

SPIROsol

*Helically Corrugated Steel Pipes
Round and Arch Profiles*

General

Bergschenhoek Civiele Techniek (BCT) is your partner in civil engineering projects.

BCT constructs, delivers and produces corrugated steel SPIROsol pipe systems for this sector. BCT is located in the Netherlands, in Bergschenhoek and in Zevenbergen

Voor elke opdrachtgever

De SPIROsol producten zijn functioneel, hoogwaardig en duurzaam. Ze worden geproduceerd voor diverse opdrachtgevers, zoals Rijkswaterstaat, Provincies, Gemeenten, Waterschappen en aannemers.

Maatschappelijk Verantwoord Ondernemen

BCT neemt haar verantwoordelijkheid op dit gebied en legt ook verantwoording af aan haar stakeholders. Zo wordt vanaf 2016 jaarlijks een sociaal verslag opgesteld.

Bewust duurzaam

Duurzaam ondernemen is voor BCT vanzelfsprekend. Het is een proces van initiatieven nemen, anticiperen en innoveren. Zo voldoet BCT sinds 2012 aan de eisen van de CO₂-prestatieladder op niveau 3 en heeft o.a. door gebruik van groene stroom en andere reductiemaatregelen haar CO₂-footprint al met meer dan 70% verlaagd!

Financieel gezond

Duurzaamheid komt terug in het financiële beleid van het familiebedrijf. Dit beleid heeft ervoor gezorgd dat BCT een financieel gezond bedrijf is. Dit maakt BCT tot een duurzame leverancier waar u op kunt bouwen.

Ook maatwerk

Voor maatwerk kunt u ook bij ons terecht, het is een van onze specialismen. Samen met u maken we een uitvoerbaar plan en ideeën. Kijk eens op onze website voor inspirerende projecten, zoals de omlegging van de A9.

Bestekservice op onze site

U kunt bestekteksten van SPIROsol ronde & muilprofielen rechtstreeks in uw bestek opnemen. Vanaf onze website zijn de bestekteksten volgens de RAW systematiek gemakkelijk te downloaden.

www.bergschenhoek-ct.com

Content

| | |
|---|----|
| General | 2 |
| Instruction | 4 |
| Properties | 4 |
| Steel | 4 |
| Plate thickness and corrugation | 7 |
| Production | 8 |
| Geometric parameters SPIROsol | 9 |
| Geometric SPIROsol type SPM | 10 |
| Section length and couplers | 11 |
| Fittings | 12 |
| Grids | 13 |
| Sustainability and durability | 14 |
| Minimum cover depth | 15 |
| SPIROsol and SPIROsol type SPM Installation instruction | 16 |
| Structural and design | 18 |
| Special applications | 18 |

Naast de informatie in deze brochure vindt u op onze website aanvullende informatie zoals o.a. bestekteksten, tekeningen van muilprofielen, hulpstukken en vragenlijsten.



➔ www.spirosol.nl



Introduction

Since 1973 BCT produces and develops a complete range of SPIROsol corrugated steel pipes. With the SPIROsol corrugated steel pipes and SIROsol Pipe Arches (type SPM) BCT has a strong position in the market. It is the largest producer of corrugated steel culverts in the Benelux. At first the tubes were mainly applied in drainage projects. The

advantages of easy installation, long lengths, light weight and durability were also noticed by other clients. Nowadays SPIROsol is used in the entire market of civil engineering. SPIROsol is generally applied for Public Works and Water Boards.



Properties of SPIROsol and SPIROsol type SPM corrugated steel pipes

Sustainability and Environment

Steel is a very durable material. You don't consume steel, you use it!

- The steel of SPIROsol can be 100% recycled. Scrap can be turned into steel in all standards steel qualities. There is no question of 'down-cycling': the recycled steel retains its properties and remains suitable for high performance applications. Also, the zinc will be separated from steel and will be recycled to new zinc.
- Due to the increasing involvement of used steel (scrap) in the production of new steel the need for the primary raw materials like iron ore and coal decreases.

Strong and light

The SPIROsol pipes are corrugated to provide a high strength with a minimum use of material. Therefore SPIROsol is light and very strong. With the choice of different types of corrugation and plate thicknesses an optimal design can be realized.

Applications

SPIROsol corrugated steel culverts produced by BCT are systems that are used in civil engineering for:

- Culverts for roads and railways;
- Pedestrian tunnels
- Bicycle tunnels;
- Conveyer protection;
- Ecological passages;
- Temporarily tunnels for events;
- Rainwater retention tanks;
- Relining of existing old structures
- Underground ventilation systems for example in parking garages

The program is completed by elbows, pits, manholes, T-connections, etc. In accordance with European standards SPIROsol pipes can be applied for civil engineering solutions and can hold load models according the Euro codes.

The installation time for SPIROsol pipes is shorter than the installation for concrete pipes. Simple and fast set-up help to install pipes in a brief short time and to minimize the postponement of the traffic. Building with SPIROsol pipes is cheaper than building with concrete.

Advantages:

- SPIROsol is lighter than concrete;
- Long culvert elements (max. 12 meter);
- Simple installation because of couplers
- Flexible (limited uneven settlements allowable)
- Long product life.
- No foundation necessary, just a compacted sand/gravel bedding

The SPIROsol pipes are manufactured in Zevenbergen (NL) and delivered in many European countries.

Aanleg SPIROsol veetunnel in De Bilt. Diameter 2,8 m, lengte ca. 60 m.



Steel

The steel that is applied for the SPIROsol and SPIROsol type SPM and special parts meets the following European standards:

NEN-EN 10346:2009 Continuously-coated flat steel products – “technical delivery conditions”

NEN-EN 10143:2006 Plate and strip steel coated by continuously dipping – “tolerances on measurements and shape”

Mechanical properties of the steel for SPIROsol and SPIROsol SPM

| Steel Grade | Standards | Yield Point (MPa) | Ultimate strength (MPa) | ElongationA80 (%) |
|-------------|--------------|-------------------|-------------------------|-------------------|
| DX51D | NEN-EN 10346 | | 270-500 | 22 |
| S280GD | NEN-EN 10346 | 280 | 330 | 19 |

The steel coils will be delivered in the factory with an anti-corrosive coating according the applicable standards. The following possibilities for protecting steel against corrosion are deliverable:

| Type | gr/m ² | Execution |
|--------|-------------------|--|
| Z600 | 600 | Zinc coating thickness of 42 micron per side. |
| Z725 | 725 | Zinc coating thickness of 51 micron per side. |
| Z1000 | 1000 | Zinc coating thickness of 70 micron per side. |
| Z600TC | 600 | Zinc coating thickness of 42 micron per side, and an extra protection of 250 micron applied black PE-foil (trench coat of W-protection) at 1 or 2 sides. |
| Z275P | 275 | Zinc coating thickness of 21 micron per side, and an extra protection of 200 micron applied double-sided black Plastisol-coating. |

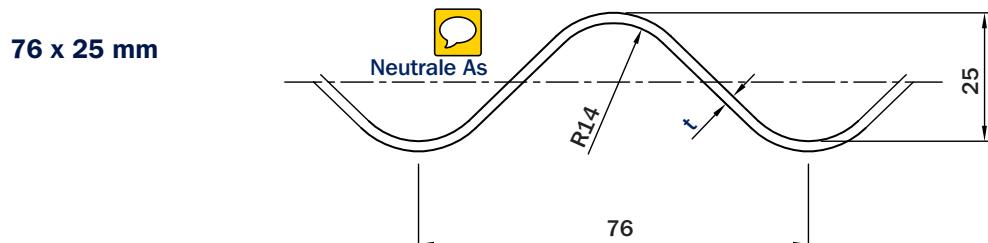
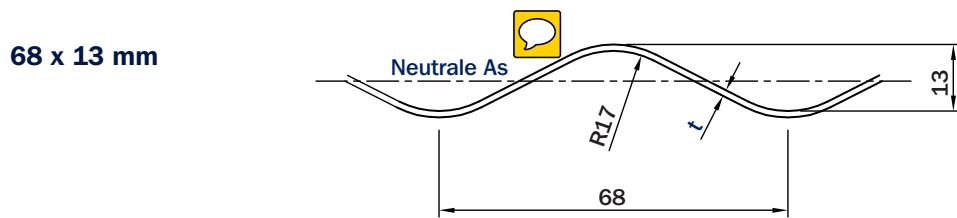
Aanleg 3 SPIROsol duikers in het Vechtdal. Diameter 3 m, lengte ca. 100 m.



Plate thickness and corrugation

SPIROsol and SPIROsol type SPM are produced from steel strip with thickness from 1,2 mm till 2,7 mm. in 2 types of corrugation.

Golf 68 x 13 mm of 76 x 25 mm



| | |
|----|---------------------|
| T | = plate thickness |
| L | = moment of inertia |
| W | = section modules |
| F | = area |
| EI | = bending stiffness |

| Corrugation mm | t mm | I mm ⁴ /mm | W mm ³ /mm | F mm ² /mm | EI kNm ² /m |
|-------------------|---------|--------------------------|--------------------------|--------------------------|---------------------------|
| 68 x 13 | 1,2 | 24,3 | 3,5 | 1,29 | 5,10 |
| 68 x 13 | 1,5 | 31,5 | 4,4 | 1,62 | 6,61 |
| 68 x 13 | 2,0 | 40,9 | 5,6 | 2,16 | 8,59 |
| 68 x 13 | 2,7 | 56,2 | 7,3 | 2,92 | 11,80 |
| 76 x 25 | 1,5 | 140,1 | 10,4 | 1,86 | 29,42 |
| 76 x 25 | 2,0 | 178,7 | 13,1 | 2,36 | 37,52 |
| 76 x 25 | 2,7 | 257,6 | 18,3 | 3,36 | 54,10 |

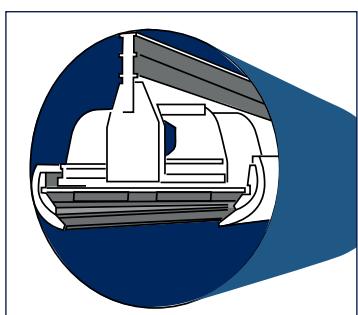
Production



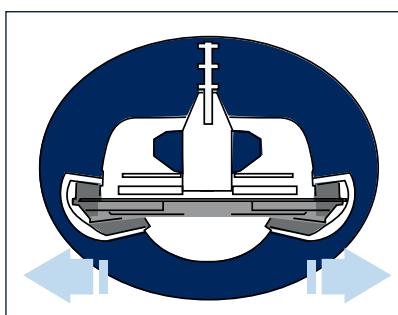
SPIROsol pipes are produced by cold forming of the strip. Initially the strip of steel will be mechanically formed with corrugations and after that bent/rolled in a diameter varies from 300 mm till 3000 mm. During forming of the pipe a lockseam is performed to provide a final strength and seal.



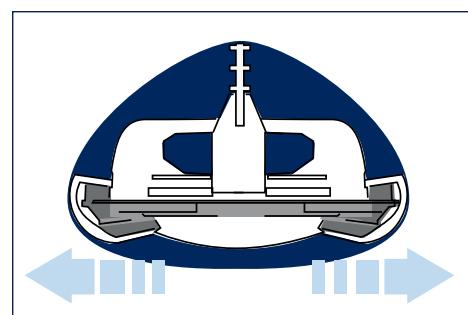
SPIROsol type SPM are produced through controlled mechanical cold deformation of round SPIROsol pipes with hydraulically cylinders to arch shape culverts.



Start with the round SPIROsol pipe



Transformation of the SPIROsol to type SPM



Final result: SPIROsol type SPM

Geometric parameters SPIROsol

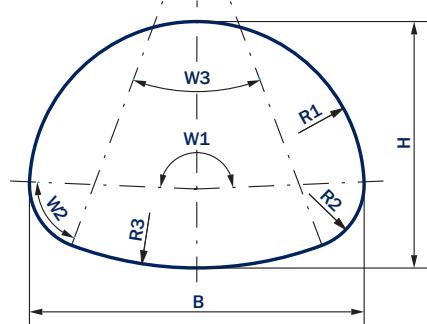


| Corrugation mm | Geometric parameters SPIROsol | | | | | Coating Plastisol | Duflex 240 of Trenchcoat |
|-------------------|-------------------------------|--------------------------|------------------------|-------------|-----------------------------|----------------------|-----------------------------|
| | Diameter mm | Plate thickness mm | Area m ² | Radius m | Weight kg/m ¹ | | |
| 68 x 13 | 300 | 1,2 | 0,07 | 0,94 | 12 | • | • |
| | 400 | | 0,13 | 1,26 | 15 | • | • |
| | 500 | | 0,20 | 1,57 | 19 | • | • |
| | 600 | | 0,28 | 1,88 | 23 | • | • |
| | 700 | | 0,38 | 2,20 | 26 | • | • |
| | 800 | | 0,50 | 2,51 | 31 | • | • |
| | 900 | | 0,64 | 2,83 | 35 | • | • |
| 68 x 13 | 700 | 1,5 | 0,38 | 2,20 | 33 | • | • |
| | 800 | | 0,50 | 2,51 | 38 | • | • |
| | 900 | | 0,64 | 2,83 | 43 | • | • |
| | 1000 | | 0,79 | 3,14 | 47 | | • |
| | 1100 | | 0,95 | 3,45 | 52 | | • |
| | 1200 | | 1,13 | 3,77 | 56 | | • |
| 76 x 25 | 1250 | 1,5 | 1,23 | 3,93 | 68 | | • |
| | 1300 | | 1,33 | 4,08 | 70 | | • |
| | 1400 | | 1,54 | 4,40 | 76 | | • |
| | 1500 | | 1,77 | 4,71 | 81 | | • |
| | 1600 | | 2,01 | 5,02 | 86 | | • |
| | 1700 | | 2,27 | 5,34 | 91 | | • |
| | 1750 | | 2,40 | 5,50 | 94 | | • |
| 76 x 25 | 1700 | 2,0 | 2,27 | 5,34 | 112 | | • |
| | 1750 | | 2,40 | 5,50 | 115 | | • |
| | 1800 | | 2,54 | 5,65 | 119 | | • |
| | 1900 | | 2,83 | 5,97 | 125 | | • |
| | 2000 | | 3,14 | 6,28 | 131 | | • |
| | 2100 | | 3,46 | 6,59 | 138 | | • |
| | 2200 | | 3,80 | 6,91 | 144 | | • |
| | 2250 | | 3,97 | 7,07 | 147 | | • |
| 76 x 25 | 2300 | 2,7 | 4,15 | 7,22 | 206 | | • |
| | 2400 | | 4,52 | 7,54 | 215 | | • |
| | 2500 | | 4,91 | 7,85 | 220 | | • |
| | 2600 | | 5,30 | 8,16 | 229 | | • |
| | 2700 | | 5,72 | 8,48 | 238 | | • |
| | 2800 | | 6,15 | 8,79 | 246 | | • |
| | 2900 | | 6,60 | 9,11 | 255 | | • |
| | 3000 | | 7,06 | 9,42 | 264 | | • |

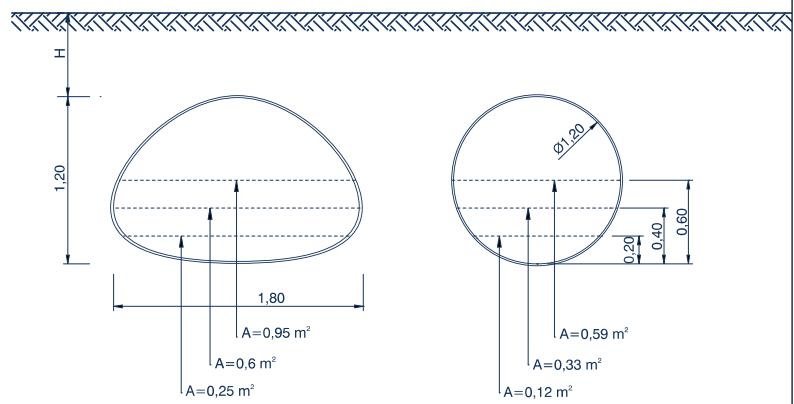
Geometric SPIROsol type SPM



| Corrugation mm | Width m | Height m | Plate thickness mm | Area m ² | Weight kg/m ¹ | Type Nr. |
|--------------------------|---------|----------|--------------------|---------------------|--------------------------|----------|
| 68 x 13 of 76 x 25 | 1,34 | 1,05 | 2,0 | 1,13 | 71 | SPM-01 |
| | 1,44 | 0,97 | | 1,10 | 72 | SPM-02 |
| | 1,49 | 1,24 | | 1,46 | 81 | SPM-03 |
| | 1,62 | 1,10 | | 1,42 | 80 | SPM-04 |
| | 1,65 | 1,38 | | 1,82 | 90 | SPM-05 |
| 76 x 25 | 1,80 | 1,20 | 2,5 | 1,70 | 112 | SPM-06 |
| | 1,80 | 1,50 | | 2,15 | 122 | SPM-07 |
| | 1,84 | 1,39 | | 2,04 | 120 | SPM-08 |
| | 1,84 | 1,48 | | 2,16 | 123 | SPM-09 |
| | 1,89 | 1,55 | | 2,32 | 127 | SPM-10 |
| | 1,91 | 1,46 | | 2,23 | 125 | SPM-11 |
| | 1,95 | 1,32 | | 2,04 | 121 | SPM-12 |
| | 2,01 | 1,59 | | 2,55 | 134 | SPM-13 |
| | 2,04 | 1,49 | | 2,41 | 131 | SPM-14 |
| | 2,10 | 1,45 | | 2,42 | 134 | SPM-15 |



At the same water level SPIROsol type SPM has 65% to 100% better flow capacity in comparison with round SPIROsol with the same water level



Section lengths and couplers

The standard length of SPIROsol pipes are 6 and 8 meter, but it is also possible to produce the pipes to any other length between 3 and 12 m.

The production process of SPIROsol type SPM allows to produce pipes with 6 m length.

Couplers are used to connect the pipes. De couplers are produced from flat or corrugated strip steel with sheet thickness of 1,2mm. Depending on the diameter and application there are different systems you can choose from:

Type Spifix: parallel corrugated coupler. Applicable to the end finishing of the culvert. Diameter 300 mm to 2400 mm (standard);

Type Flexcor: helically corrugated coupler. Applicable to the helical end of the culvert. Diameter 300 mm to 3000 mm;

Type Widecor: extra wide parallel corrugated coupler. Applicable to the end finishing of the culvert. Diameter 2500 mm to 3000mm;

Type Refix: coupler with reduced external dimensions for re-lining.

Guidelines to unload and connect SPIROsol pipes by Spifix couplers:

1. Use hoisting belts to unload pipes. Do not use chains etc. to avoid damaging;
2. It is important that pipe ends and couplers are clean and not deformed;
3. Slide the Spifix coupler over one pipe end completely;
4. Put the pipe elements against each other and align level and vertical;
5. Slide the coupler halfway over the other pipe end;
6. Tighten the fittings correctly.



The Spifix couplers are a ground tight system although by using fine backfill material its possible to use geotextile between coupler and pipe.



Flexcor coupler to extend the existing SPIROsol culvert without the standard right ending.



Standardized fittings

The SPIROsol pipes are constructed out of a corrugated steel. This means that it is possible to weld the hot zinc dipped pipe and to coat it afterwards with a Duflex 240 coating.

We can offer you many fittings for the corrugated steel pipes. Due delivery times and the design conveniences some sizes of the accessories are standardized. For each project a customized solution is available.



| T-part (with cover) | Inspection chamber (with road cover) | Elbow ($\alpha = 90^\circ - 180^\circ$) |
|---|--|---|
| | | |
| Deposit part (on behalf of the connection of prefab concrete construction) | End-shield (connection of dam wall or bridge) | Slope ends |
| | | |
| Diameter (mm) | Aantal ankers | |
| 300 - 500 | 3 | |
| 600 - 800 | 4 | |
| 900 - 1200 | 6 | |
| > 1200 | 7 | |
| Diameter (mm) | x-maat | |
| 300 - 500 | 100 | |
| 600 - 800 | 200 | |
| 900 - 1200 | 300 | |
| > 1200 | 500 | |



Steel end protector / finishing for bevel endd

The steel end protectors for level end provides protection to the end of a pipe. This sturdy coated steel edge provides also protection against damages caused by mowing and cleaning activities. The horseshoe shaped protection edge is installed in the factory, but it is also possible to assemble it afterwards using bolts and nuts.

HDPE end protector

The HDPE end protector provides a sturdy protection against damages and casting caused by mowing and cleaning activities.

The end protector is installed to the pipe end in the factory so there will not be any extra activities for the contractor. This protection edge is also simple to install. Also for the existing SPIROsol pipes this product provides extra protection.



Technical information

| | |
|---------------|---|
| Material: | HDPE 15 mm thick |
| Diameter: | 0400 – 01200 mm (larger diameter on request) |
| Length: | 300 mm |
| Construction: | with bolts (countersunk head) and nuts at the end of the pipe |

Grids



SPIROsol faunapassage A2 Kombos
Diameter 1,6 m, lengte 80 m



Sustainability and Durability

- 1. Corrugated steel culvert pipes** exposed to air, water and soil require a special corrosion protection.
- 2. SPIROsol culverts** are always provided with a zinc layer. The zinc layer is also coated with TRENCHCOAT, Plastisol or Duflex 240 Coating, for extra protection against corrosion. These protection coatings are provided following the NEN7063 norm, why a Duplex system is generated.
- 3. The Duplex-system is more than just a zinc coating.** The out of galvanizing zinc system provides a special protection. And also does the top coating. Both systems provide an extra long period of protection. The total period of protection is 1.5 to 2 times longer as the sum of both systems.
- 4. The synergistic effect.** The mutual sides protection of zinc and topcoat is known as the synergistic effect. Due to this effect the protection period is considerably longer. What happens is the zinc coating eliminates corrosion underneath the coating and, on the other hand, the coating itself prevents the zinc coating from being removed. The coating protects the zinc surface against atmospheric attacks, even if it shows pores, cracks or scratches caused through weathering or damages.
- 5. Formule:** Bos = 1,5 – 2,0 (Bzn + Bco)

Bos = protection period Duplexsystem till 5% rust at the steel surface

Note: if there is 5% rust it is possible to fix to surface

Bzn = protection period zinc coat

Bco = protection period topcoat on steel

Description of TRENCHCOAT™ / W-Protect®

The TRENCHCOAT (ASTM A742) c.q. the W-Protect (EN 10169) is directly sealed on the zinc after galvanizing in accordance with the norm. This patented technique has been applied in the USA since 1974 and is applied in Europe since 1998. At this time it is still the best coating for corrugated steel. The warm rolling strip steel is the basic material. First of all the strip steel is cleaned and heated to 450°C than conducted by a zinc bath at which it attains the required zinc coating.

The TRENCHCOAT PE (polyfine)- foil is directly sealed on the zinc after galvanizing. The sheet steel temperature in combination with the roller pressure provide an excellent chemical and mechanical bonding between the film and the coating plate.

The TRENCHCOAT combines 3 properties in one product. Steel is the base material; it is strong and solid, zinc provides to the product a chemical physical protection and the PE foil provides a mechanical protection on both sides to the product. The result is a product that is corrosion-resistant of moisture, abrasion of chemical fluids.

| | No aggressive environment | Aggressive environment | |
|--|---|---|-----------------|
| Atmospheric aggression according to the EN ISO 12944-2 | <ul style="list-style-type: none"> • C1 • C2 | <ul style="list-style-type: none"> • C3 | |
| Water parameters | <ul style="list-style-type: none"> • pH of 6.5 to 8,0 • Hardness of water • Speed of water | <ul style="list-style-type: none"> • pH of 6.5 to 8,0 • Hardness of water • Speed of water | |
| Ground parameters | <ul style="list-style-type: none"> • pH of 6,0 to 8,0 • ground permeability • no organic parts exist • uneven • humidity | <ul style="list-style-type: none"> • pH of 6,0 to 8,0 • ground permeability • no organic parts exist • uneven • humidity | |
| corrosion protection duration | Zinc coating 42 um (600 g/m ²) | 20 - 40 jaar | Not recommended |
| | Zinc coating 70 um (1000 g/m ²) | 50 - 70 jaar | On request |
| | Zinc coating 42 µm (600 g/m ²) + polymeer laag 250 µm | meer dan 100 jaar | On request |

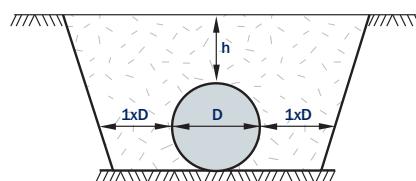
Minimum Cover Depth

The culvert depth is the vertical distance between the top of the culvert and the top of the road. For the determination of live load at a culvert a load distribution in the soil is used according the Boussinesq-methods.

In the table underneath the minimum cover is showed. The mentioned depth is based on the road structure of 10 cm. asphalt, 30 cm. mixed aggregates and remaining sand and a modulus of stiffness of 20 MPa.

Other road structures and coverage BCT can be calculated by BCT

Note: If construction traffic drives on top of the culvert before the road metal is applied, special measures can be necessary.



| Corrugation mm | Diameter mm | Plate thickness mm | Sv= 20 MPa | | |
|-------------------|----------------|-----------------------|------------|--------------------|--------------------|
| | | | LM1 | VOSB klasse 450 | VOSB Klasse 600 |
| 68 x 13 | 300 | 1,2 | 0,50 | 0,50 | 0,50 |
| | 400 | | 0,50 | 0,50 | 0,50 |
| | 500 | | 0,50 | 0,50 | 0,50 |
| | 600 | | 0,50 | 0,50 | 0,50 |
| | 700 | | 0,50 | 0,50 | 0,50 |
| | 800 | | 0,50 | 0,50 | 0,50 |
| | 900 | | 0,55 | 0,50 | 0,50 |
| 68 x 13 | 1000 | 1,5 | 0,60 | 0,50 | 0,50 |
| | 1100 | | 0,65 | 0,50 | 0,50 |
| | 1200 | | 0,70 | 0,50 | 0,50 |
| 76 x 25 | 1250 | 1,5 | 0,50 | 0,50 | 0,50 |
| | 1300 | | 0,50 | 0,50 | 0,50 |
| | 1400 | | 0,50 | 0,50 | 0,50 |
| | 1500 | | 0,55 | 0,50 | 0,50 |
| | 1600 | | 0,55 | 0,50 | 0,50 |
| 76 x 25 | 1700 | 2,0 | 0,60 | 0,50 | 0,50 |
| | 1750 | | 0,55 | 0,50 | 0,50 |
| | 1800 | | 0,60 | 0,50 | 0,50 |
| | 1900 | | 0,60 | 0,50 | 0,50 |
| | 2000 | | 0,65 | 0,50 | 0,50 |
| | 2100 | | 0,65 | 0,55 | 0,55 |
| | 2200 | | 0,70 | 0,55 | 0,55 |
| | 2250 | | 0,70 | 0,60 | 0,60 |
| 76 x 25 | 2300 | 2,7 | 0,65 | 0,60 | 0,55 |
| | 2400 | | 0,70 | 0,60 | 0,60 |
| | 2500 | | 0,70 | 0,65 | 0,65 |
| | 2600 | | 0,75 | 0,65 | 0,65 |
| | 2700 | | 0,75 | 0,70 | 0,70 |
| | 2800 | | 0,80 | 0,70 | 0,70 |
| | 2900 | | 0,80 | 0,75 | 0,75 |
| | 3000 | | 0,85 | 0,75 | 0,75 |

LM1: Lastmodel 1 volgens de EUROPipe (NEN6706).

VOSB: Verkeersbelasting met opgegeven klasse,

SPIROsol and SPIROsol TYPE SPM installation instructions

1. Bidding and fill material

The foundation and fill material must be consolidated and load capability, like sandy ground, grit and road metal etc. The tranches and the fill up soil must be in the close environment of the construction and must be clean of material like debris, wood, frozen soil etc. Besides a too high percentage of aggressive, loose and organic materials are not permitted. The surrounding ground layers should be able to provide sufficient support pressure. In the calculation of the constructions the support pressure assuming, large 20MN/m², which is referred to the SV number in our calculations. The volume weight of the replenishment material has to be 20 kN/m³ by an internal angle of friction of 30°.

2. Foundation

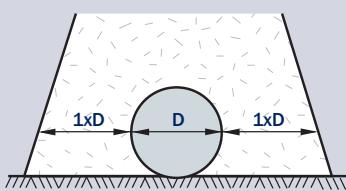
If the soil meets the requirements as mentioned above than it can be used as foundation and the construction can be installed. To assemble the corrugated pipes in the foundation it is necessary to provide 5 cm of loose sand or to rake the existing foundation. If it is a matter of a poorly energetic subsoil a soil improvement is necessary until the subsoil meets the requirement of point 1. Based on the surrounded soil improvement the norm should be 3x the diameter of width of the construction. If settlements are expected an arch is recommended. (ca ½% of the length).

The best foundation is the foundation that corresponds the shape of the construction.

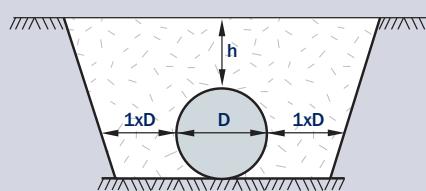


3. Filling in

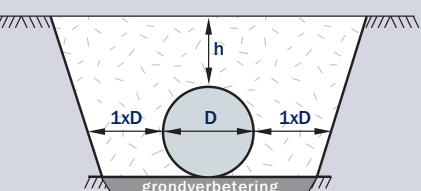
The filling in material should meet the requirements as mentioned in number 1. The required trench width is shown in picture 1 until 2. By burials the slope should



1. Placement of an embankment



2. Placement of a burial of which the excavated material meets the requirements.



3. Placement of a burial of which the excavated material does not meet the requirement soil improvement is necessary.

meet the natural slope of the excavated material. By installation at a planar foundation the filling in material should be installed underneath the pipe in the corners in 200 mm thick layers and it should be consolidated till a maximum of Proctor density of 98%. The density may not be obtained by accomplishing the soil compaction so far that the construction will be rise. When this is accomplished the actual filling of in layers of 200-300 mm thickness begins.

Every layer should be wiped out and mechanically consolidated. The soil compaction should be done simultaneously on both sites of the pipe, from the side of the trench wall into the direction of the pipe. Distances nearby 700 mm and 500 mm above the construction and in position of the bevel end the soil compaction should happen by using concrete tamper or light low frequency soil compaction material with a hit head of approx. 500 mm². Heavier soil compaction material can be applied at larger distance from the pipe.

4. Installation

By installation the SPIROsol systems the next following steps should be considered:

- a. Damages, of any kind, must be avoided.
- b. Before the construction traffic is allowed at the construction the filling in and the soil compaction activities must be completed and meet the requirements of the design, calculation of construction phase or final phase.
- c. By using the construction as culvert the filling in and the soil compaction activities must be completed before water will be lead through.

5. Remarks

When circumstances arise in which are rules are insufficient our technical department need to be contacted. The rules can be changed or supplemented without any notice.



Structural design

Every application of SPIROsol type SPM requires a technical design with i.a. an index of benchmark taxes, flow cross section, quantity of air for choosing the correct diameter. The requirements of corrosion

reserves and lifetime qualify the selection for coating and steel thickness. SPIROsol and SPIROsol type SPM are custom produced according the technical design.

Special applications



Tijdelijke duikers Almere



Wij denken en doen ook graag met u mee!



Multi-plate, gegolfd staal duikers en tunnels

Super Cor, gegolfd staal duikerbruggen en tunnelconstructies



ROwat kunststof beschoeiing en damwand



ROwat damwand



RObu PE leidingsystemen



ROwat klapankers



BERGSCHENHOEK CIVIELE TECHNIEK

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Het keurmerk voor verantwoord bosbeheer

