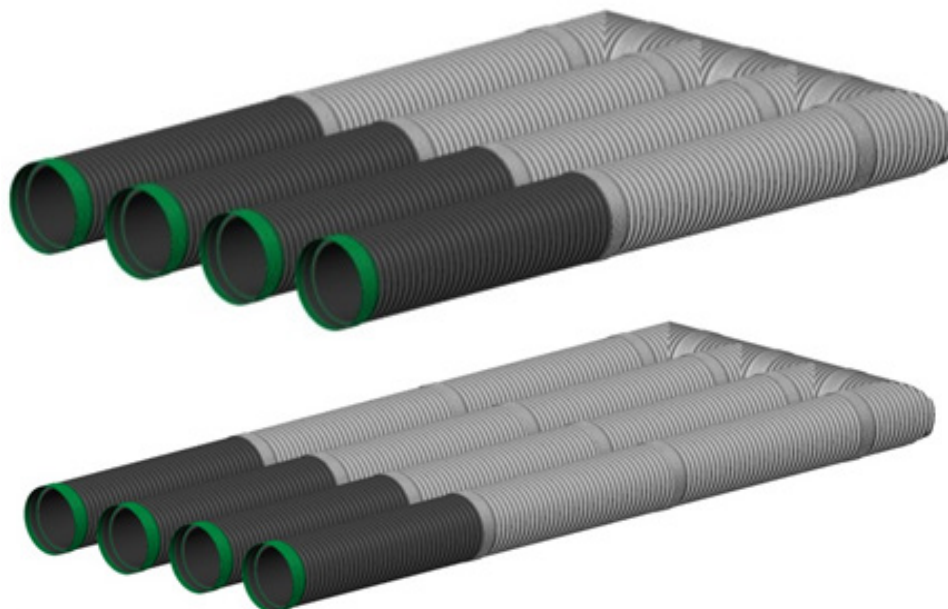
Once the assembly of a completed section is done, check the parallelism between the rows. Also make sure that the rows have the same length.



STEP 6D

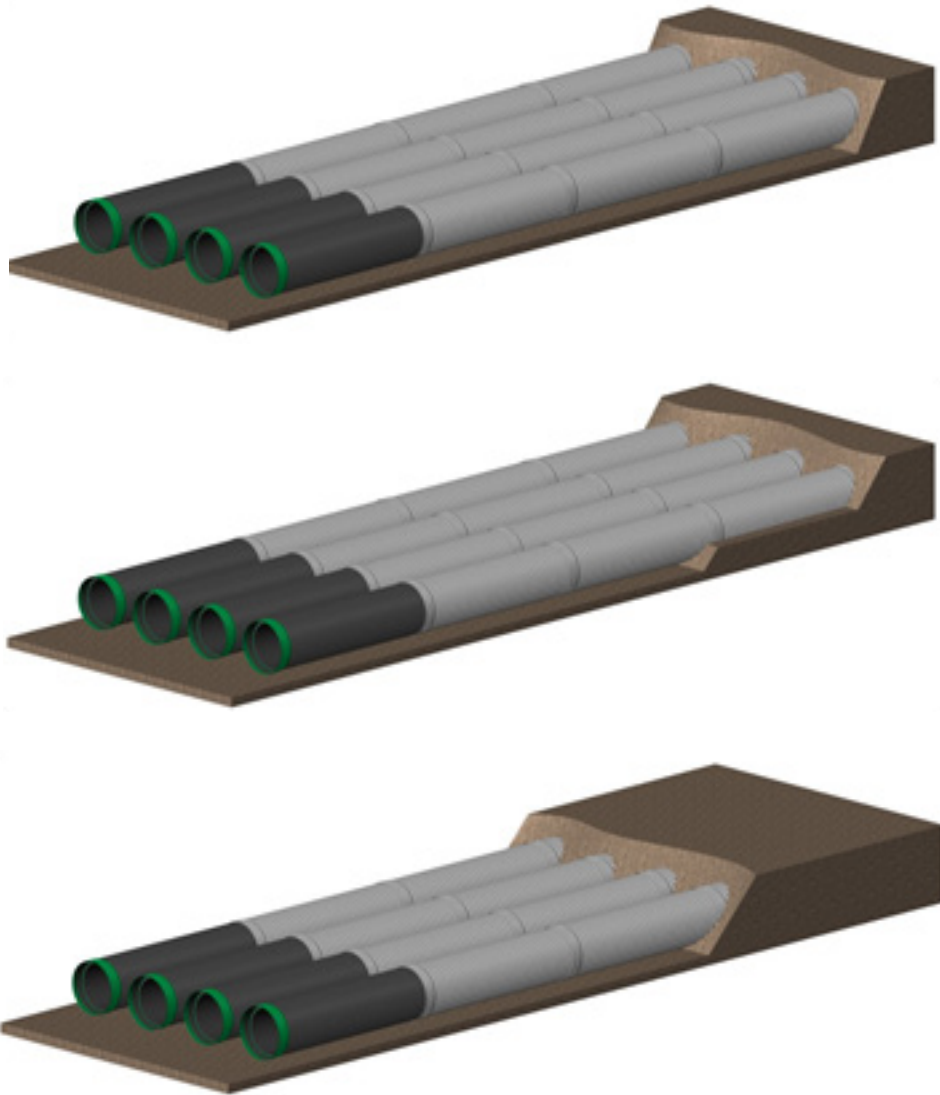
BASIN ASSEMBLY

Insert the following lengths, section by section, by making the checks described in step 6C after each section



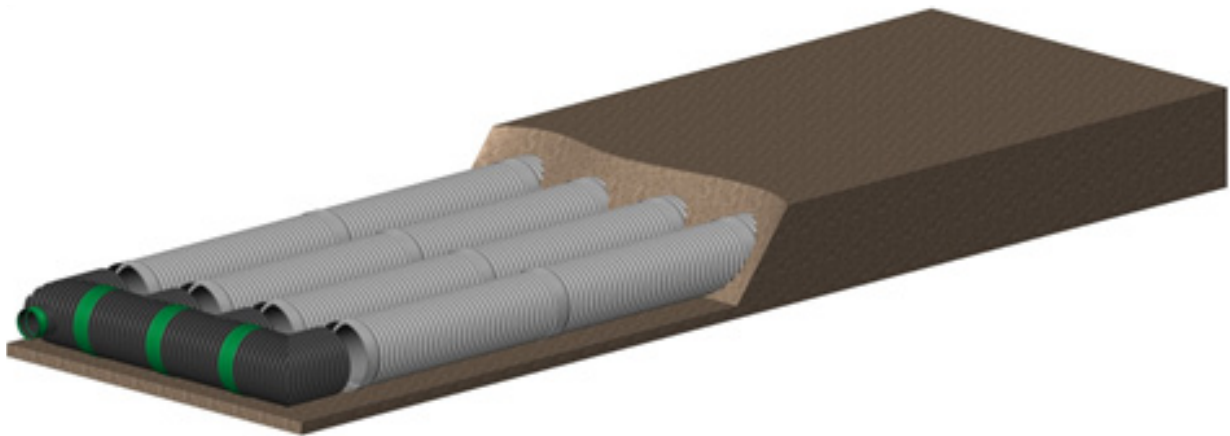
STEP 7 BACKFILL

Backfill and compact progressively as required in the specifications, making sure to keep the last 3 sections open to allow final adjustments. During backfilling, ensure an equal fill height on each side of the pipe.



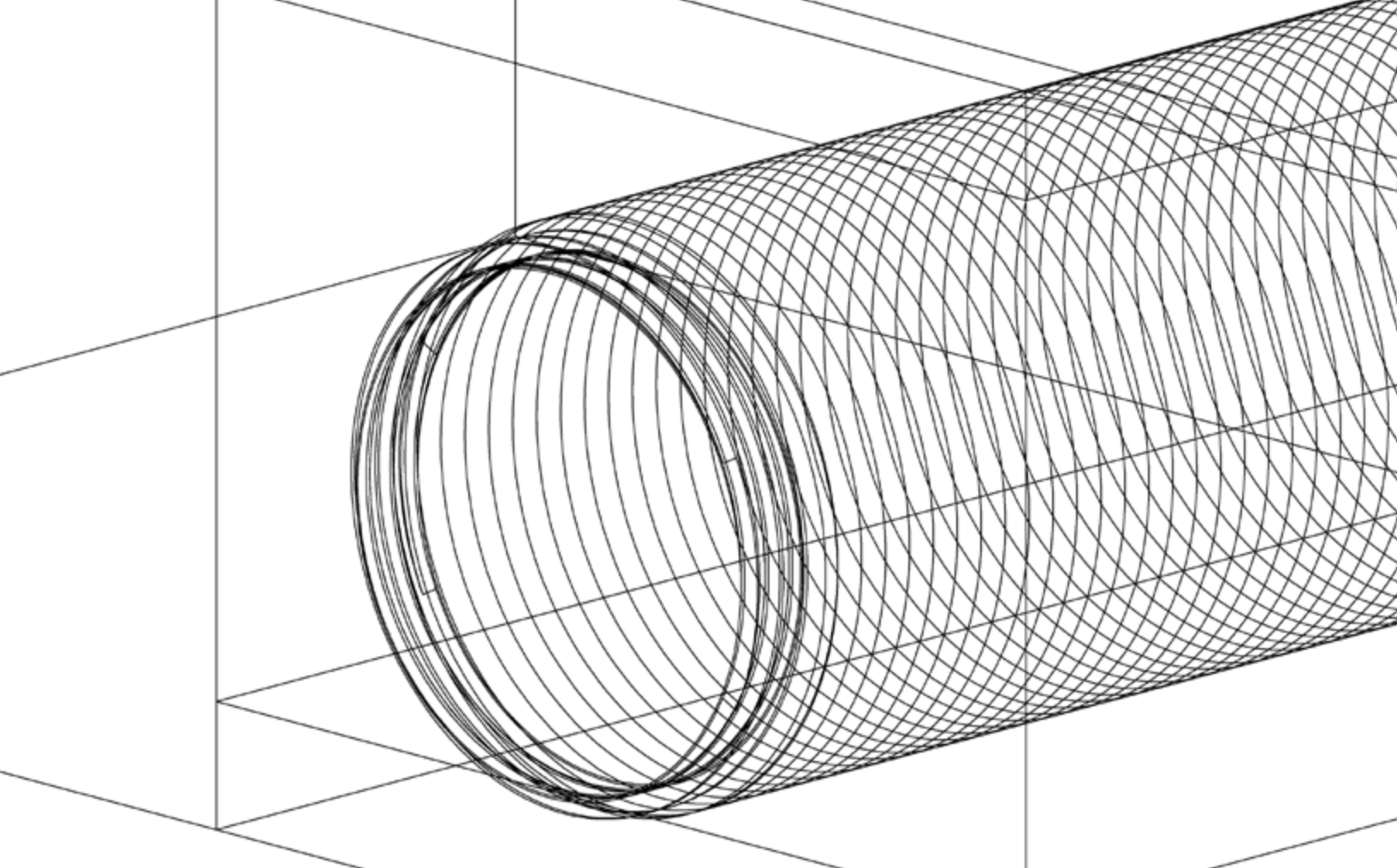
STEP 8 CONNECTION

If possible, pre-assemble the inlet collector and connect it to the pipes of the last section.



STEP 9 FINISHING

Complete the backfilling according to the specifications requirements. Make sure you have the minimum backfill height before circulating over the basin: 300 mm (12 in) for 1200 mm diameters (48 inches) or less and 500 mm (18 in) for the 1500 mm (60 in) diameter.



WEHOLITE™

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR WEHOLITE™ POLYETHYLENE PROFILE WALL PIPES

STEPS

1. Before undertaking work
2. Inspection of the materials
3. Handling
4. Storage on site
5. Trench preparation
6. Assembly
7. Backfilling

GENERAL NOTES

1. Cutting pipes on site
2. Connection to a structure
3. Traffic
4. Temperature

Figure 1 : Typical installation trench

Table 1 : Minimum fill levels

STEP 1

BEFORE UNDERTAKING WORK

In case of discrepancy between the instructions contained in this guide and those contained in the plans and specifications, please contact your Soleno representative.

Contact your Soleno representative at least 48 hours before work begins. A visit from your authorized Soleno representative is recommended after receipt of the materials on site or before work begins.

STEP 2

INSPECTION OF THE MATERIALS

Upon receipt of the materials, ensure that all items required on the packing slip are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.

STEP 3

HANDLING

For pipes 760 mm (30 in) in diameter or less, a central lifting point is sufficient. For larger pipes, use two lifting points spaced one-third of the way apart.

Pipes longer than 9.14 m (30 ft) in length can be handled with a loader, forklift or excavator with a “Y” sling, so that there are 2 lifting points.



STEP 3

HANDLING (CONT'D)

- Handling equipment must be capable of lifting the weight of the pipe¹.
- Wide belt slings or nylon straps with adequate strength are recommended.
- **Do not** use steel wire ropes, chains or hooks to unload or handle pipes.
- **Do not** drop pipes or fittings on the ground.
- **Do not** lift the pipe by inserting the forks into the ends of the pipe.

STEP 4

STORAGE ON SITE

Provide adequate storage space for pipes and fittings to prevent deformation. This storage area should be a large, flat surface, free of angular protuberances (rocks, tree stumps, etc.), in order to avoid any point loading.

For pipes 760 mm (30 in) or less, Weholite™ can be stacked with blocks to prevent pipe movement at the lower level. Under no circumstances should Weholite™ stacks exceed a height of 2.1 m (7 ft).

STEP 5

TRENCH PREPARATION

Start excavating the trench in accordance with local plans and specifications and safety regulations.

- Level and inspect the bottom of the trench. Remove any stone or debris that might damage the pipe.



Note 1: Refer to the Weholite™ data sheet for pipe weights.

STEP 5

TRENCH PREPARATION (CONT'D)

- Compact the trench foundation in layers 150 mm in thickness (see Figure 1). The foundation must be compacted to 90% of the modified Proctor. The engineer is responsible for ensuring a stable foundation.
- Install the bedding material and compact. The minimum bedding thickness is 150 mm (6 in). Bedding must be free of stones larger than 40 mm (1.5 in).



NOTES

- The granular material used to make the bedding can be Class IB or higher according to ASTM D2321 or Category CG-142 compliant with standard BNQ 2560-114 according to standard specification BNQ 1809-300. This material must be free of large stones, frozen masses or other debris. In all cases, the backfill material chosen must meet the requirements of the plans and specifications, and the design engineer is responsible for their selection.
- Where excavation is carried out in clay or silty soils, provide a uniform and unaltered bedding.
- The trench width must allow the hip to be compacted (at the backfill stage). The suggested trench width is the greater of the outside diameter of the pipe plus 405 mm (16 in) or 1.25 times the inside diameter of the pipe plus 300 mm (12 in).
- When the pipes are installed in parallel, the clearance between them must be such that a vibrating plate can be used.
- **Presence of groundwater** : The installation of the pipe must be done in a dry trench. The drying techniques used must comply with local safety standards. The design engineer must adapt the foundation to these conditions.

Note 2: CG-14 is a designation to group the grain size requirements of the granular material used to base and embed a pipe. This designation was previously known as "0-3/4 crushed stone or 0-3/4 gravel and Class A sand". This new designation is now referred to as CG-14, to be in accordance with the current nomenclature based on granular classes.

STEP 6

ASSEMBLY

The Weholite™ pipe is usually assembled by fused joints on site. In some applications, the use of a threaded joint connection is applicable. Refer to the applicable section for the type of assembly that corresponds to your project.

FUSED SEAMS

Contact a third party holding a fused polyethylene (PE) joint certification licence. Please note that a welded joint must be executed and certified by this company. Soleno Service offers this type of service. Contact your Soleno representative for more information.

Pipe alignment

The pipe ends must be properly aligned prior to the thermal extrusion welding process.

Alignment strips should be used when installing pipes larger than 1200 mm (48 in) in diameter. They will be temporarily attached to the outside of the pipe to ensure perfect alignment over the entire circumference. If required, use hydraulic or manual jacks for better alignment.

Once the weld is finished and has cooled, the alignment strip can be transferred to the next joint. When a pipe is to be welded inside and outside, the alignment strip must be removed after the internal weld has been completed.



Pipe alignment



Alignment strips



Inside weld

Extrusion welding

If necessary, refer to the thermal fusion procedure for Soleno polyethylene to find out what steps will be carried out by the mandated company.

Note: During joint welding, it is essential that the pipe be perfectly dry and the ambient temperature be at least 10 °C. Temperature is a key factor in ensuring a good weld.

STEP 6

ASSEMBLY (CONT'D)

THREADED JOINTS

The Weholite™ pipe has a spiral wound rectangular profile (see image below). This configuration allows the pipe ends to be “threaded” by removing material from the outer or inner part of the wall to form the male or female end of the pipe (see picture below). Two pipe sections (one male and one female end) can then be assembled by screwing.



Wound rectangular profile



Threaded joints

Steps

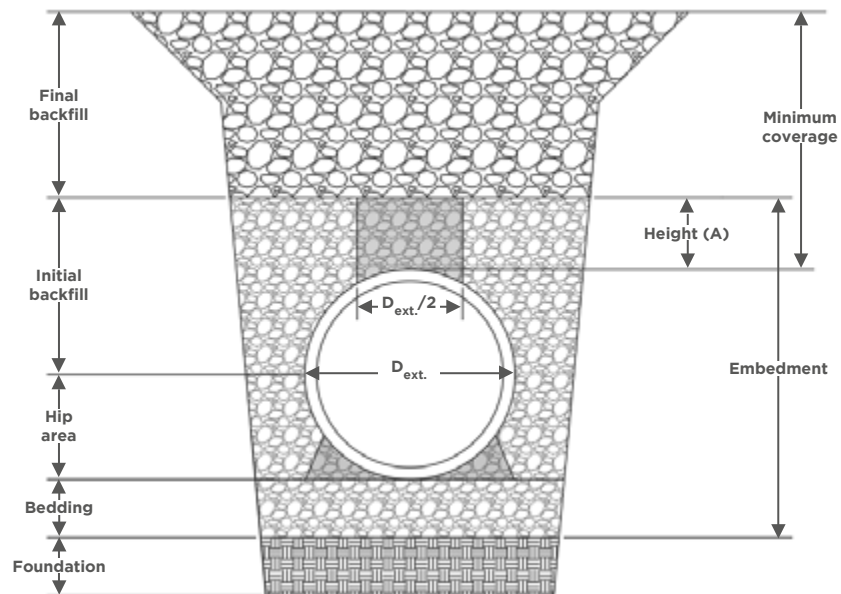
1. Ensure adequate bedding and proper pipe alignment.
2. Apply grease on both threaded ends.
3. Wrap a strap around pipe A and connect it to the existing pipe B.
4. Align the lines at the ends of each pipe to be connected. These lines indicate the start of the threads.
5. While holding pipe B stationary, with the aid of a mechanical shovel, turn pipe A until pipe B (the one already in place with the female end) turns slightly. To complete the screwing operation, two and a half turns are required.

At all times, take care not to contaminate the threaded ends. Any trapped debris can affect the seal performance.

If necessary, add Wehoseal membrane around the joint. Refer to the Wehoseal Installation Guide for installation.

STEP 7 BACKFILLING

Backfilling is the most important step in ensuring the long-term structural functioning of a flexible pipe. The most sensitive portion of the backfill is located under the hips of the pipe. Insufficient compaction at this location can lead to ovalization of the pipe, as well as alignment and level problems.



- Place the backfill material on the pipe so that it flows evenly on both sides of the pipe.



STEP 7

BACKFILLING (CONT'D)

- While immobilizing the pipe, compact the backfill material under the hips with a hand tamper to ensure proper support for the pipe. If the trench is unstable, protect the walls with a prop system or widen the trench to allow compaction under the hips. Avoid any contact between the compaction equipment and the pipe.



- Continue the initial backfilling of the pipe by compacting in layers from 150 mm (6 in) to 300 mm (12 in) in thickness at 90% of modified Proctor. At this stage, the backfill height on one side must never exceed the backfill height on the other side by more than 300 mm (12 in). Only manual compaction equipment (e. g. mechanical tamper or vibrating plate) may circulate around the pipe.
- No compaction should be made directly over the pipe until it is backfilled and compacted above its crown at a minimum height (A) of 300 mm (12 in).
- Finally, complete the final backfill (above the initial backfill area). The backfill material must be composed of excavated or borrowed material free of organic matter, up to 75 mm (3 in) in size. This area must also be compacted to 90% of modified Proctor, in layers not exceeding 300 mm (12 in).



STEP 7

BACKFILLING (CONT'D)

NOTES

1. The material used for:

- The pipe bedding can be Class IB or higher according to ASTM D2321 or Category CG-142 compliant with standard BNQ 2560-114 according to standard specification BNQ 1809-300.
- Hip and initial backfill may be Class I or II as per ASTM D2321 or Class CG-14 as per standard BNQ 2560-114 according to standard specification BNQ 1809-300.

This material must be free of stones larger than 40 mm (1.5 in.), frozen masses or other debris.

2. Minimum backfill for:

- Supporting CL-625, H-25 or HS-25 loads.

The minimum backfill height above the pipe (measured from the top of the pipe to just below a flexible pavement or just above a rigid pavement) to support CL-625, H-25 or HS-25 road traffic loads is given in Table 1.

3. Prevent buoyancy:

In order to maintain the structural capacities of the pipes, care must be taken to eliminate all conditions that would allow for buoyancy and erosion of backfill material. The design engineer must ensure sufficient backfill to prevent flotation. The minimum backfill height above the pipe to prevent buoyancy lift is given in Table 1.

In all cases, the initial backfill height above the pipe shall be a minimum of 300 mm (12 in).

Fluid backfill (i.e. concrete, light concrete):

This type of backfill is compatible with the Weholite™ pipe. When this type of backfill is used, precautions should be taken to prevent pipe lift or buoyant movement during backfilling. Your Soleno representative can advise you on pipe restraint techniques.

TABLE 1
TABLE OF MINIMUM COVERAGE
AS A FUNCTION OF LOADS OR BUOYANCY*

To support CL-625, H-25 or HS-25 loads				To prevent buoyancy*			
Nominal diameter		Minimum Backfill Height		Nominal diameter		Minimum Coverage Height	
mm	in	mm	ft	mm	in	mm	in
460	18.0	430	1.4	460	18.0	430	17.0
495	19.5	520	1.7	495	19.5	520	20.0
530	21.0	550	1.8	530	21.0	550	22.0
610	24.0	550	1.8	610	24.0	550	22.0
690	27.0	550	1.8	690	27.0	550	22.0
760	30.0	610	2.0	760	30.0	610	24.0
840	33.0	640	2.1	840	33.0	640	25.0
910	36.0	610	2.0	910	36.0	610	24.0
1020	40.0	640	2.1	1020	40.0	640	25.0
1070	42.0	670	2.2	1070	42.0	670	26.0
1220	48.0	700	2.3	1220	48.9	700	28.0
1370	54.0	760	2.5	1370	54.0	760	30.0
1520	60.0	820	2.9	1520	60.0	820	32.0
1680	66.0	850	2.8	1680	66.0	850	34.0
1830	72.0	910	3.0	1830	72.0	910	36.0
1980	78.0	910	3.0	1980	78.0	920	36.0
2130	84.0	940	3.1	2130	84.0	990	39.0
2290	90.0	940	3.1	2290	90.0	1050	41.0
2440	96.0	980	3.2	2440	96.0	1120	44.0
2590	102.0	1010	3.3	2590	102.0	1190	47.0
2740	108.0	1040	3.4	2740	108.0	1250	49.0
3050	120.0	1100	3.6	3050	120.0	1375	54.0
3355	132.0	1190	3.9	3355	132.0	1530	60.0

* Assumption for calculations: The maximum groundwater height is at the same level as the pipe crown. Contact your Soleno representative for the specific data for your project.

NOTE 1

CUTTING PIPES ON SITE

If cutting a pipe on site is required, **do not leave** the profile open at the end. An extrusion weld must be done on the cut end.

Reminder: Contact a third party holding the certification licences for fused polyethylene joint weld. Please note that a welded joint must be executed and certified by this company

NOTE 2

CONNECTION TO A STRUCTURE

When connecting to a rigid structure, make sure that the bed is properly executed. Contact your Soleno representative for the specifications for this type of connection.

NOTE 3

TRAFFIC

VEHICULAR TRAFFIC

No vehicle traffic shall be allowed over the pipes if the minimum backfill height (measured from the top of the pipe to just below a flexible pavement or just above a rigid pavement) is not complied with. See Note 2 in Step 7 of this document for this required height or refer to the product data sheet (available at soleno.com).

HEAVY VEHICLE TRAFFIC DURING CONSTRUCTION

During construction work, heavy vehicles might have to travel over the pipe. In this case, an additional minimum backfill must be added to allow for this type of traffic. The minimum total backfill (measured from the top of the pipe to just below a flexible pavement or just above a rigid pavement) must be 900 mm (36 in) for diameters of 1200 mm (48 in) or more. For smaller diameters, refer to Table 1 of this document.

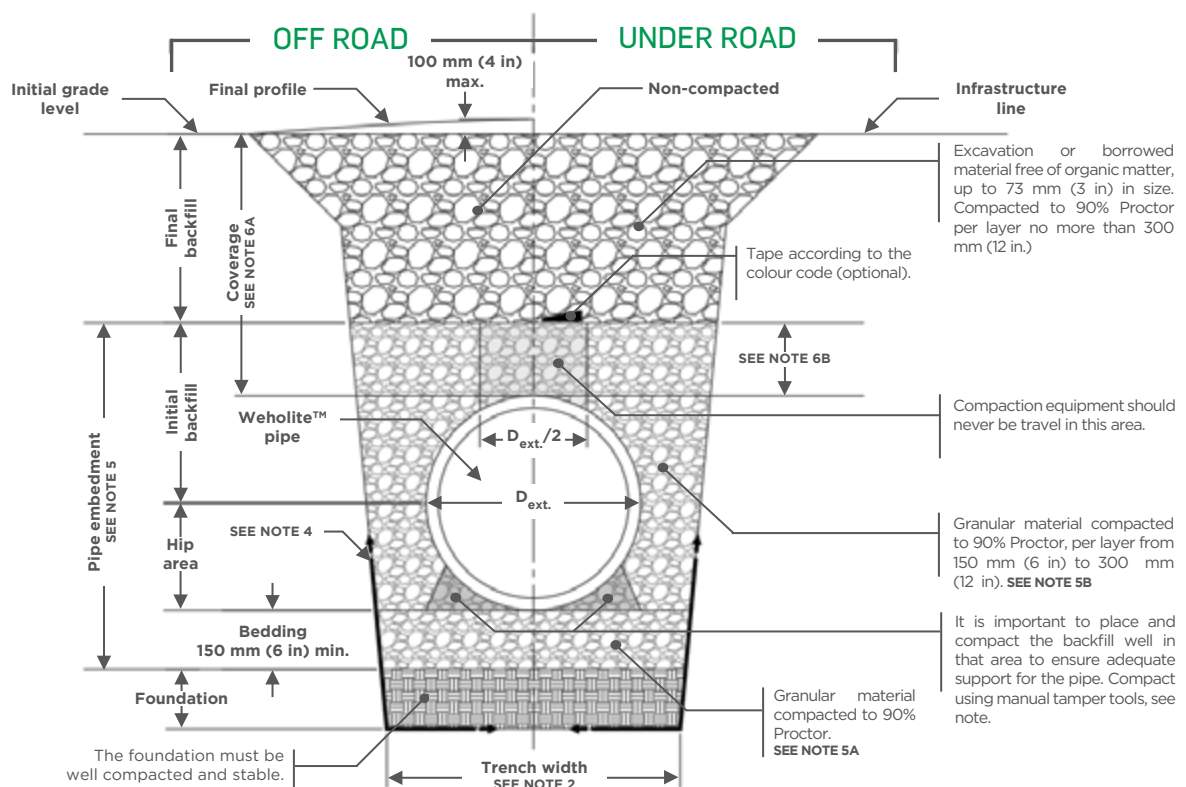
NOTE 4

TEMPERATURE

The rigidity of the Weholite™ pipe is not affected by exposure to sunlight or high ambient temperature. However, if large differences are observed between the temperature at which the pipes are stored and the temperature at the bottom of the installation trench, the pipe may require some conditioning to avoid its possible contraction. Operating temperatures above 49 °C (120 °F) are not recommended.

FIGURE 1 TYPICAL INSTALLATION TRENCH

The pipe installation method for Weholite™ shown below is based on standards BNQ 1809-300 R2007, CSA 182.11 or ASTM D2321. However, depending on the location of the project, other regulations or standards may apply. Soleno recommends that you comply with the requirements of the city or province of reference. Otherwise, Soleno recommends applying the method shown below.

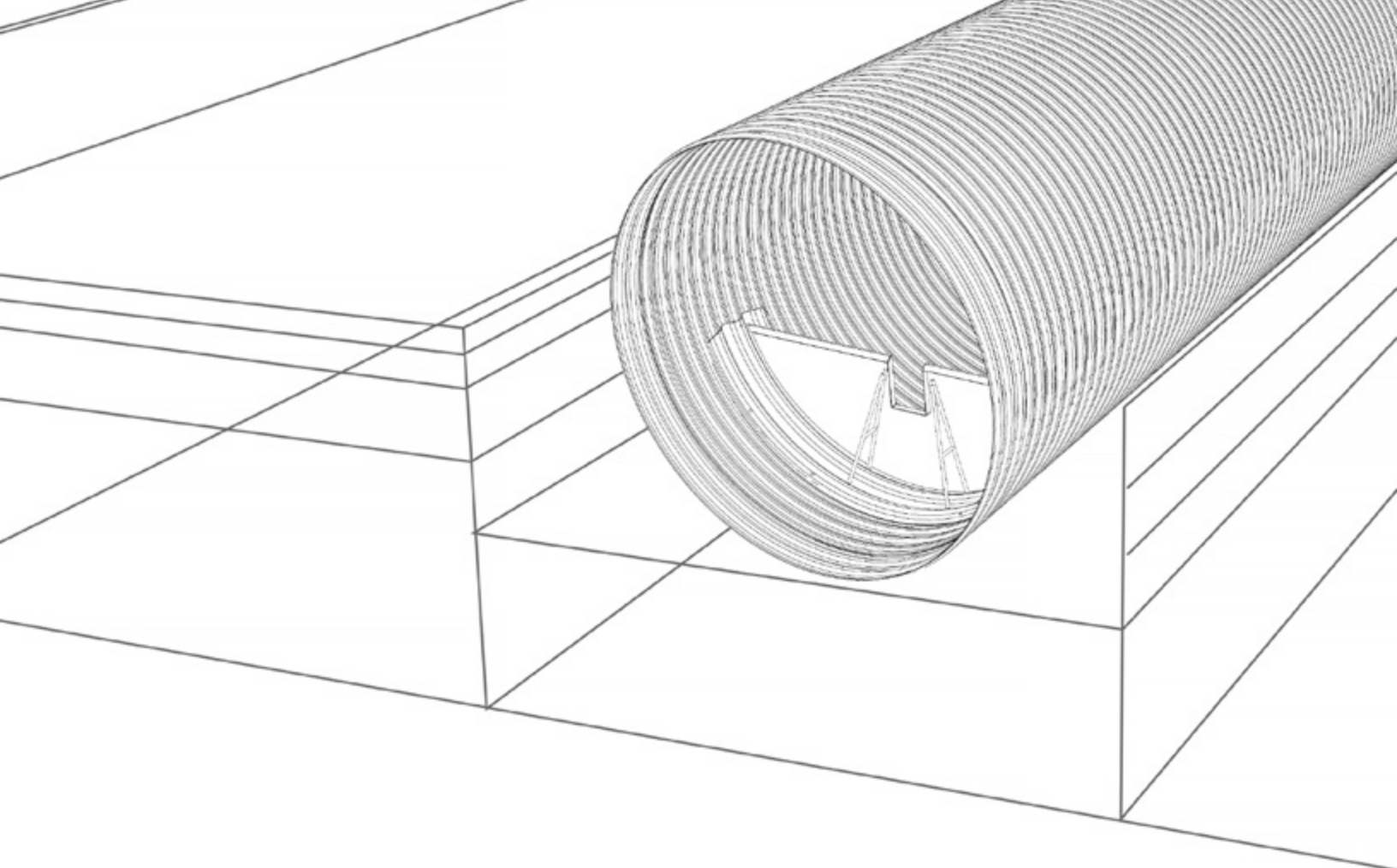


Notes

- The excavation slopes are not restricted to the slopes shown in the figure above. The excavation must meet the requirements of the Construction Safety Code.
- The suggested trench width is the greater of the outside diameter of the pipe plus 405 mm (16 in) or 1.25 times the inside diameter of the pipe plus 300 mm (12 in).
- The foundation must be free of any stone or debris that might damage the pipe.
- The use of a geotextile is necessary to prevent material migration. Geotextile is required in an installation where the water table is high in fine-grained soil. The geotextile will be installed on the walls and bottom of the trench prior to backfilling the pipe bedding and embedment.
- This material must be free of stones larger than 40 mm (1.5 in.), frozen masses or other debris.
 - The pipe bedding material can be Class IB or higher according to standard ASTM D2321 or Category CG-14, compliant with standard BNQ 2560-114 according to standard specification BNQ 1809-300.
 - The pipe bedding material can be Class IB or higher according to standard ASTM D2321 or Category CG-14, compliant with standard BNQ 2560-114 according to standard specification BNQ 1809-300.
- The minimum backfill height above the pipe (measured from the top of the pipe to just below a flexible pavement or just above a rigid pavement) to support CL-625, H-25 or HS-25 road traffic loads is given in Table 1.
 - No compaction should be made directly over the pipe until it is backfilled and compacted above its crown at a minimum height (A) of 300 mm (12 in.)

Note: During construction work, heavy vehicles might have to travel over the pipe. In this case, an additional minimum backfill must be added to allow for this type of traffic. Refer to the complete installation guide for this height.

Note: The design engineer must ensure sufficient backfill to prevent flotation. Contact your Soleno representative for the specific data for your project.
- Consult the installation guide and your Soleno representative for project-specific data.



REMOVABLE FISH WEIR

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR A REMOVABLE FISH WEIR IN A STEEL CULVERT

STEPS

Work planning

1. Before undertaking work
2. Inspection of the material
3. Handling
4. Stream slope

Installation

5. Direction of installation
6. Positioning and alignment
7. Weir installation
8. Culvert installation with fish weirs

Table 1 : Length of the wooden adapter

Appendix 1 : Location of weirs in a culvert

STEP 1 BEFORE STARTING WORK

In case of discrepancy between the instructions contained in this guide and those contained in the plans and specifications, please contact your Soleno sales representative.

Contact your Soleno sales representative at least 48 hours before work begins. A visit from your authorized Soleno representative is recommended after receipt of the materials on site or/and before the work begins.

Required tools and equipment

- Wooden adapter type 4 x 4, consult Table 1 *Length of the wooden adapter*
- Wrench (optional : ratchet) 9/16 in
- Chalk line or equivalent
- Hydraulic jack, cylinder style, minimum 4 tons
- 9/16 in deep socket
- Indelible marker
- Rubber hammer or mass
- Bubble level
- Impact drill with 1/2 in chuck
- Hand drill with 3/8 in drill bit
- Caulking gun
- Hearing protection
- Measuring tape

STEP 2 INSPECTION OF THE MATERIAL

Upon receipt of the materials, ensure that all items required on the slip are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.



Additional material supplied by Soleno (if the weirs are installed on site)

- Grade 8 anchor bolts (3/8 in by 1.25 in long), nuts and washers, steel (zinc), supplied by Soleno
- Sika 221 sealant (only)

STEP 3

HANDLING

Weirs

Follow the manual method to move the weirs individually, respecting the health and safety rules in force.

Culverts

Steel culverts can be handled using a loader, forklift or excavator, equipped with a “Y” sling, so that there are 2 lifting points.

With or without lifting eyelets welded to the culvert, follow the rules of the *Association paritaire pour la santé et la sécurité du travail du secteur de la construction* (ASP Construction).

Before continuing

If the weirs have been pre-installed (in factory) in the pipe, skip to step 8.

STEP 4

STREAM SLOPE

Culverts equipped with weirs must be installed in accordance with *Table 1 - Maximum slope of the watercourse on the basis of the length of the conduits* in [Schedule 10](#) of the Regulation Respecting the Sustainable Development of Forests (RRSDF), which varies with the length of the culvert.

STEP 5

DIRECTION OF INSTALLATION

The direction of installation must comply with the indications (stickers) on the weirs. The water flow must follow the arrows indicated on them to ensure the resistance and efficiency of the installation.

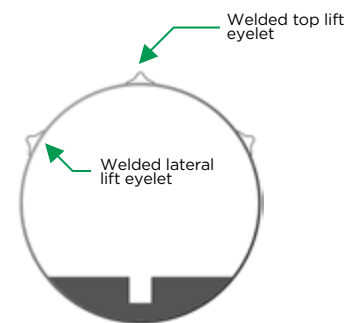


STEP 6 POSITIONING AND ALIGNMENT

Alignment

If the culvert has top lift eyelets, these must be on top of the crown (at 12 o'clock).

Using a chalk line, mark a horizontal line inside the culvert at the bottom (at 6 o'clock). This line will serve as a guide for the positioning of the weirs.



Positioning

The number of weirs and their location in culverts must meet the standards set out in *Table 2 - Number and location of the outlets in relation with the length of the conduit* in [Schedule 10](#) of the RRSDF.



- 6a. Measure the location of the first weir to be installed in accordance with the requirements of Table 2 in [Schedule 10](#) of the RRSDF.

In the case of an installation requiring more than one culvert, be more attentive to the measures taken so that they take into account the joints thus created.



- 6b. Be sure not to position the anchor bolts in the staple joint.

If this is the case, offset the weir by one ring before or one ring after, making sure to respect the **maximum** distance of 2000 mm (78.9 in) between the weirs, according to requirements of Table 2 in [Schedule 10](#) of the RRSDF.

STEP 6 POSITIONING AND ALIGNMENT (CONT'D)



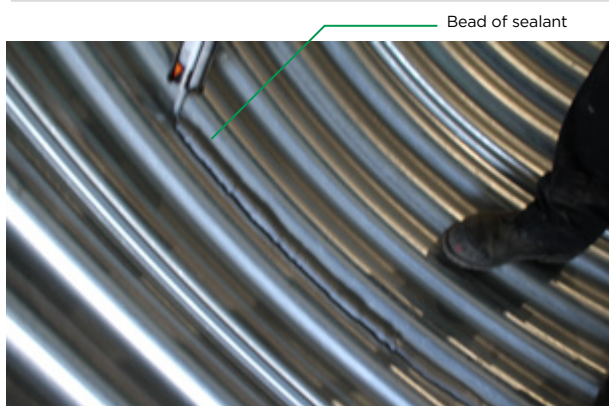
6c. Using the indelible marker, mark and number the position of the weir using the previously marked alignment line.



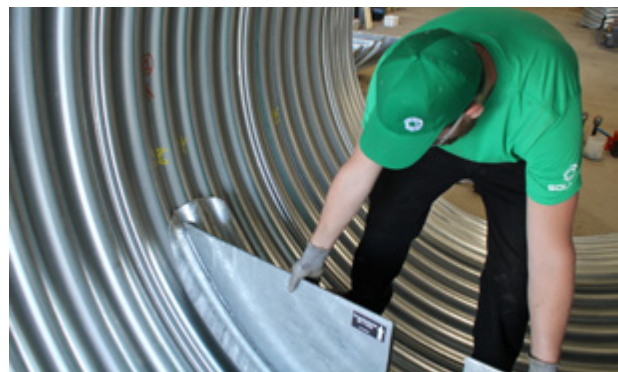
6d. Measure, mark and number the locations of the following weirs, following the steps mentioned above.

For ease of installation, Soleno recommends removing the weirs from the culvert before proceeding to step 7.

STEP 7 WEIR INSTALLATION



7a. Apply approximately 1.5 in bead of sealant (Sika 221 only), in the centre corrugation trough, outside the weir.



7b. Reposition the first weir in its place.

STEP 7 WEIR INSTALLATION (CONT'D)



7c. Using the hammer or rubber mass, make sure the weir is level. Soleno recommends wearing hearing protection.



7d. Using the jack and the wooden adapter, hold the weir at the bottom of the culvert.



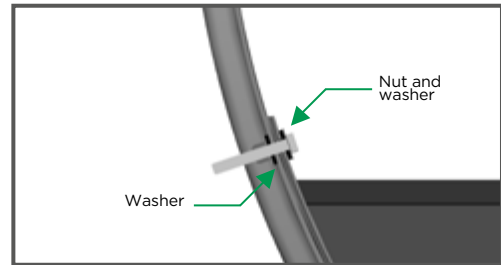
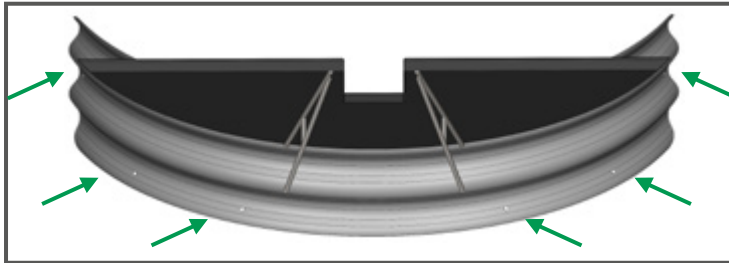
Note 1: Make sure your adapter has a beveled end so that it fits well in the corrugation.



Note 2: Make sure you have a support (2x6 wooden suggested) to provide a stable base for your hydraulic jack.

Note : The length of your wooden adapter type 4 x 4 will depend on the diameter of your pipe, consult Table 1 *Length of the wooden adapter* of this document for the recommended length.

STEP 7 WEIR INSTALLATION (CONT'D)



7f. Insert anchor bolts with the head inside the culvert. Make sure you have a washer inside and one outside.

7e. Drill the weir-culvert assembly; distribute the holes evenly **on each side** of the weir and make sure to keep the same distance between each hole, approximately.

NOTES

The following practices are prohibited:

- on-site welding;
- torch cutting of steel elements;
- cutting holes with a torch.



7g. Continue with the installation of the weirs, following the steps mentioned above, always referring to the direction arrows.

STEP 8 CULVERT INSTALLATION WITH FISH WEIR

- Referring to step 3, make sure you have the necessary equipment to lift the appropriate loads.
- Level the culvert and weirs. If available, use the lateral lift eyelets.
- The culvert(s) with weirs must be installed in accordance with the requirements of [Schedule 10](#) of the RRSDF.

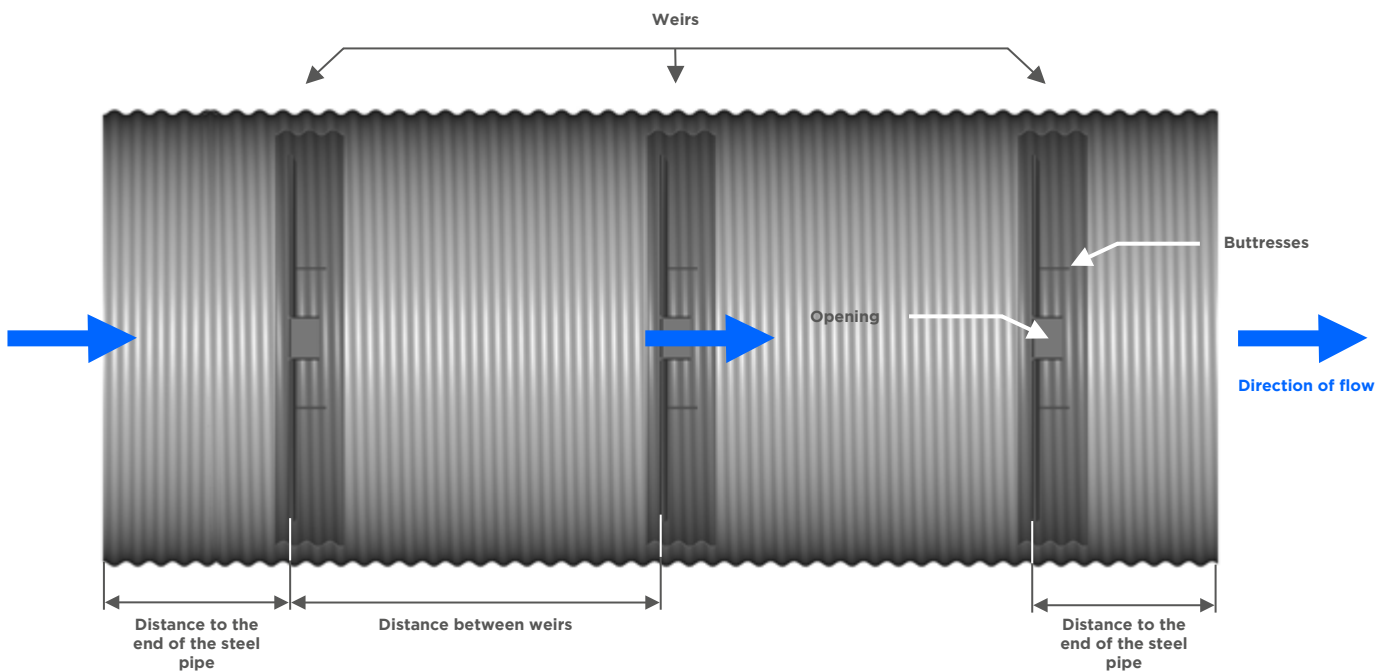
TABLE 1
LENGTH OF THE WOODEN ADAPTER TYPE 4 X 4

Nominal diameter of the pipe		Length of the wooden adapter type 4 x 4		Nominal diameter of the pipe (cont'd)		Length of the wooden adapter type 4 x 4 (cont'd)	
mm	in	mm	in	mm	po	mm	po
1200	48	900	36	2200	88	1900	76
1400	56	1100	44	2400	96	2100	84
1500	60	1200	48	2700	108	2400	96
1600	64	1300	52	3000	120	2700	108
1800	72	1500	60	3600	144	3000	120
2000	80	1700	68				

* The measurements were taken with a wooden seat type 2 x 6 and a hydraulic jack measuring 200 mm (8 in) high.

APPENDIX 1
LOCATION OF WEIRS IN A CULVERT

Bird's eye view



INSTALLATION GUIDE

ENVIRO-SPAN

This guide is based on engineering principles and good practice for the installation of arch culverts. Stream crossings are highly regulated in many areas. Check with your local regulatory agencies before installation to ensure that the ENVIRO-SPAN arch culvert is authorized for your specific crossing.

Please read this installation guide before starting work.
Supervision by an engineer is recommended.



Preparation:

Make a detailed site plan for the access path based on:

- an initial site assessment;
- the stream hydrology;
- an assessment of the ground stability;
- other factors relating to the site.

Choose the location of the access path so that the wetted perimeter of the waterway sits entirely between the bankseats, with a width not exceeding 2100 mm (6.9 ft). For example, for a stream having a normal width of 1.070 mm (3.5 ft), we recommend choosing a 2150 mm (7 ft) ENVIRO-SPAN culvert.

Hydrological calculations should be performed to determine the peak flow carried by runoff from the upstream watershed, to ensure that the structure is properly sized for each application.

Warning:

- a. Do not travel on the ENVIRO-SPAN arch culvert with a tracked vehicle before backfilling at least 600 mm (24 in) above the arch.
- b. Do not travel on the ENVIRO-SPAN arch culvert with a wheeled vehicle before the minimum recommended backfill height above the arch (see data sheet).



Installation:

1. Select two straight timber logs which will serve as bankseat footings. Plastic pipes with rigid walls (Sclairpipe) and steel pipe (foundation piles) can also be used. The log dimensions are as follows:

Log diameter	200 mm (8 in) 300 mm (12 in)
Log length	Length of the structure + 1.200 mm (48 in)

The footings used to support the ENVIRO-SPAN arch culvert system can be installed without anchoring on ground slopes of 2% or less. When the slope exceeds 2%, it is recommended to anchor the logs with steel anchors at each end of the logs, and at intervals of 2.5 m (8 ft), if needed.

2. Place the logs parallel to the stream bed with a centre to centre spacing of 2,455 mm (96.65 in) corresponding to the width of the ENVIRO-SPAN arch culvert.



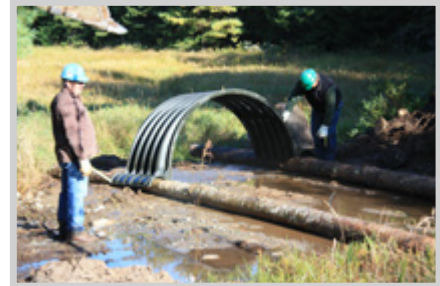
Note: If more than one log is necessary to achieve the required length, stagger the log joints from both sides of the structure to ensure its stability.

INSTALLATION GUIDE

ENVIRO-SPAN (CONT.)

3. Installing the sections:

- a. Install the first section at 600 mm (24 in) from one end of the log, positioning the culvert bankseats on the log footings.
- b. Place the second section next to the first one and place the connector on top of the two ENVIRO-SPAN sections so as to overlap the end rings of the two sections. No additional accessories are required.
- c. Continue adding sections up to the length specified in the design drawing.



4. Riprap:

For installations with seasonal flooding and during assembly, it is recommended to place inside the sections, one after the other,

- a. riprap along the bankseats
- b. a geogrid on the banks before placing riprap.



5. Coverage with a geotextile:

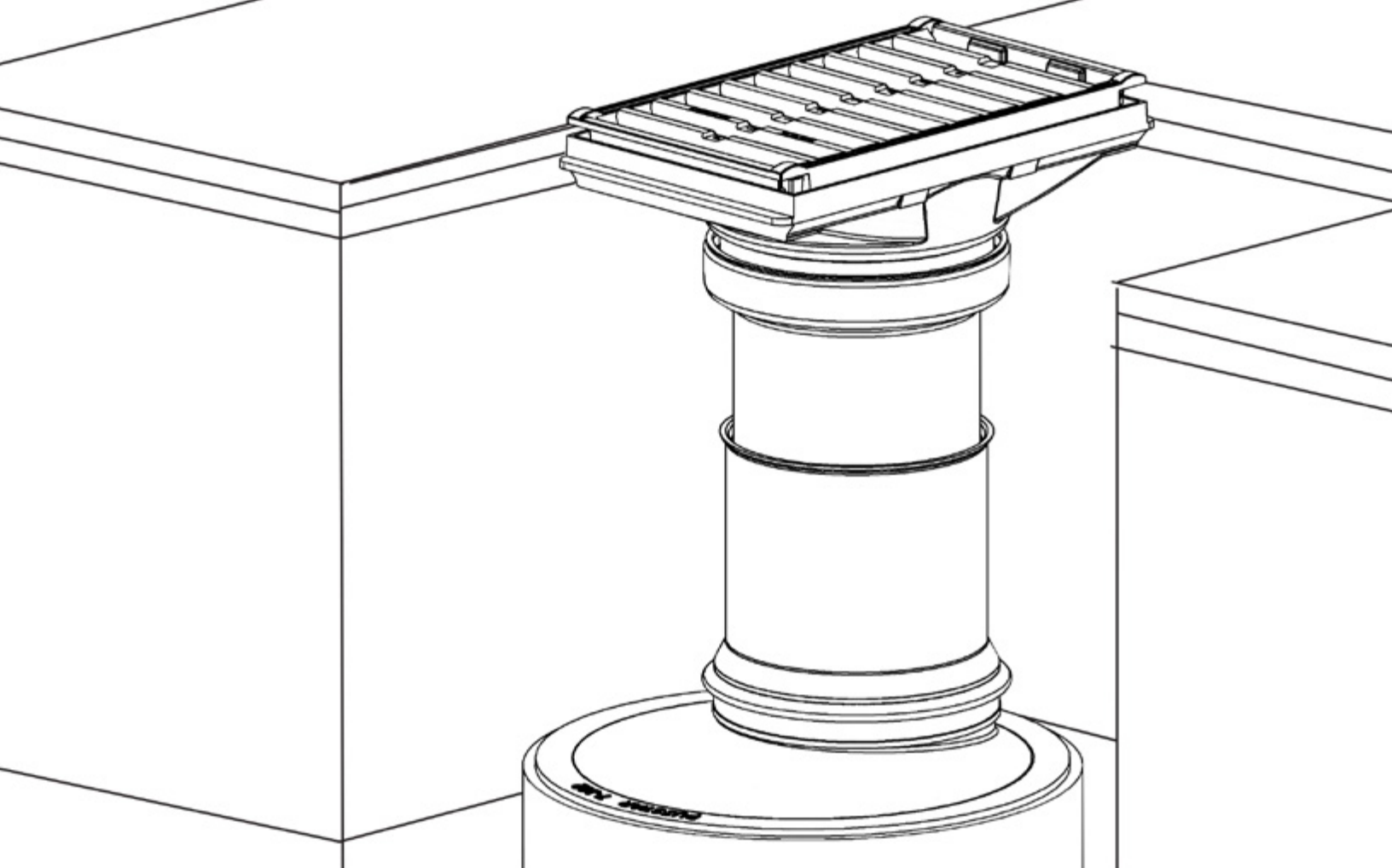
After assembly is completed, it is important to cover the entire structure with a TX-F type geotextile. The geotextile should cover the system and have an excess length of 300 mm (12 in) on each side of the ENVIRO-SPAN arch structure.



6. Backfilling:

- a. Backfilling can be done using local soil. Any stone exceeding 150 mm (6 in) in diameter must be removed.
- b. Backfilling should be laid in 300 mm layers (12 in) spread simultaneously and equally on each side of the structure.
- c. Each layer of backfill should be compacted using a vibrating plate or power shovel.
- d. Refer to the data sheet for the minimum and maximum fill heights.
- e. Take care not to displace the connectors when backfilling.





PUISTAR®

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR THE PUISTAR® SYSTEM

STEPS

1. Before undertaking the work
2. Merchandise reception
3. HDPE catch basin installation
4. Rehabilitation of an existant catch basin
5. PUISTAR® installation
6. Removing the grate

STEP 1

BEFORE UNDERTAKING THE WORK

In case of discrepancy between the instructions contained in this guide and those contained in the plans and specifications, please contact your Soleno sales representative.

Contact your Soleno sales representative at least 48 hours before work begins. A visit from your authorized Soleno representative is recommended after receipt of the materials on site or/and before the work begins.

STEP 2

MERCHANDISE RECEPTION

Upon receipt of the materials, ensure that all items required on the slip are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.



STEP 3

HDPE CATCH BASIN INSTALLATION

(For a rehabilitation, skip to step 4)

- Excavate to allow the installation of the catch basin as well as the connecting pipe.
- If required, install a trench box.
- Clear the top of the main storm water pipe and proceed to the drilling of this pipe. Make the catch basin lead connection to the storm sewer line with the appropriate universal sol tee connection.
- Install the universal sol tee as well as the necessary pipeline to get to the catch basin location.

STEP 3

HDPE CATCH BASIN INSTALLATION (CONT'D)

(For a rehabilitation, skip to step 4)

- Install the catch basin at the required location.
- Insert the pipe inside the catch basin.
- Proceed to the backfilling and the compaction according to the plans and specifications sheet and conform to the local norms in effect.
- If required, install the hooking system.
- Go to step 5.

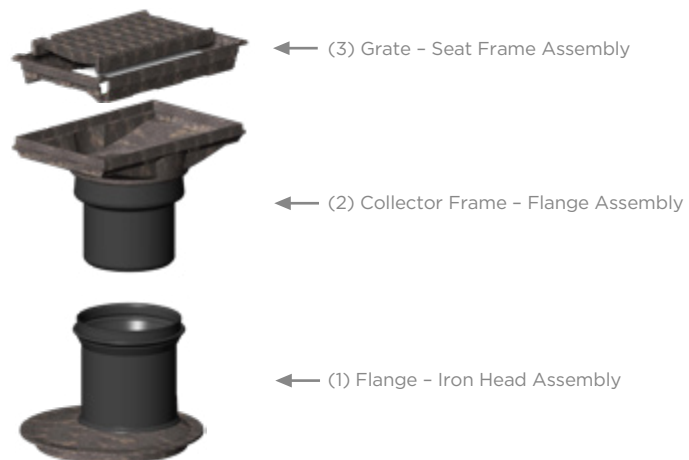
STEP 4

REHABILITATION OF AN EXISTANT CATCH BASIN

- Proceed to the paving cut in the needed rehabilitated zone.
- Excavate the backfill material to remove the broken section of the catch basin.
- Remove the defective elements and other accessories (frame, grate, head, and riser) to free the top of the catch basin.
- Ensure that the catch basin is structurally sound, stable and that the hooking system (if required) is properly placed.
- If a spigot lip is present over the catch basin, remove with the help of a concrete saw.

STEP 5

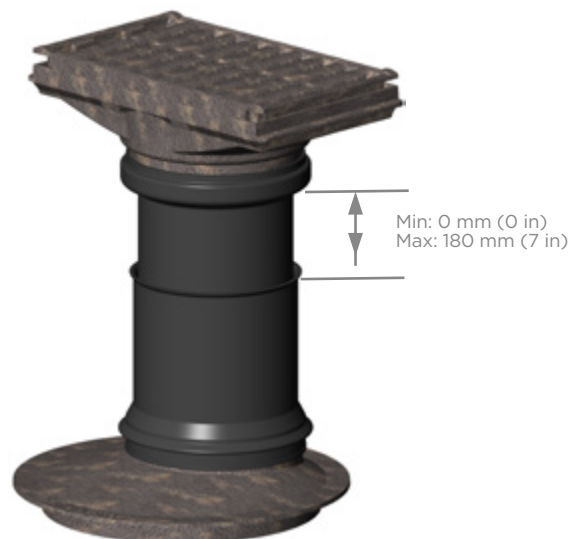
PUISTAR INSTALLATION



STEP 5

PUISTAR INSTALLATION (CONT'D)

- Lay the flange-iron head assembly (1) on top of the catch basin.
- Properly align the iron head opening with the grate location, position the flange at the required distance between the grate and the edge of the concrete or of the sidewalk.
- Insert the collector frame-flange assembly (2) in the flange-iron head assembly (1). Incline the collector frame to the same grade of the street profile pavement.
- Proceed to the backfilling with the help of compactable materials, with successive layers of 200 mm (8 in). The compaction needs to reach 90% of the M.P. on all of the width of the backfilling. Adjust the elevation and slop of the collector frame during the backfilling procedures.
- Adjust the height of the collector frame as to obtain the following dimensions:



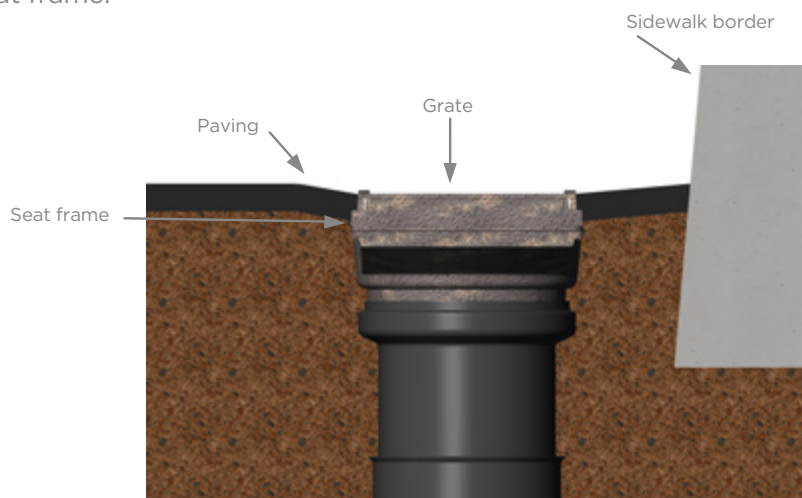
- Clean the exterior of the collector frame.
- Insert the grate-seat frame assembly (3) inside the collector frame. In the case that the grate is installed on a unidirectional slope, ensure the positioning of the grate to optimize the water flow/drainage.



STEP 5

PUISTAR INSTALLATION (CONT'D)

- Perform a fast pass with the compaction equipment on the grate to properly sit the collector frame into the backfilling.
- Temporarily cover the grate with a cardboard or geotextile (to protect the grate and prevent the infiltration of granular material).
- Proceed to the paving by taking care of aligning the top of the paving and the border of the seat frame.

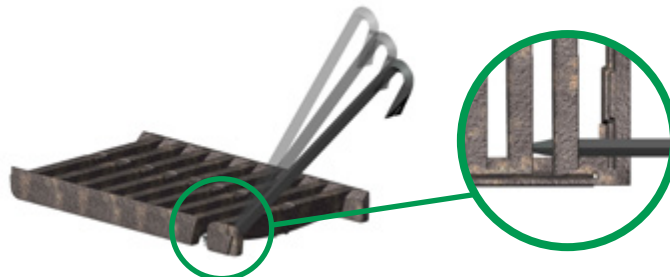


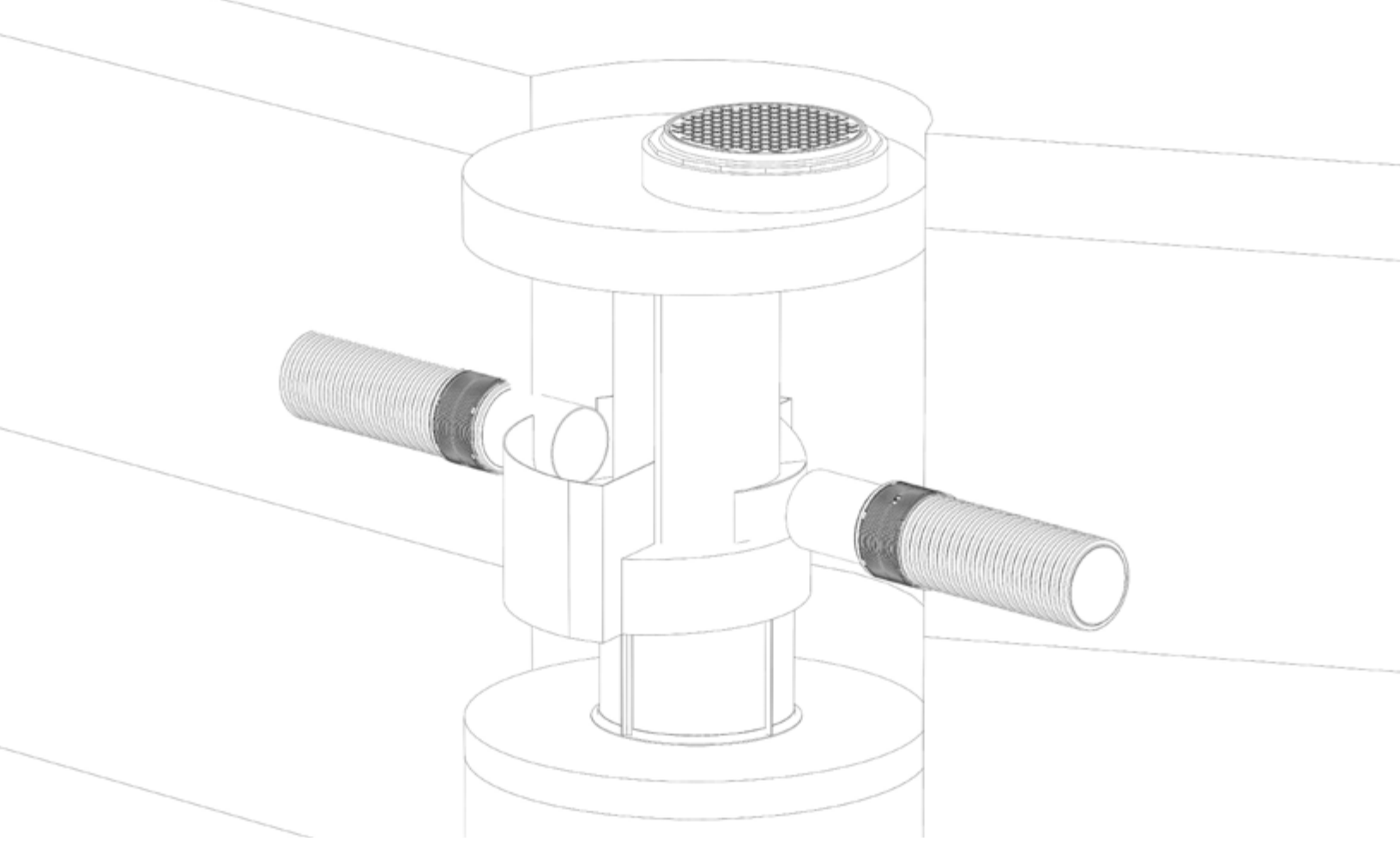
- Remove the cardboard or geotextile protection.

STEP 6

REMOVING THE GRATE

- Insert a lever or a crowbar in the first section of the grate, as shown in the picture below, at the side of the opening.
- Push down, as shown, in order to pry the first bar from the seat frame. This action will release and lift the grate up.
- To replace, simply insert one end of the grate from the bar ends into the seat frame and firmly push down the other end to fully insert the grate in place.





CDS[®]

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR THE CDS[®] HYDRODYNAMIC SEPARATOR

STEPS

1. Before undertaking the work
2. Inspection of the materials
3. Concrete structure installation

Appendix 1: Inspection form

GENERAL NOTES

1. This guide applies to all CDS models (CDS-3 to CDS-12).
2. At any time, for the CDS-8 to CDS-12 models, and if specified for any other model, refer to the Internal components assembly guide available at soleno.com

FOREWORD

ESTABLISHING THE STEPS TO BE FOLLOWED

To establish the steps to be followed, it is important to know the type of installation that will be to perform:

Installation of a concrete structure only

Follow steps 1 to 3 to install the concrete structure only, the internal components having been pre-assembled at the factory.

Note: Normally, CDS-3 to CDS-7 are delivered in several sections, but do not require assembly of internal components, unless otherwise specified.

Internal components assembly and concrete structure installation

Follow steps 1 to 3 below, as well as the steps provided in the CDS Assembly Guide to perform the installation and assembly of the concrete structure as well as the on-site assembly of the internal components.

Note: At any time, models CDS-8, CDS-10 and CDS-12 will require the contractor to perform the on-site assembly of the internal components.

STEP 1

BEFORE UNDERTAKING THE WORK

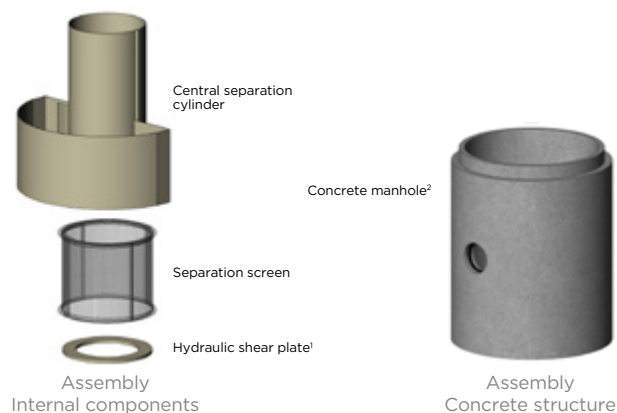
In case of discrepancy between the instructions contained in this guide and those contained in the plans and specifications, please contact your Soleno sales representative.

Contact your Soleno sales representative at least 48 hours before work begins. A visit from your authorized Soleno representative is recommended after receipt of the materials on site or before the work begins.

STEP 2

INSPECTION OF THE MATERIALS

Upon receipt of the materials, ensure that all items required on the slip are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.



Note 1: Required for models CDS-3 and CDS-4 only.

Note 2: The concrete manhole will arrive on the site in several sections: the base, one or two mid-sections and the top slab.

STEP 3

CONCRETE STRUCTURE INSTALLATION

Ensure you have the necessary equipment to lift the weight of components. As guidelines only, consult Table 1 for the weight of the heaviest component according to the different CDS models.

Important:

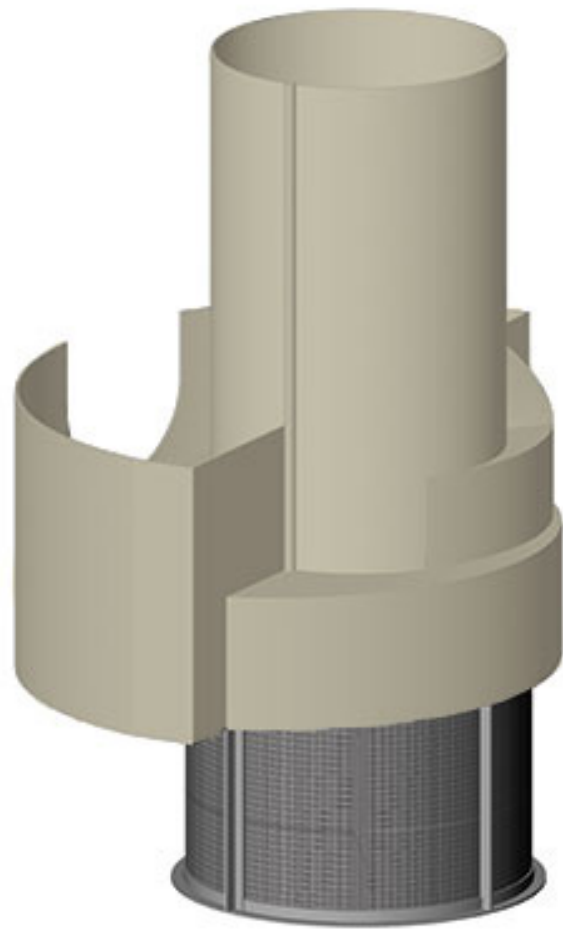
- CDS systems must be installed according to the criteria of BNQ 1809-300(18) document.
- CDS systems must be installed according to the sequence indicated in the shop drawings.
- The grade riser rings must be installed in decreasing order of height.
- The CDS, such as preformed sewer manholes prescribed in the BNQ 1809-300 standard, must be fitted with butyl seal between each section¹.

TABLE 1
TABLE OF THE HEAVIEST COMPONENTS WEIGHT*

Models	Nominal diameter		Heaviest component weight	
	mm	in	kg	lb
CDS-3	900	36	1310	2888
CDS-4	1200	48	3070	6768
CDS-5	1500	60	4950	10913
CDS-6	1800	72	7780	17152
CDS-7	2100	84	11300	24912
CDS-8	2400	96	12700	27999
CDS-10	3000	120	22200	48943
CDS-12	3600	144	28610	63074

*Weights are given for reference only and strictly for standard system heights. Actual weights will be provided upon request, contact your Soleno representative.

Note 1: The physical characteristics of the butyl must comply with the requirements of either the Appendix C of the BNQ 2622-420 document, or of the ASTM C990M document.



ASSEMBLY GUIDE

ASSEMBLY INSTRUCTIONS FOR THE INTERNAL COMPONENTS OF THE CDS[®] HYDRODYNAMIC SEPARATOR

STEPS

1. Required equipment and tooling
2. Assembling of the central separation cylinder and the separation screen
3. Cutting the central separation cylinder
4. Sealing
5. Installation of the hydraulic shear plate (if required)
6. Installation of the deflector pan (if required)

GENERAL NOTES

1. This assembly guide for the internal components of the CDS hydrodynamic separator applies to CDS-8 to CDS-12 models, and if specified for any other model.

STEP 1

REQUIRED EQUIPMENT AND TOOLING

Upon receipt of the materials, ensure that all items required on the slip are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.

Internal components

- Fiber glass central separation cylinder
- Stainless steel separation screen
- Bypass weir
- PVC hydraulic shear plate (if required)
- Stainless steel hardware

Required tools and equipment

- Impact drill 1/2 in
- Hand drill with 1/2 in wood bit*
- Hammer
- Reciprocating saw with a long blade
- 3/4 in wrench or 3/4 in socket
- 3/8 in concrete drill bit
- Measuring tape
- Caulking gun with Sikaflex 1a sealant or equivalent
- Steel removable eyelets
- Marker or soft pencil
- Wood drill bit 1/2 in
- 9/16 deep socket and ratchet wrench

STEP 2

CENTRAL SEPARATION CYLINDER AND SEPARATION SCREEN ASSEMBLY

- Turn the central separation cylinder so that it rests on the narrowest part (the widest part must be facing upward).
- To determine the direction of the separation screen, a green side (top) and a red side have been painted.
- Place the green side of the separation screen on top of the central separation cylinder and ensure it's in the right position above the opening.



Separation screen,
green side toward the top



Once positioned,
the red side is visible

* The wood drill bit is used to drill the fiber glass cylinder.

STEP 2

CENTRAL SEPARATION CYLINDER AND SEPARATION SCREEN ASSEMBLY (CONT'D)

- Using a manual drill fitted with a 1/2 in wood drill bit, drill the holes of the separation screen into the central separation cylinder.
- Drill the holes one by one and install the 1/2 in stainless steel bolts and the lock washers.
- Ensure that the separation screen remains centered before moving on to the next hole.
- Securely tighten the bolts and the lock washers.
- Turn the assembly, with the separation screen facing downward.



STEP 3

CUTTING THE CENTRAL SEPARATION CYLINDER

The central separation cylinder must be cut to height based on the internal height (H) of the CDS as shown on the manufacturing drawings supplied by Soleno.

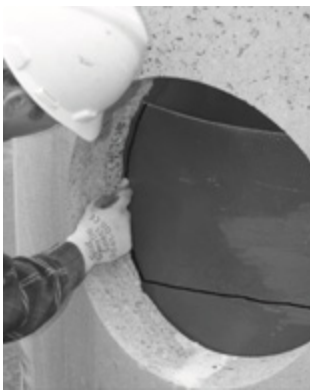
- Measure and mark the central separation cylinder to the height indicated on the manufacturing drawings.
- Cut off the excess using a reciprocating saw (if required).
- Lift the assembly and insert in the concrete structure.



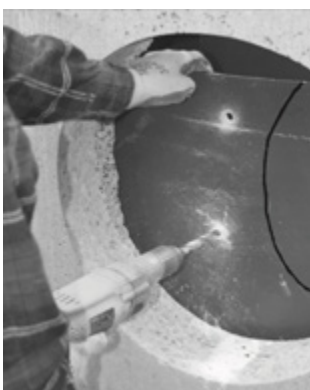
STEP 3

CUTTING THE CENTRAL SEPARATION CYLINDER (CONT'D)

- Center the separation screen with the reserve opening. Refer to the manufacturing drawing to correctly position the central separation cylinder.
- Align the inlet pipes with the upstream section of the system.
- Mark the inlets position on the central separation cylinder taking into account the bottom of the reserve.
- Raise the assembly and remove it from the concrete structure.
- Cut the inlets using a reciprocating saw. Ensure that the openings are 30 mm (1 in) wider than the marking.



- On each side of the opening, drill two 0.5 in diameter holes, 300 mm (6 in) one from the other and 100 mm (4 in) distant from the edge of the opening.
- Remove the dust in the CDS using an air compressor.
- Lift and place the assembly into the concrete structure.
- Using an impact drill with a 3/8 in concrete drill bit, drill the concrete structure wall to a depth of 80 mm (3.1 in), through the holes located on each side of the of the central separation cylinder.
- Insert the provided fasteners in the holes and secure them with a hammer.
- Securely bolt the fasteners.



STEP 4 SEALING

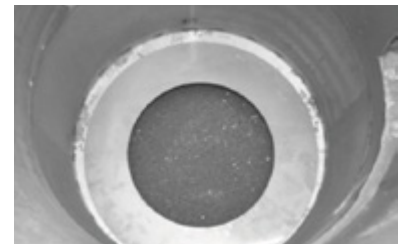
- Apply an elastomeric polyurethane sealant (Sikaflex 1A or equivalent) between the separation cylinder and the wall of the concrete structure.



STEP 5 INSTALLATION OF THE PVC HYDRAULIC SHEAR PLATE (IF REQUIRED)

The CDS system, which includes a 600 mm (24 in) internal diameter separation screen, requires the installation of a PVC hydraulic shear plate.

- Slide the hydraulic shear plate through the central separation cylinder, keeping it flat.
- Place the hydraulic shear plate at the bottom of the separation slab.
- Do not attach the hydraulic shear plate. It must remain removable at the bottom of the unit.

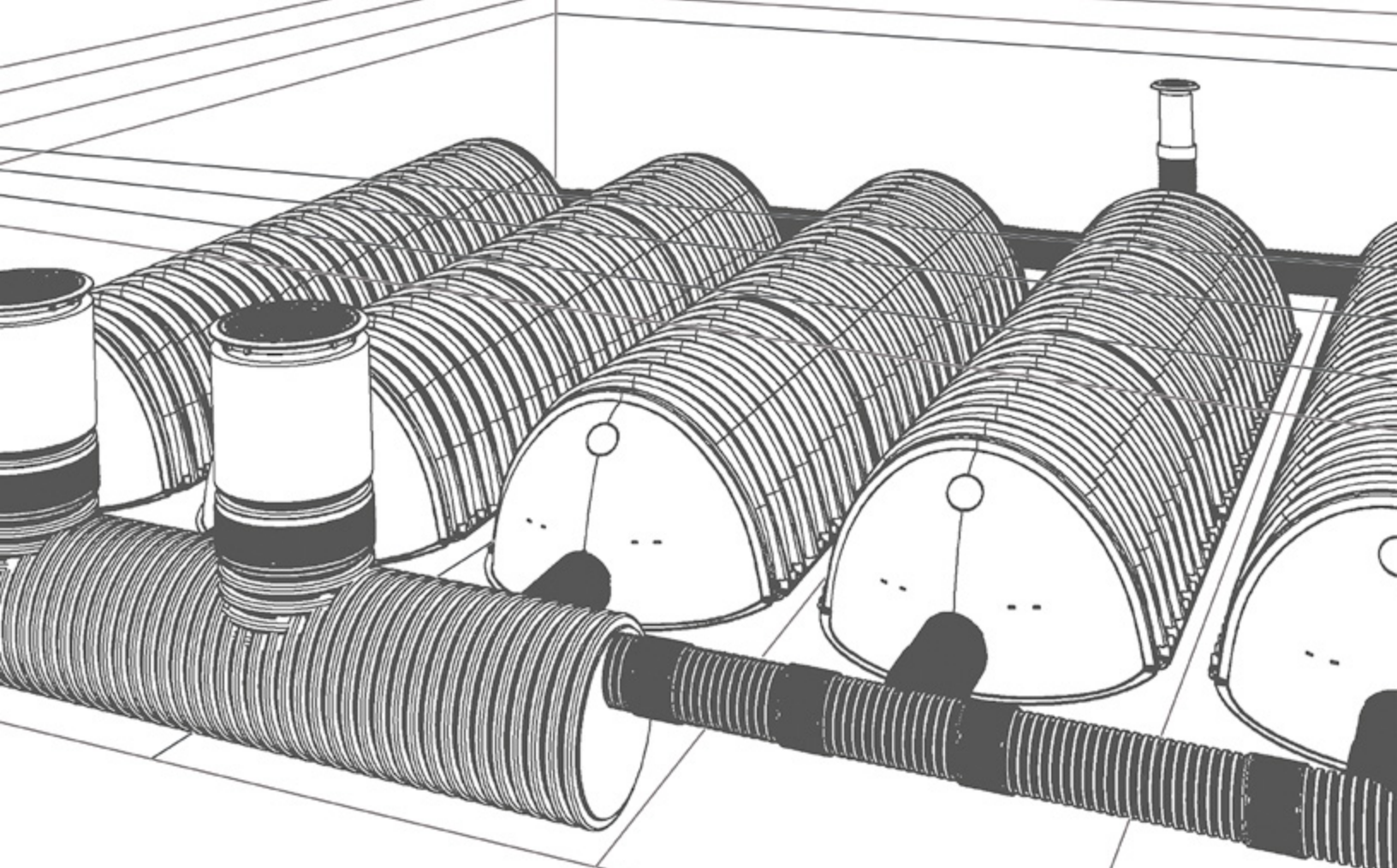


STEP 6 INSTALLATION OF THE DEFLECTOR PAN (IF REQUIRED)

The CDS systems equipped with a surface grate require the installation of a deflector pan with a fiber glass cover.

- Install the deflector pan on the top of the central separation cylinder.
- Position the open end toward the upstream section of the system. Refer to the manufacturing drawing to correctly position the deflector pan .
- Do not attach the cover, it must remain removable.





HYDROSTOR™ RETENTION SYSTEM

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR HYDROSTOR™ RETENTION CHAMBER

STEPS

1. Before undertaking the work
2. Handling and storage
3. Preparing the trench
4. Placing the separation geotextile (nonwoven)
5. Preparing the bedding
6. Installing the pretreatment unit (if required)
7. Placing the stabilisation geotextile (woven)
8. Chambers preparation and installation
9. Connecting the pipes (to the end caps)
10. Backfilling
11. Installation of frames and covers for the access port (if required)

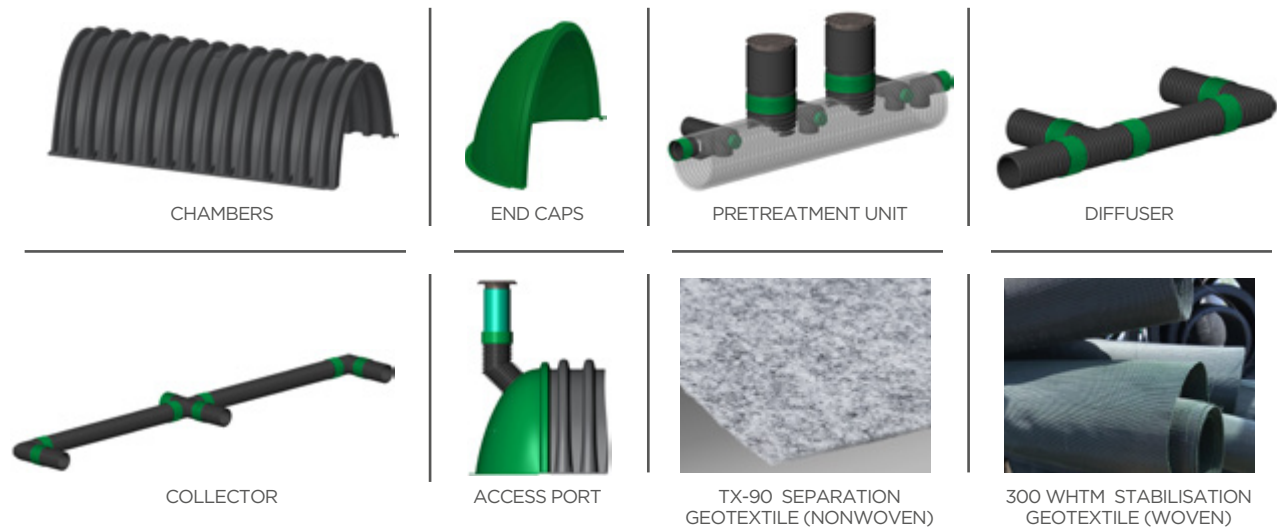
Note: The warranty applies only if all the components specified in the HYDROSTOR system are installed. No substitute part will be accepted.

STEP 1 BEFORE UNDERTAKING THE WORK

In case of discrepancy between the instructions contained in this guide and those contained in the plans and specifications, please contact your Soleno representative.

Contact your Soleno representative at least 48 hours before work begins. A visit from your authorized Soleno representative is recommended after receipt of the materials on site or before work begins.

Upon receipt of the materials, ensure that all items required on the shop drawing are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.



STEP 2 HANDLING AND STORAGE

Unloading

Unloading of the chambers must be done with an equipment with forks measuring a minimum of 1.8 m (6 ft) in length and with a minimum lifting capacity of 1134 kg (2500 lb). We recommend that you keep the chambers and end caps on their respective pallets until use.

Handling the chambers

To remove the chambers from the pallet, carefully cut the retaining straps around the chambers. Use the side handles to lift and remove the chambers (two persons are required for this step).



WARNING: The chambers must never be moved by tipping them. This approach could cause product breakage, personal injury or even death.

STEP 3 PREPARING THE TRENCH

Proceed with the trench localization and excavation according to the approved shop drawings and plans. Make sure the bottom of the excavation is dry before proceeding further.

STEP 4 PLACING THE SEPARATION GEOTEXTILE (NONWOVEN)

- Unroll the TX-90 separation geotextile according to the shop drawings and provide an overlap of 300 mm (12 in) at the joints and a surplus to fold back over the clear crushed stone above the system.
- Normally, the TX-90 separation geotextile is installed at the bottom as well as on the excavation walls and on the clean stone backfill above the system.



STEP 5 PREPARING THE BEDDING

- Unroll the drain on the downstream side and keep a spacing of 152 mm (6 in) with the chamber rows (if required).
- Level and compact the crushed clear stone of 20 mm in size (0.75 in net) with a vibrating plate.

Note: Refer to the shop drawing and engineering plan for the required thickness of the stone layer required for the bedding.

Chamber	Minimum clear crushed stones bedding thickness*
HS75	152 mm (6 in)
HS180	229 mm (9 in)

* For values below the minimum, please contact your Soleno representative.



STEP 6

INSTALLING THE PRETREATMENT UNIT (IF REQUIRED)

Install the pretreatment unit by connecting the inlet pipe and the outlet diffuser, as appropriate.

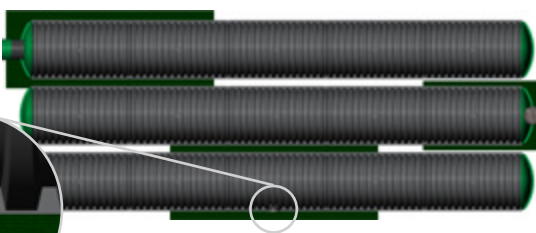
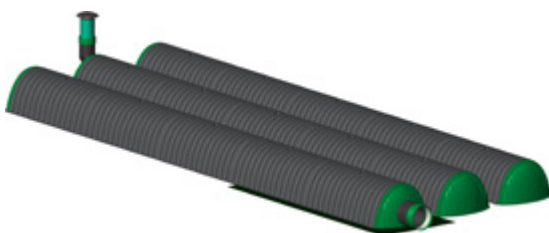


STEP 7

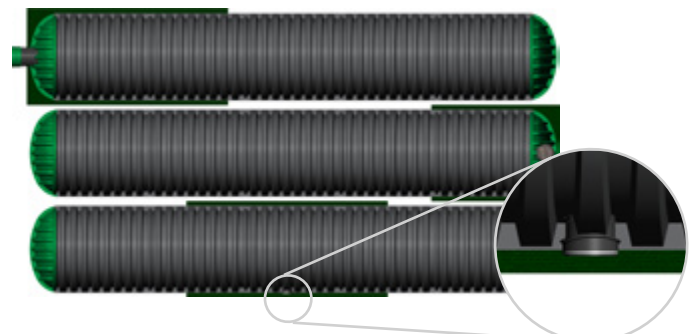
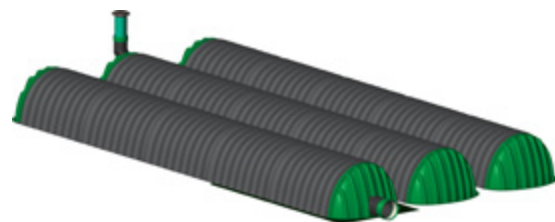
PLACING THE STABILISATION GEOTEXTILE (WOVEN)

- Unroll the 300 WHTM stabilization geotextile on the clear crushed stone, at the locations indicated in the shop drawings.
- Cut the 300 WHTM stabilization geotextile according to the shop drawings.
- For reference, normally the stabilization geotextile is installed:
 1. Under chambers with an external water uptake to prevent any stone movement.
 2. Under each chambers whoses end caps is fitted with access ports, to prevent the absorption of stones in the cleaning hose.
- **See details below for each chamber model.**

HS75 CHAMBERS



HS180 CHAMBERS



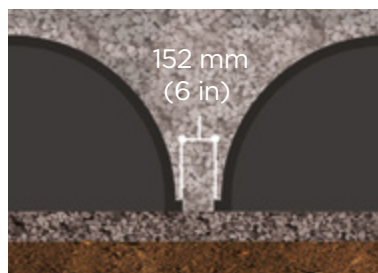
STEP 8

CHAMBERS PREPARATION AND INSTALLATION

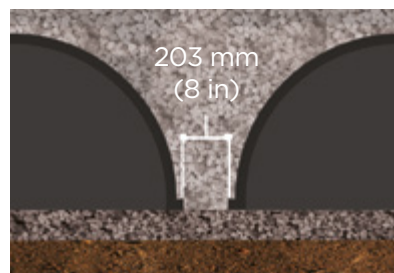
- Installation of the system must always start from the **upstream** side and as per arrows.
- Install the end cap on the first chamber ring and secure it to the chambers with three evenly-spaced screws.
- Observe the required spacings (see table) with the walls of the trench and between the rows throughout the installation process (spacers are recommended).



Chamber	Spacing between chambers	Spacing with the excavation walls
HS75	152 mm (6 in)	305 mm (12 in)
HS180	203 mm (8 in)	152 mm (6 in)

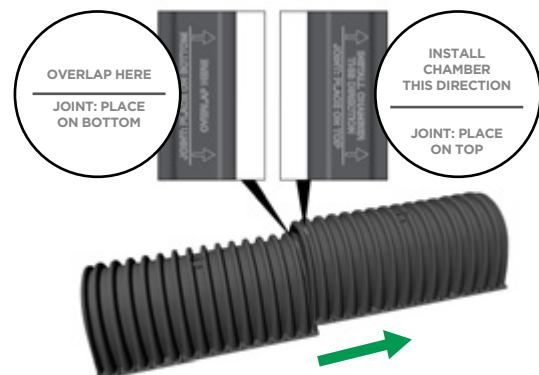


HS75



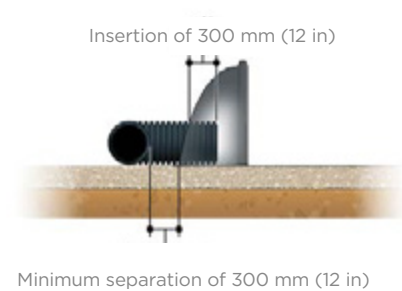
HS180

- Continue with the chamber installation, always observing the direction of the arrows and respecting the overlap indicated at the chamber extremities.
- Use end caps to close each row. Some end caps have inspection and maintenance access ports, depending on the project. Refer to the shop drawings for their location.
- When required, install the outlet pipe or collector on the corresponding end caps (see step 9).



STEP 9 CONNECTING THE PIPES (TO THE END CAPS)

- For each end caps to be connected with the inlet or with a diffuser (see shop drawing), align the end cap of each row with the corresponding inlet pipe.
- Drill the end cap at the required elevation and diameter, and then insert the pipe according to the figure below.
- Provide a TX-90 separation geotextile to prevent stone infiltration.



STEP 10 BACKFILLING

Backfill is critical step to ensure the sustainability of the HydroStor system.

- Backfill with 20 mm (0.75 in) clear crushed stone around and between the rows of chambers and on top of the chambers, as per the thickness specified in the shop drawings.

Chamber	Minimum clear crushed stones above the system
HS75	152 mm (6 in)
HS180	305 mm (12 in)

- Begin by filling the upper and central part of the chambers to prevent their displacement.
- During backfilling, ensure that the stone height difference on each side of the chamber does not exceed 300 mm (12 in).



STEP 10

BACKFILLING (CONT'D)

- Cover the top of the crushed clear stone completely with the TX-90 separation geotextile, providing a overlap of 300 mm (12 in) at the joints.
- Proceed to backfill of compactable granular material to the thickness specified in the shop drawings.
- **Note:** The compaction equipment must circulate parallel to the chambers.
- Use the material specified to complete the backfill to the required elevations.



NOTES

- The maximum height* between the top of the chambers and the top of the final elevation should not exceed 2.44 m (8 ft).
- Road traffic (load CL-625, H-25 or HS-25) is allowed if the height between the top of the chambers and the final elevation reaches a minimum:

Chamber	Minimum* clear crushed stones above the system
HS75	457 mm (18 in)
HS180	597 mm (23,5 in)

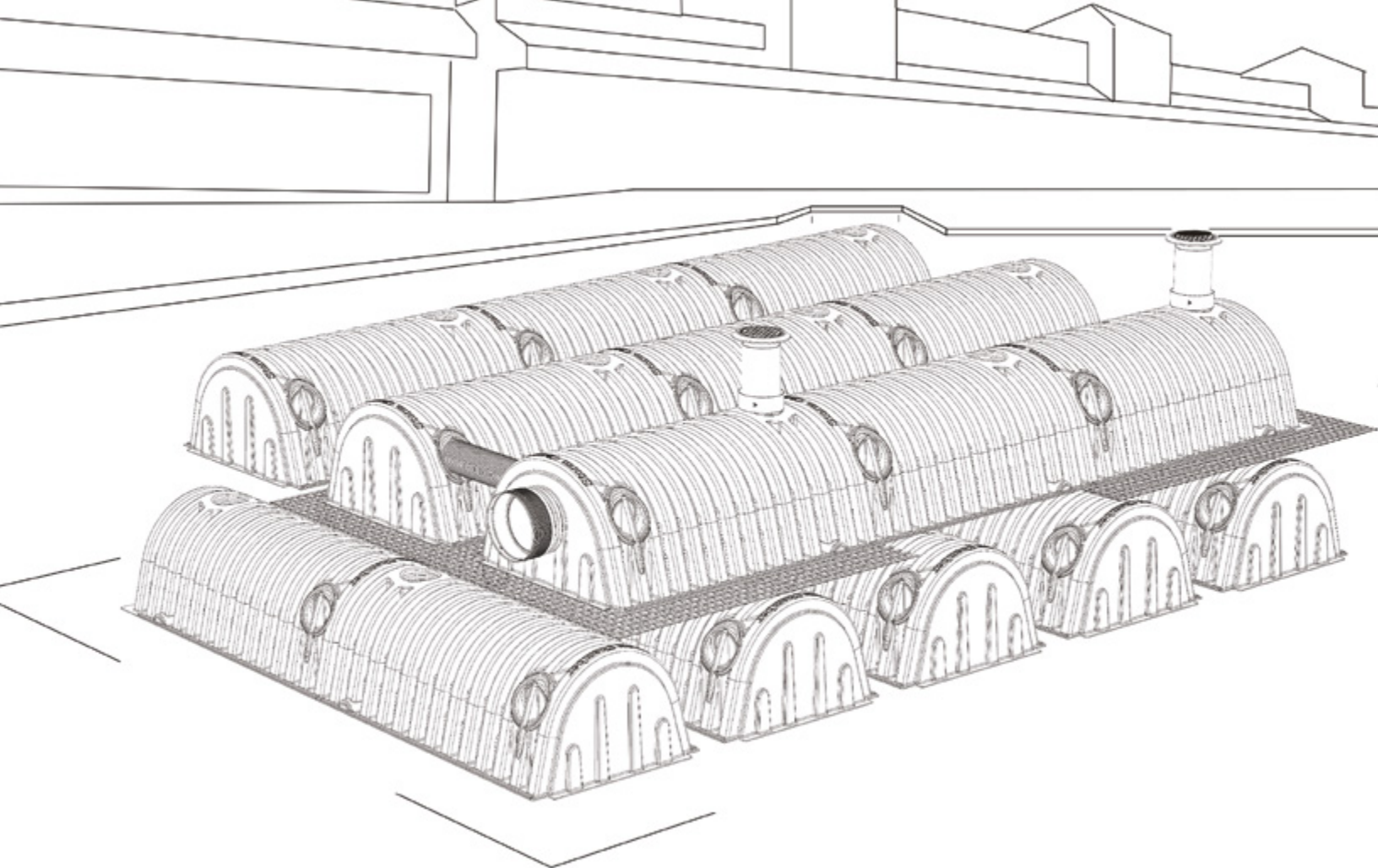
* For values below the minimum or above the maximum, please contact your Soleno representative.

STEP 11

INSTALLATION OF FRAMES AND COVERS FOR THE ACCESS PORT (IF REQUIRED)

Once the final elevation is achieved, install the adjustable frames and lids on the access ports.





STORMCHAMBER™ RETENTION SYSTEM

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR STORMCHAMBER™ RETENTION CHAMBERS

STEPS

1. Before undertaking the work
2. Handling and storage
3. Preparing the trench
4. Installing the sediment trap (if required)
5. Placing the separation geotextile (nonwoven)
6. Preparing the bedding
7. Installing the pretreatment unit (if required)
8. Placing the stabilisation geotextile (woven)
9. Chambers preparation and installation
10. Connecting the pipes
11. Installing the access ports (if required)
12. Backfilling
13. Installation of frames and covers for the access port (if required)

Note: The warranty applies only if all the components specified in the HYDROSTOR system are installed. No substitute part will be accepted.

STEP 1 BEFORE UNDERTAKING THE WORK

In case of discrepancy between the instructions contained in this guide and those contained in the plans and specifications, please contact your Soleno representative.

Contact your Soleno representative at least 48 hours before work begins. A visit from your authorized Soleno representative is recommended after receipt of the materials on site or before work begins.

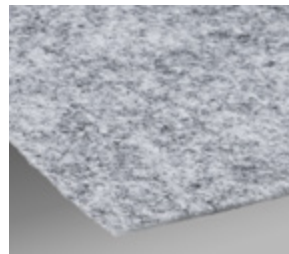
Upon receipt of the materials, ensure that all items required on the shop drawing are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.



CHAMBERS



CAST IRON FRAMES
AND COVERS



TX-90 SEPARATION
GEOTEXTILE
(NONWOVEN)



300 WHTM
STABILISATION
GEOTEXTILE (WOVEN)

STEP 2 HANDLING AND STORAGE

Unloading

Unloading of the chambers must be done with an equipment with forks and with a minimum lifting capacity of 1400 kg (3085 lb). We recommend that you keep the chambers and end caps on their respective pallets until use.

Handling the chambers

An iron bar or a piece of wood can be used to separate the stacked chambers on the pallets. (two persons are required for this step).



WARNING: The chambers must never be moved by tipping them. This approach could cause product breakage, personal injury or even death.

STEP 3

PREPARING THE TRENCH

Proceed with the trench localization and excavation according to the approved shop drawings and plans. Make sure the bottom of the excavation is dry before proceeding further.

STEP 4

INSTALLING THE SEDIMENT TRAP (IF REQUIRED)

- Excavate the exact location of the sediment traps (if required in the plan) providing 152 mm (6 in) of clear crushed stone underneath and around the trap.
- Install the 300 WHTM woven geotextile at the bottom and on the wall of the sediment trap trench. Provide an overlap of 300 mm (12 in) at the joints as well as a surplus to overlap the TX-90 separation geotextile which will be installed at the bottom of the basin.
- Install the sediment trap and backfill the perimeter with clear crushed stone. The top of the trap will be level with the chamber invert.



STEP 5

PLACING THE SEPARATION GEOTEXTILE (NONWOVEN)

- Unroll the TX-90 separation geotextile according to the shop drawings and provide an overlap of 300 mm (12 in) and a surplus to fold back over the clear crushed stone above the system.
- Normally, the TX-90 separation geotextile is installed at the bottom as well as on the excavation walls and on the clean stone backfill above the system.



STEP 6

PREPARING THE BEDDING

- Unroll the drain on the downstream side and keep a spacing of 152 mm (6 in) with the chamber rows (if required).
- Level and compact the crushed clear stone of 20 mm in size (0.75 in net) with a vibrating plate.

Note: Refer to the shop drawing and engineering plan for the required thickness of the stone layer required for the bedding.

Chamber	Minimum clear crushed stones bedding thickness*
SC-18	152 mm (6 in)
SC-34E	152 mm (6 in)
SC-44	229 mm (9 in)

* For values below the minimum, please contact your Soleno representative.



STEP 6

INSTALLING THE PRETREATMENT UNIT (IF REQUIRED)

Install the pretreatment unit by connecting the inlet pipe and the outlet diffuser, as appropriate.



STEP 7

PLACING THE STABILISATION GEOTEXTILE (WOVEN)

- Unroll the 300 WHTM stabilization geotextile on the clear crushed stone, at the locations indicated in the shop drawings.
- Cut the 300 WHTM stabilization geotextile according to the shop drawings.

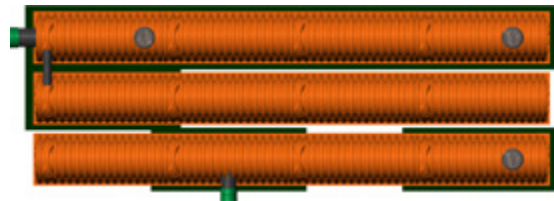
STEP 7

PLACING THE STABILISATION GEOTEXTILE (WOVEN) (CONT'D)

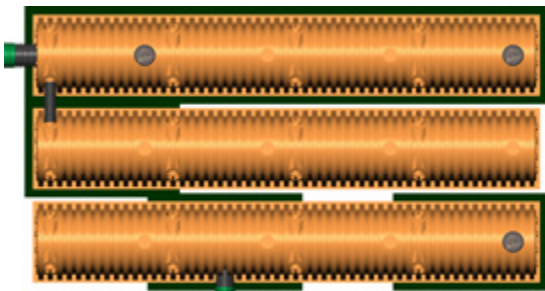
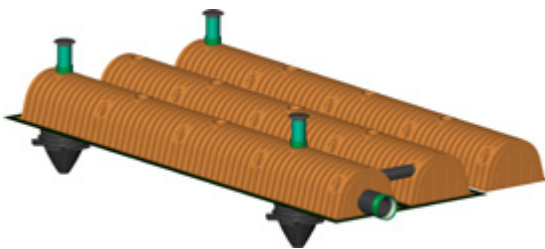
- For reference, normally the stabilization geotextile is installed:
 1. Under chambers with an external water uptake to prevent any stone movement.
 2. Under chambers with interconnecting pipes.
 3. Under chambers with access ports, to prevent the absorption of stones in the cleaning hose.
 4. Under the rows of chambers with sediment trap at the end.

See details below for each chamber model.

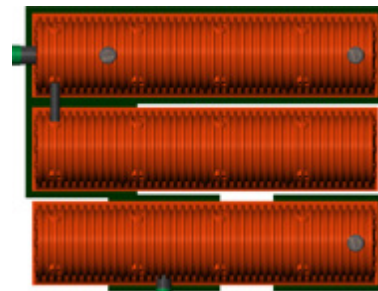
SC-18 CHAMBERS



SC-34E CHAMBERS



SC-44 CHAMBERS



STEP 9

CHAMBERS PREPARATION AND INSTALLATIONS

- Remove the 100 mm (4 in) small strip on the intermediate and end-of-line chambers.



- Installation of the system must always start from the **upstream** side and as per arrows (the starting chambers are labeled “START”).
- Observe the required spacings (see table) with the walls of the trench and between the rows throughout the installation process (spacers are recommended).

Chamber	Spacing between chambers	Spacing with the excavation walls
SC-18	152 mm (6 in)	305 mm (12 in)
SC-34E	152 mm (6 in)	305 mm (12 in)
SC-44	229 mm (9 in)	305 mm (12 in)



- Stabilize the chambers by screwing together the base of two joined chambers.



STEP 10 CONNECTING THE PIPES

Inlet and outlet pipes

Cut out openings at the chamber ends (full wall), taking into account the planned elevations, in order to connect the inlet and outlet pipes. Provide a TX-90 separation geotextile at the openings to prevent the infiltration of crushed clear stone.



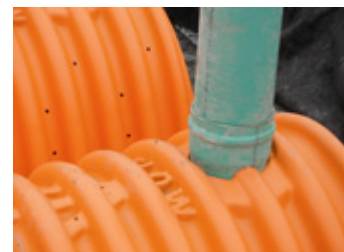
Interconnection pipes

Where indicated in the shop drawing, cut the lateral receptacles and insert a 200 mm (8 in) HDPE Solflom Max pipe at a length of 1500 mm (60 in) between two rows of chambers. Provide a TX-90 geotextile at the openings to prevent the infiltration of crushed clear stone.



STEP 11 INSTALLING THE ACCESS PORTS (IF REQUIRED)

Above the sediment traps, cut the top receptacle. Insert the bell outlet part of a 250 mm (10 in) PVC pipe or 250 mm (10 in) PVC adapter with integrated gasket. Insert the 250 mm (10 in) PVC pipe in the bell.



STEP 12 BACKFILLING

Backfill is critical step to ensure the sustainability of the StormChamber system.

- Backfill with 20 mm (0.75 in) clear crushed stone around and between the rows of chambers and on top of the chambers, as per the thickness specified in the shop drawings.
-

Chamber	Minimum clear crushed stones above the system
SC-18	152 mm (6 in)
SC-34E	152 mm (6 in)
SC-44	305 mm (12 in)

NOTES

- Begin by filling the upper and central part of the chambers to prevent their displacement.
- During backfilling, ensure that the stone height difference on each side of the chamber does not exceed 300 mm (12 in).



- Cover the top of the crushed clear stone completely with the TX-90 separation geotextile, providing a overlap of 300 mm (12 in) at the joints.



STEP 12

BACKFILLING (CONT'D)

- Proceed to backfill of compactable granular material to the thickness specified in the shop drawings.
- **Note:** The compaction equipment must circulate parallel to the chambers.
- Use the material specified to complete the backfill to the required elevations.

NOTES

- The maximum height* between the top of the chambers and the top of the final elevation should not exceed 4,44 m (16 ft) for the SC-18 and SC-34E, and 2.44 m (8 ft) for the SC-44.
- Road traffic (load CL-625, H-25 or HS-25) is allowed if the height between the top of the chambers and the final elevation reaches a minimum:

Chamber	Minimum* clear crushed stones above the system
SC-18	457 mm (18 in)
SC-34E	457 mm (18 in)
SC-44	559 mm (22 in)

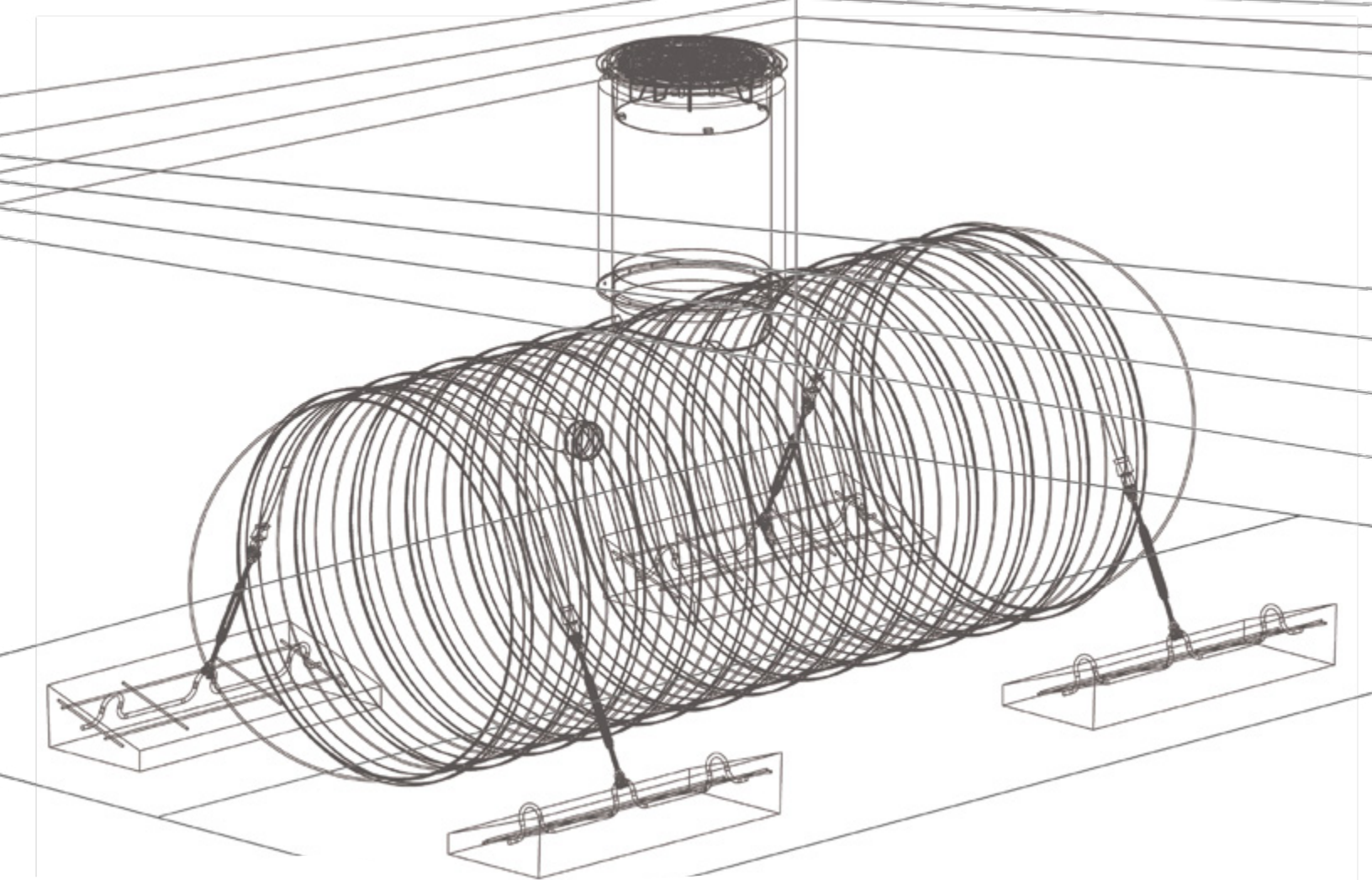
* For values below the minimum or above the maximum, please contact your Soleno representative.

STEP 13

INSTALLATION OF FRAMES AND COVERS FOR THE ACCESS PORT (IF REQUIRED)

Once the final elevation is achieved, install the adjustable frames and lids on the access ports.





NEMO TANK

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR THE NEMO TANK

STEPS

1. Before undertaking the work
2. Receiving the materials
3. Handling and storage
4. Tank layout
5. Installing the tanks

STEP 1

BEFORE UNDERTAKING THE WORK

In case of discrepancy between the instructions contained in this guide and those contained in the plans and specifications, contact your Soleno representative.

Contact your Soleno representative at least 48 hours before the work begins. The visit from your authorized Soleno representative is recommended after receipt of the materials on site or before the work begins.

STEP 2

RECEIVING THE MATERIALS

Upon receipt of the materials, ensure that all the items required on the shop drawing are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.

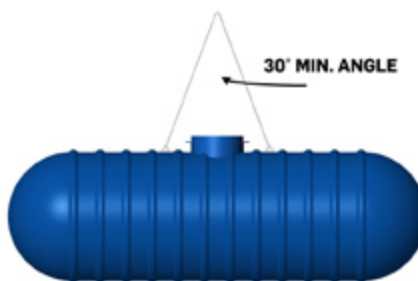
STEP 3

HANDLING AND STORAGE

Ensure that all the lifting equipment used on the site is adapted to handle this load. Refer to the tank data sheet to find out its specific weight and select the appropriate equipment for its handling.

Select a level solid surface to deposit the tank. Ensure the surface is free of rocks, debris or other objects that could damage the tank.

When lifting the tank, comply with the angle shown below with the lifting straps or chains:



STEP 3

HANDLING AND STORAGE (CONT'D)

Use the lifting rings to unload and install the tank.

Use a guide rope to move the tank (as needed) about its lifting axis.

When handling a tank equipped with plumbing accessories located on the bottom, take additional precautions not to damage them.

When the tank is stored temporarily on the site before its installation, anchor it solidly in place to prevent it from rolling.

Use ropes and wedges to stabilize the tank, as needed.

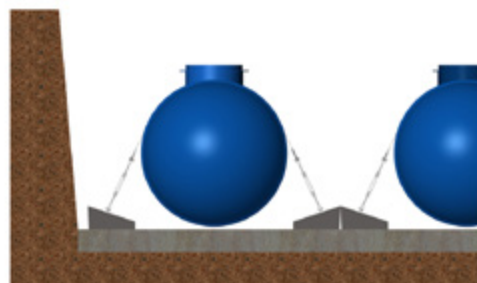


STEP 4

TANK LAYOUT

Lay out the tanks according to the approved shop drawings and engineering plans.

The dimensions specified in this section must be considered as minimal and must be increased, as needed, to adapt to the conditions of the land (anchor weights or slabs)



STEP 4

TANK LAYOUT (CONT'D)

Provide for enough clearance between tanks to allow a dummy exit for the anchor weights.

TANK SPACING

	Stable soil conditions	Unstable soil conditions*
Distance between tanks	The widest of 450 mm (18 in) or double the width of the anchor weight	The widest of 450 mm (18 in) or double the width of the anchor weight
Distance between the tanks and the trench	The widest of 450 mm (18 in) or double the width of the anchor weight	1200 mm (48 in)

*Unstable soil: peat bog, sand pit, landfill site, saturated soil

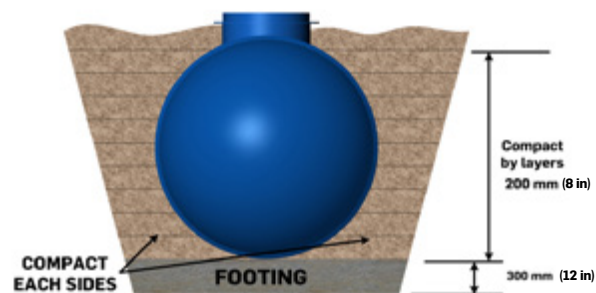
STEP 5

INSTALLATION

The excavation bottom must be stable and undisturbed.

If water is present at the bottom of the excavation, keep it dry by pumping water out of the trench.

Prepare a base 300 mm (12 in) thick, composed of clean gravel (naturally rounded) or crushed clear stone, ranging in diameter between 3 mm (0.125 in) and 19 mm (0.75 in). The base must be smooth and level.



STEP 5

INSTALLATION (CONT'D)

Deposit the tank on the base. Never install a tank directly on a concrete slab, on beams or cradles, or on the natural soil in place. Ensure the tank is perfectly horizontal and that the minimum distances are respected between the tanks and the excavation walls.

If the tank requires anchoring, install the necessary hardware at this time, according to the approved shop drawings.

Deposit the anchor beams at the bottom of the excavation, parallel to the tank. The beams must not be positioned directly on the tanks.

Tie-down straps

Exclusively use tie-down straps supplied by Soleno to anchor the tank.

The positioning of the tie-down straps on each tank is identified by the arrow symbol ►◄ or by highlights on the reinforcements.

The straps must be used at each location identified for this purpose.

Never position the straps between the tank reinforcements. Non-compliance with the appropriate positioning of the straps can damage the tank.

Also distribute the tensile load by tightening all the tie-down straps uniformly until they are strongly tensioned without deforming the tank.

Measure the inner diameter of the tank horizontally and vertically to ensure there is no deformation after tightening of the straps.

The connection between the tie-down strap and the anchor point must be established by means of the following parts: tempered steel turnbuckle, looped cable or a combination of the two methods.



If and only if the installation is done in saturated soil, partially fill the tank with water to maintain it in place during backfilling. The water level in the tank must never exceed the level of the excavation by more than 300 mm (12 in) until final backfilling.

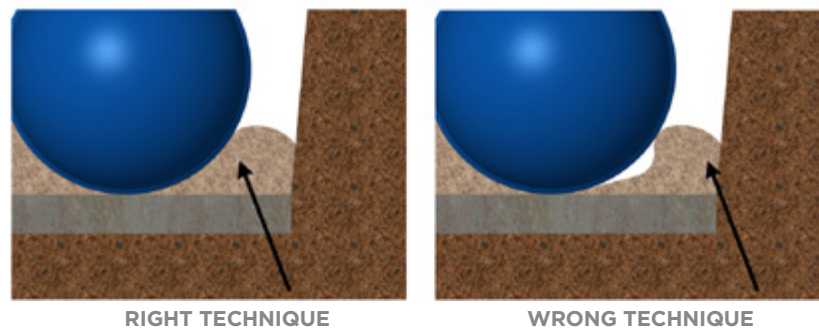
STEP 5

INSTALLATION (CONT'D)

Deposit uniformly around the tank a 300 mm (12 in) layer of backfill material of the same composition as the base.

With the assistance of a long enough non-metal piece (for example, a 2' X 4" wooden plank), compact the fill material under the tank so that it is supported uniformly over its entire surface. Ensure that no area remains free.

Avoid banging the tank during backfilling.



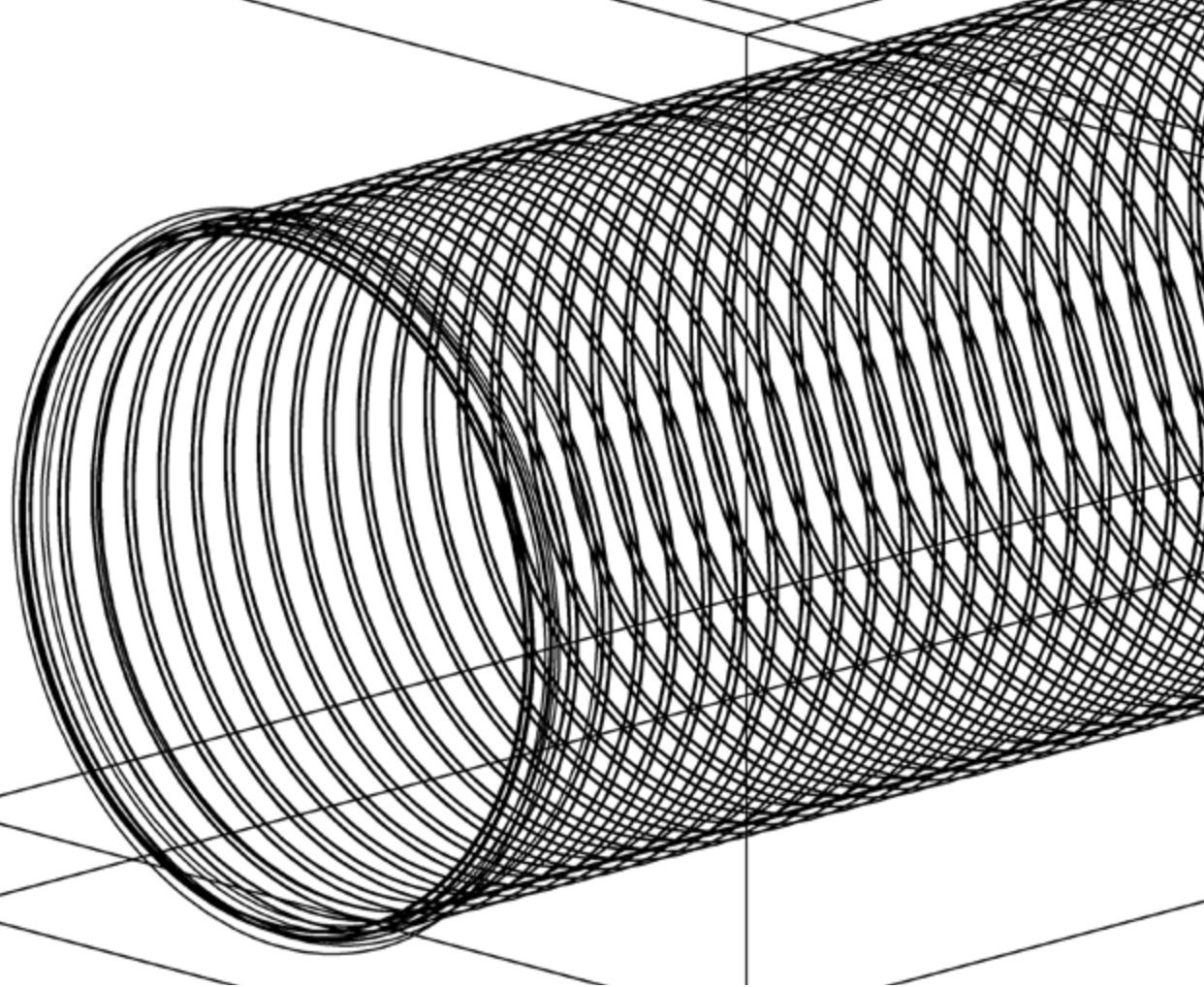
Continue backfilling in layers of 200 mm (8 in) and continue compacting the filling material under the sides of the tank and between the reinforcements to eliminate voids and ensure the necessary maintenance.

Continue for each filling layer, at least up to mid-height of the tank.

Compact each layer to 90% of M.P.

Complete the backfilling to the top of the tank with the same filling material.

After installing the piping, continue backfilling to 300 mm (12 in) above the tank.



DUROMAXX[®]

INSTALLATION GUIDE

INSTALLATION INSTRUCTIONS FOR DUROMAXX[®] STEEL REINFORCED POLYETHYLENE PIPES

STEPS

Work planning

1. Before undertaking work
2. Inspection of the materials
3. Handling
4. Storage on site

Installation

5. Trench preparation
6. Inspection, cleaning and lubrication
7. Assembly
8. Backfilling

GENERAL NOTES

1. Exposed steel profile
2. Connection to a structure
3. Traffic
4. Temperature

Figure 1 : Typical installation trench

Table 1 : Minimum fill levels

Table 2 : Minimum fill levels and loads

STEP 1

BEFORE UNDERTAKING WORK

In case of discrepancy between the instructions contained in this guide and those contained in the plans and specifications, please contact your Soleno representative.

Contact your Soleno representative at least 48 hours before work begins. A visit from your authorized Soleno representative is recommended after receipt of the materials on site or before work begins.

STEP 2

INSPECTION OF THE MATERIALS

Upon receipt of the materials, ensure that all items required on the packing slip are delivered and in good condition. Please notify immediately your Soleno representative in case of damage.

STEP 3

HANDLING

For pipes 750 mm (30 in) in diameter or less, a central lifting point is sufficient. For larger pipes, use two lifting points spaced one-third of the way apart.

Pipes longer than 9.14 m (30 ft) in length can be handled with a loader, forklift or excavator with a “Y” sling, so that there are 2 lifting points.

- Handling equipment must be capable of lifting the weight of the pipe¹.
- Wide belt slings or nylon straps with adequate strength are recommended.
- **Do not** use steel wire ropes, chains or hooks to unload or handle pipes.
- **Do not** drop pipes or fittings on the ground.
- **Do not** lift the pipe by inserting the forks into the ends of the pipe.

STEP 4

STORAGE ON SITE

Provide adequate storage space for pipes and fittings to prevent deformation. This storage area should be a large, flat surface, free of angular protuberances (rocks, tree stumps, etc.), in order to avoid any bursting.

STEP 5

TRENCH PREPARATION

Start excavating the trench in accordance with local plans and specifications and safety regulations.

- Level and inspect the bottom of the trench.
- Compact the trench foundation, respecting the specification requirements. The design engineer is responsible for ensuring a stable foundation.
- Install the geotextile at the bottom of the trench and on the walls of the excavation, if required².
- Pour the bedding material and compact. The bedding material must not be pre-formed to sit the bottom of the pipe. The minimum bedding thickness shall be 150 mm (6 in). The bedding must be free of stones larger than 40 mm (1.5 in).



Note 1: Refer to the DuroMaxx™ data sheet for pipe weights.

Note 2: Geotextile is required in the case of an installation with a high water table and fine-grained soil. Geotextile will prevent soil migration.

STEP 5

TRENCH PREPARATION (CONT'D)

NOTES

- The granular material used to make the bedding can be Class I, II or III according to ASTM D2321 or Category CG-14³ compliant with standard BNQ 2560-114 according to standard specification BNQ 1809-300. This material must be free of large stones, frozen masses or other debris. In all cases, the backfill material chosen must meet the requirements of the plans and specifications and the design engineer is responsible for their selection.
- Where excavation is carried out in clay or silty soils, provide a uniform and unaltered bedding.
- The trench width must allow the hip to be compacted (at the backfill stage). The suggested trench width is 1.25 times the nominal diameter of the pipe plus 300 mm (12 in).
- When the pipes are used in parallel, the clearance between them shall be 0.5 times the diameter of the pipe or 900 mm (36 in) for pipes 1800 mm (72 in) in diameter and larger.
- **Presence of groundwater** : The installation of the pipe must be done in a dry trench. The drying techniques used must comply with local safety standards. The design engineer must adapt the foundation to these conditions.

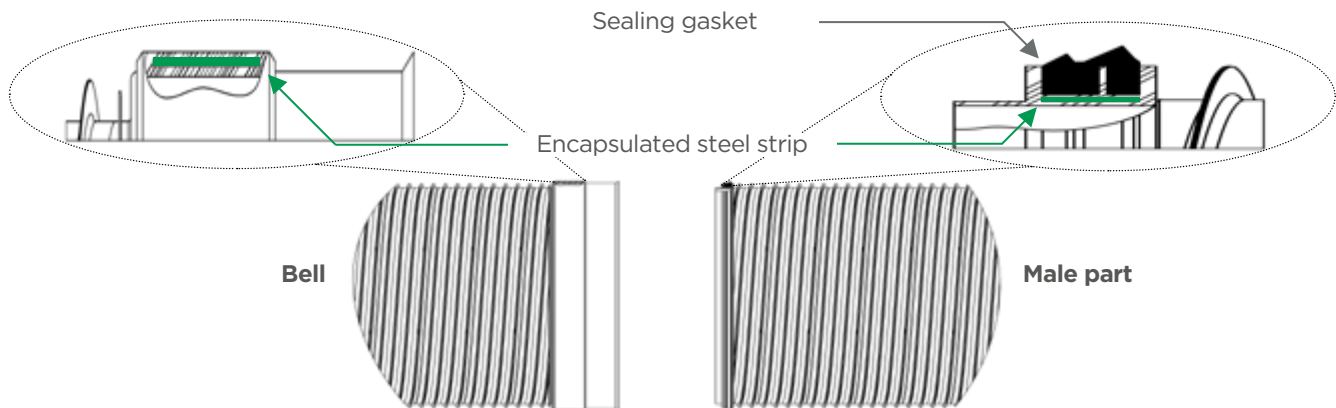
Note 3: CG-14 is a designation to group the grain size requirements of the granular material used to base and embed a pipe. This designation was previously known as "0-3/4 crushed stone or 0-3/4 gravel and Class A sand". This new designation is now referred to as CG-14, to be in accordance with the current nomenclature based on granular classes.

STEP 6

INSPECTION, CLEANING AND LUBRIFICATION

The DuroMaxx™ pipe is usually assembled with a bell with integrated gasket system.

- Make sure that the bell is not damaged.
- Remove the protective film from the sealing gasket.
- Make sure that the sealing gasket is completely inserted at the bottom of its receptacle (see figure below). A white line on the front of the gasket remains visible when it is not properly positioned. If necessary, reposition.
- Clean the male part and the inside of the bell.
- Apply generous amounts of lubricant to the gasket and inside the bell.



STEP 7

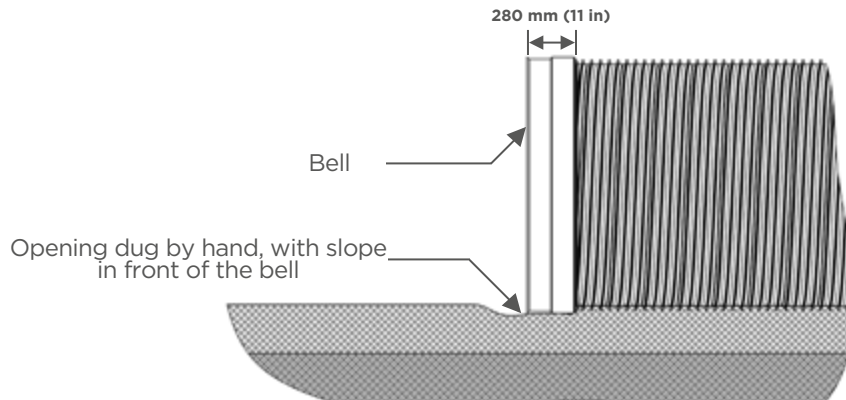
ASSEMBLY

The DuroMaxx™ pipe is usually assembled with a bell with integrated gasket system. The male end is normally inserted inside the bell. If not, be sure not to insert backfill material inside the joint. In some applications, the use of a fused joint assembly is applicable. Refer to the applicable section for the type of assembly that corresponds to your project.

BELLS

Dig a hole in the bedding to allow the bottom of the bell to settle into the thickness of the bedding while ensuring proper alignment of the pipe (see figure below). This opening should start at the end of the bell and extend approximately 280 mm (11 in) towards the pipe. Take care not to contaminate the inside of the bell during this step. **Any debris trapped between the male end and the bell may impair gasket performance or cause leakage.**

STEP 7 ASSEMBLY (CONT'D)



Slip plate

A (reusable) slip plate must be placed in front of the bottom of the bell to eliminate any possibility of stone and/or backfill material entering the bell.

This plate can be made of a piece of plastic or rubber. The plate must be removed once the male part is in place.

Pipe alignment

- Align the male end towards the inside of the bell while keeping the two pipes to be joined in the same alignment, thus preventing the gasket from moving.
- Use a nylon sling to pull the male end towards the inside of the bell. **Don't push on the pipe bell or use a chain or cable wrapped around the pipe to join the ends.** The joint insertion is complete when the end of the bell is aligned with the insertion line (white paint mark on the male end of the pipe).
- Remove the slip plate once the male part is in place.
- Fill the opening under the bell with bedding material using a shovel and compact manually to ensure uniform support under the bell.



Pipe alignment



Bell end



Completed joint insertion

STEP 7

ASSEMBLY (CONT'D)

Notes

1. Take appropriate precautions to prevent any movement of the pipe until the backfill of the hips and sides is completed.
2. **During installation in cold weather**, sealing gaskets become more rigid at lower temperatures. They compress less easily and are therefore less forgiving. Alignment of the pipes is important during their connection, the lubrication of both ends and monitoring of the steps.

FUSED SEAMS

Contact a third party holding a fused polyethylene (PE) joint certification licence. Please note that a welded joint must be executed and certified by this company. Soleno Service offers this type of service. Contact your Soleno representative for more information.

Pipe alignment

The pipe ends must be properly aligned prior to the thermal extrusion welding process. To ensure efficient welding performance, the maximum allowable axis offset (between two adjacent pipe pieces) is 6 mm (0.25 in).

It is also critical that the spacing between the two sections not exceed 38 mm (1.5 in) in any case.

Extrusion welding

If necessary, refer to the thermal fusion procedure for Soleno polyethylene to find out what steps will be carried out by the mandated company.

Note: During joint welding, it is essential that the pipe be perfectly dry and the ambient temperature be at least 10 °C. Temperature is a key factor in ensuring a good weld.



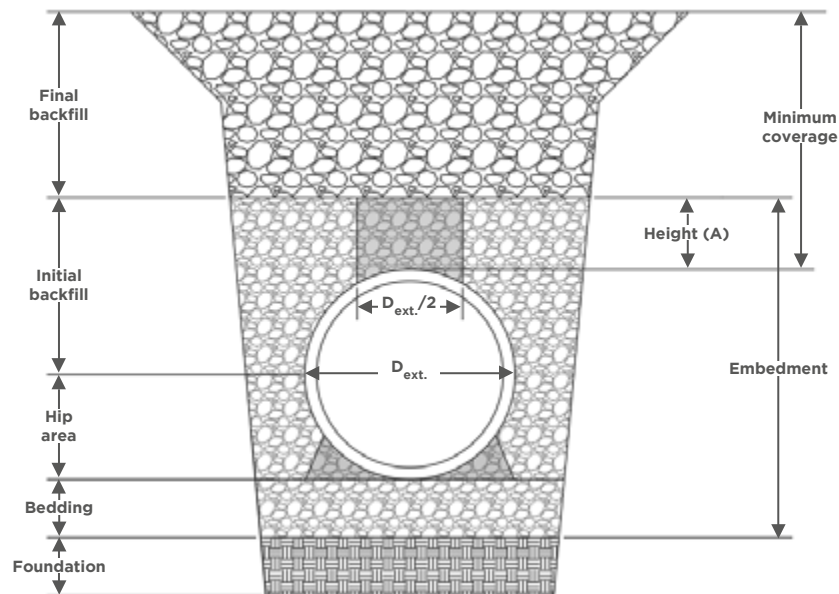
Pipe alignment



Inside weld

STEP 8 BACKFILLING

Backfilling is the most important step in ensuring the long-term structural functioning of a flexible pipe. The most sensitive portion of the backfill is located under the hips of the pipe. Insufficient compaction at this location can lead to ovalization of the pipe, as well as alignment and level problems.



- Place the backfill material on the pipe so that it flows evenly on both sides of the pipe.



STEP 8

BACKFILLING (CONT'D)

- While immobilizing the pipe, compact the backfill material under the hips with a hand tamper to ensure proper support for the pipe. If the trench is unstable, protect the walls with a prop system or widen the trench to allow compaction under the hips. Avoid any contact between the compaction equipment and the pipe.



- Continue the initial backfilling of the pipe by compacting in layers from 150 mm (6 in) to 300 mm (12 in) in thickness at 90% of modified Proctor. At this stage, the backfill height on one side must never exceed the backfill height on the other side by more than 300 mm (12 in). Only manual compaction equipment (e. g. mechanical tamper or vibrating plate) may circulate around the pipe.
- No compaction should be made directly over the pipe until it is backfilled and compacted above its crown at a minimum height (A) of:
 - 150 mm (6 in) for 750 to 1500 mm (30 to 60 in) diameters
 - 300 mm (12 in) for 1 650 to 2 400 mm (66 to 96 in) diameters
 - 450 mm (18 in) for 2 750 to 3 000 mm (108 to 120 in) diameters
- Finally, complete the final backfill (above the initial backfill area). For the selection of backfill materials in this area, consult the plans and specifications. This area must also be compacted according to the requirements of the plans and specifications.



STEP 8

BACKFILLING (CONT'D)

NOTES

1. The material used for the pipe embedment can be Class I, II or III according to ASTM D2321 or Category CG-142 compliant with standard BNQ 2560-114 according to standard specification BNQ 1809-300.

This material must be free of large stones, frozen masses or other debris.

2. Minimum backfill for supporting CL-625, H-25 or HS-25 loads.

The minimum backfill height above the pipe (measured from the top of the pipe to just below a flexible pavement or just above a rigid pavement) to support CL-625, H-25 or HS-25 road traffic loads is given in Table 1.

3. Prevent buoyancy:

In order to maintain the structural capacities of the pipes, care must be taken to eliminate all conditions that would allow for buoyancy and erosion of backfill material. The design engineer must ensure sufficient backfill to prevent flotation. The minimum backfill height above the pipe to prevent buoyancy lift is given in Table 1.

In all cases, the initial backfill height above the pipe shall be a minimum of 300 mm (12 in).

Fluid backfill (i.e. concrete, light concrete):

This type of backfill is compatible with the DuroMaxx™ pipe. When this type of backfill is used, precautions should be taken to prevent pipe lift or buoyant movement during backfilling. Your Soleno representative can advise you on pipe restraint techniques.

TABLE 1
TABLE OF MINIMUM COVERAGE
AS A FUNCTION OF LOADS OR BUOYANCY*

To support CL-625, H-25 or HS-25 loads				To prevent buoyancy*			
Nominal diameter		Minimum Backfill Height		Nominal diameter		Minimum Coverage Height	
mm	in	mm	ft	mm	in	mm	in
750	30.0	305	12.0	750	30.0	305	12.0
900	36.0	305	12.0	900	36.0	370	15.0
1050	42.0	305	12.0	1050	42.0	430	17.0
1200	48.0	305	12.0	1200	48.0	490	19.0
1350	54.0	305	12.0	1350	54.0	550	22.0
1500	60.0	305	12.0	1500	60.0	610	24.0
1650	66.0	457	18.0	1650	66.0	670	26.0
1800	72.0	457	18.0	1800	72.0	740	29.0
2100	84.0	610	24.0	2100	84.0	850	33.0
2400	96.0	610	24.0	2400	96.0	980	39.0
2750	108.0	762	30.0	2750	108.0	1090	43.0
3000	120.0	914	36.0	3000	120.0	1200	47.0

* Assumption for calculations: The maximum groundwater height is at the same level as the pipe crown. Contact your Soleno representative for the specific data for your project.

TABLE 2
TABLE OF MINIMUM COVERAGE
TO SUPPORT HEAVY VEHICLE LOADS

Nominal diameter		Axial load							
		142.0 to 222.3 kN 32 000 to 50 000 lb		224.4 to 333.5 kN 50 001 to 75 000 lb		333.6 to 444.7 kN 75 001 to 100 000 lb		444.8 to 667.2 kN 100 001 to 150 000 lb	
mm	in	mm	in	mm	in	mm	in	mm	in
750 to 1050	30,0 à 42,0	610	24.0	760	30.0	910	36.0	910	36.0
1200 to 1800	48,0 à 72,0	910	36.0	910	36.0	1070	42.0	1220	48.0
2100 to 2400	84,0 à 96,0	910	36.0	1070	42.0	1220	48.0	1370	54.0
2750 to 3000	108,0 à 120,0	1070	42.0	1220	48.0	1370	54.0	1530	60.0

* Note : This backfill must be compacted to its full height.

NOTE 1

EXPOSED STEEL PROFILE

Under no circumstances should the steel profile be left exposed. Do not leave the profile open if a pipe cut is required on site or in case of slight damage to the pipe. An extrusion-type welding must be done on the cut end. Contact your Soleno representative to determine the repair method.

Note : fusion ensures that the structural properties of the pipe are maintained. It also prevents soil migration between the pipe walls.

NOTE 2

CONNECTION TO A STRUCTURE

The DuroMaxx™ pipe connects to a rigid structure using the typical methods of installing flexible pipes. Contact your Soleno representative for the specifications for this type of connection.

NOTE 3

TRAFFIC

VEHICULAR TRAFFIC

No vehicle traffic shall be allowed over the pipes if the minimum backfill height (measured from the top of the pipe to just below a flexible pavement or just above a rigid pavement) is not complied with. See Note 2 in Step 8 of this document for this required height or refer to the product data sheet (available at soleno.com).

HEAVY VEHICLE TRAFFIC DURING CONSTRUCTION

During construction work, heavy vehicles might have to travel over the pipe. In this case, an additional minimum backfill must be added to allow for this type of traffic. The minimum total backfill (measured from the top of the pipe to just below a flexible pavement or just above a rigid pavement) must be in accordance with Table 2 of this document

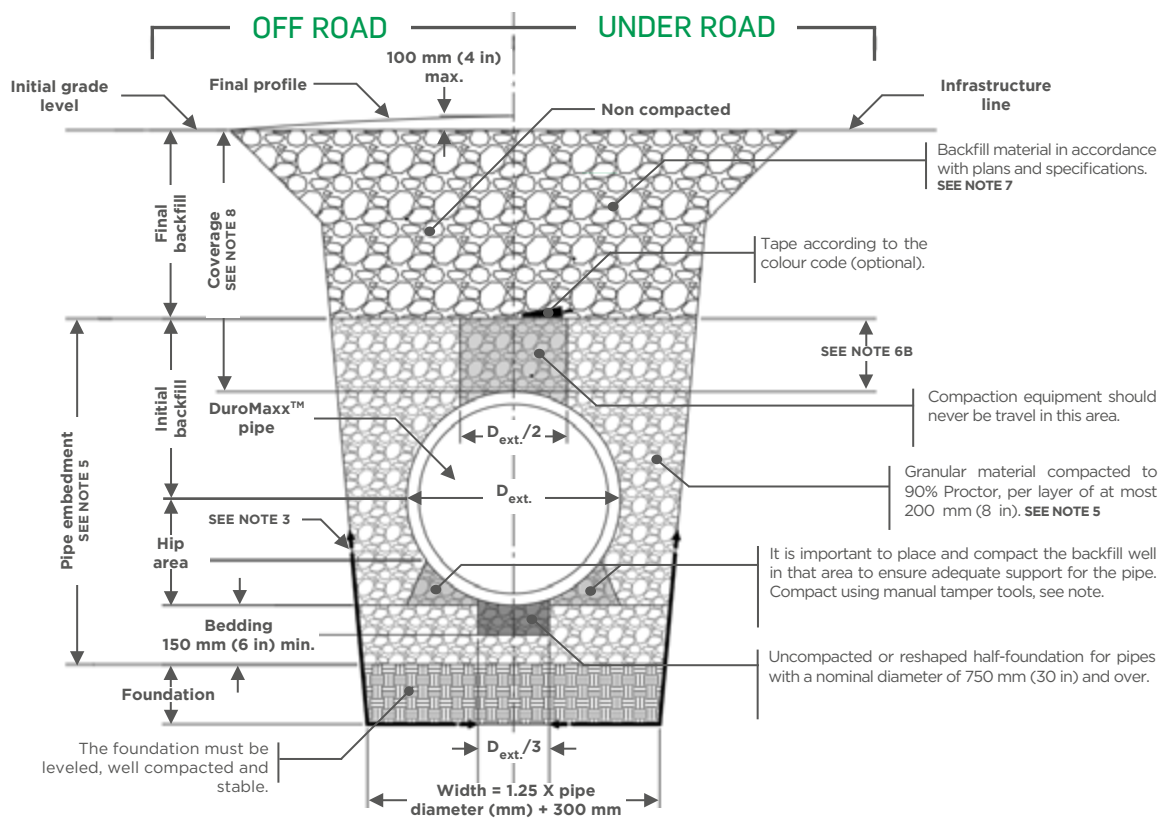
NOTE 4

TEMPERATURE

The rigidity of the DuroMaxx™ pipe is not affected by exposure to sunlight or high ambient temperature. However, if large differences are observed between the temperature at which the pipes are stored and the temperature at the bottom of the installation trench, the pipe may require some conditioning to avoid its possible contraction. Operating temperatures above 49 °C (120 °F) are not recommended.

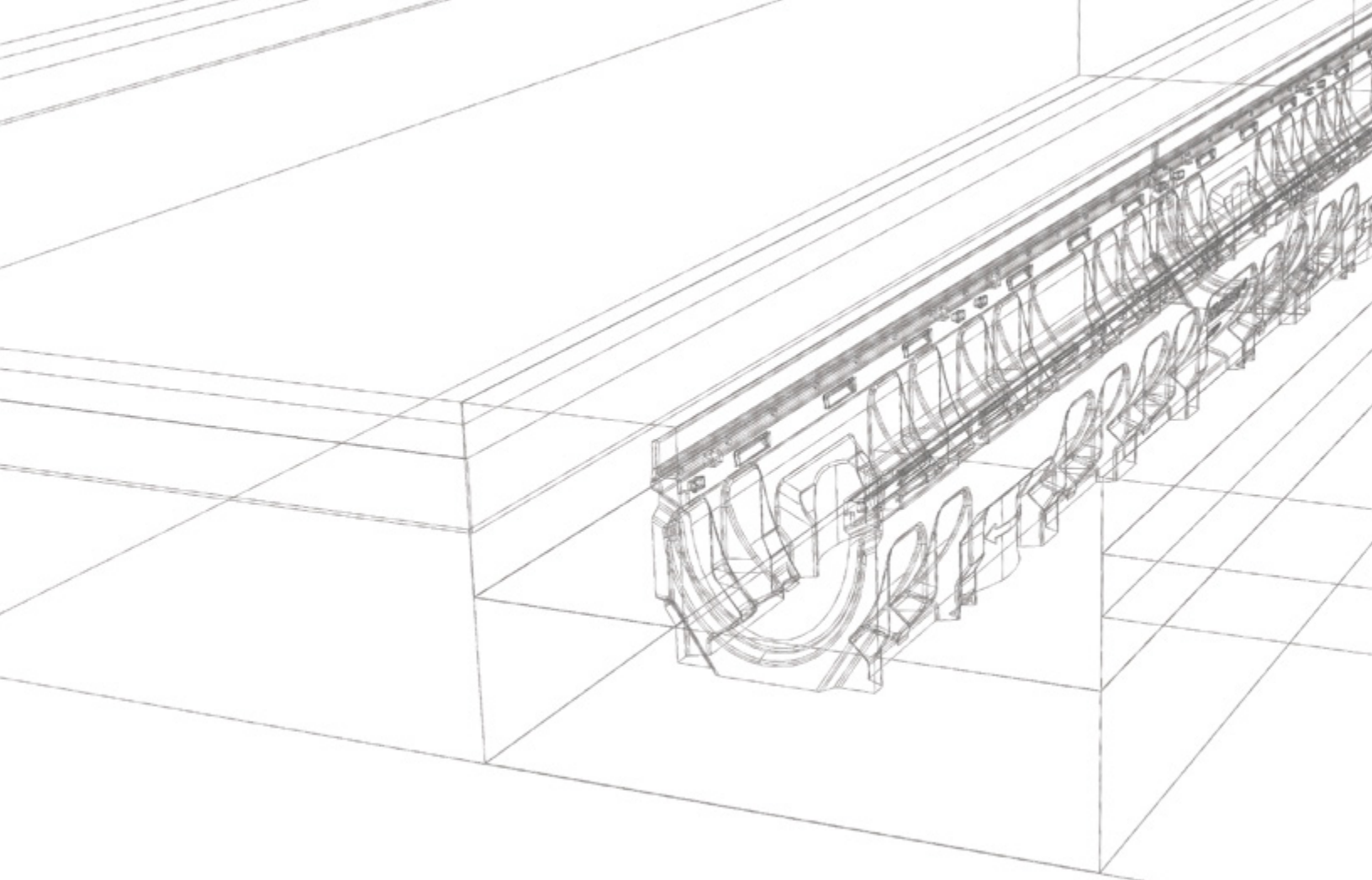
FIGURE 1
TYPICAL INSTALLATION TRENCH

The pipe installation method for DuroMaxx™ shown below is based on standards BNQ 1809-300 R2007, CSA 182.11 or ASTM D2321. However, depending on the location of the project, other regulations or standards may apply. Soleno recommends that you comply with the requirements of the city or province of reference. Otherwise, Soleno recommends applying the method shown below.



Notes

1. The excavation slopes are not restricted to the slopes shown in the figure above. The excavation must meet the requirements of the Construction Safety Code.
2. The foundation must be free of any stone or debris that might damage the pipe.
3. The use of a geotextile is necessary to prevent material migration. Geotextile is required in an installation where the water table is high in fine-grained soil. The geotextile will be installed on the walls and bottom of the trench prior to backfilling the pipe bedding and embedment.
4. When the pipes are used in parallel, the recommended clearance between them is 0.5 times the diameter of the pipe or 900 mm (36 in) for pipes 1800 mm (72 in) in diameter and larger.
5. This material used for the pipe bedding material can be Class I, II or III according to standard ASTM D2321 or Category CG-14, compliant with standard BNQ 2560-114 according to standard specification BNQ 1809-300. This material must be free of large stones, frozen masses or other debris.
6. For the first meter above the pipe, the only accepted compaction equipment is the groomer, the plate compactor or vibrating road roller. The total force applied from the equipment must not exceed 50 kN.
7. The selection, the degree of compaction and the thickness of the layers before compaction of the material used for the final backfill is the responsibility of the design engineer. Consult the plans and specifications.
8. The minimum backfill height above the pipe (measured from the top of the pipe to just below a flexible pavement or just above a rigid pavement) to support CL-625, H-25 or HS-25 road traffic loads is given in Table 1.
 - a) No compaction should be made directly over the pipe until it is backfilled and compacted above its crown at a minimum height of : 150 mm (6 in) for 750 to 900 mm (30 to 60 in) diameters, 300 mm (12 in) for 1 650 to 2 400 mm (66 to 96 in) diameters and 450 mm (18 in) for 2 750 to 3 000 mm (108 to 120 in) diameters.
- Note: During construction work, heavy vehicles might have to travel over the pipe. In this case, an additional minimum backfill must be added to allow for this type of traffic. Refer to the complete installation guide for this height.
- Note: The design engineer must ensure sufficient backfill to prevent flotation. Contact your Soleno representative for the specific data for your project.
9. Consult the installation guide and your Soleno representative for project-specific data.



FILCOTEN[®] INFRA

INSTALLATION GUIDE

Filcoten Infra 4 and 5 mm

INSTALLATION

1. Drainage outlets
2. Installation
3. Installing the vandal-proof lock (optional)

Table 1: Trench dimensions

Figure 1: Typical trenches

Figure 2: Positioning the expansion joints

Figure 3: Tees and elbows (optional)

STEP 1 DRILLING THE DRAINAGE OUTLETS

DRILLING THE WELL OPENING (IF REQUIRED)

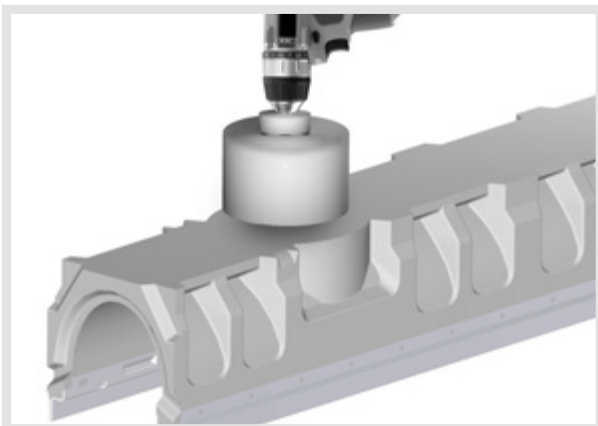


1a. Using a concrete drill bit, drill small holes following the guide which is appropriate for your installation.

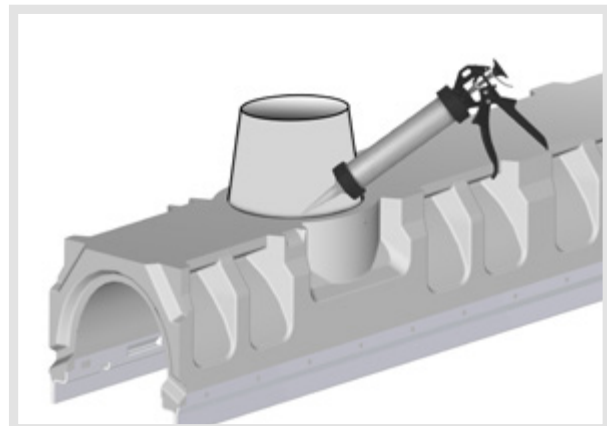


1b. Using a cold chisel, clear the well opening.

AND/OR DRILLING THE VERTICAL CHANNEL OUTLET (IF REQUIRED)

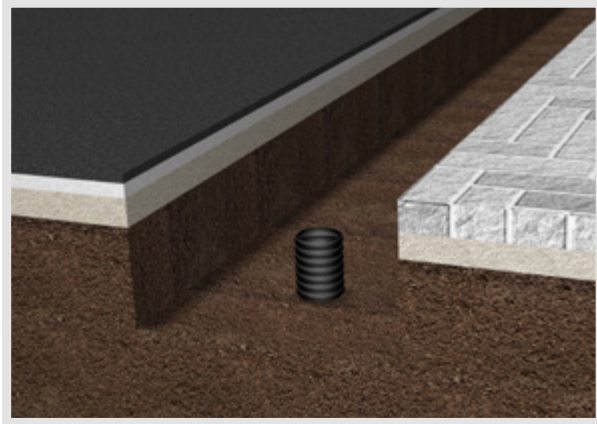


1a. Using a hole saw, drill an opening in order to install the vertical channel outlet.

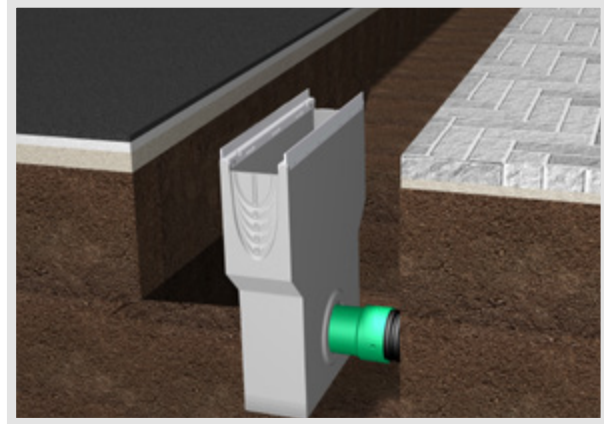


1b. Insert the vertical channel outlet above the opening and seal.

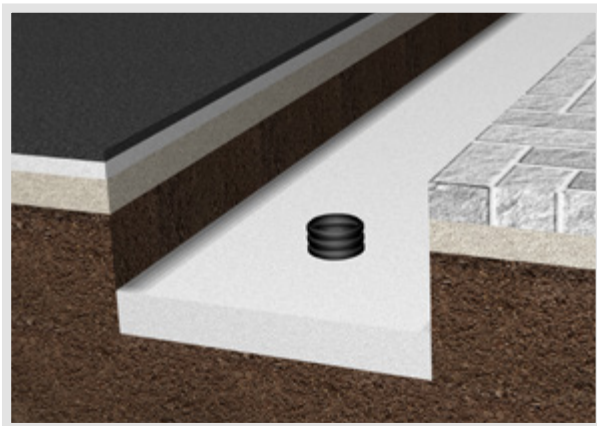
STEP 2 INSTALLATION



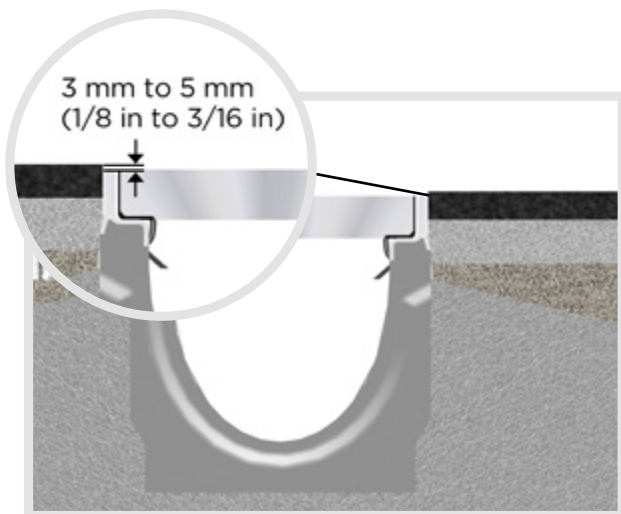
2a. Dig the trench in accordance with Table 1.



2b. Determine the outlet type: lateral for well, vertical for channel or horizontal for the end of channel with end plate with outlet used.

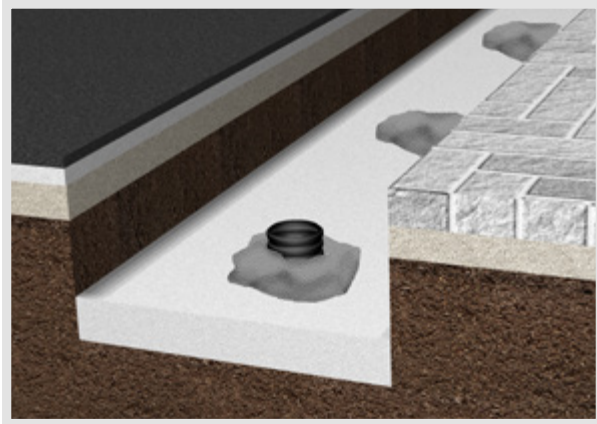


2c. Pour a concrete slab if the clearance between the base of the channel and the bottom of the trench exceeds 125 mm (5 in) and let it harden.

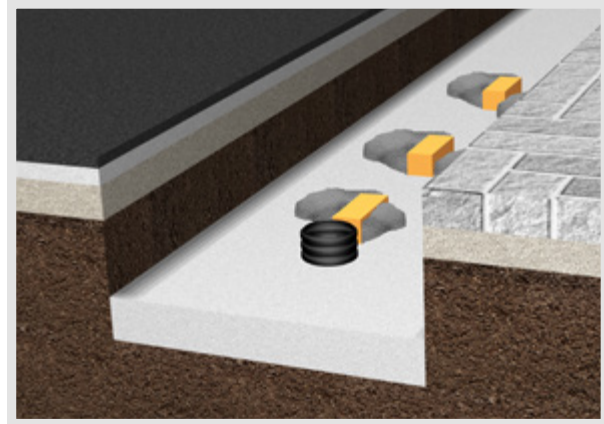


2d. Determine the final elevation level of the top of the corner bracket using a chalk line or a laser level. The final elevation level must be 3 mm to 5 mm (1/8 in to 3/16 in) lower than the finished surface.

2e. Preparation for levelling: Two suggested methods

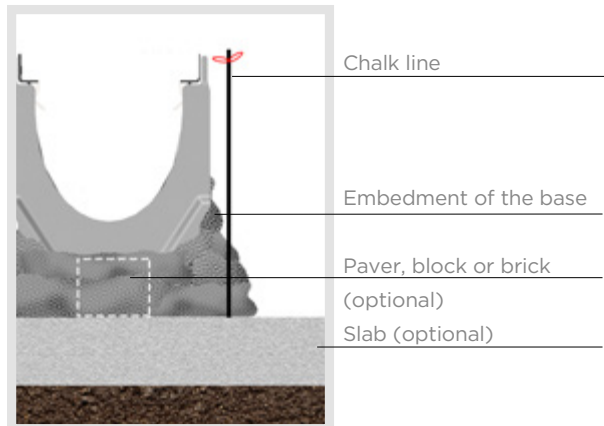
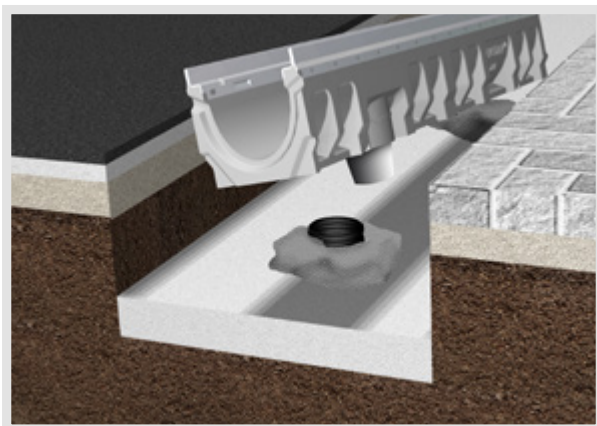


Method #1:
Place clumps of concrete having a consistent texture against the channel joints.

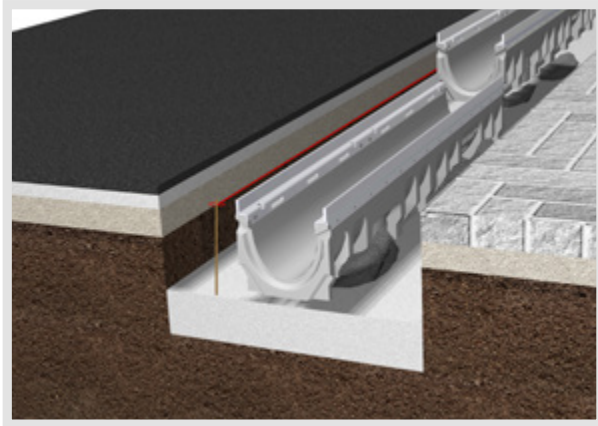


or Method #2:
Add concrete pavers or bricks against the channel joints. Embed these leveling blocks in concrete having a consistent texture.

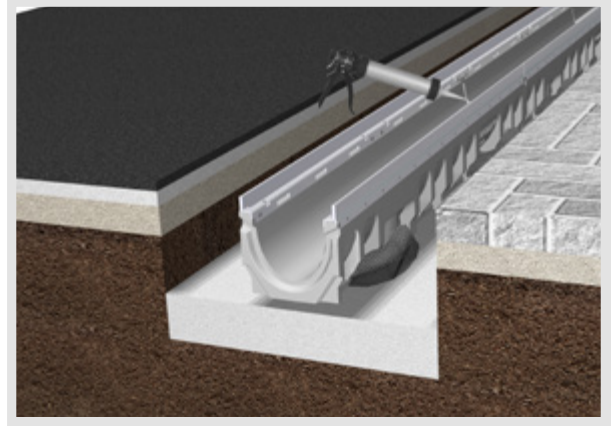
2f. Installation and levelling



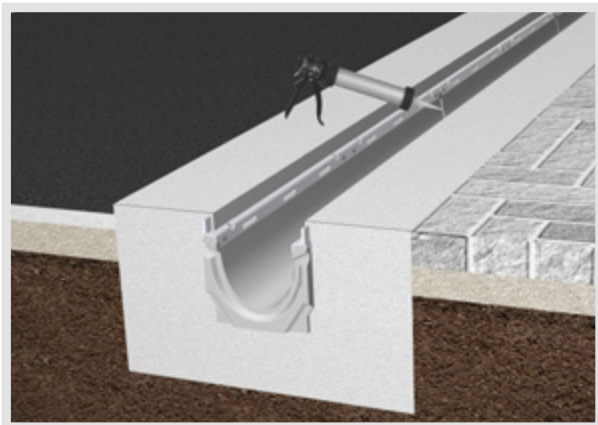
Place the first drainage channel by pushing its base in the concrete clump, until the angle corner reaches the desired level.



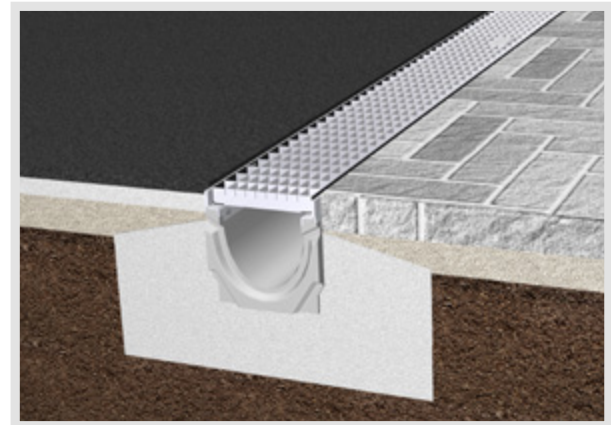
- 2g. Install the other drainage channels. Let the concrete embedment harden at the base of the channels prior to pouring the final concrete.



- 2h. Apply a concrete sealer at the joints between each channel.



- 2i. It is essential that the grates be installed in the drainage channels and covered with a plastic film or protective tape during the concrete pour. Backfill the bottom and sides of the trench, in accordance with Figure 1. Take care to spread the concrete evenly.



- 2j. Unpack the grates and reinstall them. Add the finish coating, where applicable. See Note 1 located at Figure 1.

STEP 3

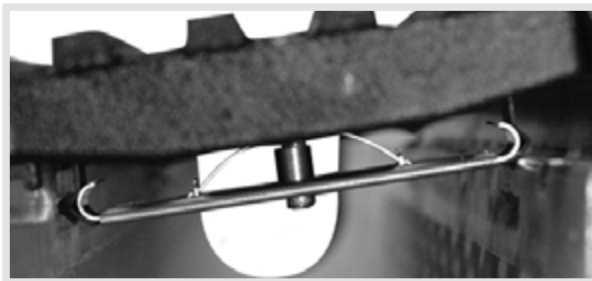
INSTALLING THE VANDAL-PROOF LOCK (OPTIONAL)



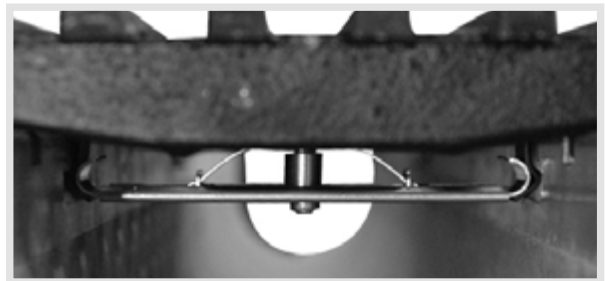
3a. Insert the vandal-proof lock under the grate.



3b. Press on the lock until it fits completely between the clips.



3c. Insert the grate into the channel.



3d. Press the grate until the clips reach the recesses inside the channel.

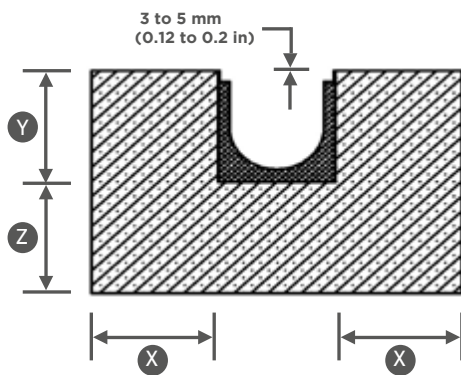


3e. Using a 5-mm Allen wrench, tighten the screw to expand the lock and thus prevent removal of the grate.

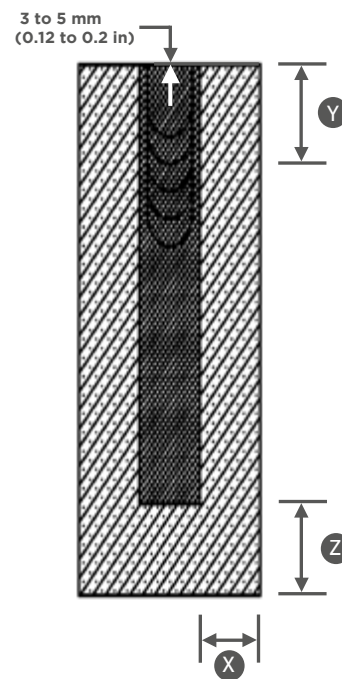
TABLE 1
TABLE TRENCH DIMENSIONS ACCORDING TO THE LOAD CLASSES OF THE INSTALLATION*

Channel width (mm)	Load Classes																	
	A 15 kN			B 125 kN			C 250 kN			D 400 kN			E 600 kN			F 900 kN		
X _{min} (mm)	100	150	200	100	150	200	150	200	250	150	200	300	200	250	300	200	250	300
Z _{min} (mm)	100	150	200	100	150	200	150	200	250	150	200	300	200	250	300	200	250	300
Y _{min} (mm)	Total height of the channel																	
Re-bar	Not required															Treillis of 10 m 200 mm x 200 mm		

CHANNEL

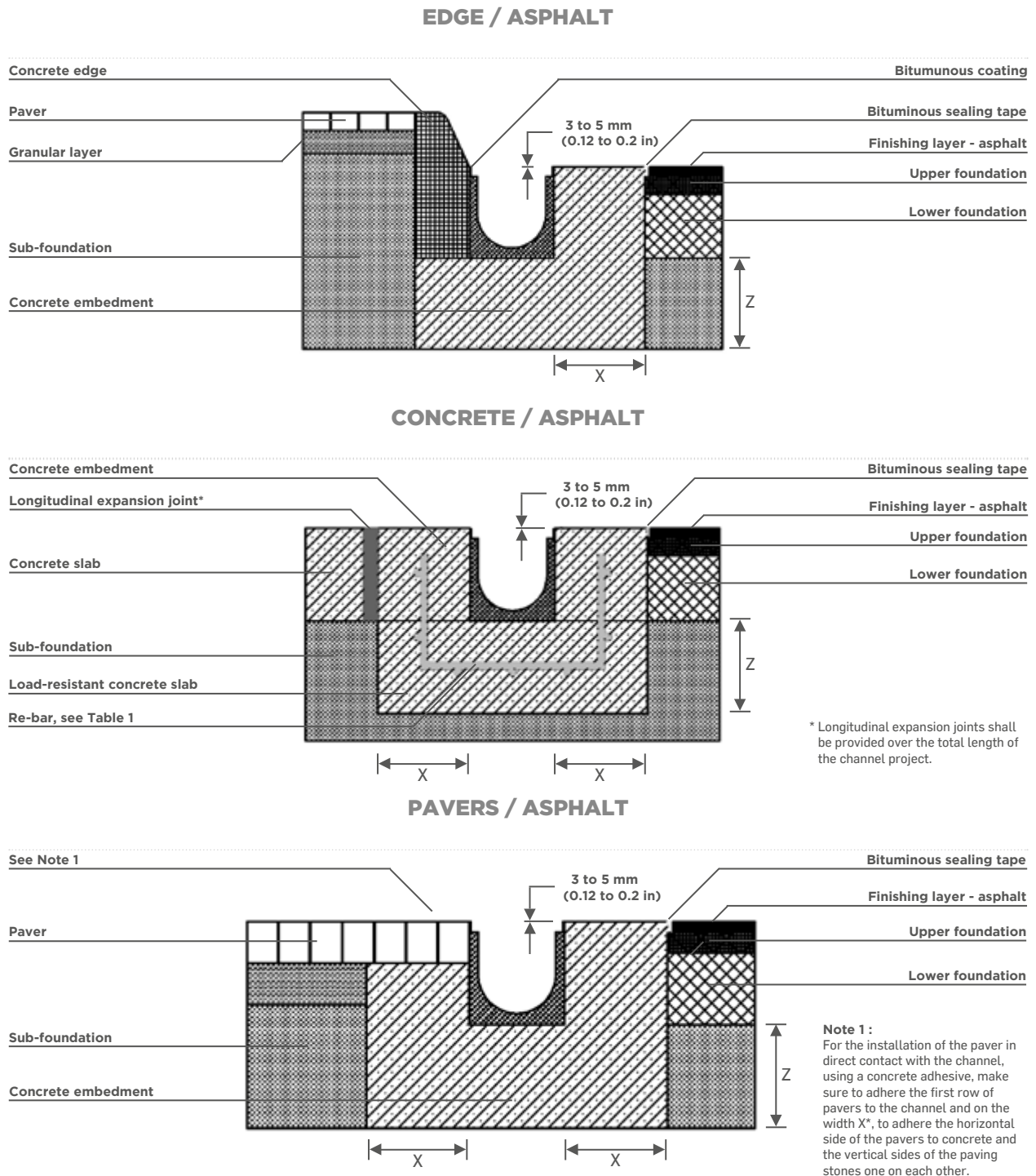


WELL



Note : The load class of the installation is governed by the lowest component. For example, an installation of a Class F channel with a Class C grate will have a global load Class C.

FIGURE 1
TYPICAL FILCOTEN INFRA TRENCHES 4 mm AND 5 mm

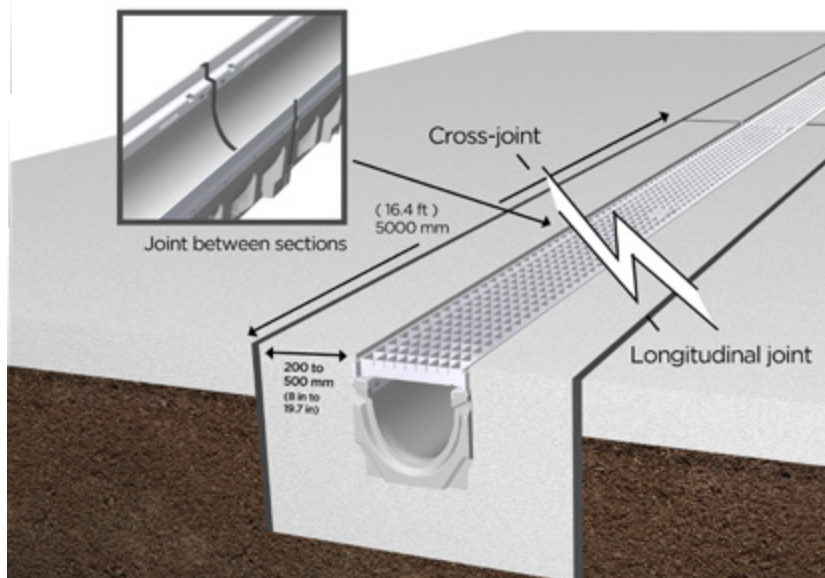


* Longitudinal expansion joints shall be provided over the total length of the channel project.

* If the paver width exceeds the width X, adjust the width X to match the width of the paver.

Note 1 :
For the installation of the paver in direct contact with the channel, using a concrete adhesive, make sure to adhere the first row of pavers to the channel and on the width X*, to adhere the horizontal side of the pavers to concrete and the vertical sides of the paving stones one on each other.

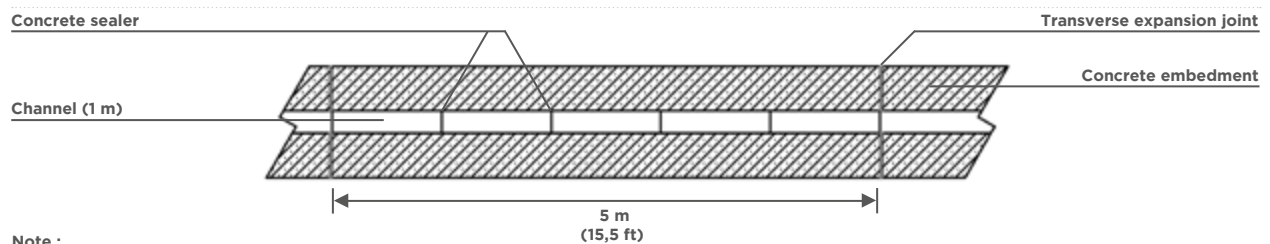
FIGURE 2
POSITIONING THE EXPANSION JOINTS



LONGITUDINAL EXPANSION JOINTS SHALL BE PROVIDED OVER THE TOTAL LENGTH OF THE CHANNEL PROJECT.

THE TRANSVERSE JOINTS SHOULD BE INSTALLED EVERY 5 METERS WHEN THE CONCRETE IS IN DIRECT CONTACT WITH THE CHANNELS.

TRANSVERSE EXPANSION JOINT
INSTALLED WHEN CONCRETE IS IN CONTACT WITH THE CHANNEL



Note :
A transverse expansion joint must be provided every 5 meters at the junction between two channels.

FIGURE 3
TEES AND ELBOWS (OPTIONAL)



ON SITE, IT IS POSSIBLE TO MAKE TEES AND ELBOWS, IF REQUIRED. CONTACT YOUR SOLENO REPRESENTATIVE FOR QUESTIONS REGARDING YOUR PROJECT.