PICENUM**PLAST**

Elysée

COMPANY PROFILE

✓ LEADING EUROPEAN PRODUCER OF PIPES MADE OF PE, PP AND STRUCTURED WALL PIPES

- ESTABLISHED IN 1974
- 2022 TURNOVER: 54 MLN EUR
- GLOBAL MARKET
  - Infrastructures (water, gas, sewage, cableducts)
  - Irrigation
  - Buildings
- N. OF EMPLOYEES: 100
- PRODUCTION: 25.000 Tons/yr
- 2 PRODUCTION SITES
  - Pipe production site: No. 3 production facilities
    - PE (polyethylene pipes)
    - PVC (PVC pipes)
    - COR (double-wall pipes)

PRODUCT PORTFOLIO

PVC-U



- Conveyance of water under pressure UNI EN ISO 1452
- Sewerage and drainage not under pressure UNI EN 1401-1
- Vertical discharge inside buildings UNI EN 1329
- Ventilation and miscellaneous applications inside buildings
- Well sleeves for vertical perforations and underground water suction
- Cable ducts for Low-Tension undreground installations

PE



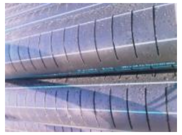
- PE100 Pipelines for underground gas distribution UNI EN 1555
- PE100 Pipelines for water and fluids distribution under pressure UNI EN 12201 - UNI EN ISO 15494
- LD-PE for irrigation not under permanent pressure UNI 7990
- HD-PE for underground sewerage not under pressure UNI EN 12666-1
- HD-PE for underground cabledeucts and miscellanous applications

COR



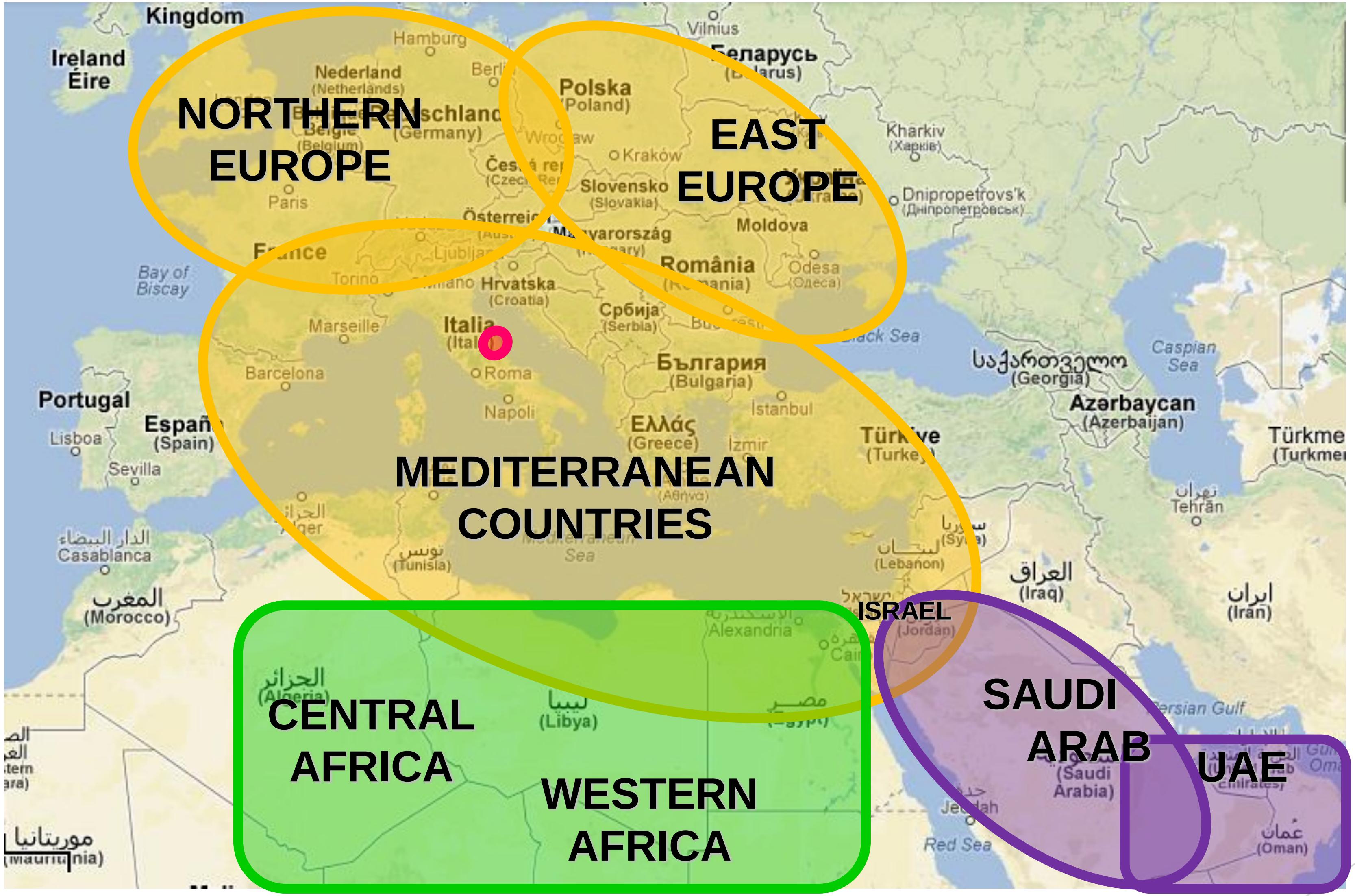
- Sewerage and drainage not under pressure UNI EN 13476-3
- Underground Cable ducts CEI EN 61386-24
- Optical fiber cable ducts and miscellaneous applications
- Slotted pipes for underground protective drainage

STV

- PE/PVC/CORSlotted pipes for draining trenches
- PESlotted pipes for bio-gas suction
- PESlotted landfill leachate captation
- PE/PVC Threaded pipes for well sleeves and miscellaneous applications

A GLOBAL MARKET



PICENUM**PLAST**

Presents

euroSewer

Mario Iaccarino
R&D Picenum Plast

05/09/2024

FRAMEWORK

- ✓ ***ENVIRONMENTAL CHANGES AND NON-CONTROLLED URBAN GROWTH LEAD TO HYDRO-GEOLOGICAL INSTABILITY AND CRITICAL SITUATIONS WHERE SAFETY IS IMPAIRED***

- ✓ ***NEW STANDARDS AND CRITERIA AIMING TO MATCH NEW CRITICAL CONDITIONS DEMAND FOR WASTEWATER AND DRAINAGE NEWTORKS WITH HIGHER PERFORMANCES, CAPABILITY AND RELIABILITY***
- ✓ ***PLASTIC MATERIALS USED IN PIPING INDUSTRY PASSED A TREND OF TECHNOLOGICAL GROWTH:***

  - ✓ ***RAW MATERIAL PEFORMANCES***
  - ✓ ***UPGRADED PRODUCT STANDARDS***
  - ✓ ***PRODUCTION TECHNOLOGY***
  - ✓ ***PRODUCT PERFORMANCES AND RELIABILITY***

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<<PE / PP structured-wall piping system according to EN 13476-3 with ribbed double-layer socket joint for sewage and drainage not under pressure>>

THE NORM

EN 13476-3 (2020)

Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of PVC-U, PP and PE
Part 3: Specifications for pipes and fittings with smooth internal and profiled external surface and the system, Type B

Raw materials: PE, PVC or PP

Structured wall type:
- A: (Outer smooth, inner smooth)
- B: (Outer profiled, inner smooth)

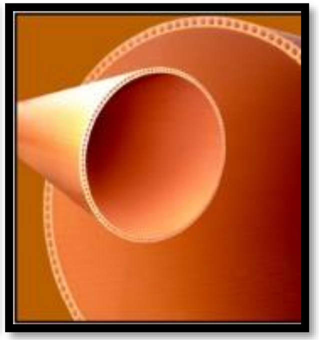
Field of application:
- U: Outside the building structure
- UD: Outside and inside the buildings

THE NORM

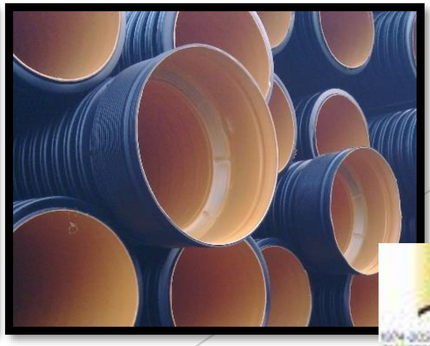
EN 13476-3
(2020)

Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of PVC-U, PP and PE
Part 3: Specifications for pipes and fittings
with smooth internal and profiled external surface and the system, Type B

Part 2 Specifications for pipes and fittings with smooth internal and smooth external surface and the system, Type A



Part 3: Specifications for pipes and fittings
with smooth internal and profiled external surface and the system, Type B

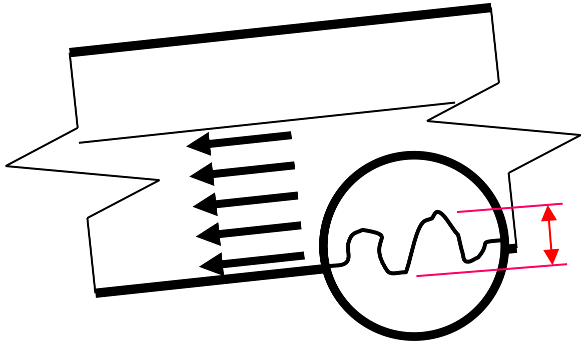


RAW MATERIAL FEATURES

CHEMICAL & PHYSICAL ASPECTS	LOW MASS DENSITY CHEMICAL STABILITY WEAR RESISTANCE
MECHANICAL ASPECTS	YOUNG MODULUS TOUGHNESS IMPACT RESISTANCE
TECHNOLOGY	MANUFACTURING RAW MATERIAL AVAILABILITY
SOCIAL, ENVIRONMENTAL & ECONOMICAL ASPECTS	MATURITY (GERMANY, 1957) NO HEAVY METALS COST EFFECTIVENESS RECYCLE

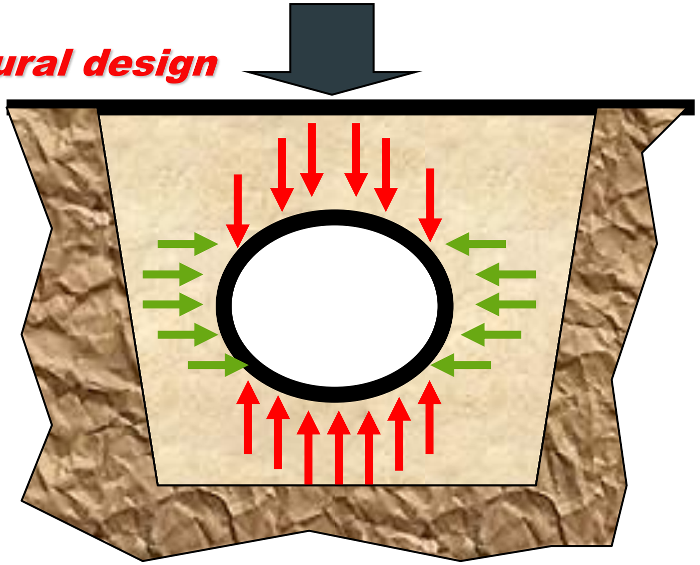
STRUCTURED WALL

Hydraulic design

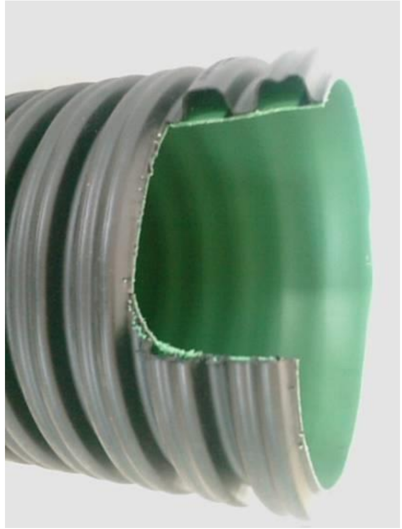


$$Q = v \cdot A = A \cdot c \cdot \sqrt{R \cdot i} \propto \varepsilon$$

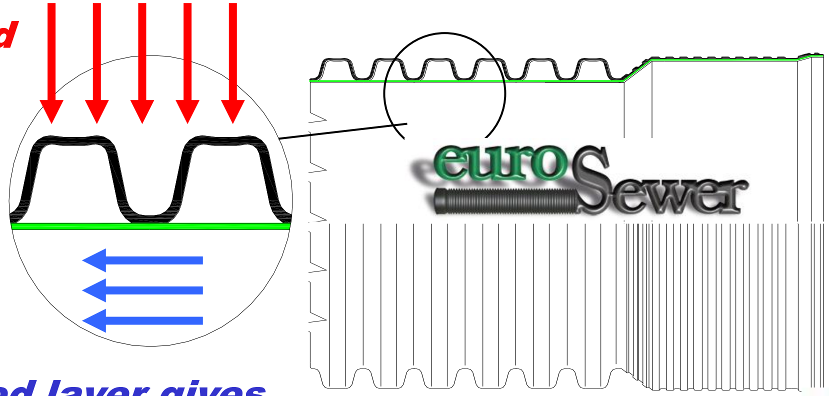
Structural design



$$SN = E \cdot \frac{I}{D_m^3} \propto e$$



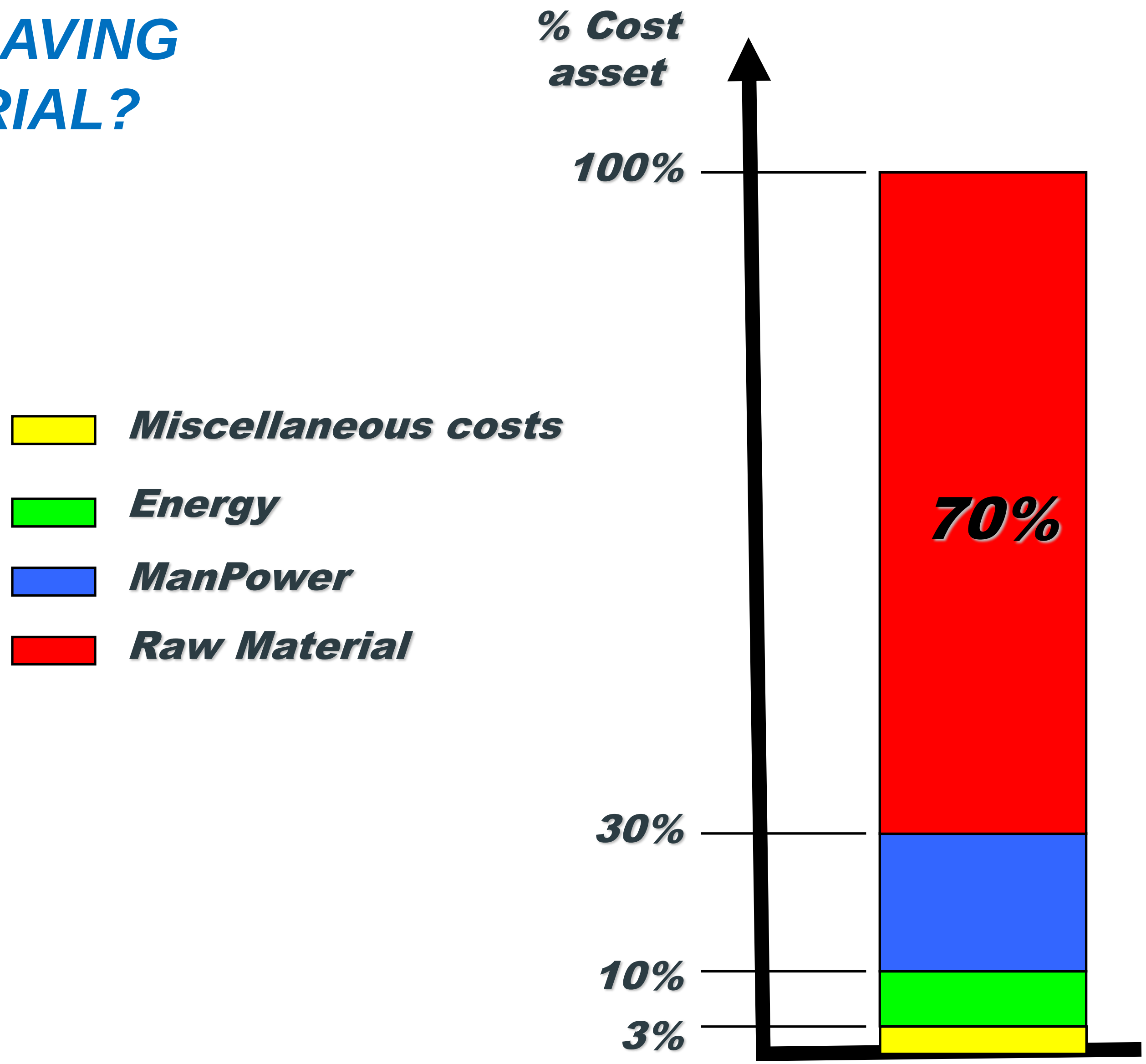
- The external profiled wall gives high Momentum of Inertia, thus providing high strenght (SN)



- The smooth calibrated layer gives low roughness, thus providing high hydraulic performances (speed, flow-rate)

STRUCTURED WALL

WHY SAVING MATERIAL?



OPERATIONAL ADVANTAGES

LIGHTWEIGHT

- ✓ **Moving advantages**
- ✓ **Handling advantages**
- ✓ **Safety of Personnel**

OPERATIONAL ADVANTAGES

CHEMICAL RESISTANCE

✓ To wear / Wash-out

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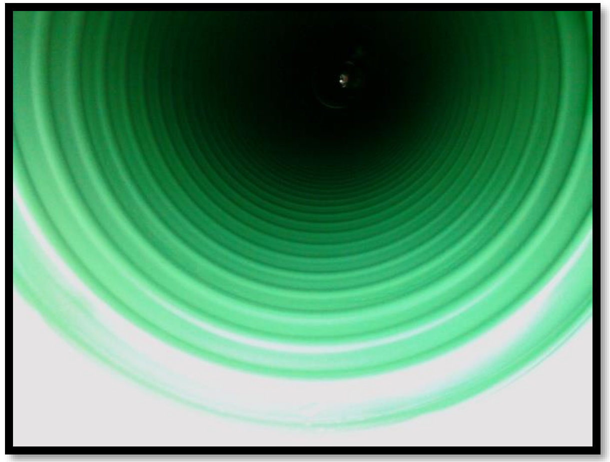
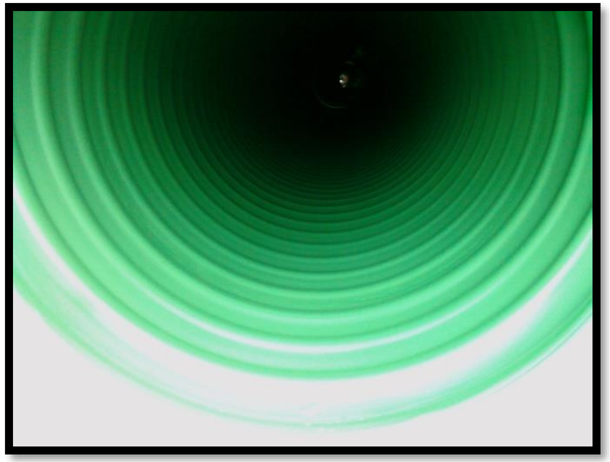


Cast Iron / mild steel

OPERATIONAL ADVANTAGES

CHEMICAL RESISTANCE

- ✓ To wear / Wash-out
- ✓ To biological housing / sedimentation

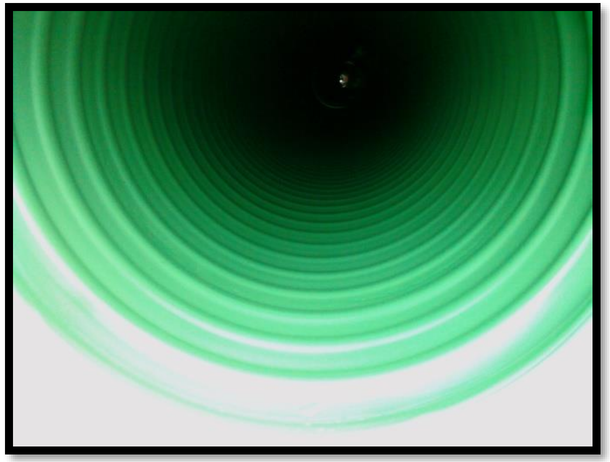


Cast Iron / mild steel

OPERATIONAL ADVANTAGES

CHEMICAL RESISTANCE

- ✓ To wear / Wash-out
- ✓ To biological housing / sedimentation
- ✓ To chemical attacks

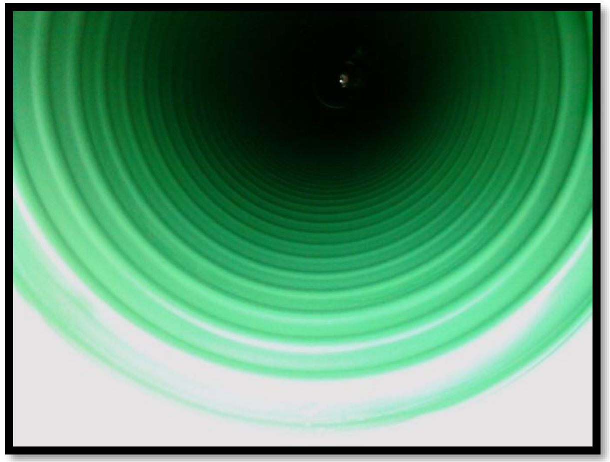


Concrete

OPERATIONAL ADVANTAGES

CHEMICAL RESISTANCE

- ✓ To wear / Wash-out
- ✓ To biological housing / sedimentation
- ✓ To chemical attacks
- ✓ To electro-chemical corrosion

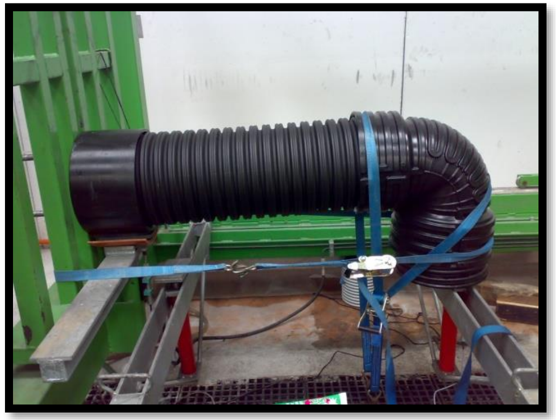


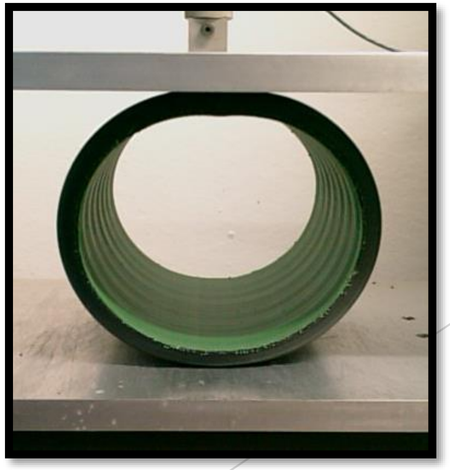
Cast iron / Mild Steel

OPERATIONAL ADVANTAGES

MECHANICAL PERFORMANCES

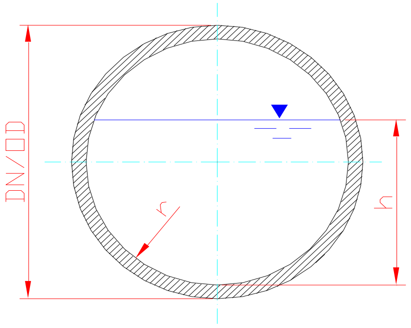
- ✓ Impact & Injuries resistance
- ✓ Optimal compromise Stiffness / Flexibility
- ✓ Joint tightness
- ✓ Bending

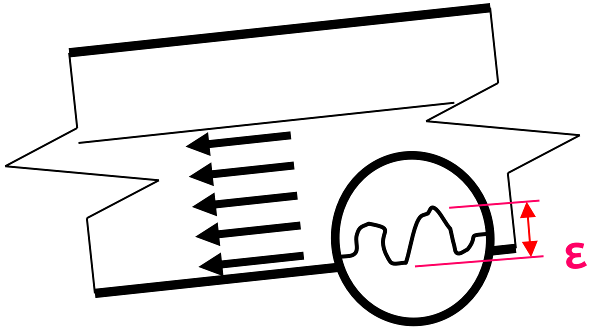




OPERATIONAL ADVANTAGES

HYDRAULIC PERFORMANCES





$$Q = C \cdot \frac{1}{2} r^2 \left\{ \left[\frac{\pi}{90} ar\cos\left(1-\frac{h}{r}\right) \right] - sen\left[2ar\cos\left(1-\frac{h}{r}\right) \right] \right\} \cdot \sqrt{i \frac{\frac{1}{2} r^2 \left\{ \left[\frac{\pi}{90} ar\cos\left(1-\frac{h}{r}\right) \right] - sen\left[2ar\cos\left(1-\frac{h}{r}\right) \right] \right\}}{r\left[\frac{\pi}{90} ar\cos\left(1-\frac{h}{r}\right) \right]}}$$

$$C = f(R, K)$$

Cross-section geometry (r) and flow conditions (h/r)

Physical features of the raw material (roughness)

OPERATIONAL ADVANTAGES

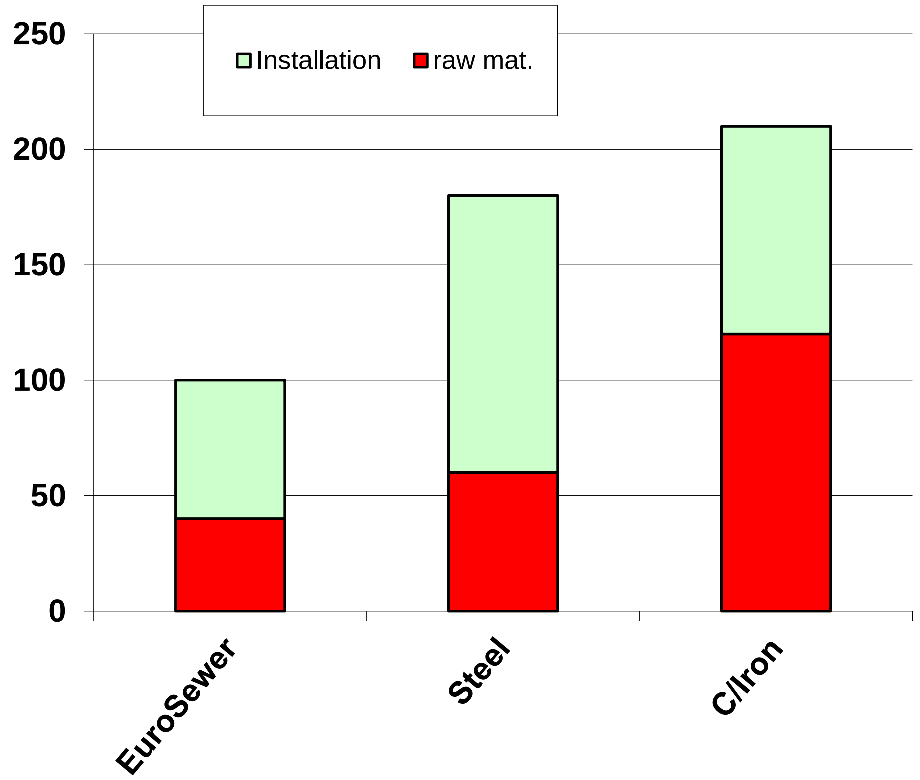
HYDRAULIC PERFORMANCES

- ✓ ***Polyethylene, as most of plastic materials, has very low roughness values***
- ✓ ***Unlike traditional materials, roughness doesn't change with use (no decay of the smoothness, due to destructive phenomena such as erosion, wear, chemical attacks, bacteria)***
- ✓ ***Under these hypothesis, the replacement of a "traditional" pipe (high roughness, low wear resistance) with a PE structured-wall pipe leads to many advantages, such as:***
  - *Flow-rate increase (long-term evaluation) up to 23%-60% with respect to concrete pipes*
  - *High resistance to chemical attacks, in particular to acids and to bacteria*
  - *Excellent wear / erosion resistance*

Raw material	K_s ($m^{1/3}$ sec^{-1})		
	PE	Concrete	Δ%
New	100÷80	80	0
After use	100÷80	65÷50	-23% ÷ -68%

Average Ks values for sewage networks, according to Gauckler-Strickler formula

OPERATIONAL ADVANTAGES



Installation costs for different materials
(EuroSewer as a reference = 100)

COST EFFECTIVENESS

- ✓ With respect to traditional materials
- ✓ Taking into account long-term costs (maintenance & repair)
- ✓ Quick Installation = less social impact

OPERATIONAL ADVANTAGES

FILLING MATERIAL GROUP	COMP. CLASS	SN (Non trafficked areas) Depth 1-3 m Undisturbed native soil group					
		1	2	3	4	5	6
1	W	1,25	1,25	2,0	2,0	4,0	5,0
	M	1,25	2,0	2,0	4,0	5,0	6,3
	N	2,0	2,0	2,0	4,0	8,0	10,0
2	W		2,0	2,0	4,0	5,0	5,0
	M		2,0	4,0	5,0	6,3	6,3
	N		*	6,3	8,0	8,0	*
3	W			4,0	6,3	8,0	8,0
	M			6,3	8,0	10,0	*
	N			*	*	*	*
4	W				6,3	8,0	8,0
	M				*	*	*
	N				*	*	*

SN4 SN8 SN16 ???

ENV 1046

- ✓ *Pipes can be installed at a depth 1-6 m without cast concrete protection*
- ✓ *Pipes can be installed either in non trafficked or heavy trafficked areas*
- ✓ *General installation prescriptions must be followed:*
  - ✓ *Trench size*
  - ✓ *Choice of filling soil*
  - ✓ *Choice of compaction method*

OPERATIONAL ADVANTAGES

Filling Material group	Compaction Class.	SN (Non trafficked areas) Depth 3-6 m Undisturbed native soil group					
		1	2	3	4	5	6
1	W	2,0	2,0	2,5	4,0	5,0	6,3
	M	2,0	4,0	4,0	5,0	6,3	8,0
2	W		4,0	4,0	5,0	8,0	8,0
	M		5,0	5,0	8,0	10,0	*
3	W			6,3	8,0	10,0	*
	M			*	*	*	*
4	W				*	*	*
	M				*	*	*

SN4 | SN8 | SN16 | ???

ENV 1046

- ✓ Pipes can be installed at a depth 1-6 m without cast concrete protection
- ✓ Pipes can be installed either in non trafficked or heavy trafficked areas
- ✓ General installation prescriptions must be followed:
  - ✓ Trench size
  - ✓ Choice of filling soil
  - ✓ Choice of compaction method

OPERATIONAL ADVANTAGES

Filling Material group	Compaction Class.	SN (Trafficked areas) Depth 1-3 m Undisturbed native soil group					
1	W	4,0	4,0	6,3	8,0	10,0	*
2	W		6,3	8,0	10,0	*	*
3	W			10,0	*	*	*
4	W				*	*	*

Depth 3-6 m

1	W	2,0	2,0	2,5	4,0	5,0	6,3
2	W		4,0	4,0	5,0	8,0	8,0
3	W			6,3	8,0	10,0	*
4	W				*	*	*

SN4 **SN8** **SN16** **???**

ENV 1046

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- ✓ *Pipes can be installed either in non trafficked or heavy trafficked areas*
- ✓ *General installation prescriptions must be followed:*
  - ✓ *Trench size*
  - ✓ *Choice of filling soil*
  - ✓ *Choice of compaction method*

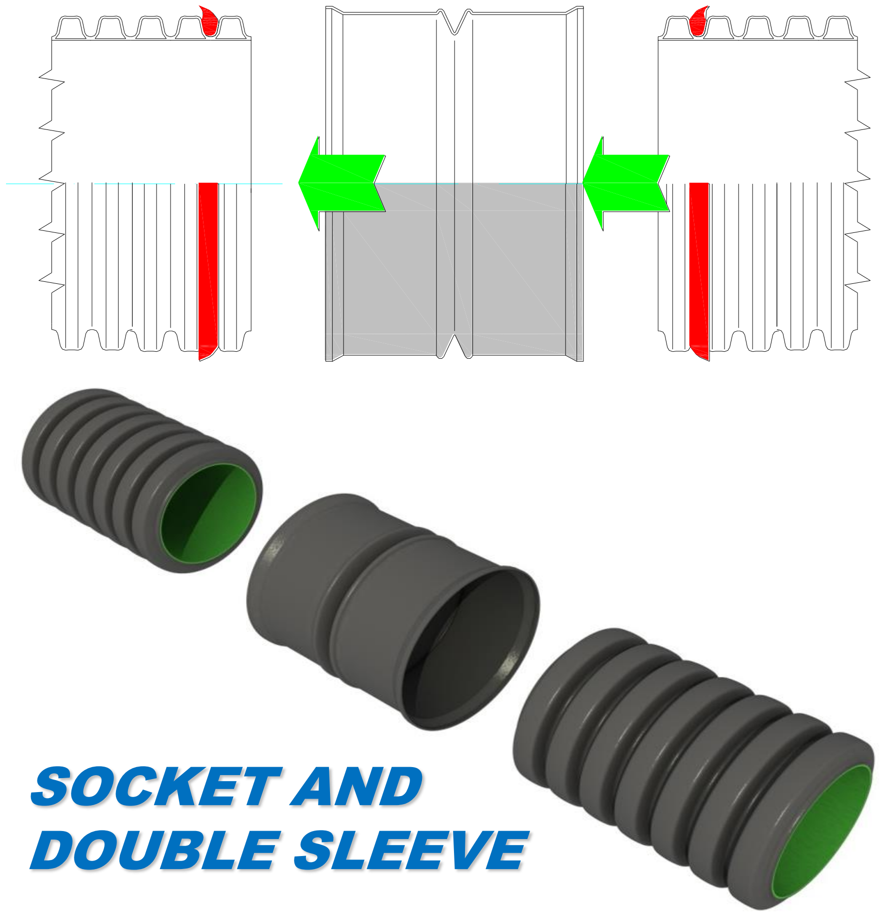
OPERATIONAL ADVANTAGES

- ✓ **Lightweight**
  - ✓ Moving & Handling advantages
  - ✓ Easy & Quick installation
- ✓ **Best resistance**
  - ✓ To electro-chemical corrosion
  - ✓ To chemical attacks
  - ✓ To wear
  - ✓ To biological housing / sedimentation
- ✓ **High mechanical performances**
  - ✓ Impact & Injuries resistance
  - ✓ Flexibility
  - ✓ Stiffness
  - ✓ Joint tightness
- ✓ **Custom manufacturing**
  - ✓ Lengths & Dimensions
  - ✓ Packages
  - ✓ Colours
- ✓ **Cost effectiveness**
  - ✓ Overall installation
  - ✓ Long-time (maintenance & repair)

QUALITY TESTING

Characteristic	Test method	Requirements
Ring Stiffness	EN ISO 9969	≥ SN declared by the prodcer
Creep modulus	EN ISO 9967 (defl. 3%)	≤ 4 (with 2-yrs extrapolation)
Impact strength at 0°C	EN ISO 3127	TIR ≤ 10%
Ring flexibility	EN 13968 (defl. 30%)	No decrease of the measured force No crack during test
Oven test	ISO 12091	No delamination
Water and air tightness of the joint	EN ISO 13259: H2O/defl.	No leakage for 15 min.
	EN ISO 13259: Air/defl.	ΔP < 10% per 15 min.
	EN ISO 13259: H2O/squash	No leakage for 15 min.
	EN ISO 13259: Air/squash	ΔP < 10% for 15 min.

JOINT SYSTEM

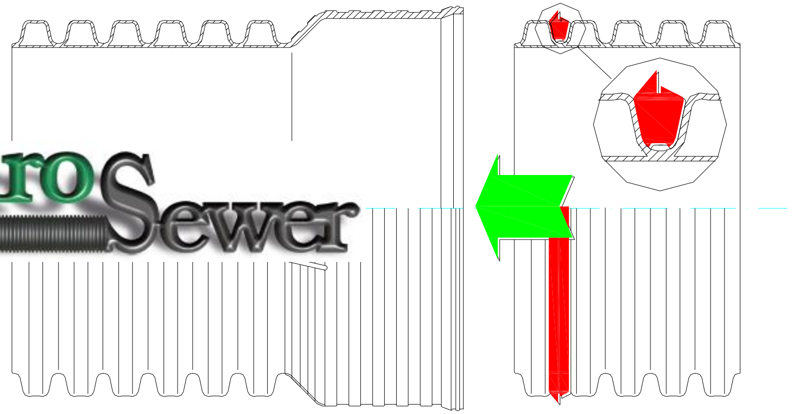


SOCKET AND DOUBLE SLEEVE

- Critical aspects:

- ✓ Two gaskets to be installed = two potential weak points for leeaking
- ✓ More time for installing, storing and checking operations
- ✓ Sleeves are generally the weakest part of the pipeline

JOINT SYSTEM



RIBBED DOUBLE-LAYER CUFF

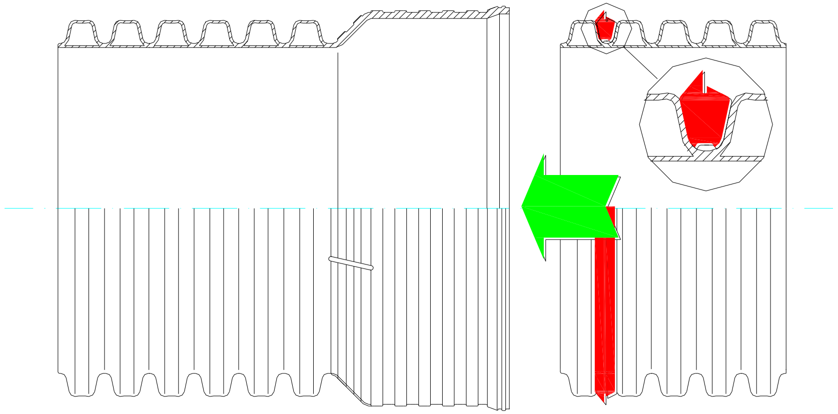
Integrated in-line joint system maufactured during pipe extrusion

euroSewer

- *Technical advantages*

- ✓ ***Half of weak points*** ***with respect to the sleeve joint system***
- ✓ ***Integrated system*** ***without any further technological process***
- ✓ ***Ribbed double-layer cuff :*** ***Structural reinforcement and mechanical stiffness just in the weakest point of the network***

JOINT SYSTEM



RIBBED DOUBLE-LAYER CUFF

Integrated in-line joint system maufactured during pipe extrusion

euroSewer

- Operational advantages

- ✓ ***Easier working site management:***
  Less items (sleeves, gaskets) to buy/manage
- ✓ ***Easier install**: less items to prepare/store/handle*
- ✓ ***Quick & safe install:***
  Less items to assemble/check
- ✓ ***Cost-effective install:***
  The advantages of structured wall pipes join to the double-layer cuff features

JOINT SYSTEM

RIBBED DOUBLE-LAYER CUFF

Integrated in-line joint system maufactured during pipe extrusion

euroSewer

- Operational advantages

- ✓ ***Easier working site management:*** Less items (sleeves, gaskets) to buy/manage
- ✓ ***Easier install:*** less items to prepare/store/handle
- ✓ ***Quick & safe install:*** Less items to assemble/check
- ✓ ***Cost-effective install:*** The advantages of structured wall pipes join to the double-layer cuff features

Raw Material: HD-PE (green), PP (yellow)

DN/OD (mm)	DN/ID (mm)	Ring Stiffness SN (KPa) HD-PE		PP	
125			8		
160			8		
200		4	8		16
250		4	8		16
315		4	8	8	16
	300	4	8	8	16
400		4	8	8	16
	400	4	8	8	16
500		4	8	8	16
	500	4	8	8	16
630		4	8	8	16
	600	4	8	8	16
800		4	8	8	16
1000		4	8	8	16
1200		4	8	8	16

✓ *Pipe sizes according to DN/OD standard (external diameter)*

- ***Wide range of sizes available (DN/OD 125 thru 1200 mm)***
- ***Availability of OD-based fittings and ancillaries from different producers for interchangeability****
- ***Easy comparison with DN/OD based sizes, e.g.:***
  - ***PVC pipes for sewerage according to EN 1401***
  - ***HD-PE pipes for sewerage according to EN 12666***

✓ *Pipe sizes according to DN/ID standard (internal diameter)*

- ***Easy hydraulic design, with a more familiar approach, since designs & checks can be performed by using tools, methods and tables***
- *Allows a quick comparison of the hydraulic properties with respect to traditional materials, in case of repair / replacement / improvement of exhisting sewage networks, e.g.:*
- ***Concrete pipes***
- ***Ceramic pipes (Grès)***
- ***Fiber-reinforced concrete pipes***
- ***Cast iron / Mild Steel***
- ***PRFV - GRP***

EUROSEWER FAMILY

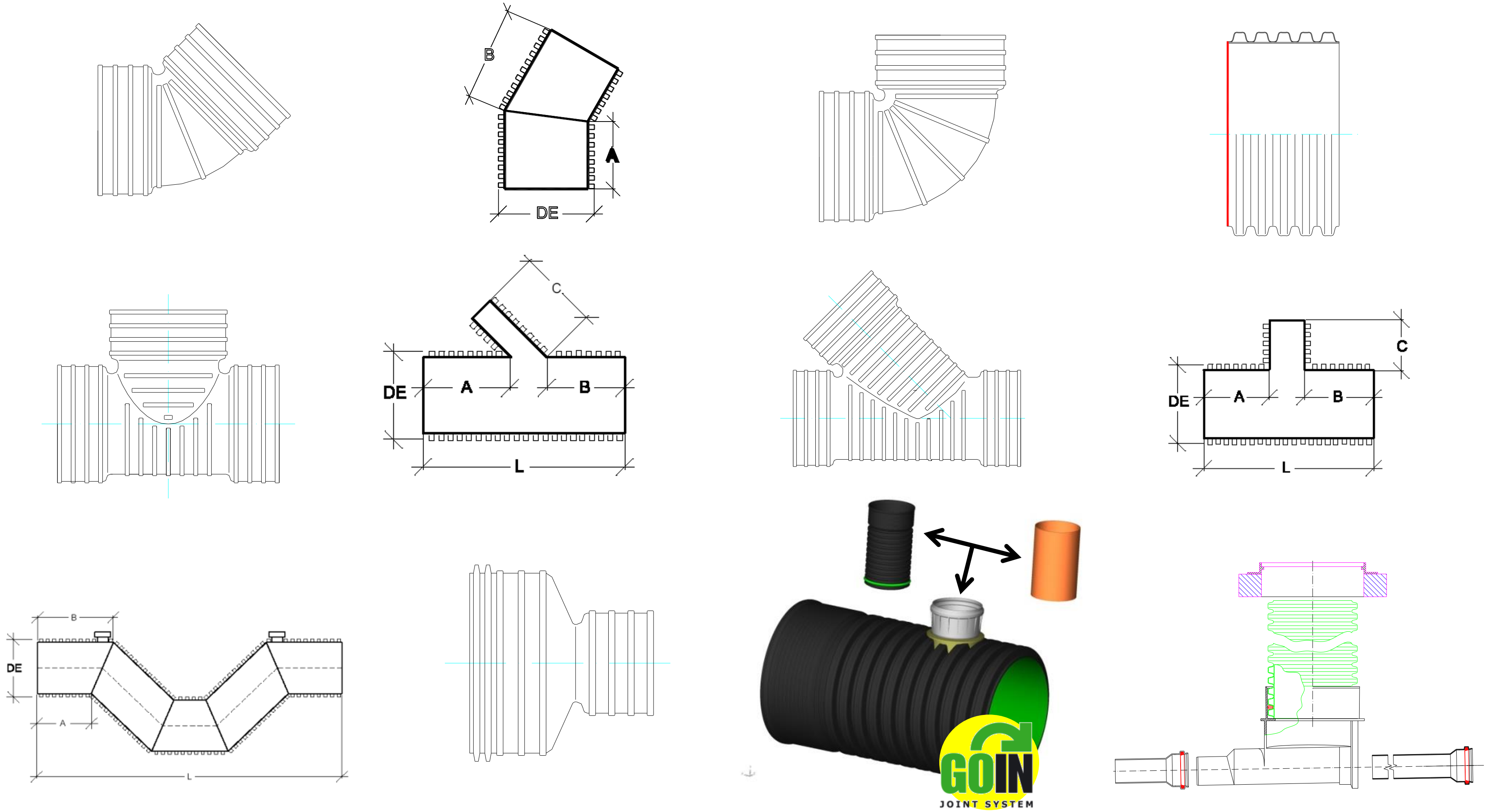
DN/OD (mm)	DN/ID (mm)	Ring Stiffness SN (KPa)			
125			8		
160			8		
200		4	8		16
250		4	8		16
315		4	8	8	16
	300	4	8	8	16
400		4	8	8	16
	400	4	8	8	16
500		4	8	8	16
	500	4	8	8	16
630		4	8	8	16
	600	4	8	8	16
800		4	8	8	16
1000		4	8	8	16
1200		4	8	8	16

✓ ***High-Stiffness pipes made of PP-HM***

- ***PP-HM provides high stiffness (SN 16 KPa) keeping constant pipe weight***
- ***High strenght makes installations more reliable against mistakes while pipe laying***
- ***Higher Stiffness helps to compensate underestimated soil conditions***
- ***Specific for critical installation conditions (e.g. high installation depth, bad native soils, high-traffick areas)***
- ***Available both DN/OD and DN/ID ranges***

Raw Material: ***HD-PE*** (green) ***PP*** (yellow)

THE SYSTEM



..And further standard / custom-made special items and fittings!

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→ Technical Data

- ✓ Product technical datasheets
- ✓ Installation procedures
- ✓ Technical manuals
- ✓ Performance tables

- ✓ Design software YouPipe BY PICENUMPLAST

CASE HISTORY

✓ **Rome (Italy)**

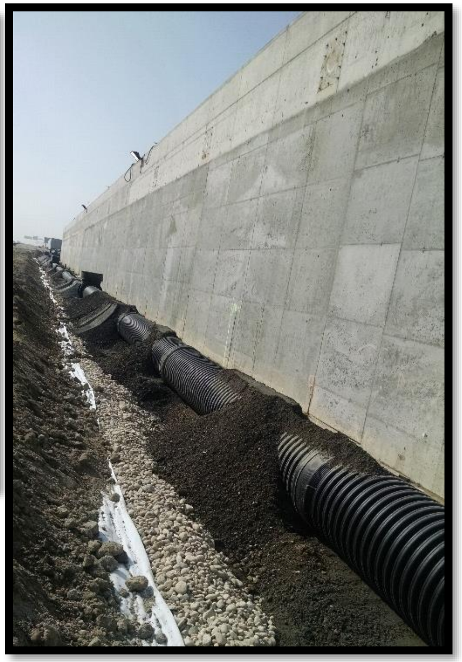
- ***Design of special pipe-in pipe for sewerage system preventing contamination in archeological areas***

CASE HISTORY

✓ ***Grottammare (Italy)***

- ***Speial manhole bases with EuroSewer pipe extention for stormwater drainage in seaside roadways***

CASE HISTORY



✓ **Milan (Italy)**

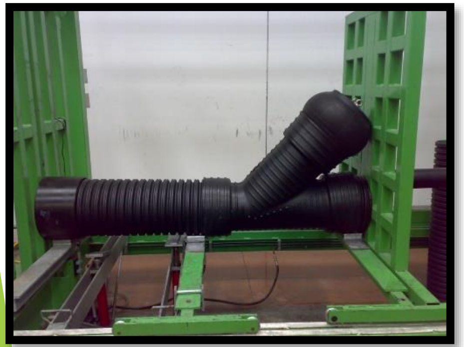
- ***Installation of DN/OD 1200 mm SN16 pipeline into a subway of a high-trafficked roadway***

CASE HISTORY

✓ **L'Aquila (Italy)**

- ***High deflection of DN/ID 300 mm pipe joint installed in earthquake area (2009)***
- ***Pipeline withstood final hydraulic test***

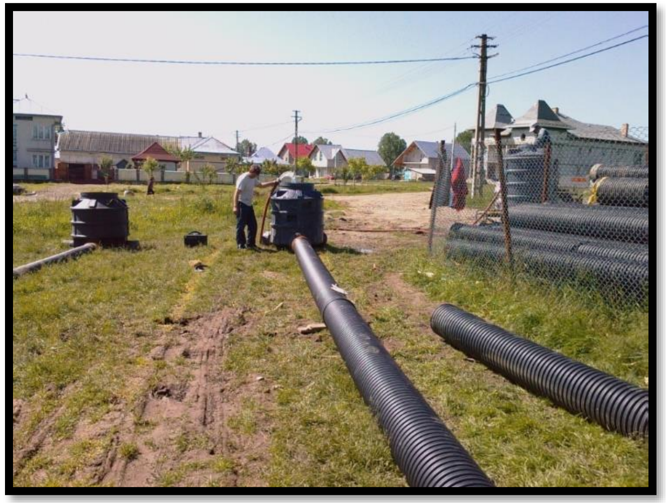
CASE HISTORY



✓ Tajura (Libya)

- ***Preliminary air test of DN/OD 800 mm pipe and fittings used in stormwater drainage system of new suburban area***

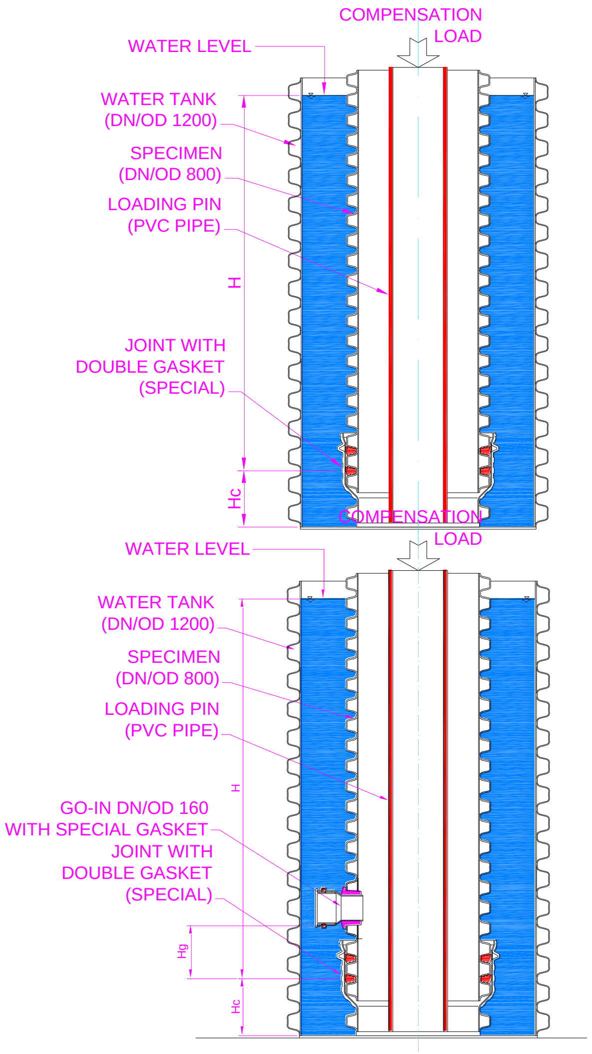
CASE HISTORY



✓ **Suceava (Romania)**

- ***Preliminary hydraulic testing of EuroSewer system (pipes+manholes) DN/OD 315 mm used in stormwater network of a main roadway***

CASE HISTORY



- ✓ **Larnaka (Cyprus)**
  - ***Special testing equipment for assessing hydraulic resistance of EuroSewer pipes and fittings to heavy watertable conditions***

Terms & Definitions

H **Depth of installation**

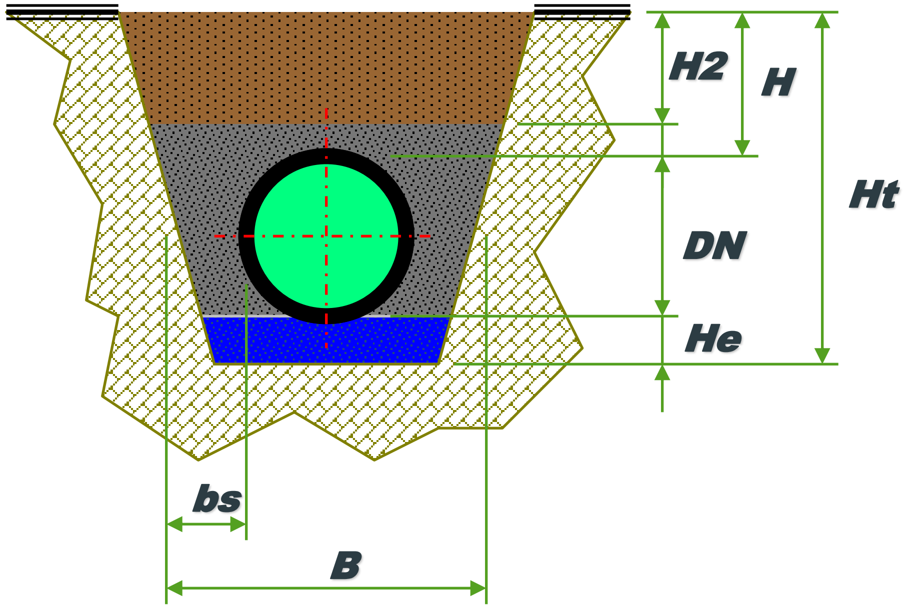
H2 **Remaining backfilling thickness**

Ht **Trench depth**

He **Bedding thickness**

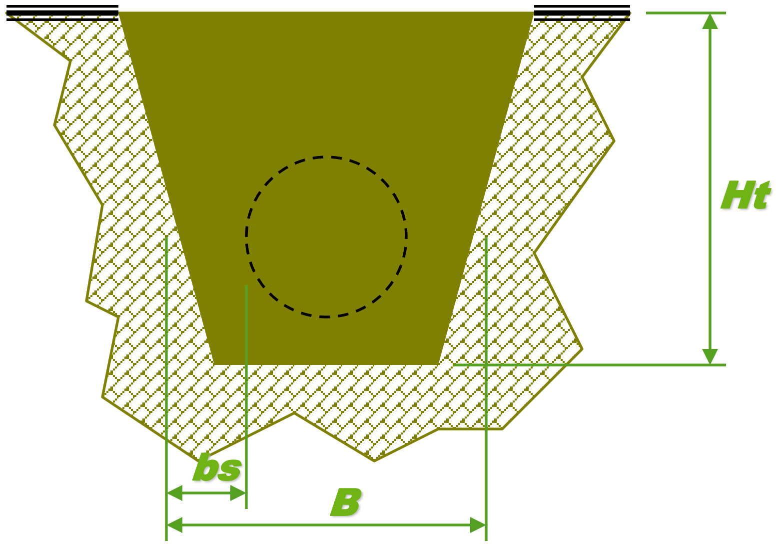
DN **Nominal size (outer diameter)**

B **Trench width**
B= DN+2bs



Trench Type	*Condition*
Narrow Trench	H ≥ 2B and B ≤ 3DN
Large Trench	H ≥ 2B and 3DN ≤ B ≤ 10DN
Infinite Trench	H ≥ 2B and B ≥ 10DN

PIPE INSTALLATION



- ✓ AVOID HAZARDOUS CONDITIONS
- ✓ SLOPE / SUPPORT THE TRENCH WALLS
- ✓ AVOID OBJECT FALLS AND WALL COLLAPSING
- ✓ BOTTOM OF THE TRENCH SMOOTH AND WITHOUT SHARP ROCKS
- ✓ KEEP MACHINERY AND HEAVY EQUIPMENT AWAY FROM THE TRENCH

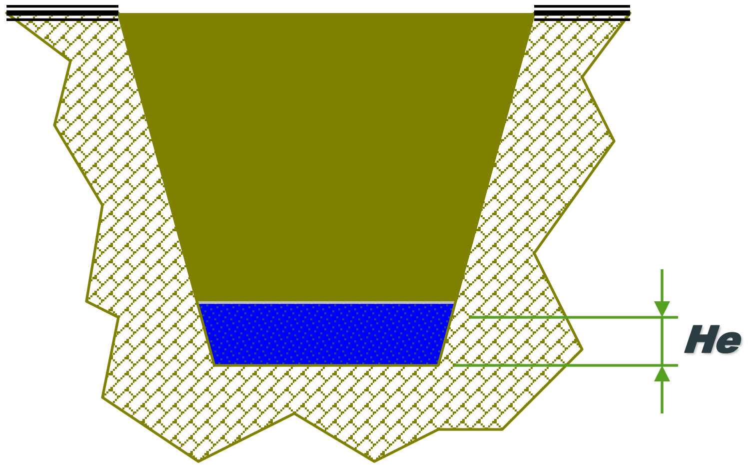
TRENCH WIDTH

bs

DN (mm)	bs (mm)	
	Typical	Minimum
DN≤300	250	250
300<DN≤900	300-400	400
900<DN≤1600	400-500	500

Backfilling

Bedding

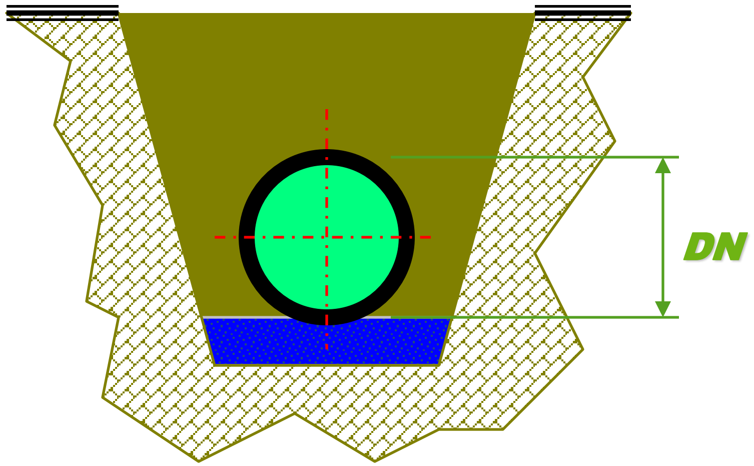


- ✓ ***PROVIDES UNIFORM SUPPORT FOR THE WHOLE LENGHT OF THE PIPE***
- ✓ ***LEVEL AND SPREAD THE BEDDING MATERIAL (KEEP SOFT)***
- ✓ ***PROVIDE HOLES FOR THE JOINTING PART (COMPACT THIS PARTS)***

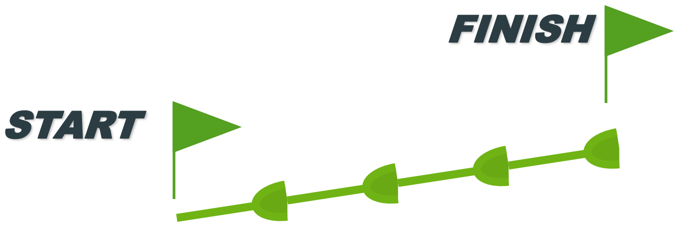
He **Bedding thickness = 100-150 mm (according to DN)**
Material: gravel / sand / crushed rock

PIPE INSTALLATION

Backfilling
Pipe laying



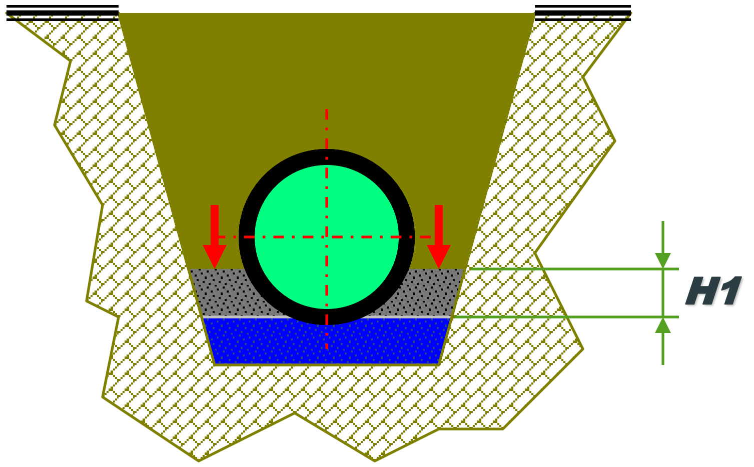
PIPE LAYING:



- ✓ PIPE MUST BEAR THROUGHOUTN ITS LENGHT
- ✓ CHECK / AVOID ANGULAR DEFLECTIONS
- ✓ CHECK THE INCLINATION OF THE PIPE FOR FLOW CONDITIONS
- ✓ JOIN PIPES ACCORDING TO I/CO-100
- ✓ CLOSE ENDS OF PIPING AFTER DAILY WORK
- ✓ PROVIDE FITTINGS FOR FUTURE CONNECTIONS

Backfilling

Pipe zone (1)

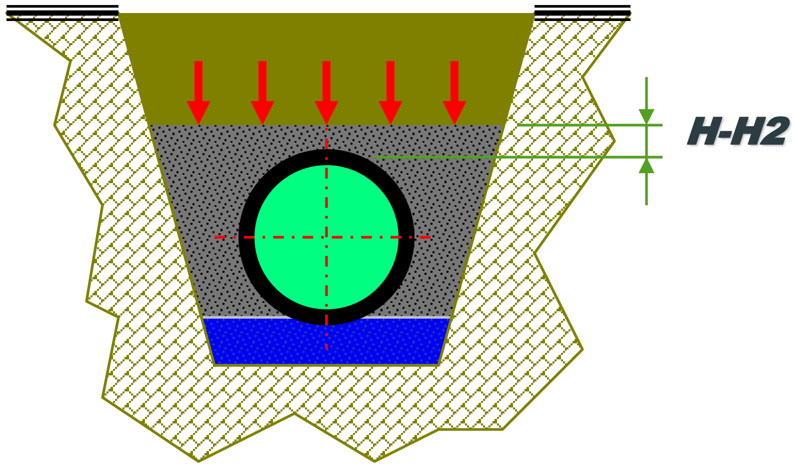


LAYER THICKNESS H1 ACCORDING TO

- ✓ **BASIC PROCEDURE:**
  - **Backfill in layers**
  - **Compact each layer**
- ✓ **USE ONLY CLASS 1-4 SOILS**

- ✓ **SOIL TYPE**
- ✓ **COMPACTION CLASS (N,M,W)**
- ✓ **COMPACTION METHOD**

Backfilling
Pipe zone (2)



LAYER THICKNESS H1

ACCORDING TO

- ✓ **BASIC PROCEDURE:**
  - **Backfill in layers**
  - **Compact each layer**
- ✓ **USE ONLY CLASS 1-4 SOILS**
- ✓ **REMOVE TRENCH PROTECTIONS WHILE FILLING**

- ✓ **SOIL TYPE**
- ✓ **COMPACTION CLASS (N,M,W)**
- ✓ **COMPACTION METHOD**

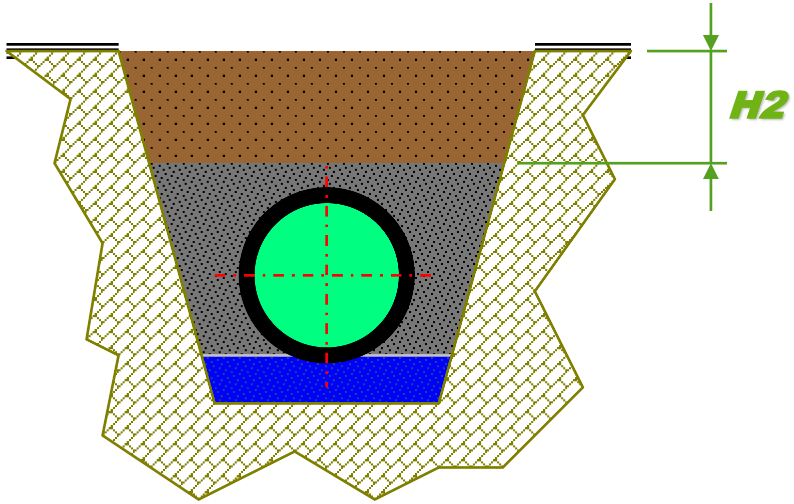
(H-H2) THICKNESS = 100 – 300 mm

Backfilling

Soil Type	Typical Name	Example(s)
1	Single-sized gravel	Crushed rock, river and beach gravel, morainic gravel, scoria, volcanic ash
	Well-graded gravels, Gravel-sand mixtures	
2	Single-sized sands	Dune & drift sand, valley sand, basin sand
	Well-graded sands, sand-gravel mixtures	Morainic sand, terrace sand, beach sand
3	Silty gravels, graded gravel-sand-silt mixures, clayey gravels	Weathered gravel, slope debris,
	Silty sands, poorly graded sand-silt mixtures	Liquid sand, loam, loess
	Clayey sands, poorly graded sand-clay mixtures	Loamy sand, alluvial clay / marl
4	Inorganic silts, very fine sands, rock flour	Loess, loam
	Inorganic clay, distinctly plastic clay	Alluvial marl, clay

Backfilling

Remaining backfilling



- ✓ ***EXCAVATED MATERIAL CAN BE USED****
- ✓ ***COMPACTION CLASS:***
  - ***W ONLY (trafficked areas)***
  - ***N (non-trafficked areas)***
- ✓ ***ARRANGE GROUND SURFACE ACCORDING TO PRESCRIPTIONS***

****MAX. PARTICLE SIZE = 300 mm***

Backfilling

Remaining backfilling – soil properties

- ✓ USE COMPACTABLE MATERIAL (WHERE APPLICABLE)
- ✓ NO PARTICLES GREATER THAN IN TAB
- ✓ NO FROZEN MATERIAL
- ✓ NO DEBRIS (E.G. ASPHALT, BOTTLES, CANS, TREES)

DN (mm)	Maximum size (mm)	
	Single size material	Well-graded gran. Mat.
DN≤100	10	15
100<DN≤300	15	20
300<DN≤600	20	30
600<DN	30	40

Final check

According to EN 1610

- ✓ ***DO NOT COVER THE JOINTS BEFORE THE FINAL CHECK (DM 12/85)***
- ✓ ***CHECK MANHOLES / FITTINGS / PIPES SEPARATELY (SUGGESTED)***
- ✓ ***CHECK METHOD:***
  - ✓ ***BY AIR (L)***
  - ✓ ***BY WATER (W) – main test***
- ✓ ***SEE EN 1610 FOR TEST PARAMETERS***

Thanks for your attention!

And now… question time

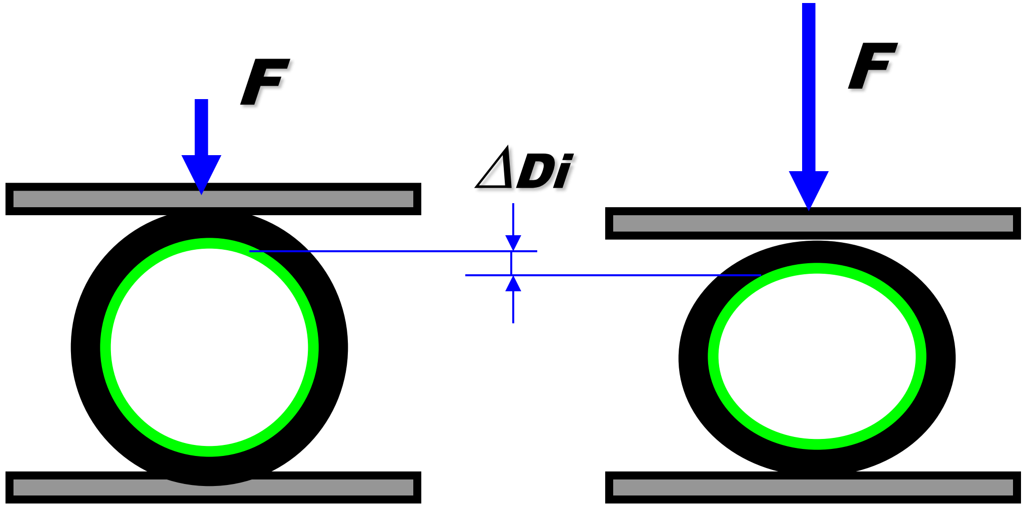
PICENUMPLAST

Picenum Plast spa
www.picenumplast.com

***Tecnical Office*:**
mario.iaccarino@picenumplast.com

EN ISO 9969

Ring Stiffness test



F steady increasing

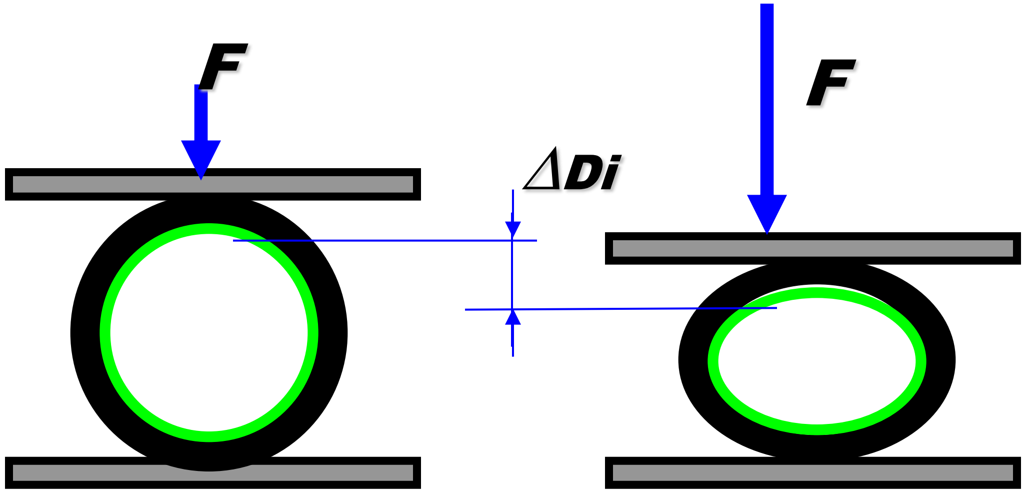
$\Delta Di = 3\% Di$

$L = 300\ mm$

$$SN = (0{,}01935)\,\frac{F_{3\%} \bullet Di}{0{,}03L}$$

EN ISO 13968

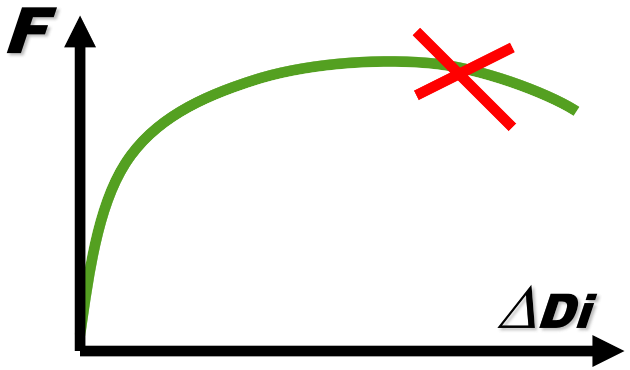
Ring flexibility test



F steady increasing

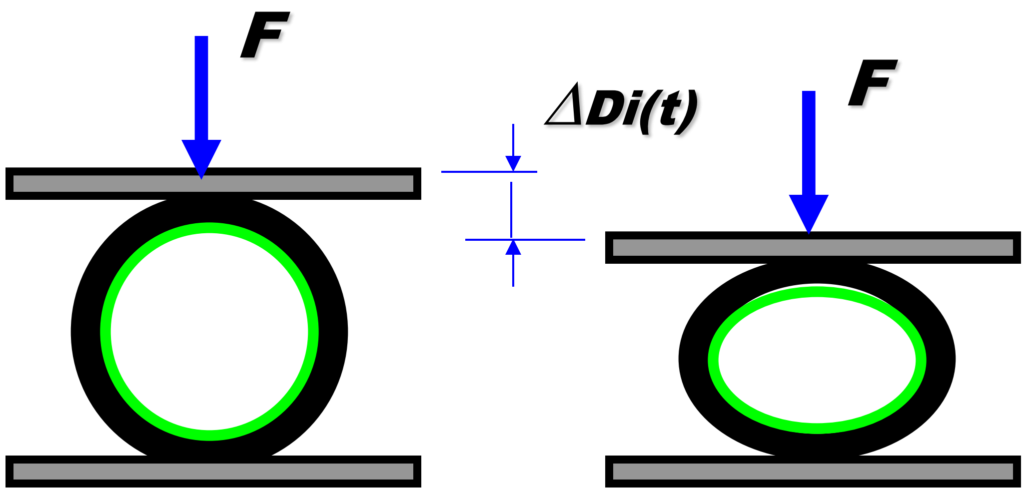
ΔDi = 30%Di

L = 5 corrugations



QUALITY TESTING

EN ISO 9967
Creep ratio test



F constant

ΔDi meas. At time intervals

Time test = 1000 hrs

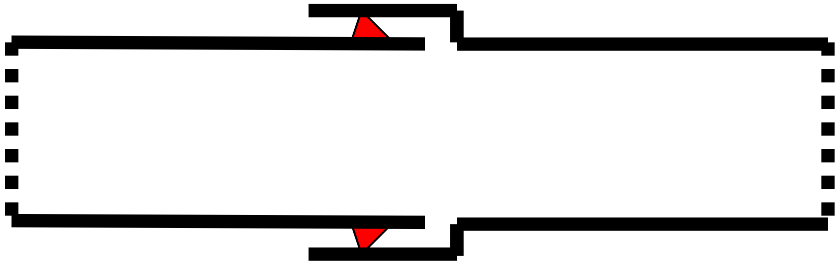
Extrapolation at 2yrs:

Creep Ratio $\leq$ 4

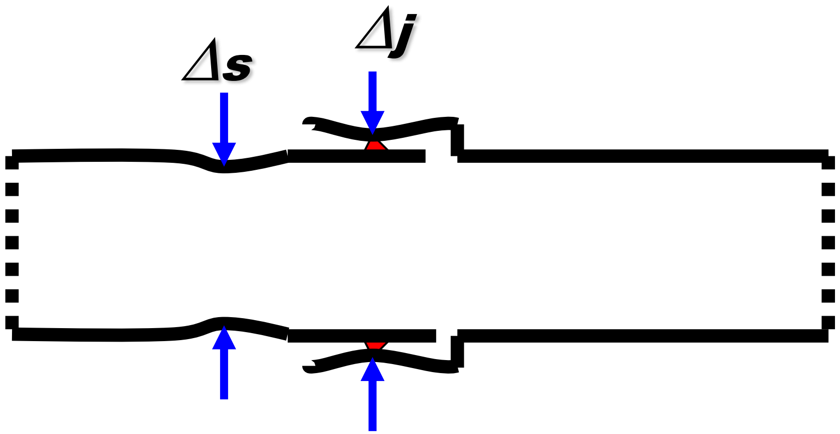
QUALITY TESTING

EN 13259

Joint tightness, cond. B – radial defl.



1m + 1m + joint sample



$\Delta j = 5\% D_i$, $\Delta s = 10\% D_i$

1. **P= 0,5 bar (water)**
2. **P= -0,3 bar (air)**

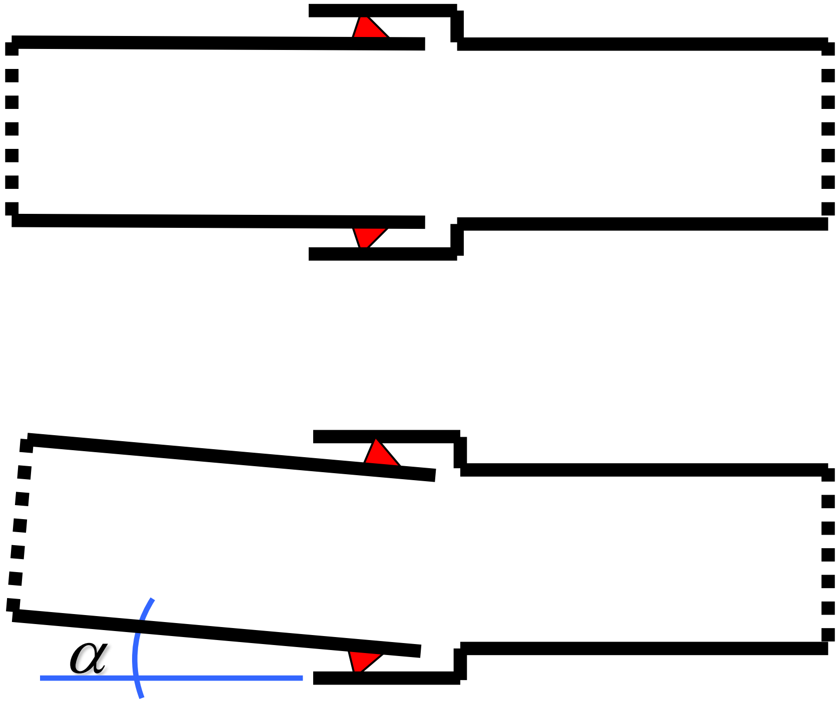
Water test:
No leakage for 15 minutes

Vacuum test:
ΔP max = 10% for 15 min.

QUALITY TESTING

EN 13259

Joint tightness, cond. C – angle defl.



1m + 1m + joint sample

α =f(D_i) 1°-2°

1. P= 0,5 bar (water)
2. P= -0,3 bar (air)

Water test:

No leakage for 15 minutes

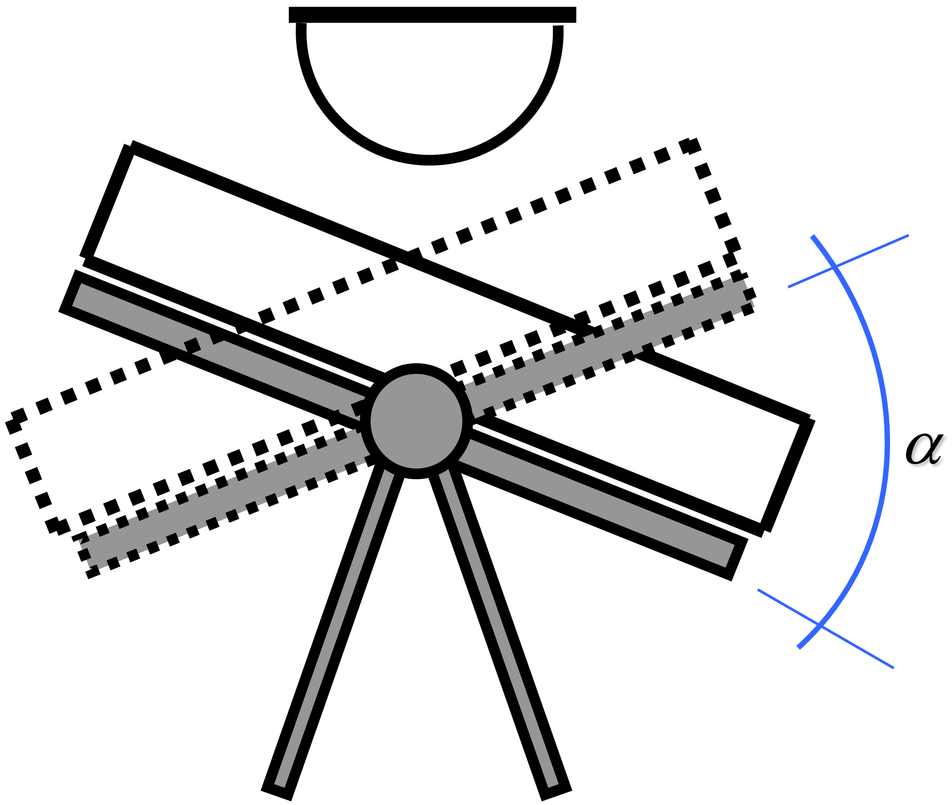
Vacuum test:

ΔP max = 10% for 15 min.

QUALITY TESTING

EN 295-3

Wear resist. test (optional)



Sample: half pipe (lenght = 1 m)

Water with sand & gravel mixture

α= 45°

100.000 cycles

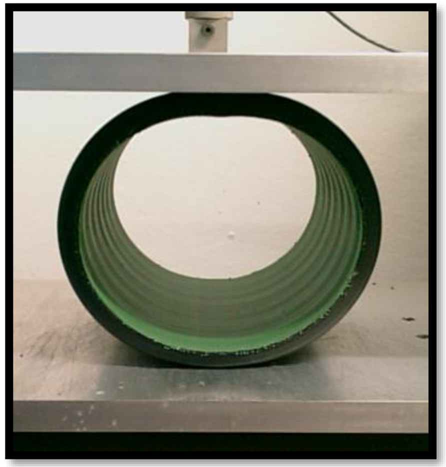
Cycle time: 3 sec.

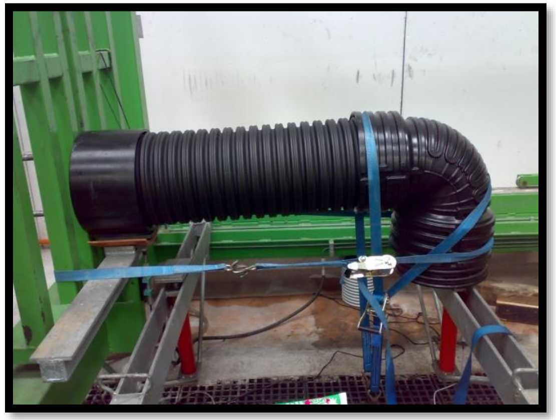
(total test time 3,5 days)

Result after 100.000 cycles:

Avg removed thickness < 0.1 mm

OPERATIONAL ADVANTAGES





MECHANICAL PERFORMANCES

- ✓ Impact & Injuries resistance
- ✓ Optimal compromise Stiffness / Flexibility
- ✓ Joint tightness
- ✓ Bending