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 UNICREDIT BANK

Techical sheet

Corrugated polyethylene pipe for gravitional sewage system

1. Product identification

Corrugated high-density polyethylene pipes for sewerage and rainwater collection networks with gravity flow, with double wall made by continuous co-extrusion. The outer wall is structured - corrugated - black and the inner wall is smooth - smooth - white or black.

SC TEHNO WORLD SRL has implemented and certified an integrated management system according to ISO 9001, ISO 14001 and ISO 45001, also the products have a Product Conformity Certificate issued by the accredited certification body Bureau Veritas.

Packaging: bars at 6 meters nominal useful length with or without a double plug mounted on the pipe and EPDM gaskets for sealing according to SR EN 681-1.

Marking: in accordance with SR EN 13476.

2. Norms

The pipes are produced according to the European standard SR EN 13476-3: Pipe systems of plastic materials for evacuation and sewerage without pressure, underground. Pipe systems with structured walls of unplasticized polyvinyl chloride (PVC-U), polypropylene (PP) and polyethylene (PE).

The pipe is approved in Romania by Technical Approval, producer SC TEHNO WORLD SRL.

3. Fabrication

Raw material: high density polyethylene granules, with the following proprieties:

Name	UM	Value
Density	kg/m ³	≥930
Fluidity index (MFR)	g/10min	<1.60
Modulus of elasticity to traction	MPa	800-1200
Tensile strength	MPa	>22
Elongation at break	MPa	50-1000
Coefficient of linear thermal expansion	mm/mK	0.13-0.19
Chemical resistance to wastewater and household water	pH	2-12
Maximul temperature for use in sewer systems	°C	90

4. Use

- ❖ Sewage systems for household waste water, meteoric water, industrial water
- ❖ Meteoric water drainage systems
- ❖ Underpasses and drainages for roads, highways, railways
- ❖ Construction of bridges and access roads
- ❖ Various hydrotechnical arrangements

5. The advantages of PE corrugated pipes

- ❖ Low specific weight, very practical for assembly and installation
- ❖ Good resistance to external loads in various conditions of use
- ❖ Optimal hydraulic performance in the short and long term
- ❖ Resistance to chemical, electrochemical and mechanical aggressions
- ❖ Abrasion resistance
- ❖ High impact resistance
- ❖ Bidirectional hydraulic tightness of the joint system
- ❖ Reduced adhesion of deposits and easy cleaning
- ❖ Lifespan of over 50 years
- ❖ Overall profitability of the installation - speed of assembly and commissioning.

6. Pipe characteristics

NAME	VALUE
Temperatures	❖ (- 20 / + 90) °C;
Circumferential stiffness	❖ (according to EN ISO 9969) ≥ 4 kN/m ² , ≥ 8 kN/m ² with internal diameter deformation equal to 3%;
Flexibility	❖ (according to EN 13968) no delamination of the walls, cracks or curvatures after the deformation of the external diameter equal to 30%;
Shock test at 0°C	❖ TIR $\leq 10\%$ (according to EN 3127) no crack, delamination or deformation after the actuation of the test beam

Hydraulic tightness test

- ❖ (according to EN 13254) - pipe assembly, plug, gasket (0.5 bar / 1min)
- ❖ No water leaks

Abrasion resistance

- ❖ according to EN 295-3 approx. 0.2mm at 400,000 cycles, Darmstadt method

7. Absolute roughness

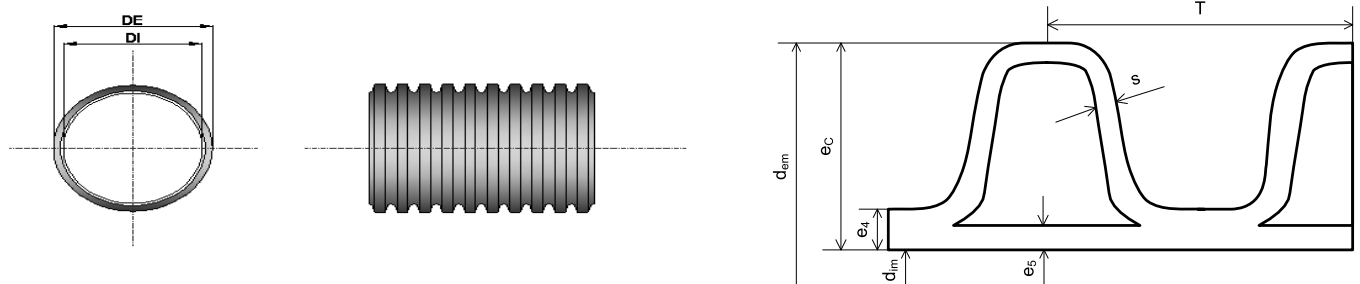
The coefficient of absolute roughness (Colebrook coefficient) for polyethylene corrugated tubes with a smooth inner wall is adopted 0.009-0.012. Based on it, the following hydraulic dimensioning table was drawn up:

DE		110	160	200	250	315	335	400	450	500
DI		90	135	176	216	271	300	343	400	427
Slope 2‰	Q	2.04	5.75	11.66	20.13	36.85	48.33	69.07	104.08	123.88
	v	0.32	0.41	0.49	0.56	0.65	0.70	0.76	0.84	0.88
Slope 5‰	Q	3.21	9.09	18.43	31.82	58.27	76.41	109.22	164.56	195.87
	v	0.50	0.65	0.77	0.88	1.03	1.10	1.20	1.33	1.39
Slope 1%	Q	4.55	12.85	26.06	45	82.4	108.06	154.46	232.73	277.01
	v	0.71	0.92	1.09	1.25	1.46	1.56	1.70	1.89	1.97
Slope 5%	Q	10.17	28.74	58.28	100.63	184.26	241.64	345.37	520.39	619.41
	v	1.60	2.05	2.44	2.8	3.26	3.48	3.81	4.22	4.41

DE		565	630	670	800	930	1000	1200
DI		500	535	600	690	800	853	1025
Slope 2‰	Q	188.71	226.02	306.86	425.09	660.86	779.25	1296.48
	v	0.98	1.02	1.11	1.20	1.34	1.40	1.59
Slope 5‰	Q	298.37	357.37	485.18	672.12	1044.91	1232.11	2049.92
	v	1.55	1.62	1.75	1.90	2.12	2.21	2.51
Slope 1%	Q	421.96	505.39	686.15	950.53	1477.72	1742.47	2899.02
	v	2.19	2.29	2.47	2.68	3	3.12	3.55
Slope 5%	Q	943.53	1130.09	1534.29	2125.44	3304.28	3896.27	6482.41
	v	4.90	5.12	5.53	6	6.70	6.98	7.93

3. Dimensional characteristic

The standard length is 6 meters. On request, pipes with different lengths can be produced.



In accordance with the provisions of the SR EN 13476-3+A1: 2020 standard, corrugated pipes are produced according to two series of diameters: DI and DE series. The dimensions of the pipes are presented in table 1.

Table 1: Dimensional characteristics of PE corrugated pipes

DN/OD	$d_{im,min}$	$e_{4,min}$	$e_{5,min}$
110	90	1.0	1.0
125	105	1.1	1.0
160	134	1.2	1.0
200	167	1.4	1.1
250	209	1.7	1.4
315	263	1.9	1.6
400	335	2.3	2.0
500	418	2.8	2.8
630	527	3.3	3.3
800	669	4.1	4.1
1000	837	5.0	5.0
1200	1005	5.0	5.0

DN/ID	$d_{im,min}$	$e_{4,min}$	$e_{5,min}$
300	294	2.0	1.7
400	392	2.5	2.3
500	490	3.0	3.0
600	588	3.5	3.5

9. Accessory

Technical options are provided for connecting pipes with structured walls:

- Coupling with an injected plug, sealing with an EPDM rubber gasket with a special profile provided by the pipe manufacturer – figure 1.

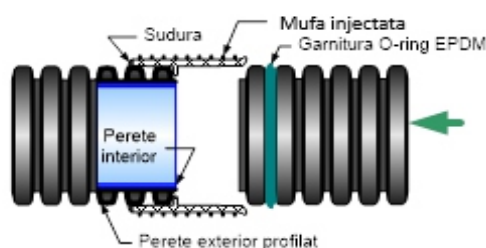


Fig. 1 Connection with injected socket

- Coupling with double plug, sealing with two EPDM rubber gaskets with a special profile provided by the pipe manufacturer - figure 2.

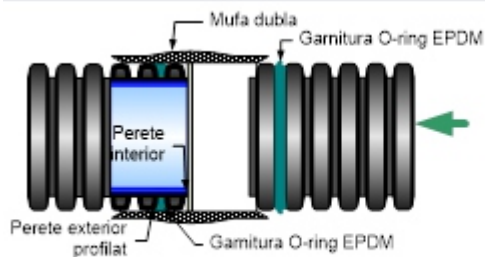


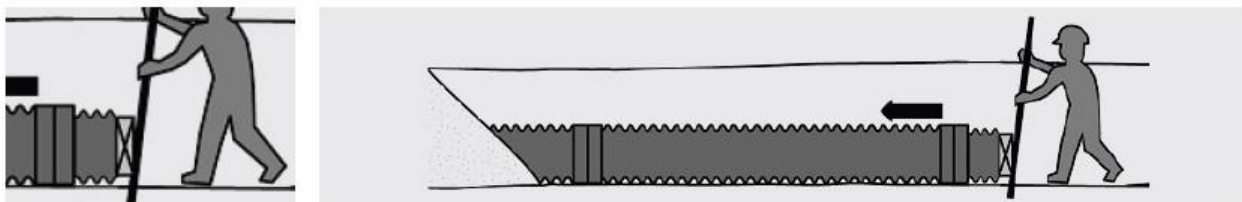
Fig. 2 Connection with double socket

10. Joints and assembly

The laying of the tubes is carried out according to SR EN 1610. For a correct merger, the following processes will be followed:

❖ Manual joining of small diameter tubes:

1. Check the correct alignment of the tubes
2. Use one end of the tube in the free sleeve
3. Use a rectangular piece of thick wood depending on the thickness of the tube
4. Place the piece of wood over the sleeve
5. With the help of a bar, make a lever and push so that the tube goes completely into the sleeve.

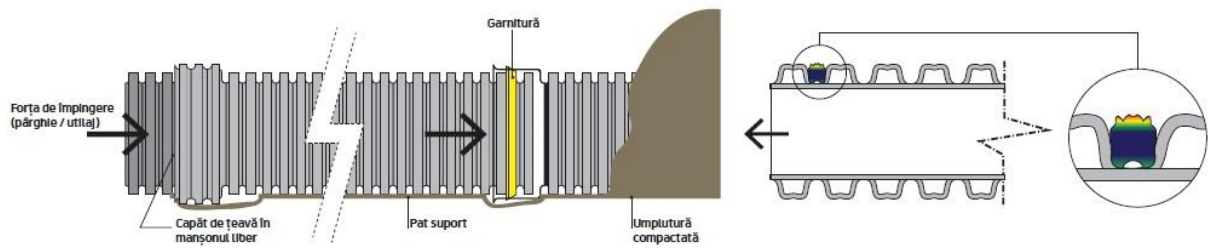


❖ Connecting large diameter pipes

1. Use one end of the pipe to press the tube; do not press directly on the sleeve of the tube!
2. Check the correct alignment of the tubes
3. Use one end of the tube in the free sleeve
4. Use a rectangular piece of thick wood depending on the thickness of the tube
5. Place the piece of wood over the sleeve
6. With the help of a machine, push slowly so that the tube goes completely into the sleeve

ASSEMBLY

Check that the tube sleeve does not show major deformations; in this case, it must be removed, and the plugging will be done with separate plugs from the connection. Before plugging in, check how far the end of the tube must enter the sleeve (without the gasket). It is good to mark the position on the tube as far as it should go so that the plug is complete.



Also check the positioning of the sealing gasket (it must be positioned between the first and second corrugated ring for tubes with $DE \geq 250$, and between the second and third corrugated ring for tubes with $DE \leq 200$).

It must not be, in any way, twisted or crooked (See the drawing).

1. Make the laying bed of the sand tube; layer thickness 100-150mm depending on the diameter of the tube.
2. Do not compact the painting bed; make gaps in the joint area, so that the pipe rests on its entire length and not on the plug/connection.
3. The maximum granularity of the filling material: 22mm for $DN \leq 200$ and 40mm for $DN > 200 \div 630$.
4. After plugging, fill the voids and compact the joint area, thus ensuring a continuous support bed.
5. Fill the space around the tube in layers of maximum 200mm which you compact successively.
6. Continue filling until it exceeds 150mm (300mm for the roadway area) the upper part of the pipe.
7. The excavated material can be used to fill the trench as long as it can be compacted and does not have large grains.
8. Take into account the degree of compaction of the filling material depending on the destination: roadable, pedestrian or non-roadable.

12. Lifetime and warranty

For buried pipe systems, under the conditions of a correct selection of the type of pipe in accordance with the demands imposed by the constructed network, of the appropriate dimensioning, of the correct handling, transport, storage and commissioning, the lifetime of the supplied PEHD sewerage pipes by SC TehnoWorld SRL is valued by the manufacturer at a minimum of 50 years.

In compliance with the requirements for handling, transport, storage and commissioning specified by this technical specification, the manufacturer grants a guarantee of 24 months from the date of delivery.

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